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 micro-instruction 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 60K bytes to 124K 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. It supports both COBOL and RPG and offers numerous application packages. Purchase prices for B 80 systems with typical application packages range from about $11,990 to $22,990.

MAIN MEMORY: 60K to 124K bytes
DISK CAPACITY: 4.6 to 37.6 megabytes
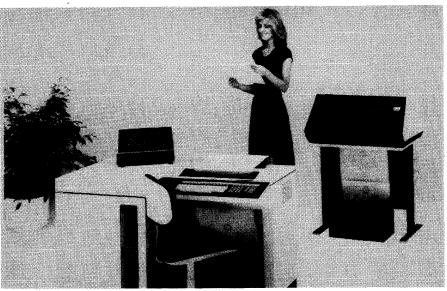WORKSTATIONS: 8 standard, up to 11 maximum
PRINTERS: 160-lpm to 350-lpm
OTHER I/O: Magnetic tape, data entry subsystems

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 ▶

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.

REFERENCE EDITION. This is a mature product line, and no significant further developments are anticipated. Because of its importance, coverage is being continued, but no future update is planned.

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▷ 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, four ICMD (Industry-Compatible Mini-Disk) diskette drives, two versions of cartridge disk drives, four versions of fixed disk drives, 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 ▷

▶ employs some 50,000 people in more than 120 countries around the globe.

MODELS: Numerous packaged systems based on the B 80 processor, varying in memory size and peripheral complement. For details, see the price list at the end of this report.

DATE ANNOUNCED: B 80-30 and B 80-40, April 1976; B 80-20 and B 80-60, April 1978.

DATE OF FIRST DELIVERY: Fourth quarter 1976.

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 micro-programmed 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 ▶

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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

▷ 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 several basic configurations at purchase prices ranging from $11,990 to $22,990. 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 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 ▷

▶ 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 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. ▶

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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

Datapro's 1980 survey of computer users included responses from 10 users representing 11 B 80 systems installed for an average of 26 months. Seven users had purchased their systems, while two rented, and one leased. Principal applications listed included accounting, payroll/personnel, government, manufacturing, banking/finance, insurance, and medical/health care.

Memory capacities ranged from 32K to 128K bytes, and disk capacities from 2.3M to 9.8M bytes. All of these users reported on single-station configurations.

The primary programming languages reported included COBOL (90 percent) and RPG (20 percent); 4 of these users had installed the MCP operating system, and 6 used the Commercial Management System (CMS). Only one respondent used a data base management system.

The ten users rated their B 80 systems as shown in the following table.

	Excellent	Good	Fair	Poor	WA*
Ease of operation	6	3	1	0	3.5
Reliability of mainframe	2	5	0	3	2.6
Reliability of peripherals	0	6	1	3	2.3
Maintenance service:					
Responsiveness	2	4	3	1	2.7
Effectiveness	3	2	3	2	2.6
Technical Support:					
Trouble-shooting	0	3	3	4	1.9
Education	0	4	5	1	2.3
Documentation	1	6	0	2	2.7
Manufacturer's Software:					
Operating System	6	2	1	0	3.6
Compilers and assemblers	5	1	3	0	3.2
Application programs	0	5	1	2	2.4
Ease of programming	1	5	2	2	2.5
Ease of conversion	0	5	2	2	2.3
Overall satisfaction	2	5	0	3	2.6

*Weighted Average of a scale of 4.0 for Excellent.

When asked to rate significant problems with the system, five users said delivery and/or installation of equipment was late, three said delivery of required software was late, and four stated the vendor did not provide all promised software or support. On the positive side, five indicated the system was easy to expand/reconfigure, two said they were happy with response times, and two felt that productivity aids helped them keep programming costs down.

Another important question asked in our 1980 survey ▷

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 (μMAR), 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 μMAR 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 sytem 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.

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was "Would you recommend this system to another user?" Six of the B 80 users responded yes to this question, and four said no. Eight of the ten users indicated that they did not plan to replace their systems in 1980.□

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.

WORKSTATIONS: See above.

DISK STORAGE: See above.

MAGNETIC TAPE: See above.

PRINTERS: Along with the standard console printer, two additional free-standing line printers can be added.

