



**ADM 5 Dumb Terminal®
Video Display Unit
Users Reference Manual**

**LEAR SIEGLER, INC.
DATA PRODUCTS DIVISION**

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**ADM 5
Dumb Terminal®
Video Display Unit**



LEAR SIEGLER, INC.

**USERS REFERENCE
MANUAL**



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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.

SUMMARY OF WARNINGS, CAUTIONS AND NOTES

WARNING

Page 2-2

Dangerous voltages exist within the ADM 5. Always disconnect the AC power cord before opening the ADM 5 case to access any internal components.

CAUTION

Page 2-1

To prevent internal condensation from developing, allow the ADM 5 to temperature stabilize when changing locations. Condensation will adversely affect the operation of the ADM 5.

Page 2-10

If power is recycled ON and OFF using the POWER ON/OFF switch, wait 10 seconds between the OFF and ON operations to prevent possible damage to the ADM 5 electronics.

Page 2-2

Set DIP switches ON or OFF using DIP Switch Setting Tool 857001. DO NOT use a ball point pen or pencil; the switches could become contaminated with conductive debris.

SUMMARY OF WARNING, CAUTIONS AND NOTES

Note

Page 2-4

The peripheral device that is attached to the EXTENSION port must operate at the same baud rate as the communication line.

Page 2-11/12

If the Full-Duplex mode is selected, typing at the keyboard will not display characters unless echo-back from the host computer or modem is provided. If Half-Duplex mode is selected, data will be displayed only if CLEAR TO SEND is present or interface cable is disconnected.

Page 3-1

Typing at the keyboard always generates codes which are transmitted. However, in order for characters to be displayed and for control codes to affect the ADM 5 in FDX Mode, the characters must be echoed back from the host computer. All display actions described below assume that the generated codes are properly echoed.

PREFACE

This Users Reference Manual describes the function and operation of the ADM 5 Video Display Unit. The instructions and information are presented to aid operational personnel in the installation, operation, and care of the instrument. All operator controls are described in detail, and remote programming considerations are presented in sufficient detail to enable an experienced operator to use the equipment efficiently when confronted with nonstandard applications.

The major topics described in the manual include:

Section I General Description

Section II Installation

Section III Operation

Appendix A Operators Quick Reference Charts

Index



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Figure 1-1. ADM 5 Video Display Unit

SECTION I GENERAL DESCRIPTION

1.1 INTRODUCTION

This section of the manual describes the primary functions of the Lear Siegler ADM 5 Video Display Unit shown in **figure 1-1**. Other information in this section includes specifications, operating features and ranges, physical dimensions, and a list of available options.

1.2 PURPOSE AND USE

There are numerous applications of the ADM 5, all involving the transfer of asynchronous data. In some applications, data transfer may be exclusively unidirectional; either from the ADM 5 to a host computer, or from the computer to the ADM 5. However, a more frequent application is one in which an operator communicates with the computer, and the computer reacts in accordance with its stored program.

The ADM 5 Video Display Unit features the following general capabilities:

- Full 128 ASCII character set with 80 x 24 character nonglare display.
- Lower case standard with full two-dot descenders.
- CAP LOCK Key
- Edit Keys
- Visual Attributes

- TAB Key
- Numeric Keypad with 15 keys
- Program Mode
- Five separate cursor control keys
- 10 communication rates in full-duplex and half-duplex send/receive modes
- Scrolling
- Absolute cursor positioning
- Variable 9-, 10-, or 11-bit word structures
- Selectable Auto New Line operation
- Selectable standard RS-232C or 20mA current-loop interface, with RS-232C extension interface for auxiliary devices. (Selectable keyboard lock or gated EXTENSION port). Optional current-loop interface on EXTENSION port.
- Special control character sequences
- Selectable refresh rate

1.3 OPERATIONAL DESCRIPTION

The ADM 5 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 teletypewriter, the operator may enter information which is immediately transmitted to

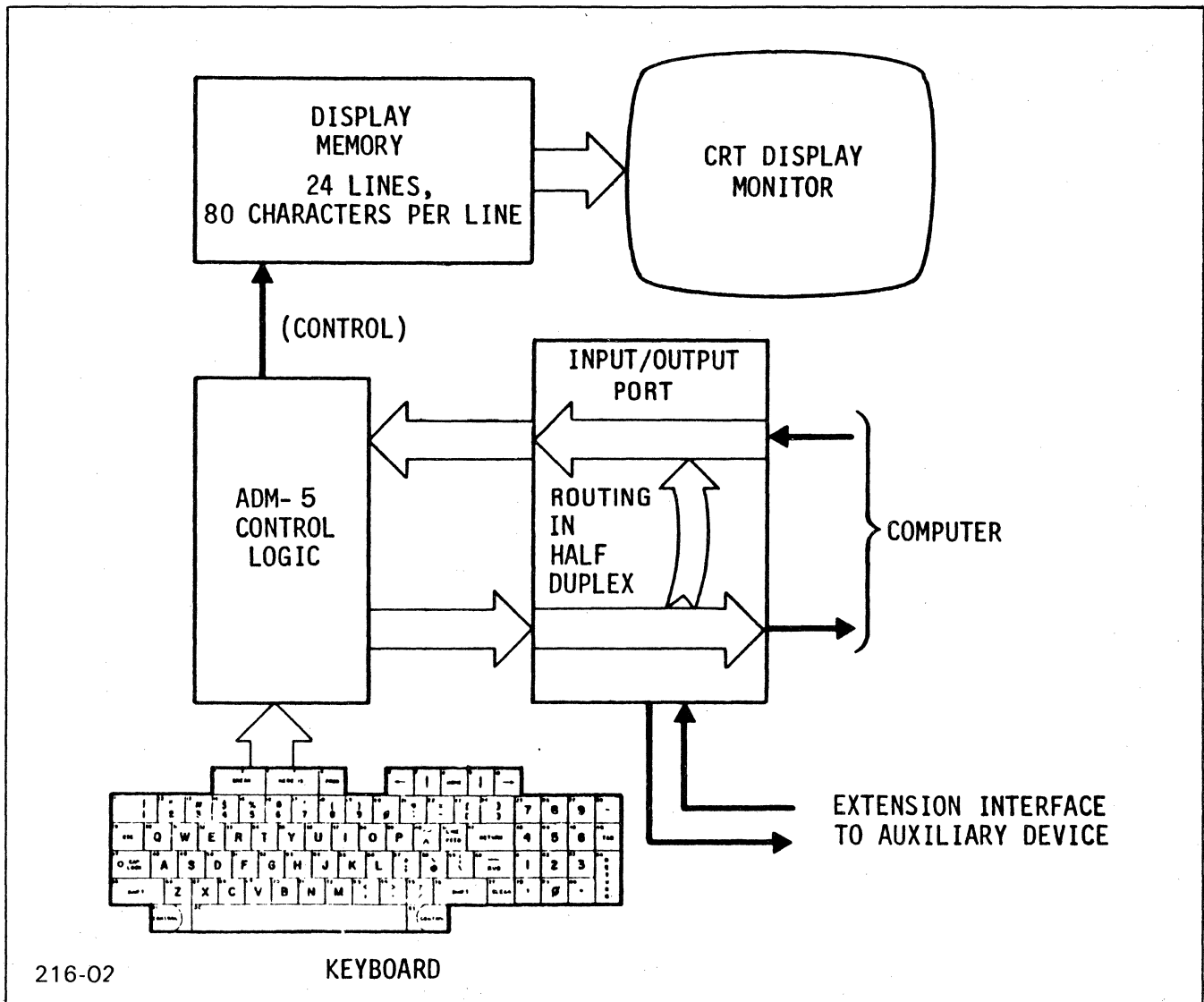


Figure 1-2. ADM 5 Data Flow Block Diagram

the computer and may be simultaneously displayed on a cathode ray tube (CRT). Data from the computer is received and displayed at baud rates as high as 19200 (the maximum baud rate when using the current loop option is 9600). **Figure 1-2** illustrates the functional areas of the ADM 5 with corresponding data flow between these functional areas.

1.3.1 Keyboard

The keyboard contains 83 keys from which data entry and control functions are initiated. Each keystroke is encoded into a corresponding ASCII

character which is immediately transmitted to the host computer. The character is also routed back to the CRT display: directly via the I/O interface in half-duplex operation, or echoed from the host computer via the I/O interface in full-duplex operation.

1.3.2 Input/Output (I/O) Port

The MODEM (I/O) port is the link, or interface, that handles the flow of data in both directions between the ADM 5 and the computer. In half-duplex operation, each character entered from the

keyboard is transmitted and simultaneously routed back to the control logic and display memory for CRT display.

1.3.3 ADM 5 Control Logic

The ADM 5 Control Logic interprets the control codes that originate either at the keyboard or host computer, and directs the activities of the ADM 5 accordingly. These activities include data handling, and formatting.

