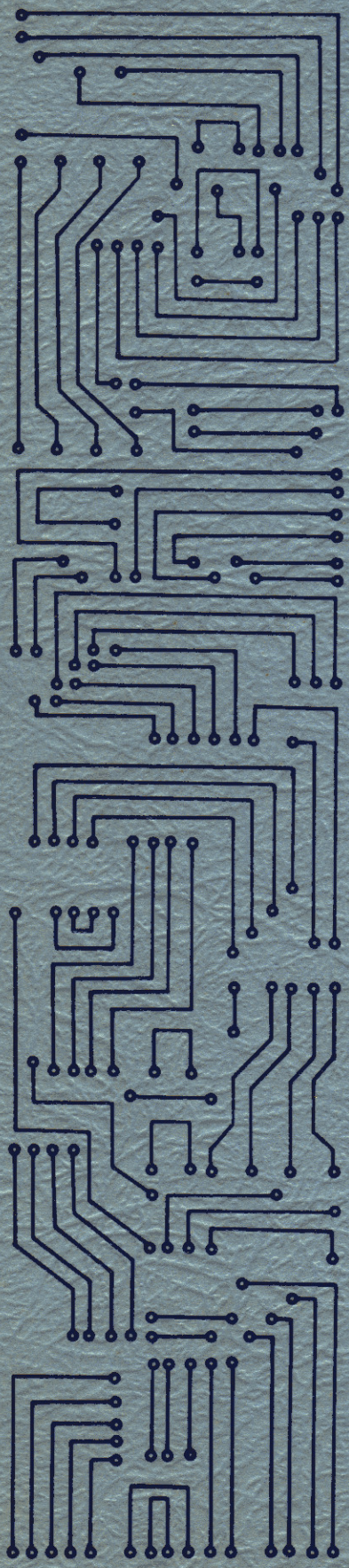

CYBERNEX LIMITED

MDL - 110

Reference Manual

MDL - 110R

Reference Manual

This manual applies to all MDL-110 terminals equipped with one of the JK8024 D10130 REV D , REV F or REV H processor modules with Version 13 EPROMS and the CKB5 detached keyboard.

MDL-110R MANUAL ORGANIZATION

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SECTION 2	Unpacking and Turn On
SECTION 3	Internal and External Controls for Rear Panel Connectors
SECTION 5	Keyboard Operation and Layout, Local Only Operated Functions
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Valid for
Ver. 13 EPROMS

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1. MDL-110 INTRODUCTION

1.1 GENERAL

All MDL SERIES terminals including the MDL-100, MDL-110, MDL-120, MDL-125 etc. contain the same JK8024 microcprocessor module. The MDL-110 is one subset of this module with the following features;

- high resolution 7x12 dot matrix including 3 dot descenders on lower case g,j,p,q,y, comma, and semi-colon
- 4 highlight field attributes
- serial asynchronous port with EIA RS-232C and
- current loop interfaces
- parallel printer port
- 14 switch selectable operating modes
- standard 87 key detachable keyboard

Options include:

- auxiliary asynchronous port with both EIA and current loop interfaces
- 2 meter current loop or RS-232 cables

Current firmware includes:

- editing features;
  - cursor address read/write
  - insert and delete lines or characters
  - full cursor movement
  - clear line, field, end of page, or entire page
- block transmit of line, field, or page
- form transmit for mask preparation
- automatic printer buffering and print screen functions
- tab forward and backward over protected fields
- status of switches displayable on screen
- transparency mode for display of control codes
- remote control of:
  - keyboard lock/unlock
  - printer on/off
  - full duplex read (one character at a time)

1.2 MANUALS

Two documents are available for the MDL-110;

MDL-110R	Reference Manual (this manual) Operating, programming, interface and test information (supplied with the MDL-110 terminal)
MDL-SERIES	Maintenance Manual (JK8024 D10130 REV D) Theory of operation, schematics, and parts lists for the MDL-110 family. (Ordered separately).
OR APL-SERIES	Maintenance Manual Supplied with JK8024, D10130 REV F and REV H modules. (Ordered separately)

1.3 SPECIFICATIONS

1.3.1 DISPLAY

Screen.....	12 inch, P31 non-glare screen minimum 12 Mhz bandwidth
Format.....	24 lines, 80 characters per line
Capacity.....	1 page
Character set.....	128 character ASCII upper/lower case ANSI X3.4 and alternate ANSI X3.32
Character Generation	7x9 dot matrix with 3 dot descenders on g,j,p,q, and y in 9x14 or 9x13 dot field
Refresh Rate.....	60Hz (50 Hz for export model)
Cursor.....	block see-through, non-blinking
Attributes.....	half intensity, blinking, underline and inverse video
Brightness Control....	external adjustment

1.3.2 COMMUNICATIONS

1.3.2.1 MAIN SERIAL PORT

Method.....	serial asynchronous, ANSI X3.15
Format.....	start bit, 7 bit ASCII code, mark or parity bit, two stop bits send, one stop bit receive
Interface.....	EIA RS-232C.D and current loop; automatically selected
Duplex.....	full or half (external switch)
Modes.....	page or roll (external switch) local or remote (external switch)
Parity.....	mark, odd or even (external switch)
Data Rates.....	one of 10 baud rates; 75,110,150, 300,600,1200,2400,4800,9600 and 19200; external thumbwheel
Modem Control.....	103 or 202 handshake (internal switch)

1.3.2.2 PARALLEL PRINTER PORT

This is a bi-directional 8 bit port. However, on the MDL-110 this is programmed for a parallel output printer port.

Method.....	7 bit parallel ASCII output with negative strobe
Acknowledge.....	demand line from printer for next character
Control.....	Printer on/off or print page
Buffering.....	automatic buffering of remote data into display memory
Drive.....	up to 10 milliamp drive on each line for printer cables up to 20 feet

1.3.2.3 AUXILIARY SERIAL PORT (OPTIONAL)

This is an independent bi-directional serial port (MODEM image) programmed on the MDL-110 as a bi-directional port requiring printer control to output data.

Format,Method,Interface	same as MAIN port except MODEM image
Parity Control	both transmit and receive are set for EVEN parity
Control	printer on/off or print page
Baud Rate	independent baud rate thumbwheel switch, same selection as MAIN port

1.3.3 CKB5 KEYBOARD

Layout	87 keyswitch communication style, logically-paired
Function Keys	7 dual functions
Numeric Pad	15 key numeric pad with period, minus signs and ENTER key
BREAK	output line on MAIN PORT is held in space condition
HERE IS	holds logic in transparent mode (control functions displayed as symbols, alternate ANSI X3.32)
Auto-Repeat	15 characters per second
Keyswitch Type	Individual mechanical crossbar switches
Keycaps	2 shot molded, ABS plastic, matte finish, with back legends
Operation	2-key rollover, N-key lockout tri-mode encoded to generate all 128 ASCII codes

1.4 ELECTRICAL AND ENVIRONMENT

Temperature	Operating: 0 to 40 degrees C Storage: -40 to 65 degrees C
Power Input	115 VAC ±10%, single phase, 60 Hz, 60 watts
Export Model Input	220 VAC ±10%, single phase, 50 Hz, 65 watts
Humidity	10% to 95%, non-condensing
Dimensions & Weight..Display Unit	13.5H x 14W x 16D inches 34H x 35W x 41D cm 25 lbs. (11 kg).
CKB5 Keyboard	2.5H x 18.5W x 8D inches 6.5H x 47W x 20D cm 5 lbs. (2 kg).

2. INSTALLATION

2.1 Unpacking

Remove the keyboard and data display terminal from the shipping container and inspect for visible damage. If any damage is found, sign the shipping receipt as damaged and notify your sales representative or Cybernex Limited. Do not discard packing materials. Items not PROPERLY packed for return to Cybernex or the dealer will be refused.

2.2 TURN ON

2.2.1 Power On Initialization

a. Place the keyboard in front of the display with the keyboard cable under the display unit. Plug the keyboard cable into the rear panel connector provided. Refer to FIGURE 2-1.

b. Insert the power cord into the normal three wire 115 VOLT AC wall socket (220 VOLT AC for export model). If the unit was stored or transported in a very cold environment allow the unit to reach operating temperature (0 to 40 degrees Celsius).

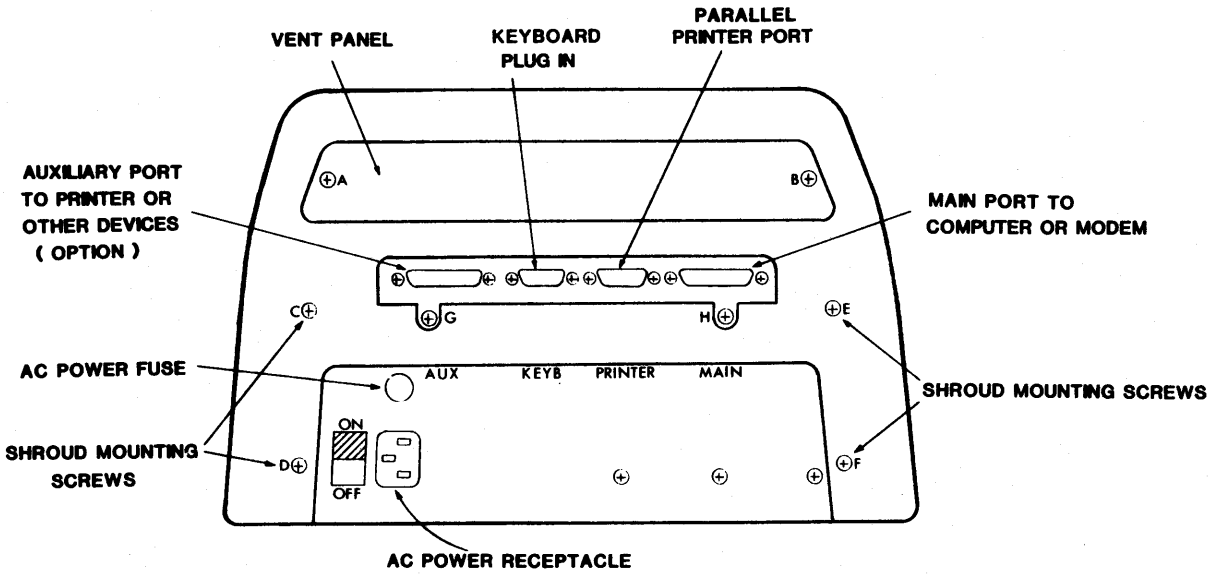
c. Set the rear panel switch to LOCAL mode (refer to FIGURE 2-1). Turn on the rear panel power switch. Allow 30 seconds for warm-up. A "POWER UP OK" message indicates that the terminal has successfully completed self-test. A "FAULT" message indicates a malfunction.

d. If the unit does not turn on, turn off the power switch, and unplug the power cord. Remove the shroud (screws C,D,E,F in FIGURE 2-1) and check that all internal connectors are secure. If no interconnection problems are found, reassemble and repackage the unit and return to the dealer or Cybernex Limited.

e. If the unit is functional resume normal customer test of all terminal functions possible in LOCAL mode before proceeding with REMOTE interconnection. Refer to SECTION 7.

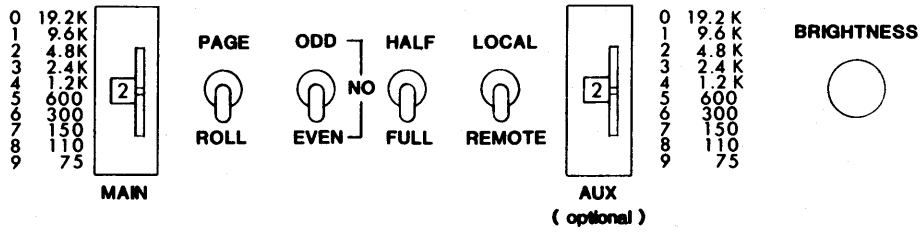
2.3 INTERNAL SWITCH CHANGES

To change internal switch settings remove the vent panel (screws A,B in FIGURE 2-1). Refer to APPENDIX A for switch locations and to Section 3 for switch functions.



CYBERNEX LIMITED	MDL / APL SERIES REAR VIEW			DR'N BY D T	SCALE
				CH'D BY J G	DWG. No. Fig. 2-1
	MAT'L	No. REQ'D	CLASS	DATE 08/12/80	

TRANSTEX 15 3M-10-79 STOCK NO. 411-1151



CYBERNEX LIMITED	MDL / APL SERIES FRONT PANEL			DR'N BY D T	SCALE
				CH'D BY J G	DWG. No. Fig. 2-2
	MAT'L	No. REQ'D	CLASS	DATE 09/12/80	

TRANSTEX 15 3M-10-79 STOCK NO. 411-1151

3. SWITCHES, CONTROLS, AND CONNECTORS

In this section the input/output ports, external switches and controls, and the function of internal DIP switches is explained. Section 3.1 deals with external connectors and controls not monitored by the internal microcprocessor.

Section 3.2 explains the function of external panel switches and internal DIP switches monitored by the microprocessor.

3.1 EXTERNAL CONTROLS AND CONNECTORS

3.1.1 POWER SWITCH

This breaks the power input to the power transformer. The power cable is three wire, the third wire is chassis ground.

3.1.2 BRIGHTNESS CONTROL

An external brightness control is provided to adjust the character display intensity relative to ambient light conditions.

3.1.3 BAUD RATE SWITCH

An external thumbwheel switch is provided for the selection of one of ten baud rates; 75, 110, 150, 300, 600, 1200, 2400, 4800, 9600, and 19200 on the MAIN port. With the AUX port option a separate thumbwheel switch is provided for independent selection of ten baud rates. Refer to FIGURE 2-1.

