

IBM System/34



The System/34 is a member of the new wave of business computer systems packaged for use in standard office environments. Unlike the earlier IBM System/32, however, the System/34 offers a number of stand-alone peripheral devices, including both table-top and free-standing printers and a magnetic character reader.

MANAGEMENT SUMMARY

IBM took a major step toward protecting and further enhancing its lion's share of the small business computer market by announcing the System/34 in April 1977. The System/34, an apparent successor to the 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 was the first in a new series of upward-compatible IBM small business computer systems that already overlap both the System/32 and System/3 performance ranges. The second and latest product in the evolutionary line is the System/38 (Report 70C-491-29), announced in October 1978. The System/34 and System/38 are the obvious successors to the highly successful IBM System/3 family.

The most significant difference between the System/32 and the System/34 is the number of users each can sup- ➤

The System/34 represents a major step in IBM's planned replacement of the System/3 and an attractive growth path for its extensive base of System/32 users. Featuring multi-terminal support and a substantial speed increase over the System/32, the System/34 offers users a broad array of packaged systems, now standing at 75 separate configurations.

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 through A15, A21 through A25, A31 through A35, B11 through B15, B21 through B25, B31 through B35, C11 through C15, C21 through C25, C31 through C35, D11 through D15, D21 through D25, D31 through D35, E11 through E15, E21 through E25, and E31 through E35.

DATE ANNOUNCED: April 1977.

DATE OF FIRST DELIVERY: December 1977.

NUMBER INSTALLED: 6000 by the end of 1978 (estimated).

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 as standard. Scientific instruction set firmware is installed when the FORTRAN program product is used.

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, 65,536, 98,304, or 131,072 bytes.

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

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▷ port. 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.

During the 20 months since its introduction, IBM has expanded the System/34 in fixed disk capacity, main memory capacity, remote workstation capability, and software products. Fixed disk capacity, previously limited to 27.1 megabytes, has been expanded to 128.4 megabytes. Main memory, previously set at a maximum of 64K bytes, has been increased to 128K bytes. The System/34's remote workstation capability now allows for the attachment of up to 64 workstations. New program products include COBOL, FORTRAN, a Workstation Search Facility, and the Interactive Communications Feature of SSP. To date, a total of 21 application software products have been announced for the System/34, including new products, System/32 carryover products, and System/32 products revised to make use of System/34 facilities.

The System/34 hardware components were all newly designed for use in the system. 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 functions as an execution processor, performing the actual computations. The system control processor is most visible to users and is available with five capacities of 600-nanosecond memory: 32K, 48K, 64K, 96K, and 128K 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 or 5252 CRT display and/or a 5256 tabletop-mounted printer. It appears 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. Five capacities of disk storage are available: 8.6, 13.2, 27.1, 63.9, and 128.4 million bytes. Average access time for all models is 40 milliseconds, and ▷

▶ **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 uses a combination of LSI/MSI logic circuitry and 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-, 64K-, 96K-, or 128K-byte main memory.

The execution processor operates in parallel with the system processor and 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, diskette magazine facility, and disk drive. The unit is 48 inches high, 26 inches wide, 60 inches deep, and weighs a minimum of 884 pounds.

Service clearance requirements are 36 inches in front of the 5340, 30 inches in the rear, 36 inches to the right, and 30 inches to the left.

The system is designed to operate at altitudes from sea level up to 7000 feet above sea level. Operating temperature range is 60 to 100 degrees F., with a noncondensing relative humidity of 8 to 80 percent. Optimum operating conditions are a temperature of 70 to 75 degrees and a noncondensing relative humidity of 40 to 50 percent. The 5340 outputs 3400 BTU per hour (1000 watts).

The power requirement for the 5340 is 208/330 VAC, single phase. Voltage must be maintained within ± 10 percent of the rated system voltage. A transient voltage condition must not exceed +15 or -18 percent of the nominal voltage and must return to the normal range within one-half second. Line frequency is 60 Hertz $\pm 1/2$ Hertz. Voltages outside the USA and Canada are 200/220/230 volts, 50 Hertz or 200/208/230 volts, 60 Hertz.

INPUT/OUTPUT CONTROL

I/O CHANNELS: A direct memory access channel is a standard feature. ▶

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- 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.

A recent addition to the System/34 diskette capability is the diskette magazine drive, which can process either individual diskettes or magazines holding up to 10 diskettes each. The diskettes may be of either the Diskette 1 or Diskette 2D type in either extended or basic format.

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 (or a 5252 Dual Display Stations unit and its keyboards) and/or a 5256 tabletop printer. All workstation components can be installed by the customer, using connectors provided for the purpose.

The 5251 Display Station includes either a 1920-character display (24 lines of 80 characters) or a 960-character display (12 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 5252 Dual Display Stations unit functions as two 960-character displays. Each of these displays has the same functional characteristics as the 5251.

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 ➤

- **SIMULTANEOUS OPERATIONS:** Diskette reading or writing is overlapped with system and execution processing and with other device functions except disk storage data transfers. All diskette seek operations are overlapped with processing and I/O device operation.

CONFIGURATION RULES

Each 5340 submodel includes a CPU, either 32K, 48K, 64K or 128K bytes of memory, a diskette magazine drive, a diskette drive, and a fixed-disk storage unit. The system must also include an operator console/workstation consisting of one 5251 Model 1 or Model 11 CRT Display Station or 5252 Dual CRT Display Station and a printer, which can be either a 5256 Serial Matrix Printer or a 5211 Line Printer.

The 5340 System Unit provides four twinax cable connectors for attachment of 5251 Model 1 and 11 Display Stations, 5252 Dual Display Stations, and 5256 Printers. One cable connector is dedicated to the exclusive attachment of a display station utilized as the system console. No other devices may be attached to this cable. The three additional twinax cable connectors on the 5340 are provided for attachment of additional workstations.

Up to seven additional workstations can be directly connected. A workstation consists of a 5251 with keyboard, one of the dual displays of a 5252 with 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 and attached through twinax cable. Remote attachment of up to 64 workstations is possible via the 2500/3500 Communications Adapters and up to eight 5251 Models 2 or 12, each acting as a controller for up to eight 5251's and/or 5256's.

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 and Communications Control sections of this report for additional details.

MASS STORAGE

FIXED DISK DRIVES: The 5340 System Unit contains the System/34 disk storage facilities. Five sizes of non-removable disk storage are offered: an 8.6-megabyte, 13.2-megabyte, or 63.9-megabyte single-spindle configuration or a 27.1-megabyte or 128.4-megabyte dual-spindle subsystem. The disk subsystem is an integral part of every System/34.

For the 8.6-, 13.2-, and 27.1-megabyte drives, the 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 63.9- and 128.4-megabyte drives also employ 256-byte sectors; IBM has not released information on the number of tracks per surface, the bit density, or the number of sectors per track for these new drives.

The 8.6-megabyte unit has 201 cylinders, while the 13.2-megabyte unit has 301 cylinders per drive, of which 186.67 and 287.67 cylinders, respectively, are available for data storage. The 27.1-megabyte unit uses two 301-cylinder drives of which 589.33 cylinders are available for data storage. The 63.9-megabyte drive contains a total of 359 cylinders, with 354.50 cylinders available for data storage. On the 128.4-megabyte drive, 712.50 cylinders are available for data storage out of the 718 cylinders present.

For the 8.6-, 13.2-, and 27.1-megabyte units, the disk rotational speed is 2964 rpm, the average rotational delay is 10 milliseconds, and the data transfer rate is 889,000 bytes per second. Average head positioning times for these ➤

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▷ 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 525X displays, it uses a 96-character set with both upper and lower cases. A multinational character set of up to 128 characters is optional.

The operator console is one of the eight directly attached workstations and must include both a 525X 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. A variety of print belts, including multinational character sets, makes the 5211 an unusually versatile printer.

The new 525X Display Stations represent a significant improvement over the Model 3277 terminal currently used in most IBM systems. The basic purchase price of \$3,010 with keyboard 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 a significant price advantage over a 3277/3284 display/printer combination. IBM recently added a magnetic stripe reader capability to all models of the 5251 and 5252 as an option. The reader provides the capability for reading numerically encoded information from magnetic strips on a wide variety of credit cards and documents.

The System/34 is expected to play a major role in IBM's System Network Architecture (SNA). It supports, interchangeably, both the binary synchronous (BSC) and SDLC protocols. The 2500/3500 Communications Adapters are microcomputer-based and operate under program control. They 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 can support up to two communications adapters (a 2500 and a 3500). Between these two adapters, up to 64 remote workstations can be supported.

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

System software for the S/34 now consists of a System Support Program Product (SSP), a Utilities Program ▷

▶ drives are 10 milliseconds cylinder-to-cylinder, 35 milliseconds (8.6-megabyte) or 38 milliseconds (13.2- or 27.1-megabyte) average, and 55 milliseconds (8.6-megabyte) or 70 milliseconds (13.2- or 27.1-megabyte) across-all-tracks. Disk rotational speed for the 63.9- and 128.4-megabyte units is 3125 rpm, with an average rotational delay of 9.4 milliseconds and a data transfer rate of 1,031,000 bytes per second. These two drives have head positioning times of 9 milliseconds cylinder-to-cylinder, 27 milliseconds average, and 46 milliseconds across-all-tracks.

Actual recording capacities for the five drives are 8,616,960, 13,271,040, 27,156,480, 63,905,792, and 128,425,984 bytes.

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

The diskette magazine drive can process up to three individual diskettes and up to two magazines. Each magazine holds up to ten operator-accessible diskettes. The selection of diskettes within a magazine, the progression from the first magazine to the second, and the selection of up to three individual diskettes are automatic (under program control). Both type 1 and type 2D diskettes can be used in the diskette magazine drive, and both may be recorded in either basic or extended format.

Diskette 1 diskettes are organized into 74 tracks with 26 sectors per track and 128 bytes per sector in the basic format, and with 8 sectors per track and 512 bytes per sector in the extended format. Both formats provide one track per cylinder. Total capacity is 246,272 bytes in basic format and 303,104 bytes in extended format.

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 total diskette capacity to 1,212,416 bytes. Extended format recording employs eight sectors per track.

