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Burroughs B 2800, B 3800, & B 4800

MANAGEMENT SUMMARY

The first models of Burroughs' new generation of computer systems were unveiled in December 1975, when the company announced the B 2800, B 3800, and B 4800 systems. The new systems occupy the medium-scale portion of a new Burroughs "800 Series" family of computer systems, which Burroughs management indicates will replace the company's entire current computer product line, with replacements for both the small-scale end of the line and the large-scale B 6700 and B 7700 systems scheduled for announcement throughout 1976.

The new B 2800, B 3800, and B 4800 systems provide a preview of some of the important features that will characterize the architecture of the new generation of Burroughs computers. Significantly, the central processor design does not deviate from that of the earlier B 2700/3700/4700 series of computers, assuring users of the current medium systems of complete protection of their software investment. The new processors, however, employ a new Burroughs-developed LSI circuitry called Burroughs Current Mode Logic (BCML), which the company says will result in up to a 50 percent reduction in central processor floor space requirements, yield higher central processor performance, and provide greater reliability. In terms of overall system performance, Burroughs estimates that the new systems can provide from 1.5 to 4 times the performance of the earlier B 2700, B 3700, and B 4700 systems in multiprogramming environments.

Architectural innovations in the new systems include an entirely new input/output subsystem based on the use of microprocessors to achieve distributed input/output processing, and special processors within the systems to assist in maintenance and diagnostic functions, to monitor environmental conditions, and to regulate the flow of data between main memory, the central processor, and the input/output subsystem.

The new I/O subsystem is composed of a series of LSI Data Link Processors (DLP's), a Burroughs trademark for ▷

The new B 2800, B 3800, and B 4800 medium-scale computers are compatible upgrades for the Burroughs B 2700, B 3700, and B 4700 systems that offer improved price/performance and upward software compatibility. The new series features an enhanced version of the MCP operating system, the DMS-II data base management system, and new families of head-per-track and removable disk pack drives.

CHARACTERISTICS

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

MODELS: B 2800, B 3800, and B 4800 computer systems; see table on page 70C-112-09c for characteristics of the seven processor models.

DATA FORMATS

BASIC UNIT: 16-bit word (plus parity bit). Each word can hold two 8-bit bytes or four 4-bit BCD digits. Main storage is addressable by digit position.

FIXED-POINT OPERANDS: Can range from 1 to 100 decimal digits or bytes for most instructions. Data in 4-bit format can be either signed (with 4-bit sign digit in leftmost position) or unsigned. Data in 8-bit format is always unsigned.

The optional Fixed-Length Floating-Point Arithmetic capability provides high-speed arithmetic operations on either "short" or "long" operands. Short operands have an exponent of 2 decimal digits plus sign and a fraction of 8 decimal digits plus sign. Long operands have an exponent of 2 digits plus sign and a fraction of 16 digits plus sign.

INSTRUCTIONS: May consist of from one to four 6-digit and/or 8-digit "syllables," a single 8-digit or 10-digit "syllable," or a single 2-digit "syllable" consisting of an op code only. Each instruction can contain from 0 to 3 memory addresses.

INTERNAL CODE: EBCDIC (standard) or ASCII, depending upon the setting of a mode flip-flop.

MAIN STORAGE

STORAGE TYPE: Metal oxide semiconductor (MOS) in the B 2830, B 3830, B 3831, and B 3832; bipolar ▶
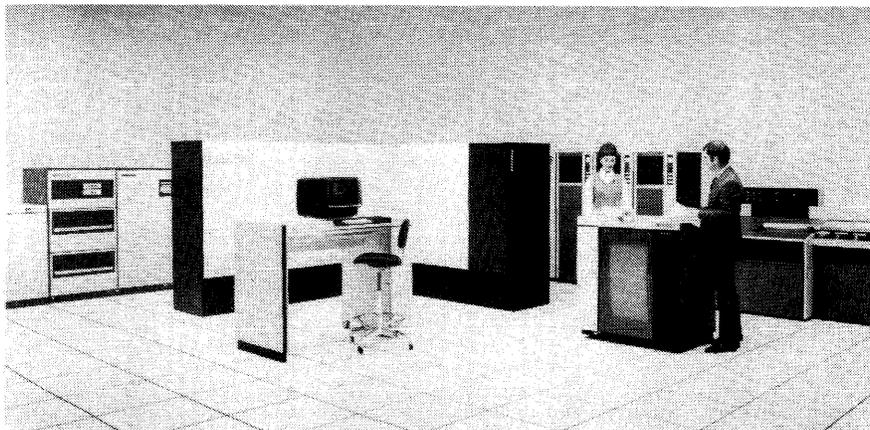
The B 4800, at the top of the new Burroughs line of medium-scale systems, is shown in a configuration oriented toward the banking environment, with MICR reader/sorter at right. The B 4800 is available in single and dual-processor systems with from 200,000 to 2,000,000 bytes of fast bipolar main memory.

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the processors that are attached to each input/output channel and take the place of conventional control units for attaching peripheral devices to the system. The Data Link Processors execute input/output commands independently of central processor operations and have a separate path to main memory through the Memory Control hardware. Each Data Link Processor is specialized for controlling a particular type of peripheral device, including an appropriately sized buffer, and transmits data to the central system at the message level. Thus, depending on the number of channels available for each central processor model, these systems can have from 8 to 128 DLP-based I/O processors controlling input/output traffic in parallel with central processor operations.

The new family of computers is targeted for environments with extensive data base/data communications requirements. Both single and dual-processor models are provided to assure continuous system availability. The announcement also included a selection of new high-performance fixed-head disks and removable disk pack drives, which can be shared by multiple processors and accessed through multiple data paths, to provide attractively priced random-access storage to house users' data bases. Software support for the new applications includes Burroughs' highly regarded DMS-II data base management system, a COBOL-74 compiler with interfaces to DMS-II, and the Network Definition Language to facilitate communications programming, plus a new version of the MCP operating system with multiprogramming support for up to 256 user jobs.

THE B "800 SERIES" PROCESSORS

The new series of Burroughs medium-to-large-scale processors includes seven central processor models—one B 2800 central processor, and three models each for the B 3800 and B 4800 systems.

The smallest, the B 2830, is a single-processor system that includes a central processor with a 333-nanosecond cycle time, one I/O subsystem with from 8 to 16 input/output channels, and from 100,000 to 500,000 bytes of metal oxide semiconductor (MOS) main memory. The cycle time for main memory is 650 nanoseconds to access two bytes. A basic B 2830 central system equipped with eight input/output channels has an aggregate input/output data rate of 1.5 million bytes per second. An optional DLP Multiplexor can be added to B 2830 systems equipped with the maximum of 16 I/O channels to double the input/output throughput to 3 million bytes per second. Each B 2830 system can include one optional 8-channel I/O Cabinet which provides eight channels for attaching older peripherals that use conventional control units.

The B 2830 systems offer performance comparable to that of the earlier B 3771 system. Monthly rental rates for typical systems range from $12,000 to $18,500, and purchase prices for comparable systems range from $485,000 to $750,000. First customer shipments of the B 2830 are scheduled for the third quarter of 1976.

semiconductor in the B 4840, B 4841, and B 4842 (see table).

CAPACITY: See table and price list.

CYCLE TIME: See table.

CHECKING: Main memory for all central processor models includes a "self-correcting" feature that automatically corrects single-bit memory errors.

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 PROCESSORS

The B 2830, B 3830, B 3831, B 4840, and B 4841 systems contain one central processor, while the B 3832 and B 4842 systems contain two central processors, each with its own main memory and I/O subsystem. Each central system includes a memory control feature which operates independently of the central processor and controls the transfer of data between the central processor, main memory, and the I/O subsystem. The I/O subsystem receives highest priority for accessing main memory.

Each central processor includes a Snap Processor, a special-purpose processor that monitors the status of all circuitry in the central processor during the test mode of operation. Software for the Snap Processor compares the test results with standard test results recorded at the time of manufacture of the central processor in order to detect malfunctions at the circuit level. A software system is also provided that permits specially designed tests to be run on the Snap Processor to assist in the isolation of intermittent processor malfunctions.

Each central processor also includes an automatic environmental monitoring system that measures computer room temperatures and humidity, monitors the computer system power supply, and maintains logs on these environmental conditions. The system illuminates a warning light on the central processor and issues messages at the Operator Control Station when a temperature rise to a predetermined level is detected, and stores processing programs and data and brings the system to an orderly shutdown if the temperature rises to an intolerable level. The system also records fluctuations in the power supply and issues warnings of potential "brown-out" conditions.

INDEX REGISTERS: Three 8-digit index registers for each program are stored in reserved main memory locations.

INDIRECT ADDRESSING: Can be specified within the first digit of any instruction address field. If specified, the indicated memory location is considered to hold the address of the required operand rather than the operand itself. Multi-level indirect addressing to any depth is possible.

INSTRUCTION REPERTOIRE: The standard instruction set includes instructions for arithmetic, comparison, and data movement operations on variable-length operands in either 4-bit numeric or 8-bit alphanumeric code. Included are 3-address add, subtract, multiply, and divide commands and 2-address add and subtract commands, as well as convenient edit, search, and translate instructions. Binary arithmetic is not available, but logical AND, OR, and NOT instructions are included.

Floating-point decimal arithmetic, an optional feature, includes a set of floating-point instructions that use fixed-length operands for efficient operation.

A number of the standard instructions, including Initiate I/O, are "privileged" and may not be used in normal user-written programs.

