LSI LEAR SIEGLER INC.

ADM 22
Video Display Terminal
Users Reference Manual

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ADM 22

Video Display Terminal

LSI

®
LEAR SIEGLER, INC.

USERS REFERENCE
MANUAL

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<div style="border:1px solid;">

WARNING

This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instruction manual, may cause interference to radio communications. As temporarily permitted by regulation it has not been tested for compliance with the limits for Class A computing devices pursuant to Subpart j of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference. Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

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SUMMARY OF CAUTIONS AND NOTES

CAUTION

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*Allow the **ADM 22** to adjust to any change in the environment before applying power. Moving the unit from one location to another could produce internal condensation and adversely affect its operation.*

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Changing communications characteristics when in Set-Up Mode may affect or prevent further data transfer with the host or auxiliary device.

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To avoid damage to the CRT screen when the terminal is to remain ON but unchanged for extended periods of time, reduce the screen brightness using the CONTRAST control.

Note

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The BAUD RATE is factory set to 9600 baud.

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"V12F1" is the firmware version number and may be different for subsequent releases.

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The Control codes and ESCape sequences (command code set) used in the Emulation operations are detailed in **Appendix B.**

PREFACE

The ADM 22 Video Display Terminal is a general purpose ergonomic, "low-end smart" terminal. It ideally suits a wide range of user's requirements for low - cost applications.

This User's Reference Manual describes the functional characteristics of the ADM 22, and provides information on the installation and care of the terminal. Emphasis is placed on the character and significance of the various control codes required to exercise the great variety of ADM 22 features.

The major topics described in this manual include:

Figure 1-1. ADM 22 Video Display Terminal

SECTION I
GENERAL DESCRIPTION

1.1 INTRODUCTION

This section describes and lists the specifications of the Lear Siegler ADM 22 Video Display Terminal (figure 1-1), along with its functional capabilities.

1.2 PURPOSE AND USE

There are numerous applications of the ADM 22, all involving the transfer of data, including data entry and data enquiry. Data transfer in some applications may be almost exclusively unidirectional, such as from the unit to the computer. However, a more frequent application is one in which an operator communicates with a computer, and the computer responds in accordance with its stored program.

The ADM 22 has the following general capabilities:

• Twelve inch (30.5 cm) diagonal non-glare display

• Full 128 ASCII character set displayable in an 80 column by 24-row format

• Four visual attributes - blink, reduce, reverse and underline

• Detachable 92-key keyboard with a typewriter style layout

• Fourteen key numeric keypad

• Separate cursor control keys

• Seven function keys

• Remote or local display editing

• Conversational or block mode communications at fifteen selectable transmission rates

• RS-232C or 20mA current loop serial asynchronous interfacing

• RS-232C auxiliary communications port

• Non-volatile set-up mode for terminal configuration

1.3 PHYSICAL DESCRIPTION

The ADM 22 is a two-piece modular design that includes a monitor assembly and keyboard assembly. The monitor assembly contains the main logic board, the display drive board with associated CRT, and the regulated power supply. The power ON/OFF switch and video contrast control are located on the front of the monitor assembly. At the back of the housing are the interface connectors, keyboard connector, and power cord. The keyboard assembly contains the 92-key keyboard and associated logic. A six-foot coiled cord connects the keyboard to the monitor assembly. Both assemblies are packaged in lightweight, compact housings that provide flexibility and convenience in operation.

1.4 OPERATIONAL DESCRIPTION

The ADM 22 is an interactive device which is used to enter, display, and send information to a host computer, and to receive and display information from the computer. Using a keyboard similar to that of a typewriter, the operator may enter information which is either immediately transmitted to the

computer (conversation mode), or, stored in display memory for block transmission to the computer (block mode). Data from the computer is received and displayed at baud rates as high as 19200. **Figure 1-3** illustrates the flow of data through the functional areas of the **ADM 22**.

1.4.1. Control Logic

The Control Logic contains the microprocessor and various integrated circuits which control all operations of the **ADM 22**. These operations include: timing and control, data handling and storage, interpreting and responding to control commands from the keyboard and the host, video control, I/O interfacing and status control.

Data entering the terminal is received by the Control Logic from the Interface Port. The microprocessor decodes the input data and reformats it into data and control instructions for the Video Logic and Control Logic.

1.4.2 Video Logic and Drive

The Video Logic and Drive section provides the circuitry needed to drive the cathode ray tube (CRT) on the display drive board. The 2 thousand bytes of display random access memory (RAM), and character generation circuits, as well as the video logic, are on the main logic board. The CRT screen can display 24 lines of data containing as many as 80 characters per line. Data from the control logic is written into the display RAM; control signals from the CRT controller cause the contents of the RAM to be displayed on the monitor screen. **Figure 1-2** depicts the character format and associated hex codes used for display in the **ADM 22**.

1.4.3 Keyboard

The keyboard contains 92 keys from which data entry and control functions are locally initiated. In the conversational transmission mode, each keystroke is encoded into a corresponding ASCII character by the control logic, which is immediately transmitted to the host computer. The

character is also routed back to the video logic in half-duplex operation, or echoed from the host computer via the Primary Port in full-duplex operation. In the block transmission mode, characters are displayed on the CRT but are not transmitted to the host computer until the appropriate SEND LINE or SEND PAGE command has been given.

1.4.4 Primary (Modem) and Auxiliary Ports

The **ADM 22** comes standard with two ports - the Primary (Modem) Port and Auxiliary Port which are located at the back of the terminal. The host computer and the **ADM 22** interface at the Primary Port. The Auxiliary Port is designed as an RS-232C serial output port only, with a control signal interface. Primarily an asynchronous serial RO printer is connected to the Auxiliary Port. The printer used may be a character-by-character type or buffered type. The printer may operate at a different transmission rate than used on the Primary Port.

With the X-ON/X-OFF (Busy/Ready Handshake) feature, the **ADM 22** is able to pass a busy status of the Auxiliary Port device to the host and also state the terminal's local condition during operations which need long execution times. This avoids any loss of data.

Data and control information from the host is routed through the Primary port to the Control Logic. The control logic causes data to be displayed on the monitor in the same manner as the keyboard data. The interface logic contains the circuitry appropriate for interfacing with RS-232C or 20mA current loop signals. The interface logic also contains the baud rate clock which permits the **ADM 22** to receive and transmit data at selected baud rates from 75 to 19200 baud or 75 to 9600 for current loop.

The **ADM 22** transmits blocks of data by retrieving data from the display memory for transmission by the control logic. The control logic reformats the data and routes data and control information to the appropriate interface. Interface logic is used to prepare

Figure 1-2A. 128 Character ASCII Format, with Hex Codes

Figure 1-2B. Line Drawing and Four-Segment Mosaic Graphic Character Set
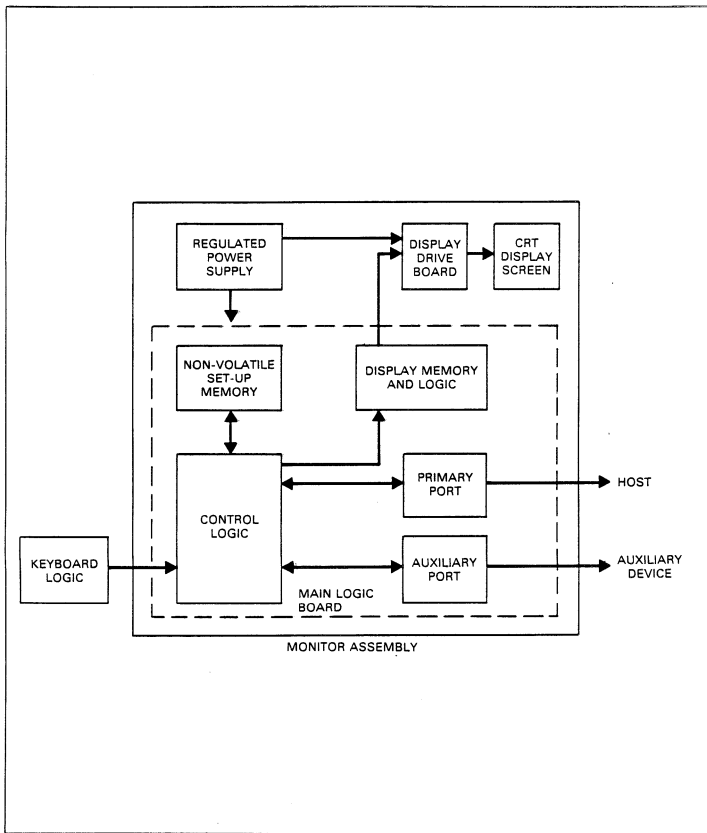
Figure 1-3. ADM 22 Data Flow Block Diagram

data and control information for transmission to the appropriate device connected.

1.4.5 Set-Up Logic

The **ADM 22** features a non-volatile Set-Up Mode to establish terminal operating characteristics. Through commands from the keyboard or host, the control logic causes the Set-Up parameters to be loaded onto the system RAM. This information can then be "saved" to non-volatile RAM by the appropriate keyboard command, thus retaining the set-up even during a power-down. Features selectable in Set-Up Mode include; baud rates, word structure, protected field visual attributes, cursor type, emulations, communications control, operating modes and scrolling.

1.4.6 Regulated Power Supply

The **ADM 22** Power Supply is a regulated power supply located in the rear of the base. Four regulated DC voltages are provided: +5 volts, 12 volts, and +15 volts. The power supply can accept line voltage inputs of 115 VAC or 230 VAC (with 230-volt Power Supply Option installed).

1.5 SPECIFICATIONS

Table 1-1 lists the specifications for the **ADM 22**.

1.6 DISPLAY CHARACTER FORMAT

The standard **ADM 22** character set contains 128 ASCII characters, 32 of which are control characters (see **figure 1-2A** and **1-4**.) The entire character set may be displayed on the CRT screen by setting Program Mode in the terminal. The **ADM 22** also features an 11-character character set as well as a 15-character four-segment mosaic graphics character set. Refer to **figure 1-2B** and **Section III** for details of operation.

1.7 ADM 22 WORD STRUCTURE

The **ADM 22** transmits serial asynchronous data in a 9, 10, 11, or 12 bit format in the

sequence; one start bit, seven or eight data bits, one or no parity bit and one or two stop bits. The parity bit can be either odd, even, or none and is defined by a Set-Up Mode selection.

The received data shall be formatted the same as the transmit data. The word structure, baud rates, and other communications characteristics are established via Set-Up Mode selections. Refer to **Section II** for details.

1.8 OPTIONS

The **ADM 22** can be equipped with two options, each requiring additions and/or alterations to the standard configuration of the unit. In addition to the following listed options, other optional features, such as special key caps and housing colors, are available.

1.8.1 230 VAC Operation

The **ADM 22** may be optionally ordered to operate on 230-volts AC. This option is factory installed only and must be indicated at the time of order.

1.9 RELATED DOCUMENTS

ADM 22 Maintenance Manual DP322 and Illustrated Parts Catalog.

Table 1-1. ADM 22 Specifications

SPECIFICATION	DESCRIPTION
DISPLAY	
CRT Screen	12-inch (30.5 cm) diagonal, P31 Green Phosphor with etched faceplate.
Vertical Refresh Rate	60 Hz, non-interlaced. (Vertical Refresh Rate is independent of power line frequency.)
Horizontal Refresh Rate	18.25 KHz @ 60 Hz 15.75 KHz @ 50 Hz
Display Page	1920 characters/page.
Display Format	80 characters x 24 lines, plus a status line which indicates terminal configuration.
Display Area	5.5 inches (13.9 cm) high x 7.75 inches (19.7 cm) wide.
Character Set	128 ASCII characters, plus line drawing and four-segment cell graphics.
Character Matrix	7 x 11 dot matrix.
Character Field	9 x 12 dot matrix.
Cursor	9 x 12 dot matrix, selectable reverse image block or underline, steady or blinking.
Cursor Controls	Backspace, Forespace, Up, Down, Home, Return, Read Cursor, and Cursor Addressing.
Visual Attributes/Protected Fields	Blink, reverse, underline, reduced intensity, and combinations thereof, used to designate protected fields for editing and transmission formatting when protect mode is set.
KEYBOARD	
Alpha/Numeric	26-letter alphabet with upper and lower case, numerics 0 through 9, Return, Shift, Punctuation, Backspace, Tab, and Caps Lock. Most keys are auto repeating (approximately 15 characters per second). Selectable audible key-click.
Numeric Key Pad	14 keys, 0 through 9, Enter, Comma, Period, and Minus.
Cursor Control Keys	Right, Left, Up, Down, Home, Return, Back Space, and Line Feed
Edit Keys	Character insert, character delete, line insert, and line delete.

