

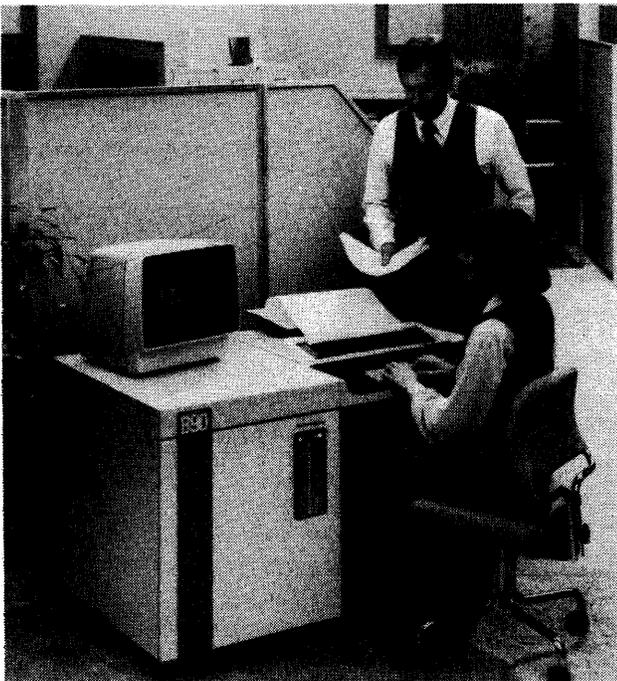
Burroughs B 90

MANAGEMENT SUMMARY

In October 1983, Burroughs introduced the B 95, the new entry-level model in the B 90 series of small business computers. The B 95 is a customer-installable system that runs on standard current and can be used as either a freestanding or desktop system. The B 95 comprises three basic modules: the processor module, the storage module, and the power supply module.

The B 95 processor module houses a 2MHz CPU that employs 64K-bit RAM technology. Memory is confined to a single board and can be either 256KB or 512KB. Also included in the processor module are input/output controllers for storage modules, printers, and data communications ports.

The storage module employs 5¼-inch Winchester disks—the first implementation of 5¼-inch Winchester technology for the B 90 family. Three types of storage modules are available: a 10.3MB module featuring a .7MB floppy disk and a 9.6MB Winchester disk; a 15.1MB module with a .7MB floppy and a 14.4MB Winchester disk; and a module with a single 14.4MB Winchester disk. A second storage module can be configured with any of those types for maximum mass storage of 28.8MB.



The B 92 is a console-based system for general business data processing. It has 256KB of main memory and includes a 120 cps console printer with keyboard. The B 92 can be expanded to support 512KB of memory, 154MB of disk storage, and eight workstations.

Burroughs has enhanced the B 90 product line with the addition of the B 95, an entry-level, modular system that operates under the CMS environment used by the other members of the family: the B 91, B 92, B 93, and B 96. A new CMS software product, CMS Superstart, provides B 90 users with interactive facilities for creating and customizing menu systems.

MODELS: B 91, B 92, B 93, B 95, B 96.

MEMORY: 256KB-1.5MB.

DISK CAPACITY: 10MB-231MB.

WORKSTATIONS: Up to 4 on the B 95; up to 8 on the B 91, B 92, and B 93; and up to 12 on the B 96.

PRICE: \$14,000-\$75,000.

CHARACTERISTICS

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

CANADIAN ADDRESS: Burroughs-Canada, 801 York Mills Road, Don Mills, Ontario, Canada M3B 1X7. Telephone (416) 445-4030.

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: Information unavailable from vendor.

FLOATING POINT OPERANDS: Information unavailable from vendor.

INSTRUCTIONS: The B 90 is an interpreter-based system using variable micrologic. Utilizing the microinstruction set, operand lengths permit from 1 to 256 bytes of data to be addressed with a single instruction, and up to 8 bits to be transferred in parallel between main memory and the processor.

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

MAIN STORAGE

TYPE: Dynamic MOS RAM, the contents of which are refreshed at intervals of two milliseconds or less.

CYCLE TIME: 0.5 microseconds per 8-bit fetch, with a 0.015 nanosecond access time.

CAPACITY: Memory ranges from 256KB to 1.5MB. See CHART A for the capacities of specific systems.

Burroughs B 90

CHART A. SYSTEM COMPARISON

MODEL	B 91/B 92	B 93	B 95	B 96
SYSTEM CHARACTERISTICS				
Date of introduction	October 1979	May 1981	October 1983	February 1983
Date of first delivery	December 1979	May 1981	October 1983	February 1983
Operating system	CMS MCP	CMS MCP	CMS MCP	CMS MCP
Upgradable from	—	—	—	—
Upgradable to	—	—	—	—
MIPS	Information unavailable	Information unavailable	Information unavailable	Information unavailable
Relative performance	Information unavailable	Information unavailable	Information unavailable	Information unavailable
MEMORY				
Minimum capacity, bytes	256K	256K	256K	512K
Maximum capacity, bytes	512K	512K	512K	1.5M
Type	MOS	MOS	MOS	MOS
Cache memory	None	None	None	None
Cycle time, nanoseconds	5	5	5	2.5
Bytes fetched per cycle	Information unavailable	Information unavailable	Information unavailable	Information unavailable
INPUT/OUTPUT CONTROL				
Number of channels	6-11	8-11	6	7-10
High-speed buses	Information unavailable	Information unavailable	Information unavailable	Information unavailable
Low-speed buses	Information unavailable	Information unavailable	Information unavailable	Information unavailable
MINIMUM DISK STORAGE				
MAXIMUM DISK STORAGE				
NUMBER OF WORKSTATIONS				
COMMUNICATIONS PROTOCOLS				
	18MB	18MB	10MB	40MB
	86MB/154MB	160MB	29MB	231MB
	8	8	4	12
	BDLC, SDLC, HDLC, X.25, SNA, RJE, 2780/3780			

➤ The B 95 power module plugs into a conventional wall socket and is connected to the processor and storage modules through cables and push-on, D-type connectors.

The features of the other four models in the B 90 family are discussed in the following paragraphs.

The B 91 was the entry-level system prior to the advent of the B 95. It is essentially a single-station, packaged system that includes 256KB of memory and a 90 cps console matrix printer and keyboard. It can, however, be expanded to support up to 512KB of memory, 86MB of disk storage, and eight workstations.

The B 92 is a more powerful console-based system. It is packaged with 256KB of memory and a 120 cps console printer, and has greater I/O capability than the B 91. (The B 92 has eight I/O channels, versus six on the B 91.) Like the B 91, the B 92 can be expanded, supporting a maximum of 512KB of main memory, eight workstations, and 154MB of disk storage.

The B 93 is a terminal-based, expandable system similar to the B 91 and the B 92. The B 93 processor supports a minimum of 256KB of memory and includes eight I/O channels. The B 93 can support a maximum memory of 512KB, disk storage of 160MB, and eight workstations.

The B 96 is the top-of-the-line system in the B 90 family; it was the first to be based on 64K chip technology. The basic

➤ All B 90 systems feature a 4KB Read Only Memory (ROM) containing routines for loading interpreters and customer confidence routines.

CHECKING: Parity standard.

