

Rev.
1/79

IBM System/34

MANAGEMENT SUMMARY

On April 14, 1977, IBM took steps to protect its lion's share of the small business computer market by announcing the System/34. The new system, an apparent successor to the already highly successful System/32, is a multiprogramming entry-level business data processing system that represents a logical evolutionary step from the single-user System/32. It also represents the next technological step by offering an internal performance level nearly eight times that of its forebear, at substantially lower cost.

The System/34 appears to be the first in a series of upward-compatible low-end computer products that already partially overlap both the System/32 and the System/3 performance ranges and in all likelihood will eventually replace some or all models in those families. Or, at least, the System/34-style architecture seems destined to become dominant.

The most significant difference between the System/32 and the System/34 is the number of users each can support. While the S/32 is rigidly restricted to serving one user at a time, the S/34 can handle up to eight independently functioning users plus an output spooling task operating as a system utility in a background mode. Although much of the early emphasis has been on the multi-user interactive capabilities of the system, IBM has carefully pointed out that the S/34 can also function well as a batch system. One of the eight concurrent jobs on the system can be a batch-mode job.

The System/34 components are all new. The CPU consists of two microcomputers plus several microcomputer-based I/O controllers. One of the microcomputers functions as a system control processor while the other

The System/34 represents the next logical step in IBM's succession of small business computer systems, a market that largely owes its existence to the earlier IBM System/32. As compared with the S/32, the new system features more processing power, larger memory capacity, larger disk storage capacity, and the ability to attach up to seven additional independent multiprogramming workstations to the basic system.

CHARACTERISTICS

MANUFACTURER: International Business Machines Corporation, General Systems Division, 875 Johnson Ferry Road, N.E., Atlanta, Georgia 30342. Telephone (404) 256-7000.

MODEL: System/34 Models A11, A12, A13, A21, A22, A23, B11, B12, B13, B21, B22, B23, C4, C12, C13, C21, C22, and C23.

DATE ANNOUNCED: April 1977.

DATE OF FIRST DELIVERY: Scheduled for January 1978.

DATA FORMATS

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

FIXED-POINT OPERANDS: Can range from 1 to 16 digits for source fields and from 1 to 35 digits for result fields. Logical operands can range from 1 to 256 bytes.

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



This three-workstation System/34 configuration includes a 5340 System Unit with disk and diskette storage (center rear), a 5211 Line Printer (to left of System Unit), and three workstations mounted on customer-supplied furniture. Two of the workstations consist of 5251 CRT Display Stations, while the third (center foreground) includes both a 5251 Display and a 5256 Serial Printer. A System/34 can include up to eight workstations located up to 5000 feet away from the 5340 System Unit.

IBM System/34

▷ functions as an execution processor, performing the actual computations. The system control processor is most visible to users and is available with three capacities of 600-nanosecond memory: 32K, 48K, and 64K bytes. The execution processor is transparent to users and has its own 16K-byte memory. Both processors and the I/O controllers operate asynchronously to provide overlapped operations to enhance performance. It has been estimated that the System/34 will yield internal performance eight times as great as the System/32 and over twice that of the System/3 CPU.

The System/34 is a much more unbundled package than the System/32, especially from a hardware point of view. Whereas the S/32 was purposely constructed in a single desk-like module to reduce its "computer appearance," the S/34 consists of individual components in more conventional packaging. The 5430 CPU and fixed disk are housed in a separate stand-alone cabinet, as is the optional 5211 line printer. The S/34 console and workstations each consist of a 5251 CRT display and/or a 5256 tabletop-mounted printer. It would appear that IBM now feels that potential users are no longer afraid of the concept of a computer, thus eliminating the need to disguise it.

The System/34 disks are fixed within the system like those of the S/32, but have higher capacities and offer faster average access times. Three capacities of disk storage are available: 8.6, 13.2, and 27.1 million bytes. Average access time for all models is 40 milliseconds, and the data transfer rate of 339,000 bytes per second is the same as that of the S/32 disks.

The System/34 diskette subsystem offers two different drives, designated Diskette 1 and Diskette 2D. Diskette 1 is a conventional 3741-compatible unit. Using 128-byte sectors, the unit can store up to 246,272 bytes. When 512-byte extended-format sectors are used, the capacity is increased to 303,104 bytes. Diskette 2D uses IBM's new drive that records data on both sides of the diskette at twice the standard density. Using the 2D drive, the diskette subsystem has a storage capacity of 985,008 bytes using 256-byte sectors or 1,212,416 bytes with 1024-byte extended-format sectors. Diskettes can be exchanged between S/34's and other compatible systems (S/32 or 3741) with one restriction: Diskette 1 systems can read only identically formatted diskettes, while Diskette 2D systems can read and write on both types of diskettes. The diskette subsystem cannot be extended beyond one drive.

The CRT display/keyboard and tabletop printer are the elements of the Model 5250 workstation, the principal operator device in the System/34. The workstations and the associated controller make up a single microcomputer-controlled subsystem within the S/34. Up to eight workstations can be attached to the 5250 Workstation Controller. Each workstation consists of a 5251 display station and keyboard and/or a 5256 tabletop printer. All workstation components can be installed by the customer, using connectors provided for the purpose. ▷

▶ **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 either a 2-byte direct address or a 1-byte displacement. 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

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

CYCLE TIME: 600 nanoseconds per 1-byte access.

CAPACITY: 32,768, 49,152, or 65,536 bytes.

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

STORAGE PROTECTION: None.

RESERVED STORAGE: A 14K-byte area is reserved for the System Support Program (SSP) and may be increased in 2K-byte increments. The remainder of main storage is available for user programming.

CENTRAL PROCESSOR

The System/34 central processing unit consists of two computing elements: a system processor and an execution processor.

The system processor is a firmware-controlled version of a System/3 language processor. It addresses main storage, and performs all system-level functions such as OCL commands and I/O operations, as well as higher-level functions associated with the System Support Program. This is the processor most visible to users, and associated with it is the 32K, 48K, or 64K-byte main memory.

The execution processor has its own separate and independent 16K-byte control memory. It performs the actual computations and executes machine-level instructions, and is invisible to users.

IBM has not released details on these microcomputer-based elements of the System/34 to date, but most users will not be involved with these aspects of the system.

INSTRUCTION TIMINGS: The following average times, in microseconds, assume the use of direct (2-byte) operand addresses. Please note that the figures are *approximations* calculated by scaling the times for the same instructions executed on a System/32.

Decimal add (5 digits):	68.5
Decimal subtract (5 digits):	68.5
Binary (logical) add (5 bytes):	3.27
Binary (logical) subtract (5 bytes):	32.4
Move (5 bytes):	19.4
Compare (5 bytes):	25.5
Load or store register (2 bytes):	9.0 to 11.5
Add to register (2 bytes):	11.9 to 17.4
Jump on condition:	11.9 to 13.1

PHYSICAL SPECIFICATIONS: The 5340 System Unit houses the CPU, memory, diskette drive, and disk drive. The unit is 48 inches high, 26 inches wide, 60 inches deep, and weighs 750 pounds. The 524 Line Printer stands 39.4 inches high, 39.2 inches wide, 29.5 inches deep, and weighs 500 pounds. The 5251 Display Station is 15.1 inches high, 20.9 inches wide, 15.6 inches deep, and weighs 75 pounds. The 5256 Serial Printer is 14.5 inches high, 25 inches wide, 21.5 inches deep, and weighs 100 pounds. ▶

IBM System/34

▷ The 5251 display station includes a 1920-character display (24 lines of 80 characters) and a movable typewriter-style alphanumeric keyboard with a 10-key numeric pad. Both upper and lower case characters can be displayed. The display is capable of normal or bright intensity levels, nondisplay, blinking, underscore, and reverse-image functions. The keyboard also features 24 user-defined command functions through dual-purpose keys. The 5251 is microcomputer-based and can perform several field editing and control functions for data entry at the terminal. These locally defined functions include right justification, mandatory entry and fill, field exit required, alpha data only, signed numeric data only, monospace (upper case only), automatic entry, and duplicate fields.

