

# Burroughs B 1700 Series

## MANAGEMENT SUMMARY

During the nearly six years that have elapsed since their June 1972 unveiling, the Burroughs B 1700 Series computers have undergone several model and package changes. When first introduced, these systems were considered the most exciting new computer development since IBM's 1969 announcement of the System/3. The excitement centered about Burroughs' unique hardware and software concepts that earned the new systems the designation of "fourth generation." The B 1700's featured the most advanced hardware and software concepts, including semiconductor main memories, integrated-circuit logic, dynamically variable microprogramming, automatic multiprogramming, and virtual memory. Although competitive systems have now incorporated most of these innovations, Burroughs still stands virtually alone with its use of dynamically variable microprogramming, a concept that permits the processor to be continually optimized for specific programming languages.

## BACKGROUND

The B 1700 Series was introduced in June 1972 and expanded through the addition of the B 1728 Processor in July 1973 and the B 1718 Processor a year later. Then, in March 1975, the B 1716 Processor was added to the B 1700 Series as an upgrade system for the smaller models. Customer deliveries of systems using the B 1712 and B 1714 Processors began in the third quarter of 1972, while B 1726 and B 1728 deliveries began in the second and third quarters of 1973, respectively. Deliveries of the B 1716 began in the second quarter of 1975. By January 1976, according to industry sources, Burroughs had delivered well over 1,300 of the B 1700 systems, with an ➤

The B 1700 small-scale business computer systems occupy a unique position in the Burroughs product line by co-existing with their successor series, the B 1800's. The six-year-old B 1700 systems offer technological innovations, such as variable micrologic, that are just beginning to appear in other vendors' systems. There are seven current models based on two CPU's: a 4-megahertz version and a larger, faster 6-megahertz version.

## CHARACTERISTICS

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

**MODELS:** B 1705, B 1707, B 1709, B 1713, and B 1717 based on the B 1710 processor; B 1720-1 and B 1724 based on the B 1720 processor.

## DATA FORMATS

The B 1700 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.

## MAIN STORAGE

**STORAGE TYPE:** Metal oxide semiconductor (MOS).

**CAPACITY:** See Characteristics table on page 70C-112-04c.

**CYCLE TIME:** See Table.

**CHECKING:** Parity bit associated with each 8-bit byte is generated during writing and checked during reading. ➤

*The Burroughs B 1700 system incorporates many technological advances that are just beginning to appear in competing systems, including the use of variable microcode that permits the B 1700 to be dynamically "tailored" for optimized performance in varying applications. This large B 1720-based system includes high-speed control memory for microcode storage.*



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

## Burroughs B 1700 Series

➤ estimated 400 systems still on order. The majority of systems installed utilized the smaller B 1712 and B 1714 Processors.

In October 1975, Burroughs announced six new central processor models for the small-scale end of the B 1700 product line. The new processor models were called the B 1705, B 1707, B 1709, B 1713, B 1715, and B 1717. All six were based on the B 1714 central processor, but were marketed in specific application-oriented configurations, including two new, low-priced cardless computer systems.

Six months later, Burroughs repriced and reconfigured the upper end of the B 1700 Series. Three new configurations based on the larger and faster "B 1720" central processor were announced in April 1976, including new lower-priced versions of the B 1726 and B 1728 and a new low-cost, entry-level B 1720 system designated the B 1776. The new processor models replaced all the previous B 1700 systems in the Burroughs marketing line-up, including the B 1712, B 1714, B 1716, and B 1718 systems.

The B 1776 and B 1726 systems can be upgraded in the field to the higher-performance B 1728.

More recently, the B 1715, B 1726, and B 1728 systems were repackaged and reintroduced as the B 1717 and B 1720-1 systems. The B 1776 was also redesignated the B 1724.

The most innovative feature of the B 1700 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 1700 central processors, with their "variable micrologic," are essentially "universal emulators" that should be capable, when equipped with the appropriate microprograms, of executing programs written for virtually any other computer at a relatively high level of efficiency. However, only two emulator programs have been released for the B 1700 systems: a Burroughs B 100/200/300/500 Emulator and an IBM 1401/1440/1460 Emulator. The stand-alone emulator programs later were supplemented by "interpreter" programs which operate under control of the MCP operating system concurrently with B 1700 native-mode programs. Interpreters for the Burroughs B 300 and B 3500, the IBM 1130, and the IBM 1401 systems are now available for the entire line of B ➤

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

### CENTRAL PROCESSORS

The B 1700 Series processors feature dynamically variable microprogrammed logic and bit-addressable memories. The processors' logical functions are performed by a set of elementary operators called microinstructions, which operate on strings of bits. There are 28 defined microinstructions in the B1705 through B 1717 processors, and 32 in the faster B 1720-1 and B 1724 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 1700 programming language, Burroughs has defined an "ideal machine" and developed a specialized microprogram, called an Interpreter, that makes the B 1700 appear to be logically equivalent to that machine. The interpreter executes the instructions which have been generated by the corresponding compiler. These compiler-generated instructions are expressed in an appropriate S-language. Because the S-language and its Interpreter are oriented toward the characteristics of each programming language, Burroughs states that on the average only about one-tenth as many S-instructions need to be executed to perform a given function as in typical machine-level computer programs.

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

Under MCP II 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 1700 changes rapidly from one state to another (e.g., from a "COBOL machine" to a "FORTRAN machine") whenever the MCP transfers control from program to program. The Interpreters, S code, and user data are all location-independent.

All B 1700 Series processor models are program-compatible and generally similar in architecture, with one major exception. In the B 1705, B 1707, B 1709, B 1713, and B 1717 processors, all microprograms reside in main memory along with the compiler-generated S code and user data. The fast B 1720-1 and B 1724 processors include from 2,048 to 8,192 bytes of high-speed control memory that is used exclusively for microprogram storage. The control memory holds the most frequently used portions of the resident MCP and the currently active Interpreters, while the remaining portions reside in main memory.

Other differences between the processor models, in addition to those shown in the chart, are as follows: 1) the B 1720-1 and B 1724 processors have four additional microinstructions and four additional hardware registers beyond those of the B 1705 through B 1717; 2) the B 1720-1 and B 1724 processors have an address (A) stack consisting of 32 elements, each 24 bits wide, whereas the address stack in the B 1705 through B 1717 processors consists of only 16 elements, also 24 bits wide; 3) the B 1720-1 and B 1724, unlike the smaller processors, have an 8-position Port Interchange that controls all accesses to main memory.

The B 1700 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. ➤

## Burroughs B 1700 Series

## CHARACTERISTICS OF THE B 1700 SYSTEMS

SYSTEM	B 1705	B 1707	B 1709	B 1713	B 1717	B 1720-1	B 1724
PRIMARY PURPOSE	Configurable system	Magnetic entry	Direct data entry	MICR entry	Extended memory	Data communications	Configurable system
CENTRAL PROCESSORS							
Processor cycle time, nanoseconds	250	250	250	250	250	167	167
Address stack, 24-bit words	16	16	16	16	16	32	32
No. of microinstructions	28	28	28	28	28	32	32
MAIN MEMORY							
Type	MOS	MOS	MOS	MOS	MOS	MOS	MOS
Minimum capacity, bytes	24,576	24,576	49,152	49,152	32,768	98,304	49,152
Maximum capacity, bytes	65,536	65,536	65,536	65,536	131,072	262,144	262,144
Read cycle time, nanoseconds	1,000	1,000	1,000	1,000	667	667	667
Write cycle time, nanoseconds	1,500	1,500	1,500	1,500	1,500	1,000	1,000
Bits fetched per cycle	1 to 24	1 to 24	1 to 24	1 to 24	1 to 24	1 to 24	1 to 24
Increment size, bytes	8,192	8,192	8,192	8,192	8,192; 16,384; or 32,768	16,284 or 32,768	16,384 or 32,768
CONTROL MEMORY							
Type	—	—	—	—	—	Bipolar	Bipolar
Minimum capacity, bytes	—	—	—	—	—	4,096	2,048
Maximum capacity, bytes	—	—	—	—	—	8,192	8,192
Cycle time, nanoseconds	—	—	—	—	—	167/225	167/225
Increment size, bytes	—	—	—	—	—	2,048	2,048
Bits fetched per cycle	—	—	—	—	—	1 to 16	1 to 16
I/O CONTROL							
Maximum I/O controls in basic system	10	10	10	10	10	10	10
Maximum I/O controls with I/O expansion	14	14	14	14	14	14	14
No. of communications lines, maximum	4	4	4	4	4	32	32

➤ 1700 Series systems. Compatibility between the B 1700 and the IBM System/3 is achieved through the RPG II language and through COFIRS II, an IBM RPG to B 1720 COBOL translator. B 1700 users who are converting from Honeywell Level 62 systems can make use of a Honeywell-to-Burroughs COBOL translator.

The principal differences between the smaller and less powerful B 1710 processor and the B 1720 processor are processor speed, memory capacity, and the addition of separate control in the B 1720. The B 1720 processor features a 167-nanosecond cycle time compared to the 250-nanosecond cycle time of the B 1710 processor. The main memory capacity of the B 1720 is 256K bytes, twice that of the extended-memory B 1717 and four times that of the other B 1710-based systems. But the most important performance-enhancing feature of the B 1720 is the inclusion of separate bipolar control memory for the B 1700 variable microcode. In the B 1710, the microcode is stored in main memory, with the user programs imposing a substantial time overhead. The B 1720 microcode is stored in much faster control memory—167 nanoseconds compared to the 1000-nanosecond read access time of the B 1710 main memory. The basic B 1720 system includes 2K bytes of bipolar control memory, expandable in 2K-byte increments to 8K bytes. This faster memory permits microcode execution rates that are six times those of the B 1710 processor.

#### PROCESSOR MODELS

The general characteristics of the current B 1700 Series processors are summarized in the accompanying table. The family is logically subdivided into two categories: the small-scale "B 1710 Series," now consisting of the B 1705, B 1707, B 1709, B 1713, and B 1717, and the ➤

#### ➤ 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 "slot" in the central processor. The maximum number of I/O controls is 10 in all B 1700 systems.

**CONFIGURATION RULES:** *The B 1705 Basic System* is an entry-level system designed to be configured to meet the demands of users who do not want the packaged B 1700 configurations. It consists of a 4-megahertz central processor and 24K bytes of main memory, expandable to a maximum of 64K. The B 1705 system can incorporate any peripherals (except MICR reader-sorters) available for B 1710 systems, up to a maximum of 10 I/O controls per system.

*The B 1707 Magnetic Entry System* includes a 4-megahertz processor with 48K bytes of main memory, a B 9340 Console, a 4.6-megabyte B 9480-12 Disk Cartridge Subsystem and Control, a 160-lpm B 9249-2 Printer and Control, a B 9480-25 Magnetic Tape Cassette and Control, and an AE 501 Audit Entry Station. The basic configuration can be expanded to incorporate peripherals previously released for the B 1710 systems, with the exception of MICR reader-sorters, up to a maximum of four disk cartridge subsystems, two cassette tape stations, and two printers.

*The B 1709 Direct Data Entry System* includes a 4-megahertz processor with 48K bytes of main memory, a B 9340 Console, a 4.6-megabyte B 9480-12 Disk Cartridge Subsystem and Control, a 160-lpm B 9249-2 Printer and Control, a B 1351 Single-Line Communications Control, and two TD 701 Input/Display Stations and Keyboards. The basic system can be expanded to include any peripherals available with B 1710 systems, with the exception of MICR reader-sorters, up to a maximum of 4 disk cartridge subsystems, 4 tape drives, 2 card I/O devices, 2 printers, and 16 TD 701 Input/ Display Stations.

