

Burroughs B 80

MANAGEMENT SUMMARY

To the end user, the B 80 is similar in concept to many of the other small business computer systems available today. But if you delve below the surface, you will find that Burroughs has incorporated into this low-priced system many of the concepts and much of the sophistication of the company's larger, established B 800 and B 1800 computer lines. Dynamically variable microprogrammed logic, microprogrammed interpreters, and automatic multiprogramming are noteworthy features of the B 80, as is a Master Control Program with many of the same capabilities found on the larger Burroughs computers.

The heart of the B 80 is its CPU, which now consists of four LSI circuits (formerly nine) on a single board. This basic CPU was first used in the Burroughs AE 501 Audit Entry System, the TC 5100 Terminal Computer, and the S 1000 Document Processing Systems. The processor offers 8-bit parallel data paths, overlapping of microinstruction fetching and execution, microinstructions capable of multiple counting (which expedites repetitive operations), and, on larger models, up to 11 separate, buffered control units for handling I/O devices. These features and others add up to an integrated approach to increasing system throughput and efficiency of operation.

The B 80's MOS user memory is expandable from a basic 61,440 bytes to 126,976 bytes in 16K increments. An additional 4K bytes is employed as ROM. Parity checking is a standard feature, with one parity bit associated with each byte.

The B 80 is a packaged small business computer intended as both a replacement for the older Burroughs L Series computers and an entry-level system for first-time users. Designed for ease in upward growth, the B 80 supports both COBOL and RPG and offers numerous application packages. Purchase prices for B 80 systems with typical application packages range from about \$18,000 to \$45,000.

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 nonprogrammable 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: Numerous packaged systems based on the same processor, varying in memory size and peripheral complement. For details, see the price list at the end of this report.

DATE ANNOUNCED: April 1976.

DATE OF FIRST DELIVERY: Fourth quarter 1976.



The entry-level B 80-20 system is available with a variety of disk configurations: up to two BSM diskette drives, a cartridge disk subsystem with a total capacity of up to 18.4 megabytes, a combination BSM drive and fixed-disk subsystem with a total capacity of 19.8 megabytes, or a combination of cartridge disk and fixed disk with a total capacity of 28 megabytes. Purchase price for the basic B 80-20 system with two BSM drives is \$17,065.

Burroughs B 80

▷ Reminiscent of other systems in its class, the B 80 processor is housed in a desk-sized cabinet containing a keyboard, a console printer, and a 256-character Self-Scan display panel. Magnetic tape cassette drives and diskette drives can also be built-in. Provision is made for up to two cassette drives or a combination of up to two Burroughs Super Mini-Disk (BSM) drives and two cassette drives.

The BSM drive is a double-density, double-sided diskette unit capable of reading and writing floppy disks on both sides by means of two sets of read/write heads. The BSM is also available in a single or dual stand-alone configuration.

The console printer may be either a 60-cps dot matrix printer with 15-inch single pinfeed forms handler or a 180-cps dot matrix printer with 25.6-inch dual pinfeed forms handler and an additional systems communications pinfeed forms handler.

Other available peripherals include 160-, 250-, and 350-lpm free-standing line printers, single ICMD (Industry-Compatible Mini-Disk) free-standing diskette drives, three versions of cartridge disk drives, three versions of fixed disk drives, a broad line of CRT display terminals, and up to four data communications channels (on the B 80-60 systems).

All software for the B 80 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 80 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 and cartridge disk subsystems. All B 80 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 80 can control its own network of terminals, communicate with other B 80 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 provides a method of interfacing between the NDL and the user's programs. Among the

▶ NUMBER INSTALLED TO DATE: Over 4000.

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

CYCLE TIME: 1 microsecond per 8-bit fetch, with a 450-nanosecond access time.

CAPACITY: All B 80 models have at least 61,440 bytes of semiconductor user memory as standard equipment, expandable to a maximum of 126,976 bytes. Memory expansion can be implemented in increments of 16,384 bytes.

CHECKING: One parity bit is associated with each byte, and is generated during writing and checked during reading in the memory control unit.

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 80 is composed of four LSI chips mounted on one circuit board. Interfacing between the microprocessor and memory requires a protocol of signals, a technique which Burroughs hopes will protect the basic system design against obsolescence.

