IBM System/3 Model 10

A drawer beneath the 5424 Multi-Function Card Unit houses the compact 5444 Disk Storage Drive and its removable single-disk cartridge.

The System/3, IBM's low-cost computer for small-scale business data processing, has aroused controversy because of its new 96-column punched card and limited compatibility with other current equipment. Recent announcements have greatly increased the System/3's power and broadened its sales appeal.

MANAGEMENT SUMMARY

As announced on July 30, 1969, the IBM System/3 was oriented primarily toward filling the business data processing needs of small companies that had not previously used computers. For these "entry" users, the System/3 clearly had—and still has—a lot to offer: compactness, ease of operation, surprisingly high internal speed, and an attractively low price-tag.

But when viewed by companies that were already using computers, and by first-time users who had familiarized themselves with competitive equipment, the original System/3 had some serious limitations. It offered little upward compatibility with the larger IBM computers. Its new 96-column card, though compact and easy to handle, was incompatible with all existing punched card equipment. It offered no data communications capabilities. Its printing and disk access speeds were way below par. Its disk storage capacities were quite limited. And it offered no compiler for the widely used COBOL or FORTRAN language.

Between February 1970 and March 1971, a series of IBM product announcements eliminated most of these limitations and greatly broadened the system's sales appeal. As a result, the System/3 now has something to offer practically every prospective buyer of a small-scale computer. It ▷

CHARACTERISTICS

MANUFACTURER: International Business Machines Corporation, 112 East Post Road, White Plains, N.Y. 10601.

MODEL: System/3 Model 10.

DATA FORMATS

BASIC UNIT: 8-bit byte. Each byte can represent 1 alphanumeric character, 1 BCD digit, or 8 binary bits.

FIXED-POINT OPERANDS: Can range from 1 to 16 digits for source fields and from 1 to 31 digits for result fields. Logical operands can range from 1 to 256 bytes.

FLOATING-POINT OPERANDS: No facilities for floating-point arithmetic are provided.

INSTRUCTIONS: 4, 5, or 6 bytes long in 2-address format; 3 or 4 bytes long in 1-address format; 3 bytes long in command format. (Each address can be represented by either a 2-byte direct address or a 1-byte "displacement," and all instructions contain a 1-byte operation code and a 1-byte "Q" code.)

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

MAIN STORAGE

STORAGE TYPE: Magnetic core.

CAPACITY: 8,192, 12,288, 16,384, 24,576, 32,768, or 49,152 bytes.

CYCLE TIME: 1.52 microseconds per 1-byte access.

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

STORAGE PROTECTION: None.

CENTRAL PROCESSOR

INDEX REGISTERS: Two 16-bit base registers. The contents of either register can be added to a one-byte address (or "displacement") contained in an instruction, permitting base-plus-displacement addressing of any higher storage location within 256 bytes of the base address contained in the register. ▶

IBM System/3 Model 10

▷ is equally well suited for use as a stand-alone business data processing system or as a programmable batch terminal in a data communications network. And it now represents an attractive upgrade machine for users of the IBM 1130, System/360 Model 20, and other small-scale computers as well as users of punched-card tabulating equipment.

In October 1970, IBM introduced the System/3 Model 6, a keyboard-oriented system designed to appeal to current users of accounting machines or time-sharing terminals. Simultaneously, the original System/3 was designated the System/3 Model 10. The Model 6, which is strikingly different from the Model 10 in its peripheral equipment, software, and applications orientation, is fully described in the preceding report (70C-491-21).

Hardware rental prices for the System/3 Model 10 begin at $945 per month for card systems and $1,325 per month for disk systems. Overall costs to System/3 users, however, will generally be substantially higher than these figures because the software, education, and systems engineering assistance are all separately priced under IBM's "unbundling" policy. When comparing the System/3 with competitive equipment, prospective users should carefully consider the amounts of these "extras" they will need and the associated costs.

First customer deliveries of card-oriented System/3 configurations were made in January 1970, just six months after announcement. Deliveries of disk systems began in the third quarter of 1970. More than 1500 systems have been installed to date, and most of the early System/3 users seem well pleased with the system's reliability, effectiveness, and simplicity of operation.

Designed mainly for "entry" users who are installing their first computers, the System/3 is rapidly superseding the IBM 1130 and System/360 Model 20 computers in this important phase of the market. The 1130 was designed as a small-scale scientific computer, but it has also been employed in many business applications where users were unable to afford a Model 20. The System/3, with its clear-cut orientation toward business data processing requirements, represents a far more appropriate choice than the 1130 for most installations of this type. The System/3 is considerably less expensive and easier to use than the System/360 Model 20, though it still can't match the Model 20's card, tape, and program compatibility with the larger System/360 and System/370 models.

The System/3 processing unit is byte-oriented and uses IBM's integrated "Monolithic Systems Technology" (MST). Nearly all of the associated peripheral equipment is completely new. The key input/output device, required ▷

INDIRECT ADDRESSING: None.

INSTRUCTION REPERTOIRE: 28 instructions, including 2-address addition and subtraction of unpacked (1 digit per byte) decimal operands, but no multiply or divide. Also included are an edit instruction and addition, subtraction, and comparison of logical characters.

INSTRUCTION TIMES: The following times, in microseconds, assume the use of direct (2-byte) operand addresses.

