

Burroughs B 800 Series

MANAGEMENT SUMMARY

The Burroughs 800 family of computers is expanding. Burroughs has recently announced new or improved systems ranging from the B 80 and B 800 minicomputers to the B 6800 and B 7800 large-scale computers. One of the main goals in the Burroughs product line is software compatibility. This compatibility provides a relatively easy route for upgrading existing installations, as well as allowing Burroughs to take advantage of existing application software throughout the product line.

The new B 800 series of business computers is a good example. There are two distinct versions: the B 801 is a foreground/background processing system that functions just like the previous B 700 batch-oriented computers, while the B 810 and B 820 models offer true multiprogramming, disk packs, fixed-disk storage, and other improvements over the B 700 Series. The only significant hardware difference between the two B 800 versions is the minimum allowable memory size: a B 801 running under SCP system software requires a minimum of 32K bytes, while a multiprogramming B 810 or B 820 running under CMS system software requires a minimum of 64K bytes of MOS memory. The only software differences are that the B 801 is loaded with the SCP operating system in the morning, while the B 810 or B 820 is loaded with CMS, and that the COBOL and RPG compilers are slightly different, requiring a "filtering" program and recompilation. Since the operating systems are sold separately, users can customize their own combinations or hardware and op-

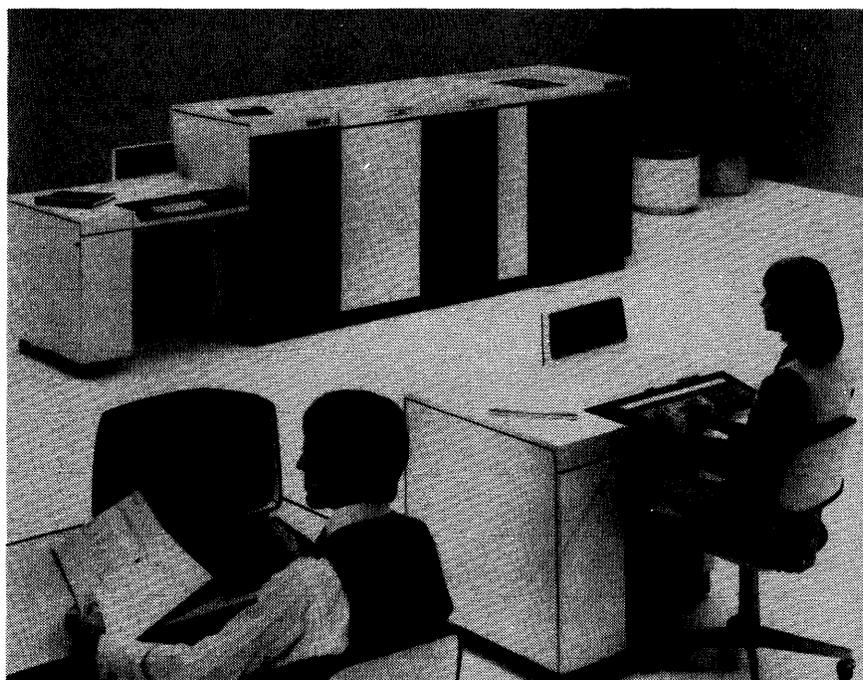
This new family of small-scale computers consists of the B 801, B 810, and B 820 models for business applications and the B 866 and B 876 models for data communications. The B 800 Series features sophisticated new processors, increased disk storage capacity ranging to 500 million bytes through two new disk pack drives, four new fixed-disk drives, a new 120-cps printing console, true multiprogramming, dual line printer capability, and compatibility with existing B 700 programs.

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: B 801, B 811, B 812, B 821, and B 828 packaged systems; and B 866 and B 876 communications processors.



Burroughs calls this a "medium" configuration of the B 810 system. In the foreground are a TD 830 CRT display at left and a Direct Data Entry Station (DDES) at right. The system in the background consists of (from left to right) a DDES console, the B 810 processor, one cabinet of fixed-disk storage, one cabinet containing two removable disk cartridge drives, and a line printer. The little rectangle at the upper left corner of the CPU cabinet is a Burroughs Super Mini-Disk reader.

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CHARACTERISTICS OF THE B 800 PROCESSORS

MODEL	B 801	B 810	B 820	B 866-1/-2	B 876
CENTRAL PROCESSORS					
Word size, bits	64	64	64	16	16
Clock speed, MHz	1	1	2	1/2	2
Maximum number of I/O controls	7	7	7	5	9
MAIN MEMORY					
Type	MOS	MOS	MOS	MOS	MOS
Minimum capacity, bytes	32,768	65,536	65,536	49,152	49,152
Maximum capacity, bytes	81,920	131,072	131,072	116,736	150,528
Cycle time, microseconds	1	1	1	1	1
Access time, microseconds	0.5	0.5	0.5	0.5	0.5
Bits fetched per cycle	16	16	16	16	16
Increment, bytes	8,192	8,192	8,192	8,192	8,192
Parity checking	Standard	Standard	Standard	Standard	Standard
CONTROL MEMORY					
Type	MOS	MOS/bipolar	MOS/bipolar	MOS/bipolar	MOS/bipolar
Size, bytes	16,384	49,152	49,152	49,152	49,152
Access time, microseconds	0.5	0.5 (MOS)/0.25	0.5 (MOS)/0.25	0.5 (MOS)/0.25	0.5 (MOS)/0.25
Cycle time, microseconds	1	1 (MOS)/0.5	1 (MOS)/0.5	1 (MOS)/0.5	1 (MOS)/0.5
Bits fetched per cycle	16	16	16	16	16

➤ erating systems to best execute their existing or planned application programs.

Typical B 800 peripheral devices include printers ranging to 750 lpm, TD 730 and TD 830 display terminals, DDES data entry stations, AE 500 remote audit entry stations, card readers, tape drives, and MICR reader/sorters. Mass storage comes in various forms: disk cartridge drives ranging to 9.2 million bytes each, fixed-disk drives ranging to 37.6 million bytes each, disk pack drives ranging to 130.4 million bytes each, and either industry-compatible floppy disk drives with 243K bytes or the Burroughs Super Mini Disk drives with a capacity of 1 million bytes each.

Typical configurations of terminals might include a maximum of four DDE stations, two DDE stations and three to six TD terminals, or one DDE station and a string of TD terminals where the limits of the "string" are determined by the activity of the terminals, the line speeds selected, and the desired line response time. If no DDE stations are used, from 4 to 10 TD terminals represent a practical configuration.

With the introduction of the B 800, punched paper tape has finally departed from the Burroughs product line. No provisions are made for punched paper tape readers or punches in the B 800 configurations. (Hang on to those readers and punches; the Smithsonian will be calling soon.)

A unique feature of the B 800 family is the 10-megahertz Data Communications Pre-Processor (DCPP), which handles all of the polling, error/retry, and stripping tasks that would normally be done by the main CPU. Completed messages are taken from, and placed into, queues in main memory without placing a burden on the main

➤ **DATE ANNOUNCED:** December 1976 (B 866 and B 876); January 1977 (B 801, B 811, B 812, B 821, and B 828).

DATA FORMATS

BASIC UNIT: 64-bit word in all B 800's except the B 86X and 87X Series, where the word length is 16 bits. Each word in memory may be thought of as eight 8-bit characters or hexadecimal bytes, 16 4-bit decimal digits or hexadecimal digits, one 4-bit sign plus 15 4-bit decimal digits, or two 32-bit halfwords each containing four 8-bit characters or eight 4-bit digits. Memory capacities are usually expressed in 8-bit bytes.

INSTRUCTIONS: The B 800 is an interpreter-based system using variable micrologic to produce a machine-level language which Burroughs calls S-Language. The user does not have an assembler-type language available to him. The S-Language code requires an interpreter for further breakdown so that it can be executed. S-Language consists of instructions which are 2, 3, 4, or 5 bytes long. In all cases the operation code is one byte in length and resides in the right-most byte of the instruction. Instructions are stored and read from right to left. There are 216 S-Language instructions defined on machines such as the B 800. A maximum of 256 such instructions can be defined. A single instruction can address from 4 bits to 64 bits. Up to 16 bits can be transferred in parallel between main memory and the processor.

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

MAIN STORAGE

TYPE: MOS RAM and/or bipolar RAM. MOS refresh is not required. For specific B 800 models, refer to the table on page M11-112-452. On B 820 models, 16K bytes of bipolar memory are standard.

CYCLE TIME: Refer to the table on page M11-112-452.

CAPACITY: Refer to the table on page M11-112-452.

CHECKING: One parity bit is associated with each 16 bits of memory. Correct parity is generated when writing and checked when reading. See the table on page M11-112-452 for a more definitive breakdown of models.

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PERIPHERALS/TERMINALS TABLE

DEVICE	DESCRIPTION AND SPEED	MANUFACTURER
MAGNETIC TAPE EQUIPMENT		
A 9491-2	Reel-to-Reel; 9-track, 800 bpi, 7-inch reels, 12.5 ips, 50 ips rewind, read-after-write, NRZI; 10 KBS	Burroughs
A 9490-25	Cassette; 2-track, one track for clocking, 800 bpi, 282 feet, 10 ips, 60 ips rewind, read-after-write, NRZI, bit-serial encoding using 8-bit ASCII code; 3 KBS	Burroughs
PRINTERS (2 allowed)		
A 9249-2	Chain; 132 positions, 48- (64 or 96 optional) character set, 3- to 17-inch paper 8.3-ips slew rate, 10 characters per inch, 2-channel VFU (12 optional); 160 lpm	Burroughs
A 9249-3	Chain; 132 positions, 48- (64 or 96 optional) character set, 3- to 17-inch paper, 8.3-ips slew rate, 10 characters per inch, 2-channel VFU (12 optional); 250 lpm	Burroughs
A 9247-12	Train; 132 positions; 48- (16, 64, or 96 optional) EBCDIC or ASCII character set, 4- to 20-inch paper, 20-ips slew rate, 12-channel VFU; 400 lpm	Burroughs
A 9247-13	Train; 132 positions; 48- (16, 64 or 96 optional) EBCDIC or ASCII character set, 4- to 20-inch paper, 20-ips slew rate, 12-channel VFU; 750 lpm (for B 820 CMS only)	Burroughs
PUNCHED CARD EQUIPMENT		
A 9115	Reader; 80-column, 51-column optional, 1000-card input stacker, 1000-card output hopper; 300 cpm	Burroughs
A 9116	Reader; 80-column, 51-column optional, 1000-card input hopper, 1000-card output stacker; 600 cpm	Burroughs
A 9119-1	Reader; 96-column, 600-card input hopper, 600-card output stacker, 300 cpm	Burroughs
PUNCHED CARD EQUIPMENT (SCP systems only)		
A 9418-2	Reader/Punch/Data Recorder; 80-column, 600-card primary & 400-card secondary input hoppers, three 80-character buffers, two 400-card output stackers; 200/45/45 cpm	Burroughs
A 9419-2	Reader/Punch/Data Recorder; 96-column, 600-card primary & 400 card secondary input hoppers, three 96-character buffers, two 400-card output stackers; 300/60/60 cpm	Burroughs
A 9419-6	Reader/Punch/Data Recorder/Sorter; 96-column, 600-card primary & 400-card secondary input hoppers, three 96-character buffers, six 400-card output stackers; 300/60/60 cpm	Burroughs
MICR READER/SORTERS		
B 9135-2, 3	Reader/Sorter; processes documents of intermixed weight, width, & length; 17.5-inch deep input hopper, 8 (12 in the 9135-3) 3.5-inch deep output pockets; 4-pocket increments up to 32 pockets may be added; MICR E-13B font character recognition system; 900 dpm	Burroughs
B 9134-1	Reader/Sorter; processes documents of intermixed weight, width & length; 17.5-inch deep input hopper, four 3.5-inch deep output pockets; 4-pocket increments up to 16 pockets may be added; MICR E-13B or OCR "A" Size 1 font character recognition system; 1625 dpm	Burroughs

➤ system processor, thus reducing the main processor's data communications burdens by as much as 40 to 60 percent. Also, the DCPD has access to the direct memory access channel (DMA), so that the DCPD can share memory cycles with the main system processor and the disk I/O control. The DMA prohibits any one of them from preempting memory to the detriment of the other two. The DCPD also controls the line characteristics, which are fully programmable for each line through the Network Definition Language (NDL).