3.1.4 MAIN SERIAL PORT

A DB-25S connector is provided containing both RS-232C and current loop interfaces for connection to a MODEM or computer. Selection of either interface is automatic on REV D and REV F modules. REV H modules require a jumper on the mating DB-25P cable connector to operate current loop. Refer to SECTION 4.

3.1.5 PARALLEL PRINTER PORT

A DA-15S connector is provided for parallel printer output at TTL levels. Refer to SECTION 4 for signal pin-out and hand-shaking.

3.1.6 AUXILIARY SERIAL PORT (OPTION)

A DB-25S connector is provided for serial data output with both RS-232C and current loop levels. Current loop is selected with a jumper on the mating DB-25P connector.

3.1.7. KEYBOARD INPUT PORT

A DA-15S connector is provided for interconnection of the detachable keyboard.

3.2 INTERNAL AND EXTERNAL SWITCHES

When the STATUS key is depressed on the keyboard the status of internal and external switch functions is reported on the screen. Refer to SECTION 5.5.1 for a sample status line.

To change some of the functions it is necessary for the terminal to reinitialize itself. This will create a test pattern terminated by a cleared screen and a "POWER UP OK" message. TABLE 3-1 summarizes the functions and the status line messages. An R in the table indicates which function changes will cause reinitialization.

Internal DIP switches are accessed by removing the rear vent panel. Refer to FIGURE 2-1 and APPENDIX A. Switch positions 4 through 8 on SWITCH 1 (S1) must be OFF to enable the front panel switches. In the following discussion, external switches are designated by asterisks (*).

3.2.1 SWITCH 1 (S1)

Refer to APPENDIX A for internal location of this 8 position DIP switch.

POS 1 NUMERIC FIELDS ENABLE

OFF Underlined fields are not designated (normal operation)

ON Underlined fields allows entry of 0 to 9, period, plus, minus, comma and slash (/) only. Other characters are refused.

POS 2 FORMAT MODE ENABLE

OFF Non-format Mode; half intensity data is not protected. FORMAT LOCK and UNLOCK commands have no effect. FORWARD and BACK TAB become forward space and backspace.

ON Format Mode is enabled. FORMAT LOCK is automatically asserted when format mode is switched ON thus protecting half intensity fields from cursor entry and read/write operations. FORWARD TAB moves the cursor forward to the next unprotected field. BACK TAB moves the cursor to the start of the previous unprotected field. TABS are illegal if FORMAT UNLOCK is asserted.

POS 3 TEXT COMPRESSION MODE

OFF Normal mode; all spaces are transmitted when any block mode function is activated.

ON Trailing spaces on each line are not transmitted for any block mode transmit functions.

*POS 4 EVEN/ODD PARITY

Position 4 and position 8 are combined into a single 3 position switch on the front panel. If the front panel switches are disconnected (Connector P7 removed in FIGURE A-1 of APPENDIX A) then POS 4 is not active unless POS 8 is ON.

OFF EVEN parity; The eighth bit of the serial data from the main port is set for even parity.

OFF ODD PARITY; The eighth bit is set for odd parity.

NOTES: For JK8024 D10130 REV D and REV F modules, when the MAIN port is disconnected and the front panel switches are set to REMOTE and ODD parity, the NUL character input at the current loop (constant spaces) will appear as EVEN parity. Thus the screen will fill up with question marks. If the Optional AUXILIARY serial port is provided, the send and receive are both set for EVEN parity. Parity cannot be changed on the AUX port. For REV H modules the current loop is enabled externally on the mating connector and thus these conditions do not exist.

*POS 5 PAGE/ROLL MODE

OFF ROLL Mode; In roll mode when the cursor is advanced downward on the bottom line, data moves up one line on the screen. The top line is lost and the cursor remains on the newly cleared bottom line of the screen.

ON PAGE Mode; In page mode, when the cursor is advanced downward from the bottom line, it moves to the top line. Data on the screen is not affected.

*POS 6 FULL/HALF DUPLEX MODE

OFF FULL Duplex; In full duplex mode, data is written to the MAIN port output and is not displayed on the screen unless re-echoed by the computer.

ON HALF Duplex; In half duplex mode data is written to the MAIN port output and onto the screen simultaneously. This mode is used on systems which do not echo keyboard data. If this switch is set to half duplex on a full duplex system, a double entry will appear on the screen for each keystroke.

POS 7 LOCAL/REMOTE MODE

OFF LOCAL Mode; In local mode, input and output data is inhibited on the MAIN port. The PRINTER port and the optional AUXILIARY port are not affected. Data output on these ports is controlled by the PRINT ON and PRINT OFF control codes or the PRINT SCREEN command. Also refer to SECTION 3.2.2. POS 7 for QUASI-LOCAL mode.

ON REMOTE Mode; In remote mode data input and output are enabled on the MAIN port.

POS 8 PARITY ENABLE

OFF NO PARITY; Parity is not recognized on data input from the MAIN port. Output data has the eighth bit set in the MARK state.

ON PARITY ENABLED; With parity enabled, either EVEN or ODD parity is transmitted. Refer to SECTION 3.2.1 POS 4.

NOTES: The three position front panel switch replaces both POS 4 and POS 8. Parity is automatically enabled when EVEN or ODD is selected and parity is disabled in the NO position.

3.2.2 SWITCH 2 (S2)

Refer to APPENDIX A for internal location.

POS 1 UNUSED

POS 2 ANSWERBACK MODE

OFF Normal mode, disabled.

ON When the ANSWERBACK code sequence is received (Section 6.1.2) the contents of the optional 32 byte PROM is transmitted. The message in this PROM may be terminated with a HEX 04 code for sequences less than 32 bytes.

POS 3 AUTO NEW LINE ENABLE

OFF Normal mode.

ON A LINE FEED code is automatically inserted after each CURSOR RETURN code generated from the keyboard.

POS 4 DUMB TERMINAL ENABLE

OFF Normal mode, all functions are active.

ON All control codes and control sequences are disabled with the exception of cursor return, line feed, back space, bell and tab. This mode is normally used for time-share operation.

POS 5 FIXED FIELD

OFF Normal mode. TRANSMIT PAGE (Section 6.1) frames the page with STX and ETX only.

ON Fixed Field mode. If FORMAT MODE is enabled, TRANSMIT PAGE frames the page with an STX and ETX and inserts a CR code at the end of each unprotected field. Field attributes cannot be altered in this mode if FORMAT LOCK is asserted (Section 6.1.2).

POS 6 FIELD EXIT

OFF Normal mode. Given an unprotected field between two protected fields, this field can be exited with any character or control code.

ON — Control exit. An unprotected field between two protected fields can only be exited with a control code. Any attempt to exit this field with other than a control code will not move the cursor and the buzzer will sound.

POS 7 QUASI-LOCAL MODE

ON — Normal, the external LOCAL/REMOTE switch determines the mode of operation. Refer to Section 3.1.2.

OFF — Quasi-local mode. The terminal will initialize in local or remote mode according to the external LOCAL/REMOTE switch. Thereafter remote reception of an STX (02) places the terminal in REMOTE mode. An ETX code (HEX 03) sets the terminal to LOCAL operation except for the TRANSMIT PAGE, FIELD/LINE and FORM functions.

POS 8 103/202 MODEM

OFF — 103 type handshaking. The handshake signals CTS, RLSD and DSR (refer to Section 4) must be asserted active from the computer or MODEM on the MAIN serial port. RTS and DTR are asserted from the terminal back to the computer or MODEM.

ON — 202 type handshaking. RLSD and DSR are asserted by the remote device. During character reception CTS is asserted high by the remote device. DTR is held active but RTS only becomes active when a keystroke is sensed and is returned to the inactive state 300 milliseconds after a CURSOR RETURN from the keyboard is sensed. A 200 millisecond delay can be programmed for the TRANSMIT LINE, TRANSMIT PAGE, TRANSMIT FORM, READ CURSOR ADDRESS and ANSWERBACK functions. Refer to DELAY ON in Section 6.1.1.

TABLE 3-1
SUMMARY OF SWITCH POSITIONS AND STATUS MESSAGES

SWITCH 1 (S1) POS	OFF		ON	
	MESSAGE	FUNCTION	MESSAGE	FUNCTION
1		*NUM FIELDS DISABLED	NumField	NUMERIC FIELDS ENABLED
2	----	NON-FORMAT MODE	ProtField	*FORMAT MODE ENABLED
3	----	*TRAILING SPACES TRANSMITTED	SpSuppr	TEXT COMPRESSION ENABLED
R 4	Even	EVEN PARITY	Odd	ODD PARITY
5	Roll	ROLL MODE	Page	PAGE MODE
6	Fdplx	FULL DUPLEX	Hdplx	HALF DUPLEX
7	Local	LOCAL	Rem	REMOTE
R 8	Mark	NO PARITY	Par	PARITY ENABLED
SWITCH 2 (S2)				
R 1	----	UNUSED	----	UNUSED
2	----	*NO ANSWERBACK	Ansbak	ANSWERBACK ENABLED
3	----	*AUTO NEW LINE DISABLED	Autolf	AUTO NEW LINE ENABLED
4	Smart	*ALL FEATURES ENABLED	Dumb	DUMB TERMINAL MODE
R 5	----	*FIXED FIELD DISABLED	HP	FIXED FIELD ENABLED
6	----	*ANY FIELD EXIT	NoExit	FIELD EXIT BY CONTROL
7	Quas	QUASI-LOCAL MODE	----	*NORMAL LOCAL/REMOTE
8	103	*103 HANDSHAKE	202	202 HANDSHAKE

* - Asterisk indicates settings of internal switch positions when the terminal is shipped. Front panel switches may be in any position.
R - Indicates that the terminal will reinitialize when this switch is changed.

4. INTERFACES

4.1 MAIN PORT

A DB-25S connector is provided for interconnection to a computer or MODEM. Both EIA RS-232C and current loop interfaces are available on this connector. RS-232 operation on REV D and REV H modules is automatically selected with the assertion of the DSR (Data Set Ready) signal. If DSR is not asserted (or no connection) current loop operation is assumed by the interface. On REV H modules the current loop is selected by an external connection on the mating DB-25P connector.

4.1.1 EIA RS-232C.D Interconnection

TABLE 4-1 gives the pin assignment and signal names for the RS-232C signals for subclass D operation. Both 103 and 202 MODEMs are supported. Refer to SECTION 3.2.2. POS 8 for the 103 202 internal switch. Supervisory or reverse interrupt channels are not supported.

For 202 MODEM operation the cable in FIGURE 4-1A is normally used. For 103 operation (no handshaking) the cable of FIGURE 4-1B is normally used. Pins 2 and 3 may have to be interchanged on the computer end depending on the manufacturer's configuration. The RS signals must be present on the computer or MODEM to use the RSD-9 cable. If 202 mode is not required it is advisable to use the 4-wire cable (FIGURE 4-1B) with the handshake signals defeated.

4.1.2 Current Loop Interconnection

TABLE 4-2 gives the pin assignment for current loop interconnection. Since the computer normally provides the current sources, the current loop interfaces on the terminal are passive isolated switches. FIGURE 4-2 indicates the typical interconnection cable.

4.2 PARALLEL PRINTER PORT

TABLE 4-3 gives the DA-15S pin assignment for the parallel printer port. All signals are TTL levels (0 to plus 5 volts). Output drive is up to 10 milliamps per line permitting printer cables up to 20 feet in length depending on noise environments. This bi-directional port is programmed for printer output only with an acknowledge input line from the printer.

4.3 KEYBOARD INPUT PORT

TABLE 4-1 gives the DA-15S pin assignment for the parallel keyboard input. Signals are at TTL levels. Power for the keyboard logic is supplied from this connector. This bi-directional port is programmed for keyboard input only on the MDL series.

4.4 AUXILIARY PORT (OPTIONAL)

A DB-25S connector is provided for interconnection to a serial printer or auxiliary send-receive device. Both RS-232C and current loop is available on this connector, but interfaces are not automatically switched. Normal operation is RS-232C. A jumper must be inserted on the mating DB-25P connector for current loop operation. Standard MDL series software permits input and output on this port only when the PRINT PAGE or PRINTER ON commands are initiated.