Decimal add (5 digits):	24.4
Decimal subtract (5 digits):	24.4
Binary (logical) add (5 bytes):	24.4
Binary (logical) subtract (5 bytes):	24.4
Move (5 bytes):	24.4
Compare (5 bytes):	24.4
Edit (5 digits):	24.4
Load or store register (2 bytes):	9.1
Add to register (2 bytes):	9.1
Jump on condition:	4.56

INTERRUPTS: There are five levels of program interrupts, in descending priority order: (1) Serial I/O Channel, (2) Unassigned, (3) BSCA, (4) Data Entry Keyboard or Printer-Keyboard, and (5) Dual Program Control (Interrupt Key). Any level of interrupt can interrupt the main program or the servicing of any lower-level interrupt. An interrupt causes a transfer of control to a predetermined location; the interrupt servicing program must store and then restore the index registers and program status register for the interrupted program.

OPTIONAL FEATURE: The Dual Program feature permits independent loading and processing of two simultaneous programs. The operator can initiate, restart, or terminate either program independently of the other one. Whenever one of the two programs halts to await completion of an I/O operation, the other program is automatically initiated. (The feature is software-supported only for disk-oriented systems with at least 12K bytes.)

Extra-cost features, called attachments, controls, or channels, must be added to the 5410 Processing Unit to accommodate each of the standard peripheral devices.

INPUT/OUTPUT CONTROL

CONFIGURATION RULES: Every System/3 requires one 5410 Processing Unit, one 5203 or 1403 Printer, and one 5424 Multi-Function Card Unit. In addition, a maximum of two 5444 Disk Storage Drives, two 5445 Disk Storage Drives, one 1255 Magnetic Character Reader, and one 5471 Printer-Keyboard or 5475 Data Entry Keyboard can be connected. To utilize IBM software support, disk-oriented systems must include at least 12K bytes of core storage and one 5444 Disk Storage Drive.

I/O CHANNELS: The 5410 Processing Unit acts as a controller for all System/3 I/O operations. All I/O devices are connected, via the appropriate attachment features, to a single I/O attachment interface called the Input/Output Channel. The channel includes logic to establish the "cycle-stealing" and interrupt priorities and to perform code translations between the punched card and internal EBCDIC codes. ►

IBM System/3 Model 10

▷ in all System/3 Model 10 installations, is the 5424 Multi-Function Card Unit (MFCU). The MFCU, like the 2560 Multi-Function Card Machine used in the System/360 Model 20, can perform the functions of card reading, punching, collating, and interpreting. Consolidation of all these functions into a single compact unit leads to reduced equipment costs and card handling time, but the complexity of the unit could also lead to increased maintenance problems.

The System/3 hardware is compact and well-designed. The basic system—consisting of processing unit, printer, and MFCU—requires only 150 square feet of floor space. Moreover, the units are interconnected by concealed, above-the-floor cables, eliminating the need for a raised floor. The optional disk storage drives are housed in drawers under the MFCU. The system console, MFCU, disk drives, and optional printer-keyboard are all within reach of a seated operator.

Internal speed of the System/3 is surprisingly high. Its core storage cycle time is 1.52 microseconds per one-byte access. Moreover, its addition speed of 24.4 microseconds for two 5-digit operands is faster than that of the System/360 Model 30. Conversely, the System/3's instruction repertoire is far smaller and less powerful than that of the System/360 or System/370, and there is no program compatibility, at the machine or assembly-language level, between the System/3 and the larger IBM computers.

The most surprising aspect of the original System/3 announcement was the complete absence of any data communications facilities. This serious limitation on the system's sales appeal was removed in February 1970, when IBM announced a Binary Synchronous Communications Adapter (BSCA) for the System/3. The BSCA can turn the System/3 into a low-cost and highly flexible terminal computer, able to process data locally and communicate with other IBM computers at speeds ranging from 600 to 50,000 bits per second. The BSCA can be field-installed on any card or disk System/3. Deliveries began in the first quarter of 1971. The RPG II Telecommunications Feature facilitates the programming of BSCA applications—at an additional software cost of $35 per month.

In October 1970, IBM added the 300-line-per-minute 5203 Model 3 Printer and the 750-document-per-minute 1255 Model 2 and 3 Magnetic Character Readers to the System/3 product line. Each of these units provides a 50 percent speed increase over the previously available models.

Then, in February 1971, IBM announced a number of new products that greatly alleviated many of the ▷

▶ SIMULTANEOUS I/O OPERATIONS: Input/output operations are overlapped with computing through a memory "cycle-stealing" technique. The I/O devices "time-share" the processing unit according to predefined priorities established for each device.

MASS STORAGE

5444 DISK STORAGE DRIVE, MODELS 1, 2, & 3: Models 1 and 2 each consist of one removable single-disk cartridge and one fixed disk on a single drive, served by a single access mechanism with four vertically-aligned heads. Model 3 accommodates one removable single-disk cartridge only. A System/3 can include one or two disk drives, housed in sliding drawers beneath the Multi-Function Card Unit. The following combinations of models and resulting capacities are available:

No. of Drives	Models	Data Capacity
1	1	2,457,600 bytes
1	2	4,915,200 bytes
2	2 + 3	7,372,800 bytes
2	2 + 2	9,830,400 bytes

Model 1 has 100 data tracks on each recording surface, while Models 2 and 3 have 200 data tracks per surface. Each track consists of 24 sectors, and each sector can hold a 256-byte record.

For all models, average rotational delay is 20 milliseconds and data transfer rate is 199,000 bytes/second. Average head movement time is 153 milliseconds in Model 1 and 269 milliseconds in Models 2 and 3; minimum head movement time for all three models is 39 milliseconds.

The removable 5540 Disk Cartridge weighs 6 pounds and is about 15 inches in diameter and 2.5 inches high. It stores 1.22 million bytes when used with the 5444 Model 1 Drive and 2.45 million bytes when used with the 5444 Model 2 or 3.