The 5256 printer is a bidirectional serial matrix printer available in three speeds: 40, 80, or 120 characters per second. It features a lookahead capability that permits the print head to begin at any point instead of moving to a margin before printing. The 5256 has 132 print positions and can accept up to 15-inch forms. Like the 5211 display, it uses a 96-character set with both upper and lower cases.

The operator console is one of the eight workstations and must include both a 5251 display and either a 5256 serial printer or, optionally, a 5211 line printer. The 5211 line printer is a separate stand-alone unit that can be substituted for the console printer. It is attached to the S/34 through the 5810 Printer Attachment and is available in two models rated at 160 and 300 lines per minute.

The new 5251 display station represents a significant improvement over the Model 3277 terminal currently used in most IBM systems. Its basic purchase price of \$3,200 is far lower than the \$5,015 price tag of a 3277 display station and its accompanying 4632 keyboard, and the 5251 provides much more functionality. When the 5251 is paired with a 5256 serial printer into a 5250 workstation, the new components offer about a \$650 price advantage over a 3277/3284 display/printer combination.

The System/34 is expected to play a major role in IBM's System Network Architecture (SNA), but not for 2½ years according to IBM's timetable. It supports, interchangeably, both the binary synchronous (BSC) and SDLC protocols. The 2500 Communications Adapter is also microcomputer-based and operates under program control. It can function on switched, non-switched, private, or public communications lines. The appropriate protocol program is loaded into the adapter from system memory, as required. On multipoint lines, however, the S/34 can function only as a tributary station, since no support has been provided to enable the system to function as a control station. A separate adapter is available for connection to the AT&T Dataphone Digital Service network.

The System/34 is largely firmware-driven, implementing several operating system functions in microcode. In ▷

▶ inches deep, and weighs 60 pounds. Both the 5251 display and the 5256 printer are tabletop-mounted devices and require customer-supplied desks or tables.

The 5430 System Unit and 524 line printer require 208/230 VAC, 60-Hertz, single-phase power, while the 5251 display and 5256 printer require 115 VAC, 60-Hertz power.

INPUT/OUTPUT CONTROL

CONFIGURATION RULES: Each 5340 submodel includes a CPU, either 32K, 48K, or 64K bytes of memory, a diskette drive, and a fixed-disk storage unit. The system must also include an operator console/workstation consisting of one 5251 display/keyboard unit and a printer, which can be either a 5256 serial matrix printer or a 5211 line printer.

Up to seven additional workstations can be added. A workstation consists of a 5251 display/keyboard and/or a 5256 serial printer. The operator console/workstation must be within 20 feet of the 5340 System Unit, while the remaining workstations (up to 7) can be located up to 5000 feet away.

The addition of communications capabilities or the 1255 MICR Reader/Sorter requires the use of one or more Processor Unit Expansions, depending on the exact configuration desired. Refer to the Equipment Prices section of this report for additional details.

SIMULTANEOUS OPERATIONS: The system processor, execution processor, and all peripheral controllers operate asynchronously within the System/34, providing several levels of overlapped operations.

MASS STORAGE

DISK STORAGE: The 5340 System Unit contains the System/34 disk storage facilities. Three sizes of non-removable disk storage are offered, consisting of an 8.6-megabyte or 13.2-megabyte single-drive configuration or a 27.1-megabyte dual-drive subsystem. The disk subsystem is an integral part of every System/34. Data recording format is the same as that employed in the System/32, using 256-byte sectors, 60 sectors per track, organized in 3-track cylinders. The 8.6-megabyte unit has 201 cylinders, of which 186.67 are available for data storage. The 13.2-megabyte and 27.1-megabyte units use one or two 302-cylinder drives, of which 287.67 and 589.33 cylinders, respectively, are available for data storage.

The disk rotational speed is 2964 rpm, providing a data transfer rate of 889,000 bytes per second. Average rotational delay is 10.1 milliseconds, and average head positioning time is 35 milliseconds for the 8.6-megabyte version and 40 milliseconds for the 13.2-megabyte and 27.1-megabyte versions.

INPUT-OUTPUT UNITS

INTEGRATED DISKETTE DRIVE: Each IBM 5340 System Unit includes a single diskette drive. Two types of drives are available for the System/34: the Diskette 1 drive, identical to that offered with the System/32 and the IBM 3740 data entry terminals; and the new Diskette 2D drive, which records data on both sides of the diskette and at twice the density of the Diskette 1.

Diskette 1 diskettes are organized into 74 tracks, with 26 sectors per track and 128 bytes per sector, providing a total diskette capacity of 246,272 bytes. Extended format recording increases the sectors to 512 bytes each, and the total capacity to 303,104 bytes. ▶

IBM System/34

▷ particular, the functions of task management, storage management, and I/O control have been removed from the software operating system and placed in system firmware, a change that allows effective multiprogramming on the small system.

Software for the S/34 consists of a System Support Program Product (SSP), a Utilities Program Product, an RPG II compiler, and, significantly, an assembler. The SSP provides the functions of an operating system in conjunction with the S/34 firmware facilities. It executes programs, processes system commands and data from display stations, manages both the disk and diskette subsystems, and outputs data to display terminals and printers. It also provides multiprogramming support, performs spooling as needed, maintains and executes operator-specified job queues, performs basic file utilities such as copying or deleting files, and prepares assembly-language programs for execution.

Each workstation that has been designated as a command terminal can initiate one job. Workstations that are designated as data terminals by the system console can only input or receive data. Each job can initiate one or more programs. Programs are divided into 2K-byte segments and do not have to be located in contiguous areas.

The System/34 Utilities Program product provides users with the ability to create and maintain files on disk. It is a group of four routines: the Disk File Utility (DFU), the source Entry Utility (SEU), the Sort Utility, and the Workstation Utility.

The DFU functions as a primitive query language, permitting users to create and maintain fields and also to inquire into and print file contents. The utility can be used to sort a file, select records based on key values, accumulate field totals, and make computations using data read from files.

The Source Entry Utility permits users to enter and maintain program files on disk. Using the SEU, RPG II or assembly-language statements can be entered into a program file for later compilation or assembly. Similarly, sort specifications, workstation utility specifications, and display screen format specifications can be entered into files for later processing by the system. The SEU checks all program file statements for syntax errors, alerting the operator via display messages. The SEU module also has some program editing capabilities that enable users to insert or delete statements from files or to perform file searches.

The S/34 Workstation Utility is capable of more complex editing and computation functions than the DFU. It aids operators in entering and editing data by producing user-defined prompting messages on the display. The prompting messages are first defined using IBM-supplied specification sheets and entered through the SEU. ▷

▶ Diskette 2D diskettes provide four times the capacity of Diskette 1 by recording data at twice the density of the Diskette 1 and by recording on both sides of the diskette. These higher-capacity diskettes are organized into 74 two-track cylinders, with 26 sectors per track and 256 bytes per sector, providing a total diskette capacity of 985,088 bytes. Extended format recording, also applicable to these units, increases the sectors to 1,024 bytes each and the total diskette capacity to 1,212,416 bytes.

Diskette 1 drives can read and write on diskettes only from other Diskette 1 drives or from similar devices such as the IBM 3741 data entry terminals. Diskette 2 drives can read and write on diskettes from both types of drives.

The data transfer rates are 31.2K bytes per second for the Diskette 1 drive and 62.5K bytes per second for the Diskette 2D drive.

5251 CRT DISPLAY STATION: This device consists of two units, a CRT display and a separate, movable Model 4600 keyboard. The CRT unit features a 1920-character screen (24 lines by 80 characters). The set of 96 EBCDIC characters includes both upper and lower cases and uses an 8-by-16 dot matrix. Display attributes include normal or bright intensity, nondisplay, blinking, underscore, column separator, and reverse image; these functions, as well as 11 data entry functions, are controlled from within the display and do not interfere with System/34 processing.