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

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

CENTRAL PROCESSOR

GENERAL: The following paragraphs discuss both the features common to all B 90 processors and the characteristics of individual processors.

The central processor of each B 90 employs Large Scale Integrated (LSI) circuitry as an aid in improving performance and reducing overall unit size. As part of the LSI design four microprocessors are utilized; the interface between the processor and memory is handled through a signal protocol.

The B 90 processor features dynamically variable microprogrammed logic. The processor's logic functions are formed by a set of elementary operators, called microinstructions, which operate on bit strings up to 256 bytes long. There are 256 defined microinstructions in the B 90. Microinstructions are basically 8 bits long, but they can be extended to 16 or 24 bits. The B 90 has the capability to look ahead while executing microinstructions. This is possible because of the overlapping of microinstruction fetching and execution.

In the B 90, Burroughs has also implemented a microprogram stack to improve the efficiency of repetitive processes, ➤

Burroughs B 90

➤ B 96 processor complex includes 512KB of main memory, an inbuilt 40MB fixed disk drive, and a 100 ips streaming tape drive. The B 96 can be expanded to support up to 1.5MB of memory, 231MB of disk storage, and 12 workstations.

All B 90 systems operate under Burroughs' CMS (Computer Management System) environment, which centers around MCP (Master Control Program), a nonpartitioned, multiprogramming operating system. The CMS environment includes a number of collateral software products; the newest is CMS Superstart, an interactive menu management facility. CMS Superstart provides the B 90 operator with menus that guide use of the system; it also includes facilities for development and maintenance of customized menu systems that link the operating system and applications programs.

COMPETITIVE POSITION

The B 90 family competes in the market for general-purpose commercial systems; B 90 systems are used in such applications as budgetary accounting, inventory management, and payroll. They can be used as standalone systems or as nodes in distributed processing networks; the B 95, with its limited size and configurability, is particularly well suited for use in distributed data processing.

The B 91 and B 92 compete against such small systems as Computer Automation's SYFA 200 and Point4 Data Corporation's Mark 2T. The B 93 stacks up against the Four Phase Model 260, Computer Designed Systems' Adviser 100, the MAI/Basic Four 310, and the Wang VS25. The B 95 can compete against such small systems as Northern Telecom's 503 and 565. The B 96 competes against a bevy of machines, including the IBM System/34, BTI 5000 Mark II, Hewlett-Packard's HP 250, the Microdata Reality 4700, the MAI/Basic Four 510, Point4 Data Corporation's Mark 3, the Plexus P/35, Texas Instruments Business Systems 600A series, the Centurion 6400/6500, and the Northern Telecom 585.

ADVANTAGES AND RESTRICTIONS

The B 90 systems have several advantages within the overall Burroughs product line and in the general marketplace as well. Because all of the systems operate under the CMS environment, applications can be transported from system-to-system if the user moves to a new model within the B 90 family. In addition, CMS gives users upward application compatibility with larger Burroughs systems, such as the B 900 and B 1900, thus facilitating migration to bigger machines. The B 95 gives the B 90 family an advantage in the general market, because it brings the line into the desktop arena, providing would-be micro users with mini-computer power and compatibility with larger lines of systems.

The principal disadvantage in the B 90 line is occasioned by the age and increasing obsolescence of the older, console-based B 91 and B 92. One can reasonably question ➤

➤ such as subroutines used for I/O interrupt servicing. The microinstruction set contains members capable of multiple counting, a feature that allows for repetitive execution.

The processors also employ S-language (Secondary language) instructions as intermediate instructions equivalent to the machine-language instructions of conventional computers. Each S-language instruction is implemented by a string of microinstructions that interpretively executes the functions specified by the S-instruction. In most cases, S-instructions specify an operation to be performed, one or more operand addresses, data field lengths, and units of data.

For each B 90 programming language, Burroughs has defined an "ideal machine" and developed a specialized microprogram, called an Interpreter, that makes the B 90 appear to be logically equivalent to that machine. The Interpreter executes the instructions which have been generated by the corresponding compiler. These compiler-generated instructions are expressed in an appropriate S-language.

The processor also stores Confidence Test Routines (CTRs) in ROM; these routines work with maintenance test routine programs to isolate faults and detect performance degradation.

The B 91 and B 92 processors have integral peripheral units built into the CPU housing. These include a printing unit, a keyboard, and a BSMD (Burroughs Super Mini-Disk) or BSMD II floppy disk drive. The system display sits on top of the B 92 CPU housing and is integral only in the sense of its tie-in to the console printer, while the display is physically mounted on the B 91. The differences between the B 91 and B 92 are in the size and speed of the inbuilt matrix printer and peripheral expandability. All the B 90s are two-megahertz systems.

The B 93 is available in a single cabinet that occupies less than five square feet of floor space and includes a two-megahertz processor, eight input/output channels, up to three disk controllers, up to four data communications channels, on-board diagnostics, and a six-megabyte Burroughs Super Mini-Disk II inbuilt disk subsystem.

The B 95 processor is a two-megahertz module housing the CPU, a single 256KB or 512KB memory board, and input/output controllers for the disk storage module, the printer, and data communications ports. The B 95 processor supports up to six I/O channels.

The B 96 is a four-megahertz processor supporting up to 10 I/O channels; an 80-megabyte fixed disk drive is integral, and a one-megabyte minidisk for system loading and backup can also be inbuilt.

CONTROL STORAGE: The 4KB ROM contains cold and warm starts, a basic maintenance test routine, an interrupt analysis routine, and general-purpose routines such as binary-to-decimal conversion and absolute memory address conversion. When the processor must temporarily suspend a task because of a peripheral interrupt, information from processor registers is stored in main memory.

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 main 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 ➤

Burroughs B 90

CHART B. MASS STORAGE

MODEL	B9480-22	B9481-12	B9493-18	B9493-20	B9493-37
Type	Cartridge	Cartridge	Fixed	Fixed	Fixed
Controller model	Integrated	Integrated	Integrated	Integrated	Integrated
Drives per subsystem/ controller	2	2	1	1	1
Formatted capacity per drive, megabytes	4.6	9.2	18.8	19.3	37.6
Number of usable surfaces	2	2	4	2	8
Number of sectors or tracks per surface	200 tracks	400 tracks	200 tracks	Information unavailable	200 tracks
Bytes per sector or track	180/sector	180/sector	180/sector	180/sector	180/sector
Average seek time	125 ms	80 ms	35 ms	48 ms	35 ms
Average rotational/relay time	20 ms	20 ms	20 ms	7 ms	20 ms
Average access time	145 ms	100 ms	55 ms	55 ms	55 ms
Data transfer rate	193KB/sec.	193KB/sec.	384KB/sec.	384KB/sec.	384KB/sec.
Supported by system models	B 91, B 92, B 93, B 96	B 91, B 92, B 93, B 96			
Comments					

CHART B. MASS STORAGE (Continued)

