Burroughs L 8000 Series

MANAGEMENT SUMMARY

The L 8000 Series computers, introduced in October 1972, are the latest and most powerful members of Burroughs' large and highly successful L Series family of small accounting computers.

The first L Series models were introduced in 1968 as non-communications versions of the keyboard-oriented TC 500 Terminal Computer. Since then, Burroughs has installed more than 25,000 of the L Series computers, and they are serving effectively in a broad range of industries and applications. (The characteristics of the earlier L Series models—and most of the competitive systems—are summarized in Feature Report 70F-420-01.)

In contrast to the disk memories used in all the earlier L and TC Series computers, the L 8000 Series processors utilize MOS memory and logic circuitry to achieve greatly increased internal speed—yet complete upward compatibility of programs, data, and operating procedures has been maintained with the earlier models. This compatibility yields two major benefits:

- Current L Series users can easily upgrade to a more powerful system while preserving their investment in software.

- New users can benefit from the availability of a large library of field-proven application programs, which ▷

> These keyboard-oriented accounting computers employ MOS memory and substantially extend the performance range of Burroughs' popular L Series family, while maintaining full compatibility with the earlier models. A wide array of forms-handling facilities and input/output equipment is available.

CHARACTERISTICS

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

MODELS: L 8200, L 8300, and L 8400 Accounting Computers and L 8500 Magnetic Record Computers. Model distinctions are clarified by the accompanying table.

DATA FORMATS

BASIC UNIT: 64-bit word. Each word in memory can hold 15 decimal digits plus sign, 8 alphanumeric characters, or up to 4 instructions. (Note: Memory capacities are usually expressed in 8-bit bytes, with eight bytes equaling one 64-bit word.)

FIXED-POINT OPERANDS: One word, consisting of 15 decimal digits plus sign or 8 alphanumeric characters.

FLOATING-POINT OPERANDS: No provisions for floating-point arithmetic are offered.

INSTRUCTIONS: Basic instruction format is 4 digits in length. However, systems with more than 8K bytes (1024 ▶
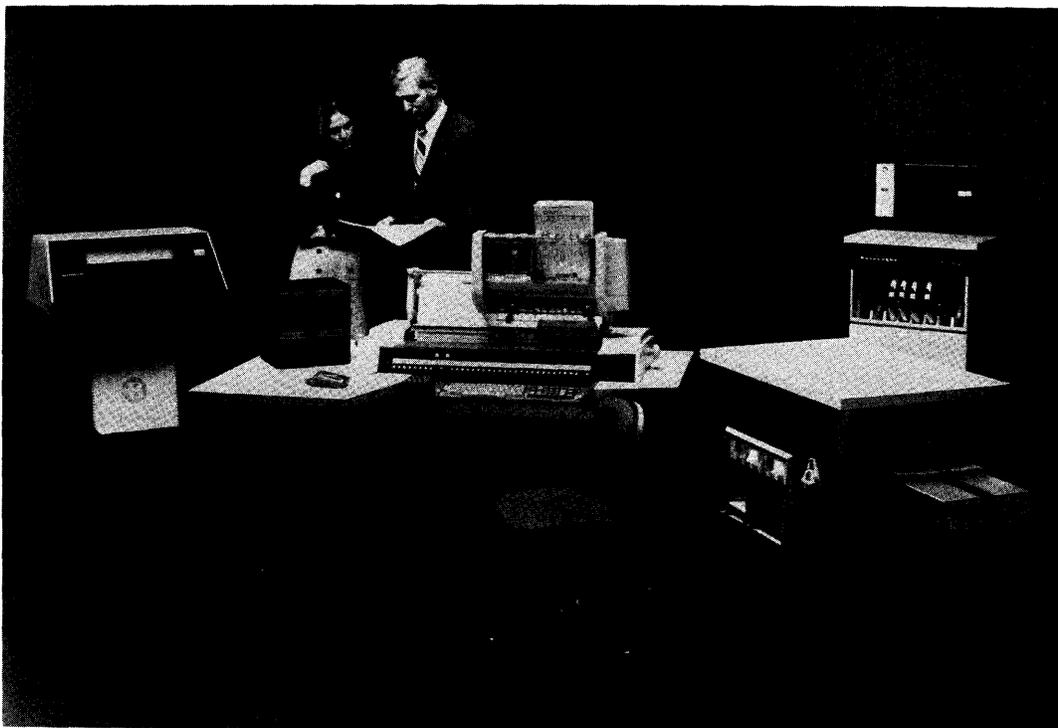
An expanded configuration of the L 8500 Magnetic Record Computer is shown here. From left to right are a line printer, 4-drive Cassette Tape Subsystem (on console shelf), console with optional Magnetic Record Handler, free-standing Magnetic Record Reader, and 9-track magnetic tape unit.

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Burroughs develops and supports at the corporate, district, and branch office levels.

