Burroughs B 90

MANAGEMENT SUMMARY

UPDATE: *Since this report was last revised, Burroughs has added another console-based system to its B 90 line. The addition of the B 91S system cements Burroughs' commitment to the small business market. The B 91S, with its inbuilt 230-cps bidirectional matrix printer, is targeted for general small business use. Applications include software packages for general accounting, banking, personnel, health care, and local government use.*

In July 1984, Burroughs introduced the B 91S, the new console-based model in the B 90 series of small business computers. The B 91S can be used as a freestanding system, a terminal computer within a data communication network, and as a host computer system.

The B 91S processor module houses a 2MHz CPU that employs 64K-bit RAM technology. Minimum main memory is 256KB; memory is expandable up to 512KB in increments of 128KB. Also included in the processor module are input/output controllers for storage modules, printers, and data communications ports.

The B 91S can be configured with up to two disk subsystems from a range of magnetic disk storage devices. Choices include Burroughs Super Mini-Disk subsystems— ➢

The B 91S is a console-based system for general business data processing. It has 256KB of main memory and includes a 230-cps console printer with keyboard. The B 91S 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 91S, a console-based system that operates under the CMS environment used by the other members of the family: the B 91, B 92, B 93, B 95, and B 96. The systems are used for general-purpose commercial computing in small installations and feature software and peripheral compatibility with the B 900 and CMS models of the B 1900.

MODELS: B 91, B 91S, B 92, B 93, B 95, B 96.
MEMORY: 256KB-1.5MB.
DISK CAPACITY: 10MB-231MB.
WORKSTATIONS: Up to 8 on the B 91, B 91S, B 92, and B 93; up to four on the B 95; 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. ➢

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CHART A. SYSTEM COMPARISON

MODEL	B91S	B91/B92	B93	B95	B96
SYSTEM CHARACTERISTICS					
Date of introduction	July 1984	October 1979	May 1981	October 1983	February 1983
Date of first delivery	July 1984	December 1979	May 1981	October 1983	February 1983
Operating system	CMS MCP	CMS MCP	CMS MCP	CMS MCP	CMS MCP
Upgradable from	—	—	—	—	—
Upgradable to	—	—	—	—	—
MIPS	Information unavailable	—	—	—	—
Relative performance	Information unavailable	—	—	—	—
MEMORY					
Minimum capacity, bytes	256K	256K	256K	256K	512K
Maximum capacity, bytes	512K	512K	512K	512K	1.5M
Type	MOS	MOS	MOS	MOS	MOS
Cache memory	None	None	None	None	None
Cycle time, nanoseconds	500	500	500	500	250
Bytes fetched per cycle	Information unavailable	—	—	—	—
INPUT/OUTPUT CONTROL					
Number of channels	6-11	6-11	8-11	6	7-10
High-speed buses	Information unavailable	—	—	—	—
Low-speed buses	Information unavailable	—	—	—	—
MINIMUM DISK STORAGE	18MB	18MB	18MB	10MB	40MB
MAXIMUM DISK STORAGE	86MB/154MB	86MB/154MB	160MB	29MB	231MB
NUMBER OF WORKSTATIONS	8	8	8	4	12
COMMUNICATIONS PROTOCOLS	BDLC, SDLC, HDLC, X.25, SNA, RJE, 2780/3780	BDLC, SDLC, HDLC, X.25, SNA, RJE, 2780/3780	BDLC, SDLC, HDLC, X.25, SNA, RJE, 2780/3780	BDLC, SDLC X.25, SNA, RJE, 2780/3780	BDLC, SDLC, X.25, SNA, RJE, 2780/3780

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

1MB single drive inbuilt (BSMD0); 2MB dual drive freestanding (BSMD); and 6MB dual drive inbuilt (BSMD II). Other choices include Burroughs 4.6MB or 9.2MB cartridge disk subsystems or Burroughs fixed disk subsystems of 18.8MB, 19.2MB, 38.6MB, or 77.2MB.