INPUT/OUTPUT CONTROL

Each central processor includes one or two input/output subsystems (see table) which control the movement of data

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CHARACTERISTICS OF THE B 2800, B 3800 & B 4800 SYSTEMS

	B 2830	B 3830	B 3831	B 3832	B 4840	B 4841	B 4842
CENTRAL PROCESSORS							
No. of processors per system	1	1	1	2	1	1	2
Processor cycle time, nanoseconds	333	250	250	250	125	125	125
Add time (5 digits), microseconds	18.6	14	14	14	7	7	7
Multiply time (5 digits), microseconds	*	*	*	*	*	*	*
MAIN STORAGE							
Type of storage	MOS	MOS	MOS	MOS	Bipolar	Bipolar	Bipolar
Minimum capacity, bytes	100,000	100,000	100,000	100,000	200,000	200,000	200,000
Maximum capacity, bytes	500,000	500,000	500,000	500,000	1,000,000	1,000,000	2,000,000
Increment size, bytes	50,000	50,000	50,000	50,000	100,000	100,000	100,000
Cycle time, nanoseconds	650	500	500	500	250	250	250
Bytes fetched per cycle	2	2	2	2	2	2	2
I/O CONTROL							
No. of I/O subsystems	1	1	1	2	1	1	2
No. of I/O channels—standard (DLP's)	8	16	16	16	16	16	16
No. of I/O channels—maximum (DLP's)	16	40	40	40	64	64	128
Maximum total I/O date rate, bytes/ second, per I/O subsystem	1,500,000 or 3,000,000	4,000,000	4,000,000	4,000,000	8,000,000	8,000,000	8,000,000
File Protect Memory facility	Optional	Optional	Standard	Standard	Optional	Standard	Standard
DLP Bases—standard	1	2	2	2	2	2	4
DLP Bases—maximum	2	5	5	5	8	8	16
8-Channel I/O Cabinets—maximum	1	2	2	2	2	2	2

*Instruction execution times not available.

The B 3830 processors, with a cycle speed of 250 nanoseconds, offer performance roughly equivalent to that of the earlier B 4771 systems and approximately twice that of the Burroughs B 1720 computers. Three B 3830 processor models were announced in December 1975, one of which is a dual-processor system. The B 3830 and B 3831 both incorporate one central processor and one input/output subsystem, and they differ only in that the B 3831 can include the File Protect Memory to permit multiple processors to share a single set of disk files. B 3832 systems include two central processors, each with its own main memory and I/O subsystem.

All B 3830 systems can be equipped with from 100,000 to 500,000 bytes of error-correcting MOS main memory with a cycle time of 500 nanoseconds to access two bytes. The maximum input/output data rate per processor is 4 million bytes per second, and each central processor can be configured with from 16 to 40 input/output channels. One or two optional 8-channel I/O Cabinets can be configured with each processor to accommodate older B 2700/3700/4700 peripheral devices.

Monthly rental for typical B 3800 systems ranges from $14,000 to $26,500, with purchase prices for comparable configurations ranging from $605,000 to $1,135,000. The B 3800 systems are scheduled for first customer delivery in April 1976.

B 4800 systems are also available in three models, one of which is a dual-processor configuration. These systems incorporate the earlier B 4790 central processor along with the new B "800 Series" input/output system. The central processor has a cycle time of 125 nanoseconds and ▷

between main memory and the system input/output devices. 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 32 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 32 for each plane. Data Link Processors are supplied for all new peripheral devices announced for the B 2800/3800/4800 systems and for many of the peripherals previously released for B 2700/3700/4700 systems.

An optional 8-Channel I/O Cabinet provides eight input/output channels of the conventional B 2700/3700/4700 type; these channels can be used to connect older B 2700/3700/4700 peripherals to B 2800/3800/4800 systems through standard control units. Each 8-Channel I/O Cabinet can accommodate five Type B channels plus three Type A channels. See the table for the maximum number of optional 8-Channel I/O Cabinets that can be configured with each central processor. The combined number of DLP channels and conventional input/output channels cannot exceed the maximum number of input/output channels specified for each central processor.

SIMULTANEOUS OPERATIONS: One input or one output operation on each installed DLP input/output channel or B 2700/3700/4700-type channel can occur simultaneously with computing. Maximum input/output data rates for each processor are shown in the table.

MASS STORAGE

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 ▶

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▷ from 300,000 to 1,000,000 bytes of error-correcting bipolar memory, with a cycle time of 250 nanoseconds for two bytes of data. Each input/output subsystem can have from 16 to 64 channels and has an aggregate data transfer rate of 8 million bytes per second. In addition, a maximum of two 8-channel I/O Cabinets can be substituted for up to 16 input/output subsystem channels for attachment of peripheral units which use conventional control units instead of the new Data Link Processors.

The Burroughs B 4790 systems were announced in September 1974 and scheduled for delivery late in 1975. With the unveiling of the B 4800, offering comparable performance at lower prices, Burroughs placed the B 4790 systems on an "as available" basis and gave customers with B 4790 systems on order the option to substitute a B 4800 for the original B 4790.

Typical B 4800 systems rent for $19,500 to $85,500 per month and have purchase prices ranging from $850,000 to $2,725,000. The systems are scheduled for delivery in the first quarter of 1976.

NEW PERIPHERALS

The new B "800 Series" computer systems are designed to provide users of Burroughs medium-scale equipment with advanced data base/data communications capabilities. To support their performance in these environments, Burroughs announced a series of new direct-access storage facilities that feature very large storage capacities, fast access to data, and attractive price/performance.

The B 9470, newest of Burroughs' broad line of head-per-track disk files, comes in four models, all of which feature an average access time of 5 milliseconds—four times faster than earlier head-per-track disk files—and a data transfer rate of 650,000 bytes per second. The B 9470-1 and add-on B 9470-2 disk files record data in 100-byte sectors and have a capacity of 5.5 million bytes per disk file, while the B 9470-11 and add-on B 9470-12, which are also available for the large-scale B 6700 and B 7700 systems, record data in 180-byte sectors and have a capacity of 5.9 million bytes per disk file. The maximum subsystem capacity is 472 million bytes, and the information can be accessed by up to eight Data Link Processors from one or multiple processors with the fully expanded exchange capability. The B 9470 Head-Per-Track Disks feature a number of reliability features, including the capability to detect the loss of bursts of up to 11 bits out of each sector transmitted and new monolithic read/write heads.

Two new removable disk-pack drives were also announced in December 1975 for on-line storage of larger amounts of information. The B 9484 Dual Disk Storage subsystems offer from 130.4 million to 1.04 billion bytes of storage per subsystem with an average access time of 33.3 milliseconds and a data transfer rate of 605,000 bytes per second. Each removable disk pack has a formatted capacity of 65.2 million bytes and contains the track ▷

▶ 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.

FPM is a standard component of the multiple-processor B 3832 and B 4842 systems and of the single-processor B 3831 and B 4841 systems.

B 9470 HEAD-PER-TRACK FILES: These new fixed-head disk files, announced in December 1975 for use with B 2800/3800/4800 and B 6700/7700 systems, provide very fast access to up to 472 million bytes of data per subsystem. The disk units use noninterchangeable disks and have a fixed read/write head serving each data track. The B 9470-1 Primary Storage Module and B 9470-2 Add-On Storage Module are available for B 2800/3800/4800 systems only, record data in 100-byte sectors, and have a capacity of 5.5 million bytes per disk drive. The B 9470-11 Primary Storage Module and B 9470-12 Add-On Module are available for both B 2800/3800/4800 and B 6700/7700 systems, record data in 180-byte sectors, and have a capacity of 5.9 million bytes per disk drive.

The basic B 9470 subsystem includes either one B 9470-1 or one B 9470-11 Primary Storage Module, each of which contains a power supply and air system and one disk drive with either 5.5 or 5.9 million bytes of storage. The B 9470-1 can accommodate one B 9470-2 Add-On Storage Module with a capacity of 5.5 million bytes, and the B 9470-11 can accommodate one B 9470-12 Add-On Module with a storage capacity of 5.9 million bytes. Additional expansion of either subsystem can be achieved by adding additional B 9470-1 or B 9470-11 Primary Storage Modules and associated B 9470-2 or B 9740-12 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 or 180-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 can be connected to a computer either directly through a disk control or Data Link Processor or through a B X377-6 Basic Exchange which permits up to four disk controls to address up to four B 9471-6 Disk Electronics Units. The Basic Exchange can be expanded into 8 x 8, 8 x 12, 8 x 16, and 8 x 20 configurations in order to achieve the maximum subsystem capacity of 471 million bytes. 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. First customer shipments of the B 9470 subsystems for B 2800/3800/4800 systems are scheduled for the third quarter of 1976.

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 9484-5 DISK PACK DRIVE SUBSYSTEMS: These medium-capacity disk pack drives have a capacity of 65.2 million bytes per spindle 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, ▶

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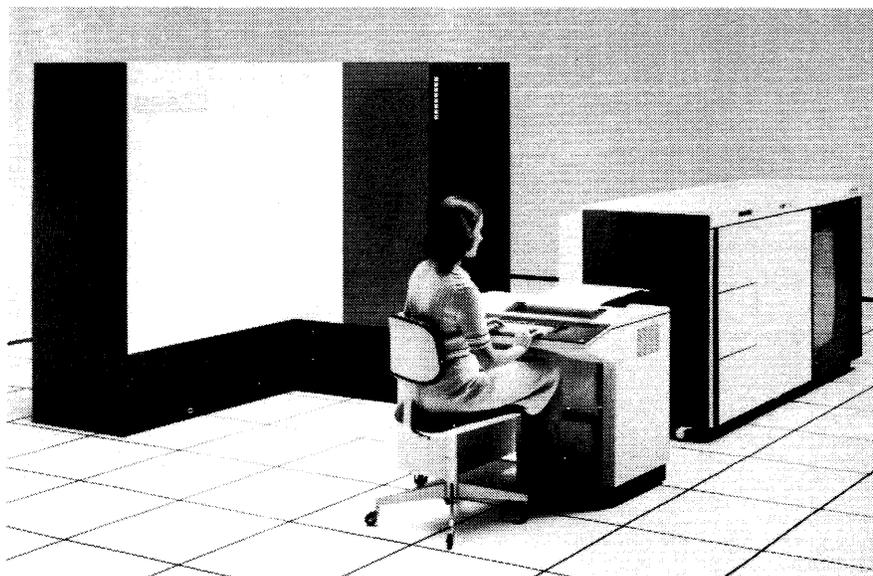
The B 2830, smallest member of the new Burroughs medium-scale computer family, is a single-processor system designed and priced to compete effectively at the IBM 370/125 level. It offers 100K to 500K bytes of MOS memory with a cycle time of 650 nanoseconds per 2-byte fetch.

