SM-ZT-1

Personal Information Terminal

Service Manual

585-17

SAINT JOSEPH, MICHIGAN 49085

Printed in the United States of America

CAUTION

Do not attempt to modify any circuit.

Do not attempt to remove or replace any component while the power cord is plugged in.

Do not attempt to service this equipment unless you have been properly trained.

WARNING

The video monitor contains high voltage. Be very careful when working in this area.

NOTE: FCC regulations require that you do not perform service on the MODEM board. If you determine that service is required on the MODEM board, the board must be replaced. The defective board should be sent to ZDS for service.

TABLE OF CONTENTS

Specifications

KEYBOARD	63 alphanumeric keys.
MODEM	
Baud Rate	110, 150, 300.
Telephone Jack	Modular.
Modes	Originate and Answer.
TERMINAL LOGIC BOARD	
TTL	Serial I/O — 110, 150, 300, 600, 1200 baud.
Printer Interface	Parallel Port.
Video Interface	RCA phono plug connection to any RS-232 compatible monochrome monitor.
ELECTRICAL	
Power Requirements	12 watts at 120 VAC, 60 Hz.
Circuit Protection	15 amperes — fuse or circuit breaker.
Power Supply	Power supply plugs into a standard 120 VAC electrical outlet.
Battery	Nickel-Cadmium 2.4 VDC.
GENERAL	
Dimensions	15.75″ wide × 3″ high × 7.25″ deep.
Weight	5 lbs.

Setup

To set up the ZT-1 Personal Information Terminal you will need enough electrical outlets to power the keyboard and monitor, and a printer, if you use one. You will also need a telephone line with a modular plug and jack. If the telephone has a 4-prong connector or terminal block, you will need to obtain adapters to accept the modular plugs.

To interconnect the keyboard, monitor, telephone and optional printer, refer to the following steps and Figures 2-1, 2-2 and 2-3.

- Disconnect the modular plug from the telephone base and plug it into the WALL jack on the rear of the keyboard. Refer to Figure 2-1.
- Connect the modular phone cable (supplied) to the telephone base and to the PHONE jack on the rear of the keyboard. Refer to Figure 2-1.
- Connect the cable from the monitor to the VIDEO OUTPUT jack on the rear of the keyboard. Refer to Figure 2-1.
- Connect the monitor power cord to an electrical outlet and place the monitor power switch in the On position.
- Connect the keyboard power supply cable to the POWER socket on the rear of the keyboard. Plug the power supply into an 120 VAC electrical receptacle. Refer to Figure 2-1

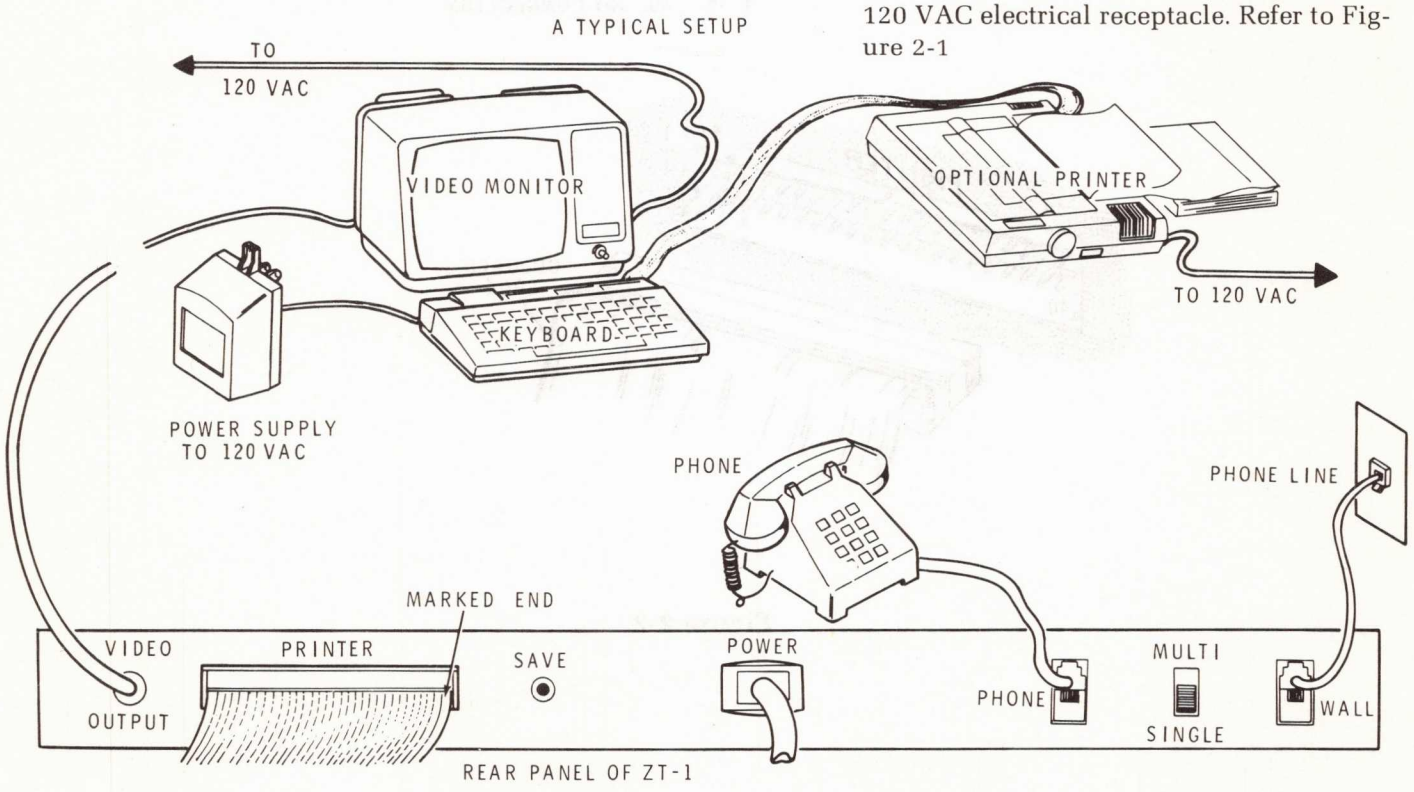


Figure 2-1

- If you use a line printer, connect its cable to the PRINTER socket on the rear of the keyboard and connect its power cord to an electrical outlet. NOTE: The ZT-1 printer port will accept a 3M-3417 series plug (or equivalent). Refer to Figure 2-1 for the keyboard printer socket location. Refer to Figure 2-2 for printer connector pin identification.

ZT-1 PRINTER PART
PLUG-#3m-3417 SERIES OR EQUIVALENT.

	PIN		
DATA STROBE	1.	2.	
(LOW ORDER DATA BIT) D0	3.	4.	
D1	5.	6.	
D2	7.	8.	
D3	9.	10.	GROUND
D4	11.	12.	
D5	13.	14.	
D6	15.	16.	
(HIGH ORDER DATA BIT) D7	17.	18.	
ACKNOWLEDGE	19.	20.	
	21.	22.	
	23.	24.	
	25.	26.	
	27.	28.	NO CONNECTION
NO CONNECTION	29.	30.	
	31.	32.	
	33.	34.	
	35.	36.	
	37.	38.	GROUND
	39.	40.	NO CONNECTION

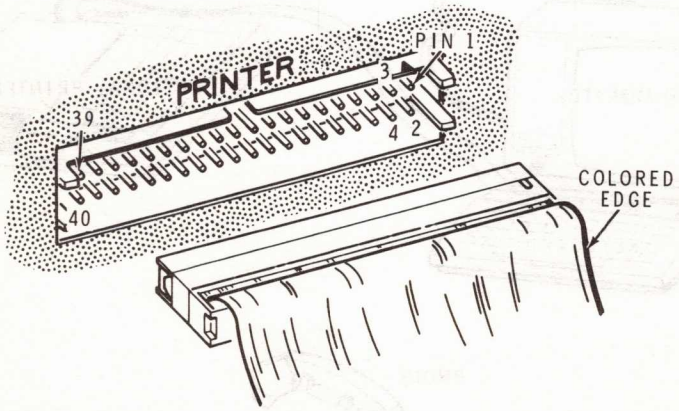


Figure 2-2

- To insure that the power supply remains permanently connected, remove the plate screw from the wall outlet and use it to mount the power supply. Refer to Figure 2-3.

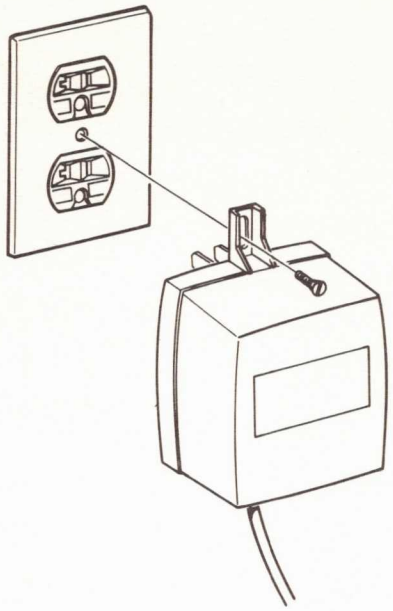


Figure 2-3
Keyboard Power Supply

Operation

This Operation section of the Manual will first familiarize you with the keyboard character and function keys and their affect on the video monitor display. Then, the operation as a terminal will be described with practice examples.

NOTE: With a Menu (Directory and Actions list) displayed on your monitor, the keyboard will respond differently than when you have data, text, or just a blinking cursor displayed. Familiarize yourself with the keyboard and its function and control keys before you attempt to communicate with your Personal Information Terminal.

THE KEYBOARD

The 58-key, typewriter layout keyboard has 26 letters, ten numerals, eleven punctuation and special characters, and twelve control or function keys, as well as four cursor control/action-select keys, as shown in Figure 3-1.

The following paragraphs will describe the operation of the alphabet, numeral, and character keys, since they function differently when unshifted, shifted, and with CAPS LOCK down. Note that all alphabet, numeral, and character keys will repeat if you hold them down for more than a second or two.

Have your keyboard and monitor set up with only the status line (OFF LINE, Clock, and a blinking cursor) showing as you read the following paragraphs. You will become more familiar with the keyboard if you try the keys as they are described.

NOTES:

1. As you become familiar with the keyboard, you will notice that, when a line on the screen is filled, the cursor will automatically move to the beginning of a new line. If you want to end a line and begin a new one, use the RETURN key to move the cursor to the left margin, and the LINE FEED key to start the new line.

2. If you fill the screen with typing, the first line will move upward (scroll), off the top of the screen, and the new line will show at the bottom of the screen. CAUTION: The first line of copy is lost when it scrolls upward. In actual use, you probably would have output the first line before it scrolled upward.

3. While you are practicing on the keyboard, you can use the QUIT and HELP keys to clear the screen and restore the Main Menu. Later in this Operation section, you will learn to use function and control keys to manipulate the display.

4. If you have a printer connected to your ZT-1, be sure its Power switch is in the On position, and it is set to receive, even if you do not intend to print out your copy.

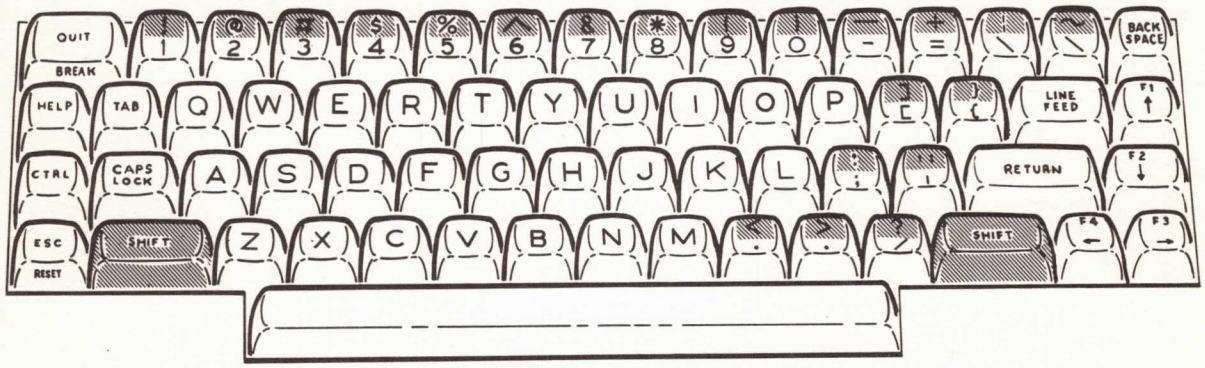


Figure 3-1
Keyboard

ALPHABET KEYS

In normal typing, you will have the CAPS LOCK key up, so lower case letters will be produced by the 26 alphabet keys. If you press an alphabet key while you hold down either of the SHIFT keys, or with the CAPS LOCK key down, upper case or capital letters are produced.

NUMERALS AND OTHER CHARACTERS

Numbers 1 through 0 and characters that are printed on the lower half of the key tops will be produced when you type unshifted or with the CAPS LOCK key up or down. The characters printed on the upper half of the key tops are produced ONLY if you hold down either SHIFT key while you press the character key. These characters are shown shaded in Figure 3-2.

CAPS LOCK

With the CAPS LOCK key down, all letters are produced in capitals or upper case. However, CAPS LOCK does not effect the numerals or characters printed on the lower half of the key tops. To produce the characters that are printed on the upper half of the key tops, you must hold down either SHIFT key while you strike the character.

OTHER TYPING KEYS

RETURN — When the terminal is OFF LINE and only the status lines displayed, the RETURN key moves the cursor to the left edge of the monitor screen. It does not start a new line.

When the terminal ON LINE with a Computer, or with a Menu on the screen, the RETURN key is used after entering data in reply to a prompt, to execute a response.

LINE FEED — Moves the cursor to the next line. The cursor will not go to the beginning of the next line unless you press RETURN and LINE FEED.

BACK SPACE — Moves the cursor one space to the left each time you press the key. If you press the BACK SPACE simultaneously with the CTRL (Control) and SHIFT keys, the cursor will return to the "home" position in the upper left corner of the screen.

TAB — Each tab column is five spaces wide. Each time you press the TAB key, the cursor moves to the first space in the next tab column.

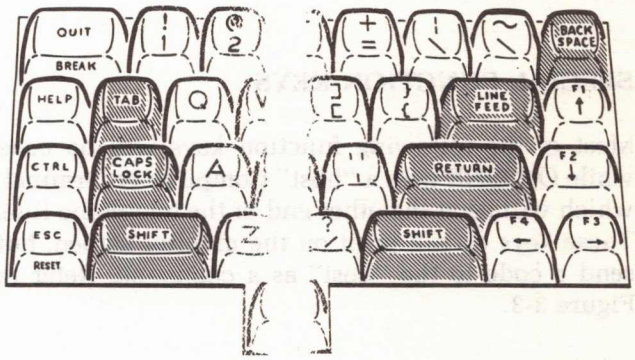


Figure 3-2
Keyboard

CURSOR CONTROL KEYS

The cursor control keys (F_1, F_2, F_3 and F_4) move the cursor up, down, left, or right, as indicated by the arrows printed on them. Each press of the key moves the cursor one character or one line in the direction of the arrow. If you hold the key down, the cursor will move rapidly in the direction of the arrow.