MASS STORAGE

BURROUGHS SUPER MINI-DISK (BSM) DRIVE: The B 9489-2 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, 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, 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 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
B 9493-9	9.4 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.

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

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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/Wraparound/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	—

153.6KHz Crystal		57.6KHz Crystal	
High	Low	High	Low
2400	1200	900	450
1200	800	450	300
800	600	300	225
600	—	225	—
1200	600	450	225
600	400	225	150
400	300	150	112
300	—	112	—

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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.
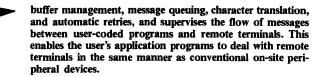
LANGUAGES: Under the B 80 MCP, both COBOL and RPG are supported. For data communications environments, the Network Definition Language and Message Processing Language are also supported.

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 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,

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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 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.

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▶ 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 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 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.
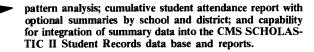
B 80 Hospital BMS—Burroughs Hospital Administration System II (BHAS II) is designed as a four-module system. The A/P, payroll, and general ledger modules are adopted to meet hospital requirements from the generalized BMS modules of the same name which were previously described. The patient accounting 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 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

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pattern analysis; cumulative student attendance report with optional summaries by school and district; and capability for integration of summary data into the CMS SCHOLAS-TIC 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 SCHO-LASTIC 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-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.

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▶ 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: Includes CPU with 180-cps printer, 60K bytes of read/write memory, 256-character self-scan display, self-scan display controller, self-scan device control, and disk controller. Purchase price is $12,990; one-year lease price is $780 per month.

B 80 CARTRIDGE DISK SYSTEM: Includes CPU with 180-cps printer, 60K bytes of read/write memory, 256-character self-scan display, self-scan display controller, self-scan device control, 4.6M byte disk drive, and disk cartridge control. Purchase price is $16,950; one-year lease price is $869 per month.■

