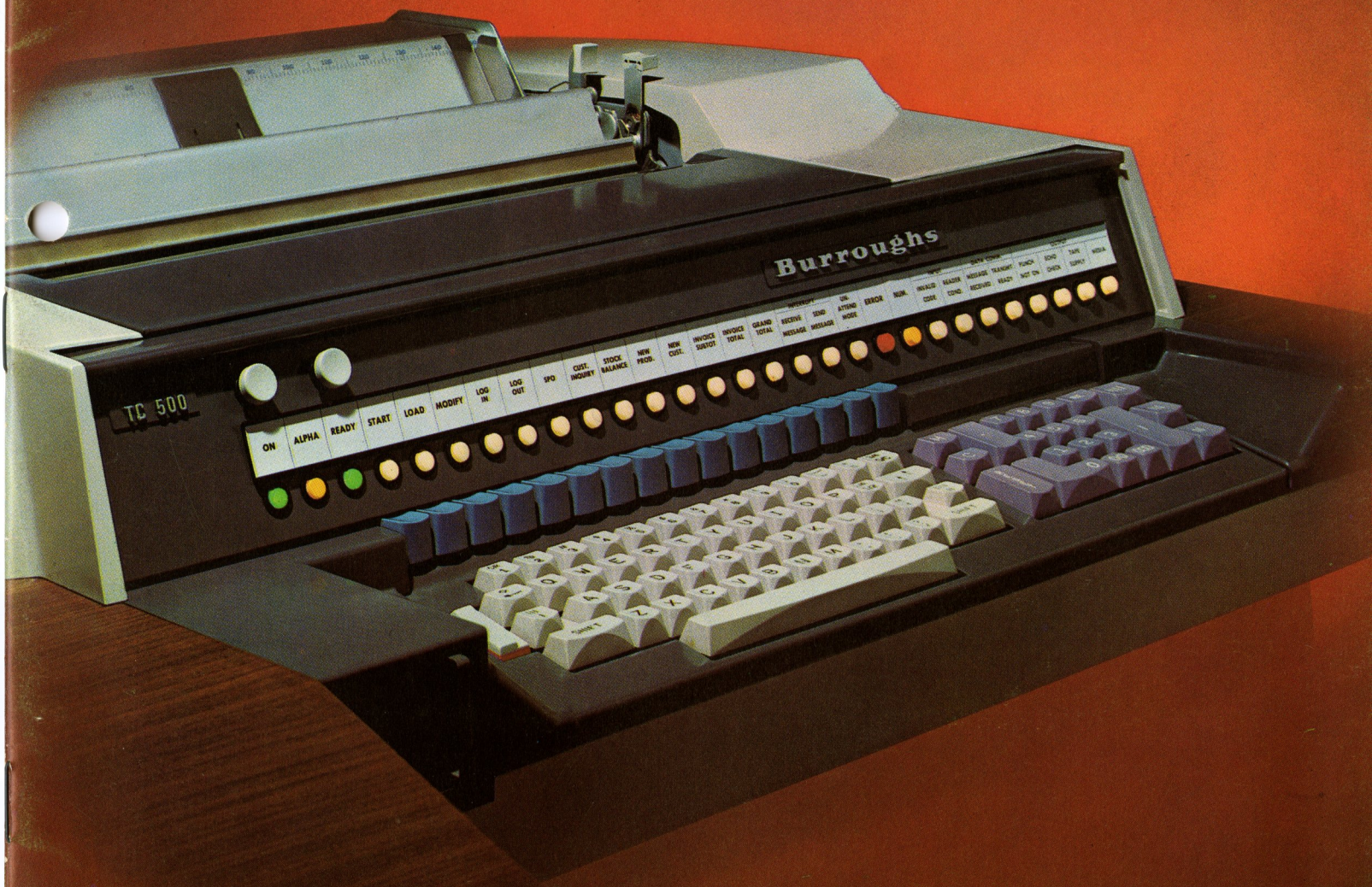
Burroughs INTRODUCES...