Table 1-1. ADM 22 Specifications (continued)

SPECIFICATION	DESCRIPTION
Function Keys	F1 - F7 which transmit a three-character sequence.
Functional Command Keys	Set-Up, Break, ESCape, Print, Delete and Save
EDITING	
Edit Operation	Clear entire screen, insert characters, delete characters insert lines, delete lines, erase line, erase to the end of line, erase to the end of the page; all or unprotected only.
COMMUNICATIONS	
Block Mode	Send line, and send page; all or unprotected only.
Conversation Mode	Interactive (character by character transmission, Full or Half Duplex operation).
Program Mode	Control characters are displayed on screen.
Monitor Mode	Hex codes are displayed for all characters.
Interfaces	Primary (Modem) Port: RS-232C or 20mA current loop Auxiliary Port: RS-232C
Data Rates	75, 110, 150, 300, 450, 600, 900, 1200, 1800, 2400, 3600, 4800, 7200, 9600 and 19,200 baud. (9600 max. for 20mA current loop.)
Word Length	7 or 8 data bits
Parity	Even, odd, or no parity.
Stop Bits	1 or 2 stop bits
Format	ASCII serial asynchronous communications
Busy Indication	Primary (Modem) Port: Sends X-OFF (DC3) or X-ON (DC1) to host on busy/ready condition of main port or auxiliary port. Auxiliary Port: Senses busy level on Pin 20 (DTR) of the Auxiliary interface.
Terminal Emulations	Code compatibility with the Hazeltine 1500, and ADDS Regent 25

Table 1-1. ADM 22 Specifications (continued)

SPECIFICATION	DESCRIPTION
GENERAL	
Operating Environment:	
Temperature	Operating: 10°C to 40°C (41°F to 104°F) Storage:
Humidity	10% to 85% without condensation.
Power Requirements:	
Standard	115V ±10%, 60 Hz, 50 watts.
Optional	230V ±10%, 50 Hz, 50 watts.
Heat Dissipation	222 BTU/Hr.
Dimensions:	
Width (Monitor)	16.5 inches (42.0 cm).
Depth (Monitor)	14 6 inches (37.0 cm).
Height (Monitor)	12.2 inches (31.0 cm).
Depth (Keyboard)	7.5 inches (19.0 cm).
Height (Keyboard)	2.8 inches (7.0 cm).
Weight	24.2 pounds (11.0 kg)
OPTIONS	
230 VAC Option	Allows terminal to operate with 230 Volt AC line input.

HEX BYTE	1ST	CONTROL CHARACTERS		DISPLAYABLE CHARACTERS					
		0	1	2	3	4	5	6	7
2ND	BITS $4 3 2_1$ BITS $7 6_5$	$0 0_0$	$0 0_1$	$0 1_0$	$0 1_1$	$1 0_0$	$1 0_1$	$1 1_0$	$1 1_1$
0	0000	NUL	DLE		0	@	P	`	p
1	0001	SOH	DC1	!	1	A	Q	a	q
2	0010	STX	DC2	"	2	B	R	b	r
3	0011	ETX	DC3	#	3	C	S	c	s
4	0100	EOT	DC4	S	4	D	T	d	t
5	0101	ENQ	NAK	%	5	E	U	e	u
6	0110	ACK	SYN	&	6	F	V	f	v
7	0111	BEEP	ETB	'	7	G	W	g	w
8	1000	BS (←)	CAN	(	8	H	X	h	x
9	1001	(SKIP) HT	EM	)	9	I	Y	i	y
A	1010	LF (↓)	SUB	*	:	J	Z	j	z
B	1011	VT (↑)	ESC	+	;	K	[	k	{
C	1100	FF (→)	FS	'	<	L	\	l	¦
D	1101	CR	GS	-	=	M	]	m	}
E	1110	SO	(HOME) RS	.	>	N	∧	n	∿
F	1111	SI	(NEW LINE) US	/	?	O	—	o	DEL

USE CTRL KEY
WITH DISPLAYABLE
CHARACTER KEYS
TO PRODUCE
CONTROL CODES

Figure 1-4. Displayable USASCII Character Set and Control Codes

SECTION II
INSTALLATION

2.1 INTRODUCTION

This section contains installation instructions for the **ADM 22**. Also included are descriptions of on site safety requirements, initial terminal configuration, communications interfaces, plus procedures for power turn-on, power turn-off, and routine maintenance.

2.2 SAFETY REQUIREMENTS

No special safety precautions are required for **ADM 22** installation. Simply observe normal safety procedures.

2.3 UNPACKING AND INITIAL INSPECTION

Each **ADM 22** is thoroughly inspected and carefully packaged prior to shipment. Every precaution is taken to ensure that each unit is complete and ready for installation at the customer's site. However, it is recommended that each unit be inspected upon receipt for transit damage. Start by examining the exterior of the package for evidence of rough or careless handling; then perform a thorough visual inspection of the internal components and subassemblies. Most transportation companies will not honor claims for damage unless they are filed promptly; therefore, the following steps should be taken:

1. Verify that each item shown on the Sales Order Packing Slip has been included in the shipment. Contact Lear Siegler or your distributor immediately in the event of packing shortage.

2. Verify that the serial number of the unit corresponds to that shown on the invoice.

3. Check the hardware to determine if any assemblies or screws were loosened during shipment. Tighten as required.

4. Inspect for dust or foreign material which may impair electrical contact when cable connections are made. Vacuum to remove any loose dirt.

5. Install and test the **ADM 22** as soon as possible after delivery. (This is very important since internal damage to the equipment cannot be determined by visual inspection alone.)

6. If, in your opinion, the equipment has been damaged - either internally or externally - notify the agent of the transportation company immediately, and ask him to make an inspection. If assistance is needed to describe the extent of the damage or the repairs that will be necessary, contact your local Sales and Service Office.

2.4 SITE REQUIREMENTS

The **ADM 22** may be conveniently used in a normal office environment, as no special mounting provisions are required. It is recommended that the environment be weather protected, with an ambient temperature range of 41° F to 104° F (10° C to 40° C), and a relative humidity of not greater than 85%.

{ CAUTION }

*Allow the **ADM 22** to adjust to any change in the environment before applying power. Moving the unit from one location to another could produce internal condensation and adversely affect its operation.*

Whenever the **ADM 22** is physically moved from a cold location to a warmer environment, be sure to allow sufficient time for the equipment temperature to equalize with the warmer location before activating the unit. Condensation developed by the temperature differential could possibly impair the **ADM 22**.

The physical dimensions of the **ADM 22** are shown in **figure 2-1**. The basic requirements for installation are as follows:

• Table or desk mounting

• Standard three-pronged 115-volt (230-volt) A.C. power outlet.

• Cable connection to the computer, data set or modem; serial printer, or other auxiliary device. If connection to a remote computer is desired, a modem or data set is usually required.

2.5 INITIAL PREPARATION

2.5.1 Line Voltage Selection

The **ADM 22** is shipped connected for either 115-volt of 230-volt AC operation, as specified on the purchase order. Any change in line voltage requires circuit changes which can only be performed by authorized maintenance personnel.

2.5.2 50/60 Hz Operation

The **ADM 22** has the capability to sync the vertical frame rate to the line frequency. This eliminates what appears as "flicker" on the screen. This selection is done only in the factory or by an authorized Lear Siegler service representative.

2.5.3. Set-Up Mode Features

The operating characteristics of the **ADM 22** are controlled by firmware "switches" that are displayed on the status line when Set-Up key is depressed **Figure 2-3** illustrates the display of the status line and the standard default settings. The status line is broken into nine four-bit "nybbles," one thru nine, and baud = xxxx, nybble 10. Each nybble has four bits, or switches, that can be set to "0" or "1". **Table 2-1** summarizes the functions that are selectable in nyibbles 1 thru 10 when in Set-Up Mode.

Entering Set-Up Mode - Pressing the │ Set Up │ key on the upper-left corner of the keyboard causes the **ADM 22** to enter Set-Up Mode. Pressing the key again will cause the terminal to exit set-up and return the previously established mode. When Set-Up Mode is entered the **ADM 22** will:

1. Scroll the display up one line and present the status line on the bottom line of the display, and

2. Transmit an X-OFF (DC3) code to the host - if the terminal was On-line and X-ON/X-OFF protocol was enabled.

When Set-Up Mode is exited the display will scroll down one line (no data is lost) and the terminal will transmit an X-ON (DC1) code under the conditions noted above.

Note

Changing communications characteristics when in Set-Up Mode may affect or prevent further data transfer with the host or auxiliary device.

Selecting Functions - When Set-Up Mode is entered the cursor will move to bit 3 of nybble 1, refer to **figure 2-3**. The cursor is moved to the bit to be changed by the → and ← cursor control keys. Pressing the ↑ key when the cursor is positioned over the desired bit (the "=" for nybble 10) will alternately select "0" or "1" for that function (sequentially select the various baud rates for nybble 10). Any invalid keystroke will sound the audible alarm and the character will be ignored.
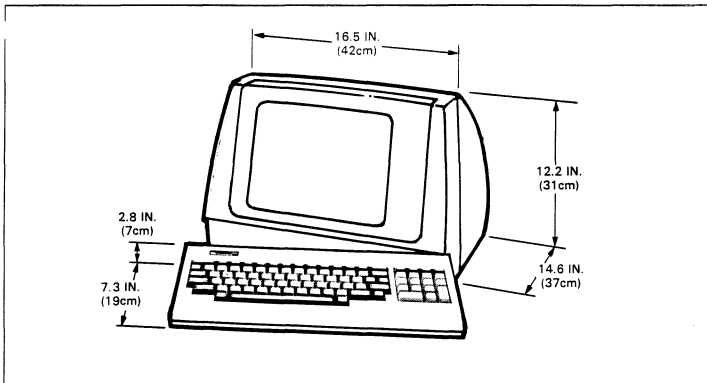
Figure 2-1. ADM 22 Mounting Requirements
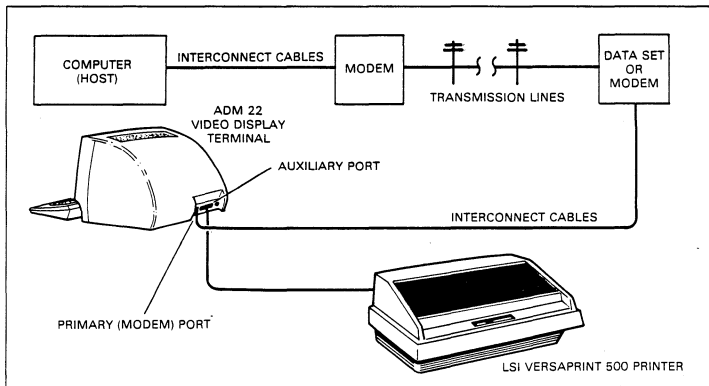
Figure 2-2. Typical ADM 22 Applications

