

Burroughs B 2900 and B 3900

MANAGEMENT SUMMARY

Introduced in 1979, the B 2900 and B 3900 Series represent the medium-scale members of Burroughs "900 Series" of computer systems. The B 2900 Series currently consists of two models: the entry-level B 2910, which was announced in June 1981, and the original B 2930. In September 1981, Burroughs introduced the B 3955, a replacement for the previously announced B 3950. Compared with the B 3950 and the B 2900 Series, the B 3955 is housed in a smaller cabinet that provides a 47 percent reduction in floor space requirements and a 25 percent reduction in power and air conditioning requirements.

The B 2900 and B 3900 systems provide performance improvements over the older B 2800 and B 3800 Series and are object-code compatible with the B 3700/4700/2800/3800/4800 systems. According to Burroughs, the B 2910 provides 1.0 to 1.4 times the performance of the B 2800, and the B 2930 provides 1.2 to 2.2 times the performance of the B 2800. The B 3955 offers 2.7 times the performance of the B 2800 and up to twice the throughput of the B 3800.

The B 2900 and B 3900 systems feature asynchronous pipelined architecture, which Burroughs calls "micro-modular concurrent" architecture. Each central processor is composed of a series of processing elements that can operate concurrently to perform such operations as instruction pre-fetch and data address calculation, data fetching and manipulation, instruction execution, and independent I/O initiation.

The Input/Output Processor (IOP) initiates data transfers between the memory and peripheral subsystems asynchronously and independently of the central processor. The IOP is interfaced to the peripheral ➤

The B 2900 and B 3900 Series are medium-scale computer systems that feature asynchronous pipelined architecture, Data Link Processors that manage I/O operations independently of the central processor, and multiprocessing capabilities. The systems offer substantial performance improvements over the older B 2800 and B 3800 Series.

MODELS: B 2910, B 2930, and B 3955.
CONFIGURATION: From 1 to 4 CPUs, 512K to 4864K bytes of main memory, 6 to 32 DLPs, and up to 288 communications lines.
COMPETITION: Honeywell Series 60 Level 64/DPS-330, IBM 4300 Series, and Sperry Univac 1100/60 Model C.
PRICING: Purchase prices for Central Systems range from \$120,000 to \$290,000.

CHARACTERISTICS

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

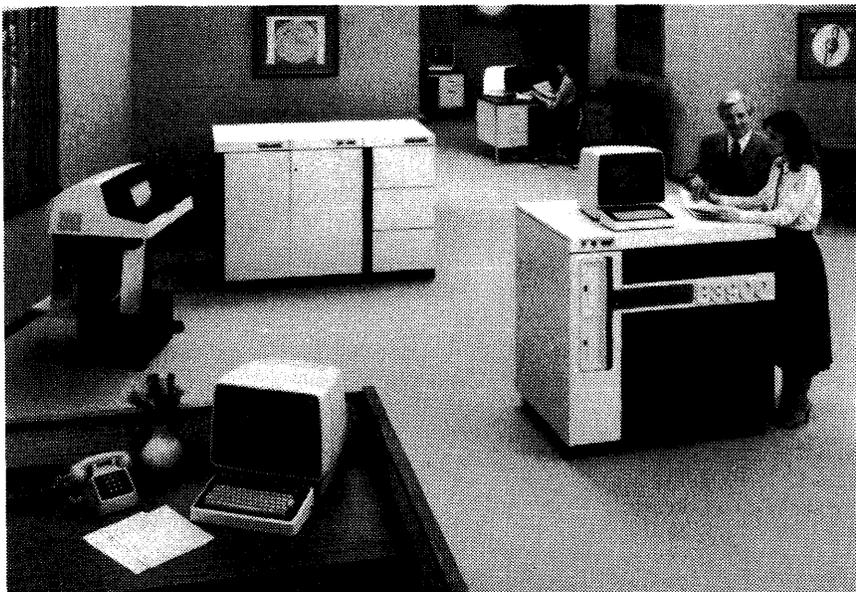
MODELS: B 2910, B 2930, and B 3955.

DATE ANNOUNCED: B 2910—June 1981; B 2930—March 1979; B 3955—September 1981.

DATE OF FIRST DELIVERY: B 2930—fourth quarter 1980; B 2910 and B 3955—fourth quarter 1981.

DATA FORMAT

Memory word size is 32 bits plus 7-bit Hamming code. No fixed word length is used. ➤



The new B 3955 features a compact system cabinet (right) that houses the CPU, main memory, two DLP Bases, and two mini-disk drives for system maintenance. The basic B 3955 comes equipped with 2048K bytes of main memory, an operator keyboard/display terminal, six DLPs, and a disk controller. The system is expandable to 4864K bytes of memory and 32 DLPs.

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➤ subsystems through Data Link Processors (DLPs). Each DLP is an independent microprocessor programmed to service a specific category of peripheral devices.

The basic B 2910 and B 2930 systems include 512K bytes of main memory, a desk-level console and operator keyboard/display terminal, a DLP Base, a 1 x 8 disk controller, and two 243K-byte mini-disk (diskette) drives. One mini-disk drive is used for data loading or unloading. Six DLPs are standard on the B 2910, while seven are standard on the B 2930. The B 2930 also includes a B 874-4 Systems and Communications Processor with 32K bytes of memory.

The B 2910 can be expanded to 1536K bytes of main memory and 16 DLPs. The B 2930 is expandable to 4864K bytes of main memory and 32 DLPs. The B 2910 can be field upgraded to a B 2930, but the B 2900 systems cannot be field upgraded to a B 3955.

The basic B 3955 system includes 2048K bytes of main memory, an integrated console, an operator keyboard/display terminal, two DLP Bases, six DLPs, two mini-disk drives, and a 2x8 disk controller. The system is expandable to 4864K bytes of main memory and 32 DLPs.

In addition to the uniprocessor configurations specified, the B 2900 and B 3900 systems can be expanded with up to three additional processors to form a loosely coupled multiprocessor system with shared mass storage, peripherals, and communications systems. With the addition of the Shared System Processor (SSP), the operating system, compilers, utilities, program libraries, and data files can also be shared by up to four central processors. The SSP forms part of the I/O subsystem and is physically a DLP with memory cards. Multiprocessor systems can include B 2800, B 3800, or B 4800 Series systems as long as at least one processor in the system is a B 2900 or B 3900. The SSP requires a dedicated DLP Base in the host B 2900 or B 3900.

PERIPHERALS AND COMMUNICATIONS

The peripheral equipment for the B 2900 and B 3900 includes mass storage media with capacities of 5.5 to 1608 megabytes, magnetic tape units with data transfer rates of 80K to 200K bytes per second PE and 470K to 1250K bytes per second GCR/PE, line printers with speeds from 650 to 2000 lines per minute, card readers rated at 300 to 800 cards per minute, and MICR and MICR/OCR readers rated at 1000, 1625, and 2600 documents per minute.

Communications facilities are provided by the B 874 Systems and Communications Processor, the Uniline Data Link Processor, and the new CP 3680 Data Communications System. Features available through all communications processors include standard synchronous/asynchronous communications, standard two-wire direct connect, automatic dial-out, binary synchronous, and BDLC protocols. The Uniline Data Link Processor accommodates Burroughs direct interface arrangements in addition to the facilities mentioned above. ➤

➤ MAIN STORAGE

STORAGE TYPE: MOS, utilizing 16K-bit chips.

CYCLE TIME: Read access time is 571 nanoseconds for a four-byte fetch.

CAPACITY: 524,288 to 1,572,864 bytes for the B 2910, 524,288 to 4,980,736 bytes for the B 2930, and 2,097,152 to 4,980,736 bytes for the B 3955. Memory increment sizes for all models is 262,144 bytes.

CHECKING: An error detection and correction scheme is employed that provides for all single-bit errors to be detected and corrected. All double-bit errors are detected.

STORAGE PROTECTION: Provided by a base register and a limit register. The high-order three digits of generated memory addresses are checked to ascertain that they fall within the range defined by these two registers.

CENTRAL PROCESSOR

The B 2900 and B 3900 Series processors employ an asynchronous pipelined architecture utilizing multiple independent processor modules. Under this scheme, some processing steps can be overlapped, including instruction pre-fetch, address calculations, and data address calculations; data fetch and manipulation; instruction execution; and I/O initiation.

The B 2900 and B 3900 systems' functional modules consist of the Memory Interface Control (MIC) module, the Parallel/Serial Interface (PSI) module, the Fetch module, the Math module, the Address Store and Manipulate (ASAM) module, the Master Control Store (MCS) module, the Clock/Timer module, and the I/O Processor (IOP).

The MIC module provides an interface to the memory storage cards. It performs BCD-to-binary conversion on memory addresses and contains the error correction and memory refresh control circuitry.

The PSI module provides a data path between main memory and the CPU, as well as requesting all memory cycles needed by the processor. The PSI module also performs data zone stripping or adding as specified by the various move instructions.

The Fetch module performs all of the functions necessary to resolve the instruction OP codes, variants, and addresses in preparation for execution. This resolution includes modifying the base address when the program base is not equal to zero, performing all address indexing, and resolving all indirect addressing. The Fetch module controls the other modules needed to fetch an instruction.

The Math module is the arithmetic unit of the central processor. It performs all data manipulation specified by an instruction during instruction execution. The Math module contains data buffers capable of storing 256 bytes of data for each operand address. The data storage capability is designed to enhance processor-to-memory interfacing during instruction execution.

The ASAM module stores the memory addresses of operands used by the processor during the execute phase of an instruction. It also performs Base and Limit boundary checking for the processor during both the fetch and execute phases of an instruction.