FIGURE 4-1
TYPICAL MAIN PORT RS-232 CABLES

FIGURE 4-1A

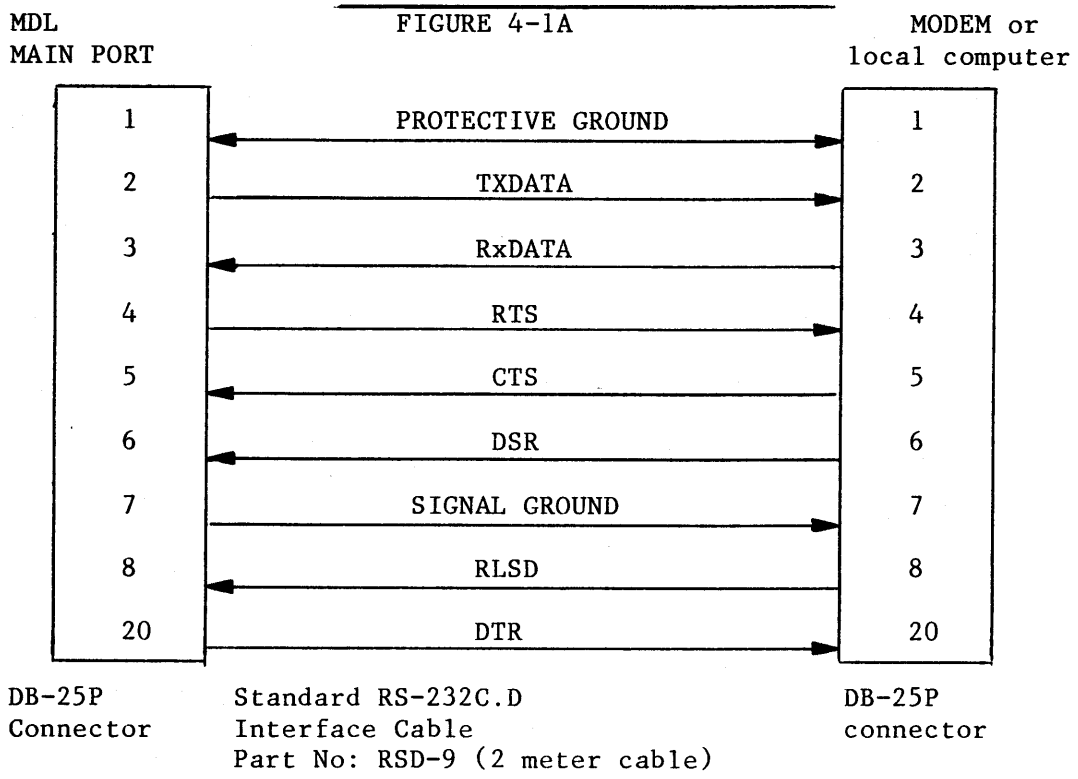


FIGURE 4-1B

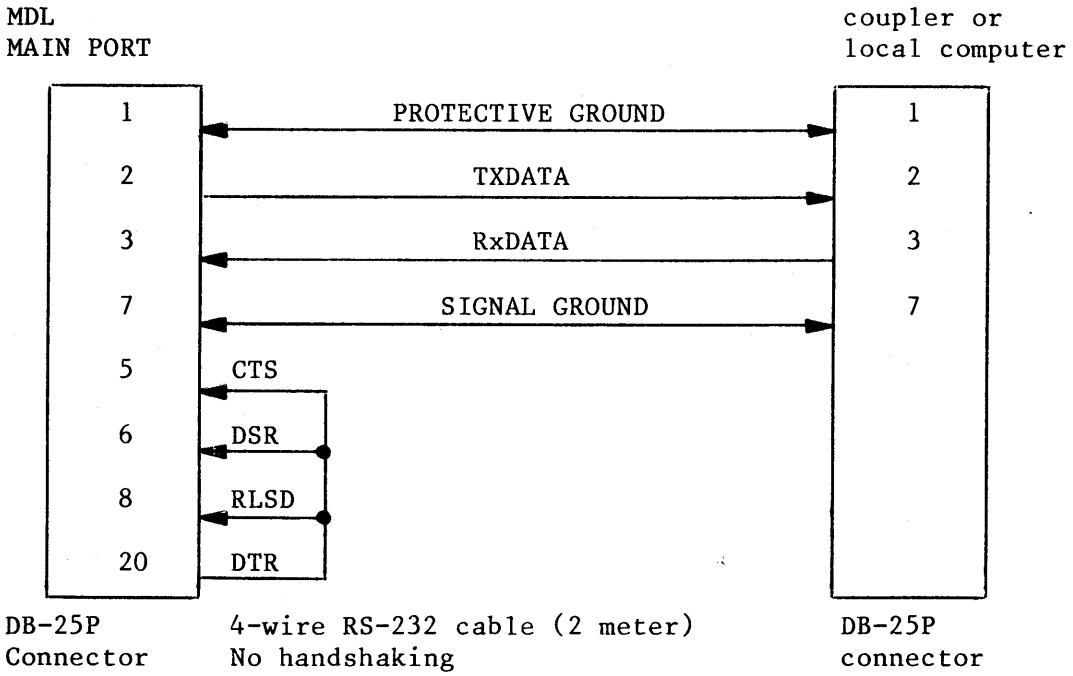


TABLE 4-1 MAIN PORT EIA RS-232C.D SIGNALS

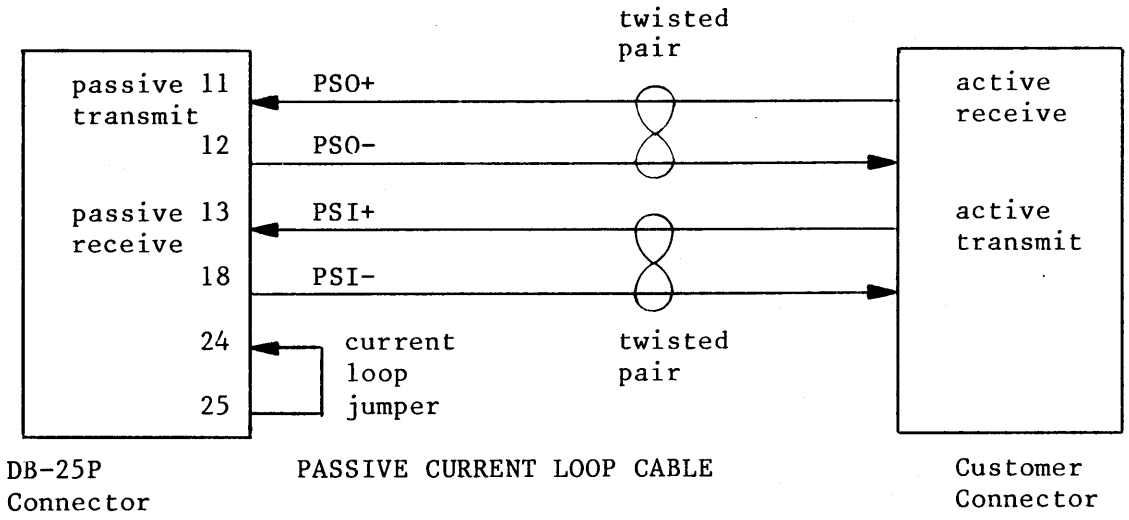
CCITT CIRCUIT	RS-232 CIRCUIT	DB-25S PIN NO.	ABBR.	SIGNAL NAME	DESCRIPTION
101	AA	1		Chassis Ground	Protective ground.
103	BA	2	TxDATA	Transmit Data	Data from terminal.
104	BB	3	RxDATA	Receive Data	Data into terminal.
105	CA	4	RTS	Request to Send	Output control line 103 - always ON 202 - asserted ON to transmit
106	CB	5	CTS	Clear to Send	Input control line 103 - Must be ON 202 - ON when ready for transmission
107	CC	6	DSR	Data Set Ready	Input control line Must be ON to assert RS-232 mode on REV D and REV F. Unused on REV H
102	AB	7		Signal Ground	Must be connected
109	CF	8	RLSD	Receiver Line Signal Detect	Input control line Must be Asserted ON to enable receive
108.2	CD	20	DTR	Data Terminal Ready	Output control line Asserted ON by power sentry if processor is running

TABLE 4-2
MAIN PORT CURRENT LOOP SIGNALS

DESCRIPTION	ABBR.	PIN NUMBER
Passive Current Loop Transmit (current flows into this pin from computer	PSO+	11
Passive Current Loop Transmit (current return to computer)	PSO-	12
Passive Current Loop Receive (current flows into this pin from computer)	PSI+	13
Passive Current Loop Receive (current return to computer)	PSI-	18

Transmit (PSO) and receive (PSI) are with respect to the terminal.

FIGURE 4-2
MAIN PORT CURRENT LOOP CABLE



This is standard for most computers (contain the current sources). NO grounds are used. If shielded twisted pair is used, ground only one end of the shield, either at the computer end or to PIN 1 (PROTECTIVE GROUND) at the terminal end.

TABLE 4-3

PARALLEL PRINTER PORT; DA-15S CONNECTOR

SIGNAL NAME	ABBR.	PIN NO.
DO NOT CONNECT	NC	1
ASCII BIT 6	P6	2
ASCII BIT 5	P5	3
ASCII BIT 4	P4	4
ASCII BIT 3	P3	5
ASCII BIT 2	P2	6
ASCII BIT 1	P1	7
ASCII BIT 0 (least significant)	P0	8
Acknowledge (from printer)	ACK	9
Data Strobe (to printer)	PSTB	10
Ground	GND	11,12,13 14,15

TABLE 4-4

KEYBOARD INPUT PORT; DA-15S CONNECTOR

SIGNAL NAME	ABBR.	PIN NO.
Keyboard SHIFT	KI7	1
ASCII BIT 6	KI6	2
ASCII BIT 5	KI5	3
ASCII BIT 4	KI4	4
ASCII BIT 3	KI3	5
ASCII BIT 2	KI2	6
ASCII BIT 1	KI1	7
ASCII BIT 0 (least significant)	KI0	8
Keyboard STROBE	KSTB	9
HERE IS	HI	10
BREAK	BRK	11
No connection	NC	12,14
Keyboard Ground	Gnd	13
Power	+5V	15

FIGURE 4-3
TYPICAL AUX PORT RS-232 CABLES

FIGURE 4-3A

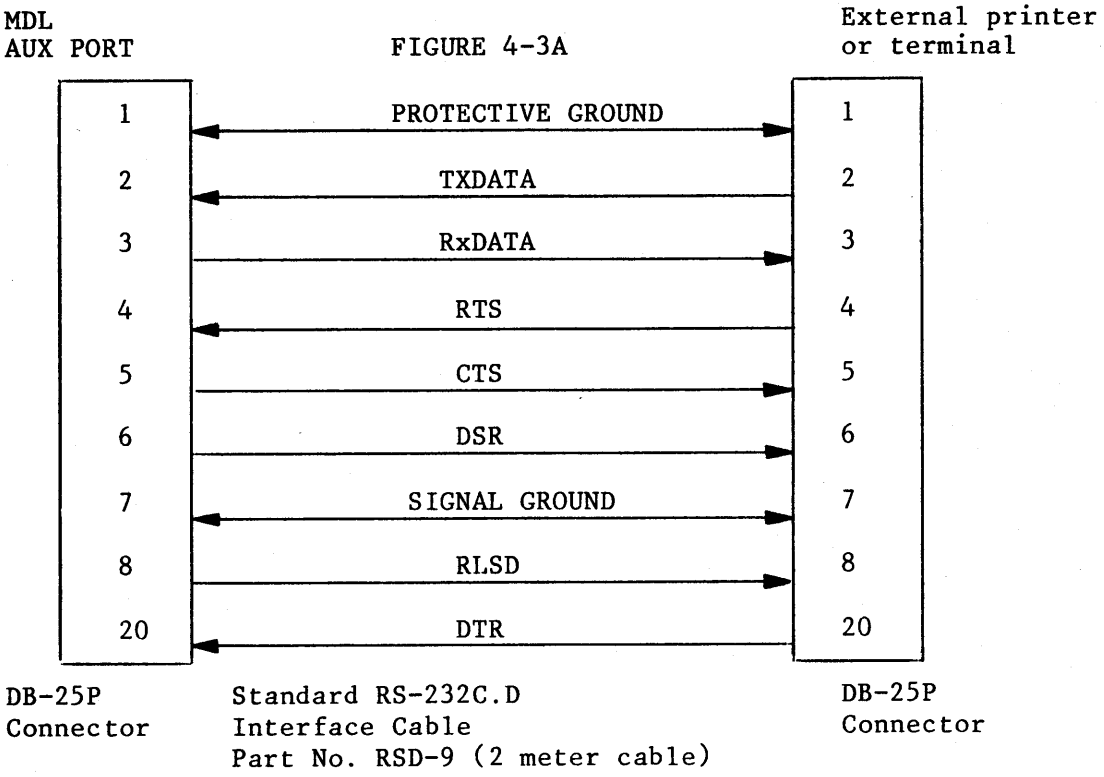


FIGURE 4-3B

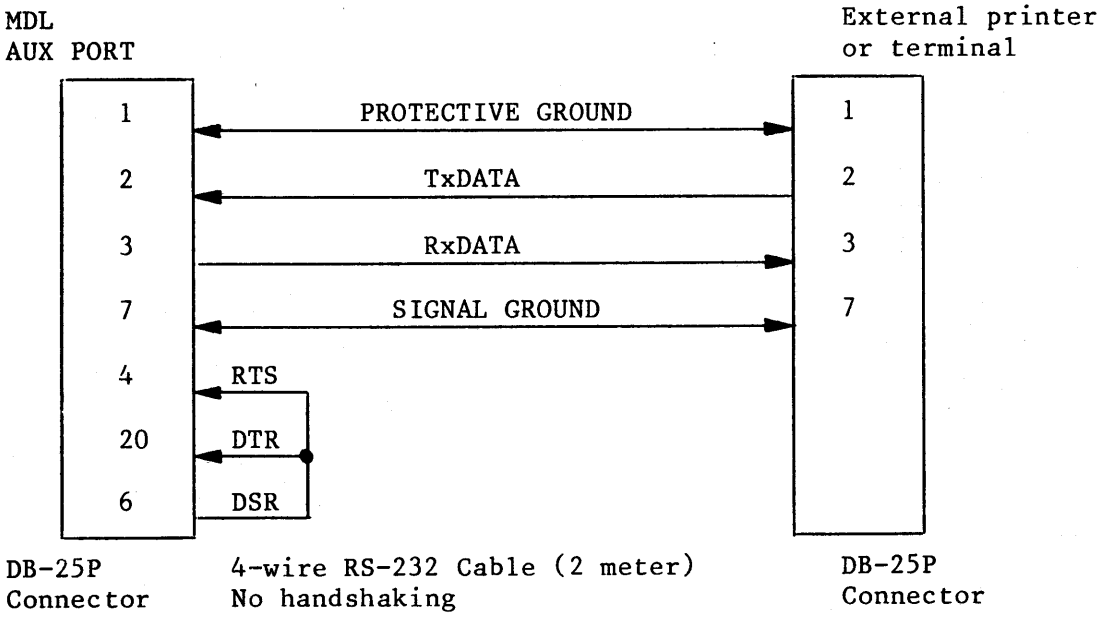


TABLE 4-5 AUX PORT EIA RS-232C.D SIGNALS

CCITT CIRCUIT	RS-232 CIRCUIT	DB-25S PIN NO.	ABBR	SIGNAL NAME	DESCRIPTION
101	AA	1		Chassis ground	Protective ground
103	BA	2	TxDATA	Transmit Data	Data into terminal
104	BB	3	RxDATA	Receive Data	Data out of terminal
105	CA	4	RTS	Request To Send	Input control line. Must be ON to transmit data on circuit BB
106	CB	5	CTS	Clear To Send	Output control line Programmed ON
107	CC	6	DSR	Data Set Ready	Output control line Asserted ON by by power sentry if processor is running
102	AB	7		Signal Ground	Must be connected
109	CF	8	RLSD	Receiver Line Signal Detect	Output control line Always ON
108.2	CD	20	DTR	Data Terminal Ready	Input control line Must be ON to enable receive data on circuit BA

