

# Burroughs B 2900 and B 3900

## MANAGEMENT SUMMARY

Virtually every mainframe manufacturer has during the past few months countered IBM and its announcement of the 4300 Series. Burroughs has proven to be no exception to the pattern. While the new 900 family will eventually encompass several series of systems, the initial Burroughs entry is in the medium-scale mainframe area with the 2900 and 3900 series.

This past February was the formal introduction time for the Burroughs 900 Series. The first two models in these series, the B 2930 and the B 3950, are Burroughs direct response to the IBM 4300 Series. The B 2930 and B 3950 provide substantially better throughput capacity than the older B 2800 and B 3800, and are object code compatible with the B 3700/4700/2800/3800/4800. In addition to improved throughput capacity, the B 2930 and the B 3950 offer 45-nanosecond access control storage, error checking and correcting (ECC) MOS memory composed of 16K-bit chips, occupy half as much space as the B 2800, and use 50 percent less power. The B 2930 and B 3950 both use TTL (transistor to transistor logic) with circuit chips containing up to 800 gates. Burroughs calls the architecture of the B 2930 and B 3950 micro-modular concurrent (perhaps better identified as asynchronous pipelined). Each CPU is composed of a series of processing elements which can operate concurrently.

These processing elements include:

- The program module, for instruction prefetch and decoding;



Featuring an asynchronous pipelined central processor architecture, the B 2900 and B 3900 are the first two series in the new Burroughs 900 family of systems. The two series provide from two to five times the throughput performance of the entry-level B 2800, occupy only half the space, and use only half the power.

## CHARACTERISTICS

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

Burroughs is generally considered to be one of the strongest competitors in the data processing marketplace, with a broad line of computer equipment spanning the range from small, entry-level systems to very large, multi-user, multi-processor systems. In addition to data processing equipment, Burroughs also markets magnetic media; business forms and supplies; document counting, encoding, signing, protecting, and disbursing equipment; programmable and nonprogrammable desktop calculators; specialized banking equipment; and other related products. Burroughs is international in scope and employs some 50,000 people in more than 120 countries around the globe.

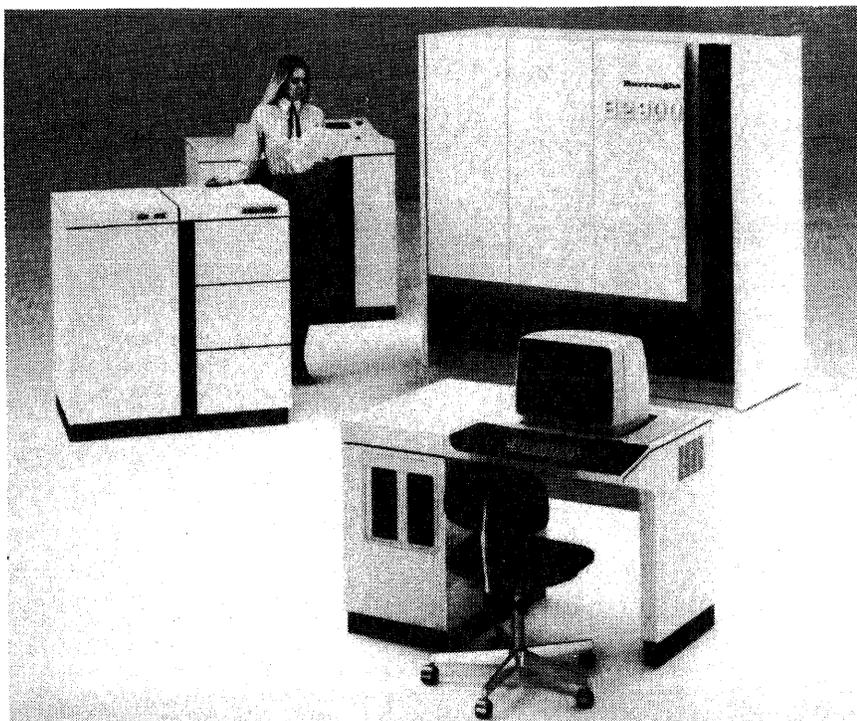
**MODELS:** B 2900 Series, B 2930; B 3900 Series, B 3950.

**DATE ANNOUNCED:** March 15, 1979.

**DATE OF FIRST DELIVERY:** Fourth quarter 1980.

## DATA FORMAT

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



The entry-level system in the new medium-scale series of the Burroughs 900 family, the B 2930 provides as standard seven data link processors, a data communications processor, and a microprocessor based disk controller. The basic B 2930 system also includes an operator console, operator display, and 243K byte mini-disk drive for system maintenance. Purchase price for the basic system is \$140,000; the one-year lease rate is \$4,250 per month.

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- ▷ ● The control module, for processing of addresses, size, and formats of the operation;
- The memory access module, which performs all data or memory accesses required by the execution module and stores or retrieves the data in the data buffer;
- The execution module;
- The data buffer;
- The memory control module, which coordinates memory requests from the memory access module and the I/O processor; and
- The I/O processor, for movement of data between the main memory and peripheral devices.

The Data Link Processors (DLP's), a group of micro-processor controlled devices that each control and service a particular category of peripheral devices, connect directly to the I/O processor for simultaneous processing and satisfaction of peripheral demands.

The B 2930 is the entry level system in the 900 Series medium-scale range. This system features memory expandable from 512K bytes to 1 million bytes in 256K byte increments, 7 Data Link Processors with an eighth optionally available, a data communications processor, an operator console and display, and up to 2 minidisk drives. The minidisk drives are diskette units with a capacity of 243K bytes each. The first minidisk drive is standard and is provided for use in system maintenance. The second drive is optional and is designed for program and/or data loading.

As an indication of the price range for the B 2930 processor, the basic system specified above can be purchased for \$140,000 or leased for one year at \$4,250 per month. A fully configured processor with one million bytes of memory and eight DLP's would be priced at \$151,500 on purchase and \$4,635 per month on a one-year lease.

The B 3950 includes 2 million bytes of memory expandable to 5 million bytes in 256K byte increments, 7 Data Link Processors expandable to 32, an operator console and display, and one minidisk drive with a second drive optional. The basic B 3950 can be purchased for \$230,000, while the B 3950 with maximum memory and maximum number of datalink processors can be purchased for \$399,640. A one-year lease for the basic and fully expanded B 3950 is quoted at \$7,200 and \$13,145 per month respectively.

Basic lease rates include 24 hour-per-day, seven-days-per-week maintenance service. The B 2930 and B 3950 are also available on three- or five-year leases. First shipments are expected to be made in the fourth quarter of 1979.

In addition to the uniprocessor configurations specified, the B 2930 and B 3950 can be expanded with up to three ▷

### ▶ 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 bytes to 1,048,576 bytes for the B 2930 and 2,097,152 bytes to 4,980,736 bytes for the B 3950. Memory increment size for either processor 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 functional units comprising these processors include the program module, the address buffer, the process control module, memory access module, data buffers, data preparation module, memory control module, execution module, and I/O processor.

The program module prefetches program instructions from memory, analyzes operators, calculates data addresses, and passes the translated instruction to the address buffer. The program module functions asynchronously with the execution module. The address buffer temporarily stores the translated instruction until the process control module is ready to receive operands. The process control module processes the translated instruction, passing the operation to the execution module. If the instruction calls for data, the addresses, lengths, and formats of the data are passed to the memory access module. The memory access module initiates all instruction fetches for the program module and all data requests for the execution module. The memory access module has the capability to pass data to and from the data buffer and instructions to the program module. Data is converted to the required format with boundary alignment and zone stripping in the data preparation module, a sub-module of the memory access module.

The data buffers are a temporary storage and work area for all data going to or coming from the execution module. Data buffers exist for both source and destination data.

The memory control module coordinates memory requests from the memory access module and the I/O processor. A dual port feature allows both the memory access module and the I/O processor to set up and queue memory requests concurrently. Memory access requests and actual memory accesses can be accepted concurrently.

The execution module performs all specified operations such as arithmetic, logical operations, and special operations. Logic of all modules is transistor to transistor logic (TTL) microcircuit technology.

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 (DLP's). Each DLP is microprocessor controlled and is independent of every other DLP. ▶

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➤ additional processors to form a loosely coupled multiprocessor system with shared mass storage, peripherals, and communications systems. The B 2930 and B 3950 can function in a systems network based on Burroughs Network Architecture or can interface with competitive networks.

### SOFTWARE

Software for the B 2930 and B 3950 is unbundled and packaged. The basic software facilities package includes the Master Control Program (MCP IV); an enhanced version of the Network Definition Language (NDL), the Generalized Message Control System (GEMCOS), and a language compiler. The compiler may either be COBOL, RPG II, FORTRAN, or BASIC.

Other software products are individually available for a monthly license fee. These include Command and Edit Language (CANDE), Automated Documentation System (ADS), On-Line Data Entry System (ODESY), DMS II, On-Line Reporter (Reporter II), Test Data Generator, and two new program products, Workflow Management System, and Data Management Inquiry (DMINQ).

The Workflow Management System allows the user to control the execution of jobs consisting of interrelated tasks.

System resources are assigned to jobs that must be executed concurrently on the basis of job classification and priorities. A workflow programming language is provided as part of the system. DMINQ is a new module designed to make access and inquiry to a DMS II data base easier. At the same time, DMINQ adds an extra level of security for individuals seeking access to a DMS II data base.

The new processors allow field engineering personnel to execute on-line diagnostic routines simultaneously with standard processing. A standard feature of the new processors is internal environmental monitoring, which warns against excessive fluctuations in heat or power.

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 compiler or translated into COBOL by the COFIRS II (COBOL from IBM RPG Specifications) routines.

### PERIPHERALS

The peripheral equipment for the B 2900 and B 3900 Series includes mass storage media with capacities of 5.5 megabytes to 349 megabytes, magnetic tape units from 40KBS to 200KBS PE and 470KBS to 1250KBS GCR/PE, line printers with speeds from 750 to 1500 lpm, card punches with speeds of 150 and 300 cpm, card ➤

➤ Multiprocessor configurations of up to four central processors are possible. The multiprocessor configurations can share the B 874-4 Systems and Communication Processor, mass storage, magnetic tape units, printers, punched card equipment, and MICR/OCR reader sorters.

Multiprocessor configurations are also supported by the B X376-90 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 and controls clock pulses to the system.

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.

**PHYSICAL SPECIFICATIONS:** The B 2930/B 3950 is housed in a system cabinet that is 76.5 inches long, 32 inches wide, and 73 inches high. The exchange/base cabinet is 43 inches long, 32 inches wide, and 73 inches high. The operator console is 44 inches long, 26 inches wide and 30 inches high.

### INPUT/OUTPUT CONTROL

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

The Data Link Processors are housed in the central processor on a Data Link Base, which contains 34 card positions and a power supply sufficient to handle 8 Data Link Processors. Although the maximum number of Data Link Processors per base is always 8, the exact number of Data Link Processors that can be housed in one Data Link Base is determined by the number of cards required by the individual DLP's, as signified in each DLP's numeric suffix, and cannot exceed 20 for each backplane. Data Link Processors are supplied for all peripheral devices announced for the B 2900 and B 3900 Series systems.

The aggregate data rate through the IOP is seven megabytes per second.

**SIMULTANEOUS OPERATIONS:** One input or one output operation on each installed DLP I/O channel can ➤

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➤ readers rated at 300 to 800 cpm, 1625 dpm and 2600 dpm MICR reader/sorters, operator console, and displays.

### COMMUNICATIONS

Communications facilities are provided by the B 874 System and Communication Processor and the BX351-9Y Uniline Data Link Processor. Features available through all communications processors include standard synchronous/asynchronous communications, standard two-wire direct connect, and automatic dialout. The B 874 also accommodates binary synchronous and BDLC protocols in either half- or full-duplex. The BX351-9Y accommodates Burroughs direct interface arrangements in addition to facilities mentioned above.