The B 91S 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 other five models in the B 90 family—B 91, B 92, B 93, B 95, and B 96, are discussed in the following paragraphs.

The B 91 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 and B 91S. (The B 92 has eight I/O channels, versus six on the B 91.) The B 92 can be expanded to support 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, B 91S, and 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.

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

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The B 95 is packaged with a single 256KB or 512KB memory board, input/output controllers for the disk storage module, and printer and data communications ports. The B 95 processor supports up to six I/O channels. Disk storage ranges from 10MB to 29MB and the system supports four 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 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. One notable facility is CMS Superstart, which 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. In addition to CMS Superstart other CMS products include: CMS Reporter and On-Line Reporter, CMS Domain, CMS Cande, CMS Automatic Run Control System, CMS On-line Data Entry System, and IBM System/32 to Burroughs CMS Conversion Program.

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 small business computing and distributed data processing. In the target market, B 90 systems face competition from other general-purpose systems, including the IBM System/36, DEC PDP-11, NCR Tower, and Honeywell DPS 6.

For example, Burroughs envisions the IBM System/36 as the primary competition for the B 96. The B 96 can hold its own against the Model 5362, the low end of the System/36 line. The 5362 supports only 512KB of memory, while the B 96 supports 1.5MB. The B 96 also has a larger storage capacity,—231MB; the 5362 supports only 120MB of disk. The 5362 has the edge in workstations, however, allowing configuration of 22 local and 64 remote stations; the B 96 can support only 12 stations. The B 96 has a harder time competing against the upper-end 5360 Bxx models; however, while they support less memory (1MB) than the B 96, they allow configuration of up to 800MB of disk and 36 local and 64 remote workstations.

Direct competition for the B 91S comes from the Honeywell DPS 6/22 system. Matching the memory capabilities on the two systems, one sees that the DPS 6/22 outguns

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, B 91S, 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 and B 91S. The differences among the B 91, B 91S, and B 92 are in the size and speed of the inbuilt matrix printer and peripheral expandability. The B 91, B 91S, and B 92 are all two-megahertz processors.

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 80MB fixed disk drive is integral, and a 1MB minidisk for system loading and backup can also be inbuilt. The B9498 magnetic tape streamer can also be used as the system load and backup device.

CONTROL STORAGE: The 4KB ROM on B 90 processors contain 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 temporary storage areas for data being manipulated by the microprogram and the special-purpose Memory Address Register (MAR), Micro Memory Address Register (μMAR), and Timing Machine State (TMS) registers. The MAR register is used to address those main memory locations from which data is to be read or written, while the μMAR register addresses that portion of main memory from which microinstructions are read, and the

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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	400	200	—	200
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 91S, B 92, B 93, B 96	B 91, B 91S, B 92, B 93, B 96	B 91, B 91S, B 92, B 93, B 96	B 91, B 91S, B 92, B 93, B 96	B 91, B 91S, B 92, B 93, B 96
Comments					

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

the Burroughs system; the B 91S supports up to 512KB of memory, while the 6/22's capacity is 1.8MB. In the disk storage category, the B 91S outdoes the DPS 6/22 with 154MB maximum disk storage compared with the 6/22's 80MB storage. The B 91S also has a workstation edge, supporting 8 workstations, while the DPS 6/22 suppports five. Again, the B 91S has a tough time competing against upper-end models, in this case the DPS 6/75, which supports up to 96 terminals, 2MB of memory, and 1GM of disk storage capacity as opposed to Burroughs' top-of-the-line B 90 model, the B 96.

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 CMS-based models of the B 1900 series, thus facilitating migration to bigger machines, with some peripherals shared among the three system families. 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 minicomputer power and compatibility with larger lines of systems. Moreover, with the introduction of the B 91S, Burroughs proved that it is still committed to supporting its console-based computer line.

The principal disadvantage in the B 90 line lies in the increasing obsolescence of 8-bit systems, which are losing ground to more powerful and comparably priced 16- and 32-bit supermicros. Yet, there is still a viable market for general business applications systems like the B 90 family. The question remains as to how long Burroughs can profitably market, service, and enhance the B 90 line.