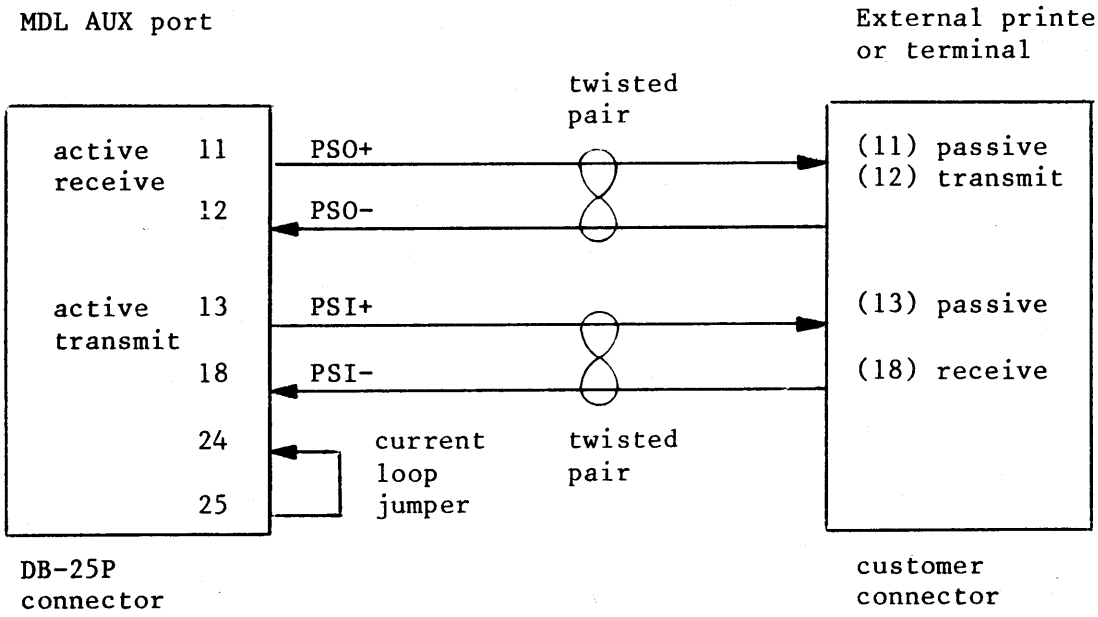
NOTE: Transmits (TxDATA) and receive (RxDATA) are with respect to the external device.

TABLE 4-6

AUX PORT CURRENT LOOP SIGNALS

DESCRIPTION	ABBR.	PIN NUMBER
Active Current Loop Receive (current flows out of this pin to external device)	PSO+	11
Active Current Loop receive (current return from external device)	PSO-	12
Active current loop transmit (current flows out of this pin to external device)	PSI+	13
Active Current Loop Transmit (current return from external device)	PSI-	18

FIGURE 4-4
AUX PORT CURRENT LOOP CABLE



Bracketed values are for MAIN PORT of a second MDL terminal. Pin numbers and connectors may be different for other manufacturers devices.

5. CKB5 KEYBOARD

5.1 GENERAL

The CKB5 keyboard is standard for one-hundred series MDL terminals. All individually replaceable keyswitches are held in a rigid aluminum switchplate. Encoding logic is provided on the keyboard. Output data is 8 bit parallel including 7 bit ASCII. The eighth bit is monitored by the MDL-110 to provide two code sequences for special functions with a single keystroke.

5.1.1 Rollover

These keyboards feature 2-key rollover with N-key lockout. When a second keyswitch is depressed while the first key is held down the second code is not transmitted until the first key is released hence the term "rollover". If a second key is depressed and released while the first key is held down the second code is not transmitted hence the term "lockout". These rollover and lockout features pertain only to coded keyswitches. SHIFT, CTRL, CAPS LOCK, and HERE IS must be held down or locked to effect other keyboard modes.

5.1.2 Coding

The action of the CKB5 keyboard is tri-mode. All 128 characters of the ASCII code set can be generated by depressing either the CTRL or SHIFT keys or depressing neither. This is a communications style or "logically-paired" keyboard.

5.1.3 Auto-Repeat

When any encoded key is depressed a character is printed or a function is executed. After a delay of about 0.75 seconds the character (or function) is repeated at about 15 times per second for as long as the key is depressed.

5.2 MAIN KEYBOARD

5.2.1 Normal Mode

Referring to TABLE 5-1, columns 6 and 7 of the table give the lower case characters when none of the SHIFT, CTRL or CAPS LOCK keys are depressed.

5.2.2 CAPS LOCK Mode

The CAPS LOCK key is alternate action. When depressed the switch will stay locked in the down position. When depressed a second time the switch will release to the up position. When in the down position CAPS LOCK is asserted. This function performs a subset of SHIFT. For the CKB5 keyboard only the alphameric characters A through Z, in columns 6 and 7 are shifted to the upper case characters in columns 4 and 5.

5.2.3 SHIFT Mode

For all keytops containing dual symbols, the SHIFT key selects the upper symbol. This includes special function keys not shown in the table. The SHIFT key must be held down while another key is depressed.

5.2.4 CTRL Mode

The CTRL key shifts all characters in columns 6 and 7 (or columns 4 and 5 if CAPS LOCK is locked down) to columns 0 and 1. Columns 2 and 3 are not affected. The CTRL key must be held down while another key is depressed. The transparency mode symbols are also shown for the 32 control codes in columns 0 and 1.

5.2.5 BREAK

The BREAK key holds the transmitter output line in the space condition for as long as this keyswitch is depressed. BREAK is always active, it is not under program control.

5.2.6 SPACE BAR

When the space bar is depressed an ASCII space (blank) appears on the screen. CTRL, SHIFT and CAPS LOCK have no effect on this key.

5.2.7 DELETE

The DELETE key is also regarded as the RUB OUT key on some systems. This code is inhibited from display on the screen during normal mode since it is often used as a fill character. In transparency mode it is displayed as a cross hatched block.

5.3 CONTROL KEYS

The functions executed by the control keys (top row on keyboard) are described in SECTION 6. As was the case with dual legend symbols on the main keyboard the SHIFT key selects the upper symbol on the keytop.

5.4 NUMERIC PAD

On the CKB5 keyboard, the numeric pad is not affected by the CTRL or CAPS LOCK keys. For one-hundred series MDL terminals the numeric pad is dual function. For NORMAL PAD operation, when any SHIFT key is held down the numeric keys generate a two code sequence for user defined functions. The first code is always SO (0E HEX) followed by a lower case character "a" through "j" for numerics 0 through 9 respectively. A SHIFT key is provided on the numeric pad for convenience.

For ALTERNATE PAD operation the shift sequences SO,a through SO,j are always produced for numerics 0 through 9 respectively on the numeric pad. The SHIFT key does not have to be depressed. Refer to SECTION 6.1.2 and TABLE 5-2.

The NULINE key generates a single code to move the cursor to the beginning of the next line. Any SHIFT key must be held down before depressing the NULINE key.

5.5 LOCALLY OPERATED KEYBORD FUNCTIONS

The following functions can be generated from the keyboard only. They do not transmit codes to the computer.

5.5.1 SWITCH STATUS

. STATUS key

This displays the external panel and internal switch settings on the current line occupied by the cursor.

When a unit is shipped from the factory the internal switches are set as shown by the asterisks in TABLE 3-1.

When the status key is depressed the status displayed on the screen is given as;

Local Fdplx Roll Par Protfield Even 103 Smart

NOTE:

For REV D and REV Modules, if STATUS is executed with the MAIN port (to MODEM or computer) unconnected and the terminal in REMOTE mode, the message will appear scrambled since the current loop interface is actively generating a NUL input.

Note also that if the terminal is in REMOTE mode and the MAIN port is unconnected with ODD parity selected, the NUL from the current loop input will appear as question marks written on the display.

For REV H modules, the current loop is selected externally on the mating current loop cable. Therefore the unconnected MAIN port does not input NULS and question marks do not appear. Refer to SECTION 4.

5.5.2 PRINT PAGE

. SHIFT PRINT/STATUS

Transmits the entire displayed page of data to the printer. This command automatically inserts CARRIAGE RETURN and LINE FEED codes after each line of the displayed page. Refer to SECTION 6.2.3 for printer port selection and default message.

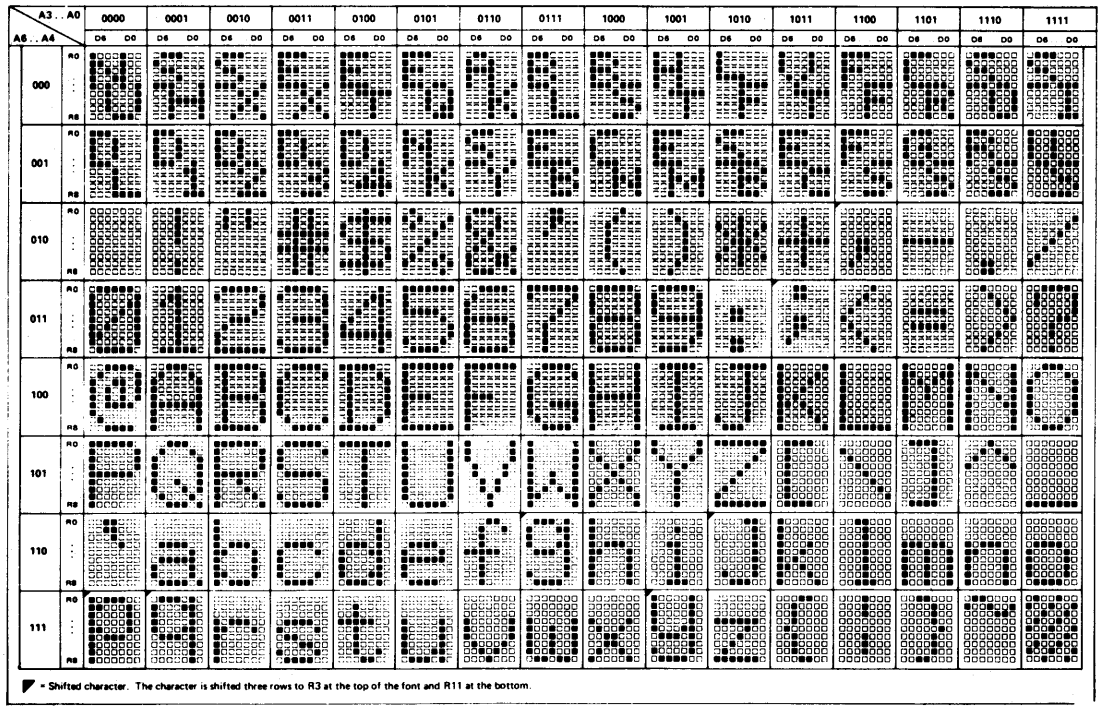
5.5.3 TRANSPARENCY MODE

. HERE IS (held down)

When transparency mode is asserted ON, all control codes are displayed but not executed. Refer to TABLE 5-1 for symbol representation of control codes. The DELETE code (7F) which is normally inhibited is displayed as a cross-hatched block.

