

# Burroughs B 1900 Series

## MANAGEMENT SUMMARY

Introduced in October 1979, the B 1900 Series computers deliver increased performance while maintaining full program compatibility with the older B 1700 and B 1800 systems.

The B 1900 product line consists of four packaged computer systems: the entry-level B 1905, the more powerful B 1910, the larger B 1955, and the dual-processor B 1985. For B 1700 and B 1800 users who wish to retain their existing peripheral equipment, Burroughs offers processor-only versions of the two larger systems designated the B 1955-1 and B 1985-1. Also available is the B 1913, a special version of the B 1905 that is designed for financial applications.

Burroughs states that the B 1900 systems will accomplish up to 30 percent more work in a given time period than the earlier B 1800 systems, while occupying from 50 to 65 percent less floor space. These improvements are made possible by the use of denser and faster logic and memory circuits, larger main memory capacities, larger and faster cache memories, and more efficient programming and control software. High-density Transistor-Transistor Logic (TTL) is used in the B 1900 processors and controls to provide increased performance and reduce the number of electronic components, thereby enhancing system reliability. The maximum memory capacities of 512K bytes in the B 1905 and 2 megabytes in the B 1955 and B 1985 are twice the capacities of the corresponding B 1800 Series models. The capacity of the micro-instruction cache memory has also been doubled, from 4K bytes on the B 1800 processors to 8K bytes on all B 1900 models. Two ➤

The B 1900 Series consists of four packaged small-to-medium-scale systems that offer price/performance improvements over the earlier B 1700 and B 1800 systems together with full program compatibility.

**MODELS:** B 1905, B 1910, B 1955, and B 1985.

**CONFIGURATION:** From 128K bytes to 2.0 megabytes of main memory, 1 to 32 communications lines, and 6 to 15 I/O controls.

**COMPETITION:** Honeywell DPS 6, IBM System/38, NCR 8400/8500, and Sperry Univac System 80/5.

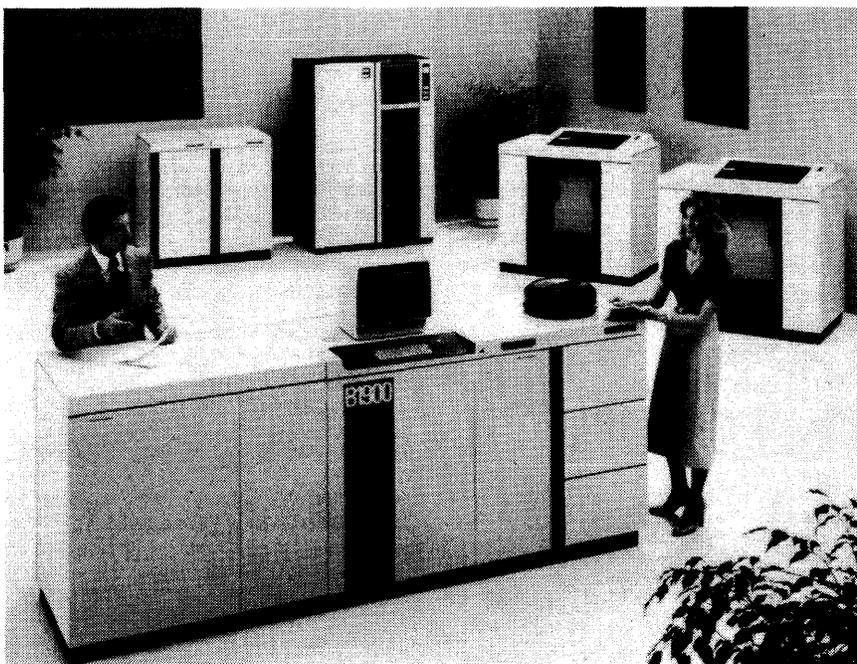
**PRICE:** Purchase prices range from \$59,500 to \$148,960.

## CHARACTERISTICS

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

**MODELS:** Four packaged systems: the entry-level B 1905, the more powerful B 1910, the larger B 1955, and the dual-processor B 1985; and two processor-only systems: the B 1955-1 and B 1985-1. (Also available is the B 1913, a special version of the B 1905 that is designed for financial applications.)

**DATE ANNOUNCED:** B 1905, B 1955, and B 1985 — October 1979; B 1910 — August 1980. ➤



*The B 1985, the largest current member of the B 1900 family, is a dual-processor system whose two central processors share from 0.5 to 2 million bytes of main memory. The dual-processor configuration is designed to provide the continuous availability that is required in certain types of networking and commercial data processing operations.*

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▷ operating systems—MCP-TCS III for the B 1905 and B 1910 and MCP-TCS IV for the B 1955 and B 1985—combine an improved version of Burroughs' time-tested Master Control Program with the software facilities required for on-line transaction processing.

Like the earlier B 1700 and B 1800 Series, the B 1900 systems feature dynamically variable microprogramming, automatic multiprogramming, and virtual memory. Probably the most noteworthy feature of these systems is their "variable micrologic," an advanced form of microprogramming that alters the central processor's logical operations to suit the characteristics of each programming language. The central processors are "soft" machines whose logical structure is largely undefined until the appropriate microprograms are loaded to control their operations. Main memories which are addressable down to the individual bit level provide great flexibility in data field lengths and, according to Burroughs, yield increases of 20 to 40 percent in the efficiency of memory utilization for most applications.

The B 1900 Series systems, like the large-scale Burroughs systems, are programmed almost exclusively in higher-level languages. Compilers are available for the ANSI 74 COBOL, ANSI 77 FORTRAN, RPG II, and BASIC languages. Associated with each compiler is an Interpreter, a specialized microprogram that is used at execution time to interpret and execute the code generated by the compiler. The B 1900 microprogramming itself is not user-accessible.

Burroughs is placing strong marketing emphasis on its library of Business Management Systems. These are groups of related application programs that should significantly reduce the cost and time required to get a B 1900 system into productive operation for many users in manufacturing, wholesaling, distribution, banking, utilities, hospitals, government agencies, schools, and motor freight companies. In addition, Burroughs will, for a fee, provide all the system support required to install and maintain a system.

The B 1955 can also operate with the Computer Management System (CMS) software used on the smaller Burroughs B 80, B 90, B 800, and B 900 systems. When the B 1955 is equipped with the CM-TCS systems software and a B 1361 Data Communications Processor, it can execute application programs written for any of the smaller CMS computers and can be intermixed with the other CMS computers in networks. According to Burroughs, the availability of CMS on the B 1955 provides from two or four times the performance previously available on CMS systems.

### THE B 1900 MODELS

The packaged B 1900 Series computer systems differ primarily in central processor speed, number of processors, main memory capacity, and peripheral equipment. ▷

▶ **DATE OF FIRST DELIVERY:** B 1905, B 1955, and B 1955-1 — 1st quarter 1980; B 1985 and B 1985-1 — 2nd quarter 1980; B 1910 — 4th quarter 1980.

### DATA FORMATS

The B 1900 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 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:** EBCDIC; other media codes, such as ASCII, can be translated. ASCII is used with the Computer Management System (CMS) software.

### MAIN STORAGE

**TYPE:** N-channel MOS; 16K bits per chip.

**CAPACITY:** B 1905 - 131,072 to 1,048,576 bytes in 131,072- or 262,144-byte increments; B 1910 - 524,288 to 1,048,576 bytes in 131,072- or 262,144-byte increments; B 1955 or B 1985 - 524,288 to 2,097,152 bytes in 262,144-byte increments.

