Burroughs B 90

MANAGEMENT SUMMARY

In February of 1983, Burroughs expanded their entry into the small business computer market with the introduction of the B 96, the most powerful computer in Burroughs' B 90 Series that also features the B 91, B 92, and B 93. Featuring many of the concepts employed in the larger B 900 family, primarily dynamically variable microprogrammed logic, LSI circuitry, and microprogrammed interpreters, the B 90 Series offers state-of-the-art hardware and impressive data communications capabilities.

The B 90 is marketed in the form of basic packaged systems. Burroughs provides considerable latitude by offering the user the ability to configure their system from these basic packages. The basic packages include the processor, memory, console printer (except on the B 93 and B 96), and from six to eight I/O channels. Basic systems do not include the operator display station, and mass storage units or magnetic tape cassette units. The user may select from a reasonably extensive list of peripherals to complete his or her system. In addition, packaged system prices do not include the required software.

Two models are available in the entry-level B 91 group—the B 91C and B 91-8. Marketed primarily as a single workstation system, the B 91C includes the CPU, 128K bytes of memory, 90 cps console matrix printer plus keyboard, and six I/O channels expandable to eight I/Os with the addition of the H9108 expansion kit. Maximum configurations for the B 91C include 77.2 MB of fixed storage, 4.6MB of backup storage, a Burroughs wide-line printer, and a printing console. The B 91-8 offers the same features

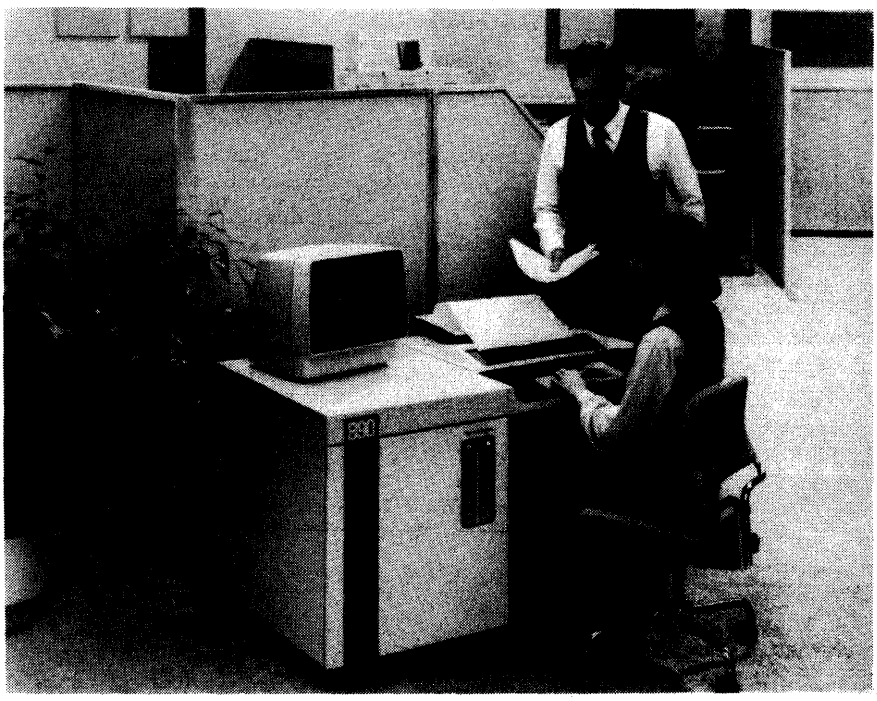
The B 90 Series is comprised of the B 91, B 92, B 93, and B 96 small business systems. The B 90 is designed both as an entry level system for first time computer users and as an upgrade from existing B 80 and some B 800 users. Prices for the B 90 Series range from $8,350 for the B 91C system to $38,000 for the B 96.

MAIN MEMORY: 128K bytes to 1.5MB
DISK CAPACITY: 4.6 megabytes to 231.6 megabytes
WORKSTATIONS: Up to 8
PRINTERS: 90 cps to 650 lpm
OTHER I/O: Magnetic tape cassette, card readers

CHARACTERISTICS

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

Burroughs is considered to be one of the strongest competitors in the data processing marketplace, with a broad line of computer equipment spanning the range from small, entry-level systems to very large, multi-user, multiprocessor systems. In addition to data processing equipment, Burroughs also markets magnetic media; business forms and supplies; document counting, encoding, signing, protecting, and disbursing equipment; programmable and non-programmable desktop calculators; specialized banking equipment; word processing equipment; facsimile devices; and other related



The B 92 is available with up to 512K bytes of main memory and 11 I/O channels, 4 of which may be communications channels. Peripherals available include several types of diskette drives, 2 different fixed disk drives, 2 different cartridge disk drives, 2 magnetic tape cassette devices, 9 line printers, and a variety of terminals. The B 91, B 92, B 93 and B 96 are capable of running under CMS or ACSYS software.

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B90 SPECIFICATIONS CHART

MODEL	B91/92	B93	B96
CPU Type	MOS	MOS	MOS
Word Length (bits)	8	8	8
No. of I/O ports on basic system and max.	6, 8/8, 11	8, 11	8, 11
Main memory (min.)	128KB	256KB	512KB
Main memory (max.)	512KB	512KB	1,536KB
Cycle/access time, microseconds	0.5/0.3	0.5	0.25
Max. Disk Storage	160.4MB	160.4MB	231.6MB
Communications lines (max.)	2/4	4	4
Protocols supported	2780/3780, BDLC	2780/3780, BDLC	2780/3780
IBM 3270 Emulation	Yes	Yes	Yes
Max. no. of jobs run concurrently	—	—	23
Multiprogramming	Yes	Yes	Yes
Data Base Management System	No	No	No
Languages Supported	Cobol, RPG, NDL, MPL II	Cobol, RPG, NDL, MPL II	Cobol, RPG NDL, MPL II

as the B 91C but with two additional I/O channels in the basic configuration.

The B 92C with CPU, 128K bytes of memory, 120 cps console printer, and 8 I/O channels (expandable to 11 I/Os), offers forms compatibility to existing B 80 users who wish to upgrade to the B 90. Also, the B 92 offers additional I/O capability for medium to large users over the B 91-8.

