

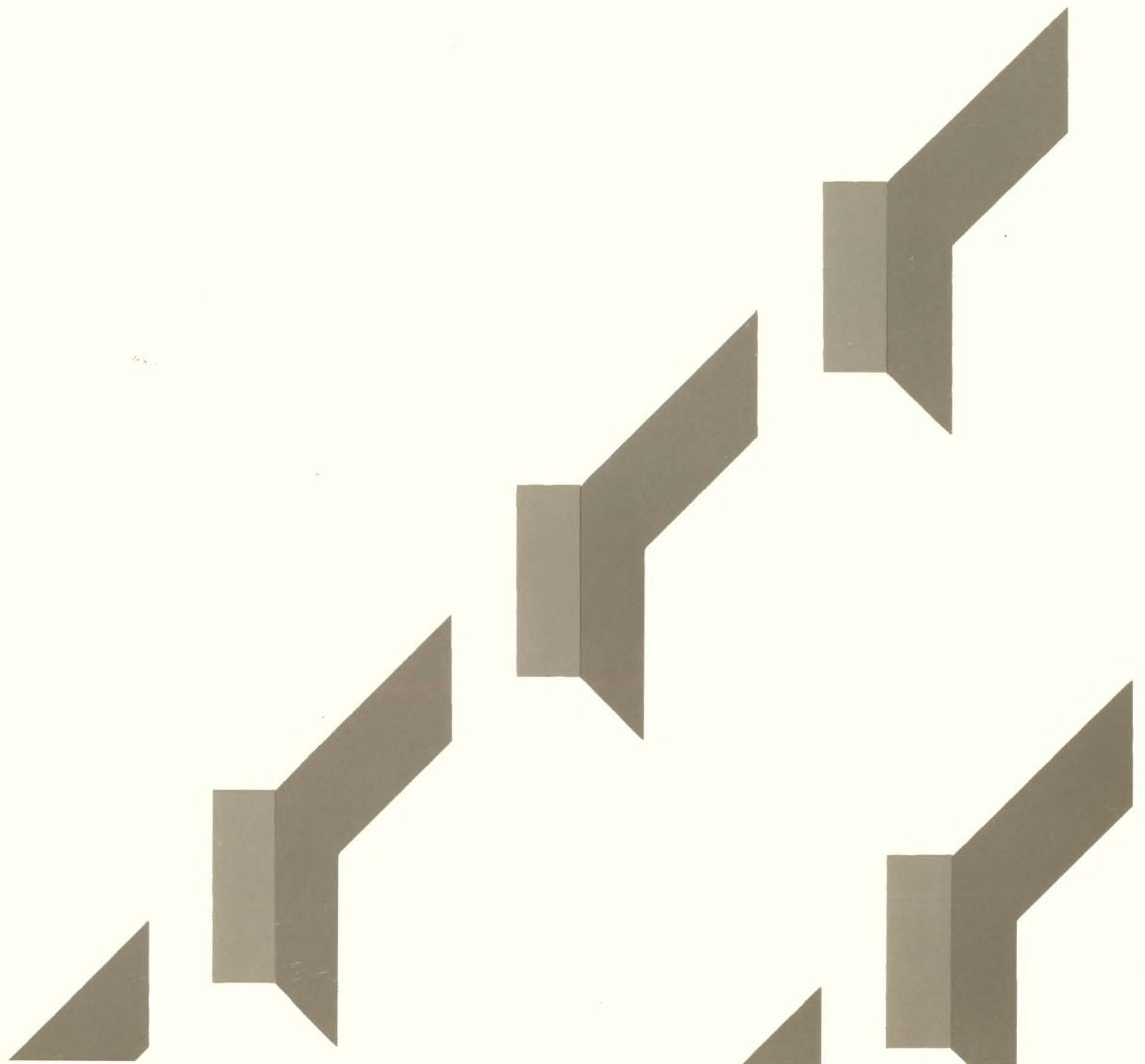


**data
systems**

THE QUALITY GOES IN BEFORE THE NAME GOES ON

VIDEO DISPLAY TERMINAL

Z-29 USER'S & TECHNICAL GUIDE



Z-29 Terminal

Printed in the
United States of America

Copyright © 1983
Zenith Data Systems
All Rights Reserved

ZENITH | data
systems

REGULATORY AND REGISTRATION INFORMATION

Warning — This equipment has been certified to comply with the limits for a Class B computing device, pursuant to Subpart J of Part 15 of FCC Rules. Only computers certified to comply with the Class B limits may be attached to this equipment. Operation with non-certified computers is likely to result in interference to radio and TV reception. This equipment uses radio frequency energy for its operation and if not installed and used properly, that is, in strict accordance with the instruction manual, may cause interference to radio and television reception. It has been type tested and found to comply with the RF emission limits for a Class B computing device which is intended to provide reasonable protection against such interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Move the computing device away from the receiver being interfered with.
- Relocate (turn) the computing device with respect to the receiver.
- Reorient the radio or television receiving antenna.
- Plug the computing device into a different AC outlet so that the computing device and receiver are on different branch circuits.
- Disconnect and remove any I/O cables that are not being used. (**Unterminated** I/O cables are a potential source of high RF emission levels.)
- Unplug and remove any circuit boards that are not being used. (Here again, **unterminated** cards can be a source of potential interference.)
- Be certain that the computing device is plugged into grounded outlet receptacles. (Avoid using A/C cheater plugs. Lifting of the power cord ground may increase RF emission levels and may also present a lethal shock hazard to the user.)

If you need additional help, consult your dealer or ask for assistance from the manufacturer. Customer service information may be found on the inside back cover of this manual or on an insert sheet supplied with the equipment. You may also find the following booklet helpful: "How to Identify and Resolve Radio-TV Interference Problems." This booklet is available from the US Government Printing Office, Washington, D.C. 20402 — Stock No. 004-000-000345-4.

ZENITH ENGINEERING

The device has been designed and manufactured to comply with all applicable rules and regulations of the following agencies:

Underwriters Laboratories
Canadian Standards Association
Federal Communications Commission — Part 15, Radio Frequency Interference

Any attempt to alter or modify the design, or to use this device in a manner other than described in the Manual, will void the Warranty and release the manufacturer from any responsibility for its operation.

REGISTRATION

To receive the full benefits of your Warranty, complete and mail the accompanying Registration Card. Also, record the series and serial number of your equipment below. Refer to these numbers in any correspondence you have with Zenith Data Systems regarding this equipment.

Model _____

Series _____

Serial # _____

Date Purchased _____

TABLE OF CONTENTS

	Introduction	VII
Specifications	Section 1	
	Display	1.1
	Cursor	1.1
	Keyboard	1.2
	Editing & Erasing Functions	1.2
	Communications	1.2
	Environment	1.3
	Power	1.3
	Dimensions	1.4
Controls	Section 2	
	Controls and Indicators	2.1
	Keyboard	2.3
	Connector	2.4
	Indicators	2.4
	Alphabetic Keys	2.5
	Nonalphabetic Keys	2.6
	Other Keys	2.7
Installation	Section 3	
	Introduction	3.1
	Connections	3.2
	Interfacing	3.4
	DTE and DCE Devices	3.4
	Power On	3.8
	Built-in Diagnostics	3.8
	Power-on Indicator	3.9

TABLE OF CONTENTS

Section 4	Operation
Introduction	4.1
Entering the Setup Mode	4.3
Menu Selection	4.3
Setup Menu A	4.3
On/Off Line	4.3
TAB Menu	4.4
Cursor Movement	4.4
Set TAB	4.4
Clear TAB	4.4
Exit	4.5
Setup Menu B	4.5
Baud Rate	4.5
Parity	4.6
Duplex Mode	4.6
Handshaking	4.6
Setup Menu C	4.7
Port Assignment	4.8
Terminal Modes	4.8
Hold Screen	4.8
Monitor Mode	4.9
Setup Menu D	4.9
Clock	4.10
Status Line	4.10
Wrap On/Off	4.11
Screen Saver	4.11

TABLE OF CONTENTS

Setup Menu E	4.11
Keypad Shift	4.12
Alternate Keypad	4.12
Key Repeat	4.12
Key Click	4.13
Setup Menu F	4.13
Auto CR	4.13
Auto LF	4.13
Cursor Selection	4.13
Line Frequency	4.14
Setup Menu G	4.14
Character Sets	4.14
Fill Screen	4.15
Video Attributes	4.15
Test	4.16

Theory of Operation

Section 5

Power-up	5.1
Start-up	5.2
Timing and Clock Functions	5.2
Character and Command Sources	5.2
On-Screen Character Generation	5.3
Placing the Character in Memory	5.3
Placing Characters on the Screen	5.3
Communication	5.4

In Case of Difficulty

Section 6

Troubleshooting Chart	6.2
If the Problem Persists	6.3
User Maintenance	6.4

TABLE OF CONTENTS

Sections A, B, C, D, E, & F

ASCII Code Information	A.1
Zenith Mode Code Information	B.1
ANSI Mode Code Information	C.1
Lear Siegler ADM3A Mode Code Information	D.1
Hazeltine 1500 Mode Code Information	E.1
Software Handshaking Data	F.1
Programmers Data Information	G.1
Index	X.1

Appendices

INTRODUCTION

Congratulations on your purchase of the Zenith Data Systems Z-29 Terminal. The Z-29 Terminal represents a truly state-of-the-art design capable of satisfying both your business and personal needs. Its many features include:

- Built-in power-up diagnostics.
- Four terminal emulation modes: Zenith, ANSI, Lear Siegler ADM 3A, and Hazeltine 1500.
- Programmable character attributes and scrolling regions.
- Advanced keyboard features: automatic key repeat, "N" key rollover, status indicators, user function keys, and full cursor control keys.
- A detached keyboard with an eight-foot coiled cable.
- No switches to set: all features are accessible through the keyboard and a nonvolatile memory to remember your settings.
- A professional screen with 24 rows of 80 characters, a 25th status line, and special attributes including character-by-character reverse video, half intensity, blinking, and underlining capabilities.

With this Terminal, the future is here today. The built-in flexibility and ease of operation make it one of the most versatile units available today. It can serve as the heart or as a remote unit of a powerful and expandable business automation package.

This Terminal has been prepared with you in mind. Welcome to computing at its best, with Zenith's assurance and commitment that - the quality goes in before the name goes on.

INTRODUCTION

YOUR Z-29 MANUAL

This Manual is divided into the following sections:

Specifications — Tells you about the characteristics of your new Z-29 Terminal.

Controls and Connections — Introduces you to the connections, keyboard, and controls.

Installation — Tells you how to install the Terminal into your computer system.

Operation — Describes the many features of the Z-29 Terminal you can put into use in your installation.

Theory of Operation — Gives you a brief overview of your new Z-29 Terminal and how it works.

In Case of Difficulty — Will help you through those difficult moments - in case something doesn't seem to work like it should. A special troubleshooting chart has been provided to make locating the source of a problem easy.

Programming — Is a continuing reference for programmers who will be working with your Z-29 Terminal. All of the information concerning special control codes and operation is here.

Index — Helps you quickly locate any feature of your Z-29 Terminal or other subject that is in this Manual.

SPECIFICATIONS

DISPLAY

CRT	12"(30.5cm), P31, green, nonglare video screen.
Display Format	25 rows of 80 characters.
Display Size	6.0" high × 8.5" wide.
Character Type	8 × 10 character cell.
Character Size	0.2" (5 mm) high × 0.1" (2.5 mm) wide (approximate).
Character Set	Normal: 128 characters; 95 ASCII, upper and lower case, numerics and punctuation, 33 graphic characters. Alternate: 128 characters; 95 ASCII, super script and subscript, scientific notation and 33 graphic characters. (VT-100)
Video Attributes	Normal or reverse character, normal or underline character, normal or half-intensity character, normal or blinking.
Refresh Rate	60 Hz.

CURSOR

Type	Underline or reverse(solid) video block.
Attributes	On, off, or blinking.
Controls	Up, Down, Left, Right, Backspace, Tab, Back Tab, Home, Carriage Return(CR), and Line Feed (LF).
Addressing	Direct or relative.

SPECIFICATIONS

KEYBOARD

Unit	91-key, detached keyboard unit with 8 ft. (1.9 m), 6-wire coiled cord.
Layout	Split; 77-key standard typewriter style with special function keys and 14-key numeric keypad.
Indicators	Visual: Power, locked keyboard, off-line and caps lock(LED). Audible: Key click with each key entry (programmable on/off). Beep tone, 1 kHz for 200 msec.

EDITING AND ERASING FUNCTIONS

Editing	Insert or delete character. Insert or delete line.
Erasing	Erase page, erase line, erase to end of line, erase to beginning of line, erase to beginning of page and erase line.

COMMUNICATIONS

Type	EIA RS-232C.
Baud Rates	75, 110, 150, 300, 600, 1200, 1800, 2400, 4800, 9600, or 19200 baud.
Mode	Half or full duplex.
Code	ASCII
Format	Serial asynchronous
Word Length	7-data bits, one parity bit.

SPECIFICATIONS

Stop Bits	2 at 75 and 110 baud rates, 1 at all other baud rates.
Sync	Auto XON and XOFF
Parity	Even, odd, mark, or space.

ENVIRONMENT

Operation	Temperature: 32 to 105 degrees Fahrenheit (0-40 degrees Celsius). Humidity: 10-90% (relative) noncondensing.
Storage	Temperature: -40 to 150 degrees Fahrenheit or -40 to 66 degrees Celsius. Humidity: 0-95% (relative) noncondensing.

POWER

Voltage Range	105-127 volts.
Frequency	60 Hz.
Fuse	3/4 Ampere, slow-blow.
Consumption	45 Watts.

SPECIFICATIONS

DIMENSIONS

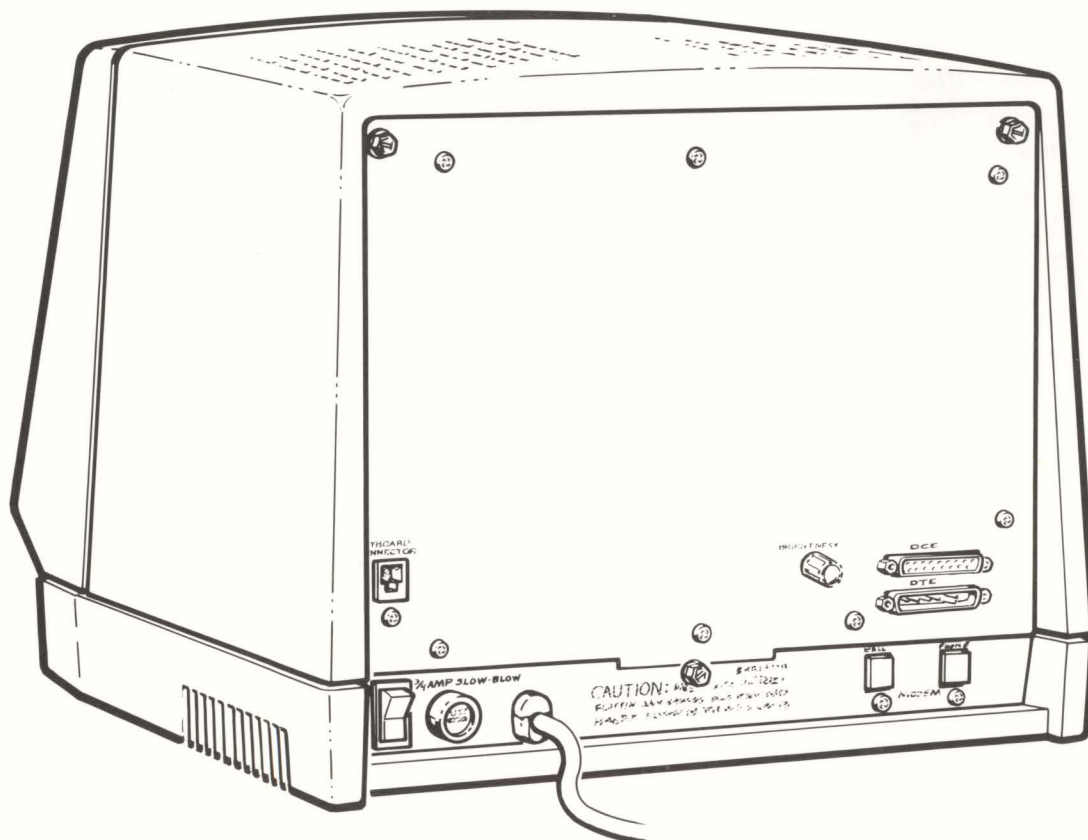
Monitor	13-5/8" high × 15-3/8" wide × 14-1/2" deep (34.6 × 39.1 × 36.8 cm).
Keyboard	3" high × 18" wide × 7-1/4" deep (7.6 × 45.7 × 18.4 cm).
Weight	22 pounds (10 kg).

CONTROLS

Controls and Indicators

The following paragraphs will describe each plug, connector, and control on your Terminal. While you are examining the back panel and the connectors, be sure that the Z-29 Terminal is off and unplugged. Rotate the Video unit so that you are looking at its back.

Refer to Pictorial 1.



PICTORIAL 1

CONTROLS

Keyboard Connector — Provides the necessary signals to the separate keyboard of your Z-29 Terminal.

Brightness — Adjusts the brightness of the video display. Adjust it to obtain the brightness most suitable to you.

DCE — Provides the necessary EIA-standard RS-232 signals to data terminal devices.

DTE — Provides the necessary EIA-standard RS-232 signals to a modem and/or computer.

Power ON/OFF Switch — The main power switch to your Z-29 Terminal.

Fuse — Provides protection against line voltage surges and/or component failure. Replace only with a 3/4 ampere slow blow fuse.

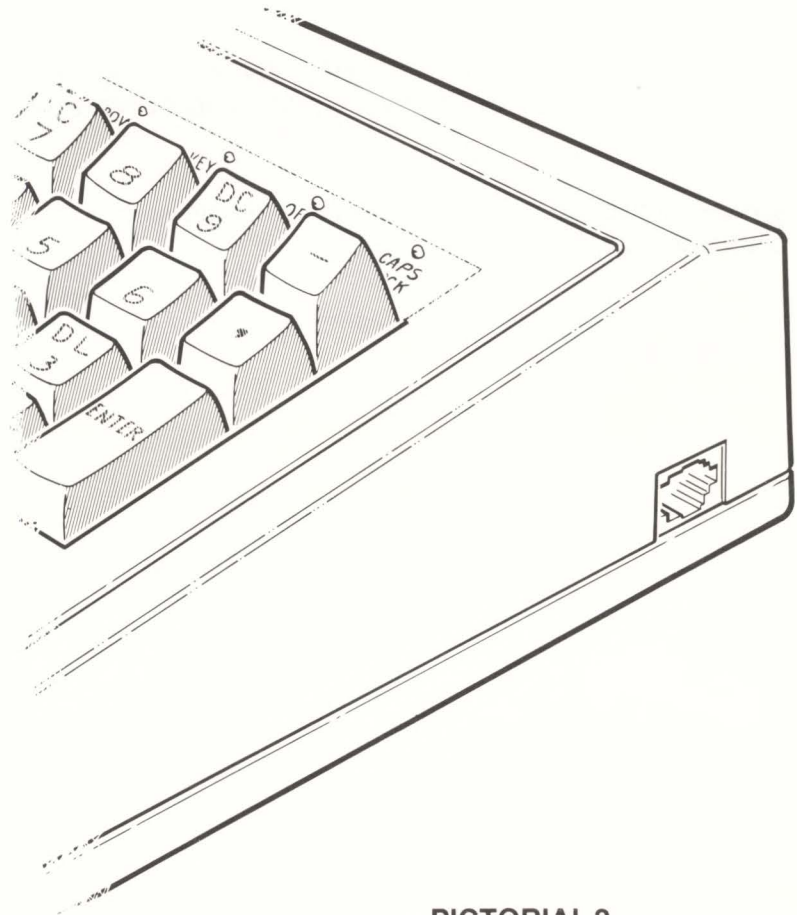
Line Cord — Connects the Terminal to the 120 volt AC line through a common wall or floor outlet.

There are two (currently) unused positions on the rear panel which are marked "Wall" and "Phone".

Keyboard

The keyboard of your Z-29 Terminal consists of 91 keys, a connector, and four status indicators.

Refer to Pictorial 2.



PICTORIAL 2

CONTROLS

CONNECTOR

Terminal Connector — Provides the necessary signal and power connections for the keyboard unit of your Terminal.

INDICATORS

Power On — Provides a visual indication that power is applied to the unit (lit) and the keyboard is properly connected.

KEYBRD Lock — Provides a visual indication that the keyboard unit is locked (lit) and the Terminal must be reset to function.

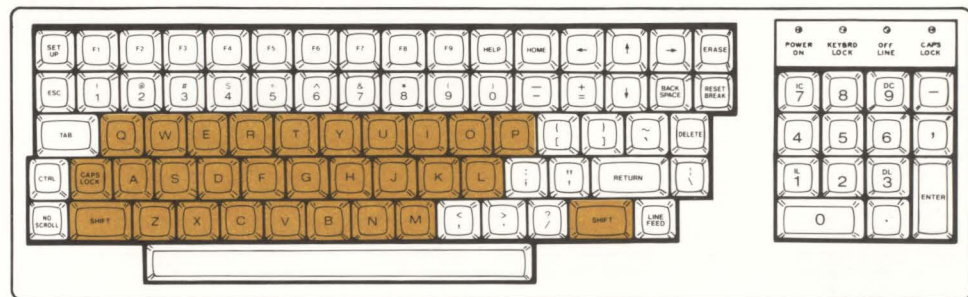
Off Line — Provides a visual indication that the Terminal is on-line or off-line (lit) with the host equipment.