The CPU clock speed is controlled at the time of warm-starting the system. Thus, a B 800 can be run under SCP ➤

➤ **STORAGE PROTECTION:** Main storage write operations by user programs are permitted only within the limits defined by the concatenation of the memory address register and one of the base registers.

RESERVED STORAGE: A variable portion is reserved for microinstructions. This portion of memory is called the Micro Program Memory (MPM) and consists of three elements. The resident area contains certain registers used by interpreter-generated programs, the loader, the I/O manager, basic micro-subroutines, common housekeeping subroutines, instruction fetch and decode routines, disk and console controller routines, and common code. The overlap area is used for such functions as trace operations or residence for search, keyboard, or console print operators. Finally, the variable area is used for peripheral device controllers, disk address calculation, numeric editing in both ➤

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PERIPHERALS/TERMINALS TABLE (Continued)

DEVICE	DESCRIPTION AND SPEED	MFR.
TERMINALS		
TD 700	Self-Scan display/keyboard; 256 characters, 8 lines by 32 characters, 64 ASCII character set, 5 x 7 dot matrix, red phosphor illumination, detachable typewriter-style keyboard; 150 to 1800 bps asynchronous, 2400 to 4800 bps synchronous, 9600 bps via two-wire direct interface (TDI), 64,000 bps via Burroughs direct interface (BDI)	Burroughs
TD 701/TD 73X	Self-scan display/keyboard; 256 or 480 characters, 8 lines by 32 or 12 lines by 40 characters, 128 ASCII character set, 5 x 7 dot matrix, red phosphor illumination, extended memory options, various keyboards & peripherals; same data transfer rates as TD 700	Burroughs
TD 801/TD 802	CRT display/keyboard; 960 or 1920 characters, 12 lines by 80 or 24 lines by 80 characters, 64 ASCII character set, 5 x 7 dot matrix, extended memory options, detachable keyboard; 75 to 1800 bps asynchronous, 2400 or 4800 bps synchronous, 9600 bps via TDI, 64,000 bps via BDI	Burroughs
TD 820	CRT display/keyboard; 960 or 1920 characters, 12 lines by 80 or 24 lines by 80 characters, 96 ASCII character set, 5 x 7 dot matrix, detachable keyboard, extended memory options, various peripherals including cassette drive, floppy disk, line printer, and magnetic card reader, and features such as negative, reverse, blink and blank video; same data transfer rates as TD 801/TD 802	Burroughs
TD 83X	CRT display/keyboard; 1920 characters plus 80-character system status line, 24 lines (plus system line) by 80 characters, 128-ASCII character set, 5 x 7 dot matrix, various keyboards & peripherals including serial line printers, cassette drive, magnetic badge readers; and features such as negative, reverse, blink and blank video; same data transfer rates as TD 801/TD 802	Burroughs
TC 4001	Printing terminal; serial impact, 7 x 7 dot matrix, 150 positions, 64-ASCII character set, 3- to 16.75-inch paper, 10 characters per inch, forms compose feature with 5-ips slew rate optional, up to 1536-character buffer, 6 lines per inch; 60 cps; transmission of 75 to 1800 bps asynchronous, 2400 to 9600 bps synchronous, 9600 bps via TDI or BDI	Burroughs
TC 5110-5115	Intelligent terminals; built-in keyboard, same processor as B 80, same printer as TC 4001, one or two 9490 cassette drives or 9481 ICMD floppy disk drives, 256-character Self-Scan display optional; same data transfer rates as TC 4001	Burroughs

➤ at 1 megahertz in the morning, and then under CMS at 2 megahertz in the afternoon, simply by loading a different operating system.

The B 800 is the first small disk system that Burroughs has released that doesn't require a printing console for recording the log. With the B 810 and B 820 models, prospective users have a choice of either a 120-cps printing console, which resembles the console found on the B 700 computer, or a B 9347-2 Direct Data Entry Station (DDES). Messages from the operating system are displayed on the DDES, and then saved in a disk file for later use and for printing a system log. The consoles can be used in conjunction with application software for data entry; the printing console can be used as a second or third printer in a multiprogramming environment.

A minimal B 801 system consisting of a 1-megahertz processor with 32K bytes of MOS main memory, one 120-cps printing console, and one 4.6-million-byte dual disk cartridge drive can be purchased for \$32,400. The SCP operating system is priced separately at \$1,500, while the utilities are also priced separately at \$540. (The total package costs \$34,440.) The same system with a 160-lpm line printer sells for \$39,440 including SCP and utilities.

➤ COBOL and RPG, and some of the more complex instructions.

CENTRAL PROCESSORS

GENERAL: The B 800 processors feature dynamically variable microprogrammed logic, in which the processor has a minimal predefined structure. Under this design, a fundamental systems control program resides in a high-speed bipolar read-only-memory (ROM) called the "nanomemory." A second "shared" main memory is provided for use by both the applications program being executed and a microprogram system called the "Interpreter." The Interpreter consists of the detailed logic required to convert or interpret the object-language version of an application program into the basic, Boolean-type manipulations or I/O operations that are directly executable by the B 800 processor.

The amount of shared memory used by the Interpreter is variable, with only those specific portions of the Interpreter present in the system during program execution that are required by a given program. This capability is referred to as Dynamic Interpreter Configurability. It is also known as run-time, or simply late, "binding." It results in a dynamic boundary line in the shared memory between the Interpreter and the application program that permits reducing of system software memory overhead to a minimum.

Each object program has a directory or catalog appended to it that enumerates the specific instruction types, buffer requirements, and I/O devices used by that program. When the application program is loaded into the system, the direc-

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B 800 FAMILY MASS STORAGE DEVICES

Model	Description	Capacity/Drive (Bytes)	Avg. Access Time (Milliseconds)	Allowable Systems
A 9489-5, -17	Industry-compatible floppy disk drive	243,000	343	All
A 9489-18	Dual industry-compatible floppy disk drives	486,000	343	All
A9489-1/-2	Burroughs Super Mini Disk (Master/Slave)—Inbuilt	1 million	266	B 810, B 820 (CMS)
A 9489-11	Burroughs Super Mini Disk—Free Standing	1 million	266	B 810, B 820 (CMS)
A 9489-12	Burroughs Dual Super Mini Disk—Free Standing	2 million	266	B 810, B 820 (CMS)
B 9480-12	Dual disk cartridge drive	4.6 million	80	All
B 9480-22	Dual disk cartridge drive	4.6 million	145	All
B 9481-12	Dual disk cartridge drive	9.2 million	100	All
B 9493-9	Fixed disk drive	9.4 million	55	B 810, B 820 (CMS)
B 9493-18	Fixed disk drive	18.8 million	55	B 810, B 820 (CMS)
B 9493-28	Fixed disk drive	28.2 million	55	B 810, B 820 (CMS)
B 9493-37	Fixed disk drive	37.6 million	55	B 810, B 820 (CMS)
B 9387-11	Disk pack drive	65.2 million	33	B 820 (CMS)
B 9387-12	Disk pack drive	130.4 million	33	B 820 (CMS)

➤ A minimal B 811 system consisting of a 1-megahertz processor, 64K bytes of memory, a 4.6-million-byte dual disk cartridge drive, one Direct Data Entry Station (DDES) console, and one 160-lpm line printer sells for \$37,400. The CMS software is separately priced at \$2,500, while the utility package costs \$540. (The total package costs \$40,440.)

A minimal B 820 system consisting of a 2-megahertz processor with 48K bytes of MOS memory, 16K bytes of bipolar memory, one 4.6-million-byte dual disk cartridge drive, one DDES console, one 160-lpm printer, and CMS software with utilities sells for \$44,940. The same system with a 120-cps printing console substituted for the DDES and without a line printer sells for \$43,440 including CMS and utilities.

An expanded B 820 system including a 2-megahertz processor, one DDES console, 48K bytes of MOS memory, 16K bytes of bipolar memory, one 250-lpm printer, and one 65.2-million-byte disk pack drive sells for \$74,315 including CMS and utilities.

COMMUNICATIONS PROCESSORS

Burroughs has also unveiled three communications-oriented B 800 series processors that boast improvements over the previous B 776 models. The new processors are compatible with most existing Burroughs mainframes and terminal systems. The B 876 is twice as fast as the B 776, and can be configured with 2 data communications processors for a total of up to 32 data communications lines; the B 866-1 and -2 are limited to a single DCP with a maximum of 7 data communications lines.

The new communications processors are object-code-compatible with existing B 776's and utilize the same ➤

➤ tory or catalog is matched against the complete repertoire of functions supported by the full Interpreter, and unused functions are deleted.

The Interpreter itself is designed to facilitate execution of the S-Language or machine-level language for a virtual machine best suited to a particular high-level language. For the B 800 systems, COBOL and RPG are both supported by the same Interpreter. The logical structure of a B 800 system, including instruction repertoire, I/O configuration, and buffer requirements, is "bound" at a run time so that the B 800 system looks as if it were custom-developed to execute a specific program.

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. Because the S-Language and its Interpreter are oriented toward the characteristics of each programming language, Burroughs states that on the average only about one-tenth as many S-instructions need to be executed to perform a given function as in typical machine-level computer programs.

User memory consists of variable buffers A, B, D, and E; a scratch-pad memory consisting of a maximum of 256 64-bit words; and an area for user program residence. Early B 800's feature a bootstrap memory loader consisting of a self-threading 100-cps paper tape reader that is also used for loading maintenance test routines. Later models will feature an automatic warm start capability through the use of a ROM chip.

The B 800 numbering scheme is as follows: B 80X is a 1-MHz processor running under SCP software, B 81X is a 1-MHz processor running under CMS software, and B 82X is a 2-MHz processor running under CMS software. The "X" in the number represents the standard disk drive. Please refer to the price list at the end of this report for packaged system configurations. SCP configurations with 32K bytes of memory and CMS configurations with 64K bytes of memory include enough memory to house the operating system and still leave about 16K bytes for user software. ➤

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➤ MCP operating system as the B 810 and B 820 computers. Two cartridge disk drives provide a choice of 4.6 or 9.2 million bytes per cabinet; users can also choose either 65.2- or 130.4-million-byte disk pack drives. Standard Burroughs peripherals usable with the new processors include CRT consoles, line printers ranging to 750 lpm, reel-to-reel magnetic tape drives, tape cassette units, 80-column card readers, and either industry-compatible floppy disk drives or the Burroughs Super Mini Disk drive with a capacity of 1 million bytes.

A typical entry-level configuration that includes a B 866-1 processor, 4.6 million bytes of disk storage (on removable cartridges), 48K bytes of MOS memory, one TD 830 CRT console, a seven-line data communications processor with one line adapter, and a real-time clock sells for about \$29,275 or leases on a 5-year basis for about \$767 per month.

An expanded B 876 system with a 4.6 megabyte cartridge drive, 98K bytes of storage, a CRT console, and a 250-lpm printer has a purchase price of about \$75,000 or leases for \$2,300 per month. These prices include hardware only, as the software is completely unbundled.

The Master Control Program (MCP) costs \$2,500 or can be leased for \$70 per month, while a Generalized Message Control System (GEMCOS) sells for \$4,000 or \$133 per month on a three-year lease. Remote Job Entry packages are available, as well as HASP software. COBOL and RPG are also offered, as is Burroughs' Network Definition Language (NDL).

Burroughs is also offering a "Store and Forward" message switching package that is parameter-driven and designed to help implement small-scale, general-purpose networks. The message switching software costs \$20,000.

BACKGROUND

The B 700 systems (Report M11-112-40) are still available from Burroughs as of this writing. The B 700 was introduced in March 1973, and was Burroughs' first disk-oriented minicomputer to enter the small business computer market. The B 700 represented an excellent design compromise between the then-existing L 8000 and B 1700 system installations by combining the keyboard and forms handler so familiar to the thousands of users of the Burroughs L and TC Series systems with many of the general-purpose computer characteristics of the larger Burroughs systems.