The data entry functions provided include alpha-only, alphanumeric, signed numeric, field exit required, auto-entry, mandatory entry fields, right justification with blank or zero-fill, auto-duplicate, auto-skip, and monospace (upper case only).

The eight-station Model 5250 controller is microcomputer-based and provides self-check digit verification (modulus 10 and 11) plus a display-station polling function that is independent of CPU processing.

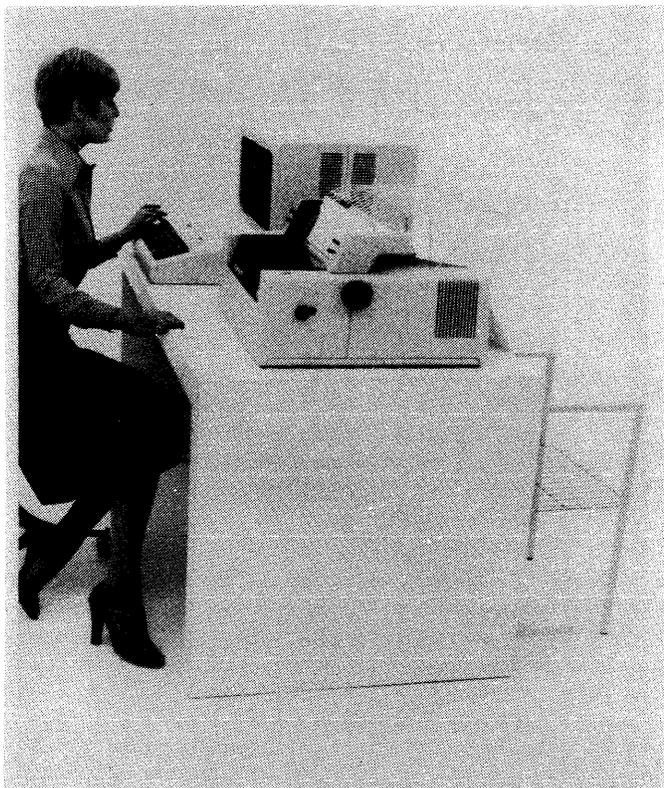
The Model 4600 keyboard is functionally identical to the System/32 keyboard, offering the standard 49 alphanumeric keys in typewriter format and a 10-key numeric pad. As in the System/32, the 12 top keys are dual-defined and provide 24 user-defined command functions.

5256 SERIAL PRINTER: This unit is similar in characteristics to the System/32 bidirectional integrated printer. It uses the same 4-by-8 dot matrix to form 96 EBCDIC characters. The tabletop-mounted 5256 is designed for use as a workstation either separately or with the 5251 CRT display/keyboard. One feature worth noting is the printer's ability to move the print head directly to any specified starting point without having to go to a margin. This feature permits greater printing output by reducing time lost due to unnecessary print head travel. The 5256 Printer is available in three versions: Model 1, rated at 40 cps; Model 2, 80 cps; and Model 3, 120 cps.

5211 LINE PRINTER: This 132-position belt-type printer is available as a substitute for the 5256 Serial Printer where higher printing speeds are required. It attaches to the 5340 System Unit through a 5810 Printer Attachment, and can be used only in place of the system printer. IBM offers three sizes of character sets in both ASCII and EBCDIC formats: 48, 64, or 96 characters. A print belt must be purchased separately with each printer.

The 5211 is available in two models. The printing speed depends upon the character set, as summarized below. ▶

IBM System/34



This System/34 workstation consists of a 5251 CRT Display Station and a 5256 Serial Printer. The 5256 is available in three models rated at 40, 80, and 120 characters per second.

- ▷ The RPG II compiler has been enhanced to support the System/34 in multiple-workstation environments, and is source-compatible with S/32 RPG II. System/32 users who upgrade to a System/34 can retain their Industry Application Programs by recompiling them.

A minimum System/34 configuration includes a 32K-byte CPU, an 8.6-megabyte disk subsystem, a 243K-byte diskette subsystem, one CRT display/keyboard, and a 40-cps serial printer. This smallest S/34 can be purchased for \$34,700 or rented for \$1,062 per month. Substitution of a 2D diskette drive adds \$2,160 to the purchase price or \$66 to the monthly rental charge. Increasing the disk storage capacity to 13.2 megabytes adds \$1,780 or \$72 to the purchase price or monthly rental charge, respectively, and a maximum 27.1-megabyte disk subsystem adds \$9,160 to the purchase price or \$297 to the rental charge. Main memory increments of 16K bytes cost \$1,600 each or add \$44 to the monthly rental charge.

The Model 5251 CRT display/keyboard sells for \$3,200 or rents for \$100 per month. The three versions of the model 5256 serial printer are priced at \$5,200 (40 cps), \$5,800 (80 cps), and \$6,250 (120 cps), or \$176, \$200, and \$217 per month, respectively.

The optional Model 5211 line printer has a base price of \$12,800, but a print belt and attachment feature bring the minimum price to \$14,410 for the 160-lpm version and \$17,210 for the 300-lpm version. Rental charges for the

Characters	Model 1 Speed	Model 2 Speed
48	160 lpm	300 lpm
64	123 lpm	235 lpm
96	84 lpm	164 lpm

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 be equipped with the High-Order Zero and Blank Selection feature, which reduces off-line sorting times. One 1255 can be connected to a System/34 via a Model 1100 attachment.

COMMUNICATIONS CONTROL

MODEL 2500 BSC/SDLC COMMUNICATIONS ADAPTER: Operates in conjunction with stored-program control to provide half-duplex communications on non-switched point-to-point lines or multipoint lines, at data rates up to 9600 bps, or on switched point-to-point lines at data rates up to 4800 bps. On multipoint lines, however, the System/34 operates only as a tributary station, since no support is provided for operation as a control station. Communications between the S/34 and other non-control stations can be accomplished only on a point-to-point line. The 2500 Communications Adapter requires a minimum of 48K bytes of main storage.

The 2500 is a microcomputer-based controller that provides either the Binary Synchronous (BSC) or Synchronous Data Link Control (SDLC) protocols. The controller is loaded from system memory with the appropriate protocol, and can be changed as required. The adapter operates asynchronously with other S/34 I/O controllers and with CPU processing. Units at each end or drop point of a network must use the same clocking source and must transmit at the same data rate, using the same transmission code.

IBM also offers five integrated modems, two switched-network backup adapters, an EIA interface adapter for use with non-IBM modems, an internal clock for modems without a clocking source, and an adapter for attaching the System/34 to an AT&T Dataphone Digital Service (DDS) network, for use with the 2500 adapter.

Using a 2500 Communications Adapter, a System/34 can communicate in binary synchronous mode with the following other 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 S/370 supported by OS BTAM; DOS BTAM; OS TCAM; OS/VSI 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).

IBM System/34

▷ two models are \$420 and \$502 per month, respectively. Software license fees are \$85 per month for the System Support Program, \$25 per month for the RPG compiler, and \$75 per month for the assembler.

Although the System/34 clearly outdistances the System/32 in price/performance comparisons, IBM notes that the System/32 will continue as the low end of the IBM small business computer line, due mainly to the fact that there are several S/32 models priced below the minimum S/34 system. In addition, IBM has made the rental charges for System/32's more attractive than those for the System/34.

The minimum System/34, consisting of a 32K-byte CPU, 8.6 megabytes of disk storage, one diskette drive, one CRT console terminal, and a 40-cps serial printer, can be purchased for \$34,700. This represents a \$4,536 saving over a similarly configured 32K-byte System/32 with a 40-cps bidirectional printer, 9.1 megabytes of disk storage, and one diskette drive. The monthly rental charges for these two systems, however, differ by only \$39—\$1,023 per month for the S/32 and \$1,062 for the S/34.