The basic L 8000 Series system consists of a single compact console that houses the processor logic, MOS memory, 20-cps ball printer, basic forms handler, alphanumeric and numeric keyboards, and operating keys and indicators. The basic system is offered in 12 models, whose distinguishing characteristics are summarized in the table.

Purchase prices of the basic L 8200, L 8300, and L 8400 Accounting Computers range from $12,990 to $15,690, and their monthly rental prices (for 1-year leases) range from $394 to $476; customer deliveries of these models are scheduled to begin late in the first quarter of 1973. Purchase prices of the basic L 8500 Magnetic Record Computers range from $20,990 to $23,990, with monthly rental prices ranging from $637 to $727; first deliveries of these models are scheduled for the third quarter of 1973. The prices quoted here can escalate substantially when expanded memory capacity, auxiliary input/output units, and optional forms-handling facilities are added to the basic systems.

The 1.5-microsecond MOS memory used in the L 8000 Series computers gives them a 30-to-1 internal speed advantage over the earlier L Series computers. Even so, the instruction execution speeds of the L 8000 processors fall far below those of the computers in the Burroughs B 1700 and IBM System/3 class; a decimal add instruction, for example, takes 1.8 milliseconds. Also, prospective users should carefully note that the impressive 30-to-1 internal speed ratio between the L 8000 processors and the earlier L Series models will, in most applications, translate into a far more modest increase in overall throughput. The reason is that most L Series applications are limited by the keying speed of the human operator and/or by the speed of one or more peripheral devices rather than by the speed of the central processor.

The L 8000 Series computers, like the provocative Burroughs B 1700 systems, are controlled by "variable micrologic", an advanced form of microprogramming. Object programs produced by the COBOL compiler and the Assembler are expressed in an "S-level" code, which is the system's machine language from the user's point of view. The S-level language is the same as the machine language of the earlier Series L and TC computers, with extensions to permit use of the new peripheral devices and extended memory addressing capabilities of the L 8000 Series. The S-level instructions are decoded and executed by means of standard microprograms, which are stored in 8K to 16K bytes of MOS memory, depending upon the system configuration. Changes in the microprograms could effectively alter the structure and/or instruction repertoire of the L 8000 Series processors—but Burroughs is actively discouraging the idea of any user access to the microprograms.

words) of user memory use an expanded 6-digit format for instructions that reference memory.

INTERNAL CODE: ASCII.

MAIN STORAGE

STORAGE TYPE: MOS (metal-oxide semiconductor).

CAPACITY: 4096 to 49,152 bytes of user memory, in 2048-byte increments; plus 8192 to 16,384 bytes of micro program memory (MPM). The basic processor and console require 8192 bytes of MPM, and additional MPM is automatically furnished with each additional peripheral device. Minimum user memory capacity is 6K bytes for the L 8500 Magnetic Record Computers and 4K bytes for all other models. The A 2011 or A 2012 Extended Memory Potential feature is required for total user memory capacities in excess of 16K or 40K bytes, respectively.

CYCLE TIME: 1.5 microseconds. (Memory access times, however, will average 3 microseconds – the same as the central processor's machine cycle time.)

CHECKING: Parity check on each byte.

CENTRAL PROCESSOR

Note: The following entries refer to the "S-level" machine, which provides program compatibility with the earlier Burroughs L and TC Series computers. The S-level machine is, in fact, a "soft" processor whose functions are implemented through standard microprograms.

INDEXING: Four index registers are provided. Indexing is specified by a "Modify" instruction which immediately precedes the instruction to be modified.

INDIRECT ADDRESSING: None.

INSTRUCTION REPERTOIRE: Approximately 250 instructions are defined, including add, subtract, multiply, divide, transfer, clear, shift, branch, skip, set flags, test flags, increment index registers, and a wide variety of I/O and control operations for the various peripheral devices. Arithmetic instructions are of the one-address, "add-to-accumulator" type, in which the result replaces the previous contents of the accumulator. All arithmetic is performed in fixed-point decimal mode upon one-word operands consisting of up to 15 digits plus sign. A Print Format instruction uses format masks to provide convenient editing of numeric fields.

INSTRUCTION TIMES: Representative execution times, in milliseconds, are listed below.