Table 5-1 Display Characters

B4 B3 B2 B1	Row \ Col	0 (B7 B6 B5 = 0 0 0)	1 (B7 B6 B5 = 0 0 1)	2 (0 1 0)	3 (0 1 1)	4 (1 0 0)	5 (1 0 1)	6 (1 1 0)	7 (1 1 1)
0 0 0 0	0	NUL N_U	DLE D_L	SP	0	@	P	`	p
0 0 0 1	1	SOH S_H	DC1 D_1	!	1	A	Q	a	q
0 0 1 0	2	STX S_X	DC2 D_2	"	2	B	R	b	r
0 0 1 1	3	ETX E_X	DC3 D_3	#	3	C	S	c	s
0 1 0 0	4	EOT E_T	DC4 D_4	$	4	D	T	d	t
0 1 0 1	5	ENQ E_Q	NAK N_K	%	5	E	U	e	u
0 1 1 0	6	ACK A_K	SYN S_Y	&	6	F	V	f	v
0 1 1 1	7	BEL B_L	ETB E_B	'	7	G	W	g	w
1 0 0 0	8	BS B_S	CAN C_N	(	8	H	X	h	x
1 0 0 1	9	HT H_T	EM E_M	)	9	I	Y	i	y
1 0 1 0	10	LF L_F	SUB S_B	*	:	J	Z	j	z
1 0 1 1	11	VT V_T	ESC E_C	+	;	K	[	k	{
1 1 0 0	12	FF F_F	FS F_S	,	<	L	\	l	¦
1 1 0 1	13	CR C_R	GS G_S	-	=	M	]	m	}
1 1 1 0	14	SO S_O	RS R_S	.	>	N	^	n	~
1 1 1 1	15	SI S_I	US U_S	/	?	O	_	o	DEL



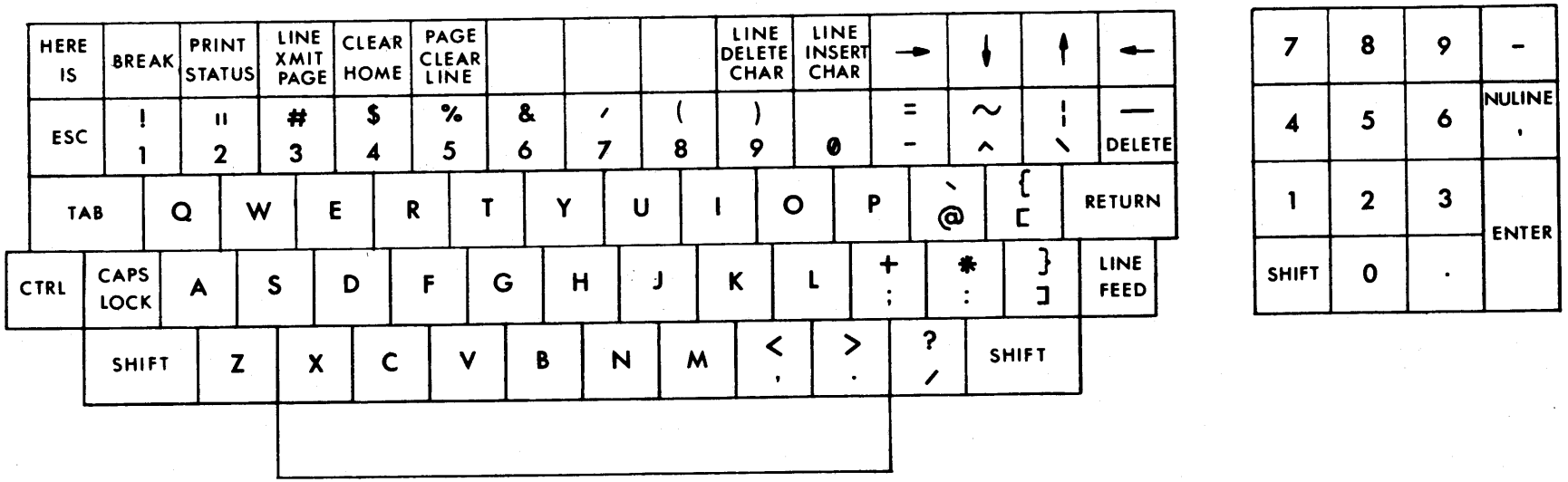


FIGURE
5-1

CYBERNEX LIMITED	CKB5-L Keyboard for MDL-110	DR'N BY G.M.	SCALE
		CH'D BY	DWG. No. CKB5-7
	MAT'L / No. REQ'D / CLASS	DATE 1-6-79	

TRANSTEX 8M-10-77

STOCK NO. 411-4152

TABLE 5-2: NUMERIC PAD USER DEFINED FUNCTION KEYS

The numeric pad can operate in two modes; NORMAL PAD and ALTERNATE PAD. In NORMAL PAD mode numerics are generated in UNSHIFTED mode. When the SHIFT key is held down each keystroke generates a two code sequence; a SHIFT OUT contrl code (0E HEX) followed by a lower case alphameric "a" (61 HEX) through "j" (6A HEX) for numerals 0 through 9 respectively.

In ALTERNATE PAD mode only the shift out sequences are generated regardless of the SHIFT key. Refer to SECTION 6.1.2 for numeric pad control.

KEY	SEQUENCE	HEX	DEC	OCTAL
0	SO,a	0E,61	14,97	016,141
1	,b	,62	,97	,142
2	,c	,63	,99	,143
3	,d	,64	,100	,144
4	,e	,65	,101	,145
5	,f	,66	,102	,146
6	,g	,67	,103	,147
7	,h	,68	,104	,150
8	,i	,69	,105	,151
9	,j	,6A	,106	,152

6. PROGRAMMING INFORMATION

The MDL-110 may be operated in either a NON-FORMAT or FORMAT mode. (Refer to SECTION 3.2.1., POS 2).

In NON-FORMAT mode half-intensity is only a display attribute. The FORMAT LOCK code sequence has no effect.

In FORMAT MODE, half-intensity fields can be protected or unprotected with the FORMAT LOCK and UNLOCK commands respectively. Protected fields inhibit cursor entry during read/write operations. The TAB key is used to skip over protected fields backwards of forwards. The INSERT LINE or DELETE LINE functions are disabled in protected mode, that is, when FORMAT MODE is asserted.

PROTECTED MODE is defined when FORMAT LOCK is asserted with the internal switch set to FORMAT MODE.

DEFAULT MODE is defined as the mode the terminal assumes when the power is turned on.

6.1 CODE OPERATED FUNCTIONS

In addition to the local only keyboard functions described in SECTION 5.5, there are two other classes of functions; keyboard/remote functions and remote only functions.

Of these functions, some are single control code operated and others require a two code sequence. For two code sequences the first code (or LEAD IN code) is always the SHIFT OUT code generated by CNTL N on the keyboard or code 0E HEX from the computer.

The asterisks (*) shown for the following functions indicate that there is a special key present on the keyboard to execute the function. These special keys generate either a single or two code sequence with a single keystroke. Also most special keys are dual function and to execute the top legend on the keytop, the SHIFT key must be held down.

Remote only functions are also indicated in the following tables.

6.1.1 Single Code Functions

CONTROL	HEX	DEC	OCTAL	
Remote only	02	2	002	REMOTE MODE ON (STX) Places terminal in remote mode if enabled. (SECTION 3.2.2, POS. 7).
Remote only	03	3	003	REMOTE MODE OFF (ETX) Places terminal in local mode if enabled.
G	07	7	007	BELL
H	08	8	010	*BACKSPACE or ← Forward space if in non-format mode. Tab to next unprotected field if in protected mode.
I	09	9	011	*FORWARD TAB (TAB key)
J	0A	10	012	*LINE FEED or ↓
K	0B	11	013	DELAY OFF No delay for transmit functions
L	0C	12	014	DELAY ON A 200 ms delay is introduced before transmission of Transmit Line, Page, Form or Read Cursor Address and Answerback.
M	0D	13	015	*CURSOR RETURN (also ENTER)
N	0E	14	016	LEAD IN CODE (SHIFT OUT) For two code sequences (Section 6.1.2)
P	10	16	020	WRITE CURSOR ADDRESS Binary Y, binary X offset (see TABLE 6-1).
R	12	18	022	PRINTER ON Enables printer port to output data (Section 6.2.3).
T	14	20	024	PRINTER OFF Disables printer port ouput (Section 6.2.3)

U	15	21	025	*FORWARD SPACE or → Non-destructive movement of cursor one position forward.
V	16	22	026	*CLEAR TO END OF LINE (CLEAR LINE/PAGE key) Clears from cursor position. Clear to end of field in protected mode.
W	17	23	027	*CLEAR TO END OF PAGE (SHIFT CLEAR LINE/PAGE key) Clears from cursor position. Only unprotected data is cleared in protected mode. Underline is not cleared if numeric fields are enabled.
X	18	24	030	*CLEAR PAGE (SHIFT CLEAR/HOME key) Clears all data and attributes, resets all attribute controls and moves cursor to the home position.
Y	19	25	031	*CURSOR HOME (CLEAR/HOME key) Non-destructive cursor movement to upper left-hand corner of screen.
Z	1A	26	032	*CURSOR UP or ↑ Moves the cursor up one line, if on the top line of the display no action occurs.
(ESC)	1B	27	033	*ESCAPE Code is transmitted only.
\	1C	28	034	*TRANSMIT PAGE (XMIT LINE/PAGE) key Transmits an STX (02), the contents of the display from home to end of page and ETX (03). Only full intensity characters are transmitted in protected mode. A CR code is transmitted after each unprotected field if FIXED FIELD is enabled. (Section 3.2.2, POS. 2).

]	1D	29	035	*INSERT CHARACTER Moves all characters, on the same line as and to the right of the cursor, one space right. Does not wrap around to the following line. If protected or numeric modes are on, only characters in the field currently occupied by the cursor are affected.
^	1E	30	036	*DELETE CHARACTER (DELETE LINE/CHAR key) Moves all characters, on the same line as and to the right of the cursor, one space left. The character at the cursor position is destroyed. If protected or numeric modes are on, only characters in the field currently occupied by the cursor are affected.
_	1F	31	037	READ CURSOR ADDRESS Binary Y, binary X offset. (See TABLE 6-1).

6.1.2 Shift Out Sequences

CONTROL	HEX	DEC	OCTAL	
N,I	0E,09	14,9	016,011	*BACKTAB (SHIFT TAB key) Backspace if in non-format mode. Tab to start of previous unprotected field if in protected mode.
N,	0E,1C	14,28	016,034	*TRANSMIT LINE/FIELD (SHIFT XMIT LINE/PAGE key) Transmit the complete line currently occupied by the cursor. Terminated with a CR (0D) code. In protected mode, only characters in the unprotected field currently occupied by the cursor are transmitted.
N,	0E,1D	14,29	016,035	*INSERT LINE (SHIFT LINE/CHAR key) Moves all display data from the line currently displaying the cursor to the bottom of the page, down one line. Inhibited in protected mode.
N,	0E,1E	14,30	016,036	*DELETE LINE (SHIFT LINE/CHAR key) Moves all display data, from the line currently displaying cursor to the bottom of the page, up one line. The line of data containing the cursor is destroyed. Inhibited in protected mode.

CONTROL N+ NORMAL KEYSTROKE	HEX	DEC	OCTAL	
Remote Only	0E,20	14,32	016,040	LOCK KEYBOARD Inhibits all keyboard entry except BREAK. A keystroke will only ring the alarm.
Remote Only	0E,21	14,33	016,041	UNLOCK KEYBOARD Normal keyboard operation.
N,"	0E,22	14,34	016,042	ANSWERBACK When enabled (Section 3.2.2 POS. 2) contents of the optional PROM are transmitted.
N,%	0E,25	14,37	016,045	TRANSMIT FORM Transmits a leading STX (02) followed by the entire display contents plus the attribute on and off codes required to reproduce the display contents when re-transmitted to the screen. A trailing ETX (03) is also transmitted. (Section 6.2.4).
N,&	0E,26	14,38	016,046	CLEAR TO HALF INTENSITY Clears the screen to half intensity spaces then leaves the format unlocked. (Section 6.2.5).
N,'	0E,27	14,39	016,047	AUX. SERIAL PORT ON Turns port on, does not buffer data onto screen.
N,(	0E,28	14,40	016,048	AUX. SERIAL PORT OFF
N,@	0E,40	14,64	016,100	FORMAT LOCK If FORMAT MODE is enabled and FORMAT LOCK is asserted, half intensity fields become protected, (default mode). In NON-FORMAT mode FORMAT LOCK is ignored.

N,A	0E,41	14,65	016,101	FORMAT UNLOCK Allows cursor entry into and modification of half-intensity fields.
N,B	0E,42	14,66	016,102	HALF INTENSITY ON All subsequent characters entered are at half-intensity and will also be protected if protected mode is enabled.
N,C	0E,43	14,67	016,103	HALF INTENSITY OFF
N,D	0E,44	14,68	016,104	INVERSE VIDEO ON All characters entered will be dark in a light field.
N,E	0E,45	14,69	016,105	INVERSE VIDEO OFF
N,F	0E,46	14,70	016,106	UNDERLINE ON If numeric fields are enabled all characters entered will be underlined and will subsequently allow only numeric entry. Numeric fields can be destroyed only by a CLEAR PAGE code.
N,G	0E,47	14,71	016,107	UNDERLINE OFF
N,H	0E,48	14,72	016,110	BLINK ON All characters subsequently entered will blink.
N,I	0E,49	14,73	016,111	BLINK OFF
N,J	0E,4A	14,74	016,112	READ CHAR Transmits the character at the cursor position and advances the cursor to the next unprotected position.
N,K	0E,4B	14,75	016,113	*NEW LINE (SHIFT NULINE/ , key) Moves cursor to first position (or first unprotected position) of next line.

N,N	0E,4E	14,78	016,116	CURSOR ON Cursor is displayed (default mode). While receiving data at rates greater than 300 baud, the cursor is turned off.
N,O	0E,4F	14,79	016,117	CURSOR OFF Cursor is not displayed on screen.
N,P	0E,50	14,80	016,120	CLEAR INVERT All non-protected fields are cleared of data and changed to inverse video. In FIXED FIELD mode these fields remain inverse if FORMAT LOCK has been asserted.
N,Q	0E,51	14,81	016,121	ALTERNATE PAD Always transmits 0E,61 through 0E,6A for numeric pad numerals 0 through 9.
N,R	0E,52	14,82	016,122	NORMAL PAD Performs as ALTERNATE PAD only when SHIFT key is held down.

Note that the second alphameric code of the two code sequence is an upper case character. Therefore, if generating these functions from the keyboard CAPS LOCK must be locked down or SHIFT must be depressed.

TABLE 6-1
CURSOR ADDRESS TABLE

Addresses are read and written as binary Y, binary X offset.

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

TABLE 6 - 2 MDL - 110 SUMMARY CODE LIST

CTRL	HEX	CONTROL FUNCTIONS
Remote	2	REMOTE MODE ON
Remote	3	REMOTE MODE OFF
G	7	BELL
H	8	← BACKSPACE
I	9	FORWARD TAB
J	A	↓ LINE FEED
K	B	DELAY OFF
L	C	DELAY ON
M	D	RETURN (ENTER)
N	E	LEAD IN CODE
P	10	WRITE CURSOR ADDRESS
R	12	PRINTER ON
T	14	PRINTER OFF
U	15	→ FORWARD SPACE
V	16	CLEAR LINE/FIELD
W	17	CLEAR TO END OF PAGE
X	18	CLEAR PAGE
Y	19	HOME
Z	1A	↑ CURSOR UP
[	1B	ESCAPE (No Op.)
/	1C	TRANSMIT PAGE
]	1D	INSERT CHARACTER
^	1E	DELETE CHARACTER
-	1F	READ CURSOR ADDRESS

* SEQUENCES consists of CTRL N (0E) followed by the code in the sequence table.