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 2D drives can read and write on diskettes from both types of drives.

The data transfer rates are 31,250 bytes per second for the Diskette 1 drive, 62,500 bytes per second for the Diskette 2D drive using Diskette 2D, and 125,000 bytes per second for the diskette magazine drive using Diskette 2D.

INPUT/OUTPUT UNITS

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 numerous sizes of character sets, many in both ASCII and EBCDIC formats: 38- and 42-character special sets; 48-character OCR A or B; 48-, 64-, or 96-character standard sets; and 64-, 96-, or 188-character multinational sets. A print belt must be purchased separately with each printer. The 5211 operates at 10 characters per inch with operator-controlled line spacing of 6 or 8 lines per inch. Formatting is program-controlled. The 5211 also has a translation capability (printed character substitution via OCL). ▶

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▷ Product, a Workstation Search Facility, an RPG II compiler, a COBOL compiler, a FORTRAN compiler, and 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 Interactive Communications Feature (SSP-ICF) provides the necessary functions to allow the System/34 to operate in an interactive distributed network. The network can be hierarchical, with either a System/370 or a System/3 Model 15 as the host, or it can provide System/34-to-System/34 communications. SSP-ICF provides for multiple users sharing the same communications line, remote initiation of System/34 programs, program-to-program communication within the System/34, and program independence from host subsystem support and line protocol. RPG II, Assembler, and COBOL support SSP-ICF.

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

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 Screen Design Aid (SDA) is interactive and provides for the design, creation, and maintenance of display formats and job menus.

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

<u>Characters</u>	<u>Model 1 Speed</u>	<u>Model 2 Speed</u>
38	190	355
42	160 or 225*	300 or 395*
48	160	300
64	123	235
96	84	164
188	44	86

*The higher speed is for lines containing numerics only.

The following devices are components of the 5250 Information Display System.

5251 CRT DISPLAY STATION: This device consists of two units, a CRT display and a separate, movable Model 4600 keyboard. The CRT unit features either a 1920-character screen of 24 lines by 80 characters (Models 11 and 12) or a 960-character screen of 12 lines by 80 characters (Models 1 and 2). Models 1 and 11 attach to the 5340 as a system console or to the 5251 Model 2 or 12. The set of 188 multinational characters or the set of 96 EBCDIC characters includes both upper and lower cases an 8-by-16 dot matrix. display attributes include normal or bright intensity, non-display, 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 5220 controller is microcomputer-based and provides self-check digit verification (modules 10 and 11) plus a display-station polling function that is independent of CPU processing.

Models 2 and 12 communicate with a System/34 communications adapter operating in SDLC mode only; these models communicate in half-duplex mode on non-switched point-to-point and multipoint communications lines which may be duplex or half-duplex facilities at speeds up to 9600 bps, and on switched point-to-point communications lines at speeds up to 4200 bps. A Model 2 or 12 can serve as a communications controller for up to eight additional workstations which may be either 5251's or 5256's. A combination of up to eight Model 2 or Model 12 Display Stations can be attached remotely to a System/34 for a total of up to 64 remotely attached workstations.

5252 DUAL CRT DISPLAY STATION: The 5252 functions as a pair of independent 960-character display stations, allowing separate jobs to be executed concurrently on each. Its specifications are the same as those of the 5251 Models 1 and 2. The user has the option to employ the 5252 as a system console.

4600 KEYBOARD: This unit, employed by all models of the 5251 and 5252, 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. The 4600 provides an EBCDIC character set and a typewriter-like keyboard layout. The keyboard is movable and is optionally available with a keylock.

4910 MAGNETIC STRIPE CHARACTER READER: This optional device for either the 5251 (all models) or the

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► 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.

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.

System/34 COBOL conforms to the standards of ANS COBOL, X3.23 1974. Most of the processing modules are implemented on level 2, with the exception of Indexed I/O, Segmentation, Debug, and Interprogram Communications, which are implemented on level 1. IBM has also implemented numerous extensions to the standard language.

The Workstation Search Facility (WSF) provides the means to search the System/34 disk files for records meeting terminal user-selected search criteria. WSF consists of an interactive entry/edit program, a tailoring program, and two skeletal programs which, when copied and modified by the tailoring program, provide user-unique index build and search programs.

IBM has released versions of numerous System/32 Industry Applications Programs (IAP's) that have been modified for execution on the System/34, plus several new programs developed explicitly for the S/34. However, the S/32 IAP's will execute only a *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 packages developed specifically for the System/34 can fully exploit the new features of the system.

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.

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 \$1,101 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 ►

► 5252 reads magnetic stripes containing up to 128 ABA numeric characters (including control characters). The unit is useful in enhancing data security by providing the ability to read an operator identification card without information on the card being displayed.

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 5256 Printer is available in three versions: Model 1, rated at 40 cps; Model 2, 80 cps; and Model 3, 120 cps. All three models have 132 positions and print 10 characters per inch, at 6 or 8 lines per inch, on continuous forms 3 to 15 inches wide and individual forms 6 to 14.5 inches wide. The tabletop-mounted 5256 is designed for use as a workstation either separately or with the 5251 CRT Display Station and 4600 Keyboard or the 5252 Dual CRT Display Station and 4600 Keyboards. The print head is capable of moving directly to any specified starting point, thereby reducing lost time due to unnecessary print head travel.

5250 SYSTEM MULTIPLE UNITS AND CLUSTERING: Feature 2680 provides the capability to connect multiple 5251 Models 1 and 11, 5252's, and 5256's to a single cable. Feature 2550 allows the attachment of up to four workstations, including 5251 Models 1 or 11, 5252's or 5256's; feature 2551 increases the number of directly attached workstations to eight.

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 AND 3500 BSC/SDLC COMMUNICATIONS ADAPTERS: Operate in conjunction with stored-program control to provide a half-duplex mode of 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. Non-standard point-to-point lines may be either duplex or half-duplex facilities. Up to two communications adapters (the first a Model 2500 and the second a Model 3500) can be attached to a System/34, with each adapter operating independently under program control at a maximum aggregate bit rate of 9600 bps for both adapters operating concurrently. 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 System/34 and other non-control stations can be accomplished only on a point-to-point line. The 2500/3500 Communications Adapter requires a minimum of 48K bytes of main storage.

Switched network versions include a basic capability to support manual dial and manual or auto answer operations (based on modem support of the latter capability).

The 2500/3500 is a microcomputer-based controller that provides either the Binary Synchronous (BSC) or Synchronous Data Link Control (SDLC) protocol. ASCII, EBCDIC, or EBCDIC Text Transparency are standard. ►

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➤ \$1,780 or \$72 to the purchase price or monthly rental charge, respectively, and a maximum 128.4-megabyte disk subsystem adds \$19,170 to the purchase price or \$625 to the rental charge. Main memory increments of 16K bytes cost \$1,600 each or add \$44 to the monthly rental charge.

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.

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 while its System/3 Model 4 counterpart costs \$42,171. And when one considers the maximum capabilities of the two systems, the System/34 is clearly 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 limitation that Datapro feels is significant is 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 this limitation will be eliminated in due course as IBM continues to expand and improve the System/34 product line.

USER REACTION

Detailed below are the results of a mail survey of IBM System/34 users made during September and October 1978. We received responses from 12 users with a total of 20 installed systems; there were 7 users with 1 system each, 4 users with 2 systems each, and 1 user with 5 systems. Most of the systems had been installed during the second and third quarters of 1978, but two had been installed in December 1977. No user participating in the survey had been using a System/34 for more than 11 months. Thus, the following user ratings and comments may be preliminary and subject to change as the users gain more experience.

A typical system included 64K bytes of memory, 27.1 megabytes of fixed disk storage, and 4 workstations. The prime programming language was RPG II. Of the 12 users, 6 were leasing their systems from IBM, 1 had both purchased and leased System/34's, and the remaining 5 had purchased their systems from IBM. Every user reported that in-house personnel were heavily involved in the development of application programs.

The results of the user survey are tabulated below. ➤

➤ The controller is loaded from system memory with the appropriate protocol, which can be changed as required. The adapter operates asynchronously with other System/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 six types of integrated modems, two switched-network backup adapters, and 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 2500/3500 adapter.

Using a 2500/3500 Communications Adapter, a System/34 can communicate in binary synchronous mode with the following other systems:

- Another System/34 equipped with a 2500 or 3500 Communications Adapter.
- A System/32, System 360/20, System/7 equipped with a 2074 BSC Communications Adapter, 5110 (as a 3741 Model 2 or 4), or 5231 Model 2 (point-to-point unidirectional transmission only).
- A System/3 equipped with either a 2074 or 2084 Communications Adapter.
- A System/360 or S/370 supported by OS BTAM; DOS BTAM; OS TCAM; OS/VS1 or OS/VS2 BTAM, TCAM, or VTAM; DOS/VS BTAM or VTAM; using an Integrated Communications Adapter, a 2701 Data Adapter Unit, a 2703 Transmission Control Unit, or a 3704/3705 Communications Controller under control of either the Network Control Program (NCP) or Partitioned Emulation Program (PEP).
- 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 2500/3500 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).

The System/34 SSP provides SDLC communications support for multipoint line control when 5251 Model 2 or 12 CRT Display Stations are attached to the 2500 or 3500.

A prerequisite to the use of the 2500/3500 adapter 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 six types of integrated modems for use with a System/34 equipped with the 2500/3500 Communications Adapter. Their characteristics can be summarized as follows (the 5000 series modems are used with the 2500, and the 6000 series modems with the 3500):

Models 6500 & 5500 — 1200 bps, non-switched.

Models 6501 & 5501—1200 bps, switched network with Auto-Answer.

Models 6004 & 5600 — 2400 bps, non-switched point-to-point. ➤

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	Excellent	Good	Fair	Poor	WA*
➤ Ease of operation	7	5	0	0	3.6
Reliability of mainframe	9	3	0	0	3.7
Reliability of peripherals	9	3	0	0	3.7
Maintenance service:					
Responsiveness	10	2	0	0	3.8
Effectiveness	9	2	0	0	3.8
Technical support	2	7	2	1	2.8
Manufacturer's software:					
Operating system	3	9	0	0	3.3
Compilers and assemblers	5	7	0	0	3.4
Application programs	0	2	3	0	2.4
Ease of programming	5	6	1	0	3.3
Ease of conversion	5	4	3	0	3.1
Overall satisfaction	6	6	0	0	3.5

*Weighted Average on a scale of 4.0 for Excellent.