▷ alignment data required for a new servo positioning technique designed to provide superior head positioning accuracy. The minimum system consists of a B 9387-1 Dual Disk Drive and Controller, with a capacity of 130.4 million bytes; this can be expanded by the addition of one B 9484-5 dual-drive increment to a maximum of four spindles and 260.8 million bytes. Larger subsystems must include one or more B 9387-2 Controllers and can be expanded to control a maximum of 16 spindles addressed by up to 8 controllers.

Direct-access storage for very large quantities of information is provided by the new B 9383-16, -17, and -18 Disk Storage Subsystems, also announced in December 1975, which use a removable disk pack with a formatted capacity of 174.4 million bytes of data. The B 9383-16 Disk Storage/Single Controller Subsystem and the B 9383-17 Disk Storage/Dual Controller Subsystems both have a capacity of from 348.8 million bytes to 1.4 billion bytes, while the very large B 9383-18 subsystem consists of dual controllers and from five to eight dual drive units with an on-line storage capacity of up to 2.8 billion bytes. All three models feature an average access time of 42.5 milliseconds and a data transfer rate of 625,000 bytes per second. Each dual drive can be equipped with a Dual Port Feature, which allows two dual controllers to access each drive and up to four channels to address the subsystem maximum of 16 spindles.

Like the B 9484 Disk Pack Drives, the large-capacity B 9383 Disk Pack Drives incorporate the new servo positioning system in which head positioning information is prerecorded between data sectors on each disk pack to ensure accurate head positioning for disk packs with high recording densities. These disk drive subsystems also feature overlapped seeks on up to 16 spindles and automatic detection and correction of error bursts of up to 11 bits. The B 9383-16, -17, and -18 subsystems are scheduled for initial customer delivery in November 1976. ▷

average rotational delay is 8.3 milliseconds, and data transfer rate is 605K bytes per second.

The entry-level B 9387-1 subsystem includes a 1 x 4 controller and a dual disk drive with a capacity of 130.4 million bytes in the 180-byte sector mode. One additional B 9484-5 dual drive can be connected to the B 9387-1 for a maximum subsystem capacity of 260.8 million bytes.

B 9484-5 subsystems with more than four spindles require a B 9387-2 programmable controller, which can control up to four B 9484-5 dual drives. A B X387-5 Disk Pack Drive Basic Exchange allows two B 9387-2 controllers to access four dual drives. Additional B X387-6 Port Expansion Adapters permit the attachment of two additional B 9387-2 controllers to the subsystem, up to a maximum of eight controllers. The Basic Exchange can also be expanded by adding B X387-8 and B X387-7 Exchange Expansion Adapters to increase the total number of spindles per subsystem to a maximum of 16.

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. The B 9484-5 Dual Drives are scheduled for first customer delivery in the fourth quarter of 1976.

B 9383-16, -17, AND -18 DISK PACK DRIVE SUBSYSTEMS: Announced in December 1975 for use with B 2800/3800/4800 and B 6700/7700 systems, these disk drives provide very large quantities of on-line storage in removable disk pack drives. The B 9383-16 Disk Storage/Controller includes a single-channel programmable controller and one dual disk pack drive with a storage capacity of 348.8 million bytes. The B 9383-17 Disk Storage Controller consists of a dual-channel programmable controller and one dual disk pack drive, also with a capacity of 348.8 million bytes. Both the B 9383-16 and B 9383-17 can accommodate up to three additonal B 9484-8 Dual Drive Increments, each with a capacity of 348.8 million bytes, for a total subsystem storage capacity of 1.4 billion bytes. The B 9383-18 Disk Storage/Dual Controller ▶

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A new high-speed printer was also added to the B "800" medium systems product line-up in December 1975. The B 9247-15 Train Printer operates at 1500 lines per minute with a standard 48-character set, and also offers optional 72- or 96-character print trains. The new printer also features enhanced forms positioning and control features, including an Electronic Forms Control Buffer, automatic detection of forms-related printing interruptions, and a powered forms stacker to automatically stack a full box of paper.

In addition to the new high-performance peripherals, Burroughs is also offering a selection of Data Link Processors for attachment of selected B 2700/3700/4700 peripheral units to the new B "800 Series" central processors. These include the B 9247 Line Printers, the B 9115, B 9116, and B 9117 Card Readers, the B 9495 and B 9496 Magnetic Tape Units, and the B 774 System and Communications Processor. In addition, other peripheral units originally available with B 2700/3700/4700 systems can be transferred to the new B "800 Series" processors by substituting an optional 8-Channel I/O Cabinet to provide channels for peripheral devices that are attached to the system through standard input/output controllers.

SOFTWARE

An important feature of the new B 2800, B 3800, and B 4800 systems is object-code-level software compatibility with the earlier B 2700, B 3700, and B 4700 medium-scale computers. As a result, purchasers of the new systems can expect to have full use of all the software and applications programs developed for the earlier Burroughs medium-scale computers plus some important new facilities, including the sophisticated DMS-II data base management system.

Operating system support is centered around the Master Control Program, the comprehensive operating system originally developed for the B 2700/3700/4700 systems. MCP V-5.7, scheduled for release for B 2800/3800/4800 systems in March 1976, contains all of the features of the current MCP for B 2700/3700/4700 systems and will support configurations with up to 500,000 bytes of main memory. A substantial revision of the MCP, MCP VI-6.0, with facilities for supervising the concurrent execution of up to 256 user programs, is scheduled for release in August 1976.

MCP VI incorporates Burroughs' unique implementation of virtual memory, in which system compilers automatically divide programs into logical segments so that only the main segment of the program must reside in main memory throughout program execution. Other segments of the program are brought into main memory as overlays from disk storage as they are required. MCP VI-6.0 will also support systems configured with the maximum 1,000,000 bytes of main memory. Other features scheduled for MCP VI-6.0 include a comprehensive system audit and security system, the Time Analysis and Billing System (TABS) for allocating costs of computer usage,

Disk-Pack Drive Subsystem includes a dual-path programmable controller and five dual disk pack drives that provide a basic capacity of 1.7 billion bytes of storage. The B 9383-18 can be expanded through the addition of three B 9484-8 Dual-Drive Increments, each with a capacity of 348.8 million bytes, to achieve a total subsystem storage capacity of 2.8 billion bytes.

The B 9383-16, -17, and -18 subsystems use the B 9974-7 Disk Pack, which contains 11 platters and 20 recording surfaces for user data. Each working surface of the disk pack contains prerecorded information to identify the location of each data track on the surface, enabling the same read/write head to read the head positioning data and perform the read/write operation. This head positioning technique is designed to eliminate errors caused by head misalignment or thermal gradients and to facilitate interchangeability of disk packs with high bit densities. Data is recorded in 180-byte segments at a density of 4400 bits per inch.

Each disk pack has a data storage capacity of 174.4 million bytes. For all three B 9383 models, the average access time is 30 milliseconds, average rotational delay is 12.5 milliseconds, and data transfer rate is 625,000 bytes per second. The field-installable B 9984 Dual Port Feature permits each dual drive to be accessed by two dual-channel control units to provide throughput equivalent to that of a 4 x 8 or 4 x 16 disk pack drive subsystem. Other standard features include overlapped seek operations on up to 16 spindles and automatic detection and correction of error bursts of up to 11 bits. The B 9383 Disk Pack Drive Subsystems are scheduled for first customer delivery in November 1976.

One B X304-8 Disk Pack DLP-4 (Data Link Processor) is required for a B 9383-16 subsystem, and two B X304-8 DLP-4's are required for each B 9383-17 and B 9383-18 dual-controller subsystem.

INPUT/OUTPUT UNITS

B 9495-5 & B 9495-6 MAGNETIC TAPE UNITS: These high-performance 9-track units record data on ½-inch tape in IBM-compatible phase-encoded mode at 1600 bpi. The B 9495-5 has a tape speed of 200 ips and a data transfer rate of 320,000 bytes/second, while the B 9495-6 has a tape speed of 250 ips and a data transfer rate of 400,000 bytes/second. Both models have a rewind speed of 700 ips, enabling a 2400-foot reel to be rewound in less than 45 seconds. Both 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 tape-up reel, reducing the overall width of the unit to just 24 inches.

B 9495-2 & B 9495-3 MAGNETIC TAPE UNITS: These 9-track units, released in August 1973, offer all the features of the faster B 9495-5 and B 9495-6 units described above. Data is recorded on ½-inch tape in IBM-compatible phase-encoded mode at 1600 bpi. Data transfer rate is 120,000 bytes/second for the B 9495-2 and 200,000 bytes/second for the B 9495-3. Both models can optionally be equipped to operate in NRZI mode at 800 bpi, at half the above data transfer rates. These units can be used with any B 2800/3800/4800 computer in a subsystem consisting of up to 4 tape controls, up to 16 tape units, and an appropriate Master Electronic Exchange (1 x 4, 1 x 8, 2 x 8, 2 x 16, 3 x 16, or 4 x 16).