The B 700 was employed in more than 3,000 installations between May 1973 and December 1976, and is supported by a large assortment of disk-oriented application programs that run the gamut from Fuel Oil Billing to Burroughs Hospital Administration System (BHAS). The same software (usually written in COBOL) is now available for use on the B 800 computers, with no modification on some models and minor modifications on other models. Burroughs also produced the B 760 series and the

➤ A unique feature of the B 800 family is the 10-MHZ Data Communications Pre-Processor (DCPP), which handles all of the polling, error/retry, and stripping tasks that would normally be done by the main CPU. Completed messages are taken from, and placed into, queues in main memory without placing a burden on the main CPU, thus reducing the main processor's data communications burden. Also, the DCPP has access to the Direct Memory Access channel (DMA), so that the DCPP can share memory cycles with the main processor and the disk I/O control. The DMA prohibits any one of them from preempting memory to the detriment of the other two. The DCPP also controls the line characteristics, which are fully programmable for each line through the Network Definition Language (NDL). The clock speed of the main CPU is controlled by the operating system that is warm-started into the system. By changing operating systems (SCP to CMS), the CPU will automatically revert from 1 MHz to 2 MHz.

B 800's can have up to two line printers, with a printing console acting as back-up or as a third line printer.

COMMUNICATIONS PROCESSORS: The B 860 and B 870 communications processors are free-standing versions of the company's B 800 general-purpose data processing systems specifically tailored for data communications environments. These systems operate under the Burroughs Computer Management System (CMS) recently introduced for the B 800 and B 1800 general-purpose systems. CMS includes the Generalized Message Control System, a store and forward message switching program, a Network Definition Language (NDL), a Message Processing Language (MPL), a COBOL compiler, an RPG compiler, and a remote job entry module. A full range of peripheral devices is available, including line printers up to 750 lpm, cassette tape drives, IBM-compatible and Burroughs high-density floppy disk drives, 9-track tape drives, 80-column card readers, cartridge disk drives, and disk pack drives. A CRT display can be used as the console.

Three models have been introduced to date: the B 876, B 866-2, and B 866-1. The models are differentiated by the type and size of control memory, the permissible amount of main memory, the processor speed, the number of communications lines interfaced, and the permissible number of peripheral subsystems.

In all communications models, access to memory is controlled by a Direct Memory Access Channel (DMA) that allocates memory cycles among the main system processor, the disk I/O control, and one or two data communications processors (DCP's). The DCP's are microprocessors.

The largest model, the B 876, can have up to 32K bytes of MOS control memory, 16K bytes of bipolar control memory, and up to 96K bytes of user memory. The B 876 can include up to ten I/O controllers and one or two DCP's, each of which can handle up to 16 communications lines.

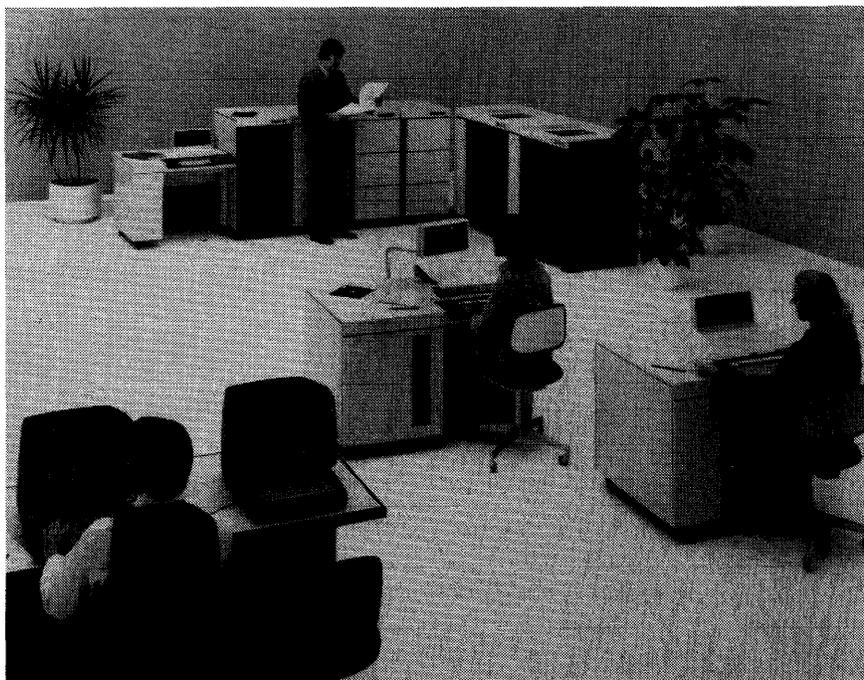
The smallest model, the B 866-1, utilizes up to 48K bytes of MOS control memory, up to 64K bytes of user memory, up to 6 I/O controllers, and 1 DCP, which can accommodate up to 7 communications lines.

The in-between model, the B 866-2, utilizes the same processor as the B 876, which is twice as fast internally as the B 866-1 processor, but shares the peripheral and communications line configuration limitations of the B 866-1.

The DCP bit-oriented microprocessor includes a memory of 6144 12-bit words, which is used to store the Network Definition Language interpreter. The main system processor is not interrupted, except for cycle sharing, until a complete message is assembled in main memory.

Communications lines operating at up to 1800 bps asynchronously and up to 9600 bps or 64,000 bps synchronously can be accommodated. Local connections of up to 9600 or 19,200 bps can also be accommodated.

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This large configuration of the Burroughs B 820 system covers most of the bases. In the foreground are two TD 830 CRTs at left, a Direct Data Entry Station (DDES) at right, and an AE 500 Audit Entry Station with two Super Mini-Disk drives in the center. From left to right in the background are the DDES console, a double-width B 820 processor, two disk pack drive cabinets, and two line printers.

- B 770 series for use as RJE (remote job entry) and communications processors. These models have in turn been superseded by the new B 866 and B 876 models.

Along with the B 700 systems, Burroughs announced the AE 301 Audit Entry computer—a stand-alone, key-to-cassette data entry device intended for off-line data collection. The AE 301 and its successors prepare a line-by-line journal listing of all input transactions for audit trail purposes and provide basic user storage for edit criteria and data validity checking. Input transactions are also recorded on a standard tape cassette for data transfer to the main B 700 console. At the time of its introduction, the AE 301 added a welcome data preparation/audit entry capability to Burroughs' small-scale computers, at a per-station cost that was competitive with large-configuration key-to-disk and key-to-diskette systems. The Burroughs Audit Entry technique is easy to use from a file standpoint, has a relatively fast transfer rate, and can be configured with on-line capability.

On February 4, 1975, exactly four weeks after IBM introduced the System/32, Burroughs responded to the new marketing challenge with four low-cost B 700 system models based on the B 711 processor and two new B 720 Series system models based on the new B 721 processor. The new systems were all available for immediate delivery. In the entry-level B 700 Series, the B 702, B 704, B 709, and B 713 were introduced. Each of these systems was designed with a special approach to data entry in mind. Expanded capabilities were made available through the two B 720 Series models, the general-purpose B 721 and the financially configured B 723.

The B 720 models at the time of announcement were the only B 700 systems offering the following capabilities: ➤

- The Master Control Program, included under CMS, provides a virtual, multiprogramming environment for concurrent execution of up to six programs, including one batch program. Software also includes data entry support for operation of a B 870 or B 860 system as a key/disk or direct data entry system.

CONTROL STORAGE: See the table on page M11-112-452.

REGISTERS: The B 800 contains both hardware and software registers. Listed below is a brief summary of the register complement.

Hardware Registers:

- **BSW**—a matrix of gates used to shift a parallel input data word left or right a number of places.
- **A1, A2, and A3**—16-bit registers used for temporary storage of data being transferred from the adder via the BSW.
- **B Register**—a 16-bit register which provides the primary interface between S-level (user) memory and the I/O controls. The B Register is also a secondary input to the adder.
- **Memory Information Register**—a 16-bit register utilized as a buffer for data written in memory or sent to a device.
- **Microprogram Count Register**—a 14-bit register used as a program counter.
- **Auxiliary Microprogram Count Register**—a 14-bit register used to store the address for jumps and subroutine returns within microprograms.
- **Memory Address Register**—holds the eight low-order bits of a memory address.
- **BR1 and BR2**—8-bit used to hold a device address or the base address of a 256-word block of data. ➤

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➤ twice as much main memory as the earlier B 700's (up to 98,304 bytes, versus a previous maximum of 49,152 bytes), MOS memory rather than core, industry-compatible mini-disk storage (Burroughs parlance for diskette storage), a new disk controller that reduces processor loading, industry-standard magnetic tape I/O, a 400-line-per-minute printer, an electronic keyboard for system/operator communications with an attached console printer, MICR document input, and a new independent and simultaneous data communications processor with the ability to handle four lines concurrently. These capabilities have been retained and in many cases expanded in the B 800 Series systems.

SOFTWARE

Two operating systems are available for the B 800 systems.

SCP is a foreground/background operating system that provides essentially the same functions as the SCP running on a B 700. Under this operating system, a limited form of multiprogramming is allowed through the ability to run one batch job and up to four DDES units with their associated Audit Entry Language programs. An interrupt/resume or checkpoint/restart function, which rolls out the present status of the machine and its processing onto disk to allow a high-priority job to be loaded into the system, is also utilized on the B 800 under SCP. Following completion of the high-priority run, the first program can be restored and processed. The interrupt can be initiated either by the operator or by a request from a TD 730 or TD 830 terminal, where an interrupt might take two or three seconds. If the DDES units are utilized in an SCP environment, the memory size must be at least 48K bytes.

SCP automatically maintains a system log on the console of the B 800. The size of the interpreter is about 16K bytes, leaving an additional 16K bytes for application software on minimal systems. However, the interpreter size can vary depending upon the peripheral requirements of the programs. The system's Dynamic Interpreter Configurator will configure only the microcode that is required to execute each particular application program.

SCP also contains trace and dump facilities, as well as operational recovery procedures. Code segmentation of user programs enables the use of overlays, with resultant efficient utilization of memory.

B 810 and B 820 models utilize the true multiprogramming CMS software that incorporates a Master Control Program (MCP), which is similar to the MCP used on the Burroughs B 1800 and B 80 computers. Under the MCP, jobs are scheduled according to memory priority, disk priority, and segment sizes. This operating system was designed to simplify the operation and control of the system and to increase productivity by automatically handling many functions that would ordinarily be handled by an operator or programmer.

- ● Counter—an 8-bit register whose function is primarily loop control.
- Literal Register—an 8-bit register used to temporarily store literals in the microprogram.
- Control Register—stores all control signals from ROM and is 40 bits long.
- Condition Register—functions as a 16-bit unit where individual bits can be tested by the microcode.
- Shift Amount Register—utilized in conjunction with the BSW to control the loading of shift amounts and the sequencing of shift operations.

Software Registers:

There are approximately 20 software registers. The least important of these are the 8-bit left Platen Forms Count and Forms Limit Registers; their right counterparts; the 16-bit Program Key Table and Numeric Print Mask Address Registers; the 8-bit Desired Print Position Register; the 1-bit Ribbon Register; and the 16-bit Inquiry Terminal Identifier Register. Other software registers include:

- Acum—a 64-bit register which serves functions of arithmetic, shifting, field isolation, communication-wide system control, logical arithmetic, and console input.
- DBT—a 16-bit register which stores the I/O descriptor table base address.
- IX1, IX2, IX3, and IX4—16-bit index registers.
- BCPR Register—provides communications from the system control program to the user program.
- REM—a 64-bit register which holds a remainder after division and scaled-off digits after multiplication.
- SR Register—controls scaling and/or rounding for multiplication and division and is five bits long.
- SRJE Register—points to the latest entry in an 8-level, 16-bit-wide circular subroutine return-to stack and is 16 bits in length.
- SRJS Register—a 16-bit register that points to the latest entry in a 4-level, 16-bit-wide circular subroutine return-from stack.

INTERRUPTS: The B 800 Series processors use a "soft" interrupt system, meaning that interrupt conditions do not cause any automatic hardware actions. Instead, the recognition of interrupt conditions and the initiation of the appropriate actions are completely under software control. Interrupts are handled by servicing the highest-priority device first.

PHYSICAL SPECIFICATIONS: The processor unit is 22.5 (B 810 or B 801) to 45 (B 820) inches wide, 29.25 inches deep, 44 inches high, and weighs 335 to 565 pounds.

