

# Burroughs B 90

## MANAGEMENT SUMMARY

The hallmark of the B 90 is the use of many concepts employed in the larger members of the 900 family, namely dynamically variable microprogrammed logic, LSI circuitry, and microprogrammed interpreters. Of equal importance, Burroughs claims the B 90 offers complete program compatibility with its predecessors in the 800 family, the B 80 and the B 800. In terms of power, the B 90 offers two to five times the speed of comparable earlier Burroughs systems. Burroughs describes the B 90 and its two available models, the B 91 and B 92, as "the fastest and most powerful systems in their class ever developed by the company."

The B 90 is marketed in the form of basic packaged systems. Burroughs provides considerable latitude by offering the user the ability to configure their system from these basic packages. The basic packages include the processor, memory, and console printer, but do not include the operator display station, and mass storage units or magnetic tape cassette units as the B 80 packaged configurations did. Instead, the user may select from a reasonably extensive list of peripherals to complete his systems. In addition, packaged system prices do not include required software. With a full complement of application programs, system software, and optional peripherals, the system purchase price can climb to over \$50,000. Besides offering the B 90 on a purchase basis, Burroughs offers several leasing plans with terms of one, three, or five years. Leasing plans include 8-hour per day, 5-day per week maintenance. ➤

The B 90 is the low-end member of the Burroughs 900 family of systems and a replacement for the now almost three years old B 80. Consisting of three packaged systems, the B 90 also serves as a growth path for Burroughs L Series computers and an entry level system for first time computer users. The purchase price for a minimum B 90 system is \$17,950.

## CHARACTERISTICS

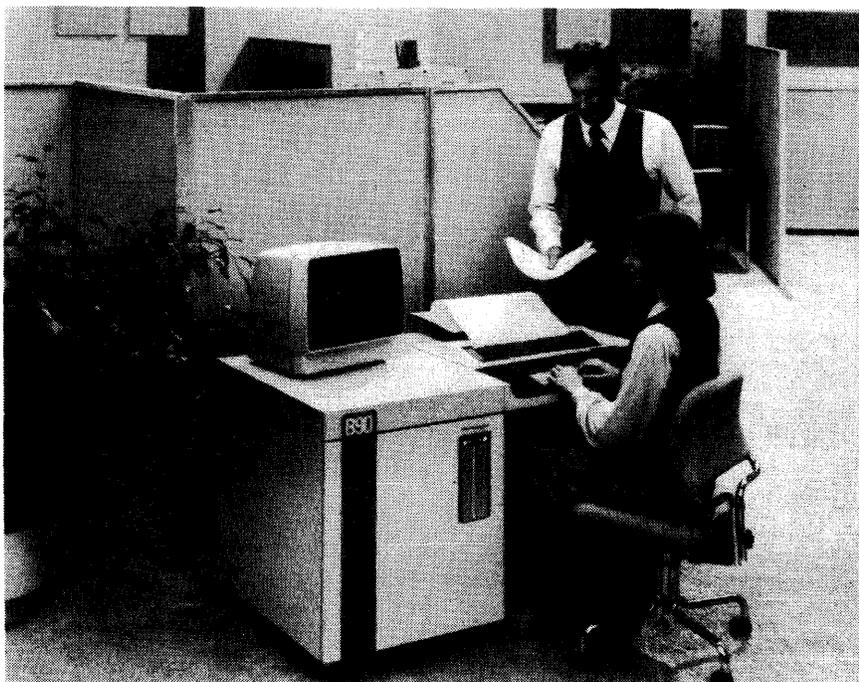
**MANUFACTURER:** Burroughs Corporation, Burroughs Place, Detroit, Michigan 48232. Telephone (313) 972-7000.

Burroughs is considered to be one of the strongest competitors in the data processing marketplace, with a broad line of computer equipment spanning the range from small, entry-level systems to very large, multi-user, multiprocessor systems. In addition to data processing equipment, Burroughs also markets magnetic media; business forms and supplies; document counting, encoding, signing, protecting, and disbursing equipment; programmable and non-programmable desktop calculators; specialized banking equipment; word processing equipment; facsimile devices; and other related products. Burroughs is international in scope and employs some 50,000 people in more than 120 countries around the globe.

**MODELS:** B 91 and B 92.

**DATE ANNOUNCED:** October 1979.

**DATE OF FIRST DELIVERY:** December 1979. ➤



The B 92, the largest in the B 90 series, is available with up to 412K bytes of main memory, 11 I/O channels, and 4 communications channels. Peripherals available include several types of diskette drives, 4 different fixed disk drives, 2 different cartridge disk drives, 2 magnetic tape cassette devices, 7 line printers, and a variety of terminals. The B 92 is capable of running under CMS or ACSYS software.

## Burroughs B 90

▷ All software for the B 90 is integrated into two systems known as the Computer Management System (CMS) and the Accounting Computer System (ACSYS). Falling under the CMS and ACSYS umbrella are the Master Control Program (MCP) operating system; the higher-level language compilers, COBOL and RPG; the Communications Language Compilers, Network Definition Language (NDL) and Message Processing Language (MPL); the stand-alone utility set; and the currently available applications packages.

The ACSYS software provides for the use of existing Burroughs L/TC Series cassette programs on the B 90 system using disk media as cassettes. ACSYS is actually a language with a built-in monitor. It does not support fixed disk subsystems, but does support BSM, BSM II, and cartridge disk subsystems. All B 90 software is separately priced.

The MCP is a full operating system that provides an automatic, nonpartitioned multiprogramming environment. Among the features of the MCP are dynamic memory and resource allocation and the virtual memory concept of operation.

In a data communications environment, the B 90 can control its own network of terminals, communicate with other B 90 systems, or serve as a terminal to a larger system. The Network Definition Language is designed to ease the work of a user in implementing or reconfiguring a data communications network. The Message Processing Language MPL II provides a method of interfacing between the NDL and the user's programs. Among the communications protocols available are the Burroughs Data Link Control (BDLC), asynchronous, synchronous, and bisynchronous procedures.

Reminiscent of other systems in its class, the B 90 processor is housed in a desk-sized cabinet containing a keyboard, a console printer, and optionally, a diskette drive. The system display is optional and is mounted on top of the CPU cabinet. The console printer may be either a 90 cps dot matrix printer with a 9.5-inch single pinfeed forms handler (B 91) or a 120 cps dot matrix printer with a 15-inch single or dual pinfeed forms handler.

Burroughs offers a choice of several diskette drives which include the BSM I, BSM II, and ICMD drives. The BSM I and II drives are double-density, double-sided diskette units capable of reading and writing floppy disks on both sides by means of two sets of read/write heads. The BSM I provides the megabyte of disk storage per diskette, while the BSM II provides three megabytes of disk storage per diskette and six megabytes per standard subsystem. The BSM I may be built-in or freestanding. Freestanding BSM I subsystems are packaged with one or two drives while the built-in version is only available with one drive. The ICMD is a single sided diskette drive provided to users so that they may interchange media with systems of other manufacturers. ▷

▶ **NUMBER INSTALLED TO DATE:** Burroughs internal use plus selected customer test sites.

### DATA FORMATS

**BASIC UNIT:** 8-bit byte with two decimal digits or one character per word. The microinstruction set has no preferred word or byte boundaries that are visible to the rest of the system.

**INSTRUCTIONS:** The B 90 is an interpreter-based system using variable micrologic. Utilizing the microinstruction set, operand lengths permit from 1 to 256 bytes of data to be addressed with a single instruction, and up to 8 bits to be transferred in parallel between main memory and the processor.

**INTERNAL CODE:** ASCII; other media codes, such as EBCDIC, may be translated.

### MAIN STORAGE

**TYPE:** Dynamic MOS RAM, the contents of which are refreshed at intervals of two milliseconds or less.

**CYCLE TIME:** 0.5 microseconds per 8-bit fetch, with a .015 nanosecond access time.

**CAPACITY:** The B 91 has a minimum of 65,536 bytes of main memory expandable to 524,288 bytes in increments of 65,536 or 131,072 bytes. The B 92 has a minimum of 131,072 bytes of main memory expandable to 524,288 bytes. Increment sizes are the same as for the B 91.

**CHECKING:** Parity standard.

**STORAGE PROTECTION:** Main storage write operations are permitted only within the limits defined by a base register and a limit register.

**RESERVED STORAGE:** A variable portion is reserved for microinstruction storage.

### CENTRAL PROCESSOR

The central processor of the B 90 makes extensive use of large scale integrated (LSI) circuitry as an aid in improving performance and reducing overall unit size. As part of the LSI design four microprocessors are utilized. Interfacing between the processor and memory requires a protocol of signals, a technique which is designed, according to Burroughs, to protect the basic design from obsolescence.

The B 90 has certain integral peripheral units built into the CPU housing. These include a printing unit, a keyboard, and a floppy disk drive (Burroughs Super Mini-Disk II). The system display sits on top of the B 92 CPU housing and is integral only in the sense of its tie in to the console printer, while the display is physically mounted on the B 91.

The differences between the B 91 and B 92 are in the size and speed of the inbuilt matrix printer and peripheral expandability. The smallest B 90, the B 91-SYS is a one megahertz system. The other two B 90s are two megahertz systems.