B 9496-2 & B 9496-4 MAGNETIC TAPE UNITS: Introduced in August 1973, these low-cost tape drives feature improved reliability and "low-boy" cabinets (44 inches high). Data is recorded on ½-inch tape in IBM-compatible phase-encoded mode at 1600 bpi. The B 9496-2 has a tape speed of 25 ips and a data rate of 40,000 bytes/second, while the B 9496-4 has a tape speed of 50 ips and a data rate of 80,000 bytes/second. These units can be used with any B 2800/3800/4800 computer in a subsystem consisting of one or two tape controls, up to eight tape

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> and the Workflow Management System, an extension of the MCP job control language that provides sophisticated facilities for controlling and scheduling the computer workload.

MCP VI-6.1 is scheduled for release early in 1977 and will provide two important new software facilities for Burroughs medium system users, the DMS-II data base management system and an ANS-74 COBOL compiler. Originally announced in October 1974 for the large-scale B 6700 and B 7700 computers, DMS-II represents Burroughs' original approach to the implementation of a full-scale data base management system. Unique features of the system include its integration into the MCP operating system to achieve high system throughput, and an easy-to-use Data and Structure Definition Language for describing the logical organization of information in the data base. DMS-II was also released for the Burroughs B 1700 series computers in December 1975, and undoubtedly will become one of the key software products to contribute to Burroughs' marketing successes in the future. The new ANS-74 COBOL is slated to include interfaces to DMS-II and a Binder capability to permit users to write and compile small independent programs, such as transaction processing programs, that can be bound together to be executed as a large integrated program at run time.

Communications-oriented software support includes the Network Definition Language, which provides an easy-to-use language for defining telecommunications networks using station names, terminal types, line speeds and line procedures, and permits networks to be reconfigured by simply adding new parameters and recompiling the communications control program. Enhancements were also announced for the MCP time-sharing facilities. A Remote Compilation System, along with the EDITOR software, provides facilities for preparation of programs in the COBOL, FORTRAN, BASIC, and Burroughs Programming Language (BPL) languages. All programs prepared for the B 2800/3800/4800 systems can also be executed in the time-sharing mode under the new MCP Time-Sharing Module.

All new software developed for the B 2800/3800/4800 systems will also be made available to and supported for users of the B 2700, B 3700, and B 4700. Conversely, the full complement of higher-level languages provided for B 2700/3700/4700 systems, including COBOL, FORTRAN, BASIC, Burroughs Programming Language, and COFIRS (for RPG to COBOL translation) is available for the new B "800 Series" systems. Also available is an extensive collection of conversion aids designed to ease the transition from Honeywell Series 200/2000, NCR Century Series, UNIVAC (ex-RCA) Series 70, and IBM RPG environments to Burroughs equipment.

Burroughs also offers a steadily expanding selection of applications programs for the financial, manufacturing, medical, and education industry sectors, most of which, ▷

> units, and an appropriate Master Electronic Exchange (1 x 4, 1 x 8, or 2 x 8).

B 9111 CARD READER: Reads 80-column cards of either standard or postcard thickness serially by column, on demand, at up to 800 cpm. Can also read 51-, 60-, or 66-column cards. EBCDIC is the standard card code, and BCL or binary cards can also be read. The feed hopper and stacker hold up to 2400 cards each and can be loaded and unloaded while the reader is operating. Optional features permit reading of 40-column Treasury Checks and/or round-holed Postal Money Orders. Can be connected to a B 2800/3800/4800 system through a control unit and an 8-Channel I/O Cabinet.

B 9112 CARD READER: Reads up to 1400 cpm. Otherwise, has the same characteristics and features as the B 9111 Card Reader described above. Can be connected to a B 2800/3800/4800 system through a control unit and an 8-Channel I/O Cabinet.

B 9115 CARD READER: A compact, table-top unit that reads 80-column cards serially by column at a rated speed of 300 cpm. Cards are read photoelectrically, with a double strobe comparison for each column to help ensure reading accuracy. The single input hopper and output stacker hold up to 1000 cards each. An optional feature permits reading of 51-column cards. Can be connected to a B 2800/3800/4800 system through a B X110-8 Card Reader Data Link Processor-3.

B 9116 CARD READER: Reads up to 600 cpm. Otherwise, has the same characteristics as the B 9115 described above. Can be connected to a B 2800/3800/4800 system through a B X110-8 Card Reader Data Link Processor-3.

B 9117 CARD READER: Reads up to 800 cpm. Otherwise, has the same characteristics as the B 9115 described above. Can be connected to a B 2800/3800/4800 system through a B X110 Card Reader Data Link Processor-3.

B 9212 CARD PUNCH: Punches 80-column cards at up to 150 cpm.

B 9213 CARD PUNCH: Punches 80-column cards at up to 300 cpm. EBCDIC is the standard card code, and BCL or binary cards can also be punched. The feed hopper holds up to 2200 cards, and three program-selectable stackers hold at least 1400 cards each. The associated control unit contains a full-card buffer. Both the B 9212 and B 9213 Card Punches can be connected to a B 2800/3800/4800 system through a control unit and an 8-Channel I/O Cabinet.

B 9120 PAPER TAPE READER: Reads 5-, 6-, 7-, or 8-level punched tape at 500 or 1000 characters per second. The lower speed must be used for fanfold or metallized Mylar tape. Handles reels either 5.5 or 7 inches in diameter. A standard channel-select plugboard and optional Input Code Translator permit wide flexibility in codes. Can be connected to a B 2800/3800/4800 system through a control unit and an 8-Channel I/O Cabinet.

B 9220 PAPER TAPE PUNCH: Punches 5-, 6-, 7-, or 8-level tape at 100 characters per second. Handles supply reels up to 8 inches in diameter and 5.5- or 7-inch take-up reels. A standard channel-select plugboard and optional Output Code Translator permit wide flexibility in codes. Can be connected to a B 2800/3800/4800 system through a control unit and an 8-Channel I/O Cabinet.

B 9243 LINE PRINTER: This printer was originally released for B 2700/3700/4700 systems and can be connected to a B 2800/3800/4800 system through an appropriate control unit and an 8-Channel I/O Cabinet. The B 9243 Printer is a rotating-drum printer and has a printing speed of 1100 lines per minute. It has a tape-controlled carriage capable of handling continuous forms from 5 to 20 inches in width, vertical spacing of 6 to 8 lines per inch, and a standard skipping speed of 25 inches per second. The B 9243 is no longer actively marketed.

B 9246-2 HIGH-SPEED PRINTER: This fast drum-type printer, announced in June 1973, prints 1800 lines per minute when using only the first 36 characters of its ▶

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along with DMS-II and TABS, are now separately priced. The ANS-74 COBOL compiler is priced at $50 per month, although the MCP and currently available compilers, along with normal technical support and training, are still offered at no additional cost.

COMPATIBILITY

A major design goal of the B 2800, B 3800, and B 4800 is to maintain complete software compatibility at the object-code level with Burroughs' installed base of B 2700, B 3700, and 4700 computer systems. As a result, users of these "B 700" medium-scale systems can expect to run their current programs on the new systems without modification or recompilation. Since the new systems incorporate essentially the same central processor architecture and instruction repertoire as the earlier B 2700/3700/4700 systems, however, there is no object-level compatibility between the Burroughs medium-scale computers and the large-scale B 6700 and B 7700 systems. Burroughs' approach toward achieving compatibility throughout its general-purpose computer product line is through a gradual standardization of the software products offered for all three families of Burroughs computer systems. The recent release of the DMS-II data base management system for the B 1700 systems and the B 2800/3800/4800 systems, and the Workflow Management System, originally available only for B 6700 and B 7700 systems and now offered for the B 2800/3800/4800 computers as well, represent early steps toward the achievement of uniformity in Burroughs' software products. Further efforts can be expected in the standardization of the MCP job control language, remote job entry user interfaces, and compilers.

Conversion aids currently available for Burroughs medium system users upgrading to B 6700 or B 7700 systems include the B 6700/7700 COBOL-68 compiler, which accepts B 2800/3800/4800 COBOL source code as input, and "filter" programs to aid in the conversion of FORTRAN programs from one computer to another.

Compatibility between the Burroughs systems and the IBM System/370 and other competitive computers is achieved mainly through the higher-level languages, for which Burroughs provides COFIRS (COBOL From IBM RPG Specifications) and a variety of program conversion aids.

COMPETITIVE POSITION

The new processor models are designed both as upgrades for Burroughs' installed base of B 2700, B 3700, and B 4700 systems and as competitors for the IBM System/370 Models 125, 135, and 145 and comparably priced systems from other mainframe manufacturers. Since both single and dual-processor configurations are available, an exact relationship between competing processors is difficult to define. At the System/370 Model 125 level, Burroughs offers both the new B 3721 (Report 70C-112-06), an attractively priced entry-level system announced con-

64-character set. The speed is 1250 lpm when the full character set is used, and normal alphanumeric character mixes should result in a throughput of 1500-plus lpm. An optional 64-character set with OCR A numeric characters and 4 special characters yields a print speed of 1200 lpm when the first 46 characters are used and 925 lpm for the full character set. The B 9246-2 is fully buffered, has 132 print positions, prints 6 or 8 lines to the inch, and has a skipping speed of 36 inches/second. It can be connected to a B 2800/3800/4800 system through a control unit and an 8-Channel I/O Cabinet.

B 9247-12 TRAIN PRINTER: This train printer achieves its rated 400-lpm speed with the standard 48-character set. It can be equipped with other interchangeable train modules containing 16, 64, or 96 printable characters. The 96-character set contains both upper and lower case alphabetics. The B 9247-12 handles vertical format control through either the Burroughs-Forms-Self-Align system, which uses codes preprinted on the forms, or a standard 12-channel carraige control tape. The standard number of print positions is 132. Originally released for B 1728 and B 2700/3700/4700 systems, the B 9247-12 can be connected to a B 2800/3800/4800 system through a control unit and an 8-Channel I/O Cabinet.

