OPERATING INSTRUCTIONS
FOR
MODEL 2500

MEMTEC

NOTE:

PRIOR TO CONNECTING AND OPERATING THE MEMTEC 2500 WITH EITHER A TERMINAL OR MODEM/CPU, PLEASE ENSURE THAT YOUR RS-232C CONNECTOR CONFORMS ENTIRELY WITH THE EIA-RS-232C SPECIFICATION, AS DESCRIBED ON PAGE 3.

CAUTION

BEFORE CONNECTING THE MODEL 2500 TO A CRT-KEYBOARD, TELETYPEWRITER, OR MODEM, READ THE INSTALLATION INSTRUCTIONS CONTAINED IN SECTION 2.0 IMPROPER INSTALLATION MAY CAUSE DAMAGE AND VOID WARRANTY.

TABLE OF CONTENTS

TABLE OF CONTENTS
(continued)

TABLE OF CONTENTS
LIST OF ILLUSTRATIONS

TABLE OF CONTENTS
LIST OF TABLES

1.0   INTRODUCTION

The MEMTEC 2500 Buffered Data Terminal is a self-contained, stand-alone unit designed to be used in a variety of data collecting and communications systems. This highly versatile unit contains: (1) a microprocessor controller, (2) an MEMTEC 450B Cassette Tape Transport, and (3) two RS-232 interface circuits. A 20 mA current loop interface is also available for terminal TTY applications.

The MEMTEC 2500 is typically used in data collection systems and, as such, is generally connected between a data entry device (i.e., CRT/keyboard or configuration, the 2500 can be operated on-line directly to the local computer or through a modem/acoustic coupler to the remote computer. Off-line operation is achieved via the data entry device.

For proper system operation, use only 100% digitally certified clear leader tape cassettes (MEMTEC DC-40FL).

The operating instructions contained herein are intended for the typical configuration described above. However, the operational functions apply for any system configuration.

In the receive mode the MEMTEC Model 2500 writes an IRG of 0.8". Therefore, when reading a tape generated on other equipment, IRG's must not be less than .8". To be ANSI/ECMA compatible, (i.e. compatible with the 2500) a record must contain a preamble, postamble and space (2 bytes) for a CRC, as shown in Figure 1-1. A CRC calculation need not be implemented, but space for the CRC must be included.

IRG	PREAMBLE	DATA	CRC	POSTAMBLE	IRG
.8"	10101010	86 BYTES	2 BYTES	10101010	.8"

Figure 1-1:   Typical Record

1.1   Performance Specifications

Electrical Requirements

Input Voltage	100 ± 10 Vac a 50/60Hz
	117 ± 12 Vac a 50/60Hz (Standard)
	220 ± 22 Vac a 50/60Hz
	240 ± 24 Vac a 50/60Hz
Power Dissipation	50 W maximum

Environmental Requirements

Operating Temperature	50° to 113°F (10° to 45°C)
Storage Temperature	10° to 160°F (−12° to +71°C)
Relative Humidity	20% to 95%, no condensation

Interface Criteria

Terminal	RS-232 (CCITT V.24), serial send/receive, DB-25S connector 20 mA current-loop interface
Modem/CPU	RS-232 (CCITT V.24), serial send/receive, DB-25P connector
Data Format	ASCII (11 bits @ 110 baud or 10 bits at @ 300, 1200, and 2400 baud). No parity. (Parity bit is recorded as received)

Storage Medium

Type	MEMTEC DC-40FL, 100% digitally certified, tape cassettes (ANSI/ECMA compatible)
Capacity	Up to 175,000 characters (formatted), or 2000 records at 86 characters per record per track.
Recording Density	800 bpi
Recording Method	Single track, phase encoded
Recording Format	ANSI/ECMA standard (preamble, data, CRC, and postamble)
Record/File Length	86 characters per block

Average Operational Speeds

Read/Write/Search	12 ips
Skip	60 ips
Rewind	120 ips
Data Transmission	110, 300, 1200 and 2400 baud (switch selectable)

Typical Error Rate

Bit Errors	1 in 10^8 (hard errors)
	1 in 10^7 (soft errors)

Physical Characteristics

Width	8.5 inches
Depth	11.0 inches
Height	9.0 inches
Weight	9 pounds

2.0 INSPECTION AND INSTALLATION

2.1 Unpacking

The Model 2500 Buffered Data Terminal is packed completely assembled, ready for immediate installation. When unpacking, use no sharp or pointed instruments. With packing box in upright position, open top of box and lift Model 2500 out of box. Remove plastic foam cushions from Model 2500 and replace in box. It is recommended that packing be temporarily saved in the event the device must be returned to MEMTEC due to damage incurred in transit.

2.2 Inspection

Visually check the Model 2500 for any obvious shipping damage such as bent or dented terminal shrouds, cracked switches, broken cassette dust cover, damaged pins on connectors, etc. Check to make sure the cassette dust cover operates freely and that the cassette retainer is not bent or damaged.

2.3 Power Connections

The Model 2500 Buffered Data Terminal is designed to operate on any one of four standard worldwide line voltages as listed below:

$$100 \pm 10 \text{ VAC at } 50/60 \text{ Hz}$$
$$117 \pm 12 \text{ VAC at } 50/60 \text{ Hz}$$
$$220 \pm 22 \text{ VAC at } 50/60 \text{ Hz}$$
$$240 \pm 24 \text{ VAC at } 50/60 \text{ Hz}$$

Check part number label on the bottom of the Model 2500 for proper voltage configuration. Unless a specific voltage configuration at purchase time, the Model 2500 is connected for primary input of 117 VAC. If the proposed input line voltage is incompatible with the Model 2500 requirements (line voltage indicated on part number label on the bottom of the unit), it will be necessary to modify the unit internally to assure proper operation.

2.4 I/O Interface

2.4.1 Modem/CPU Connector

This connector interfaces the Model 2500 to a Modem or CPU. The communication interface is in accordance with the EIA RS-232 levels. A description and connection of the Modem is shown in Figure 2-5.

MEMTEC 2500   CPU/MODEM

MEMTEC 2500			CPU/MODEM
PROTECTIVE GROUND	1 ———————— 1		AA
TRANSMITTED DATA	2 ———————— 2		BA
RECEIVED DATA	3 ———————— 3		BB
REQUEST TO SEND	4 ——— PU ——— 4		CA
CLEAR TO SEND	5 ———————— 5		CB
DATA SET READY	6 ———————— 6		CC
SIGNAL GROUND	7 ———————— 7		AB
DATA TERMINAL READY	20 ——— PU ——— 20		CD