5444 DISK STORAGE DRIVE, MODELS A1, A2, & A3: Provide faster access than the original 5444 drives described above. Average head movement time is 86 milliseconds for Model A1 and 126 milliseconds for Models A2 and A3; minimum head movement time for all three models is 28 milliseconds. In other respects, Models A1, A2, and A3 have the same characteristics as Models 1, 2, and 3, respectively. Disk cartridges can be used interchangeably, and all programs written for the original models will run without change on the faster models. Higher-Performance Disk Attachments (#4501 and #4502) must be added to the 5410 Processing Unit to accommodate the faster drives. Deliveries are scheduled to begin in December 1971.

5445 DISK STORAGE DRIVE: Provides comparatively large-capacity random-access storage on interchangeable, 11-disk 2316 Disk Packs. Each single-spindle drive holds one pack and stores 20.48 million bytes in 256-byte physical records; when IBM software support is used, all data is recorded in this format. If the System/3 format conventions are followed on a System/360 or System/370, data recorded on 2316 Disk Packs can be interchanged between the systems. Average head movement time is 60 milliseconds, average rotational delay is 12.5 milliseconds, and data transfer rate is 312,000 bytes/second. A maximum ▶

IBM System/3 Model 10

▷ System/3's remaining limitations and broadened its spectrum of practical applications. The new 5410 Model A7 (card) and A17 (disk) Processing Units have 49,152 bytes of core storage, or 50 percent more than the previous maximum capacity. The 5444 Model A1, A2, and A3 Disk Storage Drives offer much faster access times (at higher prices) than the earlier 5444 Model 1, 2, and 3 Drives. The 5445 Disk Storage Drives provide greatly increased capacity—20.48 million bytes per 2316 Disk Pack—together with fast access and data compatibility with the System/360 and 370 computers. The 5421 Printer Control Unit permits the connection of a 600-lpm or 1100-lpm 1403 Printer in place of the much slower 5203 Printer. And finally, the COBOL and FORTRAN compilers offer System/3 users a much wider choice of programming languages and improved program compatibility with other computers.

Still conspicuously absent from the line-up of peripheral equipment for the System/3 Model 10 at this writing are magnetic tape, paper tape, optical character recognition, and CRT display units.

In March 1971, IBM announced selective price changes to certain models of the 5410 Processing Unit. The company explained that this unusual move was prompted by experience which showed that the units can be sold for less but should cost more to service. Therefore, IBM reduced the purchase prices of the 16K and 32K processors by approximately 7 and 21 percent, respectively, and raised the monthly maintenance charges for the 8K, 12K, 16K, 24K, and 32K processors by amounts ranging from $11 to $26 per month. Rental prices were unchanged.

IBM software support for the System/3, while far from sophisticated, is well tailored to complement the system's modest hardware capabilities. A set of System Control Programs, designed to handle basic operating and data management functions, is supplied to System/3 users at no extra charge. The System Control Programs for disk-oriented systems include a supervisor and scheduler that perform the functions of a simple operating system. All other System/3 software is separately priced.

IBM is encouraging most System/3 users to do their application programming in the RPG II language. RPG II is available for both card and disk systems. The language is an extended version of System/360 RPG that is capable of handling most business programming requirements quite effectively. As a significant step toward improved compatibility between the System/3 and the larger IBM computers, IBM in early 1971 announced a DOS RPG II compiler for the System/360 and 370. The DOS version ▷

▶ of two 5445 drives (one Model 1 and one Model 2) can be connected to a 5410 Processing Unit. The 5410 must be equipped with the appropriate 5445 Disk Attachment and Processing Unit Expansion features. Deliveries of the 5445 drives are scheduled to begin in June 1972.

INPUT/OUTPUT UNITS

5424 MULTI-FUNCTION CARD UNIT (MFCU): Combines the functions of a 96-column card reader/punch, collator, and interpreter in a single unit. Consists of two 2,000-card feed hoppers, a read station, and four 600-card stackers. Cards fed from either or both hoppers can be read, punched, printed, and fed into any of the four stackers under program control. Card sorting is also possible through the use of a multiple-pass sorting technique.

The 5424 is offered in two models, either of which can be used with any System/3 Processing Unit. Cards are read serially at 250 cpm in Model A1 and 500 cpm in Model A2. Punching is performed serially at 60 cpm in Model A1 and 120 cpm in Model A2.

Printing occurs at a speed of 60 cpm in Model A1 and 120 cpm in Model A2 when printing in any or all of the first three line positions on each card. There is a fourth line position which, if used, causes the printing speed to drop to 48 cpm for Model A1 and 96 cpm for Model A2. Each of the 4 lines can hold up to 32 printed characters.

5203 PRINTER: Uses interchangeable horizontal-chain cartridges. Three models are available, any of which can be used with any System/3 Processing Unit. With the standard 48-character set, rated printing speeds are 100 lpm for Model 1, 200 lpm for Model 2, and 300 lpm for Model 3.

The standard 96-position print line can optionally be expanded to 120 or 132 positions. Vertical spacing is 6 or 8 lines per inch, and horizontal spacing is 10 characters per inch. Skipping speed is 16.67 inches per second at the usual spacing of 6 lines per inch. Vertical format is under program control; there is no carriage control tape.

The standard 48-character chain cartridge can be replaced by other operator-changeable cartridges. If the Universal Character Set feature is installed, the cartridge may contain from 48 to 120 different characters. Larger character sets will usually result in reduced printing speeds.

An optional Dual-Feed Carriage allows two sets of non-overlapped forms to be printed simultaneously, with each set under independent program control. Use of this feature reduces the number of print positions by 14.