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 91S is 39 inches wide, 29 inches deep, and 47.5 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 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. 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 Btu of heat per hour.

For the B 91, B 91S, 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 to 90 degrees Fahrenheit at 10 to 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.

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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	—	—	—	4
Number of sectors or tracks per surface	—	—	—	—	—
Bytes per sector or track	180/sector	180/sector	180/sector	180/sector	180/sector
Average seek time	48 ms	—	—	—	48 ms
Average rotational/relay time	7 ms	—	—	—	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 91S, B 92 B 93, B 96	B 95	B 95	B 95	B 91, B 91S, B 92, B 93, B 96
Comments		Integral 0.7MB floppy		Integral 0.7MB floppy	

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

USER REACTION

Eighteen B 90 users responded to Datapro's 1984 Computer Users Survey, representing systems having an average installed life of 42 months. Users fell into various industries: banking (22.2 percent); public accounting (22.2 percent); retail/wholesale (16.7 percent); education (11.1 percent); health care (5.6 percent); chemical/petroleum (5.6 percent); and a service bureau (5.6 percent). Accounting/billing systems led the applications list (13 users), while 10 users were running payroll/personnel programs for their systems. Seven users (38.9 percent) were using order processing/inventory applications, and six (33.3 percent) used sales/distribution programs. Purchasing and banking-check processing applications were each employed by five users (27.8 percent). Two users were running health care/medical applications. Applications cited by one user each included: petroleum/fuel analysis; mathematics/statistics; tax planning; and insurance applications. Nine users (50 percent) bought programs from an independent supplier, while eight users (44.4 percent) bought Burrroughs' programs. Three users had programs tailored by Burroughs personnel and three had in-house personnel design their programs. Two users (11.1 percent) employed contract programmers.

The majority of the users (88.9 percent) reported 512K to less than 1M of memory, while one user reported 1M to less than 2M. Disk storage ranged from less than 10MB to 600MB. Seven users fell into the 50MB to 100MB category, six users were in the 10MB to 50MB division, two used 100MB to 600MB, and one had less than 10MB. The majority of the users (83.3 percent) had between one and five workstations/terminals on site, while one had no terminals and two had between 6 and 15. The majority of the users did not have remote workstations (93.8 percent). Two users employed a database management system, while fourteen users (77.8 percent) did not.

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

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

INPUT/OUTPUT CONTROL

Facilities for six I/O channels on the B 91 and B 95, eight I/O channels on the B 91S, 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; thus 11 is the channels system maximum on the B 92 and B 93, and 10 is the maximum on the B 96. The expander is only one of three types of I/O control used in the B 90. The 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 peripherals, including the operator 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 4MB of disk storage, Burroughs SMD II drives providing up to 6MB of inbuilt disk storage, removable cartridge disk subsystems up to 18.4MB, and fixed disk subsystems up to 77.2MB. Total disk storage capacity on the B 91 is 86.4MB. 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 91S may attach two disk controls, supporting up to 77.2MB of fixed disk. Memory, from a base 256KB, is expandable to 512KB in 128KB increments. The B 91S allows up to two wide line printer controls and up to two data communications controllers, maximum. It supports eight I/O devices, maximum, and three cable-connected I/O de-

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	Excellent	Good	Fair	Poor	WA*
Ease of operation	9	4	5	0	3.2
Reliability of system	11	6	0	1	3.5
Reliability of peripherals	7	7	4	0	3.2
Maintenance service:					
Responsiveness	8	9	1	0	3.4
Effectiveness	7	9	1	1	3.2
Technical support:					
Troubleshooting	6	8	3	1	3.1
Education	3	9	4	1	2.8
Documentation	3	8	7	0	2.8
Manufacturers software:					
Operating system	7	5	4	0	3.2
Compiler & assemblers	4	7	1	0	3.3
Application programs	3	6	4	2	2.7
Ease of programming	2	8	2	1	2.9
Ease of conversion	2	5	2	1	2.8
Overall satisfaction	5	9	1	1	3.1

*Weighted Average on a scale of 4.0 for Excellent.