DTE   DCE
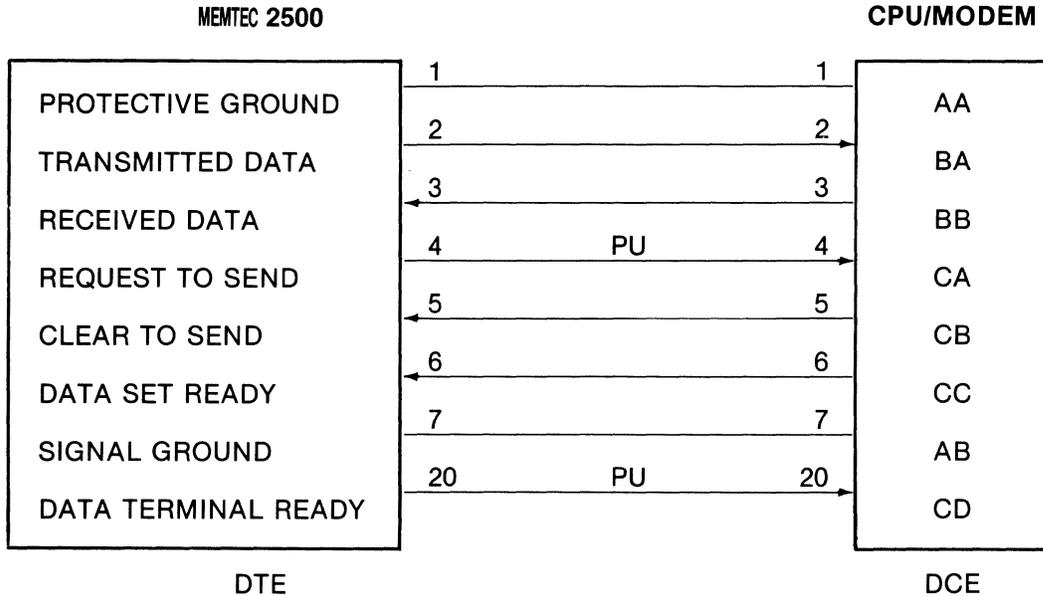
NOTE:
1. DTE = DATA TERMINAL EQUIPMENT
2. DCE = DATA COMMUNICATION EQUIPMENT
3. THE MODEL 2500 MODEM CONNECTOR HAS MALE PINS
4. PULL UP = +5V $\sim\!\!\sim\!\!\sim\!\!\rightarrow$ PU   100 Ω

Figure 2-1:   RS232 Modem/CPU Connector

2.4.2 Terminal Connector

This connector interfaces the Model 2500 to a local terminal. The communication interface is in accordance with EIA RS232 levels or a TTY 20 MA current loop. a detailed pin description of the terminal connector is shown in Figure 2-6.

Pin No.	Description	I/O (2500)	RS232	TTY
1	Protective Ground		Chassis GND	Chassis GND
2	Transmitted Data	I	TD	
3	Received Data	O	RD	
5	Clear to Send	O	PU	
6	Data Set Ready	O	PU	PU
7	Signal Ground		GND	GND
8	Received Line Signal DET	O	PU	
9	-Received Data			-RD
10	Received Data Ground			RD GND
11	Transmitted Data Converted	O		+TDC
17	+Received Data	O		+RD
18	Received Data Registor			RD RES
22	Transmitted Data Resistor			TD RES
23	+Transmitted Data	I		+TD
24	Transmitted Data Ground			TD GND
25	-Transmitted Data	I		-TD

Figure 2-2:   Terminal Connector Pin Description

2.4.2.1 RS232 Terminal Connector

A description of the Terminal connector with RS232 connections, is shown in Figure 2-1.

2.4.2.2 TTY Terminal Connector

The Model 2500 can also communicate to a local terminal in accordance with a TTY 20MA current loop. Interface connections with TTY terminals are completed utilizing optical isolator within the Model 2500. Current loops must be used to energize the optical isolator.

Current flow represents a Marking Condition. If the "Receive" current loop (M2500-TD) is broken, the M2500 will abort any operation and begin transmitting continuously "?" characters to the terminal.

The Model 2500 can be connected either to source or to sink current, as shown in Figure 2-8 and Figure 2-9 respectively.

CAUTION: Insure correct signal interfaces when implementing the 20 ma current loop options. Failure to observe signal interfaces may cause electrical damage to unit.

MFE 2500   TERMINAL

DCE			DTE
PROTECTIVE GROUND	1 ——— 1		AA
TRANSMITTED DATA	2 ——— 2		BA
RECEIVED DATA	3 ——— 3		BB
CLEAR TO SEND	5 —PU— 5		CB
DATA SET READY	6 —PU— 6		CC
SIGNAL GROUND	7 ——— 7		AB
RECEIVED LINE SIGNAL DETECT	8 —PU— 8		CF
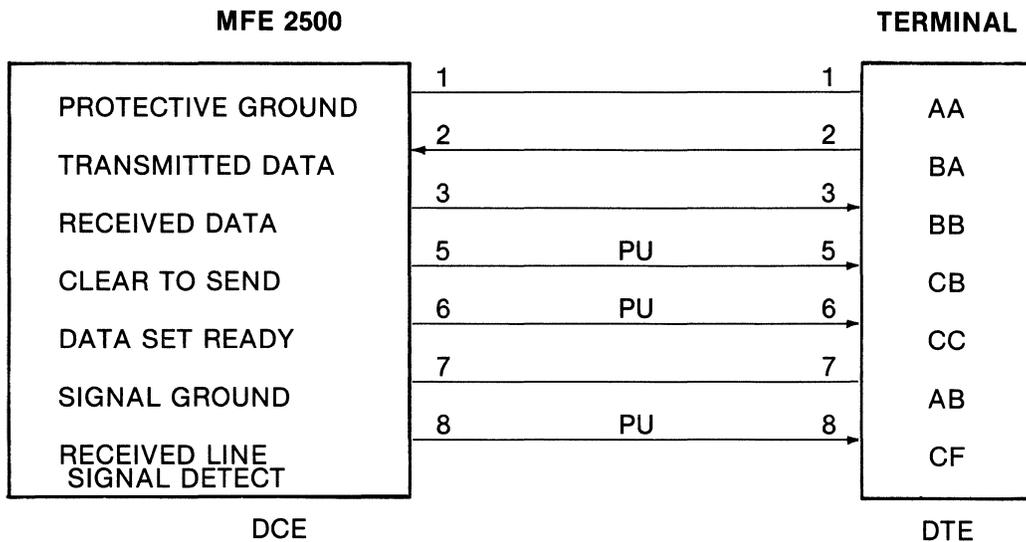
NOTE: 1. DTE = DATA TERMINAL EQUIPMENT
2. DCE = DATA COMMUNICATION EQUIPMENT
3. THE MODEL 2500 TERMINAL CONNECTOR HAS FEMALE PINS.
4. PULL UP = +5V >—/\/\/\— PU   100Ω

Figure 2-3:   RS232 Terminal Connector

— 6 —
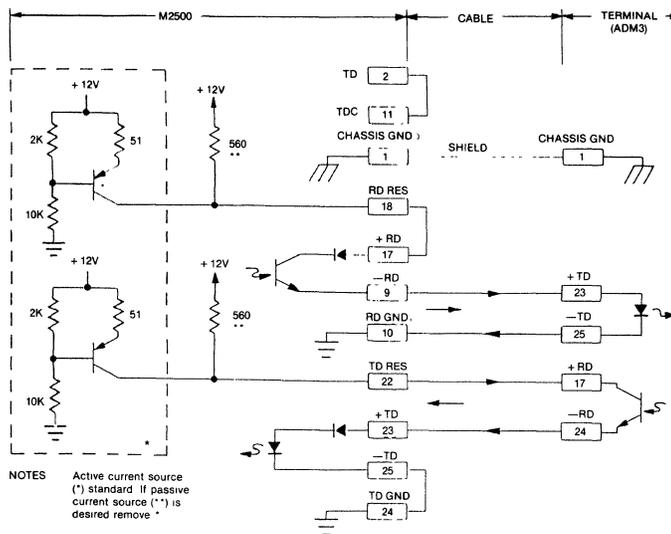
Figure 2-4: TTY Terminal Connector — Model 2500 Sources Current
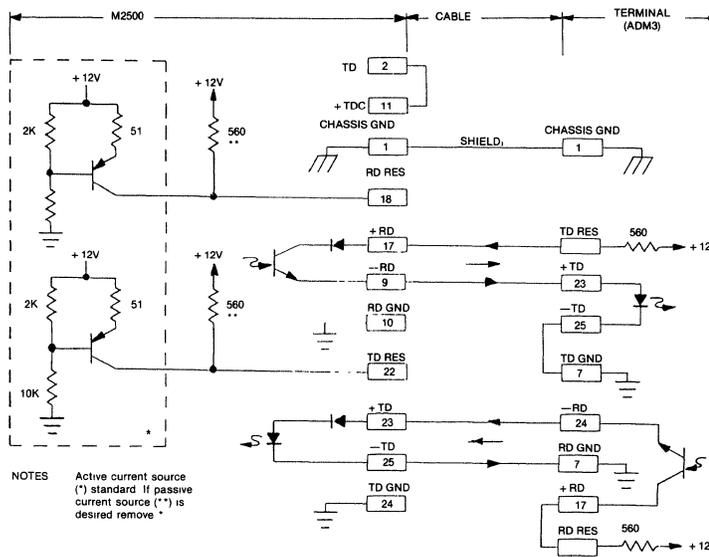
Figure 2-5: TTY Terminal Connector — Model 2500 Sinks Current

2.4.3   I/O Connector Mechanical Layout

A mechanical layout, as viewed from the back of the unit, of the two I/O connectors are shown in Figure 2-6.