Power requirements are 120/208 or 120/240 VAC +5, -10 percent at 60 Hertz +1 Hertz. The system requires 3.9 to 5.9 KVA. The operating environment is from 60 to 100 degrees Fahrenheit with a humidity tolerance ranging from 10 to 80 percent noncondensing. Additional air conditioning above normal office levels is not required except in extreme operating environments. The system dissipates about 2730 BTU's of heat per hour. General machine requirements indicate the need for a floor area of 10 by 4 feet exclusive of operator and service requirements. Configurations involving tape and disk will affect operating temperature and humidity ranges.

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▷ Operator communication with the MCP is provided through a system console that provides messages pertaining to beginning of job, end of job, errors, file requirements, status of the job mix, missing data, or messages generated by user software. This console could be either a B 9343-120 printing console or the B 9347-2 DDES data entry station. When utilizing the DDES, system messages are displayed and stored for subsequent printing on the line printer. The operator can refer back to system messages at any time, and the system enforces the saving of all messages.

The MCP in the B 800 allows multiprogramming to take advantage of all available resources. It may not be unusual to have three or more programs running on a B 800, but memory requirements and disk storage capacity will normally determine the practical extent of the multiprogramming capabilities. The B 800 MCP also supports virtual memory. COBOL and RPG programs are automatically segmented by the compiler, and only those segments that are necessary are brought into the processor. This allows the B 800 to process a mix of independent programs, any or all of which may be larger than main memory.

Two languages, COBOL and RPG, are available on the B 800 systems for general business purposes. The B 800 Series has its own on-board compiler for each, but programs may also be compiled on a larger Burroughs computer such as a B 3700.

COBOL on the B 800 is an essentially complete implementation of full American National Standard COBOL 74. The COBOL compiler runs on any B 800 processor with at least 32K bytes of main memory (16K bytes of user memory on the smaller B 800's). The compiler itself is actually broken up into about 10 segments to fit into a minimal main memory, and the segments are strung together through the ability of one program to call in another program (ZIP). This aspect of the COBOL compiler is transparent to the user.

The B 800 RPG 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 that programs can be written without the usual limitations imposed by the host computer's memory capacity. Again, the compiler is divided into numerous segments that are automatically called in when needed, so the RPG compiler can run on a minimal B 800 system with 32K bytes of memory (16K bytes of user memory). RPG programs can also be compiled on larger Burroughs computers, such as the B 3700.

Several special-purpose programming languages are also available on the B 800 systems.

The Pocket Select Language (PSL) is specifically designed to produce code that allows the user to determine the formats of documents and to pocket-select them, based on format or field values, when document-sorting ▷

▶ INPUT/OUTPUT CONTROL

I/O CHANNELS: Direct memory access channels are provided for disk and programmable data communications subsystems. For each data/control word transferred, one cycle of processor time is stolen. The maximum I/O data transfer rate is 2 million bytes per second. See the table on page M11-112-452 for more details.

SIMULTANEOUS OPERATIONS: All I/O controls are buffered to permit overlapped read/write/compute operations.

CONFIGURATION RULES: Each device or subsystem attached to a B 800 system requires one I/O channel except the single-line controller, which requires two. Some assignments to particular I/O ports are standard. These fixed assignments vary from model to model. A maximum of 2 line printers can be configured.

MASS STORAGE

A 9489-5 or -17 INDUSTRY-COMPATIBLE MINI-DISK (ICMD) DRIVE: This floppy disk drive is available either as a free-standing unit (-17) or as an inbuilt unit (-5) on all B 800's. A subsystem is composed of a controller and one ICMD drive. The ICMD drive reads only one side of each diskette. Each diskette stores 243K bytes of data, with 128 bytes per sector, 26 sectors per track, and 77 tracks per diskette (including 3 alternates). Track-to-track positioning time is 20 milliseconds per step, and settling time is 10 milliseconds, and the data transfer rate is 31K bytes per second. The ICMD is manufactured by Burroughs.

A 9489-18 ICMD: This dual floppy disk drive is available only as a free-standing unit. The technical specifications of the 9489-18 are identical with those of the 9489-5 and -17 except that there are two diskette drives, yielding a total of 486K bytes of on-line data storage.

A 9489-11 OR -12 BURROUGHS SUPER MINI-DISK (BSM) DRIVES: These floppy disk drives are available as a free-standing unit. The BSM subsystem consists of a controller with two 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 positioning 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. BSM drives are available on all B 810 and B 820 configurations. The drives are manufactured by Burroughs.

A 9489-1 OR -2 BURROUGHS SUPER MINI-DISK (BSM) DRIVES: These are the designations of the built-in versions of the 9489-11 or -12 free-standing drives.

B 9480/9481 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 cabinet houses two drives.

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. ▶

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- ▷ peripherals are configured. PSL bears some resemblance to COBOL in both concept and use.

The Audit Entry Language (AEL) consists chiefly of record names and field descriptions. Its function is to provide control over the formats of input data records that are generated on Burroughs Audit Entry Computers (the AE 501, for example).

The 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. NDL handles remote and directly connected terminals in such a way that the user can write programs in the same manner as for conventional on-site peripheral devices.

The Message Processing Language (MPL) 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 the 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 out-of-service terminals in temporary storage on disk.

The Report Creation System consists of three programs designed to retrieve and display information in a report format. Up to five variables may be loaded at run time. Allowable operations include arithmetic, record selection, comparison testing, and listing.

The Data Control System (DCS) is a comprehensive user-oriented software system designed to provide interactive audit entry input, reporting, inquiry, file maintenance, and interactive conversational prompting capabilities. In addition, this system provides uniformity in operating procedures between different programs, thereby adding to the simplicity of the total system.

There are approximately 25 utility programs in a package sold separately for the B 800. The utility package includes programs to print disk directories, sort, squash disk files, copy disks, dump files from various peripherals to other peripherals, dump programs from disk to various peripherals, and load programs from various peripherals. (For the fun-loving, games such as battleship, golf, and blackjack, are also available from your salesman.)

Since some B 800 configurations are object-code compatible with the B 700 systems, while the other B 800 configurations are at least source-code compatible, Burroughs can utilize the dozens of application programs that have been developed for the B 700 since 1973. Accounting programs run the gamut from payroll to general ledger, while specific packages have been developed for practically every industry: banking, manufacturing, wholesaling, retailing, medical clinics, hospitals, local and state governments, contractors, fuel oil, and motor freight. ▷

- ▶ 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 193 bytes per second. The 9481-12 has an average rotational delay of 20 milliseconds, and a data transfer rate of 193K bytes per second. The controller is similar to one utilized on the ICMD drives and contains two 200-character buffers.

With the use of the B 383-3 disk multiplexer (MUX), a B 800 system can use up to 4 dual disk cartridge drives for a maximum capacity of 36.8 million bytes.

Disk cartridge drives can be configured on all B 800 models. The drives are manufactured by Burroughs.

B 9493 FIXED-DISK DRIVES (FDD): Four models of fixed-disk drives are available for use with the B 810 and B 820 processors:

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

One I/O port is required for the controller (B 384-2), and a maximum of two fixed-disk drives can be configured. In order to facilitate proper disk backup, only one B 9493-37 FDD may be used on a system. In addition, the MUX will support one B 9493-18 FDD 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 2 surfaces utilized in the B 9493-9. Expanded capacities are accomplished by adding platters. (Each platter holds 9.4 million bytes.) The data transfer rate is 384K bytes per second.

B 9387 DISK PACK DRIVES: Two dual disk pack drive units and an incremental dual drive unit are available for use in B 820 systems:

Model	Capacity (bytes)	Avg. Access Time
B 9387-11	65.2 million	33 milliseconds
B 9387-12	130.4 million	33 milliseconds
B 9484-5	130.4 million increment	33 milliseconds

One B 287-2 disk drive control is required for the first drive unit, and a maximum of three increments can be added to a disk pack system, allowing a total of four 130.4-million-byte dual drive units for a maximum capacity of 521.6 million bytes of on-line storage. The controller is included in the initial disk pack drive price and serves as a separate processor for all disk pack functions. There are 180 bytes per sector, 90 sectors per track, 815 tracks per surface, and 5 of 6 surfaces are used. Five sectors are reserved in each cylinder for replacing bad sectors, and one cylinder is reserved. Each surface has one read/write head. The data transfer rate is 497.9K bytes per second.

INPUT/OUTPUT UNITS

See the Peripherals/Terminals table on page M11-112-453 for units other than the AE systems, B 9347-2, and B9343-120, which are described below.

AUDIT ENTRY DATA PREPARATION SYSTEMS: The Burroughs AE systems are minicomputer-based systems that edit, validate, and capture ready-to-process data on ▶

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▷ As alternatives to the Burroughs packages, numerous software houses specialize in writing customized programs for the B 700 and B 800 computers.

Maintenance service and technical support for the B 800 systems are provided worldwide by Burroughs' own support personnel.

Professional training is available for those who purchase standard software packages. Burroughs training centers are located in areas such as Philadelphia, Syracuse, Detroit, Atlanta, Chicago, Dallas, Los Angeles, San Francisco, and Pasadena. Currently, tuition is about \$100 per day, but some management courses are free. Training on specific packages can be arranged in some local areas, provided at least five students are enrolled and adequate classroom facilities are available. Some modules require one day of training, while complete systems may require up to 17 days of classroom work. Generalized courses include subjects such as Operator Training, COBOL, RPG, and Introduction to Computers.

COMPATIBILITY AND COMPETITION

Software compatibility is one of the greatest strengths of the B 800 family. Burroughs has built in a well-defined growth route for current B 700 users to follow. They can upgrade to a B 801 without any conversion, and later upgrade their B 801 to a B 810 or B 820 by simply recompiling the source code after passing it through a filter program. Once the programs have been recompiled, they will be compatible with the larger B 1800 Series computers, again providing a clearly defined growth path.

From a competitive standpoint, the B 800 systems are so versatile that they could conceivably compete with an IBM System/32 on the low end (\$32,400) and with a DEC Datasystem 350 on the high end (\$71,275). Burroughs salesmen will have a lot of room to maneuver, since there is an overlap on the low end with the B 80 and another overlap on the high end with the B 1800 Series. (The B 80, B 800, and B 1800 systems all feature multi-programming.) Other competition will come from Honeywell's Level 62, Basic Four's 400, IBM's System/3 Models 4, 8, and 12, NCR's 8200 and Century 50, and numerous competitors in the turnkey and systems house fields. Armed with the B 80, B 800, and B 1800, the Burroughs salesperson will be able to offer the system that will provide the best cost/performance ratio for each proposal.

The B 800 systems should place Burroughs in a strong competitive position, especially where the emphasis is on a total commitment from a single vendor (hardware, software, training, and maintenance). With extensive application programs waiting in the wings, and with more than 3,000 B 700 installations as candidates for upgrades, Burroughs should be successful with the B 800. □

▶ magnetic tape cassettes, industry-compatible floppy disks, or Burroughs Super Minidisks for batch transmission to a host computer. Errors are detected and corrected at the point of original entry. The AE systems simultaneously print an audit

journal to assist the operator and to permit subsequent auditing.

There are currently five audit entry data preparation system models offered by Burroughs. The AE 501 system is the oldest entry in the current line, having been announced in September 1975. The AE 412, AE 422, AE 511, and AE 513 were all introduced in November 1976 and are scheduled for delivery beginning in the second quarter of 1977.

All AE systems include a 28K processor, a standard Burroughs alphanumeric keyboard, a separate 10-key numeric pad, special function keys, and 16 program select keys. All systems have a data communications capability and can have up to twice the data storage capacity of the basic system.

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

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

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

The basic AE 501 system includes the matrix printer, a magnetic tape cassette unit with a data storage capacity of 204,800 bytes, and one asynchronous or synchronous data communications line.

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

B 9347-2 DIRECT DATA ENTRY STATION (DDES): The DDES is an operator-oriented data capture system that can be used with the B 800 Series systems. It is composed of four integral subsystems: display, keyboard and keyboard indicator assembly, power supply, and electronics assembly. The display is the same 256-character Self-Scan panel used in the Burroughs TD 700 and TC 5100 Series. The keyboard and keyboard indicator assembly is a version of the one used in the AE 501. Program select keys have increased in number from 16 to 24, while keyboard indicator lights have increased from 29 to 30.