In discussing the advantages of their systems, eight users rated the ease of conversion or reconfiguration for the B 90 as good or excellent. Delivery of equipment was listed by 13 users as on or ahead of schedule. Four users had equipment installed behind schedule, while one user noted very late equipment installation. Software delivery was rated ahead of or on schedule by 12 users, while four users said it was behind schedule and, again, one user said delivery was very late. Equipment noise level was rated by 14 users as quiet or tolerable. Four users responded that it was noisy.

On the other hand, five users felt that software support promised by the vendor was only fair. Another five users felt it was good, three said excellent, and two ruled it was poor. One user also felt that the system configuration proposed by Burroughs was inadequate.

To supplement the assessments provided in the survey, we contacted four respondents in March 1985; each was located in a different area of the country.

The first user, representing a bank in the East, rated the B 90 highly. Having upgraded from a B 80, the user was sold on the availability of software for his company's specific applications needs. He felt the advantage of the Burroughs system was the ability to upgrade systems without having to drastically alter software. He said that the combined hardware and software support was excellent.

The second user, with a public accounting and service bureau firm in the Midwest, commented on the expandability of memory and disk drives on the B 90 series. He found the system easy to operate. Downtime was low, he said, and he felt the B 90 was a "good piece of equipment." He is pondering an upgrade to the B 900, if the company expands.

The user did say there were some inherent bugs in the software, but it was really not much of a problem. He would recommend the B 90 to others.

A medical outfit in the Midwest, the third user, had examined IBM and DEC mini systems before settling on the B

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	TD1, RS-232-C, BDAA (opt.); screen sizes of 12 or 24 x 40 and 12 x 80 optional.

vices, that is, freestanding disks and line printers. (According to the company, data comm lines are not considered cable-connected I/O devices.)

The B 92 may attach up to three disk controls and a total of 154.4MB 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, 6MB (3 two-megabyte freestanding drives); Burroughs BSM II drives, 6MB; removable cartridge disk, 27.6MB; and fixed disk storage, 154.4MB.

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 154MB of fixed disk storage using disk storage subsystems ranging from two megabytes to 77.2MB; 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 150 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

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CHART D. PRINTERS

MODEL	B9246-6	B9249-37	B9249-375	B9249-1	B9249-2
Type	Band	Line	Line	Line	Line
Speed	450-600 lpm	270 lpm	375 lpm	85 lpm	160 lpm
Bidirectional printing	—	—	—	—	—
Paper size	3-17 inches	3-17 inches	3-17 inches	3-17 inches	3-17 inches
Character formation	Band	Chain	Chain	Chain	Chain
Horizontal character spacing (chars./inch)	10	10	10	10	10
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	48, 64	64	64	64
Controller/Interface	Integrated	Integrated	Integrated	Integrated	Integrated
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	40.5 x 30 x 24.5	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	No
Comments					

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

90. Part of the decision to purchase the system was service; the user commented that three Burroughs service technicians were based in his city. The user estimated, though, that downtime was minimal—two to three hours in 2½ years, with less than 15 minutes being the average. He cited the system as very reliable. The user is considering adding on a tape streamer as additional backup. On the negative side, he felt there was a lack of communication between Burroughs support technicians and Burroughs programmers. Otherwise, though, he endorsed the system and said that he may upgrade in the future.

The fourth user surveyed by telephone was the owner of a public accounting/consulting and service bureau operation in the West. Although satisfied overall with his B 92 system, the owner stated that required software from the vendor that was to be delivered in November was not installed until January, at the critical peak season for processing tax returns. He had expanded his system to capacity; he estimated service was costing upwards of $7,000 a year.

On the positive side though, the fourth user felt that the B 92 throughput was about twice that of the B 80 he had upgraded. Another item he liked about the system was keyboard direct access to the mainframe. The user said he only needed one operator because of this. The user said he would recommend Burroughs products to others, but could not recommend the B 92. When asked why he wouldn't recommend the system, he said that since he bought the system (December 1981), the market had changed and he felt that a buyer could get more for the money from a number of other vendors. He had examined DEC and IBM systems before deciding on the B 92.