B 9247-13 TRAIN PRINTER: Has the same characteristics as the B 9247-12, but prints at 750 lines per minute.

B 9247-14 TRAIN PRINTER: This high-performance train printer, announced in August 1973, prints 1100 lines per minute and has 132 print positions. It can be equipped with other interchangeable train modules containing 16, 64, or 96 printable characters. The 96-character set contains both upper and lower case alphabetics. A 12-channel format tape is used for vertical format control. The B 9247-14 can be connected to a B 2800/3800/4800 system through an 8-Channel I/O Cabinet.

B 9247-15 TRAIN PRINTER: Announced in December 1975 with the B 2800, B 3800, and B 4800 systems, this train printer achieves a printing speed of 1500 lines per minute with a 48-character set and incorporates enhancements to facilitate job set-up and operator communications. It can be equipped with other interchangeable print trains containing 72 or 96 printable characters, and has print speeds of 1100 or 850 lines per minute, respectively, using the 72- or 96-character sets. The standard number of print positions is 132, the skipping speed is 90 inches per second, and forms from 4 to 17.875 inches wide and from 1 to 14 inches in length can be handled. A 12-channel format tape handles vertical and horizontal forms alignment. During the job set-up, the format tape is read into an Electronic Forms Control Buffer which handles format control during program execution. The printer also incorporates a variety of fault detection sensors and operator communications indicators to signal conditions such as paper tear, out-of-paper, forms misalignment, etc. The B 9247-15 also includes a powered forms stacker which can stack a full box of paper. The B 9247-15 is scheduled for delivery in the fourth quarter of 1976 and can be connected via a Train Printer DLP-5.

B 9346-2 CONSOLE PRINTER/KEYBOARD: This micro-program-controlled console printer/keyboard includes a serial impact matrix printer that prints at 60 characters per second using a 64-character ASCII character set. The printer has 150 print position and a 64-character buffer and can handle forms from 3 to 16.75 inches wide. The B 9346-2 can be located up to 1,000 feet from the central processor, and contains an audible alarm and a media present detector to signal the end or breakage of console forms. The unit is connected to a B 2800/3800/4800 system through a B X340-8 Console Printer Data Link Processor-4.

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 letters plus control characters, which are formed using a 5-by-7 dot matrix technique. The B 9348-3 operates under

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⊳ currently with the B 2800/3800/4800 computers, and the B 2830, which Burroughs rates at twice the performance of a System/370 Model 125. The B 3800 systems are targeted primarily at the System/370 Model 135, while the B 4800 systems are designed and priced to compete with large System/370 Model 145 configurations.

The B 2800, B 3800, and B 4800 systems incorporate innovative hardware technology, a variety of performance levels, and sophisticated software to support development of the data processing applications that appear to occupy high priorities in the planning of the majority of today's medium-to-large-scale data processing installations. As a result, they promise to become strong competitors in the computer marketplace.□

▶ 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 2800/3800/4800 system through a B X341-8 Operator Display Data Link Processor-4 and can also be used as a secondary operator console on B 2700/3700/4700 systems.

B 9134-1 READER-SORTER: Reads optically and/or magnetically encoded numeric documents at up to 1625 documents per minute. Can handle both types of documents of varying sizes and weights in intermixed fashion. The sorting section is available in modules of 4 pockets each, and is expandable to a maximum of 32 pockets. Can be used either on-line or off-line. Can be connected to a B 2800/3800/4800 system through an 8-Channel I/O Cabinet.

B 9137 MICR Reader/Sorter: Has the same performance characteristics as the B 9134, but has a "double read" capability to assist in interpreting imperfect characters. The B 9137 also can be equipped with an optional non-impact printer/endorser and an optional microfilm module for microfilming documents as they are processed by the reader/sorter.

B 9410 PERIPHERAL SWITCHING UNIT: Permits peripheral devices to be manually switched between two control units, which may be connected to different central processors. Connected to a B 2800/3800/4800 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.)

COMMUNICATIONS CONTROLS

B X354-81 UNILINE DATA LINK PROCESSOR-4: Permits connection between a single B 2800/3800/4800 processor and a single directly connected communications line through a Balanced Differential Interface.

B X351-82 UNILINE DATA LINK PROCESSOR-4: Permits connection between a single B 2800/3800/4800 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.

B 774-1 COMMUNICATIONS PROCESSOR: A micro-programmed front-end communications processor that performs the specialized functions associated with the transmission and reception of data, including error recovery, code translation, line discipline management, and most network control functions for a host processor. A basic B 774 communications processor consists of a 1.7-megahertz processor with 12K bytes of micro-programmed MOS control memory and 8K bytes of MOS main memory with an access time of 500 nanoseconds for two bytes, expandable to 98K bytes. An adapter cluster contains a byte-line scanner capable of interfacing up to 16 dual-line adapters that can service up to 32 half-duplex or 16 full-duplex communications lines. Dual-line adapters that interface two half-duplex lines or one full-duplex line can accommodate asynchronous line speeds up to 1800 bits per second and synchronous or binary synchronous line speeds up to 9600 bits per second. Direct connect and automatic dial-out adapters are also available. Data is transferred between the communications processor and the host central processor at a rate of 1,000,000 bytes per second.

A maximum of eight B 774 Communications Processors can be attached to a single host computer system to support a total of 256 half-duplex lines. Each B 774 Communications Processor is attached to the host communications processor through a B X303-8 B 774 System and Communications Processor DLP-4.

A Network Definition Language (NDL) is available to prepare customized network control programs containing tables, system code, and microprograms for each B 774 Communications Processor. The network control program is compiled on the host central processor and loaded from the host system disk to the communications processor through an MCP command. The B 774 Communications Processor was announced for the B 2700/3700/4700 systems in August 1974.

SOFTWARE

MASTER CONTROL PROGRAM: The principal component of Burroughs software support for the B 2800/3800/4800 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 V, the currently available version of the operating system for the Burroughs medium-scale systems, can control up to 80 simultaneous programs and accommodates up to 80 I/O devices and an 80-request I/O queue. MCP VI, announced in December 1975 as an advanced version of the operating system for B 2800/3800/4800 systems as well as the older B 2700/3700/4700 systems, can supervise the concurrent execution of up to 256 programs.

The MCP performs the following principal functions: (1) schedules the loading and execution of user programs in a multiprogramming environment; (2) allocates core 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 ▶

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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.

Among the new features added to MCP V are: (1) support of the File Protect Memory hardware, enabling multiple programs to open and share the same head-per-track 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, announced in December 1975, represents a major revision of the operating system and contains additional enhancements to permit more flexible main memory management and the capability to dynamically alter card, tape, and disk file assignments at run time by setting parameters in an execute card. The new MCP VI multiprogramming executive has the capability to supervise the execution of up to 256 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 overlayable segments that can be brought into main memory only when required for program execution. The compiler builds a segment dictionary reflecting the program organization and computes the memory requirements for containing the resident portions of the program plus the minimum main memory space required for accommodating the largest single overlayable segment 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.

MCP VI also includes 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.

The Workflow Management System, previously available only for B 6700/7700 systems, is also included in MCP VI for the medium-scale systems. This tool is an extension of the MCP job control language that provides facilities for detailed scheduling of the computer's workload and resources. The Workflow Management Language Compiler can be used to define each job as a network of interrelated tasks, to describe the operational characteristics of each job and tasks within the job, and to define resource requirements at the task level, job sequencing, and run-time conditions. Jobs are placed in "service structures" (job queues), each of which has an associated set of parameters which define the maximum amount of processor time, I/O time, lines of output, etc., permitted for each job in the queue. Workflow Management also allows the user to specify the number of jobs from each queue that can be executed concurrently. Jobs are assigned to the job queues through job control statements, by user code, according to the location from which they are submitted, or by default in the event that no user directives are supplied. Facilities for displaying detailed operator instructions on the system console are also provided. The Workflow Management Language Compiler examines the control statements for correct syntax and stores the compiled executable code in a Job File on disk storage. Workflow Management source

statements can also be maintained in disk storage to facilitate retrieval for maintenance and updating.

MCP VI, including systems audit and security, the Workflow Management System, TABS, and overlay support, is scheduled for availability in August 1976. A future release including support for the DMS-II Data Base Management System and an ANS-1974 COBOL compiler is scheduled for March 1977.

COBOL: The three COBOL compilers currently available for B 2700/3700/4700 systems can also be used with the new B 2800/3800/4800 systems. 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," requires 17K bytes of main memory and 190K bytes of disk storage. The second compiler, called "COBOL L," requires 30K bytes of main memory and 240K bytes of disk storage. The largest and newest 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 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 listers.

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 original B 2500/3500 FORTRAN compiler, called "FORTRAN," can be used without change on the B 2700/3700/4700 and B 2800/3800/4800 systems. It requires 27K bytes of main memory (in addition to MCP requirements) and a card or paper tape reader and line printer. Also required is 200K bytes of disk storage for the compiler, plus 340K bytes of working storage for each 1000 source-program cards. The language conforms with American National Standard FORTRAN.

A newer FORTRAN 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 6700 and B 7700 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 Core-Sharing version and a Batch version. Core-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: 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.

COFIRS II, an RPG-to-COBOL translator originally developed for the B 1700 systems, was released for B

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► 2700/3700/4700 systems in July 1974 and is also available for B 2800/3800/4800 systems. COFIRS II converts source programs written in B 1700 RPG language, which is largely compatible with IBM's RPG II, into COBOL source programs.