CURSOR ON ENTERING SET-UP MODE

STATUS = 0011 0100 0000 1100 0011 1100 0011 1000 0011 BAUD = 9600
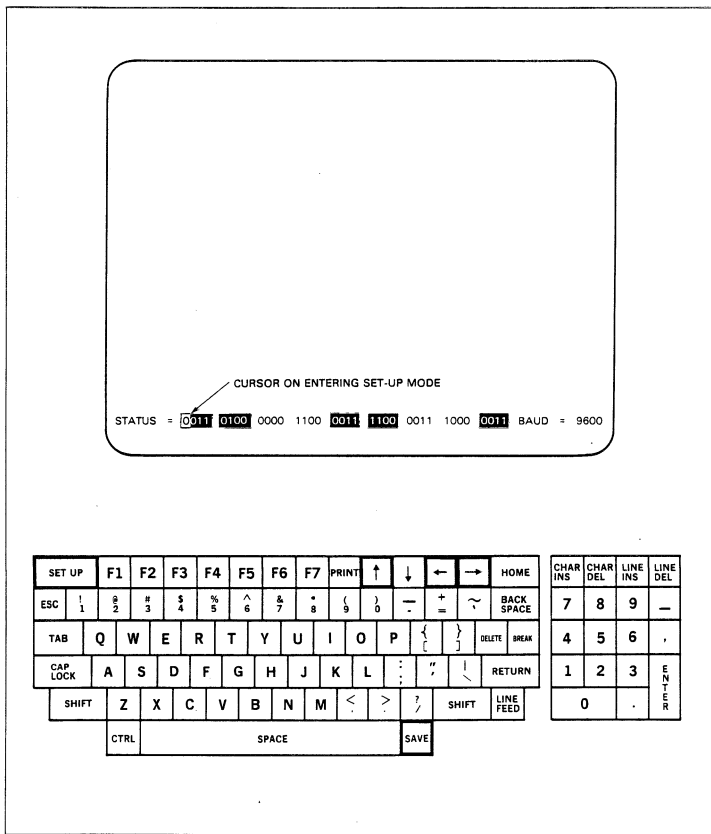
Figure 2-3. ADM 22 Set-Up Mode Display and Associated Keys (Default values indicated)

DP222

POWER ON/OFF SWITCH
CONTROLS POWER-UP
AND POWER-DOWN
SEQUENCES. ALSO PER-
FORMS HARDWARE
RESET WHEN SET TO ON.

VIDEO CONTRAST
CONTROL

AUXILIARY PORT
CONNECTOR J2

KEYBOARD CONNECTOR

AC LINE CORD

PRIMARY (MODEM) PORT
CONNECTOR J1
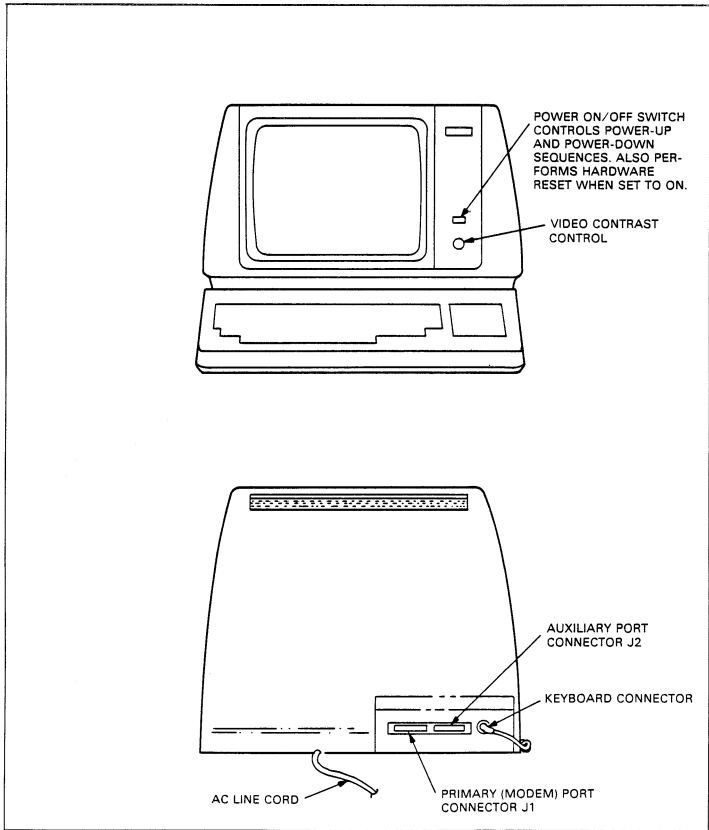
Figure 2-4. ADM 22 Controls and Connectors

Table 2-1. Set-Up Mode Functions

STATUS = [0011] [0100] 0000 1100 [0011] [1100] 0011 1000 [0011] BAUD = 9600
       1   2   3   4   5   6   7   8   9   10

*Correct settings, when different than default, for
the particular host the ADM 22 is being connected
to can be noted in the space provided in the "Bit"
column of the table for future reference.

NIBBLE
| X | X | X | X |
 3 2 1 0
BIT

NIBBLE	STATE	FUNCTION	BIT
		Default →	3 2 1 0
	0	1 Stop Bit ● →	0 0 1 1
	1	2 Stop Bits	
1 Primary (Modem) Port Word Structure	0	7 Data Bits	
	1	8 Data Bits	
	0	Odd Parity	
	1	Even Parity	
	0	Parity Bit Disabled	
	1	Parity Bit Enabled	
			0 1 0 0
	0	Reversed Disabled	
	1	Reversed Enabled	
2 Protected Field Visual Attribute	0	Reduced Disabled ——Attributes may be used in combinations	
	1	Reduced Enabled	
	0	Underline Disabled	
	1	Underline Enabled	
	0	Blink Disabled	
	1	Blink Enabled	

Table 2-1. Set—Up Mode Functions (continued)

NIBBLE	STATE	FUNCTION	BIT 3 2 1 0
3 Emulations and Cursor Type	0	Steady Cursor	0 0 0 0
	1	Blinking Cursor	
	0	Block Cursor	
	1	Underline Cursor	
	00	ADM 22 Command Code Set	
	01	ADDS Regent 25 Command Code Set (see Appendix B for restrictions).	
	10	Hazeltine 1500 Command Code Set	
	11	ADM 22 Command Code Set	
4 Communications and Display Presentation	0	Auxiliary Port Disabled	1 1 0 0
	1	Auxiliary Port Enabled	
	0	20mA Current Loop Interface Enabled	
	1	RS-232C Interface Enabled	
	0	Half Duplex - characters typed are transmitted to the host and displayed.	
	1	Full Duplex - characters typed are transmitted to the host only, requires echo back to be displayed	
	0	Normal Display (light characters on dark background)	
	1	Reverse Display (dark characters on light background)	
5 Operating Mode	0	On-Line Mode	0 0 1 1
	1	Off-Line (Local) Mode	
	00	Monitor Mode	
	01	Normal Mode	
	10	Graphic Mode	
	11	Normal Mode	
	0	Block Mode	
	1	Conversation Mode	

Table 2-1. Set—Up Mode Functions (continued)

NIBBLE	STATE	FUNCTION	BIT 3 2 1 0
6 Auto-Line Feed, Margin Bell and Key Click	0	Key-Click Disabled	1 1 0 0
	1	Key-Click Enabled	
	0	Margin Bell at 72nd Column Disabled	
	1	Margin Bell at 72nd Column Enabled	
	0	Auto Erase to end of line on Auto Line Feed Disabled	
	1	Auto Erase to end of line on Auto Line Feed Enabled · Auto Line Feed must be enabled.	
	0	Auto-Line Feed Disabled - carriage return (CR · 0D Hex) performs a carriage return only.	
	1	Auto-Line Feed Enabled - carriage return performs a carriage return and line feed.	
7 Auxiliary Port Word Structure	0	1 Stop Bit	0 0 1 1
	1	2 Stop Bits	
	0	7 Data Bits	
	1	8 Data Bits	
	0	Odd Parity	
	1	Even Parity	
	0	Parity Bit Disabled	
	1	Parity Bit Enabled	

NIBBLE	STATE	FUNCTION			BIT 3 2 1 0
8 Auxiliary Port Baud Rate	0000	19200 Baud	1000	1200 Baud	1 0 0 0
	0001	19200 Baud	1001	900 Baud	
	0010	9600 Baud	1010	600 Baud	
	0011	7200 Baud	1011	450 Baud	See Chart
	0100	4800 Baud	1100	300 Baud	for Baud
	0101	3600 Baud	1101	150 Baud	Rates
	0110	2400 Baud	1110	110 Baud	
	0111	1800 Baud	1111	75 Baud	

Table 2-1. Set—Up Mode Functions (continued)

NIBBLE	STATE	FUNCTION	BIT 3 2 1 0
9 X-ON/X-OFF Scrolling, Program Mode and Hazeltine Lead-In Code	0	Escape Lead-In Code Enabled (Hazeltine Mode Only)	0 0 1 1
	1	Tilde Lead-In Code Enabled	
	0	Program Mode Disabled	
	1	Program Mode Enabled	
	0	Scrolling Disabled	
	1	Scrolling Enabled	
	0	X-ON/X-OFF Busy Protocol Disabled	
	1	X-ON/X-OFF Busy Protocol Enabled	
10 Primary (Modem) Port Baud Rate	75 thru 19200	Pressing the ↑ key when the cursor is on nibble 10 (the = sign) will sequentially select from the available baud rates (same as nibble 8).	Baud = XXXX

Saving Set-Up Functions - When the various functions are selected they take effect upon exiting Set-Up Mode. The set-up is stored in temporary "working" memory and will be lost if the terminal is powered-down. To cause the set-up functions to be saved in non-volatile memory, press the [SAVE] key when in Set-Up Mode. A save operation will not be preformed if the [SAVE] key is pressed while the terminal is in any mode other than Set-Up. The ADM 22 will always power-up to the last saved set-up condition.

2.6 INTERFACE INFORMATION

The ADM 22 may be cabled directly to a local computer; serial printer, or other auxiliary device; or it may be connected via telephone data lines to a remote computer located anywhere in the world. **Figure 2-2** shows a typical ADM 22 application. **Figure 2-4** shows the rear panel locations of the interface connectors. **Figure 2-5** shows the logic associated with these interfaces.

2.6.1 RS-232C Interface (J1)

The Primary (Modem) Port RS-232C Interface provides the signals and levels associated with RS-232C, allowing direct connection to a computer or modem. The maximum permissable cable length is 50 feet for RS-232C applications.

2.6.2 20mA Current Loop Interface (J1)

The ADM 22 can be configured for 20mA Current Loop operation using the Primary Modem port. The current loop interface signal levels allow cable lengths of up to 1000 feet. The maximum baud rate for current loop operation is 9600.

2.6.3 Auxiliary Port Interface (J2)

The Auxiliary Port is used for connecting an RO (receive only) serial printer or other RO device to the terminal using RS-232C signal levels. The Auxiliary Port may be set for a different baud rate and word structure than the Primary Port. The ADM 22 can sense a busy condition to prevent data loss by the auxiliary device.

2.7 INSTALLING THE ADM 22

1. Check the ON/OFF switch (refer to **figure 2-4**) to ensure that it is set to OFF.

2. Connect the data interface cable(s) to the terminal using the appropriate interface information (**paragraph 2.6**).

3. Plug the power cord into a grounded AC outlet of the proper voltage.

4. Turn on the terminal.

Note

The BAUD RATE is factory set to 9600 baud.

5. Set the Baud = Set-Up function switch to the desired baud rate (refer to **Table 2-1**).

6. Select the Set-Up Mode functions as desired to establish the operating parameters of the ADM 22 (refer to **Table 2-1**). If the terminal is to power-up with the selected functions, execute a Set-Up "SAVE" operation (refer to **paragraph 2.5.2**).

2.8 POWER TURN-ON

1. Set the ON/OFF switch to ON (refer to **figure 2-4**).

2. Wait approximately 20 seconds for the unit to warm up. The cursor should appear in the HOME position.

   2a. The Self-Test message "V11F1 TEST OK" should also appear in the upper left corner and the terminal will sound the audible alarm.

Note

"V11F1" is the firmware version number and may be different for subsequent releases.

