

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. These systems have replaced 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 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 \$50,000, while the mid-range B 1855, with 2.5 times the power of the B 1815, is priced at \$66,400. The B 1885, rated at 3.5 times the B 1815, has a purchase price of \$107,465.

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 nonprogrammable 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. The B 1825, B 1830, B 1835, B 1865, and B 1870 systems are no longer actively marketed. The B 1860 has been repackaged as the B 1800 Computer Management System. ➤



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.

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

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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
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 Checking	4K/n-channel Parity	4K/n-channel Parity	4K/n-channel Parity	16K/n-channel Error correcting	16K/n-channel 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
AVAILABILITY 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
Actively marketed	As CMS system	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.

PROCESSOR MODELS

The entry-level B 1815 includes 128K bytes of memory, B9348-52 display and control, B9482-32 disk cartridge and control, B9246-3 printer and control, and B1351-81 single-line communications control. The system can be purchased for \$50,000. Maintenance is priced at \$426 per month.

The B 1855 system features 512K bytes of memory, B9348-52 display and control, B1486-1 disk pack control, B1249 printer control, B1354 4-line multi-line communications control, and B1055 power booster. The purchase price is \$66,400, and monthly maintenance at \$354.

The B 1885 includes 512K bytes of memory, B1056 expansion cabinet, B9348-52 display and control, B1486-1 disk pack control, B1249 printer control, and B1354 4-line multi-line communications control. The purchase price is \$107,465. Maintenance is priced at \$473 per month.

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.

The older B 1860 processor has been repackaged in a special hardware/software configuration designated the B 1800 Computer Management System (CMS). The B 1800 CMS is designed to bring compatibility among the B 80, B 800, and B 1800 systems. The B 1800 CMS software runs on the B 1855 and the older B 1835 and B 1865 systems, as well as on the B 1860. In order to use CMS with the older systems, the DCP-1 Base Module and the DCI Line Adapter are required. The DCP-1 Base Module accommodates up to seven line adapters. According to Burroughs, the B 1800 CMS enables users to establish networks of B 80, B 800, and B 1800 systems.

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 com-

➤ 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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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

➤ puters, 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 System 80, and Honeywell Level 62, Level 64, and DPS 6.

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 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 ➤

➤ 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 ➤

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▷ 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.

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 Job Entry Program Product and the Power/RJE 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 ▷



Burroughs claims the newer 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.

▶ 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 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. ▶

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▷ 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 newer B 1800 systems is totally unbundled and packaged for specific systems. The B 1815 package includes MCP, NDL for data communications control programs, ODESYS for on-line data entry, an on-line reporter for generating reports from terminals, a text editor, and system utilities.

Software for the B 1855 and B 1885 includes MCP, NDL, the DMS-II data management system including the DMS-II Inquiry system, ODESYS, and CANDE for command and edit functions.

USER REACTION

Representing 80 B 1800 systems, 78 users responded to Datapro's 1980 user survey. Forty-five of the systems were B 1855s, 11 were B 1860s, and 3 were B 1830s. The remaining systems were B 1885s, B 1870s, and B 1865s. Of those 78 users, 59% purchased their systems, 8% rented, and 33% leased. Principal applications included Payroll/Personnel (49%), Accounting (42%), Manufacturing (22%), and Government (19%). The main source of application programs was in-house personnel at 88%, followed by contract programming at 44%.

A total of 825 workstations were in use, representing an average of 10 workstations per user. Memory capacities ranged from 190K to 1M bytes, averaging 480K bytes per system. Averaging 222M bytes per system, disk capacities ranged from 8M to as high as 530M bytes. The primary programming language was COBOL (86%), followed by RPG (33%), FORTRAN (3%), and BASIC (1%). Fifty-one percent of those polled used the DMS-II data base management system. The primary operating systems were MCP and MCP-II.

The ratings assigned by these users are shown below.

	Excellent	Good	Fair	Poor	WA*
Ease of operation	51	22	4	0	3.6
Reliability of mainframe	39	30	7	1	3.4
Reliability of peripherals	11	41	20	5	2.8
Maintenance service:					
Responsiveness	20	26	22	10	2.7
Effectiveness	8	36	30	8	2.5
Technical support:					
Trouble-shooting	6	33	24	12	2.4
Education	12	26	32	8	2.5
Documentation	5	20	35	17	2.2
Manufacturer's software:					
Operating system	61	14	3	0	3.7
Compilers and assemblers	40	31	6	0	3.4
Application programs	11	36	12	4	2.9
Ease of programming	4	32	4	0	3.5
Ease of conversion	32	29	7	0	3.4
Overall satisfaction	31	37	7	3	3.2

*Weighted Average on a scale of 4.0 for Excellent.

MAY 1981

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► CONFIGURATION RULES

The entry-level B 1815 includes 128K bytes of memory, B 9348-52 display and control, B 9482-32 disk cartridge and control, B 9246-3 printer and control, and B 1351-81 single-line communications control.

The basic B 1855 system features 512K bytes of memory, B 9348-52 display and control, B 1486-1 disk pack control, B 1249 printer control, B 1354 4-line multi-line communications control, and B 1055 power booster.

The basic B 1885 includes 512K bytes of memory, B 1056 expansion cabinet, B 9348-52 display and control, B 1486-1 disk pack control, B 1249 printer control, and B 1354 4-line multi-line communications control.