Caps Lock — Provides a visual indication that the CAPS LOCK function is on (lit) or off.

CONTROLS

ALPHABETIC KEYS

Refer to Pictorial 3.



PICTORIAL 3

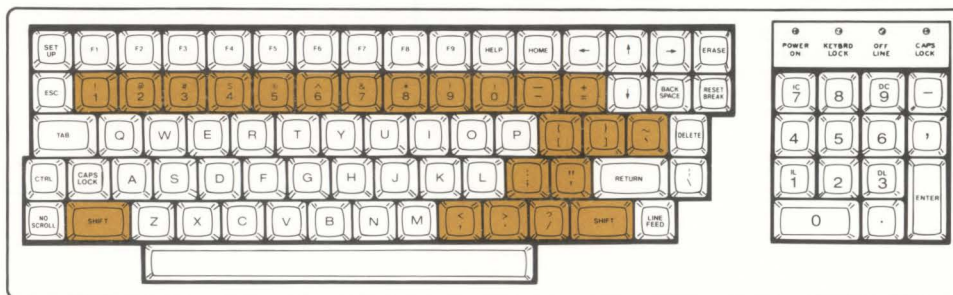
The Z-29 Terminal's keyboard has the standard 26 letters of the alphabet arranged just as they are on a conventional typewriter. These keys, like their counterparts on a typewriter, will function in either upper case or lower case. For upper case, press either SHIFT key or the CAPS LOCK key.

The CAPS LOCK key will light a keyboard indicator when it is engaged. If the status indicator line on the Video Display is active, it also displays a CAPS LOCK message. This function affects only the alphabetic keys.

CONTROLS

NONALPHABETIC KEYS

Nonalphabetic keys, shown in Pictorial 4, serve two purposes. In the “unshifted mode”, they will display conventional numbers and a portion of the punctuation marks and special characters. However, if you press **either** SHIFT key, the character printed above the number or special character will be printed. This is the same function you find on a conventional typewriter. The CAPS LOCK function, on the other hand, does not shift these keys.



PICTORIAL 4

CONTROLS

OTHER KEYS

Refer to Pictorial 5.

Set Up — Used to enter or exit the SETUP mode. See the “Operation” section.

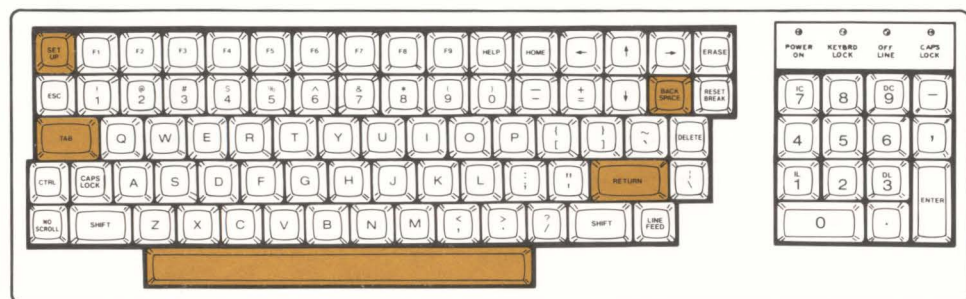
The following discussions describe the normal function for each key. However, software (a program) may direct any key to cause some other function to take place. Any key that has a special function is usually described in the documentation that accompanies the program.

Space Bar — Functions just as it does on a typewriter. You can enter a blank character (space) by pressing this bar.

Back Space — Functions just as it does on a typewriter, by moving the cursor one space to the left.

Tab — Causes the position of the cursor to move to the next tab column as set by software or in the SETUP mode. If you press **either** SHIFT key and the TAB, the cursor will return to the previous tab column. (See the “Operation” section)

Return — Returns the cursor to the left side of the display.



PICTORIAL 5

CONTROLS

Refer to Pictorial 6.

The following keys are used for special purposes. Instructions that tell you how to use them will appear with the programs which employ their functions.

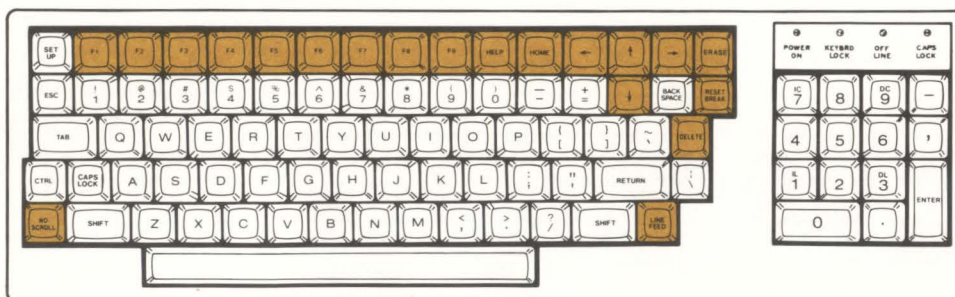
F1 - F9 (special function keys) — Used for special purposes by software definition.

Home — Moves the cursor to the “home” position, the upper left corner of the screen (the first position on the first line).

Line Feed — Moves the cursor down one line. If the cursor is on the bottom line of the scrolling region, it will remain there but the screen will scroll (move up one line), unless the HOLD SCREEN function is enabled.

← (left arrow key) — Moves the cursor one position to the left. If the cursor is already at the left side of the screen, it will remain there and nothing will happen.

→ (Right arrow key) — Moves the cursor one position to the right. If the cursor is already at the right side of the screen, it will remain there and nothing will happen.



PICTORIAL 6

CONTROLS

↑ (Up arrow key) — Moves the cursor up one line. If the cursor is already at the top of the screen, it will remain there and nothing will happen.

↓ (Down arrow key) — Moves the cursor down one line. If the cursor is at the bottom of the screen, it will remain there and nothing will happen.

Delete — Often (in software) duplicates the BACK SPACE key, but is sometimes used for other purposes. A nondisplayable character is transmitted.

Reset Break — May be used by software in the normal (unshifted) mode to interrupt program execution. When this key is used with either SHIFT key, it will reset the Z-29 Terminal to the power-up state and cause the initial diagnostic tests to be run.

Help — Used by some programs to provide operator aid in the form of special “prompts,” or “helps.”

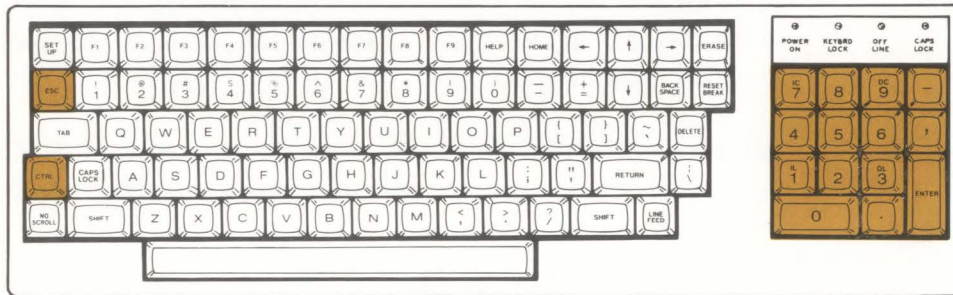
No Scroll — If the “Hold Screen” feature is active and the 24th line of the screen is filled, the Terminal prevents the host computer from transmitting additional data. Pushing this key will cause the Terminal to allow the next line to be transmitted. If you press this key and hold either of the SHIFT keys, the Terminal will accept the next full display “page” (twenty-four lines).

If the “Hold Screen” feature is **not** active, the key performs a different function. When you first press it, the key stops the transmission of data from the computer to the Z-29 Terminal by sending an XOFF. If you press the key a second time, it causes transmission to resume from where it was stopped by sending an XON. Check local operating procedures to ensure that your system recognizes this key.

Erase — Erases all unprotected information on the screen by filling the areas erased with spaces. Pressing either SHIFT key at the same time will clear the entire screen.

CONTROLS

The following keys are used in combination with other keys to perform a function. See Pictorial 7.



PICTORIAL 7

ESC — The ESCAPE key performs special functions. When you press the ESCAPE key and another key in sequence, a predetermined event occurs. For example, if you wanted the event governed by ESCAPE E, you would first depress and release the ESCAPE key and then press the E key. It is important to note that, unlike normal computer operations, the Terminal will accept the 'literal' escape code designation. What this means is if a chart of escape sequences designates a sequence as "ESC c", this is **exactly** the way you must enter the sequence. You can not enter an upper case c when the escape sequence requires a lower case c. For a complete listing of the Z-29 Terminal Escape Codes, see the "Programming" section of this Manual.

CTRL — The CONTROL key. You can use it to perform special functions by pressing it and another key. For example, if you want to enter the CTRL-C combination, you would press and hold the CTRL key and then press the C key. If you want to enter the CTRL-S key combination, you would press and hold the CTRL key and then press the S key. CONTROL ENTER (CTRL ENTER) will connect the entire contents of the screen to the printer port.

CONTROLS

The following keys are used to speed up the entry of data.

Calculator Style Keypad — This group of keys, located to the right of the main keyboard, is organized somewhat like a calculator and includes: the numbers 0 through 9; a period for entry of decimal points; a comma for data entry; a dash for entry of negative numbers; and an ENTER key for signaling the Computer that the entry has been completed.

NOTE: For compatibility with other Zenith Terminals, the numbers 2, 4, 5, 6, and 8 keys on the keypad will perform the same cursor functions as the up, left, home, right, and down arrows respectively with the keypad shift enabled.

In addition, four keys (1, 3, 7, and 9) are used in applications requiring special insertion and deletion operations of characters and lines.



Introduction

You will find your Z-29 Terminal easiest to use if all the components are located in the same general area. A good solid work surface (like you would use for a typewriter) that is near a power source and a telephone (if an RS-232 modem is to be used) will prove best. The Z-29 Terminal will work over the wide range of temperature and humidity conditions listed in the "Specifications" section of this Manual.

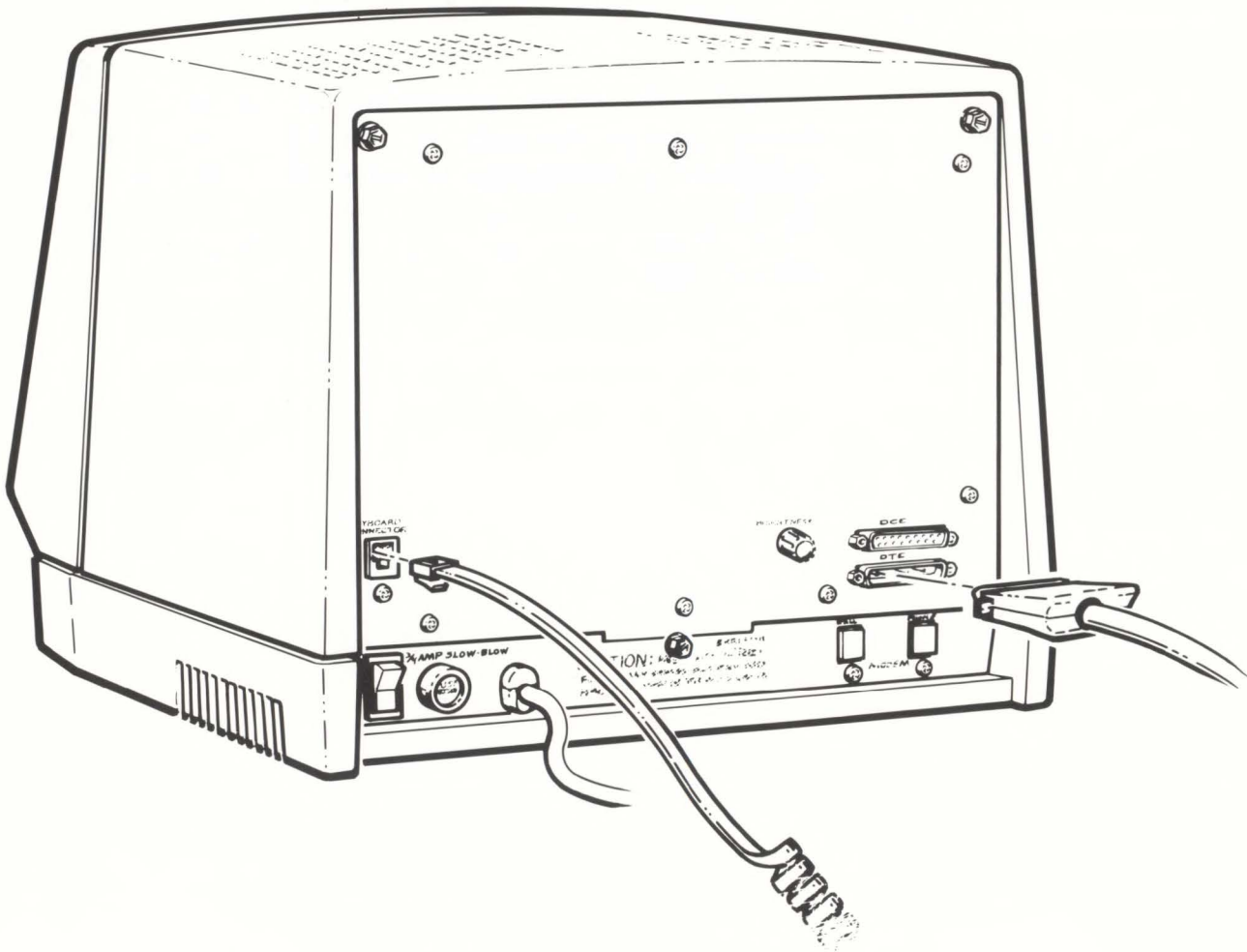
Your Zenith Data Systems Z-29 Terminal has two main components: a video monitor and a detached keyboard. The two are connected to each other with an 8-foot coiled cord. In addition to this Manual and the components listed, you will also find one RS-232 cable. If you need more than one cable or one with different connectors, contact your local Zenith Data Systems dealer.

INSTALLATION

Connections

To install your Z-29 Terminal, complete the following steps:

- Place the video unit on your selected work surface and rotate it so you are looking at its back. Refer to Pictorial 8.



PICTORIAL 8

INSTALLATION

- Locate the separate coiled keyboard cable. One end of this cable terminates with a “telephone-type” modular connector attached directly to the coiled portion. The other end is similarly terminated with a modular connector, but this connector is attached to a length of **flat, uncoiled** cable. Connect the flat portion of the cable assembly to the **KEYBOARD CONNECTOR** on the rear of your video unit. Connect the remaining end of the coiled cable assembly to the modular connector on your keyboard assembly.

NOTE: Although the coiled cable assembly resembles a conventional telephone cord, **DO NOT** attempt to connect **either** end of the cable assembly to a conventional telephone modular connector. Connecting this cable, and your Terminal, to a telephone modular connector could subject the Terminal to damage and void your warranty.

INSTALLATION

Interfacing

Your new Z-29 Terminal is designed to be used as an Input/Output (I/O) device for a computer system. You may hook it directly or through telephone lines (via a modem) to any size computer. The following discussion covers some of the considerations for proper installation with a computer.

DTE AND DCE DEVICES

On the back panel of your Z-29 Terminal, you will find two standard connectors, marked DCE and DTE. The RS-232C standard has established two classifications of equipment: DCE and DTE. DCE (Data Communication Equipment) devices are computers and modems or other similar products. DTE (Data Terminal Equipment) devices are terminals, printers, and most other peripherals.

DTE drivers are always connected to DCE drivers and vice-versa. Similar drivers are never connected together.

Both configurations have been provided in the Z-29 Terminal. The DTE connector is used for connection to a computer, either by direct wire or through a modem. The DCE connector provides an output for other DTE devices. The following chart illustrates the wiring and signals present for each connector.

INSTALLATION

DTE	DCE	SIGNAL	DESCRIPTION
1 COM	1 COM	PGND	Protective Ground.
2 OUT	3 OUT	XMT	RS-232C Serial Output. This is the output for the serial data signals.
3 INP	2 INP	REC	RS-232C Serial Input. This is the input for the serial data signals.
4 OUT	4 INP	RTS	Request To Send. This line tells the other equipment that there is data to send.
5 INP	-	CTS	Clear To Send. This line tells the other equipment that the device is ready to receive data.
7 COM	13 COM	SGND	Signal Ground.
20 OUT	20 INP	DTR	Data Terminal Ready.
-	5 OUT	CTS	Clear To Send. Tied to line 20.
-	6 OUT	DSR	Data Set Ready. Tied to line 20.
-	8 OUT	CD	Carrier Detect. Tied to line 20.

COM = COMMON CONNECTION
 INP = INPUT TO THE CONNECTOR
 OUT = OUTPUT FROM THE CONNECTOR

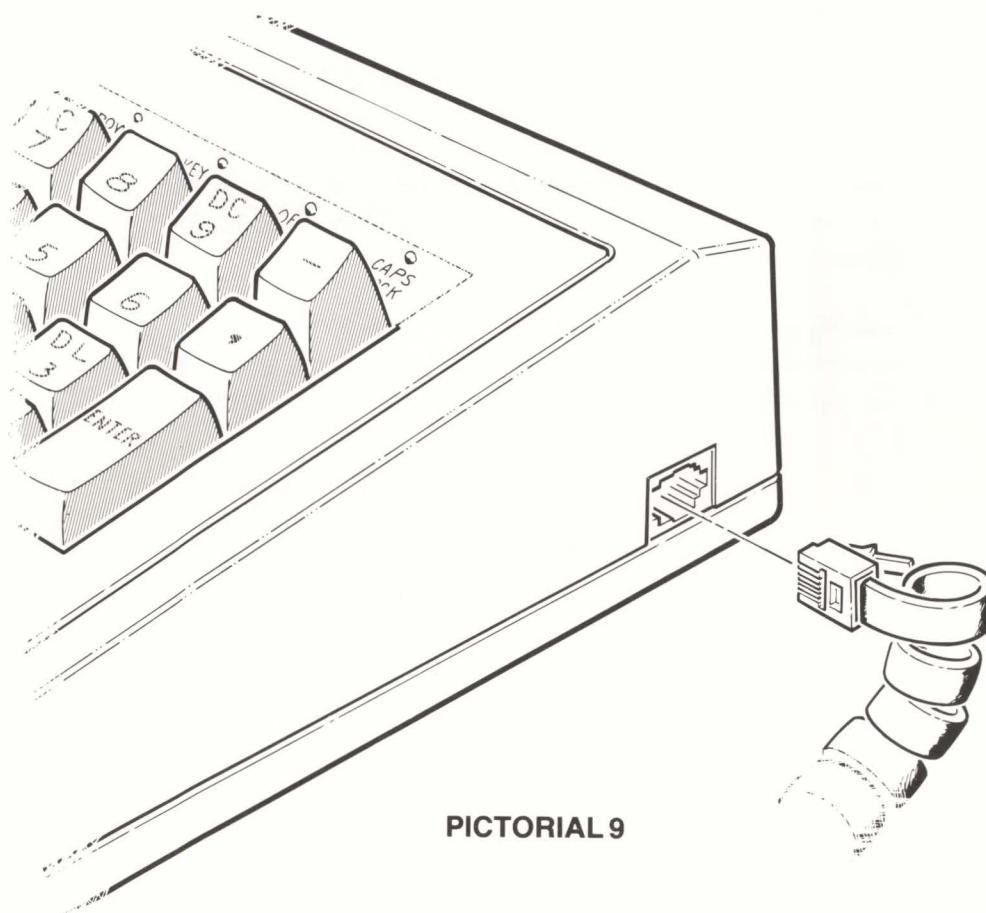
INSTALLATION

NOTE: The computer or modem that you will be using with your Z-29 Terminal must meet the RS-232C standards. If it does not, proper operation may be inhibited. If your computer system does not meet the RS-232C standards, see the "In Case of Difficulty" section, or contact Zenith Data Systems Customer Service for instructions.

- If you are going to use your Z-29 Terminal with a computer in a local installation (wired directly to your Computer), plug the RS-232 cable into the lower of the two RS-232 connectors (DTE). Then plug the other end into your Computer's terminal connector (see your Computer hardware manual for the proper connector).
- If you are going to use your Z-29 Terminal with a computer in a remote installation (not wired directly to your Computer), plug the RS-232 cable into the lower of the two RS-232 connectors (DTE) and plug the other end into a telephone modem.
- Although it is possible to connect a printer to the DCE port of the Z-29 Terminal, the printer cannot be operated while the Terminal is ON LINE to the host computer. The baud rate setting in the SETUP B Menu applies to **both** the DTE and DCE ports. Hence, the printer must be set to operate at the same baud rate as the host computer.
- Make sure that the POWER switch is off and plug the line cord into a 120 volt AC 60 Hz power source.
- Rotate the video unit so that the screen is facing the operator's position.

INSTALLATION

- Place the keyboard unit in front of the Z-29 Terminal and plug the free end of the keyboard cable (if you have not done so already) into the keyboard as illustrated in Pictorial 9.
- Turn the power on.



INSTALLATION

Power On

BUILT-IN DIAGNOSTICS

As soon as you turn your Z-29 Terminal on, it will quickly perform a series of diagnostic tests to ensure proper operation. If it finds any faults, it will display an appropriate error message. If it does not find any faults, a short beep will be emitted. The error message will print out of the port you did not select during the Setup Configuration.