The CPU is identical in all submodels. The submodels all have certain integral peripheral units built into the processor housing. These include a printing unit, a keyboard, and a 256-character display. The differences between the various submodels center on the type and speed of the printer, the type of mass storage units (diskette, cartridge disk, or fixed disk), and the presence or absence of magnetic tape cassette drives.

The B 80 processor features dynamically variable microprogrammed logic. The processor's logical functions are formed by a set of elementary operators, called microinstructions, which operate on bit strings up to 256 bytes long. There are 256 defined microinstructions in the B 80. Microinstructions are basically 8 bits long, but they can be extended to 16 or 24 bits. The B 80 has the capability to look ahead while executing microinstructions. This is possible because of the overlapping of microinstruction fetching and execution. The overlap improves overall performance by as much as 40 percent.

In the B 80, 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

Burroughs B 80

PERIPHERALS/TERMINALS

MODEL	DESCRIPTION & SPEED	MANUFACTURER
INTEGRAL WITH PROCESSOR		
System Display	Self-Scan display panel, 256 characters, 8 lines by 32 characters, 96-character set, 5 × 7 dot matrix, red phosphor illumination	Burroughs
Console Printer	Serial impact, 7 × 9 dot matrix, slew rate 5 ips, 150 print positions, 64-character set (96 optional), lateral bidirectional positioning at 160 cps, 15-inch paper; 60 cps	Burroughs
Alternate Console Printer	Serial impact, 7 × 9 dot matrix, slew rate 33 ips, 64-character set (96 optional), lateral bidirectional positioning at 450 cps, 3 pin feeds (upper, optional, 3- to 27-inch paper and 256 print positions; lower left, 3- to 6-inch paper and 50 print positions; lower right, 3- to 18-inch paper and 168 print positions); 180 cps	Burroughs
Magnetic Tape Cassette Drives	2-track, 800 bpi, 282 usable feet, 10 ips, 60 ips rewind, read-after-write, NRZI or PE, microprogrammed controlled with two 96-character buffers; 1000 bytes/sec.	Burroughs
PRINTERS		
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
TERMINALS		
TD 830 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 × 7 dot matrix, various keyboards and peripherals, including serial and line printers, cassette drive, magnetic badge readers; 9600 bps	Burroughs
Other terminals in the Burroughs product line can also be used with the B 80.		

➤ communications protocols available are the Burroughs Data Link Control (BDLC), asynchronous, synchronous, and bisynchronous procedures.

The B 80 is currently marketed in the form of "configured" or packaged systems. Burroughs, however, has built in considerable latitude by offering 72 different basic configurations at purchase prices ranging from \$17,065 to \$61,180. These system prices do not include the required software or the full set of allowable peripherals. With a full complement of application programs, system software, and optional peripherals, the system purchase price can climb to over \$150,000. Besides offering the B 80 on a purchase basis, Burroughs offers several leasing plans with terms of one, three, or five years.

Competition for the B 80 comes from numerous systems that also emphasize applications software. These include the IBM System/32 and System/34, systems from Datapoint and Basic Four, the NCR 8100 and 8200 Series, the Quantel systems, and systems from dozens of turnkey and systems houses.

The B 80 is being sold under the Burroughs Group II and VI product categories. The salesmen who sell these products are said to be the most aggressive on the Burroughs marketing staff. The company's Selected ➤

➤ 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 80 programming language, Burroughs has defined an "ideal machine" and developed a specialized microprogram, called an Interpreter, that makes the B 80 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 ➤

Burroughs B 80

▷ Accounts and Large Accounts sales forces also sell the B 80 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 80 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 80 systems and peripherals. There is no free maintenance period on these systems.

USER REACTION

Detailed below are the results of Datapro's interviews with 6 Burroughs B 80 users with a total of 14 installed systems. Included in the survey were a specialized turnkey house, three public accountants, a sportswear firm, and a savings and loan organization. Applications include client accounting and write-up, financial statements, payroll, time charges, accounts receivable, general ledger, lot status report, transaction analysis, and amortization.

A typical system for these users included a B 80 with 60K bytes of memory, a built-in 180-cps printer, two built-in BSM diskette drives, a built-in magnetic tape cassette drive, and a 256-character system display. The average system had been installed for nine months and was user-owned. Four of the six users were operating under CMS, and the other two under ACSYS. Two users were doing their own programming in COBOL, while the remainder had obtained their application programs from outside sources. Burroughs was the source of some application programs for one user.

The following table shows how the users rated the Burroughs B 80 computer system. Several of them chose not to rate the system in some categories.