1.3.4 Display Memory

The display memory contains random access memory (RAM), video logic, and character generation circuits appropriate for controlling the CRT display. The memory is capable of holding 1920 characters, which are stored in sequentially scanned locations. The scanned data is then sent to the CRT for displaying. Input to the display memory consists of the data character codes from the I/O port or keyboard, under the control of signals from the control logic circuits.

1.3.5 CRT Display Monitor

The CRT display monitor is a rectangular screen measuring 12 inches diagonally. Data characters are displayed on 24 equally-spaced rows, each consisting of 80 (maximum) characters. The 80 character lines are displayed clearly at a refresh rate of either 50 or 60 Hz, corresponding to the AC line frequency.

1.4 PHYSICAL DESCRIPTION

The ADM 5 is a self-contained unit consisting of three major assemblies: (1) base and cover assembly, (2) main logic board and (3) the CRT monitor. The power transformer, a beeper, and intercomponent cabling are located on the base portion of the terminal. Supports and guide pins are also located on the base, and these are used for installing the main logic board.

The cover portion of the terminal contains the CRT monitor and its associated subassemblies. The cover is hinged to the base at the rear, and when swung open, all components of the ADM 5 are exposed.

The main logic board contains all other operating elements of the ADM 5 that are not contained in the CRT monitor and the base assembly. This includes the keyboard. The keyboard is made up of integrated key rows, or modules. It is built directly on the main logic board. The logic board rests on supports within the base, and is held in place by guide pins. Two connectors at the rear edge of the logic board provide the RS-232C/current-loop interface and the RS-232C extension interface.

The CRT monitor is a transistorized unit consisting of three subassemblies: (1) the CRT itself, (2) a printed circuit board that contains most of the video circuitry, and (3) the flyback subassembly. The monitor display screen measures 12 inches diagonally, and resembles the CRT of a small black and white television set.

1.5 SPECIFICATIONS

The ADM 5 specifications are listed in table 1-1. In addition, several operational features, such as send/receive modes, character format, word structure, data entry and overflow, and configuration control are discussed in the paragraphs that follow. Specific operational information regarding configuration control, format and word structure, modes, etc., is contained in Section II of this manual.

1.5.1 Send/Receive Modes

Two switch-selectable send/receive modes are available in the ADM 5: half-duplex and full-duplex. In the half-duplex mode, each character is transmitted to the computer as it is entered on the keyboard and is simultaneously displayed on the CRT monitor.

In full-duplex operation, the ADM 5 can transmit and receive information in both directions simultaneously. Characters are transmitted as they are entered at the keyboard, but are displayed only upon reception. In order to display transmitted characters, they must be echoed back from the host computer or data set.

1.5.2 Character Format (Figure 1-3)

The standard ADM 5 character set consists of 128 ASCII characters. Of these, 32 are control

characters which can be displayed on the CRT screen if the terminal is operating in the PROGRAM mode. The terminal can be placed in the PROGRAM mode by means of the PROG key only. Placing the control characters on display is a feature of special use to the programmer. The normally displayable 95 characters (plus space) consist of upper and lower case letters, numerics, and punctuation marks. (See figure 1-4.)

1.5.3 Word Structure

The ADM 5 can transmit and receive data characters in any one of the asynchronous character formats shown in figure 1-5. These word format codes are selected by means of DIP switches located on the PC board.

1.5.4 Data Entry and Overflow

New data enters on progressive lines, from top to bottom. A line feed will cause upward scrolling of the entire display page, when the cursor is at the bottom line. When overflow occurs, the entire display page is scrolled upward one line as new data enters at the beginning of the new bottom line. If AUTO NEW LINE is not enabled, a CR/LF must be sent.

1.5.5 Configuration Control

Default conditions for the ADM 5 are established by the selected positions of configuration switches, which are located on the main logic board. The switches are factory set in accordance with instructions established at the time of purchase of the ADM 5. Section II of this manual shows the locations of these switches so that they may be checked and/or reset at the time of ADM 5 installation.

1.6 OPTIONAL FEATURES

The following features can be incorporated into the ADM 5 by installation of the appropriate option.

1.6.1 Answerback

When installed, this option is activated by means of the HERE IS key. Momentarily pressing this key initiates an identification message (stored in a special ADM 5 memory) that identifies the terminal. The HERE IS key is included in the keyboard of the ADM 5; however, this key has no function if the Answerback option is not installed. Answerback is activated by a remote ENQ code.

1.6.2 20mA Current Loop on Extension Port

This option permits the EXTENSION port to be used in a current-loop application.

1.6.3 230VAC

For this option, a 230-volt transformer and appropriate power cord are provided to make the ADM 5 suitable for 230-volt operation.

1.6.4 Alternate Configuration - Green Phosphor Screen

This option provides a green phosphor display screen.

1.7 RELATED DOCUMENTS

- a. ADM 5 Maintenance Manual DP319
- b. ADM 5 Illustrated Parts Catalog DP719

00 NUL	01 SOH	02 STX	03 ETX	04 EOT	05 ENC	06 ACK	07 BEL	08 BS	09 HT	0A LF	0B VT	0C FF	0D CR	0E SO	0F S1
10 DLE	11 DC1	12 DC2	13 DC3	14 DC4	15 NAK	16 SYN	17 ETB	18 CAN	19 EM	1A SUB	1B ESC	1C FS	1D GS	1E RS	1F US
20	21	22	23	24	25	26	27	28	29	2A	2B	2C	2D	2E	2F
30	31	32	33	34	35	36	37	38	39	3A	3B	3C	3D	3E	3F
40	41	42	43	44	45	46	47	48	49	4A	4B	4C	4D	4E	4F
50	51	52	53	54	55	56	57	58	59	5A	5B	5C	5D	5E	5F
60	61	62	63	64	65	66	67	68	69	6A	6B	6C	6D	6E	6F
70	71	72	73	74	75	76	77	78	79	7A	7B	7C	7D	7E	7F

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Figure 1-3. Standard ADM 5 Character Format (By Ascending
ASCII Codes) with Hex Code

Table 1-1. ADM 5 Specifications

DISPLAY FORMAT

24 lines x 80 characters

CRT SCREEN

12-inch (30.5 cm) diagonal,
P4 Phosphor, antireflective surface

REFRESH RATE

50 Hz or 60 Hz, depending on line
frequency (switch selectable).

HORIZONTAL SWEEP RATE

16.2 kHz

DISPLAY AREA

5.8 inches (14.7 cm) high x 8.3 inches
(21 cm) wide.

CHARACTER SET

128 ASCII characters, upper and lower
case, punctuation, and 32 control
characters.

CHARACTER MATRIX

5 x 9 dot matrix, including full 2 dot
descenders, 0.074 inch (1.88 mm) wide
x 0.218 inch (5.53 mm) high.

CHARACTER FIELD

7 x 10 dot matrix, 0.103 inch (2.62 mm)
wide x 0.241 inch (6.14 mm) high

CURSOR

7 x 10 dot matrix. Reverse image block
cursor. Homes to upper left of screen.

CURSOR CONTROLS

Individual cursor control keys
Backspace, Forespace, Up, Down, Home,
Return, Line Feed.

VIDEO ATTRIBUTES

Reverse video, reduced intensity and
reverse video/reduced intensity com-
bination.

KEYBOARD

83 keys, 26-letter alphabet with upper and
lower case, numerics 0 through 9, punc-
tuation, caps lock. All keys are automatic
repeating at a rate of 22 characters per
second.

NUMERIC KEY PAD

15 keys, 0 through 9, Return, Tab, Comma,
Period, and Minus.

EDIT KEYS

Erase to end of line and erase to end of page.

FUNCTIONAL COMMAND KEYS

Escape, Rubout (delete), Break, Control,
Line Feed, Return, Tab, Shift, Clear,
Program Mode, Here Is, Caps Lock.

DATA ENTRY

Data entry on progressive lines from top to
bottom. Upward scrolling of entire display
with top-of-page overflow. Auto New
Line is switch selectable.

CONVERSATION MODE

Conversation mode/full duplex,
Conversation mode/half duplex

CONTROL CHARACTERS

32 control characters may be transmitted to
the computer and/or entered on the screen.

COMPUTER INTERFACES (MODEM)

RS-232C point-to-point or 20mA current loop.

DATA RATES

75, 110, 150, 300, 600, 1200, 2400, 4800,
9600, 19,200. (Current Loop Option: 75
to 9600)

PARITY

Even, odd, mark, space, or none.

Table 1-1. ADM 5 Specifications (cont'd)

WORD STRUCTURE

Total Word Length: 9, 10, or 11 bits
Data: 7 or 8 bits (8th bit 0 or 1)
Start: 1 bit
Stop: 1 or 2 bits

EXTENSION INTERFACE

Extension RS-232C port for interfacing serial asynchronous ASCII hard copy printer, magnetic tape recorder, or other serial asynchronous devices using selectable keyboard lock or gated EXTENSION port.

