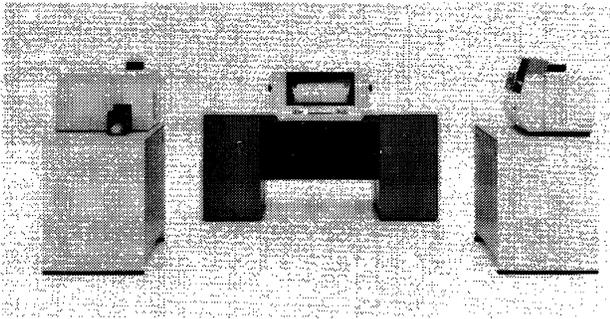


IBM 3770 Family Batch Communications Terminals



The 3775 Model P1 is one of the programmable members of the IBM 3770 Batch Communications Terminal family. The 3775 is equipped with a 120 lpm line printer, and accommodates a variety of peripherals, including card readers and a card punch.

MANAGEMENT SUMMARY

The 3770 Data Communication System was introduced in 1974. At one time, the family included 19 different models. Currently, the family consists of: the 3774 and 3775 P Series programmable terminals; 3776 and 3777 non-programmable terminals; and the 3771 teleprinter terminal, which is covered in Report C27-491-101.

The 3774 and 3775 are primarily oriented towards batch data entry. Each can perform standalone processing without control or supervision by a host CPU. When operating under IBM's Systems Network Architecture (SNA), each communicates with the host CPU as a single physical/logical unit in a single batch session. There are no facilities for establishing or maintaining inquiry/response sessions with the host.

Model 3774 provides medium speed serial printing as a standard feature, and supports a 155 lpm line printer, one or two diskette drives, a record display, a card reader, and a card punch as optional devices. The two available versions, 3774-P1 and 3774-P2, are identical, except for the speed of the serial printer, which is rated at 80 cps or 120 cps, respectively.

Model 3775 is similar to the 3774 except that it provides a line printer instead of a serial printer as standard, and accommodates no other printers. Lack of a 48-character set feature puts the top speed of the 3775's line printer at 120 lpm (64-character set) instead of the 155 lpm top speed with the 3774 optional line printer using a 48-character set.

User programs are written using a subset of 3790 Communication System programming statements, plus 3770 statements for punched I/O, the 480-character Display Feature, and diskette storage operations. Programs are assembled using a System/370 DOS/VS or OS/VS assembler and 3790 Host Support, including a Macro Library containing Program Validation Services (PVS). PVS is used to validate, ➤

This aging product line remains active as IBM's only dedicated batch terminal offering, but is slowly being overshadowed by its newer distributed processing systems, which feature multi-functional batch terminal emulation capabilities.

MODELS: 3774 Models P1 and P2; 3775 Model P1; 3776 Models 1, 2, 3, and 4; 3777 Models 1, 2, 3, and 4.

CONFIGURATION: The 3770 line consists of programmable (Models 3774 and 3775) and non-programmable (Models 3776 and 3777) batch communications terminals which feature printers operating at speeds from 80 to 120 cps, or from 300 to 1200 lpm.

SOFTWARE: Application programs for the 3774 and 3775 are written using a subset of the 3790 Communication System programming statements.

COMPETITION: Harris 1600 Series, plus other DDP systems which offer 3770 compatibility.

PRICE: Purchase prices range from \$8,310 to \$33,000. Rental and lease arrangements are available.

CHARACTERISTICS

VENDOR: International Business Machines Corporation, National Accounts Division, 1133 Westchester Avenue, White Plains, NY 10604. Telephone (914) 696-1900.

DATE OF ANNOUNCEMENT: 1974.

DATE OF FIRST DELIVERY: 3774/3775—April 1976; 3776—April 1976; 3777—August 1976.

SERVICED BY: IBM.

CONFIGURATION

Models 3774/3775

The 3774 Communication Terminal is a desk-style console equipped with a keyboard and a bidirectional serial matrix printer rated at 80 cps (in the 3774 Model P1) or 120 cps (in Model P2).

The 3775 Model P1 Communication Terminal is a desk-style console equipped with a keyboard and a line printer rated at 120 lpm when using a 64-character set and 80 lpm when using a 94-character set. ➤

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TABLE 1. MODEL COMPARISONS FOR IBM 3770 FAMILY

	3774	3774	3775	3776	3776	3776
	Model P1	Model P2	Model P1	Model 1	Model 2	Model 3
Maximum speed	80 cps	120 cps	120 lpm	300 lpm	400 lpm	300 lpm
Diskette storage	1,2, or 3 drives	1,2, or 3 drives	1,2, or 3 drives	1 or 2 drives optional	1 or 2 drives optional	1 or 2 drives optional
Console display	480 char. optional	480 char. optional	480 char. optional	None	None	1024-char. std.
Card readers	50, 150, or 300 cpm optional	150, 300, or 400 cpm optional				
Card punch	50 cpm					
Magnetic tape drive	None	None	None	None	None	1 drive optional
Protocols	BSC, SDLC, or BSC/SDLC	SDLC				
SNA addressability	Multiple Logical Unit	Multiple Logical Unit	Multiple Logical Unit	Single Logical Unit	Single Logical Unit	Multiple Logical Unit
Internal modems	1200 or 2400 bps	1200 or 2400 bps	1200 or 2400 bps	2400 or 4800 bps	2400 or 4800 bps	None
Transmission speed	Up to 4800 bps	Up to 19,200 bps				

▷ test, and format programs for the terminals. User memory capacity ranges from a basic 6K bytes to a maximum of 22K bytes.

The 3776 and 3777 batch terminals are members of the IBM 3770 family more because of a similarity of appearance than a functional similarity. Although they share some of the same peripherals (diskette storage and card devices) as the 3774 and 3775, the essential orientation is different. The 3776 and 3777 provide much faster printers (300 to 1200 lpm) than the 3774/3775 and do not permit keyboard data entry—two characteristics that distinguish them from conventional communications terminals as far as most users are concerned. The other defining characteristic of the 3774/3775, user programmability, has not been incorporated for these models.

Models 3776-1, 3776-2, 3777-1, and 3777-2 were announced in July 1975. These models were released as successors to the 2780/3780 batch terminals and the 360/20 HASP Multileaving Workstation, and were designed to provide bridging between the predecessor units and the SNA environment.

Models 3776-3, 3776-4, and 3777-3, were introduced in January 1978, and were designed specifically for operation in an SNA environment. The expanded capabilities of these units include enhanced job functions, terminal storage of utilities, operator procedures, etc. on a non-removable diskette, and the ability to control up to six concurrent job streams through SNA Multileaving. Unlike the older models, a console display (for terminal control and operator/host communications only) is standard, and support for a magnetic tape drive is available.

▶ In addition, each basic model is equipped with integrated, nonremovable diskette storage with a user capacity of 99,840 bytes (30 tracks) for storage of application programs and data. The terminals are also equipped with expandable main memory for user program storage. The 3774 and 3775 have a basic 6K-byte memory, expandable to 22K bytes in 4K, 8K, 12K, or 16K increments.

An optional Display Feature provides 480 display positions arranged in 12 lines of 40 characters each. This display employs gas panel technology and is swivel-mounted on the top left surface of the keyboard console.

Peripherals include: one or two additional diskette drives; a line printer rated at 155,120, or 80 lpm for character sets of 48, 64, or 94 symbols, respectively (available for Model 3774 only); a 50 cpm card punch; and one of three card readers rated at 50, 150, or 300 cpm.

Both the 3774 and 3775 support BSC, SDLC, or alternate BSC/SDLC operation, and are addressable in an SNA operation as a Multiple Logical Unit.

Models 3776/3777

The 3776 Communication Terminal is a desk-style console equipped with a keyboard and a line printer rated at 300 lpm (in the 3776 Models 1 and 3) or 400 lpm (in Models 2 and 4). These ratings are based on a 48-character set. The 300-lpm printer is rated at 230 lpm or 160 lpm with a 64- or 94-character set, respectively. The 400-lpm printer is rated at 300 lpm or 230 lpm with a 64- or 94-character set, respectively. The terminal can be optionally equipped with one or two diskette drives; a 50-cpm card punch; one of four card readers rated at 50 cpm (3776-1 and -2 only), 150 cpm, 300 cpm, or 400 cpm (3776-3 and -4 only); and one magnetic tape drive (3776-3 and -4 only). Keyboard data entry and editing are not supported.

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TABLE 1. MODEL COMPARISONS FOR IBM 3770 FAMILY (continued)

	3776	3777	3777	3777	3777
	Model 4	Model 1	Model 2	Model 3	Model 4
Maximum speed	400 lpm	1000 lpm std., 1200 lpm opt.	1000 lpm std., 1200 lpm opt.	1000 lpm std., 1200 lpm opt.	325 or 650 lpm; aggregate 975 or 1300 lpm
Diskette storage	1 or 2 drives optional	1 or 2 drives optional	1 or 2 drives limited use	1 or 2 drives optional	1 or 2 drives optional
Console display	1024-char. std.	None	1024-char. opt.	1024-char. std.	1024-char. std.
Card readers	150, 300, or 400 cpm optional	150, 300, or 400 cpm optional	150, 300, or 400 cpm	150, 300, or 400 cpm optional	150, 300, or 400 cpm optional
Card punch	50 cpm	None	50 cpm	50 cpm	50 cpm
Magnetic tape drive	1 drive optional	None	None	1 drive optional	1 drive optional
Protocols	SDLC	BSC, SDLC, or BSC/SDLC	BSC HASP Multi-leaving	SDLC	SDLC
SNA addressability	Multiple Logical Unit	Single Logical Unit	None	Multiple Logical Unit	Multiple Logical Unit
Internal modems	None	None	None	None	None
Transmission speed	Up to 19,200 bps	Up to 19,200 bps	Up to 19,200 bps	Up to 19,200 bps	Up to 19,200 bps

➤ The newest member of the family is the Model 3777-4. Also designed for use in an SNA environment, the 3777-4 provides for the attachment of the IBM 3262 Printer Models 2 and 12. The 3777-4 is functionally compatible with the 3777-3 with the exception of operational and forms design differences between the 3262 Printers and the IBM 3203 Printer Model 3, which attaches to the 3777-3.

A comparison of the features of the 3770 family is made in Table 1.

COMPETITIVE POSITION

The day of dedicated RJE/batch terminals is clearly over. Batch processing is one of many functions performed by today's multi-functional distributed data processing systems. Previously, the IBM 3770 product line competed with batch terminal offerings from companies such as Harris, Nixdorf, Northern Telecom, and Mohawk Data Sciences. Currently, there are a few DDP systems that provide 3770 compatibility; these include the Four-Phase Series IV, Harris 1600 Series, Inforex System 9000, Mohawk Data Sciences Series 21, Pertec XL, and Raytheon PTS 1200.

ADVANTAGES AND RESTRICTIONS

Due to the age and nature of the 3770 product line, it would not be appropriate to dwell on the restrictions of this family. The 3770 terminals were the leaders among the ➤

➤ The 3777 Communication Terminal is a desk-style console equipped with a keyboard and a line printer rated at 1000 or 1200 lpm when using a 48-character set and 870 or 1020 lpm when using a 60-character set. The terminal can be optionally equipped with one or two diskette drives; one or two Model 3262 line printers (3777-4 only); one of three card readers rated at 150, 300, or 400 cpm; a 50-cpm card punch (3777-2, -3, and -4 only); and a magnetic tape drive (3777-3 only). Keyboard data entry and editing are not supported. Models 1 and 3 (which are now in limited new production) support full off-line media operations; Model 2 (which is no longer in new production) does not.

A 1024-character console display is standard on the 3776-3/-4 and 3777-3/-4 and optional on the 3777-2. The 3776-3/-4 and 3777-3/-4 are also equipped with non-removable diskette storage used for message spooling, terminal controls, utility programs, user-generated operating procedures, and other terminal functions.

Models 3776-1, 3776-2, and 3777-1 support BSC, SDLC, or alternate BSC/SDLC operation, and are addressable in an SNA operation as a Single Logical Unit. In BSC mode, they can be used as replacements for an IBM 2780 or 3780. Models 3776-3, 3776-4, and 3777-3/-4 support SDLC operation only, and are addressable in an SNA operation as a Multiple Logical Unit. Up to six independent data streams can be transmitted to the host concurrently. The 3777-2 supports BSC only, and can replace a System/360 Model 20 HASP Multi-leaving Workstation.

TRANSMISSION SPECIFICATIONS

Models 3774/3775

Transmission is synchronous, half-duplex at up to 4800 bps, using either SDLC or BSC line protocol over the public switched telephone network or over a point-to-point or multipoint leased line. ➤

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▷ dedicated batch/RJE products that were in wide use a few years ago. With the advent of distributed processing, this product class has virtually disappeared. IBM still offers the 3770 family members still covered in this report, although a few of the models are available only on a limited basis.

USER REACTION

In June 1983, Datapro, in conjunction with *Data Communications* magazine, conducted the second edition of our Terminal Users Survey. A questionnaire, designed and produced by Datapro, was mailed to approximately 10,000 addresses selected at random from a cross-section of *Data Communications*' U.S. end-user subscriber base. A total of 36 responses were received by Datapro from users of the IBM 3770 family terminals covered in this report. Broken down by model, 4 users reported on the 3774/3775 terminals, representing an installed base of 8 units; 12 users reported on the 3776, representing an installed base of 60 terminals; and 20 3777 users responded, with a total of 72 installed units. These users were asked to rate their terminals in several categories. Their ratings are summarized in the following tables:

3774/3775—

	Excellent	Good	Fair	Poor	WA*
Overall performance	3	1	0	0	3.8
Ease of operation	2	2	0	0	3.5
Hardware reliability	3	1	0	0	3.8
Maintenance service/ technical support	3	1	0	0	3.8

3776/3777—

	Excellent	Good	Fair	Poor	WA*
Overall performance	11	17	3	1	3.2
Ease of operation	3	19	7	3	2.7
Hardware reliability	14	13	5	0	3.3
Maintenance service/ technical support	11	15	6	0	3.2

*Weighted Average based on a scale of 4.0 for Excellent.

The users were asked if they would recommend the 3770 family terminals to other users with similar applications. Of the 36 respondents, 26 answered that they would recommend them; 4 users responded that they would not; and the remaining users stated that they were undecided or did not respond to the question. □

▷ For attachment to a communications line, any 3774/3775 terminal requires one of three Communication Features, one of two Communication Drivers, and either an EIA Interface for an external modem or one of several internal modems.

The Communication Feature determines the line protocol used: Alternate SDLC/BSC; BSC Point-To-Point; or SDLC. A BSC Multipoint feature is available for use with

either the SDLC/BSC or BSC Point-to-Point option. The SDLC/BSC arrangement is switched manually between the two protocols. Either point-to-point or multipoint operation is permitted under SDLC. If multipoint operation is arranged over a full-duplex communications facility, one terminal can be transmitting while another is receiving.

The two Communication Drivers provide a clocked 1200 bps interface that is used with IBM's internal 1200 bps modems or an EIA RS-232-C interface without clocking for an external modem or IBM's self-clocking internal 2400 bps modem.

Three varieties of the 1200 bps modem are available for internal installation in all models. One is for operation over a point-to-point or multipoint leased (non-switched) line; one is for operation over the switched public telephone network with manual answering; and the third is for operation over the telephone network, but with automatic answering. The manual-answer modem connects to the network through a CDT data coupler; the automatic-answering modem requires a CBS data coupler for connection. The data couplers can be acquired from the telephone company or independent vendors. They will not be required if the modem features become FCC type certified.

There are also three types of 2400 bps internal modems: non-switched point-to-point; non-switched multipoint; and switched (telephone network) with automatic answering (requires CBS data coupler). All three provide half-speed operation at 1200 bps, with manual adjustment of equalization on the non-switched models. A Switched Network Back-Up Feature, available for either of the non-switched internal modems, permits the operator to establish a connection over the telephone network if the leased line goes down; manual intervention at the computer site and perhaps program modification may be required to fully use this feature. A Modem Fan-Out feature for the non-switched multipoint modem permits two additional terminals to share that modem. Operationally, the three terminals function as three stations in a multipoint BSC or SDLC arrangement; no special handling is required.

Models 3776/3777

Transmission is synchronous, half-duplex at up to 4800 bps (3776-1 and -2) or 19,200 bps (all other models), using either SDLC or BSC line protocol over the public switched telephone network or over a point-to-point or multipoint leased line. Models 3776-3/-4 and 3777-3 support SDLC protocol only, and can transmit in half- or full-duplex mode. The 3777-2 is restricted to point-to-point BSC operation.

The 3776-1/-2 and 3777-1/-2 terminals require one of three Communications Features and a Communications Driver to support terminal communications. The Communication Feature determines the line protocol used: Alternate SDLC/BSC; BSC Point-To-Point; or SDLC. A BSC Multipoint feature is available for use with either the SDLC/BSC or BSC Point-To-Point option. The SDLC/BSC arrangement is switched manually between the two protocols. Either point-to-point or multipoint operation is permitted under SDLC. If multipoint operation is arranged over a full-duplex communications facility, one terminal can be transmitting while another is receiving. The point-to-point BSC feature is standard in the 3777-2. The Communications Driver is without business machine clocking.

For the 3776-3/-4 and 3777, an integrated SDLC communications adapter without clocking is standard. ▶

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► Several types of interfacing are provided for attachment of an external modem. An EIA interface is available for all 3776 and 3777 models. A High Speed Digital Interface, available on all models except 3776-1/-2, supports point-to-point transmission at 19,200 bps via a leased-line wideband channel; the 3776-3/-4 and 3777-3 version also supports multipoint transmission. Two DDS Adapters, one for point-to-point and the other for multipoint communications, permit connection of the 3776-3/-4 and 3777-3/-4 to AT&T's Dataphone Digital Service network for 2400, 4800, or 9600 bps operation.

Three types of 2400 bps and 4800 bps internal modems are provided for the 3776-1 and -2 only: non-switched point-to-point; non-switched multipoint; and switched (telephone network) with automatic answering. All three provide half-speed operation at 1200 (or 2400) bps, with manual adjustment of equalization on the non-switched models. A Switched Network Back-Up Feature, available for any of the non-switched internal modems, permits the operator to establish a connection over the telephone network if the leased line goes down; manual intervention at the computer site and perhaps program modification may be required to fully use this feature. A Modem Fan-Out feature for the non-switched multipoint modems permits two additional terminals to share that modem. Operationally, the three terminals function as three stations in a multipoint BSC or SDLC arrangement; no special handling is required.

In general, operation over leased voice-grade lines with IBM modems at 1200 or 2400 bps requires no conditioning; operation at 4800 bps requires C1 conditioning. IBM markets an external 2400 bps modem (3872) and a 4800 bps modem (3874). The EIA interface is compatible with IBM, Bell System, and independent modems of appropriate characteristics.

All 3770 models include space compression/expansion for elimination of long sequences of spaces from transmission. A 2-character sequence replaces up to 63 spaces. This feature is usable with non-transparent data in either BSC or SDLC protocol as long as the diskette drive is neither the source nor destination of the transmitted data.

A 3770 terminal (any model) using SDLC line protocol can be attached to a System/370 or 4300 processor, utilizing a 3704/3705 Communications Controller. When under BSC line protocol, attachment can be made via a 3704/3705 Communications Controller or a 2701 Data Adapter unit to a System/370 or 4300 processor, or System/360 models 30, 40, 50, 65, 67, 75, or 195. All terminals and 3704/3705 features must be operating with the same type of clocking source (self-clocked modem or business-machine provide clocking) and at the same transmission speed.

SOFTWARE

Application programs for the 3774/3775 terminals are written using a subset of 3790 Communication System programming statements, plus 3770 statements for punched I/O, the 480-character Display Feature, and diskette storage operations. The programs assembled on a System/370 computer via a DOS/VS or OS/VS Assembler and 3790 Host Support, including a Macro Library containing a Program Validation Services (PVS) program. Assembled programs are validated, optionally tested, and formatted for the terminal by the PVS program. The assembled program is transmitted to the appropriate terminal and stored on diskette.

Upon request, the stored program is loaded into terminal program storage from diskette, where it is executed. Program selection can be operator or CPU initiated. The selected program can call another program from diskette storage without operator or CPU intervention. An operator-selectable job control capability permits selection and execution of a predefined series of application programs; the executing program can alter the series.

CPU messages can add or delete application programs; create load, erase (the contents of) or delete a data set at a 3774/3775 terminal; solicit a data set from a 3774/3775; select and initiate program execution at a 3774/3775; initiate an automatic power-down sequence at a 3774/3775; and deliver formatted data for a non-programmable 3774/3775, which is received and written to a system data set on diskette. The programming statements for a 3774/3775 provide support for transmitting the formatted data to the printer under control of an application program.

For SDLC operation, the 3770 series terminals are supported for IBM System/370, 4331, or 4341 processors including a 3704 or 3705 Communications Controller (using NCP/VS) attached locally or remotely and operating under DOS/VS, OS/VS1, or OS/VS2. Access methods supported are VTAM or TCAM through VTAM. IMS/VS support under OS/VS1 or VS2 and CICS/VS support under DOS/VS, OS/VS1, or OS/VS2 is provided. Remote job entry support is provided under the three operating systems by POWER/VS (DOS/VS), RES (OS/VS1), and JES2, and JES3 (OS/VS2).

COMPONENTS

KEYBOARD: (Standard on all models.) The typewriter-style keyboard consists of 44 alphanumeric data keys in an EBCDIC arrangement. The functions of the underscore/hyphen, backspace, space, and "Print Character" keys are repeated automatically when the keys are held down. The optional ASCII Feature provides 48 ASCII data keys, capable of producing 94 ASCII graphics, in place of the standard 44 keys. In addition to the data keys, the keyboard contains function keys, operating mode switches, indicator lights, and a 3-position numeric display. A Keylock feature disables all operator-activated controls.

MATRIX PRINTER: (for 3774) This bidirectional wire-matrix unit is the standard printer in the 3774 Communications Terminals. It prints serially by character at a rated speed of 80 (Model P1) or 120 (Model P2) characters per second. There are 132 print positions, spaced 10 to the inch. Vertical spacing is 6 or 8 lines per inch. A 94-character set is standard.

Up to 6-part forms ranging from 3 to 15 inches in width can be used. A friction-feed platen is standard, and a variable-width forms tractor for pin-feed forms is optional. An optional forms stand facilitates the feeding and stacking of continuous forms.

LINE PRINTER, 120 LPM: (for 3775) This unit is the standard printer in the 3775 Communication Terminal. It normally prints a line at a time from characters engraved on the revolving interchangeable metal print belt. During a key entry operation, however, the print platen lowers to enable the operator to see the line being printed. Maximum print speed is 120 lpm with a 64-character set or 80 lpm with a 94-character set. Both sizes of character sets are available with ►

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► either EBCDIC or ASCII graphics. There are 132 print positions, spaced 10 to the inch. Vertical spacing is 6 or 8 lines per inch. A variable-width forms tractor feeds continuous forms up to 15 inches in width. A Dual Independent Forms Feed option permits two forms of different sizes to be printed at the same time using two independently indexed pin feed mechanisms.

3784 LINE PRINTER (for 3774): This optional output device, available only with 3774 Communication Terminal, is functionally similar to the 3775's integral line printer described in the paragraph above. The 3784, however, can also be equipped with a 48-character set, giving the user a choice of three rated print speeds: 155 lpm with the 48-character set, 120 lpm with the 64-character set, or 80 lpm with the 94-character set. Dual buffers, 132 print positions, and a variable-width forms tractor are all standard. A 3784 Attachment is required on the 3774.

LINE PRINTERS, 300 and 400 LPM (for 3776): These units are the standard printers in the 3776 Communication Terminal. They print a line at a time from characters engraved on the revolving interchangeable metal print belt. Maximum print speed for the 3776-1 and 3776-3 is 300 lpm with a 48-character set, 230 lpm with a 64-character set, and 160 lpm with a 94-character set. Maximum print speeds for the 3776-2 and 3776-4 are 400 lpm with a 48-character set; 300 lpm with a 64-character set; and 230 lpm with a 94-character set. All three sizes of character sets are available with either EBCDIC or ASCII graphics. There are 132 print positions, spaced 10 to the inch. Vertical spacing is 6 or 8 lines per inch. A variable-width forms tractor feeds continuous forms up to 15 inches in width.

3203-3 LINE PRINTER (for 3777): This is the standard printer in the 3777 Communication Terminal. It operates at a maximum rate of 1000 lpm with a 48-character set and 870 lpm with a 60-character set. With enhancement features on both the 3777 or 3203 printer, a speed of 1200 lpm can be achieved with a 48-character set. A speed of 1020 lpm can be achieved with a 60-character PN set; a higher speed may be obtained with some other 60-character sets, such as the QN2 or QNC. The printer provides 132 print positions and accommodates 6-part continuous forms from 3½ to 20 inches wide and from 3 to 24 inches long. (Forms of up to 4 parts are recommended.) Spacing is a 10 char/inch horizontally and 6 or 8 lines/inch vertically. Forms skipping and spacing are controlled via a forms control buffer. The single-speed carriage advances paper at 18 inches/second. The 3203-3 requires the 1416 Interchangeable Train Cartridge. A 240-character Universal Character Set buffer is standard and provides storage for operator-selectable, 48- or 60-character sets supporting 15 print train arrangements. Character sets corresponding to the 48-, 64-, and 96-character sets used with 3770 console printers are also supported.

3262-2/-12 LINE PRINTER (for 3777-4): Can be attached to the 3777 Model 4 only. The 3262-2 operates at a maximum speed of 650 lpm with a 48-character set, 467 lpm with a 64-character set, and 364 lpm with a 96-character set. The 3262-12 operates at a maximum speed of 325 lpm with a 48-character set, 230 lpm with a 64-character set, and 180 lpm with a 96-character set. One or two printers can be attached. Utilizing a 48-character set, a 3262-2 combined with a 3262-12 yield an aggregate print rate of 975 lpm; two 3262-2 Printers yield an aggregate print rate of 1300 lpm. The 3262 printers provide 132 print positions. Horizontal spacing is 10 characters/inch and vertical spacing is 6 or 8 lines/inch. Continuous forms up to 16" wide are fed via a forms tractor.

DISKETTE DRIVE (for use on all models): Reads and writes on same type of flexible disk used in IBM 3740 data entry equipment. Data organization is the same as in the 3740; i.e., data is recorded on one side of the diskette in

sectors of 128 characters. There are 74 tracks and 26 sectors per track. The first track is reserved, as it is in the 3740. In addition, two sectors (one 256-character record) are reserved for job identification. The maximum storage capacity is 949 256-character records, or 242,944 characters. Data is read or written via one movable read/write head.

Data can be organized in the diskettes in two ways. An interchange format records the 256-character record in two consecutive sectors; appropriately prepared diskettes can be interchanged with 3740s. In the 3770 mode, the 256-character buffer record is written in two non-consecutive sectors for increased performance.

3411-1 MAGNETIC TAPE UNIT AND CONTROL: A single channel control unit with one tape drive, available for use only with the 3776-3/-4 and 3777-3/-4, with which it accommodates 9-track tape only. The unit can be equipped to operate at 1600 bpi only (single density) or at 800 bpi as well as 1600 bpi (dual density). The data rate is 20,000 bytes per second at 1600 bpi, or 10,000 bytes per second at 800 bpi. During write operations, both parity and signal amplitude are checked; during read operations, parity is checked. Error correction or tracking is also provided. Labeled and unlabeled tapes are supported. Records may be blocked or unblocked and of fixed or variable length. Maximum stored record size is 255 bytes; however, maximum input record size is 80 bytes because of host programming restrictions. Maximum block size is 4000 bytes; a block size of up to 2000 bytes automatically provides dual buffering. The 3411-1 is attached via the Magnetic Tape Unit and Control Attachment feature on the 3776 or 3777 and the 3770 Communication System Attachment on the 3411-1.

2502 CARD READER: For use on all models (Model A3 can be used only on 3776-3/-4 and 3777 (all models)). Reads 80-column cards punched in ASCII or EBCDIC code (determined by transmission code selection). Three models are available, which differ only in rated speed. Model A1 reads 150 cards/minute, Model A2 reads 300 cards/minute, and Model A3 reads at 400 cards/minute. The input hopper holds 700 cards, and the output stacker holds 600 cards. Options permit reading 51- or 80-column cards, 66- or 80-column cards, and mark-sense (optical) reading. Mark-sense reading permits marking up to 40 columns; marked and/or punched data can be read from the same card. Cards having unacceptable marks are offset-stacked. The mark-sense reading capability is not supported for Models 3776-3/-4 and 3777-3/-4. The 2502 can be attached to a 3774, 3775, or 3776 via the 3782/2502 Card Reader Attachment feature and the 3782 Model 2 Card Attachment Unit and to a 3777 via the 2502 Card Reader Attachment feature.

3501 CARD READER: For use on all models except 3776-3/-4 and 3777 (all models). A table-top unit that reads 80-column cards serially at 50 cards per minute. Cards can be punched in either EBCDIC or ASCII. The input hopper and output stacker each hold about 400 cards. The 3501 requires a 3501 Card Reader Attachment feature.

3521 CARD PUNCH: For use on all models except 3777-1. A table-top unit that punches cards at 50 cards/minute. The input hopper and output stacker each hold about 400 cards. The 3521 requires a 3782/3521 Card Punch Attachment feature and the 3782 Model 1 Card Attachment Unit. The 3521 fits atop the 3782.

A Card Print feature for the 3521 permits printing up to 80 characters along the top edge of a card; a 64-character set from either EBCDIC or ASCII is used.

The Card Read/Punch Check feature enables a 3521 to function as a card punch or a card reader. Cards cannot be read and punched in the same cycle. The feature also ►

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► enables a column-by-column comparison between punch data and data read from the card after punching; a failure of this check stops the punch and lights an error indicator. The Punch Check feature must be inhibited if cards with internal scores or prepunched data are punched. If the 3770 terminal is already equipped with a 3501 or 2502 Card Reader, the Card Read portion of this feature is inoperable.

OPERATOR ID READER: For use on all models. Reads magnetic stripe cards using the ABA format. A total of 40 characters can be read from the stripe. The cards are the size of a standard credit card (3½ by 2½ inches). The encoding format on the stripe is four bits plus parity for each character.

PRICING

All 3770 series models and components (except the 2502 Card Reader) are available under IBM's LRA (Lease Rental Agreement) which provides month-to-month rental and two-year lease arrangements, and for purchase. All monthly charges below include prime shift maintenance; a separate plan is available for purchased units. Unlimited usage is included under either monthly plan. Extended maintenance is available at extra cost up to a total premium of about 40 percent for 24 hours per day, 7 days per week coverage.

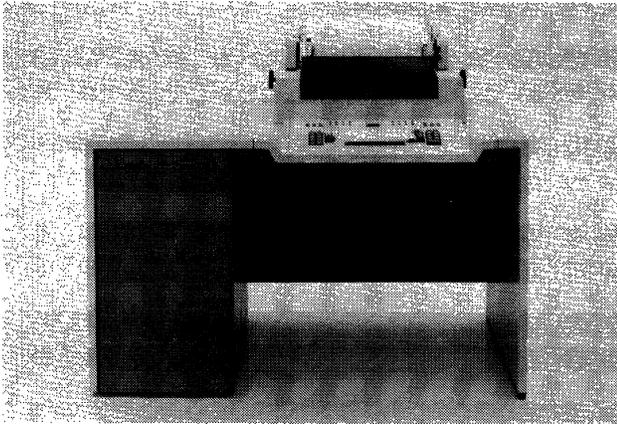
		Monthly Charges*			
		Monthly Rental	2-Year Lease	Purchase	Monthly Maint.
3774—					
	Model P1; 80 cps printer	\$ 483	\$ 411	\$ 8,310	\$194.00
	Model P2; 120 cps printer	544	463	9,385	208.00
3775—					
	Model P1; 120 lpm printer	734	625	12,600	258.00
3776—					
	Model 1; 300 lpm printer	920	783	18,000	223.00
	Model 2; 400 lpm printer	1,058	900	20,700	246.00
	Model 3; 300 lpm printer	1,375	1,170	30,000	329.00
	Model 4; 400 lpm printer	1,510	1,285	33,000	349.00
#3951	Front Feed	16	14	400	—
#4450	Forms Stand	**82	**82	82	—
#58XX	Print Belt	**160	**160	160	—
3777—					
	Model 1; requires 3203-3 1000/1200 lpm printer	577	491	13,230	59.00
	Model 2; requires 3203-3 1000/2000 lpm printer	658	560	15,070	68.50
	Model 3; requires 3203-3 1000/1200 lpm printer	955	813	21,840	142.00
	Model 4; requires 3262-2/-12 printer	1,112	946	24,840	142.00
#5595	Print Speed Enhancement (1200 lpm)	25	21	630	—
#1601	Console Display (3777-2 only)	158	135	3,780	28.50
Features					
Communications Feature—					
#1460	SDLC/BSC, Switch Control	38	32	810	6.00
#1461	BSC, Point-to-Point	20	17	504	4.00
#1470	SDLC	18	15	440	4.00
#1462	BSC Multipoint	18	15	347	1.50
Communications Driver—					
#1481	W/o Business Machine Clocking	18	15	347	2.50
#1482	With 1200 bps Business Machine Clocking (3774, 3775 only)	20	17	410	4.00
#3701	EIA Interface	18	15	462	2.00
1200 bps Integrated Modem (3774, 3775 only)—					
#5500	Non-Switched	27	23	701	6.00
#5501	Switched, Auto-Answer	38	32	882	5.50
#5502	Switched, Manual Answer	27	23	701	5.50
2400 bps Integrated Modem (3774, 3775, 3776-1/-2 only)—					
#5600	Non-Switched, Point-to-Point	104	89	2,320	7.50
#5602	Non-Switched, Multipoint	111	95	2,520	7.50
#5610	Switched with Auto-Answer	111	95	2,520	8.50
#7951	Switched Network Backup	15	13	378	1.50
#3901	Modem Fan-Out	29	25	720	2.00
4800 bps Integrated Modem (3776-1/-2 only)—					
#5700	Non-Switched Point-to-Point	215	183	3,600	56.50
#5702	Non-Switched, Multipoint	215	183	3,600	56.50
#5710	Switched with Auto-Answer	242	206	4,050	59.50
#7952	Switched Network Backup	36	31	600	4.00
#3902	Modem Fan-out	42	36	750	2.00

IBM 3770 Family Batch Communications Terminals

		Monthly Charges*			
		Monthly Rental	2-Year Lease	Purchase	Monthly Maint.
#4501	High Speed Digital Interface (3776-3/-4, 3777 only) DDS Adapter (3776-3/-4, 3777-3/-4 only)—	61	52	1,400	2.00
#5650	Point-to-Point	35	30	840	3.00
#5651	Multipoint	35	30	840	3.00
#1201	ASCII Feature	25	21	450	0.50
#1390	Audible Alarm	**42	**42	42	0.50
#3250	Display, 480 characters	140	119	2,520	59.00
#3401	Door Keylock	**15	**15	15	—
#3402	Door Keylock, Dual	**31	**31	31	—
#4650	Keylock	**36	**36	36	—
#3551	Dual Independent Forms Feed (3775 only)	42	36	788	19.00
#4660	Keypad, Numeric	16	14	315	3.00
#5450	Operator ID Reader	18	15	347	3.00
#6010	Record Format Feature	38	32	662	6.50
Diskette Storage—					
#4901	First	105	90	1,770	24.50
#4902	Second	105	90	1,770	9.50
Storage Increments (3774/3775 only)—					
#6800	4K	21	18	276	5.50
#6801	8K	39	33	501	8.00
#6802	12K	58	49	716	16.00
#6803	16K	74	63	919	19.00
I/O Attachment Features—					
#8050	3501 Card Reader	18	15	347	1.50
#8149	3782/2502 Card Reader	27	23	480	5.00
#8150	3782/3521 Card Punch	27	23	480	4.50
#8155	3784 Printer (3774 only)	27	23	480	2.50
I/O Devices					
3782 Card Attachment Unit:					
	Model 1; for 3521 Card Punch (3776, 3777-2/-3 only)	61	52	1,695	3.00
	Model 2; for 2502 Card Reader (3776 only)	89	76	2,430	2.50
#5455	Optical Mark Read	38	32	1,020	2.50
2502 Card Reader:					
	Model A1; 150 cpm	230	—	7,405	65.00
	Model A2; 300 cpm	289	—	8,030	65.00
	Model A 3; 400 cpm (3776-3/-4, 3777 only)	343	—	8,270	83.00
#4650	Interchangeable Feed, 51/80 or 66/80 column	49	—	1,590	20.00
#5450	Optical Mark Read	227	—	7,010	37.00
	3501 Card Reader; 50 cpm (3774, 3775, and 3776-1/-2 only)	180	153	4,080	37.00
	3521 Card Punch; 50 cpm (3774, 3775, 3776, 3777-2/-3 only)	382	325	8,420	77.00
#1501	Card Print	110	94	2,545	19.00
#1521	Card Read/Punch Check	96	82	2,250	54.00
#6360	3203 Model 3 Printer; 1000 lpm (3777 only)	1,445	1,230	29,950	303.00
	Speed Enhancement; 1200 lpm	79	67	2,080	—
3262 Printer (3777-4 only)—					
	Model 2; 650 lpm	595	506	15,040	180.00
	Model 12; 325 lpm	437	372	12,620	132.00
	3784 Line Printer; 80- 155 lpm (3774 only)	559	476	14,820	90.00
	3411 Model 1 Magnetic Tape Unit and Control (3776-3/-4, 3777-3 only)	633	532	7,910	162.00
#3211	Single Density	82	69	1,140	14.00
#3221	Dual Density	122	102	2,185	49.00
#7003	3770 Communication System Attachment	113	95	1,880	5.00

* Includes prime shift maintenance.
**Single use charge.

IBM 3770 Family Batch Communications Terminals



IBM's 3774 Communications Terminal is available in two models, featuring an 80 cps (Model P1) or 120 cps (Model P2) printer. The 3774 and 3775 P Series terminals are programmable keyboard/printer terminals; the 3776 and 3777 terminals are non-programmable batch units.

MANAGEMENT SUMMARY

The 3770 Data Communication System was originally launched in 1974. At one time, the family included 19 different models. Currently, the family consists of: the 3774 and 3775 P Series programmable terminals; 3776 and 3777 non-programmable terminals; and the 3771 teleprinter terminal, which is covered in report C27-491-201.

The 3774 and 3775 are primarily oriented towards batch data entry. Each can perform standalone processing without control or supervision by a host CPU. When operating under IBM's Systems Network Architecture (SNA), each communicates with the host CPU as a single physical/logical unit in a single batch session. There are no facilities for establishing or maintaining inquiry/response sessions with the host.

Model 3774 provides medium speed serial printing as a standard feature, and supports a 155 lpm line printer, one or two diskette drives, a record display, a card reader, and a card punch as optional devices. The two available versions, 3774-P1 and 3774-P2, are identical, except for the speed of the serial printer, which is rated at 80 cps or 120 cps, respectively.

Model 3775 is similar to the 3774 except that it provides a line printer instead of a serial printer as standard, and accommodates no other printers. Lack of a 48-character set feature puts the top speed of the 3775's line printer at 120 lpm (64-character set) instead of the 155 lpm top speed with the 3774 optional line printer using a 48-character set.

User programs are written using a subset of 3790 Communication System programming statements, plus 3770 statements for punched I/O, the 480-character

Four terminal systems that comprise IBM's mainstay batch terminal offerings.

Models 3774 and 3775 are programmable terminals that support keyboard data entry and low-to-medium speed batch transmission. Model 3774 is available in two models, equipped with either an 80 or 120 cps bidirectional serial matrix printer. Model 3775 features a 120 lpm line printer. All three models include an EBCDIC keyboard, 99,840 bytes of diskette storage, and a 6K-byte main memory.

Models 3776 and 3777 are non-programmable, medium-to-high speed batch terminals. Keyboard data entry and editing are not supported. Model 3776 is available in four versions and provides a 300 or 400 lpm printer; Model 3777, in three versions with a 1000 or 1200 lpm printer, or a fourth version with two printers for an aggregate rate of 1300 lpm.

A variety of peripherals are available for attachment to the 3770 models. These include line printers, card readers, a card punch, operator ID reader, and diskette drives; a magnetic tape drive is available for use with the batch models.

Purchase prices for the 3774 Models P1 and P2 are \$8,310 and \$9,385, respectively. The 3775 Model P1 sells for \$12,600. Purchase prices for the 3776 terminals range from \$18,000 to \$33,000, while the price range for the 3777 models is \$13,230 to \$24,840.

CHARACTERISTICS

VENDOR: International Business Machines Corporation, National Accounts Division, 1133 Westchester Avenue, White Plains, NY 10604. Telephone (914) 696-1900.

DATE OF ANNOUNCEMENT: 3774/3775—July 1975; 3776—July 1975; 3777—November 1975.

DATE OF FIRST DELIVERY: 3774/3775—April 1976; 3776—April 1976; 3777—August 1976.

SERVICED BY: IBM.

CONFIGURATION

Models 3774/3775

The 3774 Communication Terminal is a desk-style console equipped with a keyboard and a bidirectional serial matrix printer rated at 80 cps (in the 3774 Model P1) or 120 cps (in Model P2).

IBM 3770 Family Batch Communications Terminals

TABLE 1. MODEL COMPARISONS FOR IBM 3770 FAMILY

	3774		3775	3776		
	Model P1	Model P2	Model P1	Model 1	Model 2	Model 3
Maximum speed	80 cps	120 cps	120 lpm	300 lpm	400 lpm	300 lpm
Diskette storage	1, 2, or 3 drives	1, 2, or 3 drives	1, 2, or 3 drives	1 or 2 drives optional	1 or 2 drives optional	1 or 2 drives optional
Console display	480 char. optional	480 char. optional	480 char. optional	None	None	1024-char. std.
Card readers	50, 150, or 300 cpm optional	150, 300, or 400 cpm optional				
Card punch	50 cpm					
Magnetic tape drive	None	None	None	None	None	1 drive optional
Protocols	BSC, SDLC, or BSC/SDLC	SDLC				
SNA addressability	Multiple Logical Unit	Multiple Logical Unit	Multiple Logical Unit	Single Logical Unit	Single Logical Unit	Multiple Logical Unit
Internal modems	1200 or 2400 bps	1200 or 2400 bps	1200 or 2400 bps	2400 or 4800 bps	2400 or 4800 bps	None
Transmission speed	Up to 4800 bps	Up to 19,200 bps				

➤ Display Feature, and diskette storage operations. Programs are assembled using a System/370 DOS/VS or OS/VS assembler and 3790 Host Support, including a Macro Library containing Program Validation Services (PVS). PVS is used to validate, test, and format programs for the terminals. User memory capacity ranges from a basic 6K bytes to a maximum of 22K bytes.

The 3776 and 3777 batch terminals are members of the IBM 3770 family more because of a similarity of appearance than a functional similarity. Although they share some of the same peripherals (diskette storage and card devices) as the 3774 and 3775, the essential orientation is different. The 3776 and 3777 provide much faster printers (300 to 1200 lpm) than the 3774/3775 and do not permit keyboard data entry—two characteristics that distinguish them from conventional communications terminals as far as most users are concerned. The other defining characteristic of the 3774/3775, user programmability, has not been incorporated for these models.

Models 3776-1, 3776-2, 3777-1 and 3777-2 were announced in July 1975. These models were released as successors to the 2780/3780 batch terminals and the 360/20 HASP Multileaving Workstation, and were designed to provide bridging between the predecessor units and the SNA environment.

Models 3776-3, 3776-4, and 3777-3, were introduced in January 1978, and were designed specifically for operation in an SNA environment. The expanded capabilities of these units include enhanced job functions, terminal storage of utilities, operator procedures, etc. on a non-removable diskette, and the ability to control up to ➤

➤ The 3775 Model P1 Communication Terminal is a desk-style console equipped with a keyboard and a line printer rated at 120 lpm when using a 64-character set and 80 lpm when using a 94-character set.

In addition, each basic model is equipped with integrated, nonremovable diskette storage with a user capacity of 99,840 bytes (30 tracks) for storage of application programs and data. The terminals are also equipped with expandable main memory for user program storage. The 3774 and 3775 have a basic 6K-byte memory, expandable to 22K bytes in 4K, 8K, 12K, or 16K increments.

An optional Display Feature provides 480 display positions arranged in 12 lines of 40 characters each. This display employs gas panel technology and is swivel-mounted on the top left surface of the keyboard console.

Peripherals include: one or two additional diskette drives; a line printer rated at 155, 120, or 80 lpm for character sets of 48, 64, or 94 symbols, respectively (available for Model 3774 only); a 50 cpm card punch; and one of three card readers rated at 50, 150, or 300 cpm.

Both the 3774 and 3775 support BSC, SDLC, or alternate BSC/SDLC operation, and are addressable in an SNA operation as a Multiple Logical Unit.

Models 3776/3777

The 3776 Communication Terminal is a desk-style console equipped with a keyboard and a line printer rated at 300 lpm (in the 3776 Models 1 and 3) or 400 lpm (in Models 2 and 4). These ratings are based on a 48-character set. The 300-lpm printer is rated at 230 lpm or 160 lpm with a 64- or 94-character set, respectively. The 400-lpm printer is rated at 300 lpm or 230 lpm with a 64- or 94-character set, respectively. The terminal can be optionally equipped with one or two diskette drives; a 50-cpm card punch; one of four card readers rated at 50 cpm (3776-1 and -2 only), 150 cpm, 300 cpm, or 400 cpm (3776-3 and -4 only); and one magnetic tape drive (3776-3 and -4 only). Keyboard data entry and editing are not supported. ➤

IBM 3770 Family Batch Communications Terminals

TABLE 1. MODEL COMPARISONS FOR IBM 3770 FAMILY (continued)

	3776		3777		
	Model 4	Model 1	Model 2	Model 3	Model 4
Maximum speed	400 lpm	1000 lpm std., 1200 lpm opt.	1000 lpm std., 1200 lpm opt.	1000 lpm std., 1200 lpm opt.	325 or 650 lpm; aggregate 975 or 1300 lpm
Diskette storage	1 or 2 drives optional	1 or 2 drives optional	1 or 2 drives limited use	1 or 2 drives optional	1 or 2 drives optional
Console display	1024-char. std.	None	1024-char. opt.	1024-char. std.	1024-char. std.
Card readers	150, 300, or 400 cpm optional	150, 300, or 400 cpm optional	150, 300, or 400 cpm	150, 300, or 400 cpm optional	150, 300, or 400 cpm optional
Card punch	50 cpm	None	50 cpm	50 cpm	50 cpm
Magnetic tape drive	1 drive optional	None	None	1 drive optional	1 drive optional
Protocols	SDLC	BSC, SDLC, or BSC/SDLC	BSC HASP Multi-leaving	SDLC	SDLC
SNA addressability	Multiple Logical Unit	Single Logical Unit	None	Multiple Logical Unit	Multiple Logical Unit
Internal modems	None	None	None	None	None
Transmission speed	Up to 19,200 bps	Up to 19,200 bps	Up to 19,200 bps	Up to 19,200 bps	Up to 19,200 bps

➤ six concurrent job streams through SNA Multileaving. Unlike the older models, a console display (for terminal control and operator/host communications only) is standard, and support for a magnetic tape drive is available.

The newest member of the family is the Model 3777-4. Also designed for use in an SNA environment, the 3777-4 provides for the attachment of the IBM 3262 Printer Models 2 and 12. The 3777-4 is functionally compatible with the 3777-3 except with the exception of operational and forms design differences between the 3262 Printers and the IBM 3203 Printer Model 3, which attaches to the 3777-3.

A comparison of the features of the 3770 family is made in Tables 1. Please note that the 3777-2 has been discontinued from new production, but is expected to remain an active product as long as shelf stock and refurbished returns are available.

USER REACTION

In June 1982, Datapro, in conjunction with *Data Communications* magazine, conducted the first edition of our Terminal Users Survey. A questionnaire, designed and produced by Datapro, was mailed to approximately 10,000 addresses selected at random from a cross-section of *Data Communications*' U.S. end-user subscriber base. A total of 43 responses were received by Datapro from users of the IBM 3770 family terminals covered in this report. Broken down by model, three users reported on the 3774/3775 terminals, representing an installed base of 215 units; 12 users reported on the 3776, representing an installed base of 95 terminals; and 28 3777 users ➤

➤ The 3777 Communication Terminal is a desk-style console equipped with a keyboard and a line printer rated at 1000 or 1200 lpm when using a 48-character set and 870 or 1020 lpm when using a 60-character set. The terminal can be optionally equipped with one or two diskette drives; one or two Model 3262 line printers (3777-4 only); one of three card readers rated at 150, 300, or 400 cpm; a 50-cpm card punch (3777-2, 3, and -4 only); and a magnetic tape drive (3777-3 only). Keyboard data entry and editing are not supported. Models 1 and 3 support full off-line media operations; Model 2 (which is no longer in new production) does not.

A 1024-character console display is standard on the 3776-3/-4 and 3777-3/-4 and optional on the 3777-2. The 3776-3/-4 and 3777-3/-4 are also equipped with non-removable diskette storage used for message spooling, terminal controls, utility programs, user-generated operating procedures, and other terminal functions.

Models 3776-1, 3776-2, and 3777-1 support BSC, SDLC, or alternate BSC/SDLC operation, and are addressable in an SNA operation as a Single Logical Unit. In BSC mode, they can be used as replacements for an IBM 2780 or 3780. Models 3776-3, 3776-4, and 3777-3/-4 support SDLC operation only, and are addressable in an SNA operation as a Multiple Logical Unit. Up to six independent data streams can be transmitted to the host concurrently. The 3777-2 supports BSC only, and can replace a System/360 Model 20 HASP Multi-leaving Workstation.

TRANSMISSION SPECIFICATIONS

Models 3774/3775

Transmission is synchronous, half-duplex at up to 4800 bps, using either SDLC or BSC line protocol over the public switched telephone network or over a point-to-point or multipoint leased line.

For attachment to a communications line, any 3774/3775 terminal requires one of three Communication Features, one of two Communication Drivers, and either an EIA Interface for an external modem or one of several internal modems. ➤

IBM 3770 Family Batch Communications Terminals

➤ responded, with a total of 103 installed units. These users were asked to rate their terminals in several categories. Their ratings are summarized in the following tables:

3774/3775—

	Excellent	Good	Fair	Poor	WA*
Overall performance	2	1	0	0	3.7
Ease of operation	2	1	0	0	3.7
Hardware reliability	2	1	0	0	3.7
Maintenance service/ technical support	2	0	1	0	3.3

3776/3777—

	Excellent	Good	Fair	Poor	WA*
Overall performance	20	18	2	0	3.5
Ease of operation	15	18	6	1	3.2
Hardware reliability	17	21	2	0	3.4
Maintenance service/ technical support	12	22	4	1	3.2

*Weighted Average based on a scale of 4.0 for Excellent.

The users were asked if they would recommend the 3770 family terminals to other users with similar applications. Of the 43 respondents, 33 answered that they would recommend them; 3 users responded that they would not; and the remaining users stated that they were undecided or did not respond to the question. □

➤ The Communication Feature determines the line protocol used: Alternate SDLC/BSC; BSC Point-To-Point; or SDLC. A BSC Multipoint feature is available for use with either the SDLC/BSC or BSC Point-To-Point option. The SDLC/BSC arrangement is switched manually between the two protocols. Either point-to-point or multipoint operation is permitted under SDLC. If multipoint operation is arranged over a full-duplex communications facility, one terminal can be transmitting while another is receiving.

The two Communication Drives provide a clocked 1200 bps interface that is used with IBM's internal 1200 bps modems or an EIA RS-232-C interface without clocking for an external modem or IBM's self-clocking internal 2400 bps modem.

Three varieties of the 1200 bps modem are available for internal installation in all models. One is for operation over a point-to-point or multipoint leased (non-switched) line; one is for operation over the switched public telephone network with manual answering; and the third is for operation over the telephone network, but with automatic answering. The manual-answer modem connects to the network through a CDT data coupler; the automatic-answering modem requires a CBS data coupler for connection. The data couplers can be acquired from the telephone company or independent vendors. They will not be required if the modem features become FCC type certified.

There are also three types of 2400 bps internal modems: non-switched point-to-point; non-switched multipoint; and switched (telephone network) with automatic answering (requires CBS data coupler). All three provide half-speed operation at 1200 bps, with manual adjustment of equalization on the non-switched models. A Switched Network Back-Up Feature, available for either of the non-switched internal modems, permits the operator to establish a connection over the telephone network if the leased line

goes down; manual intervention at the computer site and perhaps program modification may be required to fully use this feature. A Modem Fan-Out feature for the non-switched multipoint modem permits two additional terminals to share that modem. Operationally, the three terminals function as three stations in a multipoint BSC or SDLC arrangement; no special handling is required.

Models 3776/3777

Transmission is synchronous, half-duplex at up to 4800 bps (3776-1 and -2) or 19,200 bps (all other models), using either SDLC or BSC line protocol over the public switched telephone network or over a point-to-point or multipoint leased line. Models 3776-3/-4 and 3777-3 support SDLC protocol only, and can transmit in half- or full-duplex mode. The 3777-2 is restricted to point-to-point BSC operation.

The 3776-1/-2 and 3777-1/-2 terminals require one of three Communications Features and a Communications Driver to support terminal communications. The Communication Feature determines the line protocol used: Alternate SDLC/BSC; BSC Point-To-Point; or SLDC. A BSC Multipoint feature is available for use with either the SDLC/BSC or BSC Point-To-Point option. The SDLC/BSC arrangement is switched manually between the two protocols. Either point-to-point or multipoint operation is permitted under SDLC. If multipoint operation is arranged over a full-duplex communications facility, one terminal can be transmitting while another is receiving. The point-to-point BSC feature is standard in the 3777-2. The Communications Driver is without business machine clocking.

For the 3776-3/-4 and 3777, an integrated SDLC communications adapter without clocking is standard.

Several types of interfacing are provided for attachment of an external modem. An EIA interface is available for all 3776 and 3777 models. A High Speed Digital Interface, available on all models except 3776-1/-2, supports point-to-point transmission at 19,200 bps via a leased-line wideband channel; the 3776-3/-4 and 3777-3 version also supports multipoint transmission. Two DDS Adapters, one for point-to-point and the other for multipoint communications, permit connection of the 3776-3/-4 and 3777-3/-4 to AT&T's Dataphone Digital Service network for 2400, 4800, or 9600 bps operation.

Three types of 2400 bps and 4800 bps internal modems are provided for the 3776-1 and -2 only: non-switched point-to-point; non-switched multipoint; and switched (telephone network) with automatic answering. All three provide half-speed operation at 1200 (or 2400) bps, with manual adjustment of equalization on the non-switched models. A Switched Network Back-Up Feature, available for any of the non-switched internal modems, permits the operator to establish a connection over the telephone network if the leased line goes down; manual intervention at the computer site and perhaps program modification may be required to fully use this feature. A Modem Fan-Out feature for the non-switched multipoint modems permits two additional terminals to share that modem. Operationally, the three terminals function as three stations in a multipoint BSC or SDLC arrangement; no special handling is required.

In general, operation over leased voice-grade lines with IBM modems at 1200 or 2400 bps requires no conditioning; operation at 4800 bps requires C1 conditioning. IBM markets an external 2400 bps modem (3872) and a 4800 bps modem (3874). The EIA interface is compatible with IBM, Bell System, and independent modems of appropriate characteristics.

All 3770 models include space compression/expansion for elimination of long sequences of spaces from transmission. A ➤

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► 2-character sequence replaces up to 63 spaces. This feature is usable with non-transparent data in either BSC or SDLC protocol as long as the diskette drive is neither the source nor destination of the transmitted data.

A 3770 terminal (any model) using SDLC line protocol can be attached to a System/370 or 4300 processor, utilizing a 3704/3705 Communications Controller. When under BSC line protocol, attachment can be made via a 3704/3705 Communications Controller or a 2701 Data Adapter Unit to a System/370 or 4300 processor, or System/360 models 30, 40, 50, 65, 67, 75, or 195. All terminals and 3704/3705 features must be operating with the same type of clocking source (self-clocked modem or business-machine provide clocking) and at the same transmission speed.

SOFTWARE

Application programs for the 3774/3775 terminals are written using a subset of 3790 Communication System programming statements, plus 3770 statements for punched I/O, the 480-character Display Feature, and diskette storage operations. The programs assembled on a System/370 computer via a DOS/VS or OS/VS Assembler and 3790 Host Support, including a Macro Library containing a Program Validation Services (PVS) program. Assembled programs are validated, optionally tested, and formatted for the terminal by the PVS program. The assembled program is transmitted to the appropriate terminal and stored on diskette. Upon request, the stored program is loaded into terminal program storage from diskette, where it is executed. Program selection can be operator or CPU initiated. The selected program can call another program from diskette storage without operator or CPU intervention. An operator-selectable job control capability permits selection and execution of a predefined series of application programs; the executing program can alter the series.

CPU messages can add or delete application programs; create load, erase (the contents of) or delete a data set at a 3774/3775 terminal; solicit a data set from a 3774/3775; select and initiate program execution at a 3774/3775; initiate an automatic power-down sequence at a 3774/3775; and deliver formatted data for a non-programmable 3774/3775, which is received and written to a system data set on diskette. The programming statements for a 3774/3775 provide support for transmitting the formatted data to the printer under control of an application program.

For SDLC operation, the 3770 series terminals are supported for IBM System/370, 4331, or 4341 processors including a 3704 or 3705 Communications Controller (using NCP/VS) attached locally or remotely and operating under DOS/VS, OS/VS1, or OS/VS2. Access methods supported are VTAM or TCAM through VTAM. IMS/VS support under OS/VS1 or VS2 and CICS/VS support under DOS/VS, OS/VS1, or OS/VS2 is provided. Remote job entry support is provided under the three operating systems by POWER/VS (DOS/VS), RES (OS/VS1), and JES2, and JES3 (OS/VS2).

COMPONENTS

KEYBOARD: (Standard on all models.) The typewriter-style keyboard consists of 44 alphanumeric data keys in an EBCDIC arrangement. The functions of the underscore/hyphen, backspace, space, and "Print Character" keys are repeated automatically when the keys are held down. The optional ASCII Feature provides 48 ASCII data keys, capable of producing 94 ASCII graphics, in place of the standard 44 keys. In addition to the data keys, the keyboard contains function keys, operating mode switches, indicator lights, and a 3-position numeric display. A Keylock feature disables all operator-activated controls.

MATRIX PRINTER: (for 3774) This bidirectional wire-matrix unit is the standard printer in the 3774 Communications Terminals. It prints serially by character at a rated speed of 80 (Model P1) or 120 (Model P2) characters per second. There are 132 print positions, spaced 10 to the inch. Vertical spacing is 6 or 8 lines per inch. A 94-character set is standard.

Up to 6-part forms ranging from 3 to 15 inches in width can be used. A friction-feed platen is standard, and a variable-width forms tractor for pin-feed forms is optional. An optional forms stand facilitates the feeding and stacking of continuous forms.

LINE PRINTER, 120 LPM: (for 3775) This unit is the standard printer in the 3775 Communication Terminal. It normally prints a line at a time from characters engraved on the revolving interchangeable metal print belt. During a key entry operation, however, the print platen lowers to enable the operator to see the line being printed. Maximum print speed is 120 lpm with a 64-character set or 80 lpm with a 94-character set. Both sizes of character sets are available with either EBCDIC or ASCII graphics. There are 132 print positions, spaced 10 to the inch. Vertical spacing is 6 or 8 lines per inch. A variable-width forms tractor feeds continuous forms up to 15 inches in width. A Dual Independent Forms Feed option permits two forms of different sizes to be printed at the same time using two independently indexed pin feed mechanisms.

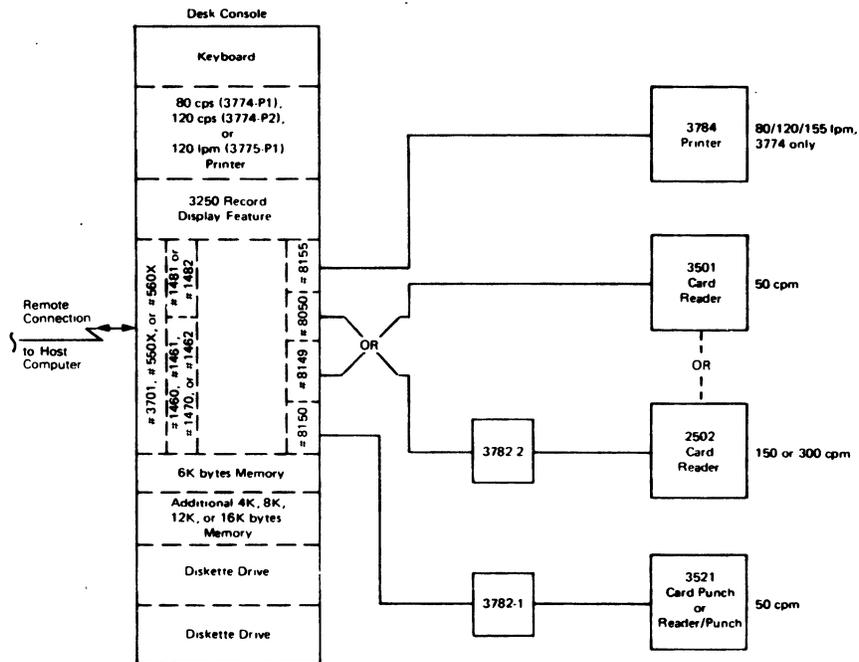
3784 LINE PRINTER: (for 3774) This optional output device, available only with 3774 Communication Terminal, is functionally similar to the 3775's integral line printer described in the paragraph above. The 3784, however, can also be equipped with a 48-character set, giving the user a choice of three rated print speeds: 155 lpm with the 48-character set, 120 lpm with the 64-character set, or 80 lpm with the 94-character set. Dual buffers, 132 print positions, and a variable-width forms tractor are all standard. A 3784 Attachment is required on the 3774.

LINE PRINTERS, 300 and 400 LPM (for 3776): These units are the standard printers in the 3776 Communication Terminal. They print a line at a time from characters engraved on the revolving interchangeable metal print belt. Maximum print speed for the 3776-1 and 3776-3 is 300 lpm with a 48-character set, 230 lpm with a 64-character set, and 160 lpm with a 94-character set. Maximum print speeds for the 3776-2 and 3776-4 are 400 lpm with a 48-character set; 300 lpm with a 64-character set; and 230 lpm with a 94-character set. All three sizes of character sets are available with either EBCDIC or ASCII graphics. There are 132 print positions, spaced 10 to the inch. Vertical spacing is 6 or 8 lines per inch. A variable-width forms tractor feeds continuous forms up to 15 inches in width.

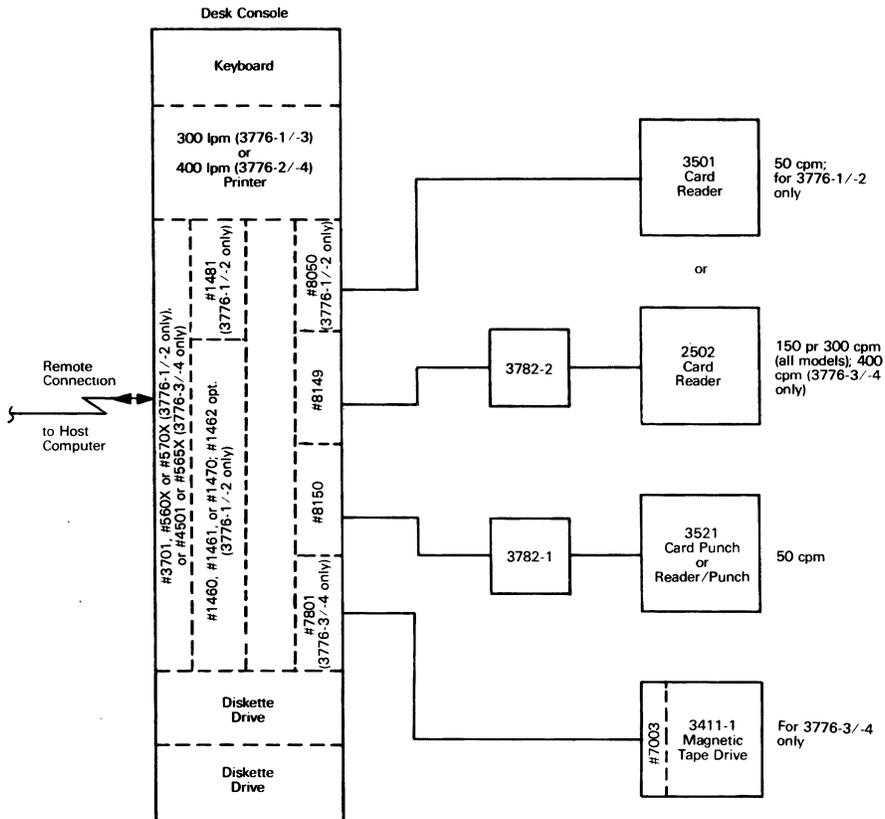
3203-3 LINE PRINTER (for 3777): This is the standard printer in the 3777 Communication Terminal. It operates at a maximum rate of 1000 lpm with a 48-character set and 870 lpm with a 60-character set. With enhancement features on both the 3777 or 3203 printer, a speed of 1200 lpm can be achieved with a 48-character set. A speed of 1020 lpm can be achieved with a 60-character PN set; a higher speed may be obtained with some other 60-character sets, such as the QN2 or QNC. The printer provides 132 print positions and accommodates 6-part continuous forms from 3½ to 20 inches wide and from 3 to 24 inches long. (Forms of up to 4 parts are recommended.) Spacing is 10 char/inch horizontally and 6 or 8 lines/inch vertically. Forms skipping and spacing are controlled via a forms control buffer. The single-speed carriage advances paper at 18 inches/second. The 3203-3 requires the 1416 Interchangeable Train Cartridge. A 240-character Universal Character Set buffer is standard and provides storage for operator-selectable, 48- or 60-character sets supporting 15 print train arrangements. Character sets corresponding to the 48-, 64-, and 96-character sets used with 3770 console printers are also supported. ►

IBM 3770 Family Batch Communications Terminals

3774/3775 Configuration

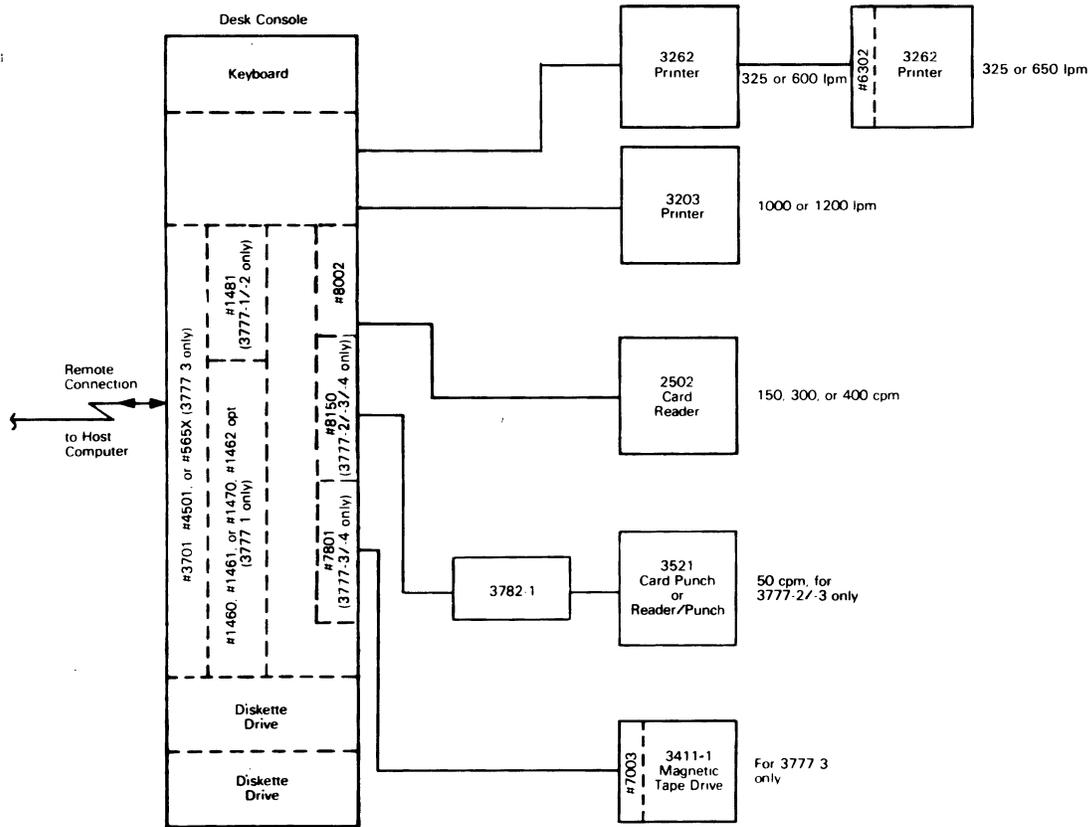


3776 Configuration



IBM 3770 Family Batch Communications Terminals

3777 Configuration



➤ **3262-2/-12 LINE PRINTER (for 3777-4):** Can be attached to the 3777 Model 4 only. The 3262-2 operates at a maximum speed of 650 lpm with a 48-character set, 467 lpm with a 64-character set, and 364 lpm with a 96-character set. The 3262-12 operates at a maximum speed of 325 lpm with a 48-character set, 230 lpm with a 64-character set, and 180 lpm with a 96-character set. One or two printers can be attached. Utilizing a 48-character set, a 3262-2 combined with a 3262-12 yield an aggregate print rate of 975 lpm; two 3262-2 Printers yield an aggregate print rate of 1300 lpm. The 3262 printers provide 132 print positions. Horizontal spacing is 10 characters/inch and vertical spacing is 6 or 8 lines/inch. Continuous forms up to 16" wide are fed via a forms tractor.

DISKETTE DRIVE (for use on all models): Reads and writes on same type of flexible disk used in IBM 3740 data entry equipment. Data organization is the same as in the 3740; i.e., data is recorded on one side of the diskette in sectors of 128 characters. There are 74 tracks and 26 sectors per track. The first track is reserved, as it is in the 3740. In addition, two sectors (one 256-character record) are reserved for job identification. The maximum storage capacity is 949 256-character records, or 242,944 characters. Data is read or written via one movable read/write head.

Data can be organized in the diskettes in two ways. An interchange format records the 256-character record in two consecutive sectors; appropriately prepared diskettes can be interchanged with 3740's. In the 3770 mode, the 256-character buffer record is written in two non-consecutive sectors for increased performance.

3411-1 MAGNETIC TAPE UNIT AND CONTROL: A single channel control unit with one tape drive, available for use only with the 3776-3/-4 and 3777-3/-4, with which it

accommodates 9-track tape only. The unit can be equipped to operate at 1600 bpi only (single density) or at 800 bpi as well as 1600 bpi (dual density). The data rate is 20,000 bytes per second at 1600 bpi, or 10,000 bytes per second at 800 bpi. During write operations, both parity and signal amplitude are checked; during read operations, parity is checked. Error correction or tracking is also provided. Labeled and unlabeled tapes are supported. Records may be blocked or unblocked and of fixed or variable length. Maximum stored record size is 255 bytes; however, maximum input record size is 80 bytes because of host programming restrictions. Maximum block size is 4000 bytes; a block size of up to 2000 bytes automatically provides dual buffering. The 3411-1 is attached via the Magnetic Tape Unit and Control Attachment feature on the 3776 or 3777 and the 3770 Communication System Attachment on the 3411-1.

2502 CARD READER: For use on all models (Model A3 can be used only on 3776-3/-4 and 3777 (all models)). Reads 80-column cards punched in ASCII or EBCDIC code (determined by transmission code selection). Three models are available, which differ only in rated speed. Model A1 reads 150 cards/minute, Model A2 reads 300 cards/minute, and Model A3 reads at 400 cards/minute. The input hopper holds 700 cards, and the output stacker holds 600 cards. Options permit reading 51- or 80-column cards, 66- or 80-column cards, and mark-sense (optical) reading. Mark-sense reading permits marking up to 40 columns; marked and/or punched data can be read from the same card. Cards having unacceptable marks are offset-stacked. The mark-sense reading capability is not supported for Models 3776-3/-4 and 3777-3/-4. The 2502 can be attached to a 3774, 3775, or 3776 via the 3782/2502 Card Reader Attachment feature and the 3782 Model 2 Card Attachment Unit and to a 3777 via the 2502 Card Reader Attachment feature. ➤

IBM 3770 Family Batch Communications Terminals

► **3501 CARD READER:** For use on all models except 3776-3/-4 and 3777 (all models). A table-top unit that reads 80-column cards serially at 50 cards per minute. Cards can be punched in either EBCDIC or ASCII. The input hopper and output stacker each hold about 400 cards. The 3501 requires a 3501 Card Reader Attachment feature.

3521 CARD PUNCH: For use on all models except 3777-1. A table-top unit that punches cards at 50 cards/minute. The input hopper and output stacker each hold about 400 cards. The 3521 requires a 3782/3521 Card Punch Attachment feature and the 3782 Model 1 Card Attachment Unit. The 3521 fits atop the 3782.

A Card Print feature for the 3521 permits printing up to 80 characters along the top edge of a card; a 64-character set from either EBCDIC or ASCII is used.

The Card Read/Punch Check feature enables a 3521 to function as a card punch or a card reader. Cards cannot be read and punched in the same cycle. The feature also enables a column-by-column comparison between punch data and data read from the card after punching; a failure of this

check stops the punch and lights an error indicator. The Punch Check feature must be inhibited if cards with internal scores or prepunched data are punched. If the 3770 terminal is already equipped with a 3501 or 2502 Card Reader, the Card Read portion of this feature is inoperable.

OPERATOR ID READER: For use on all models. Reads magnetic stripe cards using the ABA format. A total of 40 characters can be read from the stripe. The cards are the size of a standard credit card (3¾ by 2¼ inches). The encoding format on the stripe is four bits plus parity for each character.

PRICING

All 3770 series models and components (except the 2502 Card Reader) are available under IBM's LRA (Lease Rental Agreement) which provides month-to-month rental and two-year lease arrangements, and for purchase. All monthly charges below include prime shift maintenance; a separate plan is available for purchased units. Unlimited usage is included under either monthly plan. Extended maintenance is available at extra cost up to a total premium of about 40 percent for 24 hours per day, 7 days per week coverage.

		Monthly Charges*			
		Monthly Rental	2-Year Lease	Purchase	Monthly Maint.
3774—					
	Model P1; 80 cps printer	\$ 448	\$ 381	\$ 8,310	\$194.00
	Model P2; 120 cps printer	504	429	9,385	208.00
3775—					
	Model P1; 120 lpm printer	680	579	12,600	239.00
3776—					
	Model 1; 300 lpm printer	852	725	18,000	207.00
	Model 2; 400 lpm printer	980	834	20,700	228.00
	Model 3; 300 lpm printer	1,275	1,085	30,000	305.00
	Model 4; 400 lpm printer	1,398	1,190	33,000	324.00
#3951	Front Feed	15	13	400	—
#4450	Forms Stand	82**	82**	82	—
#58XX	Print Belt	160**	160**	160	—
3777—					
	Model 1; requires 3203-3 1000/1200 lpm printer	535	455	13,230	64.00
	Model 2; requires 3203-3 1000/2000 lpm printer	610	519	15,070	74.50
	Model 3; requires 3203-3 1000/1200 lpm printer	885	753	21,840	54.00
	Model 4; requires 3262-2/-12 printer	1,029	876	24,840	154.00
#5595	Print Speed Enhancement (1200 lpm)	22	19	630	—
#1601	Console Display (3777-2 only)	147	125	3,780	31.00
Features					
Communications Feature—					
#1460	SDLC/BSC, Switch Control	35	30	810	6.50
#1461	BSC, Point-to-Point	19	16	504	3.50
#1470	SDLC	16	14	440	3.50
#1462	BSC Multipoint	16	14	347	1.00
Communications Driver—					
#1481	W/o Business Machine Clocking	16	14	347	2.00
#1482	With 1200 bps Business Machine Clocking (3774, 3775 only)	19	16	410	3.50
#3701	EIA Interface	16	14	462	1.50
1200 bps Integrated Modem (3774, 3775 only)—					
#5500	Non-Switched	25	21	701	5.00
#5501	Switched, Auto-Answer	35	30	882	5.00
#5502	Switched, Manual Answer	25	21	701	5.00

* Includes prime shift maintenance.

**Single use charge.

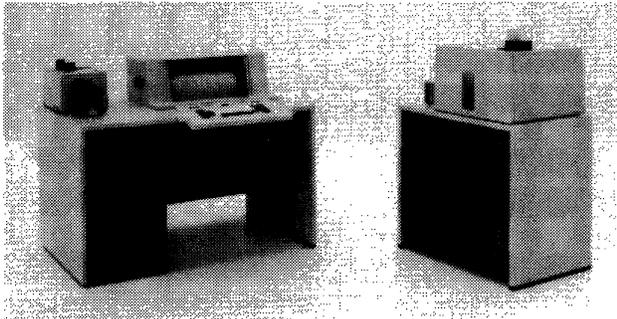
IBM 3770 Family Batch Communications Terminals

		Monthly Charges*		Purchase	Monthly Maint.
		Monthly Rental	2-Year Lease		
2400 bps Integrated Modem (3774, 3775, 3776-1/-2 only)—					
#5600	Non-Switched, Point-to-Point	96	82	2,320	7.00
#5602	Non-Switched, Multipoint	103	88	2,520	7.00
#5610	Switched with Auto-Answer	103	88	2,520	8.00
#7951	Switched Network Backup	14	12	378	1.00
#3901	Modem Fan-Out	27	23	720	1.50
4800 bps Integrated Modem (3776-1/-2 only)—					
#5700	Non-Switched Point-to-Point	200	170	3,600	52.50
#5702	Non-Switched, Multipoint	200	170	3,600	52.50
#5710	Switched with Auto-Answer	224	191	4,050	55.00
#7952	Switched Network Backup	34	29	600	3.50
#3902	Modem Fan-out	39	33	750	1.50
High Speed Digital Interface (3776-3/-4, 3777 only)					
#4501	DDS Adapter (3776-3/-4, 3777-3/-4 only)—	56	48	1,400	1.50
#5650	Point-to-Point	33	28	840	2.50
#5651	Multipoint	33	28	840	2.50
#1201	ASCII Feature	22	19	450	0.50
#1390	Audible Alarm	42**	42**	42	0.50
#3250	Display, 480 characters	130	111	2,520	54.50
#3401	Door Keylock	15**	15**	15	—
#3402	Door Keylock, Dual	31**	31**	31	—
#4650	Keylock	36**	36**	36	—
#3551	Dual Independent Forms Feed (3775 only)	39	33	788	17.50
#4660	Keypad, Numeric	15	13	315	2.50
#5450	Operator ID Reader	16	14	347	2.50
#6010	Record Format Feature	35	30	662	6.00
Diskette Storage—					
#4901	First	98	83	1,770	22.50
#4902	Second	98	83	1,770	9.00
Storage Increments (3774/3775 only)—					
#6800	4K	20	17	276	5.00
#6801	8K	36	31	501	7.50
#6802	12K	53	45	716	15.00
#6803	16K	68	58	919	17.50
I/O Attachment Features—					
#8050	3501 Card Reader	16	14	347	1.00
#8149	3782/2502 Card Reader	25	21	480	4.50
#8150	3782/3521 Card Punch	25	21	480	4.00
#8155	3784 Printer (3774 only)	25	21	480	2.00
I/O Devices					
3782 Card Attachment Unit:					
Model 1; for 3521 Card Punch (3776, 3777-2/-3 only)					
		56	48	1,695	3.00
Model 2; for 2502 Card Reader (3776 only)					
		88	70	2,430	2.50
#5455	Optical Mark Read	35	30	1,020	2.50
2502 Card Reader:					
Model A1; 150 cpm					
		213	—	7,405	70.50
Model A2; 300 cpm					
		268	—	8,030	70.50
Model A3; 400 cpm (3776-3/-4, 3777 only)					
		318	—	8,270	91.00
#4650	Interchangeable Feed, 51/80 or 66/80 column	45	—	1,590	22.50
#5450	Optical Mark Read	211	—	7,010	40.50
3501 Card Reader; 50 cpm (3774, 3775, and 3776-1/-2 only)					
		167	142	4,080	37.00
3521 Card Punch; 50 cpm (3774, 3775, 3776, 3777-2/-3 only)					
		354	301	8,420	71.50
#1501	Card Print	102	87	2,545	17.50
#1521	Card Read/Punch Check	89	76	2,250	50.00
3203 Model 3 Printer; 1000 lpm (3777 only)					
		1,340	1,140	28,800	303.00
3203 Model 3 Printer; 1000 lpm (3777 only)					
		1,340	1,140	28,800	303.00
#6360	Speed Enhancement; 1200 lpm	73	62	2,000	—
3262 Printer (3777-4 only)—					
Model 2; 650 lpm					
		566	482	17,690	180.00
Model 12; 325 lpm					
		397	338	12,620	132.00
3784 Line Printer; 80- 155 lpm (3774 only)					
		518	441	14,820	83.50
3411 Model 1 Magnetic Tape Unit and Control (3776-3/-4, 3777-3 only)					
		587	493	10,300	150.00
#3211	Single Density	76	64	1,515	13.00
#3221	Dual Density	113	95	2,185	45.50
#7003	3770 Communication System Attachment	105	88	1,915	4.50

* Includes prime shift maintenance.

**Single use charge.■

IBM 3774/3775 P Series Programmable Keyboard/Printer Terminals



This Model 3775 configuration includes the 3775 (with a 120 lpm printer), a Model 3782 Card Attachment Unit, and a Model 3501 50 cpm Card Reader.

MANAGEMENT SUMMARY

The 3770 family includes the user-programmable Models 3774 and 3775, the non-programmable Model 3771 (Report C27-491-101) and the high performance 3776 and 3777 batch terminals (Report C23-491-201). The programmable units, the three P Series models of the 3774 and 3775, are the subject of this report.

The 3774 and 3775 are primarily oriented towards batch data entry. Each can perform standalone processing without control or supervision by a host CPU. When operating under IBM's System Network Architecture (SNA), each communicates with the host CPU as a single physical/logical unit in a single batch session. There are no facilities for establishing or maintaining inquiry/response sessions with the host.

Model 3774 provides medium speed serial printing and supports a 155 lpm line printer, one or two diskette drives, a record display, a card reader, and a card punch as optional devices. The two available versions, 3774-P1 and 3774-P2, are identical, except for the speed of the serial printer, which is rated at 80 cps or 120 cps, respectively.

Model 3775 is similar to the 3774 except that it provides a line printer instead of a serial printer as standard, and accommodates no other printers. Lack of a 48-character set feature puts the top speed of the 3775's line printer at 120 lpm (64-character set) instead of the 155 lpm top speed with the 3774 optional line printer using a 48-character set.

User programs are written using a subset of 3790 Communication System programming statements, plus 3770 statements for punched I/O, the 480-character Display Feature, and diskette storage operations. Programs are assembled using a System/370 DOS/VS or OS/VS assembler and 3790 Host Support, including a Macro Library containing Program Validation Services (PVS). PVS is used to validate, test, and format programs for the terminals. User memory capacity ranges from a basic 6K bytes to a maximum of 22K bytes. ▶

The three user programmable members of IBM's 3770 Data Communications System family.

Model 3774 is available in two models, equipped with either an 80 or 120 cps bidirectional serial matrix printer; Model 3775 features a 120 lpm line printer. All models include an EBCDIC keyboard, 99,840 bytes of diskette storage, and a 6K-byte main memory.

I/O devices available for use with the 3774/3775 include: the 3782 Card Attachment Unit; the 2502 Card Reader (150 or 300 cpm); the 3521 Card Punch (50 cpm); the 3501 Card Reader (50 cpm); and the 3784 Line Printer (80-155 lpm—Model 3774 only). Main memory is expandable to 22K in 4K-, 8K, 12K-, or 16K-byte increments.

Model 3774 P1 (80 cps) can be purchased for \$8,310; the price for Model 3774 P2 (120 cps) is \$9,385. Monthly charges are \$353 and \$398, respectively, including maintenance, on a two-year lease. Model 3775 sells for \$12,600, and leases for \$537 per month.

The non-programmable Model 3771 is covered in Report C27-491-201. The non-programmable batch terminal members of the 3770 family are covered in Report C23-491-201.

CHARACTERISTICS

VENDOR: International Business Machines Corporation, Data Processing Division, 1133 Westchester Avenue, White Plains, New York 10604. Telephone (914) 696-1900.

DATE OF ANNOUNCEMENT: July 1975.

DATE OF FIRST DELIVERY: April 1976.

NUMBER DELIVERED TO DATE: Information not available.

SERVICED BY: IBM.

CONFIGURATION

The 3774 Communication Terminal is a desk-style console equipped with a keyboard and a bidirectional serial matrix printer rated at 80 cps (in the 3774 Model P1) or 120 cps (in Model P2).

The 3775 Communication Terminal is a desk-style console equipped with a keyboard and a line printer rated at 120 lpm when using a 64-character set and 80 lpm when using a 94-character set. ▶

IBM 3774/3775 P Series Programmable Keyboard/Printer Terminals

▷ Although rental and lease prices for the 3774 and 3775 have continued to rise, IBM has reduced the purchase prices, making the outright purchase of the equipment an attractive alternative for the user.

In Datapro's 1980 survey of remote batch terminal users, only one response was received covering the 3774/3775 terminals; therefore, we could not include a User Reaction section in this report. □

▶ In addition, each basic model is equipped with integrated, nonremovable diskette storage with a user capacity of 99,840 bytes (30 tracks) for storage of application programs and data. The terminals are also equipped with expandable main memory for user program storage. The 3774 and 3775 have a basic 6K-byte memory, expandable to 22K bytes in 4K, 8K, 12K, or 16K increments.

An optional Display Feature provides 480 display positions arranged in 12 lines of 40 characters each. This display employs gas panel technology and is swivel-mounted on the top left surface of the keyboard console.

Peripherals include one or two additional diskette drives, a line printer rated at 155, 120, or 84 lpm for character sets of 48, 64, or 96 symbols, respectively (available for Model 3774 only), a 50 cpm card punch, and one of three card readers rated at 50, 150, or 300 cpm.

TRANSMISSION SPECIFICATIONS

Transmission is synchronous, half-duplex at up to 4800 bps, using either SDLC (Synchronous Data Link Control) or BSC (Binary Synchronous Communication) line protocol over the public switched telephone network or over a point-to-point or multipoint leased line.

For attachment to a communications line, any 3770 terminal requires one of three Communication Features, one of two Communication Drivers, and either an EIA Interface for an external modem or one of several internal modems.

The Communication Feature determines the line protocol used: Alternate SDLC/BSC; BSC Point-To-Point; or SDLC. A BSC Multipoint feature is available for use with either the SDLC/BSC or BSC Point-To-Point option. The SDLC/BSC arrangement is switched manually between the two protocols. Either point-to-point or multipoint operation is permitted under SDLC. If multipoint operation is arranged over a full-duplex communications facility, one terminal can be transmitting while another is receiving.

The two Communication Drives provide a clocked 1200 bps interface that is used with IBM's internal 1200 bps modems or an EIA RS-232-C interface without clocking for an external modem or IBM's self-clocking internal 2400 bps modem.

Three varieties of the 1200 bps modem are available for internal installation in all models. One is for operation over a point-to-point or multipoint leased (non-switched) line; one is for operation over the switched public telephone network with manual answering; and the third is for operation over the telephone network, but with automatic answering. The manual-answer modem connects to the network through a CDT data coupler; the automatic-answering modem requires a CBS data coupler for connection. The data couplers can be acquired from the telephone company or independent vendors. They will not be required if the modem features become FCC type certified.

There are also three types of 2400 bps internal modems: non-switched point-to-point; non-switched multipoint; and

switched (telephone network) with automatic answering (requires CBS data coupler). All three provide half-speed operation at 1200 bps, with manual adjustment of equalization on the non-switched models. A Switched Network Back-Up Feature, available for either of the non-switched internal modems, permits the operator to establish a connection over the telephone network if the leased line goes down; manual intervention at the computer site and perhaps program modification may be required to fully use this feature. A Modem Fan-Out feature for the non-switched multipoint modem permits two additional terminals to share that modem. Operationally, the three terminals function as three stations in a multipoint BSC or SDLC arrangement; no special handling is required.

In general, operation over leased voice-grade lines with IBM modems at 1200 or 2400 bps requires no conditioning; operation at 4800 bps requires C1 conditioning. IBM markets an external 2400 bps modem (3872) and a 4800 bps modem (3874). The EIA interface is compatible with IBM, Bell System, and independent modems of appropriate characteristics.

All 3770 models include space compression/expansion for elimination of long sequences of spaces from transmission. A 2-character sequence replaces up to 63 spaces. This feature is usable with non-transparent data in either BSC or SDLC protocol as long as the diskette drive is neither the source nor destination of the transmitted data.

A 3770 terminal (any model) using SDLC line protocol can operate as a tributary station on a multipoint leased line with IBM 3270, 3601, 3602, 3614, 3624, 3631, 3632, 3651 Model 50, 3767, and 3791 terminals, and System/32, System/34, and Series/1 processing units; a System/370 including a 3704/3705 Controller acts as the control station. All terminals and 3704/3705 features must be operating with the same type of clocking source (self-clocked modem or business-machine provide clocking) and at the same transmission speed.

Emulation software is available that permits the programmable 3774-P1 and -P2 and 3775-P1 to function as the non-programmable 3774-1 and -2 and 3775-1, which are no longer available, to provide compatibility with existing arrangements.

DEVICE CONTROL

All models execute off-line data entry and document preparation functions under the direction of user-written application programs, which are written from a subset of IBM 3790 programming statements combined with 3770 statements that control punched card I/O, display, and diskette storage operations. Programmable functions include: data entry checking for range and self-check numbers, alphabetic or numeric-only fields, and field length; logical operations that include compare and test; conditional and unconditional branching; arithmetic operations including add, subtract, multiply, and divide; horizontal and vertical forms control; format and edit operations for picture, justify, fill, and case; support for data transfer from storage to storage, immediate data to storage, and diskette storage operations; operation with sequential data on diskettes (relative data sets); and operation with user-created indexing to data sets. Program control is provided for diskette storage, the optional 480-character display, the 2502 or 3501 Card Reader, and the 3521 Card Punch. The 3521 Read feature can serve as an alternative to the 2502 and 3501 Card Readers. Programming statements provide for writing on the display by character, field, or line, erasing the screen, and vertically and horizontally positioning the cursor. The display can be used to exhibit error messages, keyed data, responses to inquiries addressed to the data sets stored on diskettes, and fill-in-the-blanks data entry forms. Off-line operations can be automatically interrupted to receive an unsolicited CPU ▶

IBM 3774/3775 P Series Programmable Keyboard/Printer Terminals

► message, which is stored on diskette and conditionally printed. The interrupted program is then resumed.

Programmable Communications allows a 3774 or 3775 to initiate and control a communications session with the host computer and to execute a program, including peripheral input/output, during the communications session. Essentially, the communications line can be treated by the programmer as another input/output device. For SDLC operation, SNA protocols are used to maintain communications. The function is also available for BSC terminals.

The Programmable Communications feature requires 7K bytes (SDLC) or 2K bytes (BSC). The card punch requires 3K bytes. Additional memory is required for working storage buffers, the card reader and the display.

Application programs for terminals are assembled on a System/370 computer via a DOS/VS or OS/VS Assembler and 3790 Host Support, including a Macro Library containing a Program Validation Services (PVS) program. Assembled programs are validated, optionally tested, and formatted for the terminal by the PVS program. The assembled program is transmitted to the appropriate terminal and stored on diskette. Upon request, the stored program is loaded into terminal program storage from diskette, where it is executed. Program selection can be operator or CPU initiated. The selected program can call another program from diskette storage without operator or CPU intervention. An operator-selectable job control capability permits selection and execution of a predefined series of 3770 programs; the executing program can alter the series.

CPU messages can add or delete 3770 application programs; create, load, erase (the contents of) or delete a data set at a 3770 terminal; solicit a data set from a 3770; select and initiate program execution at a 3770; initiate an automatic power-down sequence at a 3770; and deliver formatted data for a non-programmable 3770, which is received and written to a system data set on diskette. The programming statements for a programmable 3770 provide support for transmitting the formatted data to the printer under control of an application program.

For SDLC operation, the 3770 series terminals are supported for IBM System/370 Model 115 through 168 systems including a 3704 or 3705 Communications Controller (using NCP/VS) attached locally or remotely and operating under DOS/VS, OS/VS1, or OS/VS2. Access methods supported are VTAM or TCAM through VTAM. IMS/VS support under OS/VS1 or VS2 and CICS/VS support under DOS/VS, OS/VS1, or OS/VS2 is provided. Remote job entry support is provided under the three operating systems by POWER/VS (DOS/VS), RES (OS/VS1), and JES2, JES2/NJE, and JES3 (OS/VS2).

Programming support via 3790 Host Support is provided under DOS/VS, OS/VS1, or OS/VS2.

A BSC 3770 terminal with appropriate input and output devices and optional features is supported under a subset of the support provided for the 2770 terminals. Specific features and functions available on the 2770 but not the 3770 family which may affect user applications programming include conversational mode, terminal-to-terminal operation, status message, 128/128 and 512/512-byte alternating buffer (supported for the 3776), security ID, printing EBCDIC transparent data, 1053 ribbon shift, punch column 81, and expanded 144-position print line. The full selection of input and output devices available with a 2770 terminal is not implemented for 3770's, which may require changes in both programming and procedures.

COMPONENTS

KEYBOARD: The standard typewriter-style keyboard consists of 44 alphanumeric data keys in an EBCDIC arrangement. The functions of the underscore/hyphen, backspace, space, and "Print Character" keys are repeated automatically when the keys are held down. The optional ASCII Feature provides 48 ASCII data keys, capable of producing 94 ASCII graphics, in place of the standard 44 keys. In addition to the data keys, the keyboard contains function keys, operating mode switches, indicator lights, and a 3-position numeric display. A Keylock feature disables all operator-activated controls.

MATRIX PRINTER: This bidirectional wire-matrix unit is the standard printer in the 3774 Communications Terminals. It prints serially by character at a rated speed of 80 or 120 characters per second, depending upon the model (see price list). There are 132 print positions, spaced 10 to the inch. Vertical spacing is 6 or 8 lines per inch. A 94-character set is standard.

Up to 6-part forms ranging from 3 to 15 inches in width can be used. A friction-feed platen is standard, and a variable-width forms tractor for pin-feed forms is optional. An optional forms stand facilitates the feeding and stacking of continuous forms.

LINE PRINTER, 120 LPM: This unit is the standard printer in the 3775 Communication Terminal. It normally prints a line at a time from characters engraved on the revolving interchangeable metal print belt. During a key entry operation, however, the print platen lowers to enable the operator to see the line being printed. Maximum print speed is 120 lpm with a 64-character set or 80 lpm with a 94-character set. Both sizes of character sets are available with either EBCDIC or ASCII graphics. There are 132 print positions, spaced 10 to the inch. Vertical spacing is 6 or 8 lines per inch. A variable-width forms tractor feeds continuous forms up to 15 inches in width. A Dual Independent Forms Feed option permits two forms of different sizes to be printed at the same time using two independently indexed pin feed mechanisms.

3784 LINE PRINTER: This optional output device, available only with 3774 Communication Terminal, is functionally similar to the 3775's integral line printer described in the paragraph above. The 3784, however, can also be equipped with a 48-character set, giving the user a choice of three rated print speeds: 155 lpm with the 48-character set, 120 lpm with the 64-character set, or 80 lpm with the 94-character set. Dual buffers, 132 print positions, and a variable-width forms tractor are all standard. A 3784 Attachment is required on the 3774.

2502 CARD READER: Reads 80-column cards punched in ASCII or EBCDIC code (determined by transmission code selection). Two models are available, which differ only in rated speed. Model A1 reads 150 cards/minute; Model A2 reads 300 cards/minute. The input hopper holds 700 cards, and the output stacker holds 600 cards. Options permit reading 51- or 80-column cards, 66- or 80-column cards, and mark-sense (optical) reading. Mark-sense reading permits marking up to 40 columns; marked and/or punched data can be read from the same card. Cards having unacceptable marks are offset-stacked. The 2502 can be attached to a 3774 or 3775 equipped with the 3782/2502 Card Reader Attachment feature via the 3782 Model 2 Card Attachment Unit.

3501 CARD READER: A table-top unit that reads 80-column cards serially at 50 cards per minute. Cards can be punched in either EBCDIC or ASCII. The input hopper and output stacker each hold about 400 cards. The 3501 requires a 3501 Card Reader Attachment feature on the 3774 or 3775. ►

IBM 3774/3775 P Series Programmable Keyboard/Printer Terminals

➤ **3521 CARD PUNCH:** A table-top unit that punches cards at 50 cards/minute. The input hopper and output stacker each hold about 400 cards. The 3521 requires a 3782/3521 Card Punch Attachment feature on the 3774 or 3775 and the 3782 Model 1 Card Attachment Unit. The 3521 fits atop the 3782. The Card Print feature permits printing up to 80 characters along the top edge of a card; a 64-character set from either EBCDIC or ASCII is used. The Card Read/Punch Check feature enables a 3521 to function as a card punch or a card reader. Cards cannot be read and punched in the same cycle. The feature also enables a column-by-column comparison between punch data and data read from the card after punching; a failure of this check stops the punch and lights an error indicator. The Punch Check feature must be inhibited if cards with internal scores or prepunched data are punched. If the 3770 terminal is already equipped with a 3501 or 2502 Card Reader, the Card Read portion of this feature is inoperable.

DISKETTE DRIVE: Reads and writes on same type of flexible disk used in IBM 3740 data entry equipment. Data organization is the same as in the 3740; i.e., data is recorded on one side of the diskette in sectors of 128 characters. There are 74 tracks and 26 sectors per track. The first track is reserved, as it is in the 3740. In addition, two sectors (one 256-character record) are reserved for job identification. The maximum storage capacity is 949 256-character records, or 242,944 characters. Data is read or written via one movable read/write head.

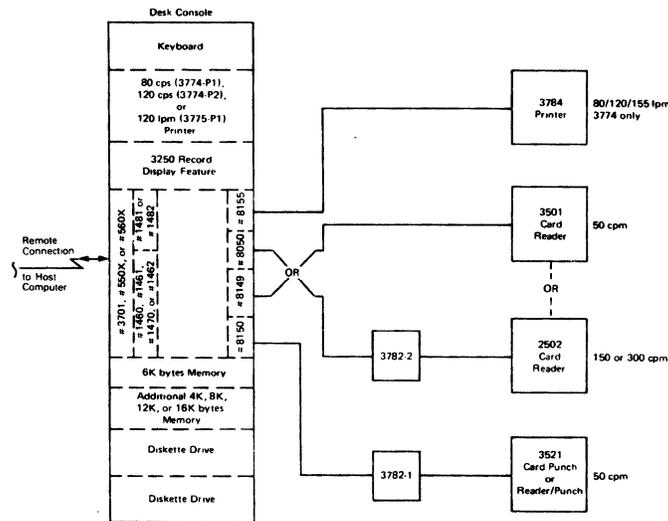
Data can be organized on the diskettes in two ways. An interchange format records the 256-character record in two consecutive sectors; appropriately prepared diskettes can be interchanged with 3740's. In the 3770 mode, the 256-character buffer record is written in two non-consecutive sectors for increased performance.

The diskette drives are located in the desk pedestals. Keylocks are available for one or both doors. The 3774 and 3775 are delivered with both pedestals in place, whether or not the two drive options are installed.

OPERATOR ID READER: Reads magnetic stripe cards using the ABA format. A total of 40 characters can be read from the stripe. The cards are the size of a standard credit card (3 3/8 by 2 1/8 inches). The encoding format on the stripe is four bits plus parity for each character.

PRICING

All 3770 series models and components (except the 2502 Card Reader) are available under IBM's LRA (Lease Rental Agreement) which provides month-to-month rental and two-year lease arrangements, and for purchase. All monthly charges below include prime shift maintenance; a separate plan is available for purchased units. Unlimited usage is included under either monthly plan. Extended maintenance is available at extra cost up to a total premium of about 40 percent for 24 hours per day, 7 days per week coverage.



Monthly Charges*

	Monthly Rental	2-Year Lease	Purchase	Monthly Maint.	
3774—					
Model P1; 80 cps printer	\$448	\$381	\$ 8,310	\$194.00	
Model P2; 120 cps printer	504	429	9,385	208.00	
3775—					
Model P1; 120 lpm printer	680	579	12,600	239.00	
Features					
Communications Feature—					
#1460	SDLC/BSC, Switch Control	35	30	810	6.50
#1461	BSC, Point-to-Point	19	16	504	3.50
#1470	SDLC	16	14	440	3.50
#1462	BSC Multipoint	16	14	347	1.00
Communications Driver—					
#1481	W/o Business Machine Clocking	16	14	347	2.00
#1482	With 1200 bps Business Machine Clocking	19	16	410	3.50

IBM 3774/3775 P Series Programmable Keyboard/Printer Terminals

► message, which is stored on diskette and conditionally printed. The interrupted program is then resumed.

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2502 CARD READER: Reads 80-column cards punched in ASCII or EBCDIC code (determined by transmission code selection). Two models are available, which differ only in rated speed. Model A1 reads 150 cards/minute; Model A2 reads 300 cards/minute. The input hopper holds 700 cards, and the output stacker holds 600 cards. Options permit reading 51- or 80-column cards, 66- or 80-column cards, and mark-sense (optical) reading. Mark-sense reading permits marking up to 40 columns; marked and/or punched data can be read from the same card. Cards having unacceptable marks are offset-stacked. The 2502 can be attached to a 3774 or 3775 equipped with the 3782/2502 Card Reader Attachment feature via the 3782 Model 2 Card Attachment Unit.

3501 CARD READER: A table-top unit that reads 80-column cards serially at 50 cards per minute. Cards can be punched in either EBCDIC or ASCII. The input hopper and output stacker each hold about 400 cards. The 3501 requires a 3501 Card Reader Attachment feature on the 3774 or 3775. ►

IBM 3774/3775 P Series Programmable Keyboard/Printer Terminals

► **3521 CARD PUNCH:** A table-top unit that punches cards at 50 cards/minute. The input hopper and output stacker each hold about 400 cards. The 3521 requires a 3782/3521 Card Punch Attachment feature on the 3774 or 3775 and the 3782 Model I Card Attachment Unit. The 3521 fits atop the 3782. The Card Print feature permits printing up to 80 characters along the top edge of a card; a 64-character set from either EBCDIC or ASCII is used. The Card Read/Punch Check feature enables a 3521 to function as a card punch or a card reader. Cards cannot be read and punched in the same cycle. The feature also enables a column-by-column comparison between punch data and data read from the card after punching; a failure of this check stops the punch and lights an error indicator. The Punch Check feature must be inhibited if cards with internal scores or prepunched data are punched. If the 3770 terminal is already equipped with a 3501 or 2502 Card Reader, the Card Read portion of this feature is inoperable.

DISKETTE DRIVE: Reads and writes on same type of flexible disk used in IBM 3740 data entry equipment. Data organization is the same as in the 3740; i.e., data is recorded on one side of the diskette in sectors of 128 characters. There are 74 tracks and 26 sectors per track. The first track is reserved, as it is in the 3740. In addition, two sectors (one 256-character record) are reserved for job identification. The maximum storage capacity is 949 256-character records, or 242,944 characters. Data is read or written via one movable read/write head.

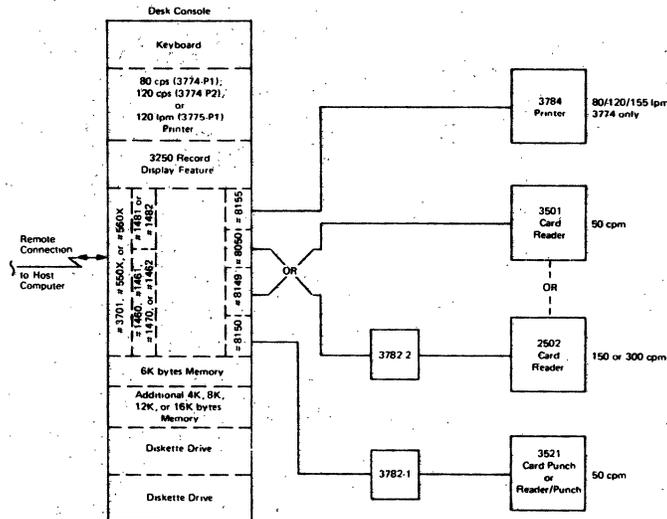
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The diskette drives are located in the desk pedestals. Keylocks are available for one or both doors. The 3774 and 3775 are delivered with both pedestals in place, whether or not the two drive options are installed.

OPERATOR ID READER: Reads magnetic stripe cards using the ABA format. A total of 40 characters can be read from the stripe. The cards are the size of a standard credit card (3 3/8 by 2 1/8 inches). The encoding format on the stripe is four bits plus parity for each character.

PRICING

All 3770 series models and components (except the 2502 Card Reader) are available under IBM's LRA (Lease Rental Agreement) which provides month-to-month rental and two-year lease arrangements, and for purchase. All monthly charges below include prime shift maintenance; a separate plan is available for purchased units. Unlimited usage is included under either monthly plan. Extended maintenance is available at extra cost up to a total premium of about 40 percent for 24 hours per day, 7 days per week coverage.



	Monthly Charges*				
	Monthly Rental	2-Year Lease	Purchase	Monthly Maint.	
3774—					
Model P1; 80 cps printer	\$415	\$353	\$ 8,310	\$169.00	
Model P2; 120 cps printer	468	398	9,385	181.00	
3775—					
Model P1; 120 lpm printer	631	537	12,600	208.00	
Features					
Communications Feature—					
#1460	SDLC/BSC, Switch Control	33	28	810	6.50
#1461	BSC, Point-to-Point	18	15	504	3.50
#1470	SDLC	15	13	440	3.50
#1462	BSC Multipoint	15	13	347	1.00
Communications Driver—					
#1481	W/o Business Machine Clocking	15	13	347	2.00
#1482	With 1200 bps Business Machine Clocking	18	15	410	3.50

**IBM 3774/3775 P Series Programmable
 Keyboard/Printer Terminals**

	Monthly Charges*			Monthly Maint.
	Monthly Rental	2-Year Lease	Purchase	
#3701 EIA Interface	\$ 16	\$ 14	\$ 462	\$ 1.50
1200 bps Integrated Modem—				
#5500 Non-Switched	25	21	701	5.00
#5501 Switched, Auto-Answer	35	30	882	5.00
#5502 Switched, Manual Answer	25	21	701	5.00
2400 bps Integrated Modem—				
#5600 Non-Switched, Point-to-Point	96	82	2,320	7.00
#5602 Non-Switched, Multipoint	103	88	2,520	7.00
#5610 Switched with Auto-Answer	103	88	2,520	8.00
#7951 Switched Network Backup	14	12	378	1.00
#3901 Modem Fan-Out	27	23	720	1.50
#1201 ASCII Feature	22	19	450	0.50
#1390 Audible Alarm	42**	42**	42	0.50
#3250 Display, 480 characters	130	111	2,520	54.50
#3401 Door Keylock	15**	15**	15	—
#3402 Door Keylock, Dual	31**	31**	31	—
#4650 Keylock	36**	36**	36	—
#3551 Dual Independent Forms Feed (3775 only)	39	33	788	17.50
#4660 Keypad, Numeric	15	13	315	2.50
#5450 Operator ID Reader	16	14	347	2.50
#6010 Record Format Feature	35	30	662	6.00
Diskette Storage—				
#4901 First	98	83	1,770	22.50
#4902 Second	98	83	1,770	9.00
Storage Increments—				
#6800 4K	20	17	276	5.00
#6801 8K	36	31	501	7.50
#6802 12K	53	45	716	15.00
#6803 16K	68	58	919	17.50
I/O Attachment Features—				
#8050 3501 Card Reader	16	14	347	1.00
#8149 3782/2502 Card Reader	25	21	480	4.50
#8150 3782/3521 Card Punch	25	21	480	4.00
#8155 3784 Printer (3774 only)	25	21	480	2.00
I/O Devices				
3782 Card Attachment Unit:				
Model 1; for 3521 Card Punch	56	48	1,695	3.00
Model 2; for 2502 Card Reader	82	70	2,430	2.50
Optical Mark Read	35	30	1,020	2.50
2502 Card Reader:				
Model A1; 150 cpm	213	—	7,405	70.50
Model A2; 300 cpm	268	—	8,030	70.50
Interchangeable Feed; 51/80 or 66/80 col.	45	—	1,590	22.50
Optical Mark Read	211	—	7,010	40.50
3501 Card Reader; 50 cpm	167	142	4,080	37.00
3521 Card Punch; 50 cpm				
Card Print	354	301	8,420	71.50
Card Read/Punch Check	102	87	2,545	17.50
	89	76	2,250	50.00
3784 Line Printer; 80-155 lpm (3774 only)	518	441	14,820	83.50
#4450 Forms Stand	56**	56**	56	—
#8700 Variable Width Forms Tractor (3774 only)	6	5	168	0.50
#58XX Print Belts	160**	160**	160	—

*Includes maintenance.

**Single use charge.■

IBM 3774/3775 P Series Programmable
Keyboard/Printer Terminals

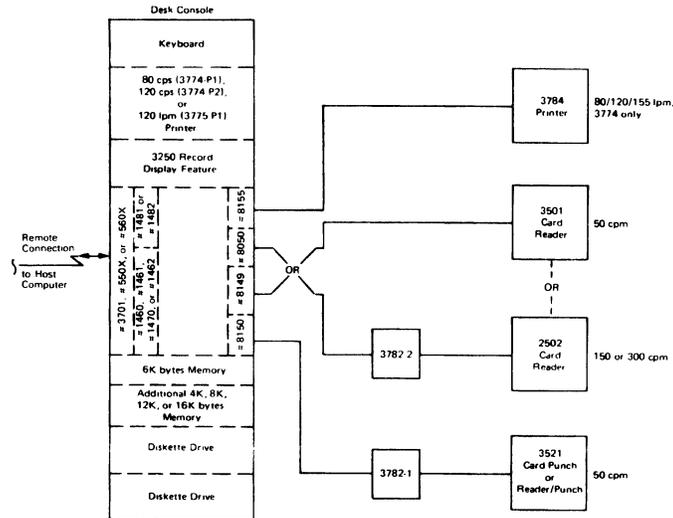
		Monthly Charges*			
		Monthly Rental	2-Year Lease	Purchase	Monthly Maint.
#3701	EIA Interface	\$ 15	\$ 13	\$ 462	\$ 1.50
1200 bps Integrated Modem—					
#5500	Non-Switched	22	19	701	4.50
#5501	Switched, Auto-Answer	33	28	882	4.50
#5502	Switched, Manual Answer	22	19	701	4.50
2400 bps Integrated Modem—					
#5600	Non-Switched, Point-to-Point	89	76	2,320	6.00
#5602	Non-Switched, Multipoint	96	82	2,520	6.00
#5610	Switched with Auto-Answer	96	82	2,520	7.00
#7951	Switched Network Backup	13	11	378	0.50
#3901	Modem Fan-Out	25	21	720	1.00
#1201	ASCII Feature	21	18	450	0.50
#1390	Audible Alarm	42**	42**	42	0.50
#3250	Display, 480 characters	122	104	2,520	47.50
#3401	Door Keylock	15**	15**	15	—
#3402	Door Keylock, Dual	31**	31**	31	—
#4650	Keylock	36**	36**	36	—
#3551	Dual Independent Forms Feed (3775 only)	36	31	788	15.00
#4660	Keypad, Numeric	14	12	315	2.50
#5450	Operator ID Reader	15	13	347	2.00
#6010	Record Format Feature	33	28	662	5.00
Diskette Storage—					
#4901	First	90	77	1,770	19.50
#4902	Second	90	77	1,770	8.00
Storage Increments—					
#6800	4K	19	16	276	5.00
#6801	8K	34	29	501	7.50
#6802	12K	49	42	716	13.00
#6803	16K	63	54	919	15.00
I/O Attachment Features—					
#8050	3501 Card Reader	15	13	347	0.50
#8149	3782/2502 Card Reader	22	19	480	4.00
#8150	3782/3521 Card Punch	22	19	480	3.50
#8155	3784 Printer (3774 only)	22	19	480	1.50
I/O Devices					
3782 Card Attachment Unit:					
	Model 1; for 3521 Card Punch	52	44	1,695	3.00
	Model 2; for 2502 Card Reader	76	65	2,430	2.50
	Optical Mark Read	33	28	1,020	2.50
2502 Card Reader:					
	Model A1; 150 cpm	198	—	7,405	64.00
	Model A2; 300 cpm	249	—	8,030	64.00
	Interchangeable Feed; 51/80 or 66/80 col.	42	—	1,590	20.50
	Optical Mark Read	196	—	7,010	37.00
	3501 Card Reader; 50 cpm	155	132	4,080	32.00
	3521 Card Punch; 50 cpm	328	279	8,420	62.00
	Card Print	95	81	2,545	15.00
	Card Read/Punch Check	82	70	2,250	43.50
	3784 Line Printer; 80-155 lpm (3774 only)	481	409	14,820	83.50
#4450	Forms Stand	82**	82**	82	—
#8700	Variable Width Forms Tractor (3774 only)	6	5	168	0.50
#58XX	Print Belts	160**	160**	160	—

*Includes maintenance.

**Single use charge. ■

IBM 3774/3775 P Series Programmable Keyboard/Printer Terminals

Update



Monthly Rental*

	<u>Short Term</u>	<u>Ext. Term</u>	<u>Purchase</u>	<u>Monthly Maint.***</u>
3774—				
Model P1; 80 cps printer	\$363	\$309	\$ 8,310	\$128.00
Model P2; 120 cps printer	410	349	9,385	138.00
3775—				
Model P1; 120 lpm printer	552	470	12,600	181.00
Features				
Communications Feature—				
#1460	28	24	810	6.50
#1461	15	13	546	3.00
#1470	13	11	462	3.00
#1462	13	11	462	1.00
Communications Driver—				
#1481	13	11	462	2.00
#1482	15	13	546	3.00
#3701	13	11	462	1.00
1200 bps Integrated Modem—				
#5500	20	17	701	4.00
#5501	28	24	882	4.00
#5502	20	17	701	4.00
2400 bps Integrated Modem—				
#5600	78	66	2,320	5.00
#5602	85	72	2,520	5.00
#5610	85	72	2,520	6.00
#7951	11	9	378	0.50
#3901	22	19	720	1.00
#1201	19	16	600	0.50
#1390	42**	42**	42	0.50
#3250	103	88	3,360	36.00
#3401	15**	15**	15	—
#3402	31**	31**	31	—
#4650	36**	36**	36	—
#3551	32	27	788	13.00
#4660	12	10	420	2.00
#5450	13	11	462	1.50
#6010	28	24	662	4.50
Diskette Storage—				
#4901	79	67	1,770	19.50
#4902	79	67	1,770	8.00

IBM 3774/3775 P Series Programmable
 Keyboard/Printer Terminals

		Monthly Rental*			
		Short Term	Ext. Term	Purchase	Monthly Maint.***
Storage Increments—					
#6800	4K	\$ 19	\$ 16	\$ 368	\$ 4.50
#6801	8K	34	29	668	6.50
#6802	12K	49	42	716	13.00
#6803	16K	63	54	1,225	13.50
I/O Attachment Features—					
#8050	3501 Card Reader	13	11	462	0.50
#8149	3782/2502 Card Reader	20	17	640	4.00
#8150	3782/3521 Card Punch	20	17	640	3.50
#8155	3784 Printer (3774 only)	20	17	640	0.50
I/O Devices					
3782 Card Attachment Unit:					
	Model 1; for 3521 Card Punch	45	38	1,540	2.00
	Model 2; for 2502 Card Reader	67	57	2,205	1.50
	Optical Mark Read	28	24	926	1.50
2502 Card Reader:					
	Model A1; 150 cpm	171	—	6,785	58.00
	Model A2; 300 cpm	214	—	7,360	58.00
	Interchangeable Feed; 51/80 or 66/80 col.	36	—	1,460	18.50
	Optical Mark Read	169	—	6,425	33.50
	3501 Card Reader; 50 cpm	135	115	3,745	24.50
	3521 Card Punch; 50 cpm	282	240	7,715	47.00
	Card Print	81	69	2,335	11.50
	Card Read/Punch Check	71	60	2,065	33.00
	3784 Line Printer; 80-155 lpm (3774 only)	421	358	13,450	83.50
#4450	Forms Stand	62**	62**	62	—
#8700	Variable Width Forms Tractor (3774 only)	6	5	168	0.50
#58XX	Print Belts	160**	160**	160	—

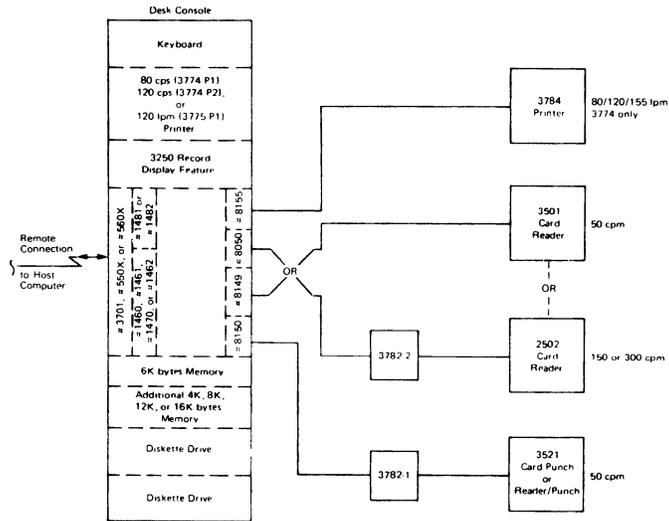
*Includes maintenance.

**Single use charge.

***Monthly maintenance charges shown for Features apply when used with Model 3774; when used with Model 3775, monthly maintenance charges for certain features may be slightly higher.■

Update

IBM 3774/3775 P Series Programmable Keyboard/Printer Terminals



		Monthly Rental*			
		Short Term	Ext. Term	Purchase	Monthly Maint.**
3774—	Model P1; 80 cps printer	\$347	\$295	\$11,080	\$122.00
	Model P2; 120 cps printer	391	333	12,510	131.00
3775—	Model P1; 120 lpm printer	526	448	16,800	172.00
Features					
Communications Feature—					
#1460	SDLC/BSC, Switch Control	27	23	840	5.50
#1461	BSC, Point-to-Point	15	13	546	3.00
#1470	SDLC	13	11	462	3.00
#1462	BSC Multipoint	13	11	462	1.00
Communications Driver—					
#1481	W/o Business Machine Clocking	13	11	462	2.00
#1482	With 1200 bps Business Machine Clocking	15	13	546	3.00
#3701	EIA Interface	13	11	462	1.00
1200 bps Integrated Modem—					
#5500	Non-Switched	20	17	701	4.00
#5501	Switched, Auto-Answer	27	23	882	4.00
#5502	Switched, Manual Answer	20	17	701	4.00
2400 bps Integrated Modem—					
#5600	Non-Switched, Point-to-Point	75	64	2,320	5.00
#5602	Non-Switched, Multipoint	81	69	2,520	5.00
#5610	Switched with Auto-Answer	81	69	2,520	6.00
#7951	Switched Network Backup	11	9	378	0.50
#3901	Modem Fan-Out	22	19	720	1.00
#1201	ASCII Feature	19	16	600	0.50
#1390	Audible Alarm	42**	42**	42	0.50
#3250	Display, 480 characters	103	88	3,360	36.00
#3401	Door Keylock	15**	15**	15	—
#3402	Door Keylock, Dual	31**	31**	31	—
#4650	Keylock	36**	36**	36	—
#3551	Dual Independent Forms Feed (3775 only)	31	26	1,050	12.50
#4660	Keypad, Numeric	12	10	420	2.00
#5450	Operator ID Reader	13	11	462	1.50
#6010	Record Format Feature	27	23	882	4.50
Diskette Storage—					
#4901	First	76	65	2,360	17.00
#4902	Second	76	65	2,360	7.00

IBM 3774/3775 P Series Programmable
 Keyboard/Printer Terminals

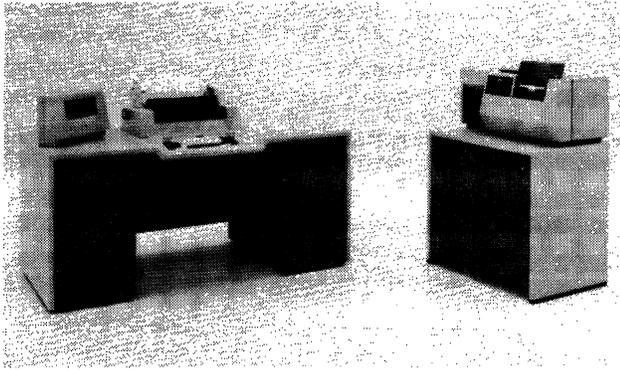
		Monthly Rental*			Monthly Maint.**
		Short Term	Ext. Term	Purchase	
Storage Increments—					
#6800	4K	19	16	368	4.50
#6801	8K	34	29	668	6.50
#6802	12K	48	41	955	11.50
#6803	16K	63	54	1,225	13.50
I/O Attachment Features—					
#8050	3501 Card Reader	13	11	462	0.50
#8149	3782/2502 Card Reader	20	17	640	4.00
#8150	3782/3521 Card Punch	20	17	640	3.50
#8155	3784 Printer (3774 only)	20	17	640	0.50
I/O Devices					
3782 Card Attachment Unit:					
	Model 1; for 3521 Card Punch	43	37	1,470	2.00
	Model 2; for 2502 Card Reader	65	55	2,100	1.50
	Optical Mark Read	27	23	882	1.50
2502 Card Reader:					
	Model A1; 150 cpm	160	—	6,465	53.00
	Model A2; 300 cpm	200	—	7,010	53.00
	Interchangeable Feed; 51/80 or 66/80 col.	34	—	1,395	17.00
	Optical Mark Read	158	—	6,120	30.50
	3501 Card Reader; 50 cpm	127	108	3,570	22.50
	3521 Card Punch; 50 cpm	264	225	7,350	43.00
	Card Print	76	65	2,225	10.50
	Card Read/Punch Check	67	57	1,970	30.00
	3784 Line Printer; 80-155 lpm (3774 only)	401	341	12,810	83.50
#4450	Forms Stand	62**	62**	62	—
#8700	Variable Width Forms Tractor (3774 only)	6	5	168	0.50
#58XX	Print Belts	160**	160**	160	—

*Includes maintenance.

**Single use charge.

***Monthly maintenance charges shown for Features apply when used with Model 3774; when used with Model 3775, monthly maintenance charges for certain features may be slightly higher.■

IBM 3774/3775 P Series Programmable Keyboard/Printer Terminals



This Model 3774 configuration includes a bidirectional serial matrix printer, an EBCDIC keyboard, the Display Feature's 480-character gas panel monitor (located to the left of the printer), and the 2502 Card Reader, which sits on top of the 3782 Card Attachment Unit.

MANAGEMENT SUMMARY

The 3770 family includes the user-programmable Models 3774 and 3775, the non-programmable Model 3771 (Report C27-491-101) and the high performance 3776 and 3777 batch terminals (Report C23-491-201). The programmable units, the three P Series models of the 3774 and 3775, are the subject of this report.

The 3774 and 3775 are primarily oriented towards batch data entry. Each can perform standalone processing without control or supervision by a host CPU. When operating under IBM's System Network Architecture (SNA), each communicates with the host CPU as a single physical/logical unit in a single batch session. There are no facilities for establishing or maintaining inquiry/response sessions with the host.

Model 3774 provides medium speed serial printing and supports a 155-lpm line printer, one or two diskette drives, a record display, a card reader, and a card punch as optional devices. The two available versions, 3774-P1 and 3774-P2, are identical, except for the speed of the serial printer, which is rated at 80 cps or 120 cps respectively.

Model 3775 is similar to the 3774 except that it provides a line printer instead of a serial printer as standard, and accommodates no other printers. Lack of a 48-character set feature puts the top speed of the 3775's line printer at 120 lpm (64-character set) instead of the 155 lpm top speed with the 3774 optional line printer using a 48-character set.

User programs are written using a subset of 3790 Communication System programming statements, plus 3770 statements for punched I/O, the 480-character Display Feature, and diskette storage operations. Programs are assembled using a System/370 DOS/VS or OS/VS assembler and 3790 Host Support, including a Macro ➤

The user-programmable members of the IBM 3770 Data Communications System family.

The basic terminals include an EBCDIC keyboard, 99,840 bytes of diskette storage, and a 6K-byte main memory. Model 3774 also includes an 80- or 120-cps bidirectional serial matrix printer; Model 3775 comes with a 120-lpm line printer.

Optional peripherals include one or two additional 242,944-byte diskette drives, a 155-lpm line printer (3774 only), a 50-cpm card punch, and one of these card readers. An optional Display Feature provides a 480-character gas discharge panel monitor. Main memory is expandable to 22K in 4K-, 8K-, 12-, or 16K-byte increments.

The basic 80-cps and 120-cps Model 3774's can be purchased for \$10,560 and \$11,920, and leased for \$264 and \$298 per month including maintenance on a two-year lease, respectively. The Model 377 starts at \$16,000, or \$400 per month.

The non-programmable 3771 terminal is covered in Report C27-491-201. The non-programmable batch terminal members of the 3770 family are covered in Report C23-491-201.

CHARACTERISTICS

VENDOR: International Business Machines Corporation, Data Processing Division, 1133 Westchester Avenue, White Plains, New York 10604. Telephone (914) 696-1900.

DATE OF ANNOUNCEMENT: July 1975.

DATE OF FIRST DELIVERY: April 1976.

NUMBER DELIVERED TO DATE: Information not available.

SERVICED BY: IBM.

CONFIGURATION

The 3774 Communication Terminal is a desk-style console equipped with a keyboard and a bidirectional serial matrix printer rated at 80 cps (in the 3774 Model P1) or 120 cps (in Model P2).

The 3775 Communication Terminal is a desk-style console equipped with a keyboard and a line printer rated at 120 lpm when using a 64-character set and 80 lpm when using a 94-character set.

In addition, each basic model is equipped with integrated, nonremovable diskette storage with a user capacity of 99,840 ➤

IBM 3774/3775 P Series Programmable Keyboard/Printer Terminals

▷ Library containing Program Validation Services (PVS). PVS is used to validate, test, and format programs for the terminals. User memory capacity ranges from a basic 6K bytes to a maximum of 22K bytes.

The IBM 3370 terminal family was originally announced in September 1974, with major expansions occurring in July and November 1975 and major contractions in May 1977. The relationships among family members can be described as follows:

- 3771—keyboard/matrix printer (40, 80, or 120 cps) terminal that can accommodate low-speed card I/O (50 cpm).
- 3774—same as the 3771 but can accommodate one or two diskette drives, a faster card reader (up to 300 cpm), an additional printer (up to 155 lpm), and is programmable.
- 3775—same as the 3774 except that a line printer (up to 120 lpm) is standard and the console matrix printer is not available.
- 3776—same as the 3775 except that it is not programmable, faster line printers are included (up to 300 or 400 lpm), and keyboard data entry is excluded.
- 3777—same as the 3776 except that a faster line printer is included (up to 1000 lpm), a faster card reader is available (up to 400 cpm), and transmission speeds up to 9600 bps are supported, as compared with 4800 bps for the other models.

USER REACTION

In Datapro's 1978 survey of remote batch terminal users, a total of 8 users responded with information on the 3774/3775. Three were 3774 users reporting on six units, and five were 3775 users with a total of 21 units.

The terminals were being used almost universally with EBCDIC code, in a point-to-point arrangement using BSC protocol at 2400 bps. Exceptions included one user with a multipoint arrangement, two users who use SDLC protocol, and two users who transmitted at other speeds (2000 and 4800 bps). Half of the users were communicating over leased voice-grade lines; the other half used dial-up communications. Six of the users reported their transmission volumes, which averaged 2683 records sent and 4436 print lines received per day. Only one of the six users reported that any records were received by the terminal; the daily volume was 250 records.

A summary of the ratings assigned by the users to the 3774 and 3775 is presented below:

	<u>Excellent</u>	<u>Good</u>	<u>Fair</u>	<u>Poor</u>	<u>WA*</u>
Overall performance	1	5	2	0	2.9
Ease of operation	0	3	5	0	2.4
Hardware reliability	2	4	1	0	3.1
Maintenance service	1	5	1	0	3.0
Terminal software	1	3	1	0	3.0
Vendor technical support	1	4	2	0	2.9

*Weighted Average on a scale of 4.0 for Excellent.

▷ bytes (30 tracks) for storage of application programs and data. The terminals are also equipped with expandable main memory for user program storage. The 3774 and 3775 have a basic 6K-byte memory, expandable to 22K bytes in 4K, 8K, 12K, or 16K increments.

An optional Display Feature provides 480 display positions arranged in 12 lines of 40 characters each. This display employs gas panel technology and is swivel-mounted on the top left surface of the keyboard console.

Peripherals include one or two additional diskette drives, a line printer rated at 155, 120, or 84 lpm for character sets of 48, 64, or 96 symbols respectively (available for Model 3774 only), a 50-cpm card punch, and one of three card readers rated at 50, 150, or 300 cpm.

TRANSMISSION SPECIFICATIONS

Transmission is synchronous, half-duplex at up to 4800 bps, using either SDLC (Synchronous Data Link Control) or BSC (Binary Synchronous Communication) line protocol over the public switched telephone network or over a point-to-point or multipoint leased line.

For attachment to a communications line, any 3770 terminal requires one of three Communication Features, one of two Communication Drivers, and either an EIA Interface for an external modem or one of several internal modems.

The Communication Feature determines the line protocol used: Alternate SDLC/BSC; BSC Point-To-Point; or SDLC. A BSC Multipoint feature is available for use with either the SDLC/BSC or BSC Point-To-Point option. The SDLC/BSC arrangement is switched manually between the two protocols. Either point-to-point or multipoint operation is permitted under SDLC. If multipoint operation is arranged over a full-duplex communications facility, one terminal can be transmitting while another is receiving.

The two Communication Drivers provide a clocked 1200 bps interface that is used with IBM's internal 1200 bps modems or an EIA RS-232C interface without clocking for an external modem or IBM's self-clocking internal 2400 bps modem.

Three varieties of the 1200 bps modem are available for internal installation in all models. One is for operation over a point-to-point or multipoint leased (non-switched) line; one is for operation over the switched public telephone network with manual answering; and the third is for operation over the telephone network, but with automatic answering. The manual-answer modem connects to the network through a CDT data coupler; the automatic-answering modem requires a CBS data coupler for connection. The data couplers can be acquired from the telephone company or independent vendors. They will not be required if the modem features become FCC type certified.

There are also three types of 2400 bps internal modems: non-switched point-to-point; non-switched multipoint; and switched (telephone network) with automatic answering (requires CBS data coupler). All three provide half-speed operation at 1200 bps, with manual adjustment of equalization on the non-switched models. A Switched Network Back-Up Feature, available for either of the non-switched internal modems, permits the operator to establish a connection over the telephone network if the leased line goes down; manual intervention at the computer site and perhaps program modification may be required to fully use this feature. A Modem Fan-Out feature for the non-switched multipoint modem permits two additional terminals to share that modem. Operationally, the three terminals function as three stations in a multipoint BSC or SDLC arrangement; no special handling is required.

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The Weighted Average user ratings for each terminal model were as follows:

	3774	3775
Overall performance	2.7	3.0
Ease of operation	2.0	2.6
Hardware reliability	2.7	3.5
Maintenance service	2.7	3.3
Terminal software	3.0	3.0
Vendor technical support	2.7	3.0

The most frequently mentioned advantages of the 3774/3775 were reliability and strong vendor support. Cost and configuration inflexibility were the most often named disadvantages. □

► In general, operation over leased voice-grade lines with IBM modems at 1200 or 2400 bps requires no conditioning; operation at 4800 bps requires C1 conditioning. IBM markets an external 2400 bps modem (3872) and a 4800 bps modem (3874). The EIA interface is compatible with IBM, Bell System, and independent modems of appropriate characteristics.

All 3770 models include space compression/expansion for elimination of long sequences of spaces from transmission. A 2-character sequence replaces up to 63 spaces. This feature is usable with non-transparent data in either BSC or SDLC protocol as long as the diskette drive is neither the source nor destination of the transmitted data.

A 3770 terminal (any model) using SDLC line protocol can operate as a tributary station on a multipoint leased line with IBM 3270, 3601, 3602, 3614, 3624, 3631, 3632, 3651 Model 50, 3767, and 3791 terminals, and System/32, System/34, and Series/1 processing units; a System/370 including a 3704/3705 Controller acts as the control station. All terminals and 3704/3705 features must be operating with the same type of clocking source (self-clocked modem or business-machine provided clocking) and at the same transmission speed.

Emulation software is available that permits the programmable 3774-P1 and -P2 and 3775-P1 to function as the non-programmable 3774-1 and -2 and 3775-1, which are no longer available, to provide compatibility with existing arrangements.

DEVICE CONTROL

All models execute off-line data entry and document preparation functions under the direction of user-written application programs, which are written from a subset of IBM 3790 programming statements combined with 3770 statements that control punched card I/O, display, and diskette storage operations. Programmable functions include: data entry checking for range and self-check numbers, alphabetic or numeric-only fields, and field length; logical operations that include compare and test; conditional and unconditional branching; arithmetic operations including add, subtract, multiply, and divide; horizontal and vertical forms control; format and edit operations for picture, justify, fill, and case; support for data transfer from storage to storage, immediate data to storage, and diskette storage operations; operation with sequential data on diskettes (relative data sets); and operation with user-created indexing to data sets. Program control is provided for diskette storage, the optional 480-character display, the 2502 or 3501 Card Reader, and the 3521 Card Punch. The 3521 Read feature can serve as an alternative to the 2502 and 3501 Card Readers. Programming statements provide for writing on the display by char-

acter, field, or line, erasing the screen, and vertically and horizontally positioning the cursor. The display can be used to exhibit error messages, keyed data, responses to inquiries addressed to the data sets stored on diskettes, and fill-in-the-blanks data entry forms. Off-line operations can be automatically interrupted to receive an unsolicited CPU message, which is stored on diskette and conditionally printed. The interrupted program is then resumed.

Programmable Communications allows a 3774 or 3775 to initiate and control a communications session with the host computer and to execute a program, including peripheral input/output, during the communications session. Essentially, the communications line can be treated by the programmer as another input/output device. For SDLC operation, SNA protocols are used to maintain communications. The function is also available for BSC terminals.

The Programmable Communications feature requires 7K bytes (SDLC) or 2K bytes (BSC). The card punch requires 3K bytes. Additional memory is required for working storage buffers, the card reader and the display.

Application programs for terminals are assembled on a System/370 computer via a DOS/VS or OS/VS Assembler and 3790 Host Support, including a Macro Library containing a Program Validation Services (PVS) program. Assembled programs are validated, optionally tested, and formatted for the terminal by the PVS program. The assembled program is transmitted to the appropriate terminal and stored on diskette. Upon request, the stored program is loaded into terminal program storage from diskette, where it is executed. Program selection can be operator or CPU initiated. The selected program can call another program from diskette storage without operator or CPU intervention. An operator-selectable job control capability permits selection and execution of a predefined series of 3770 programs; the executing program can alter the series.

CPU messages can add or delete 3770 application programs; create, load, erase (the contents of) or delete a data set at a 3770 terminal; solicit a data set from a 3770; select and initiate program execution at a 3770; initiate an automatic power-down sequence at a 3770; and deliver formatted data for a non-programmable 3770, which is received and written to a system data set on diskette. The programming statements for a programmable 3770 provide support for transmitting the formatted data to the printer under control of an application program.

For SDLC operation, the 3770 series terminals are supported for IBM System/370 Model 115 through 168 systems including a 3704 or 3705 Communications Controller (using NCP/VS) attached locally or remotely and operating under DOS/VS, OS/VS1, or OS/VS2. Access methods supported are VTAM or TCAM through VTAM. IMS/VS support under OS/VS1 or VS2 and CICS/VS support under DOS/VS, OS/VS1, or OS/VS2 is provided. Remote job entry support is provided under the three operating systems by POWER/VS (DOS/VS), RES (OS/VS1), and JES2, JES2/NJE, and JES3 (OS/VS2).

Programming support via 3790 Host Support is provided under DOS/VS, OS/VS1, or OS/VS2.

A BSC 3770 terminal with appropriate input and output devices and optional features is supported under a subset of the support provided for the 2770 terminals. Specific features and functions available on the 2770 but not the 3770 family which may affect user applications programming include conversational mode, terminal-to-terminal operation, status message, 128/128 and 512/512-byte alternating buffer (supported for the 3776), security ID, printing EBCDIC transparent data, 1053 ribbon shift, punch column 81, and ►

IBM 3774/3775 P Series Programmable Keyboard/Printer Terminals

► expanded 144-position print line. The full selection of input and output devices available with a 2770 terminal is not implemented for 3770's, which may require changes in both programming and procedures.

COMPONENTS

KEYBOARD: The standard typewriter-style keyboard consists of 44 alphanumeric data keys in an EBCDIC arrangement. The functions of the underscore/hyphen, backspace, space, and "Print Character" keys are repeated automatically when the keys are held down. The optional ASCII Feature provides 48 ASCII data keys, capable of producing 94 ASCII graphics, in place of the standard 44 keys. In addition to the data keys, the keyboard contains function keys, operating mode switches, indicator lights, and a 3-position numeric display. A Keylock feature disables all operator-activated controls.

MATRIX PRINTER: This bidirectional wire-matrix unit is the standard printer in the 3774 Communications Terminals. It prints serially by character at a rated speed of 80 or 120 characters per second, depending upon the model (see price list). There are 132 print positions, spaced 10 to the inch. Vertical spacing is 6 or 8 lines per inch. A 94-character set is standard.

Up to 6-part forms ranging from 3 to 15 inches in width can be used. A friction-feed platen is standard, and a variable-width forms tractor for pin-feed forms is optional. An optional forms stand facilitates the feeding and stacking of continuous forms.

LINE PRINTER, 120 LPM: This unit is the standard printer in the 3775 Communication Terminal. It normally prints a line at a time from characters engraved on the revolving interchangeable metal print belt. During a key entry operation, however, the print platen lowers to enable the operator to see the line being printed. Maximum print speed is 120 lpm with a 64-character set or 80 lpm with a 94-character set. Both sizes of character sets are available with either EBCDIC or ASCII graphics. There are 132 print positions, spaced 10 to the inch. Vertical spacing is 6 or 8 lines per inch. A variable-width forms tractor feeds continuous forms up to 15 inches in width. A Dual Independent Forms Feed option permits two forms of different sizes to be printed at the same time using two independently indexed pin feed mechanisms.

3784 LINE PRINTER: This optional output device, available only with 3774 Communication Terminal, is functionally similar to the 3775's integral line printer described in the paragraph above. The 3784, however, can also be equipped with a 48-character set, giving the user a choice of three rated print speeds: 155 lpm with the 48-character set, 120 lpm with the 64-character set, or 80 lpm with the 94-character set. Dual buffers, 132 print positions, and a variable-width forms tractor are all standard. A 3784 Attachment is required on the 3774.

2502 CARD READER: Reads 80-column cards punched in ASCII or EBCDIC code (determined by transmission code selection). Two models are available, which differ only in rated speed. Model A1 reads 150 cards/minute; Model A2 reads 300 cards/minute. The input hopper holds 700 cards, and the output stacker holds 600 cards. Options permit reading 51- or 80-column cards, 66- or 80-column cards, and mark-sense (optical) reading. Mark-sense reading permits marking up to 40 columns; marked and/or punched data can be read from the same card. Cards having unacceptable marks are offset-stacked. The 2502 can be attached to a 3774

or 3775 equipped with the 3782/2502 Card Reader Attachment feature via the 3782 Model 2 Card Attachment Unit.

3501 CARD READER: A table-top unit that reads 80-column cards serially at 50 cards per minute. Cards can be punched in either EBCDIC or ASCII. The input hopper and output stacker each hold about 400 cards. The 3501 requires a 3501 Card Reader Attachment feature on the 3774 or 3775.

3521 CARD PUNCH: A table-top unit that punches cards at 50 cards/minute. The input hopper and output stacker each hold about 400 cards. The 3521 requires a 3782/3521 Card Punch Attachment feature on the 3774 or 3775 and the 3782 Model 1 Card Attachment Unit. The 3521 fits atop the 3782. The Card Print feature permits printing up to 80 characters along the top edge of a card; a 64-character set from either EBCDIC or ASCII is used. The Card Read/Punch Check feature enables a 3521 to function as a card punch or a card reader. Cards cannot be read and punched in the same cycle. The feature also enables a column-by-column comparison between punch data and data read from the card after punching; a failure of this check stops the punch and lights an error indicator. The Punch Check feature must be inhibited if cards with internal scores or prepunched data are punched. If the 3770 terminal is already equipped with a 3501 or 2502 Card Reader, the Card Read portion of this feature is inoperable.

DISKETTE DRIVE: Reads and writes on same type of flexible disk used in IBM 3740 data entry equipment. Data organization is the same as in the 3740; i.e., data is recorded on one side of the diskette in sectors of 128 characters. There are 74 tracks and 26 sectors per track. The first track is reserved, as it is in the 3740. In addition, two sectors (one 256-character record) are reserved for job identification. The maximum storage capacity is 949 256-character records, or 242,944 characters. Data is read or written via one movable read/write head.

Data can be organized on the diskettes in two ways. An interchange format records the 256-character record in two consecutive sectors; appropriately prepared diskettes can be interchanged with 3740's. In the 3770 mode, the 256-character buffer record is written in two non-consecutive sectors for increased performance.

The diskette drives are located in the desk pedestals. Keylocks are available for one or both doors. The 3774 and 3775 are delivered with both pedestals in place, whether or not the two drive options are installed.

OPERATOR ID READER: Reads magnetic stripe cards using the ABA format. A total of 40 characters can be read from the stripe. The cards are the size of a standard credit card (3 $\frac{3}{8}$ by 2 $\frac{1}{8}$ inches). The encoding format on the stripe is four bits plus parity for each character.

PRICING

All 3770 series models and components (except the 2502 Card Reader) are available under IBM's LRA (Lease Rental Agreement) which provides month-to-month rental and two-year lease arrangements, and for purchase. All monthly charges below include prime shift maintenance; a separate plan is available for purchased units. Unlimited usage is included under either monthly plan. Extended maintenance is available at extra cost up to a total premium of about 40 percent for 24 hours per day 7 days per week coverage.

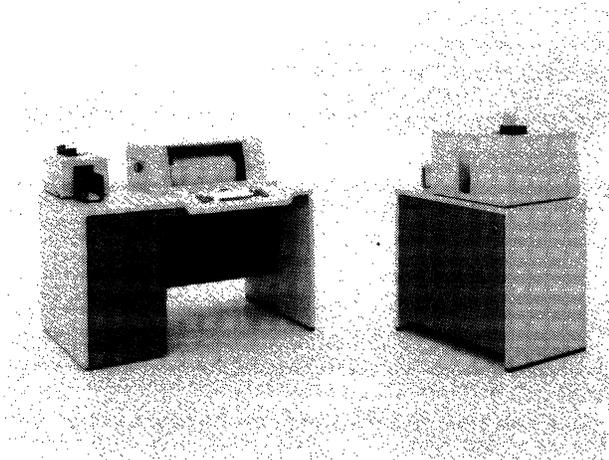
**IBM 3774/3775 P Series Programmable
 Keyboard/Printer Terminals**

		Monthly Rental*			
		<u>Short</u> <u>Term</u>	<u>Ext.</u> <u>Term</u>	<u>Purchase</u>	<u>Monthly</u> <u>Maint.</u>
Storage Increments—					
#6800	4K	18	15	351	4.50
#6801	8K	33	28	637	6.50
#6802	12K	46	39	910	11.50
#6803	16K	60	51	1,170	13.50
I/O Attachment Features—					
#8050	3501 Card Reader	13	11	440	0.50
#8149	3782/2502 Card Reader	19	16	640	4.00
#8150	3782/3521 Card Punch	19	16	640	3.50
#8155	3784 Printer (3774 only)	19	16	640	0.50
I/O Devices					
3782 Card Attachment Unit:					
	Model 1; for 3521 Card Punch	42	36	1,400	2.00
	Model 2; for 2502 Card Reader	61	52	2,000	1.50
	Optical Mark Read	26	22	840	1.50
2502 Card Reader:					
	Model A1; 150 cpm	150	—	6,160	50.50
	Model A2; 300 cpm	187	—	6,680	50.50
	Interchangeable Feed; 51/80 or 66/80 col.	32	—	1,330	16.00
	Optical Mark Read	148	—	5,830	29.00
	3501 Card Reader; 50 cpm	119	101	3,400	19.50
	3521 Card Punch; 50 cpm	248	211	7,000	37.50
	Card Print	72	61	2,120	9.00
	Card Read/Punch Check	63	54	1,880	26.00
	3784 Line Printer; 80-155 lpm (3774 only)	375	319	12,200	83.50
#4450	Forms Stand	62**	62**	62	—
#8700	Variable Width Forms Tractor (3774 only)	6	5	160	0.50
#58XX	Print Belts	160**	160**	160	—

*Includes maintenance.

**Single use charge. ■

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An expanded 3775 Model P1 is shown above. Included in this configuration are the 80/120 lpm printer and one diskette drive (left pedestal); a second drive could be added via a right pedestal mounting. Atop the terminal work surface is a 3501 50-cpm card reader. The 3521 50-cpm card punch is shown at the right of the photograph sitting on top of the 3782 Card Attachment Unit, which controls the punch.

MANAGEMENT SUMMARY

The IBM 3770 terminal family, originally announced in September 1974 with major expansions in July and November 1975 and major contractions in May 1977, includes a total of 10 distinct models divided into three groups: keyboard/printer terminals, programmable keyboard/printer terminals, and batch terminals. In a nutshell, the 3770 family includes the:

- 3771—keyboard/matrix printer (40, 80, or 120 cps) terminal that can accommodate low-speed card I/O (50 cpm).
- 3774—same as the 3771 but can accommodate one or two diskette drives, a faster card reader (up to 300 cpm), an additional printer (up to 155 lpm), and is programmable.
- 3775—same as the 3774 except that a line printer (up to 120 lpm) is standard and the console matrix printer is not available.
- 3776—same as the 3775 except that it is not programmable, faster line printers are included (up to 300 or 400 lpm), and keyboard data entry is excluded.
- 3777—same as the 3776 except that a faster line printer is included (up to 1000 lpm), a faster card reader is available (up to 400 cpm), and transmission speeds up to 9600 bps are supported, as compared with 4800 bps for the other models.

A family of three user programmable keyboard/printer terminals oriented towards data entry.

The three models offer print speeds from 80 cps to 155 lpm, diskette storage, and card input and output. Programs are assembled on the host IBM computer. Both SDLC and BSC disciplines are supported.

At the low end, a basic 3774 P1 prints at 80 cps and, with the internal 1200 bps modem, costs \$304 per month, including maintenance, on a two-year lease.

Moving up in capability, a 3774 P2 with 120 cps printer, internal 1200 bps modem, 50 cpm card reader and an extra 4K bytes of memory costs \$455 per month (lease).

A 3775 P1 with 120 lpm printer, 2400 bps internal modem, one diskette drive (in addition to the built in drive), an additional 8K bytes of memory, and a 150 cpm card reader costs \$714 per month (lease).

The non-programmable 3771 terminal is covered in Report C27-491-201. The batch terminal members of the 3770 family are covered in Report C23-491-201.

This report reflects substantial price reductions made in May 1977.

CHARACTERISTICS

VENDOR: International Business Machines Corporation, Data Processing Division, 1133 Westchester Avenue, White Plains, New York 10604. Telephone (914) 696-1900.

DATE OF ANNOUNCEMENT: July 1975.

DATE OF FIRST DELIVERY: April 1976.

NUMBER DELIVERED TO DATE: Information not available.

SERVICED BY: IBM.

CONFIGURATION

The 3774 Communication Terminal is a desk-style console equipped with a keyboard and a bidirectional serial matrix printer rated at 80 cps (in the 3774 Model P1) or 120 cps (in Model P2). It can optionally be equipped with one or two diskette drives, a line printer rated at 155, 120, or 84 lpm (for character sets of 48, 64, or 94 symbols, respectively), a 50-cpm card punch, and one of three card readers rated at 50, 150, or 300 cpm.

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➤ The programmable models, the three P series models of the 3774 and 3775 are the subject of this report. All of these models are primarily oriented towards data entry. The essential differences among the P series can be summarized as:

- **3774:** Medium speed serial printing with or without a line printer and one or two diskette drives, record display, and card peripherals optional.
- **3775:** This is a 3774 without the serial printer, but with the line printer standard. Lack of a 48-character set feature puts the top speed of the line printer at 120 lpm (64-character set) instead of the 155 lpm top speed with the 3774 optional line printer using a 48-character set.

The prices for the basic terminals and for the diskette storage units were substantially reduced in May 1977. The three configurations priced in the boxed text at the beginning of this report are excellent examples of the net effect of the price changes. The present monthly cost of the 3774 Model P1 with just an integrated modem option was reduced by 32 percent. The cost reduction for the 3774 Model P2 with internal modem, 50 cpm reader, and an extra 4K bytes of memory was 24 percent. The reduction for the 3775 Model P1 with internal modem, one diskette drive, an extra 8K bytes of memory, and a 150 cpm reader was 26 percent.

With the dropping of the non-programmable models of the 3774 and 3775, IBM introduced an emulator program that allows the programmable models to function as the previous 3774-1, -2 and 3775-1 for compatibility with existing arrangements.

The terminals can be programmed to check data; control forms; perform logic, arithmetic, storage, and format/edit operations; and control operations with user-created indexing to data sets and relative data sets on diskettes.

In addition to the above, user-written application programs for the 3774 and 3775 can be used to control a standard integrated diskette device with a nonremovable diskette, one or two optional storage devices with removable diskettes for storage and application programs, an optional 480-character display, a 2502 or 3501 Card Reader and 3521 Card Punch, and the communications line.

User programs are written using a subset of 3790 Communication System programming statements plus a number of new 3770 statements that provide support for configurations with diskette storage, card I/O, and the 480-character display feature. Programs are assembled using a System/370 DOS/VS or OS/VS assembler and 3790 Host Support, including a Macro Library containing Program Validation Services (PVS). PVS is used to validate, test, and format programs for the terminals.

Programs in object code are loaded from diskette storage into terminal storage for execution. User program storage ➤

➤ The 3775 Communication Terminal is a desk-style console equipped with a keyboard and a line printer rated at 120 lpm when using a 64-character set and 80 lpm when using a 94-character set. The terminal can optionally be equipped with one or two diskette drives, a 50-cpm card punch, and one of three card readers rated at 50, 150, or 300 cpm.

In addition each model is equipped with integrated, nonremovable diskette storage with a user capacity of 99,840 bytes (30 tracks) for storage of application programs and data. One or two additional diskette drives are optional. The terminals are also equipped with expandable main memory for user program storage. The 3774 and 3775 have a basic 6K-byte memory, expandable to 22K bytes in 4K, 8K, 12K, or 16K increments. An optional Display Feature provides 480 display positions arranged in 12 lines of 40 characters each. This display employs gas panel technology and is swivel-mounted on the top left surface of the keyboard console. A numeric keypad is optional for all models.

TRANSMISSION SPECIFICATIONS

Transmission is synchronous, half-duplex at up to 4800 bps, using either SDLC (Synchronous Data Link Control) or BSC (Binary Synchronous Communication) line protocol over the public switched telephone network or over a point-to-point or multipoint leased line.

For attachment to a communications line, any 3770 terminal requires one of three Communication Features, one of two Communication Drivers, and either an EIA Interface for an external modem or one of several internal modems.

The Communication Feature determines the line protocol used: Alternate SDLC/BSC; BSC Point-To-Point; or SDLC. A BSC Multipoint feature is available for use with either the SDLC/BSC or BSC Point-To-Point option. The SDLC/BSC arrangement is switched manually between the two protocols. Either point-to-point or multipoint operation is permitted under SDLC. If multipoint operation is arranged over a full-duplex communications facility, one terminal can be transmitting while another is receiving.

The two Communication Drivers provide a clocked 1200 bps interface that is used with IBM's internal 1200 bps modems or an EIA RS-232C interface without clocking for an external modem or IBM's self-clocking internal 2400 bps modem (for the 3774 and 3775 only).

Three varieties of the 1200 bps modem are available for internal installation in all models. One is for operation over a point-to-point leased (non-switched) line; one is for operation over the switched public telephone network with manual answering; and the third is for operation over the telephone network, but with automatic answering. The manual-answer modem connects to the network through a CBT data coupler; the automatic-answering modem requires a CBS data coupler for connection. The data couplers can be acquired from the telephone company or independent vendors. They will not be required if the modem features become FCC type certified.

There are also three types of 2400 bps internal modems: non-switched point-to-point; non-switched multipoint; and switched (telephone network) with automatic answering (requires CBS data coupler). All three provide half-speed operation at 1200 bps, with manual adjustment of equalization on the non-switched models. A Switched Network Back-Up Feature, available for either of the non-switched internal modems, permits the operator to establish a connection over the telephone network if the leased line goes down; manual intervention at the computer site and perhaps program modification may be required to fully use this feature. A Modem Fan-Out feature for the ➤

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▷ capacity ranges from a basic 6K bytes to a maximum of 22K bytes. The programs are selected and initiated by the operator at the 3770 terminal or by a special control command sent from the host CPU. An initiated program can also call another program from diskette storage without intervention by the operator or host CPU. The terminals also provide an operator-selectable job-control capability which enables selection and execution of a predefined series of 3770 programs. This series can be altered by the executing program.

The Record Display feature provides 480 display positions (12 lines of 40 characters) and a 94-character set. The display uses gas panel technology and is swivel-base mounted on the keyboard console cabinet. User programs can be written to enable writing on the display by character, field, or line and erasing the screen. Parameters in the statements permit vertical and horizontal cursor control. Possible applications include displaying data entered at the keyboard; creating, formatting and displaying operator guidance messages; displaying inquiry response messages from 3770 application data sets stored on diskettes; and providing for fill-in-the-blanks data entry. User programs can also use the printer or display in conjunction with a program stop and display/print capability to facilitate program testing and debugging at the terminal site.

Functions of the 3770 programmable terminals which are system—not user—controlled include batch data communication between the host CPU and diskette storage, message transmission from the host CPU to the console printer, diskette data set management, setting the system date, printing the error log, and entering the communicate mode upon completion of a specific user program without operator intervention. Additional functions which are under terminal control include a CPU interrupt capability, an application program debug facility, and a data transfer capability, including card reader to console printer, card reader to card punch, keyboard to card punch, diskette copy, and data set copy.

A 3774 or 3775 programmable terminal can be used as a free standing processing system with batch communications with a host computer. A new feature announced in May 1977 permits the terminals to include the communications line as an input/output device. Direct card-to-line, line-to-card, and line-to auxiliary printer (3774) operations can be programmed in addition to the line-to-diskette and diskette-to-line batch operations previously supported. The capability for interactive, programmed exchanges with a host computer increases the value of a 3774 or 3775 for distributed processing. □

▶ **non-switched multipoint modem permits two additional terminals to share that modem. Operationally, the three terminals function as three stations in a multipoint BSC or SDLC arrangement; no special handling is required.**

In general, operation over leased voice-grade lines with IBM modems at 1200 bps requires no conditioning; operation at 2400 bps requires C1 conditioning; and operation at 4800 bps requires C2 conditioning. IBM markets an external

2400 bps modem (3872). The EIA interface is compatible with IBM, Bell System, and independent modems of appropriate characteristics.

All 3770 models include space compression/expansion for elimination of long sequences of spaces from transmission. A 2-character sequence replaces up to 63 spaces. This feature is usable with non-transparent data in either BSC or SDLC protocol as long as the diskette drive is neither the source nor destination of the transmitted data.

A 3770 terminal (any model) can operate as a tributary station on a multipoint leased line with IBM 3270, 3601, 3614, 3651 Model 50, 3767, and 3790 terminals; a System/370 including a 3704/3705 Controller acts as the control station. The same SDLC line appearance on the 3704/3705 attached to a System/370 can serve 3651 Models 50 and 60, 3767, 3770, and 3790 terminals over the switched telephone network. In both cases, all terminals and 3704/3705 features must be operating with the same type of clocking source (self-clocked modem or business-machine provided clocking) and at the same transmission speed.

DEVICE CONTROL

All models execute off-line data entry and document preparation functions under the direction of user-written application programs, which are written from a subset of IBM 3790 programming statements and combined 3770 statements for punched card I/O, display, and diskette storage operations. Programmable functions include: data entry checking for range and self-check numbers, alphabetic or numeric-only fields, and field length; logical operations that include compare and test; conditional and unconditional branching; arithmetic operations including add, subtract, multiply, and divide; horizontal and vertical forms control; format and edit operations for picture, justify, fill, and case; support for data transfer from storage to storage, immediate data to storage, and diskette storage operations; operation with sequential data on diskettes (relative data sets); and operation with user-created indexing to data sets. Program control is provided for diskette storage, display, the 2502 or 3501 Card Reader, and the 3521 Card Punch. The 3521 Read feature can serve as an alternative to the 2502 and 3501 Card Readers. Programming statements provide for writing on the display by character, field, or line, erasing the screen, and vertically and horizontally positioning the cursor. Off-line operations can be automatically interrupted to receive an unsolicited CPU message, which is stored on diskette and conditionally printed. The interrupted program is then resumed.

A new feature, called Programmable Communications, was added in May 1977 that allows a 3774 or 3775 to initiate and control a communications session with the host computer and to execute a program, including peripheral input/output, during the communications session. Essentially, the communications line can be treated by the programmer as another input/output device. For SDLC operation, SNA protocols are used to maintain communications. The function is also available for BSC terminals.

For BSC terminals, a feature was added that makes the supervisor resident in 3K bytes of memory. This feature enhances throughput when demands on the supervisor are frequent, but reduces the amount of memory available to the user. Also announced for BSC terminals was a standard feature for overlapping keyboard operations with other processing.

The Programmable Communications feature requires 2K bytes (SDLC) or 4K bytes (BSC). A card reader or the display require 2.5K bytes each. The card punch requires 3K bytes. Additional memory is required for working storage and buffers. ▶

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► Application programs for terminals are assembled on a System/370 computer via a DOS/VS or OS/VS Assembler and 3790 Host Support. Assembled programs are validated, optionally tested, and formatted for the terminal by the Program Validation Services (PVS) program. The assembled program is transmitted to the appropriate terminal and stored on diskette. Upon request, the stored program is loaded into terminal program storage from diskette, where it is executed. Program selection can be operator or CPU initiated. The selected program can call another program from diskette storage without operator or CPU intervention. An operator-selectable job control capability permits selection and execution of a predefined series of 3770 programs; the executing program can alter the series.

CPU messages can add or delete 3770 application programs; create, load, erase (the contents of) or delete a data set at a 3770 terminal; solicit a data set from a 3770; select and initiate program execution at a 3770; initiate an automatic power-down sequence at a 3770; and deliver formatted data for a non-programmable 3770, which is received and written to a system data set on diskette. The programming statements for a programmable 3770 provide support for transmitting the formatted data to the printer under control of an application program.

For SDLC operation, the 3770 series terminals are supported for IBM System/370 Model 115 through 168 systems including a 3704 or 3705 Communications Controller (using NCP/VS) attached locally or remotely and operating under DOS/VS, OS/VS1, or OS/VS2. Access methods supported are VTAM or TCAM through VTAM. IMS/VS support under OS/VS1 or VS2 and CICS/VS support under DOS/VS, OS/VS1, or OS/VS2 is provided. Remote job entry support is provided under the three operating systems by POWER/VS (DOS/VS), RES (OS/VS1), and JES2 (OS/VS2).

Programming support via 3790 Host Support is provided under DOS/VS, OS/VS1, or OS/VS2.

A BSC 3770 terminal with appropriate input and output devices and optional features is supported under a subset of the support provided for the 2770 terminals. Specific features and functions available on the 2770 but not the 3770 family which may affect user applications programming include conversational mode, terminal-to-terminal operation, status message, 128/128 and 512/512-byte alternating buffer (supported for the 3776), security ID, printing EBCDIC transparent data, 1053 ribbon shift, punch column 81, and expanded 144-position print line. The full selection of input and output devices available with a 2770 terminal is not implemented for 3770's, which may require changes in both programming and procedures.

COMPONENTS

KEYBOARD: The standard typewriter-style keyboard consists of 44 alphanumeric data keys in an EBCDIC arrangement. The functions of the underscore/hyphen, backspace, space, and "Print Character" keys are repeated automatically when the keys are held down. The optional ASCII Feature provides 48 ASCII data keys, capable of producing 94 ASCII graphics, in place of the standard 44 keys. In addition to the data keys, the keyboard contains function keys, operating mode switches, indicator lights, and a 3-position numeric display. A Keylock feature disables all operator-activated controls.

MATRIX PRINTER: This bidirectional wire-matrix unit is the standard printer in the 3774 Communications Terminals. It prints serially by character at a rated speed of 80 or 120 characters per second, depending upon the model (see

price list). There are 132 print positions, spaced 10 to the inch. Vertical spacing is 6 lines per inch. A 94-character set is standard.

Up to 6-part forms ranging from 3 to 15 inches in width can be used. A friction-feed platen is standard, and a variable-width forms tractor for pin-feed forms is optional. An optional forms stand facilitates the feeding and stacking of continuous forms.

LINE PRINTER, 120 LPM: This unit is the standard printer in the 3775 Communication Terminal. It normally prints a line at a time from characters engraved on the revolving interchangeable metal print belt. During a key entry operation, however, the print platen lowers to enable the operator to see the line being printed. Maximum print speed is 120 lpm with a 64-character set or 80 lpm with a 94-character set. Both sizes of character sets are available with either EBCDIC or ASCII graphics. There are 132 print positions, spaced 10 to the inch. Vertical spacing is 6 lines per inch. A variable-width forms tractor feeds continuous forms up to 15 inches in width.

3784 LINE PRINTER: This optional output device, available only with 3774 Communication Terminal, is functionally similar to the 3775's integral line printer described in the paragraph above. The 3784, however, can also be equipped with a 48-character set, giving the user a choice of three rated print speeds: 155 lpm with the 48-character set, 120 lpm with the 64-character set, or 80 lpm with the 94-character set. Dual buffers, 132 print positions, and a variable-width forms tractor are all standard. A 3784 Attachment is required on the 3774.

2502 CARD READER: Reads 80-column cards punched in ASCII or EBCDIC code (determined by transmission code selection). Three models are available, which differ only in rated speed. Model A1 reads 150 cards/minute; Model A2 reads 300 cards/minute. The input hopper holds 700 cards, and the output stacker holds 600 cards. Options permit reading 51- or 80-column cards, 66- or 80-column cards, and mark-sense (optical) reading. Mark-sense reading permits marking up to 40 columns; marked and/or punched data can be read from the same card. Cards having unacceptable marks are offset-stacked. The 2502 can be attached to a 3774 or 3775 via the 3782 Model 2 Card Attachment Unit.

3501 CARD READER: A table-top unit that reads 80-column cards serially at 50 cards per minute. Cards can be punched in either EBCDIC or ASCII. The input hopper and output stacker each hold about 400 cards. The 3501 requires a 3501 Card Reader Attachment feature on the 3774 or 3775.

3521 CARD PUNCH: A table-top unit that punches cards at 50 cards/minute. The input hopper and output stacker each hold about 400 cards. The 3521 requires a 3782/3521 Card Punch Attachment feature on the 3774 or 3775 and the 3782 Model 1 Card Attachment Unit. The 3521 fits atop the 3782.

A Card Print feature for the 3521 permits printing up to 80 characters along the top edge of a card; a 64-character set from either EBCDIC or ASCII is used.

The Card Read/Punch Check feature enables a 3521 to function as a card punch or a card reader. Cards cannot be read and punched in the same cycle. The feature also enables a column-by-column comparison between punch data and data read from the card after punching; a failure of this check stops the punch and lights an error indicator. The Punch Check feature must be inhibited if cards with internal scores or prepunched data are punched. If the 3770

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▶ terminal is already equipped with a 3501 or 2502 Card Reader, the Card Read portion of this feature is inoperable.

DISKETTE DRIVE: Reads and writes on same type of flexible disk used in IBM 3740 data entry equipment. Data organization is the same as in the 3740; i.e., data is recorded on one side of the diskette in sectors of 128 characters. There are 74 tracks and 26 sectors per track. The first track is reserved, as it is in the 3740. In addition, two sectors (one 256-character record) are reserved for job identification. The maximum storage capacity is 949 256-character records, or 242,944 characters. Data is read or written via one movable read/write head.

Data can be organized on the diskettes in two ways. An interchange format records the 256-character record in two consecutive sectors; diskettes can be interchanged with 3740's. In the 3770 mode, the 256-character buffer record is written in two non-consecutive sectors for increased performance.

There are areas of incompatibility in interchanging diskettes between 3740's and 3770's and among the 3770's themselves. According to existing information, in order for a 3770 to prepare a diskette for a 3740 key entry station, the data must be received from the host computer and written to diskette. A diskette prepared manually on a 3770 will not be accepted by the 3740. On the other hand, a 3770 can read any diskette prepared by a 3740. In addition, there are limitations on the capability of a 3773

to read diskettes prepared by a 3774, 3775, 3776, or 3777. A 3774, 3775, 3776, or 3777, however, can read any diskette prepared on a 3773, 3774, 3775, 3776, or 3777.

The diskette drives are located in the desk pedestals. Keylocks are available for one or both doors. The 3774 and 3775 are delivered with both pedestals in place, whether or not the two drive options are installed.

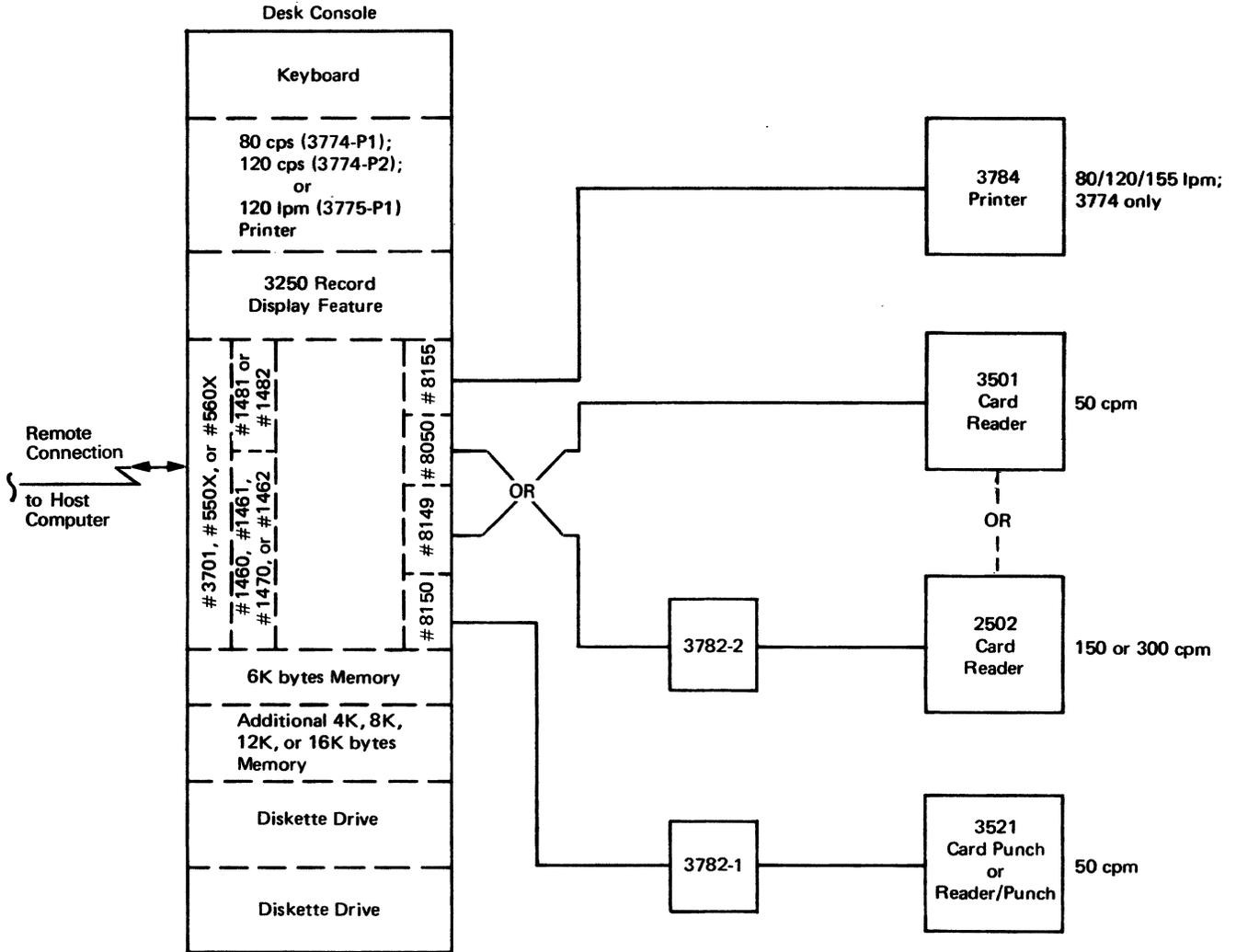
OPERATOR ID READER: Reads magnetic stripe cards using the ABA format. A total of 40 characters can be read from the stripe. The cards are the size of a standard credit card (3-3/8 by 2-1/8 inches). If the BSC transmission mode is used, the reader is operable only when the operator is keying directly to the line. Data read from the stripe cannot be printed. The encoding format on the stripe is four bits plus parity for each character.

PRICING

All 3770 series models and components (except the 2502 Card Reader) are available under IBM's LRA (Lease Rental Agreement) which provides month-to-month rental and two-year lease arrangements, and for purchase. All monthly charges below include prime shift maintenance; a separate plan is available for purchased units. Unlimited usage is included under either monthly plan. Extended maintenance is available at extra cost up to a total premium of about 40 percent for 24 hours per day 7 days per week coverage.