	Excellent	Good	Fair	Poor	WA*
Ease of operation	4	2	0	0	3.7
Reliability of mainframe	5	1	0	0	3.8
Reliability of peripherals	5	0	1	0	3.7
Maintenance service:					
Responsiveness	3	3	0	0	3.5
Effectiveness	4	1	0	0	3.8
Technical support	0	1	1	0	2.5
Manufacturer's software:					
Operating system	2	3	0	0	3.4
Compilers and assemblers	0	2	0	0	3.0
Application programs	0	3	0	0	3.0
Ease of programming	0	2	0	0	3.0
Ease of conversion	1	2	0	0	3.3
Overall satisfaction	4	2	0	0	3.7

*Weighted Average on a scale of 4.0 for Excellent.

From the preceding ratings, it seems clear that the users were generally well pleased with the B 80 product line and with Burroughs' services. However, their specific comments tell a more revealing story about some present and

▶ 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 (μ 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 μ 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 80. 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. The B 80 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 cassette tape drives (if installed) and the serial printer along with the processor, varies in dimensions according to the style of cabinetry. For example, style B 80-64 is 67.25 inches wide, 57 inches deep, and 37 inches high; style B 80-31 is 49.7 inches wide, 39 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 2.3 KVA. The operating environment is from 35 to 105 degrees F., with a humidity tolerance ranging from 5 to 95 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 6800 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 eight I/O channels are standard on the B 80. 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. The expander is only one of three types of I/O control used in the B 80. The more-or-less traditional controller used with the line 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.

Burroughs B 80

➤ possible future problems for Burroughs with the B 80. These comments included "Too much fixed-disk down-time," "Technical support is almost nonexistent; I rate them a qualified fair," "MCP has a bug in it that no one can resolve, including Burroughs," "MCP sometimes confuses itself in swapping program segments and goes out to lunch," "We would like to see more inventory of B 80 spare parts in the district maintenance offices," and "We are in a small city and sometimes have to wait two days for service if the one man located in our local maintenance office is out of town in the boondocks."

Favorable comments included "JCL is excellent," "For what they know, maintenance people do well," and "We bought the B 80 because it was at the time the only small system programmable in COBOL. We would buy it again."

In order to maintain user satisfaction, Burroughs will have to be ready and willing to work at satisfying user complaints and changing the things that bring the most criticism from its users. The task will not be easy, and is likely to become increasingly more complex as the B 80 systems proliferate and their users gain in experience. □

➤ **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

Each device or subsystem attached to the B 80 requires one I/O channel. Three assignments are standard among all B 80 configurations. These include the operator's console, the console printer, and the disk subsystem. The magnetic tape cassette subsystem can include up to two cassette tape drives. The disk subsystem can include one dual cartridge disk drive or up to two single and one dual floppy drives of either the Mini-Disk or Burroughs Super Mini-Disk type. The remaining five I/O channels can be expanded to eight through the use of the channel expander. A choice of several peripheral combinations can then be allocated. Up to two additional disk subsystems, two free-standing line printers, and/or up to four dedicated communications lines may be attached. Each dedicated communications line requires its own channel.

MASS STORAGE

BURROUGHS SUPER MINI-DISK (BSM) DRIVES: These floppy disk drives are available either built into the processor cabinet and/or as free-standing units. The B 9489-2 is the built-in BSM drive; the BD 5489-11 is a free-standing single drive with BD 9489-11 Controller; and the BD 5489-12 is a free-standing dual drive with BD 9489-11 Controller. 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. Each diskette stores one million bytes, with 180 bytes per sector, 32 sectors per track, and 88 tracks on each side of the diskette. 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 is 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 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/A 9481 DUAL CARTRIDGE DISK SUBSYSTEM: Provides low-cost random-access data storage on removable single-platter cartridges. Three dual-drive models are available:

Model	Capacity, bytes	Avg. Access Time
9480-12	4.6 million	80 milliseconds
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.

For the 9480-12, average head positioning time is 60 milliseconds, average rotational delay is 20 milliseconds, and data transfer rate is 193K bytes per second. 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): Three models of fixed-disk drives are available for use with the B 80:

Model	Capacity, bytes	Avg. Access Time
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 (BD 9493), and a maximum of 37.6 megabytes of fixed disk can be configured in conjunction with one BSM drive or one cartridge drive. This yields a total disk capacity of 38.6 megabytes or 46.8 megabytes, respectively. In order to facilitate proper disk backup, only one B 9493-37 FDD may be used on a system. In addition, the B 80 will support one BSM and one disk cartridge drive for backup. This can provide a maximum of 65.6 million bytes of disk storage. 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 AE 501, and the AE 111, which are described below. ➤

Burroughs B 80

► **KEYBOARD:** The B 80 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.