*The B 1713 MICR Entry System* includes a 4-megahertz processor with 48K bytes of main memory, a B 9340 Console, a 300-cpm Card Reader and Control, 4.6-megabyte B 9480-12 Disk Cartridge Subsystem and Control, a 250-lpm B 9249-3 Line Printer and Control, a 900-dpm B 9135-2 MICR Reader-Sorter and Control, and a B 1351 Single-Line Communications Control. The basic system can be expanded to incorporate any peripherals available for B 1710 systems up to a maximum of 4 disk pack drives, 4 magnetic tape units, 1 MICR reader-sorter, 2 card I/O units, 2 line printers, and 2 single-line communications controls, subject to the maximum of 10 I/O controls per system. ➤

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➤ considerably more powerful "B 1720 Series," consisting of the B 1720-1 and B 1724 systems. The B 1720 Series processors, feature faster cycle times, high-speed control memories, and several other throughput-boosting features which are not present in the smaller models.

The entry-level B 1705 includes 24K bytes of main memory and can be expanded to a maximum of 64K bytes of main memory. The system can be equipped with any peripheral units currently available for Burroughs B 1710 Processors with the exception of MICR sorter-readers.

Three of the B 1710-based systems are special packaged configurations which include a central processor and a basic complement of peripheral devices. Of these, the B 1707 and B 1709 are cardless configurations that were designed to compete with the IBM System/3 Model 8, the Honeywell Model 61/60, and other small-scale systems targeted at first-time computer users.

The smaller of the two cardless systems, the B 1707 Magnetic Entry System, uses magnetic tape cassettes for data entry. The basic B 1707 system includes a central processor with 24K bytes of main memory, 9340 Operator Console and control, 9480 Disk Cartridge Drive and control with a capacity of 4.6 million bytes, 9249-2 Line Printer (160 lines per minute), 9490-25 Tape Cassette Unit, and a free-standing AE 501 Audit Entry System (a cassette-oriented, minicomputer-based data entry station). The basic B 1707 Magnetic Entry System rents for \$1,930 per month (5-year lease) and can be purchased for \$72,900. The B 1707 Magnetic Entry System operates under control of the MCP I or MCP II operating system. Programming languages available for the B 1707 are IBM-compatible RPG I and RPG II, ANS COBOL, FORTRAN, and BASIC.

The B 1709 Direct Data Entry System, the larger cardless configuration, uses CRT displays for data entry. The basic B 1709 configuration has a monthly rental of \$2,725 and a purchase price of \$77,900 and includes a central processor with 48K bytes of main memory, 9340 Console and control, 9480-12 Disk Cartridge Drive and control (4.6 million bytes), 9249-12 Line Printer and control (160 lines per minute), 1351 Single-Line Communications Control with 9600-bps direct connect adapter, and two TD 831 Input Display Stations with typewriter keyboard, poll and select options, and expanded memory feature. The B 1709 operates under control of the MCP II operating system and must include the separately priced B 1700 Data Entry software package, which provides software support for data entry from the CRT displays. In addition, a separately priced B 1700 Text Editor program provides conversational file editing and manipulation capabilities. B 1709 installations which have not purchased the Text Editor program must include a card reader in order to perform program compilations.

Both the B 1707 and B 1709 can be enhanced to include up to 64K bytes of main memory. In addition, all ➤

➤ *The B 1717 Extended Memory System*, like the B 1705, is a basic configurable system. It includes a 4-megahertz processor with 32K bytes of main memory and can be expanded to include one console printer, four disk pack drives, one or more punched card I/O units, one or more line printers, four magnetic tape subsystems, and two single-line communications controls up to a maximum of 10 I/O controls per system. Addition of the B 1020 Expansion Cabinet expands the B 1717's I/O control capacity by 28 I/O card slots.

*The B 1724 Basic System* is a configurable base system for the higher-performance 6-megahertz B 1720 processor. The B 1724 includes the CPU with 48K bytes of main memory and 2K bytes of control memory. Main memory is expandable to 256K bytes, and control memory can be expanded to 8K bytes. Like the B 1710 processor-based systems, the B 1724 is restricted to 10 I/O controls and can attach all B 1700-type peripherals.

*The B 1720-1 Basic Data Communication System* is a packaged configuration based on the B 1720 processor. It includes a 6-megahertz processor with 96K bytes of main memory and 4K bytes of control memory. Main memory and control memory are expandable to 256K bytes and 8K bytes, respectively. The B 1720-1 package includes a B 9340 Console Printer and Keyboard, a 400-lpm B 9247-12 Line Printer and Control, an 87.2-megabyte disk subsystem consisting of one B 9499-8 Disk Pack Drive, and one B 1351 Single-Line Communications Control.

*The B 1720-1 and B 1724 systems* are based on the B 1720 processor which has 10 different types of I/O subsystem "slots" that determine the number and types of I/O controls that can be connected. The maximum numbers of I/O controls that can be accommodated by the basic B 1724 and B 1720-1 processors are as follows: five Type A, three Type B, and one Type C through Type K.

The optional B 1305 I/O Expansion Feature provides the capability to accommodate as many as five more Type A, three Type B, one Type C, or two Type D controls. The allowable combinations of controls, however, are limited by various inter-relationships and by the overall maximum limit of 10 controls.

The types of I/O controls required by the various I/O units used with the B 1700 systems are as follows:

### Control Type A

9340 Console Printer  
All 80-column card readers  
All 80-column card punches  
9249 Printers

### Control Type B

All 96-column card readers  
9418 80-column Reader/Punch Data Recorder  
9419 96-column Multi-Purpose Card Unit  
9247 Printers  
9484, 9499 Disk Drives  
MICR reader-sorters  
9490 Cassette Tape Subsystem  
9489 Mini-Disk Drives  
9495, 9496 PE Magnetic Tape Units

### Control Type C

All disk cartridge units

### Control Type D

Single-line communications control

### Control Type E

9484, 9499 Dual-Drive Disk Drives  
9495, 9496 Magnetic Tape Units

### Control Type F

All head-per-track disk drives

### Control Type G

9495, 9496 NRZI Magnetic Tape Units  
9491 Magnetic Tape Units ➤

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- peripheral equipment which was previously available for the B 1710-based systems can be attached to the B 1707 and B 1709 with the exception of MICR reader-sorters.

The B 1713 Financial MICR Systems are designed to provide remote MICR processing for both larger Burroughs and IBM computers. The basic B 1713 system includes a central processor with 48K bytes of main memory, 9340 console and control, 9115 Card Reader and control (300 cards per minute), 9249-3 Line Printer and control (250 lines per minute), 9480-12 Disk Cartridge Drive and control (4.6 million bytes), 9135 MICR Reader-Sorter and control, and 1135 Single-Line Communications Control. The basic B 1713 configuration rents for \$3,050 per month and has a purchase price of \$102,320. The basic system can also be equipped with up to 64K bytes of main memory and any of the B 1710 peripheral devices, including disk pack drives. Software for the B 1713 includes the MCP II operating system, HASP RJE, remote job entry, RPG, COBOL, BASIC, FORTRAN, and the Burroughs Bank Management System applications programs.

The B 1717 Processor is an expanded-memory model that includes a basic 32K bytes of main memory, expandable to a maximum of 131K bytes. Configurations based on the B 1717 can include any available B 1710 peripherals, and can also incorporate an optional I/O Expansion Cabinet Feature, which provides 28 additional I/O Slots.

The B 1713, 1717, and 1720 systems can execute either Burroughs B 2700/3700/4700 or B 6700/7700 remote job entry software, and can also function as remote job entry terminals to IBM System/360 or System/370 computers by executing the Burroughs HASP Remote Terminal Program.

The B 1720-based processors initially included the B 1726 and B 1728. Later, the B 1776 was added as an entry-level B 1720 system. These three systems have now been discontinued, and the line reduced to two models: the B 1724 basic system and the B 1720-1 Data Communications System, a packaged specialty configuration.

The B 1724 consists of a CPU with 48K bytes of main memory and 2K bytes of control memory. It is provided for users who wish to configure their own systems. All peripheral subsystems must be ordered separately. Purchase price of the basic B 1724 is \$64,800, and the monthly rental fee is \$1,850 on a 5-year lease.

The B 1720-1 is a packaged system for data communications applications. It was released in June 1977 and includes a CPU with 96K bytes of main memory, 4K bytes of control memory, a B 9430 console and control, a 400-lpm B 9247-12 line printer and control, and 87.2-megabyte disk storage subsystem, and a B 1351 single-line communications controller. It is priced at \$141,176 for purchase or \$4,240 per month on a 5-year lease.

Technologically, the B 1700 central processors are in tune with the times. They use medium-scale integration ➤



*This B 1705 basic system, the smallest B 1710-based system, is offered to users who wish to configure their own systems rather than choose one of the packaged B 1700's. The system includes a CPU with 24K bytes of main memory and a 160-lpm console printer/keyboard.*

➤ **Control Type H**

1351-1 Dual Line Control

**Control Type J**

Multi-Line Communications Control

**Control Type K**

Multi-Line Communications Control Extension

**SIMULTANEOUS OPERATIONS:** All I/O controls are buffered to permit overlapped read/write/compute operations. In addition, the Multi-Line Communications Control is connected directly to the Port Interchange, which controls access to main memory, rather than to the processor.

**MASS STORAGE**

**B 9489-1 OR -17 INDUSTRY-COMPATIBLE MINIDISK (ICMD) DRIVES:** These floppy disk drives are available only as free-standing units. A subsystem is composed of a controller and one (B 9489-17) or two (B 9489-16) ICMD drives. 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.

**HEAD-PER-TRACK SYSTEMS MEMORY DISK:** Usable on all B 1700 systems, this unit provides rapid random access to system software and to compile, sort, and program work space on a nonremovable disk file with a fixed read/write head serving each track. The 9370-3 System Memory stores 1.9 million bytes with an average access time of 17 milliseconds.

**HEAD-PER-TRACK MEMORY BANKS:** Usable only in B 1720-1 and B 1724 systems, these units provide rapid random access to data on nonremovable disk files with a fixed read/write head serving each track. Burroughs offers head-per-track disk files for B 1700 systems only on an as-available basis. ➤

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➤ (MSI) logic circuits with processor cycling rates of up to 6 million cycles per second and MOS main memories with read cycle times as low as 667 nanoseconds per 24-bit access. The high-speed control memory, used only in the B 1720-1 and B 1724 processors, provides 167-nanosecond bipolar storage for the most frequently used portions of the microprograms.

A magnetic tape cassette reader, housed in the console of the processor, is used for initial loading of the systems software. The cassette reader is also used to load diagnostic routines which aid Burroughs field engineers in isolating malfunctioning circuit boards. A Maintenance Diagnostic Unit helps the field engineers to identify faulty components on the circuit boards. Moreover, the individual MSI circuit devices can readily be unplugged from the boards and replaced when failures occur.

### PERIPHERALS

The peripheral equipment for the B 1700 systems, though far less innovative in design than the central processors, is broad in scope and attractively priced. Burroughs offers both conventional 80-column card I/O equipment and a complete line of 96-column equipment that includes multipurpose on-line units plus off-line data recorders and sorters, all designed and built by Decision Data Corporation.