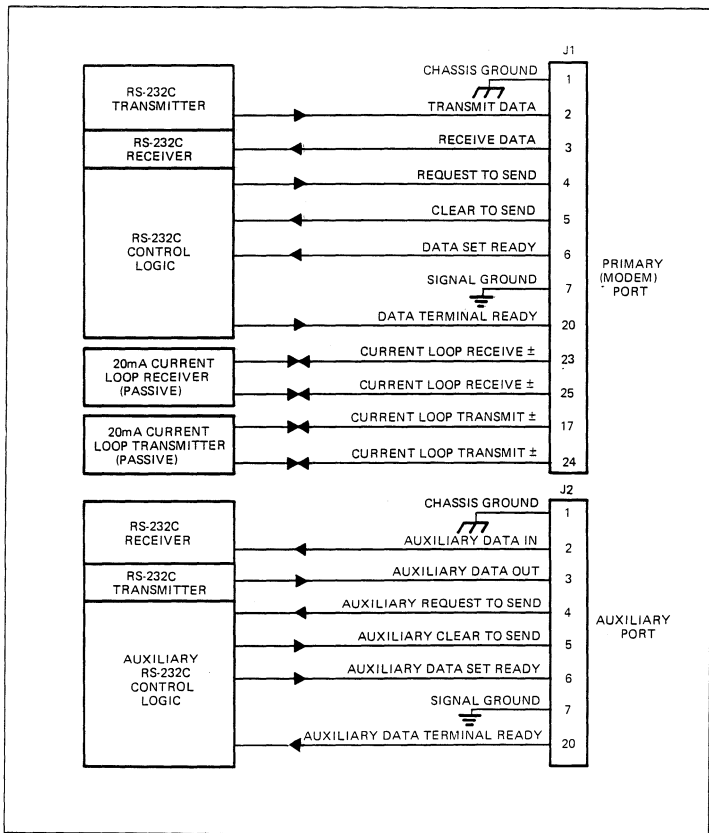   2b. If the Self-Test message and the cursor do not appear, turn off the

Figure 2-5. Primary (Modem) and Auxiliary Port

ADM 22, wait 15 seconds and apply power again. If the message and cursor still do not appear, check the CONTRAST control, then contact your authorized Lear Siegler service representative.

> **CAUTION**

To avoid damage to the CRT screen when the terminal is to remain ON but unchanged for extended periods of time, reduce the screen brightness using the CONTRAST control.

3. Adjust CONTRAST control (**figure 2-4**) for desired display brightness.

2.9 POWER TURN-OFF

1. If the unit is displaying information which must be retained, be sure to transmit this information to host immediately. This is necessary, as display is cleared when power is removed from the unit. An alternative is to send the information to a printer prior to turning OFF unit.

2. Turn off the **ADM 22** by setting ON/OFF switch to OFF.

2.10 CARE OF THE ADM 22

Proper care of the **ADM 22** consists of performing the routine cleaning and inspection procedures listed in the following paragraphs.

2.10.1 Cleaning

At periodic intervals, clean the exterior housing and lightly dust the unit using a soft brush or damp lint-free cloth. Paper towels may be substituted if desired. Do not use petroleum base cleaners, such as lighter fluid, as this could be harmful to the painted surface. Remove smudges from the CRT exterior screen and the housing with conventional spray cleaners or alcohol. Be careful not to scratch the CRT screen.

2.10.2 Inspection

Periodically inspect the keyboard assembly and switches for freedom of movement. Determine that the intensity of characters displayed on the CRT screen have not diminished. Any required mechanical and electrical adjustment should only be performed by an authorized Lear Siegler service representative.

SECTION III
OPERATION

3.1 INTRODUCTION

This section provides the information necessary for the operator to utilize the ADM 22 to its fullest capabilities. This section emphasizes the commands required to initiate and control various terminal operations, whether originating at the host or the keyboard.

3.2 OPERATIONAL MODES

The ADM 22 provides several different modes of operation which are selectable by the host or from the keyboard. The following paragraphs summarize the operating modes and the associated interactions. The power-on mode conditions are established by the last saved functions selected in the associated Set-Up features. The various command sequences used to change the operating characteristics of the ADM 22 are detailed in paragraph 3.4.

3.2.1 On-Line Or Local Mode

On-Line Mode - When the terminal is placed On-Line, data being received will be displayed or acted upon, and keyboard entries will be transmitted and/or displayed, depending on the communications mode selected.

Local Mode - In Local Mode the terminal ignores the communications interface and keyboard entries are displayed or acted on locally, no transmission takes place.

3.2.2 Block Or Conversation Mode

Block Mode - When Block Mode is selected

data entered on the keyboard is sent to the display only. This allows the operator the ability to format and correct a screen of data prior to transmission to the host. The extent of transmission (line or page, unprotected only or all) depends on the command issued to initiate the send operation. The ⌈ENTER⌉ key is used to send data in Block Mode.

Conversation Mode - In Conversation Mode data entered on the keyboard is immediately transmitted to the host, character-by-character. When Conversation Mode is selected the display action is determined by the setting of Full or Half Duplex Mode as follows:

  Full Duplex - Characters typed are transmitted only, no local operation takes place. In order for data to be displayed, it must be echoed from the host.

  Half Duplex - Characters typed are transmitted to the host and routed to the display locally.

3.2.3 Protect Mode

Protect Mode operation allows specified characters on the display to be "protected" or reserved when performing block transmission, tabbing, or erase operations. Characters to be protected are entered after a "Set Write Protect" command is issued. This will cause the data subsequently entered to be displayed with the "Protected Field Visual Attribute" selected in Set-Up Mode. If "Protect Mode" is not set, no special actions take place. If Protect Mode is set, then the highlighted (Write-Protected) data is not

Cursor Control Keys (3.3.5)

← → ↑ ↓ - Cursor moves one increment in the specified direction. Characters passed over by the cursor are not erased.

HOME - Moves cursor to first character position on page (upper left corner).

Alphanumeric and Punctuation Keys (3.3.2).

Typing any of these keys with Shift depressed produces an upper case alpha character or the symbol imprinted on the upper position of the key. Setting Cap Lock also produces upper case alpha characters only.

SPACE - Advances cursor one space to the right each time bar is typed. Any character under cursor is replaced by a space. Generates ASCII Space code (20).

DEL - Generates ASCII DEL code (7F).

TAB - Generates ASCII HT code (09). Modulo tabs or tab to unprotected fields can be selected.

BACKSPACE - Moves cursor one space to the left each time the key is typed. Generates ASCII BS code (08).

RETURN - Moves cursor to the first character position in either the line containing cursor or the next line depending on the Set-Up Mode function. Generates an ASCII CR (00) code.

LINE FEED - Moves the cursor to the next lower line on the display, may cause scrolling. Generates an ASCII LF code (0A).
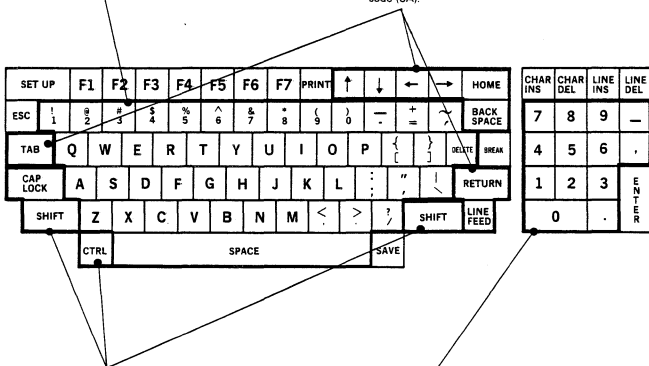
Modifier Keys (3.3.4)

SHIFT - Must be held down while affected key is typed. Enables upper case alpha characters and symbols, as well as a shift in certain special operations.

CAP LOCK - Produces upper case alpha characters only, when engaged. Does not affect numeric keypad characters.

CTRL - To generate ASCII Control codes (in conjunction with displayable character key).

Numeric Keypad (3.3.3)

For convenience when several numeric entries need to be made. Key pad characters are not affected by SHIFT and CAP LOCK keys.

Numbers in parentheses are paragraphs which detail the Key(s) Operation.

Figure 3-1. ADM 22 Keyboard Functions

Function Keys (3.3.8)

The Function Keys are used to generate a three character sequence to the host. i.e. SOH (ASCII character) CR. No local operation is performed.

Edit Keys (3.3.6)

CHAR INS - Moves character under cursor and all following characters one position to the right. The operation terminates at the end of the line, or protected field, and the last character is lost (if line is full). A Space character is written under the cursor.

CHAR DEL - Deletes character under the cursor. All characters that follow in the line, or un-protected field, move one position to the left and fill the space left by the deletion. A Space is written in the last character position.

LINE INS - Causes the entire line where the cursor is located and all lower lines, to shift downwards one line. This creates an empty line of Spaces in which additional characters may be entered. If the entire page is filled when creating this new line, the bottom line is lost. The cursor moves to the first position of the new blank line. No operation is performed if Protect Mode is set.

LINE DEL - Causes the entire line on which the cursor is located to be erased. Simultaneously, all lower lines shift upwards one line. The cursor moves to the first character position of the first lie (that moves upwards). The bottom line if filled with spaces. If Protect Mode is set, no operation is performed.
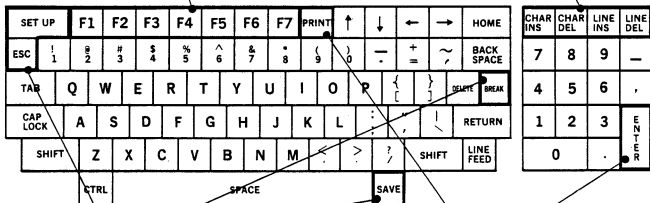
Special Operation Keys (3.3.9)

SET-UP - Causes the ADM 22 to enter and exit Set-Up Mode.

SAVE - Used only in Set-Up Mode to store set-up functions in non-volatile memory.

BREAK - Generates a Break (mark) condition on the XMIT Data Line for approximately 300 milliseconds.

ESC - An ASCII escape code (1B) used as a "Lead-In" to invoke a specific terminal operation which is different from or in addition to regular terminal operation (3.4.2).

Transmission Keys (3.3.7)

ENTER - Sends unprotected data on page if Block and Protect Modes are set, starting with the first character and continuing to the cursor position. If Protect Mode is not set, all data is sent from home to the cursor position. If Conversation Mode is set, the Enter key transmits an ASCII CR code (0D). In Local or Half Duplex it operates as a Return key.

PRINT - Transmits display contents from home to the cursor position to attached auxiliary device. Formatting characters are included in the text (CR, LF).

Numbers in parentheses are paragraphs which detail the Key(s) Operations.

Figure 3-1. ADM 22 Keyboard Functions

transmitted or erased when the appropriate commands are initiated and tabbing to unprotected fields is enabled. Setting Protect Mode also prevents the display from scrolling.

3.2.4 Normal, Graphics, Or Monitor Mode

Normal Mode – Normal Mode causes the 96-displayable ASCII character set (Hex 20-7F) to be displayed when received. The 32-control codes (Hex 00-1F) are acted upon for those utilized by the **ADM 22**, otherwise ignored.

Graphics Mode - When Graphics Mode is enabled the lower case alpha characters (Hex 60-7A) are replaced with an 11-character line drawing and 4-segment cell graphics character set (see **figure 1-2**). The upper case alphanumerics, punctuation, and control codes remain unchanged.

Monitor Mode - Enabling Monitor Mode causes all data to be displayed as ASCII hexadecimal pairs (00-7F). No control codes are acted upon and all data is displayed. Monitor Mode may only be exited by resetting the terminal or through Set-Up Mode.

3.2.5 Program Mode

Setting Program Mode causes the terminal to display all 32-control codes (00-1F) instead of acting upon them. This allows the embedding of formatting information particularly useful in block transmission or print output, and as a diagnostic aid.

3.2.6 Set-Up Mode

Set-Up Mode is entered by pressing the SET-UP key on the keyboard. The terminal will sound the audible alarm, transmit an X-OFF code (DC3, Hex 13), if X-ON/X-OFF is enabled, and present the 25th status line on the display by scrolling the data up one line. Changes may then be made to the Set-Up Mode features as described in **paragraph 2.5.2**. Pressing the SET-UP key again exits Set-Up Mode and causes any changes that were made to take effect. The terminal will transmit an X-ON Code (DC1, Hex 11), if X-ON/X-OFF is enabled, and scroll the data down one line returning the original

display. The **ADM 22** ignores all received data while in Set-Up Mode and any invalid keystroke sounds the audible alarm.

