Burroughs B 1800 Series

MANAGEMENT SUMMARY

Burroughs' formal introduction of what can be considered the "new" B 1800 Series computer family came in February 1979, after these products had been marketed for a period of time by the field sales force. The product line now consists of three models: the B 1815, B 1855, and B 1885. All are packaged systems which include the processor(s), memory, disk storage devices, a printer, a communications facility, and an operator console. Delivery of the new packaged systems is expected to begin in the third quarter of 1979. These systems are expected to eventually replace the older B 1800 models, including the B 1825, B 1835, B 1860, and B 1865.

Introduced in November 1976, the Burroughs B 1800 Series computers are the small-to-medium-scale members of the Burroughs "800" computer family. The B 1800 systems are object-code-compatible with their counterpart systems in the older Burroughs "700" family, the B 1700 systems. Thus, programs written for the B 1700 can be run on the B 1800 without modification. The B 1800 systems are also compatible with the Computer Management System (CMS) that was released with the entry-level Burroughs B 80 computer system.

According to Burroughs, the use of faster and more compact logic and memory circuits, processor performance improvements, and—in the larger B 1800 systems —the use of high-speed microinstruction cache memory and fast system disk memory, enable the new B 1800 systems to provide up to 40 percent more throughput for a little more than one-half the price and in about 75 percent less floor space than the B 1700 systems. ▷

The current offerings in the B 1800 Series of medium-scale packaged business systems present a wide span of performance from the entry-level B 1815 to the high-end B 1885. The basic B 1815 can be purchased for $60,000, while the mid-range B 1855, with 2.5 times the power of the B 1815, is priced at $85,000. The B 1885, rated at 3.5 times the B 1815, has a purchase price of $133,000.

CHARACTERISTICS

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

Burroughs is generally 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, multi-processor 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 nonprogammable desktop calculators; specialized banking equipment; 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 1815, B 1855, and B 1885 packaged systems; for customers who require a B 1800 prior to the third quarter of 1979, Burroughs will ship one of the now inactively marketed B 1825, B 1830, B 1835, B 1860, B 1865, or B 1870 systems, depending on configuration requirements. ▶

Burroughs claims the B 1885, shown here, is the first system in its price class to offer two independent central processors. The processors share the main memory, which can extend from 512K bytes to 1.02 megabytes. One processor acts as a slave in this configuration, with the MCP operating system residing only in the master processor.

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CHARACTERISTICS OF THE B 1800 SYSTEMS

	B 1815	B 1825**	B 1830**	B 1835**	B 1855
CENTRAL PROCESSORS					
Date announced	February 1979	June 1978	November 1976	June 1978	February 1979
Date of first delivery	3rd Qtr. 1979	October 1978	May 1977	September 1978	3rd Qtr. 1979
Number installed to date	—	—	150	—	—
Actively marketed	Yes	No	No	No	Yes
Power rating	—	107% of B 1710	114% of B 1710; 107% of B 1825	170% of B 1830	250% of B 1815
Processor cycle time, nano-seconds	200	200	200	250	167
Maximum processor I/O controls	10	10	10	13	13
Max. processor + expansion I/O controls	14	14	14	17	17
MAIN MEMORY					
Minimum capacity, bytes	131,072	98,304	49,152	131,072	524,288
Maximum capacity, bytes	262,144	262,144	262,144	524,288	1,048,576
Cycle time, microseconds (per byte)	1.2	1.2	1.2	1.2	—
Read access time, microseconds (per byte)	0.40	0.40	0.40	0.40	0.333
Chip size (bits)/type	4K/n-channel	4K/n-channel	4K/n-channel	16K/n-channel	16K/n-channel
Checking	Parity	Parity	Parity	Error correcting	Error correcting
COMMUNICATIONS CAPABILITIES					
Maximum no. of lines	1 std.; 4 opt.	5 opt.	5 opt.	32 opt.	4 std.; 28 opt.
Synchronous	Opt.; 50,000 bps	Opt.; 50,000 bps	Opt.; 50,000 bps	Opt.; 50,000 bps	Opt.; 50,000 bps
Asynchronous	Opt.; 9600 bps	Opt.; 9600 bps	Opt.; 9600 bps	Opt.; 9600 bps	Opt.; 9600 bps
Protocols supported	Basic mode, bisync, BDLC	Basic mode, bisync., BDLC	Basic mode, bisync., BDLC	Basic mode, bisync., BDLC	BDLC
Single-line communications control	Yes	Yes	Yes	Yes	Yes
Multi-line communications control	Dual only	Dual only	Dual only	Yes	Yes
MICROINSTRUCTION CACHE MEMORY					
Minimum capacity, bytes	0	0	0	4,096	4,096
Maximum capacity, bytes	0	0	0	4,096	4,096
Read cycle time, nanoseconds (per byte)	—	—	—	125	83
Write cycle time, nanoseconds (per byte)	—	—	—	125	83
MAXIMUM I/O SPEEDS					
80-column card reading	300/1400 cpm	300/1400 cpm	300/1400 cpm	300/1400 cpm	300/1400 cpm
80-column card punching	150/300 cpm	150/300 cpm	150/300 cpm	150/300 cpm	150/300 cpm
96-column card reading	300/1000 cpm	300/1000 cpm	300/1000 cpm	300/1000 cpm	300/1000 cpm
96-column card punching	60 cpm	60 cpm	60 cpm	60 cpm	60 cpm
Printing (standard character sets)	80/1500 lpm	80/1500 lpm	80/1500 lpm	80/1500 lpm	80/1500 lpm
Magnetic tape I/O (PE)	40/80 KBS	40/80 KBS	40/80 KBS	40/80 KBS	40/80 KBS
Magnetic Tape I/O (NRZI)	10/60 KBS	10/60	10/60	10/60	10/60
Magnetic tape I/O (PE)	No	No	No	120 KBS	120 KBS
Magnetic tape I/O (NRZI/PE)	No	No	No	40/120 KBS switchable	40/120 KBS switchable
MICR/OCR reader-sorters	900/1625 dpm	900/1625 dpm	900/1625 dpm	900/1625 dpm	900/1625 dpm
AVAILABILTIY OF MASS STORAGE					
Disk cartridge drives	Yes	Yes	Yes	Yes	Yes
Dual disk cartridge drives	Yes	Yes	Yes	Yes	Yes
Dual disk pack drives	Yes, one sub-system	Yes, one sub-system	Yes, one sub-system	Yes	Yes
Head-per-track systems memory	No	No	No	Yes	Yes

* Dual Master/Slave system sharing memory and cache.
**No longer actively marketed.

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CHARACTERISTICS OF THE B 1800 SYSTEMS (Continued)

	B 1860**	B 1865**	B 1870**	B 1885*
CENTRAL PROCESSORS				
Date announced	November 1976	June 1978	November 1976	February 1979
Date of first delivery	May 1977	January 1979	May 1977	3rd Qtr. 1979
Number installed to date	350 (with B 1870)	—	350 (with B 1860)	—
Actively marketed	No	No	No	Yes
Power rating	193% of B 1825	200% of B 1825	350% of B 1705	150% of B 1865; 350% of B 1815
Processor cycle time, nanoseconds	167	167	167	167
Maximum processor I/O controls	13	13	13	13
Max. processor expansion I/O controls	17	17	17	17
MAIN MEMORY				
Minimum capacity, bytes	65,536	262,144	98,304	524,288
Maximum capacity, bytes	393,216	1,048,576	542,288	1,048,576
Cycle time, microseconds (per byte)	—	—	—	—
Read access time, microseconds (per byte)	0.333	0.333	0.333	0.333
Chip size (bits)/type	4K/n-channel	16K/n-channel	4K/n-channel	16K/n-channel
Checking	Error correcting	Error correcting	Error correcting	Error correcting
COMMUNICATIONS CAPABILITIES				
Maximum no. of lines	32 opt.	32 opt.	32 opt.	4 std.; 28 opt.
Synchronous	Opt.; 50,000 bps	Opt.; 50,000 bps	Opt.; 50,000 bps	Opt.; 50,000 bps
Asynchronous	Opt.; 9600 bps	Opt.; 9600 bps	Opt.; 9600 bps	Opt.; 9600 bps
Protocols supported	Basic mode, bisync., BDLC	Basic mode, bisync., BDLC	Basic mode, bisync., BDLC	Basic mode, bisync., BDLC
Single-line communications control	Yes	Yes	Yes	Yes
Multi-line communications control	Yes	Yes	Yes	Yes
MICROINSTRUCTION CACHE MEMORY				
Minimum capacity, bytes	4,096	4,096	4,096	4,096
Maximum capacity, bytes	4,096	4,096	4,096	4,096
Read cycle time, nanoseconds (per byte)	83	83	83	83
Write cycle time, nanoseconds (per byte)	83	83	83	83
MAXIMUM I/O SPEEDS				
80-column card reading	300/1400 cpm	300/1400 cpm	300/1400 cpm	300/1400 cpm
80-column card punching	150/300 cpm	150/300 cpm	150/300 cpm	150/300 cpm
96-column card reading	300/1000 cpm	300/1000 cpm	300/1000 cpm	300/1000 cpm
96-column card punching	60 cpm	60 cpm	60 cpm	60 cpm
Printing (standard character sets)	80/1500 lpm	80/1500 lpm	80/1500 lpm	80/1500 lpm
Magnetic tape I/O (PE)	40/80 KBS	40/80 KBS	40/80 KBS	40/80 KBS
Magnetic tape I/O (NRZI)	10/60 KBS	10/60 KBS	10/60 KBS	10/60 KBS
Magnetic tape I/O (PE)	120 KBS	120 KBS	120 KBS	120 KBS
Magnetic tape I/O (NRZI/PE)	40/120 KBS switchable	40/120 KBS switchable	40/120 KBS switchable	40/120 KBS switchable
MICR/OCR reader-sorters	900/1625 dpm	900/1625 dpm	900/1625 dpm	900/1625 dpm
AVAILABILITY OF MASS STORAGE				
Disk cartridge drives	Yes	Yes	Yes	Yes
Dual disk cartridge drives	Yes	Yes	Yes	Yes
Dual disk pack drives	Yes	Yes	Yes	Yes
Head-per-track systems memory	Yes	Yes	Yes	Yes

* Dual Master/Slave system sharing memory and cache.
**No longer actively marketed.

▷ The largest B 1800 system has over 7 times the processing power of the minimum B 1700 system.

As with the B 1700 Series, Burroughs has incorporated into the B 1800 systems nearly all of today's most advanced hardware and software concepts, including semiconductor main memories, integrated-circuit logic, dynamically variable microprogramming, automatic multiprogramming, and virtual memory—and all at a competitive price. ▷

▶ **DATE ANNOUNCED: See table.**

DATE OF FIRST DELIVERY: See table.

NUMBER INSTALLED TO DATE: See table.

DATA FORMATS

The B 1800 Series main memories are addressable to the bit level and utilize no preferred word or byte boundaries that are visible to the rest of the system. Variable instruction and operand lengths permit from 1 to 65,536 bits of data to be ▶

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▷ One of the most noteworthy features of the B 1800 systems is their "variable micrologic," an advanced form of microprogramming that alters the central processor's logical operations to suit the characteristics of each programming language. The central processors are "soft" machines whose logical structure is largely undefined until the appropriate microprograms are loaded to control their operations. Main memories which are addressable down to the individual bit level provide great flexibility in data field lengths and, according to Burroughs, yield increases of 20 to 40 percent in the efficiency of memory utilization for most applications.

The B 1800 Series systems, like the large-scale Burroughs systems, are programmed almost exclusively in higher-level languages. Compilers are available for the ANSI 74 COBOL, ANSI 77 FORTRAN, RPG, and Interactive BASIC languages, but not for PL/1. Associated with each compiler is an Interpreter, a specialized micro-program that is used at execution time to interpret and execute the code generated by the compiler. The B 1800 microprogramming itself is not user-accessible.

Burroughs is placing strong marketing emphasis on its library of Business Management Systems. These are well-designed groups of related application programs that should significantly reduce the cost and time required to get a B 1800 system into productive operation for many users in manufacturing, wholesaling, distribution, banking, utilities, hospitals, government agencies, schools, and motor freight companies. In addition, Burroughs will, for a fee, provide all system support required to install and maintain a system.

PROCESSOR MODELS

The three models currently offered in the B 1800 Series differ principally in central processor speed, number of processors, main memory capacity, and the use of cache memory and system disk memory.

The entry-level B 1815 employs the same 5-megahertz processor as the B 1825 and includes 131K bytes of main memory expandable to 256K bytes, a 37-megabyte dual disk drive, a 350-lpm line printer, a single-line data communications control, and an operator control console. The system can be purchased for $60,000 or leased for one year at $2,125 per month. Three- and five-year leases are also available. Maintenance is priced at $360 per month. The B 1815-1 is the same system with a 65-megabyte dual disk drive in place of the B 1815's 37-megabyte unit. The B 1815-1 can be purchased for $65,000. Maintenance is provided at $380 per month.

The B 1855 utilizes the same 6-megahertz processor as the B 1860, and includes 4K bytes of cache memory, 512K bytes of main memory (expandable to 1024K bytes), a 65-megabyte dual disk drive, a 750-lpm line printer, a multi-line communications control, and an operator control console. The B 1855 can be purchased for $85,000 or leased for five years at $2,145 per month. The user ▷

▶ addressed with a single instruction, and up to 24 bits can be transferred in parallel between main memory and the processor. According to Burroughs, this feature yields a 20 to 40 percent reduction in memory requirements for typical programs.