The B 90 processor features dynamically variable micro-programmed logic. The processor's logic functions are formed by a set of elementary operators, called micro-instructions, which operate on bit strings up to 256 bytes long. There are 256 defined microinstructions in the B 90. Microinstructions are basically 8 bits long, but they can be extended to 16 or 24 bits. The B 90 has the capability to look ahead while executing microinstructions. This is ▶

## Burroughs B 90

## PERIPHERALS/TERMINALS

DEVICE	DESCRIPTION & SPEED	MANUFACTURER
System Display	Switchable between 256 and 1920 characters to match program requirements; 8 lines by 32 characters (256 characters) and 24 lines of 80 characters (1920 characters)	Burroughs
Console Printer (B 91)	Serial impact, 9 x 9 dot matrix, slew rate 9 ips, 64 character set, bidirectional printing, 9.5-inch single pinfeed forms handler, 8 inch forms width; 10, 12.5, or 16.67 characters per inch; 6 or 8 lines per inch with line spacing and multipitch print under software control; 90 cps	Burroughs
Console Printer (B 92)	Serial impact, 7 x 9 dot matrix, slew rate 16 ips, 64 character set, bidirectional printing, 15-inch single or dual pinfeed forms handler, 14.8 or 17.1 forms width dependent on forms handlers), 10 or 15 characters per inch; 6 lines per inch, multipitch print and print direction under software control; 120 cps	Burroughs
SMD II	See mass storage section of this report	
<b>MAGNETIC TAPE UNITS</b>		
B 9497-11	2-track, 800 bpi, 282 usable feet, 10 ips, 60 ips rewind, read-after-write, NRZI, microprogram controlled with two 96-character buffers; 1000 bytes/second	Burroughs
B 9497-15	Same as B 9497-11 but PE	Burroughs
<b>PRINTERS</b>		
B 9249-2	Chain, 132 positions, 48-character set (64 or 96 optional), 17-inch paper, slew rate 8.3 ips, 10 characters per inch, optional 12-channel VFU; 160 lpm	Burroughs
B 9249-3	Chain, 132 positions, 48-character set (64 or 96 optional), 17-inch paper, slew rate 8.3 ips, 10 characters per inch, optional 12-channel VFU; 250 lpm	Burroughs
B 9249-4	Chain, 132 positions, 48-character set (64 or 96 optional), 17-inch paper, slew rate 8.3 ips, 10 characters per inch, optional 12-channel VFU; 350 lpm	Burroughs
B 9249-250	Chain, 132 positions, 48- or 64-character set, 17 inch paper, slew rate 14 ips, 10 characters per inch, soft VFU; 6 or 8 lines per inch; 300/250 lpm	Burroughs
B 9249-375	Chain, 132 positions, 48- or 64-character set, 17 inch paper, slew rate 14 ips, 10 characters per inch, soft VFU; 6 or 8 lines per inch; 500/375 lpm	Burroughs
B 9246-3	Band, 132 positions, 48- or 64-character set, 16 inch paper, slew rate 15 ips, 10 characters per inch, 12 channel VFU; 6 or 8 lines per inch; 320/300 lpm	Burroughs
B 9246-6	Same as B 9246-3 but 650/600 lpm	Burroughs
<b>TERMINALS</b>		
TD 73X Series	Self-Scan display/keyboard, 480 characters, 12 lines by 40 characters, 128 ASCII character set, 5 x 7 dot matrix, red phosphor illumination, various keyboards and peripherals including magnetic card reader, cassette tape drives, and printers; 9600 bps maximum	Burroughs
TD 83X Series	CRT display/keyboard, 1920 characters plus 80-character system status line, 24 lines (plus system line) by 80 characters, 128 ASCII character set, 5 x 7 dot matrix, various keyboards and peripherals, including serial and line printers, cassette drive, magnetic badge readers; 9600 bps maximum  Other terminals in the Burroughs product line can also be used with the B 90.	Burroughs

## Burroughs B 90

▷ Other mass storage devices available include fixed disk with capacities from 9.4 to 37.6 megabytes and cartridge disks with capacities of 4.6 or 9.2 megabytes.

In addition to mass storage devices, Burroughs offers seven printers with speeds up to 650 lpm, four magnetic cassette tape drives (NRZI and PE), a variety of data communication controllers with speeds up to 9600 bps, and multiple terminals in the TD, BMT, and TC class.

Competition for the B 90 comes from numerous systems that also emphasize application software. These include systems from traditional vendors such as IBM, Basic Four, Quantel, NCR, and Datapoint and numerous turnkey houses.

The B 90 is being sold under the Burroughs Group II product category. The salesmen who sell these products are said to be the most aggressive on the Burroughs marketing staff. The company's Selected Accounts and Large Accounts sales forces also sell the B 90 and its peripherals as Group VI products. Service is provided through Burroughs' nationwide and worldwide field engineering and customer support network.

Training in applications programs, B 90 hardware, and systems software is offered through Burroughs training centers worldwide, and is strongly recommended by the company to insure smooth installation and to produce self-assured users.

Burroughs' standard warranty applies to all B 90 systems and peripherals. There is no free maintenance period on these systems. □

▶ possible because of the overlapping of microinstruction fetching and execution. The overlap improves overall performance by as much as percent.

In the B 90, Burroughs has also implemented a microprogram stack to improve the efficiency of repetitive processes, such as subroutines used for I/O interrupt servicing. The microinstruction set contains members capable of multiple counting, a feature that allows for repetitive execution. This feature has a wide spectrum of application in data streaming, operating system table manipulation, and byte processing operations.

Burroughs defines S-language (Secondary-language) instructions as intermediate instructions which are equivalent to the machine-language instructions of conventional computers. Each S-language instruction is implemented by a string of microinstructions which interpretively execute the functions specified by the S-instruction. Because the S-instructions are software-defined by the microprograms, the functions they specify can be quite complex. In most cases, S-instructions specify an operation to be performed, one or more operand addresses, data field lengths, and units of data.

For each B 90 programming language, Burroughs has defined an "ideal machine" and developed a specialized microprogram, called an Interpreter, that makes the B 90 appear to be logically equivalent to that machine. The Interpreter executes the instructions which have been

generated by the corresponding compiler. These compiler-generated instructions are expressed in an appropriate S-language.

Confidence Test Routines (CTR's) stored in ROM, together with maintenance test routine programs, make fault analysis and performance degradation detection easier for field engineers and customers. This includes both the isolation and analysis of the problem.

**CONTROL STORAGE:** The 4KB ROM (read-only memory) contains cold and warm starts, a basic maintenance test routine, an interrupt analysis routine, and general-purpose routines such as binary to decimal conversion and absolute memory address conversion. When the processor must temporarily suspend a task because of a peripheral interrupt, information from processor registers is stored in main memory.

**REGISTERS:** None apparent to users. Internal registers include registers for storage protection, temporary storage areas for data being manipulated by the microprogram and the special-purpose Memory Address Register (MAR), Micro Memory Address Register ( $\mu$ MAR), and Timing Machine State (TMS) registers. The base and limit registers are used for storage protection, defining the space that may be utilized by the user within main memory. The MAR register is used to address those main memory locations from which data is to be read or written, while the  $\mu$ MAR register addresses that portion of main memory from which microinstructions are read, and the TMS registers determine the period of time when a microinstruction remains active. Together, these registers control the timing of all processor operations.

**INTERRUPTS:** Both external and internal interrupts are present in the B 90. Internal interrupts can occur on a memory parity error, when the Load Enable button is depressed, or when power is first connected to the system. External interrupts occur when a peripheral device requests attention (active data movement operation required). The B 90 uses an automatic hardware interrupt system; the individual I/O channel notifies the processor when data is ready for processing or transmission.

**PHYSICAL SPECIFICATIONS:** The processor unit, a single desk-size cabinet that houses the Super Mini-Disk II and the serial printer along with the processor, varies in dimensions according to the model. The B 91 is 39 inches wide, 29 inches deep, and 30 inches high; the B 92 is 49.7 inches wide, 29 inches deep, and 30 inches high.

Power requirements for the U.S.A. are 120 VAC +5 percent, -10 percent, at 60 Hertz. The system requires 1.35 KVA. The operating environment is from 55 to 104 degrees F., with a humidity tolerance ranging from 20 to 85 percent, noncondensing. Additional air conditioning above normal office levels is not required except in extreme operating environments. The processor and standard units integral with the processor dissipate about 4000 BTUs of heat per hour. Service area and general machine requirements indicate the need for a floor area with about a three-foot clearance around the system. Models to satisfy all international requirements are also available.

### INPUT/OUTPUT CONTROL

**I/O CHANNELS:** Facilities for six I/O channels on the B 91 and eight I/O channels on the B 92 are standard. A channel expander unit allows a single I/O channel to be expanded to four similar channels, yielding a total of 11 as a system maximum on the B 92. The expander is only one of three types of I/O control used in the B 90. The more-or-less traditional controller used with the line

## Burroughs B 90



Burroughs states that the B 90 is marketed as stand-alone data processing system, as a remote processor in a distributed processing network, or as a processor in a data communications network. The environmental requirements for the B 90 make it possible to install the system in numerous locations without the need for special environmental devices such as additional air conditioning and raised floors.

printers represents the second type. The last type is a combination of a device controller and microprocessor placed between the controller and the CPU. This type is utilized where complex control is necessary to provide greater throughput to the processor; the control for the tape cassette drives is an example. All three types of control offer their own identification to the processor, allowing the operating system to call into main memory only the necessary disk-resident I/O control segments.

**SIMULTANEOUS OPERATIONS:** Processing must cease during I/O command transfers and during transfers of data. During periods of "I/O overhead," such as paper skipping on the printer, simultaneous operations can occur. All parts of the system other than main memory are considered as peripherals, including the operator's console.

#### CONFIGURATION RULES

The B 91 may attach up to two disk controls with freestanding Burroughs SMD drives providing up to four megabytes of disk storage, Burroughs SMD II drives providing up to 12 megabytes of disk storage (six megabytes inbuilt and six megabytes freestanding), removable cartridge disk subsystems up to 18.4 megabytes, and fixed disk subsystems up to 18.8 megabytes. Total disk storage capacity on the B 91 is 28 megabytes.

