

Burroughs B 900 Series

MANAGEMENT SUMMARY

Burroughs has realigned the B 900 Series of general-purpose commercial systems, removing the B 920 from major production and focusing on the B 930, which the company introduced in 1982. Like the older B 920, the B 930 is a multiprocessor system. However, by using 3MHz processors and 64K-bit RAM memory technology, the B 930, according to Burroughs, delivers 30 percent higher throughput than the B 920, which employed 2MHz processors and 16K-bit RAM technology.

The B 930 grouping comprises Models 1 and 2. Each model can support up to eight 3MHz processors. Each processor has an associated memory module and independently executes instructions from its own memory. In addition, each processor supports its share of the total processing environment in a multiprogramming mode. The four types of processors used by the system are: Operating System, Disk File Management, Data Communications, and Task.

The Operating System Processor manages the internal operations of the system, containing and executing all control routines associated with the Master Control Program (MCP), except for disk routines. The Operating System Processor is called upon by the other processors as operating system services are needed; it addresses the other processors only when control information is required. The Operating System Processor requires either 256KB or 512KB of memory.

The Disk File Management Processor and its associated memory provide a direct interface to disk devices for file management, storing and executing physical disk access

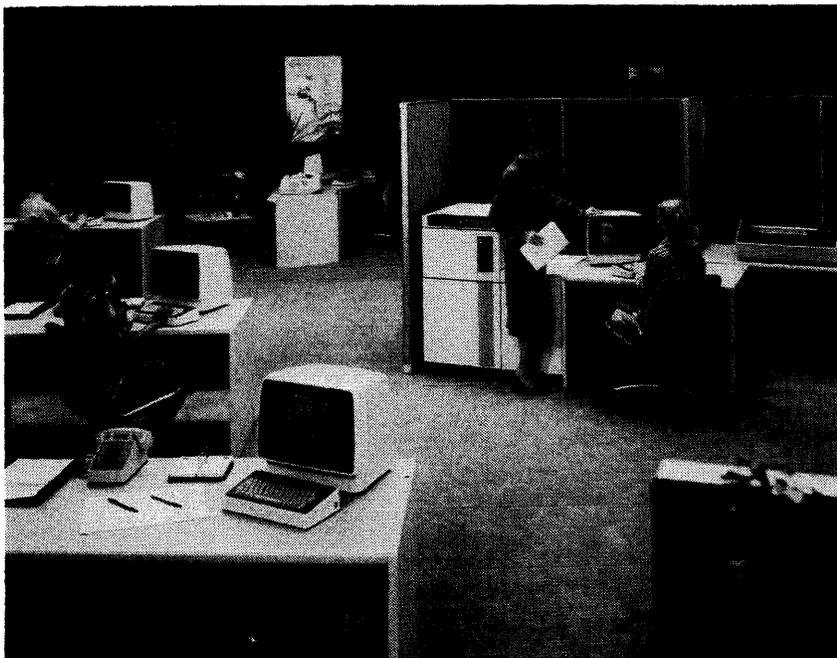
Burroughs has shifted the focus of the B 900 Series, removing the B 920 from major production and concentrating its marketing efforts on the B 930. Positioned between Burroughs' B 90 and B 1900 systems, the B 900 Series features application and peripheral compatibility with Burroughs' other CMS (Computer Management System) small and midrange business computers. The B 900 Series competes in the market for general-purpose commercial systems that has traditionally been targeted by CMS systems.

MODELS: B 930 Models 1 and 2.
MEMORY: 640KB to 3.2MB.
DISK CAPACITY: 77.2MB to 1.7GB.
WORKSTATIONS: Up to 36 concurrently active.
PRICE: \$23,228-\$36,750 (base processor complexes).

CHARACTERISTICS

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

CANADIAN ADDRESS: Burroughs-Canada, 801 York Mills Road, Don Mills, Ontario, Canada M3B1X7. Telephone (416) 445-4030.



The B 930, available in Models 1 and 2, employs a multiple processor architecture. The system can employ up to eight processors, each with an associated memory module. The B 930, which operates in Burroughs' Computer Management System (CMS) software environment, supports up to 3.2MB of main memory, 1.7GB of online disk storage, and 36 concurrently active workstations.

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CHART A. SYSTEM COMPARISON

MODEL	B 930 Model 1	B 930 Model 2
SYSTEM CHARACTERISTICS		
Date of introduction	Aug. 1982	Aug. 1982
Date of first delivery	Nov. 1982	Nov. 1982
Operating system	CMS MCP	CMS MCP
Upgradable from	Not applicable	B 930 Model 1
Upgradable to	B 930 Model 2	Not applicable
MIPS	—	—
Relative performance	—	—
MEMORY		
Minimum capacity, bytes	640KB	896KB
Maximum capacity, bytes	3.2MB	3.2MB
Type	MOS RAM	MOS RAM
Cache memory	None	None
Cycle time, nanoseconds	333	333
Bytes fetched per cycle	1	1
INPUT/OUTPUT CONTROL		
Number of channels	12	12
High-speed buses	Not applicable	Not applicable
Low-speed buses	Not applicable	Not applicable
MINIMUM DISK STORAGE		
	77.2MB	77.2MB
MAXIMUM DISK STORAGE		
	1.7GB	1.7GB
NUMBER OF WORKSTATIONS		
	36	36
COMMUNICATIONS PROTOCOLS		
	2780/3780, SDLC, BDLC, HDLC, Hasp 360-20, RJE, X.25, 3270/ Bisync, BNA, SNA	2780/3780, SDLC, BDLC, HDLC, Hasp 360-20, RJE, X.25, 3270/ Bisync, BNA, SNA

Note: A dash (—) in a column indicates that the information is unavailable from the vendor.

➤ functions usually associated with the operating system. The Disk File Management Processor includes a PRAM module with 64KB of RAM memory for disk processor functions and a 16KB ROM bootstrap loader; the PRAM module is included in the basic system and is not freely configurable.

The Task Processors execute user programs and user-oriented utilities. Each Task Processor can operate in a multiprogramming mode under the management of the MCP; each job is reviewed by the MCP in light of the system workload prior to assignment to a particular Task Processor. Each Task Processor supports a 256KB or 512KB memory module to store all programs and utilities during their periods of execution. The memory of each processor also stores the interpreters used to execute user programs. The B 930 can support up to five Task Processors.

The Data Communications Processor (DCP) interfaces terminals and workstations, executing a network defined through Burroughs' Network Definition Language (NDL). The DCP can handle up to twelve communications lines of varying types and speeds with a total bandpass up to 150,000 bps (depending on the protocol) and a maximum line speed of 38,400 bps in a direct connect environment. The B 930 can support two DCPs.

The multiple processor architecture of the B 930 is intended to provide a greater measure of system availability than is provided by a single-processor system. A Task Processor can fail, for example, without affecting jobs running in other processors. An additional processor redundancy feature (optional on Model 1, inbuilt on Model 2) maintains the system if either the Operating System Processor or the Disk File Management Processor should fail, assigning the

➤ DATA FORMATS

BASIC UNIT: 8-bit byte with two decimal digits or one character per word. The microinstruction set has no preferred word or byte boundaries that are visible to the rest of the system.

FIXED-POINT OPERANDS: One to fifteen digits plus sign.

FLOATING-POINT OPERANDS: None.