The B 93, introduced in April 1981, is designed to simplify automation of key business functions and allow data processing and word processing operations to be merged in an integrated system. The B 93 is similar in design to the B 91 and B 92, but does not include a console printer. The system includes eight I/O channels and is expandable to eleven channels. The B 93 also offers an increase of up to four times in data communications speed and twice the disk storage capacity of the other models in the B 90 Series.

The B 93, available in a single cabinet that occupies less than five square feet of floor space, includes large-scale integrated circuitry; a 2 MHz cycle time; basic memory of 256K bytes expandable to 512K bytes; 4K byte memory for cold start, warm start, and maintenance test routines; eight input/output channels (see Configuration Rules); up to three disk controllers; up to four data communication channels; and on-board diagnostics. Through the English language Word Management System (WMS) software, word processing operations can run in parallel, or be combined with computer application programs.

The B 96 features three times the main memory capacity, twice the processor clock rate, and 33 percent more disk storage than other B 90 models. First in the B 90 Series to use 64K chip technology, the B 96 features a 4MHz processor and main memory expansion from the basic 512KB to

products. Burroughs is international in scope and employs some 50,000 people in more than 120 countries around the globe.

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

DATE ANNOUNCED: B 91 and B 92, October 1979; B 93, May 1981; B 96, February 1983.

DATE OF FIRST DELIVERY: B 91 and B 92, December 1979; B 93, May 1981; B 96, February 1983.

NUMBER INSTALLED TO DATE: Not available.

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.

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 .015 nanosecond access time.

CAPACITY: The B 91 and B 92 have a minimum of 131,072 bytes of main memory expandable to 524,288 bytes

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PERIPHERALS/TERMINALS

DEVICE	DESCRIPTION
TERMINALS	
MT985	12-inch Display Monitor and Processor
MT993	9-inch Display Monitor and Processor
TP110	Alpha Keyboard
TP119	Source Data Keyboard
TP130	Expanded Alphanumeric with 10 Keypad
MAGNETIC TAPE UNITS	
N9497-5	Cassette Control (B92/B93/B96)
B9497-11	NRZI Freestanding Cassette Station; B92 and B93 only
B9497-15	PE Freestanding Cassette Station; B92 and B93 only
BD9800	Tape Streamer Control
CARD/MMR READERS	
B9116	600 cpm reader (80-column)
B9119-1	300 cpm reader (96-column)
B9161-1	Magnetic Record Reader
PRINTERS	
N9250	N9250 Control (B96)
B9251	230 cps, Matrix
H9200	B91 Control
N9200	B92/B93 Control
B9249-31	270/370 lpm, soft VFU, 64/48 character set
B9249-375	375 lpm, 64/48 character set
B9349-1	85 lpm printer
B9249-2	160 lpm printer
B9249-3	250 lpm printer
B9349-4	350 lpm printer
B9246-6	600 lpm band printer

1.5 megabytes. The system can communicate through up to four data communications channels using either asynchronous or synchronous/bisynchronous transmission modes over leased or switched lines. The Data Comm Power Pak on a B 96 allows a baudpass of up to 60,000 bits per second, providing faster terminal response and enhanced connectivity in a network. The B 96 processor, with a built-in 80 megabyte fixed disk and an optional 1 megabyte Burroughs super mini disk, is housed in a single cabinet occupying less than five square feet of floor space.

All software for the B 90 is integrated into two systems known as the Computer Management System (CMS) and the Accounting Computer System (ACSYS).

The ACSYS software provides for the use of existing Burroughs L/TC Series cassette programs on the B 91/B 92 system using disk media as cassettes. ACSYS is actually a language with a built-in monitor. It does not support fixed disk subsystems, but does support BSM, BSM II, and cartridge disk subsystems. All B 90 software is separately priced.

Falling under the CMS umbrella are the Master Control Program (MCP) operating system; the higher-level language compilers, Cobol and RPG; the Communications

in increments of 131,072 bytes. B 93 systems have a minimum of 256K bytes of MOS memory expandable to 512K bytes in increments of 128K bytes. The B 96 has a minimum main memory capacity of 512K bytes expandable to 1.5 megabytes in increments of 512K bytes. They also feature a 4K byte Read Only Memory containing routines for loading interpreters and customer confidence routines, and a 252K byte Random Access Memory for the Master Control Program (MCP).

CHECKING: Parity standard.

STORAGE PROTECTION: Main storage write operations are permitted only within the limits defined by a base register and a limit register.

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

CENTRAL PROCESSOR

The central processor of the B 90 makes extensive use of 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. Interfacing between the processor and memory requires a protocol of signals, a technique which is designed, according to Burroughs, to protect the basic design from obsolescence.

The B 90 has certain integral peripheral units built into the CPU housing. These include a printing unit, a keyboard,

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Language Compilers, Network Definition Language (NDL) and Message Processing Language (MPL); the stand-alone utility set; and the currently available applications packages.

The MCP is a full operating system that provides an automatic, nonpartitioned multiprogramming environment. Among the features of the MCP are dynamic memory and resource allocation and the virtual memory concept of operation.

In a data communications environment, the B 90 can control its own network of terminals, communicate with other B 90 systems, or serve as a terminal to a larger system. The Network Definition Language is designed to ease the work of a user in implementing or reconfiguring a data communications network. The Message Processing Language MPL II provides a method of interfacing between the NDL and the user's programs. Among the communications protocols available are ACSYS, asynchronous, synchronous, and bisynchronous procedures.

COMPETITIVE POSITION

In the rapidly growing small business minicomputer arena, the Burroughs B 90 Series fits nicely into a market that emphasizes conventional business data processing applications as well as applications software. The B 90 features many of the concepts employed in the larger members of the B 900 family, and Burroughs describes the B 90 as the fastest and most powerful system in its class ever developed by the company. Be that as it may, the B 90 is in competition with the likes of the IBM Datamaster and System/34, Wang's 2200 Series, and Basic Four's Business Systems family.