SWITCH SELECTABLE SETTINGS

All Baud Rates
Half/Full Duplex
RS-232C/Current Loop (MODEM)
Auto New Line ON/OFF
Odd/Even Parity
7 or 8 Data Bits
1 or 2 Stop Bits
Parity/Inhibit
Bit 8 = 0 or 1
Keyboard Lock/Gated EXTENSION port
Secondary Channel
Code Turnaround
Local
103 Modem
202 Modem

OPERATING ENVIRONMENT

Temperature: 41°F to 122°F (5°C to 50°C)
Humidity: 5% to 95%, noncondensing
Altitude: 10,000 feet (3.048 km) maximum

POWER REQUIREMENTS

Standard: 115 VAC \pm 10%, 60 \pm 3 Hz, 60 Watts nominal.
Optional: 230 VAC \pm 10%, 50/60 \pm 3 Hz, 60 Watts nominal.
Heat Dissipation: 205 BTU per hour.

DIMENSIONS AND WEIGHT

Width: 15.6 inches (39.6 cm)
Depth: 20.2 inches (51.3 cm)
Height: 13.5 inches (34.3 cm)
Weight: 32 pounds (14.5 kg)

OPTIONS

Answerback
20mA Current Loop on EXTENSION port
Green Phosphor Screen

HEX		*CONTROL		GRAPHIC CHARACTER SET					
		0	1	2	3	4	5	6	7
BITS 4 3 2 1 ↓	BITS 7 6 5 →	000	001	010	011	100	101	110	111
0	0000	NUL	DLE	SP	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	\$	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	HT (TAB)	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	RS (HOME)	.	>	N	^	n	~
F	1111	SI	US	/	?	O	-	o	*DEL (RUB)

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CONTROL
CODES

DISPLAYABLE IN
STANDARD ADM 5

(Generated by
holding CTRL key
while typing the
corresponding key
shown in columns
4 and 5.)

* Displayable in Program Mode

Figure 1-4. ADM 5 Graphic Set and CTRL Codes

WORD FORMAT	PCB SWITCHBANK S2					9-, 10-, OR 11-BIT WORD STRUCTURE										
						BITS										
	S2-10	S2-9	S2-8	S2-7	S2-6	0	1	2	3	4	5	6	7	8	9	10
Eleven-Bit Word with EVEN Parity and 2 STOP Bits	7 BIT	EVEN	2 STOP	ENPR*		START				ACTIVE BITS = 1 OR 0				EVN PAR	STOP	STOP
Eleven-Bit Word with ODD Parity and 2 STOP Bits	7 BIT	ODD	2 STOP	ENPR		START				ACTIVE BITS = 1 OR 0				ODD PAR	STOP	STOP
Ten-Bit Word with EVEN Parity and 1 STOP Bit	7 BIT	EVEN	1 STOP	ENPR		START				ACTIVE BITS = 1 OR 0				EVN PAR	STOP	
Ten-Bit Word with ODD Parity and 1 STOP Bit	7 BIT	ODD	1 STOP	ENPR		START				ACTIVE BITS = 1 OR 0				ODD PAR	STOP	
Eleven-Bit Word with No Parity and 2 STOP Bits	8 BIT		2 STOP	DISPR**	BIT 8 = 0 OR BIT 8 = 1	START				ACTIVE BITS = 1 OR 0				1 OR 0	STOP	STOP
Ten-Bit Word with No Parity and 1 STOP Bit	8 BIT		1 STOP	DISPR	BIT 8 = 0 OR BIT 8 = 1	START				ACTIVE BITS = 1 OR 0				1 OR 0	STOP	
Eleven-Bit Word with EVEN Parity and 1 STOP Bit	8 BIT	EVEN	1 STOP	ENPR	BIT 8 = 0 OR BIT 8 = 1	START				ACTIVE BITS = 1 OR 0				1 OR 0	EVN PAR	STOP
Eleven-Bit Word with ODD Parity and 1 STOP Bit	8 BIT	ODD	1 STOP	ENPR	BIT 8 = 0 OR BIT 8 = 1	START				ACTIVE BITS = 1 OR 0				1 OR 0	ODD PAR	STOP
Nine-Bit Word with No Parity and 1 STOP Bit	7 BIT		1 STOP	DISPR		START				ACTIVE BITS = 1 OR 0				STOP		

*ENPR - Enables Parity
**DISPR - Disables Parity

Figure 1-5. Word Format Codes with Switch Configurations

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SECTION II INSTALLATION

2.1 GENERAL

Installation procedures involving unpacking, site requirements, initial set-up, and operation checkout of the ADM 5 Video Display Unit are contained in this section of the manual.

2.2 SPECIAL SAFETY REQUIREMENTS

Observe normal safety procedures when installing the ADM 5. No special safety requirements are imposed.

2.3 UNPACKING AND INITIAL INSPECTION

Each ADM 5 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. As a rule, 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 LSI 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 5 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 5 may be used conveniently in a normal office environment, as no special mounting provisions are required. However, it is recommended that a weather protected environment with an ambient temperature range of 41°F to 122°F (5°C to 50°C), and relative humidity of less than 95 percent be maintained for equipment use.

CAUTION

To prevent internal condensation from developing, allow the ADM 5 to temperature stabilize when changing locations. Condensation will adversely affect the operation of the ADM 5.

Whenever the ADM 5 is physically moved to a warmer environment than its former location, be sure to allow sufficient time for the equipment temperature to equalize with the warmer location before activating the terminal. Condensation developed by the temperature differential may possibly impair ADM 5 operation.

Refer to **Section I** of this manual for physical dimensions of the ADM 5, as well as installation power and environmental parameters. The basic requirements for reliable installation of the ADM 5 are as follows:

- Table or desk for mounting
- Standard three-pronged, 115-volt, power outlet.
- Cable connection to the host, modem, serial printer, or other auxiliary device. If connection to a remote computer is desired, a modem or data set may be required.

2.5 INITIAL PREPARATION

Initial preparation includes: making sure that the ADM 5 will not be plugged into an AC line power outlet that will damage the equipment; and checking and/or resetting the configuration control switches as necessary.

2.5.1 Line Voltage Selection

The ADM 5 is shipped properly wired for either 115-volt or 230-volt AC line power, as specified in the purchase order. Any change for operation on a different line voltage requires changing components in the ADM 5, which should be accomplished only by authorized LSI Maintenance Personnel. (Unauthorized circuit or component changes invalidate the equipment warranty.)

2.5.2 Configuration Control Switch Settings

DIP switches located on the main logic board are provided for establishing the default state of selected system operating characteristics. These

switches are initially set at the factory in accordance with customer requirements, as expressed on the Terminal Ordering Form. Any required switch settings should be made before attempting to operate the terminal. **Figure 2-1** shows the location and identity of the configuration control switches, as well as connector/pin designations. **Tables 2-1** and **2-2** describe the function and factory setting of each switch.

WARNING

Dangerous voltages exist within the ADM 5. Always disconnect the AC power cord before opening the ADM 5 case to access any internal components.

CAUTION

Set DIP switches ON or OFF using DIP Switch Setting Tool 857001. DO NOT use a ball point pen or pencil; the switches could become contaminated with conductive debris.

Access to the configuration control switches is obtained by opening the cover of the ADM 5, as follows:

1. Disconnect the AC power cord from source receptacle.
2. Remove the two screws located under the front corners of the base and lift the cover upwards and to the rear of the terminal, until it rests on the table or desk supporting the equipment.