INSTRUCTIONS: The B 900 is an interpreter-based system using variable micro-logic. Utilizing the microinstruction set, operand lengths permit from 1 to 256 bytes of data to be addressed with a single instruction, and up to eight bits to be addressed in parallel between main memory and the processor.

INTERNAL CODE: ASCII; other media codes, such as EBCDIC, may be translated.

MAIN STORAGE

TYPE: N-channel MOS RAM, 64K bits per chip.

CYCLE TIME: 333 nanoseconds.

CAPACITY: 640KB to 3.2MB. See Chart A for capacities of individual models.

CHECKING: Parity standard.

STORAGE PROTECTION: Address bounds and checks are performed by the interpreters.

RESERVED STORAGE: A variable portion is reserved for microinstruction storage.

CACHE MEMORY: B 930 systems do not employ cache memory in the conventional sense. However, the Disk File Cache Module (DFCM) can be configured with either a 256MB or 512MB memory module to hold copies of those

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▷ failed processor's position to a Task Processor. The assignment is effected by the user's depressing a button on the system control panel at warm start. (A Task Processor providing backup for the Operating System Processor must be configured with a memory module of the same capacity as that used for the Operating System Processor.)

The B 930 can also use the Disk File Cache Module (DFCM), configured with either a 256MB or 512MB memory module, to hold copies of those portions of disk with a high probability of being accessed. The DFCM is optional on Model 1 and inbuilt on Model 2.

The basic B 930 Model 1 is configured with four 3MHz processors: the Operating System Processor, with 256KB or 512KB of associated memory; a single Task Processor with 256KB or 512KB of memory; a Data Communications Processor (DCP) with 64KB of memory; and a Disk File Management Processor with a PRAM module containing 64KB of RAM and 16KB of ROM.

The unextended Model 1 can support two additional Task Processors and associated memory modules; one of the additional Task Processors can be configured as a DCP. Although the basic 64KB of associated memory is sufficient, the second DCP can be configured instead with 256KB or 512KB of memory and can be used alternately as a DCP or as a Task Processor. (According to Burroughs, the added memory does not enhance the second processor's performance if it is used as a DCP.) The addition of an extended backplane to the Model 1 allows it to be upgraded to a Model 2, permitting configuration of two more processors and up to 1MB of memory, for a system total of eight processors and 3.2MB of memory. The Model 1 can also support processor redundancy and Disk File Cache Module options.

The basic B 930 Model 2 is a five-processor system that includes the same components as the basic Model 1, along with an additional Task Processor and 256KB or 512KB of associated memory. The basic Model 2 also incorporates a factory-installed performance enhancement pack that includes the processor redundancy feature and the Disk File Cache Module with 256KB of memory.

Model 2 can support three additional Task Processors and memory modules; one of those added processors can be configured as a second DCP with 64KB, 256KB, or 512KB of associated memory (as on the Model 1). Model 2 can support up to 3.2MB of memory.

Both the B 930 Model 1 and Model 2 can support from 77.2MB to 1.7GB of on-line disk storage and, in a typical application environment, 36 workstations.

Burroughs also offers the B 933, a packaged configuration of the basic Model 1 that includes two 256KB memory modules (for the Operating System Processor and the Task Processor), a 77.2MB fixed disk drive, a 9-track streaming tape drive, and disk, tape, and printer controls. The B 933 has the same expandability features as the B 930 Model 1. ▷

▶ portions of disk with a high probability of being accessed. The DFCM is optional on Model 1 and inbuilt on Model 2; in the latter it includes a 256KB memory module.

CENTRAL PROCESSOR

B 900 systems employ a multiprocessor architecture, with up to eight 3 MHz processors. Each processor independently executes instructions from its own associated memory. Also, each processor supports its share of the total processing environment in a multiprogramming mode. The breakdown of processor functions and associated memory sizes is as follows:

- The Operating System Processor manages the internal operations of the system; it contains and executes all the control routines associated with the Master Control Program (MCP), except for disk. This processor's memory provides data storage and data communications buffers as required for peripherals. The Operating System Processor is called upon by the other processors as operating system services are needed. It only addresses the other processors when control information is required. The Operating System Processor also controls the Time-of-Day Clock, the Operator Display Terminal, and certain other peripherals. The basic B 930 system includes either 256KB or 512KB of memory for the Operating System Processor.
- The Disk File Management Processor provides a direct interface to the disk devices for file management. This processor and its associated memory store and execute the physical disk access functions usually associated with the operating system. Disk data flows directly to and from buffer memory which is a part of memory associated with the Operating System Processor. The Disk File Management Processor includes a PRAM module with 64KB of RAM memory for disk processor functions and a 16KB ROM bootstrap loader; the PRAM module is included in the basic system and is not freely configurable.
- One (Model 1) or two (Model 2) Task Processors are included in the basic B 930 system. Each Task Processor can operate in a multiprogramming mode under the management of the MCP. Each job is reviewed by the MCP in light of the system workload prior to assignment to a particular task processor. This results in an optimal system resources/system performance mix. The 256KB or 512KB of memory associated with each Task Processor stores all user programs and user-oriented utilities during their period of execution. The interpreters, used to execute user programs, are also stored within each processor's memory. All buffers reside within the Operating System Processor to free maximum memory for the execution of user programs and utilities.
- A Data Communications Processor (DCP) with 64KB of memory is also included in the basic system. Please refer to the Communications Control section of this report for further details on DCP operation.

The multiple processor architecture is intended to provide system availability. If a Task Processor fails, jobs running in that processor must be restarted and will be allocated by the MCP to another Task Processor. Jobs running in processors other than the failed one continue to execute.

In addition, a processor redundancy feature (optional on Model 1, inbuilt on Model 2) maintains the system if either the Operating System Processor or the Disk File Management Processor should fail, assigning the failed processor's position to a Task Processor. This assignment is implemented at warm start through the user's depressing a button on the system control panel. (A Task Processor providing backup for the Operating System Processor must be configured with a memory module of the same capacity as that ▶

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CHART B. MASS STORAGE

MODEL	B 9484-51	B 9493-20	B 9493-40	B 9493-80	B 9494-41
Type	Removable pack	Fixed	Fixed	Fixed	Fixed
Controller model	B 9387-41 through MP 1484 host control	MP 1943	MP 1943	MP 1943	B 9387-41 through MP 1484 host control
Drives per subsystem/ controller	4	1	1	1	4
Formatted capacity per drive, megabytes	130.4MB	19.2MB	38.6	77.2	402
Number of usable surfaces	10	2	8	8	16
Number of sectors or tracks per surface	815 tracks	—	—	—	1564
Bytes per sector or track	180/sector	180/sector	180/sector	180/sector	180/sector
Average seek time	25 ms	48 ms	45 ms	45 ms	28 ms
Average rotational/relay time	8 ms	7 ms	10 ms	10 ms	8 ms
Average access time	33 ms	55 ms	55 ms	55 ms	36 ms
Data transfer rate	1.2MB/sec.	888KB/sec.	888KB/sec.	888KB/sec.	1.3MB/sec.
Supported by system models	B 930 Models 1 and 2	B 930 Models 1 and 2	B 930 Models 1 and 2	B 930 Models 1 and 2	B 930 Models 1 and 2

Note: A dash (—) in a column indicates that the information is unavailable from the vendor.

➤ The B 930 operates in Burroughs' Computer Management System (CMS) software environment, and, thus, features source code and object code compatibility for batch and screen-based applications with B 90 systems, B 1900 CMS systems, and the older B 80 and B 800 systems. The B 930 can also employ a range of CMS utilities and related products for system and data management and program development.