Figure 2-6:   I/O Connector Mechanical Layout

3.0 GENERAL OPERATING INSTRUCTIONS

3.1 Controls and Indicators

The Model 2500 has a rear and front control panel. The rear panel has the main AC power control switch, while the front panel has all of the indicators and operating control switches. In addition, there are internal controls that consist of DIP switches that are mounted on the PC board. These switches are normally set at the factory for a specific mode of operation but are easily field selectable.

3.1.1 Rear Panel

AC Power Switch - This is a toggle switch. Controls the application and removal of primary AC power. The primary power is applied to the Model 2500 when the toggle switch is in the "up" position. (See Figure 3-1)

AC Fuse - This is the buss for the AC primary power, It is an 1/2 amp fuse. (See Figure 3-1)

AC Power Cord - Standard 3 wire ground cord for connection to a 115VAC power source.
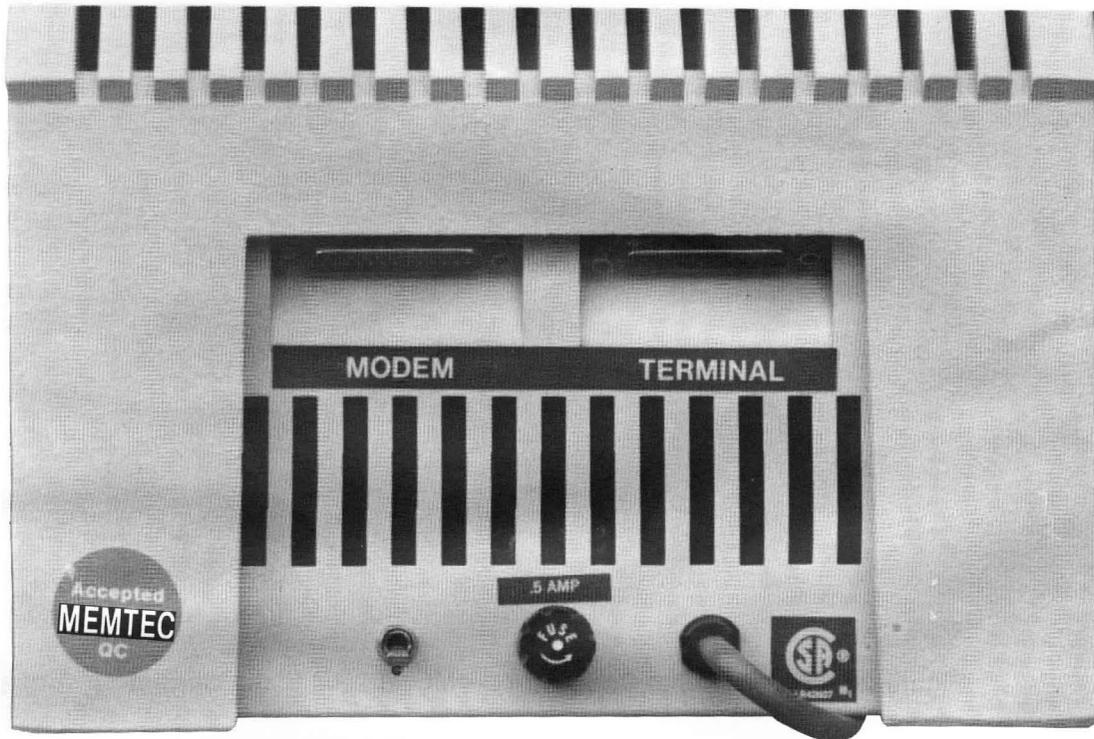
Figure 3-1:   Rear Panel

3.1.2   Front Panel

The front panel has all of the indication and operating switches that permit an operator to select and monitor the Model 2500 modes of operations. All switches are so interlocked that once a mode is activated, it will be impossible to enter into another operating mode without completing the initial cycle first. If an improper command is issued or a fault condition exists, the respective function switch light will BLINK. The front panel controls are shown in Figure 3-2.

3.1.2.1   Power Indicator Lamps

This lamp indicates the status of the AC power switch that is located in the rear panel. (See Figure 3-2) When the lamp is on, it indicates that the AC primary power is present on the Model 2500.

3.1.2.2   Local Copy - Toggle Switch

This toggle switch selects if characters are to be sent to the local terminal in the Off-line or On-line mode and operates in the following manner: (See Figures 3-3 through 3-9).

OFF LINE MODE

LOCAL COPY: OFF

     MODE   Idle or Receive
All characters (including control codes) received from the terminal will not be echoed back to the terminal. The M2500 will execute meaningful control code and update the status register.

LOCAL COPY: ON

     MODE: Idle or Receive
All characters (including control codes) received from the terminal will be echoed back to the terminal with the following exception: Status Request (CTRL])
- the status character plus a carriage return (CR) will be sent to the terminal but the Status Request (CTRL]) will not be echoed.

LOCAL COPY: OFF/ON

     MODE: SEND
All characters (including control codes) received from the terminal will not be echoed back to the terminal. However, if a Status (CTRL]) is requested, the M2500 will transmit the status character plus a carriage return (CR) character. Therefore, care should be taken not to ask for status while the M2500 is in the SEND mode and is transmitting data.

If a Stop Send (CTRL S) is received from the terminal, the M2500 will stop the transmission of data but will not echo the CTRL S back to the terminal.

ON LINE MODE

LOCAL COPY: ON/OFF

     MODE: Idle or Receive
All characters received from the modem will be transmitted to the terminal. No data is ever echoed to the Modem.

LOCAL COPY: OFF

     MODE: SEND
Disables data transmitted by the M2500 to the modem from being copied at the terminal.

LOCAL COPY: ON

     MODE: SEND
Enables data transmitted by the M2500 to the modem to be copied at the terminal.

3.1.2.3 Rewind - Momentary Switch

ACTIVATED: Rewind tape to the starting leader at fast speed. When leader is detected, it continues rewinding the tape to hub at low speed and stops. Note: After this command has been given, the M2500 will not execute Start Receive command until a Load Point command has been received.

3.1.2.4 On-Line - Toggle Switch and Indicator Lamp

This switch selects the Off-line or On-line mode. The indicator lamp displays the mode that the Model 2500 is presently in.

OFF: This is the Off-line mode. Disables communication with the attached modem and enables communication with the attached terminals.

ON: This is the On-line mode. Allows communication with the attached modem. The terminal displays data received from the modem.

BLINKING: Indicates one of the following:

On Line: Modem is improperly configured, attached, malfunctioning or no data set ready (DSR).

Off-Line: No operation. The lamp will be off.

3.1.2.5 Binary - Toggle Switch and Indicator Lamp

OFF: Enables interpretation of all remote control codes received either from modem, terminal or cassette.

ON: Disables interpretation of all control codes thereby allowing every byte to be recorded or transmitted (Binary operation).