		Monthly Rental*			
		Short Term	Ext. Term	Purchase	Monthly Maint.
3774—					
	Model P1; 80 cps printer	\$310	\$264	\$10,560	\$106.00
	Model P2; 120 cps printer	350	298	11,920	114.00
3775—					
	Model P1; 120 lpm printer	470	400	16,000	136.00
Features					
Communications Feature—					
#1460	SDLC/BSC, Switch Control	25	21	840	5.00
#1461	BSC, Point-to-Point	15	13	520	2.50
#1470	SDLC	13	11	440	2.50
#1462	BSC Multipoint	13	11	440	1.00
Communications Driver—					
#1481	W/o Business Machine Clocking	13	11	440	2.00
#1482	With 1200 bps Business Machine Clocking	15	13	520	2.50
#3701	EIA Interface	13	11	440	1.00
1200 bps Integrated Modem—					
#5500	Non-Switched	19	16	668	3.50
#5501	Switched, Auto-Answer	25	21	840	3.50
#5502	Switched, Manual Answer	19	16	668	3.50
2400 bps Integrated Modem—					
#5600	Non-Switched, Point-to-Point	68	58	2,320	4.50
#5602	Non-Switched, Multipoint	74	63	2,520	4.50
#5610	Switched with Auto-Answer	74	63	2,520	5.00
#7951	Switched Network Backup	11	9	360	0.50
#3901	Modem Fan-Out	21	18	720	1.00
#1201	ASCII Feature	18	15	600	0.50
#1390	Audible Alarm	40**	40**	40	0.50
#3250	Display, 480 characters	94	80	3,200	31.50
#3401	Door Keylock	15**	15**	15	—
#3402	Door Keylock, Dual	30**	30**	30	—
#4650	Keylock	35**	35**	35	—

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Monthly Rental*

		Short Term	Ext. Term	Purchase	Monthly Maint.
#4660	Keypad, Numeric	12	10	400	2.00
#5450	Operator ID Reader	13	11	440	1.50
Diskette Storage—					
#4901	First	69	59	2,360	15.00
#4902	Second	69	59	2,360	6.00
Storage Increments—					
#6800	4K	25	21	540	4.00
#6801	8K	47	40	980	6.00
#6802	12K	67	57	1,400	10.00
#6803	16K	88	75	1,800	12.00
I/O Attachment Features—					
#8050	3501 Card Reader	13	11	440	0.50
#8149	3782/2502 Card Reader	19	16	640	3.50
#8150	3782/3521 Card Punch	19	16	640	3.00
#8155	3784 Printer (3774 only)	19	16	640	0.50
I/O Devices					
3782 Card Attachment Unit:					
	Model 1; for 3521 Card Punch	41	35	1,300	1.50
	Model 2; for 2502 Card Reader	59	50	2,000	1.00
	Optical Mark Read	25	21	840	1.00

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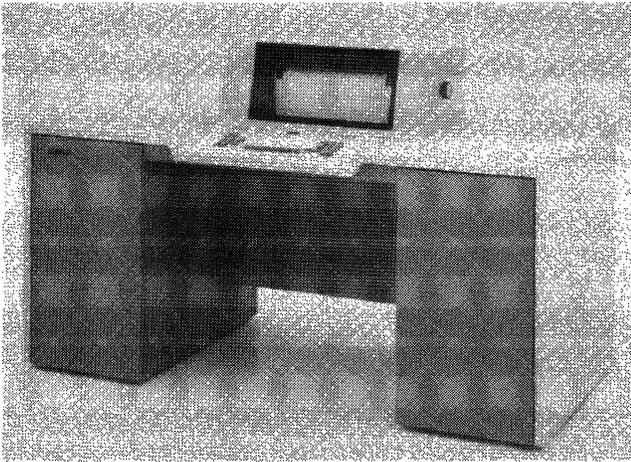


		Monthly Rental*			
		Short Term	Ext. Term	Purchase	Monthly Maint.
I/O Devices (cont'd.)					
2502 Card Reader:					
	Model A1; 150 cpm	125	—	6,160	44.00
	Model A2; 300 cpm	156	—	6,680	44.00
	Interchangeable Feed; 51/80 or 66/80 col.	28	—	1,330	14.00
	Optical Mark Read	123	—	5,830	25.00
3501 Card Reader; 50 cpm					
		100	85	3,400	12.00
3521 Card Punch; 50 cpm					
	Card Print	206	175	3,000	23.00
	Card Read/Punch Check	62	53	2,120	6.00
		55	47	1,880	16.00
3784 Line Printer; 80-155 lpm (3774 only)					
		358	305	12,200	76.00
#4450	Forms Stand	54**	54**	54	—
#8700	Variable Width Forms Tractor (3774 only)	6	5	160	0.50
#58XX	Print Belts	160**	160**	160	—

* Includes maintenance.

**Single use charge. ■

IBM 3773/3774/3775 P Series Programmable Keyboard/Printer Terminals



This is a photo of the 3775 terminal, showing its standard line printer and keyboard. A diskette drive for "floppy" disks can optionally be housed in each of the desk pedestals. Also optionally, several different table-top card readers and a punch can be added. Other models in the 3770 series look similar except that the 3773 has only one pedestal.

MANAGEMENT SUMMARY

The IBM 3770 terminal family, originally announced in September 1974 with major expansions in July and November 1975, includes a total of 18 distinct models divided into three groups: keyboard/printer terminals, programmable keyboard/printer terminals, and batch terminals. In a nutshell, the 3770 family includes the:

- 3771—keyboard/matrix printer (40, 80, or 120 cps) terminal that can accommodate low-speed card I/O (50 cpm).
- 3773—same as the 3771 except that one diskette drive is standard and there are no card I/O options.
- 3774—same as the 3771 but can accommodate one or two diskette drives, a faster card reader (up to 300 cpm), and an additional printer (up to 155 lpm).
- 3775—same as the 3774 except that a line printer (up to 120 lpm) is standard and the console matrix printer is not available.
- 3776—same as the 3775 except that faster line printers are included (up to 300 or 400 lpm) and keyboard data entry is excluded.
- 3777—same as the 3776 except that a faster line printer is included (up to 1000 lpm), a faster card reader is available (up to 400 cpm), and transmission speeds up to 9600 bps are supported, as compared with 4800 bps for the other models.

A family of user programmable keyboard/printer terminals oriented towards data entry.

A total of six models offer print speeds from 40 cps to 155 lpm, diskette storage, and, for some models, card input and output. Programs are assembled on the host IBM computer. Both SDLC and BSC disciplines are supported.

At the low end, a basic 3773 P1 prints at 40 cps and, with the internal 1200 bps modem, costs \$355 per month including maintenance on the Extended Term Plan (2 years).

Moving up in capability, a 3774 P2 with 120 cps printer, internal 1200 bps modem, 50 cpm card reader and an extra 4K bytes of memory costs \$602 per month ETP.

A 3775 P1 with 120 lpm printer, 2400 bps internal modem, one diskette drive (in addition to the built in drive), an additional 8K bytes of memory, and a 150 cpm card reader costs \$904 per month ETP.

The non-programmable versions of these terminals are covered in Report C27-491-201. The batch terminal members of the 3770 family are covered in Report C23-491-201.

CHARACTERISTICS

VENDOR: International Business Machines Corporation, Data Processing Division, 1133 Westchester Avenue, White Plains, New York 10604. Telephone (914) 696-1900.

DATE OF ANNOUNCEMENT: July 1975.

DATE OF FIRST DELIVERY: April 1976.

NUMBER DELIVERED TO DATE: Information not available.

SERVICED BY: IBM.

CONFIGURATION

The 3773 Communication Terminal is a desk-style console equipped with a keyboard, a bidirectional serial matrix printer rated at 40 cps (in the 3773 Model P1), 80 cps (in Model P2), or 120 cps (in Model P3), and a single diskette drive that reads and records data on removable, IBM 3740-compatible diskettes. No optional I/O devices are currently available for the 3773.

The 3774 Communication Terminal is a desk-style console equipped with a keyboard and a bidirectional serial matrix printer rated at 80 cps (in the 3774 Model P1) or 120 cps

**IBM 3773/3774/3775 P Series Programmable
 Keyboard/Printer Terminals**

	3773	3774	3775
Print Speeds	Mod. P1: 40 cps Mod. P2: 80 cps Mod. P3: 120 cps	Mod. P1: 80 cps Mod. P2: 120 cps Plus optional 8/120/155 lpm line printer	Mod. P1: 80/120 lpm
Memory	4K bytes std.; Additional 4K or 8K bytes opt.	6K bytes std.; Additional 4K, 8K, 12K, or 16K bytes opt.	6K bytes std.; Additional 4K, 8K, 12K, or 16K bytes opt.
Diskette storage	One drive std.	One or two drives opt.	One or two drives opt.
Card readers	None	50, 150, or 300 cpm	50, 150, or 300 cpm
Card punch	None	50 cpm	50 cpm
Transmission speed	Up to 4800 bps	Up to 4800 bps	Up to 4800 bps
Optional internal modems	1200 bps	1200 or 2400 bps	1200 or 2400 bps
Record Display	No	Optional	Optional

➤ The programmable models, the six P series models of the 3773, 3774, and 3775 that are the subject of this report, are summarized in more detail in the accompanying table. The differences among the models include print speed, memory sizes allowed, internal modem options, and peripheral devices allowed. All of these models are primarily oriented towards data entry. When separated from the 3770 family, the P series models lose some of the apparently uniform progression of capabilities that the whole family shows. The essential differences among the P series can be summarized as:

- 3773: Medium speed serial printing with one diskette drive.
- 3774: Medium speed serial printing with or without a line printer and one or two diskette drives, record display, and card peripherals optional.
- 3775: This is a 3774 without the serial printer, but with the line printer standard. Lack of a 48-character set feature puts the top speed of the line printer at 120 lpm (64-character set) instead of the 155 lpm top speed with the 3773 optional line printer using a 48-character set.

Much of the additional memory available with the 3774 and 3775 models will typically be used to support the card reader, card punch, and record display options, which require 2.5K to 3.0K bytes each. If one of these options is not used in a program, that memory space is available for user programming.

The terminals can be programmed to check data; control forms; perform logic, arithmetic, storage, and format/edit operations; and control operations with user-created indexing to data sets and relative data sets on diskettes. The non-programmable models can be field-upgraded to programmable models.

In addition to the above, user-written application programs for the 3774 and 3775 can be used to control a standard integrated diskette device with a nonremovable ➤

➤ (in Model P2). It can optionally be equipped with one or two diskette drives, a line printer rated at 155, 120, or 84 lpm (for character sets of 48, 64, or 94 symbols, respectively), a 50-cpm card punch, and one of three card readers rated at 50, 150, or 300 cpm.

The 3775 Communication Terminal is a desk-style console equipped with a keyboard and a line printer rated at 120 lpm when using a 64-character set and 80 lpm when using a 94-character set. The terminal can optionally be equipped with one or two diskette drives, a 50-cpm card punch, and one of three card readers rated at 50, 150, or 300 cpm.

In addition each model is equipped with integrated, nonremovable diskette storage with a user capacity of 99,840 bytes (30 tracks) for storage of application programs and data. One or two additional diskette drives are optional. The terminals are also equipped with expandable main memory for user program storage. The 3773 has a basic 4K-byte memory, expandable to 12K bytes in 4K or 8K increments; the 3774 and 3775 have a basic 6K-byte memory, expandable to 22K bytes in 4K, 8K, 12K, or 16K increments. An optional Display Feature (available for the 3774 and 3775 only) provides 480 display positions arranged in 12 lines of 40 characters each. This display employs gas panel technology and is swivel-mounted on the top left surface of the keyboard console. A numeric keypad is optional for all models.

TRANSMISSION SPECIFICATIONS

Transmission is synchronous, half-duplex at up to 4800 bps, using either SDLC (Synchronous Data Link Control) or BSC (Binary Synchronous Communication) line protocol over the public switched telephone network or over a point-to-point or multipoint leased line.

For attachment to a communications line, any 3770 terminal requires one of three Communication Features, one of two Communication Drivers, and either an EIA Interface for an external modem or one of several internal modems.

The Communication Feature determines the line protocol used: Alternate SDLC/BSC; BSC Point-To-Point; or SDLC. A BSC Multipoint feature is available for use with either the SDLC/BSC or BSC Point-To-Point option. The SDLC/BSC arrangement is switched manually between the two protocols. Either point-to-point or multipoint operation is permitted under SDLC. If multipoint operation is arranged over a full-duplex communications facility, one terminal ➤

IBM 3773/3774/3775 P Series Programmable Keyboard/Printer Terminals

▷ diskette, one or two optional storage devices with removable diskettes for storage and application programs, an optional 480-character display, and a 2502 or 3501 Card Reader and 3521 Card Punch.

User programs for the new models are written using a subset of 3790 Communication System programming statements plus a number of new 3770 statements that provide support for configurations with diskette storage, card I/O, and the 480-character display feature. Programs are assembled using a System/370 DOS/VS or OS/VS assembler and 3790 Host Support, including a Macro Library containing Program Validation Services (PVS). PVS is used to validate, test, and format programs for the terminals.

Programs in object code are loaded from diskette storage into terminal storage for execution. User program storage capacity ranges from a basic 4K bytes to a maximum of 12K bytes in the 3773, and from a basic 6K bytes to a maximum of 22K bytes in the 3774 and 3775. The programs are selected and initiated by the operator at the 3770 terminal or by a special control command sent from the host CPU. An initiated program can also call another program from diskette storage without intervention by the operator or host CPU. The terminals also provide an operator-selectable job-control capability which enables selection and execution of a predefined series of 3770 programs. This series can be altered by the executing program.

The Record Display feature provides 480 display positions (12 lines of 40 characters) and a 94-character set. The display uses gas panel technology and is swivel-base mounted on the keyboard console cabinet. User programs can be written to enable writing on the display by character, field, or line and erasing the screen. Parameters in the statements permit vertical and horizontal cursor control. Possible applications include displaying data entered at the keyboard; creating, formatting and displaying operator guidance messages; displaying inquiry response messages from 3770 application data sets stored on diskettes; and providing for fill-in-the-blanks data entry. User programs can also use the printer or display in conjunction with a program stop and display/print capability on the 3774 or 3775 to facilitate program testing and debugging at the terminal site.

Functions of the 3770 programmable terminals which are system—not user—controlled include batch data communication between the host CPU and diskette storage, message transmission from the host CPU to the console printer, diskette data set management, setting the system date, printing the error log, and entering the communicate mode upon completion of a specific user program without operator intervention. Additional functions, applicable to the 3774 and 3775 terminals only, which are under terminal control include a CPU interrupt capability, an application program debug facility, and a data transfer capability, including card reader to console printer, card reader to card punch, keyboard to card punch, diskette copy, and data set copy. ▷

▶ can be transmitting while another is receiving.

The two Communication Drivers provide a clocked 1200 bps interface that is used with IBM's internal 1200 bps modems or an EIA RS-232C interface without clocking for an external modem or IBM's self-clocking internal 2400 bps modem (for the 3774 and 3775 only).

Three varieties of the 1200 bps modem are available for internal installation in all models of the 3770 except the 3776 and 3777. One is for operation over a point-to-point leased (non-switched) line; one is for operation over the switched public telephone network with manual answering; and the third is for operation over the telephone network, but with automatic answering. The manual-answer modem connects to the network through a CBT data coupler; the automatic-answering modem requires a CBS data coupler for connection. The data couplers can be acquired from the telephone company or independent vendors. They will not be required if the modem features become FCC type certified.

There are also three types of 2400 bps internal modems: non-switched point-to-point; non-switched multipoint; and switched (telephone network) with automatic answering (requires CBS data coupler). All three provide half-speed operation at 1200 bps, with manual adjustment of equalization on the non-switched models. A Switched Network Back-Up Feature, available for either of the non-switched internal modems, permits the operator to establish a connection over the telephone network if the leased line goes down; manual intervention at the computer site and perhaps program modification may be required to fully use this feature. A Modem Fan-Out feature for the non-switched multipoint modem permits two additional terminals to share that modem. Operationally, the three terminals function as three stations in a multipoint BSC or SDLC arrangement; no special handling is required.

In general, operation over leased voice-grade lines with IBM modems at 1200 bps requires no conditioning; operation at 2400 bps requires C1 conditioning; and operation at 4800 bps requires C2 conditioning. IBM markets an external 2400 bps modem (3872). The EIA interface is compatible with IBM, Bell System, and independent modems of appropriate characteristics.

All 3770 models include space compression/expansion for elimination of long sequences of spaces from transmission. A 2-character sequence replaces up to 63 spaces. This feature is usable with non-transparent data in either BSC or SDLC protocol as long as the diskette drive is neither the source nor destination of the transmitted data.

A 3770 terminal (any model) can operate as a tributary station on a multipoint leased line with IBM 3271/3275 (Models 11 and 12), 3601, 3614, 3651 Model 50, 3767, and 3790 terminals; a System/370 including a 3704/3705 Controller acts as the control station. The same SDLC line appearance on the 3704/3705 attached to a System/370 can serve 3651 Models 50 and 60, 3767, 3770, and 3790 terminals over the switched telephone network. In both cases, all terminals and 3704/3705 features must be operating with the same type of clocking source (self-clocked modem or business-machine-provided clocking) and at the same transmission speed.

DEVICE CONTROL

All models execute off-line data entry and document preparation functions under the direction of user-written application programs, which are written from a subset of IBM 3790 programming statements and combined 3770 ▶

IBM 3773/3774/3775 P Series Programmable Keyboard/Printer Terminals

▷ The programmable 3773, 3774, and 3775 terminals communicate with the host CPU using BSC or SDLC at speeds up to 4800 bps over switched or non-switched communications facilities. Communication is in batched mode only, using diskette-to-line, line-to-diskette, or, under certain conditions, line-to-console printer transmission. The host CPU communicates with the terminals to add or delete 3770 application programs, create/load data sets for use by user-written application programs, erase or delete data sets, start automatic execution of a specified application program at the 3770, or specify an automatic power-down sequence. Data formatted for a non-programmable 3770 can be received and written to a system data set on diskette storage. The programming statements for a programmable 3770 provide support for transmitting this data to the printer under control of a user-written 3770 application program. □

▶ statements for punched card I/O, display, and diskette storage operations. Programmable functions include: data entry checking for range and self-check numbers, alphabetic or numeric-only fields, and field length; logical operations that include compare and test; conditional and unconditional branching; arithmetic operations including add, subtract, multiply, and divide; horizontal and vertical forms control; format and edit operations for picture, justify, fill, and case; support for data transfer from storage to storage, immediate data to storage, and diskette storage operations; operation with sequential data on diskettes (relative data sets); and operation with user-created indexing to data sets. Program control is provided for diskette storage, display, the 2502 or 3501 Card Reader, and the 3521 Card Punch. The 3521 Read feature can serve as an alternative to the 2502 and 3501 Card Readers. Programming statements provide for writing on the display by character, field, or line, erasing the screen, and vertically and horizontally positioning the cursor. On the 3774 and 3775, off-line operations can be automatically interrupted to receive an unsolicited CPU message, which is stored on diskette and conditionally printed. The interrupted program is then resumed.

Application programs for terminals are assembled on a System/370 computer via a DOS/VS or OS/VS Assembler and 3790 Host Support. Assembled programs are validated, optionally tested, and formatted for the terminal by the Program Validation Services (PVS) program. The assembled program is transmitted to the appropriate terminal and stored on diskette. Upon request, the stored program is loaded into terminal program storage from diskette, where it is executed. Program selection can be operator or CPU initiated. The selected program can call another program from diskette storage without operator or CPU intervention. An operator-selectable job control capability permits selection and execution of a predefined series of 3770 programs; the executing program can alter the series.

CPU messages can add or delete 3770 application programs; create, load, erase (the contents of) or delete a data set at a 3770 terminal; solicit a data set from a 3770; select and initiate program execution at a 3770; initiate an automatic power-down sequence at a 3770; and deliver formatted data for a non-programmable 3770, which is received and written to a system data set on diskette. The programming statements for a programmable 3770 provide support for transmitting the formatted data to the printer under control of an application program.

For SDLC operation, the 3770 series terminals are supported for IBM System/370 Model 115 through 168 systems including a 3704 or 3705 Communications

Controller (using NCP/VS) attached locally or remotely and operating under DOS/VS, OS/VS1, or OS/VS2. Access methods supported are VTAM or TCAM through VTAM. IMS/VS support under OS/VS1 or VS2 and CICS/VS support under DOS/VS, OS/VS1, or OS/VS2 is provided. Remote job entry support is provided under the three operating systems by POWER/VS (DOS/VS), RES (OS/VS1), and JES2 (OS/VS2).

Programming support via 3790 Host Support is provided under DOS/VS, OS/VS1, or OS/VS2.

A BSC 3770 terminal with appropriate input and output devices and optional features is supported under a subset of the support provided for the 2770 terminals. Specific features and functions available on the 2770 but not the 3770 family which may affect user applications programming include conversational mode, terminal-to-terminal operation, status message, 128/128 and 512/512-byte alternating buffer (supported for the 3776), security ID, printing EBCDIC transparent data, 1053 ribbon shift, punch column 81, and expanded 144-position print line. The full selection of input and output devices available with a 2770 terminal is not implemented for 3770's, which may require changes in both programming and procedures.

COMPONENTS

KEYBOARD: The standard typewriter-style keyboard consists of 44 alphanumeric data keys in an EBCDIC arrangement. The functions of the underscore/hyphen, backspace, space, and "Print Character" keys are repeated automatically when the keys are held down. The optional ASCII Feature provides 48 ASCII data keys, capable of producing 94 ASCII graphics, in place of the standard 44 keys. In addition to the data keys, the keyboard contains function keys, operating mode switches, indicator lights, and a 3-position numeric display. A Keylock feature disables all operator-activated controls.

MATRIX PRINTER: This bidirectional wire-matrix unit is the standard printer in the 3771, 3773, and 3774 Communication Terminals. It prints serially by character at a rated speed of 40, 80, or 120 characters per second, depending upon the model (see table or price list). There are 132 print positions, spaced 10 to the inch. Vertical spacing is 6 lines per inch. A 94-character set is standard.

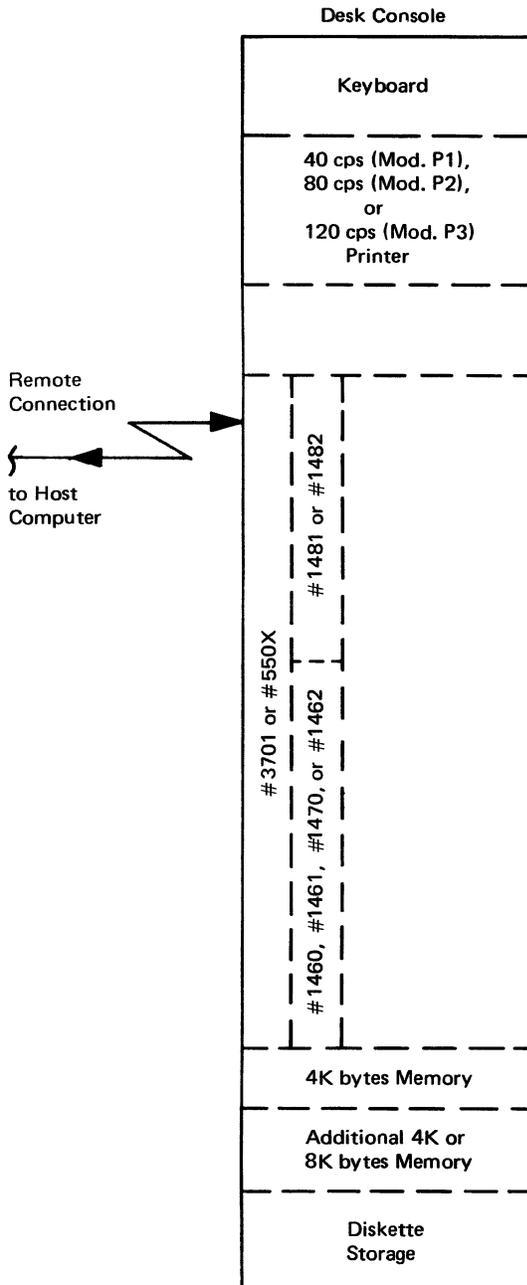
Up to 6-part forms ranging from 3 to 15 inches in width can be used. A friction-feed platen is standard, and a variable-width forms tractor for pin-feed forms is optional. An optional forms stand facilitates the feeding and stacking of continuous forms.

LINE PRINTER, 120 LPM: This unit is the standard printer in the 3775 Communication Terminal. It normally prints a line at a time from characters engraved on the revolving interchangeable metal print belt. During a key entry operation, however, the print platen lowers to enable the operator to see the line being printed. Maximum print speed is 120 lpm with a 64-character set or 80 lpm with a 94-character set. Both sizes of character sets are available with either EBCDIC or ASCII graphics. There are 132 print positions, spaced 10 to the inch. Vertical spacing is 6 lines per inch. A variable-width forms tractor feeds continuous forms up to 15 inches in width.

3784 LINE PRINTER: This optional output device, available only with 3774 Communication Terminal, is functionally similar to the 3775's integral line printer described in the paragraph above. The 3784, however, can also be equipped with a 48-character set, giving the user a choice of ▶

IBM 3773/3774/3775 P Series Programmable Keyboard/Printer Terminals

3773 P Series Configurations



▶ three rated print speeds: 155 lpm with the 48-character set, 120 lpm with the 64-character set, or 80 lpm with the 94-character set. Dual buffers, 132 print positions, and a variable-width forms tractor are all standard. A 3784 Attachment is required on the 3774.

2502 CARD READER: Reads 80-column cards punched in ASCII or EBCDIC code (determined by transmission code selection). Three models are available, which differ only in rated speed. Model A1 reads 150 cards/minute; Model A2 reads 300 cards/minute. The input hopper holds 700 cards, and the output stacker holds 600 cards. Options permit reading 51- or 80-column cards, 66- or 80-column cards, and mark-sense (optical) reading. Mark-sense reading permits marking up to 40 columns; marked and/or punched data can be read from the same card. Cards having

unacceptable marks are offset-stacked. The 2502 can be attached to a 3774 or 3775 via the 3782 Model 2 Card Attachment Unit.

3501 CARD READER: A table-top unit that reads 80-column cards serially at 50 cards per minute. Cards can be punched in either EBCDIC or ASCII. The input hopper and output stacker each hold about 400 cards. The 3501 requires a 3501 Card Reader Attachment feature on the 3771, 3774, or 3775.

3521 CARD PUNCH: A table-top unit that punches cards at 50 cards/minute. The input hopper and output stacker each hold about 400 cards. The 3521 requires a 3782/3521 Card Punch Attachment feature on the 3771, 3774, or 3775 and the 3782 Model 1 Card Attachment Unit. The 3521 fits atop the 3782.

A Card Print feature for the 3521 permits printing up to 80 characters along the top edge of a card; a 64-character set from either EBCDIC or ASCII is used.

The Card Read/Punch Check feature enables a 3521 to function as a card punch or a card reader. Cards cannot be read and punched in the same cycle. The feature also enables a column-by-column comparison between punch data and data read from the card after punching; a failure of this check stops the punch and lights an error indicator. The Punch Check feature must be inhibited if cards with internal scores or prepunched data are punched. If the 3770 terminal is already equipped with a 3501 or 2502 Card Reader, the Card Read portion of this feature is inoperable.

DISKETTE DRIVE: Reads and writes on same type of flexible disk used in IBM 3740 data entry equipment. Data organization is the same as in the 3740; i.e., data is recorded on one side of the diskette in sectors of 128 characters. There are 74 tracks and 26 sectors per track. The first track is reserved, as it is in the 3740. In addition, two sectors (one 256-character record) are reserved for job identification. The maximum storage capacity is 949 256-character records, or 242,944 characters. Data is read or written via one movable read/write head.

Data can be organized on the diskettes in two ways. An interchange format records the 256-character record in two consecutive sectors; diskettes can be interchanged with 3740's. In the 3770 mode, the 256-character buffer record is written in two non-consecutive sectors for increased performance.

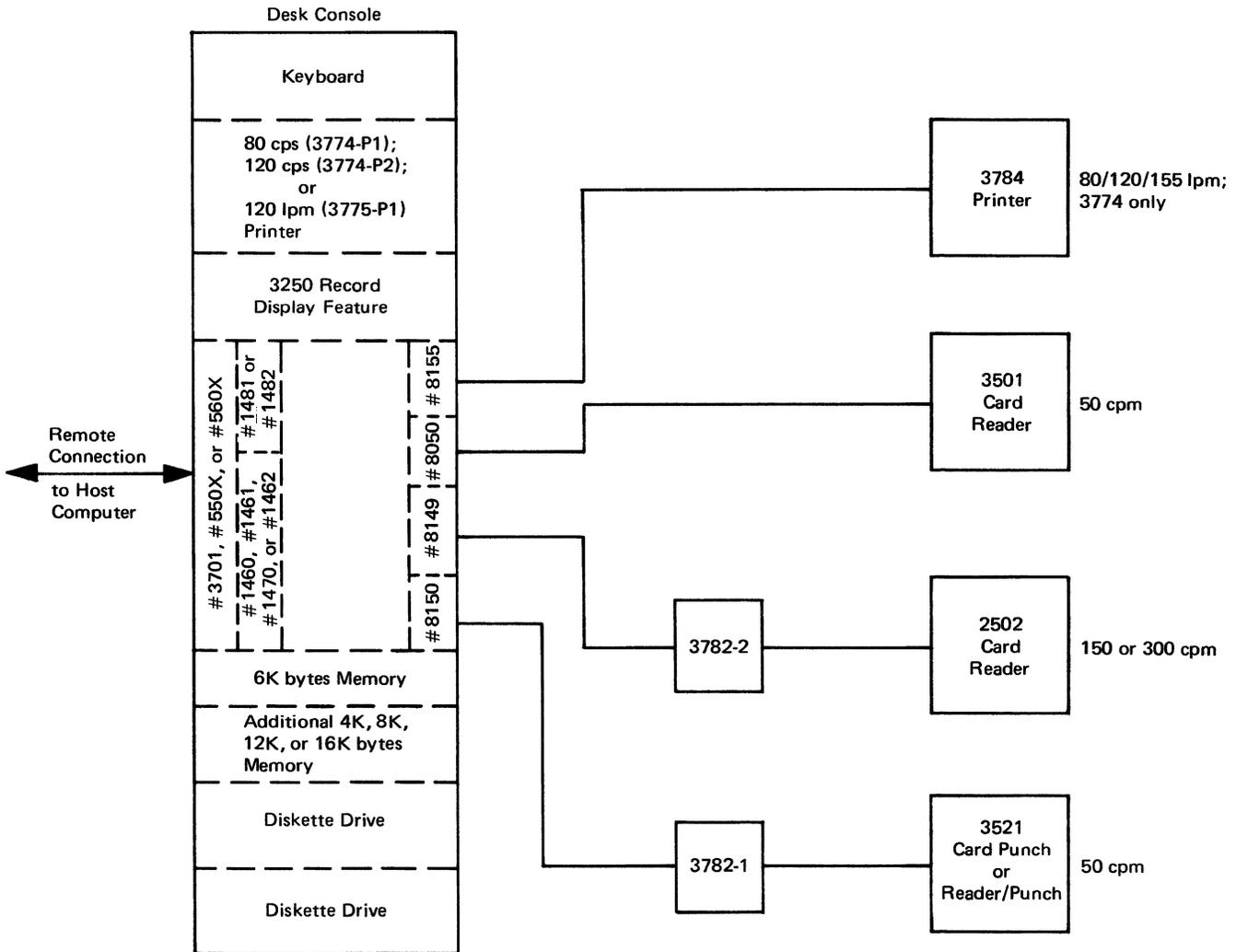
There are areas of incompatibility in interchanging diskettes between 3740's and 3770's and among the 3770's themselves. According to existing information, in order for a 3770 to prepare a diskette for a 3740 key entry station, the data must be received from the host computer and written to diskette. A diskette prepared manually on a 3770 will not be accepted by the 3740. On the other hand, a 3770 can read any diskette prepared by a 3740. In addition, there are limitations on the capability of a 3773 to read diskettes prepared by a 3774, 3775, 3776, or 3777. A 3774, 3775, 3776, or 3777, however, can read any diskette prepared on a 3773, 3774, 3775, 3776, or 3777.

The diskette drives are located in the desk pedestals. Keylocks are available for one or both doors. The 3774 and 3775 are delivered with both pedestals in place, whether or not the two drive options are installed.

OPERATOR ID READER: Reads magnetic stripe cards using the ABA format. A total of 40 characters can be read from the stripe. The cards are the size of a standard credit card (3-3/8 by 2-1/8 inches). If the BSC transmission mode is used, the reader is operable only when the operator is

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3774/3775 P Series Configurations



keying directly to the line. Data read from the stripe cannot be printed. The encoding format on the stripe is four bits plus parity for each character.

PRICING

All 3770 series models and components (except the 2502 Card Reader) are available under IBM's month-to-month

rental arrangement, under the Extended Term Plan (a two-year lease), and for purchase. All monthly charges below include maintenance; a separate plan is available for purchased units. Unlimited usage is included under either monthly plan.

Terminals

- 3773—
 - Model P1; 40 cps printer
 - Model P2; 80 cps printer
 - Model P3; 120 cps printer
- 3774—
 - Model P1; 80 cps printer
 - Model P2; 120 cps printer
- 3775—
 - Model P1; 120 lpm printer

	Monthly Rental*			Monthly Maint.
	Short Term	Ext. Term	Purchase	
3773—				
Model P1; 40 cps printer	\$370	\$315	\$13,200	\$ 82.00
Model P2; 80 cps printer	400	340	13,600	85.00
Model P3; 120 cps printer	447	380	15,200	95.00
3774—				
Model P1; 80 cps printer	476	405	16,200	106
Model P2; 120 cps printer	523	445	17,800	114
3775—				
Model P1; 120 lpm printer	617	525	21,000	136

IBM 3773/3774/3775 P Series Programmable
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Monthly Rental*

Features	Monthly Rental*			Monthly Maint.
	Short Term	Ext. Term	Purchase	
Communications Feature—				
# 1460 SDLC/BSC, Switch Control	25	21	840	5.00
# 1461 BSC, Point-to-Point	15	13	520	2.50
# 1470 SDLC	13	11	440	2.50
# 1462 BSC Multipoint	13	11	440	1.00
Communications Driver—				
# 1481 w/o Business Machine Clocking	13	11	440	2.00
# 1482 with 1200 bps Business Machine Clocking	15	13	520	2.50
#3701 EIA Interface	13	11	440	1.00
1200 bps Integrated Modem				
# 5500 Non-Switched	19	16	668	3.50
# 5501 Switched, Auto-Answer	25	21	840	3.50
# 5502 Switched, Manual Answer	19	16	668	3.50
2400 bps Integrated Modem (3774/3775 only)—				
# 5600 Non-Switched, Point-to-Point	68	58	2,320	4.50
# 5602 Non-Switched, Multipoint	74	63	2,520	4.50
# 5610 Switched with Auto-Answer	74	63	2,520	5.00
# 7951 Switched Network Backup	11	9	360	0.50
# 3901 Modem Fan-Out	21	18	720	1.00
# 1201 ASCII Feature	18	15	600	0.50
# 1390 Audible Alarm	40**	40**	40	0.50
# 3250 Display, 480 characters (3774/3775 only)	94	80	3,200	31.50
# 3401 Door Keylock (3773/3774/3775 only)	15**	15**	15	—
# 3402 Door Keylock, Dual (3774/3775 only)	30**	30**	30	—
# 4650 Keylock	35**	35**	35	—
# 4660 Keypad, Numeric (3773/3774/3775 only)	12	10	400	2.00
# 5450 Operator ID Reader	13	11	440	1.50
Diskette Storage (3774/3775 only)—				
# 4901 First	80	68	2,720	15.00
# 4902 Second	71	60	2,400	6.00
Storage Increments—				
# 6800 4K	25	21	540	4.00
# 6801 8K	47	40	980	6.00
# 6802 12K (3774/3775 only)	67	57	1,400	10.00
# 6803 16K (3774/3775 only)	88	75	1,800	12.00
I/O Attachment Features—				
# 8050 3501 Card Reader (3771/3774/3775 only)	13	11	440	0.50
# 8149 for 3782/2502 Card Reader (3774/3775 only)	19	16	640	3.50
# 8150 for 3782/3521 Card Punch (3771/3774/3775 only)	19	16	640	3.00
# 8155 for 3784 Printer (3774 only)	19	16	640	0.50
I/O Devices				
3782 Card Attachment Unit:				
Model 1; for 3521 Card Punch (3771/3774/3775 only)	41	35	1,300	1.50
Model 2; for 2502 Card Reader (3774/3775 only)	59	50	2,000	1.00
Optical Mark Read	25	21	840	1.00
2502 Card Reader (3774/3775 only):				
Model A1; 150 cpm	125	—	6,160	44.00
Model A2; 300 cpm	156	—	6,680	44.00
Interchangeable Feed; 51/80 or 66/80 col.	28	—	1,330	14.00
Optical Mark Read	123	—	5,830	25.00
3501 Card Reader; 50 cpm (3771/3774/3775 only)	100	85	3,400	12.00
3521 Card Punch; 50 cpm (3771/3774/3775 only)	206	175	3,000	23.00
Card Print	62	53	2,120	6.00
Card Read/Punch Check	55	47	1,880	16.00
3784 Line Printer; 80-155 lpm (3774 only)	358	305	12,200	76.00
# 4450 Forms Stand	54**	54**	54	—
# 8700 Variable Width Forms Tractor (3771/3773/3774 only)	6	5	160	0.50
# 5811/12/13/21/22/23 Print Belts	160**	160**	160	—

* Includes maintenance.

**Single use charge. ■

IBM Personal Computer Family Data Communications Capabilities

MANAGEMENT SUMMARY

The current standard of the microcomputer industry, the IBM Personal Computer, was introduced in 1981. Widespread acceptance of the IBM unit as a viable and important corporate tool has enabled the industry giant to capture nearly a 25 percent share of the booming microcomputer market in just two years. Over 500,000 PCs have been shipped by IBM, and a huge aftermarket consisting of manufacturers of IBM PC-compatible systems, software, and peripherals has quickly sprung up.

Many industry analysts have billed the microcomputer as the workstation of the future, eventually replacing the display terminal as the major human interface with the computer. In fact, the emergence of the microcomputer, coupled with the increased price/performance capabilities currently available on the traditional "smart" display terminal, have virtually eliminated the "intelligent," or user-programmable, terminal from the marketplace. In order to achieve the place of prominence forecast for it, the microcomputer must possess the capability to communicate with host computer systems, as well as with other microcomputers.

Since the unveiling of the original PC, IBM has aggressively enhanced its personal computer product line with new models and a steady stream of new product and capability announcements. New models include: the PC XT, a hard disk version; the 3270-PC, which can function as a local 3270 workstation; the XT/370, which is capable of running some IBM 370 applications; and the PCjr, a home/business computer. Significant product enhancements include attachability of the PC to a 3278 or 3279 Display Station, and IBM 5250 emulation. This report deals specifically with the communications capabilities of the IBM Personal Computer product line. For more detailed information on the IBM

The IBM Personal Computer, some two years after its introduction, has become the standard for the microcomputer industry. Many believe that IBM's entry into this market legitimized the microcomputer as a corporate tool. This report deals with the communications capabilities of the Personal Computer and the other members of IBM's PC product line.

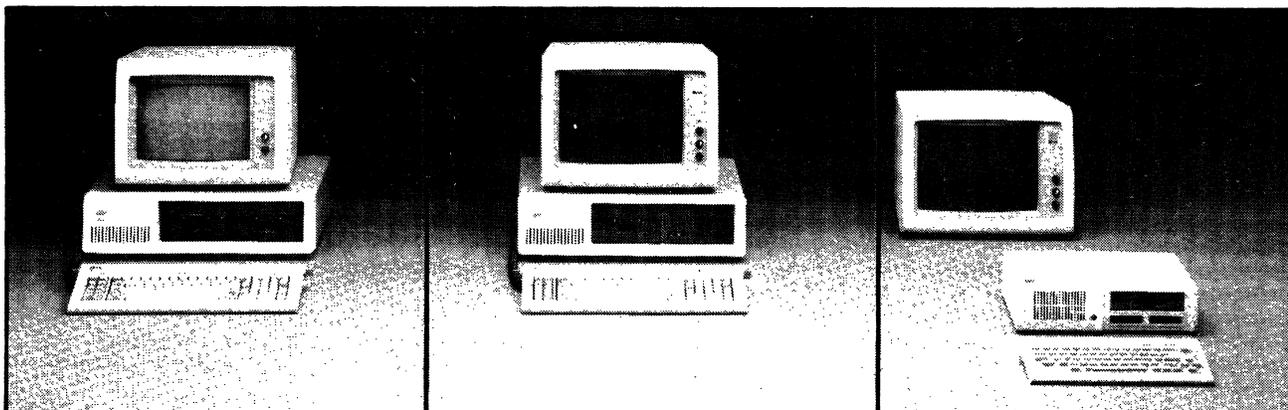
MODELS: Personal Computer, PC XT, 3270-PC, XT/370, and PCjr.

CONFIGURATION: IBM Personal Computers are a family of single-station microcomputers including a display unit (except PCjr), keyboard, and diskette drives; a hard disk drive is included with the PC XT. Monochrome and color displays are available. Expansion slots are available for the installation of a variety of options, including communications features.

SOFTWARE: The IBM PC supports the PC-DOS operating system, a version of MS-DOS (by Microsoft Corporation). A large number of applications software programs (available from IBM and independent software vendors) are available to run on PC-DOS, including communications programs.

COMPETITION: Columbia Data Products MPC, Compaq Computer Portable Computer, Eagle Computer PC Series, and other IBM PC-compatible microcomputers; also non-IBM-compatible microcomputers from Apple, DEC, and many others.

PRICE: Purchase prices range from \$699 for the PCjr, to \$8,995 for the XT/370.



IBM Personal Computer Family Data Communications Capabilities

➤ Personal Computer and the rest of the microcomputer market, Datapro provides an information service dedicated to this market, DATAPRO REPORTS ON MICROCOMPUTERS.

COMPETITIVE POSITION

As was mentioned previously in this report, IBM is the leader in the microcomputer industry, having carved out nearly a 25 percent share of the market (despite entering it relatively late). Because the IBM Personal Computer has become the standard for this industry, an active market has emerged for manufacturers of IBM-compatible microcomputers, add-on peripherals, and software products. Vendors of IBM PC-compatible systems include Columbia Data Products, Compaq Computer, and Eagle Computer. The PC's operating system, PC-DOS (a version of Microsoft's MS-DOS), has succeeded CP/M as the most popular microcomputer operating system, and the library of applications software written to run on MS-DOS is considerable and still growing.

ADVANTAGES AND RESTRICTIONS

IBM Personal Computer compatibility has become virtually a prerequisite for many vendors in the microcomputer market. IBM has made its personal computer products especially attractive for users looking for communications capabilities. The addition of 3270 and 5250 emulation enables PC users to communicate directly with the IBM Series/1, System/34, System/36, System/38, System/370, 30XX Series, and 43XX Series processors. Particularly significant in this area is the ability to integrate the Personal Computer into a 3270 environment, via either the 3270-PC, or through the 3278 and 3279 Personal Computer Attachment features. The move is seen by some analysts as IBM's way of protecting its huge installed base of 3270 equipment, thus safeguarding what has been a very lucrative market and ensuring its continued growth.

USER REACTION

IBM PC

Datapro received 742 responses to the 1983 Microcomputer User Survey (conducted by Datapro in conjunction with *Byte* and *Popular Computing* magazines) describing IBM PCs. The majority were purchased from retail computer stores and had been installed for less than 18 months. Users with over 64K to 512K bytes accounted for 92 percent of the responses. Most systems cost from \$3,000 to \$5,999. Users were asked to rate the IBM PC in the following categories.

	Excellent	Good	Fair	Poor	WA*
Ease of operation	361	343	32	2	3.4
Keyboard usability	267	321	124	30	3.1
Speed of disk access	174	395	157	12	3.0
Documentation	254	326	136	21	3.1
Ease of expansion	377	291	58	3	3.4
Hardware reliability	506	198	23	10	3.6
Human interface	189	427	104	11	3.1
Cost/performance ratio	213	395	108	13	3.1
Overall satisfaction	340	372	24	2	3.4

*Weighted Average based on a scale of 4.0 for Excellent.

➤ CHARACTERISTICS

VENDOR: International Business Machines Corporation, Old Orchard Road, Armonk, NY 10504. Contact your local IBM representative.

DATE OF ANNOUNCEMENT: Personal Computer—August 1981; PC XT—March 1983; 3270-PC and XT/370—October 1983; PCjr—November 1983.

DATE OF FIRST DELIVERY: Personal Computer—October 1981; PC XT—June 1983; 3270-PC and XT/370—1984; PCjr—1984.

NUMBER DELIVERED TO DATE: 700,000 (all models).

CONFIGURATION

The IBM Personal Computers are a family of 16-bit, general-purpose, single-station microcomputers. All models (except the PCjr) include expansion slots for the installation of a variety of options such as mass storage, communications, display units, and memory.

The Personal Computer is available in four models, varying in diskette storage capacity. Main memory ranges from 64K to 640K bytes; diskette storage ranges from 180K to 720K bytes, and is available in single or dual drives. The system unit and detached keyboard are standard; the PC may be configured with either a monochrome or color monitor. Five expansion slots and a built-in speaker are also standard. Optional features include 10MB to 20MB of hard disk storage, a system expansion unit, and a variety of printers. The system expansion unit contains one 10MB hard disk drive and eight additional expansion slots.

The Personal Computer XT contains 128K bytes of main memory (expandable to 640K), a hard disk containing 10MB of storage, and a diskette drive with 360K bytes of storage. Fixed disk storage is expandable to 20MB, while diskette storage is expandable to 720K. The system unit and detached keyboard are standard; the PC XT may be configured with either a monochrome or color monitor. Eight expansion slots, an asynchronous communications adapter, and a built-in speaker are standard. Other optional features include a system expansion unit and a variety of printers. The system expansion unit contains one 10MB hard disk drive and eight additional expansion slots.

The PCjr contains 64K bytes of main memory expandable to 128K bytes. A slimline diskette drive is optional. No expansion slots are available, but two software cartridge slots are standard. Options include a display, printer, internal modem, light pen, and joysticks.

The Personal Computer XT/370 is an extended version of the PC XT that can be used as: a single-user System/370 workstation; an IBM 3277 Model 2 Display Station; or an IBM PC XT. The XT/370 can execute many of the IBM System/370 mainframe instructions. Two models are available: Model 568 includes neither a fixed disk drive nor a disk adapter and requires an expansion unit for fixed disk storage (the XT/370 expansion unit includes 20MB of fixed disk storage on two drives); Model 588 includes 10MB of fixed disk storage.

The IBM 3270 Personal Computer combines the host interactive functions of the 3270 Information Display System with those of the IBM PC. The 3270-PC can operate with up to seven concurrent sessions that can be simultaneously viewed: four 3270-type sessions, two local notepad sessions, and one IBM PC DOS 2.0 session. The 3270-PC can display each session or part of a session on the display at any location the user chooses. In addition, the 3270-PC can be used in the IBM Information Network. The 3270-PC is offered in several configurations.

IBM Personal Computer Family Data Communications Capabilities

► The table shows that these users were generally happy with the IBM PC. Additional comments obtained from the group varied. Some found the PC to be "a little too expensive." A spokesperson for a small private business commented on their eight standalone models, saying, "The system is excellent; however, the manual is too technically written for first-time users."

When asked if they would recommend their IBM PCs to other users, 96 percent of the respondents said yes, while only 4 percent said no.

IBM PC XT

Seventy-five responses were received from users of the IBM PC XT during Datapro's 1983 Microcomputer User Survey. The majority of the systems had been purchased from retail computer stores; average main memory was from 64K to 512K bytes. Average length of installation was less than six months.

Users rated their systems in the following categories.

	Excellent	Good	Fair	Poor	WA*
Ease of operation	36	35	2	0	3.5
Keyboard usability	25	31	15	4	3.0
Speed of disk access	39	29	5	0	3.5
Documentation	26	31	11	5	3.1
Ease of expansion	43	22	5	0	3.5
Hardware reliability	47	22	4	1	3.6
Human interface	14	47	9	2	3.0
Cost/performance ratio	16	45	10	1	3.1
Overall satisfaction	32	39	3	0	3.4

*Weighted Average based on a scale of 4.0 for Excellent.

The IBM PC XT scored well in every category. A few users made additional comments; the most common was a complaint about the position of the shift key. Others felt the system was very reliable but somewhat expensive; over 50 percent of the respondents paid more than \$6,000 for their XTs.

Of the IBM PC XT users, 76 percent responded that they would recommend their systems, 3 percent said that they would not, and the remaining 21 percent were undecided.

Datapro's 1983 Microcomputer Survey contains responses from 5615 users, reporting on their experiences with microcomputer systems, software, and peripherals. Complete results of this survey may be found in DATAPRO REPORTS ON MICROCOMPUTERS. □

► COMMUNICATIONS FEATURES

IBM offers a *PCjr Internal Modem*, an optional 300 bps internal modem which can be configured with the PCjr only; the modem supports auto-dial, touch-tone or pulse dialing by software command and is Bell 103 compatible. All other communications configurations for the PC and XT require user supplied independent modems and appropriate cables.

The PC and PC XT support the following communications capabilities: the Asynchronous Communications Adapter, the Binary Synchronous Communications Adapter, and the Synchronous Data Link Control (SDLC) Communications Adapter. The following emulation hardware is also available: the IBM PC/Display Station Emulation Adapter, the 3278/79 Emulation Adapter, the XT/370 personal computer, and the 3270-PC personal computer.

The *Asynchronous Communications Adapter* system control signals and voltage requirements are provided through a 2 by 31 position card edge tab. Two jumper modules are provided on the adapter. One jumper module selects either RS-232-C or current-loop operation. The other jumper module selects one of two addresses for the adapter, so two adapters may be used in one system.

The adapter is fully programmable and supports asynchronous communications only. It will add and remove start bits, stop bits, and parity bits. A programmable baud rate generator allows operation from 50 to 9600 bps. Five, six, seven or eight bit characters with 1, 1½, or 2 stop bits are supported. A fully prioritized interrupt system controls transmit, receive, error, line status, and data set interrupts. Diagnostic capabilities provide loopback functions of transmit/receive and input/output signals.

Additional features are:

- Full double buffering which eliminates the need for precise synchronization,
- Independent receive clock input,
- Modem control functions—clear to send (CTS), request to send (RTS), data set ready (DSR), data terminal ready (DTR), ring indicator (RI) and carrier detect,
- False-start bit detection, and
- Line-break generation and detection.

The communications protocol is a function of the system microcode and must be loaded before the adapter is operational. All pacing of the interface and control signal status must be handled by the system software.

The different modes of operation are selected by programming the 8250 asynchronous communications element. This is done by selecting the I/O address (hex 3F8 to 3FF primary, and hex 2F8 to 2FF secondary) and writing data out to the card. Address bits A0, A1, and A2 select the different registers that define the modes of operation. Also, the divisor latch access bit (bit 7) of the line control register is used to select certain registers.

The *IBM Binary Synchronous Communications (BSC) Adapter* is a 4 x 7.5 inch wide card that provides an RS-232-C compatible communication interface for the IBM Personal Computer. All system control, voltage, and data signals are provided through a 2- by 31-position card-edge tab. External interface is in the form of EIA drivers and receivers connected to an RS-232-C, standard 25-pin, D-shell connector.

The adapter is programmed by communication software to operate in binary synchronous mode. Maximum transmission rate is 9600 bits per second (bps). The heart of the adapter is an Intel 8251A Universal Synchronous/Asynchronous Receiver/Transmitter (USART). An Intel 8255A-5 programmable peripheral interface (PPI) is also used for an expanded modem interface, and an Intel 8253-5 programmable interval timer provides time-outs and generates interrupts. ►

IBM Personal Computer Family Data Communications Capabilities

► The 8251A operational characteristics are programmed by the System Unit's software, and it can support virtually any form of synchronous data technique currently in use. In the configuration being described, the 8251A is used for IBM's binary synchronous communications (BSC) protocol in half-duplex mode.

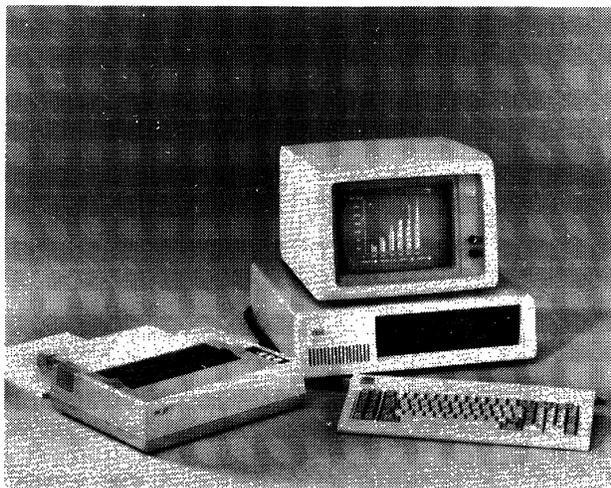
Operation of the 8251 is started by programming the communications format, then entering commands to tell the 8251A what operation is to be performed. In addition, the 8251A can pass device status to the System Unit by doing a Status Read operation. The sequence of events to accomplish this are mode instruction, command instruction, and status read. Mode instruction must follow a master reset operation. Commands can be issued in the data block at any time during operation of the 8251A.

When the *SDLC Communications Adapter* is used with SNA 3270 Emulation and RJE Support Programs, the IBM PC will emulate 3270 interactive SNA operation or 3770 batch SNA. The SDLC Communications Adapter provides control and data signals through a 2 x 31 position card edge tab. Modem interface is in the form of EIA drivers and receivers connecting to an RS-232-C standard connector.

The adapter is programmed by communications software to operate in a half-duplex synchronous mode with switched or leased lines. Maximum transmission rate is 9600 bits per second, as generated by the attached modem or other data communication equipment.

The SDLC adapter utilizes an Intel 8273 SDLC protocol controller and an Intel 8255A-5 programmable peripheral interface for an expanded external modem interface. An Intel 8253 programmable interval timer is also provided to generate timing and interrupt signals. Internal test loop capability is provided for diagnostic purposes.

The *IBM PC/Display Station Emulation Adapter* allows the IBM PC to be attached to a twinax line. The adapter consists of printed circuit card (for installation in any unused system expansion slot in the personal computer), a twinax connector assembly (for installation in the rear panel of the IBM PC), a manual, and a 5¼-inch diskette containing diagnostic programs. This adapter allows the IBM PC to connect to the 5520 Administrative System, System/34, System/36, and System/38 hardware for terminal emulation



The Personal Computer XT is a hard disk version of the original IBM PC. The PC XT combines a 10MB fixed disk with a standard 360K-byte diskette drive. An asynchronous communications adapter is also standard.

purposes. Terminals emulated are the 5253, for the Administrative System, and the 5251-11, 5291, or 5292 for the System/34, /36, and /38. Software support for 5253 emulation is provided by the 5520-Personal Computer Attachment Program; the IBM PC 5250 Emulation Program allows for emulation of the 5251-11, 5291, or 5292 terminals.

The *3278/79 Emulation Adapter* allows an IBM PC or XT to attach to an IBM control unit or display/prINTER adapter. This attachment, in conjunction with the appropriate software, supports IBM PC and XT emulation of IBM 3278/9 terminals. Specifically, the IBM personal computers can emulate the functions of a 3278 Display Station (Model 2) or a 3279 Color Display Station (Model 2A or S2A), and can also support file transfer with the host. Both the host-controlled 3270 session and a local Personal Computer DOS session can be active concurrently, and the user can interact with either session alternately. Coaxial cable attachment of the IBM PC or XT can be to either a 3274 control unit or to any of the following display/prINTER adapters: 4321, 4331, or 4361. Attachment is also possible to a 4701 Finance Communication Controller with a Device Cluster Adapter.

Minimum hardware requirements are an IBM Personal Computer with at least 128K bytes of memory, one single-sided or dual-sided diskette drive and adapter, a full-feature slot in the System Unit, a keyboard, a coaxial cable, DOS Version 2, and a monochrome or color display. A color display is required to emulate the 3279 Color Display Stations. The 3278/79 Emulation Adapter is customer-installable and requires no host hardware or system software modifications for the functions emulated. The 3278/79 Emulation Adapter is scheduled to be available in April 1984.

SOFTWARE

OPERATING SYSTEM SOFTWARE: IBM supports three operating systems on the PC and XT. They are: the IBM Disk Operating System—DOS, CP/M-86, and UCSD p-System.

The IBM Disk Operating System provides the system support needed to use most of the IBM Personal Computer software diskettes on the IBM Personal Computer, the IBM Personal Computer XT, and the PCjr. It will also support a large number of programs sold by other manufacturers.

Each of the other two operating systems, CP/M-86 and the UCSD p-System, offers access to independently sold programs developed to run with these respective operating systems on the IBM Personal Computer (but not on the IBM Personal Computer XT or PCjr). Because both CP/M-86 and the UCSD p-System run on microcomputers from a variety of vendors, many of the programs they support have been converted for use on personal computers from IBM.

COMMUNICATION SOFTWARE: IBM offers several data communications software packages for the IBM PC or XT. They are: SNA 3270 Emulation and RJE Support, the 3101 Emulation Program, the 5250 Emulation Program, the 5520-Personal Computer Attachment Program, the Batch Communication Program, the 3278/79 Emulation Control Program, the Virtual Machine/Personal Computer (VM/PC) Program, and the 3270-PC Control Program.

The *Personal Communications Manager* enables users to send or receive files asynchronously. Prerequisites are one double-sided diskette drive and 128K bytes of memory.

The *SNA 3270 Emulation and RJE Support Program* permits the IBM PC to act as a terminal that can communicate with a host system, in one of two modes: supporting either Systems Network Architecture (SNA) 3270 or SNA 3770 Remote Job Entry (RJE).

IBM Personal Computer Family Data Communications Capabilities

► The *IBM 3101 Emulation Program* provides emulation of the IBM 3101 Display Terminal, Model 20—with some differences. Differences are based on user-selected options in specification files and transmission of ASCII format diskette files to and from binary format.

With the *5250 Emulation Program*, the IBM PC can be used as local or remote workstation attached to a System/34, System/36, or System/38. The IBM PC emulates an IBM 5251-12 display station, and in emulation mode has access to all the functions of the host system. A prerequisite is the IBM PC Display Station Emulation Adapter.

The *5520-Personal Computer Attachment Program* enables the IBM PC or XT to be configured with a 5520 Administrative System, and function as a standalone personal computer, perform 5520 text processing and document distribution, or access larger computer systems through 3270 terminal emulation. Data from a host may be saved and merged into 5520 documents or personal computer files. The 5520 serves as a cluster controller for up to 35 users of the personal computer. This software requires the installation of the IBM PC Display Station Emulation Adapter.

The *Batch Communication Program* allows users to transmit files via a switched network or to support host applications such as IMS and CICS. Communications implementation is SNA/SDLC. The program supports both attended and unattended operation. The support includes automatic session recovery with message synchronization, selective routing of incoming messages in the Personal Computer, multiple sessions within the same telephone call, auto-answer, and user exits for security, encryption, and additional user control.

With the *3278/3279 Emulation Control Program*, either the IBM PC or XT can be used as an intelligent workstation within an interactive office. Both 3270 emulation and file transfer are provided using coaxial cable attachment to IBM 3274 control units. When used with the IBM PC emulation adapter, the personal computer can emulate the functions of a 3278 Display Station Model 2 or a 3279 Color Display Station Model 2A or S2A. Both the host-controlled 3270 session and a local Personal Computer DOS session can be active concurrently, and the user can interact with either session alternately. The user can switch between the two sessions using a "hot key" to determine whether the PC DOS application or the host application receives keystrokes and has its output displayed.

Minimum requirements for running the 3278/79 Emulation Control Program are:

- An IBM PC or XT with 128K bytes of main storage with 108K bytes available for concurrent operation of DOS and application programs.
- An IBM PC 3278/79 Emulation Adapter.
- One single-sided or dual-sided diskette drive and associated adapter.
- An IBM Monochrome Display or IBM Color Display and associated adapter (the Color Display is required to emulate the 3270 Color Display Station Model 2A or S2A).
- An IBM PC keyboard.
- A coaxial cable.
- PC-DOS Version 2.0 or 2.1 at the current level.

The 3270-PC File Transfer program or equivalent in the host system is required in the host system if file transfer is desired. File transfer is not supported when attached to the 4701.

Planned availability for the 3278/79 software package is April 1984.

The *Virtual Machine/Personal Computer (VM/PC) Program* is designed to run on the XT/370, a specially configured version of the IBM PC XT. When using the VM/PC program, the XT/370 supports either: host CMS programs (operating as a single-user System/370 workstation), remote 3277 Model 2 emulation, or optional 3101 emulation. VM/PC has the ability to transfer files between a PC DOS format file and a CMS minidisk on the XT/370. File transfer is also possible between a minidisk on the XT/370 and a minidisk on the System/370 host.

VM/PC requires an XT/370, with one 10M-byte fixed disk drive, one 360K-byte diskette drive, and a 25 x 80 character video display with adapter. In addition, VM/PC requires PC-DOS Version 2. To use the host upload/download facility, one of the following System/370 Host VM environments is required: BSEP Release 2, VM/SP (Release 1, 2, or 3), and System/370 programs.

The VM/PC Program will be available in the second quarter of 1984.

The *3270-PC Control Program* is available for the IBM 3270 Personal Computer (3270-PC), a specially designed IBM PC. This hardware/software configuration supports the host-interactive functions of the 3270 Information Display System with the functions of the IBM PC. The 3270-PC Control Program provides the 3270-PC with the controls necessary for the user to select screen configurations, to manipulate and interact with displayed data, and to manage screen presentations. Some of this program's features are:

- Concurrent operation of up to four host interactive sessions, two local notepad sessions, and one PC-DOS 2.0 session.
- Base 3270 (four-color) or 3270 extended data stream (eight-color, distributed function terminal mode only) support.
- Two host-interactive modes, set during 3270-PC and 3274 customization. One is a Distributed Function terminal mode with one to four sessions emulating any model 3178, 3278, (except Models 2A and 5), or 3279 (except Model 2C) via a 3274 with configuration support T or D. The second is a Control Unit Terminal mode with one session emulating a 3178, 3278 Model 2, or 3279 Model S2A via a 3274 or 4321, 4331, or 4361 Display/Printer Adapter.
- Advanced screen management. With windows on the display screen, users can view selected portions or all of the application presentation spaces that have been defined, move a window to any location on the display screen or within the presentation space, alter the size of a window—thus permitting various combinations of concurrent applications to be seen, define the background for the 5272 screen, or define combinations of windows in up to 10 logical screens.
- File transfer (host to and from a 3270-PC file) in ASCII, binary, or EBCDIC data format.
- IBM PC function in native mode, except APA graphics.

Planned availability for the 3270-PC software is the first quarter of 1984.

COMPONENTS

CRT DISPLAY UNIT: The PCjr can be connected to either an IBM Color Display (with a connector), independent ►

IBM Personal Computer Family Data Communications Capabilities

► compatible monitor, or to a home television set (with an adapter cable). The Monochrome Display is not supported by the PCjr.

All other models can use either a monochrome display or color display. Each of the displays connect to the system via an adapter that fits in one of the System Unit's expansion slots.

The IBM Monochrome Display Unit features a 25-by-80 character screen, direct drive output, and 7-by-9 dot matrix characters with full descenders. The monochrome display unit attaches to the System Unit via two cables—each is approximately three feet long. One cable is a signal which contains direct drive interface from the IBM Monochrome Display and Printer Adapter. The second cable provides AC power to the display from the System Unit. This allows the System Unit power ON/OFF switch to also control the display unit. The monitor contains a 12-inch diagonal CRT. The CRT and analog circuits are packaged in an enclosure so the display may either sit on top of the System Unit or on a nearby table top or desk. The unit has both brightness and contrast adjustment controls on the front available to the operator.

The monochrome display is connected to the system via the prerequisite Monochrome Display and Printer Adapter. This adapter has dual functions: the first is to interface to the IBM Monochrome Display and the second is to provide a parallel printer interface. The monitor interface is designed around the Motorola 6845 CRT controller module. It supports 256 character codes. An 8KB character generator contains the fonts for the character codes.

The IBM Personal Computer Color Display is a high contrast (black) screen which displays up to 16 colors when used with the IBM Color/Graphics Monitor Adapter. The characters are defined in an 8-by-8 dot matrix on a 13-inch screen. Red, green, and blue video signals and intensity are all independent. The screen is refreshed at 60 Hz with 200 vertical lines of resolution. The CRT and analog circuits are packaged in an enclosure so the display may sit either on top of the System Unit or a nearby tabletop or desk. Front panel controls and indicators include: Power-On control, Power-On indicator, brightness and contrast controls. Two additional rear panel controls are the vertical hold and vertical size controls.

The Color Display attaches to the System Unit by a signal cable that is approximately five feet in length. This signal cable provides a direct drive interface from the IBM Color/Graphics Monitor Adapter. A second cable provides AC power to the display from a standard wall outlet. The IBM Color/Graphics Monitor Adapter is designed to attach to the IBM Color Display, to a variety of television-frequency monitors, or to home television sets (a user-supplied RF modulator is required for a home television set). This adapter is necessary to support any of these displays. The adapter is capable of operating in black and white or color. It provides three video interfaces: a composite-video port, a direct-drive port, and a connection interface for driving a user-supplied RF modulator. In addition, a light pen interface is provided.

KEYBOARDS: The programmable, chiclet-style, typewriter oriented keyboard for the PCjr can be either cable-connected or cordless, using customer supplied batteries for the cordless version, and communicates with the System Unit using infrared signals; users can key information at distances of up to 20 feet away from the System Unit. The keyboard consists of 62 color-coded keys. The PCjr keyboard does not include a numeric keypad or function keys. However, the 10 typewriter-style numeric keys also serve as function keys.

The Keyboard for the IBM PC, PC XT, XT/370, and 3270-PC has a permanently attached cable that connects to a DIN connector at the rear of the System Unit. The cable is approximately six feet long and is coiled, like that of a telephone handset. The keyboard has three tilt positions for operator comfort (5-, 7-, or 15-degree tilt orientations).

The keyboard has 83 keys arranged in three major groupings. The central portion of the keyboard is a standard typewriter keyboard layout. On the left side are 10 function keys. These keys are user-defined by the software or programmable. On the right is a 15-key keypad. These keys are defined by the software, but have legends for the functions of numeric entry, cursor control, calculator pad, and screen edit. The keys provide a tactile audible feedback when touched indicating that a keystroke has been registered.

The keyboard interface is defined so that system software has maximum flexibility in defining certain keyboard operations. This is accomplished by having the keyboard return scan codes rather than American Standard Code for Information Interchange (ASCII) codes. In addition, all keys are typematic and generate both a make and a break scan code. For example, key 1 produces scan code hex 01 on make and code hex 81 on break. Break codes are formed by adding hex 80 to make codes. The keyboard I/O driver can define keyboard keys as shift keys or typematic, as required by the application.

The microcomputer (Intel 8048) in the keyboard performs several functions, including a power-on self-test when requested by the System Unit. This test checks the microcomputer ROM, tests memory, and checks for stuck keys. Additional functions are: keyboard scanning, buffering of up to 16 key scan codes, maintaining bidirectional serial communications with the System Unit, and executing the hand-shake protocol required by each scan-code transfer.

Both the Monochrome and Color Displays may operate simultaneously when used with the appropriate adapters.

DISKETTE STORAGE: PCjr, with operating system Version 2.1, supports one optional double-sided diskette drive. The PCjr Diskette Drive is a slimline drive; its maximum diskette storage is 360K bytes.

Both single- and double-sided diskette drives are available for the IBM PC, PC XT, XT/370, and 3270-PC. Operating system (DOS) Versions 1.1 or higher are required for the double-sided diskette drives. Obsolete DOS Version 1.0 may also be used but will acknowledge and format only one side. The System Unit has space and power for one or two 5¼-inch diskette drives. The 5¼-inch Single-sided Diskette Drive houses soft sector diskettes. When formatted by DOS Version 1.1, they are modified frequency modulation (MFM) coded in 512-byte sectors, 40 tracks, 48 tracks per inch, giving a formatted capacity of 163,840 bytes per drive. The drive has a track access time of 8 ms, 20K bytes per second transfer rate, and a motor start time of 500 ms. When formatted by DOS Version 2.0, the drive yields 184,320 bytes per diskette due to the introduction of an additional 512-byte sector per track. The 5¼-inch Double-sided Diskette Drive, formatted by DOS 1.1, yields 327,680 bytes per drive. DOS 2.0 or higher formatting provides 368,640 bytes by formatting an additional 512-byte sector per track.

The 5¼-inch Diskette Drive Adapter is a prerequisite for installing diskette drives in the IBM PC or XT. It is a standard feature on the XT. It fits in one of the system board's expansion slots to support either single- or double-sided diskettes. A connector on one end of the adapter attaches one or two drives via an internal daisy chained flat ribbon cable. The adapter has a second connector on the other end which extends through the rear panel of the System Unit. This connector contains the signals for two

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► additional external drives, thus the 5¼-inch diskette drive adapter is capable of attaching four 5¼-inch drives, two internal, and two external.

HARD DISK STORAGE: The IBM XT includes a 10MB Fixed Disk Drive as a standard feature. A second 10MB Fixed Disk Drive may be added to the XT. It is supported by the XT's standard Fixed Disk Drive Adapter. Another method of increasing the XT's storage is via the Expansion Unit 5161 Model 2 which includes a 10MB fixed disk as well as an expansion chassis. The Fixed Disk Drive Adapter and 10MB fixed disk are also available on the PC via the Expansion Unit Type 5161 Model 1. 20MB of additional storage are available via the Expansion Unit Type 5161 Model 3 on the Personal Computer XT/370 only.

The hard disk drive is a random access storage device that uses two non-removable 5¼-inch disks for storage. Each disk surface employs one movable head to service 306 cylinders. The total formatted capacity of the four heads and surfaces is 10M bytes (17 sectors per track with 512 bytes per sector and a total of 1224 tracks).

The Fixed Disk Drive Adapter attaches to one or two fixed disk drive units, through an internal daisy-chained flat cable (data/control cable). Each system supports a maximum of one Fixed Disk Drive Adapter and two fixed disk drives, therefore, a total of 20M bytes of hard disk storage is possible for either the PC or XT. The adapter is buffered on the I/O bus and uses the system board direct memory access (DMA) for record data transfers. An interrupt level also is used to indicate operation completion with status conditions that require processor attention.

EXPANSION SLOTS: The IBM PC and 3270-PC have five expansion slots as standard and the XT has eight. The PC has five full-feature slots; the XT has six full-feature slots and two half-size feature slots. The PCjr has no expansion slots, but includes two software cartridge slots.

EXPANSION UNITS: No expansion units are offered for the PCjr. The Personal Computer Expansion Unit 5161 Model 1 attaches to the IBM Personal Computer, and Expansion Unit 5161 Model 2 attaches to the IBM Personal Computer XT. The Personal Computer Expansion Unit 5161 Model 3 attaches to the specially configured XT/370. Each contains 10MB fixed disk drive and eight expansion slots, except Model 3 which contains 20MB. These slots allow additional expansion cards to support additional features or devices. Six of these slots are full-feature slots that accept full-size feature cards. The remaining two are special slots which accept only smaller feature cards. One full-feature slot is used for the Fixed Disk Drive Adapter that is included with the Expansion Unit 5161 Model 1. The Expansion Unit Model 2 for the XT does not include a Fixed Disk Adapter. Instead, it uses the XT's Fixed Disk Drive Adapter to support the second 10MB fixed disk. In addition, in each unit, one slot is used in both the System Unit and expansion unit for attachment cards. Memory cards, the Diskette Adapter and the primary monitor/display attachment card must reside in the System Unit. Other IBM attachment adapters may reside in either an expansion unit or System Unit. One additional 10MB fixed disk drive can be installed in the expansion unit for a total of 20MB of fixed disk storage, except Model 3 which already contains 20MB.

The IBM Personal Computer Expansion Unit 5161 Model 1 includes the fixed disk drive and its adapter card. The IBM Personal Computer XT Expansion Unit 5161 Model 2 includes only the fixed disk drive. A fixed disk drive adapter card and fixed disk drive must be moved from the IBM Personal Computer XT System Unit to the IBM Personal Computer Expansion Unit Model 2 at installation time to

support the maximum total of 20MB of fixed disk storage. Expansion Units have an average access time of 90 ms, and a 5M bps transfer rate.

INPUT/OUTPUT: Adapters are not standard features of the IBM PC, 3270-PC, or PCjr. The following optional adapters may be added to the IBM PC and 3270-PC: the Monochrome Display and Printer Adapter, the Color/Graphics Monitor Adapter, the 5¼-inch Diskette Drive Adapter, an Asynchronous Communication Adapter, and a Binary Synchronous Communication Adapter. The PCjr uses optional adapter cables; these connect peripheral devices to corresponding connectors on the System Unit. The PCjr has 18 connectors for adding such peripherals as a color display, television set, printer, joysticks, light pen, modem and cassette player. In addition, a Parallel Printer Attachment connects to the side of the PCjr's System Unit.

The PC XT and XT/370 include three standard adapters: one Asynchronous Communications Adapter, one Diskette Drive Adapter, and one Fixed Disk Drive Adapter. The Asynchronous Communications Adapter resides in the eighth slot of the XT. It is a standard RS-232-C interface and may be used not only for communications but to support serial printers, paper tape readers, laboratory instruments and other serial devices. See the COMMUNICATIONS FEATURES section of this report for further description of the Asynchronous Communications Adapter. The Printer Adapter provides attachment of IBM or other Centronics-style parallel interface printers to the PC or XT. This option is used when the Color Graphics Adapter is selected instead of the Monochrome Display and Printer Adapter. The Game Control Adapter is a half-length feature card that supports customer supplied joysticks, mice, paddles or other such devices. This allows a user to move objects or text on the screen in any random direction. The Prototype Adapter enables board developers to work outside the System Unit on their designing via this extension device. I/O devices are addressed using I/O mapped address space. The channel is designed so that 768 I/O device addresses are available to the I/O channel cards.

PRINTERS: The IBM 80 cps Printer is a self-powered, standalone, tabletop unit. It attaches to the System Unit through a parallel signal cable, six feet in length. The printer is a bidirectional, wire-matrix device which uses pin-feed, continuous form (four inch to 10 inch width), multi-part paper. It prints characters in a 9-by-9 dot matrix with a nine-wire head. Under program control, it can print in a compressed mode of 132 characters per line, in a standard mode of 80 characters per line, in a double width, compressed mode of 66 characters per line and/or in a double width mode of 40 characters per line. It can also print double-size characters and double-strike characters. The character set is standard ASCII, with 96 characters printing in upper and lower case. A printer without an extended character set also has a set of 64 special block graphic characters.

The IBM 80 cps Graphics Printer has additional capabilities including: an extended character set for international languages, subscript, superscript, an underline mode, and programmable graphics.

Both printers can accept commands setting the line-feed control desired for the application. They attach to the System Unit through the Printer Adapter or the combination Monochrome Display and Printer Adapter.

The Personal Computer Color Printer supports as many as eight colors using an eight-color ribbon. It supports the same graphics capabilities as the above 80 CPS Graphics Printer. The printing speed of the Color Printer is 200 cps. A near letter-quality 35 cps mode is also supported by using an optional black-only ribbon. The printer also includes user- ►

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▶ programmable features, including spacing, margins, tabs, underlining, and different typefaces. A four-color ribbon is also available.

The Compact Printer is a lightweight thermal printer and is specifically designed for the PCjr. It requires special fanfold heat-sensitive paper and prints single-directionally at 50 cps in a choice of three type styles.

PRICING

IBM Personal Computers are sold through IBM retail stores and other authorized dealers. All models of IBM Personal Computers, with the exception of the PCjr and the 5161 Expansion Unit, are included in the IBM Personal Computer Volume Procurement Amendment (VPA). The VPA allows for quantity discounts as follows:

Quantity of Eligible Machines for each Category	Discount Percent
20 to 49	12%
50 to 149	16%
150 to 249	20%
250 to 499	24%
500 to 999	27%
1000 or more	30%

The discount policy for the PCjr has not yet been announced.

Personal Computers are provided with a three-month limited warranty, which may be extended for a fee. A variety of annual maintenance agreements are available for the IBM PC, XT, and PCjr. Self-paced instruction manuals are also available. Non-IBM dealers may establish their own maintenance agreements; pricing and degree of support will fluctuate widely.

EQUIPMENT PRICES

	Price	Monthly Maint.
4860004	\$ 669	N/A
4860067	1,269	N/A
5150104	1,355	\$165.00
5150114	1,864	165.00
5150164	2,104	165.00
5150174	2,633	165.00
516087	4,995	275.00
5271002	4,290	N/A
5271004	5,319	N/A
5271006	7,180	N/A
5272000	995	N/A
5730000	295	N/A
5160588	8,995	N/A
5160568	6,720	N/A
1501001	30	N/A
1501002	260	N/A
1501003	165	N/A
1501013	350	50.00
8600007	140	N/A
8600020	30	N/A
8600021	20	N/A
1501100	270	N/A
1501300	55	N/A
1501400	45	N/A
1502074	120	N/A
1502075	300	N/C
8600008	199	N/A
8600005	480	N/A
1502090	300	N/A
1503780	220	N/A
1503800	289	58.00
1503810	529	83.00
1504900	335	N/A
1504910	244	N/A
1505200	150	N/A
1525612	55	N/A
8600009	99	N/A
8600022	30	N/A
8600026	25	N/A
8600012	20	N/A
8600010	40	N/A
1602507	905	N/A

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& Intelligent Terminals

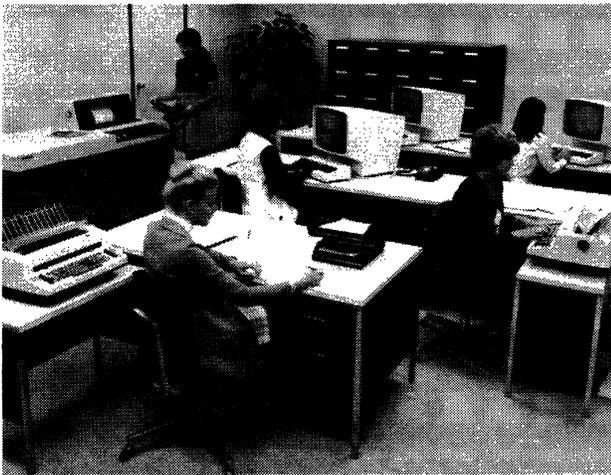
EQUIPMENT PRICES (Continued)		<u>Price</u>	<u>Monthly Maint.</u>
0005326	3270 PC attachment	1,950	N/A
0005328	3279 adapter	1,100	N/A
6072534	Systems 34, 36, & 38 5251 emulation adapter	600	N/A
1503891	PC/XT/370 option kit	3,790	N/A
1602500	10MB fixed disk drive	1,695	295.00
1602501	Fixed disk drive adapter	695	N/A
5152001	Printer	495	N/A
5181001	Compact printer	175	N/A
5152002	Graphics printer	595	62.50
5182001	Color printer	1,995	N/A
5151001	Monochrome display	345	44.00
5153001	Color display	680	125.00
5161001	Expansion unit, fixed disk drive adapter, 10MB fixed disk drive	3,390	125.00
5161002	Expansion unit, 10MB fixed disk drive	2,695	125.00
5161003	Expansion unit	4,970	N/A

Note: N/A means prices not available from vendor.

SOFTWARE PRICES

IBM-licensed Software.		<u>Single-Unit One-Time Charge</u>
Operating Systems and Communications Software		
6024001	IBM Personal Computer Computer Disk Operating System (DOS) 1.1 and Basic extension 1.1	\$ 40.00
6024061	IBM DOS 2.0 and Basic extension 2.0	60.00
6024120	IBM DOS 2.1	65.00
6024040	UCSD p-System runtime support	50.00
6024035	CP/M-86	240.00
6024032	Asynchronous Communications Support	60.00
6024036	SNA 3270 Emulation and RJE Support	700.00
6024037	Binary Synchronous 3270 Emulation	700.00
6024042	IBM 3101 Emulation	140.00
6092651	IBM Personal Computer IBM 5250 Emulation Program	164.00
7033703	IBM 5520/Personal Computer Attachment Program (version 1)	164.00
6109558	IBM 5520/Personal Computer Attachment Program (version 2)	284.00
1837434	3270-PC control program available: 1st quarter-1984	300.00
6024134	PC 3278/79 emulation control program available: April 1984	235.00
6936733	VM/PC program available: 2nd quarter-1984	1,000.00
6428147	PC computer batch comm program available December 1983	350.00
6092651	5250 emulation program	164.00 ■

IBM 3790 Communications System



MANAGEMENT SUMMARY

The IBM 3790 Communications System is one of the few IBM products which was not a critical success. The system was announced in December 1973 and was enhanced several times since then, but it was just too complex and too costly to be welcomed enthusiastically by the DP community. It has effectively been rendered obsolete by the IBM 8100 system (Report C13-491-901).

The foregoing remarks do not apply to the 3790 Data Entry Configuration (Report 70D-491-43 in Datapro 70) which is IBM's version of a key/disk data entry system. That system is enjoying reasonably good success and offers specialized data entry terminals not available on competitive key disk systems.

USER REACTION

Datapro's most recent user survey (October 1978) of Batch Terminals produced responses from five users who had a total of 48 3790 Systems installed. Only one of these users (with 11 installed systems) was using the 3790 for key entry. All others were using it as either a batch terminal or stand-alone processor or both. Ratings supplied by these users are summarized below.

	Excellent	Good	Fair	Poor	WA*
Overall performance	1	3	1	0	3.0
Ease of operation	0	3	2	0	2.6
Hardware reliability	1	3	1	0	3.0
Maintenance service	1	3	0	1	2.8
Terminal software	0	4	1	0	2.8
Technical support	0	3	1	1	2.4

*Weighted Average on a scale of 4.0 for Excellent.

A multistation, multi-task, programmable system for remote processing which supports keyboard/display and teleprinter terminals. Up to 30 million bytes of fixed disk storage is available. Output can be sent over a communications line and/or to an on-site line printer and up to four magnetic tape drives.

A typical small 4-display configuration with 480-character displays and integrated 2400 bps modem costs about \$1,100 per month on the Extended Term Plan (two-year lease).

Up to 52 operator stations can be attached, and depending on certain parameters either 16 or 31 different tasks may occur concurrently. Under certain conditions, up to 80 additional remote devices can supplement those at the principal 3790 site, so that very large and expensive systems can be configured.

CHARACTERISTICS

VENDOR: International Business Machines Corp., Data Processing Division, 1133 Westchester Avenue, White Plains, New York, 10604. Telephone (914) 606-1900.

DATE OF ANNOUNCEMENT: December 1973.

DATE OF FIRST DELIVERY: Mid-1975.

NUMBER DELIVERED TO DATE: This information is not available.

SERVICED BY: IBM.

CONFIGURATION

The basic components of an IBM 3790 Communication System are the programmable 3791 Controller and its basic cluster of operator stations, including 3793 Keyboard-Printers, 3277 Display Stations, and 3284/3286/3288 Printers. Three support levels are defined: Configuration Support #9431, #9165, and #9169. These refer to the software and processing feature support. Special capabilities for each support level follow the general configuration discussion.

The 3791 Controller provides from 10 to 30 million bytes of disk storage. It is available in the following models that determine the disk storage capacity:

3791 Model	Disk Storage Capacity
1C	10 million bytes
2A	20 million bytes
2B	30 million bytes

REFERENCE EDITION. This is a mature product line, and no significant further developments are anticipated. Because of its importance, coverage is being continued, but no future update is planned.

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Figure 1. Minimum and Maximum 3790 Control Storage Requirements

	#9431		Configuration Support #9165		#9169	
	Min.	Max.	Min.	Max.	Min.	Max.
Control Storage Increment, Type I—						
#1602, 8K bytes	—	1	—	—	—	1
#1603, 16K bytes	—	3	3	3	6	7
Control Storage Increment, Type II—						
#1612, 8K bytes	—	1	—	—	—	1
#1613, 16K bytes	—	1	1	1	1	5
Total bytes	0	82K	65K	65K	115K	213K

➤ These ratings are generally lower than those normally achieved by IBM computer hardware. One user wrote the comment “not operator oriented” below the ratings which this individual provided. Four of the five users regarded “cost” as an advantage of the 3790 system. □

➤ The basic 3791 Controller will permit up to a maximum of thirty-one 3277's and/or 3284/3286/3288's in any combination; additionally, up to four 3793 Keyboard-Printers can be accommodated via separate attachments. An 80- or 132-column line printer with a speed of up to 155 lpm or a 410 lpm 132-column printer can also be attached to the basic system. The 3791 Controller can be expanded to accommodate up to three additional clusters of up to four 3793 Keyboard-Printers and two remote IBM 2741 Communications Terminals each via 1 to 3 3792 Auxiliary Control Units. The expanded 3790 system can accommodate a second printer. The use of device attachments is defined as follows:

Control storage is available in 8K- or 16K-byte increments up to a maximum of 213K bytes. The requirements for control storage capacity are configuration- and usage-dependent. The procedure for determining the required storage for a given configuration is quite complex and is based on the quantities and types of attached devices, the number of devices operating concurrently, and communications line usage. See Figure 1.

The 3792 Auxiliary Control Unit allows additional 3793 Keyboard-Printers to be attached to the basic 3791 Controller and provides a communications capability for the attachment of remote IBM 2741 Communications Terminals.

Each 3792 Auxiliary Control Unit can accommodate up to four 3793 Keyboard-Printers and up to two communications lines for the one or two remote 2741 terminals as a subcluster to the 3791 Controller. However, if any 3792 Auxiliary Control Unit includes a line printer, its combined total of 3793's and remote 2741's cannot exceed four. Each attached 3793 Keyboard-Printer requires a separate 3793 Attachment. Each attached communications line requires a separate Asynchronous Communication Control (a maximum of two per 3792) and the EIA Interface or IBM Leased Line Adapter. The Adapter Base (one per 3792) is prerequisite to the Asynchronous Communication Control.

The 3791 Controller can accommodate up to three 3792 Auxiliary Control Units via the 3792 Attachment, and each 3792 can be located up to 2000 cable-feet from the 3791 Controller.

One 3792 Auxiliary Control Unit can be equipped with an 80- or 132-column line printer.

The 3411 Magnetic Tape unit and control Model 1 can be attached to the 3791 to provide magnetic tape output or input. Model 3410 magnetic tape drive can be attached via the 3411. A total of four drives per system is permitted.

The Security Keylock feature, which permits power to be applied only when the key is in place, is available for the 3791 Controller and for each attached 3792 Auxiliary Control Unit.

CONFIGURATION SUPPORT #9431: This support level provides for the attachment of 3277 Display stations Models 1 and 2, 3284/3286/3287 printers and the Model 3288 line printer. The 3791 Controller will permit up to a maximum of 31 of the devices enumerated above to be attached in any combination. In addition, up to four 3793 keyboard/printers can be attached. Up to three 3792 Auxiliary Control units can be attached. This Configuration support provides up to 16 concurrent operations per system.

CONFIGURATION SUPPORT #9165: This support offers all of the capabilities of Configuration Support #9431 plus RJE function, full screen processing, 3270 compatibility, transmission speeds of up to 9600 bps, and up to 31 concurrent tasks including system printer tasks. It also provides ASCII support, and expanded 3790 DB/DC VTAM and TCAM host support.

CONFIGURATION SUPPORT #9169: This support provides all of the functions of Configuration Support #9431 and #9165. It also supports attachment of the 3276 Control Unit Display Station, 3278 Display and 3287 and 3289 printers via the Data Link Adapter, plus attachment of the 3411 Magnetic Tape unit and control Model 1.

TRANSMISSION SPECIFICATIONS

Transmission between the 3790 Communication System and its host System/370 Computer is supported by Synchronous Data Link Control (SDLC). Transmission is half-duplex at 1200, up to 2400, or up to 9600 bits per second, as determined by one of three SDLC Communications Adapters that can be specified for the 3791 Controller. Transmission at 1200 bps is clocked via the SDLC Adapter; an EIA Standard RS-232 interface for use with an external modem or an integral IBM modem can be specified. Transmission at up to 2400 or 9600 bps is unlocked; an EIA Standard RS-232 interface is provided for an external modem, which must provide its own clocking.

The 3791 is transmission-compatible with the IBM 3704 and 3705 Communications Controllers operating under the Network Control Program (NCP) and can be used in a switched or non-switched point-to-point or a non-switched multipoint communications arrangement.

DEVICE CONTROL

Built around a minicomputer as its nucleus, the 3790 Communication System is designed to serve in a stand-alone capacity as a shared-processor data entry system, gathering and editing data from as many as 52 local and remote operator stations and storing the data on diskettes or magnetic tape for later batch transmission (batch session) to

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► the host computer. When equipped with the Data Link Adapters, up to 80 additional remote devices can be controlled. As an alternative, the data can be transmitted to the host computer as it is edited (inquiry session), without being stored on diskettes. Magnetic tape can also provide input to the system.

All operations are executed under program control. The 3790 receives its operating software from the host computer via the communications facility. Following receipt of the software, the 3790 operates independently of the host system.

All 3790 programs are compiled and can be tested on the host System/370 computer prior to use on the remote 3790. The application programs are prepared by the user via a System/370 assembler and statements defined in an IBM-supplied macro library. Program debugging is performed with the aid of a utility package, Program Validation Service (PVS), on the host computer. PVS also formats 3790 programs for storage at the host computer and later transmission to the 3790. Subsystem Support Services (SSS), another utility, controls 3790 program libraries at the host site and controls the transmission of 3790 programs from the host computer to the 3790.

COMPONENTS

3793 KEYBOARD-PRINTER: The 3793 is a modified Selectric II typewriter terminal oriented toward the functions of the 3790 system. It contains a serial impact printer that prints full characters at speeds up to 15.5 characters per second; input symbols total 88. Vertical forms movement and print positioning can be performed under program control.

The printer accommodates friction-fed or pin-fed (optional) continuous forms up to 15.5 inches wide; the printing width is 13 inches. Horizontal spacing is 10 to 12 characters per inch; vertical spacing is 6 lines per inch.

The typewriter-style EBCDIC keyboard includes operator guidance lights and switches.

3277 DISPLAY STATION: The 3277 is a CRT display unit with a 14-inch (diagonal measurement) CRT screen. The display screen arrangement is dependent on the model, as shown below.

3277 Display:	Model 1	Model 2
Characters/display:	480	1920
Lines/display:	12	24
Characters/line:	40	80

A character set of 64 ASCII characters, including upper case alphabetic, numerics, and special symbols is displayed in green against a dark background. Each character is formed by a 7-by-9 dot matrix.

Many keyboards are available for the 3277 Display Station, but only the 66- or 78-key EBCDIC typewriter-style keyboard can be used when the 3277 is employed as an operator station attached to the 3791 Controller. The 78-key version of the typewriter-style keyboard includes 12 Program Function keys, which are defined by the application program.

Not all features for the 3277 display stations are supported when attached to a 3791 controller. The following features are supported: Audible Alarm, Operator Identity Card Reader, Keyboard Numeric Lock, and Security Keylock.

See Report C25-491-101 for complete details on the 3270 components, including 3277 display stations and 3284, 3286, and 3288 printers.

PRINTED OUTPUT: Printed copy is produced at a rated speed of up to 155 lpm with a 48-character print belt, 120 lpm with a 64 character set, and 80 lpm with a 96 character set by the #4710 and #4711 line printers for the 3791 or #4712 and #4713 for the 3792. These printers have 80 or 132 print positions and accommodate 6-part, continuous pin-fed forms up to 8 inches (80 columns) or 14 $\frac{1}{8}$ inches (132 columns) in width. Horizontal and vertical spacings are 10 characters per inch and 6 lines per inch, respectively. The #4715 printer available with the 3791 operates at 410 lpm with a 48 character set, 300 lpm with a 64 character set, and 230 lpm with a 96 character set. This printer provides 132 positions. Other characteristics are similar to the printers above except that program selection between 6 and 8 lines per inch vertical spacing is included for Configuration Support #9165 and #9169.

MAGNETIC TAPE INPUT/OUTPUT: The IBM 3411 Magnetic Tape Unit and Control model 1 can provide input and output to a 3791 Control Unit. Additional magnetic tape capacity is provided by attaching 3410 Magnetic Tape units via the 3411. A total of four magnetic tape units per system are supported.

DATA LINK ADAPTER: The Data Link Adapter permits attaching the 3276 Control Display Stations plus 3278 Display Stations and 3287 or 3289 printers to a 3791 via non-switched communications lines. Only SDLC communications protocol and the 1920 character screen format are supported. A maximum of five Data Link Adapter features can be attached to a 3791 controller. The maximum number of 3276 Control Display stations permitted on each Data Link Adapter is also five. A maximum of 80 units in any combination are permitted on the five Data Link adapters.

PRICING

All 3790 components, except the 2741 terminal, are available under the terms of IBM's Rental or Lease Agreement (LRA) or for purchase. LRA includes prime-shift maintenance; a separate contract is available for purchased units.

		Monthly Rental*			
		Short Term	Ext. Term	Purchase	Monthly Maint.
3791 Controllers—					
	Model 1C	\$541	\$460	\$18,700	\$204.00
	Model 2A	717	610	24,800	194.00
	Model 2B	893	760	30,900	248.00
Features					
#1515	Local Channel Attachment	88	75	3,000	4.00
#3701	EIA Interface	12	10	400	4.00
	1200 bps Integrated Modem:				
#5500	Non-switched	19	16	630	5.00
#5501	Switched	25	21	860	7.00

*Includes maintenance.

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		Monthly Rental*			Monthly Maint.
		Short Term	Ext. Term	Purchase	
	SDLC Feature:				
#6301	With Business Machine Clock (for 1200 bps)	19	16	670	3.00
#6302	Without Business Machine Clock (for up to 2400 bps)	12	10	450	2.50
#6303	Without Business Machine Clock (for up to 9600 bps)	35	30	1,200	10.50
#6350	Security Keylock	35**	35**	35	—
	Control Storage:				
#1590	Control Storage Expansion	31	26	1,055	5.50
	Control Storage Increments:				
#1602	Type I, 8K bytes	32	27	637	5.00
#1603	Type IA, 16K bytes	58	49	1,170	10.00
#1612	Type II, 8K bytes	32	27	637	5.00
#1613	Type IIA, 16K bytes	58	49	1,170	10.00
	Additional Disk Heads for 3791 1B, 1C, 2A, or 2B	32	27	1,080	17.00
	Attachment Features—				
#7911	3270 Attachment, First	38	32	1,300	5.00
#7912	3270 Attachment, Additional	32	27	1,100	3.00
#7900	3792 Attachment	36	31	1,300	4.00
#7901	3793 Attachment, First	36	31	1,300	3.00
#7902	3793 Attachment, Second	36	31	1,300	5.50
#7903	3793 Attachment, Additional	36	31	1,300	3.00
#7840	Magnetic Tape Attachment	182	155	6,200	8.00
	Line Printers for 3791:				
#4710	155 lpm, 80 print positions	177	151	6,175	56.00
#4711	155 lpm, 132 print positions	199	169	6,825	59.50
#4715	410 lpm, 132 print positions	351	299	11,960	114.00
	3792 Auxiliary Control Unit				
#4712	Line Printer, 155 lpm, 80 print positions	200	170	6,900	34.50
#4713	Line Printer, 155 lpm, 132 print positions	274	233	9,500	56.00
#7901	3793 Attachment	306	260	10,500	59.50
#7901	3793 Attachment	36	31	1,300	3.00
#1622	Control Storage Increment, 8K bytes	32	27	637	5.00
	Communications Features—				
#1021	Adapter Base	49	42	1,700	1.00
#1081	Asynchronous Communications Control	19	16	650	3.00
#3701	EIA Interface	12	10	400	4.00
#5400	Leased Line Adapter	19	16	650	5.00
#6350	Security Keylock	35**	35**	35	—
#4450	Forms Stand	54**	54**	54	—
	3793 Keyboard Printer				
#5560	Power Line Keylock	119	101	3,450	28.00
		75**	75**	75	—
	3411 Model 1 Magnetic Tape Unit and Control (requires #7003 and #3211 or #3221)				
		454	381	12,460	95.00
	3410 Model 1 Magnetic Tape Unit (requires #3211 or #3221)				
		206	173	5,655	61.50
#7003	3790 Attachment	83	70	2,315	3.50
#3211	Single density; 1600 bpi PE	60	50	1,835	9.50
#3211	Dual Density; 800/1600 bpi	88	74	2,645	36.50

*Includes maintenance

**Single use charge

Updated

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► the host computer. When equipped with the Data Link Adapters, up to 80 additional remote devices can be controlled. As an alternative, the data can be transmitted to the host computer as it is edited (inquiry session), without being stored on diskettes. Magnetic tape can also provide input to the system.

All operations are executed under program control. The 3790 receives its operating software from the host computer via the communications facility. Following receipt of the software, the 3790 operates independently of the host system.

All 3790 programs are compiled and can be tested on the host System/370 computer prior to use on the remote 3790. The application programs are prepared by the user via a System/370 assembler and statements defined in an IBM-supplied macro library. Program debugging is performed with the aid of a utility package, Program Validation Service (PVS), on the host computer. PVS also formats 3790 programs for storage at the host computer and later transmission to the 3790. Subsystem Support Services (SSS), another utility, controls 3790 program libraries at the host site and controls the transmission of 3790 programs from the host computer to the 3790.

COMPONENTS

3793 KEYBOARD-PRINTER: The 3793 is a modified Selectric II typewriter terminal oriented toward the functions of the 3790 system. It contains a serial impact printer that prints full characters at speeds up to 15.5 characters per second; input symbols total 88. Vertical forms movement and print positioning can be performed under program control.

The printer accommodates friction-fed or pin-fed (optional) continuous forms up to 15.5 inches wide; the printing width is 13 inches. Horizontal spacing is 10 to 12 characters per inch; vertical spacing is 6 lines per inch.

The typewriter-style EBCDIC keyboard includes operator guidance lights and switches.

3277 DISPLAY STATION: The 3277 is a CRT display unit with a 14-inch (diagonal measurement) CRT screen. The display screen arrangement is dependent on the model, as shown below.

3277 Display:	Model 1	Model 2
Characters/display:	480	1920
Lines/display:	12	24
Characters/line:	40	80

A character set of 64 ASCII characters, including upper case alphabets, numerics, and special symbols is displayed in green against a dark background. Each character is formed by a 7-by-9 dot matrix.

Many keyboards are available for the 3277 Display Station, but only the 66- or 78-key EBCDIC typewriter-style keyboard can be used when the 3277 is employed as an operator station attached to the 3791 Controller. The 78-key version of the typewriter-style keyboard includes 12 Program Function keys, which are defined by the application program.

Not all features for the 3277 display stations are supported when attached to a 3791 controller. The following features are supported: Audible Alarm, Operator Identity Card Reader, Keyboard Numeric Lock, and Security Keylock.

See Report C25-491-101 for complete details on the 3270 components, including 3277 display stations and 3284, 3286, and 3288 printers.

PRINTED OUTPUT: Printed copy is produced at a rated speed of up to 155 lpm with a 48-character print belt, 120 lpm with a 64 character set, and 80 lpm with a 96 character set by the #4710 and #4711 line printers for the 3791 or #4712 and #4713 for the 3792. These printers have 80 or 132 print positions and accommodate 6-part, continuous pin-fed forms up to 8 inches (80 columns) or 14 $\frac{1}{8}$ inches (132 columns) in width. Horizontal and vertical spacings are 10 characters per inch and 6 lines per inch, respectively. The #4715 printer available with the 3791 operates at 410 lpm with a 48 character set, 300 lpm with a 64 character set, and 230 lpm with a 96 character set. This printer provides 132 positions. Other characteristics are similar to the printers above except that program selection between 6 and 8 lines per inch vertical spacing is included for Configuration Support #9165 and #9169.

MAGNETIC TAPE INPUT/OUTPUT: The IBM 3411 Magnetic Tape Unit and Control model 1 can provide input and output to a 3791 Control Unit. Additional magnetic tape capacity is provided by attaching 3410 Magnetic Tape units via the 3411. A total of four magnetic tape units per system are supported.

DATA LINK ADAPTER: The Data Link Adapter permits attaching the 3276 Control Display Stations plus 3278 Display Stations and 3287 or 3289 printers to a 3791 via non-switched communications lines. Only SDLC communications protocol and the 1920 character screen format are supported. A maximum of five Data Link Adapter features can be attached to a 3791 controller. The maximum number of 3276 Control Display stations permitted on each Data Link Adapter is also five. A maximum of 80 units in any combination are permitted on the five Data Link adapters.

PRICING

All 3790 components, except the 2741 terminal, are available under the terms of IBM's Rental or Lease Agreement (LRA) or for purchase. LRA includes prime-shift maintenance; a separate contract is available for purchased units.

		Monthly Rental*			
		Short Term	Ext. Term	Purchase	Monthly Maint.
3791 Controllers—					
	Model 1C	\$568	\$483	\$18,700	\$214.00
	Model 2A	752	640	24,800	203.00
	Model 2B	936	797	30,900	260.00
Features					
#1515	Local Channel Attachment	92	78	3,000	4.00
#3701	EIA Interface	12	10	400	4.00
	1200 bps Integrated Modem:				
#5500	Non-switched	19	16	630	5.00
#5501	Switched	26	22	860	7.00

*Includes maintenance.

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		Monthly Rental*			
		<u>Short Term</u>	<u>Ext. Term</u>	<u>Purchase</u>	<u>Monthly Maint.</u>
SDLC Feature:					
#6301	With Business Machine Clock (for 1200 bps)	19	16	670	3.00
#6302	Without Business Machine Clock (for up to 2400 bps)	12	10	450	2.50
#6303	Without Business Machine Clock (for up to 9600 bps)	36	31	1,200	11.00
#6350	Security Keylock	35**	35**	35	—
Control Storage:					
#1590	Control Storage Expansion	32	27	1,055	5.50
Control Storage Increments:					
#1602	Type I, 8K bytes	33	28	637	5.00
#1603	Type IA, 16K bytes	60	51	1,170	10.50
#1612	Type II, 8K bytes	33	28	637	5.00
#1613	Type IIA, 16K bytes	60	51	1,170	10.50
	Additional Disk Heads for 3791 1B, 1C, 2A, or 2B	32	27	1,080	17.00
Attachment Features—					
#7911	3270 Attachment, First	39	33	1,300	5.00
#7912	3270 Attachment, Additional	33	28	1,100	3.00
#7900	3792 Attachment	36	31	1,300	4.00
#7901	3793 Attachment, First	36	31	1,300	3.00
#7902	3793 Attachment, Second	36	31	1,300	5.50
#7903	3793 Attachment, Additional	36	31	1,300	3.00
#7840	Magnetic Tape Attachment	190	162	6,200	8.00
Line Printers for 3791:					
#4710	155 lpm, 80 print positions	184	157	6,175	58.50
#4711	155 lpm, 132 print positions	208	177	6,825	62.00
#4715	410 lpm, 132 print positions	368	313	11,960	119.00
3792 Auxiliary Control Unit					
#4712	Line Printer, 155 lpm, 80 print positions	209	178	6,900	34.50
#4713	Line Printer, 155 lpm, 132 print positions	287	244	9,500	56.00
#7901	3793 Attachment	321	273	10,500	59.50
#1622	Control Storage Increment, 8K bytes	36	31	1,300	3.00
Communications Features—					
#1021	Adapter Base	33	28	637	5.00
#1081	Asynchronous Communications Control	51	43	1,700	1.00
#3701	EIA Interface	19	16	650	3.00
#5400	Leased Line Adapter	12	10	400	4.00
#6350	Security Keylock	19	16	650	5.00
#4450	Forms Stand	35**	35**	35	—
		54**	54**	54	—
3793 Keyboard Printer					
#5560	Power Line Keylock	123	105	3,450	29.00
		75**	75**	75	—
3411 Model 1 Magnetic Tape Unit and Control (requires #7003 and #3211 or #3221)					
		476	400	12,460	99.50
3410 Model 1 Magnetic Tape Unit (requires #3211 or #3221)					
		216	181	5,655	64.50
#7003	3790 Attachment	86	72	2,315	3.50
#3211	Single density; 1600 bpi PE	62	52	1,835	9.50
#3221	Dual Density; 800/1600 bpi	92	77	2,645	38.00

*Includes maintenance

**Single use charge

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► the host computer. When equipped with the Data Link Adapters, up to 80 additional remote devices can be controlled. As an alternative, the data can be transmitted to the host computer as it is edited (inquiry session), without being stored on diskettes. Magnetic tape can also provide input to the system.

All operations are executed under program control. The 3790 receives its operating software from the host computer via the communications facility. Following receipt of the software, the 3790 operates independently of the host system.

All 3790 programs are compiled and can be tested on the host System/370 computer prior to use on the remote 3790. The application programs are prepared by the user via a System/370 assembler and statements defined in an IBM-supplied macro library. Program debugging is performed with the aid of a utility package, Program Validation Service (PVS), on the host computer. PVS also formats 3790 programs for storage at the host computer and later transmission to the 3790. Subsystem Support Services (SSS), another utility, controls 3790 program libraries at the host site and controls the transmission of 3790 programs from the host computer to the 3790.

COMPONENTS

3793 KEYBOARD-PRINTER: The 3793 is a modified Selectric II typewriter terminal oriented toward the functions of the 3790 system. It contains a serial impact printer that prints full characters at speeds up to 15.5 characters per second; input symbols total 88. Vertical forms movement and print positioning can be performed under program control.

The printer accommodates friction-fed or pin-fed (optional) continuous forms up to 15.5 inches wide; the printing width is 13 inches. Horizontal spacing is 10 to 12 characters per inch; vertical spacing is 6 lines per inch.

The typewriter-style EBCDIC keyboard includes operator guidance lights and switches.

3277 DISPLAY STATION: The 3277 is a CRT display unit with a 14-inch (diagonal measurement) CRT screen. The display screen arrangement is dependent on the model, as shown below.

3277 Display:	Model 1	Model 2
Characters/display:	480	1920
Lines/display:	12	24
Characters/line:	40	80

A character set of 64 ASCII characters, including upper case alphabets, numerics, and special symbols is displayed in green against a dark background. Each character is formed by a 7-by-9 dot matrix.

Many keyboards are available for the 3277 Display Station, but only the 66- or 78-key EBCDIC typewriter-style keyboard can be used when the 3277 is employed as an operator station attached to the 3791 Controller. The 78-key version of the typewriter-style keyboard includes 12 Program Function keys, which are defined by the application program.

Not all features for the 3277 display stations are supported when attached to a 3791 controller. The following features are supported: Audible Alarm, Operator Identity Card Reader, Keyboard Numeric Lock, and Security Keylock.

See Report C25-491-101 for complete details on the 3270 components, including 3277 display stations and 3284, 3286, and 3288 printers.

PRINTED OUTPUT: Printed copy is produced at a rated speed of up to 155 lpm with a 48-character print belt, 120 lpm with a 64 character set, and 80 lpm with a 96 character set by the #4710 and #4711 line printers for the 3791 or #4712 and #4713 for the 3792. These printers have 80 or 132 print positions and accommodate 6-part, continuous pin-fed forms up to 8 inches (80 columns) or 14 $\frac{1}{4}$ inches (132 columns) in width. Horizontal and vertical spacings are 10 characters per inch and 6 lines per inch, respectively. The #4715 printer available with the 3791 operates at 410 lpm with a 48 character set, 300 lpm with a 64 character set, and 230 lpm with a 96 character set. This printer provides 132 positions. Other characteristics are similar to the printers above except that program selection between 6 and 8 lines per inch vertical spacing is included for Configuration Support #9165 and #9169.

MAGNETIC TAPE INPUT/OUTPUT: The IBM 3411 Magnetic Tape Unit and Control model 1 can provide input and output to a 3791 Control Unit. Additional magnetic tape capacity is provided by attaching 3410 Magnetic Tape units via the 3411. A total of four magnetic tape units per system are supported.

DATA LINK ADAPTER: The Data Link Adapter permits attaching the 3276 Control Display Stations plus 3278 Display Stations and 3287 or 3289 printers to a 3791 via non-switched communications lines. Only SDLC communications protocol and the 1920 character screen format are supported. A maximum of five Data Link Adapter features can be attached to a 3791 controller. The maximum number of 3276 Control Display stations permitted on each Data Link Adapter is also five. A maximum of 80 units in any combination are permitted on the five Data Link adapters.

PRICING

All 3790 components, except the 2741 terminal, are available under the terms of IBM's Rental or Lease Agreement (LRA) or for purchase. LRA includes prime-shift maintenance; a separate contract is available for purchased units.

		Monthly Rental*			
		Short Term	Ext. Term	Purchase	Monthly Maint.
3791 Controllers—					
	Model 1C	\$ 636	\$541	\$19,630	\$224.00
	Model 2A	844	718	26,030	213.00
	Model 2B	1,050	894	32,430	273.00
Features					
#1515	Local Channel Attachment	102	87	3,150	4.00
#3701	EIA Interface	12	10	420	4.00
	1200 bps Integrated Modem				
#5500	Non-switched	20	17	661	5.00
#5501	Switched	28	24	903	7.00

*Includes maintenance

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		Monthly Rental*			
		Short Term	Ext. Term	Purchase	Monthly Maint.
SDLC Feature:					
#6301	With Business Machine Clock (for 1200 bps)	\$ 20	\$ 17	\$ 703	\$ 3.00
#6302	Without Business Machine Clock (for up to 2400 bps)	12	10	472	2.50
#6303	Without Business Machine Clock (for up to 9600 bps)	39	33	1,260	11.50
#6350	Security Keylock	35**	35**	35	—
Control Storage:					
#1590	Control Storage Expansion	34	29	1,105	5.50
Control Storage Increments:					
#1602	Type I, 8K bytes	34	29	668	5.00
#1603	Type IA, 16K bytes	63	54	1,225	11.00
#1612	Type II, 8K bytes	34	29	668	5.00
#1613	Type IIA, 16K bytes	63	54	1,225	11.00
	Additional Disk Heads for 3791 1B, 1C, 2A, or 2B	32	27	1,080	17.00
Attachment Features—					
#7911	3270 Attachment, First	42	36	1,365	5.00
#7912	3270 Attachment, Additional	35	30	1,155	3.00
#7900	3792 Attachment	39	33	1,365	4.00
#7901	3793 Attachment, First	39	33	1,365	3.00
#7902	3793 Attachment, Second	39	33	1,365	3.00
#7903	3793 Attachment, Additional	39	33	1,365	3.00
#7840	Magnetic Tape Attachment	213	181	6,510	8.00
Line Printers for 3791:					
#4710	155 lpm, 80 print positions	204	174	6,480	61.00
#4711	155 lpm, 132 print positions	283	198	7,165	65.00
#4715	410 lpm, 132 print positions	411	350	12,550	124.00
3792 Auxiliary Control Unit					
#4712	Line Printer, 155 lpm, 80 print positions	234	199	7,245	34.50
#4713	Line Printer, 155 lpm, 132 print positions	322	274	9,975	56.00
#7901	3793 Attachment	360	306	11,020	59.50
#1622	Control Storage Increment, 8K bytes	39	33	1,365	3.00
Communications Features—					
#1021	Adapter Base	34	29	668	5.00
#1081	Asynchronous Communications Control	56	48	1,785	1.00
#3701	EIA Interface	20	17	682	3.00
#5400	Leased Line Adapter	12	10	420	4.00
#6350	Security Keylock	20	17	682	5.00
#4450	Forms Stand	35**	35**	35	—
		54**	54**	54	—
#5560	3793 Keyboard Printer	136	116	3,620	36.00
	Power Line Keylock	75**	75**	75	—
	3411 Model 1 Magnetic Tape Unit and Control (requires #7003 and #3211 or #3221)	509	428	13,080	114.00
	3410 Model 1 Magnetic Tape Unit (requires #3211 or #3221)	230	193	5,935	74.00
#7003	3790 Attachment	91	76	2,430	3.50
#3211	Single density; 1600 bpi PE	65	55	1,925	10.00
#3221	Dual Density; 800/1600 bpi	98	82	2,775	39.50

*Includes maintenance

**Single use charge ■

Update

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► the host computer. When equipped with the Data Link Adapters, up to 80 additional remote devices can be controlled. As an alternative, the data can be transmitted to the host computer as it is edited (inquiry session), without being stored on diskettes. Magnetic tape can also provide input to the system.

All operations are executed under program control. The 3790 receives its operating software from the host computer via the communications facility. Following receipt of the software, the 3790 operates independently of the host system.

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Characters/line:	40	80

A character set of 64 ASCII characters, including upper case alphabets, numerics, and special symbols is displayed in green against a dark background. Each character is formed by a 7-by-9 dot matrix.

Many keyboards are available for the 3277 Display Station, but only the 66- or 78-key EBCDIC typewriter-style keyboard can be used when the 3277 is employed as an operator station attached to the 3791 Controller. The 78-key version of the typewriter-style keyboard includes 12 Program Function keys, which are defined by the application program.

Not all features for the 3277 display stations are supported when attached to a 3791 controller. The following features are supported: Audible Alarm, Operator Identity Card Reader, Keyboard Numeric Lock, and Security Keylock.

See Report C25-491-101 for complete details on the 3270 components, including 3277 display stations and 3284, 3286, and 3288 printers.

PRINTED OUTPUT: Printed copy is produced at a rated speed of up to 155 lpm with a 48-character print belt, 120 lpm with a 64 character set, and 80 lpm with a 96 character set by the #4710 and #4711 line printers for the 3791 or #4712 and #4713 for the 3792. These printers have 80 or 132 print positions and accommodate 6-part, continuous pin-fed forms up to 8 inches (80 columns) or 14 $\frac{1}{8}$ inches (132 columns) in width. Horizontal and vertical spacings are 10 characters per inch and 6 lines per inch, respectively. The #4715 printer available with the 3791 operates at 410 lpm with a 48 character set, 300 lpm with a 64 character set, and 230 lpm with a 96 character set. This printer provides 132 positions. Other characteristics are similar to the printers above except that program selection between 6 and 8 lines per inch vertical spacing is included for Configuration Support #9165 and #9169.

MAGNETIC TAPE INPUT/OUTPUT: The IBM 3411 Magnetic Tape Unit and Control model 1 can provide input and output to a 3791 Control Unit. Additional magnetic tape capacity is provided by attaching 3410 Magnetic Tape units via the 3411. A total of four magnetic tape units per system are supported.

DATA LINK ADAPTER: The Data Link Adapter permits attaching the 3276 Control Display Stations plus 3278 Display Stations and 3287 or 3289 printers to a 3791 via non-switched communications lines. Only SDLC communications protocol and the 1920 character screen format are supported. A maximum of five Data Link Adapter features can be attached to a 3791 controller. The maximum number of 3276 Control Display stations permitted on each Data Link Adapter is also five. A maximum of 80 units in any combination are permitted on the five Data Link adapters.

PRICING

All 3790 components, except the 2741 terminal, are available under the terms of IBM's Rental or Lease Agreement (LRA) or for purchase. LRA includes prime-shift maintenance; a separate contract is available for purchased units.

	Monthly Rental*			
	Short Term	Ext. Term	Purchase	Monthly Maint.
3791 Controllers—				
Model 1C	\$606	\$516	\$19,630	\$224.00
Model 2A	804	684	26,030	213.00
Model 2B	1,001	852	32,430	273.00
Features				
#1515 Local Channel Attachment	98	83	3,150	4.00
#3701 EIA Interface	12	10	420	4.00
1200 bps Integrated Modem:				
#5500 Non-switched	20	17	661	5.00
#5501 Switched	27	23	903	7.00

*Includes maintenance.

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		Monthly Rental*			
		Short Term	Ext. Term	Purchase	Monthly Maint.
SDLC Feature:					
#6301	With Business Machine Clock (for 1200 bps)	20	17	703	3.00
#6302	Without Business Machine Clock (for up to 2400 bps)	12	10	472	2.50
#6303	Without Business Machine Clock (for up to 9600 bps)	38	32	1,260	11.50
#6350	Security Keylock	35**	35**	35	—
Control Storage:					
#1590	Control Storage Expansion	33	28	1,105	5.50
Control Storage Increments:					
#1602	Type I, 8K bytes	34	29	668	5.00
#1603	Type IA, 16K bytes	63	54	1,225	11.00
#1612	Type II, 8K bytes	34	29	668	5.00
#1613	Type IIA, 16K bytes	63	54	1,225	11.00
	Additional Disk Heads for 3791 1B, 1C, 2A, or 2B	32	27	1,080	17.00
Attachment Features—					
#7911	3270 Attachment, First	41	35	1,365	5.00
#7912	3270 Attachment, Additional	34	29	1,155	3.00
#7900	3792 Attachment	38	32	1,365	4.00
#7901	3793 Attachment, First	38	32	1,365	3.00
#7902	3793 Attachment, Second	38	32	1,365	3.00
#7903	3793 Attachment, Additional	38	32	1,365	3.00
#7840	Magnetic Tape Attachment	203	173	6,510	8.00
Line Printers for 3791:					
#4710	155 lpm, 80 print positions	196	167	6,480	61.00
#4711	155 lpm, 132 print positions	222	189	7,165	65.00
#4715	410 lpm, 132 print positions	392	334	12,550	124.00
3792 Auxiliary Control Unit					
#4712	Line Printer, 155 lpm, 80 print positions	223	190	7,245	34.50
#4713	Line Printer, 155 lpm, 132 print positions	307	261	9,975	56.00
#7901	3793 Attachment	343	292	11,020	59.50
#1622	Control Storage Increment, 8K bytes	38	32	1,365	3.00
Communications Features—					
#1021	Adapter Base	34	29	668	5.00
#1081	Asynchronous Communications Control	54	46	1,785	1.00
#3701	EIA Interface	20	17	682	3.00
#5400	Leased Line Adapter	12	10	420	4.00
#6350	Security Keylock	20	17	682	5.00
#4450	Forms Stand	35**	35**	35	—
		54**	54**	54	—
#5560	3793 Keyboard Printer	130	111	3,620	33.00
	Power Line Keylock	75**	75**	75	—
	3411 Model 1 Magnetic Tape Unit and Control (requires #7003 and #3211 or #3221)	509	428	13,080	104.00
	3410 Model 1 Magnetic Tape Unit (requires #3211 or #3221)	230	193	5,935	67.50
#7003	3790 Attachment	91	76	2,430	3.50
#3211	Single density; 1600 bpi PE	65	55	1,925	9.50
#3221	Dual Density; 800/1600 bpi	98	82	2,775	39.50

*Includes maintenance

**Single use charge ■

IBM 3790 Communication System

MANAGEMENT SUMMARY

In the latest round of enhancements for the 3790, IBM has provided not only several highly useful system improvements, but has provided a more convenient way of distinguishing between the 3790 communications oriented system and the 3790/3760 data entry/data communications system.

New capabilities provide interactive and batch interfaces between the 3790 and IBM IMS/VS or CICS/VS that permit adding, changing, and deleting records in data bases from transactions entered at the 3790. Data stream compatibility with the IBM 3270 display system is available to simplify the use of host applications programs written for a 3270 system with the 3790. In addition, the message switching capabilities of IMS/VS and CICS/VS can be used for intercommunications among terminals. All of these facilities are available to local or remote 3790 configurations. Local attachment can now be made through the block multiplexor channel of a System/370 computer as well as the byte multiplexor channel. Several other enhancements were included in the announcement, such as support for full screen processing (filling the screen before transferring data to the controller), support for the 3284 and 3286 serial printers, SDLC transmission up to 9600 bps, and RJE capabilities.

The new capabilities are included with a new software support system for the 3790. The previous 3790 support is continued as Configuration Support #9431, a "specify" feature. The new support level, which also supports up to 31 concurrent terminal tasks compared to the previous 16, is called Configuration Support #9165. The data entry configuration is now called Configuration Support #9155. ➤

Multistation, multi-task, programmable work station supporting display/keyboard, printer, and printer/keyboard terminals.

Diskette drive and up to 30 million bytes of fixed disk storage included in all models.

Typical small 4-display configuration with 480-character displays and integrated 1200 bps modem costs about \$1,260 (or more) per month, including maintenance, on the Extended Term Plan (two-year lease).

An expanded 8 display workstation with 480 character displays, line printer, 2 printer terminals, and integrated 1200 bps modem costs about \$2,400 (or more) per month, including maintenance, ETP.

A large 16-display workstation with 1920 character displays, 4 printer terminals, 410 lpm line printer, and 3 printer/keyboard terminals costs about \$6,000 (or more) per month, including maintenance, ETP.

Much larger configurations can be put together, with costs of over \$12,000 per month and as many as 51 terminals. Programming limitations restrict the maximum number of active terminal tasks to 16 or 31.



This typical 3790 system installation demonstrates the operating flexibility that can be derived by mixing 3277 Display Stations and 3793 Keyboard-Printers to serve various business applications. The 3791 Controller with line printer is shown at left.

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▷ You may have run into Configuration Support #9431 under the title Version 5 and #9165 as Version 6 of the 3790. The differences in support provided and hardware features required for the two support packages are clearly spelled out in the Characteristics of this report.

A review of the enhancements to the 3790 system since its December 1973 announcement is in order.

At its September 1974 unveiling of a new family of SDLC-compatible communications terminals, IBM announced configuration and functional enhancements for the 3790 Communication System and designated it as one of the products in a newly formed category that IBM refers to as Advanced Function for Communications. All products in the new IBM category are related with respect to IBM's new approach to communications architecture, a key element of which is Synchronous Data Link Control (SDLC), an advanced form of communications discipline for improved transmission efficiency.

In July 1975, under the guise of enhancements to the 3790 system, IBM unveiled a new configuration called the 3790 Communication System/Data Entry Configuration. This configuration was the first IBM product that was directly competitive with the key/disk data entry systems marketed by firms such as CMC, Entrex, and Inforex. Although the Data Entry Configuration uses the same 3791 Controller as the original 3790 system, it is available with only one type of input device—the newly announced 3760 Dual Key Entry Station.

In a series of announcements in 1975, the configuration capabilities of the original 3790 system were significantly increased to allow up to 31 display units and/or line printers per system. Additionally, four keyboard-printers could be added to the basic system for a total of 35 units. An auxiliary control unit allowed for further expansion to a maximum system configuration of 51 devices.

Additional system function capabilities included: 1) expansion of the user program range from 832 programs to 5,952; 2) user program support for batch data exchange via diskette; 3) expanded error control; 4) improved access methods; and 5) expanded interrupt capabilities. Operational changes included 1) enhanced host batch communications; 2) an additional input buffer; 3) packing and identification of transaction records from disk; 4) improved print features; and 5) logical addressing of terminals. Finally, the 3790 was provided with System/370 Model 115 support via a multiplexer channel on the 3704/3705 Communication Controllers. Existing programming support was extended to the 3115 Processing Unit for DOS/VS/VTAM, and the CICS/DOS/VS/EXTM program product was being extended to the 3115.

Taken in total, this series of major enhancements makes one wonder what the original 3790 could do, if anything. Two clear thoughts emerge. The 3790 was announced in late 1973 for delivery in mid-1975, and development was ▷

CHARACTERISTICS

VENDOR: International Business Machines Corp., Data Processing Division, 1133 Westchester Avenue, White Plains, New York 10604. Telephone (914) 606-1900.

DATE OF ANNOUNCEMENT: December 1973.

DATE OF FIRST DELIVERY: Mid-1975.

NUMBER DELIVERED TO DATE: This information is not available. The general impression gathered from the trade press and industry observers is that IBM is actively proposing the system for many applications, including those formerly satisfied by a small IBM computer, and that acceptance of the system has been slow.

SERVICED BY: IBM.

CONFIGURATION

The basic components of an IBM 3790 Communication System are the programmable 3791 Controller and its basic cluster of operator stations, including 3793 Keyboard-Printers, 3277 Display Stations, and 3284/3286/3288 Printers. Two support levels are defined: Communication Support #9431 and #9165. These refer to the software and processing feature support. Special configurations for each support level follow the general configuration discussion; the capabilities of each support level are discussed under Device Control.

The 3791 Controller provides from 4.2 to 26.9 million bytes of disk storage, removable diskette storage, and control storage. It is available in the following four models that determine the disk storage capacity:

3791 Model	Disk Storage Capacity
1A	5 million bytes
1B	10 million bytes
2A	20 million bytes
2B	30 million bytes

The basic 3791 Controller will permit up to a maximum of thirty-one 3277's and/or 3284/3286/3288's in any combination; additionally, up to four 3793 Keyboard-Printers can be accommodated via separate attachments. An 80- or 132-column line printer with a speed of up to 155 lpm can also be attached to the basic system. The 3791 Controller can be expanded to accommodate up to three additional clusters of up to four 3793 Keyboard-Printers and two remote IBM 2741 Communications Terminals each via 1 to 3 3792 Auxiliary Control Units. The expanded 3790 system can accommodate a second printer. The use of device attachments is defined as follows:

Control storage is available in 8K- or 16K-byte increments up to a maximum of an additional 64K bytes. The requirements for control storage capacity are configuration- and usage-dependent. The procedure for determining the required storage for a given configuration is quite complex and is based on the quantities and types of attached devices, the number of devices operating concurrently, and communications line usage.

The 3792 Auxiliary Control Unit allows additional 3793 Keyboard-Printers to be attached to the basic 3791 Controller and provides a communications capability for the attachment of remote IBM 2741 Communications Terminals.

Each 3792 Auxiliary Control Unit can accommodate up to four 3793 Keyboard-Printers and up to two communica- ▶

IBM 3790 Communication System

▷ incomplete when announced. The long delivery time was required for IBM to get enough input from potential customers to determine just what features and functions were required for a marketable system.

The 3790, as it was announced and as it now appears, is a distributed processing system built around and controlled by a minicomputer that offers on-site processing capabilities for a variety of computer-based applications. Operation is primarily keyed to the concurrent servicing of multiple key-entry workstations. Data can be simultaneously keyed from as many as 51 (theoretically) local and remote workstations, edited, and stored on diskettes for later transmission to the host System/370 computer. As a terminal, the 3790 can serve both as a remote batch processing system and as a transaction-oriented interactive device communicating with a centralized System/370 operating under DOS/VS, OS/VS1, or OS/VS2. In addition to its principal functions of data entry and data communications, the 3790 can handle a variety of small-scale business data processing applications.

Programming of the 3790 is performed exclusively at the central System/370 site. Source programs are compiled on the host 370 computer, and the resulting object programs are transmitted to the 3790. Up to 16 or 32 disk-stored programs can serve as many operators concurrently, or multiple operators can concurrently share the same programs.

The difficulty of evaluating the 3790 is graphically shown by taking a look at system prices. A small four-display workstation costs as little as \$1,259 per month on a two-year lease with integrated 1200 bps modem. At the top end, systems can be configured that cost over \$12,000 per month on a two-year lease. That price range represents a ratio comparable to the ratio between a small disk oriented System/370 115-3 and a tape/disk 158-3. The only purpose for such an illustration is to call your attention to the span of capabilities that come under the general heading of 3790 System. If you are not careful, your evaluation bogs down in trying to figure out the configuration and support upper limits, which are highly complex, without answering the question of whether or not you can advantageously use a 3790. The best way to proceed with an evaluation is to figure out what kind of capabilities you need at the remote site and see what a 3790 configured to meet those requirements would cost. Then you can compare that with the systems available from independent vendors. True, this does not put definite limits on upwards system growth; but, the 3790 has been so volatile in capabilities that a precise top-end evaluation may not be meaningful in the time frame your expansion will occur. The 3790 is flexible enough to be configured for almost any local or remote application that does not require the services of a full scale computer or extensive computation. However, this does not mean that any particular configuration, large or small, is cost effective. That's what your planning is all about. ▷

▶ tions lines for the one or two remote 2741 terminals as a subcluster to the 3791 Controller. However, if any 3792 Auxiliary Control Unit includes a line printer, its combined total of 3793's and remote 2741's cannot exceed four. Each attached 3793 Keyboard-Printer requires a separate 3793 Attachment. Each attached communications line requires a separate Asynchronous Communication Control (a maximum of two per 3792) and the EIA Interface or IBM Leased Line Adapter. The Adapter Base (one per 3792) is prerequisite to the Asynchronous Communication Control.

The 3791 Controller can accommodate up to three 3792 Auxiliary Control Units via the 3792 Attachment, and each 3792 can be located up to 2000 cable-feet from the 3791 Controller.

One 3792 Auxiliary Control Unit can be equipped with an 80- or 132-column line printer.

The Security Keylock feature, which permits power to be applied only when the key is in place, is available for the 3791 Controller and for each attached 3792 Auxiliary Control Unit.

CONFIGURATION SUPPORT #9431: The basic controller configuration, with no added control storage can, in general accommodate one active task for one device type (3277 or 3793) and concurrent communications with a host system. To expand the capabilities of the system, additional control storage must be added. The amount and type of control storage required depends on: (1) the number of inquiry terminals active simultaneously (inquiry sessions), (2) the number of terminals active simultaneously with the host communications link, (3) the number of terminals active simultaneously when the communications link is inactive, and (4) the particular mix and number of devices and features. For Type I storage, the controlling factor will normally be the number of terminals active simultaneously or the number of programs running concurrently. Each program requires from three to nine 256-byte buffers for a storage requirement of up to 2304 bytes. This figure alone is not particularly meaningful for computation of original control storage requirements, since it must be blended with many other factors, but it points up some of the costs of system expansion. For Type II storage, an additional increment will usually be required if any two of the following options are included: a 3792, a 3277/3284/3286/3288, a directly attached 3793, or line printer. Configuration with small terminal complements may get by with no additional Type II storage. When Configuration Support #9431 is implemented the usable disk storage space for user programs and data is reduced to 4.2, 8.3, 17.6, or 26.9 million bytes depending on 3791 model. If the #1613 Type IIA Storage Increment is included, only 3 3793's can be directly attached. Support level #9431 supports transmission speeds up to 2400 bps.

CONFIGURATION SUPPORT #9165: There is no difficulty in computing control storage requirements for this support level: all available increments are required. Disk storage capacity for user programs and data is reduced to 3.7, 7.8, 17.1, or 26.4 million bytes depending on 3791 model. Only three 3793's can be directly attached. This support level requires feature #322 1, additional disk heads, which provide faster access to certain portions of the data stored on disk. Only support level #9165 supports transmission speeds over 2400 bps.

TRANSMISSION SPECIFICATIONS

Transmission between the 3790 Communication System and its host System/370 Computer is supported by Synchronous Data Link Control (SDLC). Transmission is half-duplex at 1200, up to 2400, or up to 9600 bits per ▶

IBM 3790 Communication System

▷ Datapro has not been able to interview enough operational users to obtain a meaningful survey of experience. It is likely that, with the diversity of possible configurations, support levels, and use modes, it will be awhile before a comprehensive survey can be put together. □

► second, as determined by one of three SDLC Communications Adapters that can be specified for the 3791 Controller. Transmission at 1200 bps is clocked via the SDLC Adapter; an EIA Standard RS-232 interface for use with an external modem or an integral IBM modem can be specified. Transmission at up to 2400 or 9600 bps is unclocked; an EIA Standard RS-232 interface is provided for an external modem, which must provide its own clocking.

The 3791 is transmission-compatible with the IBM 3704 and 3705 Communications Controllers operating under the Network Control Program (NCP) and can be used in a switched or non-switched point-to-point or a non-switched multipoint communications arrangement.

DEVICE CONTROL

Built around a minicomputer as its nucleus, the 3790 Communication System is designed to serve in a stand-alone capacity as a shared-processor data entry system, gathering and editing data from as many as 52 local and remote operator stations and storing the data on diskettes for later batch transmission (batch session) to the host computer. As an alternative, the data can be transmitted to the host computer as it is edited (inquiry session), without being stored on diskettes.

All operations are executed under program control. The 3790 receives its operating software from the host computer via the communications facility. Following receipt of the software, the 3790 operates independently of the host system.

All 3790 programs are compiled and can be tested on the host System/370 computer prior to use on the remote 3790. The application programs are prepared by the user via a System/370 assembler and statements defined in an IBM-supplied macro library. Program debugging is performed with the aid of a utility package, Program Validation Service (PVS), on the host computer. PVS also formats 3790 programs for storage at the host computer and later transmission to the 3790. Subsystem Support Services (SSS), another utility, controls 3790 program libraries at the host site and controls the transmission of 3790 programs from the host computer to the 3790.

Specific features of each of the two support levels are described below.

CONFIGURATION SUPPORT #9431: Data entry is performed under the control of user applications programs received from the host computer. Up to 16 terminals can be active at any one time to handle as many different tasks. Each operator can use a different program, or several operators can use the same program concurrently. In addition, one batch session and two system printer tasks can be active. Programs can be accessed from the host computer as they are needed.

The programs allow byte-by-byte and field-by-field data editing and processing that is format and function oriented. The 3790 also supports the entry of data for direct file updating at the host computer. Error correction is supported at multiple levels, including field, line, and document. Corrections can be made immediately or at the operator's option.

Application programs written for the 3790 are register oriented. Programming statements can be grouped into program definition, data definition, data movement, device control, processing, execution control, data set services, and host communications. Data definition is oriented to page, line, and item (field) corresponding to a display or printer layout. Processing statements provided include incrementing/decrementing a register, addition, subtraction, multiplication, division, comparing, setting indicators, handling small imbedded tables, branching, loop control, and recovery procedures.

User data sets can be organized as relative or indexed. Up to 16, 32, or 48 user data sets can be defined depending on system generation. All data sets can be accessed by a single program. Data sets are always open. A record lock is instituted for any read/write operation; it can be released only by the completion or direct instruction by the accessing program.

A relative data set is limited to a maximum of 491,520 bytes. The number of records depends on record size. For example, if the record size is the maximum of 256 bytes, the maximum number of records is 1920. A record in a relative data set can be retrieved with one disk access. The data set is assigned to contiguous disk sectors.

For the indexed data set, multi-sector records of up to 1920 bytes can be accommodated. The index size, assigned during system generation, can accommodate from 256 to 65,536 entries (record pointers). A total of 64 index entries are stored in each index sector (256 bytes). Control information occupies 16 characters of each data record sector; the maximum amount of data per sector is 240 characters. The data records can be retrieved based on one or two key fields of up to 24 bytes each. In general, two disk accesses are required to retrieve the first block (sector) of an indexed data set record; one additional disk access is required for each additional data sector in the record.

In addition to user data sets, a total of six system-oriented data sets are maintained. The Program data set is an indexed data set for storing 3790 programs. IBM estimates program size as typically 5 to 50 sectors (1200 to 12,000 bytes) for programs containing up to 100 keyboard entry fields with some data manipulation. The Transaction data set is composed of up to 8192 records output from the 3790 programs; the data set can be organized into up to 32 groups, with a group usually associated with one application. The Transmission data set is a compressed form of the Transaction data set containing only the fields selected for transmission; it can be up to 8192 records long. The Print data set can also be divided into up to 32 groups for associating records with applications. The Panel data set permits defining up to 999 display formats for controlling data entry, displaying menus, etc. The Message data set contains systems messages transferred to and from the 3790; each message can be up to 240 bytes long.

The 3790 Configuration Support #9431 can be used for local or remote attachment to an IBM System/370 Model 115 through 168MP computer system. Model 115 configurations use the EXTM access method supplied by CICS/DOS/VS. The other models are supported under DOS/VS, OS/VS1, and OS/VS2 using VTAM and NCP/VS (in the 370X front end controller). Support for IMS/VS and CICS/VS is provided, since these programs run as applications.

CONFIGURATION SUPPORT #9165: This support level provides major expansions of the 3790 capabilities. These expansions include:

- 3270 data stream compatibility. ►

IBM 3790 Communication System

- ▶ ● Full screen processing.
- Support for RJE.
- Expanded host computer system support including IMS/VS, CICS/VS, VTAM, TCAM through VTAM, and TCAM NCP/VS direct.
- Up to 31 concurrent terminal tasks.
- Support for transmission speeds up to 9600 bps.
- Support for ASCII character sets.
- Local attachment via block multiplexor channel.
- Support for 370/115-2 under CICS/DOS/VS/VTAM.

The 3270 data stream compatibility capability permits the 3277 displays attached to a 3790 system to be used as a 3270 display system in support of a host DB/DC application program written to use 3270 systems. The local copy function is supported. If not used in this mode, 3277 displays attached to the 3790 system can be used by 3790 programs.

Full screen processing allows all unprotected data fields to be entered prior to transfer to the 3791 controller, instead of transferring data field by field. This feature also supports the light pen option for the 3277.

RJE support is provided through the RES/JES1 and JES2 host system software. Functions provided include concurrent multiple printer data streams, console operation, and reader input; data compaction; and choice between direct and 3790 disk spooled printer output by a formatted header record. The data compaction allows a specified pair of alphanumeric characters to be transmitted as one byte. This support is available for both local and remotely attached 3790 systems.

IMS/VS support expansions include the capability to enter transactions for adding, changing, or deleting records in an IMS/VS data base with full retention of data base integrity and system recovery functions. In addition, the message switching capability for transferring data between any two terminals is supported.

The CICS/VS user can use the 3790 to add, change, or delete records in a data base, through DL/1, or data set, through VSAM, ISAM, or BDAM, while retaining recovery capability. Using the 3270 data stream compatibility mode, the CICS/VS message switching function can be employed.

The above IMS/VS and CICS/VS functions are provided under VTAM for local and remote 3790 systems and for CICS/VS under TCAM NCP/VS Direct for remote systems.

For either local or remote 3790 systems, an application program written using VTAM Application Program Interface can access both the user programs and controller functions of a 3790 system.

A device independent interface is provided between a host application program and a 3690 application program via TCAM through VTAM. However, some changes to the TCAM application program may be required due to protocol differences between the 3791 controller and a 3271 controller.

TCAM NCP/VS Direct provides the same capabilities as TCAM through VTAM for a system attached over a private line. This support provides some increased efficiencies and functions for operator control commands, control block pooling and management, and execution of TOTE.

COMPONENTS

3793 KEYBOARD-PRINTER: The 3793 is a modified Selectric II typewriter terminal oriented toward the functions of the 3790 system. It contains a serial impact printer that prints full characters at speeds up to 15.5 characters per second; print symbols total 88. Vertical forms movement and print positioning can be performed under program control.

The printer accommodates friction-fed or pin-fed (optional) continuous forms up to 15.5 inches wide; the printing width is 13 inches. Horizontal spacing is 10 to 12 characters per inch; vertical spacing is 6 lines per inch.

The typewriter-style EBCDIC keyboard includes operator guidance lights and switches.

3277 DISPLAY STATION: The 3277 is a CRT display unit with a 14-inch (diagonal measurement) CRT screen. The display screen arrangement is dependent on the model, as shown below.

3277 Display:	<u>Model 1</u>	<u>Model 2</u>
Characters/display:	480	1920
Lines/display:	12	24
Characters/line:	40	80

A character set of 64 ASCII characters, including upper case alphabets, numerics, and special symbols is displayed in green against a dark background. Each character is formed by a 7-by-9 dot matrix.

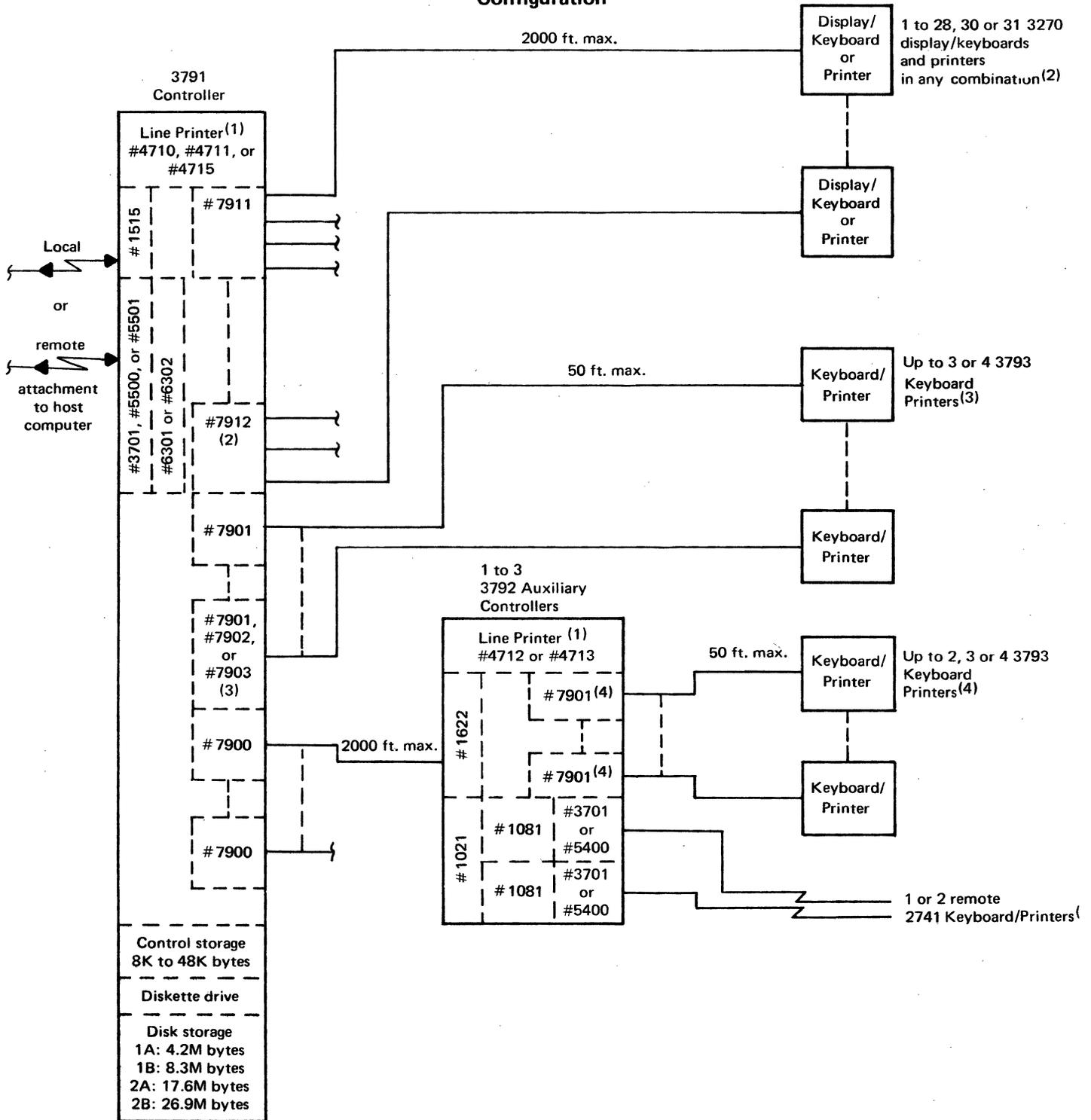
Three keyboards are available for the 3277 Display Station, but only the 66- or 78-key EBCDIC typewriter-style keyboard can be used when the 3277 is employed as an operator station attached to the 3791 Controller. The 78-key version of the typewriter-style keyboard includes 12 Program Function keys, which are defined by the application program.

PRINTED OUTPUT: Printed copy is produced at a rated speed of up to 155 lpm with a 48-character print belt, 120 lpm with a 64 character set, and 80 lpm with a 96 character set by the #4710 and #4711 line printers for the 3791 or #4712 and #4713 for the 3792. These printers have 80 or 132 print positions and accommodate 6-part, continuous pin-fed forms up to 8 inches (80 columns) or 14-7/8 inches (132 columns) in width. Horizontal and vertical spacings are 10 characters per inch and 6 lines per inch, respectively. The #4715 printer available with the 3791 operates at 410 lpm with a 48 character set, 300 lpm with a 64 character set, and 230 lpm with a 96 character set. This printer provides 132 positions. Other characteristics are similar to the printers above except that program selection between 6 and 8 lines per inch vertical spacing is included for Configuration Support #9165.

PRICING: All components of the 3790 Communication System except the 3277 Display Station are available under IBM's short-term (month-to-month) rental plan or its 24-month Extended Term Plan. The 3277 Display Station is not currently available under the Extended Term Plan. Components can also be purchased. The monthly rental figures below include monthly maintenance and unlimited usage. A separate maintenance agreement is available for purchased units.

IBM 3790 Communication System

Configuration



- (1) Two line printers, 1 per 3971 plus 1 on any 3792 max.
- (2) 4 3277/3288's per #7911 or #7912; any 3792 eliminates 1 #7912; 30 devices max.; if #4710, #4711, or #4715 printer installed.
- (3) #7902/#7903 required on 3791 1A and 1B; max. 3 if #1613 Control Storage Increment included.
- (4) If #4712 or #4713 printer is installed, the combined total number of local and remote devices per 3792 is 4.

IBM 3790 Communication System

	Monthly Rental*			
	Short Term	Ext. Term	Purchase	Monthly Maint.
3791 Controllers—				
Model 1A	\$ 897	\$ 763	\$31,000	\$167
Model 1B	983	837	34,000	178
Model 2A	1,381	1,175	48,000	194
Model 2B	1,721	1,465	59,000	248
Features				
#1515 Local Channel Attachment	88	75	3,000	4.00
#3701 EIA Interface	12	10	400	4.00
#1200 bps Integrated Modem:				
#5500 Non-switched	19	16	630	5.00
#5501 Switched	25	21	860	7.00
SDLC Feature:				
#6301 With Business Machine Clock (for 1200 bps)	19	16	670	3.00
#6302 Without Business Machine Clock (for up to 2400 bps)	12	10	450	2.50
#6303 Without Business Machine Clock (for up to 9600 bps)	35	30	1,200	10.50
#6350 Security Keylock	35**	35**	35	—
Control Storage:				
#1590 Control Storage Expansion	49	42	1,700	5.50
Control Storage Increments:				
#1602 Type I, 8K bytes (1 max.)	47	40	980	5.00
#1603 Type IA, 16K bytes (2 max.)	88	75	1,800	10.00
#1612 Type II, 8K bytes (1 max.)	47	40	980	5.00
#1613 Type IIA, 16K bytes (1 max.)	88	75	1,800	10.00
#3221 Additional Disk Heads for 3791 2A or 2B	53	45	1,800	28.00
Attachment Features—				
#7911 3270 Attachment, First	75	64	2,600	5.00
#7912 3270 Attachment, Additional	62	53	2,200	3.00
#7900 3792 Attachment	36	31	1,300	4.00
#7901 3793 Attachment, First	36	31	1,300	3.00
#7902 3793 Attachment, Second	62	53	2,200	5.50
#7903 3793 Attachment, Additional	36	31	1,300	3.00
Line Printers for 3791:				
#4710 155 lpm, 80 print positions	274	233	9,500	56.00
#4711 155 lpm, 132 print positions	306	260	10,500	59.50
#4715 410 lpm, 132 print positions	541	460	18,400	114.00
3792 Auxiliary Control Unit				
#4712 Line printer, 155 lpm, 80 print positions	274	233	9,500	56.00
#4713 Line Printer, 155 lpm, 132 print positions	306	260	10,500	59.50
#7901 3793 Attachment	36	31	1,300	3.00
#1622 Control Storage Increment, 8K bytes	47	40	980	5.00
Communications Features—				
#1021 Adapter Base	49	42	1,700	1.00
#1081 Asynchronous Communications Control	19	16	650	3.00
#3701 EIA Interface	12	10	400	4.00
#5400 Leased Line Adapter	19	16	650	5.00
#6350 Security Keylock	35**	35**	35	—
Terminals				
3793 Keyboard Printer	119	101	3,450	28.00
#5560 Power Line Keylock	75**	75**	75	—
3270 Components—				
3277 Display:				
Model 1 480 character display	84	—	2,940	8.00
Model 2 1920 character display	23	—	3,810	17.50
#4630 66 Key EBCDIC Typewriter Keyboard	16	—	520	4.50
#4631 66 Key EBCDIC Data Entry Keyboard	16	—	520	5.50
#4633 78 Key EBCDIC Typewriter Keyboard	33	—	1,035	7.50
#4636 66 Key EBCDIC Data Entry (Keypunch) Keyboard	18	—	622	5.50
#4690 Keyboard Numeric Lock	—	—	—	—
#6340 Security Keylock	35**	—	35	—
#6350 Selector Light Pen	28	—	867	1.50
#1090 Audible Alarm	5	—	173	0.50
#4600 Operator Identity Card Reader	16	—	520	3.00
3284 Printer, 40 cps:				
Model 1, 480 character buffer	168	—	5,065	33.00
Model 2, 1920 character buffer	179	—	5,685	33.00



IBM 3790 Communication System

	Monthly Rental*			
	<u>Short Term</u>	<u>Ext. Term</u>	<u>Purchase</u>	<u>Monthly Maint.</u>
3286 Printer, 66 cps:				
Model 1, 480 character buffer	201	—	6,775	33.00
Model 2, 1920 character buffer	213	—	7,505	33.00
3288 Printer Model 2, 120 lpm	427	363	12,500	87.00
#4450 Forms Stand	54**	—	54	—
2741 Communication Terminal	105	—	3,400	29.50
#3255 Dial Up	3	—	116	—
#4708 Receive Interrupt	2.50	—	99	—
#4639 2-Wire Leased Line Adapter	10	—	347	1.00
#4647 4-Wire Leased Line Adapter	10	—	347	1.00
#8341 Typamatic Keys (repeat)	5	—	195	—
#5501 Print Inhibit	10	—	303	—

* Includes maintenance.

**Single use charge. ■

IBM 3790 Communication System

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- Support for 370/115-2 under CICS/DOS/VS/VTAM.

The 3270 data stream compatibility capability permits the 3277 displays attached to a 3790 system to be used as a 3270 display system in support of a host DB/DC application program written to use 3270 systems. The local copy function is supported. If not used in this mode, 3277 displays attached to the 3790 system can be used by 3790 programs.

Full screen processing allows all unprotected data fields to be entered prior to transfer to the 3791 controller, instead of transferring data field by field. This feature also supports the light pen option for the 3277.

RJE support is provided through the RES/JES1 and JES2 host system software. Functions provided include concurrent multiple printer data streams, console operation, and reader input; data compaction; and choice between direct and 3790 disk spooled printer output by a formatted header record. The data compaction allows a specified pair of alphanumeric characters to be transmitted as one byte. This support is available for both local and remotely attached 3790 systems.

IMS/VS support expansions include the capability to enter transactions for adding, changing, or deleting records in an IMS/VS data base with full retention of data base integrity and system recovery functions. In addition, the message switching capability for transferring data between any two terminals is supported.

The CICS/VS user can use the 3790 to add, change, or delete records in a data base, through DL/1, or data set, through VSAM, ISAM, or BDAM, while retaining recovery capability. Using the 3270 data stream compatibility mode, the CICS/VS message switching function can be employed.

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A device independent interface is provided between a host application program and a 3690 application program via TCAM through VTAM. However, some changes to the TCAM application program may be required due to protocol differences between the 3791 controller and a 3271 controller.

TCAM NCP/VS Direct provides the same capabilities as TCAM through VTAM for a system attached over a private line. This support provides some increased efficiencies and functions for operator control commands, control block pooling and management, and execution of TOTE.

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Characters/line:	40	80

A character set of 64 ASCII characters, including upper case alphabets, numerics, and special symbols is displayed in green against a dark background. Each character is formed by a 7-by-9 dot matrix.

Many keyboards are available for the 3277 Display Station, but only the 66- or 78-key EBCDIC typewriter-style keyboard can be used when the 3277 is employed as an operator station attached to the 3791 Controller. The 78-key version of the typewriter-style keyboard includes 12 Program Function keys, which are defined by the application program.

Not all features for the 3277 display stations are supported when attached to a 3791 controller. The following features are supported: Audible Alarm, Operator Identity Card Reader, Keyboard Numeric Lock, and Security Keylock.

See Report C25-491-101 for complete details on the 3270 components, including 3277 display stations and 3284, 3286, and 3288 printers.

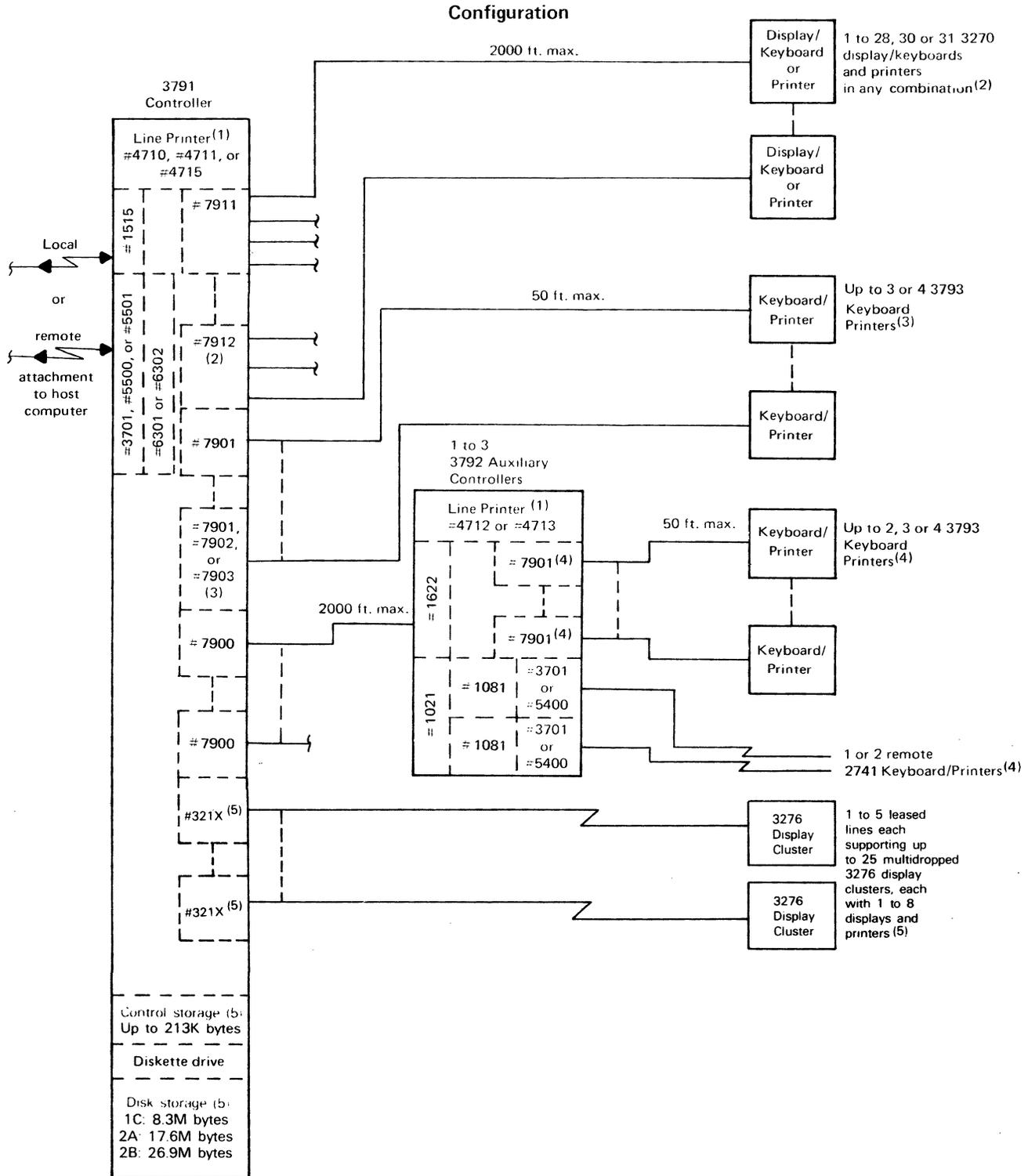
PRINTED OUTPUT: Printed copy is produced at a rated speed of up to 155 lpm with a 48-character print belt, 120 lpm with a 64 character set, and 80 lpm with a 96 character set by the #4710 and #4711 line printers for the 3791 or #4712 and #4713 for the 3792. These printers have 80 or 132 print positions and accommodate 6-part, continuous pin-fed forms up to 8 inches (80 columns) or 14 $\frac{1}{4}$ inches (132 columns) in width. Horizontal and vertical spacings are 10 characters per inch and 6 lines per inch, respectively. The #4715 printer available with the 3791 operates at 410 lpm with a 48 character set, 300 lpm with a 64 character set, and 230 lpm with a 96 character set. This printer provides 132 positions. Other characteristics are similar to the printers above except that program selection between 6 and 8 lines per inch vertical spacing is included for Configuration Support #9165.

PRICING

All 3790 components, except the 2741 terminal, are available under the terms of IBM's Rental or Lease Agreement (LRA) or for purchase. LRA includes prime-shift maintenance; a separate contract is available for purchased units.

LRA was announced for general application in April 1977. Basically, this arrangement provides for month-to-month

IBM 3790 Communication System



- (1) Two line printers, 1 per 3971 plus 1 on any 3792 max.
- (2) 4 3277/3288's per #7911 or #7912; any 3792 eliminates 1 #7912; 30 devices max.; if #4710, #4711, or #4715 printer installed.
- (3) #7902/#7903 required on 3791 1A and 1B; max. 3 if #1613 Control Storage Increment included.
- (4) If #4712 or #4713 printer is installed, the combined total number of local and remote devices per 3792 is 4.
- (5) See new product announcement page C21-491-209, for details on 3791 Model 1C, new control storage features, and remote 3276 display cluster support, as well as other new features.

IBM 3790 Communication System

rental or for a two-year lease with penalties for early termination (including model downgrades and feature termination). The lease can be extended indefinitely, one year at a time. The monthly charges for the lease arrangement are generally 15 percent lower than the month-to-month arrangement. The prime-shift maintenance period is for any consecutive nine hours between 7 AM and 6 PM, Monday through Friday. (The maintenance charges given in the accompanying price list are for prime shift maintenance for purchased equipment and also serve as the basis for calculating extended charges for rented or leased equipment.) Extended-period maintenance is available up to 24 hours per day, 7 days per week.

For the 3791 controllers, the termination charge for the lease arrangement is two percent of the remaining value of the lease.

All 3791/3792/3793 components are in maintenance category D. The premium for extended maintenance is expressed in the table below as a percentage of the basic maintenance charges, which are listed in the accompanying price list.

	Consecutive Hours				
	9*	12	16	20	24
Monday-Friday	10%	12%	14%	16%	18%
Saturday	4	5	7	8	9
Sunday	5	7	9	11	12

*For periods outside the basic 7 AM to 6 PM prime shift.

All 3791/3792/3793 components are classified under rental category B (unlimited usage) and warranty category B (three months). Purchase credits can be accrued up to a maximum of 55 percent.

		Monthly Rental*			
		Short Term	Ext. Term	Purchase	Monthly Maint.
3791 Controllers—					
	Model 1A	\$640	\$545	\$22,100	\$167
	Model 1B	640	545	22,100	178
	Model 2A	911	775	31,400	194
	Model 2B	1,181	1,005	40,700	248
Features					
#1515	Local Channel Attachment	88	75	3,000	4.00
#3701	EIA Interface	12	10	400	4.00
	1200 bps Integrated Modem:				
#5500	Non-switched	19	16	630	5.00
#5501	Switched	25	21	860	7.00
	SDLC Feature:				
#6301	With Business Machine Clock (for 1200 bps)	19	16	670	3.00
#6302	Without Business Machine Clock (for up to 2400 bps)	12	10	450	2.50
#6303	Without Business Machine Clock (for up to 9600 bps)	35	30	1,200	10.50
#6350	Security Keylock	35**	35**	35	—
	Control Storage:				
#1590	Control Storage Expansion	31	26	1,055	5.50
	Control Storage Increments:				
#1602	Type I, 8K bytes	47	40	980	5.00
#1603	Type IA, 16K bytes	88	75	1,800	10.00
#1612	Type II, 8K bytes	47	40	980	5.00
#1613	Type IIA, 16K bytes	88	75	1,800	10.00
	Additional Disk Heads for 3791 IA	32	27	1,080	28.00
	Additional Disk Heads for 3791 1B, 1C, 2A, or 2B	32	27	1,080	28.00
	Attachment Features—				
#7911	3270 Attachment, First	38	32	1,300	5.00
#7912	3270 Attachment, Additional	32	27	1,100	3.00
#7900	3792 Attachment	36	31	1,300	4.00
#7901	3793 Attachment, First	36	31	1,300	3.00
#7902	3793 Attachment, Second	36	31	1,300	5.50
#7903	3793 Attachment, Additional	36	31	1,300	3.00
	Line Printers for 3791:				
#4710	155 lpm, 80 print positions	177	151	6,175	56.00
#4711	155 lpm, 132 print positions	199	169	6,825	59.50
#4715	410 lpm, 132 print positions	351	299	11,960	114.00
	3792 Auxiliary Control Unit	200	170	6,900	34.50
#4712	Line Printer, 155 lpm, 80 print positions	274	233	9,500	56.00
#4713	Line Printer, 155 lpm, 132 print positions	306	260	10,500	59.50
#7901	3793 Attachment	36	31	1,300	3.00
#1622	Control Storage Increment, 8K bytes	47	40	980	5.00
	Communications Features—				
#1021	Adapter Base	49	42	1,700	1.00
#1081	Asynchronous Communications Control	19	16	650	3.00
#3701	EIA Interface	12	10	400	4.00
#5400	Leased Line Adapter	19	16	650	5.00
#6350	Security Keylock	35**	35**	35	—
#4450	Forms Stand	54**	54**	54	—

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		Monthly Rental*			
		Short Term	Ext. Term	Purchase	Monthly Maint.
Terminals					
	3793 Keyboard Printer	119	101	3,450	28.00
#5560	Power Line Keylock	75**	75**	75	—
	2741 Communication Terminal	105	—	3,400	29.50
#3255	Dial Up	3	—	116	—
#4708	Receive Interrupt	2.50	—	99	—
#4639	2-Wire Leased Line Adapter	10	—	347	1.00
#4647	4-Wire Leased Line Adapter	10	—	347	1.00
#8341	Typamatic Keys (repeat)	5	—	195	—
#5501	Print Inhibit	10	—	303	—
#4634/5	Line Adapter, Limited Distance Type 1, 2 Wire/4 Wire	3	—	116	—
#464X	Shared Line Adapter, 2-Wire/4-Wire, per sub channel	21	—	694	1.50
#469X					

* Includes maintenance
 ** Single use charge ■

IBM 3790 Communication System

New Product Announcement

On May 18, 1977, IBM announced major enhancements for the 3790 Communications System, including:

- A new 10-megabyte 3791 Controller, Model 1C, that can be upgraded to the Model 2 specifications.
- Availability of remote display clusters connected to the 3791 controller through a new Configuration Support (#9169), the new 3276 Controller/Display Station, and Data Link Adapters on the 3791.
- Support for distributed data bases and distributed processing through a new application package for host System/370's called Display Management System/3790.

The 3791 Model 1C is functionally identical to the Model 1B, except that it can be field-upgraded to a Model 2A or 2B. The 3791 Model 1A (5 megabytes of disk storage) and Model 1B (10 megabytes of disk storage) have been discontinued for new acquisition, but existing installations will continue to be supported. Prices for existing Model 1A's and 1B's have been dropped 29 to 35 percent, and the new Model 1C is priced at that lower level.

The new 3276 Controller/Display units with attached 3278 Displays and 3287 Printers (see Report 70D-491-11) can function as remote clusters to a 3791 via Data Link Adapters and the new #9169 Configuration Support, which can be implemented on any model of the 3791, including existing Model 1A's and 1B's. Substantial increases in Control Memory are required for #9169.

Remote 3276 clusters of up to eight displays and printers are supported on leased lines only. A maximum of five Data Link Adapters are supported, each connected to one line; each line will support up to 25 3276 units. The maximum number of devices supported via Data Link Adapters is 80. Only 3276 Model 12 units are allowed; these models utilize SDLC protocol and display 1920 characters. Two variations of Data Link Adapters are available. The #3210 provides clocking and supports on Integrated Modem (#4781) or external modem; only 1200-bps operation is permitted. The #3211 supports an external modem providing its own clocking at up to 4800 bps. The EIA/CCITT Interface (#3703) is required for any external modem. Except for the impact of control memory on 3793 connections and the additional control memory required for #9169, attachment of remote 3276 clusters does not affect other 3790 configuration considerations.

The price reductions for existing 3790 components are reflected in the revised price list on the preceding page. Prices for the new components are shown on the following page.

A separate Control Storage Expansion Type I feature (#1591) is required for Configuration Support #9169. This permits expansion of control memory by up to 213K bytes. Because the amount of control memory for other Configuration Support features has been upgraded, the complete picture is presented below.

	Configuration Support					
	#9431		#9165		#9169	
	Req'd.	Max.	Req'd.	Max.	Req'd.	Max.
Control Memory Increment, Type I—						
#1602, 8K bytes	—	1	—	—	—	1
#1603, 16K bytes	—	3	3	3	6	7
Control Memory Increment, Type II—						
#1612, 8K bytes	—	1	—	—	—	1
#1613, 16K bytes	—	1	1	1	1	5
Total bytes	0	82K	65K	65K	115K	213K



IBM 3790 Communication System

New Product Announcement

- Configuration Support #9169 includes all of the functions of #9431 and #9165 in addition to supporting remote 3276 clusters.

The basic Data Management System/3790 (DMS/3790) is a parameter-driven program generator that runs on the host System/370 computer; input to DMS/3790 is prepared on a set of forms that allow the designer to specify operator interface with a 3790, including screen layout, programmable key definitions, editing, checking, selector pen handling, and error handling and messages. Alternatively, input to DMS/3790 can be generated interactively from a local or remote 3270 subsystem under TSO/TCAM, TSO/VTAM, CICS/VS, or VM/370; special helps are provided for interactive input.

DMS/3790 allows the identification of a new data grouping called a collection, which is a group of related fields accessible via a key field. In addition, a processing step (function) can be identified, much as you would a macro. Programs generated through DMS/3790 are two-level, including a root segment and multiple dependent segments.

Through a separate module, Communications Interface Monitor (CIM), collections and functions can be located in the host computer system with automatic linkage when requested or invoked by a 3790 application program. With CIM, collections and functions can be located in the 3790, in the host computer, or both; location is transparent to the 3790 programmer and user. Locations can be altered, but 3790 programs must be reassembled.

The basic DMS/3790 program product runs on a 192K System/370 Model 115 or larger under DOS/VS, OS/VS1, OS/VS2 MVS, or OS/VS2 SVS; direct-access storage (using VSAM), a card read/punch, and a printer are required. (A magnetic tape drive is required for installation.) Under OS/VS, support for the interactive forms generation capability requires CICS/VS or TSO with VTAM or TCAM; the interactive capability is supported under CICS/VS only for DOS/VS. CIM is supported by CICS/VS or IMS/VS (via VTAM and NCP/VS) under OS/VS; CIM is supported under DOS/VS only for CICS/VS. VM/370 supports program generation, but not the CIM feature or the downline loading of programs into the 3790.

The basic DMS/3790 application product costs \$300 per month and will be available in January 1978. The CIM feature costs an additional \$200 per month and will be available in March 1978 (CICS/VS) or May 1978 (IMS/VS).□

	Monthly Charges			Monthly Maint.
	Rental	Lease	Purchase	
3791 Controller, Model 1C	\$640	\$545	\$22,100	\$178.00
#1591 Control Storage Expansion Type I	31	26	1,055	5.50
Data Link Adapter—				
#3210 With Clocking	41	35	1,400	11.00
#3211 Without Clocking	35	30	1,200	10.50
#3703 EIA/CCITT Interface Data Link	12	10	400	4.00
#4781 1200-bps Integrated Modem Data Link	25	21	840	7.00

IBM 3790 Communication System New Product Announcement

In March 1978, IBM announced the capability to attach up to four 1/2-inch magnetic tape drives to a 3790 Communications System operating under Configuration Support #9169 (which was announced in May 1977; see page C21-491-209). In addition, a multitude of additional capabilities, some major and some minor, were announced for all three communications Configuration Support levels (#9431, #9165, and #9169).

One IBM 3411 Model 1 Tape Controller/Tape Drive can be attached to a 3791 (any model) running under #9169. Up to three 3410 Magnetic Tape Drives can be added, bringing the maximum to four tape drives supported. Feature #7840 is required on the 3791, and Feature #7003 is required on the 3411 for attachment. Features on each 3411 and 3410 drive support 1600 bpi PE recording (#3211) or 800/1600 dual density recording (#3221). Pricing for the tape drives and attachment and density features is given below. These facilities will become available in June 1978. Attachment of the tape drives will require additional control storage.

In general, magnetic tape can be used as an input or an output medium. Access to data sets on tape is restricted to one 3790 program at a time, and only one data set at a time can be accessed. Records are accessed sequentially. Data can be organized in fixed or variable length records. Records can be up to 256 bytes of data each, and logical records can be blocked into physical records of up to 2048 bytes each. Standard IBM labeled tapes and unlabeled tapes are supported. Batch Data Exchange can be executed with tape in the same manner as for diskettes. Data can be dumped from disk to tape and later restored. Unit and volume tape statistics are collected and can be printed or displayed.

		Monthly Charges			
		<u>Rental</u>	<u>Lease</u>	<u>Purchase</u>	<u>Monthly Maint.</u>
#7840	Magnetic Tape Attachment (for 3791)	\$182	\$155	\$ 6,200	\$ 8.00
	3411 Model 1 Magnetic Tape Unit and Control (requires #7003 and #3211 or #3221)	454	381	15,570	95.00
	3410 Model 1 Magnetic Tape Unit (requires #3211 or #3221)	206	173	7,065	61.50
#7003	3790 Attachment	83	74	2,890	36.50
#3211	Single density; 1600 bpi PE	60	50	2,295	9.50
#3211	Dual Density; 800/1600 bpi	88	74	3,305	36.50

Configuration Support #9169 has been functionally enhanced as well. Feature #3211, which supports remote attachment of 3276 display and printer clusters, can now be operated at up to 9600 bps. (Feature #3211 supports connection of an external modem and SDLC protocol.) The magnetic slot reader (PN 4123500) is now supported on remote 3276 clusters. Other enhancements for #9169 include 3790 Program Execution Monitor (PEM); Interactive/Program Validation Services (IPVS); Multiple FSP Data Streams for concurrent operation of a display and printer; intertask communications; Host Request Unit of up to 1536 data bytes; Move Buffer command; support for remote 3276 to function as SYSEDIT and RJE operator console; a new algorithm, Hash Type 3, for reducing synonym chaining within an index data set; capabilities for recording and displaying or printing disk and other system component utilization; more flexible rules for use of relative data sets; and chronological scanning of condition incident log through recording time and date records in the log.

The 3790 PEM permits local 3790 monitoring of the execution of tasks and subtasks with stops permitted at a specified location, after a specified number of assembled statements have been executed, and on reaching specified register values, indicator status, or buffer values. A 3277 Model 2 attached to the 3791 is used as the monitor terminal. Program resources, such as registers and buffers, can be displayed in a formatted manner. IPVS is an enhancement of the existing batch PVS. It is executed in the host computer, but is controlled interactively through a 1920-character keyboard/display locally or remotely attached to the 3790. Batch PVS or Interactive PVS can be used in conjunction with the 3790 PEM for program testing.

Intertask communications have been implemented through two facilities: Note Queues and Keyed Messages. Note Queues provides 255 queues, accessible by any 3790 program, for storing "notes" consisting of a number between 0 and 225 and 4 bytes of data. Keyed Message facility permits identifying a message of up to 236 data bytes with a 4-byte key; these messages are also available to any 3790 program.

IBM 3790 Communication System New Product Announcement

A new programming statement (Move Buffer or MOVEBUF) allows the transfer of the contents of a FSP input buffer, 3790 program buffer, or host input buffer to a FSP output buffer or a 3790 program buffer through the use of a single programming statement.