Although the B 900 is essentially a standalone system for commercial applications, it supports a range of communications software that permits it to access Burroughs and IBM systems in distributed networks. The B 900 supports Burroughs Network Architecture (BNA) and the System Communications Module (Sycom) for distributed communications with other Burroughs systems, as well as RJE, Hasp, IBM 2780/3780, IBM 3270, and IBM SNA interface software for distributed communications with IBM and SNA-based systems. (Burroughs also markets the CP 9500, a specialized version of the B 900 for distributed processing applications; the CP 9500, when fully extended, can support up to 150 communications lines.)

COMPETITIVE POSITION

The B 900 is an endangered species—an 8-bit minicomputer in a small systems market that increasingly favors 32-bit supermicrocomputers. However, the B 930's multiprocessor architecture and modular expandability features enable it to occupy a solid competitive position in the market for general-purpose, multiuser business systems.

The B 930 systems compete in their target market primarily against Data General's Eclipse S/series systems, the DEC PDP-11/24, Hewlett-Packard's HP 3000 Series 39, Honeywell's DPS 6/40 and DPS 6/45, IBM's System/34 and System/36 A models, the MAI/Basic Four Model 710, and Texas Instruments' Business System 600A and 800A series.

ADVANTAGES AND RESTRICTIONS

The B 930 has intrinsic architectural advantages for both current and prospective Burroughs users, along with compatibility features that should appeal particularly strongly to the former group. In the first place, the system's modular

➤ used for the Operating System Processor.) The redundancy feature requires at least five processors to be configured.

CONTROL STORAGE: The 8KB ROM contains cold and warm start code and a basic maintenance test routine.

REGISTERS: None apparent to users. Internal registers include registers for storage protection, temporary storage areas for data being manipulated by the microprogram and the special-purpose Memory Address Register (MAR), Micro Memory Address Register (μ MAR), and Timing Machine State (TMS) registers. The base and limit registers are used for storage protection, defining the space that may be utilized by the user within user data segments of memory. The MAR register is used to address those main memory locations from which data is to be read or written, while the μ MAR register addresses the portion of main memory from which microinstructions are read. The TMS registers determine the period of time when a microinstruction remains active. Together, these registers control the timing of all processor operations.

ADDRESSING: Information unavailable from Burroughs.

INTERRUPTS: Both external and internal interrupts are present in the B 930. Internal interrupts can occur on a memory parity error, when the Clear button is depressed, or when power is first connected to the system. External interrupts occur when a peripheral device requests attention (active data movement operation required). The B 900 uses an automatic hardware interrupt system, with the individual I/O channel notifying the processor when data is ready for processing or transmission.

OPERATING ENVIRONMENT: The multiple processors used in the B 930 system are housed in a single cabinet. The memory associated with each processor, the time-of-day interfaces are also housed in the same cabinet. This one cabinet is also used to house the integral version of the Burroughs Super Mini Disk unit. The processor cabinet is 44 inches high, 29 inches deep, and 23 inches wide. The weight of the cabinet is 375 pounds (domestic version).

Power requirements for the USA are 120 VAC + 10 percent, -15 percent, at 60 Hertz. The systems requires 1.7 KVA. The operating environment is from 55 to 104 degrees F, with a humidity tolerance ranging from 20 to 85 percent, noncondensing. Additional air conditioning above normal office levels is not required except in extreme operating environments. The processor cabinet and contents dissipate a maximum of about 5100 BTUs of heat per hour. Service area and general machine requirements necessitate a floor area with a clearance of about three feet around the system.

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▷ multiprocessor architecture permits nondisruptive migration to a more powerful system. Users who want greater processing power or data communications capabilities can add processors and associated memory increments to address increased system requirements. In addition, the multiprocessor architecture allows distribution of applications tasks so that, even if one Task Processor goes down, the jobs running in other Task Processors remain unaffected. Similarly, the processor redundancy feature available for the B 930's Operating System and Disk File Management Processors endows the system with a measure of fault tolerance, allowing the system some latitude for performance in high-volume applications areas, like finance. (However, the B 930's redundancy technology, which involves user intervention, hardly equips it to compete with truly and automatically fault tolerant systems like the Stratus/32.)

The B 930 systems feature software compatibility with the smaller B 90, with the larger B 1900 CMS systems, and with the older B 80 and B 800 systems. That compatibility permits users migrating to larger or newer systems to transport their application software without alteration, and also allows those with a mixture of systems to port software easily among the various machines. In addition, the B 930 features hardware compatibility with the aforementioned systems, as well as with the native-mode B 1900 systems to an extent, allowing users implementing newer or more powerful systems to reduce their outlays for new hardware.

The major disadvantage of the B 930 is generic rather than specific to the machine; it is a member of a group of systems that is becoming increasingly obsolescent in the face of the incursion by high-powered, less expensive multiuser microcomputers. Nonetheless, the B 930 and systems of its ilk are still actively marketed and obviously fill a niche within the small systems marketplace that, while diminishing, will not disappear in the immediate future.

USER REACTION

Five B 900 users responded to Datapro's 1984 Computer Users Survey; their systems had an average installed life of 37.4 months. Three users had purchased their systems, and two leased theirs from Burroughs. Accounting/billing, payroll/personnel, and purchasing applications were being run by three users each. Two users reported running order processing/inventory and sales/distribution programs. One user reported health care/medical applications. Three of the users developed their applications in-house, while two relied on contract programming, one obtained packaged program products from Burroughs, and one purchased programs from a third-party vendor. Cobol, cited by all five respondents, was the only programming language used.

For main memory capacity on the installed systems, four respondents listed between 512KB and 1MB, while one user reported between 4MB and 8MB. Disk storage ranged from 10MB to 4.8GB. One user reported between 10MB and 50MB of disk, one reported between 50MB and 100MB, two cited 100MB to 600MB, and one listed 1.2GB to 4.8GB.

▶ INPUT/OUTPUT CONTROL

I/O CHANNELS: The B 930 supports up to 12 I/O channels. The MCP directly handles all physical I/O operations and controls the operation of I/O devices. These activities include:

- Shared files.
- Printer back-up.
- Index file handling.
- Locating files.
- Data transfer.
- Buffer management.
- Automatic label recognition.
- Error monitoring.
- Automatic retry on error detection.

CONFIGURATION RULES

GENERAL: The basic B 930 Model 1 is configured with four 3MHz processors: the Operating System Processor, with 256KB of memory; a single Task Processor with 256KB of memory; a Data Communications Processor (DCP) with a 64KB memory; and a Disk File Management Processor with a PRAM module containing 64KB of RAM and 16KB of ROM. The basic five-processor B 930 Model 2 includes the same components, along with an additional Task Processor and 256KB of associated memory. It also includes a factory-installed performance enhancement pack that includes a processor redundancy feature and a Disk File Cache Module.

The Operating System Processor and the Task Processors of both models can support either 256KB or 512KB memory modules. Only one memory module per processor is permitted.

The unextended Model 1 can support two additional Task Processors and associated memory modules; one of the additional Task Processors can be configured as a DCP. The addition of an extended backplane permits configuration of two more processors and up to 1MB of memory, for a system total of eight processors and 3.2MB of memory. The Model 1 can also support processor redundancy and Disk File Cache Module options.