3.3 KEYBOARD OPERATION

The operator uses a keyboard very similar to that of a standard office typewriter to enter data and perform control operations. Functionally the keyboard consists of the displayable 96-ASCII character set keys and various control or modifier keys. All keys will repeat automatically if held down for approximately one-half second or more. **Figure 1-3** describes the functions of the **ADM 22** keyboard. **Paragraphs 3.3.2** thru **3.3.9** detail the keyboard by the following types of operation.

- Alphanumeric and Punctuation Keys
- Numeric Keypad
- Modifier Keys
- Cursor Control Keys
- Edit Keys
- Transmission Keys
- Function Keys
- Special Operation Keys

3.3.1 Keystroke Conventions

Ordinarily each keystroke typed by the operator is independent of the one preceding or following it. The 2-key lockout feature of the unit prevents the production of a second code before the key already typed is released. There are some exceptions, such as when using SHIFT and CRTL keys. In this manual, a special convention is used to identify keystrokes and whether successive keystrokes are independent or concurrent, as shown in **Table 3-1**.

3.3.2 Alphanumeric and Punctuation Keys

The upper/lower case, numerics, and punctuation characters from the 96-displayable ASCII character set, (Hex 21-7E) including space (Hex 20) and DEL (Hex 7F), are output to the display and/or transmitted when a key is pressed. Keys that have a

Table 3-1. Keystroke Conventions

Keystrokes	Description
ESC A	Independent keystrokes typed sequentially. This particular sequence enables the copy print with display mode of operation.
CTRL Z	Concurrent keystrokes. The second key must be typed while holding CTRL . This operation clears the screen.

double legend produce the lower-case or lower legend unshifted, and the upper-case or upper legend when pressed with the shift key. The SPACE key generates an ASCII 20 Hex code for transmission and occupies a space on the display. The DEL key produces an ASCII 7F Hex code for transmission, but will not occupy a space on the display unless Program Mode is set.

3.3.3 Numeric Keypad

The ASCII numerials 0 thru 9 and minus, comma, and period are output to the display and/or transmitted (depending upon the communications mode selected) when a key is pressed. The ASCII hex codes generated are identical to the lower legend numerials and punctuation on the main keyboard area.

3.3.4 Modifier Keys

The following keys do not generate an output by themselves, but modify the code generated by the alphanumeric keys on the keyboard. SHIFT causes the upper legend character of a double legend key to be produced when pressed in conjunction with either SHIFT key. The 26-alpha characters are shifted for upper-case, and unshifted for lower case.

CAP LOCK this alternate action key causes the 26-alpha characters to stay shifted (upper-case) when on. The numeric and punctuation keys, as well as the various control keys, are not affected.

CTRL the control key causes one of the 32-ASCII control codes to be generated when pressed in conjunction with an otherwise

displayable character key. The character generated will not display a character on the display unless program mode or monitor mode are set. Some control codes are utilized by the ADM 22, refer to Table 3-2 for details.

3.3.5 Cursor Control Keys

The Cursor is used to indicate the next character position to be entered on the display. The cursor may be positioned by remote commands from the host or by cursor control keys on the keyboard. The following keys are used to position the cursor on the display:

↑ ↓ ← → and HOME move the cursor as indicated and transmit the ASCII ccontrol codes listed in Table 3-2 when the standard ADM 22 command code set has been selected. The keys will not transmit a code when either emalation command code set has been selected. (Refer to Appendix B for emulation restrictions.)

If the position moved to is protected, the cursor will move to the first unprotected position in the direction commanded.

TAB will cause the cursor to advance to the next tab stop and an HT (Hex 09) code to be generated. There are two types of tab operations possible, Modulo tabs and Protected Field tabs. When Protect Mode is not set the tab stops are automatically set at every eight character position 0, 8, 16,...72. When Protect Mode is set tab will cause the cursor to advance to the first unprotected character position following the next protected field. Tabbing will move the cursor to the first tab stop on the next line when at the last tab position on a line.

Table 3-2. Control Codes Utilized by the ADM 22

OPERATION	FROM HOST (ASCII Code)	FROM KEYBOARD	HEX CODE	DESCRIPTION
Bell	BEL	☐ CONTROL ☐ G	07	Sounds the audible alarm.
Backspace	BS	☐ ← ☐ , ☐ BACKSPACE	08	Moves the cursor to the left one character position. The cursor moves to the last position of the previous line. When at the first character position of the line.
Tab	HT	☐ TAB	09	Moves the cursor to the next tab stop - beginning of the next unprotected field if protect mode is set, to every eighth character position (modulo 8 column tabs) if protect mode is reset. (Same as ESC i)
Line Feed	LF	☐ ↓ ☐ or ☐ LINEFEED	0A	Moves the cursor to the next line down in the same column. If the cursor is located on the last line, a scroll operation will be performed, if enabled.
Upline	VT	☐ ↑	0B	Moves the cursor to the previous line up in the same column. If the cursor is located on the first line, no operation takes place.
Forespace	FF	☐ →	0C	Moves the cursor to the right one character position. The cursor moves to the first position of the next line, when at the last character position of a line.
Carriage Return	CR	☐ RETURN*	0D	Moves the cursor to the first character position of the line containing the cursor when auto line feed is disabled.
Keyboard Enable	SO	☐ CONTROL ☐ N*	0E	Allows data to be entered on the keyboard - keyboard unlock (*from Host only if keyboard is already locked). (Same as ESC ")
Keyboard Disable	S1	☐ CONTROL ☐ O	0F	Prevents data from being entered on the keyboard - keyboard lock. (Same as ESC #)
Reset Auxiliary Port with/without Display	DC4	☐ CONTROL ☐ T	14	Resets auxiliary port with/ without display, printing will continue until the buffer is empty.

Table 3-2. Control Codes Utilized by the ADM 22 (continued)

OPERATION	FROM HOST (ASCII Code)	FROM KEYBOARD	HEX CODE	DESCRIPTION
Clear all to Space	SUB	[CTRL][Z]	1A	Erases the display to spaces, and, moves the cursor to the Home position.
Escape	ESC	[ESC]	1B	Recognized by the ADM 22 as a code extension character which must be followed by otherwise displayable character or characters to invoke a specific terminal operation.
Home Cursor	RS	[HOME]	1E	Moves the cursor to the first character position of the first line of the display.
New Line	US	[RETURN] * or [CTRL][——]	1F	Moves the cursor to the first character position of the next line (*when auto line feed is enabled).

| BACKSPACE | causes the cursor to move one character position to the left, or end of the previous line if the cursor has been at the beginning of a line. A BS code (Hex 08) is generated when the key is pressed in Conversation Mode.

| RETURN | moves the cursor to the beginning of the line it was in, or the beginning of the next line (carriage return + line feed) depending upon the auto-line feed selection made in Set-Up Mode. The key will generate a CR (Hex 0D) code in Conversation Mode.

| LINE FEED | moves the cursor to same column position on the next line down. This will cause a scroll operation to occur if the cursor was on the bottom line of the display, and scrolling was enabled in Set-Up Mode and Protect Mode is not set. If scrolling is disabled or Protect Mode is set, the cursor will move to the same column in the top line. If the position is protected the cursor will move to the first unprotected position on the line. The Line Feed key produces an LF (Hex 0A) code when pressed in Conversation Mode.

3.3.6 Edit Keys

The Edit keys are used to format and correct display data prior to transmission to the host, typically in Block Mode. These keys do not transmit any codes in any mode, but perform the following operations locally:

| CHAR INS | causes the character under the cursor and all following character to move one position to the right. The character insert operation terminates at the end of the line, or first protected field if Protect Mode is set, and the last character on the line is lost. A space character is written under the cursor.

| CHAR DEL | deletes the character under the cursor and moves all characters that follow on the line, or first protected field if Protect Mode is set, to the left. A space is written in the last character position of the line or field.

| LINE INS | causes the entire line the cursor is in to move down one line as well as all lower lines. The bottom line of the display scrolls off and is lost. The cursor moves to the

beginning of the line created which is filled with spaces. If Protect Mode is set no operation is performed.

| LINE DEL | erases the line containing the cursor and moves all lower lines upward one line. The cursor moves to the beginning of the first line that moves upward. The bottom line of the display is filled with spaces. If Protect Mode is set no operation takes place.

3.3.7 Transmission Keys

Two types of data transmission may be initiated from the keyboard; a Send Page Unprotected and a Page Print, as follows:

| ENTER | will cause the unprotected data from home to the cursor position to be transmitted out the Primary (Modem) Port if Block Mode and Protect Mode are set. If Protect Mode is not set, all data from home to the cursor position will be sent. If Conversation Mode is set, then the | ENTER | key generates a CR (Hex 0D) code only and no block transmission takes place.

| PRINT | causes the data from home to the cursor position to be output to the Auxiliary Port device, usually a printer. At the end of each line transmitted the **ADM 22** automatically insets a CR (Hex 0D) and LF (Hex 0A) code in the output data. The Auxiliary Port must be enabled in Set-Up Mode for the operation to take place.

3.3.8 Function Keys

The seven function keys, F1 thru F7, transmit a special three-character sequence in either Block or Conversation Mode of operation. The keys perform no local operation and are used as special commands to be interpreted by the host for particular system operations. The keys and each associated transmit sequence are as follows:

    F1 = SOH @ CR
    F2 = SOH A CR
    F3 = SOH B CR
    F4 = SOH C CR
    F5 = SOH D CR
    F6 = SOH E CR
    F7 = SOH F CR

3.3.9 Special Operation Keys

The keys listed below perform special operations or have a unique effect on the ADM 22.

SET-UP key causes the ADM 22 to enter Set-Up Mode when pressed, as described in **paragraph 2.5.2.** Pressing the key again exits Set-Up Mode.

SAVE is active only when the terminal is in Set-Up Mode. Pressing the key causes the current set-up functions to be saved in non-volatile memory. The saved selections are used to establish the power-on or reset configuration of the ADM 22. The SAVE key has no effect when not in Set-Up Mode.

BREAK causes a break (mark) condition to be presented on the transmit data line of the Primary (Modem) Port for approximately 300 milliseconds. This operation has no effect on the terminal and is usually used for control signaling to the host device.

ESC generates a special control code (Hex 1B), usually followed by one or more characters, used for command operations. Thus, ESCape is usually considered as a "Lead-In" character for terminal control operations. **Paragraph 3.4 and Table 3-3** detail the ESCape sequences utilized by the ADM 22.

3.4 COMMAND CODE SET

3.4.1 Control Codes

The operational characteristics of the ADM 22 are controlled, in part, by a group of control codes which may originate at the host or at the keyboard. Control codes are not displayable unless Program Mode is set. In that case the ADM 22 will display but not act upon the recognized control code. Of the 32 ASCII standard control codes available for use, the ADM 22 utilizes the control codes listed in **Table 3-2.**

Note

ESC X or ESC u will reset Program Mode.

3.4.2 Escape Sequences

An ESCape sequence is formed by executing the ESC ASCII control code, followed by one or more otherwise displayable ASCII characters. Each ESCape sequence controls a specific terminal operation. Some operations are one-time only, others remain operative for as long as power to the unit is not interrupted or until terminated by a control code or ESCape sequence.

Table 3-3 shows the ESCape sequences used by the ADM 22, whether initiated from the host or the keyboard. ESCape sequences may be initiated from the keyboard using the ESC key during Block Mode or Conversation Mode operations, as follows:

Block Mode - each ESC sequence is immediately acted upon the ADM 22, unless Program Mode is set. If embedded in memory, the ESC sequence will be displayed but not acted upon, and will be transmitted, along with the block of data.

Conversation Mode, Full Duplex - ESC is transmitted directly to the host and is utilized by the ADM 22 only when echoed back by the host.

