ADM 42
Ergonomic Terminal™
Video Display Unit

LEAR SIEGLER, INC.

USERS REFERENCE
MANUAL

TABLE OF CONTENTS

TABLE OF CONTENTS (continued)

TABLE OF CONTENTS (continued)

TABLE OF CONTENTS (continued)

TABLE OF CONTENTS (continued)

LIST OF FIGURES

LIST OF TABLES

TABLE   **PAGE**

APPENDIX

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. It has been tested and found to comply 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 when operated in a commercial environment. 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. Only shielded cables with the shield terminated to the metal hood of the connector can be used.

SUMMARY OF CAUTIONS AND NOTES

CAUTION

Page 2-1

Allow the unit to adjust to the new environment when changing locations from one room to another, before energizing the unit. Condensation could develop in the unit and adversely affect its operation.

Page 2-3

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.

Page 2-16

To avoid damage to the CRT phosphor, it is recommended that the display brightness be reduced when the display remains unchanged for significant periods of time.

Page 4-4

Power ON RESET should be used only if the following RESET operations do not effect the desired reset. When recycling power using the ON/OFF switch, wait 10 seconds between the OFF and ON operations.

Note

Page 2-16

The BAUD RATE switches are factory set as follows:

Page 3-8

A STOP (EM) code within the text will cause the printing to stop at that point.

SUMMARY OF CAUTIONS AND NOTES (cont'd)

Note

Page 3-9

All Buffered Print commands are inoperative in Polling Mode. Polling uses the addressable printer port.

Page 4-4

Control codes may also be imbedded in the text (by preceding the control code with ESC) for transmittal along with the block of data.

Page 4-5

Any RESET may be used to read DIP switch positions; however, a Firmware RESET is recommended.

Page 4-11

"K" designated messages will be displayed and transmitted to the host if CONV MODE is set.

Page 4-14

If the last known position or HOME is protected, the cursor goes to the first available unprotected position.

Page 4-18

If DIP switch S7-SW3 at location 15M is set to ON, NULL codes will not be displayed.

Page 4-28

For detailed information on Polling and Addressing, refer to Section V of this manual.

Page 4-35

When the ADM 2 Attribute Mode is set, the ADM 42 attributes are inhibited.

Page 4-35

When the optional Line Drawing character generator is installed, the Standard Character Generator is also available for use.

Page 5-1

This requirement may be modified by setting bit X_1 of Personality Byte B.

Page 5-2

Setting bit X_4 of Personality Byte B will inhibit transmission of the character position under the cursor.

Page 5-6

Setting bit X_2 of Personality Byte B will cause FAST SELECT to be conditional only if terminal is in Idle state.

Page 5-12

The GROUP POLL address should not be the same as the standard POLL address on any terminal in the group.

Page 5-13

If no terminal in the chain has data to send only the last terminal will respond with an "EOT".

PREFACE

This Users Reference Manual describes the operational characteristics of the **ADM 42** *Video Display Unit. The manual also provides information on the installation and care of the* **ADM 42.** *Emphasis is placed on the character and significances of the various control codes required to exercise the great variety of* **ADM 42** *features in non-standard applications. For details of* **ADM 42** *keyboard operations, refer to Operators Quick Reference Guide, DP110.*

This manual is applicable to ADM 42 Part Number 129810 containing firmware version 2.03. To verify that your terminal is equipped with the specified firmware, before using the terminal:

EXECUTE   ESC o 9
OBSERVE   V2.03

The major topics described in this manual include:

Section I   General Description

Section II   Installation

Section III Functional Description

Section IV Operation

Section V   Polling and Addressing

Operators Quick Reference Charts

Index

Figure 1-1. ADM 42 Video Display Unit

SECTION I
GENERAL DESCRIPTION

1.1   INTRODUCTION

This section describes and lists the specifications of the Lear Siegler ADM 42 Ergonomic Terminal™ Video Display Unit (see **figure 1-1**), along with available options.

1.2   PURPOSE AND USE

There are numerous applications of the **ADM 42** all involving the transfer of data. Data transfer, in some applications, may be almost exclusively unidirectional; either from the **ADM 42** to the computer, or from the computer to the **ADM 42**. A more frequent application of the **ADM 42**, however, is one in which an operator communicates with a computer, and the computer responds in accordance with its stored program.

1.3   DESCRIPTION

The **ADM 42 Video Display Unit** is a stand-alone terminal, consisting of a Terminal Control Unit (TCU), Keyboard Unit, and Monitor Unit. The TCU contains the logic circuitry, baud rate switches, power supply ON/OFF switch, cabling, and interface connectors. The keyboard and the monitor are self-contained and each may be physically moved several feet away from the TCU without interrupting operations. The monitor display screen is a 15-inch diagonal CRT. The display format consists of 80 characters x 24 lines, plus a 25th status line. **Figure 1-2** shows the standard 128-character format for the ADM 42.

1.4   SPECIFICATIONS

Table 1-1 lists the specifications of the **ADM 42.**

1.5   OPTIONS

The **ADM 42** can be equipped with several optional features, each requiring additions and/or alterations to the standard terminal configuration.

1.5.1   Memory Extension Option

The Memory Extension Option extends the basic RAM memory capability from 4 pages (8K-bytes) to 8 pages by the addition of 8-K bytes of memory.

1.5.2   Direct Connect Option

The Direct Connect circuit contains a line interface used to connect CRT data terminals to computer I/O channels. The interface is operated in the half-duplex polling mode. It may be used with up to nine additional interface circuits of the same type connected on one line. The following specification defines the DC interface.

RECEIVER PERFORMANCE

Input (DC LINE)

Maximum Receive Rate ....9600 BAUD
Maximum Line Length ....1000 FT.
Marking Signal Level....................-12±1V
Spacing Signal Level ....0+1/-2V
Receive Threshold .... 6±1V

Figure 1-2. ADM 42 Character Format (By Ascending ASCII Codes) with HEX Code

DP210

Output (DCRCV)

TTL Compatible .... 2 LOADS

Gate Inputs (RTS/ & XRTS/)

TTL Compatible .... 1 LOAD

TRANSMITTER PERFORMANCE

Input (DC SEND)

Maximum Transmission Rate ...... 9600 BAUD
RS232 Voltage Levels .... +6 To +12V

Output (DC LINE)

Maximum Line Length .... 1000 FT.
Marking Signal Level .... -12+0.5/-0V
Spacing Signal Level .... 0+0/-0.5V

1.5.3 Answer Back Memory Option

The Answer Back Memory Option allows the ADM 42 to respond to an ENQ input either from the host, or the keyboard. The answer back message is stored in a PROM which is programmed (up to 30 characters in length) in accordance with the user's requirements.

1.5.4 Alternate Character Generator Set Option

The Alternate Character Generator Set Option permits the ADM 42 to display data in many different fonts and languages. A ROM determines the font and/or language to be displayed on the monitor. When necessary, this option is supplemented by replacement key caps.

To provide the ADM 42 with a limited graphics capability, a graphics ROM is available for drawing forms and continuous lines.

1.5.5 TCU Desk Mount Option

The TCU Desk Mount Option allows the three separate ADM 42 assemblies (TCU, Keyboard Assembly, and Monitor Assembly) to be individually mounted on a desk. This option is supplied in kit form only, for customer installation.

1.6 ADDITIONAL OPTIONS

This group of options involve the installation of an option logic board in addition to the main logic board in the ADM 42. Certain standard option board features are included with the installation of the option board. Several other optional capabilities may be selected in addition to these standard features.

1.6.1 Standard Option Board Features

Installation of the option board includes a Serial Printer Port Option and a 31-Character Function Key Option.

1.6.1.1 Serial Printer Option

The Serial Printer Option allows the ADM 42 to be connected to an asynchronous serial printer via the PRINTER port. Included in the option is the ability to program the port so that the printer connected to the port may be controlled directly from the host computer without otherwise affecting ADM 42 operation.

1.6.1.2 31-Character Function Key Option

The 31-Character Function Key Option provides the capability of storing in memory 31 characters under each function key F1 thru F16. Using SHIFT in conjunction with any key F1 thru F16 extends the storage capacity to an additional 16 keys, or 32 in all.

1.6.2 Polling and Addressing Option

The Polling and Addressing Option allows the **ADM 42** to accommodate the following polling modes: Standard Poll, Select, Sequential Select, Fast Select, Broadcast Select, Group Poll/Select and Multipoint Contention. Logic-board mounted DIP switches are provided to permit a user selected terminal address consisting of two ASCII characters. When active in a polling environment, the **ADM 42** is prevented from initiating transmission of data except under the control of the network control center. The Polling and Addressing Option may be disabled by setting the appropriate DIP switch to OFF.

With Polling Option installed, it is possible for the host to enable or address the PRINTER port (when installed) and send a message to the terminal's addressable print buffer at the terminal's communication rate. The buffered data may then be read out to the printer at the printer baud rate. No other ADM 42 operation is affected during this operation.

1.6.3 63-Character Function Key Option

The 63-Character Function Key Option provides the capability of storing in memory an additional 32 characters under each function key F1 thru F16, giving a total of 63 characters. Using SHIFT in conjunction with any key, F1 thru F16 extends the storage capacity to an additional 16 keys or 32 in all.

1.7 RELATED DOCUMENTS

a. **ADM 42** Operators Quick Reference Manual DP110.

b. **ADM 42** Maintenance Manual DP309.

c. **ADM 42** Illustrated Parts Catalog DP710.

Table 1-1. Specifications

DISPLAY

CRT Screen: 15-inch diagonal, P4 Phosphor with non-glare faceplate

Refresh Rate: 50 Hz or 60 Hz, depending on line frequency, non-interlaced

Horizontal Rate: 19.2 kHz

Four Page Display: 2000 characters per page

Display Format: 80 characters/line by 25 lines

Display Area: 7.25" (18.4 cm) high x 9.75" (24.8 cm) wide

Character Set: 128 ASCII characters

Character Matrix: 7 x 9 dot matrix (plus full 2 dot descenders)

Character Field: 10 x 12 dot matrix (6 mm high x 3mm wide)

Cursor: 10 x 12 dot matrix. Reverse Image block cursor

Cursor Controls: Backspace, Forespace, Up, Down, Home, Tab, Return, New Line, Read Cursor, Cursor Addressing, Line Feed, and Back Tab

Visual Attributes: Blink, blank, reverse video, underline. Protected fields are displayed in reduced intensity.

KEYBOARD FUNCTIONS

Keyboard: 26-letter alphabet with upper & lower case, numerics 0 through 9. Punctuation, Break, RUBout (delete), Caps Lock. Most keys are auto repeating (approximately 30 characters per second).

Numeric Key Pad: 15 keys, 0 through 9, Return, Tab, Comma, Period, and Minus

Cursor Control: Individual cursor control keys

Edit Keys: Character insert, character delete, line insert, line delete, line erase, page erase, clear space, clear null, page edit

Functional Command Keys: Break, Start of Message, End of Message, ESCape, Conversation/Block Mode, Program Mode, Write Protect Mode, Protect Mode, Reset/Command, RUBout (delete), Control, New Line, Tab/Back Tab, Page Forward, Page Back, Tab set/clear, Send Line, Send Page, Send Message and Print

Function Keys: 16 function keys shiftable to 32. Each key transmits SOH an ASCII character & carriage return.

FORMATTING AIDS

Protect Mode: Screen formatting of protected & unprotected fields displayed in dual intensity

Program Mode: Displays all control characters

EDITING

Edit Operations: Page/line edit, clear entire screen to spaces, clear unprotected positions to spaces, clear entire screen to nulls, clear unprotected positions to nulls, character insert by line or page basis, character delete by line or page basis, line insert, line delete, erase line to spaces, erase line to nulls, page erase to spaces and nulls. All edit operations can be activated remotely by the host using ESCape sequence.

TERMINAL 25TH STATUS/MESSAGE LINE

Terminal Status Line Displays: Page #, protect mode, write protect mode, keyboard lock, auto page, insert mode, program mode, page edit mode, ADM 1 mode, printing, error messages and user status

TRANSMISSION MODES

Block Transmission: Send line unprotected, send line all (shift), send page unprotected, send page all (shift), send message unprotected, send message all (shift), send cursor coordinate, send function sequence

Table 1-1. Specifications (cont'd)

Conversation Mode: Conversation mode/half duplex, Conversation mode/full duplex, dynamic control of block/conversation and duplex mode from remote or keyboard

Control Characters: Control characters may be transmitted to the computer and/or entered on the screen.

Interfaces: RS232-C point-to-point or 20mA current loop, RS232-C extension

Data Rates: 50, 75, 110, 134.5, 150, 300, 600, 1200, 1800, 2000, 2400, 3600, 4800, 7200, 9600

Parity: even, odd or none

OPERATING ENVIRONMENT

5°C to 50°C (41° to 122°F): 5% to 95% relative humidity, without condensation

Power Requirements:

Standard: 115V +10%, 60 Hz
Optional: 230V +10%, 50 Hz

Heat Dissipation: 534 BTU/HR

Dimensions:

Width: 18.88 inches (48.0 cm)
Depth: 25.38 inches (64.51 cm)
Height: 18.0 inches (45.72 cm)

Weight: 62 pounds (28.12 kg)

OPTIONS

Serial printer port (RS-232C)
Parallel internal system bus interface
Direct Connect Interface
Polling and Addressing
Answerback Memory
Alternate Character Generators:
  United Kingdom
  Limited Graphics: 11 special line drawing
    characters
Additional memory (4 additional pages)
Programmable function keys (31 or 63 characters)
PC-110 green phosphor
Special Personality
Micro Program Source Code Listing
Output cables
Clear or Blank key caps
Special paint
Key locks
Remote monitor stand
8-foot keyboard cable
6-foot monitor cable

DP210

SECTION II
INSTALLATION

2.1   INTRODUCTION

Installation procedures involving unpacking, initial set-up, and operational checkout of the **ADM42** Video Display Unit are described in this section of the manual.

2.2   SAFETY REQUIREMENTS

No special safety precautions are required for **ADM 42** installation.

2.3   SITE REQUIREMENTS

The **ADM 42** may conveniently be used 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), relative humidity not greater than 95% be maintained for equipment use.

Whenever the **ADM 42** 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 terminal. Condensation developed by the temperature differential could possibly impair the **ADM 42**.

{ CAUTION }

Allow the unit to adjust to the new environment when changing locations from one room to another, before energizing the unit. Condensation could develop in the unit and adversely affect its operation.

The physical dimensions of the **ADM 42** are shown in **figure 2-1**. The basic requirements for installation are the following:

- Table or desk mounting

- Standard three-pronged 115-volt or special 230-volt power outlet.

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

2.4   INITIAL PREPARATION

2.4.1   Line Voltage Selection

The **ADM 42** is shipped connected for either 115-volt or 230-volt operation, as specified in the purchase order. Any change in line voltage requires changes which can be accomplished only by authorized LSI maintenance personnel.

18 IN.
45.7 CM

4.4 IN.
11.2 CM

9.3 IN.
23.6 CM

12 IN.
30.5 CM
(MIN.)

25.4 IN.
64.5 CM

18.9 IN.
48.0 CM

STANDARD INSTALLATION

12 IN.
30.5 CM
(MIN.)

CRT

4 FT. (1.22 M) CABLE STANDARD

KEYBOARD

TCU

26 IN.
66.0 CM

OPTIONAL DESK MOUNT INSTALLATION
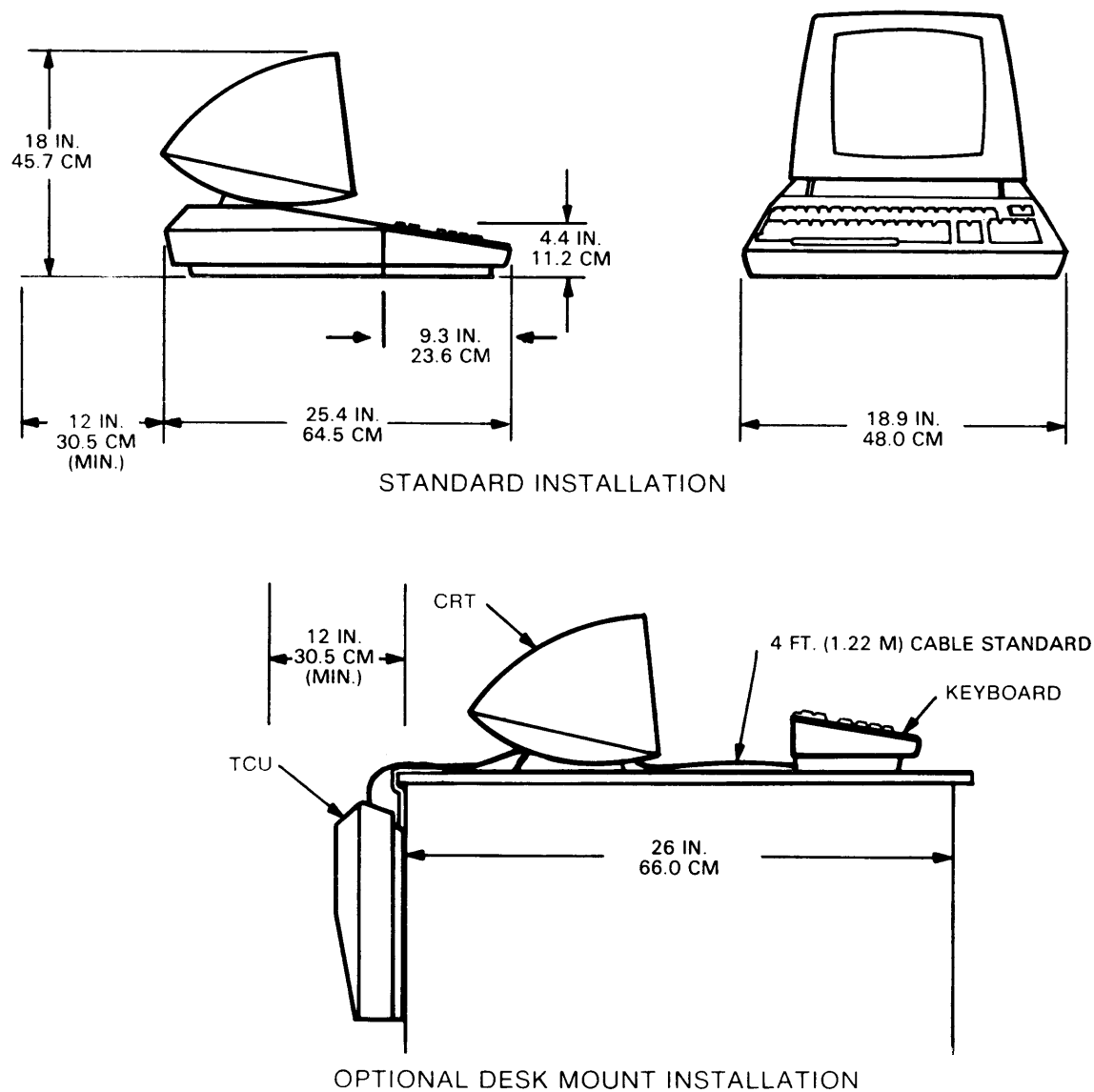
Figure 2-1. ADM 42 Mounting Requirements

2.4.2 Configuration Control DIP Switch Settings

⟨ **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.

2.4.2.1 Main Board Switches

Figures 2-2 and **2-3** show the locations and factory settings of the configuration control DIP switches and other front panel controls. Commonly used DIP switches are accessible through the **ADM 42** access door on the front panel (see **figure 2-2**). The functions of all DIP switches are summarized in **table 2-1.** To gain unrestricted access to all DIP switches, proceed as follows:

1. If the unit is ON, set ON/OFF switch to OFF and remove power cord from its receptacle.

2. Remove monitor power cord from TCU receptacle. Remove monitor from the top of the Terminal Control Unit (TCU) and set the monitor safely aside.

3. Remove keyboard assembly by lifting the assembly straight up. Set the assembly safely aside.

4. Open front panel access cover and release the spring catch while lifting the front of the TCU cover, to expose the main logic board.

5. To return the terminal to service, reverse the above procedure.

2.4.2.2 Option Board DIP Switches

Figure 2-4 shows the locations and the factory settings of the Option Board configuration control DIP switches. Refer to **table 2-2** for a summary of the functions of these switches. To gain unrestricted access to these switches, proceed as follows:

1. If the unit is operating, set ON/OFF switch to OFF and remove power cord from its receptacle.

2. Remove all cable connections from the rear of the terminal.

3. Remove monitor and keyboard assembly; set each safely aside.

4. Open front panel access cover and release the spring catch while lifting the front of the TCU cover.

5. From the left side, raise the main logic board to its vertical position using the slots provided. The option board is now exposed.

6. To return the terminal to service reverse the above procedure.

S5 @ 12 M
WORD STRUCTURE

	OFF	ON	
BRK DIS	O	1 ●	BRK ENA
60 HZ	●	2 O	50 HZ
ODD PAR	O	3 ●	EVEN PAR
1 STOP BIT	●	4 O	2 STOP BITS
8 BITS	O	5 ●	7 BITS
NORM RCV BUFF	●	6 O	EXPAND RCV BUFF
SEND BIT 8=0	●	7 O	SEND BIT 8=1
HALF DUPLEX	●	8 O	FULL DUPLEX

S6 @ 14M
ATTRIBUTE CONTROL

	OFF	ON	
ADM-42 ATT MODE	●	1 O	ADM-2 ATT MODE
PAGE ATT	●	2 O	LINE ATT
BLANK ATT	O	3 ●	UNDERLINE ATT
RESERVED	O	4 O	RESERVED
RESERVED	O	5 O	RESERVED
RESERVED	O	6 O	RESERVED
RESERVED	O	7 O	RESERVED
RESERVED	O	8 O	RESERVED

S7 @ 16M
DISPLAY CONTROL

	OFF	ON	
ATT NOT DSPLY	●	1 O	DISPLY ATT CODE
ENA ALT CHAR EXT	O	2 ●	DIS ALT CHAR EXT
DSPLY NULL AS NULL	O	3 ●	DSPLY NULL AS SPACE

● = FACTORY SETTING

CONTRAST slide potentiometer controls the character brightness relative to the background.

BRIGHTNESS slide potentiometer controls overall brightness of display.

ACTIVITY indicator lights when communication network is active on a polling terminal.

TRANSMIT indicator lights when terminal is transmitting data.

RECEIVE indicator lights when terminal is receiving data.

BAUD RATES

MODEM		PRINTER
POSITION = BAUD RATE		
0 = 50	5 = 300	10 = 2400
1 = 75	6 = 600	11 = 3600
2 = 110	*7 = 1200	12 = 4800
3 = 134.5	8 = 1800	13 = 7200
4 = 150	9 = 2000	**14 = 9600
* Printer port factory setting		
**Modem port factory setting		

Figure 2-2. ADM 42 Front Panel Controls and Indicators
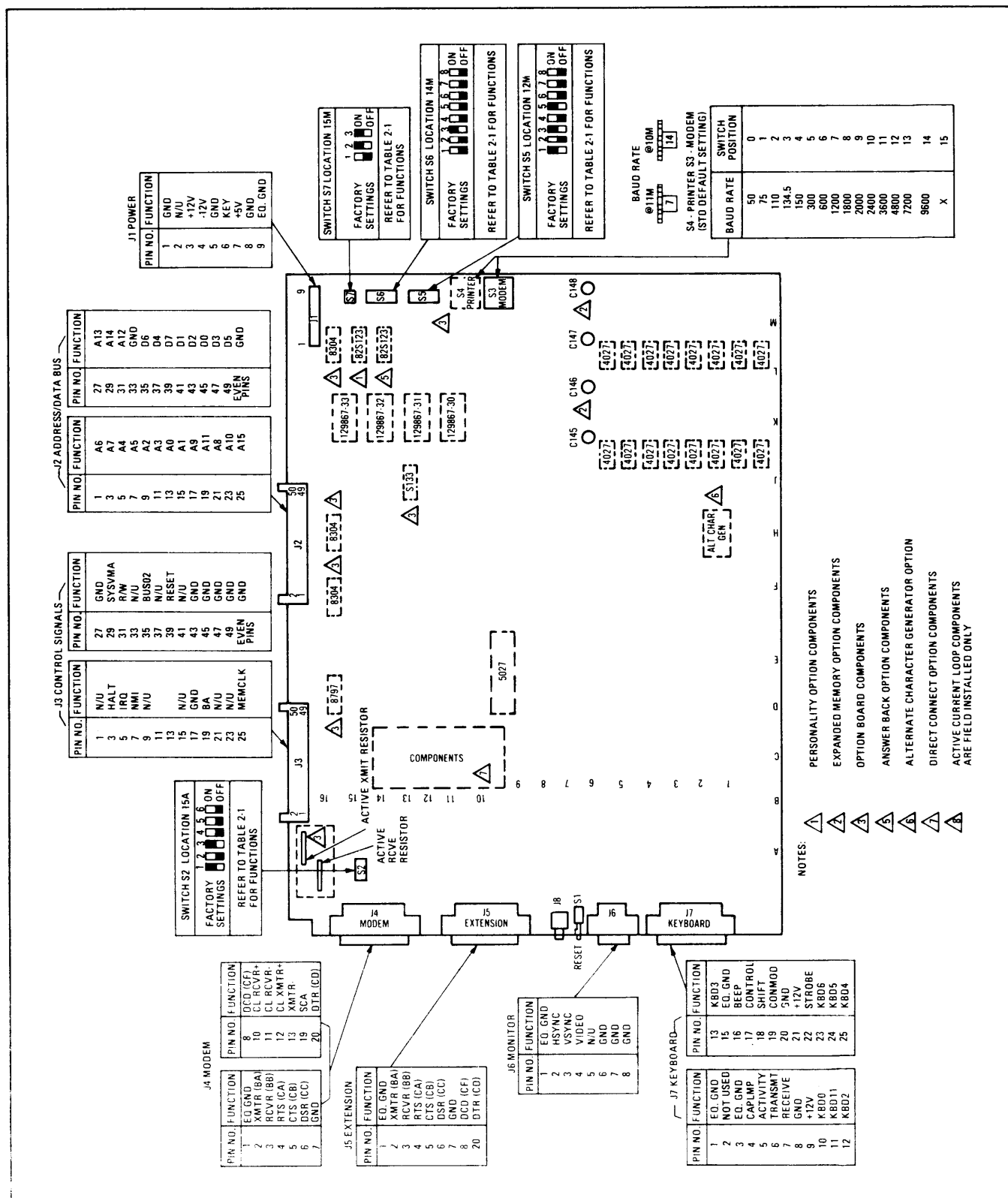
Figure 2-3.   Connector and DIP Switch Locations on Main Logic Board
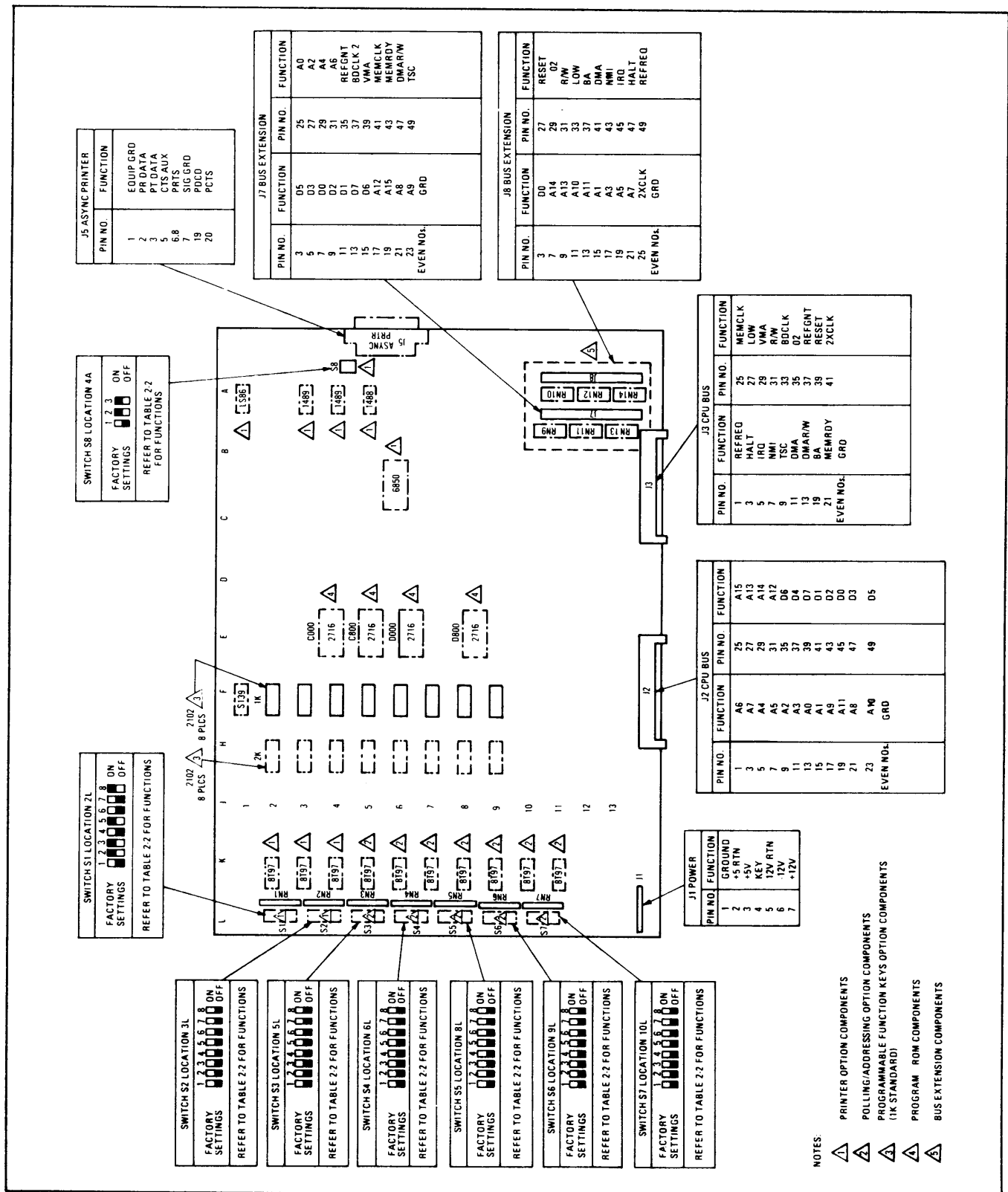
Figure 2-4.   Connector and DIP Switch Locations on Option Logic Board

Table 2-1. Main Logic Board Configuration Control Switch Settings

SWITCH BANK S2 @ 15A INTERFACE					OPERATION
SW1	SW2	SW3	SW4	SW5	
ON	OFF	ON	OFF	OFF	*RS-232C enabled; Direct Connect disabled.
OFF	OFF	ON	OFF	ON	Enable Current Loop; Direct Connect disabled.
OFF	ON	OFF	ON	OFF	Enable Direct Connect; Disable RS-232C and Current Loop.
All other SW1, SW2, SW3, SW4, SW5 combinations not allowed					
SW6					*OFF disables secondary channel control (SCF); ON is not defined.