Model 2 can support three additional Task Processors and memory modules; one of those added processors can be configured as a DCP. Model 2 can support up to 3.2MB of memory.

WORKSTATIONS: Both B 930 models can theoretically support up to 288 workstations. While the real maximum can vary according to application and configuration requirements, 36 concurrently active workstations is a typical maximum. If the B 930's system software is at level 3.04.50 or higher, an Operator Display Terminal (ODT) is not mandatory; however, one application terminal in the network must be defined at run time as the ODT and must operate in a multifunction capacity as both ODT and application device. (An ODT is only mandatory with B 9484-51 and B 9494-41 disk subsystems.)

DISK STORAGE: B 930 systems support between 77.2MB and 1.7GB of fixed and removable disk storage. A system supports up to four disk host controls through the Disk File Management Processor; at least one disk control must be

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CHART C. WORKSTATIONS

MODEL	ET 1100
DISPLAY PARAMETERS	
Max. chars./screen	2080
Buffer capacity	10 pages
Screen size (lines x chars.)	24 x 80 plus 2 status lines
Tilt/swivel screen	Standard
Symbol formation	7 x 9 dot matrix
Character phosphor	Green on black
Total colors/no. simult. displayed	Not applicable
KEYBOARD PARAMETERS	
Style	Typewriter
Character/code set	128 ASCII
Detachable	Yes
Program function keys	10 standard
TERMINAL INTERFACE	
Comment	TDI, RS-232-C, BDAA (opt.) Screen sizes of 12 or 24 x 40 and 12 x 80 optional.

➤ The number of local workstations and terminals on the systems ranged from 1 to more than 60. One user had between 1 and 5, two reported between 6 and 15, one cited between 16 and 30, and one listed more than 60. The number of remote workstations and terminals did not exceed 15; one user reported no remote stations, two cited between 1 and 5, and two reported between 6 and 15.

In miscellaneous comments, three users stated that they had disaster recovery plans; two had no such plans. Only one user employed a communications monitor.

The ratings that the respondents gave their B 900s are shown in the following table:

	Excellent	Good	Fair	Poor	WA*
Ease of operation	4	0	0	1	3.4
Reliability of system	3	2	0	0	3.6
Reliability of peripherals	1	4	0	0	3.2
Maintenance service:					
Responsiveness	2	3	0	0	3.4
Effectiveness	1	3	0	1	2.8
Technical support:					
Troubleshooting	1	2	1	1	2.6
Education	1	2	2	0	2.8
Documentation	1	1	2	1	2.4
Manufacturers software:					
Operating system	5	0	0	0	4.0
Compiler & assemblers	4	1	0	0	3.8
Application programs	1	0	2	0	2.7
Ease of programming	4	1	0	0	3.8
Ease of conversion	3	1	0	0	3.8
Overall satisfaction	2	3	0	0	3.4

*Weighted Average on a scale of 4.0 for Excellent.

Discussing advantages of the B 900, four users gave their systems a rating of "excellent" for ease of conversion and reconfiguration. Four users awarded the B 900 high marks for power and energy efficiency, while three respondents gave high ratings to each of the following features: compatibility of terminals and peripherals transported from other systems, compatibility of programs and data carried over from other systems, and the effectiveness of productivity aids in reducing programming costs. ➤

➤ assigned to an inbuilt BSMD (Burroughs Super Mini-Disk) or BSMD II. If either the B 9484-51 removable pack or the B 9494-41 fixed disk subsystem is configured, a B 9387-41/-51 controller is required. This controller is attached to a single host control, but allows configuration of up to four disk pack or fixed disk drives.

MAGNETIC TAPE: The B 930 supports two types of 9-track, phase-encoded magnetic tape units: the B 9491-4 tape drive and the B 9498 streamer. The system supports one B 9491-4 drive through the B 1491 control or up to four B 9498 units through the B 1498 control; the second, third, and fourth B 9498 drives each require an interconnect cable.

PRINTERS: A minimum of one and a maximum of two printers can be configured on B 930 systems. Print speeds range from 180-230 cps to 1250 lpm.

MASS STORAGE

See Chart B for information on available mass storage devices.

INPUT/OUTPUT UNITS

See Chart C for workstations, Chart D for line printers, and Chart E for magnetic tape equipment.

OTHER PERIPHERALS: B 930 systems support the inbuilt 1MB B 9489-1 BSMD and 3/6MB B 9489-21 BSMD II drives, as well as the freestanding 243KB B 9489-17 industry-compatible mini-disk drive. The systems also support the B 9115 (300 cpm) and B 9116 (600 cpm) card readers.

COMMUNICATIONS CONTROL

GENERAL: The B 930 systems use the Data Communications Processor (DCP) to interface terminals and workstations. The processor and its associated 64KB of memory execute the network as defined by the Burroughs Network Definition Language (NDL). The DCP can handle up to twelve communications lines of varying types and speeds with a total bandpass up to 150,000 bps (depending on the protocol) and a maximum line speed of 38,400 bps in a direct connect environment. A second DCP can be added to the basic system for a total bandpass up to 300,000 bps. If a second DCP is configured, the system supports up to 18 inbuilt lines. Up to 32 lines can be supported through attachment of the MP2011 LEU-DCP Interface Kit, a Line ➤

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CHART D. PRINTERS

MODEL	B 9246-6	B 9246-13	B 9249-37	B 9249-375	B 9251
Type	Band	Band	Chain	Chain	Dot-matrix
Speed	600 lpm*	1250 lpm*	270 lpm*	375 lpm*	180-230 cps
Bidirectional printing	Not applicable	Not applicable	Not applicable	Not applicable	Yes
Paper size	3-17 inches wide	4-17 in. wide, 8-14 in. long	3-17 in. wide, up to 14 in. long	3-17 in. wide	3-17 in. wide
Character formation	Full	Full	Full	Full	—
Horizontal character spacing (chars./inch)	10	10	10	10	10, 12.5, 16.7
Vertical line spacing (lines/inch)	6 or 8	6 or 8	6 or 8	6 or 8	6 or 8
Character set	48, 64, 96 ASCII	48, 64, 96 ASCII	48, 64, 96 ASCII	48, 64, 96 ASCII	Universal
Controller/Interface	MP 1205	MP 1205	MP 1205	MP 1205	MP 1205
No. of printers per controller/interface	1	1	1	1	1
Printer dimensions, in. (h x w x d)	43.7 x 33.6 x 30.3	44 x 37 x 32	40.5 x 30 x 24.5	40.5 x 30 x 24.5	10.9 x 27.9 x 19.5
Graphics capability	No	No	No	No	No
Comments	Can use OCR-A and OCR-B fonts.				

Note: A dash (—) in a column indicates that the information is unavailable from the vendor.

*Based on 64-character set.

CHART E. MAGNETIC TAPE EQUIPMENT

MODEL	B 9491-4	B 9498
TYPE	Reel-to-reel	Streaming
FORMAT		
Number of tracks	9	9
Recording density, bits per inch	1600	1600
Recording mode	PE	PE
CHARACTERISTICS		
Controller model	MP 1491	MP 1498
Drives per controller	1	4
Storage capacity, bytes	Depends on tape size	37M
Tape speed, inches per second	25	100
Data transfer rate, units per second	40KB	160KB/40KB
Streaming technology	No	Yes
Start/stop mode; speed	No	Yes; 25 ips
Switch selectable	Yes	2nd, 3rd, and 4th drives require B 1498-1 interconnect cable.