ADVANTAGES AND RESTRICTIONS

One of the B 90's particular strengths in the small business mini area is the array of applications software packages available for the system that includes, among others, the Hospital Business Management System, Production Control System, Commercial Business Management System, Education Systems, Government Systems, and Credit Union System. In a brief comparison with another 8-bit system, IBM's System/34, Burroughs' B 92 offers a greater main memory capacity (512KB to the System/34's 256KB) but less on-line storage available (160.4MB as opposed to the System/34's 257.4MB). The B 92 basic system includes 128KB of main memory, a 120 cps console printer, and out-of-paper detect priced at $14,700. The System/34 basic system includes 32KB of main memory, one diskette drive, and 8.6MB of disk storage at $14,770.

USER REACTION

Seven users representing 15 Burroughs B 90 systems (with an average life of 19.1 months) responded to Datapro's 1982 User Survey. Five of the users purchased their systems, 1 rented or leased from the manufacturer, and 1 leased from a third party. The types of industries represent-

and a floppy disk drive (Burroughs Super Mini-Disk II). 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 (see Configuration Rules), 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 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, 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. This feature has a wide spectrum of application in data streaming, operating system table manipulation, and byte processing operations.

Burroughs defines S–language (Secondary language) instructions as intermediate instructions which are equivalent to the machine-language instructions of conventional computers. Each S–language instruction is implemented by a string of microinstructions which interpretively execute the functions specified by the S–instruction. Because the S–instructions are software-defined by the microprograms, the functions they specify can be quite complex. 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.

Confidence Test Routines (CTRs) stored in ROM, together with maintenance test routine programs, make fault analysis and performance degradation detection easier for field engineers and customers. This includes both the isolation and analysis of the problem.

CONTROL STORAGE: The 4KB ROM (read-only memory) 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

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ed in the survey included Construction, Education, Manufacturing, Retail/Wholesale, and Service Bureau industries. Principal applications included Accounting/Billing, Order Processing/Inventory Control, Payroll/Personnel, and Sales Distribution. The major source of applications programs came from in-house personnel followed by packaged programs from the manufacturer. All the systems were located in a central processing installation as opposed to a distributed processing site.

The number of local workstation/terminals employed onsite averaged between 1 and 5. None of the users, however, employed remote workstation/terminals. Memory capacities averaged between 256KB to 512KB while total disk storage in use ran anywhere from 1 megabyte to as high as 80 megabytes. Five of the users employed a data base management system, and of those, 3 were manufacturer's packages and 2 were homegrown systems. None of the users had integrated word processing functions on their computers. The principal programming language used by all the respondents was Cobol. When asked if they expected to replace their systems in 1982, 6 users said no, and 1 said yes but with the same manufacturer. The seven Burroughs B 90 users rated their systems as shown in the table below.

	Excellent	Good	Fair	Poor	WA*
Ease of operation	3	3	0	1	3.1
Reliability of mainframe	6	1	0	0	3.8
Reliability of peripherals	3	2	1	0	3.3
Maintenance service:					
Responsiveness	4	2	1	0	3.4
Effectiveness	2	3	1	0	3.1
Technical support:					
Trouble-shooting	0	3	4	0	2.4
Education	0	2	5	0	2.2
Documentation	0	2	3	1	2.1
Manufacturer's software:					
Operating system	4	3	0	0	3.5
Compilers and assemblers	1	6	0	0	3.1
Applications programs	0	3	1	1	2.4
Ease of programming	4	2	1	0	3.4
Ease of conversion	3	1	1	0	3.4
Overall satisfaction	2	4	1	0	3.1

*Weighted Average on a scale of 4.0 for Excellent.

When asked to state the significant advantages of their systems, 5 users said the system was easy to expand/reconfigure, 4 users stated that programs/data carried over from other systems were compatible as the vendor promised, and 3 users said that the system is power/energy efficient and that they were happy with response times. On the negative side, two users each stated that the delivery of required software was late, that the vendor did not provide all the promised software or support, that vendor enhancements/changes to hardware/software were hard to keep up with, and that the installation of equipment was late. Two of the users polled did not mention any significant problems they may have had with their computers. Asked if their computers did what they expected them to do, 6 users said yes and 1 user said no. Furthermore, when asked if they would recommend the system to another user, 5 said yes, 1 said no, and 1 was undecided.□

areas for data being manipulated by the microprogram and the special-purpose Memory Address Register (MAR), Micro Memory Address Register (MMAR), 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 MAR 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.

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.

PHYSICAL SPECIFICATIONS: The processor unit, a single desk-size cabinet that houses the Super Mini-Disk II and the serial printer along with the processor, 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 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, thus reducing the footprint by 40 percent.

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 F., with a humidity tolerance ranging from 20 to 85 percent, noncondensing. Additional air conditioning above normal office levels is not required except in extreme operating environments. The processor and standard units integral with the processor dissipate about 4000 BTUs of heat per hour. Service area and general machine requirements indicate the need for a floor area with about a three-foot clearance around the system. Models to satisfy all international requirements are also available.

INPUT/OUTPUT CONTROL

I/O CHANNELS: Facilities for six I/O channels on the B 91, eight I/O channels on the B 92, and eight I/O channels on the B 93 and 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, B 93, and 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 controller 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.

SIMULTANEOUS OPERATIONS: Processing must cease during I/O command transfers and during transfers of data. During periods of "I/O overhead," such as paper skipping on the printer, simultaneous operations can occur.

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All parts of the system other than main memory are considered as peripherals, including the operator's console.

CONFIGURATION RULES

The B 91 may attach up to two disk controls with freestanding Burroughs SMD 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 83.2 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, 6 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.

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, 350, 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 93 has eight input/output channels expandable to eleven I/Os; 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 96 has eight input/output channels expandable to eleven I/Os. 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; flexible, removable or fixed disk storage media providing up to 231.6 million bytes of on-line storage, and seven input/output channels, including data communications.

WORKSTATIONS: A maximum of eight workstations can be configured on all B 90 models.

DISK STORAGE: See above.

MAGNETIC TAPE: See above.

PRINTERS: Up to 2 system printers can be configured.