SWITCH BANK S5 @ 12M WORD STRUCTURE			OPERATION
SW1			*ON enables BREAK key; OFF disables key
SW2			ON selects 50 Hz monitor refresh rate; *OFF selects 60 Hz monitor refresh rate
SW5	SW4	SW3	MODEM PORT SELECTION
ON	ON	ON	Selects 7 DATA bits, even parity, 2 STOP bits
ON	ON	OFF	Selects 7 DATA bits, odd parity, 2 STOP bits
ON	OFF	ON	*Selects 7 DATA bits, even parity, 1 STOP bit
ON	OFF	OFF	Selects 7 DATA bits, odd parity, 1 STOP bit
OFF	ON	ON	Selects 8 DATA bits, no parity, 2 STOP bits
OFF	ON	OFF	Selects 8 DATA bits, no parity, 1 STOP bit
OFF	OFF	ON	Selects 8 DATA bits, even parity, 1 STOP bit
OFF	OFF	OFF	Selects 8 DATA bits, odd parity, 1 STOP bit
SW6			ON enables the 2048-byte expanded input buffer; *OFF enables the standard input buffer.
SW7			ON sends Bit 8 as 1 (mark); *OFF sends Bit 8 as 0 (space), when 8-bit word structure has been selected.
SW8			ON selects Full Duplex Mode at power-up; *OFF selects Half Duplex Mode. Setting may be modified dynamically from host or keyboard.

*Indicates standard factory setting.

NOTE: If the position of any DIP switch is changed, a RESET (with power on) must be executed in order for the change to take effect. **Depressed side of the switch is the set position.**

Table 2-1. Main Logic Board Configuration Control Switch Settings (cont'd)

SWITCH BANK S6 @ 14M ATTRIBUTE CONTROL	OPERATION
SW1	*OFF establishes ADM 42 Video Attribute Control Mode (requiring ESC G entry code). ON establishes ADM 2 Video Attribute Control Mode (requiring appropriate ADM 2 entry code)
SW2	*OFF causes any Video Attribute Control Sequence (ESC G) to be effective for entire page. ON causes sequence to be effective only to the end of current line.
SW3	Establishes whether blanked fields or underlined fields may be selected using the appropriate Video Attribute Control Sequence (ESC G): OFF = Blanked fields *ON = Underlined fields
SW4 thru SW8	Reserved

SWITCH BANK S7 @ 16M DISPLAY CONTROL	OPERATION
SW1	*OFF causes SPACE to be displayed, instead of the code identifying the attribute selected. ON causes the appropriate attribute code to be displayed.
SW2	OFF allows horizontal segments of adjacent Line Drawing Set symbols to be joined. *ON prevents joining of adjacent horizontal segments. (Settings are applicable only when Alternate Character Generator Option is installed and enabled.)
SW3	OFF causes NULLS to be displayed as NULLS; *ON causes NULLS to be displayed as SPACES.

*Indicates standard factory setting

NOTE: If the position of any DIP switch is changed, a RESET (with power on) must be executed in order for the change to take effect. Depressed side of the switch is the set position.

DP210

Table 2-2.   Option Logic Board Configuration Control Switch Settings

SWITCH BANK S1 @ 2L SERIAL PRINTER WORD FORMAT			OPERATION
SW1			*OFF enables ASYNCHRONOUS PRINTER port ON enables PARALLEL PRINTER port
SW2			OFF enables communication with the printer via the print buffer (last page of display memory). *ON disables print buffer
SW5	SW4	SW3	PRINTER PORT SELECTIONS
ON	ON	ON	Selects 7 DATA bits, even parity, 2 STOP bits
ON	ON	OFF	Selects 7 DATA bits, odd parity, 2 STOP bits
ON	OFF	ON	*Selects 7 DATA bits, even parity, 1 STOP bit
ON	OFF	OFF	Selects 7 DATA bits, odd parity, 1 STOP bit
OFF	ON	ON	Selects 8 DATA bits, no parity, 2 STOP bits ⎫
OFF	ON	OFF	Selects 8 DATA bits, no parity, 1 STOP bit ⎬ 8th BIT = $\emptyset$
OFF	OFF	ON	Selects 8 DATA bits, even parity, 1 STOP bit ⎪
OFF	OFF	OFF	Selects 8 DATA bits, odd parity, 1 STOP bit ⎭
SW6, SW7			Reserved
SW8			OFF enables the ASYNCHRONOUS PRINTER port receive (input) line *ON disables the receive (input) line
SWITCH BANK S2 @3L			OPERATION
SW1 thru SW8			Reserved
SWITCH BANKS S3 @ 5L 1ST POLLING ADDRESS			OPERATION
SW1 thru SW7			Define the ASCII code for the 1st Polling Address Character ($^A1$) *OFF = Logic 1; ON = Logic 0
SW8			*OFF disables Polling function ON enables Polling function
SW1 thru SW7			Define the ASCII code for the 2nd Polling Address character ($^A2$). *OFF = Logic 1; ON = Logic 0

*Indicates standard factory settings

NOTE: If the position of any DIP switch is changed, a RESET (with power on) must be executed in order for the change to take effect. **Depressed side of the switch is the set position.**

Table 2-2. Option Logic Board Configuration Control Switch Settings (cont'd)

SWITCH BANK S4 @ 6L 2ND POLLING ADDRESS	OPERATION
SW8	*OFF disables Polling communications buffer ON enables buffer (Personality Byte B bit X_6 must be set)
SWITCH BANK S5 @ 8L 1ST GROUP POLL ADDRESS	**OPERATION**
SW1 thru SW7	Define the ASCII code for the 1st Group Poll Address character (A_1). *OFF = Logic 1; ON = Logic 0
SW8	Reserved
SWITCH BANK S6 @ 9L 2ND GROUP POLL ADDRESS	**OPERATION**
SW1 thru SW7	Define the ASCII code for the 2nd Group Poll Address character (A_2). *OFF = Logic 1; ON = Logic 0
SW8	Reserved
SWITCH BANK S7 @ 11L GROUP POLL ADDRESS	**OPERATION**
SW1 thru SW7	Define the ASCII code for the Group Select Address character (G_a). *OFF = Logic 1; ON = Logic 0
SW8	Reserved
SWITCH BANK S8 @ 4A PRINTER	**OPERATION**
SW1	*OFF disables reception of the printer Carrier Detect (DCD) signal via connector J5-20 ON enables reception of DCD via connector J5-20

SW2	SW3	PRINTER BUSY SELECTIONS
ON	ON	*Selects BUSY LOW via connector J5-19
ON	OFF	Selects BUSY HIGH via connector J5-19
OFF	ON	Not allowed
OFF	OFF	BUSY not active (Unit senses printer as never BUSY)

*Indicates standard factory settings

NOTE: If the position of any DIP switch is changed, a RESET (with power on) must be executed in order
for the change to take effect. Depressed side of the switch is the set position.

2.5 INTERFACE INFORMATION

The **ADM 42** 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. Remote computer connections require the use of a modem or data set. **Figure 2-5** shows a typical **ADM 42** application, while **figure 2-6** shows the rear panel locations of the interface connectors.

2.5.1 Standard or RS-232C Extension Interface

The Standard RS-232C interface consists of connecting a computer directly to the **ADM 42** through the MODEM port. The RS-232C extension interface requires the use of the MODEM port. Through the EXTENSION port several terminals or other devices may be daisychained, usually in a polling environment. **Figure 2-7** shows the logic associated with these interfaces. Refer to **table 2-1** for the settings of DIP switches in switch bank S2 which are required to enable these interfaces.

2.5.2 Current Loop Interface

The **ADM 42** can be configured for current loop using the MODEM port, without interfering with normal RS-232C signals required for asynchronous operation. The current loop interface increases the maximum permissible distance between the terminal and connected device. **Figure 2-8** shows the logic associated with passive and active current loop interfaces. Refer to **table 2-1** for the settings of DIP switches in switch bank S2 which are required to enable Current Loop operation.

2.5.3 Direct Connect Interface

The Direct Connect interface using the MODEM port, is used with many Burroughs-type computer systems operating in **Half-Duplex Mode**, in a polling environment. The interface can accommodate up to nine terminals connected to the line pair (AWG #24 twisted pair, or larger) having a maximum length of 1000 feet. **Figure 2-9** shows the logic associated with this interface. Refer to **table 2-1** for the settings of DIP switches in switch bank S2 which are required to enable Direct Connect.

2.5.4 Printer Interface

The PRINTER port is used to connect the **ADM 42** directly to an asynchronous serial printer. **Figure 2-10** shows the logic associated with this interface. The option logic board must be installed in addition to the main board. Refer to **tables 2-1** and **2-2** for the settings of DIP switches on the main board and option board respectively, required to enable the PRINTER interface.

2.6 INSTALLING THE ADM 42

To install the **ADM 42**, proceed as follows:

1. Connect the data interface cable to the terminal using the appropriate interface information (**paragraph 2.5**).

2. Check the ON/OFF switch (**figure 2-6**) to ensure that it is set to OFF.

3. Plug the terminal into a grounded AC outlet of the proper voltage.
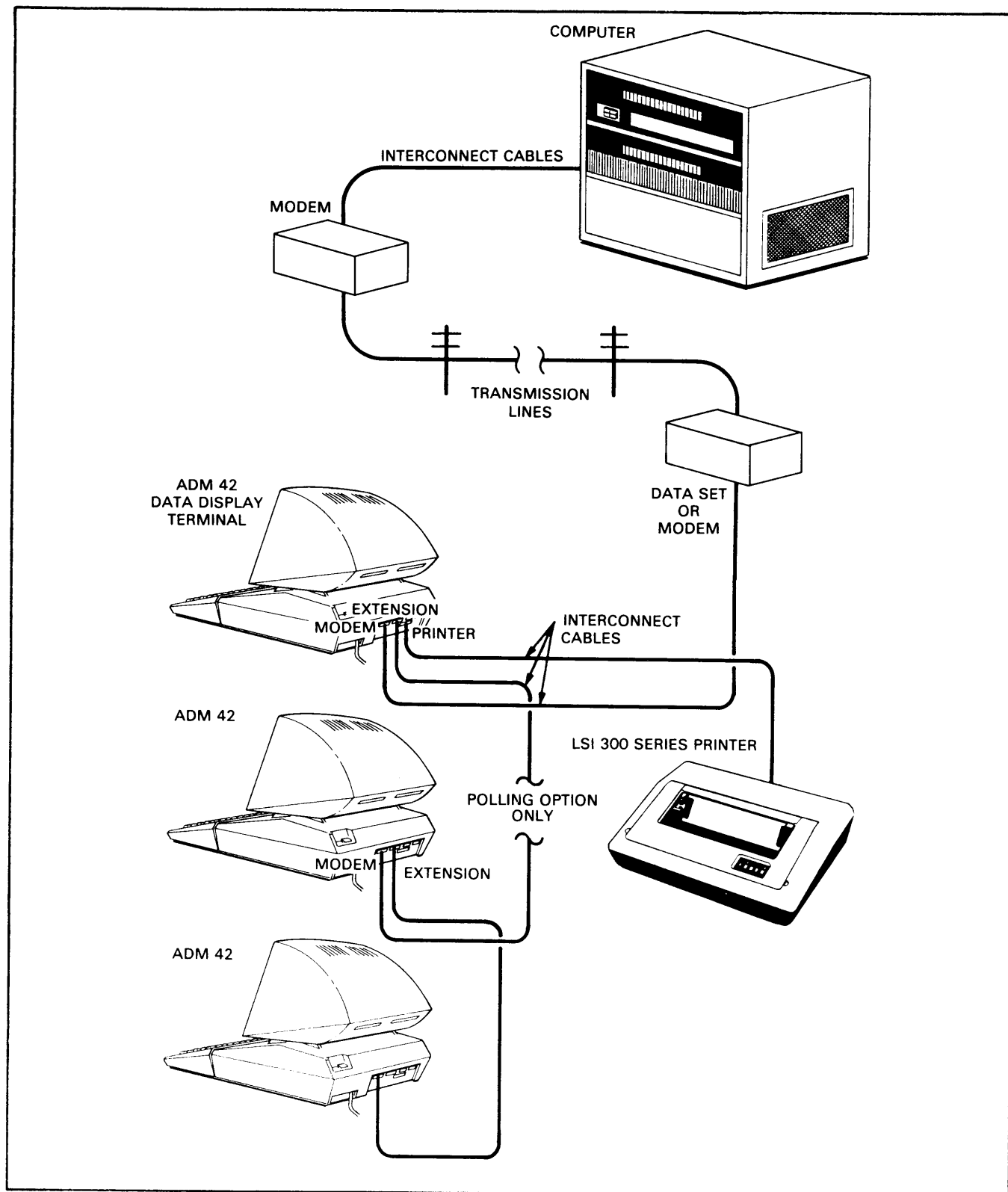
Figure 2-5. Typical ADM 42 Application

DP210

[ON/OFF] switch controls AC power to the unit.

[MONITOR] is a three-pole receptacle for connecting AC power to monitor.

[MODEM J4] is terminal to host interface port, operating at RS-232C logic levels. Some pins may be used for current loop and direct connect applications.

[RESET] spring-return push switch performs the same function of a power-up restart. Any data on display and in memory is cleared.

[MONITOR J6] interface connector between ADM 42 logic circuits and CRT monitor.

[KEYBOARD J7] interface connector between ADM 42 logic circuits and keyboard.

[FUSE] AC line fuse, 3.0A Slo-Blo (115V) 1.5A Slo-Blo (230V).

[AC LINE CORD] three-conductor power cord.

[EXTENSION J5] is RS-232C interface between additional ADM 42 terminals or other auxiliary devices; ideal for daisychaining applications on polling networks.

[ASYNC PRTR J5] (optional) interface port for serial printer connection.

[PARALLEL PRTR J4] (optional) - interface port for parallel printer connection. Enabled and disabled by ADM 42 logic. (Option not available.)

Figure 2-6. ADM 42 Rear Panel Controls
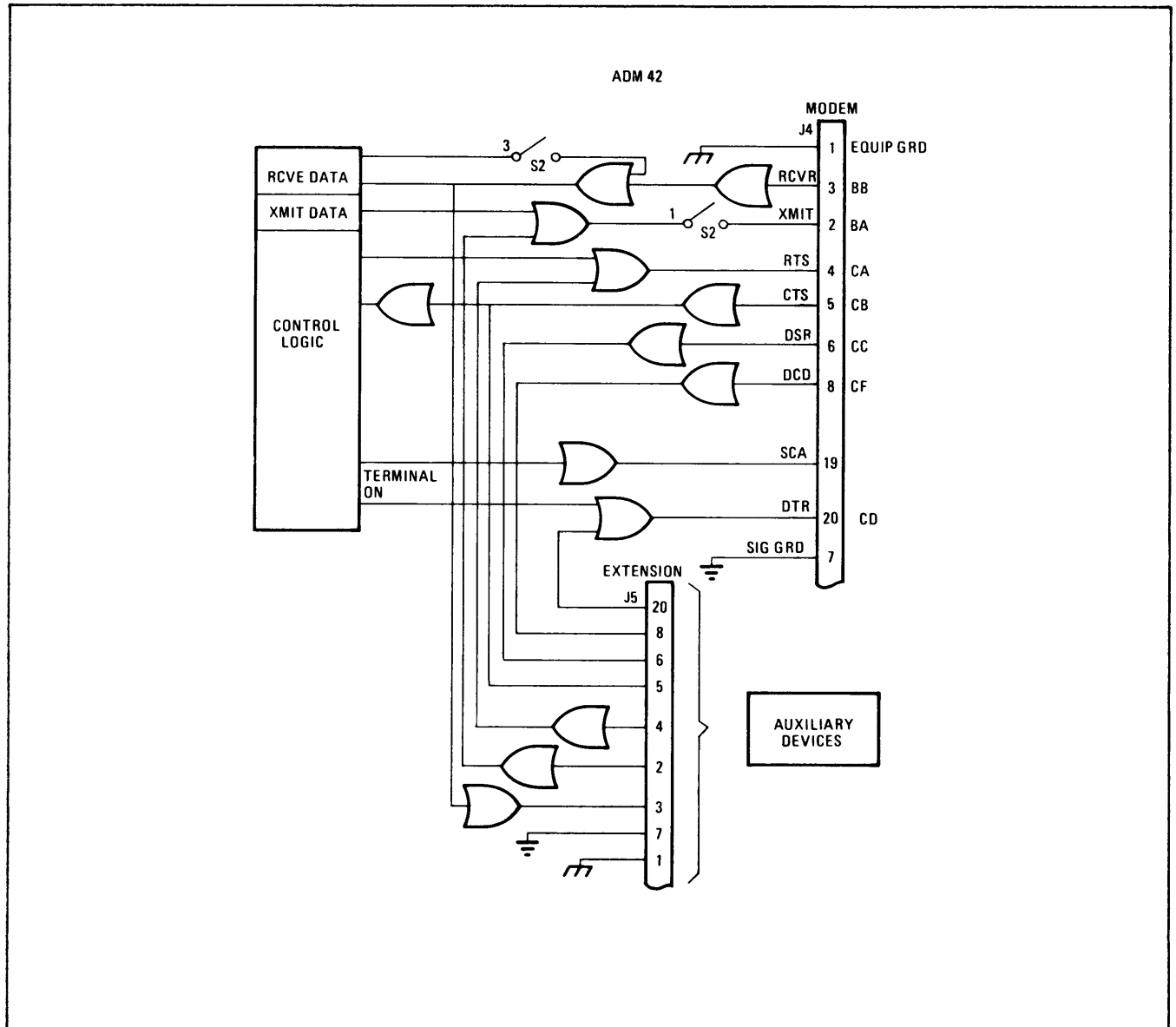
Figure 2-7.   MODEM and RS-232C Extension Interface Logic
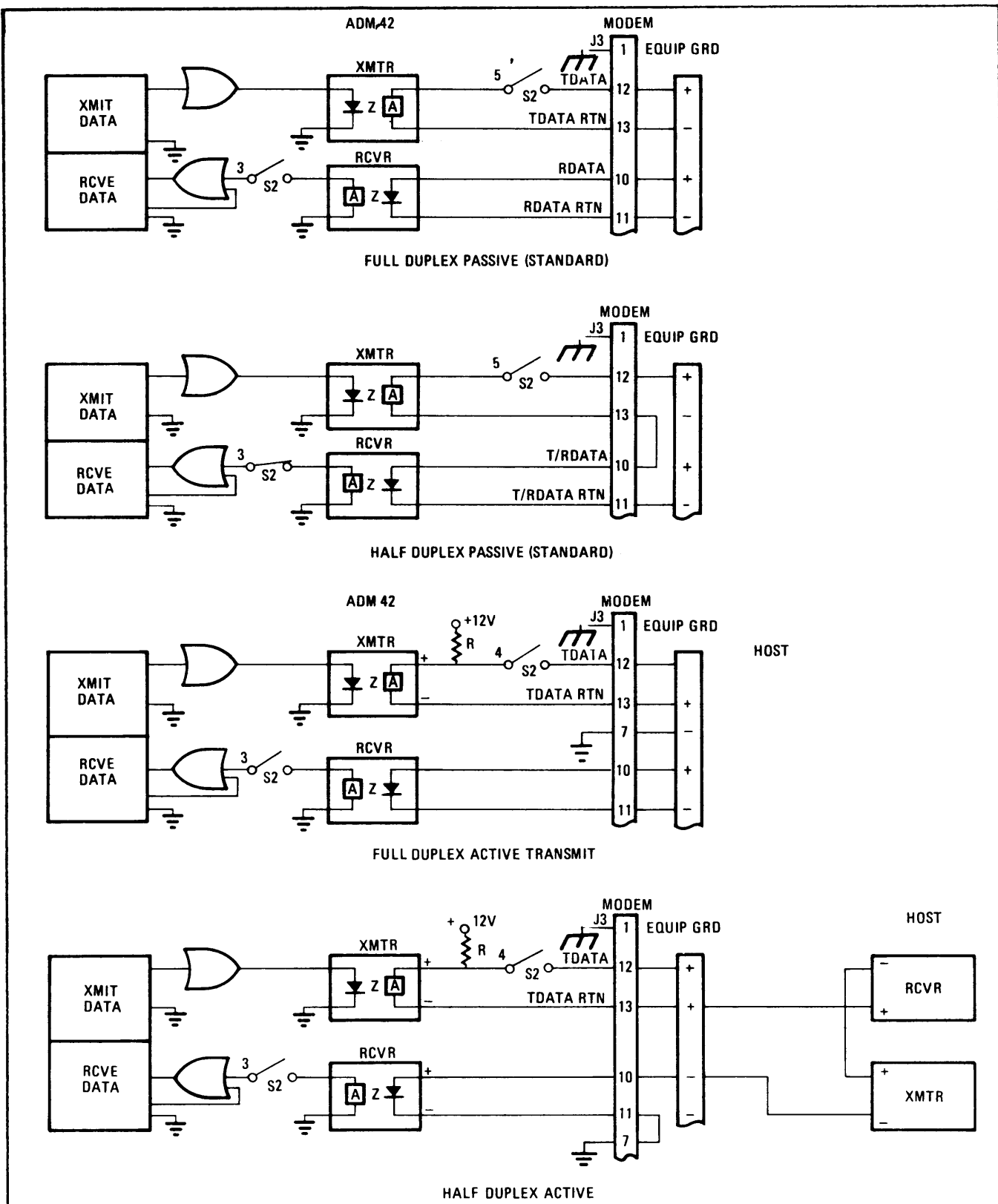
Figure 2-8.   Current Loop Interface Logic

4. Set the MODEM and PRINTER (if required) BAUD RATE switches (see **figure 2-2**) to the desired baud rate.

Note

The BAUD RATE switches are factory set as follows:

Switch	Position	Baud Rate
MODEM	14	9600
PRINTER	7	1200

5. Set the configuration control DIP switches (refer to **tables 2-1** and **2-2**) to the appropriate positions for controlling the **ADM 42 characteristics.**

6. Turn on the terminal.

2.7   POWER TURN-ON

1. Set the ON/OFF switch to ON. Blower must be running. (See **figure 2-6**.)

2. Wait approximately 20 seconds for the unit to warm up and self test. The cursor should appear at the HOME position, and PG=1 should appear in the 25th Status Line.

```
CAUTION
```

To avoid damage to the CRT phosphor, it is recommended that the display brightness be reduced when the display remains unchanged for significant periods of time.

3. Adjust CONTRAST and BRIGHTNESS controls (see **figure 2-2**) for desired display brightness.

4. If the cursor does not appear, or if an error indication appears, execute from the keyboard CTRL SHIFT RESET/CMD .

5. If the display still does not appear, troubleshoot the monitor, then the terminal electronics, if necessary.

6. If a memory error is present, the display will indicate the source of error (memory location) and the bit(s) in error. For example, assume indication:

    "01   0400   80 0800"

01   0400 Signifies that the LSB at memory address 0400 is bad.

80   0800 Signifies that the MSB at memory address 0800 is bad.

7. Troubleshoot appropriate terminal electronics according to the memory error indication.

8. Terminal operation may continue without interruption without regard for errors detected; however results involving the indicated memory locations are unpredictable.

2.8   POWER TURN-OFF

1. If the terminal contains any information which must be retained, be sure to transmit this information immediately to the host computer. This is necessary, as the display memory is cleared when power is removed from the terminal. As an alternate measure, print the information prior to turning off the terminal.

2. Turn off the **ADM 42** by setting ON/OFF switch to OFF.

2.9 CARE OF THE ADM 42

Proper care of the **ADM 42** Video Display Unit consists of performing the routine cleaning and inspection procedures listed in the following paragraphs.

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 monitor 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.

This terminal is equipped with a Sun-flex non-glare filtered screen. Observe the following precautions when cleaning the screen:

1. Remove dust from the glare filter surface by lightly rubbing with the treated cloth which is supplied with each terminal.

2. Occasionally shake out excess dust from the cloth.

3. To remove pencil marks, grease pen marks, etc. from the filter, use a <u>clean lint-free cloth</u> (NOT THE CLOTH PROVIDED WITH THE TERMINAL) and plain rubbing alcohol, wiping the filter surface while the filter is in place.