Up to two data communications channels (two ports per channel) and up to six I/O channels can be configured on the B 91. One freestanding printer rated at 160, 250, 300, 320, or 350 lpm can also be configured.

The B 92 may attach up to three disk controls and a total of 46.8 megabytes of disk storage. Total disk capacity can be allocated among several types of disk devices in various combinations. Individual limits for disk devices include Burroughs BSM drives, 6 megabytes (3 two-megabyte freestanding drives); Burroughs BSM II drives, 18 megabytes (2 six-megabyte freestanding drives and 1 six-megabyte inbuilt drive); removable cartridge disk, 27.6 megabytes; and fixed disk storage, 37.6 megabytes.

The B 92 can have up to four data communications channels (two ports per channel) and up to 11 I/O channels.

Up to two freestanding printers rated at 160, 250, 300, 320, 350, or 650 lpm (48 character set) or 64, 250, 300, 375, or 600 lpm (64 character set) can be configured. The B 92 can also be configured with magnetic tape cassette stations. Up to four PE and four NRZI cassette stations or a combination of these stations may be included in the B 92 configuration. A magnetic tape cassette control can handle up to two cassette stations.

#### MASS STORAGE

**BURROUGHS SUPER MINI-DISK (BSM I & II) DRIVES:** These floppy disk drives are available either built into the processor cabinet and/or as free-standing units. The BSM subsystem consists of a controller with 200-character buffers and either a dual BSM drive or one or two single BSM drives. The BSM has the capability of reading and recording on both sides of the floppy disk by means of two sets of read/write heads. The BSM I drive is capable of storing one million bytes per diskette (500,000 bytes per side). Each diskette contains 180 bytes per sector, 32 sectors per track, and 88 tracks per side. Track density is 64 tracks per inch, with a track-to-track access time of 20 milliseconds per single step and a settling time of 80 milliseconds. Average access time is 266 milliseconds, and the data transfer rate is 45K bytes per second.

The BSM II drive is capable of storing three million bytes per diskette (1,500,000 bytes per side). Each diskette contains 180 bytes per sector, 59 sectors per track, and 142 tracks per side. Track density is 150 tracks per inch, with a track to track access time of 38 milliseconds per single step including a settling time. Average access time is 157 milliseconds and the data transfer rate is 125K bytes per second. BSM I and II are manufactured by Burroughs.

**B 9489-17 INDUSTRY-COMPATIBLE MINI-DISK (ICMD) DRIVE:** These floppy disk drives are available only as free-standing units. The ICMD subsystem uses a controller similar to the one used in the BSM subsystem. A subsystem is composed of a controller and a single ICMD drive. Unlike the BSM drive, the ICMD drive reads only one side of the diskette. Each diskette stores 243K bytes of data with 128 bytes per sector, 26 sectors per track, and 77 tracks per diskette, including three alternates. Track-to-track

## Burroughs B 90

► access time is 20 milliseconds per single step, and settling time is 10 milliseconds. Average access time is 343 milliseconds, and the data transfer rate is 31K bytes per second. The ICMD is manufactured by Burroughs under license from CDC.

**B 9480/B 9481 DUAL CARTRIDGE DISK SUBSYSTEM:** Provides low-cost random-access data storage on removable single-platter cartridges. Two dual-drive models are available:

Model	Capacity, bytes	Avg. Access Time
9480-22	4.6 million	145 milliseconds
9481-12	9.2 million	100 milliseconds

Each drive accommodates one disk cartridge and has two read/write heads, one serving the top and one the bottom recording surface of the cartridge. The disk cartridge is 15 inches in diameter, 1.5 inches high, and weighs 5 pounds. The two drives are "stacked" so that the unit occupies less than five square feet of floor space. Data is recorded in 180-byte segments.

The 9480-22 has an average head positioning time of 125 milliseconds, an average rotational delay of 20 milliseconds, and a data transfer rate of 193K bytes per second. The 9481-12 has an average head positioning time of 60 milliseconds, an average rotational delay of 20 milliseconds, and a data transfer rate of 193K bytes per second. The controller for the dual cartridge subsystem is similar to the one used for the BSM. The controller contains two 200-character buffers. The B 9480/B 9481 subsystem is manufactured by Burroughs.

**B 9493 FIXED-DISK DRIVES (FDD):** Four models of fixed-disk drives are available for use with the B 90:

Model	Capacity, bytes	Avg. Access Time
B 9493-9	9.4 million	55 milliseconds
B 9493-18	18.8 million	55 milliseconds
B 9493-28	28.2 million	55 milliseconds
B 9493-37	37.6 million	55 milliseconds

One I/O port is required for the controller of the -9, -18; two are required for the -28, -37, and a maximum of 37.6 megabytes of fixed disk can be configured in conjunction with one BSM I or II drive or one cartridge drive.

The B 9493-37 is a good candidate for disk backup. Alternately, one BSM drive and one cartridge disk may be used. There are 180 bytes per sector, 64 sectors per track, 406 tracks per surface, and 4 surfaces utilized in the B 9493-18. Expanded capacities are accomplished by adding platters. (Each platter holds 9.4 million bytes.) The data transfer rate is 384K bytes per second. The drives are manufactured by Burroughs.

### INPUT/OUTPUT UNITS

See Peripherals/Terminals table for units other than the system keyboard, the Audit Entry Data Preparation Systems, and the MT 600 Series terminals which are described below.

**KEYBOARD:** The B 90 keyboard is used by the operator to enter data and control the system's functions. It consists of a typewriter-style keyboard (59 keys), 24 program select keys, a ready request key, and four keys for special functions such as changing the sign of data being entered. These special keys are coupled with the 13-key numeric keyboard. The keyboard is adapted from the one utilized in the Burroughs L series, TC 5100, and AE series.

**AUDIT ENTRY DATA PREPARATION SYSTEMS:** The Burroughs AE systems are minicomputer-based systems that edit, validate, and capture ready-to-process data on magnetic tape cassettes, industry-compatible floppy disks, or Burroughs Super Minidisks for batch transmission to a host computer. Errors are detected and corrected at the point of original entry. The AE systems simultaneously print an audit journal to assist the operator and to permit subsequent auditing.

There are currently five audit entry data preparation system models offered by Burroughs. The AE 501 system is the oldest entry in the current line, having been announced in September 1975. The AE 511 and AE 513 were introduced in November 1976 and are currently being delivered. The AE 411 and AE 412 are scheduled for delivery in the fourth quarter of 1979.

All AE systems include a 28K processor, implemented in large- and medium-scale integrated circuits. Data movement is byte-serial, 8-bit parallel and is moved one byte at a time from the processor to one of four dedicated I/O channels. One byte of information can be moved within the processor or between the processor, the memory, and the I/O channels in 1 microsecond. The memory is modular in 4K-byte increments and consists of 4K bytes of ROM (read-only memory) used for interpreter bootstrap (cold start) and permanent customer confidence programs, plus up to 28K bytes of RAM (random-access memory) available for interpreter and user storage. All systems have a data communications capability.

The electronic keyboard consists of a standard Burroughs alphanumeric typewriter keyboard, a separate 10-key numeric keyboard, and special function keys. The keyboard includes an upper row of 16 Program Select Keys to implement various program options. The unit printer uses an interchangeable 64-character set and prints at 60 characters/second. A 150-position print line is standard, and spacing is 6 lines per inch. The unit is equipped with a single pin-feed device for handling forms from 3 to 16.75 inches wide. It is capable of handling farfold, single, or multiple-part forms with folds from 3.5 to 12 inches apart.

The basic AE 412 also includes a 60-cps matrix printer, a Burroughs Self-Scan 240-character visual display panel, and a 243,000-byte industry-compatible mini-disk drive.

The basic AE 422 is a nonprinting version of the AE 412, having the same characteristics with the exception of the omitted matrix printer.

The basic AE 511 and AE 513 have the same characteristics as the AE 412 with the exception of the data storage media. The AE 511 uses a 239,000-byte magnetic tape cassette for data storage, and the AE 513 uses a Burroughs Super Mini-disk having 1 million bytes of data storage capacity.

The basic AE 501 system includes the matrix printer, a magnetic tape cassette unit with a data storage capacity of 239,000 bytes, and one asynchronous or synchronous data communications line.

The AE systems can communicate in either asynchronous or synchronous mode with a central computer or another terminal over leased or switched lines, via a Two-Wire Direct Interface (TDI) at up to 1000 feet, or via a Burroughs Direct Interface (BDI) at up to 15,000 feet. The line protocols available with the AE systems include Burroughs Basic Mode, Point-to-Point Batch, and the bit-oriented Burroughs Data Link Control (BDLC) procedures.

**BURROUGHS MT 600 SERIES TERMINALS:** These units are stand-alone, microprocessor-based terminals designed for interactive and remote batch applications. The ►

## Burroughs B 90

Basic configuration consists of a 12-inch (diagonal measurement) CRT display, a processor (housed in the display cabinet) and a detached keyboard. The system's firmware and peripheral handlers, including diagnostic test routines, data communications procedures, and the program language interpreter, are stored in ROM. An electronically alterable read-only memory (EAROM) stores configuration data and system variables. A 16K-byte RAM (expandable in 4K-byte increments up to 96K bytes on Model MT 687 only) provides working storage, data communications buffers, and data storage.

Two configurations are currently available and are distinguished only by the processor provided:

**MT 686**—includes a Model FLD 1 Processor, which contains a 16K-byte RAM.

**MT 687**—includes a Model FLD 2 Processor, which contains a 16K-byte RAM expandable in 4K-byte increments to 96K bytes, plus an extension of the FDL program language interpreter to include computation functions (add (+), subtract (-), multiply (x), divide (÷), and signed value (+, -)).