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

To facilitate the development of communications control programs, Burroughs provides the Generalized Message Control System (GEMCOS), a parameter-based system that executes 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. BPL is an ALGOL-like language and compiler designed to aid experienced programmers in solving complex message handling problems. The GEMCOS Message Control System forms the interface between the network control program and the user programs processing the communications messages.

### COMPETITIVE POSITION

The B 2930 provides something over twice the throughput capacity of the entry level B 2835 for about 30 percent less cost. In terms of relative performance and pricing it stands above the IBM 4331 and Honeywell Level 64 DPS-320. If the IBM 370/158-3 is taken to have a relative performance of 45, then the relative performance of the IBM 4331, Honeywell Level 64 DPS-320, and Burroughs B 2930 is 11, 11, and 14.3 (30 percent increase over DPS-320 and 4331), respectively. In comparison to IBM and Honeywell, the purchase price of the basic B 2930 is about twice that of the basic IBM 4331 and 72 percent higher than the basic DPS-320. The B 2930 purchase price includes seven channels as standard; the IBM 4331, none; and the DPS-320, two.

The B 3950 provides up to five times the throughput capacity of the entry level B 2835 and up to three times ➤

➤ occur simultaneously with computing. Other simultaneous operations are described under the Central Processor Section of this report.

### CONFIGURATION RULES

The basic B 2930 consists of 512K bytes of memory expandable to 1024K bytes in 256K byte increments. Each 256K increment is mounted on one board. Maximum memory in the B 2930 thus requires four boards. One DLP base and seven DLP's are standard on the B 2930. One DLP can be added to the B 2930. No DLP expansion beyond this limit is possible on the B 2930. DLP's packaged with the basic B 2930 include those for the line printer, operator display terminal, disk pack drive, card reader, magnetic tape subsystem, B 874-4 Systems and Communications Processor, and diagnostic console. The basic B 2930 also includes a universal disk pack controller and the B 874-4 Processor.

The basic B 3950 consists of 2048K bytes of memory expandable to 4864K bytes in 256K byte increments. A total of 22 boards are required for a maximum memory configuration. Two DLP bases and DLP's for line printer, operator display terminal, disk pack drive, magnetic tape subsystem, card reader, and diagnostic console are standard. Two additional DLP bases and 28 additional DLP's (maximum) can be added. The fourth DLP base requires the exchange/base cabinet.

The input/output processor (IOP) of the B 2900 and B 3900 Series is interfaced to the peripheral subsystems through Data Link Processors (DLP's). Each DLP is an independent microprocessor uniquely programmed for the specific peripheral subsystem it services. Every subsystem has at least one dedicated DLP. Multiple DLP's allow multiple channel access to a peripheral subsystem. DLP's provide high speed data transfer through record length buffers of 80 characters for punched card equipment, 132 characters for printers, and 5 256-byte buffers for disk pack drives.

I/O controls or DLP's from the B 2800/3800/4800 Series systems are not compatible with the B 2900 or B 3900 Series systems. Peripheral limitations on the B 2930 and B 3950 are only restricted by the number of available spaces for DLP's and the number of board spaces per DLP base. When configuring a system, the number of boards per DLP base must be less than or equal to 20 and the number of DLP's per DLP base must be less than or equal to 8. The currently available DLP's and the number of boards each contains is given in the Equipment Price List at the end of this report.

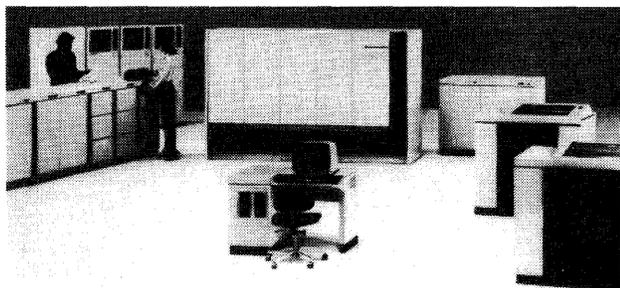
The B X376-90 Shared System Processor (SSP) permits code and data files residing on mass storage devices to be shared on any combination of up to four B X800 or B X900 Series systems. In order to connect a mass storage peripheral to the SSP, a port interface adapter is required between the disk drive control and the SSP. The B X800 and B X900 have their own port interface adaptor.

Additional configuration information can be found in the I/O Control and Mass Storage sections of this report.

### MASS STORAGE

**B 9470 HEAD-PER-TRACK FILES:** These fixed-head disk files, announced in December 1975 for use with B 2800/3800/4800 systems, 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. ➤

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The one announced model in the B 3900 series of the Burroughs 900 family is the B 3950. As a companion to the smaller B 2930, the B 3950 offers greater expandability with up to five million bytes of main memory and up to 32 data link processors. As with the B 2930, up to four B 3950 Central Processors can be interconnected to form a multiprocessor system.

▷ that of the B 3845. Cost of the B 3845 and B 3950 is about the same. The B 3950 is equal in relative performance (37) to the IBM 4341 and Univac 1100/60 Model C2, again based on the IBM 370/158-3 taken to have a relative performance of 45. A comparison of purchase prices shows that the basic B 3950 is about \$15,000 cheaper than the basic IBM 4341 and about \$150,000 cheaper than the Univac 1100/60 Model C2. The B 3950 comes with seven channels as standard; the IBM 4341 three; and the Univac 1100/60 Model C2, five. □

► 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. These subsystems may be configured with up to eight DLP's, with a maximum of four per CPU. The 8 DLP's simultaneously access up to 10 exchange disk subsystems, each with up to 22 megabytes of storage.

The B 9470 Head-Per-Track Subsystems can be used in conjunction with the File Protect Memory to permit multiple programs to share a common head-per-track subsystem.

The read/write heads are implemented using a new Burroughs integrated head technology, in which all of the functional components of a conventional read/write head are manufactured as one monolithic structure. Burroughs states that the new technology produces read/write heads that are more reliable and permits increased recording densities.

**B 9387 and B 9484-51 DISK PACK DRIVE SUBSYSTEMS:** These medium-capacity disk pack drives have 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.

The entry-level B 9387-2 subsystem includes a 1x4 controller and a dual disk drive with a capacity of 130.4 million bytes in the 180-byte sector mode. Four B 9484-51 dual drives can be connected to the B 9387-2 for a maximum subsystem capacity of 521.6 million bytes.

As many as eight spindles (four dual drives) can be attached to a B 9387-2, B 9387-41, or B 9387-42 controller. The B 9484-51 can also be configured with the B 9387-46 controller(s) to permit up to 16 spindles (8 dual drives) with up to 8 simultaneous access paths to the disk pack subsystem. The disk pack subsystems are interfaced through DLP's located in one or more central systems with a maximum of four disk pack DLP's per system. The B 9387 controllers can optionally have dual host switches which provide redundant connectivity for the data paths.

The B 9484-5 Dual Drives use the B 9974-5 Disk Pack, which contains five disk platters and provides five surfaces for user data and one surface for head guidance information. Each disk pack contains 814 user cylinders and one maintenance cylinder, with five tracks per cylinder. There are 90 sectors of 180 bytes each per track. A Track Following Servo feature permits the track alignment reference information to be placed in the disk pack to achieve greater head positioning accuracy. Other reliability features incorporated in the disk drive include Programmed Data Offset and Variable Strobe to facilitate recovery of marginal data, a Contamination Control System to provide a closed filtered air system, and modular construction of the units to facilitate maintenance. The B 9387-1 and -2 Controllers also generate error detection codes that can detect 11-bit error bursts during the transfer of a 180-byte sector and can automatically retry transmission of the sector.

**FILE PROTECT MEMORY:** This feature permits multiple programs, residing in either single or multiple processors, to share a common data base stored on Burroughs head-per-track disk files or disk pack drives. The feature makes it possible to "lock" specific disk record addresses, thus guarding against the errors that can occur when one program attempts to access a data record while it is being updated by another program.

The basic File Protect Memory (FPM) consists of a series of registers and sixteen 40-bit words of memory, permitting simultaneous locking of up to 16 disk record addresses. Up to 7 additional 16-word modules of FPM can be added, for a total capacity of 128 words. The FPM can interface into as many as four Disk File Controls, enabling up to four processors to share a common data base. All processors also share a common MCP residing on disk, a common File Directory, and a common Disk Available Table.

**B 9494 FIXED DISK DRIVE:** Stores 180 or 360 megabytes of data on 1 or 2 non-removable four-platter packs. The B 9494-21 contains 1 spindle and stores 180 megabytes. The B 9494-41 contains 2 spindles with a capacity of 360 megabytes.

Each spindle has an independent actuator and four non-removable platters with eight recording surfaces. All recording surfaces are used for data storage. Servo information, used to locate data storage tracks, is interspersed between the data tracks. There are 714 tracks per inch with a recording density of 6,551 bits per inch. Rotational delay is quoted as 8.17 milliseconds. Average head positioning time is given as 28 milliseconds. The data transfer rate is 650,000 bytes per second. ►

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► Using the B 9387-4X controllers, the B 9494-21 and B 9494-41 drives can be intermixed with B 9484-51 drives. The B 9494-21 and B 9494-41 can be configured with multiple B 9387-4X controllers to provide up to eight simultaneous access paths to a fixed disk or mixed removable and fixed disk subsystem. These data paths can communicate with DLP's located in one or more central systems, with a maximum of four in any one system. The B 9387 controllers can optionally have dual host switches which provide redundant connectivity for the data paths.

The B 9494 Fixed Disk Drive is also packaged in dual fixed disk data banks. The B 9494-41 stores 360 megabytes in 1 cabinet with 2 spindles; the B 9494-42, 720 megabytes in 2 cabinets; the B 9494-43, 1080 megabytes in 3 cabinets; and the B 9494-44, 1440 megabytes in 4 cabinets.

**B 9484-8 DUAL DISK PACK DRIVE:** This large capacity disk drive stores up to 348.8 million bytes of data on 2 removable disk packs.

Data is recorded on an 11-platter disk pack that is physically compatible but not format-compatible with the IBM 2316 Disk Pack. There are 180 bytes per sector, 60 sectors per track, and 10,800 bytes per track. Each surface consists of 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 9385-X controller is used with the B 9484-8 and can provide up to 4 simultaneous access paths to up to 16 disk pack spindles (8 dual drives) when the optional dual port feature is included in the drives. These data paths can communicate with DLP's located in one or more central systems. The 9385-X may have dual host switches as an option. These switches provide redundant connectivity for the multiple access paths.

**B 9489 INDUSTRY-COMPATIBLE MINI-DISK (ICMD) DRIVES:** The 9489-17 is a single drive housed in a 30-inch cabinet. Control for the B 9489 drives is furnished by the B 1489/-80 Mini-Disk Control. Each diskette stores 243K bytes of data, with 128 bytes per sector, 26 sectors per track, and 77 tracks per diskette, including three alternates. Track-to-track access time is 20 milliseconds per single step, and settling time is 10 milliseconds. Average access time is 343 milliseconds, and the data transfer rate is 31K bytes per second.

### INPUT/OUTPUT UNITS

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

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

All AE systems include a 28K processor, implemented in large- and medium-scale integrated circuits. Data movement is byte-serial, 8-bit parallel and is moved one byte at a time from the processor to one of four dedicated I/O channels. One byte of information can be moved within the

processor or between the processor, the memory, and the I/O channels in 1 microsecond. The memory is modular in 4K-byte increments and consists of 4K bytes of ROM (read-only memory) used for interpreter bootstrap (cold start) and permanent customer confidence programs, plus up to 28K bytes of RAM (random-access memory) available for interpreter and user storage. All systems have a data communications capability.

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

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

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

The basic AE 511 and AE 513 have the same characteristics as the AE 412 with the exception of the data storage media. The AE 511 uses a 239,000-byte magnetic tape cassette for data storage, and the AE 513 uses a Burroughs Super Mini-disk having 1 million bytes of data storage capacity.