REPORTER: The Reporter System enables users to generate customized report programs from simplified free-form statements describing the contents of the reports to be produced. Its output is COBOL source code, ready for compilation and execution on either a one-shot or production basis. Reports can be created from information contained in standard disk, tape, or card files or from data base files created and maintained by Disk FORTE or Disk FORTE/2. To describe the files and generate the necessary vocabulary (a one-time operation), the Reporter System 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 produced are described in a concise, English-like language that is largely self-documenting. Numerous default features make it unnecessary for the user 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. Burroughs states that the Reporter System is already being used in more than 100 installations.

PROBLEM ORIENTED LANGUAGE GENERATOR: POLGEN provides the facilities for creating problem-oriented languages (POLs) that enable users to access the computer using free-form statements in a vocabulary that is relevant to the application environment. The POLs created by POLGEN are designed primarily for interactive processing applications, but can also be executed in batch mode. POLGEN includes a COBOL-like grammar definition language for defining a language syntax, using terminology commonly used in the application environment, and for establishing a list of user-supplied procedures to accomplish the processing objectives of the language. COBOL procedures can also be included in the user grammar description. The statements are processed by the POLGEN program, and a machine representation of the grammar description is created on a disk file for access by the POL translator. During execution, the POL processor controls all user routines, automatically provides services such as opening files and reading input, and scans incoming user statements and selects the procedures to be performed based on the grammar description. A standard POL translator can process any POL language by accessing the specific grammar file defining the language. POLGEN was announced for the B 2700/3700/4700 systems in August 1973 and is a separately priced program product.

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 procedures 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 replacment language, but a replacement for the Assembler for programs that require extensive modification of instructions.

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 2700/3700/4700, B 2800/3800/4800, and B 6700/7700 systems. Future enhancements include a search feature, a remap feature for restructuring the data base, and an automatic audit/recovery capability.

DMS-II: The Burroughs DMS-II Data Base Management System is scheduled for release to B 2800/3800/4800 users in March 1977. DMS-II is described in detail in Report 70E-112-01.

MCP TIME-SHARING SYSTEM: The MCP V Time-Sharing System, announced in July 1974, combines Editor, a new Command and Edit (CANDE) language for terminal user communications, and the BASIC programming language into a time-sharing facility that operates concurrently with other modes of operation under control of the MCP operating system. The Editor language permits terminal users to enter symbolic programs as permanent disk files, compile and execute the programs, load and update previously created symbolic programs, and perform various other operations. An edited file can be a source language file for the BASIC compiler or a data file. Both the BASIC and Editor modules are re-entrant to allow their use by multiple users. The BASIC compiler includes a powerful file handling capability that permits up to 16 data files to be opened by one program at a time and provides string variable operators and functions for problem solving. A DEBUG facility permits the time-sharing user to perform interactive program debugging and to trace his program during execution.

The MCP VI Time-Sharing System, scheduled for release in August 1976, includes a Remote Compilation System, a Time-Sharing Module, and the EDITOR capability for program and data file creation. The Remote Compilation System provides facilities for compiling programs using the COBOL V, FORT IV, FORTRAN, BPL, and BASIC V compilers. Both program and data files can be entered through remote terminals. Program and file editing are performed under control of the MCP VI Time-Sharing Module, and all programs compiled for B 2800/3800/4800 systems can be executed in the time-sharing mode under control of the Time-Sharing Module. The Time-Sharing System operates under control of an extension of MCP VI.

NETWORK DEFINITION LANGUAGE: NDL enables users to generate customized data communications control programs. The NCL generator runs on a B 2800/3800/4800 system and produces communications control programs for the B 774 Communications Processor. It can also be used to develop a Message Control System for the host processor that interfaces to a B 774 and/or to the Single-Line and ►

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► Multi-Line Communications Controls. 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.

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 paper tape file or transcribe a file between any two types of hardware devices. The file ID, record length, blocking factor, and/or parity can be altered during the transcription compilations and executions, and for program listings.

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

Burroughs offers a number of conversion programs designed to assist users in converting from other Burroughs and competitive computers to the B 2700/3700/4700 systems, and these conversion aids are also available for B 2800/3800/4800 systems. Translation programs are available to facilitate conversions from (1) Burroughs B 500 or B 5500 COBOL to B 2800/3800/4800 COBOL; (2) Burroughs B 300/500 Basic or Advanced Assembler to B 800 Series Assembler; (3) Burroughs B 300/500 Basic and Advanced Assembler to B 2800/3800/4800 COBOL; (4) IBM System/360 RPG and RPG II to B 2800/3800/4800 COBOL; (5) IBM 1400 Series Autocoder or SPS to Burroughs COBOL; (6) UNIVAC (ex-RCA) Series 70 COBOL or BAL to Burroughs COBOL; (7) Honeywell Series 200/2000 COBOL to Burroughs COBOL; (8) Honeywell Series 200 Easycoder to Burroughs COBOL; and (9) NCR Century Series NEAT/3 Level 1 to Burroughs COBOL.

APPLICATION PROGRAMS: The steadily expanding array of applications software for the B 2700/3700/4700 systems can also be executed on the B 2800/3800/4800 systems and includes the following programs:

Advanced Linear Programming System (ALPS)
Assist (integrated statistical system)
Burroughs Hospital Administrative System-II (BHAS-II)
Burroughs Hospital Information Processing System (BHIPS)
Burroughs Inventory Control System (BICS)
Burroughs Numerical Control System (remote and conversational APT)
Commercial Banking (including item processing, demand deposit, personal trust, total information system, commercial loan, installment loan, and time deposit)
Federal Reserve Banking (including item processing and automatic item correction)
GASP (FORTRAN-based discrete-change simulation language)
Generative General Ledger
Generative Accounts Payable
Mathematical Programming System (including basic optimization module and matrix/generator report writer module)
On-Line Wholesale Distribution Package

Production Control System-II (including engineering data control, work in process inventory, capacity requirements planning, requirements planning, forecasting and inventory analyses, on-line file maintenance, and on-line inquiry)
Project Oriented Management Information System (PROMIS)
Scholastic Systems (including scheduling, financial processing, student records test scoring, payroll, and instructional materials)
Thrift Industry (including time deposits, mortgage loans, consumer loans, general ledger, and on-line credit union)

PRICING

EQUIPMENT: The following configurations illustrate the wide range of price and performance that can be achieved with the B 2800, B 3800, and B 4800 systems. All necessary control units and exchange units are included in the indicated prices. The quoted rental prices are for the basic one-year lease and include equipment maintenance.

BASIC B 2830 TAPE/DISK SYSTEM: Consists of 100KB B 2830 Central Processor with one I/O Subsystem and one DLP Base, Console Keyboard/Printer and Display, two B 9496-4 Magnetic Tape Drives (80 KB), B 9116 Card Reader (600 cpm), B 9247-15 Line Printer (1500 lpm), and B 9387-1 Dual Disk Subsystem (130.4 MB). Monthly rental is approximately $11,100 and purchase price is approximately $436,000.

B 3830 TAPE/DISK SYSTEM: Consists of a B 3830 Central Processor with I/O Subsystem, two DLP Bases, and 200K bytes of main memory, Console Printer/Keyboard and Display, B 9116 Card Reader (600 cpm), four B 9495-2 Magnetic Tape Units (120 KB), B 9247-15 Line Printer (1500 lpm), 11.8 million bytes of B 9470-1 Head-Per-Track Disk Storage, and two B 9484-5 Dual Drive Disk Units (260.8 MB). Monthly rental is approximately $19,000 and purchase price is approximately $805,700.

B 4840 TAPE/DISK SYSTEM: Consists of B 4840 Central Processor with I/O Subsystem, two DLP Bases, Floating Point Arithmetic, and 400K bytes of main memory, Console Printer/Keyboard and Display, B 9116 Card Reader (600 cpm), B 9247-15 Line Printer (1500 lpm), four B 9495-3 Magnetic Tape Units (200 KB), 23.6 million bytes of B 9470-1 Head-Per-Track Disk Storage, and four B 9484-5 Dual Disk Drives (521.6 MB). Monthly rental is approximately $27,700 and purchase price is approximately $1,173,000.

B 4842 DUAL-PROCESSOR SYSTEM: Consists of B 4842 System with two Central Processors, each including Floating Point Arithmetic, two I/O Subsystems, four DLP Bases, File Protect Memory, and 500K bytes of main memory. Each Central Processor also includes a Console Keyboard/Printer and Display, B 9116 Card Reader (600 cpm), B 9247-15 Line Printer (1500 lpm), and four B 9495-3 Magnetic Tape Units (200KB). The shared random-access storage includes 23.6 million bytes of B 9470-1 Head-Per-Track Disk Storage and three B 9383-17 Dual Disk Drives (1.05 billion bytes). Monthly rental is approximately $46,100 and purchase price is approximately $2,000.000.

SOFTWARE: Program Products for the B 2800/3800/4800 systems are offered under either an Unlimited-Time License Plan, for a one-time charge followed by an annual maintenance fee, or a Limited-Time License Plan, with monthly payments during either a three-year or five-year lease term. The available Program Products and their associated license fees are listed under "Software Prices" at the end of this report and Report 70C-112-06. The MCP Operating System and utilities and all other software facilities not classified as Program Products are still available to users at no extra cost.

TECHNICAL SUPPORT: The B 2800/3800/4800 hardware prices include "normal and reasonable" technical support to assist in training and advising the customer in the use of his system. ►

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► CONTRACT TERMS: The standard equipment lease agreement includes equipment maintenance and entitles the customer to unlimited use of the equipment The standard agreement covers maintenance of the equipment for eight consecutive hours a day, Monday through Friday. (No 176-hour nor Measured Time Usage lease plans are available for the B 2800/3800/4800 systems.)