One printer and one microdisk drive may be added to the basic system.

A 12-inch CRT display with a display capacity of 2240 characters arranged in 28 lines of 80 characters is standard. The first 26 lines are used to display data; the 27th line, message/commands; and the 28th line, status. A 96-character ASCII character set, including upper and lower case alphabets, is standard. Highlighting features include high/normal intensity, underlining, and reverse video.

A 106-key typewriter-style expanded alphanumeric/function keyboard. The key arrangement is segmented into five sections: a 61-key main keygroup; a 13-key numeric keypad and a 12-key function cluster, which are both located to the right of the main keygroup; a row of 10 user-definable program function keys plus 6 control keys located above the main keygroup; and a row of 4 command keys, (Send, Receive, Command/Message, and Break/Clear) located above the numeric and function clusters.

Two matrix printers are available with the MT 600 Series: Model TP 313 Journal Printer and Model TP 323 Validating/Journal Printer. The TP 323 is capable of printing a customer receipt in addition to the journal. Each printer supports 90 cps bidirectional matrix printing over an 8.5-inch print line. All printer features are program-controlled and include complete data formatting capabilities, receive-message and formatted-print buffers, a 5-by-7 or 9-by-7 dot matrix, a ROM-stored 96-character ASCII character set, reverse image printing (background only), and an out-of-paper detector. Horizontal spacing is program-selectable at 6, 8, 12 or 16 characters per inch; vertical spacing is variable in 1/24-inch increments. A pin-feed platen accommodates continuous forms 9.5 inches wide and 5.5 or 11 inches (program-selectable) long. A document-present detector is featured on Model TP 323 only.

Two microdisk drives are available: Model TP 410, a single drive with 80K bytes of storage; and Model TP 420, a dual drive with 80K bytes of storage per drive, for a total of 160K bytes. Each drive contains its own microprocessor-based controller and power supply, and communicates with the BMT microprocessor subsystem via the serial SIO channel. Average access time for the 5.25-inch diskette is 463 milliseconds with a transfer rate of 15.6K bytes per second.

MT 600 Series software is designed to facilitate the gathering, processing, and distributing of information via either

interaction between the host and the keyboard/display or remote batch key entry. Programs are written in Burroughs' Forms Definition Language (FDL), a high-level user-oriented applications programming language. The language is format-oriented and permits the user to design a form and define instructions for its usage. Maximum forms length is limited only by RAM capacity; forms exceeding 26 lines (screen capacity) can be viewed via up-and-down scrolling. Every form has a separate program, which controls data entry, input editing, forms processing, data storage, and communications with the host for that particular form. Programs can be stored on the host system and down line loaded, or stored on the terminal's microdisk system and recalled by the operator through keyed commands or automatically during processing of another form's program.

When program logic calls for interactive communications, program execution at the terminal is synchronized with execution of the appropriate host program and the data is entered, edited, processed, and stored interactively. When batch-mode programs are executed by the terminal alone, data is stored in microdisk for transmission to the host at a later time.

## COMMUNICATIONS CONTROL

A standard mix of communications network configurations is possible, ranging from a tie-in of one processor to another, to various terminal mixes using a variety of communications links. The links may be in-house facilities using data sets or direct connection, or they may use telephone facilities of either the switched or leased-line type. Communications modes may be simplex, half-duplex, or full-duplex, using synchronous, bisynchronous, or asynchronous transmission. Direct connection may be up to 1000 feet in length using the Two-wire Direct Interface (TDI).

The TDI interface allows concatenation in normal or group poll environments under control of an appropriate multipoint line procedure. Among the protocols available are the Burroughs Data Link Control, Burroughs Basic Mode, and Point-to-Point Batch.

Speeds up to 9600 bps are possible with the TDI. Data sets available include asynchronous and synchronous/bisynchronous varieties. Two asynchronous data sets are available offering speeds up to 1200 bps and 1800 bps, respectively. The synchronous/bisynchronous data set offers speeds up to 4800 bps.

## BURROUGHS NETWORK ARCHITECTURE (BNA):

A set of software designed to enhance the interaction of terminals with host CPU's in a network environment. BNA is also designed to facilitate a move into distributed data processing. Through the new architecture, Burroughs processors and terminals can be granted access to data bases throughout a network, job tasks and information files can be transferred from one point to another, and data processing resources available in a network can be shared among participants regardless of location. BNA is designed to work with existing Burroughs terminal networks and with the Global Memory multi-processing facility available on Burroughs large-scale processors. BNA depends on logical links rather than physical links, relying on network tables maintained in the host processors for routing. All routing is through host mainframes. Services provided by BNA include those designated host and those designated network. Host services include coordination of communication between tasks being executed at various hosts; control of the creation, updating, and transfer of data from host to host; and handling of communication with logical points within the network. Network services perform message routing, linking hosts using the Burroughs Data

## Burroughs B 90

► Link Control (BDLC) bit oriented protocol. Network services also permit connection of Burroughs processors to packet-switching services using X.25 procedures. Links can also be established to non-Burroughs machines using currently available software such as NDL and MCS.

**BURROUGHS DATA LINK CONTROL:** Until the adoption of BDLC, a bit-oriented line control procedure for synchronous transmissions, Burroughs' protocol was Basic Mode, a character-oriented line control procedure. In the Basic Mode protocol system, the user data was "enveloped" or bracketed by line control characters before transmission.

In BDLC, the data is bracketed with a lesser number of characters because bits, rather than whole characters, are used to represent the control codes. This reduction in non-information control data transmitted with user data is significant despite the addition of transmission error detecting control bits.

BDLC is based on High-Level Data Line Control Procedures (HDLC), the protocol standard developed by the International Standards Organization (ISO) and by the European Computer Manufacturers Association (ECMA), and Advanced Data Communications Control Procedures (ADCCP), the protocol standard developed by the American National Standards Institute (ANSI). It is Burroughs' intention to maintain BDLC compatible with the bit-oriented protocols of selected competitors (such as IBM's SDLC).

In networks using BDLC, one device, a processor, operates as a Primary Station. All other devices, whether processors or terminals, function as Secondary Stations. (This arrangement is referred to as the Unbalanced Configuration.) Any line can be full- or half-duplex, switched or non-switched, analog or digital. In the point-to-point arrangement, the Primary Station is at one end of a communications line, and a Secondary Station is at the other end. In the multi-point arrangement, the Primary Station is at one end of the line and two or more Secondary Stations are connected to the line. A device can function as a Secondary Station on one line and as a Primary Station on another line. Such an arrangement can occur when a given Secondary Station has one line to a Primary Station and another line to devices that are not connected to that Primary Station.

The Primary Station controls the establishment of links for data transfer, controls the actual data transfer, and controls error recovery operations. The Secondary Stations can operate in the Normal Response Mode (NRM) or in the Asynchronous Response Mode (ARM). In the Normal Response Mode, the Secondary Station cannot initiate transmissions. Specific permission to transmit and/or respond to a command must be given to the Secondary Station by the Primary Station. Once given permission, a Secondary Station can transmit up to seven frames (messages) without requiring additional permission. In an optional version of BDLC, up to 127 frames can be transmitted without requiring additional permission.

In the Asynchronous Response Mode, the Secondary Stations can initiate transmission without permission from the Primary Station. In this mode, Secondary Stations on a multi-point line must contend with each other to obtain a link for transmission. In the NRM, the Primary Station polls each station and thereby assures each station equal opportunity for link establishment.

### SOFTWARE

**OPERATING SYSTEM:** The Master Control Program II (MCP II) is the only operating system offered by Burroughs

for the B 90. It is conceptually similar to the MCP offered on the larger B 1900 Systems.

Designed as a comprehensive operating system, the MCP II provides support for operator communications, multiprogramming, virtual memory techniques, dynamic resource allocation, input/output control, and maintenance of a library of files. The system display (or, alternatively, the console printer) serves as the communications device between the operator and MCP II.

Multiprogramming under the B 90 MCP II takes place without partitioning. During I/O operations, the processor is free and thus able to handle the processing of a second program. The virtual memory concept is implemented by breaking up programs into a variable number of segments consisting of I/O functions, constant data, variable data, and executable logic code. Program segmentation is determined at compilation time, with the compiler building a dictionary for each program. When a program is to be executed, only those segments necessary for execution are brought into main memory.

Dynamic resource allocation under the MCP maintains resource-available files which are constantly updated. The factors affecting these files are the identities of the programs currently running and the segments of each program, memory assignments and available space, peripheral assignments and available units, disk files and file space available, and program priority.

I/O control is fairly conventional, with the MCP handling physical I/O and the programmer taking care of logical I/O. Among the processes of physical I/O handled by the MCP are locating files, data transfers, error monitoring, buffer management, label handling, and automatic retry on detection of an error.

The MCP is an integral part of the B 90 Computer Management System (CMS), whereas the alternative Accounting Computer System (ACSYS) has its own built-in monitor.

CMS consists of the MCP, a Data Control System (DCS), high-level language compilers, utility routines, related CMS Products, a Data Bridging System, and the Business Management System (BMS) application programs.

ACSYS is a software/firmware package that permits the use of existing Burroughs Series L/TC cassette programs on B 90 systems using disk and cassettes without change to the program products. ACSYS consists of system software and utilities as currently used on the TC 5100 and Series L plus cassette emulation firmware and the BMS applications. The system software enables the use of up to two magnetic tape cassette stations, up to four data communications channels utilizing the same procedures as currently release with the TC 5100, a 256-character Self-Scan system display, and a 160-, 250-, or 350-lpm line printer.