*CTRL N	HEX	SEQUENCES
CTRL I	9	BACK TAB
CTRL \	1C	TRANSMIT LINE/FIELD
CTRL]	1D	INSERT LINE
CTRL ^	1E	DELETE LINE
Remote	20	KEYBOARD LOCK
Remote	21	KEYBOARD UNLOCK
Remote	22	ANSWERBACK
%	25	TRANSMIT FORM
&	26	HALF INTENSITY CLEAR
'	27	AUX PRINT ON
(	28	AUX PRINT OFF
@	40	FORMAT LOCK
A	41	FORMAT UNLOCK
B	42	HALF INTENSITY ON
C	43	HALF INTENSITY OFF
D	44	INVERSE VIDEO ON
E	45	INVERSE VIDEO OFF
F	46	UNDERLINE ON
G	47	UNDERLINE OFF
H	48	BLINK ON
I	49	BLINK OFF
J	4A	READ CHARACTER
K	4B	NEW LINE
N	4E	CURSOR ON
O	4F	CURSOR OFF
P	50	CLEAR INVERT
Q	51	ALTERNATE PAD
R	52	NORMAL PAD

6.2 FUNCTION DESCRIPTION

This section provides additional detailed information to facilitate writing software drivers for the host computer.

6.2.1 Attributes

The control codes for delimiting attribute fields do not occupy a character position on the screen. Any combination of the four attributes is possible. Any number of attributes are allowed per line.

6.2.2 Function Execution Time

An internal scratch memory permits stacking of up to 150 characters of input while previous functions are executing. At the maximum baud rate of 19200 a character is received every 0.5 ms (milliseconds). Thus 75 ms are available before the stack "overflows" (150 ms at 9600 baud, 300 ms at 4800 baud etc). The worst case execution times for various functions is given below. Functions which execute in less than 0.5 ms are not listed.

CLEAR TO END OF LINE/FIELD	6 ms
CLEAR TO END OF PAGE	145 ms
CLEAR PAGE (or CLEAR TO HALF INTENSITY)	70 ms
INSERT CHAR	3.5 ms
DELETE CHAR	3.5 ms
INSERT LINE	35 ms
DELETE LINE	40 ms
FORWARD TAB	43 ms
BACK TAB	72 ms
ROLL	6 ms

CLEAR TO END OF PAGE assumes the worst case clear from the home position while examining for numerically defined fields, protected fields etc.

The worst case FORWARD TAB is to tab from the home position to the last character on the page with the rest of the screen protected. To tab a distance of one line, divide this execution time by 24 (approximately 2 ms).

The worst case BACK TAB is defined as a backward tab from the last character on the page to an unprotected home position with the rest of the screen protected. To BACK TAB one line approximately 3 ms is required.

Normal cursor movement functions (up, down, backspace, forward space, return, new line and write cursor address) require only tens of

miroseconds to execute. However, if the cursor destination is a protected field, time must be allowed for the cursor to tab out. This is also true of the FORMAT LOCK control if the cursor was in a protected field.

For 50 Hz operation (export version), execution times must be multiplied by 1.2

6.2.3 Print Functions

For buffered remote printer control, the host computer must send a PRINT ON code (12 HEX) followed by the data. The terminal transfers this data and any imbedded control codes to the display memory. The display page acts as a 2K character FIFO buffer from which the data is transferred to the printer at the appropriate rate. During printing the terminal is in transparency mode and the cursor is turned off. When transmission of the data block is complete the computer sends a PRINT OFF code (14 HEX). The terminal will continue printing until the buffer is empty; the printer port is then turned off, the CURSOR reappears; and an ACK code (HEX 06) is sent to the computer. Thus printing is most easily accomplished using 2K character blocks framed by the PRINT ON and PRINT OFF codes and triggered by the ACK code response of the previous block. The keyboard can send data to the compuur during printing but this data is not displayed. For the case where computer data is received following the PRINT OFF code but while the buffer is being emptied to the printer, up to 150 characters are buffered and displayed after printing has ceased.

This terminal supports buffered transmission to both a parallel printer port and an optional AUX serial printer port. Independent baud rate selection is available for this AUX serial port permitting different speeds on the MAIN and AUX ports.

With the optional AUX serial port an unbuffered AUX PRINT ON and AUX PRINT OFF control can be used. The baud rate of the AUX port must be higher (faster) or the same as the MAIN port since data is not buffered into the display memory. If no AUX port exists the control codes are ignored and printer data is written onto the screen.

The local PRINT function cannot be interrupted until completed or unless the printer is turned off. The cursor moves through the display page until all data is printed. The keyboard remains active to the computer and commands can be sent and up to 150 characters can be received which are displayed only after the PRINT function is fully executed. If this 150 character buffer is overflowed the incoming message is truncated.

When the terminal is powered up, the power restart firmware automatically verifies the existence of the AUX serial port. When printer output is enabled the terminal automatically tries to print out on the parallel port first. If the ACKNOWLEDGE line on the parallel printer port does not respond within three seconds (no printer or printer turned off) the terminal automatically switches to the AUX port. If the RTS (Request to Send) or DTR (Data Terminal Ready) is not asserted from the serial printer (no printer or printer turned off) the terminal responds with the message "NO PRINTER".

For the parallel printer, the printer ACKNOWLEDGE line must respond when the printer is ready for another character. Indeed this line is used to control data flow and temporarily halt printer output when the buffer is full or when executing a lengthy function such as RETURN or LINE FEED.

For the serial printer the terminal monitors the RTS and DTR signal line for controlling data rates if the RS-232 interface is being operated. If the current loop interface is used there is no control. Printer functions must execute at the data rate.

6.2.4 Transmit Functions

The TRANSMIT PAGE or TRANSMIT LINE/FIELD codes are output to the computer. In FULL DUPLEX the code or sequence must be transmitted back to the terminal before block transmission starts. TRANSMIT PAGE frames data with an STX (02) at the start of the data and an ETX (03) at the end of the data. If FIXED FIELD is enabled (Section 3.2.2 POS. 5) the TRANSMIT PAGE function also transmits a CR code at the end of each unprotected field. If FORMAT LOCK is asserted, attributes cannot be modified in this mode.

If no protected data exists on the line, TRANSMIT LINE sends the entire line with a CR code (0D) terminator. If protected fields exist on the line, the TRANSMIT LINE is actually a TRANSMIT FIELD function. The unprotected field containing the cursor is transmitted with a CR terminator. If this field extends to another line of display data, only that segment to the end of the line is transmitted. Half-intensity fields are not transmitted if protected.

When the TEXT COMPRESSION mode is enabled, trailing spaces on a line are not transmitted. For protected fields all data within an unprotected field is transmitted if followed by another protected field on the same line. Only the last unprotected field on the line is compressed, and this too can be defeated if the last character position on the line is protected.

For text preparation in LOCAL mode with QUASI LOCAL mode enabled (SECTION 3.2.2, POS 9) no data is sent to the computer until the TRANSMIT LINE - PAGE key is depressed. The TRANSMIT LINE-PAGE code or sequence is not transmitted to the computer. Only the data string properly framed (STX and ETX of TRANSMIT PAGE, or CR for TRANSMIT LINE/FIELD) is transmitted. This block of data is transmitted regardless of the setting of the FULL/HALF duplex switch.

For the TRANSMIT FORM command, an STX code is transmitted followed by the entire contents of the displayed page including protected data plus the attribute on and off codes required to reproduce the dislay contents when retransmitted to the terminal. An ETX code is transmitted following the block of data. Thus for forms preparation the form can be prepared visually on the screen and transmitted in its entirety for storage, bypassing the nasty job of forms coding.

Some computer systems may require a delay for transmit functions. When DELAY ON is asserted a 200 ms delay is introduced before data is transmitted for TRANSMIT LINE/FIELD, TRANSMIT PAGE, TRANSMIT FORM, READ CURSOR ADDRESS and ANSWERBACK. DELAY OFF mode provides no such delay. When the terminal is powered up DELAY OFF is asserted.

For 202 mode operation (Section 3.2.2. POS 8) the RTS line control is used for all transmit functions.

The READ CHAR function permits the computer to read the screen one character at a time. When this code sequence (0E,4A) is received the character at the cursor position is transmitted to the computer and the cursor is automatically advanced to the next character position. The computer must again transmit this code sequence to read the next character. No framing codes are transmitted unless inbedded on he screen by the operator in transparency mode. Thus the computer program must read some predetermined record length. This READ CHAR function is useful on computer systems where input loading is high and block mode transmissions might otherwise result in loss of data.

6.2.5 Clear Functions

All clear functions reset the attribute controls. For example, if BLINK ON had been previously received by the terminal it would be turned off by any of the four clear functions. FORMAT LOCK is not affected.

CLEAR to HALF INTENSITY clears all data and attributes from the screen except that all character positions are set to half intensity. The FORMAT LOCK is automatically turned off. This mode enables data to be written at half intensity and unprotected fields are cleared leaving all trailing spaces protected. For some conditions this results in a net saving of time when transmitting protected field masks from the computer. Care must be taken not to assert FORMAT LOCK until after the mask is written otherwise the entire page will be protected and the cursor will tab forever.

CLEAR TO END OF PAGE and CLEAR TO END OF LINE do not clear protected fields. Also these functions do not clear the underline attribute if numeric fields are enabled.

6.2.6 Protected Fields

Half intensity fields are only read/write protected if FORMAT MODE is enabled (Section 3.2.2., POS 2) and FORMAT LOCK is asserted.

A cursor movement (up, down, forward space, return or write cursor address) which places the cursor into a protected field will result in the cursor tabbing forward out of the field to the first available unprotected position. If the cursor is backspaced into a protected field it will skip over this field. The NEW LINE function ensures that the cursor does move to the first unprotected position of the next line

since for some combinations of protected field patterns the RETURN, LINE FEED sequence will fail to execute the desired result. A Write Cursor Address function which places the cursor into a protected field will cause the cursor to tab forward to the first available unprotected position.

Protected fields are transmitted during the PRINT function (local page print) and the TRANSMIT FORM function.

6.2.7 Insert and Delete Functions

INSERT CHAR and DELETE CHAR functions operate only on the current line occupied by the cursor. Data is not wrapped to or from other lines. When the cursor is between protected fields on the same line, data is inserted and deleted only in the protected field. Data outside of the field is not affected. When the cursor is inside a numeric designated field (Numeric Fields enabled) data can only be inserted and deleted in this underline field; data outside of the field is not affected.

The INSERT LINE and DELETE LINE functions are inhibited when in FORMAT MODE with FORMAT LOCK asserted, that is, in PROTECTED mode.

6.2.8 Wrap-Around

When the cursor is moved beyond the end of a line or is moved forward into a protected field which extends to the end of the line, it will move to the start (or first unprotected position) of the next line.

Similarly if the cursor is backspaced beyond the start of the line or into a protected field which extends to the start of the line, it will move to the end (or last unprotected position) of the previous line.

6.2.9 Alarm Operation

The alarm is sounded when the BEL code is received or on the 72nd character of the display line from the keyboard entered data. The alarm is not sounded on the 72nd character for data received from the computer unless the last code generated from the keyboard is identical to the code witten from the computer into the 72nd position of any subsequent line.

The alarm is sounded for each keystroke when the keyboard is locked.

6.2.10 Parity

When either even or odd parity is enabled and a parity error is received

by the terminal, a question mark is written at the cursor position. If transparency mode is enabled, parity errors are ignored, the data is written onto the screen whether correct or not.

When the MAIN port is unconnected and the terminal is in REMOTE mode and ODD parity, the current loop input is asserting NULS which will be written continuously on the screen as question marks. This is true only for REV D and REV F modules. Refer to Section 3.2.1, POS 4).

6.2.11 Cursor Addressing

A two address code sequence binary Y and binary X offset is used to specify the absolute cursor position on the screen. Refer to TABLE 6-1. During cursor address write, if the first address is illegal (binary Y offset not in TABLE 6-1) the cursor address routine is aborted and the cursor does not move. If the second address is illegal (binary X offset not in TABLE 6-1) the first address, binary Y offset will execute; the second will not. If the cursor is addressed into a protected field it will tab forward to the first unprotected position.

During cursor address read (remote only function) two characters are output from the terminal; the Y address, then the X address. A 200 ms delay before transmission of the Y, X codes is implemented with the DELAY ON code (Section 6.1.1.).

The cursor can be turned off or on by the CURSOR ON/OFF control (Section 6.1.2). For baud rates above 300 baud, the cursor is turned off while receiving data.

7. TEST

7.1 GENERAL

This section details the testing of all terminal functions and interfaces. It is recommended that the programmer execute these tests to facilitate further understanding of the terminal. A good familiarization of SECTIONS 3,4,5 and 6 is required before proceeding with these tests. An abbreviated list of control codes for implementing functions is given in TABLE 6-2.

In the following examples, when a control code is to be generated from the keyboard, (say CTRL N) this implies that the CTRL key is held down while the upper case letter N is typed. Similarly if a SHIFT function, (say SHIFT TAB) is executed the SHIFT key must be held down while TAB is depressed.

7.1.1 Turn On

Follow the installation procedure of SECTION 2. Set the front panel switches to;

- LOCAL mode
- FULL DUPLEX
- NO parity
- PAGE mode

Referring to the abbreviated TABLE 3-1 ensure that the internal switches are in the following positions:

SWITCH S1 All positions OFF
SWITCH S2 All positions OFF

Finally set the front panel baud rate switch to 19200 baud.