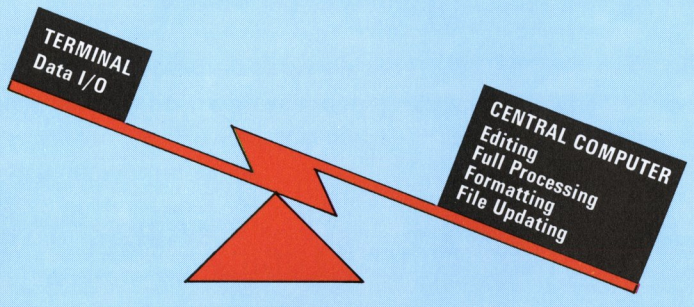
A NEW APPROACH TO ON-LINE SYSTEMS DESIGN



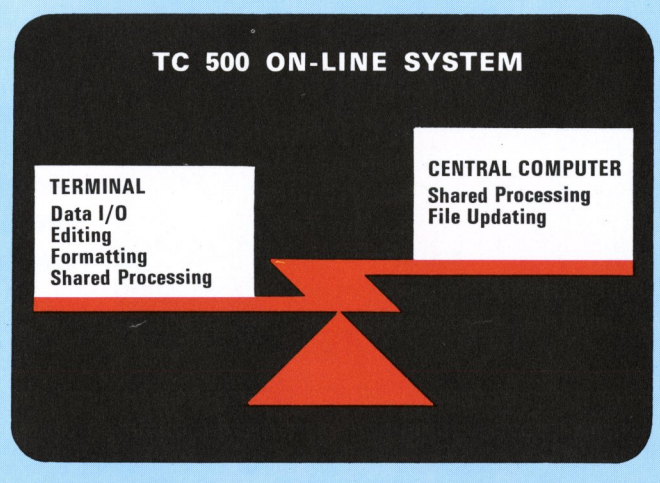
Burroughs TC 500
A new concept in terminals . . . a new
approach to on-line systems design.
Burroughs

THE BURROUGHS TC 500 IS A HIGHLY RESPONSIVE TERMINAL THAT INTRODUCES A NEW APPROACH TO ON-LINE SYSTEMS DESIGN. IT PERMITS YOU TO DESIGN A BALANCED SYSTEM . . . A SYSTEM IN WHICH *THE TERMINAL AND THE CENTRAL COMPUTER CONTRIBUTE EQUALLY* TOWARD A MORE PRODUCTIVE AND PROFITABLE ON-LINE OPERATION.

CONVENTIONAL ON-LINE SYSTEM



TC 500 ON-LINE SYSTEM



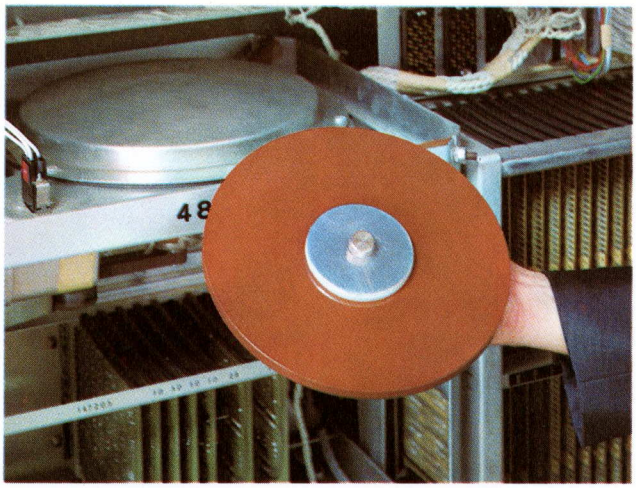
This is now possible because of the TC 500's unique combination of features never before available in an on-line terminal:

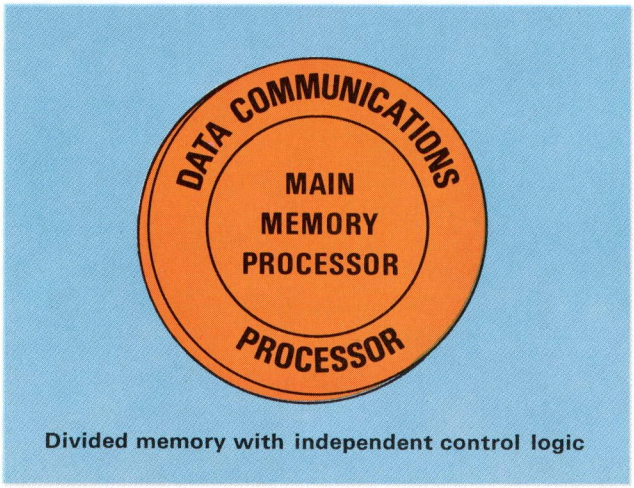
- It's a solid state computer with its own compact memory, powerful logic and full arithmetic capability.
- It's programable! The internally stored program provides complete local control of processing, print formatting, printer positioning, and forms movement.
- Its buffering assures maximum operating simplicity and productivity, and line speed transmission of larger, more complete messages.
- Its monolithic integrated circuitry and other advanced electronic techniques assure speed, reliability and flexibility.