The MCS module receives an instruction from the Fetch module after all variables are resolved. It sequences all events needed to complete an instruction and controls all other modules involved in the execution of an instruction. ➤

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Characteristics of the B 2900 and B 3900 Systems

	B 2910	B 2930	B 3955
CENTRAL PROCESSORS			
Date of introduction	June 1981	March 1979	September 1981
Number of processors per system	1 to 4	1 to 4	1 to 4
Processor clock	7 megahertz	7 megahertz	7 megahertz
Relative performance to B 2800	1.0 to 1.4	1.2 to 2.2	2.7
MAIN STORAGE			
Type	IC MOS	IC MOS	IC MOS
Cycle time, nanoseconds	571	571	571
Minimum capacity, bytes	524,288	524,288	2,097,152
Maximum capacity, bytes	1,572,864	4,980,736	4,980,736
Increment size, bytes	262,144	262,144	262,144
Bytes fetched per cycle	4	4	4
Error correction	Standard	Standard	Standard
I/O AND COMMUNICATIONS			
Number of DLPs	6 to 16	7 to 32	7 to 32
Aggregate I/O data rate, bytes per second	7,000,000	7,000,000	7,000,000
Number of B 874 SCPs per CPU	Up to 10	Up to 10	Up to 10
Communication lines per B 874	Up to 32	Up to 32	Up to 32
Number of CP 3680 Communications Systems per CPU	1	1	1
Communications lines per CP 3680	Up to 288	Up to 288	Up to 288

➤ The CP 3680, introduced in September 1981, is a front-end communications system that provides on-line network generation and management capabilities for up to four B 2000/B 3000/B 4000 central processors. The CP 3680 supports two types of communications interfaces: an eight-line asynchronous adapter and a two-line asynchronous/synchronous adapter. Also available is the CP 3680-01 Redundant System, which automatically assumes control of the network in the event of a failure in the CP 3680.

To facilitate the development of B 874 communications control programs, Burroughs provides the Generalized Message Control System (GEMCOS), a parameter-based system that executes user-tailored message control programs, plus the Network Definition Language (NDL), a language and compiler that enables users to define and generate customized network control programs. The GEMCOS message control system forms the interface between the network control program and the user programs processing the communications messages.

For the CP 3680, Burroughs provides the CP 3600 Data Communications Software, a task-based operating system that includes an integrated message control system.

SOFTWARE

The B 2900/B 3900 Software Facilities Program includes the Master Control Program (MCP) operating system, NDL, GEMCOS, and a language compiler. The compiler can be Cobol, Basic, RPG II, or Fortran.

With the introduction of the B 3955, Burroughs announced a new release of the operating system, MCP IX. MCP IX is functionally compatible with the previous release, MCP VI, and supports the same features. MCP IX has been optimized to take advantage of the B 3955 system technology and to increase total system throughput.

Other software products available for the B 2900 and B 3900 systems include Command and Edit Language ➤

➤ The Clock/Timer module produces the 7-megahertz main system clock used by the central processor and also generates a 7-megahertz clock for use by the MIC. The MIC clock is 180 degrees out of phase with the system clock. The Clock/Timer module also provides a real-time clock function.

The I/O processor (IOP), independently of the central processor, initiates data transfers between main memory and peripheral subsystems. The IOP uses I/O descriptors to manage the entire I/O operation. The IOP is interfaced to the peripheral subsystems through Data Link Processors (DLPs). Each DLP is microprocessor-controlled and is independent of every other DLP.

Multiprocessor configurations of up to four central processors are possible. The multiprocessor configurations can share the CP 3680 Data Communications System, mass storage, magnetic tape units, printers, punched card equipment, and MICR/OCR reader sorters.

Multiprocessor configurations are also supported by the B X376-95 Shared System Processor (SSP). The SSP enables the capabilities of the operating system, compilers, utilities, program libraries, and data files to be shared by up to four processors. The SSP provides the capability for both read and write access of the same file by different programs executing in one to four central systems. The SSP prevents the erroneous updating of data that may be concurrently accessed from multiple processors.

A System Maintenance Vehicle (SMV) enables maintenance personnel to run special diagnostics called maintenance test cases. These test cases consist of data files built from simulated proper functioning of all circuits in all modules of the central processor. When run, the test cases give a circuit-by-circuit comparison of actual operation to the test case file. The test case files are stored on ICMD media in the system console.

The SMV consists of a programmable microprocessor, a system maintenance controller, and I/O ports which provide test paths to all system modules. The SMV also loads both operational and diagnostic firmware into the processor modules, control store, controls clock pulses to the system, and emulates maintenance panel functions.

The B 2900 and B 3900 Series Systems also monitor their own environmental conditions, including input air cooling and power source. Warning lights, operator messages, and maintenance log entries are part of the monitoring system.

CONTROL STORAGE: Access time to microcode is 45 nanoseconds. ➤

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➤ (CANDE), Automated Documentation System (ADS), On-Line Data Entry System (ODESY), Data Management System II (DMS II), DMS Inquiry, Reporter II, and the Workflow Management System.

Program compatibility with other computers is achieved via higher-level languages. The Cobol and Fortran compilers conform to the American National Standards for these languages. Programs written in RPG or RPG II for IBM computers can either be compiled by the RPG II compiler or translated into Cobol by the COFIRS II (Cobol from IBM RPG Specifications) routines. Conversion programs are also available to translate Honeywell Cobol or EasyCoder to Burroughs Cobol and NCR Cobol or Neat/3 to Burroughs Cobol.

USER REACTION

Datapro's 1981 survey of general-purpose computer users yielded responses from only two B 2930 users. In November, we located two additional users and asked them to report on their experience with the system. These four respondents had a total of five B 2930 CPUs which had been installed for an average of nine months. (The B 2910 and B 3955 had not been delivered at the time of our survey.)

The users surveyed represented two local government agencies, a manufacturer, and a transportation company. The B 2930 had replaced a B 2700 in one installation, a B 3800 in another installation, and a B 4700 in the remaining installations. None of the users reported any significant problems in converting from the older systems to the B 2930. The users' ratings are summarized in the table below.

	Excel.	Good	Fair	Poor	WA*
Ease of operation	4	0	0	0	4.00
Reliability of mainframe	3	1	0	0	3.75
Reliability of peripherals	2	2	0	0	3.50
Maintenance service:					
Responsiveness	1	2	1	0	3.00
Effectiveness	1	2	1	0	3.00
Technical support:					
Trouble-shooting	1	3	0	0	3.25
Education	0	2	0	0	3.00
Documentation	0	4	0	0	3.00
Manufacturer's software:					
Operating system	4	0	0	0	4.00
Compilers & assemblers	3	0	0	0	4.00
Application programs	1	0	1	0	3.00
Ease of programming	2	1	0	0	3.66
Ease of conversion	4	0	0	0	4.00
Overall satisfaction	2	2	0	0	3.50

*Weighted Average on a scale of 4.0 for Excellent.

The ratings indicate an unusually high level of satisfaction with the B 2930. Two of the users commented that the B 2930 provided a significant improvement in performance and speed over the older systems it replaced. One user added that he had experienced "very few problems" with the new system.

The only negative comments came from a user who reported having "a lot of trouble" with the B 9247-14 and B 9247-15 line printers. He also expressed dissatisfaction with the effectiveness of the maintenance service on the B 874 communications processor. However, he said that ➤

➤ **PHYSICAL SPECIFICATIONS:** The B 2910 and B 2930 are housed in a system cabinet that measures 76.5 inches long, 32 inches wide, and 73 inches high. The Exchange/Base Cabinet is 42 inches long, 32 inches wide, and 73 inches high. The desk-level operator console is 44 inches long, 27 inches wide, and 30 inches high.

The B 3955 is housed in a system cabinet that measures 45 inches long, 29 inches wide, and 44 inches high. The Extension Cabinet is the same size as the system cabinet. The operator console is integrated into the system cabinet.

INPUT/OUTPUT CONTROL

Each central processor includes one or two input/output processors (IOPs) that control the movement of data between main memory and the system input/output devices. On all B 2900 and B 3900 processors, individual peripheral devices operate under control of Data Link Processors (DLPs), which are associated with each input/output channel. Each DLP is designed to control a particular type of peripheral device and contains one or more record-length buffers to minimize contention for accesses to main memory.

The Data Link Processors are housed in the DLP Base, which contains 34 card positions and a power supply sufficient to handle 8 DLPs. Although the maximum number of DLPs per base is always eight, the exact number that can be housed in one base is determined by the number of cards required by the individual DLPs, as signified by each DLP's numeric suffix. A total of 20 cards per base are available for the DLPs. The DLPs provide high-speed data transfer through record-length buffers of 80 bytes for punched card equipment, 132 bytes for printers, and five 256-byte buffers for disk pack drives.

The aggregate data rate through the input/output processor is seven megabytes per second.

SIMULTANEOUS OPERATIONS: One input or output operation on each installed DLP I/O channel can occur simultaneously with computing. Other simultaneous operations are described under the Central Processor section of this report.

CONFIGURATION RULES

The basic B 2910 system includes 512K bytes of main memory expandable to 1536K bytes in 256K-byte increments. One DLP Base and six DLPs are standard. An additional DLP Base and 10 additional DLPs can be configured with a B 2910 system. DLPs packaged with the B 2910 include those for the operator display terminal, diagnostic console, card reader, line printer, magnetic tape subsystem, and disk pack drive. A 1 x 8 disk pack controller is also included. A B 2910 can be field upgraded to a B 2930.

The basic B 2930 system includes 512K bytes of memory expandable to 4864K bytes in 256K-byte increments. One DLP base and seven DLPs are standard on the B 2930. A maximum of 4 DLP Bases and 32 DLPs can be configured. The fourth DLP Base requires the Exchange/Base Cabinet. DLPs packaged with the B 2930 include those for the operator display terminal, diagnostic console, card reader, line printer, magnetic tape subsystem, disk pack drive, and B 874 Systems and Communications Processor. The basic B 2930 system also includes a 1 x 8 disk pack controller and a B 874-4 Systems and Communications Processor. The B 2930 cannot be field upgraded to a B 3955.