**CHECKING:** All models 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. 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 1900 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 1900 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 1900 programming language, Burroughs has defined an "ideal machine" and developed a specialized microprogram, called an Interpreter, that makes the B 1900 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 ▶

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## CHARACTERISTICS OF THE B 1900 SYSTEMS

	B 1905	B 1910	B 1955	B 1985
<b>CENTRAL PROCESSORS</b>				
Date announced	October 1979	August 1980	October 1979	October 1979
Date of first delivery	1st quarter 1980	4th quarter 1980	1st quarter 1980	2nd quarter 1980
No. of central processors	1	1	1	2
Processor cycle time, nanoseconds	250	250	167	167
Maximum processor I/O controls	7	8	8	8
Max. processor + expansion I/O controls	15	15	15	15
<b>MAIN MEMORY</b>				
Minimum capacity, bytes	131,072	524,288	524,288	524,288
Maximum capacity, bytes	1,048,576	1,048,576	2,097,152	2,097,152
Read cycle time, nanoseconds (per byte)	500	500	333	333
Chip size (bits)/type	16K/n-channel MOS	16K/n-channel MOS	16K/n-channel MOS	16K/n-channel MOS
Checking	Error correcting	Error correcting	Error correcting	Error correcting
<b>MICROINSTRUCTION CACHE MEMORY</b>				
Minimum capacity, bytes	8,192	8,192	8,192	16,384 (8K per CPU)
Maximum capacity, bytes	8,192	8,192	8,192	16,384 (8K per CPU)
Read cycle time, nanoseconds (per 16-bit access)	82	82	55	55
<b>COMMUNICATIONS CAPABILITIES</b>				
Maximum no. of lines	1 std.; 8 max.	2 std.; 8 max.	8 std.; 32 max.	8 std.; 32 max.
Synchronous	Opt.; to 50,000 bps	Opt.; to 50,000 bps	Opt.; to 50,000 bps	Opt.; to 50,000 bps
Asynchronous	Opt.; to 9,600 bps	Opt.; to 9,600 bps	Opt.; to 9,600 bps	Opt.; to 9,600 bps
Protocols supported	Basic Mode, BDLC, Bisync	Basic Mode, BDLC, Bisync	Basic Mode, BDLC, Bisync	Basic Mode, BDLC, Bisync
Single-line communications control	Yes	Yes	Yes	Yes
Multi-line communications control	No	No	Yes	Yes
<b>MAXIMUM I/O SPEEDS</b>				
80-column card reading	300-800 cpm	300-800 cpm	300-800 cpm	300-800 cpm
80-column card punching	150/300 cpm	150/300 cpm	150/300 cpm	150/300 cpm
96-column card reading	300 cpm	300 cpm	300 cpm	300 cpm
96-column card punching	60 cpm	60 cpm	60 cpm	60 cpm
Printing (standard character sets)	320-1500 lpm; 320 std.	320-1500 lpm; 650 std.	320-1500 lpm; 650 std.	320-1500 lpm; 650 std.
Magnetic tape I/O (PE)	40 KBS	40 KBS	40 KBS	40 KBS
Magnetic tape I/O (NRZI/PE)	80/120 KBS PE	80/120 KBS PE	80/120 KBS PE; 40/60 KBS NRZI	80/120 KBS PE; 40/60 KBS NRZI
Magnetic tape I/O (GCR/PE)	No	No	470/120 KBS	470/120 KBS
Cassette tape I/O	1 KBS	1 KBS	1 KBS	1 KBS
MICR/OCR reader-sorters	1625 dpm	1625 dpm	900-1625 dpm	900-1625 dpm
<b>AVAILABILITY OF MASS STORAGE</b>				
Disk cartridge drives	No	No	No	No
Dual disk pack drives	Yes	Yes	Yes	Yes
Fixed disk drives	Yes	Yes	Yes	Yes
Mini-disk drives	Yes	Yes	Yes	Yes

➤ The entry-level B 1905 consists of a 4-megahertz central processor, 131,072 bytes of MOS main memory (expandable to a maximum of 1 megabyte), 8,192 bytes of cache memory, a 65.2-megabyte dual disk pack drive, a 320-lpm line printer, a single-line communications control, a display console, and one data communications line. A maximum of seven I/O controls can be housed in the processor cabinet. The basic B 1905 system occupies only one-third of the floor space required by its B 1800 Series counterpart, the B 1815, while delivering up to 30 percent more performance. Entry-level B 1905 systems can operate in any normal office environment, according to Burroughs. The B 1905 can be field-upgraded to a B 1910. ➤

➤ **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.

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 1900 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. ➤

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► The B 1910 system consists of a faster 6-megahertz central processor, 524,288 bytes of MOS main memory (expandable to 1 megabyte), 8,192 bytes of cache memory, a 65.2-megabyte dual disk pack drive, a 650-lpm printer, a single-line communications control, a display console, and an expansion cabinet. The B 1910 can include up to 15 I/O controls.

The B 1955 system consists of a 6-megahertz central processor, 524,288 bytes of MOS main memory (expandable to a maximum of 2 megabytes), 8,192 bytes of cache memory, a 65.2-megabyte dual disk pack drive, a 650-lpm line printer, an 8-line communications control, and a display console. The B 1955 system can be expanded to include up to 15 I/O controls and a wide variety of peripheral equipment. An expansion cabinet is required when the memory capacity exceeds one megabyte and/or the number of I/O controls exceeds eight. Burroughs rates the B 1955's performance approximately 30 percent above that of the B 1905.

The B 1985 is a dual-processor, master/slave system consisting of two 6-megahertz central processors sharing 524,288 bytes of MOS main memory (expandable to a maximum of 2 megabytes), 8,192 bytes of cache memory per processor, a 130-megabyte dual disk pack drive and control, a 650-lpm line printer, an 8-line communications control, a display console, and an expansion cabinet. The system can include up to 15 I/O controls.

The B 1955-1 and B 1985-1 are the same as the B 1955 and B 1985 systems, respectively, except that the disk pack drive, line printer, and printer control are omitted and the prices are correspondingly reduced.

Main memory for all the B 1900 systems is built from 16K-bit chips. A 128K-byte add-on memory increment for the B 1905 or B 1910 is purchase-priced at \$3,450. A 256K-byte memory increment usable with any of the B 1900 Series processors has a purchase price of \$5,750.

### PERIPHERALS AND COMMUNICATIONS

The peripheral equipment for the B 1900 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 display terminals. Introduced along with the B 1900 computers were two new line printers, the 320-lpm B 9246-3 and the 650-lpm B 9246-6, which use operator-changeable print bands to produce high-quality printing at a relatively low cost.

The increasingly important role of data communications is underlined by the fact that a communications control is included in each of the packaged B 1900 systems. A single-line control is part of the B 1905 and B 1910, and a B 1352 Multi-Line Communications Control (MLC) is included in the B 1955 and B 1985 systems. The basic B 1352 handles up to 8 lines, and the B 1353 MLC Extension permits a ►

► All of the B 1900 Series processor models are program-compatible and similar in architecture. They utilize transistor-transistor logic (TTL) and feature a high-speed, bipolar microinstruction cache memory with a capacity of 8,192 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 1985 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 1985 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.

**INTERRUPTS:** The B 1900 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.

### 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 card slots in the processor chassis or expansion cabinet. The maximum number of I/O controls allowed in each B 1900 system is listed in the table.

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

### CONFIGURATION RULES

The basic packaged *B 1905* system consists of a 4-megahertz central processor with 131,072 bytes of main memory and 8,192 bytes of cache memory, a console display and control, a 65.2-megabyte dual disk pack drive and control, a 320-lpm B 9246-3 Line Printer and control, and a B 1351-2 Universal Single-Line Communications Control. The basic processor cabinet accommodates a maximum of 7 I/O controls and 524,288 bytes of main memory. An optional expansion cabinet permits up to 1,048,576 bytes of memory and 15 I/O controls to be used. The B 1052 1.0-Megabyte Memory Base feature is required to expand the memory to 1,048,576 bytes. The B 1905 supports one- and two-card I/O controls. The Universal Single-Line Control (USCL) requires a one-card I/O position. The B 1905 supports USCLs to its I/O maximum. The built-in disk electronics controller accommodates up to four disk drives. A second 1 x 8 disk subsystem may be added. With the expansion cabinet and a 6-megahertz clock kit, the B 1905 can be field-upgraded to a B 1910.

The basic packaged *B 1910* system consists of a 6-megahertz central processor with 524,288 bytes of main memory, 8,192 bytes of cache memory, a console display and control, a 65.2-megabyte dual disk pack drive and control, a 650-lpm B 9246-6 Line Printer and control, two Universal Single Line Controls, two I/O expansion features, and an expansion ►

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▷ total of 16 communications lines to be attached to each control. With the MLC, a B 1900 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.

The Burroughs Network Architecture (BNA) is designed to enhance the interaction of terminals with host CPUs in network environments. 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 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 1900 Series systems through the HASP Remote Terminal Program Product and the Power/RJE Remote Terminal Program Product. Operating under MCP, the HASP program enables the B 1900 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 1900 systems are made to look like IBM 3780 remote workstations. Under control of the MCP, the B 1900 systems function as remote batch terminals on-line to an IBM 360/370 or 4300 system running DOS/POWER or OS/JES2. Other Burroughs programs enable the B 1900 systems to serve as remote job entry terminals for the larger Burroughs B 2000, B 3000, B 4000, B 6000, or B 7000 Series computers.