While the DDES is often configured for on-line, high-speed data entry and inquiry, in some B 800 configurations the DDES is used as an operator console to communicate with the MCP operating system. This is the first time that Burroughs has introduced a paperless operator console for use with its small disk systems. With the DDES as an operator console, system messages are displayed and then stored on disk, and can be printed on a line printer at a later time. The storage of all messages is enforced and automatic; messages can be recalled at will by the operator.

When used as an input device under the SCP software, the DDES acts the same as it would on a B 700. Under those conditions, several environments have been defined. Their requirements are given in the following table. The table is based on up to four DDES units on-line with an average requirement of 2K bytes for each AEL (Audit Entry Language) program. ▶

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Batch Job	Number of Required B 800	
	DDES Units	Memory Capacity
No batch	4	40K bytes
Small batch (8K)	4	48K bytes
Medium batch (14K)	1	48K bytes
Large batch (16K)	4	56K bytes

Unlike other AE devices, the B 9347-2 has no peripherals of its own, but rather relies solely on the direct interfaces of the B 800. This is particularly important in consideration of the mass storage requirements of the B 800 with DDES.

When used in the CMS environment with multiprogramming, the DDES interaction is handled by the DCP, which uses the Network Definition Language (NDL) to process all information.

The DDES has six machine states: ready, accept, load, operation, unload, error. In each state, the DDES can accept only certain program signals via the keyboard. All others are either ignored or cause error procedures to be initiated. Operator communications include prompting messages, an audible alarm, program control indicators, and error message display.

The Audit Entry Language (AEL), developed for the DDES, is a simplified language with strong editing capability. AEL is designed to be used by the customers with no programming experience and a minimum of training. At the moment of input, AEL interacts with selected B 800 disk files for verification of valid account numbers and visual display of related alpha descriptions. A complete audit trail is provided by line printer listings of all entered data.

B 9343-120 PRINTING CONSOLE: This 120-cps printing console is similar to the popular L 9000 Series minicomputer console. Since Burroughs wants to maintain compatibility with previous B 700 programs that used the L Series-type console, the printing console on the B 800 models must be software-compatible, and therefore almost identical. The B 9343 features a typewriter keyboard, a 10-key numeric pad, 255 printing positions with dual independent forms control mechanisms, front-feed form insertion, and 24 program select keys that can be used with application software to provide operator control over branching and other decisions. Besides having hardware and software compatibility when upgrading to a B 800, L Series users will also experience operator compatibility, since the operator will be using the same basic console.

The B 9343 provides three functions on B 800 systems: first, as an operator's console, the interaction between the MCP operating system and the operator is recorded on paper for immediate reference; second, the console is used as a data entry device in conjunction with application software; and third, the console can be used as a back-up printer for printing at the same time as the normal line printer(s), or it can be used exclusively in the event that the line printer(s) are down. Whether the B 9343 is used for any or all of the above functions will be dependent upon the system software that is in use at the time.

DATA COMMUNICATIONS

The B 800 Series permits data communications through the use of a B 358-1 Data Communications Pre-Processor (DCPP), which takes one port and allows up to four B 658-1 single-line adapters. Any or all lines may be either modem- or direct-connected to the single-line adapter. In addition, any or all lines may use the B 658-1 single-line adapter for DDES direct connect.

Typical configurations of terminals might include a maximum of four DDE stations, two DDE stations and three to six TD terminals, or one DDE station and a string of TD terminals where the limits of the "string" are determined by the activity of the terminals, the line speeds selected, and the

desired line response time. If no DDE stations are used, from 4 to 10 TD terminals will represent a practical configuration.

Another method is to use a single B 658-9 two-line Auto Call Unit with each DCP. Each line could be attached to a B 658-1 single-line adapter, and then to a TA 714 Auto Call Data Set or a Bell 801 Data Set.

For direct-connect purposes, a B 358-1 DCP can be connected to a B 810 or B 820 CPU under CMS software, and each line can then go to a B 658-7 line adapter for DDES stations, or to a B 658-1 line adapter and then through a B 552 direct-connect kit to qualified terminals.

Qualified terminals include the Burroughs TD 700, TD 730, TD 800, TD 830, TC 3500, TC 3600, TC 3800, TC 3900, TC 4000, TC 5100, TC 500, TC 600, TC 700, TC 750, and DC 140.

Permissible data sets include the Burroughs TA 713, TA 714, TA 783, TA 734-24, TA 733-48, TA 753, TA 1203, and TA 2403, and Bell 202 A/C/D, 201 A/B, 103 A/F, and the 801 A auto call unit.

The single-line data communications feature enables synchronous or asynchronous data transmission at rates up to 9600 bits per second. It can be used to transmit data to another B 800, to a B 800 from a TD series terminal, to a larger Burroughs or other vendor's host mainframe, or to accept data from a host processor for printing at the local site. The B 800 can also be made to look like an IBM 3780 for communications to an IBM 360 or 370.

The B 358-1 Data Communications Pre-Processor operates independently of the CPU to permit simultaneous handling of four concurrent lines, which can be asynchronous or synchronous at rates from 75 to 9600 bits per second. It is programmed using the Network Definition Language (NDL) that is used in data communications networks supported on the entire Burroughs B Series computer family.

One or two data communications processors (DCP) can be attached to the B 876. Each of these processors is capable of servicing up to 16 lines concurrently in either a full- or half-duplex mode in a multipoint or point-to-point network. The DCP is a microprocessor with 6144 12-bit words of memory. The DCP memory contains the NDL interpreter and communicates with the main B 876 memory at speeds up to 2 megabytes per second via a direct memory access channel. The DCP is capable of operating concurrently with the main processor. Data communications line characteristics are fully controlled by the MCP. NDL offers full programmability for each line.

Line characteristics include odd, even, or no parity; 5-, 6-, 7-, or 8-bit characters; asynchronous transmission to 1800 bps; synchronous transmission to 9600 bps; two-wire direct connect to 9600 bps; Burroughs direct connect to 19,200 bps; and broad-band transmission to 50,000 bps. Up to 14 different asynchronous clock rates can be accommodated by the DCP.

DC 140: To provide more efficient communications with a central site, Burroughs also offers the DC 140 Series System Processor. The DC 140 has its own peripheral capabilities including up to four magnetic tape cassette drives, reel-to-reel magnetic tape drives, punched paper tape units, 80- and 96-column card units, 85 to 250 lpm printers, and data entry and display units. Present in the DC 140 is a 64K-byte MOS memory with a 1.5-microsecond cycle time and a 1.2 microsecond access time. Approximately 14K bytes of memory are dedicated to microcode, with the remainder available for user programs. Word length is 64 bits. Transmit and receive buffers can be programmed to be as large as 4096 characters. Half-duplex operations are standard, with an asynchronous speed of 1200 bps (75, 100, 110, 150, 200, 300, 600, 1800, 4800, and 9600 bps optional) and a

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► synchronous speed of 2400 bps (2000, 4800, 9600 bps optional). Each DC 140 can have up to two independent data communications channels, permitting two different speeds at the same time, and two different line connectors. Line control procedures may be Burroughs standard Poll/Select or Point-to-Point, IBM 2260 procedures for four-wire leased line, IBM Binary Synchronous, Burroughs Central Terminal Controller, Burroughs Data Link Control, and auto-answer/auto-call switched lines.

REMOTE TERMINAL PROGRAM 3780 LOOK-ALIKE: A firmware set designed to make the B 800 function as an IBM 3780 remote batch terminal. The set consists of the 3780 Look-Alike Monitor and the 3780 Look-Alike Program. Both the monitor and program require a configuration which includes a B 800 with 32K bytes of memory, a single-line control, an system console, and a disk subsystem. The 3780 Look-Alike Monitor also requires a line printer, and an 80-column card reader/punch is optional. The 3780 Look-Alike Program has options to handle a line printer, an 80-column card reader, and an 80-column card reader/punch.

SOFTWARE

OPERATING SYSTEMS: By changing operating systems, a B 800 computer can take on two very different appearances. Under the System Control Program (SCP) software, the B 800 acts just like its predecessor (the B 700), while under the Computer Management System (CMS) software, the B 800 acts like the B 1800 multiprogramming computer. The only hardware consideration is the minimum memory size—32K bytes for an SCP system, and 64K bytes for a CMS system.

Through the *CMS* operating system, the B 800 computers utilize a Master Control Program (MCP) that is similar to the MCP used on the Burroughs B 1800 and B 80 computers. This operating system was designed to simplify the operation and control of the system, and to increase productivity by automatically handling many functions that would ordinarily be handled by an operator or programmer.

Operator communication is provided through a system console that provides messages pertaining to beginning the job, end of job, errors, file requirements, status of the job mix, missing data, or messages generated by user software. The console can be either a B 9343-120 printing console or the B 9347-2 DDES.

The MCP for the B 800 family allows multiprogramming to take advantage of all available resources. It is possible to have three or more programs running simultaneously on a B 800, but memory requirements and disk storage capacity will tend to impose practical limits on the system's multiprogramming capabilities. The B 800 MCP also support virtual memory. COBOL programs are automatically segmented by the COBOL compiler, and only those segments that are necessary are brought into the processor. Typically a program will be broken into input/output functions, constant data, variable data, and executable logic code. This allows the B 800 to process a mix of independent programs, any or all of which may be larger than main memory. The MCP will continually attempt to maximize main memory utilization by accepting new programs or by permitting large portions of active programs to remain resident in main memory.

CMS software can execute existing B 700 programs after the source code has been passed through a "filter" program and then recompiled. After this has been accomplished, the program can then take advantage of devices that were not available on B 700 configurations through the MCP's "dynamic resource allocation," where the MCP assigns alternate I/O devices when available. For example, if the line printers are being used when a program requires printer output, the MCP will make a

request to the operator to transfer printing to a B 9343 console (if configured), and will begin printing a report on the 120-cps matrix printer, although the program was written to print on a standard line printer. Disk allocation, memory assignments, program priority, and other functions are also under the control of the MCP.

The CMS software is loaded by simply inserting a disk on which the operating system is resident when warm-starting the B 800 (usually the first thing in the morning). Likewise, in order to load the SCP software, a disk holding the SCP operating system is used when warm-starting.

Under *SCP*, the B 800 utilizes an interrupt/resume or checkpoint/restart function, which rolls out the present status of the machine and its processing onto disk to allow a high-priority job to be loaded into the system. Following completion of the high-priority run, the first program can be restored and processed.

If a batch program is run concurrently with transaction input from DDES, a slight degradation will occur because of the interrupt/resume facility used by the batch job. This form of concurrency between a batch job and transaction in/out is the only multiprogramming capability offered on the B 800 under SCP software. (This type of "multiprogramming" is typical of the procedures used on many of the systems that will be competing with the B 800.) If the DDES units are utilized in an SCP environment, the memory size must be increased to 48K bytes.

The system control program controls the maintenance of a system log which uses the B 800's printing console to produce a journal record on one side of the carriage.

The full size of the SCP Interpreter is generally about 16,000 bytes. The main memory requirements for the Interpreter will vary from 5K to 32K bytes depending upon the peripheral requirements of the program. The system's DIC (Dynamic Interpreter Configurability) will configure only the microcode that is required to execute each particular application program. Various other non-resident segments of the Interpreter are brought into main memory as they are needed for each program.

SCP has the ability to handle up to four B 9347-2 DDES units. When the DDES option is operational, SCP checks for the presence of a character from the attached B 9347-2 station(s) at the end of each S-level instruction or every 500 microseconds (whichever occurs first). The appropriate Audit Entry program is given control if a character is found. The character is then processed according to the proper format specification, and the batch job is resumed until another character from a DDES is found.

The SCP I/O manager has the capability of handling automatic I/O error retries. SCP also contains trace and dump facilities, as well as operational recovery procedures. Code segmentation of user programs enables the use of overlays, with resultant efficient utilization of memory.

LANGUAGES: Both COBOL and RPG are supported under SCP or CMS. For the B 812, SCP also supports a Pocket Select Language for MICR readers. SCP supports both a standard and augmented Audit Entry Language for several models of the B 800. For data communications environments, the Network Definition Language and Message Processing Language are supported.