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

MAIN STORAGE

TYPE: See table.

CAPACITY: B 1815: 131,072 or 262,144 bytes; B 1855 or B 1885: 524,288 to 1,048,576 bytes in increments of 262,144 bytes.

CHECKING: A parity bit is associated with each 8-bit byte and is generated during writing and checked during reading on the B 1815. The B 1855 and B 1885 employ error-correcting (EC) main memory.

EC detects and corrects all single-bit main memory errors and detects most multiple-bit errors. EC generates a 3-bit check field for each 8-bit byte as it is written, and recomputes the field when the byte is read. If the check bits do not match, the erroneous bit is corrected before data is transmitted to the processor. Correction takes 167 nanoseconds. EC helps to provide uninterrupted operation and is transparent to the user. A modified Hamming code is used by the hardware encoder on each memory board to construct the check field.

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

CENTRAL PROCESSORS

The B 1800 Series processors feature dynamically variable microprogrammed logic and bit-addressable memories. The processors' logic functions are performed by a set of elementary operators called microinstructions, which operate on strings of bits. There are 32 defined microinstructions in the B 1800 processors. All current microinstructions are 16 bits in length.

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

For each B 1800 programming language, Burroughs has defined an "ideal machine" and developed a specialized microprogram, called an Interpreter, that makes the B 1800 appear to be logically equivalent to that machine. The interpreter executes the instructions which have been generated by the corresponding compiler. These compiler-generated instructions are expressed in an appropriate S-language. 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.

No execution times for either individual microinstructions or S-instructions have been released by Burroughs to date. ▶

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▷ may also elect a one- or three-year lease. The monthly maintenance charge is $500.

The B 1885 is a dual-processor, master/slave system utilizing two B 1860 processors that share 512K bytes of main memory, expandable to 1024K bytes. Besides the two processors, the B 1885 includes a 130-megabyte disk drive, a 750-lpm line printer, a multi-line communications control, and an operator control console. The B 1885 can be purchased for $133,000 or leased for $3,965 per month on a one-year basis, $3,278 on a three-year basis, or $3,132 on a five-year basis. Maintenance is priced at $600 per month. (All hardware lease rates include maintenance.)

Add-on memory for the B 1815 and B 1815-1 is built from 4K-bit chips and is packaged in 128K-byte increments; each increment carries a purchase price of $10,000. A 256K-byte memory increment for the B 1855 employs 16K-bit chips and is purchase-priced at $5,000. Memory for the B 1885 is priced at $7,000 per 256K-byte increment and is composed of 16K-bit chips.

Burroughs rates the B 1855 and B 1885 at 2.5 times and 3.5 times the performance of the B 1815, respectively. The B 1885 offers 1.5 times the performance of the most powerful B 1800 now installed (the B 1870), according to Burroughs.

COMPATIBILITY AND COMPETITION

The B 1800 systems provide full object-code compatibility with the architecturally similar Burroughs B 1700 systems. Integrated Interpreters, which operate under control of the MCP operating system and permit direct execution of object programs written for older computers, are available for the IBM 1401/1440/1460, the IBM 1130, and Burroughs' own B 100/200/300/500 Series computers.

Program compatibility with other computers is achieved via higher-level languages. The B 1800 COBOL and FORTRAN compilers conform to the American National Standards for these languages. Programs written in RPG or RPG II for IBM computers can either be compiled by the B 1800 RPG compiler or translated into COBOL by the COFIRS II (COBOL from IBM RPG Specifications) routines.

The B 1800 systems compete against the IBM System/38, as an alternative for growth from the IBM System/3, System/32, or System/34, and against systems such as the Univac 90/30 and Honeywell Levels 62 and 64.

PERIPHERALS

The peripheral equipment for the B 1800 systems includes a wide variety of removable and non-removable disk storage units, line printers, MICR/OCR document reader/sorters, magnetic tape and cassette drives, diskette ▷

▶ Under MCP control, it is possible for programs written in two or more languages to run concurrently in a multiprogramming mix. In this case, all of the corresponding Interpreters reside in main or control memory, and the B 1800 changes rapidly from one state to another (e.g., from a "COBOL machine" to a "FORTRAN machine") whenever the MCP transfers control from program to program. The Interpreters, S code, and user data are all location-independent.

All B 1800 Series processor models are program-compatible and generally similar in architecture, with one major exception. The B 1855 and B 1885 systems have a high-speed, bipolar microinstruction cache memory that operates at 83 nanoseconds per byte and has a capacity of 4,096 bytes. The processor has the capability to dynamically execute all types of microcode from this memory, which is managed by the hardware on a demand basis, thereby allowing a greater percentage of microinstructions to be resident in the cache for immediate retrieval. Overlap logic within the system provides for complete simultaneity of fetch/execute and effectively eliminates read access time when executing from the cache.

The B 1815 utilizes the same processor as the now-inactive B 1825, while the B 1855 and B 1885 use the old B 1860 processor. The B 1815, B 1855, and B 1885 processors all utilize CTL chip technology.

The B 1885 is a dual-processor system in which the two processors share a common memory and operate under a master/slave concept. The master processor contains the MCP operating system and executes all system code as well as performing all resource management. While the master processor can also execute user code, the slave processor *only* executes user code, making demands on the master to execute system code. The B 1885 master/slave system is queue-driven. If the master is executing user code, the slave may queue its request to the master and interrupt it. Upon completion of the requested work, the master is free to return to the user job it suspended.

CONTROL STORAGE: See table for cache memory speeds and capacities. No other information is available from Burroughs.

INTERRUPTS: The B 1800 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 initiation of the appropriate actions is completely under software control.

PHYSICAL SPECIFICATIONS: The B 1815 and B 1855 are housed in a cabinet that is 44 inches high, 45 inches wide, and 29 inches deep. The B 1885 is housed in a dual cabinet that is 44 inches high, 90 inches wide, and 29 inches deep. The B 1815 processor with stand-up console weighs 640 pounds; with desk-level printing console, 800 pounds; and with desk-level display console, 650 pounds. The B 1855 processor weighs 575 pounds, while the B 1885 dual processor weighs 1,150 pounds.

Power requirements for the B 1885 are 190/250 volts, single phase, 50/60 Hertz + 1 percent. The B 1815 and B 1855 require 190/250 volts, single phase, 50/60 Hertz + 1 percent. The B 1800 systems operate under a temperature range of 64.4 to 86 degrees Fahrenheit, with a relative humidity rate of 40 to 60 percent noncondensing.

INPUT/OUTPUT CONTROL

I/O CHANNELS: Each type of peripheral device or subsystem requires a different I/O control, and each I/O control, in turn, requires an appropriate number of slots in the processor chassis or its extenders. Up to 56 slots ▶

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I/O CONTROLS

Control Types	Basic Systems		With B 1304 Expansion		With B 1305 Expansion		With B 1306 Expansion	
	B 1815	B 1855/B 1885	B 1815	B 1855/B 1885	B 1815	B 1855/B 1885	B 1815	B 1855/B 1885
A	5	8	7	10	10	13	10	13
B	2	4	3	5	4	6	6	8
C	1	0	2	1	2	1	0	0
Total A, B, & C	5	8	7	10	10	13	8	13
Total D, E, F, G, H, J, & K	5	5	4	4	4	4	4	4
Total System	10	13	11	14	14	17	12	17

▷ drives, 80- and 96-column card devices, and a console printer and displays.

All three of the B 1800 systems can have 14 or more individual channels for input/output devices and subsystems. All channels are fully buffered, allowing processor and peripheral units to run independently at their full rated speeds.

DATA COMMUNICATIONS

To supplement the Single-Line and Multi-Line Controls (for up to 16 lines) available with the older B 1700 systems, a new Dual-Line Control (for 2 lines) has been added to the B 1800's. Also, a Wideband Adapter has been added to permit binary synchronous transmission of data in transparent and nontransparent modes at speeds of 19,200 or 50,000 bits per second. Full error checking is provided by a cyclic redundancy check on the EBCDIC code transmitted.

The B 1352 Multi-Line Controller (MLC) provides the capability to handle multiple-line networks. The basic B 1352 handles up to 8 lines, and the B 1353 MLC Extension permits a total of 16 communications lines to be attached to each control. With the MLC, a B 1800 Series system can function either as a central computer in a multiple-line communications network or as a high-powered remote terminal communicating with a larger central computer.

Burroughs Network Architecture (BNA) is designed to enhance the interaction of terminals with host CPU's in network environment. BNA facilitates Burroughs' commitment to move into distributed data processing. Through the new architecture, Burroughs processors and terminals can be granted access to data bases throughout a network, job tasks and information files can be transferred from one point to another, and data processing resources available anywhere in a network can be shared by participants regardless of the distance between them. ▷

▶ are available to the I/O system. All B 1800 systems have at least one I/O system. The maximum number of I/O controls is given in the table. The B 1351-1/80 and B 1351-1/81 communications controls are attached to the processors via the I/O base, as are the B 1352, B 1353, and B 1354.

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

CONFIGURATION RULES

The basic packaged *B 1815* system consists of a 5-MHz central processor, a console display and control, 131,072 bytes of main memory, a 37-megabyte dual cartridge disk drive and control, a 350-lpm line printer and control, and a universal single-line communications control. The B 1815-1 is the same as the B 1815 except that mass storage is increased by the use of a 65.2-megabyte dual disk pack drive.

The basic packaged *B 1855* system consists of a 6-MHz central processor, a console display and control, 131,072 bytes of main memory, 4096 bytes of cache memory, 524,288 bytes of main memory, a 62.5-megabyte dual disk pack drive and control, a 750-lpm line printer and control, an 80-ampere power booster, and a 4-line multi-line communications control.

The basic packaged *B 1885* system consists of 6-MHz master and slave central processors, 524,288 bytes of main memory, 4096 bytes of cache memory, an expansion cabinet, a display console and control, a 130.4-megabyte dual disk pack drive and control, a 750-lpm line printer and control, and a 4-line multi-line communications control.

The B 1800 systems have eight different types of I/O subsystem "slots" which determine the number and types of I/O controls that can be connected. The allowable combinations of controls, however, are limited by various interrelationships and by the overall maximum limits on the number of controls. See the I/O Controls table for the various combinations and maximums allowed.

The types of I/O controls required by the various I/O units used with the B 1800 systems are as follows:

Control Type A (one I/O card)

All 80-column card readers (300, 600, 800, or 1400 cpm) ▶

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▷ To facilitate the development of communications control programs, Burroughs provides the Generalized Message Control System (GEMCOS), a parameter-based system that operates user-tailored Message Control Programs, plus the Network Definition Language (NDL) and User Programming Language (UPL). NDL is a language and compiler that enables users to define and generate customized network control programs. UPL is an ALGOL-like language and compiler designed to aid experienced programmers in solving complex message handling problems. The GEMCOS Message Control System forms the interface between the network control program and the user programs processing the communications messages.

Remote job entry applications can be implemented on the B 1800 Series systems through the HASP Remote Terminal Program Product and the Power/RJE Remote Terminal Program Product. Operating under MCP, the HASP program enables the B 1800 to multiprogram on-site processing with remote job entry to IBM System/360 or System/370 computers operating under the HASP binary synchronous multi-leaving protocol. Using the Power/RJE program, B 1800 systems are made to look like IBM 2770 remote workstations. Under control of the MCP, the B 1800 systems function as remote batch terminals on-line to an IBM 360/370 or 4300 system running DOS/POWER.

SOFTWARE

All software support for the B 1800 Series systems is built around a new version of the Master Control Program (MCP) that is specifically designed for transaction processing. The MCP is an integrated operating system that complements the hardware to create an unusually effective environment for multiprogrammed operation in any B 1800 system. Like the MCP operating systems for the larger Burroughs computers, the B 1800 MCP is user-oriented and much easier to understand and use than most of the competitive operating systems. The MCP receives its orders through straightforward messages entered via the console keyboard or control cards.

Software for the three new B 1800 systems is totally unbundled and packaged for specific systems. The B 1815 package includes MCP, NDL for data communications control programs, Odesy for on-line data entry, an on-line reporter for generating reports from terminals, a text editor, and system utilities. Purchase price for this software is $3,840 with an annual license fee of $384, and the monthly license fee on a three-year plan is $128.

Software for the B 1855 and B 1885 includes MCP, NDL, the DMS-2 data management system including the DMINQ data inquiry system, Odesy, and Cande for command and edit functions. Purchase price for this software package is $13,750 with an annual license fee of $1,374, and the monthly license fee on a three-year plan is $458. ▷

Burroughs claims the new B 1800 processors offer significant price/performance improvements over the older models. The B 1815, B 1855, and B 1885, which now make up the actively marketed B 1800 product line, occupy 50 percent less floor space and consume 25 percent less electrical power than the older processor models such as the B 1870.

▶ All 80-column card punches (150 or 300 cpm)
9249 Printers (85, 180, 250, or 350 lpm)

Control Type B (two I/O cards)

Integrated console cassette
All 96-column card readers (300 or 1000 cpm)
9418 80-column Reader/Punch Data Recorder (200/45 cpm)
9419 96-column Reader/Punch Multi-Purpose Card Unit (300/60 cpm)
9247 Printers (400, 750, 1100, or 1500 lpm)
MICR reader-sorters (900 or 1625 lpm)
9490 Cassette Tape Subsystem
9484, 9499 Disk Drives
9489 Mini-Disk Drives
9495, 9496 PE Magnetic Tape Units
NRZI/PE magnetic tape unit switchable configuration (also requires control type G)

Control Type C (three I/O cards)

All disk cartridge units (4, 6, 9, 2, or 18.4 megabytes)

Control Type F (four I/O cards)

Single-line communications control
High-speed systems memory

Control Type G (eight I/O cards)

9495, 9496 NRZI Magnetic Tape Units ▶

Burroughs B 1800 Series

▷ USER REACTION

Our survey of Burroughs B 1800 users consisted of a combination of mailed-in responses to Datapro's annual survey of computer users and telephone interviews. A total of five users with six installed systems responded to the mail survey, while the phone survey provided two additional users, each with one installed system.