2.6 INTERFACE INFORMATION

The ADM 5 may be cabled directly to a local computer, or it may be connected via telephone data lines to a remote computer located anywhere

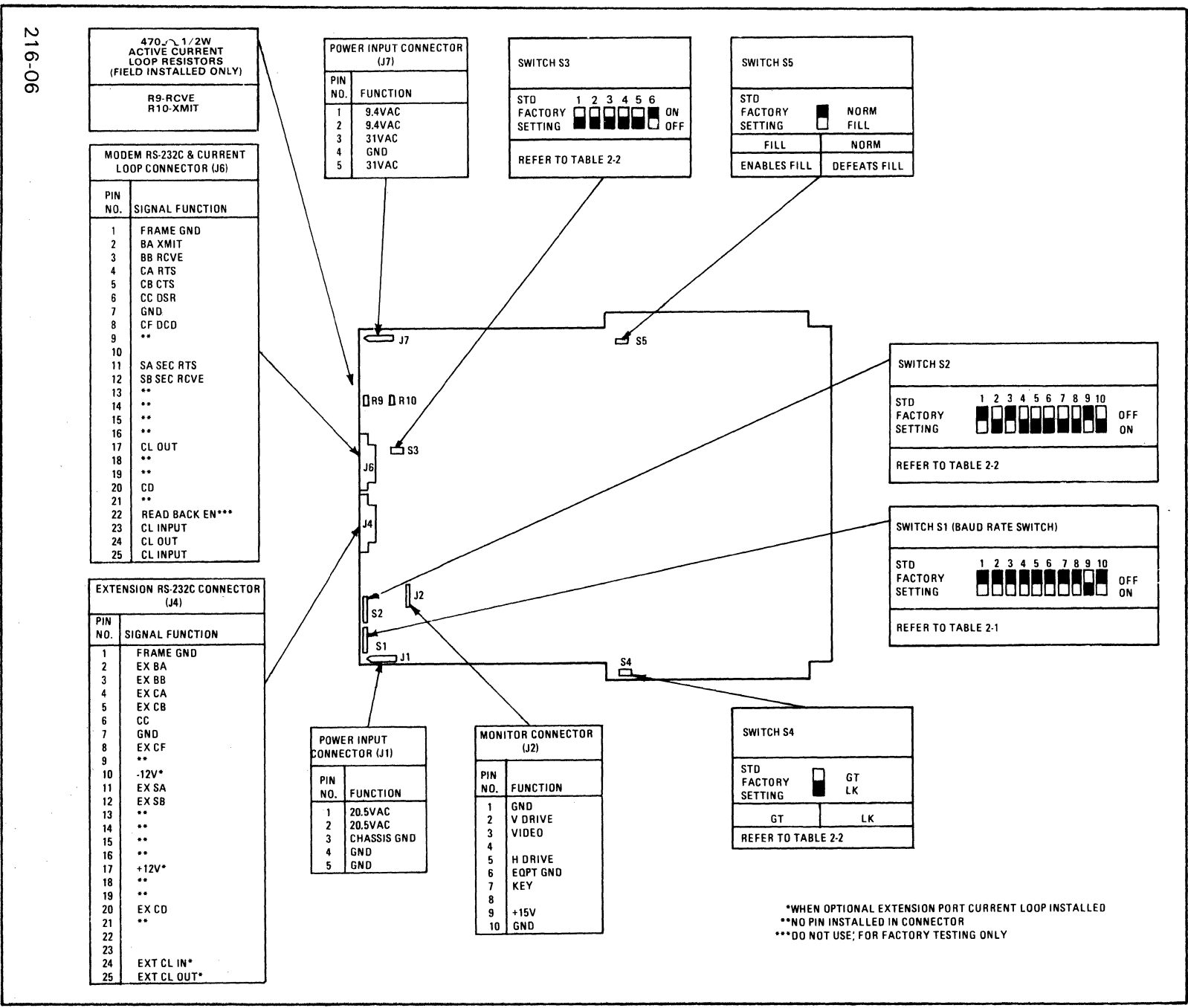


Figure 2-1. ADM 5 Connector and Configuration Switch Locations

Table 2-1. Baud Rate Switch Functions

SWITCH NO.	NAME	FUNCTION
S1-1	75 BAUD	} BAUD RATE switches for selecting MODEM port baud rate. SELECT ONE ONLY.
S1-2	110 BAUD	
S1-3	150 BAUD	
S1-4	300 BAUD	
S1-5	600 BAUD	
S1-6	1200 BAUD	
S1-7	2400 BAUD	
S1-8	4800 BAUD	
S1-9	* 9600 BAUD	
S1-10	** 19200 BAUD	

* Factory Setting

** Not applicable for current-loop operation

in the world. Remote computer connections require the use of a modem or data set. **Figure 2-1** shows the connector/pin assignments for the MODEM and EXTENSION ports. **Figure 2-2** shows several typical ADM 5 interfaces.

2.6.1 RS-232C Modem Port Interface

The MODEM port interface is used to connect the terminal directly to a computer, modem or data set, in RS-232C or current-loop application. See **figures 2-3** and **2-4**.

2.6.2 RS-232C Extension Port Interface

The EXTENSION port interface extends the standard RS-232C capabilities of the ADM 5 by allowing the connection of a serial RS-232C peripheral.

The gated EXTENSION port mode, when selected by switch S4, allows selective transmission of data from the keyboard, in Half-Duplex mode, or the communication line through the EXTENSION port.

Note

The peripheral device that is attached to the EXTENSION port must operate at the same baud rate as the communication line.

2.7 INSTALLING THE ADM 5

To install the ADM 5, proceed as follows:

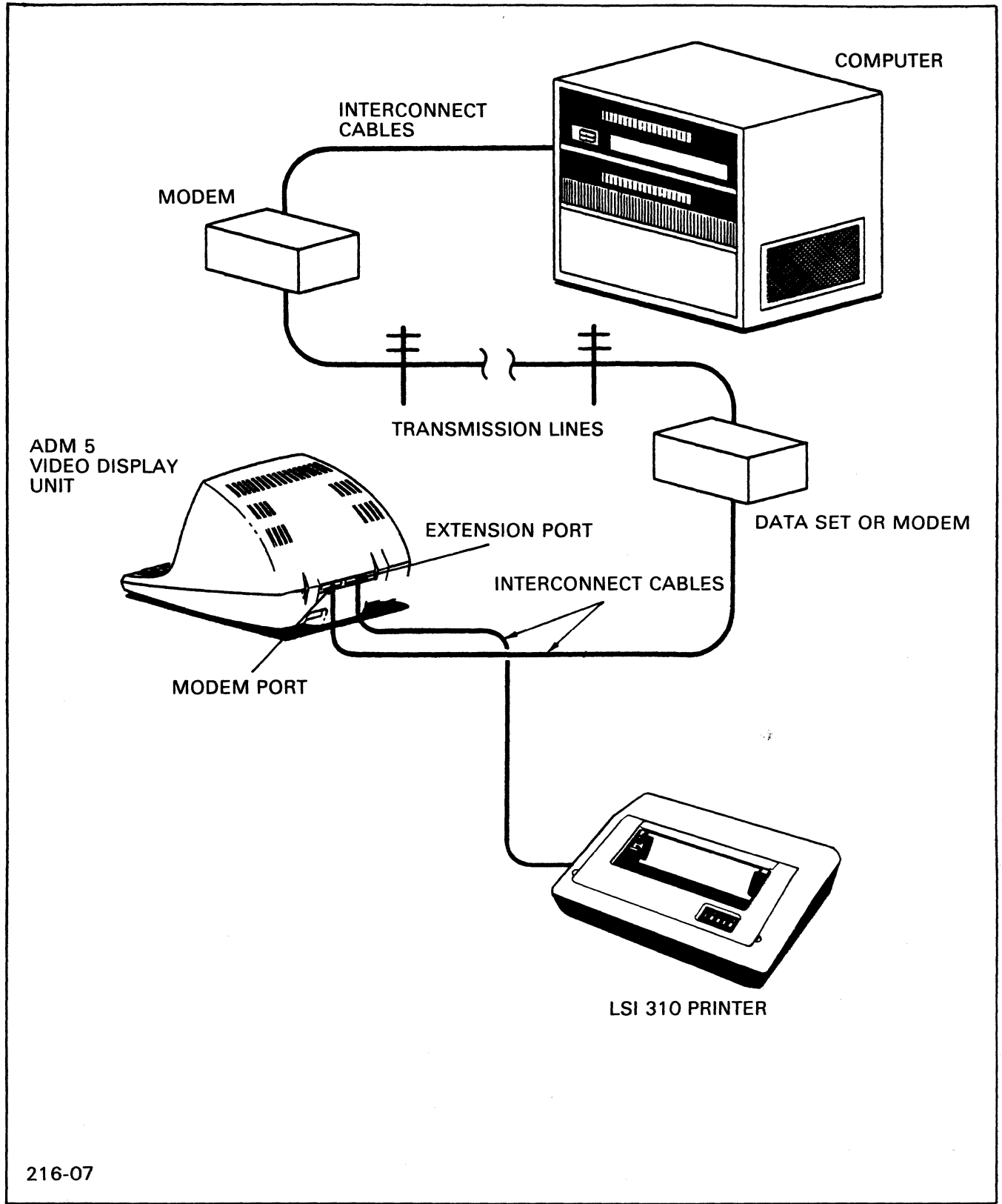
1. Verify that the POWER ON/OFF switch is OFF. See **figure 2-5**.
2. Connect the interconnect cable(s) using the appropriate information in **figures 2-1** and **2-2**.