Comparing the S/34 to Univac's BC/7, the new IBM system shows aggressive purchase pricing, coming in at \$37,700 while a similar BC/7 system is priced at \$34,168. But Univac is clearly the aggressor when leased-system prices are compared; the same BC/7 can be leased for \$760 per month compared to \$1,062 monthly for the S/34.

At the upper end, the System/34 encroaches into the performance range of the low-end IBM System/3's—particularly the newest member of that line, the System/3 Model 4. Again, comparing similar hardware configurations, a 64K S/34 can be purchased for \$37,900 or rented for \$1,180 per month, while its System/3 Model 4 counterpart costs \$42,171 purchase or \$1,728 per month. And when one considers the maximum capabilities of the two systems—eight workstations on an S/34 compared to four on the System/3—the System/34 clearly appears to be the more cost-effective choice.

The System/34 hardware is a well-conceived package utilizing the most recent advances in system design, particularly in its central processor and I/O controllers. The only current hardware limitations that Datapro feels are significant are the maximum of one diskette drive, the inability to place workstations at remote locations and communicate with the CPU through modems, and the lack of provisions for high-speed, removable-media mass storage units, which forces users to rely on slow, low-capacity diskettes to create back-up files as a safeguard against loss of their on-line disk files. It's likely that these obvious limitations will be eliminated in due course as IBM expands and improves the System/34 product line.

Whereas IBM seems to have done its homework on the System/34 hardware, the software products initially offered with the new system are less impressive. The system control program for the System/34 has been redesigned

- ▶ ● A 3741 Model 2 Data Station or a 3741 Model 4 Programmable Workstation.
- A 3747 Data Converter equipped with a Model 1660 Communications Adapter.

SDLC-mode communications can be accomplished between a System/34 with a 2500 controller and a System/370 Model 115 to 168 under control of DOS/VS, OS/VS1, or OS/VS2 VTAM through a 3704/3705 Communications Controller operating under the Network Control Program/VS (NCP/VS).

Only one 2500 Communications Adapter can be installed on a System/34. A prerequisite is any one of the integrated modems described below or any EIA-compatible modem connected through the 3701 EIA Interface adapter.

INTEGRATED MODEMS: IBM offers a choice of five integrated modems for use with a System/34 equipped with the 2500 Communications Adapter. Their characteristics can be summarized as follows:

- Model 5500—1200 bps, non-switched.
- Model 5501—1200 bps, switched network with Auto-Answer.
- Model 5600—2400 bps, non-switched point-to-point.
- Model 5602—2400 bps, non-switched multipoint tributary.
- Model 5610—2400 bps, switched network with Auto-Answer.

Only one integrated modem can be installed in a System/34. Processing Expansion Units B and D are required to attach the three 2400-bps modems, and a Processing Expansion Unit B or C is required for the Model 5501 modem.

The optional Switched Network Backup (SNBU) feature, available with or without an Auto-Answer capability, provides for backup attachment of the System/34 to the public switched network when one of the 2400-bps integrated modems (Model 5600 or 5602) is used on a non-switched line as the prime communications link.

MODEL 3701 EIA INTERFACE: This feature can be chosen as an alternative to the IBM integrated modems for use with a System/34 equipped with the 2500 Communications Adapter. It provides a cable and interface that meet the EIA RS-232C specifications and permit the attachment of an external modem supplied by IBM or another vendor. If the modem does not provide its own clocking, the Model 4703 Internal Clock feature, which provides a clocking speed of 600 or 1200 bps, is also required. IBM modems that can be connected to the EIA Interface include the 3872 Model 1 (2400/1200 bps), 3974 Model 1 (4800/2400 bps), and 3875 Model 1 (7200/3600 bps).

MODEL 5650/5651 DATAPHONE DIGITAL SERVICE (DDS) ADAPTER: This adapter is available in two versions for use on AT&T non-switched DDS lines. The unit interfaces to a DDS channel service unit at the customer site. Three data transmission rates are offered: 2400, 4800, and 9600 bps. The Model 5650 adapter is for use in point-to-point applications, and Model 5651 is for multipoint applications. The DDS adapter cannot be used with the Model 3701 EIA Interface or with any version of the 1200- or 2400-bps integrated modems.

SOFTWARE

OPERATING SYSTEM: The System/34 System Support Program (SSP) is so named because many of its routines have been implemented in system firmware. Between the SSP and the firmware-implemented routines, the same func-

IBM System/34

▷ a system *support* program because so many of the functions normally performed by the control program have been implemented in system firmware. The remainder of the software modules not implemented in firmware are left in software and designated the System/34 System Support Program (SSP). In addition to SSP, IBM has announced an upgraded version of S/32 RPG II that operates in a multiprogramming environment, a basic assembler and macro processor, and four system utilities that are virtually identical with those for the System/32.

These four principal software packages are all scheduled for delivery in late January 1978, when the first S/34's are slated for shipment. However, software support for communications, particularly for SNA applications under SDLC, is not scheduled for release until 1979. The SSP utility for SNA/SDLC communication with RES, JES2, and Power/VS is scheduled to appear in January 1979, and the SSP SNA/SDLC communication support and the basic assembler macro support for communication with CICS/VS and IMS/VS will be released in July 1979. Until then, users who want to use System/34's as remote terminals for larger host systems will have to rely on their own ingenuity for communications software for these systems.

IBM also announced 15 versions of System/32 Industry Applications Programs (IAP's) that have been modified for execution on the System/34, plus one new program, the Distributors Management Accounting System II (DMAS II), developed explicitly for the S/34. However, the 15 S/32 IAP's will execute only in *single-program mode*, thereby effectively reducing the multiprogramming System/34 to a single-workstation System/32 that cannot take advantage of the S/34's spooling and file sharing capabilities. Only the DMAS II package, scheduled for release in April 1978, can fully exploit the new features of the System/34.

The new S/34-modified IAP's also require two to three times the amount of memory occupied by their System/32 counterparts. In a single-user environment, this may present few problems, especially in view of the recent drastic memory price cuts made by numerous manufacturers, including IBM. But, in a multiprogramming environment, the increased memory requirements mean that more segmentation will be required for concurrent execution and that system performance will be reduced because more disk accesses will be required to roll in and roll out program segments.

It is a foregone conclusion that IBM will waste no time in releasing new versions of the System/32 IAP's that fully exploit the System/34's capabilities—but exactly when is not known at this time. Hence, early System/34 users will have to develop their own application software (or pay to have it developed) if they expect to derive the benefits of multi-user multiprogramming from the new system. □

▶ **tionality provided by the System/32 System Control Program plus the added support for multiprogramming is provided.**

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 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 designated 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 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 ▶

IBM System/34

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 multiprogram mode, or 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 file scan 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: Communications software for the System/34, like 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/34 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/34 executing a program written in RPG II to function as a terminal in one of three types of networks: point-to-point switched, point-to-point non-switched, or multipoint.

SYSTEM/34 UTILITIES PROGRAM PRODUCT (5725-UT1): In addition to the file management utilities supplied with the SCP control program, 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. 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.

RPG II (REPORT PROGRAM GENERATOR; 5726-RG1): System/34 RPG II is identical to its System/32 counterpart except for certain functions implemented to

IBM System/34

► 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 modes: 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.

BASIC ASSEMBLER AND MACRO PROCESSOR (5726-ASI): The addition of an assembler 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.

INDUSTRY APPLICATION PROGRAMS (IAP's)

Every System/32 IAP can be executed on a System/34 after recompilation. The IAP's listed in this section, with one exception, are recompiled System/32 IAP's that can be executed *only in program mode*. When these programs are being executed, only one workstation is supported and the multiprogramming, spooling, and file-sharing capabilities of the System/34 cannot be utilized.