EQUIPMENT PRICES

		Annual Maint.	Rental (1-year lease)*	Rental (3-5-year lease)*
PACKAGED SYSTEMS				
B80 Mini Disk Systems:				
B80-041-1	Mini Disk System with 60K bytes of memory, 60-cps printer, 15-inch single pinfeed forms handler, and 2.0M byte, 266 millisecond Burroughs Super Mini Disk	11,990	NA	NA
B80-034-1	Mini Disk System with 60K bytes of memory, 25.6-inch dual pinfeed forms handler, 180-cps printer, and 2.0M byte 266 millisecond Burroughs Super Mini Disk	12,990	NA	NA
B80-221-1·	Mini Disk System with 76K bytes of memory, small processor cabinet, 60-cps printer, 15-inch single pinfeed forms handler, and 2.0M byte 266 millisecond Burroughs Super Mini Disk	12,990	643	610
B80-223-1	Mini Disk System with 76K bytes of memory, small processor cabinet, 180-cps printer, 15-inch single pinfeed forms handler, and 2.0M byte, 266 millisecond Burroughs Super Mini Disk	13,990	693	658
B80-224-1	Mini Disk System with 76K bytes of memory, small processor cabinet, 180-cps printer, 25.6-inch dual pinfeed forms handler, and 2.0M byte, 266 millisecond Burroughs Super Mini Disk	13,990	693	658
B80-261-1	Mini Disk System with 76K bytes of memory, large processor cabinet, 60-cps printer, 15-inch single pinfeed forms handler, and 2.0M byte 266 millisecond Burroughs Super Mini Disk	11,990	593	563
B80-264-1	Mini Disk System with 76K bytes of memory, large processor cabinet, 180-cps printer, 25.6-inch dual pinfeed forms handler, and 2.0M byte, 266 millisecond Burroughs Super Mini Disk	12,990	643	610
B80-263-1	Mini Disk System with 76K bytes of memory, large processor cabinet, 180-cps printer, 15-inch single pinfeed forms handler, and 2.0M byte, 266 millisecond Burroughs Super Mini Disk	12,990	643	610
4.6M Byte Cartridge Systems:				
B80-221-3	Cartridge System with 76K bytes of memory, small processor cabinet, 60-cps printer, 15-inch single pinfeed forms handler, and 4.6M byte, 145 millisecond cartridge	15,990	793	753
B80-224-3	Cartridge System with 76K bytes of memory, small processor cabinet, 180-cps printer, 25.6-inch dual pinfeed forms handler, and 4.6M byte, 145 millisecond cartridge	16,990	843	800
B80-264-3	Cartridge System with 76K bytes of memory, large processor cabinet, 180-cps printer, 25.6-inch dual pinfeed forms handler, and 4.6M byte, 145 millisecond cartridge	15,990	793	753
9.2M Byte Cartridge Systems:				
B80-221-5	Cartridge System with 76K bytes of memory, small processor cabinet, 60-cps printer, 15-inch single pinfeed forms handler, and 9.2M byte, 100 millisecond cartridge	18,990	943	895
B80-224-5	Cartridge System with 76K bytes of memory, small processor cabinet, 180-cps printer, 25.6-inch dual pinfeed forms handler, and 9.2M byte, 100 millisecond cartridge	19,990	993	943
B80-264-5	Cartridge System with 76K bytes of memory, large processor cabinet, 180-cps printer, 25.6-inch dual pinfeed forms handler, and 9.2M byte, 100 millisecond cartridge	18,990	943	895
9.4M Byte Fixed Disk Systems:				
B80-221-6	Fixed Disk System with 76K bytes of memory, small processor cabinet, 60-cps printer, 15-inch single pinfeed forms handler, 9.4M byte, 55 millisecond fixed disk, and 1M byte Burroughs Super Mini Disk	18,990	943	895
B80-223-6	Fixed Disk System with 76K bytes of memory, small processor cabinet, 180-cps printer, 15-inch pinfeed forms handler, 9.4M byte fixed disk, and 1M byte Burroughs Super Mini Disk	19,990	993	943
B80-224-6	Fixed Disk System with 76K bytes of memory, small processor cabinet, 180-cps printer, 25.6-inch pinfeed forms handler, 9.4M byte, 55 millisecond fixed disk, and 1M byte Burroughs Super Mini Disk	19,990	993	943
B80-261-6	Fixed Disk System with 76K bytes of memory, large processor cabinet, 60-cps printer, 15-inch pinfeed forms handler, 9.4M byte, 55 millisecond fixed disk, and 1M byte Burroughs Super Mini Disk	17,990	893	848
B80-263-6	Fixed Disk System with 76K bytes of memory, large processor cabinet, 180-cps printer, 15-inch pinfeed forms handler, 9.4M byte, 55 millisecond fixed disk, and 1M byte Burroughs Super Mini Disk	18,990	943	895
B80-264-6	Fixed Disk System with 76K bytes of memory, large processor cabinet, 180-cps printer, 25.6-inch pinfeed forms handler, 9.4M byte, 55 millisecond fixed disk, and 1M byte Burroughs Super Mini Disk	18,990	943	895
18.8M Byte Fixed Disk Systems:				
B80-221-7	Fixed Disk System with 76K bytes of memory, small processor cabinet, 60-cps printer, 15-inch single pinfeed forms handler, 18.8M byte, 55 millisecond fixed disk, and 1M byte Burroughs Super Mini Disk	22,990	1,143	1,085