You can also control the cursor by using Escape sequences. Some basic Escape sequences are described under "Special Function Keys", while a complete list of Escape sequences is presented in the Appendix section of this Manual.

Whenever a Menu is displayed on the screen, the cursor control keys operate as Function keys (F_1, F_2, F_3, and F_4), and are used to select actions from the Menu, as will be described later.

NOTE: Up to this point, you have practiced using Cursor Control keys, and keys that produce letters or characters on the monitor screen. All of those keys were described in the OFF LINE mode without a Menu displayed. As you proceed further, you will be introduced to special function keys that control the operation of your terminal. Remember that the QUIT and HELP keys will get you out of trouble and return the Main Menu to the screen if you accidentally press the wrong key.

SPECIAL FUNCTION KEYS

Most of the following function keys will be used while ON LINE with a "host" Computer or terminal, which will be at the other end of the telephone line. These keys do not print on the monitor screen, but send a code to the "host" as a command. Refer to Figure 3-3.

QUIT/BREAK — Tells the terminal (or "host") to "QUIT" the operation in progress and return to a menu. When your keyboard is OFF LINE and a Menu is on the screen, the QUIT key will return the previous Menu to the screen, or if the Main Menu is on the screen, the QUIT key will remove all display except the status line and clock.

When you press the QUIT/BREAK key simultaneously with a SHIFT, a BREAK or interrupt signal is transmitted to the host, but does not QUIT communication.

HELP — If you press the HELP key while OFF LINE and without a Menu on the screen, the Main Menu (Directory and Actions list) will appear. If you press HELP while you are ON LINE with a host, the screen will display a list of available functions and menus from the host.

CTRL (Control) — The CTRL key is used simultaneously with other keys for control functions. For example, if you press CTRL, SHIFT, and space bar simultaneously, you will see the status line change from OFF LINE to ON LINE. Repeat those three keys and the status line will change back to OFF LINE. Other uses of the CTRL key will be described later.

ESC/RESET — The Escape key is used with various other keys to generate commands. You need not hold down the ESC key while you press the accompanying letter or character. However, be sure to press the SHIFT key for capital letters or characters that are printed on the upper half of the key tops.

A complete list of the Escape sequences appears in the Appendix section. The following are examples of some basic Escape sequences.

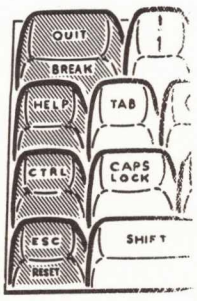


Figure 3-3
Keyboard

Basic Escape Sequences

FUNCTION	ESC
Clear screen display	ESC E
Cursor to home	ESC H (or CTRL BACKSPACE)
Save cursor position	ESC j
Cursor to saved position	ESC k
Insert line	ESC L
Printer ON	ESC a1
Printer OFF	ESC m1
Output page to printer	ESC `

If you simultaneously press the CTRL and ESC keys, you will quickly terminate a call.

CAUTION: If you simultaneously press the SHIFT, ESC, and CTRL keys, you will reset the terminal: The clock will reset to 00:00:00, and any modes or parameters that you might have set will be returned to default or start-up values. DO NOT reset the terminal unless absolutely necessary.

USE AS AN ELECTRONIC TYPEWRITER

This section will discuss the use of your ZT-1 with a printer as an electronic typewriter. If you do not have a printer in your setup, proceed to "The Terminal" on Page 3-6.

With a quality printer connected to your terminal, you can use your information window as a versatile electronic typewriter. You can type a full page (screen full) of copy, edit and correct the copy, and then output the whole page to the printer. Or, you can output dynamically, a line of copy at a time, as you compose on the screen. Even after you have output a line at a time, and composed a full page of copy, you can re-edit and change the copy and then print the page. You can re-output the page for as many copies as you want.

To use the "typewriter" feature:

1. Press the QUIT key to remove all display except the status line from the screen.
2. Be sure the status line shows "OFF LINE". (Press the CTRL, SHIFT, and SPACE BAR keys if necessary.)
3. Press **ESC a1** to turn on the printer if you want each line to print as it is completed, or press **ESC m1** to turn off the printer if you do not want to print until you have composed and edited the page.
4. Compose your copy on the screen. Use the letter, number, and character keys as they were described in the "Keyboard" section of this Manual. Also use the TAB key to indent copy or to center headings, and the RETURN and LINE FEED keys to end lines and start new lines.
5. When you have finished your page of copy, or when you near the bottom of the screen, output the copy to the printer. Press **ESC a1** to turn on the printer, and press **ESC** : to print.

6. If you have more copy to compose, turn off the printer by typing **ESC m1** then clear the screen by typing **ESC E** and compose and output your copy as before.

NOTE: While you are using your terminal as a typewriter, you can use your telephone independently to make or receive voice calls. However, if a data call is received at your terminal, its data carrier will trigger the terminal to ON LINE, and the incoming message will display on your screen.

If you are subject to receiving data calls, you must be careful when you use the terminal as a typewriter. To avoid losing copy that you have typed, in case a data call is received, disconnect the phone line from the terminal and connect it directly to the telephone.

THE TERMINAL

Previous sections of this Manual have told you how to set up your ZT-1 keyboard and the video monitor into a communications terminal, and you were introduced to the keyboard and its characters and commands. This section will further define the commands and show you how to select Actions from the Menu. You will be guided through practice examples to prepare you to communicate with your terminal.

- Press the HELP key and the Main Menu will display with a status line (OFF LINE/ON LINE and other information), a clock, a directory, and a number of Actions, as shown in Figure 3-4.

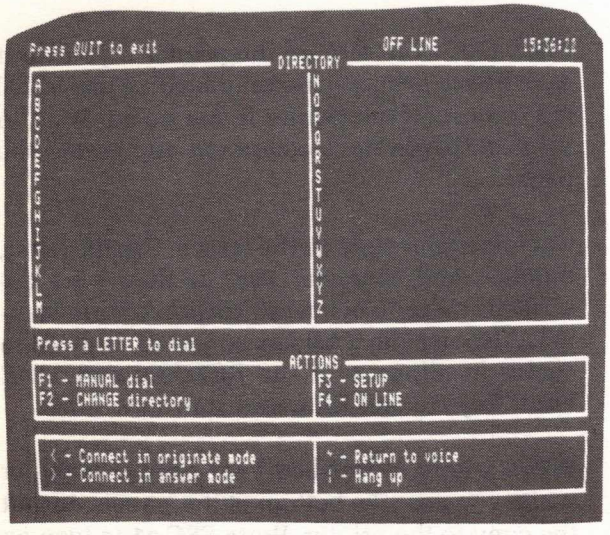


Figure 3-4

THE STATUS LINE

At the top of the monitor screen, a status line indicates whether the terminal is ON LINE or OFF LINE, and a clock shows the time from the point of power-up or reset. The status line and clock will remain on the screen whether or not a Menu is displayed.

THE DIRECTORY

- Press the HELP key, and the directory will appear.

Twenty-six lettered areas appear in the directory. You can store a name and phone number in each of the lettered areas. After you perform the practice examples in using the Action Menu, you will be able to set up the directory with your often-used phone numbers.

ACTIONS MENU

The following pages describe the use of function keys to select actions from the Menu. Refer to Figure 3-5. Read this section carefully and perform the actions as directed.

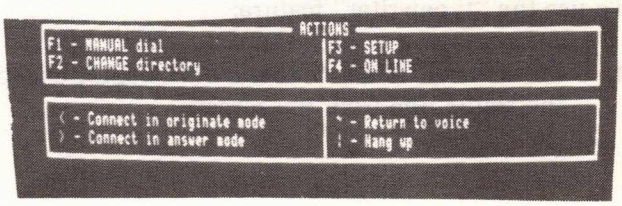


Figure 3-5

- Press the F1 key to select MANUAL DIAL. Note that the directory disappears and the Actions Menu now shows with the cursor flashing after the F3 line. Refer to Figure 3-6.

Figure 3-6

The video display of "dial #" is a cue or prompt that tells you what to do. So, heed the prompt as follows:

- Type the phone number that you wish to dial, then press RETURN. The cursor will disappear.

NOTE: When you dial a voice call, either by Manual dial or from the directory, you must remove the telephone handset from its cradle before the dialing is completed. Otherwise the line will immediately disconnect.

- Press F4 momentarily, and wait. You will hear clicking sounds from your terminal as it "dials" the number.

- Pick up the telephone handset and you will also hear the dialing sounds, just as if you were dialing the number on the phone.

- When your party answers, talk as you normally would, and hang up the hand set when you are through. A few seconds after you hang up, you will hear a click in the terminal as it disconnects the call.

NOTES:

1. If a number had been entered since power was applied or since the terminal was reset, the most recently entered number would display after the prompt "Dial #". To dial that number, simply select F4 and the number will be dialed.

2. To dial another number, select F1, type in the other number, and press RETURN. Then select F4 and the number will be dialed. The most recently dialed number will remain until changed, or until power is removed from the keyboard.

- From the Main Menu ACTIONS, select F3 (Change directory). Note that the Actions now give you the options:

F1 — ADD	F3 — CHANGE
F2 — ERASE	F4 — ERASE ALL

- Select F1 — ADD (directory entry). Think of someone you call frequently and enter their name and phone number as directed in the following steps.

- Press a letter (the initial of the person whose number you are going to enter). The screen will prompt you with "Name:", so type his name and press RETURN.

- After "Number:" type the phone number and a RETURN.

NOTE: The screen now displays "Call Type (Source direct, Telenet, Tymnet, Data, and Voice). If you type "S", "T", or "Y", you can enter "log-on" identification for communicating with those three major computer data banks. "D" is used for data calls to another ZT-1 terminal, and "V" is for voice calls.

- Type "V", since your first practice call should be a voice call.

- The screen now asks if you are sure. Read what you have entered - to be sure. If you notice any errors, type "N" for no and the CHANGE menu will return to the screen. Then you can start over and enter the correct information.

- When you have entered the correct data, type "Y" for yes. Note the use of the SAVE button located on the rear of the keyboard. Hold the SAVE button in while you press RETURN.

The above sequence will repeat, for the storage of more phone numbers, until you press QUIT, or until insufficient memory space remains in the directory. In that case, "OUT OF DIRECTORY SPACE" will display.

- If you have more names and phone numbers you want to enter, repeat the preceding steps.

- Press QUIT to return the Main Menu to the screen, then press the letter of a voice number that you entered. You will hear a clicking sound as the terminal "dials" the number. Be sure to lift the telephone handset from its cradle before dialing stops, or the line will disconnect.

- When your called party answers, converse as you normally would, and hang up the handset when you are through.

You probably noticed how self-explanatory the prompts were as you entered names and numbers in the directory. You will find it just as easy to ERASE, CHANGE, or DELETE ALL from the Actions Menu. Perform the following steps to familiarize yourself with those Actions.

- Select F2 (ERASE) — and follow the prompts that replace the Actions Menu. Erase one of the entries that you made; you can ADD it again later.

- Select F3 (CHANGE) — and follow the prompts.

CAUTION: Do not select F4 (ERASE ALL), unless you are prepared to reenter the numbers you want to save.

- From the Main Menu, select F3 (SET UP). Note that the directory changes to a list of Setup parameters, and the Actions Menu tells you which Function key to press to increase, decrease, or save the changes.

CAUTION: The correct parameters and modes are preset in your terminal when power was first applied. DO NOT change any of these unless you are thoroughly familiar with computer operation.

NOTE: If the "SAVE" button is held in while the RETURN key is pressed, the values in effect at that time will be saved in the battery back-up RAM. If these values are not SAVEd, they will be in effect only until power is removed or until the terminal is reset. Then, the values last saved in back-up RAM will return.

COMMUNICATING

You can use your Personal Information Terminal as a simple telephone dialer for voice calls to frequently-called numbers as well as for data calls to or from other terminals or computers. The terminal does not interfere with normal use of the telephone when it is not ON LINE. When the terminal is in the auto-answer mode, incoming calls will ring the bell and, if it is a data call, its carrier will trigger the terminal ON LINE to start receiving data. If the incoming call does not have the data carrier (is a voice call), the phone will ring till answered or until the calling party hangs up.

MAIN MENU

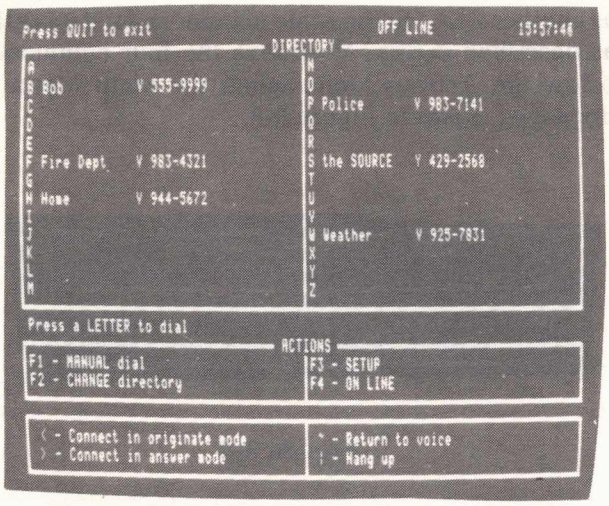


Figure 3-7

VOICE CALLS

With the Main Menu displayed on the monitor, you can dial any of the numbers from the directory by pressing the letter key corresponding to the desired number. Be sure to pick up the phone handset before the dialing is completed. Refer to Figure 3-7.

If the number you want to call is not in your directory, you can dial it on your telephone in the usual way, or you can manually dial the number from the Keyboard as follows:

- Select F1 (MANUAL DIAL) from the Main Menu and enter the number. Then press F2 to designate a voice call. Press RETURN when you are done. If your desired number had been entered in Manual Dial (F3) before, it will show at F3 on the Action Menu. Press F2 to dial the number.

- If a different number shows at F3, you can change it by pressing F3 and typing in the desired number, and pressing RETURN. Then press F2 to designate a voice call, and F3 to dial the number.

DATA CALLS

Data calls are those made to another terminal or to a remote computer. You cannot access (make contact with) data bank computers unless you have subscribed to their service.

When you dial a data call, the terminal generates a "data carrier", or high-pitched tone, that is detected by the receiving computer or terminal. Without the data carrier the host Computer will assume it is a voice call and disconnect.

Data calls are made the same way as voice calls. When you enter the remote computer phone number in the directory, you assign it a letter (S, T, Y, D, or V) which differentiates between data and voice calls. When you dial a data number from the directory, it automatically transmits the data carrier.