2.9.2 Inspection

Periodically, inspect switches and keyboard assembly for freedom of movement. Determine that the intensity of character trace on the CRT screen has not diminished. Any required mechanical and electrical adjustment shall only be performed by an authorized **Lear Siegler** Service Representative.
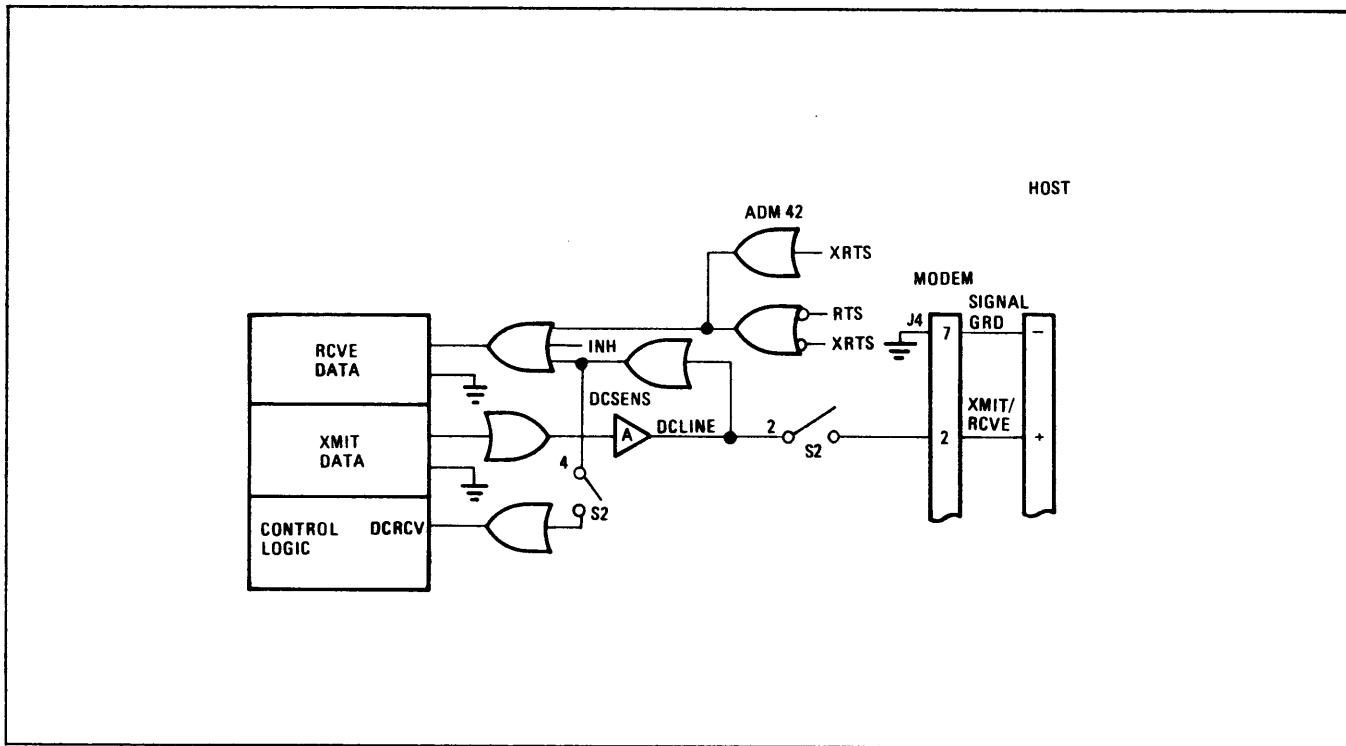
Figure 2-9.   Direct Connect Interface Logic
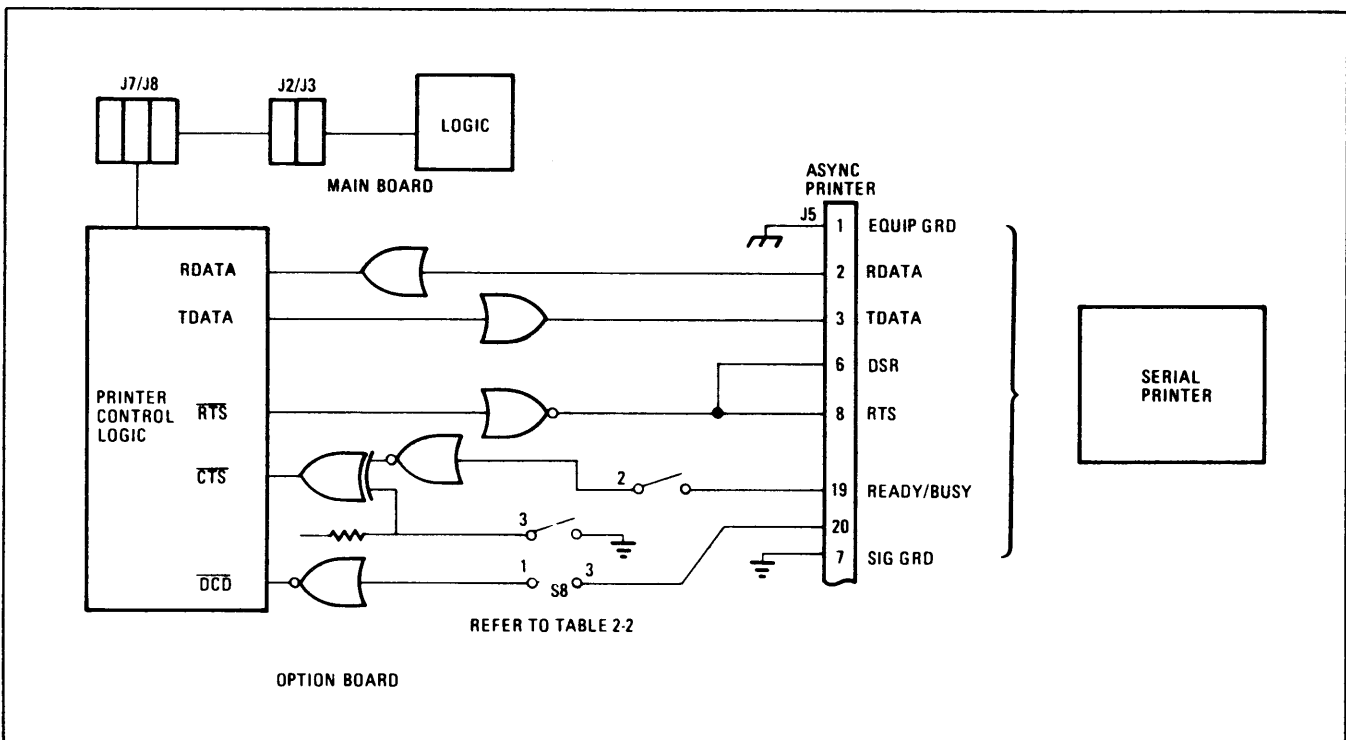
Figure 2-10.   Printer Interface Logic

SECTION III
FUNCTIONAL DESCRIPTION

3.1 INTRODUCTION

This section describes the functional characteristics of the **ADM 42** which contribute to the full operational use of the terminal.

Ordinarily each keystroke typed by the operator is independent of the one preceding or following it.

In fact, the rollover protection feature of the terminal prevents the production of a second character code before the key already typed is released. There are some exceptions. such as when using the SHIFT and CTRL keys. In this manual, a special convention is used to identify keystrokes and whether successive keystrokes are independent or concurrent, as follows:

KEYSTROKES	DESCRIPTION
ESC Z	Independent keystrokes typed sequentially. This operation code executes a special RESET operation, discussed in Section IV.
SHIFT RESET/CMD	Concurrent keystrokes. The second key must be pressed while holding SHIFT. Refer to Section IV for a discussion of this RESET operation.
CTRL SHIFT RESET/CMD	Three concurrent keystrokes. The sequence in which CTRL and SHIFT are operated is not significant; however, both keys must be held down while typing the third key. Refer to Section IV for a discussion of this RESET operation.

3.2 OPERATIONAL DESCRIPTION

The **ADM 42** is a microprocessor-based device which provides a means of communicating with a host computer, and which allows the user full control of the content and format of data entered by means of the keyboard. **Figure 3-1** illustrates the flow of data through the functional areas of the **ADM 42.**

The standard **ADM 42** consists of a power supply, keyboard, control section (MPU), video logic and control, monitor display, configuration control switches, and interface logic. The interface logic provides the standard and RS-232C extension interfaces and the serial printer interface.

3.2.1 Keyboard

Data to be processed by the terminal is either entered from the keyboard or is sent from the host computer. Keyboard entry is made using one of the 118 keys on the keyboard. Each keystroke is encoded into an ASCII character which appears on seven data lines connected to the MPU. Accompanying the 7-bit character is a keystroke which alerts the program that a character has been input from the keyboard.

3.2.2 Control Section (MPU)

The Control Section (MPU) contains the microprocessor and various integrated circuits which control all the operations of the **ADM 42.** These operations include: timing and control, data handling and storage, interpreting and responding to control commands from the keyboard and the computer, video control, I/O interfacing, and status control.

Data entering the terminal is placed on the Data Bus and sent to the MPU section which contains the microprocessor and various other integrated circuits and switches. The MPU, executing a stored read only memory (ROM) program, decodes the input data and reformats it into data and control instructions for the video logic and control section.

3.2.3 Video Logic and Control

The Video Logic and Control section contains the display logic needed to drive the monitor, 8K of random access memory (RAM), and character generation circuits, as well as the video logic and 15-inch monitor. The monitor screen can display 24 lines of data containing as many as 80 characters per line, plus a 25th Status Line. Data from the MPU is written into the video RAM; control instructions from the MPU cause the contents of the RAM to be periodically displayed on the monitor screen.

3.2.4 Interface Section

Data and control information from a remote computer is routed through the MODEM port to the interface section, and then to the MPU. The MPU causes data to be displayed on the monitor in the same manner as the keyboard data. The interface contains the logic circuitry appropriate for interfacing with RS-232C point-to-point signals or 20-ma current loop signals, and modem logic. Optional circuits for an RS-232C serial printer and direct connect interfaces are available. The interface section also contains the baud rate clock and baud rate switches which permit the **ADM 42** to receive or transmit data at selected baud rates from 50 to 9600 baud.

The **ADM 42** transmits data by retrieving data from the video RAM and placing it on the Data Bus for routing to the MPU. The MPU reformats the data and routes data and control information to the interface section over the Data Bus. Interface logic is used to prepare the data and control information for transmission to the appropriate device connected.

3.2.5 System Configuration Switches

Several banks of system configuration switches are provided to control various attributes and characteristics of the **ADM 42.** The switches are mounted on the main and option logic boards. The characteristics thus controlled include: mode of transmission/reception, parity, word structure, refresh rate, cursor/display attributes, and the polling address (optional).
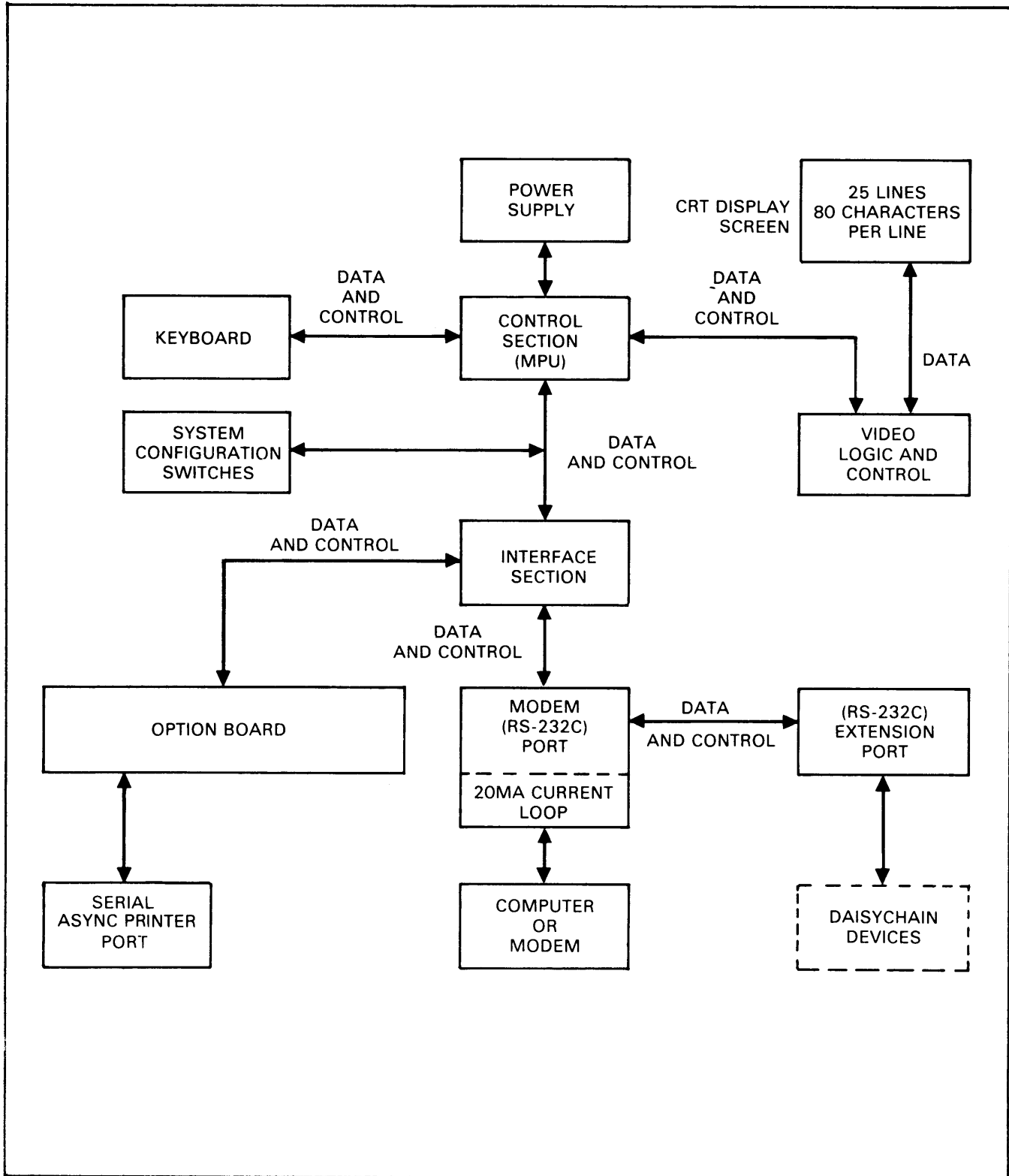
Figure 3-1.   ADM 42 Data Flow Block Diagram

3.2.6 Regulated Power Supply

The **ADM 42** power supply is a regulated power supply located adjacent to the main printed circuit board assembly. Three regulated dc voltages are provided: +5 volts, and ± 12 volts. The power supply can accept line voltage inputs of 115 Vac or 230 Vac (with 230-volt power supply option).

3.3 STANDARD CHARACTER FORMAT

The standard **ADM 42** character set contains 128 ASCII characters, 32 of which are control characters. (See **figure 3-2**.) The entire character set may be displayed on the monitor by placing the terminal in **Program Mode** or by preceding control characters with an **ESC** code.

3.4 ADM 42 WORD STRUCTURE

The **ADM 42** can transmit and receive data characters in any one of the asynchronous character formats shown in **figure 3-3**. The appropriate word format for the user's application (including the use of a serial printer) is selected by means of the indicated DIP switches.

3.5 DATA TRANSMISSION CHARACTERISTICS

Data which has been written in memory and displayed on the monitor may be transmitted to the host computer either character-by-character as during **Conversation Mode** operation, or in message blocks, as during **Block Mode** operation. Transmission is asynchronous, using one of the word formats specified in **figure 3-3**, and at a transmission rate determined by the application. Using the MODEM BAUD RATE or optional PRINTER BAUD RATE switch on the front panel (see **figure 2-2**), it is possible to select a data transmission rate of 50, 75, 110, 134.5, 150, 300, 600, 1200, 1800, 2000, 2400, 3600, 4800, 7200, or 9600 baud. The standard ADM 42 MODEM port is set for 9600 baud at the factory. The factory setting for the optional ASYNC PRINTER port is 1200 baud.

3.5.1 Conversation Mode Characteristics

Conversation Mode communication between the **ADM 42** and the host computer is character-by-character only. Transmission may be in one direction at a time, as in **Half-Duplex** operation; or in both directions simultaneously, as in **Full-Duplex** operation. At power-up, the standard **ADM 42** is initialized in **Block Mode**. Refer to **Section IV** for the modifications possible using personality.

The **ADM 42** may receive data over the RCVE line (BB) with Carrier Detect (DCD) over line CF. Data for transmission is controlled by Request to Send (RTS) over line CA, and Clear to Send (CTS) over line CB.

Request to Send (RTS) is set (high) to inform the host that the **ADM 42** wishes to transmit. Clear to Send (CTS) from the host or modem should be set (high) to initiate **ADM 42** transmission. In **Full Duplex Mode**, RTS is set high and remains high. In Half-Duplex Mode, RTS is reset to low whenever Return (CR), End of Transmission (EOT) or End of Text (ETX) is sensed by **ADM 42** logic.

SHIFT CONV sets ON LINE Mode in which Data Terminal Ready (DTR) is held high. SHIFT CONV also sets OFF LINE Mode in which DTR is held low.

3.5.2 Block Mode Characteristics

In **Block Mode**, information is transmitted and received as complete messages or blocks of data (compared with character-by-character transmission in **Conversation Mode**). Complete messages, up to four full pages (optionally, eight full pages) in length may be displayed and stored in display memory. These messages may be edited or otherwise modified from the keyboard before being transmitted to the host and/or to an optional auxiliary device such as a printer. At power-up, the standard **ADM 42** is initialized in **Block Mode**.

			CONTROL CHARACTERS		DISPLAYABLE CHARACTERS					
HEX → BYTE ↓ 2ND	1ST		0	1	2	3	4	5	6	7
	BITS 4321	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	$	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

CONTROL CODES

▤ Utilized by Std ADM 42 with Printer Option

▨ Utilized by Polling ADM42

USE [CTRL] KEY WITH DISPLAYABLE CHARACTER KEYS TO PRODUCE CONTROL CODES

Figure 3-2. Displayable Character Set and Control Codes

WORD FORMAT	DIP SWITCH CONFIGURATIONS			BIT 0	BIT 1	BIT 2	BIT 3	BIT 4	BIT 5	BIT 6	BIT 7	BIT 8	BIT 9	BIT 10
	SW5	SW4	SW3											
Eleven-Bit Word with Even Parity and 2 STOP Bits	ON	ON	ON	Start	ACTIVE BITS = 1 OR 0							even parity	stop	stop
Eleven-Bit Word with Odd Parity and 2 STOP Bits	ON	ON	OFF	Start	ACTIVE BITS = 1 OR 0							odd parity	stop	stop
* Ten-Bit Word with Even Parity and 1 STOP Bit	ON	OFF	ON	Start	ACTIVE BITS = 1 OR 0							even parity	stop	✕
Ten-Bit Word with Odd Parity and 2 STOP Bits	ON	OFF	OFF	Start	ACTIVE BITS = 1 OR 0							odd parity	stop	✕
Eleven-Bit Word with No Parity and 2 STOP Bits	OFF	ON	ON	Start	ACTIVE BITS = 1 OR 0							always 0 **	stop	stop
Ten-Bit Word with No Parity and 1 STOP Bit	OFF	ON	OFF	Start	ACTIVE BITS = 1 OR 0							always 0 **	stop	✕
Eleven-Bit Word with Even Parity and 1 STOP Bit	OFF	OFF	ON	Start	ACTIVE BITS = 1 OR 0							always 0 **	even parity	stop
Eleven-Bit Word with Odd Parity and 1 STOP BIT	OFF	OFF	OFF	Start	ACTIVE BITS = 1 OR 0							always 0 **	odd parity	stop

*Factory Standard Setting

**Always 0 for PRINTER port; switch selectable for MODEM port, via S5-SW7

Figure 3-3. Word Format Codes with DIP Switch Configurations

DP210

3.5.3 ADM 1 Mode Characteristics

The **ADM 42** may be placed in the **ADM 1 Mode** by typing ESC % at the keyboard. In this mode, the transmission of text is modified as follows:

1. The FS character indicating the presence of protected fields are not sent.

2. The US characters indicating the end of line are not sent.

3. The cursor goes to the first unprotected position on the screen, when **Protect Mode** is set.

3.6 PRINT MODE TRANSMISSION CHARACTERISTICS

Print Mode transmission requires an optional Serial Printer Interface installation as described in Section II of this manual. The interface can be used with most RS-232C compatible serial printers, which includes buffered as well as character-by-character printers. With this interface, configuration control DIP switches (refer to **table 2-2**) are provided to establish: word format, BUSY ON/OFF and polarity characteristics. In addition, the PRINTER BAUD RATE switch on the front panel (see **figure 2-2**), makes it possible to select a transmission rate of 50, 75, 110, 134.5, 150, 300, 600, 1200, 1800, 2000, 2400, 3600, 4800, 7200, or 9600 baud, independent of the MODEM port baud rate. The factory setting for the ASYNC PRINTER port baud rate is 1200.

The logical conditions required for proper terminal/printer control are as follows:

1. The Printer Interface and the READY BUSY control lines are enabled as appropriate for the application (see **figure 2-10** and **table 2-2**).

2. When the terminal is ready to transmit data, the printer Request to Send (RTS) line (pins 6 and 8) is set (high).

3. If the printer is READY, it signals not BUSY over the READY line, which alerts the terminal. Depending upon which printer is used, BUSY may be active when high or low on pin 19 of connector J5.

4. When the PRINT command is executed, the word PRINT is displayed in the 25th Status Line as long as not BUSY is indicated.

5. If the PRINT command is executed by the host, the **ADM 42** transmits a CR code to the host upon completion of the transmission to the printer.

3.6.1 Formatted Print Mode

Formatted Print Mode (Page Format Mode) transmits data to the printer so that it will be printed exactly as displayed on the CRT screen. A set of operation codes permits ALL displayed data to be sent with no distinction made between protected and unprotected data; or permits only unprotected data, as formatted, to be transmitted to the printer, with protected data sent as spaces. Trailing spaces or nulls are not transmitted and operation codes are transmitted as spaces. When a **Formatted Print** command is executed (refer to **Print Transmission Control Operations** in Section IV), the following events take place:

1. "PRNT" is displayed in the Status Line.

2. "EM" is written at the cursor position as a STOP code.

3. The cursor moves to the HOME position. If **Auto Page** is set, the cursor moves to the HOME position on Page 1, and transmission begins.

4. The code sequence CR NULL LF NULL is sent to the printer, followed by the data as formatted on the screen.

5. NULL characters and trailing spaces on a line are not sent. When the last character on each line is sent, the terminal sends CR NULL LF NULL before moving to the next line.

Note

A STOP (EM) code within the text will cause the printing to stop at that point.

6. Upon reaching the STOP code, the operation is terminated, a final CR NULL LF NULL is sent, and the STOP code (EM) is overwritten with a space.

3.6.2 Unformatted Print Mode

Unformatted Print Mode transmits in a continuous stream, without inserting control characters or internal **ADM 42** delays. This mode allows greater flexibility in formatting the printed copy, especially with printers having other than 80-character lines. No distinction is made between protected and unprotected data as displayed. When this PRINT command is executed (refer to **Print Transmission Control Operations** in **Section IV**), the following events take place:

1. Control codes for print formatting must be embedded in the text using local coding sequences. Such control codes include: CR, LF, FF, VT, BEL, ESC, BS, FS, GS, RS, and US.

2. A STOP code (EM) may be written at the stopping point designated by the user.

3. The cursor is usually set at the beginning of the data to be transmitted, then the PRINT command is executed.

4. "PRNT" is displayed in the Status Line, and transmission begins.

5. Line control characters (CR, LF, etc.) are not inserted at the end of each **ADM 42** line;

transmission continues without delay from line to line, until the EM STOP code, if written, is reached. The STOP code is not overwritten.

6. NULL characters on the screen are sent to the printer, and all trailing spaces are transmitted.

3.6.3 Copy Print Mode

In **Copy Print Mode**, data is sent to the printer via the **ADM 42** print buffer, with or without data being displayed. Operating under the software control, the print buffer is formed by taking over the last page of display memory (Page 4 standard; Page 8 with option installed). Data is transmitted from the buffer in **Unformatted Print Mode** at a transmission rate determined by the PRINTER BAUD RATE switch setting. Dynamic operation codes permit data to be read into the buffer and retransmitted to the printer either: a) without being displayed; or b) after being displayed and/or acted upon by the **ADM 42**.

When the **Copy Print** command is executed (refer to **Print Transmission Control Operations** in **Section IV**), the following events take place:

1. "PRNT" is not displayed in the Status Line.

2. The last page is not accessible for display.

3. Data is transmitted at the selected printer baud rate, in accordance with the printer BUSY/READY protocol previously discussed.

4. Control code DC4 from the host resets **Copy Print Mode**; however, printing from the buffer continues until the buffer is empty.

5. ESC A 0 releases the print buffer if and only if the buffer is empty.

3.6.4 Buffered Print Mode

In Buffered Print Mode, displayed data is transferred to the buffer then sent to the printer.

Operating under software control, the print buffer is formed by taking over the last page of display memory (Page 4, standard; Page 8, with option installed). Unless modified by a set of dynamic operation codes, data is transmitted from the buffer in **Page Format Mode** at a transmission rate determined by the PRINTER BAUD RATE switch setting. The dynamic operation codes permit data to be read into the buffer and retransmitted to the printer in various formats. When the **Buffered Print** command is executed (refer to **Print Transmission Control**

Operations in Section IV), the following events take place:

1. "PRNT" is displayed in the Status Line.

2. The last page is not accessible for display.

3. Data is transmitted at the selected baud rate, in accordance with the printer BUSY/ READY protocol discussed in **paragraph 3.6.**

4. **ESC A 0** releases the last page; however, printing from the buffer must first be completed.

Note

All Buffered Print commands are inoperative in Polling Mode. Polling uses the addressable printer port.

SECTION IV
OPERATION

4.1　INTRODUCTION

This section provides the information necessary for the operator to utilize the **ADM 42** to its fullest capabilities. Emphasis is given to the control codes required to initiate and control the various terminal operations, whether they originate at the host or the **ADM 42** keyboard. It is assumed that the operator is thoroughly familiar with keyboard operations, which are not discussed herein, except as required to execute a given terminal operation. Refer to the **ADM 42 Operators Quick Reference Guide DP110** for detailed keyboard information.

4.2　CONTROL CODES AND OPERATING MODES

4.2.1　Standard Control Codes

The operational characteristics of the **ADM 42** are controlled in part, by a group of control codes which may originate at the host computer or at the terminal keyboard. Control codes are not displayable unless preceded by an ESC character or **Program Mode** is set. In either case, the

ADM 42 will display but not act upon the recognized control code. Of the 32 standard control codes available for use, the standard (non-polling) **ADM 42** utilizes the control codes listed in **table 4-1.**

4.2.2　Escape Sequence

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

Escape sequences are used primarily to control **ADM 42** operations, but may also be extended to control a printer or other auxiliary device connected to the **ADM 42**.