AE 501 AUDIT ENTRY DATA PREPARATION SYSTEM: The AE 501 was announced by Burroughs in September 1975. Consisting of a processor with up to 28K bytes of semiconductor memory, one or two magnetic tape cassette drives, an electronic keyboard, a serial matrix printer, and one asynchronous or synchronous data communications line, the AE 501 is designed for use with the Burroughs Business Management Systems (BMS) library. The system edits, validates, and captures ready-to-process data on magnetic tape cassettes for batch transmission to the computer. Errors are detected and corrected at the point of original entry. The AE 501 simultaneously prints an audit journal to assist the operator and to permit subsequent auditing.

The processor is implemented in large- and medium-scale integrated circuits and is the same one as used in the B 80, the TC 5100 Terminal Computer, and the S 1000 Document Processing Systems. 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 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.

Up to two magnetic tape cassette stations can be housed in the AE 501 system. Storage capacity per 300-foot cassette is 204,800 characters. Read/write speed is 10 inches/second, search speed is 30 inches/second, and rewind speed is 60 inches/second. Approximate time to load the full memory capacity is 60 seconds.

The electronic keyboard consists of an 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 printer uses a 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 fanfold, single, or multiple-part forms with folds from 3.5 to 12 inches apart.

The AE 501 can communicate in either the 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 501 include Burroughs Basic Mode, Point-to-Point Batch, and the bit-oriented Burroughs Data Link Control procedures.

AE 111 AUDIT ENTRY DATA PREPARATION SYSTEM: The AE 111 is a desk-top audit and data entry system for preparing and validating numeric data for computer input. It consists of a data input unit which utilizes a standard 10-key numeric pad, specialized data entry function keys, a 16-character Self-Scan display, and a 16-character audit printer. A free-standing magnetic tape cassette drive provides program input into the system, and captures and records accumulated data for subsequent computer processing.

System buffering of the keyboard, printer, and tape cassette provides for continuous data entry, printing, and recording. Program prompting is provided through the Self-Scan display. A wide range of cassette record formats and data verification methods is provided. Data records can be written to the cassette under program control in single or blocked formats. From 1 to 124 characters with up to 34 varying data fields are available for each data record.

Two types of magnetic tape cassette devices are offered: Non Return to Zero (NRZ) and Phase Encoded (PE). Both offer a capacity of 280 feet of useful recording area at 800 data bits per inch. The NRZ recorder has a maximum storage capacity of 164,000 characters, while the Phase-Encoded recorder's maximum storage capacity is 328,000 characters.

Data formatting and verification are accomplished by means of programmable check-digit verification, data field range checking, field sizing, controlled skipping and duplication, and line, group, and batch totaling.

User programs are created through the AE 111 keyboard in the form of parameters which, after verification, are then stored in a library cassette. These programs can then be selected and read from the library cassette into the AE 111 memory for selected data entry routines.

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 either synchronous or asynchronous transmission. Direct connection may be up to 1000 feet in length using the Two-wire Direct Interface (TDI) or 15,000 feet using the Burroughs Direct Interface (BDI). The Concatenate/Wrap-around/Modem interface (CWM) permits EIA RS-232C and CCITT V.24 or V.26 usage for B 80 communications. The TDI, BDI, and CWM interfaces all allow 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.

ASYNCHRONOUS DATA COMMUNICATIONS CONTROLLER (ADC): Provides versatility of control through alteration ability both by hardware adjustment and by system software control. Through hardware adjustment by a field engineer, the number of data bits may be set at five, six, seven, or eight; the number of stop bits selected at one or two; odd parity or parity control by software selection set; and a high/low transmission and receive rate fixed by oscillator crystal and jumper wire selection. The CWM, TDI and BDI interface boards can be used with the ADC. Bit rates up to 1800 bps can be handled through data sets, and up to 9600 bps through direct connection. The available transmission and reception rates, in bits per second, are listed in the following table.