The basic AE 501 system includes the matrix printer, a magnetic tape cassette unit with a data storage capacity of 239,000 bytes, and one asynchronous or synchronous data communications line.

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

**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. The B 9495-7 has a tape speed of 25 ips and a data transfer rate of 40,000 bytes per second. The 9495-8 has a tape speed of 50 ips and a data transfer rate of 80,000 bytes per second. The 9495-82 has a tape speed of 75 ips and a data transfer rate of 120,000 bytes per second for 1600 bpi, while the 9495-83 has a tape speed of 125 ips and a data transfer rate of 200,000 bytes per second. Maximum time to rewind a 2400-foot reel of tape is 115 seconds for the 9495-7, 96 seconds for the 9495-8, 92 seconds for the 9495-82. 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 on the model and master electronics unit. The B 9495-7 and B 9495-8 employ either 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 2x8 configuration employing two DLP's is possible ►

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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 DLP's, up to 16 tape units, and the appropriate B 9499-5X Master Electronics Exchange (1x4, 1x8, 2x8, 2x16, 3x16, or 4x16). In addition to the Master Electronic Units, a subsystem containing the B 9495-7 and B 9495-8 require a B X395-90 DLP (Data Link Processor) and the B 9495-8X, the B X395-91 DLP.

**B 9495 PE/GCR MAGNETIC TAPE UNITS:** These drives employ tapes certified at 1600 bpi or 3200 fci. Data is recorded on 1/2-inch tape in IBM-compatible PE mode at 1600 bpi or in GCR mode at 6250 bpi. The B 9495-22 has a tape speed of 75 ips and a data transfer rate of 470,000 bytes per second at 6250 bpi and 120,000 bytes per second at 1600 bpi. The B 9495-23 has a tape speed of 125 ips and a data transfer rate of 780,000 bytes per second at 6250 bpi and 200,000 bytes per second at 1600 bpi. With a tape speed of 200 ips, the B 9495-24 has a data transfer rate of 1,250,000 bytes per second at 6250 bpi and 320,000 bytes per second at 1600 bpi. Rewind speed for the B 9495-22 and B 9495-23 is 55 seconds; for the B 9495-24, 45 seconds.

A tape subsystem consisting of B 9495-2X Magnetic 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, 1x8; the B 9499-22, 2x8; the B 9499-23, 3x8; and the B 9499-24, 4x8. The B 9499-4X Electronic Exchange increases the capabilities of B 9499-22, B 9499-23, and B 9499-24 to 2x16, 3x16 and 4x16, respectively. In addition to the Master Exchange Units, a subsystem containing a B 9495-2X requires the B X395-92 DLP.

**B 911X CARD READERS:** The B 9115 reads standard 80-column cards serially by column at a rated speed of 300 cpm. The B 9115 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. The optional B 9915 Feature enables the B 9115 to read 51-column cards.

The B 9116 Card Reader reads up to 600 cpm. Otherwise, it has the same characteristics as the B 9115.

The B 9117 Card Reader reads up to 800 cpm. Otherwise, it has the same characteristics as the B 9115.

A B 911X Card Reader is usable with any B 2900 or B 3900 Series system and requires a B X110-90 DLP.

**B 921X CARD PUNCHES:** The B 9212 punches standard 80-column cards at up to 150 cards per minute.

The B 9213 Card Punch punches standard 80-column cards at up to 300 cpm. The feed hopper holds up to 2200 cards, and three program-selectable stackers hold at least 1400 cards each. Usable with any B 2900 or B 3900 Series system, a B 921X requires a B X112-90 DLP.

**LINE PRINTERS:** Burroughs offers three printers that span a range of speeds from 750 to 1500 lines per minute. All three models are usable with any B 2900 or B 3900 Series system. Their model numbers, rated speeds, printing techniques, and required DLP as follows:

- B 9247-16: 750-lpm, train; B X247-92 DLP
- B 9247-14: 1100-lpm, train; B X247-93 DLP
- B 9247-15: 1500-lpm, train; B X247-94 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, and the 96-character set contains both upper and lower case ASCII or EBCDIC alphabets. The train printers handle vertical format control through either the Burroughs Forms-Self Align System, which uses codes preprinted on the forms, or a 12-channel VFU. The B 9247 Train Printers can employ 4- to 20-inch-wide paper and have a skipping speed of 20 ips.

**MICR READER-SORTERS:** Burroughs offers a choice of two MICR Reader-Sorters for use on the B 2900 and B 3900 Series systems. The B 9137-3 and the B 9138, in addition to the standard functions of MICR reading and sorting, can also endorse and microfilm documents during the prime pass. Both the B 9137-3 and B 9138 employ a double read method, in which the MICR characters are read twice during each pass by two separate read heads. The first read is termed a "deep" read, and the second a "shallow" read. Both techniques are capable of reading perfect MICR characters, but the deep read technique can also interpret imperfect characters that have been weakly encoded, have marred surfaces, or are creased or folded across their surface. The deep reading technique goes deeply into the characters in an attempt to read whatever fragments of the characters are present.

The B 9137-3 contains four pockets, and the system can be expanded in multiples of 4 pockets up to 32 pockets. For any configuration beyond 16 pockets, an Expansion Feature must be included. Maximum throughput rate of the system is 1625 items per minute for a batch containing only 5 3/4-inch documents, the minimum length that the unit can process. Slower feed speeds are developed with longer documents, so that the maximum-length documents of 9 1/2 inches are processed at a rate of 984 documents per minute. Documents of varying sizes within the specification limits can be intermixed for processing and may be encoded either in MICR or OCR characters. In addition to the length limits of 5 3/4 to 9 1/2 inches, items must be between 2 1/2 and 4 1/2 inches in height with a length to height ratio between 1.6:1 and 3:1. Thickness must not exceed 0.009 inch.

The system will process items in carrier envelopes or those with correction labels. No more than 50 documents with correction labels between 0.006 and 0.009 inch thick can be in the input hopper at any one time. The input hopper holds a total of 17 1/2 inches of documents.

The B 9137-3 is equipped with a number of optional features in addition to pocket expansion, including stacker overflow, valid character check, multi-track E13B, endorser, batch ticket detector, short document read, short document module expander, mobile carrier, resettable or non-resettable item counter, and running-time meter. Off-line features include basic and extended sort, digit override, edit field override, or edit and zero kill, including a numeric optical character recognition feature.

The features that distinguish the B 9138 from the B 9137 extend well beyond the matter of its greater sorting speed. Although certain characteristics are identical, there are many important differences, as the following discussion emphasizes.

Two feeders are provided with the B 9138. 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 1/4 inches in length, the rated throughput of the B 9138 is 131,000 documents per hour if no stops occur. The rated speed for 6-inch documents is 2600 dpm, or 156,000

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► documents per hour. Reading, endorsing (optional), microfilming (optional), and sorting are accomplished at full sort speed.

The B 9138 has its own microprocessor with 16,000 bytes of user memory, expandable to 44,000 bytes in 4096-byte increments. The system can also utilize a 234,000-byte diskette drive which provides the ability to store and reload multiple off-line sort programs independently of the central system. It also allows the user to create off-line sort programs from the B 9138 keyboard with the utility sort generator. Additional capabilities of the diskette unit are on-line "cold-start" of the controller programs and extended maintenance and diagnostic program storage media.

The B 9138 has bulk filing capability when equipped with the endorsing and microfilm options. Unlike a B 9137 system, in which a CRT screen can be used as an option when attached to and controlled by the host computer, the integrated screen on the B 9138 is attached to the system processor, which allow its use during off-line as well as on-line operations. The display has the capacity for 480 characters per screen, and is used for programming, field engineering, and operator communications. The operator uses it for operating status as well as jam and missort recovery information.

The pocket modules each contain 4 pockets and can be jointed to other pocket modules for a maximum configuration of 32 pockets. Each stacker pocket has a capacity of 950 documents and can be unloaded while the sorter is operating.

The B 9137-3 requires a B X137-90 DLP while the B 9138 requires a B X138-90 DLP.

**B 9348-3 OPERATOR DISPLAY AND STANDING-LEVEL CONSOLE:** Announced in December 1975, the B 9348-3 includes an alphanumeric keyboard and a 9.5 by 7.5 inch CRT display with a capacity of 1,920 characters in 24 lines of 80 characters each. The display character set consists of 69 characters, including upper and lower case letter plus control characters, which are formed using a 5-by-7 dot matrix technique. The B 9348-3 operates under control of the MCP operating system, which interrogates system tables every 10 seconds and automatically displays information on the active job mix and system status, the jobs in the schedule, and system resource allocation. Single or multiple processor configurations can have up to eight display consoles per processor. The B 9348-3 is connected to a B 2900 or B 3900 Series system through console and operator display DLP's.

**B 9410 PERIPHERAL SWITCHING UNIT:** Permits peripheral devices to be manually switched between two DLP's, which may be connected to different central processors. It is connected to a B 2900 or B 3900 Series system through an 8-Channel I/O Cabinet. (The B 9410 will generally be used for card readers, printers, and other low-speed I/O devices; electronic Exchange units permit magnetic tape units and disk files to be shared by two or more processors.) The B 9495-2X Magnetic Tape Units have their own dual port switch, the B 9999-3.

**TD 73X SELF-SCAN DISPLAY/KEYBOARD:** This display unit has the capability to display 12 lines of 40 characters for a total of 480 characters. A 128 ASCII character set is employed, with each character displayed in a 5-by-7 dot matrix. Illumination is red phosphor. The TD 73X has extended memory options; A/N source data, 10-key auxiliary, alphanumeric, and extended alphanumeric keyboards; and various peripherals. Data rates are 150 to 1800 bps asynchronous, 2400 to 4800 bps synchronous, 9600 bps via two-wire direct interface (TDI), and 64,000 bps via Burroughs direct interface (BDI).

The TD 731 has control for asynchronous data sets and direct-connect communications interfaces; the TD 733, control for synchronous data sets; and the TD 737, control for synchronous data set communications and IBM bisynchronous data communications procedures. The TD 732, TD 734, and TD 738 are equivalent to the TD 731, TD 733, and TD 737, respectively, but with peripheral capability added. Available peripherals include a magnetic card reader, cassette tape drives, and printers of the B 9249 series.

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

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

### COMMUNICATIONS CONTROL

**B 874-4 SYSTEMS AND COMMUNICATIONS PROCESSOR:** Includes a 4-megahertz microprogrammed processor with 16K bytes of control memory and 16K bytes of MOS main memory, expandable to 96K bytes. Control memory houses the microcode that is the result of the B 874 NDL (Network Definition Language) compilation process. Microcode consists of four major functional routines; the line scanner, which controls the adapter cluster and the line adapters; the host interface, which communicates with the host system and performs the functions requested by the host message control system (MCS); the NDL interpreter which fetches and executes NDL system code; and the manager, a routine that senses host system and adapter interrupts and transfers control to the proper microcode procedures.

Main memory houses NDL system code, NDL system tables, and an I/O buffer for data. The processor also controls the host interface adapter, the adapter cluster, and line controls. Other major components of the B 874-4 include a 600K byte-per-second DMA facility, which time shares memory with the processor for transferring message blocks to/from the host system; a memory exchange; host adapter and host control, which provide the interface between the host system, the processor, and main storage through the DMA; dual host switch, for manual switching of the B 874-4 from one host system to another; and an adapter cluster, for provision of buffering and operation coordination between the B 874-4 and the line adapters.

Line adapters available for the B 874-4 include BDLC (half- or full-duplex), standard asynchronous/synchronous/ binary synchronous, standard two-wire direct connect, and automatic dial-out communications lines. The B 874-4 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 19.2K bits per second per line adapter in an environment of up to 32 half-duplex communications lines or 16 BLDC half- full-duplex lines. Up to four different speeds in support of asynchronous data set and direct connect operation are ►

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► handled by the adapter cluster. Speeds may be selected from 50, 75, 110, 150, 300, 600, 1000, 1200, 1800, 2400, 4800, 9600, and 19,200 bps. These speeds can be assigned to any asynchronous data set connect or direct connect as required. In synchronous operation, line speeds are derived from the data set supplied clock. Each auto call/data set adapter occupies one of the 16 full positions in the adapter cluster, with a corresponding reduction in line interface potential.