Overall, the users surveyed were pleased with their B 90s. Seventeen users (94.4 percent) said that the system did what they expected it to do, and 16 (88.9 percent) said that they would recommend the B 90 to other prospective users. □

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 91S, B 92, and B 93 each support up to eight workstations; the B 95 can support up to four workstations, and the B 96 can support up to 15 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 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 1,000 feet in length using the Two-wire Direct Interface (TDI).

Speeds up to 38,400 bps are possible with the TDI, and, speeds from 19 to 2K bps asynchronous and synchronous/bisynchronous can be achieved, depending on data sets.

A variety of communications protocols are available (asynchronous, synchronous, bisynchronous, and bit-oriented). Burroughs Data Link Control (BDLC) is a bit-oriented line control procedure for synchronous transmissions. BDLC is based on High-Level Data Link 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

Burroughs B 90

CHART D. PRINTERS (Continued)

MODEL	B9249-3	B9249-4	B9251	B9252
Type	Line	Line	Serial	Serial
Speed	250 lpm	350 lpm	230 cps	150 cps
Bidirectional printing	—	—	Yes	Yes
Paper size	3-17 inches	3-17 inches	3-17 inches	3-17 inches
Character formation	Chain	Chain	Dot matrix	Dot matrix
Horizontal character spacing (char./inch	10	10	10, 12.5, 16.7	10,17.2
Vertical line spacing (lines/inch)	6 or 8	6 or 8	6 or 8	6 or 8
Character set	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	10.9 x 27.9 x 19.5	7 x 24 x 14
Graphics capability	No	No	No	No
Comments				B95/B96 only

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

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 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; reentrant code; and print spooling from system and terminal printers. The system display (or, alternatively, the console printer on the B 91, B 91S, 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 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 any B 90 system terminal-oriented environment. It provides System Control Language (SCL) facilities to any (and more than one) 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.) All compilers run on any B 90, B 900, or CMS B 1900 system. The object programs (S-code) generated are portable to any of these systems without recompilation.

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 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. The program thus enables the user's application programs to deal with remote terminals in the same manner as conventional on-site peripheral devices.

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	B 92, B 93, B 96 only

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 sample 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 system 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.
- *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 (Automatic Run Control System), CMS RPG-Edit, and CMS (On-line Data Entry System). 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, B 91S, 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 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) 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.

CMS On-Line Data Entry System 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.

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 Management 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 runs concurrently with data processing applications.

APPLICATIONS: Burroughs offers a variety of application programs for the B 90 series. Application areas include government accounting and financial management, commercial business management, wholesale/distribution, manufacturing, health care business management, banking, business planning, and decision support.

Burroughs B 90

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 application 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 below 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 both telephone support and assistance on-site in diagnosis and reporting of 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 major centers throughout the United States and worldwide.

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

The following is a typical B 91S packaged system:

B91-SP5 Packaged System; includes: CPU 512KB memory 230-cps console printer Operator Display System (ODS) 80MB fixed disk Data Comm Power Pak TDI kit Printer and ODS controls	$21,000
Total Price	$21,000

The following is a typical B 95 configuration:

B95-SYS Processor Complex; includes: CPU Power supply Disk control Dual Data Comm Power Pak Dual Cable Operator/TDI kit	$3,900
B4256-4 256KB memory board	1,445
B9493-54 10.3MB fixed disk module	1,515
N9252-1 printer control and cable	495
B9252 150-cps matrix printer	1,295
Two ET1100 workstations	3,890
Total Price	$12,540

The following is a typical B 96 configuration:

B96-41 Processor Complex; includes: CPU 1MB memory BSMD 1MB Mini-Disk and controller 40MB fixed disk and controller 100-ips streaming tape drive and Controller Printer control Data Comm Power Pak TDI kit	$29,140
N9280-25 printer control cable	200
B9246-6D 600-lpm band printer	14,700
N9252-2 printer control and cable	680
252 150-cps matrix printer	1,295
Eight ET1100 workstations	15,560
Total Price	$61,575