153.6KHz Crystal		57.6KHz Crystal	
High	Low	High	Low
9600	4800	3600	1800
4800	3200	1800	1200
3200	2400	1200	900
2400	—	900	—
4800	2400	1800	900
2400	1600	900	600
1600	1200	600	450
1200	—	450	—

Burroughs B 80

153.6KHz Crystal

High	Low
2400	1200
1200	800
800	600
600	—
1200	600
600	400
400	300
300	—

57.6KHz Crystal

High	Low
900	450
450	300
300	225
225	—
450	225
225	150
150	112
112	—

Systems software selection can indicate whether or not to generate and check parity (parity mode) or replace the parity bit with a data bit from the 8-bit I/O data highway (transparent mode). Software also selects one of the two rates fixed by the hardware setting.

SYNCHRONOUS DATA COMMUNICATIONS CONTROLLER (SDC): Provides data rates up to 9600 bps in half-duplex transmission mode or up to 4800 bps in full-duplex mode. The SDC is alterable by systems software for no parity, even parity, or odd parity, and for no block checking or longitudinal redundancy check (LRC) block checking. The CWM can be used with the SDC.

SOFTWARE

OPERATING SYSTEM: The Master Control Program (MCP) is the only operating system offered by Burroughs for the B 80. It is conceptually similar to the MCP offered on the larger B 1800 systems.

Designed as a comprehensive operating system, the MCP 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. On systems equipped with the 180-cps printer, the lower left feed, with its 50 print positions, serves primarily as a hard-copy recording device for all operator communications. Both data input requests and error notification can be handled.

Multiprogramming under the B 80 MCP 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 requires 11.5K bytes of main memory and an additional memory block for each active non-disk peripheral on the system.

The MCP is an integral part of the B 80 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, 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 80 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 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 80 is operationally identical to the all-cassette system. For emulation of a system with three cassette units, the additional drive may employ the cassette drive on the B 80, 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 80 MCP, both COBOL and RPG are supported. For data communications environments, the Network Definition Language and Message Processing Language are also supported.

The *B 80 COBOL* language is based on American National Standard COBOL 74, except that the Report Writer module is not implemented. 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 80 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.

The *B 80 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 80 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 any B 80 processor with at least 48K bytes of main memory

Burroughs B 80

► 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 80 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 80 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 80. 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.

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 80 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 80 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

Burroughs B 80

► 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.

All CBMS II modules are currently available in batch mode. Multiple-screen interactive modules are scheduled to be available in September 1978.

B 80 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.

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 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 80 with 4.6 megabytes of cartridge disk storage. A line printer is optional. Availability of the manufacturing payroll, job cost actual, and order release modules is scheduled for October 1978, with all other modules currently available. Additional modules in the system are planned for announcement later in 1978.

B 80 Credit Union Management System performs all the normal accounting and record-keeping functions required for federal and state-chartered credit unions. Sixteen differ-

ent 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 80 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 and will be available in the fourth quarter of 1978.

B 80 Budgetary Accounting System (BAS) is a three-module system designed to run on a minimum B 80 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 and became available in September 1976.

B 80 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 any configured B 80 system.

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

Burroughs B 80

► 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 test scorer module is designed to perform scoring and analysis functions for both standardized and teacher-made tests. The system provides automated student test population creation from the Student Records data base; application of standard or user-defined guess correction formulas in processing raw scores; permanent storage of test answer keys; user definition of test subparts within a total test; support of standard derived test scores, such as Z-scores, percentiles, stanines, and IQ's; user-defined norms tables, based on derived scores; calculation of standard statistical test population measures such as mean, median, and standard deviation; additional test measures including response frequency distributions and cumulative frequency distributions; capability for test response item analysis; student results as raw or derived score lists and result profile labels; and capability to store selected scores in the CMS SCHOLASTIC II Student Records data base.

The Scholastic modules, in conjunction with the Budgetary Accounting System and the government/scholastic payroll module (see B 80 Government Information System), provide the education user with a total administrative processing system. All modules are written in COBOL.

B 80 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.

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.

B 80 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 80 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 80 users at a price of \$345 per day. Installation support varies from one day, for some applications modules, up to 14 days for the B 80 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 B 80 hardware and software include operator self-►

Burroughs B 80

► study, priced at \$150, and nine other courses on subjects from Introduction to Computers (2 days) through Introduction to the B 80 (5 days) to B 80 COBOL (10 days). All cost \$110 per day. 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.