These, and many other features make the TC 500 a highly responsive terminal with a favorable cost/performance ratio. They give the TC 500 the unique capability to completely pre-process data; to clean up and reorganize data into the best computer acceptable form; to compact data for efficient transmission; and to expand incoming data into easily understood information.

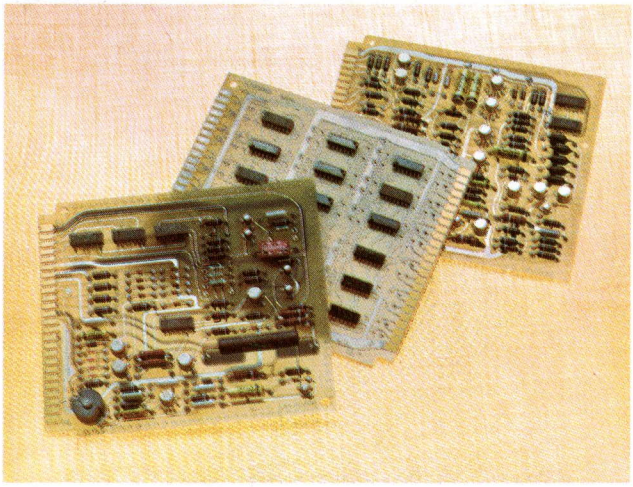
The TC 500's new level of responsiveness introduces these outstanding benefits for the first time into on-line systems operations:

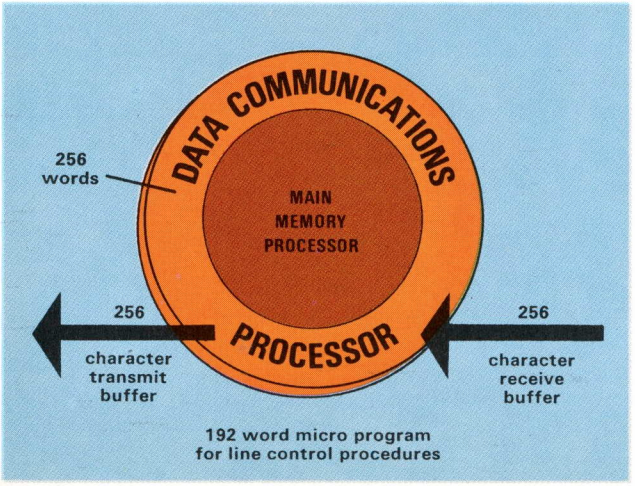
- The central computer is relieved of many housekeeping and processing responsibilities.
- The central computer programing task is simplified, and hardware requirements are reduced.
- The central computer is freed to perform its primary function of file updating and data manipulation.
- Terminal point management enjoys a new freedom in the organization of work at the remote site, without impairing central computer efficiency.
- Data communications economy is realized through reduced hardware and line requirements, a more practical network design and assured efficient use of lines.





Divided memory with independent control logic





192 word micro program
for line control procedures

TC 500 *RESPONSIVENESS* THROUGH PROCESSING POWER

MEMORY

The TC 500 memory is a modern, 40 track magnetic disk. It's hermetically sealed to assure reliable and accurate operation. The read/write head per track design assures fast access to stored data. The disk revolves at 6,000 RPM for an average access time of five milliseconds. Words per track: 32. Total Words: 1,280. Bits per word: 64. Numeric storage per word: 15 digits plus sign. Alpha storage per word: 8 characters. Program instructions per word: 4.

YOU BENEFIT BECAUSE—This compact, versatile memory gives the TC 500 outstanding programing and processing capabilities.

INDEPENDENT LOGIC

The disk is divided into two major areas: The Data Communications Processor and the Main Memory Processor. The Data Communications Processor automatically controls the transmitting and receiving of messages. The Main Memory Processor controls the TC 500 input and output and local manipulation of data. Each memory division has its own independent control logic. This permits the TC 500 to send or receive messages, while at the same time printing out a previously received message or preparing a new message.