The basic B 3955 includes 2048K bytes of memory expandable to 4864K bytes in 256K-byte increments. Two DLP Bases and DLPs for the operator display terminal, diagnostic console, card reader, line printer, magnetic tape subsystem, and disk pack drive are standard. A B 3955 can support a maximum of 4 DLP Bases and 32 DLPs. The third and fourth DLP Base requires the Extension Cabinet.

I/O controls or DLPs from the B 2800/B 3800/B 4800 Series systems are not compatible with the B 2900 or B 3900 Series. Peripheral devices on the B 2900 and B 3900 are only restricted by the number of available spaces for DLPs and the ➤

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➤ the maintenance service on the peripheral equipment was "good."

All four users said they would recommend the B 2930 to others. □

▶ number of card spaces per DLP Base. When configuring a system, the number of cards per DLP Base cannot exceed 20 and the number of DLPs per DLP Base cannot exceed 8. The currently available DLPs and the number of cards each contains are given in the Equipment Prices section at the end of this report.

The Shared System Processor (SSP) permits code and data files residing on mass storage devices to be shared by up to four B X800 or B X900 systems, provided that at least one system is a B 2900 or B 3900. In order to connect the SSP, a port interface adapter is required for each system configuration. If a B 9470 Disk File is shared, a minimum of three storage modules is required for a two-system configuration. The B 2377-6 Disk File Exchange is required for more than two systems and must be housed in a B 2900 or B X800 auxiliary cabinet; it cannot be housed in a B 3955 system. The SSP requires a dedicated DLP Base on the host B 2900 or B 3900 system, thus reducing the maximum number of DLPs by eight. On a B 2930 or B 3955, the SSP can reside in the Exchange/Base Cabinet or Extension Cabinet as the fourth DLP Base.

MASS STORAGE

B 9470 HEAD-PER-TRACK FILES: These fixed-head disk files provide very fast access to data. The disk units use non-interchangeable disks and have a fixed read/write head serving each data track. The B 9470-1 Primary Storage Module and B 9470-11 Add-On Storage Module record data in 100-byte sectors, and have a capacity of 5.5 million bytes per disk drive.

The basic B 9470 subsystem includes one B 9470-1 Primary Storage Module, which contains a power supply and air system and one disk drive with 5.5 million bytes of storage. The B 9470-1 can accommodate one B 9470-11 Add-On Storage Module with a capacity of 5.5 million bytes. Additional expansion of the subsystem can be achieved by adding additional B 9470-1 Primary Storage Modules and associated B 9470-11 Add-On Modules. One B 9471-6 Disk Electronics Unit is required for every four disk storage units; the DEU includes circuitry to support Angular Position Sensing, in which I/O requests are serviced according to read/write head position to optimize performance, and the capability to detect the loss of up to 11 bits in a transfer of one 100-byte sector.

Each B 9470 disk unit has a rotational speed of 10 milliseconds and an average access time of 5 milliseconds. Data transfer rate for all models is 650K bytes per second. A maximum of eight data paths from one or several systems can be accommodated by each B 9470 subsystem. The disk unit is connected to the B 2900 or B 3900 Series processor through a B X373-90 DLP.

B 9484-51 DISK PACK DRIVE SUBSYSTEM: This medium-capacity disk pack drive has a capacity of 65.2 million bytes per spindle, 130.4 million bytes per drive, and a total storage capacity of 1.04 billion bytes in a subsystem with the maximum of 16 spindles. The average access time is 25 milliseconds, average rotational delay is 8.3 milliseconds, and data transfer rate is 605K bytes per second.

As many as eight spindles (four dual drives) can be attached to a B 9387-41 or B 9387-42 Controller. The B 9484-51 can also be configured with the 2 x 16 B 9387-46 Controller, the 4 x 16 B 9387-49 Controller, or the 6 x 16 B 9387-40 Controller to permit up to 16 spindles (8 dual drives) with up to 8 simultaneous access paths to the disk pack subsystem. The B 9387-40, -46, and -49 controllers include a disk exchange. For the B 9387-41 and -42 controllers, a B X387-5 Basic Disk Pack Drive Exchange is required. The B 9484-51 subsystem is

interfaced to the B 2900 or B 3900 system through the B X304-90 DLP.

B 9484-81 DUAL DISK PACK DRIVE: This dual-spindle disk drive stores up to 348.8 million bytes of data—174.4 megabytes on each of 2 removable disk packs. The 11-platter disk packs are physically compatible but not format-compatible with the IBM 2316 Disk Pack. There are 180 bytes per sector, 60 sectors per track, and 10,800 bytes per track. Each surface consists of 812 usable data tracks plus two spares. 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 B 9484-81 disk subsystem can include up to 16 spindles (8 dual drives) and is controlled by the B 9385-X Controller, which is available in three models: the 1 x 8 B 9385-1 Single Controller, the 2x8 B 9385-2 Dual Controller, and the 2 x 16 B 9385-3 Dual Controller. Also required is a B X304-90 DLP.

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

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

The B 9494 disk subsystems are controlled by a B 9387-4X Controller, which is available in 5 models (1 x 8, 2 x 8, 2 x 16, 4 x 16, and 6 x 16) and is capable of accommodating up to 6 simultaneous access paths and 16 disk spindles. A B X304-90 Disk Drive DLP is required.

INPUT/OUTPUT UNITS

B 9495 PE MAGNETIC TAPE UNITS: These high-performance 9-track units record data on 1/2-inch tape in IBM-compatible phase-encoded (PE) mode at 1600 bpi. Three models are available: the B 9495-8, B 9495-82, and B 9495-83. The B 9495-8 has a tape speed of 50 inches per second and a data transfer rate of 80,000 bytes per second. The B 9495-82 has a tape speed of 75 inches per second and a data transfer rate of 120,000 bytes per second, while the B 9495-83 has a tape speed of 125 inches per second and a data transfer rate of 200,000 bytes per second. An NRZ option is available to enable B 9495-82 or -83 drives to record in NRZ mode at 800 bpi. All drives can handle 10.5-inch reels holding 2400 feet of tape. The drives feature a single vacuum-driven capstan, a sealed tape-path chamber, a power access window, a positive reel latch, automatic tape threading and loading, and "on-the-fly" detection and correction of most errors. A unique "coaxial" hub mounts the feed reel directly in front of the take-up reel, reducing the overall width of the unit to just 24 inches.

The B 9495 drives can be configured in several ways, depending upon the model and master electronics unit. The B 9495-8 employs the B 9499-33, B 9499-34, or B 9499-35 Master Electronics Exchange. The B 9499-33 can attach up to four drives; the B 9499-34, up to eight. A 2 x 8 configuration employing two B X395-90 DLPs is possible utilizing the B 9499-35. The B 9495-82 and B 9495-83 utilize the B 9499-5X Master Electronics Exchanges. With these exchanges, the B 9495-82 and B 9495-83 can be configured in a subsystem consisting of up to 4 B X395-91 DLPs, up to 16 tape units, and the appropriate B 9499-5X Master Electronics Exchange (1 x 4, 1 x 8, 2 x 8, 2 x 16, 3 x 16, or 4 x 16).

B 9495 GCR/PE MAGNETIC TAPE UNITS: These drives record data on 1/2-inch tape in IBM-compatible PE mode at 1600 bpi or in GCR mode at 6250 bpi. Five models are

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► available: the B 9495-24, B 9495-32, B 9495-33, B 9495-32M, and B 9495-33M. The B 9495-24 has a tape speed of 200 inches per second. The data transfer rate is 1,250,000 bytes per second at 6250 bpi and 320,000 bytes per second at 1600 bpi. Rewind speed is 45 seconds. With a tape speed of 75 inches per second, the B 9495-32 has a data transfer rate of 470,000 bytes per second in GCR mode or 120,000 bytes per second in PE mode. The B 9495-33 has a tape speed of 125 inches per second and a data transfer rate of 780,000 bytes per second in GCR mode or 200,000 bytes per second in PE mode. Rewind time on the B 9495-32 and B 9495-33 is a maximum of 55 seconds. The B 9495-32M and B 9495-33M are B 9495-32 or B 9495-33 tape drives with built-in formatter/controllers.

A tape subsystem consisting of B 9495-24 or B 9495-3X tape units can be configured with up to 4 simultaneous access paths to up to 16 tape drives employing the B 9499-2X controllers. Capabilities of these controllers are as follows: the B 9499-21, 1 x 8; the B 9499-22, 2 x 8; the B 9499-23, 3 x 8; and the B 9499-24, 4 x 8. The B 9499-4X Electronics Exchange increases the capabilities of the B 9499-22, B 9499-23, and B 9499-24 to 2 x 16, 3 x 16, and 4 x 16, respectively. In addition to the B 9499-2X controller, the subsystem must include a B X395-92 DLP.

B 9115, B 9116, & B 9117 CARD READERS: These units read standard 80-column cards serially by column. The B 9115, B 9116, and B 9117 have rated speeds of 300, 600, and 800 cards per minute, respectively. Either EBCDIC or binary-coded cards can be read. The 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. An optional feature permits the reading of 51-column cards. The B 9115, B 9116, and B 9117 card readers can be connected to a B 2900/3900 system through a B X110-90 DLP.

LINE PRINTERS: Burroughs offers a choice of four printers that span a range of speeds from 650 to 2000 lines per minute. Their model numbers, rated speeds, printing techniques, and required DLPs are as follows:

B 9246-6: 650 lpm; band; B X246-92 DLP
B 9247-14: 1100 lpm; train; B X247-93 DLP
B 9247-15: 1500 lpm; train; B X247-94 DLP
B 9246-20: 2000 lpm; train; B X246-91 DLP

All of the printers have 132 print positions. The B 9247 Train Printers achieve their rated speeds with the standard 48-character train module; other interchangeable modules containing 16, 64, or 96 printable characters are also available. The 96-character set contains both upper and lower case ASCII or EBCDIC alphabets. The train printers handle vertical format control through either the Burroughs Forms Self-Align System, which uses codes preprinted on the forms, or a 12-channel VFU. The B 9247 Train Printers can employ 4- to 20-inch-wide paper and have a skipping speed of 20 ips. The B 9246-20 Train Printer has a skipping rate of 90 ips.