B 80 MINI-DISK SYSTEM: CPU with 60K bytes of MOS memory, a 60-cps console printer, a 256-character system display, two BSM drives, system software, customer training, and two days of hardware installation support. Purchase price is \$21,640; one-year lease price is \$721 per month; and monthly maintenance charge is \$126.

B 80 CARTRIDGE DISK SYSTEM WITH TD DISPLAY: CPU with 60K bytes of MOS memory; a 60-cps console printer; a 4.6-megabyte, 145-millisecond cartridge disk drive; a 256-character system display; a 160-lpm, 132-position printer; a two-wire direct connect interface; a TD input/display system; poll/select procedure; system software; customer training; and two days of hardware installation support. Purchase price is \$43,975; one-year lease price is \$1,106 per month; and monthly maintenance charge is \$312.■

EQUIPMENT PRICES

		<u>Purchase Price</u>	<u>Annual Maint.</u>	<u>Rental (1-year lease)*</u>	<u>Rental (3-5-year lease)*</u>
PACKAGED SYSTEMS**					
All configured systems below are built around the same B 80 processor, which includes 4K bytes of ROM, variable micrologic, system display panel, eight I/O ports, on-board diagnostics, 8-bit parallel data movement, and overlap of fetch and execution of microinstructions. All systems include one built-in 60-cps or 180-cps printer and a 256-character system display. The 60-cps printer is supplied with a 15-inch single pinfeed forms handler and the 180-cps printer with a 25.6-inch dual pinfeed forms handler.					
The following systems include 60K bytes of MOS memory.					
B 80 26-111	Specified system including built-in 60-cps matrix printer and two BSM drives; up to two data communications channels optional	\$17,065	\$1,511	—	—
B 80 24-111	Specified system including built-in 180-cps matrix printer, two BSM drives, and 160-lpm 9249-2 Line Printer; up to two data communications channels optional	21,640	1,691	\$721	\$685
B 80 21-113	Specified system including built-in 60-cps matrix printer, 160-lpm 9249-2 Line Printer, and two BSM drives; up to two data communications channels optional	26,790	2,343	893	849
B 80 24-113	Specified system including built-in 180-cps matrix printer, two BSM drives, and 160-lpm 9249-2 Line Printer; up to two data communications channels optional	29,365	2,523	979	930
B 80 64-111	Specified system including built-in 180-cps matrix printer and two BSM drives; up to four data communications channels optional	22,670	1,691	156	718
B 80 61-113	Specified system including built-in 60-cps matrix printer, two BSM drives, and 160-lpm 9249-2 Line Printer; up to four data communications channels optional	27,820	2,343	927	881
B 80 64-113	Specified system including built-in 180-cps matrix printer, two BSM drives, and 160-lpm 9249-2 Line Printer; up to four data communications channels optional	30,395	2,523	1,014	963
B 80 24-311	Specified system including built-in 180-cps matrix printer and 4.6-megabyte 9480-22 Cartridge Disk Drive; up to two data communications channels optional	29,560	1,795	779	740
B 80 64-311	Specified system including built-in 180-cps matrix printer and 4.6-megabyte 9480-22 Cartridge Disk Drive; up to four data communications channels optional	30,600	1,795	806	765
B 80 24-711	Specified system including built-in 180-cps matrix printer, one BSM drive, and 18.8-megabyte B 9493-18 Fixed Disk Drive	35,770	2,487	951	902
B 80 64-711	Specified system including built-in 180-cps matrix printer, one BSM drive, and 18.8-megabyte B 9493-18 Fixed Disk Drive	36,800	2,489	980	930
The following packaged systems all include 92K bytes of MOS memory, TDI Data Communications Controller and Line Adapter, two TD 831 Displays and two TD 013 keyboards.					
B 80 24-331	Specified system including built-in 180-cps matrix printer and 4.6-megabyte 9480-22 Cartridge Disk Drive; up to two data communications channels optional	35,410	3,088	984	934
B 80 64-331	Specified system including built-in 180-cps matrix printer and 4.6-megabyte 9480-22 Cartridge Disk Drive; up to four data communications channels optional	36,345	3,088	1,012	962
B 80 61-333	Specified system including built-in 60-cps matrix printer, 4.6-megabyte 9480-22 Cartridge Disk Drive, and 160-lpm 9249-2 Line Printer; up to four data communications channels optional	42,925	3,740	1,193	1,133
B 80 64-731	Specified system including built-in 180-cps matrix printer, one BSM drive, and 18.8-megabyte B 9493-18 Fixed Disk Drive; up to four data communications channels optional	42,335	3,780	1,176	1,118
B 80 61-733	Specified system including built-in 60-cps matrix printer, one BSM drive, 18.8-megabyte B 9493-18 Fixed Disk Drive, and 160-lpm 9249-2 Line Printer; up to four data communications channels optional	48,825	4,432	1,357	1,289
SYSTEM OPTIONS					
BD 7762	Second pinfeed device for 180-cps built-in printer (BD 10-40)	773	—	26	25
BD 104-201	96-character Printer Controller Option for BD 10-40	515	—	15	14
BD 7766	60-cps BD 10-10 Media Present Detector	103	—	5	5
BD 7767-1	180-cps BD 10-40 Media Present Detector for drive 1	103	—	5	5
BD 7767-2	180-cps BD 10-40 Media Present Detector for drive 2	103	—	5	5