The same diagnostic tests are performed when the Terminal is reset. To reset the Terminal, press the **SHIFT** AND **RESET** **BREAK** keys at the same time.

The following tests are performed and, if a fault is found, the respective error message will be displayed. If you receive an error message, refer to the "In Case of Difficulty" section for further information and instructions.

Test:	Error Message
_____	<u>if fault is found:</u>
ROM	ROMChecksum
RAM	RAMFault
CRT Controller	CRTCError
Keyboard	Keyboard
Non-volatile RAM	NVRAMChecksum

INSTALLATION

POWER-ON INDICATOR

When you turn the POWER switch on, you should see the POWER-ON LED (Light Emitting Diode) light up on your keyboard. If you do not, either your keyboard is not plugged into the video unit properly, or your Z-29 Terminal is not properly connected to an acceptable source of power.

After a moment, you should see a cursor* in the upper left corner of the screen. You may also see a display on the 25th line of the display. If you do, you will see a display of the time (it starts at 0:00:00) and/or one or more other messages, such as CAPS LOCK, OFF LINE, or INSERT MODE.

You are now ready to configure your new Z-29 Terminal.

* A cursor is an indicator on the display that lets you know where the next key entry will appear. The indicator may be an underline or an inverse (solid) video block. It may be steady or blinking on and off.



Introduction

The Z-29 Terminal makes use of the latest in solid-state technology for setting up and maintaining vital communication parameters. Instead of using switches and jumpers (as is the case in most other terminals), the Z-29 uses nonvolatile memory. This means that you can enter all the parameters through the keyboard quickly and easily without any disassembly. This section covers all the features you may establish in this manner.

Use the SET UP key when you want to program the Terminal's parameters. This will activate the Setup Mode. After you have established the parameters, you can choose either to use them on a temporary basis or to store them in the nonvolatile memory of your Z-29 Terminal. This memory will retain your instructions even if the Z-29 Terminal is turned off, or unplugged. Several setup procedures can be set via escape sequences, more information about this feature will be found in the "Programming" section.

There is an optional hardware modification that will prevent the Terminal operator from entering the Setup Mode. If you desire more information, contact your local Zenith Data Systems Dealer.

NOTE: Placing the Terminal in the Setup Mode puts the Z-29 Terminal in an "off line" state. It does not communicate with a host computer until the setup mode is exited.

The Setup Mode has eight different displays that are shown in reverse video (black on green) on the 25th line of your screen. The displays are referred as Setup Menu A through Setup Menu G and T. Each of these displays show the status of various features.

OPERATION

The following chart is a quick summary of the setup functions, where they are used, and which Setup Mode they are found in.

<u>FEATURE</u>	<u>SETUP MENU</u>
Automatic Carriage Return	F
Automatic Line Feed	F
Automatic Repeat	E
Baud Rate Selection	B
Character Sets	G
Clock	D
Communications Mode	B
Cursor Selection	F
Fill Screen	G
Hold Screen	C
Key Click	E
Keypad Alternate/Shifted	E
Line Frequency Selection	F
Monitor	C
Off Line/On Line	A
Operating Mode	C
Parity Selection	B
Port Selection	C
Screen Saver	D
Status Line	D
Tabs	T
Video Attributes	G
Wraparound	D

Entering the Setup Mode

To enter the Setup Mode, press the **SET UP** key. The bottom line will show setup menu A's display.

Menu Selection

To select any of the eight different Setup menu presentations, Setup A through Setup G, and Setup T, press the corresponding alphabetic key. You can access any of these menus from any other setup presentation by simply pressing the alphabetic key associated with that particular menu. Each function in the menu is accessed by its associated numeral. Once you have established your particular setup configuration, you may store this menu in nonvolatile memory; just exit the Setup Mode by pressing and holding the **SHIFT** key and then pressing the **SET UP** key.

Setup Menu A

To enter Setup Menu A, press the **A** key if you are in the Setup Mode. If you are not in the Setup Mode, press the **SET UP** key. The bottom line will display:

**** SETUP MENU A ** (Ver.1.00) 1. off line MENUS-A-to-G-or-T-for TABS**

ON/OFF LINE

Whenever you are "on line," the Terminal is an input/output device for a host machine. If you are "off line," the Terminal can not transmit to or receive information from the host computer, but is controlled through its own keyboard.

When the mode selected is off line, and the Status Line is enabled, the OFF LINE will be displayed on the bottom line.

You can change the state of the on/off line status by pressing the **I** key on the main keyboard.

OPERATION

Tab Menu

To enter the Tab Mode, press the **T** key if you are in the Setup menu. If you are not in the Setup menu, press the **SET UP** key and then the **T** key. The bottom line will display:

```
#234|678901|3456789012|45678901234567890123456789012345678901234567890|234567890
```

In this example, the vertical lines represent tab locations at the 5th, 12th, 23rd, and 71st character positions. You can set and reset tabs by moving the graphics block left or right with the appropriate arrow keys.

CURSOR MOVEMENT

To move the cursor right, press the right arrow (→) key. Once the cursor reaches the right side of the display, it will not move any further.

To move the cursor left, press the left arrow (←) key. Once the cursor reaches the left side of the display, it will not move any further.

SET TAB

To set a tab, position the cursor to the desired location and press the up arrow (↑) key.

CLEAR TAB

To reset (clear) a tab, position the cursor to the desired location and press the down arrow (↓) key.

OPERATION

EXIT

To exit the Tab Mode without storing the tab settings, just press the **SET UP** key. When the Z-29 Terminal is reset or turned off and then on again, the tab stops will return to the settings that existed before you made any changes.

To exit and store the tab stop settings in nonvolatile memory, press and hold the **SHIFT** key and then press the **SET UP** key. The tab stops will remain set until changed again in the Setup Mode.

Setup Menu B

- To enter Setup Mode B, press the **B** key if you are in the Setup Mode. If you are not in the Setup Mode, press the **SET UP** key and then the **B** key. The bottom line will display:

MENU B 1. BAUD 9600 2. PARITY space 3. DUPLEX full 4. HANDSHAKE software

BAUD RATE

Your Z-29 Terminal can use a wide number of baud rates to communicate with its host computer: 75, 110, 150, 300, 600, 1200, 1800, 2400, 4800, 9600, and 19200 baud. The sample illustrated shows 9600 baud selected.

You can change the baud rate by pressing the **1** key. The current baud rate will be stepped to the next available baud rate. If you do not want that rate, continue pressing the **1** key until you reach the baud rate that you want to use. When you reach 19200, the next rate displayed will be 75 baud.

Please note that the number of data bits and the number of stop bits are **not** programmable at the Terminal. Your Z-29 Terminal uses seven data bits and one stop bit at all baud rates **except** 75 and 110 baud. These last two utilize two stop bits.

OPERATION

PARITY

The available parity options are: space, odd, even, or mark (continuously on). You can change the parity (illustrated as space in the sample) by pressing the **2** key, which will change the parity to the next selection and display it. If you do not want that selection, continue pressing the **2** key until you reach the selection that you want to use.

NOTE: Heath/Zenith Data Systems operating systems on the H-8, H/Z-89, and Z-90 computers do not check parity with the Terminal. The Terminal ignores parity on all incoming data.

DUPLEX MODE

Your Z-29 Terminal can communicate in either full or half duplex. You can change the mode of operation by pressing the **3** key.

HANDSHAKING

The Z-29 accommodates two methods of "handshaking".

In the software handshake mode, your Z-29 Terminal will automatically generate the XON or XOFF codes. XOFF signals that data transmission from the computer to the Terminal should cease. XON signals that transmissions can be resumed. The Z-29 Terminal will automatically generate the XOFF code when its internal buffer is almost full.

The hardware handshake is performed via the RS232 interface in conjunction with the CTS, RTS, and DTR lines. The DTE connector makes use of all three lines, while the DCE connector can utilize the RTS line only.

You can change the mode of handshaking by pressing the **4** key.

OPERATION

The following table outlines the interface protocols you can choose in the Setup Mode for the primary (DTE) and auxiliary (DCE) ports in the Z-29. The ports may not be independently configured. If you select either option, both ports will be simultaneously configured as shown.

SETUP MENU OPTION	PRIMARY PORT (DTE)	AUXILIARY PORT (DCE)
Hardware	<p>Responds to (Obeys) hardware handshake.</p> <p>Asserts (uses) hardware handshake.</p>	<p>Responds to (Obeys) hardware handshake.</p> <p>Asserts nothing (Passive).</p>
Software	<p>Responds to nothing.</p> <p>Asserts (uses) software handshake.</p>	<p>Responds to (Obeys) hardware handshake.</p> <p>Asserts (uses) software handshake.</p>

Setup Menu C

To enter Menu C, press the **C** key if you are in the Setup Mode. If you are not in the Setup Mode, press the **SET UP** key and then the **C** key. The bottom line will display:

MENU C 1. PORT normal 2. MODE zenith 3. HOLD SCRN off 4. MONITOR off

OPERATION

PORT ASSIGNMENT

In normal operation, your Z-29 Terminal will use the DTE port to communicate with a computer. The DCE port could be connected to a second computer or an optional printer. Occasionally you may want to exchange ports. Or, you may wish to connect the Z-29 Terminal to two different computers and selectively use one or the other without making any wiring changes. This feature allows you to send the signals to one port or the other. However, be aware that there are limitations between the two ports for handshaking arrangements and that the baud rate used by one port has to be the same for the other.

You can change the routing of the signals to the DTE and DCE ports by pressing the **1** key. When swapped, the display will show:

1. PORT auxil

TERMINAL MODES

Your Z-29 Terminal can emulate four common terminal types: The Heath/Zenith H/Z-19, the Lear Siegler ADM 3A, the Hazeltine 1500, or the ANSI (American National Standards Institute) standard X3.64-1979 (similar to the VT100). Each of the four modes responds differently to codes it receives. For more information, refer to the Appendices in this Manual.

You can change the Terminal Mode by pressing the **2** key on the main keyboard. The next Terminal emulated will be displayed. If you do not want to use that mode, continue to press the **2** key until the mode you want to use is displayed.

HOLD SCREEN

The HOLD SCRIN (Hold Screen) function offers the operator control over the scrolling of the display. When activated, you must press the **NO SCROLL** key to allow each new line to be displayed. To display an entire new page of information, press either **SHIFT** key and the **NO SCROLL** key at the same time.

OPERATION

If the “Hold Screen” feature is **not** active, the key performs a different function. When you first press it, the key stops the transmission of data from the computer to the Z-29 Terminal by sending an XOFF. If you press the key a second time, it causes transmission to resume from where it was stopped by sending an XON. Check local operating procedures to ensure that your system recognizes this key.

You can enable or disable the Hold Screen function by pressing the **3** key on the main keyboard.

MONITOR MODE

The MONITOR function will put the screen of your Terminal into a state where it will display all control characters in reverse video. Normally, control characters (such as Escape) are not displayed even though they are received and processed. However, be aware that screen formatting is not possible when this feature is enabled.

You can enable or disable the Monitor function by pressing the **4** key on the main keyboard.

Setup Menu D

- To enter Setup Menu D, press the **D** key if you are in the Setup Mode. If you are not in the Setup Mode, press the **SET UP** key and then the **D** key. The bottom line will display:

MENU D 1. SET CLOCK 2. STATUS LINE on 3. WRAP on 4. SCR N SAVER on.

OPERATION

CLOCK

The Z-29 has 24- hour clock which is displayed on the status line. To set the clock:

- Press the **1** key. The bottom line will display:

Enter hours >

- Enter a one or two digit number between 0 and 23 from the main keyboard and press the **RETURN** key. The bottom line will display:

Enter minutes >

- Enter a one or two digit number between 0 and 59 from the main keyboard and press the **RETURN** key. The clock will be set to the time you entered the moment you complete the entry.

NOTE: Any illegal entry will cause the display to return to the menu with no changes made. Press the **BACKSPACE** or **DELETE** key to clear the entire entry.

STATUS LINE

The Status line on the CRT displays the following information for operator convenience: 24-hour clock; CAPS LOCK if the caps lock is on; OFF LINE if the Z-29 Terminal is in the Off Line Mode; and INSERT MODE if the Terminal is in the Insert Mode.

The clock will always be displayed unless the Status line is turned off or the 25th line has been turned on by a software command in a program. If the Status line is enabled, it will always appear as long as the 25th line is disabled.

You can turn the Status line display on or off by pressing the **2** key on the main keyboard.

OPERATION

WRAP ON/OFF

When the wraparound feature is enabled and you enter the 81st character of any line, it is automatically printed at the first character position of the next line. If the line is the last line of the designated scrolling region, the screen will be "scrolled" up one line and a new bottom line started with your character in the first position. If this feature is disabled, any characters you type after the 80th character will replace the 80th character on that line.

You can enable or disable the wraparound feature by pressing the **WRAP** key on the main keyboard.

SCREEN SAVER

The screen will be automatically blanked out if no key is pressed or the Terminal receives no data from the computer for 15 minutes. This feature will help increase the life of the CRT. You can restore the screen by pressing the **CAPS LOCK** key.

You can enable or disable the screen saver feature by pressing the **SCREEN SAVER** key on the main keyboard.

Setup Menu E

To enter Setup menu E, press the **E** key if you are in the Setup Mode. If you are not in the Setup Mode, press the **SET UP** key and then the **E** key. The bottom line will display:

MENU E 1. KEYPAD SHFT off 2. KEYPAD ALT off 3. REPEAT on 4. CLICK on

OPERATION

KEYPAD SHIFT

In normal operation, shifted characters on the numeric keypad may be transmitted only when you press the SHIFT key along with the corresponding key. This function reverses the operation, requiring the SHIFT key to be used to transmit unshifted characters.

You can enable or disable the shifted keypad function by pressing the **1** key on the main keyboard.

ALTERNATE KEYPAD

Normally, the codes generated on the numeric keypad are the ASCII numerals for 0 through 9, the comma, the dash (hyphen, or minus sign), the period (or decimal point), and ENTER. In the alternate keypad mode, other codes are transmitted. See Page A.17 for the codes transmitted while in this mode.

You can enable or disable the alternate keypad function by pressing the **2** key on the main keyboard.

KEY REPEAT

When the key repeat feature is enabled, holding any key except the SHIFT, CAPS LOCK, CTRL, SET UP, and RESET BREAK keys for more than about one half second will cause that key to be repeated. The longer you hold the key down, the faster the repeat rate. The key will continue to repeat until you release it.

You can enable or disable the key repeat function by pressing the **3** key on the main keyboard.

KEY CLICK

An audible “click” has been provided to let you know that a key entry has been made. Some keys, such as the SHIFT and CTRL keys, will not sound the key “click” when pressed, as they modify other keys when pressed in conjunction with them.

You can enable or disable the key click function by pressing the **4** key on the main keyboard.

SETUP Menu F

To enter Setup Menu F, press the **F** key if you are in the Setup Mode. If you are not in the Setup Mode, press the **SET UP** key and then the **F** key. The bottom line will display:

MENU F 1. AUTO CR off 2. AUTO LF off 3. CURSOR blnk line 4. FREQ 60 Hz

AUTO CR

When this feature is enabled, a carriage return (CR 0DH) is also generated whenever a line feed is received.

You can enable or disable this feature by pressing the **1** key on the main keyboard.

AUTO LF

When this feature is enabled, a line feed (LF - 0AH) is generated whenever a CR (0DH) is received.

You can enable or disable this feature by pressing the **2** key on the main keyboard.

CURSOR SELECTION

The cursor shows you where the next information or key entry will appear on the screen. You can change the characteristics of this indicator with this setup feature.

OPERATION

You may select any one of four different cursor formats by pressing the **3** key on the main keyboard. The cursor type and display are:

<u>Cursor Type</u>	<u>Display</u>
block (reverse space)	block
underline	underline
blinking block	blnk blk
blinking underline	blnk line

LINE FREQUENCY

The scan rate of the display depends on your local AC line frequency: 60 Hz in areas served by 60 Hz AC lines and 50 Hz in areas served by 50 Hz AC lines. The nominal line frequency for the United States is 60 Hz.

You can change the scan rate frequency by pressing the **4** key on the main keyboard.

Setup Menu G

To enter Setup Menu G, press the **G** key if you are in the Setup Mode. If you are not in the Setup Mode, press the **SET UP** key and then the **G** key. The bottom line will display:

```
*MENU G* 1. CHAR SET normal 2. FILL SCREEN 3. ATTRIBUTES 4. TEST
```

CHARACTER SETS

Your Z-29 Terminal is supplied with two character sets. Both sets are illustrated in Appendix A (see Pages A.5 and A.8). In most instances, you will use the normal character set. However, there may be times when you will want to access some of the special characters available in the alternate set.

You can enable or disable the alternate character set by pressing the **1** key on the main keyboard.

FILL SCREEN

The fill screen function allows you to fill the entire screen with any one character. This function is used principally for service of the video monitor and character generator within the Z-29 Terminal.

After you press the **F2** key on the main keyboard, you can fill the entire screen with any character you select by pressing the appropriate key. You may change the displayed character as many times as you desire. To return to Setup Menu G, press the **RETURN** key.

Video Attributes

There are sixteen different attributes available on a full screen or character-by-character basis through software. For programming information, see Appendixes A, B, and C.

You may step through the attributes of the entire screen by pressing the **F3** key on the main keyboard. The sixteen attributes are:

1. Normal display at normal intensity.
2. Reverse video at normal intensity.
3. Normal video underlined at normal intensity.
4. Reverse video underlined at normal intensity.
5. Same as number 1 but blinking.
6. Same as number 2 but blinking.
7. Same as number 3 but blinking.
8. Same as number 4 but blinking.
9. Same as number 1 but half intensity.
10. Same as number 2 but half intensity.
11. Same as number 3 but half intensity.
12. Same as number 4 but half intensity.
13. Same as number 5 but half intensity.
14. Same as number 6 but half intensity.
15. Same as number 7 but half intensity.
16. Same as number 8 but half intensity.

OPERATION

Test

This terminal has a built-in series of tests used for servicing. These tests check the ROM and RAM, filling the screen with all characters from the character set, and beeping when the tests are successful. The tests automatically repeat until a failure is detected or you exit from them by pressing any key.

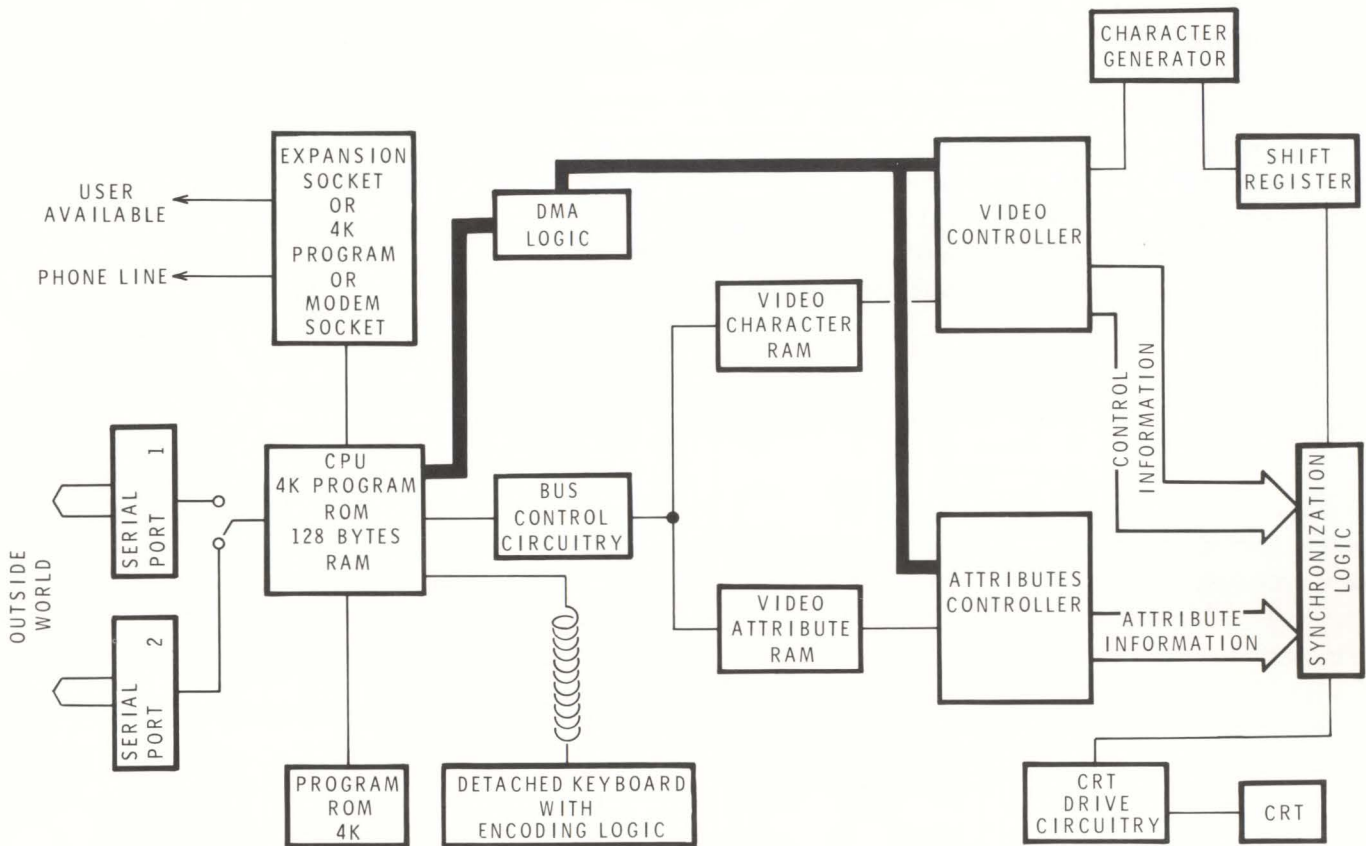
To activate this test function (of Setup Menu G), press the **4** key. To exit from the tests, press any key.