READER-SORTERS: Burroughs offers a choice of three reader-sorters for the B 2900 and B 3900 systems: the B 9137-4 MICR Reader-Sorter, the B 9138-4 MICR Reader-Sorter, and the B 9190-2 MICR/OCR Reader-Sorter.

The B 9137-4 has a rated speed of 1000 documents per minute. The basic unit includes E13B character recognition, four pockets, off-line sorting in two fields, a resettable item counter, and a host control interface.

The B 9138-4 Reader-Sorter is a microprocessor-controlled unit with two document feeders. The primary feeder has the capacity for approximately 4400 documents to be processed, and a secondary feeder bundles tickets and other documents to be merged with checks from the primary feeder. Both feeders handle documents of mixed sizes. Throughput depends on the lengths and mix of the documents being processed and on the number of stops incurred during processing. For a normal mix of documents averaging 7 $\frac{1}{8}$ inches in length, the rated throughput of the B 9138-4 is 131,000 documents per hour if no stops occur. The rated

speed for 6-inch documents is 2600 documents per minute, or 156,000 documents per hour. Reading, endorsing, microfilming, and sorting are all accomplished at full sort speed. The B 9138-4 pocket modules contain 4 pockets each and can be combined for a maximum configuration of 32 pockets. Each pocket holds up to 950 documents and can be unloaded while the sorter is operating.

The B 9190-2 is a MICR/OCR reader-sorter with a rated speed of 1625 documents per minute. The B 9190-2 is a four-pocket unit to which must be added at least one character recognition module and one internal interface module. Optional features include three types of endersors, a microfilm camera module, an off-line sort package, special equipment for processing 51-column cards, and additional 4-pocket modules that can be combined for a maximum configuration of 32 pockets.

The B 9137-4 and B 9190-2 connect to a B 2900 or B 3900 system through the B X137-90 DLP. The B 9138-4 reader-sorter connects to the system via the B X138-90 DLP.

COMMUNICATIONS CONTROL

B 874 SYSTEMS AND COMMUNICATIONS PROCESSOR (SCP): The B 874 SCP is a microprogrammed front-end communications processor that performs the specialized functions associated with the transmission and reception of data, including error recovery, code translation, line discipline management, and most network control functions. The B 874 SCP is available in two models, the B 874-1 and the B 874-4. The basic B 874-1 system consists of a 1.7-megahertz processor with 12K bytes of control memory, integrated host interface, and 32-line adapter cluster. The faster B 874-4 contains a 4-megahertz processor with 16K bytes of control memory. A 4K-byte or 16K-byte user memory module, expandable to 96K bytes, is available for both models.

Line adapters available for the B 874 SCP include standard asynchronous/synchronous/binary synchronous, standard two-wire direct connect, automatic dial-out, and, on the B 874-4, Burroughs Data Link Control (BDLC). The B 874 Adapter Cluster will accommodate up to 16 line adapters. Most of the line interface adapters are dual adapters, handling two full-duplex lines, each with different characteristics. The adapter cluster allows data speeds up to 19,200 bits per second per line adapter in an environment of up to 32 half-duplex communications lines or 16 BDLC half-/full-duplex lines. A TTY-compatible line adapter provides data transmission at up to 38,500 bits per second.

The B 874 Network Definition Language (NDL) is available to prepare customized network control programs containing tables, system code, and microprograms for each B 874 SCP. The network control program is compiled on the host processor and loaded from the host system disk to the communications processor through an MCP command. Also available is the Generalized Message Control System (GEMCOS), a software package designed to generate a custom-tailored Message Control System. GEMCOS is described in more detail in the "Software" section of this report.

The B 874 SCP connects to a B 2900 or B 3900 system through the B X303-90 DLP. The DLP on the B 3955 supports the B 874-4 SCP only.

UNILINE DLP: The B X351-90 Uniline DLP provides connection for data sets (with or without automatic dial out), while the B X351-91 provides Burroughs direct interface and two-wire direct connect facilities. The B X351-90 Uniline DLP permits connection between a single processor and one communications line through a data set employing either the Burroughs standard asynchronous or synchronous line procedures. In the synchronous mode the maximum transmission speed is 9600 bits per second, and in the asynchronous mode the maximum transmission speed is 1800 bits per second. ►

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► **CP 3680 DATA COMMUNICATIONS SYSTEM:** Announced in September 1981, the CP 3680 is a front-end communications system that can simultaneously service up to four Burroughs B 2000/B 3000/B 4000 host computers. Two models are available: the basic CP 3680 Data Communications System and the CP 3680-01 Redundant Communications System. The CP 3680-01, operating in a "hot standby" mode, assumes control of the network and host interfaces in the event of a CP 3680 failure.

CP 3680 capabilities include on-line network generation and management; control of all line protocol functions such as polling and selecting stations; support for polled, bisynchronous, Teletype, point-to-point, and bit-oriented protocols; user-defined protocols; control character mapping for device-independent application programs; on-line network statistics and monitoring; and queuing of inbound and outbound messages. Optional features include the Remote Diagnostic Facility and the Power Fail Recovery Option, which provides battery backup in the event of an external power failure.

The CP 3680 supports a number of commonly used communications protocols, which Burroughs has grouped into five Protocol Classes. Class 1 protocols include polled protocols such as Burroughs Poll-Select, Lear-Siegler ADM-2, NCR 270 variants, NCR 796 variants, and IBM 2260. Class 2 protocols are binary synchronous protocols such as point-to-point (IBM 2780/3780), multipoint (IBM 3270), multipoint inverse (to communicate with IBM hosts), and NCR bisynch transparent (3270 variant). Class 3 protocols include Teletype, TWX, and Bell Vu-Set protocols. Class 4 protocols include point-to-point protocols, such as Burroughs Remote Job Entry (B 761) and Burroughs point-to-point batch mode variant, contention mode variant, and conversational variant. Class 5 protocols, which are scheduled for future release, include Burroughs Data Link Control (BDLC), ISO High-Level Data Link Control (HDLC), ANSI Advanced Data Communications Control Procedures (ADCCP), and IBM Synchronous Data Link Control (SDLC).

The basic CP 3680 system includes a processor with 256K bytes of memory; 14 I/O ports, of which 9 can be used for data communications interfaces; a 20-megabyte disk subsystem with interface; a real-time clock; a Dual Channel Port Controller (DCPC); a system console interface; and a firmware set. A CP 3641-01 system console is required for the first CP 3680 system at each site. Also required are a host interface for each host computer and the CP 3600 Data Communications Software (DCS). If the CP 3680-01 redundant system is added, the CP 3600 Standby Communications Software (SCS) is required.

Two types of microprocessor-based communications adapters are available: an eight-line asynchronous adapter and a two-line asynchronous/synchronous adapter. Each adapter requires one I/O port and supports an aggregate data rate of up to 8000 characters per second. With the eight-line asynchronous adapter, all communications lines must operate at the same data rate and the protocols used must be of the same protocol class. When the two-line synchronous adapter is used, all communications lines must use protocols of the same protocol class, but data rates can vary.

The CP 3680 system can be expanded to 25 I/O ports by the addition of the I/O Expansion Unit. Further expansion, to a maximum of 41 I/O ports, is accomplished by adding the I/O Port Extender. Of the total of 41 I/O ports, 36 can be used for communications interfaces. The number of line adapters cannot exceed 8 on an entry-level CP 3680, 22 on a CP 3680 with the I/O Expansion Unit, or 36 on a CP 3680 with the I/O Expansion Unit and the I/O Port Extender. A maximum CP 3680 configuration supports up to 288 asynchronous multi-drop lines or 72 synchronous multi-drop lines, up to 2000 terminal stations, and up to 2000 transaction types. However, when the number of terminals in the network exceeds 400, a 256K-byte memory module must be added. The CP 3680

transfers data to the host computer at a rate of 200,000 characters per second.

The table-driven CP 3600 DCS software enables users to modify, control, and monitor networks on-line. It also includes an integrated message control system that provides five-level message security, dynamic and fixed message routing, on-line forms generation, and simultaneous servicing of up to four host processors. Message control system files, forms files, and application data save areas are stored in CP 3680 memory or on the CP 3680 disk.

Existing Network Definition Language (NDL) applications will run on the CP 3680 with little or no modification, according to Burroughs. NDL applications can run concurrently with the CP 3680 resident message control system. Support for Burroughs program products that currently require a B 874 communications processor, such as GEMCOS and CANDE, will be available in the second quarter of 1982.

SOFTWARE

The Software Facility Program is required for all B 2900 and B 3900 systems. The package includes the MCP operating system, utilities, Basic GEMCOS, B 874 NDL, Medium Systems NDL, and a choice of one compiler. These programs are described in the paragraphs that follow.

MASTER CONTROL PROGRAM: The principal component of Burroughs software support for the B 2900 and B 3900 Series systems is the MCP, a modular operating system that schedules and controls all operations of the systems. The MCP requires from 14K to 50K bytes of main memory, up to 400K bytes of disk storage, at least one magnetic tape unit, a card reader, and a console typewriter or display console. A high-speed trace option adds another 7.5K bytes to the main memory requirements.

MCP VI, released in 1976, is the currently available version of MCP for the B 2900 Series. MCP IX was released in September 1981 concurrently with the B 3955 system. MCP IX is functionally compatible with MCP VI and supports the same functions. However, MCP IX has been optimized to take advantage of the B 3955 system technology and increase system throughput. Specific details on MCP IX were not available from Burroughs at the time this report went to press.