If you also enter your terminal identifier and log-on information, the terminal will dial the number and transmit the log-on data for you when you press the letter corresponding to the remote computer phone number.

If you have a printer connected to your terminal, be sure its power switch is turned on and it is ready to print.

If you wish to MANUAL dial a data call from the terminal:

- Display the Main Menu on the monitor screen.

- Select F1 from the Main Menu Actions. If your desired remote terminal or computer number shows at F3, simply press F1 for data call.

- If you wish to call a new number, press F3 type in the new number and a RETURN, press F1 for data call.

NOTE: Be patient after you have dialed. It may take several seconds for the host Computer to "answer", and you will have no indication that the number is ringing. However, your monitor screen will change, and the status line will show ON LINE once the call is connected.

Your telephone handset can be left on its cradle throughout the dialing and communicating on a data call. This will prevent stray noises from interfering with transmitted data, and keep the unintelligible data sounds from being heard from the handset.

Once you have dialed your data number and established contact, the status line on your monitor will change to ON LINE and the directory and Actions Menu will disappear.

From this point on, you will be guided by the messages and prompts on the monitor. Your host Computer will identify itself, and you may be asked for a "password" that will give you access to the data in the host Computer.

If you have subscribed to a data bank or information service, you have been assigned a unique identification code and a "password", and you have been given instructions on how to use the service. Follow those instructions to receive or exchange the data or information you desire.

When the Main Menu is displayed, and you have dialed the remote terminal, watch for the Menu to disappear and the status line to change to ON LINE. If a message appears, read it and follow its direction.

- If no message appears within approximately ten seconds, press the < character (that is SHIFT COMMA). Your terminal is now in the Originate mode.

- Type an appropriate greeting to the remote, such as:

This is George Smith calling 555-5555, Hi: (RETURN) >

Notice that the greeting ended with a RETURN and the command to change to the Answer mode.

- Continue your "conversation" with the remote terminal. Press the < (originate) key each time you wish to send, and complete your message with a RETURN. Then press the > (answer) key to place your terminal in the Answer mode.

When you are through communicating with the host Computer, sign off by typing STOP and RETURN, or by pressing the CTRL and QUIT keys simultaneously. Refer to the instructions supplied by your host Computer service for signing off.

REMOTE TERMINAL

You can communicate with a remote terminal (such as another ZT-1) in the same manner as for data calls, as described earlier. Memorize the four commands below the Actions Menu when the Main Menu is displayed. Refer to Figure 3-8.

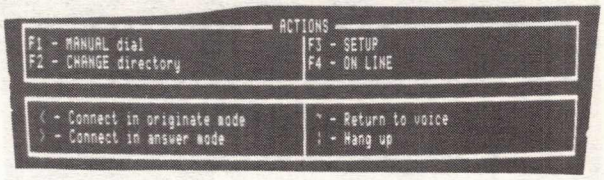


Figure 3-8

- When you are through communicating with the remote, press the ! key to hang up. Then restore your terminal to the Answer mode to await calls that you might receive. If the status line still shows ON LINE, simultaneously press the CTRL, SHIFT, and F4 keys.

If you wish to place another call, you must return the Main Menu to the screen by pressing the HELP key.

When you are not communicating with your terminal, leave it in the Answer mode and OFF LINE. This will enable another terminal to communicate with you.

ZT TERMINAL DIFFERENCES

Three models of the ZT-1 Information Terminal are available. Their only differences are a change in the ROM at U113 on the Terminal Logic Board.

The different ROM's are used to access different computer networks. Refer to the following chart for Model and ROM numbers.

Model	U113	U114
ZTX-1	HE 444-162-1*	HE 444-197
ZTX-1-A	HE 444-188-1**	HE 444-197
ZTX-1-B	HE 444-163***	HE 444-187

* ROM HE 444-162-1 is Generic and is used to access various user defined telecommunication networks.

** ROM HE 444-188-1 is used for Source, a special telecommunications network.

*** ROM HE 444-163 is used for Prime-Fax, a special telecommunications network.

NOTE: You will be notified of any upgrade changes in ROM, and their associated part numbers through the Field Service Bulletins.

PARITY

Parity is the method used for checking transmission accuracy. Transmissions are transmitted with either an odd or an even parity bit. The ROM's used at U113 and U114 allow for selectable parity; that is, they will check for odd or even parity bit.

SERIAL MULTIPLEXER

Modes Of Operation

Serial data from and to the MODEM, the terminal, and the computer serial port is multiplexed to the CPU by U145 and U146. The multiplexers operate in four modes, 0 through 3. The functions of each mode are as follows:

Mode 0 — Connects the MODEM to the terminal, and vice versa.

Mode 1 — Connects the TTL serial local computer port to the terminal, and vice versa. The MODEM is not connected to the terminal in this mode.

Mode 2 — Connects the MODEM to the terminal, and vice versa. Plus, it connects the MODEM to the serial port input, but not the serial port output to the MODEM. This allows information from the phone lines to be stored on magnetic disk.

Mode 3 — Connects the MODEM to the local computer serial port, and vice versa. Plus, the MODEM is connected to the input of the terminal, but the output of the terminal is not connected to the MODEM. This allows information from the phone lines to be monitored on the terminal display.

Change Modes

You may change modes in either OFF-LINE or ON-LINE by pressing the appropriate key combination as described below.

To enter Mode 0, press CTRL-SHIFT-F1.

To enter Mode 1, press CTRL-SHIFT-F2.

To enter Mode 2, press CTRL-SHIFT-F3.

To enter Mode 3, press CTRL-SHIFT-F4.

Baud Rates

Baud rates are selectable. However, when you are using the MODEM in the Terminal, you are restricted to a 300 baud maximum. This restriction applies to Modes 0, 2, and 3.

You may select the baud rate by pressing ESC r then the code letter as listed below.

BAUD RATE	PRESS KEYS
110	ESC r A
150	ESC r B
300	ESC r C
600	ESC r D
1200	ESC r E
2400	ESC r H

Circuit Description

BLOCK DIAGRAM

The Block Diagram in Figure 4-1 gives you a flow of how the various sections relate to each other.

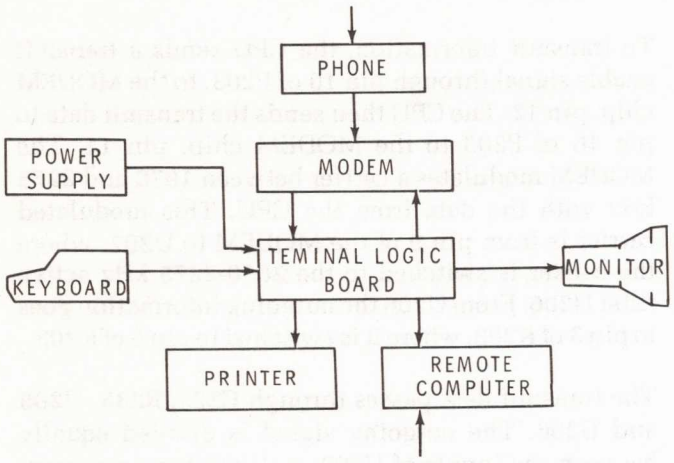


Figure 4-1
Block Diagram

MODEM BOARD

Refer to the MODEM Board Block Diagram, Figure 4-2, as you read this description.

The heart of the MODEM board is the MC14412 MODEM chip (U204). The MODEM chip has a frequency shift keyed (FSK) modulator and demodulator, and can originate and answer calls.

The MODEM chip receives its input from the telephone line interface circuitry. This circuitry isolates the phone lines from the voltage of the terminal. The interface then filters the incoming signals with an active filter network before sending the signal on to be demodulated by the MODEM chip.

The MODEM chip modulates the data received from the terminal logic board, sending the modulated information through another active filter network, and then to the phone lines.

Figure 4-2

MODEM Board Block Diagram

Receive

Refer to the fold-in Schematic Diagram when you are reading this description.

The terminal is connected to the phone line through plugs P201 and P202. Pins 3 and 4 carry information to and from the terminal. Pins 2 and 5 are not used.

When a ringing signal is present on pins 3 and 4, the signal is transmitted through relay K202, C202, D206, opto-isolator U201, and monostable U211. U211 latches the remaining signal and produces a ring detect pulse. The ring detect pulse is sent to the CPU on the terminal logic board through pin 12 of P203.

When the CPU detects a ring detect signal, it returns a mode signal to the MODEM with either a (0) to answer, or a (1) to originate. In this case, the CPU saw a ring detect signal, so it sends a (0) to answer the MODEM.

The mode (0) from the CPU also turns on transistor Q204 which energizes relay K203 in the filter circuit. The CPU also sends an off-hook signal that turns on Q203 on the MODEM board, which energizes relay K202.

When K202 is energized, it sends the incoming signal through diodes D201 through D204. These diodes maintain a positive signal on C203, and a negative signal to pin 3 of transformer T201.

D205 prevents voltage spikes on the line. Q201 maintains a constant current on the line, where C203 blocks DC current, allowing only the pulsed sine waves on the phone lines to reach T201.

T201 connects to C226 on the MODEM board, providing further DC blocking. From there, the signal connects to U206 pin 12, and is then sent to pin 14.

From U206, the signal is switched through U207, which is controlled by Q204 and Q205 on the MODEM board. Whether or not Q205 is turned on depends on whether the mode is originate or answer. The switch (U207) sends the incoming information to the proper filter network. Since we are in the answer mode, the switch sends the information to the 1070-1270 kHz filter, U205. The filtered incoming signals are sent through relay K203, C228, U209 and U211, a monostable that produces a carrier detect signal at CPU pin 6.

The signal from the active filter also goes to C227 and U208, which pass the signal to the MODEM chip, U204. The MODEM demodulates the incoming signal and sends the resulting digital information through pin 7 to pin 16 of plug P203.

Transmit

To transmit information, the CPU sends a transmit enable signal through pin 10 of P203, to the MODEM chip, pin 12. The CPU then sends the transmit data to pin 16 of P203 to the MODEM chip, pin 11. The MODEM modulates a carrier between 1070 and 2275 kHz with the data from the CPU. This modulated carrier is from pin 9 of the MODEM to U207, where the carrier is switched to the 2070-2275 kHz active filter U206. From U206 the outgoing information goes to pin 3 of K203, where it is switched to pin 5 of K203.

The transmit data passes through C225, R238, U205 and U206. The outgoing signal is divided equally between the inputs of U206, so U206 has no output. This prevents feedback of the outgoing information to the active filters. The outgoing data passes through C226, T201, diodes D201-D204, and to the phone line.

TERMINAL LOGIC BOARD

Refer to the Terminal Logic Board Block Diagram, Figure 4-3, as you read this description.

Data and control signals to the terminal logic board enter through the MODEM port. They then pass through the buffer logic, and to the CPU (U117). Using the program in system ROM, the CPU stores the information in RAM (U124 and U125) until there is time for the CPU to process the information.

Data is transmitted faster than the terminal can use it. So, the memory holds the information until the terminal can use it. When the memory becomes full, the CPU sends a "memory full" message to the MODEM.

When the CPU recalls the information it stored, RAM places the data on the address bus, which the CPU reads and processes, acting immediately on command signal and placing display information in the video memory (U126).

The CRT controller (U134) takes data from the video memory by interrupting the CPU and performing a Direct Memory Access (DMA) operation. The controller then sends the display data to the character generator (U135). The character generator translates parallel ASCII data into parallel character pulses. These pulses are converted into serial character pulses (that the CRT can display) by parallel-to-serial shift register (U114). The serial pulses are mixed with horizontal and vertical synchronization signals and sent to the CRT.

Data from the MODEM can also be printed on a printer. The process is similar to the one described above, except that the CRT controller is not involved. Instead, the CPU reads the data in the video memory and sends this ASCII code to the printer.

Information from the keyboard is read by the CPU from the data bus after the data has been read by U211 from the keyboard matrix.

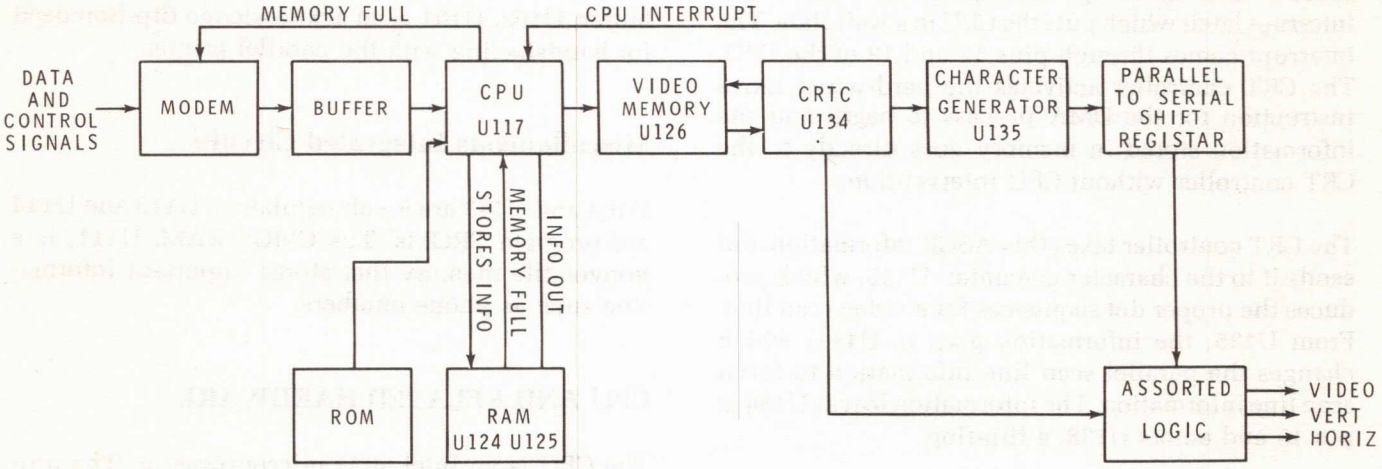


Figure 4-3

Terminal Logic Board Block Diagram

Receive

Refer to the fold-in Schematic Diagram as you read this description.

Input from the MODEM board enters the terminal logic board through pin 15 of the MODEM port. From pin 15, the input data passes through OR gate U116 and AND gate U107. The data is ANDed with the input select pulse from the data select chip U105, which is controlled by the CPU U117. The CPU selects the MODEM input when it detects an off-hook condition. It then enables the data select chip. From U107, the incoming data goes to pin 10 on the CPU, the receive data line. The CPU takes the incoming data, outputs it to the data bus, and stores it in system RAM by first enabling the RAM. Then the CPU puts the address where the data is to be stored on the multiplexed address bus. The CPU puts the first byte of address through U118, the low order address latch. The data for the address latch comes from pins 32-39 on the CPU>. The high order address byte comes from pins 21-28 and go directly to the address bus.