The sample of installed B 1800 Series systems consisted of one 1825, five 1860's, and two 1870's. The smallest configuration in the survey included a processor with 128K bytes of memory, 160 megabytes of on-line disk storage, one magnetic tape unit, and two on-line interactive terminals. A B 1870 represented the largest overall configuration, although one B 1860 had more memory (384K bytes). The B 1870 configuration included a CPU with 256K bytes of memory, 250 megabytes of on-line disk storage, 6 magnetic tape units, 16 on-line remote batch terminals, and 12 on-line interactive terminals. None of the systems had been installed for more than 15 months.

The seven users were equally divided between purchase and lease of their systems, considering that one user failed to respond to the question. Only one of the seven users had taken advantage of the application packages available from Burroughs. A few proprietary packages were in use, but most of the programs being run by the users had been written by their in-house staffs. As you would expect, COBOL was the most frequently utilized language, followed by RPG and FORTRAN. Management reporting was the main function of all the machines in the survey. The applications most commonly found under the management reporting umbrella were accounts receivable, accounts payable, payroll, and general ledger.

The ratings provided by the seven B 1800 users appear in the table below.

	Excellent	Good	Fair	Poor	WA*
Ease of operation	3	2	2	0	3.1
Reliability of mainframe	2	2	2	0	3.0
Reliability of peripherals	1	2	3	0	2.3
Responsiveness of maintenance service	1	3	2	0	2.8
Effectiveness of maintenance service	1	3	1	1	2.7
Technical support	1	2	4	0	2.6
Operating systems	3	3	1	0	3.5
Compilers and assemblers	2	5	0	0	3.3
Applications programs	1	2	2	0	2.8
Ease of programming	2	5	0	0	3.3
Ease of conversion	4	1	1	0	3.5
Overall satisfaction	3	3	0	1	3.1

*Weighted Average on a scale of 4.0 for Excellent.

The users voiced very few comments along with their ratings. The categories where they gave Burroughs the lowest ratings were reliability of peripherals, maintenance, and technical support. No one peripheral unit was singled out as being a particular problem. Since Burroughs ▷

▶ 9491 Magnetic Tape Unit
Four-line multi-line communications control

Control Type H (six I/O cards)

   Dual-line communications control

Control Type J (twelve I/O cards)

   Eight-line multi-line communications control

Control Type K (ten I/O cards)

   Eight-line multi-line communications control extension

On the B 1815, if total cabinet card space exceeds 18, a B 1056 Expansion Cabinet is required. A maximum of 64 cards is allowed. The maximum number of allowable cards on the B 1855 or B 1885 is 58 or 40, respectively. The B 1855 requires a B 1056 Expansion Cabinet if the total cabinet card space exceeds 12. All processors may have up to five independent backplanes. A power expansion unit is needed if the total number of I/O cards in the basic plus expansion space exceeds 45 cards (B 1815), 42 cards (B 1855), or 23 cards (B 1885).

Other configuration restrictions include these: 1) a maximum of one B 1486-1 Dual Disk-Pack Control is allowed on the B 1815; 2) a maximum of two cabinets, housing two, three, or four spindles may be connected to a B 1489/-80 Mini-Disk Control; 3) for the integrated console cassette tape station (on the B 1855 and B 1885) to perform read/write operations, a B 1490-25 Cassette Control must be added; 4) the 1496-4/84 PE Tape Control and the B 1495-15/-85 and B 1496-15/85 NRZI Tape Controls cannot be used with the B 1815; 5) the B 1352 Eight-Line Multi-Line Control, the B 1354 Four-Line Multi-Line Control, and the B 1353 Multi-Line Control Extension cannot be used with the B 1815; and 6) the maximum number of B 1352 Multi-Line Controls on the B 1855 and B 1885 is two.

For further details on configurations of individual peripherals, see the Input/Output Units and Mass Storage sections of this report.

MASS STORAGE

B 9470 HEAD-PER-TRACK FILES: These fixed-head disk files, originally announced in December 1975 for use with B 2800/3800/4800 and B 6700/7700 systems, provide very fast access to up to 23.6 megabytes of data per subsystem on the B 1855 and B 1885. The disk units use noninterchangeable disks and have a fixed read/write head serving each data track. The B 9470-2 Primary Storage Module and B 9470-12 Add-On Module record data in 180-byte sectors and have a capacity of 5.9 million bytes per disk drive.

The basic B 9470 subsystem includes one B 9470-2 Primary Storage Module, which contains a power supply and air system and one disk drive with 5.9 million bytes of storage. The B 9470-2 can accommodate one B 9470-12 Add-On Module with a storage capacity of 5.9 million bytes. The B 9470-12 contains no power or air supply of its own. Additional expansion of the subsystem can be achieved by adding additional B 9470-2 Primary Storage Modules and associated B 9740-12 Add-On Modules. One B 9471-6 Disk File Eelctronics Unit is required for every four disk storage units; the DEU includes circuitry to support Angular Position Sensing, in which I/O requests are serviced according to read/write head position to optimize performance, and the capability to detect the loss of up to 11 bits in a transfer of one 180-byte sector. The DEU is connected to the B 1470-2 High-Speed Systems Memory Control. ▶

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> manufactures the majority of its own peripherals, it is in a strong position to rectify the reliability problem before it grows worse. As for technical support, Burroughs finds itself in the same situation as many other computer manufacturers, with not enough strong in-the-field technical support personnel. The reasons why users give low ratings in the two maintenance categories are often complex and interrelated with other factors such as ignorance of equipment operations, less-than-optimum equipment environments, and failure to have a maintenance contract. In Burroughs' case, the users seemed most concerned about problems with preventive maintenance (PM), which one user summed up as "Simply not enough PM!"

The problems expressed by these B 1800 users are neither uncommon nor insurmountable. The manufacturers of mainframes have all too frequently expanded their user bases faster than they can build good technical support staffs. Time will at least partially solve this problem, and a concerted effort on Burroughs' part should take care of the rest.□

▶ Each B 9470 disk unit has a maximum access time of 10 milliseconds and an average access time of 5 milliseconds. Data transfer rate is 650K bytes per second. A maximum of eight data paths from a system can be accommodated by each B 9470 subsystem.

B 9480/9481 DISK CARTRIDGE MEMORY SUBSYSTEMS: Provide low-cost random-access data storage on removable single-disk cartridges. Two models are available:

B 9480-12: dual drives, stores 4,667,120 bytes total.

B 9481-12: dual drives, stores 9,334,240 bytes total.

Each drive accommodates one disk cartridge and has two read/write heads, one serving each recording surface. The disk cartridge is 15 inches in diameter, 1.5 inches high, and weighs 5 pounds. The two drives are "stacked" so that the unit occupies less than five square feet of floor space. Data is recorded in 180-byte segments. Average head positioning time is 60 milliseconds, average rotational delay is 20 milliseconds, and data transfer rate is 193,000 bytes/second.

The B 9480/9481 Disk Cartridge Memory Subsystem can be used with all B 1800 Series processor models. A subsystem consists of a B 1480/-80 Control and one or two B 9480-12 Dual Drive Units, providing up to four spindles and storing up to 9.3 million bytes on line; one or two B 9481-12 Dual Drive Units, providing up to four spindles and storing up to 18.6 million bytes on line; or a 9480-12 Dual Drive Unit and a 9481-12 Dual Drive Unit, providing up to four spindles and storing up to 11.8 megabytes on line. Each control has a 720-byte buffer that holds up to four 180-byte segments of data and is cleared in "rotating" fashion.

B 9482-32 DISK CARTRIDGE DRIVE SUBSYSTEM: A dual disk drive system with removable single-disk cartridges that provides a total storage capacity of 18,660,480 bytes. Each drive accommodates one disk cartridge and has two read/write heads, one serving each recording surface. Comparatively high throughput results from direct movement of the read/write heads from one track to another without first returning to a "home position." Independent seek operation allows the overlapping of head movement on one cartridge

drive with any operation on another drive. The B 9482-32 uses a 32-bit error detection/correction code. Each drive in the dual-drive unit has its own logic and power supply, and is therefore not dependent on the other drive. Average head positioning time is 35 milliseconds, average rotational delay is 20 milliseconds, and data transfer rate is 387,500 bytes/ second.

The B 9482-32 Disk Cartridge Drive Subsystem can be used with all B 1800 Series systems. Up to four B 9482-32 dual drives can be attached to a B 1800 system via a B 1482/-80 Control, thus providing a maximum data storage capacity of 74,673,920 bytes.

B 9499-7 DUAL DISK STORAGE/CONTROLLER: Usable on all B 1800 systems, this high-performance disk pack subsystem can consist of two to eight spindles with an on-line storage capacity of 87.2 megabytes per spindle. The B 9499-7 includes a 1 x 4 Disk Pack Electronics Controller; to achieve a 1 x 8 capability, a B 9499 Controller Expansion Adapter must be configured with the system. The B 9499-7 is connected to a B 1486-1 Disk Pack Control; a maximum of one B 1486-1 is allowed on the B 1815. Data is recorded on an 11-platter disk pack that is physically compatible but not format-compatible with the IBM 2316 Disk Pack. There are 180 bytes per sector, 60 sectors per track, and 10,800 bytes per track. Each surface consists of 406 usable data tracks plus one spare. Average head movement time is 30 milliseconds, average rotational delay is 12.5 milliseconds, and data transfer rate is 625,000 bytes per second. The 9486-4 Dual Drive Add-On can be added for a maximum subsystem capacity of eight spindles and 697.6 million bytes.

B 9499-8 DUAL DISK STORAGE/CONTROLLER: Usable on all B 1800 systems, this disk pack subsystem consists of two spindles of on-line storage with a storage capacity of 43.6 megabytes per spindle. Every B 9499-8 must include a 1486-1 Disk Pack Control. On the B 1815, one B 1486-1 is allowed. The drive in this subsystem is a single-density version of the drive used in the B 9499-7, with each surface having 203 tracks. All other specifications are the same. There are no add-on increments for the 9499-8; however, the 9499-8 Dual Disk Storage/Controller can be field-upgraded to the 9499-7 Dual Disk Storage/ Controller.

B 9484 DUAL DISK SUBSYSTEM: Usable on all B 1800 systems, the B 9484 subsystem consists of a B 1486-1 Dual Disk Pack Control and either a 65.2-megabyte B 9484-25 Dual Disk Pack Drive and Electronic Controller or a 130.4-megabyte B 9484-55 Dual Disk Pack Drive and Electronic Controller with optional add-ons; or a B 9499-6 Universal Disk Drive Electronic Controller and add-ons. Add-ons to the B 9484-25 or B 9499-6 may be any combination of 130.4-megabyte B 9484-5 Add-on Dual Disk Drives, 201-megabyte B 9484-2 Single Fixed Disk Drives, and 402-megabyte Dual Fixed Disk Drives. One B 1486-1 Disk Pack Control is allowed on the B 1815.

The B 9484-25 Dual Disk Pack Drive consists of two spindles with an on-line storage capacity of 32.6 megabytes per spindle. The average head movement time for the B 9484-25 is 25 milliseconds, the average rotational delay is 8.3 milliseconds, and the data transfer rate is 605,000 bytes per second. The B 9484-25 employs a 5-platter disk pack with 5 usable surfaces. Each surface contains 406 data tracks plus 1 spare. There are 180 bytes per sector, 90 sectors per track, and 16,200 bytes per track.

The B 9484-55 is a double-density version of the B 9484-25 with 370 tracks per inch, 814 tracks per surface, 65.2 megabytes per spindle, and other specifications the same. The B 9484-5 is the add-on drive for the B 9484-55. ▶

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▶ The B 9494-2 is a fixed disk drive with a single spindle and a capacity of 201 megabytes. There are 8 surfaces for data storage, with 714 tracks per inch and 1564 tracks per surface. The 9494-2 packs data at 6551 bits per inch. There are 90 sectors per track and 180 bytes per sector. The drive rotates at 3672 rpm. The average head movement time is 28 milliseconds, the average rotational delay is 8.2 milliseconds, and the data transfer rate is 650,000 bytes per second.

The B 9494-4 is the dual-spindle version of the B 9494-2, with a total formatted data capacity of 402 megabytes.

B 9489 INDUSTRY-COMPATIBLE MINI-DISK (ICMD) DRIVES: These floppy disk drives are available only as free-standing units. The 9489-17 is a single ICMD drive in a 30-inch cabinet, while the 9489-16 consists of dual ICMD drives housed in a 44-inch cabinet. Control for the B 9489 drives is furnished by the B 1489/-80 Mini-Disk Control. Any combination of up to two cabinets (two, three, or four spindles) may be connected to a B 1489/-80. Each diskette stores 243K bytes of data, with 128 bytes per sector, 26 sectors per track, and 77 tracks per diskette, including three alternates. Track-to-track access time is 20 milliseconds per single step, and settling time is 10 milliseconds. Average access time is 343 milliseconds, and the data transfer rate is 31K bytes per second.