MASS STORAGE

BURROUGHS SUPER MINI-DISK (BSM I & II) DRIVES: These floppy disk drives are available either built into the processor cabinet and/or as free-standing units. The BSM subsystem consists of a controller with 200-character buffers and either a dual BSM drive or one or two single BSM drives. The BSM has the capability of reading and recording on both sides of the floppy disk by means of two sets of read/write heads. The BSM I drive is capable of storing one million bytes per diskette (500,000 bytes per side). Each diskette contains 180 bytes per sector, 32 sectors per track, and 88 tracks per side. Track density is 64 tracks per inch, with a track-to-track access time of 20 milliseconds per single step and a settling time of 80 milliseconds. Average access time is 266 milliseconds, and the data transfer rate is 45K bytes per second.

The BSM II drive is capable of storing three million bytes per diskette (1,500,000 bytes per side). Each diskette contains 180 bytes per sector, 59 sectors per track, and 142 tracks per side. Track density is 150 tracks per inch, with a track to track access time of 38 milliseconds per single step including a settling time. Average access time is 157 milliseconds and the data transfer rate is 125K bytes per second. BSM I and II are manufactured by Burroughs.

B 9489-17 INDUSTRY-COMPATIBLE MINI-DISK (ICMD) DRIVE: These floppy disk drives are available only as free-standing units. The ICMD subsystem uses a controller similar to the one used in the BSM subsystem. A subsystem is composed of a controller and a single ICMD drive. Unlike the BSM drive, the ICMD drive reads only one side of the diskette. Each diskette stores 243K bytes of data with 128 bytes per sector, 26 sectors per track, and 77 tracks per diskette, including three alternates. Track-to-track access time is 20 milliseconds per single step, and settling time is 10 milliseconds. Average access time is 343 milliseconds, and the data transfer rate is 31K bytes per second. The ICMD is manufactured by Burroughs under license from CDC.

B 9480/B 9481 DUAL CARTRIDGE DISK SUBSYSTEM: Provides low-cost random-access data storage on removable single-platter cartridges. Two dual-drive models are available:

Model	Capacity, bytes	Avg. Access Time
9480-22	4.6 million	145 milliseconds
9481-12	9.2 million	100 milliseconds

Each drive accommodates one disk cartridge and has two read/write heads, one serving the top and one the bottom recording surface of the cartridge. The disk cartridge is 15 inches in diameter, 1.5 inches high, and weighs 5 pounds. The two drives are "stacked" so that the unit occupies less than five square feet of floor space. Data is recorded in 180-byte segments.

The 9480-22 has an average head positioning time of 125 milliseconds, an average rotational delay of 20 milliseconds, and a data transfer rate of 193K bytes per second. The 9481-12 has an average head positioning time of 60 milliseconds, an average rotational delay of 20 milliseconds, and a data transfer rate of 193K bytes per second. The controller for the dual cartridge subsystem is similar to the one used for the BSM. The controller contains two 200-character buffers. The B 9480/B 9481 subsystem is manufactured by Burroughs.

B 9493 FIXED-DISK DRIVES (FDD): Four models of fixed-disk drives are available for use with the B 90:

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Model	Capacity, bytes	Avg. Access Time
B 9493-9	9.4 million	55 milliseconds
B 9493-18	18.8 million	55 milliseconds
B 9493-37	37.6 million	55 milliseconds
B 9493-20	19.3 million	55 milliseconds
B 9493-80	77.2 million	55 milliseconds
B 9493-40	38.6 million	55 milliseconds

One I/O port is required for the controller of the -9, -18, -20, -80; two are required for the -28, -37, and a maximum of 154.4 megabytes of fixed disk can be configured in conjunction with one BSM I or II drive or one cartridge drive.

For backup a BSM II, BSM I, or a cartridge disk may be used. There are 180 bytes per sector, 64 sectors per track, 406 tracks per surface, and 4 surfaces utilized in the B 9493-18. Expanded capacities are accomplished by adding platters. (Each platter holds 9.4 million bytes.) The data transfer rate is 384K bytes per second. The drives are manufactured by Burroughs.

INPUT/OUTPUT UNITS

See Peripherals/Terminals table for units other than the system keyboard, and the MT 600 Series terminals which are described below.

KEYBOARD: The B 90 keyboard is used by the operator to enter data and control the system's functions. It consists of a typewriter-style keyboard (59 keys), 24 program select keys, a ready request key, and four keys for special functions such as changing the sign of data being entered. These special keys are coupled with the 13-key numeric keyboard. The keyboard is adapted from the one utilized in the Burroughs L series, TC 5100, and AE series.

BURROUGHS MT 600 SERIES TERMINALS: These units are stand-alone, microprocessor-based terminals designed for interactive and remote batch applications. The basic configuration consists of a 12-inch (diagonal measurement) CRT display, a processor (housed in the display cabinet) and a detached keyboard. The system's firmware and peripheral handlers, including diagnostic test routines, data communications procedures, and the program language interpreter, are stored in ROM. An electronically alterable read-only memory (EAROM) stores configuration data and system variables. A 16K-byte RAM (expandable in 4K-byte increments up to 96K bytes on Model MT 687 only) provides working storage, data communications buffers, and data storage.

Two configurations are currently available and are distinguished only by the processor provided:

MT 686—includes a Model FLD 1 Processor, which contains a 16K-byte RAM.

MT 687—includes a Model FLD 2 Processor, which contains a 16K-byte RAM expandable in 4K-byte increments to 96K bytes, plus an extension of the FDL program language interpreter to include computation functions add ((+), subtract (-), multiply (×), divide (÷), and signed value (+, -)).

One printer and one microdisk drive may be added to the basic system.

A 12-inch CRT display with a display capacity of 2240 characters arranged in 28 lines of 80 characters is standard. The first 26 lines are used to display data; the 27th line, message/commands; and the 28th line, status. A 96-character ASCII character set, including upper and lower case alphabetics, is standard. Highlighting features include high/normal intensity, underlining, and reverse video.

A 106-key typewriter-style expanded alphanumeric/function keyboard. The key arrangement is segmented into five sections: a 61-key main keygroup; a 13-key numeric keypad and a 12-key function cluster, which are both located to the right of the main keygroup; a row of 10 user-definable program function keys plus 6 control keys located above the main keygroup; and a row of 4 command keys, (Send, Receive, Command/Message, and Break/Clear) located above the numeric and function clusters.