The system RAM is made up of chips U124 and U125. The CPU processes the data from system RAM and stores display data in video RAM. When the video contents are to be displayed, CRT controller U134 sends a DMA interrupt through U128. U128 is the interrupt latch which puts the CPU in a wait state. The interrupt comes through pins 12 and 13 of the CPU. The CRT controller activates the hard-wired move instruction for the DMA process to begin and the information stored in memory goes directly to the CRT controller without CPU intervention.

The CRT controller takes this ASCII information and sends it to the character generator, U135, which produces the proper dot sequences for a video scan line. From U135, the information goes to U141, which changes the parallel scan line information to serial scan line information. The information leaves U134 at pin 13 and enters U138, a flip-flop.

The scan line information is combined with vertical and horizontal CRT signals. These signals come from CRT controller pins 7, 8, 32, 35, 36, and 37. They are latched by U137, U138, and exclusively ORed by U133. The signals are then combined by the open collector buffers U131 and U139. The signals are sent to the base of Q101, which outputs the composite video signal to the CRT.

The clock signal for the board comes from a 14.7656 MHz crystal, which is divided down to 7.3828 MHz by U142.

Transmit

To transmit information, the CPU first enables U121 and U122 and then scans the keyboard matrix by reading U121 and U122. The CPU transmits the information through pin 11 of the CPU. Pin 11 enables the port select chip. The MODEM port is selected by pins 2 and 3 of the port select chip, U105. From there, the outgoing information is sent to U107 and pin 14 of the MODEM port.

The procedure that the CPU uses to activate and control the MODEM was explained in the MODEM board circuit description.

Other Terminal Logic Board Functions

The terminal logic board can also communicate with a parallel printer through the parallel port or with a serial device through the serial port. The parallel printer takes information from the data bus. The information is called by the CPU, placed on the data bus, and sent to the parallel port through the printer buffer, U102. U101 is an acknowledge flip-flop used for handshaking with the parallel printer.

Miscellaneous Integrated Circuits

U104 and U143 are 5-volt regulators. U113 and U114 are program PROMs. The CMOS RAM, U111, is a nonvolatile memory that stores important information such as phone numbers.

CPU AND RELATED HARDWARE

The CPU is an Intel 8031 microprocessor. The program for the CPU is contained in two 2732-type 4K EPROMs, U113 and U114. Addressing of memory is from the CPU, through U118 (and address latch), to the address bus for the lower half of the address. Addressing is performed directly from the CPU to the address bus for the upper half of the address.

Memory mapping and I/O mapping is performed for the CPU by U116, and address decoder.

RESET CIRCUIT

The reset circuit driver (U108, pins 4-6) performs two resets: one for power-up, and the other for a keyboard-activated reset. Pin 5 of U108 is the input for the power-up reset. This pin connects to a time-constant circuit that provides a slow charge of capacitor C106 during power-up. The slow charge keeps the processor in the reset condition until the power supply voltages are stable.

The other reset circuit, which is basically Q102, resets the CPU when the SHIFT, CONTROL, and ESC keys are held down simultaneously.

OSCILLATOR

A 12.96 MHz oscillator is the video dot clock. This clock signal is divided by U142 to provide a 6.48 MHz CPU clock signal and to provide a 1.62 MHz character clock for the CRT controller.

CRT CONTROLLER

An Intel 8275 CRT controller controls the display. Commands arrive to the controller from the CPU through the secondary data bus and the bus transceiver, U119. Data arrives to the controller from the video RAM also via the secondary data bus.

Characters to be displayed on the screen are sent to the character generator, U135, and from there to the video shift register, U141. Synchronization signals are superimposed on the video by combining the three signals at the base of Q101.

For reverse video, pin 1 of U133 is raised to a logic 1, which inverts the normal video signal from U141. The VSP output of U134 is used to enable or disable the character being shifted from U141. Half intensity is implemented by making the HGLT output on the CRT controller high. This gates the active low output of U137, pin 14, to U139, which decreases the maximum voltage that the base of Q101 can receive, thus limiting brightness.

A 3-character "pipeline" or delay exists in the flow from the CRT controller to the CRT. U141 is the first character delay. U137 synchronizes the signal coming from the CRT controller with those comming from U141. U138A is the second character delay, while U138B is third character delay.

U128 is a latch that indicates whether the CPU is performing a DMA operation or not. The latch is set when the CRT controller is accepting a DMA transfer from the video memory, under control of the CPU. For the memory, under control of the CPU. For the CPU to perform a DMA operation, U109 and U112 gate a MOV A,#74 instruction to the CPU via the data bus. The CPU provides the addresses of the video memory that is to be transferred to the CRT controller. When the DMA process is complete, the CRT controller puts a logic 0 on its DRQ pin (pin 5), and U128 clears, causing an interrupt to the CPU that stops the DMA process.

SYNCHRONIZATION SIGNAL GENERATION

U147 generates horizontal synchronization signals using the character clock and the HRTC output of the CRT controller. This synchronization, or "sync" signal, is about four microseconds wise and is delayed by four character clock cycles from the leading edge of the HRTC signal.

U148 generates the vertical sync signals using the horizontal sync signals and the VRTC output of the CRT controller. This signal lasts for a total of four horizontal lines. The signal starts at the end of the eighth horizontal retrace following the leading edge of the VRTC signal.

The vertical and horizontal signals are combined in U133. This results in an inverted horizontal sync signal during vertical retrace, maintaining horizontal oscillator lock during the vertical retrace period. The sync signals are combined with the character signals at Q101, producing a composite video signal at the junction of R126 and R127.

VIDEO RAM

U124, U125, and U126 are the video RAM memory that store screen information. This RAM memory is addressed at locations 4000-4BFF and 6000-6BFF hex. The reason for this is that the DMA operation to the CRT controller occurs at a different address than the data transfer from the CPU to the video memory, allowing simplified decoding of the enable signals for bus transceiver U119.

CMOS RAM

U111 is a 4-bit RAM powered by battery B101. This RAM contains phone numbers and log-on sequences for use with time-sharing computer services. This RAM is addressed at locations 3000-33FF hex.

KEYBOARD PORT

The keyboard port consists of a 3-to-8 line decoder (U121) and two bus buffers (U122 and U123). Firmware detects an input from U122 or U123 that indicates a key closure. The position of the key when it is closed is determined by scanning the addresses 0-7. Debouncing of the keyboard is handled by the firmware.

PRINTER PORT

Data for the printer port is latched through U102, an 8-bit parallel latch. Data is strobed through this latch by the CPU's port 1, bit 6. When an acknowledgement signal is received from the printer, the latch is cleared. When the latch is cleared, the CPU can send more data. The printer port is addressed from the 2000-2FFF hex.

BELL

A bell tone is produced by dividing the horizontal oscillator frequency output of the CRT controller by 16, using U129.

This output is routed through inverter U132 and connected to transducer TD101. To activate the bell, the T1 output of the CPU is made logic 1, which causes counter U129 to begin counting. The counting occurs at a 1000 Hz rate, which is the tone of the bell. To deactivate the bell, the T1 output of the CPU is held low, or at a logic 0.

Disassembly

To remove the keyboard, you must first remove the four screws on the bottom that hold the terminal cover in place. Then, lift off the cover. You may now lift up the keyboard and disconnect the harness connector. Refer to Figure 5-1.

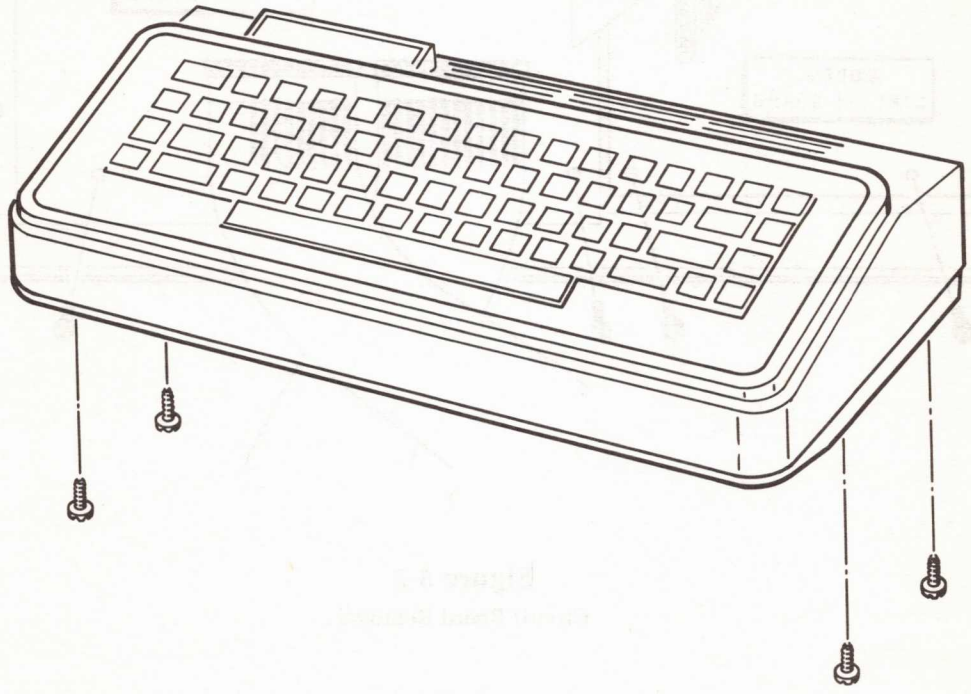


Figure 5-1
Keyboard Disassembly

CIRCUIT BOARDS

MODEM Board

To remove the MODEM board, first remove the keyboard. Then remove the screws that hold the circuit board in place and lift out the MODEM board. Refer to Figure 5-2.

Terminal Logic Board

To remove the terminal logic board, first remove the keyboard. Then remove the screws to the capacitor bracket and remove bracket. Next remove the screws that hold the circuit board in place and lift out the MODEM board. Refer to Figure 5-2.

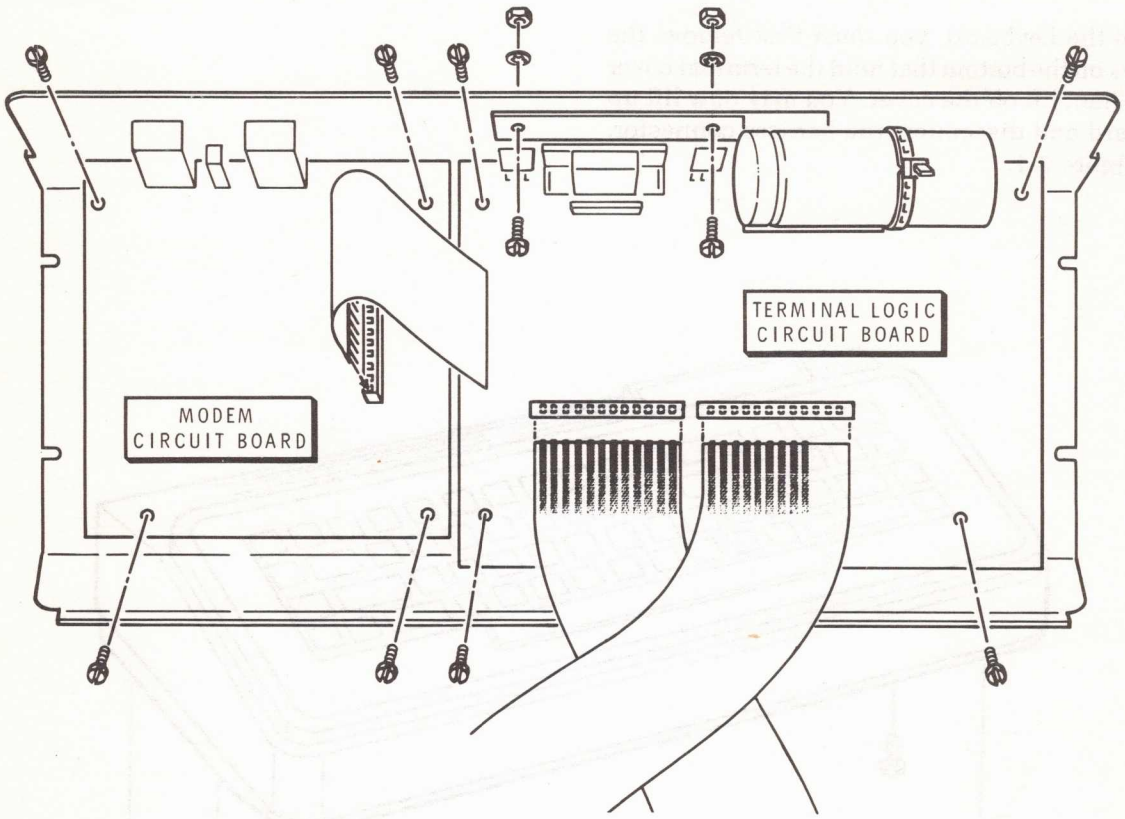


Figure 5-2
Circuit Board Removal

Service

QUICK CHECKS

When you are servicing this unit, you should make sure the unit is properly set up. Use the following Quick Checks to help you systematically check the setup.

- Check to see that the power supply is plugged into a 115 VAC/60 Hz electrical outlet.
- Check to see that there is 115 VAC present at the outlet.
- Measure the output voltage of the external power supply. Refer to Figure 6-1.
- Check to see that proper cable connection are made to the terminal and to the peripheral equipment such as the monitor, printer and remote computer.

At this point, you have determined the unit is properly set up and is receiving the proper voltage.

Pin No.	Power Supply Output
5-1	6.8 VAC
5-4	18 VAC
5-6	5.5 VAC
5-9	9 VAC

Figure 6-1

POWER SUPPLY

The power supply is a wall-mounted power transformer that supplies approximately 18 volts AC, (center-tapped) through a 9-pin power connector to the back of the terminal. Refer to Figure 6-1.

Voltage Checks

Refer to the MODEM board schematic and check the supply voltage points for the VCC +5 VDC, +12 VDC and −12 VDC. If these voltages are not present, check to see that P203 is properly seated in the MODEM board socket.

TERMINAL LOGIC BOARD

Voltage Checks

If the supply voltages are incorrect or not present on the MODEM board, then check the voltages at S103 on the Terminal Logic board. Refer to Figure 6-2.

The power supply section on the Terminal Logic board consists of D101, D102, D103, D104, C101, C102, C103, C104, and regulators U143 and U104.

The input voltage to U143 and U104 is +12 VDC, with approximately .4 V ripple. The output voltage is +5 VDC, with negligible ripple voltage.