Time and date records within the condition incident log are also supported by Configuration Support #9165. IPVS, disk and system component utilization reporting are also supported under Configuration Support #9165 and #9431. All of these capabilities are scheduled to be available by June 1978, with some having an earlier delivery date.

Latest IBM Information indicates that the available disk storage space for user programs and data has decreased slightly; about 0.3 to 0.4 megabytes less is now available to the user, depending on 3791 model and Configuration Support. With a maximum 3791 configuration the amount of user space on disk is now:

	Megabytes of user disk space with 3791 Model			
	<u>1A</u>	<u>1B/C</u>	<u>2A</u>	<u>2B</u>
Configuration Support:				
#9431	3.9	8.0	17.2	26.5
#9165	3.4	7.5	16.8	26.0
#9169	2.4	6.5	15.8	25.1□

IBM 8100 Information System

MANAGEMENT SUMMARY

This report has been updated to include the addition of two program releases for the 8100: the Distributed Office Support System/8100/Distributed Office Support Facility (DIS-OSS/8100/DOSF) Release 2 and Distributed Processing Programming Executive/System Product (DPPX/SP) Release 3, which has been recently enhanced to extend its support to workstation clusters attached to the IBM Token-Ring and PC Networks. DPPX/SP Release 3 now includes support for IBM 4245 Model D12 and D20 printers.

IBM has recently announced that it will no longer manufacture the 8100, but will continue to service and support existing 8100 systems.

For those in the data processing industry who believe every product that IBM introduces is an instant and unqualified success, we offer the 8100 Information System. Introduced in 1978, the 8100 has been a product line that failed to find a niche in the market, as either a distributed data processing system or as a small business minicomputer. A number of enhancements were added to the 8100 to make it more attractive to prospective users. These included several new high-end processors, enhancements to the DPPX and DPCX operating systems, and Personal Computer, 3270-PC, and Displaywriter support. However, IBM has recently announced that it will no longer produce new models of the 8100, but may allow some 8100 applications to run on IBM mainframes. These will probably include data processing applications that run under the DPPX operating system. Applications running under the DPCX word processing operating system will most likely not be supported. IBM will continue to service and support existing 8100s.

During 1984, IBM enhanced both the hardware and software areas of the 8100 Information System. Enhancements in the hardware area included: the addition of the 8150 processor family, increasing the storage capacity of the 8100 system to 8 megabytes; the introduction of the 8102

The 8100 Information System is a family of processors that supports distributed processing in a host controlled arrangement. An 8100 system can include up to 8 megabytes of main memory, up to 259 megabytes of fixed-disk storage, and numerous local and/or remote display and printer terminals.

MODELS: 8130 Processor Models A21, A22, A23, A24, B23, & B24; 8140 Processor Models A31, A32, A33, A34, A41, A42, A43, A44, A51, A52, A53, A54, A61, A62, A63, A64, A71, A72, A73, A74, B51, B52, B61, B62, B71, B72, C72, C82, & C92; 8150 Processor Models A10, A20, A30, A40, B20, B40, B60, & B80.

CONFIGURATION: All processor models support attachment of 8101 and/or 8102 Storage and I/O Units and 8809 Magnetic Tape Units; attachment of other peripherals is accomplished via direct attachment or attachment through ports.

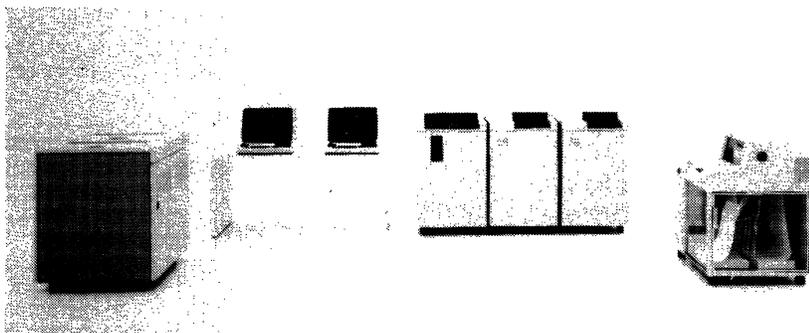
SOFTWARE: The Distributed Processing Program Executive (DPPX) and Distributed Processing Control Executive (DPCX) program products are available for use as operating systems.

COMPETITION: Large-scale DDP systems from Motorola Computer Systems and Harris or departmental computing systems from DEC and Wang.

PRICE: Purchase prices for the 8100 processors range from \$19,040 to \$160,000.

CHARACTERISTICS

VENDOR: International Business Machines Corporation (IBM), Old Orchard Road, Armonk, NY 10504. Contact



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 2048K bytes of memory and 639 megabytes of disk storage.

REFERENCE EDITION: This is a mature product. No significant further developments are anticipated, but because of its importance in the history of the industry, coverage is being continued. No future updates are planned.

IBM 8100 Information System

TABLE 1. IBM 8100 INFORMATION SYSTEM CHARACTERISTICS

	8130 A21/A22/ A23/A24	8130 B23/B24	8140 A31/A32/ A33/A34	8140 A41/A42/ A43/A44	8140 A51/A52/ A53/A54 (4)	8140 A61/A62/ A63/A64	8140 A71/A72/ A73/A74(4)
Main memory, bytes	256K to 1024K	1024K-2096K	256K, 384K	320K	512K	768K	1024K
8101/8102 Storage and I/O units	2	3	4	4	4	4	4
Disk storage, bytes max.	64M	64M	64M	64M	64M	64M	64M
Diskette drives, max.	2	2	2	2	2	2	2
Tape drives, max.	4	4	4	4	4	4	4
Communications ports	2 to 6	2 to 6	3	2 (1)	0	0	0
Communications protocols:							
SDLC	Yes	Yes	Yes	Yes (2)	Yes	Yes	Yes
BSC	Limited	Limited	Limited	Limited (2)	Limited	Limited	Limited
S/S (asynchronous)	Limited	Limited	Limited	Limited (2)	Limited	Limited	Limited
X.21	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Floating point hardware	No	No	No	Yes	No	No	No
Expanded Function Panel	No	No	Yes	Yes (1)	No	No	No

(1) Mutually exclusive

(2) Not with Expanded Function Panel

(3) All in the 8101/8102 units

(4) Available only as model upgrades

➤ Storage and I/O Unit; a hardware timer facility; and the 8100 PC Adapter. Software announcements included enhancements to the Distributed Processing Programming Executive operating system (DPPX/SP Release 2), and enhancements to the Distributed Processing Control Executive operating system (DPCX/DOSF Release 4). Workstation and office services were announced, providing for network and shared resource management services of the IBM Personal Computer, 3270-PC, and Displaywriter. In addition, the IBM 8100 Information System is supported by the IBM Information Network.

In a March 1986 announcement, IBM offered Distributed Office Support System/8100/Distributed Office Support Facility (DISOSS/8100/DOSF) Release 2 that allows an 8100/DOSF system to use the DISOSS/370 document and message filing and distribution services. This will allow 8100 users to enter validation of file and distribution request parameters, create documents at a text or data terminal without leaving DISOSS, define a set of stored requests for each operator, prefill processing option fields with a user-selected value when the screen is displayed, process for a selected function all items listed on a screen in a single operation, sort (by date and time, author, or document name) document descriptors displayed as a result of a search request, and request a header page that can be appended to a DOSF document. DISOSS/8100/DOSF Release 2 also provides the options to exit DISOSS, return to the main menu, or return to the previous menu. Message enhancements include an increase in message length to 256 bytes, automatic appendage of "response" information to a document or message, and the attachment of a "buckslip" to a local document. DISOSS/8100/DOSF Release 2 supports Document Content Architecture FFT. The program is available only on diskettes; DOSF Release 5 is a prerequisite.

The 8150 processor family includes eight models: Model A10 with 1 megabyte memory; Model A20 with 2 megabytes of memory; Model A30 with 3 megabytes of memory; Model A40 with 4 megabytes of memory; Model B20 with 2

➤ your local IBM representative. In Canada: IBM Canada Ltd., Markham, 3500 Steeles Avenue East, Markham, Ontario L3R 2Z1. Telephone (416) 474-2111. Or contact the IBM office in the nearest major city.

DATE OF ANNOUNCEMENT: October 1978.

DATE OF FIRST DELIVERY: August 1979.

NUMBER DELIVERED TO DATE: Information not available.

SERVICED BY: IBM.

CONFIGURATION

There are a total of 43 8100 processor models, which can be conveniently grouped into the following series: 8130 A21/A22/A23/A24; 8130 B23/B24; 8140 A31/A32/A33/A34; 8140 A41/A42/A43/A44; 8140 A51/A52/A53/A54; 8140 A61/A62/A63/A64 (available as model upgrades only); 8140 A71/A72/A73/A74 (available as model upgrades only); 8140 B51/B52; 8140 B61/B62; 8140 B71/B72; 8140 C72/C82/C92; 8150 A10/A20/A30/A40; and 8150 B20/B40/B60/B80.

Table 1 details the specifications of the various 8100 processor models.

One nonremovable high-performance disk and one diskette are standard on all 8130, 8140 and 8150 models. All 8130 models can attach up to 6 communication links or local loops, while the 8140 can attach up to 10, depending on the model. A maximum of 12 ports are available on the 8150 models, however, only 10 loops and SDLC lines may be activated at any one time on each processor. The limitation on the total number of active ports at greater than 9600 bps is four on each processor. Some 8140 models and the 8150 models offer floating-point arithmetic hardware. Floating-point arithmetic can be performed on the 8130, 8140 and 8150 models without floating-point hardware via the DPPX/ Fortran floating-point subroutines.

➤ The 8130 base system can be expanded to include up to three 8101 and/or 8102 Storage and Input/Output units, while the 8140 base system can be expanded to include up to four 8101 and/or 8102 units. Up to eight 8101 and/or 8102 units may be attached to an 8150 processor. Up to four 8809 magnetic tape units can be attached to an 8100 Information System. ➤

IBM 8100 Information System

TABLE 1. IBM 8100 INFORMATION SYSTEM CHARACTERISTICS (Continued)

	8140 B51/B52	8140 B61/B62	8140 B71/B72	8140 C72	8140 C82	8140 C92
Main memory, bytes	512K	768K	1024K	1024K	1536K	2048K
8101/8102 Storage and I/O units	4	4	4	4	4	4
Disk Storage, bytes max.	123M	123M	123M	123M	123M	123M
Diskette drives, max.	2	2	2	2	2	2
Tape drives, max.	4	4	4	4	4	4
Communications ports	Up to 11	Up to 11	Up to 11	Up to 10	Up to 10	Up to 10
Communications protocols:						
SDLC	Yes	Yes	Yes	Yes	Yes	Yes
BSC	Limited	Limited	Limited	Limited	Limited	Limited
S/S (asynchronous)	Limited	Limited	Limited	Limited	Limited	Limited
X.21	Yes	Yes	Yes	Yes	Yes	Yes
Floating point hardware	Optional	Optional	Optional	Optional	Optional	Optional
Expanded Function Panel	Yes	Yes	Yes	Yes	Yes	Yes

- (1) Mutually exclusive
(2) Not with Expanded Function Panel
(3) All in the 8101/8102 units
(4) Available only as model upgrades

➤ megabytes of memory; Model B40 with 4 megabytes of memory; Model B60 with 6 megabytes of memory; and Model B80 with 8 megabytes of memory. Logical storage of up to 16MB is also provided.

The 8150 A models offer one Processing and Control Element (PCE) with a single I/O bus. The 8150 B models have two PCEs and two I/O buses with the capability of operating in dual mode or in single mode with either PCE. The 8150 B models have two separate and identical main storage banks that can operate together in interleave mode or in noninterleave mode. This dyadic (dual) processing provides a higher level of system availability. The 8150 is fault tolerant in the sense that it will perform a self test, and if any of these elements are found to be failing during an initial program load (IPL), the 8150 will automatically reconfigure itself to remove the failing element. Although reduced in memory, I/O, and/or processing capability, the resulting configuration will continue operations.

Disk storage is not available within the 8150 processor itself, but is available through attached 8101 or 8102 storage and input/output units. The 8150 processor allows for the attachment of up to four 8101 and/or 8102 storage and I/O units, or three 8101 or 8102 storage and I/O units and one 8809 magnetic tape unit. Up to three additional magnetic tape units can attach to the 8809 magnetic tape unit.

The introduction of the 8150 models created a new growth path for users of the 8100 system by providing improved performance and increased main storage capacities than was previously available on an 8130 or 8140 processor. This allows for either a faster system response time or provides computing power that can service more users while maintaining response levels. The increased main storage capacity of the 8150 provides additional logical address space and allows more shared programs to reside on a system, improving programming capabilities.

The 8100 processor distributed processing system has a 16-bit memory bandwidth, 48 sets of eight 32-bit registers, and 32-bit logical addressing (4-megabyte range). There are ➤

➤ an 8809 Model B magnetic tape unit is attached to the processor, the maximum number of 8101 or 8102 units that can be attached are reduced by one.

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.

Any combination of display terminals and/ or printers may be attached to the 8100. Each Display and Printer Additional feature (1506 or 3220) allows the attachment of up to four additional I/O devices in any combination; however, there are limits to the attachment of some device types. If both the 1506 and 3220 are attached, the maximum number of I/O devices can be further expanded to 24. A maximum of six device attachment features can be selected for one 8101 or 8102 unit, allowing a maximum total of 24 of these I/O devices. Each I/O device is connected to the 8101 or 8102 by a single coaxial cable with a maximum length of 2,000 feet.

The 8101 and 8102 Storage and I/O Units allow expansion of the system's communication and I/O capabilities, as well as additions to disk storage. All devices attachable to the 8130, 8140, and 8150 are attachable to the 8101 and 8102. The 8101 and 8102 are attached to the I/O bus of the 8130, 8140, or 8150 processor.

The 8100 PC Adapter feature provides for the direct connection of the IBM Personal Computer or Personal Computer XT to local or remote 8100 loops.

TRANSMISSION SPECIFICATIONS

Each communication adapter in an 8100 system controls one loop or data link (i.e., through a common carrier communication line) or one "direct connection" to an I/O unit that is a limited distance from the 8100 system. Synchronous data link control (SDLC), binary synchronous communications (BSC), start-stop (S/S), or X.21 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 ➤

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TABLE 1. IBM 8100 INFORMATION SYSTEM CHARACTERISTICS (Continued)

	8150 A10	8150 A20/B20	8150 A30	8150 A40/B40	8150 B60	8150 B80
Main memory, bytes	1MB	2MB	3MB	4MB	6MB	8MB
8101/8102 Storage and I/O units	8	8	8	8	8	8
Disk Storage, bytes max.	16B (3)	16B (3)	16B (3)	16B (3)	16B (3)	16B (3)
Diskette drives, max.	2	2	2	2	2	2
Tape drives, max.	4	4	4	4	4	4
Communications ports	Up to 12	Up to 12	Up to 12	Up to 12	Up to 12	Up to 12
Communications protocols:						
SDLC	Yes	Yes	Yes	Yes	Yes	Yes
BSC	Limited	Limited	Limited	Limited	Limited	Limited
S/S (asynchronous)	Limited	Limited	Limited	Limited	Limited	Limited
X.21	Yes	Yes	Yes	Yes	Yes	Yes
Floating point hardware	Optional	Optional	Optional	Optional	Optional	Optional
Expanded Function Panel	No	No	No	No	No	No

- (1) Mutually exclusive
 (2) Not with Expanded Function Panel
 (3) All in the 8101/8102 units
 (4) Available only as model upgrades

presently 43 processor models available within three model numbers: 8130, 8140, and 8150. The 8130 operates with a cycle time of 1500 nanoseconds, and the 8140 has a cycle time of 800 nanoseconds on 8-, 16-, or 32-bit operands. Memory capacity ranges from 256K on the low end 8130 to 6MB on the top of the line 8150. This storage makes use of Error Correction Code (ECC) to provide correction of all single and most double-bit main storage errors. Capability for address translation and storage protection for up to 16 million bytes of logical storage is provided.

The 8140 C and 8150 B models are similar in that they can have one or two processors, depending on user requirements, with the capability of operating in single or dual mode. All 8100 processors are alike in that each 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 or 8102 Storage and I/O Units. The 8130 models can have up to three 8101 or 8102s attached; the 8140 models can have up to four attached, while the 8150 models support up to eight.

The 8130 B processor uses high-density circuitry providing internal speeds up to 50 percent faster than the 8130 A (the current small 8100 processor) and double its maximum main storage to two megabytes. The 8150 A models provide growth up to 1.5 times the throughput of the 8140 C models. The 8150 B models provide growth up to 1.8 times the throughput of the 8150 A models.

The 8100 Information System, a communications-oriented system, can operate either on a standalone basis, or can attach to a System/370, a 4300 system, or to another 8100 system. The system provides a flexible attachment method for a wide variety of input/output (I/O) devices that can be attached to the I/O bus of the 8100 processors via communication features which include data link (common carrier communication lines), direct-connect (connected directly to the system without modem), and loops that are direct-

speeds range from 600 to 9600 bps. The maximum distance for direct connection through an RS-232-C interface is 40 feet. The maximum distance for direct connection through a V.35 interface is 1,000 feet.

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

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

The *S/S communications adapter* can connect to analog networks or direct connections. Analog network speeds and direct connection speeds range from 110 to 300 bps for the 8130 and from 110 to 1200 bps for the 8140. S/S direct connections are through an RS-232-C 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.

Table 2 lists the communication attached devices that can attach to the 8100 communication ports.

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, 8140, or 8150 processor, or an 8101 or 8102 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 and a receiver at the other end, neither of which is an I/O unit.) I/O units that are attachable to a directly

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- ▶ attached or data link-attached. Up to 12 communication and loop ports can be configured in an 8150 Processor. Additional ports can be configured via an 8101 or 8102.

A hardware timer facility provides the 8150 system with the date, time-of-day, automatic power on, an interval timer, and (optionally) system clock synchronization.

The 8101 and 8102 Storage and I/O Units attach to the I/O bus of all 8100 processors and provide additional disk storage and device attachment capabilities for the 8100 system, resulting in enhanced growth capability and extended configuration flexibility of the 8100 Information System. The 8102 is available in two models, the A15 (129MB) and the A17 (259MB), and can potentially provide twice the data and number of data sets as the 8101. Disk storage for the 8101 and 8102 is provided by a nonremovable high-speed direct access storage device. The 8102 Model A15 contains a single disk drive and access mechanism. The 8102 Model A17 contains two disk drives, each with its own access mechanism. Maximum file capacity of over one gigabyte (1036MB) can be achieved with the addition of 8102 units. The 8102 can coexist in the same configuration with the 8101 storage and input/output unit.

The 8100 PC Adapter consists of a printed circuit card and a program diskette for installation in the IBM Personal Computer or the IBM Personal Computer XT for direct loop attachment to the IBM 8100 Information System. The adapter has also been enhanced to include support for the IBM Personal Computer 5153 Color Display.

The 8100 uses two operating systems. One, the Distributed Processing Programming Executive (DPPX), provides substantial standalone processing capabilities for an 8100 system, including Cobol, Fortran, and PL/1 compilers and support for a wide range of terminals. The other, the Distributed Processing Control Executive (DPCX), makes the 8100 operate like an IBM 3790 Communications System, with applications developed at the host site.

Several enhancements have been made to the DPCX operating system. These include support for the 8130 Model B and 8150 processors, which enhance the modularity of the 8100 processor family and provide increased performance, availability, and reliability; increased functional capability and usability improvements to the the Data Stream Compatibility (DSC) facility; Displaywriter attachment alternatives; an increase in the number of data sets from 96 to 191; and support of the 5210 printer Models E1 and E2. The DPCX/DOSF system has also been enhanced to allow Displaywriter documents and Personal Computer files to be stored in the 8100 and exchanged with other users.

Enhancements to the DPPX operating system include support of the IBM 8150 A processor by providing a new performance and reliability hardware option, the 8150 hardware timer, which provides power on and off capabilities to further reduce the need for 8100 operators at remote locations; and the 8102 storage and I/O unit. Enhancements to DPPX also include the new Interactive Map ▶

TABLE 2. 8100 COMMUNICATION ATTACHED DEVICES

Terminals conforming to 2780/3780 line protocol

3274 Control Unit Models 41C, 51C, 61C with:
3178 Display Station
3180 Display Station Model 1
3262 Printer Models 3, 13
3268 Printer Model 2
3278 Display Station Models 1, 2, 3, 4, 5
3278 PC Attachment
3279 Color Display Station Models 2A, 2B, 3A, 3B
3287 Printer Models 1, 2, 1C, 2C
3289 Printer Models 1, 2
3290 Information Panel
5210 Printer Models G1, G2
6580 Displaywriter w/3270 AW
3276 Control Unit/Display Station Models 1, 2, 3, 4, 11, 12, 13, 14 with:
3178 Display Station
3262 Printer Model 13
3268 Printer Model 2
3278 Display Station Models 1, 2, 3, 4
3279 Color Display Station Models 2A, 2B, 3A, 3B
3287 Printer Models 1, 2, 1C, 2C
3289 Printer Models 1, 2
5210 Printer Models G1, G2
6580 Displaywriter w/3270 AW
3601 Finance Communication Controller Models 1, 2A, 2B, 3A, 3B
3602 Finance Communication Controller Models 1A, 1B
3631 Plant Communication Controller Models 1A, 1B
3632 Plant Communication Controller Models 1A, 1B
3651 Store Controller Models 25, 75
3684 Point-of-Sale Control Unit Models 1, 2
3705-II, 80 Communications Controller
3725 Communication Controller
3767 Communication Terminal Models 1, 2, 3
3842 Loop Control Unit
3843 Loop Control Unit
4701 Finance Communication Controller Model 1
4952, 4954, 4955, 4959 Processor (Series/1)
5150 Personal Computer
5285, 5288 Programmable Data Stations
6580 Displaywriter (3270 DSC load only)
6670 Information Distributor
7426 Terminal Interface Unit Model 2 (w/associated terminals)
8101 Storage and I/O unit
8130, 8140, 8150 Processors
8775 Display Terminal Models 11, 12

- ▶ 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 LSCs 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.) ▶

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▷ Definition (IMD) program that enables the application programmer to create and update screen and printer panel layouts on-line; support for the DisplayWrite 2 program that provides the 8100 user with the text capabilities of the Displaywriter; support for the DPPX/PT (Performance Tool) Version 2 that provides a set of functions to monitor performance, collect workload information, and print reports relating to the operation of an IBM 8100 system; and the DPPX Shadow File Manager.

The DPPX Shadow File Manager provides a high level of protection against loss of data due to disk hardware failures. This is accomplished by maintaining an exact copy of a vital DPPX disk volume on a second disk volume. Every update to one disk volume is automatically applied to the other disk volume as a dual data management function. The Shadow File Manager has been designed to function on any 8100 system that operates under a DPPX/FEP6 or DPPX/SP operating system. The system must have at least three disk volumes. Two of the disks for shadow processing should be the same size, and the disk containing the critical data must have a volume catalog. All disks must have the same volume serial. DPPX/SP has been enhanced to support the IBM Personal Computer (via loop attachment), the 3270 Personal Computer, and the 3270-PC Attachment stations.

COMPETITIVE POSITION

Upon its introduction in October 1978, the 8100 Information System was viewed by many observers as IBM's "official sanction" of the distributed data processing concept. The system proved to be a disappointment to IBM, however. Software problems and the system's difficulty of use were cited by many users contacted by Datapro as drawbacks of the 8100 product line. IBM has recently announced that it will not produce any new 8100s, but is offering its System 36 minicomputer as an alternative product. However, some who have migrated from an 8100 to the System 36 have expressed dissatisfaction with the newer product. Although it is generally unlikely that staunch IBM users will migrate to other vendors' products, those looking for an alternative departmental computing system might consider offerings from Digital Equipment Corporation and Wang Laboratories. Large distributed data processing systems from Motorola and Harris offer some competition, as well.

IBM is now concentrating its major development efforts in local area networking and telecommunications products. The company will continue to support and service 8100 systems, but will gradually phase out the product as LANs and other communications products assume greater importance in the overall IBM strategic plan. It is clear that the trend in departmental processing is toward systems that handle both voice and data applications, as well as high-speed data transmission.

ADVANTAGES AND RESTRICTIONS

Since IBM has announced that it will no longer manufacture new 8100s, those looking for a departmental comput-

▷ 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-C 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.

Table 3 lists the devices that can be attached to a direct-attached loop or a data-link attached loop via the 3842 or 3843 loop control unit.

SOFTWARE

OPERATING SYSTEMS: Two primary IBM licensed program products are currently available to support the 8100 system hardware. They are the Distributed Processing Control Executive (DPCX) and the Distributed Processing Programming Executive (DPPX).

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 Program Executive (DPPX) is a general-purpose, transaction-oriented operating system that supports a number of optional licensed programs, including Cobol and Fortran.

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

The *Distributed Processing Control Executive (DPCX)* is a programmable, multiapplication, display-oriented control system that can control the execution of up to 62 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 databases 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.

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ing system will have to choose an alternative product. The System 36 has been designated the "official" IBM replacement product, but those who have migrated to the machine have cited less processing power and support for less users as drawbacks. Present 8100 users will be serviced and supported for the next several years, at least, and therefore may be able to postpone a migration to another product since they will be able to add applications and expand the network for some time.

The strength of the 8100 Information System is as a host-managed distributed processing system. The distributed processing functions of the 8100 allow the user to take advantage of the processing power of a large host computer and shared disk space, while providing a cost advantage in that large expenditures are not required to purchase a large in-house computer. However, accessing the remote host computer can provide for some disadvantages as well, such as line problems or inaccessibility of the host computer, leading to processing delays and poor response time. The 8100 Information System can also be used as a standalone small business computer.

One of the 8100's significant advantages is that it provides an interface that allows PCs to access it, as well as host applications. In its latest 8100 announcement, IBM made DISOSS/370 document and message filing and distribution services available through the 8100. It is expected that IBM will allow 8100 data processing applications running under the DPPX operating system to run on IBM mainframes, but applications running under DPCX, the 8100 word processing operating system, will not be supported.

USER REACTION

Although the 8100 has been slated for the graveyard for several years, there are still a number of users who staunchly support the system. When Datapro ran its 1984 Computer Users Survey in February, six users of the IBM 8100 Information System responded. The systems rated were 8130 and 8140 processors. The average life of all the systems was 45 months. Of the systems rated, one was purchased, three were leased from the manufacturer, and two were leased from third party vendors. Only one of the respondents was a first time computer user, four converted from other manufacturer's systems, while one had upgraded from another IBM system. The type of industry represented most in the survey was manufacturing (3 users), government (2 users), and insurance (1 user). Principal applications included manufacturing (3 users), order processing/inventory control (3 users), sales and distribution (3 users), accounting/billing (2 users), engineering (2 users) payroll/personnel (2 users), purchasing (2 users), construction (1 user), education/scheduling/administration (1 user), mathematics/statistics (1 user), process control (1 user), and criminal justice (1 user). Most of the users developed their own applications software in-house (5 users), while two stated they obtained their software from the manufacturer and two stated that software was obtained from contract programming. Only one said they obtained their software from an independent supplier.

TABLE 3. LOOP ATTACHED DEVICES

3104 Display Terminal Models B1, B2
3262 Printer Models 2, 12
3268 Printer Model 1
3274 Control Unit Models 51C, 61C with:
3178 Display Station
3262 Printer Models 3, 13
3268 Printer Model 2
3278 Display Station Models 1, 2, 3, 4, 5
3278 PC Attachment
3279 Color Display Station Models 2A, 2B, 3A, 3B
3287 Printer Models 1, 2, 1C, 2C
3289 Printer Models 1, 2
3290 Information Panel
5210 Printer Models G1, G2
6580 Displaywriter w/3270 AW
3276 Control Unit/Display Station Models 11, 12, 13, 14 with:
3178 Display Station
3262 Printer Model 13
3268 Printer Model 2
3278 Display Station Models 1, 2, 3, 4
3278 PC Attachment
3279 Color Display Station Models 2A, 2B, 3A, 3B
3287 Printer Models 1, 2, 1C, 2C
3289 Printer Models 1, 2
5210 Printer Models G1, G2
6580 Displaywriter w/3270 AW
3287 Printer Models 11, 12
3289 Printer Model 3 with:
2502 Card Reader Model A1
3501 Card Reader
3521 Card Punch
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
3647 Time and Attendance Terminal
5210 Printer Models E1, E2
7426 Terminal Interface Unit Model 1 (w/associated terminals)
8775 Display Terminal Models 1, 2

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

DPCX application programs are coded using the IBM 3790 programming statements. Thus, programs written for the 3790 can be run unchanged on an 8100 system under DPCX although the programs must be modified if they are coded for hardware not supported by DPCX. 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 host support programs provided with the Host Prep 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

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Only one of the users responded that they used remote workstations (16 to 30), while all the users employed local workstation/terminals (averaging between 15 and 30 per user). Memory capacities averaged between 512K bytes to 1MB, while total disk storage capacities averaged over 100MB. Planned acquisitions for 1984 included additional software from the manufacturer (2 users), expansions to data communications (3 users), and expansions to hardware (3 users). All six users stated the system met their requirements, and all six stated they would recommend the system to other users. The six users rated their systems as shown in the table below.

	Excellent	Good	Fair	Poor	WA*
Ease of operation	2	4	0	0	3.33
Reliability of system	4	2	0	0	3.67
Reliability of peripherals	3	2	1	0	3.33
Maintenance service:					
Responsiveness	3	3	0	0	3.50
Effectiveness	2	4	0	0	3.33
Technical support:					
Troubleshooting	3	2	0	1	3.17
Education	2	3	1	0	3.17
Documentation	2	3	1	0	3.17
Manufacturer's software:					
Operating system	2	4	0	0	3.33
Compilers and assemblers	2	3	0	0	3.40
Applications programs	2	4	0	0	3.33
Ease of programming	1	4	0	0	3.00
Ease of conversion	1	4	1	0	3.00
Overall satisfaction	2	4	0	0	3.33

*Weighted Average based on a scale of 4.0 for Excellent.

To further expand on the user's reaction, four users were contacted by telephone. Two of the users contacted have an 8130 system, one has an 8140 system, and one has an 8140 system at the home site with several 8140 and 8130 systems at various locations.

An East Coast user representing a government agency was contacted to discuss his feelings on the IBM 8100. This user presently has an 8130 (wasn't sure which model), had a growth path from the IBM 3276, up through the IBM 3790 to the 8130, and plans to expand in the next year or so to the IBM 4330. The user commented that they need to be less restricted, able to operate more independently, and have more flexibility. He felt this could be better accomplished with the 4330. This user's primary application is business licensing which includes the processing of 500,000 records employing 200 different codes. This involves the monthly mailings of bills, licenses, renewal notices, and past due notices. Other applications include in-house personnel record processing and budgeting. The system supports between six to fifteen workstations, and provides up to 512K bytes of memory and up to 10MB disk storage. This user feels the system is meeting up to 90 percent of their requirements.

The user stated they were one of the first to have an 8130 installed (1979) and had some problems originally with the connections between the loop and I/O devices but that has all been ironed out and the system is now running well. The main advantage mentioned was that the system provides

programs have been completed are copies transmitted through the network to the various 8100/DPCX installations.

DPCX offers a full-screen system reconfiguration facility, a simplified logon procedure, the ability to dump to disk, and operands and instructions for improved performance. It also supports the downstream connection of Series/1 systems via a communications port.

Support is provided by DPCX for all the processor models of the 8100 Information System, including those offering dual-processor mode. The IBM Displaywriter can be attached to the 8100.

DPCX Release 4 provides enhanced functional capability and usability improvements of the Data Stream Compatibility (DSC) facility, and provides enhanced connectivity and network management. With Release 4, the number of supported user data sets has been increased from 96 to 191, bulk print support is extended to include the 5210 printer Models E1 and E2, and support for additional attachment alternatives for the IBM Displaywriter is provided. These attachment alternatives allow the Displaywriter to function as a 3270 display.

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, 8140, and 8150 processors, the 8101 and 8102 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 communications.

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

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

DPPX/Base Functional Enhancement Package 6 (FEP6) supports the IBM 3640 Plant Communication System for host communications, the Displaywriter, the 5280 Distributed Data System, and the Series/1. DPPX also provides users with the capability to access the Distributed Office Support Facility (DOSF) on an attached 8100 system running DPCX. An IBM 8775 display with Interactive Display Test Facility (IDTF) software can be used either as a DPPX terminal or an occasional text terminal to DOSF under DPCX.

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➤ for online distributed processing, which provides them with the processing power of a large host system, without the expenses required to install an in-house large-type computer. The user added, "It cuts down on budget expenditures." However, the advantages also seemed to be this user's disadvantages in that while they enjoyed the cost advantages of the processing power of a larger host computer, operations were impaired if the host was down or tied up.

The second user we contacted represented a West Coast manufacturing company utilizing an 8130 A24 with up to 15 workstations, up to 1MB main memory, and up to 600MB disk storage. This company converted from a Qantel system in 1979 and does not have any present plans to upgrade the system. All applications software packages are developed in-house at the home office. Principal applications at four different manufacturing locations are accounting, manufacturing, order entry, billing, and inventory control. The user considers the system very reliable. They have had no hardware problems. He stated one of the greatest advantages was the system's support of Cobol, which provides for easy system development. The user did state, however, that since they presently do not have a system administrator/programmer, they are having difficulty understanding, maintaining, and configuring the operating system. He feels the operating system support could be improved upon, the documentation could be better, and the class education and/or self-explanatory text is inadequate.

The third user contacted represented a Midwest manufacturing firm with 46 different locations. An 8140 C system was utilized with up to 60 workstations supported and up to 1MB of memory. When asked to list the advantages of this system, the user simply said, "None." The user had no problem listing the disadvantages such as poor host response time, poor turn-around time from the host computer, and electrical and software problems at the host computer. However, as one will note, these complaints were geared more toward the IBM host computer rather than the 8100 system. The user's principal applications were accounting, education/scheduling/administration, engineering, manufacturing, mathematics/statistics, order processing/inventory, payroll/personnel, process control, purchasing, and sales/distribution. No processing of these applications are done at the user's facility, all is done through the host computer. The user is looking at the possibility of moving up to the IBM 4368 system in the near future.

The fourth user contacted represented a government agency on the East Coast. They have several systems installed at various sites which include both 8130 and 8140 models. All are used for criminal justice case tracking, and the one at this user's site, an 8140 Model B, is also used for product development. The 8140 B at the user's site supports up to 15 workstations with up to 2MB of memory and up to 600MB of disk storage. When asked if they could list any system problems, the answer was, "No, the system is performing well for all intended purposes." All applications software is developed by the user—none is purchased from

➤ *DPPX/SP (System Product)* extends the distributed data processing capabilities of the DPPX/Base operating system to provide improved usability and additional functional and connectivity enhancements. It combines and enhances the benefits of DPPX/Base FEP6, plus ten additional DPPX programs, into a single transaction-oriented product. Release 2 provides enhanced support for the IBM Personal Computer, 3270 Personal Computer, 3270 Personal Computer Attachment stations, and Displaywriter workstations, plus support of the 8150 hardware timer. This support provides for documents and files to be exchanged between the workstations and DPPX/SP Release 2, to be stored and printed at the 8100, and to be shared with other DPPX/SP Release 2 users.

DPPX/SP Release 3 provides support for Systems Network Architecture Distribution Services (SNADS), direct attachment facilities to X.25 packet switched public networks, the Application Productivity Facility (APF), Router peer-to-peer network enhancements, the ability to dynamically extend data sets, and support for the IBM PC AT, IBM 5531 Industrial Computer, IBM portable PC, IBM Quietwriter, IBM Wheelprinter, IBM Proprinter, the 3278/3279 Emulation Adapter and Control Program for the IBM PC, and the 3179 Model G. Through SNADS, DPPX/SP workstations can exchange documents, personal computer files, messages and DPPX data sets between 8100 systems equipped with DPPX/SP Release 3 software. DPPX/SP Release 3 support has been recently enhanced to support downstream workstation clusters attached to the IBM Token-Ring and PC Networks, as well as the System/36. Through the IBM 3708 Network Conversion Unit, IBM 4245 Model D12 and D20 printers emulate 3287 printers, and the 3161 and 3163 Models 11 and 12 may access DPPX/SP applications.

DATABASE MANAGEMENT SYSTEM: The *DPPX/Database and Transaction Management System (DTMS)* provides transaction management and routing as well as database management and control for the 8100/DPPX system. Facilities to assist in developing, operating, and managing on-line applications are provided.

LANGUAGES: The following languages are offered for the IBM 8100 system:

DPPX/Assembler is 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.

DPPX/APPL is compatible with VS APL Release 4, this implementation of the APL language includes the primitives and operator functions of VS APL, plus most of the system commands and variables.

DPPX/Cobol is a program product that offers a Cobol compiler and a run-time library containing reentrant routines that support arithmetic, logic, and data conversion, as well as input/output operations.

DPPX/Fortran is a high-level, mathematically oriented programming language and compiler designed according to the specifications of ANSI Fortran X3.10-1966.

DPPX/PL/1 is a program product that includes a PL/1 compiler and library with reentrant routines. The PL/1 implementation in the 8100 conforms to the NAIS X3.53-1976 standard.

COMMUNICATIONS: The *DPPX/3270 Data Stream Compatibility (DSC)* is 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.

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➤ IBM. The user listed the advantages of the system as being flexible, providing for remote processing, and the ability to tie into personal computers. The user also stated that if we had called him a few years ago, he could have listed a lot of disadvantages, but says that IBM has provided good support and most of the original deficiencies in the system have been solved. One of the problems he mentioned was that the IBM 8100 previously provided no growth path for him, but feels this has been corrected with the addition of the 8150 processor. They do not plan to expand the system at the present time at the user's site, but will possibly upgrade systems at other sites to the 8150. □

▶ **DPPX/Distributed Presentation Services (DPS)** is a program product that provides device-independent control for terminals supported by DPPX, and eliminates the need for datastream communication and buffer programming.

DPPX/Remote Job Entry-Workstation Facility (RJE) permits the 8100 to function as an SNA or BSC remote job entry workstation for submitting jobs to a host 4300, 303X, or System/370. The host requires an OS/VS, DOS/VS, DOS/VSE, or VM/370 operating system with a job entry subsystem installed.

Host Command Facility is designed to enable a host-attached terminal to function as if it were directly attached to an 8100/DPPX or DPCX system, the Host Command Facility gives the operator at a central System/370 site the capability to operate and control remote SLC-connected 8100 systems.

UTILITIES: The **Interactive Display Text Facility (IDTF)** provides text entry and edit functions for an IBM 8775 Display Terminal connected to an IBM 8100. Text/edit functions are similar to those on the IBM 3732 Text Display Station, while existing 8775 data functions are maintained.

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.

Development Management System (DMS)/DPPX is a program product that aids in the design and generation of application programs by providing a simple programming interface to the user.

DPPX/Interactive Productivity Facility is a simplified, full-screen interactive interface to the DPPX command facility with tutorial routines included that explain system functions. The latest update to DPPX/IPF, Release 2, provides improved productivity functions in the areas of system use, system operation, and system management.

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/Performance Tool (PT) is a program product consisting of the DPPX/PT Monitor and the DPPX/PT Reporter feature. The DPPX/PT Monitor collects performance data, and the DPPX/PT Reporter generates reports on the basis of data collected by the Monitor. PT Release 2 combines the previously separate monitor program and reporter feature and a new accounting collector into a single program.

The **Distributed Processing Development System (DPDS)** enables systems programmers to code programs for an 8100 system running under DPPX and to compile and test them on the host before implementing them on the 8100.

The **DPPX/Distributed Processing Connection Facility (DPCF)** provides concurrent access to multiple applications and subsystems from a single terminal. Multiple terminal users can log on to DPCF, and the various application sessions can be selected dynamically. Sessions can be with systems such as DPPX/DTMS, DPCX, IMS, CICS, and TSO. SNA protocols are supported.

DPPX/Problem Determination Aid (PDA) is designed to improve central problem management, DPPX/PDA works in conjunction with the Network Problem Determination Application (NPDA) running in a System/37 or 4300 Series processor. It provides increased central site awareness of and ability to react to malfunctions at remote sites.

The **DPPX/Programmed Operator Facility** provides the ability for an 8100 to intercept and service messages directed to the system operator. Each message can have a unique programmed response which can be specified by the user.

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

The **DPPX Shadow File Manager** provides the DPPX/SP Release 1 or DPPX/FEP6 user with a high level of protection against loss of data due to disk hardware failures. This is accomplished by maintaining an exact copy of a vital DPPX disk volume on a second disk volume.

The **DPPX/SP Interactive Map Definition (DPPX/SP IMD)** offers improved programmer productivity by enabling the application programmer to create and update screen and printer panel layouts online at program development time. DPPX/SP IMD is upward compatible with the DPS Version 1 and Version 2 Interactive Map Definition feature.

The **Distributed Systems Executive (DSX)** is 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.

OFFICE AUTOMATION: The **DPCX/Distributed Office Support Facility (DOSF)** supports the preparation of office correspondence and other business-related documents. DPCX/DOSF permits document creation, revision, formatting, storage, retrieval, printing, and host transfer. DPCX/DOSF Release 4 also provides Personal Computer or Personal Computer XT attachment alternatives, text printing of DPPX/SP attached 5210 printers, and 3179 and 3180 display terminal support.

The **Distributed Office Support System/8100/Distributed Office Support Facility (DISOSS/8100/DOSF) Release 2** allows an 8100 DOSF system to use the DISOSS/370 document and message filing and distribution services. Release 2 of DISOSS/8100/DOSF provides the ability to file and distribute personal computer files to other DISOSS workstations. Personal computer files also can be copied to DOSF permanent store or to an IBM PC. Mail log enhancements available under Release 2 allow the following:

- The copying of documents or personal computer files in the mail log directly to DOSF permanent store or an IBM PC.

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- ▶ • Printing, in a single operation, of mail logs and suspense files of all principals for whom a user may be working.
- Displaying a list of principals whose mail logs the user is authorized to process. The list indicates which users have new mail.
- Notifying a recipient of new mail waiting to be processed.
- Marking mail urgent or confidential.
- Time- and date-stamping of mail.
- The displaying of the name under which a document is stored in the host library.

DISOSS/8100/DOSF Release 2 supports Document Content Architecture FFT. FFT documents can be filed or distributed and copied from the mail list to permanent store or to an attached IBM PC. They also may be moved from the host library to an attached IBM PC or permanent store.

APPLICATIONS: The 8100 Information System functions as a distributed data processing system offering text processing, data entry, and remote job entry. A variety of applications software is available, either from the manufacturer, a third-party vendor, or through program development. Applications available for the 8100 include financial, construction, manufacturing, office automation, mathematical/statistical, sales/distribution, inventory, and accounting, along with many other customized programs.

COMPONENTS

PROCESSORS: The basic parameters of the forty-three 8100 processor models are shown in Table 1. All 8100 processor models, with the exception of the 8140 C and 8150 B, use a single, interrupt-driven central processor. The 8140 C models use one or two CPUs, which are similar to 8130 and 8140 A and B models. The 8150 A models use one CPU and the 8150 B models use two CPUs. One CPU handles channel logic and system control functions and the other does not. With both processors operating in what IBM calls "dual mode," a 60 percent performance improvement is possible, according to IBM. The 8140 C can also operate with a single CPU, although no performance gains are stated. The 8150 A models provide up to 1.5 times the throughput of the 8140 C models. The 8150 B models provide up to 1.8 times the throughput of the 8150 A models.

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

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

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

DISK STORAGE: The 8101 and 8102 Storage and I/O Units allow 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 A20 has no disk storage; Model A23 has 64 megabytes; and Model A25 has 128 megabytes. The 8102 is available in two models: Model A15 has 129 megabytes of disk storage, and Model A17 has 259 megabytes of disk storage. All devices attachable to the 8130, 8140, and 8150 are attachable to the 8101 and 8102. The 8101 and 8102 are attached to the I/O bus of the 8130, 8140, or 8150 processor.

DISKETTE STORAGE: One drive with a capacity of 985,088 bytes is contained in each processor model. One additional drive can be added to one 8101 or 8102 Storage and I/O Unit in an 8100 system. The data transfer rate is 62K bytes per second. The Basic Data Exchange format is used; either IBM 2D or Type 1 diskettes can be used.

8809 MAGNETIC TAPE DRIVE: Four models are provided that are identical in operating parameters, but differ according to connection. The tape format is 9-track, 1600 bpi, phased-encoded. Direct reel-to-reel tape transport is employed that replaces vacuum columns with electronic control. This means that the unit is sensitive to reel inertia, and the use of large-hub, 1200-foot reels is not recommended. The 8809 operates in a start/stop mode at 12.5 inches per second, which gives a data rate of 20,000 bytes per second. A special streaming mode operates at 100 inches per second for a data rate of 160K bytes per second. The streaming mode is intended for volume dumps and loads to and from disk, and completely occupies the 8100 processor. The 8809 1A is the first drive that attaches to an 8101. The 1B is the first drive that attaches to an 8100 processor. The string of four drives is completed by adding a Model 2, a Model 3, and another Model 2, in that order.

OTHER PERIPHERAL DEVICES: Members of many IBM display and printer product lines can be attached to the 8100 Information System. Among the most important products or families represented are:

- 8775 Display Terminal. Introduced with the 8100 System in October 1978, the 8775 currently offers two pairs of models. One pair is designed for attachment via the Loop Adapter; the other pair, via data communications lines. Within each pair, one model provides a display capacity of 960, 1920, or 2560 characters and the second model adds the capability for displaying 3440 characters.
- 3104 Display Terminal. A lower cost version of the 8775, the 3104 was introduced in March 1982. There are two models available: Model B1 comes with a 75-key data entry keyboard, while Model B2 is equipped with an 87-key EBCDIC typewriter keyboard. Both keyboard models are detachable. The 3104 contains a 12-inch display screen with a 1920-character display capacity, arranged in 24 lines of 80 characters each. The display may be tilted or swivelled for operator convenience.
- 3270 Information Display System family. The 3274 Control Unit (Models 51C or 61C) or the 3276 Control Unit/Display Station (any model) may be used to attach clusters of 3270 family displays and printers to the 8100 System.
- 3262 Band Printer series. Models 2 and 12 are offered for loop attachment to the 8100 and operate at 650 lpm and 325 lpm, respectively.
- Personal Computer and Personal Computer XT. The PC or PC XT may be connected directly to local and remote 8100 loops via the 8100 PC Adapter feature.
- IBM 5280 Distributed Data System. Applications running in the 5280 can communicate with applications running under DPPX.
- IBM Series/1. Applications may be written for the Se- ▶

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ries/1 and 8100 under DPPX, and can be used to provide a file transfer facility between the two systems.

Specific model numbers and attachment capabilities of these and other devices that can be configured with the 8100 system are listed in Table 2. Detailed reports on many of these product lines can be found in the following reports: *IBM 5280 Distributed Data System* (C21-491-501); *IBM Personal Computer Family Data Communications Capabilities* (C22-491-101); *IBM 3270 Information Display System* (C25-491-101). Information on the 3104 and 8775 display terminals can be found in *Alphanumeric Display Terminals* (C25-010-101).

PRICING

IBM offers the 8100 Information System for purchase, monthly rental, or monthly lease. Rental and lease arrangements include prime-shift maintenance. Purchased components may have a separate maintenance contract.

The Monthly Maintenance Column in the accompanying price table is the dollar amount for the additional monthly maintenance charge for Plan Offering D lease/rental machines (optional periods of maintenance service following expiration of the initial period of maintenance service) or minimum maintenance charge for purchased machines. Prime-shift maintenance is provided for any consecutive nine-hour period between 7 a.m. and 6 p.m., Monday through Friday.

For users without a maintenance contract, the 8100 is maintained under a per-call basis. Under this basis the per-call charge during regular hours is \$109 per hour, and during off hours the charge is \$126 per hour. The hourly rate for systems engineering service is \$85. Programming service/programming assistance costs \$158 per hour during regular hours and \$181 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. CPUs 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.

Volume purchase discounts are available for 8130, 8140, and 8150 processors and the 8101 and 8102 Storage and Input/Output Unit. Discounts for volume purchase are shown in the following chart:

Quantity of Eligible Machines	Volume Purchase Discount Percent
5-9	10%
10-19	15%
20-29	25%
30-44	30%
45 or more	35%

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.

IBM's Customer Center, which handles the problems that cannot be identified by the user, directs the customer to the IBM group responsible for that specific need.

TYPICAL CONFIGURATIONS: The following are representative 8100 Information System configurations.

An example of a small 8100 Information System

8130	B24 Processor	\$38,380
3276	1 Model 1 Control Unit	5,380
	Display Station	
3278	1 Model 1 Display Station	1,855
3287	1 Model 1 Printer	4,830
TOTAL		\$50,445

An example of a midsize 8100 Information System

8140	B62 Processor	\$57,500
8809	Magnetic Tape Unit	11,960
3278	8 Model 1 Display Units (directly attached loop)	14,840
3287	1 Model 1 Printer (directly attached loop)	4,830
TOTAL		\$89,130

An example of a large-size 8100 Information System

8150	B20 Processor	\$115,000
8102	A17 Storage and I/O Unit	33,500
8809	Magnetic Tape Unit	11,960
3278	16 Model 2 Display Terminals (directly attached loop)	31,440
3287	3 Model 1 Printers (directly attached loop)	14,490
3274	1 Loop Control Unit	4,885
3278	7 Model 2 Display Terminals (data link attached loop)	12,985
3287	1 Model 11 Printer (data link attached loop)	4,995
TOTAL		\$229,255

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EQUIPMENT PRICES

		Purchase Price (\$)	Monthly Maint. (\$)	Monthly Rental* (\$)	Monthly Lease (\$)
PROCESSORS AND MAIN MEMORY					
8130 Processor					
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	19,040	161.00	1,216	1,035
A22	23 megabytes disk storage, 131K bytes, fixed-head disk	19,820	170.00	1,246	1,060
A23	64 megabytes disk storage	20,600	170.00	1,275	1,085
A24	58 megabytes disk storage, 131K bytes fixed-head disk	21,380	180.00	1,304	1,110
B23	64 megabytes of nonremovable disk storage	37,600	120.00	2,625	—
B24	130 bytes of fixed head and 58 megabytes of non-removable disk storage	38,380	130.00	2,655	—
8140 Processor					
Basic processor; includes main memory as indicated, 4K bytes non-programmable ROM, up to 128 megabytes disk storage, instruction set, eight I/O interrupt levels:					
A31	256K bytes of main memory, 29 megabytes disk storage	26,440	175.00	1,810	1,540
A32	256K bytes of main memory, 23 megabytes disk storage, 131K bytes fixed-head disk	27,220	184.00	1,839	1,565
A33	256K bytes of main memory, 64 megabytes disk storage	28,000	184.00	1,874	1,595
A34	256K bytes of main memory, 58 megabytes disk storage, 131K bytes fixed-head disk	28,780	192.00	1,904	1,620
A41	320K bytes of main memory, 29 megabytes disk storage, floating-point arithmetic	31,780	215.00	2,256	1,920
A42	320K bytes of main memory, 23 megabytes disk storage, 131K bytes fixed-head disk, float-point arithmetic	32,560	224.00	2,291	1,950
A43	320K bytes of main memory, 64 megabytes disk storage, floating-point arithmetic	33,340	224.00	2,321	1,975
A44	320K bytes of main memory, 58 megabytes disk storage, 131K bytes fixed-head disk, floating-point arithmetic	34,120	231.00	2,350	2,000
A51	512K bytes of main memory, 29 megabytes disk storage	28,940	236.00	2,791	2,375
A52	512K bytes of main memory, 23 megabytes disk storage, 131K bytes, fixed-head disk	29,720	245.00	2,820	2,400
A53	512K bytes of main memory, 64 megabytes disk storage	30,500	245.00	2,855	2,430
A54	512K bytes of main memory, 58 megabytes disk storage, 131K bytes fixed-head disk	31,280	253.00	2,891	2,460
A61	768K bytes of main memory, 29 megabytes disk storage	41,440	174.00	2,949	2,510
A62	768K bytes of main memory, 23 megabytes disk storage, 131K bytes fixed head disk	42,220	183.00	2,990	2,545
A63	768K bytes of main memory, 64 megabytes disk storage	43,000	183.00	3,020	2,570
A64	768K bytes of main memory, 58 megabytes disk storage, 131K bytes fixed-head disk	43,780	191.00	3,055	2,600
A71	1024K bytes of main memory, 29 megabytes disk storage	43,940	185.00	3,225	2,745
A72	1024K bytes of main memory, 23 megabytes disk, storage, 131K bytes fixed-disk	44,720	193.00	3,250	2,770
A73	1024 bytes of main memory, 64 megabytes disk storage	45,500	193.00	3,290	2,800
A74	1024 bytes of main memory, 58 megabytes disk, storage, 131K bytes fixed-head disk	46,280	200.00	3,325	2,830
B51	512K bytes of main memory, 58 megabytes disk storage, 131K bytes fixed-head disk	46,110	210.00	2,985	2,540
B52	512K bytes of main memory, 128 megabytes disk storage, 131K bytes fixed-head disk	55,000	256.00	3,484	2,965
B61	768K bytes of main memory, 58 megabytes disk storage, 131K bytes fixed-head disk	48,610	219.00	3,255	2,770
B62	768K bytes of main memory, 123 megabytes disk storage, 131K bytes fixed-head disk	57,500	267.00	3,754	3,195
B71	B71 1024K bytes of main memory, 58 megabytes disk storage, 131K bytes fixed-head disk	51,110	230.00	3,525	3,000
B72	1024K bytes of main memory, 123 megabytes disk storage, 131K bytes fixed-head disk	60,000	276.00	4,024	3,425
C72	1024K bytes of main memory, 123 megabytes disk storage, 131K bytes fixed-head disk	79,500	293.00	4,559	3,880
C82	1536K bytes of fixed-memory, 123 megabytes disk storage, 131K bytes fixed-head disk	84,500	311.00	5,105	4,345
C92	2048K bytes of main memory, 123 megabytes disk storage, 131K bytes fixed-head disk	89,500	329.00	5,658	4,815

*Includes maintenance

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Purchase Price (\$)	Monthly Maint. (\$)	Monthly Rental* (\$)	Monthly Lease (\$)
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PROCESSORS AND MAIN MEMORY (Continued)

8150 Processor

Basic processor; includes up to 4 megabytes storage for A Models; up to 8 megabytes storage for B Models; up to 1 megabyte removable diskette storage. Up to 12 communication and loop ports may be configured:

		Purchase Price (\$)	Monthly Maint. (\$)	Monthly Rental* (\$)	Monthly Lease (\$)
A10	1 megabyte disk storage	75,000	100.00	4,265	—
A20	2 megabytes disk storage	82,500	110.00	4,690	—
A30	3 megabytes disk storage	90,000	120.00	5,120	—
A40	4 megabytes disk storage	97,500	130.00	5,555	—
B20	2 megabytes disk storage	115,000	150.00	6,540	—
B40	4 megabytes disk storage	130,000	170.00	7,390	—
B60	6 megabytes disk storage	145,000	190.00	8,250	—
B80	8 megabytes disk storage	160,000	210.00	9,120	—

Additional Storage

1710	128K bytes additional storage for 8130 processor; maximum one per processor (cannot be used if 1720 storage is used)	1,250	9.50	137.00	117.00
1720	256K bytes additional storage for 8130 processor; maximum three per processor (cannot be used if 1710 storage is used)	2,500	19.00	275.00	235.00
1490	128K byte storage increment for 8140 processor, models A31 through A34; maximum one per processor	1,250	30.50	433.00	369.00
8101	Storage and Input/Output Unit; provides additional disk storage and device attachment capability for 8130/40/50 processors; maximum two per 8130 A Model processor; three per 8130 B Model processor; four with and 8140 or 8150 processor				
	A20 Device attachment capability	6,725	15.50	293.00	250.00
	A23 Provides 64 megabytes disk storage with movable heads	16,635	76.00	832.00	708.00
	A25 Provides 129 megabytes disk storage with movable heads	25,525	132.00	1,328.00	1,130.00
8102	Storage and Input/Output Unit; provides additional disk storage and device attachment capability for 8130/40/50 processors; maximum two per 8130 A Model processor; three per 8130 B Model processor; four with an 8140 or 8150 processor				
	A15 Provides 129 megabytes disk storage with movable heads	21,000	68.00	1,165.00	—
	A17 Provides 259 megabytes disk storage with movable heads	33,500	88.00	1,860.00	—

PROCESSOR OPTIONS AND FEATURES

1530	System Expansion; provides additional interrupt levels; required for attachment of up to two 8101 or 8102 Storage and Input/Output Units or one 8101 or 8102 and one 8809 Magnetic Tape Unit, Model 1B, to processor; maximum one per processor	2,780	13.50	118.00	101.00
1701	Communications Adapter	460.00	0.50	19.00	16.00
3220	Display and Printer Attachment	3,120	16.50	128.00	110.00
3750	Floating Point Feature	4,710	23.50	210.00	179.00
3901	Feature Expansion Prerequisite; required for 1701	560.00	3.50	20.00	17.00
4901	Magnetic Tape Attachment	2,545	10.50	112.00	96.00
5500	Non-Switched Integrated Modem, 600/1200 bps; requires 1601 SDLC Communications Adapter with Clock or 1603 BSC/SS Communications with Clock	625	6.50	28.00	24.00

*Includes maintenance

IBM 8100 Information System

		Purchase Price (\$)	Monthly Maint. (\$)	Monthly Rental* (\$)	Monthly Lease (\$)
PROCESSOR OPTIONS AND FEATURES (Continued)					
Features for 8130, 8140, and 8150 Processors via the 8101 or 8102 Storage and I/O Unit:					
1501	Display and Printer Attachment, Type I; provides attachment of 3277 display, 3287 printer, and 3284, 3286, or 3288 printers (8101 A11 and A13 units only); requires 1505/06 adapters	1,076	4.50	43.00	37.00
1502	Display and Printer Attachment, Type II; same as 1501 but requires 1503	481.00	1.00	19.00	16.00
1503	Communications Attachment, Type I; provides attachment of loops and communications ports (8101 A11 and A13 units only)	1,076	4.50	43.00	37.00
1504	Communications Attachment, Type II; same as 1503; requires 1503	481.00	1.00	19.00	16.00
1505	Display and Printer Adapter	2,765	18.50	117.00	100.00
1506	Additional Display and Printer Adapter	486.00	3.00	19.00	16.00
1507	Diskette Drive and Magnetic Tape Attachment for Model A10; required for attachment of one 4520 diskette drive and one 4521 magnetic tape attachment to 8101 Storage and Input/Output Unit, Model A10	1,076	4.50	43.00	37.00
4520	Second Diskette Drive for 8101 Storage and Input/Output Unit; 1 megabyte	3,455	34.50	157.00	134.00
4521	Magnetic Tape Attachment for 8101 Storage and Input/Output Unit	2,155	11.00	99.00	84.00

COMMUNICATION FEATURES

1711	Two single lobe loops	2,220	22.00	148.00	—
1712	Two single lobe loops	2,220	22.00	148.00	—
1716	Two single lobe loops	2,220	22.00	148.00	—
1721	Two double lobe loops	3,270	29.00	202.00	—
1726	Two double lobe loops	3,270	29.00	202.00	—
1732	Two SDLC EIA links	1,918	22.00	124.00	—
1733	Two SDLC EIA links	1,918	22.00	124.00	—
1734	Two SDLC EIA links	1,918	22.00	124.00	—
1735	Two SDLC EIA links	1,918	14.00	22.00	—
1742	Two SDLC V.35 links	2,292	19.00	134.00	—
1745	Two SDLC V.35 links	2,292	19.00	134.00	—
1752	Two SDLC X.21 links	2,885	19.00	159.00	—
1755	Two SDLC X.21 links	2,885	19.00	159.00	—
1763	Two BSC EIA links	4,748	17.00	226.00	—
1764	Two BSC EIA links	4,748	17.00	226.00	—

*Includes maintenance

SOFTWARE PRICES

		Monthly License Fee Basic (\$)	Monthly License Fee DSLO* (\$)
Distributed Processing Control Executive (DPCX):			
5761-DS1	DPCX/Base	442	376
	Feature 6001	85	64
5761-XR1	Distributed Office Support Facility (DOSF)	753	639
5668-956	Interactive Display Text Facility (IDTF)	92	68
5668-955	DISOSS/8100/DOSF	235	200

*(DSLO) Distributed System License Option

**One-time charge

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		Monthly License Fee Basic (\$)	Monthly License Fee DSLO* (\$)
	Distributed Processing Programming Executive (DPPX):		
5760-010	DPPX/Base	314	294
5760-AS1	DPPX/ASSM	84	71
5760-CB1	DPPX/Cobol Compiler	158	126
5760-LB1	DPPX/Cobol Run-Time Library	27	23
5760-FO1	DPPX/Fortran Compiler	127	108
5760-LM1	DPPX/Fortran Library	62	52
5760-XR1/01	DPPX/DPS Interactive Map Definition	134	114
5760-XR1/02	DPPX/DPS Format Management	53	44
5760-XR2	DPPX/APL Interpreter	424	361
5760-TD1	DPPX/DTMS (Data Base and Transaction Management System)	162	138
5760-RC1	DPPX/DSC (Data Stream Compatibility)	27	23
5760-XC1	DPPX/RJE	42	36
5760-SM1	DPPX/Sort/Merge	37	32
5760-XC2	DMS/DPPX	150	112
5760-ED1	DPPX/GEN3644	26	20
5748-XXG	Distributed Systems Executive (DSX)	235	177
5735-XR1	Host Command Facility for 8100/DPCX systems	120	90
5760-XR5/01	DPPX/PT Monitor	60	—
5760-XR5/02	DPPX/PT Reporter Feature	70	—
5660-271	DPPX/Interactive Productivity Facility	42	36
5660-272	DPPX/PDA (Problem Determination Aid)	32	26
5660-273	DPPX/Programmed Operator Facility	**580	**493
5798-DKX	DPPX/Distributed Processing Connection Facility	**900	—
5760-PL1	DPPX/PL1 Compiler	383	325
5760-LM2	DPPX/PL/1 Library	66	56
5760-XR6	Data Capture and Management System/DPPX	119	88

*(DSLO) Distributed System License Option

**One-time charge ■

IBM 8100 Information System

MANAGEMENT SUMMARY

For those in the data processing industry who believe every product that IBM introduces is an instant and unqualified success, we offer the 8100 Information System. Introduced in 1978, the 8100 has been a product line that, to date, has failed to find a niche in the market, as either a distributed data processing system or as a small business minicomputer. IBM has not left the system for dead, however. Since 1983, a long line of enhancements have been added to the 8100, making the system much more attractive to prospective users. Several new high-end processors have been introduced, the DPPX and DPCX operating systems were enhanced, and Personal Computer, 3270-PC, and Displaywriter support has been added.

During 1984, IBM enhanced both the hardware and software areas of the 8100 Information System. Enhancements in the hardware area included: the addition of the 8150 processor family, increasing the storage capacity of the 8100 system to 8 megabytes; the introduction of the 8102 Storage and I/O Unit; a hardware timer facility; and the 8100 PC Adapter. Software announcements include enhancements to the Distributed Processing Programming Executive operating system (DPPX/SP Release 2), and enhancements to the Distributed Processing Control Executive operating system (DPCX/DOSF Release 4). Workstation and office services were announced, providing for network and shared resource management services of the IBM Personal Computer, 3270-PC, and Displaywriter. In addition, the IBM 8100 Information System is now supported by the IBM Information Network.

The 8150 processor family includes eight models: Model A10 with 1 megabyte memory; Model A20 with 2 megabytes of memory; Model A30 with 3 megabytes of memory; Model A40 with 4 megabytes of memory; Model B20 with 2 megabytes of memory; Model B40 with 4 megabytes of memory; Model B60 with 6 megabytes of memory; and Model B80 with 8 megabytes of memory. Logical storage of up to 16MB is also provided.

The 8100 Information System is a family of processors that support distributed processing in a host controlled arrangement. An 8100 system can include up to 8 megabytes of main memory, up to 259 megabytes of fixed-disk storage, and numerous local and/or remote display and printer terminals.

MODELS: 8130 Processor Models A21, A22, A23, A24, B23, & B24; 8140 Processor Models A31, A32, A33, A34, A41, A42, A43, A44, A51, A52, A53, A54, A61, A62, A63, A64, A71, A72, A73, A74, B51, B52, B61, B62, B71, B72, C72, C82, & C92; 8150 Processor Models A10, A20, A30, A40, B20, B40, B60, & B80.

CONFIGURATION: All processor models support attachment of 8101 and/or 8102 Storage and I/O Units and 8809 Magnetic Tape Units; attachment of other peripherals is accomplished via direct attachment or attachment through ports.

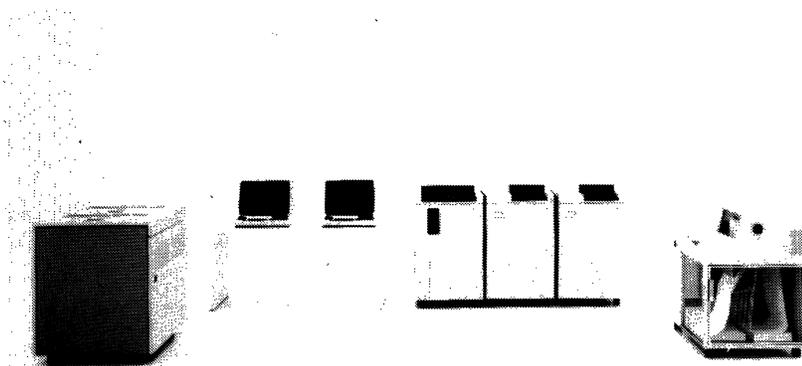
SOFTWARE: The Distributed Processing Program Executive (DPPX) and Distributed Processing Control Executive (DPCX) program products are available for use as operating systems.

COMPETITION: Large scale DDP systems from Four-Phase, Harris, and others.

PRICE: Purchase prices for the 8100 processors range from \$19,040 to \$160,000.

CHARACTERISTICS

VENDOR: International Business Machines Corporation (IBM), Old Orchard Road, Armonk, NY 10504. Contact your local IBM representative. In Canada: IBM Canada Ltd., Markham, 3500 Steeles Avenue East, Markham, Ontario L3R 2Z1. Telephone (416) 474-2111. Or contact the IBM office in the nearest major city.



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 2048K bytes of memory and 639 megabytes of disk storage.

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TABLE 1. IBM 8100 INFORMATION SYSTEM CHARACTERISTICS

	8130 A21/A22/ A23/A24	8130 B23/B24	8140 A31/A32/ A33/A34	8140 A41/A42/ A43/A44	8140 A51/A52/ A53/A54 (4)	8140 A61/A62/ A63/A64	8140 A71/A72/ A73/A74 (4)
Main memory, bytes	256K to 1024K	1024K-2096K	256K, 384K	320K	512K	768K	1024K
8101/8102 Storage and I/O units	2	3	4	4	4	4	4
Disk storage, bytes max.	64M	64M	64M	64M	64M	64M	64M
Diskette drives, max.	2	2	2	2	2	2	2
Tape drives, max.	4	4	4	4	4	4	4
Communications ports	2 to 6	2 to 6	3	2 (1)	0	0	0
Communications protocols:							
SDLC	Yes	Yes	Yes	Yes (2)	Yes	Yes	Yes
BSC	Limited	Limited	Limited	Limited (2)	Limited	Limited	Limited
S/S (asynchronous)	Limited	Limited	Limited	Limited (2)	Limited	Limited	Limited
X.21	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Floating point hardware	No	No	No	Yes	No	No	No
Expanded Function Panel	No	No	Yes	Yes (1)	No	No	No

(1) Mutually exclusive

(2) Not with Expanded Function Panel

(3) All in the 8101/8102 units

(4) Available only as model upgrades

➤ The 8150 A models offer one Processing and Control Element (PCE) with a single I/O bus. The 8150 B models have two PCEs and two I/O buses with the capability of operating in dual mode or in single mode with either PCE. The 8150 B models have two separate and identical main storage banks that can operate together in interleave mode or in noninterleave mode. This dyadic (dual) processing provides a higher level of system availability. The 8150 is fault tolerant in the sense that it will perform a self test, and if any of these elements are found to be failing during an initial program load (IPL), the 8150 will automatically reconfigure itself to remove the failing element. Although reduced in memory, I/O, and/or processing capability, the resulting configuration will continue operations.

Disk storage is not available within the 8150 processor itself, but is available through attached 8101 or 8102 storage and input/output units. The 8150 processor allows for the attachment of up to four 8101 and/or 8102 storage and I/O units, or three 8101 or 8102 storage and I/O units and one 8809 magnetic tape unit. Up to three additional magnetic tape units can attach to the 8809 magnetic tape unit.

The introduction of the 8150 models created a new growth path for users of the 8100 system by providing improved performance and increased main storage capacities than was previously available on an 8130 or 8140 processor. This allows for either a faster system response time or provides computing power that can service more users while maintaining response levels. The increased main storage capacity of the 8150 provides additional logical address space and allows more shared programs to reside on a system, improving programming capabilities.

The 8100 processor distributed processing system has a 16-bit memory bandwidth, 48 sets of eight 32-bit registers, and 32-bit logical addressing (4-megabyte range). There are presently 43 processor models available within three model numbers: 8130, 8140, and 8150. The 8130 operates with a cycle time of 1500 nanoseconds, and the 8140 has a cycle time of 800 nanoseconds on 8-, 16-, or 32-bit operands. ➤

➤ **DATE OF ANNOUNCEMENT:** October 1978.

DATE OF FIRST DELIVERY: August 1979.

NUMBER DELIVERED TO DATE: Information not available.

SERVICED BY: IBM.

CONFIGURATION

There are a total of 43 8100 processor models, which can be conveniently grouped into the following series: 8130 A21/A22/A23/A24; 8130 B23/B24; 8140 A31/A32/A33/A34; 8140 A41/A42/A43/A44; 8140 A51/A52/A53/A54; 8140 A61/A62/A63/A64 (available as model upgrades only); 8140 A71/A72/A73/A74 (available as model upgrades only); 8140 B51/B52; 8140 B61/B62; 8140 B71/B72; 8140 C72/C82/C92; 8150 A10/A20/A30/A40; and 8150 B20/B40/B60/B80.

Table 1 details the specifications of the various 8100 processor models.

One nonremovable high-performance disk and one diskette are standard on all 8130, 8140 and 8150 models. All 8130 models can attach up to 6 communication links or local loops, while the 8140 can attach up to 10, depending on the model. A maximum of 12 ports are available on the 8150 models, however, only 10 loops and SDLC lines may be activated at any one time on each processor. The limitation on the total number of active ports at greater than 9600 bps is four on each processor. Some 8140 models and the 8150 models offer floating-point arithmetic hardware. Floating-point arithmetic can be performed on the 8130, 8140 and 8150 models without floating-point hardware via the DPPX/ Fortran floating-point subroutines.

The 8130 base system can be expanded to include up to three 8101 and/or 8102 Storage and Input/Output units, while the 8140 base system can be expanded to include up to four 8101 and/or 8102 units. Up to eight 8101 and/or 8102 units may be attached to an 8150 processor. Up to four 8809 magnetic tape units can be attached to an 8100 Information System. If an 8809 Model B magnetic tape unit is attached to the processor, the maximum number of 8101 or 8102 units that can be attached are reduced by one.

An expanded Function Operator Panel (EFOP) feature is available with some models of the 8140 processor. The ➤

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TABLE 1. IBM 8100 INFORMATION SYSTEM CHARACTERISTICS (Continued)

	8140 B51/B52	8140 B61/B62	8140 B71/B72	8140 C72	8140 C82	8140 C92
Main memory, bytes	512K	768K	1024K	1024K	1536K	2048K
8101/8102 Storage and I/O units	4	4	4	4	4	4
Disk Storage, bytes max.	123M	123M	123M	123M	123M	123M
Diskette drives, max.	2	2	2	2	2	2
Tape drives, max.	4	4	4	4	4	4
Communications ports	Up to 11	Up to 11	Up to 11	Up to 10	Up to 10	Up to 10
Communications protocols:						
SDLC	Yes	Yes	Yes	Yes	Yes	Yes
BSC	Limited	Limited	Limited	Limited	Limited	Limited
S/S (asynchronous)	Limited	Limited	Limited	Limited	Limited	Limited
X.21	Yes	Yes	Yes	Yes	Yes	Yes
Floating point hardware	Optional	Optional	Optional	Optional	Optional	Optional
Expanded Function Panel	Yes	Yes	Yes	Yes	Yes	Yes

- (1) Mutually exclusive
 (2) Not with Expanded Function Panel
 (3) All in the 8101/8102 units
 (4) Available only as model upgrades

➤ Memory capacity ranges from 256K on the low end 8130 to 6MB on the top of the line 8150. This storage makes use of Error Correction Code (ECC) to provide correction of all single and most double-bit main storage errors. Capability for address translation and storage protection for up to 16 million bytes of logical storage is provided.

The 8140 C and 8150 B models are similar in that they can have one or two processors, depending on user requirements, with the capability of operating in single or dual mode. All 8100 processors are alike in that each 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 or 8102 Storage and I/O Units. The 8130 models can have up to three 8101 or 8102s attached; the 8140 models can have up to four attached, while the 8150 models support up to eight.

The 8130 B processor uses high-density circuitry providing internal speeds up to 50 percent faster than the 8130 A (the current small 8100 processor) and double its maximum main storage to two megabytes. The 8150 A models provide growth up to 1.5 times the throughput of the 8140 C models. The 8150 B models provide growth up to 1.8 times the throughput of the 8150 A models.

The 8100 Information System, a communications-oriented system, can operate either on a standalone basis, or can attach to a System/370, a 4300 system, or to another 8100 system. The system provides a flexible attachment method for a wide variety of input/output (I/O) devices that can be attached to the I/O bus of the 8100 processors via communication features which include data link (common carrier communication lines), direct-connect (connected directly to the system without modem), and loops that are direct-attached or data link-attached. Up to 12 communication and loop ports can be configured in an 8150 Processor. Additional ports can be configured via an 8101 or 8102. ➤

➤ 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.

Any combination of display terminals and/or printers may be attached to the 8100. Each Display and Printer Additional feature (1506 or 3220) allows the attachment of up to four additional I/O devices in any combination; however, there are limits to the attachment of some device types. If both the 1506 and 3220 are attached, the maximum number of I/O devices can be further expanded to 24. A maximum of six device attachment features can be selected for one 8101 or 8102 unit, allowing a maximum total of 24 of these I/O devices. Each I/O device is connected to the 8101 or 8102 by a single coaxial cable with a maximum length of 2,000 feet.

The 8101 and 8102 Storage and I/O Units allow expansion of the system's communication and I/O capabilities, as well as additions to disk storage. All devices attachable to the 8130, 8140, and 8150 are attachable to the 8101 and 8102. The 8101 and 8102 are attached to the I/O bus of the 8130, 8140, or 8150 processor.

The 8100 PC Adapter feature provides for the direct connection of the IBM Personal Computer or Personal Computer XT to local or remote 8100 loops.

TRANSMISSION SPECIFICATIONS

Each communication adapter in an 8100 system controls one loop or data link (i.e., through a common carrier communication line) or one "direct connection" to an I/O unit that is a limited distance from the 8100 system. Synchronous data link control (SDLC), binary synchronous communications (BSC), start-stop (S/S), or X.21 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-C interface is 40 feet. The maximum distance for direct connection through a V.35 interface is 1,000 feet.

➤ CCITT X.21 support can be provided on all 8100 models for accessing switched or nonswitched data transmission lines ➤

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TABLE 1. IBM 8100 INFORMATION SYSTEM CHARACTERISTICS (Continued)

	8150 A10	8150 A20/B20	8150 A30	8150 A40/B40	8150 B60	8150 B80
Main memory, bytes	1MB	2MB	3MB	4MB	6MB	8MB
8101/8102 Storage and I/O units	8	8	8	8	8	8
Disk Storage, bytes max.	16B (3)	16B (3)	16B (3)	16B (3)	16B (3)	16B (3)
Diskette drives, max.	2	2	2	2	2	2
Tape drives, max.	4	4	4	4	4	4
Communications ports	Up to 12	Up to 12	Up to 12	Up to 12	Up to 12	Up to 12
Communications protocols:						
SDLC	Yes	Yes	Yes	Yes	Yes	Yes
BSC	Limited	Limited	Limited	Limited	Limited	Limited
S/S (asynchronous)	Limited	Limited	Limited	Limited	Limited	Limited
X.21	Yes	Yes	Yes	Yes	Yes	Yes
Floating point hardware	Optional	Optional	Optional	Optional	Optional	Optional
Expanded Function Panel	No	No	No	No	No	No

(1) Mutually exclusive
 (2) Not with Expanded Function Panel
 (3) All in the 8101/8102 units
 (4) Available only as model upgrades

➤ A hardware timer facility provides the 8150 system with the date, time-of-day, automatic power on, an interval timer, and (optionally) system clock synchronization.

The 8101 and 8102 Storage and I/O Units attach to the I/O bus of all 8100 processors and provide additional disk storage and device attachment capabilities for the 8100 system, resulting in enhanced growth capability and extended configuration flexibility of the 8100 Information System. The 8102 is available in two models, the A15 (129MB) and the A17 (259MB), and can potentially provide twice the data and number of data sets as the 8101. Disk storage for the 8101 and 8102 is provided by a nonremovable high-speed direct access storage device. The 8102 Model A15 contains a single disk drive and access mechanism. The 8102 Model A17 contains two disk drives, each with its own access mechanism. Maximum file capacity of over one gigabyte (1036MB) can be achieved with the addition of 8102 units. The 8102 can coexist in the same configuration with the 8101 storage and input/output unit.

The 8100 PC Adapter consists of a printed circuit card and a program diskette for installation in the IBM Personal Computer or the IBM Personal Computer XT for direct loop attachment to the IBM 8100 Information System. The adapter has also been enhanced to include support for the IBM Personal Computer 5153 Color Display.

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

Several enhancements have been made to the DPCX operating system. These include support for the 8130 Model B and 8150 processors, which enhance the modularity of the 8100 processor family and provide increased performance, availability, and reliability; increased functional capability ➤

➤ available on public data networks. More flexible configurations are possible with X.21 support, according to IBM. The feature also provides autoanswer and autocal capabilities. Speeds up to 48,000 bps can be supported.

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

The *S/S communications adapter* can connect to analog networks or direct connections. Analog network speeds and direct connection speeds range from 110 to 300 bps for the 8130 and from 110 to 1200 bps for the 8140. S/S direct connections are through an RS-232-C 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.

Table 2 lists the communication attached devices that can attach to the 8100 communication ports.

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, 8140, or 8150 processor, or an 8101 or 8102 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 and a receiver at the other end, 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) ➤

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➤ and usability improvements to the the Data Stream Compatibility (DSC) facility; Displaywriter attachment alternatives; an increase in the number of data sets from 96 to 191; and support of the 5210 printer Models E1 and E2. The DPCX/DOSF system has also been enhanced to allow Displaywriter documents and Personal Computer files to be stored in the 8100 and exchanged with other users.

Enhancements to the DPPX operating system include support of the IBM 8150 A processor by providing a new performance and reliability hardware option, the 8150 hardware timer, which provides power on and off capabilities to further reduce the need for 8100 operators at remote locations; and the 8102 storage and I/O unit. Enhancements to DPPX also include the new Interactive Map Definition (IMD) program that enables the application programmer to create and update screen and printer panel layouts on-line; support for the DisplayWrite 2 program that provides the 8100 user with the text capabilities of the Displaywriter; support for the DPPX/PT (Performance Tool) Version 2 that provides a set of functions to monitor performance, collect workload information, and print reports relating to the operation of an IBM 8100 system; and the DPPX Shadow File Manager.

The DPPX Shadow File Manager provides a high level of protection against loss of data due to disk hardware failures. This is accomplished by maintaining an exact copy of a vital DPPX disk volume on a second disk volume. Every update to one disk volume is automatically applied to the other disk volume as a dual data management function. The Shadow File Manager has been designed to function on any 8100 system that operates under a DPPX/FEP6 or DPPX/SP operating system. The system must have at least three disk volumes. Two of the disks for shadow processing should be the same size, and the disk containing the critical data must have a volume catalog. All disks must have the same volume serial. DPPX/SP has been enhanced to support the IBM Personal Computer (via loop attachment), the 3270 Personal Computer, and the 3270-PC Attachment stations.

COMPETITIVE POSITION

Upon its introduction in October 1978, the 8100 Information System was viewed by many observers as IBM's "official sanction" of the distributed data processing concept. The system proved to be a disappointment to IBM, however. Software problems and the system's difficulty of use were cited by many users contacted by Datapro as drawbacks of the 8100 product line. The 8100 Information System falls into the IBM systems grouping that includes the Series/1; System/34, 36, and 38; and 4300. The 8100 system seems, at times, to be overshadowed by the other IBM systems, especially the 4300 group, and may be even further affected by the newly released 4361 Model Group 3, and its reduced pricing structure. In comparison of the two systems, the entry-level 4361 Group 3 offers 2MB to 4MB of memory with the basic processor prices ranging from \$56,500 to \$71,500. The 8100 processors comparable in that memory range are the 8150 models A20 (2MB), B20

TABLE 2. 8100 COMMUNICATION ATTACHED DEVICES

Terminals conforming to 2780/3780 line protocol
3274 Control Unit Models 41C, 51C, 61C with:
3178 Display Station
3180 Display Station Model 1
3262 Printer Models 3, 13
3268 Printer Model 2
3278 Display Station Models 1, 2, 3, 4, 5
3278 PC Attachment
3279 Color Display Station Models 2A, 2B, 3A, 3B
3287 Printer Models 1, 2, 1C, 2C
3289 Printer Models 1, 2
3290 Information Panel
5210 Printer Models G1, G2
6580 Displaywriter w/3270 AW
3276 Control Unit/Display Station Models 1, 2, 3, 4, 11, 12, 13, 14 with:
3178 Display Station
3262 Printer Model 13
3268 Printer Model 2
3278 Display Station Models 1, 2, 3, 4
3279 Color Display Station Models 2A, 2B, 3A, 3B
3287 Printer Models 1, 2, 1C, 2C
3289 Printer Models 1, 2
5210 Printer Models G1, G2
6580 Displaywriter w/3270 AW
3601 Finance Communication Controller Models 1, 2A, 2B, 3A, 3B
3602 Finance Communication Controller Models 1A, 1B
3631 Plant Communication Controller Models 1A, 1B
3632 Plant Communication Controller Models 1A, 1B
3651 Store Controller Models 25, 75
3684 Point-of-Sale Control Unit Models 1, 2
3705-II, 80 Communications Controller
3725 Communication Controller
3767 Communication Terminal Models 1, 2, 3
3842 Loop Control Unit
3843 Loop Control Unit
4701 Finance Communication Controller Model 1
4952, 4954, 4955, 4959 Processor (Series/1)
5150 Personal Computer
5285, 5288 Programmable Data Stations
6580 Displaywriter (3270 DSC load only)
6670 Information Distributor
7426 Terminal Interface Unit Model 2 (w/associated terminals)
8101 Storage and I/O unit
8130, 8140, 8150 Processors
8775 Display Terminal Models 11, 12

➤ 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 LSCs 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 ➤

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➤ (2MB), and B40 (4MB) with a price range of \$82,500 to \$130,000.

However, the enhancements that IBM has made to the 8100 product line in the past year, including the announcement of the 8150 processor family, the PC Adapter, fault tolerant dual processing, increased memory, and increased throughput speed, shows a continuing interest on IBM's part in making the 8100 system a viable contender in the distributed processing arena. As a distributed data processing system, the 8100 competes with other large DDP systems, including the Four-Phase Series 5000 and the Harris MIND.

ADVANTAGES AND RESTRICTIONS

The strength of the 8100 Information System is as a host-managed distributed processing system. The distributed processing functions of the 8100 allows the user to take advantage of the processing power of the large-type host computer and shared disk space, while providing a cost advantage in that large expenditures are not required to purchase a large in-house computer. However, accessing the remote host computer can provide for some disadvantages as well, such as line problems, or the host computer may be down or tied up, leading to processing delays and poor response time. The 8100 Information System can also be used as a standalone small business computer.

A significant advantage provided the 8100 system within the past year is the introduction of the 8150 processor, which extends the growth path, increases the memory and disk storage capacity, provides a faster system response time, increases the system computing power, and last but not least, provides improved availability through dual processing, automatic reconfiguration, and fault locating self tests. However, IBM does not provide a growth path for the user after the 8150 without major reconfiguration of both hardware and software.

Another advantage offered by the 8100 is the new PC interface which allows PCs to access the 8100 as well as host applications. Support for the 3270-PC and Displaywriter have also been provided for on an 8100 system.

Additional advantages include enhancements to the operating systems. An example would be the DPPX/SP Release 2 which further strengthens the primary role of the IBM 8100 as a distributed data processing system, while adding a new dimension as an office system and workstation cluster controller.

USER REACTION

When Datapro ran its 1984 Computer Users Survey in February, six users of the IBM 8100 Information System responded. The systems rated were 8130 and 8140 processors. The 8150 processors have not been installed long enough to get an accurate analysis of their performance. The average life of all the systems was 45 months. Of the systems rated, one was purchased, three were leased from the manufacturer, and two were leased from third party ➤

➤ 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-C 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.

Table 3 lists the devices that can be attached to a direct-attached loop or a data-link attached loop via the 3842 or 3843 loop control unit.

SOFTWARE

OPERATING SYSTEMS: Two primary IBM licensed program products are currently available to support the 8100 system hardware. They are the Distributed Processing Control Executive (DPCX) and the Distributed Processing Programming Executive (DPPX).

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 Program Executive (DPPX) is a general-purpose, transaction-oriented operating system that supports a number of optional licensed programs, including Cobol and Fortran.

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

The *Distributed Processing Control Executive (DPCX)* is a programmable, multiapplication, display-oriented control system that can control the execution of up to 62 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 databases 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/VTAME, ACF/TCAM, and EXTM host SNA access methods. VSAM and QSAM are also supported. The 8100 system is connected to the host via an SDLC line. System Control program (SCP) support is provided by DOS/VS, DOS/VSE, OS/VS1, and OS/VS2 (MVS). In addition, DPCX is supported by a number of program products such ➤

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▷ vendors. Only one of the respondents was a first time computer user, four converted from other manufacturer's systems, while one had upgraded from another IBM system. The type of industry represented most in the survey was manufacturing (3 users), government (2 users), and insurance (1 user). Principal applications included manufacturing (3 users), order processing/inventory control (3 users), sales and distribution (3 users), accounting/billing (2 users), engineering (2 users) payroll/personnel (2 users), purchasing (2 users), construction (1 user), education/scheduling/administration (1 user), mathematics/statistics (1 user), process control (1 user), and criminal justice (1 user). Most of the users developed their own applications software in-house (5 users), while two stated they obtained their software from the manufacturer and two stated that software was obtained from contract programming. Only one said they obtained their software from an independent supplier.

Only one of the users responded that they used remote workstations (16 to 30), while all the users employed local workstation/terminals (averaging between 15 and 30 per user). Memory capacities averaged between 512K bytes to 1MB, while total disk storage capacities averaged over 100MB. Planned acquisitions for 1984 included additional software from the manufacturer (2 users), expansions to data communications (3 users), and expansions to hardware (3 users). All six users stated the system met their requirements, and all six stated they would recommend the system to other users. The six users rated their systems as shown in the table below.

	Excellent	Good	Fair	Poor	WA*
Ease of operation	2	4	0	0	3.33
Reliability of system	4	2	0	0	3.67
Reliability of peripherals	3	2	1	0	3.33
Maintenance service:					
Responsiveness	3	3	0	0	3.50
Effectiveness	2	4	0	0	3.33
Technical support:					
Troubleshooting	3	2	0	1	3.17
Education	2	3	1	0	3.17
Documentation	2	3	1	0	3.17
Manufacturer's software:					
Operating system	2	4	0	0	3.33
Compilers and assemblers	2	3	0	0	3.40
Applications programs	2	4	0	0	3.33
Ease of programming	1	4	0	0	3.00
Ease of conversion	1	4	1	0	3.00
Overall satisfaction	2	4	0	0	3.33

*Weighted Average based on a scale of 4.0 for Excellent.

To further expand on the user's reaction, four users were contacted by telephone. Two of the users contacted have an 8130 system, one has an 8140 system, and one has an 8140 system at the home site with several 8140 and 8130 systems at various locations.

An East Coast user representing a government agency was contacted to discuss his feelings on the IBM 8100. This user presently has an 8130 (wasn't sure which model), had a growth path from the IBM 3276, up through the IBM 3790 to the 8130, and plans to expand in the next year or so to the

TABLE 3. LOOP ATTACHED DEVICES

3104 Display Terminal Models B1, B2
3262 Printer Models 2, 12
3268 Printer Model 1
3274 Control Unit Models 51C, 61C with:
3178 Display Station
3262 Printer Models 3, 13
3268 Printer Model 2
3278 Display Station Models 1, 2, 3, 4, 5
3278 PC Attachment
3279 Color Display Station Models 2A, 2B, 3A, 3B
3287 Printer Models 1, 2, 1C, 2C
3289 Printer Models 1, 2
3290 Information Panel
5210 Printer Models G1, G2
6580 Displaywriter w/3270 AW
3276 Control Unit/Display Station Models 11, 12, 13, 14 with:
3178 Display Station
3262 Printer Model 13
3268 Printer Model 2
3278 Display Station Models 1, 2, 3, 4
3278 PC Attachment
3279 Color Display Station Models 2A, 2B, 3A, 3B
3287 Printer Models 1, 2, 1C, 2C
3289 Printer Models 1, 2
5210 Printer Models G1, G2
6580 Displaywriter w/3270 AW
3287 Printer Models 11, 12
3289 Printer Model 3 with:
2502 Card Reader Model A1
3501 Card Reader
3521 Card Punch
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
3647 Time and Attendance Terminal
5210 Printer Models E1, E2
7426 Terminal Interface Unit Model 1 (w/associated terminals)
8775 Display Terminal Models 1, 2

▷ as IMS/VS, CICS/VS, VSPC and TSO, DSX, RES/JES1, JES2, JES3, POWER/VS, and POWER/VE. 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. 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 host support programs provided with the Host Prep 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.

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▷ IBM 4330. The user commented that they need to be less restricted, able to operate more independently, and have more flexibility. He felt this could be better accomplished with the 4330. This user's primary application is business licensing which includes the processing of 500,000 records employing 200 different codes. This involves the monthly mailings of bills, licenses, renewal notices, and past due notices. Other applications include in-house personnel record processing and budgeting. The system supports between six to fifteen workstations, and provides up to 512K bytes of memory and up to 10MB disk storage. This user feels the system is meeting up to 90 percent of their requirements.

The user stated they were one of the first to have an 8130 installed (1979) and had some problems originally with the connections between the loop and I/O devices but that has all been ironed out and the system is now running well. The main advantage mentioned was that the system provides for online distributed processing, which provides them with the processing power of a large host system, without the expenses required to install an in-house large-type computer. The user added, "It cuts down on budget expenditures." However, the advantages also seemed to be this user's disadvantages in that while they enjoyed the cost advantages of the processing power of a larger host computer, operations were impaired if the host was down or tied up.

The second user we contacted represented a West Coast manufacturing company utilizing an 8130 A24 with up to 15 workstations, up to 1MB main memory, and up to 600MB disk storage. This company converted from a Qantel system in 1979 and does not have any present plans to upgrade the system. All applications software packages are developed in-house at the home office. Principal applications at four different manufacturing locations are accounting, manufacturing, order entry, billing, and inventory control. The user considers the system very reliable. They have had no hardware problems. He stated one of the greatest advantages was the system's support of Cobol, which provides for easy system development. The user did state, however, that since they presently do not have a system administrator/programmer, they are having difficulty understanding, maintaining, and configuring the operating system. He feels the operating system support could be improved upon, the documentation could be better, and the class education and/or self-explanatory text is inadequate.

The third user contacted represented a Midwest manufacturing firm with 46 different locations. An 8140 C system was utilized with up to 60 workstations supported and up to 1MB of memory. When asked to list the advantages of this system, the user simply said, "None." The user had no problem listing the disadvantages such as poor host response time, poor turn-around time from the host computer, and electrical and software problems at the host computer. However, as one will note, these complaints were geared more toward the IBM host computer rather than the 8100 system. The user's principal applications were accounting, education/scheduling/administration, ▷

▷ DPCX offers a full-screen system reconfiguration facility, a simplified logon procedure, the ability to dump to disk, and operands and instructions for improved performance. It also supports the downstream connection of Series/1 systems via a communications port.

Support is provided by DPCX for all the processor models of the 8100 Information System, including those offering dual-processor mode. The IBM Displaywriter can be attached to the 8100.

DPCX Release 4 provides enhanced functional capability and usability improvements of the Data Stream Compatibility (DSC) facility, and provides enhanced connectivity and network management. With Release 4, the number of supported user data sets has been increased from 96 to 191, bulk print support is extended to include the 5210 printer Models E1 and E2, and support for additional attachment alternatives for the IBM Displaywriter is provided. These attachment alternatives allow the Displaywriter to function as a 3270 display.

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, 8140, and 8150 processors, the 8101 and 8102 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 communications.

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

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

DPPX/Base Functional Enhancement Package 6 (FEP6) supports the IBM 3640 Plant Communication System for host communications, the Displaywriter, the 5280 Distributed Data System, and the Series/1. DPPX also provides users with the capability to access the Distributed Office Support Facility (DOSF) on an attached 8100 system running DPCX. An IBM 8775 display with Interactive Display Test Facility (IDTF) software can be used either as a DPPX terminal or an occasional text terminal to DOSF under DPCX.

▷ *DPPX/SP (System Product)* extends the distributed data processing capabilities of the DPPX/Base operating system ▷

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► engineering, manufacturing, mathematics/statistics, order processing/inventory, payroll/personnel, process control, purchasing, and sales/distribution. No processing of these applications are done at the user's facility, all is done through the host computer. The user is looking at the possibility of moving up to the IBM 4368 system in the near future.

The fourth user contacted represented a government agency on the East Coast. They have several systems installed at various sites which include both 8130 and 8140 models. All are used for criminal justice case tracking, and the one at this user's site, an 8140 Model B, is also used for product development. The 8140 B at the user's site supports up to 15 workstations with up to 2MB of memory and up to 600MB of disk storage. When asked if they could list any system problems, the answer was, "No, the system is performing well for all intended purposes." All applications software is developed by the user—none is purchased from IBM. The user listed the advantages of the system as being flexible, providing for remote processing, and the ability to tie into personal computers. The user also stated that if we had called him a few years ago, he could have listed a lot of disadvantages, but says that IBM has provided good support and most of the original deficiencies in the system have been solved. One of the problems he mentioned was that the IBM 8100 previously provided no growth path for him, but feels this has been corrected with the addition of the 8150 processor. They do not plan to expand the system at the present time at the user's site, but will possibly upgrade systems at other sites to the 8150. □

► to provide improved usability and additional functional and connectivity enhancements. It combines and enhances the benefits of DPPX/Base FEP6, plus ten additional DPPX programs, into a single transaction-oriented product. Release 2 provides enhanced support for the IBM Personal Computer, 3270 Personal Computer, 3270 Personal Computer Attachment stations, and Displaywriter workstations, plus support of the 8150 hardware timer. This support provides for documents and files to be exchanged between the workstations and DPPX/SP Release 2, to be stored and printed at the 8100, and to be shared with other DPPX/SP Release 2 users.

DATABASE MANAGEMENT SYSTEM: The *DPPX/Database and Transaction Management System (DTMS)* provides transaction management and routing as well as database management and control for the 8100/DPPX system. Facilities to assist in developing, operating, and managing on-line applications are provided.

LANGUAGES: The following languages are offered for the IBM 8100 system:

DPPX/Assembler is 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.

DPPX/APPL is compatible with VS APL Release 4, this implementation of the APL language includes the primitives and operator functions of VS APL, plus most of the system commands and variables.

DPPX/Cobol is a program product that offers a Cobol compiler and a run-time library containing reentrant rou-

ties that support arithmetic, logic, and data conversion, as well as input/output operations.

DPPX/Fortran is a high-level, mathematically oriented programming language and compiler designed according to the specifications of ANSI Fortran X3.10-1966.

DPPX/PL/1 is a program product that includes a PL/1 compiler and library with reentrant routines. The PL/1 implementation in the 8100 conforms to the NAIS X3.53-1976 standard.

COMMUNICATIONS: The *DPPX/3270 Data Stream Compatibility (DSC)* is 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.

DPPX/Distributed Presentation Services (DPS) is a program product that provides device-independent control for terminals supported by DPPX, and eliminates the need for datastream communication and buffer programming.

DPPX/Remote Job Entry-Workstation Facility (RJE) permits the 8100 to function as an SNA or BSC remote job entry workstation for submitting jobs to a host 4300, 303X, or System/370. The host requires an OS/VS, DOS/VS, DOS/VSE, or VM/370 operating system with a job entry subsystem installed.

Host Command Facility is designed to enable a host-attached terminal to function as if it were directly attached to an 8100/DPPX or DPCX system, the Host Command Facility gives the operator at a central System/370 site the capability to operate and control remote SLC-connected 8100 systems.

UTILITIES: The *Interactive Display Text Facility (IDTF)* provides text entry and edit functions for an IBM 8775 Display Terminal connected to an IBM 8100. Text/edit functions are similar to those on the IBM 3732 Text Display Station, while existing 8775 data functions are maintained.

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.

Development Management System (DMS)/DPPX is a program product that aids in the design and generation of application programs by providing a simple programming interface to the user.

DPPX/Interactive Productivity Facility is a simplified, full-screen interactive interface to the DPPX command facility with tutorial routines included that explain system functions. The latest update to DPPX/IPF, Release 2, provides improved productivity functions in the areas of system use, system operation, and system management.

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/Performance Tool (PT) is a program product consisting of the DPPX/PT Monitor and the DPPX/PT Reporter feature. The DPPX/PT Monitor collects performance data, and the DPPX/PT Reporter generates reports on the basis of data collected by the Monitor. PT Release 2 combines the previously separate monitor program and reporter feature and a new accounting collector into a single program. ►

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- The *Distributed Processing Development System (DPDS)* enables systems programmers to code programs for an 8100 system running under DPPX and to compile and test them on the host before implementing them on the 8100.

The *DPPX/Distributed Processing Connection Facility (DPCF)* provides concurrent access to multiple applications and subsystems from a single terminal. Multiple terminal users can log on to DPCF, and the various application sessions can be selected dynamically. Sessions can be with systems such as DPPX/DTMS, DPCX, IMS, CICS, and TSO. SNA protocols are supported.

DPPX/Problem Determination Aid (PDA) is designed to improve central problem management. DPPX/PDA works in conjunction with the Network Problem Determination Application (NPDA) running in a System/37 or 4300 Series processor. It provides increased central site awareness of and ability to react to malfunctions at remote sites.

The *DPPX/Programmed Operator Facility* provides the ability for an 8100 to intercept and service messages directed to the system operator. Each message can have a unique programmed response which can be specified by the user.

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

The *DPPX Shadow File Manager* provides the DPPX/SP Release 1 or DPPX/FEP6 user with a high level of protection against loss of data due to disk hardware failures. This is accomplished by maintaining an exact copy of a vital DPPX disk volume on a second disk volume.

The *DPPX/SP Interactive Map Definition (DPPX/SP IMD)* offers improved programmer productivity by enabling the application programmer to create and update screen and printer panel layouts online at program development time. DPPX/SP IMD is upward compatible with the DPS Version 1 and Version 2 Interactive Map Definition feature.

The *Distributed Systems Executive (DSX)* is 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.

OFFICE AUTOMATION: The *DPCX/Distributed Office Support Facility (DOSF)* supports the preparation of office correspondence and other business-related documents. DPCX/DOSF permits document creation, revision, formatting, storage, retrieval, printing, and host transfer. DPCX/DOSF Release 4 also provides Personal Computer or Personal Computer XT attachment alternatives, text printing of DPPX/SP attached 5210 printers, and 3179 and 3180 display terminal support.

APPLICATIONS: The 8100 Information System functions as a distributed data processing system offering text processing, data entry, and remote job entry. A variety of applications software is available, either from the manufacturer, a third-party vendor, or through program development. Applications available for the 8100 include financial, construction, manufacturing, office automation, mathematical/statistical, sales/distribution, inventory, and accounting, along with many other customized programs.

COMPONENTS

PROCESSORS: The basic parameters of the forty-three 8100 processor models are shown in Table 1. All 8100

processor models, with the exception of the 8140 C and 8150 B, use a single, interrupt-driven central processor. The 8140 C models use one or two CPUs, which are similar to 8130 and 8140 A and B models. The 8150 A models use one CPU and the 8150 B models use two CPUs. One CPU handles channel logic and system control functions and the other does not. With both processors operating in what IBM calls "dual mode," a 60 percent performance improvement is possible, according to IBM. The 8140 C can also operate with a single CPU, although no performance gains are stated. The 8150 A models provide up to 1.5 times the throughput of the 8140 C models. The 8150 B models provide up to 1.8 times the throughput of the 8150 A models.

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

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

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

DISK STORAGE: The 8101 and 8102 Storage and I/O Units allow 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 A20 has no disk storage; Model A23 has 64 megabytes; and Model A25 has 128 megabytes. The 8102 is available in two models: Model A15 has 129 megabytes of disk storage, and Model A17 has 259 megabytes of disk storage. All devices attachable to the 8130, 8140, and 8150 are attachable to the 8101 and 8102. The 8101 and 8102 are attached to the I/O bus of the 8130, 8140, or 8150 processor.

DISKETTE STORAGE: One drive with a capacity of 985,088 bytes is contained in each processor model. One additional drive can be added to one 8101 or 8102 Storage and I/O Unit in an 8100 system. The data transfer rate is 62K bytes per second. The Basic Data Exchange format is used; either IBM 2D or Type 1 diskettes can be used.

8809 MAGNETIC TAPE DRIVE: Four models are provided that are identical in operating parameters, but differ according to connection. The tape format is 9-track, 1600 bpi, phased-encoded. Direct reel-to-reel tape transport is employed that replaces vacuum columns with electronic control. This means that the unit is sensitive to reel inertia, and the use of large-hub, 1200-foot reels is not recommended. The 8809 operates in a start/stop mode at 12.5 inches per second, which gives a data rate of 20,000 bytes per second. A special streaming mode operates at 100 inches per second for a data rate of 160K bytes per second. The streaming mode is intended for volume dumps and loads to and from disk, and completely occupies the 8100 processor. The 8809 1A is the first drive that attaches to an 8101. The 1B is the first drive that attaches to an 8100 processor. The string of four drives is completed by adding a Model 2, a Model 3, and another Model 2, in that order.

OTHER PERIPHERAL DEVICES: Members of many IBM display and printer product lines can be attached to the

IBM 8100 Information System

► **8100 Information System.** Among the most important products or families represented are:

- **8775 Display Terminal.** Introduced with the 8100 System in October 1978, the 8775 currently offers two pairs of models. One pair is designed for attachment via the Loop Adapter; the other pair, via data communications lines. Within each pair, one model provides a display capacity of 960, 1920, or 2560 characters and the second model adds the capability for displaying 3440 characters.
- **3104 Display Terminal.** A lower cost version of the 8775, the 3104 was introduced in March 1982. There are two models available: Model B1 comes with a 75-key data entry keyboard, while Model B2 is equipped with an 87-key EBCDIC typewriter keyboard. Both keyboard models are detachable. The 3104 contains a 12-inch display screen with a 1920-character display capacity, arranged in 24 lines of 80 characters each. The display may be tilted or swivelled for operator convenience.
- **3270 Information Display System family.** The 3274 Control Unit (Models 51C or 61C) or the 3276 Control Unit/Display Station (any model) may be used to attach clusters of 3270 family displays and printers to the 8100 System.
- **3262 Band Printer series.** Models 2 and 12 are offered for loop attachment to the 8100 and operate at 650 lpm and 325 lpm, respectively.
- **Personal Computer and Personal Computer XT.** The PC or PC XT may be connected directly to local and remote 8100 loops via the 8100 PC Adapter feature.
- **IBM 5280 Distributed Data System.** Applications running in the 5280 can communicate with applications running under DPPX.
- **IBM Series/1.** Applications may be written for the Series/1 and 8100 under DPPX, and can be used to provide a file transfer facility between the two systems.

Specific model numbers and attachment capabilities of these and other devices that can be configured with the 8100 system are listed in Table 2. Detailed reports on many of these product lines can be found in the following reports: *IBM 5280 Distributed Data System (C21-491-501)*; *IBM Personal Computer Family Data Communications Capabilities (C22-491-101)*; *IBM 3270 Information Display System (C25-491-101)*. Information on the 3104 and 8775 display terminals can be found in *Alphanumeric Display Terminals (C25-010-101)*.

PRICING

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.

The Monthly Maintenance Column in the accompanying price table is the dollar amount for the additional monthly maintenance charge for Plan Offering D lease/rental machines (optional periods of maintenance service following expiration of the initial period of maintenance service) or minimum maintenance charge for purchased machines. Prime-shift maintenance is provided for any consecutive nine-hour period between 7 a.m. and 6 p.m., Monday through Friday.

For users without a maintenance contract, the 8100 is maintained under a per-call basis. Under this basis the per-call charge during regular hours is \$109 per hour, and during off hours the charge is \$126 per hour. The hourly rate for systems engineering service is \$85. Programming service/programming assistance costs \$158 per hour during regular hours and \$181 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. CPUs 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.

Volume purchase discounts are available for 8130, 8140, and 8150 processors and the 8101 and 8102 Storage and Input/Output Unit. Discounts for volume purchase are shown in the following chart:

Quantity of Eligible Machines	Volume Purchase Discount Percent
5-9	10%
10-19	15%
20-29	25%
30-44	30%
45 or more	35%

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.

IBM's Customer Center, which handles the problems that cannot be identified by the user, directs the customer to the IBM group responsible for that specific need.

TYPICAL CONFIGURATIONS: The following are representative 8100 Information System configurations.

An example of a small 8100 Information System

8130	B24 Processor	\$38,380
3276	1 Model 1 Control Unit	5,380
	Display Station	
3278	1 Model 1 Display Station	1,855
3287	1 Model 1 Printer	4,830
TOTAL		\$50,445

An example of a midsize 8100 Information System

8140	B62 Processor	\$42,220
8809	Magnetic Tape Unit	11,960
3278	8 Model 1 Display Units (directly attached loop)	14,840
3287	1 Model 1 Printer (directly attached loop)	4,830
TOTAL		\$73,850

An example of a large-size 8100 Information System

8150	B20 Processor	\$115,000
8102	A17 Storage and I/O Unit	33,500
8809	Magnetic Tape Unit	11,960
3278	16 Model 2 Display Terminals (directly attached loop)	31,440
3287	3 Model 1 Printers (directly attached loop)	14,490
3274	1 Loop Control Unit	4,885
3278	7 Model 2 Display Terminals (data link attached loop)	12,985
3287	1 Model 11 Printer (data link attached loop)	4,995
TOTAL		\$229,255

IBM 8100 Information System

EQUIPMENT PRICES

		Purchase Price (\$)	Monthly Maint. (\$)	Monthly Rental* (\$)	2-Year Lease* (\$)
PROCESSORS AND MAIN MEMORY					
8130 Processor					
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	19,040	161.00	1,216	1,035
A22	23 megabytes disk storage, 131K bytes, fixed-head disk	19,820	170.00	1,246	1,060
A23	64 megabytes disk storage	20,600	170.00	1,275	1,085
A24	58 megabytes disk storage, 131K bytes fixed-head disk	21,380	180.00	1,304	1,110
B23	64 megabytes of nonremovable disk storage	37,600	120.00	2,625	—
B24	130 bytes of fixed head and 58 megabytes of non-removable disk storage	38,380	130.00	2,655	—
8140 Processor					
Basic processor; includes main memory as indicated, 4K bytes non-programmable ROM, up to 128 megabytes disk storage, instruction set, eight I/O interrupt levels:					
A31	256K bytes of main memory, 29 megabytes disk storage	26,440	175.00	1,810	1,540
A32	256K bytes of main memory, 23 megabytes disk storage, 131K bytes fixed-head disk	27,220	184.00	1,839	1,565
A33	256K bytes of main memory, 64 megabytes disk storage	28,000	184.00	1,874	1,595
A34	256K bytes of main memory, 58 megabytes disk storage, 131K bytes fixed-head disk	28,780	192.00	1,904	1,620
A41	320K bytes of main memory, 29 megabytes disk storage, floating-point arithmetic	31,780	215.00	2,256	1,920
A42	320K bytes of main memory, 23 megabytes disk storage, 131K bytes fixed-head disk, float-point arithmetic	32,560	224.00	2,291	1,950
A43	320K bytes of main memory, 64 megabytes disk storage, floating-point arithmetic	33,340	224.00	2,321	1,975
A44	320K bytes of main memory, 58 megabytes disk storage, 131K bytes fixed-head disk, floating-point arithmetic	34,120	231.00	2,350	2,000
A51	512K bytes of main memory, 29 megabytes disk storage	28,940	236.00	2,791	2,375
A52	512K bytes of main memory, 23 megabytes disk storage, 131K bytes, fixed-head disk	29,720	245.00	2,820	2,400
A53	512K bytes of main memory, 64 megabytes disk storage	30,500	245.00	2,855	2,430
A54	512K bytes of main memory, 58 megabytes disk storage, 131K bytes fixed-head disk	31,280	253.00	2,891	2,460
A61	768K bytes of main memory, 29 megabytes disk storage	41,440	174.00	2,949	2,510
A62	768K bytes of main memory, 23 megabytes disk storage, 131K bytes fixed head disk	42,220	183.00	2,990	2,545
A63	768K bytes of main memory, 64 megabytes disk storage	43,000	183.00	3,020	2,570
A64	768K bytes of main memory, 58 megabytes disk storage, 131K bytes fixed-head disk	43,780	191.00	3,055	2,600
A71	1024K bytes of main memory, 29 megabytes disk storage	43,940	185.00	3,225	2,745
A72	1024K bytes of main memory, 23 megabytes disk, storage, 131K bytes fixed-disk	44,720	193.00	3,250	2,770
A73	1024 bytes of main memory, 64 megabytes disk storage	45,500	193.00	3,290	2,800
A74	1024 bytes of main memory, 58 megabytes disk, storage, 131K bytes fixed-head disk	46,280	200.00	3,325	2,830
B51	512K bytes of main memory, 58 megabytes disk storage, 131K bytes fixed-head disk	46,110	210.00	2,985	2,540
B52	512K bytes of main memory, 128 megabytes disk storage, 131K bytes fixed-head disk	55,000	256.00	3,484	2,965
B61	768K bytes of main memory, 58 megabytes disk storage, 131K bytes fixed-head disk	48,610	219.00	3,255	2,770
B62	768K bytes of main memory, 123 megabytes disk storage, 131K bytes fixed-head disk	57,500	267.00	3,754	3,195
B71	B71 1024K bytes of main memory, 58 megabytes disk storage, 131K bytes fixed-head disk	51,110	230.00	3,525	3,000

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

IBM 8100 Information System

		Purchase Price (\$)	Monthly Maint. (\$)	Monthly Rental* (\$)	2-Year Lease* (\$)
PROCESSORS AND MAIN MEMORY (Continued)					
B72	1024K bytes of main memory, 123 megabytes disk storage, 131K bytes fixed-head disk	60,000	276.00	4,024	3,425
C72	1024K bytes of main memory, 123 megabytes disk storage, 131K bytes fixed-head disk	79,500	293.00	4,559	3,880
C82	1536K bytes of fixed-memory, 123 megabytes disk storage, 131K bytes fixed-head disk	84,500	311.00	5,105	4,345
C92	2048K bytes of main memory, 123 megabytes disk storage, 131K bytes fixed-head disk	89,500	329.00	5,658	4,815

8150 Processor

Basic processor; includes up to 4 megabytes storage for A Models; up to 8 megabytes storage for B Models; up to 1 megabyte removable diskette storage. Up to 12 communication and loop ports may be configured:

A10	1 megabyte disk storage	75,000	100.00	4,265	—
A20	2 megabytes disk storage	82,500	110.00	4,690	—
A30	3 megabytes disk storage	90,000	120.00	5,120	—
A40	4 megabytes disk storage	97,500	130.00	5,555	—
B20	2 megabytes disk storage	115,000	150.00	6,540	—
B40	4 megabytes disk storage	130,000	170.00	7,390	—
B60	6 megabytes disk storage	145,000	190.00	8,250	—
B80	8 megabytes disk storage	160,000	210.00	9,120	—

Additional Storage

1710	128K bytes additional storage for 8130 processor; maximum one per processor (cannot be used if 1720 storage is used)	1,250	9.50	137.00	117.00
1720	256K bytes additional storage for 8130 processor; maximum three per processor (cannot be used if 1710 storage is used)	2,500	19.00	275.00	235.00
1490	128K byte storage increment for 8140 processor, models A31 through A34; maximum one per processor	1,250	30.50	433.00	369.00
8101	Storage and Input/Output Unit; provides additional disk storage and device attachment capability for 8130/40/50 processors; maximum two per 8130 A Model processor; three per 8130 B Model processor; four with an 8140 or 8150 processor				
	A20 Device attachment capability	6,725	15.50	293.00	250.00
	A23 Provides 64 megabytes disk storage with movable heads	16,635	76.00	832.00	708.00
	A25 Provides 129 megabytes disk storage with movable heads	25,525	132.00	1,328.00	1,130.00
8102	Storage and Input/Output Unit; provides additional disk storage and device attachment capability for 8130/40/50 processors; maximum two per 8130 A Model processor; three per 8130 B Model processor; four with an 8140 or 8150 processor				
	A15 Provides 129 megabytes disk storage with movable heads	21,000	68.00	1,165.00	—
	A17 Provides 259 megabytes disk storage with movable heads	33,500	88.00	1,860.00	—

PROCESSOR OPTIONS AND FEATURES

1530	System Expansion; provides additional interrupt levels; required for attachment of up to two 8101 or 8102 Storage and Input/Output Units or one 8101 or 8102 and one 8809 Magnetic Tape Unit, Model 1B, to processor; maximum one per processor	2,780	13.50	118.00	101.00
1701	Communications Adapter	460.00	0.50	19.00	16.00
3220	Display and Printer Attachment	3,120	16.50	128.00	110.00

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

IBM 8100 Information System

		Purchase Price (\$)	Monthly Maint. (\$)	Monthly Rental* (\$)	2-Year Lease* (\$)
PROCESSOR OPTIONS AND FEATURES (Continued)					
3750	Floating Point Feature	4,710	23.50	210.00	179.00
3901	Feature Expansion Prerequisite; required for 1701	560.00	3.50	20.00	17.00
4901	Magnetic Tape Attachment	2,545	10.50	112.00	96.00
5500	Non-Switched Integrated Modem, 600/1200 bps; requires 1601 SDLC Communications Adapter with Clock or 1603 BSC/SS Com- munications with Clock	625	6.50	28.00	24.00

Features for 8130, 8140, and 8150 Processors via the 8101 or 8102 Storage and I/O Unit:

1501	Display and Printer Attachment, Type I; provides attachment of 3277 display, 3287 printer, and 3284, 3286, or 3288 printers (8101 A11 and A13 units only); requires 1505/06 adapters	1,076	4.50	43.00	37.00
1502	Display and Printer Attachment, Type II; same as 1501 but requires 1503	481.00	1.00	19.00	16.00
1503	Communications Attachment, Type I; provides attachment of loops and communications ports (8101 A11 and A13 units only)	1,076	4.50	43.00	37.00
1504	Communications Attachment, Type II; same as 1503; requires 1503	481.00	1.00	19.00	16.00
1505	Display and Printer Adapter	2,765	18.50	117.00	100.00
1506	Additional Display and Printer Adapter	486.00	3.00	19.00	16.00
1507	Diskette Drive and Magnetic Tape Attachment for Model A10; re- quired for attachment of one 4520 diskette drive and one 4521 magnetic tape attachment to 8101 Storage and Input/Output Unit, Model A10	1,076	4.50	43.00	37.00
4520	Second Diskette Drive for 8101 Storage and Input/Output Unit; 1 megabyte	3,455	34.50	157.00	134.00
4521	Magnetic Tape Attachment for 8101 Storage and Input/Output Unit	2,155	11.00	99.00	84.00

COMMUNICATION FEATURES

1711	Two single lobe loops	2,220	22.00	148.00	—
1712	Two single lobe loops	2,220	22.00	148.00	—
1716	Two single lobe lops	2,220	22.00	148.00	—
1721	Two double lobe loops	3,270	29.00	202.00	—
1726	Two double lobe loops	3,270	29.00	202.00	—
1732	Two SDLC EIA links	1,918	22.00	124.00	—
1733	Two SDLC EIA links	1,918	22.00	124.00	—
1734	Two SDLC EIA links	1,918	22.00	124.00	—
1735	Two SDLC EIA links	1,918	14.00	22.00	—
1742	Two SDLC V.35 links	2,292	19.00	134.00	—
1745	Two SDLC V.35 links	2,292	19.00	134.00	—
1752	Two SDLC X.21 links	2,885	19.00	159.00	—
1755	Two SDLC X.21 links	2,885	19.00	159.00	—
1763	Two BSC EIA links	4,748	17.00	226.00	—
1764	Two BSC EIA links	4,748	17.00	226.00	—

*Includes maintenance

**5-year lease

***One-time charge

IBM 8100 Information System

SOFTWARE PRICES

		Monthly License Fee Basic (\$)	Monthly License Fee DSLO* (\$)
Distributed Processing Control Executive (DPCX):			
5761-DS1	DPCX/Base	442	376
	Feature 6001	85	64
5761-XR1	Distributed Office Support Facility (DOSF)	753	639
5668-956	Interactive Display Text Facility (IDTF)	92	68
Distributed Processing Programming Executive (DPPX):			
5760-010	DPPX/Base	314	294
5760-AS1	DPPX/ASSM	84	71
5760-CB1	DPPX/Cobol Compiler	158	126
5760-LB1	DPPX/Cobol Run-Time Library	27	23
5760-FO1	DPPX/Fortran Compiler	127	108
5760-LM1	DPPX/Fortran Library	62	52
5760-XR1/01	DPPX/DPS Interactive Map Definition	134	114
5760-XR1/02	DPPX/DPS Format Management	53	44
5760-XR2	DPPX/APL Interpreter	424	361
5760-TD1	DPPX/DTMS (Data Base and Transaction Management System)	162	138
5760-RC1	DPPX/DSC (Data Stream Compatibility)	27	23
5760-XC1	DPPX/RJE	42	36
5760-SM1	DPPX/Sort/Merge	37	32
5760-XC2	DMS/DPPX	150	112
5760-ED1	DPPX/GEN3644	26	20
5748-XXG	Distributed Systems Executive (DSX)	235	177
5735-XR1	Host Command Facility for 8100/DPCX systems	120	90
5760-XR5/01	DPPX/PT Monitor	60	—
5760-XR5/02	DPPX/PT Reporter Feature	70	—
5660-271	DPPX/Interactive Productivity Facility	42	36
5660-272	DPPX/PDA (Problem Determination Aid)	32	26
5660-273	DPPX/Programmed Operator Facility	**580	**493
5798-DKX	DPPX/Distributed Processing Connection Facility	**900	—
5760-PL1	DPPX/PL1 Compiler	383	325
5760-LM2	DPPX/PL/1 Library	66	56
5760-XR6	Data Capture and Management System/DPPX	119	88

*(DSLO) Distributed System License Option

**One-time charge ■

IBM 8100 Information System

MANAGEMENT SUMMARY

IBM's series of enhancements to the enigmatic 8100 Information System, the latest of which have been software-oriented, have served to make the 8100 a viable entrant in the distributed processing marketplace. With the July 1981 introduction of the high-end 8140 C models, IBM gave users the power they wanted. Late in 1982, numerous enhancements to both the DPCX and DPPX operating systems were announced, giving users even more performance potential. Among the highlights were: Release 3 of DPCX, which can support the 8140 C models and doubles the number of concurrent jobs from 31 to 62; DPPX system attachment of an 8100 DPCX system running an 8775 display under the Distributed Office Support facility (DOSF); DPPX/Base operating system support for application-to-application communication with the 5280 Distributed Data System and the Series/1; and, finally, support for attachment of the IBM Personal Computer. In June 1983, IBM announced two new models of the 8130 processor, B23 and B24, featuring a new high density technology to increase price/performance. IBM also reduced purchase prices on all processor models, while introducing two new program products, DPPX/SP and DPPX/SP IMD. A new release of DOSF was unveiled.

The 8100 processor is a minicomputer with a 16-bit memory bandwidth, 48 sets of eight 32-bit registers, and 32-bit logical addressing (4-megabyte range). Thirty-three processor models are now available within two model numbers: 8130 and 8140. The 8130 operates with a cycle time of 1500 nanoseconds, and the 8140 has a cycle time of 800 nanoseconds on 8-, 16-, or 32-bit operands. Memory capacity ranges from 256K to 2048K bytes. The newer 8140 C models can have one or two processors, depending on user requirements.

Each processor contains fixed-disk storage, a diskette drive, a limited number of ports for connecting terminals, and provisions for expanding the disk storage and port capacities through one or more 8101 Storage and I/O Units.

A family of processors that support distributed processing in a host controlled arrangement or as a loosely connected partner to a host computer system.

An 8100 system can include up to 2048K bytes of main memory, up to 123 megabytes of fixed-disk storage, and numerous local and/or remote display and printer terminals. Up to four magnetic tape drives can also be included. Configuration is not completely modular; 33 different processor models provide a variety of alternates. Two operating systems provide 3790-style support (DPCX) or stand-alone transaction-based processing support with Cobol and Fortran compilers (DPPX).

Purchase prices for the 8130 processor models range from \$28,890 to \$31,230. Prices for the 8140 A models run from \$44,380 to \$69,420. The 8140 B processors range in price from \$62,110 to \$85,660, while the 8140 C models are priced from \$100,130 to \$125,450.

CHARACTERISTICS

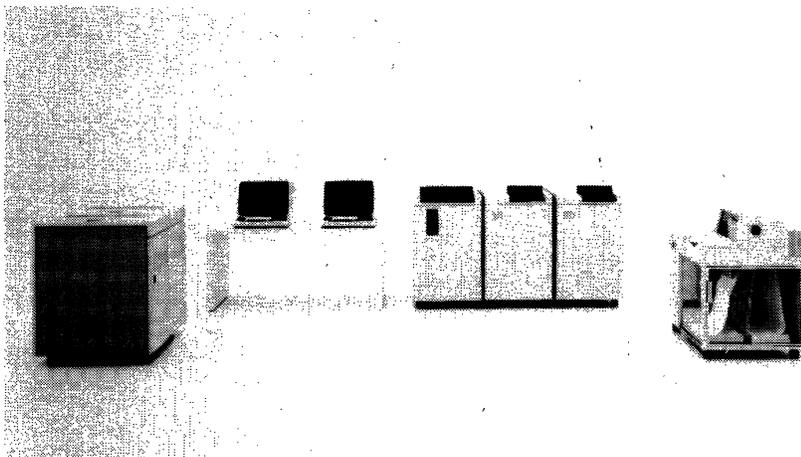
VENDOR: IBM Corporation, Data Processing Division, 1133 Westchester Avenue, White Plains, New York 10604. Telephone (914) 696-1900.

DATE OF ANNOUNCEMENT: October 1978.

DATE OF FIRST DELIVERY: August 1979.

NUMBER DELIVERED TO DATE: Information not available.

SERVICED BY: IBM.



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

IBM 8100 Information System

Table 1. IBM 8100 INFORMATION SYSTEM CHARACTERISTICS

	8130 A21-A24	8130 B23-B24	8140 A31-A34	8140 A41-A44	8140 A51-A54	8140 A61-A64(4)	8140 A71-A74(4)
Main memory, bytes	256K to 1024K	1024K-2096K	256K, 384K	320K	512K	768K	1024K
Memory cycle time, nsec.	1500	800	800	800	800	800	800
8101 Storage and I/O units	2	2	4	4	4	4	4
Disk drives—total (3)	3	3	5	5	5	5	5
Disk storage, bytes max.	23M-64M	58M-64M	23M-64M	23M-64M	23M-64M	23M-64M	23M-64M
Diskette drives, max.	2	2	2	2	2	2	2
Tape drives, max.	4	4	4	4	4	4	4
Directly attached displays, max.	24	24	24	24	24	24	24
Ports:							
Basic processor	2 to 6	2 to 6	3	2(1)	0	0	0
System max.	14	14	19	18	16	16	16
Communications:							
SDLC	Yes	Yes	Yes	Yes(2)	Yes	Yes	Yes
BSC	Limited	Limited	Limited	Limited (2)	Limited	Limited	Limited
S/S (asynchronous)	Limited	Limited	Limited	Limited (2)	Limited	Limited	Limited
Floating point hardware	No	No	No	Yes	No	No	No
Expanded Function Panel	No	No	Yes	Yes (1)	No	No	No

- (1) Mutually exclusive.
- (2) Not with Expanded Function Panel.
- (3) Includes disk drive in processor and in each 8101 unit.
- (4) Available only as model upgrades.

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

The 8100 uses two operating systems. One, the Distributed Processing Programming Executive (DPPX), provides substantial standalone processing capabilities for an 8100 system, including Cobol, Fortran, and PL/1 compilers and support for a wide range of terminals. The other, the Distributed Processing Control Executive (DPCX), makes the 8100 operate like an IBM 3790 Communications System, with applications developed at the host site.

The 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, permits the host-site personnel the same kind of access to the 8100 that an operator would have at the 8100 console. Programs can be written in Cobol, Fortran, PL/1, APL, or assembly language. An English-language Cobol pre-compiler is also available. The Distributed Presentation Service 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 ►

► CONFIGURATION

There are a total of 35 8100 processor models, which can be conveniently grouped into the following series: 8130 A2X; 8130 B2X; 8140 A3X, A4X, A5X, A6X, and A7X; 8140 B5X, B6X, and B7X; and 8140 CXX. The four submodels in each of the AXX groups show a similar pattern with regard to disk capacity:

- AX1: 29 megabytes of fixed-disk storage.
- AX2: 23 megabytes of fixed-disk storage plus 131K bytes of fixed-head storage.
- AX3: 64 megabytes of fixed-disk storage.
- AX4: 58 megabytes of fixed-disk storage plus 131K bytes of fixed-head storage.

The two models in each of the BXX groups provide 58 and 123 megabytes of fixed disk storage; all BXX models also include 131K bytes of fixed-head storage. The CXX models provide 123 megabytes of fixed disk storage and 131K bytes of fixed head storage.

Other differences among the processor models are shown in Table 1.

All memory is contained in the processor. Peripheral attachments are permitted to the basic processor and are expanded through one or more 8101 Storage & I/O Units; the 8101 can also contain additional fixed-disk storage.

Attachment of peripherals to the processor is accomplished either by direct attachment or by attachment through ports. All processor models support direct attachment of one or more 8101s and up to four magnetic tape devices. An 8140-BXX or 8140-CXX model can also support direct attachment of up to 24 3277 keyboard/display units, 3284/6/7/8 printers, 3732 text display stations, and 3736 printers in any combination. However, some configurational restrictions exist. For example, if the tape drives are configured with the processor (the first drive is attached directly to the processor; up to three additional drives may be daisy-chained through the first), the maximum number of 8101s is reduced by one. Moreover, on the 8140-BXX, and 8140-CCX, configuration of directly attached devices affects the number of processor ports that can be added and ►

IBM 8100 Information System

Product Enhancement

On October 18, 1983, IBM announced a series of enhancements to the 8100 Information System. The most significant of these enhancements is the addition of a new high-end processor to the product line, the 8150. The 8150 features a new "dyadic processing" architecture, and is designed to provide a higher level of performance and system reliability than predecessor models.

The 8150 Processor is available in three models. Model B20 features 2MB of processor storage; Model B40, 3MB; and Model B60, 6MB. Logical storage can be as high as 16MB; this logical storage capacity was previously available only on the 8140 Model C processors. A new management storage option offered on the 8150 allows for more efficient use of the logical storage system. A new high density memory technology provides 64K of storage per module. An enhanced error correction code has also been implemented. All 8100-compatible applications software is supported by the new processor.

The dyadic processing capability of the 8150 stems from the implementation of dual Processing and Control Elements (PCEs) and two I/O buses. Both PCEs and both buses can be used simultaneously. Each PCE is composed of four VLSI custom bipolar chips packaged into a single module.

The 8150 can support up to eight high-speed (over 9600 bps) communications ports. These high-speed ports may be located either in the 8150 or in an 8101 Storage and I/O unit. The 8150 allows for the attachment of up to four 8101s; since no disk drives are integrated in the 8150, at least one 8101 is required. A variety of I/O devices may be attached to the 8150 via communication features including data link, direct connect, and loops that are directly attached or data link attached. Up to 12 communications ports can be configured on the 8150.

The October 18 announcements also included the following 8100 product enhancements: DPPX/SP Release 2 and DPCX Release 4 were announced to provide these operating systems with new and enhanced functions. The DPPX/SP Personal Computer connectivity was enhanced with two new PRPQs that provide file transfer capabilities. DSX Network Management facilities for DPCX were improved, while DOSF Release 4 was expanded. The 8100's applications development facilities were enhanced, and DPPX Performance Tool Version 2 and a new DPPX Shadow File Facility were announced.

EQUIPMENT PRICES

		<u>Monthly Rental</u>	<u>Purchase Price</u>	<u>Monthly Maint.</u>
8150	Processor; includes 12 ports, 16 megabytes of logical storage, and:			
B20	2 megabytes of disk storage	\$6,540	\$115,000	\$150.00
B40	4 megabytes of disk storage	7,390	130,000	170.00
B60	6 megabytes of disk storage	8,250	145,000	190.00
Communication Features				
1711/12/16	Two single lobe loops	\$148	\$2,200	\$22.00
1721/26	Two double lobe loops	202	3,270	29.00
1732/33/ 34/35	Two SDLC EIA links	124	1,918	22.00
1742/45	Two SDLC V.35 links	134	2,292	19.00
1752/55	Two SDLC X.21 links	159	2,885	19.00
1763/64	Two BSC EIA links	226	4,748	17.00
3750	Floating Point Feature	197	4,710	24.00
3901	Feature Expansion Prerequisite	180	3,000	15.00
5200	Multi-Speed Clock	18	486	1.50 □

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MANAGEMENT SUMMARY

IBM's series of enhancements to the enigmatic 8100 Information System, the latest of which have been software-oriented, have served to make the 8100 a viable entrant in the distributed processing marketplace. With the July 1981 introduction of the high-end 8140 C models, IBM gave users the power they wanted. Late in 1982, numerous enhancements to both the DPCX and DPPX operating systems were announced, giving users even more performance potential. Among the highlights were: Release 3 of DPCX, which can support the 8140 C models and doubles the number of concurrent jobs from 31 to 62; DPPX system attachment of an 8100 DPCX system running an 8775 display under the Distributed Office Support facility (DOSF); DPPX/Base operating system support for application-to-application communication with the 5280 Distributed Data System and the Series/1; and, finally, support for attachment of the IBM Personal Computer. In June 1983, IBM announced two new models of the 8130 processor, B23 and B24, featuring a new high density technology to increase price/performance. IBM also reduced purchase prices on all processor models, while introducing two new program products, DPPX/SP and DPPX/SP IMD. A new release of DOSF was unveiled.

The 8100 processor is a minicomputer with a 16-bit memory bandwidth, 48 sets of eight 32-bit registers, and 32-bit logical addressing (4-megabyte range). Thirty-three processor models are now available within two model numbers: 8130 and 8140. The 8130 operates with a cycle time of 1500 nanoseconds, and the 8140 has a cycle time of 800 nanoseconds on 8-, 16-, or 32-bit operands. Memory capacity ranges from 256K to 2048K bytes. The newer 8140 C models can have one or two processors, depending on user requirements.

Each processor contains fixed-disk storage, a diskette drive, a limited number of ports for connecting terminals, and provisions for expanding the disk storage and port capacities through one or more 8101 Storage and I/O Units.

A family of processors that support distributed processing in a host controlled arrangement or as a loosely connected partner to a host computer system.

An 8100 system can include up to 2048K bytes of main memory, up to 123 megabytes of fixed-disk storage, and numerous local and/or remote display and printer terminals. Up to four magnetic tape drives can also be included. Configuration is not completely modular; 33 different processor models provide a variety of alternates. Two operating systems provide 3790-style support (DPCX) or stand-alone transaction-based processing support with Cobol and Fortran compilers (DPPX).

Purchase prices for the 8130 processor models range from \$28,890 to \$31,230. Prices for the 8140 A models run from \$44,380 to \$69,420. The 8140 B processors range in price from \$62,110 to \$85,660, while the 8140 C models are priced from \$100,130 to \$125,450.

CHARACTERISTICS

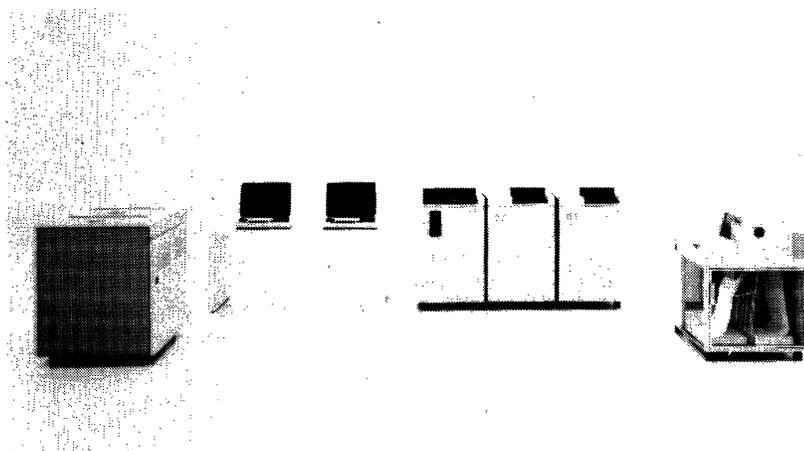
VENDOR: IBM Corporation, Data Processing Division, 1133 Westchester Avenue, White Plains, New York 10604. Telephone (914) 696-1900.

DATE OF ANNOUNCEMENT: October 1978.

DATE OF FIRST DELIVERY: August 1979.

NUMBER DELIVERED TO DATE: Information not available.

SERVICED BY: IBM.



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

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Table 1. IBM 8100 INFORMATION SYSTEM CHARACTERISTICS

	8130 A21-A24	8130 B23-B24	8140 A31-A34	8140 A41-A44	8140 A51-A54	8140 A61-A64(4)	8140 A71-A74(4)
Main memory, bytes	256K to 1024K	1024K-2096K	256K, 384K	320K	512K	768K	1024K
Memory cycle time, nsec.	1500	800	800	800	800	800	800
8101 Storage and I/O units	2	2	4	4	4	4	4
Disk drives—total (3)	3	3	5	5	5	5	5
Disk storage, bytes max.	23M-64M	58M-64M	23M-64M	23M-64M	23M-64M	23M-64M	23M-64M
Diskette drives, max.	2	2	2	2	2	2	2
Tape drives, max.	4	4	4	4	4	4	4
Directly attached displays, max.	24	24	24	24	24	24	24
Ports:							
Basic processor	2 to 6	2 to 6	3	2(1)	0	0	0
System max.	14	14	19	18	16	16	16
Communications:							
SDLC	Yes	Yes	Yes	Yes(2)	Yes	Yes	Yes
BSC	Limited	Limited	Limited	Limited (2)	Limited	Limited	Limited
S/S (asynchronous)	Limited	Limited	Limited	Limited (2)	Limited	Limited	Limited
Floating point hardware	No	No	No	Yes	No	No	No
Expanded Function Panel	No	No	Yes	Yes (1)	No	No	No

- (1) Mutually exclusive.
(2) Not with Expanded Function Panel.
(3) Includes disk drive in processor and in each 8101 unit.
(4) Available only as model upgrades.

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

The 8100 uses two operating systems. One, the Distributed Processing Programming Executive (DPPX), provides substantial standalone processing capabilities for an 8100 system, including Cobol, Fortran, and PL/1 compilers and support for a wide range of terminals. The other, the Distributed Processing Control Executive (DPCX), makes the 8100 operate like an IBM 3790 Communications System, with applications developed at the host site.

The 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, permits the host-site personnel the same kind of access to the 8100 that an operator would have at the 8100 console. Programs can be written in Cobol, Fortran, PL/1, APL, or assembly language. An English-language Cobol pre-compiler is also available. The Distributed Presentation Service 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 ▷

► CONFIGURATION

There are a total of 35 8100 processor models, which can be conveniently grouped into the following series: 8130 A2X; 8130 B2X; 8140 A3X, A4X, A5X, A6X, and A7X; 8140 B5X, B6X, and B7X; and 8140 CXX. The four submodels in each of the AXX groups show a similar pattern with regard to disk capacity:

- AX1: 29 megabytes of fixed-disk storage.
- AX2: 23 megabytes of fixed-disk storage plus 131K bytes of fixed-head storage.
- AX3: 64 megabytes of fixed-disk storage.
- AX4: 58 megabytes of fixed-disk storage plus 131K bytes of fixed-head storage.

The two models in each of the BXX groups provide 58 and 123 megabytes of fixed disk storage; all BXX models also include 131K bytes of fixed-head storage. The CXX models provide 123 megabytes of fixed disk storage and 131K bytes of fixed head storage.

Other differences among the processor models are shown in Table 1.

All memory is contained in the processor. Peripheral attachments are permitted to the basic processor and are expanded through one or more 8101 Storage & I/O Units; the 8101 can also contain additional fixed-disk storage.

Attachment of peripherals to the processor is accomplished either by direct attachment or by attachment through ports. All processor models support direct attachment of one or more 8101s and up to four magnetic tape devices. An 8140-BXX or 8140-CXX model can also support direct attachment of up to 24 3277 keyboard/display units, 3284/6/7/8 printers, 3732 text display stations, and 3736 printers in any combination. However, some configurational restrictions exist. For example, if the tape drives are configured with the processor (the first drive is attached directly to the processor; up to three additional drives may be daisy-chained through the first), the maximum number of 8101s is reduced by one. Moreover, on the 8140-BXX, and 8140-CCX, configuration of directly attached devices affects the number of processor ports that can be added and]

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Table 1 (continued). IBM 8100 INFORMATION SYSTEM CHARACTERISTICS

	8140 B51-B52	8140 B61-B62	8140 B71-B72	8140 C72	8140 C82	8140 C92
Main memory, bytes	512K	768K	1024K	1024K	1536K	2048K
Memory cycle time, nsec.	800	800	800	800	800	800
8101 Storage and I/O units	4	4	4	4	4	4
Disk drives—total (3)	65	65	6	6	6	6
Disk Storage, bytes max.	58M-123M	58M-123M	58M-123M	123M	123M	123M
Diskette drives, max.	2	2	2	2	2	2
Tape drives, max.	4	4	4	4	4	4
Directly attached displays, max.	24	24	24	24	24	24
Ports:						
Basic processor	Up to 11	Up to 11	Up to 11	Up to 10	Up to 10	Up to 10
System max.	19	19	19	19	19	19
Communications:						
SDLC	Yes	Yes	Yes	Yes	Yes	Yes
BSC	Limited	Limited	Limited	Limited	Limited	Limited
S/S (asynchronous)	Limited	Limited	Limited	Limited	Limited	Limited
Floating point hardware	Optional	Optional	Optional	Optional	Optional	Optional
Expanded Function Panel	Yes	Yes	Yes	Yes	Yes	Yes

- (1) Mutually exclusive.
(2) Not with Expanded Function Panel.
(3) Includes disk drive in processor and in each 8101 unit.
(4) Available only as model upgrades.

➤ BSC), as well as the 8775 display terminal and the 3289 and 3287 printers. New printers and terminals include the 3230 non-impact printer and the 5210 daisy wheel printer. 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.

New enhancements to DPPX/Base include support for more non-8100 systems, such as the 5280 Distributed Data System and the Series/1, attachment of the IBM Personal Computer, and the ability to attach an 8100 under DPCX/DOSF to the DPPX system. An APL interpreter, based on the VS APL program product, was added. IBM also introduced the DPPX/Distributed Processing Connection Facility (DPCF), which gives DPPX users access to multiple applications and subsystems from a single terminal.

The Distributed Processing Control Executive (DPCX) is slanted more toward host-oriented systems, where all or most of the program development effort occurs. DPCX also received several enhancements, designed for greater performance and manageability. The current version of DPCX, Release 2.2, provides improved operator functions, support of the Series/1, and support for the 8140 C models in single-processor configuration. Release 3 supports up to 62 concurrent jobs, double the present capacity, and the 8140 C dual-processor systems. IBM projects a 60-percent improvement in throughput using Release 3 and an 8140 C in dual mode over an 8140 B running Release 2.2.

The 8100 features flexibility of terminal connection. Each port can support a communications link (SDLC, BSC, or asynchronous), a loop, or directly connected devices with an RS-232-C interface (up to 40 feet) or a V.35 interface (up to 1000 feet). DPPX and DPCX support a growing variety of terminals, such as IBM 327X displays, 8775 displays, ➤

➤ requires that the tape drives be added to the system through an attached 8101.

One 8101 in an 8130 or 8140-BXX 1CXX system, or 8101s in an 8140-AXX system, can also be configured to accommodate direct attachment of peripheral devices. Peripherals can include the magnetic tape drives and/or directly attached displays and printers, as well as a second system diskette drive. The selection of displays and printers is the same as for direct attachment to the 8140-BXX 1CXX, and up to 24 devices can be configured.

The principal facilities for attaching peripheral devices, however, are ports. Each port can service a communications line, a local or remote loop, or a directly connected device. The types of connections provided and the number of ports available with the basic processor and system maximums are given in the accompanying tables. One (but only one) 8101 attached to an 8130 may be configured with ports; one or two 8101s attached to an 8140 may be configured with ports. In general, each 8101 can accommodate up to eight ports.

Specific devices supported through direct attachment and through ports via communications lines, loops, and direct connections are shown in Table 2.

TRANSMISSION SPECIFICATIONS

Each communications adapter in a 8100 system controls one loop, one 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 ➤

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▷ 328X printers, and the new 3230/5210 printers. The CCITT X.21 interface is supported under DPPX, and permits access into public data networks. In addition to the ports, up to 24 3277/3278/3279 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 substantial. Careful analysis will be required to see whether the more ambitious complements will satisfy terminal response-time criteria.

COMPETITIVE POSITION

As a distributed data processing system, the IBM 8100 Information System competes with other large scale DDP systems such as the Four-Phase Series 5000, Inforex 9000, and Harris' recently introduced MIND Series.

ADVANTAGES AND RESTRICTIONS

Since its introduction in 1978, the IBM 8100 Information System has failed to establish a niche in the marketplace. Software problems and the system's difficulty of use are problems that are frequently mentioned by users (see the User Reaction that follows). IBM, however, continues to add enhancements to the product; the most recent of these include support for the IBM Personal Computer and application-to-application communication capability with the more popular 5280 and Series/1 systems. It remains to be seen whether enhancements such as these can make the 8100 a viable contender in the DDP marketplace.

USER REACTION

In the 1983 edition of Datapro's annual Computer System Users Survey, responses were received from a total of 15 IBM 8100 Information System Users. Of these 15 respondents, nine indicated that they were utilizing the 8100 as a distributed processing system; for the purpose of this report, we have included only these responses here.

The users were asked to rate the 8100 with regard to a variety of characteristics. Their ratings are summarized in the following table.

	Excellent	Good	Fair	Poor	WA*
Ease of operation	0	3	5	1	2.2
Reliability of processor	4	4	1	0	3.3
Reliability of peripherals	2	3	4	0	2.8
Maintenance service:					
Responsiveness	2	4	3	0	2.9
Effectiveness	2	2	3	2	2.4
Technical support:					
Trouble-shooting	0	4	3	2	2.2
Education	0	3	2	4	1.9
Documentation	1	4	3	1	2.6
Manufacturer's software:					
Operating system	0	6	2	1	2.6
Compilers and assemblers	0	5	1	1	2.6
Applications programs	1	4	2	1	2.6
Ease of programming	0	5	0	3	2.3
Ease of conversion	1	2	1	3	2.1
Overall satisfaction	0	5	3	1	2.4

*Weighted Average based on a scale of 4.0 for Excellent.

▶ interface is 1000 feet. The 8100 system can use the SDLC communications adapter to communicate with an IBM System/370 or 4300 host through a 3704/3705 or Integrated Communications Adapter with line speeds up to 56,000 bits per second, or with another 8100 system, as well as with various SDLC-compatible peripheral devices. Host connections operating at greater than 9600 bps preclude a second high-speed (38.4 bps) loop in 8140/8101 configurations.

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

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

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

The loop can be directly attached or data-link-attached to an 8100 system (8130 or 8140 processor, or an 8101 Storage and I/O unit). A directly attached loop operates at 9600 or 38.4K bps, and a data-link-attached loop operates at 1200 to 9600 bps. The loop speed selected is dependent on the capabilities of the attached devices and system requirements. Only one directly attached loop, or loop with a second lobe, per system can operate at 38.4K bps in 8130/8101 configurations; two high-speed loops are supported for 8140/8101 configurations. (A lobe is defined as a portion of 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 LSCs 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

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Table 2. 8130/8140/8101 TERMINAL ATTACHMENT SUPPORT

	Direct Attachment (1)	Port-Attachment			
		Via Local or Remote Loop (2)	Via High-Speed Local Loop (3)	Via Data Communications Link	Via Direct Connection
2741	—	—	—	Yes	Yes
3101-10/12/13/20/22/ with 3102 printer	—	—	—	Yes	Yes
3104-B1/B2	—	Yes	Yes	—	—
3230-1	—	Yes	Yes	—	—
3262-2/12	—	Yes	Yes	—	—
3268-1	—	Yes	Yes	—	—
3274-51C with:	—	Yes	Yes	Yes	Yes
3230-2	—	Yes	Yes	Yes	Yes
3262-3/13	—	Yes	Yes	Yes	Yes
3268-2	—	Yes	Yes	Yes	Yes
3278-1/2/3/4/5	—	Yes	Yes	Yes	Yes
3279-52A/52B/53G/2X/3X	—	Yes	Yes	Yes	Yes
3287-1/2/1C/2C	—	Yes	Yes	Yes	Yes
3289-1/2	—	Yes	Yes	Yes	Yes
5210-G1/G2	—	Yes	Yes	Yes	Yes
3276-1/2/3/4/11/12/13/ 14 with:	—	Models 11, 12, 13 & 14 only	—	Yes	Yes
3230-2	—	Yes	—	Yes	Yes
3262-13	—	Yes	—	Yes	Yes
3268-2	—	Yes	—	Yes	Yes
3278-1/2/3/4	—	Yes	—	Yes	Yes
3279-52A/52B/53G/2X/3X	—	Yes	—	Yes	Yes
3287-1/2/1C/2C	—	Yes	—	Yes	Yes
3289-1/2	—	Yes	—	Yes	Yes
5210-G1/G2	—	Yes	—	Yes	Yes
3277-1/2	Yes	—	—	—	—
3284-1/2	Yes	—	—	—	—
3286-1/2	Yes	—	—	—	—
3287-1/2/11/12	Models 1 & 2 only	Models 11 & 12 only	Models 11 & 12 only	—	—
3288-2	Yes	—	—	—	—
3289-3 with:	—	Yes	—	—	—
2502-A1 card reader (4)	—	Yes	—	—	—
3501 card reader	—	Yes	—	—	—
3521 card punch (4)	—	Yes	—	—	—
3601-1/2A/2B/3A/3B	—	—	—	Yes	—
3602-1A/1B	—	—	—	Yes	—
3631-1A/1B	—	—	—	Yes	—
3632-1A/1B	—	—	—	Yes	—
3641-1/2	—	Yes	—	—	—
3642-1/2	—	Yes	—	—	—
3643-2/3/4	—	Yes	—	—	—
3644/3645/3646/3647	—	Yes	—	—	—
3651-25/75	—	—	—	Yes	—
3684-1/2	—	—	—	Yes	—
3767-1/2/3	—	—	—	Yes	Yes
3842	—	—	—	Yes	Yes
3843	—	—	—	Yes	Yes
4701	—	—	—	Yes	Yes
5150	—	—	—	Yes	Yes
6670	—	—	—	Yes	—
8775-1/2/11/12	—	Models 1 & 2 only	Models 1 & 2 only	Models 11 & 12 only	Yes
7426 w/associated terminals	—	—	—	Yes	Yes
TTY 33/35 & equivalent devices	—	—	—	Yes	—
2780/3780-compatible devices	—	—	—	Yes	Yes
Another 8130 or 8140 processor	—	—	—	Yes	Yes

(1) Mutually exclusive.
(2) Not with Expanded Function Panel.
(3) Includes disk drive in processor and in each 8101 unit.
(4) Available only as model upgrades.

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▷ The most frequently mentioned applications running on these 8100s were (in order of frequency of response): order processing/inventory control (5 users); accounting/billing (4 users); education-scheduling/administration, payroll/personnel, and sales/distribution (3 users); and manufacturing and mathematics/statistics (2 users). Seven of the users indicated that applications programs were written by in-house personnel, while four said that they had obtained packaged programs and two had obtained contract programming.

All but one of the users indicated that they were using at least six local workstations, with one user having in excess of 60. Three of the users indicated that they were also using some remote workstations. The users were evenly divided among the DPPX and DPCX operating systems (one user indicated usage of both).

When given a check-list of possible system benefits and problems, the users indicated these advantages most frequently: that the system is easy to expand/reconfigure (3 users); that terminals/peripherals carried over from other systems are compatible (3 users); and that users are happy with response time (2 users). Problems most frequently mentioned were: that installation of equipment was late (4 users); that the vendor did not provide all of the promised software of support (3 users); that delivery of required software was late (2 users); that system costs exceeded the expected total (2 users); and that vendor enhancements to hardware and/or software were hard to keep up with (2 users).

When asked if the 8100 system had done what they had expected it to do when they purchased it, four users answered that it had, three responded that it had not, and two either did not respond or were undecided. When asked whether or not they would recommend the 8100 to another user, three answered yes, three answered no, and three were undecided. □

▶ 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 3843 Loop Control Unit provides the interface between the data link and the data-link-attached loop. 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.

COMPONENTS

PROCESSORS: The basic parameters of the 35 8100 processor models are shown in Table 1. Each processor is structured around 48 sets of high speed general registers. Each set of registers can be used as 8 32-bit registers, 8 16-

bit registers, or 16 8-bit registers. Multiple, independent operands can be held in one register. Two sets of registers are assigned to each program. Processor Models A41-A44, and optionally, Models B5X-B7X, and CXX include 8 sets of 4 64-bit floating point registers for short format (32-bit) or long format (64-bit) floating point arithmetic.

Each processor contains a dynamic address translation facility to isolate logical application program instruction, operand, and I/O addresses from real memory addresses; provided at the expense of 6 megabytes of moving-head storage.

The 8101 and 8140-BXX and CXX models utilize newer dual-spindle drives. In the 8101-A23, only one of the two spindles is used, providing 64,520,192 bytes of moving-head storage; in the 8101-A25 both spindles are used providing 129,040,384 bytes. The 8140-BX1 and BX2 provide 58,654,720 bytes and 123,174,912 bytes of moving-head storage. The inclusion of 131,072 bytes of fixed-head storage, which is provided for all BXX and CXX models, accounts for the reduction of moving-head storage capacity by 6 megabytes.

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.

DISKETTE STORAGE: One drive with a capacity of 985,088 bytes is contained in each processor model. One additional drive can be added to one 8101 Storage and I/O Unit in an 8100 system. The data transfer rate is 62K bytes per second. The Basic Data Exchange format is used; either IBM 2D or Type 1 diskettes can be used.

8809 MAGNETIC TAPE DRIVE: Four models are provided that are identical in operating parameters, but differ according to connection. The tape format is 9-track, 1600 bpi, phased-encoded. Direct reel-to-reel tape transport is employed that replaces vacuum columns with electronic control. This means that the unit is sensitive to reel inertia, and the use of large-hub, 1200 foot reels is not recommended. The 8809 operates in a start/stop mode at 12.5 inches per second, which gives a data rate of 20,000 bytes per second. A special streaming mode operates at 100 inches per second for a data rate of 160K bytes per second. The streaming mode is intended for volume dumps and loads to and from disk and completely occupies the 8100 processor. The 8809 1A is the first drive that attaches to an 8101. The 1B is the first drive that attaches to an 8100 processor. The string of four drives is completed by adding a Model 2, a Model 3, and another Model 2, in that order.

OTHER PERIPHERAL DEVICES: Members of many IBM display and printer product lines can be attached to the 8100 Information System. Among the most important products or families represented are:

- The 8775 Display Terminal. Introduced with the 8100 System in October 1978, the 8775 currently offers two pairs of models. One pair is designed for attachment via the Loop Adapter; the other pair, via data communications lines. Within each pair, one model provides a display capacity of 960, 1920, or 2560 characters and the second model adds the capability for displaying 3440 characters.

- The 3104 Display Terminal. A lower cost version of the 8775, the 3104 was introduced in March 1982. There are two models available: Model B1 comes with a 75-key data entry keyboard, while Model B2 is equipped with an 87-key EBCDIC typewriter keyboard. Both keyboard models are detachable. The 3104 contains a 12-inch display screen with a 1920-character display capacity, arranged in ▶

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- 24 lines of 80 characters each. The display may be tilted or swivelled for operator convenience.
- The 3270 Information Display System family. The 3274-51C or the 3276 (any model) control unit may be used to attach clusters of 3270 family displays and printers to the 8100 System. In addition, 3277 displays and certain 328X printers can be directly attached to the 8140-BXX processors and the 8101 unit.
 - The 3262 Band Printer series. Models 2 and 12 are offered for loop attachment to the 8100 and operate at 650 lpm and 325 lpm, respectively.
 - The 3101 Display Terminal. Six models that offer various interface compatibilities and a choice of character- or block-mode transmission are port-attachable directly or via a data link. Software support for the 3101 and other TTY-compatible devices must be provided by the user.
 - The 3630 Plant Communication Terminal family. The 3631 and 3622 control units may be used to attach 364X terminals to the 8100 system, or the 364X devices may be loop-attached as stand-alone devices.
 - The 3732 Text Display Station and 3736 Printer. These devices provide the 8100 System with a word processing capability.
 - The IBM 5150 Personal Computer. The PC may be attached using the 7426 Terminal Interface Unit, and appears to the 8100 as a 3274-51C Control Unit with an attached 3278-2 display.
 - The IBM 5280 Distributed Data System. Applications running in the 5280 can communicate with applications running under DPPX.
 - The IBM Series/1. Applications may be written for the Series/1 and 8100 under DPPX, and can be used to provide a file transfer facility between the two systems.
 - The 6670 Information Distributor. This document printer/distributor may be attached to the 8100 System through a data link adapter.

Specific model numbers and attachment capabilities of these and other devices that can be configured with the 8100 system are listed in Table 2. Detailed reports on many of these product lines, including the 3270 family and the 8775 and 3101 displays, can be found elsewhere in this Datapro service.

SOFTWARE

OPERATING SYSTEMS: There are two primary IBM licensed program products currently available to support the 8100 system hardware. The Distributed Processing Programming Executive (DPPX) is a general multipurpose operating system for commercial, interactive, scientific, and plant floor applications and supports a number of optional licensed programs, including Cobol and Fortran. 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 provides upward compatibility from an IBM 3790.

Under DPCX, all program development is performed on the host computer. Under DPPX, programs are developed on

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

The *Distributed Processing Control Executive (DPCX)* is a programmable, multi-application, display-oriented control system that can control the execution of up to 62 user programs concurrently. Application programs written for the 3790 Communication System will run without change or recompilation under DPCX when the same or compatible devices are used. User data sets can be transferred via diskettes from 3790 disk storage to 8100 disk storage using a DPCX service routine.

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

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

DPCX application programs are coded using the IBM 3790 programming statements. Thus, programs written for the 3790 can be run unchanged on an 8100 system under DPCX although the programs must be modified if they are coded for hardware not supported by DPCX. 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.

The current version of DPCX, Release 2.2, includes a full-screen system reconfiguration facility, a simplified logon procedure, the ability to dump to disk, and new operands and instructions for improved performance. Release 2.2 supports the downstream connection of Series/1 systems via a communications port and the 8140 Models C72, C82, and C92 in single-processor mode. An enhancement to DPCX, Feature #6001 Level F, provides improved BROWSE, VIEW, and SPOOL commands.

An updated version of DPCX, Release 3, was announced during July 1982, and provides additional performance capabilities. Support is provided for the three 8140C models ►

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► In dual-processor mode, and the maximum number of concurrent jobs is doubled from 31 to 62. Feature #6001 is integrated into DPCX/Base, and the IBM Displaywriter can be attached to the 8100. IBM projects a 60-percent throughput improvement with an 8140 Model C running DPCX Release 3 over an 8140 Model B running Release 2.2. Release 3 is scheduled for release April 1983.

DPCX/DISTRIBUTED OFFICE SUPPORT FACILITY (DOSF): Supports the preparation of office correspondence and other business-related documents. DPCX/DOSF permits document creation, revision, formatting, storage, retrieval, printing, and host transfer. DOSF has been enhanced to allow documents exchanged between the 8100 and IBM Displaywriter may be edited.

INTERACTIVE DISPLAY TEXT FACILITY (IDTF): Provides text entry and edit functions for an IBM 8775 Display Terminal connected to an IBM 8100. Text/edit functions are similar to those on the IBM 3732 Text Display Station, while existing 8775 data functions are maintained.

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

The major components of DPPX/Base include: the Supervisor, Command Facility, Data Management, and Interactive Editor. The Supervisor manages processor and error recovery; queues, locks, and timers; storage addresses and contents; and the Initial Program Load (IPL) function. DPPX/Base includes a set of commands used to define system environments, initiate work, and manage the operation of the system. The Command Facility interprets these commands and invokes other programs as needed to execute the commands. Commands can be executed interactively or in a batch mode. The Data Management portion of DPPX provides two access methods: the Relative Sequential Access Method (RSAM) and the Indexed Sequential Access Method (ISAM). RSAM provides direct access to records using a relative record or block number, as well as sequential access to records. ISAM 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.

In July 1982, IBM announced increased capabilities of DPPX/Base. The program product can now support the IBM 3640 Plant Communication System for host communications, the Displaywriter, the 5280 Distributed Data System, and the Series/1. DPPX/Base Functional Enhancement Package 6 (FEP6) provides these features and became available September, 1982. IBM also announced the capability for DPPX users to access the Distributed Office Support Facility (DOSF) on an attached 8100 system running DPCX. An IBM 8775 display with Interactive Display Text Facility (IDTF) software can be used either as a DPPX terminal or an occasional text terminal to DOSF under DPCX. This function became available April, 1983.

In October 1982, the connectivity capabilities of the 8100 were extended with additional enhancements to DPPX/Base. These enhancements provided the 8100 with support for the attachment of: the IBM Personal Computer (5150); the IBM 5280 for application-to-application communication; the IBM Series/1 for application-to-application communication; and SNA Dial. The IBM Personal Computer attaches via the 7426 Terminal Interface Unit, and operates as a 3275 Model 51C Control Unit with a 3278 Model 2 display attached; it attaches directly to an SDLC link on the 8100.

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.

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.

DPPX/FORTRAN: A high-level, mathematically oriented programming language and compiler designed according to the specifications of ANSI Fortran X.310-1966.

DPPX/PL/1: A program product that includes a PL/1 compiler and library with re-entrant routines. The PL/1 implementation in the 8100 conforms to the ANSI X3.53-1976 standard.

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/DATABASE 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.

DATA CAPTURE AND MANAGEMENT SYSTEM/DPPX: A data entry product that consists of an interactive job definition program, an on-line executor for data capture, and two batch utility programs.

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.

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

DPPX/SORT/MERGE (SORT): Provides a sort for the 8100 system that is designed to run with the DPPX/Base and provides users with facilities for extracting and sequencing data sets.

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. ►

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► **DPPX/INTERACTIVE PRODUCTIVITY FACILITY:** A simplified, full-screen interactive interface to the DPPX command facility with tutorial routines included that explain system functions. The latest update to DPPX/IPF, Release 2, provides improved productivity functions in the areas of system use, system operation, and system management. It became available September, 1982.

DPPX/PARAMETER TABLE GENERATION FACILITY (GEN3644): Provide 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/SYSTEM PRODUCT (SP): Extends the distributed data processing capabilities of DPPX/Base by combining DPPX/Base enhancement package 6 with 10 additional DPPX licensed programs.

DPPX/SP INTERACTIVE MAP DEFINITION (IMD): Generates mapgroups to fully utilize the enhanced functions provided by DPPX/SP.

DPPX/PERFORMANCE TOOL (PT): A program product consisting of the DPPX/PT Monitor and the DPPX/PT Report feature. 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): Enables systems programmers to code programs for an 8100 system running under DPPX and to compile and test them on the host before implementing them on the 8100.

DPPX/PROBLEM DETERMINATION AID (PDA): Designed to improve central problem management, DPPX/PDA works in conjunction with the Network Problem Determination Application (NPDA) running in a System/370 or 4300 Series processor. It provides increased central site awareness of and ability to react to malfunctions at remote sites.

DPPX/PROGRAMMED OPERATOR FACILITY: Provides the ability for an 8100 to intercept and service messages directed to the system operator. Each message can have a unique programmed response which can be specified by the user.

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

DISTRIBUTED SYSTEMS EXECUTIVE (DSX): A set of routines and files that give IBM 8100 and 3790 system network users a simple and comprehensive means of data and network management. DSX combines, in one product,

the host libraries, holding files, and control files, and the transmission, formatting, and reporting functions needed for library and transmission control in 8100 and 3790 system networks. Version 2 of DSX has been introduced, providing support for Series/1 processors.

HOST COMMAND FACILITY: Designed to enable a host-attached terminal to function as if it were directly attached to an 8100/DPPX or DPCX system, the Host Command Facility gives the operator at a central System/370 site the capability to operate and control remote SDLC-connected 8100 systems.

PRICING

IBM offers the 8100 Information System for purchase, for 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. Prime-shift maintenance is provided for any consecutive nine-hour period between 7 a.m. and 6 p.m., Monday through Friday. The maintenance categories determine the schedule of extended maintenance charges. The two schedules differ for extended Monday-through-Friday maintenance. 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				
	<u>9*</u>	<u>12</u>	<u>16</u>	<u>20</u>	<u>24</u>
Monday-Friday—					
Category A	10%	14%	18%	22%	26%
Category B	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. 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. ►

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		<u>Monthly Charges*</u>			<u>Monthly</u>
		<u>Rental</u>	<u>Lease</u>	<u>Purchase</u>	<u>Maint.</u>
8130	Processor; includes 256K bytes of memory, 1 diskette drive, two ports, and:				
A21	29 megabytes of disk storage	\$1,055	\$898	\$19,040	\$161
A22	23 megabytes of disk storage and 131K bytes of fixed-head storage	1,080	920	19,820	170
A23	64 megabytes of disk storage	1,110	945	20,600	170
A24	58 megabytes of disk storage and 131K bytes of fixed-head storage	1,135	966	21,380	180
1530	System Expansion; for attachment of 8101 units and direct attachment of tape drive	103	88	2,780	13.50
1710	Processor Storage Type 1; 128K bytes, 1 max.	119	102	2,695	9.50
1720	Processor Storage Type 1; 256K bytes, 3 max.	239	204	5,395	19
B23	64 megabytes of disk storage	2,455	—	37,600	120
B24	58 megabytes of disk storage and 131K bytes of fixed-head storage	2,483	—	38,380	130
1530	System Expansion; for attachment of 8101 units and direct attachment of tape drive	111	—	2,780	13.50
1730	Processor storage; 512K bytes, 2 max.	512	—	5,000	20
8140	Processor; includes 1 diskette drive and—				
	A3X Series; includes 256K bytes of memory, 3 ports, and:				
A31	29 megabytes of disk storage	1,570	1,335	26,440	190
A32	23 megabytes of disk storage plus 131K bytes of fixed-head storage	1,595	1,360	27,220	200
A33	64 megabytes of disk storage	1,625	1,385	28,000	200
A34	58 megabytes of disk storage plus 131K bytes of fixed-head storage	1,650	1,405	28,780	208
1490	Storage Increment; 128K bytes	376	320	6,540	33
4545	Expanded Function Operator Panel	119	102	2,775	33.50
	A4X Series; includes 320K bytes of memory, 2 ports, floating point arithmetic, and:				
A41	29 megabytes of disk storage	1,955	1,665	31,780	233
A42	23 megabytes of disk storage and 131K bytes of fixed-head storage	1,985	1,690	32,560	243
A43	64 megabytes of disk storage	2,015	1,715	33,340	243
A44	58 megabytes of disk storage and 131K bytes of fixed-head storage	2,035	1,735	34,120	251
4545	Expanded Function Operator Panel; eliminates 2 processor ports	119	102	2,775	33.50
	A5X Series; includes 512K bytes of memory, no ports, and:				
A51	29 megabytes of disk storage	2,420	2,060	28,940	256
A52	23 megabytes of disk storage plus 131K bytes of fixed-head storage	2,445	2,080	29,720	266
A53	64 megabytes of disk storage	2,475	2,110	30,500	266
A54	58 megabytes of disk storage plus 131K bytes of fixed-head storage	2,505	2,130	31,280	274
	A6X Series; includes 768K bytes of memory, 1 diskette drive, no ports, and:				
A61	29 megabytes of disk storage	2,560	2,180	41,440	189
A62	23 megabytes of disk storage plus 131K bytes of fixed-head storage	2,590	2,205	42,220	198
A63	64 megabytes of disk storage	2,620	2,230	43,000	198
A64	58 megabytes of disk storage plus 131K bytes of fixed-head storage	2,645	2,250	43,780	207
	A7X Series; includes 1024 bytes of memory, 1 diskette drive, no ports, and:				
A71	29 megabytes of disk storage	2,795	2,380	43,940	201
A72	23 megabytes of disk storage plus 131K bytes of fixed-head storage	2,820	2,400	44,720	209
A73	64 megabytes of disk storage	2,850	2,430	45,500	209
A74	58 megabytes of disk storage plus 131K bytes of fixed-head storage	2,880	2,450	46,280	217
	BXX Series; includes 3 ports, 1 diskette drive, 131K bytes of fixed-head storage, and:				
B51	512K bytes of memory, plus 58 megabytes of disk storage	2,585	2,200	46,110	228
B52	512K bytes of memory, plus 123 megabytes of disk storage	3,015	2,570	55,000	278
B61	768K bytes of memory, plus 58 megabytes of disk storage	2,820	2,400	48,610	238
B62	768K bytes of memory, plus 123 megabytes of disk storage	3,250	2,770	57,500	290
B71	1024K bytes of memory, plus 58 megabytes of disk storage	3,055	2,600	51,110	250
B72	1024K bytes of memory, plus 123 megabytes of disk storage	3,485	2,970	60,000	300
	CXX Series; includes 10 ports, 1 diskette drive, 123 megabytes of disk storage, and:				
C72	1024K bytes of memory	3,950	3,365	79,500	318
C82	1536K bytes of memory	4,420	3,765	84,500	338
C92	2048K bytes of memory	4,890	4,165	89,500	358
4545	Extended Function Operator Panel	119	102	2,775	33.50
3750	Floating Point Feature	183	156	4,710	25.50
1701	Communication Attachment; provides 4 additional ports; 2 max; requires 3901	16	14	460	0.50
3220	Display & Printer Attachment; for first 4 devices; requires 3901	119	102	3,120	18
1506	Display & Printer Attachment; for additional 4 devices; 5 max.	16	14	486	3
4901	Magnetic Tape Attachment; for up to 4 drives; requires 3901	97	83	2,545	11.50
3901	Feature Expansion Prerequisite	17	15	560	4
4655	Keylock (all models)	—	—	57	—
6555	Security Cover Locks (all models)	—	—	39	—
6566	Security Lock, Diskette (all models)	—	—	34	—

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Monthly Charges*

		<u>Rental</u>	<u>Lease</u>	<u>Purchase</u>	<u>Monthly Maint.</u>
8101	Storage and Input/Output Unit:				
A20	Device attachment only	254	217	6,725	14.50
A23	64 megabytes disk storage and device attachment	719	613	16,635	73.50
A25	128 megabytes disk storage and device attachment	1,150	980	25,525	127
1701	Communications Attachments; provides 4 additional ports; 2 max; requires 3901	16	14	460	0.50
3220	Display & Printer Attachment; for first 4 devices; requires 3901	119	102	3,120	18
3901	Feature Expansion Prerequisite	17	15	560	4
1506	Display & Printer; additional (for additional 4 devices)	16	14	486	3
1507	Diskette Drive and Magnetic Tape Attachment (A20 only)	37	32	1,076	4.50
4520	Diskette 2D Drive; 1 megabyte; requires 1507 on A20	137	117	3,455	31.50
4521	Magnetic Tape Attachment; for up to 4 Model 8809 drives; requires 1507 on A20	86	73	2,155	10
8809	Magnetic Tape Unit:				
-1A	First Drive for 8101	470	400	11,960	76.50
-1B	First Drive for 8130 or 8140	573	488	14,640	101
-2	Second or Fourth Drive	418	356	10,610	69
-3	Third Drive	470	400	11,960	76.50
4920	Multi-Drive Feature for 8809-1B	15	13	411	2.50

Communications and I/O Adapters for 8130/8140/8101

1601	SDLC Communications With Business Machine Clock	60	51	625	8.50
1602	SDLC Communications Without Business Machine Clock	43	37	585	8
1603	BSC/SS Communications With Business Machine Clock	26	22	774	3
1604	BSC Communications Without Business Machine Clock	16	14	519	2.50
1550	CCITT V.35 Interface	19	16	561	2
3701	EIA RS-232-C Interface	14	12	374	4
4830	Loop Adapter	25	21	525	4
4835	Loop Adapter, Second Lobe	25	21	525	4
5200	Multi-Speed Clock (for direct connection at speeds greater than 2400 bps)	16	14	486	1.50
5500	Integrated Modem, Non-Switched	25	21	625	5.50
5501	Integrated Modem, Switched	34	29	972	7
5655	X.21 Adapter for nonswitched networks	27	23	770	2
5656	X.21 Adapter for switched networks	34	29	945	2
5660	Digital Data Service (DDS) Adapter	35	30	972	2
	Communications Port Features for 8140 CXX Series:				
1610	Two directly attached loops plus two SDLC/RS-232-C interfaces	250	214	4,138	48
1611	Three loops plus one SDLC/RS-232-C interface	261	223	4,289	48
1612	Three loops plus one SDLC/X.21 switched interface	281	240	4,860	46
1613	Three loops plus one SDLC/X.21 non-switched interface	274	234	4,685	46
1614	Three loops plus one SDLC/V.35 interface	266	227	4,476	46
1620	One low speed loop plus three SDLC/RS-232-C interfaces	255	219	4,447	48.50
1621	Four SDLC/RS-232-C interfaces	244	210	4,296	48.50
1630	Two SDLC/EIA interfaces; requires 1620 or 1621	130	112	2,378	24.50

SOFTWARE

		<u>Monthly License Fee Basic</u>	<u>Monthly License Fee DSLO</u>
5761-DS1	Distributed Processing Control Executive (DPCX): DPCX/Base Feature 6001	\$414	\$352
5761-XR1	Distributed Office Support Facility (DOSF)	704	598
5668-956	Interactive Display Text Facility (DTF)		
	Distributed Processing Programming Executive (DPPX):		
5760-010	DPPX/Base	294	250
5760-AS1	DPPX/ASSM	79	67
5760-CB1	DPPX/Cobol Compiler	148	126
5760-LB1	DPPX/Cobol Run-Time Library	26	22
5760-FO1	DPPX/Fortran Compiler	119	101
5760-LM1	DPPX/Fortran Library	58	49
5760-XR1/01	DPPX/DPS Interactive Map Definition	126	107
5760-XR1/02	DPPX/DPS Format Management	50	42
5760-TD1	DPPX/DTMS (Data Base and Transaction Management System)	152	129
5760-RC1	DPPX/DSC (Data Stream Compatibility)	26	22
5760-XC1	DPPX/RJE	40	34
5760-SM1	DPPX/Sort/Merge	35	30
5760-XC2	DMS/DPPX	102	77
5760-ED1	DPPX/GEN3644	21	15
5748-XXG	Distributed Systems Executive (DSX)	192	144

IBM 8100 Information System



SOFTWARE

		Monthly License Fee <u>Basic</u>	Monthly License Fee <u>DSLO</u>
5660-281	DPPX/System Product	760	645
5660-282	DPPX/SP IMD	186	158
5735-XR1	Host Command Facility for 8100/DPCX systems	84	63
5760-XR5/01	DPPX/PT Monitor	42	—
5760-XR5/02	DPPX/PT Reporter Feature	48	—
5660-271	DPPX/Interactive Productivity Facility	40	34
5660-272	DPPX/PDA (Problem Determination Aid)	30	25
5660-273	DPPX/Programmed Operator Facility	580 ²	435 ²
5668-986	Distributed Systems Executive (DSX) Version 2	380	285
5760-PL1	DPPX/PL1 Compiler	358	304
5760-LM2	DPPX/PL/1 Library	62	53
5760-XR6	Data Capture and Management System/DPPX	83	62 ■

IBM 3735 Programmable Buffered Terminal

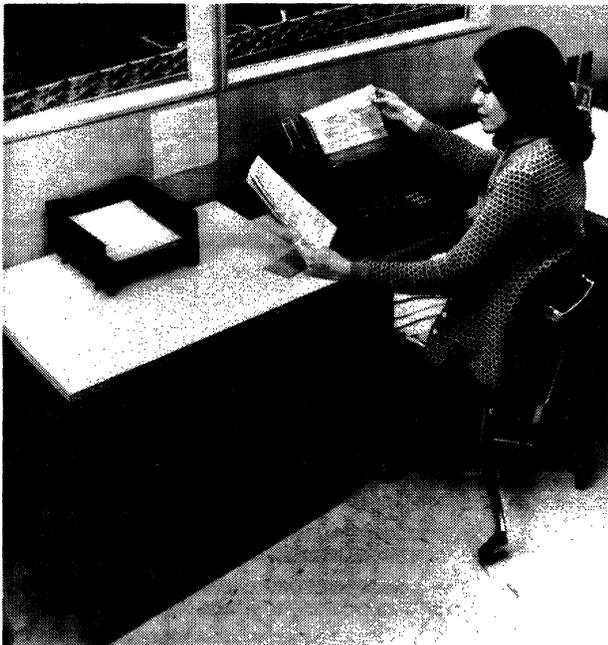
MANAGEMENT SUMMARY

First introduced in 1972, the IBM 3735 has undergone several enhancements over the years including increased transmission speed, file processing capability and host compatibility.