**SOFTWARE**

Software support for the B 1900 Series computers centers on two operating systems, MCP-TCS III for the B 1905 and B 1910 and MCP-TCS IV for the B 1955 and B 1985. MCP-TCS III consists of the Master Control Program (MCP) for overall system control, the Network Definition Language (NDL) for generating communications control programs, the ODESYS system for on-line data entry and validation, either the Text Editor or CANDE for on-line programming and/or file updating, system utilities to handle sorting and other routine operations, and the user's choice of one compiler (e.g., COBOL, RPG II, FOR- ▷

▶ cabinet. Main memory can be expanded to 1,048,576 bytes. The B 1910 can include up to 15 I/O controls.

The basic packaged *B 1955* system consists of a 6-megahertz central processor with 524,288 bytes of main memory and 8,192 bytes of cache memory, a console display and control, a 65.2-megabyte dual disk pack drive and control, a 650-lpm B 9246-6 Line Printer and control, and an 8-line B 1352 Multi-Line Communications Control. An expansion cabinet is required when the main memory capacity exceeds 1,048,576 bytes. The basic cabinet holds up to 8 I/O controls in addition to the multi-line control, and an expansion cabinet permits up to 15 I/O controls to be used.

The basic *B 1955-1* system is the same as the basic B 1955 system except that the dual disk pack drive, line printer, and printer control are omitted.

The basic packaged *B 1985* system consists of 6-megahertz master and slave central processors, 524,288 bytes of main memory, 8,192 bytes of cache memory per processor, an expansion cabinet, a console display and control, a 130-megabyte dual disk pack drive and control, a 650-lpm B 9246-6 Line Printer, and an 8-line B 1352 Multi-Line Communications Control. The system can include up to 15 I/O controls in addition to the multi-line control.

The basic *B 1985-1* system is the same as the basic B 1985 system except that the dual disk pack drive, line printer, and printer control are omitted.

Seven different types of I/O controls are available for the B 1900 Series systems. The number and types of I/O controls that can be connected to each system are governed by the overall limitations shown in the table, by restrictions on the number of card slots available, and by various complex interrelationships. The B 1905 can use only Type A and B controls. The basic system can have a maximum of seven controls, of which no more than two can be Type B. The maximum number of card slots on a B 1910 is 29. The total number of card slots cannot exceed 55 on a B 1955 or 40 on a B 1985 system.

The types of I/O controls required by the various I/O units used with the B 1900 systems are as follows:

**Control Type A (one I/O card)**

All 80-column card readers (300, 600, or 800 cpm)  
All 80-column card punches (150 or 300 cpm)  
9246 Printers (320 or 650 lpm)  
9247 Printers (1100 or 1500 lpm)  
Universal Single-line communications control  
CMS data communications processor base

**Control Type B (two I/O cards)**

All 96-column card readers (300 cpm)  
9419 96-column Reader/Punch Multi-Purpose Card Unit (300/60 cpm)  
MICR reader-sorters (900, 1000, or 1625 lpm)  
9490 Cassette Tape Subsystem  
9484 or 9494 Disk Drives  
9489 Mini-Disk Drives  
9495 or 9491 PE Magnetic Tape Units  
NRZI/PE magnetic tape unit switchable configuration (also requires control type G)  
CMS data communications processor basic plus extension

**Control Type F (four I/O cards)**

Single-line communications control

**Control Type G (eight I/O cards)**

9495 NRZI Magnetic Tape Units  
Four-line multi-line communications control ▶

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▷ TRAN, or Interactive BASIC). MCP-TCS IV includes all the facilities of MCP-TCS III plus the Generalized Message Control System (GEMCOS) and either the DMS-II data base management system or the Reporter II System for generating customized report programs.

The Master Control Program is an integrated operating system that complements the hardware to create an unusually effective environment for multiprogrammed operation. Like the MCP operating systems for the larger Burroughs computers, the B 1900 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.

### COMPATIBILITY AND COMPETITION

The B 1900 systems provide full object-code compatibility with the architecturally similar Burroughs B 1700 and B 1800 systems. Program compatibility with other computers is achieved via higher-level languages. The B 1900 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 1900 RPG compiler or translated into COBOL by the COFIRS II (COBOL from IBM RPG Specifications) routines.

The B 1900 systems compete against the IBM 4331 and System/38 (as an alternative growth path for users of the System/3, System/32, or System/34) and against systems such as the Sperry Univac System 80, the Honeywell DPS6, NCR 8400/8500, and Hewlett-Packard 3000 Series.

### USER REACTION

Sixteen B 1900 Series users responded to Datapro's 1981 survey of general-purpose computer users. These respondents had 2 B 1905 systems, 13 B 1955 systems, 2 B 1985 systems, and 2 unspecified B 1900 systems installed. The average usage time was 4.8 months.

We asked the users to indicate the significant advantages of their systems and any problems encountered. The B 1900 Series received 83 specific mentions of advantages and 14 mentions of problems. The most frequently cited advantages were ease of expansion and reconfiguration (16 responses), good response time (11 responses), and compatibility of programs and data carried over from other systems (11 responses). Only two problem areas were mentioned by more than one user. Six users said that installation of the equipment was late, and three said that Burroughs did not provide all the promised software and support.

One user, whose B 1985 system had replaced a B 1700, commented, "The software features (ease of use, ease of training, outstanding operating system, and flexible easily modified data base package) are the primary reasons I ▷

▶ *Control Type H (six I/O cards)*

Dual-line communications control

*Control Type J (twelve I/O cards)*

Eight-line multi-line communications control  
DCP-1 data communications processor

*Control Type K (ten I/O cards)*

Eight-line multi-line communications control extension  
DCP-1 extension

### MASS STORAGE

**B 9484 DUAL DISK SUBSYSTEM:** Usable on all B 1900 Series systems, the B 9484 subsystem consists of a B 1486-1 Dual Disk Pack Control and either a 65.2-megabyte B 9484-2 Dual Disk Pack Drive and Electronic Controller or a 130.4-megabyte B 9484-51 Dual Disk Pack Drive and Electronic Controller.

On all B 1900 systems, the B 1486-1 Dual Disk Pack Control is included in the basic system configuration, and the required Electronic Controller is built into the system cabinet. A 65.2-megabyte B 9484-2 Dual Disk Pack Drive is standard in the basic B 1905, B 1910, and B 1955 systems, while a 130.4-megabyte B 9484-51 Dual Disk Pack Drive is standard in the basic B 1985 system. The B 1905 has a 1x4 Electronic Controller, while the larger B 1900 Series systems have a 1x8 Electronic Controller. The B 1905 can support an additional 1x8 disk subsystem.

The B 9484-2 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 is 25 milliseconds, the average rotational delay is 8.3 milliseconds, and the data transfer rate is 605,000 bytes per second. The B 9484-2 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.

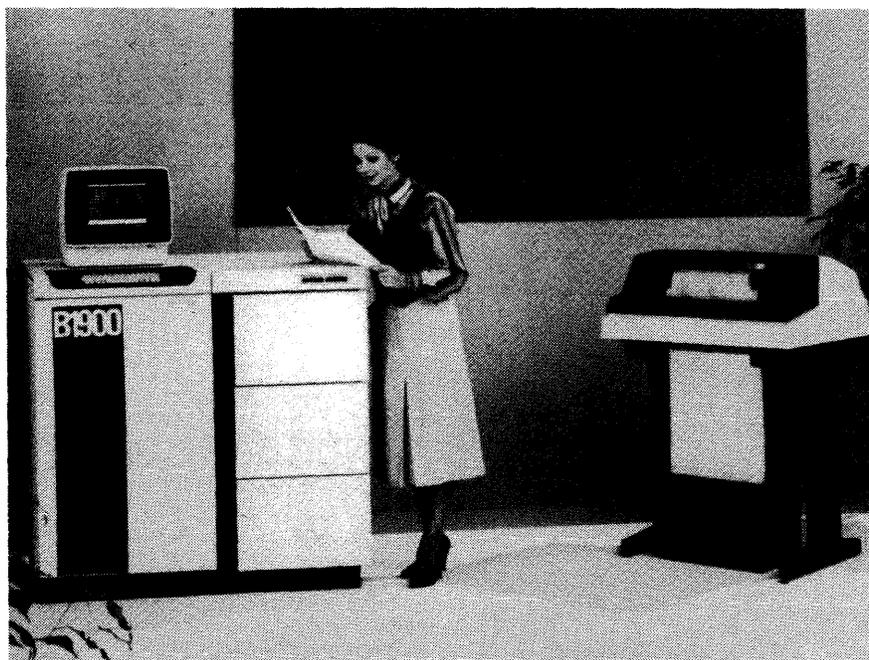
The B 9484-51 is a double-density version of the B 9484-2 with 370 tracks per inch, 814 tracks per surface, 65.2 megabytes per spindle, and other specifications the same.