Add:	1.8 milliseconds
Multiply:	50.0 milliseconds (for two 6-digit fields)
Transfer (Move):	1.0 millisecond

INPUT/OUTPUT CONTROL

CONFIGURATION: The number of peripheral devices and/or memory modules that can be used in an L 8000 Series system is limited by the capacity of the processor backplane, which can house a maximum of 100 circuit cards. There is room for 10 rows of 10 cards each. The basic processor logic and the first 16K bytes of user ▶

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DISTINGUISHING CHARACTERISTICS OF THE L 8000 SERIES PROCESSORS

Processor Model	L 8200-100 or L 8200-200*	L 8300-100 or L 8300-200*	L 8400-100 or L 8400-200*	L 8541-100 or L 8541-200*	L 8541-104 or L 8541-204*	L 8542-100 or L 8542-200*
Width of forms handler, inches	15.5	15.5	26	26	26	26
Number of print positions	150	150	255	255	255	255
Type of forms feed	Rear	Front	Front	Front	Front	Front
Type of platen	Split	Split	Split	Split	Split	Split
Magnetic Memory Record facilities	None	None	None	Standard	Standard	Standard
Maximum capacity of each magnetic-stripe document, digits	–	–	–	352	352	704
Basic user memory capacity, bytes	4,096	4,096	4,096	6,144	6,144	6,144
Max. user memory capacity, bytes	49,152	49,152	49,152	49,152	49,152	49,152

* Processors with the suffix -200 or -204 include one Cassette Tape Station as standard equipment.

▷ In addition to the 8K to 16K bytes of microprogram memory, L 8000 Series computers contain from 4K to 48K bytes of MOS user memory, in 2K-byte increments, which holds the user's programs and data. (Minimum user memory capacity of the L 8500 Magnetic Record Computers is 6K bytes.) The 48K upper limit represents an unusually large memory capacity for systems in this class.

For users who may be ill at ease about the integrity of data stored in MOS memory, Burroughs furnishes two novel safeguards as standard features. A Standby Power facility provides a "trickle current" from the main power source to both the microprogram and user memories, permitting normal shutdowns of the system without any loss of data. A battery-operated Data Save System provides an automatic dump of the entire contents of memory to a dedicated magnetic tape cartridge whenever a power failure or major power fluctuation occurs.

Designed primarily for applications that involve visible records and keyboard entry of transaction data, the L 8000 Series computers feature "human-engineered" controls and flexible forms-handling facilities that can accommodate a wide variety of continuous and cut forms, either singly or in various combinations. In addition, the L 8500 Magnetic Record Computers can read and write up to 704 digits of data on magnetic-stripe documents, which can be fed and stacked automatically by novel console attachments.

In addition to the flexible console facilities, Burroughs offers a wide array of free-standing input/output units that can significantly enhance the performance capabilities of the L 8000 Series computers. These include a cassette tape subsystem, a 9-track magnetic tape unit, a paper tape reader and punch, an 80-column card reader, three I/O units for 96-column cards, two line printers, and two magnetic record readers. Burroughs expects most L 8000 users who install punched card equipment ▷

▶ memory require 5 rows of cards, leaving the other 5 rows available for additional memory and/or peripheral control logic. Row requirements for the various peripheral controllers and extended memory options are as follows:

A 2331	96-Column Card I/O	1 row
A 2322	Paper Tape I/O and/or 80-column Card Reader	1 row
A 2391	Cassette Tape Subsystem	1 row
A 2392*	9-Track Magnetic Tape Unit	1 row
A 2361*	Line Printer	1 row
A 2011*	Extended Memory Potential (24K)	2 rows
A 2012	Extended Memory Potential (32K)	2 rows
–	Magnetic Memory Record facilities	2 rows

*Either the A 2392 or the A 2361 can be combined with the A 2011 and the combination will require only 2 rows rather than 3.

Peripheral subsystems, additional memory, and/or the Magnetic Memory Record facilities can be added so long as their total row requirements do not exceed 5 rows.

SIMULTANEOUS OPERATIONS: In general, only one I/O data transfer operation at a time can be performed, and internal processing is suspended while the processor is transferring data to or from any peripheral device. However, the keyboard, the console printer, and each of the five peripheral controllers contain a 32-character buffer that provides a degree of overlapping of peripheral functions with internal processing. Additional buffering capabilities are included in the line printers and 96-column card I/O units.

MASS STORAGE

No magnetic disc unit nor any other type of random-access mass storage device has been announced for the L 8000 Series computers to date. ▶

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▷ to choose the new, compact 96-column card, but an 80-column card reader is offered for compatibility with existing systems.

The magnetic tape cassette drives are expected to be the most popular auxiliary I/O units among L 8000 Series buyers, and 6 of the 12 processor models include one drive as standard equipment. Burroughs tested 50 commercially available cassette drives and failed to find one that could meet its exacting requirements. As a result, Burroughs is manufacturing its own drives, using a variable-speed servo motor on each reel to eliminate the need for pinch rollers. The cassette drives can be used for external storage of both data and programs. They are also used to implement the Dynamic Memory Overlay feature, which permits COBOL-coded programs larger than the capacity of user memory to be executed without operator intervention. The programs are divided into logical segments by the compiler, and the individual segments are transferred from tape to user memory as required.