The 9490 cassette tape subsystem can serve as a low-cost alternative to punched cards for use as an input medium and for program storage and file backup. The tape cassettes are interchangeable between the B 1700 computer systems and other Burroughs business systems such as the L 8000 systems, the B 80, the B 700 systems, the extensive line of TC Series Terminal computers, and the Burroughs Audit Entry computers, one model of which is included in the basic B 1707 Magnetic Entry System.

Industry-compatible floppy disk subsystems are also offered for low-cost data entry and mass storage. The B 9489 drives each store up to 243K bytes of data in the IBM 3740 format.

A family of low-cost cartridge disk drives provides 4.6, 9.2 or 18.4 million bytes of data storage on each dual-disk cartridge for B 1705 through B 1713 systems. Larger disk pack drives with capacities of 130.4 or 174.4 megabytes are also available for use on the B 1700 systems, and the time tested head-per-track disk files can be attached to B 1720 systems.

Magnetic tape units available range from the low-cost and compact 10-KBS B 9491 magnetic tape units to the attractively-priced 60/120-KBS B 9495 units that were originally available only to users of Burroughs' medium-scale computer systems. Only the larger B 1720 processor-based systems can utilize free-standing magnetic tape units rated at 60 KB or 120 KB.

➤ The 9371-7 Memory Bank stores 8.1 million bytes with an average access time of 20 milliseconds; up to 4 additional 8.1-million-byte modules can be added for a maximum subsystem capacity of 40.5 million bytes. The 9371-14 Memory Bank stores 14 million bytes with an average access time of 40 milliseconds, up to 4 additional 14-million-byte modules can be added for a maximum subsystem capacity of 70 million bytes. A 1374 Disk File Control is required in each subsystem. The basic B 1728-1 Control System includes a 1374 Control and one 8.1-million-byte module of the 20-millisecond 9371-7 storage; up to four additional 8.1-million-byte modules can be added.

Two Head-per-Track Exchanges provide increased subsystem capacities and/or dual access paths. The 1674-1 1 x 2 Adapter allows two Disk File Electronics Units (DFEU's) on one 1374 Disk File Control; up to five Memory Bank storage modules can be connected to each DFEU, thereby doubling the subsystem storage capacity. The 1674-2 2 x n Exchange allows interconnection of two 1374 Disk File Controls on two separate channels; each 1374 Control can handle one or two DFEU's, and up to five Memory Bank storage modules can be connected to each DFEU.

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

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

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

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

The 9480/9481 Disk Cartridge Memory Subsystems can be used with all B 1700 Series processor models. A 9480 subsystem consists of a 1480 control and one or two 9480-12 drive units, providing up to four spindles and storing up to 9.3 million bytes on-line. A 9481 subsystem consists of a 1481 control and one or two 9481-12 drive units, providing up to four spindles and storing up to 18.6 million bytes on-line. Each control has a 720-byte buffer that holds up to four 180-byte segments of data and is cleared in "rotating" fashion.

**9482-32 DISK CARTRIDGE DRIVE SUBSYSTEM:** A dual disk drive system with removable single-disk cartridges that provides a total storage capacity of 18,660,480 bytes. Each drive accommodates one disk cartridge and has two read/write heads, one serving each recording surface. Comparatively high throughput results from direct movement of the read/write heads from one track to another without first returning to a "home position." Independent seek operation allows the overlapping of head movement on one cartridge drive with any operation on another drive. The 9482-32 uses a 32-bit error detection/correction code. Each drive in the dual-drive unit has its own logic and power supply, and is therefore not dependent on the other drive. Average head positioning time is 35 milliseconds, average rotational delay is 20 milliseconds, and data transfer rate is 387,500 bytes/second.

The 9482-32 Disk Cartridge Drive Subsystem can be used with all B 1700 Series systems. Up to four 9482-32 dual drives can be attached to a B 1700 system, thus providing a maximum data storage capacity of 74,673,920 bytes.

9484-55 DUAL DISK SUBSYSTEM: In June 1976, Burroughs announced the 9484-25 and 9484-55 disk pack subsystems. Usable on all B 1700 systems, the 9484-55 subsystem can consist of up to eight spindles with an on-line storage capacity of 62.5 million bytes per spindle. The 9484-55 includes a 1 x 4 Disk Pack Electronics Controller; to achieve a 1 x 8 capability, a 9499-4 Controller Expansion Adapter must be configured with the system. Each 9484-25/55 Disk Pack Subsystem must include

**Burroughs B 1700 Series**

➤ The banking field, where Burroughs has gained a strong position, is served by the specially priced B 1713 MICR Entry System, which includes a 900 document-per-minute MICR reader-sorter that is also available for B 1717 systems. A 1625 document-per-minute MICR reader-sorter can also be used with the B 1700 Series processors.

**DATA COMMUNICATIONS**

The data communications capabilities of the B 1700 Series, initially quite limited, received a major boost when Burroughs announced the 1352 Multi-Line Controller (MLC) in July 1973. The MLC gives the B 1720 Series processors the welcome capability to handle multiple-line networks. The basic 1352 handles up to 8 lines, and the 1353 MLC Extension permits a total of 32 communications lines to be attached. The B 1705, B 1707, B 1709, B 1713, and B 1717 systems can use a maximum of two 1351 single-line or 1351-1 dual-line controllers.

Thanks to the advent of the MLC, a B 1700 Series system can function either as the central computer in a multiple-line communication network of modest size or as a high-powered remote terminal communicating with a larger central computer. To facilitate the development of communications control programs, Burroughs provides the Generalized Message Control System (GEMCOS), a parameter-based system which 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 Program forms the interface between the network control program and the user programs processing the communications messages.

Remote job entry capabilities are available for B 1700 Series systems through the B 1700 HASP Remote Terminal Product. This communications software operates in systems with a minimum of 16K bytes of main memory under control of the MCP operating system, permitting the B 1700 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. Thus, the B 1700 is able to replace small System/360 and System/3 computers operating as remote batch terminals to larger IBM computer sites.

Burroughs also provides remote job entry software that permits a B 1700 computer to act as an intelligent remote terminal to either a B 2800/3800/4800 or a B 6800/7800 host computer system. This capability enables a B 1700 user to enter a job at his system for execution by the host computer, to monitor and control the execution of the program via the B 1700 console printer, ➤

➤ a 1486-1 Disk Pack Control. Average head movement time is 25 milliseconds, average rotational delay is 8.3 milliseconds, and data transfer rate is 605,000 bytes per second.

**9484-25 DUAL DISK SUBSYSTEM:** Usable on all B 1700 systems, the 9484-25 Disk Subsystem has the same requirements and characteristics as the 9484-55 disk subsystem but has an on-line storage capacity of 32.6 million bytes per spindle. The subsystem is restricted to two spindles per system.

**9499-7 DUAL DISK STORAGE/CONTROLLER:** Usable only in B 1720-1 and B 1724 systems, this high-performance disk pack subsystem can consist of two to eight spindles with an on-line storage capacity of 87.2 million bytes per spindle. The 9499-7 includes a 1 x 4 Disk Pack Electronics Controller; to achieve a 1 x 8 capability, a 9499-9 Controller Expansion Adapter must be configured with the system. Data is recorded on an 11-disk pack that is physically compatible but not format-compatible with the IBM 2316 Disk Pack. Average head movement time is 30 milliseconds, average rotational delay is 12.5 milliseconds, and data transfer rate is 625,000 bytes per second. The 9486-4 Dual Drive Add-On and/or the 9486-45 Single Drive Add-On can be added for a maximum subsystem capacity of eight spindles and 697.6 million bytes.

**9499-8 DUAL DISK STORAGE/CONTROLLER:** Usable only in B 1713, B 1715, B 1717, B 1720-1, and B 1724 systems, this disk pack subsystem consists of two spindles of on-line storage with a storage capacity of 43.6 million bytes per spindle. Every 9499-8 must include a 1486-1 Disk Pack Control. Data is recorded on an 11-disk pack that is physically compatible but not format-compatible with the IBM 2316 Disk Pack. Average head movement time is 30 milliseconds, average rotational delay is 12.5 milliseconds, and data transfer rate is 625,000 bytes per second. There are no add-on increments for the 9499-8; however, the 9499-8 Dual Disk Storage/Controller can be field-upgraded to the 9499-7 Dual Disk Storage/Controller.

**INPUT/OUTPUT UNITS**

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

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

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

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

The electronic keyboard consists of an alphanumeric typewriter keyboard, a separate 10-key numeric keyboard, and special function keys. The keyboard includes an upper row of 16 Program Select Keys to implement various program options. The unit printer uses an interchangeable 64-character set and prints at 60 characters/second. A 150-position print line is standard, ➤

## Burroughs B 1700 Series

▷ and to receive program output via the B 1700 printer or card punch or to direct the output to B 1700 disk files. A multiprogramming capability permits on-site processing to be performed concurrently with remote job entry functions.

### SOFTWARE

All software support for the B 1700 systems is built around the Master Control Program (MCP), the integrated operating system that complements the hardware to create an unusually effective environment for multiprogrammed operation in any B 1700 system with at least 32K bytes of main memory. (A smaller version of MCP without multiprogramming, MICR, or communications capabilities is available for use on 28K systems). Like the MCP operating systems for the larger Burroughs computers, the B 1700 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.

The most recent releases of the B 1700 MCP, Mark V.0 and Mark V.I, achieve an estimated 10 to 13 percent increase in throughput through the implementation of portions of the operating system in microcode in the central processor. Other enhancements include support for the DMS-II data base management system, disk storage optimization, micro-coded printer-punch backup, a tape sort that can use from three to eight tape units for work files, use of ANSI magnetic tape and cassette labels, emulation under MCP control, and a redesigned queue mechanism.

The B 1700 Series systems, like the large-scale B 6800/7800 Series systems, are programmed almost exclusively in higher-level languages. Compilers are available for the COBOL, RPG, FORTRAN, and BASIC languages, but not for PL/1. 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 1700 microprogramming itself—which presents all sorts of fascinating possibilities for systems engineers and software designers—is not user-accessible, although Burroughs will, under separate contract, disclose details of the machine structure and microprogramming to universities and colleges for use in advanced computer science or special research activities.

Burroughs is placing strong marketing emphasis upon its library of Business Management Systems. These are well-designed groups of related application programs that can significantly reduce the cost and time required to get a B 1700 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 support required to install and maintain a system.

▶ and spacing is 6 lines per inch. The unit is equipped with a single pin-feed device for handling forms from 3 to 16.75 inches wide. It is capable of handling fanfold, single, or multiple-part forms with folds from 3.5 to 12 inches apart.

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

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

The basic AE 511 and AE 513 have the same characteristics as the AE 412 with the exception of the data storage media.

The AE 511 uses a 239,000-byte magnetic tape cassette for data storage, and the AE 513 uses a Burroughs Super Minidisk having 1 million bytes of data storage capacity.

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

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

**DIRECT DATA ENTRY: B 1700 direct data entry systems** are designed to provide a variety of users with the ability to directly enter and/or retrieve information from the central system, as and when required, without leaving the user departments. Direct data entry systems can be configured with the B 1800 processors utilizing Burroughs TD 730 visual display units connected either directly or via data sets. These systems can use the Burroughs Data Entry Software (DEI) and, for remote programming facilities, the Burroughs Text Editor. The Data Entry Software (DEI) is a complete generative program product used to format input procedures to fit internal documents and to format output files to be used by application programs. This provides the user with the ability to interface with Burroughs standard program products.