➤ On the whole, the users were pleased with the sales and post-sales support they received from Burroughs. All five stated that their equipment and software had been delivered on schedule; four stated that they found it easy to keep up with and implement changes that Burroughs made to hardware and software. On the negative side, however, two users gave low ratings to Burroughs for delivery of promised software and support, and one stated that it was very difficult to keep up with and implement vendor-initiated changes to hardware and software.

To supplement the assessments provided in the survey, we contacted three respondents in July 1984; each was located in a different state.

The first respondent, representing a retail/wholesale firm in the Midwest, was very pleased with his B 900. He remarked that he had converted from a B 800, and had been able to transfer all peripherals from the older system without any problems. He said that he found the B 900 extremely reliable; although the system experienced initial operational problems, it now runs continuously with very little maintenance. He also rated the MCP operating system as "very good" and easy to use. The respondent remarked that he had recently been able to expand the system's communications capabilities, using an IBM 2780 lookalike program from Burroughs to talk to an IBM system and take orders from one of his customers.

➤ Expansion Module, and the the MP2030 line adapter 3 (LA3), which allows two data communication lines on a single adapter.

The characteristics of each B 930 data communications line are outlined in the following table.

Line Discipline	Line Distance	Maximum Line Speed
Asynchronous Modem Connect	No restriction	19,200 bps
Asynchronous Direct Connect (TDI)	250 feet	38,400 bps
	500 feet	19,200 bps
	1,000 feet	9,600 bps
Synchronous/Bisynchronous Modem Connect	No restriction	19,200 bps
BDLC Modem Connect	No restriction	19,200 bps

SOFTWARE

Burroughs' Computer Management System (CMS) software integrates the complete line of Burroughs Small Business Computers. CMS programs are object code compatible and will run on similarly configured B 90, B 900, and B 1900 CMS systems, as well as on older B 80, B 800, and B 1800 CMS systems with no reprogramming. Console-based pro-

Burroughs B 900 Series

▶ The first user expressed mixed sentiments about Burroughs support, although his feelings were generally positive. He was somewhat unhappy because the regular serviceman had left the local branch and the replacement was not as technically proficient. However, the user did say that he generally receives a good response to requests for maintenance; he can expect at least a return call, if not a service visit, within a few hours.

The second respondent, associated with a Midwestern software house, had also converted smoothly from a B 800. He said that he had been able to transfer floppy and cartridge disks to the new system without difficulty, and had copied data files and application programs easily from system to system. He remarked that several of his clients had been able to perform similar upgrades in one day. He stated that he hopes to upgrade his B 900 even further by migrating to a B 930, adding a second 80MB disk drive, and implementing on-line delivery of programs to clients through modems and telephone lines.

The second respondent cited the reliability and ease of use of the B 900's system software as the computer's most appealing features. He said that he finds the whole CMS environment, including utilities and application development products, very effective for program development. He also praised the maintenance support he receives from Burroughs. By calling an operator at a central location when his system experiences a problem, he gets a return call within 30 minutes to an hour. Assessing Burroughs' support overall, the user remarked, "They've improved their maintenance, generally speaking, 500 percent since the late '70s."

The third user, affiliated with a retail/wholesale concern in the Southwest, was very happy with the B 900. The user lauded the MCP operating system for its ease of use and the clarity of its system messages. (As he put it, "It talks to you and you can respond to it.") He remarked that the friendliness of the operating system allowed each person in the firm to perform his or her computer duties easily and without assistance. The user also expressed satisfaction with the durability of the hardware, saying that his system experienced very little downtime.

The third respondent characterized Burroughs' responsiveness to maintenance requests as "super." He said he can rely on a return phone call regarding a trouble report within one to two hours, and on a service visit within four hours. He said that Burroughs had once brought a service representative from Detroit over a weekend to rectify a difficult problem. The user also expressed satisfaction with the software support he receives through Burroughs' hotline.

Discussing recent expansions to his system, the third user remarked that his company had recently implemented an open-end order entry/inventory system developed on the company's system by an outside consultant. He said that the system, written in Burroughs' CMS Cobol, functions well and could be transported to a comparable IBM system with very little conversion.

▶ programs are not portable to B 930 systems. The CMS approach covers the entire system of computer software, incorporating the Master Control Program (MCP), utilities, interactive development aids, on-line programming tools, high-level languages and generative aids, distributed processing software, conversion aids, and business management systems.

OPERATING SYSTEMS: The *Master Control Program (MCP)* operating system uses the multiprocessor architecture of the B 900, permitting concurrent multiprogramming in each task processor available on the system. The B 900 MCP allocates jobs to task processors depending on the system's workload. Peripheral units are assigned as needed to meet I/O requirements. Memory and processor usage are allocated by the appropriate task processor. Processors, memory, peripherals, disk storage, and program priorities are inventoried and assigned to meet job requirements.

The B 900 MCP provides automatic multiprogramming to run segments of multiple programs concurrently. The MCP automatically allocates memory areas, initiates I/O operations, provides automatic error handling procedures, and allocates resources according to program priorities. MCP automates such programming operations as memory allocation loading routines, file opening and closing, input/output procedures, indexed file handling, program library calls, error handling, and other "housekeeping" functions.

To maximize memory usage, the B 900 MCP provides a virtual memory system, enabling the B 900 to run programs larger than the available memory.

The B 900 MCP includes a CMS shared files feature that allows multiple update programs concurrent access to individual indexed and sequential files and to groups of those files. Two or more programs can concurrently update a file while multiple inquiry programs access the file. Locking and unlocking blocks of data avoids data corruption caused by simultaneous updating of the same data.

In addition, the MCP offers special printer and disk support features. A printer backup option helps to prevent a system stoppage caused by several programs' simultaneously requesting one printer. The printer backup option automatically diverts printer files to disk if no printer is available. A contiguous fixed disk feature allows one or more fixed disk units with multiple platters to be treated as one large contiguous disk instead of several small ones.

The MCP also provides logging capabilities. The System Log acts as a diary of all system events that have occurred since the previous log was printed. The Maintenance Log records the performance of the B 900 hardware and peripherals, and can be used to highlight potential faults in a device before a hard failure.

DATABASE MANAGEMENT SYSTEM: The B 900 does not use a database management system.

LANGUAGES: Languages available for the B 900 are Cobol and RPG. Two special-purpose languages, Network Definition Language (NDL) and Message Processing Language II (MPL II), are also available and are discussed in the COMMUNICATIONS portion of the Software section.

CMS Cobol is a subset of ANSI 74 Cobol. Extensions developed by Burroughs take advantage of CMS system software and hardware capabilities; the extensions include shared files, interface to console printers and displays, and file attributes.

CMS RPG is a standard implementation of RPG with extensions for the CMS environment; as with CMS Cobol, ▶

Burroughs B 900 Series

➤ As the statistics and supplementary comments indicate, the surveyed users were generally quite pleased with their B 900 systems. All five users said that their systems had done what they expected them to do, and, while one was undecided, four said that they would recommend the B 900 to prospective users. □

➤ those extensions include shared files, interface to console printers and displays, and file attributes.

COMMUNICATIONS: *Network Definition Language (NDL)* is a special-purpose parameter-driven programming tool that enables users to define and generate customized Network Controller programs for data communications applications. The Network Controller program handles line disciplines, buffer management, message queuing, character translation, and automatic retries, and supervises the flow of messages between user-coded programs and remote terminals. This enables the user's application programs to deal with remote terminals in the same manner as conventional on-site peripheral devices.

