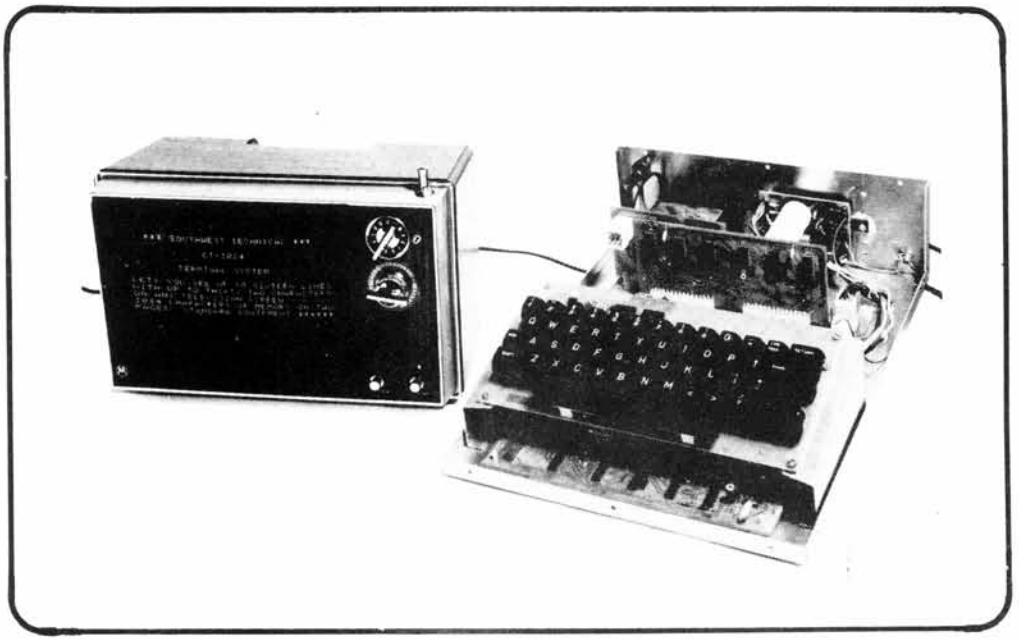


CT-1024
TERMINAL
SYSTEM

CT-1024 Terminal System Kit (TV Typewriter II)

The CT-1024 Terminal System kit is a low cost alphanumeric character generator designed to simultaneously display sixteen lines of 32 characters/line on a standard video monitor or slightly modified television set. Together with its low cost options it may be used to simply display messages and data on a TV screen, to communicate with either local or remote computer systems, such as the SWTPC 6800 Computer System or to store and recover data from an audio cassette tape recorder just to mention a few.

The termianal system is an upper case only, ASCII device. It is not compatable with IBM EBCDIC coded systems or the older 5 level Baudot coded Teletypes®. Although we may have a Baudot code converter for the terminal system in the near future, one is not available at the time of this writing. With the exception of the 2513 character generator, the UART chip on the serial interface option and the 2102 static, random access memories, the entire system is constructed using low cost, easy to get TTL integrated circuits.

The six 2102 memories give the system the capability of storing 1024 characters. 512 of these are being displayed on the screen while the other 512 are stored and may be accessed and displayed just by flipping a switch.

The CT-1024 terminal system does not have scrolling. When you get to the last character position of the bottom line it will return to the first character position of the first line (home-up position) on either the same page or opposite page, switch selectable.

The terminal system does have both hardware and software carriage return/line feed. If you are entering data thru either the keyboard or interface board and reach the end of a line, the terminal will do a self-generated carriage return/line feed (home-up if on the last line) to prevent the loss of data. In addition to this you may at any time generate a carriage return or line feed by entering a Control M or Control J respectively, from either the keyboard or from a computer thru an interface board.

Both erase to end-of-line (EOL) and erase to end-of-frame (EOF) features have been incorporated into the terminal system. Since these erase functions always start from the cursor location, a home-up function has been provided as well. Each is enabled thru a separate pushbutton switch unless the CT-CA computer controlled cursor option is used in which case either user selected control characters from the keyboard or pushbutton switches may be used.

The actual display device for the terminal system may be an unmodified video monitor or slightly modified television set. Although specific instructions are supplied for modifing a small screened Motorola set, almost any set may be used. Be sure to use one that does not have a "hot" chassis, otherwise you will need an isolation transformer. The suggested modification to the television set even includes a switch to allow one to select from terminal or normal television reception.