Burroughs B 80

EQUIPMENT PRICES

		Purchase Price	Annual Maint.	Rental (1-year lease)*	Rental (3-5-year lease)*
MEMORY					
BD 4017-16	Additional 16K bytes of MOS memory	1,545	261	52	49
MASS STORAGE					
B 9489-2	Built-in BSM drive	1,854	145	62	59
B 9489-11	Free-standing single BSM drive and BD 9489-1 Controller	4,635	407	155	146
B 9489-12	Free-standing dual BSM drives and BD 9489-1 Controller	5,768	407	193	183
BD 9489-11	BSM Disk Controller	3,605	77	100	95
B 9489-17	Free-standing single ICMD drive	3,286	265	113	103
BD 9489-17	ICMD Disk Controller	618	40	21	20
B 9480-22	Dual-Cartridge Disk Drive; 4.6 megabytes, 145 msec.	9,270	904	296	278
B 9480-12	Dual-Cartridge Disk Drive; 4.6 megabytes, 80 msec.	11,330	959	372	384
B 9481-12	Dual-Cartridge Disk Drive; 9.2 megabytes, 100 msec.	13,390	1,303	452	413
BD 9480	Dual-Cartridge Disk Controller	3,605	77	100	95
B 9493-18	Fixed Disk Drive; 18.8 megabytes	11,227	1,056	439	353
B 9493-28	Fixed Disk Drive; 28.2 megabytes	15,347	1,356	607	489
B 9493-37	Fixed Disk Drive; 37.6 megabytes	18,437	1,572	722	581
BD 9493	Fixed Disk Drive Controller	3,605	77	100	95
MAGNETIC TAPE EQUIPMENT					
B 9497-1	Built-in NRZI Magnetic Tape Cassette Drive	1,530	101	52	49
B 9497-5	Built-in PE Magnetic Tape Cassette Drive	1,530	101	52	49
BD 9497-1/5	Magnetic Tape Cassette Controller	376	77	15	14
PRINTERS					
B 9249-2	Chain Printer; 160 lpm	9,270	1,104	332	283
B 9249-3	Chain Printer; 250 lpm	12,875	1,487	457	389
B 9249-4	Chain Printer; 350 lpm	14,900	1,560	610	505
BD 9249	Printer Controller	618	37	21	20
TERMINALS					
TD 830/	CRT; 2000-character display and keyboard	2,715	275	120	116
TD 831					
DATA ENTRY SUBSYSTEMS					
AE 501	Audit Entry Data Preparation System	9,940	782	295	286
AE 111	Audit Entry Data Preparation System	2,500	—	—	—
COMMUNICATIONS EQUIPMENT					
All controllers below include BD 4551-2 DataComm Adapter					
BD 2356-2	Asynchronous data set controller	618	77	26	25
BD 2356-5	Burroughs direct interface	721	77	31	30
BD 2356-6	Two-wire direct interface	618	77	26	25
BD 2356-7	Synchronous data set controller	1,030	77	41	39
BD 2356-3	Burroughs Data Link Control (BDLC) controller				

* Rental prices include equipment maintenance.