In addition to the standard 1-year lease, Burroughs offers 3-year and 5-year leases at prices 7 and 11 percent lower, respectively, than the 1-year lease prices shown in the equipment price list. A 5-year lease plan providing unlimited maintenance coverage (24 hours/day, 7 days/week) is available at a 7 percent discount from the 1-year lease price.

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

EQUIPMENT PRICES*

		Purchase Price	Monthly Maint.	Rental (1-year lease)**
CENTRAL PROCESSORS				
B 2830	System (includes 3-MHz central processor, 1.5-MB/sec. I/O Subsystem, 1 DLP base, and 100K bytes of MOS main memory)	235,200	330.00	5,880
B 3830	System (includes 4-MHz central processor, 4-MB/sec. I/O Subsystem, 2 DLP bases, and 100K bytes of MOS main memory)	310,080	390.00	6,460
B 3831	System (includes 4-MHz Central Processor, 4-MB/sec. I/O Subsystem, 2 DLP Bases, 100K bytes of MOS main memory, File Protect Memory, Auxiliary Cabinet, and Auxiliary Independent Power)	352,980	571.00	7,435
B 3832	System (includes 4-MHz Central Processor, two 4-MB/sec I/O Subsystems, 4 DLP Bases, 100K bytes of MOS memory, File Protect Memory, Auxiliary Independent Power)	585,540	961.00	12,280
B 4840	System (includes 8-MHz Central Processor, 8-MB/sec I/O Subsystem, 2 DLP Bases, and 200K bytes of MOS main memory)	445,920	515.00	9,290
B 4841	System (includes 8-MHz Central Processor, 8-MB/sec. I/O Subsystem, 2 DLP Bases, 200K bytes of MOS main memory, File Protect Memory, Auxiliary Cabinet, and Auxiliary Independent Power)	488,820	696.00	10,265
B 4842	System (includes two 8-MHz Central Processors, two 8-MB/sec. I/O Subsystems, 2 DLP Bases, 200K bytes of MOS main memory, File Protect Memory, Auxiliary Cabinet, and Auxiliary Independent Power	823,260	1,211.00	17,235
B 2830 SYSTEM OPTIONS				
B 2305-8	Additional DLP Base (6-8 DLP's)	9,000	20.00	225
B 2094-8	DLP Multiplexor	9,000	20.00	225
B 2096-8	8-Channel I/O Cabinet	31,400	40.00	785
B 2096-8	Auxiliary Cabinet	18,000	35.00	450
B 2098-8	Auxiliary Independent Power	8,000	18.00	200
B 2099-8	Floating Point Arithmetic	6,000	12.00	150
B 3830/B 3831/B 3832 SYSTEM OPTIONS				
B 3305-8	Additional DLP Base (6-8 DLP's)	9,000	20.00	225
B 3095-8	Additional DLP Cabinet (Includes 1 DLP Base)	19,000	55.00	425
B 3096-8	8-Channel I/O Cabinet	31,400	40.00	785
B 3097-8	Auxiliary Cabinet	18,000	35.00	450
B 3098-8	Auxiliary Independent Power	8,000	18.00	200
B 3099-8	Floating Point Arithmetic	6,000	12.00	150
B 4840/B 4841/B 4842 SYSTEM OPTIONS				
B 4305-8	Additional DLP Base (6-8 DLP's)	9,000	20.00	225
B 4095-8	Additional DLP Cabinet (Includes 1 DLP Base)	17,000	55.00	425
B 4096-8	8-Channel I/O Cabinet	31,400	40.00	785
B 4097-8	Auxiliary Cabinet	18,000	35.00	450
B 4098-8	Auxiliary Independent Power	8,000	18.00	200
B 4099-8	Floating Point Arithmetic	6,000	12.00	150

* Please refer to the price list at the end of Report 70C-112-06 for prices of B 2700/3700/4700 peripheral devices and Program Products, which are also available for use with B 2800/3800/4800 systems.
** Rental prices include equipment maintenance.

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EQUIPMENT PRICES*

		Purchase Price	Monthly Maint.	Rental (1-year lease)**
B 2830 MEMORY MODULES		*14,940*		
B 2015-8	150,000 Bytes IC Memory (additional 50KB)	18,400	35.00	460
B 2020-8	200,000 Bytes IC Memory (additional 100KB)	36,800	70.00	920
B 2025-8	250,000 Bytes IC Memory (additional 150KB)	55,200	105.00	1,380
B 2030-8	300,000 Bytes IC Memory (additional 200KB)	73,600	140.00	1,840
B 2035-8	350,000 Bytes IC Memory (additional 250KB)	92,000	175.00	2,300
B 2040-8	400,000 Bytes IC Memory (additional 300KB)	110,400	210.00	2,760
B 2045-8	450,000 Bytes IC Memory (additional 350KB)	128,800	245.00	3,220
B 2050-8	500,000 Bytes IC Memory (additional 400KB)	147,200	280.00	3,680
B 3830/B 3831/B 3832 MEMORY MODULES				
B 3015-8	150,000 Bytes IC Memory (additional 50KB)	23,100	45.00	500
B 3020-8	200,000 Bytes IC Memory (additional 100KB)	46,200	90.00	1,000
B 3025-8	250,000 Bytes IC Memory (additional 150KB)	69,300	135.00	1,500
B 3030-8	300,000 Bytes IC Memory (additional 200KB)	92,400	180.00	2,000
B 3035-8	350,000 Bytes IC Memory (additional 250KB)	115,500	225.00	2,500
B 3040-8	400,000 Bytes IC Memory (additional 300KB)	138,600	270.00	3,000
B 3045-8	450,000 Bytes IC Memory (additional 350KB)	161,700	315.00	3,500
B 3050-8	500,000 Bytes IC Memory (additional 400KB)	184,800	360.00	4,000
B 4840/B 4841/B 4842 MEMORY MODULES				
B 4030-8	300,000 Bytes IC Memory (additional 100KB)	58,210	90.00	1,260
B 4040-8	400,000 Bytes IC Memory (additional 200KB)	116,420	180.00	2,520
B 4050-8	500,000 Bytes IC Memory (additional 300KB)	174,630	270.00	3,780
B 4060-8	600,000 Bytes IC Memory (additional 400KB)	232,840	360.00	5,040
B 4070-8	700,000 Bytes IC Memory (additional 500KB)	291,050	450.00	6,300
B 4080-8	800,000 Bytes IC Memory (additional 600KB)	349,260	540.00	7,560
B 4090-8	900,000 Bytes IC Memory (additional 700KB)	407,470	630.00	8,820
B 4100-8	1,000,000 Bytes IC Memory (additional 800KB)	465,680	720.00	10,080
B 2830 ASSOCIATED DLP'S, EXCHANGES, AND FEATURES				
B 2110-81	Card Reader DLP-3 (for B 9115/6/7 only)	2,400	11.00	60
B 2247-81	Line Printer DLP-5 (for B 9247-12/-13/-14 only)	6,000	18.00	150
B 2247-82	Line Printer DLP-5 (for B 9247-15 only)	14,400	18.00	400
B 2395-81	40/80 Mag Tape DLP-3 (for B 9246,2/-4 only)	12,200	35.00	305
B 2395-82	120/200/320/400KB Mag Tape DLP-3 (for B 9245-2/-3/-5/-6 only)	17,000	60.00	500
B 2304-8	Disk Pack Drive DLP-4	4,000	16.00	150
B 2373-81	HPT Disk File 1 x 2 DLP-4 (for B 9470 Series only)	14,000	17.00	350
B 2373-82	HPT Disk File 1 x 2 DLP-5 w/FPM Adapter (for B 9470 Series only)	16,400	22.00	410
B 2340-8	Console Printer DLP-4 (for B 9346-2 only)	6,200	18.00	155
B 2341-8	Operator Display DLP-4 (for B 9348-2/-3 only)	3,800	18.00	95
B 2351-81	Uniline DLP-4; Balance Differential Interface	7,000	9.00	175
B 2351-82	Uniline DLP-4; Data Set Connect Only (Synchronous, Burroughs Standard up to 2400 bps; Asynchronous, Burroughs Standard up to 1800 bps)	7,000	9.00	175
B 2303-8	B 774 System and Communications Processor DLP-4	6,000	16.00	150
B 2377-6	Basic N1 x N2 Exchange (up to 4 x 4; for B 9470 Series only)	8,400	25.00	210
B 2377-8	N1 x N2 Expander for B 2377-6 (expands B 2377-6 to 8 x 8)	1,000	3.00	25
B 2377-12	N2 Expansion Adapter for B 2377-8 (3 max.—up to 8 x 12, 8 x 16, 8 x 20)	1,000	3.00	25
B 2377-31	DLP Adapter for B 2377-6/-8 (N1 side—up to 8)	1,200	4.00	30
B 2377-32	DE Adapter for B 2377-6/-8 (N2 side—up to 20)	1,200	4.00	30
Operator Control Stations:				
B 9346-2	Console Printer/Keyboard (60 cps)	5,100	23.00	130
B 9348-3	Operator Display and Standing-Level Console	7,900	26.50	170
B3830/3831/3832 ASSOCIATED DLP'S, EXCHANGES, AND FEATURES				
B 3110-8	Card Reader DLP-3 (for B 9115/6/7 only)	2,400	60.00	11
B 3247-81	Line Printer DLP-5 (for B 9247-12/-13/-14 only)	6,000	150.00	18
B 3247-82	Line Printer DLP-5 (for B 9247-15)	14,400	400.00	18
B 3395-81	40/80 KB Mag Tape DLP-3 (for B 9246-2/-4 only)	12,200	305.00	35
B 3395-82	120/200/320/400 KB Mag Tape DLP-3 (for B 9245-2/-3/-5/-6 only)	17,000	500.00	60
B 3304-8	Disk Pack Drive DLP-4	4,000	150.00	16
B 3373-81	HPT Disk File 1 x 2 DLP-4 (for B 9470 Series only)	14,000	350.00	17
B 3373-82	HPT Disk File 1 x 2 DLP-5 W/FPM Adapter (for B 9470 Series only)	16,400	410.00	22
B 3340-8	Console Printer DLP-4 (for B 9346-2 only)	6,200	155.00	18
B 3341-8	Operator Display DLP-4 (for B 9348-2/-3 only)	3,800	95.00	18
B 3351-81	Uniline DLP-4; Balance Differential Interface; up to 9600 bps	7,000	9.00	175
B 3351-82	Uniline DLP-4; Data Set Connect Only (Synchronous, Burroughs Standard up to 2400 bps; Asynchronous, Burroughs Standard up to 1800 bps)	7,000	9.00	175

* Please refer to the price list at the end of Report 70C-112-06 for prices of B 2700/3700/4700 peripheral devices and Program Products, which are also available for use with B 2800/3800/4800 systems.
** Rental prices include equipment maintenance.