Conversation Mode, Half Duplex - ESC is transmitted and acted upon locally by the ADM 22.

Note

The Control codes and ESCape sequences (command code set) used in the Emulation operations are detailed in **Appendix B.**

3.5 DATA TRANSMISSION

Data which has been written in memory and displayed on the monitor may be transmitted to the host either character-by-character as during Conversation Mode operation, or in message blocks, as during Block Mode operation. Communications are serial asynchronous, with an ASCII character format of 1 start bit, 7 or 8 data bit odd/even/no parity bit and 1 or 2 stop bits. The word structure and baud rate used for transmission are selectable in Set-Up Mode. Primary (Modem) Port communications are via a bi-directional RS-232C or 20mA current loop interfaces detailed in **Section II.** Auxiliary Port communications is uni-directional via RS-232C interfacing, also detailed in **Section II.**

Table 3-3. ADM 22 Escape Sequences

OPERATION	HOW TO EXECUTE		HEX CODE	DESCRIPTION
	FROM HOST	FROM KEYBOARD		
Keyboard Unlock	ESC "	SET UP (twice)	1B 22	Allows data to be entered on the keyboard (same as SO).
Keyboard Lock	ESC #		1B 23	Prevents data from being entered on the keyboard (same as SI).
Read Status* Line	ESC $		1B 24	Upon receipt of this command the ADM 22 will transmit the 10 nibbles of the status line function settings, followed by a CR code (0D Hex), Format as the write status command. ASCII bits 5, 6, and 7 low, the lower 4-bits depending upon the function. (Codes will be 00-0F Hex).
Write Status* Line	ESC % (XXX XXXXXXX)		1B 25 $0X_1...0X_{10}$	Causes the functions in nibbles 1 thru 10 of the Set-Up mode status line to be set or reset in accordance with the lower 4-bits of the ASCII control character t transmitted in positions $0X_1$ thru $0X_{10}$. The codes used must have bits 5,6, and 7 low, consequently be from column 0 of the ASCII code chart (00-0F Hex).
Set Protect Mode	ESC &		1B 26	Causes Protect Mode to be entered.
Reset Protect Mode	ESC '		1B 27	Causes Protect Mode to be exited.
Reset Write Protect	ESC (		1B 28	Causes Write Protect to be terminated.
Set Write Protect	ESC)		1B 29	Causes all subsequent data to be entered as write protected. Data will be highlighted by the protected field visual attribute se-lected in Set-Up Mode. Data will not be "Protected", however, unless Protect Mode is set.
Clear All to NULL	ESC *		1B 2A	Causes all display data to be cleared to Nulls protected or not, and the cursor moves home. (Same as ESC :)
Clear Unprotected To Spaces	ESC +		1B 2B	Causes only unprotected data on display to be cleared to spaces. Cursor moves home. If Protect Mode is not set, all data is cleared. (Same as ESC ;)
Send Line · Unprotected	ESC 4		1B 34	Transmits the unprotected data in the line containing the cursor, starting at the beginning of the line and up to the cursor position.

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Table 3-3. ADM 22 Escape Sequences (continued)
(Operations which have an * beside them are also selectable in Set-Up Mode.)

OPERATION	HOW TO EXECUTE FROM HOST	HOW TO EXECUTE FROM KEYBOARD	HEX CODE	DESCRIPTION
Send Page - Unprotected	ESC 5	ENTER (if Block Mode is set)	1B 35	Transmits the unprotected data on the display starting at home and through to the cursor position. A CR code (0D Hex) is transmitted at the end of the block.
Send Line - All	ESC 6		1B 36	Transmits all data in the line containing the cursor starting at the beginning of the line and up to the cursor position. Protected data will be bracketed by ESC (and ESC).
Send Page - All	ESC 7		1B 37	Transmits all data on display beginning at home and continuing through to the cursor position. Protected data will be bracketed by ESC (and ESC).
Clear All To Nulls	ESC :		1B 3A	Causes all data, protected or not, on the display to be cleared to nulls. The cursor moves home. (Same as ESC *)
Clear Unprotected To Spaces	ESC ;		1B 3B	Causes the unprotected data on the display to be cleared to space and the cursor moves home. (Same as ESC +)
Erase Line - Unprotected	ESC <		1B 3C	Erases all unprotected data on the line containing the cursor from the beginning to the end. The cursor moves to the first unprotected location on the line.
Address Cursor	ESC = ($X^1 X^2$)		1B 3D (20-37) (20-6F)	Used to position the cursor to a specified row and column on the display. The location is expressed as two ASCII characters. The first (X^1) specifies the row co-ordinate and is between "Space" and "o" (20-6F Hex) Refer to Figure 3-2.
Erase Line - All	ESC >		1B 3E	Erases all data on the line containing the cursor from the beginning to the end. The cursor moves to the first location on the line.
Read Cursor	ESC ?		1B 3F	Causes the terminal to transmit the cursor row and column position in the same format as described in "Address Cursor" (ESC =) command. Row position is transmitted first, followed by column position.
Print Page - Unprotected	ESC @		1B 40	Transmits the contents of the display, from home up to the cursor position, to the Auxiliary Port device. A CR and LF code (0D and 0A Hex) are inserted at the end of each line transmitted. Protected data is sent as spaces.
Enabled Auxiliary Port With Display	ESC A		1B 41	This command causes all data received by the Primary Port to be displayed and/or acted upon, and transmitted to the Auxiliary Port device. In Conversation/Half Duplex Mode keyboard entries are transmitted to the host only.
Set Block Mode*	ESC B		1B 42	Cancels Conversation Mode and causes Block Mode to be entered. Refer to paragraph 3.2.2 for details of Block Mode operation.

Table 3-3. ADM 22 Escape Sequences (continued)
(Operations which have an * beside them are also selectable in Set-Up Mode.)

OPERATION	HOW TO EXECUTE		HEX CODE	DESCRIPTION
	FROM HOST	FROM KEYBOARD		
Set Conversation* Mode	ESC C		1B 43	Cancels Block Mode and causes Conversation Mode to be entered. Refer to paragraph 3.2.2 for details of Conversation Mode operation.
Set Full-Duplex*	ESC D F		1B 44 46	When in Conversation Mode this command cancels Half-Duplex, and causes keyboard entries to be transmitted only. For characters to be displayed they must be echoed by the host.
Set Half-Duplex*	ESC D H		1B 44 48	When in Conversation Mode this command cancels Full-Duplex, and causes all keyboard data to be transmitted, and routed to the display.
Insert Line	ESC E	LINE INS	1B 45	Causes a line of spaces to be inserted at the line containing the cursor. All lower lines scroll down one line, the bottom line being lost. No action takes place if protect mode is set.
Set Graphics* Mode	ESC G		1B 47	When set the lower-case alpha characters (60-7A Hex) are replaced with special character graphics symbols.
Reset Graphics* Mode	ESC H		1B 48	Returns the display to normal 96-character ASCII mode.
Back Tab	ESC I		1B 49	Moves the cursor to the beginning of the previous unprotected field if Protect Mode is set; to the left eight character positions (Modulo 8 tab) if Protect Mode is reset.
Set Monitor* Mode	ESC M		1B 4D	When set, all data will be displayed as Hex-a-decimal ASCII pairs, 00 thru 7F.
Print Page - All	ESC P	PRINT	1B 50	Causes all data from home up to the cursor position to be transmitted to the Auxiliary Port device. A CR and LF code (0D and 0A Hex) are added at the end of each line as it is sent.
Insert Character	ESC Q	CHAR INS	1B 51	Moves all data from the cursor position to the end of the line or protected field one position to the right. A space is written at the cursor position.
Delete Line	ESC R	LINE DEL	1B 52	Erases the line containing the cursor and moves all lower lines upward one line. No action takes place if Protect Mode is set.
Erase To End-Of-Line Unprotected	ESC T		1B 54	Erases the unprotected data from the cursor position up to the end of the line, or protected field.
Set Program Mode	ESC U		1B 55	When set the 32-ASCII control characters are displayed and not acted upon.

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Table 3-3. ADM 22 Escape Sequences (continued)
(Operations which have an * beside them are also selectable in Set-Up Mode.)

OPERATION	HOW TO EXECUTE FROM HOST	HOW TO EXECUTE FROM KEYBOARD	HEX CODE	DESCRIPTION
Delete Character	ESC W	CHAR DEL	1B 57	Deletes the character under the cursor and moves all characters from the cursor to the end of the line or protected field to the left one position.
Reset Program* Mode	ESC X		1B 58	Causes Program Mode to be exited, the 32-ASCII control characters will be acted upon, if utilized by the ADM 22.
Erase To End-Of-Page Unprotected	ESC Y		1B 59	Erases the unprotected data from the cursor position up to the end of the display or protected field.
Tab	ESC i	TAB	1B 69	Moves the cursor to the beginning of the next unprotected field ;if Protect Mode is set; the eighth character position following (Modulo 8 tab) if Protect Mode is reset.
Enable Auxiliary Port Without Display	ESC n		1B 6E	This command causes all data received by the Primary Port to be transmitted to the Auxiliary Port device. No data is sent to the display.
Reset Terminal	ESC o		1B 6F	Causes the Power-On Self-Test routine to be executed, and the status line to be loaded with the last saved Set-Up functions.
Erase To-End-Of-Line All	ESC t		1B 74	Erases all data from the cursor position up to the end of the line.
Send Character At Cursor	ESC x		1B 78	Causes the character the cursor is positioned over to be transmitted to the Primary Port device.
Erase To End-Of-Page All	ESC y		1B 79	Erases all data from the cursor position up to the end of the display.

Data communications can take place whenever the ADM 22 is placed in On-Line Mode. When On-Line, there are two basic ways in which data may be transmitted; conversationally or in blocks. When receiving data the ADM 22 has an X-ON/X-OFF busy indication feature used to command the host to suspend transmission to prevent data loss.

3.5.1 Conversation Mode Operation

When the terminal is operating in Conversation Mode, characters entered on the keyboard are immediately transmitted to the host. This includes any control codes or ESCape sequences which are normally not

displayed. For characters to be displayed or commands acted upon, the terminal must be set to Half Duplex Mode. If Full Duplex Mode is set, then only those codes echoed by the host will be displayed or cause any action to take place.

3.5.2 Block Mode Operation

During Block Mode operation, data entered on the keyboard is routed only to the display or acted upon for command sequences utilized by the ADM 22. This allows complete display editing and formatting prior to transmission to the host. By setting Program Mode, control codes may also be embedded in the display for transmission. A block of data can be

transmitted in whole or in part by the use of the Protect Mode feature. This allows the host the ability to send a form to the terminal which is Write-Protected, and when Protect Mode is set, only the data the operator had entered is transmitted when commanded. Block Mode commands may be used to cause the terminal to transmit a line or page, unprotected only or all of the data. Received data is accepted conversationally or in blocks regardless of the mode selected.

3.5.3 X-ON/X-OFF (Busy/Ready Status)

The ADM 22 has the ability to signal the host of a potential data loss due to the input buffer being nearly full or the terminal is otherwise unable to accept data. The X-ON/X-OFF feature may be enabled or disabled through Set-Up Mode. When enabled the terminal will transmit an X-OFF code (DC3, Hex 13) to the host if the input buffer has fewer than 256 character locations remaining. An X-ON code (DC1, Hex 11) will be transmitted when there are 1024 locations available in the input buffer. Executing the Page Print function or using the Pass-through Print with low speed printers will also cause the X-ON/X-OFF commands to be issued when appropriate. Busy/Ready condition is sensed on the Auxiliary Port via one of the RS-232C signal levels.