Cassette emulation firmware allows execution of Series L/TC cassette programs on either BSM, BSM II, or cartridge disk drives. Emulation characteristics include sequential accessing of disk, addressing of up to two dual disk drives (either BSM or cartridge disk), assigning from 1 to 4 cassette files per disk, and compatibility of disks initialized and used in an ACSYS environment with disks employed in a CMS environment. Minimum memory requirement for ACSYS is 12K bytes. This requirement may grow, depending on the configuration, optional resident utilities, and data communications procedures.

When emulating a two-cassette system on disk, one cassette is assigned to each disk, and the B 90 is operationally identical to the all-cassette system. For emulation of a ►

## Burroughs B 90

► system with three cassette units, the additional drive may employ the cassette drive on the B 90, or up to four cassette files may be assigned to each disk.

The complete list of BMS applications that run under ACSYS is given in the price list.

**LANGUAGES:** Under the B 90 MCP, both COBOL and RPG are supported. For data communications environments, the Network Definition Language and Message Processing Language are also supported.

The *B 90 COBOL* language is based on American National Standard COBOL 74, except that the Report Writer module is not implemented. Burroughs extensions are provided to allow programmer control of the keyboard, console printer, and system display. COBOL object programs are regarded as collections of logical segments which can be loaded and executed individually or in groups, meaning that programs can be written without the usual limitations imposed by the computer's memory capacity.

The COBOL compiler runs on any currently available B 90 processor. Object programs generated by the COBOL compiler are expressed in an S-language that is oriented toward efficient handling of 4-bit digits and 8-bit characters. The COBOL Interpreter, required at execution time, occupies about 8K bytes of memory in addition to the object program's requirements. Multiple COBOL programs all share a single copy of the interpreter.

The *B 90 Report Program Generator (RPG)* is a compiler-driven language. The compiler converts source programs written in the widely used RPG language into object programs that can be executed by B 90 systems. The compiler permits programs written in IBM RPG or RPG II, or in most other versions of the RPG language, to be compiled and run with little or no change. RPG programs are automatically segmented during compilation, so programs can be written without the usual limitations imposed by the computer's memory capacity. The RPG compiler runs on the B 90 processor with at least 48K bytes of main memory plus a console printer and disk drive. The RPG Interpreter occupies about 8K bytes of memory at execution time in addition to the object program's requirements.

*Network Definition Language (NDL)* is a special-purpose, parameter-driven programming tool that enables users to define and generate customized Network Controller programs for data communications applications. These programs are executed when required by the NDL Interpreter. The Network Controller program handles line disciplines, buffer management, message queuing, character translation, and automatic retries, and supervises the flow of messages between user-coded programs and remote terminals. This enables the user's application programs to deal with remote terminals in the same manner as conventional on-site peripheral devices.

After the programmer defines his custom Network Controller in the NDL syntax, the source statements are processed by the NDL Compiler and converted into the necessary object code and tables. Various line disciplines may be programmed in NDL and are stored as reusable library routines, known as request sets. Standard request sets for many line procedures are available from Burroughs. NDL runs under MCP on any currently available B 90 system.

*Message Processing Language II (MPL II)* is a high-level, parameter-driven language for generating installation-tailored Message Control Programs. The Message Control Program provides the interface between the Network Controller and user application programs by decoding, validating, and directing incoming messages to the appropriate

user program for processing. This program can also record all processed messages on secondary storage for audit purposes and place messages intended for terminals out of service in temporary storage on disk.

**DATA CONTROL SYSTEM (DCS):** Provides data handling capabilities which can be divided into four distinct elements. The first, interactive entry and prompting, is a transaction-oriented element designed to accept data from the B 90 keyboard or via magnetic tape cassettes. Characteristically, this data is from Audit Entry sources. The second element allows the operator to build and maintain files. DCS takes care of this function automatically after the operator specifies the file name, whether the file is to be created or changed, what records are to be affected, and what fields are to be entered. A third element provides a basic reporting and inquiry capability without the requirements of writing a separate report program. The final element enables the entry and storage of program source statements for later compilation. DCS requires up to 12K bytes of user memory.

**UTILITIES:** A comprehensive set of utility routines is available for the B 90. The following are some of the utilities provided:

- *Cold Start* is a set of programs involved in the initial loading of system software into disk storage. Separate programs handle disk initialization, disk copying, and disk loading of the systems software.
- The *Tape Library Utility* performs four functions. Both the Add and Load functions write files from cassette tape to disk. Load also eliminates identically named files. Dump writes files from disk to cassette tape.
- *Interrogate Disk Directory* determines whether or not a file or group of files is present on tape or disk.
- *List Directory* generates a listing of file parameters such as record size, block size, creation date, last access, and file type of a particular file or group of files.
- *Analyze Disk Space Assignment* produces a printed analysis of disk space utilization.
- *Remove Disk Files* deletes specified file names from the disk directory.
- *Copy* provides a means to change file attributes while copying a file or parts of a file.
- *List* provides a hexadecimal and/or alpha printout of a file or parts of a file.
- *Modify* allows the user to change file name, device type, and file size for a file as referenced by a particular program.
- *File Squash* removes all deleted records from a data file on disk.
- *Sort/Merge* sorts a data file on specified keys and maintains key files as necessary. An index file can be created or sorted, a data file can be sorted, and a merge can be executed to combine up to 16 ordered files into one.

**RELATED CMS PRODUCTS:** Included in this group are CMS Reporter, CMS Domain, CMS Cande, CMS ARCS (Automatic Run Control System), CMS RPG-Edit, and CMS ODESY, and IBM System/32 to Burroughs CMS.

**CMS REPORTER:** The Reporter System enables users to generate customized report programs from simplified free-►

## Burroughs B 90

► form statements describing the contents of the reports to be produced. Its output is COBOL source code, ready for compilation and execution on either a one-shot or production basis. Reports can be created from information contained in data base files created by CMS. To describe the files and generate the necessary vocabulary (a one-time operation), VOCAL (Vocabulary Language) allows direct reference to COBOL data names and file layouts in existing COBOL source programs; alternatively, the data names and descriptions can be entered separately in standard COBOL notation.

The reports to be reproduced are described in a concise, English-like language, called REPORTER, that is largely self-documenting. Numerous default features make it unnecessary to specify each option. The user specifies each data element by name only, and is not required to know its size or format. In similar fashion, the user need only specify the column headings, and the system will automatically handle all other aspects of formatting the output. A security system denies access to sensitive data items by unauthorized users. Through an interface module, the reports can be generated from and viewed at remote workstations.

**CMS DOMAIN:** Provides an interactive method of specification and development of file maintenance and inquiry programs via a terminal. With Domain, the user can create a disk file; add, delete, or maintain records in a disk file, or inquire into records in a disk file.

**CMS COMMAND AND EDIT (CANDE):** Provides generalized file preparation on-line programming, editing, and updating in an interactive terminal-oriented environment. CANDE runs in conjunction with NDL. The NDL generated network controller performs all the data communications related functions, while CANDE performs file updating and text editing functions. The on-line user has all compilers available including COBOL, RPG, and MPL. CANDE can support a maximum of 16 terminals and makes optimum use of the operator console and TD 83X CRT's. CANDE also provides a recovery system.

**CMS AUTOMATIC RUN CONTROL SYSTEM (CMS ARCS):** A utility that enables the automatic execution of sequences of commands and programs. CMS ARCS, according to Burroughs, is particularly valuable when used with commands and programs that are repetitive in nature (job streams). No operator intervention is required under normal circumstances once a job stream is initiated using CMS ARCS.

**CMS ON-LINE DATA ENTRY SYSTEM (ODESY):** A sophisticated data entry and validation system using multiple on-line visual display units. It provides a generalized and generative "front end" for the existing application packages. It enables future packages to be designed to use its extensive editing facilities and thus reduce development effort by virtually eliminating conventional input control programs. Because of these editing facilities, ODESY is able to produce batches of essentially error-free data for input to application programs.

**IBM SYSTEM/32 TO BURROUGHS CMS:** This product is designed to convert IBM RPG source and sequential EBCDIC data files to standard CMS formats.

**BURROUGHS DATA BASE BRIDGING SYSTEM:** Provides a method of converting files utilized on the Burroughs L Series and other manufacturers' systems into a proper format for B 90 disk storage. The system is a series of programs that use magnetic tape cassettes as the medium for data transfer.

**APPLICATION SOFTWARE:** Packages currently available for the B 90 are all listed in the price list. Most are described in the following paragraphs.

**Commercial Business Management System II (CBMS II)** is aimed at a wide range of businesses including industrial distributors, electrical and electronic distributors, hardware distributors, appliance distributors, paper merchants and office suppliers, paint and chemical distributors, and plumbing, heating, and air conditioning distributors. CBMS II is composed of seven modules, written in COBOL and each available separately or as a complete package.

The accounts receivable (A/R) module, which can be interfaced with the invoicing and general ledger modules, can be run as either an open item or balance forward system. Reports in the module include trial balance, age analysis, periodic activity, customer account status, and sales and profit analysis.

The invoicing module is designed as a post billing system and can be interfaced with the accounts receivable and inventory modules. Invoicing provides reports on product sales analysis and sales analysis by customer and sales representative. Both of these reporting areas cover cost of sales to date, sales to date, and gross profit and percentage of profit. A choice of fixed or user-specified invoice formats is available. The module provides a costed invoice with many features including flexible pricing with up to five prices per billing item.

The inventory control module can be interfaced into the invoicing module to provide inventory stock updating. Reports are produced on current inventory status; stock valuation at average and replacement cost; stock take worksheet (for physical inventory); buyer's guide listing quantity on hand, available, reserved, on order, and shipped to date, as well as unit cost; and current inventory for up to six locations. The function of all these reports is to enable a user to establish and maintain optimum stock levels versus return on investment.