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EQUIPMENT PRICES*

		Purchase Price	Monthly Maint.	Rental (1-year lease)**
B 3830/3831/3832 ASSOCIATED DLP'S, EXCHANGES, AND FEATURES (Continued)				
B 3303-8	B 774 System and Communications Processor DLP-4	6,000	16.00	150
B 3377-6	Basic N1 x N2 Exchange (up to 4 x 4; for B 9470 Series only)	8,400	25.00	210
B 3377-8	N1 x N2 Expander for B 3377-6	1,000	3.00	25
B 3377-12	N2 Expansion Adapter for B 3377-8 (3 max.—up to 8 x 12, 8 x 16, 8 x 20)	1,000	3.00	25
B 3377-31	DLP Adapter for B 3377-6/-8 (N1 side—up to 8)	1,200	4.00	30
B 3377-32	DE Adapter for B 3377-6/-8 (N2 side—up to 20)	1,200	4.00	30
Operator Control Stations:				
B 9346-2	Console Printer/Keyboard (60 cps)	5,100	23.00	130
B 9348-3	Operator Display and Standing—Level Console	7,900	26.50	170
B 4840/4841/4842 ASSOCIATED DLP'S, EXCHANGES, AND FEATURES				
B 4110-8	Card Reader DLP-3 (for B 9115/6/7 only)	2,400	11.00	60
B 4247-81	Line Printer DLP-5 (for B 9247-12/-13/-14 only)	6,000	18.00	150
B 4247-82	Line Printer DLP-5 (for B 9247-15)	14,400	18.00	400
B 4395-81	40/80 KB Mag Tape DLP-3 (for B 9246-2/-4 only)	12,200	35.00	305
B 4395-82	120/200/320/400 KB Mag Tape DLP-3 (for B 9245-2/-3/-5/-6 only)	17,000	60.00	500
B 4304-8	Disk Pack Drive DLP-4	4,000	16.00	150
B 4373-81	HPT Disk File 1 x 2 DLP-4 (for B 9470 Series only)	14,000	17.00	350
B 4373-82	HPT Disk File 1 x 2 DLP-5 W/FPM Adapter (for B 9470 Series only)	16,400	22.00	410
B 4340-8	Console Printer DLP-4 (for B 9346-2 only)	6,200	18.00	155
B 4341-8	Operator Display DLP-4 (for B 9348-2/-3 only)	3,800	18.00	95
B 4351-81	Uniline DLP-4; Balance Differential Interface; up to 9600 bps	7,000	9.00	175
B 4351-82	Uniline DLP-4; Data Set Connect Only (Synchronous, Burroughs Standard up to 2400 bps; Asynchronous, Burroughs Standard up to 1800 bps)	7,000	9.00	175
B 4303-8	B 774 System and Communications Processor DLP-4	6,000	16.00	150
B 4377-6	Basic N1 x N2 Exchange (up to 4 x 4; for B 9470 Series only)	8,400	25.00	210
B 4377-8	N1 x N2 Expander for B 4377-6	1,000	3.00	25
B 4377-12	N2 Expansion Adapter for B 4377-8 (3 max.—up to 8 x 12, 8 x 16, 8 x 20)	1,000	3.00	25
B 4377-31	DLP Adapter for B 4377-6/-8 (N1 side—up to 8)	1,200	4.00	30
B 4377-32	DE Adapter for B 4377-6/-8 (N2 side—up to 20)	1,200	4.00	30
Operator Control Stations:				
B 9346-2	Console Printer/Keyboard (60 cps)	5,100	23.00	130
B 9348-3	Operator Display and Standing-Level Console	7,900	26.50	170
B 9470 HEAD-PER-TRACK DISK SUBSYSTEMS				
B 9470-1	Primary Storage Module for B 4800/B 3800/B 2800 systems; 5.5M bytes, 5 ms access	34,000	63.00	850
B 9470-2	Add-On Storage Module for B 4800/B 3800/B 2800 systems; 5.5M bytes, 5 ms access (requires one B 9470-1)	34,000	63.00	850
B 9470-11	Primary Storage Module for B 7700/B 6700 and B 4800/B 3800/B 2800 systems; 5.9M bytes, 5 ms access	28,000	61.00	700
B 9470-12	Add-on Storage Module for B 7700/B 6700 and B 4800/B 3800/B 2800 systems; 5.9M bytes, 5 ms access (requires one B 9470-2)	28,000	61.00	700
B 9471-6	Disk Electronics Unit for B 9470-1 or B 9470-2 Storage Module (one required for every four modules)	10,000	38.00	250
B x377-6	Basic N1 x N2 Exchange (up to 4 x 4)	8,400	25.00	210
B x377-8	N1 x N2 Expander for B x377-6 (up to 8 x 8)	1,000	3.00	25
B x377-12	N2 Expansion for B x377-8 (3 maximum—up to 8 x 12, 8 x 16, 8 x 20)	1,000	3.00	25
B x377-31	Control or DLP Adapter for B x377-6/-8 (N1 side—up to 8)	1,200	4.00	30
B x377-32	DE Adapter for B x377-6/-8 (N2 side—up to 20)	1,200	4.00	30
B 6377-1	1 x 1 Control for B 6700 systems	23,200	87.00	580
B 7377-1	1 x 1 Control for B 7700 systems	31,200	87.00	780
B x377-2	N2 Expander for B x377-1 (3 maximum—up to 1 x 2, 1 x 3, 1 x 4)	2,000	7.00	50
B x377-3	Continuous Processing Adapter for B x377-6 Basic Exchange (required for dual port DE operation)	3,000	11.00	75
B 9387-1, B 9387-2, AND B 9484-5 DISK PACK SUBSYSTEMS				
B 9387-1	Disk Storage/Single Controller; 130.4M bytes, 25 ms average access, 8.3 ms average latency; maximum 1 x 4 spindle exchange	46,000	224.00	1,150
B 9387-2	Disk Pack Drive Controller for use with B 9484-5 Disk-Pack Drive	36,200	94.00	905
B x387-5	Basic Disk Pack Drive Exchange for use with B 9387-2 Controllers and B 9484-5 Drive	8,000	36.00	200
B x387-6	Controller Port Expansion Adaptor; allows B x387-5 to be addressed by two additional B 9387-2 Controllers	1,600	7.00	40
B x387-7	Exchange Expansion Adaptor; allows B x387-5 to be expanded for use with up to 16 drives	4,800	22.00	120
B x387-8	Spindle Exchange Expansion; allows four additional spindles to be attached to a B x 387-5 (maximum 16 spindles per subsystem)	3,200	14.00	80
B 9484-5	130.4M byte Dual Disk Pack Drive; 25 ms average access, 8.3 ms average latency	31,150	130.00	770

* Please refer to the price list at the end of Report 70C-112-06 for prices of B 2700/3700/4700 peripheral devices and Program Products, which are also available for use with B 2800/3800/4800 systems.

** Rental prices include equipment maintenance.

Burroughs B 2800, B 3800, & B 4800

EQUIPMENT PRICES*

		Purchase Price	Monthly Maint.	Rental (1-year lease)**
B 9383-16/-17/-18 DUAL DISK PACK DRIVE SUBSYSTEMS				
B 9383-16	Disk Storage/Single Controller; 348.8 MB, 30 ms avg. access, 12.5 ms avg. latency	109,350	324.00	2,680
B 9383-17	Disk Storage/Dual Controller; 348.8 MB, 30 ms avg. access, 12.5 ms avg. latency	177,500	376.00	3,610
B 9383-18	Disk Storage/Dual Controller; 1744.0 MB, 30 ms avg. access, 12.5 ms avg. latency	305,200	1,211.00	6,245
B 9484-8	Dual Drive Increment; 348.8MB, 30 ms avg. access, 12.5 ms avg. latency	33,700	195.00	840
B x304-3	Disk Drive Control for B 7700/B 6700 systems	9,000	15.80	385
B 9984	Dual Port Feature (one required per dual drive)	2,000	7.00	55
B x304-8	Disk Pack DLP-4 for B 4800/B 3800/B 2800 Systems	4,000	16.00	150
PRINTERS				
B 9247-15	Train Printer, 1500 lpm	52,200	435.00	1,450

SOFTWARE PRICES*

		UNLIMITED-TIME PLAN			LIMITED-TIME PLANS	
		Single Payment	12 Monthly Payments	Annual Maint. Charge	Monthly Fee (3-Year Plan)	Monthly Fee (5-Year Plan)
DMS-II	Data Base Management System	11,700	1,073	1,170	390	374

		Monthly License Fee
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TABS VI	Billing Systems	35
ANS 74	COBOL	50

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** Rental prices include equipment maintenance.