1403 PRINTER: Provides fast, high-quality printed output by means of a horizontal chain or train mechanism. With the standard 48-character set, rated printing speed is 600 lpm for the 1403 Model 6 and 1100 lpm for the 1403 Model N1. Both models have 132 print positions. Skipping speed is 33 inches per second on short skips and 75 inches per second on skips of more than 8 lines. Vertical format is controlled by the stored program. The optional Universal Character Set feature permits the use of operator-changeable chain or train cartridges containing up to 120 different characters. The 5421 Printer Control Unit, which controls the 1403 Printer, physically replaces the basic 5203 Printer; ▶

IBM System/3 Model 10
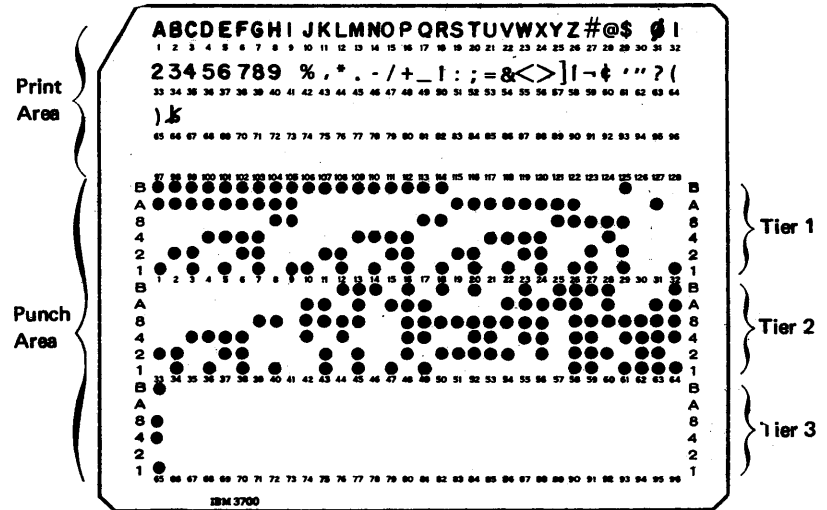
A full-size reproduction of the new 96-column IBM card, showing the punch patterns for each of the 64 characters.

▷ supports all the facilities of System/3 RPG II except the telecommunications and automatic program overlay functions.

The ANS COBOL and FORTRAN compilers for the System/3, announced in February 1971, provide alternative ways to bridge the compatibility gap. Both compilers offer upward language compatibility with their DOS and OS counterparts for the System/360 and 370.

Thus, System/3 users can now elect to write their programs in any of three languages—RPG II, COBOL, or FORTRAN—without fear that they may have to start over if and when it becomes necessary to move up to a larger computer. Even so, the compatibility problems still have not been fully resolved. The expected 96-column card equipment for the larger IBM computers has not materialized to date, and there are numerous differences in system control, data management, and operational characteristics which could hamper conversions from the System/3 to the System/370.

To assist System/3 users in preparing their application programs for payroll, accounts receivable, and six other common business data processing functions, IBM offers a unique Application Customizer Service. Using questionnaires defining the user's requirements as its input, the Application Customizer program produces detailed documentation to guide the user's programmer in writing the necessary RPG II coding. This approach to the application programming problem is a new and interesting one, yet it seems reasonable to believe that a company with IBM's ▷

▶ only one printer can be connected to a System/3 at any one time. Programs written for the 5203 Printer require no changes when a 1403 is installed. Customer deliveries of the 1403 Printers to System/3 users are scheduled to begin in March 1972.

5471 PRINTER-KEYBOARD: Provides keyboard input and typed output. Consists of a 44-key typewriter-style keyboard and a Selectric-type printing mechanism, which operates independently under program control. Rated output speed is 15.5 characters per second. Mounts on the System/3 console work table. (IBM software support for the 5471 requires a disk-oriented System/3 with at least 12K bytes of core storage.)

5475 DATA ENTRY KEYBOARD: Permits on-line data recording and verification in conjunction with the System/3 Processing Unit and Multi-Function Card Unit. Has the same keyboard, character set, and touch as the independent IBM 5496 Data Recorder, which is the basic unit for punching and verifying the new 96-column cards. Mounts on the System/3 console work table. (On-line data entry, of course, represents extremely inefficient use of the System/3 hardware and will normally be done only in installations with very low-volume input and processing requirements.)

1255 MAGNETIC CHARACTER READER: Reads and sorts MICR-encoded documents from 5.75 to 8.875 inches in length, 2.5 to 4.25 inches in width, and 0.003 to 0.007 inch in thickness. Three models are available. Model 1 reads up to 500 six-inch documents per minute, while Models 2 and 3 read up to 750 six-inch documents per minute. Models 1 and 2 have six horizontal stackers arranged in a single vertical bay and require one and one-half sort passes for each digit position. Model 3 has twelve horizontal stackers in two vertical bays. The optional Self-Checking Number, 51-Column Card Sorting, and Dash Symbol Transmission features are available for all three models. Model 3 can also be equipped with the High-Order Zero and ▶

▷ vast technical resources could have come up with something better. Once the user has filled out the forms which define his requirements, why shouldn't the computer do *all* the remaining work of generating a ready-to-run program?

IBM's new 96-column card is about one-third the size of the familiar 80-column card and holds 20 percent more information. The card is 3.25 inches wide and 2.63 inches high. The upper portion of the card can accommodate up to 4 printed lines, each containing up to 32 characters. The lower portion consists of 3 "tiers" of punching positions; each tier can hold 32 characters of data. Punched data is expressed as a 6-bit code and represented by tiny round holes.