The MCP multiprogramming executive has the capability to supervise the execution of up to 99 concurrent jobs. Under MCP, user programs can be divided into a resident portion that must be resident in main memory for program execution and a series of overlayable segments that can be brought into main memory only when required for program execution. The compiler builds a segment dictionary reflecting the program organization and computes the memory requirements for containing the resident portions of the program plus the minimum main memory space required for accommodating the largest single overlayable segments of the program. During program execution, the MCP uses the segment dictionary to locate required program segments and loads them from disk storage into the user-program overlay area. When adequate main memory space is available, the MCP's overlay segments are allowed to remain in main memory until the space is required by another program.

The MCP performs the following principal functions: 1) schedules the loading and execution of user programs in a multiprogramming environment; 2) allocates main memory storage and relocates user programs as necessary to achieve efficient storage utilization; 3) schedules and initiates all I/O operations; 4) services all interrupts and attempts recovery from I/O errors; 5) provides I/O control functions such as blocking, buffering, file opening and closing, data communications control, etc.; 6) loads program segments or overlays upon request; 7) creates and maintains disk program libraries in symbolic and/or machine-language form; 8) establishes communication between the system and its operator via the console typewriter, display console, and ►

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- control cards; 9) provides dump, trace, and checkpoint/restart facilities; and 10) maintains a system log.

The MCP handles batch-mode jobs entered both locally and from remote terminals, as well as data communications and time-sharing jobs. Programs are loaded and executed in a sequence determined by their assigned priorities and memory requirements. Jobs of equal priority are processed on a first-in/first-out basis, and a time-slicing technique is used to ensure access to the central processor for programs of equal priority. Top-priority jobs can cause lower-priority jobs to be rolled out to disk to make the required main memory available. When the end of a job is reached and other jobs are waiting, the remaining programs in main memory are compacted to maximize the contiguous memory area available for loading and initiating one or more new programs.

Other significant MCP features are: 1) a "STOQUE" capability that permits asynchronous transfers of data between programs; 2) a 3-level priority system that permits assignment of separate priorities for scheduling, processing, and memory utilization; 3) a 3-level logging system that provides an Operator Display Terminal Log of all system messages, a Maintenance Log showing the performance of each system component, and a Run Log that facilitates cost distribution and system audits; 4) ability to relocate the MCP modules in main memory; and 5) ability to overlap MCP I/O operations (such as opening files) with computing.

MCP has comprehensive facilities for accumulating data on the utilization of system resources by each executing user program. The program logs central processor utilization, peripheral use by type, and system overhead factors such as load-dumps, print-backup, and pseudo-reader, for each job executed. The log file can be analyzed by the TABS program to prepare billing reports for computer usage.

Optional modules within MCP include the Data Communications Processor Control (DCP) module, the Data Management System II (DMS II) module, and the Shared Systems Processor (SSP) module.

The DCP module controls all communications between the B 874 Systems and Communications Processor and the active Message Control System (MCS). The DMS II module is a data management facility provided to establish logical relationships between data. (DMS II is discussed elsewhere in this section.) The SSP module provides the capability for concurrent access, both read and write, of the same file by different programs executing in one to four central systems. Protection from erroneous updating of data by independently functioning processors is also provided by the SSP module.

COBOL: The most recently released Burroughs Cobol compiler is based on Cobol-74 and includes all the facilities of full American National Standard Cobol, including the Sort and Segmentation modules. Source-language program debugging facilities, data communications constructs, and a number of other useful extensions are also included. The EBCDIC, BCL, and ASCII character sets are supported. The compiler accepts a Cobol source program and generates a machine-code object program which is placed in disk storage, ready for execution. The compiler automatically divides all object programs into logical, relocatable segments.

Also available for the B 2900 and B 3900 systems is a Cobol 68 compiler, which is compatible with the older American National Standard Cobol 68 language.

FORTRAN: This compiler provides extended language facilities which are compatible with IBM Fortran IV Level H, includes the full ANS Fortran language plus numerous extensions, and is upward-compatible with the Fortran compilers for the larger B 5900, B 6800, B 6900, and B 7800 systems. The compiler requires 45K bytes of main memory and makes use of the fixed-length floating-point arithmetic instructions, extended addressing capabilities, and 4-digit

adders of the processors to achieve significantly higher object program execution speeds.

BASIC: B 2900/B 3900 Basic is an industry-standard implementation of the Basic language that generally corresponds to the original Dartmouth Basic.

RPG II: A full implementation of the RPG II language with extensions for data communications and DMS II data base management.

BURROUGHS PROGRAM LANGUAGE (BPL): BPL enables assembly language programmers to code in a higher-level language that permits complete control of all machine-level facilities, including instruction modification, indexing, incrementation, and character or bit manipulation. Data declarations are required, and facilities for macro instructions and program segmentation are provided. Burroughs emphasizes that BPL is not a Cobol or Fortran replacement language, but a replacement for the Assembler for programs that require extensive machine-dependent coding.

NETWORK DEFINITION LANGUAGE (NDL): 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 the 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 for the B 874 Systems and Communications Processor. The NDL compiler requires a minimum of 90K bytes of main memory.

GENERALIZED MESSAGE CONTROL SYSTEM (GEMCOS): This software system generates an installation-defined message control system (MCS) that manages a transaction-oriented communications network, provides security, handles transaction routing, controls message formatting, and provides a transaction processing interface for applications programs. All transaction terminals in the network are controlled by the GEMCOS-created MCS and interfaced to the applications programs and the data base. Thus, GEMCOS enables users to develop transaction processing application programs independently of the network environment. The input to GEMCOS is coded in the Transaction Control Language, a descriptive, free-form language that uses key words to describe both the network environment and the requirements for message routing, message formats, access control, recovery, etc. Alternatively, a user-developed Message Control System can be written in Cobol or the Burroughs Program Language (BPL).

COMMAND AND EDIT LANGUAGE (CANDE): This time-sharing Message Control System enables multiple users at remote terminals to create programs or data files, compile and execute programs, edit and alter programs or files, search files, send messages to other terminals, and perform a variety of other functions. Files created through CANDE can be saved and used later by the same user or by other users to whom access is granted. CANDE provides the capability for interactive program development and testing concurrently with the execution of applications programs. It also provides effective control of the access, security, and charging functions in a computer time-sharing network.

AUTOMATED DOCUMENTATION SYSTEM (ADS): Enables a CANDE user to create, modify, or resequence the text content of a document and to establish the formatting parameters. The resulting file may be input to the ADS facility which will format the text into the form of the document on a printer back-up file that may be used to produce documents such as operating procedures, pro- ►

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► programming standards, program definitions, reference manuals or training texts.

ON-LINE DATA ENTRY SYSTEM (ODESY): A sophisticated data entry and validation system using multiple on-line visual display units. It provides a generalized and generative "front end" for the existing 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.

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

In addition to the basic (RP2) version, REPORTER II is available in an Advanced version, an Audit version, and an On-Line version. REPORTER II (Advanced) adds the capabilities for generation of multiple reports in one pass through the input data, creation of summary-only (matrix) reports, and controlled formatting for special reports or preprinted forms. AUDIT-REPORTER extends the REPORTER II system by providing auditors with effective software tools for testing and evaluating the records produced by an EDP system. The On-Line REPORTER is an optional module that can be added to any of the three preceding systems to provide an on-line mode of operation that enables users at remote terminals to enter, generate, compile, and execute report programs.

DATA MANAGEMENT SYSTEM II (DMS II): This comprehensive data base management system is integrated with the MCP operating system and uses MCP facilities for accessing records in the data base to achieve greater run-time efficiency. Through the MCP facilities, the DMS II data base can be accessed by applications programs operating in multiple processing environments, such as batch, remote job entry, time-sharing, and transaction processing. DMS II incorporates a Data And Structure Definition Language (DASDL) that provides for the logical description of data in sets or subsets and for mapping the logical data into physical structures. A variety of retrieval methods is supported, including indexed sequential, random, and ordered lists. The latter method creates indices that require small amounts of disk storage and permit very fast searches.

DMS II permits multiple indices to be established for accessing a file, and each file can be accessed by any of the available access methods to provide retrieval of information by different applications programs. Cobol and RPG II interfaces are provided. When multiple programs are accessing the data base, DMS II provides lockout protection at the record level to prevent simultaneous updating of a record. The DMS II audit trail captures a record of all data base maintenance functions to facilitate automatic recovery.

DMS INQUIRY: This optional extension of DMS II provides an easy-to-use language that enables non-EDP personnel to access the data base via remote terminals. Users can "browse" through information stored in the data base and retrieve it either serially or randomly, without the delays normally associated with programming and debugging an inquiry program.

BURROUGHS NETWORK ARCHITECTURE (BNA): A set of software designed to enhance the interaction of

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

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

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

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

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

The Primary Station controls the establishment of links for data transfer, controls the actual data transfer, and controls error recovery operations. The Secondary Stations can operate in the Normal Response Mode (NRM) or in the Asynchronous Response Mode (ARM). In the Normal Response Mode, the Secondary Station cannot initiate transmissions. Specific permission to transmit and/or respond to a command must be given to the Secondary Station by the Primary Station. Once given permission, a Secondary Station can transmit up to seven frames ►

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► (messages) without requiring additional permission. In an optional version of BDLC, up to 127 frames can be transmitted without requiring additional permission.

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

WORK FLOW MANAGEMENT: Implemented with the Work Flow Language (WFL), a free form English-like language for managing the flow of job streams, priorities, and resource allocation in a Burroughs multiprogramming environment. WFL can implement work flow control functions including task initiation, task termination, task attributes, file attributes, file equation, control statements, declarations, and printout control. WFL provides job streaming capabilities by specifying the execution sequence of interrelated programs as serial or parallel.

FUNCTIONAL LOGICAL ANALYSIS OF MACHINE EFFICIENCY (FLAME): FLAME is a performance evaluation tool designed to measure both hardware and software performance. FLAME collects raw data at specified intervals and writes it out to magnetic tape or disk for subsequent processing by the FLAMER report program. Additional program modules provide supplementary reports, report summaries, special versions of the System Run Log, disk utilization analyses, and real-time monitoring of the B 2900 and B 3900 systems.