**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 nonremovable 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.

**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 Mini-Disk Control. Any combination of up to two cabinets (two, three, or four spindles) may be connected to a B 1489. 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. ▶

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*The B 1905 is the entry-level member of the B 1900 Series. Designed to operate in any normal office environment, it occupies only one-third of the floor space required by its B 1800 Series counterpart, the B 1815, while delivering up to 30 percent more performance.*

▷ have upgraded within the Burroughs line." A B 1955 user, who had also upgraded from a B 1700, said, "We . . . feel the Burroughs system is a very good machine. The MCP operating system is good and the ease of operation is great."

The users' ratings of the B 1900 Series are summarized in the following table.

	Excellent	Good	Fair	Poor	WA*
Ease of operation	12	4	0	0	3.75
Reliability of mainframe	8	8	0	0	3.50
Reliability of peripherals	2	11	3	0	2.94
Maintenance service:					
Responsiveness	3	8	4	1	2.81
Effectiveness	3	9	3	1	2.88
Technical support:					
Trouble-shooting	0	9	6	1	2.50
Education	1	11	2	2	2.69
Documentation	0	7	7	2	2.31
Manufacturer's software:					
Operating system	12	4	0	0	3.75
Compilers & assemblers	9	6	1	0	3.50
Applications programs	0	4	5	0	2.44
Ease of programming	8	8	0	0	3.50
Ease of conversion	6	6	3	0	3.20
Overall satisfaction	6	10	0	0	3.38

\*Weighted Average on a scale of 4.0 for Excellent.

We interviewed three of the survey respondents to obtain additional information on their experiences with the B 1900 systems. Two of these users had B 1905 systems and one had a B 1955. All three had converted from another system: one from an NCR Century 75, one from an IBM System/3, and one from a Burroughs B 800. Interestingly, the smoothest conversions were reported by the former NCR and IBM users, both of whom now have B 1905 systems.

## ▷ INPUT/OUTPUT UNITS

**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 inches per second. The unit has read-after-write electronics and rewinds tape at 60 inches per second. The data transfer rate is 1000 bytes per second.

**B 9491 MAGNETIC TAPE DRIVES:** The B 9491 tape drives read and write data on ½-inch tape in 9-track phase-encoded mode at 1600 bits per inch. 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 1900 systems through the B 1491-4 Control.

**B 9495 MAGNETIC TAPE DRIVES:** These high-performance 9-track units record data on ½-inch tape in IBM-compatible phase-encoded mode at 1600 bits per inch. Three models are currently available for the B 1900 systems: the B 9495-8, B 9495-82, and B 9495-35M. 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 rate of 120,000 bytes per second. An NRZI option is available to enable the B 9495-82 tape drives to record data in NRZI mode at 800 bits per inch. The B 9495-35M can be used with the B 1955 and B 1985 systems only. The B 9495-35M records data in Group Coded Recording (GCR) mode at 6250 bits per inch or in phase-encoded mode at 1600 bits per inch. Tape speed is 75 inches per second, and the data transfer rate is 486,000 bytes per second in GCR mode and 120,000 bytes per second in PE mode.

All 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, ▷

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➤ The user who had converted from the NCR system said he used Burroughs' NCR Neat 3 to Burroughs COBOL translator and "most programs ran right away." He commented that the conversion may have been simpler than some because he was using the B 1905 in a batch environment and "not doing anything fancy" with it. The former IBM System/3 user said he had encountered "no unusual" problems in converting to the B 1905. However, the third user, who had converted from a Burroughs B 800 to a B 1955, stated that the conversion was "not as smooth as they'd led me to believe." He said he was working out the problem with Burroughs and did not want to go into specific details.

Overall, the users' ratings and comments indicate that they were quite well satisfied with the B 1900 Series systems. All 16 survey respondents said they would recommend the systems to others. Only three of the users planned to replace their B 1900 systems, and all three intended to acquire another Burroughs system. □

➤ a positive reel latch, automatic tape threading and loading, and "on-the-fly" detection and correction of most errors. A unique "coaxial" hub mounts the feed reel directly in front of the 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, or 2 x 8). The B 9495-35M has a built-in formatter/controller that can control up to three B 9495-32 add-on drives. The B 9495-35M connects to a B 1955 or B 1985 system via the B 1495-32 Control.

Burroughs also offers the packaged B 9495-4X Magnetic Tape Subsystems. The B 9495-45 consists of a B 9499-33 1x4 Electronics Unit and one B 9495-8 Magnetic Tape Drive, while the B 9495-46 is its two-drive counterpart. Each of these subsystems connects to a B 1495-32 PE Tape Control, and each can be expanded to a maximum of four tape drives.

**B 9246 BAND PRINTERS:** These two printers, introduced with the B 1900 Series systems in October 1979, 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:

	<u>B 9246-3</u>	<u>B 9246-6</u>
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 of 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. A B 9246-3 or B 9246-6 Printer can be connected to any B 1900 Series system by means of a B 1249 Control. The B 9246-3 is part of the basic B 1905 system, and the B 9246-6 is included in the basic B 1910, B 1955, and B 1985 configurations.

**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 inches per second. The B 9247 Train Printers require a B 1247-4 Control (B 9247-14), or a B 1247-5 Control (B 9247-15).

**B 9246-20 TRAIN PRINTER:** A heavy-duty, high-performance line printer designed for high-volume impact printing requirements. The B 9246-20 is rated at 2000 lines per minute with a 48-character set and at 1630 lines per minute with a 64-character set. Features include a powered hood release, a type array cartridge, and a built-in vacuum.

**B 9115 CARD READER:** Reads standard 80-column cards serially by column at a rated speed of 300 cards per minute. Reads EBCDIC or binary-coded cards. Cards are read photoelectrically, with a double strobe comparison for each column to help ensure reading accuracy. A single input hopper and output stacker hold up to 1000 cards each. Usable with any B 1900 Series system. Each B 9115 requires a B 1115 Control. The optional B 9915 Feature enables the B 9115 to read 51-column cards.

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

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

**B 9419-2 CARD READER PUNCH/DATA RECORDER:** Reads 96-column cards at 300 cards per minute, and punches and/or prints full cards at 60 cards per minute; 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 cards per minute, 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 1900 Series system, the B 9419-2 requires a B 1419 Control.

**B 9416-6 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

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- ▶ 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 Control and is usable with any B 1900 Series system.

**MICR READER-SORTERS:** The four MICR or MICR/OCR Reader-Sorters available for use with the B 1900 Series systems have the following characteristics:

**B 9135-2:** MICR; 900 dpm, 8 stacker pockets; B 1130 Control.

**B 9135-3:** MICR; 900 dpm, 12 stacker pockets; B 1130 Control.

**B 9137-4:** MICR; 1000 dpm, 8 stacker pockets; B 1130 Control.

**B 9190-2:** MICR/OCR; 1625 dpm, 4 to 32 stacker pockets; B 9990-90 or -91 Control.

The B 9190-2 Reader-Sorter is available for use with all B 1900 systems. The other reader-sorter models can be used with the B 1955 and B 1985 systems only.

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

The B 9137-4 Reader-Sorter is equipped with a double read capability so that MICR characters are read twice during each pass by two separate read heads. Optional features include an impact endorser, basic and extended off-line sort capabilities, valid character check, digit and field edit and override, resettable or non-resettable item counters, a batch ticket detector, and 4-pocket add-on modules that can be combined for a total of 16 pockets.

The B 9190-2 is a four-pocket MICR/OCR reader-sorter to which must be added at least one character recognition module and one internal interface module. Optional features include three types of enders, a microfilm camera module, an off-line sort package, special equipment for processing 51-column cards, and additional 4-pocket modules that can be combined for a maximum configuration of 32 pockets.