The B 1800 Computer Management System is a B 1860 processor packaged in a special hardware/software configuration designed to bring compatibility between the B 80, B 800, and B 1800 systems. A basic B 1800 CMS consists of a B 1860 processor with 256K bytes of main memory, B 9348-52 display and control, B 1249 printer control, B 1480 disk cartridge control, B 1360 DCP-1 base module, B 1660 DCI line adapter, and B 1098-1 expansion cabinet. The DCP-1 base module can accommodate up to seven line adapters.

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)
9246 Printers (320 or 650 lpm)

Control Type B (two I/O cards)

Integrated console cassette
All 96-column card readers (300 or 1000 cpm)
9419 96-column Reader/Punch Multi-Purpose Card Unit (300/60 cpm)
9247 Printers (1100 or 1500 lpm)
MICR reader-sorters (1000 or 1625 lpm)
9490 Cassette Tape Subsystem
9484, 9494 Disk Drives
9489 Mini-Disk Drives
9495 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, 9, 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 NRZI Magnetic Tape Units
9491 Magnetic Tape Unit
Four-line multi-line communications control



Burroughs B 1800 Series

➤ To obtain additional insight into the users' experience, we interviewed four of the survey respondents in March 1981. These four users represented a hospital, a food services company, and two manufacturing firms. One user had a B 1885 system; the others were using B 1855 systems. All four were planning to add expanded data communications facilities to their systems.

One user had replaced an IBM System/32 with a Burroughs B 1855 system. He stated that the conversion went smoothly and he was very well satisfied with the Burroughs equipment. Another user, whose B 1855 had replaced a B 1700, reported that she had experienced problems with the B 9494 disk drives. She stated that the drives were among the first shipped and were continually breaking down. They were replaced after six months, and the new B 9494 drives have been "working fine." The B 1885 user also reported disk drive problems. He said one drive "hasn't worked at all" and the others are frequently down. However, these were the only problems reported by the four users interviewed. All four were well satisfied with the B 1800 processors, the operating system, and Burroughs' maintenance service. And all four said they would recommend the B 1800 systems to other users. □

➤ *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 two cabinets, housing two, three, or four spindles may be connected to a B 1489/-80 Mini-Disk Control; 2) 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; 3) 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 4) 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 9470-12 Add-On Modules. One B 9471-6 Disk File Electronics 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.

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

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► 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 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 9484-51 is the add-on drive for the B 9484-55.

B 9494 FIXED-DISK DRIVES: These units store data on nonremovable 4-platter disk packs. The basic B 9494-41 contains 2 spindles and has a total capacity of 402 megabytes. The B 9494-42, B 9494-43, and B 9494-44 consist of 2, 3, and 4 B 9494-41 units and store 804, 1206, and 1608 megabytes of data, respectively.

Each spindle has an independent actuator and four non-removable platters with eight recording surfaces. All recording surfaces are used for data storage. Servo information, used to locate data storage tracks, is interspersed between the data tracks. Average head positioning time is 28 milliseconds, and average rotational delay is 8.17 milliseconds. The data transfer rate is 650,000 bytes per second.

The B 9494-4X drives can be used as add-on drives to the B 9484-51 or B 9499-6 disk drives.

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.

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 AE systems have essentially been replaced by the On-Line Data Entry System (ODESY) software.

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 MAGNETIC TAPE DRIVES: The B 9491 tape drives read and write data on 1/2-inch tape in 9-track phase-encoded mode at 1600 bpi. The B 9491-4 features a built-in controller that can control up to three B 9491-5 add-on drives. Tape speed is 25 inches per second and the data transfer rate is 40,000 bytes per second. All standard tape reels up to 10.5 inches in diameter are accommodated. The B 9491-4 and B 9491-5 tape drives interface with the B 1800 systems through the B 1491-4 Control.

B 9495 MAGNETIC TAPE DRIVES: These high-performance 9-track units record data on 1/2-inch tape in IBM-compatible phase-encoded mode at 1600 bpi. Two models are currently available for the B 1800 systems: the B 9495-8 and the B 9495-82. The B 9495-8 has a tape speed of 50 inches per second and a data transfer rate of 80,000 bytes per second, while the B 9495-82 has a tape speed of 75 inches per second and a data transfer of 120,000 bytes per second. An NRZ option is available to enable the B 9495-82 tape drives to record data in NRZ mode at 800 bpi.

Both models can handle 10.5-inch reels holding 2400 feet of tape. The B 9495 drives feature a single vacuum-driven capstan, a sealed tape-path chamber, a power access window, a positive reel latch, automatic tape threading and

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► loading, and "on-the-fly" detection and correction of most errors. A unique "coaxial" hub mounts the feed reel directly in front of the take-up reel, reducing the overall width of the unit to just 24 inches.

The B 9495 drives can be configured in several ways, depending upon the model and master electronics unit. The B 9495-8 employs the B 9495-33, B 9499-34, or B 9499-35 Master Electronics Exchange and the B 1495-32 Control. The B 9499-33 can attach up to four drives; the B 9499-34, up to eight. A 2 x 8 configuration is possible utilizing the B 9499-35. The B 9495-82 utilizes the B 9499-5X Master Electronics Exchanges. With these exchanges, the B 9495-82 can be configured in a subsystem consisting of the B 1491 or B 1495 Control, up to 16 tape units, and the appropriate B 9499-5X Master Electronics Exchange (1 x 4, 1 x 8, 2 x 8, 2 x 16, 3 x 16, or 4 x 16).