The *B 800 COBOL* language is an essentially complete implementation of full American National Standard COBOL 74. COBOL object programs are regarded as a collection of logical segments which can be loaded and executed individually or in groups; thus, programs can be written without the usual limitations imposed by the computer's memory capacity. ►

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► The COBOL compiler runs on any B 800 processor with at least 32K bytes of main memory (16K bytes of user memory), a line printer, and a disk drive. Object programs generated by the COBOL compiler are expressed in an S-language that is oriented toward efficient handling of 4-bit digits or 8-bit characters.

The *B 800 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 800 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 800 processor with at least 32K bytes of main memory (16K bytes of user memory) plus a line printer and disk drive.

The *B 800 Pocket Select Language (PSL)* is specifically designed to produce a PSL code file in S-language that allows the user to determine the formats of documents and to pocket-select them based on format or field values. The file built on PSL resides on disk and is utilized by the PSL Interpreter. Pocket Select Language is operational on a B 812 with a minimum of 32K bytes of memory, a cartridge disk drive, a line printer and a MICR Reader/Sorter. PSL bears some resemblance to COBOL in both concept and use. A Pocket Select Language Generator is also available to create a PSL source program from PSGEN input parameter cards.

The *B 800 Audit Entry Language (AEL)* consists chiefly of record names and field descriptions. Its functions is to provide control over the formats of input data records. No logical control beyond format considerations is inherent in the language. AEL permits sequencing of input data to fit the sequence of the source document and to write the data to disk in the format required for batch interfacing. All defined fields fall into one of six categories. Alpha fields place alphanumeric data into a record and may be tested for existence in a tag file. Constant fields place either an operator message on the screen or constant strings in a record. Increment fields function to add constants to accumulators. Numeric fields, which may be 4-bit packed digits or 8-bit bytes (with or without sign), may be range-checked, check-digit verified, searched for in a tag file, or added to or subtracted from an accumulator. Blank fields may clear the screen or blank part of a record, while accumulator display fields display the contents of an accumulator on the screen.

There are several extensions to standard AEL for the B 800 systems, including a program information format giving information about the data file to be created, such as data file name, disk drive number, and number of records in a file, along with the blocking factor, record size, and the size of the intermediate work file. Also, blanks may be used in AEL source programs for spacing, but will be ignored by the compiler. Leading zeroes of all integers will also be ignored by the compiler.

AEL features include the following: up to 100 accumulators may be utilized and incremented or decremented; up to 10 error messages or warnings may be printed for each AEL source line, directly below the line; accumulators may be checked for non-clear conditions; and numeric data to be displayed on the screen may be edited by a picture specification. All error messages may be defined by the programmer and displayed any place on the screen at the programmer's option.

The DDES program generated will vary from a minimum of 486 bytes to a maximum of 6480 bytes. An average program will be 2K bytes. During operations with DDES, approximately 16K bytes are required by the SCP Interpreter and 16K bytes by the DDES manager.

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 and directly connected 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 requires at least 32K bytes of memory above the requirements for SCP or CMS. A console printer and disk subsystem are also required.

Message Processing Language (MPL) 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 the 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.

The *B 800 Report Creation System* consists of three programs designed to retrieve and display information in a report format. The File Generation program interactively accepts and edits both file and record specifications entered from the console keyboard. The Report Specification Generator program functions to input the specifications of a desired report. The Report Writer program utilizes the parameter file from the report specification generator to produce the desired report. Up to five variables may be loaded at run time. Allowable operations include addition, subtraction, multiplication, and division; record selection; comparison testing; and listing. The system requires a B 800 with a minimum of 32K bytes of memory, a system console, and a disk subsystem. COBOL is required for compilation.

The *Data Control System (DCS)* is a comprehensive user-oriented software system designed to provide interactive audit entry input, reporting inquiry, file maintenance and interactive conversational prompting capabilities. In addition, this system provides a high degree of uniformity in operating procedures between different programs, thereby adding to the simplicity of the total system.

UTILITIES: Burroughs offers 24 programs and micro-coded routines to the B 800 user. Basic requirements are a B 800 processor with a minimum of 32K bytes of memory and a disk subsystem. The utilities include the Check Digit Table Generator; Card List; Card Load to Disk; Cold Start from 80-column cards, 96-column cards, magnetic tape, or tape cassette; Disk Director List; Disk File List; Dump/Purge File; Disk Primer Cold Start; Dump Disk Files to Tape; Create Cold Start Tape/Cassette; Object Program-Disk to 80-column card, or to 96-column card; 80 to 96 Object Program Conversion; Paper Tape Copy; Restart; Generalized Sort; Disk Squash; Tape/Cassette Copy; Tape/Cassette to Disk; Tape/Cassette List; and Warm Start.

APPLICATION SOFTWARE: Burroughs presently offers application programs either by the module or by the package. All B 700 programs can be utilized on B 800 SCP systems without modification, and can be utilized with

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► minor modifications on CMS systems. Currently available packages include the Bank Business Management System, Thrift Business Management System, Credit Union Business Management System, Contractor Business Management System, Fuel Oil Business Management System, Manufacturing Job Cost System, Production Control System, Hospital Management System, Public Utility Billing System, Wholesale Business Management System, Wholesale/Distribution BMS On-Line Order Entry and Inquiry System, TBA (Tire, Battery and Accessory) Business Management System, Motor Freight Business Management System, and Commercial Business Management System (Keyboard Entry). For a detailed listing of the individual modules that constitute these systems, please refer to the price list at the end of this report.

PRICING

POLICY: Burroughs offers the B 800 systems for purchase or lease. In addition to the basic one-year lease, Burroughs offers three-year and five-year leases at a discount.

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. Individual monthly maintenance charges are detailed in the price list; not all of these charges were available at press time. Burroughs software technical assistance, for installation support and

beyond, is available to B 800 users at a price of \$225 per day. Hardware installation support for purchased system is billable at \$225 per day. Two days are usually the maximum requirement.

Application software prices quoted in the price list are for an unlimited-time license plan for each designated CPU. Besides this plan, two limited-time (3-to-5 year) plans are available. The first involves an initial payment and an annual fee, while the second involves the same annual fee but divides the initial fee into 12 monthly installments.

Customer education for application programs is charged at a rate of \$100 per day. Some modules require one day, while complete systems may require up to 17 days. Courses on the B 800 hardware and software include subjects from Introduction to Computers (2 days) through B 800 COBOL (10 days). All cost \$100 per day.

Training is available at many Burroughs centers throughout the United States, including 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: Representative configurations are best shown by the packaged systems offered by Burroughs. These can be evaluated in detail in the price list that follows. ■

EQUIPMENT PRICES

PACKAGED SYSTEMS

		Purchase Price	Monthly Maint.	Rental (1-year lease)*	Rental (3-5-year lease)*
B 801-xxx	Each of the following B 801 packaged systems includes a minimum of: a 1-MHz CPU, 1 B 9343-120 120-cps console printer, 1 console control, 1 PF-29 pin-feed forms controller, 1 A 9480-22 4.6-million-byte dual disk cartridge drive, and 1 disk drive controller. The prices do not include system software, utilities, training, or area destination charges. B 801-xxx packages run under SCM software.				
B 801-200	Specified system with 32,768 bytes of main MOS memory	\$32,400	\$198	\$ 968	\$ 880
B 801-204	Specified system with 32,768 bytes of main MOS memory, 1 A 9249-2 160-lpm line printer, and 1 printer control	37,400	227	1,118	1,016
B 801-504	Specified system with 49,152 bytes of main MOS memory, 1 A 9249-2 160-lpm line printer, 1 printer control, 1 B 9347-2 DDES workstation, and 1 DDES control	44,900	271	1,341	1,219
B 801-604	Specified system with 49,152 bytes of main MOS memory, 1 A9249-2 160-lpm line printer, 1 printer control, 1 TD 731 display, 1 TD 016 keyboard, cable and interface, and 1 B 351-3 single-line control	45,900	227	1,372	1,247
B 801-xxx	SCM system software (for all above B 801-xxx packages)	1,500	—	—	—
	Utilities	540	—	—	—
B 811-xxx	Each of the following B 811 packaged systems includes a minimum of: a 1-MHz CPU, 65,536 bytes of main MOS memory, 1 A 9480-22 4.6-million-byte dual disk cartridge drive, and 1 disk drive control. B 811-xxx packages run under CMS software.				
B 811-104	Specified system with 1 DDES console, 1 console control, 1 A 9249-2 160-lpm printer, and 1 printer control	37,400	233	1,118	1,016
B 811-200	Specified system with 1 B 9347-120 120-cps console, 1 console control, and 1 PF-29 pin-feed forms control	35,900	227	1,073	975
B 811-204	Specified system with 1 B 9347-120 120-cps console, 1 console control, 1 PF-29 pin-feed forms control, 1 A 9249-2 160-lpm line printer, and 1 printer control	40,900	254	1,222	1,111
B 811-304	Specified system with 1 B 9347-2 DDES console, 1 DDES control, 1 A 9249-2 160-lpm printer, 1 printer control, 1 B 358-1 DCPD data communications pre-processor, 1 B 9347-2 DDES workstation, 1 B 658-7 line adapter, and 1 B 358-26 4-line half duplex control	44,900	277	1,341	1,219
B811-404	Specified system with 1 B 9347-2 DDES console, 1 console control, 1 A 9249-2 160-lpm printer, 1 printer control, 1 B 358-1 DCPD data communications pre-processor, 1 TD 731 display, 1 TD 016 keyboard, 1 cable and interface, 1 B 522 direct-connect kit, 1 B 658-1 data comm. line adapter, and 1 B 358-26 4-line half-duplex control	45,900	283	1,372	1,247
B 811-504	Specified system with 1 B 9343-120 120-cps console, 1 console control, 1 PF-29 pin-feed forms control, 1 A 9249-2 160-lpm printer, 1 printer control, 1 B 9347-2 DDES workstation, 1 B 658-7 line adapter, 1 B 358-1 DCPD data communications pre-processor, and 1 B 358-26 4-line half-duplex control	48,400	297	1,445	1,315
B 811-604	Specified system with 1 B 9343-120 120-cps console, 1 console control, 1 PF-29 pin-feed forms control, 1 A 9249-2 160-lpm printer, 1 printer control, 1 B 358-1 DCPD data commu-	49,400	302	1,476	1,342

*Equipment rental prices include maintenance.