At this early period in the life of the System/34, most of these users loved their systems. Their comments expressed strong satisfaction with both the hardware and the system software. Application programs received the lowest rating, a point that seems characteristic of vendor-supplied application software in general. The users' only real complaints centered on hardware delivery schedules, particularly of 5250 display system components. On the constructive criticism side, users expressed a desire for a faster printer and for magnetic tape capabilities.

It can be safely said that the System/34 has met or exceeded the requirements of the great majority of its early users. Recent announcements from GSD in the areas of both software and hardware can only serve to strengthen an already well-satisfied customer base. □

➤ Models 6601 & 5601—2400 bps, non-switched multipoint control.

Models 6602 & 5602—2400 bps, non-switched multipoint tributary.

Models 6610 & 5610—2400 bps, switched network with Auto-Answer.

Only one integrated modem can be installed in a System/34. The modems are mutually exclusive with the 3701/3702 EIA Interface and the 5650/5651/5652/5653 Dataphone Digital Service Adapter. Processing Expansion Units B and D are required to attach the three 2400-bps modems, and a Processing Expansion Unit C is required for the Model 5500 and 5501 modems.

MODEL 3701/3702 EIA INTERFACE: This feature can be chosen as an alternative to the IBM integrated modems for use with a System/34 equipped with the 2500/3500 Communications Adapter. The 3701 works with the 2500, and the 3702 with the 3500. It provides a cable and interface that meet the EIA RS-232C specifications and permits 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), 3874 Model 1 (4800/2400 bps), and 3875 Model 1 (7200/3600 bps).

MODEL 5650/5651/5652/5653 DATAPHONE DIGITAL SERVICE (DDS) ADAPTER: This adapter is available in four 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 or multipoint control in conjunction with the 2500 Communications Adapter; the 5652 with the 3500. The Model 5651 is for multipoint tributary applications in conjunction with the 2500; the 5653 with the 3500.

MODEL 7951/7952/7953/7954 SWITCHED NETWORK BACKUP (SNBU): This unit provides for backup attachment of a System/34 to the public switched network when one of the 2400-bps integrated modems (Model 5600, 5602, 6600, or 6602) is used on a non-switched line as the prime communications link. Models 7951 and 7952 are for use with the 2500 Communications Adapter, and Models 7953 and 7954 with the 3500. Models 7952 and 7954 provide auto answer capability, while Models 7951 and 7953 do not.

Attachment to the switched network is made via a common carrier arrangement, type CDI or equivalent. Calls must be established and answered manually. Operator intervention, program modification, or both may be required on the using system/terminal. This feature can be used with BTAM programs for DOS, DOS/VS, OS, OS/VS1, OS/VS2 in certain configurations, or with TCAM/VTAM under OS/VS1 or OS/VS2. Additional customer program routines will be required, in existing BTAM programming, to fully utilize the capabilities of the Switched Network Backup feature.

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 functionality 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

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- 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. A recent SSP enhancement makes available a new logical OCL capability permitting a test for execution in a single-program mode.

Certain operator-entered commands do not invoke OCL procedures or system utility programs on a System/34 as they do on a System/32. Hence, S/32 OCL procedures using these commands need revisions to account for these differences.

Control of all I/O operations is provided by the SSP data management routines. Support is provided for the CRT display, the keyboard (including the capability to recognize and interpret special function and command keys), the printer, and the disk unit. The diskette is supported by a Load/Dump utility only. Disk files can be organized in sequential, indexed sequential, or direct fashion.

A roll-out/roll-in capability is provided to suspend processing programs in order to allow an inquiry to be made into the file. The executing program is rolled out to disk storage, the inquiry program is executed, and the interrupted processing program is then returned (rolled in) to main memory to resume processing.

The SSP maintains a system history area on the disk that contains a log of recently executed OCL statements and system activities. The contents of the history area may be displayed on the operator console and printed if desired to provide a record of system processing activity. IBM recently enhanced this function so that the file will contain an end of job entry for each job showing the start and end times for the job.

Unlike the System/32, the System/34 in 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 pro-

STORAGE REQUIREMENTS OF
IBM SYSTEM/34 SOFTWARE

	Minimum Memory, Bytes	Minimum Disk Storage
System Support Program	14K*	8.6MB
BSC Support	6K*	—
SSPICF	64K*	—
System/34 Utilities	14K/utility*	—
Workstation Search Facility	48K	8.6MB
Basic Assembler	32K	8.6MB
COBOL	32K	8.6MB
FORTRAN IV	32K	8.6MB
RPG II	32K	8.6MB
CAFRS	32K	8.6MB
CAFRS II	32K	8.6MB
DMAS	32K	8.6MB
DMAS II	48K	8.6MB
LDMAC	32K	8.6MB
FDMAS	32K	8.6MB
DFAS	32K	8.6MB
DFAS II	32K	8.6MB
SAS	48K	8.6MB
FICAS	48K	8.6MB
MSLF	32K	8.6MB
PBAA	48K	8.6MB
HFMS	32K	8.6MB
MGMS	32K	8.6MB
MGMS II	48K	8.6MB
MMLS	32K	8.6MB
MMAS	48K	8.6MB
MAPICS	48K	8.6MB
5230 DSC	48K	8.6MB

*Actual requirement; other figures represent system minimums.

vided include Disk Initialization, Alternate Track Assignment, Alternate Track Rebuild, File and Volume Display, and File Delete. In addition, a set of routines is provided to permit copying of data, programs, and procedures from the diskette to the disk file and to transfer such information from the disk file to the diskette to provide back-up files and off-line storage. The entire system library, selected files, or portions of files can be transferred to diskette files. In order to provide sufficient contiguous storage space for creation of new files, the operator can invoke the COMPRESS OCL procedure to reorganize the contents of the disk file in a contiguous area next to the systems library. The SAVE procedure allows one file or all files to be transferred to diskette with a specified retention period. Files can also be added to existing files saved previously on diskette. New options recently added by IBM to the utility which produces interchangeable diskette files permit adding data to an existing diskette file. Both single- and multiple-volume diskette files can be created. The DELETE procedure permits files to be removed from disk storage to create space for new members.

Enhancements recently added to the System/34 SSP include:

- A third workstation data management residence option, which permits both input and output functions to be resident in main storage.
- A system measurement facility, which, in conjunction with new firmware, monitors and reports system and SSP utilization data.
- The capability to extend sequential, direct, or indexed files on end of extent by an amount specified by the FILE OCL.
- Additional security through support of operator badge entry on the 5250 Magnetic Stripe Reader and expansion of the operator profile by restricting job selection to menu entries from an assigned menu.

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- ▶ ● A HELP procedure to facilitate entering of command procedures for SSP, utilities, languages, data communications, and service aids.
- The capability to duplicate a diskette to produce multiple copies.
- A checkpoint/restart facility supporting COBOL RE-RUN statements.
- Support for new peripherals or hardware features including the diskette magazine drive; support for multi-national character sets on the 5211, 5251, 5252, and 5256; support for the magnetic stripe reader, 1255 multiple modulus checking, and 5211 translation capability.
- The capability to specify a startup procedure to be initiated automatically at each IPL.

COMMUNICATIONS SOFTWARE: Communications software for the System/34 consists of the RPG II Telecommunications Feature, BSC support for RPG II and the basic assembler, the MRJE and SRJE utilities, SNA/SDLC data management support for remote workstations, SNA assembler macro support, the Interactive Communications Feature of SSP.

The *RPG II Telecommunications Feature* provides support for transmission and reception of binary synchronous data over voice-grade or high-speed communications lines. The feature permits a System/34 to operate in any one of the following communications modes: receive only, transmit only, receive with conversational reply, or alternate transmit and receive file. The feature permits a System/34 executing a program written in RPG II to function as a terminal in one of the three types of networks: point-to-point switched, point-to-point non-switched, or multipoint.

BSC (binary synchronous communications) support is provided via RPG II and basic assembler macro instructions, where SSP provides the management for transmitting and receiving data. BSC transfers are possible between a System/34 and another System/34 with basic assembler or RPG II; a System/32 with basic assembler or RPG II; a System/3 with RPG II, MLMP, OR CCP; a System/7 with MSP/7; a System/360 or 370 with OS BTAM, OS/VS BTAM, DOS/VS BTAM, or DOS BTAM; a System/360 Model 20 with IOCS for the binary synchronous communications adapter; a 360/370 system with OS TCAM or OS/VS TCAM; a 360/370 system with OS/VTAM or DOS/VS BTAM; a 360/370 system with CICS/DOS/VS or CICS/VS; a 360/370 system with IMS/VS; an IBM 3741 Model 2 Data Station or 3741 Model 4 Programmable Workstation; an IBM 3747 Data Converter; an IBM 5231 Data Collection Controller Model 2 acting as a 3741 Model 2 in transmit mode; and an IBM 3750 Switching System. The System/34 appears as a System/3 when communicating with a System/360 or System/370.

The *MRJE utility* uses BSC to communicate with the host system over point-to-point switched or nonswitched communications lines via a 2500 or 3500 Communications Adapter. Under MRJE, the System/34 acts as a System/3 and is always considered to be the remote station which must initiate transmission of data to the host system. MRJE allows submission of jobs to an IBM System/370 for processing by RES under OS/VS1, JES2 under OS/VS2, JES3 under OS/VS2, HASP II under OS/VS2, ASP under OS/VS2, or VM/370 RSCS. Any job that can be entered into the host system from its locally attached and similarly functioning I/O devices can be entered through MRJE. Output can be returned to MRJE, routed to another remote terminal attached to the host system, or directed to the host's local I/O devices.

The *SRJE utility* supports SNA/SDLC communications with a host System/370. SRJE allows submission of jobs to an IBM System/370 that uses VTAM and NCP/VS for processing by OS/VS1 RES, OS/VS2 JES2, and DOS/VS POWER/VS.