MODEL	B9493-40	B9493-54	B9493-64	B9493-74	B9493-80
Type	Fixed	Winchester	Winchester	Winchester	Winchester
Controller model	Integrated	Integrated	Integrated	Integrated	Integrated
Drives per subsystem/ controller	1	2	1	2	1
Formatted capacity per drive, megabytes	38.6	9.6	14.4	14.4	77.2
Number of usable surfaces	4	Information unavailable	Information unavailable	Information unavailable	4
Number of sectors or tracks per surface	Information unavailable	Information unavailable	Information unavailable	Information unavailable	Information unavailable
Bytes per sector or track	180/sector	180/sector	180/sector	180/sector	180/sector
Average seek time	48 ms	Information unavailable	Information unavailable	Information unavailable	48 ms
Average rotational/relay time	7 ms	Information unavailable	Information unavailable	Information unavailable	7 ms
Average access time	55 ms	75 ms	95 ms	95 ms	55 ms
Data transfer rate	384KB/sec.	625KB/sec.	625KB/sec.	625KB/sec.	384KB/sec.
Supported by system models	B 91, B 92, B 93, B 96	B 95	B 95	B 95	B 91, B 92, B 93, B 96
Comments		Integral .7MB floppy		Integral .7MB floppy	

➤ Burroughs' willingness to continue supporting them. Burroughs' overall systems support tends to be erratic in any case, so support problems loom as a possibility for B 90 users.

USER REACTION

Seven B 90 users responded to Datapro's 1983 Computer User Survey, representing 12 systems with an average installed life of 33.5 months. Six users had purchased their systems, and one leased from the manufacturer. Four users (57.1 percent) were running accounting/billing applications on their systems; three reported using payroll/personnel applications. Two users were employing their systems for order processing/inventory control, while manufacturing, process control, sales/distribution, and mathematics/statistics applications were cited by one user each. All seven users developed programs in-house; three also used Burroughs packaged programs and contract programming. One user employed proprietary software from a third party. Cobol, cited by six users (85.7 percent) was the predominant programming language; one user reported employing RPG.

➤ register addresses that portion of main memory from which microinstructions are read, and 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 vendor.

INTERRUPTS: Both external and internal interrupts are present in the B 90. Internal interrupts can occur on a memory parity error, when the Load Enable 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 90 uses an automatic hardware interrupt system; the individual I/O channel notifies the processor when data is ready for processing or transmission.

OPERATING ENVIRONMENT: The B 90 processor unit varies in dimensions according to the model. The B 91 is 39 inches wide, 29 inches deep, and 30 inches high; the B 92 is 49.7 inches wide, 29 inches deep, and 30 inches high. The B 93 is 23 inches wide, 29 inches deep, and 30 inches high. The B 95 processor module measures 6.88 inches wide, 14 inches deep, and 14.25 inches high; it weighs 22 pounds. The B 96 processor, with a built-in 80MB fixed disk and an optional 1MB Burroughs Super Mini-Disk, is housed in a single cabinet occupying less than five square feet of floor

Burroughs B 90

➤ Memory capacity on the installed systems ranged from 128KB to 1MB. Three users reported a memory capacity between 256KB and 512KB; two used between 128KB and 256KB, and two more had between 512KB and 1MB. Disk storage ranged from 256KB to 200MB. Four users had between 20MB and 200MB, while two had between 1MB and 20MB; only one user had less than 1MB.

Six users stated that their systems were installed in central processing sites; only one user had a distributed processing site. Of those with central installations, only one user reported employing distributed processing nodes. Four users reported having between one and five local workstations; three users reported between 6 and 15. Only two users employed remote workstations; one had between one and five, and the other had between 6 and 15.

Although B 90 computers usually do not employ database management systems, one user reported a home-grown DBMS. Only one user employed a communications monitor; the package was supplied by Burroughs. Only one user had integrated word processing functions on the system; another planned to implement those functions in 1983. Four users had disaster recovery plans; three did not.

The ratings that the users gave their B 90s are shown in the following table:

	Excellent	Good	Fair	Poor	WA*
Ease of operation	5	2	0	0	3.7
Reliability of mainframe	3	4	0	0	3.4
Reliability of peripherals	2	3	2	0	3.0
Maintenance service:					
Responsiveness	3	1	3	0	3.0
Effectiveness	3	2	2	0	3.1
Technical support:					
Trouble-shooting	1	2	4	0	2.6
Education	0	3	2	1	2.3
Documentation	0	3	3	1	2.3
Manufacturers software:					
Operating system	5	2	0	0	3.7
Compiler & assemblers	4	2	1	0	3.4
Application programs	1	1	4	0	2.5
Ease of programming	1	5	1	0	3.0
Ease of conversion	2	4	0	0	3.3
Overall satisfaction	2	3	2	0	3.0

*Weighted Average on a scale of 4.0 for Excellent.

In discussing the advantages of their systems, four users mentioned that they were pleased with response time and that programs and data carried over from previous systems demonstrated the compatibility with the B 90 that Burroughs had promised. Three users said that the system was easy to expand and reconfigure, and that terminals and other peripherals were easily transported from other systems. Two users remarked that they found their B 90s to be power- and energy-efficient.

On the negative side, four users complained that costs for hardware, software, and support were greater than they had expected. Other complaints centered on support. Three users said that equipment had been installed late; two reported late delivery of required software. Two more remarked that they found it difficult to keep up with the

➤ space; it stands 30 inches high and is 29 inches deep and 23 inches wide; it weighs 390 pounds.

Power requirements for the U.S.A. are 120 VAC +5 percent, -10 percent, at 60 Hertz. The system requires 1.35 KVA. The operating environment is from 55 to 104 degrees Fahrenheit, with a humidity tolerance ranging from 10 to 85 percent, noncondensing. Additional air conditioning above normal office levels is not required except in extreme operating environments. The processor and standard units integral with the processor dissipate about 4000 BTUs of heat per hour.

For the B 91, B 92, B 93, and B 96, service area and general machine requirements indicate the need for a floor area with about a three-foot clearance around the system. The B 95 requires only that the air vents at the front and rear of the system not be blocked and that a commercial office environment (55-90 degrees Fahrenheit at 10-80 percent humidity) be provided. The storage and processor modules are connected to the B 95 power supply by D-type connectors; the modules have integral power supply cables operating at a maximum voltage of 12 VDC.

Models of B 90 systems that satisfy all international requirements are also available.

INPUT/OUTPUT CONTROL

I/O CHANNELS: Facilities for six I/O channels on the B 91 and B 95, eight I/O channels on the B 92 and B 93, and seven I/O channels on the B 96 are standard. A channel expander unit allows a single I/O channel to be expanded to four similar channels, yielding a total of 11 as a system maximum on the B 92 and B 93 and 10 as the maximum on the B 96. The expander is only one of three types of I/O control used in the B 90. The more-or-less traditional controller used with the line printers represents the second type. The last type is a combination of a device controller and microprocessor placed between the device and the CPU. This type is utilized where complex control is necessary to provide greater throughput to the processor; the control for the tape cassette drives is an example. All three types of control offer their own identification to the processor, allowing the operating system to call into main memory only the necessary disk-resident I/O control segments.

Processing must cease during I/O command transfers and during transfers of data. During periods of "I/O overhead," such as disk seek, simultaneous operations can occur. All parts of the system other than main memory are considered as peripherals, including the operator's console.