Any errors found will be displayed and printed out of the port you did **not** select during the setup configuration.

NOTE: If you experience a failure during this test function, consult the "In Case of Difficulty" section of this Manual, or contact your Zenith Data Systems Dealer for service.

THEORY OF OPERATION

Refer to Pictorial 10 as you read the following discussion.



PICTORIAL 10

POWER-UP

When you turn the power on for your Z-29 Terminal, AC line voltage is applied to the power supply, where it is converted into several DC voltage levels. These DC voltages are then fed to the various components of the Terminal for operation.

THEORY OF OPERATION

START-UP

The CPU (Central Processor Unit) contains a portion of memory (ROM-Read Only Memory) which instructs the Terminal to perform a series of tests to verify proper operation. At the successful completion of these tests, all circuitry is reset (including a built-in time clock). The system is then initialized by the programming in the program and expansion ROM(s) (permanent program memory) and by the nonvolatile memories (you program these while the Terminal is in the Setup Mode). Communication is established with a host computer (if present) through the port you select during the Setup operation (normal or auxiliary).

TIMING AND CLOCK FUNCTIONS

In addition to maintaining a time clock function, the system also uses various timing signals (clocking frequencies) to maintain synchronization within the Terminal and to establish the communication channel's baud rates (the rate at which information is transmitted from a computer).

CHARACTER AND COMMAND SOURCES

Characters and Terminal commands (single or multiple byte) may be received at the Terminal from any of three sources: the keyboard, a host computer, or its own internal memory.

- When the Terminal receives character and terminal commands are received from the keyboard, the Terminal CPU processes them in accordance with the programming you established when you set up the Terminal, or the instructions contained in its program ROM(s).
- Codes received from a host computer are passed through the Terminal CPU, which strips the data from the transmitted signal. The resulting code can be acted upon if it is a command, or stored in your Terminal's memory if it is a character.

THEORY OF OPERATION

- The internal memory source includes the time clock and the characteristics you establish during Setup or initialization. These may or may not involve characters to be placed on the display.

Regardless of the source of the character or command sequence, the CPU receives and processes the code and then either acts upon it (if it is a command) or routes it to the appropriate memory for use by the Terminal.

ON-SCREEN CHARACTER GENERATION

A complex interrelationship is maintained between the CPU, video character and attribute RAM (memory), the CRT controllers, and display synchronization logic. Part of this relationship is aided by DMA (Direct Memory Access) logic.

PLACING THE CHARACTER IN MEMORY

When a new character is to be generated on the screen, the CPU will route (handled by the bus control circuitry) the character code into the appropriate location (which corresponds to a screen location) in the video character RAM and the attribute code into the corresponding location in the video attribute RAM.

PLACING CHARACTERS ON THE SCREEN

The CPU, under timing control of the clocking signals, and in conjunction with the DMA logic, directs the video and attribute CRT controllers to access the video character and attribute memories in sequential order with respect to placement on the screen.

The codes for the individual characters are sent through the video CRT controller to the character generator, where they are translated into the proper bit pattern for display. From there, the bit pattern is sent to a shift register. Here, the information is sent in a serial fashion through synchronization logic where it is mixed with the attribute for that character. The resulting signal is then routed into the video drive circuitry and reproduced on the screen of the Terminal.

THEORY OF OPERATION

Communication

The CPU, in addition to controlling placement of generated characters, following instructions generated by control codes, and placing data into the appropriate memory location, also handles communication with external devices. The instructions are stored in the program ROM(s) and executed as a result of keyboard entry or a command sequence. Routing of transmitted and received code is handled by the CPU in a manner similar to storing a new character.

If one or more stored characters are to be sent to either a host computer or auxiliary printer, the CPU will make use of the bus control circuitry to locate and retrieve data on a character-by-character basis from the video character and attribute memories. Each character is then converted to serial data and transmitted with the selected protocols (baud rate, handshaking, and parity characteristics) out the appropriate port.

IN CASE OF DIFFICULTY

All ZDS Computer hardware and software products are designed to work together as a complete system. Proper operation can be assured only when your Terminal is used with ZDS designed or approved accessories. ZDS does not assume the responsibility for improper operation resulting from custom interfacing, custom software, or the use of accessories not approved by Zenith Data Systems.

All Terminal components have been wired and tested by ZDS. If you encounter any malfunction during the warranty period, call your Zenith Data Systems Dealer or authorized Zenith Data Systems repair facility to arrange for service. **Do not** attempt to service this Terminal yourself during the warranty period; to do so will void the Warranty.

You can have out-of-warranty products repaired by your Zenith Data Systems Dealer or authorized Zenith Data Systems repair facility. You may wish to obtain a maintenance contract for your Terminal.

If you cannot locate a Zenith Data Systems Dealer or repair facility, call 1-800-447-4700 (in Illinois, 1-800-322-4400) for the name and location of the one nearest you.

IN CASE OF DIFFICULTY

Troubleshooting Chart

The following chart illustrates some difficulties you could encounter and the possible causes.

CONDITION	POSSIBLE CAUSE
Nothing happens at turn on, and Power-on indicator in the keyboard is not lit.	<ol style="list-style-type: none"> 1. Line Cord not plugged in. 2. Power not on at wall plug. 3. Power Switch is not on. 4. Fuse missing, or is blown. 5. Brightness is turned down and keyboard is not connected.
Power-on indicator is not lit, but cursor is evident on screen. Screen reads "ERROR-KEYBOARD"	Keyboard is not plugged into the Terminal (keyboard cable not plugged into keyboard or Terminal).
No video (blank screen). Power-on indicator lit.	Brightness control turned down or screen saver option enabled.
Insufficient brightness.	Brightness control turned down.
Terminal resets to power-on point.	Loose line cord. Loose keyboard cable.
Monitor does not respond to the keyboard.	On line (under host computer control). Keyboard locked. Keyboard cord not connected to either Terminal or keyboard.
Strange or wrong characters appear on screen.	Wrong terminal mode. Wrong communications mode (baud rate, parity, duplex) or protocols.*
* NOTE: In order to communicate effectively with a host computer directly or via modem, the baud rate, parity, and duplex characteristics must agree. Zenith/Heath software utilizes full duplex and does not check parity.	
Screen display wavers.	Wrong line frequency selected during Setup Mode.
Unable to alter Setup Modes.	Optional "hardwire" setup feature has been installed. Contact your local ZDS Dealer for assistance.
Error Message received during diagnostic test.	Contact your local ZDS Dealer for assistance.
RS-232 incompatibility.	Contact your local ZDS Dealer for assistance, giving data on what signals are noncompatible.

IN CASE OF DIFFICULTY

If the Problem Persists

In case you are unable to resolve a difficulty, you may want to contact your local Zenith Data Systems Dealer or authorized Zenith Data Systems repair facility.

If you can isolate the problem to a particular symptom or unit, such as the Printer, you will save time and possibly service expense.

IMPORTANT: Try to list the following information about your Computer. It will help your ZDS dealer to diagnose and repair your unit.

- A. The problem you are having.
- B. The name, Model number, and Series number of your Terminal system.
- C. System configuration (your computer system, including the peripherals you are using).
- D. Any additional information that will help describe your system, such as: specific connection arrangement, what DOS (disk operating system) is being used, and at what baud rate.

IN CASE OF DIFFICULTY

User Maintenance

Your Z-29 Terminal was designed to be as maintenance free as possible. The cabinet may be cleaned with a damp lint free cloth. **CAUTION:** Do not use a liquid or spray solution on your Terminal. High voltage is present inside the cabinet and you could create a serious shock hazard.

The ventilation slots in the cabinet and the openings around the keys could allow paper clips and other small objects to fall inside the case. **DO NOT ALLOW THIS TO HAPPEN.** This can cause a serious malfunction and/or damage to your Terminal.

DO NOT attempt to plug **either** end of the keyboard cable into a conventional telephone company modular outlet. If you do, the voltages present at the telephone company's outlet will seriously damage the Terminal or the keyboard and will affect the status of your warranty.

DO NOT block the ventilation slots by placing papers, folders, or other objects on top of or under the Terminal.

APPENDIX A

ASCII Code Information

ASCII CONVERSION CHART

OCT	DEC	HEX	ASCII	KEYS	DESCRIPTION
000	0	0	NUL	CTRL-@	Null, tape feed.
001	1	1	SOH	CTRL-A	Start of heading.
002	2	2	STX	CTRL-B	Start of text.
003	3	3	ETX	CTRL-C	End of text.
004	4	4	EOT	CTRL-D	End of transmission.
005	5	5	ENQ	CTRL-E	Enquiry, also WRU.
006	6	6	ACK	CTRL-F	Acknowledge, also RU.
007	7	7	BEL	CTRL-G	Rings the bell.
010	8	8	BS	CTRL-H	Backspace; also format effector backspace (FEB).
011	9	9	HT	CTRL-I	Horizontal Tab.
012	10	A	LF	CTRL-J	Line feed: advances cursor to next line.
013	11	B	VT	CTRL-K	Vertical Tab (VTAB).
014	12	C	FF	CTRL-L	Form feed to top of next page.
015	13	D	CR	CTRL-M	Carriage return to beginning of line.
016	14	E	SO	CTRL-N	Shift-out.
017	15	F	SI	CTRL-O	Shift-in.
020	16	10	DLE	CTRL-P	Data line escape.
021	17	11	DC1	CTRL-Q	Device control 1: turns transmitter on (XON).
022	18	12	DC2	CTRL-R	Device control 2.
023	19	13	DC3	CTRL-S	Device control 3: transmitter off (XOFF).
024	20	14	DC4	CTRL-T	Device control 4.
025	21	15	NAK	CTRL-U	Negative acknowledge; also ERR (error).
026	22	16	SYN	CTRL-V	Synchronous idle (SYNC).
027	23	17	ETB	CTRL-W	End of transmission block.
030	24	18	CAN	CTRL-X	Cancel (CANCL). Cancels current escape sequence.
031	25	19	EM	CTRL-Y	End of medium.
032	26	1A	SUB	CTRL-Z	Substitute.
033	27	1B	ESC	CTRL-[	Escape.
034	28	1C	FS	CTRL-\	File separator.

APPENDIX A**ASCII Code Information**

OCT	DEC	HEX	ASCII	KEYS	DESCRIPTION
035	29	1D	GS	CTRL-]	Group separator.
036	30	1E	RS	CTRL- ^	Record separator.
037	31	1F	US	CTRL- -	Unit separator.
040	32	20	SP	SPACE BAR	Space.
041	33	21	!	!	Exclamation 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	0	Number 0.
061	49	31	1	1	Number 1.
062	50	32	2	2	Number 2.
063	51	33	3	3	Number 3.
064	52	34	4	4	Number 4.
065	53	35	5	5	Number 5.
066	54	36	6	6	Number 6.
067	55	37	7	7	Number 7.
070	56	38	8	8	Number 8.
071	57	39	9	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.

APPENDIX A**ASCII Code Information**

OCT	DEC	HEX	ASCII	KEYS	DESCRIPTION
101	65	41	A	A	Letter A.
102	66	42	B	B	Letter B.
103	67	43	C	C	Letter C.
104	68	44	D	D	Letter D.
105	69	45	E	E	Letter E.
106	70	46	F	F	Letter F.
107	71	47	G	G	Letter G.
110	72	48	H	H	Letter H.
111	73	49	I	I	Letter I.
112	74	4A	J	J	Letter J.
113	75	4B	K	K	Letter K.
114	76	4C	L	L	Letter L.
115	77	4D	M	M	Letter M.
116	78	4E	N	N	Letter N.
117	79	4F	O	O	Letter O.
120	80	50	P	P	Letter P.
121	81	51	Q	Q	Letter Q.
122	82	52	R	R	Letter R.
123	83	53	S	S	Letter S.
124	84	54	T	T	Letter T.
125	85	55	U	U	Letter U.
126	86	56	V	V	Letter V.
127	87	57	W	W	Letter W.
130	88	58	X	X	Letter X.
131	89	59	Y	Y	Letter Y.
132	90	5A	Z	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	a	Letter a.
142	98	62	b	b	Letter b.
143	99	63	c	c	Letter c.
144	100	64	d	d	Letter d.
145	101	65	e	e	Letter e.

APPENDIX A**ASCII Code Information**

OCT	DEC	HEX	ASCII	KEYS	DESCRIPTION
146	102	66	f	f	Letter f.
147	103	67	g	g	Letter g.
150	104	68	h	h	Letter h.
151	105	69	i	i	Letter i.
152	106	6A	j	j	Letter j.
153	107	6B	k	k	Letter k.
154	108	6C	l	l	Letter l.
155	109	6D	m	m	Letter m.
156	110	6E	n	n	Letter n.
157	111	6F	o	o	Letter o.
160	112	70	p	p	Letter p.
161	113	71	q	q	Letter q.
162	114	72	r	r	Letter r.
163	115	73	s	s	Letter s.
164	116	74	t	t	Letter t.
165	117	75	u	u	Letter u.
166	118	76	v	v	Letter v.
167	119	77	w	w	Letter w.
170	120	78	x	x	Letter x.
171	121	79	y	y	Letter y.
172	122	7A	z	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	DEL	Delete (rubout).

APPENDIX A

ASCII Code Information

GRAPHIC SYMBOLS

KEY (OCTAL) [DECIMAL] {HEX}	SYMBOL	KEY (OCTAL) [DECIMAL] {HEX}	SYMBOL	KEY (OCTAL) [DECIMAL] {HEX}	SYMBOL	KEY (OCTAL) [DECIMAL] {HEX}	SYMBOL
^ (136) [94] {5E}	<pre> *** ***** ***** ***** *** </pre>	b (142) [98] {62}	<pre> ** ** ** ** ***** ***** ** ** ** ** </pre>	f (146) [102] {66}	<pre> ***** ***** ** ** ** ** </pre>	j (152) [106] {6A}	<pre> **** **** **** **** **** **** </pre>
_ (underscore) (137) [95] {5F}	<pre> ***** ***** ***** ***** **** *** ** * * </pre>	c (143) [99] {63}	<pre> ***** ***** ** ** ** ** </pre>	g (147) [103] {67}	<pre> * * ***** * * ***** </pre>	k (153) [107] {6B}	<pre> * * * *** *</pre>
` (grave accent) (140) [96] {60}	<pre> ** ** ** ** ** ** ** ** ** ** </pre>	d (144) [100] {64}	<pre> ** ** ** ** ***** ***** </pre>	h (150) [104] {68}	<pre> * * ***** * *</pre>	l (154) [108] {6C}	<pre> **** **** **** **** </pre>
a (141) [97] {61}	<pre> ***** ***** </pre>	e (145) [101] {65}	<pre> ** ** ** ** ***** ***** </pre>	i (151) [105] {69}	<pre> * </pre>	m (155) [109] {6D}	<pre> **** **** **** **** </pre>

APPENDIX A

ASCII Code Information

Graphic Symbols (cont'd.)

KEY (OCTAL) [DECIMAL] {HEX}	SYMBOL	KEY (OCTAL) [DECIMAL] {HEX}	SYMBOL
Z (172) [122] {7A}	<pre> ***** ***** </pre>	~ (176) [126] {7E}	<pre> **** **** **** *** ** ** ** </pre>
{ (173) [123] {7B}	<pre> ***** ***** </pre>		
| (174) [124] {7C}	<pre> ** ** ** ** ** ** ** ** </pre>		
} (175) [125] {7D}	<pre> ** ** ** ** ** ** ** </pre>		

APPENDIX A

ASCII Code Information

ALTERNATE CHARACTER SET AND GRAPHICS

KEY (OCTAL) [DECIMAL] {HEX}	SYMBOL	KEY (OCTAL) [DECIMAL] {HEX}	SYMBOL	KEY (OCTAL) [DECIMAL] {HEX}	SYMBOL
^ @ (200) [128] {80}	<pre> * **** ***** ***** ***** ***** * </pre>	^ D (204) [132] {84}	<pre> **** * * **** **** * * * * * * </pre>	^ H (210) [136] {88}	<pre> * * ** * ** * ** * ** * * * * * * * ***** </pre>
^ A (201) [129] {81}	<pre> * </pre>	^ E (205) [133] {85}	<pre> * * * * ***** ***** * ***** * * </pre>	^ | (211) [137] {89}	<pre> * * * * * * * ***** * * * * </pre>
^ B (202) [130] {82}	<pre> * </pre>	^ F (206) [134] {86}	<pre> * * * * * * * * * * </pre>	^ J (212) [138] {8A}	<pre> * * * * * * * </pre>
^ C (203) [131] {83}	<pre> ***** * ***** * * ***** * ***** * * * </pre>	^ G (207) [135] {87}	<pre> * * ***** * * ***** </pre>		

APPENDIX A

ASCII Code Information

Alternate Character Set and Graphics (cont'd.)

KEY (OCTAL) [DECIMAL] {HEX}	SYMBOL	KEY (OCTAL) [DECIMAL] {HEX}	SYMBOL	KEY (OCTAL) [DECIMAL] {HEX}	SYMBOL	KEY (OCTAL) [DECIMAL] {HEX}	SYMBOL
^ [(233) [155] {9B}	<pre> ***** * * * * * * * * </pre>	^ _ (237) [159] {9F}	<pre> ***** </pre>	ASCII '#' (243) [163] {A3}	<pre> ***** * ** * * *** </pre>	ASCII ''' (247) [167] {A7}	<pre> ***** * * * * </pre>
^ \ (234) [156] {9C}	<pre> * ***** * ***** * </pre>	ASCII ''' (240) [160] {A0}	<pre> *** * * * * * * * * * *** </pre>	ASCII '\$' (244) [164] {A4}	<pre> * ** * * ***** * </pre>	ASCII '(' (250) [168] {A8}	<pre> *** * * * * * * * * * *** </pre>
^] (235) [157] {9D}	<pre> * * * * ***** * *** * * * * * * </pre>	ASCII '!' (241) [161] {A1}	<pre> * ** * * *** </pre>	ASCII '%' (245) [165] {A5}	<pre> **** * **** * **** </pre>	ASCII ')' (251) [169] {A9}	<pre> *** * * * * * * * * * *** </pre>
^ ^ (236) [158] {9E}	<pre> * </pre>	ASCII '''' (242) [162] {A2}	<pre> *** * * * ** * ***** </pre>	ASCII '&' (246) [166] {A6}	<pre> *** * **** * * *** </pre>	ASCII '*' (252) [170] {AA}	<pre> * * * * * * * * * * </pre>

APPENDIX A

ASCII Code Information

Alternate Character Set and Graphics (cont'd.)

KEY (OCTAL) [DECIMAL] {HEX}	SYMBOL	KEY (OCTAL) [DECIMAL] {HEX}	SYMBOL	KEY (OCTAL) [DECIMAL] {HEX}	SYMBOL	KEY (OCTAL) [DECIMAL] {HEX}	SYMBOL
ASCII '+' (253) [171] {AB}	<pre> **** * * * * * * * * **** </pre>	ASCII '/' (257) [175] {AF}	<pre> **** * * * * * * * * **** </pre>	ASCII '3' (263) [179] {B3}	<pre> ***** * * * * ***** </pre>	ASCII '7' (267) [183] {B7}	<pre> ***** * * * * ***** </pre>
ASCII ',' (254) [172] {AC}	<pre> **** * * * * * * * * **** </pre>	ASCII '0' (260) [176] {B0}	<pre> **** * * * * * * * * **** </pre>	ASCII '4' (264) [180] {B4}	<pre> * * * * * * * * * </pre>	ASCII '8' (270) [184] {B8}	<pre> *** * * * * * * * * *** </pre>
ASCII '-' (255) [173] {AD}	<pre> **** * * * * * * * * * </pre>	ASCII '1' (261) [177] {B1}	<pre> * * * * * </pre>	ASCII '5' (265) [181] {B5}	<pre> ***** * * * * ***** </pre>	ASCII '9' (271) [185] {B9}	<pre> *** * * * * * * * * *** </pre>
ASCII '.' (256) [174] {AE}	<pre> * * * * * * * * * </pre>	ASCII '2' (262) [178] {B2}	<pre> **** * * * * * ***** </pre>	ASCII '6' (266) [182] {B6}	<pre> *** * * * * * * </pre>	ASCII ':' (272) [186] {BA}	<pre> * * * * * * * * * </pre>

APPENDIX A

ASCII Code Information

Alternate Character Set and Graphics (cont'd.)