The capacity of the B 874-4 is approximately 50,000 bytes per second using Burroughs supplied request sets. If all half-duplex lines attached are operated at the listed speeds, up to 32 lines can operate at up to 1800 bps each; up to 32 lines can operate at up to 9600 bps; or 4 lines can operate at a speed over 9600 bps. The maximum number of stations pollable on one line is 100. A total of 10 B 874-4's can be attached to a B 2900 or B 3900 Series system, limited only by the available DLP positions. Since 10 B 874-4's can be attached, the maximum number of lines per system is 320.

Use of the B 874-4 in a B 2900 or B 3900 Series system can reduce total main memory requirements for line handler functions by up to 60 percent, according to Burroughs.

**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 2400 bits per second, and in the asynchronous mode the maximum transmission speed is 1800 bits per second.

## SOFTWARE

**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, announced in December 1975 and released in August 1976 for the B 2800/B 3800/B 4800 Series systems is the currently available version of MCP and represents a major revision of the MCP V operating system. It contains additional enhancements to permit more flexible main memory management and interface the DLP I/O subsystem. The MCP VI multiprogramming executive has the capability to supervise the execution of up to 80 concurrent jobs. Under MCP VI, user programs can be divided into a resident portion that must be resident in main memory for program execution and a series of over-layable 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 "quick overlay" area. When adequate main memory space is available, program 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 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 insure 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 VI features are: 1) support of the File Protect Memory hardware, enabling multiple programs to open and share the same head-per-tack disk files at the same time; 2) a "STOQUE" capability that permits asynchronous transfers of data between programs; 3) a 3-level priority system that permits assignment of separate priorities for scheduling, processing, and memory utilization; 4) a 3-level logging system that provides an SPO 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; 5) ability to relocate the MCP modules in main memory; 6) ability to overlap MCP I/O operations (such as opening files) with computing; 7) redesigned I/O routines with higher execution speeds; 8) improved directory management and searching techniques; and 9) improved checkpoint/restart facilities.

MCP VI 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 VI 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 874-4 System and Communication 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. ►

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► 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 NCP is in use, all or part of the SDL Interpreter must be resident in memory.

**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, Report Writer, 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 now supported. The compiler accepts a COBOL source program and generates a machine-code object program which is placed in disk storage, ready for execution; it can also be written on magnetic tape if desired. The compiler automatically divides all object programs into logical, relocatable segments, and all coding generated by the compiler is re-entrant. COBOL compilation is a 2-pass process.

A compile-time option permits the COBOL compiler to accept the source code of COBOL programs prepared for Burroughs B 2700/3700/4700 and IBM System/360 and System/370 computers without requiring a filter program.

Older versions of the COBOL compiler, originally developed for use with the B 2700, B 3700, and B 4700 systems and also usable with the B 2800, B 3800, and B 4800 systems, are still available on the B 2900 and B 3900. These older compilers are required if the COBOL translators for IBM, Univac, Honeywell or NCR are employed. All three versions offer identical language facilities, but the larger ones provide faster compilation and higher limits on the number of data names, procedure names, and pictures that can be used. The smallest compiler, called "COBOL L," requires 30K bytes of main memory and 240K bytes of disk storage. The largest compiler, called "COBOL V," requires 45K bytes of main memory and generates more efficient object programs. The B 2700/3700/4700 COBOL language is generally consistent with American National Standard COBOL 68 and includes most of its facilities, although the Report Writer module has not been implemented. Effective (though non-standard) language facilities are included for the control of data communications, MICR sorter-readers, and multi-tape lists.

The COBOL Cross-Reference Utility System accepts COBOL source programs as input and generates convenient flowcharts and/or cross-reference listings that show where each data name, internal program switch, and special register is used.

**FORTRAN:** The compiler, called "FORT IV," 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 6800 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 these processors to achieve significantly higher object program execution speeds.

**BASIC:** Burroughs offers two different compilers for the BASIC language, a Memory Sharing version and a Batch version. Memory Sharing BASIC provides interactive compilation of programs entered from remote terminals. Batch BASIC compiles source programs entered via a card reader. Both versions implement a language that generally corresponds to the original Dartmouth BASIC system, and both provide immediate execution of successfully compiled programs.

**REPORT PROGRAM GENERATOR:** The compiler converts source programs written in the widely used RPG language into object programs that can be executed by B 2900 or B 3900 Series 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.

For users accustomed to programming in the IBM 360/20 RPG language, Burroughs offers a software tool called COFIRS (COBOL From IBM RPG Specifications). COFIRS accepts 360/20 RPG source statements and generates a COBOL source program reflecting the RPG program logic, which is then compiled and executed. Although COFIRS was developed primarily to facilitate conversions from the 360/20, Burroughs maintains that it can also be used effectively on a continuing basis by RPG-oriented installations.

**ASSEMBLERS:** Assembler Language is the symbolic programming language used to write machine-oriented programs. The Advanced Assembler requires 11K bytes of main memory and at least 90K bytes of disk storage (in addition to MCP and working storage requirements), plus card or paper tape reader and printer. Magnetic tape can be used for input and/or output if desired.

The assembly language programmer normally uses a fixed-format coding sheet whose arrangement corresponds closely with the 3-address format of the machine instructions. If the programmer chooses, he can code in a Free-Form Assembly Language which is translated into the regular Assembler format by the Free-Form Translator and then assembled in the usual manner. The Advanced Assembler provides numerous macro and pseudo operations, including data communications control macros. Facilities such as blocking, label checking, and comprehensive error recovery procedure are provided by the MCP.

A Burroughs Program Language (BPL) Compiler, delivered in April 1972, enables 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 modification of instructions.

**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 for the B 874-4 Systems and Communications Processor.

It can also be used to develop a Message Control System for the host processor that interfaces to the B 874-4 processor. Alternatively, a user-developed Message Control System can be written in COBOL or the Burroughs Program Language (BPL). The NDL compiler requires a minimum of 90K bytes of main memory. ►

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► **COMMAND AND EDIT (CANDE):** Provides generalized file preparation on-line programming, editing, and updating in an interactive terminal-oriented environment. CANDE is an MCS (Message Control System) that runs in conjunction with NDL. The NDL generated network controller performs all the data communications related functions, while CANDE performs file updating and text editing functions. The on-line user has all compilers available including COBOL, FORTRAN, RPG II, BPL, and BASIC. CANDE can support a maximum of 16 terminals and makes optimum use of Model 33 teletypewriters and TD 83X CRT's. A basic user code/password type of security is available with the system. CANDE also provides a recovery system. CANDE requires 22K bytes of memory for one terminal plus 2K bytes for each additional terminal when specific file functions such as "GET" are used. MCP and NDL are not included in the memory requirements of CANDE.

**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.

**GENERALIZED MESSAGE CONTROL SYSTEM (GEMCOS):** GEMCOS is a generalized system that uses parameters for generating an installation-tailored Message Control System (MCS). The Message Control System (MCS) provides the interface between the B 874-4 and user application programs by decoding, formatting, and directing incoming messages to the appropriate user program for processing. The system can accommodate user-written code and contains facilities for exchange of data between application programs. Recovery capabilities include dynamic restoration of the network configuration, an audit mechanism for logging specified messages, and a network control command for orderly system shutdown in the event of system failure. The recovery mechanism can be synchronized with DMS II recovery to insure data base integrity. A password security system is provided to control access to the communications network. The system also includes an auxiliary program to permit network commands to be entered into the MCS from the console printer or a card reader. GEMCOS also provides a transaction translation feature which translates data from the format required by the workstation to the format required by the application program.

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

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

denies access to sensitive data items by unauthorized users. Through an interface module, the reports can be generated from and viewed at remote workstations.

On-line Reporter supplements Reporter II and provides all the facilities of Reporter II for creation of reports. On-line Reporter defines the size of the viewing screen and can direct reports or portions of a report to a printer.

**DISK FORTE/2:** Announced in August 1973 as an improved version of Burroughs' original Disk FORTE, Disk FORTE/2 is a file management system that provides the ability to structure and maintain a data base on Burroughs head-per-track disk files, disk pack drives, or disk cartridge drives. Up to 999 managed files with 16,000,000 or more records per file can be defined using a free-form keyword language. Six access methods are supported for data retrieval from the data base: index-random, random, index-sequential, index-sequential-grouped, ordered lists, and unordered lists. 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. A Resource Optimizing Feature permits elements of a data base to be combined on a single disk file to reduce buffer space requirements.

Disk FORTE/2 permits user library routines written in COBOL to be included at generation time to handle such functions as defining item-level record layouts, data validation, and exit handling. Disk FORTE/2 generates COBOL source code which is compiled along with the user's application program. A filter program is available to convert FORTE control files and programs to the new FORTE/2 specifications. Disk FORTE/2 files are interchangeable between B 1700, B 1800, B 2700/3700/4700, B 2800/3800/4800, B 6700/7700, and B 6800/7800 systems. Future enhancements include a search feature, a remap feature for restructuring the data base, and an automatic audit/recovery capability.

**TIME AND ANALYSIS BILLING SYSTEM (TABS):** Designed to provide B 1800 system users with a comprehensive analysis of the SYSTEM/LOG, which is automatically maintained by the MCP. TABS provides information for system mix and peripheral utilization reports, program execution reports, and services-rendered reports. The automatic logging function of the MCP creates the SYSTEM/LOG, which contains information about all significant events in a multiprogramming system. The analysis function of TABS extracts and generates machine utilization statistics and program performance. 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, compiles, program testing, and use of program utilities.

As the selected reports are produced, month-to-date statistics are maintained in TABS data files. The statistics, together with information on installation costs supplied by the user, can be used to distribute the system cost equitably among individuals, departments, or applications using the data processing services. TABS requires a minimum of 20K bytes exclusive of MCP.

**DATA MANAGEMENT SYSTEM II:** DMS-II is a data base management system consisting of two components: a Data and Structure Definition Language (DASDL), which

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► provides for the logical description of data sets or subsets and for mapping the logical data onto physical structures, and a COBOL interface.

DMS-II Inquiry provides access to a data base from any terminal. In addition to extracting information from the data base, DMS-II Inquiry allows the terminal user to interrogate the description of a data base. Inquiry statements are composed of basic functions tied together by English like connectors. Inquiry statements include HELP, which provides information to the user on how to use Inquiry; SHOW, which allows the user to list on a terminal all or selected portions of a data base; REPEAT, which allows the user to repeat a previous statement; EDIT, for modification of a previous statement; GENERATE, for creation of a private copy of a portion of a data base; DEFINE, for creation of statement abbreviations; and INQUIRY, which provides a means of selecting records of interest and naming the information to be displayed. For more information on DMS-II, see Report 70E-112-01.

### BURROUGHS NETWORK ARCHITECTURE (BNA):

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

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

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

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

BDLC is based on High-Level Data Line Control Procedures (HDLC), the protocol standard developed by the International Standards Organization (ISO) and by the European Computer Manufacturers Association (ECMA), and Advanced Data Communications Control Procedures (ADCCP), the protocol standard developed by the American National Standards Institute (ANSI). It is Burroughs' inten-

tion to maintain BDLC compatible with the bit-oriented protocols of selected competitors (such as IBM's SDLC).

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

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

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

**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 print out control. WFL provides job streaming capabilities by specifying the execution sequence of interrelated programs as serial or parallel.

### 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 which may be used to produce documents such as operating procedures, programming standards, program definitions, reference manuals or training texts.

**UTILITY ROUTINES:** A Sort Program Generator accepts parameters entered by the user and generates disk or tape sort programs tailored to meet his 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 ►

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► 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.