After the programmer defines the custom Network Controller in the NDL syntax, the source statements are processed by the NDL Compiler and converted into the necessary object code and tables. Various line disciplines may be programmed in NDL and are stored as reusable library routines, known as request sets. Standard request sets for many line procedures are available from Burroughs. The NDL can be altered if terminal locations change or if additional workstations are connected to the network.

Message Processing Language II (MPL II) is a high-level, parameter-driven compiler language used to generate Message Control Systems (MCS) for data communications networks. The Message Control System provides the interface between the Network Controller and user application programs by decoding, validating, and directing incoming messages to the appropriate user program for processing. This system can also record all processed messages on secondary storage for audit purposes and place messages intended for terminals out of service in temporary storage on disk.

Burroughs' *Generalized Message Control System (Gemcos)* works with NDL to provide the link between a terminal user and an application program. Gemcos is used to generate a Message Control System (MCS) with the following functions: restrict access by users only to programs which they are qualified to run; route messages between terminals and applications; and record all messages for use at a later time if recovery is required.

Burroughs Network Architecture (BNA) is a set of software facilities that permits terminals to interact with host CPUs in a network environment and allows implementation of distributed data processing. Through the BNA architecture, Burroughs processors and terminals can be granted access to data bases throughout a network, job tasks and information files can be transferred from one point to another, and data processing resources available in a network can be shared among participants regardless of location.

Burroughs Data Link Control (BDLC) is a bit-oriented line control procedure for synchronous transmissions. In BDLC, data is bracketed; bits, rather than whole characters, are used to represent control codes. BDLC is based on High-Level Data Link Control (HDLC), the protocol standard developed by the International Standards Organization (ISO) and the European Computer Manufacturers Association (ECMA), and Advanced Data Communications Control Procedure (ADCCP), the protocol standard developed by ANSI.

System Communications Module (Sycom) provides a mechanism for linking two Burroughs computers to permit file transfers, remote execution from the console keyboard, and program communication between the systems. Sycom contains its own data communications handler and operates under MCP control, permitting the Sycom functions to be combined with on-site work in a multiprogramming job mix. Sycom operates in point-to-point mode through a switched or leased communications line.

In addition to BNA, Sycom, and BDLC for distributed communications with Burroughs systems, the B 900 Series also supports *RJE*, *Hasp*, *IBM 2780/3780*, *IBM 3270*, and *IBM SNA* interface software for distributed communications with IBM and SNA-based systems.

UTILITIES: A range of utilities is available on the B 900, including sorts, file dump, file load, file lists, directory maintenance, and media conversion. One utility, configurator, provides facilities for assigning resources specific to a multi-processor system.

RELATED CMS PRODUCTS: Related CMS products include CMS Superstart, CMS On-line Reporter, CMS Domain, CMS Cande, CMS RPG-Edit, CMS Arcs (Automatic Run Control System), CMS Odyssey (On-line Data Entry System), and the IBM System/32 to B 900 CMS Conversion Program. These products are discussed in the following paragraphs.

CMS Superstart is an interactive menu management facility that permits users without any programming experience to create and maintain a customized menu structure that links daily operations and application programs. Help screens are available to assist the user in creation and maintenance.

CMS On-line Reporter is a generalized reporting system that allows nontechnical personnel to create and maintain unique or recurring reports and labels that supplement those normally produced by application systems; it can produce a hard-copy report or display data on the terminal.

With On-line Reporter, the user creates a dictionary of the fields and files from the data base that will appear in the report, defines how the information is to be ordered, and prints or displays the report. Information can be added or suppressed at run time, and the report can be produced directly or stored on disk for future use.

CMS Domain provides an interactive method for specifying and developing file maintenance and inquiry programs through a terminal. With Domain, the user can create a disk file, add, delete, or maintain records in a disk file, or inquire into records in a disk file.

CMS Command and Edit (Cande) provides generalized file preparation, on-line programming, editing, and updating in an interactive, terminal-oriented environment. Cande runs in conjunction with NDL. The NDL-generated network controller performs all data-communications-related functions, while Cande performs file updating and text editing functions. The on-line user has all compilers available including Cobol, RPG, and MPL II. Cande also provides a recovery system.

CMS RPG-Edit provides the main features of Cande, but is designed specifically for the RPG programming language, allowing interactive prompting and editing of RPG specifications.

CMS Automatic Run Control System (Arcs) enables automatic execution of sequences of commands and programs and is used with repetitive commands and programs (job streams). No operator intervention is required under normal

Burroughs B 900 Series

► circumstances once a job stream is initiated using CMS Arcs.

CMS On-line Data Entry System (Odesy) is a data entry and validation system using multiple on-line visual display units. It provides a generalized and generative "front end" for existing application packages. It enables future packages to be designed to use its editing facilities and thus reduce development effort by eliminating conventional input control programs.

IBM System 32 to B 900 CMS Conversion Program converts IBM RPG source and sequential EBCDIC data files to standard CMS formats.

OFFICE AUTOMATION: The *Word Management System (WMS)* provides integrated data processing and word processing capabilities for B 900 and B 90 series small business computer systems using Computer Management System (CMS) operating software and ET 1100 workstations. WMS is designed to incorporate information from data processing files into letters and office documents. WMS is a shared logic system that runs concurrently with data processing applications.

APPLICATIONS: MCS- and NDL-defined controllers are required of all application systems. Those controllers are available with most Burroughs screen-based programs in a predefined form.

Burroughs library of program products includes applications for wholesalers, utilities, contractors, manufacturers, hospitals, local governments, financial institutions, and other small business computer users.

PRICING

POLICY: Burroughs offers the B 900 systems either for purchase or for lease. In addition to the basic one-year lease, Burroughs offers three-year and five-year leases at a discount of approximately 10 percent. Discounts for purchase of multiple units are available.

SUPPORT: Support for B 900 systems is available through Burroughs support centers. Maintenance agreement rates are based on the location of the installation. The standard equipment lease agreement includes remedial maintenance service during any continuous nine-hour period from 7 a.m. to 6 p.m., Monday through Friday, excluding Burroughs-recognized holidays. Additional extra-shift charges are billable for maintenance coverage on a 24 hours/day, 7 days/week basis.

Program products for the B 900 systems are offered under either an unlimited-time license plan with a full or 12-month initial payment, or a limited-time license plan with monthly payments. Also available for the program products are annual Product Service Agreements (PSAs), which are charged separately from the aforementioned product charges. There are two principal types of PSAs. PSA-1 provides telephone support, while PSA-2 provides telephone and field support as well as remedial software releases to correct reported problems.

In addition, Burroughs' Software Products and Services group offers the Professional Services Annual Retainer Plan. This plan, customized according to user needs and implemented on a yearly basis, allows a customer to contract for a fixed number of days per month on which the technical staff of his or her organization can receive on-site support and training from Burroughs personnel. The support dates in each month must be scheduled at least 30 days in advance. The contract can be cancelled with 60 days' written notice; the customer will be billed for services rendered up to the

cancellation date at the difference between the contract rate and the rates published at the time of cancellation.

TRAINING: Customer education is charged at specific per-course rates. Currently available hardware and software courses range in length from one day to more than two weeks. Training is available at Burroughs centers throughout the United States and worldwide.

TYPICAL CONFIGURATIONS: The following are typical configurations and purchase prices for B 900 systems.