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 photo-electrically, 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.

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 9419-2 requires a B 1419/-80 Control.

B 9419-6 MULTI-PURPOSE CARD UNIT: Provides the same 300-cpm reading, 60-cpm punching, and 60-cpm 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.

B 9246 BAND PRINTERS: These two printers are designed for customers who require medium-speed printing together with high reliability and print quality. Rated printing speeds depend upon the size of the character set, as follows:

	B 9246-3	B 9246-6
48-character set	320 lpm	650 lpm
64-character set	300 lpm	600 lpm
96-character set	200 lpm	450 lpm

A 64-character EBCDIC print band is standard on both models. Optional print bands include a 48-character ASCII set, a 64-character ASCII set, a 64-character OCR A set, a 64-character OCR B set, and a 96-character OCR B set. The print bands are operator-changeable. Both the the B 9246 Printers have the following features: 132 print positions, horizontal spacing of 10 characters per inch, vertical spacing of 6 or 8 lines per inch, skipping speed of 15 inches per second, full-line print buffer, electronic forms control buffer (loaded from a standard 12-channel format tape), and interchangeable ribbon cartridge.

B 9247 TRAIN PRINTERS: These printers use the horizontal-train technique to produce high-quality printing and are offered in two models: the 1100-lpm B 9247-14 and the 1500-lpm B 9247-15.

Both models 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 alphabets. 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. They can employ 4- to 20-inch-wide paper and have a skipping speed of 20 ips. The B 9247 Train Printers require a B 1247-4/-84 Control (B 9247-14) or a B 1247-5/-85 Control (B 9247-15).

READER-SORTERS: Burroughs offers a choice of two reader-sorters for use on the B 1800 systems: the B 9137-3S MICR/OCR Reader-Sorter and the B 9137-4 MICR Reader-Sorter. The basic B 9137-3S Reader-Sorter contains four pockets, and the system can be expanded in multiples of 4 pockets up to 32 pockets. For any configuration beyond 16 pockets, an Expansion Feature must be included. Maximum throughput rate of the system is 1625 items per minute for a batch containing only 5 3/4-inch documents, the minimum length the unit can process. Slower feed speeds are developed with longer documents, so that the maximum-length documents of 9 1/2 inches are processed at a rate of 984 documents per minute. Documents of varying sizes within the specification limits can be intermixed for processing and may be encoded either in MICR or OCR characters. The B 9137-4 is a MICR-only reader-sorter with a rated speed of 1000 documents per minute. The B 9137-3S and B 9137-4 interface with the B 1800 systems through the B 1130 Reader-Sorter Control.

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 and 2400 to 4800 bps synchronous.

The TD 731 has control for asynchronous data sets and direct-connect communications interfaces; the TD 733, control for synchronous data sets. The TD 732 and TD 734 are equivalent to the TD 731 and TD 733, respectively, but with peripheral capability added. Available peripherals include a magnetic card reader, cassette tape drives, and 90-cps display printers. ►

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

The B 1351/-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.

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 accumulated by the buffer.

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

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 1650-1/-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.

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 implementation 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 pro- ►

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► grams 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.

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 MCP. 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. The interactive BASIC compiler permits interactive, conversational problem-solving and requires about 17K bytes of memory exclusive of MCP.

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 con-

catenation 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 bit or character formats. The UPL Compiler and its object programs operate under MCP supervision on a 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 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: ►

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► 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 NDLE. The NDLE 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 NDLE 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.

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.

HASP REMOTE JOB ENTRY 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 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 Job Entry 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 additional programs for RJE. One permits entry to a B 7000/B 8000; the second, to a B 4000/3000/2000. 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 INTERPRETER: 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 1400 INTERPRETER: 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 ►

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► 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: RPG 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 in-place 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 un-ordered. 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 auditing facilities and thus reduce development effort by virtually eliminating conventional input control programs. Because of these auditing facilities, ODESY is able to produce batches of essentially error-free data for input to application programs.

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 BNA 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 BDLC, a bit-oriented line control procedure for synchronous transmissions, Burroughs' protocol was Basic Mode, a character-oriented line control procedure. In the Basic Mode protocol system, the user data was "enveloped" or bracketed by line control characters before transmission.

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

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

In networks using BDLC, one device, a processor, operates as a Primary Station. All other devices, whether processors or terminals, function as Secondary Stations. (This arrangement is referred to as the Unbalanced ►

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► 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.

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 systems are available for purchase or for lease under a 1-year, 3-year, or 5-year lease agreement. The standard lease agreement entitles the customer to unlimited use of the equipment and includes full-time equipment maintenance coverage (24 hours/day, 7 days/week). The standard maintenance agreement for purchased systems covers maintenance of the equipment for eight consecutive hours per day on Monday through Friday only; extended maintenance coverage is available at higher rates. The central system (CPU, memory, channels, etc.) is warranted for one year; the peripheral equipment, for 90 days.

All maintenance charges listed 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.

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

SOFTWARE: All software is unbundled except for the MCP operating system. Some software is offered under a Limited-Time License Plan, with monthly payments during either a 3-year or 5-year lease term. Other software is also offered under an Unlimited-Time License Plan for either a one-time charge followed by an annual maintenance fee or for 12 monthly payments followed by an annual maintenance fee.