Table 2-2. Configuration Control Switch Functions

SWITCH NO.	NAME	FACTORY SETTING	FUNCTION
S2-1	Reserved		
S2-2	AUNL EN - AUNL DIS	AUNL EN	<p>AUNL EN (Auto New Line Enable): Causes the cursor to move to the beginning of the next line automatically after the 80th character position is typed. If the cursor was previously on the bottom line, the display will scroll upward one line. The operator continues typing on the next new line.</p> <p>AUNL DIS (Auto New Line Disable): Disables Automatic New Line Function.</p>
S2-3	50 Hz - 60 Hz	60 Hz	Selects 50 Hz or 60 Hz refresh rate for data on CRT. Refresh rate is not synchronized to line frequency, but should be set to correspond with powerline frequency.
S2-4	RS232 - CUR LP	RS232	<p>RS232: Selects RS-232C interface for communication through MODEM connector.</p> <p>CUR LP (Current Loop): Selects 20mA current-loop interface for communication through MODEM connector.</p>
S2-5	HDX - FDX	HDX	<p>HDX: Places ADM 5 in half-duplex mode. Each character is sent to the computer as it is entered on keyboard and displayed on CRT.</p> <p>FDX: Places ADM 5 in full-duplex mode. ADM 5 transmits and receives in both directions simultaneously. Each character must be echoed back from the host or modem to be displayed.</p>
S2-6	BIT 8 = 0 - BIT 8 = 1	See Function	<p>NOTE This switch is active only when S2-10 is in position BIT 8</p> <p>BIT 8 = 0: Forces bit 8 to a zero value.</p> <p>BIT 8 = 1: Forces bit 8 to a one value.</p>
S2-7	ENPR - DISPR	ENPR	<p>ENPR (Enable Parity): Enables parity bit after 7- or 8-bit data word.</p> <p>DISPR (Disable Parity): No parity bit after 7- or 8-bit data word.</p>
S2-8	1 STOP - 2 STOP	1 STOP	<p>1 Stop: Selects 1 STOP bit</p> <p>2 Stop: Selects 2 STOP bits</p>

Table 2-2. Configuration Control Switch Functions (cont'd)

SWITCH NO.	NAME	FACTORY SETTING	FUNCTION
S2-9	ODD - EVEN	EVEN	<p>NOTE This switch is active only when S2-7 is in position ENPR</p> <p>ODD: Selects ODD parity EVEN: Selects EVEN parity</p>
S2-10	7 BIT - 8 BIT	7 BIT	<p>7 BIT: Selects 7-bit data word 8 BIT: Selects 8-bit data word</p>
S3-1 S3-2	ET (EOT) EX (ETX)	See Function	One switch active only in conjunction with 202 - type modem operation to select the primary channel turnaround code. (See Function Description for S3-3 and S3-4)
S3-3	CD (CODE)	See Function	<p>Active only when S3-4 (22) is ON. Used to select method of line turnaround for half-duplex operation as follows:</p> <p>ON: Enables line turnaround using primary channel. Turnaround code may be either ETX or EOT.</p> <p>OFF: Enables line turnaround using secondary channel. Both S3-1 (EOT) and S3-2 (ETX) must be OFF.</p>
S3-4 S3-5 S3-6	22 (202) 13 (103) LC (LOCAL)	See Function	<p>Only one switch may be active at any time. Used to select one of the following methods of communicating with host computer.</p> <p>22: ON enables connection to 202-type modem. Secondary channel or line turnaround code changes direction of data in primary channel.</p> <p>13: ON enables connection to 103-type modem. CA line is held high.</p> <p>LC: ON enables direct computer connection without modems. Request to Send (CA) line rises and falls with each character transmitted.</p>
S4	GT - LK	See Function	<p>GT: Enables gated EXTENSION port mode which allows ON/OFF control of the EXTENSION port.</p> <p>LK: Used to enable the keyboard Enable/Disable operation.</p>
S5	NORM - FILL	NORM	<p>NORM: Disables FILL function.</p> <p>FILL: Enables FILL function. Display is filled with zeroes for test purposes.</p>



