



MX-50II
PROFESSIONAL TAPE RECORDER
OPERATION AND MAINTENANCE MANUAL
FIFTH EDITION

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Printed in Japan

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WARNING

This equipment generates, uses and can radiate radio frequency energy and if not installed and used in accordance with the instructions manual, may cause interference to radio communications.

It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user at this own expense will be required to take whatever measures may be required to correct the interference.

CAUTION

To prevent fire or shock hazard:

Do not expose this unit to rain or moisture.

Do not remove panels (unless instructed to do so).

There are no user-serviceable parts inside.

Refer servicing to qualified service personnel.

PLEASE READ THROUGH THE SAFETY INSTRUCTIONS ON THE NEXT PAGE.

SAFETY INSTRUCTIONS

1. **Read Instructions** All safety and operating instructions should be read before the device is operated.
2. **Retain Instructions** The safety and operating instructions should be retained for future reference.
3. **Heed Warnings** All warnings on the device and in the operating instructions should be complied with.
4. **Follow Instructions** All operating and use instructions should be followed.
5. **Water and Moisture** The device should not be used near water — for example, near a bathtub, wash bowl, sink, laundry tub, in a wet basement, near a swimming pool, etc.
6. **Carts and Stands** The device should be used only with a cart or stand that is recommended by the manufacturer.
7. **Ventilation** The device should be situated so that its location or position does not interfere with its proper ventilation. For example, the device should not be situated on a bed, sofa, rug, or similar surface that may block the ventilation openings; or, placed in a built-in installation, such as a bookcase or cabinet that may impede the flow of air through the ventilation openings.
8. **Heat** The device should be situated away from heat sources such as a radiator, heat register, stove or other appliances (including amplifiers) that produce heat.
9. **Power Sources** The device should be connected to a power supply only of the type described in the operating instructions or as marked on the device.
10. **Grounding or Polarization** Precautions should be taken so that the grounding or polarization means of the device is not defeated.
11. **Power Cord Protection** Power supply cords should be routed as they are not likely to be walked on or pinched by items placed upon or against them, paying particular attention to cords at plugs, convenience receptacles, and the point where they exit from the device.
12. **Cleaning** The device should be cleaned only as recommended by the manufacturer.
13. **Non-Use Periods** The power cord of the device should be unplugged from the out-let when left unused for a long period of time.
14. **Object and Liquid Entry** Care should be taken that objects do not enter and that liquids are not spilled into the enclosure through openings.
15. **Damage Requiring Service** The device should be serviced by qualified service personnel when:
 - A. The power supply cord or the plug has been damaged; or
 - B. Objects have entered, or liquid has been spilled into the appliance; or
 - C. The appliance has been exposed to rain; or
 - D. The appliance does not appear to operate normally or exhibits marked change in performance; or
 - E. The appliance has been dropped, or the enclosure damaged.
16. **Servicing** The user should not attempt to service the device beyond that described in the operating instructions. All other service should be referred to qualified personnel.

COMMUNICATION WITH OTARI

FOR SERVICE INFORMATION AND PARTS

All Otari products are manufactured under strict quality control. Each unit is carefully inspected and tested prior to shipment.

If, however, some adjustment or technical support becomes necessary, replacement parts are required, or technical questions arise, please contact your Otari dealer or contact Otari at:

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Another part of Otari's continuing technical support program for our products is the continuous revision of manuals as the equipment is improved or modified. In order for you to receive the information and support which is applicable to your equipment, and for the technical support program to function properly, please include the following information, most of which can be obtained from the Serial number label on the machine, in all correspondence with Otari:

- Model Number:
- Serial Number:
- Date of Purchase:
- Name and address of the dealer where the machine was purchased and the power requirements (voltage and frequency) of the machine.

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Section 1 Introduction

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1.1 General

The Otari MX-50II series tape recorders are economical high-performance 1/4" tape recorder/reproducers utilizing the latest technology in analog tape recording. The MX-50II series recorder/reproducers are comprised of two machines in the following configurations.

Table 1-1

MX-50II Series Machine Configurations

Model	Track Configuration
MX-50II-N	NAB 2 track 2 channel
MX-50II-D	DIN Stereo

Main Features:

All machines in the series will accept any size reel from a 5" EIA reel to an 11.2" DIN reel. Different size reels can be used for supply and take-up.

The front panel pitch control provides $\pm 8\%$ variable speed range. The capstan motor speed can also be controlled by an external source of 9600 Hz (nominal) square waves for easy interface with a synchronizer or similar controller. The speed range under external control is -50– +100%.

An optional VOICE EDIT MODE PCB assembly allows listening at twice normal play speed without pitch shift for easy editing of lecture and interview work or for transcription.

For convenience of tape editing work, the monitor speaker unit and headphone connector with channel selector switches are equipped.

The built-in tape timer displays the current tape position as Hours, Minutes and Seconds. The tape timer incorporates a search-to-cue locator with one cue point memory and a zero location memory.

All machines in the series feature front panel selection of two operating speeds, with internal switch selection of either high (15 ips and 7.5 ips) or low (7.5 ips and 3.75 ips) speed pair operation.

The MX-50II series machines provide switch selection of NAB or IEC equalization with front panel indication of equalization. XL type connectors are provided for inputs and outputs.

1.2 Using this Manual

This manual is intended for use with both MX-50II models. For convenience, the descriptions and references apply to the MX-50II-N, where any differences exist between this model and others in the series, those differences will be fully explained in context.

◆ **Organization:** This manual is divided into nine sections beginning with this Introduction which contains general information about the MX-50II Series and about the manual.

Section 2, Installation, contains the information necessary when first unpacking and installing the machine. The information and procedures contained in this section should be followed very carefully when the machine is first unpacked and installed.

Section 3, Controls and Indicators, contains a keyed reference guide to the operating controls, indicators, and connectors on the machine. This section contains detailed information about each control and its function. Refer to this section when you have a question about the function of a particular control, indicator, or connector.

Section 4, Operation, describes the operation of the MX-50 machines, and is divided into two parts; a. A table of machine operating modes listing each mode and the controls necessary to enter that mode; and b. Detailed operating instructions, which describe each operation and the controls and indicators associated with that operation.

Section 5, Maintenance and Alignment, provides the information necessary to perform routine maintenance operations, including head cleaning and demagnetizing and capstan motor lubrication. It also covers the audio and transport adjustments associated with normal operation of the machine.

Section 6 Printed Circuit Board Layouts and Parts Lists, contains two-color "x-ray" views of the printed circuit boards (PCBs) showing component locations and foil traces. This section also contains Parts Lists of the electronic components associated with each PCB.

Section 7 Exploded Views and Parts Lists, contains assembly drawings of the machine "exploded" to show internal parts and hardware, and the order of assembly. Each drawing is keyed to an accompanying Parts List containing the Otari part number for each mechanical component.







Appendix contains the installation instruction for optional accessories.

The final section contains the **Schematic Diagrams** for electronics assemblies and major printed circuit boards.

◆ Conventions within this Manual

This manual uses the following notation:

Buttons, Switches	PLAY BUTTON OF TAPE TIMER
Indicators, LED lamps	READY INDICATOR
Modes	PLAY or PLAY MODE

Button Symbol	Name
	PLAY
	RECORD
	STOP
	FAST FORWARD (F.FWD)
	REWIND
	CUE

The six major transport control buttons are not labeled on the machine, but are labeled on the button caps with graphic symbols. This manual uses the name of the button rather than the graphic symbol whenever the buttons are referred.

1.3 Specifications

1.3.1 Transport

Track Configuration	1/4" (6.3 mm), 2 track		
Heads	Erase x 1 Record x 1 Reproduce x 1		
Motors	Capstan x 1 Quartz PLL Servo Controlled Direct Drive Brushless DC Motor Reel x 2 AC Induction Motor		
Reel Size	Max. 11.2" (DIN)		
Tape Speeds	High speed version	15 and 7.5 ips (38.1 and 19.05 cm/s)	
	Low speed version*	7.5 and 3.75 ips (19.05 and 9.5 cm/s) *manufactured to order	
Tape Speed Accuracy	Max. $\pm 0.2\%$		
Tape Speed Deviation	Max. 0.2%		
Vari Speed	$\pm 8\%$		
VEM Tape Speed	+100% with optional VEM accessory, at 7.5 ips and 3.75 ips only.		
Wow and Flutter (Peak Weighted DIN 45507)	15 ips	Max. $\pm 0.06\%$	
	7.5 ips	Max. $\pm 0.08\%$	
	3.75 ips	Max. $\pm 0.12\%$	
Start Time*	15 ips	Max. 0.4 s	*Time required to accelerate to double the specified Wow and Flutter value
	7.5 ips	Max. 0.3 s	
	3.75 ips	Max. 0.25 s	
Stop Time	15 ips	Max. 0.5 s	
	7.5 ips	Max. 0.4 s	
	3.75 ips	Max. 0.4 s	
Fast Wind Time	60 Hz	100 s for 2,500 ft	
	50 Hz	120 s for 2,500 ft	

1.3.2 Electronics

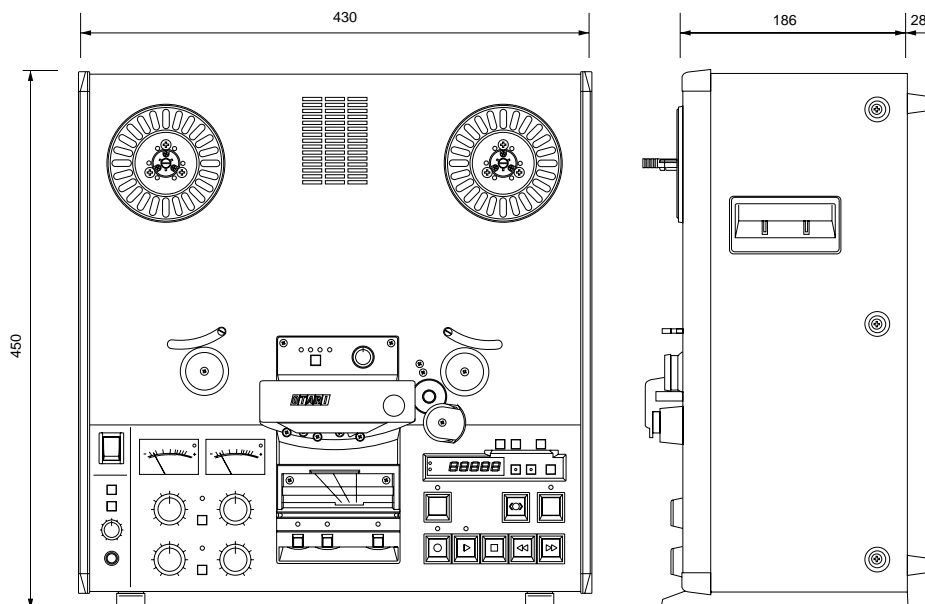
NOTE: All specifications are measured with AMPEX #456.

Line Input	Mode	Transformerless Active Balanced
	Input Impedance	10 k Ω
	Nominal Level	+4 dBu (MX-50II-N) +6 dBu (MX-50II-D)
	Max. Level	+30 dBu
	Connector	XL type
	Line Output	Mode
	Output Impedance	Min. 5 Ω
	Nominal Level	+4 dBu (MX-50II-N) +6 dBu (MX-50II-D)
	Max. Level	+22 dBu
	Connector	XL type (Male)
Phone Output	Load Impedance	Min. 8 Ω
	Connector	1/4" (6 mm) Stereo Phone Jack

Equalization	NAB/IEC switchable			
Reference Fluxivity	250 nWb/m (185 – 510 nWb/m adjustable)			
Frequency Response (Overall)	15 ips	30 Hz – 20 kHz ± 2 dB (SRL)	[MX-50II-D SRL -20 dB]	
MX-50II-N: SRL = 250 nWb/m	7.5 ips	30 Hz – 18 kHz ± 2 dB (SRL -10 dB)	[MX-50II-D SRL -20 dB]	
MX-50II-D: SRL = 510 nWb/m	3.75 ips	20 Hz – 10 kHz ± 2 dB (SRL -20 dB)	[MX-50II-D SRL -20 dB]	
Signal to Noise Ratio	Unweighted with audio filter (30 Hz – 18 kHz)			
		NAB	IEC	Recording Level
MX-50II-N	15 ips	Min. 69 dB	Min. 70 dB	1040 nWb/m
	7.5 ips	Min. 71 dB	Min. 67 dB	1040 nWb/m
	3.75 ips	Min. 64 dB	Min. 67 dB	740 nWb/m
MX-50II-D	15 ips	Min. 69 dB	Min. 70 dB	1040 nWb/m
	7.5 ips	Min. 66 dB	Min. 67 dB	1040 nWb/m
	3.75 ips	Min. 62 dB	Min. 63 dB	740 nWb/m
Distortion (THD)	Max. 0.3% (MX-50II-N: 1 kHz, 250 nWb/m, 15 ips, Rec/Rep) Max. 0.7% (MX-50II-D: 1 kHz, 510 nWb/m, 15 ips, Rec/Rep)			
Crosstalk	Min. 55 dB (MX-50II-N: 1 kHz) Min. 50 dB (MX-50II-D: 1 kHz)			
Depth of Erasure	Min. 75 dB (MX-50II-N: 1 kHz, 1040 nWb/m, 15 ips) Min. 70 dB (MX-50II-D: 1 kHz, 1040 nWb/m, 15 ips)			
Bias and Erase Frequency	150 kHz ±10 kHz			

1.3.3 Physical

Power Requirements	100/117/220/240 Volts ±10% single phase AC, 50 or 60 Hz
Power Consumption	100 VA
Operating Environment	5°–40°C, 20–80% RH
Storage Environment	-20°–45°C, 10–80% RH
Weight	25 kg (55 lbs)
Dimensions (W x D x H)	430 x 455 x 250mm (16.9" x 7.3" x 17.1")



1.3.4 Accessories

Standard Accessory	NAB Hub Reel Hold Down Knob	2 pcs	
	Power Cable	1 pc	
	Fuse 2A	1 pc	
	Fuse 3A	1 pc	
	Fuse 4A	1 pc	
	Fuse 5A	1 pc	
	Time Lag Fuse	2 pcs	1 pc for MX-50II-N
	Lubrication Oil	1 pc	PZ9E003
	Operation Manual	1 pc	OS3-322
Optional Accessory	Transport Remote Control Unit	CB-127-S	CB-127
	Mono Head Kit	KH-43X-S	
	Scissors	SB-12X	for MX-50II-D
	Scissors (Reverse cut angle)	SB-13D-S	for MX-50II-D
	10.5" NAB Reel	ZA-51A	
	11.2" DIN Reel	ZA-5EG	
	Rack Mount 19" Rack Adapter	ZA-5EK	
	VEM Unit	ZA-5EL	
	Pedestal (Stand)	ZA-5ET	
	Input Transformer	ZA-5EY	
	Output Transformer	ZA-5EZ	
Proximity Sensor	SR-21F-S		

Otari reserves the right to change specifications without notice or obligation.

Section 2 Installation

This section contains the necessary information for unpacking, inspecting, and installing the MX-50II, and includes procedures for customizing the MX-50II.

<i>2.1 Unpacking and Inspection</i>	2-2
<i>2.2 Connecting the MX-50II</i>	2-3

2.1 Unpacking and Inspection

◆ **Uncrating the Machine:** We recommend that you open the carton carefully and retain the packing materials at least until proper operation of the machine has been established.

When sending the machine back to Otari or to your Otari dealer, follow the packing instructions printed on the carton.

CAUTION: The MX-50II weighs approximately 25 kg (55 lb.). Although uncrating and installation can be done by one person, it is recommended that you do these procedures with another person.

The carton contains the following standard accessories:

Table 2-1
Standard Accessories

Item	Part No.	Q'ty	Notes
Reel Clamper	KWOHV	1 set	
Power Cord	PZ9D003	1	for MX-50II-N
Power Cord	PZ9D229	1	for MX-50II-D
Time Lag Fuse	FH9-018	1	
Time Lag Fuse 3.15A	FH9-020	1	for MX-50II-D
Fuse 2A	FH7F020	1	5 x 20 mm
Fuse 3A	FH7F030	1	5 x 20 mm
Fuse 4A	FH7F040	1	5 x 20 mm
Fuse 5A	FH7F050	1	5 x 20 mm
Lubrication Oil	PZ9E003	1	for capstan motor bearing
Operation Manual	OS3-322	1	
M4 x 6 Screw	————	4	for re-attaching bottom cover after removing bottom feet

◆ **Inspection:** Before making any electrical connections, inspect the machine visually. If there is any evidence of damage due to rough handling during transportation, a claim should be filed with the transportation company. Do not connect or operate the MX-50II until the inspection has been completed, and any damage identified and corrected if necessary.

◆ **Customizing your MX-50II:** Some of the operating methods can be changed according to your preferences.