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EQUIPMENT PRICES

PACKAGED SYSTEMS (Continued)		Purchase Price	Monthly Maint.	Rental (1-year lease)*	Rental (3-5-year lease)*
	nications pre-processor, 1 TD 731 display, 1 TD 016 keyboard, 1 cable and interface, 1 direct connect kit, B 658-1 data comm. line adapter, and 1 B 358-26 4-line half-duplex control				
B 812-295	Banking system; includes a 1-MHz CPU, 1 B 9343-120 120-cps console, 1 console control, a total of 65,536 bytes of MOS main memory, 1 B 9480-12 4.6-million-byte 80-millisecond dual disk cartridge drive, 1 disk drive control, 1 A 9249-3 250-lpm printer, 1 printer control, 1 B 9135-2 900-dpm 8-pocket reader/sorter, and 1 reader/sorter control	91,400	702	2,730	2,482
B 821-xxx	Each of the following B 821 packaged systems includes a minimum of: a 2 MHz-CPU, 49,152 bytes of MOS main memory, 16,384 bytes of bipolar memory, 1 A 9480-22 4.6-million-byte dual disk cartridge drive, and 1 disk drive control.				
B 821-104	Specified system with 1 B 9347-2 DDES console, 1 console control, 1 A 9249-2 160-lpm printer, and 1 printer control	41,900	259	1,253	1,139
B 821-200	Specified system with 1 B 9347-120 120-cps console, 1 console control, and 1 PF-29 pin-feed forms control	40,400	251	1,208	1,098
B 821-204	Specified system with 1 B 9343-120 120-cps console, 1 console control, 1 PF-29 pin-feed forms control, 1 A 9249-2 160-lpm printer, and 1 printer control	45,400	280	1,357	1,234
B 821-304	Specified system with 1 B 9347-2 DDES console, 1 console control, 1 A 9249-2 160-lpm printer, 1 printer control, 1 DCPD data comm. pre-processor, 1 TD 731 display, 1 TD 016 keyboard, 1 cable and interface, 1 B 658-1 line adapter, 1 direct-connect kit, and 1 B 358-26 4-line half-duplex control	49,400	303	1,476	1,342
B 821-404	Specified system with 1 B 9347-2 DDES console, 1 console control, 1 A 9249-2 160-lpm printer, 1 printer control, 1 DCPD data communications pre-processor, 1 TD 731 display, 1 TD 016 keyboard, 1 cable and interface, 1 B 658-1 adapter, 1 direct-connect kit, and 1 B 358-26 4-line half-duplex control	50,400	309	1,505	1,368
B 821-504	Specified system with 1 B 9343-120 120-cps console, 1 console control, 1 PF-29 pin-feed forms control, 1 A 9249-2 160-lpm printer, 1 printer control, 1 B 9347-2 DDES workstation, 1 line adapter, 1 DCPD data comm. pre-processor, and 1 B 358-26 4-line half-duplex control	52,900	324	1,581	1,437
B 821-604	Specified system with 1 B 9343-120 120-cps console, 1 console control, 1 PF-29 pin-feed forms control, 1 A 9249-2 160-lpm printer, 1 printer control, 1 B 358-1 DCPD data comm. pre-processor, 1 TD 731 display, 1 TD 016 keyboard, 1 cable and interface, 1 direct-connect kit, 1 B 658-1 line adapter, 1 B 358-26 4-line half-duplex control	53,900	329	1,609	1,463
B 828-105	Disk pack system; includes a 2-MHz CPU, 1 B 9347-2 DDES console, 1 console control, 49,152 bytes of MOS main memory, 16,384 bytes of bipolar memory, 1 A 9249-3 250-lpm printer, 1 printer control, 1 B 9387-11 65.2-million-byte disk pack drive and control, and 1 B 387-2 host control.	71,275	431	2,339	2,126
B 8xx-xxx	CMS system software (for all B 811, B 812, B 821, and B 828 systems) Utilities	2,500 540	— —	— —	— —
	Upgrade option from B 81x-xxx to B 82x-xxx (1 MHz to 2 MHz)	5,990	—	171	163
MEMORY					
B 31-2	8,192 bytes of MOS memory	990	10	39	35
MASS STORAGE					
A 9489-1	1-million-byte Burroughs Super Mini-Disk drive (master)—inbuilt	—	—	—	—
A 9289-2	1-million-byte Burroughs Super Mini-Disk drive (slave)—inbuilt	—	—	—	—
A 9489-11	1-million-byte Burroughs Super Mini-Disk Drive—free standing	3,200	28	89	85
A 9489-12	2-million-byte dual Burroughs Super Mini-Disk Drive—free standing	—	—	—	—
A 9489-5	243K-byte industry-compatible floppy disk drive—inbuilt	2,950	17	82	78
A 9489-17	243K-byte industry-compatible floppy disk drive—free standing	3,200	22	89	85
A 9489-18	486K-byte industry-compatible dual floppy disk drive—free standing	5,000	22	139	132
B 9480-12	4.6-million-byte dual disk cartridge drive (80 msec. access)	11,900	70	342	325
B 9481-12	9.2-million-byte dual disk cartridge drive (100 msec. access)	14,900	95	502	477
B 9480-22	4.6-million-byte dual disk cartridge drive (145 msec. access)	9,500	66	274	260
B 9493-9	9.4-million-byte fixed-disk drive	9,250	82	308	270
B 9493-18	18.8-million-byte fixed-disk drive	10,900	88	363	327
B 9493-28	28.2-million-byte fixed-disk drive	14,900	113	502	452
B 9493-37	37.6-million-byte fixed-disk drive	17,900	131	597	537
B 9387-11	65.2-million-byte dual disk pack drive and control	34,000	254	850	808
B 9387-12	130.4-million-byte dual disk pack drive and control	46,000	254	1,150	1,093
B 9484-5	130.4-million-byte dual disk pack increment to B 9387-12 (maximum of 3); uses first controller	31,500	140	770	732
B 386-3	Control for floppy disk drives A 9489-5, -17, -18	1,340	6	42	38
B 386-4	Control for Super Mini Disk drives A 9489-11, -12	1,875	12	63	57
B 384-2	Control for fixed disk drives (all)	1,875	12	63	57
B 383-4	Control for disk cartridge drives (all)	675	18	21	18
MAGNETIC TAPE EQUIPMENT					
A 9490-25	Magnetic tape cassette drive; 10 ips	1,640	8	55	53
A 9491-2	9-track, 800 bpi, 12.5-ips magnetic tape drive	8,900	25	226	204
B 394-2	Control for cassette drives (A 9490)	800	4	26	24
B 395-2	Control for tape drives (A 9491)	1,250	12	32	29

*Equipment rental prices include maintenance.

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EQUIPMENT PRICES

		Purchase Price	Monthly Maint.	Rental (1-year lease)*	Rental (3-5-year lease)*
PRINTERS					
A 9249-2	Line printer; 160 lpm, 132 positions, chain	9,900	88	293	278
A 9249-3	Line printer; 250 lpm, 132 positions, chain	13,400	118	392	372
A 9247-12	Line printer; 400 lpm, 132 positions; 12-channel VFU, train	21,500	173	613	562
A 9247-13	Line printer; 750 lpm, 132 positions; 12-channel VFU, train	35,000	—	968	—
B 244	Control (EBCDIC or ASCII) for 450- or 700-lpm printers	1,200	7	37	34
B 243-4	Control for 160- or 250-lpm printers	625	7	19	17
B 9948-1	12-channel format tape upgrade for 160- and 250-lpm printers	1,200	—	32	—
B 9942-9	Additional train module for 400- and 750-lpm printers	3,500	—	68	63
PUNCHED CARD EQUIPMENT					
A 9115	80-column card reader; 300 cpm	5,075	40	135	124
A 9116	80-column card reader; 600 cpm	7,135	55	213	196
A 9119-1	96-column card reader; 300 cpm	4,420	33	110	93
B 115-2	Control for 80-column readers	880	9	25	23
B 313-1	Control for 96-column readers	850	3	26	24
PUNCHED CARD EQUIPMENT (SCP systems only)					
A 9418-2	80-column reader/punch/data recorder, 200/45/45 cpm	12,060	109	321	305
A 9419-2	96-column reader/punch/data recorder, 300/60/60 cpm	8,750	93	274	260
A 9419-6	96-column reader/punch/sorter/data recorder 300/60/60 cpm	9,250	111	326	310
B 313-1	Control for 96-column card devices	850	3	26	24
MICR READER/SORTER					
B 9134-1	Reader/sorter, 4 pockets, 1625 dpm; requires B 9938-X	49,200	460	1,072	1,018
B 132-1	Control without endorser option	750	5	23	21
B 132-2	Control with endorser option	1,000	5	26	24
B 9935-2	4-pocket module (5 through 16)	14,400	49	314	298
B 9938-1	Multitrack E-13B, 1625 dpm	18,000	71	392	372
TERMINALS					
All TD Series terminals except the TD 730 & 830 are not in new production but are warehouse stocks subject to availability.					
TD 700	Self-Scan 256-character Display/Keyboard; 64-character set	4,150	—	115	—
TD 701	Self-Scan 256-character Display/Keyboard; 128-character set	2,300	—	85	—
	Self-Scan II 480-character Display/Keyboard, 128-character set:	—	—	—	—
TD 731	With control for async. data sets & direct-connect communications interface	3,200	—	100	—
TD 732	Unit with peripheral capability added	3,550	—	110	—
TD 733	With control for sync. data set communications	3,200	—	100	—
TD 734	Unit with peripheral capability added	3,550	—	110	—
TD 801	CRT; 960-character display/keyboard	2,880	—	100	—
TD 802	CRT; 1920-character display/keyboard	3,150	—	110	—
TD 821	CRT; 960-character display/keyboard; peripheral capability	3,400	—	125	—
TD 822	CRT; 1920-character display/keyboard with 80-character system status line; 128-character set	3,655	—	135	—
TD 831	With control for async data sets & direct-connect communications interface	3,850	—	120	—
TD 832	Unit with peripheral capability added	4,200	—	130	—
TD 833	With control for sync. data set communications	3,850	—	120	—
TD 834	Unit with peripheral capability added	4,200	—	130	—
Options for TD 700, TD 701, TD 801, & TD 802:					
TD 011	Typewriter-style keyboard	340	—	13	—
TD 011-1	Same as TD 11, but used with TD 052	340	—	13	—
TD 012	Keypunch-style keyboard	340	—	13	—
TD 012-1	Same as TD 012, but used with TD 052	340	—	13	—
TD 013	Numeric keyboard	335	—	13	—
TD 013-1	Same as TD 013 but used with TD 052	335	—	13	—
TD 052	Expanded (1024-character) memory for TD 700	300	—	11	—
TD 054	"V" cable for concatenation, per unit	50	—	4	—
TD 070	Upper/lower case character set for TD 800	255	—	9	—
TD 072	Field upgrade; TD 801 to TD 802	500	—	15	—
Options for TD 700, TD 701, TD 801, TD 802, & TD 820:					
TD 074	Interface for B 9354-6 Printer	130	—	5	—
B 9354-6	Printer	—	—	—	—
Options for TD 820:					
TD 015	A/N typewriter keyboard (includes 6-foot separation cable)	400	—	13	—
TD 072-1	TD 821 field upgrade to 1920-character screen	500	—	15	—
TD 075-1	A 9249 printer interface	210	—	8	—
TD 055-1	TD/A 9249 interface cable	100	—	5	—
TD 054-1	Shared A 9249 connection cable	75	—	4	—
TD 078	Magnetic card reader	1,225	—	41	—
TD 076	Cassette controller (includes one A 9490-25 drive)	3,160	—	105	—
TD 080	Cassette interface	350	—	12	—

*Equipment rental prices include maintenance.

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EQUIPMENT PRICES

TERMINALS (Continued)		Purchase Price	Monthly Maint.	Rental (1-year lease)*	Rental (3-5-year lease)*
Options for TD 730, TD 820, & TD 830:					
TD 016	A/N source data keyboard (includes 6-foot separation cable)	400	—	13	—
TD 017	Ten-key auxiliary keyboard (includes 2-foot separation cable)	200	—	7	—
Options for TD 730 & TD 830 Series:					
TD 015-A	Alphanumeric typewriter keyboard	400	—	13	—
TD 019	Expanded alphanumeric keyboard	1,000	—	30	—
TD 019-1	Expanded alphanumeric keyboard with built-in magnetic card reader	1,400	—	45	—
TD 100	Expanded memory (expands TD 730 and TD 830 display memory from a standard 2000 to 4080 characters and data communications buffer from 1200 to 3000 characters)	500	—	20	—
TD 105	No-display of control characters (the display of control characters, such as form delimiters, is inhibited—feature is available on a special factory order basis only)	200	—	10	—
Peripherals for TD X32 & TD X34:					
TD 078-1	Auxiliary magnetic card reader for TD 015	1,225	—	41	—
TD 076	Cassette controller (includes one A 9290-25 driver—can be shared by up to four TD's); other peripherals include the A 9249 series of printers and the A 9490-25 additional cassette tape drive	3,160	—	105	—
Options for all TD Series terminals (except 730 and 830):					
TD 021	Asynchronous 75 to 1800 bps communications interface	130	—	5	—
TD 022	Synchronous 2400 or 4800 bps communications interface	130	—	5	—
TD 023	Two-wire direct connect to 9600 bps (includes TD 077 TD 1 connection)	170	—	7	—
TD 024	BDI (Burroughs Direct-connect Interface) to 64,000 bps (includes BDI connection kit)	255	—	9	—
TD 031	Poll and Select (includes modified connection, fast select, broadcast and group select) Communications Procedure	130	—	5	—
TD 032	Poll and Select with Group Poll (includes modified contention, fast select, broadcast and group select) Communications Procedure	130	—	5	—
TD 034	IBM 2260 Communication Procedure	380	—	14	—
TD 035	IBM 3270 Communications Procedure	500	—	19	—
TD 053	Data rate selection dial (75/150/200/300/600/1200/1800 bps)	50	—	4	—
TC 4001	Printing Terminal; 60 cps				
Intelligent Terminal with TC 4001 Printing Unit:					
TC 5110	With one cassette drive	13,900	—	430	—
TC 5113	With two cassette drives	16,900	—	528	—
TC 5114	With one floppy drive	17,900	—	555	—
TC 5115	With two floppy drives	21,900	—	680	—
	Self-Scan Display	1,900	—	55	—

DATA ENTRY SUBSYSTEMS

AE 501	Audit Entry Data Preparation System	9,940	782	295	286
B 9347-2	Direct Data Entry System	4,990	—	125	119
B 354	Direct Data Entry Control	1,050	—	26	—

COMMUNICATIONS EQUIPMENT

B 351-2	SCL modem connect	750	13	37	34
B 351-3	SCL direct connect	1,000	13	42	38
B 358-1	DCPP data communications pre-processor	2,500	41	105	95
B 358-26	4-line half-duplex SPM	350	3	11	10
B 358-27	4-line full-duplex SPM	700	6	22	20
B 552	Direct connect kit	100	0	6	5
B 658-1	Data comm. line adapter	525	3	17	15
B 658-7	Line adapter, BDI/DDE	660	3	21	19
B 658-8	Line adapter, BDLC	840	5	26	24
B 658-9	2-line auto call unit	375	2	12	11

*Equipment rental prices include maintenance.