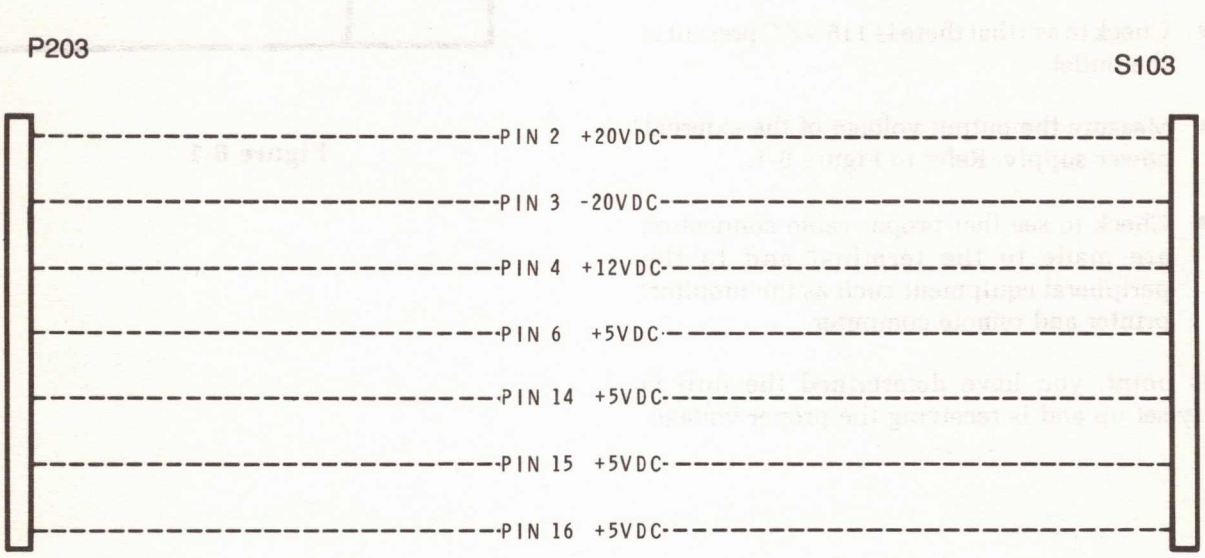


Figure 6-2

Video Output

You can check the vertical sync pulse at pin 9 of U133 (see Figure 6-3), and the horizontal sync pulse at pin 10 of U133 (see Figure 6-4).

If the Video RAM is defective, a blank screen will appear on the monitor screen.

Figure 6-3
Vertical Sync Pulse

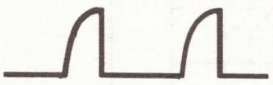


Figure 6-4
Horizontal Sync Pulse

The first half of the Video RAM is located in U126. The other half is located in U124 and U125. If U126 is defective, you will see the top portion of the screen go blank. However, if you scroll the screen, the blank portion will jump to the bottom.

With a good monitor and no video present, the terminal logic board should be replaced.

MODEM BOARD

NOTE: Due to FCC regulations, field service of the MODEM board is prohibited. If the MODEM board needs to be serviced, it must be replaced. The original board must be sent back to ZDS for factory service.

MODEM Board Test

To test the MODEM board, listen to the phone receiver as you perform the following steps.

- Reset — Press (CTRL ESC SHIFT).
- Press (HELP).
- Press (<) — This is the Originate tone carrier, which you hear in the receiver.*
- Press (SHIFT QUIT) and listen to the tone change.*
- Repeat the first two steps.
- Press (>) — This is Answer tone carrier.*
- Press (SHIFT QUIT) and listen to the tone change.*
- Dial a phone number either manually or through the Menu.
- Listen to the clicks on the receiver.

If any of these steps fail, replace the MODEM board.

Character Generator

The character generator controls the key click. Pressing the keys and receiving a key click indicates that the character generator is probably running properly.

*NOTE: In some electronic phone systems you may not be able to hear a tone. In this case, you should install a "Y" fitting to connect a phone receiver in parallel with the ZT-1 Terminal so that you may hear the tones.

KEYBOARD

To check the operation of the keyboard keys, refer to the keyboard matrix in Figure 6-5. Place the leads of your ohmmeter on the corresponding leads from S101 and S102. Depress the key and watch your ohmmeter for continuity.

If there is a defective keyboard switch, the keyboard must be replaced, as the keyboard is a sealed unit and it is not possible to replace the individual switches.

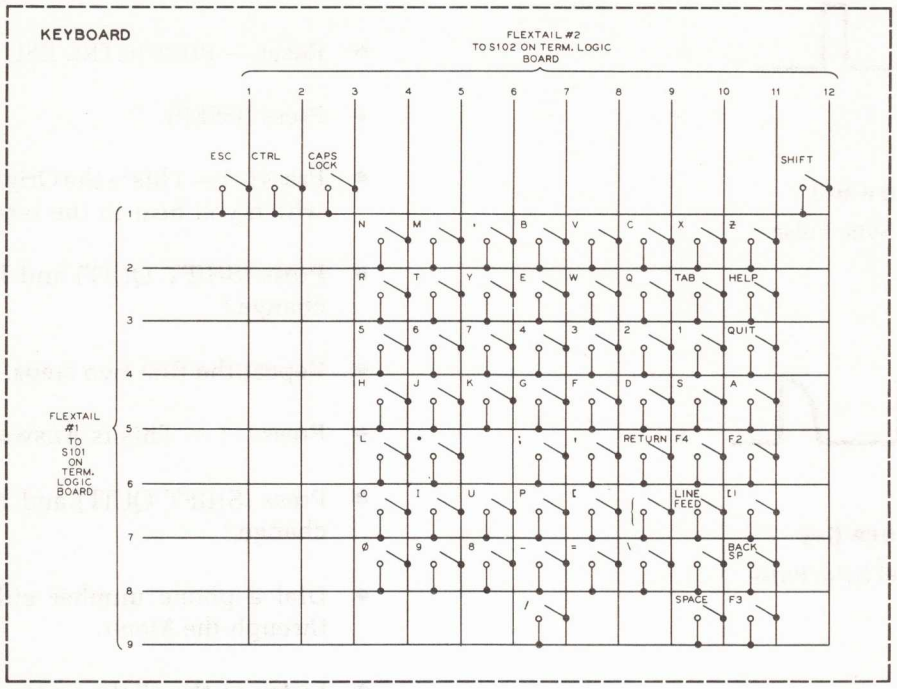
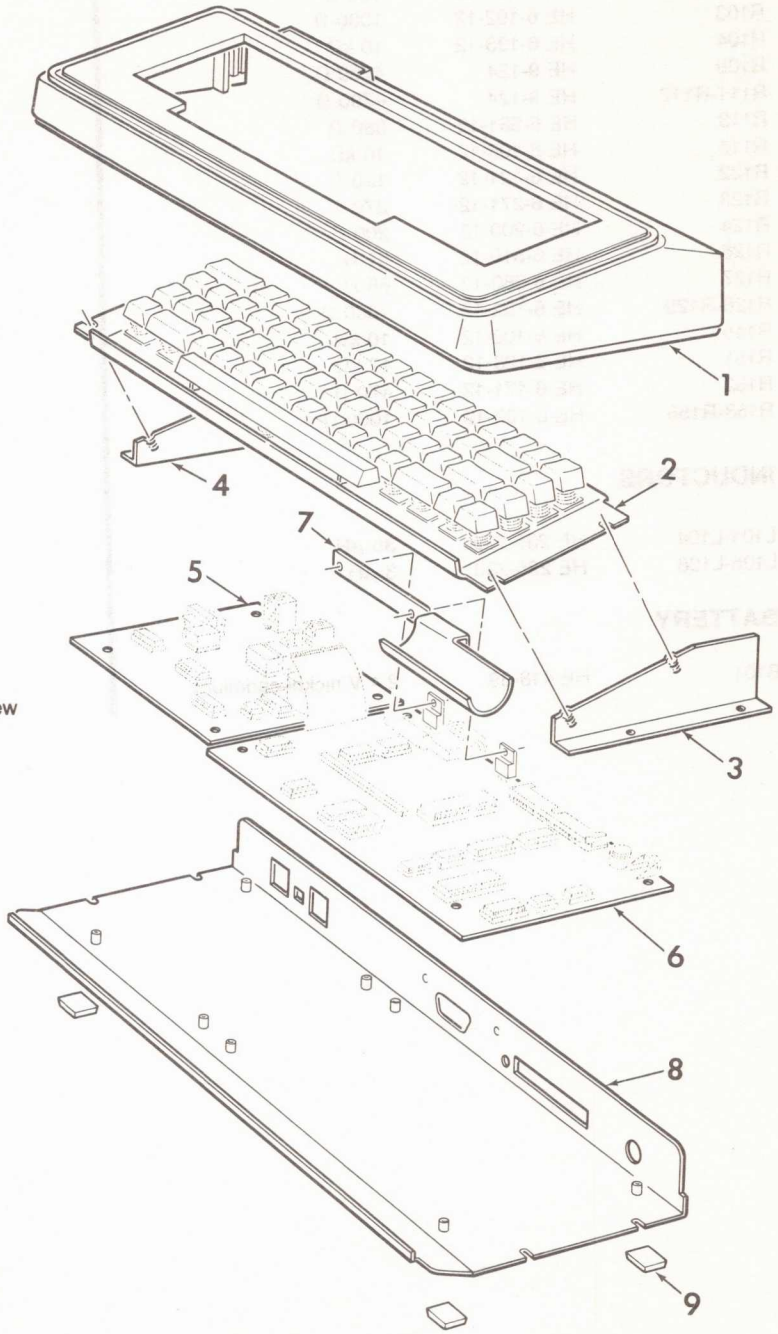


Figure 6-5
Keyboard Matrix

Replacement Parts List

KEY No.	PART No.	DESCRIPTION
1	HE 92-893	Cover
2	HE 64-893	Keyboard assembly
3	HE 204-2578	Right bracket
4	HE 204-2579	Left bracket
5	HE 181-3746	MODEM board
6	HE 181-4075	Terminal logic board
7	HE 204-2621	Capacitor bracket
8	HE 205-1874-1	Base
9	HE 261-49	Foot
—	HE 134-1185	4-conductor telephone cable
—	HE 134-1188	1-conductor video cable
—	HE 347-83	16-conductor cable
—	HE 434-357	Phone socket
—	HE 60-654	Pushbutton switch
—	HE 64-895	Slide switch
—	HE 434-359	Phone jack
—	HE 250-1263	#6 × 3/8″ sheet metal phillips screw
—	HE 250-1280	6-32 × 3/8″ phillips screw
—	HE 250-1322	#6 × 5/8″ sheet metal phillips screw
—	HE 250-1361	4-40 × 1/4″ hex screw
—	HE 252-3	6-32 × 1/4″ nut



TERMINAL LOGIC BOARD
(Assembled HE 181-4075)

RESISTORS

All resistors are 1/4 W, 5%.

CIRCUIT Comp. No.	PART No.	DESCRIPTION
R101	HE 6-101-12	100 Ω
R103	HE 6-102-12	1000 Ω
R104	HE 6-103-12	10 kΩ
R109	HE 9-124	4700 Ω
R111-R112	HE 9-124	4700 Ω
R113	HE 6-681-12	680 Ω
R115	HE 6-103-12	10 kΩ
R122	HE 6-121-12	120 Ω
R123	HE 6-271-12	270 Ω
R124	HE 6-200-12	200 Ω
R126	HE 6-510-12	51 Ω
R127	HE 6-680-12	68 Ω
R128-R129	HE 6-102-12	1000 Ω
R145	HE 6-103-12	10 kΩ
R151	HE 6-123-12	12 kΩ
R152	HE 6-471-12	470 Ω
R153-R155	HE 6-102-12	1000 Ω

INDUCTORS

L101-L104	HE 235-229	35 μH
L105-L106	HE 235-230	3 μH

BATTERY

B101	HE 418-39	2.4 V nickel-cadmium

CAPACITORS

CIRCUIT Comp. No.	PART No.	DESCRIPTION
C101-C102	HE 25-195	2.2 μF, 15 V
C103-C104	HE 25-221	2.2 μF, 20 V
C105	HE 25-902	10,000 μF
C106	HE 25-915	47 μF
C107	HE 25-900	1 μF
C108	HE 20-103	150 pF
C109	HE 25-195	.01 μF
C110	HE 20-101	47 pF
C111-C119	HE 21-769	.01 μF
C120	HE 25-195	2.2 μF
C121-C126	HE 21-769	.01 μF
C128-C129	HE 21-769	.01 μF
C131	HE 21-769	.01 μF
C134-C139	HE 21-769	.01 μF
C142-C144	HE 21-769	.01 μF
C146-C152	HE 21-769	.01 μF
C154	HE 25-195	2.2 μF
C157	HE 20-107	47 pF
C158-C159	HE 21-711	470 pF

SEMICONDUCTORS

See "Semiconductor Identification".

MODEM BOARD

(Assembled HE 181-3746)

RESISTORS

CIRCUIT Comp. No.	PART No.	DESCRIPTION
R201-R202	HE 6-229-12	2.2 Ω
R203	HE 6-102-12	1000 Ω
R204	HE 6-682-12	6800 Ω
R206	HE 6-561-12	560 Ω
R207	HE 6-271-12	270 Ω
R208	HE 6-561-12	560 Ω
R209	HE 6-271-12	270 Ω
R211	HE 6-561-12	560 Ω
R212	HE 6-271-12	270 Ω
R213	HE 6-472-12	4700 Ω
R215	HE 1-194-12	15 MΩ
R216	HE 6-102-12	1000 Ω
R217	HE 6-1502-12	15 kΩ
R218	HE 6-8450-12	845 Ω
R219	HE 6-1653-12	165 kΩ
R221	HE 6-2152-12	21.5 kΩ
R222	HE 6-1241-12	1240 Ω
R223	HE 6-2373-12	237 kΩ
R224	HE 6-8871-12	8870 Ω
R225	HE 6-2551-12	2550 Ω
R226	HE 6-9762-12	97.6 kΩ
R227	HE 6-1502-12	15 kΩ
R228	HE 6-2670-12	267 Ω
R229	HE 6-1653-12	165 kΩ
R231	HE 6-1872-12	18.7 kΩ
R232	HE 6-3160-12	316 Ω
R233	HE 6-2103-12	210 kΩ
R234	HE 6-8661-12	8660 Ω
R235	HE 6-6190-12	619 Ω
R236	HE 6-9532-12	95.3 kΩ
R237	HE 6-6812-12	68.1 kΩ
R238	HE 10-1176	100 kΩ
R239	HE 6-1003-12	100 kΩ
R241	HE 6-1503-12	150 kΩ
R242	HE 6-103-12	10 kΩ
R243	HE 6-6040-12	604 Ω
R244-R245	HE 6-103-12	10 kΩ
R246-R247	HE 6-1003-12	100 kΩ
R248	HE 6-1004-12	1 MΩ
R249	HE 6-273-12	27 kΩ
R251	HE 6-104-12	100 kΩ
R252	HE 6-103-12	10 kΩ
R253	HE 6-104-12	100 kΩ
R254	HE 6-103-12	10 kΩ
R255	HE 6-105-12	1 MΩ
R256	HE 6-684-12	680 kΩ
R257	HE 6-472-12	4700 Ω
R259	HE 6-103-12	10 kΩ
R261	HE 6-472-12	4700 Ω
R262	HE 6-102-12	1000 Ω

CAPACITORS

CIRCUIT Comp. No.	PART No.	DESCRIPTION
C201	HE 27-193	.047 μF
C202	HE 27-130	.22 μF
C203	HE 25-299	1.5 μF
C204	HE 25-942	220 μF
C205	HE 25-917	10 μF
C206	HE 25-942	220 μF
C207-C208	HE 25-917	10 μF
C211	HE 21-769	.01 μF
C212-C219	HE 29-67	.01 μF
C221-C224	HE 29-67	.01 μF
C225	HE 27-189	.1 μF
C226	HE 25-917	10 μF
C227-C228	HE 27-189	.1 μF
C229	HE 27-63	.022 μF
C231	HE 25-858	.33 μF
C232-C236	HE 21-769	.01 μF
C238	HE 21-769	.01 μF

INDUCTORS

L201-L208	HE 235-229	35 μH

CRYSTALS, RELAYS

X201	HE 404-636	Crystal 1 MHz
K201-K203	HE 69-105	DPPT relay, 50 mA

SEMICONDUCTORS

See "Semiconductor Identification".