3.1.2.6 Send - Momentary Switch and Indicator Lamp

First Activation:

Manually begins transmission of recorded data to the attached modems (On-line mode) or terminal (Off-line mode). The command is acknowledged by turning on the lamp. A load point will be executed first if the tape is on clear leader. See "Start Send" command in Table 3-1 for more details.

Second Activation:

Manually stops transmission of recorded data. Transmission of data will stop after the next character is transmitted. Whenever data transmission is resumed, the transmission of data will continue from where it was stopped. See "Stop Send" command in Table 3-1 for more details.

Blinking: Indicates one of the following:

A. No cassette is inserted in transport.
B. A read error has interrupted data transmission.
C. The tape has reached clear leader.

3.1.2.7 Receive - Momentary Switch and Indicator Lamp

First Activation:

Manually begins recording of data received from attached modem/CPU (On-line mode) or terminal (Off-line mode). A load point command will be executed first if the tape is on clear leader. See "Start Receive" command in Table 3-1 for more details.

Second Activation:

Manually stops recording of data received from attached modem/CPU (On-line mode) or terminal (Off-line mode). See "Stop Receive" command in Table 3-1 for more details.

Blinking: Indicates one of the following:

A. No cassette is inserted in transport.
B. The cassette is in a write-protected mode.
C. A write error has interrupted data recording.
D. The tape has reached clear leader.

3.1.2.8 Baud Rate - Rotary Switch

This rotary switch selects the data transmission's baud rate of 110, 300, 1200 and 2400 baud. (See Figure 3-2)

3.2 Remote Control Codes

The Model 2500 can be operated either manually from the Front Panel or from an external source. Appropriate external control codes will be accepted from any source, but are usually generated locally by a CRT/TTY keyboard, or remotely by a CPU operating through an attached modem. Table 3-1 describes in detail the function of each remote control code.

In some cases, a command to perform a function can be overridden by an external command to void or cease the function. For example, if the RCV switch on the Model 2500 Front Panel is activated, a stop receive command from an external source will override the operator's command at the Model 2500 front panel. Likewise, if the Model 2500 has received a start send command (SEND switch momentarily depressed), an external source command to terminate the send mode may override the operator's command from the Model 2500 Front Panel. Activating the RCV switch on the front panel after an external command to send has been received will merely cause the RCV lamp to flash indicating unacceptable or incompatible commands. Similarly, activating the SEND switch after a receive command has been received from an external source will merely cause the SEND switch to flash. Once a mode of operation has been commanded by an external source, the Model 2500 will remain in that mode until a stop send, stop receive or reset command is received from the external source.

In the case of rewind or load point commands, the operation must be completed before other commands will be accepted by the Model 2500. For example, if a load point command is received from an external source, the operation must be completed before any front panel switches can be utilized.

If Local Copy, On-Line or Binary front panel switches are depressed and latched, there is no method of overriding these modes from an external source. The Local Copy, On-Line and Binary switches must be manually released to cancel these modes of operation.

T = TOGGLE SWITCH
M = MOMENTARY SWITCH
R = ROTARY SWITCH
L = LED INDICATOR
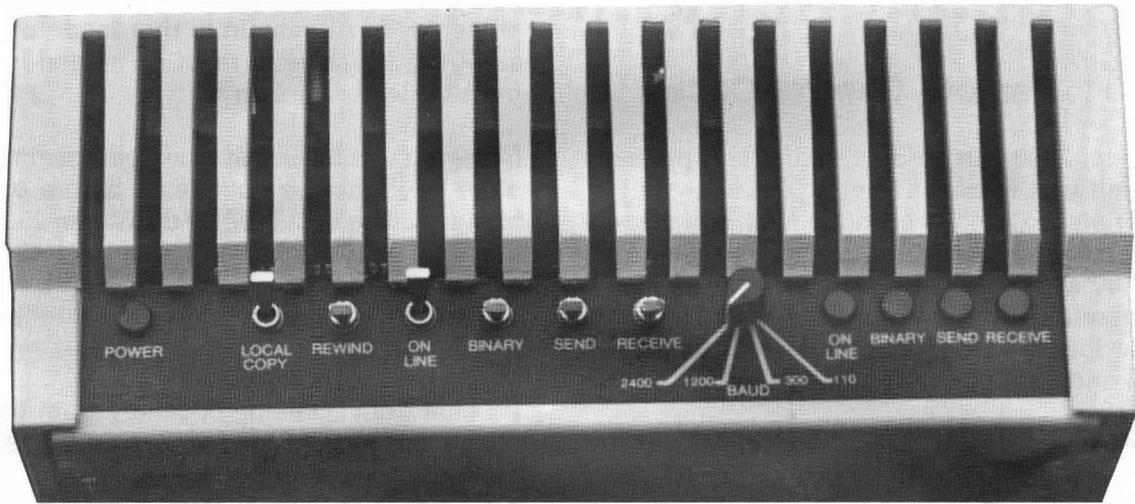
Figure 3-2:   Front Panel Control and Indicators

Table 3-1: Remote Control Codes & Functions

COMMAND GENERATE	CONTROL CODE	ASCII CODE	COMMAND FUNCTION
START	CTRL Q	DC 1	Read the next record from the tape and store it in the M2500 read buffer. The command is acknowledged by turning on the "SEND" lamp. If the record was successfully read (no data CRC) the M2500 begins transmission of the data in the read buffer to the terminal or modem and continues until one of the following occurs: (a) The end of the record in the read buffer is reached. If the "BLOCK SEND" switch is OFF, the next record is read from tape and data's transmission continues. If the "BLOCK SEND" switch is ON, the data transmission stops. (b) The "SEND" switch is activated. The transmission of data is immediately stopped. The remainder of the record is still in the read buffer and will be transmitted simply by re-activating the "SEND" switch or by sending a "START SEND" (DC1) command. (c) A "STOP SEND" (DC3) control character is read from tape or received remotely. The transmission of data is immediately stopped. The remainder of the record is still in the read buffer and will be transmitted simply by reactivating the "SEND" switch or by sending a "START SEND" (DC1) command. (d) No data is present on tape. The M2500 will search for data 1 second and if no data is found, it will back the tape to the end of the last record. The "SEND" lamp will flash and remain in this mode until one of the front panel switches is activated or remote "RESET" (CTRL U) command is received. (e) NOTE: If the tape is on clear leader, a "LOAD POINT" command will not automatically be executed.
STOP SEND	CTRL S	DC 3	Stop the transmission of data (on character) from the read buffer to the terminal or modem. The read buffers' pointer will be saved and upon the reception of a DC1 from the terminal or modem, the 2500 will resume data transmission of the read buffer. Data transmission will continue until the read buffer is empty. At the end of the record, the 2500 checks the "SEND" switch, and if activated, stops the transmission of any more records. NOTE: The front panel "SEND" switch must be activated of long enough duration for the 2500 to detect the command at the end of the record transmission.

Table 3-1:   **(continued)**

COMMAND GENERATE	CONTROL CODE	ASCII CODE	COMMAND FUNCTION
START RECEIVE	CTRL R	DC 2	Set the M2500 in a receive mode. Data sent by the local terminal or remote CPU will be stored in the M2500's write buffer. The data in the write buffer is recorded on tape when one of the following conditions occur: (a)The write buffer is full. 86 characters were received by the M2500. (b)A "STOP RECEIVE (DC4)" command was received. The M2500 fills the remaining write buffer with "NULLS". (c)The front panel "RCV" switch is activated. As each byte of data is written on tape the M2500 also reads that byte from the read after write head. The CRC is then calculated and if correct, the next record is written on tape. If the CRC was not correct, the tape is moved backwards to the end of the last record and the data in the write buffer is again written on tape. If the CRC is again not correct, the tape is moved backward to the end of the last record and a record of 86 characters (cancel, Hex 18) is written on tape. The tape is now moved forward (approximately 0.8 inch) and the record is again written on tape. If the CRC is still incorrect, the M2500 blinks all of the lamps, sets the "Fault" bit in status word, flashes lamps and begins transmitting "Bell (Hex 07)" characters to the Modem (On-line) or Terminal (Off-line). A reset is required to clear this condition. A reset (CTRL U) command or an activation of the front panel switch is now required to get out of this mode. If the tape is on clear leader, an automatic "Loadpoint" will be executed if the "START RCV" command is from the front panel. If the "START RCV" command was remote, the status "Clear Leader" bit will be set and the M2500 will return to the command scan routine. When a "START RCV" command is received, a cassette without the write tab in place will cause the M2500 to flash the RCV lamp and set the status "Fault" bit.