The System/34 SSP includes a print utility for both the MRJE and SRJE utilities. This utility prints or makes new disk files from punch output and printer output that was directed to the disk during an MRJE or SRJE session. (A session is a path for two programs exchanging messages.) The print data that was directed to the disk contains carriage control information. In conjunction with the print utility, SSP provides a forms control utility which builds a disk file containing forms control information for MRJE and SRJE.

The System/34 SSP provides *SNA/SDLC data management support for remote workstations*, including the IBM 5251 or 5252 Display Stations and 5256 Printers. The remote workstations may be on one or two communications lines. Whether a workstation is directly attached or remotely attached is transparent to an application program.

SNA assembler macro support is provided for the System/34, in conjunction with the Basic Assembler and Macro Processor program product. The macros support all communications programs that use SNA/SDLC. Basic assembler macro-instructions provides the user interface for SNA communications with the IBM System/370 host telecommunications access methods and associated subsystems. The macros also provide the user with the ability to communicate with user-written host applications which use the same protocols as these IBM-supplied subsystems.

The *Interactive Communications Feature of SSP (SSP-ICF)* provides support for both BSC and SNA/SDLC interactive communications between application programs, remote procedure initiation on the System/34, and communications line monitoring on a multipoint line where the System/34 is a tributary station (maintained even though no user application program is active). Interactive communications permits multiple concurrent communications sessions over the same data link. SSP-ICF also provides an application program interface which is substantially independent of BSC or SDLC protocol and the communications support for the remote system, IMS/VS, CICS/VS, or CCP.

The application program access to SSP-ICF is available at two levels that are a logical extension of the System/34 workstation interface. The first is through predefined screen format names that control evoking programs, sending of data, and issuing of special commands to SSP-ICF. The second is through assembler programming for communication to systems which are not a part of the standard SSP-ICF support.

System/34 link connection is either point-to-point or multipoint tributary (except for 5250 devices). In the BSC environment, SSP-ICF supports a System/3 Model 15 with CCP, RPG II T/P or ML/MP; a System/370 with IMS/VS Version 1.1.4 via IRSS; a System/370 with CICS/VS Version 1.3.0, OS/VS, DOS/VS with BTAM, or OS/VS TCAM where the System/34 acts as a System/3; a System/34 with SSP-ICF, RPG II, COBOL with the workstation support subroutines PRPQ, or Basic Assembler; an IBM 5110 as a 3741, point-to-point only; a System/7 with MSP/7 where the System/7 acts as a System/3; a System/32 with RPG II or Basic Assembler; IBM 3741 Models 2 and 4, point-to-point only (no multiple file support); an IBM 3747, point-to-point only; an IBM 5231 Model 2 as a 3741; and an IBM 3750 Switching System (GBG/1 only). In the SNA/SDLC environment, SSP-ICF supports a System/370 using NCP/VS and TCAM Direct (TCAM 10) or VTAM or ACF/NCPLUS and ACF/TCAM or ACF/VTAM; a Sys-

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► tem/370 with IMS/V S Version 1.1.4 using SLU type P protocols; a System/370 with CICS/V S Version 1.3.0 and OS/V S where the System/34 acts as a 3790; a System/370 with CICS/V S Version 1.3.0 and DOS/V S where the System/34 acts as a 3790; and a System/370 with user-written communication support using SNA protocol profiles TSP 3 or 4 and FMP 3 or 4.

Remote procedure initiation allows programs in a remote system to send a message to the local system to cause any of the available System/34 procedures to be evoked. If the program(s) in the evoked procedure use SSP-ICF, they can communicate interactively with a program in the evoking system. If the evoked procedure is of the MRT type, the session from the evoking program will be attached to the Multiple Requestor Terminal (MRT) program.

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 similar to the S/32 utilities. It provides basic data management capabilities. This separately priced program product consists of five programs; Data File Utility (DFU), Sort, Source Entry Utility (SEU), Screen Design Aid (SDA), and Work Station Utility (WSU).

The *Data File Utility (DFU)* program provides the following data base management functions: data file creation and maintenance, data file inquiry, and data file list. All three functions utilize catalogued RPG II File Description and Input Specifications so that the operator need enter only the name of the file and the name of the catalogued RPG II specifications. The utility prompts the operator to enter additional information required to tailor the program to the user's processing requirements.

The Data File Creation and Maintenance function of DFU operates only on indexed sequential files and provides facilities for creating and updating user data files. The program prompts the operator by displaying the field name for the data to be entered on the display console. When updating is being performed, the data currently in the field is displayed to assist the operator. Other features include automatic duplication of fields, control totals, generated record keys, and modulus 10 and 11 self-check digits for verifying entered data.

The Data File Inquiry function of DFU allows inquiries into indexed sequential files. Retrievals are performed by record key, and a function key can be used to roll forward or backward in key sequence through the file. Selected records can be printed with page and column headings.

The Data File List function of DFU provides a report-writing capability for listing and summarizing selected information from indexed or sequential files. Selection of records is based on record types defined in the RPG II input specifications for the file, and the file can be sorted in either ascending or descending order prior to printing, using up to five fields as sort fields. Records may also be selected for printing based upon a comparison of a user-supplied constant or another data field. This selection precedes the sorting function if sorting is specified. Data can be retrieved from a second file based on the use of a field in the records being listed as a key; the retrieved record from the second file is considered as an extension to the original record being listed. A total of 40 fields can be processed per record. Output 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, descending, or user-defined sequence. The Sort program accepts files organized in sequential, indexed, or direct order. It can select records based on a comparison of the contents of a field with a constant or another field or a tag sort in which only the control field and a record address are retrieved. A summary sort groups records with similar control fields and summarizes designated numeric fields into a single summary record. The sort program automatically allocates disk space for a work file and can handle indexed, direct, and sequential file organizations.

Recent IBM enhancements to the System/34 Sort include support for up to eight input files, a loadable Sort interface from user programs written in COBOL or Basic Assembler, ALTSEQ by field, and standard sequencing when control fields are equal.

The *Source Entry Utility (SEU)* program can be used to create and maintain user-written OCL procedures; specifications for display formats, 1255 control, Auto Report, and the Workstation Utility; FORTRAN, Assembler, and RPG II source code statements; and Sort source code statements. The SEU is accompanied by Sort, RPG II, Auto Report, and format descriptions to aid the user in entering source statements correctly. Display formats are free-form for any statement to be entered, with user-defined display formats permitted. Functions include the capability to move statements within source or procedure members to new members, to insert up to 99 new statements into an already-existing member from any source or procedure library member in the system or user library, to roll forward or backward through catalogued statements, 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 re-sequence statements in a source-code member.

The *Work Station Utility (WSU)* provides a set of specifications for defining interactive data entry programs which support one or more IBM 5251 Display Stations. Included in the program variables provided by the WSU specifications are job name, number of workstations, region size; Transaction File (a special direct-organization disk file created and managed by WSU to contain key-entered records for up to 10 disk files; formats to be displayed on the IBM 5251 to prompt for data entry and/or display error messages; arithmetic, logical edit, or I/O operations to be performed in conjunction with the entry of data in response to a display format; and references to RPG II file and input specifications for a description of the transaction and master files.

The WSU specifications are processed by the WSU Generator and the SSP Screen Format Generator Routine (SFGR) to produce: 1) an object definition module to be executed by WSU when the job is invoked, 2) display formats, and 3) System/34 OCL procedures to control execution of the job when invoked.

WSU allows up to eight active workstations. WSU programs are executed as MRT programs to optimize performance. These programs will be dynamically adjusted to larger region sizes to reduce overlay fetches or to smaller region sizes if necessary. Multiple WSU-generated programs can be executed concurrently. Recovery after system failures is provided for the Transaction File.

Recent extensions to WSU provide support for random additions to indexed master files, for on-line debugging, ►

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► for testing the results of disk I/O operations, and for additional system operator options during abort processing.

The *Screen Design Aid (SDA)* is an interactive utility for the design, creation, and maintenance of display formats and job menus. Entire formats can be updated or deleted, and individual source specifications can be updated, inserted, or deleted. SDA allows for the creation and updating of menus and their associated source members. SDA also allows for the creation, from a SFGR source member, of an RPG II skeleton program to use the formats. A Help function, which displays text describing the use of SDA, is included with the utility.

Recent extensions to SDA include the ability to generate WSU source programs that allow master file inquiry and maintenance and simple data capture (Transaction File creation and addition). Extensions have also been made to the ATTRIBUTE screen facility with options for replacement of constant data in a field, deletion of fields from a screen, shifting fields left or right, moving fields from one location to another, and insertion of new fields. An extension for syntax checking of user-altered but SDA-generated source code has also been added.

LANGUAGES: IBM now offers the COBOL, RPG II, FORTRAN and Assembly languages for use with the System/34.

System/34 COBOL (5726-CBI) is designed according to the specifications for American National Standard (ANS) COBOL, X3.23 1974. ANS COBOL is identical to ISO 1989 COBOL, approved in February 1978 by the International Organization for Standardization.

System/34 COBOL is implemented with the following processing modules, where level 2 is the highest level specified in the standard: Nucleus, level 2; Table Handling, level 2; Sequential I/O, level 2; Relative I/O, level 2; Indexed I/O, level 1; Sort-Merge, level 2; Segmentation, level 1; Library, level 2; Debug, level 1; and Interprogram Communication, level 1. The following exceptions apply: the DELETE function is implemented by marking deleted records with a hexadecimal FF in position 1 of the record; and no position in a key for indexed random READ or indexed START statements can be hexadecimal FF.

IBM extensions to the standard COBOL include use of apostrophe instead of quotes, Extended data types of computational-3 (packed) and computational-4 (binary), indexed file support for CORE-INDEX, additional debugging support with EXHIBIT and TRACE, ACCEPT from the console, and DISPLAY upon the console.