Two matrix printers are available with the MT 600 Series: Model TP 313 Journal Printer and Model TP 323 Validating/Journal Printer. The TP 323 is capable of printing a customer receipt in addition to the journal. Each printer supports 90 cps bidirectional matrix printing over an 8.5-inch print line. All printer features are program-controlled and include complete data formatting capabilities, receive-message and formatted-print buffers, a 5-by-7 or 9-by-7 dot matrix, a ROM-stored 96-character ASCII character set, reverse image printing (background only), and an out-of-paper detector. Horizontal spacing is program-selectable at 6, 8, 12 or 16 characters per inch; vertical spacing is variable in 1/24-inch increments. A pin-feed platen accommodates continuous forms 9.5 inches wide and 5.5 or 11 inches (program-selectable) long. A document-present detector is featured on Model TP 323 only.

Two microdisk drives are available: Model TP 410, a single drive with 80K bytes of storage; and Model TP 420, a dual drive with 80K bytes of storage per drive, for a total of 160K bytes. Each drive contains its own microprocessor-based controller and power supply, and communicates with the BMT microprocessor subsystem via the serial SIO channel. Average access time for the 5.25-inch diskette is 463 milliseconds with a transfer rate of 15.6K bytes per second.

MT 600 Series software is designed to facilitate the gathering, processing, and distributing of information via either interaction between the host and the keyboard/display or remote batch key entry. Programs are written in Burroughs' Forms Definition Language (FDL), a high-level user-oriented applications programming language. The language is format-oriented and permits the user to design a form and define instructions for its usage. Maximum forms length is limited only by RAM capacity; forms exceeding 26 lines (screen capacity) can be viewed via up-and-down scrolling. Every form has a separate program, which controls data entry, input editing, forms processing, data storage, and communications with the host for that particular form. Programs can be stored on the host system and down line loaded, or stored on the terminal's microdisk system and recalled by the operator through keyed commands or automatically during processing of another form's program.

When program logic calls for interactive communications, program execution at the terminal is synchronized with execution of the appropriate host program and the data is entered, edited, processed, and stored interactively. When batch-mode programs are executed by the terminal alone, data is stored in microdisk for transmission to the host at a later time.

COMMUNICATIONS CONTROL

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 telephone facilities of

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either the switched or leased-line type. 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).

The TDI interface allows concatenation in normal or group poll environments under control of an appropriate multi-point line procedure. Among the protocols available are ACSYS Burroughs Basic Mode, and Point-to-Point Batch.

Speeds up to 38,400 bps are possible with the TDI. Data sets available include asynchronous and synchronous/bi-synchronous 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.

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

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

BDLC is based on High-Level Data Line Control Procedures (HDLC), the protocol standard developed by the International Standards Organization (ISO) and by the European Computer Manufacturers Association (ECMA), and Advanced Data Communications Control Procedures (ADCCP), the protocol standard developed by the American National Standards Institute (ANSI). It is Burroughs' intention to maintain BDLC compatible with the bit-oriented protocols of selected competitors (such as IBM's SDLC).

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

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

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

SOFTWARE

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

Designed as a comprehensive operating system, the MCP II provides support for operator communications, multiprogramming, virtual memory techniques, dynamic resource allocation, input/output control, and maintenance of a library of files. The system display (or, alternatively, the console printer) 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.

I/O control is fairly conventional, with the MCP handling physical I/O and the programmer taking 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.

The MCP is an integral part of the B 90 Computer Management System (CMS), whereas the alternative Accounting Computer System (ACSYS) has its own built-in monitor.

CMS consists of the MCP, high-level language compilers, utility routines, related CMS Products, and the Business Management system (BMS) application programs.

ACSYS is a software/firmware package that permits the use of existing Burroughs Series L/TC cassette programs on B 91/B 92 systems using disk and cassettes without change to the program products. ACSYS consists of system software and utilities as currently used on the TC 5100 and Series L plus cassette emulation firmware and the BMS applications. The system software enables the use of up to two magnetic tape cassette stations, up to four data communications channels utilizing the same procedures as currently released with the TC 5100, a 256-character Self-Scan system display, and a 160-, 250-, or 350-lpm line printer.

Cassette emulation firmware allows execution of Series L/TC cassette programs on either BSM, BSM II, or cartridge disk drives. Emulation characteristics include sequential

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accessing of disk, addressing of up to two dual disk drives (either BSM or cartridge disk), assigning from 1 to 4 cassette files per disk, and compatibility of disks initialized and used in an ACSYS environment with disks employed in a CMS environment. Minimum memory requirement for ACSYS is 12K bytes. This requirement may grow, depending on the configuration, optional resident utilities, and data communications procedures.

When emulating a two-cassette system on disk, one cassette is assigned to each disk, and the B 90 is operationally identical to the all-cassette system. For emulation of a system with three cassette units, the additional drive may employ the cassette drive on the B 90, or up to four cassette files may be assigned to each disk.

The complete list of BMS applications that run under ACSYS is given in the price list.

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.

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. The Cobol Interpreter, required at execution time, occupies about 8K bytes of memory in addition to the object program's requirements. 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. The RPG Interpreter occupies about 8K bytes of memory at execution time in addition to the object program's requirements.

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. These programs are executed when required by the NDL Interpreter. 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 his custom Network Controller in the NDL syntax, the source statements are processed by the NDL Compiler and converted into the necessary object code and tables. 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 language for generating installation-tailored Message Control Programs. The Message Control Program 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 program 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.

WORD MANAGEMENT SYSTEM (WMS): Burroughs WMS software program 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 TD 830 or MT983 display 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.

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.
- The *Tape Library Utility* performs four functions. Both the Add and Load functions write files from cassette tape to disk. Load also eliminates identically named files. Unload and Dump write files from disk to cassette tape. Unload also removes the file from the disk directory.
- *Interrogate Disk Directory* determines whether or not a file or a group of files is present on tape or disk.
- *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.
- *Analyze Disk Space Assignment* produces a printed analysis of disk space utilization.
- *Remove Disk Files* deletes specified file names from the disk directory.
- *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.
- *File Squash* removes all deleted records from a data file on disk.
- *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.