Standard Utility functions provided with MCP V1 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 COBOL-68; UNIVAC (ex-RCA) Series 70 COBOL or BAL to Burroughs COBOL; Honeywell Series 200/2000 COBOL to Burroughs COBOL; Honeywell Series 200 Easy-coder to Burroughs COBOL; and NCR Century Series NEAT/3 Level 1 to Burroughs COBOL.

**APPLICATION PROGRAMS:** See the Software Prices section at the end of this report for a listing of applications programs available for the B 2900 and B 3900 Series systems.

**CONTRACT TERMS:** The B 2900 and B 3900 Series systems available for purchase or by standard equipment lease agreement which includes equipment maintenance and entitles the customer to unlimited use of the equipment. The standard agreement for purchased systems covers maintenance of the equipment for eight consecutive hours a day, Monday through Friday. Leased systems are covered for 24 hour, 7 day maintenance. The CPU is warranted for one year; the other equipment, for 90 days.

In addition to the standard 1-year lease, Burroughs offers 3-year and 5-year leases. All lease plans may include purchase options which allow 50% of the rental paid during the first 36 months to be applied toward the purchase price at any time during the lease period.

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

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

|                                 | <u>Rate</u> | <u>Minimum</u> |
|---------------------------------|-------------|----------------|
| Mon. through Fri., 8 AM to 5 PM | \$72/hr.    | 1 hour         |
| All other times                 | \$84/hr.    | 2 hours        |

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

All applications software is separately priced under Burroughs' Program Products plan. The Program Products are offered under either an Unlimited-Time License Plan, for a one-time charge followed by an annual maintenance fee, or a Limited-Time License Plan, with monthly payments. The available Program Products and their associated license fees are listed under Software Prices at the end of this report.

**TECHNICAL SUPPORT:** Users can purchase Burroughs technical assistance in several ways: under a System Analyst Assistance Agreement, for \$425 on a per-diem basis or by the hour at \$53 per hour.

**EDUCATION:** Users can obtain the necessary training by paying for individual courses. The separately priced courses announced to date range from 3 to 8 days in length and cost \$125 per day for each attendee.■

## EQUIPMENT PRICES

| <b>PROCESSORS</b> |   | <u>Purchase Price</u> | <u>Monthly Maint.*</u> | <u>1-Year Lease**</u> | <u>5-Year Lease**</u> |
|-------------------|---|-----------------------|------------------------|-----------------------|-----------------------|
| B 2930            | Basic system; includes CPU with 512K bytes of error correcting main memory; I/O sub-system; data link processor (DLP) base; DLPs for system console/maintenance function, operator display, card reader, line printer, magnetic tape units, disk units, and B 874-4 Systems and Communications Processor (SCP); desk-level console; operator display; 243K-byte mini-disk drive for system maintenance; SCP; 32K-byte user memory for SCP; and integrated B 9387-41 Universal Disk Drive Controller | \$140,000             | \$320.00               | \$4,250               | \$3,400               |
| B 3950            | Basic system; includes CPU with 2048K bytes of error correcting main memory; I/O sub-system; two DLP basis; DLPs for system console/maintenance function, operator display, card reader, line printer, magnetic tape units, and disk units; desk level console; operator display; and 243K-byte mini disk drive   | 230,000               | 500.00                 | 7,200                 | 5,800                 |

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

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

\*\*\*X equals 2 for 2900 series and 3 for 3900 series.

†Lease prices do not include maintenance rates, which are quoted on an hourly basis depending on usage.

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### EQUIPMENT PRICES

|                             |  | <u>Purchase Price</u> | <u>Monthly Maint.*</u> | <u>1-Year Lease**</u> | <u>5-Year Lease**</u> |
|-----------------------------|--|-----------------------|------------------------|-----------------------|-----------------------|
| <b>PROCESSOR OPTIONS***</b> |  |                       |                        |                       |                       |
| B 3905-90                   | Additional DLP Base for B 3950   | 4,200                 | 20.00                  | 150                   | 130                   |
| B 2095-90                   | Exchange Cabinet   | 16,240                | 31.00                  | 580                   | 500                   |
| B 3095-90                   | Exchange/DLP Base Cabinet for B 3950   | 16,240                | 31.00                  | 580                   | 500                   |
| B 2999                      | Field Upgrade Kit; Upgrades B 2930 to a B 3950; includes second DLP base, second memory base, processor firmware cards, performance level-3 firmware | 150,000               | 200.00                 | 3,845                 | 3,180                 |
| B X110-90                   | B 9115/B 9116/B 9117 Card Reader DLP Version 2   | 2,500                 | 12.00                  | 90                    | 75                    |
| B X112-90                   | B 9112/B 9113 Card Punch DLP (two boards)  | 3,500                 | 12.00                  | 125                   | 110                   |
| B X305-90                   | Mini-Disk DLP (two boards)   | 3,500                 | 12.00                  | 125                   | 110                   |
| B X247-92                   | B 9247-13/B 9247-16 Line Printer DLP (two boards)  | 4,480                 | 12.00                  | 115                   | 100                   |
| B X247-93                   | B 9247-14 Line Printer DLP (two boards)  | 4,480                 | 12.00                  | 115                   | 100                   |
| B X247-94                   | B 9247-15 Line Printer DLP (two boards)  | 4,480                 | 12.00                  | 115                   | 100                   |
| B X395-90                   | B 9495-7/B 9495-8 Magnetic Tape Unit DLP (two boards)  | 3,500                 | 12.00                  | 125                   | 110                   |
| B X395-91                   | B 9495-82/B 9495-83 Magnetic Tape Unit DLP (two boards)  | 3,500                 | 12.00                  | 125                   | 110                   |
| B X395-92                   | B 9495-22/B 9495-23/B 9495-24 Magnetic Tape Unit DLP (three boards)  | 4,000                 | 18.00                  | 145                   | 125                   |
| B X373-90                   | B 9470 Head-Per-Track Disk File DLP (three boards)   | 4,000                 | 18.00                  | 145                   | 125                   |
| B X304-90                   | B 9484-51/B 9494-21/B 9494-41/B 9484-8 Disk Drive DLP (two boards)   | 4,000                 | 12.00                  | 145                   | 125                   |
| B X137-90                   | B 9137-3 Reader Sorter DLP (three boards)  | 7,280                 | 18.00                  | 260                   | 225                   |
| B X138-90                   | B 9138 Reader Sorter DLP (three boards)  | 8,400                 | 18.00                  | 300                   | 260                   |
| B X303-90                   | B 874 Communication DLP (two boards)   | 2,940                 | 12.00                  | 105                   | 90                    |
| B X351-90                   | Uniline Data Set Connect DLP (three boards)  | 2,940                 | 18.00                  | 105                   | 90                    |
| B X351-91                   | Uniline BDI/TDI DLP (three boards)   | 2,940                 | 18.00                  | 105                   | 90                    |
| B X351-92                   | Auto-Call Adapter for B X351-90  | 140                   | 1.00                   | 5                     | 5                     |
| B X376-90                   | Shared Systems Processor   | 29,260                | 96.00                  | 1,045                 | 905                   |
| B X376-92                   | Port Interface Adapter for B X800 controls   | 2,240                 | 17.00                  | 80                    | 70                    |
| B X376-93                   | Port Interface Adapter for B X800 DLPs   | 2,240                 | 17.00                  | 80                    | 70                    |
| B X376-94                   | Port Interface Adapter for B X900 DLPs   | 2,240                 | 17.00                  | 80                    | 70                    |
| B 9410                      | Peripheral Switching Unit  | 7,715                 | 25.30                  | 197                   | 161                   |
| B 9410-1                    | Switching Relay Module   | 1,545                 | 5.00                   | 40                    | 33                    |
| <b>MEMORY</b>               |  |                       |                        |                       |                       |
| B 2005-256                  | 256K-byte Memory Increment for B 2930  | 3,750                 | 10.00                  | 120                   | 90                    |
| B 2005-256                  | 256K-byte Memory Increment for B 3950  | 3,750                 | 10.00                  | 120                   | 90                    |
| <b>MASS STORAGE</b>         |  |                       |                        |                       |                       |
| B 9470-1                    | Head-Per-Track Disk File, Primary Drive; 5.5 megabytes; includes power supply and air system   | 34,000                | 71.40                  | 1,030                 | 840                   |
| B 9470-11                   | Add-on Drive; 5.5 megabytes; requires B 9470-1   | 28,000                | 69.20                  | 850                   | 695                   |
| B 9471-6                    | Head-Per-Track Disk File Electronics Unit for B 9470 drives; one required for each four B 9470 drives  | 10,000                | 43.10                  | 305                   | 250                   |
| B 9387-2                    | Disk Pack Drive Controller for up to four B 9484-51 drives   | 10,651                | 30.00                  | 323                   | 275                   |
| B 9387-41                   | Universal Disk Pack Drive Controller for up to eight B 9484-51 B 9494-21/B 9494-4X drives and data banks   | 40,000                | 51.00                  | 1,068                 | 904                   |
| B 9387-42                   | Dual Access Universal Disk Pack Drive Controller for up to eight B 9484-51/B 9494-21/B 9494-4X drives and data banks                                 | 54,750                | 155.00                 | 1,478                 | 1,260                 |
| B 9387-46                   | Dual Access Universal Disk Pack Drive Controller for up to 16 B 9484-51/B 9494-21/B 9494-4X drives and data banks                                    | 65,150                | 159.00                 | 1,820                 | 1,525                 |
| BX387-5                     | 2 x 4 Disk Drive Exchange for B 9387-2 and B 9484-5  | 25,460                | 85.00                  | 830                   | 670                   |
| BX387-6                     | Port Expansion Adapter; expands B 9484-5 to four controller paths; up to three BX387-6 allowed for up to eight controller paths                      | 5,090                 | 20.00                  | 160                   | 140                   |
| BX387-7                     | Further Port Expansion Adapter; expands B 9484-5 to 16 controller paths  | 16,125                | 60.00                  | 530                   | 425                   |

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

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

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## Burroughs B 2900 and B 3900