TECHNICAL SUPPORT: Users can purchase Burroughs technical support in several ways: under a Systems Analyst Assistance Agreement, on a per-diem basis, or on an hourly basis.

EDUCATION: Users can obtain the necessary training by paying for individual courses. The currently available courses range from 2 to 10 days in length, cost \$250 to \$1,250 for each attendee, and fall into the following broad categories: Systems Support, Operations, Languages, Environmental (data base and data communications), Management Decision Aids, and Applications.

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

EQUIPMENT PRICES

		<u>Purchase Price</u>	<u>Monthly Maint.</u>	<u>1-year Lease</u>	<u>5-year Lease</u>
PACKAGED SYSTEMS					
B 1815-SYS	System includes B1815 CPU, 128K bytes of memory, B9348-52 display and control, B9482-32 disk cartridge and control, B9246-3 printer and control, and B1351-81 single-line communications control	\$50,000	\$426.00	\$2,125	\$1,705
B 1815-1SY	System includes B1815 CPU, 128K bytes of memory, B9348-52 display and control, B9246-1 printer and control, B9484-2 disk pack drive and control, and B1351-82 single-line communications control	55,000	449.00	2,300	1,870
B 1825-SYS	System includes B1825 CPU, 96K bytes of memory, B9348-52 display, and B1348-32 console control	48,500	286.00	1,575	1,350
B 1830-SYS	System includes B1830 CPU, 48K bytes of memory, B9348-52 display, and B1348-32 console control	57,750	230.00	2,050	1,680
B 1835-SYS	System includes B1835 CPU, 128K bytes of memory, B9348-52 display, and B1348-32 console control	69,700	272.00	2,260	1,935
B 1855-SYS	System includes B1855 CPU, 512K bytes of memory, B9348-52 display and console control, B9484-2 disk pack and control, B9246-6 printer and control, B1354 4-line multi-line communications control, and B1055 power booster	105,750	591.00	3,600	3,080
B 1855-1SY	System includes B1855 CPU, 512K bytes of memory, B9348-52 display and console control, B1486-1 disk pack control, B1249 printer control, B1354 4-line multi-line communications control, and B1055 power booster	66,400	354.00	2,315	2,080
B 1860-SYS	System includes B1860 CPU, 64K bytes of memory, B9348-52 display, and B1348-32 console control	55,000	310.00	2,300	1,870
B 1860-1SY	CMS System; includes B1860 CPU, 256K bytes of memory, B9348-52 display and control, B9246-3 printer and control, B9482-32 disk cartridge and control, B1360 DCP-1 base module, B1660 DCI adapter, and B1098-1 expansion cabinet	80,000	534.00	2,900	2,500
B 1860-2SY	CMS System; includes B1860 CPU, 256K bytes of memory, B9348-52 display and control, B9246-3 printer and control, B9484-2 disk pack drive and control, B1360 DCP-1 base module, B1660 DCI adapter, and B1098-1 expansion cabinet	90,000	534.00	3,225	2,778
B 1860-3SY	CMS System; includes B1860 CPU, 256K bytes of memory, B9348-52 display and control, B1249 printer control, B1480 cartridge control, B1360 DCP-1 base module, B1660 DCI adapter, and B1098-1 expansion cabinet	60,000	534.00	2,258	1,944