Figure 4-1 shows the escape sequences utilized by the **ADM 42**, whether from the host or from the keyboard. Escape sequences may be initiated from the keyboard using the ESC key during **Block Mode** or **Conversation Mode** operations, as follows:

HEX 1ST BYTE → 2ND ↓	2		3		4		5		6		7	
0			0	CLEAR TABS	@	PRINT PROT AS SP	P	PRINT PAGE ALL	`	POLLING ADDRESS*	p	PRINT UNFORMAT
1	!	FUNKEY PROG*	1	SET TYPWR TABS	A	COPY PRINT*	Q	INSERT CHAR	a	AUX CONTROL*	q	SET INS MODE
2	"	KBD ENA**	2	CLEAR COL OF TABS	B	SET BLOCK MD	R	DELETE LINE	b	STATUS 1 OFF	r	CLEAR INS MODE
3	#	KBD DISA**	3	TYPWR TAB CTRL*	C	SET CONV MD	S	SEND MSG	c	STATUS 1 ON	s	SEND MSG ALL
4	$	CLEAR ADM1 MD	4	SEND FG LINE	D	SET DUPLH OR F	T	ERASE LINE (PERS)	d	STATUS 2 OF F	t	ERASE LINE TO NUL
5	%	SET ADM 1 MD	5	SEND FG PAGE	E	INSERT LINE	U	SET PGM MODE	e	STATUS 2 ON	u	CLEAR PGM MODE
6	&	SET PROTECT	6	SEND ALL LINE	F	MESSAGE TO ROW 25*	V	SET COL PROT SP AT CURSOR	f	STATUS 3 OFF	v	SET AUTO PG
7	'	CLEAR PROTECT	7	SEND ALL PAGE	G	ATTRIB CONTROL*	W	DELETE CHAR	g	STATUS 3 ON	w	CLEAR AUTO PG
8	(	CLEAR WPROT	8	WRITE SOM (STX)	H		X	CLEAR PGM MODE	h		x	
9	)	SET WPROT	9	WRITE EOM (ETX)	I	BACK TAB	Y	ERASE PAGE (PERS)	i	TAB (SKIP)	y	ERASE PG TO NULL
A	*	CLEAR ALL TO NULL	:	CLEAR FG TO NULL	J	PAGE BACK	Z	CLEAR ALL MODES	j		z	
B	+	CLR ALL TO SPACE	;	CLR FG SP/PERS	K	PAGE FWD	[	BUFFERED PRINT CONTROL*	k		{	
C	'	CLR ALL TO PROT SP	<	STATUS 4 ON	L	GO TO PAGE N (1-8)*	\	EVOKE FUNKEY*	l		|	BAUD RATE CTRL*
D	-	LOAD PRC*	=	LOAD RC*	M	MULT ESC*	]		m	WRITE MULT CHAR*	}	
E	.	CHANGE PERS*	>	STATUS 4 OFF	N	SET PAGE EDIT	^	BLINK CONTROL	n		~	CURSOR VIDEO CTRL*
F	/	READ PRC**	?	READ RC**	O	CLEAR PAGE EDIT	_	BLANK CONTROL	o	DISPLAY PERS*	DEL	

Table heading: ESCAPE SEQUENCE

*Multiple Characters Required

**Remote (from host) Only

Figure 4-1. Chart of Escape Sequences

Table 4-1. Control Codes Utilized by Standard ADM 42

CONTROL CODE		HEX CODE	OPERATION
FROM HOST	FROM KEYBOARD		
	CTRL C	03	ETX (End of Text) EOT (End of Transmission), or CR (Carriage Return) are used as line turnaround characters during half-duplex operation.
	CTRL D	04	
CR	RETURN	0D	
BEL	CTRL G	07	BEEP - Generates audible alarm.
BS	◄—	08	Back Space - Moves cursor to the next unprotected position to the left on the line or on the next previous line, moving from right to left.
HT	BACK TAB TAB	09	Horizontal Tab - Skips cursor to next tab set position, when Protect Mode is set. If no such position, cursor moves to HOME (or next unprotected position) on page, or other page if Auto Page is set.
LF	↓	0A	Line Feed - Moves cursor to same column position in next lower line, or to next unprotected position in new line or next line, if necessary.
VT	↑	0B	**Up Line - Moves cursor to same column position in next previous line, or to next unprotected position (moving from right to left) in new line or next line, if necessary.**
FF	—►	0C	Forespace - Moves cursor to the next unprotected position to the right on the line, or to the first unprotected location on the next lower line, moving from left to right.
CR	RETURN	0D	Return - Moves cursor to first unprotected position in line containing the cursor.
DC4		14	From host only, control code resets Copy Print Mode. Printing from the buffer continues until buffer is empty.
EM	SPECIAL OPERATION	19	**Special Print Mode control code used to designate STOP code during Formatted Print Mode operations, and optionally as a STOP code during Unformatted Print Mode operation.**

Table 4-1. Control Codes Utilized by Standard ADM 42 (cont'd)

CONTROL CODE		HEX CODE	OPERATION
FROM HOST	FROM KEYBOARD		
ESC	ESC	1B	Escape - Recognized by ADM 42 as code extension character which must be followed by otherwise displayable character(s) to invoke a specific terminal operation. Also used preceding a control code to cause control code to be displayed instead of acted upon
FS	SPECIAL OPERATION	1C	Field Separator - Used to designate protected fields in a block send operation.
RS	HOME	1E	HOME - Moves cursor to first character position on page, even if Auto Page is set. If HOME is protected, cursor moves to first unprotected position on affected page.
US	NEW LINE	1F	New Line - Causes a combined Return (CR) and Line Feed (LF) to be executed. Cursor moves to first unprotected position on next line.

• **Block Mode** - Each escape sequence is immediately acted upon by the terminal, unless the sequence is preceded by an additional **ESC** character, or **Program Mode** is set. In either case, the escape sequence will be displayed but not acted upon, and transmitted along with the block of data.

Note

Control codes may also be imbedded in the text (by preceding the control code with ESC) for transmittal along with the block of data.

• **Conversation Mode, Full Duplex** - ESC is transmitted directly to the host and is utilized by the **ADM 42** only when echoed by the host.

4.2.3   Terminal RESET Operations

The **ADM 42** may be RESET in several ways, depending upon the purpose and extent of RESET desired.

4.2.3.1   Power ON RESET

CAUTION

Power ON RESET should be used only if the following RESET operations do not effect the desired reset. When recycling power using the ON/OFF switch, wait 10 seconds between the OFF and ON operations.

A Power ON RESET consists of a complete recycling of all **ADM 42** 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 memory are erased by powering down. Upon power-up, the terminal is subject to the complete **Power Turn-ON** procedure specified in **Section II.**

4.2.3.2 RESET Button

The RESET button resets the microprocessor and causes all Power ON RESET functions to be performed, without shutting down power.

4.2.3.3 Firmware RESET

A firmware RESET consists of resetting all display and other memory without powering down. In addition to resetting the memories to their default status, Firmware RESET causes the current position of the configuration control DIP switches and baud rate switches to be read. Each time a DIP switch or baud rate switch position is changed a Firmware **RESET** should be executed in order for the change to take effect. Execute at the keyboard [CTRL|SHIFT|RESET/CMD] .

Note

Any RESET may be used to read DIP switch positions; however, a Firmware RESET is recommended.

4.2.3.4 Selected Operational RESETS

Several RESET operations are available, using special keys, for resetting specific operational conditions in the terminal:

• Type [RESET/CMD] to reset a keyboard LOCK condition. [RESET/CMD] also swaps the 25th Status Line display with the Status Line message in memory as described further along in this section.

• Type [SHIFT|RESET/CMD] to clear a parity error from the 25th Status Line, and to abort all **Send** and **Print** operations.

4.2.4 Multiple Escape Sequences

Any number of escape sequences may be executed one after another without preceding each operation with an **ESC** character, thus facilitating operations which require more than one escape sequence. This operation is activated as follows:

1. Execute **ESC M.**

2. Execute only the action character of each desired escape sequence. For example, assume it is desired to set **Protect Mode** and **Send Page Foreground.** The sequence would be: **ESC M & 5.**

3. Terminate the operation by executing CR, LF, HOME, or any other control code.

4.2.5 Keyboard Enable/Disable

The **ADM 42** keyboard is always active unless disabled by an **ESC #** sequence. The keyboard on a polling terminal is disabled unless **Compose (LOCAL) MODE** is set. Once disabled, the keyboard may be enabled by an **ESC ″** sequence from the host only, or by executing [RESET/CMD] at the keyboard.

4.2.6 Scrolling

In the **ADM 42**, data is entered into display memory starting at **HOME** position on each page (except as modified by certain restrictions when protected fields are involved), and continuing through Position 80 in Line 24. When Position 80 is filled, the display is shifted upwards one line and data entry continues, starting with Position 1 in the new Line 24. The original top line is lost. Scrolling on each page continues indefinitely, unless **Auto Page** is set; if so, scrolling is inhibited. Also scrolling is inhibited if **Protect**

Mode is set. Scrolling and automatic New Line, when Position 80 is filled (Auto Line Wrap) may be inhibited by a dynamic personality change sequence (described later in this section).

4.2.7 Display of Program Version

The firmware program installed varies with its level of enhancement and with customer requirements. The program version installed is **V2.03**; it may be displayed by executing **ESC o 9.**

4.2.8 Status Line Characteristics

Various kinds of status information are displayed in Status Line 25, shown in **table 4-2.** Display is in normal video, except status indicators S1, S2, S3, and S4, which are in reverse video. S4 is also blinking.

4.2.8.1 Status Indicator Control

Status Indicators S1, S2, S3, and S4 may be used to alert the **ADM 42** operator to the existence of a user-specified condition. This condition could be "message waiting," or "garbled transmission," or any such condition.

The Status Indicators are displayed in designated positions in Status Line 25 (refer to **table 4-2**) in reverse video, by means of the operation codes listed in **table 4-3.** Status S4 appears in reverse video, blinking, and usually specifices a special condition of some kind.

4.2.8.2 Status Line Message Control

An override message may be placed in Status Line positions 2 thru 80 at any time by the host. Any data residing in the Status Line will be temporarily replaced by this message and stored in memory. Any host initiated or keyboard entry which affects the status line (refer to **table 4-2**) will recall the original Status Line data from memory and place the Status Line message in

memory. The Status Line display and Status Line message in memory (if any) may be swapped by typing RESET/CMD at the keyboard. **Table 4-4** lists the Status Line message control operations.

4.3 FUNCTION KEY (FUNKEY) CHARACTERISTICS

Function keys F1 thru F16 are used to store and/or transmit specific messages to the host upon command from the host or the keyboard. These messages may be used for any purpose specified by the user. In the standard **ADM 42**, the stored message is always a fixed three- or four-character code (refer to **table 4-5**) which is different for each function key. This code may be transmitted to the host at any time by typing the appropriate key F1 thru F16, with or without SHIFT.

The stored message may be increased to 31 or 63 characters, maximum, with the installation of 31- or 63-Character (Programmable) Function Key Option. The information that follows concerns FUNKEY operations on terminals equipped with the programmable function key option.

4.3.1 Displaying FUNKEY Messages

To display all of the FUNKEY messages stored in the terminal execute ESC ! 1 or ESC ! 2 from host or keyboard. **Figure 4-2** shows a sample FUNKEY message display format in which each recorded message depicts a significant characteristic of each message. An un-programmed function key displays an "X".

4.3.2 Storing FUNKEY Messages

1. Storing FUNKEY messages may be accomplished from the keyboard or the host.

2. Each message must start in position 1 on a new line to be accepted.

FUNKEY STORE CODES

KEYBOARD	HOST UNSHIFTED	HOST SHIFTED
CTRL F1 *	ESC I @	ESC I `
CTRL F2 *	ESC I A	ESC I a
CTRL F3 *	ESC I B	ESC I b
CTRL F4 *	ESC I C	ESC I c
CTRL F5 *	ESC I D	ESC I d
CTRL F6 *	ESC I E	ESC I e
CTRL F7 *	ESC I F	ESC I f
CTRL F8 *	ESC I G	ESC I g
CTRL F9 *	ESC I H	ESC I h
CTRL F10 *	ESC I I	ESC I i
CTRL F11 *	ESC I J	ESC I j
CTRL F12 *	ESC I K	ESC I k
CTRL F13 *	ESC I L	ESC I l
CTRL F14 *	ESC I M	ESC I m
CTRL F15 *	ESC I N	ESC I n
CTRL F16 *	ESC I O	ESC I o

CAUTION

All programmable function keys are erased when Power ON, RESET button, or Firmware RESET is executed.

——— SAMPLE DISPLAY ———

K THIS IS A SAMPLE OF A COMPLETE DISPLAY, CALLED UP BY ESC I 1
K FOR UNSHIFTED FUNKEY CODES, OR ESC I 2 FOR SHIFTED CODES,
K WITH THE 63-CHARACTER PROGRAMMABLE KEY OPTION INSTALLED.
K TO ENTER THIS LINE, CLEAR SCREEN THEN TYPE: K (MSG) CTRL F4
K EACH MESSAGE MUST START WITH K, H, OR A TO BE ACCEPTED.
K "K" AT START OF EACH MESSAGE MEANS: DISPLAY ON TERMINAL CRT.
K "K" MESSAGE WILL ALSO BE XMITTED TO HOST IF CONV MODE IS SET.
K "H" AT START OF MESSAGE MEANS: XMIT TO HOST; DO NOT DISPLAY.
K "A" AT START OF MESSAGE MEANS: XMIT TO PRTR; DO NOT DISPLAY.
K TO LINK EXTRA LENGTH MSG TO NEXT ADDR (J), WRITE ESC \ J,
K WITHIN 63-CHARACTER LIMIT. AT END OF MESSAGE, TYPE CTRL F11.
K TO CALL UP EXTRA LENGTH MESSAGE, TYPE F10 (HOST ESC \ I).
K TO ERASE THIS FUNKEY MSG: CLR SCRN; TYPE CTRL 'F13 (HOST ESC I L).
K TO ERASE ALL FUNKEY STORAGE. TYPE SHIFT CTRL RESET (HOST ESC I X).
K "X" INDICATES UNPROGRAMMED FUNKEY LOCATION.
X

——— SAMPLE DISPLAY ———

*Type SHIFT CTRL Fx to store data in shifted Fx locations

Figure 4-2. Sample FUNKEY Message Format and Store Codes

Table 4-2.   Chart of Assigned Status Line Positions

CHARACTER POSITIONS	DISPLAY	STATUS INFORMATION
1-5	PG=X	Current Page No. X, where "X" may be 1 thru 8.
6-10	APG	Auto Page ON
11-15	EDIT	Edit Mode ON
16-20	PROG	Program Mode ON
21-25	PROT	Protect Mode ON
26-30	WPRT	Write Protect Mode ON
31-35	INSM	Insert Mode ON
36-40	LOCK	Keyboard Locked
41-45	ADM 1	ADM 1 Mode ON
46-50	PRNT or PBSY	"PRNT" denotes Print Mode ON "PBSY" denotes printer busy
51-60	PARITY ERR	Error message
2-80	(User Msg)	Override message from host; replaces current Status Line display which is stored in memory.
66-67 70-71 74-75 78-79	S1 S2 S3 S4	Status Line indicators which are used to specify any user-determined condition. S4 (blinking) points to a special condition.

Table 4-3.   Status Code Control Operation Codes

STATUS INDICATOR	S1	S2	S3	S4
ON	ESC c	ESC e	ESC g	ESC <
OFF	ESC b	ESC d	ESC f	ESC >

Table 4-4.   Status Line Message Control Operations

OPERATION	SOURCE	OPERATION CODE	ACTIVITY
Initiate Override Message	Host	ESC F Message CR*	Message placed in Status Line positions 2 thru 80, overriding, but not erasing, current display.
Clear Override Message	Host Keyboard	ESC Z, ESC %, etc. RESET/CMD	Message is cleared from display but retained in memory by any operation code which affects Status Line.
Erase Override Message	Host	ESC F CR*	Message is erased from screen and memory; original Status Line display is restored.
Recall Status Line Message	Keyboard	RESET/CMD	Status Line display and Status Line message are swapped each time key is typed.

*Any control character (CR, LF, HT, etc.) may be used.

3. Each message must start with a "K", "H", or "A" destination code, where:

   K - Designates a message for CRT display, when evoked. If **Conversation Mode** is set, the message will also be transmitted to the host.

   H - Designates a message for transmission to host, with no CRT display, when evoked.

   A - Designates a message for transmission to a printer, with no CRT display, when evoked.

4. **Block Mode** should be set to avoid unintentionally transmitting data to the host when storing data at the keyboard.

5. Immediately following the last character of the message, execute the appropriate FUNKEY Store Code (see **figure 4-2**). The cursor will backspace one space to indicate acceptance of the message.

4.3.3 Linking FUNKEY Messages

FUNKEY messages stored under different function keys may be linked together to form a single message, as when a message is too lengthy to be stored under one key. The linking capability can also be used to link two or more operations under one command.

Table 4-5. Function Key/FUNKEY Characteristics

EVOKING OPERATION			EVOKING OPERATION		
EVOKE CODE	KEYBOARD	UNPROGRAMMED CODE TRANSMITTED	EVOKE CODE	KEYBOARD	UNPROGRAMMED CODE TRANSMITTED
ESC \ @	F1	SOH @ CR*	ESC \ \	SHIFT F1	SOH \ CR*
ESC \ A	F2	SOH A CR*	ESC \ a	F2	SOH a CR*
ESC \ B	F3	SOH B CR*	ESC \ b	F3	SOH b CR*
ESC \ C	F4	SOH C CR*	ESC \ c	F4	SOH c CR*
ESC \ D	F5	SOH D CR*	ESC \ d	F5	SOH d CR*
ESC \ E	F6	SOH E CR*	ESC \ e	F6	SOH e CR*
ESC \ F	F7	SOH F CR*	ESC \ f	F7	SOH f CR*
ESC \ G	F8	SOH G CR*	ESC \ g	F8	SOH g CR*
ESC \ H	F9	SOH H CR*	ESC \ h	F9	SOH h CR*
ESC \ I	F10	SOH I CR*	ESC \ i	F10	SOH i CR*
ESC \ J	F11	SOH J CR*	ESC \ j	F11	SOH j CR*
ESC \ K	F12	SOH K CR*	ESC \ k	F12	SOH k CR*
ESC \ L	F13	SOH L CR*	ESC \ l	F13	SOH l CR*
ESC \ M	F14	SOH M CR*	ESC \ m	F14	SOH m CR*
ESC \ N	F15	SOH N CR*	ESC \ n	F15	SOH n CR*
ESC \ O	F16	SOH O CR*	ESC \ o	SHIFT F16	SOH o CR*

*If established by a Dynamic Personality Change operation, a second transmission terminator (End Block character) is also transmitted. The first End Block character (CR) may also be changed via personality.

4.3.3.1 Storing Extra-Length FUNKEY Messages (See Figure 4-2)

1. An extra-length FUNKEY message is one which is greater than 31 characters if the 31-character option is installed, or greater than 63 characters if the 63-character option is installed.

2. Store the extra-length message in the same manner as for shorter messages, except:

a. Within the 31- or 63-character limit, display ESC \ (ASCII), where (ASCII) is the location of the next FUNKEY memory.

b. Immediately following the (ASCII) character, above, execute CTRL F_x , where F_x is the function key to be programmed.

c. Before continuing the message, execute New Line and enter the desired destination code to start the message.

d. Continue the message to its completion. If necessary, extend the message to any memory location in accordance with a, b, and c, above.

e. Immediately following the last character of the message, execute the appropriate Store Code (see **figure 4-2**) of the FUNKEY to be linked. The cursor will backspace one space to indicate acceptance of the message.

4.3.3.2 Linking Multiple Commands

Upon occasion it may be required to execute a terminal operation requiring a specific operation code in conjunction with sending data to the host. For example: assume that it is desired to send only "LIST CR" to the host many times; the CRT screen must be cleared before writing the message. The operation would be as follows:

1. Clear the screen to spaces.

E Execute: H I I S T ESC RETURN (Typing ESC causes CR to be displayed).

3. Execute: CTRL F1 to store H LIST CR under FUNKEY F1 .

4. Execute: NEW LINE .

5. Execute: K ESC ESC * , to write K E$_C$*on the screen.

6. Execute: ESC ESC \ @ , to write E$_C$ \ @ on the screen.

7. Execute: CTRL F2 to store E$_C$ * E$_C$\@ under FUNKEY F2 .

8. Now, whenever F2 is called for, the CRT screen will be cleared and LIST CR will be sent to the host.

4.3.4 Erasing FUNKEY Messages

1. To erase a specific FUNKEY message from the keyboard: Clear screen, then type CTRL F$_x$, where F$_x$ is the FUNKEY memory location to be erased.

2. To erase a specific FUNKEY message from the host, execute ESC ! (ASCII), where the (ASCII) is the address of the FUNKEY memory location to be erased (see **figure 4-2**).

3. To erase all FUNKEY messages, execute ESC ! X.

4.3.5 Evoking FUNKEY Messages

A FUNKEY message is "evoked" when it is recalled from memory and transmitted. Its destination is determined by the "H", "K", or "A" destination code at the beginning of the message. FUNKEY messages may be evoked in one of the following ways:

Note

"K" designated messages will be displayed and transmitted to the host if CONV MODE is set.

1. Type appropriate key F1 thru F16 unshifted or shifted, or

2. Execute appropriate Evoke code (refer to **table 4-5**).

a. To evoke a complete extra-length FUNKEY message, execute the Evoke Code associated with the initial memory address. Example - ESC \ I or F10 would evoke the complete I - J message in **figure 4-2**.

b. To evoke a selected portion of an extra-length FUNKEY message, execute the Evoke Code associated with the 2nd or 3rd, etc. portion of the message. Example - ESC \ J or F11 would evoke only the following message:

"WITHIN 63-CHARACTER LIMIT. AT END OF MESSAGE, TYPE CTRL F11 ."

4.4 FORMAT CONTROL OPERATIONS

Certain **ADM 42** operations are concerned primarily with formatting or controlling the manner in which data is formatted, whether it is input from the host or from the keyboard.

4.4.1 Program Mode

Program Mode is typically used for transparent operation. In **Program Mode** control characters (CR, LF, FS, etc.) are written and displayed as they are received or keyed but are not acted upon. **Program Mode** is set by typing [PROG MODE] once (PROG appears in Status Line). **Program Mode** is terminated by typing [PROG MODE] again.

4.4.2 Protected Fields and Modes

Areas in the **ADM 42** display may be designated as protected fields. These fields appear at reduced intensity and have the following characteristics:

- Protected fields cannot be overwritten as long as **Protect Mode** is set.

- Forms appearing on the display initiated by the computer are usually in protected characters.

4.4.2.1 Write Protect Mode

Write Protect Mode is set by typing [SHIFT] [WRITE PROT] . (WPRT appears in Status Line). Characters written while **Protect Mode** is set are immediately protected. **Write Protect Mode** is terminated by typing [WRITE PROT] .

4.4.2.2 Protect Mode

Protect Mode is set by typing [PROT MODE] (PROT appears in Status Line). **Protect Mode** is terminated by typing [PROT MODE] again.

4.4.2.3 Designated Protected Field

The operator has complete control over any character typed into display memory. Consequently, the operator may elect to protect or leave unprotected any character entered from the keyboard. To enter protected characters **Write Protect Mode** must be set. Usually **Protect Mode** is also set so that the characters are protected as they are written. The ESC) and ESC (codes are used during a **Send All** operation as delimiters for protected fields in a line, page, or message.

4.4.2.4 Selected Protected Fields

The (` ) character may be used to establish a special protected field in which characters which have been written protected will be transmitted along with unprotected characters in a message. While operating in **Write Protect Mode** a ( `) character will establish the field and another (` ) character will terminate the field. Any character bracketed by the ( `) character will thus be transmitted as though unprotected during a **Send Line, Send Page,** or **Send Message** routine. The bracketed field will not be erased by a **Clear to Foreground** routine. The selected protected field is cleared along with and in the same manner as any other protected field.

The following is an example of this special operation:

1. Assume that the terminal is in **Write Protect Mode** (with **Protect Mode** set).

2. The operator enters a combination of protected (P) characters, specially protected (p) characters, and unprotected (U) characters, as follows:

    PPP ` ppp    UU    ppp ` PPP   UU

3. If **Send Line, Send Page,** or **Send Message** is commanded, the following will be transmitted. (An FS character is sent in the place of each protected field not sent.

    FS   ppp   UU   ppp   FS   UU

4.4.3 Auto Page Mode

Auto Page Mode is set by typing
[SHIFT] [PAGE BACK] (APG appears in
Status Line), and terminated by typing
[SHIFT] [PAGE FWD] . This mode connects all
memory pages (4 or 8) together to form one
continuous page, with the current page retaining
its page status. When **Auto Page** is set, several
modifications to terminal operations take place:

* Cursor Position - The cursor goes to HOME
  position on the next page in a Page Forward
  operation or to the last position on the previous
  page in a Page Back operation.

* Scrolling - Scrolling is inhibited. When data is
  entered in the last position of the current page,
  data entry continues in the HOME position or
  the first unprotected position of the next page.
  When data is entered into the last position of the
  last page, cursor goes to HOME on first page.

4.4.4 Limited Graphics Mode

When an optional Line Drawing Alternate
Character Generator is installed in the **ADM 42**,
the terminal is equipped to produce simple line
drawings in **Limited Graphics Mode**. In this
mode, the characters on seven terminal keys are
modified to produce eleven graphic symbols (see
figure 4-3). Transmission of the graphics
constructed from these keys is the same ASCII
character as the original character. **Limited
Graphics Mode** is established by ESC G 8.

4.4.5 Write Character "c" "N" Times

Any displayable character "c" may be written any
specified number of times "N", using operation
code **ESC m N c**. The number of times "N" is
expressed by a modulo number which is in turn
expressed by a single otherwise displayable
ASCII character. **Figure 4-4** is a chart of the 96
displayable characters and the modulo numbers
they represent. Example: To write the character
"D" 29 times, execute ESC m = D.

4.5 CURSOR CONTROL OPERATIONS

4.5.1 Non-Addressed Cursor Positioning

The cursor may be moved to any unprotected
position on the screen under the remote or local
control of the operator; 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 unprotected
position in the next line each time a character is
written under its present position. The cursor
cannot stop in a protected field. The operation
codes and keyboard operations required to control
the non-addressed and absolute (addressed)
cursor positions are listed and described in
table 4-6.

4.5.2 Absolute Cursor Addressing

Absolute cursor addressing consists of
commanding the cursor to a specific display
location or reading out the exact cursor location,
using operation codes. Commanding the cursor to
a specific location (loading the cursor) may be
executed by host or keyboard commands; reading
the cursor may be executed only by the host, and
the position codes are sent only to the host. The
load/read commands are executed by means of
multiple character escape sequences in which the
exact page, row, and column location of the cursor
is expressed in a set of ASCII characters, as shown
below. See **figure 4-5** for the ASCII characters
assigned to each row and column location.

4.5.2.1 Load Cursor Operation

When the **Load Cursor** operation is initiated, the
cursor moves to the commanded position, except
that if **Protect Mode** is set, the cursor will not
stop in a protected field; it will perform in the same
manner as described for Horizontal Tab in **table
4-6**. The operation codes required to load the
cursor are as follows:

KEY	SYMBOL (UNSHIFTED)	SYMBOL (WITH SHIFT)	KEY	SYMBOL (UNSHIFTED)	SYMBOL (WITH SHIFT)
22			42 { [		
24			43 }]		
25			75 < ,	,	
			76 > ▪	▪	

Figure 4-3. Limited Graphics Mode Symbols
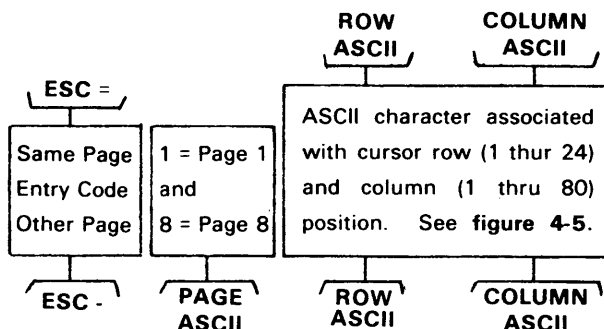
Example: Operation code ESC - 2 2 M commands the cursor to Page 2, Row 19, Column 46.

4.5.2.2 Read Cursor Operations

The **Read Cursor** operation consists of the read command from the host only and an immediate response from the terminal defining the cursor position, regardless of whether **Conversation Mode** or **Block Mode** is set. If the page in which the cursor rests is known, the host executes **ESC ?**, and the terminal responds with the appropriate Row ASCII and Column ASCII characters followed by CR. If the page in which the cursor rests is not known, the host executes **ESC /**, and the terminal responds with the appropriate Page ASCII, Row ASCII and Column ASCII, followed by CR. Example: To read the position to which the cursor was commanded, above, the operation code sequence is as follows:

From Host		ADM 42 Response
Page Known	ESC ?	2 M CR
Page Unknown	ESC /	22 M CR

4.5.2.3 Go To Page "N" Operations

Any page may be called up for display at any time by executing **ESC L,** followed by the desired page number. The appropriate page will be displayed and the cursor will go to the last known position on that page. If **Auto Page** is set, the cursor will go to the same column position of the top row on the selected page. Example: To call up page 4 for display, execute **ESC L 4.**

Note
If the last known position or HOME is protected, the cursor goes to the first available unprotected position.