The 6-bit code restricts the card character set to 64 characters—a startling backward step in this era of expanded character sets. The restricted card code is all the more surprising in view of IBM's use of EBCDIC, which can accommodate up to 256 different characters, as the System/3's internal code.

The new 96-column card is clearly easier to handle, less expensive, and more compact to store than the 80-column card. Nonetheless, its introduction has aroused considerable controversy. The EDP industry has made significant progress toward standardization and data compatibility during the past few years, with the 80-column card being accepted as an almost universal standard. The 96-column card is incompatible with all existing punched card equipment. Its introduction by the industry leader may well make it the card of the future—but even IBM is hedging its bet by offering to connect the 80-column 1442 Card Read Punch to the System/3 on an RPQ basis for any installation that wants it.

Along with the System/3, IBM introduced two off-line devices for use with the 96-column card. The 5496 Data Recorder is a buffered unit that performs the functions of both a keypunch and verifier, at a rather stiff rental price of $155 per month. The 5486 Card Sorter is a table-top unit that has six stackers and requires one and one-half card passes for each numeric column sorted—another curious step backward. The sorter is offered in a 1000-cpm model at $85 per month and a 1500-cpm model at $115 per month.

The System/3 has come a long way since IBM introduced it in July 1969. Subsequent announcements have removed or lessened many of the early limitations on both its performance capabilities and its compatibility with other equipment. The System/3's 96-column cards and IBM's unbundled support stance may or may not represent ▷

▶ Blank Selection feature, which reduces off-line sorting times.

One 1255 can be connected to a System/3 via a Serial I/O Channel on the Processing Unit and a System/3 Adapter (#6303) on the 1255 itself. All three models can also be used for off-line sorting.

COMMUNICATION CONTROL

BINARY SYNCHRONOUS COMMUNICATIONS ADAPTER (BSCA): Enables a System/3 computer to communicate with any of the following IBM computers:

● Another similarly-equipped System/3.

● A 360/20 equipped with a BSCA.

● A 360/25 equipped with an Integrated Communications Adapter and BSC features.

● A System/360 Model 25, 30, 40, 50, 65, 67 (operating in 65 mode), 75, 85, 91, or 195 or a System/370 computer equipped with a 2701 or 2703 control unit containing the appropriate BSC adapter and features.

Transmission is in half-duplex binary synchronous mode over a switched, leased, or private line. Either ASCII or EBCDIC transmission code can be used. Transmission over a non-switched data link can occur at 600, 1200, 2000, 2400, 4800, 19,200, 40,800 or 50,000 bits per second. When switched lines are used, transmission speed is limited to 600, 1200, or 2000 bits per second. BSCA operations are overlapped with computing and other I/O operations.

Several optional features are available to enhance the capabilities of the BSCA. The Text Transparency feature permits transmission and reception of data in 8-bit binary image form as well as in EBCDIC code. The Station Selection feature enables the BSCA-equipped System/3 to operate as one of a number of IBM BSC terminals on a multipoint line. The Internal Clock feature generates timing signals for use with modems that lack a clocking facility. The Auto Call feature enables the System/3 to dial and initiate a call to a remote BSC terminal under program control.

SOFTWARE

SYSTEM CONTROL PROGRAMS: These programs, which "perform the system control functions that are basic to every installation," are supplied with the system at no additional charge, in separate versions for card-oriented and disk-oriented configurations. (All other System/3 software is separately priced.)

CARD-ORIENTED SYSTEM CONTROL PROGRAMS: Consist of a User Maintenance Program, which facilitates maintenance of program decks, and a System Initialization Program, which initializes a communication area in core storage at the beginning of each day. These programs require a minimum System/3 configuration (8K bytes, 5203 Printer, and 5424 MFCU). Also available is a Remote Job Entry Work Station Support routine that permits a System/3 equipped with a Binary Synchronous Communications Adapter to transmit OS/360 jobs to a central System/360 or 370 computer ▶

IBM System/3 Model 10

significant liabilities; each prospective user will have to decide that for himself. On the basis of its overall capabilities, as well as its IBM nameplate, the System/3 now demands careful consideration by virtually every company that is considering the installation of a small-scale business data processing system. □

(256K Model 40 or above) and receive output from the central system upon completion of each job.

DISK-ORIENTED SYSTEM CONTROL PROGRAMS: Consist of Disk System Management Programs, a Library Maintenance Program, Disk Utility Programs, and a Disk Copy/Dump Program. The Disk System Management Programs include a supervisor and scheduler which provide automatic job-to-job transition, selective retrieval of object programs from a disk library, program overlays, program roll-in/roll-out capability that facilitates the processing of inquiries, and support of the optional Dual Program feature. The Library Maintenance Program creates and updates source and object program libraries in disk storage. The Disk Utilities and Disk Copy/Dump facilitate the initialization and maintenance of disk files. These programs require a System/3 with at least 12K bytes of core storage, one 5444 Disk Storage Drive, 5203 Printer, and 5424 MFCU. Also available is a Remote Job Entry Work Station Support routine that performs the same functions as in card-oriented systems (above).

RPG II (REPORT PROGRAM GENERATOR): This is the principle programming system for the IBM System/3. The programmer, using five different types of preprinted specification sheets, 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. These specifications are transcribed into punched cards and fed into the MFCU. The RPG processor then generates a machine-language object program to perform the specified functions.

The RPG II language is an extended version of earlier IBM RPG languages. It provides the facilities of System/360 RPG plus at least 20 useful extensions, including the ability to define and execute closed subroutines, to use dual input/output areas, and to debug programs at the source-language level.