A more comprehensive direct data entry system is a B 1700 processor utilizing Burroughs TD 730 and/or TD 830 visual display units connected directly or via data sets. Combined with Burroughs' On-Line Data Entry System, ODESYS (DE2), NDL and, for remote programming capability, Burroughs' Command And Edit (CANDE), this system provides the user with substantial flexibility.

**9490-25 CASSETTE TAPE SUBSYSTEM:** Consists of a 1490 cassette control and one 9490-25 Cassette Tape Station. Records at a density of 800 bits per inch and has a capacity of up to 861 256-byte records. The data transfer rate is 1,000 bytes per second. Available for all B 1700 Series systems.

**9495-2, 9496-2, AND 9496-4 MAGNETIC TAPE UNITS:** Burroughs offers three models of free-standing tape drives for use in B 1700 Series systems. All three models read and record data on 1/2-inch tape in IBM-compatible formats. Their individual characteristics are as follows:

9495-2: 9-track phase-encoded, 75 ips, 1600 bpi, 120,000 bytes/second; up to 8 drives per 1495-2 control.

9496-2: 9-track phase-encoded, 25 ips, 1600 bpi, 40,000 bytes/second; up to 8 drives per 1496-4 control.

9496-4: 9-track phase-encoded, 50 ips, 1600 bpi, 80,000 bytes/second; up to 8 drives per 1496-4 control. ▶

## Burroughs B 1700 Series

## ➤ COMPATIBILITY AND COMPETITION

Integrated interpreters, which operate under control of the MCP operating system, are available for IBM 1401/1440/1460, IBM 1130, and Burroughs' own B 100/200/300/500 Series computers. Program compatibility with other computers is achieved via higher-level languages. The B 1700 COBOL and FORTRAN compilers conform with the the American National Standards for these languages. Programs written in RPG or RPG II for IBM computers can either be compiled by the B 1700 RPG compiler or translated into COBOL by the COFIRS II (COBOL from IBM RPG Specifications) routines.

The new small-scale B 1710 systems, with their attractively priced packaged configurations, are designed to compete against the low-end IBM System/3 models and other small-scale, entry-level computer systems. Within this class, the B 1700 systems still rank at or near the top in technology. The larger B 1720-based systems compete in the range of the IBM System/3 Model 15, the IBM System/370 Model 115 and Model 125, the Univac 90/30, and the Honeywell Level 62 and Level 64 Processors—and even in this fast company, the sophisticated software, advanced technology, and user-oriented design of the Burroughs systems make them thoroughly competitive.

## USER REACTION

Datapro received responses from 30 users of the B 1700 computer systems during the 1977 survey of general-purpose computer users. These 30 users, collectively, had 34 B 1700 systems consisting of one B 1705, 6 B 1715's, 3 B 1717's, 19 B 1726's, 4 B 1728's, and one B 1776. Seventeen of the 30 users were renting their systems from Burroughs, 11 had purchased them, and the other two had third-party leases.

As expected, business data processing was the primary usage listed by 29 of the 30 users, with program development, data base management, and data communications also listed as important applications by about one-third of the user population each. Despite the fact that only one-third of the survey group indicated program development as an important usage, all 30 noted that their applications software packages had been developed by in-house personnel, and only a few of the 30 listed software sources other than in-house personnel. Thus, it appears that the remaining two-thirds of the users considered their applications programming requirements largely satisfied and are not spending much time in further development.

The principal programming language employed by the survey group was COBOL, as one would expect on a machine claimed by its manufacturer to be optimized for that language. In addition, about half the group also did some programming in RPG, and six users indicated some FORTRAN programming.

The B 1700 systems' installed life ranged from 2 to 45 months and averaged nearly 23 months. About 70 percent ➤

➤ 9115 CARD READER: Reads standard 80-column cards serially by column at a rated speed of 300 cpm. Reads EBCDIC or binary-coded cards. Cards are read photoelectrically, with a double strobe comparison for each column to help ensure reading accuracy. A single input hopper and output stacker hold up to 1000 cards each. Usable with any B 1700 Series system.

9116 CARD READER: Reads up to 600 cpm. Otherwise, has the same characteristics as the B 9115 described above. Usable with any B 1700 Series system.

9117 CARD READER: Reads up to 800 cpm. Otherwise, has the same characteristics as the B 9115 described above. Usable with any B 1700 Series system.

9111/9112 CARD READER: Reads standard 80-column cards serially by column, on demand, at up to 800 cpm (9111) or 1400 cpm (9112). The feed hopper and stacker hold up to 2400 cards each and can be loaded and unloaded while the reader is operating. Usable with any B 1700 Series system.

B 9212 CARD PUNCH: Punches standard 80-column cards at up to 150 cards per minute. Available for B 1720-1, and B 1724 systems.

9213 CARD PUNCH: Punches standard 80-column cards at up to 300 cpm. The feed hopper holds up to 2200 cards, and three program-selectable stackers hold at least 1400 cards each. Available for B 1720-1 or B 1724 systems.

9119-1 CARD READER: Reads 96-column cards at 300 cpm. Includes a 600-card input hopper and one 600-card stacker. Fits on a tabletop, where it occupies less than 1.5 square feet. Usable with any B 1700 Series system.

9119-2 CARD READER: Reads 96-column cards at 1000 cpm. Usable with any B 1700 Series system.

9418-2 CARD READER PUNCH/DATA RECORDER: Reads 80-column cards at 200 cpm, and punches and/or prints full cards at 45 cpm; high punching speeds are possible if fewer columns are punched. The single card feed path includes: 600-card primary input hopper, 400-card secondary input hopper, read station, visible wait station, punch station, punch check station, print station, and two 400-card stackers. The unit features a 64-character movable keyboard, 64-character printing, a full 80-column print line, and 80-column read, punch, and print buffers. Usable with any B 1700 Series system.

9419-2 CARD READER PUNCH/DATA RECORDER: Reads 96-column cards at 300 cpm, and punches and/or prints full cards at 60 cpm; higher punching speeds are possible if fewer columns are punched. The single card feed path includes: 600-card primary input hopper, 400-card secondary input hopper, read station, visible wait station, punch station, punch check station, print station, and two 400-card stackers. The print station permits printed interpretation of the punched data at 60 cpm, with three 32-character lines per card. Input and output data is buffered, and the unit features a keyboard that permits off-line use as a 96-column keypunch or verifier. Program storage for four format-control programs is included. Usable with any B 1700 Series system.

9419-6 MULTI-PURPOSE CARD UNIT: Provides the same 300-cpm reading, 60-cpm punching, and 60-cpm printing facilities and data recorder keyboard as the 9419-2 Card Reader Punch/Data Recorder described above, plus the ability to sort cards into any of six 400-card stackers under program control at 300 cpm. Can be used off-line for sorting, keypunching, or verifying. Numeric sorting requires 1.5 passes per card column, while alphabetic sorting requires 2.5 passes per card column. Usable with any B 1700 Series system. ➤

## Burroughs B 1700 Series

➤ of the systems had been installed for between 1 and 3 years. Memory sizes ranged from 56K bytes to 512K bytes, averaging about 135K bytes. The most prevalent memory sizes were 64K, 96K, and 128K bytes, employed in 22 of the 34 systems. Disk storage ranged from 9.2 megabytes to 525 megabytes, with an average of 213 megabytes. The 174.4-megabyte dual disk pack drive was the unit most frequently employed.

Only about two-thirds of the 34 B 1700 systems included magnetic tape subsystems. The vast majority of these systems had from 2 to 4 tape drives, but one user reported having 10 magnetic tape units on his system.

Six of the 30 users had remote batch terminals connected to their B 1700 systems, and 12 had interactive terminals. The number of remote batch terminals on a system was usually one or two, but one user had eight. The variance in the number of interactive terminals was even greater, ranging from 1 to 84. The average number of terminals on the 30 systems was 6, and 4 users had 10 or more.

The B 1700 user responses from the 1977 survey are tabulated below, along with weighted average ratings from the previous user survey for comparison.

	Excellent	Good	Fair	Poor	1977 WA*	1976 WA*
Ease of operation	25	5	0	0	3.8	3.7
Reliability of mainframe	7	19	2	2	3.0	2.9
Reliability of peripherals	1	3	11	4	2.4	2.5
Responsiveness of maintenance service	1	17	0	2	2.6	2.9
Effectiveness of maintenance service	2	14	3	9	2.3	2.4
Technical support	2	9	13	6	2.2	2.2
Operating system	22	8	0	0	3.6	3.4
Compilers and assemblers	15	12	3	0	3.4	3.3
Applications programs	3	11	3	1	2.9	2.4
Ease of programming	15	15	0	0	3.5	3.4
Ease of conversion	10	16	2	1	3.2	3.1
Overall satisfaction	4	22	3	1	3.0	2.9

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

The B 1700 user ratings gathered during the latest Datapro survey of general-purpose computer users show a slight overall improvement compared to those obtained during the previous year's poll. Nine of the 12 categories varied no more than one-tenth of a point from the previous year's ratings, and the greatest difference was noted in the category of applications programs, up five-tenths of a point. With the exception of the improved rating for the B 1700 applications programs, the same conditions that prompted last year's ratings still exist. Burroughs, as well as most other mainframe vendors, is usually rated lower in the categories of Responsiveness of Maintenance Service, Effectiveness of Maintenance Service, and Technical Support. Similarly, the Reliability of Peripherals category is usually rated lower than that of Mainframe Reliability. These lower numerical ratings were also reflected in the comments supplied by the B 1700 users. Sixteen of the 30 users specifically noted that the principal disadvantages of their B 1700 systems were weaknesses in Burroughs' support services (maintenance and technical support) and reliability, chiefly that of the peripheral devices. ➤

➤ **B 9120 PAPER TAPE READER:** Reads 5-, 6-, 7-, or 8-level punched tape at 500 or 1000 characters per second. The lower speed must be used for fanfold or metalized Mylar tape. Handles reels either 5.5 or 7 inches in diameter. A standard channel-select plugboard and optional Input Code Translator permit wide flexibility in codes.

**B 9220 PAPER TAPE PUNCH:** Punches 5-, 6-, 7-, or 8-level tape at 100 characters per second. Handles supply reels up to 8 inches in diameter and 5.5- or 7-inch tape-up reels. A standard channel-select plugboard and optional Output Code Translator permit wide flexibility in codes.

**LINE PRINTERS:** Burroughs offers printers that span a range of printing speeds from 85 to 1100 lpm for the B 1700 systems. Their rated speeds, printing techniques, and the processor models with which they can be used are as follows:

9249-1: 85-lpm Chain Printer (for B 1705, B 1707, B 1709, B 1713, and B 1717 systems.)

9249-2: 160-lpm Chain Printer (for B 1705, B 1707, B 1709, B 1713, and B 1717 systems.)

9249-3: 250-lpm Chain Printer (for any B 1700 Series system).

9247-12: 400-lpm Train Printer (for any B 1700 Series system).

9247-13: 750-lpm Train Printer (for any B 1700 Series system).

9247-14: 1100-lpm Train Printer (for any B 1700 Series system).

All of the printers have 132 print positions. The 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 alphabets. The 9247 Train Printers handle vertical format control through either the Burroughs Forms-Self-Align System, which uses codes preprinted on the forms, or an optional 12-channel carriage control tape.