Burroughs B 90

EQUIPMENT PRICES

		Purchase Price ($)	Monthly Maint. ($)	Monthly lease, 1-year ($)	Monthly lease, 3-/5-year ($)
PACKAGED SYSTEMS AND PROCESSORS					
B91-S	B91-S System includes 2MHz CPU, 230-cps console printer, (2) 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	18,000	—	—	—
B91-PK1	B91-PK1 System includes 2MHz CPU, 90-cps console printer, (2) 256KB memory, operator display system (ODS), ODS controls, (2) disk controls—1MB 4.6 cartridge, 18.8/37 fixed cont., printer controller, Data Communication Power Pak,TDI kit, 1MB super mini-disk drive, and 18.8MB fixed disk	14,650	226.92	—	—
B91-PK2	B91-PK2 System includes 2MHz CPU, 90-cps console printer, (4) 512KB, operator display system (ODS), ODS controls, 1MB 4.6 cartridge, 18.8/37 fixed cont., 3/6MB 20/40/80 fixed cont., printer controller, Data Comm Power Pak, TDI kit, 1MB super mini-disk drive, 38.7MB fixed disk, and 270 lpm printer	23,260	384.83	—	—
B91-SP5	B91-SP5 System includes 2MHz CPU, 230-cps console printer, (4) 512KB memory, ODS, ODS controls, 1MB, 4.6 cartridge 18.8 fixed cont., 3/6, 40/80MB fixed cont., printer controller, Data Comm Power Pak, TDI kit, 1MB mini-disk, and 77MB fixed disk	21,000	309.92	—	—
B92-256	B92-256 System includes 2MHz CPU, 120-cps console printer, (2) 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, and tape streamer	16,115	95.10	778	740
B93-CSY	B93 2MHz System includes CPU, (2) 256KB memory, 8 I/O channels, disk control, controller for 18.8MB fixed disk, printer control, 3/6 in built, 18.8MB fixed disk, 375/500 lpm 64/48 channel set, Data Comm Power Pak, and TDI kit	20,999	375.97	—	—
B95-SYS	Includes Processor Complex, 2MHz 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.	3,900	45.25	375	320
B96-40	B96-40 System includes 4MHz CPU, 38.7MB fixed disk, two 256KB boards, data comm power pak, TDI kit, printer control, tape streamer	24,300	154.00	1,384	1,179
B96-41	B96-41 System includes 4MHz CPU, 38.7MB 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	196.00	1,511	1,292
B91C I/O EXPANSION KITS					
H9108-1	I/O Expansion Kit for 128KB system	3,151	3.50	97	92
H9108-2	I/O Expansion Kit for 192KB or 256KB system	4,200	3.50	128	122
MEMORY OPTIONS					
BD4128	2MHz, 128KB	1,575	28.50	132	119
BD4128-K	2MHz, 128KB (field add-on)	2,190	26.40	131	118
BD4022-64	2MHz, 64KB, B91/92, 64KB board system	1,418	33.70	63	58
B4256-4	256KB board system for B 95; maximum one board per system	1,445	6.20	86	82
B4512-4	512KB board system for B 95; maximum one board per system	2,865	10.40	171	163
INBUILT MINI-DISK OPTIONS					
B9489-1	1MB Inbuilt BSMD (B 91, B 92 only)	956	39.10	51	44
B9489-21	3/6MB BSMD II Inbuilt (B 91, B 92, B 93)	3,150	52.70	246	211
CONSOLE/CPU OPTIONS FOR B 91/B 91S/B 91C/B 92C/B 96					
N4305	B 92/B 93 I/O Channel Expander, 8 to 11 I/O (B 96 I/O chan. expand 7 to 10 I/O)	541	5.80	22	20
BD7760	B92 second pinfeed option (includes out-of-paper detect)	839	8.90	34	31
H7751	B 91-S second pinfeed option	—	8.60	—	—
CONSOLE/SPO OPTIONS					
B9356-01	Operator Display (B 91/B 92; not available as add-on unit)	2,100	27.10	128	114
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 92/B 93/B 96)	940	8.30	37	34
H2357	Time of Day Clock (B 91)	895	7.40	35	32
DATA COMMUNICATIONS					
H2356-25	Data Comm Power Pak (B 91)	850	7.10	33	30
N2356-25	Data Comm Power Pak (B 92/B 93/B 96)	893	6.60	35	32
N2356-35	Dual Data Comm Power Pak (B 95)	945	10.40	32	29
H2356-1	1200 bps async (B 91)	651	5.10	27	25
N2356-1	1200 bps async (B 92)	651	5.10	27	25
H2356-2	1800 bps async (B 91)	940	7.40	37	34
N2356-2	1800 bps async (B 92)	940	7.40	37	34