YOU BENEFIT BECAUSE—The two independent logic sections permit true simultaneous processing similar to a dual processor system.

DATA COMMUNICATIONS PROCESSOR

It contains 256 words of memory. 64 words are used for two buffers —a 256 character transmit buffer and a 256 character receive buffer. The remaining 192 words contain micro programs that automatically handle line control procedures.

YOU BENEFIT BECAUSE—The buffers permit the TC 500 to send and receive a more complete message, from 1 to 255 data characters in length, *at line speeds.* Implementation of line control procedures through software, instead of hardware, means procedure changes can be made by software modification rather than hardware replacement. Buffering and flexible line control procedures reduce data communications costs by assuring maximum effective use of the line.

PLUS . . . PROGRAMING FLEXIBILITY

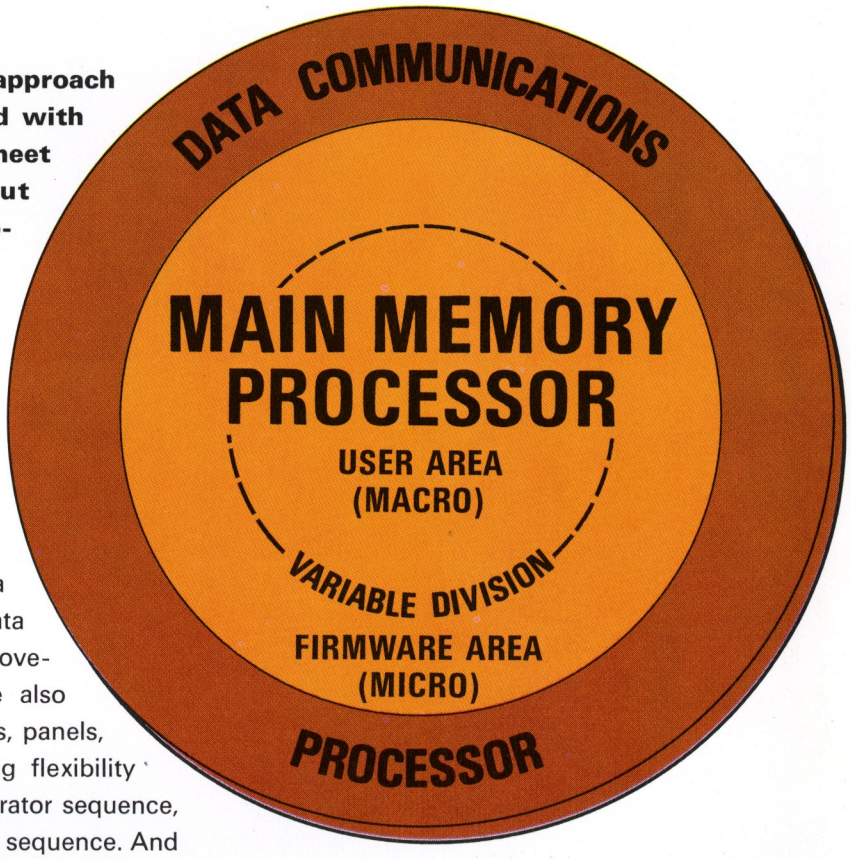
MAIN MEMORY PROCESSOR

It contains 1,024 words and is divided into two variable areas, the User (applicational) area and the Firmware area.

Firmware

This is a new concept in data processing. Firmware means specially designed micro programs, resident in memory. These micro programs give the TC 500 its power and flexibility. For example: on conventional computers, commands such as add and subtract are functions of hardware. On the TC 500, add and subtract and all other commands are functions of firmware.

YOU BENEFIT BECAUSE — The firmware approach eliminates the limitations normally associated with fixed hardware design. It permits you to meet changing functional requirements without purchasing new equipment. It gives your programmer a powerful, variable and flexible command list.



User Area

This is where the applicational program resides. Programs are written utilizing the command list provided through firmware. These commands permit programing such important editing functions as: check digit verify, field sizing, field capacity control, alpha and numeric compare and enforced sequence of data entry. Print formatting, printer positioning, forms movement, and input/output with local peripherals are also internally program controlled. No supplemental tapes, panels, pin boards, or plug boards are required. Programing flexibility is such that data may be entered in one logical operator sequence, and then printed or transmitted in an entirely different sequence. And programs are easily changed to meet new applicational requirements.