The following is a small B 930 Model 1 configuration:

B 930-SY1 Basic system; includes:	\$ 23,228
Processor cabinet, time-of-day clock, and 64KB PRAM memory	
Four 3MHz processors	
Two 256KB and one 64KB memory modules	
Two data comm I/O extender cables	
MP 1423 disk loader cable A for 1MB Burroughs Standard Mini-Disk (BSMD)	332
MP 1480 disk control	918
B 9489-1 inbuilt 1MB BSMD	956
MP 1484 disk pack host control	1,155
B 9387-41 disk control	42,000
B 9484-51 130.4MB removable pack drive	21,000
MP 1362 Operator Display Terminal (ODT) control	630
ET 1100 ODT	1,895
Four ET 1100 ergonomic workstations and keyboards	7,580
MP 2005 line adapter 2	788
MP 1205 wide line printer control	635
B 9249-375 chain printer (375 lpm)	8,915
Total Price	\$110,032

The following is a medium B 930 Model 1 configuration:

B 930-SY1 Basic system; includes:	\$ 23,228
Processor cabinet, time-of-day clock, and 64KB PRAM memory	
Four 3MHz processors	
Two 256KB and one 64KB memory modules	
Two data comm I/O extender cables	
Two B 900-3 3MHz add-on processors	3,500
Two BD 4256-3 256KB add-on memory modules	3,500
B 9468-6 Disk File Cache Module (DFCM)	3,250
BD 4256-3 256KB memory module for DFCM	1,750
MP 1423 disk loader cable A for 1MB Burroughs Standard Mini-Disk (BSMD)	332
MP 1480 disk control	918
B 9489-1 inbuilt 1MB BSMD	956
MP 1484 disk pack host control	1,155
B 9387-41 disk control	42,000
Two B 9484-51 130.4MB removable pack drives	42,000
MP 1362 Operator Display Terminal (ODT) control	630
ET 1100 ODT	1,895
12 ET 1100 ergonomic workstations and keyboards	22,740
MP 2030 dual line adapter	1,000
MP 1498 magnetic tape control	1,360
B 9498 streaming tape drive	7,875
Two MP 1205 wide line printer controls	1,270
B 9251 180-230 cps dot-matrix printer	3,487
B 9246-6 band printer (600 lpm)	14,700
Total Price	\$177,546

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► The following is a large B 930 Model 2 configuration:

B 930-SY2 Basic system; includes:	\$36,750
Processor cabinet, time-of-day clock, and 64KB PRAM memory	
Five 3MHz processors	
Three 512KB and one 64KB memory modules	
Two data comm I/O extender cables	
Extended backplane	
Redundancy kit	
Disk File Cache Module and associated 256KB memory module	
Three B 900-3 3MHz add-on processors	5,250
Two BD 4512-3 512KB add-on memory modules	6,000
BD 4064-3 64KB add-on memory module	750
MP 1423 disk loader cable A for 1MB Burroughs Standard Mini-Disk (BSMD)	332
MP 1480 disk control	918
B 9489-1 inbuilt 1MB BSMD	956
MP 1484 disk pack host control	1,155
B 9387-41 disk control	42,000
Three B 9494-41 402MB fixed disk drives	64,500
MP 1362 Operator Display Terminal (ODT) control	630
ET 1100 ODT	1,895
24 ET 1100 ergonomic workstations and keyboards	45,480
MP 2013 additional DCP kit	725
Two MP 2030 dual line adapters	2,000
MP 1498 magnetic tape control	1,360
B 9498 streaming tape drive	7,875
Two MP 1205 wide line printer controls	1,270
Two B 9246-13 band printers (1250 lpm)	85,000
Total Price	\$304,846

EQUIPMENT PRICES

		<u>Purchase</u>	<u>Annual</u>	<u>Monthly Lease</u>	
		<u>Price</u>	<u>Maint.</u>	<u>1-year</u>	<u>3-5-year</u>
		<u>(\$)</u>	<u>(\$)</u>	<u>(\$)</u>	<u>(\$)</u>
BASIC SYSTEMS					
B 930-SY1	B 930 Model 1 System; includes B 930-1 processor cabinet with time-of-day clock, 64KB PRAM memory, four 3MHz processors, two 256KB memory modules, one 64KB memory module, and two data comm I/O extender cables	23,228	790.00	1,009	841
B 930-SY2	B 930 Model 2 System; includes B 930-2 processor cabinet with time-of-day clock, 64KB PRAM memory, five 3MHz processors, three 256KB memory modules, one 64KB memory module, two data comm I/O extender cables, extended backplane, redundancy kit, B 930 Disk File Cache Module (DFCM), 256KB memory for DFCM	33,000	1,588.00	1,480	1,233
B 933-SYS	B 933 System: B 930-1 processor cabinet, four 3MHz processors, two 256KB memory modules, 64KB memory, data comm extender cable, disk loader cable, two disk controls, wide line printer control and cable, tape control, direct connect kit, 1MB BSMD, 77MB fixed disk, streaming tape, and dual line adapter	35,400	2,232.00	1,956	1,661
B 930-2 DEDUCT OPTIONS					
These items can be deducted from the B 930-2 base system.					
MP1195	Redundancy kit	-1,000	-216.00	-47	-45
B 9468-6	Disk File Cache Module and associated 256KB memory module	-3,250	-376.00	-155	-148
ADDITIONAL PROCESSORS					
B 900-3	3MHz processor (B930)	1,750	216.00	73	63
ADDITIONAL MEMORY					
BD 4064-3	64KB memory module	750	120.00	31	27
BD 4256-3	256KB memory module	1,750	280.00	73	63
BD 4512-3	512KB memory module	3,000	480.00	125	108