Table 3-1:   (continued)

COMMAND GENERATE	CONTROL CODE	ASCII CODE	COMMAND FUNCTION
STOP RECEIVE	CTRL T	DC 4	The remainder of the M2500's write buffer is filled with "NULLS" and the data in the write buffer is recorded on tape. The RCV lamp is turned off and the recording of data is terminated.
REWIND	CTRL Y	EM	Rewind tape to the starting leader at high speed (120 inches per second). When clear leader is detected, it continues rewinding the tape to hub at low speed and stops.
LOAD POINT	CTRL \	FS	Initiates operation to position tape at start of the recording area. Rewinds tape to starting leader and then advances tape forward until beginning of tape (BOT) hole is sensed.
SKIP	CTRL __	US	Initiate operation to move the tape one or multiple records forward or reverse. Sending a CTRL__ followed by "F" or "R" followed by "LF" will cause the tape to ship one record forward or reverse. Sending a CTRL__ followed by "F" or "R" followed by "CR" will cause the tape to move fast forward or reverse until stopped by "CR". At the completion of the skip command, the M2500 will send a bell character (CTRL G) to the terminal (Off Line) or modem (On Line).
BACK SPACE	CTRL H	BS	Causes the M2500's write buffer pointer to be backed up one character for every CTRL H. This allows the changing of a character if it is within the same text line. When in receive mode, the CTRL H character will not be written on tape. With the Local Copy switch off and the CRT terminal (such as ADM3) in half duplex, the cursor and write buffer pointer will back up one character for every CTRL H. The desired character now can be typed and will be stored in the write buffer. With the Local Copy switch on and the CRT terminal in full duplex, for every CTRL H the write buffer pointer is backed up by one character. This character is transmitted to the CRT terminal. This will result in a display of an additional character identical to the one being removed. However, only the corrected character will be recorded on the tape.

Table 3-1: **(continued)**

COMMAND GENERATE	CONTROL CODE	ASCII CODE	COMMAND FUNCTION
CANCEL	CTRL X	CAN	The write buffer pointer is reset which cancels the entire test line (Receive mode only).
ERASE	CTRL [CTRL V	ESC SYN	This command (CTRL [followed by CTRL V) erases the tape in "Fast Forward" from its present position to the end of tape (EOT). The tape automatically rewinds to starting leader after erase sequence is completed.
RESET	CTRL U	NAK	Terminate current operation and reinitialize the program.
STATUS	CTRL]	GS	This command causes the M2500 to transmit status information as an upper case ASCII character by which bits are set in the status word. A carriage return (CR) character follows the status character. The status truth table is shown in Table 3-2. NOTE: The characters with an asterisk are the most commonly returned status.
ANSWER- BACK	CTRL E	ENO	The M2500 responds with a 32 character customer supplied message. A default answer back message "MEMTEC Model 2500 Pxxy" will be sent in response of a ENO if no customer supplied response is present. XX will be the last two digits of the program number. Y is the program number revision level. A Carriage Return (CR) and Line Feed (LF) will be transmitted at the beginning and end of the default message.

3.3   Status Bits Description

When the Modem or Terminal request status, the M2500 responds by sending an upper case ASCII character followed by a carriage return (CR) character. The Status Truth Table is shown in Table 3-2. The first character contains bits set in the status register. These bits are defined as follows:

FAULT (BIT 0)

Declared that one of the following error conditions has occured:

A.   In receive, a hard CRC error was detected when performing read after wirte.

B.   Tape is jammed while attempting to execute a Send or Receive command.

C.   The EOT hole was sensed. Tape was moved until the clear leader was reached (end of tape).

CRC ERROR (BIT 1)

A.   In Receive, a CRC error occured when writing a record on tape.

B.   In send, a CRC error was detected when a record was read from tape.

TD READY (BIT 2)

This bit declares that the tape deck is ready to accept data. Tape is not moving and it is not on clear leader.

M2500 BUSY (BIT 3)

The M2500 is busy performing a command such as Receive, Send, Load Point, Rewind, etc.

CLEAR LEADER (BIT 4)

The EOT hole at the end tape has been sensed. This bit will remain set until a command such as or Rewind, Load Point, Stop Receive or Reset is received.

RECEIVE ERROR (BIT 5)

This bit will be set when the UART has sensed that a framing error has occured. This occurs when the correct number of stop bits are not received.

INVERTED BIT (BIT 6)

This bit is the Receive Error (BIT 5) inverted. This is done to guarantee that an upper case character will always be transmitted for a status character.

PARITY BIT (BIT 7)

This bit is always a 0. No parity.

Table 3-2: Status Truth Table

CHARACTER	RCV ERROR	CLEARED	M2500 BUSY	TD READY	CRC ERROR	FAULT	CHARACTER	RCV ERROR	CLEARED	M2500 BUSY	TD READY	CRC ERROR	FAULT
* @	0	0	0	0	0	0	SP	1	0	0	0	0	0
A	0	0	0	0	0	1	!	1	2	2	2	2	1
B	0	0	0	0	1	0	"	1	0	0	0	1	0
C	0	0	0	0	1	1	#	1	0	0	0	1	1
* D	0	0	0	1	0	0	* $	1	0	0	1	0	0
* E	0	0	0	1	0	1	%	1	0	0	1	0	1
* F	0	0	0	1	1	0	&	1	0	0	1	1	0
* G	0	0	0	1	1	1	'	1	0	0	1	1	1
* H	0	0	1	0	0	0	(	1	0	1	0	0	0
I	0	0	1	0	0	1	)	1	0	1	0	0	1
J	0	0	1	0	1	0	*	1	0	1	0	1	0
K	0	0	1	0	1	1	+	1	0	1	0	1	1
* L	0	0	1	1	0	0	,	1	0	1	1	0	0
M	0	0	1	1	0	1	-	1	0	1	1	0	1
N	0	0	1	1	1	0	.	1	0	1	1	1	0
O	0	0	1	1	1	1	/	1	0	1	1	1	1
* P	0	1	0	0	0	0	0	1	1	0	0	0	0
Q	0	1	0	0	0	1	1	1	1	0	0	0	1
R	0	1	0	0	1	0	2	1	1	0	0	1	0
S	0	1	0	0	1	1	3	1	1	0	0	1	1
* T	0	1	0	1	0	0	* 4	1	1	0	1	0	0
U	0	1	0	1	0	1	5	1	1	0	1	0	1
* V	0	1	0	1	1	0	6	1	1	0	1	1	0
W	0	1	0	1	1	1	7	1	1	0	1	1	1
* X	0	1	1	0	0	0	* 8	1	1	1	0	0	0
Y	0	1	1	0	0	1	9	1	1	1	0	0	1
Z	0	1	1	0	1	0	:	1	1	1	0	1	0
[	0	1	1	0	1	1	;	1	1	1	0	1	1
	0	1	1	1	0	0		1	1	1	1	0	0
]	0	1	1	1	0	1	=	1	1	1	1	0	1
	0	1	1	1	1	0		1	1	1	1	1	0
_	0	1	1	1	1	1	?	1	1	1	1	1	1

Bit 0 = Fault or error condition.
Bit 1 = CRC Read error detected on tape.
Bit 2 = Tape transport is ready (Cassette loaded, no tape motion).
Bit 3 = MEMTEC 2500 is busy (Command in operation).
Bit 4 = Tape is on clear leader.
Bit 5 = Receive error (Framing).
Bit 6 = Inverted Bit 5 for upper case.
Bit 7 = Always 0. No parity.