**MICR READER-SORTERS:** Burroughs includes the B 9135-2 MICR Reader-Sorter in the packaged B 1713 MICR Entry Computer System. The B 9134-1 and B 9135-1 MICR Reader-Sorters are available for all B 1700 systems, and the B 9137 Reader-Sorter is available for B 1720-1 and B 1724-systems. These reader-sorters have the following characteristics:

9135-2: 900 dpm, 8 stacker pockets.

9135-3: 900 dpm, 12 stacker pockets.

9134-1: 1625 dpm, 4, 8, 12, or 16 stacker pockets.

9137-1: 1625 dpm, 4, 8, 12, or 16 stacker pockets; has "double read" capability to reduce the number of reject items.

The 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 sorting capability.

The 9134-1 and 9137-1 are high-performance units that can be equipped with a variety of optional features, including a numeric optical character recognition feature. In addition, the 9137-1 is equipped with a double read capability so ➤

## Burroughs B 1700 Series

MINIMUM MEMORY REQUIREMENTS  
OF B 1700 SOFTWARE

MCP II	28KB plus 2KB per interpreter
COBOL	16KB
RPG	10KB
FORTRAN	16KB
BASIC	12KB
System SORT	11KB plus 8KB for MERGE
Micro Implementation Language (MIL)	44KB
Software Development Language (SDL)	20KB
User Programming Language (UPL)	20KB
Network Definition Language (NDL)	12KB
Report Writer	25KB
Data Management language (DMS II)	64KB
GEMCOS	24KB for generation; 7KB for execution
Text Editor	9.1 to 10.8 KB
CANDE	22KB plus 2KB per terminal
Time and Accounting Billing System (TABS)	20KB
Disk FORTE/2	24KB
HASP	16KB
POWER/RJE	32KB
B 4000/B 3000/B 2000 RJE	16KB (SDL); 26KB (NDL)
B 7000/B 6000 RJE	16KB (SDL); 26KB (NDL)
B 100/B 200/B 300/B 500 Emulator	48KB
IBM 1401/1440/1460 Emulator	48KB
Honeywell COBOL Translator	48KB
Honeywell Easycoder to COBOL	100KB
NCR NEAT/3 Translator	80KB
IBM 1400 Interpreter	21KB to 33KB plus up to 36KB tape buffer
B 100/B 200/B 300/B 500 Interpreter	16KB to 26KB plus up to 19.2KB tape buffer
IBM 1130 Interpreter	16KB plus memory size of 1130
On-Line Wholesale Distribution System	96KB
Production Control System I:	
Costing	40KB
Material Requirements Planning	48KB
Bill of Material	40KB
Work Center and Routing	40KB
Stock Status	40KB
BIPASS:	
On-Line Inquiry and Data Entry	30KB
Analysis and Simulation	30KB
Operation and Control	30KB
Budgetary Management System	12KB
System Purchase Order Module	12KB
Utility Business Management System	16KB
School Administrative Systems:	
Financial	24KB
Payroll	18KB
Scheduler	400 bytes per student plus 3800 bytes per course
Student Records	35KB
Test Scorer	30KB

that MICR characters are read twice during each pass by two separate read heads. The first read is called a "deep" read, in which an attempt is made to interpret imperfect characters, and the second is a "shallow" read which is capable of reading perfect MICR characters.

## COMMUNICATIONS CONTROL

**1351 SINGLE-LINE CONTROL:** Provides the interface between a single leased or switched communications line and a B 1705, B 1707, B 1709, B 1713, B 1717, B 1720-1, or B 1724 Processor. The maximum number of single-line controls that can be connected to a B 1700 Series processor is two. Each control must be equipped with an appropriate line adapter. Thirteen different line adapters, as listed in the Equipment Prices section, permit communication with Teletype terminals and with the full range of Burroughs computers and terminal equipment.

**1351-1 DUAL-LINE CONTROL:** A two-line version of the 1351 single-line control. All specifications and characteristics are the same as those for the single-line unit.

**1352 MULTI-LINE CONTROLLER:** Provides the interface between a B 1720-1 or B 1724 Processor and up to eight leased or switched communications lines. With the 1353 Controller Extension, available for use in B 1728 systems only, a total of up to 16 lines can be serviced. The 1352 MLC must be equipped with an appropriate line adapter for each line. Thirteen different line adapters, as listed in the Equipment Prices section, 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. 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.

## SOFTWARE

**OPERATING SYSTEM:** The central component of Burroughs software support for the B 1700 systems is the MCP (Master Control Program), a modular operating system that manages and controls all operations of the system. It performs the following principal functions: 1) schedules the loading and execution of user programs in a multiprogramming environment, in accordance with user-assigned priorities; 2) allocates memory areas, processor logic, and peripheral units; 3) schedules and initiates all I/O operations; 4) provides automatic error-handling procedures; 5) creates and maintains a disk program library; 6) handles communication between the system and its operator via the console typewriter and control cards; 7) provides a printout showing the status of all active jobs upon request; 8) guides the compilation of programs written in COBOL, FORTRAN, BASIC, and RPG; 9) handles file opening and closing, physical data management, utility functions, program loading, and program library calls; and 10) controls data communications devices and MICR reader-sorters.

The MCP is written in Burroughs' Software Development Language (SDL), a high-level language oriented toward facilitating the writing of systems software. Therefore, whenever the MCP is in use, all or part of the SDL Interpreter must be resident in memory. The total memory residence requirement for the MCP is approximately 24K bytes at present.

**LANGUAGES:** The B 1700 Series computer systems support COBOL, RPG, FORTRAN, BASIC, Network Definition Language, and User Definition Language.

The B 1700 COBOL language is an essentially complete implementation of full American National Standard COBOL except for the Report Writer module, which is omitted from the B 1700 version. COBOL object programs are regarded as a

Datapro is continually amazed that the mainframe vendors, in general, have not hearkened to the collective voices of their respective user populations. With the one notable exception of IBM, the vendors have chosen to ignore this vital aspect of their total product, electing instead to compete by offering more favorable price/performance ratios. While the superior performance and

## Burroughs B 1700 Series

▷ lower prices are attractive initially, it would appear that users are turning their attention more to the aspect of continued availability and less to equipment costs.

On the positive side, the B 1700 fared well in the areas traditionally rated higher by Burroughs users. The categories of Ease of Operation, Ease of Programming, and Operating System all received high marks. Moreover, 16 users (not all the same 16 mentioned previously) took the time to note that the principal strengths of the B 1700 systems are the MCP operating system, ease of operation, and ease of programming, thus confirming the higher ratings.

The definitive category of Overall Satisfaction, then, undoubtedly reflects the users' dissatisfaction with the B 1700's reliability problems and with Burroughs' support. This category, while rated a solid 3.0 despite the low ratings in several other categories, would probably have been rated substantially higher were it not for the aforementioned problems. □

▶ 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 1700 system. The compiler requires about 12K 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.

Recent enhancements to B 1700 COBOL include a new queue handling technique and a new sort capability that includes a tag search, a restart facility, vertical collating sequence, and tape sorting.

The *B 1700 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 1700 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 1700 system. The compiler requires about 8K bytes of memory. The RPG Interpreter occupies about 3K bytes of memory at execution time in addition to the object program's requirements.

The *B 1700 FORTRAN* language is compatible with American National Standard FORTRAN and includes certain Burroughs extensions to provide features available in IBM FORTRAN IV Level II. The compiler requires about 16K bytes of memory. Object programs produced by the FORTRAN compiler are expressed in an S-language that is oriented toward efficient handling of 36-bit "words" and 72-bit "doublewords." The FORTRAN Interpreter, required at execution time, occupies about 3.5K bytes of memory in addition to the object program's requirements.

*B 1700 BASIC*, like RPG, is a compiler-driven language. The compiler will accept source programs written in a language that generally corresponds to the original Dartmouth BASIC (Beginner's All-purpose Symbolic Instruction Code). The batch-mode BASIC compiler requires about 8K bytes of memory. Object programs produced by the BASIC compiler are expressed in an S-language that is oriented toward efficient handling of 40-bit (5-character) "words." The BASIC Interpreter, required at execution time, occupies about 3K bytes of memory in addition to the object program's requirements. At a later date, Burroughs plans to deliver a BASIC compiler that will permit interactive, conversational problem-solving.

*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 1700 Series system.

*CANDE (Command and Edit)* is a message control system that enables users at remote terminals to enter programs or data files into disk storage, compile and execute programs, edit and alter programs or files, search files, send messages to other terminals, and perform a variety of other functions.

B 1700 CANDE is a subset of B 6700/6800 CANDE. It runs in conjunction with the B 1700 NDL system and performs file updating and text editing functions under control of the MCP. CANDE can support up to 16 terminals and is designed for use with the Teletype Model 33, the Burroughs TD 800 display terminal, or equivalent terminals. The program also includes a user code/password security system to protect selected files from unauthorized access.

CANDE requires 22K bytes of main memory plus 2K bytes for each user terminal when a GET, MERGE, or REMERGE is used or whenever a FIND, LIST, or INSERT from a non-current workfile is used.

*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 1700 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.

**GENERALIZED MESSAGE CONTROL SYSTEM (GEMCOS):** GEMCOS is a generalized system that uses parameters for generating installation-tailored Message Control Programs. The Message Control Program 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, and audit mechanism for logging specified messages, and a network control command for orderly system shutdown in the event of system failure. 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 requires a minimum of 24K bytes of main memory for Message Control Program generation (not including MCP and Network Definition Language memory requirements), plus a console printer, card reader, line printer and 4.6 million bytes of disk storage, exclusive of MCP and NDL requirements.

**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 1700 DMS-II is a logical subset of B 6700/6800 DMS-II. The COBOL constructs used in B 1700 Series COBOL programs for accessing the data base are syntactically and semantically compatible with those used in B 6700 COBOL. However, the physical mapping algorithms for structuring the data base records on direct-access storage differ, so that a B 1700

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► DMS-II data base must be reloaded before being transferred to B 6800 DMS-II. The B 1700 DMS-II DASDL parameters and DMS statements in COBOL programs are compatible with B 6800 DMS-II, eliminating the necessity of converting DMS-II COBOL user programs and user DASDL or the DASDL definition of the data base.

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

The reports to be reproduced are described in a concise, English-like language that is largely self-documenting. Numerous default features make it unnecessary to specify each option. The user specifies each data element by name only, and is not required to know its size or format. In similar fashion, the user need only specify the column headings, and the system will automatically handle all other aspects of formatting the output. A security system denies access to sensitive data items by unauthorized users.

**B 1700 TEXT/EDITOR (TEI):** This remote text editing programs runs under control of the MCP operating system and provides facilities for source file maintenance operations concurrently with batch and other remote processing. The system provides a conversational English-language command language which includes editing, manipulation, and control commands that can be entered from TD 700 or TD 800 series remote terminals. Each terminal user is provided with a re-entrant copy of the Text/Editor program in order to insure effective response. The minimum 49K system supports the execution of two copies of Text/Editor executing on two TD 701 terminals attached to one single-line communications control.

**HASP REMOTE TERMINAL PROGRAM:** Permits a B 1700 Series system to function as a remote batch terminal on-line to IBM System/360 and 370 computer systems that utilize the HASP Binary Synchronous Multileaving Protocol. With the HASP Remote Terminal Program, a B 1700 system can be made functionally equivalent to a standard IBM 360/20 HASP workstation. Communication between the B 1700 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 1700 peripheral devices is compressed, blocked, and stored on a disk file to 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 1700 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).