Any L 8000 Series computer can be equipped with a single or dual data communications interface; when so equipped, it becomes a TC 3500 Series Terminal Computer. Data can be transmitted in either asynchronous or synchronous mode, at speeds ranging from 75 to 9600 bits per second. The TC 3500 can communicate with any other Burroughs computer or terminal, as well as with BSC-mode devices from other vendors, enabling it to serve effectively in a wide range of communications functions.

COBOL is the principal programming language for the L 8000 Series computers. Although the L 8000 COBOL language is a limited, non-compatible subset of the American National Standard COBOL language, its use will nonetheless simplify future conversions to larger computer systems. Moreover, learning to use the language will be a breeze for experienced COBOL programmers and should not be unduly difficult for neophytes. Unfortunately, COBOL programs cannot be compiled on the L 8000 Series computers themselves; a medium-scale Burroughs B 3500, B 3700, or B 4700 computer, usually located at a Burroughs data center, is required for the compilation process. Burroughs is also preparing an Assembler, which will allow users to code their programs in a symbolic machine-oriented language and assemble them on virtually any L 8000 Series computer.

Most L 8000 Series buyers will count on Burroughs to provide some or all of the programs they need, and the firm is well equipped to respond to this demand. The large library of existing application programs for the L Series computers gives the new models "instant maturity." Moreover, most of these programs are written in COBOL, making it comparatively easy to modify the standard programs to satisfy the requirements of individual users. Burroughs offers technical assistance either ▷

▶ INPUT/OUTPUT UNITS

CONSOLE: This basic unit, available in 12 different models, is the central component of every L 8000 Series computer system. It houses the system's processing logic, memory, keyboard, basic printer and forms handler, control keys and indicators, and basic program loader (a small paper tape reader). In some models, the console also contains Magnetic Memory Record facilities and/or a single cassette tape drive.

The console is 53 or 59 inches wide (for 15.5-inch or 26-inch forms handlers, respectively), 41 inches deep, and 30 inches high. Its weight ranges from 500 to 600 pounds depending upon the model.

The standard keyboard and control facilities consist of an alphanumeric typewriter keyboard, a 10-key numeric keyboard, 4 control keys (on both the typewriter and 10-key keyboards), 16 or 24 program selection keys, and 29 indicator lights. A 32-character keyboard buffer permits data entry to be largely overlapped with internal processing. The basic program loader reads 8-channel paper tape from self-threading cartridges at a speed of 15.5 characters/second; designed solely for program loading, the unit cannot be used for input of transaction data.

The integrated printer uses an interchangeable ball-shaped printing element that prints data in character-at-a-time fashion at a rated speed of 20 characters/second. Horizontal positioning operations are performed at an average speed of 20 inches/second. The element contains 64 ASCII characters in either a commercial or data communications set. The print line has a maximum of 150 character positions in the L 8200 and L 8300 models, and 255 positions in all other models. A "print in place" (PIP) capability permits numeric punctuation marks (decimal points or commas) to be inserted without using additional character positions. Print spacing is 10 characters/inch horizontally and 6 lines/inch vertically. A 32-character print buffer permits printing and printer positioning to be largely overlapped with internal processing.

The basic forms handler accommodates a wide variety of individual or continuous forms. Maximum width is 15.5 inches in the L 8200 and L 8300 models, and 26 inches in all other models. Forms can be inserted from the front in all models except the L 8200, which has a rear-feed forms handler. A split platen is standard in all models except the L 8541-104 and L 8541-204, which have a solid platen. Vertical spacing is controlled by the program and proceeds at a speed of 20 lines/second. A thickness sensor provides automatic printer adjustment for varying forms thicknesses.

Burroughs offers a variety of optional Continuous Forms Pin-Feed Devices for improved feeding of marginally-punched continuous forms. Both single-form and dual-form models are available, each in a width of either 15.5 or 26 inches. Vertical spacing is controlled entirely by the stored program; no forms-control tape is used. The dual-form models provide simultaneous or independent spacing of the two continuous forms. Front-fed forms can be inserted in front of one or both of the continuous forms. The pin-feed devices can accommodate forms up to 0.035 inch in thickness (approximately 15 parts).

MAGNETIC MEMORY RECORD (MMR) FACILITIES: These facilities, standard in all the L 8500 Series computers, permit data to be read from and recorded upon ledger cards and other documents containing magnetic stripes. The L 8541 models have a single-track MMR facility and can record a maximum of 352 digits on each docu- ▶

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on a per-diem basis or under fixed-price turnkey contracts.

The L 8000 Series computers represent a direct Burroughs response to the NCR 399 Accounting Computer, an impressive minicomputer-based system that was unveiled in March 1972 by Burroughs' perennial arch-rival in the small accounting computer market. Whether by accident or by design, the two competitive product lines are closely comparable in performance and pricing, and both currently rank among the "best buys" in their segment of the computer market. Prospective buyers comparing the Burroughs and NCR systems are unlikely to discover any major differences in their overall capabilities. Instead, most buyers will probably base their decisions on factors such as the quantity and quality of local support, availability of specific application programs, and compatibility with existing equipment. □

ment. The L 8542 models feature an expanded, dual-track MMR facility and can record a maximum of 704 digits on each document.