3.4   Cassette Loading and Removal

3.4.1   MEMTEC Tape Cassettes

The Model 2500 is designed to operate with cassettes supplied by MEMTEC Corporation or an equivalent. MEMTEC tape cassettes are designed and manufactured to meet or exceed ANSI-ECMA specifications. Use of any other cassette with the Model 2500 Buffered Data Terminal will cause improper operation and may damage the unit.

3.4.2   Write-Protect Tabs

Each MEMTEC tape cassette is provided with write-protect tabs at the rear of the cassette. If Side A is to be written on, the tab for Side A of the cassette should cover the hole. If Side A of the tape is to be read-only (write-protected), the tab should be positioned so the hole is uncovered. Figure 3-3 shows a rear view of an MEMTEC Tape Cassette with Side A facing up.

Note that the right hole is covered, permitting the reading or writing of Side A. The left hole is not covered, permitting only the readings of Side B, thus protecting the data stored in Side B.

3.4.3   Cassette Installation

After checking the position of the write-protect tabs, the operator may install the tape cassette in the tape transport as follows (see Figure 3-4):

a.   Raise plexiglass dust cover

b.   Check to ensure recording-head dust cover is removed

c.   Insert the top edge of the cassette under retaining fingers and firmly press the bottom of the cassette down into the locking mechanism.

d.   Close plexiglass dust cover

3.4.4   Cassette Removal

To remove the tape cassette from the tape transport open plexiglass dust cover and press down sharply on the cassette release lever shown on Figure 3-5. Cassette should "snap" release from tape transport.

CAUTION

It is extremely important to **always** rewind the tape to the beginning clear leader before removing the cassette from the transport and before removing power from the Model 2500

Write protect tab for Side A -
Shown in Read or Write position
(i.e., hole covered)

Figure 3-3:   Movable Write-Protect Tabs
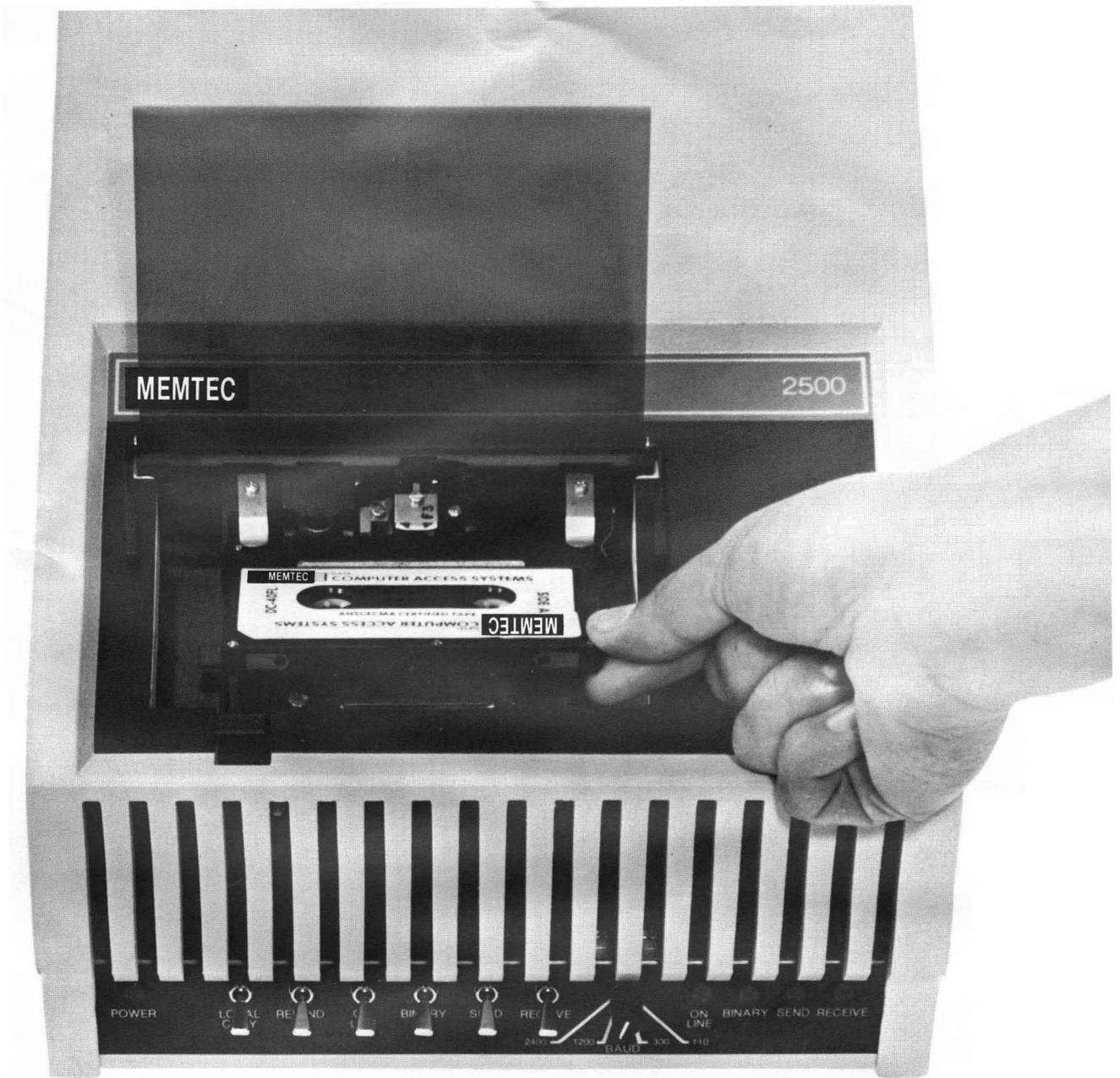
Figure 3-4:   Tape Cassette Loading

Tape Cassette
Release Lever

Figure 3-5:   Tape Cassette Release Lever

3.5   Initial Test and Preparation for Operation

3.5.1   Initializing the Model 2500

Initialization consists of powering the unit on, establishing proper communication criteria between the Model 2500 and interfacing equipment, and checking basic operation of the tape transport. Proceed as follows:

CAUTION

Fully read and follow instructions contained in Section 2.0 of this manual before initializing or testing the Model 2500. It is **not** necessary, however, to connect the unit to a Modem to perform the tests outlined below. Connection to a CRT-Keyboard terminal will permit completion of the tests without termination of the Modem cable. If a TTY terminal is utilized, it is necessary to correctly terminate the Modem cable as described in Section 2.6.2.2.

a.   Turn primary power to Model 2500 on by positioning OFF/ON switch on rear panel to "up" position while monitoring operation of front panel power lamps. When power is first applied, the ON-LINE and SEND lamps will turn on and off. The same procedure will follow for the BINARY and RECEIVE lamps.

b.   Turn on primary power to interfacing terminal.

c.   Set baud rate selector (110-2400) to proper baud rate as dictated by the interfacing terminal. It is extremely important to set the baud rate selector correctly. Communication with the local terminal or remote CPU will not take place with an incorrect baud rate setting.

d.   Install MEMTEC Tape Cassette (or equivalent) in tape transport as described in Section 3.4.3.

e.   Set Terminal or CPU to: NO PARITY
                                 Full Duplex
                                 The same
                                 transfer rate as
                                 the 2500

f.   Set 2500 to On-Line (Modem Connector) or Off-Line (Terminal Connector)

g.   Activate the rewind switch

h.   If manual operation is to be used the 2500 is now ready to or receive data.

i.   If remote operation is to be used perform a "load point" command. The 2500 is now ready to send or receive data.