**TERMINALS:** The B 1900 Series systems support most Burroughs' terminals, including the MT 687 user-programmable terminal and the MT 983 terminal. Both models are keyboard/display units with 12-inch screens. The MT 687 is described in detail in Report 70D1-112-01 in Volume 2. The MT 983 includes controls for asynchronous and synchronous, data set and direct-connect communications. Matrix printers can be attached to either terminal model.

### COMMUNICATIONS CONTROL

**B 1351 SINGLE-LINE CONTROL:** Provides the interface between a single leased or switched communications line and any B 1900 Series processor. 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 Single-Line Control can utilize any adapter listed below except the B 1667-5, 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 DUAL SINGLE-LINE CONTROL:** Provides the interface between two leased or switched communications lines and a B 1900 Series processor. Otherwise similar to the B 1351 Single-Line Control.

**B 1352 EIGHT-LINE MULTI-LINE CONTROL:** Provides the interface between B 1955 or B 1985 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.

A B 1955 or B 1985 system can include a maximum of two B 1352 MLCs, each equipped with a 1353 Controller Extension, for a maximum total of 32 lines.

**B 1354 FOUR-LINE MULTI-LINE CONTROL:** Similar to the B 1352, but restricted to four lines. No extension is available to increase the B 1354's capacity.

**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—up to 1200 bps, connection types II, III, or IV; B 1650-2—up to 1800 bps, connection type V; and B 1652-1—Teletype, connection type II.

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

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

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

**B 1667-5 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.** ▶

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

**B 1360 DATA COMMUNICATIONS PROCESSOR (DCP-1):** Used only in B 1955 systems utilizing the Computer Management System (CMS) software for compatibility with the smaller Burroughs B 80, B 90, B 800, and B 900 computers, the DCP-1 is a communications processor with 16K bytes of N-channel MOS memory. A maximum of three DCP-1's can be connected to a B 1955 system, and each DCP-1 can control up to seven communications lines. A B 1660 DCI Adapter is required for each line. The basic DCP-1 accommodates up to three DCI Adapters, and addition of the B 1365 DCP-1 Extension permits up to four more DCI Adapters to be used. Each DCI Adapter can handle any of the types of connections described above under "Line Adapters" except wideband communications and connections to Teletype equipment.

**B 1361 DATA COMMUNICATIONS PROCESSOR (DCP-3):** Similar to B 1360, except that a maximum of five DCP-3's can be connected to any B 1900 system with a maximum of 10 data communications lines each.

### SOFTWARE

**OPERATING SYSTEMS:** The B 1900 Series announcement included two new operating systems which bring together the software capabilities required for both conventional data processing and on-line transaction processing.

**MCP-TCS III (Master Control Program—Transaction Control System III)** is the required operating system for all B 1905 or B 1910 computer systems. It consists of the Master Control Program (MCP) for overall system control; the Network Definition Language (NDL) for generating communications control programs; the ODESYS on-line data entry system; either the Text Editor or CANDE for on-line programming and/or file updating; the user's choice of one compiler; and system utilities to handle sorting and other routine operations.

**MCP-TCS IV** is the required operating system for all B 1955 and B 1985 computer systems. It includes all the facilities of MCP-TCS III plus the Generalized Message Control System (GEMCOS) and either the DMS-II data base management system or the Reporter II System for generating customized report programs.

The components of MCP-TCS III and MCP-TCS IV are individually described below.

**CM-TCS (Computer Management—Transaction Control System):** This alternative set of systems software is designed for use in B 1955 installations that need to maintain program compatibility with the Computer Management System (CMS) software used on the smaller Burroughs B 80, B 90, B 800, and B 900 Series computers. CM-TCS consists of the

following components: Master Control Program, CANDE, ODESYS, NDL, CMS COBOL or RPG Compiler, and system utilities. The B 1360 or B 1361 Data Communications processor (DCP-1 or DCP-3) is required in all B 1955 systems using the CM-TCS software; it can be configured in place of the standard B 1352 Multi-Line Communications Control.

**Master Control Program:** The MCP is 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.

The MCP requires a minimum of 28K bytes of memory plus the memory space required to hold the users' programs. Required peripheral equipment includes a display console, dual disk pack drive unit, and line printer.

**LANGUAGES:** The B 1900 Series computer systems support COBOL, RPG, FORTRAN, BASIC, Micro Implementation Language, Software Development Language, Network Definition Language, and User Programming Language.

The **B 1900 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 1900 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 1900 system. The compiler requires about 40K bytes of memory. Object programs generated by the COBOL compiler are expressed in an S-language that is oriented toward efficient handling of 4-bit digits and 8-bit characters. The COBOL Interpreter, required at execution time, occupies about 3K bytes of memory in addition to the object program's requirements.

B 1900 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 1900 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 1900 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 1900 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. ►

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► The *B 1900 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 48K 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.

*B 1900 BASIC* is a language that generally corresponds to the original Dartmouth BASIC (Beginners' All-Purpose Symbolic Instruction Code). Burroughs offers both a batch-mode BASIC compiler and an Interactive BASIC System for the B 1900 Series computers.

The batch-mode BASIC compiler requires a minimum of 12K bytes of memory exclusive of MCP requirements. 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 System accepts commands, program instructions, and data values from users at local or remote terminals. Commands cause the requested functions to be performed immediately; program instructions are stored for later execution; and data values are entered in response to program requests. The results of each program are routed to the originating terminal. The BASIC source language is converted to an internal form that can be efficiently executed on a B 1900 system. Extensive text editing and debugging facilities are provided to facilitate programming. Burroughs' Interactive BASIC language includes all the facilities of ANSI's Minimal BASIC plus enhancements in these areas: string handling, array handling, mathematical functions, external file handling, and formatted output. The Interactive Basic System requires about 17K bytes of memory exclusive of the MCP.

*B 1900 Micro Implementation Language (MIL)* is a compiler-level language that produces microcode that is directly executable on a B 1900. 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 microinstruction. 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 microinstruction 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 1900 Software Development Language (SDL)* is a compiler-level system language that is procedure-oriented with extensive subscripting, indexing, and data concatenation capabilities. Data declarations include arrays and substructures in bit or character formats. Data space can be allocated as permanent, dynamic (shared space local to procedures), and virtual. Dynamic space is calculated at run time. SDL requires 20K bytes of memory exclusive of MCP.

*Network Definition Language (NDL)* is a special-purpose programming tool that enables users to define and generate customized Network Control programs for data communications applications. The Network Controller handles line disciplines, buffer management, message queuing, and auditing, and supervises the flow of messages between user-coded programs and remote terminals. This enables the user's

application programs to deal with remote terminals in the same manner as with conventional on-site peripheral devices. After the programmer defines his custom Network Controller in the NDL syntax, the source statements are processed by the NDL Compiler and converted into the necessary object code and tables. NDL runs under MCP on any B 1900 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 1900 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 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 exclusive of MCP.

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

Specifically, B 1900 DMS-II is a logical subset of B 6000 DMS-II. The COBOL constructs used in B 1900 Series COBOL programs for accessing the data base are syntactically and semantically compatible with those used in B 6000 COBOL. However, the physical mapping algorithms for structuring the data base records on direct-access storage differ, so that a B 1900 DMS-II data base must be reloaded before being transferred to B 6000 DMS-II. The B 1900 DMS-II DASDL parameters and DMS statements in COBOL programs are compatible with B 6000 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 ►

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► 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 1900 CANDE is a subset of B 6000 CANDE and conforms to the same functional behavior. B 1900 CANDE is an MCS (Message Control System) that runs in conjunction with NDL. The NDL-generated network controller performs all the data communications related functions, while CANDE performs file updating and text editing functions. CANDE can support a maximum of 16 terminals. A basic user code/password type of security is available with the system. CANDE also provides a recovery system. CANDE requires 22K bytes of memory for one terminal plus 2K bytes for each additional terminal when specific file functions such as "GET" are used. MCP and NDL are not included in the memory requirements of CANDE.

**REPORTER II:** This is a report writer designed to simplify the retrieval, analysis, and reporting of information maintained in computer files. REPORTER II accepts report specifications coded in a free-form report description language and generates a COBOL program tailored to produce the required report. The system can retrieve input data from multiple files and/or DMS II data bases, select data based on a wide range of criteria, perform arithmetic and statistical functions, sort data in ascending or descending order according to multiple keys, control access through a password system, produce automatically formatted reports, and create one or more files of extracted data for subsequent processing or reporting.

