TABLE OF CONTENTS

TABLE OF CONTENTS (cont.)

TABLE OF CONTENTS (cont.)

ILLUSTRATIONS

TABLES

SECTION I

INTRODUCTION

1.1 PURPOSE

The purpose of this manual is to provide operating procedures and maintenance instructions for the Model 1280A Modem. Individual sections are devoted to installation, operation, theory of operation, preventive and corrective maintenance, and diagrams and parts lists.

1.2 GENERAL DESCRIPTION

The Model 1280A FSK Modem is microprocessor controlled, (Figure 1-1). It is designed for use as a modem, a one or two channel modulator, or a one or two channel demodulator. It will accept input data of EIA-RS-232C, MIL-STD-188C, or high level (20 to 60 milliamps) loop current. It operates in the FSK* mode with shifts of 60 to 200 Hz and in the FEK mode with shifts from 60 to 2000 Hz. Shifts from 60 to 3000 Hz are available. Baud rates are selectable to 1200. Operating parameters are entered by the front panel keypad (or a remote terminal) and displayed on the front panel plasma display.

The Modulator card(s) accepts high level current loop, EIA-RS-232 or MIL-STD-188C data in and modulates it at the frequencies selected. The Demodulator card(s) receives the keyed tones and demodulates them as determined by the selected parameters with a resulting data output of EIA-RS-232, MIL-STD-188C and optional high level current loop. The Control card serves as an interface between the keypad (or remote terminal) and the demodulator and modulator cards. The Control Board contains the high speed demodulator circuit with the standard configuration.

N O T E

The Demodulator Board D9087 and the Control Board D9084 make up the standard configuration. A dash one version (D9087-1 and D9084-1) is also available on special order.

* The modem offers true FSK as defined by FEC's U.S. Patent Number 4,317,209, which allows the change from mark to space to be made as a smooth progression of intermediate frequencies directly related to the selected keying rate. This reduces side band energy normally produced by the nearly instantaneous change from mark to space associated with the more commonly used FEK technique.

The location of the used cards are depicted in Figure 1-2. The keypad and plasma display are located on the front panel.

N O T E

When the standard configuration is used as a dual demodulator, only one of the demodulators will operate at 1200 baud. The second demodulator is limited to 600 baud operation.

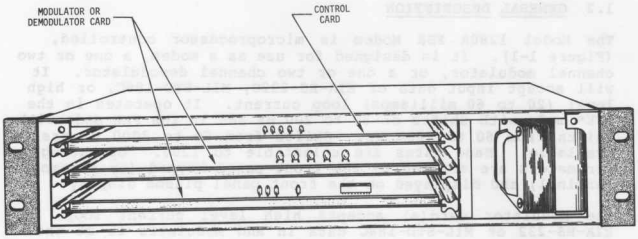


Figure 1-2. Unit With Front Panel Removed

The parameters selectable by the front panel keypad (or remote terminal) are as follows:

a. Channel (one or two)

b. Keying Type (FSK, Mark Only, Space Only, FEK)

c. Diversity

d. Mark Frequency

e. Space Frequency

f. Synchronous/Asynchronous mode

g. Mute

h. Baud Rate

i. Output Polarity (normal or reverse)

j. Auto Mark Hold/Hold (Standby)

A detailed functional analysis of each board is provided in Section IV, Theory of Operation.

Specifications are listed in Table 1-1.

Table 1-1. Modem Specifications

ITEM	SPECIFICATION
MODULATOR	
Output Impedance	600 ohms ± 10% (Balanced and Isolated)
Output Level	Set at factory -10 dBm. (Adjustable internally from -20 dBm to +6 dBm into 600 ohms.)
Output Frequency Range	300-3000 Hz 300-6000 Hz (Special Order)
Shift	60-200 Hz (FSK) 60-2000 Hz (FEK) 60-3000 Hz (FEK) (Special Order)
Transmit Clock*	EIA-RS-232
Mark and Space Tones	Selectable in 0.5 Hz Increments
Mute (Low Level Only)	Automatic (strap selectable), 0-2.25 seconds transition time (switch selectable)* Manual (keypad selectable)
Input Data	EIA-RS-232C, MIL-STD-188C or Optional High Level Loop
Sense	Selectable
Waveform Quality	Level of any harmonic will be less than -40 dB referenced to 0 dBm tone output. Maximum level of spurious output -60 dBm tone into 600 ohms
Keyline Control*	Keyline enabled if no transitions are detected within preset time (0-2.25 seconds). (Standard) Keyline control via RTS/CTS handshake lines. (Optional)

*Added Feature

Table 1-1. Modem Specifications (cont.)

ITEM	SPECIFICATION
DEMODULATOR	
Input Impedance	60 or 10K ohms (Balanced and Isolated) (Strap Selectable)
Input Level	+6 to -45 dBm into 600 ohms
Input Frequency Range	300-3000 Hz 300-6000 Hz (Special Order)
Mark and Space Frequency	Selectable in 0.5 Hz steps
Shift Standard Configuration	60 to 2000 Hz up to 600 baud 850 to 1200 Hz from 601 to 1200 baud
Baud Rate	Selectable 30 to 1200
Diversity	Selectable in 2-channel DEMOD configuration. (Up to 600 baud only with the standard configuration).
Data Output	Selectable (keypad or remote)
Synchronous Mode Asynchronous Mode	Regenerated EIA-RS-232 and MIL-STD-188C Programmable 5, 6, 7, or 8-level EIA-RS-232 and MIL-STD-188C
Mid-Bit Clock	EIA-RS-232
Auto Mark Hold/ Carrier Detect	Switch Selectable 0 to -42 dBm in 6 dB increments, 1 to 5 second delay (switch selectable) after signal drops below threshold. Carrier detect sense is strap selectable.*
Sense	Selectable (keypad or remote)
Indicators	Plasma display of energy in filter (Bar Graphs), frequency of Mark/Space tones and baud rate
Synchronizer	Tracking Range $\pm$ 5% of Baud Rate

*Added Feature

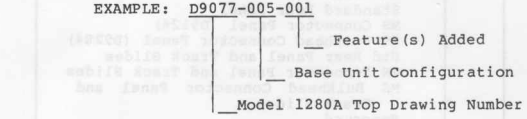
Table 1-1. Modem Specifications (cont.)