**B 100/200/300/500 EMULATOR:** This emulator enables any B 1700 Series system to execute object programs written for the second-generation Burroughs B 100, 200, 300, or 500 Series computers. The emulator is essentially a microcoded B 300 Series instruction set that has been implemented in the variable micrologic of the B 1700 Series. The following B 300 Series peripheral devices are directly replaced by their B 1700 Series counterparts: 80-column card readers and punches, buffered line printers, magnetic tape units, disk files, and the supervisory printer. On-line banking systems, data communications terminals, MICR reader-sorters, and 6-tape listers, however, are not supported under emulation.

**IBM 1401, 1440, 1460 EMULATOR:** This emulator enables any B 1700 Series system to execute object programs written for an

IBM 1401, 1440, or 1460 computer. The emulator is essentially a microcoded IBM 1400 Series instruction set that has been implemented in the variable micrologic of the B 1700 Series. The emulator supports most of the 1401/1440/ 1460 processor functions and all of the standard peripheral equipment except MICR, OCR, paper tape, and data communications devices. Burroughs states that the emulator will normally execute instructions two to three times as fast as the original 1400 Series system, while the I/O operations will normally be performed at peripheral speeds.

**CONVERSION AIDS:** In addition to emulators, Burroughs offers several interpreters and translators to aid users in making transitions from other vendors' systems to the B 1700 systems.

**IBM 1400 INTERPRETER:** Allows interpretation of source programs written for IBM 1401, 1440, and 1460 systems under control of the MCP. The interpreter is used as an interim measure until a complete conversion can be performed. The IBM 1400 Interpreter supports most 1401, 1440, and 1460 functions and all standard input/output devices except MICR, data communications, and paper tape devices. In addition, programs written for the 4KC IBM 1401, 1440, and 1460 systems that are dependent on address register settings after execution cannot be interpreted correctly.

The IBM 1400 Interpreter accommodates one level of indexing, the use of sense switches, the process overlap feature, and disk emulation. The Interpreter requires between 21K bytes and 53K bytes for the basic system plus 100 bytes for each disk drive, 2.5K bytes for each disk file parameter block, 120 bytes for each tape station, and up to 36K bytes for a tape buffer.

**IBM 1130 INTERPRETER:** Allows the direct execution of IBM 1130 object code without the need for recompilation and source code conversions. The interpreter operates as a normal-state program and can be multiprogrammed with other B 1700 object programs. Files created by IBM 1130 object programs can be accessed by programs written in other B 1700 languages.

The IBM 1130 Interpreter maintains the instruction address register, accumulator, and accumulator extension; provides full indexing and indirect addressing facilities; provides the ability to release peripherals to the system while a task is running; and furnishes an instruction trace. The interpreter executes all input/output instructions for the IBM 2501 Card Reader Model A1 or A2, 1403 Line Printer Model 6 or 7, 2310 Disk Storage Model B1 or B2, and the 1131 Console Printer/Keyboard. It can also execute programs written for the 1132 Line Printer and the 1442 Card Reader.

System requirements for the IBM 1130 Interpreter include 16K bytes for the basic system, a quantity of memory equal to that of the IBM 1130 system, plus 1.125 million bytes of disk storage space for each 1130 logical disk drive.

**B 100/200/300/500 INTERPRETER:** Permits the execution of object programs written for the early Burroughs character-oriented processors under control of the MCP. The interpreter executes most B 100/200/300/500 programs without any change to the object programs.

Among the functions performed by the interpreter program are Sense Switches 1 through 6, single instruction, read and write memory, clear, halt, memory display, load, and continue. The interpreter executes the following functions; arithmetic, editing, control, interrogate, card reader and punch, line printer, magnetic tape, supervisory printer, and disk file. Instructions not interpreted include: paper tape, reader sorter, lister, data communications, transfer and translate, and data compression and expansion.

The B 100/200/300/500 Interpreter program requires between 15.6K bytes and 26K bytes of main memory plus 2.5K bytes for each B 500 electronics unit, 200 bytes for each B 500 tape station, and up to 19.2K bytes for a tape buffer.

**TRANSLATORS:** Program translators offered for the B 1700 systems include the following:

- Honeywell Easycode to B 1700 COBOL
- NCE Century COBOL to B 1700 COBOL
- IBM Autocoder to B 1700 COBOL

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- NCR NEAT/3 to B 1700 COBOL
  - Honeywell COBOL to B 1700 COBOL.

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

Other B 1700 Series utility routines include System Loading Procedures, Disk Cartridge Initializer, Disk File Copy, Memory Dump, Memory Dump Analyzer, File/Loader, File/Puncher, and DMPALL. The last-named routine is a flexible listing and reproducing program for printing the contents of files and transcribing data from one medium to another.

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

The latest Program Product offerings by Burroughs, introduced with the B 1700 Series, are the Time and Analysis Billing System (TABS) and the On-Line Data Entry System (ODESY).

TABS is designed to provide B 1700 system users with a comprehensive analysis of the SYSTEM/LOG, which is automatically maintained by the MCP. TABS provides information for system mix and peripheral utilization reports, program execution reports, and services-rendered reports. The automatic logging function of the MCP creates the SYSTEM/LOG, which contains information about all significant events in a multi-programming system. The analysis function of TABS extracts and generates machine utilization statistics and program performance. As the selected reports are produced, month-to-date statistics are maintained in TABS data files. The statistics, together with information on installation costs supplied by the user, can be used to distribute the system cost equitably among individuals, departments, or applications using the data processing services.

ODESY is a sophisticated data entry system using multiple on-line visual display units. It provides a generalized and generative "front end" for the existing B 1700 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.

**APPLICATION PROGRAMS:** The following applications programs are available for B 1700 Series systems:

### Business Management System

- Accounts Receivable
- Accounts Payable
- Payroll
- General Ledger

### Bank Management System

- Demand Deposit Accounting
- Proof and Transit
- Savings
- Installment Loans
- Certificate of Deposit
- General Ledger
- COS Reporting Module
- CIS On-Line Inquiry
- CIS On-Line Update
- Commercial Loans

### Hospital Management System

- Patient Accounting
- General Ledger
- Medical Records
- Payroll
- Accounts Payable

- Utility Management System
- Utility Business Management System
- Utility Billing System

- Local Government Utility Management System
- Local Government and Utility Management System
- Local Government Management System
- Municipal Budgetary System

### Auto Dealer Management System

- Auto Dealer System
- General Accounting
- Payroll
- Parts Inventory
- Leasing

### Scholastic

- Test Scorer
- Scheduling
- Financial System
- Student Record
- Payroll

### Motor Freight

- General Ledger and Reporting System
- Vehicle Maintenance and Asset Control
- Accounts Receivable and Freight
- Payroll
- Accounts Payable

### Contractor Management System

- Contractor System
- Payroll and Labor Cost
- Accounts Payable
- Equipment Cost
- Job Cost Reporting
- General Ledger

### Hotel Back Office Business Management System

- Hotel System
- Accounts Payable
- City Ledger
- General Ledger
- Payroll

### Production Control System

- Engineering Data Control Module
- Inventory Control Module
- Requirements Planning Module
- Work In Process Module
- On-Line inquiry Module
- On-Line File Maintenance Module
- Capacity Requirements Planning Module
- Forecasting and Inventory Analyses Module

### On-Line Wholesale Distribution System

- Order Entry
- Warehouse Picking Lists
- Multiple Scheduled Shipments
- Backorder Processing
- Invoicing
- Inventory Updating and Reporting
- Open Items Accounts Receivable
- Customer Accounts Receivable Statements
- Aged Trial Balance
- Sales Analysis
- On-Line Inquiry

### Manifest

- General Ledger, Management Reporting and Cost Accounting
- Payroll
- Vehicle Maintenance and Asset Control
- Accounts Receivable, Freight Billing and Revenue Reporting
- Accounts Payable

## PRICING

**EQUIPMENT:** The following systems are representative of the types of B 1700 Series systems that are likely to be commonly installed and are supported by the standard Burroughs software. Prices for the basic systems are shown in the Equipment Prices section at the end of this report. In the configurations that follow, ►

## Burroughs B 1700 Series

all necessary control units are included in the indicated prices. The quoted rental prices are for the basic one-year lease and include equipment maintenance.

**TYPICAL B 1705 SYSTEM:** Consists of 65K B 1705 Central Processor, console printer, 600-cpm card reader, 300-cpm card punch, and dual-disk storage/controller (130.4 million bytes). Monthly rental and purchase prices are approximately \$3,343 and \$125,758, respectively.

**TYPICAL B1724 SYSTEM:** Consists of a 128K-byte B 1724 Central Processor, console printer, 96-column card reader punch/data recorder, 400-lpm printer, dual-disk storage/controller (174.4 million bytes), and single-line control. Monthly rental and purchase prices are approximately \$6,407 and \$180,940, respectively.

**TYPICAL B 1717 SYSTEM:** Consists of a 128K B 1717 Central System console printer, 800-cpm card reader, 300-cpm card punch, 1100-lpm printer with 132 print positions, two 80 KB magnetic tape units, and one dual-disk storage controller (174.4 million bytes). Monthly rental and purchase prices are approximately \$8,410 and \$256,800, respectively.

**SOFTWARE:** The appropriate Master Control Program, sort package, and utility routines are provided to all B 1700 users at no additional cost. The compilers and other "program development aids" are offered at the monthly license fees listed under "Software Prices" at the end of this report. All applications software is separately priced under Burroughs' Program Products plan. The Program Products are offered under either an Unlimited-Time License Plan, for a one-time charge followed by an annual

maintenance fee, or a Limited-Time License Plan, with monthly payments during either a 3-year or 5-year lease term. The available Program Products and their associated license fees are listed under "Software Prices" at the end of this report.

**TECHNICAL SUPPORT:** B 1700 users can purchase Burroughs technical assistance in three ways: (1) as part of a Business Management System (see "Software Prices"); (2) under a System Analyst Assistance Agreement, for \$2,000 per year; or (3) on a per-diem basis, when available, for \$150 per day.

**EDUCATION:** B 1700 users can obtain the necessary training: 1) as part of a Business Management System (see "Software Prices"); or 2) by paying for individual courses. The 10 separately priced courses announced to date range from 3 to 8 days in length and cost \$100 per day for each attendee.

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

**CONTRACT TERMS:** The standard equipment lease agreement includes equipment maintenance and entitles the customer to unlimited use of the equipment. The standard agreement includes 7-day, 24-hour equipment maintenance.