INPUT/OUTPUT UNITS

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

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

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

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

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

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

The basic AE 511 and AE 513 have the same characteristics as the AE 412 with the exception of the data storage media. The AE 511 uses a 239,000-byte magnetic tape cassette for data storage, and the AE 513 uses a Burroughs Super 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 239,000 bytes, and one asynchronous or synchronous data communications line.

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

DIRECT DATA ENTRY: B 1800 direct data entry systems are designed to provide a variety of users with the ability to directly enter and/or retrieve information from the central system, as and when required, without leaving the user departments. Direct data entry systems can be configured with the B 1800 processors utilizing Burroughs TD 73X or TD 83X visual display units connected either directly or via data sets. These systems can use the Burroughs Data Entry Software (DEI) and, for remote programming facilities, the Burroughs Text Editor. The Data Entry Software (DEI) is a completely generative program product used to format input procedures to fit internal documents and to format output files to be used by application programs. This provides the user with the ability to interface with Burroughs standard program products.

A more comprehensive direct data entry system is a B 1800 processor utilizing Burroughs TD 73X and/or TD 83X visual display units connected directly or via data sets. Combined with Burroughs' On-Line Data Entry System, ODESY (DE2), NDL, and, for remote programming capability, Burroughs' Command And Edit (CANDE), this system provides the user with substantial flexibility.

B 9490-25 CASSETTE TAPE SUBSYSTEM: Consists of a B 1490 cassette control and either two B 9490-25 Cassette Tape Stations or an integrated console cassette unit and one B 9490-25 Cassette Tape Station. The cassette unit records at a density of 800 bits per inch and has a capacity of up to 861 256-byte records on 282 feet of tape. The tape contains two tracks, with one for clocking and the other for bit serial encoding using an 8-bit ASCII code. Recording is NRZI at 10 ips. The unit has read-after-write electronics and rewinds tape at 60 ips. The data transfer rate is 1000 bytes per second. The subsystem is usable with all B 1800 Series systems.

The B 1855 and 1885 console includes a switch to allow the integrated cassette to perform read/write operations provided a B 1490-25 control is present. The B 1490-85 is required for a dual B 9490-25 configuration.

B 9491-2 MAGNETIC TAPE DRIVE: Reads and records data on ½-inch tape in the IBM-compatible 9-track NRZI mode at 800 bpi. Tape speed is 12.5 inches/second, data transfer rate is 10,000 bytes/second, and rewind speed is 50 inches/second. Read-after-write electronics are a standard ▶

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feature. Standard vertical and horizontal parity checking are performed. The compact, table-top units accommodate 7-inch reels which hold 600 feet of tape. An optional stand/cabinet supports two of the tape drives and provides storage space for tape reels underneath. A B 9491-2 tape subsystem, usable with all of the B 1800 Series processor models, consists of an A/B 1491/-81 Magnetic Tape Control and from one to four B 9491-2 drives.

B 9495 MAGNETIC TAPE UNITS: These high-performance 9-track units record data on ½-inch tape in IBM-compatible phase-encoded mode at 1600 bpi and NRZI mode at 800 bpi. The B 9495-7 has a tape speed of 25 ips and a data transfer rate of 20,000 bytes per second (800 bpi) or 40,000 bytes per second (1600 bpi). The 9495-8 has a tape speed of 50 ips and a data transfer rate of 40,000 bytes per second (800 bpi) or 80,000 bytes per second (1600 bpi). The 9495-82 has a tape speed of 75 ips and a data transfer rate of 60,000 or 120,000 bytes per second for 800 bpi or 1600 bpi, respectively. Maximum time to rewind a 2400-foot reel of tape is 115 seconds for the 9495-7, 96 seconds for the 9495-8, and 92 seconds for the 9495-82. All three drives can handle 10.5-inch reels holding 2400 feet of tape. The drives feature a single vacuum-driven capstan, a sealed tape-path chamber, a power access window, a positive reel latch, automatic tape threading and loading, and "on-the-fly" detection and correction of most errors. A unique "coaxial" hub mounts the feed reel directly in front of the tape-up reel, reducing the overall width of the unit to just 24 inches.

The B 9495 drives can be configured in several ways, depending on the model, master electronics unit, and tape control:

B 9495 Submodel	9495-7	9495-8	9495-82
B 1496-4/-84 PE Control	—	—	—
and B 9499-33 Electronics Unit	Up to 4	Up to 4	—
or B 9499-34 Electronics Unit	Up to 8	Up to 8	—
Dual B 1496-4/-84's	—	—	—
and B 9499-35 Electronics Unit	Up to 8	Up to 8	—
B 1495-2/-82 PE Control**	—	—	X
and B 9499-50 Electronics Unit	—	—	Up to 4
or B 9499-51 Electronics Unit	—	—	Up to 8
Dual B 1495-2/-82's**	—	—	X
B 9499-52 Electronics Unit	—	—	Up to 8
B 1381/-80 NRZI Control	—	—	—
and B 9499-33 Electronics Unit			
with B 9499-5 NRZI Option	Up to 4*	Up to 4*	
with B 9999-5 NRZI Option			Up to 4*
or B 9499-34 Electronics Unit			
with B 9499-5 NRZI Option	Up to 8*	Up to 8*	
with B 9999-5 NRZI Option			Up to 8*
Dual B 1381/-80's			
and B 9499-35 Electronics Unit			
with B 9499-5 NRZI Option	Up to 8*	Up to 8*	
with B 9999-5 NRZI Option			Up to 8*
B 1495-15/-85 Dual Control**	—	—	—
and B 9499-52 Electronics Unit			
with B 9999-5 NRZI Option	—	—	Up to 8*
B 1496-15/-85 Dual Control**	—	—	—
and B 9499-52 Electronics Unit			
with B 9999-5 NRZI Option	Up to 8*	Up to 8*	—

* Cannot be configured on B 1815.
**Requires B 9999-4 Switchable Feature.

B 9115 CARD READER: Reads standard 80-column cards serially by column at a rated speed of 300 cpm. Reads EBCDIC or binary-coded cards. Cards are read photoelectrically, with a double strobe comparison for each column to help ensure reading accuracy. A single input hopper and output stacker hold up to 1000 cards each. Usable with any B 1800 Series system. Each B 9115 requires a B 1115/-80 Control. The optional B 9915 Feature enables the B 9115 to read 51-column cards.

B 9116 CARD READER: Reads up to 600 cpm. Otherwise, has the same characteristics as the B 9115 described above.

B 9117 CARD READER: Reads up to 800 cpm. Otherwise, has the same characteristics as the B 9115 described above.

B 9111/9112 CARD READER: Reads standard 80-column cards serially by column, on demand, at up to 800 cpm (9111) or 1400 cpm (9112). The feed hopper and stacker hold up to 2400 cards each and can be loaded and unloaded while the reader is operating. Usable with any B 1800 Series system. Each B 9111 or B 9112 requires a B 9111/-80 Control. Optional features for the B 9111 and B 9112 include the B 9917 Card Counter, the B 9918 Postal Money Order Feature, and the B 9919 40-Column Read Feature.

B 9212 CARD PUNCH: Punches standard 80-column cards at up to 150 cards per minute. Usable with any B 1800 Series system, the B 9212 requires a B 1213/-80 Control.

B 9213 CARD PUNCH: Punches standard 80-column cards at up to 300 cpm. The feed hopper holds up to 2200 cards, and three program-selectable stackers hold at least 1400 cards each. Usable with any B 1800 Series system, the B 9213 requires a B 1213/-80 Control.

B 9119-1 CARD READER: Reads 96-column cards at 300 cpm. Includes a 600-card input hopper and one 600-card stacker. Fits on a tabletop, where it occupies less than 1.5 square feet. Usable with any B 1800 Series system, the B 9119-1 requires a B 9119/-80 Control.

B 9119-2 CARD READER: Similar to the B 9119-1, but reads 96-column cards at 1000 cpm. Usable with any B 1800 Series system, the B 9119-2 requires a B 9119/-80 Control.

B 9418-2 CARD READER PUNCH/DATA RECORDER: Reads 80-column cards at 200 cpm, and punches and/or prints full cards at 45 cpm; higher punching speeds are possible if fewer columns are punched. The single card feed path includes: 600-card primary input hopper, 400-card secondary input hopper, read station, visible wait station, punch station, punch check station, print station, and two 400-card stackers. The unit features a 64-character movable keyboard, 64-character printing, a full 80-column print line, and 80-column read, punch, and print buffers. Usable with any B 1800 Series system, the B 9418-2 requires a B 1418-2 Control.

B 9419-2 CARD READER PUNCH/DATA RECORDER: Reads 96-column cards at 300 cpm, and punches and/or prints full cards at 60 cpm; higher punching speeds are possible if fewer columns are punched. The single card feed path includes: 600-card primary input hopper, 400-card secondary input hopper, read station, visible wait station, punch station, punch check station, print station, and two 400-card stackers. The print station permits printed interpretation of the punched data at 60 cpm, with three 32-character lines per card. Input and output data is buffered, and the unit features a keyboard that permits off-line use as a 96-column keypunch or verifier. Program storage for four format-control programs is included. Usable with any B 1800 Series system, the B 1419-2 requires a B 1419/-80 Control.

B 9416-6 MULTI-PURPOSE CARD UNIT: Provides the same 300-cpm reading, 60-cpm punching, and 60-cpm ▶

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▶ printing facilities and data recorder keyboard as the 9419-2 Card Reader Punch/Data Recorder described above, plus the ability to sort cards into any of six 400-card stackers under program control at 300 cpm. Can be used off-line for sorting, keypunching, or verifying. Numeric sorting requires 1.5 passes per card column, while alphabetic sorting requires 2.5 passes per card column. The B 9419-6 requires a B 1419/-80 Control and is usable with any B 1800 Series system.

LINE PRINTERS: Burroughs offers eight printers that span a range of speeds from 85 to 1500 lines per minute. All seven models are usable with any B 1800 system. Their model numbers, rated speeds, and printing techniques are as follows:

B 9249-1: 85-lpm Chain Printer
B 9249-2: 160-lpm Chain Printer
B 9249-3: 250-lpm Chain Printer
B 9249-4: 350-lpm Chain Printer

B 9247-16: 750-lpm Train Printer
B 9247-14: 1100-lpm Train Printer
B 9247-15: 1500-lpm Train Printer

All of the printers have 132 print positions. The B 9247 Train Printers achieve their rated speeds with the standard 48-character train module; other interchangeable modules containing 16, 64, or 96 printable characters are also available, and the 96-character set contains both upper and lower case ASCII or EBCDIC alphabetics. The train printers handle vertical format control through either the Burroughs Forms-Self Align System, which uses codes preprinted on the forms, or a 12-channel VFU.

The B 9247 Train Printers can employ 4- to 20-inch-wide paper and have a skipping speed of 20 ips. The B 9247 Train Printers require a B 1247/-80 Control (-12 and -13 submodels), a B 1247-4/-84 Control (-14 submodel), or a B 1247-5/-85 Control (-15 submodel).

A 48-character EBCDIC or ASCII character set is standard on the B 9249 Chain Printers, with 64- and 96-character sets optional. These printers have an 8.3-ips skipping speed, employ 3- to 17-inch-wide paper, print at 10 characters to the inch, and utilize a 2-channel VFU, with a 12-channel VFU optional. The B 9248 Printers require a B 1249/-80 Control.

MICR READER-SORTERS: The four MICR Reader-Sorters available for use with the B 1800 Series systems have the following characteristics:

B 9135-2: 900 dpm, 8 stacker pockets; B 1130/-80 Control.

B 9135-3: 900 dpm, 12 stacker pockets; B 1130/-80 Control.

B 9134-1: 1625 dpm, 4, 8, 12, or 16 stacker pockets; B 1130 Control.

B 9137-1: 1625 dpm, 4, 8, 12, or 16 stacker pockets; has B 9937-22 "double read" MICR E13-B capability to reduce the number of reject items or B 9937-30 Numeric OCR A Size 1 Feature; B 1130 Control.

The B 9135 Reader-Sorters can process intermixed documents of varying lengths, widths, and weights. The input hopper holds a 17.5-inch stack of documents, and each of 8 or 12 pockets can hold a 3.5-inch stack. Documents can be loaded and removed while the unit is in operation. Other features include positive detection of mis-sorts and double documents, a resettable item counter, and a basic off-line sorter capability.

The B 9134-1 and B 9137-1 are high-performance units that can be equipped wtih a variety of optional features. The B 9134-1 on-line optional features include 4-pocket add-on modules, stacker overflow, valid character check, multi-track E13B, endorser, batch ticket detector, short document read, short document module expander, mobile carrier, resettable or non-resettable item counter, and running-time meter. Off-line features include basic and extended sort, digit override, edit field override, or edit and zero kill, including a numeric optical character recognition feature. In addition, the B 9137-1 is equipped with a double read capability so that MICR characters are read twice during each pass by two separate read heads. The first read is called a "deep" read, in which an attempt is made to interpret imperfect characters, and the second is a "shallow" read which is capable of reading perfect MICR characters.