KEY (OCTAL) [DECIMAL] {HEX}	SYMBOL	KEY (OCTAL) [DECIMAL] {HEX}	SYMBOL	KEY (OCTAL) [DECIMAL] {HEX}	SYMBOL	KEY (OCTAL) [DECIMAL] {HEX}	SYMBOL
ASCII 'K' (313) [203] {CB}	<pre> * * * * * * * * * * </pre>	ASCII 'O' (317) [207] {CF}	<pre> *** * * * * *** </pre>	ASCII 'S' (323) [211] {D3}	<pre> *** * *** * *** </pre>	ASCII 'W' (327) [215] {D7}	<pre> * * * * * * * * * * </pre>
ASCII 'L' (314) [204] {CC}	<pre> ** * * * *** </pre>	ASCII 'P' (320) [208] {D0}	<pre> **** * * **** * * </pre>	ASCII 'T' (324) [212] {D4}	<pre> * *** * * ** </pre>	ASCII 'X' (330) [216] {D8}	<pre> * * * * * * * * * </pre>
ASCII 'M' (315) [205] {CD}	<pre> * * * * * * * * * * * * </pre>	ASCII 'Q' (321) [209] {D1}	<pre> **** * * * * * * * * </pre>	ASCII 'U' (325) [213] {D5}	<pre> * * * * * * * * * * </pre>	ASCII 'Y' (331) [217] {D9}	<pre> * * * * * * * * *** </pre>
ASCII 'N' (316) [206] {CE}	<pre> ***** * * * * * * </pre>	ASCII 'R' (322) [210] {D2}	<pre> * * * * * * * * </pre>	ASCII 'V' (326) [214] {D6}	<pre> * * * * * * * </pre>	ASCII 'Z' (332) [218] {DA}	<pre> ***** * * ***** </pre>

APPENDIX A

ASCII Code Information

Alternate Character Set and Graphics (cont'd.)

KEY (OCTAL) [DECIMAL] {HEX}	SYMBOL	KEY (OCTAL) [DECIMAL] {HEX}	SYMBOL	KEY (OCTAL) [DECIMAL] {HEX}	SYMBOL	KEY (OCTAL) [DECIMAL] {HEX}	SYMBOL
ASCII 'k' (353) [235] {EB}	<pre> * * * * * * * * *</pre>	ASCII 'o' (357) [239] {EF}	<pre> *** * * * * * * * * * ***</pre>	ASCII 's' (363) [243] {F3}	<pre> *** * * * * * * * * * * ***</pre>	ASCII 'w' (367) [247] {F7}	<pre> * * * * * * * * * * * * * * *</pre>
ASCII 'l' (354) [236] {EC}	<pre> ** * * * ***</pre>	ASCII 'p' (360) [240] {F0}	<pre> **** * * * * * * * * * * *</pre>	ASCII 't' (364) [244] {F4}	<pre> * * * * * * * **</pre>	ASCII 'x' (370) [248] {F8}	<pre> * * * * * * * * * * * * *</pre>
ASCII 'm' (355) [237] {ED}	<pre> ** * * * * * * * * * *</pre>	ASCII 'q' (361) [241] {F1}	<pre> **** * * * * * * * * * * *</pre>	ASCII 'u' (365) [245] {F5}	<pre> * * * * * * * * * * * ** *</pre>	ASCII 'y' (371) [249] {F9}	<pre> * * * * * * * * * * * ***</pre>
ASCII 'n' (356) [238] {EE}	<pre> **** * * * * * * * * *</pre>	ASCII 'r' (362) [242] {F2}	<pre> * * * * * * * *</pre>	ASCII 'v' (366) [246] {F6}	<pre> * * * * * * * * * *</pre>	ASCII 'z' (372) [250] {FA}	<pre> ***** * * *****</pre>

APPENDIX A

ASCII Code Information

KEYPAD KEYS	UNSHIFTED	ZENITH	ANSI	SHIFTED
		UNSHIFTED ALTERNATE	UNSHIFTED ALTERNATE	
0	0	ESC?p	ESCOp	0
1/IL	1	ESC?q	ESC Oq	ESC L(Insert Line)
2/↓	2	ESC?r	ESC Or	ESC B(Down Arrow)
3/DL	3	ESC?s	ESC Os	ESC M(Delete Line)
4/←	4	ESC?t	ESC Ot	ESC D(Left Arrow)
5/HOME	5	ESC?u	ESC Ou	ESC H(Home)
6/→	6	ESC?v	ESC Ov	ESC C(Right Arrow)
7/IC	7	ESC?w	ESC Ow	ESC @(Enter Insert-Character mode) ESC O (Exit Insert-Character mode)
8/↑	8	ESC?x	ESC Ox	ESC A(Up Arrow)
9/DC	9	ESC?y	ESC Oy	ESC N(Delete Character)
,	,	ESC?l	ESC Ol	,(Comma)
-	-	ESC?m	ESC Om	-(Dash)
.	.	ESC?n	ESC On	.(Period)
ENTER	ENTER	ESC?M	ESC OM	RETURN

SPECIAL FUNCTION KEYS

KEY	ZENITH ESCAPE CODE	ANSI ESCAPE CODE
F1	ESC S	ESC OS
F2	ESC T	ESC OT
F3	ESC U	ESC OU
F4	ESC V	ESC OV
F5	ESC W	ESC OW
F6(BLUE)	ESC P	ESC OP
F7(RED)	ESC Q	ESC OQ
F8(GREY)	ESC R	ESC OR
F9	ESC OI	ESC OX



APPENDIX B

Zenith Mode Code Information

The Z-29 Terminal recognizes the following ASCII characters while it is operating in the Zenith mode.

OCT	DEC	HEX	Chr	FUNCTIONAL DESCRIPTION OR CHARACTER
007	7	7	BEL	Sounds a tone.
010	8	8	BS	Backspace. Moves the cursor one position to the left. If it is at the left end of the screen, nothing happens.
011	9	9	HT	Tab. Moves the cursor to the next tab stop.
012	10	A	LF	Line Feed. Advances the cursor to the next line. At the bottom of the screen, it scrolls text up one line.
015	13	D	CR	Carriage Return. Moves the cursor to the first character position in the current line. Nothing happens if the cursor is already at the first character position.
016	14	E	SO	Shift Out. Selects the G1 character set as designated by SCS control sequence.
017	15	F	SI	Shift In. Selects the G0 character set as designated by SCS control sequence.
030	24	18	CAN	Cancel. Cancels the current escape sequence.
033	27	1B	ESC	Escape.

SUMMARY OF ZENITH ESCAPE SEQUENCES

In the following listings of escape sequences, we have elected for the purpose of clarity to include a space between the escape key (ESC) and the actual code. Under no circumstances **should you include** this space. The term "defined scrolling region" appears several times in these listings and means lines 1-24 of the screen unless you have specifically altered this region through the use of escape sequences and codes.

APPENDIX B**Zenith Mode Code Information****CURSOR FUNCTIONS**

ESCAPE SEQUENCE	MNEMONIC	DEFINITION
ESC H	ZCUH	Cursor Home
ESC C	ZCUF	Cursor Forward
ESC D	ZCUB	Cursor Backward
ESC B	ZCUD	Cursor Down
ESC A	ZCUU	Cursor Up
ESC I	ZRI	Reverse Index
ESC n	ZCPR	Cursor Position Report
ESC j	ZSCP	Save Cursor Postion
ESC k	ZRCP	Set Cursor to Previously Saved Position
ESC Y	ZDCA	Direct Cursor Addressing
ESC -	ZCBT	Cursor Backward Tabulation
ESC .0	ZTCP	Clear Tab at Cursor Position
ESC .3	ZCAT	Clear All Tab Positions
ESC .8	ZSTCP	Set Tabs at Current Cursor Postion

EDITING AND ERASING

ESCAPE SEQUENCE	MNEMONIC	DEFINITION
ESC E	ZCD	Clear Display (Shift Erase)
ESC b	ZBD	Erase Beginning of Display
ESC J	ZEOP	Erase to End of Display
ESC I	ZEL	Erase Entire Line
ESC o	ZEBL	Erase Beginning of Line
ESC K	ZEOL	Erase to End of Line
ESC L	ZIL	Insert Line
ESC M	ZDL	Delete Line
ESC N	ZDCH	Delete Character
ESC @	ZEIM	Enter Character Insert Mode
ESC O	ZERM	Exit Insert Character Mode

APPENDIX B**Zenith Mode Code Information****CONFIGURATION**

ESCAPE SEQUENCE	MNEMONIC	DEFINITION
ESCz	ZRAM	Reset to Power Up Configuration
ESC r B _n	ZMBR	Modify Baud Rate:[B _n = @ = 75,A = 110, B = 150,C = 300,D = 600,E = 1200, F = 1800,G = ignored,H = 2400, I = ignored,J = 4800,K = ignored, L = 9600, and M = 19200
ESC x P _n	ZSM	Sets these modes where P _n equals: 1 = Enable "25th Line" 2 = Disable Key Click 3 = Enter Hold Screen Mode 4 = Block Cursor 5 = Cursor Off 6 = Keypad Shifted 7 = Enter Alternate Keypad Mode 8 = Auto LF on CR 9 = Auto CR on LF
ESC y P _n	ZRM	Resets these modes where P _n equals: 1 = Disable "25th Line" 2 = Enable Key Click 3 = Exit Hold Screen Mode 4 = Underscore Cursor 5 = Cursor On 6 = Keypad Unshifted 7 = Exit Alternate Keypad Mode 8 = No Auto LF on CR 9 = No Auto CR on LF
ESC < ESC[c	ZEAM	Enter ANSI Mode Identify as VT100 (ESC[?1;2c).

APPENDIX B

Zenith Mode Code Information

MODES OF OPERATION

ESCAPE SEQUENCE	MNEMONIC	DEFINITION
ESC[	ZEHS	Enter Hold Screen Mode
ESC \	ZXHS	Exit Hold Screen Mode
ESC p	ZERV	Enter Reverse Video Mode
ESC q	ZXRV	Exit Reverse Video Mode
ESC s	ZSA	Set Attribute
ESC ~	ZHLP	HELP Key
ESC F	ZEGM	Enter Graphics Mode
ESC G	ZXGM	Exit Graphics Mode
ESC t	ZEKS	Enter Keypad Shifted Mode
ESC u	ZXKS	Exit Keypad Shifted Mode
ESC =	ZAKM	Enter Alternate Keypad Mode
ESC >	ZXAM	Exit Alternate Keypad Mode

APPENDIX B

Zenith Mode Code Information

ADDITIONAL FUNCTIONS

ESCAPE SEQUENCE	MNEMONIC	DEFINITION
ESC }	ZDK	Keyboard Disabled
ESC {	ZEK	Keyboard Enabled
ESC v	ZEWA	Wrap Around at End of Line
ESC w	ZXWA	Discard at End of Line
ESC Z	ZID	Identify as VT52 [ESC/K]
ESC i 0	ZRTT	Request Terminal Type [ESC i B 0]
ESC ^	ZXCL	Transmit Current Line
ESC _	ZXCC	Transmit Character at Cursor
ESC]	ZX25	Transmit 25th Line
ESC #	ZXMP	Transmit Page
ESC `	ZXPP	Transmit Page to Printer

NOTE: The Terminal will transmit the following sequences, but it will not respond to them if they are received by the Terminal.

ESC S	ZF1	Function Key 1 (F1)
ESC T	ZF2	Function Key 2 (F2)
ESC U	ZF3	Function key 3 (F3)
ESC V	ZF4	Function Key 4 (F4)
ESC W	ZF5	Function Key 5 (F5)
ESC P	ZF6	Function Key 6 (F6) Blue
ESC Q	ZF7	Function Key 7 (F7) Red
ESC R	ZF8	Function Key 8 (F8) Grey
ESC O I	ZF9	Function Key 9 (F9)

APPENDIX B

Zenith Mode Code Information

ZENITH ESCAPE SEQUENCES DEFINED

Cursor Functions

Cursor Home — Moves the cursor (home) to the first character position on the first line.

Code: ESC H
Mnemonic: ZCUH

Cursor Forward — Moves the cursor one character position to the right. If the cursor is at the right end of the line, it remains there.

Code: ESC C
Mnemonic: ZCUF

Cursor Backward — Moves the cursor one character position to the left (backspaces). If the cursor is at the start (left end) of a line, it remains there.

Code: ESC D
Mnemonic: ZCUB

Cursor Down — Moves the cursor down one line without changing columns. The cursor will not move past the bottom of the defined scrolling region and no scrolling will take place. Use HDCA (Direct Cursor Addressing) to move the cursor to the "25th Line" - when line 25 is active.

Code: ESC B
Mnemonic: ZCUD

Cursor Up — Moves the cursor up one line. If the cursor reaches the top line of the defined scrolling region, it remains there. No scrolling takes place.

Code: ESC A
Mnemonic: ZCUU

APPENDIX B

Zenith Mode Code Information

Reverse Index — Moves the cursor to the same horizontal position on the preceding line. If the cursor is on the top line of the defined scrolling region, a scroll down is performed.

Code: ESC I
Mnemonic: ZRI

Cursor Position Report — The Terminal indicates the cursor position in the form of ESC Y line# column#.

Code: ESC n
Mnemonic: ZCPR

Save Cursor Position — The present cursor position is saved so that the cursor can be returned there later when given the ZRCP (Set Cursor to Previously Saved Position) command.

Code: ESC j
Mnemonic: ZSCP

Set Cursor to Previously Saved Position — Returns the cursor to the position where it was when the ZSCP (Save Cursor Position) command was received. If the saved position was the “25th Line” and the “25th Line” is no longer enabled, the cursor will not change lines, but, does change columns.

Code: ESC k
Mnemonic: ZRCP

Direct Cursor Addressing — Moves the cursor to a position on the screen by entering the escape code, the ASCII character which represents the line number, and the ASCII character which represents the column number. The first line and the left column are both 32_{10} (the smallest value of the printing characters) and increase from there. Since the lines are numbered from 1_{10} to 25_{10} (from top to bottom) and the columns from 1_{10} to 80_{10} (from left to right), you must add the proper line and column numbers to 31_{10} . Convert these decimal numbers to their equivalent ASCII characters and enter them in the following order:

APPENDIX B

Zenith Mode Code Information

ESC Y line #(ASCII character) column #(ASCII character)

If the line number entered is too high, the cursor will not move. If the column number is too high, the cursor will move to the end of the line. This is the only way to move the cursor to the "25th Line". The "25th Line" must first be enabled.

Code: ESC Y line #(ASCII character) column # (ASCII character)

Mnemonic: ZDCA

Cursor Backward Tabulation — Moves the cursor backwards to the last tab set.

Code: ESC -

Mnemonic: ZCBT

Clear Tab at Cursor Position — Clears the TAB set at the current cursor position.

Code: ESC .0

Mnemonic: ZCTCP

Clear All Tab Positions — Clears all TABs previously set.

Code: ESC .3

Mnemonic: ZCAT

Set Tabs at Current Cursor Position — Sets a TAB at the current cursor position.

Code: ESC .8

Mnemonic: ZSTCP

APPENDIX B

Zenith Mode Code Information**Erasing and Editing**

Clear Display (Shift Erase) — Erases the entire screen, fills the screen with spaces, and then places the cursor in the home position.

Code: ESC E
Mnemonic: ZCD

Erase Beginning of Display — Erases from the start of the screen to the cursor, and includes the cursor position.

Code: ESC b
Mnemonic: ZBD

Erase to End of Display (Erase Key) — Erases all the information from the cursor (including the cursor position) to the end of the display.

Code: ESC J
Mnemonic: ZEOP

ERASE Entire Line — Erases all of the line, including the cursor position.

Code: ESC I
Mnemonic: ZEL

Erase Beginning of Line — Erases from the beginning of the line to the cursor, including the cursor position.

Code: ESC o
Mnemonic: ZEBL

Erase to End of Line — Erases from the cursor (including the cursor position) to the end of the line.

Code: ESC K
Mnemonic: ZEOL

APPENDIX B

Zenith Mode Code Information

Insert Line — Inserts a new blank line by moving the line that the cursor is on, and all following lines, down one line. The cursor is moved to the beginning of the new blank line. No area outside of the scrolling region will be affected.

Code: ESC L
Mnemonic: ZIL

Delete Line — Deletes the contents of the line that the cursor is on, places the cursor at the beginning of the line, moves all the following lines up one line, adding a blank line at the bottom of the defined scrolling region.

Code: ESC M
Mnemonic: ZDL

Delete Character — Deletes the character at the cursor position and shifts any existing text (to the right of the cursor) one character position to the left.

Code: ESC N
Mnemonic: ZDCH

Enter Insert Character Mode — Lets you insert characters or words into text already displayed on the screen. As you type new characters, existing text at the right of the cursor shifts to the right. As each new character is inserted, the character at the end of the line is lost.

Code: ESC @
Mnemonic: ZEIM

Exit Insert Character Mode — Exits from the insert character mode.

Code: ESC O
Mnemonic: ZERM

APPENDIX B

Zenith Mode Code Information**Configuration**

Reset to Power-up Configuration — Cancels all previously set escape modes and returns to the power-up configuration.

Code: ESC z
Mnemonic: ZRAM

Modify Baud Rate — Modifies the baud rate, where B_n equals:
@ = 75, A = 110, B = 150, C = 300, D = 600,
E = 1200, F = 1800, G = ignored, H = 2400,
I = ignored, J = 4800, K = ignored, L = 9600, M = 19200

Code: ESC r B_n
Mnemonic: ZMBR

Set Mode(s) — Sets the following modes, where P_n equals:

- 1 = Enable "25th Line".
- 2 = Disable key click.
- 3 = Enter hold screen mode.
- 4 = Block cursor.
- 5 = Cursor off.
- 6 = Keypad shifted.
- 7 = Enter alternate keypad mode.
- 8 = Auto line feed on receipt of CR.
- 9 = Auto CR on receipt of line feed.

Code: ESC x P_n
Mnemonic: ZSM

APPENDIX B

Zenith Mode Code Information

Reset Mode(s) — Resets special modes, where P_n equals:

- 1 = Disable “25th Line”. If the cursor is on the 25th Line, it returns to home.
- 2 = Enable key click.
- 3 = Exit hold screen mode.
- 4 = Underscore cursor.
- 5 = Cursor on.
- 6 = Keypad unshifted.
- 7 = Exit alternate keypad mode.
- 8 = No auto line feed on CR.
- 9 = No auto CR on LF.

Code: ESC y P_n
Mnemonic: ZRM

Enter ANSI Mode — Enters the ANSI mode.

Code: ESC <
Mnemonic: ZEAM
Identify as VT100 — VT100 (ESC[?1;2c).

Modes of Operation

Enter Hold Screen Mode — Determines when new information is printed on the screen. — Type the NO SCROLL key and a new line of information will be printed on the bottom line. The top line will scroll off. — Type SHIFT NO SCROLL and a whole new page of text will scroll onto the screen and stop as the old page scrolls up and off the screen.

Code: ESC [
Mnemonic: ZEHS

APPENDIX B

Zenith Mode Code Information

Exit Hold Screen Mode — Exits the hold screen mode.

Code: ESC \
Mnemonic: ZXHS

Enter Reverse Video Mode — Enters the reverse video mode so characters are displayed as black characters on a green background.

Code: ESC p
Mnemonic: ZERV

Exit Reverse Video Mode — Exits the reverse video mode.

Code: ESC q
Mnemonic: ZXRV

Set Attribute — Sets the video attribute in the following form:

ESC s <attribute>

Where <attribute> is the ASCII character formed when the ASCII value for '0' (30 hex, 48 decimal) is added to the binary value obtained from data where each bit position represents an attribute. Bit positions are in the following locations:

<alt> <undr> <half> <blink> <rev>

Code: ESC s <attribute>
Mnemonic: ZSA

HELP Key

Code: ESC ~
Mnemonic: ZHLP

APPENDIX B

Zenith Mode Code Information

Enter Graphics Mode — Enters the graphics mode to display any of the 33 special symbols accessed by 26 lower-case keys and seven other keys corresponding to the graphic symbols in the selected character set.

Code: ESC F
Mnemonic: ZEGM

Exit Graphics Mode — Exits the graphics mode and returns to the standard character display in the selected character set.

Code: ESC G
Mnemonic: ZXGM

Enter Keypad Shifted Mode — Inverts the normal and shifted functions of the keypad. If you hold either SHIFT key down, you will get a normal, unshifted character.

Code: ESC t
Mnemonic: ZEKS

Exit Keypad Shifted Mode — Exits the keypad shifted mode.

Code: ESC u
Mnemonic: ZXKS

APPENDIX B**Zenith Mode Code Information**

Enter Alternate Keypad Mode — Enters the alternate keypad mode, which allows the keypad keys to transmit the following escape codes instead of the normal character codes:

<u>KEY</u>	<u>ESCAPE CODE</u>
0	ESC ? p
1	ESC ? q
2	ESC ? r
3	ESC ? s
4	ESC ? t
5	ESC ? u
6	ESC ? v
7	ESC ? w
8	ESC ? x
9	ESC ? y
-	ESC ? m
.	ESC ? n
,	ESC ? l
ENTER	ESC ? M

These special escape codes can be used by your software.

Code: ESC =
Mnemonic: ZAKM

Exit Alternate Keypad Mode — Exits the alternate keypad mode and returns to transmission of normal character codes.

Code: ESC >
Mnemonic: ZXAM

APPENDIX B

Zenith Mode Code Information

Additional Functions

Keyboard Disabled — Disables the output of the keyboard.

Code: ESC }
Mnemonic: ZDK

Keyboard Enabled — Enables the keyboard after it was disabled by the ZDK (Keyboard Disabled) command.

Code: ESC {
Mnemonic: ZEK

Wrap Around at End of Line — After receiving the 80th character, the cursor is automatically moved to the first character position on the next line. The region scrolls up if necessary.