UTILITY ROUTINES: A Sort Program Generator accepts parameters entered by the user and generates disk or tape sort programs tailored to meet specific requirements. It can also utilize the "intrinsic sort" capability of the MCP to perform immediate sorts without generating specialized programs. When disk units are used to hold the work files, either a tag sort or a full-record sort can be performed. For tape sorting, from 3 to 8 tape units can be used. A merge capability permits from 2 to 8 properly sequenced input files to be combined into a single output file.

DMPALL is a general information transfer routine that can print the contents of any card, disk, magnetic tape, or paper tape file or transcribe a file between any two types of hardware devices. The file ID, record length, blocking factor, and/or parity can be altered during the transcription compilations and executions, and for program listings.

The Time Analysis and Billing System (TABS) utilizes the MCP-created system log to analyze computer usage and disburse the costs of the computer and related services according to a hierarchy of charge numbers. The system consists of a series of daily programs that analyze central processor, peripheral, and main memory utilization, multiprogramming performance, and the total number of program executions and use time accumulated by each charge number. A monthly billing report reflects the total dollar value of computer services by charge number and prorates the charges for utility services based on the percentage use of the system. A computer charge summary provides a summary of accumulated month-to-date charges per account number for production runs, compilers, program testing, and use of program utilities.

Standard Utility functions provided with MCP include library maintenance, system log maintenance, conversion of data files from one format or media to another, and set/change program priorities for processor, memory, and scheduling before or during program scheduling and execution.

CONVERSION PROGRAMS: Burroughs offers a number of conversion programs designed to assist users in converting from competitive computers to the B 2900 and B 3900 Series systems. Translation programs are available to facilitate conversions from IBM System/360 RPG and RPG II to Burroughs Cobol, IBM BAL to Burroughs Cobol, Honeywell Cobol to Burroughs Cobol, Honeywell Easycode to Burroughs Cobol, NCR Cobol to Burroughs Cobol, and NCR Neat/3 to Burroughs Cobol.

APPLICATION PROGRAMS: Among the applications programs available from Burroughs are:

APT III (Numerical control)

BHAS II (Burroughs Hospital Administration System)

BHIPS (Burroughs Hospital Information Processing System)

BIPASS (Burroughs Inventory Planning, Analysis, and Simulation System)

BPS (Business Planning System)

DIS (Distribution Information System)

GBMS (General Business Management System)

Infostats (forecasting and statistical analysis)

PCS (Production Control System)

SCHOLASTIC System

TMS (Text Management and Electronic Mail System)

Total Banking System

PRICING

EQUIPMENT: Listed below are typical B 2900 and B 3900 configurations. All necessary control units and exchange units are included in the indicated prices. The quoted rental prices are for a one-year lease and include maintenance service.

SMALL B 2910 SYSTEM: Includes a B 2910 Central System (CPU with 512K bytes of main memory, system console, operator display terminal, two mini-disk drives, DLP Base, six DLPs, and B 9387-41 1 x 8 Disk Pack Drive Controller) plus one 130.4-megabyte B 9484-51 Dual Disk Pack Drive, one 80KBS B 9495-8 Magnetic Tape Unit with 1 x 4 Master Electronic Exchange, one 300-cpm B 9115 Card Reader, and one 650-lpm B 9246-6 Line Printer. The purchase price is \$203,158 and monthly rental is \$7,435.

TYPICAL B 2930 SYSTEM: Includes one B 2930 Central System (same as B 2910 above, with the addition of one B 874-4 Systems and Communications Processor and B 874 DLP) plus two 256K-byte memory modules for a total of 1024K bytes of main memory, one 402-megabyte B 9494-41 Dual Fixed-Disk Drive, two 120KBS B 9495-82 Magnetic Tape Units with 1x4 Master Electronic Exchange, one 600-cpm B 9116 Card Reader, one 1100-lpm B 9247-14 Line Printer, and two Synchronous/Asynchronous Data Set Dual Line Adapters. The purchase price is \$344,655 and monthly rental is \$12,758.

TYPICAL B 3955 SYSTEM: Includes one B 3955 Central System (CPU with 2048K bytes of main memory, integrated console, operator display terminal, two mini-disk drives, two DLP Bases, seven DLPs, and a B 9387-42 2x8 Disk Pack Drive Controller) plus one 804-megabyte B 9494-42 Dual Fixed-Disk Data Bank, four 120KBS B 9495-82 Magnetic

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► **Tape Units with 1x4 Master Electronic Exchange, one 600-cpm B 9116 Card Reader, one 1500-lpm B 9247-15 Line Printer, and one CP 3680 Data Communications System with an 8-Line Asynchronous Communications Adapter. The purchase price is \$566,145 and monthly rental is \$21,295.**

CONTRACT TERMS: The B 2900 and B 3900 systems are available for purchase or for lease under a 1-year, 3-year, or 5-year lease agreement. The standard lease agreement entitles the customer to unlimited use of the equipment and includes full-time equipment maintenance coverage (24 hours/day, 7 days/week). The standard maintenance agreement for purchased systems covers maintenance of the equipment for eight consecutive hours per day on Monday through Friday only; extended maintenance coverage is available at higher rates. The central system (CPU, memory, channels, etc.) is warranted for one year; the peripheral equipment, for 90 days.

All maintenance charges listed in this report are for "metro 1" (city) districts. Super city rates (e.g. New York or Chicago) are four percent higher. Rates outside a metro area (10 miles from city) are 20 percent higher.

All lease plans may include purchase options that allow 50 percent of the rental paid during the first 36 months to be

applied toward the purchase price at any time during the lease period.

SOFTWARE: All software is unbundled. Program Products for the B 2900/B 3900 systems are offered under either an Unlimited-Time License Plan, for a one-time charge or 12 monthly payments followed by an annual maintenance fee, or a Limited-Time License Plan, with monthly payments.

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

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

Effective January 1, 1982, Burroughs raised most purchase and 5-year lease prices 5 percent. Detailed prices were not available at the time this report went to press.

EQUIPMENT PRICES

		<u>Purchase Price</u>	<u>Monthly Maint. *</u>	<u>1-Year Lease**</u>	<u>5-Year Lease**</u>
PROCESSORS					
B 2910	Central System; includes CPU with 512K bytes of main memory; I/O processor; console and operator display with keyboard; two mini-disk drives for system maintenance; Data Link Processor (DLP) Base; DLPs for console, operator display, disk pack drive, magnetic tape drive, line printer, and card reader; and 1x8 disk pack drive controller; expandable to 1536K bytes of memory and 16 DLPs	\$120,000	\$280.00	\$ 4,550	\$3,600
B 2930	Central System; includes CPU with 512K bytes of main memory; I/O processor; console and operator display with keyboard; two mini-disk drives for system maintenance; DLP Base; DLPs for console, operator display, disk pack drive, magnetic tape drive, line printer, card reader, and B 874 Systems and Communications Processor (SCP); B 874 SCP with 32K bytes of memory; and 1x8 disk pack drive controller; expandable to 4864K bytes of main memory and 32 DLPs	190,000	344.00	7,300	5,750
B 3955	Central System; includes CPU with 2048K bytes of main memory; I/O processor; integrated console; operator display with keyboard; two mini-disk drives for system maintenance; two DLP Bases; DLPs for integrated console, operator display, disk pack drive, magnetic tape drive, line printer, and card reader; and 2x8 disk pack drive controller; expandable to 4864K bytes of main memory and 32 DLPs	290,000	537.00	11,000	9,000
SYSTEM OPTIONS***					
B 2999	Performance Upgrade Kit; upgrades a B 2910 to a B 2930	40,000	60.00	1,800	1,400
B 2905-90	Additional DLP Base for B 2900 systems; maximum of one per B 2910, three per B 2930	4,620	22.00	173	151
B 3909-91	Additional DLP Base for B 3955; maximum of three	10,000	35.75	390	325
B 2095-90	Exchange/Base Cabinet for B 2900 systems; can house a B 2377-6 Disk File Exchange or, on a B 2930 only, an additional DLP Base and/or a Shared System Processor	17,864	40.30	670	578
B 3095-91	Extension Cabinet for B 3955; includes one DLP Base; can house a second DLP Base or a Shared Systems Processor	25,000	13.00	970	800
B X376-95	Shared Systems Processor	12,000	49.70	470	400
B X376-92	Port Interface Adapter for B 3800/4800 DLPs	2,464	20.10	92	81
B X376-93	Port Interface Adapter for B 2800 DLPs	2,464	20.10	92	81
B X376-94	Port Interface Adapter for B X900 DLPs	2,464	20.10	92	81
B X373-90	B 9470 Disk File DLP-3 (three cards)	4,400	21.20	167	144
B X304-90	B 9484-51/B 9484-81/B 9494-41 Disk Drive DLP-2 (two cards)	4,400	14.20	167	144
B X305-90	Mini-Disk DLP-2 (two cards)	3,850	14.20	144	128
B X395-90	B 9495-8 Magnetic Tape DLP-2 (two cards)	3,850	14.20	144	128
B X395-91	B 9495-82/B 9495-83 Magnetic Tape DLP-2 (two cards)	3,850	14.20	144	128
B X395-92	B 9495-24/B 9495-32/B 9495-33 Magnetic Tape DLP-3 (three cards)	4,400	14.20	167	144
B X395-93	B 9495-82/B 9495-83 NRZ Magnetic Tape DLP-2 (two cards)	3,850	21.30	145	125
B X246-91	B 9246-20 Line Printer DLP-2 (two cards)	4,928	28.60	133	116
B X246-92	B 9246-6 Line Printer DLP-2 (two cards)	4,928	0.00	133	116

*Maintenance rates are for eight hours, five days per week.