ITEM	SPECIFICATION
REMOTE CONTROL	
Device Number	Switch Selectable 01 thru 08.
Data In/Out	EIA-RS-232C Asynchronous (1 Start bit, 8 Data bits, 2 Stop bits)
Status	Received data only
Data Rate	Strap Selectable for 300, 600, 1200, 2400, 4800, 9600, or 19,200 baud
Frequency	300 to 3000 Hz (Must be 4-digit entry)
Baud Rate	To 1200 baud (Must be 4-digit entry)
GENERAL	
Dimensions	19 in (48.26 cm) W x 3.5 in (8.89 cm) H x 14 in (35.56 cm) D. With High Level or DC Power Supply Options, 18 in (45.72 cm) D; with High Level and DC Power Supply Options, 22 in (55.88 cm) D; with MS Connector Panel 16.69 in (42.4 cm) D; and with MS Connector Bulkhead 22.1 in (56.13 cm) D.
Weight	Approximately 12 lbs (5.44 Kg).
Voltage	115/230 Vac $\pm$ 15%, 47 to 440 Hz (switch card selectable)
Optional Voltage #1	10 to 16 Vdc, 6A maximum at 10V
Optional Voltage #2	19 to 31 Vdc, 2.5A maximum at 19V

1.5 CONFIGURATION IDENTIFICATION

Configuration of the Model 1280A, as shipped from the factory, can be identified by the Part Number on the rear I.D. Plate. Should the customer reconfigure his unit, a space is provided on the I.D. Plate to write in the "as configured" identifier.

The part (configuration) number consists of 11 digits (Refer to example).



The first five digits are the model top drawing number. The 6th through 8th digits identify the base unit configuration; the 6th and 7th digits identify the various options available and the 8th digit identifies the board configuration (Refer to Table 1-4 for an explanation of the base unit identifiers). Digits nine through 11 identify features added to the base unit that do not appear on earlier versions. Any unit incorporating an added feature may be back fitted to an earlier version. Any unit with a feature number higher than the one preceding it will incorporate the previous feature i.e., units identified as having feature 002 will also have 001 incorporated. Features currently identified are as follows:

Feature Number	Features Added
001	Incorporates modulator "Transmit Clock" and allows adjustment of the modulator output level from the front of the unit.
002	On modulator changes Auto-Mute from level detection to transition detection. Adds keyline control and keyline output. On demodulator, changes the AMH Thresholds and provides an AMH delay switch. Adds a loss of carrier detection circuit (carrier detect) and carrier detect output. Modifies firmware to allow asynchronous capabilities at speeds above 600 baud.

Table 1-4. Base Unit Configuration Identifiers

DIGITS 6	DIGITS 7	DIGITS 8	EXPLANATION
0			Reserved
1			Reserved
2			Standard Rear Panel
3			MS Connector Panel (D9124)
4			MS Bulkhead Connector Panel (D9284)
5			Std Rear Panel and Track Slides
6			MS Connector Panel and Track Slides
7			MS Bulkhead Connector Panel and Track Slides
8			Reserved
9			Reserved
	0		Reserved
	1		10-16 Vdc Power Supply
	2		19-31 Vdc Power Supply
	3		High Level (HL) Keyer Assembly
	4		HL Keyer Assembly and 10-16 Vdc Power Supply
	5		HL Keyer Assembly and 19-31 Vdc Power Supply
	6-9		Reserved
		0	Reserved
		1	Single Demodulator (Std)
		2	Dual Demodulators (Std)
		3	Single Modulator
		4	Dual Modulators
		5	Modem (Std)
		6	Single Demodulator (Dash -1)
		7	Dual Demodulators (Dash -1)
		8	Modem (Dash -1)
		9	Reserved

SECTION II

INSTALLATION

2.1 GENERAL

This section contains instructions for unpacking, mounting and making all connections to the Modem and its options.

2.2 UNPACKING AND INSPECTION

Open the shipping container. Do not use sharp metallic objects that might damage the contents. Remove the packing and the unit from the container and inspect for damage. If any damage is observed, file a written claim with the shipping agency and forward a copy of the claim to:

FREDERICK ELECTRONICS CORPORATION
7450 New Technology Way/P.O. Box 502
Frederick, MD 21701-0502

If packing for storage or reshipment is anticipated, replace the packing material in the shipping container and store for future use.

2.3 POWER REQUIREMENTS

The Modem operates on either 115 or 230 Vac, ±15 percent, 47 to 440 Hz or with optional Direct Current (dc) supplies, 10 to 16 Vdc (6 Amps. maximum at 10V) or 19 to 31 Vdc (2.5 Amps. maximum at 19V). The unit can be set to operate on 115 volts or 230 volts by the position of the printed circuit (switch) board, located behind the fuse (F1) on the lower right-hand side of the unit. (Refer to Figure 2-1.) Power switch (S1) is located on the front panel. Turn the switch to the ON position to apply power.

****
* W A R N I N G *
****

The AC input circuit of this unit contains voltages which may be hazardous to life. Exercise caution while working in the unit when protective cover is removed.

- - - - - - -
C A U T I O N
- - - - - - -

Insure the switch board is inserted correctly for the input voltage being used. Refer to Figure 2-1.

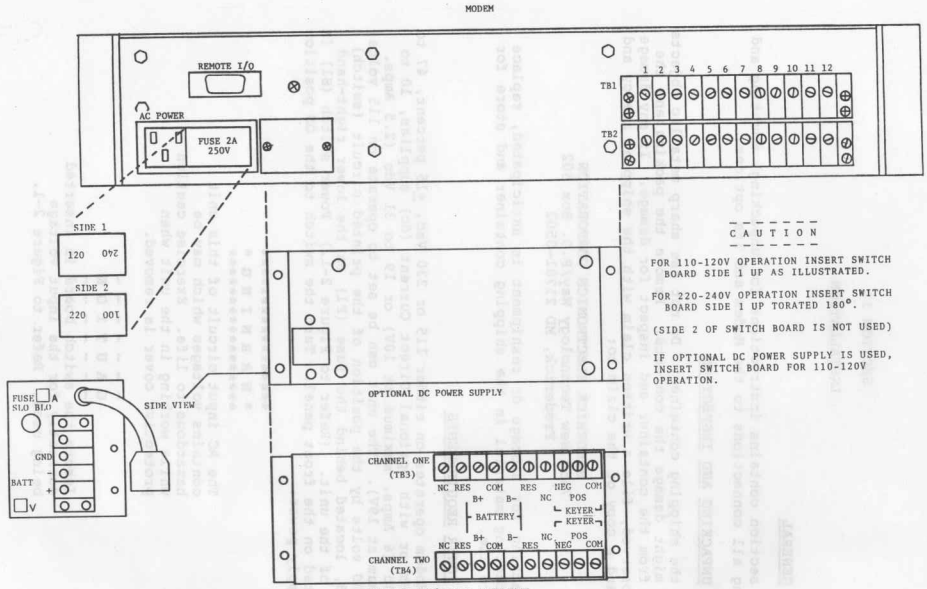


Figure 2-1. Rear Panel

2.4 MOUNTING

The Modem is designed to mount in a standard 19-inch (48.3 cm) rack. A vertical rack space of 3.5 inches (8.9 cm) is required. Refer to Figure 2-1.1 for an installation drawing which provides unit dimensions.