Code: ESC v
Mnemonic: ZEWA

Discard at End of Line — After the 80th character in a line, any characters received will overprint. Therefore, only the last character received will be displayed in position 80.

Code: ESC w
Mnemonic: ZXWA

Identify as VT52 (ESC/K) — The Terminal replies to the interrogation with ESC/K indicating that it can perform as a DEC VT52.

Code: ESC Z
Mnemonic: ZID

Request Terminal Type (ESC i B 0) — Requests terminal type. Terminal responds with ESC i B 0.

Code: ESC i 0
Mnemonic: ZRTT

APPENDIX B

Zenith Mode Code Information

Transmit Current Line — Transmits the current line.

Code: ESC ^
Mnemonic: ZXCL

Transmit Character at Cursor — Transmits the character at the cursor position.

Code: ESC _
Mnemonic: ZXCC

Transmit 25th Line — Transmits the “ 25th line”. (The computer requires a special user routine to handle this feature.)

Code: ESC]
Mnemonic: ZX25

Transmit Page — Transmits lines 1 through 24. (The computer requires a special user routine to handle this feature.)

Code: ESC #
Mnemonic: ZXMP

Transmit Page to Printer — Transmits the page to printer through the port **not** selected during the setup configuration.

Code: ESC `
Mnemonic: ZXPP

Function Key #1 (F1) — Transmits an escape code to be used to perform a user-defined function. There is no response by the Terminal.

APPENDIX B

Zenith Mode Code Information

Function Key #2 (F2) — Transmits an escape code to be used to perform a user-defined function. There is no response by the Terminal.

Code: ESC T
Mnemonic: ZF2

Function Key #3 (F3) — Transmits an escape code to be used to perform a user-defined function. There is no response by the Terminal.

Code: ESC U
Mnemonic: ZF3

Function Key #4 (F4) — Transmits an escape code to be used to perform a user-defined function. There is no response by the Terminal.

Code: ESC V
Mnemonic: ZF4

Function Key #5 (F5) — Transmits an escape code to be used to perform a user-defined function. There is no response by the Terminal.

Code: ESC W
Mnemonic: ZF5

NOTE: Function Keys F6, F7, and F8 correspond to the Blue, Red and Grey Keys, respectively, as found on older Zenith Terminals.

Function Key #6 (F6) — Transmits an escape code to be used to perform a user-defined function. There is no response by the computer.

Code: ESC P
Mnemonic: ZF6

APPENDIX B

Zenith Mode Code Information

Function Key #7 (F7) — Transmits an escape code to be used to perform a user-defined function. There is no response by the Terminal.

Code: ESC Q
Mnemonic: ZF7

Function Key #8 (F8) — Transmits an escape code to be used to perform a user-defined function. There is no response by the Terminal.

Code: ESC R
Mnemonic: ZF8

Function Key #9 (F9) — Transmits an escape code to be used to perform a user-defined function. There is no response by the Terminal.

Code: ESC OI
Mnemonic: ZF9



APPENDIX C

ANSI Mode Code Information

The Z-29 Terminal recognizes the following ASCII characters while it is operating in the ANSI mode.

<u>OCT</u>	<u>DEC</u>	<u>HEX</u>	<u>Chr</u>	<u>FUNCTIONAL DESCRIPTION OR CHARACTER</u>
007	7	7	BEL	Sounds a tone.
010	8	8	BS	Backspace. Moves the cursor one position to the left. If it is at the left end of the screen, nothing happens.
011	9	9	HT	Tab. Moves the cursor to the next tab stop.
012	10	A	LF	Line Feed. Advances the cursor to the next line. At the bottom of the screen, it scrolls text up one line.
015	13	D	CR	Carriage Return. Moves the cursor to the first character position in the current line. Nothing happens if the cursor is already at the first character position.
016	14	E	SO	Shift Out. Selects the G1 character set as designated by the SCS control sequence.
017	15	F	SI	Shift In. Selects the G0 character set as designated by the SCS control sequence.
030	24	18	CAN	Cancel. Cancels the current escape sequence.
033	27	1B	ESC	Escape.

APPENDIX C

ANSI Mode Code Information

SUMMARY OF ANSI ESCAPE SEQUENCES

NOTES:

1. In the ANSI mode, the Terminal only recognizes and responds to escape codes whose syntax and semantics are in accordance with ANSI specifications.
2. "Default" is the value assumed when no explicit value, or a value of zero, is specified.
3. P_n - Numeric Parameter. Any decimal number that is substituted for P_n .
4. P_s - Selective Parameter. Any decimal number taken from a list and used to select a subfunction. You can select several subfunctions at once by putting one number after another, separating them with delimiters (semicolons), to a maximum of eight parameters.

APPENDIX C

ANSI Mode Code Information

CURSOR FUNCTIONS

ESCAPE SEQUENCE	MNEMONIC	DEFINITION
ESC [H or ESC [0 ; 0 H or ESC [1 ; 1 H ESC [f or ESC [0 ; 0 f or ESC [1 ; 1 f	CUP or HUP	Cursor Home.
ESC [P _n C	CUF	Cursor forward.
ESC [P _n D	CUB	Cursor backward.
ESC [P _n B	CUD	Cursor down.
ESC [P _n A	CUU	Cursor up.
ESC M	RI	Reverse index.
ESC [6 n	CPR	Cursor position report.
ESC [s	PSC	Save cursor position.
ESC [u	CUP	Restore cursor position.
ESC [p _i ; P _c H or ESC [P _i ; P _c f	CUP CHT	Direct cursor addressing.
ESC H		Cursor horizontal tab set.
ESC [P _n Z	CBT	Cursor backward tabulation.
ESC [P _s g	CCT	Clear horizontal cursor tab stops, P _s = 0 = Clear horizontal tab at cursor. 3 = Clear all horizontal tab stops.
ESC D	IND	Index

APPENDIX C

ANSI Mode Code Information

ERASING AND EDITING

ESCAPE SEQUENCE	MNEMONIC	DEFINITION
ESC[2J	ED	Clear display (shift erase).
ESC[1J	ED	Erase beginning of display.
ESC[J or ESC[0J	ED	Erase to end of page (erase key).
ESC[2K	EL	Erase entire line.
ESC[1K	EL	Erase beginning of line.
ESC[K or ESC[0K	EL	Erase to end of line.
ESC[P _n L	IL	Insert line.
ESC[P _n M	DL	Delete line.
ESC[P _n @	IC	Perform insert character.
ESC[P _n P	DCH	Delete character.
ESC[4h	IRM	Insert replacement (Insert-character) Mode On.
ESC[4l	IRM	Insert/Replacement (Insert-character) Mode Off.
ESC[6h	ERM	Set Erasure Mode.
ESC[6l	ERM	Reset Erasure Mode.

APPENDIX C

ANSI Mode Code Information

CONFIGURATION

ESCAPE SEQUENCE	MNEMONIC	DEFINITION
ESC c	RIS	Reset to power-up configuration.
ESC [z or	PRAM	
ESC [P _n W	PMBR	Modify baud rate(P _n = ; 0 = 75, 1 = 110, 2 = 150, 3 = 300, 4 = 600, 5 = 1200, 6 = 1800, 7 = ignored, 8 = 2400, 9 = ignored, 10 = 4800, 11 = ignored, 12 = 9600, 13 = 19200)
ESC [> P _s h	SM	Set Mode(s): P _n = 1 = Enable 25th line. 2 = Disable key click. 3 = Enter Hold Screen Mode. 4 = Block cursor. 5 = Cursor off. 6 = Keypad shifted. 7 = Enter Alternate Keypad Mode. 8 = Auto LF on CR. 9 = Auto CR on LF.
ESC [> P _s l	RM	Reset Mode(s): P _n = 1 = Disable 25th line. 2 = Enable key click. 3 = Exit Hold Screen Mode. 4 = Underscore cursor. 5 = Cursor off. 6 = Keypad unshifted. 7 = Exit Alternate Keypad Mode. 8 = No auto LF on CR. 9 = No auto CR on LF.
ESC [? 2 h	PEZM	Enter Zenith Mode.
ESC [20 h	LNM	Enter auto CR on LF.
ESC [20 l	LNM	Exit auto CR on LF.
ESC [P _t ; P _b r	SR	Define scrolling region.
ESC [? 2 l		Enter VT52 mode.

APPENDIX C

ANSI Mode Code Information

ESCAPE SEQUENCE	MNEMONIC	DEFINITION
ESC(P _n	SCS	G0 designator. Select character set where P _n = B = United States (USASCII). 0 = Special characters and line drawing set(VT100). 1 = Alternate character ROM, 2 = Alternate character ROM, special graphics characters.
ESC)P _n	SCS	G1 designator. Select character set where P _n = B = United States (USASCII). 0 = Special character and line drawing set(VT100). 1 = Alternate character ROM, 2 = Alternate character ROM, special graphics characters.
ESC [c or ESC [0c	RDA	Report device attributes (VT100/VT101 responds ESC [?1;2c)

APPENDIX C

ANSI Mode Code Information

MODES OF OPERATION

ESCAPE SEQUENCE	MNEMONIC	DEFINITION
ESC[> 3 h	SM	Enter Hold Screen Mode.
ESC[> 3 l	RM	Exit Hold Screen Mode.
ESC[7 m	SGR	Enter Reverse Video Mode.
ESC[m	SGR	Exit Reverse Video Mode.
ESC[P _n v	SAR	Set blinking attribute.
ESC[P _h ; P _m ; P _s	SC	Set Clock (h:m:s).
ESC[10 m	SGR	Enter Graphics Mode.
ESC[11 m	SGR	Exit Graphics Mode.
ESC[P _s m	SGR	Set Mode. Enter/exit Select Graphic Rendition Mode, where P _s = 0 = Exit all attributes. 2 = Enter 1/2 intensity. 4 = Enter underline. 5 = Enter blinking. 7 = Enter reverse video.
ESC = or ESC[> 7 h	SM	Enter Alternate Keypad Mode.
ESC > or ESC[> 7 l	RM	Exit Alternate Keypad Mode.
ESC[> 6 h	SM	Enter Keypad Shift Mode.
ESC[> 6 l	SM	Exit Keypad Shift Mode.
ESC[P _n }	SPF	Select protective field, where P _n = 0 = no fields protected. 2 = 1/2 intensity protected. 4 = underline protected. 5 = blinking protected. 7 = rev. video protected. 254 = all attributes off-protected.

APPENDIX C

ANSI Mode Code Information

ESCAPE SEQUENCE	MNEMONIC	DEFINITION
ESC[1h	GATM	Set Guarded Area Transfer Mode.
ESC[1l	GATM	Reset Guarded Area Transfer Mode.
ESC[~	SS3	HELP key.

ADDITIONAL FUNCTIONS

ESCAPE SEQUENCE	MNEMONIC	DEFINITION
ESC[2h	SM	Keyboard disabled.
ESC[2l	RM	Keyboard enabled.
ESC[?7h	SM	Wraparound at EOL
ESC[?7l	RM	Discard at EOL.
ESC #7	ZXPP	Transmit page to printer.
ESC[_p nP	PXMT	Transmit Mode, where P _n = 0 = transmit page. 1 = transmit current line. 2 = transmit character at-cursor. 3 = transmit "25th Line".
ESC[<P _n >v	SM	Set blinking rate in 1/30sec.
ESC OS	SS3	Function key 1 (F1).
ESC OT	SS3	Function key 2 (F2).
ESC OU	SS3	Function key 3 (F3).
ESC OV	SS3	Function key 4 (F4).
ESC OW	SS3	Function key 5 (F5).
ESC OP	SS3	Function key 6 (F6)Blue.
ESC OQ	SS3	Function key 7 (F7)Red.
ESC OR	SS3	Function key 8 (F8)Gray.
ESC OX	SS3	Function key 9 (F9).

NOTE: Function key F1 corresponds to DEC™ key F4.
 Function key F6 corresponds to DEC key F1.
 Function key F7 corresponds to DEC key F2.
 Function key F8 corresponds to DEC key F3.

APPENDIX C**ANSI Mode Code Information**

ANSI ESCAPE SEQUENCES DEFINED

NOTES:

1. In the ANSI mode, the Terminal only recognizes and responds to escape sequences whose syntax and semantics are in accordance with ANSI specifications.
2. "Default" is the value assumed when no explicit value, or a value of zero, is specified.
3. P_n - Numeric Parameter. Any decimal number that is substituted for P_n .
4. P_s - Selective Parameter. Any decimal number taken from a list and used to select a subfunction. You can select several subfunctions at once by putting one number after another, separating them with delimiters (semicolons), to a maximum of eight parameters.

APPENDIX C

ANSI Mode Code Information

Cursor Functions

Cursor Position and **Horizontal/Vertical Position** — Moves the cursor to a position specified by the parameters. The first parameter specifies the line number. The second parameter specifies the column number. When the value zero is used, it is considered to be the value one. If no parameter is given, the cursor is placed in the home position.

CUP Cursor Position	ESC [H or ESC [0;0H or
<u>OR</u>	ESC [1;1 H

HVP Horizontal & Vertical Position	ESC [f or ESC [0;0f (or)
	ESC [1;1 f

Default Value:1

Cursor Forward — Moves the cursor right the number of characters determined by the value of P_n . If this number is zero or one, the cursor moves one position. The cursor stops at the right-most character position.

Code: ESC [P_n C
 Mnemonic: CUF
 Default Value: 1

Cursor Backward — Moves the cursor left the number of characters determined by the value of P_n . If this number is zero or one, the cursor moves one position. The cursor stops at the left-most character position.

Code: ESC [P_n D
 Mnemonic: CUB
 Default Value: 1

APPENDIX C

ANSI Mode Code Information

Cursor Down — Moves the cursor down without changing columns. The number of lines moved is determined by the value of P_n . If this number is zero or one, the cursor moves down one line. The cursor will stop at the bottom most line of the defined scrolling region. Direct Cursor Addressing must be used to move to the “25th Line”.

Code: ESC [P_n B
Mnemonic: CUD
Default Value: 1

Cursor UP — Moves the cursor up without changing columns. The number of lines moved is determined by the value of P_n . If this number is zero or one, the cursor moves up one line. The cursor will stop at the top line.

Code: ESC [P_n A
Mnemonic: CUU
Default Value: 1

Index — Moves the cursor down, functions in the same manner as line feed.

Code: ESC D
Mnemonic: IND

Reverse Index — Moves the cursor to the same position on the preceding line. If the cursor is on the top line of the defined scrolling region, it will not move.

Code: ESC M
Mnemonic: RI

APPENDIX C

ANSI Mode Code Information

Cursor Position Report — The Terminal reports the cursor position as: ESC [P_l ; P_c R, where _l = line and _c = column expressed as decimals.

Code: ESC [6 n
Mnemonic: CPR

Save Cursor Position — The present cursor position is saved so that the cursor can be returned here later when the PRCP (Move To Previously Saved Position) command is given.

Code: ESC [s
Mnemonic: PSCP

Move To Previously Saved Position — Returns the cursor to the position where it was when it received the PSCP (Save Cursor Position) command.

Code: ESC [u
Mnemonic: PRCP

Direct Cursor Addressing — Same as CUP and HVP above. If the line number (P_l) entered is too high, the cursor will not move. If the column number (P_c) is too high, the cursor will move to the end of the line.

With the “25th Line” enabled, this is the only way to move the cursor to the “25th Line”. To move the cursor home, enter 0 ; 0 or 1 ; 1 or do not enter any values.

Code: ESC [P_l ; P_c H ESC [P_l ; P_c f
Mnemonic: CUP
Default Value: 1

Cursor Horizontal Tab Set — Sets the horizontal tabs at the cursor position.

Code: ESC H
Mnemonic: CHT

APPENDIX C

ANSI Mode Code Information

Cursor Backward Tabulation — Moves the cursor backwards to the previous tab set, where P_n indicates the number of tabs back from the cursor position.

Code: ESC[P_n Z

Mnemonic: CBT

Default Value: 0

Clear Horizontal Cursor Tab Stops — Clears the horizontal tab stops, where P_s determines where the horizontal tabs will be cleared.

0 = Clear horizontal tabs at cursor

3 = Clear all horizontal tabs stops

Code: ESC[p_s g

Mnemonic: CCT

Default Value: 0

APPENDIX C

ANSI Mode Code Information

Erasing and Editing

Erase in Display — Erases some or all of the characters in the display according to the value of P_n .

<u>P_n</u>	<u>MEANS</u>
0	Erases from the cursor to the end of the screen, including the cursor position.
1	Erases from the start of the screen to the cursor, including the cursor position.
2	Erases all of the screen. The cursor goes to the home position.

Code: ESC [P_n , J

Mnemonic: ED

Default Value: 0

Erase In Line — Erases some or all of the characters in the cursor line according to the value of P_n .

<u>P_n</u>	<u>MEANS</u>
0	Erases from the cursor to the end of the line including the cursor position.
1	Erases from the start of the line to the cursor including the cursor position.
2	Erases all of the line including the cursor position.

Code: ESC [P_n , K

Mnemonic: EL

Default Value: 0

Insert Line — Inserts one or more blank lines (depending on the value of P_n) by moving the line the cursor is on and all following lines down P_n lines. The cursor is moved to the beginning of the new blank line.

Code: ESC [P_n L

Mnemonic: IL

Default Value: 1

APPENDIX C

ANSI Mode Code Information

Delete Line — Deletes the line of characters that the cursor is in, and the other following lines for the number of lines indicated by P_n if P_n is greater than one. The remaining lines below the deleted area move up the number of lines that were deleted. The cursor is placed at the beginning of the next line.

Code: ESC [P_n M
Mnemonic: DL
Default Value: 1

Delete Character — Deletes characters at the cursor position, and other positions on the cursor line (to the right of the cursor) if P_n is greater than one. Any remaining character to the right of the deleted characters move left the number of characters that were deleted.

Code: ESC [P_n P
Mnemonic: DCH
Default Value: 1

Perform Insert Character — Inserts the number of characters as indicated by P_n if P_n is greater than one. Existing characters to the right of the inserted character(s) move right the number of characters that were inserted.

Code: ESC [P_n @
Mnemonic: IC
Default Value: 1

Insert/Replacement Mode On — Allows characters or words to be inserted into text already displayed on the screen. As new characters are entered, existing text (to the right of the cursor) shifts to the right. As each new character is inserted, the character at the end of the line is lost.

Code: ESC [4 h
Mnemonic: IRM

Insert/Replacement Mode OFF — Exits from the I/R mode.

Code: ESC [4 l
Mnemonic: IRM

APPENDIX C

ANSI Mode Code Information

Set Erasure Mode — Enables the erasure mode.

Code: ESC [6 h
Mnemonic: ERM

Reset Erasure Mode — Disables the erasure mode.

Code: ESC [6 l
Mnemonic: ERM

Configuration

Reset to Power-Up — Cancels all previously set escape modes and returns to the power-up configuration.

Code: ESC c or ESC [z
Mnemonic: PRAM

Modify Baud Rate — Modifies the baud rate, where P_n equals: 0 = 75, 1 = 110, 2 = 150, 3 = 300, 4 = 600, 5 = 1200, 6 = 1800, 7 = ignored, 8 = 2400, 9 = ignored, 10 = 4800, 11 = ignored, 12 = 9600, 13 = 19200

Code: ESC [P_n w
Mnemonic: PMBR

Set Mode(s) — Sets the following modes, where P_n equals:

- 1 = Enable 25th line.
- 2 = Disable key click.
- 3 = Enter hold screen mode.
- 4 = Block cursor.
- 5 = Cursor off.
- 6 = Keypad shifted.
- 7 = Alternate keypad mode.
- 8 = Auto LF on CR.
- 9 = Auto CR on LF.

You can set one or more modes as determined by the parameter string $P_s ; P_s ; P_s$, etc.

APPENDIX C

ANSI Mode Code Information

Select Character Set — The appropriate G0 and G1 character sets are designated from one of the possible character sets. The G0 and G1 sets are invoked by the codes SI and SO (shift in and shift out) respectively. P_n = B = United States (USASCII), 0 = special character and line drawing set (VT100), 1 = alternate character ROM, and 2 = alternate character ROM, special characters, and line drawing sets.

For G0:

Code: ESC (P_n)

For G1:

Code: ESC)P_n

Mnemonic(both): SCS

Code: ESC [>P_s h

Mnemonic: SM

Default Value: None

Reset Mode(s) — Resets the following modes, where P_s equals:

- 1 = Disable 25th line.
- 2 = Enable key click.
- 3 = Exit hold screen mode.
- 4 = Underscore cursor.
- 5 = Cursor on.
- 6 = Keypad unshifted.
- 7 = Exit alternate keypad mode.
- 8 = No auto LF on CR.
- 9 = No auto CR on LF.

You can reset one or more modes as determined by the parameter string P_s;P_s;P_s, etc.

Code: ESC [> P_s I

Mnemonic: RM

Default Value: None

APPENDIX C

ANSI Mode Code Information

Enter ZDS Mode — Enters the ZDS Mode.

Code: ESC [? 2 h
Mnemonic: PEZM

Enter VT52 mode — Enters VT52 mode

Code: ESC [? 2 I

Enter auto CR on LF Mode — Enables the auto carriage return on Line Feed Mode.

Code: ESC [20 h
Mnemonic: LNM

Exit auto CR on LF Mode — Disables the auto carriage return on Line Feed Mode.