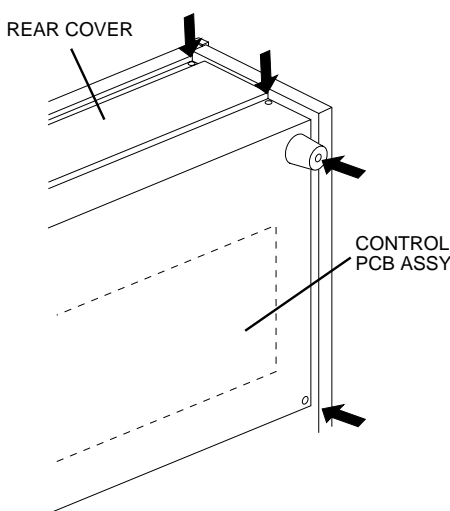


Figure 2-1
Opening the Transport Rear Cover

1. Remove the rear cover by removing the four screws on the top of the machine, the upper rear feet, and the two screws above the slanted portion of the rear cover. Refer to **Figure 2-1**.
2. Loosen the two screws at the top of CONTROL PCB ASSEMBLY and hinge it down to horizontal.
3. Change the settings of the DIP switch on CONTROL PCB ASSEMBLY if necessary. Refer to **Table 2-2**.

Table 2-2
DIP Switch Functions

Switch	Function	Factory Setting
SW1-1	Punch In (How to enter RECORD mode)	off
	ON Press RECORD when in PLAY MODE. off While Holding RECORD down, press PLAY.	
SW1-2	Punch Out (How to leave RECORD without stopping the transport)	off
	ON Press PLAY. off While holding RECORD down, press STOP.	
SW1-3	Speed Pair Selection	off
	ON Low Speed Pair = 7.5 and 3.75 ips. off High Speed Pair = 15 and 7.5 ips.	
SW1-4	Vari Speed During Record mode.	ON
	ON EXT and VARI SPEED MODES cannot be entered during RECORD MODE. off EXT and VARI SPEED MODES can be entered while in RECORD MODE.	
SW2	Fader Control Logic Level Selection (MX-50II-D Only)	M
	M Make (Normally open) contact closure, or logic level active low. B Brake (Normally closed) contact closure, or logic level active high.	

NOTE: Turn off the power to the MX-50II whenever changing the setting of SW1 or SW2. The change of setting does not take effect until the power is turned back on.

Please refer to **Appendix** for more information about operating the MX-50II at 3.75 ips.

2.2 Connecting the MX-50II

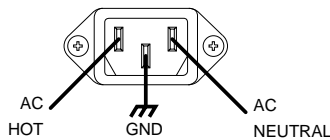


Figure 2-2
Power Connector Pin Assignment

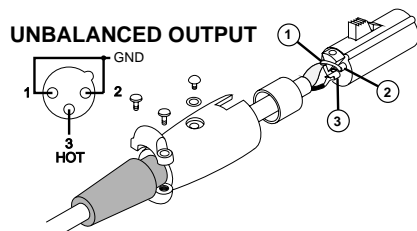
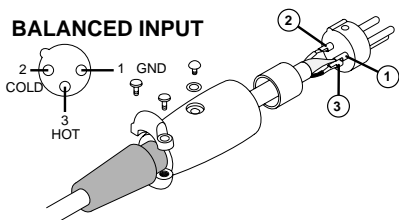


Figure 2-3
Audio Connector Wiring (MX-50II-N)

◆ **Power Connection:** Insure that the voltage and frequency supplied to the machine agree with the machine's power requirement printed on the label on the connector panel or on the carton. Make sure that the MX-50II POWER switch is turned off then connect the supplied power cord from the AC mains to the machine.

◆ **Connecting the Audio Signal:** The audio inputs to the MX-50II are balanced. The outputs are unbalanced.

INPUT CONNECTORS of the MX-50II-N are wired as follows:

Pin 1 = Shield (GND), Pin 2 = Cold, Pin 3 = Hot.

OUTPUT CONNECTORS of the MX-50II-N are wired as follows:

Pin 1 = GND, Pin 2 = GND, Pin 3 = Hot.

INPUT CONNECTORS of the MX-50II-D are wired as follows:

Pin 1 = Shield (GND), Pin 2 = Hot, Pin 3 = Cold.

OUTPUT CONNECTORS of the MX-50II-D are wired as follows:

Pin 1 = GND, Pin 2 = Hot, Pin 3 = GND.

◆ Connector Pin Assignments

Table 2-3
REMOTE Connector Pin Assignment

No.	Description	Level	I/O	No.	Description	Level	I/O
1.	RECORD Switch	Low	In	20.	Capstan Spd Control Clock (*2)	—	In
2.	PLAY Switch	Low	In	21.	Tape Speed A (*3)	H/L	Out
3.	STOP Switch	Low	In	22.	Tape Speed B (*3)	H/L	Out
4.	F.FWD Switch	Low	In	23.	External Pitch Control Enable	Low	In
5.	REWIND Switch	Low	In	24.	NC	—	—
6.	Lifter Switch	Low	In	25.	NC	—	—
7.	NC	—	—	26.	NC	—	—
8.	NC	—	—	27.	NC	—	—
9.	Safety Switch Shut off	Low	Out	28.	NC	—	—
10.	Record Mode Tally	Low	Out	29.	NC	—	—
11.	Play Mode Tally	Low	Out	30.	NC	—	—
12.	Stop Mode Tally	Low	Out	31.	NC	—	—
13.	F.FWD Mode Tally	Low	Out	32.	NC	—	—
14.	REWIND Tally	Low	Out	33.	+5V ±10% Reg. Power Supply (max 150 mA)		
15.	NC	—	—	34.	24–40V Unreg. Power Supply (max 500 mA)		
16.	Signal Ground			35.	24–40V Unreg. Power Supply (max 500 mA)		
17.	Tach. Pulse (*1, 9)		Out	36.	Power Ground		
18.	Tape Direction (Fwd=Low)	H/L	Out	37.	Power Ground		
19.	NC	—	—				

- NOTES:
- 1 Tach Pulse Rate (pulse/s) 3.75 ips = 30, 7.5 ips = 60, 15 ips = 120
 - 2 Capstan Control Freq. 9.6 kHz = nominal tape speed.
Acceptable external frequency range = 4.8–19.2 kHz
 - 3 Tape Speed Definition
3.75 ips Speed A = Low, Speed B = Low
7.5 ips Speed A = Low, Speed B = High
15 ips Speed A = High, Speed B = Low
 - 4 Connector Type D-sub 37 pin (female)
 - 5 Output Signals
Output Type = Open Collector
V_{OL} = 0–0.5 V, I_{OL} = 20 mA (max), V_{IL} = TTL Level
Leakage Current = 20 μA
Pull Up = 10 kΩ (terminated to +5 V)
V_{OH} (High Level) = +30 V (max)
 - 6 Input Signals
Fan-in = 1.5
V_{IL} = 0–0.5 V (2.4 mA), V_{IH} = 2.5–5.25 V (60 μA)
 - 7 Cable Length: max 10 m (32 feet)
 - 8 Input Command Pulse: 100 ms (min)
 - 9 Tach Pulse: 50 μs (min)
 - 10 Capstan Clock Duty Cycle: 40–60%

Table 2-4
FADER Connector Pin Assignment (Only MX-50II-D models)

No.	Description	I/O
1.	Fader Play Switch	In
3.	Repro Contact*	Out
6.	Signal Ground	—
8.	Repro Contact*	Out
9.	Frame Ground	—

NOTE: To enter PLAY, connect pin 1 to pin 6. Pins 3 and 8 are closed when in REPRO MODE.

Section 3 Controls and Indicators

This section describes the controls, indicators, and connectors on the MX-50II tape recorders.

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<i>3.2 Connector Panel</i>	3-8

3.1 Transport Control Panel

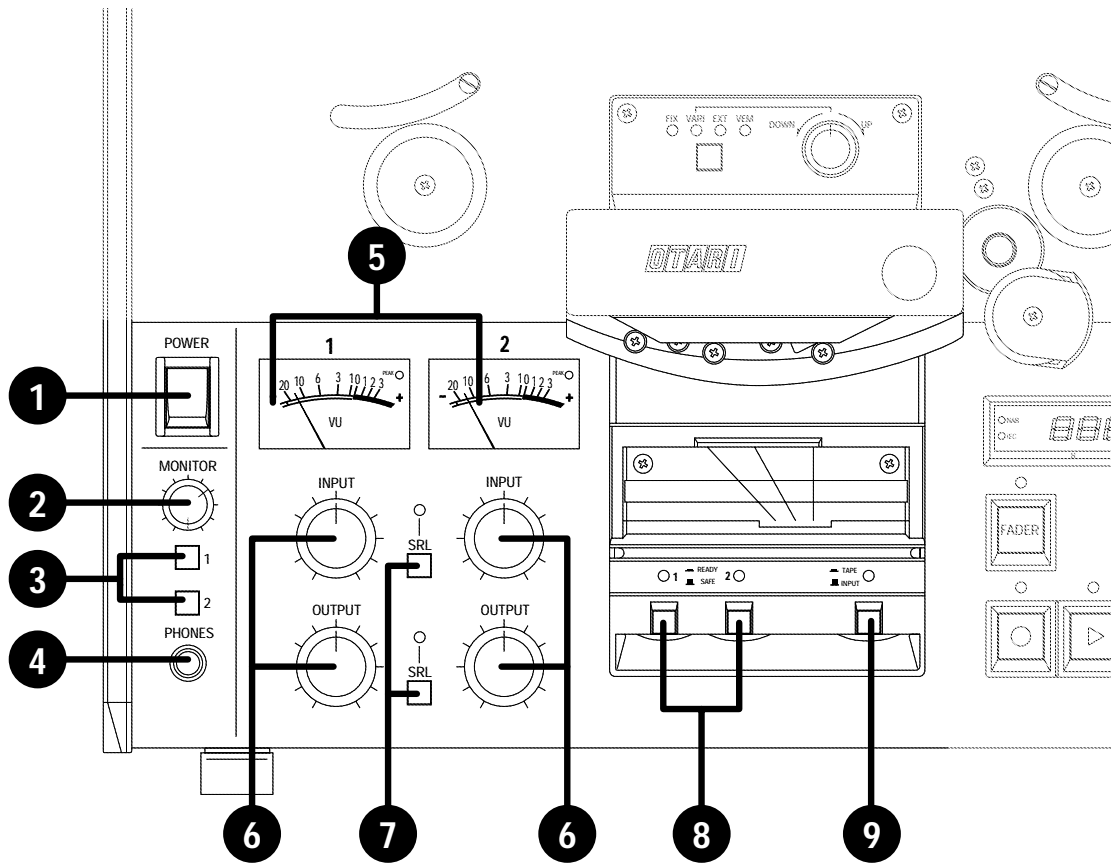


Figure 3-1
Transport Control Panel — 1

[1] POWER SWITCH Pressing the upper portion of this switch causes power to be applied to the machine.

[2] MONITOR LEVEL KNOB This control adjusts the level of the signal at PHONES CONNECTOR [4] or built-in MONITOR SPEAKER [32].

[3] MONITOR CHANNEL SELECT BUTTONS These buttons select the channel or channels to be sent to PHONES CONNECTOR [4] or built-in MONITOR SPEAKER [32]. Pressing CHANNEL 1 BUTTON selects channel 1 for monitoring, pressing CHANNEL 2 BUTTON selects channel 2. One or both buttons may be pressed at any time.

[4] PHONES CONNECTOR This 1/4" tip-ring-sleeve phone jack provides signal output for headphones having input impedance of 8 Ω or greater. Connecting the headphone to this connector cuts off the signal to MONITOR SPEAKER [32].

- [5] VU METERS** Each VU METER incorporates a PEAK INDICATOR which illuminates when the signal reaches a level equivalent to 1040 nWb/m.
- [6] INPUT AND OUTPUT LEVEL CONTROLS** These controls adjust the line input and output levels. When SRL SWITCH [7] associated with INPUT or OUTPUT LEVEL CONTROLS is pressed, and its indicator illuminated, the corresponding level controls have no effect.
- [7] SRL SWITCHES AND INDICATORS** When one of these switches is pressed, the "0 VU" indication on VU METER [5] corresponds to the reference flux level (SRL: Standard Reference Level).
- [8] READY/SAFE SWITCHES AND READY INDICATORS** Setting one or both of these switches to "READY" places the corresponding channel(s) into RECORD READY MODE, in which the input(s) to the channel(s) will be recorded on the tape when the transport is placed into RECORD MODE. Setting this switch to "READY" while the MX-50II is in PLAY MODE places the channel in RECORD MODE immediately. Setting one or both of switches to "SAFE" places the corresponding channel(s) into SAFE MODE, in which recording cannot take place. Setting either READY/SAFE SWITCH to "SAFE" while the MX-50II is in RECORD MODE causes that channel to leave RECORD MODE immediately.
- READY INDICATOR flashes when the channel is in RECORD READY MODE, and becomes steadily illuminated when the channel is in RECORD MODE.
- [9] INPUT/TAPE SWITCH AND TAPE INDICATOR** This switch selects the machine output and monitor signals. When the switch is set to "INPUT", the signal at that channel's OUTPUT CONNECTOR is the signal present at that channel's INPUT CONNECTOR. When the switch is set to "TAPE", the signal at that channel's OUTPUT CONNECTOR is the signal present on tape reproduced by that channel's reproduce head. TAPE INDICATOR will be illuminated.

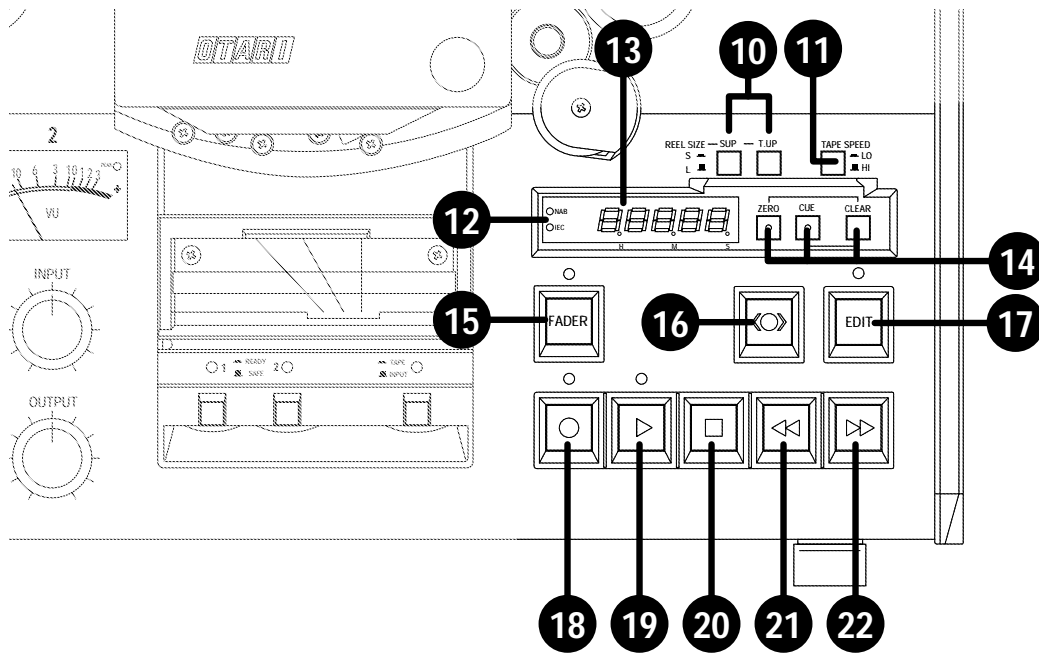


Figure 3-2
Transport Control Panel — 2

[10] REEL SIZE S/L KEY

Selects the tape tension to match the reel size being used.

[11] TAPE SPEED LO/HI KEY

Pressing this key causes the tape speed to change.

[12] NAB AND IEC INDICATORS

Indicates the current position of EQUALIZATION IEC/NAB SWITCH [38] on the connector panel.

[13] TAPE TIMER

Displays the current tape location as Hours, Minutes, and Seconds.

[14] SEARCH ZERO, CUE AND CLEAR KEYS

Pressing SEARCH ZERO key places the transport into SEARCH ZERO MODE.

SEARCH CUE key is used to store and/or initiate a search to a stored tape location.

Pressing CLEAR key together with another key clears TAPE TIMER [13] or the memory associated with that key.

CLEAR + SEARCH ZERO resets TAPE TIMER to 0.00.00.
 CLEAR + SEARCH CUE clears stored cue point memory.