Semiconductor Identification

COMPONENT NUMBER INDEX

MODEM BOARD

CIRCUIT Comp. No.	PART No.
D201-D204	HE 57-65
D205	HE 56-25
D206	HE 57-65
D207-D209	HE 56-652
Q201	HE 417-809
Q202	HE 417-875
Q203	HE 417-875
Q204	HE 417-875
Q205	HE 417-875
Q206	HE 417-874
U201	HE 443-908
U202	HE 442-644
U203	HE 442-646
U204	HE 442-735
U205	HE 442-737
U206	HE 442-737
U207	HE 442-99
U208	HE 442-75
U209	HE 442-75
U211	HE 443-916

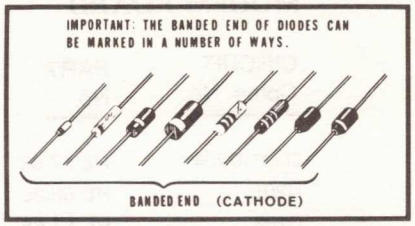
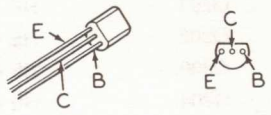
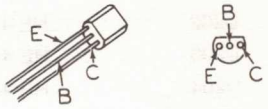
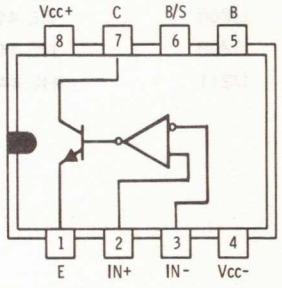
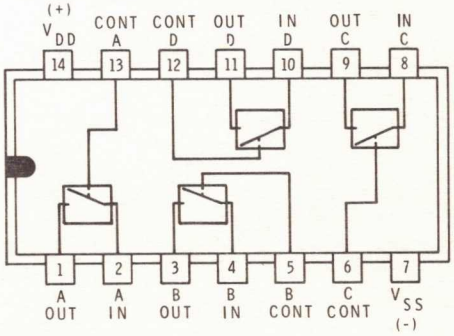
TERMINAL LOGIC BOARD

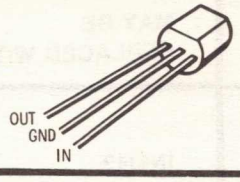
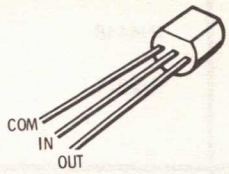
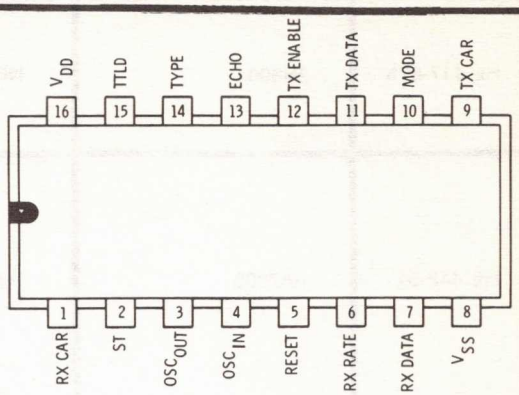
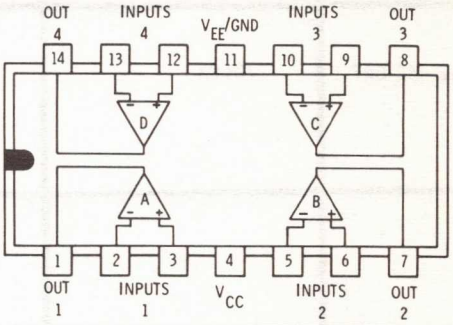
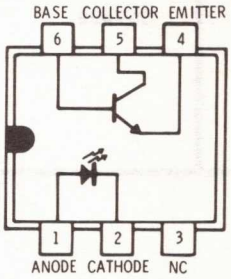
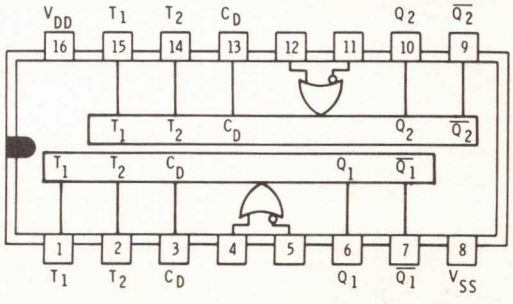
	CIRCUIT Comp. No.	PART No.
	D101-D104	HE 57-27
	D105-D108	HE 56-652
	D109	HE 56-56
	D111-D112	HE 56-652
	D121-D124	HE 56-56
	Q101-Q102	HE 417-875
	U101	HE 443-730
	U102	HE 443-837
	U103	HE 443-779
	U104	HE 442-54
	U106	HE 443-875
	U107	HE 443-780
	U108	HE 443-728
	U109	HE 443-1024
	U111	HE 443-1043
	U112	HE 443-1024
*	U113	HE 444-162-ZTX-1 HE 444-188-ZTX-1-A HE 444-163-ZTX-1-B
	U114	HE 444-187
	U115	HE 443-875
	U116	HE 443-877
	U117	HE 443-1025
	U118	HE 443-837
	U119	HE 443-885
	U121	HE 443-902
	U122-U123	HE 443-1024
	U124-U125	HE 443-764
	U126	HE 443-1027
	U127	HE 443-1056
	U128	HE 443-730
	U129	HE 443-838
	U131	HE 443-780
	U132	HE 443-797
	U133	HE 443-891
	U134	HE 443-1026
	U135	HE 444-92
	U136	HE 443-755
	U137	HE 443-752
	U138	HE 443-1031
	U139	HE 443-89
	U141	HE 443-892
	U142	HE 443-757
	U143	HE 442-54
	U145-U146	HE 443-955
	U147-U148	HE 443-815

* Check your Field Service Bulletins for possible ROM changes

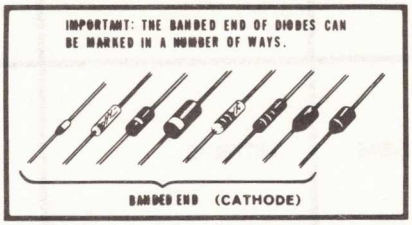
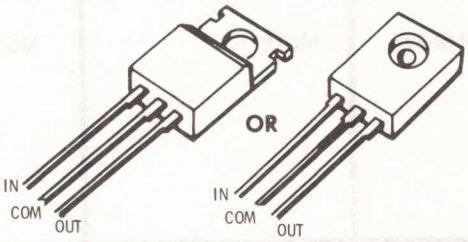
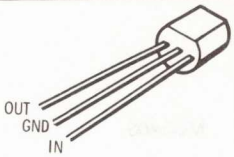
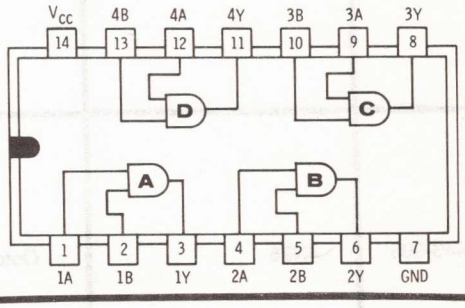
PART NUMBER INDEX

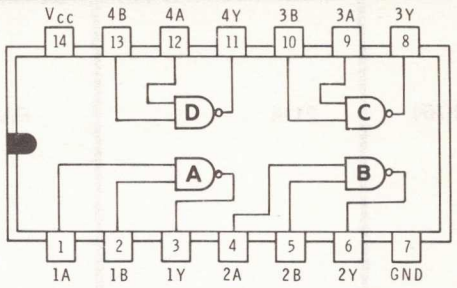
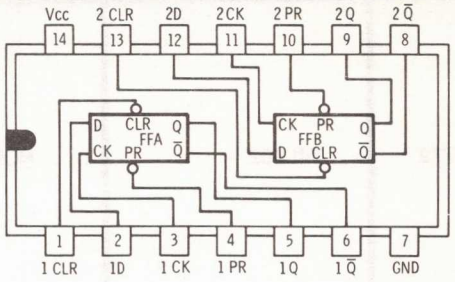
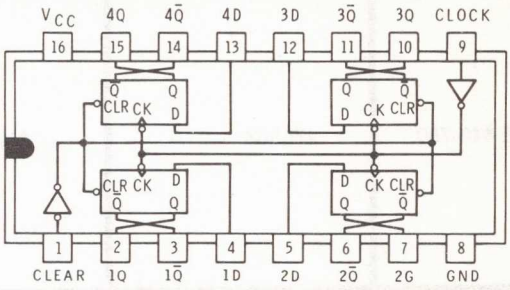
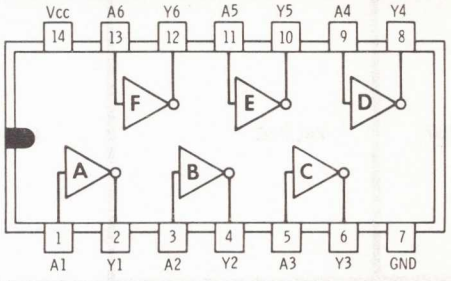
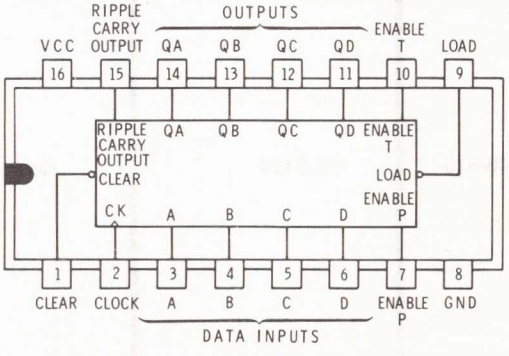
MODEM BOARD

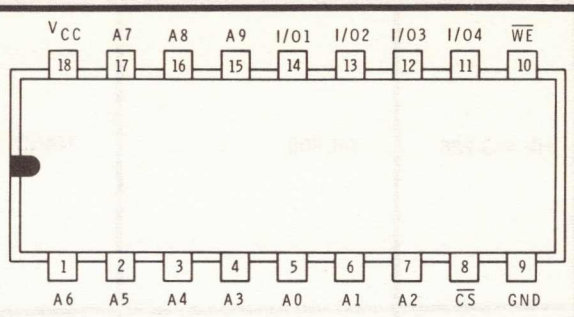
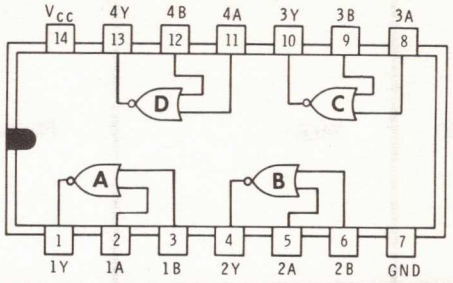
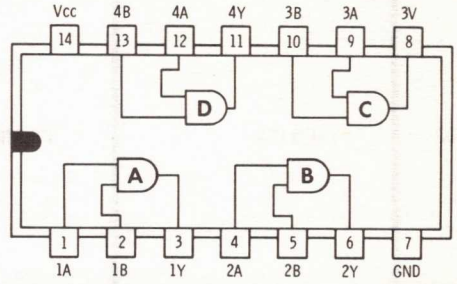
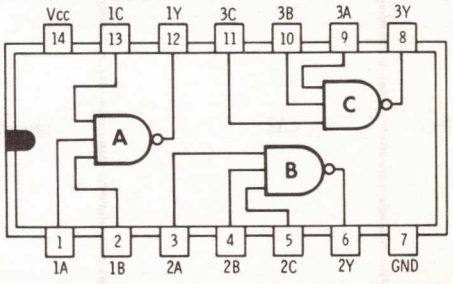
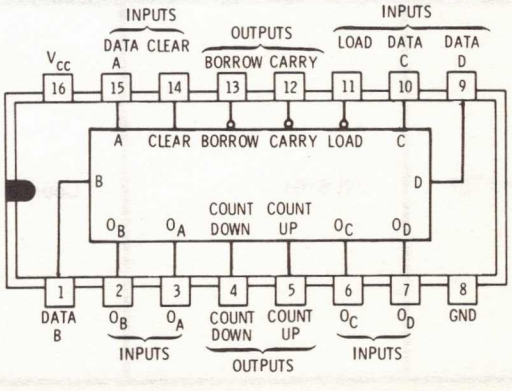
PART NO.	MAY BE REPLACED WITH	DESCRIPTION	IDENTIFICATION
HE 56-25 HE 56-652 HE 57-65	1N4166A 1N4448 1N4002	Zener diode Diode Diode	
HE 417-809	2N3704	NPN Transistor	
HE 417-874 HE 417-875	2N3906 2N3904	PNP Transistor NPN Transistor	
HE 442-75	LM311	Comparator	
HE 442-99	CD4016	Electronic switch	