TD 73X SELF-SCAN DISPLAY/KEYBOARD: This display unit has the capability to display 12 lines of 40 characters for a total of 480 characters. A 128 ASCII character set is employed, with each character displayed in a 5-by-7 dot matrix. Illumination is red phosphor. The TD 73X has extended memory options; A/N source data, 10-key auxiliary, alphanumeric, and extended alphanumeric keyboards; and various peripherals. Data rates are 150 to 1800 bps asynchronous, 2400 to 4800 bps synchronous, 9600 bps via two-wire direct interface (TDI), and 64,000 bps via Burroughs direct interface (BDI).
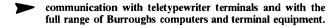
The TD 731 has control for asynchronous data sets and direct-connect communications interfaces; the TD 733, control for synchronous data sets; and the TD 737, control for synchronous data set communications and IBM bisynchronous data communications procedures. The TD 732, TD 734, and TD 738 are equivalent to the TD 731, TD 733, and TD 737, respectively, but with peripheral capability added. Available peripherals include a magnetic card reader, cassette tape drives, and printers of the B 9249 series.

TD 83X CRT DISPLAY KEYBOARD: Displays 24 lines plus a systems line. Each line is 80 characters wide, yielding a total display capacity of 2000 characters including the systems line. The character set is displayed by means of a 5-by-7 dot matrix and contains 128 ASCII characters. The TD 83X includes such features as negative, reverse, blink, and blank video. This CRT utilizes the same keyboards and peripherals as the TD 73X. Data rates are 75 to 1800 bps asynchronous, 2400 or 4800 bps synchronous, 9600 bps via TDI, and 64,000 bps via BDI.

The TD 831 has control for asynchronous data sets and direct-connect communications interfaces; the TD 833, control for synchronous data sets, and the TD 837, control for synchronous data set communications and IBM bisynchronous data communications procedures. The TD 832, TD 834, and TD 838 are equivalent to the TD 831, TD 833 and TD 837; respectively, but with peripheral capability added. Available peripherals include a magnetic card reader, cassette tape drives, and printers of the B 9249 series.

COMMUNICATIONS CONTROL

B 1351 SINGLE-LINE CONTROL: Provides the interface between a single leased or switched communications line and a B 1800 processor. The maximum number of single-line controls that can be connected to a B 1800 Series processor is two. Each control must be equipped with an appropriate line adapter. Line adapters, as listed below, permit ▶

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communication with teletypewriter terminals and with the full range of Burroughs computers and terminal equipment.

The B 1351-1/-80 Single-Line Control can utilize any adapter listed below except the B 1667-5/-85, while the B 1351-2 Single-Line Control has a universal adapter that handles all connections except Burroughs direct interface at up to 19,200 bps, Burroughs standard synchronous at up to 4800 bps or 9600 bps, and bisynchronous at up to 50,000 bps.

LINE ADAPTERS: Burroughs offers 16 different line adapters, divided between asynchronous, direct connect, synchronous, wideband, and automatic calling models. They can be summarized as follows:

Asynchronous data set adapters: B 1650-/81—up to 1200 bps, connection types II, III, or IV; B 1650-2/-82—up to 1800 bps, connection type V; and B 1652-1/-81— Teletype, connection type II.

Direct connect adapters: B 1650-5/-85—two-wire, up to 2400 bps; B 1650-6/-86—two-wire, up to 4800 bps; B 1650-7/-87—two-wire, up to 9600 bps; B 1652-5/-85—Teletype, all the above with connection type II; and B 1667-2/-82—Burroughs Direct, up to 19,200 bps, connection type X.

Synchronous data set adapters: B 1651-1/-81—Burroughs standard, up to 2400 bps, connection type VI or VII, B 1651-2/-82—Burroughs standard, up to 4800 bps, connection type VIII; B 1651-3/-83—Burroughs standard, up to 9600 bps, connection type XII; B 1653-1/-81—bisync, up to 2400 bps, connection type VI or VII; B 1653-2/-82—bisync, up to 4800 bps, connection type VIII; and B 1653-3/-83—bisync, up to 9600 bps, connection type IX.

B 1352-2/-82 Wideband Data Set Adapter—bisync, up to 50,000 bps with connection type XI.

B 1667-5/-85 Automatic Calling Unit Adapter—connects with up to four Bell 801 Automatic Calling Units or three Bell 801 Automatic Calling Units and one in-built data set automatic calling unit.

Connection type I is a standard two-wire direct interface without a data set. Connection types II and III are a Western Electric 103A Data Set or equivalent with either an asynchronous switched line up to 150 bps (type II) or an asynchronous unconditioned lease line with capabilities up to 300 bps (type III). Western Electric 202C Data Sets with an asynchronous switched line up to 1200 bps form the type IV connection. TA 713 or TA 783 Data Sets or equivalent along with an asynchronous unconditioned leased line with capabilities up to 1800 bps form the type V connection. Type VI and VII connections consist of a TA 734-24 data set or equivalent and either a 2000-bps synchronous switched line (type VI) or an unconditioned 2400-bps synchronous leased line (type VII). A synchronous C1 conditioned 4800-bps leased line and TA 734-48 Data Set or equivalent form type VIII connection. A type IX connection is composed of a 9600-bps synchronous leased line and Rixon DS9601 Data Sets. No data set is required for a type X connection, which is a Burroughs direct interface (BDI). A type XI connection consists of a WE303 and leased wideband service.

B 1351-1/-81 DUAL SINGLE-LINE CONTROL: Provides the interface between two leased or switched communications lines and a B 1800 processor. Otherwise similar to the B 1351 Single-Line Control.

B 1352 EIGHT-LINE MULTI-LINE CONTROL: Provides the interface between B 1855/B 1885 Processors and up to eight leased or switched communications lines. With the 1353 Controller Extension, a total of up to 16 lines can be serviced. The 1352 MLC must be equipped with an

appropriate line adapter for each line. Line adapters permit communication with Teletype terminals and with the full range of Burroughs computers and terminal equipment. Transmission speeds up to 9600 bits/second can be handled in either asynchronous, synchronous, or binary synchronous mode. Wideband transmission is possible at up to 50,000 bps. The transmission code is 7-bit ASCII plus parity.

The 1352 MLC interfaces directly with main memory through the Port Interchange, thereby reducing the demands it imposes upon the central processor. Although the MLC performs numerous communications control functions and operates in a largely processor-independent manner, it is a hard-wired controller rather than a programmable communications processor. One character of buffering per adapter is provided in the MLC, in addition to the one character accummulated by the buffer.

B 1354 FOUR-LINE MULTI-LINE CONTROL: Similar to the B 1352, but restricted to four lines.

SOFTWARE

OPERATING SYSTEM: The central component of Burroughs software support for the B 1800 systems is the MCP (Master Control Program), a modular operating system that manages and controls all operations of the system. It performs the following principal functions: 1) schedules the loading and execution of user programs in a multiprogramming environment, in accordance with user-assigned priorities; 2) allocates memory areas, processor logic, and peripheral units; 3) schedules and initiates all I/O operations; 4) provides automatic error-handling procedures; 5) creates and maintains a disk program library; 6) handles communication between the system and its operator via the console typewriter and control cards; 7) provides a printout showing the status of all active jobs upon request; 8) guides the compilation of programs written in COBOL, FORTRAN, BASIC, and RPG; 9) handles file opening and closing, physical data management, utility functions, program loading, and program library calls; and 10) controls data communications devices and MICR reader-sorters.

The MCP is written in Burroughs' Software Development Language (SDL), a high-level language oriented toward facilitating the writing of systems software. Therefore, whenever the MCP is in use, all or part of the SDL Interpreter must be resident in memory.

LANGUAGES: The B 1800 Series computer systems support COBOL, RPG, FORTRAN, BASIC, Audit Entry Language, Micro Implementation Language, and Software Development Language, Network Definition Language, and User Definition Language.

The *B 1800 COBOL* language is an essentially complete implemention of full American National Standard 1974 COBOL except for the Report Writer module, which is omitted from the B 1800 version. COBOL object programs are regarded as a collection of logical segments which can be loaded and executed individually or in groups, meaning that programs can be written without the usual limitations imposed by the computer's memory capacity.

The COBOL compiler runs on any B 1800 system. The compiler requires about 40K bytes of memory. Object programs generated by the COBOL compiler are expressed in an S-language that is oriented toward efficient handling of 4-bit digits and 8-bit characters. The COBOL Interpreter, required at execution time, occupies about 3K bytes of memory in addition to the object program's requirements.

B 1800 COBOL includes a queue handling technique and a sort capability that includes a tag search, a restart facility, vertical collating sequence, and tape sorting.

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▶ The *B 1800 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 1800 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 1800 system. The compiler requires about 10K bytes of memory exclusive of HCP. The RPG Interpreter occupies about 3K bytes of memory at execution time in addition to the object program's requirements.

The *B 1800 FORTRAN* language is compatible with American National Standard 1977 FORTRAN and includes certain Burroughs extensions to provide features available in IBM FORTRAN IV Level II. The compiler requires about 16K bytes of memory. Object programs produced by the FORTRAN compiler are expressed in an S-language that is oriented toward efficient handling of 36-bit "words" and 72-bit "doublewords." The FORTRAN Interpreter, required at execution time, occupies about 3.5K bytes of memory in addition to the object program's requirements. The FORTRAN compiler requires 16 to 21K bytes of memory exclusive of MCP.

B 1800 Interactive BASIC, like RPG, is a compiler-driven language. The compiler will accept source programs written in a language that generally corresponds to the original Dartmouth BASIC (Beginners' All-Purpose Symbolic Instruction Code). The batch-mode BASIC compiler requires about 8K bytes of memory. Object programs produced by the BASIC compiler are expressed in an S-language that is oriented toward efficient handling of 40-bit (5-character) "words." The BASIC Interpreter, required at execution time, occupies about 3K bytes of memory in addition to the object program's requirements. At a later date, Burroughs plans to deliver a BASIC compiler that will permit interactive, conversational problem-solving. The BASIC compiler requires about 17K bytes of memory exclusive of MCP.

The *B 1800 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. 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.

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.

AEL also includes 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. 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.

B 1800 Micro Implementation Language (MIL) is a compiler level language that produces micro-code that is directly executable on a B 1800. Register to register operations; variable length operations; bit field extraction; control memory overlay; and shift, rotate, and compare functions are possible. Read/Write/Swap of 1 to 24 bits forward or backward in main memory, with incrementing and decrementing of length attributes, is performed in one micro instruction. Scratchpad storage of main memory pointers and a 16- or 32-level pushdown stack for microcode return linkage are addressable. To use MIL, a knowledge of gating functions of timing of hardware events is not required. A single micro instruction will bias the microprocessor mode for data type, which may be binary, 4-bit decimal, or EBCDIC. Data field length can be from one to 65,536 bits. MIL requires 44K bytes of memory exclusive of MCP.

B 1800 Software Development Language (SDL) is a compiler level system language that is procedure oriented with extensive subscripting, indexing, and data concatenation capabilities. Data declarations include arrays and substructures in bit or character formats. Data space can be allocated as permanent, dynamic (shared space local to procedures), and virtual. Dynamic space is calculated at run time. SDL requires 20K bytes of memory exclusive of MCP.

Network Definition Language (NDL) is a special-purpose programming tool that enables users to define and generate customized Network Control programs for data communications applications. The Network Controller handles line disciplines, buffer management, message queuing, and auditing, and supervises the flow of messages between user-coded programs and remote terminals. This enables the user's application programs to deal with remote terminals in the same manner as with 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. NDL runs under MCP on any B 1800 Series system. NDL requires a minimum of 12K bytes of memory exclusive of MCP.

User Programming Language (UPL) is an ALGOL-like compiler language designed to facilitate the solution of complex logic and decision-making problems, primarily in the design of data communications message control programs. UPL is a procedure-oriented language with extensive subscripting, string manipulation, and data concatenation facilities. Arrays and data substructures can be defined in or character formats. The UPL Compiler and its object programs operate under MCP supervision on an B 1800 Series system. UPL can be used to prepare a customized Message Control System (MCS) for use with an NDL-generated Network Controller when the user wishes to exert control over system decisions such as security, file control, error handling, preprocessing, or postprocessing. UPL requires a minimum of 20K bytes of memory exclusive of MCP.

GENERALIZED MESSAGE CONTROL SYSTEM (GEMCOS): GEMCOS is a generalized system that uses parameters for generating an installation-tailored Message Control System (MCS). The Message Control System (MCS) provides the interface between the network controller and user application programs by decoding and directing incoming messages to the appropriate user program for processing. The system can accommodate user-written code ▶

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and contains facilities for exchange of data between application programs. Recovery capabilities include dynamic restoration of the network configuration, an audit mechanism for logging specified messages, and a network control command for orderly system shutdown in the event of system failure. The recovery mechanism can be synchronized with DMS II recovery to insure data base integrity. A password security system is provided to control access to the communications network. The system also includes an auxiliary program to permit network commands to be entered into the MCS from the console printer or a card reader. GEMCOS also provides a transaction translation feature which translates data from the format required by the workstation to the format required by the application program.

GEMCOS requires a minimum of 24K bytes of main memory for Message Control Program generation (not including MCP and Network Definition Language memory requirements), plus a console printer, card reader, line printer and 4.6 million bytes of disk storage, exclusive of MCP and NDL requirements. Each MCS requires a minimum of 7K bytes of memory plus 5K bytes of disk storage.

DATA MANAGEMENT SYSTEM II: DMS-II is a data base management system consisting of two components: a Data and Structure Definition Language (DASDL), which provides for the logical description of data sets or subsets and for mapping the logical data onto physical structures, and a COBOL interface.