- [15] **FADER BUTTON AND INDICATOR*** Pressing this button enables the fader start line on FADER CONNECTOR [35] on the connector panel. When the fader start function is enabled, PLAY and STOP BUTTONS on the transport are disabled. *(MX-50D Only)
- [16] **CUE BUTTON AND INDICATOR** Pressing this button during FAST WIND MODES initiates CUE MODE, in which the tape lifters retract allowing the tape to be in contact with the reproduce head for audio monitoring at wind speed.
- Holding CUE BUTTON pressed causes the tape lifters to remain retracted as long as the button is held pressed. Tapping CUE BUTTON quickly causes the lifters to remain retracted until the next time CUE BUTTON is pressed.
- [17] **EDIT BUTTON AND INDICATOR** Pressing this button while in STOP MODE causes the MX-50II to enter EDIT READY MODE, in which the take-up motor is turned off, the safety switch for the supply swing arm is deactivated, and EDIT INDICATOR flashes. Pressing PLAY BUTTON while in EDIT READY MODE, or pressing EDIT BUTTON while in PLAY MODE, causes the MX-50II to enter DUMP EDIT MODE, in which the take-up reel does not rotate allowing tape to be "dumped" from the transport.
- NOTE:** If there is slack in the tape path and the safety switch for the supply swing arm is deactivated, EDIT READY MODE will be activated when EDIT BUTTON is pressed, and DUMP EDIT MODE will start when PLAY BUTTON is pressed.
- [18] **RECORD BUTTON AND INDICATOR** Places the transport into RECORD MODE.
- [19] **PLAY BUTTON AND INDICATOR** Places the transport into PLAY MODE. Pressing this button when there is slack in the tape path causes the take-up reel to rotate very slowly until the slack is removed, then the transport enters PLAY MODE.
- [20] **STOP BUTTON** Pressing this button when the transport is in RECORD, PLAY, DUMP EDIT, FAST FORWARD, or REWIND MODE causes the tape motion to stop.
- [21] **REWIND BUTTON** Places the transport into REWIND MODE, in which the tape moves from the take-up reel to the supply reel at fast wind speed.
- [22] **F.FWD BUTTON** Places the transport into FAST FORWARD MODE, in which the tape moves from the supply reel to the take-up reel at fast wind speed.

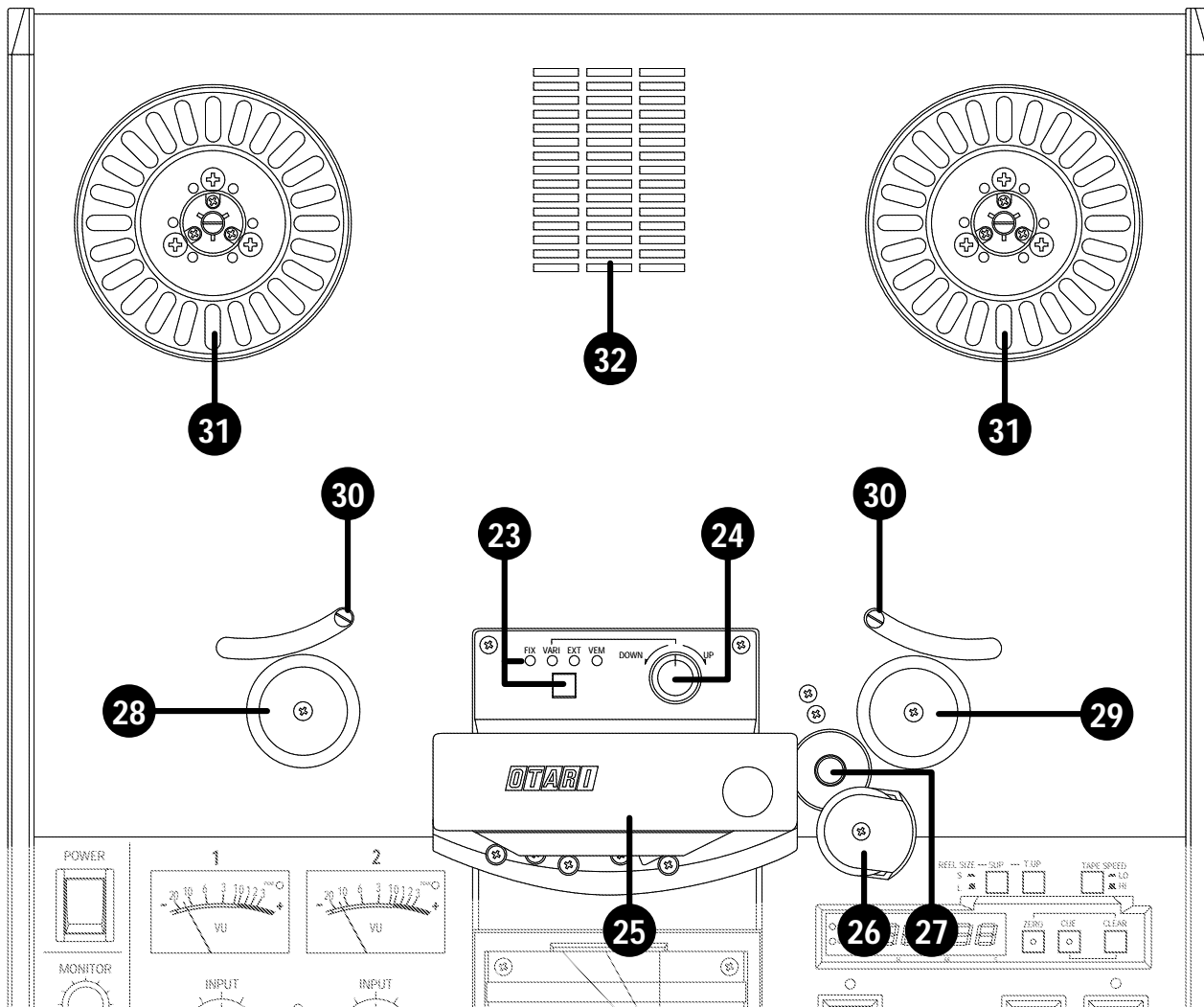


Figure 3-3
Transport Control Panel — 3

[23] SPEED MODE BUTTON AND INDICATORS

Repeatedly pressing this button causes the speed mode of the MX-50II to step through the four speed modes (FIX, VARI, EXT, VEM) in the sequence (if the optional VEM PCB ASSEMBLY is not installed, VOICE EDIT MODE cannot be selected).

- ❑ In FIX SPEED MODE, the capstan motor speed is controlled by the internal crystal oscillator.
- ❑ In VARI SPEED MODE, the tape speed is controlled by PITCH CONTROL KNOB [24].
- ❑ In EXT SPEED MODE, the tape speed is controlled by the external speed reference signal connected to REMOTE CONNECTOR [34] on the rear panel. If the speed mode is set to EXT, and the PITCH ENABLE line (Pin 23 on REMOTE CONNECTOR) is not activated, FIX INDICATOR will remain illuminated, and EXT INDICATOR will flash. Set the speed mode to EXT when using a synchronizer or resolver to control the MX-50II. Refer to §2.2 for additional information about controlling the tape speed using an external controller.
- ❑ In VOICE EDIT MODE (VEM), the tape is reproduced at two times the currently selected speed, but the pitch of the signal remains constant.
- ☞ If SW1-4 on CONTROL PCB ASSEMBLY is "ON", the MX-50II cannot enter VARI or EXT SPEED MODES when in RECORD MODE.

-
- [24] PITCH CONTROL KNOB** When the speed mode is set to VARI, the Pitch Control changes the tape speed in RECORD and PLAY MODES.
- [25] HEAD ASSEMBLY** The erase, record, and reproduce heads are mounted on the head assembly. Azimuth, height, zenith and wrap are individually adjustable on the reproduce and record heads.
- [26] PINCH ROLLER** The tape is driven by the rotation of the capstan shaft against this roller.
- [27] CAPSTAN SHAFT** The Capstan Shaft is directly driven by a Quartz crystal Phase Locked Loop controlled brushless DC servo capstan motor.
- [28] GUIDE ROLLER** This roller provides tape guidance and helps isolate the heads from variations in tape motion caused by irregularities in tape supply.
- [29] TACHOMETER ROLLER** The tape motion causes this roller to rotate, which generates tach pulses which are used to calculate tape time and tape direction.
- [30] SUPPLY AND TAKE-UP SWING ARMS** These arms help correct tape tension fluctuations due to changes in tape pack diameter or irregularities in tape pack.
- The take-up swing arm is provided with a safety switch which stops the transport when the tape becomes unthreaded from the reel or when too much slack develops in the tape path.
- [31] SUPPLY AND TAKE-UP REEL TABLES** Reel tables with reel clamps for 5–7" reels. When using a 10.5" NAB reel, use the supplied reel clasper. Select the appropriate tape tension for the reel size being used by pressing REEL SIZE S/L KEYS [10]. Different reel sizes can be accommodated on each reel table by selecting the appropriate switch setting.
- [32] MONITOR SPEAKER** The monitor speaker is used to monitor the signal recorded on the tape. The monitor speaker can output the signal from channel 1, channel 2, or both channel 1 and 2 (selected with the MONITOR CHANNEL SELECT BUTTON [3]).

3.2 Connector Panel

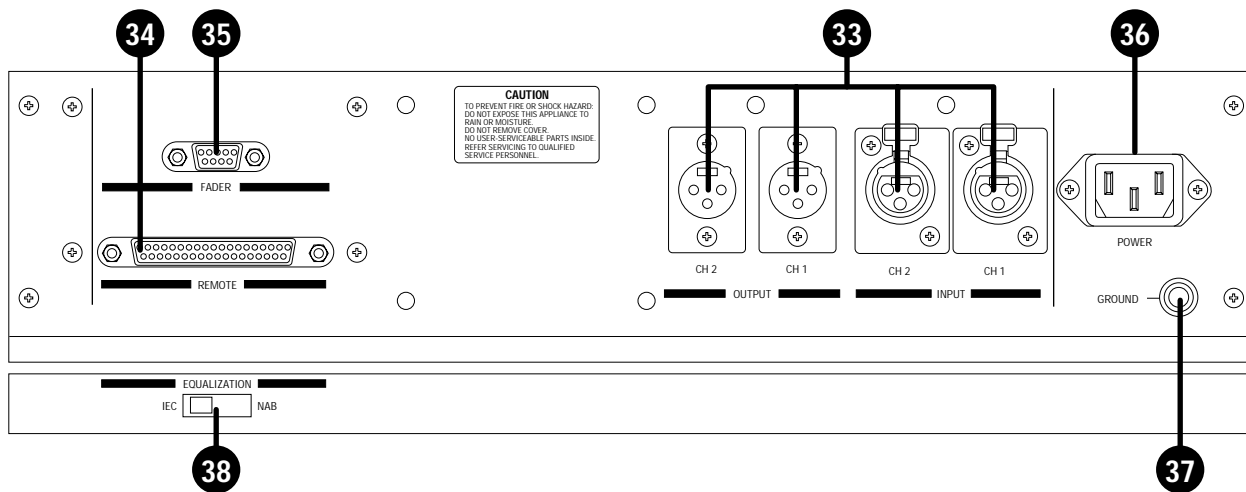


Figure 3-4
Connector Panel

[33] INPUT AND OUTPUT CONNECTORS

These XL type connectors are for audio input and output. Refer to §2.2 for more information about connector wiring.

[34] REMOTE CONNECTOR

This 37 conductor D-type connector contains transport control command lines, status tally signals, and external speed control signals. The optional Remote Control Unit plugs into this connector. Refer to §2.2 for more information about connecting a synchronizer, resolver, or other controller to this connector.

[35] FADER CONNECTOR*

This 9 conductor D-type connector contains transport playback command lines and tally contact closure for interface to a broadcasting console. Refer to §2.2 for more information about interface to this connector. *(MX-50D Only)

[36] POWER INPUT CONNECTOR

Connect the supplied AC power cord to this connector.

[37] GROUND TERMINAL

This connector provides a location for connecting an external chassis ground to the MX-50II.

[38] EQUALIZATION IEC/NAB SWITCH

This switch selects the equalization for recording and playback. This switch should be set to "NAB" when using NAB standard equalization for recording and playback. This switch should be set to "IEC" when using IEC standard equalization for recording and playback.

Section 4 Operation

This section contains, first, a list and accompanying brief explanation of each of the operating conditions (or modes) of the MX-50II, and second, a detailed explanation of each operation or activity associated with the operation of the MX-50II Tape Recorder. Please read both parts of this section when first becoming familiar with the machine, and then refer to them whenever more information about the operation of the machine is required.

Information regarding installation of the machine is provided in Section 2 of this manual. If you are uncrating and hooking up the machine for the first time, please refer to Section 2 before continuing with this section.

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4.1 Modes of Operation

Table 4-1
Transport Modes

MODE	CONTROL	EXPLANATION
STOP	STOP	Tape motion stops.
PLAY	PLAY	Tape moves from supply to take-up at the currently selected speed.
FAST FORWARD	F.FWD	Tape moves from supply to take-up at fast wind speed.
REWIND	REWIND	Tape moves from take-up to supply at fast wind speed.
RECORD	RECORD (or +PLAY)*	Any channel in RECORD READY begins to RECORD.
EDIT READY	STOP + EDIT	Transport is ready for EDIT or DUMP EDIT MODE.
DUMP EDIT	PLAY in EDIT READY	Tape moves towards take-up reel but take-up reel does not turn.
CUE	CUE in REWIND or F.Fwd	Lifters will be retracted to allow audio to be monitored.

* Selected with SW1-1 on CONTROL PCB assembly.

Table 4-2
Audio Channel Modes

MODE	CONTROL	EXPLANATION
READY	READY/SAFE switch to Ready	The selected channel will enter RECORD when RECORD and PLAY are pressed.
SAFE	READY/SAFE switch to Safe	The selected channel will not enter RECORD.
Input Monitor	INPUT/TAPE switch to Input	The signal at the OUTPUT connector for that channel is the signal present at the INPUT connector.
Repro Monitor	INPUT/TAPE switch to Tape	The signal at the OUTPUT connector is the signal on tape reproduced by the Reproduce Head.

Table 4-3
Locator Modes

MODE	CONTROL	EXPLANATION
SEARCH CUE	SEARCH CUE with stored location	Tape is moved to the Cue Point at Fast Wind speed and Stops.
Search Zero	SEARCH ZERO	Tape is moved to 0:00:00 at Fast Wind speed and Stops.

4.2 Mounting the Reels and Threading the MX-50II

4.2.1 Placing the Reels on the Machine

◆ For 5–7" EIA Reels

1. Turn the reel clamp portion of the reel spindle until it lines up with the three reel drive blades on the reel table.
2. Place the reel on the reel table, so that the reel drive blades are inserted into the slots in the reel.
3. Lift and turn the reel clamp portion of the reel spindle 60 degrees (until it clamps the reel in place).

◆ For 10.5" NAB Hub Reels

1. Turn the reel clamp portion of the reel spindle until it lines up with the three reel drive blades on the reel table.
2. Place the reel adapter on the reel table and lift and turn the reel clamp portion of the reel spindle 60 degrees (until it clamps the adapter in place).
3. Place the reel on the reel adapter and lift and turn the upper portion of the adapter until it locks the reel in place.

◆ For AEG (or DIN) Hubs (Optional)

1. Turn the reel clamp portion of the reel spindle until it lines up with the three reel drive blades on the reel table.
2. Place the reel adapter on the reel table and lift and turn the reel clamp portion of the reel spindle 60 degrees (until it clamps the adapter in place).
3. Place the hub of tape on the adapter and rotate the adapter 90 degrees to lock the hub in place.

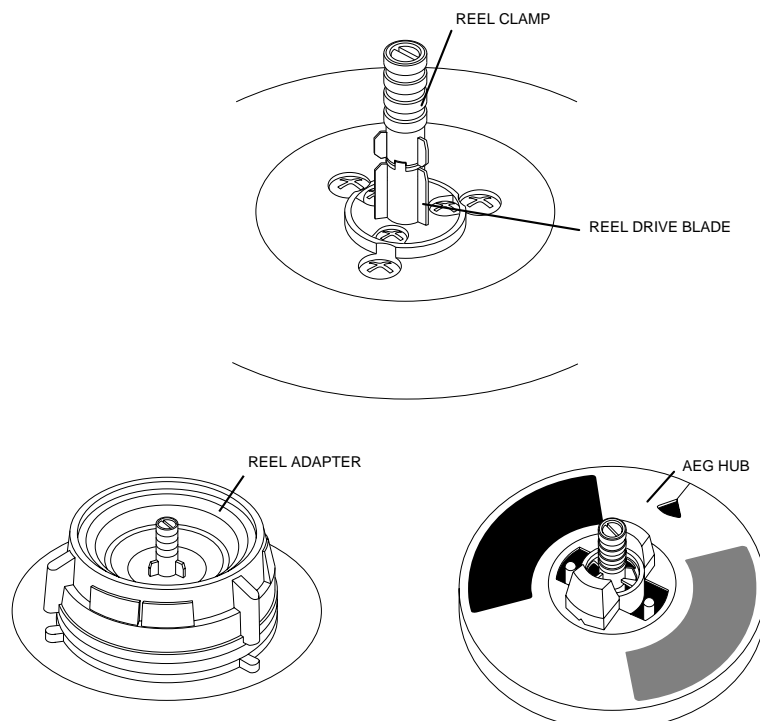


Figure 4-1
Reel Mounting

4.2.2 Threading the Tape

1. Mount an appropriate empty reel on the machine. Place the empty reel on the take-up reel table. Place the reel of tape on the supply reel table.
 2. Press REEL SIZE SUP and REEL SIZE T.UP keys to set the reel tension to correspond with the size of the reels being used on each reel table. Set REEL SIZE KEY to "L" when using 10.5" NAB reels or 11.2" AEG hubs on the corresponding reel table. Set REEL SIZE KEY to "S" when using any other reel size (5" or 7") on the corresponding reel table.
 3. Thread the tape from the supply reel to the take-up reel as shown in **Figure 4-2** and turn the take-up reel counterclockwise to remove the slack from the tape path.
 4. Press SPEED LO/HI key to change tape speed if desired.
- ☞ For information regarding changing machine speed pairs (15/7.5 or 7.5/3.75) refer to **Appendix**.