The access methods supported by System/34 COBOL include: sequential organization through consecutive processing by update in place and consecutive add (extend) and random processing by relative record number, including updating; indexed organization through random processing by key, including file loading; and direct organization through random processing by relative record number, including updating and file loading and consecutive processing. Record size can range from 1 to 4096 bytes, and records may be processed as blocked or unblocked (up to a maximum block size of 9999 bytes). The block size for a given file can be varied between programs up to a maximum block size of 9999 bytes. Logical records may span physical disk sectors, blocks, tracks, or cylinders.

Additional compiler features available to the programmer include the FIPS Flagger, which issues messages identifying statements and clauses in a COBOL source program that exceed a user-specified FIPS level; symbol cross-reference listings of the Data Division and Procedure Division; a semi-interactive debugger, which builds a file that can be

retrieved and updated at a workstation; a syntax checking compilation which generates error messages but no object code; screen prompting, which allows the user to request parameter specifications for entering, updating, compiling, or executing COBOL programs; specifications of up to 99 printer files in the same program; and standard program linkages for calls to or from other programs written in COBOL, FORTRAN, or Basic Assembler.

Low-volume, unformatted, line-at-a-time workstation support is provided with the ACCEPT and DISPLAY verbs. Formatted workstation input and output can be accomplished by the use of callable user-written Assembler subroutines or by use of the System/34 PRPQ Work Station Support Subroutines (5799-AYW). These subroutines also provide support for data communications (SSP-ICF) for the COBOL user.

RPG II (Report Program Generator (5726-RG1)) is identical to its System/32 counterpart except for certain functions implemented to support multiple workstations and to provide SSP-ICF support. The programmer, using up to six different preprinted coding forms, prepares a set of specifications that describe the form of the input data, the calculations to be performed, and the format of the desired output. RPG II for the System/34 offers essentially the same features as the System/3 Model 6 RPG II, with variations in the data management facilities for the support of System/34 input/output devices. 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. ►

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► 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 2500/3500 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.

A recent enhancement to RPG II allows programs to be written that use the facilities of SSP-ICF through the WORKSTN file support. Information on SSP-ICF can be found under the COMMUNICATIONS SOFTWARE heading in this report.

System/34 FORTRAN IV (5726-F01) contains the features defined in ANS Basic FORTRAN, X3.10.1966; language extensions supported by IBM 1130, System/3, and System/32 Basic FORTRAN; and the full FORTRAN compiler features listed below.

- Programs can be corrected or modified in a semi-interactive mode at the workstation by displaying a source program file into which the compiler has interspersed diagnostic messages. The compile turnaround time can be reduced because the programmer can start to correct or modify the program without waiting for a listing.
- Logical data, logical expressions, and logical IF are supported.
- Logical elements (constants, variables, and arrays) contain true or false values.
- Operation symbols are used in logical expressions: NOT, AND, OR, LT, LE, EQ, GT, NE, and GE.
- Logical expressions evaluate elements to obtain true or false values.
- Logical assignment statements define a relationship, placing the value of a logical expression in a variable or array element.

The System/34 FORTRAN IV library contains mathematical and service subprograms required during execution to perform arithmetic operations, input and output constant conversions, and input/output control.

The *Basic Assembler and Macro Processor (5726-ASI)* produces relocatable object programs that are subsequently converted to executable format by the SSP overlay linkage editor. Source statement programs, relocatable object programs, and executable load modules are stored in the System/34 libraries.

Assembled subroutines may be called by RPG II programs, but the assembly is performed separately. Program linking is accomplished during the compilation of the RPG II source program.

System/34 macros include support for disk functions, printer operation, keyboard and display screen access, binary synchronous communications, SNA/SDLC communications, timer, end of job, message logging, and program logging.

With the announcement of SSP-ICF, IBM enhanced this product with additional macros and macro extensions to acquire and release logical communications sessions, evoke user programs in the same or different systems, read and write data between user programs attached to a logical session, control operations to facilitate synchronization between user programs attached to a logical session, and invoke the checkpoint/restart facility. Information on workstation support is furnished in the next paragraph.

PRPQ WORK STATION SUPPORT SUBROUTINES (5799-AYW): These subroutines operate under SSP and provide the COBOL and Basic Assembler user with access to the workstation formatting capabilities of the Screen Format Generation Routine (SFGR) and Work Station Data Management (WSDM). The subroutines provide the user with support for single or multiple requestor programs (SRT/MRT), never-ending programs (NEP), and single or multiple acquired terminals. Support is provided for reading and updating the Work Station Local Data Area (WSDA) and UPSI switches. Support is also provided for the Interactive Communications Feature (SSP-ICF) for COBOL and Basic Assembler.

This PRPQ allows a user to write a format after rolling a specific section of the screen up or down and write a message to the error line of the workstation. In addition, a user can read/write to the system console, read workstation attributes, test for status of an operation ended invite, and stop a pending invite.

WORK STATION SEARCH FACILITY (WSF/34 5726-XRI): WSF/34 allows the user to search his disk files for records meeting terminal user-selected search criteria. These records are then processed by user-written routines. A keyword in context (KWIC) technique is employed by WSF/34 for searching alphabetic fields without requiring data base changes by the user. Blanks and special characters are considered delimiters if preceded or followed by a blank position. The search argument may be up to eight characters long. WSF/34 employs six logical search operators: equal, less than, less than or equal, greater than, greater than or equal, or not equal. The relationship between primary, secondary and tertiary searches is defined by AND/OR logic. WSF/34 supports all versions of the 5251 displays and all file structures of the System/34. This facility displays up to 20 matches at a time and creates up to 16 cross-reference indices per master file for fast searching of high-use data fields. Forward or backward paging, termination of a search, or start of a search may be initiated at any time.

WSF/34 is written in RPG II and requires a 5340 System Unit with a Diskette 1 drive; 8.6 megabytes of disk storage; 48K bytes of memory (Model B11); one system printer, either line printing at 160 lines per minute or serial printing at 40 characters per second; and one 5251 Display Station (Model 11).

5230 ONLINE DATA COLLECTION: This program product (5798-NNE) 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, ►

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► 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.

APPLICATION PROGRAMS

Every System/32 IAP can be executed on a System/34 after recompilation. The programs listed in this section, with a few specified exceptions, are recompiled System/32 IAP's (now called AP's on the System/34) that can be executed *only in single-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 AP 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.

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

The billing module (5726-D41 for DMAS II, 5726-D4A for DMAS) dynamically maintains stock balances and allocates available quantities to order 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 (5726-D42 for DMAS II, 5726-D4B for DMAS) 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 (5726-D43 for DMAS II, 5726-D4C for DMAS) 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 immediately 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 (5726-D44 for DMAS II, 5726-D4D for DMAS) 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): FDMAS is 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 other 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 FDMAS 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, Accounts Payable (5725-D6B for DFAS, 5726-M47 for DFAS II), and Payroll (5725-D6C for DFAS, 5726-M42 for DFAS II). DFAS operates in single-program mode, while DFAS II supports multiple program mode applications. The DFAS 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 DFAS 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.

SYSTEM/34 CLIENT ACCOUNTING AND FINANCIAL REPORTING SYSTEM: This AP is designed for ►

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► CPA's, bookkeepers, and small accounting firms as an aid in solving the problems of client accounting. CAFRS (5726-C21) operates in single-program mode, while CAFRS II (5726-C22) runs in multiple-program mode. Data can be entered via keyboard or through cassettes 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.

MEDICAL GROUP MANAGEMENT SYSTEM: MGMS (5726-H15) and MGMS II (5726-H16) provide 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.

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.

SYSTEM/34 MANUFACTURING MANAGEMENT ACCOUNTING SYSTEM (MMAS): Ten programs are included in this AP: 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), Order Entry and Invoicing (5726-M39), and 5520 Disk Collection Support for System/34 (5726-M3A).

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 furniture, 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 of the nine application areas listed above. 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. ►

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► Data Collection Support for System/34 is similar to that listed under the MAPICS application.

SYSTEM/34 CONSTRUCTION MANAGEMENT ACCOUNTING SYSTEM (CMAS): This 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.

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.

SYSTEM/34 MEMBERSHIP AND MAILING LIST SYSTEM (5726-K11): The MMLS 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 interrogation 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.

MOTOR FREIGHT ACCOUNTING SYSTEM (MFAS) ACCOUNTING (5725-T21): This AP 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: This group of packages is designed to aid commercial banks in organizing data on customer account records. The Customer Information File (5726-F11) is a prerequisite for the other three packages, which include ►

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► Demand Deposit Accounting (5726-F12), Savings Accounting (5726-F13), and Installment Loan Accounting (5726-F14). With the system, data can be obtained for a given customer by supplying his name or account number.

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 AP's offer a broad range of functional support. The Demand Deposit Accounting (DDA) AP 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 AP 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 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.

Loan Accounting supports add-on, discount, and simple interest loans with the capabilities for calculating bank earnings, monthly and quarterly payment schedules, different accrual and refund methods for the same loan, dealer interest and recourse reporting, and credit life and health or accident insurance refunds. The bank can specify the number of days from loan origination to the date of the first payment, and it can produce payment notices and reminder, late, extension, or auditor notices. Reports reflecting trial balance, monthly earnings, aged delinquency, and loan class can be provided along with standard processing and exception reports. The Demand Deposit Accounting application, if installed with the system, allows loan payments to be credited automatically (AFT) to a customer's account.

SYSTEM/34 MANAGEMENT SYSTEM FOR LAW FIRMS (MSLF): This AP (5726-F52) is designed to aid law firms in effectively controlling their time and disbursement accounting, billing, and accounts receivable. The Billing Information Memo and other reports such as Unbilled Time and Disbursements, Matter Billing Summary, and Aged Accounts can be printed weekly, monthly, or on demand to provide the necessary information to make the necessary billing decisions.

STUDENT ADMINISTRATION SYSTEM (SAS): AP's included in this system are Student Records (5726-E31), Student Accounting (5726-E32), and Student Scheduling (5726-E33).

Student Records, a prerequisite for the other two programs, provides the required master file information with student profiles, student and instructor schedules, and options for printing student lists in various sequences. These lists may be used for name and address labels; to print course, instructor, and class lists; to indicate ethnic distribution; or to show promotion of students to the next higher grade level.