SOFTWARE PRICES

NOTE: The following B 700 programs are object-code-compatible with the B 800 under SCP.

B 700 BANK BUSINESS MANAGEMENT SYSTEM		Single Payment	12 Monthly Payments	Annual Maint. Charge	Monthly Fee (3-Year Plan)	Down Payment
B721 BP1	Proof and Transit MICR Module	\$ 1,000	\$ 92	\$150	\$ 34	\$ 400
B721 BP2	Module with training and technical support	2,095	193	150	58	838
B700 BD1	Demand Deposit Module	2,500	230	150	66	1,000
B700 BD2	Module with training and technical support	3,565	327	150	90	1,426
B700 BS1	Savings Module	1,500	138	150	45	600
B700 BS2	Module with training and technical support	2,400	220	150	65	960
B700 BC1	Certificate of Deposit Module	750	69	150	29	300
B700 BC2	Module with training and technical support	1,570	144	150	47	628
B721 B03	MICR Entry Module	7,250	665	363	187	2,900
B721 B04	Module with training and technical support	9,475	869	363	235	3,790
B700 BG1	General Ledger Module	500	46	150	24	200
B700 BG2	Module with training and technical support	1,510	139	150	46	604
B700 B01	Complete package of all modules	6,250	573	313	161	2,500
B700 B02	Package with training and technical support	8,500	780	313	210	3,400

Burroughs B 800 Series

SOFTWARE PRICES

		Single Payment	12 Monthly Payments	Annual Maint. Charge	Monthly Fee (3-Year Plan)	Down Payment
B 700 THRIFT BUSINESS MANAGEMENT SYSTEM						
B700 TS1	Time Deposits Module	2,250	206	150	61	900
B700 TS2	Module with training and technical support	3,150	289	150	81	1,260
B700 TM1	Mortgage Loan Module	2,400	220	150	65	960
B700 TM2	Module with training and technical support	3,250	298	150	83	1,300
B700 TG1	General Ledger Module	500	46	150	23	200
B700 TG2	Module with training and technical support	1,510	139	150	45	604
B700 TO1	Complete package of all modules	5,150	473	258	133	2,060
B700 TO2	Package with training and technical support	6,800	624	258	169	2,720
B 700 CREDIT UNION BUSINESS MANAGEMENT SYSTEM						
B700 CU1	Complete package with training and technical support	6,500	596	250	162	2,600
B 700 CONTRACTOR BUSINESS MANAGEMENT SYSTEM						
B700 CP2	Payroll and Labor Cost Module	2,510	230	150	67	1,004
B700 CA2	Accounts Payable and Material Cost Module	2,510	230	150	67	1,004
B700 CE2	Equipment Cost Module	1,510	138	150	45	604
B700 CJ2	Job Cost Reporting Module	1,995	183	150	56	798
B700 CG2	General Ledger and Financial Statement Module	3,175	291	150	81	1,270
B700 CO8	Complete package	8,100	743	310	201	3,240
B 700 PRODUCTION CONTROL SYSTEM 1						
B700 MC1	Bill of Material Module	2,100	192	150	58	840
B700 MC2	Module with training and technical support	3,300	302	150	84	1,320
B700 ME1	Work Center and Routing Module	2,100	192	150	58	840
B700 ME2	Module with training and technical support	3,300	302	150	84	1,320
B700 MG1	Stock Status Module	1,300	119	150	41	520
B700 MG2	Module with training and technical support	2,100	192	150	58	840
B700 MJ1	Costing Module	1,500	137	150	45	600
B700 MJ2	Module with training and technical support	2,300	210	150	63	920
B700 MA1	Complete package of all modules	6,500	595	325	168	2,600
B700 MA2	Package with training and technical support	8,200	750	325	205	3,280
B 700 MANUFACTURING JOB COST SYSTEM						
B700 JO2	Complete package	2,500	229	150	67	1,000
B 700 HOSPITAL BUSINESS MANAGEMENT SYSTEM						
B700 HAH	Patient Accounting System Module with training and technical support	4,250	389	150	105	1,700
B700 HAJ	Hospital Payroll System Module	1,200	110	150	39	480
B700 HAK	Module with training and technical support	2,350	215	150	63	940
B700 HAL	Hospital General Ledger System Module	900	83	150	32	360
B700 HAM	Module with training and technical support	2,100	193	150	58	840
B700 HAN	Hospital Accounts Payable System Module	1,000	92	150	34	400
B700 HAP	Module with training and technical support	2,150	197	150	59	860
B700 HAA	Patient Accounting, Payroll, General Ledger, A/P	5,200	477	260	134	2,080
B700 HAB	Module with training and technical support	8,000	733	260	195	3,200
B700 HAC	Module with terminal entry	5,600	513	280	145	2,240
B700 HAD	B700 HAC with training and technical support	8,500	779	280	208	3,400
B700 HAE	BHAS II Patient Accounting Keyboard Entry	2,500	229	150	67	1,000
B700 HAF	Module with training and technical support	3,750	344	150	94	1,500
B700 HAG	BHAS II Patient Accounting Terminal Entry	3,000	275	150	78	1,200
B 700 PUBLIC UTILITY BILLING SYSTEM						
B700 UT1	Customer Billing Package	3,000	275	150	78	1,200
B700 UT2	Package with training and technical support	4,250	390	150	105	1,700
B 700 WHOLESALE BUSINESS MANAGEMENT SYSTEM						
Invoicing, Accounts Receivable, & Inventory Control Module:						
B700 RKN	Systems keyboard input	2,600	236	150	69	1,040
B700 RAN	Automated input	3,200	290	160	83	1,280
B700 RMN	Magnetic tape cassette input	800	75	40	NA	NA
B700 RCN	Punched card input	800	75	40	NA	NA
B700 RPN	Punched paper tape input	800	75	40	NA	NA
B700 RXL	Systems printer output	500	45	25	NA	NA
B700 RXC	Line printer output	500	45	25	NA	NA
B700 RAE	Module with training and technical support	4,470	400	224	116	1,788
Accounts Payable Module:						
B700 AKN	Systems keyboard input	1,100	102	150	30	440
B700 AAN	Automated input	1,400	128	150	43	560
B700 AMN	Magnetic tape cassette input	350	32	18	NA	NA
B700 ACN	Punched card input	350	32	18	NA	NA
B700 APN	Punched paper tape input	350	32	18	NA	NA
B700 AXL	Systems printer output	200	21	10	NA	NA
B700 AXC	Line printer output	200	21	10	NA	NA
B700 AAE	Module with training and technical support	2,445	224	150	65	978

Burroughs B 800 Series

SOFTWARE PRICES

B 700 WHOLESALE BUSINESS MANAGEMENT SYSTEM (Continued)		Single Payment	12 Monthly Payments	Annual Maint. Charge	Monthly Fee (3-Year Plan)	Down Payment
Payroll Module:						
B700 PKN	Systems keyboard input	1,400	128	150	43	560
B700 PAN	Automated input	1,800	165	150	52	720
B700 PMN	Magnetic tape cassette input	450	42	23	NA	NA
B700 PCN	Punched card input	450	42	23	NA	NA
B700 PPN	Punched paper tape input	450	42	23	NA	NA
B700 PXL	Systems printer output	300	28	15	NA	NA
B700 PXC	Line printer output	300	28	15	NA	NA
B700 PAE	Module with training and technical support	2,790	255	150	1,116	73

General Ledger Module:

B700 GKN	Systems keyboard input	1,100	102	150	36	440
B700 GAN	Automated input	1,400	128	150	43	560
B700 GMN	Magnetic tape cassette input	350	32	18	NA	NA
B700 GCN	Punched card input	350	32	18	NA	NA
B700 GPN	Punched paper tape input	350	32	18	NA	NA
B700 GXL	Systems printer output	200	21	10	NA	NA
B700 GXC	Line printer output	200	21	10	NA	NA
B700 GAE	Module with training and technical support	2,445	224	150	65	978
B700 BAN	Complete package	7,100	650	360	184	2,840
B700 BAE	Complete package with training and technical support	9,500	857	360	236	3,800

B 700 WHOLESALE/DISTRIBUTION BMS ON-LINE ORDER ENTRY & INQUIRY SYSTEM

B700 WOG	Complete package	5,970	547	220	142	2,388
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B 700 COMMERCIAL BUSINESS MANAGEMENT SYSTEM (KEYBOARD ENTRY)

B700 WJ2	Invoicing, Accounts Receivable, & Inventory Update	2,450	225	150	66	980
B700 WB2	Accounts Payable System	1,875	172	150	53	750
B700 WD2	Payroll System	2,150	198	150	59	860
B700 WG2	General Ledger System	1,750	161	150	50	700
B700 WO2	Complete package	5,500	506	220	138	2,200

B 700 FUEL OIL BUSINESS MANAGEMENT SYSTEM

B700 FS1	Mainline Delivery Scheduling & A/R	3,000	275	150	78	1,200
B700 FS2	Module with training and technical support	3,800	345	150	95	1,520
B700 FM1	Complete package	6,600	607	330	171	2,640
B700 FM2	Package with training and technical support	9,500	871	330	233	3,800

B 700 TBA BUSINESS MANAGEMENT SYSTEM

B700 WA3	TBA (Tire, Battery, and Accessory) module	400	37	50	NA	NA
B700 WO3	Complete Package	7,500	687	380	194	3,000
B700 WO4	Package with training and technical support	9,900	907	380	246	3,960

B700 MOTOR FREIGHT BUSINESS MANAGEMENT SYSTEM

B700 MT1	G/L & Reporting with training and technical support	4,560	418	180	114	1,824
B700 MT2	Vehicle Maintenance & Asset Control with training and technical support	4,560	418	180	114	1,824
B700 MT3	A/R & Billing with training and technical support	3,760	345	150	94	1,504
B700 MT4	Payroll with training and technical support	2,480	227	150	66	992
B700 MT5	A/P with training and technical support	2,480	227	150	66	992
B700 MTO	Complete package with training and technical support	15,000	1,375	590	374	6,000

B 800 PROGRAM PRODUCTS

CMS System Software and Utilities

		Monthly License Fee
CM800 NDL	Network Definition Language compiler	\$ 25
CM800 MPL	Message Processing Language compiler	25
CM800 RPG	Report Program Generator compiler	50
CM800 COB	COBOL compiler	50
CM800 UTL	Utilities	15
CM800 PSL	Pocket Select Language	35
CM800 MCP	Computer Management (Operating) System	70
CM800 R41	Burroughs RJE to medium systems	35
CM800 R61	Burroughs RJE to large systems	35
CM800 HSP	IBM 360/20 look-alike HASP	35
CM800 DC1	B 800 Data Control System	35
CM800 GMC	GEMCOS (Generalized Message Control System) for the B 800	133

SCP System Software and Utilities

B800 SCP	System Control Program (Operating System)	35
B800 PSL	Pocket Select Language	35