YOU BENEFIT BECAUSE—Programing power gives remote site management a highly responsive terminal. Local editing, error detection and easy error correction assure "clean data" for transmission. Line costs, and central computer processing and programing time, are reduced. Changes in central computer requirements do not require a change in operator procedure, just a change in TC 500 programs.

This brochure discusses the capabilities of a fully featured TC 500 Terminal Computer. The TC 500 Series includes other styles with varying capabilities so you can select the style most responsive to your on-line requirements.

TC 500 *RESPONSIVENESS* THROUGH ELECTRONICALLY

The TC 500 permits complete data input through its *electronic* alphanumeric typewriter and numeric ten-key keyboards.

Electronic Flexibility

Because of the firmware approach, TC 500 internal design is quite simple. Its four major components—memory, logic, keyboard and printer are cable connected. The electronic connection of keyboard to printer through memory gives the TC 500 new and unusual flexibility. For example: When any key is depressed, that key's unique electronic code is delivered to memory. What action the code causes depends on how it is interpreted in memory. It's that flexible.

YOU BENEFIT BECAUSE—the electronic keyboard concept provides the flexibility to program keyboard functions to best suit each application.

Keyboard Features

The ten-key keyboard permits numeric input, operator decimal control, and operator "flagsetting" through the "C" and "M" keys. The reverse entry key is used for entering minus amounts.

The typewriter keyboard permits full alphabetical input. It can be programed to permit numeric input for applicational convenience. For simple correction, the *backspace key* function not only re-positions the printer but also decrements memory. Then merely by re-typing the data, you can correct a letter, word or entire field *before transmission.*

Both keyboards have four programable *Operation Control Keys* which terminate the keyboard instruction and permit the applicational program to continue its execution.

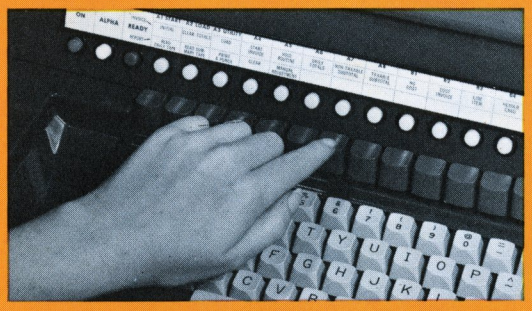
YOU BENEFIT BECAUSE—Full data input capability and spècial purpose keys permit efficient and orderly input of the most complex data. Simple error correction assures preparation of the cleanest possible data for transmission.

Buffering

Through electronic design, a 35-character keyboard buffer is provided. Buffering allows the operator to maintain a steady, rhythmic data input flow regardless of the action of the printer, forms movement or internal processing. Buffering and the independent data communications processor provide the flexibility of building up a message for transmission while simultaneously transmitting or receiving another message and printing out an earlier message.

YOU BENEFIT BECAUSE—The ability to process simultaneously, at three levels, assures maximum productivity by the *operator*, the *TC 500* and the *entire on-line system.*

Y CONTROLLED INPUT

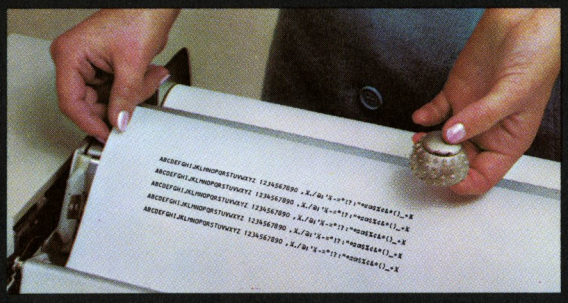


Above the typewriter are 16 *Program Select Keys.* They enforce a controlled sequence of operation because they are selectively activated under program control. They are used, for example, to permit: single key initiation of identification codes for common inquiries, or operator selection of the application program routines. Each key has an operator availability communication light to guide the operator in making the proper selection. The other *Operator/System Communication Lights* tell the operator what to do

next, and indicate the status of data communications and the input/output peripherals. The error light and a bell activate when an input error is made, e.g., exceed capacity.

YOU BENEFIT BECAUSE—Program control of the sequence of operation provides the flexibility to handle any application. It also provides a controlled operating simplicity for the most complex applications. Program controlled error detection and simple operational recovery assures accurate data preparation. Anyone can operate the TC 500 with a minimum of training.