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RELATED CMS PRODUCTS: Included in this group are CMS Reporter, CMS Domain, CMS Cande, CMS ARCS (Automatic Run Control System), CMS RPG-Edit, and CMS ODESY, and IBM System/32 to Burroughs CMS.

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

The reports to be reproduced are described in a concise, English-like language, called REPORTER, that is largely self-documenting. Numerous default features make it unnecessary to specify each option. The user specifies each data element by name only, and is not required to know its size or format. In similar fashion, the user need only specify the column headings, and the system will automatically handle all other aspects of formatting the output. A security system denies access to sensitive data items by unauthorized users. Through an interface module, the reports can be generated from and viewed at remote workstations.

CMS DOMAIN: Provides an interactive method of specification and development of file maintenance and inquiry programs via 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 the 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 can support a maximum of 16 terminals and makes optimum use of the operator console and TD 83X CRTs. CANDE also provides a recovery system.

CMS AUTOMATIC RUN CONTROL SYSTEM (CMS ARCS): A utility that enables the automatic execution of sequences of commands and programs. CMS ARCS, according to Burroughs, is particularly valuable when 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): A sophisticated data entry and validation system using multiple on-line visual display units. It provides a generalized and generative "front end" for the existing application packages. It enables future packages to be designed to use its extensive editing facilities and thus reduce development effort by virtually eliminating conventional input control programs. Because of these editing facilities, ODESY is able to produce batches of essentially error-free data for input to application programs.

IBM SYSTEM/32 TO BURROUGHS CMS: This product is designed to convert IBM RPG source and sequential EBCDIC data files to standard CMS formats.

BURROUGHS DATA BASE BRIDGING SYSTEM: Provides a method of converting files utilized on the Burroughs L Series and other manufacturers' systems into a proper format for B 90 disk storage. The system is a series of programs that use magnetic tape cassettes as the medium for data transfer.

APPLICATION SOFTWARE: Packages currently available for the B 90 are all listed in the price list. Most are described in the following paragraphs.

Commercial Business Management System II (CBMS II) is aimed at a wide range of businesses including industrial distributors, electrical and electronic distributors, hardware distributors, appliance distributors, paper merchants and office suppliers, paint and chemical distributors, and plumbing, heating, and air conditioning distributors. CBMS II is composed of seven modules, written in Cobol and each available separately or as a complete package.

The accounts receivable (A/R) module, which can be interfaced with the invoicing and general ledger modules, can be run as either an open item or balance forward system. Reports in the module include trial balance, age analysis, periodic activity, customer account status, and sales and profit analysis.

The invoicing module is designed as a post billing system and can be interfaced with the accounts receivable and inventory modules. Invoicing provides reports on product sales analysis and sales analysis by customer and sales representative. Both of these reporting areas cover cost of sales to date, sales to date, and gross profit and percentage of profit. A choice of fixed or user-specified invoice formats is available. The module provides a costed invoice with many features including flexible pricing with up to five prices per billing item.

The inventory control module can be interfaced into the invoicing module to provide inventory stock updating. Reports are produced on current inventory status; stock valuation at average and replacement cost; stock take worksheet (for physical inventory); buyer's guide listing quantity on hand, available, reserved, on order, and shipped to date, as well as unit cost; and current inventory for up to six locations. The function of all these reports is to enable a user to establish and maintain optimum stock levels versus return on investment.

The inventory management analysis module presents comprehensive management reports on comparative return on investment, turnover on current stock, potential excess stock, ranked sales analysis by product, and buyers' guide, based on previous year's information and other statistics.

The payroll module allows exceptions to standards payroll items via operator entry. Complete accounting from time card to general ledger is performed with one handling of the input data. Reports available include cost center analysis, employee status, and deduction registers as well as the traditional payroll reports.

The accounts payable (A/P) module produces purchase journal, cash disbursements journal, periodic liability forecast, cash requirements, transaction inquiry, and others. The reports are designed to enable the controller of a business to effectively manage liabilities, cash disbursements, and the associated general ledger distribution. A/P can interface with general ledger.

The general ledger module is designed to provide a comprehensive control and reporting system. The ability of this module to interface with other CBMS II modules provides a good avenue for transaction information. More than 10 major report types are produced, including master file trial

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balance, balance sheet and income statement trial balance, current period activity, variable and floating budget reports, comparison reports, and chart of accounts.

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 modules for general accounting based on CBMS II, adapted 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, and provide full or exception stock status reports to manage inventory, plus recording of 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 all of the features of the payroll module in CBMS II, plus additional capabilities to meet the needs of the manufacturer, such as daily time card input, shift differential pay, multiple union handling, SUB benefit, and COLA pay capabilities.

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 the normal accounting and record-keeping functions required for federal and state-chartered credit unions. Sixteen different types of transactions can be keyboard-entered. These include open-end loans, bill payments, and share drafts as well as the normal 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. These automatic transactions eliminate much repetitious preparation of transactions. Up to 99 loan types, with 99 loans per member and 99 club accounts per member, can be handled.

The system also allows for 120 different variable or fixed bill payment transactions. It can be used on any B 90 configuration with dual BSM, disk cartridge, or fixed disk units.

An on-line inquiry and file maintenance module will allow multiple/remote access to the members' data. This module is completely compatible with the Credit Union Management System and will be available in the fourth quarter of 1978.

An on-line transaction posting inquiry module will allow multiple/remote access to the data for real-time account updating. This module is also completely compatible with all existing modules.

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 the authorized expenditures. The revenue processing module maintains an updated history of budgeted source revenue. BAS maintains complete audit trails and descriptions of each general fund transaction. The system maintains 22 separate disk files. BAS is written in Cobol.

Hospital BMS—Burroughs Hospital Administration System II (BHAS II) is designed as a four-module system. The A/P, payroll, and general ledger modules are adopted to meet hospital requirements from the generalized BMS modules of the same name which were previously described. 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.

Scholastic II is a series of administration applications for schools. Each of the modules can operate as a free-standing unit or function within a total administrative system with a data interface to the student record module. The following modules are available:

The student records module provides its users with the capability to obtain information pertaining to district, school, and student enrollments, together with schedule and grade reporting data.