**Lease prices include 24-hour, 7-day maintenance.

***X equals 2 for B 2900 systems and 3 for B 3900 systems.

Burroughs B 2900 and B 3900

EQUIPMENT PRICES

		Purchase Price	Monthly Maint.*	1-Year Lease**	5-Year Lease**
SYSTEM OPTIONS*** (Continued)					
B X247-93	B 9247-14 Line Printer DLP-2 (two cards)	4,928	14.20	133	116
B X247-94	B 9247-15 Line Printer DLP-2 (two cards)	4,928	14.20	133	116
B X110-90	B 9115/9116/9117 Card Reader DLP-2 (two cards)	2,750	14.20	105	87
B X137-90	B 9137-4/B 9190-2 Reader-Sorter DLP-3 (three cards)	8,008	21.20	300	260
B X138-90	B 9138-4 Reader-Sorter DLP-3 (three cards)	9,240	21.20	347	300
B X303-90	B 874 Systems and Communications Processor DLP-2 (two cards)	3,234	14.20	121	101
B X351-90	Uniline Data Set Connect DLP-3 (three cards)	2,500	18.00	130	110
B X351-91	Uniline TDI Connect DLP-3 (three cards)	2,500	18.00	130	110
MEMORY					
B 2005-262	256K-byte Memory Increment for B 2900 systems; 4 maximum on B 2910 and 17 maximum on B 2930	4,125	13.00	139	105
B 2909	Memory Expander for B 2930; required if memory exceeds 1536K bytes	12,765	24.00	472	417
B 3006-16	256K-byte Memory Increment for B 3955; 11 maximum	4,125	13.00	165	135
MASS STORAGE					
B 9470-1	Hear-Per-Track Disk File; primary drive; 5.5 megabytes; includes power supply and air system	40,800	102.00	1,260	1,020
B 9470-11	Add-on Drive; 5.5 megabytes; requires B 9470-1	34,800	99.00	1,070	870
B 9471-6	Disk File Electronics Unit for B 9470 drives; one required for every four drives	12,000	61.70	370	300
B 9484-81	Dual Disk Pack Drive; 348.8 megabytes	19,000	212.00	890	630
B 9385-1	Single Controller for B 9484-81 drive; 1x8	49,035	103.00	1,518	1,162
B 9385-2	Dual Controller; 2x8	60,795	206.00	1,869	1,443
B 9385-3	Dual Controller; 2x16	65,415	206.00	1,986	1,518
B 9484-51	Dual Disk Pack Drive; 130.4 megabytes	20,000	96.00	739	601
B 9494-41	Dual Fixed-Disk Drive; 402 megabytes	24,000	78.10	733	555
B 9494-42	Dual Fixed-Disk Data Bank; includes two dual-spindle B 9494-41 drives; 804 megabytes	40,000	157.00	1,374	1,023
B 9494-43	Dual Fixed-Disk Data Bank; includes three dual-spindle B 9494-41 drives; 1206 megabytes	57,000	235.00	1,934	1,599
B 9494-44	Dual Fixed-Disk Data Bank; includes four dual-spindle B 9494-41 drives; 1608 megabytes	75,000	315.00	2,394	1,952
B 9987-1	Dual Port Feature for B 9494-41 drive	5,600	19.50	170	140
B 9387-41	Controller for B 9494 or B 9484-51 drives; 1x8	40,000	66.30	1,177	996
B 9387-42	Controller for B 9494 or B 9484-51 drives; 2x8	54,750	201.00	1,630	1,389
B 9387-46	Controller for B 9494 or B 9484-51 drives; 2 x 16; includes disk exchange	65,150	207.00	2,007	1,681
B 9387-49	Controller for B 9494 or B 9484-51 drives; 4 x 16; includes disk exchange	132,300	385.00	4,267	3,363
B 9387-40	Controller for B 9494 or B 9484-51 drives; 6 x 16; includes disk exchange	210,450	578.00	6,676	5,485
B X387-5	Basic Disk Pack Drive Exchange for B 9387-41 and -42 controllers and B 9484-51 drive	25,460	111.00	872	667
B X387-6	Controller Port Expansion Adapter; expands B X387-5 to 4X or 8X	5,090	26.10	168	137
B X387-7	Exchange Expansion Adapter; allows B X387-5 to be used with up to 16 drives	16,125	78.10	557	425
B X387-8	Spindle Exchange Expansion; allows four additional spindles to be attached to B X387-5; maximum of 16 spindles per subsystem	6,365	26.10	221	168
MAGNETIC TAPE UNITS					
B 9495-8	Magnetic Tape Unit; 80 KBS, 9-channel, 1600 bpi, PE; requires B 9499-33, -34, or -35 Exchange	10,500	118.00	386	314
B 9495-45	Magnetic Tape Subsystem; consists of B 9495-8 tape unit and B 9499-33 Exchange	15,500	123.00	495	408
B 9495-46	Magnetic Tape Subsystem; consists of two B 9495-8 tape units and B 9499-33 Exchange	25,500	215.00	863	704
B 9499-33	1x4 Master Electronic Exchange	10,400	33.60	340	260
B 9499-34	1x8 Master Electronic Exchange	11,200	33.60	365	285
B 9499-35	2x8 Master Electronic Exchange	13,120	73.60	430	330
B 9495-82	Magnetic Tape Unit, 120 KBS, 9-channel, 1600 bpi, PE; requires B 9499-5X Exchange	16,720	114.00	581	451
B 9495-83	Magnetic Tape Unit, 120 KBS, 9-channel, 1600 bpi, PE; requires B 9499-5X Exchange	20,425	130.00	738	571
B 9499-50	1 x 4 Master Electronic Exchange	17,325	143.00	631	481
B 9499-51	1 x 8 Master Electronic Exchange	19,110	143.00	666	509
B 9499-52	2 x 8 Master Electronic Exchange	46,478	299.00	1,808	1,048
B 9499-53	2 x 16 Master Electronic Exchange	48,924	299.00	1,902	1,213
B 9499-54	3 x 16 Master Electronic Exchange	75,570	442.00	2,822	1,913
B 9499-55	4 x 16 Master Electronic Exchange	99,950	585.00	3,694	2,519
B 9999-4	NRZI Option for B 9495-82 and -83 drives	750	5.50	25	20
B 9999-5	NRZI Option for B 9499-50 to -55 exchanges	2,600	32.60	80	65
B 9495-24	Magnetic Tape Unit; 1250/320KBS, 9-channel, 6250/1600 bpi, GCR/PE	34,500	182.00	1,009	799
B 9495-32	Magnetic Tape Unit; 470/120 KBS, 9-channel, 6250/1600 bpi, GCR/PE	20,700	133.00	750	591
B 9495-32M	Same as B 9495-32, but includes formatter/controller	47,864	187.00	1,786	1,425
B 9495-33	Magnetic Tape Unit; 780/200 KBS, 9-channel, 6250/1600 bpi, GCR/PE	23,720	140.00	840	670
B 9495-33M	Same as B 9495-33, but includes formatter/controller	50,895	192.00	1,881	1,501
B 9499-21	GCR/PE Controller; 1 x 8	40,603	195.00	1,250	999
B 9499-22	GCR/PE Controller; 2 x 8	81,226	389.00	2,510	1,993
B 9499-23	GCR/PE Controller; 3 x 8	121,808	585.00	3,753	2,993
B 9499-24	GCR/PE Controller; 4 x 8	162,431	781.00	4,997	3,991