## EQUIPMENT PRICES

| MASS STORAGE (Continued)   |   | Purchase Price | Monthly Maint.* | 1-Year Lease** | 5-Year Lease** |
|----------------------------|---|----------------|-----------------|----------------|----------------|
| BX387-8                    | Spindle Exchange Expansion; allows B 9387-2 to handle up to eight B 9848-51 drives; up to three allowed BX387-8 allowed for up to 16 drives | 6,365          | 20.00           | 210            | 170            |
| B 9484-51                  | Dual Disk Pack Drive; 130.4 megabytes   | 20,000         | 85.00           | 670            | 545            |
| B 9494-21                  | Fixed Disk Drive; 180 megabytes   | 16,000         | 65.00           | 444            | 345            |
| B 9494-41                  | Fixed Disk Drive; 360 megabytes   | 24,000         | 95.00           | 665            | 504            |
| B 9494-41                  | Fixed Disk Drive Data Bank; 360 megabytes   | 24,000         | 95.00           | 665            | 504            |
| B 9494-42                  | 720 megabytes   | 40,000         | 190.00          | 1,247          | 928            |
| B 9494-43                  | 1080 megabytes  | 57,000         | 285.00          | 1,754          | 1,450          |
| B 9494-44                  | 1440 megabytes  | 75,000         | 380.00          | 2,171          | 1,770          |
| B 9385-1                   | Single Controller for up to eight B 9484-8 drives   | 49,035         | 78.80           | 1,518          | 1,162          |
| B 9385-2                   | Dual Controller for up to eight B 9484-8 drives   | 60,795         | 158.00          | 1,869          | 1,443          |
| B 9385-3                   | Dual Controller for up to 16 B 9484-8 drives  | 65,415         | 158.00          | 1,986          | 1,518          |
| B 9484-8                   | Dual Disk Pack Drive; 348.8 megabytes   | 32,760         | 200.00          | 1,010          | 777            |
| B 1489/-80                 | MiniDisk Control for the B 9489-16  | 4,244          | 12.30           | 128            | 106            |
| B 9489-16                  | Industry Compatible MiniDisk Drive; dual spindle, 486K bytes  | 6,530          | 25.00           | 221            | 180            |
| <b>MAGNETIC TAPE UNITS</b> |   |                |                 |                |                |
| B 9495-7                   | Magnetic Tape Unit; 40KB, 9 channel, 1600 bpi, PE   | 9,000          | 85.10           | 320            | 265            |
| B 9495-8                   | Magnetic Tape Unit; 80KB, 9 channel, 1600 bpi, PE   | 10,000         | 90.40           | 350            | 285            |
| B 9499-33                  | 1x4 Master Electronics Exchange for B 9495-7 and B 9495-8; PE   | 10,400         | 25.80           | 340            | 260            |
| B 9499-34                  | 1x8 Exchange  | 11,200         | 25.80           | 365            | 285            |
| B 9499-35                  | 2x8 Dual Exchange   | 13,120         | 56.60           | 430            | 330            |
| B 9495-82                  | Magnetic Tape Unit; 120KB, 9 channel, 1600 bpi, PE  | 17,600         | 88.10           | 555            | 430            |
| B 9495-83                  | Magnetic Tape Unit; 200KB, 9 channel, 1600 bpi, PE  | 21,500         | 100.00          | 705            | 545            |
| B 9499-50                  | 1x4 Master Electronics Exchange for B 9495-82 and B 9495-83; PE   | 16,500         | 110.00          | 545            | 415            |
| B 9499-51                  | 1x8 Exchange  | 18,200         | 110.00          | 575            | 440            |
| B 9499-52                  | 2x8 Dual Exchange   | 46,478         | 230.00          | 1,640          | 950            |
| B 9499-53                  | 2x16 Dual Exchange  | 48,924         | 230.00          | 1,725          | 1,100          |
| B 9499-54                  | 3x16 Three Way Exchange   | 75,570         | 340.00          | 2,560          | 1,735          |
| B 9499-55                  | 4x16 Four Way Exchange  | 99,950         | 450.00          | 3,350          | 2,285          |
| B 9495-22                  | Magnetic Tape Unit; 470/120KB, 9 channel, 6250/1600 bpi, GCR/PE   | 25,874         | 110.00          | 680            | 536            |
| B 9495-23                  | Magnetic Tape Unit; 780/200KB, 9 channel, 6250/1600 bpi, GCR/PE   | 29,664         | 115.00          | 762            | 608            |
| B 9495-24                  | Magnetic Tape Unit; 1250/320KB, 9 channel, 6250/1600 bpi, GCR/PE  | 32,548         | 145.00          | 891            | 711            |
| B 9499-21                  | 1x8 GCR/PE Controller for B 9495-2X   | 40,603         | 150.00          | 1,133          | 906            |
| B 9499-22                  | 2x8 Controller  | 81,226         | 300.00          | 2,276          | 1,808          |
| B 9499-23                  | 3x8 Controller  | 121,808        | 450.00          | 3,404          | 2,714          |
| B 9499-24                  | 4x8 Controller  | 162,431        | 600.00          | 4,532          | 3,620          |
| B 9499-42                  | 2x16 Exchange for B 9499-22   | 7,210          | 15.00           | 227            | 175            |
| B 9499-43                  | 3x16 Exchange   | 9,219          | 20.00           | 294            | 242            |
| B 9499-44                  | 4x16 Exchange   | 10,815         | 20.00           | 345            | 273            |
| B 9999-3                   | Dual Port Switch  | 5,356          | 10.50           | 165            | 134            |
| B 9495-41                  | Packaged Magnetic Tape Subsystem; B 9495-7 Drive and B 9499-33 Exchange   | 11,700         | 85.00           | 360            | 295            |
| B 9495-42                  | Package with additional B 9495-7 Drive  | 20,700         | 140.00          | 680            | 560            |
| B 9495-45                  | Packaged Magnetic Tape Subsystem; B 9495-8 Drive and B 9499-33 Exchange   | 13,500         | 95.00           | 420            | 345            |
| B 9495-46                  | Package with additional B 9495-8 Drive  | 23,500         | 165.00          | 770            | 630            |
| <b>LINE PRINTERS</b>       |   |                |                 |                |                |
| B 9247-16                  | Train Printer; 750 lpm, 132 positions   | 20,000         | 200.00          | 650            | 525            |
| B 9247-14                  | Train Printer; 1100 lpm, 132 positions  | 33,000         | 349.00          | 1,100          | 875            |
| B 9247-15                  | Train Printer; 1500 lpm, 132 positions  | 44,000         | 400.00          | 1,500          | 1,200          |
| B 9942-10                  | Additional Train Module for the B 9247-14 or B 9247-15  | 3,245          | —               | 124            | 101            |

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### EQUIPMENT PRICES

|                               |  | <u>Purchase Price</u> | <u>Monthly Maint.*</u> | <u>1-Year Lease**</u> | <u>5-Year Lease**</u> |
|-------------------------------|--|-----------------------|------------------------|-----------------------|-----------------------|
| <b>PUNCHED CARD EQUIPMENT</b> |  |                       |                        |                       |                       |
| B 9115                        | Card Reader; 300 cpm, 80-column; requires B 115 Control                                    | 7,809                 | 39.20                  | 283                   | 191                   |
| B 9116                        | Card Reader; 600 cpm, 80-column; requires B 1115 Control                                   | 9,845                 | 54.90                  | 324                   | 245                   |
| B 9117                        | Card Reader; 800 cpm, 80-column, requires B 1115 Control                                   | 11,204                | 67.30                  | 366                   | 282                   |
| B 9212                        | Card Punch; 150 cpm, 96-column; requires B 1213 Control                                    | 24,014                | 142.00                 | 610                   | 478                   |
| B 9213                        | Card Punch; 300 cpm, 96-column; requires B 1213 Control                                    | 29,605                | 182.00                 | 748                   | 585                   |
| <b>READER-SORTERS</b>         |  |                       |                        |                       |                       |
| B 9137-3                      | Reader/Non-impact Endorser/Microfilmer/Sorter; 1625 dpm, 4 pockets, double read capability | 41,200                | 660.00                 | 1,524                 | 1,339                 |
| B 9937-10                     | Expansion Feature; pockets 17 to 32  | 4,944                 | 14.60                  | 134                   | 117                   |
| B 9937-11                     | Four Pocket Module; pockets 5 to 16  | 14,832                | 51.00                  | 400                   | 351                   |
| B 9937-12                     | Four Pocket Module; pockets 17 to 32   | 14,832                | 51.00                  | 400                   | 351                   |
| B 9937-22                     | Double Read Feature; MICR E13B   | 31,930                | 123.00                 | 922                   | 811                   |
| B 9937-24                     | Dual Read Option; MICR/OCR or OCR/OCR  | 7,416                 | 36.50                  | 200                   | 176                   |
| B 9937-25                     | Short Document Read Feature  | 494                   | 2.80                   | 14                    | 12                    |
| B 9937-26                     | Short Document Module Expander   | 247                   | —                      | 7                     | 7                     |
| B 9937-30                     | Numeric OCR-A Size 1 Character Recognition   | 47,380                | 172.00                 | 1,330                 | 1,169                 |
| B 9937-32                     | OCR-7B Credit Card Character Recognition   | 47,380                | 168.00                 | 1,329                 | 1,169                 |
| B 9937-33                     | OCR-A 1428 Character Recognition   | 47,380                | 168.00                 | 1,329                 | 1,169                 |
| B 9937-34                     | OCR-B 1403 Character Recognition   | 47,380                | 168.00                 | 1,329                 | 1,169                 |
| B 9937-40                     | OCR-A 1428/OCR-B 1403 Character Recognition  | 47,380                | 251.00                 | 1,329                 | 1,169                 |
| B 9937-41                     | OCR-7B/OCR-A 1428 Character Recognition  | 71,070                | 251.00                 | 1,994                 | 1,755                 |
| B 9937-42                     | OCR-7B/OCR-B 1403 Character Recognition  | 71,070                | 251.00                 | 1,994                 | 1,755                 |
| B 9937-53                     | Endorser/Printer; three lines, one time non impact   | 27,295                | 205.00                 | 790                   | 694                   |
| B 9937-60                     | Microfilm Module   | 95,275                | 489.00                 | 2,766                 | 2,432                 |
| B 9937-70                     | Basic Two Field Off-Line Sort  | 1,236                 | 7.40                   | 34                    | 30                    |
| B 9937-71                     | Eight Pocket Basic Two field Off-Line Sort   | 1,483                 | 7.40                   | 41                    | 36                    |
| B 9937-72                     | Expanded Off-Line Field Sort; provides for one additional                                  | 247                   | —                      | 7                     | 7                     |
| B 9937-73                     | Extended Sort Control  | 2,472                 | 21.80                  | 67                    | 60                    |
| B 9937-74                     | Valid Character Check  | 247                   | 1.50                   | 7                     | 7                     |
| B 9937-76                     | Zero Kill; can elect two others from B 9937-77 to -81                                      | 494                   | 1.50                   | 14                    | 12                    |
| B 9937-77                     | No Field, No Digit; can elect two others from B 9937-76 to -81                             | 494                   | 1.50                   | 14                    | 12                    |
| B 9937-78                     | Digit Override; can elect two others from B 9937-76 to -81                                 | 494                   | 1.50                   | 14                    | 12                    |
| B 9937-79                     | Digit Edit; can elect two others from B 9937-76 to -81                                     | 494                   | 1.50                   | 14                    | 12                    |
| B 9937-80                     | Field Override; can elect two others from B 9937-76 to -81                                 | 494                   | 1.50                   | 14                    | 12                    |
| B 9937-81                     | Field Edit; can elect two others from B 9937-76 to -81                                     | 494                   | 1.50                   | 14                    | 12                    |
| B 9937-82                     | Stacker Overflow   | 494                   | 1.50                   | 14                    | 12                    |
| B 9937-83                     | Batch Ticket Detector  | 494                   | 1.50                   | 14                    | 12                    |
| B 9937-84                     | Resettable Item Counter  | 247                   | 1.50                   | 7                     | 7                     |
| B 9937-85                     | Nonresettable  | 247                   | 1.50                   | 7                     | 7                     |
| B 9937-86                     | Running Time Meter   | 247                   | 1.50                   | 7                     | 7                     |
| B 9937-87                     | Mobile Carrier   | 155                   | —                      | —                     | —                     |
| B 9937-88                     | One Tray Document Rack   | 62                    | —                      | —                     | —                     |
| B 9138-4                      | Reader/Nonimpact Endorser/Microfilmer/Sorter; 2600 dpm, 4 pockets, double read capability  | 233,295               | 1,560                  | 3,850+                | 3,319+                |
| B 9138-8                      | 8 pockets  | 261,826               | 1,730                  | 4,293†                | 3,702†                |
| B 9138-12                     | 12 pockets   | 290,460               | 1,890                  | 4,737†                | 4,084†                |
| B 9138-16                     | 16 pockets   | 319,094               | 2,050                  | 5,181†                | 4,467†                |
| B 9138-20                     | 20 pockets   | 347,728               | 2,215                  | 5,626†                | 4,850†                |
| B 9138-24                     | 24 pockets   | 376,156               | 2,375                  | 6,072†                | 5,282†                |
| B 9138-28                     | 28 pockets   | 404,996               | 2,535                  | 6,514†                | 5,734†                |
| B 9138-32                     | 32 pockets   | 433,527               | 2,685                  | 6,958†                | 6,125†                |
| B 9938-72                     | 4K bytes of Additional Memory  | 9,919                 | 15                     | 282†                  | 243†                  |
| B 9938-53                     | Endorser   | 46,144                | 390                    | 599†                  | 484†                  |
| B 9938-60                     | Microfilm Module   | 131,840               | 835                    | 2,045†                | 1,755†                |

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

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

\*\*\*X equals 2 for 2900 series and 3 for 3900 series.