216-07

Figure 2-2. Typical ADM 5 Application

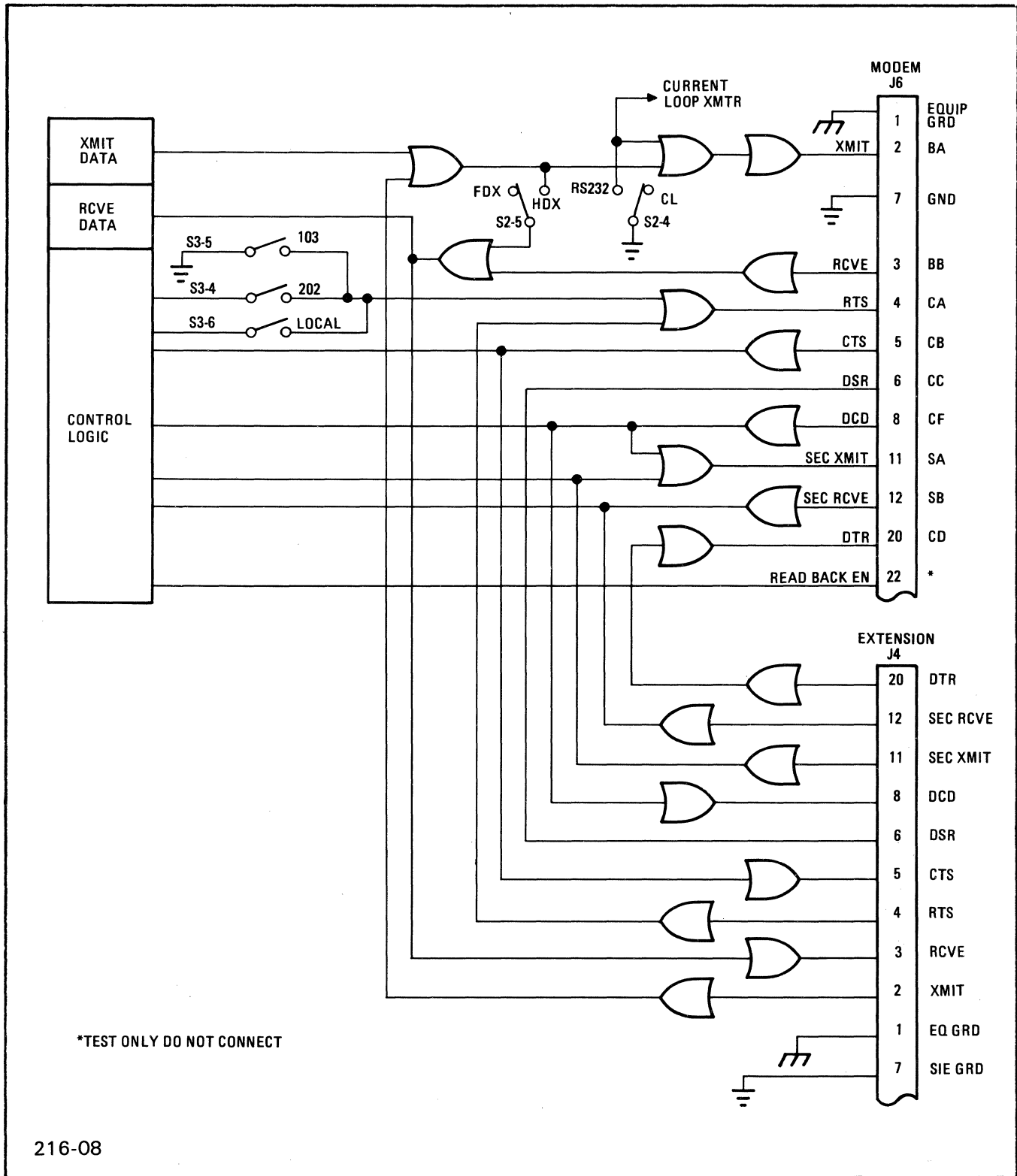


Figure 2-3. RS-232C MODEM and EXTENSION Interface Logic

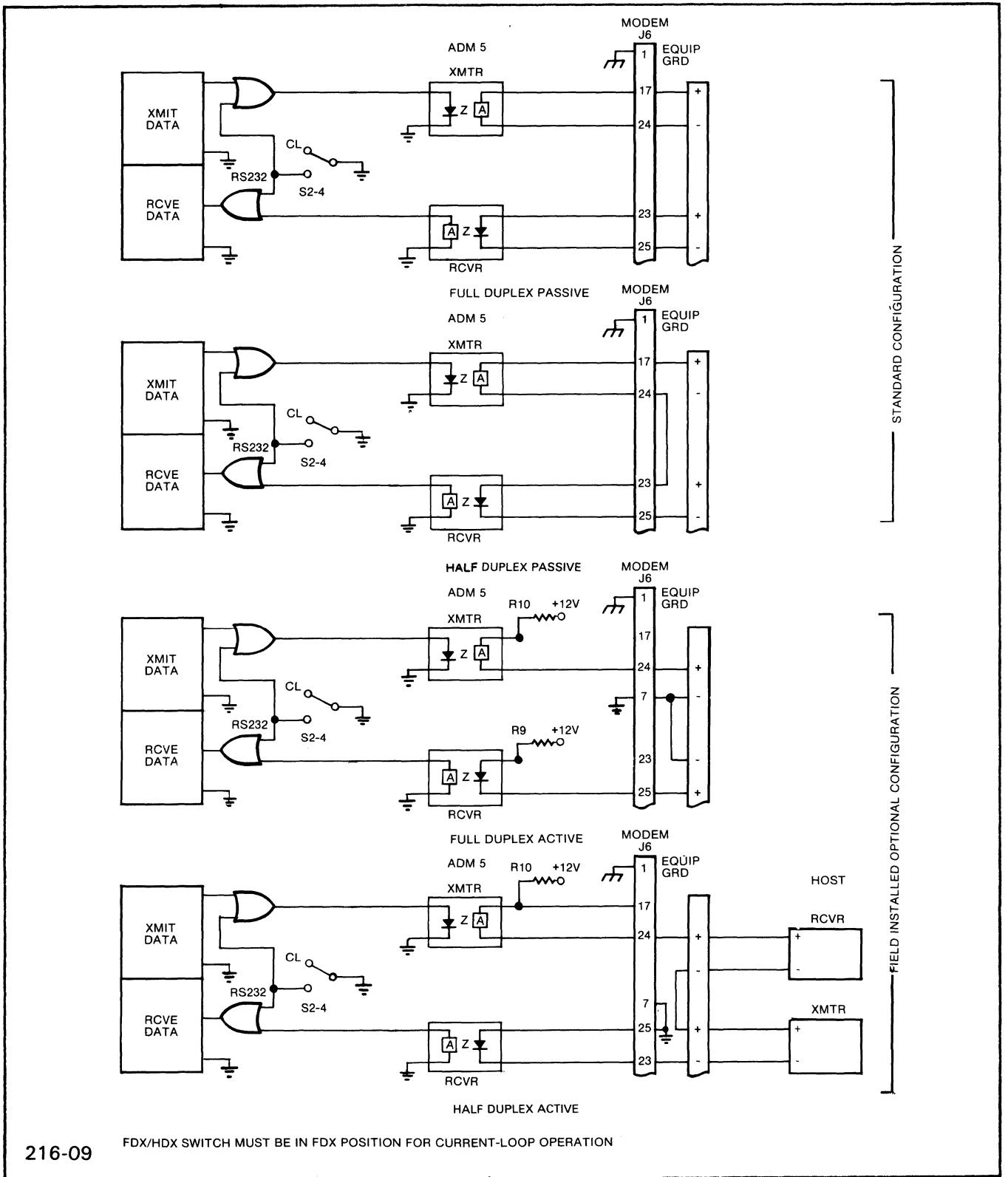


Figure 2-4. Current-Loop Interface Logic

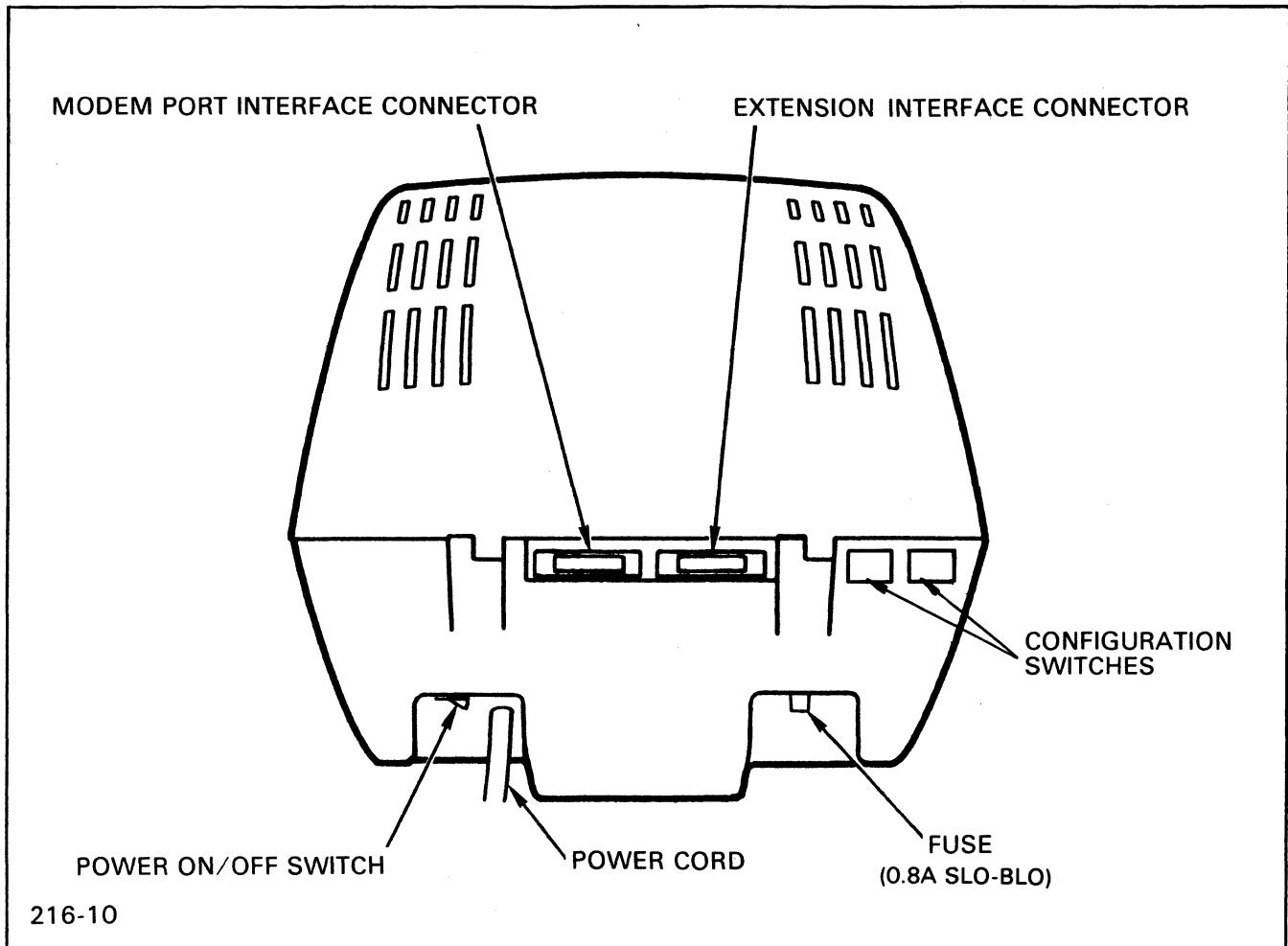


Figure 2-5. ADM 5 Rear Panel Controls

3. Set the configuration control switches to the positions desired. See table 2-2.
4. Set S1 (Baud Rate Switch) for the desired baud rate. See table 2-1.
5. Connect the power cord to a grounded AC outlet of the proper voltage.

2.8 POWER TURN-ON AND TURN-OFF

Proceed as follows:

1. Set the POWER ON/OFF switch to ON. See figure 2-5.

2. Wait approximately 20 seconds for the ADM 5 to warm up. A reverse block cursor should appear in the upper left corner of the screen.

CAUTION

If power is recycled ON and OFF using the POWER ON/OFF switch, wait 10 seconds between the OFF and ON operations to prevent possible damage to the ADM 5 electronics.

3. If the cursor does not appear, momentarily press HOME Key. If this fails to produce the cursor, adjust the CONTRAST control on the front panel. The cursor should be present.

Note

If the Full-Duplex mode is selected, typing at the keyboard will not display characters unless echo-back from the host computer or modem is provided. If Half-Duplex mode is selected, data will be displayed only if CLEAR TO SEND is present or interface cable is disconnected.