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Burroughs B 2900 and B 3900

EQUIPMENT PRICES

		Purchase Price	Monthly Maint.*	1-Year Lease**	5-Year Lease**
MAGNETIC TAPE UNITS (Continued)					
B 9499-42	Electronic Exchange for B 9499-21 through -24; 2 x 16	7,210	19.50	238	184
B 9499-43	Electronic Exchange for B 9499-21 through -24; 3 x 16	9,219	26.10	309	254
B 9499-44	Electronic Exchange for B 9499-21 through -24; 4 x 16	10,815	26.10	362	287
B 9999-3	Dual Host Switch	5,356	13.60	165	134
CARD READERS					
B 9115	Card Reader; 300 cpm, 80 column	8,198	56.00	280	211
B 9116	Card Reader; 600 cpm, 80 column	10,830	78.50	374	282
B 9117	Card Reader; 800 cpm, 80 column	12,335	96.30	423	326
B 9915	51-Column Read Feature for B 9115, B 9116, and B 9117	803	0.00	22	18
PRINTERS					
B 9246-6	Band Printer; 650 lpm, 132 positions	14,000	165.00	499	383
B 9247-14	Train Printer; 1100 lpm, 132 positions	33,000	413.00	1,334	1,062
B 9247-15	Train Printer; 1500 lpm, 132 positions	44,000	473.00	1,810	1,455
B 9942-10	Additional Train Module	3,245	36.40	124	101
B 9246-20	Train Printer; 2000 lpm, 132 positions	69,293	545.00	2,322	1,824
READER-SORTERS					
B 9137-4	MICR Reader-Sorter; 1000 dpm, 4 pockets; includes Multirack E13B, basic off-line sort, resettable item counter, and control interface	50,796	546.00	1,512	1,281
B 9937-11S	Four-Pocket Module; pockets 5 to 16	11,990	49.60	420	375
B 9937-50	Impact Endorser	8,362	102.00	245	199
B 9937-70	Basic Two-Field Off-Line Sort	1,236	9.70	34	30
B 9937-71	Eight-Pocket Basic Off-Line Sort; two fields only	1,483	9.70	41	36
B 9937-72	Expanded Off-Line Field Sort; provides one additional; maximum of eight fields	247	2.20	7	7
B 9937-73	Extended Sort Control	2,472	28.30	67	60
B 9937-74	Valid Character Check	247	2.00	7	7
B 9937-76	Zero Kill; three maximum	494	2.00	14	12
B 9937-77	No Field, No Digit; three maximum	494	2.00	14	12
B 9937-78	Digit Override; three maximum	494	2.00	14	12
B 9937-79	Digit Edit; three maximum	494	2.00	14	12
B 9937-80	Field Override; three maximum	494	2.00	14	12
B 9937-81	Field Edit; three maximum	494	2.00	14	12
B 9937-82	Stacker Overflow	494	2.00	14	12
B 9937-83	Batch Ticket Detector	494	2.00	14	12
B 9937-84	Resettable Item Counter	247	2.00	7	7
B 9937-85	Non-Resettable Item Counter	247	2.00	7	7
B 9937-86	Running Time Meter	247	2.00	7	7
B 9937-87	Mobile Carrier	155	0.00	0	0
B 9937-88	One-Tray Document Rack	62	0.00	0	0
B 9937-90	Control Interface; 3A Host Control	1,650	2.40	50	41
B 9937-91	Control Interface; 4A Host Control	1,650	2.40	50	41
B 9138-4	Reader/Nonimpact Endorser/Microfilmer/Sorter; 2600 dpm, 4 pockets, double read capability	233,295	1,430.00	5,980	5,105
B 9138-8	8 pockets	261,826	1,595.00	6,650	5,680
B 9138-12	12 pockets	290,460	1,760.00	7,935	6,260
B 9138-16	16 pockets	319,094	1,914.00	8,020	6,860
B 9138-20	20 pockets	347,728	2,068.00	8,710	7,440
B 9138-24	24 pockets	376,156	2,222.00	9,390	8,020
B 9138-28	28 pockets	404,996	2,376.00	10,080	8,610
B 9138-32	32 pockets	433,527	2,530.00	10,765	9,200
B 9938-72	4K bytes of Additional Memory	9,919	16.50	282	243
B 9938-53	Endorser	46,144	325.00	595	484
B 9938-60	Microfilm Module	131,840	605.00	2,045	1,755
Note: Lease rates for B 9138-4 Reader-Sorters include 7-day, 24-hour maintenance coverage and 100 hours of metered use per month; additional use is billed at the rate of \$13 to \$23 per hour, depending on the number of pockets.					
B 9190-2	MICR/OCR Reader-Sorter; 1625 dpm, 4 pockets; requires one control interface and at least one character recognition module	35,500	619.00	1,920	1,630
B 9990-90	Control Interface; 4A Host Control	1,650	3.50	50	40
B 9990-91	Control Interface; 3A Host Control	1,650	3.50	50	40
B 9990-21	MICR E13B Character Recognition Module; single track	14,695	51.60	480	410
B 9990-22	MICR E13B Character Recognition Module; double read	38,550	103.00	1,280	1,090
B 9990-32	OCR 7B (Credit Card)	50,300	138.00	1,640	1,390
B 9990-33	OCR A/1428	50,300	138.00	1,640	1,390
B 9990-34	OCR B/1403/407	50,300	138.00	1,640	1,390
B 9990-10	Four-Pocket Module; pockets 17-20	22,400	83.10	710	605
B 9990-11	Four-Pocket Module; pockets 5-16	12,450	52.00	395	335

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Burroughs B 2900 and B 3900

EQUIPMENT PRICES

► READER-SORTERS (Continued)

		Purchase Price	Monthly Maint.*	1-Year Lease**	5-Year Lease**
B 9990-12	Four-Pocket Module; pockets 21-32	12,450	52.00	395	335
B 9990-50	Impact Endorser; with digital advance	14,980	68.80	515	440
B 9990-53	Non-Impact Endorser, Ink Jet	32,900	186.00	1,055	895
B 9990-55	Impact Endorser; without digital advance	14,400	65.40	495	420
B 9990-60	Microfilm Camera	81,400	516.00	3,060	2,600
B 9990-70	Off-Line Sort Package	4,950	34.40	135	115

COMMUNICATIONS EQUIPMENT

B 874-1	Systems and Communications Processor (SCP); includes 1.7-megahertz processor, 12K bytes of control storage, integrated host interface, and 32-line adapter cluster	20,000	134.00	625	541
B 874-4	Similar to B 874-1, but includes 4-megahertz processor and 16K bytes of control storage	26,000	189.00	809	698
B 1-4	4K bytes of user memory for B 874	745	6.90	21	16
B 32-2	16K bytes of user memory for B 874	2,400	6.90	90	80
B 74-1	Memory Expansion Module for B 874 systems over 32K bytes	5,285	58.70	173	142
B 74-5	Dual Host Switch for B 874-4 processor	2,660	19.60	79	63
B 74-7	BDLC Feature for B 874-4 processor	1,760	10.50	53	42
B 551-1	Direct Connect Dual Line Adapter, two-wire; maximum data rate 9600 bps	1,910	6.60	45	37
B 551-2	Direct Connect Dual Line Adapter, TTY-compatible; maximum data rate 38,500 bps	1,175	6.60	37	32
B 551-3	Direct Connect Dual Line Adapter, Balanced Differential Interface; maximum data rate 19,200 bps	1,565	6.60	47	42
B 551-6	Synchronous/Asynchronous Data Set Dual Line Adapter; maximum data rate 9600 bps	1,175	6.60	37	32
B 551-7	BDLC Single Line Adapter for B 874-4; maximum data rate 9600 bps	1,410	9.20	42	37
B 551-12	Synchronous/Asynchronous Single Line Adapter with addressing; maximum data rate 9600 bps	980	6.60	32	26
CP 3680	Data Communications System; includes processor with 256K bytes of memory; 14 I/O interfaces, 20MB disk subsystem with interface, real-time clock, Dual Channel Port Controller (DCPC), firmware set, system console interface, and system cabinet	61,000	450.00	2,500	2,100
CP 3680-01	Redundant Data Communications System; includes second CP 3680 system plus CP 3643-01 Dual Port Interface Unit with cable, CP 3644-01 Dual System I/O Interface Unit with cable, CP 3645-01 I/O Expansion Cabinet, and CP 3646-01 I/O Port Extender with DCPC	58,000	400.00	2,400	2,000
CP 3610	Memory Module, 256K bytes	17,000	90.00	625	515
CP 3620-01	Host Interface Unit; one required for each host CPU (available through the first quarter of 1982)	2,500	15.00	110	90
CP 3620-03	Host Interface Unit; one required for each host CPU (available the second quarter of 1982)	2,500	15.00	110	90
CP 3630-01	Eight-Line Asynchronous Communications Adapter	5,150	30.00	190	155
CP 3631-01	Two-Line Synchronous/Asynchronous Communications Adapter	2,300	18.00	90	80
CP 3632-01	Direct Connect Interface Unit	350	2.00	18	10
CP 3633-01	Automatic Calling Unit	1,200	7.00	45	35
CP 3634-01	Line Interface Extension Cable, 50 feet	60	5.00	4	2
CP 3640-01	Remote Diagnostic Unit with modem	1,900	15.00	65	55
CP 3641-01	System Console	3,000	25.00	110	90
CP 3642-01	Power Fail Recovery System	2,500	20.00	90	80
CP 3643-01	Dual Processor Interface with cables	2,800	25.00	105	85
CP 3644-01	Dual System I/O Interface Unit with cables	3,650	28.00	135	110
CP 3645-01	I/O Port Expansion Cabinet with CP 3646-01	20,000	175.00	775	600
CP 3646-01	I/O Port Extender with Dual Channel Port Controller	17,400	160.00	640	520

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SOFTWARE PRICES

		Unlimited-Time Plan		Limited-Time Plan	
		Initial Charge			
		Single Payment	12 Monthly Payments	Annual Maint.	Monthly License
SSF	Software Facilities Program; includes MCP operating system, utilities, Basic GEMCOS, B 874 ND, Medium Systems ND, and one compiler	\$23,100	\$2,118	\$4,389	\$770
CBV	Cobol '68 Compiler	NC	NC	NC	NC
COB	Cobol '74 Compiler	3,300	303	627	110
RPG	RPG II Compiler	3,300	303	627	110
BAS	Basic Compiler	3,300	303	627	110
FTV	Fortran Compiler (IBM Level H compatible)	3,300	303	627	110
BPL	Burroughs Programming Language	NC	NC	NC	NC
TAB	TABS Analysis System	NC	NC	NC	NC
CE1	CANDE	2,250	206	430	75

Burroughs B 2900 and B 3900

SOFTWARE PRICES

		Unlimited-Time Plan		Limited-Time Plan	
		Initial Charge			
		Single Payment	12 Monthly Payments	Annual Maint.	Monthly License
▶ DE2	ODESY	4,675	428	890	157
MCA	GEMCOS Advanced	10,815	992	2,055	361
MCT	GEMCOS Total	13,905	1,275	2,645	464
RP2	Reporter II Basic	7,000	642	1,330	234
RPO	On-Line Reporter	1,030	95	195	94
AUD	Audit Reporter	15,080	1,382	2,865	503
ARP	Advanced Reporter II	11,030	1,011	2,095	368
ADS	Automated Documentation System	2,250	206	430	75
DM2	Data Management System II (DMS II)	12,000	1,100	2,280	400
DM1	DMS II Inquiry	3,000	275	570	100
WFL	Work Flow Management System	1,650	152	314	55
MC7	Message Control System Generator	2,660	244	505	89
BNS	Burroughs Network Services	14,025	1,285	2,668	468
FLM	FLAME Monitor	2,400	232	384	200
CP 3680 Software					
CP 3600 DCS	Data Communications Software for CP 3680	10,000	—	1,900	300
CP 3600 SCS	Standby Communications Software for CP 3680-01	5,000	—	950	150
Translators					
COF	RPG to Burroughs Cobol (CONFIRS)	7,415	680	1,410	206
BEA	IBM BAL to Burroughs Cobol	12,980	1,190	2,470	361
EZE	Honeywell Easycode to Burroughs Cobol	12,980	—	2,470	361
HN1	Honeywell Cobol to Burroughs Cobol	3,705	340	705	103
N3C	NCR Neat/3 Level 1 to Burroughs Cobol	8,500	779	1,615	283
CF1	NCR Cobol to Burroughs Cobol	5,560	510	1,060	288 ■