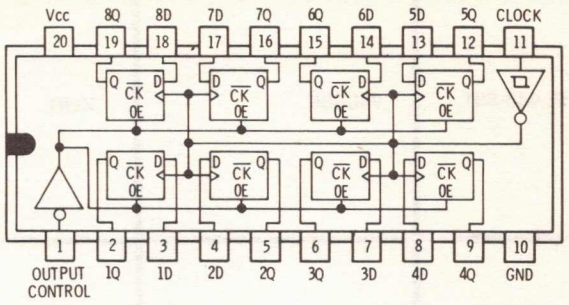
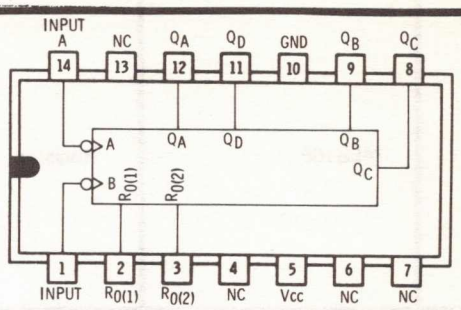
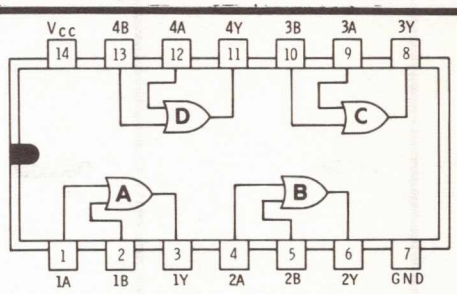
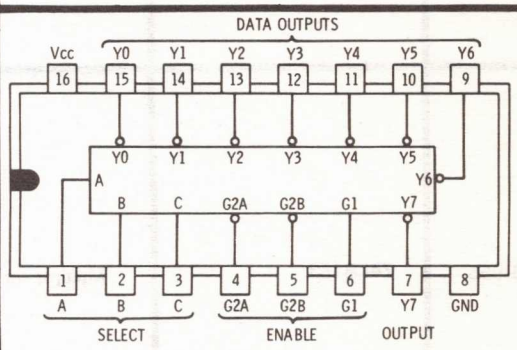
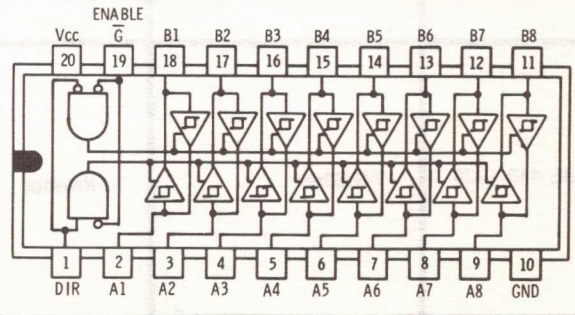
PART NO.	MAY BE REPLACED WITH	DESCRIPTION	IDENTIFICATION
HE 442-644	LM78L12	+12 V Regulator	
HE 442-646	MC79L12	−12 V Regulator	
HE 442-735	MC14412	MODEM	
HE 442-737	MC3403	OPAMP	
HE 443-908	4N25	Optoisolator	
HE 443-916	MC14538	Multivibrator	

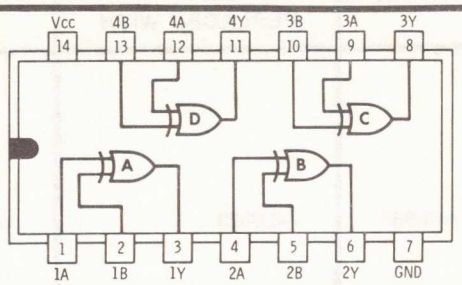
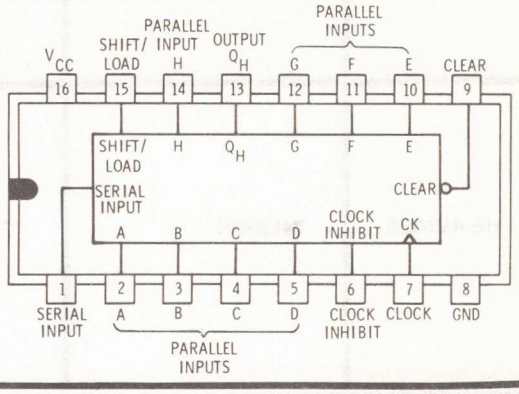
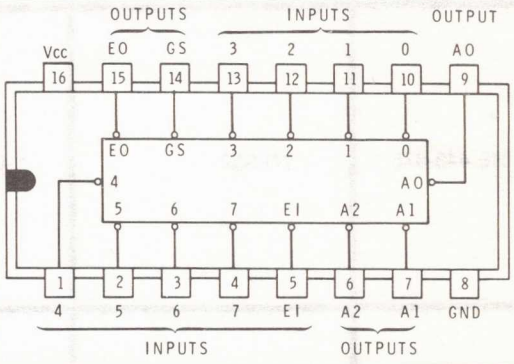
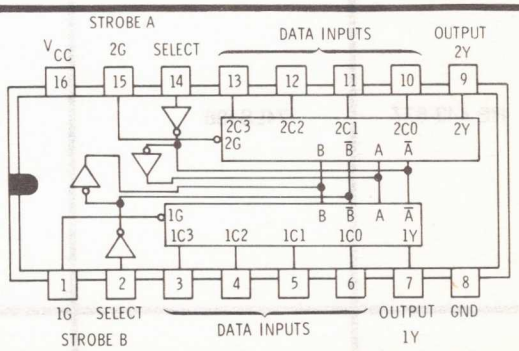
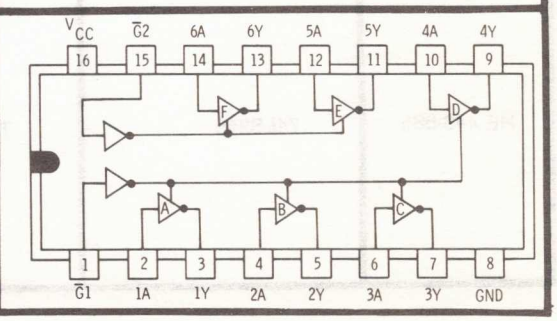
TERMINAL LOGIC BOARD

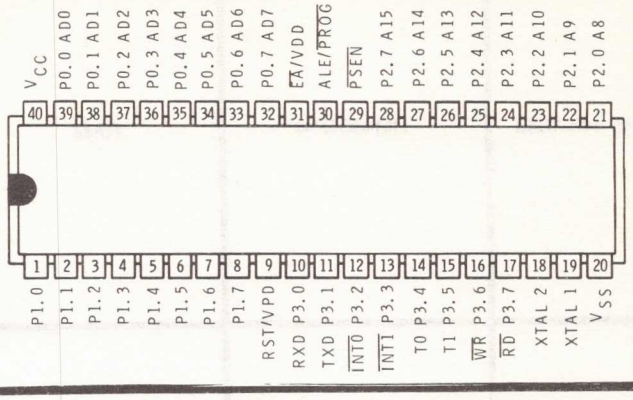
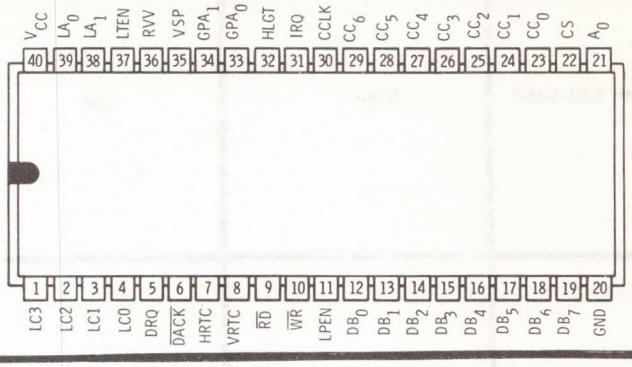
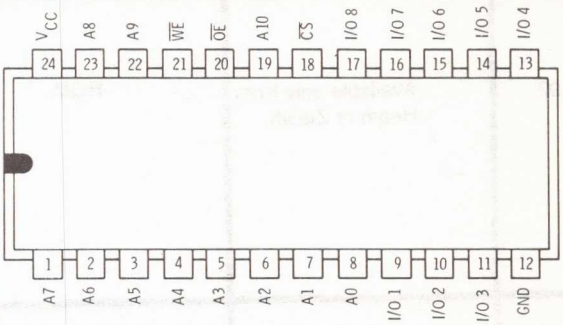
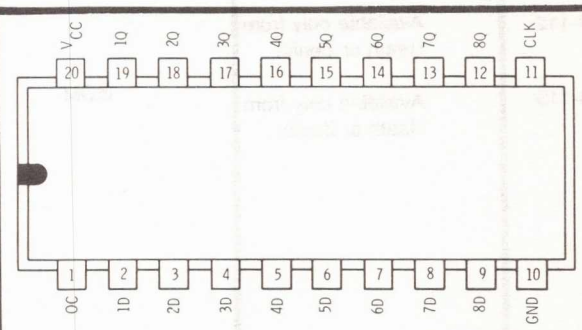
PART NO.	MAY BE REPLACED WITH	DESCRIPTION	IDENTIFICATION
HE 56-56 HE 56-652 HE 57-27	1N4149 1N4448 1N2071	Diode Diode Diode	
HE 417-875	2N3904	NPN Transistor	
HE 442-54	μA7805	+5 V Regulator	
HE 442-627	78L05	+5 V Regulator	
HE 443-89	SN7409	NAND	

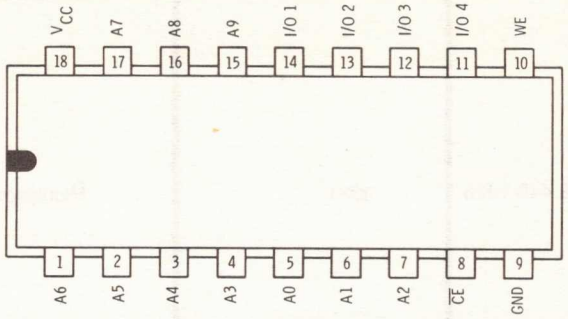
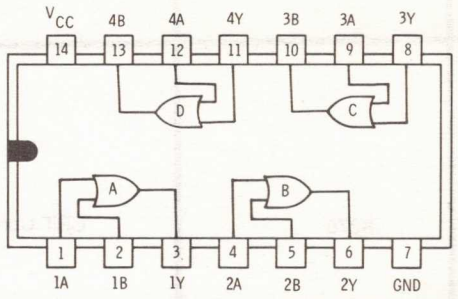
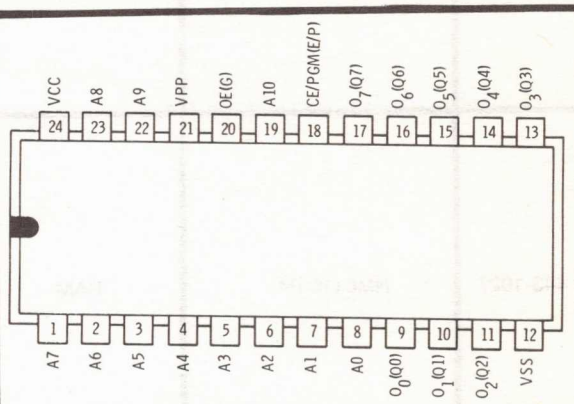
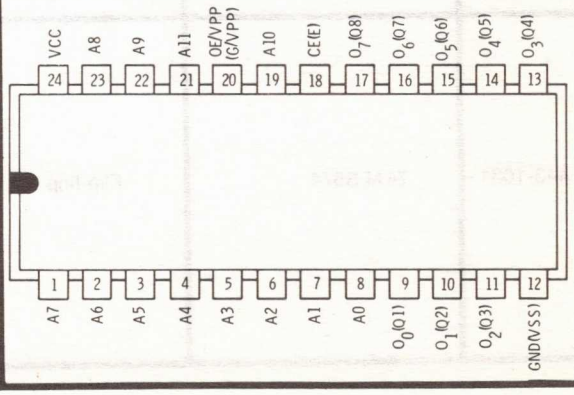
PART NO.	MAY BE REPLACED WITH	DESCRIPTION	IDENTIFICATION
HE 443-728	74LS00	NAND	
HE 443-730	74LS74	Flip-flop	
HE 443-752	74LS175	Flip-flop	
HE 443-755	74LS04	Inverter	
HE 443-757	74LS161	Counter	

PART NO.	MAY BE REPLACED WITH	DESCRIPTION	IDENTIFICATION
HE 443-764	2114	RAM	
HE 443-779	74LS02	NOR	
HE 443-780	47LS08	AND	
HE 443-797	74LS10	NAND	
HE 443-815	74LS193	Counter	

PART NO.	MAY BE REPLACED WITH	DESCRIPTION	IDENTIFICATION
HE 443-837	74LS373	Latch	
HE 443-838	74LS93N	Counter	
HE 443-875	74LS32	OR	
HE 443-877	74LS138	Decoder	
HE 443-885	74LS245	Transceiver	

PART NO.	MAY BE REPLACED WITH	DESCRIPTION	IDENTIFICATION
HE 443-891	74LS86	XOR	
HE 443-892	74LS166	Register	
HE 443-902	74156	Decoder	
HE 443-955	74LS153	Multiplexer	
HE 443-1024	74LS368	Inverter	

PART NO.	MAY BE REPLACED WITH	DESCRIPTION	IDENTIFICATION
HE 443-1025	8031	Microprocessor	
HE 443-1026	8275	CRT Controller	
HE 443-1027	HM6116-P4	RAM	
HE 443-1031	74ALS574	Flip-flop	

PART NO.	MAY BE REPLACED WITH	DESCRIPTION	IDENTIFICATION
HE 443-1043	HM4334P-4	RAM	
HE 443-1056	7432	OR	
HE 444-92	Available only from Heath or Zenith.	ROM	
HE 444-112 HE 444-113	Available only from Heath or Zenith. Available only from Heath or Zenith.	ROM	