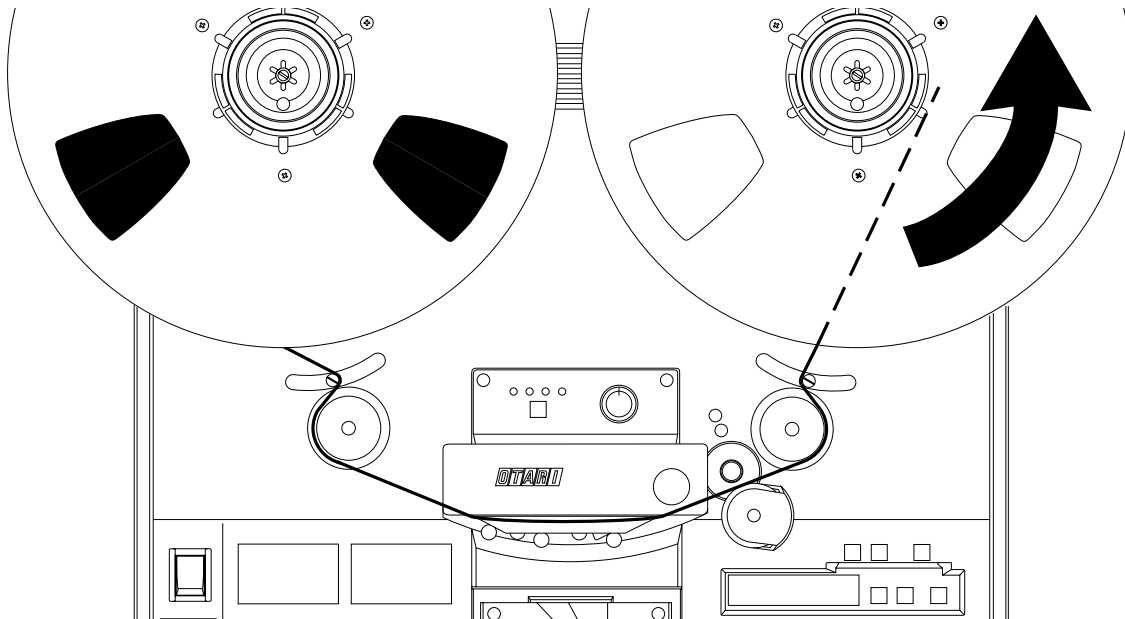


Figure 4-2
Tape Threading

4.3 Transport Modes

◆ **Play mode:** To enter PLAY MODE, press PLAY BUTTON. The tape will move from supply reel to take-up reel at the currently selected tape speed. The indicator above PLAY BUTTON will become illuminated. PLAY MODE can be entered from any other mode except EDIT READY and SEARCH MODES. To exit from PLAY MODE, press STOP, F.FWD, or REWIND BUTTON.

◆ **Fast Forward mode:** To enter FAST FORWARD MODE, press F.FWD BUTTON. The tape will move from the supply reel to the take-up reel at fast wind speed. FAST FORWARD MODE can be entered from STOP, PLAY, REWIND and RECORD MODES. To exit from FAST FORWARD MODE, press STOP, PLAY, or REWIND BUTTON.

◆ **Rewind mode:** To enter REWIND MODE, press REWIND BUTTON. The tape will move from the take-up reel to the supply reel at fast wind speed. REWIND MODE can be entered from STOP, PLAY, FAST FORWARD and RECORD MODES. To exit from REWIND MODE, press STOP, PLAY, or F.FWD BUTTON.

◆ **Record mode:** To enter RECORD MODE, when a channel is in RECORD READY MODE, press PLAY BUTTON while holding RECORD BUTTON down*. The indicator above RECORD BUTTON will become steadily illuminated when the MX-50II is in RECORD MODE. To exit from RECORD MODE without stopping the tape, press STOP BUTTON while holding RECORD BUTTON or press PLAY BUTTON*.

* The method of entering and leaving RECORD MODE is selected by the position of SW1-1 and SW1-2 on CONTROL PCB ASSEMBLY. Refer to §2.1 for further information.

◆ **Edit Ready mode:** To enter EDIT READY MODE, while in STOP MODE, press the EDIT BUTTON. The indicator above EDIT BUTTON will flash when the MX-50II is in EDIT READY MODE. EDIT READY MODE can be entered even if there is slack in the tape path.

◆ **Dump Edit mode:** To enter EDIT PLAY MODE while in EDIT READY MODE, press PLAY BUTTON. The pinch roller will engage the capstan, the take-up reel will not rotate, and the tape will be spilled from the right side of the transport. To enter DUMP EDIT MODE while in PLAY MODE, press EDIT BUTTON. The take-up reel will stop rotating and the tape will be spilled from the right side of the transport. Pressing STOP BUTTON during DUMP EDIT MODE causes tape motion to STOP and EDIT MODE to be canceled.

◆ **Cue mode:** To enter CUE MODE while in FAST FORWARD or REWIND MODE, press CUE BUTTON. The tape lifters will be retracted and the audio attenuated allowing the signals on the tape to be monitored while tape is moving at fast wind speed. Tapping CUE BUTTON quickly causes the tape lifters to remain retracted until the next time CUE BUTTON is pressed. Holding CUE BUTTON pressed causes the lifters to remain retracted only as long as CUE BUTTON is held pressed.

4.4 Audio Channel Modes

◆ **Record Ready mode:** To place any channel into RECORD READY MODE, set RECORD/READY SWITCH for that channel to "READY". READY INDICATOR and the indicator above the RECORD BUTTON will flash. When the RECORD BUTTON, or the RECORD and PLAY BUTTONS (depending on the position of SW1-1 on CONTROL PCB ASSEMBLY), are pressed, any channel which is in RECORD READY will begin to RECORD.

◆ **Record Safe mode:** To place either or both channels in RECORD SAFE MODE, set RECORD/SAFE SWITCH for that channel to "SAFE". Any channel which is in SAFE MODE will not enter RECORD.

◆ **Input Monitor mode:** To place both channels in INPUT MONITOR MODE set INPUT/TAPE SWITCH to "INPUT". The signal at OUTPUT CONNECTORS, VU METERS, MONITOR SPEAKER, and PHONES CONNECTOR will be the signals present at INPUT CONNECTORS. The amber indicator will become illuminated.

◆ **Repro Monitor mode:** To place both channels in REPRO MONITOR MODE set INPUT/TAPE SWITCH to "TAPE". The signal at OUTPUT CONNECTORS, VU METERS, MONITOR SPEAKER, and PHONES CONNECTOR will be the signals on tape reproduced by the reproduce head.

4.5 Locator Modes

The MX-50II series tape recorders feature a built-in locator which has one point memory and a zero location memory.

◆ **Storing a Tape Location:** To store a tape location in the cue point memory, locate the tape at the point to be stored, and press SEARCH CUE KEY if its indicator is not illuminated. If the indicator is illuminated, a tape location is already stored. To store a new location, clear the cue point memory by pressing CLEAR and SEARCH CUE KEYS simultaneously.

◆ **Clearing a Tape Location:** If the indicator in CUE KEY is illuminated, a tape location is already stored. To clear the cue point memory, press CLEAR and SEARCH CUE KEYS simultaneously.

◆ **Search mode:** To enter SEARCH MODE, press SEARCH CUE KEY if its indicator is illuminated, showing that a tape location has been stored as that cue point. The MX-50II will move the tape at fast wind speed to the cue point and stop. During SEARCH MODE, the location being searched to will be shown on the display briefly, and the key indicator will flash.

◆ **Search Zero mode:** To enter SEARCH ZERO MODE, press SEARCH ZERO KEY. The tape will move at fast wind speed to the location corresponding to 0:00:00 on TAPE TIMER, and stop. During the SEARCH the indicator in SEARCH ZERO KEY will flash.

NOTE: Pressing PLAY BUTTON during SEARCH or SEARCH ZERO MODE causes the MX-50II to enter PLAY MODE immediately upon reaching the destination. Pressing any other transport control button (FFWD, REWIND, or STOP) during SEARCH causes the MX-50II to leave SEARCH and enter the selected mode of operation.

NOTE: SEARCH or SEARCH ZERO operation is disabled when the MX-50II is in RECORD MODE.

4.6 *Vari Speed mode*

To enter VARI SPEED MODE, in which the tape speed is controlled by the PITCH CONTROL KNOB, press SPEED MODE BUTTON until VARI INDICATOR becomes illuminated.

NOTE: VARI and EXT speed modes are disabled when the MX-50II is in RECORD if SW1-4 on CONTROL PCB ASSEMBLY is "ON".

4.7 *Voice Edit mode*

(Optional with installation of VEM PCB ASSEMBLY)

To enter VOICE EDIT MODE, in which the tape speed is increased to twice normal play speed but the pitch of the signal remains constant, press SPEED MODE BUTTON until VEM INDICATOR becomes illuminated. (If the optional VEM PCB ASSEMBLY has not been installed, the speed mode cannot be set to "VEM".)

NOTE: VOICE EDIT MODE can not be entered when the tape speed is 15 ips.

Section 5 Maintenance and Adjustment

This section describes the maintenance and adjustment procedures which are necessary to keep the MX-50II in peak operating condition, and when components are replaced for any reason.

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5.1 Routine Maintenance

This section describes the maintenance procedures which should be performed at regular intervals.

5.1.1 Demagnetizing the Heads and Tape Path

Demagnetizing should be performed before every recording session and prior to performing any alignments. Demagnetizing should always be done with extreme caution:

DEMAGNETIZING CAUTION: To avoid damage to the MX-50II, always be sure the POWER is off before proceeding. The magnetic field created by the demagnetizer is extremely powerful and could seriously damage the electronics if the power is on. Remove all recorded tapes, especially alignment tapes from the vicinity. Never turn the power to the demagnetizer on or off unless it is at least 1 meter (3 feet) away from the MX-50II. Turning the power on or off in close proximity can cause an extremely strong moving magnetic field which could possibly place a permanent magnetic charge on parts of the machine. Under normal circumstances the demagnetizer would not be powerful enough to remove these charges, and the parts might have to be removed and discarded. ONLY USE HIGH FLUX DENSITY DEMAGNETIZERS; inexpensive "Hi-Fi" type demagnetizers can leave residual fields that will cause more harm than benefit.

1. Turn off the power to the MX-50II. With the demagnetizer at least 1 meter from the MX-50II, plug the demagnetizer into the AC mains and turn it on.
2. Slowly move the demagnetizer toward the supply swing arm until the tip is approximately 3 mm (1/8") away from the arm. Slowly move the tip of the demagnetizer up and down along the arm so that the entire surface is exposed to the demagnetizing field. DO NOT TOUCH ANY PART OF THE MX-50II WITH THE DEMAGNETIZER. Slowly move the demagnetizer at least 1 meter away from the MX-50II.
3. Working from left to right repeat Step 2 for each of the following parts in the tape path:

A. Supply Swing Arm	E. Supply Tape Lifter	I. Take-up Tape Guide
B. Guide Roller	F. Record Head	J. Capstan Shaft
C. Supply Tape Guide	G. Take-up Tape Lifter	K. Take-up Swing Arm
D. Erase Head	H. Reproduce Head	
4. When all the above parts have been demagnetized, slowly move the demagnetizer at least 1 meter away from the MX-50II and turn it off or unplug it.

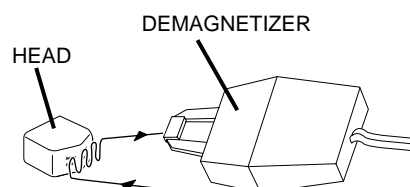


Figure 5-1
Demagnetizing the Head

5.1.2 Cleaning the Heads and Tape Path

It is extremely important to clean the entire tape path regularly. Oxide and dirt will be shed from the tape and accumulate on these parts, causing a build-up that can degrade audio performance, cause slippage, and cause undue wear on the tape.

CAUTION: Never use any metallic item or abrasive to clean the heads or any other tape guidance parts. Never use spirits, lacquer thinner, acetone or other solvents on the tape heads. Rubbing alcohol should be avoided since it contains oil that will leave a residue.

Moisten a cotton swab in pure isopropyl alcohol, and wipe the entire surface of the following parts:

- | | | |
|----------------------|------------------------|-----------------------|
| A. Supply Swing Arm | E. Supply Tape Lifter | I. Take-up Tape Guide |
| B. Guide Roller | F. Record Head | J. Capstan Shaft |
| C. Supply Tape Guide | G. Take-up Tape Lifter | K. Take-up Swing Arm |
| D. Erase Head | H. Reproduce Head | |

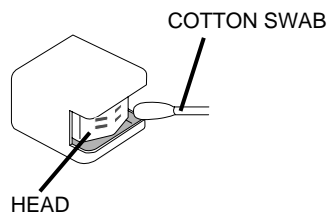


Figure 5-2
Cleaning the Head

5.1.3 Lubrication

The capstan motor bearing requires lubrication. *USE ONLY OTARI OIL P/N PZ9E003.* To lubricate the capstan motor bearing, follow these steps:

1. Lay the machine on its back, with the reel tables uppermost. Remove the head housing cover by pulling it away from the deck plate.
2. Remove the pinch roller by unscrewing its cap and removing the pinch roller and its guard from the shaft. Note the position of the pinch roller guard as it mates with indexed cuts on each side of the pinch roller shaft. The pinch roller guard must be properly aligned before tightening the screw.
3. Remove the head base cover by removing the two screws which attach it to the deck plate. The screws are located above and to the left and right of PITCH CONTROL KNOB. Gently pry the capstan dust cap off using a small screwdriver in the pry hole in the dust cap. The pry hole is located near the exposed shiny deck plate.
4. Remove the felt pad from on top of the bearing, and insert 3 drops of oil in the cavity surrounding the bearing. Apply one drop of oil every 3 to 6 months depending on machine usage. Do not over lubricate, and be careful not to apply oil to the portion of the capstan shaft which contacts the tape.
5. Check the pinch roller bearing. Apply one drop of oil if necessary.
6. Snap the dust cover back in place, and reassemble in reverse order of disassembly.

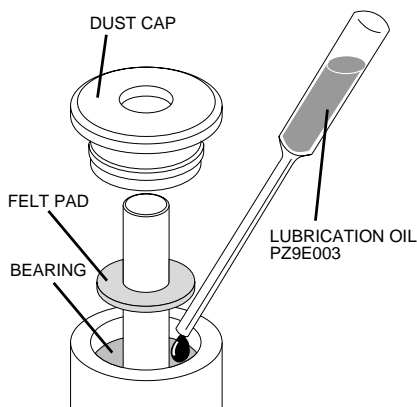


Figure 5-3
Capstan Motor Bearing Lubrication

5.2 Transport Alignment

Although the MX-50II tape transport does not require frequent alignment, re-alignment is required whenever any component is changed. We recommend that you check the performance of the machine at least every six months or every 2000 hours of operation and perform adjustments if necessary.

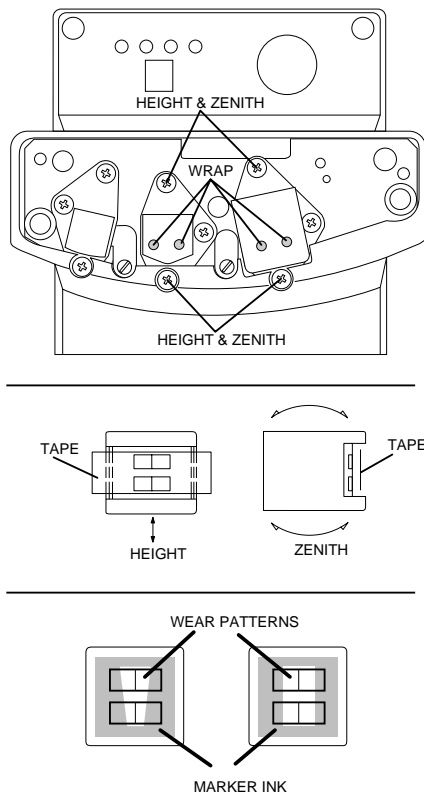
The following tools and equipment are required for transport alignment.