**Annual maintenance fee applicable to B 95 products only.*

Burroughs B 90

EQUIPMENT PRICES

		Purchase Price ($)	Monthly Maint. ($)	Monthly lease, 1-year ($)	Monthly lease, 3-/5-year ($)
DATA COMMUNICATIONS (Continued)					
H2356-6	TDI Connect (B 91)	649	5.10	27	25
N2356-6	TDI Connect (B 92)	649	5.10	27	25
H2356-18	CMS sync/bisync (B 91)	1,082	8.50	42	38
N2356-18	CMS sync/bisync (B 92)	1,082	8.50	42	38
H2358	Data Comm Harness (required for each data comm control, except H2356-25)	109	.70	6	5
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	8.20	41	37
H9400	B 91 Control for 3/6MB, 40/80MB	1,040	8.20	41	37
N9300	B 92/B 93 Control for 1MB; 9.4/18.8MB, cartridge	1,040	8.20	41	37
N9350	Control for 1MB cartridge (requires N9360-25 cable)	800	8.40	41	39
N9360-25	Cable for N9350 Control	200	—	8	7
N9400	Control for 3/6MB, 40/80MB (B 92, B 93, B 96)	1,040	8.20	41	37
N9444	Inter System (B 92/B 96); Disk Control (B 95)	1,750	7.50	96	81
N9450	Disk Control (B 95)	1,040	7.50	61	52
H9500	Control for ICMD (B 91)	1,565	12.40	59	54
N9500	Control for ICMD (B 92/B 93/B 96)	1,565	12.40	59	54
B9480-22	4.6MB 145 ms Cartridge Disk Drive	4,000	127.00	230	206/209
B9481-12	9.2MB 100 ms Cartridge Disk Drive	7,500	191.00	459	411/418
B9489-1	1MB Super Mini-Disk Drive	956	39.10	51	44
B9489-11	1MB Super Mini-Disk Single Drive	2,626	49.10	129	110
B9489-12	1MB Super Mini Dual Drive	4,006	98.20	198	172
B9480-24	4.6MB Cartridge drive w/h or N9300	4,040	63.00	257	228
B9489-17	243KB IC Mini-Disk Drive, Freestanding	2,100	37.40	118	105
B9481-13	9.2MB cartridge w/h or N9300	6,815	108.00	472	419
B9489-21	3/6 Inbuilt	3,150	52.70	246	211/198
B9489-44	700KB 5¼-inch floppy disk drive	5,500	40.35	317	271
B9493-18	18.8MB fixed drive	5,775	102.00	327	291/281
B9493-20	19.3MB fixed disk drive	10,000	80.00	486	430
B9493-37	37.6MB fixed drive	8,925	125.00	561	523/533
B9493-40	38.7MB fixed drive	13,600	108.00	609	541
B9493-9K	9MB to 18MB disk uppgrade	1,050	10.90	44	39/40
B9493-40K	40MB-80MB disk upgrade	3,676	22.70	113	101/107
B9493-54	9.6MB/700KB Disk Module (B 95)	1,515	43.15	270	232
B9493-64	14.4MB Disk Module (B 95)	3,000	40.35	245	210
B9493-74	14.4MB/700KB Disk Module (B 95)	3,500	45.10	285	245
B9493-80	77MB fixed disk drive	16,225	128.00	680	602
B9494-41	402MB fixed disk	21,500	112.00	1,234	1,112/ 1,003
MAGNETIC TAPE UNITS					
B9497-5	P.E. MTC and Harness Inbuilt	1,607	14.40	61	58
B9497-11	NRZ Freestanding Cassette Drive	1,774	14.40	75	65
B9497-15	PE Freestanding Cassette Drive	1,774	17.90	75	65
BD9800	Tape Streamer Control (B 92/B 93/B 96)	1,295	8.80	45	42
B9498	Magnetic Tape Streamer	7,875	45.40	308	272
PRINTERS					
H9200	B 91 WLP Control	1,029	8.10	40	37
N9200	WLP Control	1,029	8.10	40	37
N9250	N9250 Control (B 96)	680	8.30	35	33
N9251-1	Line Printer Control and cable for B9251, B9249-375, or B9249-37 (B 95)	495	5.17	30	26
N9251-2	Line Printer Control and cable for B9246-6 (B 95)	495	5.17	30	26
N9260-25	Cable for B9249-1, -2, -3, or -4 (B 96)	200	—	8	7
N9270-25	Cable for B9249-375	200	—	8	7
N9280-25	Cable for B9246-6 (B 96)	200	—	8	7
B9246-6	650-lpm Band Printer (64-character set)	14,700	186	559	483
B9249-37	270-lpm printer (64-character set; B 95)	9,800	94.90	400	360/324