CONFIGURATION RULES

GENERAL: The B 91 may attach up to two disk controls with freestanding Burroughs SMD (Super Mini-Disk) drives providing up to four megabytes of disk storage, Burroughs SMD II drives providing up to 6MB of inbuilt disk storage, removable cartridge disk subsystems up to 18.4 megabytes, and fixed disk subsystems up to 77.2 megabytes. Total disk storage capacity on the B 91 is 86.4 megabytes. Up to eight I/O channels, two of which can be data communication channels, can be configured on the B 91. One freestanding printer rated at up to 650 lpm can also be configured.

➤ The B 92 may attach up to three disk controls and a total of 154.4 megabytes of disk storage. Total disk capacity can be allocated among several types of disk devices in various combinations. Individual limits for disk devices include Burroughs BSM drives, six megabytes (3 two-megabyte freestanding drives); Burroughs BSM II drives, 6 megabytes; removable cartridge disk, 27.6 megabytes; and fixed disk storage, 154.4 megabytes. ➤

Burroughs B 90

CHART C. WORKSTATIONS

DEVICE	DESCRIPTION
ET 1100	Ergonomic workstation with 14-inch display and keyboard.

➤ enhancements or changes made to hardware and software by the vendor. One user mentioned that the vendor had failed to provide all promised software and support.

To supplement the assessments provided in the survey, we contacted three respondents in February 1984; each was located in a different area of the country.

The first user, representing a manufacturing company in New England, had indicated in the survey that he was dissatisfied with his B 90 and intended to replace it. However, when contacted, he said that he was still using the system. He remarked that he had initially been displeased because the system couldn't handle the number of workstations that the vendor had said it could and necessitated a greater capital outlay than he had anticipated. In addition, he had experienced problems with the application software that Burroughs had supplied; bugs in the programs produced incorrect reports. Also, he mentioned that software support was erratic; there seemed to be a lack of qualified Hot-Line support personnel who could provide solutions to the software problems.

The user did say, however, that the situation had improved in the past year. He successfully installed the system as a remote processor, with terminals and printers in another state. The memory on the system had been increased from 256KB to 512KB, and disk storage had been upgraded from 9MB to 37MB. Despite his initial displeasure, the user said that he now found the system quite reliable.

The second user represented a local government in a Plains state. He said that he found the B 90 hardware and the MCP operating system to be both extremely reliable and easy to use; he also said that he found Burroughs responsive to requests for maintenance.

This user did say, however, that the system he initially installed was too small; he had to expand the memory from 128KB to 256KB and install a new level of system software in order to add a tape drive. In addition, he said that Burroughs had initially proposed that he put on 40MB of disk storage; he eventually needed 160MB. Rather than expand the system further, he migrated to a B 930 for better price/performance. He did say, however, that the inadequacy of the initial system was not all Burroughs' fault; all parties involved in the installation had not anticipated the rate at which the organization's data processing needs would expand.

The third user represented a manufacturing concern in the upper Midwest. This user employs two B 92s solely for data entry and printing; those two systems communicate with a

➤ The B 92 can have up to 11 I/O channels, four of which can be data communications channels. Up to two freestanding printers rated at 230 cps or 160, 250, 300, 320, 500, or 650 lpm (48 character set) or 64, 250, 300, 375, or 600 lpm (64 character set) can be configured. The B 92 can also be configured with magnetic tape cassette stations. Up to four PE and four NRZI cassette stations or a combination of these stations may be included in the B 92 configuration. A magnetic tape cassette control can handle up to two cassette stations. The B 92 can also support the B9498 Magnetic Tape Streamer for application processing and data file backup, loading, and dumping.

The B 93 has eight input/output channels, expandable to eleven I/Os. The B 93 can support the following components: up to three disk controllers; up to four data communications channels; up to two line printers per system with speeds up to 650 lpm; up to 154 megabytes of fixed disk storage using disk storage subsystems ranging from two megabytes to 77.2 megabytes; and any combination of up to four cassette stations. The B 93 can also support the B9498 Magnetic Tape Streamer.

The B 95 has six I/O channels, five of which can be used for data communications. It supports 10.3MB and 15.1MB fixed/removable and 14.4MB fixed modular disk subsystems. Two storage modules can be configured, for maximum storage of 28.8MB. The B 95 supports printers with speeds of 230 cps and 370, 375/500, and 600 lpm; two printers can be configured.

The B 96 has seven input/output channels, expandable to 10 I/O channels. The system can communicate through up to four data communications channels using either asynchronous or synchronous/bisynchronous transmission modes over leased or switched lines. B 96 peripherals include a variety of display terminals and printers; wide line printers with print speeds up to 650 lpm; and flexible, removable or fixed disk storage media providing up to 231.6 million bytes of on-line storage. The B 96 requires the B9498 Magnetic Tape Streamer.

WORKSTATIONS: The B 91, B 92, and B 93 each support up to eight workstations; the B 95 can support four workstations, and the B 96 can support up to 12 workstations.

DISK STORAGE: See above.

MAGNETIC TAPE: See above.

PRINTERS: Up to two system printers can be configured.

MASS STORAGE

See CHART B.

INPUT/OUTPUT UNITS

See CHART C for workstations, CHART D for printers, and CHART E for magnetic tape devices.

COMMUNICATIONS CONTROL

➤ **GENERAL:** A standard mix of communications network configurations is possible, ranging from a tie-in of one

Burroughs B 90

CHART D. PRINTERS

MODEL	B9246-6	B9249-37	B9249-375	B9349-1
Type	Band	Line	Line	Line
Speed	450-600 lpm	270 lpm	375 lpm	85 lpm
Bidirectional printing	Not applicable	Not applicable	Not applicable	Not applicable
Paper size	3-17 inches	3-17 inches	3-17 inches	3-17 inches
Character formation	Band	Chain	Chain	Chain
Horizontal character spacing (char./inch)	10	10	10	10
Vertical line spacing (lines/inch)	6 or 8	6 or 8	6 or 8	6 or 8
Character set	48, 64, 96	48, 64	64	64
Controller/Interface	Integrated	Integrated	Integrated	Integrated
No. of printers per controller/interface	1	1	1	1
Printer dimensions, in. (h x w x d)	43.7 x 33.6 x 30.3	40.5 x 30 x 24.5	40.5 x 30 x 24.5	40.5 x 30 x 24.5
Graphics capability	No	No	No	No
Comments				

CHART D. PRINTERS

MODEL	B9349-2	B9349-3	B9349-4	B9251
Type	Line	Line	Line	Serial
Speed	160 lpm	250 lpm	350 lpm	230 cps
Bidirectional printing	Not applicable	Not applicable	Not applicable	Yes
Paper size	3-17 inches	3-17 inches	3-17 inches	3-17 inches
Character formation	Chain	Chain	Chain	Dot matrix
Horizontal character spacing (char./inch)	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
Character set	64	64	64	96
Controller/Interface	Integrated	Integrated	Integrated	Integrated
No. of printers per controller/interface	1	1	1	1
Printer dimensions, in. (h x w x d)	40.5 x 30 x 24.5	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
Comments				

➤ B 1955. He said that he originally had a B 91 as one of the systems, but it could not, as delivered, support his organization's needs. A second B 92, he said, better suited his requirements, although the resulting configuration still cannot support sufficient disk for maximum performance. Rather than attempt to upgrade the B 92 system further, he plans to replace one B 92 with CRTs that communicate with the B 1955 over leased lines. The user also said that he has experienced chronic machine problems with the B 92. However, he added that he has gotten good response from Burroughs; he said that a service call usually comes within four hours after a problem has been reported.