The Student Accounting application handles attendance and mark reporting. In reporting student attendance, the program defines specified holidays and can show weekly absences, optional daily absences, support for excused and unexcused absences and tardies, and averages for daily membership ►

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► and attendance by grade level or special education groups. Additionally, a user can define up to 13 attendance periods, each of which may be from one to nine weeks. A variety of attendance period registers is available to assist in state reporting requirements. Mark reporting functions produce report cards with up to four marking periods, academic labels for transcripts or permanent records, reporting documents for teachers to record student grades, mark analysis reports, and GPA listings, allowing the school to define up to eight marking periods within the school year and to define its own marking criteria.

Student Scheduling deals with scheduling or rescheduling for up to 4 terms in a school year and up to 24 periods in a day. Up to 20 requests per student, ranging from instructor selection to free-time requests, can be handled by the program. Reports can be produced to assist the school administration, such as student request verification, course request verification, course request tally, potential conflict matrix, student conflict report, or student schedules. The AP also has the capabilities to schedule study halls or block courses and it supports arena scheduling.

MANUFACTURING ACCOUNTING AND PRODUCTION INFORMATION CONTROL SYSTEM (MAPICS): This product consists of 11 integrated applications: Production Control and Costing (5726-M41), Payroll (5726-M42), Accounts Payable (5726-M43), Accounts Receivable (5726-M44), Inventory Management (5726-M45), Product Data Management (5726-M46), General Ledger (5726-M47), Sales Analysis (5726-M48), Order Entry and Invoicing (5726-M49), Data Collection System Support (5726-M4A), and Material Requirements Planning (5726-M4B).

Production Control and Costing (PCC) coordinates the release of production orders and prepares shop documentation. It monitors the progress of orders and assists in analyzing work center efficiency and utilization. It helps control work in process, monitors inventory and production lead time, and calculates order costs. For example, PCC calculates the current workload at each work center and the average times for each operation to build or compare to standard routings. Actual versus standard cost variance reporting indicates potential areas requiring management attention. Major reports include an Order Status Report, Work Center Status Report (shows open orders), Critical Orders List, Dispatch List, Current Value of Work in Process Report, and Work Center Analysis Report.

Payroll handles the calculation of wages, taxes, deductions, and net pay. It also prints checks and updates files for both salaried and hourly pay plans.

Accounts Payable maintains detailed records of vendor invoices and credit memos from the time they are entered into the system until they are paid and the check is reconciled.

Accounts Receivable keeps detailed records of customer charges, cash payments, credit and debit memos, and other adjusting entries from the time they are entered into the system until they are paid or otherwise applied.

The Accounts Receivable application uses summaries of invoices created by Order Entry and Invoicing to apply charges automatically to customer accounts. Invoice summary information can also be entered directly through the Accounts Receivable application.

One or more workstation operators can enter payments and adjustments with immediate updating to reflect the most current accounts receivable balance. Concurrently, one or more workstation operators can enter invoice summaries, and/or the summaries can come from the Order Entry and Invoicing application, if installed.

The system supports both open-item and balance-forward customers. A code in each customer record indicates which type of accounting is in effect for the customer. It can be changed at appropriate points in the accounting cycle to switch a customer account from one type to the other.

At the end of the month, the application prepares customer statements. The Aged Trial Balance and delinquency notices can be printed at any time, on request. Other major reports include an A/R Transaction Register and a Paid Item List.

The Inventory Management (I/M) application can be subdivided into three major areas. The first is to provide the record-keeping of inventory accounting (receipts, issues, adjustments, etc.) and the ability to perform perpetual inventory functions. The second area is to provide management with the dollar values and analysis required for sound inventory decisions. The third area is the ability to effectively release and track manufacturing and purchase orders, allowing inventory managers to manage both on-hand and on-order positions of inventory items.

A workstation operator in the warehouse or the purchasing and receiving department can enter receipts, issues, adjustments and other transactions on an item-by-item basis. The system edits the transaction for validity (item number, warehouse, etc.), and if the transaction passes all edits, the master file is updated. An inventory transaction register, printed periodically, shows the transactions processed. Other major reports include a Stock Status Report, Stock Status Review, Inventory Analysis Report, Physical Inventory List, and Material Shortage Report.

The Product Data Management (PDM) Application is designed to build and maintain a cost and engineering data base which includes data on bills of material (parts lists, formulas, or recipes) that describe the materials and components which are used in the manufacture of a product or assembly; manufacturing routings or process sheets that describe the sequence of operations and processes required to produce the assemblies of fabricated items; work center information that describes machines and manufacturing facilities; and item master data that contains such information as item number, description, standard costs, drawing number, and item type.

PDM gives automatic notification to the MAPICS Material Requirements Planning application so that bill of material changes can be reflected in the material plan. For every bill of material where the original component is used, PDM has a mass replace feature that replaces one component with another. Likewise, PDM has a mass delete feature which deletes a component from every bill of material in which it is used. Major reports in this application include an Item Where Used Report, Costing Report, Product Feature/Options Display Report, Audits Report (on maintenance), and Routing Report.

General Ledger provides management with company financial reports monthly, at year end, or at any time desired.

Sales Analysis tracks sales performance by product and salesman or manufacturer's representative and identifies customer buying trends. The application is designed to furnish information on demand, including history data or current period only. This information can help evaluate and track individual customer purchasing statistics; profit amount and percent reported by customer, item, item within item class, and salesman's productivity; sales organization effectiveness, including salesman assignments and product line coverage; and new marketing strategies. Major reports are produced for profit and sales analysis by customer, by item, and by salesman. ►

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► **Order Entry and Invoicing (OE&I)** allows rapid entry of all customer orders, including immediate credit verification. It also automatically prices, calculates, and prints invoices and shipping labels, packing lists, and bills of lading. Depending on which related applications are installed, OE&I updates item balances maintained by Inventory Management, enables charges invoiced to customers to be used to update Accounts Receivable records, and passes records of sales to the Sales Analysis application as the basis for the various sales reports. The OE&I application greatly reduces clerical functions that would otherwise be required to process information for each of the other applications independently.

OE&I operates in an interactive mode and can accommodate multiple workstation operators entering data concurrently. Each workstation operator can enter order information, verify it on the display screen, and make corrections and changes to the order before it is used for further processing. The OE&I application retrieves customer names, addresses and other predefined information; selects prices; applies discounts, markups, and taxes; calculates extensions; and prints invoices that reflect all customer charges. It also prints the invoice register that shows summary information for all invoices printed during a given period. OE&I directly associates each customer line item ordered with the appropriate item in the inventory master files, if Inventory Management is installed.

OE&I produces such reports as the Picking List, Order Acknowledgement, Invoices, Credit Memos, Bills of Lading, Invoice Register, Taxing Body Report, Customer Order Shortage Report, Open Order Status Report, Blanket Order Status Report, and Monthly Worksheets.

Material Requirements Planning (MRP) converts product requirements into a detailed material plan by generating and maintaining a master production schedule. It uses the master production schedule, bills of material, and lead times to establish dates and quantities for each component's requirements. These requirements are compared to what is currently on hand and on order to determine what new orders should be released or what existing orders should be expedited, deferred, or canceled. MRP produces such reports as the Material Requirements Plan Report, Purchase Planning Report, and Manufacturing Cash Flow Analysis Report.

Data Collection System Support works with the IBM 5230 Data Collection System data and time entry workstations, which are designed to gather information at the points where material is being received, stored, produced, assembled, or shipped. As an alternative, System/34 Data Collection System Support can be used on a stand-alone basis without the 5230 Data Collection System. In this environment, plant and warehouse personnel manually record their actions, which are later entered at a System/34 display station. The Data Collection System Support application processes these records as if they had come from the IBM 5230 Data Collection System.

The System/34 Data Collection System Support is programmed to use the data on shop packets created by the Production Control and Costing application. It is also programmed to reformat data for input to the Production Control and Costing application. Reports produced by this application include a Labor Exception Report, Labor Corrections Audit Report, and Labor Report (broken down by foreman).

SYSTEM/34 PUBLIC BUDGETING AND ACCOUNTING SYSTEM (PBA): PBA provides a workstation-oriented financial control, planning, and accounting system for public institutions. It assists users in meeting financial reporting requirements, preparing budgets through on-line budget preparation and tracking, and controlling expenditures through management reports. The system also provides

periodic reporting of expenditure and revenue accounts, and preparation of Balance Sheet and General Ledger as well as year-end closing statements. PBA reports include a Budget Report containing the previous two years' actuals and present projected amounts; Trial Balance for balance sheet, revenue, and expenditure accounts by fund; Fund Trial Balance; Accounts Payable checks; and Single Fund General Ledger.

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. The purchase price is \$34,700.

MEDIUM-SCALE THREE-USER SYSTEM: Consists of a 5340 Model C13 System Unit with 64K bytes of main memory, 27.1 megabytes of disk storage, a Diskette 1 drive, a 160-lpm 5211 line printer, and three 5251 Model 11 CRT display/keyboard units. The purchase price is \$62,670.

LARGE-SCALE SIX-USER SYSTEM: Consists of a 5340 Model E35 System Unit with 128K bytes of main memory, 128.4 megabytes of disk storage, a Diskette Magazine Drive, a 300-lpm 5211 line printer, six 5251 Model 11 CRT display/keyboard units, and two 120-cps 5256 serial printers. The purchase price is \$106,560.

SOFTWARE: All software is licensed separately, including the System Support Program, the RPG II compiler, the COBOL 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. Some of the additional testing allowance times are as follows:

16K main memory increment (over 32K):	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. Warranty period for the System/34 is three months. Two rental policies are available, the standard Monthly Availability Charge (MAC) and the System/34 Term Availability Plan (TAP). Both MAC and TAP include maintenance charges in the monthly payments.

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. ►

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► System/34 provides a 10 percent educational allowance on leased or purchased systems.

MAINTENANCE: The IBM System/34 is leased to the user under rental plan B, which entitles the user to maintenance for 24 hours per day, 7 days per week.