†Lease prices do not include maintenance rates, which are quoted on an hourly basis depending on usage.

## Burroughs B 2900 and B 3900

## EQUIPMENT PRICES

|   |  | <u>Purchase Price</u> | <u>Monthly Maint.*</u> | <u>1-Year Lease**</u> | <u>5-Year Lease**</u> |
|---|--|-----------------------|------------------------|-----------------------|-----------------------|
| <b>TERMINALS</b>                                    |  |                       |                        |                       |                       |
| TD 731  | Self-scan display/keyboard with control for async. data sets & direct-connect communications interface   | 2,715                 | 26.41                  | 120                   | 116                   |
| TD 732  | TD 731 unit with peripheral capability added   | 2,865                 | 26.41                  | 130                   | 126                   |
| TD 733  | Self-Scan display/keyboard with control for sync. data set communications  | 2,715                 | 26.41                  | 120                   | 116                   |
| TD 734  | TD 733 unit with peripheral capability added   | 2,865                 | 26.41                  | 130                   | 126                   |
| TD 737  | Self-Scan display/keyboard with control for sync. data set communications and IBM Bi-Sync. data communications procedures  | 2,715                 | 26.41                  | 120                   | 116                   |
| TD 738  | TD 737 unit with peripheral capability added   | 2,865                 | 26.41                  | 130                   | 126                   |
| TD 831  | Self-Scan display/keyboard with control for async. data sets & direct-connect communications interface   | 2,796                 | 22.91                  | 124                   | 49                    |
| TD 832  | TD 831 unit with peripheral capability added   | 2,951                 | 22.91                  | 134                   | 130                   |
| TD 833  | Self-Scan display/keyboard with control for sync. data set communications  | 2,796                 | 22.91                  | 124                   | 119                   |
| TD 834  | TD 833 unit with peripheral capability added   | 2,951                 | 22.91                  | 134                   | 130                   |
| TD 837  | Self-Scan display/keyboard with control for sync. data set communications and IBM Bi-Sync. data communications procedures  | 2,796                 | 22.91                  | 124                   | 119                   |
| TD 838  | TD 837 unit with peripheral capability added   | 2,951                 | 22.91                  | 134                   | 130                   |
| Options for the TD 730 and TD 830 Series Terminals: |  |                       |                        |                       |                       |
| TD 016  | A/N source data keyboard (includes 6-foot separation cable)  | 275                   | 3.12                   | 13                    | 10                    |
| TD 017  | Ten-key auxiliary keyboard (includes 2-foot separation cable)  | 180                   | 1.59                   | 7                     | 6                     |
| TD 015-A  | Alphanumeric typewriter keyboard   | 275                   | 3.12                   | 13                    | 10                    |
| TD 019  | Expanded alphanumeric keyboard   | 700                   | 3.25                   | 30                    | 26                    |
| TD 019-1  | Expanded alphanumeric keyboard with built-in magnetic card reader  | 900                   | 9.75                   | 39                    | 34                    |
| TD 105  | Non-display of control characters (the display of control characters, such as form delimiters, is inhibited—this feature is available on a special factory order basis only)                   | 206                   | 0.00                   | 10                    | 8                     |
| Peripherals for the TD X32, TD X34, and TD X38      |  |                       |                        |                       |                       |
| TD 078-1  | Auxiliary magnetic card reader for the TD 015  | 1,260                 | 8.17                   | 42                    | 26                    |
| TD 076  | Cassette controller (includes one A 9290-25 driver—can be shared by up to four TD's); other peripherals include the A 9249 series of printers and the A 9490-25 additional cassette tape drive | 3,255                 | 19.08                  | 108                   | 90                    |
| TC 4001   | Printing Terminal; 60 cps  |                       |                        |                       |                       |
|   | Intelligent Terminal with TC 4001 Printing Unit:   |                       |                        |                       |                       |
| TC 5110   | With one cassette drive  | 13,700                | 71.83                  | 433                   | 339                   |
| TC 5113   | With two cassette drives   | 16,790                | 94.33                  | 535                   | 407                   |
| <b>DATA ENTRY SUBSYSTEMS</b>                        |  |                       |                        |                       |                       |
| AE 412  | Audit Entry Data Preparation System  | 9,425                 | —                      | 345                   | 335                   |
| AE 422  | Audit Entry Data Preparation System  | 7,365                 | —                      | 272                   | 264                   |
| AE 501  | Audit Entry Data Preparation System  | 10,238                | 782                    | 304                   | 295                   |
| AE 511  | Audit Entry Data Preparation System  | 10,558                | —                      | 427                   | 415                   |
| AE 513  | Audit Entry Data Preparation System  | 10,764                | —                      | 422                   | 410                   |
| <b>SHARED SYSTEMS PROCESSOR***</b>                  |  |                       |                        |                       |                       |
| B X376-90   | B 2900 and B 3900 Shared Systems Processor   | 29,260                | 96.00                  | 1,045                 | 905                   |
| B X376-92   | Port Interface Adapter for B X800 controls   | 2,240                 | 17.00                  | 80                    | 70                    |
| B X376-93   | Port Interface Adapter for B X800 DLP's  | 2,240                 | 17.00                  | 80                    | 70                    |
| B X376-94   | Port Interface Adapter for B X900 DLP's  | 2,240                 | 17.00                  | 80                    | 70                    |

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

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

\*\*\*X equals 2 for 2900 series and 3 for 3900 series.

†Lease prices do not include maintenance rates, which are quoted on an hourly basis depending on usage.

## Burroughs B 2900 and B 3900

### EQUIPMENT PRICES

| COMMUNICATIONS EQUIPMENT |  | <u>Purchase Price</u> | <u>Monthly Maint.*</u> | <u>1-Year Lease**</u> | <u>5-Year Lease**</u> |
|--------------------------|--|-----------------------|------------------------|-----------------------|-----------------------|
| B 874-4                  | Systems and Communications Processor; includes 16,384 bytes of control storage, integrated host interface, 32-line adapter cluster | 26,000                | 160.00                 | 770                   | 665                   |
| B1-4                     | 4K bytes of control storage for B 874 processor; maximum 94K bytes   | 747                   | 5.00                   | 21                    | 15                    |
| B74-1                    | Memory expansion module for B 874 systems over 32K bytes   | 5,284                 | 47.30                  | 165                   | 134                   |
| B74-5                    | Dual host switch for B 874-4 processor   | 2,663                 | 15.80                  | 77                    | 62                    |
| B74-7                    | BDLC feature for B 874-4 processor   | 1,761                 | 8.40                   | 52                    | 41                    |
| B 551-1                  | Direct connect dual line adapter, two wire; max. data rate 9600 bps  | 1,174                 | 5.30                   | 36                    | 31                    |
| B 551-2                  | Direct connect dual line adapter; TTY compatible; max. data rate 38,500 bps  | 1,174                 | 5.30                   | 36                    | 31                    |
| B 551-3                  | Direct connect dual line adapter; balanced differential interface; max. data rate 19,200 bps                                       | 1,566                 | 5.30                   | 46                    | 41                    |
| B 551-6                  | Synchronous/Asynchronous Data Set dual line adapter; max. data rate 9600 bps   | 1,174                 | 5.30                   | 36                    | 31                    |
| B 551-7                  | BDLC single line adapter for B 874-4; max. data rate 9600 bps  | 1,370                 | 7.40                   | 41                    | 36                    |
| B 551-12                 | Synchronous Asynchronous single line adapter with addressing   | 979                   | 5.30                   | 31                    | 26                    |

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

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†Lease prices do not include maintenance rates, which are quoted on an hourly basis depending on usage.

### SOFTWARE PRICES\*

|             |  | <u>Unlimited Single Payment</u> | <u>Time Plan 12 Monthly Payments</u> | <u>Limited-Time Plan Annual License</u> | <u>Monthly License</u> |
|-------------|--|---------------------------------|--------------------------------------|---|------------------------|
| B X000 SSF  | Software Facilities Program; includes MCP V1, MCP utilities, basic GEMCOS, B 874 NDL, medium systems NDL, and one compiler | \$21,000                        | \$1,925                              | \$3,360                                 | \$700                  |
| B X000 CBL  | Ansi 68 COBOL Compiler (30KB)  |                                 |                                      |   |                        |
| B X000 CBV  | Ansi 68 COBOL Compiler (45KB)  |                                 |                                      |   |                        |
| B X000 COB  | Ansi 74 COBOL Compiler   | 3,000                           | 275                                  | 480                                     | 100                    |
| B X000 RPG  | RPG Compiler   | 3,000                           | 275                                  | 480                                     | 100                    |
| MS X000 BAS | BASIC Language Compiler includes Basrn, Basexc, Basint, and Basres   | 3,000                           | 275                                  | 480                                     | 100                    |
| MS X000 XFR | FORTRAN Compiler (IBM Level H compatible)  | 3,000                           | 275                                  | 480                                     | 100                    |
| B X000 BPL  | Burroughs Programming Language   |                                 |                                      |   |                        |
| MS X000 ASM | Assembler  |                                 |                                      |   |                        |
| B X000 CEI  | CANDE  | 2,250                           | 206                                  | 360                                     | 75                     |
| B X000 DE2  | ODESY  | 4,675                           | 428                                  | 468                                     | 157                    |
| B X000 MCA  | GEMCOS advanced  | 10,815                          | 992                                  | 1,082                                   | 361                    |
| B X000 MCT  | GEMCOS total   | 13,905                          | 1,275                                | 1,391                                   | 464                    |
| B X000 RPO  | On-Line Reporter   | 1,030                           | 95                                   | 180                                     | 34                     |
| B X000 AUD  | Audit Reporter   | 15,080                          | 1,382                                | 1,508                                   | 503                    |
| B X000 ARP  | Advanced Reporter II   | 11,030                          | 1,011                                | 1,103                                   | 368                    |
| B X000 RP2  | Reporter II Basic  | 7,000                           | 642                                  | 700                                     | 234                    |
| B X000 RED  | Reporter   | 3,200                           | 295                                  | —                                       | 107                    |
| B X000 ADS  | Automated Documentation System   | 2,250                           | 206                                  | 360                                     | 75                     |
| B X000 DM2  | Data Management System II (DMS II)   | 12,000                          | 1,100                                | 1,920                                   | 400                    |
| B X000 DM1  | DMS II Inquiry   | 3,000                           | 275                                  | 480                                     | 100                    |
| B X000 WFL  | Work Flow Management System  | 1,500                           | 138                                  | 240                                     | 50                     |
| B X000 FOT  | Disk FORTE/2   | 12,770                          | 1,171                                | 1,277                                   | 426                    |
| B X000 MC7  | Message Control System Generator   | 2,660                           | 244                                  | 268                                     | 89                     |

#### Translators

|             |   |        |       |       |     |
|-------------|---|--------|-------|-------|-----|
| CS X000 COF | RPG to Burroughs COBOL-68 Translator (COFIRS)       | 7,415  | 680   | 740   | 206 |
| CS X000 BAL | IBM 360/370 BAL to Burroughs COBOL-68 Translator    | 12,980 | 1,190 | —     | 361 |
| CS X000 BEA | IBM BAL to Burroughs COBOL-68                       | 12,980 | 1,190 | 1,298 | 361 |
| CS X000 BO1 | Univac Spectra BAL to Burroughs COBOL-68 translator | 12,980 | 1,190 | —     | 361 |

\*X equal 2 for 2900 Series and 3 for 3900 Series.