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

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

## EQUIPMENT PRICES

		Purchase Price	Monthly Maint.	Rental (1-year lease)*	Rental (5-year lease)*
<b>PROCESSORS AND MAIN STORAGE</b>					
B 1705	Basic System; includes 4-MHz central processor with 24K bytes of main memory	\$26,554	\$129.00	\$912	\$747
B 1707	Magnetic Entry System; includes 4-MHz central processor with 24K bytes of main memory, 4.6-megabyte disk drive and control, 10-ips cassette and control, 160-lpm printer and control, AE 501 audit entry station, and console and control	75,087	437.00	2,426	1,989
Memory Options for B 1705 and B 1707 Systems (64K bytes maximum):					
B 1010-32	8K bytes of memory	1,545	11.90	67	57
B 1010-40	16K bytes of memory	3,090	19.00	129	108
B 1010-49	24K bytes of memory	4,635	26.20	196	165
B 1010-57	32K bytes of memory	6,180	33.40	268	216
B 1010-65	40K bytes of memory	7,725	41.70	330	273
B 1709	Direct Data Entry System; includes 4-MHz central processor with 48K bytes of main memory, 4.6-megabyte disk drive and control, 160-lpm printer and control, 9600-bps single line control and adapter, two input/display stations, two keyboards, two interfaces, two poll and select options, two extended memory features, and console and control	80,237	510.00	2,807	2,297
Memory options for B 1709 (64K bytes maximum):					
B 1011-57	8K bytes of memory	1,545	11.90	67	57
B 1011-65	16K bytes of memory	3,090	19.00	129	108
B 1713	MICR Entry System; includes 4-MHz central processor with 48K bytes of main memory, 4.6-megabyte disk drive and control, card reader and control, printer and control, reader sorter and control, single-line control, and console and control	105,390	985.00	3,831	3,142
Memory options for B 1713:					
B 1011-57	8K bytes of memory	1,545	11.90	67	57
B 1011-65	16K bytes of memory	3,090	19.00	129	108
B 1717	Extended Memory System; includes 4-MHz central processor, 32K bytes of memory, console table, corner table	35,844	205.50	1,318	1,081
B 1020	I/O Expansion Cabinet for B 1717; includes 28 additional I/O card slots	12,360	70.00	381	309

\*Rental prices include equipment maintenance.

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### EQUIPMENT PRICES

		Purchase Price	Monthly Maint.	Rental (1-year lease)*	Rental (5-year lease)*
<b>PROCESSORS AND MAIN STORAGE (Continued)</b>					
Memory Options for B 1717:					
B 1017-31	32K bytes; usable only above 64K bytes	5,150	32.00	221	180
B 1017-40	8K bytes of memory	1,545	11.90	75	62
B 1017-49	16K bytes of memory	3,090	19.00	129	108
B 1017-57	24K bytes of memory	4,635	26.20	232	180
B 1017-65	32K bytes of memory	6,180	33.40	268	216
B 1017-81	48K bytes of memory	9,270	41.70	397	324
B 1724	Central System; includes 6-MHz central processor, 48K-byte main memory, and 2K bytes of control memory	66,744	230.00	2,328	1,906
B 1720-1	Basic Data Communications System; includes 6-MHz central processor, 98K-byte main memory, 4K-byte control memory, B 9340 console printer and keyboard, B 1340 control for B 9340 B 9247-12 400-lpm line printer, B 1247 control for B 9247-12 line printer, B 9499-8 disk storage/controller (87.2 megabytes), B 1486-1 disk pack control, B 1351 single-line control	149,774	800.00	5,418	4,367
Memory Options for B 1724 and B 1720-1:					
B 1020-16	16K bytes of memory	3,090	16.00	129	108
B 1020-32	32K bytes; usable only above 64K bytes	5,150	32.00	160	129
B 1020-2	2K bytes of control memory; 8K bytes maximum	5,150	32.00	221	180
<b>PROCESSOR OPTIONS</b>					
B 1305	I/O Expansion Feature for all processors	1,545	6.50	41	36
B 1020	I/O Expansion Cabinet with 28 I/O Card Slots, for B 1717	12,360	70.00	381	309
B 1098	I/O Expansion Cabinet, for B 1720 Series	10,197	18.00	283	232
B 1097-3	Corner Table	742	—	15	15
B 1340	Control for B 9340 Printer	1,854	6.50	77	57
B 9340	Console Printer and Keyboard; requires B 1340 control	2,834	19.30	72	57
B 9348-32	Display Console	6,654	30.90	165	139
B 1348-32	Display Console Control	2,472	19.30	77	62
<b>HEAD-PER-TRACK DISK FILES</b>					
B 9371-7	8.1-megabyte, 20-ms storage; includes 1 DFEU	29,664	251.00	788	644
B 9371-14	14.4-megabyte, 40-ms storage; includes 1 DFEU	37,080	264.00	979	803
B 9374-10	Add-On Storage Module; 14.4 megabytes	27,192	112.00	711	582
B 9374-17	Add-On Storage Module; 8.1 megabytes	19,776	147.00	525	427
B 1374	Control for B 9371-7/16 Head-per-Track Disk Files	9,888	15.40	247	206
B 1674-1	1 x 2 Disk File Adapter	20,394	9.10	52	46
B 1674-2	2 x 2 Disk File Exchange	1,813	6.50	46	41
B 9489-16	Mini-Disk Dual Storage Unit; 243K bytes, 260 ms average access, 44-inch cabinet	6,530	25.00	221	180
B 9489-17	Mini-Disk Single Storage Unit; 243K bytes, 260 ms average access, 30-inch cabinet	3,296	22.08	113	93
B 1489	Control for B 9489-16/17 Mini-Disk Storage Units	4,120	11.10	124	103
<b>DISK PACK DRIVES</b>					
B 9480-12	Dual Disk Cartridge Drive; 4.6 megabytes	11,330	69.50	427	335
B 9481-12	Dual Disk Cartridge Drive; 9.2 megabytes	13,390	94.40	520	422
B 9482-32	Dual Disk Cartridge Drive; 18.4 megabytes	15,862	143.00	551	448
B 1480	Control for B 9480-12/81-12 Disk Drives	3,605	19.30	124	103
B 1482	Control for B 9482 Disk Drives	4,120	19.30	149	113
B 9484-25	Dual Disk Pack Drive and Controller	32,960	186.00	1,092	845
B 9484-55	Dual Drive/Controller	41,818	186.00	1,370	1,051
B 9499-7	Disk Storage/Controller; 174.4 megabytes	58,010	306.00	1,906	1,468
B 9484-5	Dual Disk Pack Drive Increment	30,900	140.00	1,082	793
	130.4 megabytes for B 9484-55 control				
B 9499-8	Disk Storage/Controller; 87.2 megabytes	37,080	306.00	1,215	968
B 9486-4	Dual Drive Increment; 174.4 megabytes	37,904	222.00	1,241	979
B 1486-1	Disk Pack Drive Control	6,180	45.00	201	165
B 9499-9	Controller Expansion Feature; for expansion of B 9499-7 Disk Storage Controller up to 8 drives	2,493	6.20	72	58
<b>MAGNETIC TAPE UNITS</b>					
B 9490-25	10-ips Magnetic Tape Cassette	1,689	8.10	69	56
B 9491-2	10-KBS Magnetic Tape Unit; 9 tracks	9,167	25.10	283	232
B 9496-2	20/40-KBS Magnetic Tape Unit; 9 tracks, 800/1600 bpi, NRZ, PE, or NRZ/PE; requires B 9499-3X Master Electronics Exchange	9,723	85.10	330	242
B 9496-4	40/80-KBS Magnetic Tape Unit; 9 tracks, 800/1600 bpi, NRZ, PE, or NRZ/PE; requires B 9499-3X Master Electronics Exchange	12,525	90.40	422	319
B 9495-2	60/120-KBS Magnetic Tape Unit; 9 tracks, 800/1600 bpi, NRZ, PE, or NRZ/PE; requires B 9499-1X Master Electronics Exchange	16,480	88.10	525	402

\*Rental prices include equipment maintenance.

## Burroughs B 1700 Series

## EQUIPMENT PRICES

MAGNETIC TAPE UNITS (Continued)		Purchase Price	Monthly Maint.	Rental (1-year lease)*	Rental (5-year lease)*
B 9391	18/50/72-KBS Magnetic Tape Unit; 7 tracks, 800 bpi	18,911	221.10	488	400
B 9381-12	18-KBS Cluster; 2-station NRZ, 9 tracks, 800 bpi	26,868	213.00	685	561
B 9381-13	18-KBS Cluster; 3-station NRZ, 9 tracks, 800 bpi	28,742	239.00	742	608
B 9381-14	18-KBS Cluster; 4-station NRZ, 9 tracks, 800 bpi	24,289	287.00	886	726
B 9381-22	36-KBS Cluster; 2-station NRZ, 9 tracks, 800 bpi	35,823	244.00	912	747
B 9381-23	36-KBS Cluster; 3-station NRZ, 9 tracks, 800 bpi	46,056	281.00	1,174	958
B 9381-24	36-KBS Cluster; 4-station NRZ, 9 tracks, 800 bpi	56,290	318.00	1,432	1,174
B 1490-25	Control for B 9490-25 Magnetic Tape Cassette	2,266	190.00	103	77
B 1491	10-KBS NRZ Tape Control	4,120	38.60	268	221
B 1381	Control for 9-track cluster	4,120	48.90	268	221
B 1390	18/50KBS Tape Control, 7 tracks	7,169	48.90	319	263
B 1495-2	Single Control for B 9495 Magnetic Tape Units	17,016	68.30	592	489
B 1495-15	120/200 KBS PE/NRZ Control	18,097	110.80	726	592
B 1496-4	Single Control for B 9496 Magnetic Tape Units	8,755	68.30	263	216
B 1496-15	40/80 KBS PE/NRZ Control	14,884	110.80	592	489
B 9499-10	1 x 4 Master Electronics Exchange for B 9495 only	15,007	26.90	510	381
B 9499-11	1 x 8 Master Electronics Exchange for B 9495 only	15,965	26.90	541	417
B 9499-12	2 x 8 Master Electronics Exchange for B 9495 only	18,839	56.60	639	489
B 9499-30	1 x 4 Master Electronics Exchange for B 9496 only	10,712	25.80	350	268
B 9499-31	1 x 8 Master Electronics Exchange for B 9496 only	11,536	25.83	376	294
B 9499-32	2 x 8 Master Electronics Exchange for B 9496 only	13,514	56.60	443	340
<b>CARD INPUT/OUTPUT UNITS</b>					
B 9115	Card Reader; 300 cpm, 80-column; requires B 1115 control	7,581	39.20	274	185
B 9116	Card Reader; 600 cpm, 80-column; requires B 1115 Control	9,558	54.90	314	237
B 9117	Card Reader; 800 cpm, 80-column; requires B 1115 Control	10,877	67.30	355	273
B 9111	Card Reader; 800 cpm, 80-column; requires B 1111 Control	18,710	107.00	479	391
B 9112	Card Reader; 1400 cpm, 80-column; requires B 1111 Control	24,869	162.00	664	541
B 9119-1	Card Reader; 300 cpm, 96-column; requires B 1119 Control	4,552	32.80	139	113
B 9119-2	Card Reader; 100 cpm, 96-column; requires B 1119 Control	10,238	65.50	288	237
B 1115	Card Reader Control for B 9115/6/7 Card Readers	2,225	10.30	57	51
B 9915	51-Col. Read Feature for B 9115/6/7 Card Readers	803	—	22	18
B 9991-2	Stand for B 9115/6/7	258	—	8	7
B 1111	Card Reader Control for B 9111/2 Card Readers	2,400	9.10	57	52
B 9917	Card Counter for B 9111/2/3	258	—	8	7
B 9919	40-Col. Read Switch for B 9111/2/3	—	—	—	—
B 1119	Card Reader Control; 96-column	2,400	9.10	93	77
B 9212	Card Punch; 150 cpm, 96-column; requires B 1213 Control	23,314	142.00	592	464
B 9213	Card Punch; 300 cpm, 96-column; requires B 1213 Control	28,742	182.00	726	567
B 1213	Punch Control B 9212 or B 9213 Punch	4,450	17.90	118	98
B 9418-2	Card Reader Punch/Printer; 80 columns, 200 cpm read, 45 cpm punch/print, requires B 1418 Control	12,060	109.00	390	320
B 1418	Reader/Punch Control for B 9418-2 Reader/Punch/Printer	6,953	27.10	191	160
B 9419-2	Card Reader Punch/Data Recorder; 96 columns, 300-cpm read, 60-cpm punch and 60-cpm print; requires B 1419 control	9,013	93.10	340	278
B 9419-6	Multi-Purpose Card Unit; 96 columns, 300-cpm read, 60-cpm punch, and 60-cpm print, requires B 1419 control	9,528	111.00	402	335
B 1419	Card Reader Punch/Data Recorder Control for B 9419 Recorders	2,400	14.30	93	77
<b>LINE PRINTERS</b>					
B 9249-1	Printer; 85 lpm, 132 print positions; requires B 1249 controller	9,373	75.10	376	294
B 9249-2	Printer; 160 lpm, 132 print positions, requires B 1249 controller	9,888	87.60	422	330
B 9249-3	Printer; 250 lpm, 132 print positions, requires B 1249 controller	13,493	118.00	567	438
B 9247-12	Printer; 400 lpm, 132 print positions; includes 12-channel VFU; requires B 1247 controller	19,158	173.00	803	633
B 9247-13	Printer; 750 lpm; includes 12-channel VFU; requires B 1247 controller	28,840	235.00	1,020	783
B 9247-14	Printer; 1100 lpm, 132 print positions; includes 12-channel VFU; requires B 1247-4 controller	39,140	289.00	1,179	906
B 1249	Control for B 9249-1/2/3 Printers	1,339	9.10	52	52
B 1247	Control for B 9247-12/13 Printers	4,450	17.90	113	98
B 1247-4	Control for B 9247-14 Printer	5,562	25.80	155	124
B 9942-9	Additional Train Module for B 9247-2/3/12/13 Printers	3,605	—	84	69
B 9942-10	Additional Train Module for B 9247-14 Printer	3,245	—	124	101
<b>READER-SORTERS</b>					
B 9135-2	Reader-Sorter; 900 dpm, 8 pockets	49,677	565.00	1,437	1,221
B 9135-3	Reader-Sorter; 900 dpm, 12 pockets	61,028	612.00	1,869	1,586
B 9134-1	Reader-Sorter; 1625 dpm, 4 pockets; requires B 9938-1 Multi-Track Read or B 9938-6 Optical Character Recognition System	45,732	460.00	1,259	1,020
Reader-Sorter Controls and Features:					
B 1130	Control for B 9134 or B 9135	6,674	38.60	252	211
B 9932-1	Endorser; 1625 dpm	8,362	69.40	245	199
B 9933-1	Basic Off-Line Sort; provides for off-line sort in 2 fields only	1,114	7.00	32	26
B 9933-2	Basic Off-Line Sort; 8 pockets; provides for off-line sort in 2 fields only	1,338	7.00	37	31
B 9933-4	Extended Sort Control	2,230	20.80	62	50