The 3735 basic system includes an IBM Selectric keyboard/typewriter and control unit, which houses a non-removable disk, control circuitry and communications adapter. For increased data entry capability, the user may optionally configure an IBM 5496 Data Recorder. For faster printed output, an IBM 3286 Printer is another supported option.

The 3735 can access a 360/370 or System/3 host on either a point-to-point switched or multipointed leased line. The 3735 may be mixed with other BSC terminals on the same multipointed line.

Originally restricted to processing records, the 3735 is available with a limited file processing capability. The optional File Storage Capability permits the creation of a single file on disk consisting of variable-length records. Records are retrieved by key via a sequential search from the beginning of the file. Direct access is not provided. Records can be created, altered, or read from the file; new records are added in chronological order at the end of the file. The File Storage Capability increases the flexibility and usefulness of the 3735 by permitting on-site file



A programmable terminal designed for automated forms preparation and batch transmission. Functions include arithmetic operations, data editing and validation, and disk file creation. A 96-column card reader/punch and 66-cps printer are available options.

The terminal is compatible with IBM 360/370 hosts, and most System/3 models. Transmission is half-duplex synchronous at up to 4800 bps. Either ASCII or EBCDIC codes are supported.

A 3735 equipped with file storage, card reader and printer rents for \$720 per month, including maintenance.

CHARACTERISTICS

VENDOR: International Business Machines Corporation, Data Processing Division, 1133 Westchester Avenue, White Plains, New York 10604. Telephone (914) 696-1900.

DATE OF ANNOUNCEMENT: February 1972.

DATE OF FIRST DELIVERY: April 1972.

NUMBER DELIVERED TO DATE: Information not available.

SERVICED BY: IBM.

CONFIGURATION

The 3735 Terminal consists of an IBM Selectric I/O II keyboard/printer and a desk-side control unit. The control unit houses the Arithmetic and Logic Unit, a magnetic disk drive, and the Binary Synchronous Communications Adapter.

Optional attachments are available for an IBM 5496 Data Recorder, to provide 96-column punched card input and output, and for an IBM 3286 Model 3 (unbuffered) Printer, to provide faster printed output.

The Operator Identification Card Reader, also available as an option, reads data contained on the magnetic stripe of a credit card or encoded identification card. The special reader accommodates a card size of 2 $\frac{1}{8}$ by 3 $\frac{3}{8}$ inches.

TRANSMISSION SPECIFICATIONS

Transmission is half-duplex, synchronous at 4800, 2400, 2000, or 1200 bits per second. The Synchronous Clock feature is required for operation at 1200 bits per second. Either ASCII or EBCDIC can be specified as the transmission code. The binary synchronous communications (BSC) technique is employed. IBM, common-carrier, or independent modems with an RS-232C interface can be used to interface the 3735 with a voice-band communications facility. Dial or private lines can be used.

REFERENCE EDITION. This is a mature product line, and no significant further developments are anticipated. Because of its importance, coverage is being continued, but no future update is planned.

IBM 3735 Programmable Buffered Terminal

➤ maintenance to be performed on files generated locally or received from the remote computer, and by permitting completed files to be transmitted to the remote computer.

IBM has also upgraded the disk storage capacity of the 3735 since its introduction, and now provides the option to add external buffering for disk-buffered terminal functions to increase the terminal's performance. The Buffer Expansion option provides external buffering replacing all disk-based buffers and counters. Originally available with a maximum user capacity of 146.4K bytes (including basic storage and two optional increments), the 3735's disk storage can now be increased to 313.9K bytes of user storage through a third optional increment of 167.5K bytes.

USER REACTION

User experience with the IBM 3735 was obtained from the 1977 and 1978 Datapro surveys of batch terminals. A total of five 3735 users were identified, with experience reported on a total of 169 systems. (One user reported 143 systems.) Their comments were as follows:

	<u>Excellent</u>	<u>Good</u>	<u>Fair</u>	<u>Poor</u>	<u>WA*</u>
Overall performance	2	2	1	0	3.2
Ease of use	1	4	0	0	3.2
Hardware reliability	2	2	1	0	3.2
Maintenance service	2	3	0	0	3.4
Software and technical support	1	2	2	0	2.8

*Weighted Average on a scale of 4.0 for Excellent.

All the users indicated that their 3735's were remotely connected to an IBM System/370, over 2400 bps transmission lines. Primary applications were as data entry and dedicated batch terminals. Some of the advantages cited were central program creation, data checking and validation capability, and ease of operation. A disadvantage cited by nearly all the users was the slow data entry and output speed of the system. □

➤ IBM provides integrated modems for operating at 1200 or 2400 bits/second over leased or switched lines. Auto answer is optional with the 1200-bps modem, and is standard in the 2400-bps modem for switched operation. Multipoint Data Link Control is required for leased point-to-point or multipoint operation. The Synchronous Clock is required for both switched and leased versions of the IBM 1200-bps modem. IBM provides switched, point-to-point, and multipoint versions of the 2400-bps integrated modem. The Switched Network Back-Up option permits attaching either the point-to-point or multipoint version of the 2400-bps modem to the dial network as a backup facility to leased operation; calls on the dial network must be placed and answered manually.

The 3735 is program loaded from its host, which may be an IBM System/360 (models 22 through 195), System/370 (models 115 through 195), or System/3 (models 4, 8, 10, 12 or 15). An appropriate binary synchronous communications device is required at the host end. With the System/360 or 370, the line from the 3735 would access the 3704 or 3705 Communications Controller, the 2701 Data Adapter Unit, 2703 Transmission Control, or Integrated Communications Attachment. The System/3 requires the Binary Synchronous Communications Adapter (BSCA).

The 3735 can share a private communications line with other IBM binary synchronous terminals such as the IBM 2780 and 3780 Terminals, 2770 Communication System, and 1130 computer.

Data transfers are checked both from the communications line and on internal movement of data. Parity is checked when the data is read from the disk, dynamic buffers, and arithmetic and logic control unit.

DEVICE CONTROL

The operation of the 3735 Terminal is chiefly under the control of programs stored on the associated disk. The responsibilities of the operator are limited to selecting the task to be performed, entering data, and initiating automatic diagnostic checking in the event of malfunctions. All other functions, including loading of programs, is carried out under the control of the various programs, sometimes together with interaction with the remote computer system.

The basic orientation of the terminal is toward filling out standard business forms, such as orders, invoices, checks, etc., and storing the information for transmission to the central computer. A great deal of flexibility is provided to facilitate preparation of forms, such as arithmetic operations, data validity checking, and data editing. Other operations, such as collection of daily statistics about the office's operations, are also within the capability of the terminal.

There are two principal types of programs; user-generated Form Description Programs (FDPs) and the resident Terminal Control Program (TCP).

An FDP can specify the form format (such as location of each field, number of lines per page, etc.), editing and checking operations to be performed on each field, implied I/O operations (by specifying the source or destination of data), and any data manipulations (such as arithmetic or conditional comparisons).

The TCP executes the operations specified or implied by the FDP. There is only one TCP, but typically there will be several FDPs.

The Local Mode is the starting point for all operations. In this mode, the Selectric keyboard/printer acts like a conventional typewriter, and keyed data is printed without program control. The Local Mode is also used to enter other operating modes. The basic list of operations that can be entered from the Local Mode includes:

- Select an FDP.
- Initiate Enter-Form Mode.
- Enter Error-Correct Mode.
- Enter Playback Mode.
- Enter Request Mode.

Each FDP is identified by a three-digit number and can contain an operator message, a tab set routine, and a field description. The operator can elect to have the message printed out before beginning the data entry operation. The use of this message is to inform the operator about such things as form stock number, tab stops, and prerequisite forms. The operator can also elect to proceed directly to the tab set routine or to begin to create the form.

The Enter-Form Mode allows filling out of a form under control of a specific FDP. The program automatically positions the print element and paper for each field. If errors are made, the operator can backspace and retype the correct entry provided that the field has not been completed. If errors are discovered after a field is completed, corrections are made in the Error-Correct Mode or Playback Mode. ➤

IBM 3735 Programmable Buffered Terminal

► The Error-Correct Mode allows changes to be made in the line that is being typed. Entering this mode causes the logic indicators and the typing element to be reset to the beginning of the line. That line can be typed out by character or by field, allowing new data to be typed where desired.

The Playback mode permits records to be selected and printed from disk storage and can be used to update and correct records as well as to obtain clean copy. The optional File Storage Capability must be installed to modify CPU records received by the 3735. After selecting an FDP, the operator can: play back a single form record, play back all records associated with an FDP, or play back a selected record and all following records associated with the same FDP. A completed record can be recalled using the three-digit record number. The form can be typed out by line, field, or character.

The Request Mode allows the operator to select one of several auxiliary operations, including setting up the Communicate Mode. Once this mode is entered, the terminal is blocked from further operation until an exchange between the terminal and the remote computer has occurred.

Other operations that can be performed after entering the Request mode include: erase data records previously received from the remote computer, erase all operator-entered data records, type out a list of all resident FDPs, type out a list of the identifiers associated with all stored data records, and execute diagnostic tests.

The Buffer Expansion option adds three extra 480-byte dynamic buffers that provide fast-access storage for the buffers and counters that are disk-resident on the basic 3735. This option includes TCP microcode for a 3735 with all options included; no additional TCP microprograms are required for options added at a later time. The added microprograms for the Buffer Expansion option require 7.6K bytes (16 sectors) of disk storage, thus reducing user storage by the same amount.

The File Storage Capability permits data files to be created on disks. The file size, a minimum of 9 sectors (4,284 bytes), is specified at system generation. All FDPs have access to the disk file via a 236-byte File I/O Buffer. Records are accessed by key. Two index registers, included with the option, can be used for data source or destination addresses or for arithmetic operands. Use of the index registers can substantially reduce the size of the FDPs.

In general, to record new data or to access data transmitted from the computer, the terminal must be operating under control of one of the customer-created FDPs. While the primary use of FDPs is to create forms, an FDP can be created for non-form-oriented operations such as transferring a card file to the disk for transmission to the computer.

Loading of the FDP programs can be accomplished only from the remote computer, and all programs must be transferred at the same time. Thus to add or modify a single program, all programs must be retransferred.

The sources of data for manipulation include the keyboard, the card read section of the 5496, and literals imbedded in the program. Destinations (the places where the results are output) can include the Selectric I/O II and 3286 Model 3 Printers and the card punch section of the 5496. The counter, Inquiry Buffer, and Special Storage areas can be used as the sources for data and as places for results to be stored; the last two can be effectively used for holding data to be used by successive data records or to accumulate results for a group of records. In addition, the FDP and record numbers are available to the programmer for use as operands.

Data records can be generated by the operator or received from the remote computer. Once entered, data cannot be

used in the generation of other records unless it is also stored in one of the programmer-accessible areas, such as the Special Storage, Inquiry Buffer, and card input/output buffer areas. Auxiliary card files can be used in conjunction with the generation of a data record, but file-oriented processing normal to data processing functions is not possible. This is not so much a deficiency as an important consideration in evaluating how the 3735 can help you implement your overall data processing functions.

Three basic types of operations can be performed on data: validation, arithmetic, and editing.

Data fields can be checked for type (alphanumeric, alphabetic, or numeric), length (maximum, minimum, or exact), value (greater than, less than, or equal to one or more constants), and/or self-check (modulo 10 or 11). A data field can be specified as optional, which suspends the checks if the operator skips the field. Batch numbers can be assigned, permitting accumulation of batch totals; up to 128 different batches can be identified.

Arithmetic operations are performed with the counters; two counters or one counter and another storage area can be involved. Clearing, addition, subtraction, multiplication, division (with or without rounding), and comparison operations are provided.

A wide range of edit options is provided. Description of numeric fields is COBOL-like. Zero suppression with blank or asterisk fill, floating dollar and arithmetic signs (plus and minus), and CR (credit)/DB (debit) insertions can be specified. Fields to be printed can be centered, right-justified with blank or zero fill, underlined, or printed with the numeric editing specifications. Output to the Inquiry Buffer and Special Storage areas can be right-justified with zero or blank fills.

Each field that goes into the data record can be suppressed from printing and/or transmission if desired for security. Also, an operator ID card reader is another available security option.

Specification of the processing operation for a particular form should be relatively simple. Typically, the user creates a specification in a format similar to the macro-language actually used. Fields are identified by name (including counters) and by position within the storage area (excluding counters, of course).

These specifications are converted into macro-language by the programmer, using IBM System/360 Assembly language supplemented with extensive macros. After assembly, another program (Form Description Utility) formats the resulting object program for transmission to a terminal. Libraries of FDPs can be maintained at the computer site. The terminals do not have to receive the same set of programs.

The 3735 is supported in 360/370 systems operating under DOS BTAM, under DOS/VS BTAM and VTAM, under OS BTAM and TCAM, and under OS/VS BTAM, TCAM, and VTAM. Under OS, a 128K Model 40 is required for program generation. Under DOS, a 16K Model 25 can handle the program generation—but keep in mind that 32K bytes of storage are required for telecommunications under DOS. The CCP and MLMP software facilities of the System/3 support the 3735.

COMPONENTS

DISK STORAGE: The basic disk unit includes 45.2K bytes for storage of the Terminal Control Program and 62.8K bytes for storage of user FDPs and data records. The basic disk storage capacity can be expanded by one or two additional increments of 41.8K bytes each plus a third increment of 167.5K bytes to provide a maximum total storage capacity ►

IBM 3735 Programmable Buffered Terminal

► of 314.1K bytes. Disk storage is reduced by 1.9K bytes when the optional 3286 Model 3 Printer and/or Operator ID Card Reader is added, by 3.8K bytes when the optional File Storage Capability is added, by 5.7K bytes when all of the above are added, and by 7.6K bytes when the optional Buffer Expansion is added by itself or in combination with the preceding three options.

The disk is organized in sectors of 480 bytes each. Four identification bytes are required for each data record, so each data record can be up to 476 bytes long, including field and record delimiters but not communications line control characters.

KEYBOARD/PRINTER: The Selectric I/O II keyboard/printer is based on the familiar Selectric Typewriter, with keyboard and printing functions logically separated. When typing automatically (called power typing by IBM), the Selectric runs at 15.5 characters per second. Character spacing is 10 characters per inch (pica), and vertical spacing is 6 lines per inch.

The basic machine is equipped with friction-feed forms movement, like a conventional typewriter. The maximum

line width is 130 characters (13 inches). Optionally, the printer can be equipped with pin-feed forms movement. A wide selection of sizes is available, ranging from 5¼-inch form width (4⅝ writing width) to 13⅝-inch form width (12½ writing width).

3286 MODEL 3 PRINTER: This optional unit prints via the matrix technique at a rate speed of 66 char./second. The printer is available with 120, 126, or 132 print positions and forms each character of the standard 64-character set of EBCDIC or ASCII symbols via a 4-by-7 dot matrix. It accommodates six-part continuous, pin-fed forms. The 3286 Model is unbuffered.

5496 DATA RECORDER: This optional unit provides input and output via 96-column punched cards. It is a key-punch that operates at 20 columns per second (60 cps) on line. It can be used off-line like a normal keypunch.

PRICING

The IBM 3735 is available for purchase or on a monthly rental plan that includes maintenance. A separate maintenance agreement is available for purchased units. The prices of the basic unit and principal options are:

	<u>Monthly Rental*</u>	<u>Purchase</u>	<u>Monthly Maint.</u>
Terminal			
3735 Model 1	\$369	\$11,390	\$98.00
Features			
Additional Storage—			
#1001 First increment, 41.8K bytes	33	1,035	1.00
#1002 Second increment, 41.8K bytes	33	1,035	1.00
#1003 Third increment, 167.5K bytes	77	2,425	3.00
#1450 Buffer Expansion	28	867	3.00
#4001 File Storage Capability	13	416	1.50
#4600 Operator I.D. Reader	16	520	4.00
#4695 Keylock	35**	35	—
#5010 Multipoint Data Link Control	16	520	1.00
#9509 Pin Feed Platen; Purchase Only	—	62	—
1200 bps Integrated Modem—			
#5500 Point-to-Point or Switched	16	535	3.50
#5501 Switched with Auto-answer	21	714	4.00
#7705 Synchronous Clock (required)	16	520	1.00
2400 bps Integrated Modem—			
#5600 Point-to-Point	70	1,905	13.50
#5602 Multipoint	77	2,115	16.00
#5610 Switched	78	2,170	16.00
#7951 Switched Network Back-up	10	303	4.00
#3950 5496 Attachment	28	867	1.00
#7880 3286 Printer Attachment	16	520	1.00
#4450 Forms Stacker; Purchase Only	—	62	—
Peripherals			
5496 Model 1 Data Recorder	203	4,450	61.50
3286 Printer, Model 3	155	5,475	45.50

*Includes monthly maintenance.

**Single Use Charge.■


IBM 3735 Programmable Buffered Terminal

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#1003 Third increment, 167.5K bytes	80	2,425	3.00
#1450 Buffer Expansion	29	867	3.00
#4001 File Storage Capability	13	416	1.50
#4600 Operator I.D. Reader	16	520	4.50
#4695 Keylock	35**	35	—
#5010 Multipoint Data Link Control	16	520	1.00
#9509 Pin Feed Platen; Purchase Only	—	62	—
1200 bps Integrated Modem—			
#5500 Point-to-Point or Switched	16	535	4.00
#5501 Switched with Auto-answer	22	714	4.50
#7705 Synchronous Clock (required)	16	520	1.00
2400 bps Integrated Modem—			
#5600 Point-to-Point	73	1,905	15.50
#5602 Multipoint	80	2,115	18.00
#5610 Switched	81	2,170	18.00
#7951 Switched Network Back-up	10	303	4.50
#3950 5496 Attachment	29	867	1.00
#7880 3286 Printer Attachment	16	520	1.00
#4450 Forms Stacker; Purchase Only	—	62	—
Peripherals			
5496 Model 1 Data Recorder	213	4,005	68.00
3286 Printer, Model 3	162	3,835	52.00

*Includes monthly maintenance.

**Single Use Charge.■



IBM 3735 Programmable Buffered Terminal

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The Request Mode allows the operator to select one of several auxiliary operations, including setting up the Communicate Mode. Once this mode is entered, the terminal is blocked from further operation until an exchange between the terminal and the remote computer has occurred.

Other operations that can be performed after entering the Request mode include: erase data records previously received from the remote computer, erase all operator-entered data records, type out a list of all resident FDPs, type out a list of the identifiers associated with all stored data records, and execute diagnostic tests.

The Buffer Expansion option adds three extra 480-byte dynamic buffers that provide fast-access storage for the buffers and counters that are disk-resident on the basic 3735. This option includes TCP microcode for a 3735 with all options included; no additional TCP microprograms are required for options added at a later time. The added microprograms for the Buffer Expansion option require 7.6K bytes (16 sectors) of disk storage, thus reducing user storage by the same amount.

The File Storage Capability permits data files to be created on disks. The file size, a minimum of 9 sectors (4,284 bytes), is specified at system generation. All FDPs have access to the disk file via a 236-byte File I/O Buffer. Records are accessed by key. Two index registers, included with the option, can be used for data source or destination addresses or for arithmetic operands. Use of the index registers can substantially reduce the size of the FDPs.

In general, to record new data or to access data transmitted from the computer, the terminal must be operating under control of one of the customer-created FDPs. While the primary use of FDPs is to create forms, an FDP can be created for non-form-oriented operations such as transferring a card file to the disk for transmission to the computer.

Loading of the FDP programs can be accomplished only from the remote computer, and all programs must be transferred at the same time. Thus to add or modify a single program, all programs must be retransferred.

The sources of data for manipulation include the keyboard, the card read section of the 5496, and literals imbedded in the program. Destinations (the places where the results are output) can include the Selectric I/O II and 3286 Model 3 Printers and the card punch section of the 5496. The counter, Inquiry Buffer, and Special Storage areas can be used as the sources for data and as places for results to be stored; the last two can be effectively used for holding data to be used by successive data records or to accumulate results for a group of records. In addition, the FDP and record numbers are available to the programmer for use as operands.

Data records can be generated by the operator or received from the remote computer. Once entered, data cannot be

used in the generation of other records unless it is also stored in one of the programmer-accessible areas, such as the Special Storage, Inquiry Buffer, and card input/output buffer areas. Auxiliary card files can be used in conjunction with the generation of a data record, but file-oriented processing normal to data processing functions is not possible. This is not so much a deficiency as an important consideration in evaluating how the 3735 can help you implement your overall data processing functions.

Three basic types of operations can be performed on data: validation, arithmetic, and editing.

Data fields can be checked for type (alphanumeric, alphabetic, or numeric), length (maximum, minimum, or exact), value (greater than, less than, or equal to one or more constants), and/or self-check (modulo 10 or 11). A data field can be specified as optional, which suspends the checks if the operator skips the field. Batch numbers can be assigned, permitting accumulation of batch totals; up to 128 different batches can be identified.

Arithmetic operations are performed with the counters; two counters or one counter and another storage area can be involved. Clearing, addition, subtraction, multiplication, division (with or without rounding), and comparison operations are provided.

A wide range of edit options is provided. Description of numeric fields is COBOL-like. Zero suppression with blank or asterisk fill, floating dollar and arithmetic signs (plus and minus), and CR (credit)/DB (debit) insertions can be specified. Fields to be printed can be centered, right-justified with blank or zero fill, underlined, or printed with the numeric editing specifications. Output to the Inquiry Buffer and Special Storage areas can be right-justified with zero or blank fills.

Each field that goes into the data record can be suppressed from printing and/or transmission if desired for security. Also, an operator ID card reader is another available security option.

Specification of the processing operation for a particular form should be relatively simple. Typically, the user creates a specification in a format similar to the macro-language actually used. Fields are identified by name (including counters) and by position within the storage area (excluding counters, of course).

These specifications are converted into macro-language by the programmer, using IBM System/360 Assembly language supplemented with extensive macros. After assembly, another program (Form Description Utility) formats the resulting object program for transmission to a terminal. Libraries of FDPs can be maintained at the computer site. The terminals do not have to receive the same set of programs.

The 3735 is supported in 360/370 systems operating under DOS BTAM, under DOS/VS BTAM and VTAM, under OS BTAM and TCAM, and under OS/VS BTAM, TCAM, and VTAM. Under OS, a 128K Model 40 is required for program generation. Under DOS, a 16K Model 25 can handle the program generation—but keep in mind that 32K bytes of storage are required for telecommunications under DOS. The CCP and MLMP software facilities of the System/3 support the 3735.

COMPONENTS

DISK STORAGE: The basic disk unit includes 45.2K bytes for storage of the Terminal Control Program and 62.8K bytes for storage of user FDPs and data records. The basic disk storage capacity can be expanded by one or two additional increments of 41.8K bytes each plus a third increment of 167.5K bytes to provide a maximum total storage capacity ►

IBM 3735 Programmable Buffered Terminal

▶ of 314.1K bytes. Disk storage is reduced by 1.9K bytes when the optional 3286 Model 3 Printer and/or Operator ID Card Reader is added, by 3.8K bytes when the optional File Storage Capability is added, by 5.7K bytes when all of the above are added, and by 7.6K bytes when the optional Buffer Expansion is added by itself or in combination with the preceding three options.

The disk is organized in sectors of 480 bytes each. Four identification bytes are required for each data record, so each data record can be up to 476 bytes long, including field and record delimiters but not communications line control characters.

KEYBOARD/PRINTER: The Selectric I/O II keyboard/printer is based on the familiar Selectric Typewriter, with keyboard and printing functions logically separated. When typing automatically (called power typing by IBM), the Selectric runs at 15.5 characters per second. Character spacing is 10 characters per inch (pica), and vertical spacing is 6 lines per inch.

The basic machine is equipped with friction-feed forms movement, like a conventional typewriter. The maximum

line width is 130 characters (13 inches). Optionally, the printer can be equipped with pin-feed forms movement. A wide selection of sizes is available, ranging from 5¼-inch form width (4⅞ writing width) to 13⅝-inch form width (12½ writing width).

3286 MODEL 3 PRINTER: This optional unit prints via the matrix technique at a rate speed of 66 char./second. The printer is available with 120, 126, or 132 print positions and forms each character of the standard 64-character set of EBCDIC or ASCII symbols via a 4-by-7 dot matrix. It accommodates six-part continuous, pin-fed forms. The 3286 Model is unbuffered.

5496 DATA RECORDER: This optional unit provides input and output via 96-column punched cards. It is a key-punch that operates at 20 columns per second (60 cps) on line. It can be used off-line like a normal keypunch.

PRICING

The IBM 3735 is available for purchase or on a monthly rental plan that includes maintenance. A separate maintenance agreement is available for purchased units. The prices of the basic unit and principal options are:

	<u>Monthly Rental*</u>	<u>Purchase</u>	<u>Monthly Maint.</u>
Terminal			
3735 Model 1	\$434	\$12,540	\$140.00
Features			
Additional Storage—			
#1001 First increment, 41.8K bytes	37	1,135	1.00
#1002 Second increment, 41.8K bytes	37	1,135	1.00
#1003 Third increment, 167.5K bytes	89	2,670	3.00
#1450 Buffer Expansion	32	955	3.00
#4001 File Storage Capability	13	457	1.50
#4600 Operator I.D. Reader	17	573	5.50
#4695 Keylock	36**	36	—
#5010 Multipoint Data Link Control	17	573	1.00
#9509 Pin Feed Platen; Purchase Only	—	62	—
1200 bps Integrated Modem—			
#5500 Point-to-Point or Switched	17	589	4.50
#5501 Switched with Auto-answer	24	786	5.50
#7705 Synchronous Clock (required)	17	573	1.00
2400 bps Integrated Modem—			
#5600 Point-to-Point	81	2,100	19.00
#5602 Multipoint	89	2,330	22.50
#5610 Switched	90	2,385	22.50
#7951 Switched Network Back-up	10	333	5.50
#3950 5496 Attachment	32	955	1.00
#7880 3286 Printer Attachment	17	573	1.00
#4450 Forms Stacker; Purchase Only	—	74	—
Peripherals			
5496 Model 1 Data Recorder	242	4,205	85.50
3286 Printer, Model 3	181	3,260	65.00

*Includes monthly maintenance.

**Single Use Charge.■

Update

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- The Error-Correct Mode allows changes to be made in the line that is being typed. Entering this mode causes the logic indicators and the typing element to be reset to the beginning of the line. That line can be typed out by character or by field, allowing new data to be typed where desired.

The Playback mode permits records to be selected and printed from disk storage and can be used to update and correct records as well as to obtain clean copy. The optional File Storage Capability must be installed to modify CPU records received by the 3735. After selecting an FDP, the operator can: play back a single form record, play back all records associated with an FDP, or play back a selected record and all following records associated with the same FDP. A completed record can be recalled using the three-digit record number. The form can be typed out by line, field, or character.

The Request Mode allows the operator to select one of several auxiliary operations, including setting up the Communicate Mode. Once this mode is entered, the terminal is blocked from further operation until an exchange between the terminal and the remote computer has occurred.

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► of 314.1K bytes. Disk storage is reduced by 1.9K bytes when the optional 3286 Model 3 Printer and/or Operator ID Card Reader is added, by 3.8K bytes when the optional File Storage Capability is added, by 5.7K bytes when all of the above are added, and by 7.6K bytes when the optional Buffer Expansion is added by itself or in combination with the preceding three options.

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The basic machine is equipped with friction-feed forms movement, like a conventional typewriter. The maximum

line width is 130 characters (13 inches). Optionally, the printer can be equipped with pin-feed forms movement. A wide selection of sizes is available, ranging from 5¼-inch form width (4¾ writing width) to 13⅝-inch form width (12½ writing width).

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5496 DATA RECORDER: This optional unit provides input and output via 96-column punched cards. It is a key-punch that operates at 20 columns per second (60 cps) on line. It can be used off-line like a normal keypunch.

PRICING

The IBM 3735 is available for purchase or on a monthly rental plan that includes maintenance. A separate maintenance agreement is available for purchased units. The prices of the basic unit and principal options are:

Terminal	Monthly Rental*	Purchase	Monthly Maint.
3735 Model 1	\$414	\$11,950	\$128.00
Features			
Additional Storage—			
#1001 First increment, 41.8K bytes	36	1,085	1.00
#1002 Second increment, 41.8K bytes	36	1,085	1.00
#1003 Third increment, 167.5K bytes	85	2,545	3.00
#1450 Buffer Expansion	31	910	3.00
#4001 File Storage Capability	13	436	1.50
#4600 Operator I.D. Reader	17	546	5.00
#4695 Keylock	35**	35	—
#5010 Multipoint Data Link Control	17	546	1.00
#9509 Pin Feed Platen; Purchase Only	—	62	—
1200 bps Integrated Modem—			
#5500 Point-to-Point or Switched	17	561	4.50
#5501 Switched with Auto-answer	23	749	5.00
#7705 Synchronous Clock (required)	17	546	1.00
2400 bps Integrated Modem—			
#5600 Point-to-Point	78	2,000	17.50
#5602 Multipoint	85	2,220	20.50
#5610 Switched	86	2,275	20.50
#7951 Switched Network Back-up	10	318	5.00
#3950 5496 Attachment	31	910	1.00
#7880 3286 Printer Attachment	17	546	1.00
#4450 Forms Stacker; Purchase Only	—	62	—
Peripherals			
5496 Model 1 Data Recorder	227	4,005	78.00
3286 Printer, Model 3	173	3,835	59.50

*Includes monthly maintenance.

**Single Use Charge. ■

IBM 3735 Programmable Buffered Terminal



MANAGEMENT SUMMARY

The IBM 3735 is an intelligent terminal oriented toward automating the preparation of standard forms used in business operations, such as invoices, checks, orders, etc. Arithmetic operations, data editing, data validation, and logical decisions can be used to expand an operator's capabilities as she is stepped through a form line-by-line, field-by-field, under control of a program stored in the terminal's integral disk unit. Data entered through the keyboard, and perhaps through the optional 5496 Data Recorder, can also be stored on the disk.

Communication with the central computer is oriented toward transmitting large blocks of data; e.g., all the data recorded during the day may be transmitted at night.

A special provision is included for interactive communication between the terminal and the computer, but the type of communications facility used may well determine the usefulness of this feature in particular installations. For example, keeping a dialed connection open would be expensive, and placing a new call for each record processed would be both time-consuming and expensive. Interactive processing with the 3735 may well be left to those installations with leased-line communications facilities. The 3735 can share a leased line with other IBM binary synchronous terminals such as the 3780, 2780, and 2770.

Originally restricted to processing records, the 3735 is now available with a limited file processing capability. The optional File Storage Capability permits the creation of a single file on disk consisting of variable-length records. Records are retrieved by key via a sequential search from the beginning of the file. Direct access is not provided. Records can be created, altered, or read from the file; new records are added in chronological order at the end of the file. The File Storage Capability increases the flexibility and usefulness of the 3735 by permitting on-site file maintenance to be performed on files generated locally or received from the remote computer, and by permitting completed files to be transmitted to the remote computer. ➤

A programmable, buffered terminal consisting of a Selectric I/O II keyboard printer and control unit. Options include 96-column card reader/punch and printer.

The primary function of the 3735 is office data collection and document preparation with capability of localized data validation and editing and subsequent batch transmission.

Transmission is half-duplex, synchronous at up to 4800 bps, using either EBCDIC or ASCII code. Printer speed is 66 cps.

The terminal is compatible with all IBM System/360 or 360 systems using Bisync. No SDLC compatibility is offered.

A 3735 terminal equipped with file storage, card reader, and printer rents for \$720 per month, including maintenance.

CHARACTERISTICS

VENDOR: International Business Machines Corporation, Data Processing Division, 1133 Westchester Avenue, White Plains, New York 10604. Telephone (914) 696-1900.

DATE OF ANNOUNCEMENT: February 1972.

DATE OF FIRST DELIVERY: April 1972.

NUMBER DELIVERED TO DATE: Information not available.

SERVICED BY: IBM.

CONFIGURATION

The 3735 Terminal consists of an IBM Selectric I/O II keyboard/printer and a desk-side control unit. The control unit houses the Arithmetic and Logic Unit, a magnetic disk drive, and the Binary Synchronous Communications Adapter.

Optional attachments are available for an IBM 5496 Data Recorder, to provide 96-column punched card input and output, and for an IBM 3286 Model 3 (unbuffered) Printer, to provide faster printed output.

The Operator Identification Card Reader, also available as an option, reads data contained on the magnetic stripe of a credit card or encoded identification card. The special reader accommodates a card size of 2-1/8 by 3-3/8 inches.

TRANSMISSION SPECIFICATIONS

Transmission is half-duplex, synchronous at 4800, 2400, or 1200 bits per second. The Synchronous Clock feature is required for operation at 1200 bits per second. Either ASCII or EBCDIC can be specified as the transmission code. The binary synchronous communications (BSC) technique is employed. IBM, common-carrier, or independent modems with an RS-232C interface can be used to ➤

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➤ IBM has also upgraded the disk storage capacity of the 3735 since its introduction, and now provides the option to add external buffering for disk-buffered terminal functions to increase the terminal's performance. The Buffer Expansion option provides external buffering replacing all disk-based buffers and counters. Originally available with a maximum user capacity of 146.4K bytes (including basic storage and two optional increments), the 3735's disk storage can now be increased to 313.9K bytes of user storage through a third optional increment of 167.5K bytes.

The 3735's output printing speed was originally limited to 15.5 characters per second. This slow printing speed, combined with the slow card input/output speeds, eliminated the 3735 from serious consideration as a batch terminal (for remote job entry, for example). Since then, IBM has introduced the optional (and expensive) 3286 Printer, which can produce printed output at speeds up to 66 characters per second—still well below the printing speeds of most of the current batch terminals.

In a similar vein, the 3735's maximum transmission speed was originally limited to 2400 bits per second. IBM has since upgraded this to 4800 bits per second and has deleted the low-speed transmission capability of 600 bits per second.

The 3735 continues IBM's emphasis on 96-column cards for small business applications, as in the System/3 computers. (The optional 5496 Data Recorder is the keypunch for the System/3.)

USER REACTION

User opinion of the IBM 3735 was obtained from two Datapro sources, one being the November 1975 survey of batch terminal users and the other the March 1976 survey of teletypewriter users. A total of 9 users from these two surveys reported on their experience with a total of 61 systems. A combined summary of these users' ratings follows:

	Excellent	Good	Fair	Poor	WA*
Overall performance	3	5	0	1	3.1
Ease of use	2	3	4	0	2.8
Keyboard feel and usability	1	3	0	0	3.3
Print quality	1	3	0	0	3.3
Hardware reliability	2	5	1	1	2.9
Maintenance service	3	2	3	1	2.8
Software and technical support	2	2	1	0	2.4

*Weighted Average on a scale of 4.0 for Excellent.

User opinion of the terminal varied from good to bad. Major advantages cited by users were the ability to capture source data at a reasonable cost, the data editing capability, and strong vendor support.

On the negative side, the principal disadvantages cited were slow speed of the terminal, limited I/O capability, and the lack of SDLC compatibility. According to one user this lack of SDLC compatibility rendered the terminal obsolete to his future expansion program. □

➤ interface the 3735 with a voice-band communications facility. Dial or private lines can be used.

IBM provides integrated modems for operating at 1200 or 2400 bits/second over leased or switched lines. Auto answer is optional with the 1200-bps modem, and is standard in the 2400-bps modem for switched operation. Multipoint Data Link Control is required for the 1200-bps modem for leased point-to-point or multipoint operation. The Synchronous Clock is required for both switched and leased versions of the IBM 1200-bps modem. IBM provides switched, point-to-point, and multipoint versions of the 2400-bps integrated modem. The Switched Network Back-Up option permits attaching either the point-to-point or multipoint version of the 2400-bps modem to the dial network as a backup facility to leased operation; calls on the dial network must be placed and answered manually.

The 3735 is compatible with an IBM System/360 or 370 computer equipped with the appropriate devices for binary synchronous communications, such as the 3704 or 3705 Communications Controller, 2701 Data Adapter Unit, 2703 Transmission Control, or Integrated Communications Attachment.

The 3735 can share a private communications line with other IBM binary synchronous terminals such as the IBM 2780 and 3780 Terminals, 2770 Communication System, and 1130 computer. Other terminals on the shared line can be equipped with the Transparency feature, even though this feature is not currently available for the 3735.

The 3735 can be operated in an unattended mode to receive or transmit in response to a poll.

Data is transferred to and from the terminal over the communications lines in blocks of up to 476 bytes including field and record delimiters, but excluding line control characters.

Data transfers are checked both from the communications line and on internal movement of data. Parity is checked when the data is read from the disk, dynamic buffers, and arithmetic and logic control unit.

The facilities for making corrections in typed documents are discussed under "Device Control."

The 3735 continues the emphasis on extensive self-diagnostic capabilities exhibited by recent IBM computer systems and peripherals. Diagnostic tests included within the Terminal Control Program allow testing of the control unit electronics, disk surfaces, communications adapter, keyboard/printer, 5496 reader/punch, 3286 printer, and communications functions. Testing of the control unit is performed automatically every time the terminal is turned on and whenever a hardware error is detected. The others are run by operator request. Reports are generated for the disk surface and on-line (communications functions) tests; the results of the other tests are displayed via the indicator lights on the keyboard. In addition, a special program, the Trouble Record Form, can be processed in much the same way as the customer FDP to completely check out the terminal functions relating to processing forms.

DEVICE CONTROL

The operation of the 3735 Terminal is chiefly under the control of programs stored on the associated disk. The responsibilities of the operator are limited to selecting the task to be performed, entering data, and initiating automatic diagnostic checking in the event of malfunctions. All other functions, including loading of programs, is carried out under the control of the various programs, sometimes together with interaction with the remote computer system.

The basic orientation of the terminal is toward filling out standard business forms, such as orders, invoices, checks, etc., and storing the information for transmission to the central computer. A great deal of flexibility is provided to

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► facilitate preparation of forms, such as arithmetic operations, data validity checking, and data editing. Other operations, such as collection of daily statistics about the office's operations, are also within the capability of the terminal.

There are two principal types of programs; user-generated Form Description Programs (FDPs) and the resident Terminal Control Program (TCP).

An FDP can specify the form format (such as location of each field, number of lines per page, etc.), editing and checking operations to be performed on each field, implied I/O operations (by specifying the source or destination of data), and any data manipulations (such as arithmetic or conditional comparisons).

The TCT executes the operations specified or implied by the FDP. There is only one TCP, but typically there will be several FDPs.

The Local Mode is the starting point for all operations. In this mode, the Selectric keyboard/printer acts like a conventional typewriter, and keyed data is printed without program control. The Local Mode is also used to enter other operating modes. The basic list of operations that can be entered from the Local Mode includes:

- Select an FDP.
- Initiate Enter-Form Mode.
- Enter Error-Correct Mode.
- Enter Playback Mode.
- Enter Request Mode.

Each FDP is identified by a three-digit number and can contain an operator message, a tab set routine, and a field description. The operator can elect to have the message printed out before beginning the data entry operation. The use of this message is to inform the operator about such things as form stock number, tab stops, and prerequisite forms. The operator can also elect to proceed directly to the tab set routine or to begin to create the form.

The Enter-Form Mode allows filling out of a form under control of a specific FDP. The program automatically positions the print element and paper for each field. If errors are made, the operator can backspace and retype the correct entry provided that the field has not been completed. If errors are discovered after a field is completed, corrections are made in the Error-Correct Mode or Playback Mode.

The Error-Correct Mode allows changes to be made in the line that is being typed. Entering this mode causes the logic indicators and the typing element to be reset to the beginning of the line. That line can be typed out by character or by field, allowing new data to be typed where desired.

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The Request Mode allows the operator to select one of several auxiliary operations, including setting up the Communicate Mode. Once this mode is entered, the terminal is blocked from further operation until an exchange between the terminal and the remote computer has occurred.

Other operations that can be performed after entering the Request mode include: erase data records previously received from the remote computer, erase all operator-entered data records, type out a list of all resident FDPs, type out a list of the identifiers associated with all stored data records, and execute diagnostic tests.

The disk unit is divided into several special storage areas in addition to the space for the Terminal Control Program, user FDPs, and user/computer-created data records. These areas include: 21 ten-digit counters; 236 bytes of Special Storage; a 236-byte Inquiry Buffer; Reader/Punch Buffers (two 96-byte buffers); a 44-byte Identification Badge Reader Buffer; a 236-byte File Input/Output Buffer; a 236-byte Line Print Buffer; an FDP Directory that contains up to 58 FDP identifiers in one sector (up to 17 additional sectors can be used to store a total of 1000 FDP's, which would limit the user-available storage); and a Data Director that contains the identification and storage location of each FDP and data record stored in the terminal. Each of these areas is directly addressable, except the Data Directory, and can be used as the source for operands or the destination of a result.

In addition to these storage areas on the disk, three 480-byte dynamic buffers serve as the interface between the disk and all data input to or output from the terminal. The dynamic buffers also store 105 bits of bit-addressable storage which are used to indicate the results of FDP-specified tests and thereby to control branching and other functions. The programmer has access to the logic indicators but not directly to the dynamic buffers; data can be accessed from the disk areas only.

The Buffer Expansion option adds three extra 480-byte dynamic buffers that provide fast-access storage for the buffers and counters that are disk-resident on the basic 3735. This option includes TCP microcode for a 3735 with all options included; no additional TCP microprograms are required for options added at a later time. The added microprograms for the Buffer Expansion option require 7.6K bytes (16 sectors) of disk storage, thus reducing user storage by the same amount.

The File Storage Capability permits data files to be created on disks. The file size, a minimum of 9 sectors (4,284 bytes), is specified at system generation. All FDPs have access to the disk file via a 236-byte File I/O Buffer. Records are accessed by key. Two index registers, included with the option, can be used for data source or destination addresses or for arithmetic operands. Use of the index registers can substantially reduce the size of the FDPs.

In general, to record new data or to access data transmitted from the computer, the terminal must be operating under control of one of the customer-created FDPs. While the primary use of FDPs is to create forms, an FDP can be created for non-form-oriented operations such as transferring a card file to the disk for transmission to the computer.

Loading of the FDP programs can be accomplished only from the remote computer, and all programs must be transferred at the same time. Thus to add or modify a single program, all programs must be retransferred.

In addition to the buffering for block transmission of data, a separate Inquiry Buffer is provided for the interchange of data between the terminal and computer.

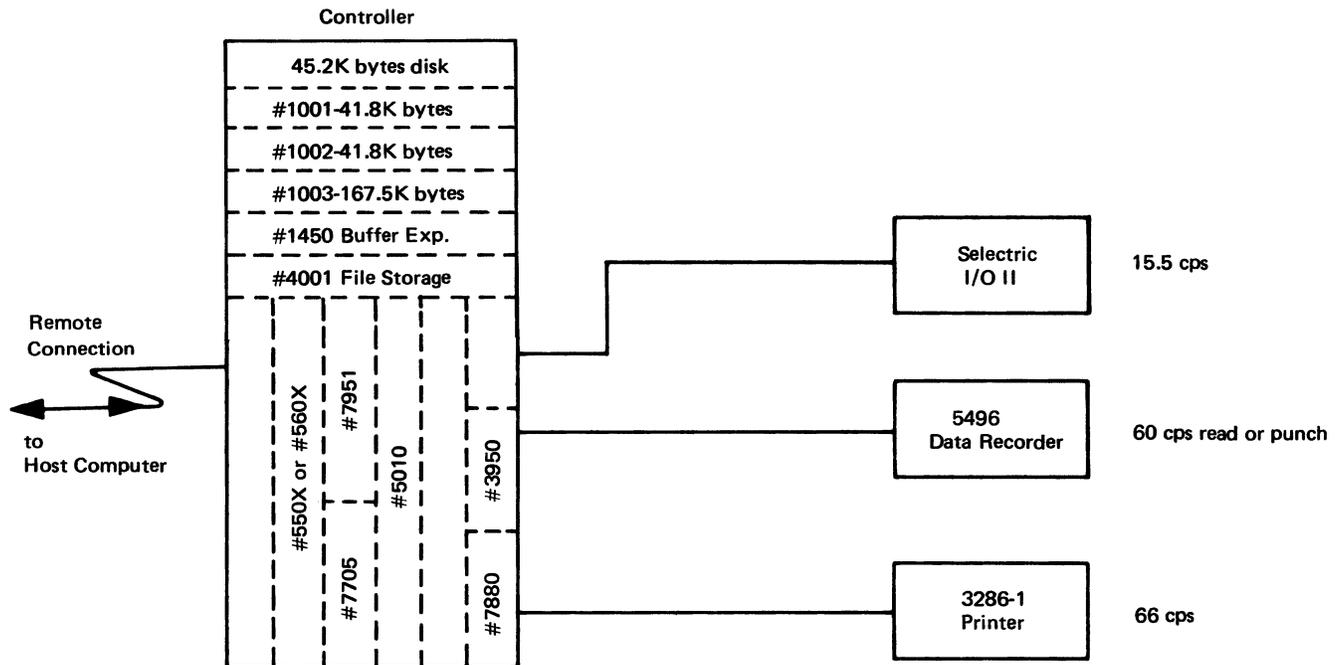
To accomplish the goals of automating form preparation and data collection, the programmer has some rather impressive yet curiously restrictive facilities at his fingertips.

The sources of data for manipulation include the keyboard, the card read section of the 5496, and literals imbedded in the program. Destinations (the places where the results are output) can include the Selectric I/O II and 3286 Model 3 Printers and the card punch section of the 5496. The counter, Inquiry Buffer, and Special Storage areas can be used as the sources for data and as places for results to be stored; the last two can be effectively used for holding data to be used by successive data records or to accumulate results for a group of records. In addition, the FDP and record numbers are available to the programmer for use as operands.

Data records can be generated by the operator or received from the remote computer. Once entered, data cannot be ►

IBM 3735 Programmable Buffered Terminal

Configurations



used in the generation of other records unless it is also stored in one of the programmer-accessible areas, such as the Special Storage, Inquiry Buffer, and card input/output buffer areas. Auxiliary card files can be used in conjunction with the generation of a data record, but file-oriented processing normal to data processing functions is just not possible the way the terminal master control program is laid out now. This is not so much a deficiency as an important consideration in evaluating how the 3735 can help you implement your overall data processing functions.

Three basic types of operations can be performed on data: validation, arithmetic, and editing.

Data fields can be checked for type (alphanumeric, alphabetic, or numeric), length (maximum, minimum, or exact), value (greater than, less than, or equal to one or more constants), and/or self-check (modulo 10 or 11). A data field can be specified as optional, which suspends the checks if the operator skips the field. Batch numbers can be assigned, permitting accumulation of batch totals; up to 128 different batches can be identified.

Arithmetic operations are performed with the counters; two counters or one counter and another storage area can be involved. Clearing, addition, subtraction, multiplication, division (with or without rounding), and comparison operations are provided.

A wide range of edit options is provided. Description of numeric fields is COBOL-like. Zero suppression with blank or asterisk fill, floating dollar and arithmetic signs (plus and minus), and CR (credit)/DB (debit) insertions can be specified. Fields to be printed can be centered, right-justified with blank or zero fill, underlined, or printed with the numeric editing specifications. Output to the Inquiry Buffer and Special Storage areas can be right-justified with zero or blank fills.

Each field that goes into the data record can be suppressed from printing and/or transmission if desired.

Specification of the processing operation for a particular form should be relatively simple. Typically, the user creates a specification in a format similar to the macro-language actually used. Fields are identified by name (including counters) and by position within the storage area (excluding counters, of course).

These specifications are converted into macro-language by the programmer, using IBM System/360 Assembly language supplemented with extensive macros. After assembly, another program (Form Description Utility) formats the resulting object program for transmission to a terminal. Libraries of FDPs can be maintained at the computer site. The terminals do not have to receive the same set of programs.

The 3735 is supported under DOS BTAM, under DOS/VS BTAM and VTAM, under OS BTAM and TCAM, and under OS/VS BTAM, TCAM, and VTAM. Under OS, a 128K Model 40 is required for program generation. Under DOS, a 16K Model 25 can handle the program generation—but keep in mind that 32K bytes of storage are required for telecommunications under DOS.

COMPONENTS

DISK STORAGE: The basic disk unit includes 45.2K bytes for storage of the Terminal Control Program and 62.8K bytes for storage of user FDPs and data records. The basic disk storage capacity can be expanded by one or two additional increments of 41.8K bytes each plus a third increment of 167.5K bytes to provide a maximum total storage capacity of 314.1K bytes. Disk storage is reduced by 1.9K bytes when the optional 3286 Model 3 Printer and/or Operator ID Card Reader is added, by 3.8K bytes when the optional File Storage Capability is added, by 5.7K bytes when all of the above are added, and by 7.6K bytes when the optional Buffer Expansion is added by itself or in combination with the preceding three options.

The disk is organized in sectors of 480 bytes each. Four identification bytes are required for each data record, so each data record can be up to 476 bytes long, including field and record delimiters but not communications line control characters.

IBM estimates that a typical FDP requires about 1000 bytes of storage. However, when FDPs are stored, half of each sector is left unused. Therefore, a typical FDP will probably take four sectors.

KEYBOARD/PRINTER: The Selectric I/O II keyboard/printer is based on the familiar Selectric Typewriter, with

IBM 3735 Programmable Buffered Terminal

▶ keyboard and printing functions logically separated. When typing automatically (called power typing by IBM), the Selectric runs at 15.5 characters per second. Character spacing is 10 characters per inch (pica), and vertical spacing is 6 lines per inch.

The basic machine is equipped with friction-feed forms movement, like a conventional typewriter. The maximum line width is 130 characters (13 inches). Optionally, the printer can be equipped with pin-feed forms movement. A wide selection of sizes is available, ranging from 5-3/4-inch form width (4-5/8 writing width) to 13-5/8-inch form width (12-1/2 writing width). IBM does not currently offer a split platen, two-color ribbon, or front-feed forms capability for the Selectric printer.

The keyboard contains many controls and indicators (lights) in addition to the alphanumeric keys. On the right-hand side of the character keyboard, a 10-key numeric pad has been overlaid (effectively a third shift) to facilitate the entry of numeric items; the layout conforms to a

standard 10-key adding machine keyboard with zero on the space bar.

3286 MODEL 3 PRINTER: This optional unit prints via the matrix technique at a rated speed of 66 char/second. The printer is available with 120, 126, or 132 print positions and forms each character of the standard 64-character set of EBCDIC or ASCII symbols via a 4-by-7 dot matrix. It accommodates six-part continuous, pin-fed forms. The 3286 Model 3 is unbuffered.

5496 DATA RECORDER: This optional unit provides input and output via 96-column punched cards. It is a keypunch that operates at 20 columns per second (60 cps) on line. It can be used off-line like a normal keypunch.

PRICING

The IBM 3735 is available for purchase or on a monthly rental plan that includes maintenance. A separate maintenance agreement is available for purchased units. The prices of the basic unit and principal options are:

Terminal	Monthly Rental*	Purchase	Monthly Maint.
3735 Model 1	\$369	\$11,390	\$68.00
Features			
Additional Storage—			
#1001 First increment, 41.8K bytes	33	1,035	0.50
#1002 Second increment, 41.8K bytes	33	1,035	0.50
#1003 Third increment, 167.5K bytes	77	2,425	2.00
#1450 Buffer Expansion	28	867	2.00
#4001 File Storage Capability	13	416	1.00
#4600 Operator I.D. Reader	16	520	3.00
#4695 Keylock	35**	35	—
#5010 Multiple Data Link Control	16	520	0.50
1200 bps Integrated Modem—			
#5500 Point-to-Point or switched	16	535	2.50
#5501 Switched with Auto-answer	21	714	3.00
#7705 Synchronous Clock (required)	16	520	0.50
2400 bps Integrated Modem—			
#5600 Point-to-point	70	1,905	10.50
#5602 Multipoint	77	2,115	12.50
#5610 Switched	78	2,170	12.50
#7951 Switched Network Back-up	10	303	3.00
#3950 5496 Attachment	28	867	0.50
#7880 3286 Printer Attachment	16	520	0.50
Peripherals			
5496 Model 1 Data Recorder	177	6,590	59.50
3286 Printer, Model 3	184	6,515	32.00

* Includes monthly maintenance.

**Single Use Charge. ■

IBM 5280 Distributed Data System



The 5280 is IBM's diskette-based DDP system. A variety of communications features are available, including IBM 3270 emulation.

MANAGEMENT SUMMARY

The 5280 Distributed Data Processing System was introduced by IBM on January 10, 1980. Originally a product of the now-defunct General Systems Division, the 5280 system consists of a family of diskette-based intelligent terminals that can be programmed to enter, validate, store, process, and print business information at the point of origin.

In January 1981, IBM announced several enhancements to the 5280 system, including new communications features, increased storage capacity, and additional processing power. The 5280-3270 Emulation Licensed Program was introduced, which allows the 5285 or 5286 terminals to appear as IBM 3270 terminals using either BSC or SNA/SDLC. The 5285 and 5286 terminals, as well as the 5288 controller, were enhanced via new models with expanded main storage capacities. Also introduced was a new printer, the 5224, and a second application microprocessor feature which provides additional processing power to the 5280 system.

In April 1983, IBM made several changes to the 5280 system. A new 10-Megabyte Disk Storage Drive feature was announced, expanding disk storage on the 5280 system to up to 70MB. A new printer attachment capability was announced, allowing the IBM 5217 and 5242 Printers to be attached to the system. Also, a new model structure was introduced for the 5280 system; in this new structure, many of the existing standard configurations were eliminated in favor of optional special features. The new structure ac- ➤

A diskette-based distributed data processing system.

The 5280 System provides for intelligent keyboard/displays and printers at both remote and local sites. Support for distributed functions, such as batch and interactive communications, intelligent data entry, batch processing, and transaction processing, is provided via three configurations, including integral single or dual keyboard/display stations and a cluster configuration that can accommodate up to four workstations. A variety of software is available for the 5280, including a 3270 emulation program.

A minimum configuration, consisting of a 5285 Model A01 Programmable Data Station with 32K bytes of main storage, one Diskette 1 drive, and a keyboard, is priced at \$5,900.

CHARACTERISTICS

VENDOR: International Business Machines Corporation, Information Systems Group, National Marketing Division, 4111 Northside Parkway, Atlanta, Georgia 30301. Telephone (404) 238-2000.

DATE OF ANNOUNCEMENT: January, 1980

DATE OF FIRST DELIVERY: June 1980.

NUMBER DELIVERED TO DATE: Information not available.

SERVICED BY: IBM.

CONFIGURATION

A 5280 System configuration can be based on any of the following units, each of which provides all processing and control functions of the system, including those of any attached auxiliary data stations or printers: 1) any model of the 5285 Programmable Data Station; 2) any model of the 5286 Dual Programmable Data Station; or 3) any model of the 5288 Programmable Control Unit with an attached 5281 Data Station or 5282 Dual Data Station (any model).

The 5285 Programmable Data Station is a single, table-top keyboard/display unit with 32K, 48K, 64K, 96K, or 128K bytes of main storage and one or two diskette drives. The standard 480-character display capacity can be expanded to 960 or 1920 characters. The following devices and features can be attached to the 5285: one auxiliary 5281 Data Station or 5282 Dual Data Station, connected via cable at a maximum distance of 200 feet; up to seven 5224, 5225, or 5256 Printers connected via twinax cable; one 5217-C2, 5222-1, or 5242-2 Printers, connected via Start/Stop Printer attachment feature (1152); one 2500 Communications Adapter ➤

IBM 5280 Distributed Data System

➤ accommodates the new Disk Storage Drive feature. Finally, IBM announced that as of August 1, 1983, several models of the 5285 and 5288 will be withdrawn from marketing (these models are noted in the price list). And as of May 1, 1983, the 5280 system will be available for purchase or on a rental basis only; IBM will no longer offer the system on a lease basis.

The 5280 hardware product line consists of nine units: single and dual programmable keyboard/display stations, single and dual auxiliary (nonprogrammable) keyboard/display stations, a programmable control unit, and four printers. Every 5280 system must include a programmable controller and at least one keyboard/display, which may or may not be housed in a single physical unit. System configuration possibilities span a wide range, from a single keyboard/display station with 32K bytes of memory and one diskette drive to a fully expanded system consisting of the programmable control unit with 288K bytes of memory, four keyboard/displays, eight printers, eight diskette drives totaling 9.6 megabytes, and a communications adapter. Hard disk drives and magnetic tape drives, however, are conspicuously absent from the 5280 product line at this writing.

The 5285 Programmable Data Station, the basic unit of the 5280 product line, is a table-top keyboard/display station with a single CRT display and keyboard, one or two diskette drives with a capacity of up to 2.4 megabytes, up to three disk drives with a capacity of up to 30 megabytes, a programmable controller, and from 32K to 128K bytes of memory. A display capacity of 480, 960, or 1920 characters can be selected. Devices that can be attached to the 5285 are limited to one 5222, 5224, 5225 or 5256 Printer and *either* one auxiliary data station (5281 or 5282) or the communications adapter. Thus, a 5280 system built around the 5285 can have up to three keyboard/display stations (through the attachment of an auxiliary 5282), but a multi-station configuration cannot be equipped for communications.

The 5286 Dual Programmable Data Station is a table-top unit that includes two independent keyboard/display stations, two diskette drives with a capacity of up to 2.4 megabytes, a programmable controller, and from 32K to 96K bytes of memory. The display capacity is limited to 480 characters at each station. The 5286 can control one auxiliary data station (5281 or 5282), but it cannot be equipped with either a printer or a communications adapter. Thus, the 5286 is a limited-function unit that appears to be designed mainly for key-to-diskette data entry functions where no communications capability is required.

The 5288 Programmable Control Unit is a floor-standing controller designed to serve as the central component of larger 5280 configurations. The 5288 contains from 32K to 288K bytes of memory, from one to four diskette drives with a total capacity of up to 4.8 megabytes, or from one to seven disk drives with a total capacity of up to 70 megabytes. It can control a cluster of up to four keyboard/displays through the attachment of auxiliary data stations (5281 or 5282). The 5288 can also accommodate the communications adapter and up to eight printers. Diskette ➤

➤ with the appropriate line interface feature; one Magnetic Stripe Reader; one Elapsed Time Counter; and one Security Keylock. The 5285 and its auxiliary 5281 or 5282 Data Station must have the same display capacity. An auxiliary 5281 or 5282 Data Station cannot be attached if the controlling 5285 has the 2500 Communications Adapter.

The 5286 *Dual Programmable Data Station* is a table-top unit that functions as two independent data stations, each with keyboard, display area, and diskette drive, main storage capacities of 32K, 48K, 64K, and 96K bytes are available. The display capacity is 480 characters of each operator position and cannot be expanded. The following devices and features can be attached to the 5286: one auxiliary 5281 Data Station or 5282 Dual Data Station, connected via cable at a maximum distance of 200 feet; one Magnetic Stripe Reader; one Elapsed Time Counter; and one Security Keylock. The 5286 and its auxiliary 5281 or 5282 Data Station must have the same display capacity (i.e., 480 characters). The 5286 cannot be equipped with either a printer or a communications adapter.

The 5288 *Programmable Control Unit* is a floor-standing controller that contains from 32K to 288K bytes of main memory and from 1 to 4 diskette drives. The 5288 provides processing, control, main memory, diskette storage, communications and device attachment capabilities for other components of the 5280 system. The following devices and features can be attached to the 5288: 5281 Data Stations and/or 5282 Dual Data Stations in any combination providing a maximum of four keyboards; up to eight printers including any combination of the 5222, 5224, 5225, and 5256 Printers; up to four 5217-C2, 5222-1, and/or 5242-2 Printers; one 2500 or 3270 Emulation Communications Adapter with the appropriate line interface feature; one magnetic stripe reader; one Elapsed Time Counter; and one Security Keylock.

Each data station requires a separate Auxiliary Data Station Attachment on the 5288 and is connected to the system by a cable 200 feet long. All of the attached data stations must have the same display capacity (480, 960, or 1920 characters for the 5281 and 480 or 960 characters for the 5282). Printers are connected to the 5288 via one of three features: the Twinax Printer Attachment (#1150), the Start/Stop Printer Attachment (#1152), and the Multiple Start/Stop Twinax Printer Attachment (#1162). The first attachment provides a single twinax port and connects up to seven 5224, 5225, and/or 5256 printers to the 5288. The second attachment features a single port for the attachment of one 5222 Model 1, 5217 Model C2, or 5242 Model 2 Printer. The third attachment provides four 5222, 5217, or 5242 Printer ports and a twinax printer port.

The 5281 *Data Station* is a single, table-top, auxiliary keyboard/display unit containing 0, 1, or 2 diskette drives. A nonprogrammable unit, the 5281 must be cable-connected to a 5285, 5286, or 5288 equipped with the appropriate Auxiliary Data Station Attachment feature. The 5281's display capacity is 480, 960, or 1920 characters, as determined by the attachment feature on the controlling device. If the 5281 contains 1 or 2 diskette drives, the controlling 5285, 5286, or 5288 must also have the appropriate Remote Diskette Drive Attachment feature. The 5281 can be equipped with an optional Magnetic Stripe Reader.

The 5282 *Dual Data Station* is a table-top unit that functions as two independent auxiliary data stations, each with keyboard, display area, and optional diskette. The 5282 is available with 0, 1, or 2 diskette drives. A nonprogrammable unit, the 5282 must be cable-connected to a 5285, 5286, or 5288 equipped with the appropriate Auxiliary Data Station Attachment feature. The display capacity at each operator position is either 480 or 960 characters, as determined by the attachment feature on the controlling device. If the 5282]

IBM 5280 Distributed Data System

► character spacing is 10, 12, or 15 characters per inch; vertical spacing is program selectable in increments of 1/96-inch, permitting line spacing of from 4 to 24 lines per inch. A variety of 96-character print wheel options are available. Single sheets are hand-fed. A cut sheet feed device and forms tractor are optionally available. One Model, C2, is available, with a rated print speed of 60 cps.

5222 LINE PRINTER: A bidirectional wire matrix line printer that connects to the 5285 or 5288. Horizontal spacing of 10 to 15 character per inch and vertical spacing of 6 or 8 lines per inch is operator-selectable. Maximum line width is 132 characters at 10 cpi and 198 characters at 15 cpi. A choice of 95-character EBCDIC, 185-character Multinational, or 95-character Spanish character sets is provided. Characters are formed via an 8-by-7 dot matrix. A forms tractor is standard. One model is available, with a rated print speed of 80 cps at both 10 and 15 cpi.

5224 LINE PRINTER: An impact matrix line printer that connects to the 5285 or 5288. Horizontal spacing of 10 or 15 characters per inch and vertical spacing of 6 or 8 lines per inch is operator-selectable. Maximum line width is 132 characters at 10 cpi and 198 characters at 15 cpi. A choice of 95-character EBCDIC, 184-character Multinational, or 95-character Spanish character sets is provided. Characters are formed via an 8-by-7 dot matrix. A forms tractor is standard. A cable thru feature provides the capability of connecting a total of seven multiple 5224s, 5225s, 5256s, 5251 Models 1 or 11, and 5252s to a single twinax cable. Two models are available and differ only in their rated print speeds: Model 1 prints at 140 lpm at 10 cpi, and at 95 lpm at 15 cpi; Model 2 prints at 240 lpm at 10 cpi, and at 175 lpm at 15 cpi.

5242 IMPACT PRINTER: A serial impact matrix printer that connects to the 5285 or 5288. Horizontal spacing of 10 to 15 cpi can be specified; vertical spacing is program-selectable in increments of 1/96-inch, permitting line spacing from 1 to 12 lpi. Originally intended for use with the IBM Datamaster, the 5242 can print any character that can be displayed on a Datamaster. A forms tractor is standard. Only the 5242 Model 2 can be used with the 5280; standard print speed is 160 cps, with a 40 cps speed available for letter quality printing on cut forms.

MODEL 5225 LINE PRINTER: A wire matrix line printer that connects to the 5285 or 5288. Horizontal spacing of 10 or 15 characters per inch and vertical spacing of 6 or 8 lines per inch is operator-selectable. Maximum line width is 132 characters at 10 cpi and 198 characters at 15 cpi. A choice of 95-character EBCDIC, 184-character Multinational (including ASCII graphics), or 95-character Spanish character sets is provided. Characters are formed by an 8-by-7 dot matrix. A forms tractor is standard. Forms skipping is program-controlled. Four models are available and differ only in their rated print speeds: at 10 cpi, Model 1 prints at 280 lpm, Model 2 at 400 lpm, Model 3 at 490 lpm, and Model 4 at 560 lpm; at 15 cpi, Model 1 prints at 195 lpm,

Model 2 at 290 lpm, Model 3 at 355 lpm, and Model 4 at 420 lpm.

MODEL 5256 SERIAL PRINTER: A bidirectional serial matrix printer that connects to the 5285 or 5288. Horizontal spacing is 10 characters per inch. Vertical spacing is operator-selectable at 6 or 8 lines per inch. Maximum line width is 132 characters. A 96-character (upper/lower case) EBCDIC character set is standard; a Multinational character set is also available. A forms tractor and a cut-forms capability are standard. Three models are available and differ only in their rated print speeds: Model 1 prints at 40 cps, Model 2 at 80 cps, and Model 3 at 120 cps.

PRICING

IBM offers the 5280 system on a purchase or rental basis. As of May 1, 1983, no new orders for the IBM 5280 will be accepted requesting an IBM lease. The warranty period is three months. The standard IBM lease or rental contract entitles the customer to unlimited usage each month. Prime-shift maintenance is included in the lease or rental price. The purchase option accrual equals 45 percent of the monthly charge up to 50 percent of the purchase price. IBM's standard educational allowance of 10 percent applies to the 5280 system for lease, rental, and purchase customers.

For purchased, leased or rented systems, the 5280 system is under maintenance group D. The minimum period of maintenance service is 9 consecutive hours between 7:00 a.m. and 6:00 p.m. Monday through Friday. Charges for maintenance coverage outside this period are based upon the following percentages of the minimum monthly maintenance charge (MMC) added to the MMC:

	<u>Consecutive hours</u>				
	9*	12	16	20	24
Monday-Friday (until 8:00 a.m. Saturday)	10	12	14	16	18
Saturday (until 8:00 a.m. Sunday)	4	5	7	8	9
Sunday (until 8:00 a.m. Monday)	5	7	9	11	12

*Outside of the hours 7:00 to 6:00 p.m.

For users without a maintenance contract, the 5280 system is maintained under per-call class 2. Under this class the per-call charge during regular hours is \$77.00 per hour, and during off hours the charge is \$89.00 per hour. The hourly rate for systems engineering service is \$57.00. ►

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Monthly Charges*

		<u>Rental</u>	<u>2-Year Lease</u>	<u>Purchase Price</u>	<u>Monthly Maint.</u>
PROGRAMMABLE DATA STATIONS					
5285	Programmable Data Station:				
A01**	With 32K and one Diskette 1 drive	\$248	\$211	\$5,900	\$40.00
A05**	With 32K and one Diskette 1 drive	273	232	6,150	47.00
B01**	With 48K and one Diskette 1 drive	265	226	6,057	41.00
B05**	With 48K and one Diskette 2D drive	290	247	6,307	48.00
C01	With 64K and one Diskette 1 drive	275	234	6,213	42.00
C05	With 64K and one Diskette 2D drive	300	255	6,463	49.00
D01	With 96K and one Diskette 1 drive	302	257	6,526	44.00
D05	With 96K and one Diskette 2D drive	327	278	6,776	51.00
E01	With 128K and one Diskette 1 drive	329	280	6,839	46.00
E05	With 128K and one Diskette 2D drive	354	301	7,089	53.00
5286	Dual Programmable Data Station:				
A02**	With 32K and two Diskette 1 drives	303	258	7,950	47.00
A10**	With 32K and two Diskette 2D drives	353	300	8,450	61.00
B02	With 48K and two Diskette 1 drives	320	273	8,107	48.00
B10	With 48K and two Diskette 2D drives	370	315	8,607	62.00
C02	With 64K and two Diskette 1 drives	330	281	8,263	49.00
C10	With 64K and two Diskette 2D drives	380	323	8,763	63.00
D02	With 96K and two Diskette 1 drives	357	304	8,576	51.00
D10	With 96K and two Diskette 2D drives	407	346	9,076	65.00
Keyboards for 5285 and 5286 (one required for each operator position):					
4600	83-key EBCDIC Keyboard	15	13	379	4.00
4601	66-key Data Entry Keyboard	15	13	379	4.00
4602	66-key Data Entry Keyboard with Proof Arrangement	15	13	379	4.00
4603	83-key ASCII Keyboard	15	13	379	4.00
Special features for 5285 and 5286 (except as noted):					
3401	Diskette 1 Drive (for 5285 only)	55	47	1,000	9.50
3402	Diskette 2D Drive (for 5285 only)	80	68	1,250	16.50
3410	10MB Disk Storage Drive (for 5285 only)	350	300	4,500	40.00
1150	5224/5225/5256 Twinax Printer Attachment (for 5285 only)	16	14	540	2.00
1152	5217/5222/5242 Printer Attachment (for 5285 only)	17	15	530	2.00
1200**	Attachment for one 480-character 5281 Data Station	19	16	654	2.00
1205**	Attachment for one 960-character 5281 Data Station (for 5285 only)	27	23	767	2.00
1210	Attachment for one 1920-character 5281 Data Station (for 5285 only)	36	30	879	3.00
1215	Attachment for one 480-character 5282 Dual Data Station	27	23	767	2.00
1220**	Attachment for one 960-character 5282 Dual Data Station (for 5285 only)	36	30	879	3.00
1240	Remote Diskette Drive Attachment (required if an attachment 5281 has either 1 or 2 diskette drives)	6	5	213	1.00
3500**	960-Character Display Size (for 5285 only)	6	5	112	1.00
3505	1920-Character Display Size (for 5285 only)	16	14	225	1.00
3610	Elapsed Time Counter (measures elapsed real time)	6	5	112	1.00
4950	Magnetic Stripe Reader (4955 or 4960 is a prerequisite)	16	14	428	2.00
4955	Magnetic Stripe Reader Adapter/Elapsed Time Counter (for 5286 or non-communicating 5285)	23	19	642	2.00
4960	Magnetic Stripe Reader Adapter/Elapsed Time Counter (for communicating 5285)	7	6	256	1.00
6340	Security Keylock	—	—	43	—
6800	Second Application Microprocessor	52	45	1,285	2.00

PROGRAMMABLE CONTROL UNITS

5288 Programmable Control Unit:

Monthly Charges*

Submodel	Bytes of Main Storage	Diskette		Monthly Charges*			
		Diskette 1 Drives	2D Drives	Rental	2-Year Lease	Purchase Price	Monthly Maint.
A01**	32K	1	0	\$246	\$212	\$6,600	\$32.50
A05**	32K	0	1	271	233	6,850	39.50
C01	64K	1	0	273	235	6,913	34.50
C05	64K	0	1	298	256	7,163	41.50
D01	96K	1	0	300	258	7,226	36.50
D05	96K	0	1	325	279	7,476	43.50
E01	128K	1	0	327	281	7,539	38.50
E05	128K	0	1	352	302	7,789	45.50
F01	160K	1	0	354	304	7,852	40.50
F05	160K	0	1	379	325	8,102	47.50
H01	224K	1	0	408	350	8,478	44.50
H05	224K	0	1	433	371	8,728	51.50
J01	228K	1	0	462	396	9,104	48.50
J05	228K	0	1	487	417	9,354	55.50

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		Monthly Charges*			
		Rental	2-Year Lease	Purchase Price	Monthly Maint.
Special features for 5288 Programmable Control Unit:					
3401	Diskette 1 Drive	\$ 55	\$ 47	\$1,000	\$ 9.50
3402	Diskette 2D Drive	80	68	1,250	16.50
3410	10MB Disk Storage Drive	350	300	4,500	40.00
1162	5217/5222/5242 Multiple Twinax Printer Attachment (for 5288 only)	29	25	925	3.00
1245**	Attachment for one 480-character 5281 Data Station	NC		NC	NC
1250**	Attachment for one 960-character 5281 Data Station	6	5	112	1.00
1255	Attachment for one 1920-character 5281 Data Station	16	14	225	1.50
1260**	Attachment for one 480-character 5282 Dual Data Station	6	5	112	1.00
1265	Attachment for one 960-character 5282 Dual Data Station	16	14	225	1.50
1270	Attachment for one additional 480-character 5281 (prerequisite: 1245 or 1260)	19	16	654	2.00
1275	Attachment for one additional 960-character 5281 (prerequisite: 1250 or 1265)	27	23	767	2.50
1280	Attachment for one additional 1920-character 5281 (prerequisite: 1255)	36	30	879	3.00
1285	Attachment for one additional 480-character 5282 (prerequisite: 1245 or 1260)	27	23	767	2.00
1290	Attachment for one additional 960-character 5282 (prerequisite: 1250 or 1265)	36	30	879	3.00
1300	Remote Diskette Drive Attachment, First (required for first and second remote drives when base 5288 has 1 or 2 drives)	6	5	213	1.00
1301	Remote Diskette Drive Attachment, Second (required for first and second remote drives when base 5288 has 3 or 4 drives, or for third and fourth remote drives when base 5288 has 1 or 2 drives)	34	28	970	4.00
1302	Remote Diskette Drive Attachment, Third (required for third and fourth remote drives when base 5288 has 3 or 4 drives, or for fifth and sixth remote drives when base 5288 has 1 or 2 drives)	6	5	213	1.00
1155	Single 5225/5256 Twinax Printer Attachment (provides a single port for attaching from 1 to 5 printers via a single twinax cable)	16	14	540	2.00
1157**	Single 5222 Printer Attachment	17	15	530	2.00
1160**	Multiple 5225/5256 Twinax Printer Attachment (provides 4 ports for attaching, via twinax cable, up to 5 printers)	23	19	755	3.00
1162	Multiple 5222/Twinax Printer Attachment	29	25	925	3.00
3610	Elapsed Time Counter	6	5	112	1.00
4955	Magnetic Stripe Reader Adapter/Elapsed Time Counter (controls up to 4 Magnetic Stripe Readers on attached 5281 and/or 5282 data stations)	23	19	642	2.00
6340	Security Keylock	—	—	43	—
6800	Second Application Microprocessor	52	45	1,285	2.50
AUXILIARY DATA STATIONS					
5281	Data Station:				
Z00	With no diskette drive	80	69	2,295	12.00
5282	Dual Data Station:				
Z00	With no diskette drive	87	74	2,604	13.50
Keyboards for 5281 and 5282 (one required for each operator position):					
4600	83-key EBCDIC Keyboard	15	13	379	4.00
4601	66-key Data Entry Keyboard	15	13	379	4.00
4602	66-key Data Entry Keyboard with Proof Arrangement	15	13	379	4.00
4603	83-key ASCII Keyboard	15	13	379	4.00
Special features for 5281 and 5282:					
4950	Magnetic Stripe Reader	16	14	428	2.00
4400	Remote Disk feature (for attachment of 3410)	NC		NC	NC
PRINTERS					
5217	Printer:				
Mdl. C2	60 cps at 10, 12, 15 cpi	—	—	4,425	58.50
5222	Printer:				
Mdl. 1	80 cps at 10 cpi; 80 cps at 15 cpi	142	—	2,345	31.50
5224	Printer:				
Mdl. 1	140 lpm at 10 cpi; 95 lpm at 15 cpi	323	275	6,395	45.00
Mdl. 2	240 lpm at 10 cpi; 175 lpm at 15 cpi	369	314	7,280	53.00
5225	Printer:				
Mdl. 1	280 lpm at 10 cpi; 195 lpm at 15 cpi	511	436	12,075	102.00
Mdl. 2	400 lpm at 10 cpi; 290 lpm at 15 cpi	584	497	13,945	142.00
Mdl. 3	490 lpm at 10 cpi; 355 lpm at 15 cpi	650	553	15,495	176.00
Mdl. 4	560 lpm at 10 cpi; 420 lpm at 15 cpi	714	607	16,940	209.00

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		<u>Monthly Charges*</u>			
		<u>Rental</u>	<u>2-Year Lease</u>	<u>Purchase Price</u>	<u>Monthly Maint.</u>
5242	Printer:				
Mdl. 2	40/160 cps at 10, 15 cpi	—	—	2,975	57.00
5256	Printer:				
Mdl. 1	40 characters per second	239	204	4,145	45.50
Mdl. 2	80 characters per second	272	231	4,340	49.50
Mdl. 3	120 characters per second	295	251	4,535	56.00
1470	Special features for the Printers: Audible Alarm (signals operator when manual intervention is required due to one of nine error conditions; for 5225 and 5256 printer only)	—	—	\$ 50	—
2680	Cable Thru (permits multiple printers to be connected to a single twinax cable; required on each printer except the last; for 5225 and 5256 printers only)	\$ 4	\$ 3	119	\$ 2.00
6100	Rear Document Insert Device (for 5222 only)	7	6	135	1.00

COMMUNICATIONS

2500	Communications Adapter (for 5285 only)	73	62	1,015	9.00
3270	3270 Emulation Communications Adapter (for 5285 or 5288 only)	110	93	2,040	13.00
3701	EIA Interface (provides RS-232-C interface for an external modem)	17	15	372	1.50
5500	1200-bps Integrated Modem, non-switched	22	19	686	4.00
5501	1200-bps Integrated Modem, switched with auto answer	32	27	744	3.50
5502	1200-bps Integrated Modem, switched without auto answer	22	19	686	3.50
5507	1200-bps Integrated Modem, non-switched with SNBU manual answer	33	28	744	4.00
5508	1200-bps Integrated Modem, non-switched with SNBU auto answer	36	31	947	4.50
5650	Digital Data Service Adapter; Point-to-Point	31	26	873	1.50
5651	Digital Data Service Adapter, Multipoint	31	26	873	1.50
5810	Power Supply Expansion (required on 5285 if 5501 or 5508 is installed)	4	3	79	1.50

SOFTWARE

Basic Monthly Lic. Charge

5708-AS1	Assembler	\$ 44
5708-CB1	Cobol-OS/BS Host Compiler and Library	166
5708-CB2	Cobol-DOS/VSE Host Compiler and Library	166
5708-CB3	Cobol-S/34 Host Compiler and Library	175
5708-CB4	Cobol-S/38 Host Compiler and Library	175
5708-DC1	Communications Utilities	17
5708-DE1	DE/RPG	14
5708-EM1	5280-3270 Emulation	53
5708-SC1	System Control Programming (SCP)	NC
5708-SM1	Sort/Merge	14
5708-UT1	Utilities	8
5708-CL1	Procedure Control Language	10
5798-NZH	OS/6 Communications and File Conversion System	143
5798-RBZ	5280 Contract Data Entry/Edit Support	50
5798-RCR	5280 Format Design Aid	600
5798-RDF	5280 Distribution Order Subsystem	35

*Includes prime shift maintenance.

**Withdrawn from marketing as of 8/1/83. ■

IBM 5280 Distributed Data System



The 5280 is IBM's diskette-based DDP system. A variety of communications features are available, including IBM 3270 emulation.

MANAGEMENT SUMMARY

The 5280 Distributed Data Processing System was introduced by IBM on January 10, 1980. Originally a product of the now-defunct General Systems Division, the 5280 system consists of a family of diskette-based intelligent terminals that can be programmed to enter, validate, store, process, and print business information at the point of origin.

In January 1981, IBM announced several enhancements to the 5280 system, including new communications features, increased storage capacity, and additional processing power. The 5280-3270 Emulation Licensed Program was introduced, which allows the 5285 or 5286 terminals to appear as IBM 3270 terminals using either BSC or SNA/SDLC. The 5285 and 5286 terminals, as well as the 5288 controller, were enhanced via new models with expanded main storage capacities. Also introduced was a new printer, the 5224, and a second application microprocessor feature which provides additional processing power to the 5280 system.

In April 1983, IBM made several changes to the 5280 system. A new 10-Megabyte Disk Storage Drive feature was announced, expanding disk storage on the 5280 system to up to 70MB. A new printer attachment capability was announced, allowing the IBM 5217 and 5242 Printers to be attached to the system. Also, a new model structure was introduced for the 5280 system; in this new structure, many of the existing standard configurations were eliminated in favor of optional special features. The new structure ac- ➤

A diskette-based distributed data processing system.

The 5280 System provides for intelligent keyboard/displays and printers at both remote and local sites. Support for distributed functions, such as batch and interactive communications, intelligent data entry, batch processing, and transaction processing, is provided via three configurations, including integral single or dual keyboard/display stations and a cluster configuration that can accommodate up to four workstations. A variety of software is available for the 5280, including a 3270 emulation program.

A minimum configuration, consisting of a 5285 Model A01 Programmable Data Station with 32K bytes of main storage, one Diskette 1 drive, and a keyboard, is priced at \$5,900.

CHARACTERISTICS

VENDOR: International Business Machines Corporation, Information Systems Group, National Marketing Division, 4111 Northside Parkway, Atlanta, Georgia 30301. Telephone (404) 238-2000.

DATE OF ANNOUNCEMENT: January, 1980

DATE OF FIRST DELIVERY: June 1980.

NUMBER DELIVERED TO DATE: Information not available.

SERVICED BY: IBM.

CONFIGURATION

A 5280 System configuration can be based on any of the following units, each of which provides all processing and control functions of the system, including those of any attached auxiliary data stations or printers: 1) any model of the 5285 Programmable Data Station; 2) any model of the 5286 Dual Programmable Data Station; or 3) any model of the 5288 Programmable Control Unit with an attached 5281 Data Station or 5282 Dual Data Station (any model).

The 5285 Programmable Data Station is a single, table-top keyboard/display unit with 32K, 48K, 64K, 96K, or 128K bytes of main storage and one or two diskette drives. The standard 480-character display capacity can be expanded to 960 or 1920 characters. The following devices and features can be attached to the 5285: one auxiliary 5281 Data Station or 5282 Dual Data Station, connected via cable at a maximum distance of 200 feet; up to seven 5224, 5225, or 5256 Printers connected via twinax cable; one 5217-C2, 5222-1, or 5242-2 Printers, connected via Start/Stop Printer attachment feature (1152); one 2500 Communications Adapter ➤

IBM 5280 Distributed Data System

▷ commodates the new Disk Storage Drive feature. Finally, IBM announced that as of August 1, 1983, several models of the 5285 and 5288 will be withdrawn from marketing (these models are noted in the price list). And as of May 1, 1983, the 5280 system will be available for purchase or on a rental basis only; IBM will no longer offer the system on a lease basis.

The 5280 hardware product line consists of nine units: single and dual programmable keyboard/display stations, single and dual auxiliary (nonprogrammable) keyboard/display stations, a programmable control unit, and four printers. Every 5280 system must include a programmable controller and at least one keyboard/display, which may or may not be housed in a single physical unit. System configuration possibilities span a wide range, from a single keyboard/display station with 32K bytes of memory and one diskette drive to a fully expanded system consisting of the programmable control unit with 288K bytes of memory, four keyboard/displays, eight printers, eight diskette drives totaling 9.6 megabytes, and a communications adapter. Hard disk drives and magnetic tape drives, however, are conspicuously absent from the 5280 product line at this writing.

The 5285 Programmable Data Station, the basic unit of the 5280 product line, is a table-top keyboard/display station with a single CRT display and keyboard, one or two diskette drives with a capacity of up to 2.4 megabytes, up to three disk drives with a capacity of up to 30 megabytes, a programmable controller, and from 32K to 128K bytes of memory. A display capacity of 480, 960, or 1920 characters can be selected. Devices that can be attached to the 5285 are limited to one 5222, 5224, 5225 or 5256 Printer and *either* one auxiliary data station (5281 or 5282) or the communications adapter. Thus, a 5280 system built around the 5285 can have up to three keyboard/display stations (through the attachment of an auxiliary 5282), but a multi-station configuration cannot be equipped for communications.

The 5286 Dual Programmable Data Station is a table-top unit that includes two independent keyboard/display stations, two diskette drives with a capacity of up to 2.4 megabytes, a programmable controller, and from 32K to 96K bytes of memory. The display capacity is limited to 480 characters at each station. The 5286 can control one auxiliary data station (5281 or 5282), but it cannot be equipped with either a printer or a communications adapter. Thus, the 5286 is a limited-function unit that appears to be designed mainly for key-to-diskette data entry functions where no communications capability is required.

The 5288 Programmable Control Unit is a floor-standing controller designed to serve as the central component of larger 5280 configurations. The 5288 contains from 32K to 288K bytes of memory, from one to four diskette drives with a total capacity of up to 4.8 megabytes, or from one to seven disk drives with a total capacity of up to 70 megabytes. It can control a cluster of up to four keyboard/displays through the attachment of auxiliary data stations (5281 or 5282). The 5288 can also accommodate the communications adapter and up to eight printers. Diskette ▷

▶ with the appropriate line interface feature; one Magnetic Stripe Reader; one Elapsed Time Counter; and one Security Keylock. The 5285 and its auxiliary 5281 or 5282 Data Station must have the same display capacity. An auxiliary 5281 or 5282 Data Station cannot be attached if the controlling 5285 has the 2500 Communications Adapter.

The 5286 *Dual Programmable Data Station* is a table-top unit that functions as two independent data stations, each with keyboard, display area, and diskette drive, main storage capacities of 32K, 48K, 64K, and 96K bytes are available. The display capacity is 480 characters of each operator position and cannot be expanded. The following devices and features can be attached to the 5286: one auxiliary 5281 Data Station or 5282 Dual Data Station, connected via cable at a maximum distance of 200 feet; one Magnetic Stripe Reader; one Elapsed Time Counter; and one Security Keylock. The 5286 and its auxiliary 5281 or 5282 Data Station must have the same display capacity (i.e., 480 characters). The 5286 cannot be equipped with either a printer or a communications adapter.

The 5288 *Programmable Control Unit* is a floor-standing controller that contains from 32K to 288K bytes of main memory and from 1 to 4 diskette drives. The 5288 provides processing, control, main memory, diskette storage, communications and device attachment capabilities for other components of the 5280 system. The following devices and features can be attached to the 5288: 5281 Data Stations and/or 5282 Dual Data Stations in any combination providing a maximum of four keyboards; up to eight printers including any combination of the 5222, 5224, 5225, and 5256 Printers; up to four 5217-C2, 5222-1, and/or 5242-2 Printers; one 2500 or 3270 Emulation Communications Adapter with the appropriate line interface feature; one magnetic stripe reader; one Elapsed Time Counter; and one Security Keylock.

Each data station requires a separate Auxiliary Data Station Attachment on the 5288 and is connected to the system by a cable 200 feet long. All of the attached data stations must have the same display capacity (480, 960, or 1920 characters for the 5281 and 480 or 960 characters for the 5282). Printers are connected to the 5288 via one of three features: the Twinax Printer Attachment (#1150), the Start/Stop Printer Attachment (#1152), and the Multiple Start/Stop Twinax Printer Attachment (#1162). The first attachment provides a single twinax port and connects up to seven 5224, 5225, and/or 5256 printers to the 5288. The second attachment features a single port for the attachment of one 5222 Model 1, 5217 Model C2, or 5242 Model 2 Printer. The third attachment provides four 5222, 5217, or 5242 Printer ports and a twinax printer port.

The 5281 *Data Station* is a single, table-top, auxiliary keyboard/display unit containing 0, 1, or 2 diskette drives. A nonprogrammable unit, the 5281 must be cable-connected to a 5285, 5286, or 5288 equipped with the appropriate Auxiliary Data Station Attachment feature. The 5281's display capacity is 480, 960, or 1920 characters, as determined by the attachment feature on the controlling device. If the 5281 contains 1 or 2 diskette drives, the controlling 5285, 5286, or 5288 must also have the appropriate Remote Diskette Drive Attachment feature. The 5281 can be equipped with an optional Magnetic Stripe Reader.

The 5282 *Dual Data Station* is a table-top unit that functions as two independent auxiliary data stations, each with keyboard, display area, and optional diskette. The 5282 is available with 0, 1, or 2 diskette drives. A nonprogrammable unit, the 5282 must be cable-connected to a 5285, 5286, or 5288 equipped with the appropriate Auxiliary Data Station Attachment feature. The display capacity at each operator position is either 480 or 960 characters, as determined by the attachment feature on the controlling device. If the 5282 ▶

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▷ drives in the attached auxiliary data stations can be accessed by the 5288 along with its own drives, providing a total system capacity of up to 8 drives and 9.6 megabytes.

The 5281 Data Station is a table-top unit containing a single keyboard/display and 0, 1, or 2 diskette or disk drives with a capacity of up to 2.4 (diskette) or 20 (disk) megabytes. A nonprogrammable unit, the 5281 must be cable-connected to a 5285, 5286, or 5288 at a maximum distance of 200 feet. The display capacity is 480, 960, or 1920 characters as determined by the attachment feature on the controlling device.

The 5282 Dual Data Station is a table-top unit containing two independent keyboard/display stations and 0, 1, or 2 diskette drives with a capacity of up to 2.4 megabytes. Like the 5281, the 5282 is a nonprogrammable unit that must be cable-connected to a 5285, 5286, or 5288 at a maximum distance of 200 feet. The display capacity at each station is 480 or 960 characters, as determined by the attachment feature on the controlling device.

The number of printer models that can be configured to either a 5285 or 5288 continues to increase. The 5280 system can now accommodate the following printers: 5217, 5222, 5224, 5225, 5242, and 5256. The 5222 is a wire-matrix table-top printer capable of printing 80 characters per second at 10 cpi (characters per inch) or 15 cpi horizontal print density. Each line of print can contain 132 characters (10 cpi) or 198 characters (15 cpi). The printer features bidirectional printing and accommodates one of three upper/lower case character sets: a 95-character EBCDIC set, a 185-character multinational set, or a 95-character Spanish set. Vertical spacing is user selectable at 6 or 8 lines per inch, while the page length is program selectable with a maximum length of 255 lines per page. A variable-width forms tractor provides for the feeding of continuous forms.

The 5224 is an impact dot-matrix (8-by-7) line printer with a user-selectable print density of 10 or 15 cpi and line spacing of 6 or 8 lines per inch. Forms skipping and vertical spacing are under program control. The 5224 is available in two models: Model 1, with a printing speed of 140 lines per minute (lpm) at 10 cpi or 95 lpm at 15 cpi; and Model 2, with a printing speed of 240 lpm at 10 cpi or 175 lpm at 15 cpi. An audible alarm informs the operator when manual intervention is required due to one of nine printer error conditions. The 5224 features the same three character sets of the 5222 Printer, with the addition of ASCII graphics capabilities with the 185-character multinational set.

The 5225 Printer is a wire-matrix line printer that can be attached to either the 5285 or the 5288. It features operator-selectable horizontal spacing of either 10 or 15 characters per inch, as well as both upper and lower case characters. The 15-cpi spacing makes it possible to print most reports on standard correspondence-size paper to reduce forms costs and simplify the handling and filing of reports. The 5225 is offered in four models with rated speeds of 280, 400, 490, and 600 lines per minute at 10 cpi and 195, 290, 355, and 420 lines per minute at 15 cpi. Each line can have ▷

▶ contains 1 or 2 diskette drives, the controlling 5285, 5286, or 5288 must also have the appropriate Remote Diskette Drive Attachment feature. Either or both stations of the 5282 can be equipped with an optional Magnetic Stripe Reader.

TRANSMISSION SPECIFICATIONS

COMMUNICATIONS ADAPTER: This optional feature (#2500) for either the 5285 Programmable Data Station or the 5288 Programmable Control Unit provides either SDLC or BSC data link control over a single communications line. Operating under stored-program control, the feature allows the 5285 or 5288 to communicate at up to 4800 bits/second on a switched point-to-point or nonswitched point-to-point or multipoint line. (On a multipoint line, the 5285 or 5288 operates as a tributary station.) All transmission is in half-duplex mode. Switched network support includes manual dialing and manual or automatic answering (where the attached modem supports the latter capability).

The 5285s, 5288s, or other devices at all the terminations (or drop points) of a network must use the same clocking source, operate at the same transmission rate, use the same transmission code, and have the same two- or four-wire connection to the line. Compatible modems must be used at all terminations in a network.

A 5285 or 5288 using BSC protocol can communicate with the following other IBM systems:

- A System/3 equipped with a 2074, 2084, or 2094 Communications Adapter.
- A System/32 equipped with a 2074 Communications Adapter.
- A System/34 equipped with a 2500, 3500, or 4500 Communications Adapter.
- A System/38 with an appropriately configured BSC Adapter and subfeatures (point-to-point only).
- A System/370 equipped with either an Integrated Communications Adapter, a 2701 Data Adapter Unit, or a 3704 or 3705 Communications Adapter with the ACE/NCP or PEP software, plus a BSC adapter and appropriate subfeatures.
- A 4331 System equipped with a communications adapter.
- A 303X or 4300 System with a 2701 Data Adapter Unit.
- A Series/1 equipped with a 2074, 2075, or 2093/2094 Binary Synchronous Control.
- A 3741 Model 2 Data Station or a 3741 Model 4 Programmable Workstation.
- A 3747 Data Converter equipped with a 1660 Communications Adapter.
- A 5265 communicating model (XX2).
- Another 5285 or 5288 equipped with the 2500 Communications Adapter.

A 5285 or 5288 using SDLC protocol can communicate with a System/370, 303X, or 4300 Series computer via a 3704 or 3705 Communications Controller equipped with appropriate features. ▶

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➤ a maximum of 132 print positions at 10 cpi and 198 positions at 15 cpi.

The 5256 Printer is a serial matrix printer that prints bidirectionally, using a 96-character upper/lower case EBCDIC character set. The 5256 is available in three models with rated speeds of 40, 80, or 120 characters per second.

The newest printers attachable to the 5280 system are the 5217 and the 5242. The 5217 Model C2 is a letter-quality matrix printer with a rated print speed of 60 cps. The 5242 Model 2 is a table-top, impact matrix printer with a print speed of 160 cps (40 cps on cut forms for quality printing).

All of the 5280 units are designated as "customer set-up" machines, and their compact size should make them relatively easy to install.

The programmable controllers in the 5285, 5286, and 5288 perform identical processing and control functions, although they vary in their memory capacities and device attachment capabilities. Multiple microprocessors (up to six) are used in each controller to enable processing and I/O devices to operate independently, and the system supports multiprogramming with up to eight main storage partitions. IBM has been strangely reticent about defining the 5280's processing capabilities, so at this time no performance comparisons can be made between the 5280 and other systems from IBM or competing vendors.

Data communications capabilities for the 5280 system are provided by an optional communications adapter on either the 5285 Programmable Data Station or the 5288 Programmable Control Unit. The 5285 or 5288 can communicate over a single line in half-duplex mode at a speed of up to 4800 bits per second, using either BSC or SDLC protocol. Point-to-point switched or nonswitched operation and multipoint tributary operation are supported. The required line interface can be provided by an internal modem, a Digital Data Service Adapter, or an EIA interface that permits the use of an external modem. The 5280 system can communicate with an IBM System/370, 303X, or 4300 Series computer in SDLC mode or with most current IBM computers and terminals in BSC mode.

The 5280's designers clearly paid considerable attention to data security provisions. Sensitive data can be entered via the keyboard without being displayed on the CRT screen. An optional Security Keylock feature makes it possible to restrict usage of the system to keyholders. An optional Magnetic Stripe Reader, available for each keyboard/display operator position, can be used to enter user identification data. Finally, a communicating 5280 system can exchange identification sequences with the host computer, thereby aiding the user in controlling access to data.

Software support for the 5280 consists of bundled System Control Programming (SCP) and separately priced licensed programs. The software is oriented toward the support of data entry, transaction processing, batch processing, and both batch and interactive communications. ➤

➤ The Communications Adapter must be connected to the communications line by means of either an Integrated Modem, an EIA Interface plus an external modem, or a DDS Adapter. These devices are described in the following paragraphs.

3270 EMULATION COMMUNICATIONS ADAPTER: In addition to the functions provided by the 2500 Communications Adapter, this feature supports the 5280—3270 Emulation licensed program, and in conjunction with stored program control, permits the 5285 and 5288 to function on a switched or nonswitched public or private communications line. This adapter is required to attach to a communications line via the appropriate interface or modem (see INTEGRATED MODEMS). The 3270 Emulation Communications Adapter cannot be installed with the 2500 Communications Adapter. In addition, as with the 2500 adapter, the 3270 cannot be configured to an auxiliary data station or to a system equipped with the Second Application Microprocessor.

INTEGRATED MODEMS: IBM offers five types of 1200-bps Integrated Modems for use with a 5285 Programmable Data Station or 5288 Programmable Control Unit equipped with the 2500 Communications Adapter. All five versions permit either BSC or SDLC data transmission at either 600 or 1200 bits/second. Their distinguishing characteristics are as follows: Model 5500—non-switched; Model 5501—switched with auto-answer; Model 5502—switched without auto-answer; Model 5507—non-switched with Switched Network Backup manual answer capability; and Model 5508—non-switched with Switched Network Backup auto-answer capability. The devices communicating with the 5285 or 5288 must be equipped with compatible 1200-bps modems. Only one Integrated Modem can be installed in a 5285 or 5288, and the Integrated Modem is mutually exclusive with the EIA Interface and the DDS Adapter. The Power Supply Expansion (#5810) is required for the Model 5501 or 5508 Integrated Modem.

EIA INTERFACE (3701): This feature can be chosen as an alternative to the IBM Integrated Modems for use with a 5285 or 5288 equipped with the 2500 Communications Adapter. The feature provides a cable and interface that meet the EIA RS-232-C specifications, permitting the attachment of an external modem supplied by IBM or another vendor. The Power Supply Expansion (#5810) is a prerequisite.

DIGITAL DATA SERVICE (DDS) ADAPTER: This feature enables a 5285 or 5288 equipped with the 2500 Communications Adapter to transmit and receive data at 2400 or 4800 bits/second in BSC or SDLC mode over AT&T's non-switched Dataphone Digital Data Service. The DDS Adapter is available in two versions: Model 5650 for point-to-point operation and Model 5651 for multipoint operation. Either model provides for appropriate interface and cable to the DDS channel service unit at the customer site.

SOFTWARE

Software support for the 5280 Distributed Data System is provided by System Control Programming (SCP), which is furnished at no charge, and by a set of separately priced licensed programs. These software facilities collectively provide the necessary support for a wide range of distributed environments including data entry, batch and interactive communications, batch processing, and transaction processing.

OPERATING SYSTEM: No integrated operating system for the 5280 has been announced to date. Instead, IBM offers the *5280 System Control Programming (SCP)*, which ➤

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➤ No integrated operating system has been announced for the 5280. The “free” SCP facilities are limited to a System Configuration Program that is used to define the physical and logical configuration of a 5280 system, an Initial Program Loader that initializes the system for program execution, a PTF/Patch Program that aids in applying program temporary fixes and program patches, and a Close Failure Recovery program that aids in recovering from abnormal program terminations.

Users of 5280 have a choice of three programming languages: DE/RPG, Cobol, and Assembler. The principal IBM emphasis appears to be on DE/RPG, a new programming system that uses RPG-style specification forms to simplify the preparation of programs for interactive data entry, high-volume key entry, and user-defined processing functions. The 5280 Cobol language is an implementation of ANSI Cobol 74 that supports interactive or batch commercial applications, provides limited data station support for interactive applications, and supports BSC and SDLC communications via a CALL interface. Cobol's usefulness, however, is limited by the fact that Cobol programs for the 5280 must be compiled on a host IBM System/370, 303X, or 4300 Series computer under either OS/VS or DOS/VSE. DE/RPG and Assembler programs, by contrast, can be compiled on the 5280 system itself.

Three utility packages complete the initial 5280 software complement. The 5280 Utilities consist of 11 routines to perform straightforward utility functions such as diskette file maintenance, resource allocation, and system status display. The 5280 Sort/Merge permits flexible sorting and merging operations on diskette files. The 5280 Communications Utilities provide software support for a 5285 or 5288 equipped with the communications adapter. Basic facilities are provided for batch data transfer and inquiry, multi-leaving remote job entry (MRJE), SNA remote job entry (SRJE), and communication configuration and job description.

COMPETITIVE POSITION

The 5280 effectively supersedes the 3740 Data Entry System, IBM's earlier key-to-diskette system. Introduced in 1973, the 3740 had been progressively upgraded through the addition of programmability, communications, and printers—but the older system is clearly outclassed by the greater power and flexibility of the 5280. To assist 3740 users in converting to the 5280, IBM is providing three software conversion aids. The 3740 Format Conversion utility facilitates the conversion of 3740 key entry program levels into DE/RPG source programs. The Key Entry Utility accepts the 3740 key entry string language as input and creates formats for simple key entry functions on the 5280. The 3740 ACL Conversion Aid Program, supplied with the 5280 Assembler, aids in converting 3740 ACL programs into 5280 Assembler language.

The 5280 naturally invites comparison with the 8100 Information System, the distributed processing system that IBM's Data Processing Division introduced in October 1978. But the 8100 is a much larger, more powerful, and ➤

➤ consists of four routines that provide the following basic system functions: 1) the System Configuration Program is used to describe the physical and logical configuration of a 5280 system; 2) the Initial Program Loader initializes the system and prepares it for program execution; 3) the PTF/Patch Program is used to apply program temporary fixes (PTF's) and to make program patches; 4) the Close Failure Recovery Program allows the user to specify an end-of-date (EOD) record in a diskette data set in the event that a program terminates abnormally.

LANGUAGES: IBM currently offers the DE/RPG, Cobol, and Assembler languages for use with 5280 system. DE/RPG and Assembler programs can be prepared on the 5280 itself, whereas Cobol programs must be compiled on a host System/370, 303X, or 4300 Series computer under either OS/VS or DOS/VSE.

5280 DE/RPG is a new product designed to simplify the preparation of programs for applications ranging from simple key entry to high-function data entry jobs that require extensive editing, data set accessing, and user-defined processing.

DE/RPG makes use of the Data Description Specifications (DDS) form, which is also supported on the IBM System/38, for specification of data entry formats. A format or series of formats, defined by the user and presented in the display screen, provides the framework for a data entry job. A typical job would consist of entering data, editing and checking the data, creating records, and writing the records to a diskette data set. The sequence of execution of the formats can be determined by job definition, by operator selection, or by the program on the basis of an analysis of current data.

DE/RPG also features an RPG subroutine capability which provides a subset of the RPG III calculation operation codes. Using the RPG Calculation Specifications, the user can define subroutines to perform functions such as complex editing, arithmetic calculations, array handling, master data set access, and report printing. A total of 40 RPG II operation codes from the following categories are available: arithmetic and data manipulation, branching, indicator testing, subroutine operations, and special I/O operations. The RPG subroutine capability can also be used to create stand-alone batch DE/RPG programs that can run in any partition. RPG programmers should note, however, that the sequence of instruction execution is defined by the user; the usual RPG “cycle” does not apply.

DE/RPG permits considerable flexibility in display screen design and in data editing. Prompts and data fields can be positioned anywhere on the screen below the top line, which is reserved for status information, and multiple formats can be displayed on a single screen. Editing can be performed on a character, field, or record basis, and a wide range of editing, checking, testing, comparison, insertion, and table lookup operations is available.

DE/RPG diskette data sets are organized in sequential fashion. Three access methods are supported: sequential, direct by relative record number, and key indexed. Data sets can be shared by multiple programs on a read or write/update basis. There are safeguards against concurrent updating of a record by two or more programs.

All DE/RPG programs maintain production statistics on both a job basis and a station basis. Counts can be maintained of keystrokes, records, marked records, verify correction keystrokes, elapsed time, and number of jobs.

The DE/RPG licensed program consists of a Source Entry Program and a Compiler. The Source Entry Program per- ➤

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➤ more costly system; the *smallest* 8100 processor has 256K bytes of main memory, and includes 29 megabytes of hard disk storage. Thus, the two systems occupy separate niches within IBM's growing line of distributed processing hardware and appear to be complementary rather than competitive.

The 5280's more direct competition will come not from other IBM products but from the distributed data systems that have long been marketed by companies such as Datapoint, Four-Phase Systems, Inforex, Mohawk Data Sciences, Nixdorf, and Pertec. Competitive systems with capabilities generally similar to those of the 5280 include the Datapoint 1560 and 1800, the Four-Phase System IV series, Harris MIND Series, the Inforex System 9000, the Mohawk Data Sciences Series 21, and the Nixdorf 600/25, /35, /45, and 55.

ADVANTAGES AND RESTRICTIONS

The 5280 equipment and software are designed to support a wide range of distributed environments and functions, including intelligent data entry, batch and interactive communications, batch processing, transaction processing, and distributed printing. Thus, the 5280 should be attractive to both large and small data processing users who are considering the use of distributed intelligent terminals as part of new or existing data processing networks. Although the 5280's processing and input/output capabilities are comparable to those of many of the current microprocessor-based small business computers, IBM's marketing emphasis and software support make it clear that the 5280 is intended for use as an element in distributed systems rather than as a stand-alone computer.

USER REACTION

During June, July, and August of 1982, Datapro conducted an extensive Terminal Users Survey in conjunction with *Data Communications* magazine. A questionnaire was designed and produced by Datapro and mailed to approximately 10,000 addresses selected at random from a cross-section of *Data Communications*' U.S. end-user subscriber base. A total of 10 users of the IBM 5280 Distributed Data System responded to the survey. These users had, on the average, a total of five display stations and one printer installed at their site. The users were asked to rate their system in several categories; their ratings are summarized in the following table.

	Excellent	Good	Fair	Poor	WA*
Overall performance	2	8	0	0	3.2
Ease of operation	3	7	0	0	3.3
Reliability of controller/ processor	5	5	0	0	3.5
Reliability of peripherals	5	5	0	0	3.5
Maintenance service	3	5	1	1	3.0
Technical support	1	6	3	0	2.8
Ease of programming	0	7	2	0	2.8
Quantity of manufacturer's software	1	9	0	0	3.1

*Weighted Average based on a scale of 4.0 for Excellent.

➤ mits interactive entry, verification, and updating of DE/RPG source statement data set, which becomes the input to the Compiler. The Compiler produces an object program data set, which is written to diskette, and an optional source listing on either printer or diskette. When two or more operators are to perform the same job, each operator must have an individual copy of the appropriate object program, executing in a separate partition.

The DE/RPG Compiler will run on any 5280 system that has at least one Diskette 2D drive or two Diskette 1 drives. Minimum main storage partition size requirements are 9K bytes for the Compiler and 13K bytes for the Source Entry Program. The 5280 SCP and 5280 Utilities are prerequisites.

5280 Cobol is available in four versions, which differ in the host IBM computers and software that are required to compile the Cobol source programs. The 5280 Cobol-OS/VS Host Compiler and Library product requires a System/370, 303X, or 4300 Series computer operating under OS/VS1 or OS/VS2 (MVS) for the compilation process, while the 5280 Cobol-DOS/VSE Host Compiler and Library product requires a System/370, 303X, or 4300 Series computer operating under DOS/VSE. The Cobol S/34 and Cobol S/38 Host Compiler and Library products require a System/34 or System/38 computer respectively. Otherwise, the versions have similar capabilities and features. Cobol object programs can be executed on a 5285, 5286, or 5288. Object programs can be transferred from the host to the 5280 system via diskette, RJE, or a user-written communications program.

The 5280 Cobol language is an implementation of 1974 ANSI Standard Cobol, X.23-1974. It provides support for both interactive and batch commercial application programs, as well as limited data station support for interactive applications. Support for BSC and SDLC communications is provided via a CALL interface.

The 5280 Assembler is used to create stand-alone programs which will run on a 5285, 5286, or 5288. Features of the Assembler include mnemonic operation codes, symbolic addresses, symbolic data representation, automatic storage assignments, address displacement calculation, operand expressions, binary and decimal arithmetic, a source program listing, a cross-reference listing, error checks, and diagnostic messages. The 3740 ACL Conversion Aid Program is supplied along with the Assembler to aid the user in converting ACL programs written for the IBM 3740 Data Entry System into 5280 Assembler Language.

UTILITIES: IBM currently offers three licensed programs in this category for the 5280 system: the 5280 Utilities, the 5280 Sort/Merge, and the 5280 Communications Utilities.

The 5280 Utilities consist of 11 programs with the following names and functions:

- Diskette Initialization Utility-formats a diskette according to the user's requirements.
- Diskette/Data Set Clear Utility-clears one or all data sets on a diskette in preparation for the recording of new data.
- Diskette Label Maintenance Utility-allocates space for new data sets, deletes old data sets, and modifies the labels of volumes and data sets.
- Diskette Label List Utility-displays or prints diskette volume labels, data set labels, data set names, and data set directories.

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▷ The users were also asked whether or not they would recommend the 5280 System to other users. Nine of the users responded that they would; only one said that he would not. □

- ▶ • Diskette Copy Utility-copies all or portions of a diskette onto the same or another diskette; supports multi-volume output data sets.
- Diskette Print Utility-prints all or selected records from a diskette, without reformatting or editing.
- Resource Allocation Utility-enables the user to add, delete, display, or alter an entry in the Resource Allocation Table, which contains physical device addresses with their corresponding logical identifiers.
- 3740 Format Conversion utility-aids in the conversion of 3740 key entry program levels into DE/RPG source programs.
- Diskette Compress Utility-rearranges data sets to make one contiguous space out of the unused space between data sets.
- Key Entry Utility-permits the user to create formats for simple data entry functions using the IBM 3740 key entry string language.
- System Status Utility-displays system status information such as the number and sizes of partitions and names of programs currently being executed.

The *5280 Sort/Merge* consists of a Sort program and a Merge program. The Sort program sorts a single diskette data set into either ascending or descending sequence, using parameters entered at the keyboard or read from diskette. Records can be selected, omitted, or reformatted, and work space and data set space are allocated automatically. Four output formats are available: Full Record, Address Out (a data set of Four-byte relative record numbers), Record Subset (a data set containing user-specified data fields), and Index/Key (a data set with records consisting of a key and a relative record number). The Merge program combines records from two sorted diskette data sets into another data set, using parameters entered at the keyboard or read from diskette. It supports multi-volume data sets.

The *5280 Communications Utilities* consist of four basic facilities: Batch Data Transfer/Inquiry, SNA/SDLC Remote Job Entry (SRJE), Multi-Leaving Remote Job Entry (MRJE), and Communications Configuration and Job Description. These programs provide software support for a 5285 Programmable Data Station or 5288 Programmable Control Unit equipped with the 2500 or 3270 Emulation Communications Adapter and communicating over a single line in either BSC or SDLC mode. The communications programs operate concurrently with other applications. Only the 960-character and 1920-character display sizes are supported.

The Batch Data Transfer/Inquiry program provides for batch data transfer to a host system or terminal and inquiry to a host system. It supports SNA/SDLC communications as an LU1-type terminal to a System/370, 303X, or 4300 Series computer with CICS/VS and IMS/VS, or BSC communications with a System/370, 303X, or 4300 with CICS/VS, IMS/VS (as a 3741), and VSE/POWER, or with System/3/32/34 RPG II, System/3 CCP, System/34 SSP-ICF, Series/1 RPS, a 3740, a 5260, or another 5280. The minimum main storage required is 32K bytes for BSC communications and 64K bytes for SNA/SDLC.

The SNA/SDLC Remote Job Entry (SRJE) facility permits the 5280 system to function as an RJE terminal consisting of one console, one reader, one punch, and one printer. Printer data streams can be directed to either a printer or diskette, while punch data streams are directed to diskette. SNA support on the host computer is via ACF/VTAM and ACF/NCP/VS to RES, JES2, JES3, and VSE/POWER. The minimum main storage requirements on the 5280 is 64K bytes.

The Multi-Leaving Remote Job Entry (MRJE) facility permits the 5280 system to function as an RJE terminal with full multi-leaving support for concurrent device operation of one console, one reader, one punch, and one printer. Printer data streams are directed to diskette. BSC support on the host computer treats the 5280 as a System/3 MRJE workstation for RES, JES2, and JES3. The minimum main storage requirement is 48K bytes on a 5285 or 64K bytes on a 5288.

The Communications Configuration and Job Description program is used to prepare communications environments via job step prompts. Descriptions are stored on diskette by job name, and are used to initiate the communications link with the host computer or another terminal. Initiation of the link with the host may be either dynamic or predetermined for operator convenience.

The 5280-3270 Emulation licensed program allows the 5280 Distributed Data System to function as selected 3270 control units and devices to existing host applications. The program consists of the following: the 3270 Device Emulation Program, the 3270 Batch Transfer Utility, and the 3270 Program Interface.

The 3270 Device Emulation Program allows the 5280 to appear to the host as a 3274 Model 1C Control Unit under SNA/SDLC or as a 3271 Model 2 Control Unit under BSC. With the 3270 Device Emulation Program, the 1920-character 5281 Data Station (attached to a 5288 Programmable Control Unit) and the 1920-character 5285 Programmable Data Station appear to a host system as a 3277 Model 2 Display Station with selected features. The 5280 Distributed Data System's printers are also emulated to appear as the 3284 Model 2, the 3286 Model 2, and the 3288 Model 2 printers under BSC and the 3287 Printer Models 1 and 2 under SNA/SDLC. Host system communication subsystems that are supported include System/370 IMS/VS, CICS/VS, TSO, and System/3 Model 15D CCP.

The following BSC host system support is provided for the 5280-3270 Device Emulation Program:

- IMS/VS with BTAM under OS/VS1 or OS/VS2 (MVS)
- IMS/VS with ACF/VTAM under OS/VS1 or OS/VS2 (MVS)
- IMS/VS with ACF/TCAM under OS/VS1 or OS/VS2 (MVS)
- CICS/VS with BTAM under OS/VS1 or OS/VS2 (MVS)
- CICS/VS with ACF/TCAM under OS/VS1 or OS/VS2 (MVS)
- CICS/VS with BTAM-ES under DOS/VSE
- CICS/VS with ACF/VTAM under OS/VS1, OS/VS2 (VMS), or DOS/VSE
- CICS/VS with ACF/VTAME under DOS/VSE

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- ▶ • TSO with ACF/VTAM under OS/VS2 (MVS)*
- TSO with ACF/TCAM under OS/VS2 (MVS)*

(Note: *TSO does not support printers. All of the above systems, with the exception of the System/3, are also supported when under control of VM/370).

The following SNA/SDLC host system support is provided for the 5280-3270 DeviceEmulation Program:

- IMS/VS with ACF/VTAM under OS/VS1 or OS/VS2 (MVS)
- IMS/VS with ACF/TCAM under OS/VS1 or OS/VS2 (MVS)
- CICS/VS with ACF/VTAM under OS/VS1, OS/VS2 (MVS), or DOS/VSE
- CICS/VS with ACF/TCAM under OS/VS1 or OS/VS2 (MVS)
- CICS/VS with ACF/VTAME under DOS/VSE
- TSO with ACF/VTAM under OS/VS2 (MVS)*
- TSO with ACF/VTAM under OS/VS2 (MVS)*

*TSO with ACF/TCAM under OS/VS2 (MVS)

Minimum 5285 and 5288 system configuration requirements required to support the 5280-3270 Device Emulation Program include 64K bytes of memory (96K bytes if printer is used in conjunction with a keyboard/display), the 3270 Emulation Communications Adapter, and a display size of 1920 characters.

The 3270 Batch Transfer Emulation Utility enables the user to transmit and receive batch data when communicating with a host system via 3270 BSC protocols. Record lengths can be a maximum of 1918 bytes. Transaction IDs and how they are used during transmission may be specified. A user program is required at the host to send or receive batch data.

The 3270 Program Interface provides the 5280 user with a program-to-program interface using 3270 BSC protocols. Up to seven concurrent sessions are supported, with each session representing a different 3270 device address. The user application interface is through DE/RPG and Cobol.

COMPONENTS

DISPLAY: A standard component of the 5281 Data Station, 5282 Dual Data Station, 5285 Programmable Data Station, and 5286 Dual Programmable Data Station. Display capacities for each model are as follows:

Model	480 chars.	960 chars.	1920 chars.
5281	Std.	Opt.	Opt.
5282	Std.	—	—
5285	Opt.	Opt.	Opt.
5286	Opt.	Opt.	—

Display capacity for Models 5285 and 5286 is determined by the attachment feature selected on the controlling device. Models 5282 and 5286 provide a single split-screen display, with the indicated display capacity supported at each of the two operator positions. The display arrangement is 6, 12, and 24 lines of 80 characters for the 480-, 960-, and 1920-

character capacities, respectively. Characters are formed within an 8-by-16 dot-matrix character cell. A user-selectable choice of 94-character (upper/lower case) EBCDIC, 94-character ASCII, or 185-character Multinational character sets is provided. Program-controlled screen attributes include reverse video, high intensity, blinking, underlining, nondisplay (blinking), and column separation.

KEYBOARD: A required component of the 5281, 5282, 5285, and 5286. Dual station models (5282 and 5286) require two keyboards. Four keyboard types are offered: 83-key EBCDIC typewriter, 83-key ASCII typewriter, 66-key data entry, and 66-key data entry with proof arrangement. Each keyboard is movable and includes data keys, cursor movement keys, special function keys, and field edit keys.

MAGNETIC STRIPE READER: An optional feature for the 5281, 5282, 5285, or 5286. Up to 128 A.B.A. numeric character, including control characters, can be read from a magnetic stripe on credit cards, identification cards, and other documents.

DISKETTE DRIVES: Two types of diskette drives are available for any 5280 system in any combination: a drive that can read and write only the IBM Diskette 1 format, and a drive that can read and write the IBM Diskette 1, 2, and 2D formats. (The latter is referred to as a Diskette 2D drive.) The on-line data capacity of each drive can range from 246K bytes to 1.2 megabytes depending upon the recording format in use, as tabulated below.

Diskette Type	Format	Bytes per Sector	Capacity, Bytes
1	1	128	246K
	2	256	284K
	3	512	303K
2	4	128	492K
	5	256	568K
	6	512	606K
2D	7	128	985K
	8	256	1136K
	9	512	1212K

For exchanging diskette data between the 5280 and other systems, IBM supports the following exchange types: Basic Exchange, in formats 1 and 4; H Exchange, in format 7 only; and I Exchange, in all of the above formats. Diskettes can be interchanged with the IBM Series/1, System/3, System/32, System/34, System/38, System/370, 303X, 4300, 3540, 3740, 3747, 3770, 3790, 5110, 5230, 5260, 8100, and other systems and devices that support a compatible diskette exchange type.

Diskette data transfer rates are 31,250 bytes/second in Diskette 1 or Diskette 2 mode and 62,500 bytes/second in Diskette 2D mode. The rotation speed is 360 rpm for both types of drives.

DISK DRIVES: A 10MB Disk Storage Drive feature can be installed on the 5285 and 5288, and on the 5281 when attached to the 5285 or 5288. The disk drive occupies a physical diskette drive position on these units. A 5285 can contain up to seven disk drives. For a disk drive attached to a 5281, the controlling device requires a Remote Disk Prerequisite feature (#4400).

The rotational speed of the disk drive is 3,600 rpm. Average access time is 85 milliseconds.

5217 IMPACT PRINTER: A bidirectional, letter quality impact printer that connects to the 5285 or 5288. Horizontal ▶

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► character spacing is 10, 12, or 15 characters per inch; vertical spacing is program selectable in increments of 1/96-inch, permitting line spacing of from 4 to 24 lines per inch. A variety of 96-character print wheel options are available. Single sheets are hand-fed. A cut sheet feed device and forms tractor are optionally available. One Model, C2, is available, with a rated print speed of 60 cps.

5222 LINE PRINTER: A bidirectional wire matrix line printer that connects to the 5285 or 5288. Horizontal spacing of 10 to 15 character per inch and vertical spacing of 6 or 8 lines per inch is operator-selectable. Maximum line width is 132 characters at 10 cpi and 198 characters at 15 cpi. A choice of 95-character EBCDIC, 185-character Multinational, or 95-character Spanish character sets is provided. Characters are formed via an 8-by-7 dot matrix. A forms tractor is standard. One model is available, with a rated print speed of 80 cps at both 10 and 15 cpi.

5224 LINE PRINTER: An impact matrix line printer that connects to the 5285 or 5288. Horizontal spacing of 10 or 15 characters per inch and vertical spacing of 6 or 8 lines per inch is operator-selectable. Maximum line width is 132 characters at 10 cpi and 198 characters at 15 cpi. A choice of 95-character EBCDIC, 184-character Multinational, or 95-character Spanish character sets is provided. Characters are formed via an 8-by-7 dot matrix. A forms tractor is standard. A cable thru feature provides the capability of connecting a total of seven multiple 5224s, 5225s, 5256s, 5251 Models 1 or 11, and 5252s to a single twinax cable. Two models are available and differ only in their rated print speeds: Model 1 prints at 140 lpm at 10 cpi, and at 95 lpm at 15 cpi; Model 2 prints at 240 lpm at 10 cpi, and at 175 lpm at 15 cpi.

5242 IMPACT PRINTER: A serial impact matrix printer that connects to the 5285 or 5288. Horizontal spacing of 10 to 15 cpi can be specified; vertical spacing is program-selectable in increments of 1/96-inch, permitting line spacing from 1 to 12 lpi. Originally intended for use with the IBM Datamaster, the 5242 can print any character that can be displayed on a Datamaster. A forms tractor is standard. Only the 5242 Model 2 can be used with the 5280; standard print speed is 160 cps, with a 40 cps speed available for letter quality printing on cut forms.

MODEL 5225 LINE PRINTER: A wire matrix line printer that connects to the 5285 or 5288. Horizontal spacing of 10 or 15 characters per inch and vertical spacing of 6 or 8 lines per inch is operator-selectable. Maximum line width is 132 characters at 10 cpi and 198 characters at 15 cpi. A choice of 95-character EBCDIC, 184-character Multinational (including ASCII graphics), or 95-character Spanish character sets is provided. Characters are formed by an 8-by-7 dot matrix. A forms tractor is standard. Forms skipping is program-controlled. Four models are available and differ only in their rated print speeds: at 10 cpi, Model 1 prints at 280 lpm, Model 2 at 400 lpm, Model 3 at 490 lpm, and Model 4 at 560 lpm; at 15 cpi, Model 1 prints at 195 lpm,

Model 2 at 290 lpm, Model 3 at 355 lpm, and Model 4 at 420 lpm.

MODEL 5256 SERIAL PRINTER: A bidirectional serial matrix printer that connects to the 5285 or 5288. Horizontal spacing is 10 characters per inch. Vertical spacing is operator-selectable at 6 or 8 lines per inch. Maximum line width is 132 characters. A 96-character (upper/lower case) EBCDIC character set is standard; a Multinational character set is also available. A forms tractor and a cut-forms capability are standard. Three models are available and differ only in their rated print speeds: Model 1 prints at 40 cps, Model 2 at 80 cps, and Model 3 at 120 cps.

PRICING

IBM offers the 5280 system on a purchase, 24-month lease, or rental basis. The warranty period is three months. The standard IBM lease or rental contract entitles the customer to unlimited usage each month. Prime-shift maintenance is included in the lease or rental price. The purchase option accrual equals 45 percent of the monthly charge up to 50 percent of the purchase price. IBM's standard educational allowance of 10 percent applies to the 5280 system for lease, rental, and purchase customers.

For purchased, leased or rented systems, the 5280 system is under maintenance group D. The minimum period of maintenance service is 9 consecutive hours between 7:00 a.m. and 6:00 p.m. Monday through Friday. Charges for maintenance coverage outside this period are based upon the following percentages of the minimum monthly maintenance charge (MMC) added to the MMC:

	Consecutive hours				
	9*	12	16	20	24
Monday-Friday (until 8:00 a.m. Saturday)	10	12	14	16	18
Saturday (until 8:00 a.m. Sunday)	4	5	7	8	9
Sunday (until 8:00 a.m. Monday)	5	7	9	11	12

*Outside of the hours 7:00 to 6:00 p.m.

For users without a maintenance contract, the 5280 system is maintained under per-call class 2. Under this class the per-call charge during regular hours is \$77.00 per hour, and during off hours the charge is \$89.00 per hour. The hourly rate for systems engineering service is \$57.00. ►

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		Purchase Price	Monthly Maint.	Monthly Rental Charge*
PROGRAMMABLE DATA STATIONS				
5285	Programmable Data Station:			
A01**	With 32K and one Diskette 1 drive	\$ 5,900	\$ 40.00	\$271
A05**	With 32K and one Diskette 1 drive	6,150	47.00	299
B01**	With 48K and one Diskette 1 drive	6,057	41.00	289
B05**	With 48K and one Diskette 2D drive	6,307	48.00	317
C01	With 64K and one Diskette 1 drive	6,213	42.00	300
C05	With 64K and one Diskette 2D drive	6,463	49.00	328
D01	With 96K and one Diskette 1 drive	6,526	44.00	329
D05	With 96K and one Diskette 2D drive	6,776	51.00	357
E01	With 128K and one Diskette 1 drive	6,839	46.00	358
E05	With 128K and one Diskette 2D drive	7,221	53.00	418
5286	Dual Programmable Data Station:			
A02	With 32K and two Diskette 1 drives	7,950	47.00	332
A10	With 32K and two Diskette 2D drives	8,450	61.00	388
B02	With 48K and two Diskette 1 drives	8,107	48.00	350
B10	With 48K and two Diskette 2D drives	8,607	62.00	406
C02	With 64K and two Diskette 1 drives	8,263	49.00	361
C10	With 64K and two Diskette 2D drives	8,763	63.00	417
D02	With 96K and two Diskette 1 drives	8,576	51.00	390
D10	With 96K and two Diskette 2D drives	9,076	65.00	446
Keyboards for 5285 and 5286 (one required for each operator position):				
4600	83-key EBCDIC Keyboard	379	4.00	15
4601	66-key Data Entry Keyboard	379	4.00	15
4602	66-key Data Entry Keyboard with Proof Arrangement	379	4.00	15
4603	83-key ASCII Keyboard	379	4.00	15
Special features for 5286 (except as noted):				
3401	Diskette 1 Drive (for 5285 only)	—	—	60
3402	Diskette 2D Drive (for 5285 only)	—	—	88
3410	10MB Disk Storage Drive (for 5285 only)	4,500	40.00	350
1150	5224/5225/5256 Twinax Printer Attachment (for 5285 only)	540	2.00	17
1152	5217/5222/5242 Printer Attachment	530	2.00	18
1200	Attachment for one 480-character 5281 Data Station	654	2.00	20
1205	Attachment for one 960-character 5281 Data Station (for 5285 only)	767	2.00	29
1210	Attachment for one 1920-character 5281 Data Station (for 5285 only)	879	3.00	39
1215	Attachment for one 480-character 5282 Dual Data Station	767	2.00	29
1220	Attachment for one 960-character 5282 Dual Data Station (for 5285 only)	879	3.00	39
1240	Remote Diskette Drive Attachment (required if an attachment 5281 has either 1 or 2 diskette drives)	213	1.00	6
3300	Display Screen Filter	70	—	—
3500	960-Character Display Size (for 5285 only)	112	1.00	6
3505	1920-Character Display Size (for 5285 only)	225	1.00	17
3610	Elapsed Time Counter (measures elapsed real time)	112	1.00	6
4950	Magnetic Stripe Reader (4955 or 4960 is a prerequisite)	428	2.00	17
4955	Magnetic Stripe Reader Adapter/Elapsed Time Counter (for 5286 or non-communicating 5285)	642	2.00	25
4960	Magnetic Stripe Reader Adapter/Elapsed Time Counter (for communicating 5285)	256	1.00	7
6340	Security Keylock	43	—	—
6800	Second Application Microprocessor	1,285	2.00	57

PROGRAMMABLE CONTROL UNITS

5288 Programmable Control Unit:

Submodel	Bytes of Main Storage	Diskette		Purchase Price	Monthly Maint.	Monthly Rental Charge*
		Diskette 1 Drives	2D Drives			
A01**	32K	1	0	\$6,600	\$32.50	\$269
A05**	32K	0	1	6,850	39.50	297
C01**	64K	1	0	6,913	34.50	298
C05**	64K	0	1	7,163	41.50	326
D01	96K	1	0	7,226	36.50	327
D05	96K	0	1	7,476	43.50	355
E01	128K	1	0	7,539	38.50	356
E05	128K	0	1	7,789	45.50	384
F01	160K	1	0	7,852	40.50	385
F05	160K	0	1	8,102	47.50	413
H01	224K	1	0	8,478	44.50	443
H05	224K	0	1	8,728	51.50	471
J01	228K	1	0	9,104	48.50	501
J05	228K	0	1	9,354	55.50	529

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PROGRAMMABLE CONTROL UNITS CONTINUED

<u>Submodel</u>	<u>Bytes of Main Storage</u>	<u>Purchase Price</u>	<u>Monthly Maint.</u>	<u>Monthly Rental Charge*</u>
	Special features for 5288 Programmable Control Unit:	—	—	\$60
3401	Diskette 1 Drive	—	—	88
3402	Diskette 2D Drive	\$4,500	\$40.00	350
3410	10MB Disk Storage Drive	4,500	40.00	350
1162	5217/5222/5242 Multiple Twinax Printer Attachment (for 5288 only)	925	3.00	31
1245	Attachment for one 480-character 5281 Data Station	NC	NC	NC
1250	Attachment for one 960-character 5281 Data Station	112	1.00	6
1255	Attachment for one 1920-character 5281 Data Station	225	1.50	1
1260	Attachment for one 480-character 5282 Dual Data Station	112	1.00	6
1265	Attachment for one 960-character 5282 Dual Data Station	225	1.50	17
1270	Attachment for one additional 480-character 5281 (prerequisite: 1245 or 1260)	654	2.00	20
1275	Attachment for one additional 960-character 5281 (prerequisite: 1250 or 1265)	767	2.50	29
1280	Attachment for one additional 1920-character 5281 (prerequisite: 1255)	879	3.00	39
1285	Attachment for one additional 480-character 5282 (prerequisite: 1245 or 1260)	767	2.00	29
1290	Attachment for one additional 960-character 5282 (prerequisite: 1250 or 1265)	879	3.00	39
1300	Remote Diskette Drive Attachment, First (required for first and second remote drives when base 5288 has 1 or 2 drives)	213	1.00	6
1301	Remote Diskette Drive Attachment, Second (required for first and second remote drives when base 5288 has 3 or 4 drives, or for third and fourth remote drives when base 5288 has 1 or 2 drives)	970	4.00	37
1302	Remote Diskette Drive Attachment, Third (required for third and fourth remote drives when base 5288 has 3 or 4 drives, or for fifth and sixth remote drives when base 5288 has 1 or 2 drives)	213	1.00	6
1155	Single 5225/5256 Twinax Printer Attachment (provides a single port for attaching from 1 to 5 printers via a single twinax cable)	540	2.00	17
1157	Single 5222 Printer Attachment	530	2.00	18
1160	Multiple 5225/5256 Twinax Printer Attachment (provides 4 ports for attaching, via twinax cable, up to 5 printers)	755	3.00	24
1162	Multiple 5222/Twinax Printer Attachment	925	3.00	31
3300	Display Screen Filter	70	—	—
3610	Elapsed Time Counter	112	1.00	6
4955	Magnetic Stripe Reader Adapter/Elapsed Time Counter (controls up to 4 Magnetic Stripe Readers on attached 5281 and/or 5282 data stations)	642	2.00	25
6340	Security Keylock	43	—	—
6800	Second Application Microprocessor	1,285	2.50	57
AUXILIARY DATA STATIONS				
5281	Data Station:			
Z00	With no diskette drive	2,295	12.00	88
5282	Dual Data Station:			
Z00	With no diskette drive	2,604	13.50	95
Keyboards for 5281 and 5282 (one required for each operator position):				
4600	83-key EBCDIC Keyboard	379	4.00	15
4601	66-key Data Entry Keyboard	379	4.00	15
4602	66-key Data Entry Keyboard with Proof Arrangement	379	4.00	15
4603	83-key ASCII Keyboard	379	4.00	15
Special features for 5281 and 5282:				
3300	Display Screen Filter	\$70	—	—
4950	Magnetic Stripe Reader	428	2.00	17
4400	Remote Disk feature (for attachment of 3410)	NC	NC	NC
PRINTERS				
5217	Printer:			
Mdl. C2	60 cps at 10, 12, 15 cpi	4,425	58.50	—
5222	Printer:			
Mdl. 1	80 cps at 10 cpi; 80 cps at 15 cpi	2,345	29.00	142
5224	Printer:			
Mdl. 1	140 lpm at 10 cpi; 95 lpm at 15 cpi	6,395	45.00	300
Mdl. 2	240 lpm at 10 cpi; 175 lpm at 15 cpi	7,280	53.00	342
5225	Printer:			
Mdl. 1	280 lpm at 10 cpi; 195 lpm at 15 cpi	12,075	87.00	511
Mdl. 2	400 lpm at 10 cpi; 290 lpm at 15 cpi	13,945	122.00	584
Mdl. 3	490 lpm at 10 cpi; 355 lpm at 15 cpi	15,495	150.00	650
Mdl. 4	560 lpm at 10 cpi; 420 lpm at 15 cpi	16,940	178.00	714
5242	Printer:			
Mdl. 2	40/160 cps at 10, 15 cpi	2,975	53.00	—
5256	Printer:			
Mdl. 1	40 characters per second	4,145	38.50	239
Mdl. 2	80 characters per second	4,340	42.00	272
Mdl. 3	120 characters per second	4,535	47.50	295

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<u>Submodel</u>	<u>Bytes of Main Storage</u>	<u>Purchase Price</u>	<u>Monthly Maint.</u>	<u>Monthl Rental Charge</u>
1470	Special features for the Printers: Audible Alarm (signals operator when manual intervention is required due to one of nine error conditions; for 5225 and 5256 printer only)	\$50	—	—
2680	Cable Thru (permits multiple printers to be connected to a single twinax cable; required on each printer except the last; for 5225 and 5256 printers only)	119	\$1.50	\$ 4
4450	Forms Stand (for 5222, 5224 and 5256 printers only)	56	—	—
6100	Rear Document Insert Device (for 5222 only)	135	0.50	7
COMMUNICATIONS				
2500	Communications Adapter (for 5285 only)	1,015	9.00	80
3270	3270 Emulation Communications Adapter (for 5285 or 5288 only)	2,040	13.00	121
3701	EIA Interface (provides RS-232-C interface for an external modem)	372	1.50	18
5500	1200-bps Integrated Modem, non-switched	686	4.00	22
5501	1200-bps Integrated Modem, switched with auto answer	744	3.50	32
5502	1200-bps Integrated Modem, switched without auto answer	686	3.50	22
5507	1200-bps Integrated Modem, non-switched with SNBU manual answer	744	4.00	33
5508	1200-bps Integrated Modem, non-switched with SNBU auto answer	947	4.50	36
5650	Digital Data Service Adapter; Point-to-Point	873	1.50	31
5651	Digital Data Service Adapter, Multipoint	873	1.50	31
5810	Power Supply Expansion (required on 5285 if 5501 or 5508 is installed)	79	1.50	4
				Basic Monthly Lic. Charge
SOFTWARE				
5708-AS1	Assembler			\$ 50
5708-CB1	Cobol-OS/BS Host Compiler and Library			187
5708-CB2	Cobol-DOS/VSE Host Compiler and Library			187
5708-CB3	Cobol-S/34 Host Compiler and Library			201
5708-CB4	Cobol-S/38 Host Compiler and Library			201
5708-DC1	Communications Utilities			19
5708-DE1	DE/RPG			15
5708-EM1	5280-3270 Emulation			60
5708-SC1	System Control Programming (SCP)			NC
5708-SM1	Sort/Merge			15
5708-UT1	Utilities			9
5708-CL1	Procedure Control Language			11
5798-NZH	OS/6 Communications and File Conversion System			143
5798-RBZ	5280 Contract Data Entry/Edit Support			50
5798-RCR	5280 Format Design Aid			**600
5798-RDF	5280 Distribution Order Subsystem			35

*Rental and lease charges include maintenance.

**Withdrawn from marketing as of 8/1/73.■

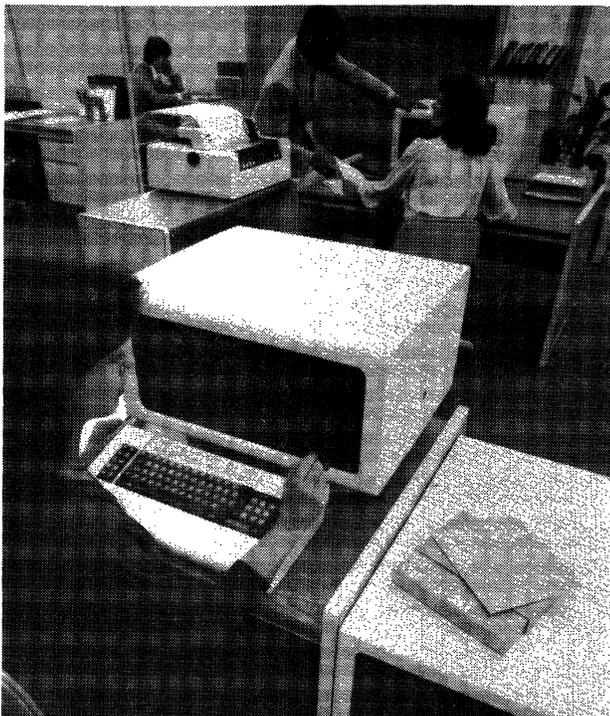
IBM 5280 Distributed Data System

MANAGEMENT SUMMARY

The 5280 Distributed Data Processing System was introduced by IBM on January 10, 1980. Originally a product of the now-defunct General Systems Division, the 5280 system consists of a family of diskette-based intelligent terminals that can be programmed to enter, validate, store, process, and print business information at the point of origin.

The 5280 equipment and software are designed to support a wide range of distributed environments and functions, including intelligent data entry, batch and interactive communications, batch processing, transaction processing, and distributed printing. Thus, the 5280 should be attractive to both large and small data processing users who are considering the use of distributed intelligent terminals as part of new or existing data processing networks. Although the 5280's processing and input/output capabilities are comparable to those of many of the current microprocessor-based small business computers, IBM's marketing emphasis and software support make it clear that the 5280 is intended for use as an element in distributed systems rather than as a stand-alone computer.

In January 1981, IBM announced several enhancements to the 5280 system, including new communications features, increased storage capacity, and additional ➤



The 5288 Programmable Control Unit (right foreground) provides the processing, control, and storage functions for larger 5280 configurations such as this one. Two keyboard/display stations and a serial matrix printer are also visible in the photo.

IBM's diskette-based distributed data processing system.

Support for distributed functions, such as batch and interactive communications, intelligent data entry, batch processing, and transaction processing, is provided via three configurations, including integral single or dual keyboard/display stations and a clustered configuration that can handle up to four workstations. Depending on the configuration, a 5280 System can support 1 to 8 diskette drives, 0 to 5 printers, and 32K to 160K bytes of user memory.

A minimum configuration, consisting of a 5285 Model A01 Programmable Data Station with 32K bytes of main storage, one Diskette 1 drive, and a keyboard, is priced at \$6,337, or \$205 per month on a two-year lease including maintenance.

A more elaborate system, consisting of a 5285 Model D10 Programmable Data Station with 96K bytes of main storage, two Diskette 2D drives, a keyboard, a communications adapter, and a 120-cps 5256 Model 3 Printer, can be purchased for \$16,207, or leased for \$615 per month on a two-year lease with maintenance.

CHARACTERISTICS

VENDOR: International Business Machines Corporation, Information Systems Group, National Marketing Division, 4111 Northside Parkway, Atlanta, Georgia 30301. Telephone (404) 238-2000.

DATE OF ANNOUNCEMENT: January, 1980.

DATE OF FIRST DELIVERY: June 1980.

NUMBER DELIVERED TO DATE: Information not available.

SERVICED BY: IBM.

CONFIGURATION

A 5280 System configuration can be based on any of the following units, each of which provides all processing and control functions of the system, including those of any attached auxiliary data stations or printers: 1) any model of the 5285 Programmable Data Station; 2) any model of the 5286 Dual Programmable Data Station; or 3) any model of the 5288 Programmable Control Unit with an attached 5281 Data Station or 5282 Dual Data Station (any model).

The 5285 Programmable Data Station is a single, table-top keyboard/display unit with 32K, 48K, 64K, or 96K bytes of ➤

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processing power. The 5280-3270 Emulation Licensed Program was introduced, which allows the 5285 or 5286 terminals to appear as IBM 3270 terminals using either BSC or SNA/SDLC. The 5285 and 5286 terminals, as well as the 5288 controller, were enhanced via new models with expanded main storage capacities. Also introduced was a new printer, the 5224, and a second application microprocessor feature which provides additional processing power to the 5280 system.

The 5280 hardware product line consists of nine units: single and dual programmable keyboard/display stations, single and dual auxiliary (nonprogrammable) keyboard/display stations, a programmable control unit, and four printers. Every 5280 system must include a programmable controller and at least one keyboard/display, which may or may not be housed in a single physical unit. System configuration possibilities span a wide range, from a single keyboard/display station with 32K bytes of memory and one diskette drive to a fully expanded system consisting of the programmable control unit with 288K bytes of memory, four keyboard/displays, eight printers, eight diskette drives totaling 9.6 megabytes, and a communications adapter. Hard disk drives and magnetic tape drives, however, are conspicuously absent from the 5280 product line at this writing.

The 5285 Programmable Data Station, the basic unit of the 5280 product line, is a table-top keyboard/display station with a single CRT display and keyboard, one or two diskette drives with a capacity of up to 2.4 megabytes, a programmable controller, and from 32K to 96K bytes of memory. A display capacity of 480, 960, or 1920 characters can be selected. Devices that can be attached to the 5285 are limited to one 5222, 5224, 5225 or 5256 Printer and either one auxiliary data station (5281 or 5282) or the communications adapter. Thus, a 5280 system built around the 5285 can have up to three keyboard/display stations (through the attachment of an auxiliary 5282), but a multi-station configuration cannot be equipped for communications.

The 5286 Dual Programmable Data Station is a table-top unit that includes two independent keyboard/display stations, two diskette drives with a capacity of up to 2.4 megabytes, a programmable controller, and from 32K to 96K bytes of memory. The display capacity is limited to 480 characters at each station. The 5286 can control one auxiliary data station (5281 or 5282), but it cannot be equipped with either a printer or a communications adapter. Thus, the 5286 is a limited-function unit that appears to be designed mainly for key-to-diskette data entry functions where no communications capability is required.

The 5288 Programmable Control Unit is a floor-standing controller designed to serve as the central component of larger 5280 configurations. The 5288 contains from 32K to 288K bytes of memory and from one to four diskette drives with a total capacity of up to 4.8 megabytes. It can control a cluster of up to four keyboard/displays through

main storage and one or two diskette drives. The standard 480-character display capacity can be expanded to 960 or 1920 characters. The following devices and features can be attached to the 5285: one auxiliary 5281 Data Station of 5282 Dual Data Station, connected via cable at a maximum distance of 200 feet; one 5225 or 5256 Printer, connected via twinax cable at a maximum distance of 5000 feet; one 2500 Communications Adapter with the appropriate line interface feature; one Magnetic Stripe Reader; one Elapsed Time Counter; and one Security Keylock. The 5285 and its auxiliary 5281 or 5282 Data Station must have the same display capacity. An auxiliary 5281 or 5282 Data Station cannot be attached if the controlling 5285 has the 2500 Communications Adapter.

The 5286 Dual Programmable Data Station is a table-top unit that functions as two independent data stations, each with keyboard, display area, and diskette drive. Main storage capacities of 32K, 48K, 64K, and 96K bytes are available. The display capacity is 480 characters at each operator position and cannot be expanded. The following devices and features can be attached to the 5286: one auxiliary 5281 Data Station or 5282 Dual Data Station, connected via cable at a maximum distance of 200 feet; one Magnetic Stripe Reader; one Elapsed Time Counter; and one Security Keylock. The 5286 and its auxiliary 5281 or 5282 Data Station must have the same display capacity (i.e., 480 characters). The 5286 cannot be equipped with either a printer or a communications adapter.

The 5288 Programmable Control Unit is a floor-standing controller that contains from 32K to 288K bytes of main memory and from 1 to 4 diskette drives. The 5288 provides processing, control, main memory, diskette storage, communications and device attachment capabilities for other components of the 5280 system. The following devices and features can be attached to the 5288: 5281 Data Stations and/or 5282 Dual Data Stations in any combination providing a maximum of four keyboards; up to eight printers including any combination of the 5222, 5224, 5225, and 5256 printers; one 2500 or 3270 Emulation Communications Adapter with the appropriate line interface feature; one magnetic stripe reader; one Elapsed Time Counter; and one Security Keylock.

Each data station requires a separate Auxiliary Data Station Attachment on the 5288 and is connected to the system by a cable 200 feet long. All of the attached data stations must have the same display capacity (480, 960, or 1920 characters for the 5281 and 480 or 960 characters for the 5282). Printers are connected to the 5288 via one of four features: the Single Twinax Printer Attachment (#1155), the Multiple Twinax Printer Attachment (#1160), the Single 5222 Printer Attachment (#1157), and the Multiple 5222/Twinax Printer Attachment (#1162). The first attachment provides a single twinax port and connects up to seven 5224, 5225, and/or 5256 printers to the 5288. The second attachment provides four ports for attaching a maximum of eight printers. The third attachment features a single port for the attachment of one 5222 Printer. The fourth attachment provides four 5222 Printer ports and a twinax printer port. A single 5222 printer can be attached to each 5222 port, while up to seven 5224, 5225, and/or 5256 printers can be supported by the twinax port.

The 5281 Data Station is a single, table-top, auxiliary keyboard/display unit containing 0, 1, or 2 diskette drives. A nonprogrammable unit, the 5281 must be cable-connected to a 5285, 5286, or 5288 equipped with the appropriate Auxiliary Data Station Attachment feature. The 5281's display capacity is 480, 960, or 1920 characters, as determined by the attachment feature on the controlling device. If the 5281 contains 1 or 2 diskette drives, the

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➤ the attachment of auxiliary data stations (5281 or 5282). The 5288 can also accommodate the communications adapter and up to eight printers. Diskette drives in the attached auxiliary data stations can be accessed by the 5288 along with its own drives, providing a total system capacity of up to 8 drives and 9.6 megabytes.

The 5281 Data Station is a table-top unit containing a single keyboard/display and 0, 1, or 2 diskette drives with a capacity of up to 2.4 megabytes. A nonprogrammable unit, the 5281 must be cable-connected to a 5285, 5286, or 5288 at a maximum distance of 200 feet. The display capacity is 480, 960, or 1920 characters as determined by the attachment feature on the controlling device.

The 5282 Dual Data Station is a table-top unit containing two independent keyboard/display stations and 0, 1, or 2 diskette drives with a capacity of up to 2.4 megabytes. Like the 5281, the 5282 is a nonprogrammable unit that must be cable-connected to a 5285, 5286, or 5288 at a maximum distance of 200 feet. The display capacity at each station is 480 or 960 characters, as determined by the attachment feature on the controlling device.

The number of printer models that can be configured to either a 5285 or a 5288 recently doubled. The 5225 and 5256 Printers are now accompanied by the 5222 and 5224 Printers. The 5222 is a wire-matrix table-top printer capable of printing 80 characters per second at 10 cpi (characters per inch) or 15 cpi horizontal print density. Each line of print can contain 132 characters (10 cpi) or 198 characters (15 cpi). The printer features bidirectional printing and accommodates one of three upper/lower case character sets: a 95-character EBCDIC set, a 185-character multinational set, or a 95-character Spanish set. Vertical spacing is user selectable at 6 or 8 lines per inch, while the page length is program selectable with a maximum length of 255 lines per page. A variable-width forms tractor provides for the feeding of continuous forms.

The 5224 is an impact dot-matrix (8-by-7) line printer with a user-selectable print density of 10 or 15 cpi and line spacing of 6 or 8 lines per inch. Forms skipping and vertical spacing are under program control. The 5224 is available in two models: Model 1, with a printing speed of 140 lines per minute (lpm) at 10 cpi or 95 lpm at 15 cpi; and Model 2, with a printing speed of 240 lpm at 10 cpi or 175 lpm at 15 cpi. An audible alarm informs the operator when manual intervention is required due to one of nine printer error conditions. The 5224 features the same three character sets of the 5222 Printer, with the addition of ASCII graphics capabilities with the 185-character multinational set.

The 5225 Printer is a wire-matrix line printer that can be attached to either the 5285 or the 5288. It features operator-selectable horizontal spacing of either 10 or 15 characters per inch, as well as both upper and lower case characters. The 15-cpi spacing makes it possible to print most reports on standard correspondence-size paper to reduce forms costs and simplify the handling and filing of reports. The 5225 is offered in four models with rated ➤

➤ controlling 5285, 5286, or 5288 must also have the appropriate Remote Diskette Drive Attachment feature. The 5281 can be equipped with an optional Magnetic Stripe Reader.

The 5282 *Dual Data Station* is a table-top unit that functions as two independent auxiliary data stations, each with keyboard, display area, and optional diskette. The 5282 is available with 0, 1, or 2 diskette drives. A nonprogrammable unit, the 5282 must be cable-connected to a 5285, 5286, or 5288 equipped with the appropriate Auxiliary Data Station Attachment feature. The display capacity at each operator position is either 480 or 960 characters, as determined by the attachment feature on the controlling device. If the 5282 contains 1 or 2 diskette drives, the controlling 5285, 5286, or 5288 must also have the appropriate Remote Diskette Drive Attachment feature. Either or both stations of the 5282 can be equipped with an optional Magnetic Stripe Reader.

TRANSMISSION SPECIFICATIONS

COMMUNICATIONS ADAPTER: This optional feature (#2500) for either the 5285 Programmable Data Station or the 5288 Programmable Control Unit provides either SDLC or BSC data link control over a single communications line. Operating under stored-program control, the feature allows the 5285 or 5288 to communicate at up to 4800 bits/second on a switched point-to-point or nonswitched point-to-point or multipoint line. (On a multipoint line, the 5285 or 5288 operates as a tributary station.) All transmission is in half-duplex mode. Switched network support includes manual dialing and manual or automatic answering (where the attached modem supports the latter capability).

The 5285s, 5288s, or other devices at all the terminations (or drop points) of a network must use the same clocking source, operate at the same transmission rate, use the same transmission code, and have the same two- or four-wire connection to the line. Compatible modems must be used at all terminations in a network.

A 5285 or 5288 using BSC protocol can communicate with the following other IBM systems:

- A System/3 equipped with a 2074, 2084, or 2094 Communications Adapter.
- A System/32 equipped with a 2074 Communications Adapter.
- A System/34 equipped with a 2500, 3500, or 4500 Communications Adapter.
- A System/38 with an appropriately configured BSC Adapter and subfeatures (point-to-point only).
- A System/370 equipped with either an Integrated Communications Adapter, a 2701 Data Adapter Unit, or a 3704 or 3705 Communications Adapter with the ACF/NCP or PEP software, plus a BSC adapter and appropriate subfeatures.
- A 4331 System equipped with a communications adapter.
- A 303X or 4300 System with a 2701 Data Adapter Unit.
- A Series/1 equipped with a 2074, 2075, or 2093/2094 Binary Synchronous Control.
- A 3741 Model 2 Data Station or a 3741 Model 4 Programmable Workstation.
- A 3747 Data Converter equipped with a 1660 Communications Adapter. ➤

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- speeds of 280, 400, 490, and 600 lines per minute at 10 cpi and 195, 290, 355, and 420 lines per minute at 15 cpi. Each line can have a maximum of 132 print positions at 10 cpi and 198 positions at 15 cpi.

The 5256 Printer is a serial matrix printer that prints bidirectionally, using a 96-character upper/lower case EBCDIC character set. The 5256 is available in three models with rated speeds of 40, 80, or 120 characters per second.

All of the 5280 units are designated as "customer set-up" machines, and their compact size should make them relatively easy to install.

The programmable controllers in the 5285, 5286, and 5288 perform identical processing and control functions, although they vary in their memory capacities and device attachment capabilities. Multiple microprocessors (up to six) are used in each controller to enable processing and I/O devices to operate independently, and the system supports multiprogramming with up to eight main storage partitions. IBM has been strangely reticent about defining the 5280's processing capabilities, so at this time no performance comparisons can be made between the 5280 and other systems from IBM or competing vendors.

Data communications capabilities for the 5280 system are provided by an optional communications adapter on either the 5285 Programmable Data Station or the 5288 Programmable Control Unit. The 5285 or 5288 can communicate over a single line in half-duplex mode at a speed of up to 4800 bits per second, using either BSC or SDLC protocol. Point-to-point switched or nonswitched operation and multipoint tributary operation are supported. The required line interface can be provided by an internal modem, a Digital Data Service Adapter, or an EIA interface that permits the use of an external modem. The 5280 system can communicate with an IBM System/370, 303X, or 4300 Series computer in SDLC mode or with most current IBM computers and terminals in BSC mode.

The 5280's designers clearly paid considerable attention to data security provisions. Sensitive data can be entered via the keyboard without being displayed on the CRT screen. An optional Security Keylock feature makes it possible to restrict usage of the system to keyholders. An optional Magnetic Stripe Reader, available for each keyboard/display operator position, can be used to enter user identification data. Finally, a communicating 5280 system can exchange identification sequences with the host computer, thereby aiding the user in controlling access to data.

Initial software support for the 5280 consists of bundled System Control Programming (SCP) and eight separately priced licensed programs. The software is oriented toward the support of data entry, transaction processing, batch processing, and both batch and interactive communications.

No integrated operating system has been announced for the 5280. The "free" SCP facilities are limited to a System ➤

- • A 5265 communicating model (XX2).

- Another 5285 or 5288 equipped with the 2500 Communications Adapter.

A 5285 or 5288 using SDLC protocol can communicate with a System/370, 303X, or 4300 Series computer via a 3704 or 3705 Communications Controller equipped with appropriate features.

The Communications Adapter must be connected to the communications line by means of either an Integrated Modem, an EIA Interface plus an external modem, or a DDS Adapter. These devices are described in the following paragraphs.

3270 EMULATION COMMUNICATIONS ADAPTER: In addition to the functions provided by the 2500 Communications Adapter, this feature supports the 5280—3270 Emulation licensed program, and in conjunction with stored program control, permits the 5285 and 5288 to function on a switched or nonswitched public or private communications line. This adapter is required to attach to a communications line via the appropriate interface or modem (see INTEGRATED MODEMS). The 3270 Emulation Communications Adapter cannot be installed with the 2500 Communications Adapter. In addition, as with the 2500 adapter, the 3270 cannot be configured to an auxiliary data station or to a system equipped with the Second Application Microprocessor.

INTEGRATED MODEMS: IBM offers five types of 1200-bps Integrated Modems for use with a 5285 Programmable Data Station or 5288 Programmable Control Unit equipped with the 2500 Communications Adapter. All five versions permit either BSC or SDLC data transmission at either 600 or 1200 bits/second. Their distinguishing characteristics are as follows: Model 5500—non-switched; Model 5501—switched with auto-answer; Model 5502—switched without auto-answer; Model 5507—non-switched with Switched Network Backup manual answer capability; and Model 5508—non-switched with Switched Network Backup auto-answer capability. The devices communicating with the 5285 or 5288 must be equipped with compatible 1200-bps modems. Only one Integrated Modem can be installed in a 5285 or 5288, and the Integrated Modem is mutually exclusive with the EIA Interface and the DDS Adapter. The Power Supply Expansion (#5810) is required for the Model 5501 or 5508 Integrated Modem.

EIA INTERFACE (#3701): This feature can be chosen as an alternative to the IBM Integrated Modems for use with a 5285 or 5288 equipped with the 2500 Communications Adapter. The feature provides a cable and interface that meet the EIA RS-232C specifications, permitting the attachment of an external modem supplied by IBM or another vendor. The Power Supply Expansion (#5810) is a prerequisite.

DIGITAL DATA SERVICE (DDS) ADAPTER: This feature enables a 5285 or 5288 equipped with the 2500 Communications Adapter to transmit and receive data at 2400 or 4800 bits/second in BSC or SDLC mode over AT&T's non-switched Dataphone Digital Data Service. The DDS Adapter is available in two versions: Model 5650 for point-to-point operation and Model 5651 for multipoint operation. Either model provides for appropriate interface and cable to the DDS channel service unit at the customer site.

SOFTWARE

Software support for the 5280 Distributed Data System is provided by System Control Programming (SCP), which is ➤

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Configuration Program that is used to define the physical and logical configuration of a 5280 system, an Initial Program Loader that initializes the system for program execution, a PTF/Patch Program that aids in applying program temporary fixes and program patches, and a Close Failure Recovery program that aids in recovering from abnormal program terminations.

Users of the 5280 have a choice of three programming languages: DE/RPG, COBOL, and Assembler. The principal IBM emphasis appears to be on DE/RPG, a new programming system that uses RPG-style specification forms to simplify the preparation of programs for interactive data entry, high-volume key entry, and user-defined processing functions. The 5280 COBOL language is an implementation of ANS COBOL 74 that supports interactive or batch commercial applications, provides limited data station support for interactive applications, and supports BSC and SDLC communications via a CALL interface. COBOL's usefulness, however, is limited by the fact that COBOL programs for the 5280 must be compiled on a host IBM System/370, 303X, or 4300 Series computer under either OS/VS or DOS/VSE. DE/RPG and Assembler programs, by contrast, can be compiled on the 5280 system itself.

Three utility packages complete the initial 5280 software complement. The 5280 Utilities consist of 11 routines to perform straightforward utility functions such as diskette file maintenance, resource allocation, and system status display. The 5280 Sort/Merge permits flexible sorting and merging operations on diskette files. The 5280 Communications Utilities provide software support for a 5285 or 5288 equipped with the communications adapter. Basic facilities are provided for batch data transfer and inquiry, multi-leaving remote job entry (MRJE), SNA remote job entry (SRJE), and communication configuration and job description. No software to support specific user applications has been announced for the 5280 to date.

The 5280 effectively supersedes the 3740 Data Entry System, IBM's earlier key-to-diskette system. Introduced in 1973, the 3740 had been progressively upgraded through the addition of programmability, communications, and printers—but the older system is clearly outclassed by the greater power and flexibility of the 5280. To assist 3740 users in converting to the 5280, IBM is providing three software conversion aids. The 3740 Format Conversion utility facilitates the conversion of 3740 key entry program levels into DE/RPG source programs. The Key Entry Utility accepts the 3740 key entry string language as input and creates formats for simple key entry functions on the 5280. The 3740 ACL Conversion Aid Program, supplied with the 5280 Assembler, aids in converting 3740 ACL programs into 5280 Assembler language.

The 5280 naturally invites comparison with the 8100 Information System, the distributed processing system that IBM's Data Processing Division introduced in October 1978. But the 8100 is a much larger, more

furnished at no charge, and by a set of separately priced licensed programs. These software facilities collectively provide the necessary support for a wide range of distributed environments including data entry, batch and interactive communications, batch processing, and transaction processing.

OPERATING SYSTEM: No integrated operating system for the 5280 has been announced to date. Instead, IBM offers the *5280 System Control Programming (SCP)*, which consists of four routines that provide the following basic system functions: 1) the System Configuration Program is used to describe the physical and logical configuration of a 5280 system; 2) the Initial Program Loader initializes the system and prepares it for program execution; 3) the PTF/Patch Program is used to apply program temporary fixes (PTF's) and to make program patches; 4) the Close Failure Recovery Program allows the user to specify an end-of-data (EOD) record in a diskette data set in the event that a program terminates abnormally.

LANGUAGES: IBM currently offers the DE/RPG, COBOL, and Assembler languages for use with the 5280 system. DE/RPG and Assembler programs can be prepared on the 5280 itself, whereas COBOL programs must be compiled on a host System/370, 303X, or 4300 Series computer under either OS/VS or DOS/VSE.

5280 DE/RPG is a new product designed to simplify the preparation of programs for applications ranging from simple key entry to high-function data entry jobs that require extensive editing, data set accessing, and user-defined processing.

DE/RPG makes use of the Data Description Specifications (DDS) form, which is also supported on the IBM System/38, for specification of data entry formats. A format or series of formats, defined by the user and presented in the display screen, provides the framework for a data entry job. A typical job would consist of entering data, editing and checking the data, creating records, and writing the records to a diskette data set. The sequence of execution of the formats can be determined by job definition, by operator selection, or by the program on the basis of an analysis of current data.

DE/RPG also features an RPG subroutine capability which provides a subset of the RPG III calculation operation codes. Using the RPG Calculation Specifications, the user can define subroutines to perform functions such as complex editing, arithmetic calculations, array handling, master data set access, and report printing. A total of 40 RPG II operation codes from the following categories are available: arithmetic and data manipulation, branching, indicator testing, subroutine operations, and special I/O operations. The RPG subroutine capability can also be used to create stand-alone batch DE/RPG programs that can run in any partition. RPG programmers should note, however, that the sequence of instruction execution is defined by the user; the usual RPG "cycle" does not apply.

DE/RPG permits considerable flexibility in display screen design and in data editing. Prompts and data fields can be positioned anywhere on the screen below the top line, which is reserved for status information, and multiple formats can be displayed on a single screen. Editing can be performed on a character, field, or record basis, and a wide range of editing, checking, testing, comparison, insertion, and table lookup operations is available.

DE/RPG diskette data sets are organized in sequential fashion. Three access methods are supported: sequential, direct by relative record number, and key indexed. Data sets can be shared by multiple programs on a read or write/update basis. There are safeguards against concurrent updating of a record by two or more programs.

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➤ powerful, and more costly system; the *smallest* 8100 processor has 256K bytes of main memory, and includes 29 megabytes of hard disk storage. Thus, the two systems occupy separate niches within IBM's growing line of distributed processing hardware and appear to be complementary rather than competitive.

The 5280's more direct competition will come not from other IBM products but from the distributed data systems that have long been marketed by companies such as Datapoint, Four-Phase Systems, Inforex, Mohawk Data Sciences, Nixdorf, and Pertec. Competitive systems with capabilities generally similar to those of the 5280 include the Datapoint 1550 and 1800, the Four-Phase System IV series, the Inforex System 9000, the Mohawk Data Sciences Series 21, the Nixdorf 600/25, /35, /45, and /55, and the Pertec XL20 and XL40. □

➤ All DE/RPG programs maintain production statistics on both a job basis and a station basis. Counts can be maintained of keystrokes, records, marked records, verify correction keystrokes, elapsed time, and number of jobs.

The DE/RPG licensed program consists of a Source Entry Program and a Compiler. The Source Entry Program permits interactive entry, verification, and updating of DE/RPG source statement data set, which becomes the input to the Compiler. The Compiler produces an object program data set, which is written to diskette, and an optional source listing on either printer or diskette. When two or more operators are to perform the same job, each operator must have an individual copy of the appropriate object program, executing in a separate partition.

The DE/RPG Compiler will run on any 5280 system that has at least one Diskette 2D drive or two Diskette 1 drives. Minimum main storage partition size requirements are 9K bytes for the Compiler and 13K bytes for the Source Entry Program. The 5280 SCP and 5280 Utilities are prerequisites.

5280 COBOL is available in two versions, which differ in the host IBM computers and software that are required to compile the COBOL source programs. The 5280 COBOL-OS/VS Host Compiler and Library product requires a System/370, 303X, or 4300 Series computer operating under OS/VS1 or OS/VS2 (MVS) for the compilation process, while the 5280 COBOL-DOS/VSE Host Compiler and Library product requires a System/370, 303X, or 4300 Series computer operating under DOS/VSE. Otherwise, the two versions have similar capabilities and features. COBOL object programs can be executed on a 5285, 5286, or 5288. Object programs can be transferred from the host to the 5280 system via diskette, RJE, or a user-written communications program.

The 5280 COBOL language is an implementation of 1974 ANS Standard COBOL, X.23-1974. It provides support for both interactive and batch commercial application programs, as well as limited data station support for interactive applications. Support for BSC and SDLC communications is provided via a CALL interface.

The 5280 Assembler is used to create stand-alone programs which will run on a 5285, 5286, or 5288. Features of the Assembler include mnemonic operation codes, symbolic addresses, symbolic data representation, automatic storage assignments, address displacement calculation, operand expressions, binary and decimal arithmetic, a source program listing, a cross-reference listing, error checks, and diagnostic messages. The 3740 ACL Conversion Aid

Program is supplied along with the Assembler to aid the user in converting ACL programs written for the IBM 3740 Data Entry System into 5280 Assembler Language.

UTILITIES: IBM currently offers three licensed programs in this category for the 5280 system: the 5280 Utilities, the 5280 Sort/Merge, and the 5280 Communications Utilities.

The 5280 Utilities consist of 11 programs with the following names and functions:

- Diskette Initialization Utility—formats a diskette according to the user's requirements.
- Diskette/Data Set Clear Utility—clears one or all data sets on a diskette in preparation for the recording of new data.
- Diskette Label Maintenance Utility—allocates space for new data sets, deletes old data sets, and modifies the labels of volumes and data sets.
- Diskette Label List Utility—displays or prints diskette volume labels, data set labels, data set names, and data set directories.
- Diskette Copy Utility—copies all or portions of a diskette onto the same or another diskette; supports multi-volume output data sets.
- Diskette Print Utility—prints all or selected records from a diskette, without reformatting or editing.
- Resource Allocation Utility—enables the user to add, delete, display, or alter an entry in the Resource Allocation Table, which contains physical device addresses with their corresponding logical identifiers.
- 3740 Format Conversion utility—aims in the conversion of 3740 key entry program levels into DE/RPG source programs.
- Diskette Compress Utility—rearranges data sets to make one contiguous space out of the unused space between data sets.
- Key Entry Utility—permits the user to create formats for simple data entry functions using the IBM 3740 key entry string language.
- System Status Utility—displays system status information such as the number and sizes of partitions and names of programs currently being executed.

The 5280 Sort/Merge consists of a Sort program and a Merge program. The Sort program sorts a single diskette data set into either ascending or descending sequence, using parameters entered at the keyboard or read from diskette. Records can be selected, omitted, or reformatted, and work space and data set space are allocated automatically. Four output formats are available: Full Record, Address Out (a data set of four-byte relative record numbers), Record Subset (a data set containing user-specified data fields), and Index/Key (a data set with records consisting of a key and a relative record number). The Merge program combines records from two sorted diskette data sets into another data set, using parameters entered at the keyboard or read from diskette. It supports multi-volume data sets.

The 5280 Communications Utilities consist of four basic facilities: Batch Data Transfer/Inquiry, SNA/SDLC Remote Job Entry (SRJE), Multi-Leaving Remote Job Entry (MRJE), and Communications Configuration and Job Description. These programs provide software support for a 5285 Programmable Data Station or 5288 Programmable Control Unit equipped with the 2500 or 3270 Emulation Communications Adapter and communicating

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over a single line in either BSC or SDLC mode. The communications programs operate concurrently with other applications. Only the 960-character and 1920-character display sizes are supported.

The Batch Data Transfer/Inquiry program provides for batch data transfer to a host system or terminal and inquiry to a host system. It supports SNA/SDLC communications as an LU1-type terminal to a System/370, 303X, or 4300 Series computer with CICS/VS and IMS/VS, or BSC communications with a System/370, 303X, or 4300 with CICS/VS, IMS/VS (as a 3741), and VSE/POWER, or with System/3/32/34 RPG II, System/3 CCP, System/34 SSP-ICF, Series/1 RPS, a 3740, a 5260, or another 5280. The minimum main storage required is 32K bytes for BSC communications and 64K bytes for SNA/SDLC.