## Burroughs B 2900 and B 3900

## SOFTWARE PRICES\*

|   |   | Unlimited<br>Single<br>Payment | Time Plan<br>12 Monthly<br>Payments | Limited-Time Plan<br>Annual<br>License | Limited-Time Plan<br>Monthly<br>License |
|---|---|--------------------------------|-------------------------------------|--|---|
| <b>Translators (Continued)</b>                                    |   |                                |                                     |  |   |
| CS X000 EZE   | Honeywell Easycode to Burroughs<br>COBOL-68 Translator              | 12,980                         | —                                   | 1,298                                  | 361                                     |
| CS X000 N3C   | NCR Neat/3 Level 1 to Burroughs<br>COBOL-68 Translator              | 8,500                          | 779                                 | 850                                    | 283                                     |
| CS X000 FO2   | IBM 360/370 COBOL to Burroughs<br>COBOL-68 Translator               | 5,560                          | 510                                 | —                                      | 155                                     |
| CS X000 F10   | Univac Spectra COBOL to Burroughs<br>COBOL-68 Translator            | 5,560                          | 510                                 | —                                      | 155                                     |
| CS X000 HN1   | Honeywell Series 200/2000 COBOL<br>to Burroughs COBOL-68 Translator | 3,705                          | 340                                 | 371                                    | 103                                     |
| CS X000 CF1   | NCR COBOL to Burroughs COBOL-68<br>Translator                       | 5,560                          | 510                                 | 556                                    | 288                                     |
| <b>Applications</b>   |   |                                |                                     |  |   |
| Project Management System:  |   |                                |                                     |  |   |
| B X000 PRT  | PROMIS Time   | 5,570                          | 511                                 | 279                                    | 186                                     |
| B X000 PRC  | PROMIS Cost   | 5,570                          | 511                                 | 279                                    | 186                                     |
| B X000 PRR  | PROMIS Resource Allocation  | 5,570                          | 511                                 | 279                                    | 186                                     |
| B X000 PRO  | PROMIS Update and Inquiry   | 4,470                          | 410                                 | 224                                    | 149                                     |
| B X000 PRQ  | PROMIS Inquiry  | 2,840                          | 261                                 | 155                                    | 95                                      |
| Mathematical Programming System:                                  |   |                                |                                     |  |   |
| B X000 TEB  | TEMPO Basic   | 6,675                          | 612                                 | 334                                    | 222                                     |
| B X000 GAM  | TEMPO Gamma   | 4,470                          | 410                                 | 224                                    | 149                                     |
| B X000 TIN  | TEMPO Integer   | 4,470                          | 410                                 | 224                                    | 149                                     |
| B X000 GUB  | TEMPO GUB   | 4,470                          | 410                                 | 224                                    | 149                                     |
| B X000 NTW  | TEMPO Network   | 4,470                          | 410                                 | 224                                    | 149                                     |
| B X000 MGR  | TEMPO Modeler   | 6,675                          | 612                                 | 334                                    | 222                                     |
| B X000 AST  | Statistical Analysis Program (ASSIST)                               | 7,775                          | 714                                 | —                                      | 260                                     |
| B X000 GAS  | General Activity Simulation Program<br>(GASP)                       | 3,370                          | 309                                 | —                                      | 112                                     |
| B X000 NSL  | Numerals Library  | 3,140                          | 288                                 | 158                                    | 105                                     |
| Burroughs Inventory Planning, Analysis,<br>and Simulation System: |   |                                |                                     |  |   |
| B X000 ASM  | BIPASS Analysis and Simulation                                      | 7,560                          | 693                                 | 378                                    | 252                                     |
| B X000 OCD  | BIPASS Operation Control  | 5,790                          | 531                                 | 289                                    | 194                                     |
| B X000 IDM  | BIPASS On-Line Inquiry and Data Entry                               | 2,840                          | 261                                 | 155                                    | 95                                      |
| Production Control System II:                                     |   |                                |                                     |  |   |
| B X000 PSE  | Engineering Data Control (EDC)                                      | 5,015                          | 460                                 | 251                                    | 168                                     |
| B X000 PSI  | Inventory Control   | 5,015                          | 460                                 | 251                                    | 168                                     |
| B X000 PSR  | Material Requirements Planning (MRP)                                | 5,015                          | 460                                 | 251                                    | 168                                     |
| B X000 PSW  | Work in Process (WIP)   | 6,675                          | 612                                 | 334                                    | 222                                     |
| B X000 PSL  | Capacity Requirements Planning (CRP)                                | 3,090                          | 283                                 | 155                                    | 103                                     |
| B X000 PSF  | Forecasting and Inventory Analysis<br>(FIA)                         | 6,015                          | 552                                 | 301                                    | 201                                     |
| B X000 PSS  | Operation Scheduling and Loading<br>(OSL)                           | 6,675                          | 612                                 | 334                                    | 222                                     |
| B X000 PSQ  | On-Line Inquiry   | 4,030                          | 370                                 | 202                                    | 135                                     |
| B X000 PSU  | On-Line File Maintenance  | 6,015                          | 552                                 | 301                                    | 201                                     |
| Distributed Information System:                                   |   |                                |                                     |  |   |
| B X000 OPM  | Order Processing  | 15,450                         | 1,416                               | 773                                    | 515                                     |
| B X000 IAM  | Inventory Accounting  | 5,150                          | 489                                 | 258                                    | 172                                     |
| B X000 ARM  | Accounts Receivable   | 5,150                          | 489                                 | 258                                    | 172                                     |
| B X000 DBM  | Data Base Manager   | 3,090                          | 283                                 | 155                                    | 103                                     |
| B X000 TMM  | Transaction Manager   | 1,545                          | 144                                 | 155                                    | 52                                      |
| Thrift System:  |   |                                |                                     |  |   |
| B X000 TSS  | Thrift System - Structures  | 19,910                         | 1,825                               | 996                                    | 664                                     |
| B X000 TDC  | Thrift System - Data Communications                                 | 8,880                          | 815                                 | 444                                    | 297                                     |
| B X000 TAS  | Thrift System - Time Deposits                                       | 13,300                         | 1,220                               | 665                                    | 444                                     |
| B X000 TAM  | Thrift System - Mortgage Loans                                      | 15,500                         | 1,421                               | 776                                    | 517                                     |
| B X000 TAL  | Thrift System - Consumer Loans                                      | 8,880                          | 815                                 | 444                                    | 297                                     |
| B X000 TAG  | Thrift System - General Ledger                                      | 4,470                          | 410                                 | 224                                    | 150                                     |
| Burroughs Hospital Administrative<br>System II (BHAS II):         |   |                                |                                     |  |   |
| B X000 HCA  | Patient Accounting  | 4,915                          | 451                                 | 246                                    | 164                                     |
| B X000 HCG  | General Ledger  | 2,525                          | 232                                 | 155                                    | 84                                      |
| B X000 HCM  | Medical Records   | 2,525                          | 232                                 | 155                                    | 84                                      |
| B X000 HCP  | Payroll   | 2,525                          | 232                                 | 155                                    | 84                                      |
| B X000 HCB  | Accounts Payable  | 2,525                          | 232                                 | 155                                    | 84                                      |
| B X000 HMB  | PSRO Administration   | 2,525                          | 232                                 | 155                                    | 84                                      |
| B X000 HDE  | On-Line Data Entry/Inquiry  | 5,665                          | 519                                 | 283                                    | 188                                     |
| B X000 NCS  | APT III (Numerical Control)   | 7,000                          | 643                                 | 350                                    | 234                                     |
| B X000 OVD  | On-Line Wholesale Distribution                                      | 11,080                         | 1,017                               | 554                                    | 370                                     |
| B X000 OES  | On-Line Order Entry   | 15,810                         | 1,450                               | —                                      | 527                                     |
| Burroughs Inventory Control System:                               |   |                                |                                     |  |   |

\*X equal 2 for 2900 Series and 3 for 3900 Series.

**Burroughs B 2900 and B 3900**

**SOFTWARE PRICES\***

| Applications (Continued)                                     |   | Unlimited         | Time Plan              | Limited-Time Plan |                    |
|--|---|-------------------|------------------------|-------------------|--------------------|
|  |   | Single<br>Payment | 12 Monthly<br>Payments | Annual<br>License | Monthly<br>License |
| B X000 BIA   | BICS Analysis                                       | 13,960            | 1,280                  | —                 | 466                |
| B X000 BIC   | BICS Control  | 9,320             | 855                    | 467               | 311                |
| B X000 CUS   | Credit Union System                                 | 22,115            | 2,028                  | —                 | 737                |
| B X000 TAC   | On-Line Credit Union System                         | 14,420            | 1,324                  | —                 | 481                |
| Commercial Banking:  |   |                   |                        |                   |                    |
| B X000 BLK   | Bulk Filing System                                  | 15,450            | 1,416                  | 773               | 515                |
| B X000 LCB   | Large Commercial Bank Item<br>Processing System I   | 17,090            | 1,567                  | 855               | 570                |
| B X000 LCS   | Large Commercial Bank Item<br>Processing System II  | 24,300            | 2,228                  | 1,215             | 811                |
| B X000 AIC   | Item Processing System Automatic<br>Item Correction | 1,460             | 135                    | 155               | 49                 |
| B X000 DDB   | Demand Deposit System                               | 9,980             | 916                    | 500               | 333                |
| B X000 TDS   | Time Deposit System                                 | 8,330             | 764                    | 417               | 278                |
| B X000 CLS   | Commercial Loan Accounting                          | 12,000            | 1,100                  | 600               | 400                |
| B X000 CCM   | Collateral Loans                                    | 8,000             | 733                    | 400               | 267                |
| B X000 PT1   | Personal Trust System I                             | 22,115            | 2,028                  | —                 | 737                |
| B X000 PT2   | Personal Trust System II                            | 5,570             | 511                    | —                 | 186                |
| B X000 TII   | Total Information System Numeric<br>Inquiry         | 7,775             | 714                    | 389               | 260                |
| B X000 TIM   | Total Information System Central<br>File Manager    | 9,980             | 916                    | 500               | 333                |
| B X000 PMS   | Proof Controller System                             | 20,600            | 1,888                  | 1,030             | 687                |
| B X000 FRB   | Federal Reserve Bank Item<br>Processing System I    | 17,090            | 1,567                  | 855               | 570                |
| B X000 FRS   | Federal Reserve Bank Item<br>Processing System II   | 24,305            | 2,229                  | 1,215             | 811                |
| Burroughs Hospital Information<br>Processing System (BHIPS): |   |                   |                        |                   |                    |
| B X000 HIH   | Data Comm Handler                                   | 4,030             | 370                    | 202               | 135                |
| B X000 HIA   | On-Line Admissions                                  | 5,615             | 515                    | 281               | 187                |
| B X000 HIE   | On-Line Order Entry                                 | 5,615             | 515                    | 281               | 187                |
| B X000 HIL   | On-Line Laboratory                                  | 5,615             | 515                    | 281               | 187                |
| B X000 HIP   | On-Line Pharmacy                                    | 5,615             | 515                    | 281               | 187                |
| Burroughs Scholastic System:                                 |   |                   |                        |                   |                    |
| B X000 SFO   | SCHOLASTIC Financial Inquiry                        | 2,740             | 251                    | 155               | 92                 |
| B X000 SFS   | SCHOLASTIC Financial                                | 4,030             | 370                    | 202               | 135                |
| B X000 SPR   | SCHOLASTIC Payroll                                  | 3,625             | 333                    | 181               | 122                |
| B X000 SS1   | SCHOLASTIC School Scheduling                        | 5,575             | 511                    | 279               | 186                |
| B X000 SSR   | SCHOLASTIC Student Records                          | 3,050             | 280                    | 155               | 102                |
| B X000 TS1   | SCHOLASTIC Test Scorer                              | 3,810             | 350                    | 191               | 128                |
| B X000 SAV   | SCHOLASTIC Instructional Material<br>Control        | 3,050             | 280                    | 155               | 102                |
| B X000 SS2   | SCHOLASTIC Student Scheduling-<br>Remote            | 2,740             | 251                    | —                 | 92                 |

\*X equal 2 for 2900 Series and 3 for 3900 Series.