\*Rental prices include equipment maintenance.

## Burroughs B 1700 Series

### EQUIPMENT PRICES

		<u>Purchase Price</u>	<u>Monthly Maint.</u>	<u>Rental (1-year lease)*</u>	<u>Rental (5-year lease)*</u>
<b>READERS-SORTERS (Continued)</b>					
B 9935-1	Expansion Feature; pockets 17-32	4,460	13.90	124	100
B 9935-2	Four-Pocket Module; pockets 5-16	13,379	48.60	369	299
B 9935-3	Four-Pocket Module; pockets 17-32	13,379	48.60	369	299
B 9938-1	Multi-Track E-13B Read; 1625 dpm	16,723	76.40	461	373
B 9938-6	Numeric OCR A Optical Character Recognition System	47,380	164.00	1,227	995
<b>COMMUNICATIONS CONTROLS</b>					
B 1351	Single-Line Control; requires B 1650 Series adapter; one maximum	3,090	20.60	103	78
B 1351-1	Dual-Line Control; requires B 1650 Series adapter; two maximum	5,150	10.30	160	134
B 1352	Multi-Line Controller; 8 lines; 2 maximum	9,270	36.10	253	212
B 1353	Multi-Line Controller Extension for B 1352 controller; 8 lines; 1 maximum	6,963	27.10	191	155
Data Communications Line Adapters; for B 1351/2/3 Line Controllers:					
B 1650-1	Asynchronous Data Set Connect; up to 1200 bps	1,545	10.30	67	52
B 1650-2	Asynchronous Data Set Connect; up to 1800 bps	1,854	12.90	83	67
B 1650-5	Asynchronous Direct Connect; up to 2400 bps	7,545	10.30	67	52
B 1650-6	Asynchronous Direct Connect; up to 4800 bps	1,854	12.90	83	67
B 1650-7	Asynchronous Direct Connect; up to 9600 bps	2,163	15.40	103	83
B 1651-1	Synchronous Data Set Connect; up to 2400 bps	1,545	10.30	67	52
B 1651-2	Synchronous Data Set Connect; up to 4800 bps	1,854	12.90	83	67
B 1651-3	Synchronous Data Set Connect; up to 9600 bps	2,163	15.40	103	83
B 1652-1	Asynchronous Data Set Connect for teletypewriters	1,545	10.30	67	52
B 1652-5	Asynchronous Direct Connect for teletypewriters	1,545	10.30	67	52
B 1653-1	Binary Synchronous Data Set Connect; up to 2400 bps	4,532	41.10	176	150
B 1653-2	Binary Synchronous Data Set Connect; up to 4800 bps	5,099	43.70	191	160
B 1653-3	Binary Synchronous Data Set Connect; up to 9600 bps	5,665	46.30	201	170
B 1667-2	Burroughs Direct Interface (BDI) Adapter	2,472	10.35	78	52
B 1352-2	Wide-Band Adapter; for Western Electric Type 303 or equivalent data set, 19,200 bps or 50,000 bps	11,845	45.00	325	268
B 1667-5	ADO Adapter	1,545	10.30	67	52

### SOFTWARE PRICES

	UNLIMITED TIME PLAN			LIMITED-TIME PLANS	
	<u>Single Payment</u>	<u>12 Monthly Payments</u>	<u>Annual License</u>	<u>Monthly Fee (3-Year Plan)</u>	<u>Monthly Fee (5-Year Plan)</u>
<b>SYSTEM SOFTWARE</b>					
MCP II	—	—	—	0	—
COBOL	—	—	—	50	—
RPG	—	—	—	50	—
FORTRAN	—	—	—	100	—
BASIC	—	—	—	70	—
UTILITIES	—	—	—	0	—
SORT	—	—	—	0	—
MIL Compiler	3,000	275	300	—	—
SDL Compiler	3,000	275	300	—	—
User Programming Language (UPL)	—	200	—	—	—
Network Definition Language (NDL)	—	50	—	—	—
Report Writer	3,000	275	300	100	96
Data Management Language (DMS II)	12,000	1,100	1,200	300	288
GEMCOS	—	—	—	150	—
Text Editor	1,500	—	—	—	—
CANDE	3,000	—	—	—	—
TABS	—	—	—	—	—
Disk FORTE/2	11,000	1,008	1,000	275	264
Data Entry	2,400	220	150	80	77
ODESY	4,000	367	200	133	128
<b>PROGRAM PRODUCT CONVERSION AIDS</b>					
IBM 1401/1440/1460 Emulator	8,250	756	825	275	264
B 100/200/300/500 Emulator	—	—	—	200	—
Honeywell COBOL Translator	3,600	330	360	100	—
NCR NEAT/3 Level 1 Translator	8,250	756	825	275	264
IBM 1401 Interpreter	—	—	—	200	—
B 100/200/300/500 Interpreter	—	—	—	200	—
IBM 1130 Interpreter	—	—	—	200	—

\*Rental prices include equipment maintenance.

## Burroughs B 1700 Series

## SOFTWARE PRICES

	UNLIMITED TIME PLAN			LIMITED-TIME PLANS	
	Single Payment	12 Monthly Payments	Annual License	Monthly Fee (3-Year Plan)	Monthly Fee (5-Year Plan)
<b>APPLICATIONS SOFTWARE</b>					
Business Management System (all modules)	7,000	650	355	237	227
Invoicing, Accounts Receivable and Inventory Control	3,200	290	160	107	102
Accounts Payable	1,400	128	150	47	45
Payroll	1,800	165	150	60	58
General Ledger	1,400	128	150	47	45
On-Line Wholesale Distribution System	10,000	917	500	333	320
Inventory Planning Analysis and Simulation System (BIPASS)					
Analysis and Simulation Module	6,800	623	340	226	218
Operation Control Module	5,200	477	260	173	166
On-Line Enquiry and data Entry Module	2,500	229	125	85	80
Bank Management system (all modules)	6,900	630	345	220	212
Demand Deposit Accounting (DDA)	2,500	230	150	82	79
Proof and Transit	1,000	90	150	40	39
Savings	1,500	140	150	54	52
Installment Loan	1,000	90	150	40	39
Certificates of Deposit	750	70	150	33	32
General Ledger	500	45	150	26	25
Commercial Loan System (CLA)	1,940	178	150	66	64
Bank Customer Information System					
Reporting Module	650	60	150	31	29
Inquiry Module	650	60	150	31	29
Update Module	650	60	150	31	29
Item Processing System	9,000	825	450	250	240
Production Control System I (PCS I)					
Bill of Material Module	3,300	305	165	110	106
Stock Status Module	2,100	194	105	70	67
Work Center and Routing Module	3,300	305	165	110	106
Costing Module	2,500	213	230	77	74
Material Requirements Planning Module	3,300	305	165	110	106
Production Control System II (PCS II)					
Engineering Data Control Module	4,500	415	225	100	96
Inventory Control Module	4,500	415	225	100	96
Requirements Planning Module	4,500	415	225	100	96
Work in Progress Module	6,000	550	300	140	135
On-Line Inquiry Module	3,600	330	180	120	115
On-Line File Maintenance Module	5,400	495	270	180	173
Capacity Requirements Planning Module	2,736	251	137	90	86
Forecasting and Inventory Analysis Module	5,400	495	270	180	173
Project Management System (PROMIS/Time)	5,000	458	250	166	160
Incentive Payroll System	900	83	150	33	32
Hospital Management System (BHAS II)					
Patient Accounting	4,400	405	220	100	96
Medical Records	2,200	200	150	50	48
General Ledger	2,200	200	150	50	48
Payroll	2,200	200	150	50	48
Accounts Payable	2,200	200	150	50	48
Educational Management Systems					
Test Scorer	3,400	310	170	95	91
School Scheduling	5,000	410	250	150	144
Financial	3,600	330	180	120	115
Student Records	2,700	250	135	90	86
Payroll	3,240	300	162	108	104
Budgetary Management System	3,000	275	150	100	96
Local Government Management	4,800	440	240	160	154
Local Government and Utility Management System	7,800	715	390	260	250
Budgetary Purchase Order Module	1,000	92	150	33	32
Utility Business Management System	7,000	641	350	233	224
Utility Billing system	3,000	275	150	100	96
Motor Freight Management System (all modules)	13,720	1,253	685	457	439
General Ledger and Reporting	3,600	330	180	120	115
Vehicle Maintenance and Asset Control	3,600	330	180	120	115
Accounts Receivable and Freight Billing	2,800	257	150	93	90
Payroll	1,600	147	150	53	51
Accounts Payable	1,600	147	150	53	51