The SNA/SDLC Remote Job Entry (SRJE) facility permits the 5280 system to function as an RJE terminal consisting of one console, one reader, one punch, and one printer. Printer data streams can be directed to either a printer or diskette, while punch data streams are directed to diskette. SNA support on the host computer is via ACF/VTAM and ACF/NCP/VS to RES, JES2, JES3, and VSE/POWER. The minimum main storage requirement on the 5280 is 64K bytes.

The Multi-Leaving Remote Job Entry (MRJE) facility permits the 5280 system to function as an RJE terminal with full multi-leaving support for concurrent device operation of one console, one reader, one punch, and one printer. Printer data streams can be directed to either a printer or diskette, while punch data streams are directed to diskette. BSC support on the host computer treats the 5280 as a System/3 MRJE workstation for RES, JES2, and JES3. The minimum main storage requirement is 48K bytes on a 5285 or 64K bytes on a 5288.

The Communications Configuration and Job Description program is used to prepare communications environments via job step prompts. Descriptions are stored on diskette by job name, and are used to initiate the communications link with the host computer or another terminal. Initiation of the link with the host may be either dynamic or predetermined for operator convenience.

The 5280—3270 Emulation licensed program allows the 5280 Distributed Data System to function as selected 3270 control units and devices to existing host applications. The program consists of the following: the 3270 Device Emulation Program, the 3270 Batch Transfer Utility, and the 3270 Program Interface.

The 3270 Device Emulation Program allows the 5280 to appear to the host as a 3274 Model 1C Control Unit under SNA/SDLC or as a 3271 Model 2 Control Unit under BSC. With the 3270 Device Emulation Program, the 1920-character 5281 Data Station (attached to a 5288 Programmable Control Unit) and the 1920-character 5285 Programmable Data Station appear to a host system as a 3277 Model 2 Display Station with selected features. The 5280 Distributed Data System's printers are also emulated to appear as the 3284 Model 2, the 3286 Model 2, and the 3288 Model 2 printers under BSC and the 3287 Printer Models 1 and 2 under SNA/SDLC. Host system communication subsystems that are supported include System/370 IMS/VS, CICS/VS, TSO, and System/3 Model 15D CCP.

The following BSC host system support is provided for the 5280—3270 Device Emulation Program:

- IMS/VS with BTAM under OS/VS1 or OS/VS2 (MVS)
- IMS/VS with ACF/VTAM under OS/VS1 or OS/VS2 (MVS)

- CICS with BTAM under OS/VS1 or OS/VS2 (MVS)
- CICS/VS with ACF/TCAM under OS/VS1 or OS/VS2 (MVS)
- CICS/VS with BTAM under DOS/VSE or DOS/VS
- CICS/VS with ACF/VTAM under OS/VS1 or OS/VS2 (VMS)
- TSO with ACF/VTAM under OS/VS2 (MVS)*
- System/3 Model 15D under CCP

(Note: *TSO does not support printers. All of the above systems, with the exception of the System/3, are also supported when under control of VM/370.)

The following SNA/SDLC host system support is provided for the 5280—3270 Device Emulation Program:

- IMS/VS with ACF/VTAM under OS/VS1 or OS/VS2 (MVS)
- CICS/VS with ACF/VTAM under OS/VS1 or OS/VS2 (MVS)
- CICS/VS with ACF/TCAM under OS/VS1 or OS/VS2 (MVS)
- CICS/VS with ACF/VTAM under DOS/VS or DOS/VSE
- TSO with ACF/VTAM under OS/VS2 (MVS)*

*TSO does not support printers.

Minimum 5285 and 5288 system configuration requirements required to support the 5280—3270 Device Emulation Program include 64K bytes of memory (96K bytes if printer is used in conjunction with a keyboard/display), the 3270 Emulation Communications Adapter, and a display size of 1920 characters.

The 3270 Batch Transfer Emulation Utility enables the user to transmit and receive batch data when communicating with a host system via 3270 BSC protocols. Record lengths can be a maximum of 1918 bytes. Transaction IDs and how they are used during transmission may be specified. A user program is required at the host to send or receive batch data.

The 3270 Program Interface provides the 5280 user with a program-to-program interface using 3270 BSC protocols. Up to seven concurrent sessions are supported, with each session representing a different 3270 device address. The user application interface is through DE/RPG and Cobol.

COMPONENTS

DISPLAY: A standard component of the 5281 Data Station, 5282 Dual Data Station, 5285 Programmable Data Station, and 5286 Dual Programmable Data Station. Display capacities for each model are as follows:

Model	480 chars.	960 chars.	1920 chars.
5281	Std.	Opt.	Opt.
5282	Std.	—	—
5285	Opt.	Opt.	Opt.
5286	Opt.	Opt.	—

Display capacity for Models 5285 and 5286 is determined by the attachment feature selected on the controlling device. Models 5282 and 5286 provide a single split-screen display, with the indicated display capacity supported at each of the two operator positions. The display arrangement is 6, 12, and 24 lines of 80 characters for the 480-, 960-, and 1920-character capacities, respectively. Characters are formed within an 8-by-16 dot matrix character cell. A user-selectable choice of 94-character (upper/lower case) EBCDIC, 94-character ASCII, or 185-character Multinational character sets is provided. Program-controlled screen attributes include reverse video, high intensity, blinking, underlining, nondisplay (blinking), and column separation.

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► **KEYBOARD:** A required component of the 5281, 5282, 5285, and 5286. Dual station models (5282 and 5286) require two keyboards. Four keyboard types are offered: 83-key EBCDIC typewriter, 83-key ASCII typewriter, 66-key data entry, and 66-key data entry with proof arrangement. Each keyboard is movable and includes data keys, cursor movement keys, special function keys, and field edit keys.

MAGNETIC STRIPE READER: An optional feature for the 5281, 5282, 5285, or 5286. Up to 128 A.B.A. numeric characters, including control characters, can be read from a magnetic stripe on credit cards, identification cards, and other documents.

DISKETTE DRIVES: Two types of diskette drives are available for any 5280 system in any combination: a drive that can read and write only the IBM Diskette 1 format, and a drive that can read and write the IBM Diskette 1, 2, and 2D formats. (The latter is referred to as a Diskette 2D drive.) The on-line data capacity of each drive can range from 246K bytes to 1.2 megabytes depending upon the recording format in use, as tabulated below.

Diskette Type	Format	Bytes per Sector	Capacity, Bytes
1	1	128	246K
	2	256	284K
	3	512	303K
2	4	128	492K
	5	256	568K
	6	512	606K
2D	7	128	985K
	8	256	1136K
	9	512	1212K

For exchanging diskette data between the 5280 and other systems, IBM supports the following exchange types: Basic Exchange, in formats 1 and 4; H Exchange, in format 7 only; and I Exchange, in all of the above formats. Diskettes can be interchanged with the IBM Series/1, System/3, System/32, System/34, System/38, System/370, 303X, 4300, 3540, 3740, 3747, 3770, 3790, 5110, 5230, 5260, 8100, and other systems and devices that support a compatible diskette exchange type.

Diskette data transfer rates are 31,250 bytes/second in Diskette 1 or Diskette 2 mode and 62,500 bytes/second in Diskette 2D mode. The rotational speed is 360 rpm for both types of drives.

5222 LINE PRINTER: A bidirectional wire matrix line printer that connects to the 5285 or 5288 via twinax cabling at a distance of up to 5000 feet. Horizontal spacing of 10 or 15 characters per inch and vertical spacing of 6 or 8 lines per inch is operator-selectable. Maximum line width is 132 characters at 10 cpi and 198 characters at 15 cpi. A choice of 95-character EBCDIC, 185-character Multinational, or 95-character Spanish character sets is provided. Characters are formed via an 8-by-7 dot matrix. A forms tractor is standard. One model is available, with a rated print speed of 80 cps at both 10 and 15 cpi.

5224 LINE PRINTER: An impact matrix line printer that connects to the 5285 or 5288. Horizontal spacing of 10 or 15 characters per inch and vertical spacing of 6 or 8 lines per inch is operator-selectable. Maximum line width is 132 characters at 10 cpi and 198 characters at 15 cpi. A choice of 95-character EBCDIC, 184-character Multinational, or 95-character Spanish character sets is provided. Characters are formed via an 8-by-7 dot matrix. A forms tractor is standard. A cable thru feature provides the capability of connecting a total of seven multiple 5224s, 5225s, 5256s, 5251 Models 1 or 11, and

5252s to a single twinax cable. Two models are available and differ only in their rated print speeds: Model 1 prints at 140 lpm at 10 cpi, and at 95 lpm at 15 cpi; Model 2 prints at 240 lpm at 10 cpi, and at 175 lpm at 15 cpi.

MODEL 5225 LINE PRINTER: A wire matrix line printer that connects to the 5285 or 5288 via twinax cabling at a distance of up to 5000 feet. Horizontal spacing of 10 or 15 characters per inch and vertical spacing of 6 or 8 lines per inch is operator-selectable. Maximum line width is 132 characters at 10 cpi and 198 characters at 15 cpi. A choice of 95-character EBCDIC, 184-character Multinational (including ASCII graphics), or 95-character Spanish character sets is provided. Characters are formed by an 8-by-7 dot matrix. A forms tractor is standard. Forms skipping is program-controlled. Four models are available and differ only in their rated print speeds: at 10 cpi, Model 1 prints at 280 lpm, Model 2 at 400 lpm, Model 3 at 490 lpm, and Model 4 at 560 lpm; at 15 cpi, Model 1 prints at 195 lpm, Model 2 at 290 lpm, Model 3 at 355 lpm, and Model 4 at 420 lpm.

MODEL 5256 SERIAL PRINTER: A bidirectional serial matrix printer that connects to the 5285 or 5288 via twinax cabling at a distance of up to 5000 feet. Horizontal spacing is 10 characters per inch. Vertical spacing is operator-selectable at 6 or 8 lines per inch. Maximum line width is 132 characters. A 96-character (upper/lower case) EBCDIC character set is standard; a Multinational character set is also available. A forms tractor and a cut-forms capability are standard. Three models are available and differ only in their rated print speeds: Model 1 prints at 40 cps, Model 2 at 80 cps, and Model 3 at 120 cps.

PRICING

IBM offers the 5280 system on a purchase, 24-month lease, or rental basis. The warranty period is three months. The standard IBM lease or rental contract entitles the customer to unlimited usage each month. Prime-shift maintenance is included in the lease or rental price. The purchase option accrual equals 45 percent of the monthly charge up to 50 percent of the purchase price. IBM's standard educational allowance of 10 percent applies to the 5280 system for lease, rental, and purchase customers.

For purchased, leased or rented systems, the 5280 system is under maintenance group D. The minimum period of maintenance service is 9 consecutive hours between 7:00 a.m. and 6:00 p.m. Monday through Friday. Charges for maintenance coverage outside this period are based upon the following percentages of the minimum monthly maintenance charge (MMC) added to the MMC:

	Consecutive hours				
	9*	12	16	20	24
Monday-Friday (until 8:00 a.m. Saturday)	10	12	14	16	18
Saturday (until 8:00 a.m. Sunday)	4	5	7	8	9
Sunday (until 8:00 a.m. Monday)	5	7	9	11	12

*Outside of the hours 7:00 to 6:00 p.m.

For users without a maintenance contract, the 5280 system is maintained under per-call class 2. Under this class the per-call charge during regular hours is \$77.00 per hour, and during off hours the charge is \$89.00 per hour. The hourly rate for systems engineering service is \$57.00

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EQUIPMENT PRICES

		Purchase Price	Monthly Maint.	Monthly Rental Charge*	Monthly Lease Charge (2-Yr. Lease)*			
OGRAMMABLE DATA STATIONS								
5	Programmable Data Station:							
	A01 With 32K and one Diskette 1 drive	\$ 5,900	\$ 40.00	\$248	\$211			
	A02 With 32K and two Diskette 1 drives	6,900	49.50	303	258			
	A05 With 32K and one Diskette 2D drive	6,282	47.00	273	232			
	A06 With 32K, one Diskette 1 drive, and one Diskette 2D drive	7,282	56.50	328	279			
	A10 With 32K and two Diskette 2D drives	7,532	63.50	353	300			
	B01 With 48K and one Diskette 1 drive	6,057	41.00	265	226			
	B02 With 48K and two Diskette 1 drives	7,057	50.50	320	273			
	B05 With 48K and one Diskette 2D drive	6,439	48.00	290	247			
	B06 With 48K, one Diskette 1 drive, and one Diskette 2D drive	7,439	57.50	345	294			
	B10 With 48K and two Diskette 2D drives	7,689	64.50	370	315			
	C01 With 64K and one Diskette 1 drive	6,213	42.00	275	234			
	C02 With 64K and two Diskette 1 drives	7,213	51.50	330	281			
	C05 With 64K and one Diskette 2D drive	6,595	49.00	300	255			
	C06 With 64K, one Diskette 1 drive, and one diskette 2D drive	7,595	58.50	355	302			
	C10 With 64K and two Diskette 2D drives	7,845	65.50	380	323			
	D01 With 96K and one Diskette 1 drive	6,526	44.00	302	257			
	D02 With 96K and two Diskette 1 drives	7,526	53.50	337	304			
	D05 With 96K and one Diskette 2D drive	6,908	51.00	327	278			
	D06 With 96K, one Diskette 1 drive, and one Diskette 2D drive	7,908	60.50	382	325			
	D10 With 96K and two Diskette 2D drives	8,158	67.50	407	346			
6	Dual Programmable Data Station:							
	A02 With 32K and two Diskette 1 drives	7,950	47.00	303	258			
	A10 With 32K and two Diskette 2D drives	8,582	61.00	353	300			
	B02 With 48K and two Diskette 1 drives	8,107	48.00	320	273			
	B10 With 48K and two Diskette 2D drives	8,739	62.00	370	315			
	C02 With 64K and two Diskette 1 drives	8,263	49.00	330	281			
	C10 With 64K and two Diskette 2D drives	8,895	63.00	380	323			
	D02 With 96K and two Diskette 1 drives	8,576	51.00	357	304			
	D10 With 96K and two Diskette 2D drives	9,208	65.00	407	346			
boards for 5285 and 5286 (one required for each operator position):								
	4600 83-key EBCDIC Keyboard	379	4.00	15	13			
	4601 66-key Data Entry Keyboard	379	4.00	15	13			
	4602 66-key Data Entry Keyboard with Proof Arrangement	379	4.00	15	13			
	4603 83-key ASCII Keyboard	379	4.00	15	13			
special features for 5285 and 5286 (except as noted):								
	1150 5224/5225/5256 Twinax Printer Attachment (for 5285 only)	540	2.00	16	14			
	1152 5222 Printer Attachment	460	2.00	17	15			
	1200 Attachment for one 480-character 5281 Data Station	654	2.00	19	16			
	1205 Attachment for one 960-character 5281 Data Station (for 5285 only)	767	2.00	27	23			
	1210 Attachment for one 1920-character 5281 Data Station (for 5285 only)	879	3.00	36	30			
	1215 Attachment for one 480-character 5282 Dual Data Station	767	2.00	27	23			
	1220 Attachment for one 960-character 5282 Dual Data Station (for 5285 only)	879	3.00	36	30			
	1240 Remote Diskette Drive Attachment (required if an attached 5281 or 5282 has either 1 or 2 diskette drives)	213	1.00	6	5			
	3300 Display Screen Filter	70	—	—	—			
	3500 960-Character Display Size (for 5285 only)	112	1.00	6	5			
	3505 1920-Character Display Size (for 5285 only)	225	1.00	16	14			
	3610 Elapsed Time Counter (measures elapsed real time)	112	1.00	6	5			
	4950 Magnetic Stripe Reader (4955 or 4960 is a prerequisite)	428	2.00	16	14			
	4955 Magnetic Stripe Reader Adapter/Elapsed Time Counter (for 5286 or non-communicating 5285)	642	2.00	23	19			
	4960 Magnetic Stripe Reader Adapter/Elapsed Time Counter (for communicating 5285)	256	1.00	7	6			
	6340 Security Keylock	43	—	—	—			
	6800 Second Application Microprocessor	1,285	2.00	52	45			
OGRAMMABLE CONTROL UNITS								
8	Programmable Control Unit:							
	<u>Submodel</u>	<u>Bytes of Main Storage</u>	<u>Diskette 1 Drives</u>	<u>Diskette 2D Drives</u>				
	A01	32K	1	0	6,600	32.50	246	212
	A02	32K	2	0	7,600	42.00	301	259
	A03	32K	3	0	8,600	51.50	356	306
	A04	32K	4	0	9,600	61.00	411	353
	A05	32K	0	1	6,982	39.50	271	233
	A06	32K	1	1	7,982	49.00	326	280

Rental and lease charges include maintenance.

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► PROGRAMMABLE CONTROL UNITS (Continued)

Submodel	Bytes of Main Storage	Diskette 1 Drives	Diskette 2D Drives	Purchase Price	Monthly Maint.	Monthly Rental Charge*	Monthly Lease Charge (2-Yr. Lease)*
A07	32K	2	1	\$ 8,982	\$ 58.50	\$381	\$327
A08	32K	3	1	9,982	68.00	436	374
A10	32K	0	2	8,232	56.00	351	301
A11	32K	1	2	9,232	65.50	406	348
A12	32K	2	2	10,232	75.00	461	395
A15	32K	0	3	9,482	72.50	431	369
A16	32K	1	3	10,482	82.00	486	416
A20	32K	0	4	10,732	89.00	511	437
C01	64K	1	0	6,913	34.50	273	235
C02	64K	2	0	7,913	44.00	326	282
C03	64K	3	0	8,913	53.50	383	329
C04	64K	4	0	9,913	63.00	438	376
C05	64K	0	1	7,295	41.50	298	256
C06	64K	1	1	8,295	51.00	353	303
C07	64K	2	1	9,295	60.50	408	350
C08	64K	3	1	10,295	70.00	463	397
C10	64K	0	2	8,545	58.00	378	324
C11	64K	1	2	9,545	67.50	433	371
C12	64K	2	2	10,545	77.00	488	418
C15	64K	0	3	9,795	74.50	458	392
C16	64K	1	3	10,795	84.00	513	439
C20	64K	0	4	11,045	91.00	538	460
D01	96K	1	0	7,226	36.50	300	258
D02	96K	2	0	8,226	46.00	355	305
D03	96K	3	0	9,226	55.50	410	352
D04	96K	4	0	10,226	65.00	465	399
D05	96K	0	1	7,608	43.50	325	279
D06	96K	1	1	8,608	53.00	380	326
D07	96K	2	1	9,608	62.50	435	373
D08	96K	3	1	10,608	72.00	490	420
D10	96K	0	2	8,858	60.00	405	347
D11	96K	1	2	9,858	69.50	460	394
D12	96K	2	2	10,858	79.00	515	441
D15	96K	0	3	10,108	76.50	485	415
D16	96K	1	3	11,108	86.00	540	462
D20	96K	0	4	11,358	93.00	565	483
E01	128K	1	0	7,539	38.50	327	281
E02	128K	2	0	8,539	48.00	382	328
E03	128K	3	0	9,539	57.50	437	375
E04	128K	4	0	10,539	67.00	492	422
E05	128K	0	1	7,921	45.50	352	302
E06	128K	1	1	8,921	55.00	407	349
E07	128K	2	1	9,921	64.50	462	396
E08	128K	3	1	10,921	74.00	517	443
E10	128K	0	2	9,171	62.00	432	370
E11	128K	1	2	10,171	71.50	487	417
E12	128K	2	2	11,171	81.00	542	464
E15	128K	0	3	10,421	78.50	512	438
E16	128K	1	3	11,421	88.00	567	485
E20	128K	0	4	11,671	95.00	592	506
F01	160K	1	0	7,852	40.50	354	304
F02	160K	2	0	8,852	50.00	409	351
F03	160K	3	0	9,852	59.50	464	398
F04	160K	4	0	10,852	69.00	519	445
F05	160K	0	1	8,234	47.50	379	325
F06	160K	1	1	9,234	57.00	434	372
F07	160K	2	1	10,234	66.50	489	419
F08	160K	3	1	11,234	76.00	544	466
F10	160K	0	2	9,484	64.00	459	393
F11	160K	1	2	10,484	73.50	514	440
F12	160K	2	2	11,484	83.00	569	487
F15	160K	0	3	10,734	80.50	539	461
F16	160K	1	3	11,734	90.00	594	508
F20	160K	0	4	11,984	97.00	619	529
H01	224K	1	0	8,478	44.50	408	350
H02	224K	2	0	9,478	54.00	463	397
H03	224K	3	0	10,478	63.50	518	444
H04	224K	4	0	11,478	73.00	573	491
H05	224K	0	1	8,860	51.50	433	371
H06	224K	1	1	9,860	61.00	488	418
H07	224K	2	1	10,860	70.50	543	465
H08	224K	3	1	11,860	80.00	598	512

*Rental and lease charges include maintenance.

IBM 5280 Distributed Data System

PROGRAMMABLE CONTROL UNITS (Continued)

Submodel	Bytes of Main Storage	Diskette 1 Drives	Diskette 2D Drives	Purchase Price	Monthly Maint.	Monthly Rental Charge*	Monthly Lease Charge (2-Yr. Lease)*
H10	224K	0	2	\$10,110	\$ 68.00	\$513	\$439
H11	224K	1	2	11,110	77.50	568	486
H12	224K	2	2	12,110	87.00	623	533
H15	224K	0	3	11,360	84.50	593	507
H16	224K	1	3	12,360	94.00	648	554
H20	224K	0	4	12,610	101.00	673	575
J01	288K	1	0	9,104	48.50	462	396
J02	288K	2	0	10,104	58.00	517	443
J03	288K	3	0	11,104	67.50	572	490
J04	288K	4	0	12,104	77.00	627	537
J05	288K	0	1	9,486	55.50	487	417
J06	288K	1	1	10,486	65.00	542	464
J07	288K	2	1	11,486	74.50	597	511
J08	288K	3	1	12,486	84.00	652	558
J10	288K	0	2	10,736	72.00	567	485
J11	288K	1	2	11,736	81.50	622	532
J12	288K	2	2	12,736	91.00	677	579
J15	288K	0	3	11,986	88.50	647	553
J16	288K	1	3	12,986	98.00	702	600
J20	288K	0	4	13,236	105.00	727	621
Special features for 5288 Programmable Control Unit:							
1245	Attachment for one 480-character 5281 Data Station			NC	NC	NC	NC
1250	Attachment for one 960-character 5281 Data Station			112	1.00	6	5
1255	Attachment for one 1920-character 5281 Data Station			225	1.50	16	14
1260	Attachment for one 480-character 5282 Dual Data Station			112	1.00	6	5
1265	Attachment for one 960-character 5282 Dual Data Station			225	1.50	16	14
1270	Attachment for one additional 480-character 5281 (prerequisite: 1245 or 1260)			654	2.00	19	16
1275	Attachment for one additional 960-character 5281 (prerequisite: 1250 or 1265)			767	2.50	27	23
1280	Attachment for one additional 1920-character 5281 (prerequisite: 1255)			879	3.00	36	30
1285	Attachment for one additional 480-character 5282 (prerequisite: 1245 or 1260)			767	2.00	27	23
1290	Attachment for one additional 960-character 5282 (prerequisite: 1250 or 1265)			879	3.00	36	30
1300	Remote Diskette Drive Attachment, First (required for first and second remote drives when base 5288 has 1 or 2 drives)			213	1.00	6	5
1301	Remote Diskette Drive Attachment, Second (required for first and second remote drives when base 5288 has 3 or 4 drives, or for third and fourth remote drives when base 5288 has 1 or 2 drives)			970	4.00	34	28
1302	Remote Diskette Drive Attachment, Third (required for third and fourth remote drives when base 5288 has 3 or 4 drives, or for fifth and sixth remote drives when base 5288 has 1 or 2 drives)			213	1.00	6	5
1155	Single 5225/5256 Twinax Printer Attachment (provides a single port for attaching from 1 to 5 printers via a single twinax cable)			540	2.00	16	14
1157	Single 5222 Printer Attachment			460	2.00	17	15
1160	Multiple 5225/5256 Twinax Printer Attachment (provides 4 ports for attaching, via twinax cable, up to 5 printers)			755	3.00	23	19
1162	Multiple 5222/Twinax Printer Attachment			802	3.00	29	25
3300	Display Screen Filter			70	—	—	—
3610	Elapsed Time Counter			112	1.00	6	5
4955	Magnetic Stripe Reader Adapter/Elapsed Time Counter (controls up to 4 Magnetic Stripe Readers on attached 5281 and/or 5282 data stations)			642	2.00	23	19
6340	Security Keylock			43	—	—	—
6800	Second Application Microprocessor			1,285	2.50	52	45

AUXILIARY DATA STATIONS

i281 Data Station:							
Z00	With no diskette drive			2,295	12.00	80	69
Z01	With one Diskette 1 drive			3,510	23.00	141	122
Z02	With two Diskette 1 drives			4,510	32.50	196	169
Z05	With one Diskette 2D drive			3,760	30.00	166	143
Z06	With one Diskette 1 drive and one Diskette 2D drive			4,760	39.50	221	190
Z10	With two Diskette 2D drives			5,010	46.50	246	211
i282 Dual Data Station:							
Z00	With no diskette drive			2,604	13.50	87	74
Z01	With one Diskette 1 drive			3,819	24.50	148	127
Z02	With two Diskette 1 drives			4,819	34.00	203	174
Z05	With one Diskette 2D drive			4,069	31.50	173	148
Z06	With one Diskette 1 drive and one Diskette 2D drive			5,069	41.00	228	195
Z10	With two Diskette 2D drives			5,319	48.00	253	216

*Rental and lease charges include maintenance.

IBM 5280 Distributed Data System

► **AUXILIARY DATA STATIONS (Continued)**

		<u>Purchase Price</u>	<u>Monthly Maint.</u>	<u>Monthly Rental Charge*</u>	<u>Monthly Lease Charge (2-Yr. Lease)</u>
Keyboards for 5281 and 5282 (one required for each operator position):					
4600	83-key EBCDIC Keyboard	\$ 379	\$ 4.00	\$ 15	\$ 13
4601	66-key Data Entry Keyboard	379	4.00	15	13
4602	66-key Data Entry Keyboard with Proof Arrangement	379	4.00	15	13
4603	83-key ASCII Keyboard	379	4.00	15	13
Special features for 5281 and 5282:					
3300	Display Screen Filter	70	—	—	—
4950	Magnetic Stripe Reader	428	2.00	16	14

PRINTERS

5222	Printer:				
Mdl. 1	80 cps at 10 cpi; 80 cps at 15 cpi	2,345	29.00	142	121
5224	Printer:				
Mdl. 1	140 lpm at 10 cpi; 95 lpm at 15 cpi	6,395	45.00	300	255
Mdl. 2	240 lpm at 10 cpi; 175 lpm at 15 cpi	7,280	53.00	342	291
5225	Printer:				
Mdl. 1	280 lpm at 10 cpi; 195 lpm at 15 cpi	12,075	87.00	511	436
Mdl. 2	400 lpm at 10 cpi; 290 lpm at 15 cpi	13,945	122.00	584	497
Mdl. 3	490 lpm at 10 cpi; 355 lpm at 15 cpi	15,495	150.00	650	553
Mdl. 4	560 lpm at 10 cpi; 420 lpm at 15 cpi	16,940	178.00	714	607
5256	Printer:				
Mdl. 1	40 characters per second	4,145	38.50	239	204
Mdl. 2	80 characters per second	4,340	42.00	272	231
Mdl. 3	120 characters per second	4,535	47.50	295	251
Special features for the Printers:					
1470	Audible Alarm (signals operator when manual intervention is required due to one of nine error conditions; for 5225 and 5256 printers only)	50	—	—	—
2680	Cable Thru (permits multiple printers to be connected to a single twinax cable; required on each printer except the last; for 5225 and 5256 printers only)	119	1.00	4	3
4450	Forms Stand (for 5222, 5224 and 5256 printers only)	54	—	—	—
6100	Rear Document Insert Device (for 5222 only)	130	0.50	7	6

COMMUNICATIONS

2500	Communications Adapter (for 5285 or 5288 only)	1,015	9.00	73	62
3270	3270 Emulation Communications Adapter (for 5285 or 5288 only)	2,040	13.00	110	93
3701	EIA Interface (provides RS-232-C interface for an external modem)	372	1.50	17	15
5500	1200-bps Integrated Modem, non-switched	686	4.00	22	19
5501	1200-bps Integrated Modem, switched with auto answer	744	3.50	32	27
5502	1200-bps Integrated Modem, switched without auto answer	686	3.50	22	19
5507	1200-bps Integrated Modem, non-switched with SNBU manual answer	744	4.00	33	28
5508	1200-bps Integrated Modem, non-switched with SNBU auto answer	947	4.50	36	31
5650	Digital Data Service Adapter; Point-to-Point	873	1.50	31	26
5651	Digital Data Service Adapter, Multipoint	873	1.50	31	26
5810	Power Supply Expansion (required on 5285 if 5501 or 5508 is installed)	79	1.50	4	3

SOFTWARE PRICES

		<u>Basic Monthly License Charge</u>
5708-AS1	Assembler	\$ 44
5708-CB1	COBOL-OS/VS Host Compiler and Library	166
5708-CB2	COBOL-DOS/VSE Host Compiler and Library	166
5708-DC1	Communications Utilities	26
5708-DE1	DE/RPG	14
5708-EM1	5280-3270 Emulation	53
5708-SC1	System Control Programming (SCP)	NC
5708-SM1	Sort/Merge	14
5708-UT1	Utilities	8
5798-NZH	OS/6 Communications and File Conversion System	143
5798-RBZ	5280 Contract Data Entry/Edit Support	50
5798-RCR	5280 Format Design Aid	600**
5798-RDF	5280 Distribution Order Subsystem	35

*Rental and lease charges include maintenance.

**Available on a one-time charge only.■

IBM 5280 Distributed Data System

Product Enhancement

On July 22, 1982, IBM enhanced the 5280-3270 software package by adding the following capabilities:

- Communications in 3270 BSC printer emulation mode with the RSCS Networking Program Product.

The RSCS allows spooled printer output to be directed to 5280 systems that appear as remote 3270 printers.

- Communications in 3270 BSC display emulation mode with VM/370 or VM/SP.

This communications is achieved through the use of the Conversational Monitor System (CMS) component of VM/370 and VM/SP. CMS is designed to provide an interactive computing system for general problem solving and program development.

- SNA/SDLC communications to the Virtual Storage Personal Computing (VSPC) V2R1 Program Product running under MVS.

The 5280 operates as a terminal to VSPC. VSPC uses VTAM for terminal operations using SNA architecture.

- SNA/SDLC and BSC communications to 4331 and 4341 host systems.

There are no additional charges for these enhancements. □

IBM 5280 Distributed Data System

EQUIPMENT PRICES

		<u>Purchase Price</u>	<u>Monthly Maint.</u>	<u>Monthly Rental Charge*</u>	<u>Monthly Lease Charge (2-Yr. Lease)*</u>
PROGRAMMABLE DATA STATIONS					
285	Programmable Data Station:				
	A01 With 32K and one Diskette 1 drive	\$ 5,958	\$ 44.00	\$226	\$192
	A02 With 32K and two Diskette 1 drives	7,086	54.50	276	235
	A05 With 32K and one Diskette 2D drive	6,632	52.50	249	211
	A06 With 32K, one Diskette 1 drive, and one Diskette 2D drive	7,760	63.00	299	254
	A10 With 32K and two Diskette 2D drives	8,434	71.50	322	273
	B01 With 48K and one Diskette 1 drive	6,409	45.00	242	206
	B02 With 48K and two Diskette 1 drives	7,537	55.50	292	249
	B05 With 48K and one Diskette 2D drive	7,083	53.50	265	225
	B06 With 48K, one Diskette 1 drive, and one Diskette 2D drive	8,211	64.00	315	268
	B10 With 48K and two Diskette 2D drives	8,885	72.50	338	287
	C01 With 64K and one Diskette 1 drive	6,630	46.00	251	213
	C02 With 64K and two Diskette 1 drives	7,758	56.50	301	256
	C05 With 64K and one Diskette 2D drive	7,304	54.50	274	232
	C06 With 64K, one Diskette 1 drive, and one diskette 2D drive	8,432	65.00	324	275
	C10 With 64K and two Diskette 2D drives	9,106	73.50	347	294
	D01 With 96K and one Diskette 1 drive	7,302	48.00	276	235
	D02 With 96K and two Diskette 1 drives	8,430	58.50	326	278
	D05 With 96K and one Diskette 2D drive	7,976	56.50	299	254
	D06 With 96K, one Diskette 1 drive, and one Diskette 2D drive	9,104	67.00	349	297
	D10 With 96K and two Diskette 2D drives	9,778	75.50	372	316
286	Dual Programmable Data Station:				
	A02 With 32K and two Diskette 1 drives	8,008	50.50	276	235
	A10 With 32K and two Diskette 2D drives	9,356	67.00	322	273
	B02 With 48K and two Diskette 1 drives	8,459	51.50	292	249
	B10 With 48K and two Diskette 2D drives	9,807	68.50	338	287
	C02 With 64K and two Diskette 1 drives	8,680	52.50	301	256
	C10 With 64K and two Diskette 2D drives	10,028	69.50	347	294
	D02 With 96K and two Diskette 1 drives	9,352	54.50	326	278
	D10 With 96K and two Diskette 2D drives	10,700	71.00	372	316
	keyboards for 5285 and 5286 (one required for each operator position):				
	4600 83-key EBCDIC Keyboard	379	\$4.00	\$15	\$13
	4601 66-key Data Entry Keyboard	379	4.00	15	13
	4602 66-key Data Entry Keyboard with Proof Arrangement	379	4.00	15	13
	4603 83-key ASCII Keyboard	379	4.00	15	13
	Special features for 5285 and 5286 (except as noted):				
	1150 5224/5225/5256 Twinax Printer Attachment (for 5285 only)	540	2.00	15	13
	1152 5222 Printer Attachment	460	2.50	16	14
	1200 Attachment for one 480-character 5281 Data Station	654	2.00	18	15
	1205 Attachment for one 960-character 5281 Data Station (for 5285 only)	767	2.50	25	21
	1210 Attachment for one 1920-character 5281 Data Station (for 5285 only)	879	3.00	33	28
	1215 Attachment for one 480-character 5282 Dual Data Station	767	2.50	25	21
	1220 Attachment for one 960-character 5282 Dual Data Station (for 5285 only)	879	3.00	33	28
	1240 Remote Diskette Drive Attachment (required if an attached 5281 or 5282 has either 1 or 2 diskette drives)	213	1.00	6	5
	3300 Display Screen Filter	70	—	—	—
	3500 960-Character Display Size (for 5285 only)	112	1.00	6	5
	3505 1920-Character Display Size (for 5285 only)	225	1.00	15	13
	3610 Elapsed Time Counter (measures elapsed real time)	112	1.00	6	5
	4950 Magnetic Stripe Reader (4955 or 4960 is a prerequisite)	428	2.50	15	13
	4955 Magnetic Stripe Reader Adapter/Elapsed Time Counter (for 5286 or non-communicating 5285)	642	2.50	21	18
	4960 Magnetic Stripe Reader Adapter/Elapsed Time Counter (for communicating 5285)	256	1.00	7	6
	6340 Security Keylock	43	—	—	—
	6800 Second Application Microprocessor	1,285	2.50	48	41
PROGRAMMABLE CONTROL UNITS					
288	Programmable Control Unit:				
	<u>Submodel</u>	<u>Bytes of Main Storage</u>	<u>Diskette 1 Drives</u>	<u>Diskette 2D Drives</u>	
	A01	32K	1	0	6,657
	A02	32K	2	0	7,785
	A03	32K	3	0	8,913
	A04	32K	4	0	10,041
	A05	32K	0	1	7,331
	A06	32K	1	1	8,459
					35.50
					46.00
					57.00
					68.00
					73.31
					84.59
					224
					274
					324
					374
					43.00
					247
					297
					193
					236
					279
					322
					212
					255

*Rental and lease charges include maintenance.

IBM 5280 Distributed Data System

► PROGRAMMABLE CONTROL UNITS (Continued)

Submodel	Bytes of Main Storage	Diskette 1 Drives	Diskette 2D Drives	Purchase Price	Monthly Maint.	Monthly Rental Charge*	Monthly Lease Charge (2-Yr. Lease)*
A07	32K	2	1	\$ 9,587	\$ 65.00	\$347	\$298
A08	32K	3	1	10,715	76.00	397	341
A10	32K	0	2	9,133	62.00	320	274
A11	32K	1	2	10,261	73.00	370	317
A12	32K	2	2	11,389	84.00	420	360
A15	32K	0	3	10,935	81.00	393	336
A16	32K	1	3	12,063	92.00	443	379
A20	32K	0	4	12,737	100.00	466	398
C01	64K	1	0	7,329	37.00	249	214
C02	64K	2	0	8,457	48.00	299	257
C03	64K	3	0	9,585	59.00	349	300
C04	64K	4	0	10,713	70.00	399	343
C05	64K	0	1	8,003	45.00	272	233
C06	64K	1	1	9,131	56.00	322	276
C07	64K	2	1	10,259	67.00	372	319
C08	64K	3	1	11,387	78.00	422	362
C10	64K	0	2	9,805	64.00	345	295
C11	64K	1	2	10,933	75.00	395	338
C12	64K	2	2	12,061	86.00	445	381
C15	64K	0	3	11,607	83.00	418	357
C16	64K	1	3	12,735	94.00	468	400
C20	64K	0	4	13,409	102.00	491	419
D01	96K	1	0	8,001	39.00	274	235
D02	96K	2	0	9,129	50.00	324	278
D03	96K	3	0	10,257	61.00	374	321
D04	96K	4	0	11,385	72.00	424	364
D05	96K	0	1	8,675	47.00	297	254
D06	96K	1	1	9,803	58.00	347	297
D07	96K	2	1	10,931	69.00	397	340
D08	96K	3	1	12,059	80.00	447	383
D10	96K	0	2	10,477	66.00	370	316
D11	96K	1	2	11,605	77.00	420	359
D12	96K	2	2	12,733	88.00	470	402
D15	96K	0	3	12,279	85.00	443	378
D16	96K	1	3	13,407	96.00	493	421
D20	96K	0	4	14,081	104.00	516	440
E01	128K	1	0	8,673	41.00	299	256
E02	128K	2	0	9,801	52.00	349	299
E03	128K	3	0	10,929	63.00	399	342
E04	128K	4	0	12,057	74.00	449	385
E05	128K	0	1	9,347	49.00	322	275
E06	128K	1	1	10,475	60.00	372	318
E07	128K	2	1	11,603	71.00	422	361
E08	128K	3	1	12,731	82.00	472	404
E10	128K	0	2	11,149	68.00	395	337
E11	128K	1	2	12,277	79.00	445	380
E12	128K	2	2	13,405	90.00	495	423
E15	128K	0	3	12,951	87.00	468	399
E16	128K	1	3	14,079	98.00	518	442
E20	128K	0	4	14,953	106.00	541	461
F01	160K	1	0	9,345	43.00	324	277
F02	160K	2	0	10,473	54.00	374	320
F03	160K	3	0	11,601	65.00	424	363
F04	160K	4	0	12,729	76.00	474	406
F05	160K	0	1	10,019	51.00	347	296
F06	160K	1	1	11,147	62.00	397	339
F07	160K	2	1	12,275	73.00	447	382
F08	160K	3	1	13,403	84.00	497	425
F10	160K	0	2	11,821	70.00	420	358
F11	160K	1	2	12,949	81.00	470	401
F12	160K	2	2	14,077	92.00	520	444
F15	160K	0	3	13,623	89.00	493	420
F16	160K	1	3	14,751	100.00	543	463
F20	160K	0	4	15,425	109.00	566	482
H01	224K	1	0	10,689	48.00	374	322
H02	224K	2	0	11,817	58.50	424	365
H03	224K	3	0	12,945	69.00	474	408
H04	224K	4	0	14,073	79.50	524	451
H05	224K	0	1	11,363	56.50	397	341
H06	224K	1	1	12,491	67.00	447	384
H07	224K	2	1	13,619	77.50	497	427
H08	224K	3	1	14,747	88.00	547	470

*Rental and lease charges include maintenance.

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PROGRAMMABLE CONTROL UNITS (Continued)

Submodel	Bytes of Main Storage	Diskette 1 Drives	Diskette 2D Drives	Purchase Price	Monthly Maint.	Monthly Rental Charge*	Monthly Lease Charge (2-Yr. Lease)*
H10	224K	0	2	\$13,165	\$ 75.50	\$470	\$403
H11	224K	1	2	14,293	86.00	520	446
H12	224K	2	2	15,421	96.50	570	489
H15	224K	0	3	14,967	94.50	543	465
H16	224K	1	3	16,095	105.00	593	508
H20	224K	0	4	16,769	113.00	616	527
J01	288K	1	0	12,033	52.50	424	365
J02	288K	2	0	13,161	63.00	474	408
J03	288K	3	0	14,289	73.50	524	451
J04	288K	4	0	15,417	84.00	574	494
J05	288K	0	1	12,707	60.50	447	384
J06	288K	1	1	13,835	71.00	497	427
J07	288K	2	1	14,963	81.50	547	470
J08	288K	3	1	16,091	92.00	597	513
J10	288K	0	2	14,509	79.50	520	446
J11	288K	1	2	15,637	90.00	570	489
J12	288K	2	2	16,765	100.50	620	532
J15	288K	0	3	16,311	98.50	593	508
J16	288K	1	3	17,439	109.00	643	551
J20	288K	0	4	18,113	117.50	666	570

Special features for 5288 Programmable Control Unit:

1245	Attachment for one 480-character 5281 Data Station	NC	NC	NC	NC
1250	Attachment for one 960-character 5281 Data Station	112	1.00	6	5
1255	Attachment for one 1920-character 5281 Data Station	225	1.50	15	13
1260	Attachment for one 480-character 5282 Dual Data Station	112	1.00	6	5
1265	Attachment for one 960-character 5282 Dual Data Station	225	1.50	15	13
1270	Attachment for one additional 480-character 5281 (prerequisite: 1245 or 1260)	654	2.00	18	15
1275	Attachment for one additional 960-character 5281 (prerequisite: 1250 or 1265)	767	2.50	25	21
1280	Attachment for one additional 1920-character 5281 (prerequisite: 1255)	879	3.00	33	28
1285	Attachment for one additional 480-character 5282 (prerequisite: 1245 or 1260)	767	2.50	25	21
1290	Attachment for one additional 960-character 5282 (prerequisite: 1250 or 1265)	879	3.00	33	28
1300	Remote Diskette Drive Attachment, First (required for first and second remote drives when base 5288 has 1 or 2 drives)	213	1.00	6	5
1301	Remote Diskette Drive Attachment, Second (required for first and second remote drives when base 5288 has 3 or 4 drives, or for third and fourth remote drives when base 5288 has 1 or 2 drives)	970	4.50	31	26
1302	Remote Diskette Drive Attachment, Third (required for third and fourth remote drives when base 5288 has 3 or 4 drives, or for fifth and sixth remote drives when base 5288 has 1 or 2 drives)	213	1.00	6	5
1155	Single 5225/5256 Twinax Printer Attachment (provides a single port for attaching from 1 to 5 printers via a single twinax cable)	540	2.00	15	13
1157	Single 5222 Printer Attachment	460	2.50	16	14
1160	Multiple 5225/5256 Twinax Printer Attachment (provides 4 ports for attaching, via twinax cable, up to 5 printers)	755	3.00	21	18
1162	Multiple 5222/Twinax Printer Attachment	802	3.50	27	23
3300	Display Screen Filter	70	—	—	—
3610	Elapsed Time Counter	112	1.00	6	5
4955	Magnetic Stripe Reader Adapter/Elapsed Time Counter (controls up to 4 Magnetic Stripe Readers on attached 5281 and/or 5282 data stations)	642	2.50	21	18
6340	Security Keylock	43	—	—	—
6800	Second Application Microprocessor	1,285	2.50	48	41

AUXILIARY DATA STATIONS

5281	Data Station:				
Z00	With no diskette drive	2,295	13.50	73	63
Z01	With one Diskette 1 drive	3,636	25.50	129	111
Z02	With two Diskette 1 drives	4,764	36.00	179	154
Z05	With one Diskette 2D drive	4,310	34.00	152	130
Z06	With one Diskette 1 drive and one Diskette 2D drive	5,438	44.50	202	173
Z10	With two Diskette 2D drives	6,112	53.00	225	192
5282	Dual Data Station:				
Z00	With no diskette drive	2,604	15.00	79	68
Z01	With one Diskette 1 drive	3,945	27.50	136	116
Z02	With two Diskette 1 drives	5,073	38.00	186	159
Z05	With one Diskette 2D drive	4,450	34.00	149	127
Z06	With one Diskette 1 drive and one Diskette 2D drive	5,747	46.00	209	178
Z10	With two Diskette 2D drives	6,421	54.50	232	197

*Rental and lease charges include maintenance.

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► AUXILIARY DATA STATIONS (Continued)

		Purchase Price	Monthly Maint.	Monthly Rental Charge*	Monthly Lease Charge (2-Yr. Lease)*
Keyboards for 5281 and 5282 (one required for each operator position):					
4600	83-key EBCDIC Keyboard	\$ 379	\$ 4.00	\$ 15	\$ 13
4601	66-key Data Entry Keyboard	379	4.00	15	13
4602	66-key Data Entry Keyboard with Proof Arrangement	379	4.00	15	13
4603	83-key ASCII Keyboard	379	4.00	15	13
Special features for 5281 and 5282:					
3300	Display Screen Filter	70	—	—	—
4950	Magnetic Stripe Reader	428	2.50	15	13

PRINTERS

5222	Printer:				
Mdl. 1	80 cps at 10 cpi; 80 cps at 15 cpi	2,605	29.00	129	110
5224	Printer:				
Mdl. 1	140 lpm at 10 cpi; 95 lpm at 15 cpi	6,395	45.00	300	255
Mdl. 2	240 lpm at 10 cpi; 175 lpm at 15 cpi	7,280	53.00	342	291
5225	Printer:				
Mdl. 1	280 lpm at 10 cpi; 195 lpm at 15 cpi	12,710	87.00	465	396
Mdl. 2	400 lpm at 10 cpi; 290 lpm at 15 cpi	14,680	122.00	531	452
Mdl. 3	490 lpm at 10 cpi; 355 lpm at 15 cpi	16,310	150.00	591	503
Mdl. 4	560 lpm at 10 cpi; 420 lpm at 15 cpi	17,830	178.00	649	552
5256	Printer:				
Mdl. 1	40 characters per second	4,605	38.50	217	185
Mdl. 2	80 characters per second	4,820	42.00	247	210
Mdl. 3	120 characters per second	5,035	47.50	268	228
Special features for the Printers:					
1470	Audible Alarm (signals operator when manual intervention is required due to one of nine error conditions; for 5225 and 5256 printers only)	50	—	—	—
2680	Cable Thru (permits multiple printers to be connected to a single twinax cable; required on each printer except the last; for 5225 and 5256 printers only)	119	1.00	4	3
4450	Forms Stand (for 5222, 5224 and 5256 printers only)	54	—	—	—
6100	Rear Document Insert Device (for 5222 only)	130	0.50	7	6

COMMUNICATIONS

2500	Communications Adapter (for 5285 or 5288 only)	1,015	9.50	67	57
3270	3270 Emulation Communications Adapter (for 5285 or 5288 only)	2,040	14.50	100	85
3701	EIA Interface (provides RS-232-C interface for an external modem)	372	1.50	16	14
5500	1200-bps Integrated Modem, non-switched	686	4.00	22	19
5501	1200-bps Integrated Modem, switched with auto answer	744	3.50	32	27
5502	1200-bps Integrated Modem, switched without auto answer	686	3.50	22	19
5507	1200-bps Integrated Modem, non-switched with SNBU manual answer	744	4.00	33	28
5508	1200-bps Integrated Modem, non-switched with SNBU auto answer	947	4.50	36	31
5650	Digital Data Service Adapter; Point-to-Point	873	1.50	31	26
5651	Digital Data Service Adapter, Multipoint	873	1.50	31	26
5810	Power Supply Expansion (required on 5285 if 5501 or 5508 is installed)	79	1.50	4	3

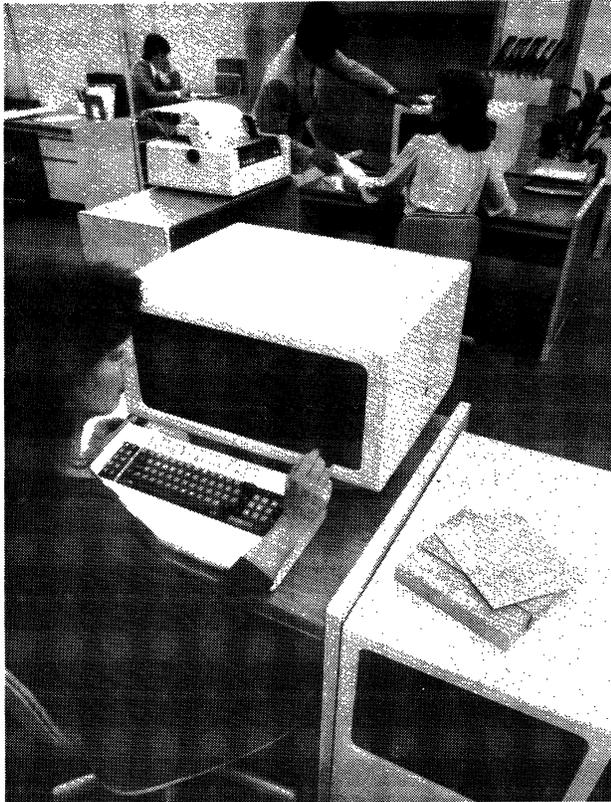
SOFTWARE PRICES

		Basic Monthly License Charge
5708-AS1	Assembler	\$ 38
5708-CB1	COBOL-OS/VS Host Compiler and Library	144
5708-CB2	COBOL-DOS/VSE Host Compiler and Library	144
5708-DC1	Communications Utilities	23
5708-DE1	DE/RPG	12
5708-EM1	5280-3270 Emulation	46
5708-SC1	System Control Programming (SCP)	NC
5708-SM1	Sort/Merge	12
5708-UT1	Utilities	7
5798-NZH	OS/6 Communications and File Conversion System	143
5798-RBZ	5280 Contract Data Entry/Edit Support	50
5798-RCR	5280 Format Design Aid	600**
5798-RDF	5280 Distribution Order Subsystem	35

*Rental and lease charges include maintenance.

**Available on a one-time charge only.■

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The 5288 Programmable Control Unit (right foreground) provides the processing, control, and storage functions for larger 5280 configurations such as this one. Two keyboard/display stations and a serial matrix printer are also visible in the photo. In a smaller 5280 configuration, the processor, 32K to 64K bytes of main storage, and one or two diskette drives are all housed within one of the table-top keyboard/display stations.

MANAGEMENT SUMMARY

IBM's belated but increasingly whole-hearted endorsement of distributed data processing gained further momentum with the announcement of the 5280 Distributed Data System on January 10, 1979. A product of IBM's General Systems Division, the 5280 system consists of a family of diskette-based intelligent terminals that can be programmed to enter, validate, store, process, and print business information at the point of origin.

The 5280 equipment and software are designed to support a wide range of distributed environments and functions, including intelligent data entry, batch and interactive communications, batch processing, transaction processing, and distributed printing. Thus, the 5280 should be attractive to both large and small data processing users who are considering the use of distributed intelligent terminals as part of new or existing data processing networks. Although the 5280's processing and input/output capabilities are comparable ➤

IBM's new, diskette-based user-programmable terminal system.

Support for distributed functions, such as batch and interactive communications, intelligent data entry, batch processing, and transaction processing, is provided via three configurations, including integral single or dual keyboard/display stations and a clustered configuration that can handle up to four workstations. Depending on the configuration, a 5280 System can support 1 to 8 diskette drives, 0 to 5 printers, and 32K to 160K bytes of user memory.

A minimum configuration, consisting of a 5285 Model A01 Programmable Data Station with 32K bytes of main storage, one Diskette 1 drive, and a keyboard, is priced at \$5,630, or \$166 per month on a two-year lease including maintenance.

A more elaborate system, consisting of a 5285 Model C10 Programmable Data Station with 64K bytes of main storage, two Diskette 2D drives, a keyboard, a communications adapter, and a 120-cps 5256 Model 3 Printer, can be purchased for \$16,660, or leased for \$517 per month on a two-year lease with maintenance.

CHARACTERISTICS

VENDOR: International Business Machines Corporation, General Systems Division, 4111 Northside Parkway, Atlanta, Georgia 30301. Telephone (404) 238-2000.

DATE OF ANNOUNCEMENT: January 10, 1980.

DATE OF FIRST DELIVERY: June 1980 for all units except the 5225 Printer, which is scheduled for October 1980.

NUMBER DELIVERED TO DATE: Information not available.

SERVICED BY: IBM.

CONFIGURATION

A 5280 System configuration can be based on any of the following units, each of which provides all processing and control functions of the system, including those of any attached auxiliary data stations or printers: 1) any model of the 5285 Programmable Data Station; 2) any model of the 5286 Dual Programmable Data Station; or 3) any model of the 5288 Programmable Control Unit with an attached 5281 Data Station or 5282 Dual Data Station (any model).

The 5285 Programmable Data Station is a single, table-top keyboard/display unit with 32K, 48K, or 64K bytes of main ➤

IBM 5280 Distributed Data System

▷ to those of many of the current microprocessor-based small business computers, IBM's marketing emphasis and software support make it clear that the 5280 is intended for use as an element in distributed systems rather than as a stand-alone computer.

IBM emphasizes that the 5280 is designed to "process business information where it begins; at a branch office down the street or across the continent, in a plant or on a loading dock." For example, manufacturers or distributors can use the 5280 in remote sales offices to process customer orders and transmit the order information, via telephone lines, to a centralized computer system to update customer records. Retailers can use the 5280 at loading docks to match incoming merchandise with purchase orders and later transmit the corrected receiving data to a central computer to update inventory files.

The initial 5280 hardware product line consists of seven units: single and dual programmable keyboard/display stations, single and dual auxiliary (nonprogrammable) keyboard/display stations, a programmable control unit, and two printers. Every 5280 system must include a programmable controller and at least one keyboard/display, which may or may not be housed in a single physical unit. System configuration possibilities span a wide range, from a single keyboard/display station with 32K bytes of memory and one diskette drive to a fully expanded system consisting of the programmable control unit with 160K bytes of memory, four keyboard/displays, five printers, eight diskette drives totaling 9.6 megabytes, and a communications adapter. Hard disk drives and magnetic tape drives, however, are conspicuously absent from the 5280 product line at this writing.

The 5285 Programmable Data Station, the basic unit of the 5280 product line, is a table-top keyboard/display station with a single CRT display and keyboard, one or two diskette drives with a capacity of up to 2.4 megabytes, a programmable controller, and from 32K to 64K bytes of memory. A display capacity of 480, 960, or 1920 characters can be selected. Devices that can be attached to the 5285 are limited to one 5225 or 5256 Printer and *either* one auxiliary data station (5281 or 5282) or the communications adapter. Thus, a 5280 system built around the 5285 can have up to three keyboard/display stations (through the attachment of an auxiliary 5282), but a multi-station configuration cannot be equipped for communications.

The 5286 Dual Programmable Data Station is a table-top unit that includes two independent keyboard/display stations, two diskette drives with a capacity of up to 2.4 megabytes, a programmable controller, and from 32K to 64K bytes of memory. The display capacity is limited to 480 characters at each station. The 5286 can control one auxiliary data station (5281 or 5282), but it cannot be equipped with either a printer or a communications adapter. Thus, the 5286 is a limited-function unit that appears to be designed mainly for key-to-diskette data entry functions where no communications capability is required.

▶ storage and one or two diskette drives. The standard 480-character display capacity can be expanded to 960 or 1920 characters. The following devices and features can be attached to the 5285: one auxiliary 5281 Data Station of 5282 Dual Data Station, connected via cable at a maximum distance of 200 feet; one 5225 or 5256 Printer, connected via twinax cable at a maximum distance of 5000 feet; one 2500 Communications Adapter with the appropriate line interface feature; one Magnetic Stripe Reader; one Elapsed Time Counter; and one Security Keylock. The 5285 and its auxiliary 5281 or 5282 Data Station must have the same display capacity. An auxiliary 5281 or 5282 Data Station cannot be attached if the controlling 5285 has the 2500 Communications Adapter.

The *5286 Dual Programmable Data Station* is a table-top unit that functions as two independent data stations, each with keyboard, display area, and diskette drive. Main storage capacities of 32K, 48K, and 64K bytes are available. The display capacity is 480 characters at each operator position and cannot be expanded. The following devices and features can be attached to the 5286: one auxiliary 5281 Data Station or 5282 Dual Data Station, connected via cable at a maximum distance of 200 feet; one Magnetic Stripe Reader; one Elapsed Time Counter; and one Security Keylock. The 5286 and its auxiliary 5281 or 5282 Data Station must have the same display capacity (i.e., 480 characters). The 5286 cannot be equipped with either a printer or a communications adapter.

The *5288 Programmable Control Unit* is a floor-standing controller that contains from 32K to 160K bytes of main storage (in 32K-byte increments) and from 1 to 4 diskette drives. The 5288 provides processing, control, main storage, diskette storage, communications, and device attachment capabilities for other components of the 5280 system. The following devices and features can be attached to the 5288: 5281 Data Stations and/or 5282 Dual Data Stations in any combination providing a maximum of four keyboards; one 5225 Printer; up to four 5256 Printers; one 2500 Communications Adapter with the appropriate line interface feature; one Elapsed Time Counter; and one Security Keylock. Each data station requires a separate Auxiliary Data Station Attachment on the 5288 and is connected to the 5288 by a cable up to 200 feet long. All of the attached data stations must have the same display capacity (480, 960, or 1920 characters for the 5281 and 480 or 960 characters for the 5282). Printers are connected to the 5288 via one of two features: the Single 5225/5256 Printer Attachment (#1155) provides a single port that permits one 5225 Printer and up to four 5256 Printers to be connected via a single twinax cable up to 5000 feet long; the Multiple 5225/5256 Printer Attachment (#1160) provides four ports that permit the attachment, via multiple twinax cables, of one 5225 Printer and up to four 5256 Printers.

The *5281 Data Station* is a single, table-top, auxiliary keyboard/display unit containing 0, 1, or 2 diskette drives. A nonprogrammable unit, the 5281 must be cable-connected to a 5285, 5286, or 5288 equipped with the appropriate Auxiliary Data Station Attachment feature. The 5281's display capacity is 480, 960, or 1920 characters, as determined by the attachment feature on the controlling device. If the 5281 contains 1 or 2 diskette drives, the controlling 5285, 5286, or 5288 must also have the appropriate Remote Diskette Drive Attachment feature. The 5281 can be equipped with an optional Magnetic Stripe Reader.

The *5282 Dual Data Station* is a table-top unit that functions as two independent auxiliary data stations, each with keyboard, display area, and optional diskette. The 5282

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▷ The 5288 Programmable Control Unit is a floor-standing controller designed to serve as the central component of larger 5280 configurations. The 5288 contains from 32K to 160K bytes of memory and from one to four diskette drives with a total capacity of up to 4.8 megabytes. It can control a cluster of up to four keyboard/displays through the attachment of auxiliary data stations (5281 or 5282). The 5288 can also accommodate the communications adapter and up to five printers (four 5256's and one 5225). Diskette drives in the attached auxiliary data stations can be accessed by the 5288 along with its own drives, providing a total system capacity of up to 8 drives and 9.6 megabytes.

The 5281 Data Station is a table-top unit containing a single keyboard/display and 0, 1, or 2 diskette drives with a capacity of up to 2.4 megabytes. A nonprogrammable unit, the 5281 must be cable-connected to a 5285, 5286, or 5288 at a maximum distance of 200 feet. The display capacity is 480, 960, or 1920 characters as determined by the attachment feature on the controlling device.

The 5282 Dual Data Station is a table-top unit containing two independent keyboard/display stations and 0, 1, or 2 diskette drives with a capacity of up to 2.4 megabytes. Like the 5281, the 5282 is a nonprogrammable unit that must be cable-connected to a 5285, 5286, or 5288 at a maximum distance of 200 feet. The display capacity at each station is 480 or 960 characters, as determined by the attachment feature on the controlling device.

The 5225 Printer is a new wire-matrix line printer that can be attached to either the 5285 or the 5288. It features operator-selectable horizontal spacing of either 10 or 15 characters per inch, as well as both upper and lower case characters. The 15-cpi spacing makes it possible to print most reports on standard correspondence-size paper to reduce forms costs and simplify the handling and filing of reports. The 5225 is offered in four models with rated speeds of 280, 400, 490, and 600 lines per minute at 10 cpi and 195, 290, 355, and 420 lines per minute at 15 cpi. Each line can have a maximum of 132 print positions at 10 cpi and 198 positions at 15 cpi.

The 5256 Printer is a previously announced serial matrix printer that can be attached to either the 5285 or the 5288. It prints bidirectionally, using a 96-character upper/lower case EBCDIC character set. The 5256 is available in three models with rated speeds of 40, 80, or 120 characters per second.

All of the 5280 units are designated as "customer set-up" machines, and their compact size should make them relatively easy to install. Customer shipments will begin in June 1980 for all units except the 5225 Printer, which is scheduled for October 1980. The minimum 5280 configuration, a 32K-byte 5285 Programmable Data Station with one diskette drive, can be purchased for \$5,630 or leased for \$166 per month on a 2-year lease.

The programmable controllers in the 5285, 5286, and 5288 perform identical processing and control functions, ▷

▶ is available with 0, 1, or 2 diskette drives. A nonprogrammable unit, the 5282 must be cable-connected to a 5285, 5286, or 5288 equipped with the appropriate Auxiliary Data Station Attachment feature. The display capacity at each operator position is either 480 or 960 characters, as determined by the attachment feature on the controlling device. If the 5282 contains 1 or 2 diskette drives, the controlling 5285, 5286, or 5288 must also have the appropriate Remote Diskette Drive Attachment feature. Either or both stations of the 5282 can be equipped with an optional Magnetic Stripe Reader.

TRANSMISSION SPECIFICATIONS

COMMUNICATIONS ADAPTER: This optional feature (#2500) for either the 5285 Programmable Data Station or the 5288 Programmable Control Unit provides either SDLC or BSC data link control over a single communications line. Operating under stored-program control, the feature allows the 5285 or 5288 to communicate at up to 4800 bits/second on a switched point-to-point or nonswitched point-to-point or multipoint line. (On a multipoint line, the 5285 or 5288 operates as a tributary station.) All transmission is in half-duplex mode. Switched network support includes manual dialing and manual or automatic answering (where the attached modem supports the latter capability).

The 5285's, 5288's, or other devices at all the terminations (or drop points) of a network must use the same clocking source, operate at the same transmission rate, use the same transmission code, and have the same two- or four-wire connection to the line. Compatible modems must be used at all terminations in a network.

A 5285 or 5288 using BSC protocol can communicate with the following other IBM systems:

- A System/3 equipped with a 2074, 2084, or 2094 Communications Adapter.
- A System/32 equipped with a 2074 Communications Adapter.
- A System/34 equipped with a 2500, 3500, or 4500 Communications Adapter.
- A System/370 equipped with either an Integrated Communications Adapter, a 2701 Data Adapter Unit, or a 3704 or 3705 Communications Adapter with the ACF/NCP or PEP software, plus a BSC adapter and appropriate subfeatures.
- A Series/1 equipped with a 2074, 2075, or 2093/2094 Binary Synchronous Control.
- A 3741 Model 2 Data Station or a 3741 Model 4 Programmable Workstation.
- A 3747 Data Converter equipped with a 1660 Communications Adapter.
- A 5265 communicating model (XX2).
- Another 5285 or 5288 equipped with the 2500 Communications Adapter.

A 5285 or 5288 using SDLC protocol can communicate with a System/370, 303X, or 4300 Series computer via a 3704 or 3705 Communications Controller equipped with appropriate features.

The Communications Adapter must be connected to the communications line by means of either an Integrated Modem, an EIA Interface plus an external modem, or a ▶

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▶ although they vary in their memory capacities and device attachment capabilities. Multiple microprocessors (up to six) are used in each controller to enable processing and I/O devices to operate independently, and the system supports multiprogramming with up to eight main storage partitions. IBM has been strangely reticent about defining the 5280's processing capabilities, so at this time no performance comparisons can be made between the 5280 and other systems from IBM or competing vendors.

Data communications capabilities for the 5280 system are provided by an optional communications adapter on either the 5285 Programmable Data Station or the 5288 Programmable Control Unit. The 5285 or 5288 can communicate over a single line in half-duplex mode at a speed of up to 4800 bits per second, using either BSC or SDLC protocol. Point-to-point switched or nonswitched operation and multipoint tributary operation are supported. The required line interface can be provided by an internal modem, a Digital Data Service Adapter, or an EIA interface that permits the use of an external modem. The 5280 system can communicate with an IBM System/370, 303X, or 4300 Series computer in SDLC mode or with most current IBM computers and terminals in BSC mode. Communication with the System/38, however, is not currently supported because the required software for the System/38 has not been announced to date.

The 5280's designers clearly paid considerable attention to data security provisions. Sensitive data can be entered via the keyboard without being displayed on the CRT screen. An optional Security Keylock feature makes it possible to restrict usage of the system to keyholders. An optional Magnetic Stripe Reader, available for each keyboard/display operator position, can be used to enter user identification data. Finally, a communicating 5280 system can exchange identification sequences with the host computer, thereby aiding the user in controlling access to data.

Initial software support for the 5280 consists of bundled System Control Programming (SCP) and seven separately priced licensed programs. The software is oriented toward the support of data entry, transaction processing, batch processing, and both batch and interactive communications.

No integrated operating system has been announced for the 5280. The "free" SCP facilities are limited to a System Configuration Program that is used to define the physical and logical configuration of a 5280 system, an Initial Program Loader that initializes the system for program execution, a PTF/Patch Program that aids in applying program temporary fixes and program patches, and a Close Failure Recovery program that aids in recovering from abnormal program terminations.

Users of the 5280 have a choice of three programming languages: DE/RPG, COBOL, and Assembler. The principal IBM emphasis appears to be on DE/RPG, a ▶

▶ **DDS Adapter.** These devices are described in the following paragraphs.

INTEGRATED MODEMS: IBM offers five types of 1200-bps Integrated Modems for use with a 5285 Programmable Data Station or 5288 Programmable Control Unit equipped with the 2500 Communications Adapter. All five versions permit either BSC or SDLC data transmission at either 600 or 1200 bits/second. Their distinguishing characteristics are as follows: Model 5500—non-switched; Model 5501—switched with auto-answer; Model 5502—switched without auto-answer; Model 5507—non-switched with Switched Network Backup manual answer capability; and Model 5508—non-switched with Switched Network Backup auto-answer capability. The devices communicating with the 5285 or 5288 must be equipped with compatible 1200-bps modems. Only one Integrated Modem can be installed in a 5285 or 5288, and the Integrated Modem is mutually exclusive with the EIA Interface and the DDS Adapter. The Power Supply Expansion (#5810) is required for the Model 5501 or 5508 Integrated Modem.

EIA INTERFACE (#3701): This feature can be chosen as an alternative to the IBM Integrated Modems for use with a 5285 or 5288 equipped with the 2500 Communications Adapter. The feature provides a cable and interface that meet the EIA RS-232C specifications, permitting the attachment of an external modem supplied by IBM or another vendor. The Power Supply Expansion (#5810) is a prerequisite.

DIGITAL DATA SERVICE (DDS) ADAPTER: This feature enables a 5285 or 5288 equipped with the 2500 Communications Adapter to transmit and receive data at 2400 or 4800 bits/second in BSC or SDLC mode over AT&T's non-switched Dataphone Digital Data Service. The DDS Adapter is available in two versions: Model 5650 for point-to-point operation and Model 5651 for multipoint operation. Either model provides for appropriate interface and cable to the DDS channel service unit at the customer site.

SOFTWARE

Software support for the 5280 Distributed Data System is provided by System Control Programming (SCP), which is furnished at no charge, and by a set of separately priced licensed programs. These software facilities collectively provide the necessary support for a wide range of distributed environments including data entry, batch and interactive communications, batch processing, and transaction processing.

OPERATING SYSTEM: No integrated operating system for the 5280 has been announced to date. Instead, IBM offers the *5280 System Control Programming (SCP)*, which consists of four routines that provide the following basic system functions: 1) the System Configuration Program is used to describe the physical and logical configuration of a 5280 system; 2) the Initial Program Loader initializes the system and prepares it for program execution; 3) the PTF/Patch Program is used to apply program temporary fixes (PTF's) and to make program patches; 4) the Close Failure Recovery Program allows the user to specify an end-of-data (EOD) record in a diskette data set in the event that a program terminates abnormally.

LANGUAGES: IBM currently offers the DE/RPG, COBOL, and Assembler languages for use with the 5280 system. DE/RPG and Assembler programs can be prepared on the 5280 itself, whereas COBOL programs must be compiled on a host System/370, 303X, or 4300 Series computer under either OS/VS or DOS/VSE. ▶

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▷ new programming system that uses RPG-style specification forms to simplify the preparation of programs for interactive data entry, high-volume key entry, and user-defined processing functions. The 5280 COBOL language is an implementation of ANS COBOL 74 that supports interactive or batch commercial applications, provides limited data station support for interactive applications, and supports BSC and SDLC communications via a CALL interface. COBOL's usefulness, however, is limited by the fact that COBOL programs for the 5280 must be compiled on a host IBM System/370, 303X, or 4300 Series computer under either OS/VS or DOS/VSE. DE/RPG and Assembler programs, by contrast, can be compiled on the 5280 system itself. The 5280 COBOL compiler is scheduled for availability in February 1981, whereas the other software products will be available with the first 5280 hardware shipments in June 1980.

Three utility packages complete the initial 5280 software complement. The 5280 Utilities consist of 11 routines to perform straightforward utility functions such as diskette file maintenance, resource allocation, and system status display. The 5280 Sort/Merge permits flexible sorting and merging operations on diskette files. The 5280 Communications Utilities provide software support for a 5285 or 5288 equipped with the communications adapter. Basic facilities are provided for batch data transfer and inquiry, multi-leaving remote job entry (MRJE), SNA remote job entry (SRJE), and communication configuration and job description. No software to support specific user applications has been announced for the 5280 to date.

The 5280 effectively supersedes the 3740 Data Entry System, IBM's earlier key-to-diskette system. IBM made this point clear by announcing a 25 percent purchase price cut on most components and features of the 3740 system on the same day it announced the 5280. Introduced in 1973, the 3740 had been progressively upgraded through the addition of programmability, communications, and printers—but the older system is clearly outclassed by the greater power and flexibility of the 5280. To assist 3740 users in converting to the 5280, IBM is providing three software conversion aids. The 3740 Format Conversion utility facilitates the conversion of 3740 key entry program levels into DE/RPG source programs. The Key Entry Utility accepts the 3740 key entry string language as input and creates formats for simple key entry functions on the 5280. The 3740 ACL Conversion Aid Program, supplied with the 5280 Assembler, aids in converting 3740 ACL programs into 5280 Assembler language.

GSD's new distributed data system naturally invites comparison with the 8100 Information System, the distributed processing system that IBM's Data Processing Division introduced in October 1978. But the 8100 is a much larger, more powerful, and more costly system; the *smallest* 8100 processor has 256K bytes of main memory, includes 29 megabyte of hard disk storage, and sells for \$25,200—more than four times the \$5,630 purchase price ▷

▶ *5280 DE/RPG* is a new product designed to simplify the preparation of programs for applications ranging from simple key entry to high-function data entry jobs that require extensive editing, data set accessing, and user-defined processing.

DE/RPG makes use of the Data Description Specifications (DDS) form, which is also supported on the IBM System/38, for specification of data entry formats. A format or series of formats, defined by the user and presented in the display screen, provides the framework for a data entry job. A typical job would consist of entering data, editing and checking the data, creating records, and writing the records to a diskette data set. The sequence of execution of the formats can be determined by job definition, by operator selection, or by the program on the basis of an analysis of current data.

DE/RPG also features an RPG subroutine capability which provides a subset of the RPG III calculation operation codes. Using the RPG Calculation Specifications, the user can define subroutines to perform functions such as complex editing, arithmetic calculations, array handling, master data set access, and report printing. A total of 40 RPG II operation codes from the following categories are available: arithmetic and data manipulation, branching, indicator testing, subroutine operations, and special I/O operations. The RPG subroutine capability can also be used to create stand-alone batch DE/RPG programs that can run in any partition. RPG programmers should note, however, that the sequence of instruction execution is defined by the user; the usual RPG "cycle" does not apply.

DE/RPG permits considerable flexibility in display screen design and in data editing. Prompts and data fields can be positioned anywhere on the screen below the top line, which is reserved for status information, and multiple formats can be displayed on a single screen. Editing can be performed on a character, field, or record basis, and a wide range of editing, checking, testing, comparison, insertion, and table lookup operations is available.

DE/RPG diskette data sets are organized in sequential fashion. Three access methods are supported: sequential, direct by relative record number, and key indexed. Data sets can be shared by multiple programs on a read or write/update basis. There are safeguards against concurrent updating of a record by two or more programs.

All DE/RPG programs maintain production statistics on both a job basis and a station basis. Counts can be maintained of keystrokes, records, marked records, verify correction keystrokes, elapsed time, and number of jobs.

The DE/RPG licensed program consists of a Source Entry Program and a Compiler. The Source Entry Program permits interactive entry, verification, and updating of DE/RPG source statement data set, which becomes the input to the Compiler. The Compiler produces an object program data set, which is written to diskette, and an optional source listing on either printer or diskette. When two or more operators are to perform the same job, each operator must have an individual copy of the appropriate object program, executing in a separate partition.

The DE/RPG Compiler will run on any 5280 system that has at least one Diskette 2D drive or two Diskette 1 drives. Minimum main storage partition size requirements are 9K bytes for the Compiler and 13K bytes for the Source Entry Program. The 5280 SCP and 5280 Utilities are prerequisites.

5280 COBOL is available in two versions, which differ in the host IBM computers and software that are required to compile the COBOL source programs. The 5280 COBOL-OS/VS Host Compiler and Library product requires a ▶

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▷ of a minimum 5280 system. Thus, the two systems occupy separate niches within IBM's growing line of distributed processing hardware and appear to be complementary rather than competitive.

The 5280's more direct competition will come not from other IBM products but from the distributed data systems that have long been marketed by companies such as Datapoint, Four-Phase Systems, Inforex, Mohawk, Nixdorf, and Pertec. Competitive systems with capabilities generally similar to those of the 5280 include the Datapoint 1500 and 1800, the Four-Phase System IV series, the Inforex System 7000, the Mohawk Series 21, the Nixdorf 600/15 and 600/25, and the Pertec XL20. In comparisons with systems such as these, the 5280 generally appears to rank near the low end in terms of both price and functional capabilities. As a result, a flurry of new low-end products and/or price reductions can be expected from the competing vendors during the coming months. □

▶ **System/370, 303X, or 4300 Series computer operating under OS/VS1 or OS/VS2 (MVS) for the compilation process, while the 5280 COBOL-DOS/VSE Host Compiler and Library product requires a System/370, 303X, or 4300 Series computer operating under DOS/VSE. Otherwise, the two versions have similar capabilities and features. COBOL object programs can be executed on a 5285, 5286, or 5288. Object programs can be transferred from the host to the 5280 system via diskette, RJE, or a user-written communications program.**

The 5280 COBOL language is an implementation of 1974 ANS Standard COBOL, X.23-1974. It provides support for both interactive and batch commercial application programs, as well as limited data station support for interactive applications. Support for BSC and SDLC communications is provided via a CALL interface.

The *5280 Assembler* is used to create stand-alone programs which will run on a 5285, 5286, or 5288. Features of the Assembler include mnemonic operation codes, symbolic addresses, symbolic data representation, automatic storage assignments, address displacement calculation, operand expressions, binary and decimal arithmetic, a source program listing, a cross-reference listing, error checks, and diagnostic messages. The 3740 ACL Conversion Aid Program is supplied along with the Assembler to aid the user in converting ACL programs written for the IBM 3740 Data Entry System into 5280 Assembler Language.

UTILITIES: IBM currently offers three licensed programs in this category for the 5280 system: the 5280 Utilities, the 5280 Sort/Merge, and the 5280 Communications Utilities.

The *5280 Utilities* consist of 11 programs with the following names and functions:

- **Diskette Initialization Utility**—formats a diskette according to the user's requirements.
- **Diskette/Data Set Clear Utility**—clears one or all data sets on a diskette in preparation for the recording of new data.
- **Diskette Label Maintenance Utility**—allocates space for new data sets, deletes old data sets, and modifies the labels of volumes and data sets.

- **Diskette Label List Utility**—displays or prints diskette volume labels, data set labels, data set names, and data set directories.
- **Diskette Copy Utility**—copies all or portions of a diskette onto the same or another diskette; supports multi-volume output data sets.
- **Diskette Print Utility**—prints all or selected records from a diskette, without reformatting or editing.
- **Resource Allocation Utility**—enables the user to add, delete, display, or alter an entry in the Resource Allocation Table, which contains physical device addresses with their corresponding logical identifiers.
- **3740 Format Conversion utility**—aids in the conversion of 3740 key entry program levels into DE/RPG source programs.
- **Diskette Compress Utility**—rearranges data sets to make one contiguous space out of the unused space between data sets.
- **Key Entry Utility**—permits the user to create formats for simple data entry functions using the IBM 3740 key entry string language.
- **System Status Utility**—displays system status information such as the number and sizes of partitions and names of programs currently being executed.

The *5280 Sort/Merge* consists of a Sort program and a Merge program. The Sort program sorts a single diskette data set into either ascending or descending sequence, using parameters entered at the keyboard or read from diskette. Records can be selected, omitted, or reformatted, and work space and data set space are allocated automatically. Four output formats are available: Full Record, Address Out (a data set of four-byte relative record numbers), Record Subset (a data set containing user-specified data fields), and Index/Key (a data set with records consisting of a key and a relative record number). The Merge program combines records from two sorted diskette data sets into another data set, using parameters entered at the keyboard or read from diskette. It supports multi-volume data sets.

The *5280 Communications Utilities* consist of four basic facilities: Batch Data Transfer/Inquiry, SNA/SDLC Remote Job Entry (SRJE), Multi-Leaving Remote Job Entry (MRJE), and Communications Configuration and Job Description. These programs provide software support for a 5285 Programmable Data Station or 5288 Programmable Control Unit equipped with the 2500 Communications Adapter and communicating over a single line in either BSC or SDLC mode. The communications programs operate concurrently with other applications. Only the 960-character and 1920-character display sizes are supported.

The Batch Data Transfer/Inquiry program provides for batch data transfer to a host system or terminal and inquiry to a host system. It supports SNA/SDLC communications as an LUI-type terminal to a System/370, 303X, or 4300 Series computer with CICS/VS and IMS/VS, or BSC communications with a System/370, 303X, or 4300 with CICS/VS, IMS/VS (as a 3741), and VSE/POWER, or with System/3/32/34 RPG II, System/3 CCP, System/34 SSP-ICF, Series/1 RPS, a 3740, a 5260, or another 5280. The minimum main storage required is 32K bytes for BSC communications and 64K bytes for SNA/SDLC.

The SNA/SDLC Remote Job Entry (SRJE) facility permits the 5280 system to function as an RJE terminal consisting of one console, one reader, one punch, and one printer. Printer ▶

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► data streams can be directed to either a printer or diskette, while punch data streams are directed to diskette. SNA support on the host computer is via ACF/VTAM and ACF/NCP/VSE to RES, JES2, JES3, and VSE/POWER. The minimum main storage requirement on the 5280 is 64K bytes.

The Multi-Leaving Remote Job Entry (MRJE) facility permits the 5280 system to function as an RJE terminal with full multi-leaving support for concurrent device operation of one console, one reader, one punch, and one printer. Printer data streams can be directed to either a printer or diskette, while punch data streams are directed to diskette. BSC support on the host computer treats the 5280 as a System/3 MRJE workstation for RES, JES2, and JES3. The minimum main storage requirement is 48K bytes on a 5285 or 64K bytes on a 5288.

The Communications Configuration and Job Description program is used to prepare communications environments via job step prompts. Descriptions are stored on diskette by job name, and are used to initiate the communications link with the host computer or another terminal. Initiation of the link with the host may be either dynamic or predetermined for operator convenience.

COMPONENTS

DISPLAY: A standard component of the 5281 Data Station, 5282 Dual Data Station, 5285 Programmable Data Station, and 5286 Dual Programmable Data Station. Display capacities for each model are as follows:

Model	480 chars.	960 chars.	1920 chars.
5281	Std.	Opt.	Opt.
5282	Std.	—	—
5285	Opt.	Opt.	Opt.
5286	Opt.	Opt.	—

Display capacity for Models 5285 and 5286 is determined by the attachment feature selected on the controlling device. Models 5282 and 5286 provide a single split-screen display, with the indicated display capacity supported at each of the two operator positions. The display arrangement is 6, 12, and 24 lines of 80 characters for the 480-, 960-, and 1920-character capacities, respectively. Characters are formed within an 8-by-16 dot matrix character cell. A user-selectable choice of 94-character (upper/lower case) EBCDIC, 94-character ASCII, or 185-character Multinational character sets is provided. Program-controlled screen attributes include reverse video, high intensity, blinking, underlining, nondisplay (blinking), and column separation.

KEYBOARD: A required component of the 5281, 5282, 5285, and 5286. Dual station models (5282 and 5286) require two keyboards. Four keyboard types are offered: 83-key EBCDIC typewriter, 83-key ASCII typewriter, 66-key data entry, and 66-key data entry with proof arrangement. Each keyboard is movable and includes data keys, cursor movement keys, special function keys, and field edit keys.

MAGNETIC STRIPE READER: An optional feature for the 5281, 5282, 5285, or 5286. Up to 128 A.B.A. numeric characters, including control characters, can be read from a magnetic stripe on credit cards, identification cards, and other documents.

DISKETTE DRIVES: Two types of diskette drives are available for any 5280 system in any combination: a drive that can read and write only the IBM Diskette 1 format, and a drive that can read and write the IBM Diskette 1, 2, and 2D formats. (The latter is referred to as a Diskette 2D drive.) The on-line data capacity of each drive can range from 246K

bytes to 1.2 megabytes depending upon the recording format in use, as tabulated below.

Diskette Type	Format	Bytes per Sector	Capacity, Bytes
1	1	128	246K
	2	256	284K
	3	512	303K
2	4	128	492K
	5	256	568K
	6	512	606K
2D	7	128	985K
	8	256	1136K
	9	512	1212K

For exchanging diskette data between the 5280 and other systems, IBM supports the following exchange types: Basic Exchange, in formats 1 and 4; H Exchange, in format 7 only; and I Exchange, in all of the above formats. Diskettes can be interchanged with the IBM Series/1, System/3, System/32, System/34, System/38, System/370, 303X, 4300, 3540, 3740, 3747, 3770, 3790, 5110, 5230, 5260, 8100, and other systems and devices that support a compatible diskette exchange type.

Diskette data transfer rates are 31,250 bytes/second in Diskette 1 or Diskette 2 mode and 62,500 bytes/second in Diskette 2D mode. The rotational speed is 360 rpm for both types of drives.

MODEL 5225 LINE PRINTER: A wire matrix line printer that connects to the 5285 or 5288 via twinax cabling at a distance of up to 5000 feet. Horizontal spacing of 10 or 15 characters per inch and vertical spacing of 6 or 8 lines per inch is operator-selectable. Maximum line width is 132 characters at 10 char./inch and 198 characters at 15 char./inch. A choice of 95-character EBCDIC, 184-character Multinational (including ASCII graphics), or 95-character Spanish-speaking character sets is provided. Characters are formed by a 7-by-8 dot matrix. A forms tractor is standard. Forms skipping is program-controlled. Four models are available and differ only in their rated print speeds: at 10 char./inch, Model 1 prints at 280 lpm, Model 2 at 400 lpm, Model 3 at 490 lpm, and Model 4 at 560 lpm; at 15 char./inch, Model 1 prints at 195 lpm, Model 2 at 290 lpm, Model 3 at 355 lpm, and Model 4 at 420 lpm.

MODEL 5256 SERIAL PRINTER: A bidirectional serial matrix printer that connects to the 5285 or 5288 via twinax cabling at a distance of up to 5000 feet. Horizontal spacing is 10 characters per inch. Vertical spacing is operator-selectable at 6 or 8 lines per inch. Maximum line width is 132 characters. A 96-character (upper/lower case) EBCDIC character set is standard; a Multinational character set is also available. A forms tractor and a cut-forms capability are standard. Three models are available and differ only in their rated print speeds: Model 1 prints at 40 cps, Model 2 at 80 cps, and Model 3 at 120 cps.

PRICING

IBM offers the 5280 system on a purchase, 24-month lease, or rental basis. The warranty period is three months. The standard IBM lease or rental contract entitles the customer to unlimited usage each month. Prime-shift maintenance is included in the lease or rental price. The purchase option accrual equals 45 percent of the monthly charge up to 50 percent of the purchase price. IBM's standard educational allowance of 10 percent applies to the 5280 system for lease, rental, and purchase customers. ►

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► For purchased, leased or rented systems, the 5280 system is under maintenance group D. The minimum period of maintenance service is 9 consecutive hours between 7:00 a.m. and 6:00 p.m. Monday through Friday. Charges for maintenance coverage outside this period are based upon the following percentages of the minimum monthly maintenance charge (MMC) added to the MMC:

	Consecutive hours				
	9*	12	16	20	24
Monday-Friday (until 8:00 a.m. Saturday)	10	12	14	16	18

	Consecutive hours				
	9*	12	16	20	24
Saturday (until 8:00 a.m. Sunday)	4	5	7	8	9
Sunday (until 8:00 a.m. Monday)	5	7	9	11	12

*Outside of the hours 7:00 to 6:00 p.m.

For users without a maintenance contract, the 5280 system is maintained under per-call class 2. Under this class the per-call charge during regular hours is \$77.00 per hour, and during off hours the charge is \$89.00 per hour. The hourly rate for systems engineering service is \$57.00

EQUIPMENT PRICES

	Purchase Price	Monthly Maint.	Monthly Rental Charge*	Monthly Lease Charge (2-Yr. Lease)*
PROGRAMMABLE DATA STATIONS				
5285 Programmable Data Station:				
A01 With 32K and one Diskette 1 drive	\$5,490	\$44.00	\$196	\$167
A02 With 32K and two Diskette 1 drives	6,530	54.50	241	205
A05 With 32K and one Diskette 2D drive	6,115	52.50	215	183
A06 With 32K, one Diskette 1, and one Diskette 2D drive	7,155	63.00	260	221
A10 With 32K and two Diskette 2D drives	7,780	71.50	278	237
B01 With 48K and one Diskette 1 drive	5,905	45.00	210	179
B02 With 48K and two Diskette 1 drives	6,945	55.50	255	217
B05 With 48K and one Diskette 2D drive	6,530	53.50	229	195
B06 With 48K, one Diskette 1, and one Diskette 2D drive	7,570	64.00	274	233
B10 With 48K and two Diskette 2D drives	8,195	72.50	293	249
C01 With 64K and one Diskette 1 drive	6,110	46.00	219	186
C02 With 64K and two Diskette 1 drives	7,150	56.50	263	224
C05 With 64K and one Diskette 2D drive	6,735	54.50	237	202
C06 With 64K, one Diskette 1, and one diskette 2D drive	7,775	65.00	282	240
C10 With 64K and two Diskette 2D drives	8,400	73.50	302	257
5286 Dual Programmable Data Station:				
A02 With 32K and two Diskette 1 drives	7,380	50.50	241	205
A10 With 32K and two Diskette 2D drives	8,630	67.00	278	237
B02 With 48K and two Diskette 1 drives	7,795	51.50	255	217
B10 With 48K and two Diskette 2D drives	9,045	68.50	293	249
C02 With 64K and two Diskette 1 drives	8,000	52.50	263	224
C10 With 64K and two Diskette 2D drives	9,250	69.50	302	257
Keyboards for 5285 and 5286 (one required for each operator position):				
4600 83-key EBCDIC Keyboard	350	4.00	13	11
4601 66-key Data Entry Keyboard	350	4.00	13	11
4602 66-key Data Entry Keyboard with Proof Arrangement	350	4.00	13	11
4603 83-key ASCII Keyboard	350	4.00	13	11
Special features for 5285 and 5286 (except as noted):				
3500 960-Character Display Size (for 5285 only)	104	1.00	6	5
3501 1920-Character Display Size (for 5285 only)	200	0.50	12	10
1150 5225/5256 Printer Attachment (for 5285 only)	499	2.00	13	11
1200 Attachment for one 480-character 5281 Data Station	603	2.00	15	13
1205 Attachment for one 960-character 5281 Data Station (for 5285 only)	707	2.50	21	18
1210 Attachment for one 1920-character 5281 Data Station (for 5285 only)	811	3.00	28	24
1215 Attachment for one 480-character 5282 Dual Data Station	707	2.50	21	18
1220 Attachment for one 960-character 5282 Dual Data Station (for 5285 only)	811	3.00	28	24
1240 Remote Diskette Drive Attachment (required if an attached 5281 or 5282 has either 1 or 2 diskette drives)	197	1.00	6	5
4950 Magnetic Stripe Reader (4955 or 4960 is a prerequisite)	395	2.50	13	11
4955 Magnetic Stripe Reader Adapter/Elapsed Time Counter (for 5286 or non-communicating 5285)	592	2.50	19	16
4960 Magnetic Stripe Reader Adapter/Elapsed Time Counter (for communicating 5285)	237	1.00	7	6
3610 Elapsed Time Counter (measures elapsed real time)	104	1.00	6	5
6340 Security Keylock	40	—	—	—

PROGRAMMABLE CONTROL UNITS

5288	Programmable Control Unit:							
Submodel	Bytes of Main Storage	Diskette 1 Drives	Diskette 2D Drives					
A01	32K	1	0	6,135	35.50	196	167	
A02	32K	2	0	7,175	46.00	239	204	
A03	32K	3	0	8,215	57.00	282	241	
A04	32K	4	0	9,255	68.00	325	278	
A05	32K	0	1	6,755	43.00	216	184	
A06	32K	1	1	7,795	54.00	259	221	
A07	32K	2	1	8,835	65.00	302	258	
A08	32K	3	1	9,875	76.00	345	295	

*Rental and lease charges include maintenance.

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► data streams can be directed to either a printer or diskette, while punch data streams are directed to diskette. SNA support on the host computer is via ACF/VTAM and ACF/NCP/VSE to RES, JES2, JES3, and VSE/POWER. The minimum main storage requirement on the 5280 is 64K bytes.

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Display capacity for Models 5285 and 5286 is determined by the attachment feature selected on the controlling device. Models 5282 and 5286 provide a single split-screen display, with the indicated display capacity supported at *each* of the two operator positions. The display arrangement is 6, 12, and 24 lines of 80 characters for the 480-, 960-, and 1920-character capacities, respectively. Characters are formed within an 8-by-16 dot matrix character cell. A user-selectable choice of 94-character (upper/lower case) EBCDIC, 94-character ASCII, or 185-character Multinational character sets is provided. Program-controlled screen attributes include reverse video, high intensity, blinking, underlining, nondisplay (blanking), and column separation.

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For exchanging diskette data between the 5280 and other systems, IBM supports the following exchange types: Basic Exchange, in Formats 1 and 4; H exchange, in format 7 only; and I exchange, in all of the above formats. Diskettes can be interchanged with the IBM Series/1, System/3, System/32, System/34, System/38, System/370, 303X, 4300, 3540, 3740, 3747, 3770, 3790, 5110, 5230, 5260, 8100, and other systems and devices that support a compatible diskette exchange type.

Diskette data transfer rates are 31,250 bytes/second in Diskette 1 or Diskette 2 mode and 62,500 bytes/second in Diskette 2D mode. The rotational speed is 360 rpm for both types of drives.

MODEL 5225 LINE PRINTER: A wire matrix line printer that connects to the 5285 or 5288 via twinax cabling at a distance of up to 5000 feet. Horizontal spacing of 10 or 15 characters per inch and vertical spacing of 6 or 8 lines per inch is operator-selectable. Maximum line width is 132 characters at 10 char./inch and 198 characters at 15 char./inch. A choice of 95-character EBCDIC, 184-character Multinational (including ASCII graphics), or 95-character Spanish Speaking character sets is provided. Characters are formed by a 7-by-8 dot matrix. A forms tractor is standard. Forms skipping is program-controlled. Four models are available and differ only in their rated print speeds: at 10 char./inch, Model 1 prints at 280 lpm, Model 2 at 400 lpm, Model 3 at 490 lpm, and Model 4 at 560 lpm; at 15 char./inch, Model 1 prints at 195 lpm, Model 2 at 290 lpm, Model 3 at 355 lpm, and Model 4 at 420 lpm.

MODEL 5256 SERIAL PRINTER: A bidirectional serial matrix printer that connects to the 5285 or 5288 via twinax cabling at a distance of up to 5000 feet. Horizontal spacing is 10 characters per inch. Vertical spacing is operator-selectable at 6 or 8 lines per inch. Maximum line width is 132 characters. A 96-character (upper/lower case) EBCDIC character set is standard; a Multinational character set is also available. A forms tractor and a cut-forms capability are standard. Three models are available and differ only in their rated print speeds: Model 1 prints at 40 cps, Model 2 at 80 cps, and Model 3 at 120 cps.

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IBM offers the 5280 system on a purchase, 24-month lease, or rental basis. The warranty period is three months. The standard IBM lease or rental contract entitles the customer to unlimited usage each month. Prime-shift maintenance is included in the lease or rental price. The purchase option accrual equals 45 percent of the monthly charge up to 50 percent of the purchase price. IBM's standard educational allowance of 10 percent applies to the 5280 system for lease, rental, and purchase customers. ►

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► For purchased, leased or rented systems, the 5280 system is under maintenance group D. The minimum period of maintenance service is 9 consecutive hours between 7:00 a.m. and 6:00 p.m. Monday through Friday. Charges for maintenance coverage outside this period are based upon the following percentages of the minimum monthly maintenance charge (MMC) added to the MMC:

	Consecutive hours				
	9*	12	16	20	24
Monday-Friday (until 8:00 a.m. Saturday)	10	12	14	16	18

	Consecutive hours				
	9*	12	16	20	24
Saturday (until 8:00 a.m. Sunday)	4	5	7	8	9
Sunday (until 8:00 a.m. Monday)	5	7	9	11	12

*Outside of the hours 7:00 to 6:00 p.m.

For users without a maintenance contract, the 5280 system is maintained under per-call class 2. Under this class the per-call charge during regular hours is \$77.00 per hour, and during off hours the charge is \$89.00 per hour. The hourly rate for systems engineering service is \$57.00

EQUIPMENT PRICES

		Purchase Price	Monthly Maint.	Monthly Rental Charge*	Monthly Lease Charge (2-Yr. Lease)
PROGRAMMABLE DATA STATIONS					
5285	Programmable Data Station:				
	A01 With 32K and one Diskette 1 drive	\$5,280	\$42.00	\$183	\$155
	A02 With 32K and two Diskette 1 drives	6,280	52.00	224	190
	A05 With 32K and one Diskette 2D drive	5,880	50.00	200	170
	A06 With 32K, one Diskette 1, and one Diskette 2D drive	6,880	60.00	241	205
	A10 With 32K and two Diskette 2D drives	7,480	68.00	259	220
	B01 With 48K and one Diskette 1 drive	5,680	43.00	196	166
	B02 With 48K and two Diskette 1 drives	6,680	53.00	237	201
	B05 With 48K and one Diskette 2D drive	6,280	51.00	213	181
	B06 With 48K, one Diskette 1, and one Diskette 2D drive	7,280	61.00	254	216
	B10 With 48K and two Diskette 2D drives	7,880	69.00	272	231
	C01 With 64K and one Diskette 1 drive	5,880	44.00	204	173
	C02 With 64K and two Diskette 1 drives	6,880	54.00	245	208
	C05 With 64K and one Diskette 2D drive	6,480	52.00	221	188
	C06 With 64K, one Diskette 1, and one diskette 2D drive	7,480	62.00	263	223
	C10 With 64K and two Diskette 2D drives	8,080	70.00	280	238
5286	Dual Programmable Data Station:				
	A01 With 32K and two Diskette 1 drives	7,100	48.00	224	190
	A10 With 32K and two Diskette 2D drives	8,300	64.00	259	220
	B01 With 48K and two Diskette 1 drives	7,500	49.00	237	201
	B10 With 48K and two Diskette 2D drives	8,700	65.00	272	231
C01	C01 With 64K and two Diskette 1 drives	7,700	50.00	245	238
	C10 With 64K and two Diskette 2D drives	8,900	66.00	280	238
Keyboards for 5285 and 5286 (one required for each operator position):					
	4600 83-key EBCDIC Keyboard	350	4.00	13	11
	4601 66-key Data Entry Keyboard	350	4.00	13	11
	4602 66-key Data Entry Keyboard with Proof Arrangement	350	4.00	13	11
	4603 83-key ASCII Keyboard	350	4.00	13	11
Special features for 5285 and 5286 (except as noted):					
	3500 960-Character Display Size (for 5285 only)	100	0.50	6	5
	3501 1920-Character Display Size (for 5285 only)	200	0.50	12	10
	1150 5225/5256 Printer Attachment (for 5285 only)	480	1.50	12	10
	1200 Attachment for one 480-character 5281 Data Station	580	1.50	14	12
	1205 Attachment for one 960-character 5281 Data Station (for 5285 only)	680	2.00	20	17
	1210 Attachment for one 1920-character 5281 Data Station (for 5285 only)	780	2.50	26	22
	1215 Attachment for one 480-character 5282 Dual Data Station	680	2.00	20	17
	1220 Attachment for one 960-character 5282 Dual Data Station (for 5285 only)	780	2.50	26	22
	1240 Remote Diskette Drive Attachment (required if an attached 5281 or 5282 has either 1 or 2 diskette drives)	190	0.50	6	5
	4950 Magnetic Stripe Reader (4955 or 4960 is a prerequisite)	380	2.00	12	10
	4955 Magnetic Stripe Reader Adapter/Elapsed Time Counter (for 5286 or non-communicating 5285)	570	2.00	18	15
	4960 Magnetic Stripe Reader Adapter/Elapsed Time Counter (for communicating 5285)	228	0.50	7	6
	3610 Elapsed Time Counter (measures elapsed real time)	100	0.50	6	5
	6340 Security Keylock	40	—	—	—

PROGRAMMABLE CONTROL UNITS

	Submodel	Bytes of Main Storage	Diskette 1 Drives	Diskette 2D Drives				
5288	Programmable Control Unit:							
	A01	32K	1	0	5,900	34.00	183	155
	A02	32K	2	0	6,900	44.00	224	190
	A03	32K	3	0	7,900	54.00	265	225
	A04	32K	4	0	8,900	64.00	306	260
	A05	32K	0	1	6,500	42.00	200	170
	A06	32K	1	1	7,500	52.00	241	205
	A07	32K	2	1	8,500	62.00	282	240
	A08	32K	3	1	9,500	72.00	324	275

*Rental and lease charges include maintenance.

Update

IBM 5280 Distributed Data System

EQUIPMENT PRICES (Continued)



Submodel	Bytes of Main Storage	Diskette 1 Drives	Diskette 2D Drives	Purchase Price	Monthly Maint.	Monthly Rental Charge*	Monthly Lease Charge (2-Yr. Lease)*
Programmable Control Unit: (Continued)							
A10	32K	0	2	8,415	62.00	279	238
A11	32K	1	2	9,455	73.00	322	275
A12	32K	2	2	10,495	84.00	365	312
A15	32K	0	3	10,075	81.00	342	292
A16	32K	1	3	11,115	92.00	385	329
A20	32K	0	4	11,735	100.00	405	346
C01	64K	1	0	6,755	37.00	218	186
C02	64K	2	0	7,795	48.00	261	223
C03	64K	3	0	8,835	59.00	304	260
C04	64K	4	0	9,875	70.00	347	297
C05	64K	0	1	7,375	45.00	238	203
C06	64K	1	1	8,415	56.00	281	240
C07	64K	2	1	9,455	67.00	324	277
C08	64K	3	1	10,495	78.00	367	314
C10	64K	0	2	9,035	64.00	301	257
C11	64K	1	2	10,075	75.00	344	294
C12	64K	2	2	11,115	86.00	387	331
C15	64K	0	3	10,695	83.00	364	311
C16	64K	1	3	11,735	94.00	407	348
C20	64K	0	4	12,355	102.00	427	365
D01	96K	1	0	7,375	39.00	240	205
D02	96K	2	0	8,415	50.00	283	242
D03	96K	3	0	9,455	61.00	326	279
D04	96K	4	0	10,495	72.00	369	316
D05	96K	0	1	7,995	47.00	260	222
D06	96K	1	1	9,035	58.00	303	259
D07	96K	2	1	10,075	69.00	346	296
D08	96K	3	1	11,115	80.00	389	333
D10	96K	0	2	9,655	66.00	323	276
D11	96K	1	2	10,695	77.00	366	313
D12	96K	2	2	11,735	88.00	409	350
D15	96K	0	3	11,315	85.00	386	330
D16	96K	1	3	12,355	96.00	429	367
D20	96K	0	4	12,975	104.00	449	384
E01	128K	1	0	7,995	41.00	262	224
E02	128K	2	0	9,035	52.00	305	261
E03	128K	3	0	10,075	63.00	348	298
E04	128K	4	0	11,115	74.00	391	335
E05	128K	0	1	8,615	49.00	282	241
E06	128K	1	1	9,655	60.00	325	278
E07	128K	2	1	10,695	71.00	368	315
E08	128K	3	1	11,735	82.00	411	352
E10	128K	0	2	10,275	68.00	345	295
E11	128K	1	2	11,315	79.00	388	332
E12	128K	2	2	12,355	90.00	431	369
E15	128K	0	3	11,935	87.00	408	349
E16	128K	1	3	12,975	98.00	451	386
E20	128K	0	4	13,595	106.00	471	403
F01	160K	1	0	8,615	43.00	284	243
F02	160K	2	0	9,655	54.00	327	280
F03	160K	3	0	10,695	65.00	370	317
F04	160K	4	0	11,735	76.00	413	354
F05	160K	0	1	9,235	51.00	304	260
F06	160K	1	1	10,275	62.00	347	297
F07	160K	2	1	11,315	73.00	390	334
F08	160K	3	1	12,355	84.00	433	371
F10	160K	0	2	10,895	70.00	367	314
F11	160K	1	2	11,935	81.00	410	351
F12	160K	2	2	12,975	92.00	453	388
F15	160K	0	3	12,555	89.00	430	368
F16	160K	1	3	13,595	100.00	473	405
F20	160K	0	4	14,215	109.00	497	423

Special features for 5288 Programmable Control Unit:

1245	Attachment for one 480-character 5281 Data Station	0	0.00	0	0
1250	Attachment for one 960-character 5281 Data Station	104	1.00	6	5
1255	Attachment for one 1920-character 5281 Data Station	208	1.50	13	11
1260	Attachment for one 480-character 5282 Dual Data Station	104	1.00	6	5
1265	Attachment for one 960-character 5282 Dual Data Station	208	1.50	13	11
1270	Attachment for one additional 480-character 5281 (prerequisite: 1245 or 1260)	603	2.00	15	13
1275	Attachment for one additional 960-character 5281 (prerequisite: 1250 or 1265)	707	2.50	21	18
1280	Attachment for one additional 1920-character 5281 (prerequisite: 1255)	811	3.00	28	24
1285	Attachment for one additional 480-character 5282 (prerequisite: 1245 or 1260)	707	2.50	21	18
1290	Attachment for one additional 960-character 5282 (prerequisite: 1250 or 1265)	811	3.00	28	24
1300	Remote Diskette Drive Attachment, First (required for first and second remote drives when base 5288 has 1 or 2 drives)	197	1.00	6	5
1301	Remote Diskette Drive Attachment, Second (required for first and second remote drives when base 5288 has 3 or 4 drives, or for third and fourth remote drives when base 5288 has 1 or 2 drives)	894	4.50	26	22

*Rental and lease charges include maintenance.



**IBM 5280 Distributed Data System
 EQUIPMENT PRICES (Continued)**

		<u>Purchase Price</u>	<u>Monthly Maint.</u>	<u>Monthly Rental Charge*</u>	<u>Monthly Lease Charge (2-Yr. Lease)</u>
1302	Remote Diskette Drive Attachment, Third (required for third and fourth remote drives when base 5288 has 3 or 4 drives, or for fifth and sixth remote drives when base 5288 has 1 or 2 drives)	197	1.00	6	5
1155	Single 5225/5256 Printer Attachment (provides a single port for attaching from 1 to 5 printers via a single twinax cable)	499	2.00	13	11
1160	Multiple 5225/5256 Printer Attachment (provides 4 ports for attaching, via twinax cable, up to 5 printers)	696	3.00	19	16
4955	Magnetic Stripe Reader Adapter/Elapsed Time Counter (controls up to 4 Magnetic Stripe Readers on attached 5281 and/or 5282 data stations)	592	2.50	19	16
3610	Elapsed Time Counter	104	1.00	6	5
6340	Security Keylock	40	—	—	—

AUXILIARY DATA STATIONS

5281	Data Station:				
Z00	With no diskette drive	2,115	13.50	63	54
Z01	With Diskette 1 drive	3,350	25.50	114	97
Z02	With two Diskette 1 drives	4,390	36.00	157	134
Z05	With one Diskette 2D drive	3,975	34.00	133	113
Z06	With one Diskette 1 and one Diskette 2D drive	5,015	44.50	177	151
Z10	With two Diskette 2D drives	5,640	53.00	196	167
5282	Dual Data Station:				
Z00	With no diskette drive	2,400	15.00	69	59
Z01	With one Diskette 1 drive	3,635	27.50	120	102
Z02	With two Diskette 1 drives	4,675	38.00	165	140
Z03	With one Diskette 2D drive	4,260	35.50	139	118
Z06	With one Diskette 1 and one Diskette 2D drive	5,300	46.00	183	156
Z10	With two Diskette 2D drives	5,925	54.50	202	172
Keyboards for 5281 and 5282 (one required for each operator position):					
4600	83-key EBCDIC Keyboard	350	4.00	13	11
4601	66-key Data Entry Keyboard	350	4.00	13	11
4602	66-key Data Entry Keyboard with Proof Arrangement	350	4.00	13	11
4603	83-key ASCII Keyboard	350	4.00	13	11

Special feature for 5281 and 5282:

4950	Magnetic Stripe Reader	395	2.50	13	11
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PRINTERS

5225	Printer:				
Mdl. 1	280 lpm at 10 cpi; 195 lpm at 15 cpi	11,650	79.00	400	340
Mdl. 2	200 lpm at 10 cpi; 290 lpm at 15 cpi	13,450	111.00	456	388
Mdl. 3	490 lpm at 10 cpi; 355 lpm at 15 cpi	14,950	137.00	508	432
Mdl. 4	560 lpm at 10 cpi; 420 lpm at 15 cpi	16,350	162.00	558	475
5256	Printer:				
Mdl. 1	40 char/sec	5,200	34.50	188	160
Mdl. 2	80 char/sec	5,800	40.50	213	181
Mdl. 3	120 char/sec	6,250	48.50	231	197
Special features for 5225 and 5256 Printers:					
1470	Audible Alarm (signals operator when manual intervention is required due to one of nine error conditions)	50	—	—	—
2680	Cable Thru (permits multiple printers to be connected to a single twinax cable; required on each printer except the last)	115	1.00	4	3
4450	Forms Stand (for 5256 only)	54	—	—	—

COMMUNICATIONS

2500	Communications Adapter (for 5285 or 5288 only)	936	9.50	58	49
3701	EIA Interface (provides RS-232C interface for an external modem)	343	1.50	14	12
5650	Digital Data Service Adapter; Point-to-Point	840	1.50	26	22
5651	Digital Data Service Adapter, Multipoint	840	1.50	26	22
5500	Integrated Modem, non-switched	660	4.00	20	17
5501	Integrated Modem, switched with auto answer	686	3.50	27	23
5502	Integrated Modem, switched without auto answer	660	3.50	20	17
5507	Integrated Modem, non-switched with SNBU manual answer	686	4.00	28	24
5508	Integrated Modem, non-switched with SNBU auto answer	873	4.50	32	27
5810	Power Supply Expansion (required on 5285 if 5501 or 5508 is installed)	73	1.50	4	3

*Rental and lease charges include maintenance.

SOFTWARE PRICES

	<u>Basic Monthly License Charge</u>
5280	System Control Programming (SCP)
5280	DE/RPG
5280	COBOL-OS/VS Host Compiler and Library
5280	COBOL-DOS/VSE Host Compiler and Library
5280	Communication Utilities
5280	Sort/Merge
5280	Utilities
5280	Assembler
	No charge
	\$ 8
	110
	110
	15
	8
	4
	25

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EQUIPMENT PRICES (Continued)

Submodel	Bytes of Main Storage	Diskette 1 Drives	Diskette 2D Drives	Purchase Price	Monthly Maint.	Monthly Rental Charge*	Monthly Lease Charge (2-Yr. Lease)*
Programmable Control Unit: (Continued)							
A10	32K	0	2	8,100	60.00	259	220
A11	32K	1	2	9,100	70.00	300	255
A12	32K	2	2	10,100	80.00	341	290
A15	32K	0	3	9,700	78.00	318	270
A16	32K	1	3	10,700	88.00	359	305
A20	32K	0	4	11,300	96.00	376	320
C01	64K	1	0	6,500	36.00	204	173
C02	64K	2	0	7,500	46.00	245	208
C03	64K	3	0	8,500	56.00	286	243
C04	64K	4	0	9,500	66.00	327	278
C05	64K	0	1	7,100	44.00	221	188
C06	64K	1	1	8,100	54.00	263	223
C07	64K	2	1	9,100	64.00	304	258
C08	64K	3	1	10,100	74.00	345	293
C10	64K	0	2	8,700	62.00	280	238
C11	64K	1	2	9,700	72.00	321	273
C12	64K	2	2	10,700	82.00	362	308
C15	64K	0	3	10,300	80.00	339	288
C16	64K	1	3	11,300	90.00	380	323
C20	64K	0	4	11,900	98.00	398	338
D01	96K	1	0	7,100	38.00	225	191
D02	96K	2	0	8,100	48.00	266	226
D03	96K	3	0	9,100	58.00	307	261
D04	96K	4	0	10,100	68.00	348	296
D05	96K	0	1	7,700	46.00	243	206
D06	96K	1	1	8,700	56.00	284	241
D07	96K	2	1	9,700	66.00	325	276
D08	96K	3	1	10,700	76.00	366	311
D10	96K	0	2	9,300	64.00	301	256
D11	96K	1	2	10,300	74.00	342	291
D12	96K	2	2	11,300	84.00	384	326
D15	96K	0	3	10,900	82.00	360	306
D16	96K	1	3	11,900	92.00	401	341
D20	96K	0	4	12,500	102.00	419	356
E01	128K	1	0	7,700	40.00	246	209
E02	128K	2	0	8,700	50.00	287	244
E03	128K	3	0	9,700	60.00	328	279
E04	128K	4	0	10,700	70.00	369	314
E05	128K	0	1	8,300	48.00	264	224
E06	128K	1	1	9,300	58.00	305	259
E07	128K	2	1	10,300	68.00	346	294
E08	128K	3	1	11,300	78.00	387	329
E10	128K	0	2	9,900	66.00	322	274
E11	128K	1	2	10,900	76.00	364	309
E12	128K	2	2	11,900	86.00	405	344
E15	128K	0	3	11,500	84.00	381	324
E16	128K	1	3	12,500	94.00	422	359
E20	128K	0	4	13,100	102.00	440	374
F01	160K	1	0	8,300	42.00	267	227
F02	160K	2	0	9,300	52.00	308	262
F03	160K	3	0	10,300	62.00	349	297
F04	160K	4	0	11,300	72.00	391	332
F05	160K	0	1	8,900	50.00	285	242
F06	160K	1	1	9,900	60.00	326	277
F07	160K	2	1	10,900	70.00	367	312
F08	160K	3	1	11,900	80.00	408	347
F10	160K	0	2	10,500	68.00	344	292
F11	160K	1	2	11,500	78.00	385	327
F12	160K	2	2	12,500	88.00	426	362
F15	160K	0	3	12,100	86.00	402	342
F16	160K	1	3	13,100	96.00	443	377
F20	160K	0	4	13,700	104.00	461	392

Special features for 5288 Programmable Control Unit:

1245	Attachment for one 480-character 5281 Data Station	0	0.00	0	0
1250	Attachment for one 960-character 5281 Data Station	100	0.50	6	5
1255	Attachment for one 1920-character 5281 Data Station	200	1.00	12	10
1260	Attachment for one 480-character 5282 Dual Data Station	100	0.50	6	5
1265	Attachment for one 960-character 5282 Dual Data Station	200	1.00	12	10
1270	Attachment for one additional 480-character 5281 (prerequisite: 1245 or 1260)	580	1.50	14	12
1275	Attachment for one additional 960-character 5281 (prerequisite: 1250 or 1265)	680	2.00	20	17
1280	Attachment for one additional 1920-character 5281 (prerequisite: 1255)	780	2.50	26	22
1285	Attachment for one additional 480-character 5282 (prerequisite: 1245 or 1260)	680	2.00	20	17
1290	Attachment for one additional 960-character 5282 (prerequisite: 1250 or 1265)	780	2.50	26	22
1300	Remote Diskette Drive Attachment, First (required for first and second remote drives when base 5288 has 1 or 2 drives)	190	0.50	6	5
1301	Remote Diskette Drive Attachment, Second (required for first and second remote drives when base 5288 has 3 or 4 drives, or for third and fourth remote drives when base 5288 has 1 or 2 drives)	860	4.00	24	20

*Rental and lease charges include maintenance.

**IBM 5280 Distributed Data System
 EQUIPMENT PRICES (Continued)**

		<u>Purchase Price</u>	<u>Monthly Maint.</u>	<u>Monthly Rental Charge*</u>	<u>Monthly Lease Charge (2-Yr. Lease)</u>
1302	Remote Diskette Drive Attachment, Third (required for third and fourth remote drives when base 5288 has 3 or 4 drives, or for fifth and sixth remote drives when base 5288 has 1 or 2 drives)	190	0.50	6	5
1155	Single 5225/5256 Printer Attachment (provides a single port for attaching from 1 to 5 printers via a single twinax cable)	480	1.50	12	10
1160	Multiple 5225/5256 Printer Attachment (provides 4 ports for attaching, via twinax cable, up to 5 printers)	670	2.50	18	15
4955	Magnetic Stripe Reader Adapter/Elapsed Time Counter (controls up to 4 Magnetic Stripe Readers on attached 5281 and/or 5282 data stations)	570	2.00	18	15
3610	Elapsed Time Counter	100	0.50	6	5
6340	Security Keylock	40	—	—	—
AUXILIARY DATA STATIONS					
5281	Data Station:				
Z00	With no diskette drive	2,035	13.00	59	50
Z01	With Diskette 1 drive	3,225	24.50	106	90
Z02	With two Diskette 1 drives	4,225	34.50	147	125
Z05	With one Diskette 2D drive	3,825	32.50	124	105
Z06	With one Diskette 1 and one Diskette 2D drive	4,825	42.50	165	140
Z10	With two Diskette 2D drives	5,425	50.50	182	155
5282	Dual Data Station:				
Z00	With no diskette drive	2,310	14.50	65	55
Z01	With one Diskette 1 drive	3,500	26.00	112	95
Z02	With two Diskette 1 drives	4,500	36.00	153	130
Z05	With one Diskette 2D drive	4,100	34.00	129	110
Z06	With one Diskette 1 and one Diskette 2D drive	5,100	44.00	171	145
Z10	With two Diskette 2D drives	5,700	52.00	188	160
Keyboards for 5281 and 5282 (one required for each operator position):					
4600	83-key EBCDIC Keyboard	350	4.00	13	11
4601	66-key Data Entry Keyboard	350	4.00	13	11
4602	66-key Data Entry Keyboard with Proof Arrangement	350	4.00	13	11
4603	83-key ASCII Keyboard	350	4.00	13	11
Special feature for 5281 and 5282:					
4950	Magnetic Stripe Reader	380	2.00	12	10
PRINTERS					
5225	Printer:				
Mdl. 1	280 lpm at 10 cpi; 195 lpm at 15 cpi	11,650	75.00	371	315
Mdl. 2	200 lpm at 10 cpi; 290 lpm at 15 cpi	13,450	106.00	424	360
Mdl. 3	490 lpm at 10 cpi; 355 lpm at 15 cpi	14,950	131.00	471	400
Mdl. 4	560 lpm at 10 cpi; 420 lpm at 15 cpi	16,350	155.00	518	440
5256	Printer:				
Mdl. 1	40 char/sec	5,200	34.50	188	160
Mdl. 2	80 char/sec	5,800	40.50	213	181
Mdl. 3	120 char/sec	6,250	48.50	231	197
Special features for 5225 and 5256 Printers:					
1470	Audible Alarm (signals operator when manual intervention is required due to one of nine error conditions)	50	—	—	—
2680	Cable Thru (permits multiple printers to be connected to a single twinax cable; required on each printer except the last)	115	1.00	4	3
4450	Forms Stand (for 5256 only)	54	—	—	—
COMMUNICATIONS					
2500	Communications Adapter (for 5285 or 5288 only)	900	9.00	53	45
3701	EIA Interface (provides RS-232C interface for an external modem)	330	1.00	13	11
5650	Digital Data Service Adapter; Point-to-Point	840	1.00	24	20
5651	Digital Data Service Adapter; Multipoint	840	1.00	24	20
5500	Integrated Modem, non-switched	660	3.50	19	16
5501	Integrated Modem, switched with auto answer	660	3.00	25	21
5502	Integrated Modem, switched without auto answer	660	3.00	19	16
5507	Integrated Modem, non-switched with SNBU manual answer	660	3.50	26	22
5508	Integrated Modem, non-switched with SNBU auto answer	840	4.00	29	25
5810	Power Supply Expansion (required on 5285 if 5501 or 5508 is installed)	70	1.00	4	3

*Rental and lease charges include maintenance.

SOFTWARE PRICES

	<u>Basic Monthly License Charge</u>
5280	System Control Programming (SCP)
5280	DE/RPG
5280	COBOL-OS/VS Host Compiler and Library
5280	COBOL-DOS/VSE Host Compiler and Library
5280	Communication Utilities
5280	Sort/Merge
5280	Utilities
5280	Assembler
	No charge
	\$ 8
	110
	110
	15
	8
	4
	25

IBM 5280 Distributed Data System**Product Enhancement**

The following enhancements to the 5280 Distributed Data Systems were announced by IBM's General Systems Division on January 19, 1981:

- **IBM 3270 emulation software and supporting hardware.** A new program product, the IBM 5280-3270 Emulation Licensed Program (5708-EM1), permits 5285 or 5288 terminals to emulate IBM 3270 devices, and provides for BSC batch transfer and BSC program interface.

The 3270 Emulation Communications Adapter (#3270) provides the hardware functions required by the new software, in addition to performing all the functions previously available with the #2500 Communications Adapter, with which it is mutually exclusive.

The 5280-3270 emulator program has a license fee of \$35 per month. The #3270 communications adapter is priced at \$1,885 (purchase) or \$73 per month (lease). Both are scheduled for delivery in June 1981.

- **Increased main storage capacities for the 5285 Programmable Display Station, the 5286 Dual Programmable Display Station, and the 5288 Programmable Control Unit.** Five new 5285 models offer a 96K-byte main storage capacity (previously the maximum was 64K bytes) and are designated Models D01, D02, D05, D06, and D10, depending on the type and number of diskette drives associated with each model (diskette offerings remain unchanged). Two new 5286 models, D02 and D10, also offer the new 96K-byte main storage capacity.

The 5288 is offered with two new main storage capacities, 224K and 288K bytes (designated as the H and J models, respectively), providing 28 new storage-plus-diskette combinations; the previous maximum was 160K bytes.

Purchase prices range from \$6,730 to \$9,015 for the five new 5285 models, from \$8,620 and \$9,870 for the two new 5286 models, and from \$9,855 to \$16,695 for the 28 new 5288 models. Leasing prices range from \$206 to \$276, from \$244 to \$276, and from \$284 to \$501, respectively. Deliveries are scheduled to begin in March 1981 for the new 5285 and 5286 models and in June 1981 for the new 5288 models.

- **A Second Applications Processor feature.** A second microprocessor (feature #6800) may be added to the 5285 (as long as the #2500 Communications Adapter is not configured), 5286, or 5288 to aid in improving performance in multiprogramming environments with heavy processor utilization. The second processor operates concurrently with the basic microprocessor and can be assigned to a specific partition or shared by all partitions along with the basic microprocessor. The purchase price for feature #6800 is \$1,190, and the lease charge is \$35 per month; deliveries are scheduled for June 1981.
- **A BSC Multipoint Monitor.** This feature permits 5280 terminals communicating in a BSC multipoint network to respond to host computer polling and selection without requiring a communications program to be loaded into main storage. The feature is provided as a part of the IBM 5280 Communications Utilities Licensed Program at no additional charge, and will be available in June 1981.
- **A new printer model, and expanded 5288 printer support.** The new Model 5224 printer is a tabletop, impact matrix printer that can be used with either the 5280 System or the System/34. It features standard 10-cpi horizontal spacing as well as a 15-cpi condensed printing capability, and prints at full speed regardless of character set size. The 5224 comes in two models that vary only in print speed (speeds shown are rated using the 10-cpi spacing): Model 1 has a print speed of 140 lpm; and Model 2, 240 lpm. Purchase prices are \$6,150 and \$7,000, respectively. Deliveries are scheduled to begin in November 1981.

In addition, the maximum number of printers that can be supported by the 5288 Control Unit was increased from five to eight. The upgrade is provided by the 5280 System Control Programming at no additional charge, and is available immediately. □

IBM 5280 Distributed Data System**PRODUCT DESCRIPTION**

The following enhancements to the 5280 Distributed Data Systems were announced by IBM's General Systems Division on January 19, 1981:

- *IBM 3270 emulation software and supporting hardware*—A new program product, the IBM 5280-3270 Emulation Licensed Program (5708-EM1), permits 5285 or 5288 terminals to emulate IBM 3270 devices, and provides for BSC batch transfer and BSC program interface.

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The 5288 is offered with two new main storage capacities, 224K and 288K bytes (designated as the H and J models, respectively), providing 28 new storage-plus-diskette combinations; the previous maximum was 160K bytes.

Purchase prices range from \$6,730 to \$9,015 for the five new 5285 models, from \$8,620 to \$9,870 for the two new 5286 models, and from \$9,855 to \$16,695 for the 28 new 5288 models. Leasing prices range from \$206 to \$276, from \$244 to \$276, and from \$284 to \$501, respectively. Deliveries are scheduled to begin in March 1981 for the new 5285 and 5286 models and in June 1981 for the new 5288 models.

- *A Second Applications Processor feature*—A second microprocessor (feature #6800) may be added to the

PRODUCT ANNOUNCEMENT: New communications features, increased main storage, improved processing power, a new printer model, and expanded printer support for the IBM 5280 family.

ANNOUNCEMENT DATE: January 19, 1981 (Atlanta, Georgia).

DELIVERY SCHEDULE: Most new features are planned for delivery in March and June 1981; see "Product Description" for specific feature schedules.

5285 (as long as the #2500 Communications Adapter is not configured), 5286, or 5288 to aid in improving performance in multiprogramming environments with heavy processor utilization. The second processor operates concurrently with the basic microprocessor and can be assigned to a specific partition or shared by all partitions along with the basic microprocessor. The purchase price for feature #6800 is \$1,190, and the lease charge is \$35 per month; deliveries are scheduled for June 1981.

- *A BSC Multipoint Monitor*—This feature permits 5280 terminals communicating in a BSC multipoint network to respond to host computer polling and selection without requiring a communications program to be loaded into main storage. The feature is provided as a part of the IBM 5280 Communications Utilities Licensed Program at no additional charge, and will be available in June 1981.
- *A new printer model, and expanded 5288 printer support*—The new Model 5224 printer is a tabletop, impact matrix printer that can be used with either the 5280 System or the System/34. It features standard 10-cpi horizontal spacing as well as a 15-cpi condensed printing capability, and prints at full speed regardless of character set size. The 5224 comes in two models that vary only in print speed (speeds shown are rated using the 10-cpi spacing): Model 1 has a print speed of 140 lpm; and Model 2, 240 lpm. Purchase prices are \$6,150 and \$7,000, respectively. Deliveries are scheduled to begin in November 1981.

In addition, the maximum number of printers that can be supported by the 5288 Control Unit was increased from five to eight. The upgrade is provided by the 5280 System Control Programming at no additional charge, and is available immediately. □

IBM 5280 Distributed Data System

► data streams can be directed to either a printer or diskette, while punch data streams are directed to diskette. SNA support on the host computer is via ACF/VTAM and ACF/NCP/VS to RES, JES2, JES3, and VSE/POWER. The minimum main storage requirement on the 5280 is 64K bytes.

The Multi-Leaving Remote Job Entry (MRJE) facility permits the 5280 system to function as an RJE terminal with full multi-leaving support for concurrent device operation of one console, one reader, one punch, and one printer. Printer data streams can be directed to either a printer or diskette, while punch data streams are directed to diskette. BSC support on the host computer treats the 5280 as a System/3 MRJE workstation for RES, JES2, and JES3. The minimum main storage requirement is 48K bytes on a 5285 or 64K bytes on a 5288.

The Communications Configuration and Job Description program is used to prepare communications environments via job step prompts. Descriptions are stored on diskette by job name, and are used to initiate the communications link with the host computer or another terminal. Initiation of the link with the host may be either dynamic or predetermined for operator convenience.

COMPONENTS

DISPLAY: A standard component of the 5281 Data Station, 5282 Dual Data Station, 5285 Programmable Data Station, and 5286 Dual Programmable Data Station. Display capacities for each model are as follows:

Model	480 chars.	960 chars.	1920 chars.
5281	Std.	Opt.	Opt.
5282	Std.	—	—
5285	Opt.	Opt.	Opt.
5286	Opt.	Opt.	—

Display capacity for Models 5285 and 5286 is determined by the attachment feature selected on the controlling device. Models 5282 and 5286 provide a single split-screen display, with the indicated display capacity supported at each of the two operator positions. The display arrangement is 6, 12, and 24 lines of 80 characters for the 480-, 960-, and 1920-character capacities, respectively. Characters are formed within an 8-by-16 dot matrix character cell. A user-selectable choice of 94-character (upper/lower case) EBCDIC, 94-character ASCII, or 185-character Multinational character sets is provided. Program-controlled screen attributes include reverse video, high intensity, blinking, underlining, nondisplay (blanking), and column separation.

KEYBOARD: A required component of the 5281, 5282, 5285, and 5286. Dual station models (5282 and 5286) require two keyboards. Four keyboard types are offered: 83-key EBCDIC typewriter, 83-key ASCII typewriter, 66-key data entry, and 66-key data entry with proof arrangement. Each keyboard is movable and includes data keys, cursor movement keys, special function keys, and field edit keys.

MAGNETIC STRIPE READER: An optional feature for the 5281, 5282, 5285, or 5286. Up to 128 A.B.A. numeric characters, including control characters, can be read from a magnetic stripe on credit cards, identification cards, and other documents.

DISKETTE DRIVES: Two types of diskette drives are available for any 5280 system in any combination: a drive that can read and write only the IBM Diskette 1 format, and a drive that can read and write the IBM Diskette 1, 2, and 2D formats. (The latter is referred to as a Diskette 2D drive.) The on-line data capacity of each drive can range from 246K

bytes to 1.2 megabytes depending upon the recording format in use, as tabulated below.

Diskette Type	Format	Bytes per Sector	Capacity, Bytes
1	1	128	246K
	2	256	284K
	3	512	303K
2	4	128	492K
	5	256	568K
	6	512	606K
2D	7	128	985K
	8	256	1136K
	9	512	1212K

For exchanging diskette data between the 5280 and other systems, IBM supports the following exchange types: Basic Exchange, in formats 1 and 4; H Exchange, in format 7 only; and I Exchange, in all of the above formats. Diskettes can be interchanged with the IBM Series/1, System/3, System/32, System/34, System/38, System/370, 303X, 4300, 3540, 3740, 3747, 3770, 3790, 5110, 5230, 5260, 8100, and other systems and devices that support a compatible diskette exchange type.

Diskette data transfer rates are 31,250 bytes/second in Diskette 1 or Diskette 2 mode and 62,500 bytes/second in Diskette 2D mode. The rotational speed is 360 rpm for both types of drives.

MODEL 5225 LINE PRINTER: A wire matrix line printer that connects to the 5285 or 5288 via twinax cabling at a distance of up to 5000 feet. Horizontal spacing of 10 or 15 characters per inch and vertical spacing of 6 or 8 lines per inch is operator-selectable. Maximum line width is 132 characters at 10 char./inch and 198 characters at 15 char./inch. A choice of 95-character EBCDIC, 184-character Multinational (including ASCII graphics), or 95-character Spanish-speaking character sets is provided. Characters are formed by a 7-by-8 dot matrix. A forms tractor is standard. Forms skipping is program-controlled. Four models are available and differ only in their rated print speeds: at 10 char./inch, Model 1 prints at 280 lpm, Model 2 at 400 lpm, Model 3 at 490 lpm, and Model 4 at 560 lpm; at 15 char./inch, Model 1 prints at 195 lpm, Model 2 at 290 lpm, Model 3 at 355 lpm, and Model 4 at 420 lpm.

MODEL 5256 SERIAL PRINTER: A bidirectional serial matrix printer that connects to the 5285 or 5288 via twinax cabling at a distance of up to 5000 feet. Horizontal spacing is 10 characters per inch. Vertical spacing is operator-selectable at 6 or 8 lines per inch. Maximum line width is 132 characters. A 96-character (upper/lower case) EBCDIC character set is standard; a Multinational character set is also available. A forms tractor and a cut-forms capability are standard. Three models are available and differ only in their rated print speeds: Model 1 prints at 40 cps, Model 2 at 80 cps, and Model 3 at 120 cps.

PRICING

IBM offers the 5280 system on a purchase, 24-month lease, or rental basis. The warranty period is three months. The standard IBM lease or rental contract entitles the customer to unlimited usage each month. Prime-shift maintenance is included in the lease or rental price. The purchase option accrual equals 45 percent of the monthly charge up to 50 percent of the purchase price. IBM's standard educational allowance of 10 percent applies to the 5280 system for lease, rental, and purchase customers. ►

IBM 5280 Distributed Data System

► For purchased, leased or rented systems, the 5280 system is under maintenance group D. The minimum period of maintenance service is 9 consecutive hours between 7:00 a.m. and 6:00 p.m. Monday through Friday. Charges for maintenance coverage outside this period are based upon the following percentages of the minimum monthly maintenance charge (MMC) added to the MMC:

		Consecutive hours				
		9*	12	16	20	24
Saturday (until 8:00 a.m. Sunday)		4	5	7	8	9
Sunday (until 8:00 a.m. Monday)		5	7	9	11	12

*Outside of the hours 7:00 to 6:00 p.m.

For users without a maintenance contract, the 5280 system is maintained under per-call class 2. Under this class the per call charge during regular hours is \$77.00 per hour, and during off hours the charge is \$89.00 per hour. The hourly rate for systems engineering service is \$57.00

		Consecutive hours				
		9*	12	16	20	24
Monday-Friday (until 8:00 a.m. Saturday)		10	12	14	16	18

EQUIPMENT PRICES

		Purchase Price	Monthly Maint.	Monthly Rental Charge*	Month Lease Cf (2-Yr. Le
PROGRAMMABLE DATA STATIONS					
5285	Programmable Data Station:				
A01	With 32K and one Diskette 1 drive	\$5,730	\$44.00	\$211	\$
A02	With 32K and two Diskette 1 drives	6,815	54.50	258	
A05	With 32K and one Diskette 2D drive	6,378	52.50	232	
A06	With 32K, one Diskette 1, and one Diskette 2D drive	7,433	63.00	279	
A10	With 32K and two Diskette 2D drives	8,111	71.50	300	
B01	With 48K and one Diskette 1 drive	6,164	45.00	226	
B02	With 48K and two Diskette 1 drives	7,249	55.50	273	
B05	With 48K and one Diskette 2D drive	6,812	53.50	247	
B06	With 48K, one Diskette 1, and one Diskette 2D drive	7,897	64.00	294	
B10	With 48K and two Diskette 2D drives	8,545	72.50	315	
C01	With 64K and one Diskette 1 drive	6,377	46.00	235	
C02	With 64K and two Diskette 1 drives	7,462	56.50	282	
C05	With 64K and one Diskette 2D drive	7,025	54.50	255	
C06	With 64K, one Diskette 1, and one diskette 2D drive	8,110	65.00	303	
C10	With 64K and two Diskette 2D drives	8,758	73.50	324	
5286	Dual Programmable Data Station:				
A02	With 32K and two Diskette 1 drives	7,702	50.50	258	
A10	With 32K and two Diskette 2D drives	8,998	67.00	300	
B02	With 48K and two Diskette 1 drives	8,136	51.50	273	
B10	With 48K and two Diskette 2D drives	9,432	68.50	315	
C02	With 64K and two Diskette 1 drives	8,349	52.50	282	
C10	With 64K and two Diskette 2D drives	9,645	69.50	324	
Keyboards for 5285 and 5286 (one required for each operator position):					
4600	83-key EBCDIC Keyboard	365	4.00	14	
4601	66-key Data Entry Keyboard	365	4.00	14	
4602	66-key Data Entry Keyboard with Proof Arrangement	365	4.00	14	
4603	83-key ASCII Keyboard	365	4.00	14	
Special features for 5285 and 5286 (except as noted):					
3500	960-Character Display Size (for 5285 only)	108	1.00	6	
3501	1920-Character Display Size (for 5285 only)	200	0.50	12	
1150	5225/5256 Printer Attachment (for 5285 only)	520	2.00	14	
1200	Attachment for one 480-character 5281 Data Station	629	2.00	16	
1205	Attachment for one 960-character 5281 Data Station (for 5285 only)	738	2.50	22	
1210	Attachment for one 1920-character 5281 Data Station (for 5285 only)	846	3.00	31	
1215	Attachment for one 480-character 5282 Dual Data Station	738	2.50	22	
1220	Attachment for one 960-character 5282 Dual Data Station (for 5285 only)	846	3.00	31	
1240	Remote Diskette Drive Attachment (required if an attached 5281 or 5282 has either 1 or 2 diskette drives)	205	1.00	6	
4950	Magnetic Stripe Reader (4955 or 4960 is a prerequisite)	412	2.50	14	
4955	Magnetic Stripe Reader Adapter/Elapsed Time Counter (for 5286 or non-communicating 5285)	618	2.50	20	
4960	Magnetic Stripe Reader Adapter/Elapsed Time Counter (for communicating 5285)	247	1.00	7	
3610	Elapsed Time Counter (measures elapsed real time)	108	1.00	6	
6340	Security Keylock	41	—	41	

PROGRAMMABLE CONTROL UNITS

5288	Programmable Control Unit:						
	Submodel	Bytes of Main Storage	Diskette 1 Drives	Diskette 2D Drives			
	A01	32K	1	0	6,403	35.50	209
	A02	32K	2	0	7,488	46.00	256
	A03	32K	3	0	8,573	57.00	303
	A04	32K	4	0	9,658	68.00	350
	A05	32K	0	1	7,051	43.00	230
	A06	32K	1	1	8,136	54.00	277
	A07	32K	2	1	9,221	65.00	324
	A08	32K	3	1	10,306	76.00	371

*Rental and lease charges include maintenance.

IBM 5280 Distributed Data System

EQUIPMENT PRICES (Continued)

Submodel	Bytes of Main Storage	Diskette 1 Drives	Diskette 2D Drives	Purchase Price	Monthly Maint.	Monthly Rental Charge*	Monthly Lease Charge (2-Yr. Lease)*
Programmable Control Unit: (Continued)							
A10	32K	0	2	\$ 8,784	\$ 62.00	\$298	\$256
A11	32K	1	2	9,869	73.00	345	296
A12	32K	2	2	10,954	84.00	392	336
A15	32K	0	3	10,517	81.00	366	314
A16	32K	1	3	11,602	92.00	413	354
A20	32K	0	4	12,250	100.00	434	372
C01	64K	1	0	7,050	37.00	233	200
C02	64K	2	0	8,135	48.00	280	240
C03	64K	3	0	9,220	59.00	327	280
C04	64K	4	0	10,305	70.00	374	320
C05	64K	0	1	7,698	45.00	254	218
C06	64K	1	1	8,783	56.00	301	258
C07	64K	2	1	9,868	67.00	348	298
C08	64K	3	1	10,953	78.00	395	338
C10	64K	0	2	9,431	64.00	322	276
C11	64K	1	2	10,516	75.00	369	316
C12	64K	2	2	11,601	86.00	416	356
C15	64K	0	3	11,164	83.00	390	334
C16	64K	1	3	12,249	94.00	437	374
C20	64K	0	4	12,897	102.00	458	392
D01	96K	1	0	7,697	39.00	257	220
D02	96K	2	0	8,782	50.00	304	260
D03	96K	3	0	9,867	61.00	351	300
D04	96K	4	0	10,952	72.00	398	340
D05	96K	0	1	8,345	47.00	278	238
D06	96K	1	1	9,430	58.00	325	278
D07	96K	2	1	10,515	69.00	372	318
D08	96K	3	1	11,600	80.00	419	358
D10	96K	0	2	10,078	66.00	346	296
D11	96K	1	2	11,163	77.00	393	336
D12	96K	2	2	12,248	88.00	440	376
D15	96K	0	3	11,811	85.00	414	354
D16	96K	1	3	12,896	96.00	461	394
D20	96K	0	4	13,544	104.00	482	412
E01	128K	1	0	8,344	41.00	281	240
E02	128K	2	0	9,429	52.00	328	280
E03	128K	3	0	10,514	63.00	375	320
E04	128K	4	0	11,559	74.00	422	360
E05	128K	0	1	8,992	49.00	302	258
E06	128K	1	1	10,077	60.00	349	298
E07	128K	2	1	11,162	71.00	396	338
E08	128K	3	1	12,247	82.00	443	378
E10	128K	0	2	10,275	68.00	370	316
E11	128K	1	2	11,810	79.00	417	356
E12	128K	2	2	12,895	90.00	464	396
E15	128K	0	3	12,458	87.00	438	374
E16	128K	1	3	13,543	98.00	485	414
E20	128K	0	4	14,191	106.00	506	432
F01	160K	1	0	8,991	43.00	305	260
F02	160K	2	0	10,076	54.00	352	300
F03	160K	3	0	11,161	65.00	399	340
F04	160K	4	0	12,246	76.00	446	380
F05	160K	0	1	9,639	51.00	326	278
F06	160K	1	1	10,724	62.00	373	318
F07	160K	2	1	11,809	73.00	420	358
F08	160K	3	1	12,894	84.00	467	398
F10	160K	0	2	11,732	70.00	394	336
F11	160K	1	2	12,457	81.00	441	376
F12	160K	2	2	13,542	92.00	488	416
F15	160K	0	3	13,105	89.00	462	394
F16	160K	1	3	14,190	100.00	509	434
F20	160K	0	4	14,838	109.00	530	452

Special features for 5288 Programmable Control Unit:

1245	Attachment for one 480-character 5281 Data Station	0	0.00	0	0
1250	Attachment for one 960-character 5281 Data Station	108	1.00	6	5
1255	Attachment for one 1920-character 5281 Data Station	217	1.50	14	12
1260	Attachment for one 480-character 5282 Dual Data Station	108	1.00	6	5
1265	Attachment for one 960-character 5282 Dual Data Station	217	1.50	14	12
1270	Attachment for one additional 480-character 5281 (prerequisite: 1245 or 1260)	629	2.00	16	14
1275	Attachment for one additional 960-character 5281 (prerequisite: 1250 or 1265)	738	2.50	22	19
1280	Attachment for one additional 1920-character 5281 (prerequisite: 1255)	846	3.00	31	26
1285	Attachment for one additional 480-character 5282 (prerequisite: 1245 or 1260)	738	2.50	22	19
1290	Attachment for one additional 960-character 5282 (prerequisite: 1250 or 1265)	846	3.00	31	26
1300	Remote Diskette Drive Attachment, First (required for first and second remote drives when base 5288 has 1 or 2 drives)	205	1.00	6	5
1301	Remote Diskette Drive Attachment, Second (required for first and second remote drives when base 5288 has 3 or 4 drives, or for third and fourth remote drives when base 5288 has 1 or 2 drives)	933	4.50	28	24

*Rental and lease charges include maintenance.

IBM 5280 Distributed Data System
EQUIPMENT PRICES (Continued)



		<u>Purchase Price</u>	<u>Monthly Maint.</u>	<u>Monthly Rental Charge*</u>	<u>Monthly Lease Charge (2-Yr. Leas</u>
1302	Remote Diskette Drive Attachment, Third (required for third and fourth remote drives when base 5288 has 3 or 4 drives, or for fifth and sixth remote drives when base 5288 has 1 or 2 drives)	\$ 205	\$ 1.00	\$ 6	\$ 5
1155	Single 5225/5256 Printer Attachment (provides a single port for attaching from 1 to 5 printers via a single twinax cable)	520	2.00	14	12
1160	Multiple 5225/5256 Printer Attachment (provides 4 ports for attaching, via twinax cable, up to 5 printers)	726	3.00	20	17
4955	Magnetic Stripe Reader Adapter/Elapsed Time Counter (controls up to 4 Magnetic Stripe Readers on attached 5281 and/or 5282 data stations)	618	2.50	20	17
3610	Elapsed Time Counter	108	1.00	6	5
6340	Security Keylock	41	—	—	—

AUXILIARY DATA STATIONS

5281	Data Station:				
Z00	With no diskette drive	2,207	13.50	68	59
Z01	With Diskette 1 drive	3,497	25.50	121	104
Z02	With two Diskette 1 drives	4,582	36.00	168	144
Z05	With one Diskette 2D drive	4,145	34.00	142	122
Z06	With one Diskette 1 and one Diskette 2D drive	5,230	44.50	189	162
Z10	With two Diskette 2D drives	5,878	53.00	210	180
5282	Dual Data Station:				
Z00	With no diskette drive	2,504	15.00	74	63
Z01	With one Diskette 1 drive	3,794	27.50	127	108
Z02	With two Diskette 1 drives	4,879	38.00	174	148
Z03	With one Diskette 2D drive	4,260	35.50	139	118
Z06	With one Diskette 1 and one Diskette 2D drive	5,527	46.00	194	166
Z10	With two Diskette 2D drives	6,175	54.50	216	184
Keyboards for 5281 and 5282 (one required for each operator position):					
4600	83-key EBCDIC Keyboard	365	4.00	14	12
4601	66-key Data Entry Keyboard	365	4.00	14	12
4602	66-key Data Entry Keyboard with Proof Arrangement	365	4.00	14	12
4603	83-key ASCII Keyboard	365	4.00	14	12

Special feature for 5281 and 5282:

4950	Magnetic Stripe Reader	412	2.50	14	12
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PRINTERS

5225	Printer:				
Mdl. 1	280 lpm at 10 cpi; 195 lpm at 15 cpi	12,230	79.00	431	367
Mdl. 2	200 lpm at 10 cpi; 290 lpm at 15 cpi	14,120	111.00	492	419
Mdl. 3	490 lpm at 10 cpi; 355 lpm at 15 cpi	15,690	137.00	548	466
Mdl. 4	560 lpm at 10 cpi; 420 lpm at 15 cpi	17,160	162.00	602	512
5256	Printer:				
Mdl. 1	40 char/sec	4,430	35.00	202	172
Mdl. 2	80 char/sec	4,640	38.00	229	195
Mdl. 3	120 char/sec	4,850	43.00	249	212

Special features for 5225 and 5256 Printers:

1470	Audible Alarm (signals operator when manual intervention is required due to one of nine error conditions)	50	—	—	—
2680	Cable Thru (permits multiple printers to be connected to a single twinax cable; required on each printer except the last)	115	1.00	4	3
4450	Forms Stand (for 5256 only)	54	—	—	—

COMMUNICATIONS

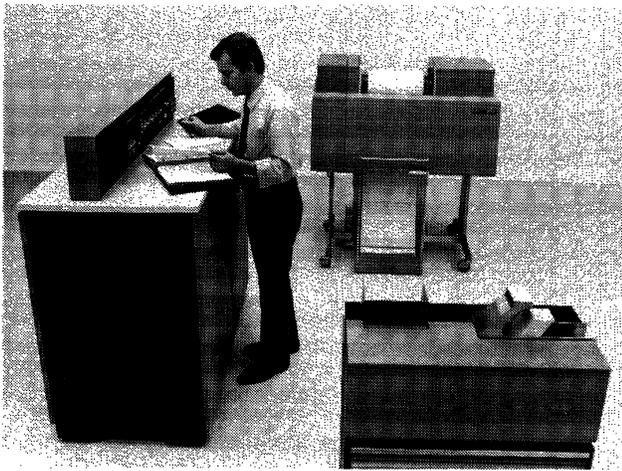
2500	Communications Adapter (for 5285 or 5288 only)	977	9.50	62	53
3701	EIA Interface (provides RS-232C interface for an external modem)	358	1.50	15	13
5650	Digital Data Service Adapter; Point-to-Point	840	1.50	28	24
5651	Digital Data Service Adapter, Multipoint	840	1.50	28	24
5500	Integrated Modem, non-switched	660	4.00	21	18
5501	Integrated Modem, switched with auto answer	716	3.50	29	25
5502	Integrated Modem, switched without auto answer	660	3.50	21	18
5507	Integrated Modem, non-switched with SNBU manual answer	716	4.00	31	26
5508	Integrated Modem, non-switched with SNBU auto answer	911	4.50	34	29
5810	Power Supply Expansion (required on 5285 if 5501 or 5508 is installed)	76	1.50	4	3

*Rental and lease charges include maintenance.

SOFTWARE PRICES

	<u>Basic Monthly License Charge</u>
5708-SC1	System Control Programming (SCP)
5708-DE1	DE/RPG
5708-CB1	COBOL-OS/VSE Host Compiler and Library
5708-CB2	COBOL-DOS/VSE Host Compiler and Library
5708-DC1	Communication Utilities
5708-SM1	Sort/Merge
5708-UT1	Utilities
5708-AS1	Assembler
5708-EM1	5280-3270 Emulation
	No charge
	\$ 9
	126
	126
	17
	9
	5
	29
	35■

IBM 2922 Programmable Terminal



This view of the 2922 Programmable Terminal clearly indicates its 360/20 origins. The controller is at left, with 500-cpm card reader in the foreground and 500-lpm chain printer at rear.

MANAGEMENT SUMMARY

The IBM System/360 Model 20 has been called one of the best high-speed remote batch terminals ever built. But it has never been called cheap. The 2922, when announced in late April 1972, eliminated that last criticism. Well, perhaps it did not make a unit with the processing power of a Model 20 cheap, but it did at least make it more competitive. Depending on configuration and leasing plan, the 2922 is 25 to 40 percent less expensive than the equivalent Model 20.

The advantages of using a Model 20 as a remote batch terminal include the availability of a processing element that makes interleaved transmission and reception possible (under HASP), the capability for a significant amount of off-line processing, and—very significantly—the reliability of the 1403 printer for continuous high-speed operation. Within limits, the 2922 provides the same advantages at a substantially lower cost.

The limits imposed on the 2922 involve the severely restricted configuration possibilities of the 2922 in comparison with the Model 20. Magnetic tape and disk peripherals, as well as memory expansion beyond the 8K included in the basic unit, are specifically excluded. It is not difficult to figure out why. If these extensions were allowed, many users would be likely to trade in their existing Model 20's, ignore the communications interface, and leave IBM with reduced revenues.

Even in the reduced 8K configuration, IBM provides a useful complement of software. The CPS RPG compiler and Basic Assembler can be used. The addition of a card punch (announced shortly after the original 2922) permits generation of object program decks.

At the reduced price, the 2922 is still not price-competitive with the many remote batch terminals offered by ➤

A programmable, remote batch terminal similar to the IBM System/360, Model 20, with limited configuration capability, but considerable less cost.

The specialized system consists of programmable controller, 500 cpm card reader, 500 lpm printer and BSC communications interface. Options include printer/keyboard, card punch and magnetic character reader.

Transmission is half-duplex at speeds from 2000 bps to 9600 bps over DDD or leased lines using bisynchronous line discipline and either EBCDIC or ASCII code.

A basic system of controller, printer and card reader rents for \$1,829 per month, including monthly maintenance, on IBM's short term plan.

CHARACTERISTICS

VENDOR: International Business Machines Corporation, Data Processing Division, 1133 Westchester Avenue, White Plains, New York 10604. Telephone: (914) 696-1900.

DATE OF ANNOUNCEMENT: April 1972.

DATE OF FIRST DELIVERY: May 1972.

NUMBER DELIVERED TO DATE: Information not available.

SERVICED BY: IBM.

CONFIGURATION

The 2922 terminal consists of a 500-cpm card reader, a 500-lpm line printer, a BSC communications interface, and a programmable controller (processor) with 8,192 bytes of core storage. Optionally, a 2152 Printer-Keyboard and/or a 1442 Model 5 Card Punch can be added. Other peripheral options include a 1403-N1 Printer and a 1255-1, -2, or -3 or 1419 Magnetic Character Reader.

TRANSMISSION SPECIFICATIONS

Transmission is half-duplex at a speed of 2000, 2400, 4800, 7200, or 9600 bits per second over the public telephone network or a leased voice-band line, using IBM's bisync (BSC) communications line discipline. Transmission code can be ASCII or EBCDIC, and transparency is available for either. The interface is the standard EIA RS-232B. IBM, common-carrier, or independent modems can be used. The 2922 can communicate with an appropriately equipped IBM System/360 or System/370 computer or point-to-point with another 2922. The specific line conditioning required for a particular speed, or the speed attainable on the switched network, is a function of the modem selected. IBM modems are available to support speeds of up to 2400 bps on the switched network and 7200 bps on a leased line with C2 conditioning. See Tab C33 Modems in Volume 3 for details on these and other independent modems as well as common-carrier modems. ➤

IBM 2922 Programmable Terminals

▷ independent manufacturers. In its basic form, with processor, card reader, and printer, the 2922 leases for \$1,557 per month under the Extended Term plan. Adding the 2152 Printer-Keyboard and 1442 Card Punch adds another \$582 per month. For users who plan to run their terminal continuously or to also use it heavily for off-line processing, the 2922 may be a good choice. Users with lower transmission volumes, who are considering batch terminals mainly to reduce connect times, are likely to find other terminals more attractive, including IBM's own 3780.

The preceding discussion and the Characteristics section of this report are predicated on the limited information released by IBM on the 2922. Its status as an RPQ item hinders a full discussion. Changes, additions, and special concessions are also possible with small public evidence. This is in no way a denigration of IBM's policies. The 2922 is a specialized unit for a specialized market. It represents the way IBM responds to such specialized requests.

USER REACTION

In Datapro's latest survey of remote batch terminal users, conducted in November 1975, 22 users reported on their experience with a total of 42 IBM 2922 Programmable Terminals. Their ratings, which follow, indicate a high degree of satisfaction with all aspects of the 2922.

	<u>Excellent</u>	<u>Good</u>	<u>Fair</u>	<u>Poor</u>	<u>WA*</u>
Overall performance	10	12	0	0	3.5
Ease of operation	12	9	1	0	3.5
Hardware reliability	11	10	1	0	3.5
Maintenance service	9	9	3	1	3.2
Software and technical support	7	12	3	0	3.2

*Weighted Average on a scale of 4.0 for Excellent.

All but one of the respondents were operating in point-to-point fashion over leased lines at speeds of 4800, 7200, or 9600 bps; the other user reported multipoint operations.

A total of 13 users responded to our questions about data volumes. Their answers highlight the principal value of the 2922 to many users: reliable high-speed printing. The average print volume for the 13 users was 268K lines per day per terminal, and that's a lot. Two users reported volumes under 10,000 lines per day. The other 11 reported print volumes ranging from 50,000 to 750,000 lines per day per terminal. Transmission volumes averaged only about 30,000 records per day. Punched output volumes averaged about 7000 cards per day, excluding the four users who reported no output punching at all.

About half the users commented on specific advantages and disadvantages of the 2922. Ease of operation (4), IBM service and support (4), equipment reliability (3), use of standard IBM peripherals, benefits of a single-vendor system, and availability of short-term rental were all cited as advantages. Cost, limited number of peripherals, and the inability to punch off-line were cited as disadvantages. Only one user complained about a specific equipment problem: his 1442-5 punch was troublesome. □

▶ DEVICE CONTROL

The 2922 executes all operations under the direction of stored programs and is software-supported by BTAM under OS or DOS and by TCAM and HASP under OS. When communicating, operator tasks are limited to the selection of a specific operation, entering data, and initiating automatic diagnostic checking in the event of malfunctions. The communications task fully occupies the processor, and additional concurrent data processing is not possible. However, the full facilities of a System/360 Model 20 of equivalent configuration can be used off-line. Included in these facilities are an RPG compiler, an assembler, and various utility routines. RPG programs can be compiled and executed with or without generation of an object deck. Assembly-language programs require object deck generation. The 2152 Printer-Keyboard can be used as a control console for the remote batch entry function and for output of status and error messages. Without the 2152, some error conditions are displayed only by console register readouts.

COMPONENTS

PROCESSOR: The 2922-1 Controller is a reworked IBM System/360 Model 20. (It probably started out as a Submodel 2.) Report 70C-491-02 is an extensive discussion of the System/360 Model 20; please refer to it for additional information on the processor.

CARD READER: The 2922-3 Card Reader strongly resembles a 2501 Model B1. It operates at a peak speed of 500 80-column cards per minute. The hopper and stacker capacities are 1200 and 1300 cards, respectively. The column binary read feature is standard. In this mode, the 12 rows of a card column are treated as two 6-bit characters, which are stored in the low-order bits of 2 bytes; the 2 high-order bits are forced to zero.

PRINTER: The standard 2922-2 Printer appears to be a 1403 Model 2. It operates at a peak speed of 500 lines per minute with a line width of 132 positions. The character set includes the 60 graphics of the PL/1-60 set. It prints at a horizontal pitch of 10 characters per inch and can produce copy readable by any IBM OCR unit. Vertical spacing is 6 or 8 lines per inch, manually changeable by the operator. Vertical format is controlled via a 12-channel tape loop mechanism.

The optional 1403-N1 Printer prints 132 print columns at a rated speed of 1100 lines/minute (or up to 1400 lpm with the Universal Character Set). The standard character set contains 48 symbols including upper case alphabets, numerics, and 12 special characters. The Universal Character Set, a no-charge option, permits printing up to 240 different characters. Horizontal and vertical spacing and vertical format control are the same as for the 2922-2 Printer.

2152 PRINTER-KEYBOARD: This unit is an IBM Selectric I/O typewriter rated at 15.5 characters per second. It includes an 88-character set of graphics and can print up to 125 characters per line. A pin-feed platen is standard, and a friction-feed platen is also available. Attachment of the 2152 requires an adapter.

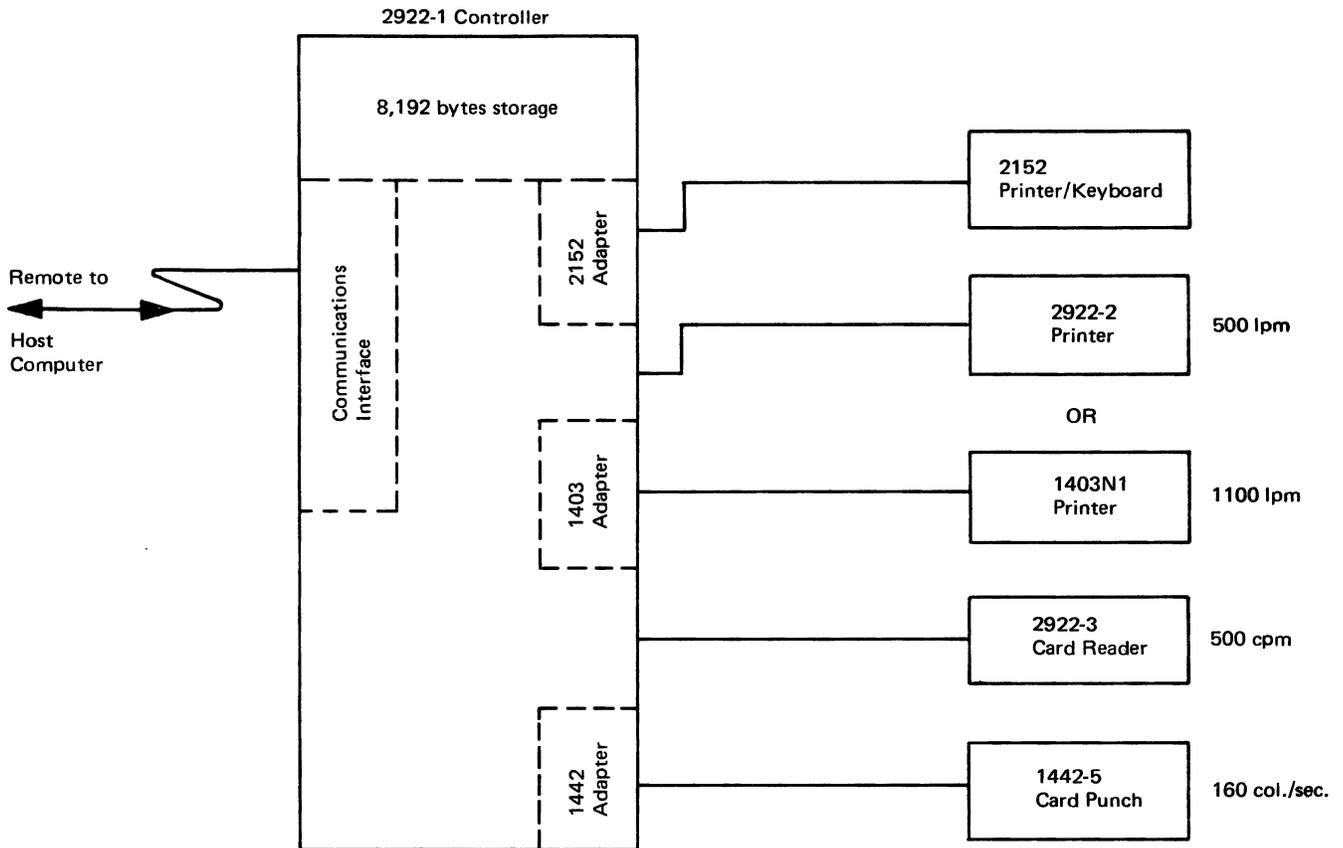
CARD PUNCH: The 1442 Model 5 Card Punch can be attached via an adapter. It operates serially at a nominal rate of 160 columns per second. This is equivalent to 91 fully punched cards per minute or 265 cards per minute if only the first 10 columns are punched. Hopper and stacker capacities are 1200 and 1300 cards, respectively. The unit cannot produce column binary punched cards.

PRICING

The IBM 2922 is available for purchase or on either a month-by-month or 24-month Extended Term leasing arrangement. All rental/leasing plans include maintenance. A separate maintenance contract is available for purchased equipment. ▶

IBM 2922 Programmable Terminals

Configuration



Monthly Rental*

	Short Term	Ex- tended Term	Purchase	Monthly Maint.
2922-1 Controller	\$915	\$779	\$27,670	\$ 94.00
2922-2 Printer	758	645	16,860	175.00
2922-3 Card Reader	156	133	4,350	36.00

Options

2152 Adapter	95	81	2,970	4.50
2152 Printer-Keyboard	146	—	5,745	72.50
1442 Adapter	65	55	2,830	5.50
1442 Model 5 Card Punch	276	—	13,360	57.00
1403-N1 Attachment	61	52	1,850	2.00
1403-N1 Printer	946	795	36,680	216.00
Serial I/O Channel**	109	93	3,845	7.00
Transparency (EBCDIC/ASCII)	18	18	550	0.50

Monthly Rental*

	Short Term	Ex- tended Term	Purchase	Monthly Maint.
BSC Adapter, 9600 bps 48-Character Set (2922-2)	0	0	0	0
Hammers (1403-N1)—	42	36	1,285	0
	72***	72***	72	—

Wide, group of four****

- * Includes monthly maintenance.
- ** Required for attaching the 1255 or 1419 Character Reader.
- *** One-time charge.
- **** An RPQ item for the 1403-N1 Printer; this incremental group of 4 hammers, each 0.098-inch wide, replaces the standard 0.082-inch wide 1403 N1 print hammers. ■

IBM 5280 Distributed Data System

MANAGEMENT SUMMARY

UPDATE: *This report has been updated to include new pricing information, additional competitive information, and product advantages and restrictions. While purchase prices for most units and features have remained the same since the last update, IBM has increased the rental prices and monthly maintenance charges on most items. Leasing is no longer available on the 5280 system.*

The 5280 now operates with a System/36, S/370, as well as 3704, 3705, or 3725 controllers. Users can attach IBM 38XX modems and 3845/3846 data encryption units to the system. Three of the five 1200 bps integrated modems—Models 5500, 5502, and 5502—have been discontinued.

The 5280 Distributed Data Processing System was introduced by IBM in January 1980. Originally a product of the now-defunct General Systems Division, the 5280 system consists of a family of diskette-based intelligent terminals that can be programmed to enter, validate, store, process, and print business information at the point of origin. ➤



The 5280 Distributed Data System is a diskette-based DDP system designed for applications such as intelligent data entry, batch and interactive communications, batch processing, and transaction processing. A variety of software is available for the 5280 system, including 3270 emulation.

The 5280 Distributed Data System is a diskette-based distributed data processing system that provides intelligent keyboard/displays and printers for both remote and local sites.

MODELS: 5285 Programmable Data Station; 5286 Dual Programmable Data Station; 5288 Programmable Control Unit; 5281 Auxiliary Data Station; 5282 Auxiliary Dual Data Station; 5217, 5222, 5224, 5225, 5242, and 5256 Printers.

CONFIGURATION: Support for distributed functions, such as batch and interactive communications, intelligent data entry, batch processing, and transaction processing, is provided via three configurations, including integral single or dual keyboard/display stations and a cluster configuration that can accommodate up to four workstations.

SOFTWARE: A variety of software is available for the 5280, including DE/RPG, Cobol, and Assembler languages, and a 3270 emulation program.

COMPETITION: Datapoint 1560 and 1800, Harris MIND, Inforex System 9000, and several others.

PRICE: A minimum configuration, consisting of a 5285 Model C01 Programmable Data Station with 64K bytes of main storage, one Diskette 1 drive, and a keyboard, is priced at \$6,592.

CHARACTERISTICS

VENDOR: International Business Machines Corporation (IBM), Old Orchard Road, Armonk, NY 10504. Contact your local IBM representative.

DATE OF ANNOUNCEMENT: January 1980.

DATE OF FIRST DELIVERY: June 1980.

NUMBER DELIVERED TO DATE: Information not available.

SERVICED BY: IBM.

CONFIGURATION

A 5280 System configuration can be based on any of the following units, each of which provides all processing and control functions of the system, including those of any attached auxiliary data stations or printers: 1) any model of the 5285 Programmable Data Station; 2) any model of the 5286 Dual Programmable Data Station; or 3) any model of the 5288 Programmable Control Unit with an attached 5281 Data Station or 5282 Dual Data Station (any model). ➤

IBM 5280 Distributed Data System

➤ In January 1981, IBM announced several enhancements to the 5280 system, including new communications features, increased storage capacity, and additional processing power. The 5280-3270 Emulation Licensed Program was introduced, which allows the 5285 or 5286 terminals to appear as IBM 3270 terminals using either BSC or SNA/SDLC. The 5285 and 5286 terminals, as well as the 5288 controller, were enhanced via new models with expanded main storage capacities. Also introduced were a new printer, the 5224, and a second application microprocessor feature, which provides additional processing power to the 5280 system.

In April 1983, IBM made several changes to the 5280 system. A new 10-megabyte Disk Storage Drive feature was announced, expanding disk storage on the 5280 system to a maximum of 70MB. A new printer attachment capability was announced, allowing the IBM 5217 and 5242 Printers to be attached to the system. Also, a new model structure was introduced for the 5280 system; in this new structure, many of the existing standard configurations were eliminated in favor of optional special features. The new structure accommodates the new Disk Storage Drive feature. Finally, in August 1983, several models of the 5285, 5286, and 5288 were withdrawn from marketing (those models containing 32K and 48K bytes of storage). Also, as of May 1983, the 5280 system will be available for purchase or on a rental basis only; IBM will no longer offer the system on a lease basis.

The 5280 hardware product line consists of nine units: single and dual programmable keyboard/display stations, single and dual auxiliary (nonprogrammable) keyboard/display stations, a programmable control unit, and four printers. Every 5280 system must include a programmable controller and at least one keyboard/display, which may or may not be housed in a single physical unit. System configuration possibilities span a wide range, from a single keyboard/display station with 64K bytes of memory and one diskette drive to a fully expanded system consisting of the programmable control unit with 288K bytes of memory, four keyboard/displays, eight printers, eight diskette drives totaling 9.6 megabytes, and a communications adapter. Hard disk drives and magnetic tape drives, however, are not supported as part of the 5280 product line.

The 5285 Programmable Data Station, the basic unit of the 5280 product line, is a tabletop keyboard/display station with a single CRT display and keyboard, one or two diskette drives with a capacity of up to 2.4 megabytes, up to three disk drives with a capacity of up to 30 megabytes, a programmable controller, and from 64K to 128K bytes of memory. A display capacity of 480, 960, or 1,920 characters can be selected. Devices that can be attached to the 5285 are limited to one 5222, 5224, 5225, or 5256 Printer and *either* one auxiliary data station (5281 or 5282) or the communications adapter. Thus, a 5280 system built around the 5285 can have up to three keyboard/display stations (through the attachment of an auxiliary 5282), but a multistation configuration cannot be equipped for communications. ➤

➤ The *5285 Programmable Data Station* is a single, tabletop keyboard/display unit with 64K, 96K, or 128K bytes of main storage and one or two diskette drives. The standard 480-character display capacity can be expanded to 960 or 1,920 characters. The following devices and features can be attached to the 5285: one auxiliary 5281 Data Station or 5282 Dual Data Station, connected via cable at a maximum distance of 200 feet; up to seven 5224, 5225, or 5256 Printers connected via twinax cable; one 5217-C2, 5222-1, or 5242-2 Printers, connected via Start/Stop Printer attachment feature (1152); one 2500 Communications Adapter with the appropriate line interface feature; one Magnetic Stripe Reader; one Elapsed Time Counter; and one Security Keylock. The 5285 and its auxiliary 5281 or 5282 Data Station must have the same display capacity (i.e., 480, 960, or 1,920 characters). An auxiliary 5281 or 5282 Data Station cannot be attached if the controlling 5285 has the 2500 Communications Adapter.

The *5286 Dual Programmable Data Station* is a tabletop unit that functions as two independent data stations, each with keyboard, display area, and diskette drive; main storage capacities of 64K and 96K bytes are available. The display capacity is 480 characters of each operator position and cannot be expanded. The following devices and features can be attached to the 5286: one auxiliary 5281 Data Station or 5282 Dual Data Station, connected via cable at a maximum distance of 200 feet; one Magnetic Stripe Reader; one Elapsed Time Counter; and one Security Keylock. The 5286 and its auxiliary 5281 or 5282 Data Station must have the same display capacity (i.e., 480 characters). The 5286 cannot be equipped with either a printer or a communications adapter.

The *5288 Programmable Control Unit* is a floor-standing controller that contains from 64K to 288K bytes of main memory and from one to four diskette drives. The 5288 provides processing, control, main memory, diskette storage, communications, and device attachment capabilities for other components of the 5280 system. The following devices and features can be attached to the 5288: 5281 Data Stations in any combination providing a maximum of four keyboards; up to eight printers including any combination of the 5222, 5224, 5225, and 5256 Printers; up to four 5217-C2, 5222-1, and/or 5242-2 Printers; one 2500 or 3270 Emulation Communications Adapter with the appropriate line interface feature; one magnetic stripe reader; one Elapsed Time Counter; and one Security Keylock.

Each data station requires a separate Auxiliary Data Station Attachment on the 5288 and is connected to the system by a cable 200 feet long. All of the attached data stations must have the same display capacity (480, 960, or 1,920 characters for the 5281). Printers are connected to the 5288 via one of three features: the Twinax Printer Attachment (#1150), the Start/Stop Printer Attachment (#1152), the Multiple Twinax Printer Attachment (#1160), and the Multiple Start/Stop Twinax Printer Attachment (#1162). The first attachment provides a single twinax port and connects up to seven 5224, 5225, and/or 5256 printers to the 5288. The second attachment features a single port for the attachment of one 5222 Model 1, 5217 Model C2, or 5242 Model 2 Printer. The third attachment provides four 5222, 5217, or 5242 Printer ports and a twinax printer port.

The *5281 Data Station* is a single, tabletop, auxiliary keyboard/display unit containing zero, one, or two diskette drives. A nonprogrammable unit, the 5281 must be cable-connected to a 5285, 5286, or 5288 equipped with the appropriate Auxiliary Data Station Attachment feature. The 5281's display capacity is 480, 960, or 1,920 characters, as determined by the attachment feature on the controlling device. If the 5281 contains one or two diskette drives, the controlling 5285, 5286, or 5288 must also have the appropriate Remote Diskette Drive Attachment feature. The 5281 can be equipped with an optional Magnetic Stripe Reader. ➤

IBM 5280 Distributed Data System

► The 5286 Dual Programmable Data Station is a tabletop unit that includes two independent keyboard/display stations, two diskette drives with a capacity of up to 2.4 megabytes, a programmable controller, and 64K or 96K bytes of memory. The display capacity is limited to 480 characters at each station. The 5286 can control one auxiliary data station (5281 or 5282), but it cannot be equipped with either a printer or a communications adapter. Thus, the 5286 is a limited-function unit that appears to be designed mainly for key-to-diskette data entry functions where no communications capability is required.

The 5288 Programmable Control Unit is a floor-standing controller designed to serve as the central component of larger 5280 configurations. The 5288 contains from 64K to 288K bytes of memory, from one to four diskette drives with a total capacity of up to 4.8 megabytes, or from one to seven disk drives with a total capacity of up to 70 megabytes. It can control a cluster of up to four keyboard/displays through the attachment of auxiliary data stations (5281 only). The 5288 can also accommodate the communications adapter and up to eight printers. Diskette drives in the attached auxiliary data stations can be accessed by the 5288 along with its own drives, providing a total system capacity of up to eight drives and 9.6 megabytes.

The 5281 Data Station is a tabletop unit containing a single keyboard/display and zero, one, or two diskette or disk drives with a capacity of up to 2.4 (diskette) or 20 (disk) megabytes. A nonprogrammable unit, the 5281 must be cable-connected to a 5285, 5286, or 5288 at a maximum distance of 200 feet. The display capacity is 480, 960, or 1,920 characters as determined by the attachment feature on the controlling device.