**Not all of the available packaged systems are listed; those selected for listing represent typical starter systems.

SOFTWARE PRICES

		Initial One-time License Payment	Monthly License Fee
CM 80 MCP	Master Control Program for the B 80	\$ 2,500 or	\$70
CM COB	Computer Management System COBOL compiler		25
CM RPG	Computer Management System RPG compiler		25
CM MP2	Computer Management System MPL compiler		50
CM NDL	Computer Management System NDL compiler		50
CM DC1	B 80 Data Control System	540 or	15
CM 80 UTL	B 80 Utilities for Computer Management System	540 or	15
Commercial Business Management System II (CBMS II):			
B 80 CRO	Accounts Receivable	1,655	47
B 80 CIO	Invoicing	1,700	46
B 80 CCO	Inventory Control	1,410	39
B 80 CMO	Inventory Management	1,410	39
B 80 CPO	Payroll	1,790	49
B 80 CGD	General Ledger	1,260	34
B 80 CYO	Accounts Payable	1,585	43
B 80 CSO	Order Processing; Console/Self Scan Display System	1,835	51

Burroughs B 80

SOFTWARE PRICES

		<u>Initial One-time License Payment</u>	<u>Monthly License Fee</u>
B 80 BPS	Bill-Post and Inventory (Entry-level)	2,795	95
B 80 BPE	Bill-Post and Expanded Inventory	3,795	120
B 80 CRS	Accounts Receivable (Entry-level)	1,100	37
B 80 CYS	Accounts Payable (Entry-level)	1,000	34
B 80 CQS	Payroll	1,100	37
B 80 CGS	General Ledger	900	30
B 80 CIB	CBMS II Package; all modules	10,170	51
B 80 Manufacturing BMS:			
B 80 MC1	Bill of Material Processor	1,400	39
B 80 MG1	Stock Status	1,185	33
B 80 ME1	Work Center and Routing	1,400	39
B 80 MJ1	Costing	1,015	28
B 80 MH1	Job Cost Actual	2,000	66
B 80 MS1	Order Release	1,000	33
B 80 MP1	Manufacturing Payroll	1,790	50
B 80 MA1	Manufacturing BMS Package; all modules	4,795	130
B 80 Credit Union Business Management System:			
B 80 CU5	Credit Union System	4,335	199
B 80 Budgetary Accounting System:			
B 80 MO7	Budgetary Accounting System	1,790	62
B 80 Hospital BMS: Burroughs Hospital Administrative System II (BHAS II):			
B 80 HAF	Patient Accounting System	2,275	66
B 80 HAK	Hospital Payroll System	2,075	61
B 80 CGO	General Ledger	1,260	34
B 80 CYO	Accounts Payable	1,585	43
B 80 Bank Business Management System:			
B 80 BD2	Demand Deposit Accounting	1,595	72
B 80 BS2	Savings Deposit Accounting	1,595	72
B 80 BL2	Loan Accounting	3,130	91
B 80 BN2	Mortgage Loan Accounting	805	52
B 80 BK2	Audit Entry Proof	1,320	59
B 80 BG2	General Ledger Accounting	975	28
B 80 BO2	Bank BMS Package; all modules	8,270	370
B 80 Scholastic II:			
	Student Records	2,525	74
	Student Scheduler	3,350	98
	Attendance Accounting	1,660	64
	Test Scorer	2,195	48
	Scholastic II; all modules	***	***
	Government Information System	***	***
	Budgeting Accounting System	1,790	62
	Government/Scholastic Payroll	***	***
B 80 PO4	Payroll	1,390	40
B 80 UTL	Utility Billing System	***	***
B 80 YO3	General Ledger Package B	885	25
B 80 YO5	General Ledger Package	1,010	30
B 80 YO7	General Ledger Package D	1,115	33
B 80 YOT	Accounts Receivable Package A	1,500	43
B 80 YOY	Accounts Receivable Package B	1,285	37
B 80 YOK	Inventory Control Package A	885	79
B 80 YOM	Inventory Control Package B	1,115	103
B 80 YOP	Inventory Control Package C	1,335	123
B 80 YOR	Inventory Control Package D	1,760	162
B 80 YO9	Accounts Payable Package A	750	22
B 80 YO8	Accounts Payable Package B	1,175	34
B 80 YOD	Accounts Payable Package C	965	28
B 80 YOF	Accounts Payable Package D	1,390	40
B 80 YOY	Accounts Payable Package E	1,045	30
B 80 Z01	Invoicing Package A	1,010	93
B 80 Z03	Invoicing Package B	1,225	113
B 80 Z05	Invoicing Package C	690	64
B 80 Z07	Invoicing Package D	795	73

***Pricing not released to date by Burroughs.