For purchased systems, the IBM System/34 is under maintenance group D. The minimum period of maintenance service is 9 consecutive hours between 7:00 a.m. and 6:00 p.m. Monday through Friday. Charges for maintenance coverage outside this period are based upon the following percentages of the minimum monthly maintenance charge (MMC) added to the MMC:

	Consecutive hours				
	9*	12	16	20	24
Monday-Friday (until 8:00 a.m. Saturday)	10	12	14	16	18
Saturday (until 8:00 a.m. Sunday)	4	5	7	8	9
Sunday (until 8:00 a.m. Monday)	5	7	9	11	12

*Outside of the hours 7:00 to 6:00 p.m.

For users without a maintenance contract, the System/34 is maintained under per-call class 2. Under this class the per-call charge during regular hours is \$58.00 per hour, and during off hours the charge is \$67.00 per hour. The hourly rate for systems engineering service is \$47.50.■

EQUIPMENT PRICES

	Purchase Price	Monthly Maint.	Rental (1-year lease)*	Rental (TAP, 1st year)*
PROCESSORS				
5340 System Unit with 32K bytes of main memory; includes CPU, main memory, fixed disk storage, and one diskette drive:				
A11 Diskette 1 drive, 8.6 megabytes of disk storage	\$26,300	\$145.00	\$ 825	\$ 750
A12 Diskette 1 drive, 13.2 megabytes of disk storage	29,080	155.00	897	815
A13 Diskette 1 drive, 27.1 megabytes of disk storage	35,460	190.00	1,122	1,020
A14 Diskette 1 drive, 63.9 megabytes of disk storage	36,900	190.00	1,169	1,063
A15 Diskette 1 drive, 128.4 megabytes of disk storage	45,470	236.00	1,450	1,318
A21 Diskette 2D drive, 8.6 megabytes of disk storage	28,460	150.00	891	810
A22 Diskette 2D drive, 13.2 megabytes of disk storage	30,240	160.00	963	875
A23 Diskette 2D drive, 27.1 megabytes of disk storage	37,620	195.00	1,188	1,080
A24 Diskette 2D drive, 63.9 megabytes of disk storage	39,060	195.00	1,235	1,123
A25 Diskette 2D drive, 128.4 megabytes of disk storage	47,630	241.00	1,516	1,378
A31 Diskette Magazine Unit, 8.6 megabytes of disk storage	30,980	170.00	968	880
A32 Diskette Magazine Unit, 13.2 megabytes of disk storage	32,760	180.00	1,040	945
A33 Diskette Magazine Unit, 27.1 megabytes of disk storage	40,140	215.00	1,265	1,150
A34 Diskette Magazine Unit, 63.9 megabytes of disk storage	41,580	215.00	1,312	1,193
A35 Diskette Magazine Unit, 128.4 megabytes of disk storage	50,150	261.00	1,593	1,448
5340 System Unit with 48K bytes of main memory; includes CPU, main memory, fixed disk storage, and one diskette drive:				
B11 Diskette 1 drive, 8.6 megabytes of disk storage	27,900	150.00	869	790
B12 Diskette 1 drive, 13.2 megabytes of disk storage	29,680	160.00	941	855
B13 Diskette 1 drive, 27.1 megabytes of disk storage	37,060	195.00	1,156	1,060
B14 Diskette 1 drive, 63.9 megabytes of disk storage	38,500	195.00	1,213	1,103
B15 Diskette 1 drive, 128.4 megabytes of disk storage	47,070	241.00	1,494	1,358
B21 Diskette 2D drive, 8.6 megabytes of disk storage	30,060	155.00	935	850
B22 Diskette 2D drive, 13.2 megabytes of disk storage	31,840	165.00	1,007	915
B23 Diskette 2D drive, 27.1 megabytes of disk storage	39,220	200.00	1,232	1,120
B24 Diskette 2D drive, 63.9 megabytes of disk storage	40,660	200.00	1,279	1,163
B25 Diskette 2D drive, 128.4 megabytes of disk storage	49,230	246.00	1,560	1,418
B31 Diskette Magazine Unit, 8.6 megabytes of disk storage	32,580	175.00	1,012	920
B32 Diskette Magazine Unit, 13.2 megabytes of disk storage	34,360	185.00	1,084	985
B33 Diskette Magazine Unit, 27.1 megabytes of disk storage	41,740	220.00	1,309	1,190
B34 Diskette Magazine Unit, 63.9 megabytes of disk storage	43,180	220.00	1,356	1,233
B35 Diskette Magazine Unit, 128.4 megabytes of disk storage	51,750	266.00	1,637	1,488
5340 System Unit with 64K bytes of main memory; includes one CPU, main memory, fixed disk storage, and one diskette drive:				
C11 Diskette 1 drive, 8.6 megabytes of disk storage	29,500	155.00	913	830
C12 Diskette 1 drive, 13.2 megabytes of disk storage	31,280	165.00	985	895
C13 Diskette 1 drive, 27.1 megabytes of disk storage	38,660	200.00	1,210	1,100
C14 Diskette 1 drive, 63.9 megabytes of disk storage	40,100	200.00	1,257	1,143
C15 Diskette 1 drive, 128.4 megabytes of disk storage	48,670	246.00	1,538	1,398
C21 Diskette 2D drive, 8.6 megabytes of disk storage	31,660	160.00	979	890
C22 Diskette 2D drive, 13.2 megabytes of disk storage	33,440	170.00	1,051	955
C23 Diskette 2D drive, 27.1 megabytes of disk storage	40,820	205.00	1,276	1,160
C24 Diskette 2D drive, 63.9 megabytes of disk storage	42,260	205.00	1,323	1,203
C25 Diskette 2D drive, 128.4 megabytes of disk storage	50,830	251.00	1,604	1,458
C31 Diskette Magazine Unit, 8.6 megabytes of disk storage	34,180	180.00	1,056	960
C32 Diskette Magazine Unit, 13.2 megabytes of disk storage	35,960	190.00	1,128	1,025

*Rental prices include equipment maintenance.

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EQUIPMENT PRICES

		<u>Purchase Price</u>	<u>Monthly Maint.</u>	<u>Rental (1-year lease)*</u>	<u>Rental (TAP, 1st year)*</u>
PROCESSORS (Continued)					
	C33 Diskette Magazine Unit, 27.1 megabytes of disk storage	43,340	225.00	1,353	1,230
	C34 Diskette Magazine Unit, 63.9 megabytes of disk storage	44,780	225.00	1,4000	1,273
	C35 Diskette Magazine Unit, 128.4 megabytes of disk storage	53,350	271.00	1,681	1,528
5340	System Unit with 96K bytes of main memory; includes one CPU, main memory, fixed disk storage, and one diskette drive:				
	D11 Diskette 1 drive, 8.6 megabytes of disk storage	32,700	165.00	1,001	910
	D12 Diskette 1 drive, 13.2 megabytes of disk storage	34,480	175.00	1,073	975
	D13 Diskette 1 drive, 27.1 megabytes of disk storage	41,860	210.00	1,298	1,180
	D14 Diskette 1 drive, 63.9 megabytes of disk storage	43,300	210.00	1,345	1,223
	D15 Diskette 1 drive, 128.4 megabytes of disk storage	51,870	256.00	1,626	1,478
	D21 Diskette 2D drive, 8.6 megabytes of disk storage	34,860	170.00	1,067	970
	D22 Diskette 2D drive, 13.2 megabytes of disk storage	36,640	180.00	1,139	1,035
	D23 Diskette 2D drive, 27.1 megabytes of disk storage	44,020	215.00	1,364	1,240
	D24 Diskette 2D drive, 63.9 megabytes of disk storage	45,460	215.00	1,411	1,283
	D25 Diskette 2D drive, 128.4 megabytes of disk storage	54,030	261.00	1,692	1,538
	D31 Diskette Magazine Unit, 8.6 megabytes of disk storage	37,380	190.00	1,144	1,040
	D32 Diskette Magazine Unit, 13.2 megabytes of disk storage	39,160	200.00	1,216	1,105
	D33 Diskette Magazine Unit, 27.1 megabytes of disk storage	46,540	235.00	1,441	1,310
	D34 Diskette Magazine Unit, 63.9 megabytes of disk storage	47,980	235.00	1,488	1,353
	D35 Diskette Magazine Unit, 128.4 megabytes of disk storage	56,550	281.00	1,769	1,608
5340	System Unit with 128K bytes of main memory; includes one CPU, main memory, fixed disk storage, and one diskette drive				
	E11 Diskette 1 drive, 8.6 megabytes of disk storage	35,900	175.00	1,089	990
	E12 Diskette 1 drive, 13.2 megabytes of disk storage	37,680	185.00	1,161	1,055
	E13 Diskette 1 drive, 27.1 megabytes of disk storage	45,060	220.00	1,386	1,260
	E14 Diskette 1 drive, 63.9 megabytes of disk storage	46,500	220.00	1,433	1,303
	E15 Diskette 1 drive, 128.4 megabytes of disk storage	55,070	266.00	1,714	1,558
	E21 Diskette 2D drive, 8.6 megabytes of disk storage	38,060	180.00	1,155	1,050
	E22 Diskette 2D drive, 13.2 megabytes of disk storage	39,840	190.00	1,227	1,115
	E23 Diskette 2D drive, 27.1 megabytes of disk storage	47,220	225.00	1,452	1,320
	E24 Diskette 2D drive, 63.9 megabytes of disk storage	48,660	225.00	1,499	1,363
	E25 Diskette 2D drive, 128.4 megabytes of disk storage	57,230	271.00	1,780	1,618
	E31 Diskette Magazine Unit, 8.6 megabytes of disk storage	40,580	200.00	1,232	1,120
	E32 Diskette Magazine Unit, 13.2 megabytes of disk storage	42,360	210.00	1,304	1,185
	E33 Diskette Magazine Unit, 27.1 megabytes of disk storage	49,740	245.00	1,529	1,390
	E34 Diskette Magazine Unit, 63.9 megabytes of disk storage	51,180	245.00	1,576	1,433
	E35 Diskette Magazine Unit, 128.4 megabytes of disk storage	59,750	291.00	1,857	1,688
OPTIONS AND FEATURES					
4655	Keylock Feature for the 5340 Processor (\$72 single use charge)	—	—	—	—
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 to 5733 Processor Expansion Unit	8,775	25.00	260	236
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	34	31
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	23	21
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 is installed	288	0.50	8	8
5735	Processor Expansion Unit D; gate assembly for installation of Models 5600, 5602, or 5610 2400-bps modems; max. one per system	288	0.50	8	8
5736	Processor Expansion Unit E; additional power required for 1255 Attachment on certain models	900	5.00	28	25
4900	Work Station Control Expansion A; for 4910 on 525X	360	3.00	11	10
4905	Multinational Control	360	0.50	11	10
PRINTERS					
5211	Line Printer; may be substituted for Model 5256 console printer; max. one per system; requires Model 5810 attachment and print belt				
	Model 1: 160 lpm	12,800	75.00	376	320
	Model 2: 300 lpm	15,600	125.00	458	390

*Rental prices include equipment maintenance.