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EQUIPMENT PRICES

		<u>Purchase Price</u>	<u>Monthly Maint.</u>	<u>1-year Lease</u>	<u>5-year Lease</u>
PACKAGED SYSTEMS (Continued)					
B 1865-SYS	System includes B1865 CPU, 256K bytes of memory, B9348-52 display, and B1348-32 console control	144,293	354.00	4,676	4,007
B 1870-SYS	System includes B1870 CPU, 96K bytes of memory, B9348-52 display and control, B9471-6 SN disk, B9470 SN primary, and B1470-11 control	148,320	457.00	4,925	4,068
B 1885-SYS	System includes B1885 CPU, B1056 expansion cabinet, 512K bytes of memory, B9348-53 display, B9484-5 disk pack drive and control, B9246-6 printer and control, B1354 4-line multi-line communication control, and B1348-82 console control	160,600	710.00	4,995	3,945
B 1885-1SY	System includes B1885 CPU, B1056 expansion cabinet, 512K bytes of memory, B9348-52 display and control, B1486-1 disk pack control, B1249 printer control, and B1354 4-line multi-line communications control	107,465	473.00	3,735	3,365
I/O SUBSYSTEMS					
B 1304	I/O Expansion (2 controls)	1,327	4.60	32	27
B 1305	I/O Expansion (5 controls)	1,591	9.50	42	37
B 1306	I/O Expansion (5 controls)	1,591	9.50	42	37
PROCESSOR OPTIONS					
B 1348-33	Desk level TD800 display	1,061	29.90	32	27
B 1346-33	TC4000 printer/display	6,578	12.50	202	165
B 1301	Model 1 power supply	1,804	4.60	54	47
B 1055	80-amp power booster for B1835 and B1865	5,150	18.70	165	144
B 1056	Expansion cabinet for B1835 and B1865	16,223	74.50	524	453
B 1099	Power booster for B1860 and B1870	4,244	11.80	128	106
B 1098	Expansion cabinet for B1860 and B1870	10,503	23.50	291	239
MEMORY OPTIONS					
For B1820 and B1830 Systems					
B 1030-65	65,536 bytes total memory	1,545	20.80	67	57
B 1030-81	81,920 bytes total memory	4,120	41.70	170	139
B 1030-98	98,304 bytes total memory	6,180	62.60	263	216
B 1030-131	131,072 bytes total memory	10,300	104.00	438	355
B 1030-163	163,840 bytes total memory	14,935	146.00	633	515
B 1030-196	196,608 bytes total memory	19,055	188.00	803	664
B 1030-262	262,144 bytes total memory	27,810	271.00	1,179	963
For B1860 Systems					
B 2060-65	65,536 bytes memory increment	6,000	18.90	175	150
B 1060-131	131,072 bytes memory increment	10,000	52.10	290	250
For B1870 Systems					
B 1070-131	131,072-byte memory increment	3,090	26.20	113	98
For B1815 Systems					
B 1015-131	131,072-byte memory increment	10,000	118.00	290	250
For B1825 Systems					
B 1025-32	32,768 bytes memory	2,790	99.90	95	80
B 1025-65	65,536 bytes memory	5,580	39.70	180	135
B 1025-131	131,072 bytes memory	11,160	79.40	360	310
For B1835 Systems					
B 1035-131	131,072 bytes memory	10,400	79.40	335	290
B 1035-262	262,768 bytes memory	20,800	86.90	675	580
For B1855 Systems					
B 1055-262	262,144-byte memory increment	7,000	24.90	265	220
For B1865 Systems					
B 1065-262	262,144 bytes memory	20,800	86.90	675	580
For B1885 Systems					
B 1085-262	262,144-byte memory increment	7,000	24.90	265	220
MASS STORAGE					
B 9470-2	Primary Head-Per-Track Disk Drive; 5.9 megabytes; includes power supply and air system	40,800	92.80	1,260	1,020
B 9470-12	Add-on Drive; 5.9 megabytes; requires B 9470-2	34,800	90.00	1,070	870
B 9471-6	Disk File Electronics Unit for B 9470 drives; one required for each four B 9470's	12,000	56.10	370	300

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EQUIPMENT PRICES

		<u>Purchase Price</u>	<u>Monthly Maint.</u>	<u>1-year Lease</u>	<u>5-year Lease</u>
MASS STORAGE (Continued)					
B 9480-12	Dual Disk Cartridge Drive; 4.6 megabytes	11,330	108.83	427	335
B 9481-12	Dual Disk Cartridge Drive; 9.2 megabytes	10,160	125.42	376	305
B 9482-32	Dual Disk Cartridge Drive; 18.4 megabytes	15,862	94.60	551	448
B 1480/-80	Control for B 9480-12/B 9481-12 Disk Drives	3,713	27.60	148	116
B 1482/-80	Control for B 9482 Disk Drives	4,244	25.20	148	116
B 9484-25	Dual Disk Pack Drive and Controller; 62.5 megabytes	32,960	118.00	1,202	931
B 9484-55	Dual Drive/Controller; 130.4 megabytes	43,073	118.00	1,556	1,194
B 9489-16	Dual industry-compatible Mini-Disk; 486K bytes	6,530	29.50	221	180
B 9489-17	Industry-compatible Mini-Disk; 243K bytes	3,296	25.67	122	103
B 9494-41	Add-on drive for the B 9484-51 or B 9499-6; 402-megabyte fixed disk drive; replaces 9494-4	24,000	71.00	733	555
B 9494-42	Data Bank; 804-megabytes of fixed disk	40,000	143.00	1,374	1,023
B 9494-43	Data Bank; 1206-megabytes of fixed disk	57,000	214.00	1,934	1,599
B 9494-44	Data Bank; 1608-megabytes of fixed disk	75,000	286.00	2,394	1,952
B 9484-51	Add-on drive for the B 9484-55 or B 9499-6; 130.4-megabyte dual disk drive; replaces 9484-5	20,000	91.40	739	601
B 1486-1/-81	Disk pack control for B 1830	6,365	58.70	207	170
B 1489/-80	Mini-Disk Control for B 1830	4,244	14.50	128	106
MAGNETIC TAPE UNITS					
B 9490-25	Cassette Tape Station; 10 ips	1,689	10.60	69	56
B 1490-25	Control for the B 9490-25 Cassette Tape Station	2,334	50.30	106	79
B 1490-85	Cassette control for B 9490-25	2,334	50.30	106	79
B 9491-4	Magnetic Tape Subsystem; 9-track, 40KBS PE tape drive and built-in controller; supports up to three B 9495-5 tape drives	12,600	60.00	465	375
B 9491-5	Add-on Tape Drive B 9491-4 subsystem	10,000	50.00	360	295
B 1491-4	Control for B 9491-4	1,800	5.00	60	50
B 9495-8	Magnetic Tape Unit; 80KBS, 9-track, 1600 bpi, PE; requires B 9499-3X Exchange	10,000	107.00	368	299
B 9495-45	Magnetic Tape Subsystem; consists of B 9495-8 tape drive and B 9499-33 Exchange	15,500	112.00	495	405
B 9495-46	Magnetic Tape Subsystem; consists of two B 9495-8 tape drives and B 9499-33 Exchange	25,500	195.00	863	704
B 9499-33	1 x 4 Master Electronic Exchange for B 9495-8	10,400	30.50	340	260
B 9499-34	1 x 8 Master Electronic Exchange for B 9495-8	11,200	30.50	365	285
B 9499-35	2 x 8 Master Electronic Exchange for B 9495-8	13,120	66.90	430	330
B 9495-82	Magnetic Tape Unit; 120KBS, 9-track, 1600 bpi, PE; requires B9499-5X Exchange	17,600	104.00	612	475
B 9499-50	1 x 4 Master Electronic Exchange for B 9495-82	16,500	130.00	601	458
B 9499-51	1 x 8 Master Electronic Exchange for B 9495-82	18,200	130.00	634	485
B 9499-52	2 x 8 Master Electronic Exchange for B 9495-82	46,478	272.00	1,808	1,048
B 9499-53	2 x 16 Master Electronic Exchange for B 9495-82	48,924	272.00	1,902	1,213
B 9499-54	3 x 16 Master Electronic Exchange for B 9495-82	75,570	402.00	2,822	1,913
B 9499-55	4 x 16 Master Electronic Exchange for B 9495-82	99,950	532.00	3,694	2,519
B 9999-4	NRZ Option for B 9495-82 drives	750	5.00	25	20
B 9999-5	NRZ Option for B 9499-5X Exchanges	2,600	29.60	80	65
B 1491-30	Control for NRZ tape drives	6,000	59.10	175	159
B 1495-32	Control for B 9495 PE tape drives	3,600	20.10	95	86
B 1495-35	Control for B 9495 PE/NRZ tape drives	10,200	79.20	270	245
LINE PRINTERS					
B 9247-14	Train Printer; 1100 lpm, 132 positions	33,000	413.00	1,213	965
B 9247-15	Train Printer; 1500 lpm, 132 positions	44,000	473.00	1,654	1,323
B 1247-4/-84	Printer Control for the B 9247-14	5,729	37.00	160	128
B 1247-5/-85	Printer Control for the B 9247-15	7,957	34.70	260	217
B 9246-3	Printer; 320-lpm, 132 positions	11,500	138.00	399	326
B 9246-6	Printer; 650-lpm, 132 positions	14,000	165.00	499	383
PUNCHED CARD EQUIPMENT					
B 9115	Card Reader; 300 cpm, 80-column; requires B 1115 Control	7,808	50.90	280	211
B 9116	Card Reader; 600 cpm, 80-column; requires B 1115 Control	9,845	71.40	356	269
B 9117	Card Reader; 800 cpm, 80-column; requires B 1115 Control	11,214	87.50	403	310
B 9111	Card Reader; 800 cpm, 80-column; requires B 1111 Control	18,710	154.00	479	391
B 9112	Card Reader; 1400 cpm, 80-column; requires B 1111 Control	24,869	232.00	664	541