Overall, the users surveyed were pleased with their B 90s. Six users (85.7 percent) said that the system did what they expected it to do, and the same number added that they would recommend the B 90 to other prospective users. □

➤ processor to another to various terminal mixes using a variety of communications links. The links may be in-house facilities using data sets or direct connection, or they may use either switched or leased-line telephone facilities. Communications modes may be simplex, half-duplex, or full-duplex, using synchronous, bisynchronous, or asynchronous transmission. Direct connection may be up to 1000 feet in length using the Two-wire Direct Interface (TDI).

Speeds up to 38,400 bps are possible with the TDI. Data sets available include asynchronous and synchronous/bisynchronous varieties. Two asynchronous data sets are

available offering speeds up to 1200 bps and 1800 bps, respectively. The synchronous/bisynchronous data set offers speeds up to 9600 bps.

The principal communications protocol is Burroughs Data Link Control (BDLC), a bit-oriented line control procedure for synchronous transmissions. BDLC is based on High-Level Data Line Control Procedures (HDLC), the protocol standard developed by the International Standards Organization (ISO) and by the European Computer Manufacturers Association (ECMA), and Advanced Data Communications Control Procedures (ADCCP), the protocol standard developed by the American National Standards Institute (ANSI).

SOFTWARE

OPERATING SYSTEM: The *Master Control Program (MCP)* is the only operating system offered by Burroughs for the B 90. It is conceptually similar to the MCP offered on the larger B 900 and B 1900 Systems.

Designed as a comprehensive operating system, the MCP II provides the following functions: operator communications; multiprogramming; virtual memory techniques; dynamic resource allocation; input/output control; maintenance of a library of files; shared index and sequential file handling; re-entrant code; and print spooling from system and terminal printers. The system display (or, alternatively, the console printer on the B 91 and B 92) serves as the communications device between the operator and the MCP.

Multiprogramming under the B 90 MCP takes place without partitioning. During I/O operations, the processor is free and thus able to handle the processing of a second ➤

Burroughs B 90

CHART E. MAGNETIC TAPE EQUIPMENT

MODEL	B9498
TYPE	Streaming
FORMAT	
Number of tracks	9
Recording density, bits per inch	1600
Recording mode	PE
CHARACTERISTICS	
Controller model	Integrated
Drives per controller	4
Storage capacity, bytes	37MB
Tape speed, inches per second	100
Data transfer rate, units per second	160KB/40KB
Streaming technology	Yes
Start/stop mode; speed	Yes; 25 ips
Switch selectable	No
Comments	

program. The virtual memory concept is implemented by breaking up programs into a variable number of segments consisting of I/O functions, constant data, variable data, and executable logic code. Program segmentation is determined at compilation time, with the compiler building a dictionary for each program. When a program is to be executed, only those segments necessary for execution are brought into main memory.

Dynamic resource allocation under the MCP maintains resource-available files which are constantly updated. The factors affecting these files are the identities of the programs currently running and segments of each program, memory assignments and available space, peripheral assignments and available units, disk files and file space available, and program priority.

In I/O control, the MCP handles physical I/O and the programmer takes care of logical I/O. Among the processes of physical I/O handled by the MCP are locating files, data transfers, error monitoring, buffer management, label handling, and automatic retry on detection of an error.

MCP also contains a Multiple Terminal Operator Display System (ODS) feature for B 95 and B 96 systems. It provides System Control Language (SCL) facilities to any remote or locally connected station designated in the Network Definition Language as ODS-capable; the operator can initiate sorts and other functions, direct printer backup facilities, and interrogate the mix from the designated station.

The MCP is an integral part of the B 90 Computer Management System (CMS), which also includes high-level language compilers, utility routines and related CMS Products.

DATABASE MANAGEMENT SYSTEM: B 90 systems do not use a DBMS.

LANGUAGES: Under the B 90 MCP, both Cobol and RPG are supported. (For data communications environments, the Network Definition Language and Message Processing Language are also supported; those languages are discussed under COMMUNICATIONS.)

The B 90 Cobol language is based on American National Standard Cobol 74, except that the Report Writer module is not implemented. Burroughs extensions are provided to allow programmer control of the keyboard, console printer, and system display. Cobol object programs are regarded as collections of logical segments which can be loaded and executed individually or in groups, meaning that programs

can be written without the usual limitations imposed by the computer's memory capacity.

The Cobol compiler runs on any currently available B 90 processor. Object programs generated by the Cobol compiler are expressed in an S-language that is oriented toward efficient handling of 4-bit digits and 8-bit characters. Multiple Cobol programs all share a single copy of the interpreter.

The B 90 Report Program Generator (RPG) is a compiler-driven language. The compiler converts source programs written in the widely used RPG language into object programs that can be executed by B 90 systems. The compiler permits programs written in IBM RPG or RPG II, or in most other versions of the RPG language, to be compiled and run with little or no change. RPG programs are automatically segmented during compilation, so programs can be written without the usual limitations imposed by the computer's memory capacity. Cobol and RPG programs share a common interpreter.

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. NDL runs under MCP on any currently available B 90 system.

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.

UTILITIES: A comprehensive set of utility routines is available for the B 90. The following are some of the utilities provided:

- *Cold Start* is a set of programs involved in the initial loading of system software into disk storage. Separate programs handle disk initialization, disk copying, and disk loading of the systems software.
- *List Directory* generates a listing of file parameters such as record size, block size, creation date, last access, and file type of a particular file or group of files.
- *Copy* provides a means to change file attributes while copying a file or parts of a file.
- *List* provides a hexadecimal and/or alpha printout of a file or parts of a file.
- *Modify* allows the user to change file name, device type, and file size for a file as referenced by a particular program.

Burroughs B 90

- *Sort/Merge* sorts a data file on specified keys and maintains key files as necessary. An index file can be created or sorted, a data file can be sorted, and a merge can be executed to combine up to 16 ordered files into one.

RELATED CMS PRODUCTS: Related CMS products include CMS Superstart, CMS Reporter and On-line Reporter, CMS Domain, CMS Cande, CMS ARCS (Automatic Run Control System), CMS RPG-Edit, CMS ODESYS (On-line Data Entry System), and the IBM System/32 to Burroughs 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 Reporter and *On-line Reporter* are generalized reporting systems that allow nontechnical personnel to create and maintain unique or recurring reports and labels that supplement those normally produced by application systems. CMS Reporter is a console-based system that produces hard-copy reports; it is used only on the B 91 and B 92. CMS On-line Reporter is a terminal-based version for the B 93, B 95, and B 96; it can produce a hard-copy report or display data on the terminal.

In either version of 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. Cande also provides a recovery system.