In addition to the basic version, REPORTER II is available in an Advanced version, an Audit version, and an On-Line version. REPORTER II (Advanced) adds the capabilities for generation of multiple reports in one pass through the input data, creation of summary-only (matrix) reports, and controlled formatting for special reports or preprinted forms. AUDIT-REPORTER extends the REPORTER II system by providing auditors with effective software tools for testing and evaluating the records produced by an EDP system. The On-Line REPORTER is an optional module that can be added to any of the three preceding systems to provide an on-line mode of operation that enables users at remote terminals to enter, generate, compile, and execute report programs.

**B 1900 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 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 9.1K bytes of memory exclusive of MCP, network controller, and message buffer space.

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

**SYSTEM COMMUNICATION MODULE (SYCOM):** Provides a mechanism for linking two B 1900, B 1800, or B 1700 computers to permit file transfers, remote execution from the console keyboard, and program communication between the systems. SYCOM contains its own data communications handler and operates under MCP control, permitting the SYCOM functions to be combined with on-site work in a multiprogramming job mix. SYCOM operates in point-to-point mode via a switched or leased communications line. Available features include auto answer, auto call, EBCDIC transparent and nontransparent, space compression/expansion, and buffer sizes ranging from 405 to 4095 bytes. The SYCOM program requires a minimum of 20K bytes of main memory plus a single-line, dual-line, or multi-line communications control with a standard synchronous, binary synchronous, or direct-connect adapter.

**HASP REMOTE TERMINAL PROGRAM:** Permits a B 1900 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 1900 system can be made functionally equivalent to a standard IBM 360/20 HASP workstation. Communication between the B 1900 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 1900 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 1900 HASP Remote Terminal Program operates under the MCP operating system, permitting the remote job entry function to be multiprogrammed with local processing. Line speeds of up to 9,600 bps are supported over leased or dial-up lines in half-duplex mode. The program requires 32K bytes of main memory in addition to that required for MCP.

**RJE TERMINAL PROGRAMS:** Burroughs offers two programs for RJE. One permits entry to a B 6000/B 7000; the second, to a B 2000/B 3000/B 4000. These programs make a B 1900 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 24K bytes of memory.

**BURROUGHS NETWORK ARCHITECTURE (BNA):** A set of software facilities designed to enhance the interaction of terminals with host CPUs 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 multiprocessing 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 ►

## Burroughs B 1900 Series

► 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 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 the European

(ADCCP), the protocol standard developed by the American National Standards Institute (ANSI). It is Burroughs' intention to maintain BDLC compatible with the bit-oriented protocols of selected competitors (such as IBM's SDLC).

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

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

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

**ON-LINE DATA ENTRY SYSTEM (ODESY):** A sophisticated data entry and validation system using multiple on-line visual display units, ODESY provides a generalized and generative "front end" for the existing B 1900 application packages. It enables future packages to be designed to use its extensive editing facilities and thus reduce development effort by virtually eliminating conventional input control programs. Because of these editing facilities, ODESY is able to produce batches of essentially error-free data for input to application programs.

**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 1900 Series utility routines include System Loading Procedures, Disk File Copy, Memory Dump, Memory Dump Analyzer, File/Loader, File/Puncher, and DM-PALL. 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.

**APPLICATION PROGRAMS:** Burroughs offers a number of application programs for the B 1900 Series, including the following:

- Burroughs Inventory Planning Analysis and Simulation System (BIPASS)
- Business Planning System (BPS)
- Distribution Information System (DIS)
- General Business Management System
- Hospital Management System
- Infostats (forecasting and statistics)
- Item Processing System
- Manufacturing Management System
- Production Control System III
- SCHOLASTIC Education Programs
- Screen Oriented Program Editor (SCOPE)
- Tax Assessment and Collection System (TACS)
- Text Management and Communications System
- Thrift On-Line System
- Total Banking System
- Utility Billing System

### PRICING

**CONTRACT TERMS:** The B 1900 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) ►

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► 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. Program Products for the B 1900 systems are offered under either an Unlimited-Time License Plan, for a one-time charge followed by an annual maintenance fee, or a Limited-Time License Plan, with monthly payments.

**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 charge basis.

**EDUCATION:** Users can obtain the necessary training by paying for individual courses. The currently available courses range from 1 to 10 days in length, cost \$125 to \$1,250 for each attendee, and fall into the following broad categories: Systems Support, Operations, Languages, Environmental (data base and data communications), and Applications.

**EQUIPMENT:** The components and prices of the packaged B 1900 Series Systems are listed in the "Equipment Prices" section, which follows. Downgrading or substitution of items with lower list prices is not allowed. Substitution of similar items with higher prices may be made by adding the current price differentials to the basic package price.

### EQUIPMENT PRICES

		<u>Purchase</u>	<u>Monthly Maint.*</u>	<u>1-Year Lease**</u>	<u>5-Year Lease**</u>
<b>PACKAGED SYSTEMS</b>					
B 1905	Basic System; includes 4-MHz CPU with 128K bytes of main memory, built-in Universal Disk Controller, B 9348-52 Display Console, B 1348-52 Console Control, B 1486-1 Disk Control, B 9484-2 Dual Disk Pack Drive (65 megabytes), B 1249 Printer Control, B 9246-3 320-lpm Line Printer, and B 1351-2 Universal Single-Line Control	\$59,500	\$310.00	\$2,100	\$1,650
B 1910	Basic system; includes 6-MHz CPU with 512K bytes of main memory, built-in Universal Disk Controller, B 9348-52 Display Console, B 1348-52 Console Control, B 1486-1 Disk Control, B 9484-2 Disk Pack Drive (65 megabytes), B 1249 Printer Control, B 9246-6 650-lpm Printer, two B 1306 I/O Expansion Features, B 1059 Expansion Cabinet, B 1051 6-MHz Clock, and B 1351-2 Universal Single-Line Control	87,000	500.00	3,000	2,500
B 1955	Basic system; includes 6-MHz CPU with 512K bytes of main memory, built-in Universal Disk Controller, B 9348-52 Display Console, B 1348-52 Console Control, B 1486-1 Disk Control, B 9484-2 Dual Disk Pack Drive (65 megabytes), B 1249 Printer Control, B 9246-6 650-lpm Line Printer, and B 1352 8-Line Multi-Line Control	104,000	540.00	3,531	3,025
B 1955-1	Same as B 1955 basic system except that the B 9484-2 Dual Disk Pack Drive, B 9246-6 Line Printer, and B 1249 Printer Control are omitted	87,450	335.00	2,770	2,373
B 1985	Basic system; includes two 6-MHz CPUs, 512K bytes of main memory, built-in Universal Disk Controller, B 9348-52 Display Console, B 1348-52 Console Control, B 1486-1 Disk Control, B 9484-51 Dual Disk Pack Drive (130 megabytes), B 1249 Printer Control, B 9246-6 650-lpm Line Printer, B 1352 8-Line Multi-Line Control, and B 1058 Expansion Cabinet	148,960	648.00	4,824	4,133
B 1985-1	Same as B 1985 basic system except that the B 9484-51 Dual Disk Pack Drive, B 9246-6 Line Printer, and B 1249 Printer Control are omitted	125,840	430.00	3,969	3,400
<b>SYSTEM OPTIONS</b>					
B 1051	6-MHz Clock Kit for B 1905	5,000	11.00	160	130
B 1052	1.0MB Memory Base for B 1905 or B 1910	1,000	11.00	30	25
B 1059	Expansion Cabinet for B 1905	10,000	38.50	315	265
B 1057	Power Booster for B 1955	5,925	20.60	185	155
B 1058	Expansion Cabinet for B 1955	16,223	82.30	524	453
B 1985-Kit	Dual Processor Kit; includes one B 1985 processor	38,390	105.00	1,199	1,027
<b>ADD-ON MAIN MEMORY</b>					
B 1005-131	128K-byte increment for B 1905 or B 1910	3,450	18.20	110	95
B 1155-262	256K-byte increment for all B 1900 models	5,750	27.80	185	155

\* For 5-day, 8-hour service.

\*\* Includes 7-day, 24-hour maintenance coverage.