Burroughs B 1800 Series

EQUIPMENT PRICES

		Purchase Price	Monthly Maint.	1-year Lease	5-year Lease
PUNCHED CARD EQUIPMENT (Continued)					
B 9915	51-Column Read Feature for B 9115/6/7 Card Readers	803	—	22	18
B 1115/-80	Card Reader Control for B 9115/6/7 Card Readers	2,292	14.70	59	47
B 1111/-80	Card Reader Control for B 9111/2 Card Readers	2,472	12.00	59	47
B 1119/-80	Card Reader Control; 96-column; for B 9119-1 or B 9119-2	2,472	12.00	96	79
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	121.08	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	144.40	407	335
B 1419/-80	Card Reader Punch/Data Recorder Control for B 9419-2 and B 9419-6	2,472	20.50	96	79
READER SORTERS					
B 9137-4	Reader sorter; 1,000 dpm, 8 pockets	50,796	496.00	1,512	1,281
B 9137-3S	Basic 4-pocket reader sorter; 1625 dpm	30,900	681.00	1,600	1,406
B 1130/-80	Control for B 9137	6,874	55.30	260	217
TERMINALS					
TD 731	Self-scan display/keyboard with control for async. data sets & direct-connect communications interface	2,715	—	120	114
TD 732	TD 731 unit with peripheral capability added	2,865	—	130	124
TD 733	Self-Scan display/keyboard with control for async. data set communications	2,715	—	120	114
TD 734	TD 733 unit with peripheral capability added	2,865	—	130	124
	Options for the TD 730 Series Terminals:				
TD 016	A/N source data keyboard (includes 6-foot separation cable)	283	—	13	12
TD 017	Ten-key auxiliary keyboard (includes 2-foot separation cable)	185	—	7	7
TD 015-A	Alphanumeric typewriter keyboard	283	—	13	12
TD 019	Expanded alphanumeric keyboard	721	—	31	29
TD 105	Non-display of control characters (the display of control characters, such as form delimiters, is inhibited—this feature is available on a special factory order basis only)	206	—	10	10
	Peripherals for the TD 732, and TD 734:				
TD 078-1	Auxiliary magnetic card reader for the TD 015	1,260	—	42	40
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	—	108	103
TP 312	Display Printer, 90 cps	2,350	—	99	94
DATA ENTRY SUBSYSTEMS					
AE 511	Audit Entry Data Preparation System	10,558	—	427	406
AE 513	Audit Entry Data Preparation System	10,764	—	422	402
COMMUNICATIONS CONTROLS					
B 1351/-80	Single-Line Control; requires B 1650 Series adapter; one maximum	3,090	14.70	103	79
B 1351-1/-81	Dual-Line Control; requires B 1650 Series adapter; two maximum	5,150	26.80	160	138
B 1351-2/-82	Universal Single-Line Control	3,000	24.90	110	98
B 1352	Multi-Line Controller; 8 lines; 2 maximum	9,270	51.80	253	217
B 1353	Multi-Line Controller Expansion for B 1352 controller; 8 lines; 1 maximum	6,951	38.90	191	160
B 1354	4-line Multi-Line Control	7,000	37.30	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	14.70	67	52
B 1650-2/-82	Asynchronous Data Set Connect; up to 1800 bps	1,854	18.60	82	67
B 1652-1/-81	Asynchronous Data Set Connect for teletypewriters	1,545	14.70	67	52
B 1650-5/-85	Asynchronous Direct Connect; up to 2400 bps	1,545	14.70	67	52
B 1650-6/-86	Asynchronous Direct Connect; up to 4800 bps	1,854	18.00	82	67
B 1650-7/-87	Asynchronous Direct Connect; up to 9600 bps	2,163	22.10	103	82
B 1652-5/-85	Asynchronous Direct Connect for teletypewriters	1,545	14.70	67	52
B 1667-2/-82	Burroughs Direct Interface (BDI) Adapter	2,472	14.90	77	52
B 1651-1/-81	Burroughs Synchronous Data Set Connect; up to 2,400 bps	1,545	14.70	67	52
B 1651-2/-82	Burroughs Synchronous Data Set Connect; up to 4,800 bps	1,854	18.60	82	67
B 1651-3/-83	Burroughs Synchronous Data Set Connect; up to 9,600 bps	2,163	22.10	103	92
B-1653-1/-81	Binary Synchronous Data Set Connect; up to 2400 bps	4,532	59.00	175	149
B 1653-2/-82	Binary Synchronous Data Set Connect; up to 4800 bps	5,099	62.70	191	160
B 1653-3/-83	Binary Synchronous Data Set Connect; up to 9600 bps	5,665	66.40	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	64.60	324	268