3.6 CURSOR CONTROL

3.6.1 Relative Cursor Positioning

The Cursor may be moved to any position on the screen typically using the separate cursor control keys. Its position signifies the next character position in the display. When data is being entered, the cursor moves one position to the right on the line or to the first position in the next line each time a character is written. The operation codes and local operations required to control the cursor positions are outlined in Table 3-2.
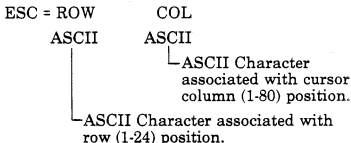
3.6.2 Absolute Cursor Positioning

Absolute Cursor Addressing requires commanding the cursor to a specific display location or reading out the exact cursor

location. Commanding the cursor to a specific location (loading the cursor) is normally executed by the host as well as reading the cursor. The Load/Read commands are executed by means of ESCape sequences in which the row and column location of the cursor is expressed in a pair of ASCII characters. See **figure 3-2** for the ASCII characters assigned to each row and column location.

3.6.2.1 Load Cursor Operation

When the Load Cursor operation is initiated the cursor moves to the commanded position. The Load Cursor operation codes required are as follows:

ESC = ROW   COL
    ASCII   ASCII
                 └─ASCII Character
                    associated with cursor
                    column (1-80) position.
        └─ASCII Character associated with
          row (1-24) position.

EXAMPLE: ESC = , K commands the cursor to Row 13, column 44.

3.6.2.2 Read Cursor Operation

The Read Cursor operation consists of the Read command usually from the host, and an immediate response from the terminal which defines the cursor position, regardless of whether Conversation Mode or Block Mode is set. The host executes ESC ?, and the terminal responds with the appropriate Row ASCII and Column ASCII character.

3.6.3 Tab Control

The ADM 22 supports two types of tab operations; Modulo tabs and Protected Field tabs. The tab and back-tab commands are detailed in Table 3-2 and 3-3. The type of tab performed depends upon whether Protect Mode is set or reset. When Protect Mode is set, the Tab command will cause the cursor to

Table 3-3. ADM 22 Escape Sequences (continued)
(Operations which have an * beside them are also selectable in Set-Up Mode.)

OPERATION	HOW TO EXECUTE FROM HOST	HOW TO EXECUTE FROM KEYBOARD	HEX CODE	DESCRIPTION
Delete Character	ESC W	CHAR DEL	1B 57	Deletes the character under the cursor and moves all characters from the cursor to the end of the line or protected field to the left one position.
Reset Program * Mode	ESC X		1B 58	Causes Program Mode to be exited, the 32-ASCII control characters will be acted upon, if utilized by the ADM 22.
Erase To End-Of-Page Unprotected	ESC Y		1B 59	Erases the unprotected data from the cursor position up to the end of the display or protected field.
Tab	ESC i	TAB	1B 69	Moves the cursor to the beginning of the next unprotected field if Protect Mode is set; the eighth character position following (Modulo 8 tab) if Protect Mode is reset.
Enable Auxiliary Port Without Display	ESC n		1B 6E	This command causes all data received by the Primary Port to be transmitted to the Auxiliary Port device. No data is sent to the display.
Reset Terminal	ESC o		1B 6F	Causes the Power-On Self-Test routine to be executed, and the status line to be loaded with the last saved Set-Up functions.
Erase To-End-Of-Line All	ESC t		1B 74	Erases all data from the cursor position up to the end of the line.
Send Character At Cursor	ESC x		1B 78	Causes the character the cursor is positioned over to be transmitted to the Primary Port device.
Erase To End-Of-Page All	ESC y		1B 79	Erases all data from the cursor position up to the end of the display.

Data communications can take place whenever the **ADM 22** is placed in On-Line Mode. When On-Line, there are two basic ways in which data may be transmitted; conversationally or in blocks. When receiving data the **ADM 22** has an X-ON/X-OFF busy indication feature used to command the host to suspend transmission to prevent data loss.

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When the terminal is operating in Conversation Mode, characters entered on the keyboard are immediately transmitted to the host. This includes any control codes or ESCape sequences which are normally not

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During Block Mode operation, data entered on the keyboard is routed only to the display or acted upon for command sequences utilized by the **ADM 22**. This allows complete display editing and formatting prior to transmission to the host. By setting Program Mode, control codes may also be embedded in the display for transmission. A block of data can be

transmitted in whole or in part by the use of the Protect Mode feature. This allows the host the ability to send a form to the terminal which is Write-Protected, and when Protect Mode is set, only the data the operator had entered is transmitted when commanded. Block Mode commands may be used to cause the terminal to transmit a line or page, unprotected only or all of the data. Received data is accepted conversationally or in blocks regardless of the mode selected.

5.3 X-ON/X-OFF (Busy/Ready Status)

The **ADM 22** has the ability to signal the host of a potential data loss due to the input buffer being nearly full or the terminal is otherwise unable to accept data. The X-ON/X-OFF feature may be enabled or disabled through Set-Up Mode. When enabled the terminal will transmit an X-OFF code (DC3, Hex 13) to the host if the input buffer has fewer than 256 character locations remaining. An X-ON code (DC1, Hex 11) will be transmitted when there are 1024 locations available in the input buffer. Executing the Page Print function or using the Pass-through Print with low speed printers will also cause the X-ON/X-OFF commands to be issued when appropriate. Busy/Ready condition is sensed on the Auxiliary Port via one of the RS-232C signal levels.

3.6 CURSOR CONTROL

3.6.1 Relative Cursor Positioning

The Cursor may be moved to any position on the screen typically using the separate cursor control keys. Its position signifies the next character position in the display. When data is being entered, the cursor moves one position to the right on the line or to the first position in the next line each time a character is written. The operation codes and local operations required to control the cursor positions are outlined in **Table 3-2.**
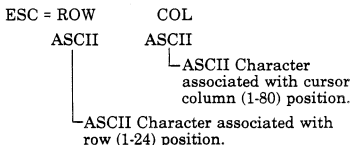
3.6.2 Absolute Cursor Positioning

Absolute Cursor Addressing requires commanding the cursor to a specific display location or reading out the exact cursor

location. Commanding the cursor to a specific location (loading the cursor) is normally executed by the host as well as reading the cursor. The Load/Read commands are executed by means of ESCape sequences in which the row and column location of the cursor is expressed in a pair of ASCII characters. See **figure 3-2** for the ASCII characters assigned to each row and column location.