Each magnetic track holds 2 line-find digits, 1 block check digit, and up to 349 data digits, and can be divided into a maximum of 64 numeric and/or alphanumeric fields. Each alphanumeric character occupies two digit positions. Magnetic-stripe documents of widely varying sizes can be used, either individually or in combination with other continuous or cut forms. Alignment of the magnetic-stripe documents is automatic, using program control and/or data stored in the document.

A 9361 CONSOLE MAGNETIC RECORD HANDLER: This optional attachment receives magnetic-stripe documents ejected from the console and — under program control — either stacks them in sequence or holds them for subsequent reprocessing. The stacking hopper holds approximately 200 documents. The A 9361 accommodates all sizes of single-ply magnetic-stripe documents and includes a dual-form pin-feed device. Usable with any of the L 8500 Series Magnetic Record Computers, the attachment can easily be installed and removed by the operator.

A 9362 CONSOLE MAGNETIC RECORD HANDLER: This optional attachment has all the characteristics and capabilities of the A 9361, above. In addition, it provides for automatic feeding and insertion of a file of magnetic-stripe documents into the console. The documents are fed sequentially, under program control, from a feed hopper that holds approximately 200 documents.

A 9161 MAGNETIC RECORD READER: This free-standing peripheral device reads data stored on magnetic-stripe documents and transmits the data to the central processor for processing. The unit feeds and reads up to 45 documents/minute, from a feed table that holds up to 500 documents. Magnetic-stripe documents 11 inches in length and from 6 to 14.5 inches in width can be read. Model A 9161 reads up to 352 digits from a single magnetic track on each document.

A 9162 MAGNETIC RECORD READER: Has the same characteristics and capabilities as the A 9161, above, plus a dual-track reading capability that permits a total of up to 704 digits to be read from two tracks on each document.

A 9490 CASSETTE TAPE SUBSYSTEM: Permits the use of magnetic tape cassettes for data and/or program storage. Consists of an A 2391 Cassette Control and from one to four A 9490-25 Cassette Tape Stations. A read or write operation can be performed on any one station while cassettes are being rewound on any or all of the remaining stations.

Each Philips-style cassette holds 280 feet of Burroughs "computer certified" tape. Data is recorded in a dual-track format, using NRZI encoding at 800 bits/inch. One track is used for data and the other is used exclusively for clocking. Eight-bit ASCII characters are recorded in bit-serial form, yielding an effective density of 100 characters/inch. Records are of variable length, up to a maximum of 256 data characters, the inter-record gap is a nominal 1.3 inches in length.

The Cassette Tape Stations read or write at a speed of 10 inches/second (1000 characters/second), search tape at 30 inches/second, and rewind at 60 inches/second. Tape can be searched to a file mark in either the forward or reverse direction. The tape is driven by a spindle-controlled, multi-speed reel drive mechanism that eliminates the need for pinch rollers. Tape speed is photoelectrically controlled. A dual-gap read/write head permits automatic read-after-write checking of recording accuracy. Each Cassette Tape Station is only 5.4 inches high, 5.4 inches wide, and 9 inches deep.

A 1495 MAGNETIC TAPE UNIT: Permits data to be recorded on or read from industry-compatible magnetic tape. Up to eight Burroughs L and/or TC Series computers can share the same tape unit. The unit accommodates standard ½-inch tape in 7-inch reels containing 600 feet of tape. Data is recorded in 9-track NRZI format at 800 bits/inch, using either ASCII or EBCDIC code. Block length is fixed at 255 data characters. Cyclic and longitudinal redundancy check characters are generated and recorded, but no read-after-write checking is performed. Read/write speed is 12.5 inches/second, or 10,000 bytes/second, and rewind speed is 50 inches/second. The tape unit interfaces with the computer via an A 2392 MTU Controller, and the tape unit is normally placed on top of its controller. The controller, in turn, is connected to the computer by a 25-foot cable.

A 9114-1 CARD READER: Reads standard 80-column cards serially at a maximum speed of 300 cpm. Connects to the computer via an A 2322 Card/Tape Controller.

A 9119-1 CARD READER: Reads 96-column cards at a maximum speed of 300 cpm. Reading is checked through multiple sensing of each card column. Includes a 600-card input hopper and one 600-card stacker. Fits on a tabletop, where it occupies less than 1.5 square feet of space. Connects to the computer via an A 2331-1 96-Column Card Controller.