Burroughs B 1800 Series

EQUIPMENT PRICES

		<u>Purchase Price</u>	<u>Monthly Maint.</u>	<u>1-year Lease</u>	<u>5-year Lease</u>
COMMUNICATIONS CONTROLS (Continued)					
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	14.70	67	52
DATA COMMUNICATIONS—CMS ONLY					
B 1365	DCP-1 Extension	4,000	36.30	130	112
B 1660	DC1 Adapter	2,800	20.90	133	108
B 1360	DCP-1 Base module	15,000	49.50	483	416
B 1361	CMS DCP-3 base module	15,000	28.00	475	395
B 1366	CMS DCP-3 Extension	4,000	28.00	125	105
B 1661	TDI dual adapter	2,800	28.00	90	75
B 1662	Dual half-duplex data set adapter	2,800	28.00	90	75
B 1663	Single duplex data set adapter	2,800	28.00	90	75
B 1664	Single SDLC data set adapter	2,800	28.00	90	75
B 1665	Single adapter with ACU	2,800	28.00	90	75
B 1666	Single SDLC adapter	2,800	28.00	90	75

SOFTWARE PRICES

		<u>UNLIMITED TIME PLAN</u>			<u>LIMITED TIME PLAN</u>
		<u>Initial Payment</u>	<u>12 Monthly Payments</u>	<u>Annual License</u>	<u>Monthly License Fee</u>
SYSTEM SOFTWARE					
B1800 MP2	MCP	0	—	0	0
B1800 BAS	BASIC	3,300	—	627	110
B1800 COB	COBOL ANSI 68	3,300	—	627	110
B1800 FOR	FORTRAN	3,300	—	627	110
B1800 RPG	RPG	3,300	—	627	110
B1800 TC1	Transaction Control System I	8,250	—	1,568	275
B1800 TC2	Transaction Control System II	18,000	—	2,880	600
B1800 CB1	COBOL/74	2,475	—	473	83
B1800 FR1	FORTRAN 77	3,960	—	759	132
B1800 BA1	Interactive BASIC	2,475	—	473	83
B1000 BNS	Burroughs Network Services	6,600	605	1,254	220
B1800 MIL	MIL Compiler	3,399	311	616	—
B1800 SDL	SDL Compiler	3,399	311	616	—
PROGRAM DEVELOPMENT AIDS					
B1800 UPL	User Programming Language	—	—	—	226
B1800 NDL	Network Definition Language	—	—	—	52
B1800 MCB	GEMCOS	4,590	421	875	153
B1800 GPB	GEMCOS and UPL	6,120	561	1,165	204
B1800 MCA	GEMCOS (Advanced)	6,120	561	1,165	204
B1800 GPA	GEMCOS (Advanced) and UPL	7,650	702	1,455	255
B1800 MCT	GEMCOS Total	7,650	702	1,455	255
B1800 GPT	GEMCOS Total with UPL	9,180	842	1,745	306
B1800 AUD	Audit REPORTER	15,080	1,382	2,865	503
B1800 ARP	Advanced REPORTER II	11,030	1,011	2,095	368
B1800 RP2	REPORTER II (Basic)	7,000	642	1,330	234
B1800 RPO	On-Line REPORTER	1,030	95	195	34
B1800 SMC	Supervisory Message Control System (SMCS)	1,545	142	295	52
B1800 SYC	System Communication (SYCOM)	3,030	283	575	103
B1800 FOT	Disk FORTE/2	12,775	1,171	2,430	426
B1800 TDG	Test Data Generator	7,000	642	1,330	234
B1800 DE2	ODESY	4,675	430	890	157
B1800 DM2	Data Management System II	13,925	1,277	2,645	465
B1800 TE1	Text Editor	1,815	167	345	61
B1800 CE1	CANDE	3,525	323	670	117
B1800 TAB	TABS	1,290	118	245	43
B1800 DM1	DMS II Inquiry	1,500	138	285	50
PROGRAM PRODUCT CONVERSION AIDS					
CS1800 BAC	B 300/B 500 BASIC/Advanced Assembly	0	0	0	0
CS1800 HN4	Honeywell COBOL to B 1800/B 1700	3,700	340	703	103