- ❑ 7" plastic reel with large hub
- ❑ Spring scale (0–2000 grams) OTARI P/N YVP2050G
- ❑ Hand tools
- ❑ Reel of the tape type that is normally used for sessions
- ❑ 2 m (6 ft.) long piece of string
- ❑ Dual trace oscilloscope
- ❑ Frequency counter
- ❑ Otari Head Inker or marker pen for white board

5.2.1 Head Position Adjustment

IMPORTANT NOTE: Head azimuth adjustment procedures for the reproduce and record heads are described in §5.3. The height, zenith and wrap of each head has already been adjusted at the factory and DO NOT REQUIRE ADJUSTMENT UNLESS A HEAD IS CHANGED.

1. Thread the machine with tape which can be discarded after this use, and visually adjust the head height and zenith using the screws in front of, and behind each head.
2. After coarse adjustment visually, apply marker pen or head marking ink to the head surface. Place the machine into PLAY MODE for approximately 2 minutes.
3. Carefully unthread the tape, and inspect the face of head where the passage of the tape has worn away the ink.
4. Adjust the head height and zenith and repeat steps 2 and 3 until the head gaps are exactly centered in the height of the wear pattern, and the wear pattern is rectangular rather than trapezoidal. Refer to **Figure 5-4**.
5. If the wrap adjustment is required, remove the head base cover by removing the two screws that attach it to the deck plate. Then remove the head assembly by removing the four screws and lift it away from the deck plate.



NOTE: The head cables will still be attached to the machine. Do not pull on the head cables.

6. Loosen the wrap adjustment screws at the bottom of the head assembly (2 each for record and reproduce heads) slightly so that the head can be moved by hand. Do not loosen the screws too much.
7. Reinstall the head assembly on the machine, ink the head as in Steps 2 and 3, and adjust the wrap until a suitable wear pattern is obtained.
8. When the wear pattern indicates that the wrap adjustment is correct, carefully remove the head assembly and tighten the wrap adjustment screws. Reinstall the head assembly, mounting it with its screws, and clean the heads and tape path.

Figure 5-4
Head Position Adjustment

5.2.2 Reel Table Height Adjustment

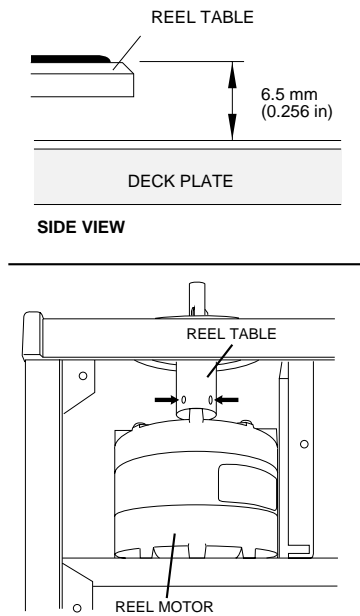


Figure 5-5
Reel Table Height Adjustment

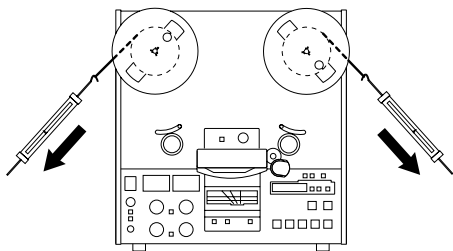
1. Measure the distance from the top surface of the deck plate to the metal surface of the reel table. If the distance is 6.5 mm (0.256 in), then no adjustment is required. Refer to **Figure 5-5**.
2. If adjustment is required, remove the rear cover by removing the eight screws. Loosen the two M4 hex socket cap screws that hold the reel table to the motor shaft using a 3 mm hex wrench and move the reel table in or out as required. Be very careful not to rotate the reel table in relation to the motor shaft. Tighten the screws.

CAUTION: IF YOU HAVE ANY DOUBT WHETHER THE SET-SCREWS ARE STILL ALIGNED WITH THE FLATS ON THE MOTOR SHAFT, DO NOT TIGHTEN THE SCREWS; LIFT THE REEL TABLE COMPLETELY OFF THE SHAFT AND INSPECT THE ALIGNMENT.

3. Test the adjustment by threading the machine with tape on 7" reels and entering FAST FORWARD MODE (if adjusting the take-up reel table) or REWIND (if adjusting the supply reel table). Observe the tape as it is wound onto the reel. If the tape winds onto the center of the reel, then the adjustment is correct.

5.2.3 Reel Brake Adjustment

1. Attach one end of a 2 m (6 ft) piece of string to the hub of a 7" large hub reel. Attach the other end of the string to the spring scale.
2. Turn off the power to the machine.
3. Place the reel on the supply [take-up] reel table so that the reel rotates counterclockwise [clockwise] when the string is pulled. Refer to **Figure 5-6**. Pull on the spring scale to unwind the string while noting the reading on the spring scale. Since the reading is dependent upon the speed with which the string is pulled, you should repeat the measurement two or three times and average the results. If the average reading is 320 ± 20 grams, then no adjustment is necessary.



Perform the following Steps only if adjustment is required.

4. Remove the rear cover by removing the eight screws. Loosen the two screws that hold the top of CONTROL PCB ASSEMBLY, and allow it to fold down.
5. Loosen the screw marked "A" in **Figure 5-6**, and move the spring anchor. Moving the spring anchor toward the brake arm decreases the brake tension.
6. Repeat the measurements in Step 3, and readjust if necessary.

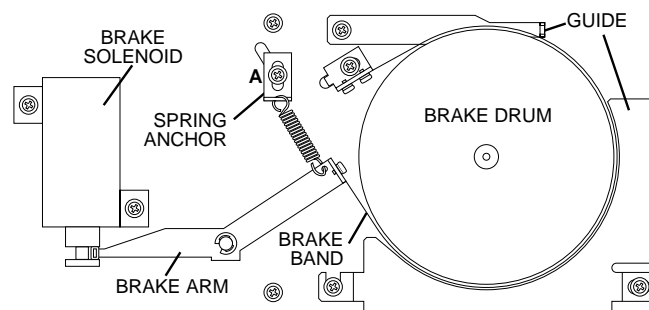
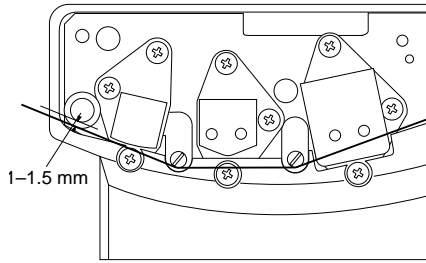


Figure 5-6
Reel Brake Adjustment

5.2.4 Tape Lifter Adjustment



1. Remove the head housing cover.
2. Thread the machine with tape and place the machine in FAST WIND MODE.
3. With the machine in FAST WIND MODE, check the separation between the tape and the surface of the supply side tape guide.

If the separation is 1–1.5mm (0.04–0.06") then adjustment is not necessary. Perform the following Steps only if adjustment is necessary.

4. Remove the rear cover by removing the eight screws.
5. Loosen the two screws that hold the top of CONTROL PCB ASSEMBLY, and allow it to fold down.
6. Loosen the two screws that attach the lifter solenoid bracket to the deck plate and slide the solenoid until the clearance between the tape and the supply side tape guide is correct. Tighten the screws.

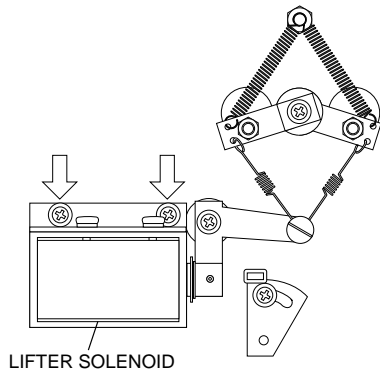


Figure 5-7
Tape Lifter Adjustment

5.2.5 Pinch Roller Adjustment

1. Make a loop of string approximately 30 cm (12") long and place it around the pinch roller shaft.
2. Attach the spring scale to the free end of the loop.
3. Turn on the power to the MX-50II.
4. Press EDIT and PLAY BUTTONS so the pinch roller engages the capstan shaft.
5. Pull on the spring scale until the pinch roller just becomes separated from the capstan shaft. Note the reading on the spring scale at that time.

The spring scale reading should be 2000 ±150 grams. If the reading is correct, then no adjustment is necessary. Perform the following steps only if adjustment is necessary.

6. Remove the rear cover by removing the eight screws and lifting the cover off the machine.
7. Loosen the two screws that hold the top of CONTROL PCB ASSEMBLY, and allow it to fold down.
8. To adjust the pinch roller pressure, loosen the three screws that attach the pinch roller solenoid bracket to the deck plate and move the solenoid. Moving the solenoid toward the center of the machine decreases the pinch roller pressure. Tighten the screws.
9. Repeat the measurement and repeat the adjustment if necessary.

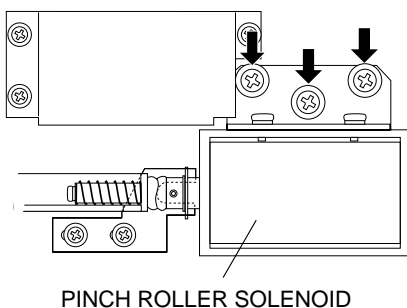


Figure 5-8
Pinch Roller Solenoid Location

5.2.6 Capstan Motor Servo Adjustment

This procedure is not necessary unless the capstan motor is changed.

1. Remove the rear cover by removing the eight screws and lifting the cover off the machine. Loosen the two screws that hold CONTROL PCB ASSEMBLY and allow it to fold down.
2. Thread the machine with tape and apply power.
3. Set the tape speed to 15 ips. Select FIXED SPEED MODE.
4. Connect the oscilloscope to check point CP3 and CP2 (GND) on CONTROL PCB ASSEMBLY. Refer to **Figure 5-9**.
5. Enter the machine into PLAY MODE and adjust the oscilloscope controls so that it shows one complete cycle of the 0–5 V square wave. While playing the tape, adjust VR7 so that the duty cycle of the displayed waveform is approximately 50%.
6. While observing the oscilloscope, apply a load to the capstan motor by briefly pinching the capstan shaft between your thumb and forefinger. Adjust VR4 on CONTROL PCB ASSEMBLY for minimum recovery time.
7. Set the tape speed to 7.5 ips, and repeat Step 5 using VR6, and then repeat Step 6 using VR 3.
8. Set the tape speed to 3.75 ips, and repeat Step 5 using VR5, and then repeat Step 6 using VR2.
9. Connect the frequency counter to CP1 and CP2 (GND).
10. Set PITCH CONTROL KNOB to the center of its range. Make sure the machine is in FIX SPEED MODE.
11. While playing the tape, adjust VR1 until the counter indicates 9600 Hz \pm 10 Hz.
12. Disconnect the frequency counter and close the rear cover of the machine. Clean the capstan shaft and pinch roller.

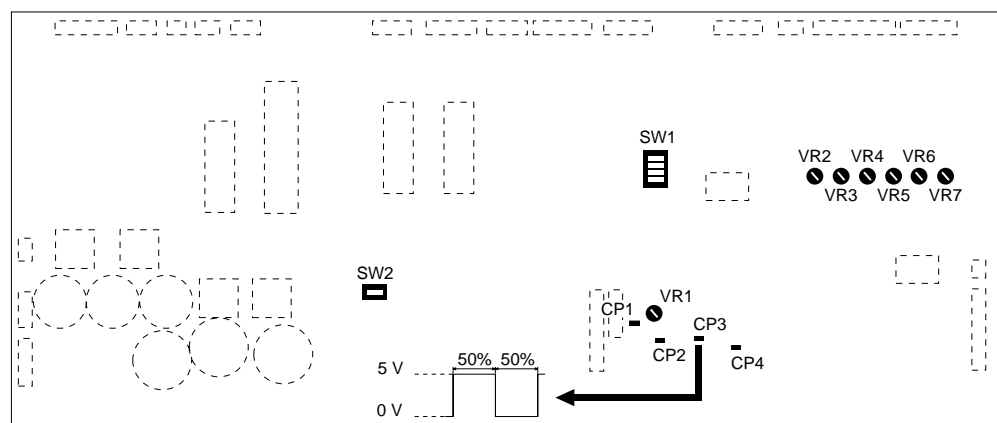


Figure 5-9
Waveform at CP3 and Controls on CONTROL PCB Assembly

VR1	Pitch Control Range.
VR2/VR3/VR4	Capstan Servo Damping (3.75 ips/7.5 ips/15 ips)
VR5/VR6/VR7	Capstan Servo Gain (3.75 ips/7.5 ips/15 ips)

5.3 Audio Channel Alignment

Tools and Equipment required

- Calibration tapes suitable to the tape speed you will use most often. Otari Recommends the following calibration tapes.

For MX-50IIN (NAB Equalization)

Tape Speed	Flux Level	MRL* Catalog No.
15 ips	250 nWb/m	21J205
7.5 ips	250 nWb/m	21T204
3.75 ips	250 nWb/m	21F101-A

* Magnetic Reference Laboratories

For MX-50IID (IEC Equalization)

Tape Speed	Flux Level	EQ	BASF Part No	Notes
38 cm/s	510 nWb/m	35 μ s	09800169XA	Level/Head Height
38 cm/s	320 nWb/m	35 μ s	09795187XB	Calibration
19 cm/s	510 nWb/m	70 μ s	09800169XB	Level/Head Height
19 cm/s	320 nWb/m	70 μ s	09795187XE	Calibration
9.5 cm/s	250 nWb/m	90+3180 μ s	09795187XG	Calibration

- An AC voltmeter calibrated in millivolts and decibels, having a high input impedance so as not to disturb the circuit under test.
- A general purpose dual-trace oscilloscope such as those made by Tektronics, Leader, Hitachi, Hewlett-Packard, etc.
- A sweepable test oscillator capable of generating sine waves at frequencies from 20 Hz to 20 kHz, at +4 dBu (or whatever standard operating level your studio uses (such as -10 dBu, or +6 dBu, etc.)).
- A reel of tape of the type normally used for sessions.
- Hand Tools.
- A non-magnetic alignment screwdriver with a blade small enough to fit the trimmers on the PCBs.
- A tape head demagnetizer (degausser).
- Pure (90%) isopropyl alcohol, cotton swabs, and lint-free cloth for cleaning the tape path.

CAUTION: DO NOT USE RUBBING ALCOHOL, as this can leave water and oil residues, and DO NOT USE ANY OTHER SOLVENT, as it may delaminate the heads.

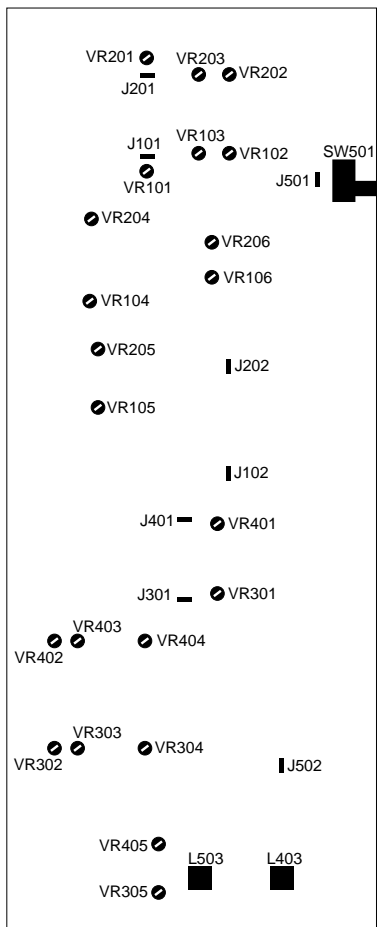
5.3.1 Input/Output Level and Peak Indicator Adjustments

These adjustments generally should be performed when first receiving the machine, and then again only when any audio component such as heads are changed. The PEAK INDICATOR is factory preset to illuminate at a level equivalent to 1040 nWb/m, which corresponds to approximately 3% THD.

1. Open the MX-50II bottom panel to gain access to AUDIO AMPLIFIER PCB ASSEMBLY.
2. Adjust the external oscillator to produce 1 kHz sine waves at your operating level (e.g., -10 dBu) and connect it to the channel 1 INPUT CONNECTOR of the MX-50II. Connect the AC voltmeter to the channel 1 OUTPUT CONNECTOR. Press INPUT SRL SWITCH so that SRL INDICATOR becomes illuminated (SRL On). Press INPUT/TAPE SWITCH to place the machine in INPUT MONITOR MODE (indicator Off).
3. Adjust VR301 [CH 1 INPUT LEVEL] on AUDIO AMPLIFIER PCB ASSEMBLY until VU METER indicates 0 VU. Adjust VR106 [CH 1 OUTPUT LEVEL] so that the AC voltmeter indicates the same as the level being supplied to the MX-50II.
4. Repeat Steps 2 and 3 for channel 2 using VR401 [CH 2 INPUT LEVEL] and VR206 [CH 2 OUTPUT LEVEL].
5. In the table below, locate the flux level at which you operate the MX-50II. The input level corresponding to 1040 nWb/m is the "additional level" above the level which causes VU METER to indicate 0VU.