PLUS . . . A FLEXIBLE, HIGH-SPEED PRINTING CONCEPT

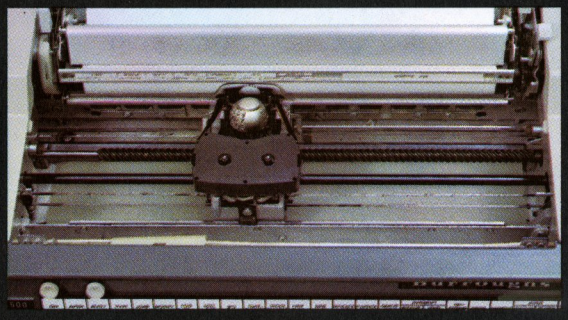


The TC 500 unit printer provides clear, easy to read printing because of its type style and the precision electronic print positioning.

Characteristics

The 64-character printer is easily removed to permit interchangeability of type fonts and special character sets. It prints 10 characters per inch with two-color ribbon control along a 150 print position line. Multiple part forms, with up to 15 carbons, are printed with the same clarity as a single form. This is because a unique device automatically senses the thickness of the forms and applies pressure accordingly.

YOU BENEFIT BECAUSE—The TC 500 printer provides exceptional printing quality, even on multiple part forms. It can be adapted for the character set that best suits your application.

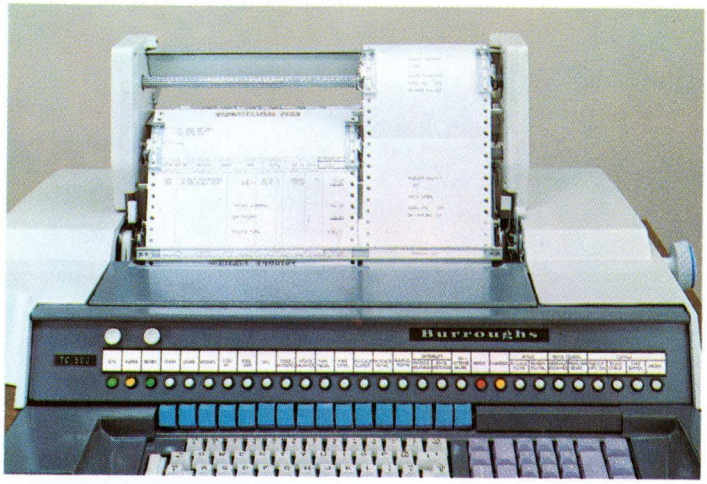


Printing Efficiency

There are no tab stops or external devices controlling the printer. Printer positioning is electronically controlled by the application program. It prints 20 characters per second; positions at the rate of 200 characters per second (10 times faster than its printing speed); AND IT ALWAYS POSITIONS TO THE MOST SIGNIFICANT DIGIT IN ANY NUMERIC FIELD.

YOU BENEFIT BECAUSE—Control of print formatting by each internally stored program simplifies operator machine setup. It also provides complete print formatting flexibility. *The ability to position directly to significance permits more efficient line use by eliminating the transmission of unproductive space codes.* In addition, high-speed positioning plus positioning directly to significance enhances the already fast printing speed yielding a fast overall printing capability.

TC 500 *RESPONSIVENESS* THROUGH FLEXIBLE, AUTOMATED FORMS HANDLING



The TC 500 complements its high-speed printing capability with highly automated and flexible forms handling. Forms are spaced 6 lines per inch at speeds up to 20 lines per second. No external tapes or other mechanical control devices are needed. Spacing is completely controlled by internal programing.

Variable Forms Setups

Several forms handling approaches allow you to select the forms setup that best suits each application. (a) A dual form pin feed device provides simultaneous or independent form spacing of two forms. (b) A single form pin feed device. (c) A forms setup without pin feed device to accommodate rear-fed forms.

Internal Control

Complete automatic control of forms is provided by two types of spacing commands. (1) An "absolute command" that in one instruction spaces from one up to 255 lines regardless of the form location. (2) A "space-to" command that spaces to a given line on a form. An example of the advantage of internal, independent forms control would be an application where the left-hand form is used for off-line build-up of data for burst transmission while the right-hand form is used as a message pad. If off-line operation is interrupted to send and/or receive messages on the message pad, the TC 500 would automatically return to the correct location in the off-line operation.