CMS Automatic Run Control System (CMS ARCS) enables the automatic execution of sequences of commands and programs and is used with commands and programs that are repetitive in nature (job streams). No operator intervention is required under normal 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 Burroughs 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 Burroughs B 90 and B 900 Series small business computer systems utilizing Computer Man-

agement System (CMS) operating software and ET 1100 workstations. WMS is designed to utilize information from data processing files for incorporation in letters and office documents. WMS is a shared logic system which will run concurrently with data processing applications.

APPLICATIONS: Key application packages for the B 90 are described in the following paragraphs.

Manufacturing Business Management System is a multiple-module integrated system written in Cobol. The system standardizes and centrally maintains product and engineering data to help plan manufacturing production, and provides general accounting modules for manufacturing firms.

The Bill of Materials module allows the user to create and maintain item master and product structure files to control production planning processes. Single-level, indented, or summarized where-used and explosion reports are provided.

The Work Center and Routing module provides an "explosion" of the production process for each item.

The Stock Status and Standard Costing modules require the Bill of Materials module as a prerequisite; they provide full or exception stock status reports for inventory management; they also record standard costs by item for single-level or end-item explosion.

The Material Requirements Planning module interfaces to the Bill of Materials and Stock Status modules to provide time-phased requirements planning for present and future order releases.

The Order Release module records, controls, and reports on the status of all orders released to production, while the Job Cost (actual) module collects and reports costs and projected costs against budgeted costs by released order.

The manufacturing Payroll module provides accounting capabilities that meet the needs of the manufacturer, such as daily time card input, shift differential pay, multiple union handling, SUB benefit, and COLA pay.

The Manufacturing Business Management System requires a 60K-byte (user) B 90 with 4.6 megabytes of cartridge disk storage. A line printer is optional.

Credit Union Management System performs all accounting and record-keeping functions normally required for federal and state-chartered credit unions. Among the types of transactions that can be keyboard-entered are open-end loans, bill payments, and share drafts, as well as share, loan, and club transactions. Automatic transactions are generated for dividend payments, payroll deposits, loan payments, interest rebates, bill payments, and share-to-loan transfers. An on-line inquiry and file maintenance module allows multiple/remote access to the members' data. An on-line transaction posting inquiry module will allow multiple/remote access to the data for real-time account updating.

The Credit Union Management System can be used on any B 90 configuration with dual BSM, disk cartridge, or fixed disk units.

Budgetary Accounting System (BAS) is a three-module system designed to run on a minimum B 90 system with either BSM or cartridge disk drive. The General Fund Accounting module maintains an updated financial history. The Appropriation Processing module maintains an updated history of authorized expenditures. The Revenue Processing module maintains an updated history of budgeted source revenue. BAS maintains audit trails and descriptions of each general fund transaction. BAS is written in Cobol.

Burroughs B 90

► **Hospital BMS—Burroughs Hospital Administration System II (BHAS II)** is a four-module system. The A/P, Payroll, and General Ledger modules are designed specifically for hospital accounting requirements. The Patient Accounting module includes census and statistical accounting and reporting, as well as complete accounting for inpatients, outpatients, and accounts receivable. BHAS II is written in Cobol and can run on B 92 systems or B 91 systems with a wide-line printer.

B 90 Government Information System is designed as an integrated multiple-application system. All modules are written in Cobol, and each can be installed as a freestanding application or in a combined total system.

The **Budgetary Accounting System** module provides an integrated accounting system for governments, educational users, and institutions using fund accounting. The system accomplishes the accounting functions required by fund accounting, purchase order encumbrance and expenditure control, cash receipts and disbursements control, general fund processing, bank account reconciliation, vendor reporting, and financial statement preparation. The system, when used with the Government/Education payroll module, provides an automatic interface to payroll. The interface also provides a statistical report which analyzes pay by grade.

The **Government/Education Payroll System** module gives government and education users a payroll system designed so that standard earnings and deductions are produced automatically. Only exceptions to the standard payroll require operator entry. The system generates all necessary management, government, and retirement reports. Fiscal as well as calendar totals are retained by the system.

The **Utility Billing System** addresses the billing, accounting, and management reporting requirements of private utilities and the utility departments of governmental units. It is designed to generate and print bills, apply cash receipts, and produce management reports. The system has the ability to handle single as well as multiple services and meters (i.e., water, sewer, fixed charges, security lights, electric, and gas).

Bank Business Management System is written in Cobol and consists of seven currently available modules.

The **Demand Deposit Accounting** module allows transactions to be entered via keyboard or cassette tape. New account information, stop payments, and holds can be entered via keyboard. A daily trial balance and itemized customer statements are provided, with all exceptions noted.

The **Savings Deposit** module accommodates passbook statement accounts with flexibility for specifying rates, computing earnings, paying earnings, and computing early withdrawal account status. Reports are provided on the customer, management, and operational levels.

The **Loan Accounting** module has capabilities to process installment loans, commercial loans, and mortgage-type loans as well as add-on, discount, and participation loans. Amortization schedules and other loan reports are produced. Loan processing includes interest accrual, loan payment distribution, and unearned interest calculation on prepared loans. Loan inquiry, new account step-up, file maintenance, and transaction entry can all be performed via keyboard.

The **Mortgage Loan** module provides a complete inquiry profile, as well as functions for required reporting, processing loan payments, and disbursing monies for taxes and insurance. An accrual accounting system is an integral part of the module.

The **Audit Entry Proof** module provides input of information either directly through keyboard entry or as an automatic

by-product of the S 1000 proof system. This module generates reports for complete audit control and cash letters, and also provides the interface to the other application modules.

The **General Ledger** module produces a comprehensive statement of financial condition, comparative statements, user-defined critical ratios, budget comparisons, and average daily balancing. The posting routine requires only a single entry of account data to update all affected records and management reports.

The **Central Information** system provides interactive inquiry and updating capabilities through both teller terminals and terminal display units. Combined trial balance and statements can be produced, as well as management information that allows bank personnel to review customer service profiles and activity.

PRICING

POLICY: Burroughs offers the B 90 for purchase or 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: 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.

Burroughs software technical assistance, for installation support and beyond, is available to B 90 users at prices determined by the type of service provided. Installation support varies from one day for some applications modules to more than 10 days for certain complete systems. Hardware installation support for purchased systems is billed according to the type of service provided.

Application software prices quoted in the price list are for a single initial license payment with a monthly license fee. Also shown are prices for annual Product Service Agreements (PSA), which are charged separately from the aforementioned product charges. There are two 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.

TRAINING: Customer education for application programs is charged at specific per-course rates. Some modules require one day, while complete systems may require up to 17 days. Courses on hardware and software are available, as are other courses on subjects from Introduction to Programming to CMS Cobol. Training is recommended by Burroughs.

Training is available at five major centers throughout the United States: Philadelphia, Atlanta, Chicago, Dallas, and Los Angeles. Major centers offering worldwide training include London, Paris, Rio de Janeiro, Sydney, Tokyo, Toronto, Amsterdam, Johannesburg, Stockholm, and Mexico City.

TYPICAL CONFIGURATIONS: The following are typical configurations and purchase prices for B 90 systems.