The circuitry on the terminal system **requires a 60 Hz power line frequency** and the U.S. standard 525 line television set. **The** terminal circuitry has been designed for sixteen lines of 32 characters/line and changing this figure for either more or less would entail complete redesign and is thus not recommended. The system is not adaptable to being fed from

external sync sources which eliminates its use in superimposed video titling applications.

The following is a list of each of the items available for the terminal system along with a brief description of each:

CT-1024 Terminal System Kit

This kit includes the 9 1/2" x 12" doubled sided, plated-thru hole main board, the 3" x 7" doubled sided, plated-thru hole memory board, plus all of the components that go on the two. There are connector provisions for a positive logic, positive or negative keypress strobe, ASCII keyboard such as one of our KBD options or another compatable keyboard if you wish. There is a connector position for the CT-CA computer controlled cursor board. There is also a connector position for either the CT-S serial interface (UART) option or the CT-L parallel interface option. There is also one connector position where the CT-E screen read option may be inserted. Power requirements for the entire system, including interfaces are +5 VDC, $\pm$5% @2.25A, -5 VDC @20 Ma. and -12 @60 Ma. which are generated by the CT-P power supply option.

The main and memory boards do the storing and displaying of the alpha-numeric data but to actually get data into the terminal's display you must use either a keyboardand/or in data communications applications one of the two interface options.

KBD-5 Keyboard Option Kit

The KBD-5 is a 56 key upper/lower case keyboard kit with switch de-bounce, N key lockout, 2 key rollover and ASCII encoding. The new key switches are firm contact, full typewriter travel, gold plated contact switches with dark grey double shot molded keytops. The keyswitches have been positioned on the 11 5/8" x 6 1/8" reinforced epoxy fibreglass circuit board so as to form an 11" wide array of keyswitches with straight blocked sides for ease of mounting. The spacebar is 6" in length and fully pressure equalized.

The complement of keys includes upper and lower case characters and numbers, brackets and parenthesis, two shift keys, carriage return, line feed, escape, two typewriter type user defined keys and two push on/push off user defined keys for locked ON control functions such as "Echo" ON/OFF and "Receive-Transmit" ON/OFF on the CT-1024 terminal system. Because the encoder circuit used a scanning type MOS integrated circuit, switches may be wired to generate ASCII data not already output by the unit. This makes it ideal for use in systems where uncommon ASCII characters are used.

The keyboard also features a unique repeat circuit. If you hold any of the keys down more than a second or so, that character will automatically repeat itself several times a second until the key is released. It even works when generating control functions which is almost impossible to do using a conventional keyboard with a separate repeat key.

CT-CA Computer Controlled Cursor Option Kit

The CT-CA Computer Controlled Cursor option is a plug-on board used with the CT-1024 terminal system that provides complete computer as well as manual control over cursor positioning. The board is attached to the terminal system simply by plugging it onto connectors on the main terminal system board. The function of the computer controlled cursor board is to allow the operator to incrementally position the cursor one position up, down, left or right, or do a home-up, erase to end of line or erase to end of frame using either manual switches or control characters generated by either the keyboard or a computer feeding data to the terminal system thru one of the interface options. By using control characters from the keyboard, the manual switches may be completely eliminated or you may retain the switches (7 each which are not supplied with the kit).

The circuitry on the 3 1/2" x 4 1/2" doubled sided, plated-thru hole circuit board provides the manual switch debouncing and control character decoding for the various cursor movements. The selection of the various control characters and their chosen functions is left to the user thru programming jumpers. The board is plugged onto the main board vertically just behind the memory board. Manual switch connections to the cursor board are made thru a nine pin

connector mounted on the board.

The CT-CA computer controlled cursor option has all of the features a manual option does plus it allows program (software) or keyboard control over cursor positioning. It's use is highly recommended in all CT-1024 Terminal System applications.