4.0 INTERNAL CONTROLS

4.1 Access to Internal Controls

WARNING

Voltages hazardous to life are present within the Model 2500 Buffered Data Terminal when plugged into line voltage. Unplug primary power cord from line receptacle before opening unit.

4.2 Disassemble Unit

To open the Model 2500, turn it upside down and place it on a soft cloth or towel (see Figure 2-1). Using a Phillips #1 screwdriver, remove the three screws on each side of the unit. Holding the unit base and case together, turn it over and place it on its base. Then, lift the case straight up (see Figure 4-2). Visually check the printed circuit board for foreign objects which could possibly short out any of the circuits.

4.3 Reassemble Unit

Before reassembling top and bottom assemblies, check placard on bottom of unit to ensure that the Model 2500 primary AC line voltage requirements are the same as the line voltage proposed for use with the Model 2500. If the placard indicates the Model 2500 is internally configured for a different line voltage than the one proposed for use, follow the instructions outlined in Section 2.5.1 of the Maintenance Manual, document number 02000222.

The internal controls consist of Dip Switch (SW8) that is located on the lower right hand corner of the PC board. They normally will be set at the factory, but are easily selectable. The switch is shown below:

8	. . . . Carriage return delay
7	. . . . Block send
6	. . . . Test
5	. . . . Demo
4	. . . . On line answerback
3	. . . . CRC enable
2	. . . . N/U
1	. . . . N/U

NOTE: Switches are off in the "OPEN" or "OFF" position.

Figure 4-1:   Internal Control DIP Switch (SW8)
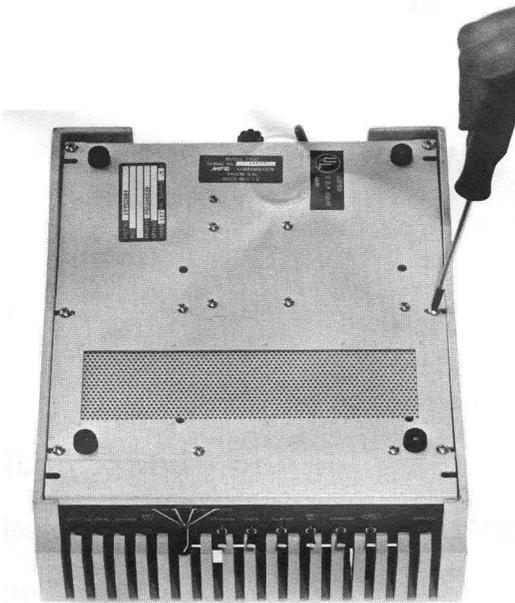
Figure 4-2:   Removal of Captive Retaining Screws
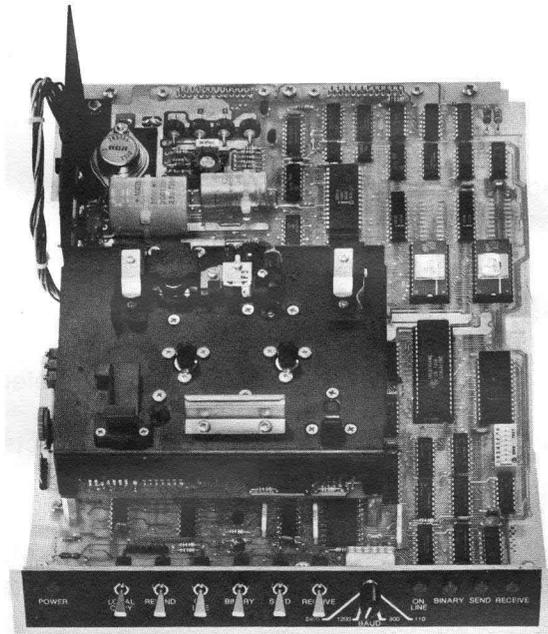
Figure 4-3:   Separation of Top & Bottom Assemblies

4.4 Internal Switches

4.4.1 SW8-1 and SW8-2

These two switches are not used.

4.4.2 CRC Enable (SW8-3)

This switch selects if the CRC in the data record is to be checked when reading tapes.

OFF: (Send Mode) CRC will be ignored (disabled)

ON: (Send Mode) CRC will be checked for validity.

4.4.3 On Line Answerback (SW8-4)

This switch allows the M2500 to respond to the CPU/Modem when in the mode. The M2500 will respond to the terminal when in the Off-Line mode. The response is a user specified, pre-programmed message of up to 32 characters. The message is in response to a Control E (Octal 005, ASCII ENQ). In the Off-Line mode, the M2500 will always respond to the ENQ with the pre-programmed message. In the On-Line mode, response to ENQ will be as follows:

OFF: No answerback message to the modem.

ON: Answerback message will be sent to the modem.

4.4.4 Demo (SW8-5)

This switch selectes continuous send operation.

OFF: Normal user operation.

ON: In send mode at end of data, CRC error or End of Tape (EOT) the cassette will rewind and restart Send operation.

4.4.5 Test (SW8-6)

This switch selects an internal test.

OFF: Normal operation

ON: Triggers all one-shots (22,25) so that their pulse width can be adjusted and flashes all lamps for lamp test.

4.4.6 Block Send (SW8-7)

This switch selects simple block data transfer.

OFF: Continuous transmission of data until "stop send" command is received or, end of data is reached or "send" switch is activated.

ON: Transmit one block of data per Send command.

4.4.7 Carriage Return Delay (SW8-8)

This switch selects the carriage return delay.

OFF: Selects no carriage return delay.

ON: Selects a carriage return delay of 360 MS. This delay is also field adjustable (100 MS - 700 MS) with a potentiometer mounted on the PCB.

4.5   Field Adjustments

The M2500 has been designed to allow field adjustment of timing variables which affect compatibility with other types of cassette based equipment such as TI 700 Series machines and various printers. These are inter-record gaps and carriage return delays. There are five pots located on the left side of the PCB. Directly below them are six header pins. The pins correspond to the pot being adjusted from top to bottom. The last pin being a ground point.

To effect adjustment:

1.   Set "Test: SW8-6"

2.   Note all four front panel LED's flashing on and off about once per second

3.   Connect scope probe to pin corresponding to function you wish to adjust.

4.   Adjust corresponding pots as listed in No. 5.

5.   Set "test switch to off position. -WARNING- For proper operation the following functions must have the following settings:

    SC   = 133 micro sec.

    ROS = 75 micro sec.

    GAP = not less than 60 msec.

    DS   = set at max.

    CRD = user determined

For an inter-record gap of .8 inch, nominal "GAP" is set for 60 millisec.

For TI compatibility, a gap of 1.2 inch is required. Set "Gap" at 100 millisec.

CRD - may be set from 90 to 750 by adjusting pot. If a different delay is needed, the user must change C 3 proportionately.

5.0   ERROR DETECTION

5.1   Send Mode

5.1.1 When a CRC error is detected, up to 3 re-read will take place. If failure results at the end of the third attempt, tape will be positioned at the beginning of the defective block. "Send" mode will be terminated and "Send" light will BLINK. At this point, the 2500 must be reset either by "Control U" (Reset Command) or by activating any of the front panel switches (except the binary switch).

5.2   Receive Mode

When a CRC error is detected, 3 re-write attempts will be made (if timing permits). If error cannot be corrected, the "Receive" mode will be terminated. At this point, the 2500 must be reset either by a "Control U" (Reset Command) or by activating any of the front panel switches (except the binary switch). If time and cost goals can be met, then at least one attempt should be made down tap from the error area.