The 5282 Dual Data Station is a tabletop unit containing two independent keyboard/display stations and zero, one, or two diskette drives with a capacity of up to 2.4 megabytes. Like the 5281, the 5282 is a nonprogrammable unit that must be cable-connected to a 5285 or 5286 at a maximum distance of 200 feet. The display capacity at each station is 480 or 960 characters, as determined by the attachment feature on the controlling device.

The 5280 system can accommodate the following printers: 5217, 5222, 5224, 5225, 5242, and 5256. The 5222 is a wire-matrix tabletop printer capable of printing 80 characters per second at 10-cpi (characters per inch) or 15-cpi horizontal print density. Each line of print can contain 132 characters (10 cpi) or 198 characters (15 cpi). The printer features bidirectional printing and accommodates one of three upper-/lowercase character sets: a 95-character EBCDIC set, a 185-character multinational set, or a 95-character Spanish set. Vertical spacing is user selectable at six or eight lines per inch, while the page length is program selectable with a maximum length of 255 lines per page. A variable-width forms tractor provides for the feeding of continuous forms.

The 5224 is an impact dot-matrix (8-by-7) line printer with a user-selectable print density of 10 or 15 cpi and line spacing of six or eight lines per inch. Forms skipping and ►

► The 5282 Dual Data Station is a tabletop unit that functions as two independent auxiliary data stations, each with keyboard, display area, and optional diskette. The 5282 is available with zero, one, or two diskette drives. A nonprogrammable unit, the 5282 must be cable-connected to a 5285 or 5286 equipped with the appropriate Auxiliary Data Station Attachment feature. The display capacity at each operator position is either 480 or 960 characters, as determined by the attachment feature on the controlling device. If the 5282 contains one or two diskette drives, the controlling 5285, 5286, or 5288 must also have the appropriate Remote Diskette Drive Attachment feature. Either or both stations of the 5282 can be equipped with an optional Magnetic Stripe Reader.

A nondisplay input mode on 5281s and 5282s allows the entry of data without display on the screen. A special Security Keylock prevents keyboard entry or display of data on all auxiliary stations. On a communicating 5288, this feature prevents the unauthorized initiation of communications and allows the exchanging of identification sequences with the host.

TRANSMISSION SPECIFICATIONS

COMMUNICATIONS ADAPTER: This optional feature (#2500) for either the 5285 Programmable Data Station or the 5288 Programmable Control Unit provides either SDLC or BSC data link control over a single communications line. Operating under stored-program control, the feature allows the 5285 or 5288 to communicate at up to 4800 bps on a switched point-to-point or nonswitched point-to-point or multipoint line. (On a multipoint line, the 5285 or 5288 operates as a tributary station.) All transmission is in half-duplex mode. Switched network support includes manual dialing and manual or automatic answering (where the attached modem supports the latter capability).

The 5285s, 5288s, or other devices at all the terminations (or drop points) of a network must use the same clocking source, operate at the same transmission rate, use the same transmission code, and have the same two- or four-wire connection to the line. Compatible modems must be used at all terminations in a network.

A 5285 or 5288 using BSC protocol can communicate with the following other IBM systems:

- A System/3 equipped with a 2074, 2084, or 2094 Communications Adapter.
- A System/32 equipped with a 2074 Communications Adapter.
- A System/34 equipped with a 2500, 3500, or 4500 Communications Adapter.
- A System/36 (5360) with a 2500 or 4500 Communications Adapter.
- A System/36 (5362) equipped with a 2910 or 2915 Communications Adapter.
- A System/38 with an appropriately configured BSC Adapter and subfeatures (point-to-point only).
- A System/370 equipped with either an Integrated Communications Adapter, a 2701 Data Adapter Unit, or a 3704 or 3705 Communications Adapter with the ACF/NCP or PEP software, plus a BSC adapter and appropriate subfeatures.
- A 4331 System equipped with a communications adapter.
- A 303X or 4300 System with a 2701 Data Adapter Unit. ►

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➤ vertical spacing are under program control. The 5224 is available in two models: Model 1, with a printing speed of 140 lines per minute (lpm) at 10 cpi or 95 lpm at 15 cpi; and Model 2, with a printing speed of 240 lpm at 10 cpi or 175 lpm at 15 cpi. An audible alarm informs the operator when manual intervention is required due to one of nine printer error conditions. The 5224 features the same three character sets as the 5222 Printer, with the addition of ASCII graphics capabilities with the 185-character multinational set.

The 5225 Printer is a wire-matrix line printer that can be attached to either the 5285 or the 5288. It features operator-selectable horizontal spacing of either 10 or 15 characters per inch, as well as both upper- and lowercase characters. The 15-cpi spacing makes it possible to print most reports on standard correspondence-size paper to reduce forms costs and simplify the handling and filing of reports. The 5225 is offered in four models with rated speeds of 280, 400, 490, and 600 lines per minute at 10 cpi and 195, 290, 355, and 420 lines per minute at 15 cpi. Each line can have a maximum of 132 print positions at 10 cpi and 198 positions at 15 cpi.

The 5256 Printer is a serial matrix printer that prints bidirectionally, using a 96-character upper-/lowercase EBCDIC character set. The 5256 is available in three models with rated speeds of 40, 80, or 120 characters per second.

The newest printers attachable to the 5280 system are the 5217 and the 5242. The 5217 Model C2 is a letter-quality matrix printer with a rated print speed of 60 cps. The 5242 Model 2 is a tabletop, impact matrix printer with a print speed of 160 cps (40 cps on cut forms for quality printing).

All of the 5280 units are designated as "customer setup" machines, and their compact size should make them relatively easy to install.

The programmable controllers in the 5285, 5286, and 5288 perform identical processing and control functions, although they vary in their memory capacities and device attachment capabilities. Multiple microprocessors (up to six) are used in each controller to enable processing and I/O devices to operate independently, and the system supports multiprogramming with up to eight main storage partitions.

Data communications capabilities for the 5280 system are provided by an optional communications adapter on either the 5285 Programmable Data Station or the 5288 Programmable Control Unit. The 5285 or 5288 can communicate over a single line in half-duplex mode at a speed of up to 4800 bits per second, using either BSC or SDLC protocol. Point-to-point switched or nonswitched operation and multipoint tributary operation are supported. The required line interface can be provided by an internal modem, a Digital Data Service Adapter, or an EIA interface that permits the use of an external modem. The 5280 system can communicate with an IBM System/370, 303X, or 4300 ➤

- • A Series/1 equipped with a 2074, 2075, or 2093/2094 Binary Synchronous Control.
- A 3741 Model 2 Data Station or a 3741 Model 4 Programmable Workstation.
- A 3747 Data Converter equipped with a 1660 Communications Adapter.
- A 5265 communicating model (XX2).
- Another 5285 or 5288 equipped with the 2500 Communications Adapter.

Under stored program control, the 5285 communications in SNA/SDLC with a 4331 through a Communications Adapter, an S/370 through an Integrated Communications Adapter, an 8100 with DPPX/BASE, or an S/370, 303X, or 4300 through a 3704, 3705, or 3725 communications controller equipped with the appropriate features. Using the 3270 Emulation Communications Adapter, the 5285 communicates in SNA/SDLC with an 8100 Information System.

The Communications Adapter must be connected to the communications line by means of either an Integrated Modem, an EIA Interface plus an external modem, or a DDS Adapter. These devices are described in the following paragraphs.

3270 EMULATION COMMUNICATIONS ADAPTER: In addition to the functions provided by the 2500 Communications Adapter, this feature supports the 5280-3270 Emulation licensed program, and in conjunction with stored program control, permits the 5285 and 5288 to function on a switched or nonswitched public or private communications line. This adapter is required to attach to a communications line via the appropriate interface or modem (see INTEGRATED MODEMS). The 3270 Emulation Communications Adapter cannot be installed with the 2500 Communications Adapter. In addition, as with the 2500 adapter, the 3270 cannot be configured to an auxiliary data station or to a system equipped with the Second Application Microprocessor.

MODEMS: IBM offers two types of 1200 bps Integrated Modems for use with a 5285 Programmable Data Station or 5288 Programmable Control Unit equipped with the 2500 Communications Adapter. Both versions permit either BSC or SDLC data transmission at either 600 or 1200 bps. The Model 5501 is designed for switched applications and offers an auto-answer capability. The Model 5508 is designed for operation on nonswitched facilities and offers Switched Network Backup auto-answer capability. Devices communicating with the 5285 or 5288 must be equipped with compatible 1200 bps modems. Only one Integrated Modem can be installed in a 5285 or 5288, and it is mutually exclusive with the EIA Interface and the DDS Adapter. The Power Supply Expansion (#5810) is required for both the Model 5501 and 5508.

Users can also attach one IBM 38XX modem to a 2500 Communications Adapter or 3270 Emulation Communications Adapter. Modems available include the following: Model 3863—a 2400 bps unit for switched and nonswitched facilities; Model 3868 1—a 2400 bps unit for nonswitched facilities; Model 3864—a 4800 bps modem for switched and nonswitched facilities; Model 3868 1 2—a 4800 bps unit for nonswitched facilities; and Model 3872—a 2400/1200 bps unit for nonswitched facilities.

DATA ENCRYPTION: A 3845 or 3846 Data Encryption Device may be attached between the 5285 Communications Adapter and an external modem. ➤

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- Series computer in SDLC mode or with most current IBM computers and terminals in BSC mode.

The 5280's designers clearly have paid considerable attention to data security provisions. Sensitive data can be entered via the keyboard without being displayed on the CRT screen. An optional Security Keylock feature makes it possible to restrict usage of the system to keyholders. An optional Magnetic Stripe Reader, available for each keyboard/display operator position, can be used to enter user identification data. Finally, a communicating 5280 system can exchange identification sequences with the host computer, thereby aiding the user in controlling access to data.

Software support for the 5280 consists of bundled System Control Programming (SCP) and separately priced licensed programs. The software is oriented toward the support of data entry, transaction processing, batch processing, and both batch and interactive communications.

No integrated operating system has been announced for the 5280. The "free" SCP facilities are limited to a System Configuration Program that is used to define the physical and logical configuration of a 5280 system, an Initial Program Loader that initializes the system for program execution, a PTF/Patch Program that aids in applying program temporary fixes and program patches, and a Close Failure Recovery program that aids in recovering from abnormal program terminations.

Users of 5280 have a choice of three programming languages: DE/RPG, Cobol, and Assembler. The principal IBM emphasis appears to be on DE/RPG, a new programming system that uses RPG-style specification forms to simplify the preparation of programs for interactive data entry, high-volume key entry, and user-defined processing functions. The 5280 Cobol language is an implementation of ANSI Cobol 74 that supports interactive or batch commercial applications, provides limited data station support for interactive applications, and supports BSC and SDLC communications via a CALL interface. Cobol's usefulness, however, is limited by the fact that Cobol programs for the 5280 must be compiled on a host IBM System/370, 303X, or 4300 Series computer under either OS/VS or DOS/VSE. DE/RPG and Assembler programs, by contrast, can be compiled on the 5280 system itself.

Three utility packages complete the initial 5280 software complement. The 5280 utilities consist of 11 routines to perform straightforward utility functions such as diskette file maintenance, resource allocation, and system status display. The 5280 Sort/Merge permits flexible sorting and merging operations on diskette files. The 5280 Communications Utilities provide software support for a 5285 or 5288 equipped with the communications adapter. Basic facilities are provided for batch data transfer and inquiry, multileaving remote job entry (MRJE), SNA remote job entry (SRJE), and communication configuration and job description.

- **EIA INTERFACE (3701):** This feature can be chosen as an alternative to the IBM Integrated Modems for use with a 5285 or 5288 equipped with the 2500 Communications Adapter. The feature provides a cable and interface that meet the EIA RS-232-C specifications, permitting the attachment of an external modem supplied by IBM or another vendor. The Power Supply Expansion (#5810) is a prerequisite.

DIGITAL DATA SERVICE (DDS) ADAPTER: This feature enables a 5285 or 5288 equipped with the 2500 Communications Adapter to transmit and receive data at 2400 or 4800 bps in BSC or SDLC mode over AT&T's nonswitched Dataphone Digital Data Service. The DDS Adapter is available in two versions: Model 5650 for point-to-point operation and Model 5651 for multipoint operation. Either model provides for appropriate interface and cable to the DDS channel service unit at the customer site.

SOFTWARE

Software support for the 5280 Distributed Data System is provided by System Control Programming (SCP), which is furnished at no charge, and by a set of separately priced licensed programs. These software facilities collectively provide the necessary support for a wide range of distributed environments including data entry, batch and interactive communications, batch processing, and transaction processing.

OPERATING SYSTEM: No integrated operating system for the 5280 has been announced to date. Instead, IBM offers the *5280 System Control Programming (SCP)*, which consists of four routines that provide the following basic system functions: 1) the System Configuration Program is used to describe the physical and logical configuration of a 5280 system; 2) the Initial Program Loader initializes the system and prepares it for program execution; 3) the PTF/Patch Program is used to apply program temporary fixes (PTFs) and to make program patches; 4) the Close Failure Recovery Program allows the user to specify an end-of-date (EOD) record in a diskette data set in the event that a program terminates abnormally.

LANGUAGES: IBM currently offers the DE/RPG, Cobol, and Assembler languages for use with 5280 system. DE/RPG and Assembler programs can be prepared on the 5280 itself, whereas Cobol programs must be compiled on a host System/370, 303X, or 4300 Series computer under either OS/VS or DOS/VSE.

5280 DE/RPG is designed to simplify the preparation of programs for applications ranging from simple key entry to high-function data entry jobs that require extensive editing, data set access, and user-defined processing.

DE/RPG makes use of the Data Description Specifications (DDS) form, which is also supported on the IBM System/38, for specification of data entry formats. A format or series of formats, defined by the user and presented in the display screen, provides the framework for a data entry job. A typical job would consist of entering data, editing and checking the data, creating records, and writing the records to a diskette data set. The sequence of execution of the formats can be determined by job definition, by operator selection, or by the program on the basis of an analysis of current data.

DE/RPG also features an RPG subroutine capability which provides a subset of the RPG III calculation operation codes. Using the RPG Calculation Specifications, the user can define subroutines to perform functions such as complex editing, arithmetic calculations, array handling, master data set access, and report printing. A total of 40 RPG II opera-

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▷ COMPETITIVE POSITION

The 5280 effectively supersedes the 3740 Data Entry System, IBM's earlier key-to-diskette system. Introduced in 1973, the 3740 had been progressively upgraded through the addition of programmability, communications, and printers—but the older system is clearly outclassed by the greater power and flexibility of the 5280. To assist 3740 users in converting to the 5280, IBM provides three software conversion aids. The 3740 Format Conversion utility facilitates the conversion of 3740 key entry program levels into DE/RPG source programs. The Key Entry Utility accepts the 3740 key entry string language as input and creates formats for simple key entry functions on the 5280. The 3740 ACL Conversion Aid Program, supplied with the 5280 Assembler, aids in converting 3740 ACL programs into 5280 Assembler language.

The 5280 naturally invites comparison with the 8100 Information System, the distributed processing system that IBM's Data Processing Division introduced in October 1978. But the 8100 is a much larger, more powerful, and more costly system; the *smallest* 8100 processor has 256K bytes of main memory, and includes 29 megabytes of hard disk storage. Thus, the two systems occupy separate niches within IBM's line of distributed processing hardware and appear to be complementary rather than competitive.

The 5280's more direct competition comes not from other IBM products but from the distributed data systems that have long been marketed by companies such as Datapoint, Four-Phase Systems, Inforex, Nixdorf, and others. Competitive systems with capabilities generally similar to those of the 5280 include the Datapoint 1560 and 1800, the Four-Phase System IV Series, Harris MIND Series, the Inforex System 9000, and the Nixdorf 600/25, /35, /45, and 55.

The 5280, as well as its competition, now represents an old technology that has been eclipsed by the development of personal computing networking products that handle interactive communications far more efficiently. IBM offers a strong line of personal computers and local area networks and continues to place its major emphasis in those areas.

ADVANTAGES AND RESTRICTIONS

The 5280 equipment and software are designed to support a wide range of distributed environments and functions, including intelligent data entry, batch and interactive communications, batch processing, transaction processing, and distributed printing. Thus, the 5280 might be attractive to both large and small data processing users who are considering the use of distributed intelligent terminals as part of new or existing data processing networks. However, the viability of systems like the 5280 is questionable, especially in light of the alternatives. Specifically, the personal computer with its first-rate operating systems, extended RAM facilities, hard disk storage, mountains of software application packages, and a communication facility provides very strong competition for the 5280. As for interactive processing, users have a host of software packages to choose from which make the personal computer emulate an IBM 3270. ▷

▷ tion codes from the following categories are available: arithmetic and data manipulation, branching, indicator testing, subroutine operations, and special I/O operations. The RPG subroutine capability can also be used to create stand-alone batch DE/RPG programs that can run in any partition. RPG programmers should note, however, that the sequence of instruction execution is defined by the user; the usual RPG "cycle" does not apply.

DE/RPG permits considerable flexibility in display screen design and in data editing. Prompts and data fields can be positioned anywhere on the screen below the top line, which is reserved for status information; multiple formats can be displayed on a single screen. Editing can be performed on a character, field, or record basis, and a wide range of editing, checking, testing, comparison, insertion, and table lookup operations are available.

DE/RPG diskette data sets are organized in sequential fashion. Three access methods are supported: sequential, direct by relative record number, and key indexed. Data sets can be shared by multiple programs on a read or write/update basis. There are safeguards against concurrent updating of a record by two or more programs.

All DE/RPG programs maintain production statistics on both a job basis and a station basis. Counts can be maintained of keystrokes, records, marked records, verify correction keystrokes, elapsed time, and number of jobs.

The DE/RPG licensed program consists of a Source Entry Program and a Compiler. The Source Entry Program permits interactive entry, verification, and updating of DE/RPG source statement data set, which becomes the input to the Compiler. The Compiler produces an object program data set, which is written to diskette, and an optional source listing on either printer or diskette. When two or more operators are to perform the same job, each operator must have an individual copy of the appropriate object program, executing in a separate partition.

The DE/RPG Compiler will run on any 5280 system that has at least one Diskette 2D drive or two Diskette 1 drives. Minimum main storage partition size requirements are 9K bytes for the Compiler and 13K bytes for the Source Entry Program. The 5280 SCP and 5280 Utilities are prerequisites.

5280 Cobol is available in four versions, which differ in the host IBM computers and software that are required to compile the Cobol source programs. The 5280 Cobol-OS/VS Host Compiler and Library product requires a System/370, 303X, or 4300 Series computer operating under OS/VS1 or OS/VS2 (MVS) for the compilation process, while the 5280 Cobol-DOS/VSE Host Compiler and Library product requires a System/370, 303X, or 4300 Series computer operating under DOS/VSE. The Cobol S/34 and Cobol S/38 Host Compiler and Library products require a System/34 or System/38 computer, respectively. Otherwise, the versions have similar capabilities and features. Cobol object programs can be executed on a 5285, 5286, or 5288. Object programs can be transferred from the host to the 5280 system via diskette, RJE, or a user-written communications program.

The 5280 Cobol language is an implementation of 1974 ANSI Standard Cobol, X.23-1974. It provides support for both interactive and batch commercial application programs, as well as limited data station support for interactive applications. Support for BSC and SDLC communications is provided via a CALL interface.

The 5280 Assembler is used to create stand-alone programs which will run on a 5285, 5286, or 5288. Features of the Assembler include mnemonic operation codes, symbolic ad- ▶

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▷ Some of the newest emulations even allow uploading/downloading of files, something not offered with native-mode 3270 operation.

While the 5280's operating system, SCP, supports up to eight partitions in a multiprogramming environment, its method for servicing interrupts is inefficient. The 5280 permits the establishment of eight partitions. Of these, up to four may be foreground, with a keyboard associated with each partition. The other upper-configuration limit allows seven background and one foreground partition. A keyboard may have more than one background partition. Partitions are serviced sequentially, beginning at F1 (highest priority) and ending with the last background (lowest priority). A problem arises when an interrupt, depressing the ATTN key for example, occurs in a higher priority partition while a lower priority partition is being serviced. In this case, service ceases in the lower partition, and control is transferred to the higher partition. After the interrupt has been serviced, the operating system first checks to see if any other ATTNs are queried to that partition and then services them. If there are no ATTNs in need of servicing, control is passed to the next partition in line, not to the partition that was initially interrupted. The net result of this interrupt handling scheme is that lower priority partitions receive considerably less service than they need, and overall processing in general degrades.

Another 5280 limitation concerns the slow speed of its diskettes. These units operate at 360 rpm, providing a data transfer rate of 1 byte every 32 microseconds (or 2 bytes on a dual-density version). With a seek time of between 40 and 80 milliseconds, track-to-track access of 5 milliseconds, head settle of 35 milliseconds, and rotational delay of 35 milliseconds, there is an average access time of 243 milliseconds. Users planning to share data sets in a highly interactive environment will find this limiting.

Although heavily upstaged now by the advent of personal computers, the 5280 satisfies the need for a clustered terminal system with local processing capabilities. Its operating system, when used correctly, can satisfactorily handle up to four keyboard applications or up to seven background partitions. A good amount of the processing can be done with minimal host/communication load. With the 3270 emulation facility, the 5280 can also take advantage of the services available to this popular IBM system. The 5280 also provides a good line of printers, one of which operates at 560 lines per minute. In addition, the 5288 handles up to eight printers. The S/3 MRJE multileaving capability is another system strength. MRJE permits the concurrent transmission and reception of data to and from peripheral devices and the network via the full-duplex capabilities of the communications line.

USER REACTION

IBM did not supply us with a list of users for this product, and in Datapro's 1984 Terminal Users Survey, no respondents rated the 5280 system; therefore, we have no current ratings for the product. □

▶ dresses, symbolic data representation, automatic storage assignments, address displacement calculation, operand expressions, binary and decimal arithmetic, a source program listing, a cross-reference listing, error checks, and diagnostic messages. The 3740 ACL Conversion Aid Program is supplied along with the Assembler to aid the user in converting ACL programs written for the IBM 3740 Data Entry System into 5280 Assembler Language.

UTILITIES: IBM currently offers three licensed programs in this category for the 5280 system: the 5280 Utilities, the 5280 Sort/Merge, and the 5280 Communications Utilities.

The *5280 Utilities* consist of 11 programs with the following names and functions:

- Diskette Initialization Utility—formats a diskette according to the user's requirements.
- Diskette/Data Set Clear Utility—clears one or all data sets on a diskette in preparation for the recording of new data.
- Diskette Label Maintenance Utility—allocates space for new data sets, deletes old data sets, and modifies the labels of volumes and data sets.
- Diskette Label List Utility—displays or prints diskette volume labels, data set labels, data set names, and data set directories.
- Diskette Copy Utility—copies all or portions of a diskette onto the same or another diskette; supports multivolume output data sets.
- Diskette Print Utility—prints all or selected records from a diskette, without reformatting or editing.
- Resource Allocation Utility—enables the user to add, delete, display, or alter an entry in the Resource Allocation Table, which contains physical device addresses with their corresponding logical identifiers.
- 3740 Format Conversion Utility—aids in the conversion of 3740 key entry program levels into DE/RPG source programs.
- Diskette Compress Utility—rearranges data sets to make one contiguous space out of the unused space between data sets.
- Key Entry Utility—permits the user to create formats for simple data entry functions using the IBM 3740 key entry string language.
- System Status Utility—displays system status information such as the number and sizes of partitions and names of programs currently being executed.

The *5280 Sort/Merge* consists of a Sort program and a Merge program. The Sort program sorts a single diskette data set into either ascending or descending sequence, using parameters entered at the keyboard or read from diskette. Records can be selected, omitted, or reformatted, and work space and data set space are allocated automatically. Four output formats are available: Full Record, Address Out (a data set of four-byte relative record numbers), Record Subset (a data set containing user-specified data fields), and Index/Key (a data set with records consisting of a key and a relative record number). The Merge program combines records from two sorted diskette data sets into another data set, using parameters entered at the keyboard or read from diskette. It supports multivolume data sets. ▶

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► The *5280 Communications Utilities* consist of four basic facilities: Batch Data Transfer/Inquiry, SNA/SDLC Remote Job Entry (SRJE), Multileaving Remote Job Entry (MRJE), and Communications Configuration and Job Description. These programs provide software support for a 5285 Programmable Data Station or 5288 Programmable Control Unit equipped with the 2500 or 3270 Emulation Communications Adapter and communicating over a single line in either BSC or SDLC mode. The communications programs operate concurrently with other applications. Only the 960-character and 1,920-character display sizes are supported.

The Batch Data Transfer/Inquiry program provides for batch data transfer to a host system or terminal and inquiry to a host system. It supports SNA/SDLC communications as an LU1-type terminal to a System/370, 303X, or 4300 Series computer with CICS/VS and IMS/VS, or BSC communications with a System/370, 303X, or 4300 with CICS/VS, IMS/VS (as a 3741), and VSE/POWER, or with System/3/32/34 RPG II, System/3 CCP, System/34 SSP-ICF, Series/1 RPS, a 3740, a 5260, or another 5280. The minimum main storage required is 32K bytes for BSC communications and 64K bytes for SNA/SDLC.

The SNA/SDLC Remote Job Entry (SRJE) facility permits the 5280 system to function as an RJE terminal consisting of one console, one reader, one punch, and one printer. Printer datastreams can be directed to either a printer or diskette, while punch datastreams are directed to diskette. SNA support on the host computer is via ACF/VTAM and ACF/NCP/VS to RES, JES2, JES3, and VSE/POWER. The minimum main storage requirement on the 5280 is 64K bytes.

The Multileaving Remote Job Entry (MRJE) facility permits the 5280 system to function as an RJE terminal with full multileaving support for concurrent device operation of one console, one reader, one punch, and one printer. Printer datastreams are directed to diskette. BSC support on the host computer treats the 5280 as a System/3 MRJE workstation for RES, JES2, and JES3. The minimum main storage requirement is 48K bytes on a 5285 or 64K bytes on a 5288.

The Communications Configuration and Job Description program is used to prepare communications environments via job step prompts. Descriptions are stored on diskette by job name, and are used to initiate the communications link with the host computer or another terminal. Initiation of the link with the host may be either dynamic or predetermined for operator convenience.

The 5280-3270 Emulation licensed program allows the 5280 Distributed Data System to function as selected 3270 control units and devices to existing host applications. The program consists of the following: the 3270 Device Emulation Program, the 3270 Batch Transfer Utility, and the 3270 Program Interface.

The 3270 Device Emulation Program allows the 5280 to appear to the host as a 3274 Model 1C Control Unit under SNA/SDLC or as a 3271 Model 2 Control Unit under BSC. With the 3270 Device Emulation Program, the 1,920-character 5281 Data Station (attached to a 5288 Programmable Control Unit) and the 1,920-character 5285 Programmable Data Station appear to a host system as a 3277 Model 2 Display Station with selected features. The 5280 Distributed Data System's printers are also able to appear as the 3284 Model 2, the 3286 Model 2, and the 3288 Model 2 printers under BSC and the 3287 Printer Models 1 and 2 under SNA/SDLC. Host system communication subsystems that are supported include System/370 IMS/VS, CICS/VS, TSO, and System/3 Model 15D CCP.

The following BSC host system support is provided for the 5280-3270 Device Emulation Program:

- IMS/VS with BTAM under OS/VS1 or OS/VS2 (MVS)
- IMS/VS with ACF/VTAM under OS/VS1 or OS/VS2 (MVS)
- IMS/VS with ACF/TCAM under OS/VS1 or OS/VS2 (MVS)
- CICS/VS with BTAM under OS/VS1 or OS/VS2 (MVS)
- CICS/VS with ACF/TCAM under OS/VS1 or OS/VS2 (MVS)
- CICS/VS with BTAM-ES under DOS/VSE
- CICS/VS with ACF/VTAM under OS/VS1, OS/VS2 (VMS), or DOS/VSE
- CICS/VS with ACF/VTAME under DOS/VSE
- TSO with ACF/VTAM under OS/VS2 (MVS)*
- TSO with ACF/TCAM under OS/VS2 (MVS)

(Note: *TSO does not support printers. All of the above systems, with the exception of the System/3, are also supported when under control of VM/370.)

The following SNA/SDLC host system support is provided for the 5280/3270 Device Emulation Program:

- IMS/VS with ACF/VTAM under OS/VS1 or OS/VS2 (MVS)
- IMS/VS with ACF/TCAM under OS/VS1 or OS/VS2 (MVS)
- CICS/VS with ACF/VTAM under OS/VS1, OS/VS2 (MVS), or DOS/VSE
- CICS/VS with ACF/TCAM under OS/VS1 or OS/VS2 (MVS)
- CICS/VS with ACF/VTAME under DOS/VSE
- TSO with ACF/VTAM under OS/VS2 (MVS)*
- TSO with ACF/TCAM under OS/VS2 (MVS)*

*TSO does not support printers.

Minimum 5285 and 5288 system configuration requirements required to support the 5280-3270 Device Emulation Program include 64K bytes of memory (96K bytes if printer is used in conjunction with a keyboard/display), the 3270 Emulation Communications Adapter, and a display size of 1,920 characters.

The 3270 Batch Transfer Emulation Utility enables the user to transmit and receive batch data when communicating with a host system via 3270 BSC protocols. Record lengths can be a maximum of 1,918 bytes. Transaction IDs and how they are used during transmission may be specified. A user program is required at the host to send or receive batch data.

The 3270 Program Interface provides the 5280 user with a program-to-program interface using 3270 BSC protocols. Up to seven concurrent sessions are supported, with each session representing a different 3270 device address. The user application interface is through DE/RPG and Cobol. ►

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► COMPONENTS

DISPLAY: A standard component of the 5281 Data Station, 5282 Dual Data Station, 5285 Programmable Data Station, and 5286 Dual Programmable Data Station. Display capacities for each model are as follows:

Model	480 chars.	960 chars.	1,920 chars.
5281	Std.	Opt.	Opt.
5282	Std.	—	—
5285	Opt.	Opt.	Opt.
5286	Opt.	Opt.	—

Display capacity for Models 5285 and 5286 is determined by the attachment feature selected on the controlling device. Models 5282 and 5286 provide a single split-screen display, with the indicated display capacity supported at each of the two operator positions. The display arrangement is 6, 12, and 24 lines of 80 characters for the 480-, 960-, and 1,920-character capacities, respectively. Characters are formed within an 8-by-16 dot-matrix character cell. A user-selectable choice of 94-character (upper-/lowercase) EBCDIC, 94-character ASCII, or 185-character Multinational character sets is provided. Program-controlled screen attributes include reverse video, high intensity, blinking, underlining, nondisplay (blinking), and column separation.

KEYBOARD: A required component of the 5281, 5282, 5285, and 5286. Dual station models (5282 and 5286) require two keyboards. Four keyboard types are offered: 83-key EBCDIC typewriter, 83-key ASCII typewriter, 66-key data entry, and 66-key data entry with proof arrangement. Each keyboard is movable and includes data keys, cursor movement keys, special function keys, and field edit keys.

MAGNETIC STRIPE READER: An optional feature for the 5281, 5282, 5285, or 5286. Up to 128 A.B.A. numeric characters, including control characters, can be read from a magnetic stripe on credit cards, identification cards, and other documents.

ELAPSED TIME COUNTER: Required feature for SNA operations under the 5280 Communications Utilities and 5280-3270 Emulation programs. The elapsed time counter is used to measure elapsed realtime. This feature cannot be installed with a Magnetic Stripe Reader Adapter/Elapsed Time Counter (#4955 or #4960).

MAGNETIC STRIPE READER/ELAPSED TIME COUNTER: Two models are available. Model 4955, used on a noncommunicating 5285, provides elapsed time counter functionality and control for up to three magnetic stripe readers on the 5285 and on an attached 5281 or 5282. This model cannot be installed with a Model 3610 Elapsed Time Counter, a 2500 Communications Adapter, or a 3270 Emulation Communications Adapter. Model 4960, used on a communicating 5285, provides elapsed time functionality for one magnetic stripe reader. This model cannot be installed with a Model 3610 Elapsed Time Counter.

DISKETTE DRIVES: Two types of diskette drives are available for any 5280 system in any combination: a drive that can read and write only the IBM Diskette 1 format, and a drive that can read and write the IBM Diskette 1, 2, and 2D formats. (The latter is referred to as a Diskette 2D drive.) The on-line data capacity of each drive can range from 246K bytes to 1.2 megabytes depending upon the recording format in use, as tabulated below.

Diskette Type	Format	Bytes per Sector	Capacity, Bytes
1	1	128	246K
	2	256	284K
	3	512	303K
2	4	128	492K
	5	256	568K
	6	512	606K
2D	7	128	985K
	8	256	1136K
	9	512	1212K

For exchanging diskette data between the 5280 and other systems, IBM supports the following exchange types: Basic Exchange, in formats 1 and 4; H Exchange, in format 7 only; and I Exchange, in all of the above formats. Diskettes can be interchanged with the IBM Series/1, System/3, System/32, System/34, System/36, System/38, System/370, 303X, 4300, 3540, 3740, 3747, 3770, 3790, 5110, 5230, 5260, 8100, and other systems and devices that support a compatible diskette exchange type.

Diskette data transfer rates are 31,250 bps in Diskette 1 or Diskette 2 mode and 62,500 bps in Diskette 2D mode. The rotation speed is 360 rpm for both types of drives.

DISK DRIVES: A 10MB Disk Storage Drive feature can be installed on the 5285 and 5288, and on the 5281 when attached to the 5285 or 5288. The disk drive occupies a physical diskette drive position on these units. A 5285 can contain up to seven disk drives. For a disk drive attached to a 5281, the controlling device requires a Remote Disk Prerequisite feature (#4400).

The rotational speed of the disk drive is 3600 rpm. Average access time is 85 milliseconds.

5217 IMPACT PRINTER: A bidirectional, letter-quality impact printer that connects to the 5285 or 5288. Horizontal character spacing is 10, 12, or 15 characters per inch; vertical spacing is program selectable in increments of 1/96-inch, permitting line spacing of from 4 to 24 lines per inch. A variety of 96-character print wheel options is available. Single sheets are hand-fed. A cut sheet feed device and forms tractor are optionally available. One Model, C2, is available, with a rated print speed of 60 cps.

5222 LINE PRINTER: A wire-matrix line printer that connects to the 5285 or 5288. Horizontal spacing of 10 to 15 characters per inch and vertical spacing of 6 or 8 lines per inch is operator-selectable. Maximum line width is 132 characters at 10 cpi and 198 characters at 15 cpi. A choice of 95-character EBCDIC, 185-character Multinational, or 95-character Spanish character sets is provided. Characters are formed via an 8-by-7 dot matrix. A forms tractor is standard. One model is available, with a rated print speed of 80 cps at both 10 and 15 cpi.

5224 LINE PRINTER: An impact-matrix line printer that connects to the 5285 or 5288. Horizontal spacing of 10 or 15 characters per inch and vertical spacing of 6 or 8 lines per inch is operator-selectable. Maximum line width is 132 characters at 10 cpi and 198 characters at 15 cpi. A choice of 95-character EBCDIC, 184-character Multinational, or 95-character Spanish character sets is provided. Characters are formed via an 8-by-7 dot matrix. A forms tractor is standard. A cable-thru feature provides the capability of connecting a total of seven 5224s, 5225s, 5256s, 5251 Models 1 or 11, and 5252s to a single twinax cable. Two models are available and differ only in their rated print speeds: Model 1 prints at 140 lpm at 10 cpi, and at 95 lpm at 15 cpi; Model 2 prints at 240 lpm at 10 cpi, and at 175 lpm at 15 cpi.

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► **5242 IMPACT PRINTER:** A serial impact-matrix printer that connects to the 5285 or 5288. Horizontal spacing of 10 to 15 cpi can be specified; vertical spacing is program-selectable in increments of 1/96-inch, permitting line spacing from 1 to 12 lpi. Originally intended for use with the IBM Datamaster, the 5242 can print any character that can be displayed on a Datamaster. A forms tractor is standard. Only the 5242 Model 2 can be used with the 5280; standard print speed is 160 cps, with a 40 cps speed available for letter-quality printing on cut forms.

MODEL 5225 LINE PRINTER: A wire-matrix line printer that connects to the 5285 or 5288. Horizontal spacing of 10 or 15 characters per inch and vertical spacing of 6 or 8 lines per inch is operator-selectable. Maximum line width is 132 characters at 10 cpi and 198 characters at 15 cpi. A choice of 95-character EBCDIC, 184-character Multinational (including ASCII graphics), or 95-character Spanish character sets is provided. Characters are formed by an 8-by-7 dot matrix. A forms tractor is standard. Forms skipping is program-controlled. Four models are available and differ only in their rated print speeds: at 10 cpi, Model 1 prints at 280 lpm, Model 2 at 400 lpm, Model 3 at 490 lpm, and Model 4 at 560 lpm; at 15 cpi, Model 1 prints at 195 lpm, Model 2 at 290 lpm, Model 3 at 355 lpm, and Model 4 at 420 lpm.

MODEL 5256 SERIAL PRINTER: A bidirectional serial-matrix printer that connects to the 5285 or 5288. Horizontal spacing is 10 characters per inch. Vertical spacing is operator-selectable at 6 or 8 lines per inch. Maximum line width is 132 characters. A 96-character (upper-/lowercase) EBCDIC character set is standard; a Multinational character set is also available. A forms tractor and a cut-forms capability are standard. Three models are available and differ only in their rated print speeds: Model 1 prints at 40 cps, Model 2 at 80 cps, and Model 3 at 120 cps.

PRICING

IBM offers the 5280 system on a purchase or rental basis. There are no leasing arrangements on this system. The warranty period is three months. The standard IBM rental contract entitles the customer to unlimited usage each month. Prime-shift maintenance is included in the rental price. The purchase option accrual equals 45 percent of the monthly charge up to 50 percent of the purchase price. IBM's standard educational allowance of 10 percent applies to the 5280 system for rental and purchase customers.

For purchased or rented systems, the 5280 system is under maintenance group D. The minimum period of maintenance service is nine consecutive hours between 7:00 a.m. and 6:00 p.m., Monday through Friday. Charges for maintenance coverage outside this period are based upon the following percentages of the minimum monthly maintenance charge (MMC) added to the MMC:

	Consecutive hours				
	*9	12	16	20	24
Monday-Friday (until 8:00 a.m. Saturday)	10	12	14	16	18
Saturday (until 8:00 a.m. Sunday)	4	5	7	8	9
Sunday (until 8:00 a.m. Monday)	5	7	9	11	12

*Outside of the hours 7:00 a.m. to 6:00 p.m.

For users without a maintenance contract, the 5280 system is maintained under per-call class 2. Under this class the per-call charge during regular hours is \$125 per hour, and during off hours the charge is \$147 per hour. The hourly rate for systems engineering service is \$85.

EQUIPMENT PRICES

PROGRAMMABLE DATA STATIONS

5285 Programmable Data Station with:

C01	64K and one Diskette 1 drive	321	6,213	44.00
C05	64K and one Diskette 2D drive	350	6,463	51.00
D01	96K and one Diskette 1 drive	352	6,526	46.00
D05	96K and one Diskette 2D drive	382	6,776	53.50
E01	128K and one Diskette 1 drive	383	6,839	48.00
E05	128K and one Diskette 2D drive	413	7,089	55.40

5286 Dual Programmable Data Station with:

C02	64K and two Diskette 1 drives	385	8,263	51.00
C10	64K and two Diskette 2D drives	443	8,763	66.00
D02	96K and two Diskette 1 drives	417	8,576	53.50
D10	96K and two Diskette 2D drives	475	9,076	68.00

Keyboards for 5285 and 5286 (one required for each operator position):

4600	83-key EBCDIC Keyboard	15	379	4.00
4601	66-key Data Entry Keyboard	15	379	4.00
4602	66-key Data Entry Keyboard with Proof Arrangement	15	379	4.00
4603	83-key ASCII Keyboard	15	379	4.00

NC—No charge.

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► PROGRAMMABLE DATA STATIONS (Continued)

		Monthly Rental (\$)	Purchase Price (\$)	Monthly Maint. (\$)
Special features for 5285 and 5286 (except as noted):				
3401	Diskette 1 Drive (for 5285 only)	64	1,000	9.50
3402	Diskette 2D Drive (for 5285 only)	94	1,250	16.50
3410	10MB Disk Storage Drive (for 5285 only)	375	4,500	42.00
1150	5224/5225/5256 Twinax Printer Attachment (for 5285 only)	18	540	2.00
1152	5217/5222/5242 Printer Attachment (for 5285 only)	19	530	2.00
1200	Attachment for one 480-character 5281 Data Station	21	654	2.00
1205	Attachment for one 960-character 5281 Data Station	31	767	2.00
1210	Attachment for one 1,920-character 5281 Data Station (for 5285 only)	41	879	3.00
1215	Attachment for one 480-character 5282 Dual Data Station	31	767	2.00
1220	Attachment for one 960-character 5282 Dual Data Station	41	879	3.00
1240	Remote Diskette Drive Attachment (required if an attachment 5281 has either 1 or 2 diskette drives)	6	213	1.00
3500	960-character Display Size	6	112	1.00
3505	1,920-character display size (for 5285 only)	18	225	1.00
3610	Elapsed Time Counter (measures elapsed realtime)	6	112	1.00
4950	Magnetic Stripe Reader (4955 or 4960 is a prerequisite)	18	428	2.00
4955	Magnetic Stripe Reader Adapter/Elapsed Time Counter (for 5286 or noncommunicating 5285)	26	642	2.00
4960	Magnetic Stripe Reader Adapter/Elapsed Time Counter (for communicating 5285)	7	256	1.00
6340	Security Keylock	—	43	—
6800	Second Application Microprocessor	61	1,285	2.00

PROGRAMMABLE CONTROL UNITS

5288	Programmable Control Unit with:			
C01	64K and one Diskette 1 drive	319	6,913	36.00
C05	64K with one Diskette 2D drive	349	7,163	53.50
D01	96K with one Diskette 1 drive	350	7,226	38.00
D05	96K with one Diskette 2D drive	380	7,476	45.50
E01	128K and one Diskette 1 drive	381	7,539	40.00
E05	128K with one Diskette 2D drive	411	7,789	47.50
F01	160K and one Diskette 1 drive	416	7,852	42.50
F05	160K with one Diskette 2D drive	444	8,102	49.50
H01	224K and one Diskette 1 drive	474	8,478	46.50
H05	224K with one Diskette 2D drive	504	8,728	54.00
J01	228K and one Diskette 1 drive	537	9,104	50.50
J05	228K and one Diskette 2D drive	565	9,354	58.00

Special features for 5288 Programmable Control Unit:

3401	Diskette 1 drive	63	1,000	9.50
3402	Diskette 2D drive	93	1,250	16.50
3410	10MB disk storage drive	375	4,500	42.00
1155	Single 5225/5256 Twinax Printer Attachment (provides a single port for attaching from 1 to 5 printers via a single twinax cable)	18	540	2.00
1162	Multiple Twinax Printer Attachment	33	925	3.00
1245	Attachment for one 480-character 5281 Data Station	—	—	—
1250	Attachment for one 960-character 5281 Data Station	6	112	1.00
1255	Attachment for one 1,920-character 5281 Data Station	16	225	1.50
1260	Attachment for one 480-character 5282 Dual Data Station	6	112	1.00
1265	Attachment for one 960-character 5282 Dual Data Station	18	225	1.50
1270	Attachment for one additional 480-character 5281	21	654	2.00
1275	Attachment for one additional 960-character 5281	31	767	2.50
1280	Attachment for one additional 1,920-character 5281 (prerequisite: 1255)	41	879	3.00
1285	Attachment for one additional 480-character 5282	31	767	2.00
1290	Attachment for one additional 960-character 5282	41	879	3.00
1300	Remote Diskette Drive Attachment, First (required for first and second remote drives when base 5288 has 1 or 2 drives)	6	213	1.00
1301	Remote Diskette Drive Attachment, Second (required for first and second remote drives when base 5288 has 3 or 4 drives, or for third and fourth remote drives when base 5288 has 1 or 2 drives)	38	970	4.00
1302	Remote Diskette Drive Attachment, Third (required for third and fourth remote drives when base 5288 has 3 or 4 drives, or for fifth and sixth remote drives when base 5288 has 1 or 2 drives)	6	213	1.00
3610	Elapsed Time Counter	6	112	1.00
4955	Magnetic Stripe Reader Adapter/Elapsed Time Counter (controls up to 4 Magnetic Stripe Readers on attached 5281 and/or 5282 data stations)	23	642	2.00
6340	Security Keylock	—	43	—
6800	Second Application Microprocessor	52	1,285	2.50

AUXILIARY DATA STATIONS

5281 (Z00)	Data Station with no diskette drive	94	2,295	12.50
5282 (Z00)	Dual Data Station with no diskette drive	101	2,604	13.50

NC—No charge.

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► AUXILIARY DATA STATIONS (Continued)

		Monthly Rental (\$)	Purchase Price (\$)	Monthly Maint. (\$)
Keyboards for 5281 and 5282 (one required for each operator position):				
4600	83-key EBCDIC Keyboard	15	379	4.00
4601	66-key Data Entry Keyboard	15	379	4.00
4602	66-key Data Entry Keyboard with Proof Arrangement	15	379	4.00
4603	83-key ASCII Keyboard	15	379	4.00
Special features for 5281:				
4950	Magnetic Stripe Reader	16	428	2.00
4400	Remote Disk feature (for attachment of 3410)	NC	NC	NC

PRINTERS

5215 (mdl. C2)	60-cps at 10, 12, 15 cpi	—	4,425	52.50
5222 (mdl. 1)	80-cps at 10 or 15 cpi	142	2,345	34.00
5224 (mdl. 1)	140-lpm at 10 cpi; 95 lpm at 15 cpi	—	6,395	48.00
5224 (mdl. 2)	240 lpm at 10 cpi; 175 lpm at 15 cpi	—	7,280	57.00
5225 (mdl. 1)	280 lpm at 10 cpi; 195 lpm at 15 cpi	—	12,075	109.00
5225 (mdl. 2)	400 lpm at 10 cpi; 290 lpm at 15 cpi	—	13,945	152.00
5225 (mdl. 3)	490 lpm at 10 cpi; 355 lpm at 15 cpi	—	15,495	188.00
5225 (mdl. 4)	560 lpm at 10 cpi; 420 lpm at 15 cpi	—	16,940	224.00
5242 (mdl. 2)	40/160 cps at 10, 15 cpi	—	2,975	61.00
5256 (mdl. 1)	40 characters per second	—	3,110	49.00
5256 (mdl. 2)	80 characters per second	—	3,255	53.00
5256 (mdl. 3)	120 characters per second	—	3,400	60.00

Special features for the Printers:

1470	Audible alarm (signals operator when manual intervention is required due to one of nine error conditions; for 5225 and 5256 printer only)	—	50	—
2680	Cable Thru (permits multiple printers to be connected to a single twinax cable; required on each printer except the last; for 5225 and 5256 printers only)	4	119	2.00
6100	Rear Document Insert Device (for 5222 only)	7	135	1.00

COMMUNICATIONS

2500	Communications Adapter (for 5285 only)	85	1,015	9.00
3270	3270 Emulation Communications Adapter (for 5285 and 5288 only)	129	2,040	13.00
3701	EIA Interface (provides RS-232-C interface for an external modem)	19	372	1.50
5501	1200 bps Integrated Modem, switched with autoanswer	34	744	3.50
5508	1200 bps Integrated Modem, nonswitched with SNBU autoanswer	38	947	4.50
5650	Digital Data Service Adapter, point-to-point	33	873	1.50
5651	Digital Data Service Adapter, multipoint	33	873	1.50
5810	Power Supply Expansion (required on 5285 if 5501 or 5508 is installed)	4	79	1.50

NC—No charge.

SOFTWARE PRICES

	Basic Monthly License Charge (\$)
5708-AS1	53
5708-CB1	200
5708-CB2	200
5708-CB3	215
5708-CB4	215
5707-CL1	10
5708-DC1	27
708-DE1	16
5708-EM1	64
5708-SC1	NC
5708-SM1	16
5708-UT1	8
5798-NZH	143
5798-RBZ	50
5798-RCR	600
5798-RDF	35

NC—No charge. ■

IBM 5280 Distributed Data System

MANAGEMENT SUMMARY

The 5280 Distributed Data Processing System was introduced by IBM in January 1980. Originally a product of the now-defunct General Systems Division, the 5280 system consists of a family of diskette-based intelligent terminals that can be programmed to enter, validate, store, process, and print business information at the point of origin.

In January 1981, IBM announced several enhancements to the 5280 system, including new communications features, increased storage capacity, and additional processing power. The 5280-3270 Emulation Licensed Program was introduced, which allows the 5285 or 5286 terminals to appear as IBM 3270 terminals using either BSC or SNA/SDLC. The 5285 and 5286 terminals, as well as the 5288 controller, were enhanced via new models with expanded main storage capacities. Also introduced were a new printer, the 5224, and a second application microprocessor feature, which provides additional processing power to the 5280 system.



The 5280 Distributed Data System is a diskette-based DDP system designed for applications such as intelligent data entry, batch and interactive communications, batch processing, and transaction processing. A variety of software is available for the 5280 system, including 3270 emulation.

The 5280 Distributed Data System is a diskette-based distributed data processing system that provides intelligent keyboard/displays and printers for both remote and local sites.

MODELS: 5285 Programmable Data Station; 5286 Dual Programmable Data Station; 5288 Programmable Control Unit; 5281 Auxiliary Data Station; 5282 Auxiliary Dual Data Station; 5217, 5222, 5224, 5225, 5242, and 5256 Printers.

CONFIGURATION: Support for distributed functions, such as batch and interactive communications, intelligent data entry, batch processing, and transaction processing, is provided via three configurations, including integral single or dual keyboard/display stations and a cluster configuration that can accommodate up to four workstations.

SOFTWARE: A variety of software is available for the 5280, including DE/RPG, Cobol, and Assembler languages, and a 3270 emulation program.

COMPETITION: Datapoint 1560 and 1800, Harris MIND, Inforex System 9000, Mohawk Data Sciences Series 21, and several others.

PRICE: A minimum configuration, consisting of a 5285 Model C01 Programmable Data Station with 64K bytes of main storage, one Diskette 1 drive, and a keyboard, is priced at \$6,592.

CHARACTERISTICS

VENDOR: International Business Machines Corporation (IBM), Old Orchard Road, Armonk, NY 10504. Contact your local IBM representative.

DATE OF ANNOUNCEMENT: January 1980

DATE OF FIRST DELIVERY: June 1980.

NUMBER DELIVERED TO DATE: Information not available.

SERVICED BY: IBM.

CONFIGURATION

A 5280 System configuration can be based on any of the following units, each of which provides all processing and control functions of the system, including those of any attached auxiliary data stations or printers: 1) any model of the 5285 Programmable Data Station; 2) any model of the 5286 Dual Programmable Data Station; or 3) any model of the 5288 Programmable Control Unit with an attached 5281 Data Station or 5282 Dual Data Station (any model).

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➤ In April 1983, IBM made several changes to the 5280 system. A new 10-megabyte Disk Storage Drive feature was announced, expanding disk storage on the 5280 system to up to 70MB. A new printer attachment capability was announced, allowing the IBM 5217 and 5242 Printers to be attached to the system. Also, a new model structure was introduced for the 5280 system; in this new structure, many of the existing standard configurations were eliminated in favor of optional special features. The new structure accommodates the new Disk Storage Drive feature. Finally, in August 1983, several models of the 5285, 5286, and 5288 were withdrawn from marketing (those models containing 32K and 48K bytes of storage). Also, as of May 1983, the 5280 system will be available for purchase or on a rental basis only; IBM will no longer offer the system on a lease basis.

The 5280 hardware product line consists of nine units: single and dual programmable keyboard/display stations, single and dual auxiliary (nonprogrammable) keyboard/display stations, a programmable control unit, and four printers. Every 5280 system must include a programmable controller and at least one keyboard/display, which may or may not be housed in a single physical unit. System configuration possibilities span a wide range, from a single keyboard/display station with 64K bytes of memory and one diskette drive to a fully expanded system consisting of the programmable control unit with 288K bytes of memory, four keyboard/displays, eight printers, eight diskette drives totaling 9.6 megabytes, and a communications adapter. Hard disk drives and magnetic tape drives, however, are not supported as part of the 5280 product line.

The 5285 Programmable Data Station, the basic unit of the 5280 product line, is a tabletop keyboard/display station with a single CRT display and keyboard, one or two diskette drives with a capacity of up to 2.4 megabytes, up to three disk drives with a capacity of up to 30 megabytes, a programmable controller, and from 64K to 128K bytes of memory. A display capacity of 480, 960, or 1920 characters can be selected. Devices that can be attached to the 5285 are limited to one 5222, 5224, 5225, or 5256 Printer and *either* one auxiliary data station (5281 or 5282) or the communications adapter. Thus, a 5280 system built around the 5285 can have up to three keyboard/display stations (through the attachment of an auxiliary 5282), but a multistation configuration cannot be equipped for communications.

The 5286 Dual Programmable Data Station is a tabletop unit that includes two independent keyboard/display stations, two diskette drives with a capacity of up to 2.4 megabytes, a programmable controller, and 64K or 96K bytes of memory. The display capacity is limited to 480 characters at each station. The 5286 can control one auxiliary data station (5281 or 5282), but it cannot be equipped with either a printer or a communications adapter. Thus, the 5286 is a limited-function unit that appears to be designed mainly for key-to-diskette data entry functions where no communications capability is required. ➤

➤ The 5285 Programmable Data Station is a single, tabletop keyboard/display unit with 64K, 96K, or 128K bytes of main storage and one or two diskette drives. The standard 480-character display capacity can be expanded to 960 or 1920 characters. The following devices and features can be attached to the 5285: one auxiliary 5281 Data Station or 5282 Dual Data Station, connected via cable at a maximum distance of 200 feet; up to seven 5224, 5225, or 5256 Printers connected via twinax cable; one 5217-C2, 5222-1, or 5242-2 Printers, connected via Start/Stop Printer attachment feature (1152); one 2500 Communications Adapter with the appropriate line interface feature; one Magnetic Stripe Reader; one Elapsed Time Counter; and one Security Keylock. The 5285 and its auxiliary 5281 or 5282 Data Station must have the same display capacity (i.e., 480 or 1920 characters; no attachment available for 960 characters). An auxiliary 5281 or 5282 Data Station cannot be attached if the controlling 5285 has the 2500 Communications Adapter.

The 5286 Dual Programmable Data Station is a tabletop unit that functions as two independent data stations, each with keyboard, display area, and diskette drive, main storage capacities of 64K and 96K bytes are available. The display capacity is 480 characters of each operator position and cannot be expanded. The following devices and features can be attached to the 5286: one auxiliary 5281 Data Station or 5282 Dual Data Station, connected via cable at a maximum distance of 200 feet; one Magnetic Stripe Reader; one Elapsed Time Counter; and one Security Keylock. The 5286 and its auxiliary 5281 or 5282 Data Station must have the same display capacity (i.e., 480 characters). The 5286 cannot be equipped with either a printer or a communications adapter.

The 5288 Programmable Control Unit is a floor-standing controller that contains from 64K to 288K bytes of main memory and from one to four diskette drives. The 5288 provides processing, control, main memory, diskette storage, communications and device attachment capabilities for other components of the 5280 system. The following devices and features can be attached to the 5288: 5281 Data Stations in any combination providing a maximum of four keyboards; up to eight printers including any combination of the 5222, 5224, 5225, and 5256 Printers; up to four 5217-C2, 5222-1, and/or 5242-2 Printers; one 2500 or 3270 Emulation Communications Adapter with the appropriate line interface feature; one magnetic stripe reader; one Elapsed Time Counter; and one Security Keylock.

Each data station requires a separate Auxiliary Data Station Attachment on the 5288 and is connected to the system by a cable 200 feet long. All of the attached data stations must have the same display capacity (480, 960, or 1920 characters for the 5281). Printers are connected to the 5288 via one of three features: the Twinax Printer Attachment (#1150), the Start/Stop Printer Attachment (#1152), and the Multiple Start/Stop Twinax Printer Attachment (#1162). The first attachment provides a single twinax port and connects up to seven 5224, 5225, and/or 5256 printers to the 5288. The second attachment features a single port for the attachment of one 5222 Model 1, 5217 Model C2, or 5242 Model 2 Printer. The third attachment provides four 5222, 5217, or 5242 Printer ports and a twinax printer port.

The 5281 Data Station is a single, tabletop, auxiliary keyboard/display unit containing zero, one, or two diskette drives. A nonprogrammable unit, the 5281 must be cable-connected to a 5285, 5286, or 5288 equipped with the appropriate Auxiliary Data Station Attachment feature. The 5281's display capacity is 480, 960, or 1920 characters. ➤

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➤ The 5288 Programmable Control Unit is a floor-standing controller designed to serve as the central component of larger 5280 configurations. The 5288 contains from 64K to 288K bytes of memory, from one to four diskette drives with a total capacity of up to 4.8 megabytes, or from one to seven disk drives with a total capacity of up to 70 megabytes. It can control a cluster of up to four keyboard/displays through the attachment of auxiliary data stations (5281 only). The 5288 can also accommodate the communications adapter and up to eight printers. Diskette drives in the attached auxiliary data stations can be accessed by the 5288 along with its own drives, providing a total system capacity of up to eight drives and 9.6 megabytes.

The 5281 Data Station is a tabletop unit containing a single keyboard/display and zero, one, or two diskette or disk drives with a capacity of up to 2.4 (diskette) or 20 (disk) megabytes. A nonprogrammable unit, the 5281 must be cable-connected to a 5285, 5286, or 5288 at a maximum distance of 200 feet. The display capacity is 480, 960, or 1920 characters as determined by the attachment feature on the controlling device.

The 5282 Dual Data Station is a tabletop unit containing two independent keyboard/display stations and zero, one, or two diskette drives with a capacity of up to 2.4 megabytes. Like the 5281, the 5282 is a nonprogrammable unit that must be cable-connected to a 5285 or 5286 at a maximum distance of 200 feet. The display capacity at each station is 480 or 960 characters, as determined by the attachment feature on the controlling device.

The 5280 system can accommodate the following printers: 5217, 5222, 5224, 5225, 5242, and 5256. The 5222 is a wire-matrix table-top printer capable of printing 80 characters per second at 10 cpi (characters per inch) or 15 cpi horizontal print density. Each line of print can contain 132 characters (10 cpi) or 198 characters (15 cpi). The printer features bidirectional printing and accommodates one of three upper-/lowercase character sets: a 95-character EBCDIC set, a 185-character multinational set, or a 95-character Spanish set. Vertical spacing is user selectable at six or eight lines per inch, while the page length is program selectable with a maximum length of 255 lines per page. A variable-width forms tractor provides for the feeding of continuous forms.

The 5224 is an impact dot-matrix (8-by-7) line printer with a user-selectable print density of 10 or 15 cpi and line spacing of six or eight lines per inch. Forms skipping and vertical spacing are under program control. The 5224 is available in two models: Model 1, with a printing speed of 140 lines per minute (lpm) at 10 cpi or 95 lpm at 15 cpi; and Model 2, with a printing speed of 240 lpm at 10 cpi or 175 lpm at 15 cpi. An audible alarm informs the operator when manual intervention is required due to one of nine printer error conditions. The 5224 features the same three character sets as the 5222 Printer, with the addition of ASCII graphics capabilities with the 185-character multinational set.

➤ as determined by the attachment feature on the controlling device. If the 5281 contains one or two diskette drives, the controlling 5285, 5286, or 5288 must also have the appropriate Remote Diskette Drive Attachment feature. The 5281 can be equipped with an optional Magnetic Stripe Reader.

The 5282 Dual Data Station is a tabletop unit that functions as two independent auxiliary data stations, each with keyboard, display area, and optional diskette. The 5282 is available with zero, one, or two diskette drives. A nonprogrammable unit, the 5282 must be cable-connected to a 5285 or 5286 equipped with the appropriate Auxiliary Data Station Attachment feature. The display capacity at each operator position is either 480 or 960 characters, as determined by the attachment feature on the controlling device. If the 5282 contains one or two diskette drives, the controlling 5285, 5286, or 5288 must also have the appropriate Remote Diskette Drive Attachment feature. Either or both stations of the 5282 can be equipped with an optional Magnetic Stripe Reader.

TRANSMISSION SPECIFICATIONS

COMMUNICATIONS ADAPTER: This optional feature (#2500) for either the 5285 Programmable Data Station or the 5288 Programmable Control Unit provides either SDLC or BSC data link control over a single communications line. Operating under stored-program control, the feature allows the 5285 or 5288 to communicate at up to 4800 bits/second on a switched point-to-point or nonswitched point-to-point or multipoint line. (On a multipoint line, the 5285 or 5288 operates as a tributary station.) All transmission is in half-duplex mode. Switched network support includes manual dialing and manual or automatic answering (where the attached modem supports the latter capability).

The 5285s, 5288s, or other devices at all the terminations (or drop points) of a network must use the same clocking source, operate at the same transmission rate, use the same transmission code, and have the same two- or four-wire connection to the line. Compatible modems must be used at all terminations in a network.

A 5285 or 5288 using BSC protocol can communicate with the following other IBM systems:

- A System/3 equipped with a 2074, 2084, or 2094 Communications Adapter.
- A System/32 equipped with a 2074 Communications Adapter.
- A System/34 equipped with a 2500, 3500, or 4500 Communications Adapter.
- A System/38 with an appropriately configured BSC Adapter and subfeatures (point-to-point only).
- A System/370 equipped with either an Integrated Communications Adapter, a 2701 Data Adapter Unit, or a 3704 or 3705 Communications Adapter with the ACF/NCP or PEP software, plus a BSC adapter and appropriate subfeatures.
- A 4331 System equipped with a communications adapter.
- A 303X or 4300 System with a 2701 Data Adapter Unit.
- A Series/1 equipped with a 2074, 2075, or 2093/2094 Binary Synchronous Control.

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➤ The 5225 Printer is a wire-matrix line printer that can be attached to either the 5285 or the 5288. It features operator-selectable horizontal spacing of either 10 or 15 characters per inch, as well as both upper- and lowercase characters. The 15-cpi spacing makes it possible to print most reports on standard correspondence-size paper to reduce forms costs and simplify the handling and filing of reports. The 5225 is offered in four models with rated speeds of 280, 400, 490, and 600 lines per minute at 10 cpi and 195, 290, 355, and 420 lines per minute at 15 cpi. Each line can have a maximum of 132 print positions at 10 cpi and 198 positions at 15 cpi.

The 5256 Printer is a serial matrix printer that prints bidirectionally, using a 96-character upper-/lowercase EBCDIC character set. The 5256 is available in three models with rated speeds of 40, 80, or 120 characters per second.

The newest printers attachable to the 5280 system are the 5217 and the 5242. The 5217 Model C2 is a letter-quality matrix printer with a rated print speed of 60 cps. The 5242 Model 2 is a tabletop, impact matrix printer with a print speed of 160 cps (40 cps on cut forms for quality printing).

All of the 5280 units are designated as "customer set-up" machines, and their compact size should make them relatively easy to install.

The programmable controllers in the 5285, 5286, and 5288 perform identical processing and control functions, although they vary in their memory capacities and device attachment capabilities. Multiple microprocessors (up to six) are used in each controller to enable processing and I/O devices to operate independently, and the system supports multiprogramming with up to eight main storage partitions.

Data communications capabilities for the 5280 system are provided by an optional communications adapter on either the 5285 Programmable Data Station or the 5288 Programmable Control Unit. The 5285 or 5288 can communicate over a single line in half-duplex mode at a speed of up to 4800 bits per second, using either BSC or SDLC protocol. Point-to-point switched or nonswitched operation and multipoint tributary operation are supported. The required line interface can be provided by an internal modem, a Digital Data Service Adapter, or an EIA interface that permits the use of an external modem. The 5280 system can communicate with an IBM System/370, 303X, or 4300 Series computer in SDLC mode or with most current IBM computers and terminals in BSC mode.

The 5280's designers clearly have paid considerable attention to data security provisions. Sensitive data can be entered via the keyboard without being displayed on the CRT screen. An optional Security Keylock feature makes it possible to restrict usage of the system to keyholders. An optional Magnetic Stripe Reader, available for each keyboard/display operator position, can be used to enter user identification data. Finally, a communicating 5280 system ➤

- • A 3741 Model 2 Data Station or a 3741 Model 4 Programmable Workstation.
- A 3747 Data Converter equipped with a 1660 Communications Adapter.
- A 5265 communicating model (XX2).
- Another 5285 or 5288 equipped with the 2500 Communications Adapter.

A 5285 or 5288 using SDLC protocol can communicate with a System/370, 303X, or 4300 Series computer via a 3704 or 3705 Communications Controller equipped with appropriate features.

The Communications Adapter must be connected to the communications line by means of either an Integrated Modem, an EIA Interface plus an external modem, or a DDS Adapter. These devices are described in the following paragraphs.

3270 EMULATION COMMUNICATIONS ADAPTER: In addition to the functions provided by the 2500 Communications Adapter, this feature supports the 5280—3270 Emulation licensed program, and in conjunction with stored program control, permits the 5285 and 5288 to function on a switched or nonswitched public or private communications line. This adapter is required to attach to a communications line via the appropriate interface or modem (see INTEGRATED MODEMS). The 3270 Emulation Communications Adapter cannot be installed with the 2500 Communications Adapter. In addition, as with the 2500 adapter, the 3270 cannot be configured to an auxiliary data station or to a system equipped with the Second Application Microprocessor.

INTEGRATED MODEMS: IBM offers five types of 1200-bps Integrated Modems for use with a 5285 Programmable Data Station or 5288 Programmable Control Unit equipped with the 2500 Communications Adapter. All five versions permit either BSC or SDLC data transmission at either 600 or 1200 bits/second. Their distinguishing characteristics are as follows: Model 5500—nonswitched; Model 5501—switched with auto-answer; Model 5502—switched without auto-answer; Model 5507—nonswitched with Switched Network Backup manual answer capability; and Model 5508—nonswitched with Switched Network Backup auto-answer capability. The devices communicating with the 5285 or 5288 must be equipped with compatible 1200-bps modems. Only one Integrated Modem can be installed in a 5285 or 5288, and the Integrated Modem is mutually exclusive with the EIA Interface and the DDS Adapter. The Power Supply Expansion (#5810) is required for the Model 5501 or 5508 Integrated Modem.

EIA INTERFACE (3701): This feature can be chosen as an alternative to the IBM Integrated Modems for use with a 5285 or 5288 equipped with the 2500 Communications Adapter. The feature provides a cable and interface that meet the EIA RS-232-C specifications, permitting the attachment of an external modem supplied by IBM or another vendor. The Power Supply Expansion (#5810) is a prerequisite.

DIGITAL DATA SERVICE (DDS) ADAPTER: This feature enables a 5285 or 5288 equipped with the 2500 Communications Adapter to transmit and receive data at 2400 or 4800 bits/second in BSC or SDLC mode over AT&T's nonswitched Dataphone Digital Data Service. The DDS Adapter is available in two versions: Model 5650 for point-to-point operation and Model 5651 for multipoint operation. Either model provides for appropriate interface and cable to the DDS channel service unit at the customer site. ➤

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➤ can exchange identification sequences with the host computer, thereby aiding the user in controlling access to data.

Software support for the 5280 consists of bundled System Control Programming (SCP) and separately priced licensed programs. The software is oriented toward the support of data entry, transaction processing, batch processing, and both batch and interactive communications.

No integrated operating system has been announced for the 5280. The "free" SCP facilities are limited to a System Configuration Program that is used to define the physical and logical configuration of a 5280 system, an Initial Program Loader that initializes the system for program execution, a PTF/Patch Program that aids in applying program temporary fixes and program patches, and a Close Failure Recovery program that aids in recovering from abnormal program terminations.

Users of 5280 have a choice of three programming languages: DE/RPG, Cobol, and Assembler. The principal IBM emphasis appears to be on DE/RPG, a new programming system that uses RPG-style specification forms to simplify the preparation of programs for interactive data entry, high-volume key entry, and user-defined processing functions. The 5280 Cobol language is an implementation of ANSI Cobol 74 that supports interactive or batch commercial applications, provides limited data station support for interactive applications, and supports BSC and SDLC communications via a CALL interface. Cobol's usefulness, however, is limited by the fact that Cobol programs for the 5280 must be compiled on a host IBM System/370, 303X, or 4300 Series computer under either OS/VS or DOS/VSE. DE/RPG and Assembler programs, by contrast, can be compiled on the 5280 system itself.

Three utility packages complete the initial 5280 software complement. The 5280 Utilities consist of 11 routines to perform straightforward utility functions such as diskette file maintenance, resource allocation, and system status display. The 5280 Sort/Merge permits flexible sorting and merging operations on diskette files. The 5280 Communications Utilities provide software support for a 5285 or 5288 equipped with the communications adapter. Basic facilities are provided for batch data transfer and inquiry, multileaving remote job entry (MRJE), SNA remote job entry (SRJE), and communication configuration and job description.

COMPETITIVE POSITION

The 5280 effectively supersedes the 3740 Data Entry System, IBM's earlier key-to-diskette system. Introduced in 1973, the 3740 had been progressively upgraded through the addition of programmability, communications, and printers—but the older system is clearly outclassed by the greater power and flexibility of the 5280. To assist 3740 users in converting to the 5280, IBM is providing three software conversion aids. The 3740 Format Conversion utility facilitates the conversion of 3740 key entry program levels into DE/RPG source programs. The Key Entry Utility accepts the 3740 key entry string language as input ➤

SOFTWARE

Software support for the 5280 Distributed Data System is provided by System Control Programming (SCP), which is furnished at no charge, and by a set of separately priced licensed programs. These software facilities collectively provide the necessary support for a wide range of distributed environments including data entry, batch and interactive communications, batch processing, and transaction processing.

OPERATING SYSTEM: No integrated operating system for the 5280 has been announced to date. Instead, IBM offers the *5280 System Control Programming (SCP)*, which consists of four routines that provide the following basic system functions: 1) the System Configuration Program is used to describe the physical and logical configuration of a 5280 system; 2) the Initial Program Loader initializes the system and prepares it for program execution; 3) the PTF/Patch Program is used to apply program temporary fixes (PTFs) and to make program patches; 4) the Close Failure Recovery Program allows the user to specify an end-of-date (EOD) record in a diskette data set in the event that a program terminates abnormally.

LANGUAGES: IBM currently offers the DE/RPG, Cobol, and Assembler languages for use with 5280 system. DE/RPG and Assembler programs can be prepared on the 5280 itself, whereas Cobol programs must be compiled on a host System/370, 303X, or 4300 Series computer under either OS/VS or DOS/VSE.

5280 DE/RPG is a new product designed to simplify the preparation of programs for applications ranging from simple key entry to high-function data entry jobs that require extensive editing, data set access, and user-defined processing.

DE/RPG makes use of the Data Description Specifications (DDS) form, which is also supported on the IBM System/38, for specification of data entry formats. A format or series of formats, defined by the user and presented in the display screen, provides the framework for a data entry job. A typical job would consist of entering data, editing and checking the data, creating records, and writing the records to a diskette data set. The sequence of execution of the formats can be determined by job definition, by operator selection, or by the program on the basis of an analysis of current data.

DE/RPG also features an RPG subroutine capability which provides a subset of the RPG III calculation operation codes. Using the RPG Calculation Specifications, the user can define subroutines to perform functions such as complex editing, arithmetic calculations, array handling, master data set access, and report printing. A total of 40 RPG II operation codes from the following categories are available: arithmetic and data manipulation, branching, indicator testing, subroutine operations, and special I/O operations. The RPG subroutine capability can also be used to create stand-alone batch DE/RPG programs that can run in any partition. RPG programmers should note, however, that the sequence of instruction execution is defined by the user; the usual RPG "cycle" does not apply.

DE/RPG permits considerable flexibility in display screen design and in data editing. Prompts and data fields can be positioned anywhere on the screen below the top line, which is reserved for status information; multiple formats can be displayed on a single screen. Editing can be performed on a character, field, or record basis, and a wide range of editing, checking, testing, comparison, insertion, and table lookup operations are available. ➤

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➤ and creates formats for simple key entry functions on the 5280. The 3740 ACL Conversion Aid Program, supplied with the 5280 Assembler, aids in converting 3740 ACL programs into 5280 Assembler language.

The 5280 naturally invites comparison with the 8100 Information System, the distributed processing system that IBM's Data Processing Division introduced in October 1978. But the 8100 is a much larger, more powerful, and more costly system; the *smallest* 8100 processor has 256K bytes of main memory, and includes 29 megabytes of hard disk storage. Thus, the two systems occupy separate niches within IBM's line of distributed processing hardware and appear to be complementary rather than competitive.

The 5280's more direct competition comes not from other IBM products but from the distributed data systems that have long been marketed by companies such as Datapoint, Four-Phase Systems, Inforex, Mohawk Data Sciences, Nixdorf, and Pertec. Competitive systems with capabilities generally similar to those of the 5280 include the Datapoint 1560 and 1800, the Four-Phase System IV series, Harris MIND Series, the Inforex System 9000, the Mohawk Data Sciences Series 21, and the Nixdorf 600/25, /35, /45, and 55.

ADVANTAGES AND RESTRICTIONS

The 5280 equipment and software are designed to support a wide range of distributed environments and functions, including intelligent data entry, batch and interactive communications, batch processing, transaction processing, and distributed printing. Thus, the 5280 should be attractive to both large and small data processing users who are considering the use of distributed intelligent terminals as part of new or existing data processing networks. Although the 5280's processing and input/output capabilities are comparable to those of many of the current microprocessor-based small business computers, IBM's marketing emphasis and software support make it clear that the 5280 is intended for use as an element in distributed systems rather than as a stand-alone computer.

USER REACTION

In the 1983 edition of Datapro's Terminal Users Survey, conducted in conjunction with *Data Communications* magazine, a total of 12 users of the IBM 5280 Distributed Data System responded to the survey. These users, who responded on a total installed base of 35 terminals, were asked to rate the 5280 system in six specific categories. Their ratings are summarized in the following table.

	Excellent	Good	Fair	Poor	WA*
Overall performance	5	7	0	0	3.4
Ease of operation	5	4	3	0	3.2
Hardware reliability	7	5	0	0	3.6
Maintenance service/ technical support	5	4	3	0	3.2
Ease of programming	2	7	2	0	3.0
Quality of manufacturer's software	3	7	1	0	3.2

*Weighted Average based on a scale of 4.0 for Excellent.

➤ DE/RPG diskette data sets are organized in sequential fashion. Three access methods are supported: sequential, direct by relative record number, and key indexed. Data sets can be shared by multiple programs on a read or write/update basis. There are safeguards against concurrent updating of a record by two or more programs.

All DE/RPG programs maintain production statistics on both a job basis and a station basis. Counts can be maintained of keystrokes, records, marked records, verify correction keystrokes, elapsed time, and number of jobs.

The DE/RPG licensed program consists of a Source Entry Program and a Compiler. The Source Entry Program permits interactive entry, verification, and updating of DE/RPG source statement data set, which becomes the input to the Compiler. The Compiler produces an object program data set, which is written to diskette, and an optional source listing on either printer or diskette. When two or more operators are to perform the same job, each operator must have an individual copy of the appropriate object program, executing in a separate partition.

The DE/RPG Compiler will run on any 5280 system that has at least one Diskette 2D drive or two Diskette 1 drives. Minimum main storage partition size requirements are 9K bytes for the Compiler and 13K bytes for the Source Entry Program. The 5280 SCP and 5280 Utilities are prerequisites.

5280 Cobol is available in four versions, which differ in the host IBM computers and software that are required to compile the Cobol source programs. The 5280 Cobol-OS/VS Host Compiler and Library product requires a System/370, 303X, or 4300 Series computer operating under OS/VS1 or OS/VS2 (MVS) for the compilation process, while the 5280 Cobol-DOS/VSE Host Compiler and Library product requires a System/370, 303X, or 4300 Series computer operating under DOS/VSE. The Cobol S/34 and Cobol S/38 Host Compiler and Library products require a System/34 or System/38 computer respectively. Otherwise, the versions have similar capabilities and features. Cobol object programs can be executed on a 5285, 5286, or 5288. Object programs can be transferred from the host to the 5280 system via diskette, RJE, or a user-written communications program.

The 5280 Cobol language is an implementation of 1974 ANSI Standard Cobol, X.23-1974. It provides support for both interactive and batch commercial application programs, as well as limited data station support for interactive applications. Support for BSC and SDLC communications is provided via a CALL interface.

The 5280 Assembler is used to create stand-alone programs which will run on a 5285, 5286, or 5288. Features of the Assembler include mnemonic operation codes, symbolic addresses, symbolic data representation, automatic storage assignments, address displacement calculation, operand expressions, binary and decimal arithmetic, a source program listing, a cross-reference listing, error checks, and diagnostic messages. The 3740 ACL Conversion Aid Program is supplied along with the Assembler to aid the user in converting ACL programs written for the IBM 3740 Data Entry System into 5280 Assembler Language.

UTILITIES: IBM currently offers three licensed programs in this category for the 5280 system: the 5280 Utilities, the 5280 Sort/Merge, and the 5280 Communications Utilities.

The 5280 Utilities consist of 11 programs with the following names and functions:

- Diskette Initialization Utility—formats a diskette according to the user's requirements.

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➤ The users were also asked whether or not they would recommend the 5280 System to other users. Seven of the users responded that they would; the remaining five users stated that they were undecided. □

- ▶ • **Diskette/Data Set Clear Utility**—clears one or all data sets on a diskette in preparation for the recording of new data.
- **Diskette Label Maintenance Utility**—allocates space for new data sets, deletes old data sets, and modifies the labels of volumes and data sets.
- **Diskette Label List Utility**—displays or prints diskette volume labels, data set labels, data set names, and data set directories.
- **Diskette Copy Utility**—copies all or portions of a diskette onto the same or another diskette; supports multivolume output data sets.
- **Diskette Print Utility**—prints all or selected records from a diskette, without reformatting or editing.
- **Resource Allocation Utility**—enables the user to add, delete, display, or alter an entry in the Resource Allocation Table, which contains physical device addresses with their corresponding logical identifiers.
- **3740 Format Conversion Utility**—aids in the conversion of 3740 key entry program levels into DE/RPG source programs.
- **Diskette Compress Utility**—rearranges data sets to make one contiguous space out of the unused space between data sets.
- **Key Entry Utility**—permits the user to create formats for simple data entry functions using the IBM 3740 key entry string language.
- **System Status Utility**—displays system status information such as the number and sizes of partitions and names of programs currently being executed.

The *5280 Sort/Merge* consists of a Sort program and a Merge program. The Sort program sorts a single diskette data set into either ascending or descending sequence, using parameters entered at the keyboard or read from diskette. Records can be selected, omitted, or reformatted, and work space and data set space are allocated automatically. Four output formats are available: Full Record, Address Out (a data set of Four-byte relative record numbers), Record Subset (a data set containing user-specified data fields), and Index/Key (a data set with records consisting of a key and a relative record number). The Merge program combines records from two sorted diskette data sets into another data set, using parameters entered at the keyboard or read from diskette. It supports multivolume data sets.

The *5280 Communications Utilities* consist of four basic facilities: Batch Data Transfer/Inquiry, SNA/SDLC Remote Job Entry (SRJE), Multileaving Remote Job Entry (MRJE), and Communications Configuration and Job Description. These programs provide software support for a 5285 Programmable Data Station or 5288 Programmable Control Unit equipped with the 2500 or 3270 Emulation Communications Adapter and communicating over a single line in either BSC or SDLC mode. The communications programs operate concurrently with other applications. Only the 960-character and 1920-character display sizes are supported.

The Batch Data Transfer/Inquiry program provides for batch data transfer to a host system or terminal and inquiry to a host system. It supports SNA/SDLC communications as an LU1-type terminal to a System/370, 303X, or 4300 Series computer with CICS/VS and IMS/VS, or BSC communications with a System/370, 303X, or 4300 with CICS/VS, IMS/VS (as a 3741), and VSE/POWER, or with System/3/32/34 RPG II, System/3 CCP, System/34 SSP-ICF, Series/1 RPS, a 3740, a 5260, or another 5280. The minimum main storage required is 32K bytes for BSC communications and 64K bytes for SNA/SDLC.

The SNA/SDLC Remote Job Entry (SRJE) facility permits the 5280 system to function as an RJE terminal consisting of one console, one reader, one punch, and one printer. Printer data streams can be directed to either a printer or diskette, while punch data streams are directed to diskette. SNA support on the host computer is via ACF/VTAM and ACF/NCP/VS to RES, JES2, JES3, and VSE/POWER. The minimum main storage requirement on the 5280 is 64K bytes.

The Multileaving Remote Job Entry (MRJE) facility permits the 5280 system to function as an RJE terminal with full multileaving support for concurrent device operation of one console, one reader, one punch, and one printer. Printer data streams are directed to diskette. BSC support on the host computer treats the 5280 as a System/3 MRJE workstation for RES, JES2, and JES3. The minimum main storage requirement is 48K bytes on a 5285 or 64K bytes on a 5288.

The Communications Configuration and Job Description program is used to prepare communications environments via job step prompts. Descriptions are stored on diskette by job name, and are used to initiate the communications link with the host computer or another terminal. Initiation of the link with the host may be either dynamic or predetermined for operator convenience.

The 5280-3270 Emulation licensed program allows the 5280 Distributed Data System to function as selected 3270 control units and devices to existing host applications. The program consists of the following: the 3270 Device Emulation Program, the 3270 Batch Transfer Utility, and the 3270 Program Interface.

The 3270 Device Emulation Program allows the 5280 to appear to the host as a 3274 Model 1C Control Unit under SNA/SDLC or as a 3271 Model 2 Control Unit under BSC. With the 3270 Device Emulation Program, the 1920-character 5281 Data Station (attached to a 5288 Programmable Control Unit) and the 1920-character 5285 Programmable Data Station appear to a host system as a 3277 Model 2 Display Station with selected features. The 5280 Distributed Data System's printers are also able to appear as the 3284 Model 2, the 3286 Model 2, and the 3288 Model 2 printers under BSC and the 3287 Printer Models 1 and 2 under SNA/SDLC. Host system communication subsystems that are supported include System/370 IMS/VS, CICS/VS, TSO, and System/3 Model 15D CCP.

The following BSC host system support is provided for the 5280-3270 Device Emulation Program:

- IMS/VS with BTAM under OS/VS1 or OS/VS2 (MVS)
- IMS/VS with ACF/VTAM under OS/VS1 or OS/VS2 (MVS)
- IMS/VS with ACF/TCAM under OS/VS1 or OS/VS2 (MVS)
- CICS/VS with BTAM under OS/VS1 or OS/VS2 (MVS) ▶

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- ▶ • CICS/VS with ACF/TCAM under OS/VS1 or OS/VS2 (MVS)
- CICS/VS with BTAM-ES under DOS/VSE
- CICS/VS with ACF/VTAM under OS/VS1, OS/VS2 (VMS), or DOS/VSE
- CICS/VS with ACF/VTAME under DOS/VSE
- TSO with ACF/VTAM under OS/VS2 (MVS)*
 *TSO with ACF/TCAM under OS/VS2 (MVS)

(Note: *TSO does not support printers. All of the above systems, with the exception of the System/3, are also supported when under control of VM/370).

The following SNA/SDLC host system support is provided for the 5280-3270 DeviceEmulation Program:

- IMS/VS with ACF/VTAM under OS/VS1 or OS/VS2 (MVS)
- IMS/VS with ACF/TCAM under OS/VS1 or OS/VS2 (MVS)
- CICS/VS with ACF/VTAM under OS/VS1, OS/VS2 (MVS), or DOS/VSE
- CICS/VS with ACF/TCAM under OS/VS1 or OS/VS2 (MVS)
- CICS/VS with ACF/VTAME under DOS/VSE
- TSO with ACF/VTAM under OS/VS2 (MVS)*
- TSO with ACF/TCAM under OS/VS2 (MVS)*
 *TSO does not support printers.

Minimum 5285 and 5288 system configuration requirements required to support the 5280-3270 Device Emulation Program include 64K bytes of memory (96K bytes if printer is used in conjunction with a keyboard/display), the 3270 Emulation Communications Adapter, and a display size of 1920 characters.

The 3270 Batch Transfer Emulation Utility enables the user to transmit and receive batch data when communicating with a host system via 3270 BSC protocols. Record lengths can be a maximum of 1918 bytes. Transaction IDs and how they are used during transmission may be specified. A user program is required at the host to send or receive batch data.

The 3270 Program Interface provides the 5280 user with a program-to-program interface using 3270 BSC protocols. Up to seven concurrent sessions are supported, with each session representing a different 3270 device address. The user application interface is through DE/RPG and Cobol.

COMPONENTS

DISPLAY: A standard component of the 5281 Data Station, 5282 Dual Data Station, 5285 Programmable Data Station, and 5286 Dual Programmable Data Station. Display capacities for each model are as follows:

Model	480 chars.	960 chars.	1920 chars.
5281	Std.	Opt.	Opt.
5282	Std.	—	—
5285	Opt.	Opt.	Opt.
5286	Opt.	Opt.	—

Display capacity for Models 5285 and 5286 is determined by the attachment feature selected on the controlling device. Models 5282 and 5286 provide a single split-screen display, with the indicated display capacity supported at each of the two operator positions. The display arrangement is 6, 12, and 24 lines of 80 characters for the 480-, 960-, and 1920-character capacities, respectively. Characters are formed within an 8-by-16 dot-matrix character cell. A user-selectable choice of 94-character (upper-/lowercase) EBCDIC, 94-character ASCII, or 185-character Multinational character sets is provided. Program-controlled screen attributes include reverse video, high intensity, blinking, underlining, nondisplay (blinking), and column separation.

KEYBOARD: A required component of the 5281, 5282, 5285, and 5286. Dual station models (5282 and 5286) require two keyboards. Four keyboard types are offered: 83-key EBCDIC typewriter, 83-key ASCII typewriter, 66-key data entry, and 66-key data entry with proof arrangement. Each keyboard is movable and includes data keys, cursor movement keys, special function keys, and field edit keys.

MAGNETIC STRIPE READER: An optional feature for the 5281, 5282, 5285, or 5286. Up to 128 A.B.A. numeric characters, including control characters, can be read from a magnetic stripe on credit cards, identification cards, and other documents.

DISKETTE DRIVES: Two types of diskette drives are available for any 5280 system in any combination: a drive that can read and write only the IBM Diskette 1 format, and a drive that can read and write the IBM Diskette 1, 2, and 2D formats. (The latter is referred to as a Diskette 2D drive.) The on-line data capacity of each drive can range from 246K bytes to 1.2 megabytes depending upon the recording format in use, as tabulated below.

Diskette Type	Format	Bytes per Sector	Capacity, Bytes
1	1	128	246K
	2	256	284K
	3	512	303K
2	4	128	492K
	5	256	568K
	6	512	606K
2D	7	128	985K
	8	256	1136K
	9	512	1212K

For exchanging diskette data between the 5280 and other systems, IBM supports the following exchange types: Basic Exchange, in formats 1 and 4; H Exchange, in format 7 only; and I Exchange, in all of the above formats. Diskettes can be interchanged with the IBM Series/1, System/3, System/32, System/34, System/38, System/370, 303X, 4300, 3540, 3740, 3747, 3770, 3790, 5110, 5230, 5260, 8100, and other systems and devices that support a compatible diskette exchange type.

Diskette data transfer rates are 31,250 bytes/second in Diskette 1 or Diskette 2 mode and 62,500 bytes/second in Diskette 2D mode. The rotation speed is 360 rpm for both types of drives.

DISK DRIVES: A 10MB Disk Storage Drive feature can be installed on the 5285 and 5288, and on the 5281 when attached to the 5285 or 5288. The disk drive occupies a physical diskette drive position on these units. A 5285 can ▶

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► contain up to seven disk drives. For a disk drive attached to a 5281, the controlling device requires a Remote Disk Prerequisite feature (#4400).

The rotational speed of the disk drive is 3600 rpm. Average access time is 85 milliseconds.

5217 IMPACT PRINTER: A bidirectional, letter quality impact printer that connects to the 5285 or 5288. Horizontal character spacing is 10, 12, or 15 characters per inch; vertical spacing is program selectable in increments of 1/96-inch, permitting line spacing of from 4 to 24 lines per inch. A variety of 96-character print wheel options is available. Single sheets are hand-fed. A cut sheet feed device and forms tractor are optionally available. One Model, C2, is available, with a rated print speed of 60 cps.

5222 LINE PRINTER: A wire matrix line printer that connects to the 5285 or 5288. Horizontal spacing of 10 to 15 character per inch and vertical spacing of 6 or 8 lines per inch is operator-selectable. Maximum line width is 132 characters at 10 cpi and 198 characters at 15 cpi. A choice of 95-character EBCDIC, 185-character Multinational, or 95-character Spanish character sets is provided. Characters are formed via an 8-by-7 dot matrix. A forms tractor is standard. One model is available, with a rated print speed of 80 cps at both 10 and 15 cpi.

5224 LINE PRINTER: An impact matrix line printer that connects to the 5285 or 5288. Horizontal spacing of 10 or 15 characters per inch and vertical spacing of 6 or 8 lines per inch is operator-selectable. Maximum line width is 132 characters at 10 cpi and 198 characters at 15 cpi. A choice of 95-character EBCDIC, 184-character Multinational, or 95-character Spanish character sets is provided. Characters are formed via an 8-by-7 dot matrix. A forms tractor is standard. A cable thru feature provides the capability of connecting a total of seven 5224s, 5225s, 5256s, 5251 Models 1 or 11, and 5252s to a single twinax cable. Two models are available and differ only in their rated print speeds: Model 1 prints at 140 lpm at 10 cpi, and at 95 lpm at 15 cpi; Model 2 prints at 240 lpm at 10 cpi, and at 175 lpm at 15 cpi.

5242 IMPACT PRINTER: A serial impact matrix printer that connects to the 5285 or 5288. Horizontal spacing of 10 to 15 cpi can be specified; vertical spacing is program-selectable in increments of 1/96-inch, permitting line spacing from 1 to 12 lpi. Originally intended for use with the IBM Datamaster, the 5242 can print any character that can be displayed on a Datamaster. A forms tractor is standard. Only the 5242 Model 2 can be used with the 5280; standard print speed is 160 cps, with a 40 cps speed available for letter quality printing on cut forms.

MODEL 5225 LINE PRINTER: A wire matrix line printer that connects to the 5285 or 5288. Horizontal spacing of 10 or 15 characters per inch and vertical spacing of 6 or 8 lines per inch is operator-selectable. Maximum line width is 132 characters at 10 cpi and 198 characters at 15 cpi. A choice of 95-character EBCDIC, 184-character Multinational (including ASCII graphics), or 95-character Spanish character sets is provided. Characters are formed by an 8-by-7 dot

matrix. A forms tractor is standard. Forms skipping is program-controlled. Four models are available and differ only in their rated print speeds: at 10 cpi, Model 1 prints at 280 lpm, Model 2 at 400 lpm, Model 3 at 490 lpm, and Model 4 at 560 lpm; at 15 cpi, Model 1 prints at 195 lpm, Model 2 at 290 lpm, Model 3 at 355 lpm, and Model 4 at 420 lpm.

MODEL 5256 SERIAL PRINTER: A bidirectional serial matrix printer that connects to the 5285 or 5288. Horizontal spacing is 10 characters per inch. Vertical spacing is operator-selectable at 6 or 8 lines per inch. Maximum line width is 132 characters. A 96-character (upper-/lowercase) EBCDIC character set is standard; a Multinational character set is also available. A forms tractor and a cut-forms capability are standard. Three models are available and differ only in their rated print speeds: Model 1 prints at 40 cps, Model 2 at 80 cps, and Model 3 at 120 cps.

PRICING

IBM offers the 5280 system on a purchase or rental basis. *As of May 1, 1983, no new orders for the IBM 5280 will be accepted requesting an IBM lease.* The warranty period is three months. The standard IBM lease or rental contract entitles the customer to unlimited usage each month. Prime-shift maintenance is included in the lease or rental price. The purchase option accrual equals 45 percent of the monthly charge up to 50 percent of the purchase price. IBM's standard educational allowance of 10 percent applies to the 5280 system for lease, rental, and purchase customers.

For purchased, leased or rented systems, the 5280 system is under maintenance group D. The minimum period of maintenance service is nine consecutive hours between 7:00 a.m. and 6:00 p.m. Monday through Friday. Charges for maintenance coverage outside this period are based upon the following percentages of the minimum monthly maintenance charge (MMC) added to the MMC:

	Consecutive hours				
	9*	12	16	20	24
Monday-Friday (until 8:00 a.m. Saturday)	10	12	14	16	18
Saturday (until 8:00 a.m. Sunday)	4	5	7	8	9
Sunday (until 8:00 a.m. Monday)	5	7	9	11	12

*Outside of the hours 7:00 to 6:00 p.m.

For users without a maintenance contract, the 5280 system is maintained under per-call class 2. Under this class the per-call charge during regular hours is \$125.00 per hour, and during off hours the charge is \$147.00 per hour. The hourly rate for systems engineering service is \$85.00. ►

IBM 5280 Distributed Data System

Monthly Charges*

		Rental	Purchase Price	Monthly Maint.
PROGRAMMABLE DATA STATIONS				
5285	Programmable Data Station:			
C01	With 64K and one Diskette 1 drive	\$275	\$6,213	\$42.00
C05	With 64K and one Diskette 2D drive	300	6,463	49.00
D01	With 96K and one Diskette 1 drive	302	6,526	44.00
D05	With 96K and one Diskette 2D drive	327	6,776	51.00
E01	With 128K and one Diskette 1 drive	329	6,839	46.00
E05	With 128K and one Diskette 2D drive	354	7,089	53.00
5286	Dual Programmable Data Station:			
C02	With 64K and two Diskette 1 drives	330	8,263	49.00
C10	With 64K and two Diskette 2D drives	380	8,763	63.00
D02	With 96K and two Diskette 1 drives	357	8,576	51.00
D10	With 96K and two Diskette 2D drives	407	9,076	65.00
Keyboards for 5285 and 5286 (one required for each operator position):				
4600	83-key EBCDIC Keyboard	15	379	4.00
4601	66-key Data Entry Keyboard	15	379	4.00
4602	66-key Data Entry Keyboard with Proof Arrangement	15	379	4.00
4603	83-key ASCII Keyboard	15	379	4.00
Special features for 5285 and 5286 (except as noted):				
3401	Diskette 1 Drive (for 5285 only)	55	1,000	9.50
3402	Diskette 2D Drive (for 5285 only)	80	1,250	16.50
3410	10MB Disk Storage Drive (for 5285 only)	350	4,500	40.00
1150	5224/5225/5256 Twinax Printer Attachment (for 5285 only)	16	540	2.00
1152	5217/5222/5242 Printer Attachment (for 5285 only)	17	530	2.00
1210	Attachment for one 1920-character 5281 Data Station (for 5285 only)	36	879	3.00
1215	Attachment for one 480-character 5282 Dual Data Station	27	767	2.00
1240	Remote Diskette Drive Attachment (required if an attachment 5281 has either 1 or 2 diskette drives)	6	213	1.00
3505	1920-Character Display Size (for 5285 only)	16	225	1.00
3610	Elapsed Time Counter (measures elapsed realtime)	6	112	1.00
4950	Magnetic Stripe Reader (4955 or 4960 is a prerequisite)	16	428	2.00
4955	Magnetic Stripe Reader Adapter/Elapsed Time Counter (for 5286 or non-communicating 5285)	23	642	2.00
4960	Magnetic Stripe Reader Adapter/Elapsed Time Counter (for communicating 5285)	7	256	1.00
6340	Security Keylock	—	43	—
6800	Second Application Microprocessor	52	1,285	2.00

PROGRAMMABLE CONTROL UNITS

5288 Programmable Control Unit:

Submodel	Bytes of Main Storage	Monthly Charges*				
		Diskette 1 Drives	Diskette 2D Drives	Rental	Purchase Price	Monthly Maint.
C01	64K	1	0	\$273	\$6,913	\$34.50
C05	64K	0	1	298	7,163	41.50
D01	96K	1	0	300	7,226	36.50
D05	96K	0	1	325	7,476	43.50
E01	128K	1	0	327	7,539	38.50
E05	128K	0	1	352	7,789	45.50
F01	160K	1	0	354	7,852	40.50
F05	160K	0	1	379	8,102	47.50
H01	224K	1	0	408	8,478	44.50
H05	224K	0	1	433	8,728	51.50
J01	228K	1	0	462	9,104	48.50
J05	228K	0	1	487	9,354	55.50

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		Monthly Charges*		
		Rental	Purchase Price	Monthly Maint.
Special features for 5288 Programmable Control Unit:				
3401	Diskette 1 Drive	\$ 55	\$1,000	\$ 9.50
3402	Diskette 2D Drive	80	1,250	16.50
3410	10MB Disk Storage Drive	350	4,500	40.00
1162	5217/5222/5242 Multiple Twinax Printer Attachment (for 5288 only)	29	925	3.00
1255	Attachment for one 1920-character 5281 Data Station	16	225	1.50
1280	Attachment for one additional 1920-character 5281 (prerequisite: 1255)	36	879	3.00
1300	Remote Diskette Drive Attachment, First (required for first and second remote drives when base 5288 has 1 or 2 drives)	6	213	1.00
1301	Remote Diskette Drive Attachment, Second (required for first and second remote drives when base 5288 has 3 or 4 drives, or for third and fourth remote drives when base 5288 has 1 or 2 drives)	34	970	4.00
1302	Remote Diskette Drive Attachment, Third (required for third and fourth remote drives when base 5288 has 3 or 4 drives, or for fifth and sixth remote drives when base 5288 has 1 or 2 drives)	6	213	1.00
1155	Single 5225/5256 Twinax Printer Attachment (provides a single port for attaching from 1 to 5 printers via a single twinax cable)	16	540	2.00
1162	Multiple 5222/Twinax Printer Attachment	29	925	3.00
3610	Elapsed Time Counter	6	112	1.00
4955	Magnetic Stripe Reader Adapter/Elapsed Time Counter (controls up to 4 Magnetic Stripe Readers on attached 5281 and/or 5282 data stations)	23	642	2.00
6340	Security Keylock	—	43	—
6800	Second Application Microprocessor	52	1,285	2.50

AUXILIARY DATA STATIONS

5281	Data Station:			
200	With no diskette drive	80	2,295	12.00
5282	Dual Data Station:			
200	With no diskette drive	87	2,604	13.50
Keyboards for 5281 and 5282 (one required for each operator position):				
4600	83-key EBCDIC Keyboard	15	379	4.00
4601	66-key Data Entry Keyboard	15	379	4.00
4602	66-key Data Entry Keyboard with Proof Arrangement	15	379	4.00
4603	83-key ASCII Keyboard	15	379	4.00
Special features for 5281 and 5282:				
4950	Magnetic Stripe Reader	16	428	2.00
4400	Remote Disk feature (for attachment of 3410)	NC	NC	NC

PRINTERS

5217	Printer:			
Mdl. C2	60 cps at 10, 12, 15 cpi	—	4,425	52.50
5222	Printer:			
Mdl. 1	80 cps at 10 cpi; 80 cps at 15 cpi	142	2,345	34.00
5224	Printer:			
Mdl. 1	140 lpm at 10 cpi; 95 lpm at 15 cpi	346	6,395	48.00
Mdl. 2	240 lpm at 10 cpi; 175 lpm at 15 cpi	395	7,280	57.00
5225	Printer:			
Mdl. 1	280 lpm at 10 cpi; 195 lpm at 15 cpi	547	12,075	109.00
Mdl. 2	400 lpm at 10 cpi; 290 lpm at 15 cpi	625	13,945	152.00
Mdl. 3	490 lpm at 10 cpi; 355 lpm at 15 cpi	696	15,495	188.00
Mdl. 4	560 lpm at 10 cpi; 420 lpm at 15 cpi	764	16,940	224.00
5242	Printer:			
Mdl. 2	40/160 cps at 10, 15 cpi	—	2,975	61.00
5256	Printer:			
Mdl. 1	40 characters per second	256	4,145	49.00
Mdl. 2	80 characters per second	291	4,340	53.00
Mdl. 3	120 characters per second	316	4,535	60.00
Special features for the Printers:				
1470	Audible Alarm (signals operator when manual intervention is required due to one of nine error conditions; for 5225 and 5256 printer only)	—	50	—
2680	Cable Thru (permits multiple printers to be connected to a single twinax cable; required on each printer except the last; for 5225 and 5256 printers only)	4	119	2.00
6100	Rear Document Insert Device (for 5222 only)	7	135	1.00



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	Monthly Charges*		
	Rental	Purchase Price	Monthly Maint.
COMMUNICATIONS			
2500			
3270			
3701			
5501			
5508			
5650			
5651			
5810			

COMMUNICATIONS

2500	Communications Adapter (for 5285 only)	73	1,015	9.00
3270	3270 Emulation Communications Adapter (for 5285 or 5288 only)	110	2,040	13.00
3701	EIA Interface (provides RS-232-C interface for an external modem)	17	372	1.50
5501	1200-bps Integrated Modem, switched with auto answer	32	744	3.50
5508	1200-bps Integrated Modem, nonswitched with SNBU auto answer	36	947	4.50
5650	Digital Data Service Adapter; Point-to-Point	31	873	1.50
5651	Digital Data Service Adapter; Multipoint	31	873	1.50
5810	Power Supply Expansion (required on 5285 if 5501 or 5508 is installed)	4	79	1.50

SOFTWARE

		Basic Monthly Lic. Charge
5708-AS1	Assembler	\$ 44
5708-CB1	Cobol-OS/BS Host Compiler and Library	166
5708-CB2	Cobol-DOS/VSE Host Compiler and Library	166
5708-CB3	Cobol-S/34 Host Compiler and Library	175
5708-CB4	Cobol-S/38 Host Compiler and Library	175
5708-CL1	Procedure Control Language	10
5708-DC1	Communications Utilities	26
5708-DE1	DE/RPG	14
5708-EM1	5280-3270 Emulation	53
5708-SC1	System Control Programming (SCP)	NC
5708-SM1	Sort/Merge	14
5708-UT1	Utilities	8
5798-NZH	OS/6 Communications and File Conversion System	143
5798-RBZ	5280 Contract Data Entry/Edit Support	50
5798-RCR	5280 Format Design Aid	600
5798-RDF	5280 Distribution Order Subsystem	35 ■

*Includes prime shift maintenance.

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The System/34 workstation utilizes a 5251-11 CRT Display Station, with its 4600 Keyboard, and a 5256 Printer.

MANAGEMENT SUMMARY

Although IBM originally designed the System/34 as a stand-alone computer for the small business environment, it has continued to enhance the communications capabilities of the system to attract the distributed processing user. The System/34 now provides full support for interactive workstation-oriented data communications in network operations.

The System/34 can function as a terminal or as a processor in a hierarchical operation, using System/370, 303X, or 4300 mainframes or any of a number of smaller IBM systems as the host. It can also provide system-to-system communications with another System/34 or other communications terminals. New communications options recently introduced double the number of communication lines supported from two to four and add a number of new line interface choices, including 4800 bps integrated modems and an analog wideband adapter.

During the time since its introduction, IBM has expanded the System/34 in fixed disk capacity, main memory capacity, and remote workstation capacity. Maximum disk capacity is now 257.4 megabytes; maximum main memory capacity is 256K bytes. Up to 16 local and up to 64 remote workstations can be attached to the System/34.

Diskette options include a Diskette 1 drive, a Diskette 2D drive, or a magazine facility. The magazine unit has five slots (drives), two of which hold up to 10 diskettes each. These 20 diskettes can be read sequentially without operator intervention. The other three slots hold an individual diskette.

Five CRT display station models are currently available. Models 5251-1 and -2 provide 1920-character screens for local and remote usage, respectively; Models 5251-11 and -12, 960-character screens. Model 5252 houses two independent display/keyboard units in a single cabinet; each screen displays 960 characters. A magnetic stripe ➤

A small computer system with distributed processing capabilities.

Communications features provide support for up to four communications lines and a wide variety of communications interfaces, including 1200, 2400, and 4800 bps integrated modems, DDS adapters, an analog wideband adapter, and support for an auto-call unit. Transmission speeds of up to 56,000 bps are supported. Both BSC and SDLC protocols are provided by all communications options. Extensive communications software permits communications between remote and local System/34 workstations and another computer system.

A typical configuration with 64K bytes of main memory, 27.1 megabytes of disk storage, a single-spindle Diskette 2D drive, 6 local keyboard/display stations, two 40-cps workstation printers, a 300-lpm system printer, and one DDS adapter for host connection can be purchased for \$73,429, or leased for \$2,634 per month on a two-year lease including maintenance.

CHARACTERISTICS

VENDOR: International Business Machines Corporation, General Systems Division, 5775 Glenridge Drive N.E., Atlanta, Georgia 30301. Telephone (404) 231-3000.

DATE OF ANNOUNCEMENT: April 1977.

DATE OF FIRST DELIVERY: January 1978.

NUMBER DELIVERED TO DATE: 6,000 by the end of 1978 (estimated).

SERVICED BY: IBM.

CONFIGURATION

The System/34 is built upon a multiple-processor architecture especially tailored to support workstation-centered data processing. Up to 16 local and up to 64 remote workstations can be attached to the System/34. A workstation can be a CRT display station with keyboard, or a character printer. Mass storage support includes single-spindle or magazine-type diskette facilities with up to 1.2 megabytes of diskette capacity per drive, plus up to 257.4 megabytes of non-removable disk capacity.

One line printer and one magnetic character reader can be locally attached to the system.

The 5340 Processing Unit is available in 90 models. The models differ in memory capacity, diskette facilities, and disk storage capacity. The first digit of the model number is an alphabetic designation for the model's main memory ➤

IBM System/34

➤ reader is available as an optional feature for System/34 users requiring security from unauthorized usage. Recently announced support for the 3262 printer increases printing capabilities from a maximum of 300 lpm using the older 5211-2 to 650 lpm.

SSP, System Support Program, is the operating system offered with the System/34. SSP provides multiprogramming support (including concurrent, independent operation of multiple workstations), data file management, password security, menu job selection, control of language compilers, utilities, and control of communications lines. Included in the system utilities are support for interactive data entry, data file maintenance, source program entry, and the operating system command entry.

The Interactive Communications feature (SSP-ICF) provides the necessary functions to allow the System/34 to operate in an interactive distributed network. It provides for multiple users to share the same communications line, remote initiation of System/34 programs, program-to-program communications within the System/34, and program independence from the host subsystem support and line protocol. Early in 1979, IBM enhanced SSP-ICF to provide System/34-to-System/34 Communications using SDLC, and a 3270 BSC program interface. The SDLC software supports processor-to-processor connections for point-to-point or multi-point operations. The 3270 BSC protocol support permits a System/34 to emulate a Model 3271-2 controller when communicating with the host system.

Languages supported by SSP now include BASIC, as well as the previously available COBOL, RPG II, FORTRAN IV, and Basic Assembler.

USER REACTION

Datapro completed a mail survey of IBM System/34 users in January and February 1980. We received responses from 31 users with a total of 46 installed systems who indicated that at least one of their principal applications was distributed processing. These 31 users represented approximately ten percent of all System/34 users responding to the survey. Their ratings are summarized below:

	Excellent	Good	Fair	Poor	WA*
Ease of operation	19	10	1	1	3.5
Reliability of mainframe	22	7	2	0	3.6
Reliability of peripherals	16	13	2	0	3.5
Maintenance service:					
Responsiveness	17	14	0	0	3.5
Effectiveness	19	9	2	1	3.5
Technical support	6	15	8	2	2.8
Manufacturer's software:					
Operating system	13	15	1	2	3.3
Compilers and assemblers	11	13	5	0	3.2
Application programs	5	11	4	2	2.9
Ease of programming	13	14	3	1	3.3
Ease of conversion	9	12	3	5	2.9
Overall satisfaction	11	16	2	2	3.2

*Weighted Average on a scale of 4.0 for Excellent.

➤ capacity: A is the designation for 32K bytes, B for 48K bytes, C for 64K bytes, D for 96K bytes, E for 128K bytes, and F for 256K bytes. The second digit of the model number indicates the type of diskette unit selected: 1 designates a one-surface/single-density, single drive; 2 indicates a single drive with read/record capabilities for either a one-sided/single-density or a two-sided/double density diskette; 3 is for the Diskette Magazine facility. The last digit of the model number indicates the disk capacity: 1 for 8.6 megabytes, 2 for 13.2 megabytes, 3 for 27.1 megabytes, 4 for 63.9 megabytes, 5 for 128.4 megabytes, 6 for 192.9 megabytes, and 7 for 257.4 megabytes. Main memory capacity, diskette unit type, and disk capacity can be mixed-and-matched in any combination except for the following ones, which are invalid: x16, x17, x26, x27, A36, A37, B36, B37, F1x, F21, F31, and F32. For example, a 5340 Model B21 is a processing unit with 48K bytes of main memory, a dual-surface/double-density single-diskette drive, and 8.6 megabytes of disk storage. The maximum configuration is the Model F37, with 256K bytes of main memory, the Diskette Magazine unit, and 257.4 megabytes of disk capacity.

Special features include a Keylock (#4655) for security purposes; a Multinational Control (#4905), which provides support for the Multinational Character Set; the Workstation Control Expansion A (#4900), which provides support for the Magnetic Stripe Reader; and the Workstation Control Equipment B (#4901), which permits local workstations 9 thru 16 to be attached to the system (as well as providing the capabilities of #4900).

Four ports, wired to a microcontroller, are provided for local attachment of workstations. One of the ports must be dedicated to the one 5251-1, 5251-11, or 5252 CRT display station and keyboard which serves as the system console. The station can dually function as a workstation. The remaining three ports can be used to attach additional local workstations. Local workstations may be 5251-1/-11 or 5252 CRT Display Stations with Keyboard, or 40-/80-/120-cps 5256 Printers. Any one port will support up to seven workstations, by using a Cable-through feature. The first workstation is attached directly to the processing unit; each additional workstation is serially connected using this feature. The total maximum number of workstations for the three ports together is fifteen. The 5252 Dual Display Station/Keyboard counts as two workstations.

➤ Up to four communications lines can be attached to the System/34 using the #2500, #3500, or #4500 Communications Adapters. Each line will support communications either with remote workstations or with another system. Systems with which the System/34 may communicate are listed under "Network Connections." Communications with remote workstations are performed in half-duplex mode over switched or non-switched facilities using SDLC protocol. Remote workstations may be a 5251-2 or 5251-12 display station with keyboard. The communications feature that corresponds to that used at the processor end is required for connection of a 5251-2/-12 to the communications line; interfaces with 1200, 2400, and 4800 bps integrated modems, an EIA interface (for attachment of an external modem), or a DDS Adapter are available. Multiple 5251-2/-12's can be attached to a single communications line in a multipoint arrangement. Each 5251-2 or -12, via a cluster attachment feature, is capable of supporting up to eight additional workstations. Any combination of 5251-1, 5251-11, and 5252 display stations with keyboards, and 5256 workstation printers may be used. The 5252 Dual Display Station counts as two workstations. However, there is a limitation of 64 remote workstations for the total system. This limitation is applicable regardless of how many of the system's allowable communications lines are used for remote workstation attachment.

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COMMUNICATIONS OPTIONS FOR THE SYSTEM/34

Line Interface Options	Communications Features			Comments
	First Comm. Adapter (#2500)	Second Comm. Adapter (#3500)	Multiline Comm. Adapter (#4500)—see Note (1)	
EIA Interface	#3701	#3702	#531X	Used to attach an external modem; see Note (2)
1200 Bps Integrated Modems— Non-switched	#5500	#6500	#533X	Half-speed (600 bps) operation is supported via a parameter modification to the support software; also see Note (2)
Switched with auto answer	#5501	#6501	#534X	
2400 Bps Integrated Modems— Non-switched point-to-point	#5600	#6600	—	Processor Expansion Unit B (additional communications power—#5733) and/or Processor Expansion Unit D (gate assembly for modems—#5735) may be required for First or Second Communications Adapters; switched network back-up is an option that may be used in conjunction with any of the non-switched 2400 bps modems
Non-switched, System/34-controlled multipoint	#5601	#6601	—	
Non-switched, multipoint on which System/34 is a tributary station	#5602	#6602	—	
Switched with auto-answer	#5610	#6610	—	
Switched network back-up option (manual answer)	#7951	#7953	—	
Switched network back-up option (auto-answer)	#7952	#7954	—	
4800 Bps Integrated Modems— Non-switched	—	—	#535X	
Switched with auto-answer & integrated protective coupler	—	—	#536X	
Dataphone Digital Service Adapter— Point-to-point or System/34-controlled multipoint	#5650	#5652	#539X	Supports 2400, 4800, 9600, or (for MLCA only) 56,000 bps transmission
Multipoint on which System/34 is a tributary station	#5651	#5653	—	
Analog Wideband Adapter	—	—	#540X	Provides for attachment of a Western Electric 303-type modem or equivalent operating at 19,200 or 50,000 bps
Auto Call Unit	—	—	#541X	Installed in conjunction with an appropriate external modem; provides automatic dialing under program control to initiate a connection to a remote device; two MLCA lines are required, one for an EIA interface connecting to the external modem and one for the auto-call adapter

- (1) A Line Base Adapter (#530X) must be configured for each MLCA line and is a prerequisite for all other communications features on that line. The last digit of each MLCA communications feature number corresponds to the line number (1, 2, 3, or 4) of the line to which it may be attached.
- (2) An Internal Clock (#4703 for the First and Second Communications Adapters, #5321 for the MLCA) is required for every 1200 bps integrated modem, and for any EIA interface connecting to an external modem that does not provide its own 1200 bps clocking. Processor Expansion Unit C (I/O modem regulator—#5734) may be required for an EIA interface or 1200 bps integrated modem attached to the First or Second Communications Adapter.

➤ In addition to providing system ratings, these users were asked to respond to questions regarding acquisition, configuration, applications, software, future system plans, and significant advantages/problems with the system.

These users' responses indicated that their systems have been installed for an average of eleven months. About half (16 users) lease their systems, 9 users rent them on month-to-month basis, and 6 users purchased their systems outright. The typical configuration includes: 128K bytes of main memory, 64 or 128 megabytes of disk storage, the diskette magazine facility, one or two printers, and an average of 5 display workstations.

Among the principal applications for which these System/34's are most frequently being used (in addition to distributed processing) are:

➤ The Cluster feature attachment is available in a four-port (#2550) and an eight-port (#2551) version. Each port can support up to four workstations. A single workstation can be directly attached to the port; up to three additional workstations can be serially connected to the directly-attached workstation by use of the Cable-through feature. The maximum number of workstations per cluster is eight, not counting the 5251-2/-12 cluster controller. The 5252 Dual Display Station/Keyboard counts as two workstations. From a throughput standpoint, direct attachment and Cable-through attachment perform comparably.

NETWORK CONNECTIONS

Any of the System/34's communications lines can be used to support communications with another computer system.

Employing BSC protocol, the System/34 can communicate with one of the following:

- Another System/34 equipped with a 2500, 3500, or 4500 Communications Adapter.

IBM System/34

	Number of responses	Percent of total responses
Accounting	26	84%
Payroll/personnel	19	61
Manufacturing	11	35
Retail	8	25
Transaction processing	6	20
Service bureau	4	13
Word processing	4	13
Engineering/scientific	4	13

The vast majority (94 percent) of these users develop their application programs in-house, although about half also utilize "ready-made" IBM programs. A few users utilize proprietary software packages or custom software developed by a third party. The primary user programming language is RPG, although a few users use COBOL, BASIC, or FORTRAN in addition to, or instead of, RPG.

These users' plans for 1980 include expansion of the data communications facilities of their systems (19 users), enhancement of distributed processing capabilities (13 users), acquisition of additional IBM software (12 users) or proprietary software from other suppliers (4 users), and integration of word processing capabilities (8 users). When asked whether their future plans included replacement of the System/34 in 1980, only two users indicated "yes," noting that they have IBM System/38's on order.

When presented with a list of possible system advantages, these users checked off the following categories most frequently as significant System/34 strengths:

	Number of responses	Percent of total responses
Users happy with response time	23	74%
System is easy to expand/reconfigure	21	68
Programs/data carried over from other systems are compatible, as vendor promised	17	55
Productivity aids help us keep programming costs down	17	55
System is power/energy efficient	10	32

When presented with a list of possible problems that might have been encountered, these users checked off the following categories most frequently as significant System/34 weaknesses:

	Number of responses	Percent of total responses
System proposed by vendor was too small and had to be replaced or expanded	11	35%
Delivery and/or installation of equipment was late	5	16
Vendor did not provide all the promised software or support	5	16

As you can see, system advantages greatly outweigh the difficulties experienced by these users. As a whole, these users' responses expressed strong satisfaction both with

- ▶ A System/32, System 360/20, 5110 (as a 3741-2/-4), a 5231-2 Controller (point-to-point unidirectional transmission only), or a System/7 equipped with a 2074 BSC Communications Adapter.
- A System/3 equipped with either a 2074, 2084, or 2094 Communications Adapter.
- A Series/1 equipped with a 2074, 2075, 2093, or 2094 Communications Adapter (as a System/3).
- A 3741-2 Data Station or 3741-4 Programmable Workstation.
- A 3747 Data Converter equipped with a 1660 Communications Adapter.
- A 5265 Point of Sale Terminal communicating in point-to-point batch mode.
- A System/370 supported by OS BTAM; DOS BTAM; OS TCAM; OS/VS1 or OS/VS2 BTAM; TCAM, or VTAM; DOS/VS BTAM or VTAM; using an Integrated Communications Adapter, a 4331 Communications Adapter, a 2701 Data Adapter Unit, a 2703 Transmission Control Unit, or a 3704/3705 Communications Controller under control of either the Network Control Program (NCP) or Partitioned Emulation Program (PEP).

Employing SDLC protocol, the System/34 can communicate with another System/34, a 3601 Financial Communications Controller, or a System/370, 303X, or 4300 processor via a 4331 Communications Adapter or a 3704/3705 Communications Controller.

TRANSMISSION SPECIFICATIONS

Using the First and Second Communications Adapters (#2500 and #3500, respectively), up to two lines can be attached to the System/34. Using the Multiline Communications Adapter (MLCA—#4500), one to four lines can be attached; the MLCA is mutually exclusive with the First and Second Communications Adapters. Both BSC and SDLC protocols are supported by all of the adapters. Under SSP (software) control, each line operates independently and can support a different type of protocol and speed. With the First and Second Communications Adapters, transmission is supported over switched lines at speeds up to 4800 bps and over non-switched lines at up to 9600 bps; speeds are restricted to an aggregate of 9600 bps for lines operating concurrently. With the MLCA, the aggregate maximum speed is 65,600 bps. All four lines may operate concurrently, each at up to 9600 bps; alternately, one line may operate at 19,200, 50,000, or 56,000 bps, in which case the remaining lines are restricted to an aggregate of 9600 bps.

A separate set of line interface options is provided for each communication line controlled by each Communication Adapter. The two sets provided for the First and Second Communications Adapters provide functionally equivalent options, which differ only in their feature numbers. The four MLCA sets provide somewhat different options from those offered for the First and Second Communications Adapter, but are functionally identical to one another. Each MLCA set provides a Line Base Adapter, which is a prerequisite for all other communications options. One MLCA set's features are distinguished from another's only by the last digit of the feature numbers, which correspond to the line position number of the line to which they may be attached. The specific line interface options provided for each Communications Adapter are described in the Communication Options Table.

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➤ the hardware/software, and with IBM as a vendor. In fact, when asked whether they would recommend the System/34 to others, the overwhelming response (28 users, or 90 percent) said "yes." □

➤ SOFTWARE

System/34 software support consists of the System Support Program operating system, the System/34 Utilities Program Product, several language compilers, numerous industry applications programs, and a variety of communications software.

The System Support Program (SSP) provides task control, I/O, and data management functions for the system's disk storage, printers, and workstations in single-program or multi-program mode. In single-program mode, only one workstation may be active as a command terminal; in multi-program mode, all workstations that have been designated as command terminals may concurrently control commands and procedures. Communication between the user and the SSP is via the Operator Control Language (OCL), which consists of statements used to direct job execution. Utility programs supplied with the SSP assist the user in preparing and maintaining disk files; copying data, programs, and procedures from disk to diskette and vice versa; and other basic file maintenance functions.

The System/34 Utilities Program Product is a separately priced package consisting of five utility programs that provide data management capabilities in addition to those included with the SSP. The *Data File Utility* program provides for data file creation and maintenance, data file inquiry and retrieval, and data file listing and summarization of selected information. The *System/34 Sort Utility* accepts files organized in sequential, indexed, or direct order and sorts them in an ascending or descending user-defined sequence. The *Source Entry Utility* is used to create and maintain user-written OCL procedures: specifications for display formats, 1255 control, Auto Report, and Workstation Utility; FORTRAN, Assembler, and RPG II source code statements; and Sort source code statements. The *Work Station Utility* provides a set of specifications for defining interactive data entry programs which support one or more IBM 5251 Display Stations. The *Screen Design Aid* is an interactive utility for the design, creation, and maintenance of display formats and job menus.

COBOL, BASIC, RPG II, Basic Assembler, and FORTRAN IV are provided for user program development. Industry application programs include accounting systems, financial systems, CPA client accounting, medical systems, manufacturing systems and many others.

Communications Software

Communications software for the System/34 consists of the RPG II Telecommunications Feature, BSC support for RPG II and the basic assembler, the MRJE and SRJE utilities, SNA/SDLC data management support for remote workstations, SNA assembler macro support, and the Interactive Communications Feature of SSP.

The *RPG II Telecommunications Feature* provides support for transmission and reception of binary synchronous data over voice-grade or high-speed communications lines. The feature permits a System/34 to operate in any one of the following communications modes: receive only, transmit only, receive with conversational reply, or alternate transmit and receive file. The feature permits a System/34 executing a program written in RPG II to function as a terminal in one of the three types of networks: point-to-point switched, point-to-point non-switched, or multipoint.

BSC (binary synchronous communications) support is provided via RPG II and basic assembler macro instructions, where SSP provides the management for transmitting and receiving data. BSC transfers are possible between a System/34 and another System/34 with basic assembler or RPG II; a System/32 with basic assembler or RPG II; a System/3 with RPG II, MLMP, OR CCP; a System/7 with MSP/7; a System/360 or 370 with OS BTAM, OS/VS BTAM, DOS/VS BTAM, or DOS BTAM; a System/360 Model 20 with IOCS for the binary synchronous communications adapter; a 360/370 system with OS TCAM or OS/VS TCAM; a 360/370 system with OS/VTAM or DOS/VS BTAM; a 360/370 system with CICS/COS/VS or CICS/VS; a 360/370 system with IMS/VS; an IBM 3741 Model 2 Data Station or 3741 Model 4 Programmable Workstation; an IBM 3747 Data Converter; an IBM 5231 Data Collection Controller Model 2 acting as a 3741 Model 2 in transmit mode; and an IBM 3750 Switching System. The System/34 appears as a System/3 when communicating with a System/360 or System/370.

The *MRJE utility* uses BSC to communicate with the host system over point-to-point switched or non-switched communications lines via a 2500 or 3500 Communications Adapter. Under MRJE, the System/34 acts as a System/3 and is always considered to be the remote station which must initiate transmission of data to the host system.

The *SRJE utility* supports SNA/SDLC communications with a host System/370. SRJE allows submission of jobs to an IBM System/370 that uses VTAM and NCP/VS for processing by OS/VS1 RES, OS/VS2 JES2, and DOS/VS POWER/VS.

The System/34 SSP includes a print utility for both the MRJE and SRJE utilities. This utility prints or makes new disk files from punch output and printer output that was directed to the disk during an MRJE or SRJE session.

The System/34 SSP provides *SNA/SDLC data management support for remote workstations*, including the IBM 5251 or 5252 Display Stations and 5256 Printers. The remote workstations may be on one or two communications lines. Whether a workstation is directly attached or remotely attached is transparent to an application program.

SNA assembler macro support is provided for the System/34, in conjunction with the Basic Assembler and Macro Processor program product. The macros support all communications programs that use SNA/SDLC. Basic assembler macro-instructions provide the user interface for SNA communications with the IBM System/370 host telecommunications access methods and associated subsystems. The macros also provide the user with the ability to communicate with user-written host applications which use the same protocols as these IBM-supplied subsystems.

The *Interactive Communications Feature of SSP (SSP-ICF)* provides support for both BSC and SNA/SDLC interactive communications between applications programs, remote procedure initiation on the System/34, and communications line monitoring on a multipoint line where the System/34 is a tributary station (maintained even though no user application program is active). Interactive communications permits multiple concurrent communications sessions over the same data link. SSP-ICF also provides an application program interface which is substantially independent of BSC or SDLC protocol and the communications support for the remote system, IMS/VS, CICS/VS, or CCP.

The application program access to SSP-ICF is available at two levels that are a logical extension of the System/34 workstation interface. The first is through predefined screen format names that control evoking programs, sending of

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► data, and issuing of special commands to SSP-ICF. The second is through assembler programming for communication to systems which are not a part of the standard SSP-ICF support.

Two enhancements recently added to SSP-ICF permit System/34-to System/34 Communications under SDLC, and 3270 BSC program interfacing. The System/34-to-System/34 communications permits up to 64 concurrent sessions to be established between two processors. Physically, the connection may be a point-to-point arrangement, in which the SSP-ICF provides a symmetrical and functionally equivalent relationship between the two processors (i.e., either processor can initiate and control the session), or multipoint arrangement, in which one System/34 is designated as a primary station and other systems as tributary stations. Functionally, in the multipoint arrangement, each session between the primary station and a secondary station is treated as a symmetrical point-to-point connection. The 3270 BSC software permits the System/34 to emulate a 3271 Model 2 remote cluster controller; concurrent sessions with up to 32 individually addressed devices/programs may be carried on with the host.

COMPONENTS

PROCESSOR: A separate, microcoded, 16K-byte Control Microprocessor with a 600 nanosecond cycle time controls the Main Processor and directs all of the attached devices through a subsidiary microprocessor. The Main Processor supports from 32K to 256K bytes of user memory with a 600 nanosecond cycle time. Included in the Main Processor is a hardwired emulator that enables the System/34 to support System/3 and System/32 instructions that are not part of the System/34 native repertoire. The emulator (S/3 language processor) was hardwired to assure no System/34 performance degradation due to the compatibility support.

DISK STORAGE: Physically housed in the processor cabinet. Seven storage capacities are available: 8.6, 13.2, 27.1, 63.9, 128.4, 192.9, and 257.4 megabytes. The 8.6, 13.2, and 27.1 megabyte units contain 187.00, 288.00, and 589.33 cylinders, respectively; each cylinder accommodates 46,080 bytes. These disks rotate at 2964 rpm to provide a data transfer rate of 0.889 megabytes per second. Head positioning time for the 8.6 megabyte unit is 33 milliseconds (average) and up to 55 milliseconds (maximum); for the 13.2 and 27.1 megabyte units, the average is 38 milliseconds, the maximum, 70 milliseconds. The average rotational delay for these disks is 10 milliseconds. The 8.6 and 13.2 megabyte units each contain one spindle; the 27.1 megabyte contains two spindles.

The 63.9, 128.4, 192.9, and 257.4 megabyte units (code-named "Piccolo drives" during their development at IBM) contain 354.50, 712.50, 1070.50, and 1428.50 cylinders, respectively; each cylinder accommodates 180,224 bytes. These disks rotate at 3125 rpm to provide a data transfer rate of 1.031 megabytes per second. Head positioning time is 27 milliseconds average and up to 46 milliseconds maximum. Average rotational delay is 9 milliseconds. The 63.9 MB unit contains one spindle; the 128.4 MB unit, two spindles; the 192.9 MB unit, three spindles; and the 257.4 MB unit, four spindles.

DISKETTE STORAGE: Housed in the processing unit. Depending on processor model, one of three diskette features is provided: a single density, one surface Diskette 1 drive; a double density, two surface Diskette 2D drive (which also accommodates single density diskettes); or a Diskette Magazine unit. All diskette drives can read and write data in either Basic or Extended format. The single surface diskettes hold 246,272 bytes in Basic format and 303,104 bytes in Extended format. The two-surface diskettes hold 985,088 bytes in Basic format and 1,212,416 bytes in

Extended format. The Diskette Magazine unit has five slots (drives), two of which hold up to 10 diskettes each. These 20 diskettes can be read sequentially without operator intervention. The other three hold individual diskettes. All diskettes are user-accessible, and both Diskette 1 and Diskette 2D diskettes can be accommodated (but not within a single job stream).

DISPLAY STATION: Five display stations can be used as local or remote workstations in a System/34 configuration. A 5251-1, 5251-11, or 5252 display station can be used as the system console, as a local workstation, or as a remote workstation (in a cluster). The 5251-2 and 5251-12 are used as remote cluster controllers/workstations. The 5251-1 and 5251-2 have a 960-character screen (12 lines of 80 characters); the 5251-11 and 5251-12 have a 1920-character screen (24 lines of 80 characters). The 5252 houses two independent display/keyboard units in a single cabinet; each screen displays up to 960 characters (12 lines of 80 characters).

Each display supports the 96-character EBCDIC code set with upper and lower case; optionally, a 188-character Multinational Character Set can be used. Characters are formed by an 8-by-16 dot matrix. All workstations on a system must have the same character set. Intensity control, blinking, non-display, underscore, column separator, and reverse-image features are provided along with field editing options. Security features, such as a Keylock and a Magnetic Stripe Reader can be provided to prevent unauthorized usage of the display station and keyboard.

The display station operating as system console is attached to the processing unit by a 20-foot cable. The maximum distance from a local workstation to the processing unit or a remote workstation to its controller is 5000 feet. For cable that is exposed to the elements, a Twinax Protection Kit to shelter the cable can be purchased. A glare filter can also be purchased for display stations exposed to unusual lighting conditions.

The 5251-2/-12 communicates with a System/34 equipped with a Communications Adapter #2500, #3500, or #4500 operating in SNA/SDLC mode. Communications features that can be attached to the 5251-2/-12 include EIA interface (#3701); 1200 bps integrated modems for non-switched lines (#5500) or switched lines (#5502); 2400 bps integrated modems with manual answer (#5640) or auto-answer (#5641), 4800 bps integrated modems with manual answer (#5740) or auto-answer (#5741) and DDS adapters for point-to-point (#5650) or multipoint tributary (#5651) lines. The communications feature selected must correspond to the communications feature configured on the System/34 processor.

The 3600 Expanded Feature for a remote 5251-2/-12 Display Station and cluster provides the ability to copy any screen image onto a workstation printer in the cluster. The feature also provides the station with a modulus 10 and 11 self-check digit function.

KEYBOARD: The 4600 Keyboard is a required attachment for the Display Station. The 4600 keyboard has a typewriter-style layout with 49 alphanumeric keys, 24 control keys, and a 10-key numeric pad.

WORKSTATION PRINTER: The 5256 serial printer is available in 40, 80, and 120 cps models. Utilizing the same character sets as the Display Station, the serial printer accommodates 132 character print positions per line and forms the character by a 7-by-8 dot matrix. Tabletop mounted, the 5256 prints either six or eight lines per inch.

LINE PRINTERS: Two models of the belt-type, 132-column Model 5211 printer are offered. Character sets of

Update

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► 48, 64, 96, or 188 are available in either ASCII or EBCDIC code. The Model 1 will operate at 160 lpm with a 48-character set, at 123 lpm with a 64-character set, at 84 lpm with a 96-character set, and 44 lpm with a 188-character set. The Model 2 will operate at 300 lpm with a 48-character set, at 235 lpm with a 64-character set, at 164 lpm with a 96-character set, and 86 lpm with a 188-character set. Both standard and multinational character sets are available.

The Model 3262-B1 (B1 designates the stand-alone version) is also a 132-column belt-type printer and prints at a speed of 650 lpm with a 48-character set, 467 lpm with a 64-character set, 364 lpm with a 96-character set, and 131 lpm with a 188-character set. Various 48, 64, 96 ASCII and EBCDIC character sets are available, as well as 64, 96, and 188 multinational sets. Horizontal and vertical spacing is 10 characters per inch and 6 or 8 lines (operator-controlled) per inch, respectively. Up to 6-part fanfold forms of 3.5 to 16 inches in width and 3 to 14 inches in length can be accommodated.

MAGNETIC CHARACTER READER: Three models of 1255 MICR readers are offered, including a 500 document-per-minute, 6-stacker model; a 750-dpm, 6-stacker model; and a 750-dpm, 12-stacker model. All models handle documents between 5.75 and 8.875 inches long and 2.5 to 4.25 inches wide.

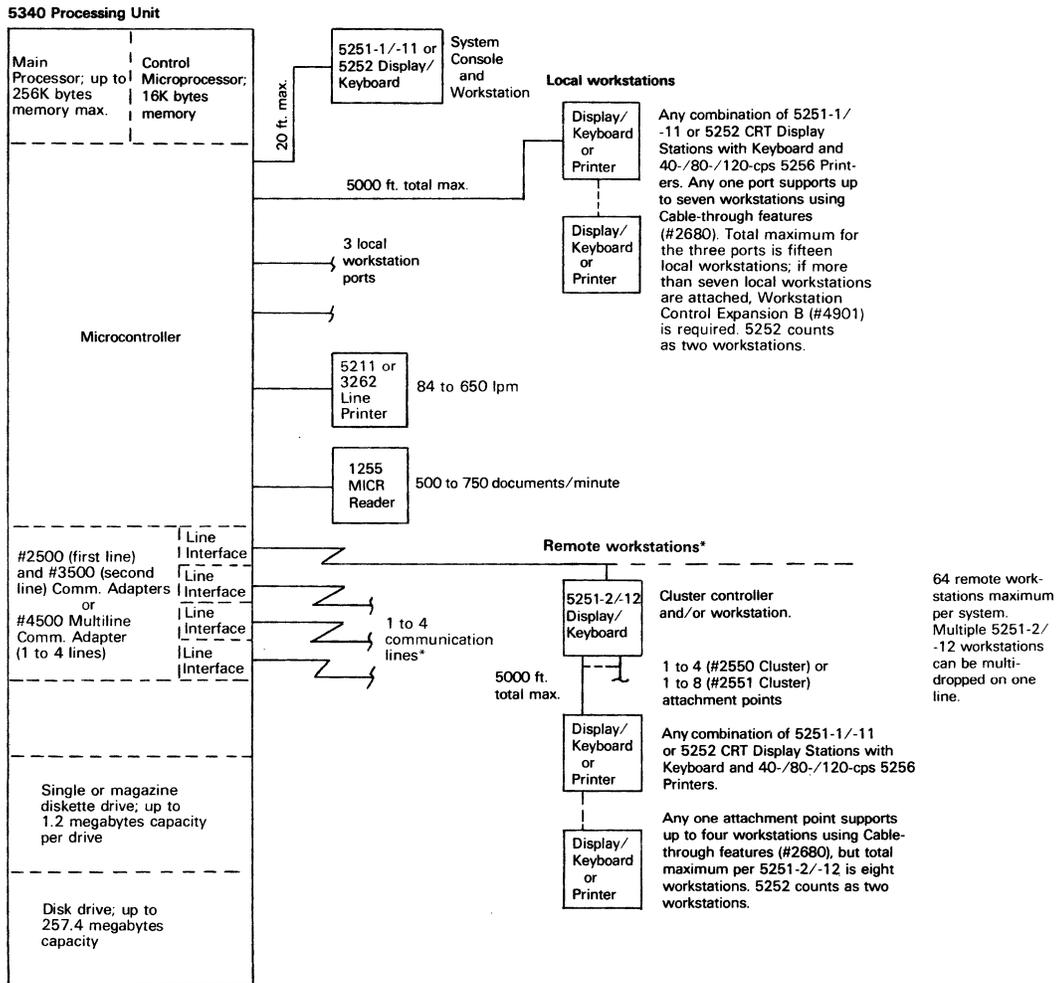
PRICING

All System/34 components are available under the terms of IBM's Lease or Rental Agreement (LRA) or for purchase, except for the 1255 magnetic card reader, which is available for purchase or month-to-month rental only. LRA includes prime shift maintenance; a separate contract is available for purchased units.

LRA provides for month-to-month rental or for a term lease with penalties for early termination (including model downgrades and feature termination). The lease term is 24 months for all equipment except the 5340 processor, which is leased for 36 months. The lease can be extended indefinitely, one year at a time. Except for the processor, the monthly charges for the lease arrangement are generally 15 percent lower than the month-to-month arrangement. The processor is approximately 9 percent lower than the month-to-month arrangement. The prime shift maintenance period is for any consecutive nine hours between 7 AM and 6 PM, Monday through Friday. (The maintenance charges given in the accompanying price list are for prime shift maintenance for purchase equipment and also serve as the basis for calculating extended charges for rented or leased equipment.) Extended period maintenance is available up to 24 hours per day, 7 days per week.

Except for the processor, the termination charge for the lease arrangement is the lower of 5 months' charges or 25

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*Each line supports connection to one or more remote workstation clusters or to a remote host computer.

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▶ percent of the remaining value of the lease. The processor termination charge for the lease arrangement is the lower of 4 months' charges or 20 percent of the remaining value of the lease.

All components are in maintenance category D, except the 1255 magnetic card reader, which is in category C, and 5211 line printer, which is in category B. These categories determine the schedule of extended maintenance charges. The premium for extended maintenance is expressed in the table below as a percentage of the basic maintenance charges, which are listed in the accompanying price list.

	Consecutive Hours				
	9*	12	16	20	24
Monday-Friday—					
Category B	10%	16%	22%	28%	34%
Category C	10	19	28	37	46
Category D	10	12	14	16	18
Saturday—					
Category B	5	6	8	10	11
Category C	8	9	11	13	15
Category D	4	5	7	8	9

Consecutive Hours
9* 12 16 20 24

Sunday—	9*	12	16	20	24
Category B	6	8	10	12	14
Category C	9	11	14	16	18
Category D	5	7	9	11	12

*For periods outside the basic 7 AM to 6 PM prime shift.

The lease arrangement also guarantees a maximum rate of increases for extended leasing periods. The rate for all components is five percent per year beginning in the second year of the lease.

All components are classed under in warranty category B (three months), and in rental category B (unlimited usage), except for the 1255 magnetic card reader, which is classed in rental category A (additional charges for use of more than 176 hours per month). Purchase credits can be accrued up to a maximum of 50 percent for the processor and line printer, 55 percent for the serial printer and CRT display station, 45 percent for the 3262 line printer, and 40 percent for the magnetic card reader.

Sub-Model	Bytes of Main Storage	Diskette Reading Surfaces	Megabytes of Disk Storage	Monthly Charge*			
				Rental Contract	Lease Contract	Purchase	Monthly Maint.
A11	32K	1	8.6	\$1,000	\$ 909	\$20,310	\$159
A12	32K	1	13.2	1,083	986	22,090	169
A13	32K	1	27.1	1,355	1,234	29,470	208
A14	32K	1	63.9	1,507	1,373	39,130	208
A15	32K	1	128.4	1,840	1,676	48,580	258
A21	32K	2	8.6	1,077	981	22,470	164
A22	32K	2	13.2	1,161	1,058	24,250	174
A23	32K	2	27.1	1,433	1,306	31,630	213
A24	32K	2	63.9	1,585	1,445	41,290	213
A25	32K	2	128.4	1,918	1,748	50,740	263
A31	32K	Magazine	8.6	1,169	1,065	24,990	186
A32	32K	Magazine	13.2	1,253	1,142	26,770	196
A33	32K	Magazine	27.1	1,525	1,390	34,150	235
A34	32K	Magazine	63.9	1,677	1,529	43,810	235
A35	32K	Magazine	128.4	2,010	1,832	53,260	285
B11	48K	1	8.6	1,048	954	21,095	164
B12	48K	1	13.2	1,132	1,031	22,875	174
B13	48K	1	27.1	1,404	1,279	30,255	213
B14	48K	1	63.9	1,556	1,418	39,915	213
B15	48K	1	128.4	1,889	1,721	49,365	263
B21	48K	2	8.6	1,126	1,026	23,255	169
B22	48K	2	13.2	1,210	1,103	25,035	179
B23	48K	2	27.1	1,482	1,351	32,415	218
B24	48K	2	63.9	1,634	1,490	42,075	218
B25	48K	2	128.4	1,967	1,793	51,525	268
B31	48K	Magazine	8.6	1,218	1,110	25,775	191
B32	48K	Magazine	13.2	1,302	1,187	27,555	201
B33	48K	Magazine	27.1	1,574	1,435	34,935	240
B34	48K	Magazine	63.9	1,726	1,574	44,595	240
B35	48K	Magazine	128.4	2,059	1,877	54,045	290
C11	64K	1	8.6	1,097	999	21,880	169
C12	64K	1	13.2	1,181	1,076	23,660	179
C13	64K	1	27.1	1,453	1,324	31,040	218
C14	64K	1	63.9	1,605	1,463	40,700	218
C15	64K	1	128.4	1,938	1,766	50,150	268
C21	64K	2	8.6	1,175	1,071	24,040	174
C22	64K	2	13.2	1,259	1,148	25,820	184
C23	64K	2	27.1	1,531	1,396	33,200	223
C24	64K	2	63.9	1,683	1,535	42,860	223
C25	64K	2	128.4	2,016	1,838	52,310	273
C31	64K	Magazine	8.6	1,267	1,155	26,560	196
C32	64K	Magazine	13.2	1,351	1,232	28,340	206
C33	64K	Magazine	27.1	1,623	1,480	35,720	245
C34	64K	Magazine	63.9	1,775	1,619	45,380	245
C35	64K	Magazine	128.4	2,108	1,922	54,830	295
C36	64K	Magazine	192.9	2,567	2,340	67,770	349
C37	64K	Magazine	257.4	2,900	2,643	77,220	399

*Includes prime-shift maintenance.

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► 48, 64, 96, or 188 are available in either ASCII or EBCDIC code. The Model 1 will operate at 160 lpm with a 48-character set, at 123 lpm with a 64-character set, at 84 lpm with a 96-character set, and 44 lpm with a 188-character set. The Model 2 will operate at 300 lpm with a 48-character set, at 235 lpm with a 64-character set, at 164 lpm with a 96-character set, and 86 lpm with a 188-character set. Both standard and multinational character sets are available.

The Model 3262-B1 (B1 designates the stand-alone version) is also a 132-column belt-type printer and prints at a speed of 650 lpm with a 48-character set, 467 lpm with a 64-character set, 364 lpm with a 96-character set, and 131 lpm with a 188-character set. Various 48, 64, 96 ASCII and EBCDIC character sets are available, as well as 64, 96, and 188 multinational sets. Horizontal and vertical spacing is 10 characters per inch and 6 or 8 lines (operator-controlled) per inch, respectively. Up to 6-part fanfold forms of 3.5 to 16 inches in width and 3 to 14 inches in length can be accommodated.

MAGNETIC CHARACTER READER: Three models of 1255 MICR readers are offered, including a 500 document-per-minute, 6-stacker model; a 750-dpm, 6-stacker model; and a 750-dpm, 12-stacker model. All models handle documents between 5.75 and 8.875 inches long and 2.5 to 4.25 inches wide.

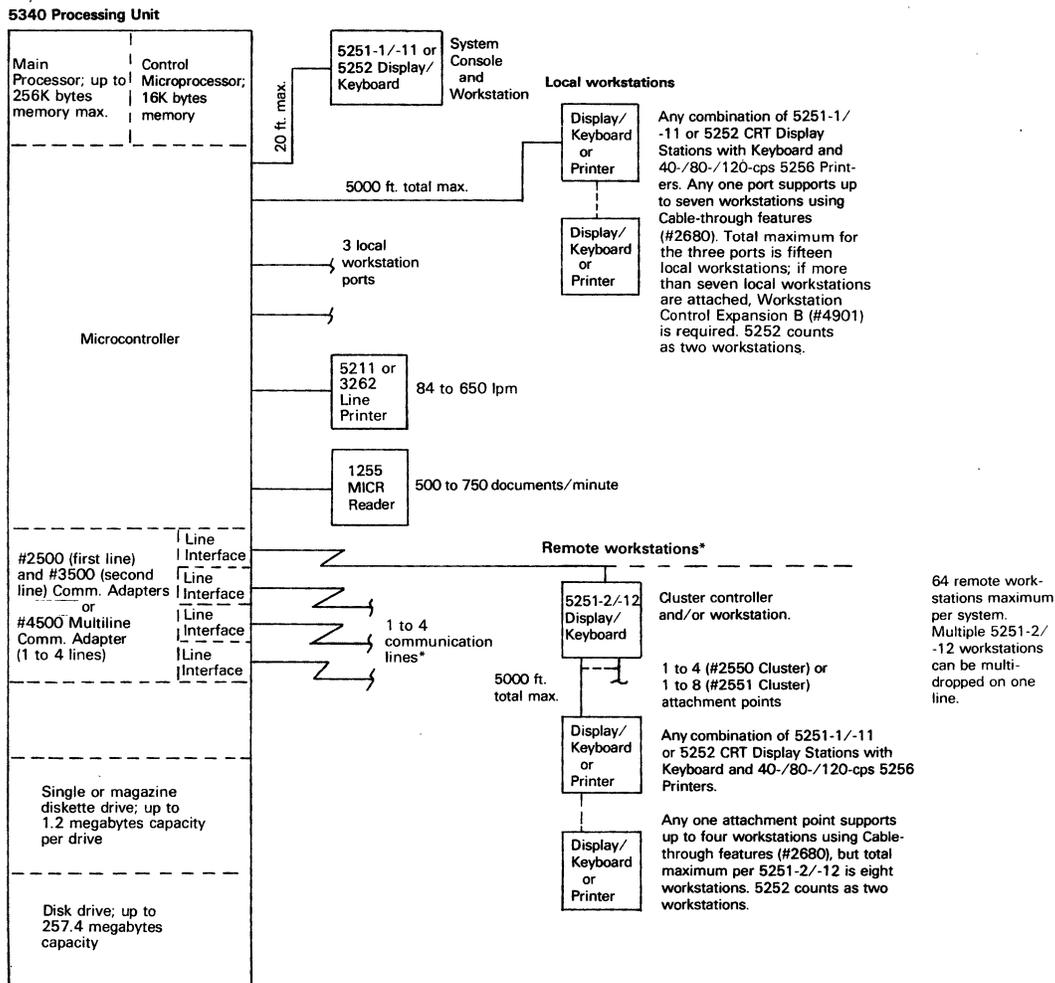
PRICING

All System/34 components are available under the terms of IBM's Lease or Rental Agreement (LRA) or for purchase, except for the 1255 magnetic card reader, which is available for purchase or month-to-month rental only. LRA includes prime shift maintenance; a separate contract is available for purchased units.

LRA provides for month-to-month rental or for a term lease with penalties for early termination (including model downgrades and feature termination). The lease term is 24 months for all equipment except the 5340 processor, which is leased for 36 months. The lease can be extended indefinitely, one year at a time. Except for the processor, the monthly charges for the lease arrangement are generally 15 percent lower than the month-to-month arrangement. The processor is approximately 9 percent lower than the month-to-month arrangement. The prime shift maintenance period is for any consecutive nine hours between 7 AM and 6 PM, Monday through Friday. (The maintenance charges given in the accompanying price list are for prime shift maintenance for purchase equipment and also serve as the basis for calculating extended charges for rented or leased equipment.) Extended period maintenance is available up to 24 hours per day, 7 days per week.

Except for the processor, the termination charge for the lease arrangement is the lower of 5 months' charges or 25 ►

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► percent of the remaining value of the lease. The processor termination charge for the lease arrangement is the lower of 4 months' charges or 20 percent of the remaining value of the lease.

All components are in maintenance category D, except the 1255 magnetic card reader, which is in category C, and 5211 line printer, which is in category B. These categories determine the schedule of extended maintenance charges. The premium for extended maintenance is expressed in the table below as a percentage of the basic maintenance charges, which are listed in the accompanying price list.

	Consecutive Hours				
	9*	12	16	20	24
Monday-Friday —					
Category B	10%	16%	22%	28%	34%
Category C	10	19	28	37	46
Category D	10	12	14	16	18
Saturday —					
Category B	5	6	8	10	11
Category C	8	9	11	13	15
Category D	4	5	7	8	9

Consecutive Hours
9* 12 16 20 24

Sunday —					
Category B	6	8	10	12	14
Category C	9	11	14	16	18
Category D	5	7	9	11	12

*For periods outside the basic 7 AM to 6 PM prime shift.

The lease arrangement also guarantees a maximum rate of increases for extended leasing periods. The rate for all components is five percent per year beginning in the second year of the lease.

All components are classed under in warranty category B (three months), and in rental category B (unlimited usage), except for the 1255 magnetic card reader, which is classed in rental category A (additional charges for use of more than 176 hours per month). Purchase credits can be accrued up to a maximum of 50 percent for the processor and line printer, 55 percent for the serial printer and CRT display station, 45 percent for the 3262 line printer, and 40 percent for the magnetic card reader.

Sub-Model	Bytes of Main Storage	Diskette Reading Surfaces	Megabytes of Disk Storage	Monthly Charge*			
				Rental Contract	Lease Contract	Purchase	Monthly Maint.
A11	32K	1	8.6	\$1,078	\$ 981	\$15,310	\$159
A12	32K	1	13.2	1,168	1,064	17,090	169
A13	32K	1	27.1	1,462	1,332	23,470	208
A14	32K	1	63.9	1,626	1,482	39,130	208
A15	32K	1	128.4	1,959	1,785	48,580	258
A21	32K	2	8.6	1,162	1,059	17,470	164
A22	32K	2	13.2	1,252	1,142	19,250	174
A23	32K	2	27.1	1,546	1,410	25,630	213
A24	32K	2	63.9	1,710	1,560	41,290	213
A25	32K	2	128.4	2,043	1,863	50,740	263
A31	32K	Magazine	8.6	1,261	1,149	19,990	186
A32	32K	Magazine	13.2	1,351	1,232	21,770	196
A33	32K	Magazine	27.1	1,645	1,500	28,150	235
A34	32K	Magazine	63.9	1,809	1,650	43,810	235
A35	32K	Magazine	128.4	2,142	1,953	53,260	285
B11	48K	1	8.6	1,130	1,029	16,095	164
B12	48K	1	13.2	1,120	1,112	17,875	174
B13	48K	1	27.1	1,514	1,380	24,255	213
B14	48K	1	63.9	1,678	1,530	39,915	213
B15	48K	1	128.4	2,011	1,833	49,365	263
B21	48K	2	8.6	1,214	1,107	18,255	169
B22	48K	2	13.2	1,304	1,190	20,035	179
B23	48K	2	27.1	1,598	1,458	26,415	218
B24	48K	2	63.9	1,762	1,608	42,075	218
B25	48K	2	128.4	2,095	1,911	51,525	268
B31	48K	Magazine	8.6	1,313	1,197	20,775	191
B32	48K	Magazine	13.2	1,403	1,280	22,555	201
B33	48K	Magazine	27.1	1,697	1,548	28,935	240
B34	48K	Magazine	63.9	1,861	1,698	44,595	240
B35	48K	Magazine	128.4	2,194	2,001	54,045	290
C11	64K	1	8.6	1,182	1,077	16,880	169
C12	64K	1	13.2	1,272	1,160	18,660	179
C13	64K	1	27.1	1,566	1,428	25,040	218
C14	64K	1	63.9	1,730	1,578	40,700	218
C15	64K	1	128.4	2,063	1,881	50,150	268
C21	64K	2	8.6	1,266	1,155	19,040	174
C22	64K	2	13.2	1,356	1,238	20,820	184
C23	64K	2	27.1	1,650	1,506	27,200	223
C24	64K	2	63.9	1,814	1,656	42,860	223
C25	64K	2	128.4	2,147	1,959	52,310	273
C31	64K	Magazine	8.6	1,365	1,245	21,560	196
C32	64K	Magazine	13.2	1,455	1,328	23,340	206
C33	64K	Magazine	27.1	1,749	1,596	29,720	245
C34	64K	Magazine	63.9	1,913	1,746	45,380	245
C35	64K	Magazine	128.4	2,246	2,049	54,830	295
C36	64K	Magazine	192.9	2,715	2,476	67,770	349
C37	64K	Magazine	257.4	3,048	2,779	77,220	399

*Includes prime-shift maintenance.

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► 48, 64, 96, or 188 are available in either ASCII or EBCDIC code. The Model 1 will operate at 160 lpm with a 48-character set, at 123 lpm with a 64-character set, at 84 lpm with a 96-character set, and 44 lpm with a 188-character set. The Model 2 will operate at 300 lpm with a 48-character set, at 235 lpm with a 64-character set, at 164 lpm with a 96-character set, and 86 lpm with a 188-character set. Both standard and multinational character sets are available.

The Model 3262-B1 (B1 designates the stand-alone version) is also a 132-column belt-type printer and prints at a speed of 650 lpm with a 48-character set, 467 lpm with a 64-character set, 364 lpm with a 96-character set, and 131 lpm with a 188-character set. Various 48, 64, 96 ASCII and EBCDIC character sets are available, as well as 64, 96, and 188 multinational sets. Horizontal and vertical spacing is 10 characters per inch and 6 or 8 lines (operator-controlled) per inch, respectively. Up to 6-part fanfold forms of 3.5 to 16 inches in width and 3 to 14 inches in length can be accommodated.

MAGNETIC CHARACTER READER: Three models of 1255 MICR readers are offered, including a 500 document-per-minute, 6-stacker model; a 750-dpm, 6-stacker model; and a 750-dpm, 12-stacker model. All models handle documents between 5.75 and 8.875 inches long and 2.5 to 4.25 inches wide.

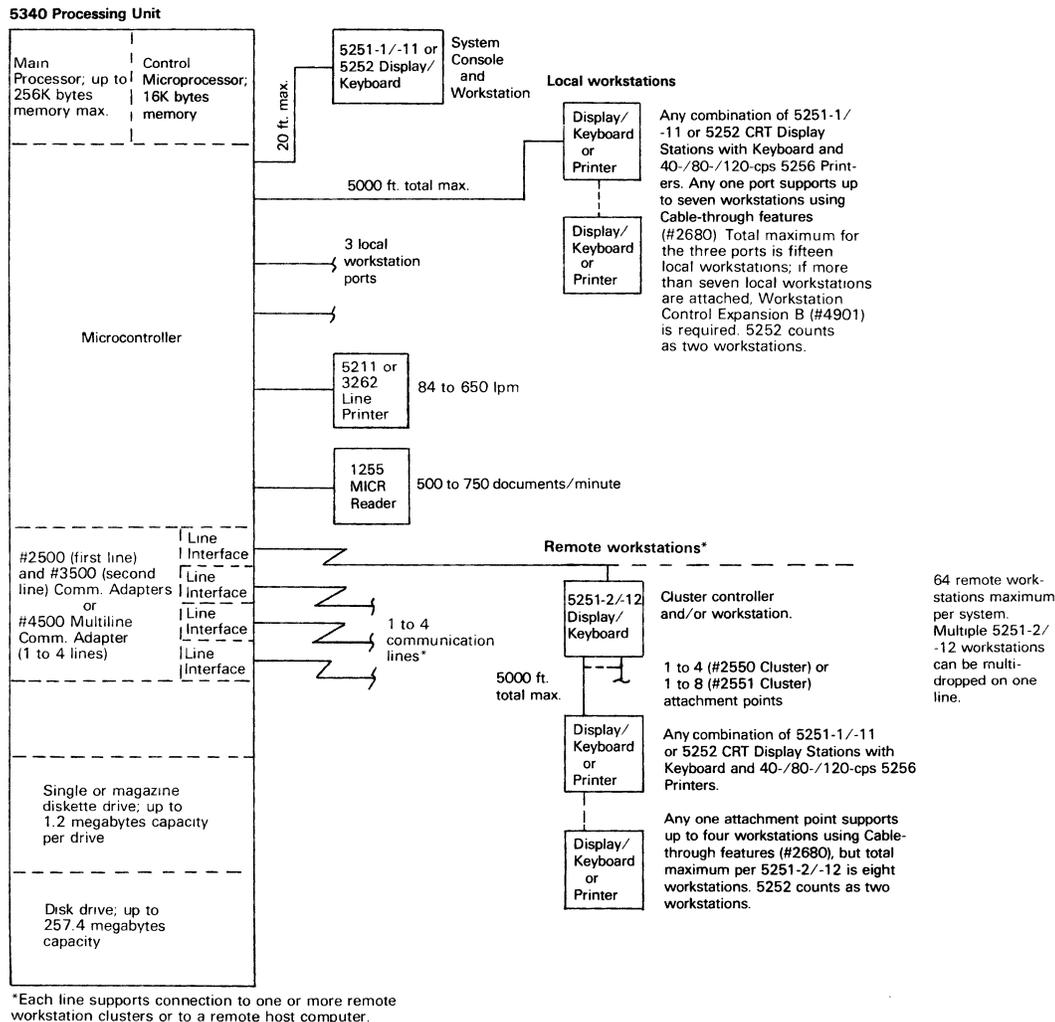
PRICING

All System/34 components are available under the terms of IBM's Rental or Lease Agreement (LRA) or for purchase, except for the 1255 magnetic card reader, which is available for purchase or month-to-month rental only. LRA includes prime shift maintenance; a separate contract is available for purchased units.

LRA provides for month-to-month rental or for a term lease with penalties for early termination (including model downgrades and feature termination). The lease term is 24 months for all equipment except the 5340 processor, which is leased for 36 months. The lease can be extended indefinitely, one year at a time. Except for the processor, the monthly charges for the lease arrangement are generally 15 percent lower than the month-to-month arrangement. The processor is approximately 9 percent lower than the month-to-month arrangement. The prime shift maintenance period is for any consecutive nine hours between 7 AM and 6 PM, Monday through Friday. (The maintenance charges given in the accompanying price list are for prime shift maintenance for purchase equipment and also serve as the basis for calculating extended charges for rented or leased equipment.) Extended period maintenance is available up to 24 hours per day, 7 days per week.

Except for the processor, the termination charge for the lease arrangement is the lower of 5 months' charges or 25 ►

Configuration



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► percent of the remaining value of the lease. The processor termination charge for the lease arrangement is the lower of 4 months' charges or 20 percent of the remaining value of the lease.

All components are in maintenance category D, except the 1255 magnetic card reader, which is in category C, and 5211 line printer, which is in category B. These categories determine the schedule of extended maintenance charges. The premium for extended maintenance is expressed in the table below as a percentage of the basic maintenance charges, which are listed in the accompanying price list.

	Consecutive Hours				
	9*	12	16	20	24
Monday-Friday —					
Category B	10%	16%	22%	28%	34%
Category C	10	19	28	37	46
Category D	10	12	14	16	18
Saturday —					
Category B	5	6	8	10	11
Category C	8	9	11	13	15
Category D	4	5	7	8	9

5340 System Units

All 90 models, corresponding to 90 valid combinations of memory, diskette, and disk storage choices, can be priced using the chart below. Simply add together the three figures, one from each category, that reflect the combination of choices represented by the model number. (The following combinations are invalid: x16, x17, x26, x27, A36, A37, B36, B37, F1x, F21, F31, F32.) —

	Rental Contract	Lease Contract	Purchase	Monthly Maint.
Main Memory Capacity:				
Axx — 32K bytes	\$ 926	\$ 842	\$20,310	\$152
Bxx — 48K bytes	972	884	21,095	157
Cxx — 64K bytes	1,018	926	21,880	162
Dxx — 96K bytes	1,110	1,010	23,450	172
Exx — 128K bytes	1,202	1,094	25,020	182
Fxx — 256K bytes	1,636	1,490	33,320	226
Diskette Facility:				
x1x — Single reading surface	0	0	0	0
x2x — Two reading surfaces	73	67	2,160	5
x3x — Diskette Magazine Facility	158	145	4,680	26
Disk Storage Capacity:				
xx1 — 8.6 Megabytes	0	0	0	0
xx2 — 13.2 Megabytes	79	72	1,780	10
xx3 — 27.1 Megabytes	332	302	9,160	47
xx4 — 63.9 Megabytes	473	431	18,820	47
xx5 — 128.4 Megabytes	785	716	28,270	95
xx6 — 192.9 Megabytes	1,214	1,108	41,210	147
xx7 — 257.4 Megabytes	1,526	1,393	50,660	195

Workstations

	Rental Contract	Lease Contract	Purchase	Monthly Maint.
CRT Display Stations—				
5251-1 Local; 960 characters	87	74	2,660	18.50
5251-11 Local; 1920 characters	94	80	2,850	19.50
5252 Local; dual display; 960 characters each display	100	85	3,040	22
2680 Cable-through	4	3	115	1
5251-2 Remote; SDLC; 960 characters	142	121	3,875	42.50
5251-12 Remote; SDLC; 1920 characters	149	127	4,050	42.50
3701 EIA Interface	13	11	430	3
5500 Interface with 1200 bps modem for non-switched line	20	17	660	5
5502 Interface with 1200 bps modem for switched line	20	17	660	5
5640 Interface with 2400 bps modem	72	61	2,050	25
5641 Interface with 2400 bps modem; includes auto-answer feature	78	66	2,260	26
5740 Interface with 4800 bps modem	126	107	3,570	37
5741 Interface with 4800 bps modem; includes auto-answer feature	132	112	3,750	39.50
4703 Internal Clock	6	5	210	1
5650 DDS Interface; 2400, 4800, 9600 bps; point-to-point	25	21	840	4
5651 DDS Interface; 2400, 4800, 9600 bps; multipoint tributary	25	21	840	4

*Includes prime-shift maintenance.

	Consecutive Hours				
	9*	12	16	20	24
Sunday —					
Category B	6	8	10	12	14
Category C	9	11	14	16	18
Category D	5	7	9	11	12

*For periods outside the basic 7 AM to 6 PM prime shift.

The lease arrangement also guarantees a maximum rate of increases for extended leasing periods. The rate for all components is five percent per year beginning in the second year of the lease.

All components are classed under in warranty category B (three months), and in rental category B (unlimited usage), except for the 1255 magnetic card reader, which is classed in rental category A (additional charges for use of more than 176 hours per month). Purchase credits can be accrued up to a maximum of 50 percent for the processor and line printer, 55 percent for the serial printer and CRT display station, 45 percent for the 3262 line printer, and 40 percent for the magnetic card reader.

Monthly Charge*

Rental Contract	Lease Contract	Purchase	Monthly Maint.
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➤ 48, 64, 96, or 188 are available in either ASCII or EBCDIC code. The Model 1 will operate at 160 lpm with a 48-character set, at 123 lpm with a 64-character set, at 84 lpm with a 96-character set, and 44 lpm with a 188-character set. The Model 2 will operate at 300 lpm with a 48-character set, at 235 lpm with a 64-character set, at 164 lpm with a 96-character set, and 86 lpm with a 188-character set. Both standard and multinational character sets are available.

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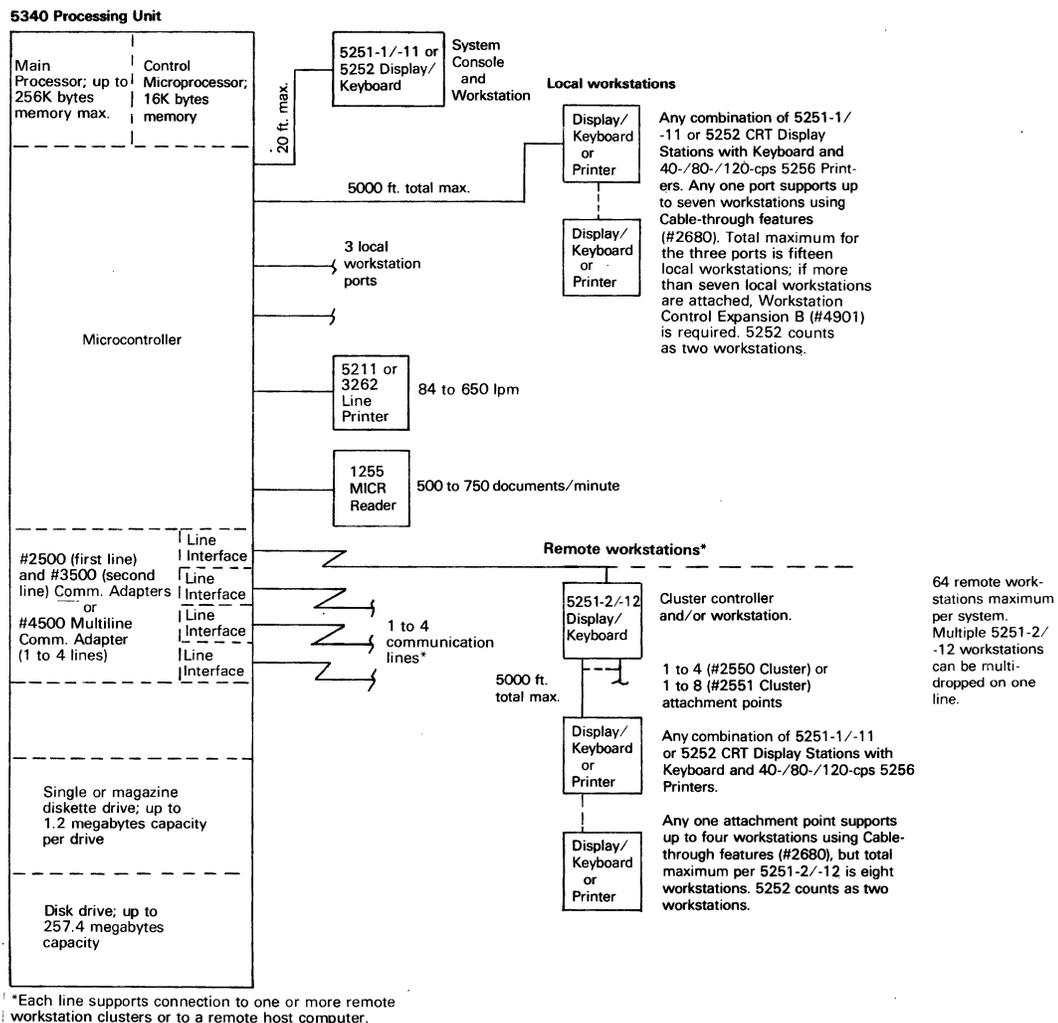
PRICING

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LRA provides for month-to-month rental or for a term lease with penalties for early termination (including model downgrades and feature termination). The lease term is 24 months for all equipment except the 5340 processor, which is leased for 36 months. The lease can be extended indefinitely, one year at a time. Except for the processor, the monthly charges for the lease arrangement are generally 15 percent lower than the month-to-month arrangement. The processor is approximately 9 percent lower than the month-to-month arrangement. The prime shift maintenance period is for any consecutive nine hours between 7 AM and 6 PM, Monday through Friday. (The maintenance charges given in the accompanying price list are for prime shift maintenance for purchase equipment and also serve as the basis for calculating extended charges for rented or leased equipment.) Extended period maintenance is available up to 24 hours per day, 7 days per week.

Except for the processor, the termination charge for the lease arrangement is the lower of 5 months' charges or 25 ➤

Configuration



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▶ percent of the remaining value of the lease. The processor termination charge for the lease arrangement is the lower of 4 months' charges or 20 percent of the remaining value of the lease.

All components are in maintenance category D, except the 1255 magnetic card reader, which is in category C, and 5211 line printer, which is in category B. These categories determine the schedule of extended maintenance charges. The premium for extended maintenance is expressed in the table below as a percentage of the basic maintenance charges, which are listed in the accompanying price list.

	Consecutive Hours				
	9*	12	16	20	24
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Category B	10%	16%	22%	28%	34%
Category C	10	19	28	37	46
Category D	10	12	14	16	18
Saturday —					
Category B	5	6	8	10	11
Category C	8	9	11	13	15
Category D	4	5	7	8	9

	Consecutive Hours				
	9*	12	16	20	24
Sunday —					
Category B	6	8	10	12	14
Category C	9	11	14	16	18
Category D	5	7	9	11	12

*For periods outside the basic 7 AM to 6 PM prime shift.

The lease arrangement also guarantees a maximum rate of increases for extended leasing periods. The rate for all components is five percent per year beginning in the second year of the lease.

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Sub-Model	Bytes of Main Storage	Diskette Reading Surfaces	Megabytes of Disk Storage	Monthly Charge*			
				Rental Contract	Lease Contract	Purchase	Monthly Maint.
A11	32K	1	8.6	\$1,164	\$1,059	\$15,920	\$159
A12	32K	1	13.2	1,261	1,148	17,770	169
A13	32K	1	27.1	1,578	1,438	24,405	208
A14	32K	1	63.9	1,755	1,600	40,690	208
A15	32K	1	128.4	2,114	1,927	50,140	258
A21	32K	2	8.6	1,254	1,143	18,165	164
A22	32K	2	13.2	1,351	1,232	20,015	174
A23	32K	2	27.1	1,668	1,522	26,650	213
A24	32K	2	63.9	1,845	1,684	42,935	213
A25	32K	2	128.4	2,204	2,011	52,385	263
A31	32K	Magazine	8.6	1,361	1,240	20,785	186
A32	32K	Magazine	13.2	1,458	1,329	22,635	196
A33	32K	Magazine	27.1	1,775	1,619	29,270	235
A34	32K	Magazine	63.9	1,952	1,781	45,555	235
A35	32K	Magazine	128.4	2,311	2,108	55,005	285
B11	48K	1	8.6	1,220	1,110	16,705	164
B12	48K	1	13.2	1,317	1,199	18,555	174
B13	48K	1	27.1	1,634	1,489	25,190	213
B14	48K	1	63.9	1,811	1,651	41,475	213
B15	48K	1	128.4	2,170	1,978	50,925	263
B21	48K	2	8.6	1,310	1,194	18,950	169
B22	48K	2	13.2	1,407	1,283	20,800	179
B23	48K	2	27.1	1,724	1,573	27,435	218
B24	48K	2	63.9	1,901	1,735	43,720	218
B25	48K	2	128.4	2,260	2,062	53,170	268
B31	48K	Magazine	8.6	1,417	1,291	21,570	191
B32	48K	Magazine	13.2	1,514	1,380	23,420	201
B33	48K	Magazine	27.1	1,831	1,670	30,055	240
B34	48K	Magazine	63.9	2,008	1,832	46,340	240
B35	48K	Magazine	128.4	2,367	2,001	54,045	290
C11	64K	1	8.6	1,276	1,161	17,490	169
C12	64K	1	13.2	1,373	1,250	19,340	179
C13	64K	1	27.1	1,690	1,540	25,975	218
C14	64K	1	63.9	1,865	1,702	42,260	218
C15	64K	1	128.4	2,226	2,029	51,710	268
C21	64K	2	8.6	1,366	1,245	19,735	174
C22	64K	2	13.2	1,463	1,334	21,585	184
C23	64K	2	27.1	1,780	1,624	28,220	223
C24	64K	2	63.9	1,957	1,786	44,505	223
C25	64K	2	128.4	2,316	2,113	53,995	273
C31	64K	Magazine	8.6	1,473	1,342	22,355	196
C32	64K	Magazine	13.2	1,570	1,431	24,205	206
C33	64K	Magazine	27.1	1,887	1,721	30,840	245
C34	64K	Magazine	63.9	2,064	1,883	47,125	245
C35	64K	Magazine	128.4	2,423	2,210	56,575	295
C36	64K	Magazine	192.9	2,929	2,671	69,655	349
C37	64K	Magazine	257.4	3,288	2,998	79,105	399

*Includes prime-shift maintenance.