2.5 OPTIONS

The M1280A can be configured with several different rear panel mounted options as listed.

2.5.1 DC Power Supply

The DC Power supply is available with voltages of 10-16 Vdc (12 Vdc nominal) or 19-31 Vdc (24 Vdc nominal) and mounts directly to the rear of the Model 1280A (refer to Figure 2-1). If this unit is used, the ac line cord is removed and the dc supply is connected to the M1280A ac power connector. The unit contains a dc fuse (5A SLO-BLO for 19 to 31 Vdc operation or 7A SLO-BLO for 10 to 16 Vdc operation).

- - - - - - -
C A U T I O N
- - - - - - -

The fused-switchboard must be inserted for 110-120V operation. (Refer to Figure 2-1.)

2.5.2 High Level Interface

The High Level (HL) Interface unit consist of a loop power supply and quad high level keyer and allows high level (20/60 MA) polar/neutral operation. The HL Interface unit mounts directly on the rear of the M1280A or, if used with the DC Power Supply, mounts on the rear of the DC supply (refer to Figure 2-1).

2.5.3 MS Connector Panel

The MS connector panel (see Figure 2-2) provides signal connections via military style connectors. With this option the M1280A can be configured as a modem only. The demodulator board must be inserted in Channel 1 position (backplane connector J3) and the modulator in Channel 2 position (backplane connector J4). Refer to Figure 6-40 and 6-41 for mating connector kits.

N O T E

If this connector panel is selected, access to the fused switchboard is through the fuse plate.

If this option is selected the HL Interface and DC Power supplies can not be used.

2.5.4 MS Connector Bulkhead

The MS Connector Bulkhead (see Figure 2-3) mounts on the rear of the Model 1280A. It provides military style connections for both signal and power. This unit can operate on 115/230 Vac, with optional and selectable 10-16 Vdc or 19-31 Vdc power supplies, and with an optional high level interface assembly. It contains an identification plate allowing the user to identify the configuration of the unit. (Refer to Figure 6-43 for mating connector kit.)

The unit contains an ac fuse (2A, 250V for 115 Vac and dc operation or 1A, 250V for 230 Vac operation) and a dc fuse (5A SLO-BLO for 19 to 31 Vdc operation or 7A SLO-BLO for 10 to 16 Vdc operation).

* * * * * * * * * *
* W A R N I N G *
* * * * * * * * * *

The AC input circuit and power supply circuits of this unit contain voltages which may be hazardous to life. Exercise caution while working in the unit when protective covers are removed.

When the high level option is used, loop current must be externally limited to 80 MA maximum (60 MA typical) from each leg of the battery and arc suppression to less than 350 volts. Connections are provided on the rear of the unit to install current limiting resistors. Recommended limiting resistor for 20 MA neutral operation is 6500 ohms, 10 watts and for 60 MA neutral operation is 2200 ohms, 10 watts.

* * * * * * * * *
* W A R N I N G *
* * * * * * * * *

The current limiting resistors contain high voltage. Exercise extreme care while working with the unit.

N O T E

Without current limiting resistors the unit will not operate.

2.6 SIGNAL CONNECTIONS

All signal connections to the modem are made on the rear panel and on the optional High Level Keyer Supply. An optional rear panel is available with MS connectors. (The High Level and DC options are not available with the optional rear panel.) Connections for the standard rear panel and High Level option are illustrated on Figure 2-1 and listed in Tables 2-1 and 2-2. The optional MS connector rear panel is illustrated in Figure 2-2 with connections listed in Table 2-3. The MS Connector bulkhead is illustrated in Figure 2-3 with connections listed in Table 2-4.

- - - - - - - -
C A U T I O N
- - - - - - - -

High level loop current must be externally limited to 80 ma maximum (60 ma typical) and arc suppression to less than 350 volts.

N O T E

WITH THE STANDARD CONFIGURATION INSTALLED and the unit operated as a modem, the demodulator must be installed in backplane connector J3 for baud rates above 600. If operated as a dual demodulator only the demodulator in backplane connector J3 will operate at 1200 baud. The demodulator in backplane connector J4 is limited to 600 baud operation and, if programmed for speeds greater than 600, Channel 2 will cease to output data.

2.6.1 Analog Cable

The analog cable interface allows the Model 1280A to connect directly into a Transworld TW100F transceiver. The cable connects to J2 of the optional MS connector panel (D9124). Refer to Table 2-3 for pin configuration.

2.6.2 Digital Cable

The digital cable interface allows the Model 1280A to connect directly into a KG84A encryption device. The cable connects to J1 of the optional MS connector panel (D9124). Refer to Table 2-3 for panel pin configuration.

Table 2-1. Modem Signal Connections

PIN NUMBER TB1/TB2	EXPLANATION
Signal connections to TB1/TB2 are determined by the board type (modulator or demodulator) which is installed in each location. TB1 corresponds to channel 1 position (backplane connector J3) and TB2 corresponds to channel 2 position (backplane connector J4).	
Modulator	**Input/Output Signals**
1	- High Level Input
2	+ High Level Input
3	Transmit Clock Output
4	Keyline
5	MARK Frequency Output
6	SPACE Frequency Output
7	Low Level Input
8	Keyline
9	Balanced Output
10	Balanced Output
11	Analog Ground
12	Analog Ground
Demodulator	**Input/Output Signals**
1	N.C.
2	N.C.
3	Data Mid-Bit Sample
4	Carrier Detect
5	Undetected MARK
6	Undetected SPACE
7	Data Output RS-232-C
8	Data Output MIL-188-C
9	Balanced Audio Input
10	Balanced Audio Input
11	Ground
12	Ground

Table 2-1. Modem Signal Connections (cont.)

PIN NUMBER J5	EXPLANATION
Remote I/O	**Remote Terminal Input/Output Connections**
1	Data Input
2	Data Output
3	Busy In (DTR)
4	Busy Out (CTS)
5	+12V Static
6	N.C.
7	Ground
8	N.C.
9	N.C.
AC POWER	**115 Vac/230 Vac/dc Power Connector**

Table 2-2. Optional High Level Keyer/Loop Supply Signal Connections

PIN CONNECTION	EXPLANATION
Signal connections to TB3/TB4 are identical and provide high level output(s) for corresponding demodulator(s).	
NC	NC Connection
RES	External Current Limiting Resistor
B+ >	Internal Loop Positive (+) Battery (B+)
COM > BATTERY	Internal Loop Common (BCOMM)
B- >	Internal Loop Negative (-) Battery (B-)
RES	External Current Limiting Resistor
NC	N.C.
NEG >	MARK Keyer Output (MK)
POS > KEYER	SPACE Keyer Output (SP)
COM >	Keyer Loop Common (LP COMM)

Table 2-4. Optional MS Connector Bulkhead Connections (cont.)