A 9419-2 CARD READER PUNCH/DATA RECORDER: Reads 96-column cards at 300 cpm, and punches and/or prints full cards at 60 cpm; higher punching speeds are possible if fewer columns are punched. The single card feed path includes: 600-card primary input hopper, 400-card secondary input hopper, read station, visible wait station, punch station, punch check station, print station, and two 400-card stackers. The print station permits printed interpretation of the punched data at 60 cpm, with three 32-character lines per card. Separate 96-column buffers are provided for reading, punching, and printing. A movable 64-character keyboard permits the unit to be used off-line as a 96-column keypunch or verifier; program storage is provided for four format-control pro-

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grams. The unit connects to the computer via an A 2331-2 96-Column Card Controller.

A 9419-6 MULTI-PURPOSE CARD UNIT: Provides the same 300-cpm reading, 60-cpm punching, and 60-cpm printing facilities and data recorder keyboard as the A 9419-2, described above, plus the ability to sort 96-column cards into any of six 400-card stackers under program control at 300 cpm. Can be used off-line for sorting, keypunching, or verifying. Numeric sorting requires 1.5 passes per card column, while alphanumeric sorting requires 2.5 passes per card column. The unit connects to the computer via an A 2331-3 96-Column Card Controller.

A 9122-1 PAPER TAPE READER: Reads 5, 6, 7, or 8-channel codes from punched tape or edge-punched cards at up to 40 characters/second. Accommodates reeled, strip, or fanfold tape 11/16 inch or 1 inch in width, as well as individual, fanfold, and Mylar-reinforced edge-punched cards. Reading is performed photoelectrically, and parity is checked to ensure accuracy. Optional features include edge-punched card support (for cards up to 11 inches in width) and a tape supply cone and take-up reel. The unit connects to the computer via an A 2322 Card/Tape Controller.

A 9222-1 PAPER TAPE PUNCH: Punches 5, 6, 7, or 8-channel codes into paper tape or edge-punched cards at up to 40 characters/second. Accommodates reeled, strip, or fanfold tape 11/16 or 1 inch in width, as well as individual, fanfold, and Mylar-reinforced cards. Punching accuracy is verified through echo checking. Optional features include a 5.5-inch or 7-inch takeup reel for punched tape and a supply and stacker tray for automatic feeding and punching of continuous card forms. The unit connects to the computer via an A 2322 Card/Tape Controller.

A 9249-1 LINE PRINTER: Prints up to 90 lines/minute using the standard 48-character print chain. An optional print chain contains 64 characters. Has 132 print positions and a full-line, 132-character buffer. Handles continuous forms from 3 to 17 inches in width and up to 14 inches in length. Spacing is 10 characters/inch horizontally and 6 lines/inch vertically. Skipping speed is approximately 48 lines (or 8 inches) per second. Vertical spacing is controlled by the program through a 2-channel punched format tape; a 12-channel format tape is optional. The printer connects to the computer via an A 2361-1 Line Printer Controller.

A 9249-2 LINE PRINTER: Prints up to 180 lines/minute using the standard 48-character print chain. All other characteristics and capabilities are the same as those of the A 9249-1, described above. The unit connects to the computer via an A 2361-2 Line Printer Controller.

DATA COMMUNICATIONS

When equipped with a data communications interface, an L 8000 Series computer becomes a TC 3500 Series Terminal Computer. Transmission can be in either asynchronous or synchronous mode, at speeds ranging from 75 to 9600 bits/second. In addition to the Burroughs standard line control procedures, used for communication with other Burroughs computers and terminals, the TC 3500 can be equipped to use the binary synchronous (BSC) procedures and communicate with various IBM and IBM-compatible devices. Transmit and receive buffers can be variable in length to a maximum of 1024 characters, as defined by the program.

The TC 3500 can be equipped to handle dual data communications operations, with each operation occurring inde-

pendently of the other. In addition, the two operations can use different transmission speeds, different modes, and different line control procedures. Thus, a TC 3500 can control a "mini-network" of smaller terminals while simultaneously communicating with a larger central computer, or it can act as a data concentrator for other Burroughs terminal systems. TC 3500 customer deliveries began in January 1973.

SOFTWARE

OPERATING SYSTEM: None.

COBOL: The principal programming language for the L 8000 Series computers is L 8000 COBOL, a revised, upward-compatible version of Burroughs' present L/TC COBOL. The language includes a limited subset of the American National Standard COBOL facilities, but direct compatibility with other ANS COBOL compilers is precluded by numerous additional constructs that are oriented toward the operator-attended features and specific hardware characteristics of the L 8000 Series computers.

Compilation of programs written in L 8000 COBOL must be performed on a Burroughs B 3500, B 3700, or B 4700 computer with a least 90K bytes of main storage. The compiler produces "S-level" object programs that can be loaded into L 8000 Series user memory and executed by the standard microprograms.

The L 8000 COBOL language includes subsets of the facilities defined in the Nucleus, Sequential Access, and Table Handling modules of ANS COBOL. The Random Access, Sort, Report Writer, and Library modules of ANS COBOL are not implemented at all.