Turn on the rear panel power switch. Allow about 30 seconds for warm-up. The message "POWER-UP OK" should appear at the HOME position. If a memory or peripheral controller has malfunctioned during power on initialization a "FAULT" message should appear though this may be mis-spelled if a display memory fault has occurred.

To observe the self-test procedure on the screen the power switch can be turned OFF and ON quickly. The microprocessor reads and writes various patterns on the screen, tests the interface adapters and then returns to write the appropriate message.

Only those devices on the microprocessor bus can be automatically tested (excluded is the character generator and interface drivers and receivers). Therefore the message may be written as OK even though a malfunction does exist.

7.2 KEYBOARD TEST

7.2.1 CAPS LOCK and SHIFT keys

With the CAPS LOCK in the UP position (alternate action switch) type and verify all keys on the main keyboard and numeric pad. Note that lower case alphameric symbols are printed and all bottom symbols on dual legend keytops are printed.

Depress the CAPS LOCK key to lock in the down position. Type all alphameric keys and note that these are shifted to upper case A through Z. Release CAPS LOCK to the UP position.

Hold down one of the SHIFT keys. Type the alphanumeric and dual symbol keys on the main keyboard. Note that all alphamerics are shifted to upper case characters and all dual symbol keytops are shifted to the upper symbol.

7.2.2 CTRL Test in Transparency Mode

To test the CTRL key, assert transparency mode by holding down both the HERE IS and CTRL keys. Type all keys on the main keyboard. Referring to TABLE 5-1 note that all alphamerics and symbols in columns 6 and 7 are shifted to the control symbols in columns 0 and 1. Typing DELETE will produce a cross-hatched block.

With the CTRL key released, type keys such as ESC, TAB, LINE FEED, and RETURN. Refer to SECTION 6.1 and verify that these functions correspond to the codes for the generated symbols in TABLE 5-1.

Depress the special function keys along the top row of the main keyboard and verify the codes as shown in SECTION 6-1 and TABLE 5-1. While holding the SHIFT key down, again verify the codes and sequences. Do not type the PRINT/STATUS key since this is a local function and will execute.

Hold down both the HERE IS and SHIFT keys and type the numerics 0 through 9 on the numeric pad and verify that the two code user defineable sequences of TABLE 5-2 are generated.

7.3 FUNCTION TEST

7.3.1 Cursor Movement

Execute several of the following functions and verify operation as described in SECTION 6.1.

- BACKSPACE
- LINE FEED
- CTRL U (forward space)
- CTRL Z (cursor up)
- RETURN and ENTER
- SHIFT NULINE/, (new line)
- CLEAR/HOME (home)

7.3.2 Clear Functions

Type characters on the screen and backspace over data to test;

- CLEAR PAGE/LINE (clear to end of line)
- SHIFT CLEAR PAGE/LINE (clear to end of page)
- SHIFT CLEAR/HOME (clear entire page and home cursor)

7.3.3. Insert Functions

Type several lines of data on the screen. Move the cursor back several lines. Type and verify;

- INSERT LINE/CHAR (inserts blank character)
- DELETE LINE/CHAR (deletes characters)
- SHIFT INSERT LINE/CHAR (inserts blank line)
- SHIFT DELETE LINE/CHAR (deletes lines)

7.3.4 STATUS Display

To display the status of both internal and external functions type;

- PRINT/STATUS key

The status information displayed on the terminal for the switch settings given in SECTION 7.1.1. is;

Local Fdplx Page Mark Quas 103 Smart

7.3.5 Write Cursor Address

To position the cursor to an asbsolute position on the screen type;

- CTRL P (write address lead in code)
- Y address (from TABLE 6-1)
- X address (from TABLE 6-1)

Assuming that the addresses were legal the cursor will move to the X, Y address destination.

7.3.6 No Printer Test

With no printer connected to the parallel printer port (and optional AUX port) type the command;

- SHIFT PRINT/STATUS

The message "NO PRINTER" will appear on the screen in about three seconds.

7.3.7 ATTRIBUTES

Attributes are normally controlled by the computer program and therefore special function keys are not provided. To test attributes execute the following, (note that the second character of each two code sequences is an upper case character);

- CTRL N,B (half-intensity ON)
- type several characters
- CTRL N,C (half-intensity OFF)
- type a few characters
- CTRL N,D (inverse ON)
- type a few characters
- CTRL N,E (inverse OFF)
- type a few characters
- CTRL N,F (underline ON)
- type a few characters
- CTRL N,G (underline OFF)
- type a few characters
- CTRL N,H (blink ON)
- type a few characters
- CTRL N,I (blink OFF)
- RETURN

The following fields exist on the line; half-intensity, normal, inverse, normal, underline, normal, and blinking fields.

Any combination of attributes is allowed. Execute the following sequence;

. CTRL N,B (half-intensity ON)
. CTRL N,H (blink ON)
. type a few characters

A half intensity blinking field is displayed.

. CTRL N,F (underline ON
. Type several characters

An underlined blinking half-intensity field is displayed. Any attribute can be removed;

. CTRL N,C (half-intensity OFF)
. type several characters

A normal intensity underlined blinking field is displayed. Recall that any clear function clears the attribute control;

. CLEAR LINE/PAGE (clear to end of line)
. type a few characters

Normal intensity data is displayed.

7.3.8 Format Mode

Change SWITCH 1 POS 2 to the ON position. Refer to SECTION 3.2.1; this changes to FORMAT MODE.

. CTRL N,@ (FORMAT LOCK; protected mode).
. SHIFT CLEAR/HOME (Clear Page)
. CTRL N,B (half-intensity ON)
. type a message
. RETURN, LINE FEED
. type another message
. CTRL N,C (half-intensity OFF)
. space forward several characters (space bar)
. CTRL N,B (half-intensity ON)
. type a message
. CTRL N,C (half-intensity OFF)
. TAB, TAB, TAB, etc.

Note that the cursor tabs over a protected field in the forward direction and stops at the beginning of a non-protected field. Data can be written into non-protected fields at normal intensity. Execute;

. SHIFT TAB, SHIFT TAB, etc.

This executes the BACK TAB function.
The cursor can not enter a protected field.

If the cursor is moved to the start of a protected field and a character typed, the cursor will automatically skip forward over the protected field. If the cursor is at the end of a protected field and a BACKSPACE is executed the cursor will skip backwards over the protected field to the first unprotected position. Execute;

. CTRL N,A (FORMAT UNLOCK)

The cursor can now enter and data can be modified in half-intensity fields. TABS are now illegal.

7.3.9 Field Exit

Change SWITCH 2 POS 6 to the ON position. Refer to SECTION 3.2.2, POS 6. Execute;

. CTRL N,@ (FORMAT LOCK, protected mode)
. SHIFT CLEAR/HOME (Clear Page)
. CTRL N,B (half-intensity ON)
. type a message
. CTRL N,C (half-intensity OFF)
. space several characters (space bar)
. CTRL N,B (half-intensity ON)
. type a message
. CTRL N,C (half-intensity OFF)
. RETURN

This moves the cursor in between the two protected fields. Type display characters into this field. Note that if a character is typed after the field is filled, the character is not written and the alarm is sounded. A control character such as TAB, FORWARD SPACE, LINE FEED etc. is required to exit the field.

When the cursor is inside the protected field, character INSERT and DELETE only affects data inside the field. Execute;

. TAB (to get cursor between the protected fields)
. INSERT LINE/CHAR (insert character)

A blank (space) is inserted and data inside the field is moved one character position to the right. The protected field to the right of the cursor does not move. Data is not transferred into the next unprotected field. Execute several;

. DELETE LINE/CHAR (delete character)

Characters are deleted at the cursor position similar to the insert. Data outside of this field is not altered.

Type several other lines of normal data on the screen. Move the cursor back to the first line. Attempt several;

- SHIFT DELETE LINE/CHAR (delete line)
- SHIFT INSERT LINE/CHAR (insert line)

These functions do not execute when FORMAT LOCK is asserted.

7.3.10 Numeric Only Fields

Change SWITCH 1, POS 1 to the ON position. Underlined fields now only allow entry of numerics 0 to 9, period, plus, minus, comma, and slash (/).

- type several characters
- CTRL N,F (underline ON)
- type some spaces
- CTRL N,G (underline OFF)
- type RETURN
- type numeric characters or allowed punctuation
- in underline field
- type other characters

Note that characters other than the permitted numerics and punctuations are refused. The alarm is sounded.

While in the underlined field execute several of the following;

- INSERT LINE/CHAR (insert character)
- DELETE LINE/CHAR (delete character)

Note that the underline attribute does not move, characters are inserted and deleted within the field only. This is true only if numeric fields are enabled; if this switch were off the attribute would move.

7.3.11 Auto New Line

Change SWITCH 2, POS 3 to the ON position. Do the following recursive routine;

- type several characters
- RETURN

Note that the cursor executes both a LINE FEED and RETURN. The terminal actually generates a LINE FEED code after the RETURN code rather than executing a LINE FEED when a RETURN is received.

7.3.12 Dumb Terminal Mode

Change SWITCH 2, POS 4 to the ON position. Attempt to execute various functions. All functions except RETURN, LINE FEED, BACKSPACE, BELL and TAB (now only forward space) are inhibited. This mode is normally used for time-share operation where smart terminals are not supported.

Change SWITCH 2, POS 4 to the OFF position to continue with testing.

7.3.13 Roll Mode

Change the front panel PAGE/ROLL switch to the ROLL position. Type data on various lines on the screen. When the cursor is on the bottom line and a LINE FEED is executed all data is scrolled up one line and the top line is lost. The cursor remains on the bottom line and the bottom line is automatically cleared.

7.4 MAIN PORT TEST

To test the interfaces on the computer port make up the test plugs shown in FIGURE 7-1. Install the RS-232 test plug. Set the front panel switch to;

- FULL DUPLEX mode
- REMOTE mode

In FULL duplex mode, data is transmitted only and must be echoed to be displayed on the screen. The "echo" is accomplished with the jumper. Switching to REMOTE mode does not reinitialize the terminal.

7.5 REMOTE MODE TESTS

Normally to test various remote mode functions a computer would be used. However, any other terminal can also be used very effectively. To connect the MAIN port of one terminal to that of another, a special RS-232 cable is required. Since both will have the same pin-out the signal lines must be crossed. Refer to FIGURE 7-2 for the simplest cable requirement.

To avoid confusion the terminal to be tested will be referred to as the "slave" and the terminal doing the testing will be referred to as the "master". Connect the cable shown in FIGURE 7-2 between the two terminals. Ensure that each terminal has the following switch settings;

- FULL duplex mode
- REMOTE mode
- NO parity (or both EVEN or both ODD)
- PAGE mode on slave, ROLL mode on master
- same baud rate

Type on the master keyboard, data will appear on the slave display. Similarly typing on the slave keyboard should enter data on the master display.

To be able to fully test all aspects of the MDL terminal the master terminal should also be an MDL or at least capable of transparency mode. In the following tests, function keys (for MDL) or control codes (for non-MDL) are given in the master terminal.

7.5.1 Transmit Function Tests

SLAVE:

Ensure that SWITCH 2, POS 2 in ON (format mode).
Switch to LOCAL mode and type;

- CTRL N,A (format unlock)

Prepare a page of data with combinations of various attributes including half-intensity fields. Switch to REMOTE mode.

MASTER:

If possible set the master terminal to transparency mode. This will enable the operator to see control codes sent from the MDL terminal. If transparency mode is not available, the master should be as dumb as possible otherwise some of the control codes emitted from the MDL might execute a different set of functions on the master. Type;

- XMIT LINE/PAGE (transmit page if MDL)
  or CTRL \

The slave will transmit an STX, the entire page of data (not including attribute) and an ETX to the master terminal. Type;

- CTRL N,@ (format lock)
- XMIT LINE/PAGE or CTRL \

By protecting half-intensity fields on the slave only unprotected data is received by the master again framed by the STX and ETX control codes. Type;

- SHIFT XMIT LINE/PAGE (transmit line)
- or CTRL N, \

The cursor line of data is transmitted with a CURSOR RETURN code (CR) to the master. Type;

- CTRL N,% (transmit form)

The entire page of data including attribute ON and OFF codes is transmitted to the master framed with STX and ETX codes. Data in protected fields is also transmitted.

Data can be typed on the master keyboard while the slave is transmitting. This data will not be displayed until the transmit function has been completed.

7.5.2 Half Duplex

Set the slave to HALF duplex mode. This will re-initialize the slave terminal. Repeat the tests of SECTION 7.5.1 except that all of the functions done by the master can now be exeuted on the slave keyboard or the master keyboard.

Data typed on the slave keyboard during any of the transmit functions will be transmitted only after the function is completed. Also, it will be displayed on the screen only after the transmit function has been completed.

Reset the slave to FULL duplex mode.

7.5.3 Keyboard LOCK

MASTER: Type the codes;

. CTRL N, SPACE BAR (keyboard lock)

SLAVE: Attempt to use the keyboard, no data is transmitted to the master. The keyboard has been locked out.

MASTER: Type the codes;

. CTRL N, ! (keyboard unlock)

SLAVE: The keyboard has been unlocked and typed data is again transmitted to the master.

7.5.4. Read Cursor Address

MASTER: Type the code;

. CTRL_(read cursor address)

The Y and X addresses will be sent from the slave to the master. Verify cursor position on the slave with the cursor addresses given in TABLE 6-1.

7.5.5 Read Character

MASTER: Type several of the following sequences;

. CTRL N,J (read character)

For each code sequence, the character at the cursor position on the slave is transmitted to the master. The cursor on the slave is automatically advanced to next character position.