Flux Level	Additional Level
185 nWb/m	15.0 dB
250 nWb/m	12.4 dB
370 nWb/m	9.0 dB

6. Set the oscillator to produce 1 kHz sine waves at your studio level plus the "additional level" shown in the table (e.g., if your studio level is -8 dBu at 250 nWb/m, then set the oscillator for +4.4 dBu).
7. Connect the oscillator to the channel 1 INPUT CONNECTOR. Adjust VR105 [CH 1 PEAK IND] until PEAK INDICATOR in the channel 1 VU METER just illuminates.
8. Connect the oscillator to channel 2 and repeat Step 7 using VR205.



VR101/VR201	CH 1/CH 2 REPRO LOW FREQ COMP	VR301/VR401	CH 1/CH 2 INPUT LEVEL
VR102/VR202	CH 1/CH 2 REPRO EQ, HI SPEED	VR302/VR402	CH 1/CH 2 REC EQ, LOW SPEED
VR103/VR203	CH 1/CH 2 REPRO EQ, LOW SPEED	VR303/VR403	CH 1/CH 2 REC EQ, HI SPEED
VR104/VR204	CH 1/CH 2 REPRO LEVEL	VR304/VR404	CH 1/CH 2 REC LEVEL
VR105/VR205	CH 1/CH 2 PEAK IND	VR305/VR405	CH 1/CH 2 REC BIAS
VR106/VR206	CH 1/CH 2 OUTPUT LEVEL	L304/L404	CH 1/CH 2 DUMMY LOAD
J101/J201	CH 1/CH 2 REPRO LOW FREQ COMP ON/OFF	J301/J401	CH 1/CH 2 INPUT LEVEL RANGE
J102/J202	CH 1/CH 2 OUTPUT LEVEL RANGE	J501/J502	CH 1/CH 2 7.5 & 3.75 IPS OPERATION

Figure 5-10
Controls on the AUDIO AMPLIFIER PCB Assembly

5.3.2 Reproduce Electronics Adjustments

NOTE: In the procedures that follow, it is assumed that your chosen studio operating level is +4 dBu. If your chosen studio operating level is different, then change the references to +4 dBu to the level you have chosen.

Precautions Before Making Adjustments: These procedures should be completed before any alignment procedures are performed.

- a. Check that the level matching procedures in §5.3.1 have been performed.
- b. Check to be sure that EQUALIZATION IEC/NAB SWITCH is correctly set.
- c. Clean and demagnetize the tape path.

5.3.2.1 Reproduce Head Azimuth Adjustment

1. Thread the machine with the 15 ips reproducer calibration tape and set tape speed to 15 ips. Set INPUT/TAPE SWITCH to "TAPE".
2. Connect one oscilloscope input channel to the channel 1 OUTPUT CONNECTOR. Connect the other oscilloscope input channel to the channel 2 OUTPUT CONNECTOR. Configure the oscilloscope to display the input waveforms as a "lissajous" pattern using the X-Y display function. Adjust the oscilloscope controls so that both signals have equal amplitude when displayed.
3. Locate and play the 1 kHz portion of the calibration tape and adjust the screw marked "REP AZ (Repro Azimuth)" in Figure 5-11, until the pattern on the oscilloscope becomes a straight line at a 45 degree angle as shown in Figure 5-11.
4. Play each increasing frequency section of the calibration tape (2, 4, 8, 10, 12.5, 16, and 20 kHz) and adjust the "REP AZ" screw.

NOTE: Less and less adjustment is required as the frequency increases to cause the oscilloscope pattern to become correctly displayed. At higher frequencies, it will be impossible to achieve a perfectly straight line, some amount of jitter is normal. Adjust the azimuth screw until the best possible result is obtained.

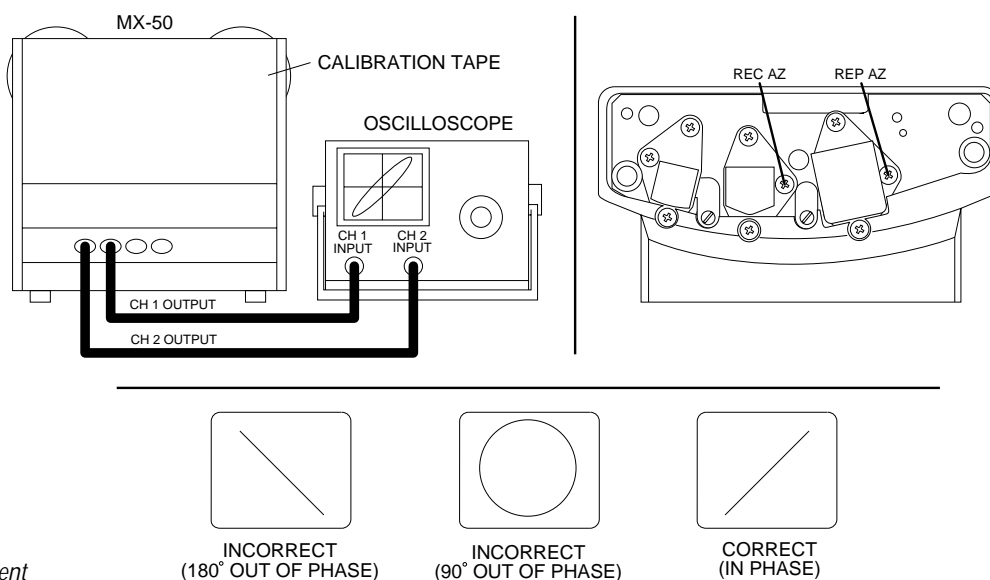


Figure 5-11
Azimuth Adjustment

5.3.2.2 Reproduce Level Adjustment

If the machine is to be used primarily at 15 ips, perform the following procedure at 15 ips. If the machine is to be used primarily at 7.5 ips then perform this procedure at 7.5 ips.

1. Connect the AC voltmeter to the channel 1 OUTPUT CONNECTOR.
2. Thread the machine with the calibration tape, press OUTPUT SRL SWITCH (SRL On) and set both READY/SAFE SWITCHES to "SAFE". Set INPUT/TAPE SWITCH to "TAPE".
3. Play the 1 kHz at reference level portion of the calibration tape and adjust VR104 [CH1 REPRO LEVEL] on AUDIO AMPLIFIER PCB ASSEMBLY so that the AC voltmeter indicates +4 dBu.
4. Connect the AC voltmeter to channel 2 and repeat Step 4 using VR204 [CH2 REPRO LEVEL].

5.3.2.3 Reproduce Equalization Adjustment

NOTE: This procedure adjusts the high frequency reproduce equalization. The low frequency reproduce equalization is adjusted during the record alignments. Due to the fringing effect which occurs at low frequencies, adjusting the low frequency reproduce equalization using the reproducer calibration tape does not produce accurate results.

1. Thread the machine with the 15 ips reproducer calibration tape.
2. Set SPEED LO/HI KEY to "HI".
3. Set both READY/SAFE SWITCHES to "SAFE". Set INPUT/TAPE SWITCH to "TAPE", and press OUTPUT SRL SWITCH (SRL On).
4. Connect the AC voltmeter to the channel 1 OUTPUT CONNECTOR.
5. Play the 10 kHz portion of the reproducer calibration tape and adjust VR102 [CH 1 REPRO EQ H] on the AUDIO AMPLIFIER PCB ASSEMBLY until the AC voltmeter indicates +4 dBu.
6. Connect the AC voltmeter to channel 2 OUTPUT CONNECTOR, and adjust VR202 [CH 2 REPRO EQ H] until the AC voltmeter indicates +4 dBu.
7. Thread the machine with the 7.5 ips reproducer calibration tape.
8. Set SPEED LO/HI KEY to "LO".
9. Connect the AC voltmeter to the channel 1 OUTPUT CONNECTOR.
10. Play the 10 kHz portion of the calibration tape and adjust VR103 [CH 1 REPRO EQ L] until the AC voltmeter indicates -6 dBu.

NOTE: 7.5 ips calibration tape equalization tones are recorded at 10 dB below reference level.

11. Connect the AC voltmeter to channel 2 OUTPUT CONNECTOR and repeat step 10 using VR203 [CH 2 REPRO EQ L].

5.3.3 Record Electronics Adjustment

5.3.3.1 Record Bias Adjustment

Table 5-1

Recommended Overbias (Unit: dB)

Tape Speed (ips)	3.75	7.5	15
Frequency (Hz)	10 k	10 k	10 k
AGFA PEM 468	8.0	5.0	3.0
AGFA PEM 469	8.0	5.5	3.5
AMPEX 406/407	7.0	4.5	2.7
AMPEX 456	8.0	5.5	3.0
BASF LGR50P	7.5	5.5	3.5
BASF SM911	8.0	5.0	3.0
SCOTCH 206/207	7.0	4.5	2.7
SCOTCH 226/227	8.0	5.0	3.0

1. Thread the MX-50II with the tape type that you normally use for sessions and set SPEED HI/LO SWITCH to "HI" (15 ips).
2. Set the external oscillator to produce sine waves at 10 kHz at +4 dBu. Connect the oscillator output to both INPUT CONNECTORS. Connect the AC voltmeter to the channel 1 OUTPUT CONNECTOR.
3. Set both READY/SAFE SWITCHES to "READY" and set INPUT/TAPE SWITCH to "TAPE". If INPUT SRL INDICATOR is not illuminated, then press INPUT SRL SWITCH (SRL On).
4. Place the machine in RECORD MODE.
5. Set VR305 [CH 1 BIAS] fully counterclockwise. While observing the AC voltmeter, turn VR305 clockwise until a peak in the indication on the AC voltmeter is observed. Continue turning VR305 clockwise until a decrease equal to the selected overbias amount is observed. Refer to **Table 5-1** for overbias amounts for various tape types.
6. Connect the AC voltmeter to channel 2 OUTPUT CONNECTOR and repeat Step 5 for channel 2 using VR405.

5.3.3.2 Record Head Azimuth Adjustment

1. Set an external oscillator to produce 1 kHz sine waves at +4 dBu or at your chosen studio level. Connect the oscillator to both INPUT CONNECTORS.
2. Thread the machine with a reel of the tape type usually used for sessions. Set both READY/SAFE SWITCHES to "READY", and set INPUT/TAPE SWITCH to "TAPE".
3. Connect the vertical inputs of the dual-trace oscilloscope to both OUTPUT CONNECTORS as shown in **Figure 5-12**. Place the machine into RECORD MODE. Configure the oscilloscope to display the input signals as a lissajous pattern using the X-Y display function.
4. Adjust the record head azimuth adjustment screw until the display on the oscilloscope becomes a straight line at 45 degrees as shown in **Figure 5-11**.
5. Set the oscillator to 10 kHz, and repeat Step 3.
6. Set the oscillator to 16 kHz, and repeat Step 3.

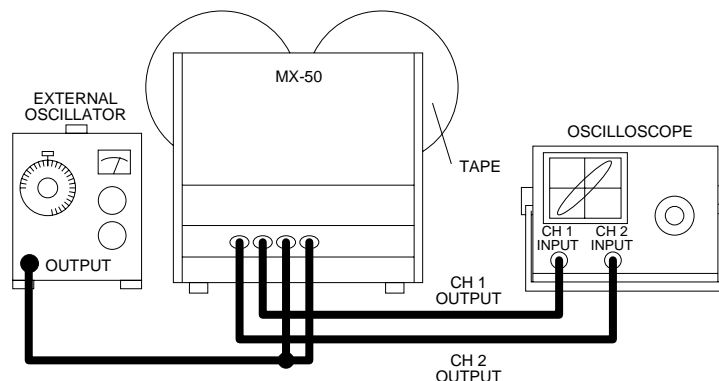


Figure 5-12
Record Azimuth Adjustment Setup

5.3.3.3 Record Level Adjustment

1. Thread the machine with tape.
2. Set the external oscillator to produce sine waves at 1 kHz at +4 dBu. Connect the oscillator output to both channel INPUT CONNECTORS.
3. Set both READY/SAFE SWITCHES to "READY", set INPUT/TAPE SWITCH to "TAPE", and check to make sure that both SRL SWITCHES are engaged (SRL INDICATORS illuminated).

NOTE: If you are performing this adjustment at 7.5 ips, then disengage INPUT SRL SWITCH, select INPUT MONITOR MODE, and set INPUT LEVEL CONTROLS so the VU METERS indicate -10 VU. Then switch back to TAPE MONITOR MODE.

4. Place the machine into RECORD MODE.
5. Adjust VR304 [CH 1 REC LEVEL] on the AUDIO AMPLIFIER PCB ASSEMBLY so that channel 1 VU METER indicates 0 VU (-20 VU if you are aligning at 3.75 ips). Check to see that there is no difference in the indication on VU METER when switching between INPUT and TAPE MONITOR MODES.
6. Repeat step 5 for channel 2 using VR404.

5.3.3.4 Record Equalization Adjustment

NOTE: These adjustments should be performed after the reproduce equalization and record bias adjustments.

1. Thread the machine with tape and set SPEED LO/HI KEY to "HI".
2. Set the external oscillator to produce sine waves at 10 kHz at +4 dBu. Connect the oscillator output to both channel INPUT CONNECTORS.
3. If this procedure is being performed at 15 ips, then press INPUT SRL BUTTON to activate the SRL. If this procedure is being performed at 7.5 ips then disengage INPUT SRL BUTTON and set INPUT LEVEL CONTROLS so that VU METERS indicate -10 VU (-20 VU for 3.75 ips).
4. Set INPUT/TAPE SWITCH to "TAPE". Set both READY/SAFE SWITCHES to "READY", and place the machine into RECORD.
5. Adjust VR303 [CH 1 REC EQ H] on AUDIO AMPLIFIER PCB ASSEMBLY until the channel 1 VU METER indicates 0VU (-10 VU at 7.5 ips).
6. Repeat Step 5 for channel 2 using VR403.
7. Set SPEED LO/HI KEY to "LO", and repeat Steps 3 through 6 using VR302 (for channel 1) and VR402 (for channel 2).

5.3.3.5 Low Frequency Reproduce Equalization Adjustment

1. Set the external oscillator to produce sine waves at 100 Hz at +4 dBu.
2. Press INPUT SRL and OUTPUT SRL BUTTONS (indicators illuminated). If you are performing this adjustment at 7.5 ips then disengage INPUT SRL BUTTON, and adjust INPUT LEVEL CONTROLS for 10 VU. Set INPUT/TAPE SWITCH to "TAPE".
3. Set SPEED LO/HI KEY to the speed you use most often.
4. Place the machine into RECORD MODE.
5. Adjust VR101 [CH 1 REPRO LOW COMP] on AUDIO AMPLIFIER PCB ASSEMBLY until the channel 1 VU METER indicates 0 VU (-10 VU at 7.5 ips).
6. Repeat Step 5 for channel 2, adjusting VR201 [CH 2 REPRO LOW COMP] for 0 VU (or -10 VU) on the channel 2 VU METER.
7. Sweep the external oscillator from 30 Hz to 250 Hz and verify that the frequency response is within ± 2 dB.

5.3.3.6 Bias Oscillator Transformer Dummy Load Adjustment

NOTE: This adjustment is not required except when the erase head is changed.

1. Remove the bottom cover to gain access to AUDIO AMPLIFIER PCB ASSEMBLY.
2. Connect the oscilloscope probe to the wiper (arm) of VR305 [CH 1 BIAS]. Use the GND test point as ground.
3. Thread the MX-50II with the tape type normally used for sessions and place both channels in RECORD MODE.
4. While recording on both channels, repeatedly switch between "READY" and "SAFE" on channel 2 while observing the oscilloscope. Adjust L404 for minimum difference in the waveform when changing from "READY" to "SAFE".
5. Connect the oscilloscope probe to the wiper (arm) of VR405 [CH 2 BIAS]. Use the GND test point as ground.
6. While recording on both channels, repeatedly switch between "READY" and "SAFE" on channel 1 while observing the oscilloscope. Adjust L304 for minimum difference in the waveform when changing from "READY" to "SAFE".

Section 6 Printed Circuit Board Layouts and Parts Lists

The following P.C.B. pattern layout drawings and parts lists are provided for service reference. Parts list includes only main parts or the parts difficult to obtain in the field.

Also the lists include the parts which should be replaced with the exact same parts supplied by Otari to maintain the performance. Many diodes, transistors, and ICs are well described in the schematic diagrams attached to the machine, so to find out the correct parts number of those parts you need, refer to the schematic diagrams.