The inventory management analysis module presents comprehensive management reports on comparative return on investment, turnover on current stock, potential excess stock, ranked sales analysis by product, and buyers' guide, based on previous year's information and other statistics.

The payroll module allows exceptions to standards payroll items via operator entry. Complete accounting from time card to general ledger is performed with one handling of the input data. Reports available include cost center analysis, employee status, and deduction registers as well as the traditional payroll reports.

The accounts payable (A/P) module produces purchase journal, cash disbursements journal, periodic liability forecast, cash requirements, transaction inquiry, and others. The reports are designed to enable the controller of a business to effectively manage liabilities, cash disbursements, and the associated general ledger distribution. A/P can interface with general ledger.

The general ledger module is designed to provide a comprehensive control and reporting system. The ability of this module to interface with other CBMS II modules provides a good avenue for transaction information. More than 10 major report types are produced, including master file trial balance, activity trial balance, balance sheet and income statement trial balance, current period activity, variable and floating budget reports, comparison reports, and chart of accounts.

**Manufacturing Business Management System** is a multiple-module integrated system written in COBOL. The system standardizes and centrally maintains product and engineering data to help plan manufacturing production, and provides modules for general accounting based on CBMS II, adapted for manufacturing firms. ►

## Burroughs B 90

► The bill of materials module allows the user to create and maintain item master and product structure files to control production planning processes. Single-level, indented, or summarized where-used and explosion reports are provided.

The work center and routing module provides an "explosion" of the production process for each item.

The stock status and standard costing modules require the bill of materials module as a prerequisite, and provide full or exception stock status reports to manage inventory, plus recording of standard costs by item for single level or end-item explosion.

The material requirements planning module interfaces to the bill of materials and stock status modules to provide time-phased requirements planning for present and future order releases.

The order release module records, controls, and reports on the status of all orders released to production, while the job cost (actual) module collects and reports costs and projected costs against budgeted costs by released order.

The manufacturing payroll module provides all of the features of the payroll module in CBMS II, plus additional capabilities to meet the needs of the manufacturer, such as daily time card input, shift differential pay, multiple union handling, SUB benefit, and COLA pay capabilities.

The Manufacturing Business Management System requires a 60K-byte (user) B 90 with 4.6 megabytes of cartridge disk storage. A line printer is optional.

*Credit Union Management System* performs all the normal accounting and record-keeping functions required for federal and state-chartered credit unions. Sixteen different types of transactions can be keyboard-entered. These include open-end loans, bill payments, and share drafts as well as the normal share, loan, and club transactions. Automatic transactions are generated for dividend payments, payroll deposits, loan payments, interest rebates, bill payments, and share-to-loan transfers. These automatic transactions eliminate much repetitious preparation of transactions. Up to 99 loan types, with 99 loans per member and 99 club accounts per member, can be handled.

The system also allows for 120 different variable or fixed bill payment transactions. It can be used on any B 90 configuration with dual BSM, disk cartridge, or fixed disk units.

An on-line inquiry and file maintenance module will allow multiple/remote access to the members' data. This module is completely compatible with the Credit Union Management System and will be available in the fourth quarter of 1978.

An on-line transaction posting inquiry module will allow multiple/remote access to the data for real-time account updating. This module is also completely compatible with all existing modules.

*Budgetary Accounting System (BAS)* is a three-module system designed to run on a minimum B 90 system with either BSM or cartridge disk drive. The general fund accounting module maintains an updated financial history. The appropriation processing module maintains an updated history of the authorized expenditures. The revenue processing module maintains an updated history of budgeted source revenue. BAS maintains complete audit trails and descriptions of each general fund transaction. The system maintains 22 separate disk files. BAS is written in COBOL.

*Hospital BMS—Burroughs Hospital Administration System II (BHAS II)* is designed as a four-module system. The A/P, payroll, and general ledger modules are adopted to meet hospital requirements from the generalized BMS modules of the same name which were previously described. The patient accounting module includes census and statistical accounting and reporting as well as complete accounting for inpatients, outpatients, and accounts receivable. BHAS II is written in COBOL and can run on B 92 systems or B 91 systems with a wide-line printer.

*Scholastic II* is a series of administration applications for schools. Each of the modules can operate as a free-standing unit or function within a total administrative system with a data interface to the student record module. The following modules are available:

The student records module provides its users with the capability to obtain information pertaining to district, school, and student enrollments, together with schedule and grade reporting data.

The student scheduler module performs the automatic assignment of students to sections of courses in a user-created or system-generated school master schedule. File maintenance capabilities make complete reruns unnecessary and include the ability to add new courses and sections at any time; to change the seating capacities and meeting times of existing sections; to change any one of the student's courses and sections; to replace an individual student's schedule with a new one; to make mass changes based on specific grade, sex, or course request; and/or to reschedule only students who have been changed by file maintenance or who have conflicts.

The attendance accounting module is designed to provide timely information pertaining to public attendance across all or any part of a school district. The system provides for the following: attendance accounting calendar over any portion of the school year; attendance unit as period, half-day, or whole day; user-defined attendance exception definition; attendance data collection and posting on a detail or summary basis; daily exceptions control report; detail classroom-level attendance ledgers; monthly or other period teacher, school, and district attendance summaries; monthly entry, re-entry, and withdrawal reports; irregular attendance pattern analysis; cumulative student attendance report with optional summaries by school and district; and capability for integration of summary data into the CMS SCHOLASTIC II Student Records data base and reports.

The Scholastic modules, in conjunction with the Budgetary Accounting System and the government/scholastic payroll module (see B 90 Government Information System), provide the education user with a total administrative processing system. All modules are written in COBOL.

*B 90 Government Information System* is designed as an integrated multiple-application system. All modules are written in COBOL, and each can be installed as a free-standing application or in a combined total system.

The budgeting accounting system module provides an integrated accounting system for governments, educational users, and institutions using fund accounting. The system accomplishes the accounting functions required by fund accounting, purchase orders encumbering and expenditure control, cash receipts and disbursements control, general fund processing, bank account reconciliation, vendor reporting, and financial statement preparation. The system, when used with the government/scholastic payroll module, provides an automatic interface to payroll. The interface also provides a statistical report which analyzes pay by grade. ►

## Burroughs B 90

► The government/scholastic payroll module gives government and education users a payroll system designed so that standard earnings and deductions are produced automatically. Only exceptions to the standard payroll require operator entry. The system generates all necessary management, government, and retirement reports. Fiscal as well as calendar totals are retained by the system.

The utility billing system is designed to meet the billing, accounting, and management reporting requirements of private utilities and the utility departments of governmental units. It is designed to generate and print bills, apply cash receipts, and produce management reports. The system has the ability to handle single as well as multiple services and meters (i.e., water, sewer, fixed charges, security lights, electric, and gas).

Other government systems are planned and scheduled to be announced shortly.

*Bank Business Management System* is written in COBOL and consists of seven currently available modules.

The demand deposit accounting module allows transactions to be entered via keyboard or cassette tape. New account information, stop payments, and holds can be entered via keyboard. A daily trial balance and itemized customer statements are provided, with all exceptions noted.

The savings deposit module accommodates passbook statement accounts with flexibility for specifying rates, computing earnings, paying earnings, and computing early withdrawal account status. Reports are provided on the customer, management, and operational levels.

The loan accounting module has capabilities to process installment loans, commercial loans, and mortgage-type loans as well as add-on, discount, and participation loans. Amortization schedules and other loan reports are produced. Loan processing includes interest accrual, loan payment distribution, and unearned interest calculation on prepared loans. Loan inquiry, new account step-up, file maintenance, and transaction entry can all be performed via keyboard.

The mortgage loan module provides a complete inquiry profile as well as the necessary functions for required reporting, processing loan payments, and disbursing monies for taxes and insurance. An accrual accounting system is an integral part of the module.

The audit entry proof module provides input of information either directly through keyboard entry or as an automatic by-product of the S1000 proof system. Reports are generated for complete audit control and cash letters besides providing the interface to the other applicational modules.

The general ledger module produces a comprehensive statement of financial condition, comparative statements, user-defined critical ratios, budget comparisons, and average daily balancing. The posting routine requires only a single entry of account data to update all affected records and management reports.

The central information system provides interactive inquiry and updating capabilities, using both teller terminals and terminal display units. Combined trial balance and statements can be produced, as well as management information that allows bank personnel to review customer service profiles and activity.

### PRICING

**POLICY:** Burroughs offers the B 90 for purchase or lease. In addition to the basic one-year lease, Burroughs offers three-year and five-year leases at a discount of approximately five percent.

The standard equipment lease agreement includes equipment maintenance and permits use of the equipment during one 8-hour period per day. Additional extra-shift charges are billable for maintenance coverage on a 24 hours/day, 7 days/week basis.

Burroughs software technical assistance, for installation support and beyond, is available to B 90 users at a price of \$110 per day. Installation support varies from one day, for some applications modules, up to 11 days for the Bank BMS complete system. Hardware installation support for purchased systems is billable at \$225 per day. Two days are usually the maximum requirement.

Application software prices quoted in the price list are for either a single initial license payment with an annual license fee, or for a monthly license fee.

Customer education for application programs is charged at the rate of \$110 per day. Some modules require one day, while complete systems may require up to 17 days. Courses on the hardware and software include operator self-study, priced at \$150, and other courses on subjects from Introduction to Programming (5 days) to CMS COBOL (10 days). Training is recommended by Burroughs.

Training is available at nine major centers throughout the United States: Philadelphia, Syracuse, Detroit, Atlanta, Chicago, Dallas, Los Angeles, San Francisco, and Pasadena. Other major centers offering worldwide training include London, Paris, Rio de Janeiro, Sydney, Tokyo, Toronto, Amsterdam, Johannesburg, Stockholm, and Mexico City.