Specifically, B 1800 DMS-II is a logical subset of B 6700/6800 DMS-II. The COBOL constructs used in B 1800 Series COBOL programs for accessing the data base are syntactically and semantically compatible with those used in B 6700 COBOL. However, the physical mapping algorithms for structuring the data base records on direct-access storage differ, so that a B 1800 DMS-II data base must be reloaded before being transferred to B 6700 DMS-II. The B 1800 DMS-II DASDL parameters and DMS statements in COBOL programs are compatible with B 6700 DMS-II, eliminating the necessity of converting DMS-II COBOL user programs and user DASDL or the DASDL definition of the data base.

DMS-II Inquiry provides access to a data base from any terminal. In addition to extracting information from the data base, DMS-II Inquiry allows the terminal user to interrogate the description of a data base. Inquiry statements are composed of basic functions tied together by English like connectors. Inquiry statements include HELP, which provides information to the user on how to use Inquiry; SHOW, which allows the user to list on a terminal all or selected portions of a data base; REPEAT, which allows the user to repeat a previous statement; EDIT, for modification of a previous statement; GENERATE, for creation of a private copy of a portion of a data base; DEFINE, for creation of statement abbreviations; and INQUIRY, which provides a means of selecting records of interest and naming the information to be displayed.

DMS-II requires 128K bytes of memory for operation; this includes space for MCP, the network controller, and DMS-II. Additional users of the same data base will require 32K bytes each. For further information on DMS-II see Report 70E-112-01.

COMMAND AND EDIT (CANDE): Provides generalized file preparation and updating in an interactive terminal-oriented environment. B 1800 CANDE is a subset of B 6700 and B 6800 CANDE and conforms to the same functional behavior. B 1800 CANDE is an MCS (Message Control System) that runs in conjunction with NDL. The NDL

generated network controller performs all the data communications related functions, while CANDE performs file updating and text editing functions. CANDE can support a maximum of 16 terminals and makes optimum use of Model 33 teletypewriters and TD 83X CRT's. A basic user code/password type of security is available with the system. CANDE also provides a recovery system. CANDE requires 22K bytes of memory for one terminal plus 2K bytes for each additional terminal when specific file functions such as "GET" are used. MCP and NDL are not included in the memory requirements of CANDE.

REPORTER: The Reporter System enables users to generate customized report programs from simplified free-form statements describing the contents of the reports to be produced. Its output is COBOL source code, ready for compilation and execution on either a one-shot or production basis. Reports can be created from information contained in standard disk, tape, or card files or from data base files created by DMS-II. To describe the files and generate the necessary vocabulary (a one-time operation), VOCAL (Vocabulary Language) allows direct reference to COBOL data names and file layouts in existing COBOL source programs; alternatively, the data names and descriptions can be entered separately in standard COBOL notation.

The reports to be reproduced are described in a concise, English-like language, called REPORTER, that is largely self-documenting. Numerous default features make it unnecessary to specify each option. The user specifies each data element by name only, and is not required to know its size or format. In similar fashion, the user need only specify the column headings, and the system will automatically handle all other aspects of formatting the output. A security system denies access to sensitive data items by unauthorized users. Through an interface module, the reports can be generated from and viewed at remote workstations. The Reporter System requires 25K bytes of memory and 2 megabytes of disk storage.

B 1800 TEXT/EDITOR (TEI): This remote text editing program runs under control of the MCP operating system and provides facilities for source file maintenance operations concurrently with batch and other remote processing. The system provides a conversational English-language command language which includes editing, manipulation, and control commands that can be entered from TD 700 or TD 800 series remote terminals. Each terminal user is provided with a re-entrant copy of the Text/Editor program in order to insure effective response. The Text/Editor requires at least 12K bytes of memory exclusive of MCP, network controller, and message buffer space.

A wide range of data sampling techniques are supplied with TEI, including systematic, tandem, and stratified. Selection of data can be based upon weighting and validation criteria, pattern matching, arithmetic expressions, and range intervals. Statistical parameters can be automatically calculated.

HASP REMOTE TERMINAL PROGRAM: Permits a B 1800 Series system to function as a remote batch terminal on-line to IBM System/360 or 370 computer systems that utilize the HASP Binary Synchronous Multileaving Protocol. With the HASP Remote Terminal Program, a B 1800 system can be made functionally equivalent to a standard IBM 360/20 HASP workstation. Communication between the B 1800 and the central system are conducted utilizing the standard IBM binary synchronous line procedures. The transmission code is EBCDIC. Two modes of operation are supported. In the Spool Mode, input data from the B 1800 peripheral devices is compressed, blocked, and stored on a disk file for later transmission to the central processor, and data records returned from the central system are stored on disk for subsequent output to printers or card punches. In the Direct Mode, input data is blocked and transmitted to

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the central system, and data records returned from the central system are immediately deblocked and routed to the appropriate output devices.

The B 1800 HASP Remote Terminal Program operates under the MCP operating system, permitting the remote job entry function to be multiprogrammed with local processing. Line speeds of up to 9,600 bps are supported over leased or dial-up lines in half-duplex mode. The program requires 32K bytes of main memory in addition to that required for MCP.

RJE TERMINAL PROGRAMS: Burroughs offers two programs for RJE. One permits entry to a B 7000/B 8000; the second, to a B 3000/B 1000. These programs make a B 1800 appear as a remote terminal to the above systems and enable direct entry to the host computer with printer or punch output returned. Both programs require either 16K or 24K bytes of memory dependent on the user selection of Network Definition or Systems Definition Language versions.

B 100/200/300/500 EMULATOR: This emulator enables any B 1800 Series system to execute object programs written for the second-generation Burroughs B 100, 200, 300, or 500 Series computers. The emulator is essentially a microcoded B 300 Series instruction set that has been implemented in the variable micrologic of the B 1800 Series. The following B 300 Series peripheral devices are directly replaced by their B 1800 Series counterparts: 80-column card readers and punches, buffered line printers, magnetic tape units, disk files, and the supervisory printer. On-line banking systems, data communications terminals, MICR reader-sorters, and 6-tape listers, however, are not supported under emulation.

IBM 1401, 1440, 1460 EMULATOR: This emulator enables any B 1800 Series system to execute object programs written for an IBM 1401, 1440, or 1460 computer. The emulator is essentially a microcoded IBM 1400 Series instruction set that has been implemented in the variable micrologic of the B 1800 Series. The emulator supports most of the 1401/1440/1460 processor functions and all of the standard peripheral equipment except MICR, OCR, paper tape, and data communications devices. Burroughs states that the emulator will normally execute instructions two to three times as fast as the original 1400 Series system, while the I/O operations will normally be performed at peripheral speeds.

IBM 1130 INTERPRETER: Decodes and executes 1130 programs on the B 1800 under control of MCP in an 1130 environment. The Interpreter can be multiprogrammed with any standard B 1800 object program. I/O instructions for the 2501 Card Reader, 1403 Printer Models 6021, 2310 Disk Storage Models 1 or B 2, 1131 Console Printer and Keyboard, 1132 Line Printer, and 1442 Card Reader can be executed. The interpreter requires 16K bytes plus the memory size of the IBM 1130, exclusive of MCP.

CONVERSION AIDS: In addition to emulators, Burroughs offers the following language translators as aids for converting from competitive computer systems: Honeywell Easycoder to B 1800 COBOL, NCR Century Series COBOL to B 1800 COBOL, IBM Autocoder to B 1800 COBOL, NCR NEAT/3 to B 1800 COBOL, B 300/B 500 Assembly Language to Burroughs COBOL, and Honeywell COBOL to B 1800 COBOL.

UTILITY ROUTINES: A disk sort program sorts records into ascending or descending sequence in accordance with specification cards that describe the input and output files, the key field or fields, and various options. The sort function can also be invoked from within a COBOL or RPG source program. The user can specify either of two sorting techniques; vector replacement (the one most commonly used) or in-place (which minimizes the amount of disk storage space required).

The systems SORT provides for both sorting or merging utilizing tape or disk. The program requires 3K bytes of memory for the sort generator, 8K bytes for the tape, disk, or inplace sort, and 8K bytes for the merge. User options in using the sort utility include sorting technique, memory allocation, and percentage of byte in order.

Other B 1800 Series utility routines include System Loading Procedures, Disk Cartridge Initializer, Disk File Copy, Memory Dump, Memory Dump Analyzer, File/Loader, File/Puncher, and DMPALL. The last-named routine is a flexible listing and reproducing program for printing the contents of files and transcribing data from one medium to another.

DISK-FORTE II: A file management system that enables a user to structure and maintain data files in disk storage. The files may have any of four distinct types of organization: indexed sequential, random, indexed random, and unordered. Appropriate search strategies are used to access the data records in each type of file. "Pointers" can be defined to establish chaining and linking network structures among the files. Disk-FORTE II generates COBOL source code which is compiled along with the user's application programs. Disk-FORTE-II requires a minimum of 24K bytes of memory.

TIME AND ANALYSIS BILLING SYSTEM (TABS): Designed to provide B 1800 system users with a comprehensive analysis of the SYSTEM/LOG, which is automatically maintained by the MCP. TABS provides information for system mix and peripheral utilization reports, program execution reports, and services-rendered reports. The automatic logging function of the MCP creates the SYSTEM/LOG, which contains information about all significant events in a multiprogramming system. The analysis function of TABS extracts and generates machine utilization statistics and program performance. As the selected reports are produced, month-to-date statistics are maintained in TABS data files. The statistics, together with information on installation costs supplied by the user, can be used to distribute the system cost equitably among individuals, departments, or applications using the data processing services. TABS requires a minimum of 20K bytes exclusive of MCP.

ON-LINE DATA ENTRY SYSTEM (ODESY): A sophisticated data entry and validation system using multiple on-line visual display units. It provides a generalized and generative "front end" for the existing B 1800 application packages. It enables future packages to be designed to use its extensive editing facilities and thus reduce development effort by virtually eliminating conventional input control programs. Because of these editing facilities, ODESY is able to produce batches of essentially error-free data for input to application programs.

AUDIT ENTRY HOST SYSTEMS UTILITIES (AEU): A set of utilities provided to complement the AEL language and provide a media between AEL machines and the host B 1800. AEU load the files from the host system ICMD device or from the data communications link. File manipulation facilities are also provided by these utilities. The host utilities include Batch Load, for loading AEL-produced files from a host peripheral; Concatenate, to combine a number of AEL produced files; Remote Load, which allows files to be received at a host system after transmission from an AEL machine and visa versa; Reformat, which allows the sequence of fields in an AEL record to be altered subsequent to the file being loaded in the host; and File Maintenance, for record insertion, deletion, and replacement on AEL produced files. These utilities require a minimum of 22K bytes of memory, exclusive of system software.

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➤ BURROUGHS NETWORK ARCHITECTURE (BNA): A set of software designed to enhance the interaction of terminals with host CPU's in a network environment. BNA is also designed to facilitate a move into distributed data processing. Through the new architecture, Burroughs processors and terminals can be granted access to data bases throughout a network, job tasks and information files can be transferred from one point to another, and data processing resources available in a network can be shared among participants regardless of location. BNA is designed to work with existing Burroughs terminal networks and with the Global Memory multi-processing facility available on Burroughs large-scale processors. BNA depends on logical links rather than physical links, relying on network tables maintained in the host processors for routing. All routing is through host mainframes. Services provided by BNA include those designated host and those designated network. Host services include coordination of communication between tasks being executed at various hosts; control of the creation, updating, and transfer of data from host to host; and handling of communication with logical points within the network. Network services perform message routing, linking hosts using the Burroughs Data Link Control (BDLC) bit oriented protocol. Network services also permit connection of Burroughs processors to packet-switching services using X.25 procedures. Links can also be established to non-Burroughs machines using currently available software such as NDL and MCS.

Burroughs has sought to protect the user's programming investment by devising extensions to COBOL, PL/1, Algol, and FORTRAN under BNA.

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

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

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

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

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

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

APPLICATION PROGRAMS: See the Software Prices section at the end of this report for a listing of applications programs available for the B 1800 Series.

CONTRACT TERMS: The B 1800 is available for purchase or by standard equipment lease agreement which includes equipment maintenance and entitles the customer to unlimited use of the equipment. The standard agreement covers maintenance of the equipment for eight consecutive hours a day, Monday through Friday. The CPU is warranted for one year; the other equipment, for 90 days.

In addition to the standard 1-year lease, Burroughs offers 3-year and 5-year leases at prices approximately 10 and 15 percent lower, respectively, than the 1-year lease prices.

All lease plans may include purchase options which allow 50% of the rental paid during the first 36 months to be applied toward the purchase price at any time during the lease period.

MAINTENANCE: In addition to the standard maintenance agreement, a user with a purchased or leased unit can elect extended maintenance by adding to the monthly charges the percentage given by the following table. All maintenance rates given in this report are for metro 1 (city) districts. Super city rates (e.g., New York or Chicago) are four percent higher. Rates outside a metro area (10 miles from city) are 20 percent higher.

For purchased systems not under maintenance contract, the user charges are as follows:

	Rate	Minimum
Mon. through Fri., 8 AM to 5 PM	$40/hr.	1 hour
All other times	$48/hr.	2 hours

SOFTWARE: All software is unbundled. System software is provided to the user in a packaged form at a monthly license rate listed in "Software Prices" at the end of this report. The compilers and other "program development aids" are offered under the same consideration.

All applications software is separately priced under Burroughs' Program Products plan. The Program Products are offered under either an Unlimited-Time License Plan, for a one-time charge followed by an annual maintenance fee, or a Limited-Time License Plan, with monthly payments during either a 3-year or 5-year lease term. The available Program Products and their associated ➤

Burroughs B 1800 Series

▶ license fees are listed under "Software Prices" at the end of this report.