YOU BENEFIT BECAUSE—Forms handling is completely controlled by the applicational program. This simplifies the operator's job and permits greater productivity. It also permits greater latitude in forms design and report formatting to best suit each application.

Changing forms devices to suit each application is a simple matter of moving two levers to free the light-weight pin feed device.

TC 500 *RESPONSIVENESS* THROUGH PERIPHERAL DATA INPUT/OUTPUT

To extend the TC 500's productivity further, optional input/output capability is provided. You have a choice of either punched cards in and out, or punched paper tape and edge punched cards in and out. While the TC 500's internal code is USASCII, the use of internal conversion tables permits peripheral data input or output in any desired code.

Input

The solid-state *Punched Card Reader* reads standard 80-column cards serially by photo-electric sensing at up to 100 CPM. The *Punched Paper Tape/Edge Punched Card Reader* photoelectrically reads 5, 6, 7, or 8 channel tape, in reels or strips; or various-size continuous or individual edge punched cards at up to 40 CPS. Take-up and supply reels assure efficient handling of tape. Parity checking assures reading accuracy. Either unit may be used for TC 500 program and data input.

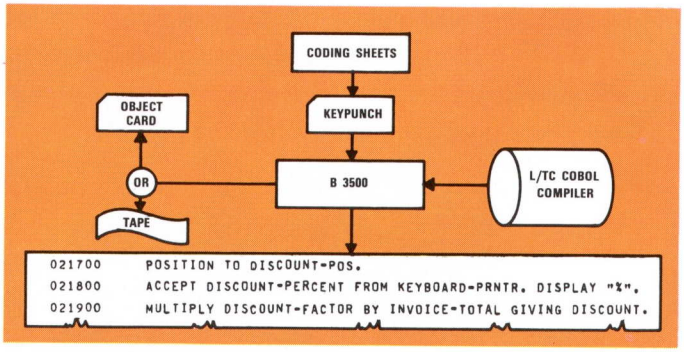
Output

The 80-column *Card Punch* punches, prints and reproduces at 25 CPS, in any desired code. It skips and releases at 80 CPS. It can be used off-line as an operator-attended keypunch. The solid-state *Punched Paper Tape/Edge Punched Card Perforator* punches 5, 6, 7, or 8 channel tape, in strips or reels; and various-size individual or continuous edge punched cards at up to 40 CPS. Echo check assures accuracy. Supply and take-up reels provide efficient tape handling. Both units may be used for capturing data generated by the TC 500 or transmitted from the central computer.

You BENEFIT BECAUSE—These input/output capabilities give the TC 500 increased flexibility and provide remote site management with a more versatile terminal.

TC 500 *RESPONSIVENESS* THROUGH PROGRAMING FLEXIBILITY

The TC 500 responds instantly to your applicational requirements because the hardware, systems software and fourth-generation firmware were developed concurrently. Programing can be accomplished in either L/TC COBOL or Assembler language with a full range of utility routines.



Cobol Programing

L/TC COBOL* (COmmon Business Oriented Language) Compiler. Programs are written in English and compiled on a Burroughs electronic data processing system. This capability provides maximum software support to any TC installation and offers such advantages as:

**L/TC COBOL is based on USASI COBOL with additional constructs to enable operator attended features and certain unique hardware characteristics.*

Improved Communication—During program definition, program requirements are communicated in the same language that the programmer will use.

Easier and Faster Program Creation—Using COBOL, the entire program is written in English. The programmer can concentrate on the logical correctness of the program, instead of the details of hardware manipulation.

Easily Understood Documentation—Program documentation is in the English language.

Easier Maintenance—Program maintenance is a fast, simple procedure. Easy-to-read documentation facilitates future modification . . . even if programing personnel have been changed.

Assembly Level Programing

Burroughs also offers a comprehensive assembler language for those who prefer to program at the assembly level. Assembler programs are written with a simple, powerful symbolic language and can be assembled on the TC 500 or on Burroughs electronic data processing systems.

Utility Routines

A full range of special routines designed to assist you during program debugging and installation are available with all TC Systems. They include trace routines, memory modify routine, memory punch, memory listing, tape and card copy routines for aid in debugging. Reader load and a tape identification routine are also provided.