2.9 CARE OF THE ADM 5

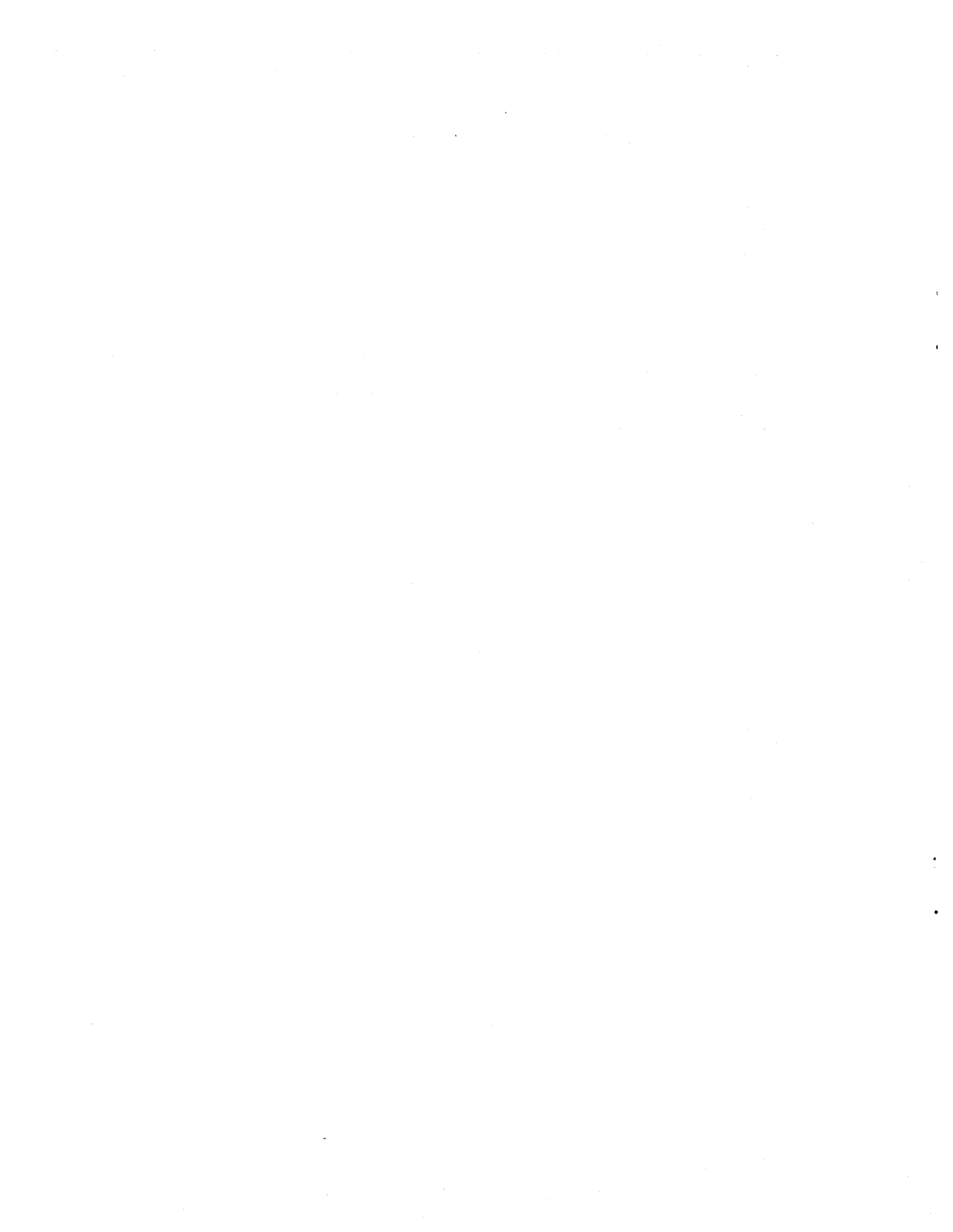
This portion of the manual provides the required operator instructions pertaining to routine maintenance for the ADM 5. Preventive maintenance procedures are limited primarily to cleaning and inspection steps.

2.9.1 Cleaning

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

2.9.2 Inspection

Periodically, inspect keyboard assembly for freedom of movement. Determine that the intensity of character trace on the CRT screen has not diminished. Any required mechanical or electrical adjustment should only be performed by an authorized Lear Siegler Service representative to insure warranty.



SECTION III OPERATION

3.1 GENERAL

The ADM 5 is used to enter, display, and send information to a host computer. It performs a similar function by accepting information from the host and displaying the information on the CRT screen. In this section of the manual, the various keys and specific control codes are described.

3.2 KEYBOARD OPERATIONS

The operator uses a keyboard very similar to the keyboard of a teletypewriter to enter data. Information typed by the operator may be displayed on the CRT screen immediately, as during half-duplex operation, or as an echo from the remote computer, as during full-duplex operation.

Figure 3-1 shows the layout of a standard ADM 5 keyboard. Functionally, the keyboard consists of displayable character keys and special function keys. Some of the special function keys can also be used in conjunction with certain displayable character keys to command specific control operations. All keys repeat automatically when held down longer than approximately 400 milliseconds.

In the standard ADM 5, 95 characters (plus space) are displayed. These include upper and lower case alphabet, numbers, punctuation marks, and most symbols. For special applications, usually at the discretion of the Programmer, all 128 ASCII characters may be displayed in Program Mode. Control characters (CR, LF, FS, etc.) are written as they are keyed, and the appropriate symbols are

displayed. For example: CR, LF, and FS would be displayed as C_R, L_F, and F_S.

Note

Typing at the keyboard always generates codes which are transmitted. However, in order for characters to be displayed and for control codes to affect the ADM 5 in FDX Mode, the characters must be echoed back from the host computer. All display actions described below assume that the generated codes are properly echoed.

3.3 INTERFACE CONTROL OPERATIONS

3.3.1 Data Communication Ports

Communication between the ADM 5 and the host computer or modem is accomplished using the MODEM port. Transmission may be in one direction at a time, as in Half-Duplex operation; or in both directions simultaneously, as in Full-Duplex operation.

3.3.2 Request To Send Operation

The ADM 5 may receive data at any time over the RCVE line (BB). Data transmission is controlled by Request to SEND (RTS) over line CA, Clear to Send (CTS) over line CB, and Carrier Detect (DCD) over line CF (Secondary Channel).

Request to Send (RTS) is set (high) to inform the host that the ADM 5 wishes to transmit. RTS may be controlled in one of five ways, as follows:

[ESC] is used in conjunction with otherwise displayable characters to produce an ESC sequence (See Operators Quick Reference Chart of Control and Operation Codes in Appendix A.)

[HERE IS] key is operational only if Answerback Option is installed. When typed, key transmits an identification message (stored in a special ADM 5 memory).

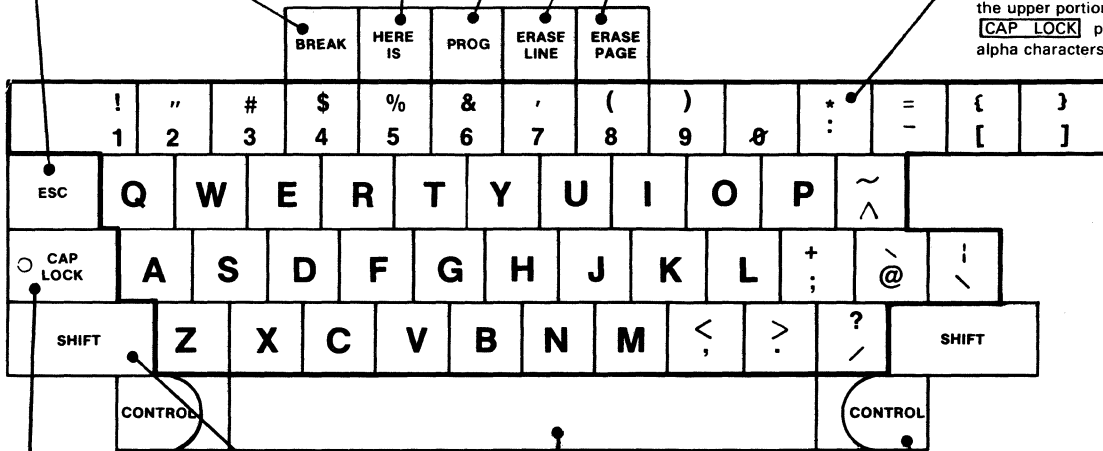
[PROG] puts terminal in Program Mode which causes control codes, entered from keyboard or received from host to be displayed. Terminal does not execute operations specified by control codes while in Program Mode. Typing **[PROG]** again terminates Program Mode.

[ERASE LINE] erases characters starting with the cursor position through the end of the line. Erased characters are replaced with spaces.

[ERASE PAGE] erases all characters starting with the cursor position through the last character displayed. Erased characters are replaced with spaces.

[BREAK] generates a BREAK condition on the Transmit Data, Current Loop and Secondary Transmit lines.

Alphanumeric, punctuation, and special character keys produce 128 displayable characters. Typing any of these keys with **[SHIFT]** depressed produces an upper case alpha character or the symbol imprinted on the upper portion of the key. Setting **[CAP LOCK]** produces upper case alpha characters only.



[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.

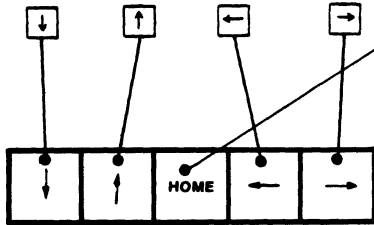
[CAP LOCK] shifts only lower case alpha characters into upper case. To set (lamp ON), press **[CAP LOCK]** once to release (lamp OFF), press **[CAP LOCK]** again.

[SPACE] bar advances cursor one space to the right each time bar is typed. Any character under cursor is replaced by a SPACE. Holding bar down produces a continuous string of SPACES until released.