The student scheduler module performs the automatic assignment of students to sections of courses in a user-created or system-generated school master schedule. File maintenance capabilities make complete reruns unnecessary and include the ability to add new courses and sections at any time; to change the seating capacities and meeting times of existing sections; to change any one of the student's courses and sections; to replace an individual student's schedule with a new one; to make mass changes based on specific grade, sex, or course request; and/or to reschedule only students who have been changed by file maintenance or who have conflicts.

The attendance accounting module is designed to provide timely information pertaining to public attendance across all or any part of a school district. The system provides for the following: attendance accounting calendar over any portion of the school year; attendance unit as period, half-day, or whole day; user-defined attendance exception definition; attendance data collection and posting on a detail or summary basis; daily exceptions control report; detail classroom-level attendance ledgers; monthly or other period teacher, school, and district attendance summaries; monthly entry, re-entry, and withdrawal reports; irregular attendance pattern analysis; cumulative student attendance report with optional summaries by school and district; and capability for integration of summary data into the CMS SCHOLASTIC II Student Records data base and reports.

The Scholastic modules, in conjunction with the Budgetary Accounting System and the government/scholastic payroll module (see B 90 Government Information System), provide the education user with a total administrative processing system. All modules are written in Cobol.

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.

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The budgeting 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 orders encumbering 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/scholastic payroll module, provides an automatic interface to payroll. The interface also provides a statistical report which analyzes pay by grade.

The government/scholastic payroll 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 is designed to meet 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).

Other government systems are planned and scheduled to be announced shortly.

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 the necessary 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 an automatic by-product of the S1000 proof system. Reports are generated for complete audit control and cash letters besides providing the interface to the other applicational 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, using 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 five percent.

The standard equipment lease agreement includes equipment maintenance and permits use of the equipment during one 8-hour period per day. 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 a price of $110 per day. Installation support varies from one day, for some applications modules, up to 11 days for the Bank BMS complete system. Hardware installation support for purchased systems is billable at $225 per day. Two days are usually the maximum requirement.

Application software prices quoted in the price list are for either a single initial license payment with an annual license fee, or for a monthly license fee.

Customer education for application programs is charged at the rate of $225 per day. Some modules require one day, while complete systems may require up to 17 days. Courses on the hardware and software, and other courses on subjects from Introduction to Programming (5 days) to CMS Cobol (10 days). Training is recommended by Burroughs.

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

EQUIPMENT: The following typical system prices include all required control units and adapters. The lease prices include equipment maintenance.

MINIMUM B 91 SYSTEM: Includes two megahertz CPU with capabilities for CMS/ACSYS, 128K bytes of memory, six megabyte SMD II (inbuilt), and operator display station. Purchase price is $16,980 with a yearly maintenance charge of $1,707. On a one year lease the system costs $665 per month.

MINIMUM B 93 SYSTEM: Includes a two megahertz CPU, 256K bytes of memory, eight I/O channels, a 6 megabyte inbuilt Burroughs Super Mini-Disk II, 18.8MB of fixed disk, 230 cps printer, and a CRT. The purchase price is $33,928. All systems include system software.

MINIMUM B 96 SYSTEM: Includes a four megahertz CPU, 512KB of main memory, seven input/output channels, four data communications channels, and a built-in 80MB fixed disk. In a typical configuration, the B 96 is priced at approximately $38,000.

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EQUIPMENT PRICES

		Purchase Price	Annual Maint.	Rental (1-year lease)	Rental (3-5 year lease)
PACKAGED SYSTEMS					
B91-CSY	B91C 2 megahertz System; CMS/ACSYS; includes 2MHz CPU, 90 cps matrix printer; 128KB memory; operator display is excluded	$ 8,350	—	$ 369	$ 332
B91-CSY	2 megahertz System; CMS/ACSYS; includes 2MHz CPU, 90 cps matrix printer; 128KB memory, eight I/O ports; operator display is excluded	9,870	—	388	349
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-CSY	B92C 2MHz System; CMS/ACSYS; includes 120 cps matrix printer (single pinfeed), out-of-paper detect, and 128KB memory; operator display station is excluded	14,700	—	466	418
B92-CDS	B92-CDS System includes 2MHz CPU, 120 cps console printer, 128KB memory, operator display system (ODS), ODS control, 1/4.6/18.8/37MB fixed disk or 40/80MB fixed disk, printer controller, data comm power pak, and TDI kit	14,115	—	744	708
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
B96-80	B96-80 System includes 4MHz CPU, 80MB fixed disk, two 256KB boards, data comm power pak, TDI kit, printer control, tape control, tape streamer, and 80MB fixed disk controller	38,615	—	1,971	1,642
B96-81	B96-81 System includes 4MHz CPU, 80MB fixed disk, two 256KB boards, data comm power pak, TDI kit, printer control, tape control, tape streamer, BSMD Inbuilt, BSMD control, and 80MB fixed controller	40,615	—	2,215	1,846
B91C I/O EXPANSION KITS					
H9108-1	I/O Expansion Kit for 128KB system	3,151	264	95	90
H9108-2	I/O Expansion Kit for 192KB or 256KB system	4,200	264	126	120
MEMORY OPTIONS					
BD4128	2MHz, 128KB (all CMS B90s)	1,575	73	128	115
BD4022-64	2MHz, 64KB, B91/92, 64KB board system	1,418	79	60	66
B4256-4	256KB board system (B96)	1,750	—	84	80
B4512-4	512KB board system (B96)	3,500	—	168	160
INBUILT MINIDISK OPTIONS					
B9489-1	1.0MB Inbuilt BSMD (B91, B92 only)	956	—	41	35
B9489-21	3/6MB BSMD II Inbuilt (B91, B92, B93)	3,150	—	196	176
CONSOLE/CPU OPTIONS FOR B91/B91C/B92C					
N4305	B92/B93 I/O Channel Expander, 8 to 11 I/O	541	63	20	18
BD7760	B92 second pinfeed option (includes out-of-paper detect)	839	—	32	29
CONSOLE/SPO OPTIONS					
B9356-01	Operator Display (B91/B92)	2,100	NC	117	105
H9356	ODS Control (B91)	NC	NC	—	—
N9356	ODS Control (B92)	NC	NC	—	—
B9356-98	Non-CRT Cover (B91/B92)	NC	NC	—	—
DATA COMMUNICATIONS					
H2356-25	Data Comm Power Pak (B91)	850	63	31	28
N2356-25	Data Comm Power Pak (B92/B93/B96)	893	63	33	30
H2356-1	1200 bps asynch (B91)	651	63	25	23
N2356-1	1200 bps asynch (B92)	651	63	25	23
H2356-2	1800 bps asynch (B91)	940	63	35	32
N2356-2	1800 bps asynch (B92)	940	63	35	32
H2356-6	TDI Connect (B91)	649	63	25	23
N2356-6	TDI Connect (B92)	649	63	25	23
H2356-18	CMS synch/bisynch (B91)	1,082	63	40	36
N2356-18	CMS synch/bisynch (B92)	1,082	63	40	36
H2358	Data Comm Harness	109	NC	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