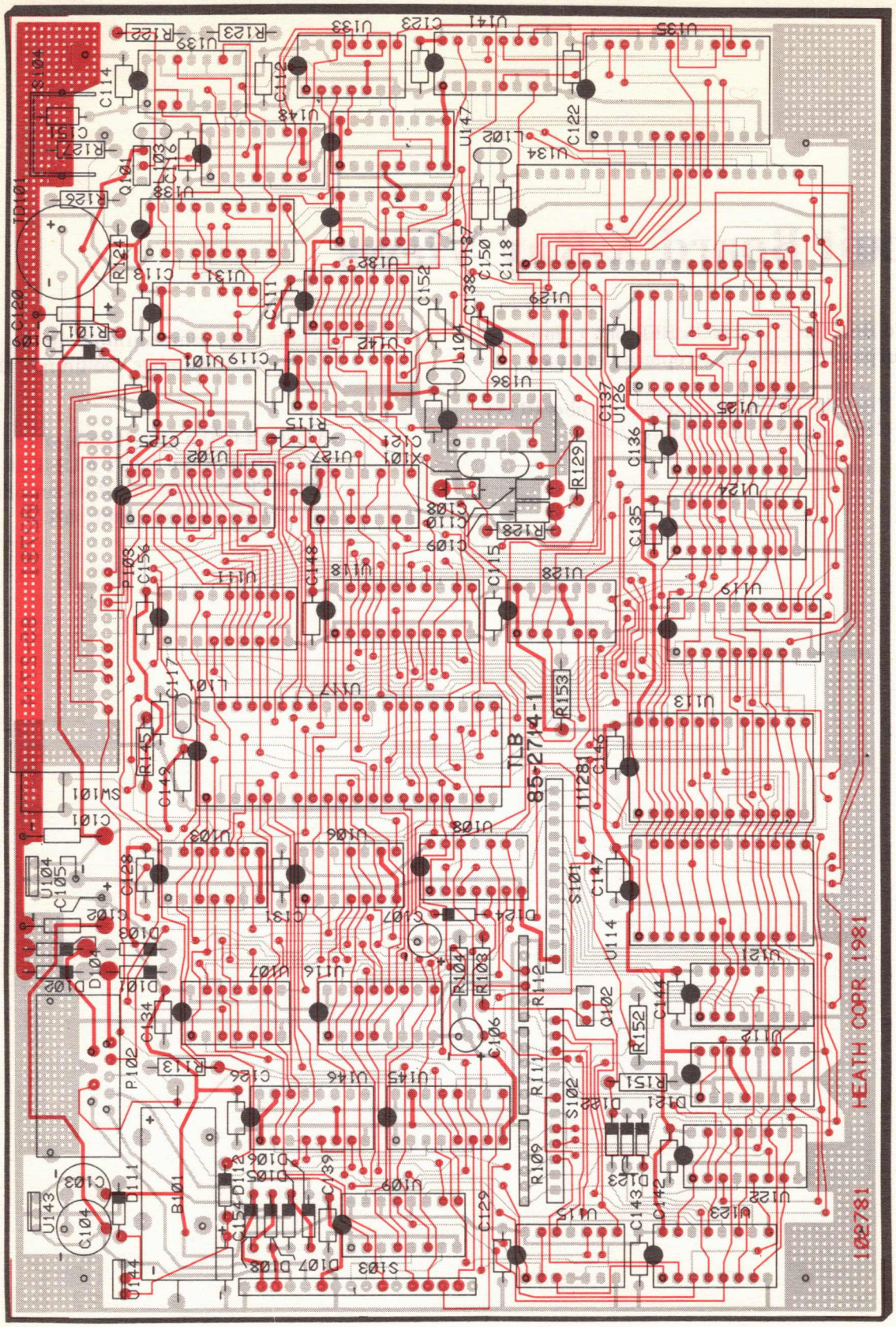
Circuit Board X-Ray Views

NOTE: To find the PART NUMBER of a component for the purpose of ordering a replacement part:

A. Find the circuit component number (R111, C101, etc.) on the "X-Ray View."

B. Locate this same number in the "Circuit Component Number" column of the "Parts List."

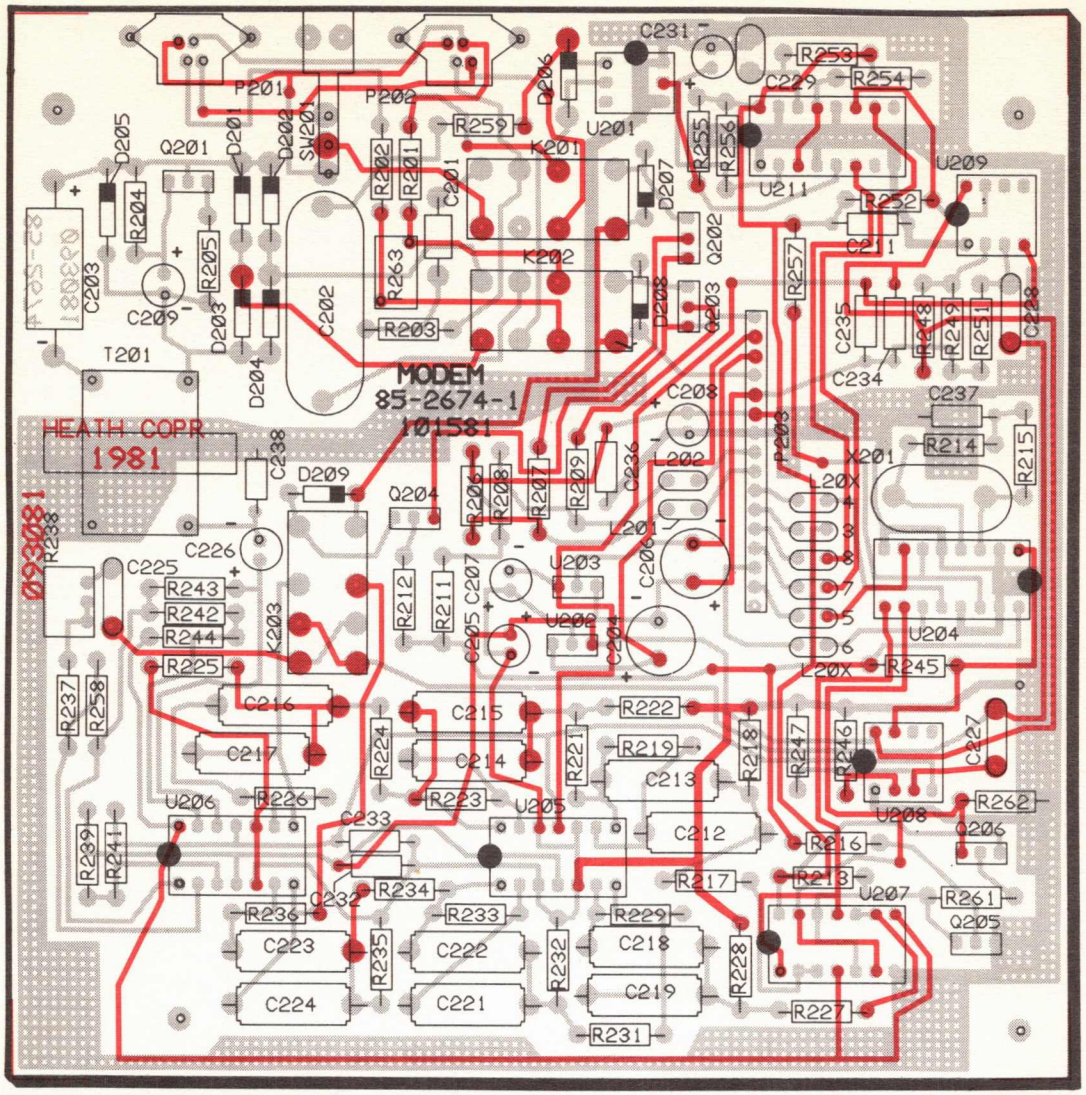
C. Adjacent to the circuit component number, you will find the PART NUMBER and DESCRIPTION which must be supplied when you order a replacement part.



TERMINAL LOGIC BOARD

Part number HE 181-4075.

Shown from component side.



MODEM BOARD
Part number HE 181-3746.
Shown from component side.

Appendix A

Escape Sequences

CURSOR POSITION CONTROL

Cursor to home	ESC H
Cursor to right	ESC C
Cursor to left	ESC D
Cursor up one line	ESC A
Cursor down one line	ESC B
Save cursor position	ESC j
Cursor to saved position	ESC k
VT52 direct cursor addressing	ESC Y (line) (column)
Cursor position report	ESC n
Reverse index	ESC I

EDIT AND ERASE FUNCTIONS

Clear screen display	ESC E
Erase to beginning of display	ESC b
Erase to end of page	ESC J
Erase entire line	ESC l
Erase to beginning of line	ESC o
Erase to end of line	ESC K
Insert line	ESC L
Delete line	ESC M

KEYBOARD CONTROL

Disable keyboard	ESC }
Enable keyoard	ESC {
Disable key click	ESC x 2
Enable key click	ESC y 2
Auto line feed on return	ESC x 8
Cancel auto line feed	ESC y 8
Auto return on line feed	ESC x 9
Cancel auto return	ESC y 9

DISPLAY CONTROL

Normal display	ESC s 0
Reverse video	ESC s 1
Blinking characters	ESC s 2
Reverse video + blinking	ESC s 3
Half intensity display	ESC s 4
Reverse video + half intensity	ESC s 5
Blinking + half intensity	ESC s 6
Reverse + blinking + half	ESC s 7
Enter reverse video	ESC p
Exit reverse video	ESC q

DISPLAY CONTROL (Cont'd.)

Wrap-around at end of line	ESC v
Discard at end of line	ESC w
Enter graphic mode	ESC F
Exit graphic mode	ESC G
Blinking cursor	ESC y ;
Steady cursor	ESC x ;
Disable cursor	ESC x 5
Enable cursor	ESC y 5
Enable status line	ESC y =
Disable status line	ESC x =
Enable 25th line	ESC x 1
Disable 25th line	ESC y 1

CLOCK FUNCTIONS

Enable clock display	ESC c
Disable clock display	ESC d
Send time to host	ESC e
Set time	ESC X (six digits)
Set baud rates	ESC r
110 baud	A
150 baud	B
300 baud	C
600 baud	D
1200 baud	E
2400 baud	H

OTHER FUNCTIONS

Transmit 25th line	ESC]
Transmit current line	ESC
Transmit page	ESC #
Transmit character at cursor	ESC
Printer on	ESC X :
Printer off	ESC y :
Transmit page to printer	ESC '
Reset terminal	ESC z
Save data in CMOS RAM	ESC :
Report data in CMOS RAM	ESC ;
VT52 identify	ESC Z
Quit	ESC
Help	ESC ~

Appendix B

ASCII Codes

The American Standard Codes for Information Interchange (ASCII) were developed as a common language for operating a computer and communicating between computer terminals.

In the following list, the characters in the shaded areas are not processed by the ZT-1 Terminal.

7-BIT OCTAL CODE	DECIMAL CODE	HEX CODE	CONTROL KEYS	DESCRIPTION
000	0	0	@	Null, tape feed.
001	1	1	A	Start of heading.
002	2	2	B	Start of text.
003	3	3	C	End of text.
004	4	4	D	End of transmission.
005	5	5	E	Enquiry.
006	6	6	F	Acknowledge.
007	7	7	G	Rings the bell.
010	8	8	H	Backspace; also FEB, format effector backspace.
011	9	9	I	Horizontal tab.
012	10	A	J	Line feed: advances cursor to next line.
013	11	B	K	Vertical tab (VTAB).
014	12	C	L	Form feed to top of next page.
015	13	D	M	Carriage return to beginning of line.
016	14	E	N	Shift out.
017	15	F	O	Shift in.
020	16	10	P	Data line escape.
021	17	11	Q	Device control 1: turns transmitter on (XON).
022	18	12	R	Device control 2.
023	19	13	S	Device control 3: turns transmitter off (XOFF).
024	20	14	T	Device control 4.
025	21	15	U	Negative acknowledge: also ERR (error).
026	22	16	V	Synchronous idle (SYNC).
027	23	17	W	End of transmission block.
030	24	18	X	Cancel (CANCL). Cancels current escape sequence.
031	25	19	Y	End of medium.
032	26	1A	Z	Substitute.
033	27	1B	[	Escape.
034	28	1C	\	File separator.
035	29	1D	]	Group separator.
036	30	1E	^	Record separator.
037	31	1F	-	Unit separator.

7-BIT OCTAL CODE	DECIMAL CODE	HEX CODE	CHARACTERS	DESCRIPTION
040	32	20	SP	Space.
041	33	21	!	Explanation point.
042	34	22	"	Quotation mark.
043	35	23	#	Number sign.
044	36	24	$	Dollar sign.
045	37	25	%	Percent sign.
046	38	26	&	Ampersand.
047	39	27	'	Acute accent or apostrophe.
050	40	28	(	Open parenthesis.
051	41	29	)	Close parenthesis.
052	42	2A	*	Asterisk.
053	43	2B	+	Plus sign.
054	44	2C	,	Comma.
055	45	2D	–	Hyphen or minus sign.
056	46	2E	.	Period.
057	47	2F	/	Slash.
060	48	30	0	Number 0.
061	49	31	1	Number 1.
062	50	32	2	Number 2.
063	51	33	3	Number 3.
064	52	34	4	Number 4.
065	53	35	5	Number 5.
066	54	36	6	Number 6.
067	55	37	7	Number 7.
070	56	38	8	Number 8.
071	57	39	9	Number 9.
072	58	3A	:	Colon.
073	59	3B	;	Semicolon.
074	60	3C	<	Less than.
075	61	3D	=	Equal sign.
076	62	3E	>	Greater than.
077	63	3F	?	Question mark.
100	64	40	@	At sign.
101	65	41	A	Letter A.
102	66	42	B	Letter B.
103	67	43	C	Letter C.
104	68	44	D	Letter D.
105	69	45	E	Letter E.
106	70	46	F	Letter F.
107	71	47	G	Letter G.
110	72	48	H	Letter H.
111	73	49	I	Letter I.
112	74	4A	J	Letter J.
113	75	4B	K	Letter K.
114	76	4C	L	Letter L.
115	77	4D	M	Letter M.
116	78	4E	N	Letter N.
117	79	4F	O	Letter O.

7-BIT OCTAL CODE	DECIMAL CODE	HEX CODE	CHARACTERS	DESCRIPTION
120	80	50	P	Letter P.
121	81	51	Q	Letter Q.
122	82	52	R	Letter R.
123	83	53	S	Letter S.
124	84	54	T	Letter T.
125	85	55	U	Letter U.
126	86	56	V	Letter V.
127	87	57	W	Letter W.
130	88	58	X	Letter X.
131	89	59	Y	Letter Y.
132	90	5A	Z	Letter Z.
133	91	5B	[	Open brackets.
134	92	5C	\	Reverse slash.
135	93	5D	]	Close brackets.
136	94	5E	↑	Up arrow/caret.
137	95	5F	_	Underscore.
140	96	60	`	Grave accent.
141	97	61	a	Letter a.
142	98	62	b	Letter b.
143	99	63	c	Letter c.
144	100	64	d	Letter d.
145	101	65	e	Letter e.
146	102	66	f	Letter f.
147	103	67	g	Letter g.
150	104	68	H	Letter h.
151	105	69	i	Letter i.
152	106	6A	j	Letter j.
153	107	6B	k	Letter k.
154	108	6C	l	Letter l.
155	109	6D	m	Letter m.
156	110	6E	n	Letter n.
157	111	6F	0	Letter o.
160	112	70	p	Letter p.
161	113	71	q	Letter q.
162	114	72	r	Letter r.
163	115	73	s	Letter s.
164	116	74	t	Letter t.
165	117	75	u	Letter u.
166	118	76	v	Letter v.
167	119	77	w	Letter w.
170	120	78	x	Letter x.
171	121	79	y	Letter y.
172	122	7A	z	Letter z.
173	123	7B	{	Left brace.
174	124	7C	¦	Vertical bar (broken).
175	125	7D	}	Right brace.
176	126	7E	~	Tilde.
177	127	7F	DEL	Delete (rubout).