ASCII CHARACTER	MODULO NUMBER	ASCII CHARACTER	MODULO NUMBER	ASCII CHARACTER	MODULO NUMBER
SPACE	0	@	32	`	64
!	1	A	33	a	65
"	2	B	34	b	66
#	3	C	35	c	67
$	4	D	36	d	68
%	5	E	37	e	69
&	6	F	38	f	70
'	7	G	39	g	71
(	8	H	40	h	72
)	9	I	41	i	73
*	10	J	42	j	74
+	11	K	43	k	75
,	12	L	44	l	76
−	13	M	45	m	77
.	14	N	46	n	78
/	15	O	47	o	79
0	16	P	48	p	80
1	17	Q	49	q	81
2	18	R	50	r	82
3	19	S	51	s	83
4	20	T	52	t	84
5	21	U	53	u	85
6	22	V	54	v	86
7	23	W	55	w	87
8	24	X	56	x	88
9	25	Y	57	y	89
:	26	Z	58	z	90
;	27	[	59	{	91
<	28	\	60	¦	92
=	29	]	61	}	93
>	30	^	62	~	94
?	31	—	63	DEL	95

Figure 4-4.   Chart of ASCII Characters vs. Modulo Numbers

OPERATIONAL CODES		POSITION ROW	POSITION COL	OPERATIONAL CODES		POSITION ROW	POSITION COL	OPERATIONAL CODES		POSITION ROW	POSITION COL
↑	SPACE	1	1	↑	;		28	↑	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
Same Page Load:	'	8	8	Same Page Load:	B		35	Same Page Load:	]		62
ESC =	(	9	9	ESC =	C		36	ESC =	∧		63
Same Page Read:	)	10	10	Same Page Read:	D		37	Same Page Read:	_		64
ESC ?	*	11	11	ESC ?	E		38	ESC ?	\		65
*Nth Page Load:	+	12	12	*Nth Page Load:	F		39	*Nth Page Load:	a		66
ESC - N	,	13	13	ESC - N	G		40	ESC - N	b		67
*Nth Page Read:	-	14	14	*Nth Page Read:	H		41	*Nth Page Read:	c		68
ESC / N	.	15	15	ESC / N	I		42	ESC / N	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		o		80
↓	:		27	↓	U		54	↓			

*N = Selected page 1 thru 4 (standard) or 1 thru 8 (optional)

Figure 4-5. *Absolute Cursor Addressing Operation Codes*

Table 4-6.   Chart of Cursor Control Operations

OPERATION	HOW TO EXECUTE		DESCRIPTION
	FROM HOST	KEYBOARD	
Cursor HOME	RS	HOME	Cursor moves to upper left corner position on page or if protected, to first unprotected position on page.
Downline	LF	↓ or LINE FEED	Cursor moves one increment in the specified direction. If the new position is protected, cursor moves to first unprotected position in the specified line (for Backspace, the next previous position is selected). Character under cursor or character passed over is not erased.
Upline	VT	↑	
Backspace	BS	←	
Forespace	FF	→	
Return	CR	RETURN	Cursor moves to the first unprotected position in the line containing cursor.
New Line	US	PAGE/NEW/LINE	Cursor moves to the first unprotected position in the new line (combined CR and LF).
Horizontal Tab or Skip	HT or ESC i	BACK TAB/TAB	**Operational only when Protect Mode or Typewriter Tab Mode is set. Tab moves cursor forward to the next unprotected position on the page. If there is no such position, cursor moves to HOME or the next unprotected position following HOME.**
Backtab	ESC l	SHIFT BACKTAB/TAB	Backtab moves cursor backwards to the last previous unprotected position after a protected field on the page. If there is no such position, cursor moves to the end of the page.
Load Cursor: Same Page, Row, Column	ESC =	ROW ASCII COL ASCII	Refer to paragraph 4.5.2.1 for details.
Page N, Row, Column	ESC – PAGE ASCII	ROW ASCII COL ASCII	
Rear Cursor: Known Page, Row, Col	ESC ?	Terminal Response ROW ASCII COL ASCII CR	Refer to paragraph **4.5.2.2** for details.
Unknown Page, Row, Column	ESC / PAGE ASCII	ROW ASCII COL ASCII CR	

4.5.3 Tab Control

4.5.3.1 Protect Mode Tab Operations

At the keyboard, BACK TAB/TAB is used to tab forward, and SHIFT BACK TAB/TAB to tab backwards to preset tab positions, with **Protect Mode** set. From the host, the **HT** or **ESC i** code commands foreward tab, and **ESC I** commands backward tab. **Protect Mode** tabs are established by setting a vertical column of protected spaces from the cursor position down: execute **ESC V** or type SHIFT TAB/SET/CLEAR **Protect Mode** is automatically set. The tab stop is the unprotected position immediately following the protected position. **Protect Mode** tabs (and **Protect Mode**) are cleared by any **Clear All** operation.

4.5.3.2 Typewriter Tab Mode Operations

In **Typewriter Tab Mode**, tab stops may be set, cleared and utilized in much the same way as with an ordinary typewriter. If **Protect Mode** is set, **Typewriter Tab Mode** is inhibited; however, setting **Protect Mode** does not clear any typewriter tabs which have been set. The tab stop is the actual cursor position at the time the tab set command is executed. (For **Protect Mode** tabs, the tab stop is the next unprotected position.)

ESC 3 p establishes **Typewriter Tab Mode**, if **Protect Mode** is not set. If **Auto Page** is set either before or after **Typewriter Tab Mode**, is set, the conditions established apply to every page. While **Typewriter Tab Mode** is set, the following operation codes are active:

- **ESC 0**   Clears all Typewriter Tabs, but not Modulo Tabs.

- **ESC 1**   Sets a column of tabs at the cursor position for the entire page.

- **ESC 2**   Clears column of tabs at cursor position for the entire page.

- **ESC 3 SPACE**   Clears Typewriter Tab Mode (and all modulo tabs).

4.5.3.3 Modulo Tab Mode Operations

In **Modulo Tab Mode**, multiple columns of tabs at reqular intervals for the entire page may be established using an **ESC 3 (ASCII)** sequence. The ASCII character entered defines the number of character positions in each interval. This character expresses a modulo number from 0 to 79, which is the value of the interval. See **figure 4-4** for character vs modulo values. **Example:** To set tab stops every 10 character positions on every line, execute **ESC 3 ***.

- **ESC 3 (ASCII)** sets modulo tabs.

- **ESC 3 Space** resets **Modulo Tab Mode** (and **Typewriter Tab Mode**).

4.6 DATA EDITING CONTROL OPERATIONS

The ADM 42 is equipped with extensive data editing capabilities, most of which may be executed from the host and from the keyboard. **Table 4-7** lists and describes all the data editing operations available on the terminal, along with the operation codes and/or keyboard operations required to execute them. **Clear** and **Erase** commands apply only to the current page, even if **Auto Page** is set.

Note

If DIP switch S7-SW3 at location 15M is set to ON, NULL codes will not be displayed.

Table 4-7. Data Editing Control Operations

OPERATION	HOW TO EXECUTE		DESCRIPTION
	FROM HOST	KEYBOARD	
Clear ALL to NULL*	ESC *	SHIFT CLEAR NULL	All displayed data, unprotected and protected, is cleared and replaced with null codes. Cursor goes to HOME.
Clear ALL to SPACES (Personality)	ESC +	SHIFT CLEAR SPACE	All displayed data, unprotected and protected, is cleared and replaced with space or personality codes. Cursor goes to HOME.
Clear ALL to Protected SPACES	ESC ,	ESC ,	All displayed data is cleared and replaced with protected spaces. If Protect Mode is set at this time, the last space on the screen becomes unprotected, and cursor may rest there.
Clear Foreground to NULL*	ESC :	CLEAR NULL	Unprotected data is cleared and replaced with null codes. Cursor goes to HOME or first unprotected position on page.
Clear Foreground to SPACES (Personality)	ESC ;	CLEAR SPACE	Unprotected data is cleared and replaced with spaces or personality codes. Cursor goes to HOME or first unprotected position on page.
Set/Clear Page Edit Mode	Set: ESC N (EDIT appears in Status Line) Clear: ESC O (EDIT removed from Status Line)	PAGE EDIT PAGE EDIT	Modifies movement of data for CHAR INSERT and CHAR DELETE operations.
Set/Clear Auto Page	Set: ESC v (APG appears in Status Line) Clear: ESC w (APG removed from Status Line)	SHIFT PAGE BACK SHIFT PAGE FWD	All memory pages (4 or 8) connected together to form one continuous page; current page retains its page status. For additional information, refer to paragraph 4.4.3.
Set/Clear Insert Mode	Set: ESC q (INSM appears in Status Line) Clear: ESC r (INSM removed from Status Line)	SHIFT CHAR INSERT SHIFT CHAR INSERT	In the line containing the cursor, a string of characters may be written under cursor, without first writing a space. All following characters move one space to the right for each insertion. Insertions are inhibited when inserted characters fill the line (previous characters following the cursor are lost), or protected field occupies last space in the line.

*Nulls are not displayed when switch S7-SW3 at location 15M is set to ON.

Table 4-7. Data Editing Control Operations (cont'd)

OPERATION	HOW TO EXECUTE		DESCRIPTION
	FROM HOST	KEYBOARD	
Line Insert	ESC E	LINE INSERT	Line containing the cursor and all lower lines shift downwards one line. Deleted line is replaced with unprotected spaces and cursor moves to first position in the line. When screen is full, bottom line is lost. If Write Protect Mode is set, Line Insert resets that mode. If Protect Mode is set, Line Insert cannot be performed.
Line Delete	ESC R	LINE DELETE	Line containing cursor is erased, simultaneously, all lower lines shift upwards one line. Cursor moves to the first position of the line that moves upwards, and the bottom line is filled with unprotected spaces. If Protect Mode is set, Line Delete cannot be performed.
Line Erase	ESC T	LINE ERASE	Starting with the cursor position, all characters in the line (or current field, if Protect Mode is set) are erased and replaced with space or personality codes. Write Protect Mode is not reset (Refer to Personality Byte 10).
Line Erase to Null	ESC t	SHIFT LINE ERASE	Starting with the cursor position and continuing to the end of the line, all data, unprotected and protected, is erased and replaced with unprotected null codes. If Write Protect Mode is set it is not reset (Refer to Personality Byte 10).
Page Erase	ESC Y	PAGE ERASE	Starting with the cursor position and continuing to the end of the page, all unprotected characters are erased and replaced with unprotected space or personality codes. If Write Protect Mode is set, it is not reset (Refer to Personality Byte 10).
Page Erase to Nulls*	ESC y	SHIFT PAGE ERASE	Starting with the cursor position and continuing to the end of the page, all data, unprotected and protected is cleared and replaced with unprotected null codes. If Write Protect Mode is set, it is not reset (Refer to Personality Byte 10).

*Nulls are not displayed when switch S7-SW3 at location 15M is set to ON

Table 4-7. Data Editing Control Operations

OPERATION	HOW TO EXECUTE		DESCRIPTION
	FROM HOST	KEYBOARD	
Page Back Page Forward	ESC J ESC K	PAGE BACK PAGE FWD	Each time a Page Forward or Page Back command is executed, the current page and cursor position are memorized (unless Auto Page is set). Data which is resident on a page is retained when another page is called up. During a Page Forward operation, the shift is to Page 1 when the last page (4 or 8) is reached. There is no shift from Page 1 during a Page Back operation.
Character Insert	ESC Q	CHAR INSERT	Writes a space under the cursor; all following characters move one space to the right. If line is full, last character in the line is lost, unless character is protected or Page Edit is set. If Page Edit is set, last character in each line wraps around to the next line, and so on to the end of the page. Operation terminates when line is filled with inserted spaces or a protected field is encountered.
Character Delete	ESC W	CHAR DELETE	Deletes character under cursor; all characters that follow in the field or line move one space to the left to fill deleted position. A space is written at the end of the field or line (or page if Page Edit is set). When Page Edit is set, the first character in the following line moves up to fill the deleted last position in the previous line; characters that follow move one space to the left, and so on, to the end of the page. Protected positions are not disturbed.

4.7 DATA TRANSMISSION CONTROL OPERATIONS

4.7.1 Block Mode Send

Data Transmission or Send operations are associated most directly with **Block Mode** or optional Polling transmissions to the host computer. **Table 4-8** lists and describes all the **Data Transmission** operations available, along with the operation codes and/or keyboard operations required to execute them. For additional **Data Transmission** information, refer to **paragraph 3.5.**

4.7.2 Dynamic Baud Rate Control

The baud rate at which the MODEM port and ASYNC PRINTER port transmissions occur are independently controlled. The standard or default baud rate for each port is established by the MODEM and PRINTER BAUD RATE rotary switches on the front panel. This default setting can be dynamically modified by executing an appropriate ESC¦ (ASCII) operation code, where the (ASCII) character corresponds to the desired baud rate listed in **table 4-9.** The table also shows the equivalent BAUD RATE switch position for each dynamic setting. Any Power ON, RESET button, or Firmware RESET operation terminates all dynamic baud rate settings.

Table 4-8. Data Transmission Control Operations

OPERATION	HOW TO EXECUTE		DESCRIPTION
	FROM HOST	KEYBOARD	
Start of Message		SOM	Imbeds STX code in displayed message; used to designate start of message during Send Message operations (Block Mode only).
End of Message		EOM	Imbeds ETX code in displayed message; used to designate end of message during Send Message operations (Block Mode only).
Send Line Foreground	ESC 4	SEND LINE	Sends line of unprotected data, starting at beginning of line containing cursor and ending at the cursor position.
Send Page Foreground	ESC 5	SEND PAGE	Sends only unprotected data on page, starting with first unprotected character and continuing to cursor position. If Auto Page is set, unprotected data on all pages, up to cursor position, is sent.
Send Line All*	ESC 6	SHIFT SEND LINE	Sends line of unprotected and protected data, starting at the beginning of the line containing the cursor and ending at cursor position. Protected fields are bracketed by ESC) and ESC (.
Send Page All*	ESC 7	SHIFT SEND PAGE	Sends all data on page, starting with HOME and continuing to cursor position. Protected fields are bracketed by ESC) and ESC (. If Auto Page is set, all data on all pages, up to cursor position, is sent.
Send Message Foreground	ESC S	SEND MSG	Sends unprotected data in message displayed which is bracketed by STX - ETX (SOM EOM) codes. If no STX code is encountered, cursor starts at HOME or first unprotected position following HOME. If no ETX code is encountered transmission stops at end of page (end of last page if Auto Page is set).
Send Message All*	ESC s	SHIFT SEND MSG	Sends all data, unprotected and protected, in message which is bracketed by STX - ETX (SOM EOM) codes. If no STX code is encountered, cursor starts at HOME or first unprotected position following HOME. If no ETX code is encountered, transmission stops at end of page (end of last page if Auto Page is set). Protected fields are bracketed by ESC) and ESC (.

*Operation is modified by ADM 42/ADM 2 Attribute Control operations.

4.8 PRINT TRANSMISSION CONTROL OPERATIONS

Table 4-10 lists and describes all the Print Transmission operations available, along with the operation codes and/or keyboard operations required to execute them. For additional Print Transmission information, refer to paragraph 3.6.

4.9 PERSONALITY CONTROL

The ADM 42 personality has the capability of allowing certain terminal characteristics to be altered. These characteristics or traits may be "permanent" or "dyanmic" (temporary). Dynamic operation codes may be executed from the host or the keyboard.
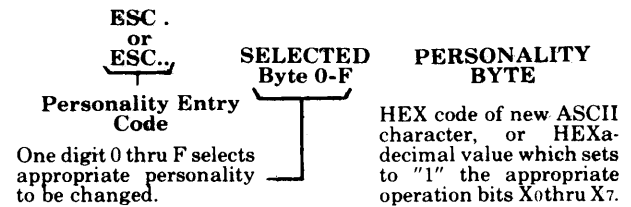
4.9.1 Display of Personality Codes

Figure 4-6 shows a coding chart for all the personality codes available in the ADM 42. This chart may be called up to the screen by executing ESC o 0. The displayed codes are HEX codes which have the following significance. The ADM 42 personality has the capability to allow certain terminal characteristics to be altered.

a. HEX code 00 means NULL or NO-OP.

b. The HEX codes for Bytes No. 0 thru No. 8 define the actual ASCII characters used in the applicable operation.

c. The HEX codes for Bytes No. 9 and No. A have special significance for RTS ON Delay and RTS OFF Delay control operations as described in the paragraphs which follow.

d. The HEX codes for Bytes No. B thru No. F and No. 10 and No. 11 have hexidecimal values which are defined during the following discussion of Dynamic Personality Change Codes.

4.9.2 Dynamic Personality Change Codes

Dynamic (temporary) personality modifications may be made by means of personality change operation codes. Dynamic modifications are reset during power-up of the ADM 42. The operation codes are escape sequences having the following structure:

```
ESC .
  or
 ESC.,        SELECTED      PERSONALITY
  └─┬─┘        Byte 0-F         BYTE
             └────┬────┘
Personality Entry              HEX code of new ASCII
    Code             ┌──────   character, or HEXa-
                     │         decimal value which sets
One digit 0 thru F selects     to "1" the appropriate
appropriate personality ──┘    operation bits X0 thru X7.
to be changed.
```

4.9.2.1 Modification of Escape Lead-In Character

As shown in figure 4-6, the standard or default Escape Lead-In Character is ESC (HEX 1B). Personality Byte 0 (ESC . 0) can modify the lead-in sequence to replace the normal ESC code with another ASCII character, which then would be used as an escape sequence lead in. SHIFT ESC then may also be used to execute an escape sequence from the keyboard.

4.9.2.2 Modification of End Block Character(s)

Figure 4-6 shows that the standard 1st End Block (transmission terminator) character is CR (HEX 0D), and the 2nd End Block character is NUL (HEX 00). Personality Byte 1 (ESC . 1) is used to modify the 1st terminator, and Byte 2 (ESC . 2) is used to modify the 2nd terminator. These characters are transmitted at the end of all Block Mode transmissions.

4.9.2.3 Modification of New Line Character(s)

Figure 4-6 shows that the standard 1st New Line character is US (HEX 1F) and the standard 2nd End Block character is NUL (HEX 00). Personality Byte 3 (ESC . 3) is used to modify the 1st New Line character, and Byte 4 (ESC . 4) is used to modify the 2nd New Line character. Example - It is desired to transmit LF and CR instead of the standard US character: execute: ESC . 3 0A, followed by ESC . 4 0D.
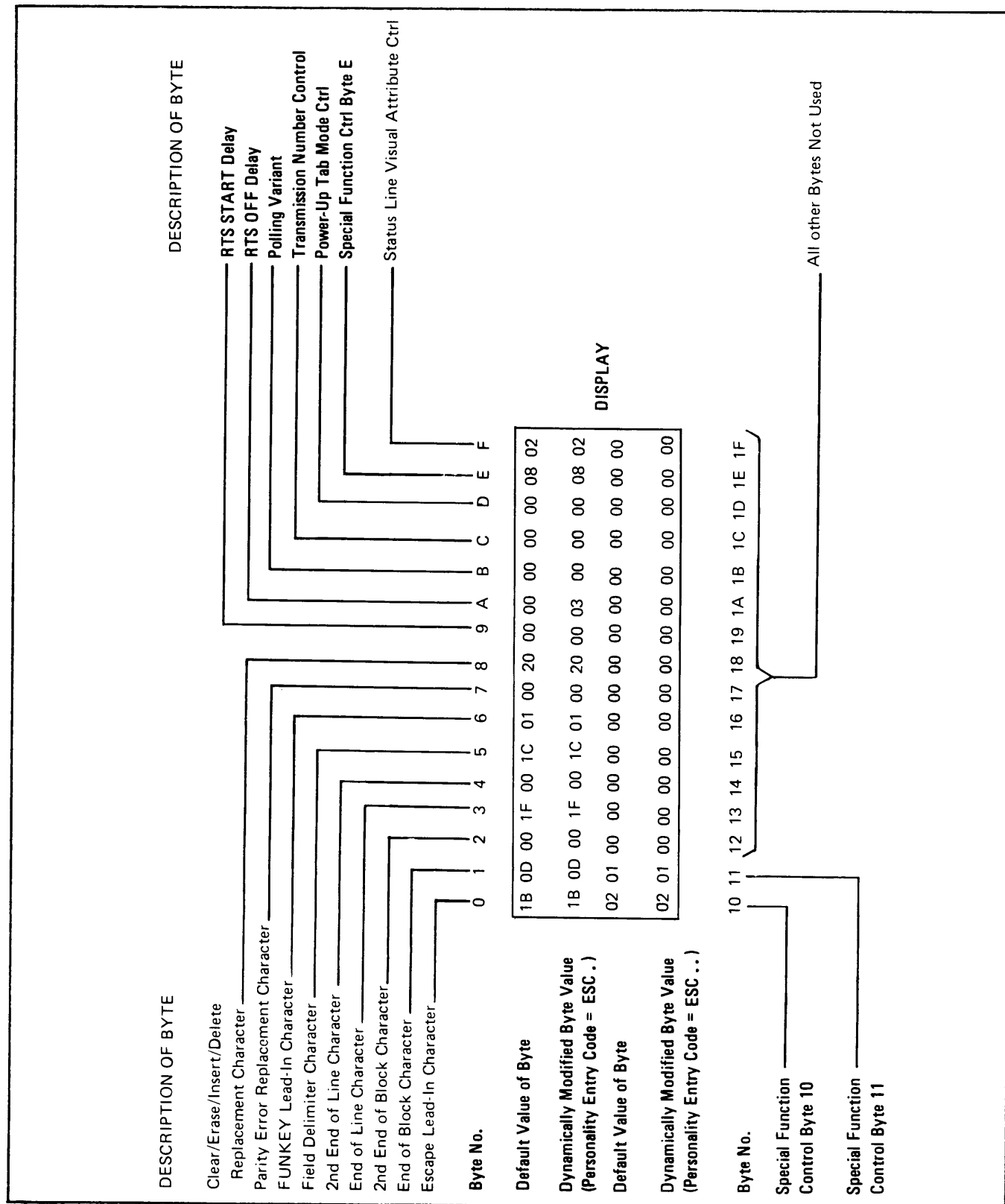
DESCRIPTION OF BYTE

Clear/Erase/Insert/Delete
Replacement Character
Parity Error Replacement Character
FUNKEY Lead-In Character
Field Delimiter Character
2nd End of Line Character
End of Line Character
2nd End of Block Character
End of Block Character
Escape Lead-In Character

DESCRIPTION OF BYTE

RTS START Delay
RTS OFF Delay
Polling Variant
Transmission Number Control
Power-Up Tab Mode Ctrl
Special Function Ctrl Byte E
Status Line Visual Attribute Ctrl

DISPLAY

Byte No.	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Default Value of Byte	1B	0D	00	1F	00	1C	01	00	20	00	00	00	00	00	08	02
Dynamically Modified Byte Value (Personality Entry Code = ESC .)	1B	0D	00	1F	00	1C	01	00	20	00	03	00	00	00	08	02
Default Value of Byte	02	01	00	00	00	00	00	00	00	00	00	00	00	00	00	00
Dynamically Modified Byte Value (Personality Entry Code = ESC ..)	02	01	00	00	00	00	00	00	00	00	00	00	00	00	00	00

Byte No.	10	11	12	13	14	15	16	17	18	19	1A	1B	1C	1D	1E	1F

Special Function Control Byte 10

Special Function Control Byte 11

All other Bytes Not Used

Figure 4-6.   Display of Standard Personality Byte Values

Table 4-9. Dynamic Baud Rate Control Operation Codes

DESIRED BAUD RATE	MODEM PORT	PRINTER PORT	EQUIVALENT BAUD RATE SWITCH POSITION
50	ESC ¦ @	ESC ¦ `	0
75	ESC ¦ A	ESC ¦ a	1
110	ESC ¦ B	ESC ¦ b	2
134.5	ESC ¦ C	ESC ¦ c	3
150	ESC ¦ D	ESC ¦ d	4
300	ESC ¦ E	ESC ¦ e	5
600	ESC ¦ F	ESC ¦ f	6
1200*	ESC ¦ G	ESC ¦ g	7
1800	ESC ¦ H	ESC ¦ h	8
2000	ESC ¦ I	ESC ¦ i	9
2400	ESC ¦ J	ESC ¦ j	10
3600	ESC ¦ K	ESC ¦ k	11
4800	ESC ¦ L	ESC ¦ l	12
7200	ESC ¦ M	ESC ¦ m	13
9600**	ESC ¦ N	ESC ¦ n	14

* Standard (default) baud rate for PRINTER port
** Standard (default) baud rate for MODEM port

4.9.2.4 Modification of Field Separator Character

Figure 4-6 shows that the standard Field Separator character is FS (HEX 1C). Personality Byte 5 (ESC . 5) is used to modify this character. Field separators are usually employed when **Protect Mode** is set to delimit protected fields. **Example** - To change the Field Separator character from FS to EM, execute: **ESC . 5 19.**

4.9.2.5 Modification of FUNKEY Lead-In Character

Figure 4-6 shows that the standard FUNKEY Lead-In character for unprogrammed function keys F1 thru F16 , without or with SHIFT , is SOH (HEX 01). Personality Byte 6 (ESC . 6) is used to modify this character. **Example** - To change the SOH character to the STX character, execute: **ESC . 6 02.**

Table 4-10. Print Transmission Control Operations

OPERATION	HOW TO EXECUTE		DESCRIPTION
	FROM HOST	KEYBOARD	
Print Page Formatted	ESC P	PRINT	Sends all data on page, up to cursor position to be transmitted in Page Format Mode (refer to paragraph 3.6). If Auto Page is set, print data on all pages up to cursor position, is sent.
Print Page Unformatted	ESC p	SHIFT PRINT	Sends all data on page, from cursor to EM code or end of page, in Unformatted Page Mode (refer to paragraph 3.6). If Auto Page is set, print data on all pages is sent. Space and null codes are transmitted along with all trailing spaces.
Print Protected Data as Spaces	ESC @	ESC @	Unprotected data is sent, with protected data sent as spaces. Nulls or trailing spaces are not transmitted and attribute codes are transmitted as spaces. If Auto Page is set, print data on all pages, up to cursor position, is sent.
Copy Print Without Display	Set: ESC A 1 Reset: DC4	ESC A 1	Data is read into print buffer (last page) at terminal baud rate and transmitted at printer baud rate in Unformatted Print Mode (refer to paragraph 3.6). Meanwhile, normal ADM 42 operations continue on other pages. Data is lost if buffer overflows.
Copy Print With Display	Set: ESC A 2 Reset: DC4	ESC A 2	Data is read into print buffer (last page) and displayed on current page(s) at terminal baud rate; transmitted at printer baud rate in Unformatted Print Mode (refer to paragraph 3.6). Data is lost if buffer overflows.
Unbuffered Print Page Format	ESC [0 P	ESC [0 P	All data on page is transmitted to printer, just as displayed on screen.
Unbuffered Print Protected Data as Spaces	ESC [0 @	ESC [0 @	All unprotected data on page is transmitted to printer, with protected data sent as spaces. Trailing spaces or nulls are not transmitted, and attribute control codes are transmitted as spaces
Buffered Print Page Format	ESC [2 P	ESC [2 P	**Print buffer (last page of display memory) enabled. Data in page format is transferred to print buffer, then from the buffer to printer at printer baud rate.**

Table 4-10.   Print Transmission Control Operations (cont'd)

OPERATION	HOW TO EXECUTE		DESCRIPTION
	FROM HOST	KEYBOARD	
Buffered Print Protected Data as Spaces	ESC [2 @	ESC [2 @	Print buffer enabled. All unprotected data on page is transferred to print buffer with protected data sent as spaces. Trailing spaces or nulls are not transferred, and attribute control codes are sent as spaces. Contents of buffer are then transmitted to printer at printer baud rate.
Unbuffered Print Unformatted Data	ESC [0 p	ESC [0 p	All data on page, from cursor to EM code or end of page is transmitted unformatted, in one continuous stream. Line control codes and internal ADM 42 delay codes are omitted. SPACE and NULL codes are transmitted, along with trailing spaces.
Buffered Print Unformatted Data	ESC [2 p	ESC] 2 p	Print buffer enabled. All data on page, from cursor to EM code or end of page is transferred unformatted, in one continuous stream to print buffer. Line control codes and internal ADM 42 delay codes are omitted. SPACE and NULL codes are transmitted, along with all trailing spaces. Contents of buffer are then transmitted to printer at printer baud rate.
Release Print Buffer	ESC A 0	ESC A 0	Print buffer is released but only after buffer is emptied and mode is reset.

4.9.2.6 Modification of Parity Error Replacement Character

As shown in **figure 4-6**, the standard parity error replacement character (the character written on the screen when the **ADM 42** senses a parity error). Thus, whatever is received in a message is displayed. Personality Byte 7 (**ESC . 7**) is used to modify this character. **Example** - To change the replacement character to NAK, execute: **ESC . 7 95**. Upon receipt of parity error, a NAK is displayed as a replacement character and PARITY is displayed in Status Line 25, if Bit X_7 of Personality Byte 7 is set.

4.9.2.7 Modification of Clear/Erase/ Insert/Delete Replacement

As shown in **figure 4-6** the standard Clear/Erase/Insert/Delete replacement character is SPACE (HEX 20). Personality Byte 8 (**ESC . 8**) is used to modify this character. (Operation bits X_6 and X_7 of Personality Byte 10 modify the use of this character.) **Example** - To change the Clear/Erase/Insert/Delete character to NUL, execute: **ESC . 8 00**.