TECHNICAL SUPPORT: B 1800 users can purchase Burroughs technical assistance in four ways: (1) as part of a Business Management System (see "Software Prices"); (2) under a System Analyst Assistance Agreement, for $2,000 per year; (3) on a per-diem basis, when available, for $150 per day; or (4) by the hour at $50 per hour.

EDUCATION: B 1800 users can obtain the necessary training: 1) as part of a Business Management System (see

"Software Prices"); or 2) by paying for individual courses. The separately priced courses announced to date range from 3 to 8 days in length and cost $100 per day for each attendee.

DEBUGGING TIME: One hour per $1,000 of rental or per $48,000 of purchase price, not to exceed 120 hours.

EQUIPMENT: All B 1800's currently being offered are packaged systems. Please refer to the Equipment Price List section of this report.■

EQUIPMENT PRICES

PACKAGED SYSTEMS		Purchase Price	Monthly Maint.	1-Year lease*	5-Year lease*
B 1815	Basic system; includes 5-MHz CPU with 96K bytes of main memory, 32K-byte B 1015-132 Memory Increment, B 9348-31 Console Display, B 1348-32 Console Control, B 1480 Disk Cartridge Control, two 36-megabyte B 9484-32 Disk Cartridge Drives, B 1249 Line Printer Control, 350-lpm B 9249-4 Line Printer, and B 1351-2 Universal Single Line Communications Control	$60,000	$360.00	$2,125	$1,705
B 1815-1	Basic system; same as B 1815 but B 1486-1 Disk Pack Control and 65-megabyte B 9484-25 Disk Pack Drive are substituted for cartridge drive and control	65,000	380.00	2,300	1,870
B 1855	Basic system; includes 6-MHz CPU with 256K bytes of main memory, 256K-byte B 1055-262 Memory Increment, 4K-byte cache memory, B 9348-31 Console Display, B 1348-32 Console Control, B 1486-1 Disk Pack Control, 65-megabyte B 9484-25 Disk Pack Drive, B 1247 Printer Control, 750-lpm B 9247-13 Line Printer, B 1354 Four Line Multi-Line Communications Control, and 80-amphere B 1055 Power Booster	85,000	500.00	2,645	2,145
B 1885	Basic system; includes two 6-MHz CPUs, B 1085-524 with 524K bytes of main memory, B 9348-31 Console Display, B 1348-32 Console Control, B 1486-1 Disk Pack Control, 130-megabyte B 9484-55 Disk Pack Drive, B 1247 Printer Control, 750 lpm B 9247-13 Line Printer, and B 1354 Four Line Multi-Line Communications Control	133,000	600.00	3,965	3,132
PROCESSOR OPTIONS					
B 1304	I/O Expansion (2 controls)	1,288	3.70	31	26
B 1305	I/O Expansion (5 controls)	1,545	7.60	41	36
B 1306	I/O Expansion (5 controls)	1,545	7.60	41	36
B 1301	Model 1 Power Supply	1,751	3.70	52	46
B 1055	80-amp Power Booster for the B 1885	5,000	15.00	160	140
B 1056	Expansion Cabinet for the B 1855	15,750	60.00	510	440
MEMORY					
B 1015-132	128K-byte Memory Increment for the B 1815	10,000	100.00	290	250
B 1055-262	256K-byte Memory Increment for the B 1855	5,000	21.00	166	147
B 1085-262	256K-byte Memory Increment for the B 1885	7,000	21.00	265	220
MASS STORAGE					
B 9470-2	Primary Head-Per-Track Disk Drive; 5.9 megabytes; includes power supply and air system	34,000	71.40	1,030	840
B 9470-12	Add-on Drive; 5.9 megabytes; requires B 9470-2	28,000	69.20	850	695
B 9471-6	Disk File Electronics Unit for B 9470 drives; one required for each four B 9470's	10,000	43.10	305	250
B 9480-12	Dual Disk Cartridge Drive; 4.6 megabytes	11,330	69.50	427	335
B 9481-12	Dual Disk Cartridge Drive, 9.2 megabytes	13,390	94.40	520	422
B 9482-32	Dual Disk Cartridge Drive, 18.4 megabytes	15,862	143.00	551	448
B 1480/-80	Control for B 9480-12/B 9481-12 Disk Drives	3,605	19.30	124	103
B 1482/-80	Control for B 9482 Disk Drives	4,120	19.30	149	113
B 9499-7	Dual Disk Storage/Controller, 174.4 megabytes	58,010	306.00	1,906	1,468
B 9486-4	Dual Drive Increment for the B 9499-7	39,041	268.00	1,278	1,008
B 9499-8	Dual Disk Storage/Controller	37,080	306.00	1,215	968
B 9484-25	Dual Disk Pack Drive and Controller; 62.5 megabytes	32,960	186.00	1,092	845
B 9484-55	Dual Drive/Controller; 130.4 megabytes	43,073	186.00	1,412	1,083
B 9484-5	Add-on drive for the B 9484-55 or B 9499-6; 130.4-megabytes dual disk pack drive	20,000	85.00	670	545
B 9494-2	Add-on drive for the B 9484-55 or B 9499-6; 201-megabyte fixed disk drive	16,000	65.00	444	345
B 9494-4	Add-on drive for the B 9484-55 or 9499-6; 402-megabyte dual fixed disk drive	24,000	95.00	665	504

* Includes equipment maintenance.

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EQUIPMENT PRICES (Continued)

		Purchase Price	Monthly Maint.	1-Year lease*	5-Year lease*
MASS STORAGE (Continued)					
B 1486-1	Disk Pack Drive Control	6,180	45.00	201	165
B 9489-17	Industry Compatible Mini-Disk Drive; single spindle, 243K bytes	3,296	22.10	113	103
B 9489-16	Industry Compatible Mini-Disk Drive; dual spindle, 486K bytes	6,530	25.00	221	180
B 1489/-80	Mini-Disk Control for the B 9489-17 and B 9489-16	4,244	12.30	128	106
MAGNETIC TAPE UNITS					
B 9490-25	Cassette Tape Station; 10 ips	1,689	8.10	69	56
B 1490-25	Control for the B 9490-25 Cassette Tape Station	2,266	190.00	103	77
B 9491-2	Magnetic Tape Drive; 9 tracks, 10 KBS, NRZI	9,167	25.10	283	232
B 9495-7	Magnetic Tape Drive; 9-track, 20/40 KBS, NRZI/PE	9,000	85.10	320	265
B 9495-8	Magnetic Tape Drive; 9-track, 40/80 KBS, NRZI/PE	10,000	90.40	350	300
B 9495-82	Magnetic Tape Drive; 9-track, 60/120 KBS, NRZI/PE	17,600	88.10	555	430
B 9499-33	1 x 4 Master Electronics Unit; PE; for B 9495-7 or B 9495-8	10,400	25.80	340	260
B 9499-34	1 x 8 Master Electronics Unit; PE; for B 9495-7 or B 9495-8	11,200	25.80	365	285
B 9499-35	2 x 8 Master Electronics Unit; PE; for B 9495-7 or B 9495-8	13,120	56.50	430	330
B 9499-50	1 x 4 Master Electronics Unit; PE; for B 9495-82	16,500	110.00	545	415
B 9499-51	1 x 8 Master Electronics Unit; PE; for B 9495-82	18,200	110.00	575	440
B 9499-52	2 x 8 Master Electronics Unit; PE; for B 9495-82	46,478	230.00	1,640	950
B 9999-2	NRZI Option for B 9499-33, B 9499-34, B 9499-35; allows use of B 9495-7 or B9495-8 in NRZI mode	2,600	25.00	80	65
		2,600	25.00	80	65
B 1495-32	PE/NRZI Control; for use with B 9499-50, B 9499-51, or B 9499-52	3,600	17.00	95	86
B 1491-30	NRZI Control; for use with B 9499-33, B 9499-34, or B 9499-35	6,000	57.00	175	159
B 1495-35	PE/NRZI Control; for use with B 9499-52	10,200	67.00	270	245
LINE PRINTERS					
B 9249-1	Chain Printer; 85 lpm, 132 positions	9,373	75.10	376	294
B 9249-2	Chain Printer; 160 lpm, 132 positions	9,888	87.60	422	330
B 9249-3	Chain Printer; 250 lpm, 132 positions	13,493	118.00	567	438
B 9249-4	Chain Printer; 350 lpm, 132 positions	14,900	137.00	610	480
B 1249/-80	Printer Control for the B 9249	1,379	11.00	54	54
B 9247-16	Train Printer; 750 lpm, 132 positions	20,000	200.00	650	525
B 9247-14	Train Printer; 1100 lpm, 132 positions	33,000	349.00	1,100	950
B 9247-15	Train Printer; 1500 lpm, 132 positions	44,000	400.00	1,500	1,200
B 1247/-80	Printer Control for the B 9247-12 or B 9247-16	4,450	18.80	113	98
B 1247/-84	Printer Control for the B 9247-14	5.562	27.90	155	124
B 1247/-85	Printer Control for the B 9247-15	7,725	27.90	252	211
B 9942-9	Additional Train Module for the B 9247-12 or B 9247-13	3,605	—	84	69
B 9942-10	Additional Train Module for the B 9247-14 or B 9247-15	3,245	—	124	101
B 9948-1	12-channel VFU for the B 9249	618	16.10	41	26
PUNCHED CARD EQUIPMENT					
B 9115	Card Reader; 300 cpm, 80-column; requires B 1115 Control	7,809	39.20	283	191
B 9116	Card Reader; 600 cpm, 80-column; requires B 1115 Control	9,845	54.90	324	245
B 9117	Card Reader; 800 cpm, 80-column; requires B 1115 Control	11,204	67.30	366	282
B 9111	Card Reader; 800 cpm, 80-column; requires B 1111 Control	18,710	107.00	479	391
B 9112	Card Reader; 1400 cpm, 80-column; requires B 1111 Control	24,869	162.00	664	541
B 9119-1	Card Reader; 300 cpm, 96-column; requires B 1119 Control	4,552	32.80	139	113
B 9119-2	Card Reader; 100 cpm, 96-column; requires B 1119 Control	10,238	65.50	288	237
B 1115/-80	Card Reader Control for B 9115/6/7 Card Readers	2,225	10.30	57	51
B 9915	51-Col. Read Feature for B 9115/6/7 Card Readers	803	—	22	18
B 9991-2	Stand for B 9115/6/7	258	—	8	7
B 1111	Card Reader Control for B 9111/2 Card Readers	2,400	9.10	57	52
B 9917	Card Counter for B 9111/2/3	258	—	8	7
B 9919	40-Col. Read Switch for B 9111/2/3				
B 1119/-80	Card Reader Control; 96-column; for B 9119-1 or B 9119-2	2,400	9.10	93	77
B 9212	Card Punch; 150 cpm, 96-column; requires B 1213 Control	24,014	142.00	610	478
B 9213	Card Punch; 300 cpm, 96-column; requires B 1213 Control	29,605	182.00	748	585
B 1213/-80	Punch Control B 9212 or B 9213 Punch	4,450	17.90	118	98
B 9418-2	Card Reader Punch/Data Recorder; 80 columns, 200 cpm read, 45 cpm punch/print, requires B 1418 Control	12,060	109.00	390	320
B 1418-2	Reader/Punch Control for B 9418-2 Reader/Punch/Data Recorder	6,953	27.10	191	160

* Includes equipment maintenance.

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EQUIPMENT PRICES (Continued)