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EQUIPMENT PRICES

		<u>Purchase Price</u>	<u>Monthly Maint.</u>	<u>Rental (1-year lease)*</u>	<u>Rental (TAP, 1st year)*</u>
PRINTERS (Continued)					
59XX	Print Belt for the 5211	170	—	—	—
TERMINALS					
5251	Mdl. 11 CRT Display Station; 1920 characters; one required for each system	2,850	18.00	88	75
5251	Mdl. 12 CRT Display Station; 1920 characters; attaches up to eight 5251 Model 11 display stations or 5256 printers; Model 4600 keyboard required	4,050	39.00	140	119
2550	Cluster Adapter for 5251 Model 12 Display; permits attachment of up to four workstations (5251 Models 1 and 11 Displays, 5252 Displays, or 5256 Printers); four cable connections can be used with 2680 cable-through feature to attach up to four workstations per line; cannot be used with 2551 dual cluster; max. one per system	1,520	10.00	47	40
2551	Dual Cluster Adapter for 5251 Model 12 Display; same characteristics as 2550 cluster adapter except attaches up to eight 5251 Model 11 displays or 5256 printers	3,040	20.00	94	80
5251	Mdl. 1 CRT Display Station; same as 5251 Model 11 but with 960-character display	2,660	17.00	82	70
5251	Mdl. 2 CRT Display Station; same as 5251 Model 12 but with 960-character display	3,875	38.00	134	114
3600	Expanded Function for 5251; includes copy screen to printer and modulus 10 to 11 keyboard checking	300	1.00	11	9
3225	Display Screen Filter for 5251 Models 11 and 12	39	—	—	—
3226	For 5251 Models 1 and 2	39	—	—	—
5252	CRT Display Station; functions as two independent 960-character CRT displays with two keyboards	3,040	20.00	94	80
4600	Keyboard for Model 5251 and 5252 CRT Display Stations	350	3.00	12	10
4655	Keylock feature for Model 5251, 5252 CRT Display Stations (\$40 single use charge)	—	—	—	—
2680	Cable-Through feature for Model 5251, 5252 CRT Display Stations 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 (\$50 single use charge)	—	—	—	—
4450	Forms Stand for 5256	76	0.50	2	2
4910	Magnetic Stripe Reader for 5251 and 5252	420	2.00	13	11
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	92	84
5500	1200-bps Integrated Modem, with Auto-Answer; for use with 2500 adapter on switched lines; requires 4703 internal clock; cannot be used with other modems, 3701 EIA Interface, or 5650 and 5651 DDS adapter	660	5.00	20	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	27	25
	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	75	68
5601	For non-switched multipoint lines	2,240	11.50	75	68
5602	For non-switched multi-point tributary lines	2,490	13.00	81	74
5610	With Auto-Answer; for switched lines	2,550	14.00	83	75
3500	Second BSC/SDLC Communications Adapter; requires 2500 adapter and either an integrated modem, EIA Interface, or Dataphone Digital Service adapter	2,880	20.00	92	84
6500	1200-bps Integrated Modem, for use with 3500 adapter on non-switched lines, requires 3734 Processor Unit Expansion C and 4703 internal clock; cannot be used with other modems	660	5.00	19	18
6501	1200-bps Integrated Modem with Auto-Answer; same characteristics as 6500 integrated modem	880	7.00	27	25
6600	2400-bps Integrated Modem; for use with 3500 adapter; non-switched point-to-point lines, equivalent to IBM 3872 modem; requires 5733 and 5735 Processor Unit Expansions; cannot be used with other modems	2,240	11.50	75	68

*Rental prices include equipment maintenance.

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EQUIPMENT PRICES

		<u>Purchase Price</u>	<u>Monthly Maint.</u>	<u>Rental (1-year lease)*</u>	<u>Rental (TAP, 1st year)*</u>
COMMUNICATIONS (Continued)					
6601	2400-bps Integrated Modem; for use with 3500 adapter; non-switched multipoint control; same characteristics as 6600 modem	2,240	11.50	75	68
6602	2400-bps Integrated Modem; for use with 3500 adapter; non-switched multipoint tributary, same characteristics as 6600 modem	2,490	13.00	81	74
6610	2400-bps Integrated Modem; for use with 3500 adapter; switched lines; auto-answer capability; same characteristics as 6600 modem	2,550	14.00	83	75
5650	Dataphone Digital Service Adapter for use with 2500 adapter in point-to-point cannot be used with other modems or 3701 EIA Interface	840	5.00	25	23
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	25	23
5652	Same as 5650 but for use with 3500; cannot be used with other modems or 3702 EIA Interface	840	5.00	25	23
5653	Same as 5651 but for use with 3500; cannot be used with other modems or 3702 EIA Interface	840	5.00	25	23
3701	EIA Interface for connection of 2500 communications adapter for 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
3702	EIA Interface; for use with 3500 adapter; permits attachment of IBM and non-IBM modems; cannot be used with 650X, 660X, 6610, or 525X modems or adapters; requires 5734 Processor Unit Expansion C; may require 4703 internal clock	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	26	24
7953	Switched Network Backup Unit; for use with 660X modems; requires 3500 adapter; cannot be used with 7954 backup unit	540	3.50	16	15
7954	Switched Network Backup Unit; for use with 660X modems; includes auto-answer capability; requires 3500 adapter; cannot be used with 7953 backup unit	828	5.00	26	24

SOFTWARE PRICES

		<u>Monthly License Charge</u>
PROGRAM PRODUCTS		
5726-SS1	System Support Program	\$ 85
6000, 6001	Interactive Communications Feature for SSP	75
5726-UT	System/34 Utilities	31
5726-XR1	Workstation Search Facility	250
5799-AYW	PRPQ Workstation Support Subroutines	15
5726-AS1	Basic Assembler and Macro Processor	78
5726-CB1	COBOL	75
5726-RO1	FORTRAN IV	105
5726-RG1	RPG II	26
5798-NNE	5230 On-line Data Collection	100
APPLICATION PROGRAMS		
5726-C21	Client Accounting and Financial Reporting System	99
5726-C22	Client Accounting and Financial Reporting System II	99
	Distributors Management Accounting System II (DMAS II)	
5726-D41	Billing	52
5726-D42	Accounts Receivable	36
5726-D43	Inventory Control	47
5726-D44	Sales Analysis	47
	Distributors Management Accounting System (DMAS):	
5726-D4A	Billing	51
5726-D48	Accounts Receivable	34
5726-D43	Inventory Control	45
5726-D44	Sales Analysis	45
	Lumber Dealers Management Accounting System (LDMAC):	
5726-D4E	Billing	51
5726-D4F	Accounts Receivable	34
5726-D4G	Inventory Control	45
5726-D4H	Sales Analysis	45

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SOFTWARE PRICES

Monthly
License Charge

	Food Distributors Management Accounting System (FDMAS):	
5726-D65	Billing	51
5726-D66	Accounts Receivable	35
5726-D67	Inventory Control	45
4726-O68	Sales Analysis	45
	Distribution Financial Accounting System (DFAS):	
5726-D6A	General Ledger	29
5726-D6A	Accounts Payable	29
4726-D6C	Payroll	37
	Distribution Financial Accounting System II (DFAS II):	
5726-M47	General Ledger	36
5726-M43	Accounts Payable	36
5726-M42	Payroll	49
	Student Administrative System (SAS):	
5726-E31	Student Records	68
5726-E32	Student Accounting	75
5726-E33	Student Scheduling	90
	Financial Institutions Customer Accounting System (FICAS):	
5726-F11	Customer Information File	92
5726-F12	Demand Deposit Accounting	82
5726-F13	Savings Accounting	81
5726-F14	Installment Loan Accounting	94
5726-F52	Management System for Law Firms (MSLF)	192
5726-G21	Public Budgeting and Accounting Application	162
	Hospital Financial Management System (HFMS)	
5726-411	Patient Billing	33
5726-412	Accounts Receivable	28
5726-413	Payroll	55
5726-414	General Ledger/Accounts Payable	44
5726-H15	Medical Group Management System	94
572--H16	Medical Group Management System II	131
5726-K11	Membership and Mailing List System	107
	Manufacturing Management Accounting System (MMAS):	
5726-M31	Product Status and Costing	37
5726-M32	Payroll	37
5726-M33	Accounts Payable	29
5726-M34	Accounts Receivable	30
5726-M35	Inventory Management	37
5726-M36	Product Definition and Costing	34
5726-M37	General Ledger	29
5726-M38	Sales Analysis	37
5726-M39	Order Entry and Invoicing	37
5726-M3A	5230 Data Collection Support for System/34	
	Manufacturing Accounting and Production Information System (MAPICS):	
5726-M41	Production Control and Costing	94
5726-M42	Payroll	49
5726-M43	Accounts Payable	36
5726-M44	Accounts Receivable	36
5726-M45	Inventory Management	47
5726-M46	Product Data Management	78
5726-M47	General Ledger	36
5726-M48	Sales Analysis	47
5726-M49	Order Entry and Invoicing	52
5726-M4A	Data Collection System Support	55
5726-M4B	Material Requirements Planning	94
	Construction Management Accounting System (CMAS):	
5726-M61	Job Costing	34
5726-M62	Accounts Payable	44
5726-M63	Payroll	59
5726-M64	General Ledger	34
5726-T21	Motor Freight Accounting System	152