4.9.2.8 RTS START Delay Control

The time delay in milliseconds from when Request To Send (RTS) goes high and the actual start of transmission (CTS) during a **Block Mode** transmission is the RTS START Delay time. Personality Byte 9 (ESC . 9) is used to establish a different time delay than that inherent in the terminal. HEX 00 (see **figure 4-6**) means no change in the inherent value. Any other HEX code, when converted to a decimal value, would express 1/2 the desired delay time in milliseconds. **Example** - To establish an RTS START Delay time of 115 milliseconds; execute: **ESC .9 3A.** (HEX 3A=Decimal 58.)

4.9.2.9 RTS OFF Delay Control

The time delay, in milliseconds, from the end of transmission until RTS is turned OFF (RTS goes low), during **Block Mode** transmission, is the RTS OFF Delay time. Personality Byte A (ESC.A) is used to establish a different RTS OFF Delay time than that automatically established under firmware control (proportional to baud rate). Any other value desired should be established in accordance with the RTS OFF Delay times recommended by the chart in **figure 4-7.** **Example** - To establish an RTS OFF Delay time of 9 milliseconds (approximately 2x the number of interrupts required at 1800 baud,) execute: **ESC . A 05.**

4.9.2.10 Polling Option Variant Control

Personality Byte B (ESC . B) controls the optional Polling Option variables listed in **table 4-11.** Each operation is either set to ON or OFF depending upon the logical condition (1 = ON; 0 = OFF) of the operation bit controlling that operation. The HEX code of this byte (ESC . B) is the HEXadecimal value of all the operation bits X_0 thru X_7 which must be set to ON at the same time. (Refer to **table 4-11**). **Example** - To establish a Polling operation in which: a) headers are required; b) any key may be used to establish Local Mode; and c) FAST SELECT is conditional, other polling operations are standard. Operation bits $X_2 X_1 X_0$ must be set; execute **ESC . B 0 7.**

Note

For detailed information on Polling and Addressing, refer to Section V of this manual.

4.9.2.11 Polling Transmission Number Limit Control

The transmission number is the number of Polling transmissions that will be counted before recycling the count. This number is imbedded in the Polling header (refer to **Section V**) when operation bit X_0 of Personality Byte B (**table 4-11**) is set to ON. Personality Byte C (ESC . C) controls the transmission number limit. The default value (00) of this byte (see **figure 4-6**) specifies that the transmission number will not be sent. Other transmission number limits may be established as follows:

- **ESC . C 01** specifies transmission number alternating between 01 and 00.

- **ESC . C 02** thru **ESC . C 09** counts transmission number 02 thru 09 before recycling.

4.9.2.12 Power-Up Tab Mode Control (See figure 4-6.)

Power-Up Tab Mode Control Byte D (ESC . D) establishes whether or not **Modulo Tab Mode** is automatically set at power-up. Operation bits X_0 thru X_6 of this byte are set to ON to express an ASCII character which determines the modulo tabbing interval, in accordance with the ASCII vs. modulo values in **figure 2-4.** When bits X_0 thru X_6 are all OFF, **Modulo Tab Mode** is not set at power-up; modulo tabs can be set only by executing **ESC 3 (ASCII)**, as described in **paragraph 4.5.3.3. Modulo Tab Mode** (and **Typewriter Tab Mode**) are reset by **ESC 3 Space.**

Bit X_7 of byte D is used as specified in **table 4-12** to control whether **Modulo** tabs or **Protect Mode** tabs may be reset by the **Clear All (ESC * and ESC +)** commands.

Table 4-11. Polling Option Variant Byte B Operations

OPERATION		ESC . B (BYTE)	DESCRIPTION	STD (DEFAULT) BIT CONDITION
BIT	TITLE			
X_7	Reserved	80	Reserved	
X_6	Communications Buffer Control	40	ON= Polling Communications Buffer (last two pages) is reserved (DIP Switch S4-SW8 ON). Incoming data held in buffer until message is completed. If no errors, message goes to screen. OFF= Polling Communications Buffer disabled; incoming data goes directly to screen.	OFF
X_5	Addressable Print Buffer Control	20	ON = Addressable Print Buffer (last page display memory) enabled (see Section V). OFF= Addressable Print Buffer disabled.	OFF
X_4	Transmit Last Character	10	ON = Transmission of last character (under cursor) is inhibited. OFF= Last character (under cursor) is transmitted.	OFF
X_3	Return to Local/ Idle State	08	ON = Terminal automatically returns to Local State upon completion of Polling message. OFF= Terminal automatically returns to Idle State upon completion of Polling message.	OFF
X_2	FAST SELECT Control	04	ON = FAST SELECT is conditional; terminal must be in Idle State to receive data. OFF= FAST SELECT is unconditional; terminal is commanded to Idle State and must respond.	OFF
X_1	Local Mode Control	02	ON = Any key may be used to establish Local State. OFF= CONV required to establish Local State (Compose Mode).	OFF
X_0	Headers Required	01	ON = Headers are required in all communications. OFF= Headers are not required.	OFF

RECOMMENDED RTS OFF DELAY TIMES

RTS DELAY (MILLISECONDS)	BAUD RATE	OPERATION CODE	RTS DELAY (MILLISECONDS)	BAUD RATE	OPERATION CODE
343	50	ESC . A AC	9	1800	ESC . A 05
229	75	ESC . A 73	9	2000	ESC . A 05
175	110	ESC . A 58	7	2400	ESC . A 04
127	134.5	ESC . A 40	7	3600	ESC . A 04
115	150	ESC . A 3A	5	4800	ESC . A 03
57	300	ESC . A 1D	5	7200	ESC . A 03
29	600	ESC . A 0F	5	9600	ESC . A 03
15	1200	ESC . A 08			

Figure 4-7.   Chart of Recommended RTS OFF Delay Times

Table 4-12.   Power-Up Default Modulus Tabs Byte D

OPERATION BIT	OPERATION TITLE	ESC . D (BYTE)	DESCRIPTION	STD (DEFAULT) BIT CONDITION
X_7	Typewriter Tab Clear	80	ON = Clear all typewriter tabs with Clear All (ESC * and ESC +) commands. OFF= Only Protect Mode tabs cleared by Clear All command. Typewriter Tabs and Modulo Tabs are cleared in normal manner.	OFF
X_6	Power-Up Tab Mode	40	Bits ON or OFF as required to define the ASCII character selected which may be used at Power-Up time to initialize Modulo Tab Mode, without executing ESC 3. Nominally, character utilized is the same used when the sequence ESC 3 is used.	ALL OFF
X_5		20		
X_4		10		
X_3		08		
X_2		04		
X_1		02		
X_0		01		

4.9.2.13 Special Function Control Byte E (See Figure 4-6)

Several miscellaneous operations are controlled by Personality Control Byte E, as shown in table 4-13. The HEX value of this byte determines which operations are set to ON. The default value of this byte (08) specifies that video is not automatically turned off after approximately 20 minutes of no change in the display. Example - Execute ESC . E 89 to set operation bits $X_7X_3X_0$ which specify: a) personality changes from the keyboard are inhibited; b) automatic video off is inhibited; and c) programming of function keys and display of FUNKEY messages are inhibited. Other default operations are not affected.

4.9.2.14 Status Line Attribute Control Byte F

The personality byte (Byte F) controls the visual attribute of the message in Status Line 25, as shown in table 4-14. The HEX value of the byte determines which operation bits are set to ON. Also, operation bit X_0 is further controlled by DIP switch S6-SW3 at location 14M, which defines whether the Status Line field will be underlined (SW3 ON) or blanked (SW3 OFF). The default value of this byte is 02 (see figure 4-6) which specifies that the 25th Line message will be blinking when entered. Example - Execute ESC . F 07 to set operation bits $X_2X_1X_0$ and specify that the Status Line entry shall be reversed, blinking and underlined (SW3 set to ON position).

4.9.2.15 Special Function Control Byte 10

Several miscellaneous operations are controlled by Personality Byte 10, as shown in table 4-15. The HEX value of the personality byte determines which operations are set to ON. The default value of this byte is 02 (see figure 4-6) which specifies that the Erase Page operation when used, will terminate Write Protect (WPRT). Example - Execute ESC .. 0 62 to set operation bits $X_6X_5X_1$ which specify: a) for Clear operations, the replacement character is as specified in Personality Control Byte 8. The Erase Line, Scrolling, New Line, and Erase to Spaces operations are normal; b) protected field delimiter, FS, is imbedded after an unprotected field; and c)

Erase Page operation terminates Write Protect.

4.9.2.16 Special Function Control Byte 11

Several power-up conditions are controlled by Personality Byte 11, as shown in table 4-16. The HEX value of the byte determines which operations are set to ON. The default value of this byte is 01 (see figure 4-6) which specifies that CAP LOCK is set when power-up is complete.

4.10 VIDEO ATTRIBUTE CONTROL OPERATIONS

Video attributes highlight or otherwise call attention to selected portions of the display. The underlining or blanking video is selected by means of DIP switch S6-SW3 at location 14M.

4.10.1 Cursor and Video Control

The sequence for modifying the cursor and video is ESC ~ (ASCII), where (ASCII) defines the modification. The modification applies to every display page and remains in effect until the terminal is RESET or is further modified by an ESC ~ operation code. The cursor and video modification operation codes are as follows:

- ESC ~ 0 Video OFF (data entered is retained)
- ESC ~ 1 Video ON; cursor OFF
- ESC ~ 2 Video ON; cursor steady
- ESC ~ 3 Video ON; cursor blinking

4.10.2 Displayable Character Video

The video attributes for displayable characters (including displayed control codes) may be modified by ESC G (0 thru F), where (0 thru F)

Table 4-13. Special Function Control Byte E Operations

OPERATION		ESC . E (BYTE)	DESCRIPTION	STD (DEFAULT) BIT CONDITION
BIT	TITLE			
X_7	Keyboard Personality Changes	80	ON = Inhibit personality changes from the keyboard. OFF= Personality changes from keyboard are accepted.	OFF
X_6	Line Erase With CR	40	ON = CR erases remainder of current line before executing normal CR operation. OFF= Normal CR operation.	OFF
X_5	New Line With CR	20	ON = Executing CR also executes New Line. OFF= Normal CR operation.	OFF
X_4	Auto Line Wrap	10	ON = Auto Line Wrap is inhibited. Operator must use CR , NL , etc. to get to next line. OFF= Auto Line Wrap - New Line automatically executed when position 80 is filled.	OFF
X_3	Auto Video Shut Off	08	ON = CRT video not shut off after approximately 20 minutes of no display activity. OFF= CRT video automatically shut off after approximately 20 minutes of no display activity.	ON
X_2	Pseudo Send	04	ON = [PRINT] sends SOH P CR [SHIFT] [PRINT] sends SOH p CR [SEND LINE] sends SOH Q CR [SHIFT] [SEND LINE] sends SOH q CR [SEND PAGE] sends SOH R CR [SHIFT] [SEND LINE] sends SOH r CR [SEND MSG] sends SOH S CR [SHIFT] [SEND MSG] sends SOH s CR OFF= Disables mode; normal SEND or PRINT operations	OFF

Table 4-13. Special Function Control Byte E Operations (cont'd)

OPERATION		ESC . E (BYTE)	DESCRIPTION	STD (DEFAULT) BIT CONDITION
BIT	TITLE			
X_1	Load Cursor Skip	02	ON = Cursor skips out of protected field if position is specified during a Load Cursor operation. OFF= Cursor remains in protected field if position is specified during a Load Cursor operation.	OFF
X_0	FUNKEY Programming/ Display	01	ON = Inhibit programming of function keys and display of FUNKEY messages. OFF= Normal FUNKEY operations.	OFF

Table 4-14. Status Line Visual Attribute Control Byte F Operations

OPERATION		ESC . . F (BYTE)	DESCRIPTION	STD (DEFAULT) BIT CONDITION
BIT	TITLE			
X_7	Reserved	80	Reserved	OFF
X_6		40		
X_5		20		
X_4		10		
X_3		08		
X_2	Reversing Control	04	ON = Status Line message reversed. OFF= Status Line message in normal or personality video.	OFF
X_1	Blinking Control	02	ON = Status Line message blinking. OFF= Status Line message in normal or personality video.	ON
X_0	Underlining or Blanking Control	01	ON = Status Line message underlined (S6-SW3 @ 14M set to ON) or blanked (S6-SW3 at OFF). OFF= Status Line message in normal or personality video.	OFF

Table 4-15. Special Function Control Byte 10 Operations

OPERATION		ESC . . 0 (BYTE)	DESCRIPTION	STD (DEFAULT) BIT CONDITION
BIT	TITLE			
X_7	Erase to Spaces Replacement Character	80	ON = Erase to Spaces operation uses replacement character specified by Personality Byte 8. OFF= Normal Erase to Spaces operation.	OFF
X_6	Clear to Spaces Replacement Character	40	ON = Clear to Spaces operation uses replacement character specified by Personality Byte 8. OFF= Normal Clear to Spaces operation.	OFF
X_5	FS vs. Protected Field Control	20	ON = Protected field delimiter, FS, is imbedded after unprotected field. OFF= Protected field delimiter, FS, is imbedded before unprotected field.	OFF
X_4	Transmit NL Control	10	ON = Inhibit transmission of 1st and 2nd New Line characters (Personality Bytes 3 and 4) OFF= Normal transmission of 1st and 2nd New Line characters.	OFF
X_3	Scrolling Control	08	ON = Scrolling of an unprotected page is inhibited. OFF= Normal Scrolling operation.	OFF
X_2	Reserved	04	Reserved	OFF
X_1	Erase Page vs. **Write Protect**	02	ON = Erase Page operation resets Write Protect Mode. OFF= Normal Erase Page operation.	ON
X_0	Erase Line vs. Write Protect	01	ON = Erase Line operation resets Write Protect Mode (WPRT). OFF= Normal Erase Line operation.	OFF

DP210

Table 4-16. Special Function Control Byte 11 Operations

OPERATION		ESC . . 1		STD (DEFAULT)
BIT	TITLE	(BYTE)	DESCRIPTION	BIT CONDITION
X_7	Reserved	80	Reserved	ALL OFF
X_6		40		
X_5		20		
X_4		10		
X_3		08		
X_2	Power-Up Conv Mode Control	04	ON = Conversation Mode is set when power-up is completed. OFF= Block Mode is set when power-up is completed.	OFF
X_1	Reserved	02	Reserved	OFF
X_0	Power-Up CAP LOCK Control	01	ON = CAP LOCK is set when power-up is completed. OFF= CAP LOCK is not set when power-up is completed.	ON

defines the attribute. (Refer to **table 4-17.**) The attributes apply to the area bracketed by the operation code, or to the end of the current page (DIP switch S6-SW2 OFF) if a closing operation code is not entered. (DIP, switch S6-SW2 ON causes the attribute to be effective only to the end of the current line.) The operation is not changed if **Auto Page** is set.

Note

When the optional Line Drawing character generator is installed, the Standard Character Generator is also available for use.

4.10.3 ADM 42/ADM 2 Attribute Mode Control

Main logic board DIP switch S6-SW1 provides a means of selecting **ADM 42 Attribute Mode** (S6-

SW1 OFF) or **ADM 2 Attribute Mode** (S6-SW1 ON) for special control of the blanking and underlining attributes. **Table 4-18** lists the various operation codes required to select the attributes. If any of these special attributes is selected, the **Send Line All, Send Page All,** and **Send Message All** operations (**table 4-8**) are modified as follows:

- **ADM 42 Attribute Mode** - ESC G (*) is sent for the attribute code, where (*) is the appropriate ASCII from **table 4-17.**

- **ADM 2 Attribute Mode** - Between the ESC) and ESC (codes which bracket protected fields, BEL is sent for the BLINK delimiter, and CAN is sent for the BLANK (UNDERLINE) delimiter.

Note

When the ADM 2 Attribute Mode is set, the ADM 42 attributes are inhibited.

Table 4-17. Video Attribute Control Operation Codes

FUNCTION	STD CHAR. GENERATOR	ALT. CHAR. GENERATOR
Reset to Normal Video	ESC G 0	ESC G 0
Limited Graphics Mode Enable		ESC G 8
Blanking (S6-SW3 OFF) or Underlining (S6-SW3 ON) of area	ESC G 1 or ESC —	ESC G 9 or ESC —
Blinking of Area	ESC G 2 or ESC ∧	ESC G A or ESC ∧
Blanking (S6-SW3 OFF) or Underlining (S6-SW3 ON) and Blinking of Area	ESC G 3	ESC G B
Reversing of Area	ESC G 4	ESC G C
Blanking (S6-SW3 OFF) or Underlining (S6-SW3 ON) and Reversing of Area	ESC G 5	ESC G D
Blinking and Reversing of Area	ESC G 6	ESC G E
Blanking (S6-SW3 OFF) or Underlining (S6-SW3 ON) and Reversing of Area	ESC G 7	ESC G F

NOTE: The above operations apply when ADM 42 Attribute Mode is selected (S6-SW1 OFF).
If ADM 2 Attribute Mode is selected (S6-SW1 ON), the above operations are
inhibited; the attribute codes will be displayed but not acted upon.

Table 4-18. Operation Codes for ADM 42/ADM 2 Attribute Mode Control

FUNCTION	ADM 42 MODE	ADM 2 MODE
Blanking for entire page	ESC G (Space)	ESC G !
Blanking to end of line	ESC G "	ESC G #
Underlining for entire page	ESC G $	ESC G %
Underlining to end of line	ESC G &	ESC G '

SECTION V
POLLING AND ADDRESSING

5.1   ADM 42 POLLING

When the Polling Option is installed in the **ADM 42**, the terminal may then act as a polling terminal in a multi-point communications network. Group Poll, Group Select, and Multi-Point Contention polling activities are also available. When active in a polling environment, the **ADM 42** is prevented from initiating transmission of traffic (data) except under the control of the network control center. All message transmission is between the network control center and the selected terminal or terminals; these messages, as well as control of the entire communications network, are controlled entirely by a polling/addressing dialogue initiated by the control center. Within the dialogue, the control center periodically asks or "polls" each device to see if any messages are waiting; if so, the device is commanded to transmit its message in a prescribed format. The control center may also send messages to a specified terminal or terminals at any time.

5.1.1 Setting ADM 42 Address

The **ADM 42** Polling Address is a two-character code (A_1A_2) which must be ASCII characters and not control characters. The terminal will recognize and respond to only the specified address. The address is preset by means to two banks of DIP switches (locations 5L and 6L) on the option board (see **figure 2-4**). Each switch in the bank represents one bit in the 7-bit address: SW1 OFF sets bit 0 (LSB) = 1; SW2 OFF sets bit 1 = 1; etc. SW8 (location 5L only) ON enables the polling option. SW8 ON at location 6L enables the Polling

Communications Buffer, which must be selected by setting bit X_6 of Personality Byte B. The preset switch settings establish the Polling Address for the **ADM 42**. This address may be displayed by executing **ESC ' A** from the keyboard.

5.1.2 Establishing Polling Operations

5.1.2.1 Setting Up Terminal

The information to be transmitted when the terminal is polled must be entered on the **ADM 42** display prior to being polled. Proceed as follows:

1. Type CONV MODE to lighted state, to enable data entry from the keyboard.

Note

This requirement may be modified by setting bit X_1 of Personality Byte B.

2. Enter the data just as it is to be transmitted. All editing and embedding of control characters must be done at this time.

3. Select and execute the appropriate activity to enable the **ADM 42** response to a POLL inquiry, as follows:

• SEND LINE , to cause the **ADM 42** to send all unprotected characters from the beginning of the line through the cursor position. To send protected as well as unprotected characters, type SHIFT | SEND LINE . This operation is the same as the forced **Send v** or **Send x** from the computer.

Note

Setting bit X₄ of Personality Byte B will inhibit transmission of the character position under the cursor.

- SEND PAGE , to cause the **ADM 42** to send all unprotected characters from the beginning of the page through the cursor position. To send protected, as well as unprotected characters, type SHIFT SEND PAGE . This operation is the same as the forced **Send w** or **Send y** from the computer.

Note

Setting bit X₄ of Personality Byte B will inhibit transmission of the character position under the cursor.

- SEND MSG , to cause the **ADM 42** to send all unprotected characters in the display bracketed by **STX** and **ETX** codes. If no **STX** is encountered, transmission will start at the HOME position; if no **ETX** is encountered, transmission will stop at the end of the page. To send protected, as well as unprotected characters, type SHIFT SEND MSG . This operation is the same as the forced **Send z** or **Send {** from the computer.

4. The terminal is now ready to transmit. It waits to be polled. (The **CONV MODE** light is out).

5.1.2.2 Monitor Mode Operation

The **ADM 42 may be set up for Monitor Mode** operation by executing **ESC ' M** from the keyboard. This operation causes all data (including line control data) on the RCVE line to be displayed, whether addressed to this terminal or not. This mode is usually employed as a troubleshooting activity. **Monitor Mode** is reset by executing SHIFT RESET from the keyboard or by an unconditional polling sequence from the host computer.

5.1.2.3 Enabling Keyboard

To enable the **ADM 42** keyboard for data entry, type CONV MODE to its lighted state. If this operation does not return the terminal to keyboard operation, type SHIFT RESET . The lighted CONV MODE key indicates when control has been returned to the keyboard. The computer can override local keyboard operation by executing FAST SELECT, or BROADCAST SELECT.

5.1.3 Removing Terminal from Polling Status

To set **Non-Polling Mode**, execute ESC R from the keyboard. The **ADM 42** will no longer respond as a polling terminal. To re-establish **Polling Mode**, execute ESC ' S from the keyboard. **Polling Mode** may also be disabled by setting option board DIP switch S3-SW8 @ 5L to OFF.

5.1.4 Initiating Standard Polling Sequence

All polling operations are initiated by the network control through a standard control sequence. This sequence consists of the following:

1. EOT Character (EOT).

2. **Two Address Characters (A₁A₂).** In order for the terminal to respond, these characters must match the two address characters established by option board DIP switches S3 @ 5L and S4 @ 6L.

3. **Function Code.** This code is an ASCII character, used to identify the operation to be performed by the terminal. It may be one of the following:

p POLL

q SELECT

r SEQUENTIAL SELECT

s FAST SELECT

t BROADCAST SELECT

v SEND LINE FOREGROUND

w SEND PAGE FOREGROUND

x SEND LINE ALL

y SEND PAGE ALL

z SEND MSG FOREGROUND

{ SEND MSG ALL

4. **ENQ Character (ENQ).** This character is present only when a POLL (p), SELECT (q), or SEND (v, w, x, y, z,{) operation is called for.

5.1.5 POLL Responses (See Figure 5-1)

The POLL sequence is initiated by the control center to inquiry the **ADM 42** whether there is data to be sent. When the **ADM 42** is sent the sequence "EOT A_1A_2p ENQ" the terminal will respond as follows:

1. If there is no message waiting to be sent (traffic), the terminal sends an EOT character to the control center and then returns to the Idle state.

2. If there is traffic, the terminal sends the message to the control center in accordance with how the message is prepared, the instructions in the Function Code and the personality of the terminal.

a. If the poll message is to be taken from the screen or a programmed FUNKEY, the terminal response is as follows:

- ***SOH Character (SOH).**

- ***Two Address Characters (A_1A_2).** These characters are the preset terminal address.

- ***Transmission Number (#).** This number may be inhibited by executing **ESC . C 00**, and thus not appear. If enabled, the maximum number of transmissions counted (re-transmissions are not counted) may be between 1 and 9, depending upon the value selected by Personality Byte C (**ESC . C**).

- **STX Character (STX).** This character identifies the beginning of the message to be transmitted.

- **Text.** This is the message which is written on the screen or stored under a FUNKEY. The message is sent in one of two formats, depending on whether or not **Protect Mode** is set, as follows:

1. **Protect Mode OFF.** All characters except NUL are sent. A US character is inserted in the string as the cursor moves from the end of one line to the beginning of the next.

2. **Protect Mode ON.** All foreground characters are sent; each protected field is designated by an **FS** character. A **US** character is transmitted as in 1 above.

3. If the Function Code is a **Send** code (v, w, x, y, z, or {) instead of "p" the terminal complies with the instruction as described under **Send Responses.**

- **ETX Character (ETX).** This character designates the end of the polled message.

- **LRC Character (LRC).** This character represents the modulo 2 sum of the text transmitted, plus the **ETX** character. It is used by the control center to determine whether or not the text was received correctly.

b. If the polling message is to be taken from an unprogrammed function key F1 thru F16

*Headers are not part of the standard **ADM 42** polling response. Header characters will be present only, if selected by setting bit X_0 of Personality Byte B.

CONTROL
CENTER

TERMINAL

EOT
A_1A_2
p
ENQ

(NO MESSAGE
WAITING)

(MESSAGE
WAITING)

EOT

'[SOH A_1A_2 (#)]
STX TEXT ETX
LRC

(DISCONNECT)

EOT   NAK   ACK

EOT

(DISCONNECT)

(NO. OF TRIES PROGRAMMED AT CENTER)

(DISCONNECT)

(RETURNS TO WAIT TO
BE POLLED STATUS)

'IF HEADER IS SELECTED
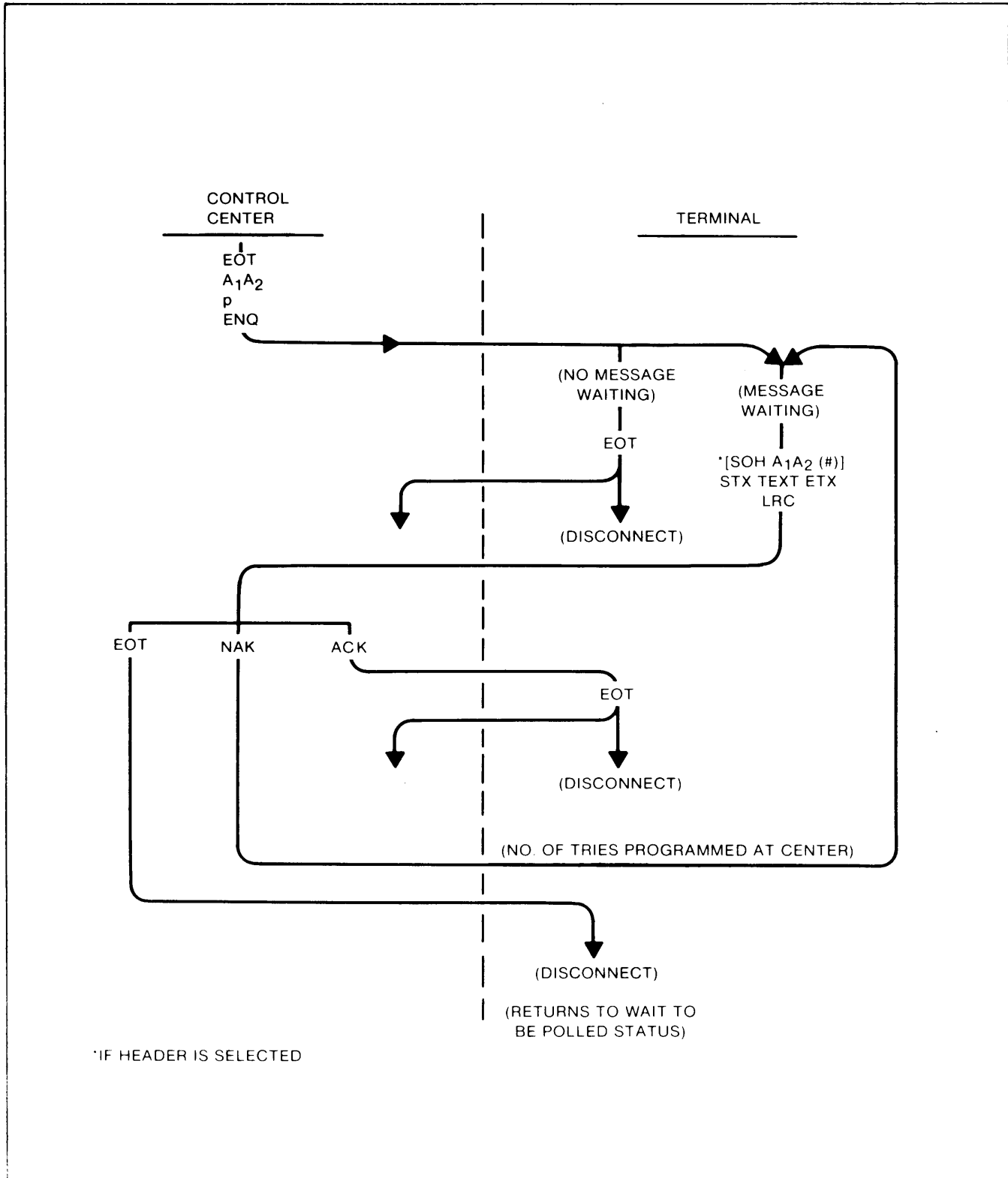
Figure 5-1.   POLL Function Dialogue, Flow Diagram

and headers are not selected, the terminal responds: "SOH (character) ETX LRC". Note that "SOH" replaces the normal STX character and the (character) is the assigned F1 thru F16 character.

c. If the polling message is to be taken from an unprogrammed function key F1 thru F16 and headers are selected, the terminal responds: "SOH A_1A_2 (#) STX DLE (character) ETX LRC". Note that DLE (or some character other than SOH, STX, EOT, ETX, or LRC) replaces the normal SOH character.