6.1 Control PCB Assembly	6-2
6.2 Audio Amplifier PCB Assembly	6-7



6.1 CONTROL PCB Assembly

Ref. No.	Description	Otari Part No.
IC1	M5L8085AP	IM5L8085
IC2	Main ROM Assembly	PG-1391
IC3	HM6116P-4	I-0021
IC4	TC74HC373P	IQ373
IC5	TC74HC393P	IQ393
IC6	MC14518	IMC14518
IC7	MC14520	IMC14520
IC8	SN74HC139N	IQ139
IC9, 10	SN74HC138N	IQ138
IC11	32 bit up down counter	I-0012
IC12	MC14013	IMC14013
IC13-15, 20, 21, 23-25	MC14174	IMC14174
IC16	MC14555	IMC14555
IC17	MC14539	IMC14539
IC18	TL082CP	ITL082CP
IC19	NE555N	I-NE555V
IC22	TC74HC273P	IQ273
IC26, 27, 29	MC14503	IMC14503
IC28	SN74HC244N	IQ244
IC30	SN74HC00N	IQ00
IC31	MC14011	IMC14011
IC32	MC14049	IMC14049
IC33	SN74HC14N	IQ14
IC34, 35	M5223P	IM5223P
IC36, 44	M51957BL	IM51957B
IC37	MC14194	IMC14194
IC38-41	M5219P	I-0067
IC42	MC14070	IMC14070
IC43	MC14081	IMC14081
IC45	NJM7818A	IHC818
IC46	M5230L	I-0062
IC47, 48	MPC7805	IHC7805
IC49	MPC7824	IHC7824
IC50	MPC7812	IHC7812
Q1-7, 22-32, 38-47, 64-69, 72	DTC124EF	Q-0008
Q8-16, 48, 49, 62	RN1224	Q-0T008
Q17, 18	RT1N241S	Q-0009
Q19	2SA995G	QA995G
Q20, 21, 63	2SC1815BL	QC1815BL
Q33-37	2SC1627	QC1627
Q50-53, 73	2SA1020Y	QA1020Y
Q54-56	2SD1415	QD1415
Q57-59	2SB1020	QB1020
Q60	2SC2655Y	QC2655Y
Q61	DTA124EF	Q-0005
Q70	2SD525	QD525
Q71	2SB595	QB595
D1-10, 12-35, 37, 38, 43	1SS133	PN1SS133
D11, 44-46	1SR-35-100	PN-0319
D39-41	3D4B41	PN3D4B41
D36	TLR124	PNTLR124
D42	4D4B41	PN4D4B41
RL1, 2	MZ-12HG Relay	RY1CC064
X'tal	HC 18 μ 6.144 MHz	PZ4C053
VR1	410063-00 Potentiometer	RV253116
VR2-7	410065-00 Potentiometer	RV214114

CONTROL PCB Assembly

AUDIO AMPLIFIER PCB Assembly

6.2 AUDIO AMPLIFIER PCB Assembly

Ref No.	Description	Otari Part No.
IC501	NJM2043D	I-0031
IC 502-507, 509-514	M5219P	I-0067
IC508	NJM4556D	I-0009
Q101-105, 201-205, 109, 209, 110, 210, 114, 214, 119, 219, 301, 401, 303, 403, 304, 404, 307, 407, 308, 408	2SK362BL	Q2K362BL
Q106, 107, 206, 207, 115, 215, 116, 216	2SC3327B	QC3327B
Q108, 208, 111, 211, 113, 213, 120, 220, 302, 402, 305, 405	2SJ104V	Q2SJ104V
Q112, 212, 515, 516	2SA1015GR	QA1015GR
Q117, 217	2SC3421Y	QC3421Y
Q118, 218	2SA1358Y	QA1358Y
Q309, 409, 306, 406, 310, 410, 311, 411, 514	2SC1815BL	QC1815BL
Q312, 412, 502, 508, 513	RT1N241S	Q-0009
Q313, 413, 501, 503-507, 509-512, 517	RT1P241S	Q-0005
Q518, 519	2SC3581F	QC3581F
D112, 212, 113, 213	1K60 Diode	PN1K60
T501	Bias Osc. Transformer	TF41008
VR101, 201, 302, 402, 303, 404	Potentiometer 50K(B)	RV254115
VR102, 202 103, 203, 104, 204, 304, 404	Potentiometer 5K(B)	RV253116
VR105, 205	Potentiometer 10K(B)	RV214114
VR106, 206, 301, 401	Potentiometer 20K(B)	RV224117
VR305, 405	Potentiometer 20K(B)	RV224118
RL301, 401	RZ-12W-K Relay	RY2CC105
SW1	Switch SSW-114	WH34066

Section 7 Exploded View Drawings and Parts Lists

The following exploded view drawings and parts lists are provided for service reference. Each drawing has its own parts list followed with a same key number and title.

When ordering parts, give a full description, using both the part number and the name of the part. If there seems to be a discrepancy between the drawings herein and your MX-50II, contact Otari; we assume no liability for improper servicing due to changes and improvements which we make that subsequently render certain of those documents obsolete. Most all of exploded view drawings are not prepared for the parts which differ from those for the MX-50II, please refer to the parts list in which you will find the proper information. Following are the lists of the exploded view drawings included in this edition.

7.1 Case Assembly	7-2
7.2 Head Assembly	7-4
7.3 Reel Assembly	7-6
7.4 Transport Assembly (1)	7-8
7.5 Transport Assembly (2)	7-10
7.6 Transport Assembly (3)	7-12
7.7 Amplifier and Connector Panel Assemblies	7-14



7.1 Case Assembly

No.	Parts Name	Parts No.	Remarks
1.	Cover L, Side	K114701	
2.	Cover R, Side	K114702	
3.	Sash A, Side	K114707	
4.	Block A1, Corner	CY5013	
5.	Block B1, Corner	CY5015	
6.	Handle	CY1051	
7.	Panel Assembly, Bottom	K1147-A	
	Foot	K114706	
	Spacer	KZ7A861	
8.	Cover, Rear	K114703	
9.	Foot	CY4013	
10.	Bracket B, Cover	T005321	

Case Assembly

7.2 Head Assembly

No.	Parts Name	Parts No.	Remarks
1.	Cover Assembly, Head	KH-43VA	without hole
2.	Cover Assembly, Head	KH-44AA	with hole
3.	Head Assembly, Erase Bracket, Head	GH4E004H KH0D169	NAB
4.	Head Assembly, Record Bracket, Head	GH4R005E KH0D168	NAB
5.	Head Assembly, Reproduce Bracket, Head Case, Shield	GH4P027D KH0D170 KH0B028	NAB
6.	Spring, Head Adjust	GS2019	NAB
7.	Head Assembly, Erase Bracket, Head	GH4E082E KH0D169	DIN
8.	Head Assembly, Record Bracket, Head	GH4R100F KH0D168	DIN
9.	Head Assembly, Reproduce Bracket, Head Case, Shield	GH4P099E KH0D170 KH0B028	DIN
10.	Housing, Support	KH43V01	
11.	Guide, Tape	KG4A005	
12.	Base, Head	KH0C075	
13.	Stud	KZ71A141	
14.	Shield, Reproduce Head	KH0B036	
15.	Spring, Head Adjust	GS2147	DIN
16.	Plug, Hole	PZ1G118	

Head Assembly

7.3 Reel Assembly

No.	Parts Name	Parts No.	Remarks
1.	Pin, Reel Shaft	KW0E058	
2.	Spring	GS2109	
3.	Clamp, Reel	KW0B052	
4.	Nail, Reel Drive	KW0E063	
5.	Reel Table Assembly	KW-41DF	
6.	Holder, Reel Table	KW0B054	
7.	Screen	PZ1B077	
8.	PCB Assembly, REEL MDA	PB-4MNA	
9.	Bracket A, Reel MDA PCB	T005317	
10.	Bracket B, Reel MDA PCB	T005318	
11.	Bracket, Reel Motor Spacer	T005319	
12.	Transformer, Power	TF11128	
13.	Motor, Reel	MR1C032S	
14.	Chassis, Reel Motor	KW-41GC	
15.	Brake Drum Assembly	KW-41GA	
16.	Band, Brake	KW0D048	
17.	Bracket R, Brake	KW0E065	
18.	Bracket L, Brake	KW0E066	
19.	Bracket, Brake Spring	KW4P014	
20.	Arm L, Brake	KW0D049	
21.	Arm R, Brake	KW0D050	
22.	Solenoid	GP1A08	
23.	Tube, Rubber	AS4Z120A	
24.	Spring	GS1173	
25.	Clamp, Cable	-----	
26.	L-Angle	KW0D058	
27.	Guide, L	KW0D056	
28.	Guide, R	KW0D057	
26.	Retaining Ring, E-Type	F7503.0	

Reel Assembly

7.4 Transport Assembly (1)

No.	Parts Name	Parts No	Remarks
1.	Block, Splicing	T004109	
2.	Base, B1, Housing	T005316	
3.	Panel, Deck Skin	T007302	
4.	Panel, Top	T007301	
5.	Panel L, Side	T0053-C	
6.	Panel R, Side	T0053-D	
7.	Plate, Shield	T005305	
8.	Housing, Receptacle (LLR-12)	CN412523	
9.	Housing, Plug (LLR-12)	CN412530	
10.	Bracket, Connector	T005314	
11.	Bracket A, Control PCB	PB4MK01	
12.	Bracket B, Control PCB	PB4MK02	
13.	Bracket, Hinge	T005307	
14.	Bracket D, Control PCB	PB4MK03	
15.	Heatsink A	KZ1A095	
16.	Insulator, Transistor	PZ4B054	
17.	PCB Assembly, CONTROL (MX-50II-N)	PB-4MKAA	
	PCB Assembly, CONTROL (MX-50II-D)	PB-4MKBA	
18.	_____	_____	
19.	Bracket, Fuse PCB	T005303	
20.	PCB Assembly, FUSE	PB-7RGA	
21.	Cover, Fuse	T005306	
22.	Screw	KZ6A124	
23.	Screw	KZ6A104	
24.	Retaining Ring	F952Z001	
25.	Speaker	SF1009	
26.	Bracket, Speaker	T007307	
27.	Bracket A, PCB	T007308	
28.	Bracket B, PCB	T007309	
29.	PCB Assembly, MONITOR AMP	PB-1CYA	

Transport Assembly (1)

7.5 Transport Assembly (2)

No.	Parts Name	Parts No.	Remarks
1.	Cap, Roller	KI4P003	
2.	Ball Bearing	BA1Z064	
3.	Spring B, Roller	GS2145	
4.	Spring A, Roller	GS2143	
5.	Collar B	KZ7C102	
6.	Roller	KIOA065	
7.	Shaft B, Roller	KI4P001	
8.	Cap, Knob	KN1099	
9.	Knob	KN1108	
10.	Button A2 (Yellow)	KN2183	
11.	Base A1, Housing	T007311	
12.	Collar A	KZ7C101	
13.	Roller Assembly, Tachometer	GR04014	
14.	Ring, Tach.	SR3Z033	
15.	_____	_____	
16.	_____	_____	
17.	Bracket, VR	T005320	
18.	Bracket, Speed Mode PCB	T005308	
19.	Shaft A, Roller	GR41A02	
20.	Spacer	KZ9E115B	
21.	Bracket, VR	GR41A01	
22.	PCB Assembly, TACHO SENSOR	PB-7RLA	
23.	PCB Assembly, SPEED MODE	PB-7RJA	
24.	Shaft, Arm	KA0A050	
25.	Guide, Tension Arm	KA0D006	
26.	Arm, Tension	KA0A049	
27.	Spring	GS1174	
28.	Bracket L, Safety Sensor	T005311	
29.	Bracket R, Safety Sensor	T005312	
30.	Tube, Rubber	PZ1C151	
31.	PCB Assembly, SAFETY	PB-7RKA	
32.	Cover, Left Tension Arm	T005304	
33.	_____	_____	
34.	Spring	GS2146	
35.	Washer	PZ1C135	
36.	Spacer	KZ9A020B	
37.	Collar	KZ7C120	

Transport Assembly (2)

7.6 Transport Assembly (3)

No.	Parts Name	Parts No.	Remarks
1.	Roller Assembly, Pinch	KP-4S-B	
2.	Cover A, Pinch Roller	KP0C031	
3.	Shaft, Pinch Roller	KP0B053	
4.	Stopper, Lifter Arm	KR4U007	
5.	Tube, Rubber	PZ1C133	
6.	Stopper, Pinch Roller	KP4U004	
7.	Pin A, Lifter	KR4U002	
8.	Pin B, Lifter	KR4U003	
9.	Arm Shaft, Lifter	KR4U004	
10.	Anchor, Spring	KZ5B018	
11.	Arm, Lifter	KR4U001	
12.	Spring	GS1170	2.5x60
13.	Spring, Lifter	GS1169	
14.	Link, Lifter	KR4U005	
15.	Screw	KZ6A103	
16.	Shaft Arm, Pinch Roller	KP4U003	
17.	Roller Arm Sub Assembly	KP-4U-A	
18.	Bracket, Pinch Roller	KP0E031	
19.	Bracket, Pinch Roller Solenoid	GP1B14	
20.	Plate, Solenoid Shielding	KP4U002	
21.	Rubber Tube	PZ1C136	3x5x7
22.	Washer	PZ1C135	8x12x4
23.	Shaft, Pinch Roller	KP0F010	
24.	Link, Pinch Roller	KP4U001	
25.	Spring	GS2144	
26.	Spacer, Capstan Motor	KZ7A328	
27.	Bracket, Capstan Motor	T005313	
28.	Capstan Motor Assembly	KC-41D	
29.	Spring Pin	F62314	
30.	Bracket, Lifter Solenoid	KR4U006	
31.	Solenoid, Lifter	GP1R01	
32.	Washer	PZ1C137	8x12x10
33.	Retaining Ring, E-type	F7503.0	
34.	Spring, Pinch Roller	GS1172	
35.	Spring Anchor	KZ5B018	
36.	Shaft, Arm	KZ7A862	
37.	Rubber Tube	PZ1C151	3.5x7.5x5
38.	Washer, Polyslider	F524-6	
39.	Washer, Polyslider	F523-6	
40.	Spring Pin	F62322	





Transport Assembly (3)

7.7 Amplifier and Connector Panel Assemblies

No.	Parts Name	Parts No.	Remarks
1.	Guard, Power Switch A	KN5015	
2.	Bracket, Power Switch	T005310	
3.	Switch, Power	WH92194	
4.	Cap, Knob	KN1099	
5.	Knob	KN1108	
6.	Spacer	KZ6C048	
7.	Cap, Knob	KN1102	
8.	Knob	KN1109	
9.	Spacer	KZ6C054	
10.	Counter Escutcheon Assembly A	T0053-B	
11.	Switch Escutcheon A (Smaller)	PZ4A028	
12.	Switch Escutcheon A	PZ4A030	
13.	VU Meter	ME11025	
14.	Holder, VU Meter	A1153-A	
15.	PCB Assembly, VU METER	PB-7RBA	
16.	PCB Assembly, TIMER DISPLAY	PB-7RHA	
17.	PCB Assembly 1 (MX-50II-N)	PB-7RCA	
	PCB Assembly 1 (MX-50II-D)	PB-7RCB	
18.	PCB Assembly 2	PB-7RDA	
19.	PCB Assembly, IN/OUT CONTROL VR	PB-7XNA	
20.	Bracket, VR	A118701	
21.	Bracket, Phone Jack	A115302	
22.	Phone Jack	CN602001	
23.	PCB Assembly, MONI VOLUME	PB-1DCA	
24.	Bracket, PCB	A115303	
25.	Side Panel, Amplifier L	A115304	
26.	Side Panel, Amplifier R	A115305	
27.	Plate, Rear	A115307	
28.	Bracket, Switch	A115306	
29.	PCB Assembly, AUDIO AMPLIFIER	PB-1BCA	
30.	Button, A1 (Grey)	KN2184	
31.	Panel, Connector A (MX-50II-N)	CB77001	
	Panel, Connector B (MX-50II-D)	CB77101	
32.	Plate, Connector A	CB77003	
33.	Connector	CN237326	
34.	Screw, Lock	CN7B-212	
35.	Connector (MX-50II-D)	CN209325	
36.	Terminal, Ground	CN901040	
37.	AC Inlet	CN603012	
38.	Connector	CN103194	
39.	Connector	CN103195	
40.	Bracket, Amplifier PCB	T005302	
41.	Spacer	KZ9H135A	
42.	Spacer	KZ9H180A	
43.	Button, RECORD	KN2144	
44.	Button, PLAY	KN2142	
45.	Button, STOP	KN2141	
46.	Button, WIND	KN2143	
47.	Button, CUE	KN2145	
48.	Button, EDIT	KN2147	
49.	Button, FADER (MX-50II-D)	KN2180	
50.	Stud	KZ9A100C	

Amplifier and Connector Panel Assemblies

Hardware

Name	Code	Name	Code
 Bind SEMS Screw	BS	 Hex Head Bolt	H
 Pan SEMS Screw	PS	 Hex Nut	N
 Triple Screw	TS	 Flat Washer	W
 Binding Head Screw	B	 Fiber Washer	FW
 Pan Head Screw	P	 Plastic Washer	PW
 Flat Countersunk Head Screw	F	 Stainless Steel Washer	SSW
 Oval Countersunk Head Screw	O	 Spring Washer	SW
 Truss Head Screw	T	 Lock Washer	LW
 Pan Screw with Spring Washer and Flat Washer	PZ	 Knob Washer	KW
 Hex Socket Head Screw	C	 Retaining Ring, E-type	E
 Hex Socket Headless Set Screw, Flat	S	 Retaining Ring, C-type, Outer	CO
 Hex Socket Headless Set Screw, Pinpoint	SP	 Retaining Ring, C-type, Inner	CI
 Button Head Socket Cap Screw	BC	 Spring Pin	SPN
 Flat Head Socket Cap Screw	FC	<div data-bbox="771 1496 1347 1881" style="border: 1px solid black; padding: 5px;"> <p>Example 1: Screw</p> <p>BS 3 x 6 N</p> <p>BS: Code</p> <p>3: Length (mm)</p> <p>x: Diameter of Thread (mm)</p> <p>6: Length (mm)</p> <p>N: Nickel</p> <p>No indication: Zinc</p> <p>B: Black Zinc</p> <p>K: Black Nickel</p> <p>Plating</p> <p>Example 2: Washer</p> <p>3 SW</p> <p>3: Diameter (mm)</p> <p>SW: Code</p> </div>	
 Tapping Pan Head Screw	TP		
 Tapping Flat Countersunk Head Screw	TF		
 Flat Head Wood Screw	FWS		

All screws conform to ISO standard, and have a cross-recessed head, unless otherwise noted. ISO screws have a point inscribed in the head.