Two different versions of RPG II are offered:

CARD RPG II: Can be used on a minimum System/3 configuration consisting of an 8K Processing Unit, a 5203 Printer, and a 5424 MFCU. Permits full utilization of the capabilities of these three devices. The only limitations on the number of input and/or output files are those imposed by the number of physical I/O devices available. Object programs are produced in the form of punched card decks which can be loaded for immediate execution; there are no associated control programs.

DISK RPG II: Requires a System/3 with at least a 12K Processing Unit, one 5444 Disk Storage Drive, a 5203

Printer, and a 5424 MFCU. Permits full utilization of the capabilities of these devices. Provides all the functions of Card RPG II plus disk-file data management facilities, automatic overlays for programs which exceed core storage capacity, and six other useful language extensions. Permits three basic types of disk file organization: sequential, indexed, and direct. With all three types of organization, processing may be either sequential or direct.

RPG II TELECOMMUNICATIONS FEATURE: This optional extension of either Card or Disk RPG II 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/3 equipped with the BSCA to operate in any of the following communications modes: receive only, transmit only, receive with conversational reply, transmit with conversational reply, or alternate transmit and receive file. The System/3 can function as a terminal in one of three types of networks: point-to-point switched, point-to-point nonswitched, or multi-point.

COBOL: The System/3 Subset ANS COBOL Compiler supports these six modules of the American National Standard COBOL language: Nucleus (Level 1), Sequential Access (Level 1), Random Access (Level 1), Table Handling (Level 2), Segmentation (Level 1), and Library (Level 1). The compiler also supports certain elements of higher-level ANS COBOL modules and some IBM extensions. The ANS Sort and Report Writer modules, however, are not implemented. System/3 COBOL is upward compatible with the ANS COBOL compilers for the System/360 and 370, and is a superset of IBM 1130 COBOL. A 16K System/3 with at least one 5444 Disk Storage Drive is required for compilation. The compiler is scheduled for delivery in June 1972; a second release in September 1972 will support the large-capacity 5445 Disks.

FORTRAN: The System/3 Disk FORTRAN IV compiler accepts source programs written in the IBM System/360 Basic FORTRAN IV language, which encompasses American National Standard Basic FORTRAN. It also accepts programs written in IBM 1130 Basic FORTRAN IV with minor modifications. Language extensions beyond the Basic FORTRAN level include the DEBUG facility, the IMPLICIT statement, the relational IF statement, and explicit length specification for the INTEGER and REAL Type statements. Also included are commercial subroutines which perform essentially the same functions as the IBM 1130 Commercial Subroutine Package. A System/3 with at least 12K bytes of core storage and one 5444 Disk Storage Drive is required for compilation; a program of approximately 150 source cards can be compiled and executed on a 12K system. The compiler is scheduled for delivery in the third quarter of 1972.

BASIC ASSEMBLER: Converts programs coded in a symbolic assembly language into executable object programs. Creates stand-alone programs that have no defined interfaces with the other System/3 software support. May be used to assemble relocatable subroutines for use with Card or Disk RPG II programs. Requires a System/3 with at least 12K bytes of core storage, a 5424 MFCU, a 5203 ▶

IBM System/3 Model 10

▶ Printer with the Universal Character Set feature and a 60-character chain, and one 5444 Disk Storage Drive.

DISK SORT: Sorts disk files into either ascending or descending sequence. Accepts files organized in sequential, indexed, or direct fashion. Can perform a full-record sort, a tag sort (yielding a file of 3-byte record addresses arranged in the desired sequence), or a "tagalong" sort (yielding a sequenced file of records containing only the key fields and data fields specified by the user). Requires a System/3 with at least a 12K processing Unit, one 5444 Disk Storage Drive, a 5203 Printer, and a 5424 MFCU.

CARD SYSTEM UTILITIES: A set of six programs designed for operation on an 8K card-oriented System/3. The Reproduce/Interpret Program handles the reproduction and/or interpretation of 96-column cards, with or without reformatting. The 96-Column List Program lists cards on the printer without reformatting. The MFCU Sort/Collate Program performs a variety of sorting, merging, matching, selecting, and sequence-checking functions. The Data Recording and Data Verification Programs enable a System/3 equipped with a 5475 Data Entry Keyboard to be used for on-line punching and verification of 96-column cards. The 80-96 Conversion Program allows a System/3 equipped with a 1442 Card Read Punch (an RPQ item) to read 80-column cards and punch the information into 96-column cards, with reformatting.

DISK-RESIDENT CARD UTILITIES: These six programs perform the same functions as the Card System Utilities described above, but are designed for disk-resident operation on a 12K System/3 with a 5444 Disk Storage Drive.

1225 MAGNETIC CHARACTER READER UTILITY: Controls the reading of MICR-encoded documents, accumulates appropriate totals, and places the data from the documents on disk and/or printer files. Requires a 12K disk-oriented System/3.

APPLICATION CUSTOMIZER SERVICE: As an alternative to the usual "packaged" application programs, IBM is offering a new service called the Application Customizer which is designed to assist users in preparing programs to handle eight common data processing applications: Order Writing and Invoicing, Accounts Receivable, Inventory Accounting, Sales Analysis, Payroll, General Ledger, Accounts Payable, and Labor Distribution.

The user defines his requirements by completing application-oriented questionnaires and report specification sheets. These are keypunched and fed into a System/360 Model 20 computer at an IBM Basic Systems Center. The resulting output consists of detailed application documentation, from which the user's own programmer writes the necessary System/3 programs (usually in the RPG II language).

Documentation produced by the Application Customizer includes a data dictionary, a listing of the contents and format of each record, an application flowchart, an RPG-oriented description of each program, and a sample of each report.