The following is a typical B 91 packaged system:

B91-256 Packaged System; includes:	\$13,982
CPU	
256KB memory	
90 cps console printer	
Operator Display System (ODS)	

Burroughs B 90

- 18.8MB fixed disk
- Data Comm Power Pak
- TDI kit
- Printer and ODS controls

Total Price \$13,982

The following is a typical B 95 configuration:

- B95-SYS Processor Complex; includes: **\$6,600**
- CPU
- Power supply
- Disk control
- Dual Data Comm Power Pak
- Dual Cable Operator/TDI kit
- B4256-4 256KB memory board **1,445**
- B9493-54 10.3MB fixed disk module **4,495**
- N9251-1 printer control cable **495**
- B9251 230 cps matrix printer **3,487**
- Two ET1100 workstations **3,790**

Total Price \$20,312

The following is a typical B 96 configuration:

- B96-41 Processor Complex; includes: **\$26,300**
- CPU
- 512KB memory
- BSMD 3/6MB Mini-Disk and controller
- 40MB fixed disk and controller
- 100 ips streaming tape drive and controller
- Printer control
- Data Comm Power Pak
- TDI kit
- B4512-4 add-on 512KB memory board **3,500**
- N9280-25 printer control cable **200**
- B9246-6 600 lpm band printer **14,701**
- N9270-25 printer control cable **200**
- B9251 230 cps matrix printer **3,487**
- Eight ET1100 workstations **15,160**

Total Price \$63,548

EQUIPMENT PRICES

		Purchase Price	Monthly Maint.	Monthly lease, 1-year	Monthly lease, 3-/5-year
PACKAGED SYSTEMS AND PROCESSORS					
B91-256	B91-256 System includes 2MHz CPU, 90 cps console printer, 256KB memory, operator display system (ODS), ODS controls, 1/4.6/18.8/37MB fixed disk or 3/6/40/80MB fixed disk, printer controller, data comm power pak, and TDI kit	\$ 13,982	—	\$ 727	\$ 692
B92-256	B92-256 System includes 2MHz CPU, 120 cps console printer, 256KB memory, ODS, ODS control, 1/4.6/18.8/37MB fixed disk or 3/6/40/80MB fixed disk, printer controller, data comm power pak, TDI kit	16,115	—	781	743
B93-CSY	B93 2MHz System includes CPU, 256KB memory, 8 I/O channels	10,600	—	448	408
B95-SYS	Includes Processor Complex, 2 MHz processor, power supply, disk control, Dual Data Comm Power Pak, and choice of Dual Cable Operator/TDI or Dual Cable Operator 25 ft. D.S.	6,600	* 543.00	375	320/279
B96-40	B96-40 System includes 4MHz CPU, 40MB fixed disk, two 256KB boards, data comm power pak, TDI kit, printer control, tape control, tape streamer, and 40MB fixed disk controller	24,300	—	1,384	1,179
B96-41	B96-41 System includes 4MHz CPU, 40MB fixed disk, two 256KB boards, data comm power pak, TDI kit, printer control, tape control, tape streamer, BSMD Inbuilt, BSMD control, and 40MB fixed controller	26,300	—	1,511	1,292
B91 I/O EXPANSION KITS					
H9108-1	I/O Expansion Kit for 128KB system	\$ 3,151	—	\$ 95	\$90
H9108-2	I/O Expansion Kit for 192KB or 256KB system	4,200	—	126	120
MEMORY OPTIONS					
BD4128	2MHz, 128KB	\$ 1,575 *	—	\$ 128	\$ 115
BD4128-K	2MHz, 128KB (field add-on)	2,190	—	128	115
BD4022-64	2MHz, 64KB, B91/92, 64KB board system	1,480	—	60	66
B4256-4	256KB board system:				
	B 95**	1,445	*70.00	80	67/61
	B 96	1,750	—	84	80
B4512-4	512KB board system:				
	B 95**	2,865	*114.00	154	130/118
	B 96	3,500	—	168	160
INBUILT MINI-DISK OPTIONS					
B9489-1	1.0MB Inbuilt BSMD (B 91, B 92 only)	\$ 956	—	\$ 43	\$ 36
B9489-21	3/6MB BSMD II Inbuilt (B 91, B 92, B 93, B 96)	3,150	—	237	202
CONSOLE/CPU OPTIONS FOR B91/B92					
N4305	B 92/B 93 I/O Channel Expander, 8 to 11 I/O	\$ 541	—	\$ 20	\$ 18
BD7760	B92 second pinfeed option (includes out-of-paper detect)	839	—	32	29

*Annual maintenance fee applicable to B 95 products only.

**Maximum of one board per system (either 256KB or 512KB).

Burroughs B 90

EQUIPMENT PRICES (Continued)