7.5.6 QUASI Local/Remote Control

SLAVE: Refer to SECTION 3.2.2. POS 7. Set the QUASI LOCAL/REMOTE switch to the ON position.

MASTER: Type the code;

. CNTL B (remote mode ON)

Data typed from the master will appear on the slave. Type;

. CNTL C (remote mode OFF)

Data typed from the master will not be displayed on the slave.

SLAVE:

With the REMOTE MODE off code received by the master the slave is now in LOCAL mode regardless of the setting of the external LOCAL/REMOTE mode switch. Type on the keyboard, no data is sent to the master. Prepare a page of data with various combinations of attributes and type;

. XMIT LINE/PAGE (transmit page)

The page of displayed data framed with the STX and ETX codes is transmitted to the master. When the transmission is complete the slave returns to LOCAL mode. Type;

. SHIFT XMIT LINE/PAGE (transmit line)

A line of data is transmitted to the master terminated with a CURSOR RETURN (CR). These are the only two functions which can transmit data when in this mode. (TRANSMIT FORM does not execute). This mode is useful in transmitting blocks of data to a computer. Variations of this mode are possible since the computer has control. The BREAK line on the SLAVE is always active and thus can be used to inform the computer to exit this mode. (BREAK sends out NUL codes for as long as this key is held down).

7.5.7 Text Compression Mode

Reset SWITCH 2, POS 7 to the OFF position (normal LOCAL/REMOTE mode) and set SWITCH 1, POS 3 to the ON position. Referring to SECTION 3.2.1 POS 3, text compression mode is now enabled. Repeat the tests of SECTION 7.5.1. Data transmitted to the master will not contain trailing spaces (blanks) from the last field of each line, unless the last character position of the line is protected.

7.5.8 Other Remote Functions

Other remote functions described in SECTION 6.1 and tested in SECTION 7.3 can also be executed from the master terminal. This does not include the local only functions described in SECTION 5.5.

7.6 PRINTER FUNCTIONS

If a parallel input printer is available make up a cable with one end terminated in a DA-15P connector with signals shown in TABLE 4-3. The connector on the other end will depend on the printer manufacturer.

If the optional AUX port is provided, a cable of the type shown in either FIGURE 4-1A or FIGURE 4-3A can be used to connect from the AUX port to the computer input port (MAIN) of an RS-232 printer or another terminal.

If no handshaking is available the cable of FIGURE 4-3B can be used. If a current loop input printer is used the cable of FIGURE 4-3 can be used. Both a parallel printer and a serial printer (or second terminal) can be connected simultaneously. If the parallel printer is turned ON data will be output to this printer only. If the parallel printer is turned off the AUX port will be selected automatically.

Set the terminal into LOCAL mode.

7.6.1 Print Functions

Prepare a page of data from the MDL keyboard containing half-intensity fields. Type;

- SHIFT PRINT/STATUS key

The entire page of data including protected fields is output on the printer. If the printer is turned off or unconnected, or if handshaking is not present (ACK line on parallel printer or DTR and RTS on serial printer) the message "NO PRINTER" will be written on the screen.

For LOCAL mode test of keyboard data sent directly to the printer, type;

- CTRL R (printer ON)

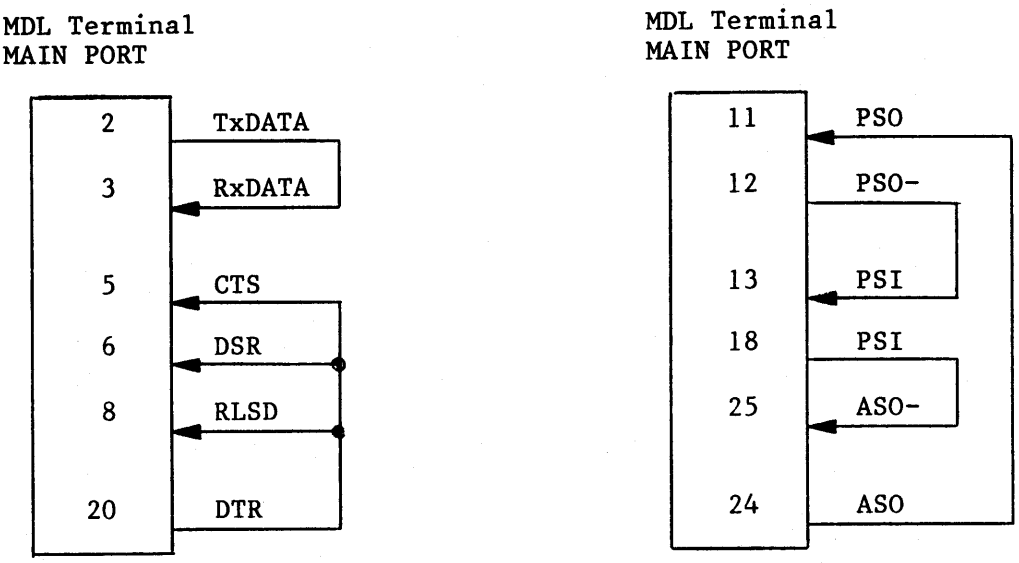
All keyboard data is written to the printer. Type;

- CTRL T (printer OFF)

Keyboard input data is not sent to the printer.

In REMOTE mode, keyboard data is not sent to the printer unless echoed from the computer.

FIGURE 7-1
SELF TEST PLUGS FOR MAIN PORT



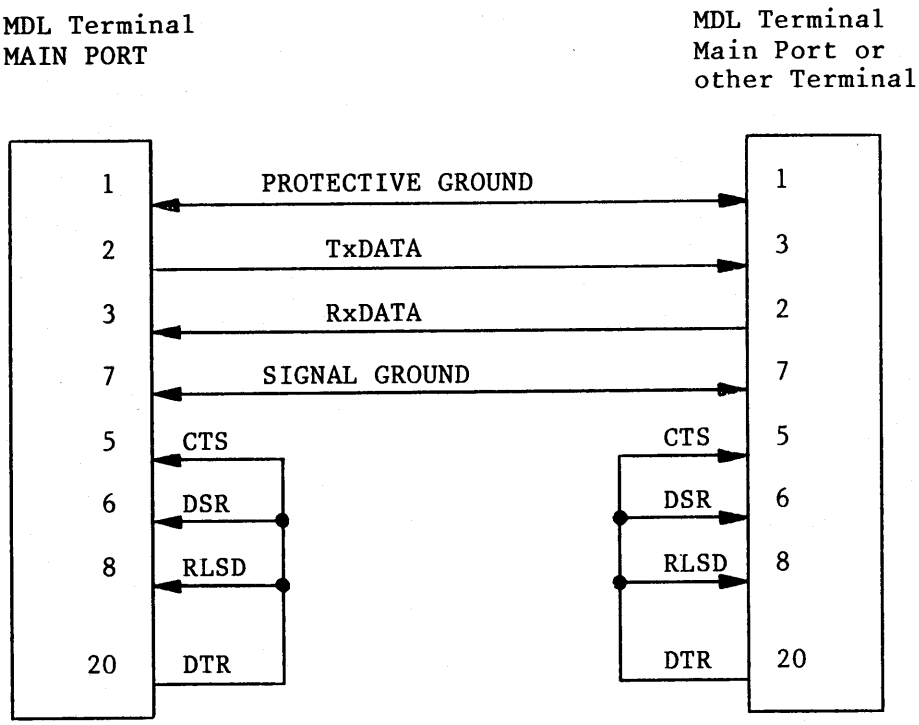
DB-25P RS-232

Test Plug

*DB-25P Current Loop

Test Plug

FIGURE 7-2
TERMINAL TO TERMINAL RS-232C CABLE



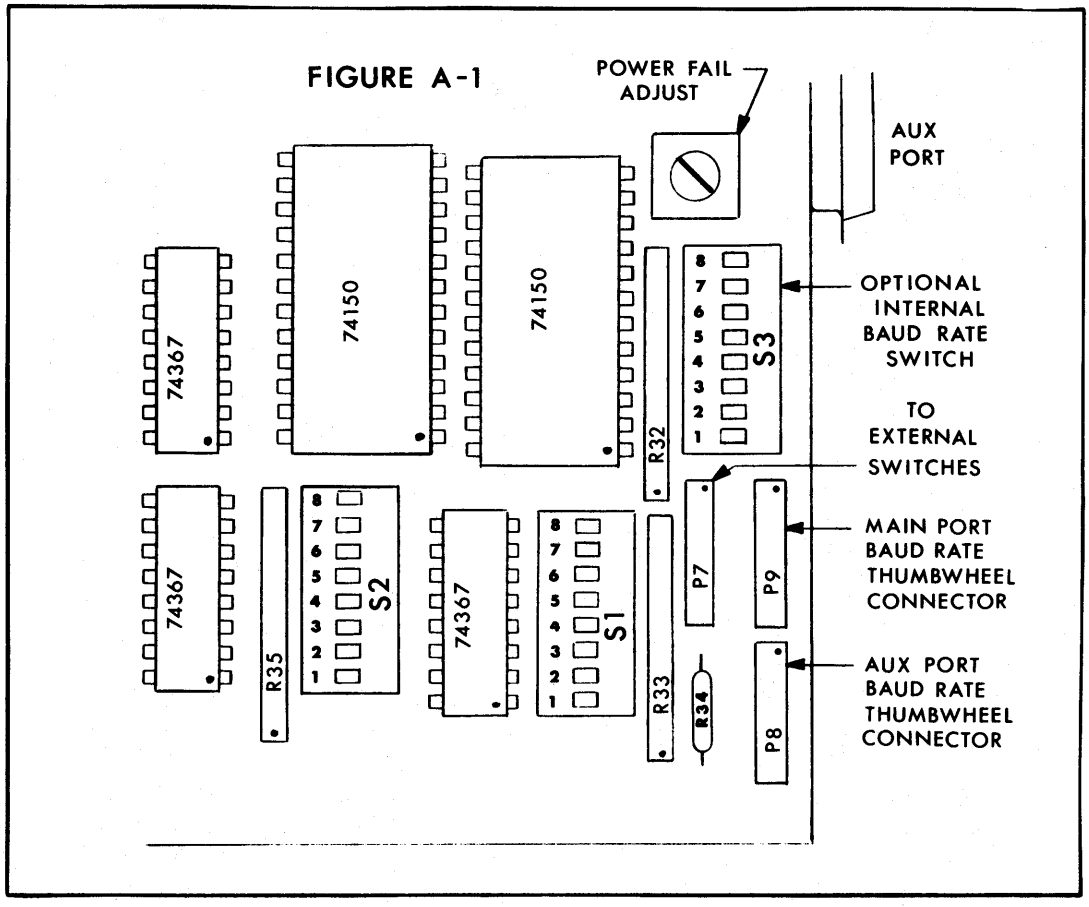
DB-25P
Connector

DB-25P
Connector

*Note: The current loop self-testing plug cannot be used on REV H modules.

APPENDIX A INTERNAL SWITCHES

FIGURE A-1



Switches S1 and S2 are described in SECTION 3.2. Positions 4 through 8 of S1 are normally OFF (open) if external switches are used.

If external switches are deleted positions 4 through 8 of S1 replace these functions. Also the external switches can be deactivated by removing the connector from P7 and setting 4 through 8 internally. If the baud rate thumbwheels are deleted S3 is provided to set the baud rates internally.

An adjustment is provided to set the power sentry. Normally this should not need adjustment. However, if the unit fails to power up (random data on screen) turn this adjustment fully clockwise. Then turn counterclockwise slowly until the alarm rings and the terminal begins its power up sequence; then an additional one-eighth turn counterclockwise.

TABLE A-1: SWITCH POSITION S1, S2 SUMMARY

SWITCH 1		
S1	OFF	ON
POS 1	NUMERIC FIELDS	NUMERIC FIELDS DISABLED ENABLED
POS 2	NON-FORMATMODE	FORMAT MODE AND TABS ENABLED
POS 3	TRAILING SPACES TRANSMITTED	TEXT COMPRESSION ENABLED
POS 4	EVEN PARITY	ODD PARITY
POS 5	ROLL MODE	PAGE MODE
POS 6	FULL DUPLEX	HALF DUPLEX
POS 7	LOCAL MODE	REMOTE MODE
POS 8	NO PARITY (MARK)	PARITY ENABLED
SWITCH 2		
POS 1	UNUSED	
POS 2	NO ANSWERBACK	ANSWERBACK ENABLED
POS 3	AUTO NEW LINE	AUTO NEW LINE
POS 4	ALL FEATURES ENABLD	DUMBER TERMINAL MODE ENABLED
POS 5	FIXED FIELD DISABLED	FIXED FILED ENABLED
POS 6	ANY FIELD EXIT	FIELD EXIT BY CONTROL
POS 7	QUASI-LOCAL MODE	NORMAL LOCAL/REMOTE
POS 8	103 HANDSHAKING	202 HANDSHAKING

SWITCH S3; INTERNAL BAUD RATE SELECTION

TABLE A-2

In the absence of thumbwheel switches, switch S3 is provided. Switch positions 1 through 4 provide for binary coded selection of ten baud rates for the MAIN port. Positions 5 through 8 are identical except these control the baud rate for the AUX port. In the following table a "0" denotes the ON position and a "1" denotes the OFF position. Selections outside of this range will render the port inoperative.

POS. 4(8)	POS. 3(7)	POS. 2(6)	POS. 1(5)	BAUD RATE
1	1	1	1	1200
1	1	1	0	9600
1	1	0	1	4800
1	1	0	0	2400
1	0	1	1	1200
1	0	1	0	600
1	0	0	1	300
1	0	0	0	150
0	1	1	1	110
0	1	1	0	75
0	1	0	1	
0	1	0	0	
0	0	1	1	
0	0	1	0	
0	0	0	1	
0	0	0	0	