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Sub-Model	Bytes of Main Storage	Diskette Reading Surfaces	Megabytes of Disk Storage	Monthly Charge*			Monthly Maint.
				Rental Contract	Lease Contract	Purchase	
D11	96K	1	8.6	\$1,388	\$1,263	\$19,060	\$179
D12	96K	1	13.2	1,485	1,352	20,910	189
D13	96K	1	27.1	1,802	1,642	27,545	228
D14	96K	1	63.9	1,979	1,804	43,830	228
D15	96K	1	128.4	2,338	2,131	53,280	278
D21	96K	2	8.6	1,478	1,347	21,305	184
D22	96K	2	13.2	1,575	1,436	23,155	194
D23	96K	2	27.1	1,892	1,726	29,790	233
D24	96K	2	63.9	2,069	1,888	46,075	233
D25	96K	2	128.4	2,428	2,215	55,525	283
D31	96K	Magazine	8.6	1,584	1,444	23,925	206
D32	96K	Magazine	13.2	1,682	1,533	25,775	216
D33	96K	Magazine	27.1	1,999	1,823	32,410	255
D34	96K	Magazine	63.9	2,176	1,985	48,695	255
D35	96K	Magazine	128.4	2,535	2,312	58,145	305
D36	96K	Magazine	192.9	3,041	2,773	71,225	359
D37	96K	Magazine	257.4	3,400	2,875	80,675	409
E11	128K	1	8.6	1,500	1,365	20,630	189
E12	128K	1	13.2	1,597	1,454	22,480	199
E13	128K	1	27.1	1,914	1,744	29,115	238
E14	128K	1	63.9	2,091	1,906	45,400	238
E15	128K	1	128.4	2,450	2,233	54,850	288
E21	128K	2	8.6	1,590	1,449	22,875	194
E22	128K	2	13.2	1,687	1,538	24,725	204
E23	128K	2	27.1	2,004	1,828	31,360	243
E24	128K	2	63.9	2,181	1,990	47,645	243
E25	128K	2	128.4	2,540	2,317	57,095	293
E31	128K	Magazine	8.6	1,697	1,546	25,495	216
E32	128K	Magazine	13.2	1,794	1,635	27,345	226
E33	128K	Magazine	27.1	2,111	1,925	33,980	265
E34	128K	Magazine	63.9	2,288	2,087	50,265	265
E35	128K	Magazine	128.4	2,647	2,414	59,715	315
E36	128K	Magazine	192.9	3,153	2,668	72,795	369
E37	128K	Magazine	257.4	3,512	2,971	82,245	419
F22	256K	2	13.2	2,226	2,028	33,105	249
F23	256K	2	27.1	2,543	2,318	39,740	288
F24	256K	2	63.9	2,720	2,480	56,025	288
F25	256K	2	128.4	3,079	2,807	65,475	338
F33	256K	Magazine	27.1	2,650	2,415	42,360	310
F34	256K	Magazine	63.9	2,827	2,577	58,645	310
F35	256K	Magazine	128.4	3,186	2,904	68,095	360
F36	256K	Magazine	192.9	3,692	3,365	81,175	414
F37	256K	Magazine	257.4	4,051	3,692	90,625	464

Workstations

CRT Display Stations—							
5251-1	Local; 960 characters			108	92	2,350	19.50
5251-11	Local; 1920 characters			116	99	2,515	20.50
5252	Local; dual display; 960 characters each display			125	106	2,685	23
2680	Cable-through			4	4	119	1
5251-2	Remote; SDLC; 960 characters			177	151	3,425	41.50
5251-12	Remote; SDLC; 1920 characters			184	157	3,580	44.50
3701	EIA Interface			16	19	447	3.50
5500	Interface with 1200 bps modem for non-switched line			22	19	686	5.50
5502	Interface with 1200 bps modem for switched line			22	19	686	5.50
5640	Interface with 2400 bps modem			90	77	2,130	26.50
5641	Interface with 2400 bps modem; includes auto-answer feature			98	83	2,350	27.50
5740	Interface with 4800 bps modem			155	132	3,710	39
5741	Interface with 4800 bps modem; includes auto-answer feature			163	139	3,900	41.50
4703	Internal Clock			6	5	218	1
5650	DDS Interface; 2400, 4800, 9600 bps; point-to-point			32	27	873	4.50
5651	DDS Interface; 2400, 4800, 9600 bps; multipoint tributary			32	27	873	4.50
2550	Cluster; four attachment points			62	53	1,340	11.50
2551	Dual Cluster; eight attachment points			125	106	2,680	23
3600	Expanded Function			14	12	265	1.50
4600	Keyboard			15	13	312	3.50
4655	Keylock			42	—	42	—
3225, 6	Display Screen Filter			41	—	41	—

*Includes prime-shift maintenance.

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Monthly Charge*

		<u>Rental Contract</u>	<u>Lease Contract</u>	<u>Purchase</u>	<u>Monthly Maint.</u>
7361807	Twinax Protector Kit	\$ —	\$ —	\$ 230	\$ —
4905	Multinational Character Set	2	2	68	1
4910	Magnetic Stripe Reader	16	14	374	2.50
	Printers—				
5256-1	40 cps	217	185	4,605	38.50
5256-2	80 cps	247	210	4,820	42
5256-3	120 cps	268	228	5,035	47.50
1470	Audible Alarm	—	—	50	—
4450	Forms Stand	—	—	54	—

Communications and Peripheral Adapters

2500	First BSC/SDLC Communications Adapter	135	123	3,140	22
3500	Second BSC/SDLC Communications Adapter	135	123	3,140	22
4500	Multiline Communications Adapter (MLCA)	312	284	7,860	35
4703	Internal Clock; for 2500/3500 Line Interfaces	6	6	218	1
5321	4500 Internal Clock; for MLCA Line Interfaces	6	6	218	1
5732	Processor Expansion Unit A (I/O Board for MICR attachment) except when 27.1 megabyte disk installed)	50	45	1,175	2.50
5733	Processor Expansion Unit B (additional communications power; not needed when a 63.9 or 128.4 megabyte disk is installed)	33	30	786	5.50
5734	Processor Expansion Unit C (I/O modem regulator; not needed when a 63.9 or 128.4 megabyte disk or 5733 attachment is installed)	12	11	314	1
5735	Processor Expansion Unit D (gate assembly for modems)	12	11	314	1
5736	Processor Expansion Unit E (additional power for MICR attachment on certain models)	39	35	982	5.50

Line Interfaces for 2500 Communications Adapter

5500	1200 bps; integrated modem for non-switched line; requires 4703, 5734	22	20	686	5.50
5501	1200 bps; integrated modem with auto-answer for switched line; requires 4703, 5734	33	30	915	7.50
5600	2400 bps; integrated modem for non-switched point-to-point line; requires 5733, 5735	110	100	2,325	12.50
5601	2400 bps; integrated modem for non-switched multipoint control line; requires 5733, 5735	110	100	2,325	12.50
5602	2400 bps; integrated modem for non-switched multipoint tributary line; requires 5733, 5735	119	108	2,585	14
5610	2400 bps; integrated modem with auto-answer for switched line; requires 5733, 5735	120	109	2,650	15
7951	Switched Network Backup for non-switched lines	23	21	589	4
7952	Switched Network Backup with auto-answer for non-switched lines	35	32	903	5.50
5650	Dataphone Digital Service Adapter; point-to-point or multipoint control	31	28	873	5.50
5651	Dataphone Digital Service Adapter; multipoint tributary	31	28	873	5.50
3701	EIA Interface for attachment of non-integrated modems requires 5734	15	14	447	5

Line Interfaces for 3500 Communications Adapter

6500	1200 bps; integrated modem for non-switched line; requires 4703, 5734	22	20	686	5.50
6501	1200 bps; integrated modem with auto-answer for switched line; requires 4703, 5734	33	30	915	7.50
6600	2400 bps; integrated modem for non-switched point-to-point line; requires 5733, 5735	110	100	2,325	12.50
6601	2400 bps; integrated modem for non-switched multipoint control line; requires 5733, 5735	110	100	2,325	12.50
6602	2400 bps; integrated modem for non-switched multipoint tributary line; requires 5733, 5735	119	108	2,585	14
6610	2400 bps; integrated modem with auto-answer for switched line; requires 5733, 5735	120	109	2,650	15
7953	Switched Network Backup for non-switched lines	23	21	589	4
7954	Switched Network Backup with automatic answer for non-switched lines	35	32	903	5.50
5652	Dataphone Digital Service Adapter for point-to-point or multipoint control line	31	28	873	5.50
5653	Dataphone Digital Service Adapter for multipoint tributary line	31	28	873	5.50
3702	EIA Interface for attachment of non-integrated modems; requires 5734	15	14	447	5

*Includes prime-shift maintenance.

Update

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Sub-Model	Bytes of Main Storage	Diskette Reading Surfaces	Megabytes of Disk Storage	Monthly Charge*			Monthly Maint.
				Rental Contract	Lease Contract	Purchase	
D11	96K	1	8.6	\$1,195	\$1,089	\$23,450	\$179
D12	96K	1	13.2	1,279	1,166	25,230	189
D13	96K	1	27.1	1,551	1,414	32,610	228
D14	96K	1	63.9	1,703	1,553	42,270	228
D15	96K	1	128.4	2,036	1,856	51,720	278
D21	96K	2	8.6	1,273	1,161	25,610	184
D22	96K	2	13.2	1,357	1,238	27,390	194
D23	96K	2	27.1	1,629	1,486	34,770	233
D24	96K	2	63.9	1,781	1,625	44,430	233
D25	96K	2	128.4	2,114	1,928	53,880	283
D31	96K	Magazine	8.6	1,365	1,245	28,130	206
D32	96K	Magazine	13.2	1,449	1,322	29,910	216
D33	96K	Magazine	27.1	1,721	1,570	37,290	255
D34	96K	Magazine	63.9	1,873	1,709	46,950	255
D35	96K	Magazine	128.4	2,206	2,012	56,400	305
D36	96K	Magazine	192.9	2,665	2,430	69,340	359
D37	96K	Magazine	257.4	2,998	2,733	78,790	409
E11	128K	1	8.6	1,293	1,179	25,020	189
E12	128K	1	13.2	1,377	1,256	26,800	199
E13	128K	1	27.1	1,649	1,504	34,180	238
E14	128K	1	63.9	1,801	1,643	43,840	238
E15	128K	1	128.4	2,134	1,946	53,290	288
E21	128K	2	8.6	1,371	1,251	27,180	194
E22	128K	2	13.2	1,455	1,328	28,960	204
E23	128K	2	27.1	1,727	1,576	36,340	243
E24	128K	2	63.9	1,879	1,715	46,000	243
E25	128K	2	128.4	2,212	2,018	55,450	293
E31	128K	Magazine	8.6	1,463	1,335	29,700	216
E32	128K	Magazine	13.2	1,547	1,412	31,480	226
E33	128K	Magazine	27.1	1,819	1,660	38,860	265
E34	128K	Magazine	63.9	1,971	1,799	48,520	265
E35	128K	Magazine	128.4	2,304	2,102	57,970	315
E36	128K	Magazine	192.9	2,763	2,520	70,910	369
E37	128K	Magazine	257.4	3,096	2,823	80,360	419
F22	256K	2	13.2	1,918	1,753	37,260	249
F23	256K	2	27.1	2,190	2,001	44,640	288
F24	256K	2	63.9	2,342	2,140	54,300	288
F25	256K	2	128.4	2,675	2,443	63,750	338
F33	256K	Magazine	27.1	2,282	2,085	47,160	310
F34	256K	Magazine	63.9	2,434	2,224	56,820	310
F35	256K	Magazine	128.4	2,767	2,527	66,270	360
F36	256K	Magazine	192.9	3,226	2,945	79,210	414
F37	256K	Magazine	257.4	3,559	3,248	88,660	464

Workstations

CRT Display Stations—							
5251-1	Local; 960 characters			94	80	2,660	19.50
5251-11	Local; 1920 characters			101	86	2,850	20.50
5252	Local; dual display; 960 characters each display			108	92	3,040	23
2680	Cable-through			4	3	115	1
5251-2	Remote; SDLC; 960 characters			153	130	3,875	41.50
5251-12	Remote; SDLC; 1920 characters			160	136	4,050	44.50
3701	EIA Interface			14	12	430	3.50
5500	Interface with 1200 bps modem for non-switched line			21	18	660	5.50
5502	Interface with 1200 bps modem for switched line			21	18	660	5.50
5640	Interface with 2400 bps modem			78	66	2,050	26.50
5641	Interface with 2400 bps modem; includes auto-answer feature			83	71	2,260	27.50
5740	Interface with 4800 bps modem			135	115	3,570	39
5741	Interface with 4800 bps modem; includes auto-answer feature			141	120	3,750	41.50
4703	Internal Clock			6	5	210	1
5650	DDS Interface; 2400, 4800, 9600 bps; point-to-point			27	23	840	4.50
5651	DDS Interface; 2400, 4800, 9600 bps; multipoint tributary			27	23	840	4.50
2550	Cluster; four attachment points			53	45	1,520	11.50
2551	Dual Cluster; eight attachment points			108	92	3,040	23
3600	Expanded Function			12	10	300	1.50
4600	Keyboard			13	11	350	3.50
4655	Keylock			—	—	40	—
3225, 6	Display Screen Filter			—	—	39	—

*Includes prime-shift maintenance.

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Monthly Charge*

		Rental Contract	Lease Contract	Purchase	Monthly Maint.
7361807	Twinax Protector Kit	\$ —	\$ —	\$ 230	\$ —
4905	Multinational Character Set	2	2	76	1
4910	Magnetic Stripe Reader	14	12	420	2.50
	Printers—				
5256-1	40 cps	188	160	5,200	37.50
5256-2	80 cps	213	181	5,800	44.50
5256-3	120 cps	231	197	6,250	53
1470	Audible Alarm	—	—	50	—
4450	Forms Stand	—	—	54	—

Communications and Peripheral Adapters

2500	First BSC/SDLC Communications Adapter	117	106	3,020	22
3500	Second BSC/SDLC Communications Adapter	117	106	3,020	22
4500	Multiline Communications Adapter (MLCA)	270	245	7,560	35
4703	Internal Clock; for 2500/3500 Line Interfaces	6	6	210	1
5321	4500 Internal Clock; for MLCA Line Interfaces	6	6	210	1
5732	Processor Expansion Unit A (I/O Board for MICR attachment) except when 27.1 megabyte disk installed)	43	39	1,130	2.50
5733	Processor Expansion Unit B (additional communications power; not needed when a 63.9 or 128.4 megabyte disk is installed)	29	26	756	5.50
5734	Processor Expansion Unit C (I/O modem regulator; not needed when a 63.9 or 128.4 megabyte disk or 5733 attachment is installed)	10	9	302	1
5735	Processor Expansion Unit D (gate assembly for modems)	10	9	302	1
5736	Processor Expansion Unit E (additional power for MICR attachment on certain models)	33	30	945	5.50

Line Interfaces for 2500 Communications Adapter

5500	1200 bps; integrated modem for non-switched line; requires 4703, 5734	21	19	660	5.50
5501	1200 bps; integrated modem with auto-answer for switched line; requires 4703, 5734	31	28	880	7.50
5600	2400 bps; integrated modem for non-switched point-to-point line; requires 5733, 5735	95	86	2,240	12.50
5601	2400 bps; integrated modem for non-switched multipoint control line; requires 5733, 5735	95	86	2,240	12.50
5602	2400 bps; integrated modem for non-switched multipoint tributary line; requires 5733, 5735	103	94	2,490	14
5610	2400 bps; integrated modem with auto-answer for switched line; requires 5733, 5735	105	95	2,550	15
7951	Switched Network Backup for non-switched lines	20	18	567	4
7952	Switched Network Backup with auto-answer for non-switched lines	31	28	869	5.50
5650	Dataphone Digital Service Adapter; point-to-point or multipoint control	26	24	840	5.50
5651	Dataphone Digital Service Adapter; multipoint tributary	26	24	840	5.50
3701	EIA Interface for attachment of non-integrated modems requires 5734	14	13	430	5

Line Interfaces for 3500 Communications Adapter

6500	1200 bps; integrated modem for non-switched line; requires 4703, 5734	21	19	660	5.50
6501	1200 bps; integrated modem with auto-answer for switched line; requires 4703, 5734	31	28	880	7.50
6600	2400 bps; integrated modem for non-switched point-to-point line; requires 5733, 5735	95	86	2,240	12.50
6601	2400 bps; integrated modem for non-switched multipoint control line; requires 5733, 5735	95	86	2,240	12.50
6602	2400 bps; integrated modem for non-switched multipoint tributary line; requires 5733, 5735	103	94	2,490	14
6610	2400 bps; integrated modem with auto-answer for switched line; requires 5733, 5735	105	95	2,550	15
7953	Switched Network Backup for non-switched lines	20	18	567	4
7954	Switched Network Backup with automatic answer for non-switched lines	31	28	869	5.50
5652	Dataphone Digital Service Adapter for point-to-point or multipoint control line	26	24	840	5.50
5653	Dataphone Digital Service Adapter for multipoint tributary line	26	24	840	5.50
3702	EIA Interface for attachment of non-integrated modems; requires 5734	14	13	430	5

*Includes prime-shift maintenance.

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Sub-Model	Bytes of Main Storage	Diskette Reading Surfaces	Megabytes of Disk Storage	Monthly Charge*			Monthly Maint.
				Rental Contract	Lease Contract	Purchase	
D11	96K	1	8.6	\$1,286	\$1,173	\$18,450	\$179
D12	96K	1	13.2	1,376	1,256	20,230	189
D13	96K	1	27.1	1,670	1,524	26,610	228
D14	96K	1	63.9	1,834	1,674	42,270	228
D15	96K	1	128.4	2,167	1,977	51,720	278
D21	96K	2	8.6	1,370	1,251	20,610	184
D22	96K	2	13.2	1,460	1,334	22,390	194
D23	96K	2	27.1	1,754	1,602	28,770	233
D24	96K	2	63.9	1,918	1,752	44,430	233
D25	96K	2	128.4	2,251	2,055	53,880	283
D31	96K	Magazine	8.6	1,469	1,341	23,130	206
D32	96K	Magazine	13.2	1,559	1,424	24,910	216
D33	96K	Magazine	27.1	1,853	1,692	31,290	255
D34	96K	Magazine	63.9	2,017	1,842	46,950	255
D35	96K	Magazine	128.4	2,350	2,145	56,400	305
D36	96K	Magazine	192.9	2,819	2,572	69,340	359
D37	96K	Magazine	257.4	3,152	2,875	78,790	409
E11	128K	1	8.6	1,390	1,269	20,020	189
E12	128K	1	13.2	1,480	1,352	21,800	199
E13	128K	1	27.1	1,774	1,620	28,180	238
E14	128K	1	63.9	1,938	1,770	43,840	238
E15	128K	1	128.4	2,271	2,073	53,290	288
E21	128K	2	8.6	1,474	1,347	22,180	194
E22	128K	2	13.2	1,564	1,430	23,960	204
E23	128K	2	27.1	1,858	1,698	30,340	243
E24	128K	2	63.9	2,022	1,848	46,000	243
E25	128K	2	128.4	2,355	2,151	55,450	293
E31	128K	Magazine	8.6	1,573	1,437	24,700	216
E32	128K	Magazine	13.2	1,663	1,520	26,480	226
E33	128K	Magazine	27.1	1,957	1,788	32,860	265
E34	128K	Magazine	63.9	2,121	1,938	48,520	265
E35	128K	Magazine	128.4	2,454	2,241	57,970	315
E36	128K	Magazine	192.9	2,923	2,268	70,910	369
E37	128K	Magazine	257.4	3,256	2,971	80,360	419
F22	256K	2	13.2	2,064	1,890	32,260	249
F23	256K	2	27.1	2,358	2,158	38,640	288
F24	256K	2	63.9	2,522	2,308	54,300	288
F25	256K	2	128.4	2,855	2,611	63,750	338
F33	256K	Magazine	27.1	2,457	2,248	41,160	310
F34	256K	Magazine	63.9	2,621	2,398	56,820	310
F35	256K	Magazine	128.4	2,954	2,701	66,270	360
F36	256K	Magazine	192.9	3,423	3,128	79,210	414
F37	256K	Magazine	257.4	3,756	3,431	88,660	464

Workstations

5251-1	CRT Display Stations— Local; 960 characters	101	86	2,660	19.50
5251-11	Local; 1920 characters	108	92	2,420	20.50
5252	Local; dual display; 960 characters each display	116	99	2,585	23
2680	Cable-through	4	3	115	1
5251-2	Remote; SDLC; 960 characters	165	140	3,295	41.50
5251-12	Remote; SDLC; 1920 characters	172	146	3,445	44.50
3701	EIA Interface	15	13	430	3.50
5500	Interface with 1200 bps modem for non-switched line	21	18	660	5.50
5502	Interface with 1200 bps modem for switched line	21	18	660	5.50
5640	Interface with 2400 bps modem	83	71	2,050	26.50
5641	Interface with 2400 bps modem; includes auto-answer feature	90	77	2,260	27.50
5740	Interface with 4800 bps modem	145	123	3,570	39
5741	Interface with 4800 bps modem; includes auto-answer feature	152	129	3,750	41.50
4703	Internal Clock	6	5	210	1
5650	DDS Interface; 2400, 4800, 9600 bps; point-to-point	29	25	840	4.50
5651	DDS Interface; 2400, 4800, 9600 bps; multipoint tributary	29	25	840	4.50
2550	Cluster; four attachment points	58	49	1,290	11.50
2551	Dual Cluster; eight attachment points	116	99	2,580	23
3600	Expanded Function	13	11	255	1.50
4600	Keyboard	14	12	300	3.50
4655	Keylock	—	—	40	—
3225, 6	Display Screen Filter	—	—	39	—

*Includes prime-shift maintenance.

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		Monthly Charge*			
		Rental	Lease	Purchase	Monthly
		Contract	Contract		Maint.
7361807	Twinax Protector Kit	\$ —	\$ —	\$ 230	\$ —
4905	Multinational Character Set	2	2	65	1
4910	Magnetic Stripe Reader	14	12	360	2.50
Printers—					
5256-1	40 cps	202	172	4,430	35
5256-2	80 cps	229	195	4,640	38
5256-3	120 cps	249	212	4,850	43
1470	Audible Alarm	—	—	50	—
4450	Forms Stand	—	—	54	—

Communications and Peripheral Adapters

2500	First BSC/SDLC Communications Adapter	125	114	3,020	22
3500	Second BSC/SDLC Communications Adapter	125	114	3,020	22
4500	Multiline Communications Adapter (MLCA)	290	264	7,560	35
4703	Internal Clock; for 2500/3500 Line Interfaces	6	6	210	1
5321	4500 Internal Clock; for MLCA Line Interfaces	6	6	210	1
5732	Processor Expansion Unit A (I/O Board for MICR attachment) except when 27.1 megabyte disk installed)	46	42	1,130	2.50
5733	Processor Expansion Unit B (additional communications power; not needed when a 63.9 or 128.4 megabyte disk is installed)	31	28	756	5.50
5734	Processor Expansion Unit C (I/O modem regulator; not needed when a 63.9 or 128.4 megabyte disk or 5733 attachment is installed)	11	10	302	1
5735	Processor Expansion Unit D (gate assembly for modems)	11	10	302	1
5736	Processor Expansion Unit E (additional power for MICR attachment on certain models)	35	32	945	5.50

Line Interfaces for 2500 Communications Adapter

5500	1200 bps; integrated modem for non-switched line; requires 4703, 5734	21	19	660	5.50
5501	1200 bps; integrated modem with auto-answer for switched line; requires 4703, 5734	31	28	880	7.50
5600	2400 bps; integrated modem for non-switched point-to-point line; requires 5733, 5735	102	93	2,240	12.50
5601	2400 bps; integrated modem for non-switched multipoint control line; requires 5733, 5735	102	93	2,240	12.50
5602	2400 bps; integrated modem for non-switched multipoint tributary line; requires 5733, 5735	111	101	2,490	14
5610	2400 bps; integrated modem with auto-answer for switched line; requires 5733, 5735	112	102	2,550	15
7951	Switched Network Backup for non-switched lines	21	19	567	4
7952	Switched Network Backup with auto-answer for non-switched lines	33	30	869	5.50
5650	Dataphone Digital Service Adapter; point-to-point or multipoint control	29	26	840	5.50
5651	Dataphone Digital Service Adapter; multipoint tributary	29	26	840	5.50
3701	EIA Interface for attachment of non-integrated modems requires 5734	15	14	430	5

Line Interfaces for 3500 Communications Adapter

6500	1200 bps; integrated modem for non-switched line; requires 4703, 5734	21	19	660	5.50
6501	1200 bps; integrated modem with auto-answer for switched line; requires 4703, 5734	31	28	880	7.50
6600	2400 bps; integrated modem for non-switched point-to-point line; requires 5733, 5735	102	93	2,240	12.50
6601	2400 bps; integrated modem for non-switched multipoint control line; requires 5733, 5735	102	93	2,240	12.50
6602	2400 bps; integrated modem for non-switched multipoint tributary line; requires 5733, 5735	111	101	2,490	14
6610	2400 bps; integrated modem with auto-answer for switched line; requires 5733, 5735	112	102	2,550	15
7953	Switched Network Backup for non-switched lines	21	19	567	4
7954	Switched Network Backup with automatic answer for non-switched lines	33	30	869	5.50
5652	Dataphone Digital Service Adapter for point-to-point or multipoint control line	29	26	840	5.50
5653	Dataphone Digital Service Adapter for multipoint tributary line	29	26	840	5.50
3702	EIA Interface for attachment of non-integrated modems; requires 5734	15	14	430	5

*Includes prime-shift maintenance.

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		Monthly Charge*			
		Rental Contract	Lease Contract	Purchase	Monthly Maint.
2550	Cluster; four attachment points	49	42	1,520	11
2551	Dual Cluster; eight attachment points	100	85	3,040	22
3600	Expanded Function	11	9	300	1
4600	Keyboard	12	10	350	3
4655	Keylock	—	—	40	—
3225, 6	Display Screen Filter	—	—	39	—
7361807	Twinax Protector Kit	—	—	230	—
4905	Multinational Character Set	2	2	76	0.50
4910	Magnetic Stripe Reader	13	11	420	2
Printers—					
5256-1	40 cps	188	160	5,200	37.50
5256-2	80 cps	213	181	5,800	44.50
5256-3	120 cps	231	197	6,250	53
1470	Audible Alarm	—	—	50	—
4450	Forms Stand	—	—	54	—
Communications and Peripheral Adapters					
2500	First BSC/SDLC Communications Adapter	109	100	3,020	21
3500	Second BSC/SDLC Communications Adapter	109	100	3,020	21
4500	Multiline Communications Adapter (MLCA)	250	228	7,560	33.50
4703	Internal Clock; for 2500/3500 Line Interfaces	6	6	210	0.50
5321	4500 Internal Clock; for MLCA Line Interfaces	6	6	210	0.50
5732	Processor Expansion Unit A (I/O Board for MICR attachment) except when 27.1 megabyte disk installed)	39	36	1,130	2
5733	Processor Expansion Unit B (additional communications power; not needed when a 63.9 or 128.4 megabyte disk is installed)	26	24	756	5
5734	Processor Expansion Unit C (I/O modem regulator; not needed when a 63.9 or 128.4 megabyte disk or 5733 attachment is installed)	8	8	302	0.50
5735	Processor Expansion Unit D (gate assembly for modems)	8	8	302	0.50
5736	Processor Expansion Unit E (additional power for MICR attachment on certain models)	30	28	945	5
Line Interfaces for 2500 Communications Adapter					
5500	1200 bps; integrated modem for non-switched line; requires 4703, 5734	21	19	660	5
5501	1200 bps; integrated modem with Auto-Answer for switched line; requires 4703, 5734	28	26	880	7
5600	2400 bps; integrated modem for non-switched point-to-point line; requires 5733, 5735	87	80	2,240	12
5601	2400 bps; integrated modem for non-switched multipoint control line; requires 5733, 5735	87	80	2,240	12
5602	2400 bps; integrated modem for non-switched multipoint tributary line; requires 5733, 5735	95	87	2,490	13.50
5610	2400 bps; integrated modem with Auto-Answer for switched line; requires 5733, 5735	96	88	2,550	14.50
7951	Switched Network Backup for non-switched lines	18	17	567	3.50
7952	Switched Network Backup with Auto-Answer for non-switched lines	28	26	869	5
5650	Dataphone Digital Service Adapter; point-to-point or multipoint control	26	24	840	5
5651	Dataphone Digital Service Adapter; multipoint tributary	26	24	840	5
3701	EIA Interface for attachment of non-integrated modems requires 5734	13	12	430	4.50
Line Interfaces for 3500 Communications Adapter					
6500	1200 bps; integrated modem for non-switched line; requires 4703, 5734	21	19	660	5
6501	1200 bps; integrated modem with Auto-Answer for switched line; requires 4703, 5734	28	26	880	7
6600	2400 bps; integrated modem for non-switched point-to-point line; requires 5733, 5735	87	80	2,240	12
6601	2400 bps; integrated modem for non-switched multipoint control line; requires 5733, 5735	87	80	2,240	12
6602	2400 bps; integrated modem for non-switched multipoint tributary line; requires 5733, 5735	95	87	2,490	13.50
6610	2400 bps; integrated modem with Auto-Answer for switched line; requires 5733, 5735	96	88	2,550	14.50
7953	Switched Network Backup for non-switched lines	18	17	567	3.50
7954	Switched Network Backup with Automatic Answer for non-switched lines	28	26	869	5
5652	Dataphone Digital Service Adapter for point-to-point or multipoint control line	26	24	840	5
5653	Dataphone Digital Service Adapter for multipoint tributary line	26	24	840	5
3702	EIA Interface for attachment of non-integrated modems; requires 5734	13	12	430	4.50

*Includes prime-shift maintenance.

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		Monthly Charge*			
		Rental Contract	Lease Contract	Purchase	Monthly Maint.
Line Interfaces for 4500 Communications Adapter					
▶ 530X	Line Base Adapters	37	34	1,130	7
531X	EIA Interfaces	13	12	430	4.50
533X	1200 bps integrated modem	22	20	693	5
534X	1200 bps integrated modem; with auto-answer	29	27	924	7
535X	4800 bps integrated modem	125	114	3,635	15.50
536X	4800 bps integrated modem; with auto-answer	132	120	3,855	15.50
539X	Dataphone Digital Service Adapter	25	23	840	5
540X	Analog Wideband Adapter	93	85	2,835	2
541X	Auto-Call Adapter	37	34	1,190	1
Other Peripherals and Features					
5811	Line Printer Adapter; for attachment of 5211 Line Printer; requires 1110	18	17	567	3
5815	Line Printer Adapter; for attachment of 3262 Line Printer; requires 1110	37	34	1,130	4
1110	Base Printer Attachment; for attachment of 5211 or 3262 Line Printer	18	17	567	3
5211-1	Line Printer; 160 lpm	294	250	9,405	63
5211-2	Line Printer; 300 lpm	360	306	11,460	105
3262-B1	Line Printer; 650 lpm; stand-alone	459	391	15,430	126
1100	Magnetic Character Reader Adapter	310	282	8,775	26
1105	Magnetic Character Reader Expansion Feature	105	96	3,210	13.50
1255-1	Magnetic Character Reader 500 dpm, 6 Stackers	1,065	—	39,090	332
1255-2	Magnetic Character Reader 750 dpm, 6 Stackers	1,295	—	44,740	531
1255-3	Magnetic Character Reader 750 dpm, 12 Stackers	1,705	—	60,920	699
4655	Keylock	—	—	72	—
4900	Workstation Control Expansion A	11	10	378	3
4901	Workstation Control Expansion B	29	27	945	6
4905	Multinational Control	11	10	378	0.50

*Includes prime-shift maintenance.

Software

		Monthly License Charge
5726-SS1	System Support Program	\$116
6000,6001	Interactive Communications Feature for SSP	82
5726-UT1	System/34 Utilities	40
5726-AS1	Basic Assembler and Macro Processor	102
5726-CB1	COBOL	99
5726-F01	FORTRAN IV	138
5726-RG1	RPG II	33
5726-BA1	BASIC	48 ■

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Except for the processor, the termination charge for the lease arrangement is the lower of 5 months' charges or 25 percent of the remaining value of the lease. The processor termination charge for the lease arrangement is the lower of 4 months' charges or 20 percent of the remaining value of the lease.

All components are in maintenance category D, except the 1255 magnetic card reader, which is in category C, and 5211 line printer, which is in category B. These categories determine the schedule of extended maintenance charges. The premium for extended maintenance is expressed in the table below as a percentage of the basic maintenance charges, which are listed in the accompanying price list.

	Consecutive Hours				
	9*	12	16	20	24
Monday-Friday—					
Category B	10%	16%	22%	28%	34%
Category C	10	19	28	37	46
Category D	10	12	14	16	18

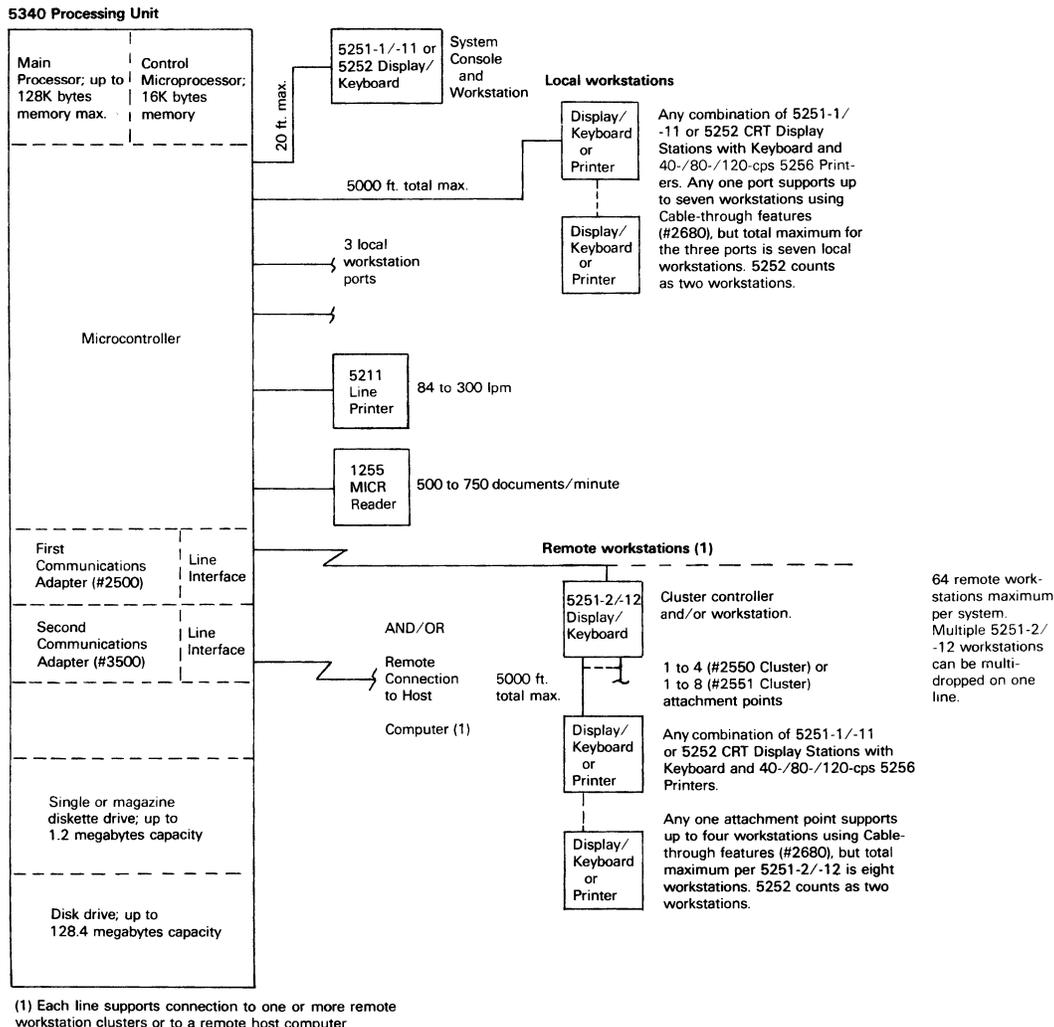
	Consecutive Hours				
	9*	12	16	20	24
Saturday—					
Category B	5	6	8	10	11
Category C	8	9	11	13	15
Category D	4	5	7	8	9
Sunday—					
Category B	6	8	10	12	14
Category C	9	11	14	16	18
Category D	5	7	9	11	12

*For periods outside the basic 7 AM to 6 PM prime shift.

The lease arrangement also guarantees a maximum rate of increases for extended leasing periods. The rate for all components is five percent per year beginning in the second year of the lease.

All components are classed under rental category B (unlimited usage) except for the 1255 magnetic card reader, which is classed in rental category A (additional charges for use of more than 176 hours per month), and warranty category B (three months). Purchase credits can be accrued up to a maximum of 50 percent for the processor and line printer, 55 percent for the serial printer and CRT display station, and 40 percent for the magnetic card reader.

Configuration



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5340 System Units

Monthly Charge*			Monthly Maint.
Rental Contract	Lease Contract	Purchase	

All 75 models, corresponding to the 75 possible combinations of memory, diskette, and disk storage choices, can be priced using the chart below. Simply add together the three figures, one from each category, that reflect the combination of choices represented by the model number —

Main Memory Capacity:				
Axx — 32K bytes	\$ 926	\$ 842	\$20,310	\$145
Bxx — 48K bytes	972	884	21,095	150
Cxx — 64K bytes	1,018	926	21,880	155
Dxx — 96K bytes	1,110	1,010	23,450	165
Exx — 128K bytes	1,202	1,094	25,020	175

Diskette Facility:				
x1x — Single reading surface	0	0	0	0
x2x — Two reading surfaces	73	67	2,160	5
x3x — Diskette Magazine Facility	158	145	4,680	25

Disk Storage Capacity:				
xx1 — 8.6 Megabytes	0	0	0	0
xx2 — 13.2 Megabytes	79	72	1,780	10
xx3 — 27.1 Megabytes	332	302	9,160	45
xx4 — 63.9 Megabytes	382	348	16,960	45
xx5 — 128.4 Megabytes	681	620	25,960	91

Workstations

CRT Display Stations—					
5251-1	Local; 960 characters	87	74	2,660	17
5251-11	Local; 1920 characters	94	80	2,850	18
5252	Local; dual display; 960 characters each display	100	85	3,040	20
2680	Cable-through	4	3	115	1
5251-2	Remote; SDLC; 960 characters	142	121	3,875	38
5251-12	Remote; SDLC; 1920 characters	149	127	4,050	39
3701	EIA Interface	13	11	430	3
5500	Interface with 1200 bps modem for non-switched line	20	17	660	5
5502	Interface with 1200 bps modem for switched line	20	17	660	5
4703	Internal Clock	6	5	210	1
5650	DDS Interface; 2400, 4800, 9600 bps; point-to-point	25	21	840	4
5651	DDS Interface; 2400, 4800, 9600 bps; multipoint tributary	25	21	840	4
2550	Cluster; four attachment points	49	42	1,520	10
2551	Dual Cluster; eight attachment points	100	85	3,040	20
3600	Expanded Function	11	9	300	1
4600	Keyboard	12	10	350	3
4655	Keylock	—	—	40	—
3225.6	Display Screen Filter	—	—	39	—
7361807	Twinax Protector Kit	—	—	230	—
4905	Multinational Character Set	2	2	76	0.50
4910	Magnetic Stripe Reader	13	11	420	2
Printers—					
5256-1	40 cps	188	160	5,200	34.50
5256-2	80 cps	213	181	5,800	40.50
5256-3	120 cps	231	197	6,250	48.50
1470	Audible Alarm	—	—	50	—
4450	Forms Stand	—	—	54	—

Communications and Peripheral Adapters

2500	First BSC/SDLC Communications Adapter	102	94	2,880	20
3500	Second BSC/SDLC Communications Adapter	102	94	2,880	20
4703	Internal Clock	6	6	210	0.50
5732	Processor Expansion Unit A (I/O Board for MICR attachment except when 27.1 megabyte disk installed)	37	34	1,080	2
5733	Processor Expansion Unit B (additional communications power; not needed when a 63.9 or 128.4 megabyte disk is installed)	25	23	720	5
5734	Processor Expansion Unit C (I/O modem regulator; not needed when a 63.9 or 128.4 megabyte disk or 5733 attachment is installed)	8	8	288	0.50
5735	Processor Expansion Unit D (gate assembly for modems)	8	8	288	0.50
5736	Processor Expansion Unit E (additional power for MICR attachment on certain models)	29	27	900	5

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➤ Except for the processor, the termination charge for the lease arrangement is the lower of 5 months' charges or 25 percent of the remaining value of the lease. The processor termination charge for the lease arrangement is the lower of 4 months' charges or 20 percent of the remaining value of the lease.

All components are in maintenance category D, except the 1255 magnetic card reader, which is in category C, and 5211 line printer, which is in category B. These categories determine the schedule of extended maintenance charges. The premium for extended maintenance is expressed in the table below as a percentage of the basic maintenance charges, which are listed in the accompanying price list.

	Consecutive Hours				
	9*	12	16	20	24
Monday-Friday—					
Category B	10%	16%	22%	28%	34%
Category C	10	19	28	37	46
Category D	10	12	14	16	18

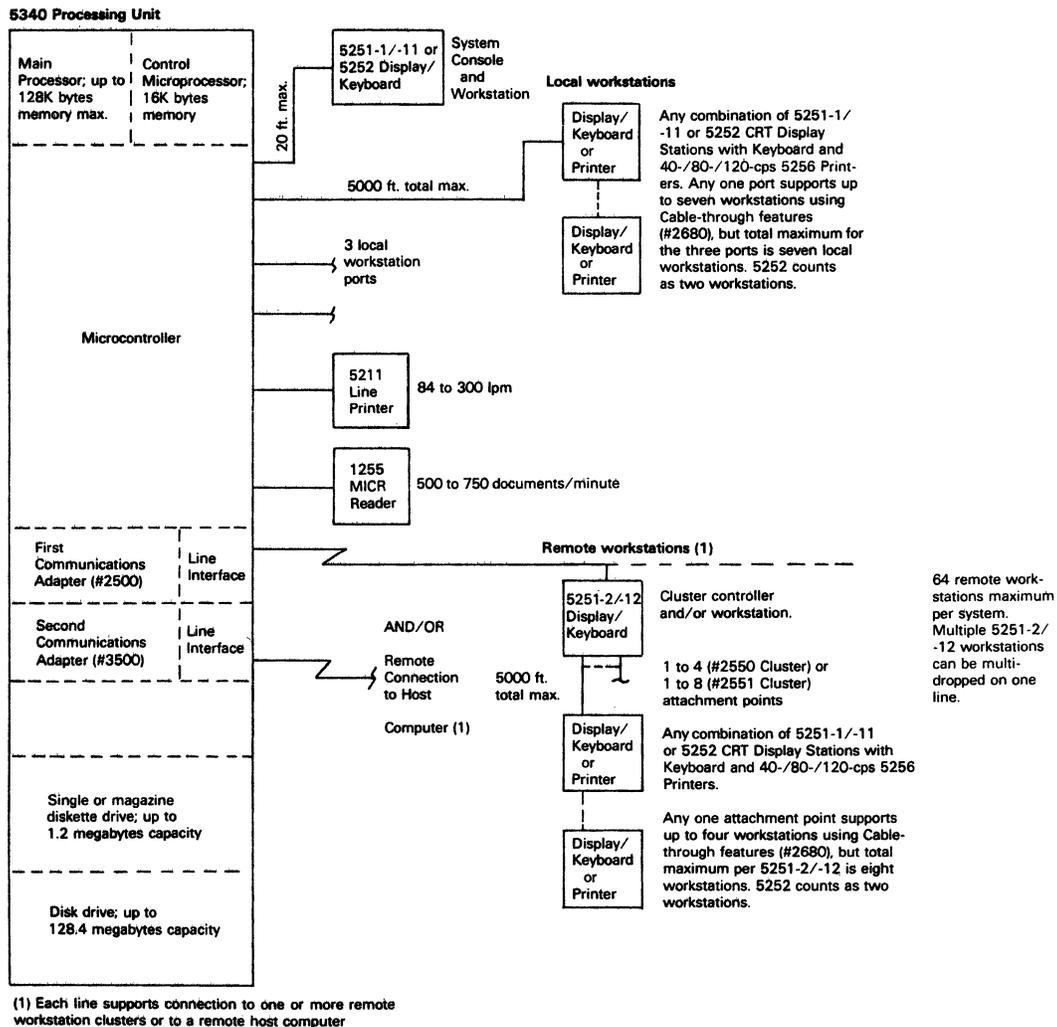
	Consecutive Hours				
	9*	12	16	20	24
Saturday—					
Category B	5	6	8	10	11
Category C	8	9	11	13	15
Category D	4	5	7	8	9
Sunday—					
Category B	6	8	10	12	14
Category C	9	11	14	16	18
Category D	5	7	9	11	12

*For periods outside the basic 7 AM to 6 PM prime shift.

The lease arrangement also guarantees a maximum rate of increases for extended leasing periods. The rate for all components is five percent per year beginning in the second year of the lease.

All components are classed under rental category B (unlimited usage) except for the 1255 magnetic card reader, which is classed in rental category A (additional charges for use of more than 176 hours per month), and warranty category B (three months). Purchase credits can be accrued up to a maximum of 50 percent for the processor and line printer, 55 percent for the serial printer and CRT display station, and 40 percent for the magnetic card reader.

Configuration



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5340 System Units	Monthly Charge*			Monthly Maint.
	Rental Contract	Lease Contract	Purchase	

All 75 models, corresponding to the 75 possible combinations of memory, diskette, and disk storage choices, can be priced using the chart below. Simply add together the three figures, one from each category, that reflect the combination of choices represented by the model number —

Main Memory Capacity:				
Axx — 32K bytes	\$786	\$715	\$26,300	\$145
Bxx — 48K bytes	830	755	27,475	150
Cxx — 64K bytes	874	795	28,650	155
Dxx — 96K bytes	962	875	31,000	165
Exx — 128K bytes	1,050	955	33,350	175

Diskette Facility:				
x1x — Single reading surface	0	0	0	0
x2x — Two reading surfaces	66	60	2,160	5
x3x — Diskette Magazine Facility	143	130	4,680	25

Disk Storage Capacity:				
xx1 — 8.6 Megabytes	0	0	0	0
xx2 — 13.2 Megabytes	72	65	1,780	10
xx3 — 27.1 Megabytes	297	270	9,160	45
xx4 — 63.9 Megabytes	344	313	10,600	45
xx5 — 128.4 Megabytes	624	568	19,170	91

Workstations

CRT Display Stations—					
5251-1	Local; 960 characters	82	70	2,660	17
5251-11	Local; 1920 characters	88	75	2,850	18
5252	Local; dual display; 960 characters each display	94	80	3,040	20
2680	Cable-through	4	3	115	1
5251-2	Remote; SDLC; 960 characters	134	114	3,875	38
5251-12	Remote; SDLC; 1920 characters	140	119	4,050	39
3701	EIA Interface	13	11	430	3
5500	Interface with 1200 bps modem for non-switched line	19	16	660	5
5502	Interface with 1200 bps modem for switched line	19	16	660	5
4703	Internal Clock	6	5	210	1
5650	DDS Interface; 2400, 4800, 9600 bps; point-to-point	24	20	840	4
5651	DDS Interface; 2400, 4800, 9600 bps; multipoint tributary	24	20	840	4
2550	Cluster; four attachment points	47	40	1,520	10
2551	Dual Cluster; eight attachment points	94	80	3,040	20
3600	Expanded Function	11	9	300	1
4600	Keyboard	12	10	350	3
4655	Keylock	—	—	40	—
3225.6	Display Screen Filter	—	—	39	—
7361807	Twinax Protector Kit	—	—	230	—
4905	Multinational Character Set	2	2	76	0.50
4910	Magnetic Stripe Reader	13	11	420	2
5256-1	40 cps	176	150	5,200	30
5256-2	80 cps	200	170	5,800	35
5256-3	120 cps	217	185	6,250	42
1470	Audible Alarm	—	—	50	—
4450	Forms Stand	—	—	—	—
				24.75	

Communications and Peripheral Adapters

2500	First BSC/SDLC Communications Adapter	88	80	2,880	20
3500	Second BSC/SDLC Communications Adapter	88	80	2,880	20
4703	Internal Clock	6	6	210	0.50
5732	Processor Expansion Unit A (I/O Board for MICR attachment except when 27.1 megabyte disk installed)	33	30	1,080	2
5733	Processor Expansion Unit B (additional communications power; not needed when a 63.9 or 128.4 megabyte disk is installed)	22	20	720	5
5734	Processor Expansion Unit C (I/O modem regulator; not needed when a 63.9 or 128.4 megabyte disk or 5733 attachment is installed)	8	8	288	0.50
5735	Processor Expansion Unit D (gate assembly for modems)	8	8	288	0.50
5736	Processor Expansion Unit E (additional power for MICR attachment on certain models)	27	25	900	5



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➤ Except for the processor, the termination charge for the lease arrangement is the lower of 5 months' charges or 25 percent of the remaining value of the lease. The processor termination charge for the lease arrangement is the lower of 4 months' charges or 20 percent of the remaining value of the lease.

All components are in maintenance category D, except the 1255 magnetic card reader, which is in category C, and 5211 line printer, which is in category B. These categories determine the schedule of extended maintenance charges. The premium for extended maintenance is expressed in the table below as a percentage of the basic maintenance charges, which are listed in the accompanying price list.

	Consecutive Hours				
	9*	12	16	20	24
Monday-Friday—					
Category B	10%	16%	22%	28%	34%
Category C	10	19	28	37	46
Category D	10	12	14	16	18

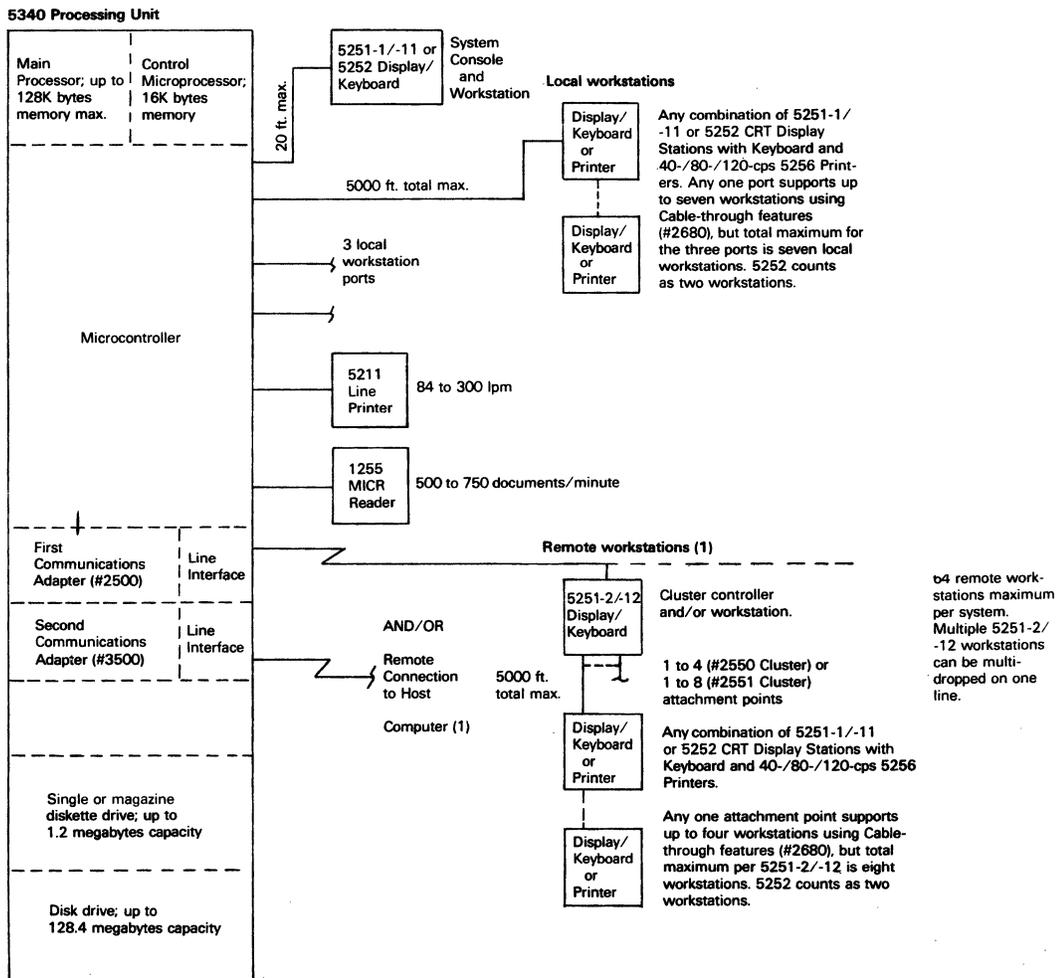
	Consecutive Hours				
	9*	12	16	20	24
Saturday—					
Category B	5	6	8	10	11
Category C	8	9	11	13	15
Category D	4	5	7	8	9
Sunday—					
Category B	6	8	10	12	14
Category C	9	11	14	16	18
Category D	5	7	9	11	12

*For periods outside the basic 7 AM to 6 PM prime shift.

The lease arrangement also guarantees a maximum rate of increases for extended leasing periods. The rate for all components is five percent per year beginning in the second year of the lease.

All components are classed under rental category B (unlimited usage) except for the 1255 magnetic card reader, which is classed in rental category A (additional charges for use of more than 176 hours per month), and warranty category B (three months). Purchase credits can be accrued up to a maximum of 50 percent for the processor and line printer, 55 percent for the serial printer and CRT display station, and 40 percent for the magnetic card reader.

Configuration



(1) Each line supports connection to one or more remote workstation clusters or to a remote host computer

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5340 System Units

Monthly Charge*			Monthly Maint.
Rental Contract	Lease Contract	Purchase	

All 75 models, corresponding to the 75 possible combinations of memory, diskette, and disk storage choices, can be priced using the chart below. Simply add together the three figures, one from each category, that reflect the combination of choices represented by the model number —

Main Memory Capacity:

Axx — 32K bytes	\$ 866	\$ 787	\$26,300	\$145
Bxx — 48K bytes	910	827	27,475	150
Cxx — 64K bytes	954	867	28,650	155
Dxx — 96K bytes	1,042	947	31,000	165
Exx — 128K bytes	1,130	1,027	33,350	175

Diskette Facility:

x1x — Single reading surface	0	0	0	0
x2x — Two reading surfaces	69	63	2,160	5
x3x — Diskette Magazine Facility	149	136	4,680	25

Disk Storage Capacity:

xx1 — 8.6 Megabytes	0	0	0	0
xx2 — 13.2 Megabytes	75	68	1,780	10
xx3 — 27.1 Megabytes	311	283	9,160	45
xx4 — 63.9 Megabytes	358	326	10,600	45
xx5 — 128.4 Megabytes	639	581	19,170	91

Workstations

CRT Display Stations—					
5251-1	Local; 960 characters	82	70	2,660	17
5251-11	Local; 1920 characters	88	75	2,850	18
5252	Local; dual display; 960 characters each display	94	80	3,040	20
2680	Cable-through	4	3	115	1
5251-2	Remote; SDLC; 960 characters	134	114	3,875	38
5251-12	Remote; SDLC; 1920 characters	140	119	4,050	39
3701	EIA Interface	13	11	430	3
5500	Interface with 1200 bps modem for non-switched line	19	16	660	5
5502	Interface with 1200 bps modem for switched line	19	16	660	5
4703	Internal Clock	6	5	210	1
5650	DDS Interface; 2400, 4800, 9600 bps; point-to-point	24	20	840	4
5651	DDS Interface; 2400, 4800, 9600 bps; multipoint tributary	24	20	840	4
2550	Cluster; four attachment points	47	40	1,520	10
2551	Dual Cluster; eight attachment points	94	80	3,040	20
3600	Expanded Function	11	9	300	1
4600	Keyboard	12	10	350	3
4655	Keylock	—	—	40	—
3225,6	Display Screen Filter	—	—	39	—
7361807	Twinax Protector Kit	—	—	230	—
4905	Multinational Character Set	2	2	76	0.50
4910	Magnetic Stripe Reader	13	11	420	2
5256-1	40 cps	176	150	5,200	30
5256-2	80 cps	200	170	5,800	35
5256-3	120 cps	217	185	6,250	42
1470	Audible Alarm	—	—	50	—
4450	Forms Stand	—	—	—	—
				24.75	

Communications and Peripheral Adapters

2500	First BSC/SDLC Communications Adapter	96	88	2,880	20
3500	Second BSC/SDLC Communications Adapter	96	88	2,880	20
4703	Internal Clock	6	6	210	0.50
5732	Processor Expansion Unit A (I/O Board for MICR attachment except when 27.1 megabyte disk installed)	35	32	1,080	2
5733	Processor Expansion Unit B (additional communications power; not needed when a 63.9 or 128.4 megabyte disk is installed)	24	22	720	5
5734	Processor Expansion Unit C (I/O modem regulator; not needed when a 63.9 or 128.4 megabyte disk or 5733 attachment is installed)	8	8	288	0.50
5735	Processor Expansion Unit D (gate assembly for modems)	8	8	288	0.50
5736	Processor Expansion Unit E (additional power for MICR attachment on certain models)	27	25	900	5

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		Monthly Charge*			
		Rental Contract	Lease Contract	Purchase	Monthly Maint.
Line Interfaces for 4500 Communications Adapter					
530X	Line Base Adapters	\$ 47	\$ 43	\$ 1,175	\$ 7.50
531X	EIA Interfaces	17	15	447	5
533X	1200 bps integrated modem	22	20	720	5.50
534X	1200 bps integrated modem; with auto-answer	33	30	960	7.50
535X	4800 bps integrated modem	156	142	3,780	16.50
536X	4800 bps integrated modem; with auto-answer	165	150	4,005	16.50
539X	Dataphone Digital Service Adapter	31	28	873	5.50
540X	Analog Wideband Adapter	117	106	2,945	2.50
541X	Auto-Call Adapter	47	43	1,235	1.50
Other Peripherals and Features					
5811	Line Printer Adapter; for attachment of 5211 Line Printer; requires 1110	23	21	589	3.50
5815	Line Printer Adapter; for attachment of 3262 Line Printer; requires 1110	47	43	1,175	4.50
1110	Base Printer Attachment; for attachment of 5211 or 3262 Line Printer	23	21	589	3.50
5211-1	Line Printer; 160 lpm	361	307	9,875	63
5211-2	Line Printer; 300 lpm	442	376	12,030	105
3262-B1	Line Printer; 650 lpm; stand-alone	566	482	17,690	144
1100	Magnetic Character Reader Adapter	388	353	9,125	27.50
1105	Magnetic Character Reader Expansion Feature	131	119	3,335	14
1255-1	Magnetic Character Reader 500 dpm, 6 Stackers	1,305	—	41,040	348
1255-2	Magnetic Character Reader 750 dpm, 6 Stackers	1,595	—	46,970	557
1255-3	Magnetic Character Reader 750 dpm, 12 Stackers	2,100	—	63,960	733
4655	Keylock	—	—	75	—
4900	Workstation Control Expansion A	14	13	393	3.50
4901	Workstation Control Expansion B	36	33	982	6.50
4905	Multinational Control	14	13	393	1

*Includes prime-shift maintenance.

Software

		Monthly License Charge
5726-SS1	System Support Program	\$152
6000,6001	Interactive Communications Feature for SSP	124
5726-UT1	System/34 Utilities	53
5726-AS1	Basic Assembler and Macro Processor	134
5726-CB1	COBOL	131
5726-F01	FORTRAN IV	181
5726-RG1	RPG II	44
5726-BA1	BASIC	63

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Monthly Charge*

		<u>Rental Contract</u>	<u>Lease Contract</u>	<u>Purchase</u>	<u>Monthly Maint.</u>
Line Interfaces for 4500 Communications Adapter					
▶ 530X	Line Base Adapters	\$ 44	\$ 40	\$ 1,130	\$ 7.50
531X	EIA Interfaces	15	14	430	5
533X	1200 bps integrated modem	22	20	693	5.50
534X	1200 bps integrated modem; with auto-answer	31	28	924	7.50
535X	4800 bps integrated modem	145	132	3,635	16.50
536X	4800 bps integrated modem; with auto-answer	153	139	3,855	16.50
539X	Dataphone Digital Service Adapter	29	26	840	5.50
540X	Analog Wideband Adapter	109	99	2,835	2.50
541X	Auto-Call Adapter	44	40	1,190	1.50
Other Peripherals and Features					
5811	Line Printer Adapter; for attachment of 5211 Line Printer; requires 1110	21	19	567	3.50
5815	Line Printer Adapter; for attachment of 3262 Line Printer; requires 1110	44	40	1,130	4.50
1110	Base Printer Attachment; for attachment of 5211 or 3262 Line Printer	21	19	567	3.50
5211-1	Line Printer; 160 lpm	345	285	9,875	63
5211-2	Line Printer; 300 lpm	410	349	12,030	105
3262-B1	Line Printer; 650 lpm; stand-alone	525	447	17,010	144
1100	Magnetic Character Reader Adapter	360	327	8,775	27.50
1105	Magnetic Character Reader Expansion Feature	122	111	3,210	14
1255-1	Magnetic Character Reader 500 dpm, 6 Stackers	1,210	—	41,040	332
1255-2	Magnetic Character Reader 750 dpm, 6 Stackers	1,480	—	46,970	531
1255-3	Magnetic Character Reader 750 dpm, 12 Stackers	1,945	—	63,960	699
4655	Keylock	—	—	72	—
4900	Workstation Control Expansion A	13	12	378	3.50
4901	Workstation Control Expansion B	34	31	945	6.50
4905	Multinational Control	13	12	378	1

*Includes prime-shift maintenance.

Software

		<u>Monthly License Charge</u>
5726-SS1	System Support Program	\$133
6000,6001	Interactive Communications Feature for SSP	94
5726-UT1	System/34 Utilities	46
5726-AS1	Basic Assembler and Macro Processor	117
5726-CB1	COBOL	114
5726-F01	FORTRAN IV	158
5726-RG1	RPG II	38
5726-BA1	BASIC	55■

IBM System/34

Update

Monthly Charge*

Line Interfaces for 4500 Communications Adapter

		<u>Rental</u>	<u>Lease</u>	<u>Purchase</u>	<u>Monthly</u>
		<u>Contract</u>	<u>Contract</u>		<u>Maint.</u>
▶ 530X	Line Base Adapters	\$ 41	\$ 37	\$ 1,130	\$ 7.50
531X	EIA Interfaces	14	13	430	5
533X	1200 bps integrated modem	22	20	693	5.50
534X	1200 bps integrated modem; with auto-answer	31	28	924	7.50
535X	4800 bps integrated modem	135	123	3,635	16.50
536X	4800 bps integrated modem; with auto-answer	142	129	3,855	16.50
539X	Dataphone Digital Service Adapter	26	24	840	5.50
540X	Analog Wideband Adapter	101	92	2,835	2.50
541X	Auto-Call Adapter	41	37	1,190	1.50

Other Peripherals and Features

5811	Line Printer Adapter; for attachment of 5211 Line Printer; requires 1110	20	18	567	3.50
5815	Line Printer Adapter; for attachment of 3262 Line Printer; requires 1110	41	37	1,130	4.50
1110	Base Printer Attachment; for attachment of 5211 or 3262 Line Printer	20	18	567	3.50
5211-1	Line Printer; 160 lpm	314	267	9,875	63
5211-2	Line Printer; 300 lpm	384	327	12,030	105
3262-B1	Line Printer; 650 lpm; stand-alone	491	418	16,200	144
1100	Magnetic Character Reader Adapter	334	304	8,775	27.50
1105	Magnetic Character Reader Expansion Feature	113	103	3,210	14
1255-1	Magnetic Character Reader 500 dpm, 6 Stackers	1,135	—	39,090	332
1255-2	Magnetic Character Reader 750 dpm, 6 Stackers	1,385	—	44,740	531
1255-3	Magnetic Character Reader 750 dpm, 12 Stackers	1,820	—	60,920	699
4655	Keylock	—	—	72	—
4900	Workstation Control Expansion A	12	11	378	3.50
4901	Workstation Control Expansion B	32	29	945	6.50
4905	Multinational Control	12	11	378	1

*Includes prime-shift maintenance.

Software

		<u>Monthly</u>
		<u>License Charge</u>
5726-SS1	System Support Program	\$133
6000,6001	Interactive Communications Feature for SSP	94
5726-UT1	System/34 Utilities	46
5726-AS1	Basic Assembler and Macro Processor	117
5726-CB1	COBOL	114
5726-FO1	FORTRAN IV	158
5726-RG1	RPG II	38
5726-BA1	BASIC	55■

IBM System/34



		Monthly Charge*			Monthly Maint.
		Rental Contract	Lease Contract	Purchase	
Line Interfaces for 2500 Communications Adapter					
5500	1200 bps; integrated modem for non-switched line; requires 4703, 5734	21	19	660	5
5501	1200 bps; integrated modem with Auto-Answer for switched line; requires 4703, 5734	28	26	880	7
5600	2400 bps; integrated modem for non-switched point-to-point line; requires 5733, 5735	82	75	2,240	11.50
5601	2400 bps; integrated modem for non-switched multipoint control line; requires 5733, 5735	82	75	2,240	11.50
5602	2400 bps; integrated modem for non-switched multipoint tributary line; requires 5733, 5735	90	82	2,490	13
5610	2400 bps; integrated modem with Auto-Answer for switched line; requires 5733, 5735	91	83	2,550	14
7951	Switched Network Backup for non-switched lines	17	16	540	3.50
7952	Switched Network Backup with Auto-Answer for non-switched lines	27	25	828	5
5650	Dataphone Digital Service Adapter; point-to-point or multipoint control	26	24	840	5
5651	Dataphone Digital Service Adapter; multipoint tributary	26	24	840	5
3701	EIA Interface for attachment of non-integrated modems requires 5734	13	12	430	4.50
Line Interfaces for 3500 Communications Adapter					
6500	1200 bps; integrated modem for non-switched line; requires 4703, 5734	20	19	660	5
6501	1200 bps; integrated modem with Auto-Answer for switched line; requires 4703, 5734	28	26	880	7
6600	2400 bps; integrated modem for non-switched point-to-point line; requires 5733, 5735	82	75	2,240	11.50
6601	2400 bps; integrated modem for non-switched multipoint control line; requires 5733, 5735	82	75	2,240	11.50
6602	2400 bps; integrated modem for non-switched multipoint tributary line; requires 5733, 5735	90	82	2,490	13
6610	2400 bps; integrated modem with Auto-Answer for switched line; requires 5733, 5735	91	83	2,550	14
7953	Switched Network Backup for non-switched lines	17	16	540	3.50
7954	Switched Network Backup with Automatic Answer for non-switched lines	27	25	828	5
5652	Dataphone Digital Service Adapter for point-to-point or multipoint control line	26	24	840	5
5653	Dataphone Digital Service Adapter for multipoint tributary line	26	24	840	5
3702	EIA Interface for attachment of non-integrated modems; requires 5734	13	12	430	4.50
Other Peripherals and Features					
5811	Line Printer Adapter	17	16	540	3
5211-1	Line Printer, 160 lpm	281	239	8,960	63
5211-2	Line Printer, 300 lpm	343	292	10,920	105
5915-5925	Print Belt for 5211	—	—	170	—
5552	48-character FORTRAN Belt	—	—	170	—
1100	Magnetic Character Reader Adapter	290	264	8,775	25
1105	Magnetic Character Reader Expansion Feature	99	90	3,060	13
1255-1	Magnetic Character Reader 500 dpm, 6 Stackers	1,015	—	37,230	302
1255-2	Magnetic Character Reader 750 dpm, 6 Stackers	1,235	—	42,610	483
1255-3	Magnetic Character Reader 750 dpm, 12 Stackers	1,625	—	58,020	636
.4655	Keylock	—	—	72	—
4900	Workstation Control Expansion A	11	10	360	3
4901	Workstation Control Expansion B	28	26	900	6
4905	Multinational Control	11	10	360	0.50

*Includes prime-shift maintenance.

Software

	Monthly License Charge	One-Time Charge
System Support Program	\$106	—
Interactive Communications Feature for SSP	75	—
System/34 Utilities	37	—
Workstation Search Facility	—	275
PRPQ Workstation Support Subroutines	15	—
Basic Assembler and Macro Processor	93	—
COBOL	90	—
FORTRAN IV	126	—
RPG II	30	—
On-line Data Collection	100	—■

IBM System/34

New Product Announcement

During the month of January 1979, IBM released several product announcements pertaining to the System/34. Highlights of these announcements include:

- An increase in the number of local workstations supported from 8 to 16. The eight additional workstations, which can be 5250 Display Stations and/or 5256 Printers, are supported via a new #4901 Workstation Control Expansion B feature. The workstations can be attached through the four existing cable connections on the 5340 System Unit via the Cable-Thru feature. The maximum number of devices on one cable remains at seven (the 5252 counts as two devices). The new expansion feature also supports magnetic stripe readers attached to the workstations, so that Work Station Control Expansion A (#4900) is not required when feature #4901 is installed.
- Enhancements to the Interactive Communications Feature (SSP-ICF) to provide System/34-to-System/34 communications using SDLC, and a 3270 BSC program interface. The SDLC software supports processor-to-processor connections for point-to-point or multipoint operations. The 3270 BSC protocol support permits a System/34 to emulate a Model 3271-2 controller when communicating with the host system.
- An expansion feature for the Model 1255 Magnetic Character Reader that provides an additional 28K bytes of controller storage for document control logic modules and tables. MICR assembler macro instructions were also announced to support implementation of more complex documentation stacker logic.
- Improvements to programming language software. A new RPG II operation code, POST, allows the user to determine the screen size of a new workstation and send appropriate formats. COBOL extensions revise COBOL-based use of SSP-ICF and Work Station Data Management (WSDM) by eliminating the need for CALLS to assembler routines.
- New applications programs for retail merchandising and auditing, material requirements planning (for Manufacturing Accounting and Production Information Control System software), and trust department accounting.
- Modifications to the System Support Program (SSP) and various utility programs to support the above features and a few other minor enhancements.□

IBM System/34

		Monthly Charge*			Monthly Maint.
		Rental Contract	Lease Contract	Purchase	
Line Interfaces for 2500 Communications Adapter					
5500	1200 bps; integrated modem for non-switched line; requires 4703, 5734	19	18	660	5
5501	1200 bps; integrated modem with Auto-Answer for switched line; requires 4703, 5734	26	24	880	7
5600	2400 bps; integrated modem for non-switched point-to-point line; requires 5733, 5735	71	65	2,240	11.50
5601	2400 bps; integrated modem for non-switched multipoint control line; requires 5733, 5735	71	65	2,240	11.50
5602	2400 bps; integrated modem for non-switched multipoint tributary line; requires 5733, 5735	78	71	2,490	13
5610	2400 bps; integrated modem with Auto-Answer for switched line; requires 5733, 5735	79	72	2,550	14
7951	Switched Network Backup for non-switched lines	16	15	540	3.50
7952	Switched Network Backup with Auto-Answer for non-switched lines	25	23	828	5
5650	Dataphone Digital Service Adapter; point-to-point or multipoint control	24	22	840	5
5651	Dataphone Digital Service Adapter; multipoint tributary	24	22	840	5
3701	EIA Interface for attachment of non-integrated modems requires 5734	13	12	430	4.50
Line Interfaces for 3500 Communications Adapter					
6500	1200 bps; integrated modem for non-switched line; requires 4703, 5734	19	18	660	5
6501	1200 bps; integrated modem with Auto-Answer for switched line; requires 4703, 5734	26	24	880	7
6600	2400 bps; integrated modem for non-switched point-to-point line; requires 5733, 5735	71	65	2,240	11.50
6601	2400 bps; integrated modem for non-switched multipoint control line; requires 5733, 5735	71	65	2,240	11.50
6602	2400 bps; integrated modem for non-switched multipoint tributary line; requires 5733, 5735	78	71	2,490	13
6610	2400 bps; integrated modem with Auto-Answer for switched line; requires 5733, 5735	79	72	2,550	14
7953	Switched Network Backup for non-switched lines	16	15	540	3.50
7954	Switched Network Backup with Automatic Answer for non-switched lines	25	23	828	5
5652	Dataphone Digital Service Adapter for point-to-point or multipoint control line	24	22	840	5
5653	Dataphone Digital Service Adapter for multipoint tributary line	24	22	840	5
3702	EIA Interface for attachment of non-integrated modems; requires 5734	13	12	430	4.50
Other Peripherals and Features					
5810	Line Printer Adapter	44	40	1,440	8
5211-1	Line Printer, 160 lpm	376	320	12,800	75
5211-2	Line Printer, 300 lpm	458	390	15,600	125
5915-5925	Print Belt for 5211	—	—	170	—
5552	48-character FORTRAN Belt	—	—	170	—
1100	Magnetic Character Reader Adapter	247	225	8,775	25
1105	Magnetic Character Reader Expansion Feature	94	85	3,060	13
1255-1	Magnetic Character Reader 500 dpm, 6 Stackers	904	—	35,460	251
1255-2	Magnetic Character Reader 750 dpm, 6 Stackers	1,100	—	40,590	400
1255-3	Magnetic Character Reader 750 dpm, 12 Stackers	1,450	—	55,260	527
4655	Keylock	—	—	72	—
4900	Workstation Control Expansion A	11	10	360	3
4901	Workstation Control Expansion B	27	25	900	6
4905	Multinational Control	11	10	360	0.50

*Includes prime-shift maintenance.

Software

	Monthly License Charge
System Support Program	\$ 85
Interactive Communications Feature for SSP	75
System/34 Utilities	31
Workstation Search Facility	250
PRPQ Workstation Support Subroutines	15
Basic Assembler and Macro Processor	78
COBOL	75
FORTRAN IV	105
RPG II	26
On-line Data Collection	100■

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- Enhancements to the Interactive Communications Feature (SSP-ICF) to provide System/34-to-System/34 communications using SDLC, and a 3270 BSC program interface. The SDLC software supports processor-to-processor connections for point-to-point or multipoint operations. The 3270 BSC protocol support permits a System/34 to emulate a Model 3271-2 controller when communicating with the host system.
- An expansion feature for the Model 1255 Magnetic Character Reader that provides an additional 28K bytes of controller storage for document control logic modules and tables. MICR assembler macro instructions were also announced to support implementation of more complex documentation stacker logic.
- Improvements to programming language software. A new RPG II operation code, POST, allows the user to determine the screen size of a new workstation and send appropriate formats. COBOL extensions revise COBOL-based use of SSP-ICF and Work Station Data Management (WSDM) by eliminating the need for CALLS to assembler routines.
- New applications programs for retail merchandising and auditing, material requirements planning (for Manufacturing Accounting and Production Information Control System software), and trust department accounting.
- Modifications to the System Support Program (SSP) and various utility programs to support the above features and a few other minor enhancements.□

IBM System/34

		Monthly Charge*			Monthly
		Rental	Lease	Purchase	Maint.
		Contract	Contract		
Line Interfaces for 2500 Communications Adapter					
5500	1200 bps; integrated modem for non-switched line; requires 4703,5734	19	18	660	5
5501	1200 bps; integrated modem with Auto-Answer for switched line; requires 4703, 5734	26	24	880	7
5600	2400 bps; integrated modem for non-switched point-to-point line; requires 5733, 5735	78	71	2,240	11.50
5601	2400 bps; integrated modem for non-switched multipoint control line; requires 5733, 5735	78	71	2,240	11.50
5602	2400 bps; integrated modem for non-switched multipoint tributary line; requires 5733, 5735	85	77	2,490	13
5610	2400 bps; integrated modem with Auto-Answer for switched line; requires 5733, 5735	86	78	2,550	14
7951	Switched Network Backup for non-switched lines	16	15	540	3.50
7952	Switched Network Backup with Auto-Answer for non-switched lines	25	23	828	5
5650	Dataphone Digital Service Adapter; point-to-point or multipoint control	24	22	840	5
5651	Dataphone Digital Service Adapter; multipoint tributary	24	22	840	5
3701	EIA Interface for attachment of non-integrated modems requires 5734	13	12	430	4.50
Line Interfaces for 3500 Communications Adapter					
6500	1200 bps; integrated modem for non-switched line; requires 4703, 5734	19	18	660	5
6501	1200 bps; integrated modem with Auto-Answer for switched line; requires 4703, 5734	26	24	880	7
6600	2400 bps; integrated modem for non-switched point-to-point line; requires 5733, 5735	78	71	2,240	11.50
6601	2400 bps; integrated modem for non-switched multipoint control line; requires 5733, 5735	78	71	2,240	11.50
6602	2400 bps; integrated modem for non-switched multipoint tributary line; requires 5733, 5735	85	77	2,490	13
6610	2400 bps; integrated modem with Auto-Answer for switched line; requires 5733, 5735	86	78	2,550	14
7953	Switched Network Backup for non-switched lines	16	15	540	3.50
7954	Switched Network Backup with Automatic Answer for non-switched lines	25	23	828	5
5652	Dataphone Digital Service Adapter for point-to-point or multipoint control line	24	22	840	5
5653	Dataphone Digital Service Adapter for multipoint tributary line	24	22	840	5
3702	EIA Interface for attachment of non-integrated modems; requires 5734	13	12	430	4.50
Other Peripherals and Features					
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5211-1	Line Printer, 160 lpm	376	320	12,800	75
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5915-5925	Print Belt for 5211	—	—	170	—
5552	48-character FORTRAN Belt	—	—	170	—
1100	Magnetic Character Reader Adapter	272	247	8,775	25
1105	Magnetic Character Reader Expansion Feature	94	85	3,060	13
1255-1	Magnetic Character Reader 500 dpm, 6 Stackers	904	—	35,460	251
1255-2	Magnetic Character Reader 750 dpm, 6 Stackers	1,100	—	40,590	400
1255-3	Magnetic Character Reader 750 dpm, 12 Stackers	1,450	—	55,260	527
4655	Keylock	—	—	72	—
4900	Workstation Control Expansion A	11	10	360	3
4901	Workstation Control Expansion B	27	25	900	6
4905	Multinational Control	11	10	360	0.50

*Includes prime-shift maintenance.

Software

	Monthly License Charge
System Support Program	\$ 85
Interactive Communications Feature for SSP	75
System/34 Utilities	31
Workstation Search Facility	250
PRPQ Workstation Support Subroutines	15
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- Enhancements to the Interactive Communications Feature (SSP-ICF) to provide System/34-to-System/34 communications using SDLC, and a 3270 BSC program interface. The SDLC software supports processor-to-processor connections for point-to-point or multipoint operations. The 3270 BSC protocol support permits a System/34 to emulate a Model 3271-2 controller when communicating with the host system.
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IBM System/34

		Monthly Charge*			Monthly Maint.
		Rental Contract	Lease Contract	Purchase	
Line Interfaces for 2500 Communications Adapter					
5500	1200 bps; integrated modem for non-switched line; requires 4703, 5734	19	18	660	5
5501	1200 bps; integrated modem with Auto-Answer for switched line; requires 4703, 5734	26	24	880	7
5600	2400 bps; integrated modem for non-switched point-to-point line; requires 5733, 5735	78	71	2,240	11.50
5601	2400 bps; integrated modem for non-switched multipoint control line; requires 5733, 5735	78	71	2,240	11.50
5602	2400 bps; integrated modem for non-switched multipoint tributary line; requires 5733, 5735	85	77	2,490	13
5610	2400 bps; integrated modem with Auto-Answer for switched line; requires 5733, 5735	86	78	2,550	14
7951	Switched Network Backup for non-switched lines	16	15	540	3.50
7952	Switched Network Backup with Auto-Answer for non-switched lines	25	23	828	5
5650	Dataphone Digital Service Adapter; point-to-point or multipoint control	24	22	840	5
5651	Dataphone Digital Service Adapter; multipoint tributary	24	22	840	5
3701	EIA Interface for attachment of non-integrated modems; requires 5734	13	12	430	4.50
Line Interfaces for 3500 Communications Adapter					
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6501	1200 bps; integrated modem with Auto-Answer for switched line; requires 4703, 5734	26	24	880	7
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6602	2400 bps; integrated modem for non-switched multipoint tributary line; requires 5733, 5735	85	77	2,490	13
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3702	EIA Interface for attachment of non-integrated modems; requires 5734	13	12	430	4.50
Other Peripherals and Features					
5810	Line Printer Adapter	48	44	1,440	8
5211-1	Line Printer, 160 lpm	376	320	12,800	75
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5915-5925	Print Belt for 5211	—	—	170	—
5552	48-character FORTRAN Belt	—	—	170	—
1100	Magnetic Character Reader Adapter	272	247	8,775	25
1105	Magnetic Character Reader Expansion Feature	94	85	3,060	13
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1255-2	Magnetic Character Reader 750 dpm, 6 Stackers	1,100	—	40,590	400
1255-3	Magnetic Character Reader 750 dpm, 12 Stackers	1,450	—	55,260	527
4655	Keylock	—	—	72	—
4900	Workstation Control Expansion A	11	10	360	3
4901	Workstation Control Expansion B	27	25	900	6
4905	Multinational Control	11	10	360	0.50

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Software

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System/34 Utilities	31
Workstation Search Facility	250
PRPQ Workstation Support Subroutines	15
Basic Assembler and Macro Processor	78
COBOL	75
FORTRAN IV	105
RPG II	26
On-line Data Collection	100■

IBM System/34



The System/34 workstation utilizes a 5251-11 CRT Display Station, with its 4600 Keyboard, and a 5256 Printer.

MANAGEMENT SUMMARY

Although IBM originally designed the System/34 as a stand-alone computer for the small business environment, it has continued to enhance the communications capabilities of the system to attract the distributed processing user. The System/34 now provides full support for interactive workstation-oriented data communications in network operations.

The System/34 can function as a terminal or as a processor in a hierarchical operation, using a System/370, System/360, or System/3 computer as the host. It can also provide system-to-system communications with another System/34 or other communications terminal.

During the time since its introduction, IBM has expanded the System/34 in fixed disk capacity, main memory capacity, and remote workstation capacity. Maximum disk capacity is now 128.4 megabytes; maximum main memory capacity is 128K bytes. Up to 8 local and up to 64 remote workstations can be attached to the System/34.

Diskette options have been expanded to include a magazine facility. This unit has five slots (drives), two of which hold up to 10 diskettes each. These 20 diskettes can be read sequentially without operator intervention. The other three slots hold an individual diskette.

Three new CRT display stations have been added. Models 5251-2 and -12 are similar to the older models 5251-1 and -11, except that they have a 960-character screen. Model 5252 houses two independent display/keyboard units in a single cabinet; each screen displays 960 characters. A magnetic stripe reader has recently become available as an optional feature for System/34 users requiring security from unauthorized usage.

SSP, System Support Program, is the operating system offered with the System/34. SSP provides multipro-

A small computer system with distributed processing capabilities that permit communications between its multiple remote and local workstations and another computer system.

The central processing unit houses a micro-processor-based control system, a non-removable disk storage unit, and a diskette drive. Main memory capacity ranges from 32K bytes to 128K bytes, depending on the model selected; disk capacity ranges from 8.6 megabytes to 128.4 megabytes. Diskette storage of up to 1.2 megabytes is available. Two communications lines support remote workstations or communications with another system. Each line operates in half-duplex mode at speeds of up to 9600 bps using BSC or SDLC protocol. Extensive software support includes the SSP operating system, file maintenance utilities, several language compilers, and many applications programs.

A small configuration with 32K bytes of main memory, 8.6 megabytes of disk storage, a single diskette drive, a local keyboard/display station, a 40-cps system printer, and one remote cluster of 4 keyboard/displays and a 40-cps printer can be purchased for \$60,328 or rented for \$1,883 per month, including maintenance.

A large configuration with 128K bytes of main memory, 128.4 megabytes of disk storage, a diskette magazine unit (5 drives), 5 local keyboard/display stations, 3 local 120-cps printers, and eight remote clusters containing a total of 48 keyboard/display stations and 16 120-cps printers costs \$397,056 or rents for \$12,850 per month, including maintenance.

CHARACTERISTICS

VENDOR: International Business Machines Corporation, General Systems Division, 5775 Glenridge Drive N.E., Atlanta, Georgia 30301. Telephone (404) 231-3000.

DATE OF ANNOUNCEMENT: April 1977.

DATE OF FIRST DELIVERY: January 1978.

NUMBER DELIVERED TO DATE: 6,000 by the end of 1978 (estimated).

SERVICED BY: IBM.

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gramming support (including concurrent, independent operation of multiple workstations), data file management, password security, menu job selection, control of language compilers, utilities, and control of communications lines. Included in the system utilities are support for interactive data entry, data file maintenance, source program entry, and the operating system command entry.

The newly announced Interactive Communications feature (SSP-ICF) provides the necessary functions to allow the System/34 to operate in an interactive distributed network. It provides for multiple users to share the same communications line, remote initiation of System/34 programs, program-to-program communications within the System/34, and program independence from the host subsystem support and line protocol.

Languages supported by SSP now include COBOL, as well as the previously available RPG II, FORTRAN IV, and Basic Assembler.

USER REACTION

Datapro completed a mail survey of IBM System/34 users in September and October 1978. We received responses from 12 users with a total of 20 installed systems. Our survey did not attempt to distinguish between systems functioning as stand-alone computers and those functioning as terminals or processors in a distributed network. Users' comments expressed strong satisfaction with both the hardware and the system software. Ratings supplied by the users are summarized below.

	Excellent	Good	Fair	Poor	WA*
Ease of operation	7	5	0	0	3.6
Reliability of mainframe	9	3	0	0	3.7
Reliability of peripherals	9	3	0	0	3.7
Maintenance service:					
Responsiveness	10	2	0	0	3.8
Effectiveness	9	2	0	0	3.8
Technical support	2	7	2	1	2.8
Manufacturer's software					
Operating system	3	9	0	0	3.3
Compilers and assemblers	5	7	0	0	3.4
Application programs	0	2	3	0	2.4
Ease of programming	5	6	1	0	3.3
Ease of conversion	5	4	3	0	3.1
Overall satisfaction	6	6	0	0	3.5

*Weighted Average on a scale of 4.0 for Excellent. □

► CONFIGURATION

The System/34 is built upon a multiple-processor architecture especially tailored to support workstation-centered data processing. Up to 8 local and up to 64 remote workstations can be attached to the System/34. A workstation can be a CRT display station with keyboard or a character printer. Mass storage support includes up to 1.2 megabytes of diskette capacity and up to 128.4 megabytes of non-removable disk capacity.

One line printer and one magnetic character reader can be locally attached to the system.

The 5340 Processing Unit is available in 75 models. The models differ in memory capacity, diskette facilities, and disk storage capacity. The first digit of the model number is an

alphabetic designation for the model's main memory capacity: A is the designation for 32K bytes, B for 48K bytes, C for 64K bytes, D for 96K bytes, and E for 128K bytes. The second digit of the model number indicates the type of diskette unit selected: 1 designates a one-surface/single-density, single drive; 2 indicates a single drive with read/record capabilities for either a one-sided/single-density or a two-sided/double density diskette; 3 is for the Diskette Magazine facility. The last digit of the model number indicates the disk capacity: 1 for 8.6 megabytes, 2 for 13.2 megabytes, 3 for 27.1 megabytes, 4 for 63.9 megabytes, and 5 for 128.4 megabytes. For example, a 5340 Model B21 is a processing unit with 48K bytes of main memory, a dual-surface/double-density single-diskette drive, and 8.6 megabytes of disk storage. The maximum configuration is the Model E35, with 128K bytes of main memory, the Diskette Magazine unit, and 128.4 megabytes of disk capacity.

Special features include a Keylock (#4655) for security purposes; a Multinational Control (#4905), which provides support for the Multinational Character Set; and the Workstation Control Expansion (#4900), which provides support for the Magnetic Stripe Reader.

Four ports, wired to a microcontroller, are provided for local attachment of workstations. One of the ports must be dedicated to the one 5251-1, 5251-11, or 5252 CRT display station and keyboard which serves as the system console. The station can dually function as a workstation. The remaining three ports can be used to attach additional local workstations. Any combination of 5251-1/-11 or 5252 CRT Display Stations with Keyboard and 40-/80-/120-cps 5256 Printers may be used. Any one port will support up to seven workstations, by using a Cable-through feature. The first workstation is attached directly to the processing unit; each additional workstation is serially connected using this feature. The total maximum number of workstations for the three ports together is seven. The 5252 Dual Display Station/Keyboard counts as two workstations.

Two communications lines can be attached to the System/34, each line operating independently at speeds up to 9600 bps and employing BSC or SDLC protocols. Each line will support either remote workstations or communications with another System/34, a System/3, a System/32, a System/7, a System/360, a System/370, a 3741-2/-4 workstation, a 5231 Controller, or a 5110. Line interfaces, with and without integrated modems, and an interface for attachment to AT&T's DDS facility are available.

Attachment of remote workstations to a communications line requires at least one 5251-2 or 5251-12, which includes support for attachment of either an EIA Line Interface for connection to an external modem feature, or a DDS Adapter. A switched or non-switched half-duplex line using SDLC protocol is supported by the System/34 operating system for operation of remote workstations. Transmission over a switched line can be at speeds up to 4800 bps and over a non-switched line at up to 9600 bps. Multiple 5251-2/-12's can be attached to a single communications line in a multipoint arrangement. Each 5251-2 or -12, via a cluster attachment feature, is capable of supporting up to eight additional workstations. Any combination of 5251-1, 5251-11, and 5252 display stations with keyboards and 5256 workstation printers may be used. The 5252 Dual Display Station counts as two workstations. However, there is a limitation of 64 remote workstations for the total system. This limitation is applicable whether one or both of the system's allowable communications lines are used for remote workstation attachment.

The Cluster feature attachment is available in a four-port (#2550) and an eight-port (#2551) version. Each port can support up to four workstations. A single workstation can be directly attached to the port; up to three additional workstations can be serially connected to the directly-attached workstation by use of the Cable-through ►

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► feature. The maximum number of workstations per cluster is eight, not counting the 5251-2/-12 cluster controller. The 5252 Dual Display Station/Keyboard counts as two workstations. From a throughput standpoint, direct attachment and Cable-through attachment perform comparably.

NETWORK CONNECTIONS

One or both of the System/34's Communications Adapters can support communications with another computer system.

Employing BSC protocol, the System/34 can communicate with one of the following:

- Another System/34 equipped with a 2500 or 3500 Communications Adapter.
- A System/32, System 360/20, 5110 (as a 3741-2/-4), a 5231 Controller (point-to-point unidirectional transmission only), or a System/7 equipped with a 2074 BSC Communications Adapter.
- A System/3 equipped with either a 2074 or 2084 Communications Adapter.
- A 3741-2 Data Station or 3741-4 Programmable Workstation.
- A 3747 Data Converter equipped with a 1660 Communications Adapter.
- A System/360 or System/370 supported by OS BTAM; DOS BTAM; OS TCAM; OS/VS1 or OS/VS2 BTAM; TCAM, or VTAM; DOS/VS BTAM or VTAM; using an Integrated Communications Adapter, a 2701 Data Adapter Unit, a 2703 Transmission Control Unit, or a 3704/3705 Communications Controller under control of either the Network Control Program (NCP) or Partitioned Emulation Program (PEP).

Employing SDLC protocol, the System/34 can communicate with a System/370 Model 115 to 168 under control of DOS/VS, OS/V1, or OS/V2 VTAM through a 3704/3705 Communications Controller operating under the Network Control Program/VS (NCP/VS).

TRANSMISSION SPECIFICATIONS

A separate Communications Adapter is required for each of the two System/34-supported communications lines. Either adapter supports BSC and SDLC protocols and a line speed up to 9600 bps. A separate set of Line Interfaces, with and without integrated modems, is provided for attachment to the respective Communications Adapter. Under SSP (software) control, each line operates independently and can support a different type of protocol and line speed.

Two versions of a 1200 bps Line Interface with integrated modem are offered for each Communications Adapter, one version for a switched line and another for a non-switched line. The switched line version includes Auto-Answer capability. An Internal Clock feature and a Processor Unit Expansion C (I/O modem regulator) feature are required for either version. The device communicating with the System/34 is required to be equipped with the same integrated modem interface. The 1200 bps Line Interfaces can be operated at 600 bps via a parameter modification to the support software.

The 1200 bps Line Interface with Integrated Modem can be used for communication with a remote workstation using SDLC protocol. The remote 5251-2/-12 must also be equipped with either the 1200 bps Line Interface with integrated modem for a non-switched line (#5500) or the 1200 bps Line Interface with Integrated Modem for switched lines (#5502).

Four versions of the 2400 bps Line Interface with Integrated Modem are offered for each Communications Adapter: one version for a switched line, one for a non-switched point-to-point line, one for a non-switched multipoint tributary line, and one for a non-switched System/34-controlled multipoint line. The multipoint tributary version is used when the System/34 is a terminal on a multi-point line that includes another processor as the control station. The switched version includes auto-answer capability. All 2400 bps Line Interfaces require a Processor Expansion Unit B (additional communications power) and a Processor Expansion Unit D (gate assembly for modems).

An EIA Line Interface is provided for each Communications Adapter that will support external modems conforming to RS-232C. The Processor Expansion Unit C attachment is required and an internal clock attachment is required for external modems that do not provide timing.

Two versions of a Dataphone Digital Service Adapter are offered for each Communications Adapter. One version will support point-to-point and multipoint lines controlled by the System/34 and the other version supports the System/34 operating as a terminal on a multipoint line having another processor as the control processor. As with the other interfaces, the protocols supported are BSC and SDLC. Speeds of 2400, 4800, and 9600 bps are available with the DDS interface features. Remote workstations that are to be linked to the System/34 via DDS require the 5251-2/-12 to have the DDS Adapter for point-to-point lines (#5650) or multipoint tributary lines (#5651).

SOFTWARE

Operating System

The System/34 System Support Program (SSP) operating system is an enhanced version of the System/32 operating system.

The SSP occupies a minimum of 14K bytes, and this can be increased in 2K-byte increments to include spooling support, increase the number of possible active tasks, or optimize overall system performance. The SSP resident nucleus includes data management for disk, printer, and workstations; buffers for workstation I/O and printer spooling; and a task control work area for system use.

The SSP permits users to select either single-program mode or multiple-program mode. Single-program mode is invoked to execute System/32 Industry Application Programs (IAP's) that have been converted for execution on the System/34. In this mode only one workstation may be active as a command terminal. The remaining workstations may be used as data terminals. In multiple-program (multiprogramming) mode, all workstations that have been designed as command terminals may concurrently invoke control commands and Operator Control Language (OCL) procedures.

Multiprogramming mode also provides an input job queue that consists of a list of jobs that are to be executed in sequence concurrently with other batch or operator-interactive jobs. The jobs in the queue are designated by any command terminal and executed under control of the system console. The station that initiated the job via the job queue is then available for other work.

Main memory is managed as a pool for non-contiguous 2048-byte segments, and all programs occupy multiples of these blocks. No segmenting is provided, and entire programs are swapped in and out of memory to make room for other active programs. Total main memory required by all active tasks can exceed the actual physical main memory, but no single program can exceed the physical limitations of main memory. ►

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► Communication between the user and the SSP is provided through the Operation Control Language (OCL). These statements provide the system with information describing the way in which a job is to be executed, such as the names of files to be processed, where the files are located, and which programs to load. Normally, the list of OCL statements required to direct the execution of a job is stored on disk and can be accessed for processing by entering commands through the keyboard. Procedures are also supplied for execution of the utility programs that accompany the System Control Program and for the Industry Application Programs available to System/34 users. New procedures can be developed for user-written applications programs and specialized operations. The System/34 OCL has the capability to prompt the operator to supply required parameters or to specify default values for missing OCL parameters, as well as a logical IF statement that initiates execution of jobs based on conditions tested by the OCL.

The System/34 OCL differs from the System/32 OCL primarily through the addition of new procedure commands and control commands to support multiprogramming. Some of the more significant additions include management of the print spool queue and input job queue, disk file sharing, assignment of display stations and printers at execution time, provisions for OCL-to-program communications in a 256-byte local data area that is accessible and modifiable through both OCL procedures and user programs, and communications between the display stations and system console. A recent SSP enhancement makes available a new logical OCL capability permitting a test for execution in a single-program mode.

Certain operator-entered commands do not invoke OCL procedures or system utility programs on a System/34 as they do on a System/32. Hence, S/32 OCL procedures using these commands need revisions to account for these differences.

Control of all I/O operations is provided by the SSP data management routines. Support is provided for the CRT display, the keyboard (including the capability to recognize and interpret special function and command keys), the printer, and the disk unit. The diskette is supported by a Load/Dump utility only. Disk files can be organized in sequential, indexed sequential, or direct fashion.

A roll-out/roll-in capability is provided to suspend processing programs in order to allow an inquiry to be made into the file. The executing program is rolled out to disk storage, the inquiry program is executed, and the interrupted processing program is then returned (rolled in) to main memory to resume processing.

The SSP maintains a system history area on the disk that contains a log of recently executed OCL statements and system activities. The contents of the history area may be displayed on the operator console and printed if desired to provide a record of system processing activity. IBM recently enhanced this function so that the file will contain an end of job entry for each job showing the start and end times for the job.

Unlike the System/32, the System/34 in multiprogramming mode *with print spooling*, will not respond to the SYSTEM LOG statement. Logging to the system history area is still performed, and messages are displayed on the operator console, but messages are not printed as they are displayed.

Utility programs supplied with the SSP assist the user in preparing and maintaining his disk files. The programs provided include Disk Initialization, Alternate Track Assignment, Alternate Track Rebuild, File and Volume Display, and File Delete. In addition, a set of routines is provided to permit copying of data, programs, and procedures from the

diskette to the disk file and to transfer such information from the disk file to the diskette to provide back-up files and off-line storage. The entire system library, selected files, or portions of files can be transferred to diskette files. In order to provide sufficient contiguous storage space for creation of new files, the operator can invoke the COMPRESS OCL procedure to reorganize the contents of the disk file in a contiguous area next to the systems library. The SAVE procedure allows one file or all files to be transferred to diskette with a specified retention period. Files can also be added to existing files saved previously on diskette. New options recently added by IBM to the utility produce interchangeable diskette files which permit adding data to an existing diskette file. Both single- and multiple-volume diskette files can be created. The DELETE procedure permits files to be removed from disk storage to create space for new members.

Other enhancements recently added to the System/34 SSP include:

- A third workstation data management residence option, which permits both input and output functions to be resident in main storage.
- A system measurement facility, which, in conjunction with new firmware, monitors and reports system and SSP utilization data.
- The capability to extend sequential, direct, or indexed files on end of extent by an amount specified by the FILE OCL.
- Additional security through support of operator badge entry on the 5250 Magnetic Stripe Reader and expansion of the operator profile by restricting job selection to menu entries from an assigned menu.
- A HELP procedure to facilitate entering of command procedures for SSP, utilities, languages, data communications, and service aids.
- The capability to duplicate a diskette to produce multiple copies.
- A checkpoint/restart facility supporting COBOL RE-RUN statements.
- Support for new peripherals or hardware features including the diskette magazine drive; support for multinational character sets on the 5211, 5251, 5252, and 5256; support for the magnetic stripe reader, 1255 multiple modulus checking, and 5211 translation capability.
- The capability to specify a startup procedure to be initiated automatically at each IPL.

Communications Software

Communications software for the System/34 consists of the RPG II Telecommunications Feature, BSC support for RPG II and the basic assembler, the MRJE and SRJE utilities, SNA/SDLC data management support for remote workstations, SNA assembler macro support, and the Interactive Communications Feature of SSP.

The *RPG II Telecommunications Feature* provides support for transmission and reception of binary synchronous data over voice-grade or high-speed communications lines. The feature permits a System/34 to operate in any one of the following communications modes: receive only, transmit only, receive with conversational reply, or alternate transmit and receive file. The feature permits a System/34 executing a program written in RPG II to function as a terminal in one of the three types of networks: point-to-point switched, point-to-point non-switched, or multipoint. ►

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► **BSC (binary synchronous communications) support** is provided via RPG II and basic assembler macro instructions, where SSP provides the management for transmitting and receiving data. BSC transfers are possible between a System/34 and another System/34 with basic assembler or RPG II; a System/32 with basic assembler or RPG II; a System/3 with RPG II, MLMP, OR CCP; a System/7 with MSP/7; a System/360 or 370 with OS BTAM, OS/VS BTAM, DOS/VS BTAM, or DOS BTAM; a System/360 Model 20 with IOCS for the binary synchronous communications adapter; a 360/370 system with OS TCAM or OS/VS TCAM; a 360/370 system with OS/VTAM or DOS/VS BTAM; a 360/370 system with CICS/COS/VS or CICS/VS; a 360/370 system with IMS/VS; an IBM 3741 Model 2 Data Station or 3741 Model 4 Programmable Workstation; an IBM 3747 Data Converter; an IBM 5231 Data Collection Controller Model 2 acting as a 3741 Model 2 in transmit mode; and an IBM 3750 Switching System. The System/34 appears as a System/3 when communicating with a System/360 or System/370.

The **MRJE utility** uses BSC to communicate with the host system over point-to-point switched or nonswitched communications lines via a 2500 or 3500 Communications Adapter. Under MRJE, the System/34 acts as a System/3 and is always considered to be the remote station which must initiate transmission of data to the host system.

The **SRJE utility** supports SNA/SDLC communications with a host System/370. SRJE allows submission of jobs to an IBM System/370 that uses VTAM and NCP/VS for processing by OS/VS1 RES, OS/VS2 JES2, and DOS/VS POWER/VS.

The System/34 SSP includes a print utility for both the MRJE and SRJE utilities. This utility prints or makes new disk files from punch output and printer output that was directed to the disk during an MRJE or SRJE session.

The System/34 SSP provides *SNA/SDLC data management support for remote workstations*, including the IBM 5251 or 5252 Display Stations and 5256 Printers. The remote workstations may be on one or two communications lines. Whether a workstation is directly attached or remotely attached is transparent to an application program.

SNA assembler macro support is provided for the System/34, in conjunction with the Basic Assembler and Macro Processor program product. The macros support all communications programs that use SNA/SDLC. Basic assembler macro-instructions provide the user interface for SNA communications with the IBM System/370 host telecommunications access methods and associated subsystems. The macros also provide the user with the ability to communicate with user-written host applications which use the same protocols as these IBM-supplied subsystems.

The **Interactive Communications Feature of SSP (SSP-ICF)** provides support for both BSC and SNA/SDLC interactive communications between applications programs, remote procedure initiation on the System/34, and communications line monitoring on a multipoint line where the System/34 is a tributary station (maintained even though no user application program is active). Interactive communications permits multiple concurrent communications sessions over the same data link. SSP-ICF also provides an application program interface which is substantially independent of BSC or SDLC protocol and the communications support for the remote system, IMS/VS, CICS/VS, or CCP.

The application program access to SSP-ICF is available at two levels that are a logical extension of the System/34 workstation interface. The first is through predefined screen format names that control evoking programs, sending of data, and issuing of special commands to SSP-ICF. The

second is through assembler programming for communication to systems which are not a part of the standard SSP-ICF support.

Remote procedure initiation allows programs in a remote system to send a message to the local system to cause any of the available System/34 procedures to be evoked. If the program(s) in the evoked procedure use SSP-ICF, they can communicate interactively with a program in the evoking system. If the evoked procedure is of the MRT type, the session from the evoking program will be attached to the Multiple Requestor Terminal (MRT) program.

Utilities

In addition to the file management utilities integral to the System/32 operating system, IBM offers a System/34 Utilities Program Product that is identical to the S/32 utilities. It provides basic data management capabilities. This separately priced program product consists of five programs: Data File Utility (DFU), Sort, Source Entry Utility (SEU), Screen Design Aid (SDA), and Work Station Utility (WSU).

The **Data File Utility (DFU)** program provides the following data base management functions: data file creation and maintenance, data file inquiry, and data file list. All three functions utilize catalogued RPG II File Description and Input Specifications so that the operator need enter only the name of the file and the name of the catalogued RPG II specifications. The utility prompts the operator to enter additional information required to tailor the program to the user's processing requirements.

The **Data File Creation and Maintenance** function of DFU operates only on indexed sequential files and provides facilities for creating and updating user data files. The program prompts the operator by displaying the field name for the data to be entered on the display console. When updating is being performed, the data currently in the field is displayed to assist the operator. Other features include automatic duplication of fields, control totals, generated record keys, and modulus 10 and 11 self-check digits for verifying entered data.

The **Data File Inquiry** function of DFU allows inquiries into indexed sequential files. Retrievals are performed by record key, and a function key can be used to roll forward or backward in key sequence through the file. Selected records can be printed with page and column headings.

The **Data File List** function of DFU provides a report-writing capability for listing and summarizing selected information from indexed or sequential files. Selection of records is based on record types defined in the RPG II input specifications for the file, and the file can be sorted in either ascending or descending order prior to printing, using up to five fields as sort fields. Records may also be selected for printing based upon a comparison of a user-supplied constant or another data field. This selection precedes the sorting function if sorting is specified. Data can be retrieved from a second file based on the use of a field in the records being listed as a key; the retrieved record from the second file is considered as an extension to the original record being listed. A total of 40 fields can be processed per record. Output records include page and column headings, edited data fields, up to six fields calculated by the use of one of the arithmetic operators and up to four fields or constants, and selected column totals with up to five levels of subtotals.

The **System/34 Sort Utility** provides basically the same functions as the System/3 and System/32 sorts. Disk files can be sorted in ascending, descending user-defined sequence. The Sort program accepts files organized in sequential, indexed, or direct order. It can select records based on a comparison of the contents of a field with a constant or another field or a tag sort in which only the control field

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► and a record address are retrieved. A summary sort groups records with similar control fields and summarizes designated numeric fields into a single summary record. The Sort program automatically allocates disk space for a work file and can handle indexed, direct, and sequential file organizations.

Recent IBM enhancements to the System/34 Sort include support for up to eight input files, a loadable Sort interface from user programs written in COBOL or Basic Assembler, ALTSEQ by field, and standard sequencing when control fields are equal.

The *Source Entry Utility (SEU)* program can be used to create and maintain user-written OCL procedures: specifications for display formats, 1255 control, Auto Report, and the Workstation Utility; FORTRAN, Assembler, and RPG II source code statements; and Sort source code statements. The SEU is accompanied by Sort, RPG II, Auto Report, and format descriptions to aid the user in entering source statements correctly. Display formats are free-form for any statement to be entered, with user-defined display formats permitted.

The *Work Station Utility (WSU)* provides a set of specifications for defining interactive data entry programs which support one or more IBM 5251 Display Stations. Included in the program variables provided by the WSU specifications are job name, number of workstations, region size; Transaction File (a special direct-organization disk file created and managed by WSU to contain key-entered records for up to 10 disk files; formats to be displayed on the IBM 5251 to prompt for data entry and/or display error messages; arithmetic, logical edit, or I/O operations to be performed in conjunction with the entry of data in response to a display format; and references to RPG II file and input specifications for a description of the transaction and master files.

WSU allows up to eight active workstations. WSU programs are executed as MRT programs to optimize performance. These programs will be dynamically adjusted to larger region sizes to reduce overlay fetches or to smaller region sizes if necessary. Multiple WSU-generated programs can be executed concurrently. Recovery after system failures is provided for the Transaction File.

Recent extensions to WSU provide support for random additions to indexed master files, for on-line debugging, for testing the results of disk I/O operations, and for additional system operator options during abort processing.

The *Screen Design Aid (SDA)* is an interactive utility for the design, creation, and maintenance of display formats and job menus. Entire formats can be updated or deleted, and individual source specifications can be updated, inserted, or deleted. SDA allows for the creation and updating of menus and their associated source members. SDA also allows for the creation, from a SFGR source member, of an RPG II skeleton program to use the formats. A Help function, which displays text describing the use of SDA, is included with the utility.

Recent extensions to SDA include the ability to generate WSU source programs that allow master file inquiry and maintenance and simple data capture (Transaction File creation and addition).

Program Languages

COBOL, RPG II, Basic Assembler, and FORTRAN IV are provided for user program development.

System/34 COBOL is designed according to the specifications for American National Standard (ANS) COBOL, X3.23 1974, ANS COBOL is identical to ISO 1989 COBOL, approved in February 1978 by the International Organization for Standardization.

System/34 COBOL is implemented with the following processing modules, where level 2 is the highest level specified in the standard: Nucleus, level 2; Table Handling, level 2; Sequential I/O, level 2; Relative I/O, level 2; Indexed I/O, level 1; Sort-Merge, level 2; Segmentation, level 1; Library, level 2; Debug, level 1; and Interprogram Communication, level 1.

IBM extensions to the standard COBOL include use of apostrophe instead of quotes. Extended data types of computational-3 (packed) and computational-4 (binary), indexed file support for CORE-INDEX, additional debugging support with EXHIBIT and TRACE, ACCEPT from the console, and DISPLAY upon the console.

The access methods supported by System/34 COBOL include: sequential organization through consecutive processing by update in place and consecutive add (extend) and random processing by relative record number, including updating; indexed organization through random processing by key, including file loading; and direct organization through random processing by relative record number, including updating and file loading and consecutive processing. Record size can range from 1 to 4096 bytes, and records may be processed as blocked or unblocked (up to a maximum block size of 9999 bytes). The block size for a given file can be varied between programs up to a maximum block size of 9999 bytes. Logical records may span physical disk sectors, blocks, tracks, or cylinders.

Low-volume, unformatted, line-at-a-time workstation support is provided with the ACCEPT and DISPLAY verbs. Formatted workstation input and output can be accomplished by the use of callable user-written Assembler subroutines or by use of the System/34 PRPQ Work Station Support Subroutines. These subroutines also provide support for data communications (SSF-ICF) for the COBOL user.

System/34 RPG II is identical to its System/32 counterpart except for certain functions implemented to support multiple workstations and to provide SSF-ICF support. The programmer, using up to six different preprinted coding forms, prepares a set of specifications that describe the form of the input data, the calculations to be performed, and the format of the desired output. RPG II for the System/34 offers essentially the same features as the System/3 Model 6 RPG II, with variations in the data management facilities for the support of System/34 input/output devices. The RPG II Interactive Data Entry (IDE) function permits the console to be used as an interactive data entry device. Data can be entered through the system keyboard, displayed for reference on the display screen, and routed to an executing RPG II program for processing. The program provides operator prompting on the CRT display.

All devices available on the System/34 are supported by System/34 RPG II except the diskette drives. However, through the use of the OCL, diskettes can be supported as a transaction or master file and as a librarian save/restore device.

System/34 RPG II supports one or more display stations as a primary or demand file, allowing programmers to treat the display station as a sequential update file. Multiple display stations can be attached to one workstation file without the need for multiple logic modules.

A console file is supported in buffered interactive mode. The operator is prompted record by record with display formats generated by the RPG II compiler. Keying of one record is buffered and overlapped with processing of the previous record.

Multiple printer files may be specified in a single program. The System/34 OCL is used to assign an RPG II printer file ►

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- to either the system printer or a workstation printer at execution time.

The RPG II Auto Report feature was optional for System/32 RPG II, but is standard with System/34 RPG II. This enhancement is a precompiler that reduces the coding effort required to prepare report programs.

RPG II also supports transmission and reception of binary synchronous data over voice-grade or high-speed communications lines. The programmer fills out an RPG II Telecommunications Specification Sheet, which specifies the functions to be performed. The feature permits a System/34 equipped with the 2500/3500 Communications Adapter to operate in any of the following communications mode: receive only, transmit only, receive with conversational reply, transmit with conversational reply, or alternate transmit and receive file. The System/34 can function as a terminal in one of three types of networks: point-to-point switched, point-to-point nonswitched, or multipoint.

A recent enhancement of RPG II allows programs to be written that use facilities of the Interactive Communications Feature (SSP-ICF) through the WORKSTN file support. Information on SSP-ICF can be found under the Communications Software heading in this report.

The Basic Assembler and Macro Processor for the System/34 is a major departure from the RPG II-only posture taken with the System/32. The Basic Assembler produces relocatable object programs that are subsequently converted to executable format by the SSP overlay linkage editor. Source statement programs, relocatable object programs, and executable load modules are stored in the System/34 libraries.

Assembled subroutines may be called by RPG II programs, but the assembly is performed separately. Program linking is accomplished during the compilation of the RPG II source program.

System/34 macros include support for disk functions, printer operation, keyboard and display screen access, binary synchronous communications, SNA/SDLC communications, timer, end of job, message logging, and program logging.

With the announcement of SSP-ICF, IBM enhanced this product with additional macros and macro extensions to acquire and release logical communications sessions, evoke user programs in the same or different systems, read and write data between user programs attached to a logical session, control operations to facilitate synchronization between user programs attached to a logical session, and invoke the checkpoint/restart facility. Information on workstation support is furnished below.

System/34 FORTRAN IV contains the features defined in ANS Basic FORTRAN, X3.10.1966; language extensions supported by IBM 1130, System/3, and System/32 Basic FORTRAN; and the full FORTRAN compiler features listed below.

- Programs can be corrected or modified in a semi-interactive mode at the workstation by displaying a source program file into which the compiler has interspersed diagnostic messages. The compile turnaround time can be reduced because the programmer can start to correct or modify the program without waiting for a listing.
- Logical data, logical expressions, and logical IF are supported.
- Logical elements (constants, variables, and arrays) contain true or false values.
- Operation symbols are used in logical expressions: NOT, AND, OR, LT, LE, EQ, GT, NE, and GE.

- Logical expressions evaluate elements to obtain true or false values.
- Logical assignment statements define a relationship, placing the value of a logical expression in a variable or array element.

The System/34 FORTRAN IV library contains mathematical and service subprograms required during execution to perform arithmetic operations, input and output constant conversions, and input/output control.

Workstation Support

The PRPQ Work Station Support Subroutines operate under SSP and provide the COBOL and Basic Assembler user with access to the workstation formatting capabilities of the Screen Format Generation Routine (SFGR) and Work Station Data Management (WSDM). The subroutines provide the user with support for single or multiple requestor programs (SRT/MRT), never-ending programs (NEP), and single or multiple acquired terminals. Support is provided for reading and updating the Work Station Local Data Area (WSDA) and UPSI switches. Support is also provided for the Interactive Communications Feature (SSP-ICF) for COBOL and Basic Assembler.

The Work Station Search Facility allows the user to search the disk files for records meeting terminal user-selected search criteria. These records are then processed by user-written routines. A keyword in context (KWIC) technique is employed by WSF/34 for searching alphabetic fields without requiring data base changes by the user. Blanks and special characters are considered delimiters if preceded or followed by a blank position. The search argument may be up to eight characters long. WSF/34 employs six logical search operators: equal, less than, less than or equal, greater than, greater than or equal, or not equal.

WSF/34 is written in RPG II and requires a 5340 System Unit with a Diskette 1 drive, 8.6 megabytes of disk storage, and 48K bytes of memory (Model B11); one system printer, either line printing at 160 lines per minute or serial printing at 40 characters per second; and one 5251 Display Station (Model 11).

Data Collection

The 5230 Online Data Collection program product accommodates 80- or 96- column card, diskette, and/or BSC teleprocessing inputs. Its function is to edit, verify, format, and consolidate data from an IBM 5230 Data Collection System. The data, once processed, is transferred to payroll, inventory management, production status, and costing master files. These master files are used in the IBM Manufacturing Management Accounting System in such areas as product costing, inventory, requirements planning, capacity planning, and production control.

Industry Application Programs

Recompiled versions of the Industry Application Programs offered with the System/32 are available for use on the System/34. The packages include accounting systems, financial systems, CPA client accounting, medical systems, manufacturing systems, and many others.

COMPONENTS

PROCESSOR: A separate, microcoded, 16K-byte Control Microprocessor with a 600 nanosecond cycle time controls the Main Processor and directs all of the attached devices through a subsidiary microprocessor. The Main Processor supports from 32K to 128K bytes of user memory with a 600 nanosecond cycle time. Included in the Main Processor is a hardwired emulator that enables the System/34 to

IBM System/34

► support System/3 and System/32 instructions that are not part of the System/34 native repertoire. The emulator (S/3 language processor) was hardwired to assure no System/34 performance degradation due to the compatibility support.

DISK STORAGE: Physically housed in the processor cabinet. Five storage capacities are available: 8.6 megabytes, 13.2 megabytes, 27.1 megabytes, 63.9 megabytes, and 128.4 megabytes. The 8.6, 13.2, and 27.1 megabyte units contain 187.00, 288.00, and 589.33 cylinders respectively; each cylinder accommodates 46,080 bytes. These disks rotate at 2964 rpm to provide a data transfer rate of 0.889 megabytes per second. Head positioning time for the 8.6 megabyte unit is 33 milliseconds (average) and up to 55 milliseconds (maximum); for the 13.2 and 27.1 megabyte units, the average is 38 milliseconds, the maximum, 70 milliseconds. The average rotational delay for these disks is 10 milliseconds.

The 63.9 and 128.4 megabyte units contain 354.50 and 712.50 cylinders, respectively; each cylinder accommodates 180,224 bytes. These disks rotate at 3125 rpm to provide a data transfer rate of 1.031 megabytes per second. Head positioning time is 27 milliseconds average and up to 46 milliseconds maximum. Average rotational delay is 9 milliseconds.

Among the five units available, the 27.1 and 128.4 megabyte units contain two disk modules; the other three units contain one module.

DISKETTE STORAGE: Housed in the processing unit. Depending on processor model, one of three diskette features is provided: a single density, one surface drive; a double density, two surface drive (which also accommodates single density diskettes); or a Diskette Magazine unit. All diskette drives can read and write data in either Basic or Extended format. The single surface diskettes hold 246,272 bytes in Basic format and 303,104 bytes in Extended format. The two-surface diskettes hold 985,088 bytes in Basic format and 1,212,416 bytes in Extended format. The Diskette Magazine unit has five slots (drives), two of which hold up to 10 diskettes each. These 20 diskettes can be read sequentially without operator intervention. The other three hold individual diskettes. All diskettes are user-accessible, and both one-sided and two-sided diskettes can be accommodated (but not within a single job stream).

DISPLAY STATION: Five display stations can be used as local or remote workstations in a System/34 configuration. A 5251-1, 5251-11, or 5252 display station can be used as the system console, as a local workstation, or as a remote workstation (in a cluster). The 5251-2 and 5251-12 are used as remote cluster controllers/workstations. The 5251-1 and 5251-2 have a 960-character screen (12 lines of 80 characters); the 5251-11 and 5251-12 have a 1920-character screen (24 lines of 80 characters). The 5252 houses two independent display/keyboard units in a single cabinet; each screen displays up to 960 characters (12 lines of 80 characters).

Each display supports the 96-character EBCDIC code set with upper and lower case; optionally, a 188-character Multinational Character Set can be used. Characters are formed by a 8-by-16 dot matrix. All workstations on a system must have the same character set. Intensity control, blinking, non-display, underscore, column separator, and reverse-image features are provided along with field editing options. Security features, such as a Keylock and a Magnetic Stripe Reader can be provided to prevent unauthorized usage of the display station and keyboard.

The display station operating as system console is attached to the processing unit by a 20-foot cable. The maximum distance from a local workstation to the processing unit or a remote workstation to its controller is 5000 feet. For cable that is exposed to the elements, a Twinax Protection Kit to shelter the cable can be purchased. A glare filter

can also be purchased for display stations exposed to unusual lighting conditions.

The 5251-2/-12 communicates with a System/34 equipped with a Communications Adapter #2500 or #3500 operating in SNA/SDLC mode. Communications Line Interfaces that can be attached to the 5251-12 include EIA Line Interface (#3701); 1200 bps Line Interface and Modem for Non-switched Lines (#5500); 1200 bps Line Interface and Modem for Switched Lines (#5502); and DDS Adapters for point-to-point (#5650) or multipoint tributary (#5651) lines.

The 3600 Expanded Feature for a remote 5251-2/-12 Display Station and cluster provides the ability to copy any screen image onto a workstation printer in the cluster. The feature also provides the station with a modulus 10 and 11 self-check digit function.

KEYBOARD: The 4600 Keyboard is a required attachment for the Display Station. The keyboard has a 49 character alphanumeric, a typewriter-like pad, and a 10-key numeric pad and supports 24 command functions.

WORKSTATION PRINTER: The 5256 serial printer is available in 40, 80, and 120 cps models. Utilizing the same character sets as the Display Station, the serial printer accommodates 132 character print positions per line and forms the character by a 7-by-8 dot matrix. Tabletop mounted, the 5256 prints either six or eight lines per inch.

LINE PRINTER: Two models of the belt-type, 132 print position 5211 printer are offered. Character sets of 48, 64, 96, or 188 are available in either ASCII or EBCDIC code. The Model 1 will operate at 160 lpm with a 48-character set, a 123 lpm with a 64-character set, at 84 lpm with a 96-character set, and 44 lpm with a 188-character set. The Model 2 will operate at 300 lpm with a 48-character set, at 235 lpm with a 64-character set, at 164 lpm with a 96-character set, and 86 lpm with a 188-character set. Both standard and multinational character sets are available.

MAGNETIC CHARACTER READER: Three models of 1255 MICR readers are offered, including a 500 document-per-minute, 6-stacker model; a 750-dpm, 6-stacker model; and a 750-dpm, 12-stacker model. All models handle documents between 5.75 and 8.875 inches long and 2.5 to 4.25 inches wide.

PRICING

All System/34 components, old and new, are available under the terms of IBM's Rental or Lease Agreement (LRA) or for purchase, except for the 1255 magnetic card reader, which is available for purchase or month-to-month rental only. LRA includes prime shift maintenance; a separate contract is available for purchased units.

LRA provides for month-to-month rental or for a term lease with penalties for early termination (including model downgrades and feature termination). The lease term is 24 months for all equipment except the 5340 processor, which is leased for 36 months. The lease can be extended indefinitely, one year at a time. Except for the processor, the monthly charges for the lease arrangement are generally 15 percent lower than the month-to-month arrangement. The processor is approximately 9 percent lower than the month-to-month arrangement. The prime shift maintenance period is for any consecutive nine hours between 7 AM and 6 PM, Monday through Friday. (The maintenance charges given in the accompanying price list are for prime shift maintenance for purchase equipment and also serve as the basis for calculating extended charges for rented or leased equipment.) Extended period maintenance is available up to 24 hours per day, 7 days per week. ►

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► Except for the processor, the termination charge for the lease arrangement is the lower of 5 months' charges or 25 percent of the remaining value of the lease. The processor termination charge for the lease arrangement is the lower of 4 months' charges or 20 percent of the remaining value of the lease.

All components are in maintenance category D, except the 1255 magnetic card reader, which is in category C, and 5211 line printer, which is in category B. These categories determine the schedule of extended maintenance charges. The premium for extended maintenance is expressed in the table below as a percentage of the basic maintenance charges, which are listed in the accompanying price list.

	Consecutive Hours				
	9*	12	16	20	24
Monday-Friday—					
Category B	10%	16%	22%	28%	34%
Category C	10	19	28	37	46
Category D	10	12	14	16	18

Consecutive Hours

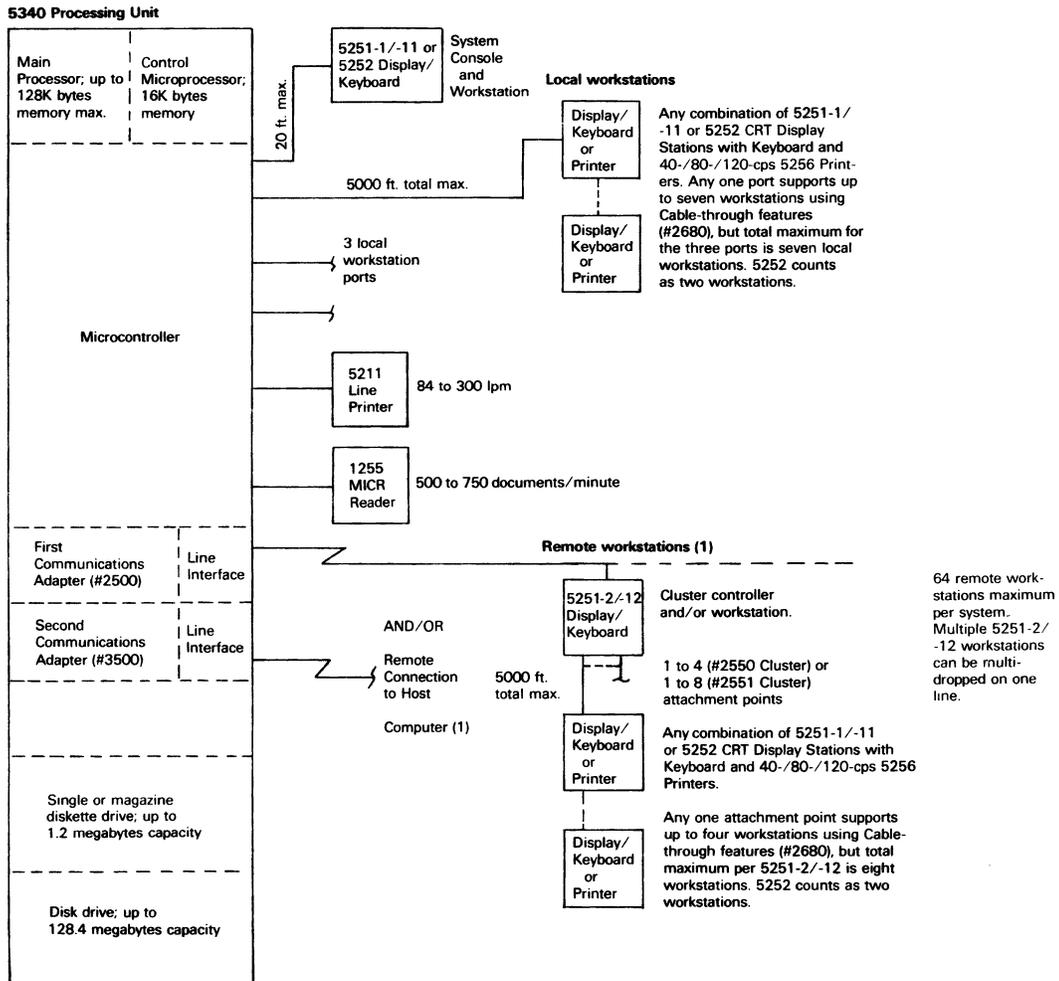
	9*	12	16	20	24
Saturday—					
Category B	5	6	8	10	11
Category C	8	9	11	13	15
Category D	4	5	7	8	9
Sunday—					
Category B	6	8	10	12	14
Category C	9	11	14	16	18
Category D	5	7	9	11	12

*For periods outside the basic 7 AM to 6 PM prime shift.

The lease arrangement also guarantees a maximum rate of increases for extended leasing periods. The rate for all components is five percent per year beginning in the second year of the lease.

All components are classed under rental category B (unlimited usage) except for the 1255 magnetic card reader, which is classed in rental category A (additional charges for use of more than 176 hours per month), and warranty category B (three months). Purchase credits can be accrued up to a maximum of 50 percent for the processor and line printer, 55 percent for the serial printer and CRT display station, and 40 percent for the magnetic card reader.

Configuration



(1) Each line supports connection to one or more remote workstation clusters or to a remote host computer

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5340 System Units	Monthly Charge*			Monthly Maint.
	Rental Contract	Lease Contract	Purchase	

All 75 models, corresponding to the 75 possible combinations of memory, diskette, and disk storage choices, can be priced using the chart below. Simply add together the three figures, one from each category, that reflect the combination of choices represented by the model number —

Main Memory Capacity:				
Axx — 32K bytes	\$786	\$715	\$26,300	\$145
Bxx — 48K bytes	830	755	27,900	150
Cxx — 64K bytes	874	795	29,500	155
Dxx — 96K bytes	962	875	32,700	165
Exx — 128K bytes	1,050	955	35,900	175

Diskette Facility:				
x1x — Single reading surface	0	0	0	0
x2x — Two reading surfaces	66	60	2,160	5
x3x — Diskette Magazine Facility	143	130	4,680	25

Disk Storage Capacity:				
xx1 — 8.6 Megabytes	0	0	0	0
xx2 — 13.2 Megabytes	72	65	1,780	10
xx3 — 27.1 Megabytes	297	270	9,160	45
xx4 — 63.9 Megabytes	344	313	10,000	45
xx5 — 128.4 Megabytes	624	568	19,170	91

Workstations

CRT Display Stations—				
5251-1 Local; 960 characters	82	70	2,660	17
5251-11 Local; 1920 characters	88	75	2,850	18
5252 Local; dual display; 960 characters each display	94	80	3,040	20
2680 Cable-through	4	3	115	1
5251-2 Remote; SDLC; 960 characters	134	114	3,875	38
5251-12 Remote; SDLC; 1920 characters	140	119	4,050	39
3701 EIA Interface	13	11	430	3
5500 Interface with 1200 bps modem for non-switched line	19	16	660	5
5502 Interface with 1200 bps modem for switched line	19	16	660	5
4703 Internal Clock	6	5	210	1
5650 DDS Interface; 2400, 4800, 9600 bps; point-to-point	24	20	840	4
5651 DDS Interface; 2400, 4800, 9600 bps; multipoint tributary	24	20	840	4
2550 Cluster; four attachment points	47	40	1,520	10
2551 Dual Cluster; eight attachment points	94	80	3,040	20
3600 Expanded Function	11	9	300	1
4600 Keyboard	12	10	350	3
4655 Keylock	—	—	40	—
3225,6 Display Screen Filter	—	—	39	—
7361807 Twinax Protector Kit	—	—	230	—
4905 Multinational Character Set	2	2	76	0.50
4910 Magnetic Stripe Reader	13	11	420	2
5256-1 40 cps	176	150	5,200	30
5256-2 80 cps	200	170	5,800	35
5256-3 120 cps	217	185	6,250	42
1470 Audible Alarm	—	—	50	—
4450 Forms Stand	—	—	—	—
			24.75	

Communications and Peripheral Adapters

2500 First BSC/SDLC Communications Adapter	88	80	2,880	20
3500 Second BSC/SDLC Communications Adapter	88	80	2,880	20
4703 Internal Clock	6	6	210	0.50
5732 Processor Expansion Unit A (I/O Board for MICR attachment except when 27.1 megabyte disk installed)	33	30	1,080	2
5733 Processor Expansion Unit B (additional communications power; not needed when a 63.9 or 128.4 megabyte disk is installed)	22	20	720	5
5734 Processor Expansion Unit C (I/O modem regulator; not needed when a 63.9 or 128.4 megabyte disk or 5733 attachment is installed)	8	8	288	0.50
5735 Processor Expansion Unit D (gate assembly for modems)	8	8	288	0.50
5736 Processor Expansion Unit E (additional power for MICR attachment on certain models)	27	25	900	5

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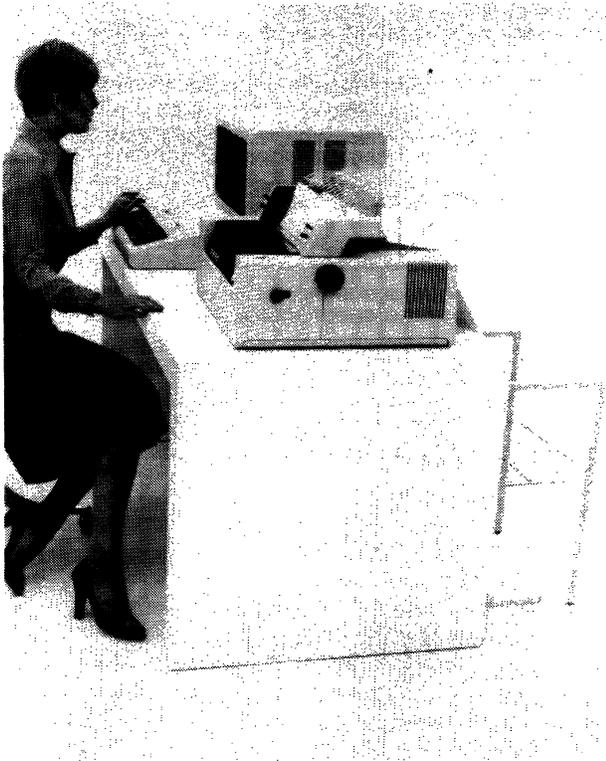


		Monthly Charge*			
		Rental	Lease	Purchase	Monthly
		Contract	Contract		Maint.
Line Interfaces for 2500 Communications Adapter					
5500	1200 bps; integrated modem for non-switched line; requires 4703,5734	19	18	660	5
5501	1200 bps; integrated modem with Auto-Answer for switched line; requires 4703, 5734	26	24	880	7
5600	2400 bps; integrated modem for non-switched point-to-point line; requires 5733, 5735	71	65	2,240	11.50
5601	2400 bps; integrated modem for non-switched multipoint control line; requires 5733, 5735	71	65	2,240	11.50
5602	2400 bps; integrated modem for non-switched multipoint tributary line; requires 5733, 5735	78	71	2,490	13
5610	2400 bps; integrated modem with Auto-Answer for switched line; requires 5733, 5735	79	72	2,550	14
7951	Switched Network Backup for non-switched lines	16	15	540	3.50
7952	Switched Network Backup with Auto-Answer for non-switched lines	25	23	828	5
5650	Dataphone Digital Service Adapter; point-to-point or multipoint control	24	22	840	5
5651	Dataphone Digital Service Adapter; multipoint tributary	24	22	840	5
3701	EIA Interface for attachment of non-integrated modems requires 5734	13	12	430	4.50
Line Interfaces for 3500 Communications Adapter					
6500	1200 bps; integrated modem for non-switched line; requires 4703, 5734	19	18	660	5
6501	1200 bps; integrated modem with Auto-Answer for switched line; requires 4703, 5734	26	24	880	7
6600	2400 bps; integrated modem for non-switched point-to-point line; requires 5733, 5735	71	65	2,240	11.50
6601	2400 bps; integrated modem for non-switched multipoint control line; requires 5733, 5735	71	65	2,240	11.50
6602	2400 bps; integrated modem for non-switched multipoint tributary line; requires 5733, 5735	78	71	2,490	13
6610	2400 bps; integrated modem with Auto-Answer for switched line; requires 5733, 5735	79	72	2,550	14
7953	Switched Network Backup for non-switched lines	16	15	540	3.50
7954	Switched Network Backup with Automatic Answer for non-switched lines	25	23	828	5
5652	Dataphone Digital Service Adapter for point-to-point or multipoint control line	24	22	840	5
5653	Dataphone Digital Service Adapter for multipoint tributary line	24	22	840	5
3702	EIA Interface for attachment of non-integrated modems; requires 5734	13	12	430	4.50
Other Peripherals and Features					
5810	Line Printer Adapter	44	40	1,440	8
5211-1	Line Printer, 160 lpm	376	320	12,800	75
5211-2	Line Printer, 300 lpm	458	390	15,600	125
5915-5925	Print Belt for 5211	—	—	170	—
5552	48-character FORTRAN Belt	—	—	170	—
1100	Magnetic Character Reader Adapter	247	225	8,775	25
1255-1	Magnetic character Reader 500 dpm, 6 Stackers	904	—	35,460	251
1255-2	Magnetic character Reader 750 dpm, 6 Stackers	1,100	—	40,590	400
1255-3	Magnetic character Reader 750 dpm, 12 Stackers	1,450	—	55,260	527
4655	Keylock	—	—	72	—
4900	Workstation Control Expansion	11	10	360	3
4905	Multinational Control	11	10	360	0.50

*Includes prime-shift maintenance.

Software	Monthly License Charge
System Support Program	\$ 85
Interactive Communications Feature for SSP	75
System/34 Utilities	31
Workstation Search Facility	250
PRPQ Workstation Support Subroutines	15
Basic Assembler and Macro Processor	78
COBOL	75
FORTRAN IV	105
RPG II	26
On-line Data Collection	100■

IBM System/34



Depicted above is a System/34 workstation with a 5251-11 CRT Display Station, a 4600 keyboard, and a 5256 Serial Printer.

MANAGEMENT SUMMARY

Not far removed from the processing power of a System/370 115, the System/34 is oriented towards supporting multiple remote and local workstations performing data entry, file maintenance, and report generating functions. When linked to an IBM SNA network, the System/34 can function as a slave processor or terminal (on either a point-to-point or multipoint line) to a host master computer. The System/34 can also function as a host to other System/34's, System/3's, System/32's and System/7's for point-to-point connections.

Recompiling is the most effort System/32 users will have to extend to upgrade to a System/34. While the System/34 internal performance is better than the System/32 by an approximate factor of eight, the capability to operate all workstations concurrently is the most commanding attribute of the System/34 over the one-user-at-a-time System/32.

The 1920-character Display Station provides 24 80-character lines and supports display attributes such as normal/bright intensity, non-display, blinking, underscore, column separator, and reverse image. The keyboard feature includes the typewriter-like keyboard, and a ten-key adding machine pad and provides for 24 command functions. The workstation printer has an upper/lower

A small computer system with software support to accommodate up to 8 local and up to 64 remote display/keyboard or serial printer workstations.

A maximum of 1.2 megabytes of diskette storage, 27.1 megabytes of non-removable disk storage, and 128K bytes of user memory is supported. One magnetic character document reader and one line printer can be optionally attached to the system. Two communications attachments are supported for remote attachment of workstations, another System/34, a System/3, a System/32, a System/360, a System/370, or a System/7. Each line operates in the half-duplex mode at speeds to 9600 bps using BSC or SDLC protocol. System Support Program (SSP) is the System/34 operating system; it is an enhanced version of the System/32 operating system and supports multi-programming, concurrent operation of workstations, data file management, and communications lines. RPG II, BASIC Assembler, and FORTRAN IV languages are provided.

A typical system with 96K bytes of main memory, 13.2 megabytes of disk storage, 300K bytes of diskette storage, 3 local display/keyboard stations, 120 cps local printer, 7 remote display/keyboard stations and a 120 cps remote printer can be purchased for \$79,418 or leased for \$2,460 per month on a one year basis, including maintenance.

CHARACTERISTICS

VENDOR: International Business Machines Corporation, General Systems Division, 5775 Glenridge Drive N.E., Atlanta, Georgia 30301. Telephone (404) 231-3000.

DATE OF ANNOUNCEMENT: April 1977.

DATE OF FIRST DELIVERY: January 1978.

NUMBER DELIVERED TO DATE: —

SERVICED BY: IBM.

CONFIGURATION

The System/34 is built upon a multiple-processor architecture especially tailored to support workstation-centered data processing. Up to 8 local and up to 64 remote workstations can be attached to the System/34. A workstation can be a CRT display station with keyboard or a character printer. Mass storage support includes up to 1.2 megabytes of diskette capacity and up to 27.1 megabytes of non-removable disk capacity. The diskette drive is used primarily as a device for data input/output and for data backup.

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- ▷ case 96-character set, 132 print positions per line, and can print 6 or 8 lines per inch. The printer is available in print speeds of 40, 80, 120 cps.

SSP, System Support Program, is the operating system offered with the System/34. An enhanced version of the System/32 operating system, SSP provides multiprogramming support (including concurrent operation of multiple workstations), data file management, password security, menu job selection, control of language compilers, utilities, and control of the communications lines. Included in the System utilities are support for interactive data entry, data file maintenance, source program entry, and the operating system command entry.

RPG II, BASIC Assembler, and FORTRAN IV languages are provided for user program development.

Conveying intelligence to non-intelligent data entry devices and providing limited data processing capabilities at the terminal system is an approach IBM's Data Processing Department has until recently consistently resisted.

Suddenly, in the summer of 1977, the 3790 was given not only file maintenance capability, but support for interactive maintenance of files between itself and the host. Now, the General Systems Division, with the System/34, offers a system that is competitive with the 3790 and with all of the minicomputer systems providing distributed data processing capabilities. The System/34 does not support the number of workstations a 3790 does, nor does the System/34 support interactive maintenance of files with a host computer, but it does offer powerful processing capabilities that lessen the need for host involvement. In fact, GSD's marketing approach is emphasizing the system as a stand-alone system, as opposed to a distributed terminal processor on a network. □

- ▷ One line printer and one magnetic character reader can be locally attached to the system.

A separate, microcoded, 16K-byte Control Microprocessor with a 600 nanosecond cycle time controls the Main Processor plus all of the attached devices through another microprocessor. The Main Processor supports up to 128K bytes of user memory with a 600 nanosecond cycle time. Included in the Main Processor is a hardwired emulator that enables the System/34 to support System/3 and System/32 instructions that are not part of the System/34 native repertoire. The emulator (S/3 language processor) was hardwired to assure no System/34 performance degradation due to the compatibility support.

Two communications lines can be attached to the System/34, each line operating independently at speeds up to 9600 bps and employing BSC or SDLC protocols. Each line will support up to eight remote workstations or can communicate with another System/34, a System/3, a System/34, a System/7, a System/360 or a System/370. Line interfaces, with and without integrated modems, and an interface for attachment to AT&T's DDS facility are available.

System/34 Models

The System/34 is available in 29 models. The models differ in memory, diskette, and disk storage capacities. The first digit of the model number is an alphabetic designation for the model's memory capacity: A is the designation for 32K bytes, B for 48K, C for 64K, D for 96K, and E for 128K bytes. The second digit of the model number indicates the number of diskette reading surfaces: 1 indicates a single reading surface with single density recording, and 2 indicates two reading surfaces with double density recording. The last digit of the model number indicates the disk capacity: 1 for 8.6 megabytes, 2 for 13.2 megabytes, and 3 for 27.1 megabytes. A System/34 Model B21, therefore, is a 5340 processing unit with 48K bytes of memory, dual surface diskette with double density recording, and 8.6 megabytes of disk storage. The maximum configuration is the Model E23, with 128K bytes of memory, dual surface, double density diskette and 27.1 megabytes of disk capacity. See the price list for a complete list of models. For some reason, a Model B22 (48K bytes of memory, double-sided diskette and 13.2 megabytes of disk storage) is not included in the product line.

Four ports, wired to a microcontroller, are provided for local attachment of workstations. One of the ports can have only one 5251-11 CRT Display Station and keyboard attached to serve as the system console. The station can dually function as a workstation. The remaining three ports can be used to attach up to seven additional local workstations. This is possible because multiple workstations (either displays or character printers) can be serially attached to one port. One workstation is directly attached to the processing unit and subsequent workstations are serially attached to the first workstation using Cable-through, a cable attachment feature. A maximum of seven workstations can be attached to one local port by use of the Cable-through feature.

When remote workstations are to be attached, the first remote workstation must be a 5251-12. This workstation includes support for one communications line attachment of either an EIA Line Interface for connection to an external modem, a 1200 bps Line Interface and internal modem feature, or a DDS Adapter. A switched or non-switched, half-duplex line with speed up to 1200 bps using SDLC protocol is supported by the System/34 operating system for operation of remote workstations.

Expansion of the single remote workstation to multiple stations is accomplished by attaching either a Four-Line or an Eight-Line Cluster feature to the 5251-12.

The Four-Line Cluster attached to a 5251-12 can support up to 16 5251-11 Display Stations/keyboards and/or workstation printers, for a total of 17 remote workstations (including the 5251-12). Each of the four lines of the cluster can support either a single 5251-11 or up to four 5251-11's serially attached by employing the Cable-through feature. The Eight-Line Cluster will support up to 32 5251-11 Display Station/Keyboards and/or workstation printers, for a total of 33 remote workstations. Each of the eight lines of the cluster can support either a single 5251-11 or up to four 5251-11's serially attached by employing the Cable-through feature.

Although the maximum allowable number of workstations per communications line is 33, the system maximum allowable is 64, not 66.

NETWORK CONNECTIONS

One or both of the System/34's Communications Adapters can support communications with another computer system. ▶

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► Employing BSC protocol, the System/34 can communicate with one of the following systems:

- Another System/34 equipped with a 2500 Communications Adapter.
- A System/32, System 360/20, or a System/7 equipped with a 2074 BSC Communications Adapter.
- A System/3 equipped with either a 2074 or 2078 Communications Adapter.
- A System/360 or System/370 supported by OS BTAM; DOS BTAM; OS TCAM; OS/VS1 or OS/VS2 BTAM; TCAM, or VTAM; DOS/VS BTAM or VTAM; using an Integrated Communications Adapter, a 2701 Data Adapter Unit, a 2703 Transmission Control Unit, or a 3704/3705 Communications Controller under control of either the Network Control Program (NCP) or Partitioned Emulation Program (PEP).

Employing SDLC protocol, the System/34 can communicate with a System/370 Model 115 to 168 under control of DOS/VS, OS/V1, or OS/V2 VTAM through a 3704/3705 Communications Controller operating under the Network Control Program/VS (NCP/VS).

TRANSMISSION SPECIFICATIONS

A separate Communications Adapter is required for each of the two System/34-supported communications lines. Either adapter supports BSC and SDLC protocols and a line speed up to 9600 bps. A separate set of Line Interfaces, with and without integrated modems, is provided for attachment to the respective Communications Adapter. Under SSP (software) control, each line operates independently and can support a different type of protocol and line speed.

Two versions of a 1200 bps Line Interface with integrated modem are offered for each Communications Adapter, one version for a switched line and another for a non-switched line. The switched line version includes Auto-Answer capability. An Internal Clock feature and a Processor Unit Expansion C (I/O modem regulator) feature are required for either versions. The device communicating with the System/34 is required to be equipped with the same integrated modem interface. The 1200 bps Line Interfaces can be operated at 600 bps via a parameter modification to the support software.

The 1200 bps Line Interfaces with Integrated Modem can be used for communication with a remote workstation using SDLC protocol. The remote 5251-12 must also be equipped with either the 1200 bps Line Interface with integrated modem for a now switched line (#5500) or the 1200 bps Line Interface with Integrated Modem for switched lines (#5502).

Four versions of the 2400 bps Line Interface with Integrated Modem are offered for each Communications Adapter: one version for a switched line, one for a non-switched point-to-point line, one for a non-switched multipoint tributary line, and one for a non-switched multipoint line. The multipoint tributary version is used when the System/34 is a terminal on a multi-point line that includes another processor as the control station. The switched version includes auto-answer capability. All 2400 bps Line Interfaces require an internal clock attachment, a Processor Expansion Unit C (I/O modem regulator), and a Processor Expansion Unit D (gate assembly for modems).

An EIA Line Interface is provided for each Communications Adapter that will support external modems conforming to RS-232C. The Processor Expansion Unit C

attachment is required and an internal clock attachment is required for external modems that do not provide timing.

Two versions of a Dataphone Digital Service Adapter are offered for each Communications Adapter. One version will support point-to-point and multipoint lines and the other version supports the System/34 operating as a terminal on a multipoint line having another processor as the control processor. As with the other interfaces, the protocols supported are BSC and SDLC. Speeds of 2400, 4800, and 9600 bps are available with the DDS interface features. Remote workstations that are to be linked to the System/34 via DDS require the 5251-12 to have the DDS Adapter for Multipoint Tributary Lines (#5651).

SOFTWARE

Operating System

The System/34 System Support Program (SSP) operating system is an enhanced version of the System/32 operating system.

The SSP occupies a minimum of 14K bytes, and this can be increased in 2K-byte increments to include spooling support, increase the number of possible active tasks, or optimize overall system performance. The SSP resident nucleus includes data management for disk, printer, and workstations; buffers for workstation I/O and printer spooling; and a task control work area for system use.

The SSP permits users to select either single-program mode or multiple-program mode. Single-program mode is invoked to execute System/32 Industry Application Programs (IAP's) that have been converted for execution on the System/34. In this mode only one workstation may be active as a command terminal. The remaining workstations may be used as data terminals. In multiple-program (multiprogramming) mode, all workstations that have been designed as command terminals may concurrently invoke control commands and Operator Control Language (OCL) procedures.

Multiprogramming mode also provides an input job queue that consists of a list of jobs that are to be executed in sequence concurrently with other batch or operator-interactive jobs. The jobs in the queue are designated by any command terminal and executed under control of the system console. The station that initiated the job via the job queue is then available for other work.

Main memory is managed as a pool of non-contiguous 2048-byte segments, and all programs occupy multiples of these blocks. No segmenting is provided, and entire programs are swapped in and out of memory to make room for other active programs. Total main memory required by all active tasks can exceed the actual physical main memory, but no single program can exceed the physical limitations of main memory.

Communication between the user and the SSP is provided through the Operation Control Language (OCL). These statements provide the system with information describing the way in which a job is to be executed, such as the names of files to be processed, where the files are located, and which programs to load. Normally, the list of OCL statements required to direct the execution of a job is stored on disk and can be accessed for processing by entering commands through the keyboard. Procedures are also supplied for execution of the utility programs that accompany the System Control Program and for the Industry Application Programs available to System/34 users. New procedures can be developed for user-written applications programs and specialized operations. The System/34 OCL has the capability to prompt the operator to supply required parameters or to specify default values for missing OCL

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- parameters, as well as a logical IF statement that initiates execution of jobs based on conditions tested by the OCL.

The System/34 OCL differs from the System/32 OCL primarily through the addition of new procedure commands and control commands to support multiprogramming. Some of the more significant additions include management of the print spool queue and input job queue, disk file sharing, assignment of display stations and printers at execution time, provisions for OCL-to-program communications in a 256-byte local data area that is accessible and modifiable through both OCL procedures and user programs, and communications between the display stations and system console.

Certain operator-entered commands do not invoke OCL procedures or system utility programs on a System/34 as they do on a System/32. Hence, S/32 OCL procedures using these commands need revisions to account for these differences.

Control of all I/O operations is provided by the SSP data management routines. Support is provided for the CRT display, the keyboard (including the capability to recognize and interpret special function and command keys), the printer, and the disk unit. The diskette is supported by a Load/Dump utility only. Disk files can be organized in sequential, indexed sequential, or direct fashion.

A roll-out/roll-in capability is provided to suspend processing programs in order to allow an inquiry to be made into the file. The executing program is rolled out to disk storage, the inquiry program is executed, and the interrupted processing program is then returned (rolled in) to main memory to resume processing.

The SSP maintains a system history area on the disk that contains a log of recently executed OCL statements and system activities. The contents of the history area may be displayed on the operator console and printed if desired to provide a record of system processing activity.

Unlike the System/32, the System/34 in either single-program or multiprogramming mode *with print spooling*, will not respond to the SYSTEM LOG statement. Logging to the system history area is still performed, and messages are displayed on the operator console, but messages are not printed as they are displayed.

Utility programs supplied with the SSP assist the user in preparing and maintaining his disk files. The programs provided include Disk Initialization, Alternate Track Assignment, Alternate Track Rebuild, File and Volume Display, and File Delete. In addition, a set of routines is provided to permit copying of data, programs, and procedures from the diskette to the disk file and to transfer such information from the disk file to the diskette to provide back-up files and off-line storage. The entire system library, selected files, or portions of files can be transferred to diskette files. In order to provide sufficient contiguous storage space for creation of new files, the operator can invoke the COMPRESS OCL procedure to reorganize the contents of the disk file in a contiguous area next to the systems library. The SAVE procedure allows one file or all files to be transferred to diskette with a specified retention period. Files can also be added to existing files saved previously on diskette. Both single- and multiple-volume diskette files can be created. The DELETE procedure permits files to be removed from disk storage to create space for new members.

Communications software consists of support for BSC or SDLC transmission and reception of data over one or two communications lines. Irrespective of the line capabilities, all transmissions are handled in the half-duplex mode. The lines can be switched (dial-up) non-switched (leased) voice-

grade, or AT&T Dataphone Digital Service (DDS). The software supports point-to-point arrangements and multipoint arrangements with the System/34 functioning under the control of another processor on a multipoint line.

In addition to the file management utilities integral to the System 32 operating system, IBM offers a System/34 Utilities Program Product that is identical to the S/32 utilities. It provides basic data management capabilities. This separately priced program product consists of three programs: Data File Utility (DFU), Sort, and Source Entry Utility (SEU).

The Data File Utility (DFU) program provides the following data base management functions: data file creation and maintenance, data file inquiry, and data file list. All three functions utilize catalogued RPG II File Description and Input Specifications so that the operator need enter only the name of the file and the name of the catalogued RPG II specifications. The utility prompts the operator to enter additional information required to tailor the program to the user's processing requirements.

The Data File Creation and Maintenance function of DFU operates only on indexed sequential files and provides facilities for creating and updating user data files. The program prompts the operator by displaying the field name for the data to be entered on the display console. When updating is being performed, the data currently in the field is displayed to assist the operator. Other features include automatic duplication of fields, control totals, generated record keys, and modulus 10 and 11 self-check digits for verifying entered data.

The Data File Inquiry function of DFU allows inquiries into indexed sequential files. Retrievals are performed by record key, and a function key can be used to roll forward or backward in key sequence through the file. Selected records can be printed with page and column headings.

The Data File List function of DFU provides a report-writing capability for listing and summarizing selected information from indexed or sequential files. Selection of records is based on record types defined in the RPG II input specifications for the file, and the file can be sorted in either ascending or descending order prior to printing, using up to five fields as sort fields. Records may also be selected for printing based upon a comparison of a user-supplied constant or another data field. This selection precedes the sorting function if sorting is specified. Data can be retrieved from a second file based on the use of a field in the records being listed as a key; the retrieved record from the second file is considered as an extension to the original record being listed. A total of 40 fields can be processed per record. Output reports include page and column headings, edited data fields, up to six fields calculated by the use of one of the arithmetic operators and up to four fields or constants, and selected column totals with up to five levels of subtotals.

The System/34 Sort Utility provides basically the same functions as the System/3 and System/32 sorts. Disk files can be sorted in ascending or descending sequence. The Sort program accepts files organized in sequential, indexed, or direct order. It can select records based on a comparison of the contents of a field with a constant or another field or a tag sort in which only the control field and a record address are retrieved. A summary sort groups records with similar control fields and summarizes designated numeric fields into a single summary record. The Sort program automatically allocates disk space for a work file and can handle indexed, direct, and sequential file organizations.

The Source Entry Utility (SEU) program can be used to create and maintain user-written OCL procedures, RPG II source code statements, and Sort source code statements. ►

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► The SEU is accompanied by Sort, RPG II, and Auto Report format descriptions to aid the user in entering source statements correctly. Functions include the capability to move statements within source or procedure members in new members, to insert up to 99 new statements into an already-existing member, and to delete selected statements. A function key can be used to roll backward or forward through the code to locate a selected statement. A record being entered or updated is displayed on the operator display screen as the data is entered. Optional functions available with SEU are the capability to perform syntax diagnosis on RPG II and Auto Report source statements as they are entered and the capability to resequence statements in a source-code member.

Program Languages

RPG II, BASIC Assembler, and FORTRAN IV are provided for user program development.

System/34 RPG II is identical to its System/32 counterpart except for certain functions implemented to support multiple workstations. The programmer, using up to six different preprinted coding forms, prepares a set of specifications that describe the form of the input data, the calculations to be performed, and the format of the desired output. RPG II for the System/34 offers essentially the same features as the System/3 Model 6 RPG II, with variations in the data management facilities for the support of System/34 input/output devices. For example, the SET/KEY display support feature provided with the System/3 Model 6 has been replaced by an operator prompting function that can display messages stored in a program or in the system library. In addition, the RPG II Interactive Data Entry (IDE) function permits the console to be used as an interactive data entry device. Data can be entered through the system keyboard, displayed for reference on the display screen, and routed to an executing RPG II program for processing. The program provides operator prompting on the CRT display. A program can be assigned one IDE file, which can accommodate various types of records from 4 to 160 characters in length. The IDE program is automatically generated by RPG II when CONSOLE is specified as the Device on the File Description Sheet.

All devices available on the System/34 are supported by System/34 RPG II except the diskette drives. However, through the use of the OCL, diskettes can be supported as a transaction or master file and as a librarian save/restore device.

System/34 RPG II supports one or more display stations as a primary or demand file, allowing programmers to treat the display station as a sequential update file. Multiple display stations can be attached to one workstation file without the need for multiple logic modules. Data fields and indicators that are unique to each workstation can be indicated as such by the programmer, and the RPG II compiler will save and restore those fields and indicators automatically. Display formats used with the workstation file must be created by using the SSP screen format generator routine. Printer output coding for workstation printers is the same as that for the system printer and is reassignable at execution time using OCL.

A console file is supported in buffered interactive mode. The operator is prompted record by record with display formats generated by the RPG II compiler. Keying of one record is buffered and overlapped with processing of the previous record.

Multiple printer files may be specified in a single program. The System/34 OCL is used to assign an RPG II printer file to either the system printer or a workstation printer at execution time.

The RPG II Auto Report feature was optional for System/32 RPG II, but is standard with System/34 RPG II. This enhancement is a precompiler that reduces the coding effort required to prepare report programs. A single Auto Report output field specification written by the programmer can result in the generation of RPG II statements to indicate printing with editing, insert column headings, control spacing and horizontal alignment of the data, define total fields, accumulate totals by control levels, and flag total lines with asterisks. The Auto Report functions may be specified for only one printer file in any RPG II program. Auto Report also provides a COPY statement that permits RPG II source statements to be copied from a disk library into source programs that are about to be compiled.

RPG II also supports transmission and reception of binary synchronous data over voice-grade or high-speed communications lines. The programmer fills out an RPG II Telecommunications Specification Sheet, which specifies the functions to be performed. The feature permits a System/34 equipped with the 2500 Communications Adapter to operate in any of the following communications mode: receive only, transmit only, receive with conversational reply, transmit with conversational reply, or alternate transmit and receive file. The System/34 can function as a terminal in one of three types of networks: point-to-point switched, point-to-point nonswitched, or multipoint.

The BASIC Assembler and Macro Processor for the System/34 is a major departure from the RPG II-only posture taken with the System/32. The Basic Assembler produces relocatable object programs that are subsequently converted to executable format by the SSP overlay linkage editor. Source statement programs, relocatable object programs, and executable load modules are stored in the System/34 libraries.

Assembled subroutines may be called by RPG II programs, but the assembly is performed separately. Program linking is accomplished during the compilation of the RPG II source program.

System/34 macros include support for disk functions, printer operation, keyboard and display screen access, binary synchronous communications, SNA/SDLC communications, timer, end of job, message logging, and program logging.

System/34 FORTRAN IV contains features defined in ANSI Basic FORTRAN, X3.10.1966 and language extensions supported by IBM 1130 Basic FORTRAN and System/3 FORTRAN IV. A Scientific Instruction Set, accessed by both FORTRAN IV and BASIC Assembler, provides for execution of commonly used scientific instructions.

Industry Application Programs

Recompiled versions of the Industry Application Programs offered with the System/32 are available for use on the System/34. The packages include accounting systems, financial systems, CPA client accounting, medical applications, and payroll.

COMPONENTS

PROCESSOR: Operation of the Main Processor and handling of the attached devices is under the control of a 16K-byte microprocessor with 600 nanosecond memory. The Main Processor also has a memory cycle time of 600 nanoseconds and supports up to 128K bytes of user memory. Hardwired into the Main Processor is an emulator that supports System/3 and System/32 instructions that are not native to the System/34.

DISPLAY STATION: The CRT Display Station features 24 lines with 80 characters per line and a 96-character

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► EBCDIC code set with upper and lower case. Characters are formed by a 8-by-16 dot matrix. Intensity control, blinking, non-display, underscore, column separator, and reverse-image features are provided along with field editing options. Keylock is provided to prevent unauthorized usage of the Display Station and Keyboard.

There are two versions of the Display Station, the 5251-11 and the 5251-12. The Model 12 has the capability of supporting a communications interface and a cluster attachment. A local 5251-11 can be up to 5000 feet from the processing unit, and a remote 5251-11 can be up to 5000 feet from the 5251-12. The 5251-11 that serves as the system console is attached to a 20 foot cable.

Communications Line Interfaces that can be attached to the 5251-12 include EIA Line Interface (#3701); 1200 bps Line Interface and Modem for Non-switched Lines (#5500); 1200 bps Line Interface and Modem for Switched Lines (#5502); and DDS Adapter (#5651).

The 3600 Expanded Feature for a remote 5251-12 Display Station and cluster provides the ability to copy any screen image onto a workstation printer in the cluster. The feature also provides the station with a modulus 10 and 11 self-check digit function.

For cable that is exposed to the elements, a Twinax Protection Kit to shelter the cable can be purchased. A glare filter also can be purchased for Display Stations exposed to unusual lighting conditions.

KEYBOARD: The 4600 Keyboard is a required attachment for the Display Station. The keyboard has a 49 character alphanumeric, a typewriter-like pad, and a 10-key numeric pad and supports 24 command functions.

WORKSTATION PRINTER: The 5256 serial printer is available in 40, 80, and 120 cps models. Utilizing the same character set as the Display Station, the serial printer accommodates 132 character print positions per line and forms the character by a 7-by-8 dot matrix. Tabletop mounted, the 5256 prints either six or eight lines per inch.

LINE PRINTER: Two models of a belt-type, 132 print position printer are offered. Character sets of 48, 64, or 96 are available in either ASCII or EBCDIC code. The Model 1 will operate at 160 lpm with the 48-character set, at 123 lpm with the 64-character set, and at 84 lpm with the 96-character set. The Model 2 will operate at 300 lpm with the 48-character set, at 235 lpm with the 64-character set, and at 164 lpm with the 96-character set. A 48-character FORTRAN/Basic Assembler graphics print belt is standard.

MAGNETIC CHARACTER READER: Three models of MICR readers are offered, including a 500 document-per-minute, 6-stacker model; a 750-dpm, 6-stacker model; and a 750-dpm, 12-stacker model. All models handle documents between 5.75 and 8.87 inches long and 2.5 to 4.25 inches wide.

DISK STORAGE: One or two non-removable disk modules, physically housed in the processor cabinet, are provided with the basic System/34. One module can be obtained with either 186.67 or 287.67 cylinders. Each cylinder can accommodate 46,080 bytes, yielding total capacities of 8.6 or 13.2 megabytes. When two modules are used, a total capacity of 589.33 cylinders or 27.1 megabytes is provided. Each cylinder has 3 tracks with 60 sectors per track. Each sector accommodates 256 bytes. (One track is unavailable for the single module units, and two for the double module unit, which results in the fractional cylinder capacities.) Rotating at 2963 rpm, the disk offers a data transfer rate of up to 889K bytes per second. Head positioning time

averages 35 milliseconds (8.6 megabyte disk) or 40 milliseconds. Average rotational delay is 10.1 milliseconds.

DISKETTE STORAGE: Housed in the processing unit, the Diskette unit is offered with recording on one or two surfaces. The latter is available only in a double density version. Both versions can record data in either BASIC format or in extended format. The single surface version accommodates 246,272 bytes in BASIC format and 303,104 in Extended format. The dual surface version accommodates 985,088 bytes in BASIC format and 1,212,416 bytes in Extended format.

PRICING

All System/34 components, old and new, are available under the terms of IBM's Rental or Lease Agreement (LRA) or for purchase. LRA includes prime shift maintenance; a separate contract is available for purchased unit.

LRA provides for month-to-month rental or for a term lease with penalties for early termination (including model downgrades and feature termination). The lease term is 24 months for all equipment except the 5340 processor, which is leased for 36 months. The lease can be extended indefinitely, one year at a time. Except for the processor, the monthly charges for the lease arrangement are generally 15 percent lower than the month-to-month arrangement. The processor is approximately 9 percent lower than the month-to-month arrangement. The prime shift maintenance period is for any consecutive nine hours between 7 AM and 6 PM, Monday through Friday. (The maintenance charges given in the accompanying price list are for prime shift maintenance for purchased equipment and also serve as the basis for calculating extended charges for rented or leased equipment.) Extended period maintenance is available up to 24 hours per day, 7 days per week.

Except for the processor, the termination charge for the lease arrangement is the lower of 5 months charges or 25 percent of the remaining value of the lease. The processor termination charge for the lease arrangement is the lower of 4 months charges or 20 percent of the remaining value of the lease.

All components are in maintenance category D, except the 5251 CRT Display Station, which is in category A. These categories determine the schedule of extended maintenance charges. The two schedules differ for extended Monday through Friday maintenance, but are the same for Saturday and Sunday maintenance. The premium for extended maintenance is expressed in the table below as a percentage of the basic maintenance charges, which are listed 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

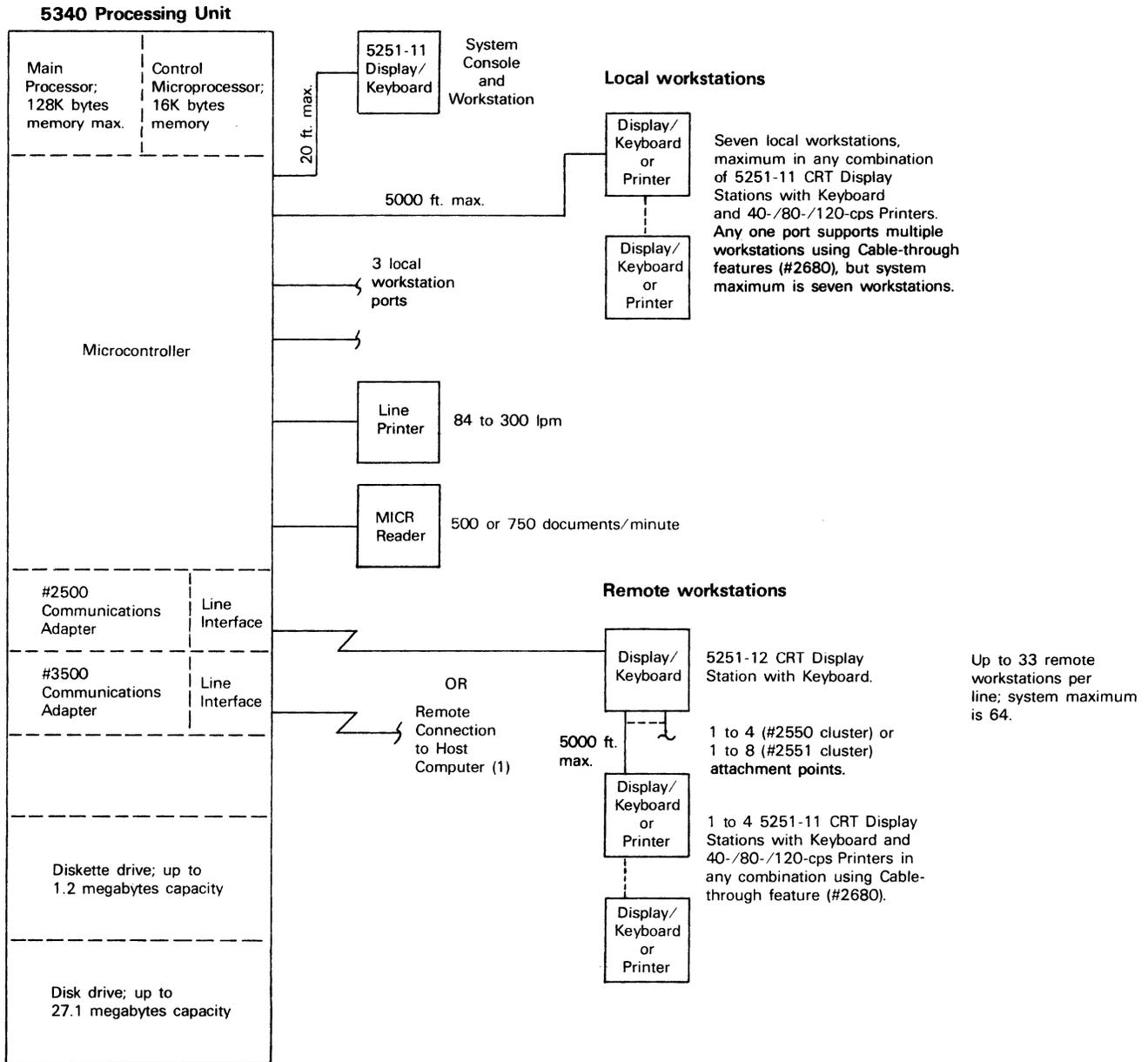
*For periods outside the basic 7 AM to 6 PM prime shift.

The lease arrangement also guarantees a maximum rate of increases for extended leasing periods. The rate for all components is five percent per year beginning in the second year of the lease.

All components are classed under rental category B (unlimited usage) and warranty category B (three months). Purchase credits can be accrued up to a maximum of 50 percent for the processor, 55 percent for the serial printers, and 60 percent for the CRT Display Stations. ►

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Configuration



(1) Each line supports connection to remote workstation cluster or to a remote host computer.

Monthly charge*			
Rental Contract	Lease Contract	Purchase Price	Monthly Maint.