Segmentation of COBOL-coded object programs is provided by Burroughs' Dynamic Memory Overlay facility. The programmer simply divides his source program into "main-line" routines (which are to be kept in user memory throughout the execution of the program) and "exception" routines (which can be called in from cassette tape when required). Use of the Dynamic Memory Overlay facility requires at least one Cassette Tape Station.

The COBOL compiler is scheduled for availability with the first L 8000 Series hardware deliveries, late in the first quarter of 1973.

ASSEMBLER: Burroughs will also provide an Assembler for users who wish to program their L 8000 Series computers in symbolic machine-oriented language. The Assembler language is fully upward-compatible with that of the earlier Burroughs L and TC Series computers, and includes additional instructions for the new L 8000 Series peripheral devices and expanded addressing facilities for user memories larger than 8K bytes.

Assembly – unlike COBOL compilation – can be performed on the L 8000 Series computer itself. Output from the Assembler is an "S-level" object program that can be loaded into user memory and executed by the standard microprograms. The Assembler is scheduled for availability in mid-1973.

UTILITY ROUTINES: Numerous routines are available to perform utility functions such as program loading, tracing, memory modification, memory listing, memory punching, tape copying, and card copying.

APPLICATION PROGRAMS: Burroughs offers a wide assortment of ready-made programs for specific applica-

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➤ tions from its "Hall of Programs" and its new library of Business Management Systems.

The Hall of Programs consists of routines from three basic sources:

- Corporate-level supported software – more than 100 Program Products, developed for specific application areas and available to all Burroughs users, with full centralized support.

- District standard packages – programs developed and supported by one of Burroughs' 18 district offices.

- Local programs – software developed by one of Burroughs' 230-odd branch offices and available to other users in the same area.

The library of Business Management Systems, introduced with the L 8000 Series computers, consists of programs designed to provide operational control of specific types of businesses through the production of comprehensive management reports. Business Management Systems are currently offered for the Wholesale, Retail, Manufacturing, Governmental, Hospital, and Banking industries. Each system maintains a general ledger, using a standard chart of accounts, and produces profit-and-loss statements, balance sheets, and various other reports. Each system is available either with or without formal training in its contents and use at a Burroughs district training site.

PRICING

EQUIPMENT: The following systems are representative of the wide range of possible L 8000 Series configurations. All necessary control units are included in the indicated prices. The quoted rental prices are for the basic one-year lease and include equipment maintenance.

MINIMUM SYSTEM: Consists of a Model L 8200-200 Processor with 4K bytes of user memory, one Cassette Tape Station, standard keyboard and ball printer, and 15.5-inch rear-feed forms handler. Monthly rental and purchase prices are $424 and $13,990, respectively.

MINIMUM MAGNETIC LEDGER SYSTEM: Consists of a Model L 8541-204 Processor with 6K bytes of user memory, one Cassette Tape Station, standard keyboard and ball printer, and 26-inch Magnetic Memory Record forms handler. Monthly rental and purchase prices are $667 and $21,990, respectively.

EXPANDED CARD/CASSETTE/PRINTER SYSTEM: Consists of a Model L 8400-100 Processor with 16K bytes of user memory, four Cassette Tape Stations, 96-column Multi-Purpose Card Unit, 180-lpm Line Printer, standard keyboard and ball printer, and 26-inch front-feed forms handler with Dual Pin Feed Device. Monthly rental and purchase prices are $1,516 and $55,180, respectively.

SOFTWARE: One-time charges for individual application programs range from about $200 to $2,500. Prices of the Business Management Systems range from $1,500 to $4,000, depending upon the industry and whether or not user training is included. When Burroughs develops application programs on a custom basis, the total software cost for an installation will usually fall between $1,000 and $8,000.

SUPPORT: Burroughs technical assistance is available to L 8000 Series users at a price of $120 per day, in half-day increments. Burroughs also offers fixed-price turnkey contracts under which it assumes responsibility for the programming and installation of a system.

EDUCATION: L 8000 Series users can obtain appropriate training either as part of a Business Management System or by paying for the individual courses they need.

CONTRACT TERMS: The standard equipment lease agreement includes equipment maintenance and permits use of the equipment during one 8-hour period per day. For usage in excess of 8 hours per day, Burroughs may negotiate for extra-shift charges; however, this is not normally done unless the user wants extended maintenance coverage. The maximum additional charge is 15 percent of the basic monthly rental for full maintenance coverage on a 24 hours/day, 7 days/week basis.