		Purchase Price	Monthly Maint.	1-Year lease*	5-Year lease*
PUNCHED CARD EQUIPMENT (Continued)					
B 9419-2	Card Reader Punch/Data Recorder; 96 columns, 300-cpm read, 60-cpm punch and 60-cpm print; requires B 1419 Control	9,013	93.10	340	278
B 9419-6	Multi-Purpose Card Unit; 96 columns, 300-cpm read, 60-cpm punch, and 60-cpm print, requires B 1419 Control	9,528	111.00	402	335
B 1419/-80	Card Reader Punch/Data Recorder Control for B 9419-2 and B 9419-6	2,400	14.30	93	77
READER-SORTERS					
B 9135-2	Reader-Sorter; 900 dpm, 8 pockets	51,168	565.00	1,481	1,258
B 9135-3	Reader-Sorter; 900 dpm, 12 pockets	62,859	612.00	1,926	1,634
B 9134-1	Reader-Sorter; 1625 dpm, 4 pockets; requires B 9938-1 Multi-Track Read or B 9938-6 Optical Character Recognition System	45,732	460.00	1,259	1,020
B 9137-1	Reader-Sorter; 1625 dpm, 4 pockets, double read capability	40,170	675.00	1,339	1,174
B 1130/-80	Control for the B 9135 or B 9134-1	6,874	46.40	260	217
B 1130	Control for the B 9137-1	6,874	46.40	260	217
	On-Line Features:				
B 9935-1	Expansion Feature; pockets 17-32	4,460	13.90	124	100
B 9935-2	Four-Pocket Module; pockets 5-16	13,379	48.60	369	299
B 9935-3	Four-Pocket Module; pockets 17-32	13,379	48.60	369	299
B 9936-1	Stacker Overflow	446	1.70	13	10
B 9937-1	Valid Character Check	222	1.70	7	6
B 9938-1	Multi-Track E13B	16,723	92.60	460	373
B 9938-6	Numeric OCR A (Size 1) Character Recognition System	47,380	198.00	1,227	995
B 9932-1	Endorser; 1625 dpm	8,362	84.10	245	199
B 9932-4	Batch Ticket Detector	446	1.70	13	10
B 9932-5	Short Document Read Feature	446	3.40	13	10
B 9932-6	Short Document Module Expander; requires B 9932-5	222	25.30	7	6
B 9930-3	Mobile Carrier	135	39.00	—	—
B 9930-4	One Tray Document Rack	56	—	—	—
B 9939-3	Resettable Item Counter	222	1.70	7	6
B 9939-4	Non-Resettable Item Counter	222	1.70	7	6
B 9939-5	Running Time Meter	222	1.70	7	6
	Off-Line Features:				
B 9933-1	Basic Off-Line Sort (2 Fields Standard)	1,114	7.00	32	26
B 9933-2	8-Pocket Basic Off-Line Sort; 2 fields standard	1,338	7.00	37	31
B 9933-3	Expanded Off-Line Sort	222	1.70	7	6
B 9933-4	Extended Sort Control	2,230	20.80	62	50
B 9933-5	Zero Kill	446	1.70	13	10
B 9933-6	No Field, No Digit	446	1.70	13	10
B 9933-7	Digit Override	446	1.70	13	10
B 9933-8	Digit Edit	446	1.70	13	10
B 9933-9	Field Override	446	1.70	13	10
B 9933-10	Field Edit	446	1.70	13	10
TERMINALS					
TD 731	Self-scan display/keyboard with control for async. data sets & direct-connect communications interface	2,715	26.41	120	116
TD 732	TD 731 unit with peripheral capability added	2,865	26.41	130	126
TD 733	Self-Scan display/keyboard with control for sync. data set communications	2,715	26.41	120	116
TD 734	TD 733 unit with peripheral capability added	2,865	26.41	130	126
TD 737	Self-Scan display/keyboard with control for sync. data set communications and IBM Bi-Sync. data communications procedures	2,715	26.41	120	116
TD 738	TD 737 unit with peripheral capability added	2,865	26.41	130	126
TD 831	Self-Scan display/keyboard with control for async. data sets & direct-connect communications interface	2,796	22.91	124	49
TD 832	TD 831 unit with peripheral capability added	2,951	22.91	134	130
TD 833	Self-Scan display/keyboard with control for sync. data set communications	2,796	22.91	124	119
TD 834	TD 833 unit with peripheral capability added	2,951	22.91	134	130
TD 837	Self-Scan display/keyboard with control for sync. data set communications and IBM Bi-Sync. data communications procedures	2,796	22.91	124	119
TD 838	TD 837 unit with peripheral capability added	2,951	22.91	134	130
	Options for the TD 730 and TD 830 Series Terminals:				
TD 016	A/N source data keyboard (includes 6-foot separation cable)	275	3.12	13	10
TD 017	Ten-key auxiliary keyboard (includes 2-foot separation cable)	180	1.59	7	6
TD 015-A	Alphanumeric typewriter keyboard	275	3.12	13	10
TD 019	Expanded alphanumeric keyboard	700	3.25	30	26
TD 019-1	Expanded alphanumeric keyboard with built-in magnetic card reader	900	9.75	39	34

* Includes equipment maintenance.

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EQUIPMENT PRICES (Continued)

		Purchase Price	Monthly Maint.	1-Year lease*	5-Year lease*
TERMINALS (Continued)					
TD 105	Non-display of control characters (the display of control characters, such as form delimiters, is inhibited—this feature is available on a special factory order basis only)	206	0.00	10	8
	Peripherals for the TD X32, TD X34, and TD X38				
TD 078-1	Auxiliary magnetic card reader for the TD 015	1,260	8.17	42	26
TD 076	Cassette controller (includes one A 9290-25 driver—can be shared by up to four TD's); other peripherals include the A 9249 series of printers and the A 9490-25 additional cassette tape drive	3,255	19.08	108	90
TC 4001	Printing Terminal; 60 cps				
	Intelligent Terminal with TC 4001 Printing Unit:				
TC 5110	With one cassette drive	13,700	71.83	433	339
TC 5113	With two cassette drives	16,790	94.33	535	407
DATA ENTRY SUBSYSTEMS					
AE 412	Audit Entry Data Preparation System	9,425	—	345	335
AE 422	Audit Entry Data Preparation System	7,365	—	272	264
AE 501	Audit Entry Data Preparation System	10,238	782	304	295
AE 511	Audit Entry Data Preparation System	10,558	—	427	415
AE 513	Audit Entry Data Preparation System	10,764	—	422	410
COMMUNICATIONS CONTROLS					
B 1351-1/-80	Single-Line Control; requires B 1650 Series adapter; one maximum	3,090	20.60	103	78
B 1351-1/-81	Dual-Line Control; requires B 1650 Series adapter; two maximum	5,150	10.30	160	134
B 1351-2	Universal Single-Line Control	3,000	20.00	110	95
B 1352	Multi-Line Controller; 8 lines; 2 maximum	9,270	36.10	253	212
B 1353	Multi-Line Controller Extension for B 1352 controller; 8 lines; 1 maximum	6,963	27.10	191	155
B 1354	4-Line Multi-Line Control	7,000	30.00	225	195
	Data Communications Line Adapters; not for B 1351-2				
B 1650-1/-81	Asynchronous Data Set Connect; up to 1200 bps	1,545	10.30	67	52
B 1650-2/-82	Asynchronous Data Set Connect; up to 1800 bps	1,854	12.90	83	67
B 1652-1/-81	Asynchronous Data Set Connect for teletypewriters	1,545	10.30	67	52
B 1650-5/-85	Asynchronous Direct Connect; up to 2400 bps	7,545	10.30	67	52
B 1850-6/-86	Asynchronous Direct Connect; up to 4800 bps	1,854	12.90	83	67
B 1650-7/-87	Asynchronous Direct Connect; up to 9600 bps	2,163	15.40	103	83
B 1652-5/-85	Asynchronous Direct Connect for teletypewriters	1,545	10.30	67	52
B 1667-2/-82	Burroughs Direct Interface (BDI) Adapter	2,472	10.35	78	52
B 1651-1/-81	Burroughs Synchronous Data Set Connect; up to 2,400 bps	1,545	10.30	67	52
B 1651-2/-82	Burroughs Synchronous Data Set Connect; up to 4,800 bps	1,854	12.90	83	67
B 1651-3/-83	Burroughs Synchronous Data Set Connect; up to 9,600 bps	2,163	15.40	103	83
B 1653-1/-81	Binary Synchronous Data Set Connect; up to 2400 bps	4,532	41.10	176	150
B 1653-2/-82	Binary Synchronous Data Set Connect; up to 4800 bps	5,099	43.70	191	160
B 1653-3/-83	Binary Synchronous Data Set Connect; up to 9600 bps	5,665	46.30	201	170
B 1352-2/-82	Wide-Band Adapter; for Western Electric Type 303 or equivalent data set, 19,200 bps or 50,000 bps	11,845	45.00	325	268
B 1667-5/-85	Automatic Calling Unit Adapter; connects with up to four Bell 801 Automatic Calling Units or three Bell 801s and one Burroughs built-in data set automatic calling unit	1,545	10.30	67	52

* Includes equipment maintenance.

SOFTWARE PRICES

	UNLIMITED TIME PLAN			LIMITED-TIME PLANS	
	Single Payment	12 Monthly Payments	Annual License	Monthly Fee (3-Year Plan)	Monthly Fee (5-Year Plan)
SYSTEM SOFTWARE					
MCP-TCS-I; for the B 1815; includes MCP, NDL, ODESY, on-line reporter, text editor, and system utilities	$3,840	—	$384	$128	$123
MCP-TCS-II; for the B 1855 and B 1885; includes MCP, NDL, ODESY, DMS-II with DMS-II Inquiry, (DM1NQ), CANDE, and system utilities	13,740	—	1,374	458	440
ANSI 74 COBOL	2,250	—	225	75	72

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SOFTWARE PRICES (Continued)

	UNLIMITED TIME PLAN			LIMITED-TIME PLANS	
	Single Payment	12 Monthly Payments	Annual License	Monthly Fee (3-Year Plan)	Monthly Fee (5-Year Plan)
SYSTEM SOFTWARE (Continued)					
RPG II				52	
ANSI 77 FORTRAN	3,600	—	360	120	115
Interactive BASIC	2,250	—	225	75	72
UTILITIES	—	—	—	0	—
SORT	—	—	—	0	—
MIL Compiler (Micro Implementation Language)	3,000	275	300	—	—
SDL Compiler (Systems Definition Language)	3,000	275	300	—	—
User Programming Language (UPL)	—	200	—	—	—
Network Definition Language (NDL)	—	50	—	—	—
Burroughs Network Architecture	6,000	—	600	200	192
Report Writer	3,000	275	300	100	96
Data Management Language (DMS II)	12,000	1,100	1,200	300	288
DMS II Inquiry	1,500	—	180	50	48
GEMCOS	—	—	—	150	—
Text Editor	1,500	—	—	—	—
CANDE	3,000	—	—	—	—
TABS	—	—	—	—	—
Disk FORTE/2	11,000	1,008	1,000	275	264
Data Entry	2,400	220	150	80	77
ODESY	4,000	367	200	133	128
PROGRAM PRODUCT CONVERSION AIDS					
IBM 1401/1440/1460 Emulator	8,498	779	850	283	272
B 100/200/500 Emulator	—	—	—	206	—
Honeywell COBOL Translator	3,708	340	371	103	—
NCR NEAT/3 Level 1 Translator	8,497	779	850	283	272
IBM 1401 Interpreter	—	—	—	206	—
B 100/200/300/500 Interpreter	—	—	—	206	—
IBM 1130 Interpreter	—	—	—	206	—
APPLICATIONS SOFTWARE					
Business Management System (all modules)	7,210	670	366	244	234
Invoicing, Accounts Receivable and Inventory Control	3,296	299	165	110	105
Accounts Payable	1,442	132	155	48	46
Payroll	1,854	170	155	62	60
General Ledger	1,442	132	155	48	46
On-Line Wholesale Distribution System	10,300	945	515	343	330
Inventory Planning Analysis and Simulation System (BIPASS)					
Analysis and Simulation Module	7,004	642	350	233	225
Operation Control Module	5,356	491	268	178	171
On-Line Inquiry and Data Entry Module	2,575	236	129	85	82
Bank Management system (all modules)	7,107	649	355	227	218
Demand Deposit Accounting (DDA)	2,575	237	155	84	81
Proof and Transit	1,030	93	155	41	40
Savings	1,545	144	155	56	54
Installment Loan	1,030	93	155	41	40
Certificates of Deposit	772	72	155	34	33
General Ledger	515	46	155	27	26
COS Reporting Module					
CIS On-line Inquiry					
CIS On-line Update					
Commercial Loans					
Commercial Loan System (CLA)	1,998	183	155	68	66
Bank Customer Information System					
Reporting Module	669	62	155	32	30
Inquiry Module	669	62	155	32	30
Update Module	669	62	155	32	30
Item Processing System	9,270	850	464	258	247
Production Control System I (PCS I)					
Bill of Material Module	3,399	314	170	113	109
Stock Status Module	2,163	200	108	72	69
Work Center and Routing Module	3,399	314	170	113	109

Burroughs B 1800 Series

SOFTWARE PRICES (Continued)

APPLICATIONS SOFTWARE (Continued)	UNLIMITED TIME PLAN			LIMITED-TIME PLANS	
	Single Payment	12 Monthly Payments	Annual License	Monthly Fee (3-Year Plan)	Monthly Fee (5-Year Plan)
Costing Module	2,575	219	237	79	76
Material Requirements Planning Module	3,399	314	170	113	109
Production Control System II (PCS II)					
Engineering Data Control Module	4,635	427	232	103	99
Inventory Control Module	4,635	427	232	103	99
Requirements Planning Module	4,635	427	232	103	99
Work in Progress Module	6,180	567	309	144	139
On-Line Inquiry Module	3,708	340	185	124	118
On-Line File Maintenance Module	5,562	510	278	185	178
Capacity Requirements Planning Module	2,818	259	141	93	89
Forecasting and Inventory Analysis Module	5,562	510	278	185	178
Project Management System (PROMIS/Time)	5,150	472	258	171	165
Incentive Payroll System	927	85	155	34	33
Hospital Management System (BHAS II)					
Patient Accounting	4,532	417	227	103	99
Medical Records	2,266	206	155	52	49
General Ledger	2,266	206	155	52	49
Payroll	2,266	206	155	52	49
Accounts Payable	2,266	206	155	52	49
Educational Management Systems					
Test Scorer	3,502	319	175	98	94
School Scheduling	5,150	422	258	155	148
Financial	3,708	340	185	124	118
Student Records	2,781	258	139	93	89
Payroll	3,337	309	167	111	107
Local Government Utility Management System					
Budgetary Management System	3,090	283	155	103	99
Local Government Management	4,944	453	247	165	159
Local Government and Utility Management System	8,034	736	402	268	258
Budgetary Purchase Order Module	1,030	95	155	34	33
Utility Management System					
Utility Business Management System	7,210	660	361	240	231
Utility Billing System	3,090	283	155	103	99
Motor Freight Management System (all modules)	14,132	1,291	706	471	452
General Ledger and Reporting	3,708	340	185	124	118
Vehicle Maintenance and Asset Control	3,708	340	185	124	118
Accounts Receivable and Freight Billing	2,884	265	155	96	93
Payroll	1,648	151	155	55	53
Accounts Payable	1,648	151	155	55	53