CONNECTOR/PIN	SIGNAL	CONNECTING TERMINAL
CHANNEL 1 R2		**(HL ASSY C5851)**
E1	HL Current Limiting	TB3-2
E2	HL Current Limiting	TB3-6
CHANNEL 2 R1		
E3	HL Current Limiting	TB4-2
E4	HL Current Limiting	TB4-6

2.7 STRAPPING AND SWITCH CONFIGURATIONS

Several switches and jumpers allow the Modem to be user modified to suit different applications and should be set before power is applied. These are identified by PWB.

2.7.1 Control Board

2.7.1.1 REMOTE I/O BAUD RATE SELECTION. The baud rate selection for the remote control device is accomplished by installing a jumper in the header U8 as shown in Figures 2-4 and 2-5. Labels beside U8 indicate the baud rate achieved by each jumper.

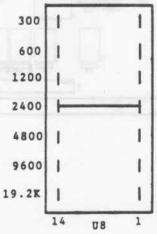


Figure 2-4. Remote I/O Baud Rate Selection

NOTE: ILLUSTRATION DEPICTS BASIC BOARD LAYOUT. THE DASH-ONE VERSION DOES NOT CONTAIN ALL COMPONENTS SHOWN

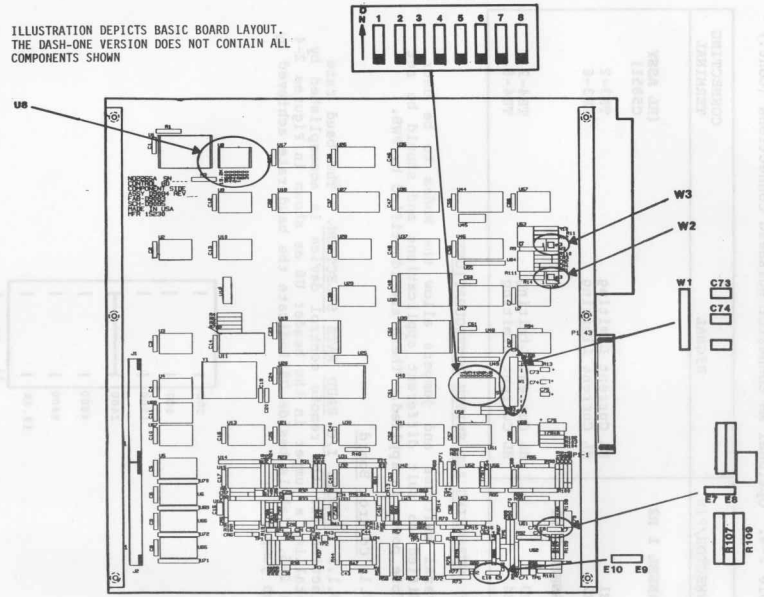


Figure 2-5. Expanded View of Control Board Showing Jumper and Switch Locations

2.7.1.2 REMOTE I/O DEVICE ADDRESS SELECTION. The remote control device address is selectable by switch S1 as shown in Figure 2-5. The address selected by each switch is labeled beside the switch from 01 through 08.

This switch selects the identification number of the unit when more than one unit is being controlled by the same remote device.

2.7.1.3 PWB JUMPERS. The following jumpers, illustrated in Figure 2-5, are provided for operations as follows.

JUMPER	POSITION	DESCRIPTION
W1		
W2	1-2	Remote output terminated.
W3	1-2	Busy out terminated.
W2	2-3	Remote output not terminated.
W3	2-3	Busy out not terminated.

NOTE: Single unit operation - install both W2 and W3 in 1-2 position. For Multi-unit operation - install W2 and W3 in 1-2 position in one unit. Install W2 and W3 in 2-3 position in remaining units.

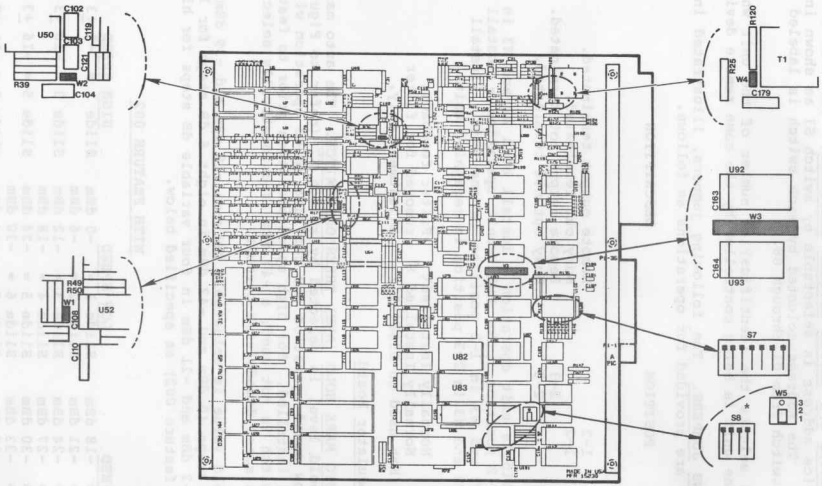
E7-8	Normally Installed\	Filter feedback,
E9-10	Normally Installed >	removed for filter
	(Not used on D9084-1)/	adjustment only.

2.7.2 Demodulator Board

2.7.2.1 AUTO MARK HOLD (AMH) THRESHOLD SWITCH. The auto mark hold threshold level is selected by switch S7 (refer to Figure 2-6) for low speed operation and for high speed operation with feature 002 installed. For high speed operation prior to feature 002, the switch is not used; a -47 dBm is automatically selected by the high speed demodulator circuit.

The threshold value is selectable between -18 dBm and -39 dBm in eight 3 dB steps (0 dBm and -42 dBm in eight 6 dB steps for low speed and -2 dBm and -21 dBm in four variable dB steps for high speed with feature 002) as specified below.