CT-S Serial Interface Option Kit

In order for the CT-1024 Terminal System to communicate via a three wire system, a phone line or a magnetic tape data storage system, the parallel ASCII data must be broken down into sequential one bit at a time form both when being transmitted out of the keyboard and when being received by the display system. The CT-S serial interface or UART (Universal Asynchronous Receiver/Transmitter) provides this conversion from the parallel form into a series of properly timed one's and zero's including not only the serial data, but the start, stop and parity bits as well. The reverse is true during the receive mode. The baud rate or speed at which the serial data is transmitted or received, is 110 baud, or if the optional parts are installed, 110, 150, 300, 600 and 1200 baud. There is a provision for "echo" OFF (full duplex) where the data is transmitted to the receiver, but is not put up on the screen until it is "echoed" back by the receiver and displayed by the terminal; or "echo" ON (half duplex) where the data is transmitted and simultaneously put up on the screen and is not "echoed" back by the receiver.

The input/output connections to the interface are RS-232 compatable and will attach directly to most couplers and data sets. However, to record on, or playback from magnetic tape it will be necessary to have some kind of FSK encoder/decoder system to get the digital data on and off the tape. We will have such a system available in early 1976.

The RS-232 pin connections include transmitted data, received data, terminal "ready" and ground. There are no provisions for automatic transmit/receive switching. Data to be transmitted can either be provided by the terminal's memory using the screen read board or the keyboard.

The CT-S Serial Interface option is constructed on a 3 1/2" x 9 1/2" doubled sided plated-thru hole circuit board and includes all components to make the terminal system operational at 110 baud only. To operate at 110, 150, 300, 600 and 1200 baud you will need to add several other components including a crystal and two TTL IC's. We do sell these components now as an optional kit called the CT-SO for $14.75 ppd in U.S.

The CT-S interface board is plugged onto the main board's interface connector vertically just behind the cursor and screen read boards. There is room for only one interface board; either the CT-S serial interface option or the CT-L parallel interface option. Only one may be plugged on at a time.

CT-L Parallel Interface Option Kit

Although there are standards for the exchange of serial data such as the RS-232 format, there are no such standards for parallel data exchange. This

is unfortunate since it makes parallel interfacing difficult when interconnecting parallel devices supported by different manufacturers. Although we have tried to make the CT-L parallel interface option as universal as possible, we cannot guarantee that it will interface to any other parallel device, especially those supported by another manufacturer. We recommend that if at all possible you stay with serial interfacing unless you are sure there will be no problems or if your application requires maximum data transfer speed.

The CT-L parallel interface is compatable with the SWTPC 6800 Microprocessor's MP-L parallel interface, but it may not be used for the Computer's control terminal. The computer's mini-operating system will only work thru a serial interface. Some customers have reported problems interfacing to the Altair 8800's parallel interface so we recommend that you stay with the CT-S serial interface on this system.

The CT-L parallel interface option is constructed on a 4" x 9 1/2" double sided, plated-thru hole circuit board with two separate input/output (I/O) connectors along the top edge of the board.

For high noise immunity, the interface has been provided with Tri-State outputs, line rejection/noise discriminators on the strobe lines, and heavy duty diode clamping on all inputs from the data buss. For maximum flexibility all data and strobe lines from the I/O buss(es) can be selectively inverted by programming jumpers on the P.C. card. The keyboard may be directed to just print data on the screen, to print the data on the screen and load it on the output buss (half duplex), or just load it on the output buss (full duplex). This is especially nice when you want to have all typed information echoed back by a computer for verification. The interface's input and output buss lines can be used seperately, or if selected, may be paralleled for applications where a bi-directional buss system is used. To make interfacing really simple, the data flow control lines can be either strobed or operated in a demand/response handshake mode, here again, selectable.

The CT-L parallel interface board is plugged onto the main board's interface connector vertically just behind the cursor and screen read boards. There is room for only one interface board, either the CT-L parallel interface option or the CT-S serial interface option. Only one may be plugged on at a time.

CT-E Screen Read Option Kit

If you ever need to use your CT-1024 terminal system in a situation where you need to get edited information that has been typed onto the screen transmitted out of the terminal and into another device, you will probably want to use the screen read board. The screen read when activated starts accessing information in the screen's cursor location and continues reading, transmitting the data out either the CT-S serial interface option or CT-L parallel interface option, advancing the cursor as it reads, until the READ ON/OFF switch is flipped off or an exclamation point is read from the screen. If when reading, the end of the page is reached it will continue after executing a home up on the same or opposite page depending upon the setting of the "page select" switch on the main terminal board.