APPLICATION PROGRAMS: In addition to the Application Customizer Service, which handles the most common business data processing functions, IBM offers a limited

number of packaged programs for more specialized applications. These include:

    Apparel Business Control

    Card Bill of Material and Requirements Planning

    Hospital Accounts Receivable

    Hospital Patient Billing

    Order Point Technique for Inventory Management

PRICING

MINIMUM CARD SYSTEM: Consists of 8K Processing Unit, 5424 Model A1 MFCU, and 5203 Model 1 Printer (with 96 print positions). Monthly rental, $945. Purchase price, $42,375.

For the above configuration with the faster 5424 Model A2 MFCU and 5203 Model 2 Printer: Monthly rental, $1,145. Purchase price, $47,800.

TYPICAL DISK SYSTEM: Consists of 12K Processing Unit, 5424 Model A2 MFCU, 5203 Model 2 Printer (with 120 print positions), 5471 Printer-Keyboard, and one 5444 Model 2 Disk Storage Drive (4.90 million bytes). Monthly rental, $1,825. Purchase price, $77,525.

For the above configuration with a 32K Processing Unit: Monthly rental, $2,400. Purchase price, $95,125.

EXPANDED DISK SYSTEM: Consists of 49K Processing Unit, 5424 Model A2 MFCU, 1403 Model N1 Printer, 5471 Printer-Keyboard, two 5444 Model 2 Disk Storage Drives (9.8 million bytes), and two 5445 Disk Storage Drives (41 million bytes). Monthly rental, $5,257. Purchase price, $223,045.

Addition of the Binary Synchronous Communications Adapter (plus the required Processing Unit Expansion feature) to either a card or disk System/3 will increase the rental by $300 to $385 per month or increase the purchase price by $13,710 to $18,875, depending upon the optional features selected.

SOFTWARE: Monthly charges for some of the basic System/3 software facilities are as follows: Card RPG II, $25; Disk RPG II, $35; RPG II Telecommunications Feature, $35; COBOL, $75; FORTRAN, $100; Basic Assembler, $75; Card System Utilities, $10. One-time charges for the Application Customizer Service Range from $180 to $265 per application. There is no charge for the basic System Control Programs.

SUPPORT: IBM Systems Engineering assistance is available to System/3 users at a basic charge of $22 per hour.

EDUCATION: Two-day introductory courses are offered at no charge. Various other System/3 courses are available at costs averaging about $40 per student per day.

CONTRACT TERMS: The standard IBM rental contract includes equipment maintenance and entitles the customer to up to 176 hours of billable time per month. Time used in excess of that amount is billed, for most System/3 components, at an extra-use rate of 10% of the basic hourly rate (i.e., 10% of 1/176 of the monthly rental for each hour of extra use). ■

datapro
70

Updated 9/71

IBM System/3 Model 10
EQUIPMENT PRICES

		Purchase Price	Monthly Maint.	Rental (1-year lease)*
PROCESSOR AND MAIN STORAGE				
5410	Processing Unit (for non-disk systems)			
	Mod. A2; 8,192 bytes	15,200	38	310
	Mod. A3; 12,288 bytes	20,100	42	410
	Mod. A4; 16,384 bytes	20,800	42	525
	Mod. A5; 24,576 bytes	37,000	56	755
	Mod. A6; 32,768 bytes	37,700	56	985
	Mod. A7; 49,152 bytes	54,600	78	1,285
5410	Processing Unit (for disk systems)			
	Mod. A12; 8,192 bytes	21,325	84	435
	Mod. A13; 12,288 bytes	26,225	88	535
	Mod. A14; 16,384 bytes	26,925	88	650
	Mod. A15; 24,576 bytes	43,125	102	880
	Mod. A16; 32,768 bytes	43,825	102	1,110
	Mod. A17; 49,152 bytes	60,725	124	1,410
3500	Dual Program Feature (for 5410)	5,400	1	110
5732	Processing Unit Expansion Feature A (for 5410)	1,725	3	35
PERIPHERAL EQUIPMENT				
5444	Disk Storage Drive			
	Mod. 1; 2.46 million bytes	8,075	47	155
	Mod. 2; 4.92 million bytes	9,700	47	255
	Mod. 3; 2.46 million bytes	8,075	47	155
	Mod. A1; 2.46 million bytes	8,450	65	200
	Mod. A2; 4.92 million bytes	10,075	65	300
	Mod. A3; 2.46 million bytes	8,450	65	200
5440	Disk Cartridge (for 5444 drives)	175	Time & Mat'l.	Purchase Only
6378	Second Disk Attachment (required on 5410 for a 5444 Mod. 3 or A3 or a 2nd 5444 Mod. 2 or A2)	2,375	5	45
4501	Higher-Performance First Disk Attachment	980	1	20
4502	Higher-Performance Second Disk Attachment (required on 5410 for a 5444 Mod. A3 or a 2nd 5444 Mod. A2; #6378 is a prerequisite)	980	1	20
5445	Disk Storage Drive			
	Mod. 1; first 5445 on 5410; 20.48 million bytes	15,750	85	350
	Mod. 2; second 5445 on 5410; 20.48 million bytes	15,075	80	335
3901	First 5445 Disk Attachment (for 5410)	20,000	33	500
3902	Second 5445 Disk Attachment (for 5410)	600	1	15
5732	Processing Unit Expansion A (required on 5410 for connection of #3901)	1,725	3	35
5733	Processing Unit Expansion B (required on 5410 if both #3901 and #2074, BSCA, are installed)	800	0.50	20
5424	Multi-Function Card Unit			
	Mod. A1; reads 250 cpm, punches and prints 60 cpm	9,450	140	270
	Mod. A2; reads 500 cpm, punches and prints 120 cpm	12,575	200	405
4100	MFCU Attachment (required on 5410 for 5424 Mod. A1)	4,200	14	80
4101	MFCU Attachment (required on 5410 for 5424 Mod. A2)	5,325	14	95
5203	Printer			
	Mod. 1; 100 lpm, 96 positions	10,600	67	230
	Mod. 2; 200 lpm, 96 positions	11,775	76	280
	Mod. 3; 300 lpm, 96 positions	17,400	127	435
3475	Dual-Feed Carriage (for 5203)	3,675	20	75
4730	Additional Chain Cartridge (for 5203 Mod. 1 & 2)	3,675	1	75
4740	Additional Chain Cartridge (for 5203 Mod. 3)	2,910	33	110
5558	24 Additional Print Positions (for 5203)	1,500	2	50
5560	36 Additional Print Positions (for 5203)	2,250	2	75
8639	Universal Character Set Attachment (for 5203)	300	1	10
3970	Printer Attachment (required for 5203 Mod. 1)	2,925	10	55
3971	Printer Attachment (required for 5203 Mod. 2)	2,925	10	55
3972	Printer Attachment (required for 5203 Mod. 3)	4,525	13	95
3480	Dual Feed Carriage Control (required on 5410 for #3475 on 5203)	1,225	1	25
8642	Universal Character Set Control (required on 5410 for #8639 on 5203)	450	1	15