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```
ESC = ROW        COL
      ASCII      ASCII
        |          └─ASCII Character
        |            associated with cursor
        |            column (1-80) position.
        └─ASCII Character associated with
          row (1-24) position.
```

EXAMPLE: ESC = , K commands the cursor to Row 13, column 44.

3.6.2.2 Read Cursor Operation

The Read Cursor operation consists of the Read command usually from the host, and an immediate response from the terminal which defines the cursor position, regardless of whether Conversation Mode or Block Mode is set. The host executes ESC ?, and the terminal responds with the appropriate Row ASCII and Column ASCII character.

3.6.3 Tab Control

The **ADM 22** supports two types of tab operations; Modulo tabs and Protected Field tabs. The tab and back-tab commands are detailed in **Table 3-2** and **3-3**. The type of tab performed depends upon whether Protect Mode is set or reset. When Protect Mode is set, the Tab command will cause the cursor to

ASCII CODES	POSITION ROW	POSITION COL	ASCII CODES	POSITION ROW	POSITION COL	ASCII CODES	POSITION ROW	POSITION COL
ESC = SPACE	1	1	ESC = ;		28	ESC = V		55
!	2	2	<		29	W		56
"	3	3	=		30	X		57
#	4	4	>		31	Y		58
$	5	5	?		32	Z		59
%	6	6	@		33	[		60
&	7	7	A		34	\		61
'	8	8	B		35	]		62
(	9	9	C		36	^		63
)	10	10	D		37	_		64
*	11	11	E		38	`		65
+	12	12	F		39	a		66
,	13	13	G		40	b		67
-	14	14	H		41	c		68
.	15	15	I		42	d		69
/	16	16	J		43	e		70
0	17	17	K		44	f		71
1	18	18	L		45	g		72
2	19	19	M		46	h		73
3	20	20	N		47	i		74
4	21	21	O		48	j		75
5	22	22	P		49	k		76
6	23	23	Q		50	l		77
7	24	24	R		51	m		78
8		25	S		52	n		79
9		26	T		53	ESC = o		80
ESC = :		27	ESC = U		54			

Figure 3-2. Absolute Cursor Addressing Operation Codes

advance to the beginning of the next unprotected field. If no protected fields are encountered by the end of the display, the cursor moves home, or to the first unprotected position if home is protected. When Protect Mode is reset the cursor will advance or backspace by eight character positions (Modulo 8 tab) for each command received.

3.6.4 Scrolling

In the ADM 22, data is entered into display memory starting at the HOME position, and continues through Position 80 of Line 24, (last data position). When Position 80 is filled, or when a New Line or Line Feed occurs in Line 24, the display is shifted upwards one line and data entry continues in Position 1 of the new Line 24. The original topline of the display is lost. Scrolling continues indefinitely. Scrolling may be enabled or disabled through a selection in Set-Up Mode. Scroll is automatically disabled when Protect Mode is set.

3.7 EDITING OPERATIONS

The ADM 22 is equipped with data editing capabilities, which may be executed from the host and from the keyboard. These features normally provide local text editing prior to a block transmission. The following paragraphs detail the various types of Edit operation available on the ADM 22. Table 3-3 describes the commands and keyboard entries used to perform display editing.

3.7.1 Erase And Clear Operations

All or selected areas of the display may be cleared of data by appropriate commands. The erase can be from the cursor to the end of the line or page, unprotected only or all. The entire display may be cleared or only the unprotected data. The character used to replace the cleared data may be either a space (Hex 20) or a NUL (Hex 00).

3.7.2 Insert Operations

There are two types of inserts that can be performed; Line Insert and Character Insert. When a Line Insert is commanded the line containing the cursor and all lower lines move down one line. The bottom line of data is

lost. Line Insert is ignored when Protect Mode is set. When Character Insert is issued the character under the cursor and all following characters move to the right one position. The last character is lost. The insert replacement character is a space (Hex 20).

3.7.3 Delete Operations

The delete commands include Line Delete and Character Delete. If a Line Delete is received the line containing the cursor is erased, and all lower lines move up one line. The new line created at the bottom is filled with NUL's (Hex 00). The Line Delete is ignored if Protect Mode is Set. The Character Delete command cause the character under the cursor to be erased and all characters following to move to the left one position. The position created at the end of the line is filled with a space (Hex 20).

3.8 DISPLAY FORMATTING OPERATIONS

The ADM 22 may have various attributes and fields used to highlight data on the display. The visual, graphic and field attributes used for display formatting are discussed in the paragraphs that follow.

3.8.1 Visual Attributes

There are four Visual Attributes that can be assigned to any character on display. They include: Blink, Underline, Reversed, and Reduced Intensity. The attribute that will be used is assigned singularity or in combination through a set-up function selection. When the "Set Write Protect" command is received all subsequent data entered will appear with the selected attribute. If Protect Mode is not set, the data is not treated uniquely, it may be overwritten and erased or cleared by all associated commands. If Protect Mode is set, the data is treated as protected.

3.8.2 Graphics

The Graphics capability of the ADM 22 allows the user to draw business type forms or simple pictures to entente the information presentation. The graphics characters may have the same visual attributes and field protection as the normal character data. The

graphical patterns that are available for use and the associated Hex coding are illustrated in **figure 1-2**. Graphics Mode may be set or reset in Set-Up Mode or by commands from the host.

3.8.3 Field Attributes

When the "Set Write Protect" command is received all subsequent data takes on the visual attribute as noted in **paragraph 3.6.1**, until a Reset Write Protect is issued. By setting Protect Mode the write protected data is treated as reserved, or protected. This will allow the commands that specify "Unprotected Only" to be used to improve throughput characteristics. In block sends the protected data will not be sent during "Send Unprotected Only" commands for line or page. During Edit operations the Erase or Clear Unprotected Only commands will leave the protected data on the display. Character Insert and Delete operations will terminate upon encountering a protected field. Scrolling is also disabled when Protect Mode is set.

3.9 SET-UP MODE OPERATIONS

The general operating characteristics of the ADM 22 are controlled by ten 4-bit "nybbles" of information that is displayed on the 25th line of the display, when Set-Up Mode is entered. Both the operator and host have the ability to change the functions selectable in Set-Up Mode. Selections may be saved in non-volatile memory to re-establish the same functions on the next power-on cycle or terminal reset operation. The operation of Set-Up Mode is fully described in **paragraph 2.5.2.**

> **Note**
>
> *When remotely writing to status line, 10 nuls should be sent to allow unit to reset to normal mode.*

3.10 PRINT OPERATIONS

The Auxiliary Port of the ADM 22 is most typically connected to a serial RO (receive-only) printer. The communications of data to the auxiliary device is uni-directional via an RS-232C interface. A Busy/Ready signal level is monitored for status during print operations. The Auxiliary Port may be

enabled or disabled through a function setting in Set-Up Mode. The three types of print output are: Page Print, Auxiliary Port with Display, and Auxiliary Port without Display, details as follows:

3.10.1 Page Print

Upon receipt of a Print Page command the ADM 22 will transmit the data from home up to the cursor position to the auxiliary device. The command may either specify to send all data, or, send the unprotected data normally but the protected data as spaces. This is useful when using a formatted screen being output to a pre-printed form. The Print Page commands can be generated from the host or keyboard. Each print line output is followed by a CR and LF (Hex 0D and 0A) in the data stream.

3.10.2 Auxiliary Port With Display

Auxiliary Port with display is enabled or disabled by entering a command from the keyboard or by receiving the ESCape sequence from the host. When using this method of transmission the terminal will display and act upon all received data as well as transmitting the data out the Auxiliary Port to the printer. When operating in Conversation Mode/Half-Duplex, keyboard entries are transmitted to the host and display only. There is no output to the printer.

3.10.3 Auxiliary Port Without Display

Auxiliary Port without display is enabled or disabled by entering command from the keyboard or by receiving the command from the host. When operating in this mode the terminal will not display received data, however, the terminal will transmit the received data out the Auxiliary Port to the printer. No commands except the reset Auxiliary Port with/without display are acted upon.

3.11 RESET OPERATIONS

The ADM 22 can be reset in one of two ways: a Power-On Reset, or a Reset Terminal command. Both cause the Self-Test to be executed and are detailed below.

3.11.1 Power-On Reset

A Power On Reset consists of a complete recycling of the ADM 22 functions, including power. This is accomplished by setting the ON/OFF switch to OFF, waiting 10 seconds, then setting the switch to ON. All display and other volatile memory is erased when powering down. Upon power up, the unit is subject to the complete Power Turn-On procedure specified in **Section II**.

3.11.2 Reset Terminal Command

The **ADM 22** may be reset by a command received from the host or from the keyboard. When executed the terminal will self-test and load the Set-Up Mode functions to those last saved.

3.11.3 Self-Test

When the **ADM 22** is reset by either of the methods described, the terminal Self-Test will be executed. Self-Test will verify the integrity of the display memory, the program memory, non-volatile memory and the associated internal control logic. Upon completion of Self-Test the terminal will sound the audible alarm and display the installed firmware version number along with a "TEST OK" message i.e. "V11F1 TEST OK".

APPENDIX A
OPERATORS
QUICK REFERENCE
CHARTS

ASCII CODE CHART

BITS B7 B6 B5								
B4 B3 B2 B1	CONTROL		NUMBERS SYMBOLS		UPPER CASE		LOWER CASE	
0 0 0 0	NUL	DLE	SP	0	@	P	`	p
0 0 0 1	SOH	DC1	!	1	A	Q	a	q
0 0 1 0	STX	DC2	"	2	B	R	b	r
0 0 1 1	ETX	DC3	#	3	C	S	c	s
0 1 0 0	EOT	DC4	$	4	D	T	d	t
0 1 0 1	ENQ	NAK	%	5	E	U	e	u
0 1 1 0	ACK	SYN	&	6	F	V	f	v
0 1 1 1	BEL	ETB	'	7	G	W	g	w
1 0 0 0	BS	CAN	(	8	H	X	h	x
1 0 0 1	HT	EM	)	9	I	Y	i	y
1 0 1 0	LF	SUB	*	:	J	Z	j	z
1 0 1 1	VT	ESC	+	;	K	[	k	{
1 1 0 0	FF	FS	,	<	L	\	l	|
1 1 0 1	CR	GS	-	=	M	]	m	}
1 1 1 0	SO	RS	.	>	N	Λ	n	~
1 1 1 1	SI	US	/	?	O	_	o	DEL RUBOUT

KEY

octal 10	←	LSI CURSOR CONTROL CODE
BS		ASCII character
hex 8	8 decimal	

Get familiar with ASCII and LSI control codes with the help of this handy table.

ABSOLUTE CURSOR ADDRESSING
OPERATION CODES

Keys Used: ESC = | ROW ASCII | COL ASCII

ASCII CODES	POSITION ROW	POSITION COL	ASCII CODES	POSITION ROW	POSITION COL	ASCII CODES	POSITION ROW	POSITION COL
ESC = SPACE	1	1	ESC = ;		28	ESC = V		55
!	2	2	<		29	W		56
"	3	3	=		30	X		57
#	4	4	>		31	Y		58
$	5	5	?		32	Z		59
%	6	6	@		33	[		60
&	7	7	A		34	\		61
'	8	8	B		35	]		62
(	9	9	C		36	∧		63
)	10	10	D		37	_		64
*	11	11	E		38	`		65
+	12	12	F		39	a		66
,	13	13	G		40	b		67
-	14	14	H		41	c		68
.	15	15	I		42	d		69
/	16	16	J		43	e		70
0	17	17	K		44	f		71
1	18	18	L		45	g		72
2	19	19	M		46	h		73
3	20	20	N		47	i		74
4	21	21	O		48	j		75
5	22	22	P		49	k		76
6	23	23	Q		50	l		77
7	24	24	R		51	m		78
8		25	S		52	n		79
9		26	T		53	ESC = o		80
ESC = :		27	ESC = U		54			

STATUS LINE CODE SUMMARY

Write Status Line	ESC % X¹ X² X³ ....X¹⁰
Read Status Line	ESC $
Response	X¹ X² X³ ....X¹⁰ CR

Where X₁ thru X₁₀ correspond to nybbles 1 thru 10. The lower four bits of each character represents the set (1) or reset (0) state of the associated nybble. The control codes used are depicted below with the various bit state combinations.

Must Be Low	BIT	ASCII CHARACTER
6 5 4	3 2 1 0	
0 0 0	0 0 0 0	NUL - 00 Hex
0 0 0	0 0 0 1	SOH - 01 Hex
0 0 0	0 0 1 0	STX - 02 Hex
0 0 0	0 0 1 1	ETX - 03 Hex
0 0 0	0 1 0 0	EOT - 04 Hex
0 0 0	0 1 0 1	ENQ - 05 Hex
0 0 0	0 1 1 0	ACK - 06 Hex
0 0 0	0 1 1 1	BEL - 07 Hex
0 0 0	1 0 0 0	BS - 08 Hex
0 0 0	1 0 0 1	HT - 09 Hex
0 0 0	1 0 1 0	LF - 0A Hex
0 0 0	1 0 1 1	VT - 0B Hex
0 0 0	1 1 0 0	FF - 0C Hex
0 0 0	1 1 0 1	CR - 0D Hex
0 0 0	1 1 1 0	SO - 0E Hex
0 0 0	1 1 1 1	SI - 0F Hex

ADM 22 ESCAPE SEQUENCES

HEX	2		3		4		5		6		7	
0			0		@	PRINT PAGE UNPROTECTED	P	PRINT PAGE ALL	`		p	
1	!		1		A	COPY PRINT WITH DISPLAY	Q	INSERT CHAR	a		q	
2	"	KEYBOARD UNLOCK	2		B	SET BLOCK MODE	R	DELETE LINE	b		r	
3	#	KEYBOARD LOCK*	3		C	SET CONV MODE	S		c		s	
4	$	READ STATUS LINE*	4	SEND LINE UNPROTECTED	D	SET H/F DUPLEX	T	ERASE TO END OF LINE UNPROTECTED	d		t	ERASE TO END OF LINE ALL
5	%	WRITE STATUS LINE*	5	SEND PAGE UNPROTECTED	E	INSERT LINE	U	SET PROGRAM MODE	e		u	
6	&	SET PROTECT MODE	6	SEND LINE ALL	F		V		f		v	
7	'	RESET PROTECT MODE	7	SEND PAGE ALL	G	SET GRAPHICS MODE	W	DELETE CHAR	g		w	
8	(	RESET WRITE PROTECT	8		H	RESET GRAPHICS MODE	X	RESET PROGRAM MODE	h		x	SEND CHARACTER AT CURSOR
9	)	SET WRITE PROTECT	9		I	BACK TAB	Y	ERASE TO END OF PAGE UNPROTECTED	i	TAB	y	ERASE TO END OF PAGE ALL
A	*	CLEAR ALL TO NULL	:	CLEAR ALL TO NULL	J		Z		j		z	
B	+	CLEAR UNPROTECT TO SPACES	;	CLEAR UNPROTECT TO SPACES	K		[		k		{	
C	,		<	ERASE LINE UNPROTECTED	L		\		l		|	
D	-		=	ADDRESS CURSOR RC**	M	SET MONITOR MODE	]		m		}	
E	.		>	ERASE LINE ALL	N		^		n	AUXILIARY PORT WITHOUT DISPLAY	~	
F	/		?	READ CURSOR RC**	O		—		o	RESET TERMINAL	DEL	

*MULTIPLE CHARACTERS REQUIRED, SEE TABLE 3-3.
**MULTIPLE CHARACTERS REQUIRED, SEE FIGURE 3-2.

DP222

APPENDIX B

EMULATION COMMAND CODE SUMMARY
(Operations are as described in Table 3-2 and 3-3)

	HAZELTINE 1500 EMULATION		ADDS REGENT 25 EMULATION	
	The Lead-In Code (LI) is selectable in Set-Up Mode to be either an ESC (IB Hex) or a TILDE (7E Hex)			
OPERATION	**COMMAND**	**HEX CODE**	**COMMAND**	**HEX CODE**
Cursor Right	DEL	10	ACK	06
Cursor Down	(LI) LF/VT	XX 0A/0B	LF	0A
Cursor Up	(LI) FF	XX0C	SUB	1A
Cursor Left	BS	08	BS/NAK	08/15
Cursor Home	(LI) DC2	XX 12	SOH	01
Bel	BEL	07	BEL	07
Carriage Return	CR	0D	CR	0D
Tab	HT	09		
Keyboard Lock	(LI) NAK	XX 15	ESC 5	1B 35
Keyboard Unlock	(LI) ACK	XX 06	ESC 6	1B 36
Clear All To Spaces	(LI) FS	XX 1C	FF	0C
Reset Write Protect	(LI) US	XX 1F		
Set Write Protect	(LI) EM	XX 19		
Enable Aux Port With Display			DC2	12
Enable Aux Port Without Display			ESC 3	1B 33
Disable Aux Port With/ Without Display			DC4	14
Clear Unprotect To Spaces	(LI) GS	XX 1D		
Direct Cursor Address	(LI) DC1 (COL) (ROW)	XX 11 XX XX	ESC Y (ROW) (COL)	1B 59 XX XX
Read Cursor Address	(LI) ENQ	XX 05		
Insert Line	(LI) SUB	XX 1A		
Delete Line	(LI) DC3	XX 13		
Erase To End Of Line All	(LI) SI	XX 0F	ESC K	1B 4B
Erase To End Of Line Unprotected			ESC K	1B 6B
Erase To End of Display All	(LI) CAN	XX 18		
Erase To End of Display With Protected Spaces	(LI) ETB	XX 17		

EMULATION COMMAND CODE SUMMARY (continued)

NOTE: In Add Regent 25 Emulation the following functions and codes are not supported:

ESC ; - Enter Function Keypad Mode 1

ESC < - Enter Function Keypad Mode 2

ESC = - Enter Function Keypad Mode 3

DLE - Code for Address Horizontal

VT - Code for Address Vertical

COMMENTS AND SUGGESTIONS

Let us know...

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