**EQUIPMENT:** The following typical system prices include all required control units and adapters. The lease prices include equipment maintenance.

**MINIMUM B 91 SYSTEM:** Includes two megahertz CPU with capabilities for CMS/ACSYS, 128K bytes of memory, six megabyte SMD II (inbuilt), and operator display station. Purchase price is \$17,950 with a monthly maintenance charge of \$1,526. On a one year lease the system costs \$665 per month.

**MINIMUM B 92 SYSTEM:** Includes two megahertz CPU with capabilities for CMS/ACSYS, 128K bytes of memory, six megabyte SMD II (inbuilt), and operator display station. Purchase price is \$20,708 with a monthly maintenance charge of \$1,760. On a one year lease the system costs \$768 per month.■

## Burroughs B 90

### EQUIPMENT PRICES

		Purchase Price	Annual Maint.	Rental (1-year lease)*	Rental (3-5 year lease)*
<b>PACKAGED SYSTEMS</b>					
All configured systems below are built around variations in the B 90 processor, which includes 4K bytes of ROM, variable micrologic, on-board diagnostics, 8-bit parallel data movement, and overlap of fetch and execution of microinstructions.					
B 91-SYS	B 90 System designed for use with ACSYS software/firmware; includes one megahertz processor with 64K bytes of main memory, 90 cps matrix console printer, and six I/O channels	\$ 7,900	\$ 672.00	\$293	\$263
B 91-CSY	B 90 System with capabilities for ACSYS/CMS; includes two megahertz processor with 128K bytes of main memory, 90 cps matrix console printer, and six I/O channels	8,950	761.00	331	298
B 92-CSY	B 90 System with capabilities for ACSYS/CMS; includes two megahertz processor with 128K bytes of main memory, 120 cps matrix console printer (out-of-paper detect included), and eight I/O channels	11,708	995.00	434	390
<b>SYSTEM OPTIONS</b>					
N 4305	B 92 I/O Channel Expander; increases I/O channels to 11	515	44.00	19	17
BD 7760	B 92 Second Pinfeed Option; includes factory installed out-of-paper detect	799	68.00	30	27
B 9356-01	256/1920—Character Operator Display Station	3,000	255.00	111	100
N 9356	CRT Host Controller for B 92	NC	—	—	—
H 9356	CRT Host Controller and Mounting Hardware for B 91	NC	—	—	—
H 9356-98	Non-CRT Top Cover for B 91	NC	—	—	—
<b>MEMORY</b>					
BD 4018-64	64K-byte Memory Increment for B 91-SYS	1,050	89.00	39	35
BD 4128	128K-byte Memory Increment for B 91-CSY and B 92-CSY	2,550	264.00	115	103
BD 4064-192	Memory Upgrade Package for B 91-CSY and B 92-CSY; 128K bytes to 192K bytes	500	132.00	57	52
BD 4064-256	128K bytes to 256K bytes	2,050	264.00	115	103
BD 4064-384	128K bytes to 384K bytes	4,600	528.00	230	206
BD 4064-512	128K bytes to 512K bytes	7,150	792.00	345	309
<b>MASS STORAGE</b>					
B 9489-21	BSM II Inbuilt Dual Drive Subsystem; six megabytes	5,010	426.00	186	167
B 9489-23	BSM II freestanding Dual Drive Subsystem; six megabytes	6,010	511.00	223	200
N 9400	Controller for the B 92	990	84.00	37	33
H 9400	Controller for the B 91	990	84.00	37	33
B 9489-1	BSM I Inbuilt Drive; one megabyte	910	294.00	34	30
B 9489-11	BSM I freestanding Drive; one megabyte	2,500	364.00	93	83
B 9489-12	BSM I freestanding Dual Drives; two megabytes	3,815	729.00	141	127
B 9480-22	4.6-megabyte Dual Cartridge Disk Drive	7,010	949.00	186	167
B 9481-12	9.2-megabyte Dual Cartridge Disk Drive	10,163	1,368.00	376	339
B 9493-9	9.4-megabyte Fixed Disk Drive	5,500	667.00	204	183
B 9493-18	18.8-megabyte Fixed Disk Drive	9,500	808.00	352	317
B 9493-28	28.2-megabyte Fixed Disk Drive	13,510	1,148.00	500	450
B 9493-37	37.6-megabyte Fixed Disk Drive	15,000	1,275.00	556	500
N 9300	Common Disk Control for BSM I, fixed disk, and cartridge disk; B 92 only	990	84.00	37	33
H 9300	Common Disk Control for BSM I, fixed disk, and cartridge disk; B 91 only	990	84.00	37	33
B 9489-17	ICMD Single Drive	3,296	280.00	122	110
N 9500	ICMD Control; for B 92	1,490	127.00	55	50
H 9500	ICMD Control; for B 91	1,490	127.00	55	50
<b>MAGNETIC TAPE UNITS</b>					
B 9497-11	NRZI Freestanding, Cassette Station; B 92 only	1,689	109.00	63	56
B 9497-15	PE Freestanding Cassette Station; B 92 only	1,689	135.00	63	56
N 9497-15	Universal Cassette Station Control; B 92 only	1,500	128.00	56	50
<b>PRINTERS</b>					
B 9249-250	Line Printer; 250 lpm, 64-character set or 300 lpm, 48-character set; B 91 or B 92	8,490	721.00	314	283
B 9249-375	Line Printer; 375 lpm, 64-character set or 500 lpm, 48-character set; B 92 only	12,500	1,063.00	463	417
B 9246-3	Line Printer; 320 lpm, 64-character set or 320 lpm, 48-character set; B 91 or B 92	11,500	978.00	430	383
B 9246-6	Line Printer; 600 lpm, 64-character set or 650 lpm, 48-character set; B 92 only	14,000	1,190.00	519	467
B 9249-2	Chain Printer; 160 lpm; B 91 or B 92	5,990	1,159.00	222	200
B 9249-3	Chain Printer; 250 lpm; B 91 or B 92	7,990	1,560.00	296	266
B 9249-4	Chain Printer; 350 lpm; B 91 or B 92	10,990	1,644.00	407	366
H 9200	Printer Controller; B 91	980	83.00	36	33
N 9200	Printer Controller; B 92	980	83.00	36	33

\*Includes equipment maintenance for 8 hours per day, 5 days per week.

**Burroughs B 90**  
**EQUIPMENT PRICES**

		<u>Purchase Price</u>	<u>Annual Maint.</u>	<u>Rental (1-year lease)*</u>	<u>Rental (3-5 year lease)*</u>
<b>DATA COMMUNICATIONS</b>					
H 2358	Data Communications Harness; B 91 only	103	8.00	4	3
N 2356-1	Asynchronous Data Set Connect; 1200 bps; B 92	620	53.00	23	21
H 2356-1	B 91	620	53.00	23	21
N 2356-1	Asynchronous Data Set Connect; 1800 bps; B 92	895	76.00	33	30
H 2356-2	B 91	895	76.00	33	30
N 2356-6	TDI Connect; 9600 bps; B 92	618	53.00	23	21
H 2356-6	B 91	618	53.00	23	21
N 2356-7	SL5 Synchronous	1,030	88.00	38	34
H 2356-18	CMS Synchronous/Bisynchronous Data Set Connect; B 92	1,030	88.00	38	34
N 2356-18	B 91	1,030	88.00	38	34
<b>TERMINALS</b>					
TD 731	Self-Scan display/keyboard with control for async. data sets and direct-connect communications interface	2,715	26.41	120	116
TD 732	TD 731 unit with peripheral capability added	2,865	26.41	130	126
TD 733	Self-Scan display/keyboard with control for sync. data set communications	2,715	26.41	120	116
TD 734	TD 733 unit with peripheral capability added	2,865	26.41	130	126
TD 737	Self-Scan display/keyboard with control for sync. data set communications and IBM Bi-Sync. data communications procedures	2,715	26.41	120	116
TD 738	TD 737 unit with peripheral capability added	2,865	26.41	130	126
TD 831	Self-Scan display/keyboard with control for async. data sets and direct-connect communications interface	2,796	22.91	124	49
TD 832	TD 831 unit with peripheral capability added	2,951	22.91	134	130
TD 833	Self-Scan display/keyboard with control for sync. data set communications	2,796	22.91	124	119
TD 834	TD 833 unit with peripheral capability added	2,951	22.91	134	130
TD 837	Self-Scan display/keyboard with control for sync. data set communications and IBM Bi-Sync. data communications procedures	2,796	22.91	124	119
TD 838	TD 837 unit with peripheral capability added	2,951	22.91	134	130
Options for the TD 730 and TD 830 Series Terminals:					
TD 016	A/N source data keyboard (includes 6-foot separation cable)	275	3.12	13	10
TD 017	Ten-key auxiliary keyboard (includes 2-foot separation cable)	180	1.59	7	6
TD 015-A	Alphanumeric typewriter keyboard	275	3.12	13	10
TD 019	Expanded alphanumeric keyboard	700	3.25	30	26
TD 019-1	Expanded alphanumeric keyboard with built-in magnetic card reader	900	9.75	39	34
TD 105	Non-display of control characters (the display of control characters, such as form delimiters, is inhibited—this feature is available on a special factory order basis only)	206	—	10	8
Peripherals for the TD X32, TD X34, and TD X38:					
TD 078-1	Auxiliary magnetic card reader for the TD 015	1,260	8.17	42	26
TD 076	Cassette controller (includes one A 9290-25 driver—can be shared by up to four TD's); other peripherals include the A 9249 series of printers and the A 9490-25 additional cassette tape drive	3,255	19.08	108	90
TC 4001	Printing Terminal; 60 cps				
Intelligent Terminal with TC 4001 Printing Unit:					
TC 5110	With one cassette drive	13,700	71.83	433	339
TC 5113	With two cassette drives	16,790	94.33	535	407
MT 686	12-inch Display and FLD 1 Processor	2,740	18.00	107	104**
MT 687	12-inch Display and FLD 2 Processor	3,440	22.00	139	135**
TP 139	Expanded Alphanumeric/Function FDL Keyboard	550	4.00	23	22**
TP 313	8.5-inch Journal Printer	2,040	14.00	82	80**
TP 323	8.5-inch Validation/Journal Printer	2,090	14.00	84	81**
TP 410	Single Microdisk Drive	1,600	11.00	67	65**
TP 420	Dual Microdisk Drive	2,200	16.00	92	89**
MM 004	4K Memory Add-on	100	2.00	5	5**
<b>DATA ENTRY SUBSYSTEMS</b>					
AE 412	Audit Entry Data Preparation System	9,425	—	345	335
AE 422	Audit Entry Data Preparation System	7,365	—	272	264
AE 501	Audit Entry Data Preparation System	10,238	782.00	304	295
AE 511	Audit Entry Data Preparation System	10,558	—	427	415
AE 513	Audit Entry Data Preparation System	10,764	—	422	410