Code: ESC [20 I
Mnemonic: LNM

Define Scrolling Region — Permits the user to define the region where scrolling may occur. The scrolling region is equal to the values of P_t and P_b , where t = the top of the scrolling region and b = the bottom of the scrolling region. The numbers indicating the line positions are expressed as decimals. Default is the entire screen. The minimum size of the scrolling region allowed is 2 lines (top must be less than bottom). The cursor is placed in the HOME position.

Code: ESC [P_t ; P_b r
Mnemonic: SR

Modes of Operation

Enter Hold Screen Mode — Determines when new information is printed onto the screen. Type the NO SCROLL key and a new line of information will be printed on the bottom line. The top line will scroll off. - Type SHIFT NO SCROLL and a whole new page of text will scroll onto the screen and stop as the old page scrolls up and off the screen.

Code: ESC [> 3 h
Mnemonic: SM

APPENDIX C

ANSI Mode Code Information

Exit Hold Screen Mode — Exits the hold screen mode.

Code: ESC [> 3 I

Mnemonic: RM

Enter Reverse Video Mode — Enters the reverse video mode so characters are displayed as black characters on a green background.

Code: ESC [7 m

Mnemonic: SGR

Exit Reverse Video Mode — Exits the reverse video mode.

Code: ESC [m

Mnemonic: SGR

Set Blinking Attributes — Sets the blinking attributes where P_n = rate in $P_n/30^{\text{th}}$ second at 60 Hz.

0 = no blinking always "on."

255 = no blinking, always "off."

Code: ESC [P_n v

Mnemonic: SAR

Default Value: 32 (32/30th sec)

Set Clock — Sets the clock in the form $P_h ; P_m ; P_s$, where h = hours (0-23), m = minutes (0-59), and s = seconds (0-59).

Code: ESC [$P_h ; P_m ; P_s$ {

Mnemonic: SC

Enter Graphics Mode — Enters the graphics mode to display any of the 33 special symbols accessed by 26 lower-case keys and seven other keys corresponding to the graphics symbols of the selected character set.

Code: ESC [10 m

Mnemonic: SGR

APPENDIX C

ANSI Mode Code Information

Exit Graphics Mode — Exits the graphics mode and returns to displaying standard, normal characters from the selected character set.

Code: ESC[11 m

Mnemonic: SGR

Enter/Exit Select Graphic Rendition Mode — Enters or exits the select graphic rendition mode where $P_s =$

0 = Exit all attributes.

2 = Enter 1/2 intensity attribute.

4 = Enter underline attribute.

5 = Enter blinking attribute.

7 = Enter reverse video attribute.

Code: ESC[P_s m

Mnemonic: SGR

Enter Keypad Shifted Mode — Inverts the normal and shifted functions of the keypad. If you hold down either SHIFT key, you get a normally unshifted character.

Code: ESC[>6 h

Mnemonic: SM

APPENDIX C

ANSI Mode Code Information

Exit Keypad Shifted Mode — Exits the keypad shifted mode.

Code: ESC [> 6I

Mnemonic: RM

Enter Alternate Keypad Mode — Allows you to enter the alternate keypad mode, which transmits the following escape codes instead of the normal codes:

<u>KEY</u>	<u>ESCAPE CODE</u>
0	ESC Op
1	ESC Oq
2	ESC Or
3	ESC Os
4	ESC Ot
5	ESC Ou
6	ESC Ov
7	ESC Ow
8	ESC Ox
9	ESC Oy
.	ESC On
,	ESC Oi
-	ESC Om
ENTER	ESC OM

These special escape codes are available for use by your software.

Code: ESC = or ESC [> 7h

Mnemonic: SM

Exit Alternate Keypad Mode — Exits the alternate mode and returns to transmit normal character codes.

Code: ESC > or ESC [> 7I

Mnemonic: RM

APPENDIX C

ANSI Mode Code Information

Select Protective Field — Selects the protective field, where $p_n =$

- 0 = No fields protected.
- 2 = 1/2 intensity protected.
- 4 = Underline protected.
- 5 = Blinking protected.
- 7 = Reverse video protected.
- 254 = All attributes OFF-protected.

Code: ESC [p_n]
Mnemonic: SPF

Set Guarded Area Transfer Mode — Enables guarded area transfer mode (transmits all data).

Code: ESC [1 h
Mnemonic: GATM

Reset Guarded Area Transfer Mode — Disables guarded area transfer mode (transmits only unprotected data).

Code: ESC [1 l
Mnemonic: GATM

HELP KEY — HELP Key.

Code: ESC [~
Mnemonic: SS3

Additional Functions

Report Device Attributes — Requests the VT100/VT101 to send a device attributes control sequence to identify itself. The VT100/VT101 responds with ESC[?1;2c.

Code: ESC[c, ESC[0c or ESC Z
Mnemonic: RDA

APPENDIX C

ANSI Mode Code Information

Keyboard Disabled — Disables the output of the keyboard. To activate the keyboard, send the “enable keyboard” escape sequence from the computer or reset the Terminal.

Code: ESC [2 h
Mnemonic: SM

Keyboard Enabled — Enables the keyboard after it was inhibited by an SM (keyboard disabled) command.

Code: ESC [2 l
Mnemonic: RM

Wraparound At End of Line — 81st character on a line is automatically placed in the first character position on the next line. The page scrolls up if necessary and permitted (no hold screen mode enabled).

Code: ESC [? 7 h
Mnemonic: SM

Discard At End Of Line — After the 80th character in a line, the next characters received overprint. Only the last character received will be displayed in position 80.

Code: ESC [? 7 l
Mnemonic: RM

Transmit Mode — Allows the transmission of data where $P_n =$

- 0 = Transmit page
- 1 = Transmit current line
- 2 = Transmit character at cursor
- 3 = Transmit “25th Line”

Code: ESC [p_n P
Mnemonic: PXMT

Transmit Page to Printer — Transmits the page to the printer through the port not selected during the setup configuration.

Code: ESC # 7
Mnemonic: ZXPP

APPENDIX C

ANSI Mode Code Information

Function Key #1 (F1) — Transmits a unique escape code to perform a user-defined function: The Terminal will not respond to this code. This key corresponds to the DEC[™] key F4.

Code: ESC O S
Mnemonic: SS3

Function Key #2 (F2) — Transmits a unique escape code to perform a user-defined function. The Terminal will not respond to this code.

Code: ESC O T
Mnemonic: SS3

Function Key #3 (F3) — Transmits a unique escape code to perform a user-defined function. The Terminal will not respond to this code.

Code: ESC O U
Mnemonic: SS3

Function Key #4 (F4) — Transmits a unique escape code to perform a user-defined function. The Terminal will not respond to this code.

Code: ESC O V
Mnemonic: SS3

Function Key #5 (F5) — Transmits a unique escape code to perform a user-defined function. The Terminal will not respond to this code.

Code: ESC O W
Mnemonic: SS3

Function Key #6 (F6) Blue — Transmits a unique escape code to perform a user-defined function. The Terminal will not respond to this code. This key corresponds to the DEC key F1.

Code: ESC O P
Mnemonic: SS3

APPENDIX C

ANSI Mode Code Information

Function Key #7 (F7) Red — Transmits a unique escape code to perform a user-defined function. The Terminal will not respond to this code. This key corresponds to the DEC key F2.

Code: ESC O Q

Mnemonic: SS3

Function Key #8 (F8) Gray — Transmits a unique escape code to perform a user-defined function. The Terminal will not respond to this code. This key corresponds to the DEC key F3.

Code: ESC O R

Mnemonic: SS3

Function Key #9 (F9) — Transmits a unique escape code to perform a user-defined function. The Terminal will not respond to this code.

Code: ESC O X

Mnemonic: SS3



APPENDIX D**Lear Siegler ADM3A Mode Code Information**

The Z-29 Terminal recognizes the following ASCII Characters while it is operating in the ADM3A mode.

<u>OCT</u>	<u>DEC</u>	<u>HEX</u>	<u>Chr</u>	<u>FUNCTIONAL DESCRIPTION OR CHARACTER</u>
007	7	7	BEL	Sounds a tone.
010	8	8	BS	Backspace. Moves the cursor one position to the left. If it is at the left end of the screen, nothing happens.
011	9	9	HT	Tab. Moves the cursor to the next tab stop.
012	10	A	LF	Line Feed. Advances the cursor to the next line. At the bottom of the screen, it scrolls text up one line.
013	11	B	VT	Moves the cursor up one position. If the cursor is already at the top of the screen, nothing else will happen.
014	12	C	FF	Moves the cursor one position to the right. If the cursor is already at the right side of the screen, nothing else will happen.
015	13	D	CR	Carriage Return. Moves the cursor to the first character position in the current line. Nothing happens if the cursor is already at the first character position.
016	14	E	SO	Enables keyboard entry after it has been disabled by code 0FH.
017	15	F	SI	Disables the keyboard entry. Use code 0EH to enable.
032	26	1A	SUB	Clears the screen and moves the cursor to the home position (first position on the top line).
036	30	1E	RS	Moves the cursor to the home position.

APPENDIX D

Lear Siegler ADM3A Mode Code Information

DIRECT CURSOR ADDRESSING

This command allows you to position the cursor to any line and column on the screen. Legal line numbers are 1 to 24 and column (print position) numbers are 1 to 80. Both are offset by 1FH(31 decimal). For instance, if you want to position the cursor to the third line, the tenth column, the code would be:

$$\text{ESC} = 34_{10}41_{10}$$

Where the desired line ($3_{10} + 31_{10}$) is 34_{10} and the desired column ($10_{10} + 31_{10}$) is 41_{10}

Code: ESC = line column

APPENDIX E

Hazeltine 1500 Mode Code Information

The Z-29 Terminal recognizes the following ASCII Characters while it is operating in the Hazeltine 1500 mode. Note that this Terminal can set up regions which act like independent screens under certain conditions. Also, instead of escape sequences (ESC), the 1500 Mode makes use of tilde (~) sequences.

OCT	DEC	HEX	Chr	FUNCTIONAL DESCRIPTION OR CHARACTER
007	7	7	BEL	Sounds a tone.
010	8	8	BS	Backspace. Moves the cursor one position to the left. If it is at the left end of the screen, nothing happens. If the line is not at the top of a scrolling region, the cursor will move up one line and be positioned to the right end of that new line.
011	9	9	HT	Tab. Moves the cursor to the beginning of the next field (foreground region — normal intensity). If there are no more fields, the cursor will not move.
012	10	A	LF	Line Feed. Moves the cursor down one line. If the cursor is on the last line of a scrolling region, the cursor will remain there and all data within the scrolling region will move up one line. Data on the top line of the scrolling region will be lost as it is scrolled out of the region. If the cursor is at the bottom of a fixed region, no action will take place.
015	13	D	CR	Carriage Return. Moves the cursor to the first character position in the current line. Nothing happens if the cursor is already at the first character position.
020	16	10	DLE	Moves the character one position to the right. If the cursor is at the right end of the line and the line is not the last line of a region, the cursor will move down one line and be placed at the first character position of the new line. If the cursor is already on the last line of the region, nothing else will happen if it is at the right end of the line.
033	27	1B	ESC	Escape.

APPENDIX E

Hazeltine 1500 Mode Code Information

In the following descriptions of special tilde control code sequences, the code is expressed in ASCII format. For instance, ENQ is equal to 5(decimal, hexadecimal, or octal) and DC3 is equal to 19(decimal), 13(hexadecimal), or 23 (octal).

READ CURSOR ADDRESS

The current position of the cursor is reported in the form: column, line. Column positions 0_{10} to 31_{10} have 96_{10} added to them. Column positions 32_{10} to 79_{10} have 0_{10} added to them. The line numbers (0_{10} to 23_{10}) also have 96_{10} added to them. If the cursor is currently on the third line in the tenth column, sending \sim ENQ will cause the Terminal to reply $106_{10}99_{10}(10_{10} + 96_{10}, 3_{10} + 96_{10})$.

If the cursor was at the 35th column of the same row, the Terminal would reply, $35_{10} 99_{10} (35_{10} + 0_{10}, 3_{10} + 96_{10})$.

Code: \sim ENQ

Enable Keyboard — The keyboard is enabled after entry has been inhibited by a disable keyboard command.

Code: \sim ACK

Down Cursor — Moves the cursor down one line. If the cursor is already on the bottom line, nothing will happen.

Code: \sim VT

Up Cursor — Moves the cursor up one line. If the cursor is already on the top line, nothing will happen.

Code: \sim FF

Erase to end of line — Clears the remainder of the current line, including the cursor position. The cursor remains at the same position.

Code: \sim SI

APPENDIX E

Hazeltine 1500 Mode Code Information

Direct Cursor Addressing — Moves the cursor to the column and line indicated. Column positions may be represented by the decimal numbers 0_{10} to 79_{10} , although columns 0_{10} to 30_{10} may also be represented by 96_{10} to 126_{10} . Line numbers may be represented by the decimal numbers 0_{10} to 23_{10} or 96_{10} to 119_{10} . The higher ranges correspond to the cursor position report; this is the preferred method of cursor addressing for the Hazeltine 1500.

Code: \sim DC1 P_{column} P_{line}

Home Cursor — Moves the cursor to the first position of the first line.

Code: \sim DC2

Delete Line — Deletes the current line. The current line is defined as the line which the cursor is located on. The cursor does not move.

Code: \sim DC3

Disable Keyboard — Inhibits entry from the keyboard. \sim ACK will cancel this command.

Code: \sim NAK

Clear and set to background to end of screen — Clears all text from the (and including the) cursor position to the end of the screen. In addition, this command will set the entire area to background spaces and leave the cursor at its current position. If you want to clear the entire screen in this manner, move the cursor to the home position first. See "Home Cursor."

Code: \sim ETB

APPENDIX E

Hazeltine 1500 Mode Code Information

Clear and set to foreground to end of screen — Clears all text from (and including) the cursor position to the end of the screen. In addition, this command will set the entire area to foreground spaces and leave the cursor at its current position. If you want to clear the entire screen in this manner, use the “Clear Screen” command. See “Clear Screen.”

Code: ~ CAN

Background Follows — All following data will be displayed as background data at half intensity. This condition will remain enabled until a “Foreground Follows” command is received. See “Foreground Follows.”

Code: ~ EM

Insert Line — All text on the current line (and following) is moved down one line to allow the insertion of a new line of data. If text existed on the 24th line, or the bottom line of the defined scrolling region, it will be lost.

Code: ~ SUB

Clear Screen — The entire screen will be cleared and set to foreground spaces. The cursor will be moved to the home position (first position on the top line).

Code: ~ FS

Clear Foreground — Clears all foreground areas and moves the cursor to the home position (first position on the first line).

Code: ~ GS

Foreground Follows — All following data will be displayed as foreground data at normal intensity. This condition will remain enabled until a “Background Follows” command is received. See “Background Follows.”

Code: ~ US

APPENDIX F

Software Handshaking Data**SOFTWARE HANDSHAKE**

The Terminal operates at speeds up to 19,200 baud; however, it may not be able to keep up with incoming data. Incoming characters are stored in a 32-character buffer and processed on a first in/first out basis. When the buffer contents reach 22 characters, the Terminal transmits 13H (XOFF or DC3). On receipt of this signal, the host should suspend its transmission to the Terminal. Eventually, if the host stops transmitting, the Terminal will deplete the buffer. When 10 characters remain in the buffer, the Terminal will transmit 11H (XON or DC1) to signal the host that it may resume transmission. If the host fails to respond to an XOFF from the Terminal in a timely manner, the buffer continues to fill. When the 32-character capacity of the buffer is exceeded, a buffer overflow will occur. To determine if the buffer will overflow, use the following formula:

$$\text{Time to respond to XOFF} = 70 / \text{receiver speed}$$

The value, 70, was obtained from the following formula:

$$\begin{aligned} 70 &= (\text{buffer length} - \text{XOFF point} - \text{worst case}) * \text{number} \\ &\text{of bits} \\ 70 &= (32-22-3)* 10 \end{aligned}$$

Example

The Z-29 is transmitting and receiving at 9600 baud. The Terminal has just sent an XOFF, which the host must respond to within 7.29 milliseconds.

$$\text{Time to respond to XOFF} = 70 / 9600 = 0.00729 \text{ seconds}$$

When the buffer overflows, the Z-29 discards the most recent character in the buffer and places the current character into the buffer.

APPENDIX F

Software Handshaking Data

Software that does not support receipt of the XOFF/XON signals from the Terminal can still use the Z-29, provided the software never sends the ESC code to the terminal and the baud rate is **limited to 4800 baud or less**.

Alternately, if XOFF/XON can not be used, a fill character such as NUL (00H) may be used after certain character strings are sent to the Terminal. A chart of fill characters required for these functions follows.

FILL CHARACTER REQUIREMENTS

Fill characters are required to keep the Z-29 synchronized with the host computer when the XON/XOFF control codes or hardware handshaking are not used. This table shows the Z-29 fill character requirements for every receive speed the Terminal is capable of operating at. No entry in a column indicates that fill characters are **not** required. All entries indicate worst case. In some situations, the Terminal can actually operate with less padding. A NUL character has "overhead" associated with it. Because of this, a time delay between characters without NUL character padding will reduce the time needed between characters at higher baud rates.

In addition to the buffer-filling condition, there is another way you can transmit XOFF/XON, by using the CTRL-S and CTRL-Q. The Terminal coordinates these two sources of XOFF and XON so that the desired effect occurs. For example, if the buffer-filling condition causes an XOFF to be sent, the operator presses the CTRL-S key and a second XOFF is not sent. Instead of sending XON when the buffer is empty, the Terminal waits until the operator presses the CTRL-Q key before sending XON. Also, when you enter the SET UP mode, the Terminal temporarily stops taking characters from the buffer. An XOFF is sent if the buffer is nearly full. If hardware handshaking is used, the buffer-filling condition does not send an XOFF, and the CTRL-S and CTRL-Q are transmitted as typed.

APPENDIX F**Software Handshaking Data****Number**

- 1a. All characters except those below (including ESC sequences).
- 1b. Same as above, but with protective fields enabled.
- 2a. Erase in display.
- 2b. Same as above, but with protective fields enabled.
- 3. Reset to initial state.
- 4a. BEL character followed by another BEL character.
- 4b. BEL character followed by any other character.
- 5a. Erase in line.
- 5b. Same as above, but with protective fields enabled.
- 6. Line feed, reverse index.