DISTRIBUTORS MANAGEMENT ACCOUNTING SYSTEM (DMAS): This IAP is offered in two versions: DMAS, which executes only in single-program mode, and DMAS II, which executes in multiple-program mode on a System/34. At the time of this writing, DMAS II is the *only* application software available from IBM that can be executed in multiple-program mode.

DMAS contains four separately priced modules: billing, accounts receivable, inventory control, and sales analysis.

The billing module dynamically maintains stock balances and allocates available quantities to orders as they are entered or released. Users can choose between pre-billing or post-billing. After an order is entered, any operator can initiate the printing of a picking list as well as other invoices.

The DMAS billing package also provides a flexible pricing structure and can price according to discount from list or markup from cost. It can also allow for item quantity discounts or accommodate manually entered overrides, such as contract prices. If the accounts receivable module is installed, the billing module can also perform credit checking, posting a warning if a customer's balance exceeds 90 percent of the limit.

The accounts receivable package permits selection of balance-forward or open-item accounting for each account. The system also permits operators to apply payments to specific invoices. Statements with past and future aging, late charges, and optional remittance tear slips can be prepared. Aged trial balance and customer account status reports are available on demand.

The inventory control module supports both the average cost and replacement cost methods of costing. Inventory balances can be maintained separately for multiple warehouses, and sales, receipts, and adjustments are im-

IBM System/34

► mediately reflected in the quantity-available reports. The module produces stock status reports, stock status reviews, and other user-specified analyses to provide stock investment data.

The sales analysis module combines information generated and collected by the billing, accounts receivable, and inventory control modules and can indicate profitability of products, customers, and salesmen. Daily sales are shown by customer within salesman. Monthly sales reports are sequenced by item, item class, item class within customer within salesman, customer, customer within salesman, and salesman.

FOOD DISTRIBUTION MANAGEMENT ACCOUNTING SYSTEM (5726-D65 to -D68): Designed specifically to meet the requirements of the wholesale food industry, this package includes programs that perform billing, inventory control, accounts receivable, and sales analysis. Functions performed by the Billing system include order entry and editing, production of slot-sequenced picking documents for warehouse operations or case labels, customer invoices, an audit trail of daily billing activities, and a daily summary of each salesperson's activity. Other information provided by the Billing program includes the provision of multiple pricing options, special allowance notations, suggested retail prices, and automatic substitutions and special offers. The Billing program accumulates accounts receivable information that is later available to the Sales Analysis, Inventory Control, and Accounts Receivable programs for further analysis and evaluation.

The Inventory Control programs maintain perpetual inventory and "on-order" status for each item in inventory. A weekly buyer's report provides data on sales by item and inventory demand and movement. Reports on inventory activities, including inventory turns, profitability, and stock-outs, can be prepared on a weekly or monthly basis or on demand.

The Sales Analysis programs produce reports on the sales activities and performance of individual items, sales personnel, and customer activities. Either detailed or summary reports can be selected.

The Accounts Receivable program uses data accumulated by the Billing program to produce weekly and monthly statements and aging reports. The programs handle both open-item and balance-forward customer accounts and print a copy of the aged trial balance on demand. Delinquent notices are automatically prepared for monthly delinquent accounts.

The Billing, Inventory Control, Accounts Receivable, and Sales Analysis programs are tailored to individual customer requirements through the use of a questionnaire that permits the user to select optional functions and reports and to tailor file volumes and data field sizes.

SYSTEM/34 DISTRIBUTION FINANCIAL ACCOUNTING SYSTEM (DFAS): Includes General Ledger (5725-D6A), Accounts Payable (5725-D6B), and Payroll (5725-D6C) applications. General Ledger permits either a 12-month or 13-period fiscal year and provides an income statement and balance sheet as standard reports. The Accounts Payable application provides a purchase journal, a cash disbursements journal, an open payables report, a cash requirements report, and a vendor analysis report. In addition, checkwriting and reconciliation are also provided. The Payroll application is an hourly/salary/executive payroll that handles regular, overtime, premium, vacation, and sick pay. It can be run weekly, bi-weekly, semi-monthly, and monthly.

These application packages are written in RPG II and run under the System Support Program. The System/34 Utilities and a minimum 32K processor are required.

SYSTEM/34 CLIENT ACCOUNTING AND FINANCIAL REPORTING SYSTEM (CAFRS): This IAP (5726-C21) is designed for certified public accounts, bookkeepers, or small accounting firms as an aid in solving the problems of client accounting. Data can be entered through the keyboard or by a cassette created on a 3740 Data Entry System. Standard types of accounting reports such as journals, ledger, trial balance, and financial statements can be generated. Other supporting analyses and lists, as well as additional comparison reports, are also available to the user. This IAP requires a minimum 32K System/34 and the System/34 Utilities. CAFRS is written in RPG II.

MEDICAL GROUP MANAGEMENT SYSTEM: This IAP (5726-H15) provides a balance-forward accounts receivable system for a medical group of from 3 to 15 doctors. Patients are billed on a monthly basis, and third parties (insurance companies) can be billed as required. Options exist to provide a detailed appointment list showing patient appointment information and patient charge slips, and a practice analysis system that provides statistical report for each doctor on a calendar year basis. MGMS requires a 32K System/34 for execution.

SYSTEM/34 HOSPITAL FINANCIAL MANAGEMENT SYSTEM (HFMS): This system is designed to handle the information processing needs of small hospitals with capacities ranging from 50 to 150 beds. Four programs are included in the package: Patient Billing (5726-H11), Accounts Receivable (5726-H12), Payroll (5726-H13), and General Ledger/Accounts Payable (5726-H14). The programs produce daily census reports on patient statistics, admissions and outpatient visits, and accounts receivable transactions.

The Patient Billing system automatically generates reports on room charges and provides daily general ledger revenue summaries for input to the General Ledger/Accounts Payable programs. The General Ledger/Accounts Payable system is based on the standard American Hospital Association chart of accounts and can be tailored to fit user charts of accounts with up to seven-digit account codes. The system provides monthly financial reports, general ledger trial balances, and accounts payable functions.

The Accounts Receivable program permits daily posting, reporting, and control of all accounts receivable transactions, and can accept keyed entry of data on new accounts or automatic entry of new accounts from the Patient Billing program. The Payroll program handles hourly or salaried employees on a biweekly payroll period. The system can accommodate up to ten rates and voluntary deductions per employee and one non-federal tax routine. Other reports include accrued benefits, personnel status, labor distribution, and automatic preparation of input to the General Ledger/Accounts Payable system.

The Hospital Financial Management System requires a 32K System/34.

SYSTEM/34 MANUFACTURING MANAGEMENT ACCOUNTING SYSTEM (MMAS): Nine programs are included in this IAP: Production Status and Costing (5726-M31), Payroll (5726-M32), Accounts Payable (5726-M33), Accounts Receivable (5726-M34), Inventory Management (5726-M35), Product Definition and Costing (5726-M36), General Ledger (5726-M37), Sales Analysis (5726-M38), and Order Entry and Invoicing (5726-M39). MMAS is aimed at those industries in the manufacture and fabrication of both ferrous and non-ferrous metals, and in the manufacture of machinery, household and office furni- ►

IBM System/34

► ture, and related products. The system is written in RPG II and runs on a 48K System/34 under the System Support Program. The Data File and Source Entry Utilities are required.

Production Status and Costing provides analysis reports for production and accounting departments, such as job status, work list, and exception reporting for quantity or cost variances from projections. Transactions are accepted through interfaces with the Payroll, Inventory Management, and Accounts Payable programs.

Payroll provides for hourly, salaried or executive employees on a weekly, biweekly, semi-monthly, or monthly basis and accounts for regular, overtime, premium, vacation, and sick pay. Transactions may be passed for use in General Ledger applications. After payroll register and checks are produced, the system can give the user reports on labor and job distribution, miscellaneous and union deductions, year- and quarter-to-date earnings, workmen's compensation worksheet, and W-2 and 941A reports.