Burroughs B 1800 Series

SOFTWARE PRICES

		UNLIMITED TIME PLAN			LIMITED TIME PLAN
		Initial Payment	12 Monthly Payments	Annual License	Monthly License Fee
PROGRAM PRODUCT CONVERSION AIDS (Continued)					
CS1800 N3C	NCR Neat/3 Level 1 to B 1800/B 1700	8,500	779	1,615	283
CS1800 COF	RPG to Burroughs COBOL Translator	7,415	680	1,410	247
CS1800 14M	IBM 1400 Interpreter	—	—	—	206
CS1800 B31	B 100/B 200/B 300/B 500 Interpreter	—	—	—	206
CS1800 113	IBM 1130 Interpreter	—	—	—	206
TERMINAL PROGRAMS					
B1800 PWR	Power RJE	1,300	119	250	43
B1800 HAS	HASP RJE	1,300	119	250	43
B1800 R61	B 7000/B 6000 Remote Job Entry (RJE)	1,235	113	155	41
B1800 R41	B 4000/B 3000/B 2000 RJE	1,235	113	155	41
MANAGEMENT DECISION AIDS					
B1800-PRT	PROMIS/TIME	5,575	511	613	199
B1800-TEB	TEMPO/BASIC	6,675	612	734	238
B1800-NTW	TEMPO/NETWORK	4,470	410	492	160
B1800-MGR	TEMPO/MODELER	6,675	612	734	238
BUSINESS MANAGEMENT SYSTEMS					
B1800 BO1	Business Management System (Accounts Receivable, Invoicing, Inventory, Accounts Payable, Payroll, General Ledger)	8,045	737	—	287
B1800 RO1	Invoicing, Accounts Receivable, and Inventory Control	3,585	329	—	128
B1800 AO1	Accounts Payable	1,690	156	—	60
B1800 PO1	Payroll	2,100	193	—	75
B1800 GO1	General Ledger	1,690	156	—	60
INCENTIVE PAYROLL SYSTEM					
B1800 NO1	Incentive Payroll System	1,165	107	—	42
PRODUCTION CONTROL SYSTEM II					
B1800 PSE	Engineering Data Control Module	3,360	322	370	120
B1800 PSI	Inventory Control Module	3,360	322	370	120
B1800 PSR	Material Requirements Planning Module	3,360	322	370	120
B1800 PSW	Work-In Process Module	3,360	322	370	120
B1800 PSQ	On-Line Inquiry Module	2,520	242	277	90
B1800 PSU	On-Line File Maintenance Module	3,640	349	400	130
B1800 PSL	Capacity Requirements Planning Module	3,360	322	370	120
B1800 PSF	Forecasting and Inventory Analysis Module	3,640	349	400	130
B1800 PSS	Operation Scheduling and Loading Module	4,030	386	447	144
B1800 PSM	Master Production Scheduling Module	3,360	322	370	120
PRODUCTION CONTROL SYSTEM III					
B1800 MMS	Manufacturing Management System (includes Engineering Data Module, Inventory Control Module, Material Requirements Planning Module, Work in Process Module, On-Line Inquiry Module, and On-Line File Maintenance Module)	19,600	1,878	2,156	700
B1800 PDS	Master Production Scheduling Module	3,360	322	370	120
B1800 PDL	Operation Scheduling and Loading Module	4,030	386	447	144
B1800 PDP	Capacity Requirements Planning Module	3,360	322	370	120
B1800 PDF	Forecasting and Inventory Analysis Module	3,640	349	400	130
MOTOR FREIGHT BUSINESS MANAGEMENT SYSTEM					
B1800 MF0	Motor Freight BMS	13,360	1,225	—	477
B1800 MF1	General Ledger and Reporting System	4,025	369	—	144
B1800 MF2	Vehicle Maintenance and Asset Control	4,025	369	—	144
B1800 MF3	Accounts Receivable and Freight Billing	3,150	289	—	113
B1800 MF4	Payroll	1,890	174	—	68
B1800 MF5	Accounts Payable	1,890	174	—	68
B1800 MF9	Owner Operator	2,260	207	—	81
DISTRIBUTION					
B1800 OPM	Order Processing	15,450	1,416	1,700	552
B1800 IAM	Inventory Accounting	5,150	472	567	184
B1800 ARM	Accounts Receivable	5,150	472	567	184
B1800 DBM	Data Base Manager (requires DMS II)	3,090	284	340	110
B1800 TMM	Transaction Manager (requires GEMCOS Total)	1,545	142	170	55