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EQUIPMENT PRICES

	Purchase Price	Rental (1-year lease)*	Rental (3-5-year lease)*
PACKAGED SYSTEMS (Continued)			
B80-223-7 Fixed Disk System with 76K bytes of memory, small processor cabinet, 180-cps printer, 15-inch single pinfeed forms handler, 18.8M byte, 55 millisecond fixed disk, and 1M byte Burroughs Super Mini Disk	23,990	1,193	1,133
B80-224-7 Fixed Disk System with 76K bytes of memory, small processor cabinet, 180-cps printer, 25.6-inch dual pinfeed forms handler, 18.8M byte, 55 millisecond fixed disk, and 1M byte Burroughs Super Mini Disk	23,990	1,193	1,133
B80-261-7 Fixed Disk System with 76K bytes of memory, large processor cabinet, 60-cps printer, 15-inch single pinfeed forms handler, 18.8M byte, 55 millisecond fixed disk, and 1M byte Burroughs Super Mini Disk	21,990	1,093	1,038
B80-263-7 Fixed Disk System with 76K bytes of memory, large processor cabinet, 180-cps printer, 15-inch single pinfeed forms handler, 18.8M byte, 55 millisecond fixed disk, and 1M byte Burroughs Super Mini Disk	22,990	1,143	1,085
B80-264-7 Fixed Disk System with 76K bytes of memory, large processor cabinet, 180-cps printer, 25.6-inch dual pinfeed forms handler, 18.8M byte, 55 millisecond fixed disk, and 1M byte Burroughs Super Mini Disk	22,990	1,143	1,085
SYSTEM OPTIONS			
BD 7762 Second pinfeed 26-inch, 180-cps console	772	26	25
BD 7761 Second pinfeed 15-inch, 180-cps console	772	26	25
MEMORY OPTIONS (For B80-40 and B80-50 Series Only)			
BD 4016-4 Additional 4K bytes of read/write memory	412	13	12
MEMORY OPTIONS (For B80-20 and B80-60 Series Only)			
BD 4017-16 Additional 16K byte memory module	1,545	51	49
BD 4306 Memory Extender	1,350	135	20
BD 4020 64K Byte Memory	2,550	—	—
MASS STORAGE			
B 9489-2 Built-in BSM drive	1,854	62	59
B 9489-11 Free-standing single BSM drive and BD 9489-1 Controller	2,500	93	83
B 9489-12 Free-standing dual BSM drives and BD 9489-1 Controller	3,815	141	127
BD 9489-15 IOMD Disk Controller	618	21	21
B 9489-17 Free-standing single ICMD drive	3,296	122	110
B 9480-22 Dual-Cartridge Disk Drive; 4.6 megabytes, 145 msec.	7,010	296	278
B 9481-12 Dual-Cartridge Disk Drive; 9.2 megabytes, 100 msec.	10,163	452	430
B 9493-9 Fixed Disk Drive; 9.4 megabytes	5,500	204	183
B 9493-18 Fixed Disk Drive; 18.8 megabytes	11,227	439	353
B 9493-28 Fixed Disk Drive; 28.2 megabytes	15,347	607	489
B 9493-37 Fixed Disk Drive; 37.6 megabytes	18,437	722	581
BD 9493 Fixed Disk Drive Controller	1,095	100	95
PRINTERS			
B 9249-2 Chain Printer; 160 lpm	5,990	222	200
B 9249-3 Chain Printer; 250 lpm	7,990	296	266
B 9249-4 Chain Printer; 350 lpm	10,990	407	366
BD 9249 Printer Controller	618	21	20
B 9948-1 12 Channel Format Tape	618	33	30
MAGNETIC TAPE EQUIPMENT			
A 9490-21 Magnetic Tape Cassette Drive; 10-ips	1,689	57	64
B 9490-25 NRZ Magnetic Tape Cassette; 10-ips	1,689	57	55
B 9497-1 NRZ Magnetic Tape Cassette and built-in Harness (B80-30 and B80-40 only)	1,530	51	49
B 9497-5 PE Magnetic Tape Cassette and built-in Harness	1,530	51	49
B 9497-11 Freestanding NRZ Cassette Drive	1,689	63	56
B 9497-15 Freestanding PE Cassette Drive	1,689	63	56
BD 9497-5 Magnetic Tape Cassette Controller (NRZ/PE)	376	15	14
SYSTEM DISPLAYS AND CONTROLS			
A 9355 256-character SELF-SCAN	2,050	57	55
B 9355-4 PD6 Self-Scan	2,050	57	55
BD 9355 Self-Scan System Display Control	618	21	20
BD 9355-4 Self-Scan II (PD6) Control	618	21	20
A 3351-2 Self-Scan Device Control	0	0	0
DATA ENTRY SUBSYSTEMS			
AE 501 Audit Entry Data Preparation System	9,940	295	286
AE 111 Audit Entry Data Preparation System	2,500	—	—

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EQUIPMENT PRICES

		Purchase Price	Rental (1-year lease)	Rental (3-5 year lease)