5340 System Units

A Series; 32K bytes of memory—			
A1X Series; single-sided diskette:			
A11	8.6 megabytes of disk storage	786	145
A12	13.2 megabytes of disk storage	858	150
A13	27.1 megabytes of disk storage	1,083	190
A2X Series; double-sided diskette:			
A21	8.6 megabytes of disk storage	852	150
A22	13.2 megabytes of disk storage	924	160
A23	27.1 megabytes of disk storage	1,149	195

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		Monthly charge*			
		Rental Contract	Lease Contract	Purchase Price	Monthly Maint.
B Series; 48K bytes of memory—					
B1X Series; single-sided diskette:					
B11	8.6 megabytes of disk storage	830	755	27,900	150
B12	13.2 megabytes of disk storage	902	820	29,680	160
B13	27.1 megabytes of disk storage	1,127	1,025	37,060	195
B2X Series; double-sided diskette:					
B21	8.6 megabytes of disk storage	896	815	30,060	155
B23	27.1 megabytes of disk storage	968	880	37,840	165
C Series; 64K bytes of memory—					
C1X Series; single-sided diskette:					
C11	8.6 megabytes of disk storage	874	795	29,500	155
C12	13.2 megabytes of disk storage	946	860	31,280	165
C13	27.1 megabytes of disk storage	1,171	1,065	38,660	200
C2X Series; double-sided diskette:					
C21	8.6 megabytes of disk storage	940	855	31,660	160
C22	13.2 megabytes of disk storage	1,012	920	33,440	170
C23	27.1 megabytes of disk storage	1,237	1,125	40,820	205
C Series; 96K bytes of memory—					
D1X Series; single-sided diskette:					
D11	8.6 megabytes of disk storage	962	875	32,700	165
D12	13.2 megabytes of disk storage	1,034	940	34,480	175
D13	27.1 megabytes of disk storage	1,259	1,145	41,860	210
D2X Series; double-sided diskette:					
D21	8.6 megabytes of disk storage	1,028	935	34,860	170
D22	13.2 megabytes of disk storage	1,100	1,000	36,640	180
D23	27.1 megabytes of disk storage	1,325	1,205	44,020	215
E Series; 128K bytes of memory—					
E1X Series; single-sided diskette:					
E11	8.6 megabytes of disk storage	1,050	955	35,900	175
E12	13.2 megabytes of disk storage	1,122	1,020	37,680	185
E13	27.1 megabytes of disk storage	1,347	1,225	45,060	220
E2X Series; double-sided diskette:					
E21	8.6 megabytes of disk storage	1,116	1,015	38,060	180
E22	13.2 megabytes of disk storage	1,188	1,080	39,840	190
E23	27.1 megabytes of disk storage	1,413	1,285	47,220	225

Workstations

CRT Display Stations—					
5251-11	Local	88	75	2,850	18
2680	Cable-through	4	3	115	1
5251-12	Remote; SDLC	140	119	4,050	39
3701	EIA Interface	13	11	430	4.50
5501	Interface with 1200 bps modem with Auto-Answer for switched line	26	24	880	7
5502	Interface with 1200 bps modem for non-switched line	19	16	660	5
5651	DDS interface; 2400, 4800, 9600 bps	24	22	840	5
2550	Cluster; four attachment points	47	40	1,520	10
2551	Dual Cluster; eight attachment points	94	80	3,040	20
3600	Expanded Function	11	9	300	1
4800	Keyboard	12	10	350	3
4655	Keylock	—	—	40	—
3225	Display Screen Filter	—	—	30	—
7361807	Twinax Protector Kit	—	—	230	—
Printers—					
5256-1	40 cps	176	150	5,200	30
5256-2	80 cps	200	170	5,800	35
5256-3	120 cps	217	185	6,250	42
1470	Audible Alarm	—	—	—	—

Communications and Peripheral Adapters

2500	First BSC/SDLC Communications Adapter	88	80	2,880	20
3500	Second BSC/SDLC Communications Adapter	88	80	2,880	20
4703	Internal Clock	6	6	210	6
5732	Processor Expansion Unit A (I/O Board for MICR attachment except when 27.1 megabyte disk or 5733 attachment is installed)	33	30	1,080	2
5733	Processor Expansion Unit B (I/O Board and additional communications power)	22	20	720	5
5734	Processor Expansion Unit C (I/O modem regulator)	8	8	288	0.50
5735	Processor Expansion Unit D (gate assembly for modems)	8	8	280	0.50



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		<u>Monthly charge*</u>			
		<u>Rental Contract</u>	<u>Lease Contract</u>	<u>Purchase Price</u>	<u>Monthly Maint.</u>
Line Interfaces for 2500 Communications Adapter					
5500	1200 bps; integrated modem for non-switched line; requires 4703,5734	19	16	660	5
5501	1200 bps; integrated modem with Auto-Answer for switched line; requires 4703, 5734	26	24	880	7
5600	2400 bps; integrated modem for non-switched point-to-point line; requires 4703, 5734, 5735	71	65	2,240	11.50
5602	2400 bps; integrated modem for non-switched multipoint tributary line; requires 4703, 5734, 5735	78	71	2,490	13
5601	2400 bps; integrated modem for non-switched multipoint line; requires 4703, 5734, 5735	71	65	2,240	11.50
5610	2400 bps, Integrated Modem with Auto-Answer for switched line; requires 4703, 5734, 5735	79	72	2,550	14
7951	Switched Network Backup for non-switched lines	16	15	540	3.50
7952	Switched Network Backup with Auto-Answer for non-switched lines	25	23	820	5
5650	Dataphone Digital Service Adapter; point-to-point	24	22	840	5
5651	Dataphone Digital Service Adapter; multipoint tributary line	24	22	840	5
3701	EIA Interface for attachment of non-integrated modems, requires 5734	13	11	430	4.50
Line Interfaces for 3500 Communications Adapter					
6500	1200 bps; integrated modem for non-switched line; requires 4703, 5734	19	18	660	5
6501	1200 bps; integrated modem with Auto-Answer for switched line; requires 4703, 5734	26	24	880	7
6600	2400 bps; integrated modem for non-switched point-to-point line; requires 5733, 5734	71	65	2,240	11.50
6601	2400 bps; integrated modem for non-switched multipoint control; requires 5733, 5734	71	65	2,240	11.50
6602	2400 bps; integrated modem for non-switched multipoint tributary line; requires 5733, 5734	78	71	2,490	13
6610	2400 bps; integrated modem with Auto-Answer for switched lines	79	72	2,550	14
7953	Switched Network Backup for non-switched lines	16	15	540	3.50
7954	Switched Network Backup with Automatic Answer for non-switched lines	25	23	828	5
5652	Dataphone Digital Service Adapter for point-to-point or multipoint control	24	22	840	5
5653	Dataphone Digital Service Adapter for multipoint tributary line	24	22	840	5
3702	EIA Interface for attachment of non-integrated modems; requires 5734	13	12	430	4.5
Other Peripherals					
5810	Line Printer Adapter	44	40	1,440	8
5211-1	Line Printer, 160 lpm	376	320	12,800	75
5211-2	Line Printer, 300 lpm	458	390	15,600	125
5915, 18	Print Belt for 5211	—	—	170	—
5552	48-character FORTRAN Belt	—	—	170	—
1100	Magnetic Character Reader Adapter	247	225	8,775	25
1255-1	Magnetic Character Reader 500 dpm, 6 Stackers	904	769	35,460	251
1255-2	Magnetic Character Reader 750 dpm, 6 Stackers	1,100	935	40,590	400
1255-3	Magnetic Character Reader 750 dpm, 12 Stackers	1,450	1,233	55,260	527

Software

	<u>Monthly License Charge</u>
System Support Program	\$ 85
System Utilities	30
RPG II	25
BASIC Assembler and Macro Processor	75
FORTRAN IV (available 7/28/78)	100■

IBM System/32



Introduced in 1975, IBM's highly successful System/32 is available in 32 different models, with various printing capabilities and storage capacities.

MANAGEMENT SUMMARY

IBM's System/32 is a compact data processing system aimed at the small businessman. Introduced in January 1975 by the company's General Systems Division, the System/32 is currently available in 32 models, with various printing capabilities and disk storage capacities. The System/32 is packaged in a desk-sized cabinet that includes all components of the basic system—the CPU, memory, CRT display with keyboard, printer, disk storage unit, and diskette drive. It can be installed in a standard office setting and requires no special flooring, air conditioning, or power supplies.

A System/32 can be equipped with only one communication line to handle half-duplex data transmission in either the binary synchronous (BSC) or Synchronous Data Link Control (SDLC) protocol. In the binary synchronous mode, it can communicate with another System/32, a System/34, a System/3, a System/7, a System/360, a System/370, a 5320 Model 2 Data Collection System, a 3747 Data Converter, a 3741 Model 2 Data Station, or a 3741 Model 4 Programmable Work Station. The SDLC line discipline is a fundamental component of IBM's System Network Architecture for future communications products. SDLC on the System/32 enables it to perform as a remote workstation to larger System/370 computers operating under the DOS/VS, OS/VS1, or OS/VS2 operating system. There is also an enhancement that allows a System/32 to appear as an IBM 3770 Data Communications System and to operate with IBM's CICS/VS communications monitor or IMS/VS data base management system on a System/370.

A small business computer with distributed processing capabilities.

The basic System/32 consists of a single workstation containing a 16K-, 24K-, or 32K-byte CPU; a 3.2, 5.0, 9.1, or 13.7 MB fixed disk drive; a single diskette drive; a 240-character display; a keyboard; and a 40, 80, or 120 cps serial printer or 50, 100, 155 or 285 lpm line printer.

Communications are supported via BSC or SDLC/SNA protocol. Point-to-point or multipoint half-duplex transmission is supported over switched facilities at speeds up to 4800 bps and over non-switched facilities at up to 7200 bps.

The minimum and maximum configurations, plus an optional BSC communications adapter and EIA interface, can be leased for \$1,106 and \$1,994 per month, respectively, including maintenance, on a 3-year lease, or purchased for \$27,475 and \$39,745, respectively.

CHARACTERISTICS

VENDOR: International Business Machines Corporation, General Systems Division, 5775 Glenridge Drive, N.E., Atlanta, Georgia 30301. Telephone (404) 231-3000.

DATE OF ANNOUNCEMENT: January 1975.

DATE OF FIRST DELIVERY: March 1975.

NUMBER DELIVERED TO DATE: Over 18,500 (estimate as of April 1978).

SERVICED BY: IBM.

CONFIGURATION

The basic System/32 consists of a processor, a single workstation, a diskette drive, and a non-removable disk housed in a single cabinet. The workstation consists of a 240-character CRT display, either a line or a character printer, and a stationary keyboard. Optionally a card reader/punch (80- or 96-column cards), a magnetic card reader/recorder, or a magnetic character document reader as a local peripheral device. A communications adapter can be used to connect the System/32 to another IBM processor or to an IBM 3741 data entry system. Local devices and the diskette drive cannot operate within the same program as the communications adapter. The data entry system permits one or more operators to key-enter data onto

REFERENCE EDITION. This is a mature product line, and no significant further developments are anticipated. Because of its importance, coverage is being continued, but no future update is planned.

IBM System/32

➤ High reliability is one of the cornerstones of the System/32. IBM has seen to it that there are enough diagnostics supplied with each System/32 to make it virtually maintenance free. As seen in Datapro's user survey, this philosophy has been very successful for IBM. Not to mention very gratifying to the many satisfied System/32 users who have had minimal maintenance problems. System/32 customers who rent the equipment have access to 24-hours-per-day, 7-days-per-week on-call maintenance service from IBM. Customers who purchase the system receive 5-days-per-week, 9-hours-per-day maintenance service under the Minimum Monthly Maintenance Charge, or they can elect round-the-clock service for an additional charge.

The System/32 is known for its ease of operation, and IBM offers a wide variety of Industry Application Programs to help users get started. There are 14 packages available, aimed at users in areas such as distribution, education, medicine, manufacturing, accounting, legal services, and membership organizations. Many of the IAP's are modular, allowing combinations of modules from various IAP's to be used together. All modules can be used on System/32's with 16K to 24K bytes of main memory.

The System/34, announced in April 1977, offers a number of significant enhancements over the System/32. In particular, the System/34 can handle up to eight independently functioning users, while the System/32 can handle only one. The System/34 can also operate in a batch mode, and can even include a batch job in its eight-job capacity. It has greater internal storage, disk storage, and nearly eight times the internal processing speed of the System/32. It's also very competitive with the System/32 on price/performance comparisons, and should be considered as an alternative to the System/32 for prospective small business computer users.

USER REACTION

In Datapro's 1981 User Ratings of Computer Systems survey, 27 responses were received from users of the IBM System/32. These users reported on their experiences with, and gave ratings for, a total of 27 systems. The average life per system was approximately 39 months. Their ratings of these systems are summarized in the following table:

	Rating*
Ease of operation	3.30
Reliability of mainframe	3.44
Reliability of peripherals	3.37
Maintenance service:	
Responsiveness	3.48
Effectiveness	3.44
Technical support:	
Trouble shooting	3.19
Education	2.92
Documentation	3.08
Manufacturer's software:	
Operating system	3.29
Compilers and assemblers	3.17
Applications programs	3.05
Ease of programming	3.17
Ease of conversion	3.16
Overall satisfaction	3.16

*User Ratings are a Weighted Average based on a scale of 4.0 for Excellent, 3.0 for Good, 2.0 for Fair, and 1.0 for Poor.

➤ diskettes in a batch mode of operation. The data on the diskettes can then be transmitted to the System/32 over a communications link. Alternatively, the diskette can be mounted onto the System/32's diskette drive.

The basic System/32 processor has 16K bytes of memory with a cycle time of 600 nanoseconds and can be expanded up to 32K bytes. The keyboard consists of the standard typewriter-like layout, a 10-key numeric pad, and provision for 24 command function keys. The line printer is available in speeds of 50, 100, 150, and 285 lines per minute. The character printer is available in speeds of 40, 80, and 120 characters per second. The 40 cps printer is available with either a unidirectional or a bidirectional carriage. All other character printers are available only with the bidirectional carriage.

Disk storage is available in capacities of 3.2, 5.0, 9.1 and 13.7 megabytes. The diskette can accommodate up to 303,104 bytes.

Communications adapters are available to support a half-duplex line using either SDLC or BSC protocols. A non-switched line can be operated at speeds up to 7200 bps, and a switched line, at speeds up to 4800 bps. The attachment arrangement can be either point-to-point or multi-point.

All models of the System/32 include as standard the 5320 System Unit composed of the processor, 16K bytes of memory, a diskette drive, a keyboard, a small CRT display, one of eight printers, and a non-removable disk with one of four capacities. The 32 models offered include all of the various combinations of printer and disk capacities possible. See the Pricing section for the complete list of models.

The single port provided for local attachments can accommodate one of three features: the Data Record Attachment (3200), the MICR Attachment (1100), or the Magnetic Card Attachment (4900). The Data Recorder Attachment permits connection of a 129-2 80-column card reader/punch (called a Data Recorder by GSD); an 8201 interface is required. The Data Recorder attachment can alternatively be cable-connected to a 96-column card reader/punch; a 7850 interface is required.

The MICR attachment can be connected to one of three models of MICR reader/sorters; a 6303 interface is required. The Magnetic Card Attachment can be connected to the Magnetic Card Reader; no special interface is required.

NETWORK CONNECTIONS

Software is provided to enable the System/32 to be attached, over communications lines, to the following systems:

- Another System/32 equipped with the Binary Synchronous communications adapter.
- A System/3, System/7, System/34, System/360 Model 20, or 5110 system computer equipped with a Binary Synchronous communications adapter.
- A System/360 or System/370 computer via an Integrated Communications Adapter, 2701 Data Adapter Unit, or 3704 or 3705 Communications Controller equipped for binary synchronous communications.
- A 3741 Model 2 Data Station or 3741 Model 4 Programmable Work Station.
- A 3747 Data Converter.
- A 5231 Model 2 Data Collection System.

IBM System/32

➤ In addition to providing system ratings, the users were asked to respond to questions regarding acquisition, applications, software, future system plans, and significant advantages or problems with the system.

With regards to system acquisition, 73 percent of the users indicated that they had purchased their System/32s. Of the remaining users, 23 percent were leasing or renting their systems from IBM, while 4 percent were leasing their equipment from a third party.

Among the principal applications for which these System/32s are being used are:

	Percent of total responses
Accounting	78%
Payroll/personnel	63
Sales distribution	37
Order processing/inventory control	33
Health care/medical	11
Insurance	11
Purchasing	11
Construction/architecture	5

Approximately 59 percent of the users indicated that the source of their applications programs was contract programming, while 56 percent also indicated that they utilized in-house personnel to develop programs. Thirty-three percent of the users indicated that they utilize "ready-made" programs from IBM. An additional 11 percent use proprietary software packages.

The users' plans for 1981 include expansions to present hardware (19 percent), obtaining proprietary software from other suppliers (11 percent), expansions to data communications facilities (7 percent), integration of word processing capabilities (7 percent), and adding another System/32 (4 percent). When asked whether their future plans included replacement of the System/32 in 1981, 22 percent of the users stated that they were planning to replace the System/32 with newer equipment from IBM. Eleven percent of the users planned to replace their System/32 with non-IBM equipment, while 7 percent were undecided about the vendor's equipment they would choose. The remaining 60 percent of the users have no immediate replacement plans.

When presented with a list of possible advantages of the System/32, the users checked off the following categories most frequently:

	Percent of total responses
Productivity aids help keep programming costs down	26%
System is easy to expand/reconfigure	19
Programs/data carried over from other systems are compatible, as vendor promised	19
System costs were less than expected	15
Delivery and/or installation of equipment was ahead of schedule	15
System is power/energy efficient	7

- ● A 6640 Document Printer.
- An Office System 6/430, 6/440, or 6/450.
- A Mag Card II Typewriter (Communicating).

TRANSMISSION SPECIFICATIONS

Two communications adapters are provided: an SDLC and a BSC communications adapter. Either supports point-to-point or multipoint, half-duplex lines over non-switched half- or full-duplex facilities at speeds up to 7200 bps, and point-to-point, half-duplex lines over switched facilities at speeds up to 4800 bps. On a multipoint line, the System/32 is supported only as a tributary station and not as a control station.

An EIA Line Interface feature is available for both adapter types. This interface is used when an external modem is to be attached to the system. Five line interfaces are offered that include integrated modems. Two switched line interfaces with integrated modems are offered, one for 1200 bps and one for 2400 bps line speeds. Two non-switched line interfaces with integrated modems are offered, one for 1200 bps and one for 2400 bps line speeds. A multipoint tributary interface is provided to operate at 2400 bps. Both switched interfaces include auto-answer. An internal clock feature is required with the 1200 bps interfaces, and the 2400 bps interfaces require a Processor Expansion Unit (I/O Board and additional communications power).

A switched network backup feature can be attached to non-switched 2400 bps interfaces as a backup. The feature is available with and without auto-answer.

SOFTWARE

The System/32 operating system, the System Control Program (SCP), includes a supervisor that occupies 2K bytes of main memory and provides the basic facilities that permit selective loading of programs from the disk, control all input/output operations, provide a program roll-out/roll-in capability, provide support for word processing applications, and provide support for data communications transmission. SCP is offered at no additional charge.

Communication between the user and the SCP is provided through an Operation Control Language (OCL). These statements provide the system with information on how a job should be executed, such as the names of files to be processed, where the files are located, and what program to load. Normally, the collection of OCL statements required to direct the execution of a job is stored in procedures in disk storage and can be invoked by entering simple commands through the operator keyboard. Procedures are also supplied for execution of the utility programs that accompany the System Control Program and for the Industry Application Programs available to System/32 users. New procedures can be developed for user-written applications programs and specialized operations. The System/32 OCL has the capability to prompt the operator to supply required parameters or to specify default values for missing OCL parameters, as well as a logical IF statement that initiates execution of jobs based on conditions tested by the OCL.

Control of all I/O operations is provided by SCP data management routines. Support is provided for the CRT display, the keyboard (including the capability to recognize and interpret special function and command keys), the printer, and the disk unit. The diskette is supported by a Load/Dump utility only. Disk files can be organized in sequential, indexed sequential, or direct fashion.

A roll-out/roll-in capability is provided to suspend processing programs in order to allow an inquiry to be made ➤

IBM System/32

- When presented with a list of possible problems that might have been encountered, the users checked off the following categories most frequently:

	Percent of total responses
System proposed by vendor was too small	19%
Delivery of required software was late	11

As indicated by the small number of system disadvantages listed by the users, overall satisfaction with the System/32 is good. When asked whether they would recommend the System/32 to others, 76 percent of the users indicated that they would. Although 20 percent of the users said that they would not recommend the system to others, we suspect that this is due more to the age of the System/32, as well as the enhanced price/performance capabilities available with the newer System/34, and not a sign of any real dissatisfaction with the System/32 itself. □

- into the file. The executing program is rolled out to disk storage, the inquiry program is executed, and the interrupted processing program is then returned (rolled in) to main memory to resume processing.

The SCP maintains a system history area on the disk that contains a log of recently executed OCL statements and system activities. The contents of the history area may be displayed on the operator console and printed if desired to provide a record of system processing activity.

Utility programs supplied with the SCP assist the user in preparing and maintaining his disk files. The programs provided include Disk Initialization, Alternate Track Assignment, Alternate Track Rebuild, File and Volume Display, and File Delete. In addition, a set of routines is provided to permit copying of data, programs, and procedures from the diskette to the disk file and to transfer such information from the disk file to the diskette to provide back-up files and off-line storage. The entire system library, selected files, or portions of files can be transferred to diskette files. In order to provide sufficient contiguous storage space for creation of new files, the operator can invoke the COMPRESS OCL procedure to reorganize the contents of the disk file in a contiguous area next to the systems library. The SAVE procedure allows one file or all files to be transferred to diskette with a specified retention period. Files can also be added to existing files saved previously on diskette. Both single- and multiple-volume diskette files can be created. The DELETE procedure permits files to be removed from disk storage to create space for new members.

The Word Processor Feature supports functions such as upper/lower case printing and keyboard/display, half-space printing, access to the 5321 Mag Card Unit, and a data management technique for storing text, as well as a software product, Word Processor/32. It also permits the transfer of documents or data files between the System/32 and another word processing system, such as an Office System 6/430, 6/440, or 6/450, a 6640 Document Printer, a Mag Card II Typewriter (Communicating), or another System/32.

Communications support provided by the SCP consists of the Binary Synchronous Communications, SNA/SDLC Batch Work Station, and Multi-Leaving Remote Work Station system utilities.

The Binary Synchronous Communications Utility operates in conjunction with the RPG II Telecommunications Feature to provide support for transmission and reception of binary synchronous data over voice grade or high-speed communications lines. The utility also permits communications characteristics, such as the line type, line speed, terminal address, and number of error retries, to be specified at program execution time.

The System/32 SNA/SDLC Batch Work Station System Utility sends and receives batch data between a System/32 and a System/370 operating under the Virtual Telecommunications Access Method (VTAM), the Network Control Program (NCP/VS), and DOS/VS POWER VS, CICS/DOS/VS, OS/VS1 Remote Entry Service (RES), OS/VS2 Job Entry Subsystem 2 (JES 2), CICS/OS/VS, or IMS/VS. The utility program operates with SDLC protocol and enables System/32 computers to perform as remote workstations to System/370 Models 115 through 168 that are equipped with 3704 or 3705 Communications Controllers operating under NCP/VS. In addition, the System/32 can act as a 3770 Data Communications System and operate with the CICS/VS communications monitor or the IMS/VS data base management system.

This utility program permits the System/32 to transmit jobs to a System/370 computer and receive output from the central system upon completion of the job. In addition, the System/32 can receive multiple jobs, including control language and data, from a System/370 computer for execution at the local site. The batch workstation utility also includes provisions for compressing blanks and duplicate characters to ensure more efficient data transmission and to expand compressed data transmitted from the central system. A minimum of 7 buffers, each 256 bytes in size, is provided.

Programming systems support is under DOS/VS, OS/VS1, OS/VS2, or any of these operating systems under VM/370. Data security and privacy features for a remote workstation on a 370 under VTAM, NCP, POWER/VS, RES, JES2, CICS/VS, or IMS/VS are applicable to this utility. The utility will run on a System/32 with 16K bytes of memory and BSCA (BSC Communications Adapter) under the Systems Control Program.

System/32 Multi-Leaving Remote Work Station System Utility (MRJE/WS) permits a System/32 to function as an RJE workstation for submission of jobs to a System/370 under control of HASP II version 3.1 or 4, ASP version 2.6 or 3.1, OS/VS1 RES, OS/VS2 JES2 or JES3, or VM/370 with the Remote Spooling Communications subsystem. Under control of the System/32 SCP and utilizing the BSCA, this utility communicates with a 370 over a point-to-point switched or non-switched communications line. The keyboard/display acts as the workstation console, and nonremovable disk storage simulates card I/O operation.

Any size record is accepted as input and formatted into 80-character segments for transmission to the 370, where reformatting is the user's responsibility. Any workstation print output may be stored on a temporary disk file and printed later using the supplied print utility. The EBCDIC text transparency capability of BSCA is supported. Details of security and configuration requirements are the same as those listed above for the SNA/SDLC Batch Work Station System Utility.

In addition to the file management utilities supplied with the SCP control program, IBM offers two separately priced System/32 program products that provide data base management capabilities. The System/32 Utilities Program Product consists of three programs: *Data File Utility (DFU)*, *Sort, and Source Entry Utility (SEU)*. The System/32 File Conversion Utility (FCU) is a stand-alone utility. ➤

IBM System/32

- The Sort program is similar in function to the System/3 sort, while the DFU, SEU, and FCU programs are newly written for the System/32.

The Data File Utility (DFU) program provides the following data base management functions: data file creation and maintenance, data file inquiry, and data file list. All three functions utilize catalogued RPG II File Description and Input Specifications so that the operator need enter only the name of the file and the name of the catalogued RPG II specifications. The utility prompts the operator to enter additional information required to tailor the program to the user's processing requirements.

The Data File Creation and Maintenance function of DFU operates only on indexed sequential files and provides facilities for creating and updating user data files. The program prompts the operator by displaying the field name for the data to be entered on the display console. When updating is being performed, the data currently in the field is displayed to assist the operator. Other features include automatic duplication of fields, control totals, generated record keys, and modulus 10 and 11 self-check digits for verifying entered data.

The Data File Inquiry function of DFU allows inquiries into indexed sequential files. Retrievals are performed by record key, and a function key can be used to roll forward or backward in key sequences through the file. Selected records can be printed with page and column headings.

The Data File List function of DFU provides a report-writing capability for listing and summarizing selected information from indexed or sequential files. Selection of records is based on record types defined in the RPG II input specifications for the file, and the file can be sorted in either ascending or descending order prior to printing, using up to five fields as sort fields. Records may also be selected for printing based upon a comparison of a user-supplied constant or another data field. This selection precedes the sorting function if sorting is specified. Data can be retrieved from a second file based on the use of a field in the records being listed as a key; the retrieved record from the second file is considered as an extension to the original record being listed. A total of 40 fields can be processed per record. Output reports include page and column headings, edited data fields, up to six fields calculated by the use of one of the arithmetic operators and up to four fields or constants, and selected column totals with up to five levels of subtotals.

The System/32 Sort Utility provides basically the same functions as the System/3 sort. Disk files can be sorted in ascending or descending sequence. The Sort program accepts files organized in sequential, indexed, or direct order. It can select records based on a comparison of the contents of a field with a constant or another field or a tag sort in which only the control field and a record address are

retrieved. A summary sort groups records with similar control fields and summarizes designated numeric fields into a single summary record. The Sort program automatically allocates disk space for a work file and can handle indexed, direct, and sequential file organizations.

The Source Entry Utility (SEU) program can be used to create and maintain user-written OCL procedures, RPG II and FORTRAN IV source code statements, and Sort source code statements. The SEU is accompanied by Sort, RPG II, and Auto Report format descriptions to aid the user in entering source statements correctly. Functions include the capability to move statements within source or procedure members in new members, to insert up to 99 new statements into an already-existing member, and to delete selected statements. A function key can be used to roll backward

or forward through the code to locate a selected statement. A record being entered or updated is displayed on the operator display screen as the data is entered. Optional functions available with SEU are the capability to perform syntax diagnosis on RPG II and Auto Report source statements as they are entered and the capability to resequence statements in a source-code member.

The File Conversion Utility is a stand-alone utility accepting input from and providing output to a 5321 Mag Card Unit or fixed disk. It provides the user with the capability of converting a file formatted for one application so that it can be used by another application program. Conversion tasks can include packing/unpacking and signing/unsigned numeric fields, reconciling upper/lower/monocase character sets, reformatting edited/unedited numeric data, resequencing fields, inserting constants, processing selected records only, displaying audit totals, combining files, etc. User instructions and/or input are prepared using data specification forms similar to the forms used by RPG.

Support for three programming languages is currently available for the System/32: RPG II, Basic Assembler, and FORTRAN IV.

RPG II permits the programmer, using up to six different preprinted coding forms to prepare a set of specifications that describe the form of the input data, the calculations to be performed, and the format of the desired output. RPG II for the System/32 offers essentially the same features as the System/3 Model 6 RPG II, with variations in the data management facilities for the support of System/32 input/output devices. For example, the SET/KEY display support feature provided with the System/3 Model 6 has been replaced by an operator prompting function that can display messages stored in a program or in the system library. In addition, the System/32 RPG II Interactive Data Entry (IDE) function permits the console to be used as an interactive data entry device. Data can be entered through the system keyboard, displayed for reference on the display screen, and routed to an executing RPG II program for processing. The program provides operator prompting on the CRT display. A program can be assigned one IDE file, which can accommodate various types of records from 4 to 160 characters in length. The IDE program is automatically generated by RPG II when CONSOLE is specified as the Device on the File Description Sheet.

The RPG II Auto Report Feature is an optional precompiler that reduces the coding effort required to prepare report programs. A single Auto Report output field specification written by the programmer can result in the generation of RPG II statements to indicate printing with editing, insert column headings, control spacing and horizontal alignment of the data, define total fields, accumulate totals by control levels, and flag total lines with asterisks. The Auto Report functions may be specified for only one printer file in any RPG II program. Auto Report also provides a COPY statement that permits RPG II source statements to be copied from a disk library into source programs that are about to be compiled.

RPG II Telecommunications Feature is an optional extension of System/32 RPG II that facilitates the transmission and reception of binary synchronous data over voice-grade or high-speed communications lines. The programmer fills out an RPG II Telecommunications Specification Sheet, which specifies the functions to be performed. The feature permits a System/32 equipped with the BSCA to operate in any of the following communications modes: receive only, transmit only, receive with conversational reply, transmit only, receive with conversational reply, transmit with conversational reply, or alternate transmit and receive file. ►

IBM System/32

- The System/32 can function as a terminal in one of three types of networks: point-to-point switched, point-to-point nonswitched, or multi-point.

The Basic Assembler and Macro Processor produces relocatable object programs that are subsequently converted to executable format by the SCP overlay linkage editor. Source statement programs, relocatable object programs, and executable load modules are stored in the System/32 libraries.

Assembled subroutines may be called by RPG II programs, but the assembly is performed separately. Program linking is accomplished during the compilation of the RPG II source program.

System/32 macros include support for disk functions, printer operation, keyboard and display screen access, binary synchronous communications, SNA/SDLC communications, timer, end of job, message logging, and program logging.

System/32 FORTRAN IV contains the features defined in ANS Basic FORTRAN, X3.10.1966; language extensions supported by IBM 1130, System/3, and System/34 Basic FORTRAN; and the full FORTRAN compiler features listed below. *

- Programs can be corrected or modified in a semi-interactive mode at the workstation by displaying a source program file into which the compiler has interspersed diagnostic messages. The compile turnaround time can be reduced because the programmer can start to correct or modify the program without waiting for a listing.
- Logical data, logical expressions, and logical IF are supported.
- Logical elements (constants, variables, and arrays) contain true or false values.
- Operation symbols are used in logical expressions: NOT, AND, OR, LT, LE, EQ, GT, NE, and GE.
- Logical expressions evaluate elements to obtain true or false values.
- Logical assignment statements define a relationship, placing the value of a logical expression in a variable or array element.

The System/32 FORTRAN IV library contains mathematical and service subprograms required during execution to perform arithmetic operations, input and output constant conversions, and input/output control.

The Word/Processor/32 program product utilizes the 5321 Mag Card Unit and enhancements to the System/32 to provide word processing capabilities. Word processing functions for automatic generation, revision, and formatting of documents can be entered from the System/32 console/keyboard or via prerecorded magnetic cards or diskettes. Documents are generated on the system printer, with options available for upper and lower case printing, and half-spacing for producing right-justified text. System/32's in use for data processing can utilize existing data files for document creation. Production statistics are an automatic by-product of this program product.

The current System/32 software complement also includes over 40 modular *Industry Application Programs (IAP's)* that provide routines to perform the data processing functions required by small businesses in fifteen selected industry areas. Each IAP package also includes detailed operator instructions and the OCL procedures required for execution of the programs. All IAP's are written

in RPG II and are distributed on IBM-owned diskettes. Various techniques are provided for tailoring the programs to satisfy specialized user requirements.

The applications include accounting and management, general ledger, order entry/invoicing, financial reporting, accounts receivable, accounts payable, inventory control, sales analysis, payroll, job costing, mailing and membership listing, and manufacturing systems, plus other specialty programs specifically designed for the following industries: lumber, food distribution, tire distribution, other distribution, law, medical, hospitals, financial institutions, motor freight, accounting, schools, manufacturing, and construction.

COMPONENTS

PROCESSOR: The System/32 central processing unit is a microprocessor that uses bipolar logic circuits and is physically located on a swing-open gate in the lower left front portion of the cabinet. A 4K, 16-bit word MOSFET writable control storage contains the microprograms that control processor operations. MOSFET user memory with a cycle time of 600 nanoseconds per 1-byte access is expandable to 32K bytes from the basic 16K bytes.

A Control Storage Increment feature provides additional memory and access to a Scientific Instruction Set for execution of FORTRAN IV generated object programs.

DISK STORAGE: Depending upon the model selected, non-removable disk storage of 3,210,240, 5,053,440, 9,169,920, or 13,777,920 bytes is an integral component of the system. The disk unit consists of either 104, 164, or 298 cylinders of 2 tracks each or 299 cylinders of 3 tracks each. Each track, in turn, contains 60 sectors of 256 bytes each.

All data is recorded on one side of a single fixed disk that is served by two read/write heads mounted on a pivoting access arm. The disk is mounted vertically in the lower left part of the System/32 cabinet, behind the CPU logic and main memory.

The disk rotational speed is 2964 rpm, yielding a nominal data transfer rate of 889,000 bytes per second and an average rotational delay (latency) of 10.1 milliseconds. Head positioning times for the four models, in milliseconds, are as follows:

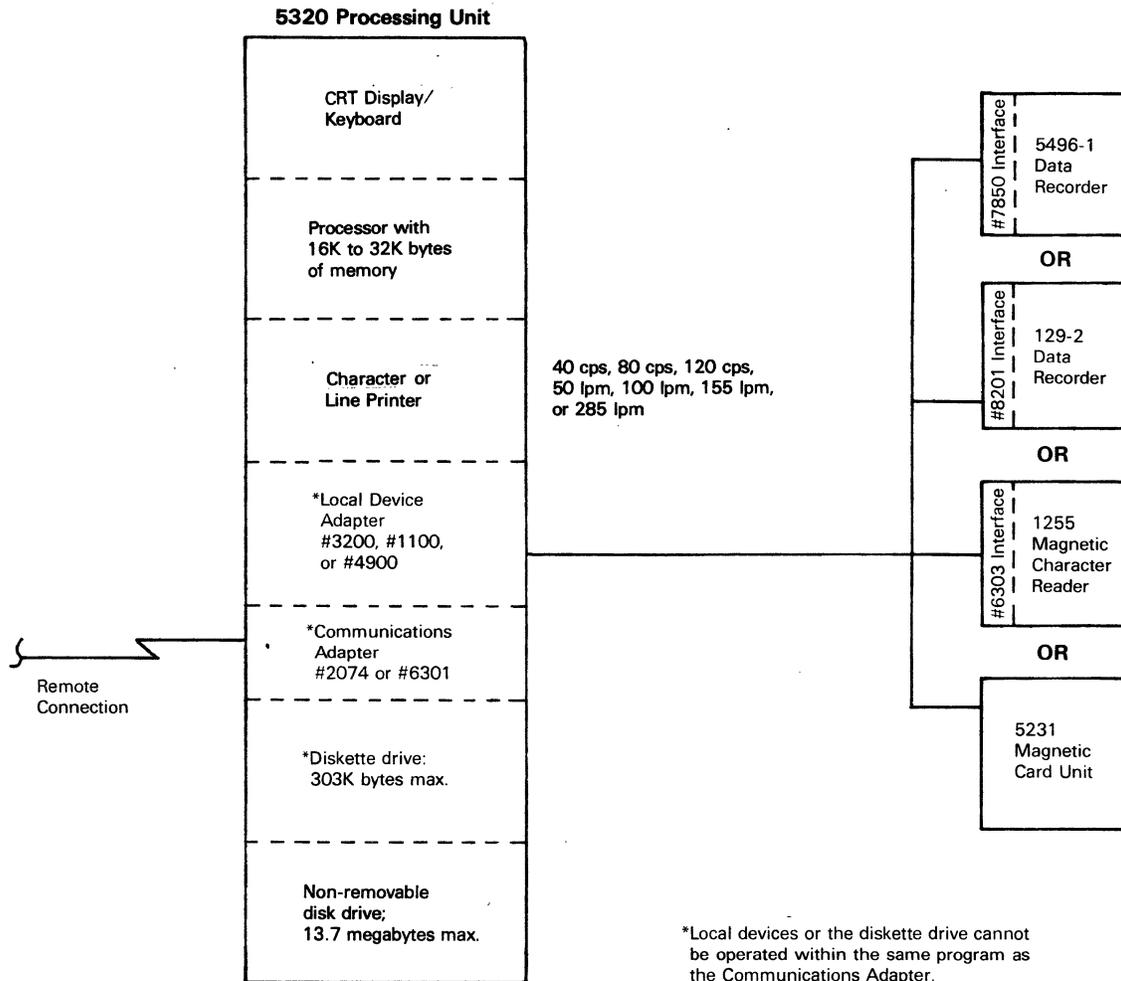
	<u>Average</u>	<u>Minimum</u>	<u>Maximum</u>
3.2-megabyte unit:	50.4	13	121
5.0-megabyte unit:	70	13	180
9.1-megabyte unit:	72.5	14.2	166.9
13.7-megabyte unit:	72.5	14.2	166.9

DISKETTE DRIVE: A single drive unit that reads and writes data on flexible diskettes is an integral component of every System/32. The IBM diskette (or "floppy disk") is a small, flexible, reusable magnetic disk that is permanently enclosed in a protective jacket about eight inches square and a fraction of an inch thick. The data capacity of each diskette is 242,944 bytes (1898 records of 128 bytes each) when used to exchange data between a System/32 and a 3740 Data Entry System or other IBM equipment. Diskettes to be used exclusively with a System/32 can contain up to 246,272 bytes of data in the standard format (128-byte sectors) or 303,104 bytes in "extended" format (512-byte sectors).

Data is read from or written on a diskette at a nominal speed of 31,250 bytes per second. Diskette records can be read at the rate of up to 3400 128-byte records per minute ►

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► and written and verified at up to 1800 128-byte records per minute.

KEYBOARD: The System/32 keyboard is used by the operator to enter data and control the system's functions. It consists of a standard typewriter keygroup, a 10-key numeric keygroup arranged in adding-machine fashion, and a group of function keys. In addition, the typewriter keys in the top row are dual-defined, providing a total of 24 command keys for controlling program functions.

A small operator panel, located at the right of the keyboard, contains the power on/off switch: LOAD, START, and STOP keys; and indicator lights that signify Keyboard Ready, Processor Check, Thermal Check, and Power Check conditions. The power on/off switch can be replaced by an optional key-operated switch that protects against unauthorized use of the system.

DISPLAY: A small CRT display screen, located just to the left of the keyboard and printer, is an integral component of every System/32. It can display up to 240 characters of information in 6 lines of 40 characters each. The display is used to provide operator guidance, input verification, and auxiliary output under program control. The System/32 will normally be programmed to display all data entered via the keyboard so that the operator can verify its accuracy before the system acts upon it.

SERIAL PRINTER: A serial matrix printer is an integral component of every System/32 Model A. Three different

serial printers are currently available: a unidirectional model rated at 40 characters per second, and three bidirectional models rated at 40, 80, and 120 characters per second. Matrix characters are formed by 8 wires arranged in a vertical array, with each wire printing dots in up to 4 of 7 possible horizontal positions. The character set consists of 64 symbols, and there are 132 print positions, spaced 10 to the inch. Vertical spacing is 6 lines per inch. A variable-width forms tractor feeds continuous forms ranging from 3-1/2 to 14-7/8 inches in width. Forms with up to 6 parts and a maximum thickness of 0.018 inch can be handled. Ledger cards and other precut forms can be processed singly in typewriter fashion.

LINE PRINTER: A horizontal-belt line printer is an integral component of every System/32 Models B and C. The rated printing speed, in lines per minute, depends upon the specific model and character set chosen, as follows:

	48-Character Set	64-Character Set	96-Character Set
Models B11, B12, B13, B14	50	50	50
Models B21, B22, B23, B24	100	100	80
Models B31, B32, B33, B34	155	120	80
Models C41, C42, C43, C44	285	225	160

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► Characters are formed by means of an interchangeable metal print belt with an engraved type font in one of three character sets: 48-character EBCDIC, 64-character EBCDIC, 64-character ASCII, or 96-character dual case modified Courier or Artisan. There are 132 print positions, spaced 10 to the inch. Vertical spacing is 6 lines per inch. A variable-width forms tractor feeds continuous forms ranging from 3-1/2 to 14-7/8 inches in width. Forms with up to 6 parts and a maximum thickness of 0.020 inch can be handled. The use of card stock is not recommended.

PUNCHED CARD EQUIPMENT: The Model 5496-1 96-column Data Recorder has a 64-character set, four program levels, buffered I/O areas, a 350-card hopper and stacker, and reads/punches/prints up to 21 cards per minute. To attach the unit locally requires the Data Recorder Attachment feature and the 7850 Interface feature.

The Model 129-2 80-column Data Recorder has a switchable 48- or 64-character set, six program levels, buffered I/O, a 500-card hopper, and a 500-card stacker. It reads at 50 cpm and punches/prints at between 12 and 50 cpm. To attach the unit locally requires the Data Recorder Attachment feature and the 8201 Interface feature.

MAGNETIC CARD EQUIPMENT: The Model 5321 Magnetic Card Reader/Recorder utilizes a magnetic card that can contain up to 5100 characters of data on 50 tracks, with each track containing 102 characters. The cards are read at a rate of 230 milliseconds per track and recorded at a rate of 450 milliseconds per track. The input card hopper accommodates 50 cards; the output stacker, 60 cards. To attach the unit locally requires the Magnetic Card Attachment feature.

MAGNETIC CHARACTER READER: Three models of 1255 MICR readers are offered, including a 500 document per minute, 6-stacker model; a 750 dpm, 6-stacker model; and a 750 dpm, 12-stacker model. All models handle documents 5.75 to 8.875 inches long and 2.5 to 4.25 inches wide. To attach the unit locally requires the MICR Reader/Sorter Attachment feature and the 6303 Interface feature.

PRICING

All System/32 components are available under the terms of IBM's Lease or Rental Agreement (LRA) or for purchase. LRA includes prime shift maintenance; a separate contract is available for purchased units.

Basically, LRA provides for month-to-month rental or for a three-year lease with penalties for early termination (including model downgrades and feature termination). The lease can be extended indefinitely, one year at a time. The monthly charges for the lease arrangement are generally 15 percent lower than the month-to-month arrangement. The prime shift maintenance period is for any consecutive nine hours between 7 AM and 6 PM, Monday through Friday. (The maintenance charges given in the accompanying price list are for prime shift maintenance for purchased equipment and also serve as the basis for calculating extended charges for rented or leased equipment.) Extended period maintenance is available up to 24 hours per day, 7 days per week.

The termination charge for the lease arrangement is the lower of 2 months' charges or 10 percent of the remaining value of the lease.

All basic components are in maintenance category D (unlimited usage). The category determines the schedule of extended maintenance charges. The premium for extended maintenance is expressed in the table below as a percentage of the basic maintenance charges, which are listed in the accompanying price list.

	Consecutive Hours				
	9*	12	16	20	24
Monday-Friday	10%	12%	14%	16%	18%
Saturday	4	5	7	8	9
Sunday	5	7	9	11	12

*For periods outside the basic 7 AM to 6 PM prime shift.

The lease arrangement also guarantees a maximum rate of increases for extended leasing periods. The rate for all components is five percent per year beginning in the second year of the lease.

All basic components are classed under warranty category B (three months). Purchase credits can be accrued up to a maximum of 45 percent.

5320 System Unit (includes CPU, 16K bytes of main storage, fixed-disk storage unit, diskette drive, printer, keyboard, and display):

		Monthly Charge*			
		Rental Contract	Lease Contract	Purchase Price	Monthly Maint.
A01	40 cps unidirectional printer, 3.2 MB disk storage	\$1,067	\$ 970	\$24,425	\$176
A02	40 cps unidirectional printer, 5.0 MB disk storage	1,171	1,065	24,860	176
A03	40 cps unidirectional printer, 9.1 MB disk storage	1,297	1,180	27,135	186
A04	40 cps unidirectional printer, 13.7 MB disk storage	1,381	1,256	28,590	198
A11	40 cps bidirectional printer, 3.2 MB disk storage	1,135	1,032	24,610	181
A12	40 cps bidirectional printer, 5.0 MB disk storage	1,239	1,127	25,045	181
A13	40 cps bidirectional printer, 9.1 MB disk storage	1,365	1,242	27,320	191
A14	40 cps bidirectional printer, 13.7 MB disk storage	1,449	1,318	28,775	203
A21	80 cps bidirectional printer, 3.2 MB disk storage	1,196	1,089	24,675	186
A22	80 cps bidirectional printer, 5.0 MB disk storage	1,300	1,184	25,200	186
A23	80 cps bidirectional printer, 9.1 MB disk storage	1,426	1,299	27,475	197
A24	80 cps bidirectional printer, 13.7 MB disk storage	1,510	1,375	28,930	208

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		Monthly Charge**			
		Rental Contract	Lease Contract	Purchase Price	Monthly Maint.
▶ A31	120 cps bidirectional printer, 3.2 MB disk storage	1,257	1,146	24,920	191
A32	120 cps bidirectional printer, 5.0 MB disk storage	1,361	1,241	25,355	191
A33	120 cps bidirectional printer, 9.1 MB disk storage	1,487	1,356	27,630	201
A34	120 cps bidirectional printer, 13.7 MB disk storage	1,571	1,432	29,085	213
B11	50 lpm line printer, 3.2 MB disk storage	1,283	1,170	27,935	202
B12	50 lpm line printer, 5.0 MB disk storage	1,387	1,265	28,370	202
B13	50 lpm line printer, 9.1 MB disk storage	1,513	1,380	30,645	212
B14	50 lpm line printer, 13.7 MB disk storage	1,597	1,456	32,100	224
B21	100 lpm line printer, 3.2 MB disk storage	1,380	1,259	28,005	213
B22	100 lpm line printer, 5.0 MB disk storage	1,484	1,354	28,440	213
B23	100 lpm line printer, 9.1 MB disk storage	1,610	1,469	30,715	223
B24	100 lpm line printer, 13.7 MB disk storage	1,694	1,545	32,170	235
B31	155 lpm line printer, 3.2 MB disk storage	1,477	1,348	28,160	223
B32	155 lpm line printer, 5.0 MB disk storage	1,581	1,443	28,595	223
B33	155 lpm line printer, 9.1 MB disk storage	1,707	1,558	30,870	233
B34	155 lpm line printer, 13.7 MB disk storage	1,791	1,634	32,325	245
C41	285-lpm line printer, 3.2 MB disk storage	1,723	1,572	32,530	250
C42	285-lpm line printer, 5.0 MB disk storage	1,827	1,667	32,965	250
C43	285-lpm line printer, 9.1 MB disk storage	1,953	1,782	35,240	260
C44	285-lpm line printer, 13.7 MB disk storage	2,037	1,858	36,695	272
1005	Additional main storage; 8192 bytes (maximum 2)	42	38	393	3
1500	Control Storage Increment	42	38	393	3
Port Attachments					
3200	Data Recorder Attachment	100	91	1,840	6.50
1100	MICR Reader/Sorter Attachment	334	304	8,775	27.50
4900	Magnetic Card Attachment	102	93	2,910	4.50
2074	Binary Synchronous Communications Adapter	136	124	2,620	11
6301	Synchronous Data Link Control Communications Adapter	169	154	3,200	16.50
*Includes monthly maintenance charge.					
Line Interfaces					
3701	EIA Line Interface	\$ 13	\$ 12	\$ 430	\$ 5.50
5500	1200 bps integrated modem, non-switched point-to-point	21	19	660	5.50
5501	1200 bps integrated modem, switched with auto-answer	31	28	880	7.50
4703	Internal clock (required for 5500, 5501)	6	6	210	1
5600	2400 bps integrated modem, non-switched point-to-point	95	86	2,240	12.50
5602	2400 bps integrated modem, non-switched multipoint tributary	103	94	2,490	14
5610	2400 bps integrated modem, switched with auto-answer	105	95	2,550	15
5733	Processing unit expansion (required for 5600, 5602, 5610)	10	9	232	1
7951	Switched network backup (for 5600, 5602)	12	11	260	4
7952	Switched network backup with Auto-Answer (for 5600, 5602)	20	18	390	5.50
Workstation Options					
3400	Upper/lower case keyboard display (B and C Models only)	34	31	1,040	1.50
4530	Half-line vertical space printing (B and C Models only)	17	15	624	1
4655	Keylock	—	—	72	—
Punched Card Units					
8201	Interface	96	—	1,450	15
129-2	80-column reader/punch (Data Recorder)	231	—	4,460	91.50
7850	Interface	69	—	1,260	26
5496-1	96-column reader/punch (Data Recorder)	261	—	4,370	94
Magnetic Card Unit					
5321	Magnetic Card reader/recorder	294	250	11,130	60.50
Magnetic Character Readers					
6303	Interface	167	—	5,880	4.50
1255-1	MICR reader/sorter; 5 sort pockets, 1 reject stacker, 500 dpm	1,135	—	39,090	332
1255-2	MICR reader/sorter; 5 sort pockets, 1 reject stacker, 750 dpm	1,385	—	44,740	531
1255-3	MICR reader/sorter; 10 sort pockets, 2 select/reject stackers, 750 dpm	1,820	—	60,920	699

*Includes monthly maintenance charge.

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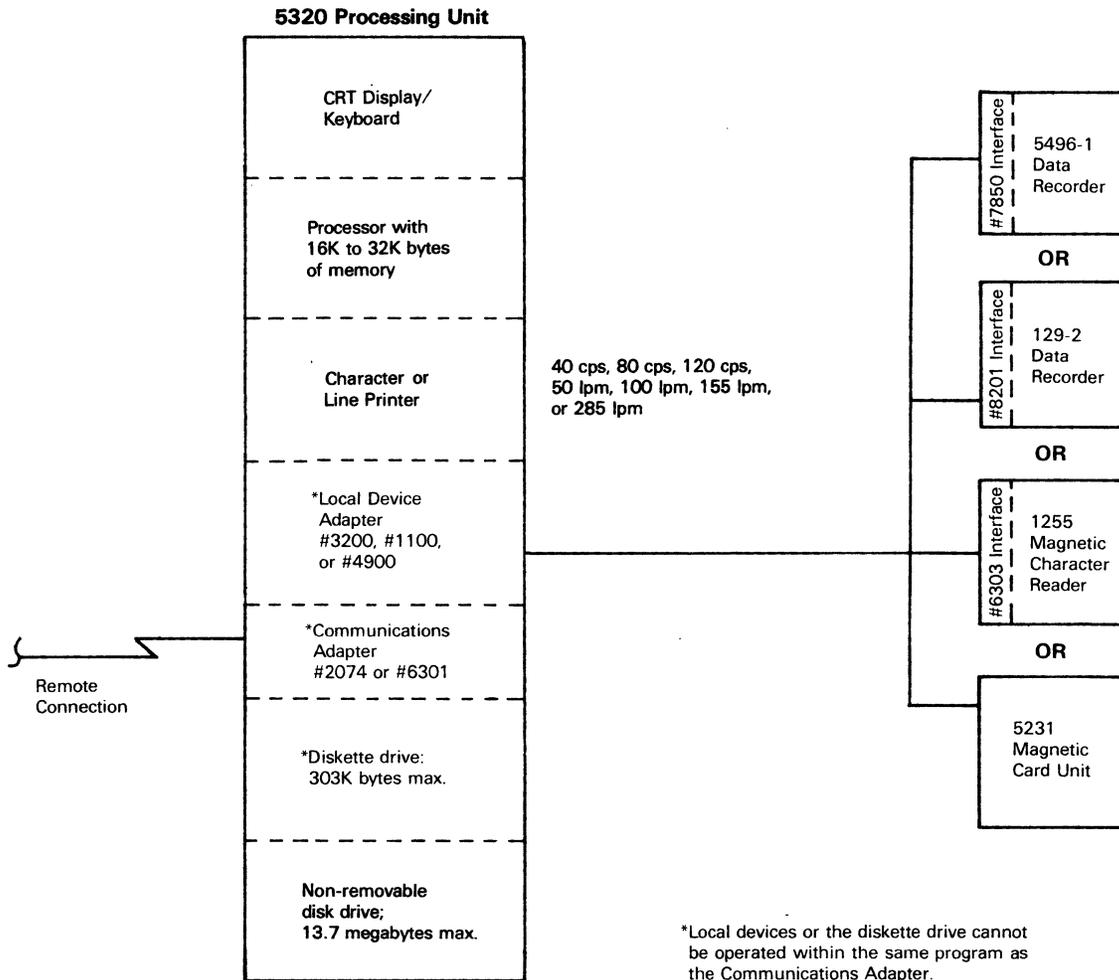
► **SOFTWARE**

		<u>Monthly License Charge</u>
5725-RG1	System/32 RPG II	\$ 43
5725-UT1	System/32 Utilities Program Product; includes Data File Utility, SORT, and Source Entry Utility	20
5725-F01	FORTRAN IV	86
5725-AS1	Basic Assembler Language and Macro Processor Program Product	117
5725-UT2	File Conversion Utility	66
5725-XX1	Word Processor/32	208■

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*Local devices or the diskette drive cannot be operated within the same program as the Communications Adapter.

► Characters are formed by means of an interchangeable metal print belt with an engraved type font in one of three character sets: 48-character EBCDIC, 64-character EBCDIC, 64-character ASCII, or 96-character dual case modified Courier or Artisan. There are 132 print positions, spaced 10 to the inch. Vertical spacing is 6 lines per inch. A variable-width forms tractor feeds continuous forms ranging from 3-1/2 to 14-7/8 inches in width. Forms with up to 6 parts and a maximum thickness of 0.020 inch can be handled. The use of card stock is not recommended.

PUNCHED CARD EQUIPMENT: The Model 5496-1 96-column Data Recorder has a 64-character set, four program levels, buffered I/O areas, a 350-card hopper and stacker, and reads/punches/prints up to 21 cards per minute. To attach the unit locally requires the Data Recorder Attachment feature and the 7850 Interface feature.

The Model 129-2 80-column Data Recorder has a switchable 48- or 64-character set, six program levels, buffered I/O, a 500-card hopper, and a 500-card stacker. It reads at 50 cpm and punches/prints at between 12 and 50 cpm. To attach the unit locally requires the Data Recorder Attachment feature and the 8201 Interface feature.

MAGNETIC CARD EQUIPMENT: The Model 5321 Magnetic Card Reader/Recorder utilizes a magnetic

card that can contain up to 5100 characters of data on 50 tracks, with each track containing 102 characters. The cards are read at a rate of 230 milliseconds per track and recorded at a rate of 450 milliseconds per track. The input card hopper accommodates 50 cards; the output stacker, 60 cards. To attach the unit locally requires the Magnetic Card Attachment feature.

MAGNETIC CHARACTER READER: Three models of 1255 MICR readers are offered, including a 500 document per minute, 6-stacker model; a 750 dpm, 6-stacker model; and a 750 dpm, 12-stacker model. All models handle documents 5.75 to 8.875 inches long and 2.5 to 4.25 inches wide. To attach the unit locally requires the MICR Reader/Sorter Attachment feature and the 6303 Interface feature.

PRICING

All System/32 components are available under the terms of IBM's Lease or Rental Agreement (LRA) or for purchase. LRA includes prime shift maintenance; a separate contract is available for purchased units.

Basically, LRA provides for month-to-month rental or for a three-year lease with penalties for early termination (including model downgrades and feature termination). The lease can be extended indefinitely, one year at a time. The monthly

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► charges for the lease arrangement are generally 15 percent lower than the month-to-month arrangement. The prime shift maintenance period is for any consecutive nine hours between 7 AM and 6 PM, Monday through Friday. (The maintenance charges given in the accompanying price list are for prime shift maintenance for purchased equipment and also serve as the basis for calculating extended charges for rented or leased equipment.) Extended period maintenance is available up to 24 hours per day, 7 days per week.

The termination charge for the lease arrangement is the lower of 2 months' charges or 10 percent of the remaining value of the lease.

All basic components are in maintenance category D (unlimited usage). The category determines the schedule of extended maintenance charges. The premium for extended maintenance is expressed in the table below as a percentage of the basic maintenance charges, which are listed in the accompanying price list.

Consecutive Hours

	<u>9*</u>	<u>12</u>	<u>16</u>	<u>20</u>	<u>24</u>
Monday-Friday	10%	12%	14%	16%	18%
Saturday	4	5	7	8	9
Sunday	5	7	9	11	12

*For periods outside the basic 7 AM to 6 PM prime shift.

The lease arrangement also guarantees a maximum rate of increases for extended leasing periods. The rate for all components is five percent per year beginning in the second year of the lease.

All basic components are classed under warranty category B (three months). Purchase credits can be accrued up to a maximum of 45 percent.

Monthly Charge*

		<u>Rental Contract</u>	<u>Lease Contract</u>	<u>Purchase Price</u>	<u>Monthly Maint.</u>
5320 System Unit (includes CPU, 16K bytes of main storage, fixed-disk storage unit, diskette drive, printer, keyboard, and display):					
A01	40 cps unidirectional printer, 3.2 MB disk storage	\$1,067	\$ 970	\$24,425	\$176
A02	40 cps unidirectional printer, 5.0 MB disk storage	1,171	1,065	24,860	176
A03	40 cps unidirectional printer, 9.1 MB disk storage	1,297	1,180	27,135	186
A04	40 cps unidirectional printer, 13.7 MB disk storage	1,381	1,256	28,590	198
A11	40 cps bidirectional printer, 3.2 MB disk storage	1,135	1,032	24,610	181
A12	40 cps bidirectional printer, 5.0 MB disk storage	1,239	1,127	25,045	181
A13	40 cps bidirectional printer, 9.1 MB disk storage	1,365	1,242	27,320	191
A14	40 cps bidirectional printer, 13.7 MB disk storage	1,449	1,318	28,775	203
A21	80 cps bidirectional printer, 3.2 MB disk storage	1,196	1,089	24,675	186
A22	80 cps bidirectional printer, 5.0 MB disk storage	1,300	1,184	25,200	186
A23	80 cps bidirectional printer, 9.1 MB disk storage	1,426	1,299	27,475	197
A24	80 cps bidirectional printer, 13.7 MB disk storage	1,510	1,375	28,930	208
A31	120 cps bidirectional printer, 3.2 MB disk storage	1,257	1,146	24,920	191
A32	120 cps bidirectional printer, 5.0 MB disk storage	1,361	1,241	25,355	191
A33	120 cps bidirectional printer, 9.1 MB disk storage	1,487	1,356	27,630	201
A34	120 cps bidirectional printer, 13.7 MB disk storage	1,571	1,432	29,085	213
B11	50 lpm line printer, 3.2 MB disk storage	1,283	1,170	27,935	202
B12	50 lpm line printer, 5.0 MB disk storage	1,387	1,265	28,370	202
B13	50 lpm line printer, 9.1 MB disk storage	1,513	1,380	30,645	212
B14	50 lpm line printer, 13.7 MB disk storage	1,597	1,456	32,100	224
B21	100 lpm line printer, 3.2 MB disk storage	1,380	1,259	28,005	213
B22	100 lpm line printer, 5.0 MB disk storage	1,484	1,354	28,440	213
B23	100 lpm line printer, 9.1 MB disk storage	1,610	1,469	30,715	223
B24	100 lpm line printer, 13.7 MB disk storage	1,694	1,545	32,170	235
B31	155 lpm line printer, 3.2 MB disk storage	1,477	1,348	28,160	223
B32	155 lpm line printer, 5.0 MB disk storage	1,581	1,443	28,595	223
B33	155 lpm line printer, 9.1 MB disk storage	1,707	1,558	30,870	233
B34	155 lpm line printer, 13.7 MB disk storage	1,791	1,634	32,325	245
C41	285-lpm line printer, 3.2 MB disk storage	1,723	1,572	32,530	250
C42	285-lpm line printer, 5.0 MB disk storage	1,827	1,667	32,965	250
C43	285-lpm line printer, 9.1 MB disk storage	1,953	1,782	35,240	260
C44	285-lpm line printer, 13.7 MB disk storage	2,037	1,858	36,695	272
1005	Additional main storage; 8192 bytes (maximum 2)	42	38	393	3
1500	Control Storage Increment	42	38	393	3

Port Attachments

3200	Data Recorder Attachment	100	91	1,840	6.50
1100	MICR Reader/Sorter Attachment	334	304	8,775	27.50
4900	Magnetic Card Attachment	102	93	2,910	4.50
2074	Binary Synchronous Communications Adapter	136	124	2,620	11
6301	Synchronous Data Link Control Communications Adapter	169	154	3,200	16.50

*Includes monthly maintenance charge.

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		<u>Rental Contract</u>	<u>Lease Contract</u>	<u>Purchase Price</u>	<u>Monthly Maint.</u>
Line Interfaces					
3701	EIA Line Interface	\$ 13	\$ 12	\$ 430	\$ 5.50
5500	1200 bps integrated modem, non-switched point-to-point	21	19	660	5.50
5501	1200 bps integrated modem, switched with auto-answer	31	28	880	7.50
4703	Internal clock (required for 5500, 5501)	6	6	210	1
5600	2400 bps integrated modem, non-switched point-to-point	95	86	2,240	12.50
5602	2400 bps integrated modem, non-switched multipoint tributary	103	94	2,490	14
5610	2400 bps integrated modem, switched with auto-answer	105	95	2,550	15
5733	Processing unit expansion (required for 5600, 5602, 5610)	10	9	232	1
7951	Switched network backup (for 5600, 5602)	12	11	260	4
7952	Switched network backup with Auto-Answer (for 5600, 5602)	20	18	390	5.50
Workstation Options					
3400	Upper/lower case keyboard display (B and C Models only)	34	31	1,040	1.50
4530	Half-line vertical space printing (B and C Models only)	17	15	624	1
4655	Keylock	—	—	72	—
Punched Card Units					
8201	Interface	96	—	1,450	15
129-2	80-column reader/punch (Data Recorder)	231	—	4,460	91.50
7850	Interface	69	—	1,260	26
5496-1	96-column reader/punch (Data Recorder)	261	—	4,370	94
Magnetic Card Unit					
5321	Magnetic Card reader/recorder	294	250	11,130	60.50
Magnetic Character Readers					
6303	Interface	167	—	5,880	4.50
1255-1	MICR reader/sorter; 5 sort pockets, 1 reject stacker, 500 dpm	1,135	—	39,090	332
1255-2	MICR reader/sorter; 5 sort pockets, 1 reject stacker, 750 dpm	1,385	—	44,740	531
1255-3	MICR reader/sorter; 10 sort pockets, 2 select/reject stackers, 750 dpm	1,820	—	60,920	699

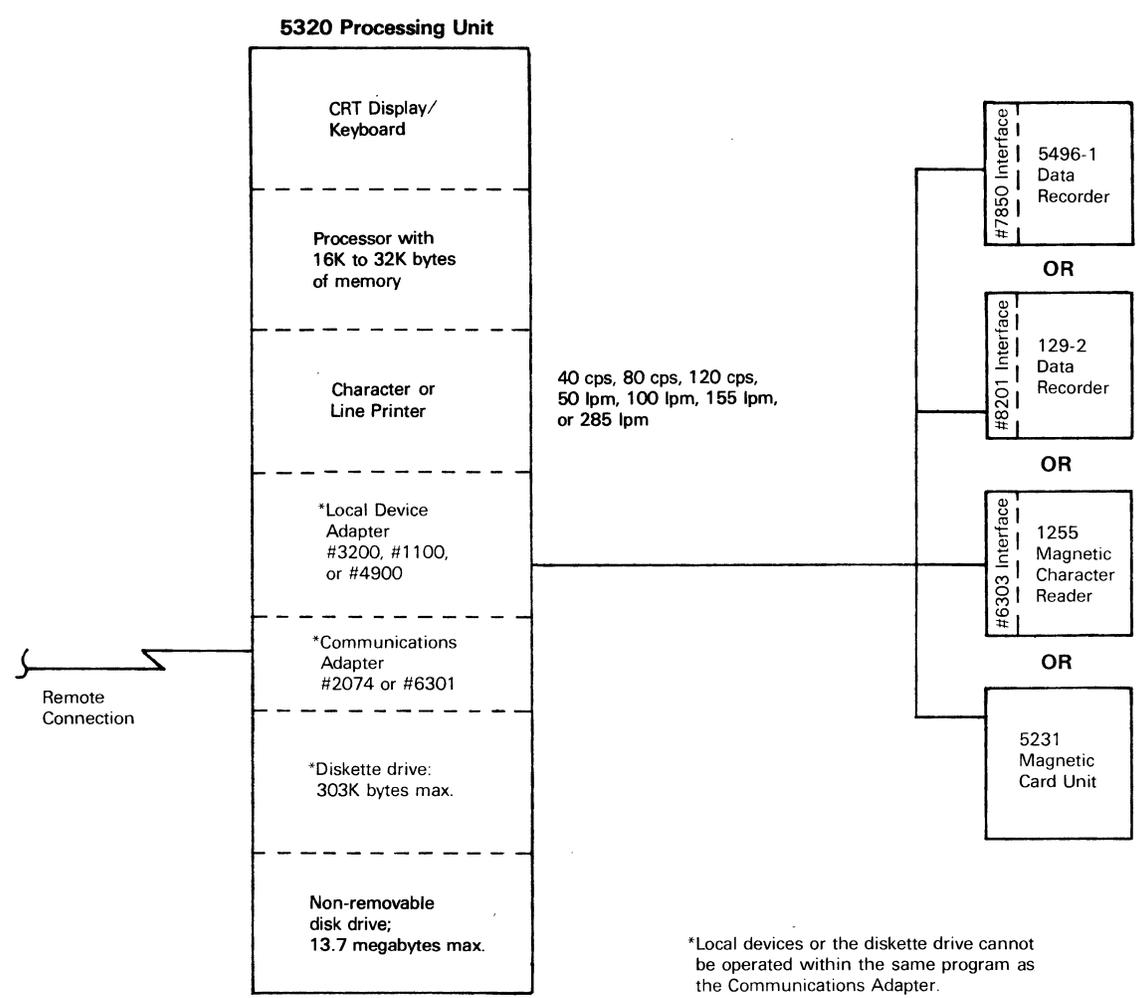
*Includes monthly maintenance charge.

SOFTWARE

		<u>Monthly License Charge</u>
5725-RG1	System/32 RPG II	\$ 43
5725-UT1	System/32 Utilities Program Product; includes Data File Utility, SORT, and Source Entry Utility	20
5725-FO1	FORTRAN IV	86
5725-AS1	Basic Assembler Language and Macro Processor Program Product	117
5725-UT2	File Conversion Utility	66
5725-XX1	Word Processor/32	208■

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Configuration



► Characters are formed by means of an interchangeable metal print belt with an engraved type font in one of three character sets: 48-character EBCDIC, 64-character EBCDIC, 64-character ASCII, or 96-character dual case modified Courier or Artisan. There are 132 print positions, spaced 10 to the inch. Vertical spacing is 6 lines per inch. A variable-width forms tractor feeds continuous forms ranging from 3-1/2 to 14-7/8 inches in width. Forms with up to 6 parts and a maximum thickness of 0.020 inch can be handled. The use of card stock is not recommended.

PUNCHED CARD EQUIPMENT: The Model 5496-1 96-column Data Recorder has a 64-character set, four program levels, buffered I/O areas, a 350-card hopper and stacker, and reads/punches/prints up to 21 cards per minute. To attach the unit locally requires the Data Recorder Attachment feature and the 7850 Interface feature.

The Model 129-2 80-column Data Recorder has a switchable 48- or 64-character set, six program levels, buffered I/O, a 500-card hopper, and a 500-card stacker. It reads at 50 cpm and punches/prints at between 12 and 50 cpm. To attach the unit locally requires the Data Recorder Attachment feature and the 8201 Interface feature.

MAGNETIC CARD EQUIPMENT: The Model 5231 Magnetic Card Reader/Recorder utilizes a magnetic

card that can contain up to 5100 characters of data on 50 tracks, with each track containing 102 characters. The cards are read at a rate of 230 milliseconds per track and recorded at a rate of 450 milliseconds per track. The input card hopper accommodates 50 cards; the output stacker, 60 cards. To attach the unit locally requires the Magnetic Card Attachment feature.

MAGNETIC CHARACTER READER: Three models of 1255 MICR readers are offered, including a 500 document-per-minute, 6-stacker model; a 750-dpm, 6-stacker model; and a 750-dpm, 12-stacker model. All models handle documents 5.75 to 8.75 inches long and 2.5 to 4.25 inches wide. To attach the unit locally requires the MICR Reader/Sorter Attachment feature and the 6303 Interface feature.

PRICING

All System/32 components are available under the terms of IBM's Rental or Lease Agreement (LRA) or for purchase. LRA includes prime shift maintenance; a separate contract is available for purchased units.

Basically, LRA provides for month-to-month rental or for a three-year lease with penalties for early termination (including model downgrades and feature termination). The lease can be extended indefinitely, one year at a time. The monthly

IBM System/32

► charges for the lease arrangement are generally 15 percent lower than the month-to-month arrangement. The prime shift maintenance period is for any consecutive nine hours between 7 AM and 6 PM, Monday through Friday. (The maintenance charges given in the accompanying price list are for prime shift maintenance for purchased equipment and also serve as the basis for calculating extended charges for rented or leased equipment.) Extended period maintenance is available up to 24 hours per day, 7 days per week.

The termination charge for the lease arrangement is the lower of 2 months' charges or 10 percent of the remaining value of the lease.

All basic components are in maintenance category D (unlimited usage). The category determines the schedule of extended maintenance charges. The premium for extended maintenance is expressed in the table below as a percentage of the basic maintenance charges, which are listed in the accompanying price list.

Consecutive Hours

	9*	12	16	20	24
Monday-Friday	10%	12%	14%	16%	18%
Saturday	4	5	7	8	9
Sunday	5	7	9	11	12

*For periods outside the basic 7 AM to 6 PM prime shift.

The lease arrangement also guarantees a maximum rate of increases for extended leasing periods. The rate for all components is five percent per year beginning in the second year of the lease.

All basic components are classed under warranty category B (three months). Purchase credits can be accrued up to a maximum of 45 percent.

Monthly Charge*

		Rental Contract	Lease Contract	Purchase Price	Monthly Maint.
5320 System Unit (includes CPU, 16K bytes of main storage, fixed-disk storage unit, diskette drive, printer, keyboard, and display):					
A01	40 cps unidirectional printer, 3.2 MB disk storage	\$ 988	\$ 899	\$23,490	\$168
A02	40 cps unidirectional printer, 5.0 MB disk storage	1,085	987	23,910	168
A03	40 cps unidirectional printer, 9.1 MB disk storage	1,202	1,094	26,100	178
A04	40 cps unidirectional printer, 13.7 MB disk storage	1,280	1,165	27,500	189
A11	40 cps bidirectional printer, 3.2 MB disk storage	1,051	957	23,670	173
A12	40 cps bidirectional printer, 5.0 MB disk storage	1,148	1,045	24,090	173
A13	40 cps bidirectional printer, 9.1 MB disk storage	1,265	1,152	26,280	183
A14	40 cps bidirectional printer, 13.7 MB disk storage	1,343	1,223	27,680	194
A21	80 cps bidirectional printer, 3.2 MB disk storage	1,108	1,010	23,820	178
A22	80 cps bidirectional printer, 5.0 MB disk storage	1,205	1,098	24,240	178
A23	80 cps bidirectional printer, 9.1 MB disk storage	1,322	1,205	26,430	188
A24	80 cps bidirectional printer, 13.7 MB disk storage	1,400	1,276	27,830	199
A31	120 cps bidirectional printer, 3.2 MB disk storage	1,165	1,063	23,970	183
A32	120 cps bidirectional printer, 5.0 MB disk storage	1,262	1,151	24,390	183
A33	120 cps bidirectional printer, 9.1 MB disk storage	1,379	1,258	26,580	193
A34	120 cps bidirectional printer, 13.7 MB disk storage	1,457	1,518	27,980	204
B11	50 lpm line printer, 3.2 MB disk storage	1,190	1,086	26,870	193
B12	50 lpm line printer, 5.0 MB disk storage	1,287	1,174	27,290	193
B13	50 lpm line printer, 9.1 MB disk storage	1,404	1,281	29,480	203
B14	50 lpm line printer, 13.7 MB disk storage	1,482	1,352	30,880	214
B21	100 lpm line printer, 3.2 MB disk storage	1,280	1,169	26,940	203
B22	100 lpm line printer, 5.0 MB disk storage	1,377	1,257	27,360	203
B23	100 lpm line printer, 9.1 MB disk storage	1,494	1,364	29,550	213
B24	100 lpm line printer, 13.7 MB disk storage	1,572	1,435	30,950	224
B31	155 lpm line printer, 3.2 MB disk storage	1,370	1,252	27,090	213
B32	155 lpm line printer, 5.0 MB disk storage	1,467	1,340	27,510	213
B33	155 lpm line printer, 9.1 MB disk storage	1,584	1,447	29,700	223
B34	155 lpm line printer, 13.7 MB disk storage	1,662	1,518	31,100	234
C41	285-lpm line printer, 3.2 MB disk storage	1,598	1,460	31,290	239
C42	285-lpm line printer, 5.0 MB disk storage	1,695	1,548	31,710	239
C43	285-lpm line printer, 9.1 MB disk storage	1,812	1,655	33,900	249
C44	285-lpm line printer, 13.7 MB disk storage	1,890	1,726	35,300	260
1005	Additional main storage; 8192 bytes (maximum 2)	38	35	393	2.50
1500	Control Storage Increment	38	35	393	2.50

Port Attachments

3200	Data Recorder Attachment	92	84	1,770	6
1100	MICR Reader/Sorter Attachment	310	282	8,775	25
4900	Magnetic Card Attachment	94	86	2,800	4
2074	Binary Synchronous Communications Adapter	127	116	2,520	10.50
6301	Synchronous Data Link Control Communications Adapter	157	143	3,080	15.50

*Includes monthly maintenance charge.

Update

IBM System/32

Monthly Charge**

		<u>Rental Contract</u>	<u>Lease Contract</u>	<u>Purchase Price</u>	<u>Monthly Maint.</u>
Line Interfaces					
3701	EIA Line Interface	\$ 12	\$ 11	\$ 420	\$ 4.50
5500	1200 bps integrated modem, non-switched point-to-point	21	19	660	5
5501	1200 bps integrated modem, switched with auto-answer	21	26	880	7
4703	Internal clock (required for 5500, 5501)	6	6	210	0.50
5600	2400 bps integrated modem, non-switched point-to-point	87	80	2,240	12
5602	2400 bps integrated modem, non-switched multipoint tributary	95	87	2,490	13.50
5610	2400 bps integrated modem, switched with auto-answer	96	88	2,550	14.50
5733	Processing unit expansion (required for 5600, 5602, 5610)	8	8	224	0.50
7951	Switched network backup (for 5600, 5602)	11	10	250	3.50
7952	Switched network backup with Auto-Answer (for 5600, 5602)	19	17	375	5
Workstation Options					
3400	Upper/lower case keyboard display (B and C Models only)	32	29	1,000	1
4530	Half-line vertical space printing (B and C Models only)	15	14	600	0.50
4655	Keylock	—	—	72	—
Punched Card Units					
8201	Interface	89	—	1,395	13
129-2	80-column reader/punch (Data Recorder)	214	—	4,290	79.50
7850	Interface	64	—	1,215	23.50
5496-1	96-column reader/punch (Data Recorder)	242	—	4,205	85.50
Magnetic Card Unit					
5321	Magnetic Card reader/recorder	273	217	10,710	55
Magnetic Character Readers					
6303	Interface	157	—	5,880	4.50
1255-1	MICR reader/sorter; 5 sort pockets, 1 reject stacker, 500 dpm	1,065	—	39,090	332
1255-2	MICR reader/sorter; 5 sort pockets, 1 reject stacker, 750 dpm	1,295	—	44,740	531
1255-3	MICR reader/sorter; 10 sort pockets, 2 select/reject stackers, 750 dpm	1,705	—	60,920	699

*Includes monthly maintenance charge.

SOFTWARE

	<u>Monthly License Charge</u>
System/32 RGP II	\$ 34
System/32 Utilities Program Product; includes Data File Utility, SORT, and Source Entry Utility	16
FORTRAN IV	75
Basic Assembler Language and Macro Processor Program Product	93
File Conversion Utility	52
Word Processor/32	165 ■

IBM System/32



System/32 software includes a broad range of programs that provide small businesses and institutions, such as the hospital depicted above, with industry-oriented applications.

MANAGEMENT SUMMARY

Designed and marketed by IBM's General Systems Division, which introduced it in 1975, the System/32 is aimed at first-time computer users. Although it can stand alone as a small business computer, it also supports BSC or SDLC communications with a host computer or other devices in a distributed processing environment.

The System/32 is packaged in a compact, desk-sized cabinet that includes all the components of the basic system—the central processing unit, memory, keyboard, CRT display, printer, disk storage unit, and diskette drive. It requires no special flooring, air conditioning, or power supplies, and can be plugged into a 208/230-volt electrical outlet right in the office. IBM claims the System/32 is so easy to use that it can be operated by clerical personnel with a minimum of training and will not require the service of a programming staff. To make that possible, IBM is supplying separately priced Industry Application Programs that contain all the coding necessary to get a user installation up and running, plus operator run books and training materials to aid the operator in understanding the functions of each application package. Fifteen such packages are currently available, aimed at users in a multitude of distributor industries, schools, hospitals, manufacturers and fabricators, medical group practices, small accounting firms, and membership organizations and associations. The System/32 also provides three programming ➤

A small business computer with distributed processing capabilities.

Communications are supported via BSC or SDLC/SNA protocol. Point-to-point or multipoint half-duplex transmission is supported over switched facilities at speeds up to 4800 bps and over non-switched facilities at up to 7200 bps.

The basic System/32 consists of a single workstation containing a 16K-, 24K-, or 32K-byte CPU; a 3.2, 5.0, 9.1, or 13.7 MB fixed disk drive; a single diskette drive; a 240-character display; a keyboard; and a 40, 80, or 120 cps serial printer or 50, 100, 155 or 285 lpm line printer. Optional peripherals include an 80- or 96-column card reader/punch, a 500- or 750-document/minute MICR reader, or a magnetic card reader/recorder.

The minimum and maximum configurations, plus an optional BSC communications adapter and EIA interface, can be leased for \$858 and \$1,635 per month, respectively, including maintenance, on a 3-year lease, or purchased for \$26,430 and \$39,996, respectively.

CHARACTERISTICS

VENDOR: International Business Machines Corporation, General Systems Division, 5775 Glenridge Drive, N.E., Atlanta, Georgia 30301. Telephone (404) 231-3000.

DATE OF ANNOUNCEMENT: January 1975.

DATE OF FIRST DELIVERY: March 1975.

NUMBER DELIVERED TO DATE: Over 18,500 (estimate as of April 1978).

SERVICED BY: IBM.

CONFIGURATION

The basic System/32 consists of a processor, a single workstation, a diskette drive, and a non-removable disk housed in a single cabinet. The workstation consists of a 240-character CRT display, either a line or a character printer, and a stationary keyboard. Optionally a card reader/punch (80- or 96-column cards), a magnetic card reader/recorder, or a magnetic character document reader as a local peripheral device. A communications adapter can be used to connect the System/32 to another IBM processor or to an IBM 3741 data entry system. Local devices and the diskette drive cannot operate within the same program as the communications adapter. The data entry system permits one or more operators to key-enter data onto ➤

IBM System/32

▷ languages—RPG II, FORTRAN IV, and Basic Assembler—for user-written programs. In addition, the system provides strong support for word processing applications via its Word Processing/32 program product.

A System/32 can be equipped with only one communication line, enabling it to handle half-duplex data transmission in either the Binary Synchronous (BSC) or Synchronous Data Link Control (SDLC) protocol. It can communicate with another System/32, a System/3, a System/7, a System/34, a 5110 System, a System/360, a System/370, a 5321 Model 2 Data Collection System, a 3747 Data Converter, a 3741 Model 2 Data Station, a 3741 Model 4 Programmable Work Station, a 6640 Document Printer, an Office Systems 6/430, 6/440, or 6/450, or a Mag Card II Typewriter (Communicating). System/32 users can expect to be compatible with additional future IBM communications offerings. SDLC on the System/32 enables it to perform as a remote workstation to larger System/370 computers operating under the DOS/VS, OS/VS1, or OS/VS2 operating system. A System/32 can also appear as an IBM 3770 Data Communications System and can operate with IBM's CICS/VS communications monitor or IMS VS data base management system on a System/370.

A major limitation of the System/32 is that it does not permit multiprogramming or multiple workstation user access, despite the system's powerful processing capabilities and significant mass storage capacity. Although first-time users may not feel that these restrictions are significant, a capability for system expansion may become increasingly important as the user's sophistication grows. The successor to the System/32 is the System/34, which can handle up to sixteen local and sixty-four remote workstations in a multiprogramming environment. In view of the strong current trend toward multi-user small business computers, a prospective user would be unwise to install a System/32 without first taking a hard look at IBM's own System/34 and at some of the competitive multi-user systems.

At one time, GSD's pricing structure made the System/32 more expensive than the System/34, except for a few unusual System/32 configurations. But in May, 1979, GSD announced substantial purchase price reductions (up to 30%) for the System/32 so that for comparable configurations, the System/32 can now be purchased for less than the System/34. For example, a System/32 with 32K bytes of main memory, a single diskette drive, 13.7 MB of disk storage, a 240-character display, a keyboard, and a 155-lpm printer can be purchased for \$32,856. A System/34 with the same main memory capacity, a single diskette, 13.2 MB of disk storage, one locally-attached 960-character display, a keyboard, and a 160-lpm printer costs \$43,890. Leasing on GSD's three-year plan has been and remains nearly equivalent for the two systems: \$1,351 per month for the System/32 versus \$1,371 per month for the System/34 (including operating system and system utilities software). ▷

▷ diskettes in a batch mode of operation. The data on the diskettes can then be transmitted to the System/32 over a communications link. Alternatively, the diskette can be mounted onto the System/32's diskette drive.

The basic System/32 processor has 16K bytes of memory with a cycle time of 600 nanoseconds and can be expanded up to 32K bytes. The keyboard consists of the standard typewriter-like layout, a 10-key numeric pad, and provision for 24 command function keys. The line printer is available in speeds of 50, 100, 150, and 285 lines per minute. The character printer is available in speeds of 40, 80, and 120 characters per second. The 40 cps printer is available with either a unidirectional or a bidirectional carriage. All other character printers are available only with the bidirectional carriage.

Disk storage is available in capacities of 3.2, 5.0, 9.1 and 13.7 megabytes. The diskette can accommodate up to 303,104 bytes.

Communications adapters are available to support a half-duplex line using either SDLC or BSC protocols. A non-switched line can be operated at speeds up to 7200 bps, and a switched line, at speeds up to 4800 bps. The attachment arrangement can be either point-to-point or multi-point.

All models of the System/32 include as standard the 5320 System Unit composed of the processor, 16K bytes of memory, a diskette drive, a keyboard, a small CRT display, one of eight printers, and a non-removable disk with one of four capacities. The 32 models offered include all of the various combinations of printer and disk capacities possible. See the Pricing section for the complete list of models.

The single port provided for local attachments can accommodate one of three features: the Data Record Attachment (3200), the MICR Attachment (1100), or the Magnetic Card Attachment (4900). The Data Recorder Attachment permits connection of a 129-2 80-column card reader/punch (called a Data Recorder by GSD); an 8201 interface is required. The Data Recorder attachment can alternatively be cable-connected to a 96-column card reader/punch; a 7850 interface is required.

The MICR attachment can be connected to one of three models of MICR reader/sorters; a 6303 interface is required. The Magnetic Card Attachment can be connected to the Magnetic Card Reader; no special interface is required.

NETWORK CONNECTIONS

Software is provided to enable the System/32 to be attached, over communications lines, to the following systems:

- Another System/32 equipped with the Binary Synchronous communications adapter.
- A System/3, System/7, System/34, System/360 Model 20, or 5110 system computer equipped with a Binary Synchronous communications adapter.
- A System/360 or System/370 computer via an Integrated Communications Adapter, 2701 Data Adapter Unit, or 3704 or 3705 Communications Controller equipped for binary synchronous communications.
- A 3741 Model 2 Data Station or 3741 Model 4 Programmable Work Station.
- A 3747 Data Converter.
- A 5321 Model 2 Data Collection System. ▶

IBM System/32

➤ USER REACTION

In the August 1979 Datapro survey on computer systems, 17 System/32 users with a total of 27 installed System/32's rated the equipment. Sixteen systems had processors with 32K bytes of memory, four had 24K bytes, and six had the basic 16K bytes. On the average, the systems had 12.9 megabytes of disk capacity. The users' ratings are:

	Excellent	Good	Fair	Poor	WA*
Overall satisfaction	5	9	1	0	3.3
Ease of operation	9	6	1	0	3.5
Reliability of mainframe	11	5	0	0	3.7
Reliability of peripherals	8	2	0	0	3.8
Maintenance responsiveness	10	5	1	0	3.6
Maintenance effectiveness	6	8	2	0	3.3
Technical support	4	5	4	0	3.0
Operating system	4	10	0	0	3.3
Compilers and assemblers	4	10	0	0	3.3
Applications programs	1	6	4	0	2.7
Ease of programming	7	5	2	0	3.4
Ease of conversion	4	7	1	1	3.1

*Weighted Average on a scale of 4.0 for Excellent.

Key advantages cited by these users included ease of operation, reliability, and technical support. Several program products were specifically mentioned as particularly noteworthy: the operating system, word processing/text editing software, and the Data File Utility.

Disadvantages mentioned centered on three weaknesses: the inability to expand the system (three users), slowness (two users), and lack of a multiprogramming/multi-tasking capability (two users).□

- ● A 6640 Document Printer.
- An Office System 6/430, 6/440, or 6/450.
- A Mag Card II Typewriter (Communicating).

TRANSMISSION SPECIFICATIONS

Two communications adapters are provided: an SDLC and a BSC communications adapter. Either supports point-to-point or multipoint, half-duplex lines over non-switched half- or full-duplex facilities at speeds up to 7200 bps, and point-to-point, half-duplex lines over switched facilities at speeds up to 4800 bps. On a multipoint line, the System/32 is supported only as a tributary station and not as a control station.

An EIA Line Interface feature is available for both adapter types. This interface is used when an external modem is to be attached to the system. Five line interfaces are offered that include integrated modems. Two switched line interfaces with integrated modems are offered, one for 1200 bps and one for 2400 bps line speeds. Two non-switched line interfaces with integrated modems are offered, one for 1200 bps and one for 2400 bps line speeds. A multipoint tributary interface is provided to operate at 2400 bps. Both switched interfaces include auto-answer. An internal clock feature is required with the 1200 bps interfaces, and the 2400 bps interfaces require a Processor Expansion Unit (I/O Board and additional communications power).

A switched network backup feature can be attached to non-switched 2400 bps interfaces as a backup. The feature is available with and without auto-answer.

SOFTWARE

The System/32 operating system, the System Control Program (SCP), includes a supervisor that occupies 2K bytes of main memory and provides the basic facilities that permit selective loading of programs from the disk, control all input/output operations, provide a program roll-out/roll-in capability, provide support for word processing applications, and provide support for data communications transmission. SCP is offered at no additional charge.

Communication between the user and the SCP is provided through an Operation Control Language (OCL). These statements provide the system with information on how a job should be executed, such as the names of files to be processed, where the files are located, and what program to load. Normally, the collection of OCL statements required to direct the execution of a job is stored in procedures in disk storage and can be invoked by entering simple commands through the operator keyboard. Procedures are also supplied for execution of the utility programs that accompany the System Control Program and for the Industry Application Programs available to System/32 users. New procedures can be developed for user-written applications programs and specialized operations. The System/32 OCL has the capability to prompt the operator to supply required parameters or to specify default values for missing OCL parameters, as well as a logical IF statement that initiates execution of jobs based on conditions tested by the OCL.

Control of all I/O operations is provided by SCP data management routines. Support is provided for the CRT display, the keyboard (including the capability to recognize and interpret special function and command keys), the printer, and the disk unit. The diskette is supported by a Load/Dump utility only. Disk files can be organized in sequential, indexed sequential, or direct fashion.

A roll-out/roll-in capability is provided to suspend processing programs in order to allow an inquiry to be made into the file. The executing program is rolled out to disk storage, the inquiry program is executed, and the interrupted processing program is then returned (rolled in) to main memory to resume processing.

The SCP maintains a system history area on the disk that contains a log of recently executed OCL statements and system activities. The contents of the history area may be displayed on the operator console and printed if desired to provide a record of system processing activity.

Utility programs supplied with the SCP assist the user in preparing and maintaining his disk files. The programs provided include Disk Initialization, Alternate Track Assignment, Alternate Track Rebuild, File and Volume Display, and File Delete. In addition, a set of routines is provided to permit copying of data, programs, and procedures from the diskette to the disk file and to transfer such information from the disk file to the diskette to provide back-up files and off-line storage. The entire system library, selected files, or portions of files can be transferred to diskette files. In order to provide sufficient contiguous storage space for creation of new files, the operator can invoke the COMPRESS OCL procedure to reorganize the contents of the disk file in a contiguous area next to the systems library. The SAVE procedure allows one file or all files to be transferred to diskette with a specified retention period. Files can also be added to existing files saved previously on diskette. Both single- and multiple-volume diskette files can be created. The DELETE procedure

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- permits files to be removed from disk storage to create space for new members.

The Word Processor Feature supports functions such as upper/lower case printing and keyboard/display, half-space printing, access to the 5321 Mag Card Unit, and a data management technique for storing text, as well as a software product, Word Processor/32. It also permits the transfer of documents or data files between the System/32 and another word processing system, such as an Office System 6/430, 6/440, or 6/450, a 6640 Document Printer, a Mag Card II Typewriter (Communicating), or another System/32.

Communications support provided by the SCP consists of the Binary Synchronous Communications, SNA/SDLC Batch Work Station, and Multi-Leaving Remote Work Station system utilities.

The Binary Synchronous Communications Utility operates in conjunction with the RPG II Telecommunications Feature to provide support for transmission and reception of binary synchronous data over voice grade or high-speed communications lines. The utility also permits communications characteristics, such as the line type, line speed, terminal address, and number of error retries, to be specified at program execution time.

The System/32 SNA/SDLC Batch Work Station System Utility sends and receives batch data between a System/32 and a System/370 operating under the Virtual Telecommunications Access Method (VTAM), the Network Control Program (NCP/VS), and DOS/VS POWER VS, CICS/DOS/VS, OS/VS1 Remote Entry Service (RES), OS/VS2 Job Entry Subsystem 2 (JES 2), CICS/OS/VS, or IMS/VS. The utility program operates with SDLC protocol and enables System/32 computers to perform as remote workstations to System/370 Models 115 through 168 that are equipped with 3704 or 3705 Communications Controllers operating under NCP/VS. In addition, the System/32 can act as a 3770 Data Communications System and operate with the CICS/VS communications monitor or the IMS/VS data base management system.

This utility program permits the System/32 to transmit jobs to a System/370 computer and receive output from the central system upon completion of the job. In addition, the System/32 can receive multiple jobs, including control language and data, from a System/370 computer for execution at the local site. The batch workstation utility also includes provisions for compressing blanks and duplicate characters to ensure more efficient data transmission and to expand compressed data transmitted from the central system. A minimum of 7 buffers, each 256 bytes in size, is provided.

Programming systems support is under DOS/VS, OS/VS1, OS/VS2, or any of these operating systems under VM/370. Data security and privacy features for a remote workstation on a 370 under VTAM, NCP, POWER/VS, RES, JES2, CICS/VS, or IMS/VS are applicable to this utility. The utility will run on a System/32 with 16K bytes of memory and BSCA (BSC Communications Adapter) under the Systems Control Program.

System/32 Multi-Leaving Remote Work Station System Utility (MRJE/WS) permits a System/32 to function as an RJE workstation for submission of jobs to a System/370 under control of HASP II version 3.1 or 4, ASP version 2.6 or 3.1, OS/VS1 RES, OS/VS2 JES2 or JES3, or VM/370 with the Remote Spooling Communications subsystem. Under control of the System/32 SCP and utilizing the BSCA, this utility communicates with a 370 over a point-to-point switched or non-switched communications line. The keyboard/display acts as the workstation console, and nonremovable disk storage simulates card I/O operation.

Any size record is accepted as input and formatted into 80-character segments for transmission to the 370, where reformatting is the user's responsibility. Any workstation print output may be stored on a temporary disk file and printed later using the supplied print utility. The EBCDIC text transparency capability of BSCA is supported. Details of security and configuration requirements are the same as those listed above for the SNA/SDLC Batch Work Station System Utility.

In addition to the file management utilities supplied with the SCP control program, IBM offers two separately priced System/32 program products that provide data base management capabilities. The System/32 Utilities Program Product consists of three programs: *Data File Utility (DFU)*, *Sort*, and *Source Entry Utility (SEU)*. The System/32 File Conversion Utility (FCU) is a stand-alone utility. The Sort program is similar in function to the System/3 sort, while the DFU, SEU, and FCU programs are newly written for the System/32.

The Data File Utility (DFU) program provides the following data base management functions: data file creation and maintenance, data file inquiry, and data file list. All three functions utilize catalogued RPG II File Description and Input Specifications so that the operator need enter only the name of the file and the name of the catalogued RPG II specifications. The utility prompts the operator to enter additional information required to tailor the program to the user's processing requirements.

The Data File Creation and Maintenance function of DFU operates only on indexed sequential files and provides facilities for creating and updating user data files. The program prompts the operator by displaying the field name for the data to be entered on the display console. When updating is being performed, the data currently in the field is displayed to assist the operator. Other features include automatic duplication of fields, control totals, generated record keys, and modulus 10 and 11 self-check digits for verifying entered data.

The Data File Inquiry function of DFU allows inquiries into indexed sequential files. Retrievals are performed by record key, and a function key can be used to roll forward or backward in key sequences through the file. Selected records can be printed with page and column headings.

The Data File List function of DFU provides a report-writing capability for listing and summarizing selected information from indexed or sequential files. Selection of records is based on record types defined in the RPG II input specifications for the file, and the file can be sorted in either ascending or descending order prior to printing, using up to five fields as sort fields. Records may also be selected for printing based upon a comparison of a user-supplied constant or another data field. This selection precedes the sorting function if sorting is specified. Data can be retrieved from a second file based on the use of a field in the records being listed as a key; the retrieved record from the second file is considered as an extension to the original record being listed. A total of 40 fields can be processed per record. Output reports include page and column headings, edited data fields, up to six fields calculated by the use of one of the arithmetic operators and up to four fields or constants, and selected column totals with up to five levels of subtotals.

The System/32 Sort Utility provides basically the same functions as the System/3 sort. Disk files can be sorted in ascending or descending sequence. The Sort program accepts files organized in sequential, indexed, or direct order. It can select records based on a comparison of the contents of a field with a constant or another field or a tag sort in which only the control field and a record address are

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► retrieved. A summary sort groups records with similar control fields and summarizes designated numeric fields into a single summary record. The Sort program automatically allocates disk space for a work file and can handle indexed, direct, and sequential file organizations.

The Source Entry Utility (SEU) program can be used to create and maintain user-written OCL procedures, RPG II and FORTRAN IV source code statements, and Sort source code statements. The SEU is accompanied by Sort, RPG II, and Auto Report format descriptions to aid the user in entering source statements correctly. Functions include the capability to move statements within source or procedure members in new members, to insert up to 99 new statements into an already-existing member, and to delete selected statements. A function key can be used to roll backward or forward through the code to locate a selected statement. A record being entered or updated is displayed on the operator display screen as the data is entered. Optional functions available with SEU are the capability to perform syntax diagnosis on RPG II and Auto Report source statements as they are entered and the capability to resequence statements in a source-code member.

The File Conversion Utility is a stand-alone utility accepting input from and providing output to a 5321 Mag Card Unit or fixed disk. It provides the user with the capability of converting a file formatted for one application so that it can be used by another application program. Conversion tasks can include packing/unpacking and signing/unsigned numeric fields, reconciling upper/lower/monospace character sets, reformatting edited/unedited numeric data, resequencing fields, inserting constants, processing selected records only, displaying audit totals, combining files, etc. User instructions and/or input are prepared using data specification forms similar to the forms used by RPG.

Support for three programming languages is currently available for the System/32: RPG II, Basic Assembler, and FORTRAN IV.

RPG II permits the programmer, using up to six different preprinted coding forms to prepare a set of specifications that describe the form of the input data, the calculations to be performed, and the format of the desired output. RPG II for the System/32 offers essentially the same features as the System/3 Model 6 RPG II, with variations in the data management facilities for the support of System/32 input/output devices. For example, the SET/KEY display support feature provided with the System/3 Model 6 has been replaced by an operator prompting function that can display messages stored in a program or in the system library. In addition, the System/32 RPG II Interactive Data Entry (IDE) function permits the console to be used as an interactive data entry device. Data can be entered through the system keyboard, displayed for reference on the display screen, and routed to an executing RPG II program for processing. The program provides operator prompting on the CRT display. A program can be assigned one IDE file, which can accommodate various types of records from 4 to 160 characters in length. The IDE program is automatically generated by RPG II when CONSOLE is specified as the Device on the File Description Sheet.

The RPG II Auto Report Feature is an optional precompiler that reduces the coding effort required to prepare report programs. A single Auto Report output field specification written by the programmer can result in the generation of RPG II statements to indicate printing with editing, insert column headings, control spacing and horizontal alignment of the data, define total fields, accumulate totals by control levels, and flag total lines with asterisks. The Auto Report functions may be specified for only one printer file in any RPG II program. Auto Report also provides a COPY

statement that permits RPG II source statements to be copied from a disk library into source programs that are about to be compiled.

RPG II Telecommunications Feature is an optional extension of System/32 RPG II that facilitates the transmission and reception of binary synchronous data over voice-grade or high-speed communications lines. The programmer fills out an RPG II Telecommunications Specification Sheet, which specifies the functions to be performed. The feature permits a System/32 equipped with the BSCA to operate in any of the following communications modes: receive only, transmit only, receive with conversational reply, transmit only, receive with conversational reply, transmit with conversational reply, or alternate transmit and receive file. The System/32 can function as a terminal in one of three types of networks: point-to-point switched, point-to-point nonswitched, or multi-point.

The Basic Assembler and Macro Processor produces relocatable object programs that are subsequently converted to executable format by the SCP overlay linkage editor. Source statement programs, relocatable object programs, and executable load modules are stored in the System/32 libraries.

Assembled subroutines may be called by RPG II programs, but the assembly is performed separately. Program linking is accomplished during the compilation of the RPG II source program.

System/32 macros include support for disk functions, printer operation, keyboard and display screen access, binary synchronous communications, SNA/SDLC communications, timer, end of job, message logging, and program logging.

System/32 FORTRAN IV contains the features defined in ANS Basic FORTRAN, X3.10.1966; language extensions supported by IBM 1130, System/3, and System/34 Basic FORTRAN; and the full FORTRAN compiler features listed below.

- Programs can be corrected or modified in a semi-interactive mode at the workstation by displaying a source program file into which the compiler has interspersed diagnostic messages. The compile turnaround time can be reduced because the programmer can start to correct or modify the program without waiting for a listing.
- Logical data, logical expressions, and logical IF are supported.
- Logical elements (constants, variables, and arrays) contain true or false values.
- Operation symbols are used in logical expressions: NOT, AND, OR, LT, LE, EQ, GT, NE, and GE.
- Logical expressions evaluate elements to obtain true or false values.
- Logical assignment statements define a relationship, placing the value of a logical expression in a variable or array element.

The System/32 FORTRAN IV library contains mathematical and service subprograms required during execution to perform arithmetic operations, input and output constant conversions, and input/output control.

The Word/Processor/32 program product utilizes the 5321 Mag Card Unit and enhancements to the System/32 to provide word processing capabilities. Word processing functions for automatic generation, revision, and formatting of documents can be entered from the System/32 console/ ►

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► keyboard or via prerecorded magnetic cards or diskettes. Documents are generated on the system printer, with options available for upper and lower case printing, and half-spacing for producing right-justified text. System/32's in use for data processing can utilize existing data files for document creation. Production statistics are an automatic by-product of this program product.

The current System/32 software complement also includes over 40 modular *Industry Application Programs (IAP's)* that provide routines to perform the data processing functions required by small businesses in fifteen selected industry areas. Each IAP package also includes detailed operator instructions and the OCL procedures required for execution of the programs. All IAP's are written in RPG II and are distributed on IBM-owned diskettes. Various techniques are provided for tailoring the programs to satisfy specialized user requirements.

The applications include accounting and management, general ledger, order entry/invoicing, financial reporting, accounts receivable, accounts payable, inventory control, sales analysis, payroll, job costing, mailing and membership listing, and manufacturing systems, plus other specialty programs specifically designed for the following industries: lumber, food distribution, tire distribution, other distribution, law, medical, hospitals, financial institutions, motor freight, accounting, schools, manufacturing, and construction.

COMPONENTS

PROCESSOR: The System/32 central processing unit is a microprocessor that uses bipolar logic circuits and is physically located on a swing-open gate in the lower left front portion of the cabinet. A 4K, 16-bit word MOSFET writable control storage contains the microprograms that control processor operations. MOSFET user memory with a cycle time of 600 nanoseconds per 1-byte access is expandable to 32K bytes from the basic 16K bytes.

A Control Storage Increment feature provides additional memory and access to a Scientific Instruction Set for execution of FORTRAN IV generated object programs.

DISK STORAGE: Depending upon the model selected, non-removable disk storage of 3,210,240, 5,053,440, 9,169,920, or 13,777,920 bytes is an integral component of the system. The disk unit consists of either 104, 164, or 298 cylinders of 2 tracks each or 299 cylinders of 3 tracks each. Each track, in turn, contains 60 sectors of 256 bytes each.

All data is recorded on one side of a single fixed disk that is served by two read/write heads mounted on a pivoting access arm. The disk is mounted vertically in the lower left part of the System/32 cabinet, behind the CPU logic and main memory.

The disk rotational speed is 2964 rpm, yielding a nominal data transfer rate of 889,000 bytes per second and an average rotational delay (latency) of 10.1 milliseconds. Head positioning times for the four models, in milliseconds, are as follows:

	Average	Minimum	Maximum
3.2-megabyte unit:	50.4	13	121
5.0-megabyte unit:	70	13	180
9.1-megabyte unit:	72.5	14.2	166.9
13.7-megabyte unit:	72.5	14.2	166.9

DISKETTE DRIVE: A single drive unit that reads and writes data on flexible diskettes is an integral component of every System/32. The IBM diskette (or "floppy disk") is a

small, flexible, reusable magnetic disk that is permanently enclosed in a protective jacket about eight inches square and a fraction of an inch thick. The data capacity of each diskette is 242,944 bytes (1898 records of 128 bytes each) when used to exchange data between a System/32 and a 3740 Data Entry System or other IBM equipment. Diskettes to be used exclusively with a System/32 can contain up to 246,272 bytes of data in the standard format (128-byte sectors) or 303,104 bytes in "extended" format (512-byte sectors).

Data is read from or written on a diskette at a nominal speed of 31,250 bytes per second. Diskette records can be read at the rate of up to 3400 128-byte records per minute and written and verified at up to 1800 128-byte records per minute.

KEYBOARD: The System/32 keyboard is used by the operator to enter data and control the system's functions. It consists of a standard typewriter keygroup, a 10-key numeric keygroup arranged in adding-machine fashion, and a group of function keys. In addition, the typewriter keys in the top row are dual-defined, providing a total of 24 command keys for controlling program functions.

A small operator panel, located at the right of the keyboard, contains the power on/off switch: LOAD, START, and STOP keys; and indicator lights that signify Keyboard Ready, Processor Check, Thermal Check, and Power Check conditions. The power on/off switch can be replaced by an optional key-operated switch that protects against unauthorized use of the system.

DISPLAY: A small CRT display screen, located just to the left of the keyboard and printer, is an integral component of every System/32. It can display up to 240 characters of information in 6 lines of 40 characters each. The display is used to provide operator guidance, input verification, and auxiliary output under program control. The System/32 will normally be programmed to display all data entered via the keyboard so that the operator can verify its accuracy before the system acts upon it.

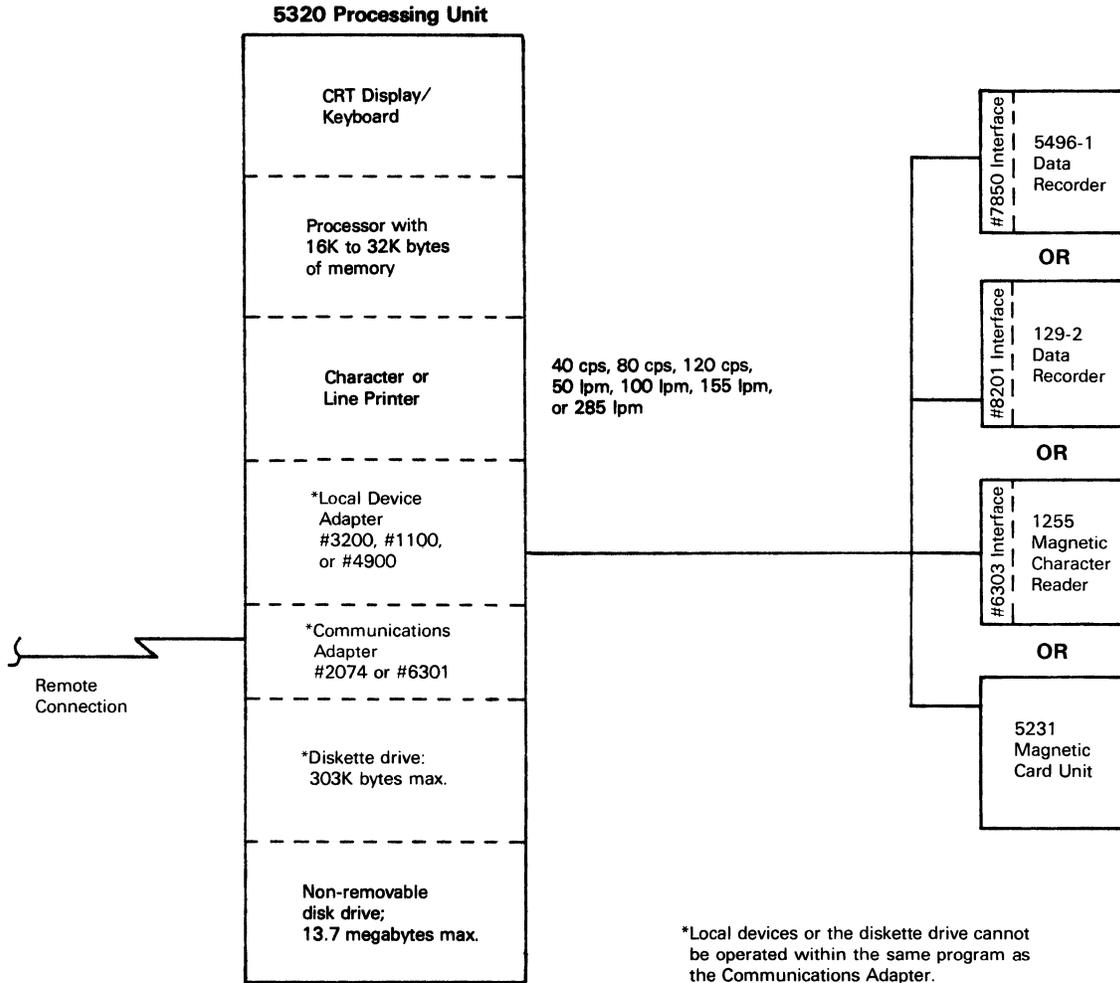
SERIAL PRINTER: A serial matrix printer is an integral component of every System/32 Model A. Three different serial printers are currently available: a unidirectional model rated at 40 characters per second, and three bidirectional models rated at 40, 80, and 120 characters per second. Matrix characters are formed by 8 wires arranged in a vertical array, with each wire printing dots in up to 4 of 7 possible horizontal positions. The character set consists of 64 symbols, and there are 132 print positions, spaced 10 to the inch. Vertical spacing is 6 lines per inch. A variable-width forms tractor feeds continuous forms ranging from 3-1/2 to 14-7/8 inches in width. Forms with up to 6 parts and a maximum thickness of 0.018 inch can be handled. Ledger cards and other precut forms can be processed singly in typewriter fashion.

LINE PRINTER: A horizontal-belt line printer is an integral component of every System/32 Models B and C. The rated printing speed, in lines per minute, depends upon the specific model and character set chosen, as follows:

	48-Character Set	64-Character Set	96-Character Set
Models B11, B12, B13, B14	50	50	50
Models B21, B22, B23, B24	100	100	80
Models B31, B32, B33, B34	155	120	80
Models C41, C42, C43, C44	285	225	160

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Configuration



► Characters are formed by means of an interchangeable metal print belt with an engraved type font in one of three character sets: 48-character EBCDIC, 64-character EBCDIC, 64-character ASCII, or 96-character dual case modified Courier or Artisan. There are 132 print positions, spaced 10 to the inch. Vertical spacing is 6 lines per inch. A variable-width forms tractor feeds continuous forms ranging from 3-1/2 to 14-7/8 inches in width. Forms with up to 6 parts and a maximum thickness of 0.020 inch can be handled. The use of card stock is not recommended.

PUNCHED CARD EQUIPMENT: The Model 5496-1 96-column Data Recorder has a 64-character set, four program levels, buffered I/O areas, a 350-card hopper and stacker, and reads/punches/prints up to 21 cards per minute. To attach the unit locally requires the Data Recorder Attachment feature and the 7850 Interface feature.

The Model 129-2 80-column Data Recorder has a switchable 48- or 64-character set, six program levels, buffered I/O, a 500-card hopper, and a 500-card stacker. It reads at 50 cpm and punches/prints at between 12 and 50 cpm. To attach the unit locally requires the Data Recorder Attachment feature and the 8201 Interface feature.

MAGNETIC CARD EQUIPMENT: The Model 5321 Magnetic Card Reader/Recorder utilizes a magnetic

card that can contain up to 5100 characters of data on 50 tracks, with each track containing 102 characters. The cards are read at a rate of 230 milliseconds per track and recorded at a rate of 450 milliseconds per track. The input card hopper accommodates 50 cards; the output stacker, 60 cards. To attach the unit locally requires the Magnetic Card Attachment feature.

MAGNETIC CHARACTER READER: Three models of 1255 MICR readers are offered, including a 500 document-per-minute, 6-stacker model; a 750-dpm, 6-stacker model; and a 750-dpm, 12-stacker model. All models handle documents 5.75 to 8.875 inches long and 2.5 to 4.25 inches wide. To attach the unit locally requires the MICR Reader/Sorter Attachment feature and the 6303 Interface feature.

PRICING

All System/32 components are available under the terms of IBM's Rental or Lease Agreement (LRA) or for purchase. LRA includes prime shift maintenance; a separate contract is available for purchased units.

Basically, LRA provides for month-to-month rental or for a three-year lease with penalties for early termination (including model downgrades and feature termination). The lease can be extended indefinitely, one year at a time. The monthly

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► charges for the lease arrangement are generally 15 percent lower than the month-to-month arrangement. The prime shift maintenance period is for any consecutive nine hours between 7 AM and 6 PM, Monday through Friday. (The maintenance charges given in the accompanying price list are for prime shift maintenance for purchased equipment and also serve as the basis for calculating extended charges for rented or leased equipment.) Extended period maintenance is available up to 24 hours per day, 7 days per week.

The termination charge for the lease arrangement is the lower of 2 months' charges or 10 percent of the remaining value of the lease.

All basic components are in maintenance category D (unlimited usage). The category determines the schedule of extended maintenance charges. The premium for extended maintenance is expressed in the table below as a percentage of the basic maintenance charges, which are listed in the accompanying price list.

Consecutive Hours

	<u>9*</u>	<u>12</u>	<u>16</u>	<u>20</u>	<u>24</u>
Monday-Friday	10%	12%	14%	16%	18%
Saturday	4	5	7	8	9
Sunday	5	7	9	11	12

*For periods outside the basic 7 AM to 6 PM prime shift.

The lease arrangement also guarantees a maximum rate of increases for extended leasing periods. The rate for all components is five percent per year beginning in the second year of the lease.

All basic components are classed under warranty category B (three months). Purchase credits can be accrued up to a maximum of 45 percent.

Monthly Charge*

		<u>Rental Contract</u>	<u>Lease Contract</u>	<u>Purchase Price</u>	<u>Monthly Maint.</u>
5320 System Unit (includes CPU, 16K bytes of main storage, fixed-disk storage unit, diskette drive, printer, keyboard, and display):					
A01	40 cps unidirectional printer, 3.2 MB disk storage	\$ 865	\$ 749	\$23,490	\$160
A02	40 cps unidirectional printer, 5.0 MB disk storage	951	825	23,910	160
A03	40 cps unidirectional printer, 9.1 MB disk storage	1,054	915	26,100	170
A04	40 cps unidirectional printer, 13.7 MB disk storage	1,123	975	27,500	180
A11	40 cps bidirectional printer, 3.2 MB disk storage	922	800	23,670	165
A12	40 cps bidirectional printer, 5.0 MB disk storage	1,007	875	24,090	165
A13	40 cps bidirectional printer, 9.1 MB disk storage	1,110	965	26,280	175
A14	40 cps bidirectional printer, 13.7 MB disk storage	1,179	1,025	27,680	185
A21	80 cps bidirectional printer, 3.2 MB disk storage	973	845	23,820	170
A22	80 cps bidirectional printer, 5.0 MB disk storage	1,058	920	24,240	170
A23	80 cps bidirectional printer, 9.1 MB disk storage	1,161	1,010	26,430	180
A24	80 cps bidirectional printer, 13.7 MB disk storage	1,230	1,070	27,830	190
A31	120 cps bidirectional printer, 3.2 MB disk storage	1,024	890	23,970	175
A32	120 cps bidirectional printer, 5.0 MB disk storage	1,109	965	24,390	175
A33	120 cps bidirectional printer, 9.1 MB disk storage	1,212	1,055	26,580	185
A34	120 cps bidirectional printer, 13.7 MB disk storage	1,281	1,115	27,980	195
B11	50 lpm line printer, 3.2 MB disk storage	1,047	910	26,870	185
B12	50 lpm line printer, 5.0 MB disk storage	1,132	985	27,290	185
B13	50 lpm line printer, 9.1 MB disk storage	1,235	1,075	29,480	195
B14	50 lpm line printer, 13.7 MB disk storage	1,304	1,135	30,880	205
B21	100 lpm line printer, 3.2 MB disk storage	1,127	980	26,940	195
B22	100 lpm line printer, 5.0 MB disk storage	1,212	1,055	27,360	195
B23	100 lpm line printer, 9.1 MB disk storage	1,315	1,145	29,550	205
B24	100 lpm line printer, 13.7 MB disk storage	1,384	1,205	30,950	215
B31	155 lpm line printer, 3.2 MB disk storage	1,207	1,050	27,090	205
B32	155 lpm line printer, 5.0 MB disk storage	1,292	1,125	27,510	205
B33	155 lpm line printer, 9.1 MB disk storage	1,395	1,215	29,700	215
B34	155 lpm line printer, 13.7 MB disk storage	1,464	1,275	31,100	225
C41	285-lpm line printer, 3.2 MB disk storage	1,408	1,225	31,290	230
C42	285-lpm line printer, 5.0 MB disk storage	1,493	1,300	31,710	230
C43	285-lpm line printer, 9.1 MB disk storage	1,596	1,390	33,900	240
C44	285-lpm line printer, 13.7 MB disk storage	1,665	1,450	35,300	250
1005	Additional main storage; 8192 bytes (maximum 2)	42	38	878	2.50
1500	Control Storage Increment	42	38	878	2.50

Port Attachments

3200	Data Recorder Attachment	81	71	1,770	6
1100	MICR Reader/Sorter Attachment	272	236	8,775	25
4900	Magnetic Card Attachment	84	73	2,800	4
2074	Binary Synchronous Communications Adapter	112	98	2,520	10
6301	Synchronous Data Link Control Communications Adapter	138	120	3,080	15

*Includes monthly maintenance charge.

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Monthly Charge**

		<u>Rental Contract</u>	<u>Lease Contract</u>	<u>Purchase Price</u>	<u>Monthly Maint.</u>
Line Interfaces					
3701	EIA Line Interface	12	11	420	4.50
5500	1200 bps integrated modem, non-switched point-to-point	20	18	660	5
5501	1200 bps integrated modem, switched with auto-answer	28	25	880	7
4703	Internal clock (required for 5500, 5501)	6	6	210	0.50
5600	2400 bps integrated modem, non-switched point-to-point	78	68	2,240	11.50
5602	2400 bps integrated modem, non-switched multipoint tributary	85	74	2,490	13
5610	2400 bps integrated modem, switched with auto-answer	86	75	2,550	14
5733	Processing unit expansion (required for 5600, 5602, 5610)	8	8	320	0.50
7951	Switched network backup (for 5600, 5602)	11	10	357	3.50
7952	Switched network backup with Auto-Answer (for 5600, 5602)	17	15	535	5
Workstation Options					
3400	Upper/lower case keyboard display (B and C Models only)	30	26	1,000	1
4530	Half-line vertical space printing (B and C Models only)	15	14	600	0.50
4655	Keylock	—	—	72	—
Punched Card Units					
8201	Interface	79	—	1,330	10.50
129-2	80-column reader/punch (Data Recorder)	187	—	4,090	63
7850	Interface	57	—	1,160	18.50
5496-1	96-column reader/punch (Data Recorder)	213	—	4,005	68
Magnetic Card Unit					
5321	Magnetic Card reader/recorder	255	217	10,200	55
Magnetic Character Readers					
6303	Interface	141	—	5,335	4.50
1255-1	MICR reader/sorter; 5 sort pockets, 1 reject stacker, 500 dpm	949	—	35,460	288
1255-2	MICR reader/sorter; 5 sort pockets, 1 reject stacker, 750 dpm	1,155	—	40,590	460
1255-3	MICR reader/sorter; 10 sort pockets, 2 select/reject stackers, 750 dpm	1,520	—	55,260	606

*Includes monthly maintenance charge.

SOFTWARE

	<u>Monthly License Charge</u>
System/32 RGP II	\$ 28
System/32 Utilities Program Product; includes Data File Utility, SORT, and Source Entry Utility	15
FORTRAN IV	75
Basic Assembler Language and Macro Processor Program Product	75
File Conversion Utility	42
Word Processor/32	131 ■

IBM System/32

MANAGEMENT SUMMARY

Introduced early in 1975, the System/32 provided an effective cardless computer system in the \$1,000-per-month rental range. A user whose data entry requirements were not satisfied by the integral workstation could elect to attach a card reader/punch, but the cardless alternative supported was the 3741 Data Station. Data keyed into a 3741 is recorded on a diskette for either subsequent transmission to the System/32 over a communications line or for mounting onto the System/32 diskette drive.

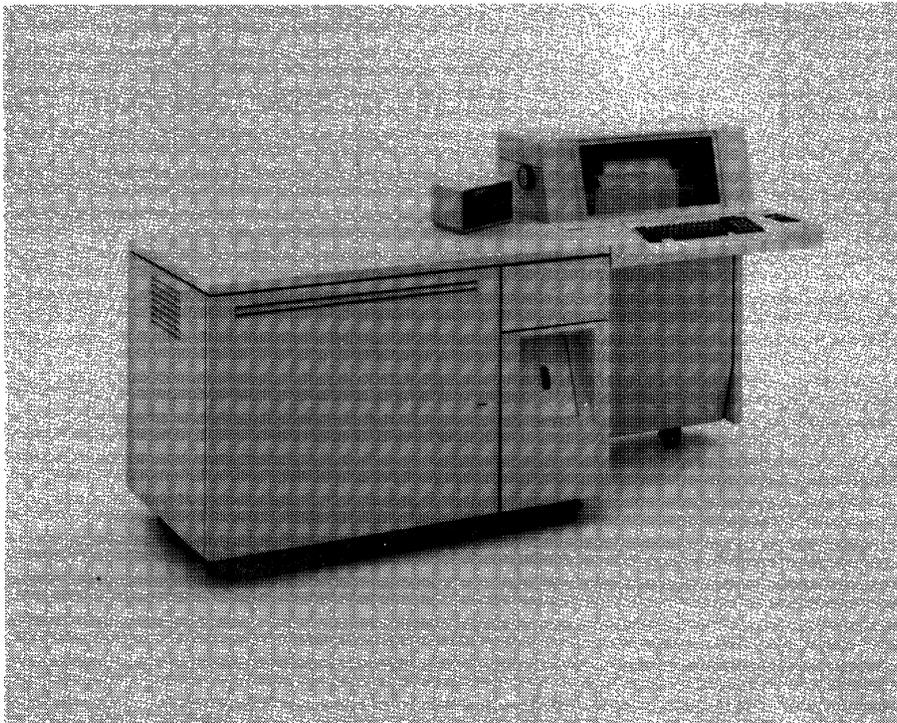
The System/32 does not permit multiple workstation user access, despite the system's powerful processing capabilities and significant mass storage capacity. While this is unimportant to a small user operating in a stand-alone environment or to the large user who staunchly supports a master/slave environment, the equipment cannot compete with the *multi-user* distributed processing terminals offered by competitors, despite its attractive pricing. The successor to the System/32, the System/34 (Report C21-491-501), is IBM General Systems Division's entry into the distributed processing terminal market. Workstations attached to the System/34 have movable keyboards, full-sized CRT displays, and printers, unlike the System/32 and the 3770 terminals and like the 3790 (Data Processing Division's entry into the multi-user distributed processing world).

The multi-user capability (including multiprogramming support) of the System/34, coupled with its more ➤

A single workstation with 240-character display, stationary keyboard, either a line or a character printer, a diskette drive (303,100 bytes), and a non-removable disk (13.7-megabytes maximum).

Either a communications adapter, a card reader (80 or 96 character card), a Magnetic Character Document Reader, or a Magnetic Card Reader can be optionally attached. BSC and SDLC protocol are supported for a half-duplex line at a speed of up to 7200 bps for a non-switched line and up to 4800 bps for a switched line. System Control Program provides a single-job operating system. RPG II is supported. Applications packages are available.

A System/32 Model B23 with a standard 100 lpm printer, 9.1 megabytes of disk capacity, a diskette drive, 16K bytes of memory, and an optional SDLC Communications Adapter and EIA Line Interface can be purchased for \$49,020. This system can be rented for \$1,355, including maintenance, on a month-to-month basis or for \$1,236, including maintenance, on a longer term lease.



Shown above is the IBM System/32 with the 240-character display situated to the left of the keyboard/printer and directly above the diskette drive.

IBM System/32

▷ favorable pricing structure, makes only unusual System/32 configurations competitive with its successor. For example, a standard System/32 Model A33 can be purchased for \$38,000, but a comparable System/34 can be purchased for \$36,000. Both have a 120 cps printer and approximately 9 megabytes of storage. The System/32 has 16K bytes of memory, while the System/34 has twice that capacity. The month-to-month rental price of the System/32 is \$1,067 or approximately \$36 less than the System/34 equivalent. Since the operating system for the System/34 is \$85 per month, but is included in the System/32 charge, the System/32 is \$111 less than the System/34 on a rental basis. The difference, however, is insignificant for any installation anticipating future multi-user requirements.

IBM has not totally embraced distributed data processing; neither the System/32 or the System/34 can operate as anything other than a slave on a multi-computer system network.

These comparisons notwithstanding, the System/32's support of magnetic card and magnetic document readers does offer exceptional application for word processing and document reading requirements.

USER REACTION

In the September 1977 Datapro survey on computer systems, 36 System/32 users with a total of 93 installed System/32's rated the equipment. Four users had processors with 32K bytes of memory, eight had 24K bytes, and the remainder had the basic 16K bytes. On the average, the users had 9.1 megabytes of disk capacity. A total of 25 users indicated use of in-house personnel to develop applications programs, and three of these users supplemented development with contract programming. The users' ratings are:

	Excellent	Good	Fair	Poor	WA*
Overall satisfaction	14	17	3	0	3.3
Ease of operation	19	15	0	0	3.6
Reliability of mainframe	27	8	0	0	3.8
Reliability of peripherals	14	11	0	0	3.6
Maintenance responsiveness	22	12	1	0	3.6
Maintenance effectiveness	18	15	1	0	3.5
Technical support	10	17	6	1	3.1
Operating system	11	19	3	0	3.3
Compilers and assemblers	13	17	5	0	3.2
Applications programs	4	13	5	3	2.7
Ease of programming	13	17	3	0	3.3
Ease of conversion	6	15	3	0	3.1

*Weighted Average on a scale of 4.0 for Excellent.

Thirteen users commented that the system was "slow." Several felt that the lack of multiprogramming capabilities was the System/32's principal disadvantage, while several others felt that the restriction of RPG as the only programming language was the principal disadvantage. Two users complained about the small display screen. Ease of use and reliability were almost universally cited as the principal advantages of the system. □

CHARACTERISTICS

VENDOR: International Business Machines Corporation, General Systems Division, 5775 Glenridge Drive, N.E., Atlanta, Georgia 30301. Telephone (404) 231-3000.

DATE OF ANNOUNCEMENT: January 1975.

DATE OF FIRST DELIVERY: March 1975.

NUMBER DELIVERED TO DATE: Information not available.

SERVICED BY: IBM.

CONFIGURATION

The basic System/32 consists of a processor, a single workstation, a diskette drive, and a non-removable disk housed in a single cabinet. The workstation consists of a 240-character CRT display, either a line or a character printer, and a stationary keyboard. Optionally attachable to a single port, shared with the diskette drive, is either a card reader/punch (80- or 96-column cards), a magnetic card reader/recorder, a magnetic character document reader, or a communications adapter. The communications adapter can be used to connect the System/32 to another IBM processor or to an IBM 3741 data entry system. The data entry system permits one or more operators to key-enter data onto diskettes in a batch mode of operation. The data on the diskettes can then be transmitted to the System/32 over a communications link. Alternatively, the diskette can be mounted onto the System/32's diskette drive.

The basic System/32 processor has 16K bytes of memory with a cycle time of 600 nanoseconds and can be expanded up to 32K bytes. The keyboard consists of the standard typewriter-like layout, a 10-key numeric pad, and provision for 24 command function keys. The line printer is available in speeds of 50, 100, 150, and 285 lines per minute. The character printer is available in speeds of 40, 80, and 120 characters per second. The 40 cps printer is available with either a unidirectional or a bidirectional carriage. All other character printers are available only with the bidirectional carriage.

Disk storage is available in capacities of 3.2, 5.0, 9.1 and 13.7 megabytes. The diskette can accommodate up to 303,104 bytes.

Communications adapters are available to support a half-duplex line using either SDLC or BSC protocols. A non-switched line can be operated at speeds up to 7200 bps, and a switched line, at speeds up to 4800 bps. The attachment arrangement can be either point-to-point or multi-point.

All models of the System/32 include as standard the 5320 System Unit composed of the processor, 16K bytes of memory, a diskette drive, a keyboard, a small CRT display, one of eight printers, and a non-removable disk with one of four capacities. The 32 models offered include all of the various combinations of printer and disk capacities possible. See the Pricing section for the complete list of models.

The single port provided for attachments can accommodate one of four features: the Data Record Attachment (3200), the MICR Attachment (1100), the Magnetic Card Attachment (4900), or one of two communications adapters. The Data Recorder Attachment permits connection of a 129-2 80-column card reader/punch (called a Data Recorder by GSD); an 8021 interface is required. The Data Recorder attachment can alternatively be cable connected to a 96-column card reader/punch; a 7850 interface is required. ▶

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- The MICR attachment can be connected to a magnetic card reader/recorder or to one of three models of MICR reader/sorters. The Magnetic Card Attachment can be connected to the Magnetic Card Reader.

NETWORK CONNECTIONS

Software is provided to enable the System/32 to be attached, over communications lines, to the following systems:

- Another System/32 equipped with the Binary Synchronous communications adapter.
- A System/3, System/7, or System/360 Model 20 computer equipped with a Binary Synchronous communications adapter.
- A System/360 or System/370 computer via an Integrated Communications Adapter, 2701 Data Adapter Unit, or 3704 or 3705 Communications Controller equipped for binary synchronous communications.
- A 3741 Model 2 Data Station or 3741 Model 4 Programmable Work Station.
- A 3747 Data Converter.
- A 5230 Model 2 Data Collection System.

TRANSMISSION SPECIFICATIONS

Two communications adapters are provided: an SDLC and a BSC communications adapter. Either supports point-to-point, half-duplex lines at speeds up to 7200 bps, and multipoint, half-duplex lines at speeds up to 4800 bps. On a multipoint line, the System/32 is supported only as a tributary station and not as a control station.

An EIA Line Interface feature is available for both adapter types. This interface is used when an external modem is to be attached to the system. Five line interfaces are offered that include integrated modems. Two switched line interfaces with integrated modems are offered, one for 1200 bps and one for 2400 bps line speeds. Two non-switched line interfaces with integrated modems are offered, one for 1200 bps and one for 2400 bps line speeds. A multipoint tributary interface is provided to operate at 2400 bps. Both switched interfaces include auto-answer. An internal clock feature is required with the 1200 bps interfaces, and the 2400 bps interfaces require a Processor Expansion Unit (I/O Board and additional communications power).

A switched network backup feature can be attached to non-switched 2400 bps interfaces as a backup. The feature is available with and without auto-answer.

SOFTWARE

The System/32 operating system, the System Control Program (SCP), includes a supervisor that occupies 2K bytes of main memory and provides the basic facilities that permit selective loading of programs from the disk, control all input/output operations, provide a program roll-out/roll-in capability, and provide support for data communications transmission. SCP is offered at no additional charge.

Communication between the user and the SCP is provided through an Operation Control Language (OCL). These statements provide the system with information on how a job should be executed, such as the names of files to be processed, where the files are located, and what program to load. Normally, the collection of OCL statements required to direct the execution of a job is stored in procedures in disk storage and can be invoked by entering simple commands through the operator keyboard. Procedures are also

supplied for execution of the utility programs that accompany the System Control Program and for the Industry Application Programs available to System/32 users. New procedures can be developed for user-written applications programs and specialized operations. The System/32 OCL has the capability to prompt the operator to supply required parameters or to specify default values for missing OCL parameters, as well as a logical IF statement that initiates execution of jobs based on conditions tested by the OCL.

Control of all I/O operations is provided by SCP data management routines. Support is provided for the CRT display, the keyboard (including the capability to recognize and interpret special function and command keys), the printer, and the disk unit. The diskette is supported by a Load/Dump utility only. Disk files can be organized in sequential, indexed sequential, or direct fashion.

A roll-out/roll-in capability is provided to suspend processing programs in order to allow an inquiry to be made into the file. The executing program is rolled out to disk storage, the inquiry program is executed, and the interrupted processing program is then returned (rolled in) to main memory to resume processing.

The SCP maintains a system history area on the disk that contains a log of recently executed OCL statements and system activities. The contents of the history area may be displayed on the operator console and printed if desired to provide a record of system processing activity.

Utility programs supplied with the SCP assist the user in preparing and maintaining his disk files. The programs provided include Disk Initialization, Alternate Track Assignment, Alternate Track Rebuild, File and Volume Display, and File Delete. In addition, a set of routines is provided to permit copying of data, programs, and procedures from the diskette to the disk file and to transfer such information from the disk file to the diskette to provide back-up files and off-line storage. The entire system library, selected files, or portions of files can be transferred to diskette files. In order to provide sufficient contiguous storage space for creation of new files, the operator can invoke the COMPRESS OCL procedure to reorganize the contents of the disk file in a contiguous area next to the systems library. The SAVE procedure allows one file or all files to be transferred to diskette with a specified retention period. Files can also be added to existing files saved previously on diskette. Both single- and multiple-volume diskette files can be created. The DELETE procedure permits files to be removed from disk storage to create space for new members.

A recent version of SCP supports word processing functions such as upper/lower case printing and keyboard/display, half-space printing, access to the 5321 Mag Card Unit, and a new data management technique for storing text, as well as a software product, Word Processor/32.

Communications software for the System/32 consists of the RPG II Telecommunications Feature, which provides support for transmission and reception of binary synchronous data over voice-grade or high-speed communications lines, and the two utilities described in this section.

The RPG II Telecommunications Feature permits a System/32 to operate in any of the following communications modes: receive only, transmit only, receive with conversational reply, or alternate transmit only, receive with conversational reply, or alternate transmit and receive file. The feature permits a System/32 executing program written in RPG II to function as a terminal in one of three types of networks: point-to-point switched, point-to-point nonswitched, or multipoint. The System/32 Binary Syn-

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► Chronous Communications support also includes a system utility that permits communications characteristics, such as the line type, line speed, terminal address, and number of error retries, to be specified at program execution time.

The System/32 SNA/SDLC Batch Work Station System Utility sends and receives batch data between a System/32 and a System/370 operating under the Virtual Telecommunications Access Method (VTAM), the Network Control Program (NCP/VS), and DOS/VS POWER VS, CICS/DOS/VS, OS/VS1 Remote Entry Service (RES), OS/VS2 Job Entry Subsystem 2 (JES 2), CICS/OS/VS, or IMS/VS. The utility program operates with SDLC protocol and enables System/32 computers to perform as remote workstations to System/370 Models 115 through 168 that are equipped with 3704 or 3705 Communications Controllers operating under NCP/VS. In addition, the System/32 can act as a 3770 Data Communications System and operate with the CICS/VS communications monitor or the IMS/VS data base management system.

This utility program permits the System/32 to transmit jobs to a System/370 computer and receive output from the central system upon completion of the job. In addition, the System/32 can receive multiple jobs, including control language and data, from a System/370 computer for execution at the local site. The batch workstation utility also includes provisions for compressing blanks and duplicate characters to ensure more efficient data transmission and to expand compressed data transmitted from the central system. A minimum of 7 buffers, each 256 bytes in size, is provided.

Programming systems support is under DOS/VS, OS/VS1, OS/VS2, or any of these operating systems under VM/370. Data security and privacy features for a remote workstation on a 370 under VTAM, NCP, POWER/VS, RES, JES2, CICS/VS, or IMS/VS are applicable to this utility. The utility will run on a System/32 with 16K bytes of memory and BSCA. (BSC Communications Adapter) under the Systems Control Program.

System/32 Multi-Leaving Remote Work Station System Utility (MRJE/WS) permits a System/32 to function as an RJE workstation for submission of jobs to a System/370 under control of HASP II version 3.1 or 4, ASP version 2.6 or 3.1, OS/VS1 RES, OS/VS2 JES2 or JES3, or VM/370 with the Remote Spooling Communications subsystem. Under control of the System/32 SCP and utilizing the BSCA, this utility communicates with a 370 over a point-to-point switched or nonswitched communications line. The keyboard/display acts as the workstation console, and nonremovable disk storage simulates card I/O operation.

Any size record is accepted as input and formatted into 80-character segments for transmission to the 370, where reformatting is the user's responsibility. Any workstation print output may be stored on a temporary disk file and printed later using the supplied print utility. The EBCDIC text transparency capability of BSCA is supported. Details of security and configuration requirements are the same as those listed above for the SNA/SDLC Batch Work Station System Utility.

In addition to the file management utilities supplied with the SCP control program, IBM offers a System/32 Utilities Program Product that provides basic data base management capabilities. This separately priced program product consists of three programs: *Data File Utility (DFU)*, *Sort*, and *Source Entry Utility (SEU)*. The Sort program is similar in function to the System/3 sort, while the DFU and SEU programs are newly written for the System/32.

The Data File Utility (DFU) program provides the following data base management functions: data file creation and

maintenance, data file inquiry, and data file list. All three functions utilize catalogued RPG II File Description and Input Specifications so that the operator need enter only the name of the file and the name of the catalogued RPG II specifications. The utility prompts the operator to enter additional information required to tailor the program to the user's processing requirements.

The Data File Creation and Maintenance function of DFU operates only on indexed sequential files and provides facilities for creating and updating user data files. The program prompts the operator by displaying the field name for the data to be entered on the display console. When updating is being performed, the data currently in the field is displayed to assist the operator. Other features include automatic duplication of fields, control totals, generated record keys, and modulus 10 and 11 self-check digits for verifying entered data.

The Data File Inquiry function of DFU allows inquiries into indexed sequential files. Retrievals are performed by record key, and a function key can be used to roll forward or backward in key sequences through the file. Selected records can be printed with page and column headings.

The Data File List function of DFU provides a report-writing capability for listing and summarizing selected information from indexed or sequential files. Selection of records is based on record types defined in the RPG II input specifications for the file, and the file can be sorted in either ascending or descending order prior to printing, using up to five fields as sort fields. Records may also be selected for printing based upon a comparison of a user-supplied constant or another data field. This selection precedes the sorting function if sorting is specified. Data can be retrieved from a second file based on the use of a field in the records being listed as a key; the retrieved record from the second file is considered as an extension to the original record being listed. A total of 40 fields can be processed per record. Output reports include page and column headings, edited data fields, up to six fields calculated by the use of one of the arithmetic operators and up to four fields or constants, and selected column totals with up to five levels of subtotals.

The System/32 Sort Utility provides basically the same functions as the System/3 sort. Disk files can be sorted in ascending or descending sequence. The Sort program accepts files organized in sequential, indexed, or direct order. It can select records based on a comparison of the contents of a field with a constant or another field or a tag sort in which only the control field and a record address are retrieved. A summary sort groups records with similar control fields and summarizes designated numeric fields into a single summary record. The Sort program automatically allocates disk space for a work file and can handle indexed, direct, and sequential file organizations.

The Source Entry Utility (SEU) program can be used to create and maintain user-written OCL procedures, RPG II source code statements, and Sort source code statements. The SEU is accompanied by Sort, RPG II, and Auto Report format descriptions to aid the user in entering source statements correctly. Functions include the capability to move statements within source or procedure members in new members, to insert up to 99 new statements into an already-existing member, and to delete selected statements. A function key can be used to roll backward or forward through the code to locate a selected statement. A record being entered or updated is displayed on the operator display screen as the data is entered. Optional functions available with SEU are the capability to perform syntax diagnosis on RPG II and Auto Report source statements as they are entered and the capability to resequence statements in a source-code member. ►

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► **RPG II** is currently the only programming language available for the System/32. The programmer, using up to six different preprinted coding forms, prepares a set of specifications that describe the form of the input data, the calculations to be performed, and the format of the desired output. RPG II for the System/32 offers essentially the same features as the System/3 Model 6 RPG II, with variations in the data management facilities for the support of System/32 input/output devices. For example, the SET/KEY display support feature provided with the System/3 Model 6 has been replaced by an operator prompting function that can display messages stored in a program or in the system library. In addition, the System/32 RPG II Interactive Data Entry (IDE) function permits the console to be used as an interactive data entry device. Data can be entered through the system keyboard, displayed for reference on the display screen, and routed to an executing RPG II program for processing. The program provides operator prompting on the CRT display. A program can be assigned one IDE file, which can accommodate various types of records from 4 to 160 characters in length. The IDE program is automatically generated by RGP II when CONSOLE is specified as the Device on the File Description Sheet.

The RPG II Auto Report Feature is an optional precompiler that reduces the coding effort required to prepare report programs. A single Auto Report output field specification written by the programmer can result in the generation of RPG II statements to indicate printing with editing, insert column headings, control spacing and horizontal alignment of the data, define total fields, accumulate totals by control levels, and flag total lines with asterisks. The Auto Report functions may be specified for only one printer file in any RPG II program. Auto Report also provides a COPY statement that permits RPG II source statements to be copied from a disk library into source programs that are about to be compiled.

RPG II Telecommunications Feature is an optional extension of System/32 RPG II that facilitates the transmission and reception of binary synchronous data over voice-grade or high-speed communications lines. The programmer fills out an RPG II Telecommunications Specification Sheet, which specifies the functions to be performed. The feature permits a System/32 equipped with the BSCA to operate in any of the following communications modes: receive only, transmit only, receive with conversational reply, transmit only, receive with conversational reply, transmit with conversational reply, or alternate transmit and receive file. The System/32 can function as a terminal in one of three types of networks: point-to-point switched, point-to-point nonswitched, or multi-point.

The Data Collection Support Product for 5230 system accommodates 80- or 96-column card, diskette, and/or BSC teleprocessing inputs. Its function is to edit, verify, format, and consolidate data from an IBM 5230 Data Collection System. The data, once processed, is transferred to payroll, inventory management, production status, and costing master files. These master files are used in the IBM Manufacturing Management Accounting System in such areas as product costing, inventory, requirements planning, capacity planning, and production control.

The 5230 Data Collection System is composed of 5234 Time Entry Stations and 5235 Data Entry Stations connected to a 5231 Controller. Time Entry Stations can read punched-hole or magnetic badges. Data Entry Stations can read 80- or 96-column cards and/or hole and magnetic badges. The 5234 also has the facility for keyed numeric entry of up to three 8-digit fields. The 5231 Controller can handle up to 15 time and/or data entry stations in any combination and is nonprogrammable. The 5231 Model 1 provides 96-column punched card output, while the 5231 Model 3 provides 80-column punched card output. The

5231 Model 2 provides diskette output and the facility for transmission over a switched or nonswitched point-to-point BSCA communications line at 600, 1200, 2000 or 2400 bps.

The Word/Processor/32 program product utilizes the 5321 Mag Card Unit and enhancements to the System/32 to provide word processing capabilities. Word processing functions for automatic generation, revision, and formatting of documents can be entered from the System/32 console/keyboard or via prerecorded magnetic cards or diskettes. Documents are generated on the system printer, with options available for upper and lower case printing, and half-spacing for producing right-justified text. System/32's in use for data processing can utilize existing data files for document creation. Production statistics are an automatic by-product of this program product.

The current System/32 software complement includes 15 *Industry Application Programs* that provide routines to perform the data processing functions required by small businesses in the selected industry areas. Each IAP package also includes detailed operator instructions and the OCL procedures required for execution of the programs. All IAP's are written on RPG II and are distributed on IBM-owned diskettes. Various techniques are provided for tailoring the programs to satisfy specialized user requirements.

The applications include accounting and management systems, financial systems, CPA client accounting systems, medical applications, payroll systems, a mailing and membership list system, and manufacturing systems. The accounting and management systems are available for the following industries: lumber, food distribution, tire distribution, wholesale wine and distilled beverage distributors, hand goods, manufacturing, and construction.

COMPONENTS

PROCESSOR: The System/32 central processing unit is a microprocessor that uses bipolar logic circuits and is physically located on a swing-open gate in the lower left front portion of the cabinet. A 4K, 16-bit word MOSFET writable control storage contains the microprograms that control processor operations. MOSFET user memory with a cycle time of 600 nanoseconds per 1-byte access is expandable to 32K bytes from the basic 16K bytes.

DISK STORAGE: Depending upon the model selected, non-removable disk storage of 3,210,240, 5,053,440, 9,169,920, or 13,777,920 bytes is an integral component of the system. The disk unit consists of either 104, 164, or 298 cylinders of 2 tracks each or 299 cylinders of 3 tracks each. Each track, in turn, contains 60 sectors of 256 bytes each.

All data is recorded on one side of a single fixed disk that is served by two read/write heads mounted on a pivoting access arm. The disk is mounted vertically in the lower left part of the System/32 cabinet, behind the CPU logic and main memory.

The disk rotational speed is 2964 rpm, yielding a nominal data transfer rate of 889,000 bytes per second and an average rotational delay (latency) of 10.1 milliseconds. Head positioning times for the four models, in milliseconds, are as follows:

	Average	Minimum	Maximum
3.2-megabyte unit:	50.4	13	121
5.0-megabyte unit:	70	13	180
9.1-megabyte unit:	72.5	14.2	167
13.7-megabyte unit:	72.5	14.2	166.9

DISKETTE DRIVE: A single drive unit that reads and writes data on flexible diskettes is an integral component of ►

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every System/32. The IBM diskette (or "floppy disk") is a small, flexible, reusable magnetic disk that is permanently enclosed in a protective jacket about eight inches square and a fraction of an inch thick. The data capacity of each diskette is 242,944 bytes (1898 records of 128 bytes each) when used to exchange data between a System/32 and a 3740 Data Entry System or other IBM equipment. Diskettes to be used exclusively with a System/32 can contain up to 246,272 bytes of data in the standard format (128-byte sectors) or 303,104 bytes in "extended" format (512-byte sectors).

Data is read from or written on a diskette at a nominal speed of 31,250 bytes per second. Diskette records can be read at the rate of up to 3400 128-byte records per minute and written and verified at up to 1800 128-byte records per minute.

KEYBOARD: The System/32 keyboard is used by the operator to enter data and control the system's functions. It consists of a standard typewriter keygroup, a 10-key numeric keygroup arranged in adding-machine fashion, and a group of function keys. In addition, the typewriter keys in the top row are dual-defined, providing a total of 24 command keys for controlling program functions.

A small operator panel, located at the right of the keyboard, contains the power on/off switch: LOAD, START, and STOP keys; and indicator lights that signify Keyboard Ready, Processor Check, Thermal Check, and Power Check conditions. The power on/off switch can be replaced by an optional key-operated switch that protects against unauthorized use of the system.

DISPLAY: A small CRT display screen, located just to the left of the keyboard and printer, is an integral component of every System/32. It can display up to 240 characters of information in 6 lines of 40 characters each. The display is used to provide operator guidance, input verification, and auxiliary output under program control. The System/32 will normally be programmed to display all data entered via the keyboard so that the operator can verify its accuracy before the system acts upon it.

SERIAL PRINTER: A serial matrix printer is an integral component of every System/32 Model A. Three different serial printers are currently available: a unidirectional model rated at 40 characters per second, and two bidirectional models rated at 40 and 80 characters per second. Matrix characters are formed by 8 wires arranged in a vertical array, with each wire printing dots in up to 4 of 7 possible horizontal positions. The character set consists of 64 symbols, and there are 132 print positions, spaced 10 to the inch. Vertical spacing is 6 lines per inch. A variable-width forms tractor feeds continuous forms ranging from 3-1/2 to 14-7/8 inches in width. Forms with up to 6 parts and a maximum thickness of 0.018 inch can be handled. Ledger cards and other precut forms can be processed singly in typewriter fashion.

LINE PRINTER: A horizontal-belt line printer is an integral component of every System/32 Models B and C. The rated printing speed, in lines per minute, depends upon the specific model and character set chosen, as follows:

	48-Character Set	64-Character Set	96-Character Set
Models B11, B12, B13, B14	50	50	50
Models B21, B22, B23, B24	100	100	80
Models B31, B32, B33, B34	155	120	80
Models C41, C42, C43, C44	285	225	160

Characters are formed by means of an interchangeable metal print belt with an engraved type font in one of three character sets: 48-character EBCDIC, 64-character EBCDIC, 64-character ASCII, or 96-character dual case modified Courier or Artisan. There are 132 print positions, spaced 10 to the inch. Vertical spacing is 6 lines per inch. A variable-width forms tractor feeds continuous forms ranging from 3-1/2 to 14-7/8 inches in width. Forms with up to 6 parts and a maximum thickness of 0.020 inch can be handled. The use of card stock is not recommended.

PUNCHED CARD EQUIPMENT: The 96-column Data Recorder has a 64-character set, four program levels, buffered I/O areas, a 350-card hopper and stacker, and reads/punches/prints up to 21 cards per minute. To attach the unit locally requires the Data Recorder Attachment feature and the 7850 Interface feature.

The 80-column Data Recorder has either a 48- or 64-character set, six program levels, buffered I/O, a 500-card hopper, and a 500-card stacker. It reads at 50 cpm and punches/prints at between 12 and 50 cpm. To attach the unit locally requires the Data Recorder Attachment feature and the 8021 Interface feature.

MAGNETIC CARD EQUIPMENT: The magnetic card reader/recorder utilizes a magnetic card that can contain up to 5100 characters of data on 50 tracks, with each track containing 102 characters. The cards are read at a rate of 230 milliseconds per track and recorded at a rate of 450 milliseconds per track. The card hopper accommodates 50 cards.

PRICING

All System/32 components are available under the terms of IBM's Rental or Lease Agreement (LRA) or for purchase. LRA includes prime shift maintenance; a separate contract is available for purchased units.

Basically, LRA provides for month-to-month rental or for a three-year lease with penalties for early termination (including model downgrades and feature termination). The lease can be extended indefinitely, one year at a time. The monthly charges for the lease arrangement are generally 15 percent lower than the month-to-month arrangement. The prime shift maintenance period is for any consecutive nine hours between 7 AM and 6 PM, Monday through Friday. (The maintenance charges given in the accompanying price list are for prime shift maintenance for purchased equipment and also serve as the basis for calculating extended charges for rented or leased equipment.) Extended period maintenance is available up to 24 hours per day, 7 days per week.

The termination charge for the lease arrangement is the lower of 2 months' charges or 10 percent of the remaining value of the lease.

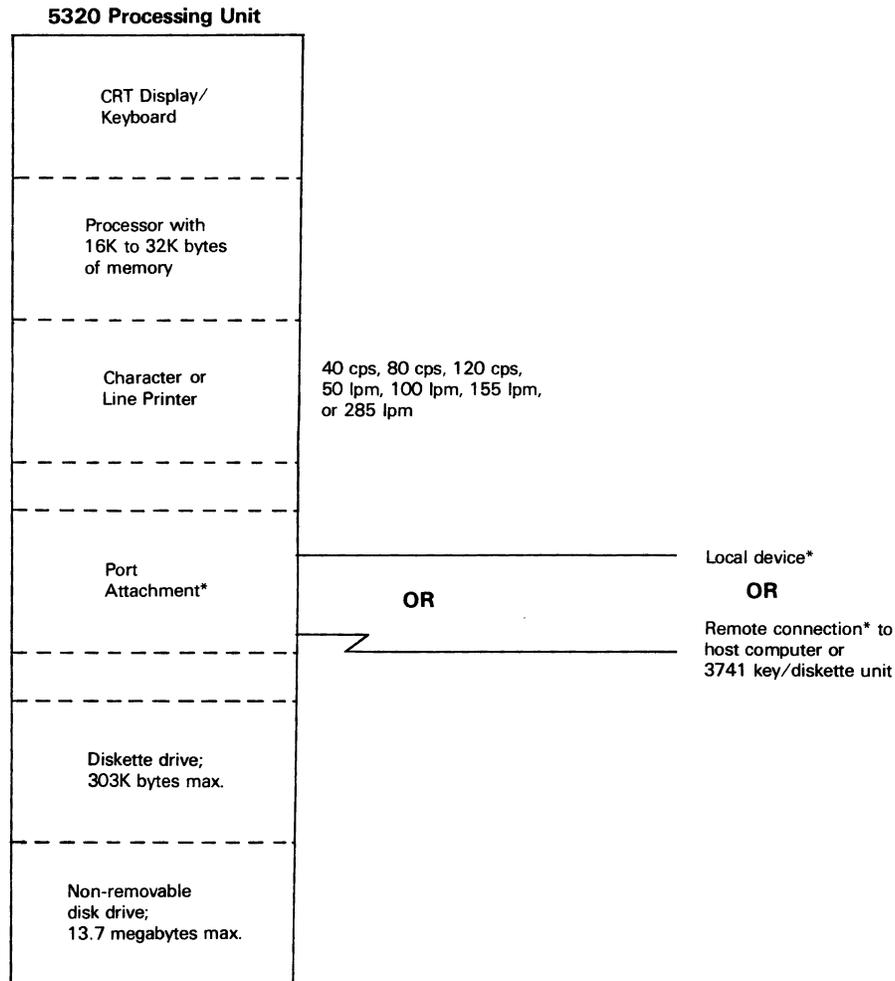
All components are in maintenance category D. The category determines the schedule of extended maintenance charges. The premium for extended maintenance is expressed in the table below as a percentage of the basic maintenance charges, which are listed in the accompanying price list.

	Consecutive Hours				
	9*	12	16	20	24
Monday-Friday	10%	16%	22%	28%	34%
Saturday	5	6	8	10	11
Sunday	6	8	10	12	14

*For periods outside the basic 7 AM to 6 PM prime shift. ➤

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Configuration



<u>*Port Attachment Feature</u>	<u>Interface Feature</u>	<u>Local Device or Communications Line</u>
3200	8021	80-column keypunch
3200	7850	96-column keypunch
1100	—	MICR document reader/sorter or magnetic card reader/recorder
4900	—	Magnetic card reader/recorder (B models only)
2074	3701, 550X, or 56XX	BSC; integrated 1200 or 2400 bps or external modem
6301	3701, 550X, or 56XX	SDLC; integrated 1200 or 2400 bps or external modem

► The lease arrangement also guarantees a maximum rate of increases for extended leasing periods. The rate for all components is five percent per year beginning in the second year of the lease.

All components are classed under rental category B (unlimited usage) and warranty category B (three months). Purchase credits can be accrued up to a maximum of 45 percent. ►

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Monthly Charge**

		Rental Contract	Lease Contract	Purchase Price	Monthly Maint.
5230 System Unit (includes CPU, 16K bytes of main storage, fixed-disk storage unit, diskette drive, printer, keyboard, and display):					
A01	40 cps unidirectional printer, 3.2 MB disk storage	\$ 748	\$ 680	\$33,560	\$160.00
A02	40 cps unidirectional printer, 5.0 MB disk storage	825	750	34,160	160.00
A03	40 cps unidirectional printer, 9.1 MB disk storage	922	838	37,280	170.00
A04	40 cps unidirectional printer, 13.7 MB disk storage	982	893	39,280	180.00
A11	40 cps bidirectional printer, 3.2 MB disk storage	803	730	33,810	165.00
A12	40 cps bidirectional printer, 5.0 MB disk storage	880	800	34,410	165.00
A13	40 cps bidirectional printer, 9.1 MB disk storage	977	888	47,530	175.00
A14	40 cps bidirectional printer, 13.7 MB disk storage	1,037	943	39,530	185.00
A21	80 cps bidirectional printer, 3.2 MB disk storage	848	771	34,020	170.00
A22	80 cps bidirectional printer, 5.0 MB disk storage	925	841	34,620	170.00
A23	80 cps bidirectional printer, 9.1 MB disk storage	1,022	929	37,740	180.00
A24	80 cps bidirectional printer, 13.7 MB disk storage	1,082	984	39,740	190.00
A31	120-cps bidirectional printer, 3.2 MB disk storage	893	812	34,230	175.00
A32	120-cps bidirectional printer, 5.0 MB disk storage	970	882	34,830	175.00
A33	120-cps bidirectional printer, 9.1 MB disk storage	1,067	970	37,950	195.00
A34	120-cps bidirectional printer, 13.7 MB disk storage	1,128	1,025	39,950	195.00
B11	50 lpm line printer, 3.2 MB disk storage	917	834	38,380	185.00
B12	50 lpm line printer, 5.0 MB disk storage	994	904	38,980	185.00
B13	50 lpm line printer, 9.1 MB disk storage	1,091	992	42,100	195.00
B14	50 lpm line printer, 13.7 MB disk storage	1,152	1,047	44,100	205.00
B21	100 lpm line printer, 3.2 MB disk storage	992	902	38,480	195.00
B22	100 lpm line printer, 5.0 MB disk storage	1,069	972	39,080	195.00
B23	100 lpm line printer, 9.1 MB disk storage	1,166	1,060	42,200	205.00
B24	100 lpm line printer, 13.7 MB disk storage	1,227	1,115	44,200	215.00
B31	155 lpm line printer, 3.2 MB disk storage	1,067	970	38,690	205.00
B32	155 lpm line printer, 5.0 MB disk storage	1,144	1,040	39,290	205.00
B33	155 lpm line printer, 9.1 MB disk storage	1,241	1,128	42,410	215.00
B34	155 lpm line printer, 13.7 MB disk storage	1,301	1,183	44,410	225.00
C41	285-lpm line printer, 3.2 MB disk storage	1,249	1,135	44,690	230.00
C42	285-lpm line printer, 5.0 MB disk storage	1,326	1,205	45,290	230.00
C43	285-lpm line printer, 9.1 MB disk storage	1,422	1,293	48,410	240.00
C44	285-lpm line printer, 13.7 MB disk storage	1,483	1,348	50,410	250.00
1005	Additional main storage; 8192 bytes (maximum 2)	42	38	878	2.50

Port Attachments

3200	Data Recorder Attachment	71	65	2,525	6
1100	MICR Reader/Sorter Attachment	248	225	8,775	25
4900	Magnetic Card Attachment	73	67	2,800	4
2074	Binary Synchronous Communications Adapter	95	90	3,600	10
6301	Synchronous Data Link Control Communications Adapter	116	110	4,400	15

Line Interfaces

3701	EIA Line Interface	12	11	420	4.50
5500	1200 bps integrated modem, non-switched point-to-point	19	18	660	5
5501	1200 bps integrated modem, switched with auto-answer	25	24	880	7
4703	Internal clock (required for 5500, 5501)	12	11	210	.50
5600	2400 bps integrated modem, non-switched point-to-point	68	65	2,240	11.50
5602	2400 bps integrated modem, non-switched multipoint tributary	75	71	2,490	13
5610	2400 bps integrated modem, switched with auto-answer	76	72	2,550	14
5733	Processing unit expansion (required for 5600, 5602, 5610)	8	8	320	.50
7951	Switched network backup (for 5600, 5602)	11	10	357	3.50
7952	Switched network backup with Auto-Answer (for 5600, 5602)	16	15	535	5

Workstation Options

3400	Upper/lower case keyboard/display (B model only)	26	24	1,000	1
4530	Half-line vertical space printing (B model only)	15	14	600	.50
4655	Keylock	—	—	72	—

Punched Card Units

8201	Interface	70	—	1,770	9
129-2	80-column reader/punch (Data Recorder)	163	—	5,450	52.50
7850	Interface	51	—	1,720	16.50
5496-1	96-column reader/punch (Data Reader)	185	—	5,935	59.50

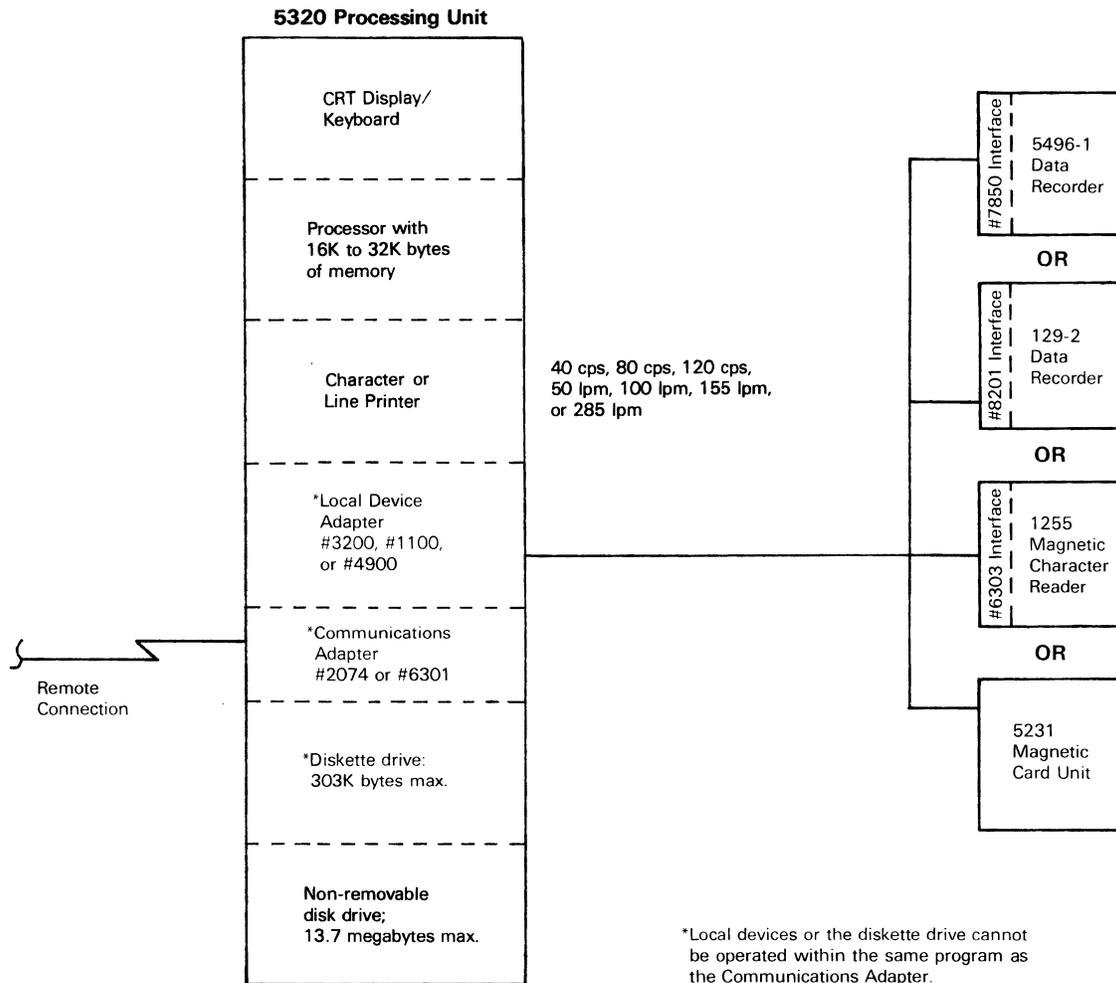
Magnetic Card Unit

5321	Magnetic Card reader/recorder	255	217	10,200	55
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*Includes monthly maintenance charge.

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Configuration



► Characters are formed by means of an interchangeable metal print belt with an engraved type font in one of three character sets: 48-character EBCDIC, 64-character EBCDIC, 64-character ASCII, or 96-character dual case modified Courier or Artisan. There are 132 print positions, spaced 10 to the inch. Vertical spacing is 6 lines per inch. A variable-width forms tractor feeds continuous forms ranging from 3-1/2 to 14-7/8 inches in width. Forms with up to 6 parts and a maximum thickness of 0.020 inch can be handled. The use of card stock is not recommended.

PUNCHED CARD EQUIPMENT: The Model 5496-1 96-column Data Recorder has a 64-character set, four program levels, buffered I/O areas, a 350-card hopper and stacker, and reads/punches/prints up to 21 cards per minute. To attach the unit locally requires the Data Recorder Attachment feature and the 7850 Interface feature.

The Model 129-2 80-column Data Recorder has a switchable 48- or 64-character set, six program levels, buffered I/O, a 500-card hopper, and a 500-card stacker. It reads at 50 cpm and punches/prints at between 12 and 50 cpm. To attach the unit locally requires the Data Recorder Attachment feature and the 8201 Interface feature.

MAGNETIC CARD EQUIPMENT: The Model 5231 Magnetic Card Reader/Recorder utilizes a magnetic

card that can contain up to 5100 characters of data on 50 tracks, with each track containing 102 characters. The cards are read at a rate of 230 milliseconds per track and recorded at a rate of 450 milliseconds per track. The input card hopper accommodates 50 cards; the output stacker, 60 cards. To attach the unit locally requires the Magnetic Card Attachment feature.

MAGNETIC CHARACTER READER: Three models of 1255 MICR readers are offered, including a 500 document-per-minute, 6-stacker model; a 750-dpm, 6-stacker model; and a 750-dpm, 12-stacker model. All models handle documents 5.75 to 8.875 inches long and 2.5 to 4.25 inches wide. To attach the unit locally requires the MICR Reader/Sorter Attachment feature and the 6303 Interface feature.

PRICING

All System/32 components are available under the terms of IBM's Rental or Lease Agreement (LRA) or for purchase. LRA includes prime shift maintenance; a separate contract is available for purchased units.

Basically, LRA provides for month-to-month rental or for a three-year lease with penalties for early termination (including model downgrades and feature termination). The lease can be extended indefinitely, one year at a time. The monthly

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► charges for the lease arrangement are generally 15 percent lower than the month-to-month arrangement. The prime shift maintenance period is for any consecutive nine hours between 7 AM and 6 PM, Monday through Friday. (The maintenance charges given in the accompanying price list are for prime shift maintenance for purchased equipment and also serve as the basis for calculating extended charges for rented or leased equipment.) Extended period maintenance is available up to 24 hours per day, 7 days per week.

The termination charge for the lease arrangement is the lower of 2 months' charges or 10 percent of the remaining value of the lease.

All basic components are in maintenance category D (unlimited usage). The category determines the schedule of extended maintenance charges. The premium for extended maintenance is expressed in the table below as a percentage of the basic maintenance charges, which are listed in the accompanying price list.

Consecutive Hours

	9*	12	16	20	24
Monday-Friday	10%	12%	14%	16%	18%
Saturday	4	5	7	8	9
Sunday	5	7	9	11	12

*For periods outside the basic 7 AM to 6 PM prime shift.

The lease arrangement also guarantees a maximum rate of increases for extended leasing periods. The rate for all components is five percent per year beginning in the second year of the lease.

All basic components are classed under warranty category B (three months). Purchase credits can be accrued up to a maximum of 45 percent.

Monthly Charge*

		Rental Contract	Lease Contract	Purchase Price	Monthly Maint.
5320 System Unit (includes CPU, 16K bytes of main storage, fixed-disk storage unit, diskette drive, printer, keyboard, and display):					
A01	40 cps unidirectional printer, 3.2 MB disk storage	\$ 925	\$ 841	\$23,490	\$160
A02	40 cps unidirectional printer, 5.0 MB disk storage	1,016	924	23,910	160
A03	40 cps unidirectional printer, 9.1 MB disk storage	1,126	1,024	26,100	170
A04	40 cps unidirectional printer, 13.7 MB disk storage	1,199	1,091	27,500	180
A11	40 cps bidirectional printer, 3.2 MB disk storage	985	896	23,670	165
A12	40 cps bidirectional printer, 5.0 MB disk storage	1,076	979	24,090	165
A13	40 cps bidirectional printer, 9.1 MB disk storage	1,186	1,079	26,280	175
A14	40 cps bidirectional printer, 13.7 MB disk storage	1,259	1,146	27,680	185
A21	80 cps bidirectional printer, 3.2 MB disk storage	1,039	946	23,820	170
A22	80 cps bidirectional printer, 5.0 MB disk storage	1,130	1,029	24,240	170
A23	80 cps bidirectional printer, 9.1 MB disk storage	1,240	1,129	26,430	180
A24	80 cps bidirectional printer, 13.7 MB disk storage	1,313	1,196	27,830	190
A31	120 cps bidirectional printer, 3.2 MB disk storage	1,093	996	23,970	175
A32	120 cps bidirectional printer, 5.0 MB disk storage	1,184	1,079	24,390	175
A33	120 cps bidirectional printer, 9.1 MB disk storage	1,294	1,179	26,580	185
A34	120 cps bidirectional printer, 13.7 MB disk storage	1,367	1,246	27,980	195
B11	50 lpm line printer, 3.2 MB disk storage	1,117	1,018	26,870	185
B12	50 lpm line printer, 5.0 MB disk storage	1,208	1,101	27,290	185
B13	50 lpm line printer, 9.1 MB disk storage	1,318	1,201	29,480	195
B14	50 lpm line printer, 13.7 MB disk storage	1,391	1,268	30,880	205
B21	100 lpm line printer, 3.2 MB disk storage	1,202	1,096	26,940	195
B22	100 lpm line printer, 5.0 MB disk storage	1,293	1,179	27,360	195
B23	100 lpm line printer, 9.1 MB disk storage	1,403	1,279	29,550	205
B24	100 lpm line printer, 13.7 MB disk storage	1,476	1,346	30,950	215
B31	155 lpm line printer, 3.2 MB disk storage	1,287	1,174	27,090	205
B32	155 lpm line printer, 5.0 MB disk storage	1,378	1,257	27,510	205
B33	155 lpm line printer, 9.1 MB disk storage	1,488	1,357	29,700	215
B34	155 lpm line printer, 13.7 MB disk storage	1,561	1,424	31,100	225
C41	285-lpm line printer, 3.2 MB disk storage	1,501	1,369	31,290	230
C42	285-lpm line printer, 5.0 MB disk storage	1,592	1,452	31,710	230
C43	285-lpm line printer, 9.1 MB disk storage	1,702	1,552	33,900	240
C44	285-lpm line printer, 13.7 MB disk storage	1,775	1,619	35,300	250
1005	Additional main storage; 8192 bytes (maximum 2)	36	33	393	2.50
1500	Control Storage Increment	36	33	393	2.50

Port Attachments

3200	Data Recorder Attachment	86	79	1,770	6
1100	MICR Reader/Sorter Attachment	290	264	8,775	25
4900	Magnetic Card Attachment	89	81	2,800	4
2074	Binary Synchronous Communications Adapter	119	109	2,520	10
6301	Synchronous Data Link Control Communications Adapter	147	134	3,080	15

*Includes monthly maintenance charge.

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Monthly Charge*

		<u>Rental Contract</u>	<u>Lease Contract</u>	<u>Purchase Price</u>	<u>Monthly Maint.</u>
Magnetic Character Readers					
1255-1	MICR reader/sorter; 5 sort pockets, 1 reject stacker, 500 dpm	904	—	35,460	251
1255-2	MICR reader/sorter; 5 sort pockets, 1 reject stacker, 750 dpm	1,100	—	40,590	400
1255-3	MICR reader/sorter; 10 sort pockets, 2 select/reject stackers, 750 dpm	1,450	—	55,260	527

*Includes monthly maintenance charge.

SOFTWARE

	<u>Initial Charge</u>	<u>Monthly License Charge</u>
System/32 RPG II	—	\$ 27
System/32 Utilities Program Product; includes Data File Utility, SORT, and Source Entry Utility	—	15
System/32 Data Collection System Support Package Word Processor/32	500	26
	—	125■

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Monthly Charge**

		<u>Rental Contract</u>	<u>Lease Contract</u>	<u>Purchase Price</u>	<u>Monthly Maint.</u>
Line Interfaces					
3701	EIA Line Interface	12	11	420	4.50
5500	1200 bps integrated modem, non-switched point-to-point	21	19	660	5
5501	1200 bps integrated modem, switched with auto-answer	28	26	880	7
4703	Internal clock (required for 5500, 5501)	6	6	210	0.50
5600	2400 bps integrated modem, non-switched point-to-point	82	75	2,240	11.50
5602	2400 bps integrated modem, non-switched multipoint tributary	90	87	2,490	13
5610	2400 bps integrated modem, switched with auto-answer	91	83	2,550	14
5733	Processing unit expansion (required for 5600, 5602, 5610)	8	8	224	0.50
7951	Switched network backup (for 5600, 5602)	11	10	250	3.50
7952	Switched network backup with Auto-Answer (for 5600, 5602)	18	16	375	5
Workstation Options					
3400	Upper/lower case keyboard display (B and C Models only)	31	28	1,000	1
4530	Half-line vertical space printing (B and C Models only)	15	14	600	0.50
4655	Keylock	—	—	72	—
Punched Card Units					
8201	Interface	84	—	1,330	12
129-2	80-column reader/punch (Data Recorder)	200	—	4,090	72.50
7850	Interface	60	—	1,160	21.50
5496-1	96-column reader/punch (Data Recorder)	227	—	4,005	78
Magnetic Card Unit					
5321	Magnetic Card reader/recorder	255	217	10,200	55
Magnetic Character Readers					
6303	Interface	150	—	5,600	4.50
1255-1	MICR reader/sorter; 5 sort pockets, 1 reject stacker, 500 dpm	1,015	—	37,230	302
1255-2	MICR reader/sorter; 5 sort pockets, 1 reject stacker, 750 dpm	1,155	—	42,610	483
1255-3	MICR reader/sorter; 10 sort pockets, 2 select/reject stackers, 750 dpm	1,625	—	58,020	636

*Includes monthly maintenance charge.

SOFTWARE

	<u>Monthly License Charge</u>
System/32 RGP II	\$ 34
System/32 Utilities Program Product; includes Data File Utility, SORT, and Source Entry Utility	16
FORTRAN IV	75
Basic Assembler Language and Macro Processor Program Product	93
File Conversion Utility	52
Word Processor/32	165 ■