		WITH FEATURE 002	
LOW SPEED	LOW SPEED		HIGH SPEED
Slide 1 = -18 dBm	Slide 1 = -0 dBm		Slide 1 = -2 ±3 dBm
Slide 2 = -21 dBm	Slide 2 = -6 dBm		
Slide 3 = -24 dBm	Slide 3 = -12 dBm		Slide 3 = -10 ±3 dBm
Slide 4 = -27 dBm	Slide 4 = -18 dBm		
Slide 5 = -30 dBm	Slide 5 = -24 dBm		Slide 5 = -16 ±3 dBm
Slide 6 = -33 dBm	Slide 6 = -30 dBm		
Slide 7 = -36 dBm	Slide 7 = -36 dBm		Slide 7 = -21 ±3 dBm
Slide 8 = -39 dBm	Slide 8 = -42 dBm		



* WITH FEATURE 002.

Figure 2-6. Expanded View of Demodulator Board
Showing Locations of Jumpers and Switches

2.7.2.2 AUTO-MARK-HOLD DELAY SWITCH.* The auto-mark-hold (AMH) delay switch (S8) allows a delay of one to five seconds after the AMH threshold has been exceeded prior to entering AMH. With all switch slides OFF a 5-second delay is provided. Other selections are identified below. Only one slide position should be selected at a time.

S8 - Slide 1 ON = 4 seconds delay
S8 - Slide 2 ON = 3 seconds delay
S8 - Slide 3 ON = 2 seconds delay
S8 - Slide 4 ON = 1 second delay

2.7.2.3 PWB JUMPERS AND OPTIONS. The following jumpers and options, as shown in Figure 2-6 will yield the indicated results.

JUMPER	IN	OUT	RESULTS
W1	X		Commutating filter feedback "Normally Installed" - Removed for troubleshooting only.
W2	X		Commutating filter feedback "Normally Installed" - Removed for troubleshooting only.
W3	X		Test probe ground "Always Installed".
W4	X		600 ohm Input Impedance.
W4		X	10K ohm Input Impedance.
W5*	1-2		Detects Loss of Carrier (Positive potential)
W5*	2-3		Detects Loss of Carrier (Negative potential)
EPROM SC574 U82/U83	X		Allows operation to 600 baud. Used on Standard (D9087) version.
EPROM SC575 U82/U83	X		Allows operation to 1200 baud. Only one demod board with SC575 EPROM is allowed.
EPROM SC614 U83	X		Allows operation 30 to 1200 baud. Used on special (D9087-1) version only.

*WITH FEATURE 002

2.7.3 Modulator Board(s)

2.7.3.1 AUTO-MUTE TRANSITION DELAY SWITCH (WITH FEATURE 002). Switch S7 (Figure 2-7) is a four position switch that allows an operator to select a specified time delay prior to going into the auto-mute and keyline enable condition after a loss of data transitions. Switch slides 3 and 4 provide control data to the down-counter and slides 1 and 2 provide a count to the down-counter's C/D input. Either slide 1 or 2 must be selected (to enable auto-mute and keyline output), but both may not be selected at the same time. To select the auto-mute thresholds, program switch S7 as indicated below. Thresholds are specified in seconds.

SWITCH SLIDE (S7)	SWITCH POSITIONS SELECTED							
1	ON	ON	ON	ON	OFF	OFF	OFF	OFF
2	OFF	OFF	OFF	OFF	ON	ON	ON	ON
3	ON	OFF	ON	OFF	ON	OFF	ON	OFF
4	ON	ON	OFF	OFF	ON	ON	OFF	OFF
THRESHOLDS	0	.0625	0.5	0.5625	0	0.250	2.0	2.25

2.7.3.2 PWB JUMPERS. The following jumpers, as shown in Figure 2-7 will yield the indicated results.

JUMPER	POSITION	RESULTS
W1	IN	Test Probe Ground "Always Installed"
W2	IN	Half-Duplex Operation
W2	OUT	Full-Duplex Operation
W3	OUT	RS-232-C Input
W3	IN	MIL-188-C Input
W4	IN	Auto Mute Enabled
W4	OUT	Auto Mute Disabled
W5	IN	Not Used "Always Installed"
W6	IN	Not Used "Always Installed"
W7	IN	20 ma Input Current Max.
W8	IN	60 ma Input Current Max.
W9	IN	Test Probe Ground "Always Installed"

2.8 INSTALLATION

Signal Connections for typical operating conditions are illustrated in Figures 2-8 through 2-11. For options not illustrated refer to Tables 2-3 and 2-4.

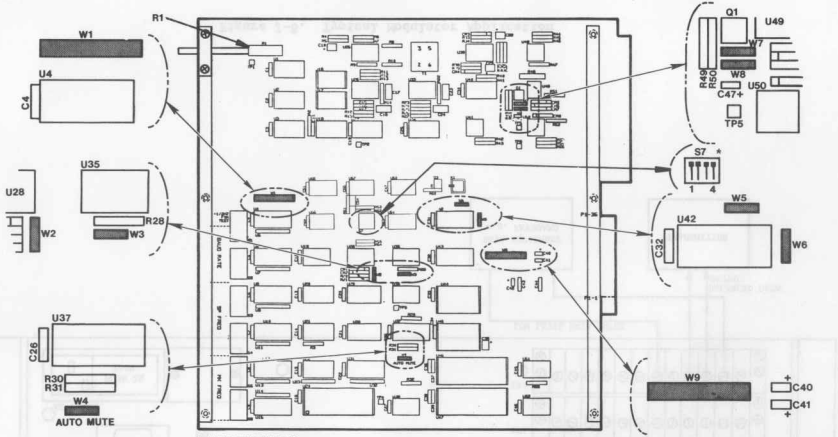


Figure 2-7. Expanded View of Modulator Board
Showing Locations of Jumpers and Switches

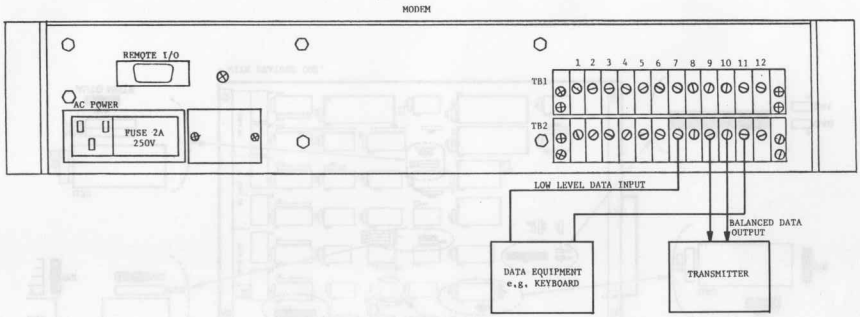
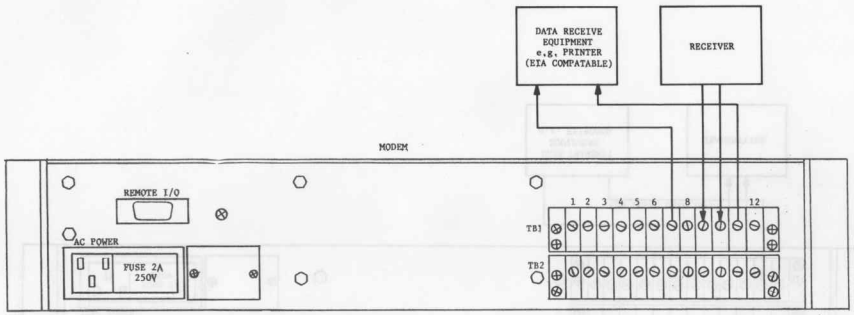


Figure 2-8. Typical Modulator Application



NOTE: When operating in diversity, the enhanced data output is available on both Channel 1 and Channel 2 data terminals.