The use of the CT-E screen read board in computer related terminal applications is more the exception than the rule. Almost all computer systems

operate in the interactive mode where each character is transmitted to the computer's instruction buffer as soon as it is keyed in. This includes those systems that do not process each line until a RETURN is keyed in thus eliminating the need for the screen read board. For those who insist on using the screen read in this type of application, there is a problem in that the terminal's memory does not store control characters which of course includes the RETURN key. Since most systems us the RETURN for line delimiters, not transmitting a RETURN at the end of each screen read line would thoroughly confuse most computers. While on the other hand screen reading one line at a time and manually entering the RETURN does not for make very efficient use of the terminal system.

The CT-E screen read option is constructed on a 4 1/2" x 3 1/16" double sided, plated-thru hole circuit board and is plugged onto the main terminal system board just behind the memory board adjacent the cursor control board. Either the CT-M manual or CT-CA computer controlled cursor board must be used along with the screen read board for proper screen read operation.

CT-P Power Supply Option Kit

The CT-P power supply is the +5 VDC, ±5% @2.25A, -5 VDC @20 Ma and -12 VDC @60 Ma power supply designed to drive the CT-1024 terminal system including all of its option boards.

The circuit board itself is a 3 3/8" x 2 1/2" single sided circuit board containing a regulator transistor which must be heatsunk to a metal chassis or heatsink (not supplied with the kit). The power supply board itself is fed from a 117 VAC primary power transformer (included with the kit) mounted somewhere on the terminal system's chassis (not supplied with the kit).

Computer Application Customers

Since most individuals using the CT-1024 Terminal System for computer and/or modem applications will be using the same set of options, we have decided to offer the terminal system with the following options for a cost of $275.00 postpaid in the U.S.:

1 EA.	CT-1024	Terminal System Kit
1 EA.	CT-P	Power Supply Option Kit
1 EA.	KBD-5	Keyboard Option Kit
1 EA.	CT-S	Serial Interface Option Kit
1 EA.	CT-CA	Computer Controlled Cursor Option Kit

This is the recommended package when using the Terminal System for most computer applications which include the SWTPC 6800 Computer System, the MITS ALTAIR 8800 and 680, as well as acoustic coupler/modem applications. This package does not include the video monitor or modified television display, chassis or cover. We do not sell these items.

General Comments

The unit is sold in kit form only and comes without a chassis or cover which we do not offer.

Our instructions have been written for the individual who has built up electronic projects before, knows how to recognize the various components, and is experienced at printed circuit board soldering. Although the instructions include step-by-step assembly details, schematics, wiring diagrams, and a theory of operation, they have not been written for the beginner. The various modules within the system simply plug together keeping the wiring to a minimum.

Assembly time will vary depending upon the number of options being assembled and the experience of the builder however most systems can be put together in less than twenty-four hours.

For those readers interested in finding out more about the circuitry in the unit, it was printed as a construction article series starting in the February 1975 issue of Radio-Electronics Magazine (TV Typewriter II page 27). If you do not have a copy of this magazine, you can probably find one in your local library. The CT-1024 (TV Typewriter II) is totally different from the TV Typewriter I printed in an earlier issue of Radio-Electronics Magazine. The two were designed by different individuals and their option boards are not interchangeable with one another. We are no longer supplying any of the parts for this older TV Typewriter I.

Since its introduction in February 1975 we have sold many of the CT-1024 terminal systems and have been very happy with its performance and reliability. However, for those customers that have difficulty getting the system working properly or have it fail after assembly, we do have repair service available at a reasonable cost.

Southwest Technical Products Corporation

CT-1024 Terminal System Price List

CT-1024 — Terminal system kit including memory but less the keyboard and chassis.
$175.00 ppd. in U.S.

CT-P — Terminal Power Supply kit which powers the terminal system including a full complement of option boards.
$ 15.50 ppd. in U.S.

KBD-5 — Deluxe Keyboard kit with N key lockout, 2 key rollover with special character programmability.
$ 49.95 ppd. in U.S.

CT-S — Serial Interface kit with bi-directional RS-232 capability for computers and modems.
$ 39.95 ppd. in U.S.

CT-CA — Computer Controlled Cursor kit which gives both manual switch and program (software) control over cursor positioning.
$ 15.50 ppd. in U.S.