Accounts Payable provides either accrual or cash basis for open payables and cash disbursements. Chief among the reports provided are a purchase journal which provides an audit trail for cost transactions, an open payables report indicating payment by date, vendor, or invoice, a cash requirement report for checking invoice selection for payment, a cash disbursement register which acts as a check register, and a vendor analysis report for information on business volumes and discounts lost. Both the cash disbursements journal and the purchase journal pass auditing information to the General Ledger Application.

Accounts Receivable can accept transactions directly or from the Order Entry and Invoicing application, and provides for open item and balance forward customers. A multi-option aged trial balance is provided, along with a facility for delinquency notices.

Inventory Management provides a transaction entry/edit/posting function for a perpetual inventory, as well as interfaces to Order Entry and Invoicing, Sales Analysis, Production Definition and Costing, and Production Status and Costing.

The Production Definition and Costing programs provide a means for organization of bills of material and calculation of product costs. Reports can be produced on costed bills of material, potential cost changes and variances, and where-used lists.

The General Ledger programs accept transactions directly or from the Accounts Payable and Payroll applications. The application uses audit registers and a financial statement worksheet for balance verification prior to closing. The major closing output is an income statement and balance sheet, whose format is user-controlled. The user can also control the chart of accounts if desired. Up to 10 companies can be supported with direct transaction input.

The Sales Analysis programs utilize input from Order Entry and Invoicing, Accounts Receivable, and/or Inventory Management. Reports provide multiple comparative analyses of profit and sales by item, customer, or salesman and a daily or monthly recap for each salesman. Reports may optionally be printed in detail or summary form.

Order Entry and Invoicing programs provide input into Inventory Management, Accounts Receivable, and Sales Analysis. This application handles editing as well as preparation of an invoice register and price lists. Pricing may be at retail price, discount from a list price, an operator-entered price, or a customer-negotiated contract price. Order and back-order status is provided by due date.

A System Tailoring Procedure is usable in all nine application areas. This procedure allows the user, through the use of a questionnaire, to select optional functions and/or programs and to tailor file sizes to his requirements. Rerunning the procedure can change the selected options and file sizes.

SYSTEM/34 CONSTRUCTION MANAGEMENT ACCOUNTING SYSTEM (CMAS): This industry application package consists of the following four programs: Job Costing (5726-M61), Accounts Payable (5726-M62), Payroll (5726-M63), and General Ledger (5726-M64). These programs provide a wide variety of accounting and management reports for single- or multi-company organizations. Reports produced by the Payroll program, in addition to paychecks and employee earnings statements, include payroll registers containing totals of employee hours worked and data on deductions and gross and net pay, a labor cost report for each job, and reports on workmen's compensation and insurance and union contributions. Job Cost Analysis produces reports on actual cost of materials, labor, subcontracting activities, and overhead compared to estimated costs. The system also provides a selection of financial management reports associated with general ledger accounting. Facilities for tailoring the programs permit the system to accommodate company growth. Use of the Construction Management Accounting System requires a 48K System/34.

IBM LUMBER AND BUILDING MATERIAL DEALERS MANAGEMENT ACCOUNTING SYSTEM (5726-D4E to -D4H): The Billing application prepares estimates and can handle selection of four or six different prices per item, dependent on customer code; these prices are in addition to the list price. The application also handles price conversion, with computations for square-foot, lineal-foot, and board-foot items in addition to multiple sales tax calculations. The Inventory Control Application provides both last and average cost figures for inventory valuation as well as inventory distribution by value. The Accounts Receivable application permits the user to change a customer from open item to balance forward or the reverse at the end of the month or accounting period. The Sales Analysis application produces daily and monthly reports by customer, as well as four-way reporting of profit margins. Facilities are built in to modify data file sizes and user-maintained constants.

This IAP requires a System/34 with 48K bytes of memory, and 8.2 megabytes of disk storage, and a printer with 132 positions. The system is written in RPG II and runs under the System Support Program. The System/34 Utilities are also required.

SYSTEM/34 MEMBERSHIP AND MAILING LIST SYSTEM (5726-K11): These programs provide the capability to establish interrelated data files to handle membership dues accounting, publication accounting, information exchange, and event participation accounting. The programs prepare invoices for membership dues and for publications, maintain lists of chapter memberships, produce dynamic listings of the membership base for analysis, and handle receipts of dues and publication payments.

Membership identification cards, 3 x 5 information cards, and membership rosters can be produced. User-defined membership codes of up to 11 characters can be used. Dues and special charges can be calculated by an individual rate per member, by class of membership, or by a set rate for all members. Mailing functions include label preparation and mailing lists based on user-specified criteria, circulation and postal zone summary reports, and agency distribution of publications. In addition, a record of individual participation in association-sponsored events can be accumulated, and a statistical summary of membership participation maintained. The ANALYZE command permits interroga- ►

IBM System/34

► tion of the data base to produce selective membership mailings, dynamic membership lists, and statistical profiles of the organization membership.

If only membership dues administration and mailing functions are desired, a minimum System/32 configuration can accommodate approximately 13,000 to 15,000 members. Interactive file maintenance facilities include automatic updating by member class to maintain membership codes, special charges and dues, and individual updating of selected records. The Membership and Mailing List System requires a 32K System/34.

DATA COLLECTION SUPPORT PRODUCT FOR 5230 SYSTEM: This 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.

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 non-programmable. 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.

MOTOR FREIGHT ACCOUNTING SYSTEM (MFAS) ACCOUNTING (5725-T21): This IAP offers revenue accounting functions to general commodity carriers and specialty carriers in the motor freight industry. These functions are divided into five categories: Freight Bill Entry and Daily Reports, Accounts Receivable, Interline Payables, Shipment Analysis, and Owner/Operator Accounting. The application is designed to help the small to medium-size general freight and specialty carrier manage his revenue accounting requirements and report prime motor freight sales and operational data.

Entry of data from a coded copy of the freight bill establishes records for daily statistical reports, accounts receivable, interline payables, shipper/consignee and interline statistics, and shipment analysis.

Entry of the owner/operator accounting data produces records of owner/operator freight bill revenue, expenses, charges, advances, and settlement amounts. Owner/operator accounting will also produce settlement sheets detailing items to be used in settling with the owner/operator. Owner/operator accounting is by owner and/or driver or unit.

This package allows the user to tailor the application to select those functions which meet his particular needs. It may be installed without customer programming capability. The order in which application functions are executed and the file sizes can be changed as the business grows by re-execution of the tailoring procedure. There are also provisions for system-controlled master file and transaction file backup procedures. Security codes are included to help deter unauthorized use. Operator input can be via the System/34 keyboard or the off-line 3740 Data Entry System. The system allows multiple batch entry for a single update.

File load and maintenance programs are provided for master files, as well as ready-to-execute procedures and object code so that no systems designing, programming, or compiling is necessary. A usage file is maintained and updated (optional) to help prevent use of duplicate freight bill numbers. MFAS may co-reside with the Distribution Financial Accounting System (DFAS) general ledger, accounts payable, and payroll modules. It will, then, update DFAS general ledger files using MFAS revenue, accounts receivable, and interline payables data.

Highlights of the MFAS system include: cash receipts applied by individual freight bill number or entire statement for direct customers, bank payment plans and transport clearing houses; automatic adjustment facility in cash receipts to relieve an open receivable when the payment is within a designated range of the expected accounts receivable amount; and ability to print interline payables checks for bills received from interline carriers and to process debit memos received from bank payment plans and transport clearing houses. The MFAS shipment analysis reports by terminal, origin/-destination, shipper, consignee, customer, lane, and commodity, and also provides key industry statistics such as revenue per hundredweight, revenue per shipment, average weight and revenue per shipment, and revenue per mile and ton mile. Year-to-date revenue accumulated is also maintained to aid in 1099 reporting for owner/operators.