Figure 2-9. Typical Demodulator Application

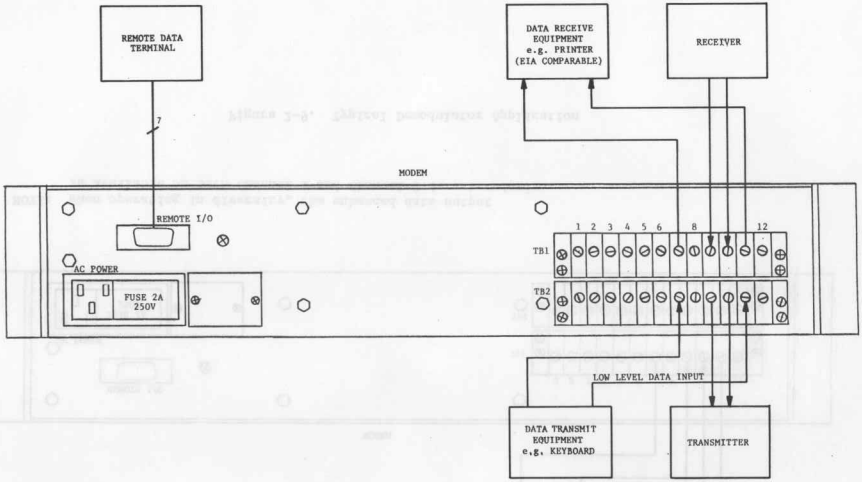


Figure 2-10. Remote Control Application

2.9 INITIAL CHECKOUT PROCEDURE

The initial checkout procedures verify operation of the Modem. They should be performed prior to connecting external signal cables. Should a fault occur during these procedures refer to Section V for troubleshooting procedures.

2.9.1 Power Supply Checkout

Turn the power switch on. Display descriptors should be illuminated.

2.9.2 Front Panel Keypad and Display Checkout

The front panel plasma display must be capable of indicating channel number, baud rate, mark and space frequencies, channel function, keying type, output polarity, auto mark hold, hold, +.5 Hz function, synchronize mode, regenerative mode, and mark only and space only mode when entered from the keypad. Refer to Section III for function of each key and display.

N O T E

The Model 1280A may be used as a modem, a one or two channel modulator, or a one or two channel demodulator depending upon user requirements. The following procedure pertains to the modem with channel one a demodulator, and channel two a modulator.

a. Press 'CHAN' (channel) and '1' keys on keypad. Observe descriptor beside DEMOD illuminates on display; and digit 1 appears below CH on display.

b. Press 'FSK' on keypad. Observe FSK descriptor illuminates on display.

c. Press 'AMH' (Auto Mark Hold) on keypad. Observe AMH descriptor illuminates on display.

d. Press '2ND' and 'REV' (Reverse) on keypad. Observe REV descriptor illuminates on display.

e. Press 'BAUD RATE' and '7', '4' keys. Observe the digits 74 appears below BAUD RATE on display.

f. Press 'SPACE/ONLY' and '1', '3', '1', '7' keys. Observe the digits 1317 appear below SPACE on display.

g. Press 'MARK/ONLY' and '1', '2', '3', '2' keys. Observe the digits 1232 appear below MARK on display.

h. Press '2ND' (second function) and '5/+.5' keys.
Observe +.5 descriptor illuminates on display.

i. Press '2ND' (second function) and 'HOLD' keys.
Observe HOLD descriptor illuminates on display.

j. Press '2ND' (second function) and 'SYNCH/REGEN' keys.
Observe REGEN descriptor illuminates on display.

k. Press '2ND' (second function) and 'SPACE/ONLY' keys.
Observe SP ONLY descriptor illuminates on display.

l. Press '2ND' (second function) and 'MARK/ONLY' keys.
Observe MK ONLY descriptor illuminates and SP ONLY extinguishes on display.

m. Press 'SYNCH/REGEN' key on keypad twice.
Observe Mark, Space and Baud Rate digits disappear and L= appears below mark on display.

Press '5' key. Observe digit 5 appears after L= on display.

n. Press 'DIV' key. Observe DIV key LED illuminates.

o. Press 'ENTER' key. Observe ENTER key LED extinguishes.

N O T E

The ENTER LED comes on when the parameters are keyed in.

p. Press 'CHAN' (channel) and '2' key on keypad.
Observe MOD descriptor illuminates on display; ENTER key LED illuminates; and digit 2 appears below CH on display.

q. Press 'MUTE' key on keypad.
Observe MUTE key LED illuminates.

r. Press 'ENTER' key on keypad.
Observe ENTER key LED extinguishes.

s. Press 'REMOTE' key on keypad.
Observe REMOTE key LED is illuminated.

N O T E

Whenever the REMOTE LED is illuminated, the modem is operable from a remote device ONLY. The keypad is disabled.

t. Verify that keypad is inoperative when REMOTE LED is illuminated by repeating step a.

2.9.3 Remote Control Verification

This procedure verifies the operation of the modem from a remote terminal. A Remote Terminal (RT) is any device that transmits and receives serial asynchronous digital messages. The digital messages consist of one start bit, eight data bits (ASCII characters), no parity, and two stop bits. When remote operating parameters are entered into the modem unit, the front panel display changes to reflect the entered operating parameters. A status report occurs when requested from the RT or when an input error is recognized by the modem.

a. Connect the RT to REMOTE I/O on the rear panel of the Modem. Refer to Table 2-1 or 2-4 for pin connection assignments.

N O T E

RT must be RS-232 compatible.

b. Set the CHANNEL ADDRESS switch S1 on the control board to 01. Refer to Paragraph 2.7.1 for an explanation of the CHANNEL ADDRESS switch settings.

c. Verify the BAUD RATE selection jumper on the control board is compatible for the RT in use. Refer to Paragraph 2.7.1 for an explanation of the BAUD RATE jumper settings.

d. Perform each input command listed in Table 2-5 from the RT. Observe status and Modem response.