[CONTROL] is held down while typing an otherwise displayable character key to generate one of the 32 control codes. Only 14 control codes are applicable to the ADM 5 operation. Refer to the Operators Quick Reference Chart of Control and Operation Codes in Appendix A.

Moves the cursor incrementally in the specified direction as long as key is held. Character under cursor, or characters passed over by cursor are not erased.

DOWNLINE UPLINE BACKSPACE FORESPACE

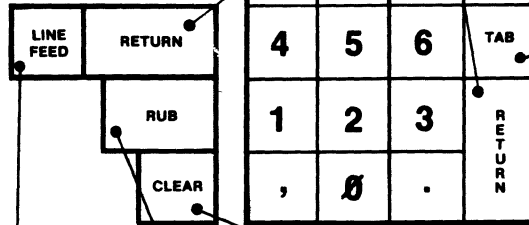


HOME moves cursor to first character position on page (upper left corner).

RETURN moves cursor to the first character position in the line containing cursor.

Numeric key pad is provided for convenience when rapid numeric entries need to be made. Key pad characters are not affected by **SHIFT** key.

TAB transmits HT character to Host (NO OP 5 Operation)



LINE FEED moves cursor to the same column position of next lower line.

CLEAR is operational only when **SHIFT** is held down. **SHIFT CLEAR** or **CTRL Z** causes data to be erased from screen and from display memory. All 80 x 24 character positions are filled with SPACE codes. Cursor goes to HOME.

RUB transmits DEL (RUBOUT) character to the host computer. Cursor does not advance after typing **RUB**. May be used by host as a character erase code.

Figure 3-1. ADM 5 Standard Keyboard Operational Characteristics

1. RTS may originate from a peripheral device connected to the EXTENSION port.
2. RTS remains low (XMIT disable) if LOCAL (S3-6), 103 (S3-5), and 202 (S3-4) switches are all set to OFF (open).
3. LOCAL (S3-6) switch set to ON (closed): RTS rises before transmission of each character and falls when character has been transmitted.
4. 103 (S3-5) switch set to ON (closed): RTS remains high all the time.
5. 202 (S3-4) switch set to ON (closed): RTS is controlled through the ADM 5 interface by either code turnaround or reverse-channel turnaround operation. Transmission may be in only one direction at a time (Half-Duplex).

3.3.3 Secondary Channel Turnaround Operation

Secondary channel turnaround operation is enabled by setting switch 202 (S3-4) to ON and switch CODE (S3-3) to OFF. Both switches EOT (S3-1) and ETX (S3-2) must be set to OFF. In this operation, RTS is controlled by secondary channel signals, instead of turnaround codes on the primary channel.

ADM 5 transmission takes place when the host raises SEC RCVE (Secondary Receive Data) over line SB, and DCD (Carrier Detect) on line CF falls to indicate that the host has completed (character) transmission. RTS (Request to Send) over line CA goes high; the CTS (Clear to Send) over line CB from the host initiates ADM 5 transmission.

When SEC RCVE (Secondary Receive Data) over line SB goes low while DCD over line CF is high, RTS is unconditionally reset, thus inhibiting ADM 5 transmission.

SEC XMIT (Secondary Transmit Data) over line SA rises, allowing the host to transmit. Each time RTS switches between high and low, the ADM 5 ignores any further commands or codes for approximately 250 milliseconds, to allow time for the host to propagate signals.

3.3.4 Code Turnaround Operation

Code turnaround operation is enabled by setting switch 202 (S3-4) to ON and switch CODE (S3-3) to ON. Additionally, either switch EOT (S3-1) or ETX (S3-2) must be set to ON. RTS over line CA is set (high) when DCD (Carrier Detect) over line CF falls as the result of decoding the ETX (EOT) code from the host, indicating that (character) transmission is complete. Data transmission from the ADM 5 may take place when CTS (Clear to Send) from the host over line CB is set (high).

When ETX (EOT), terminating each character, is again decoded, RTS (and CTS from the host) are reset to the marking state. ADM 5 transmission is inhibited, and the terminal will not recognize any further commands or codes for approximately 250 milliseconds, to allow time for the host to propagate its signals.

3.4 PROGRAMMING CONSIDERATIONS

3.4.1 Remote CTRL Operation

The host computer has full control over the ADM 5. All control operations which are possible from the keyboard can also be executed from the computer by transmitting the appropriate CTRL codes. (Refer to the Chart of Control and Operation Codes in Appendix A). Displayable characters will be recognized and acted upon, in the same manner as that described for keyboard operations.

3.4.2 Remote Load-Cursor Operation

The computer may command the ADM 5 cursor to any absolute screen position, as shown in the Chart of Absolute Cursor Positions in Appendix A.

3.5 GATED EXTENSION PORT OPERATION

The RS-232C EXTENSION port provides a convenient method for attaching an auxiliary serial asynchronous device to the ADM 5. The

device may be an additional CRT terminal; however, a more common application is for a hard copy device such as a Lear Seigler Model 310 Printer. The EXTENSION port parallels the RS-232C MODEM port, such that any data sent to the terminal through MODEM port is also passed through the EXTENSION port, unless the port is disabled using the gating function described below.

The gating function allows the host computer to turn the EXTENSION port ON and OFF, using control codes. This function is enabled by setting

DIP switch S4 on the main logic board to the GT position. With S4 in this position, the CTRL O command disables the port, while CTRL N enables the port.

When a Model 310 Printer is connected to the EXTENSION port, several control and operation codes used for controlling ADM 5 operations will be passed through the port and affect printer operations also, as shown in the following chart: Codes will execute the required functions and pass the commands through the EXTENSION port when switch S4 is in the GT (gated EXTENSION port) position.

COMMAND	ADM 5	LSI MODEL 310 PRINTER
CTRL L	Increments Cursor by 1	Performs form feed
CTRL N	Enables EXTENSION port when in gated mode	Turns ON elongated print
CTRL O	Disables EXTENSION port when in gated mode	Turns OFF elongated print
ESC G	Sets reverse video or restores standard video	Clears horizontal tabs
CTRL K	Upline	Vertical tab

3.6 VIDEO ATTRIBUTES

Video attributes (Reverse Video, Reduced Intensity, and Reverse Video/Reduced Intensity combination) highlight selected fields in the

display. The selected fields will apply only to the line containing the attribute. The attributes are established by appropriate operation codes. (Refer to the Chart of Control and Operation Codes used by the ADM 5 in Appendix A).

**APPENDIX A
OPERATORS
QUICK REFERENCE
CHARTS**

ASCII CONTROL CODE CHART

BITS B7 B6 B5 B4 B3 B2 B1	0 0 0 0		0 1 0 1		1 0 0 1		1 1 0 1	
	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	^	n	~
1 1 1 1	SI	US	/	?	O	_	o	RUBOUT (DEL)

LEGEND

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

OPERATORS QUICK REFERENCE CHART OF CONTROL AND OPERATORS CODES

CONTROL CODE		HEX CODE	OPERATION
FROM HOST	FROM KEYBOARD		
ETX	CTRL C	03	Secondary channel line turnaround codes for 202 Modem operation (From Host Only)
EOT	CTRL D	04	
ENQ	HERE IS	05	Initiates ID message when Answerback Option is installed
BEL	CTRL G	07	Sounds audible beep in Video Display Unit
BS	←	08	Backspace
HT	TAB	09	Tab - No local operation (From Host Only)
LF	↓	0A	Line Feed
VT	↑	0B	Upline
FF	→	0C	Forward Space
CR	RETURN	0D	Return
SO	CTRL N	0E	With S4 in GT position, enables gated EXTENSION port and passes CTRL N through the EXTENSION port With S4 in LK position, unlocks keyboard (From Host Only)
SI	CTRL O	0F	With S4 in GT position, disables gated EXTENSION port and passes CTRL O through the EXTENSION port With S4 in LK position, locks keyboard
SUB	SHIFT CLEAR	1A	Clears Screen
ESC	ESC	1B	Lead in for ESC sequences
RS	HOME	1E	Homes Cursor
ESC T	ERASE LINE	54	Starting with cursor position, all characters in the line are erased and replaced with spaces.
ESC Y	ERASE PAGE	59	Starting with cursor position and continuing to end of page, all characters are erased and replaced with spaces.
ESC (	ESC (	28	Restores standard intensity *
ESC)	ESC)	29	Sets reduced intensity *
ESC G	ESC G	47	Sets reverse video or restores standard video and passes ESC G through the EXTENSION port when switch S4 is in the GT (gated) position

*THESE TWO VISUAL ATTRIBUTES MAY BE USED IN COMBINATION

OPERATORS QUICK REFERENCE CHART OF ABSOLUTE CURSOR POSITIONS

Keys Used: ESC = ROW
ASCII COL
ASCII

ASCII CODES	POSITION		ASCII CODES	POSITION		ASCII CODES	POSITION	
	ROW	COL		ROW	COL		ROW	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
:		27	ESC = U		54			

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