This package permits continuing traffic study statistics, with the option to change the weight ranges and the frequency of selection within each weight range. Five weight categories plus one category for bills without shipment weight are provided.

FINANCIAL INSTITUTIONS CUSTOMER ACCOUNTING SYSTEM (5726-F11 to -F13): This IAP provides extensive support for customer account processing in small commercial banks. The package contains three modules: Customer Information File (5725-F11), Demand Deposit Accounting (5725-F12), and Savings Accounting (5725-F13).

The data organization used in the Customer Information File (CIF) module enables the bank to associate all of a customer's checking and savings accounts with a record that contains common information about the customer and his relationship with the bank. This enables the bank to make decisions based on a broader knowledge of the status of the customer's accounts. In addition, the CIF provides file maintenance procedures for the master files for the other IAP's and separate conversion procedures to create and activate the files.

The two account processing IAP's offer a broad range of functional support. The Demand Deposit Accounting (DDA) IAP includes, in addition to standard DDA support, optional overdraft banking and automatic funds transfer functions. The customer may also elect to print combined statements which include balance information from the customer's savings accounts.

The Savings Accounting IAP supports both regular savings accounts and time deposit open accounts. Time deposit open accounts earn a higher rate of interest if the money is kept on deposit for a specified period of time, while regular savings accounts normally have no time requirement. Either type of account may be supported by customer passbooks, by account statements, or by both passbooks and statements.

Several choices of interest compounding and crediting periods are supported. The system features two levels of security codes to help deter unauthorized access to programs or data. It supports entry of more than one batch of monetary transactions, with internal balancing and edit controls for ►

IBM System/34

- each batch. More than one entry cycle may precede an update posting cycle.

Data entry for the file maintenance and monetary transactions is supported through the System/34 keyboard or an off-line IBM 3740 Data Entry System. In addition, monetary transaction data entry is supported through the IBM 1255 Magnetic Character Reader for both the Demand Deposit Accounting and Savings Accounting modules.

Significant features of the Customer Information File module include access to all of a customer's checking and savings accounts through the customer's name, access to all customers associated with a single account through the account number, and consolidation of customer information, such as name and address, to facilitate maintenance changes and reduce duplication of information. CIF can provide the status of a customer's checking and savings accounts, shown by a printed customer profile or a console inquiry, and distribution of accounts and total deposits in specified ranges of account balances can be shown in a spread report.

Demand Deposit Accounting supports posting against current, available, or collected balance and provides support for up to two classes of float. The module supports stop payment either of all checks drawn on an account or of specific checks by amount or serial number. An account may also be frozen to prevent the posting of any transactions. The module also supports a hold of any amount against an account and supports short lists for accounts with large transaction volumes. DDA provides a choice of five service charge calculation options as well as free checking. If the Savings Accounting application is installed, service charges may be waived based on the balance in a savings account.

Monthly statements are provided, either a standard statement or a combined statement that includes the balances of selected savings accounts. Special statements are also provided on request.

The system allows overdraft banking. The payment due on the overdraft banking loan balance is automatically deducted from the checking account at statement time.

The Automatic Funds Transfer (AFT) function transfers funds from a checking account to another account at customer-designated intervals. Credits to a savings account on the Savings Accounting application are automatically credited; others are listed for off-line crediting. AFT provides a daily combined trial balance and activity journal, a separate overdraft trial balance, NSF notices, and auditor confirmation notices, as well as standard processing and exception reports.

Savings Accounting will supply either the low reference balance or the day of deposit to day of withdrawal interest computation for regular savings deposit plans. A period of either one full calendar quarter or 90 calendar days can be used to mature deposits for time deposit open account plans. For all but low reference balance accounts, interest is accrued daily and compounded continuously, daily, quarterly, or semi-annually; grace periods are supported; and either a LIFO or FIFO posting method may be used.

Any account may be supported with a passbook, a periodic statement, or both. No-book transactions are recorded and reported. A hold of any amount may be placed against an account, all withdrawals may be stopped, or the account may be frozen to prevent the posting of any transactions.

PRICING

EQUIPMENT: The following systems represent stand-alone systems with no communications capabilities. Software license charges are not included in the monthly rental prices.

MINIMUM SINGLE-USER SYSTEM: Consists of a 5340 Model A11 System Unit with 32K bytes of main memory, 8.6 megabytes of disk storage, a Diskette 1 drive, a 40-cps 5256 serial printer, and a 5251 Model 11 CRT display/keyboard unit. Monthly rental for the system is \$1,062, and the purchase price is \$34,700.

MEDIUM-SCALE THREE-USER SYSTEM: Consists of a 5340 Model B12 System Unit with 48K bytes of main memory, 13.2 megabytes of disk storage, a Diskette 1 drive, a 160-lpm 5211 line printer, and three 5251 Model 11 CRT display/keyboard units. Monthly rental for the system is \$1,630, and the purchase price is \$53,500.

LARGE-SCALE SIX-USER SYSTEM: Consists of a 5340 Model C23 System Unit with 64K bytes of main memory, 27.1 megabytes of disk storage, a Diskette 2D drive, a 300-lpm 5211 line printer, six 5251 Model 11 CRT display/keyboard units and two 120-cps 5256 serial printers. Monthly rental for the system is \$2,789, and the purchase price is \$88,600.

SOFTWARE: All software is licensed separately, including the System Support Program, the RPG II compiler, the basic assembler, and the system utilities. Users pay a monthly license fee for all System/34 software. No initial charges are made.

TESTING: IBM provides a 72-hour pre-installation program testing allowance for each basic System/34, plus additional testing hours depending upon the configuration. The additional testing allowance times are as follows:

16K main memory increment (over 32):	2 hours
27.1-megabyte disk storage:	4 hours
5251 display/keyboard:	3 hours
2500 Communications Adapter:	5 hours
1255 Magnetic Character Reader:	5 hours

CONTRACT TERMS: IBM offers the System/34 on a purchase or rental basis. Two rental policies are available, the standard Monthly Availability Charge (MAC) and the System/34 Term Availability Plan (TAP).

The TAP has a contract duration of 36 months and has a first-year monthly charge that is approximately 5 percent lower than the Monthly Availability Charge (MAC). The TAP provides lease and purchase price protection for a period of one year and accrual of up to 50% of the purchase price of the equipment at the end of three years. IBM reserves the right, on 60 days' notice, to increase the TAP monthly charge and/or purchase price by up to 5% during the second year of the lease, and by another 5% during the third year. The customer can elect to extend the TAP contract for any number of one-year periods and for one period of less than a year. Equipment acquired under the TAP may be field-upgraded, although modifications that result in a model downgrade will incur a termination charge. IBM offers a discount of 10 percent to qualified educational institutions. ■

IBM System/34

EQUIPMENT PRICES

BASIC SYSTEM

	<u>Purchase Price</u>	<u>Monthly Maint.</u>	<u>Rental (1-year lease)*</u>	<u>Rental (TAP, 1st year)*</u>
5340 System Unit; includes CPU, main memory, fixed disk storage, and one diskette drive:				
Model A1132K bytes, Diskette 1 drive, 8.6 megabytes of disk storage	\$26,300	145.00	786	715
Model A1232K bytes, Diskette 1 drive, 13.2 megabytes of disk storage	28,080	155.00	858	780
Model A1332K bytes, Diskette 1 drive, 27.1 megabytes of disk storage	35,460	190.00	1,083	985
Model A2132K bytes, Diskette 2D drive, 8.6 megabytes of disk storage	28,460	150.00	852	775
Model A2232K bytes, Diskette 2D drive, 13.2 megabytes of disk storage	30,240	160.00	924	840
Model A2332K bytes, Diskette 2D drive, 27.2 megabytes of disk storage	37,620	195.00	1,149	1,045
Model B1148K bytes, Diskette 1 drive, 8.6 megabytes of disk storage	27,900	150.00	830	755
Model B1248K bytes, Diskette 1 drive, 13.2 megabytes of disk storage	29,680	160.00	902	820
Model B1348K bytes, Diskette 1 drive, 27.1 megabytes of disk storage	37,060	195.00	1,127	1,025
Model B2148K bytes, Diskette 2D drive, 8.6 megabytes of disk storage	30,060	155.00	896	815
Model B2348K bytes, Diskette 2D drive, 27.1 megabytes of disk storage	31,840	165.00	968	880
Model C1164K bytes, Diskette 1 drive, 8.6 megabytes of disk storage	29,500	155.00	874	795
Model C1264K bytes, Diskette 1 drive, 13.2 megabytes of disk storage	31,280	165.00	946	860
Model C1364K bytes, Diskette 1 drive, 27.1 megabytes of disk storage	38,660	200.00	1,171	1,065
Model C2164K bytes, Diskette 2D drive, 8.6 megabytes of disk storage	31,660	160.00	940	855
Model C2264K bytes, Diskette 2D drive, 13.2 megabytes of disk storage	33,440	170.00	1,012	920
Model C2364K bytes, Diskette 2D drive, 27.1 megabytes of disk storage	40,820	205.00	1,237	1,125