Table 2-5. Remote Control Verification

INPUT COMMAND	MODEM RESPONSE
C01R1 (CR)	REMOTE key LED illuminates. DEMOD descriptor illuminates, digit 1 appears below CH on display.
J0 (CR)	FSK descriptor illuminates.
J1 (CR)	MK ONLY descriptor illuminates. FSK descriptor extinguishes.
J2 (CR)	SP ONLY descriptor illuminates. MK ONLY descriptor extinguishes.
A1 (CR)	AMH descriptor illuminates.
A0 (CR)	AMH descriptor extinguishes.
N1 (CR)	REV descriptor illuminates.
N0 (CR)	REV descriptor extinguishes.
B0074 (CR)	Digits 74 appear below Baud Rate on display.
S1317 (CR)	Digits 1317 appear below SPACE on display.
M1232 (CR)	Digits 1232 appear below MARK on display.
E1 (CR)	+.5 Hz descriptor illuminates on display.
E0 (CR)	+.5 Hz descriptor extinguishes.
H1 (CR)	HOLD descriptor illuminates on display.
H0 (CR)	HOLD descriptor extinguishes.
D1 (CR)	DIV key LED illuminates.
D0 (CR)	DIV key LED extinguishes.
Y1 (CR)	REGEN descriptor illuminates on display.
Y0 (CR)	REGEN descriptor extinguishes.

Table 2-5. Remote Control Verification (cont.)

INPUT COMMAND	MODEM RESPONSE
W5 (CR)	SYNCH descriptor illuminates on display.
W0 (CR)	SYNCH descriptor extinguishes.
C02 (CR)	MOD descriptor illuminates, digit 2 appears below CH on display.
U1 (CR)	MUTE key LED illuminates.
U0 (CR)	MUTE key LED extinguishes.

SECTION III

OPERATION

3.1 GENERAL

This section contains an explanation of the controls and display indicator elements used in the operation of the Model 1280A FSK MODEM. It also describes the location and function of each element, control input and status output in the operation of the Modem from a remote control device, and operating procedures for the Modem.

3.2 CONTROLS AND DISPLAY INDICATOR ELEMENTS

The Model 1280A can be controlled by a front panel keypad. The keypad numeric and function keys are used to set up specific operating parameters used by the Modem. Some keys are dual function keys. For example, numeric "5" key also selects "+.5 Hz." To select the latter function, the "2nd" key has to be pressed before the 5/+.5 key is pressed. Specified keys contain LEDs which indicate the state of the modem.

The front panel indicator element displays the state of the controlled channel(s) via bargraph displays, descriptor lights, and digital read-outs of frequency, baud rate, and channel selected.

Functional descriptions of the display element, keypad, and power switch are given in Table 3-1. Figure 3-1 is a front panel view of the Modem indicating the controls and indicators by item number.

Table 3-1. Controls and Indicators

ITEM	INDICATOR/CONTROL	DESCRIPTION
1	Display Elements	
	MARK Bar Graph	Indicates Mark tone input/filter output signal strength in dBm.
	SPACE Bar Graph	Indicates Space tone input/filter output signal strength in dBm.
	SYNCH Descriptor	Indicates channel in Synchronous mode when illuminated or Asynchronous mode when extinguished.
	MOD Descriptor	Indicates channel is a Modulator.
	DEMOD Descriptor	Indicates channel is a Demodulator.
	MK ONLY Descriptor	Indicates channel is in Mark Only mode.
	AMH Descriptor	Indicates Auto Mark hold selected.
	SP ONLY Descriptor	Indicates channel is in Space Only mode.
	HOLD Descriptor	Indicates channel is in Hold (Standby) condition.
	REV Descriptor	Indicates channel output is in Reverse polarity.
	+.5 Hz Descriptor	Indicates channel frequencies selected in 1/2 Hz increments.
	BAUD Rate	Indicates selected baud rate.
	CH	Indicates selected Channel is 1 or 2.
	SPACE	Four-digit display indicating Space tone frequency.
	MARK	Four-digit display indicating Mark tone frequency.
	FSK	Indicates FSK function selected.
	REGEN	Indicates regenerated data mode selected.

Table 3-1. Controls and Indicators (cont.)

ITEM	INDICATOR/CONTROL	DESCRIPTION
2	Keypad Controls	
	CHAN X	Enables channel selection and control where X is numerical key 1 or 2.
	AMH/HOLD	AMH - Selects or removes Automark hold function. 2nd-HOLD - Selects or removes Hold (STAND-BY) function.
	DIV	Selects or removes diversity of controlled channel with adjacent channel.
	FSK	Selects or removes FSK Function of frequency shifts 200 Hz and below for modulator. N O T E Anytime a shift above 200 Hz is selected the unit defaults to FEK mode.
	BAUD RATE XXXX	Enables selection of baud rate where XXXX are the four numerical keys.
	NORM/REV	Selects Normal or Reverse output polarity.
	MUTE	Selects or removes modulator Mute function; when selected mute descriptor illuminates.

Table 3-1. Controls and Indicators (cont.)

ITEM	INDICATOR/CONTROL	DESCRIPTION
2	Key Pad Controls (cont.)	
	MARK/ONLY	MARK XXXX - Enables selection of mark tone frequency for selected channel where XXXX are the four numerical keys specifying frequency in hertz. 2nd Mark Only - Places selected channel in the Mark Only mode.
	CLEAR	Clears operating parameters prior to pressing 'ENTER' Key.
	SYNCH/REGEN	Selects or removes selected channel in the synchronous regenerated data mode.
	REMOTE	Enables or disables modem for remote control function; when selected descriptor illuminates it is enabled.
	SPACE/ONLY	Space XXXX - Enable selection of Space tone frequency of selected channel where XXXX are the four numerical keys specifying frequency in hertz. 2nd Space Only - Places selected channel in the Space Only mode.
	2ND	Enables selection of 2nd functions for selected channel.
	1	Selects Numeric 1
	2	Selects Numeric 2
	3	Selects Numeric 3
	4	Selects Numeric 4

Table 3-1. Controls and Indicators (cont.)

ITEM	INDICATOR/CONTROL	DESCRIPTION
2	Key Pad Controls (cont.)	
	5/+.5	5 - Selects Numeric 5 2nd +.5 - Selects 1/2 Hertz increment for Mark and/or Space frequencies.
	6	Selects Numeric 6
	7	Selects Numeric 7
	8	Selects Numeric 8
	9	Selects Numeric 9
	0	Selects Numeric 0
	ENTER	Enters selected parameters to initiate control of the selected channel. Descriptor illuminates whenever a channel function is selected and extinguishes when parameters are entered.
3	POWER	ON/OFF switch to provide unit power.
4	OUTPUT LEVEL ADJUSTMENT	Allows adjustment of modulator output level from front panel (with feature 001).