*Rental prices include equipment maintenance.

datapro
70

IBM System/3 Model 10
EQUIPMENT PRICES

PERIPHERAL EQUIPMENT (Cont)		Purchase Price	Monthly Maint.	Rental (1-year lease) *
1403	Printer			
	Mod. 2; 600 lpm, 132 positions	32,980	159	750
	Mod. N1; 1100 lpm, 132 positions	39,965	183	875
1416	Interchangeable Train Cartridge (for 1403 Mod. N1)	2,910	No Charge	97
1376	Auxiliary Ribbon Feeding (for 1403 Mod. 2)	2,985	14.75	73
4740	Interchangeable Chain Cartridge Adapter (for 1403 Mod. 2)	3,030	No Charge	73
8640	Universal Character Set Feature (for 1403 Mod. N1)	450	1.75	10
8641	Universal Character Set Feature (for 1403 Mod. 2)	450	1.75	10
5421	Printer Control Unit (required for 1403 Mod. 2 or N1)	12,740	26	260
4140	5410 Attachment for 1403 Mod. 2	5,880	21	120
4150	5410 Attachment for 1403 Mod. N1	6,380	21	175
5471	Printer-Keyboard	4,700	32	100
4110	Printer-Keyboard Attachment (required on 5410)	2,800	5	50
5475	Data Entry Keyboard	2,250	7	40
4120	Data Entry Keyboard Attachment (required on 5410)	2,525	1	45
1255	Magnetic Character Reader			
	Mod. 1; 500 dpm, 6 stackers	38,645	210	805
	Mod. 2; 750 dpm, 6 stackers	44,260	335	980
	Mod. 3; 750 dpm, 12 stackers	60,240	440	1,300
3215	Dash Symbol Transmission (for 1255)	35	No Charge	50(1)
4380	51-Column Card Sorting (for 1255)	720	No Charge	15
4520	High-Order Zero & Blank Selection (for 1255 Mod. 3 only)	1,440	5	30
7060	Self-Checking Numbers (for 1255)	2,330	2.50	49
6303	System/3 Adapter (required on 1255)	5,820	4	121
7081	Serial I/O Channel (required on 5410 for connection of 1255)	7,350	5	150
5486	Card Sorter			
	Mod. 1; 1000 cpm	4,425	38	85
	Mod. 2; 1500 cpm	5,075	58	115
5496	Data Recorder	7,600	54	155

COMMUNICATIONS EQUIPMENT

2074	Binary Synchronous Communications Adapter (requires #5732 on 5410 Processing Unit)	12,985	65	265
1315	Auto Call Feature (for #2074)	1,960	1	40
4703	Internal Clock Feature (for #2074)	1,225	1	25
7477	Station Selection Feature (for #2074)	980	1	20
7850	Text Transparency Feature (for #2074)	980	1	20

* Rental prices include equipment maintenance.
(1) One-time charge.
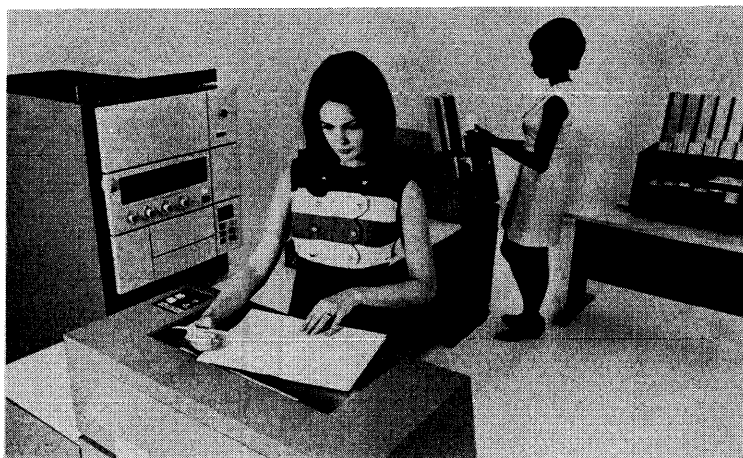
This overall view of a typical System/3 installation shows the 5203 Printer in the foreground, the 5410 Processing Unit at left, and the off-line 5486 Card Sorter at far right.