OPTIONS AND FEATURES

5810 Printer Attachment for Model 5211 line printer; max. one per system	1,440	8.00	44	40
1100 Magnetic Character Reader Attachment for Model 1255 reader; max. one per system; requires 5732 or 5733 Processor Expansion Unit	8,775	25.00	247	225
5732 Processor Expansion Unit A; I/O board; required for attachment of Model 1100 MICR attachment except on all System Unit models with 27.1-megabyte disk storage; max. one per system; not required if 5733 Processor Expansion Unit is installed	1,080	2.00	33	30
5733 Processor Expansion Unit B; I/O board and additional power for communications features; required for attachment of Model 1100 MICR attachment or Models 5600, 5602, or 5610 2400-bps modems; max. one per system	720	5.00	22	20
5734 Processor Expansion Unit C; I/O modem regulator; required for installation of Model 3701 EIA Interface or Model 5501 1200-bps modem; max. one per system; not required if Model 5733 Processor Expansion Unit installed	288	0.50	8	8
5735 Processor Expansion Unit D; gate assembly for installation of Models 5600, 5602, and 5610 2400-bps modems; max. one per system	288	0.50	8	8

PERIPHERALS

5251 CRT Display Station; one required for each system, max. eight per system; Model 4600 keyboard required	2,850	18.00	88	75
4800 Keyboard for Model 5251 CRT display station	350	3.00	12	10
4655 Keylock feature for Model 5251 CRT display station or for 5340 System Unit	40	—	—	—
2680 Cable-Through feature for Model 5251 CRT display station or for Model 5256 serial printer	115	1.00	4	3
5256 Serial Printer for workstation; one required for each system; Model 5211 line printer may be substituted for console printer; max. eight per system:				
Model 1; 40 cps	5,200	30.00	176	150
Model 2; 80 cps	5,800	35.00	200	170
Model 3; 120 cps	6,250	42.00	217	185
1470 Audible Alarm for Model 5256 serial printer				
5211 Line Printer; may be substituted for Model 5256 console printer; max. one per system; requires Model 5810 attachment and print belt	115	1.00	4	3
Model 1; 160 lpm	12,800	75.00	376	320
Model 2; 300 lpm	15,600	125.00	458	390
5915 to 5918 Print Belt for 5211 line printer	170	—	—	—

COMMUNICATIONS

2500 BSC/SDLC Communications Adapter; required for remote communications; requires one 1200-bps or 2400-bps modem, Model 3701 EIA Interface, or DDS adapter; max. one per system	2,880	20.00	88	80
5500 1200-bps Integrated Modem, with Auto-Answer; for use with 2500 adapter on non-switched lines; requires 4703 internal clock; cannot be used with other modems, 3701 EIA Interface, or 5650 and 5651 DDS adapter	660	5.00	19	18
5501 1200-bps Integrated Modem, with Auto-Answer; for use with 2500 adapter on switched lines; requires 5734 Processor Expansion Unit and 4703; internal clock; cannot be used with other modems, 3701 EIA Interface, or 5650 and 5651 DDS adapters	880	7.00	26	24
2400-bps Integrated Modems for use with 2500 adapter; requires 5734 and 5735 Processor Expansion Units; cannot be used with other modems; 3701 EIA Interface, or 5650 and 5651 DDS adapters:				
5600 For non-switched point-to-point lines	2,240	11.50	71	65
5602 For non-switched multi-point tributary lines	2,490	13.00	78	71
5610 With Auto-Answer; for switched lines	2,550	14.00	79	72
5650 Dataphone Digital Service Adapter for use with 2500 adapter in point-to-point connection; cannot be used with other modems or 3701 EIA Interface	840	5.00	24	22
5651 Dataphone Digital Service Adapter for use with 2500 adapter in multipoint tributary connection; cannot be used with other modems or 3701 EIA Interface	840	5.00	24	22

IBM System/34

EQUIPMENT PRICES

COMMUNICATIONS (Continued)		Purchase Price	Monthly Maint.	Rental (1-year lease)*	Rental (TAP, 1st year)*
3701	EIA Interface for connection of 2500 communications adapter to non-integrated modems; requires 5734 Processor Expansion Unit; may require 4703 internal clock; cannot be used with integrated modems or 5650 and 5651 DDS adapter	430	4.50	13	12
4703	Internal Clock for use with 5501 modem or 3701 EIA Interface	210	0.50	6	6
7951	Switched Network Backup Unit; for use with 5600 and 5602 modems	540	3.50	16	15
7952	Switched Network Backup Unit with Auto-Answer; for use with 5600 and 5602 modems	828	5.00	25	23

*Rental prices include equipment maintenance.

SOFTWARE PRICES

PROGRAM PRODUCTS	Monthly License Charge
System Support Program	\$ 85
System Utilities	30
RPG II	25
Basic Assembler and Macro Processor	75
INDUSTRY APPLICATION PROGRAMS	
Distributors Management Accounting System II (DMAS II):	
Billing	50
Accounts Receivable	35
Inventory Control	45
Sales Analysis	45
Distributors Management Accounting System (DMAS):	
Billing	47
Accounts Receivable	32
Inventory Control	41
Sales Analysis	41
Management System For Law Firms (MSLF)	175
Student Administrative System (SAS):	
Student Records	65
Student Accounting	72
Student Scheduling	86
Motor Freight Accounting System (MFAS)	145
Financial Institutions Customer Accounting System (FICAS):	
Customer Information File	88
Demand Deposit Accounting	79
Savings Accounting	78
Lumber Dealers Management Accounting System (LDMAC):	
Billing	47
Accounts Receivable	32
Inventory Control	41
Sales Analysis	41
Food Distributors Management Accounting System (FDMAS):	
Billing	47
Accounts Receivable	32
Inventory Control	41
Sales Analysis	41
Distribution Financial Accounting System (DFAS):	
General Ledger	27
Accounts Payable	27
Payroll	35
Construction Management Accounting System (CMAS):	
Job Costing	32
Accounts Payable	40
Payroll	55
General Ledger	32
Manufacturing Management Accounting System (MMAS):	
Product Status and Costing	35
Payroll	35
Accounts Payable	27
Accounts Receivable	28
Inventory Management	35
Product Definition and Costing	32
General Ledger	27
Sales Analysis	35
Order Entry and Invoicing	41
Medical Group Management System (MGMS)	90

IBM System/34

SOFTWARE PRICES

**Monthly
License Charge**

INDUSTRY APPLICATION PROGRAMS (Continued)

Hospital Financial Management System	
Patient Billing	31
Accounts Receivable	26
Payroll	51
General Ledger/Accounts Payable	40
IBM 5320 Data Collection System Support	36
Membership and Mailing List System	102
Client Accounting and Financial Reporting Systems	95