\*Includes equipment maintenance for 8 hours per day, 5 days per week.

\*\*5-year leases are slightly lower; figures given represent 3-year leases.

## Burroughs B 90

## SOFTWARE PRICES

		Initial One-time Charge	Payment 12-Monthly Payments	Annual License Fee	Monthly License Fee
CM90 MCP	MCP II for B 90 Systems	\$ 2,500	—	—	\$ 70
AC90 BCP	B 90 ACSYS System Software	2,000	—	—	55
CM90 ACA	B 90 ACSYS System Software and MCP II	3,500	—	—	100
CM90 COB	CMS COBOL Compiler	—	—	—	25
CM90 RPG	CMS RPG II Compiler	—	—	—	25
CM90 MPL	CMS MPL II Compiler	—	—	—	25
CM90 NDL	CMS NDL Compiler	—	—	—	25
CM90 CON	System/32 to CMS Conversion	600	\$ 55	\$ 30	—
CM90 UTL	B 90 CMS Utilities	540	—	—	15
CM90 TEL	ODESY/RPG Edit	1,080	100	150	30
CM80 DOM	CMS DOMAIN System	1,500	138	150	50
CM80 REP	CMS REPORTER	1,500	138	150	50
CM80 RPO	CMS On-Line REPORTER	2,000	183	200	67

## "ACSYS" (SL5) APPLICATION PROGRAM PRODUCTS

B 90 YO3	General Ledger Package B	900	83	41	25
B 90 YO5	General Ledger Package C	1,060	98	48	30
B 90 YO7	General Ledger Package D	1,170	108	54	33
B 90 YO9	Accounts Payable Package A	1,235	114	58	34
B 90 YO8	Accounts Payable Package B	790	72	36	22
B 90 YOD	Accounts Payable Package C	1,460	134	68	40
B 90 YOF	Accounts Payable Package D	1,015	93	46	28
B 90 YOH	Accounts Payable Package E	1,100	101	49	30
B 90 YOT	Accounts Receivable Package A (with service charge)	1,575	145	74	43
B 90 YOY	Accounts Receivable Package B (with service charge)	1,350	124	63	37
B 90 YOK	Inventory Control Package A	900	83	41	25
B 90 YOM	Inventory Control Package B	1,170	108	54	33
B 90 YOP	Inventory Control Package C	1,400	129	65	39
B 90 YOR	Inventory Control Package D	1,850	170	86	51
B 90 ZO1	Invoicing Package A	1,285	119	60	36
B 90 ZO3	Invoicing Package B	1,060	98	48	30
B 90 ZO5	Invoicing Package C	835	77	38	23
B 90 ZO7	Invoicing Package D	725	67	33	19
B 90 PO4	BMS ® Payroll	1,460	134	68	40
B 90 UT1	BMS ® Utility Billing	2,020	186	95	57

## B 90 CMS PROGRAM PRODUCTS

## MANUFACTURING BUSINESS MANAGEMENT SYSTEM

B 90 MC1	Bill of Material	1,470	135	65	39
B 90 MG1	Stock Status	1,245	114	54	33
B 90 ME1	Work Center and Routing	1,470	135	65	39
B 90 MJ1	Costing	1,065	98	48	28
B 90 MP1	MBMS Payroll	1,880	172	95	50
B 90 MS1	Order Release	1,050	99	53	33
B 90 MH1	Job Cost Actual	2,100	193	105	66
B 92 MR1	Material Requirements Planning	1,500	303	165	110

## CONTRACTOR BMS

B 90 CP2	Payroll and Labor Cost	1,575	145	79	45
B 90 CA2	Accounts Payable and Material Costs	1,575	145	79	45
B 90 CJ2	Job Cost Reporting	1,050	99	53	35
B 90 CG2	General Ledger and Fin'l Statements	1,050	99	53	35
B 90 CE2	Equipment Cost	915	84	53	25
B 90 CQ2	On-Line Inquiry	350	32	16	12
B 90 CT8	Contractor BMS; includes CP2, CA2, CJ2, CG2, CE2	6,515	604	333	197

## COMMERCIAL BUSINESS MANAGEMENT SYSTEM II

B 90 CRO	Accounts Receivable	1,740	160	87	47
B 90 CIO	Invoicing	1,785	164	90	46
B 90 CCO	Inventory Control	1,480	137	78	39
B 90 CMO	Inventory Management	1,480	137	78	39
B 90 CPO	Payroll	1,880	173	90	49
B 90 CGO	General Ledger	1,325	122	65	34
B 90 CYO	Accounts Payable	1,665	153	78	43
B 90 CDO	Data Comm Module	750	69	38	25
B 92 CTO	Order Processing Input/Display Terminal System	3,500	320	175	105
B 92 CIO	On-Line Invoicing	2,100	193	105	65

Burroughs B 90

SOFTWARE PRICES

		Initial One-time Charge	Payment 12-Monthly Payments	Annual License Fee	Monthly License Fee
<b>CBMS II—ENTRY-LEVEL SYSTEM</b>					
B 90 BPS	Bill, Post and Simplified Inventory	3,229	296	161	106
B 90 BPA	BSP Inquiry	500	46	25	17
B 90 BPE	Bill, Post and Expanded Inventory	4,389	402	219	133
B 90 CRS	Accounts Receivable	1,271	116	63	41
B 90 CYS	Accounts Payable	1,155	105	58	37
B 90 CQS	Payroll	1,271	116	63	41
B 90 CGS	General Ledger	1,040	95	52	30
B 90 FGL	Financial General Ledger	1,500	138	75	50
<b>BANK BUSINESS MANAGEMENT SYSTEM</b>					
B 90 BO2	Bank Business Management System; includes Application Program Products for BK2, BC2, BD2, BS2, BL2, FGL	12,000	1,100	600	400
B 90 BD2	Demand Deposit Accounting	2,000	184	100	67
B 90 BS2	Savings Deposit Accounting	1,750	161	88	59
B 90 BC2	Certificates of Deposit	1,750	161	88	59
B 90 BL2	Loan Accounting	3,500	321	175	117
B 90 BK2	Audit Entry Proof	1,500	138	75	50
B 90 BQ2	Central Information System Inquiry Module	2,000	184	100	67
B 90 BP2	Central Information System Reporting Module	1,250	115	63	42
B 92 BU2	Central Information System Update Module	4,500	413	225	150
<b>CREDIT UNION SYSTEM</b>					
B 90 CUS	Credit Union System; includes CSL, CCL, CBP, CRP	6,500	596	325	217
B 90 CUI	Inquiry/File Maintenance	3,500	321	175	117
B 90 CUO	Update Module	5,000	458	250	167
B 90 CSL	CMS Credit Union Share/Loan	2,500	229	125	83
B 90 CCL	CMS Credit Union Club Module	1,500	138	75	50
B 90 CBP	CMS Credit Union Bill Payments	1,000	92	50	33
B 90 CRP	CMS Credit Union Extended Reporting	1,500	138	75	50
<b>HOSPITAL BUSINESS MANAGEMENT SYSTEMS</b>					
B 90 HAF	Patient Accounting System	3,500	321	175	117
B 90 HAI	Patient Accounting with Inquiry	3,750	344	188	125
B 90 HAK	Hospital Payroll System	2,180	201	103	61
B 90 CGO	General Ledger	1,325	122	65	34
B 90 CYO	Accounts Payable	1,665	153	78	43
B 90 GPS	CMS Group Practice System	4,725	434	236	150
B 90 GEM	GEM Data Kit	790	72	40	23
B 92 HAT	On-Line B HAS II	4,000	367	200	133
<b>CMS SCHOLASTIC II</b>					
B 90 SCR	Student Records	3,000	275	150	100
B 90 SCS	Student Scheduling	4,500	412	225	150
B 90 SCA	Attendance Accounting	2,000	183	100	67
<b>GOVERNMENT ACCOUNTING SYSTEM</b>					
B 90 M07	Budgetary Accounting System	1,880	173	90	62
B 90 SGP	Government/SCHOLASTIC II Payroll	1,975	181	99	63
B 90 GCU	CMS Utility Billing System	3,500	321	175	105
B 90 GEM	GEM Data Kit	790	72	40	23
B 92 GOU	On-Line Utility Billing	3,750	344	188	125
B 92 M06	On-Line Budgetary System	3,490	320	175	116