Appendix: Optional Accessory Installation Procedure

This section contains the necessary information for installing the optional accessories.

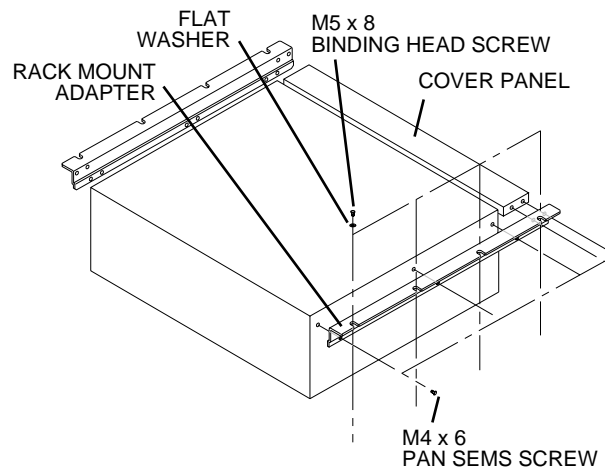
<i>A: Rack Mount Kit (ZA-5EK)</i>	AP-2
<i>B: Pedestal (Stand)</i>	AP-3
<i>C: Input and Output Transformers</i>	AP-4
<i>D: VEM (Voice Edit Mode) PCB Assembly</i>	AP-6
<i>E: Low Speed Conversion</i>	AP-7

A: Rack Mount Kit (ZA-5EK)

1. Remove the side covers (and handles) by removing the ten phillips head M4 screws.
2. Attach the rack mount adapters to each side of the machine using the M4 x 6 screws as shown in Figure below.
3. Attach the spacer panel to the rack mount adapters using M4 x 6 screws.
4. Remove the bottom feet from the machine.

CAUTION! WHEN RE-ATTACHING THE BOTTOM COVER, DO NOT USE THE LONG SCREWS THAT WERE USED TO ATTACH THE BOTTOM PANEL WITH THE BOTTOM FEET. THESE SCREWS ARE TOO LONG FOR SECURING THE BOTTOM PANEL ONLY AND WILL CONTACT THE PC BOARD INSIDE CAUSING A SHORTCIRCUIT. USE M4 x 6 SCREWS SUPPLIED WITH THE MACHINE.

5. Mount the machine in the rack.



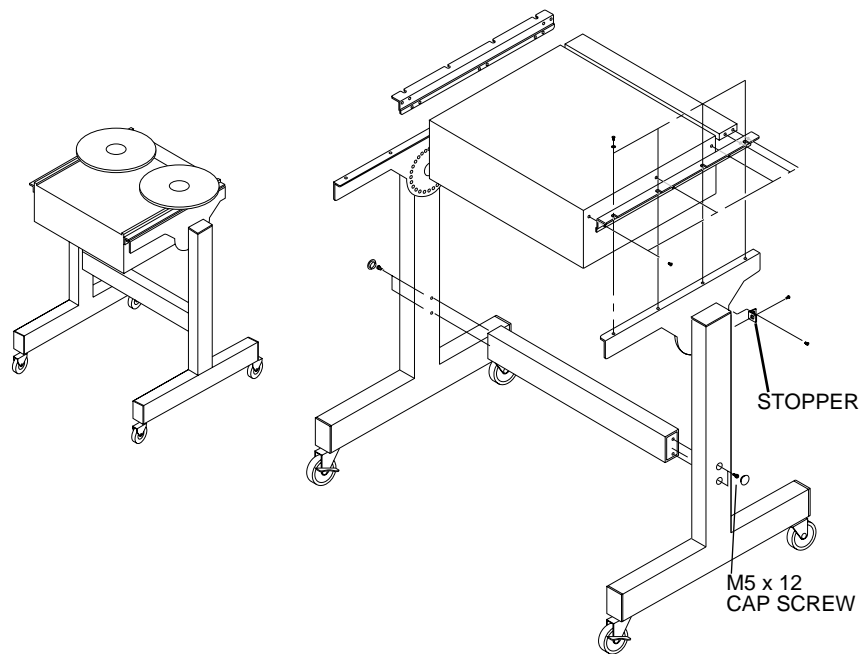
Mounting the Rack Mount Adapters

B: Pedestal (Stand)

1. Remove the side covers (and handles) by removing the ten phillips head M4 screws.
2. Attach the rack mount adapters to each side of the machine using the M4 x 6 screws as shown in **Rack Mount Kit Installation**.
3. Attach the spacer panel to the rack mount adapters using M4 x 6 screws.
4. Remove the bottom feet from the machine.

CAUTION! WHEN RE-ATTACHING THE BOTTOM COVER, DO NOT USE THE LONG SCREWS THAT WERE USED TO ATTACH THE BOTTOM PANEL WITH THE BOTTOM FEET. THESE SCREWS ARE TOO LONG FOR SECURING THE BOTTOM PANEL ONLY AND WILL CONTACT THE PC BOARD INSIDE CAUSING A SHORTCIRCUIT. USE M4 x 6 SCREWS SUPPLIED WITH THE MACHINE.

5. Assemble the stand as shown in Figure below.
6. Mount the machine in the pedestal using the M5 x 8 screws.



Assembling the Stand

A: Optional Input/Output Transformers

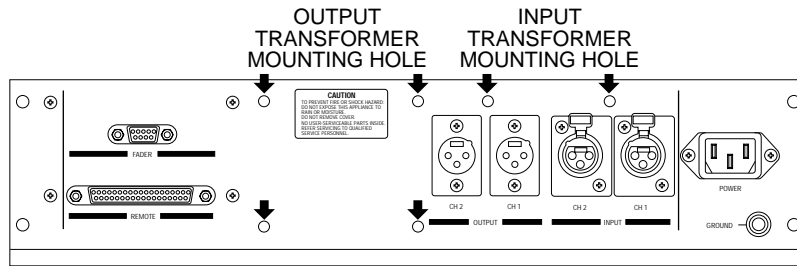
ZA-5EY Input Transformer Assembly and ZA-5EZ Output Transformer Assembly are mounted on the reverse side of the connector panel.

1. Remove the side covers (and handles) by removing the ten phillips head M4 screws. Remove the rear cover by removing the eight phillips head screws and lifting the cover off the machine.
2. Remove the knobs from the amplifier control panel. Remove the amplifier chassis, by removing the ten screws that attach the amplifier chassis to the side and rear panels. Remove the connector panel by removing the four phillips head screws that attach it to the amplifier chassis.
3. If you are installing input transformers, change resistors R305, R306, R405, and R406 on the AUDIO AMPLIFIER PCB ASSEMBLY to 10 k Ω .
4. If a 600 Ω input impedance is required, solder across the jumper positions marked "a" on the INPUT TRANSFORMER PCB ASSEMBLY.
5. If non-floating input is required, solder across the jumper positions marked "b" on the INPUT TRANSFORMER PCB ASSEMBLY.
6. If non-floating output is required, solder across the jumper positions on marked "a" on the OUTPUT TRANSFORMER PCB ASSEMBLY.
7. Select the required output impedance by soldering across the jumper positions on the OUTPUT TRANSFORMER PCB ASSEMBLY as shown below. (At factory shipping, these are shorted.)

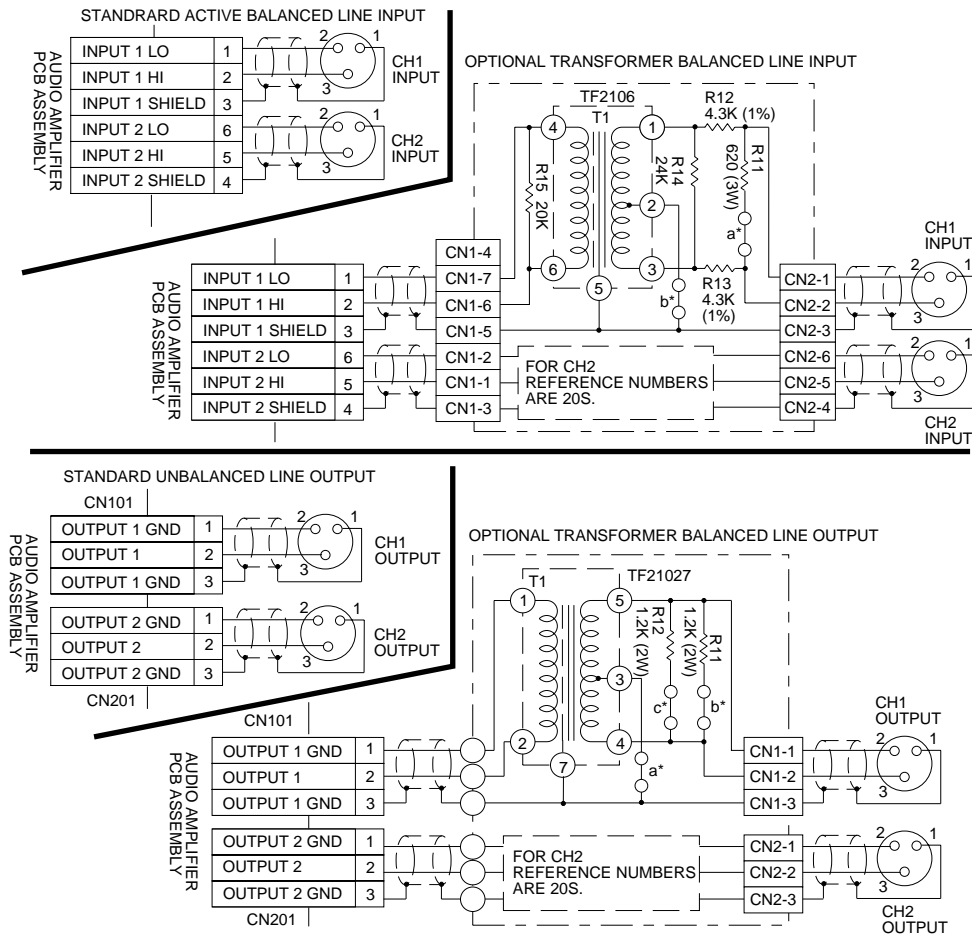
Load Impedance	b	c
Load > 3.7 k Ω	Short	Short
Load between 86–3.7 k Ω	Short	Open
Load < 860 Ω	Open	Open

8. Disconnect connectors CN508, CN101 (Ch 1), and CN201 (Ch 2) from the AUDIO AMPLIFIER PCB ASSEMBLY.
9. Connect the connecting cable assembly (ZA-64K) to CN1 (7 pin header) on the INPUT TRANSFORMER PCB ASSEMBLY.
10. Attach the PCB Bracket to the INPUT TRANSFORMER PCB ASSEMBLY using the M3 x 6 triple screws.
11. Attach the input transformer assembly to the connector panel using the two M3 binding head screws.
12. Attach the output transformer assembly to the connector panel using the four M3 binding head screws.
13. Connect the cable from the input connectors to CN2 on the input transformer assembly.
14. Connect the cable from the input transformer to CN508 on the AUDIO AMPLIFIER PCB ASSEMBLY.
15. Connect the cables from the output connectors to CN1 (Ch 1) and CN2 (Ch 2) on the output transformer assembly.
16. Connect the cables from the output transformer assembly to CN101 (Ch 1) and CN201 (Ch 2) on the AUDIO AMPLIFIER PCB ASSEMBLY.

17. Reinstall the parts removed.
18. Perform the input/output level setting procedure in §4.3.2.



Input/Output Transformer Mounting Holes



Wiring of the Transformers

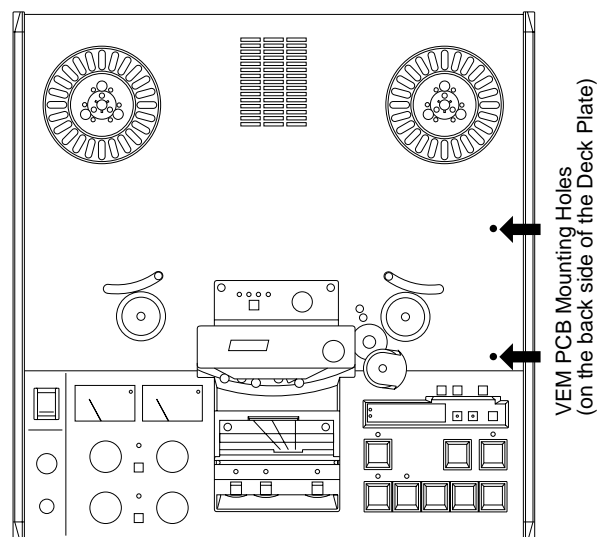
C: VEM (Voice Edit Mode) PCB Assembly

The VEM PCB assembly is a small printed circuit board assembly which allows the MX-50II to be used for twice-speed listening without the pitch change normally associated with increasing the tape speed.

1. Remove the side covers (and handles) by removing the ten phillips head M4 screws. Remove the rear cover by removing the eight phillips head screws. Open the CONTROL PCB ASSEMBLY by loosening the two captive screws and allowing the PCB to hinge down to horizontal.
2. Remove the knobs from the amplifier control panel. Remove the amplifier chassis, by removing the ten screws that attach the amplifier chassis to the side and rear panels.
3. Attach the PCB bracket to the VEM PCB ASSEMBLY using the four M3 x 6 triple screws.
4. Connect the cable assembly to CN1 (8 pin) and CN2 (7 pin) on the VEM PCB ASSEMBLY.
5. Locate the VEM PCB mounting holes on the back side of the deck plate on the take-up side of the machine as shown in Figure below. Mount the VEM PCB ASSEMBLY to the deck plate using two M3 x 6 triple screws.
6. Connect the cable assembly from the VEM PCB ASSEMBLY to CN503 on the AUDIO AMPLIFIER PCB ASSEMBLY.
7. Reinstall the parts removed.

Operation Instructions for VEM: Press the SPEED MODE BUTTON until the VEM INDICATOR becomes illuminated. When the PLAY BUTTON is pressed, the tape speed will be increased to twice the selected speed, but the pitch of the recorded material will remain unchanged.

NOTE: In VOICE EDIT MODE, the pitch-shifted audio signal appears only at the HEADPHONE CONNECTOR OR MONITOR SPEAKER.



VEM PCB Mounting

E: Low Speed Conversion Kit (ZA-31Y) for operation at 3.75 ips

The MX-50 will operate satisfactorily at 3.75 ips with NAB equalization but the equalization trimmers will not have enough range to compensate for component aging and head wear. Therefore, if continued operation at the Low Speed pair is expected, Otari recommends the installation of the Low Speed Conversion kit ZA-31Y. Please perform the following procedure.

1. Install Jumpers J501 and J502 on the AUDIO AMPLIFIER PCB ASSEMBLY.
2. Change R123 and R223 from 2.2 k Ω to 6.8 k Ω .
3. Change R124 and R224 from 4.3 Ω to 6.8 k Ω .
4. Change R330 and R430 from 1 k Ω to 100 Ω .
5. Change VR103 and VR203 from 5 k Ω to 10 k Ω .
6. Change C320 and C420 from 0.0015 μ F to 0.0082 μ F.
7. Change C322 and C422 from 0.0082 μ F to 0.012 μ F.
8. Change C323 and C423 from 0.0082 μ F to 0.015 μ F.
9. Change L301 and L401 from 12 mH to 3.9 mH.
10. Change L302 and L402 from 3.9 mH to 10 mH.
11. Remove the following components:
 - R125 and R225 (6.8 k Ω)
 - R328 and R428 (1.8 k Ω)
 - R506, R507, R544, and R545 (100 k Ω)
 - C318 and C418 (0.01 μ F)
 - C505 and C523 (1 μ F/50 V BP)
 - D105, D205, D307, D407, D511, and D512 (1SS133)
 - Q105, Q205, Q308, and Q408 (2SK362BL)
12. Set SW1-3 on the CONTROL PCB ASSEMBLY to the On position.
13. Perform Audio Channel Alignments.

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