NOTE: Cost of the preceeding five items when ordered simultaneously is $275.00 ppd. in U.S.

CT-SO — Optional baud rate parts to allow the CT-S Serial Interface to operate at 110, 150, 300, 600 and 1200 baud.
$ 14.75 ppd. in U.S.

CT-L — Parallel Interface kit to connect the terminal to a parallel data buss device.
$ 29.95 ppd. in U.S.

Circuit Boards

CT-1024b — Main Terminal System and Memory boards (G-10 fibreglass with plated thru holes).
$ 47.50 ppd. in U.S.

CT-1024c — Connector Set for the above board set (sold only when purchased simultaneously with CT-1024b).
$ 2.50 ppd. in U.S.

No other Terminal System boards are available.

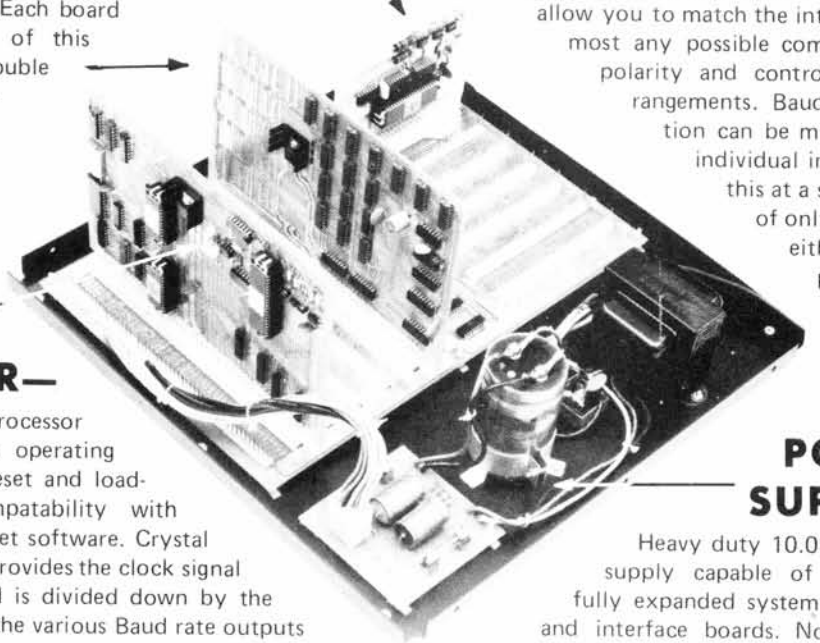
WHY SETTLE FOR LESS—
THAN A COMPLETE 6800 SYSTEM

MEMORY—

All static memory with selected 2102 IC's allows processor to run at its maximum speed at all times. No refresh system is needed and no time is lost in memory refresh cycles. Each board holds 4,096 words of this proven reliable and trouble free memory. Cost—only $125.00 for each full 4K memory.

INTERFACE—

Serial control interface connects to any RS-232, or 20 Ma. TTY control terminal. Connectors provided for expansion of up to eight interfaces. Unique programmable interface circuits allow you to match the interface to almost any possible combination of polarity and control signal arrangements. Baud rate selection can be made on each individual interface. All this at a sensible cost of only $35.00 for either serial, or parallel type



PROCESSOR—

"Motorola" M6800 processor with Mikbug® ROM operating system. Automatic reset and loading, plus full compatability with Motorola evaluation set software. Crystal controlled oscillator provides the clock signal for the processor and is divided down by the MC14411 to provide the various Baud rate outputs for the interface circuits. Full buffering on all data and address busses insures "glitch" free operation with full expansion of memory and interfaces.

POWER SUPPLY—

Heavy duty 10.0 Amp power supply capable of powering a fully expanded system of memory and interface boards. Note 25 Amp rectifier bridge and 91,000 mfd computer grade filter capacitor.

DOCUMENTATION—

Probably the most extensive and complete set of data available for any microprocessor system is supplied with our 6800 computer. This includes the Motorola programming manual, our own very complete assembly instructions, plus a notebook full of information that we have compiled on the system hardware and programming. This includes diagnostic programs, sample programs and even a Tic Tac Toe listing.

Mikbug® is a registered trademark of Motorola Inc.

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with serial interface and 2,048 words of memory. $395.00

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