**Annual maintenance fee applicable to B 95 products only.*

Burroughs B 90

EQUIPMENT PRICES

		Purchase Price ($)	Monthly Maint. ($)	Monthly lease, 1-year ($)	Monthly lease, 3-/5-year ($)
PRINTERS (Continued)					
B9249-375	375/500-lpm printer (64-/68-character set):				
	B 91/B 92/B 93/B 96	8,915	112.00	422	365
	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	32.00	118	104
	B 95	3,487	396.00	117	105
B9252	150-cps matrix printer	1,295	—	—	—
PR1	Paper Refold Device for B9251	50	—	—	—
B9349-2	160-lpm printer	4,500	97.10	264	236
B9349-3	250-lpm printer	5,500	109.00	347	309
B9349-4	350-lpm printer	6,500	121.00	472	414
WORKSTATIONS					
ET1100	Ergonomic workstation with 14-inch display and keyboard	1,945	* 20.33	105	88/79

**Annual maintenance fee applicable to B 95 products only.*

SOFTWARE PRICES

		Initial Payment ($)	Monthly License Fee ($)	Annual Product Service Agreements PSA-1 ($)	PSA-2 ($)
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				
CM90CDE	CMS Cande	—	—	—	—
AC90BCP	ACSYS SYSSoftwr	2,200	61	—	—
CM90ACA	B 90 ACSYS SYS&MCP	3,850	110	—	—
CM90COB	CMS Cobol Compiler	900	28	33	65
CM90RPG	CMS RPG Complier	900	28	33	65
CM90MPL	CMS MPL II Compiler	990	28	36	71
CM90NDL	CMS NDL Compiler	990	28	36	71
CM90TEI	Terminal Entry B 90, TDS Cont MCS, CANDE and ODESY	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	105	210
CM90GMB	GEMCOS (Basic Module)	700	33	30	59
CM90GMT	GEMCOS (TCL Compiler)	750	36	32	63
CM90GMF	GEMCOS (Formatting Module)	500	24	21	42
CM90DES	MTS Data Entry System	2,200	83	93	185
B 90 CONVERSION AIDS					
CS92SL9	B700 SL7 Cobol to B 92 CMS Cobol	644	—	—	—
CM90CON	IBM System/32 to B 90 conversion	660	28	—	—
B 90 OFFICE AUTOMATION SYSTEMS					
B92WMS	Word Management System	3,050	128	214	427

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