		Purchase Price	Monthly Maint.	Monthly lease, 1-year	Monthly lease, 3-/5-year
CONSOLE/ODS OPTIONS					
B9356-01	Operator Display (B 91/B 92; not available as add-on unit)	\$ 2,100	—	\$ 117	\$ 105
H9356	ODS Control (B 91)	NC	—	—	—
N9356	ODS Control (B 92)	NC	—	—	—
B9356-98	Non-CRT Cover (B 91/B 92)	NC	—	—	—
TIME OF DAY CLOCK					
N2357	Time of Day Clock (B 91/B 93)	\$ 940	—	\$ 35	\$ 32
H2357	Time of Day Clock (B 91)	895	—	33	30
DATA COMMUNICATIONS					
H2356-25	Data Comm Power Pak (B 91)	\$ 850	—	\$ 31	\$ 28
N2356-25	Data Comm Power Pak (B 92/B 93/B 95/B 96). Requires one MP2125-1, MP2150-1, HN2160-1, MP2004-2, or MP2004 cable.	893	*72.00	33	30
N2356-35	Dual Data Comm Power Pak (B 95)	945	*120.00	58	50/45
H2356-1	1200 bps async. (B 91)	651	—	25	23
N2356-1	1200 bps async. (B 92)	651	—	25	23
H2356-2	1800 bps async. (B 91)	940	—	35	32
N2356-2	1800 bps async. (B 92)	940	—	35	32
H2356-6	TDI Connect (B 91)	649	—	25	23
N2356-6	TDI Connect (B 92)	649	—	25	23
H2356-18	CMS sync./bisync. (B 91)	1,082	—	40	36
N2356-18	CMS sync./bisync. (B 92)	1,082	—	40	36
H2358	Data Comm Harness (required for each data comm control, except H2356-25)	109	—	5	4
MP2125-1	25 ft. data set interface	132	—	5	5
MP2150-1	50 ft. data set interface	158	—	6	6
HN2160-6	TDI Direct Connect	53	—	3	3
MP2004-2	25 ft. ACU Interface	147	—	6	5
MP2004	50 ft. ACU Interface	211	—	8	7
N9332-11	Dual Cable TDI/TDI (B 95)	175	—	10	8
N9332-14	Dual Cable TDI/50 ft. D.S. (B 95)	125	—	8	6
N9332-15	Dual Cable TDI/25 ft. D.S. (B 95)	100	—	6	5
N9332-16	Dual Cable—50 ft. D.S./50 ft. D.S. (B 95)	195	—	11	9
N9332-17	Dual Cable—25 ft. D.S./25 ft. D.S. (B 95)	150	—	9	7
MASS STORAGE					
H9300	B 91 Control for 1MB; 9.4/18.8MB and cartridge	\$ 1,040	—	\$ 39	\$ 35
H9400	B 91 Control for 3/6MB, 40/80MB	1,040	—	39	35
N9300	B 92/B 93 Control for 1MB; 9.4/18.8MB, cartridge	1,040	—	39	35
N9350	Control for 1MB cartridge (requires N9360-25 cable)	800	—	39	37
N9360-25	Cable for N9350 Control	200	—	8	7
N9400	Control for 3/6MB, 40/80MB (B 92, B 93, B 96)	1,040	—	39	35
N9444	Inter System (B 92/B 96) Disk Control (B 95)	1,750	*90.00	96	81/70
N9450	Disk Control (B 95)	1,040	*90.00	61	52/48
H9500	Control for ICMD (B 91)	1,565	—	58	53
N9500	Control for ICMD (B 92/B 93/B 96)	1,565	—	58	53
B9480-22	4.6MB 145 ms Cartridge Disk Drive	4,000	113.00	206	182
B9481-12	9.2MB 100 ms Cartridge Disk Drive	7,500	164.00	415	367
B9489-1	1.0MB Super Mini-Disk Drive	956	34.80	43	36
B9489-11	1.0MB Super Mini-Disk Single Drive	2,626	43.70	119	100
B9489-12	1.0MB Super Mini Dual Drive	4,006	87.40	180	154
B9489-17	243KB IC Mini-Disk Drive, Freestanding	2,100	33.60	111	98
B9489-21	3/6 Inbuilt	3,150	47.30	237	202
B9489-44	700KB 5¼-inch floppy disk drive and control (B 95)	5,500	*484.00	317	271/248
B9493-18	18.8MB fixed drive	5,775	90.20	307	271
B9493-20	19.3MB fixed disk drive	10,000	70.60	470	414
B9493-37	37.6MB fixed drive	8,925	110.00	536	498
B9493-40	38.7MB fixed drive	13,600	95.30	588	520
B9493-40K	40MB-80MB disk upgrade	3,676	205.00	103	91
B9493-54	9.6MB/700KB Disk Module (B 95)	4,495	*518.00	270	232/214
B9493-64	14.4MB Disk Module (B 95)	4,055	*484.00	245	210/195
B9493-74	14.4MB/700KB Disk Module (B 95)	4,795	*541.00	285	245/215
B9493-80	77.2MB fixed disk drive	16,225	—	655	577
MAGNETIC TAPE UNITS					
N9497-5	Cassette Control (B 92/B 93/B 96)	\$ 1,576	\$ 66.00	\$ 59	\$ 53
B9497-11	NRZI Freestanding Cassette Station; B 92 and B 93 only	1,774	13.00	71	61
B9497-15	PE Freestanding Cassette Station; B 92 and B 93 only	1,774	16.20	71	61
BD9800	Tape Streamer Control (B 92/B 93/B 96)	1,295	—	43	40
B9498	Magnetic Tape Streamer (B 92/B 93/B 96)	7,875	44.60	305	269

*Annual maintenance fee applicable to B 95 products only.

**Maximum of one board per system (either 256KB or 512KB).

Burroughs B 90

EQUIPMENT PRICES (Continued)

		Purchase Price	Monthly Maint.	Monthly lease, 1-year	Monthly lease, 3-/5-year
PRINTERS					
H9200	B 91 Printer Control	\$ 1,029	—	\$ 38	\$ 35
N9200	B 92/B 93 Printer Control	1,029	—	38	35
N9250	Printer Control (B 96)	680	—	33	31
N9251-1	Line Printer Control and cable for B9251, B9249-375, or B9249-37 (B 95)	495	*62.00	30	26/24
N9251-2	Line Printer Control and cable for B9246-6 (B 95)	495	*62.00	30	26/24
N9260-25	Cable for B9349-1, -2, -3, or -4 (B 96)	200	—	8	7
N9270-25	Cable for B9249-375 and B9251 (B 96)	200	—	8	7
N9280-25	Cable for B9246-6 (B 96)	200	—	8	7
B9246-6	600 lpm Band Printer (64 character set)	14,701	182	551	475
B9249-37	270 lpm printer (64 character set; B 95)	9,800	*2,184.00	400	360/324
B9249-375	375/500 lpm printer (64/68 character set): B 91/B 92/B 93/B 96	8,915	99.00	398	341
	B 95	8,915	*1,100.00	379	331
B9251	230 cps Tabletop Matrix Printer: B 91/B 92/B 93/B 96	3,487	35.60	123	109
	B 95	3,487	*396.00	117	105
PR1	Paper Refold Device for B9251	50	—	—	—
B9349-1	85 lpm printer	2,500	66.90	166	147
B9349-2	160 lpm printer	4,500	87.20	246	218
B9349-3	250 lpm printer	5,500	98.10	327	289
B9349-4	350 lpm printer	6,500	109.00	450	397
WORKSTATIONS					
ET1100	Ergonomic workstation with 14-inch display and keyboard	\$ 1,895	*\$ 122.00	\$ 105	\$ 88/79
*Annual maintenance fee applicable to B 95 products only.					
**Maximum of one board per system (either 256KB or 512KB).					

SOFTWARE PRICES

		Initial Payment	Monthly License Fee	Annual Product Service PSA-1	Annual Product Service PSA-2
SYSTEM SOFTWARE					
CM90SSF	System Software Facility; includes:	\$ 2,850	\$ 100	\$ 205	\$ 410
CM90MCP	MCP for B 90 Systems				
CM90UTL	B 90 CMS Utilities				
CM90SST	B 90 CMS Superstart				
CM90COB	CMS Cobol Compiler	900	28	33	65
CM90RPG	CMS RPG Compiler	900	28	33	65
CM90MPL	CMS MPL II Compiler	990	28	36	71
CM90NDL	CMS NDL Compiler	990	28	36	71
CM90TEI	ODESY/RPG Edit	1,150	33	50	100
B 90 DEVELOPMENT AIDS					
CM92DOM	CMS Domain System	\$ 1,950	\$ 87	\$ 102	\$ 203
CM92REP	CMS Reporter	1,950	87	102	203
CM92RPO	CMS On-line Reporter	1,950	125	102	203
CM92INQ	CMS Inquiry	800	38	47	93
B92AEU	Audit Entry Host Utilities	500	24	21	42
CM92GMC	CMS GEMCOS (Generator)	2,500	115	205	210
CM92GMB	GEMCOS (Basic Module)	700	33	30	59
CM92GMT	GEMCOS (Text Compiler)	750	36	32	63
CM92GMF	GEMCOS (Formatting Module)	500	24	21	42
CM90DES	MTS Data Entry System	2,200	83	93	185
B 90 CONVERSION AIDS					
CM90CON	IBM System/32 to B 90 conversion	\$ 660	\$ 28	—	—
B 90 OFFICE AUTOMATION SYSTEMS					
B92WMS	Word Management System	\$ 3,050	\$ 128	\$ 214	\$ 427
B92OSR	OMS-Shared Resource	1,500	63	105	210
B92OEM	OMS-Electronic Mail	3,000	125	210	420
B92OPT	OMS-Productivity Tools	3,000	125	210	420
B92ODP	OMS-DP Interface	750	32	53	105