3. After the **ADM 42** has sent the **LRC** character, it positions the cursor at the original location and waits for the control center to acknowledge receipt of the message. The acknowledgement will consist of one of the following:

● **ACK.** The message was received correctly. The terminal respond by transmitting "EOT" and disconnecting.

● **NAK.** The message was received with errors. The terminal will respond by retransmitting the message (transmission number is not incremented) and again waiting for control center acknowledgement. The control center will determine how many transmissions will be called for.

● **EOT.** Retransmission is required. The terminal responds by positioning the cursor at the original location and awaiting polling.

5.1.6 SELECT Responses (See Figure 5-2)

The SELECT sequence is used when the control center wishes to send a message to a single addressed terminal. When the **ADM 42** is addressed by the sequence "EOT A_1A_2q ENQ" the terminal responds as follows:

1. If the terminal is BUSY, it sends a NAK character, beeps to alert the operator that a message is waiting, then disconnects. BUSY is defined as any of the following states:

● The terminal is waiting to be polled.

● The operator is entering data.

● The terminal is sending data to the printer.

2. If the terminal is not BUSY, it sends an **ACK** to the control center, and waits for the center to send "*[SOH A_1A_2(#)] STX TEXT ETX LRC". If there is an **EOT** in the message, the terminal will disconnect to **Idle** state.

3. After the selected hearder is received, the following events occur:

● If there are no errors, the **ADM 42** sends an **ACK** to the control center, then disconnects to the **Idle** state.

● If there are errors, the **ADM 42** sends a **NAK** character to the control center and awaits retransmission of the message.

● The control center may then retransmit the message, starting with the selected header. If the control center decides not to retransmit, it sends an **EOT** instead of the selected header; the **ADM 42** disconnects to the **Idle** state.

5.1.7 SEQUENTIAL SELECT Responses (See Figure 5-3)

The SEQUENTIAL SELECT operation is used to sequentially address a number of terminals with a single extended control message. The header sequence is "EOT A_1A_2r B_1B_2r...N_1N_2s". Note that the FAST SELECT (s) Function Code is sent to the last terminal addressed. This code is always

---

*Headers are not part of the standard ADM 42 polling response. Header characters will be present only, if selected by setting bit X_0 of Personality Byte B.

followed by "*[SOH N₁N₂(#)]STX TEXT ETX LRC." The following events take place:

1. All terminals except the last terminal (N₁N₂) test their BUSY status. If BUSY, each terminal will disconnect without responding.

2. Last terminal (N₁N₂) connects unconditionally and waits for an **STX** character. All addressed terminals which are not **BUSY** connect and wait for an **STX** character.

3. Following receipt of "...ETX LRC" all addressed terminals except last terminal (N₁N₂) disconnect without responding Terminal N₁N₂sends either an **ACK** or **NAK** to the control center, then disconnects to **Idle** or personality state. The control center decides whether or not to retransmit if **NAK** is returned.

5.1.8 FAST SELECT Responses (See Figure 5-4)

The FAST SELECT function is used when the control center requires fast, unconditional (see note) selection of a specific terminal. Upon receiving the header sequence (EOT N₁N₂ s), the terminal will unconditionally connect and wait for the message block. The terminal will not respond until after it has received the LRC character. the complete message block code is "*[SOH N₁N₂ (#)] STX Text ETX LRC". After receiving **LRC**, the terminal sends either **ACK** or **NAK** to the control center, then disconnects to **Idle** (or personality) state. The control center decides whether or not to transmit if **NAK** is returned.

Note

Setting bit X₂ of Personality Byte B will cause FAST SELECT to be conditional only if terminal is in Idle state.

5.1.9 BROADCAST SELECT Responses (See Figure 5-5)

The BROADCAST SELECT function is used when the control center requires fast, unconditional selection of a number of terminals. All terminals on the line receive the same message under the header sequence. When each terminal receives the sequence "EOT N₁N₂t" followed by "*[SOH N₁N₂(#)] STX Text ETX LRC" it will connect unconditionally, whether BUSY or not. Following receipt of the sequence, all terminals except the addressed terminal disconnect to the **Idle** (or personality) state without responding. The addressed terminal will send either **ACK** or **NAK** to the control center, then disconnect to the **Idle** (or personality) state. The control center decides whether or not to retransmit if **NAK** is returned.

5.1.10 SEND Responses (See Figure 5-6)

One of six characters specifies the information that the addressed terminal is to send. The function character (v, w, x, y, z, or ⟨) is transmitted in place of the "q" in the standard header. The six possible **Send** functions are as follows:

1. **Send Line Foreground (v).** The terminal will send all foreground unprotected data in the line in which the cursor rests from beginning of line to the cursor position. **NUL** characters are not transmitted. The terminal marks each protected area in the line by sending an **FS** character.

2. **Send Page Foreground (w).** The terminal will send all foreground data in the page, starting at the HOME location and ending at cursor position. **NUL** characters are not transmitted. The terminal marks each protected area in the page by sending an **FS** character. Each end of line is indicated by **US** character.

*Headers are not part of the standard **ADM 42** polling response. Header characters will be present only, if selected by setting bit X₀ of Personality Byte B.
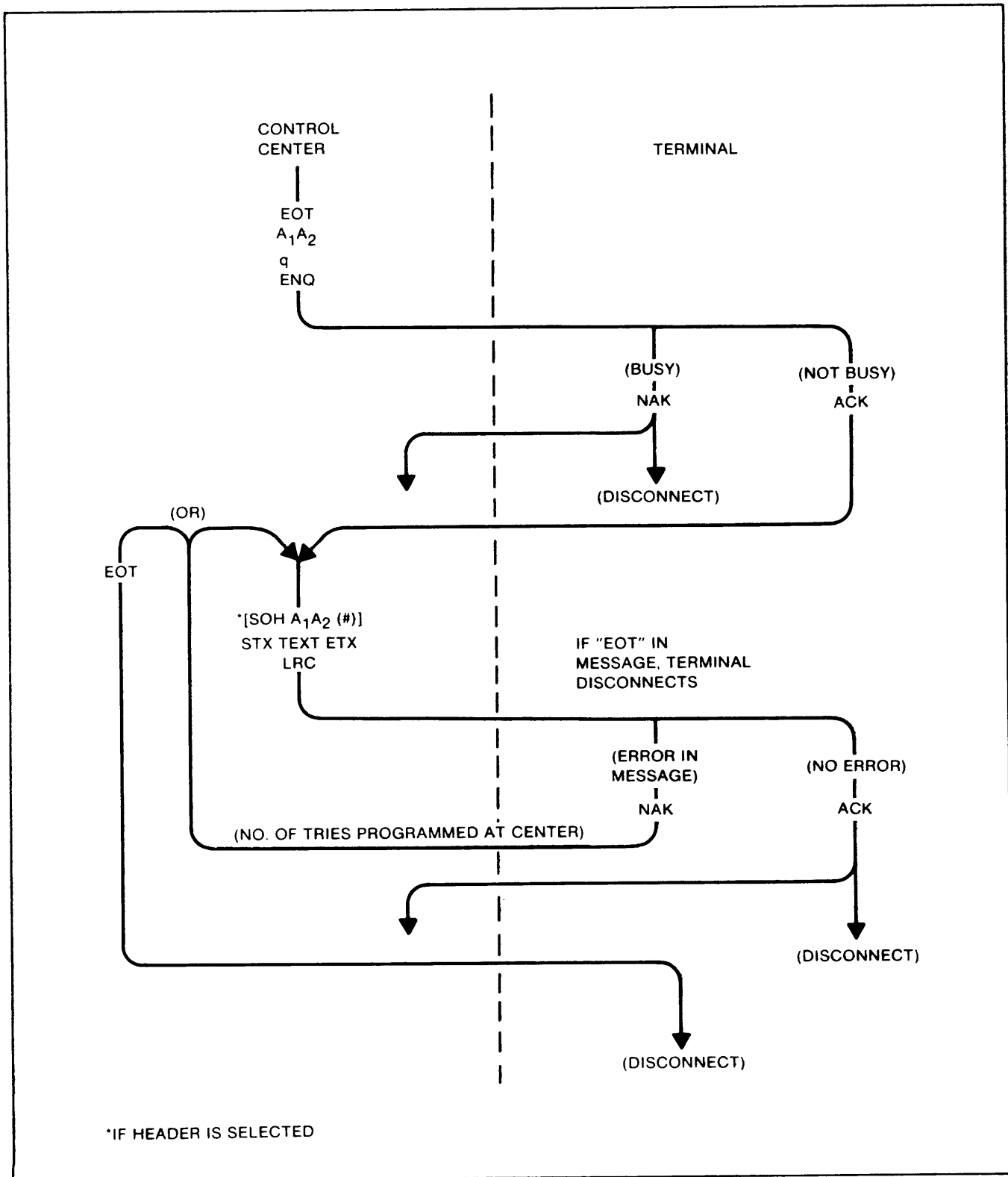
Figure 5-2. SELECT Function Dialogue, Flow Diagram
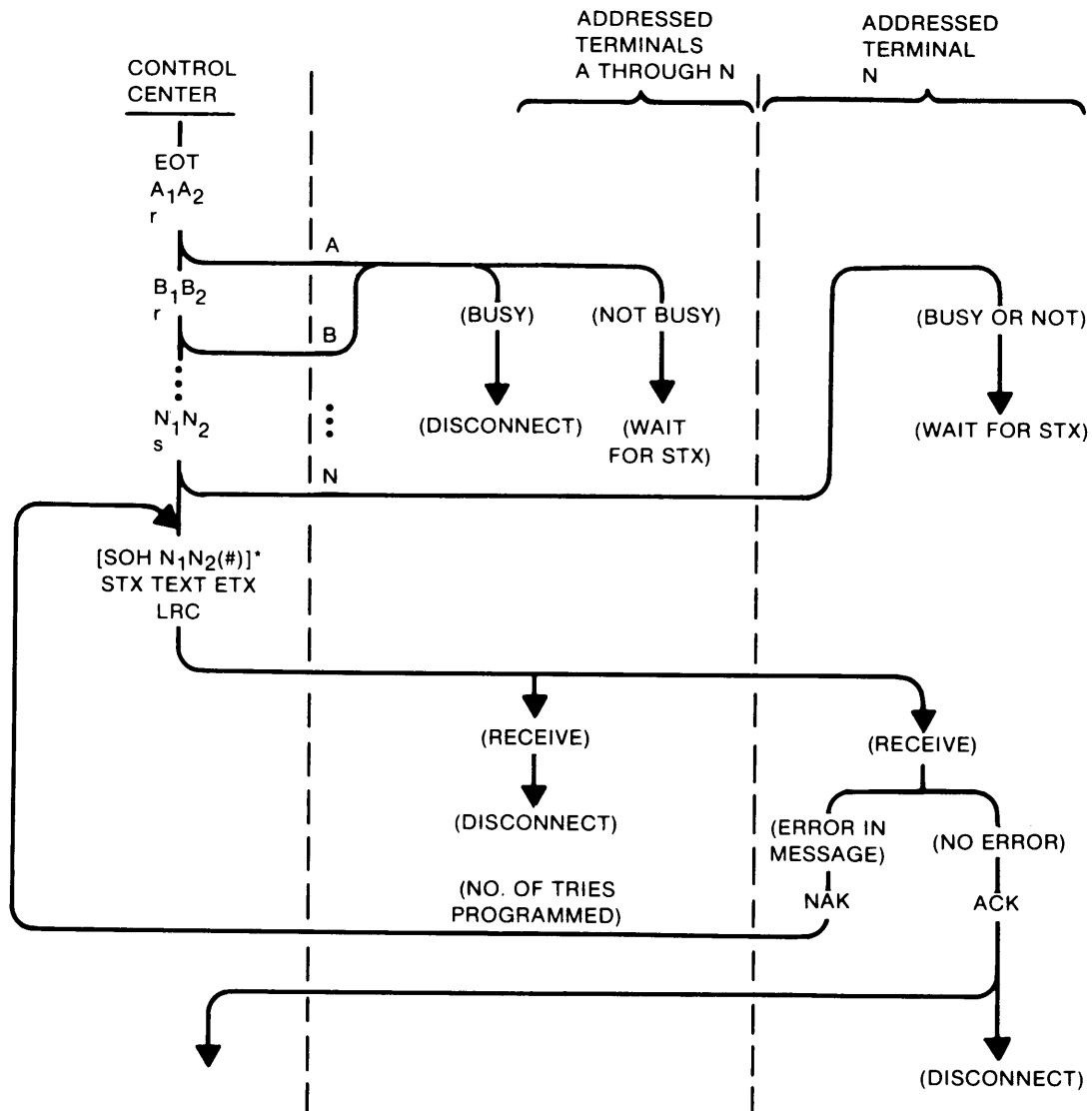
Figure 5-3. SEQUENTIAL SELECT Function Dialogue, Flow Diagram

CONTROL
CENTER

TERMINAL

EOT
N1N2
s

(BUSY OR
NOT)

(WAIT FOR STX)

[SOH N₁N₂(#)]*
STX TEXT ETX
LRC

(RECEIVE)

(ERROR IN
MESSAGE)

(NO ERROR)

NAK

ACK

(NO. OF TRIES PROGRAMMED)

(DISCONNECT)

*IF HEADER IS SELECTED
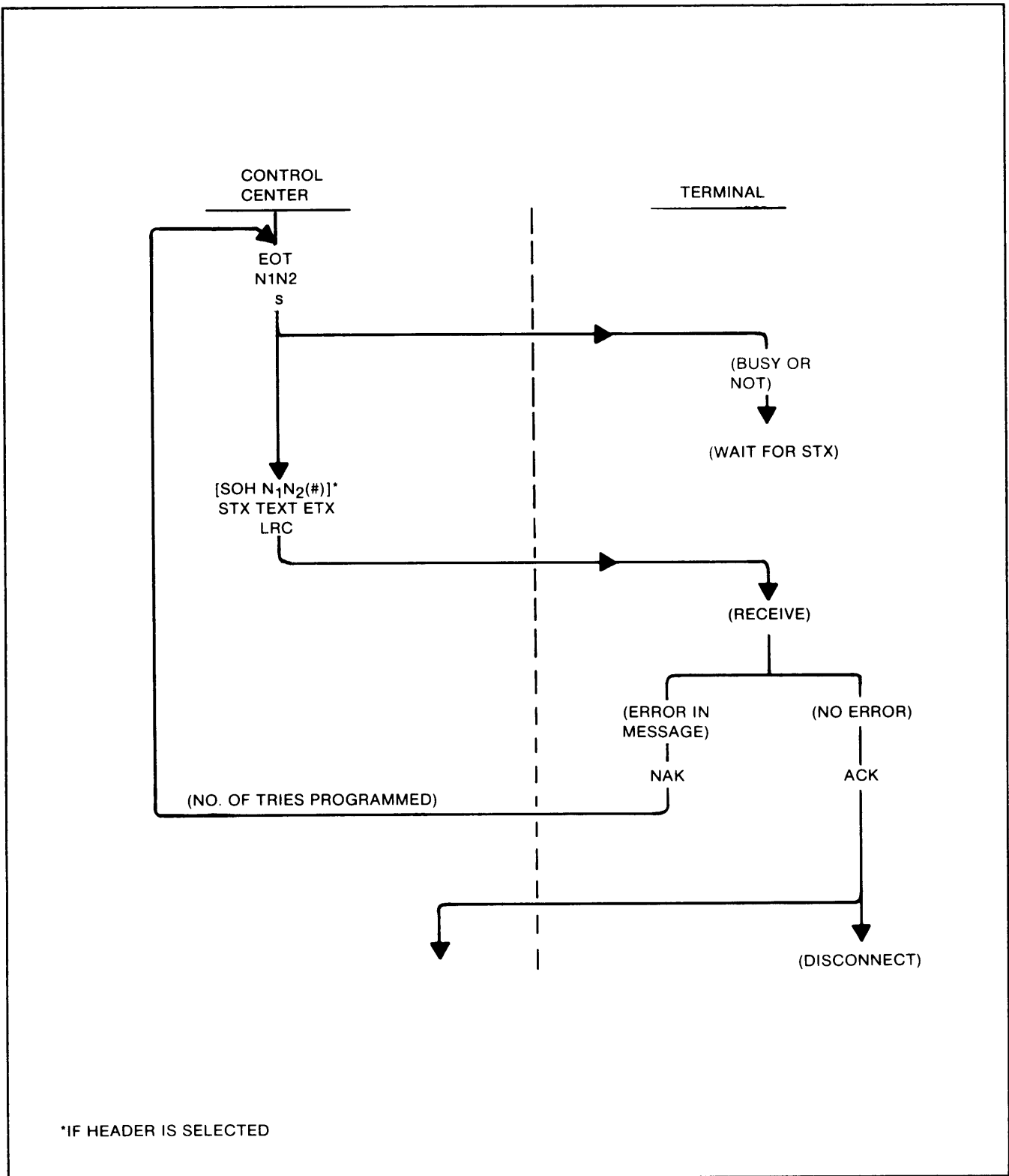
Figure 5-4. *FAST SELECT Function Dialogue, Flow Diagram*
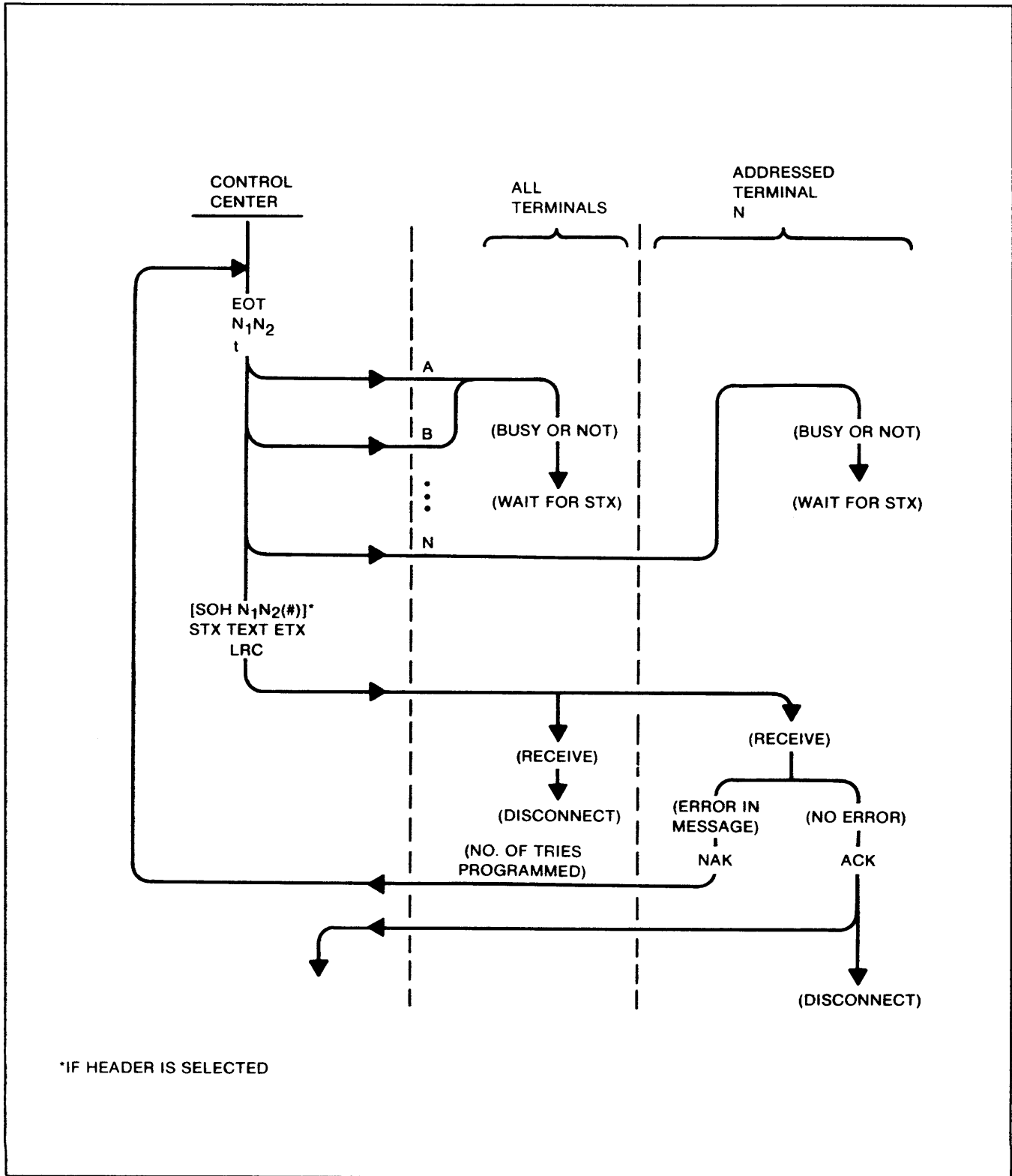
Figure 5-5.   BROADCAST SELECT Function Dialogue, Flow Diagram

CONTROL
CENTER   TERMINAL

EOT

A_1A_2 z, OR

v,w,x,y, {

ENQ

*[SOH A_1A_2 (#)]
STX TEXT EXT
LRC

EOT   NAK   ACX

EOT

(DISCONNECT)

(NO. OF TRIES PROGRAMMED)

(AWAITS POLLING)

*IF HEADER IS SELECTED
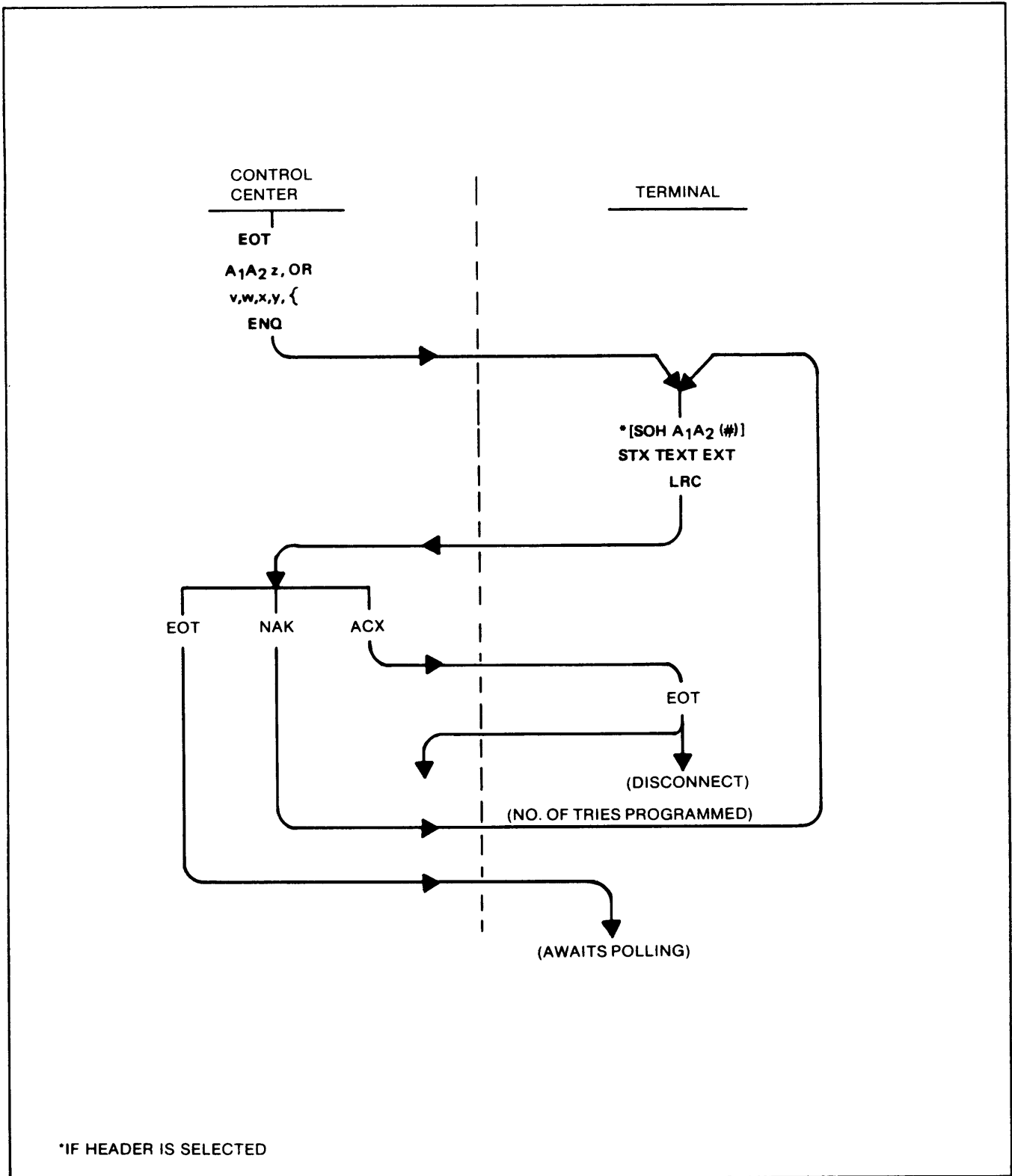
Figure 5-6.   SEND Function Dialogue, Flow Diagram

3. **Send Line All (x).** The terminal will send all data, protected and unprotected, in the line in which the cursor rests and stops at cursor. All characters are transmitted, with the operation code **ESC)** preceding the first character of a protected field, and the operation code **ESC (** following the last character of a protected field.

4. **Send Page All (y).** The terminal will send all data, protected and unprotected, in the page, beginning at the HOME location, stopping at cursor. All characters are transmitted, with the operation code **ESC)** preceding the first character of a protected field, and the operation code **ESC (** following the last character of a protected field.

5. **Send Message Foreground (z).** The terminal will send all foreground data following an **STX** code and ending with an **ETX** code. **NUL** characters are not transmitted. The terminal marks each protected area within the **STX/ETX** brackets by sending an **FS** character. If no **STX** is on the screen, transmission starts at HOME. If no **ETX** is on the screen, transmission stops at last position on the screen.

6. **Send Message All (⎰).** The terminal will send all data, protected and unprotected, between the **STX/ETX** codes. All characters are transmitted with the operation code **ESC)** preceding the first character of a protected field, and the operation code **ESC (** after the last character of a protected field. If no **STX** is on the screen, transmission starts at HOME. If no **ETX** is on the screen, transmission stops at the last position on the screen. (STX is written on the screen by typing SOM ; ETX is written by typing EOM .)

Control and operation codes may be imbedded in memory by preceding the control code by an ESC; i.e. ESC RETURN will cause CR character to be written to the screen rather than being interpreted as a **RETURN** operation.

5.2 SPECIAL POLLING OPERATIONS

The **ADM 42**, with the Polling Option installed, may perform in several special polling environments. These environments consists of GROUP POLL, GROUP SELECT, MULTI-POINT CONTENTION, and ADDRESSABLE PRINTER operation. The paragraphs which follow describe these operations in terms of their differences from standard polling operations.