In addition to the 1-year and 5-year leases shown in the equipment price list, Burroughs offers a 3-year lease at intermediate monthly rates.■

EQUIPMENT PRICES

PROCESSORS AND MAIN STORAGE		Purchase Price	Annual Maint.	Rental (1-year lease)*	Rental (5-year lease)*
L 8200-100	Processor with 4K bytes of user memory and 15.5" rear-feed forms handler	12,990	568	394	355
L 8200-200	As above, with 1 Cassette Tape Station	13,990	665	424	382
L 8300-100	Processor with 4K bytes of user memory and 15.5" front-feed forms handler	13,490	568	409	369
L 8300-200	As above, with 1 Cassette Tape Station	14,490	665	440	396
L 8400-100	Processor with 4K bytes of user memory and 26" front-feed forms handler	14,690	598	446	402
L 8400-200	As above, with 1 Cassette Tape Station	15,690	695	476	429
L 8541-100	Processor with 6K bytes of user memory and 26" single-track MMR forms handler with split platen	21,990	894	667	601

Burroughs L 8000 Series

PROCESSORS AND MAIN STORAGE (cont.)		Purchase Price	Annual Maint.	Rental (1-year lease)*	Rental (5-year lease)*
L 8541-200	As above, with 1 Cassette Tape Station	22,990	991	697	628
L 8541-104	Processor with 6K bytes of user memory and 26" single-track MMR forms handler with solid platen	20,990	894	637	574
L 8542-204	As above, with 1 Cassette Tape Station	21,990	991	667	601
L 8542-100	Processor with 6K bytes of user memory and 26" dual-track MMR forms handler with split platen	22,990	924	697	628
L 8542-200	As above, with 1 Cassette Tape Station	23,990	1,021	727	655
A 4011	2 KB Memory Module (up to 16 KB total)	1,100	21	31	28
A 4011-1	2 KB Memory Module (over 16 KB)	750	21	21	19
A 2011	24 KB Extended Memory (Potential (required for total user memory capacity of 18 KB through 40 KB)	750	—	21	19
A 2012	32 KB Extended Memory Potential (required for total user memory capacity of 42 KB through 48 KB	800	—	22	20

PERIPHERAL EQUIPMENT

		Purchase Price	Annual Maint.	Rental (1-year lease)*	Rental (5-year lease)*
A 2322	Card/Tape Controller (for A 9122-1, A 9222-1, and/or A 9114-1)	1,000	23	28	25
A 9122-1	Paper Tape Reader; 40 char/sec.	1,490	114	42	38
A 9222-1	Paper Tape Punch; 40 char/sec.	1,890	144	53	48
A 9114-1	80-Column Card Reader; 200 cpm	2,790	244	78	71
A 2331-1	Controller for A 9119-1	900	23	25	23
A 9119-1	96-Column Card Reader; 300 cpm	3,500	300	85	77
A 2331-2	Controller for A 9419-2	1,900	23	53	48
A 9419-2	96-Column Card Reader/Punch/ Data Recorder	9,490	852	240	216
A 2331-3	Controller for A 9419-6	2,100	23	59	53
A 9419-6	96-Column Multi-Purpose Card Unit	11,390	1,020	285	257
A 2361-1	Controller for A 9249-1	1,400	23	39	35
A 9249-1	Line Printer; 90 lpm	8,500	720	240	216
A 2361-2	Controller for A 9249-2	1,500	23	42	38
A 9249-2	Line Printer; 180 lpm	11,200	840	280	252
A 9490-25	Cassette Tape Subsystem:				
	First Station (includes controller)	1,800	97	51	46
	Second, Third, or Fourth Station	1,800	74	51	46
A 2392	Data Collection MTU Controller	1,000	23	28	25
A 1495-1	Magnetic Tape Unit; 2 ports	11,500	444	365	280
A 1495-2	Magnetic Tape Unit; 4 ports	11,750	444	373	286
A 1495-3	Magnetic Tape Unit; 6 ports	12,000	444	381	292
A 1495-4	Magnetic Tape Unit; 8 ports	12,250	444	389	298
A 9161	Magnetic Record Reader; single-track	4,490	305	148	112
A 9162	Magnetic Record Reader; dual-track	4,890	305	161	122
A 9361	Console Magnetic Record Handler; stacker/hold; includes PF 26 or 29	1,500	105	42	38
A 9362	Console Magnetic Record Handler; feeder/stacker/hold; includes PF 26 or 29	2,790	168	78	70
	Continuous Forms Pin-Feed Devices:				
PF 21	15.5" rear feed; single synchronous	250	—	7	6
PF 22	15.5" rear feed; single asynchronous	250	—	7	6
PF 23	15.5" rear feed; dual	500	—	14	13
PF 24	15.5" front feed; single synchronous	250	—	7	6
PF 25	15.5" front feed; single asynchronous	250	—	7	6
PF 26	15.5" front feed; dual	500	—	14	13
PF 27	26" front feed; single synchronous	250	—	7	6
PF 28	26" front feed; single asynchronous	250	—	7	6
PF 29	26" front feed; dual	500	—	14	13

* Rental prices include equipment maintenance.