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EQUIPMENT PRICES

		Purchase Price	Annual Maint.	Rental (1-year lease)	Rental (3-5 year lease)
DATA COMMUNICATIONS (Continued)					
MP2004-2	25 ft. ACU Interface	147	—	6	5
MP2004	50 ft. ACU Interface	211	—	8	7
N2357	Time of Day Clock (B91/B93)	940	62	35	32
H2357	Time of Day Clock (B91)	895	62	33	30
MASS STORAGE					
H9500	Control for ICMD (B91)	1,565	73	58	53
N9500	Control for ICMD (B92/B93)	1,565	73	58	53
B9489-1	1.0MB Super Mini-Disk Drive	956	34.80	43	36
B9489-11	1.0MB Super Mini Disk Single Drive	2,626	—	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
B9480-22	4.6MB 145 ms Cartridge Disk Drive	4,000	113	206	182
B9481-12	9.2MB 100 ms Cartridge Disk Drive	7,500	164	415	367
B9493-18	18.8MB fixed drive	5,775	90.20	307	271
B9493-37	37.6MB fixed drive	8,925	110	536	498
B9493-40	38.7MB fixed drive	13,600	95.30	588	520
H9300	B91 Control for 1MB; 9.4/18.8MB and cartridge	1,040	73	39	35
H9400	B91 Control for 3/6MB, 40/80MB	1,040	73	39	35
N9300	B92/B93 Control for 1MB; 9.4/18.8MB, cartridge	1,040	73	39	35
N9400	B92/B93 Control for 3/6MB, 40/80MB (B92, B93, B96)	1,040	73	39	35
MAGNETIC TAPE UNITS					
N9497-5	Cassette Control (B92/B93/B96)	1,576	66	59	53
B9497-11	NRZI Freestanding Cassette Station; B92 and B93 only	1,607	13	71	61
B9497-15	PE Freestanding Cassette Station; B92 and B93 only	1,774	13	71	61
BD9800	Tape Streamer Control	1,295	—	43	40
PRINTERS					
N9250	N9250 Control (B96)	680	—	33	31
B9249-31	270/370 lpm, soft VFU, 64/68 character set	9,800	79.90	400	360
B9249-375	375 lpm, 64/68 character set	8,915	91.70	398	341
B9349-1	85 lpm printer	2,500	61.90	166	147
B9249-2	160 lpm printer	4,500	80.70	246	218
B9249-3	250 lpm printer	5,500	90.80	327	289
B9349-4	350 lpm printer	6,500	101	450	397
B9246-6	600 lpm band printer	14,701	182	551	475
B9251	230 cps, Matrix	3,487	33	123	109
H9200	B91 Control	1,029	66	38	35
N9200	B92/B93 Control	1,029	66	38	35
CARD/MMR READERS					
B9116	600 cpm reader (80-column)	11,372	93.30	442	391
B9119-1	300 cpm reader (96-column)	4,781	55.80	136	117
B9161-1	Magnetic Record Reader	3,235	54	172	154
TERMINALS					
MT985	12-inch Display Monitor and Processor	2,210	—	106	103
MT993	9-inch Display Monitor and Processor	1,807	—	117	113
TP110	Alpha Keyboard	289	—	14	13
TP119	Source Data Keyboard	289	—	14	13
TP130	Expanded Alphanumeric with 10 keypad	489	—	25	24

SOFTWARE PRICES

		Initial One-Time Charge	Annual License Fee	Monthly License Fee
CM90MCP	B90 MCP (required for CMS B90s)	2,500	275	77
AC90BCP	B90 ACSYS (required for ACSYS B90s)	2,000	—	61
CM90ACA	B90 ACSYS and MCP	3,500	—	110
B90INT	B90 Hardware/Software	450	—	—

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SOFTWARE PRICES

		Initial One-Time Charge	Annual License Fee	Monthly License Fee
	Installation Support			
CM90COB	CMS Cobol Compiler	—	—	28
CM90RPG	CMS RPG Compiler	—	—	28
CM90MPL	CMS MPL II Compiler	900	99	28
CM90NDL	CMS NDL Compiler	900	99	28
CM90UTL	B90 CMS Utilities	540	60	17
CM90TEI	ODESY/RPG EDIT	1,080	165	33
CM92DOM	CMS DOMAIN/System	1,885	84	87
CM92REP	CMS REPORTER	1,885	84	87
CM900GMB	GEMCOS (Basic)	700	31	33
CM900GMT	GEMCOS (TCL Compiler)	750	33	36
CM900GMF	GEMCOS (Formatting)	500	22	24
CM92GMC	CMS GEMCOS	2,495	110	115
CM92RPO	CMS On-Line REPORTER	2,710	120	125
CM92DC1	B92 Data Control System	585	—	28
CM92INQ	CMS Inquiry	810	37	38
B92AEU	Audit Entry Host Utilities	490	22	24
B90 CONVERSION AIDS				
CS92S19	B700 S17 Cobol to B92 CMS Cobol	585	—	—
CM90CON	IBM System/32 to B90 Conversion	600	27	28
B90 OFFICE AUTOMATION SYSTEMS				
B92WMS	Word Management System	3,050	122	128
B92OSR	OMS-Shared Resource	1,500	165	63
B92OEM	OMS-Electronic Mail	3,000	330	125
B92OPT	OMS-Productivity Tools	3,000	330	125
B92ODP	OMS-DP Interface	750	83	32