## Burroughs B 1900 Series

## EQUIPMENT PRICES

		<u>Purchase</u>	<u>Monthly Maint.*</u>	<u>1-Year Lease**</u>	<u>5-Year Lease**</u>
<b>► MASS STORAGE</b>					
B 1486-1	Disk Pack Drive Control	6,365	71.10	207	170
B 9484-51	Dual Disk Pack Drive; 130.4 megabytes	20,000	96.00	739	601
B 9494-41	Dual Fixed-Disk Drive; 402 megabytes	24,000	78.10	733	555
B 9494-42	Dual Fixed-Disk Data Bank; includes two B 9494-41 drives; 804 megabytes	40,000	157.00	1,374	1,023
B 9494-43	Dual Fixed-Disk Data Bank; includes three B 9494-41 drives; 1206 megabytes	57,000	235.00	1,934	1,599
B 9494-44	Dual Fixed-Disk Data Bank; includes four B 9494-41 drives; 1608 megabytes	75,000	315.00	2,394	1,952
B 9489-17	Industry-Compatible Mini-Disk drive; 243K bytes	2,000	28.25	100	80
B 9489-16	Industry-Compatible Mini-Disk Drive; 486K bytes	6,530	29.50	221	180
B 1489	Mini-Disk Control for the B 9489-17 and B 9489-16	4,244	16.00	128	106
<b>MAGNETIC TAPE UNITS</b>					
B 9490-25	Cassette Tape Station; 10 ips	1,689	11.70	66	53
B 1490-25	Control for B 9490-25	2,334	60.80	106	79
B 9491-4	Magnetic Tape Unit; 9-track, 40KBS, PE	12,600	76.90	465	375
B 9491-5	Add-On Magnetic Tape Unit	10,000	71.68	360	295
B 1491-4	Control for B 9194-4 or -5	1,800	5.50	60	50
B 9495-35M	Magnetic Tape Unit with Formatter/Controller; 470/120KBS, GCR/PE (for B 1955 or B 1985 only)	47,864	187.00	1,786	1,425
B 9495-32	Add-On Magnetic Tape Unit for B 9495-35M	20,700	133.00	750	591
B 9495-8	Magnetic Tape Unit; 9-track, 40/80KBS, NRZI/PE	10,500	118.00	386	314
B 9495-82	Magnetic Tape Unit; 9-track, 60/120KBS, NRZI/PE	16,720	114.00	581	451
B 9495-45	Magnetic Tape Subsystem; 1x4 B 9499-33 Master Electronics Exchange and B 9495-8 drive	15,500	123.00	495	408
B 9495-46	Magnetic Tape Subsystem; same as B 9495-45, but with two drives	25,500	215.00	863	704
B 9499-33	1x4 Master Electronics Exchange; PE; for B 9495-8	10,400	33.60	340	260
B 9499-34	1x8 Master Electronics Exchange; PE; for B 9495-8	11,200	33.60	365	285
B 9499-35	2x8 Master Electronics Exchange; PE; for B 9495-8	13,120	73.60	430	330
B 9499-50	1x4 Master Electronics Exchange; PE; for B 9495-82	17,325	143.00	631	481
B 9499-51	1x8 Master Electronics Exchange; PE; for B 9495-82	19,110	143.00	666	509
B 9499-52	2x8 Master Electronics Exchange; PE; for B 9495-82	46,478	299.00	1,808	1,048
B 9999-4	PE/NRZI Switchable Feature; allows B 9495-8 or -82 to operate in NRZI mode	750	5.50	25	20
B 9999-5	NRZI Option; for use with B 9499-50, -51, or -52	2,600	32.60	80	65
B 1495-32	PE Control; for use with B 9495 tape units	3,600	22.10	95	86
B 1491-30	NRZI Control; for use with B 9495 tape units	6,000	65.00	175	159
B 1495-35	PE/NRZI Control; for use with B 9495 tape units	10,200	87.10	270	245
<b>LINE PRINTERS</b>					
B 9246-3	Band Printer; 320 lpm, 132 positions	11,500	138.00	399	326
B 9246-6	Band Printer; 650 lpm, 132 positions	14,000	165.00	499	383
B 1249	Printer Control for B 9246 printers	1,379	14.30	54	54
B 9247-14	Train Printer; 1100 lpm, 132 positions	33,000	413.00	1,334	1,062
B 9247-15	Train Printer; 1500 lpm, 132 positions	44,000	473.00	1,810	1,455
B 1247-4	Printer Control for B 9247-14	5,729	40.70	160	128
B 1247-5	Printer Control for B 9247-15	7,957	38.20	260	217
B 9942-10	Additional Train Module for B 9247 printers	3,245	36.40	124	101
B 9246-20	Train Printer; 2000 lpm, 132 positions	69,293	545.00	2,322	1,824
B 1240	Printer Control for B 9246-20	9,000	40.00	300	249
<b>PUNCHED CARD EQUIPMENT</b>					
B 9115	Card Reader; 300 cpm, 80-column	8,198	56.00	280	211
B 9116	Card Reader; 600 cpm, 80-column	10,830	78.50	374	282
B 9117	Card Reader; 800 cpm, 80-column	12,335	96.30	423	326
B 1115	Card Reader Control for B 9115/16/17	2,292	16.20	59	47
B 9915	51-column Read Feature for B 9115/16/17	803	0.00	22	18

\* For 5-day, 8-hour service.

\*\* Includes 7-day, 24-hour maintenance coverage.

## Burroughs B 1900 Series

### EQUIPMENT PRICES

		<u>Purchase</u>	<u>Monthly Maint.*</u>	<u>1-Year Lease**</u>	<u>5-Year Lease**</u>
<b>► PUNCHED CARD EQUIPMENT (Continued)</b>					
B 9419-2	Card Reader Punch/Data Recorder; 96 columns, 300 cpm read, 60 cpm punch and print	9,013	133.17	340	278
B 9419-6	Multi-Purpose Card Unit; 96 columns, 300 cpm read, 60 cpm punch and print	9,528	158.83	407	335
B 1419	Card Reader Punch/Data Recorder Control for B 9419-2 and -6	2,472	22.60	96	79
<b>READER-SORTERS</b>					
B 9135-2	MICR Reader-Sorter; 900 dpm, 8 pockets (for B 1955 or B 1985 only)	51,157	810.00	1,480	1,258
B 9135-3	MICR Reader-Sorter; 900 dpm, 12 pockets (for B 1955 or B 1985 only)	62,859	875.00	1,925	1,634
B 9137-4	MICR Reader-Sorter; 1000 dpm, 4 pockets, double read capability (for B 1955 or B 1985 only)	50,796	546.00	1,512	1,281
B 1130	Reader-Sorter Control for B 9135-2 or -3 and B 9137-4	6,874	60.80	260	217
<b>Features for B 9137-4:</b>					
B 9937-11S	Four-Pocket Module; pockets 5-16	11,990	49.60	420	375
B 9937-50	Impact Endorser	8,362	102.00	245	199
B 9937-70	Basic Off-Line Sort; 2 fields only	1,236	9.70	34	30
B 9937-71	8-Pocket Basic Off-Line Sort; 2 fields only	1,483	9.70	41	36
B 9937-72	Expanded Off-Line Sort; up to 8 fields	247	2.20	7	7
B 9937-73	Extended Sort Control	2,472	28.30	67	60
B 9937-74	Valid Character Check	247	2.00	7	7
B 9937-76	Zero Kill; maximum of 3	494	2.00	14	13
B 9937-77	No Field-No Digit; maximum of 3	494	2.00	14	12
B 9937-78	Digit Override; maximum of 3	494	2.00	14	12
B 9937-79	Digit Edit; maximum of 3	494	2.00	14	12
B 9937-80	Field Override; maximum of 3	494	2.00	14	12
B 9937-81	Field Edit; maximum of 3	494	2.00	14	12
B 9937-82	Stacker Overflow	494	2.00	14	12
B 9937-83	Batch Ticket Detector	494	2.00	14	12
B 9937-84	Resettable Item Counter	247	2.00	7	7
B 9937-85	Non-Resettable Item Counter	247	2.00	7	7
B 9937-86	Running Time Meter	247	2.00	7	7
B 9937-87	Mobile Carrier	155	0.00	0	0
B 9937-88	One-Tray Document Rack	62	0.00	0	0
B 9190-2	MICR/OCR Reader-Sorter; 1625 dpm, 4 pockets; requires one or two OCR or one MICR Character Recognition Module and 3A or 4A Control Interface	35,500	619.00	1,920	1,630
<b>Features for B 9190-2:</b>					
B 9990-21	MICR E13B Module; single track	14,695	51.60	480	410
B 9990-22	MICR E13B Module; double read	38,550	103.00	1,280	1,090
B 9990-32	OCR 7B Module (Credit Card)	50,300	138.00	1,640	1,390
B 9990-33	OCRA 1428 Module	50,300	138.00	1,640	1,390
B 9990-34	OCRB 1403/407 Module	50,300	138.00	1,640	1,390
B 9990-90	Control Interface; 4A Host Control	1,650	3.50	50	40
B 9990-91	Control Interface; 3A Host Control	1,650	3.50	50	40
B 9990-10	4-Pocket Module; pockets 17-20	22,400	83.10	710	605
B 9990-11	4-Pocket Module; pockets 5-16	12,450	52.00	395	335
B 9990-12	4-Pocket Module; pockets 21-32	12,450	52.00	395	335
B 9990-50	Impact Endorser with Digital Advance	14,980	68.80	515	440
B 9990-53	Non-Impact Endorser, Ink Jet	32,900	186.00	1,055	895
B 9990-55	Impact Endorser without Digital Advance	14,400	65.40	495	420
B 9990-60	Microfilm Camera	81,400	516.00	3,060	2,600
B 9990-70	Off-Line Sort Package	4,950	34.40	135	115
<b>TERMINALS</b>					
MT 983	CRT Workstation Keyboard; includes control for asynchronous and synchronous data set and direct connect communications	1,995	27.00	124	117
AP 300	Journal Matrix Printer, Stand-alone; 90 cps	2,240	15.00	92	87
TP 313	Display Printer; 90 cps	2,240	15.00	92	87
MT 687	Programmable Workstation; includes 64KB RAM memory	3,990	30.00	195	185
AP 1301	Letter Quality Printer, Receive Only; 35 cps	4,350	29.00	180	170
AP 1301-1	Letter Quality Printer, KSR; 35 cps	4,700	30.00	195	185
<b>COMMUNICATIONS CONTROL</b>					
B 1351	Single-Line Control; requires B 1650 Series Adapter; one maximum	3,090	16.20	103	79
B 1351-1	Dual-Line Control; requires B 1650 Series Adapter; two maximum	5,150	29.50	160	138
B 1351-2	Universal Single-Line Control	3,000	27.40	110	98
B 1352	Multi-Line Controller; 8 lines; 2 maximum	13,000	57.00	264	227
B 1353	Multi-Line Controller Extension; 8 lines; 1 maximum	9,270	42.80	252	217
B 1354	4-Line Multi-Line Controller	7,000	41.00	225	195