5.2.1 GROUP POLL Operations

GROUP POLL is essentially the same as standard POLL operations, except that the GROUP POLL address is the same for each terminal. All terminals are daisychained via their EXTENSION/MODEM ports. Each terminal responds as would an individual terminal under **ADM 42 POLL**. The GROUP POLL address for each terminal on the line is set up using option board DIP switch banks S5 @ 8L and S6 @ 9L in the same manner as for **ADM 42 POLL** (using switches S3 @ 5L and S4 @ 6L). Typing **ESC ' A** from the keyboard will display all polling addresses.

Note

The GROUP POLL address should not be the same as the standard POLL address on any terminal in the group.

GROUP POLL is functional only when groups of terminals are concatenated (daisychained). Headers must be used. The following is a typical GROUP POLL operation; with three or more terminals on a line connected to a modem or data set:

1. First terminal receives GROUP POLL command; if it has data to transmit, it sends data to control center and waits for **ACK**. (If **NAK**, operations proceed as described for POLL Responses, **paragraph 5.1.5**.) When **ACK** is received, first terminal sends CTS to next terminal.

2. If first terminal has no data to send, it checks for **DTR** (Data Terminal Ready) high on EXTENSION port, which is connected to the MODEM port of the next terminal. Finding **DTR** high, it sends **CTS** to second terminal.

3. If second terminal has data, it sends data to the control center and waits for **ACK**. When **ACK** is received, it looks for **DTR** high on its EXTENSION port and sends **CTS** to the next terminal.

4. If second terminal has no data, it checks for **DTR** high on EXTENSION port and sends **CTS** to the next terminal.

5. Process is repeated until last terminal in line fails to find **DTR** high on its EXTENSION port; terminal sends **EOT** (End of Transmission) to the control center and disconnects.

Note

If no terminal in the chain has data to send only the last terminal will respond with an "EOT".

5.2.2 GROUP SELECT Operations

GROUP SELECT is essentially the same as BROADCAST SELECT operations, except that the GROUP SELECT address (G_a) is inserted in the header in place of the "t". The complete address thus becomes: "EOT N_1N_2 G_a SOH N_1N_2(#) STX TEXT ETX LRC". (G_a is an upper case alpha character, A to Z.) Also:

1. The GROUP SELECT address resides in option board DIP switch S7 @ **10L**.

2. Several groups may be selected by means of different terminal addresses. Every terminal in a group must be on the same line, but the line does not have physical limitations.

3. All terminals on line will connect unconditionally, with the addressed terminal responding as specified for BROADCAST SELECT.

5.2.3 MULTI-POINT CONTENTION Operations

MULTI-POINT CONTENTION is a polling mode which is selectable only by the control center, using the following control characters: "EOT NUL NUL BEL". In this mode, the control center CPU notifies all terminals on the line that the CPU will not poll until it has a message to be sent or until a polling terminal signifies that it has a message for .the CPU. Terminal sends "EOT A_1A_2 p ENQ" to notify the CPU it has a message to send.

5.2.4 Addressable Printer Port Operations

The Addressable Printer Port operations are used to permit the **ADM 42** to receive CPU output messages at the selected transmission rate, store the message, and retransmit the message in the prescribed format to a printer. The operation is as follows:

1. Bit X_5 of Personality Byte B must be set.

2. With the **ADM 42** set up for standard polling, the control center calls for SELECT, as follows: "EOT A_1A_3 q ENQ". Note that the second terminal address (A_2) is incremented to A_3; this causes the **ADM 42** to enable the print buffer (highest page) for operation. A buffer-not-empty condition will cause a terminal BUSY response.

3. The terminal responds to SELECT in the same manner as described in **paragraph 5.1.6.** Also, a **NAK** may be sent upon completion of a message not only because of an incorrect **LRC,** or terminal BUSY; a printer buffer overflow will also cause the entire message to **NAK.**

4. Once the terminal responds to the message with an **ACK** the **ADM 42** disconnects, returns to the polling **Idle** (or personality) state, and begins outputting to the printer. Printing proceeds at the baud rate determined

by the PRINTER BAUD RATE switch on the front panel, and continues until the buffer is empty. The terminal operates in the **Buffered Print Mode** format established by appropriate operation codes (refer to **Print Transmission Control Operations** in **Section IV**).

5. Once printing from the buffer begins, no further messages from the control center may be received by the print buffer until the buffer is empty. (The terminal responds BUSY only to a print message.)

5.2.5 Polling Communication Buffer Operations

The Polling Communications Buffer is selected by setting option board DIP switch S4-SW8 to ON and setting bit X_6 of Personality Byte B.

1. With the buffer selected, the last two pages of memory (3 & 4) or (7 & 8) are reserved as the buffer.

2. All RCVE data is stored in the buffer; only if the message is correct will the data be sent to the display.

3. If the message **LRC** is incorrect, a **NAK** is sent to the host and nothing is displayed.

APPENDIX A
OPERATORS
QUICK REFERENCE
CHARTS

ASCII CONTROL CODE CHART

B7 B6 B5 / BITS / B4 B3 B2 B1	0 0 0 CONTROL	0 0 1 CONTROL	0 1 0 NUMBERS SYMBOLS	0 1 1 NUMBERS SYMBOLS	1 0 0 UPPER CASE	1 0 1 UPPER CASE	1 1 0 LOWER CASE	1 1 1 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
ADM 42 UTILIZED CONTROL CODES

			CONTROL CHARACTERS		DISPLAYABLE CHARACTERS					
HEX → 2ND	BITS 4321	1ST / BITS 7_65	0 0_00	1 0_01	2 0_10	3 0_11	4 1_00	5 1_01	6 1_10	7 1_11
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	$	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

CONTROL CODES
▤ Utilized by Std ADM 42 with Printer Option
▨ Utilized by Polling ADM42

USE CTRL KEY WITH DISPLAYABLE CHARACTER KEYS TO PRODUCE CONTROL CODES

OPERATORS QUICK REFERENCE CHART OF
FUNCTION KEY/FUNKEY CHARACTERISTICS

EVOKING OPERATION		UNPROGRAMMED CODE TRANSMITTED	EVOKING OPERATION		UNPROGRAMMED CODE TRANSMITTED
EVOKE CODE	KEYBOARD		EVOKE CODE	KEYBOARD	
ESC \ @	F1	SOH @ CR*	ESC \ \	SHIFT F1	SOH \ CR*
ESC \ A	F2	SOH A CR*	ESC \ a	F2	SOH a CR*
ESC \ B	F3	SOH B CR*	ESC \ b	F3	SOH b CR*
ESC \ C	F4	SOH C CR*	ESC \ c	F4	SOH c CR*
ESC \ D	F5	SOH D CR*	ESC \ d	F5	SOH d CR*
ESC \ E	F6	SOH E CR*	ESC \ e	F6	SOH e CR*
ESC \ F	F7	SOH F CR*	ESC \ f	F7	SOH f CR*
ESC \ G	F8	SOH G CR*	ESC \ g	F8	SOH g CR*
ESC \ H	F9	SOH H CR*	ESC \ h	F9	SOH h CR*
ESC \ I	F10	SOH I CR*	ESC \ i	F10	SOH i CR*
ESC \ J	F11	SOH J CR*	ESC \ j	F11	SOH j CR*
ESC \ K	F12	SOH K CR*	ESC \ k	F12	SOH k CR*
ESC \ L	F13	SOH L CR*	ESC \ l	F13	SOH l CR*
ESC \ M	F14	SOH M CR*	ESC \ m	F14	SOH m CR*
ESC \ N	F15	SOH N CR*	ESC \ n	F15	SOH n CR*
ESC \ O	F16	SOH O CR*	ESC \ o	SHIFT F16	SOH o CR*

*If established by a Dynamic Personality Change operation, a second transmission terminator

(End Block character) is also transmitted.

OPERATORS QUICK REFERENCE CHART OF
MODULO NUMBERS VS. ASCII CHARACTERS

ASCII CHARACTER	MODULO NUMBER	ASCII CHARACTER	MODULO NUMBER	ASCII CHARACTER	MODULO NUMBER
SPACE	0	@	32	`	64
!	1	A	33	a	65
"	2	B	34	b	66
#	3	C	35	c	67
$	4	D	36	d	68
%	5	E	37	e	69
&	6	F	38	f	70
'	7	G	39	g	71
(	8	H	40	h	72
)	9	I	41	i	73
*	10	J	42	j	74
+	11	K	43	k	75
,	12	L	44	l	76
—	13	M	45	m	77
.	14	N	46	n	78
/	15	O	47	o	79
0	16	P	48	p	80
1	17	Q	49	q	81
2	18	R	50	r	82
3	19	S	51	s	83
4	20	T	52	t	84
5	21	U	53	u	85
6	22	V	54	v	86
7	23	W	55	w	87
8	24	X	56	x	88
9	25	Y	57	y	89
:	26	Z	58	z	90
;	27	[	59	{	91
<	28	\	60	!	92
=	29	]	61	}	93
>	30	^	62	~	94
?	31	—	63	DEL	95

OPERATORS QUICK REFERENCE CHART OF ABSOLUTE CURSOR ADDRESSING OPERATION CODES

OPERATIONAL CODES	POSITION ROW	POSITION COL	OPERATIONAL CODES	POSITION ROW	POSITION COL	OPERATIONAL CODES	POSITION ROW	POSITION COL
SPACE	1	1	;		28	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
Same Page Load: !	8	8	Same Page Load: B		35	Same Page Load:]		62
[ESC] [=] (	9	9	[ESC] [=] C		36	[ESC] [=] ∧		63
Same Page Read:)	10	10	Same Page Read: D		37	Same Page Read: _		64
[ESC] [?] *	11	11	[ESC] [?] E		38	[ESC] [?] \		65
*Nth Page Load: +	12	12	*Nth Page Load: F		39	*Nth Page Load: a		66
[ESC] [-] [N] ,	13	13	[ESC] [-] [N] G		40	[ESC] [-] [N] b		67
*Nth Page Read: -	14	14	*Nth Page Read: H		41	*Nth Page Read: c		68
[ESC] [/] [N] .	15	15	[ESC] [/] [N] I		42	[ESC] [/] [N] 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	o		80
:		27	U		54			

*N = Selected page 1 thru 4 (standard) or 1 thru 8 (optional)

OPERATORS QUICK REFERENCE CHART OF
DYNAMIC BAUD RATE CONTROL OPERATION CODES

DESIRED BAUD RATE	MODEM PORT	PRINTER PORT	EQUIVALENT BAUD RATE SWITCH POSITION
50	ESC¦ @	ESC¦ `	0
75	ESC¦ A	ESC¦ a	1
110	ESC¦ B	ESC¦ b	2
134.5	ESC¦ C	ESC¦ c	3
150	ESC¦ D	ESC¦ d	4
300	ESC¦ E	ESC¦ e	5
600	ESC¦ F	ESC¦ f	6
1200*	ESC¦ G	ESC¦ g	7
1800	ESC¦ H	ESC¦ h	8
2000	ESC¦ I	ESC¦ i	9
2400	ESC¦ J	ESC¦ j	10
3600	ESC¦ K	ESC¦ k	11
4800	ESC¦ L	ESC¦ l	12
7200	ESC¦ M	ESC¦ m	13
9600**	ESC¦ N	ESC¦ n	14

* Standard (default) baud rate for PRINTER port
** Standard (default) baud rate for MODEM port

OPERATORS QUICK REFERENCE CHART OF
PERSONALITY CHANGE OPERATION CODES

OPERATION	PERSONALITY BYTE OPERATION	DESCRIPTION	STD DEFAULT
Escape Lead-In Character	ESC . 0	Enter HEX code associated with desired ASCII character. Example: If desired ASCII character is W, enter 5 7 .	ESC
End Block Character	ESC . 1		CR
2nd End Block Character	ESC . 2		NULL
New Line Character	ESC . 3		NULL
2nd New Line Character	ESC . 4		NULL
Field Separator Character	ESC . 5		NULL
Function Lead-In Character	ESC . 6		SOH
Parity Character	ESC . 7		NULL
Replacement Character	ESC . 8		SPACE
RTS-START Delay Time	ESC . 9	Enter HEX code whose value is 1/2 the desired delay in milliseconds. Example: If desired delay is 115 milliseconds, enter 3A.	00
RTS-OFF Delay Time	ESC . A	Calculated automatically by program when byte value is 00. If change is desired, enter HEX code appropriate to the desired delay, in accordance with chart below.	00

RECOMMENDED RTS OFF DELAY TIMES

RTS-OFF DELAY (MILLISECONDS)	BAUD RATE	OPERATION CODE	RTS-OFF DELAY (MILLISECONDS)	BAUD RATE	OPERATION CODE
343	50	ESC . A AC	9	1800	ESC . A 05
229	75	73	9	2000	05
175	1101	58	7	2400	04
127	134.5	40	7	3600	04
115	150	3A	5	4800	03
57	300	1D	5	7200	03
29	600	0F	5	9600	ESC . A 03
15	1200	ESC . A 08			

OPERATORS QUICK REFERENCE CHART OF PERSONALITY CHANGE OPERATION CODES (cont'd)

Personality Bytes B thru 11, following, are controlled by a HEXidecimal value which causes specific Operation Bits to be set to ON in accordance with the accompanying chart. Bits $X_7 X_6 X_5 X_4$ comprise the HI order bits, bits $X_3 X_2 X_1 X_0$ comprise the LO order bits. All bits to be set must be set simultaneously.

BYTE VALUE		F	E	D	C	B	A	9	8
OPERATION BITS SET TO ON	HI	$X_7 X_6 X_5 X_4$	$X_7 X_6 X_5\ \bullet$	$X_7 X_6\ \bullet\ X_5$	$X_7 X_6\ \bullet\ \bullet$	$X_7\ \bullet\ X_5 X_4$	$X_7\ \bullet\ X_5\ \bullet$	$X_7\ \bullet\ \bullet\ X_4$	$X_7\ \bullet\ \bullet\ \bullet$
	LO	$X_3 X_2 X_1 X_0$	$X_3 X_2 X_1\ \bullet$	$X_3 X_2\ \bullet\ X_0$	$X_3 X_2\ \bullet\ \bullet$	$X_3\ \bullet\ X_1 X_0$	$X_3\ \bullet\ X_1\ \bullet$	$X_8\ \bullet\ \bullet\ X_0$	$X_3\ \bullet\ \bullet\ \bullet$

BYTE VALUE		7	6	5	4	3	2	1	0
OPERATION BITS SET TO ON	HI	$\bullet\ X_6 X_5 X_4$	$\bullet\ X_6 X_5\ \bullet$	$\bullet\ X_6\ \bullet\ X_4$	$\bullet\ X_6\ \bullet\ \bullet$	$\bullet\ \bullet\ X_5 X_4$	$\bullet\ \bullet\ X_5\ \bullet$	$\bullet\ \bullet\ \bullet\ X_4$	$\bullet\ \bullet\ \bullet\ \bullet$
	LO	$\bullet\ X_2 X_1 X_0$	$\bullet\ X_2 X_1\ \bullet$	$\bullet\ X_2\ \bullet\ X_0$	$\bullet\ X_2\ \bullet\ \bullet$	$\bullet\ \bullet\ X_2 X_1$	$\bullet\ \bullet\ X_2\ \bullet$	$\bullet\ \bullet\ \bullet\ X_0$	$\bullet\ \bullet\ \bullet\ \bullet$

Polling Option Variants (ESC. B) Byte B

OPERATION		ESC . B		STD (DEFAULT)
BIT	TITLE	(BYTE)	DESCRIPTION	BIT CONDITION
X_7	Reserved	80	Reserved	
X_6	Communications Buffer Control	40	O N = Polling Communications Buffer (last two pages) is reserved (DIP Switch S4-SW8 ON). Incoming data held in buffer until message is completed. If no errors, message goes to screen. OFF= Polling Communications Buffer disabled; incoming data goes directly to screen.	OFF
X_5	**Addressable Print Buffer Control**	20	ON = Addressable Print Buffer (last page display memory) enabled (see Section V). OFF= Addressable Print Buffer disabled.	OFF
X_4	Transmit Last Character	10	ON = Transmission of last character (under cursor) is inhibited. OFF= Last character (under cursor) is transmitted.	OFF
X_3	Return to Local/ Idle State	08	ON = Terminal automatically returns to Local State upon completion of Polling message. OFF= Terminal automatically returns to Idle State upon completion of Polling message.	OFF
X_2	FAST SELECT Control	04	ON = FAST SELECT is conditional; terminal must be in Idle State to receive data. OFF= FAST SELECT is unconditional; terminal is commanded to Idle State and must respond.	OFF
X_1	Local Mode Control	02	ON = Any key may be used to establish Local State. OFF= CONV required to establish Local State (Compose Mode).	OFF
X_0	Headers Required	01	ON = Headers are required in all communications. OFF= Headers are not required.	OFF

OPERATORS QUICK REFERENCE CHART OF
PERSONALITY CHANGE OPERATION CODES (cont'd)

BIT	TITLE	BYTE	DESCRIPTION	STD (DEFAULT) BIT CONDITION
Polling Transmission Number Byte C (ESC . C)				
X_7	Reserved	80	Reserved	OFF
X_6		40		
X_5		20		
X_4		10		
X_3	Limit = 8	08	Operation bits set establish number of transmissions counted before recycling the count. 00 = transmission number inhibited, 01 = count recycles between 0 and 1.	00
X_2	Limit = 4	04		
X_1	Limit = 2	02		
X_0	Limit = 1	01		
Power-Up Default Modulus Tabs Byte D (ESC . D)				
X_7	Typewriter Tab Clear	80	ON = Clear all typewriter tabs with Clear All (ESC * and ESC +) commands. OFF= Only Protect Mode tabs cleared by Clear All command. Typewriter Tabs and Modulo Tabs are cleared in normal manner.	OFF
X_6	Power-Up Tab Mode	40	Bits ON or OFF as required to define the ASCII character selected which may be used at Power-Up time to initialize Modulo Tab Mode, without executing ESC 3. Nominally, character utilized is the same used when the sequence ESC 3 is used.	ALL OFF
X_5		20		
X_4		10		
X_3		08		
X_2		04		
X_1		02		
X_0		01		

OPERATORS QUICK REFERENCE CHART OF
PERSONALITY CHANGE OPERATION CODES (cont'd)

OPERATION		ESC . E (BYTE)	DESCRIPTION	STD (DEFAULT) BIT CONDITION
BIT	TITLE			

OPERATION		ESC . E (BYTE)	DESCRIPTION	STD (DEFAULT) BIT CONDITION
BIT	**TITLE**		**DESCRIPTION**	
Special Function Control Byte E (ESC . E)				
X_7	Keyboard Personality Changes	80	ON = Inhibit personality changes from the keyboard. OFF= Personality changes from keyboard are accepted.	OFF
X_6	Line Erase With CR	40	ON = CR erases remainder of current line before executing normal CR operation. OFF= Normal CR operation.	OFF
X_5	New Line With CR	20	ON = Executing CR also executes New Line. OFF= Normal CR operation.	OFF
X_4	Auto Line Wrap	10	ON = Auto Line Wrap is inhibited. Operator must use CR ,NL, etc. to get to next line. OFF= Auto Line Wrap - New Line automatically executed when position 80 is filled.	OFF
X_3	Auto Video Shut Off	08	ON = CRT video not shut off after approximately 20 minutes of no display activity. OFF= CRT video automatically shut off after approximately 20 minutes of no display activity.	ON
X_2	Pseudo Send	04	ON = [PRINT] sends SOH P CR [SHIFT][PRINT] sends SOH p CR [SEND LINE] sends SOH Q CR [SHIFT][SEND LINE] sends SOH q CR [SEND PAGE] sends SOH R CR [SHIFT][SEND LINE] sends SOH r CR [SEND MSG] sends SOH S CR [SHIFT][SEND MSG] sends SOH s CR OFF= Disables mode ; normal SEND and PRINT operations	OFF

OPERATORS QUICK REFERENCE CHART OF PERSONALITY CHANGE OPERATION CODES (cont'd)

OPERATION		ESC . E (BYTE)	DESCRIPTION	STD (DEFAULT) BIT CONDITION
BIT	TITLE			
Special Function Control Byte E (ESC . E) (cont'd)				
X_1	Load Cursor Skip	02	ON = Cursor skips out of protected field if position is specified during a Load Cursor operation. OFF= Cursor remains in protected field if position is specified during a Load Cursor operation.	OFF
X_0	FUNKEY Programming/ Display	01	ON = Inhibit programming of function keys and display of FUNKEY messages. OFF= Normal FUNKEY operations.	OFF

OPERATION		ESC . . F (BYTE)	DESCRIPTION	STD (DEFAULT) BIT CONDITION
BIT	TITLE			
Status Line Visual Attribute Control Byte F (ESC . F)				
X_7	Reserved	80	Reserved	OFF
X_6		40		
X_5		20		
X_4		10		
X_3		08		
X_2	Reversing Control	04	ON = Status Line message reversed. OFF= Status Line message in normal or personality video.	OFF
X_1	Blinking Control	02	ON = Status Line message blinking. OFF= Status Line message in normal or personality video.	ON
X_0	Underlining or Blanking Control	01	ON = Status Line message underlined (S6-SW3 @ 14M set to ON) or blanked (S6-SW3 at OFF). OFF= Status Line message in normal or personality video.	OFF

OPERATORS QUICK REFERENCE CHART OF
PERSONALITY CHANGE OPERATION CODE (cont'd)

OPERATION		ESC . . 0 (BYTE)	DESCRIPTION	STD (DEFAULT) BIT CONDITION
BIT	TITLE			
Special Function Control Byte 10 (ESC . . 0)				
X_7	Erase to Spaces Replacement Character	80	ON = Erase to Spaces operation uses replacement character specified by Personality Byte 8. OFF= Normal Erase to Spaces operation.	OFF
X_6	Clear to Spaces Replacement Character	40	ON = Clear to Spaces operation uses replacement character specified by Personality Byte 8. OFF= Normal Clear to Spaces operation.	OFF
X_5	FS vs. Protected Field Control	20	ON = Protected field delimiter, FS, is imbedded after unprotected field. OFF= Protected field delimiter, FS, is imbedded before unprotected field.	OFF
X_4	Transmit NL Control	10	ON = Inhibit transmission of 1st and 2nd New Line characters (Personality Bytes 3 and 4) OFF= Normal transmission of 1st and 2nd New Line characters.	OFF
X_3	Scrolling Control	08	ON = Scrolling of an unprotected page is inhibited. OFF= Normal Scrolling operation.	OFF
X_2	Reserved	04	Reserved	OFF
X_1	**Erase Page vs. Write Protect**	02	ON = Erase Page operation resets Write Protect Mode. OFF= Normal Erase Page operation.	ON
X_0	Erase Line vs. Write Protect	01	ON = Erase Line operation resets Write Protect Mode (WPRT). OFF= Normal Erase Line operation.	OFF

OPERATORS QUICK REFERENCE CHART OF
PERSONALITY CHANGE OPERATION CODES (cont'd)

| OPERATION | | ESC . . 1 | | STD (DEFAULT) |
BIT	TITLE	(BYTE)	DESCRIPTION	BIT CONDITION
Special Function Control Byte 11 (ESC . . 1)				
X_7	Reserved	80	Reserved	ALL OFF
X_6		40		
X_5		20		
X_4		10		
X_3		08		
X_2	Power-Up Conv Mode Control	04	ON = Conversation Mode is set when power-up is completed. OFF = Block Mode is set when power-up is completed.	OFF
X_1	Reserved	02	Reserved	OFF
X_0	Power-Up CAP LOCK Control	01	ON = CAP LOCK is set when power-up is completed. OFF = CAP LOCK is not set when power-up is completed.	ON

OPERATORS QUICK REFERENCE CHART OF
VIDEO ATTRIBUTE CONTROL OPERATION CODES

FUNCTION	DESCRIPTION
ESC ~ 0	Video OFF (data is retained)
ESC ~ 1	Video ON; cursor OFF
ESC ~ 2	Video ON; cursor steady
ESC ~ 3	Video ON; cursor blinking

FUNCTION	ADM 42 MODE	ADM 2 MODE
Blanking for entire page	ESC G (Space)	ESC G !
Blanking to end of line	ESC G "	ESC G #
Underlining for entire page	ESC G $	ESC G %
Underlining to end of line	ESC G &	ESC G '

FUNCTION	STD CHAR.	ALT.CHAR.
Reset to Standard Video	ESC G 0	ESC G 0
Limited Graphics Mode Enable		ESC G 8
Blanking (S6-SW3 OFF) or Underlining (S6-SW3 ON) of area	ESC G 1 or ESC ~	ESC G 9 or ESC ~
Blinking of Area	ESC G 2 or ESC ~	ESC G A or ESC ~
Blanking (S6-SW3 OFF) or Underlining (S6-SW3 ON) and Blinking of Area	ESC G 3	ESC G B
Reversing of Area	ESC G 4	ESC G C
Blanking (S6-SW3 OFF) or Underlining (S6-SW3 ON) and Reversing of Area	ESC G 5	ESC G D
Blinking and Reversing of Area	ESC G 6	ESC G E
Blanking (S6-SW3 OFF) or Underlining (S6-SW3 ON) and Blinking and Reversing of Area	ESC G 7	ESC G F

OPERATORS QUICK REFERENCE CHART
OF ADM-42 ESCAPE SEQUENCES

HEX 1ST BYTE → / 2ND ↓	2	3	4	5	6	7
0		0 CLEAR TABS	@ PRINT PROT AS SP	P PRINT PAGE ALL	` POLLING ADDRESS*	p PRINT UNFORMAT
1	! FUNKEY PROG*	1 SET TYPWR TABS	A COPY PRINT*	Q INSERT CHAR	a AUX CONTROL*	q SET INS MODE
2	" KBD ENA**	2 CLEAR COL OF TABS	B SET BLOCK MD	R DELETE LINE	b STATUS 1 OFF	r CLEAR INS MODE
3	# KBD DISA**	3 TYPWR TAB CTRL*	C SET CONV MD	S SEND MSG	c STATUS 1 ON	s SEND MSG ALL
4	$ CLEAR ADM1 MD	4 SEND FG LINE	D SET DUPLH OR F	T ERASE LINE (PERS)	d STATUS 2 OF F	t ERASE LINE TO NUL
5	% SET ADM 1 MD	5 SEND FG PAGE	E INSERT LINE	U SET PGM MODE	e STATUS 2 ON	u CLEAR PGM MODE
6	& SET PROTECT	6 SEND ALL LINE	F MESSAGE TO ROW 25*	V SET COL PROT SP AT CURSOR	f STATUS 3 OFF	v SET AUTO PG
7	' CLEAR PROTECT	7 SEND ALL PAGE	G ATTRIB CONTROL*	W DELETE CHAR	g STATUS 3 ON	w CLEAR AUTO PG
8	(CLEAR WPROT	8 WRITE SOM (STX)	H	X CLEAR PGM MODE	h	x
9	) SET WPROT	9 WRITE EOM (ETX)	I BACK TAB	Y ERASE PAGE (PERS)	i TAB (SKIP)	y ERASE PG TO NULL
A	* CLEAR ALL TO NULL	: CLEAR FG TO NULL	J PAGE BACK	Z CLEAR ALL MODES	j	z
B	+ CLR ALL TO SPACE	; CLR FG SP/PERS	K PAGE FWD	[BUFFERED PRINT CONTROL*	k	{
C	, CLR ALL TO PROT SP	< STATUS 4 ON	L GO TO PAGE N (1-8)*	\ EVOKE FUNKEY*	l	| BAUD RATE CTRL*
D	- LOAD PRC*	= LOAD RC*	M MULT ESC*	]	m WRITE MULT CHAR*	}
E	. CHANGE PERS*	> STATUS 4 OFF	N SET PAGE EDIT	^ BLINK CONTROL	n	~ CURSOR VIDEO CTRL*
F	/ READ PRC**	? READ RC**	O CLEAR PAGE EDIT	_ BLANK CONTROL	o DISPLAY PERS*	DEL

*Multiple Characters Required

**Remote (from host) Only

INDEX

INDEX

A

INDEX (cont'd)

D

E

F

G-H

I-J

INDEX (cont'd)

K

L

M-N

INDEX (cont'd)

O

P

INDEX (cont'd)

Q

R

S

T

INDEX (cont'd)

U

V

W-X-Y-Z