6.0   DAILY CARE

For normal, trouble-free system operation, the recorder head and tape handling components should be cleaned each day with the below listed materials as shown in Figure 6-1. Neglecting this daily care may cause abnormal tape wear or excessive read/write errors.

Required Cleaning Materials

1. Soft cotton swabs (such as Q-Tips)
2. Aerosol head cleaner or isopropyl alcohol
3. Camel hair brush

Figure 6-1:   Required Cleaning Materials

To properly clean the MEMTEC 2500, proceed as follows:

1. Raise the front dust cover and remove the cassette.

2. Use the aerosol head cleaner or camel hair brush (dry) to clean away accumulated dust or magnetic oxide from the EOT/BOT sensor (Figure 6-2, 6-3).
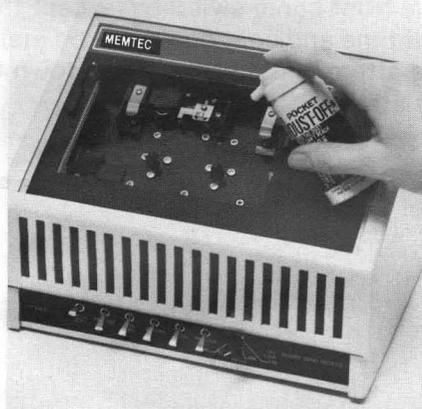
Figure 6-2:   Preferred Cleaning of the EOT/BOT Sensor
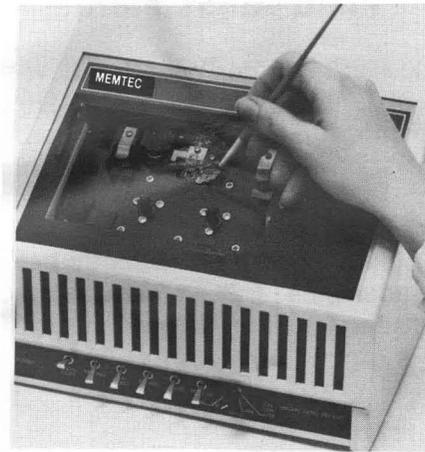
Figure 6-3:   Alternate Cleaning of the EOT/BOT Sensor

3. If using liquid head cleaner, moisten a cotton swab and carefully clean recorder head and exposed metal parts (Figure 6-4).

   DO NOT ALLOW THE CLEANER TO CONTACT THE EOT/BOT SENSOR OR ANY OF THE PLASTIC COMPONENTS IN THE TRANSPORT.

4. Remove excess liquid cleaner immediately with a clean dry swab. Ensure that the transport components are completely dry before reloading a cassette. (Figure 6-4)
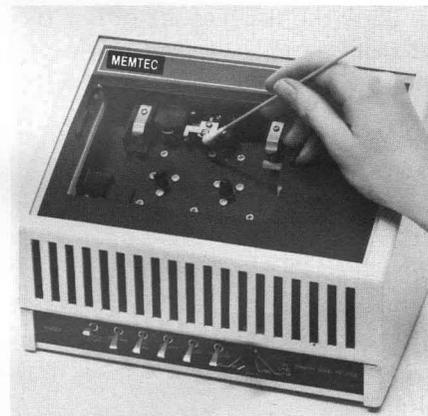

Figure 6-4:   Cleaning the Recorder Head

7.0 WARRANTY

MEMTEC Corporation warrants that this product is free from defects in workmanship and material for a period of ninety (90) days from the date of delivery. MEMTEC's sole obligation under this warranty shall be limited to correcting, without charge, at its factory, any part or parts thereof which, upon examination by MEMTEC, shall be disclosed to have been originally defective. If MEMTEC determnes that the product is not defective within the terms of this warranty, the buyer shall pay the cost of all transportation and repairs at the then prevailing MEMTEC repair rates.

This warranty does not apply to any MEMTEC equipment that has been subjected to neglect, misuse, improper installation and maintenance, or accident. MEMTEC shall not be liable for loss or damages other than above stated, whether ordinary or exemplary, caused either directly or indirectly by use of this product.

THIS WARRANTY SUPERSEDES AND IS IN LIEU OF OTHER WARRANTIES EXPRESSED OR IMPLIED, INCLUDING THE WARRANTY OF MERCHANTABILITY. NO OTHER LIABILITIES MAY BE ASSUMED UNLESS EXPRESSLY AUTHORIZED IN WRITING BY MEMTEC CORPORATION.

CAUTION: USE OF TAPE CASSETTES OTHER THAN THOSE SUPPLIED BY MEMTEC CORPORATION MAY VOID THIS WARRANTY.

8.0 Repair Service

NOTE:
For the convenience of those users who have purchased their MEMTEC 2500 directly from MEMTEC Corp. within the U.S.A.

For equipment in warranty, if the customer returns the complete system to MEMTEC, he pays the freight and insurance. For out of warranty equipment returned to MEMTEC, the customer pays for repairs according to current MEMTEC rates.

Board Replacement
At his discretion, the customer may ship a suspected defective board to MEMTEC for repair. MEMTEC, at its discretion and prior to receipt of the defective board, will ship a replacement. If the system is in warranty, MEMTEC will bill the customer list price for the board. MEMTEC will credit him for the exchange board when it is received, assuming the board was neither abused nor modified.

Board exchange is also in effect for out of warranty systems. However, upon shipment, MEMTEC will bill the customer full list price for the board. Upon receipt of the defective board, MEMTEC will credit the customer for 70% of the list price. This leaves 30% of the list price the net due MEMTEC.

The customer must understand that he is liable for all shipping and insurance charges, and that, at its discretion, MEMTEC may ship used, refurbished parts.

List prices for MEMTEC 2500 spares and PC boards are available upon request.

NOTES:

ASCII (ANSI X3.4-1968)

Most-significant Bits

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

Least-significant Bits

Remote Control Codes

FUNCTION	KEYSTROKE	HEX CODE	ASCII CODE	OPERATION
Start Send	Control Q	11	DC1	Initiates transmission of recorded data to the terminal or modem.
Stop Send	Control S	13	DC3	Terminates transmission recorded data to the terminal or modem.
Start Receive	Control R	12	DC2	Initiates recording of data received from the terminal or modem.
Stop Receive	Control T	14	DC4	Terminates recording of data received from the terminal or modem.
Rewind	Control Y	19	EM	Initiates a high speed tape rewind to the starting leader.
Load Point	Control \	1C	FS	Positions tape at the start of the recording area by rewinding to the starting leader if necessary, then advancing to the Beginning of Tape (BOT) designator.
Status	Control]	1D	GS	Transmits status information as an upper case ASCII character determined by which bits are set in the status word.

STATUS WORD	FUNCTION
(Rightmost) Bit 1	Fault
2	CRC Error
3	Ready (Tape Transport)
4	Busy
5	Tape on Leader
6	Receive Error
7	Always the inverse of Bit 6 to insure Upper Case.
P	— — —

FUNCTION	KEYSTROKE	HEX CODE	ASCII CODE	OPERATION
Skip	Control _	1F	US	Spaces fast forward or reverse, as designated, over a specified number of data blocks.
Backspace	Control H	08	BS	Backspaces one character in the internal character buffer.
Cancel	Control X	18	CAN	Resets the internal character buffer thereby canceling an entire text line.
Erase	*{Control [	1B	ESC	Erases fast forward to the End of Tape (EOT) and rewinds.
	Control V	16	SYN	
Reset	Control U	15	NAK	Terminates current operation and re-initializes.
Answerback	Control E	05	ENQ	Transmits the answerback response.

* Requires two successive keystroke selections.

MEMTEC