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		Purchase Price (\$)	Annual Maint. (\$)	Monthly Lease 1-year (\$)	3-5-year (\$)
REDUNDANCY KITS					
MP 1190	B 930 Redundancy Kit (DL2)	1,750	—	73	63
MP 1195	B 933 Redundancy Kit (DL3)	1,750	216.00	73	63
EXTENDED BACKPLANE					
MP 1150	B 930 Backplane (DL2)	1,272	—	55	58
MP 1155	B 930 Backplane (DL3)	1,272	—	55	58
ODT & CONTROL					
MP 1361	ODT Control	630	—	22	19
MP 1362	ODT Control (DL3)	630	35.00	22	19
MP 9361-2	Operator Display Terminal (MT983)	2,620	—	131	126
DISK FILE CACHE MODULE					
B 9468-6	Disk File Cache Module	3,250	357.00	136	117
MASS STORAGE					
B 9489-1	1.0MB Super Mini-Disk drive	956	*36.90	47	40/39
B 9489-17	243KB IC Mini-Disk drive, freestanding	2,100	*35.30	114	101
B 9489-21	3/6MB Inbuilt BSMD II	3,150	*49.70	241	206/193
B 9493-20	19.2MB fixed disk	10,000	*75.50	478	422
B 9493-40	38.6MB fixed disk	13,600	*102.00	599	531
B 9493-80	77.2MB fixed disk	16,225	*121.00	668	590
B 9493-40K	40MB to 80MB Upgrade Kit	3,676	*18.00	107	95/97
B 9487-11	Disk Storage/Single Controller (65.2MB)	38,271	165.00	1,286	1,059
B 9487-12	Disk Storage/Single Controller (130.4MB)	51,247	165.00	1,740	1,506
B 9484-51	130.4MB Disk Pack Increment	21,000	*147.00	840	758/689
MP 1480-B	Disk Loader B (cartridge)	893	90.00	31	27
MP 1484-F	Disk Loader F (1MB BSMD)	893	64.00	31	27
MP 1489-E	Disk Loader E (3/6MB BSMD II)	893	90.00	31	27
MP 1417	ICMD Control	918	90.00	32	28
MP 1436	3/6MB Retrofit Kit	1,864	142.00	63	62
MP 1480	Disk control for 1MB BSMD/cartridge/18/37MB fixed disk	918	90.00	31	27
MP 1484	Disk Pack Control	1,155	75.00	40	38
MP 1493	Disk Control for 3/6MB BSMD II and 40/80MB fixed disk	918	—	32	28
MP 1495	Disk Control for 3/6MB BSMD II and 40/80MB fixed disk (DL3)	918	90.00	31	27
MP 1421	Disk Loader Cable E (3/6MB BSMD II)	332	—	16	15
MP 1422	Disk Loader Cable A (1MB BSMD)	332	—	16	15
MP 1423	Disk Loader Cable for 1MB BSMD (DL3)	332	—	16	15
MP 1424	Disk Loader Cable B (Cartridge)	332	—	16	15
B 9387-41	B 9484-51, B 9494-41 Controller	42,000	875.00	1,363	1,282
B 9494-41	402MB fixed disk drive	21,500	*96.40	847	781
B 9387-8	Disk Controller Kit for B 9387-41; to upgrade a B 800 system to a B 900 system	5,000	*12.30	213	189/171
MAGNETIC TAPE					
B 9491-4	40KB, 1600 bpi magnetic tape unit (9-channel PE)	12,000	*89.70	548	458/444
B 9498	Magnetic Tape Streamer	7,875	*44.60	305	269
MP 1491	Magnetic Tape Control	2,410	—	81	77
MP 1498	B 900 Control for B 9498	1,360	—	95	84
PRINTERS					
B 9249-375	375/500 lpm printer, 64/48 character set	8,915	*105.00	409	352
B 9249-37	270 lpm chain printer, 64-character set	9,800	*80.00	413	373/337
B 9251	Tabletop, 180-230 cps matrix printer	3,487	*32.00	118	104
B 9246-6	600 lpm band printer	14,700	*182.00	1,635	1,470/ 1,360
MP 1205	Wide Line Printer Control	635	47.00	22	18
B 9246-13	1250 lpm band printer	42,500	*420.00	413	373/337
CARD READERS					
B 9115	300 cpm card reader (80-column)	8,608	*73.30	344	305/267
B 9116	600 cpm card reader (80-column)	11,372	*103.00	460	409/357
MP 1115	B 9115/6 card reader control	630	113.00	24	21
DATA COMMUNICATIONS					
MP 2004	ACU Interface; 50-ft.	211	—	8	7
MP 2004-2	ACU Interface; 25-ft.	147	—	6	6
MP 2005	Line Adapter II	788	71.00	28	27
MP 2160-2	Direct Connect Kit (LA2)	53	—	3	3
MP 2013	Additional DCP Kit (DL3)	725	48.00	31	26
MP 2012	Additional DCP Kit	725	48.00	32	27

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DATA COMMUNICATIONS (Continued)

		Purchase Price (\$)	Annual Maint. (\$)	Monthly Lease	
				1-year (\$)	3-5-year (\$)
MP 2011	LEU-DCP Interface Kit	484	40.00	19	17
MP 2030	Dual Line Adapter (DL3)	1,000	120.00	42	36
MP 2125-1	Data Set Interface; 25-ft. (Bell)	132	—	5	5
MP 2150-1	Data Set Interface; 50-ft. (Bell)	158	—	6	6
MP 2130	Dual TDI Connect (DL3)	100	—	6	6
MP 2131-1	Dual DC Interface; TDI, 25-ft. DS (DL3)	185	—	12	10
MP 2131-2	Dual Interface; TDO, 50-ft. DS (DL3)	210	—	15	13
MP 2132-1	Dual DS Interface, 25-ft. (DL3)	225	—	17	15
MP 2132-2	Dual DS Interface, 50-ft. (DL3)	300	—	22	20

TERMINALS

ET 1100	Ergonomic workstation with 14-inch display and keyboard	1,895	122.00	105	88/79
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*Monthly maintenance fee.

SOFTWARE PRICES

		Unlimited Time Plan		Limited Time Plan	Annual Product Service Agreements	
		Full Initial Payment (\$)	12-month Initial Payment (\$)	Monthly License Fee (\$)	PSA-1 (\$)	PSA-2 (\$)
SYSTEM SOFTWARE						
CM900 SSF	Software Facility; includes MCP, utilities, and CMS Superstart	2,850	274	100	205	410
CM900 COB	Cobol Compiler	900	87	28	33	65
CM900 RPG	RPG Compiler	900	87	28	33	65
CM900 NDLC	Network Definition Language (NDL) Compiler	900	87	28	36	71
CM900 MPL	Message Processing Language (MPL) Compiler	990	95	28	36	71
CM900 UTL	Utilities	594	—	17	—	—
CM900 MCP	CMS MCP	2,750	—	110	—	—
CM900 RJE	Burroughs Standard RJE	665	64	24	28	56
CM900 SYC	Sycom	750	72	36	32	63
CM900 BNS	Remote Network	3,000	288	110	126	252
CM900 X25	X.25 Station Group	1,400	135	50	59	118
CM9500 RNS	Remote Network Services (includes BDLC Station Group)	—	—	110	—	—
CM9500 B25	X.25 Station Group (requires CM9500 RNS)	—	—	50	—	—
CM900 HSP	IBM 360-20 Hasp RJE	990	95	35	42	83
CM900 R37	IBM 2780/3780 Lookalike	990	95	35	42	83
CM900 R32	IBM 3270 Protocol	990	95	35	42	83
CM900 SNA	IBM SNA Interface	2,400	231	86	101	202
DEVELOPMENT AIDS						
CM900 RPO	On-Line Reporter	1,950	188	87	102	203
CM900 DOM	Domain	1,950	188	87	102	203
CM900 AEU	Audit Entry Host Utility	500	48	24	21	42
CM900 INQ	CMS Inquiry	800	77	38	47	93
CM900 TE1	Terminal Entry for B 900 TDS Control, MCS, Cande, and Odesy	1,150	111	41	50	100
CM900 GMB	Gemcos (Basic Module)	700	68	33	30	59
CM900 GMT	Gemcos (TCL Compiler Module)	750	72	36	32	63
CM900 GMF	Gemcos (Formatting Module)	500	48	24	21	42
CM900 GMC	Gemcos (Complete System)	2,500	240	115	105	210
CM900 DES	MTS Data Entry System	2,220	213	83	93	185
CONVERSION AIDS						
CS900 SL9	B 700 SL7 Cobol to B 900 CMS Cobol	644	62	—	—	—
CM900 CON	IBM S/32 to B 900 conversion	660	64	—	—	—
OFFICE AUTOMATION						
B 900 WMS	Word Management System	3,050	293	128	214	427
B 900 OSR	OMS—Shared Resource	1,500	144	63	105	210
B 900 OEM	OMS—Electronic Mail	3,000	288	125	210	420
B 900 OPT	OMS—Productivity Tools	3,000	288	125	210	420
B 900 ODP	OMS—DP Interface	750	72	32	53	105