COMMUNICATIONS EQUIPMENT

All controllers below include BD 4551-2 DataComm Adapter

		Purchase Price	Rental (1-year lease)	Rental (3-5 year lease)
BD 2356-2	Asynchronous data set controller	620	26	25
BD 2356-5	Burroughs direct interface	720	31	30
BD 2356-6	Two-wire direct interface	618	26	25
BD 2356-7	Synchronous data set controller	1,030	41	39
BD 4551-2	Data Comm Adapter	103	10	10

SOFTWARE PRICES

M-3/O/DD

		Initial One-time License Payment	Monthly License Fee
CM80 MCP	Master Control Program (MCP) for B80 Systems	2,500	70
AC80 BCP	ACSYS System Software	2,000	55
CM80 ACA	ACSYS System and MCP	3,500	100
CM80 COB	Commercial Management System (CMS) COBOL Compiler		25
CM80 RPG	CMS Report Program		25
CM80 MPL	CMS MPL II Compiler		25
CM80 NDL	CMS NDL Compiler		25
CM80 UTL	B80 Utilities for CMS	540	15
CM80 CON	IBM System/32 to B80 Conversion Program	600	NA

B80 DEVELOPMENT AIDS

		Initial One-time License Payment	Monthly License Fee
CM80 DOM	CMS DOMAIN System	1,620	68
CM80 REP	CMS REPORTER	1,620	68
CM80 RPO	CMS On-Line REPORTER	2,160	90
CM80 DC1	B80 Data Control System	585	25
CS80 SL9	B700 SL7 COBOL to B80 CMS COBOL	585	
CM80 INQ	CMS Inquiry	810	34
B80 AEU	Audit Entry Host Utilities	490	21

B80 ACSYS APPLICATION PROGRAM PRODUCTS

		Initial One-time License Payment	Monthly License Fee
B80 YO3	General Ledger Package B	900	25
B80 YO5	General Ledger Package C	1,060	30
B80 YO7	General Ledger Package D	1,170	33
B80 YO9	Accounts Payable Package A	1,235	34
B80 YOB	Accounts Payable Package B	790	22
B80 YOD	Accounts Payable Package C	1,460	40
B80 YOF	Accounts Payable Package D	1,015	28
B80 YOH	Accounts Payable Package E	1,100	30
B80 YOT	Accounts Receivable Package A (with service charge)	1,575	151
B80 YOV	Accounts Receivable Package B (with service charge)	1,350	37
B80 YOK	Inventory Control Package A	900	25
B80 YOM	Inventory Control Package B	1,170	33
B80 YOP	Inventory Control Package C	1,400	39
B80 YOR	Inventory Control Package D	1,850	177
B80 Z01	Invoicing Package A	1,285	36
B80 Z03	Invoicing Package B	1,060	30
B80 Z05	Invoicing Package C	835	23
B80 Z07	Invoicing Package D	725	19
B80 P04	Business Management System (BMS) Payroll	1,460	40
B80 UT1	BMS Utility Billing	2,020	57
B80 BPI	Bill, Post, and Inventory	1,875	78
B80 AAR	Accounts Receivable	810	34
B80 AAP	Accounts Payable	810	34
B80 AGL	General Ledger	810	34

JOB ACCOUNTING AND COSTING SYSTEM

		Initial One-time License Payment	Monthly License Fee
B80 JAC	Job Cost, A/P, Payroll	4,800	200
B80 JAR	Accounts Receivable	1,750	73
B80 JGL	General Ledger	1,750	73
B80 JAM	Asset Management	750	32
B80 JTI	Terminal Interface	1,000	42
B80 JIC	Inventory Control	1,500	63
B80 JIV	Invoicing	1,500	63
B80 JAD	JACS Data Management Module (not required)	4,000	167