On-Line Remote Compilation or Assembly

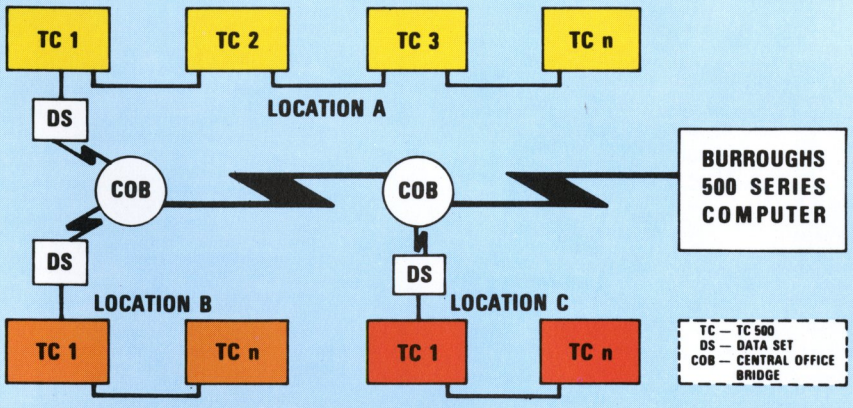
Customers using an on-line Series TC have the option of transmitting their COBOL or assembler programs to a B 3500 Central Computer. After compilation or assembly is completed, machine language programs may be loaded over the telephone line to the remote TC unit for debugging or operational use.

YOU BENEFIT BECAUSE—L/TC COBOL and Assembler Level Programing give you the option to decide the method best suited for your requirements to write, document and maintain your TC 500 programs.

TC 500-oriented systems software makes program writing and changing a simple job. Remote on-line assembly, compilation and program loading capabilities enable complete centralized control over all terminal site applications.

TC 500 *RESPONSIVENESS* FOR A NEW LEVEL OF DATA COMMUNICATIONS THROUGHPUT

Three major elements provide a new level of data communications efficiency.



Network Design Flexibility

The TC 500's flexibility permits you to design an efficient and economical on-line network. This is now possible because:

- There is no practical hardware limitation in the number of TC 500's that may use a single communications line.
- Multiple TC 500's may be concatenated through a single data set at a given location.
- Multiple locations may share the same line through telephone company central office bridging.

The flexibility in network design permits you to keep line requirements and costs to an absolute minimum. Your only consideration will be the line load and the response time you desire.

Network Efficiency

Sophisticated line control characteristics assure highly efficient procedures:

- Up to 1,800 BPS transmission speed
- USASCII, 7-bit plus parity, code
- Character parity checking
- Longitudinal message parity checking
- Automatic assignment of consecutive message numbers.
- Automatic sequence checking of received message numbers
- Automatic message re-transmission for error recovery
- Terminal address flexibility
- Automatic control character insertion
- Dedicated or switched network capability

TC 500 Processing Power

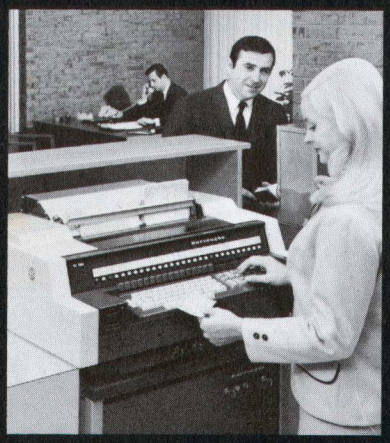
The TC 500's powerful operating capabilities also assure highly efficient line use:

- Buffering provides the ability to send and receive larger, more complete messages at line speed.
- Editing and easy error correction assure clean data and reduce the number of messages.
- Terminal programing flexibility reduces line usage by permitting variable field length transmission; by providing terminal ability to expand and contract messages; and by storing frequently printed operator instructions.

YOU BENEFIT BECAUSE—Flexible network design, network efficiency, and the TC 500's processing power permit you to design the most practical and efficient network.

Burroughs *RESPONDS* TO YOUR TOTAL DATA COMMUNICATION NEEDS...

By providing the HARDWARE, SYSTEM SUPPORT and SERVICE for your COMPLETE data communication network . . .



Terminal Computers • Teller Terminal Computers and Consoles • Input and Display Equipment • Audio Recording and Response Equipment

• Data Concentrators and Controllers

• Data Sets

• Small, Medium and Large-Scale Electronic Data Processing Systems

Wherever There's Business There's Burroughs

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