3.4 OPERATING PROCEDURES

The Model 1280A modem is controlled by two sources, either the front panel keypad or a remote terminal. The following procedures include start-up, standby, normal, and shut-down operation for local, remote, and emergency functions.

3.4.1 Local Operation

The front panel keypad is used to perform the Local operation. The commands may be selected in any sequence and entered by pressing the ENTER key. Each channel is selected by pressing the CHAN key and the Numeric key 1 or 2 for the desired channel. To clear an error in input commands, press the **CLEAR** key; do not press the ENTER key.

3.4.1.1 START-UP. Before power is supplied, refer to Section II to ensure that internal switch settings, jumpers, and cabling are properly set and connected.

3.4.1.2 NORMAL OPERATION. Turn power on and display elements illuminate. Any elements indicated were programmed prior to power off. Table 3-4 outlines the operation, key to be pressed, and results of operation for programming the Modem under normal operation.

3.4.1.3 STANDBY OPERATION. The following functions can place a channel in standby.

a. Enter '2ND - AMH/HOLD' to place the selected channel into standby mode. The HOLD (Standby) mode sets the output to a steady mark condition.

b. Enter 'AMH' to select auto mark hold for the selected channel. AMH sets the output to a steady mark when the input signal level drops below a preset level. Refer to Section II, Paragraph 2.7.2 for information required to select the AMH threshold level.

3.4.1.4 SHUT-DOWN. The Modem does not require any preparatory settings before power is turned off. Operating parameters displayed are stored in memory when power is removed.

3.4.2 Remote Operation

Refer to Section II, Paragraph 2.7.1 and Table 3-3 for setup, input commands and status responses for the Modem.

3.4.2.1 START-UP. When unit is turned on, remote operation can be accessed by either local or remote command. Entering 'REMOTE' from keypad places unit into remote operation. Command 'R1' from a remote terminal places unit into remote operation. In both cases the REMOTE LED will illuminate to indicate unit is in remote control operation. Any keypad entry, with the exception of REMOTE, will be disregarded by the unit when the REMOTE LED is illuminated.

a. Set 'CHANNEL ADDRESS' switch, S-1, for the proper channel identification setting.

b. Verify the remote baud rate header (U8) is properly jumpered to match requirements for the remote terminal (refer to Paragraph 2.7.1).

3.4.2.2 STANDBY OPERATION. The same standby operation in Paragraph 3.4.1.3 applies to the remote operation.

Table 3-4. Operating Procedures

OPERATION	PRESS KEY	RESPONSE
Select Channel	CHAN X (1 or 2)	ENTER key LED illuminates and selected channel number appears below CH on display. The proper descriptor (MOD or DEMOD) on the display illuminates for the selected channel.
Enter FSK Operation	FSK (60 Hz to 200 Hz=FSK 60 Hz to 1500 Hz=FEK) **NOTE** Anytime a shift above 200 Hz is selected, the unit defaults to FEK mode	FSK descriptor on display illuminates for FSK and is extinguished for FEK.
Enter Desired Mark Frequency	MARK ONLY XXXX (300 to 3000 Hz)	Mark frequency appears below MARK on display. Each number displayed sequencially from right when keyed.
Enter Desired Space Frequency	SPACE ONLY XXXX (300 to 3000 Hz)	Space frequency appears below SPACE on display. Each number displayed sequencially from right when keyed.
Enter Desired Baud Rate	Baud Rate XXXX	Baud rate appears below baud rate on the display. Each number displayed sequencially from right when keyed.
Place Selected Channel in Mute Condition	MUTE	Mute key LED illuminates. (Removes output tone levels.)
Remove Selected Channel from Mute Condition	MUTE	Mute key LED extinguishes. (Output tone levels return to previously set level.)

Table 3-4. Operating Procedures (cont.)

OPERATION	PRESS KEY	RESPONSE
Enable Selected Channel Auto Mark Hold	AMH/Hold	AMH descriptor illuminates. (Output goes to constant Mark condition when input level drops below a preset level.)
Disable Selected Channel Auto Mark Hold	AMH/Hold	AMH descriptor extinguishes.
Enable Selected Channel Diversity Function	DIV	DIV key LED illuminates. (Places selected channel into diversity with adjacent channel.)
Disable Selected Channel Diversity Function	DIV	DIV key LED extinguishes.
Reverse Selected Channel Output Polarity	2ND-NORM/REV	REV descriptor illuminates on display.
Change Selected Channel Output Polarity to Normal	NORM/REV	REV descriptor extinguishes.
Change from Local to Remote Operation	REMOTE	REMOTE key LED illuminates; keypad is disabled; remote control is enabled.
Change from Remote to Local Operation	REMOTE	REMOTE key LED extinguished; keypad enabled.
Change Operating mode from Asynchronous to Synchronous	SYNCH/REGEN	SYNCH descriptor on display illuminates.
Change Operating mode from Synchronous to Asynchronous	SYNCH/REGEN X	SYNCH descriptor on display extinguishes. (X= 5 thru 8; desired code level).

Table 3-4. Operating Procedures (cont.)

OPERATION	PRESS KEY	RESPONSE
Clear Improperly Keyed Input	CLEAR	Clears previous input. Returns elements to original parameters.
Enter Operating Parameters Selected	ENTER	ENTER key LED extinguishes; Operating parameters are entered.
Place Desired Channel Output to Hold Mode	2ND-AMH/HOLD	HOLD descriptor on display illuminates. (Output maintains constant Mark condition.)
Remove Hold Mode from Desired Channel Output	2ND-AMH/HOLD	HOLD descriptor on display extinguishes.
Place Desired Channel into Regenerative Mode	2ND SYNCH/REGEN	REGEN descriptor on display illuminates.
Return Desired Channel from Regenerative to Normal Operation Mode	2ND SYNCH/REGEN	REGEN descriptor on display extinguishes.
Place Desired Channel into Mark ONLY Operation	2ND-MARK ONLY	MARK ONLY descriptor illuminates. SPACE ONLY descriptor extinguishes. FSK descriptor extinguishes.
Place Desired Channel into Space ONLY Operation	2ND-SPACE ONLY	SPACE ONLY descriptor illuminates. MARK ONLY descriptor extinguishes. FSK descriptor extinguishes.
Enable MARK and SPACE Tones for 1/2 Hz Increment	2ND-5/+.5	+.5 descriptor illuminates.
Remove 1/2 Hz Increment for Mark and Space Tones	2ND-5/+.5	+.5 descriptor extinguishes.