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SOFTWARE PRICES

		Initial One-time License Payment	Monthly License Fee
PRODUCTION CONTROL SYSTEM I			
B80 MC1	Bill of Material	1,590	67
B80 MG1	Stock Status	1,345	56
B80 ME1	Work Center and Routing	1,590	67
B80 MJ1	Costing	1,150	48
B80 MP1	MBMS Payroll	2,030	85
B80 MS1	Order Release	1,135	47
B80 MH1	Job Cost Actual	2,270	95
B80 MR1	Material Requirements Planning	3,565	149
B80 MGL	Manufacturing General Ledger	1,435	60
CONTRACTOR BMS PROGRAM PRODUCTS			
B80 CM2	Data Base Maintenance	—	—
B80 CP2	Payroll and Labor Cost	1,705	71
B80 CA2	Accounts Payable and Material Costs	1,705	71
B80 CJ2	Job Cost Reporting	1,135	47
B80 CG2	General Ledger and Financial Statements	1,135	47
B80 CE2	Equipment Cost	990	41
B80 CQ2	On-Line Inquiry	380	16
B80 CT8	Contractor BMS Module	7,035	293
DISTRIBUTION MANAGEMENT SYSTEM			
B80 BPC	BPO Console	3,500	146
B81 BPT	BPO Terminal	6,500	271
B80 BAC	AR Console	1,375	58
COMMERCIAL BUSINESS MANAGEMENT SYSTEM II			
B80 CRO	Accounts Receivable	1,880	78
B80 CIO	Invoicing	1,930	80
B80 CCO	Inventory Control	1,600	67
B80 CMO	Inventory Management	1,600	67
B80 CPO	Payroll	2,030	85
B80 CGO	General Ledger	1,435	60
B80 CYO	Accounts Payable	1,800	75
B80 CDO	Data Communication Module	810	34
CBMS II—ENTRY-LEVEL SYSTEM			
B80 BPS	Bill, Post and Simplified Inventory	3,490	145
B80 BPA	BSP Inquiry	540	23
B80 BPE	Bill, Post and Expanded Inventory	4,740	198
B80 CRS	Accounts Receivable	1,375	57
B80 CYS	Accounts Payable	1,250	52
B80 CQS	Payroll	1,375	57
B80 CGS	General Ledger	1,125	47
FINANCIAL			
B80 FGL	Financial General Ledger	1,620	68
BANK BUSINESS MANAGEMENT SYSTEM			
B80 BO2	Bank Business Management System for BK2, BC2, BD2, BS2, BL2, and FGL	12,960	540
B80 BD2	Demand Deposit Accounting	2,160	90
B80 BS2	Savings Deposit Accounting	1,890	79
B80 BC2	Certificates for Deposit	1,890	79
B80 BL2	Loan Accounting	3,780	158
B80 BK2	Audit Entry Proof	1,620	68
B80 BQ2	Central Information System Inquiry Module	2,160	90
B80 BP2	Central Information System Reporting Module	1,350	56
CREDIT UNION SYSTEM			
B80 CUS	Credit Union System including CSL, CCL, CBP, and CRP	7,020	293
B80 CUI	Inquiry/File Maintenance	3,780	158
B80 CSL	CMS Credit Union Share/Loan	2,700	113
B80 CCL	CMS Credit Union Club Module	1,620	68
B80 CBP	CMS Credit Union Bill Payments	1,080	45
B80 CRP	CMS Credit Union Extended Reporting	1,620	68

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SOFTWARE PRICES

		Initial One-Time License Payment	Monthly License Fee
HOSPITAL BUSINESS MANAGEMENT SYSTEMS			
B80 HAF	Patient Accounting System	3,780	158
B80 HAI	Patient Accounting with Inquiry	4,050	169
B80 HAK	Hospital Payroll System	2,355	98
B80 CGO	General Ledger	1,435	60
B80 CYO	Accounts Payable	1,800	75
B80 GPS	CMS Group Practice System	5,105	213
B80 GEM	GEM Data Kit	855	36
B80 APM	CMS Group Practice Appointment Module	1,620	67
CMS SCHOLASTIC II			
B80 SCR	Student Records	3,240	135
B80 SCS	Student Scheduling	4,860	203
B80 SCA	Attendance Accounting	2,160	207
GOVERNMENT ACCOUNTING SYSTEM			
B80 M07	Budgetary Accounting System	2,030	85
B80 SGP	Government/SCHOLASTIC II Payroll	2,135	89
B80 GCU	CMS Utility Billing System	3,780	158
B80 GEM	GEM Data Kit	855	36