\* For 5-day, 8-hour service.

\*\* Includes 7-day, 24-hour maintenance coverage.

## Burroughs B 1900 Series

### EQUIPMENT PRICES

		<u>Purchase</u>	<u>Monthly Maint.*</u>	<u>1-Year Lease**</u>	<u>5-Year Lease**</u>
<b>▶ Line Adapters (not for B 1351-2):</b>					
B 1650-1	Asynchronous Data Set Connect; up to 1200 bps	1,545	16.20	67	52
B 1650-2	Asynchronous Data Set Connect; up to 1800 bps	1,854	20.50	82	67
B 1652-1	Asynchronous Data Set Connect for teletypewriters	1,545	16.20	67	52
B 1650-5	Asynchronous Direct Connect; up to 2400 bps	1,545	16.20	67	52
B 1650-6	Asynchronous Direct Connect; up to 4800 bps	1,854	20.50	82	67
B 1650-7	Asynchronous Direct Connect; up to 9600 bps	2,163	24.30	103	82
B 1652-5	Asynchronous Direct Connect for teletypewriters	1,545	16.20	67	52
B 1667-2	Burroughs Direct Interface (BDI) Adapter; up to 19,200 bps	2,472	16.40	77	52
B 1651-1	Burroughs Synchronous Data Set Connect; up to 2400 bps	1,545	16.20	67	52
B 1651-2	Burroughs Synchronous Data Set Connect; up to 4800 bps	1,854	20.50	82	67
B 1651-3	Burroughs Synchronous Data Set Connect; up to 9600 bps	2,163	24.30	103	82
B 1653-1	Binary Synchronous Data Set Connect; up to 2400 bps	4,532	64.90	175	149
B 1653-2	Binary Synchronous Data Set Connect; up to 4800 bps	5,099	69.00	191	160
B 1653-3	Binary Synchronous Data Set Connect; up to 9600 bps	5,665	73.00	201	170
B 1352-2	Wideband Adapter; for Western Electric Type 303 or equivalent data set; 19,200 bps or 50,000 bps	11,845	71.10	324	268
B 1667-5	Automatic Calling Unit Adapter; connects with up to 4 Bell 801 ACUs or 3 Bell 801s and 1 Burroughs built-in data set ACU	1,545	16.20	67	52

### COMMUNICATIONS CONTROLS FOR CMS SYSTEMS

B 1360	DCP-1 Base Module	15,000	54.50	483	416
B 1365	DCP-1 Extension	4,000	39.90	130	112
B 1660	DC1 Adapter	2,800	23.00	133	108
B 1361	CMS DCP-3 Base Module	3,500	16.20	103	79
B 1366	CMS DCP-3 Extension	4,000	53.90	125	105
B 1661	TDI Dual Adapter	2,800	30.80	90	75
B 1662	Dual Half-Duplex Data Set Adapter	2,800	30.80	90	75
B 1663	Single Full-Duplex Data Set Adapter	2,800	30.80	90	75
B 1664	Single Full-Duplex Data Set Adapter	2,800	30.80	90	75

\* For 5-day, 8-hour service.

\*\* Includes 7-day, 24-hour maintenance coverage.

### SOFTWARE PRICES

	UNLIMITED TIME PLAN			LIMITED TIME PLAN
	<u>Initial Charge (Single Payment)</u>	<u>Initial Charge (12 Monthly Payments)</u>	<u>Annual License Fee</u>	<u>Monthly License Fee</u>
MCP-TCS III; for the B 1905 or B 1910; includes MCP II, NDL, ODESYS, either Text Editor or CANDE, choice of one compiler, Sort, and Utilities	\$ 8,250	—	\$1,568	\$275
MCP-TCS IV; for the B 1955 or B 1985; includes MCP II, NDL, ODESYS, GEMCOS and UPL, either Text Editor or CANDE, choice of one compiler, Sort, Utilities, and either DMS-II and DMS-II Inquiry or Reporter II Basic and On-Line Reporter	18,000	—	2,880	600
BASIC	3,300	—	627	110
Interactive BASIC	2,475	—	473	83
COBOL '68	3,300	—	627	110
COBOL '74	2,475	—	473	83
FORTRAN '77	3,960	—	759	132
RPG	3,300	—	627	110
MIL Compiler (Micro Implementation Language)**	3,399	311	616	—
SDL Compiler (Systems Definition Language)**	3,399	311	616	—
User Programming Language (UPL)	—	—	—	226
Network Definition Language (NDL)	—	—	—	52
Burroughs Network Services	6,600	605	1,254	220
GEMCOS	4,590	421	875	153
GEMCOS and UPL	6,120	561	1,165	204
GEMCOS (Advanced)	6,120	561	1,165	204
GEMCOS (Advanced) and UPL	7,650	702	1,455	255
GEMCOS Total	7,650	702	1,455	255
GEMCOS Total with UPL	9,180	842	1,745	306
GEMCOS Format Generator	3,500	335	580	125

## Burroughs B 1900 Series

### SOFTWARE PRICES

#### UNLIMITED TIME PLAN

#### LIMITED TIME PLAN

	<u>Initial Charge (Single Payment)</u>	<u>Initial Charge (12 Monthly Payments)</u>	<u>Annual License Fee</u>	<u>Monthly License Fee</u>
▶ Audit Reporter	15,080	1,382	2,865	503
Advanced Reporter II	11,030	1,011	2,095	368
Reporter II (Basic)	7,000	642	1,330	234
On-Line Reporter	1,030	95	195	34
Supervisory Message Control System (SMCS)	1,545	142	295	52
System Communication (SYCOM)	3,030	283	575	103
Test Data Generator	7,000	642	1,330	234
ODESY	4,675	430	890	157
Data Management System II	13,925	1,277	2,645	465
DMS II Inquiry	1,500	138	285	50
Text Editor	1,815	167	345	61
CANDE	3,525	323	670	117
Power RJE	1,300	119	250	43
HASP RJE	1,300	119	250	43
B 7000/B 6000 Remote Job Entry Terminal Program	1,235	113	155	41
B 4000/B 3000/B 2000 Remote Job Entry Terminal Program	1,235	113	155	41■