FUNCTION NUMBER

RECEIVE BAUD RATE	1		2		3	4		5		6
	(a)	(b)	(a)	(b)		(a)	(b)	(a)	(b)	
19200	1	800	32	220	50	1	25	2	16	4
9600		340	14	100	20	1	15	1	8	2
4800		150	4	42	10		5		3	1
2400		75		20	4		1			
1800		60		15	3		1			
1200		36		8	1					
600		17		2						
300		8								
150		4								
110		3								
75		2								

TABLE 1. Fill Character Requirements



Decimal to Octal to Hex to ASCII Conversion

ANSI MODE HEATH/ZENITH MODE
 TO ENTER GRAPHICS MODE ESC | 10 m ESC F
 TO EXIT GRAPHICS MODE ESC | 11 m ESC G

Dec	Oct	Hex	ASCII	Dec	Oct	Hex	ASCII	Alter Char	Dec	Oct	Hex	ASCII	Graphic Sym	Alter Char	Alter Graphic Sym	Dec	Oct	Hex	ASCII	Graphic Sym	Alter Char	Alter Graphic Sym
0	000	00	NUL	32	040	20	SP	0	64	100	40	@				96	140	60	,			
1	001	01	SOH	33	041	21	!	1	65	101	41	A	a			97	141	61	a			
2	002	02	STX	34	042	22	"	2	66	102	42	B	b			98	142	62	b			
3	003	03	ETX	35	043	23	#	3	67	103	43	C	c			99	143	63	c			
4	004	04	EOT	36	044	24	\$	4	68	104	44	D	d			100	144	64	d			
5	005	05	ENQ	37	045	25	%	5	69	105	45	E	e			101	145	65	e			
6	006	06	ACK	38	046	26	&	6	70	106	46	F	f			102	146	66	f			
7	007	07	BEL	39	047	27	'	7	71	107	47	G	g			103	147	67	g			
8	010	08	BS	40	050	28	(	8	72	110	48	H	h			104	150	68	h			
9	011	09	HT	41	051	29	)	9	73	111	49	I	i			105	151	69	i			
10	012	0A	LF	42	052	2A	*	A	74	112	4A	J	j			106	152	6A	j			
11	013	0B	VT	43	053	2B	+	B	75	113	4B	K	k			107	153	6B	k			
12	014	0C	FF	44	054	2C	,	C	76	114	4C	L	l			108	154	6C	l			
13	015	0D	CR	45	055	2D	-	D	77	115	4D	M	m			109	155	6D	m			
14	016	0E	SO	46	056	2E	.	E	78	116	4E	N	n			110	156	6E	n			
15	017	0F	SI	47	057	2F	/	F	79	117	4F	O	o			111	157	6F	o			
16	020	10	DLE	48	060	30	0	0	80	120	50	P	p			112	160	70	p			
17	021	11	DC1	49	061	31	1	1	81	121	51	Q	q			113	161	71	q			
18	022	12	DC2	50	062	32	2	2	82	122	52	R	r			114	162	72	r			
19	023	13	DC3	51	063	33	3	3	83	123	53	S	s			115	163	73	s			
20	024	14	DC4	52	064	34	4	4	84	124	54	T	t			116	164	74	t			
21	025	15	NAK	53	065	35	5	5	85	125	55	U	u			117	165	75	u			
22	026	16	SYN	54	066	36	6	6	86	126	56	V	v			118	166	76	v			
23	027	17	ETB	55	067	37	7	7	87	127	57	W	w			119	167	77	w			
24	030	18	CAN	56	070	38	8	8	88	130	58	X	x			120	170	78	x			
25	031	19	EM	57	071	39	9	9	89	131	59	Y	y			121	171	79	y			
26	032	1A	SUB	58	072	3A	:	A	90	132	5A	Z	z			122	172	7A	z			
27	033	1B	ESC	59	073	3B	;	B	91	133	5B	[	[			123	173	7B	{			
28	034	1C	FS	60	074	3C	>	C	92	134	5C	\	\			124	174	7C	|			
29	035	1D	GS	61	075	3D	=	D	93	135	5D	]	]			125	175	7D	}			
30	036	1E	RS	62	076	3E	>	E	94	136	5E	^	^			126	176	7E	~			
31	037	1F	US	63	077	3F	?	F	95	137	5F	_	_			127	177	7F	DEL			

Programmers Data Information

APPENDIX G

APPENDIX G

Programmers Data Information

Zenith/Heath Mode	Ansi Mode	Description	Zenith/Heath Mode	Ansi Mode	Description
Control Characters			Configuration		
0 Decimal	00 Hex	NUL - Null	ESC r Bn	ESC [Pn w	Modify baud rate
7 Decimal	07 Hex	BEL - Bell	Bn = @	Pn = 0	75 baud
8 Decimal	08 Hex	BS - Backspace	A	1	110 baud
9 Decimal	09 Hex	HT - Horizontal tab (same as VT52)	B	2	150 baud
10 Decimal	0A Hex	LF - Line feed	C	3	300 baud
13 Decimal	0D Hex	CR - Carriage return	D	4	600 baud
14 Decimal	0E Hex	SO - Shift out	E	5	1200 baud
15 Decimal	0F Hex	SI - Shift in	F	6	1800 baud
17 Decimal	11 Hex	DC1 - XON	H	8	2400 baud
19 Decimal	13 Hex	DC3 - XOFF	J	10	4800 baud
24 Decimal	18 Hex	CAN - Cancel current control sequence	L	12	9600 baud
27 Decimal	1B Hex	ESC - Escape	M	13	19200 baud
Cursor Functions			ESC x Ps		
ESC A	ESC [Pn A	Cursor up	ESC [> Ps h	Ps = 1	Set modes
ESC B	ESC [Pn B	Cursor down	2		Enable 25th line
ESC C	ESC [Pn C	Cursor forward	3		No key click
ESC D	ESC [Pn D	Cursor backward	4		Enter hold screen mode
ESC H	ESC [H	Cursor home	5		Block cursor
ESC D	ESC [D	index	6		Cursor off
ESC I	ESC [M	Reverse index	7		Keypad shifted
ESC Y	ESC [Pi Pc H	Direct cursor addressing (same as VT52)	8		Enter alternate keypad mode
	or ESC [Pi Pc I		9		Auto line feed on receipt of CR
ESC j	ESC [s	Save cursor position			Auto carriage return on receipt of LF
ESC k	ESC [u	Set cursor to previously saved position	ESC y Ps		
ESC n	ESC [6n	Cursor position report	ESC [> Ps I	Ps = 1	Reset Modes
ESC -	ESC [Pn Z	Cursor backward tabulation	2		Disable 25th line
			3		Enable key click
			4		Exit hold screen mode
			5		Underscore cursor
			6		Cursor on
			7		Keypad unshifted
			8		Exit alternate keypad mode
			9		No auto line feed
					No auto carriage return
Erasing and Editing			Function Keys Sequence		
ESC E	ESC [2 J	Clear display (SHIFT ERASE)	ESC S	ESC O S	F1 function key
ESC B	ESC [1 J	Erase beginning of display	ESC T	ESC O T	F2 function key
ESC J	ESC [J	Erase to end of display (ERASE key)	ESC U	ESC O U	F3 function key
ESC 1	ESC [2 K	Erase entire line	ESC V	ESC O V	F4 function key
ESC o	ESC [1 K	Erase beginning of line	ESC W	ESC O W	F5 function key
ESC K	ESC [K	Erase to end of line	ESC P	ESC O P	F6 function key (Z-19 BLUE key)
ESC L	ESC [Pn L	Insert line	ESC Q	ESC O Q	F7 function key (Z-19 RED key)
ESC M	ESC [Pn M	Delete line	ESC R	ESC O R	F8 function key (Z-19 GRAY key)
	ESC [Pn @	Insert character	ESC 0 I	ESC O X	F9 function key
	ESC [Pn P	Delete character	ESC -	ESC [-	HELP function key
ESC @	ESC [4 h	Enter insert character mode			
ESC 0	ESC [1 i	Exit insert character mode			
ESC >	ESC [0 g	Clear tab stop at cursor position			
ESC -	ESC [3 g	Clear tab stop positions			
ESC .	ESC H	Set tab stop at cursor position			
Modes of Operation			Alternate Keypad Sequence		
ESC <	ESC [? 2 h	Enter ANSI mode of operation	ESC ? M	ESC O M	"Enter" key
ESC F	ESC [10 m	Enter ZDS mode of operation	ESC ? 1	ESC O 1	"(" (comma) key
ESC G	ESC [11 m	Enter graphics mode	ESC ? m	ESC O m	"-" (minus) key
ESC =	ESC [=	Enter alternate keypad mode	ESC ? n	ESC O n	"(" (period) key
ESC >	ESC [>	Exit alternate keypad mode	ESC ? p	ESC O p	"0" key
ESC [	ESC [> 3 h	Enter hold screen mode	ESC ? q	ESC O q	"1" key
ESC \	ESC [> 3 l	Exit hold screen mode	ESC ? r	ESC O r	"2" key
ESC s	ESC [s	Set attribute	ESC ? s	ESC O s	"3" key
	ESC [2 m	Enter half intensity mode	ESC ? t	ESC O t	"4" key
	ESC [4 m	Enter underline mode	ESC ? u	ESC O u	"5" key
	ESC [5 m	Enter blinking mode	ESC ? v	ESC O v	"6" key
ESC p	ESC [7 m	Enter reverse video mode	ESC ? w	ESC O w	"7" key
	ESC [m	Exit all attribute modes	ESC ? x	ESC O x	"8" key
ESC q	ESC [0	Exit reverse video mode	ESC ? y	ESC O y	"9" key
	ESC [2	No fields are protected			
	ESC [4	Half intensity implies protection			
	ESC [5	Underline implies protection			
	ESC [7	Blinking implies protection			
	ESC [7	Reverse video implies protection			
	ESC [254	No attribute implies protection			
ESC t	ESC [> 6 h	Enter keypad shifted mode			
ESC u	ESC [> 6 l	Exit keypad shifted mode			
	ESC [B	G0 designated as United States set			
	ESC [0	G0 designated as graphic set			
	ESC [1	G0 designated as alternate char set			
	ESC [2	G0 designated as alt char graphic set			
	ESC [B	G1 designated as United States set			
	ESC [0	G1 designated as graphic set			
	ESC [1	G1 designated as alternate char set			
	ESC [2	G1 designated as alt char graphic set			
	ESC [1 h	Set GATM (transmit all data)			
	ESC [1 i	Reset GATM (transmit only unprotected data)			
ESC |	ESC [2 h	Disable keyboard input			
ESC |	ESC [2 i	Enable keyboard input			
	ESC [6 h	Set ERM (erase all data)			
	ESC [6 i	Reset ERM (erase only unprotected data)			
	ESC [20 h	Set LNM (auto CR on receipt of LF)			
	ESC [20 i	Reset LNM (no auto CR on receipt of LF)			
ESC v	ESC [? 7 h	Wrap-around at end of line			
ESC w	ESC [? 7 i	Discard at end of line			
Additional Functions					
ESC #	ESC [p	Transmit page			
ESC ^	ESC [1 p	Transmit current line			
ESC _	ESC [2 p	Transmit character at cursor			
ESC]	ESC [3 p	Transmit 25th line			
ESC ^	ESC # 7	Transmit page to printer			
	ESC [Pt;Pb r	Define scrolling region (top;bottom)			
	ESC [Ph v	Set blinking rate (in 1/30 of second)			
	ESC [Ph;Pm;Ps {	Program clock (hours;minutes;seconds)			
ESC z	ESC c	Reset to power-up configuration			
	ESC [z				
ESC 0		Request terminal type (ESC I B 0)			
ESC Z		Identify as VT52 (ESC / K)			
	ESC [c	Identify as VT100 (ESC [? 1 ; 2 c)			
	or ESC Z				

- ACK, A.1
- Alphabetic keys, 2.5
- Alternate
 - character set, A.8-A.16
 - keypad, 4.12, B.3, B.4, B.11, B.12, B.15, C.5, C.7, C.16, C.17, C.21
- ANSI, 4.8
 - chart, G.2
 - escape sequences, C.2, C.9
 - function key codes, A.17
 - keypad codes, A.17
 - mode, C.1-C.25
- Arrow keys, 2.8-2.9
- ASCII conversion chart, A.1-A.4
- Attributes,
 - video, see Video attributes
 - screen, see Video attributes
- Auto CR, 4.13
 - on LF, B.3, B.11, B.12, C.5, C.16, C.17, C.18
- Auto LF, 4.13
 - on CR, B.3, B.11, B.12, C.5, C.16, C.17, C.18
- Auxiliary port, see DCE

- Back space key, 2.7, 2.9
- Background follows, E.4
- Baud rates, 1.2, 4.5, B.3, B.11, C.5, C.16
- BEL, A.1, B.1, C.1, D.1, E.1
- Block cursor, B.3, B.11, C.5, C.16
- Brightness control, 2.2
- BS, A.1, B.1, C.1, D.1, E.1

- Calculator keypad, 2.11
- CAN, A.1, B.1, C.1
- CANCL, see CAN
- Carrier detect, 3.5
- Caps lock
 - indicator, 2.4, 4.10
 - key, 2.5, 2.6, 4.11

INDEX

- CD, see Carrier detect
- Character
 - generation, 5.3
 - sets, 4.14
 - sources, 5.2
- Clear
 - all tabs, B.2, B.8
 - and set to background to end of screen, E.3
 - and set to foreground to end of screen, E.4
 - display B.2, B.9, C.4, C.14, E.4
 - foreground, E.4
 - horizontal cursor tab stops, C.3
 - screen, see Clear display
 - tab, 4.4, B.2, B.8, C.13
 - to send (CTS), 3.5, 4.6
- Clock,
 - see Set clock
 - theory of operation, 5.2
- Codes, function keys, see Function key codes
- Command sources, 5.2-5.3
- Communication,
 - specifications, 1.2-1.3
 - theory of operation, 5.4
- Connection, keyboard, 3.3, 3.7
- Connector,
 - Keyboard, 2.2
 - DCE, 2.2
 - DTE, 2.2
 - Terminal, 2.4
- Control key, see CTRL key
- Controls and indicators, 2.1-2.11
- Conversion chart, G.1
- CR, 4.13, A.1, B.1, C.1, D.1, E.1
- CTRL key, 2.10
- CTRL-ENTER, 2.10
- CTS, see Clear to send
- Cursor, 3.9 (footnote), 4.13-4.14, B.2
 - backward (right), B.2, B.6, C.3, C.10
 - backward tabulation, B.2, B.8, C.3, C.13
 - down, B.2, B.6, C.3, C.11, E.2

INDEX

- forward (left), B.2, B.6, C.3, C.10
 - home, B.2, B.6, C.3
 - horizontal tab set, C.3
 - movement, in tab menu, 4.4
 - off, B.3, B.11, C.5, C.16
 - on, B.3, B.12, C.5, C.17
 - position, C.10
 - position report, B.2, B.7, C.3, C.12
 - selection, 4.13-4.14
 - specifications, 1.1
 - up, B.2, B.6, C.3, C.11, E.2
 - Zenith mode, B.2
- Data terminal ready (DTR), 3.5, 4.6
- Data set ready (DSR), 3.5
- DCE, 3.4, 4.6, 4.7
 - connector, 2.2
 - pinout and wiring of, 3.5
- DC1, A.1
- DC2, A.1
- DC3, A.1
- DC4, A.1
- Define scrolling region, C.5, C.18
- DEL, A.4
- Delete
 - character, B.2, B.10, C.4, C.15
 - key, 2.9
 - line, B.2, B.10, C.4, C.15, E.3
- Diagnostics, 4.16
 - error messages, 3.8
 - power-on, 3.8
- Dimensions, 1.4
- Direct cursor addressing, B.2, B.7-B.8, C.3, C.12, D.2, E.3
- Disable
 - key click, see Key click
 - keyboard, see Keyboard disabled
 - 25th line, see 25th line
- Discard end of line, B.5, B.16, C.8, C.23
- Display,
 - time, 3.9

INDEX

- 25th line, 3.9
 - specifications, 1.1
- DLE, A.1, E.1
- Down arrow key, 2.9
- DTE, 3.4, 4.6, 4.7
 - connector, 2.2
 - pinout and wiring of, 3.5
- DTR, see Data terminal ready
- DSR, see Data set ready
- Duplex mode, 1.2, 4.6

- Editing specifications, 1.2
- EM, A.1
- Enable
 - key click, see Key click
 - keyboard, see Keyboard enabled
 - 25th line, see 25th line
- ENQ, A.1
- Enter
 - alternate keypad mode, see Alternate keypad
 - ANSI mode, B.3
 - character insert mode, B.2, B.10
 - graphics mode, see Graphics mode
 - hold screen mode, see Hold screen
 - key, 2.11
 - keypad shifted mode, see Keypad shifted
 - reverse video, see Reverse video
 - VT52 mode, C.5, C.18
 - ZDS mode, C.18
- Environment specifications, 1.3
- EOT, A.1
- Erase
 - to beginning of display, B.2, B.9, C.4, C.14
 - to beginning of line, B.2, B.9, C.4, C.14
 - to end of display, B.2, B.9, C.14
 - to end of line, B.2, B.9, C.4, C.14, E.2
 - to end of page, C.4
 - key, 2.9
 - line, B.2, B.9, C.4, C.14
 - screen, see Clear display

- specifications, 1.2
- ERR, A.1
- ESC key, 2.10
- ESC, A.1, B.1, C.1, E.1
- Escape key, see ESC key
- ETX, A.1
- Exit
 - alternate keypad mode, see Alternate keypad character insert mode, B.2, B.10
 - graphics mode, see Graphics mode
 - hold screen mode, see Hold screen
 - keypad shifted mode, see Keypad unshifted
 - reverse video, see Reverse video

- F1-F9
 - codes, C.8, C.24-C.25
 - keys, 2.8
- Fill
 - character requirements, F.3
 - screen, 4.15
- FF, A.1, D.1
- Foreground follows, E.4
- FS, A.1
- Function key codes,
 - Zenith, A.17, B.5, B.17-B.19
 - ANSI, A.17, C.8, C.24-C.25
- Function keys, 2.8, B.5, B.17-B.19, C.8, C.24-C.25
- Fuse, 2.2

- G0 designator, C.6
- G1 designator, C.6
- Graphic symbols, A.5-A.7
- Graphics mode, B.4, B.14, C.7, C.19, C.20
- GS, A.2
- Guarded area transfer mode, C.22

- H/Z-19, see Zenith mode
- Handshaking, 4.6, F.1-F.3

INDEX

Hazeltine, 4.8

mode, E.1-E.4

Help, B.4, B.13, C.8, C.22

key, 2.9

Hold screen, 2.9, 4.8-4.9, B.3, B.4, B.11, B.12-B.13, C.5, C.7,

C.16, C.17, C.18, C.19

Home

cursor, E.3

key, 2.8

HT. A.1, B.1, C.1, D.1, E.1

Identify as VT52, B.5, B.16

Index, C.3, C.11

Indicators

caps lock, 2.4, 4.10

keyboard lock, 2.4

off line, 2.4

power on, 2.4, 3.9

Interface protocols, 4.7

Interfacing, 3.4-3.7

In Case of Difficulty, 6.1-6.3

Insert

line, C.4, C.14, E.4

mode, 4.10, C.4, C.15

one character, C.4

line, B.2, B.10

Installation,

direct connection, 3.6

keyboard, 3.3, 3.7

local installation, 3.6

modem connection, 3.6

printer, 3.6

Key

click, 4.13, B.3, B.11, B.12, C.5, C.16, C.17

repeat, 4.12

Keyboard, 2.3-2.11

alternate, see Alternate keypad

connection, 3.3

INDEX

- connector, 2.2
- disabled, B.5, B.16, C.8, C.23, E.3
- lock indicator, 2.4
- specifications, 1.2
- enabled, B.5, B.16, C.8, C.23, E.2
- Keypad, 4.12
 - alternate, see Alternate keypad
 - codes, ANSI mode, A.17
 - codes, Zenith mode, A.17
 - shifted, 4.12, B.3, B.4, B.11, B.14, C.5, C.7, C.16, C.20, C.21
 - unshifted, B.3, B.4, B.12, C.5, C.7
- Lear Siegler, 4.8
 - mode, D.1-D.2
- Left arrow key, 2.8
- Line cord, 2.2
- Line feed key, 2.8
- Line frequency, 4.14
- LF, 4.13, A.1, B.1, C.1, D.1, E.1

- Maintenance, 6.4
- Menu selection, 4.3
- Modify baud rate, B.3, B.11, C.16
- Monitor
 - function, see Monitor mode
 - mode, 4.9

- NAK, A.1
- No scroll key, 2.9, 4.8
- Nonalphabetic keys, 2.6
- NUL, A.1

- Off line indicator, 2.4
- On/Off line, 4.3
- Operating environment, 1.3

- Page print, C.8, C.23
- Parity, 1.3, 4.6
- Perform insert character, C.15
- PGND, see Protective ground

INDEX

- Port assignment, 4.8
- Position cursor to previously saved position, C.12
- Power
 - ON/OFF switch, 2.2
 - indicator, 2.4, 3.9
 - specifications, 1.3
- Power-up, theory of operation, 5.1
- Primary port, see DTE
- Print page, B.5, B.17
- Protective ground, 3.5
- Protocols, interface, 4.7

- Read cursor address, E.2
- REC, see RS-232C serial input
- Request terminal type, B.5, B.16
- Request to send (RTS), 3.5, 4.6
- Report device attributes, C.6, C.22
- Reset
 - erasure mode, C.4, C.16
 - guarded area transfer mode, C.7
 - to power-up, B.3, B.11, C.5, C.16
- Reset/Break key, 2.9, 3.8
- Return key, 2.7
- Right arrow key, 2.8
- RTS, see Request to send
- Reverse
 - index, B.2, B.7, C.3, C.11
 - video, B.4, B.13, C.7, C.19
- RS, A.2, D.1
- RS-232C
 - serial input, 3.5
 - serial out, 3.5

- Save cursor position, B.2, B.7, C.12
- Screen
 - attributes, see Video attributes
 - saver, 4.11
- Select
 - G0 character set, C.17
 - G1 character set, C.17
 - protective field, C.7, C.22

Set

- attribute, B.4, B.13
- blinking cursor attribute, C.7, C.19
- blinking rate, C.8
- erasure mode, C.4, C.16
- clock, 4.10, C.7, C.19
- cursor to previously saved position, B.2, B.7
- guarded area transfer mode, C.7
- tab, 4.4, B.2, B.8, C.12

Setup

- key, 2.7
- mode, 2.7, 4.1, 4.3

SGND, see Signal ground

Shift key, 2.5, 2.6, 2.7, 2.9, 3.8, 4.8

SI, A.1, B.1, C.1, D.1

Signal ground, 3.5

SO, A.1, B.1, C.1, D.1

SOH, A.1

Sources,

- character, see Character sources
- commands, see Command sources

SP, A.2

Space bar, 2.7, A.2

Special function keys, 2.8

Specifications, 1.1-1.4

Status Line, see 25th line display

Stop bits, 1.3

Storage environment, 1.3

Start-up, theory of operation, 5.2

STX, A.1

SUB, A.1, D.1

SYN, see Sync

Sync, 1.3, A.1

Tab

- key, 2.7
- menu, 4.4

Terminal

- connector, 2.4
- modes, 4.8

INDEX

Tests, see Diagnostics

Theory of operation, 5.1-5.4

Time display, 3.9

Timing, 5.2

Transmit

character, B.5, B.17, C.8, C.23

current line, B.5, B.17, C.8, C.23

page, B.5, B.17, C.8, C.23

page to printer, see Print page

25th line, B.5, B.17, C.8, C.23

Troubleshooting chart, 6.2

25th line, B.3, B.5, B.11, B.12, B.17, C.5, C.16, C.17

display, 3.9, 4.10

Underscore cursor, B.3, B.12, C.5, C.17

Up arrow key, 2.9

US, A.2

Video attributes, 4.15

VT, A.1, D.1

VT100, B.3

Word length, 1.2

Wrap ON/OFF, 4.11, B.5, B.16, C.8, C.23

Wraparound, see Wrap ON/OFF

XOFF, 1.3, 2.9, 4.6, 4.9, A.1, F.1-F.3

XON, 1.3, 2.9, 4.6, 4.9, A.1, F.1-F.3

XMT, see RS-232C serial out

Zenith

to ANSI, see Enter ANSI mode escape sequences, B.1-B.19

function key codes, A.17

keypad key codes, A.17

mode, 4.8, B.1-B.19

mode chart, G.2

