



MX-5050BII
SERIES PROFESSIONAL RECORDERS
INSTRUCTION MANUAL

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SECTION I. GENERAL INFORMATION

The MX-5050BII Series Recorders are professional quality two-speed audio tape recorder/reproducers designed for optimum performance and long life.

The MX-5050BII units use 1/4-inch tape and are available in 4 different models. The different models, and their application, are determined by the head format.

Table 1-1

Model	Head Format	Speed	Tape
BII-2	2-track, 2-channel	*15 and 7-1/2 IPS	1/4 inch
BII-4	4-track, 2-channel		
BII-F	Full track, Mono		
BII-2E	2-track, 2-channel DIN		

* The MX-5050BII is factory set to operate at tape speeds of 15 and 7-1/2 ips. By users conversion the unit can be reset to operate at 7-1/2 and 3-3/4 ips. Refer to page 5-1.

1.1 SYSTEM DESCRIPTION

Among the many professional features of the MX-5050BII Series are: selective reproduction, motion sensing, an edit control that permits spilling, an adjustable cueing control for audible monitoring in the fast-forward and rewind modes, a built-in two frequency low distortion test and cue-tone oscillator, a computerized elapsed time indicator with a digital LED display, front adjustable record bias, equalization, and level controls, active balanced input and output circuits, a reference flux level indicator on the front amplifier panel, a standard reference level output switch, separate line and microphone input level controls for each channel, switches for recording levels, equalization, microphone, and output level attenuators, play-back equalization pots for each speed, a memory stop for automatically stopping the tape in the rewind mode at a predetermined position, ceramic tape guides, big head housing, lower transport noise, and improved specifications for distortion, erase effect, and signal and noise ratio.

1.1.1 TAPE TRANSPORT

All components of the tape transport system are mounted on a rigid aluminum frame for stability. The transport design incorporates two 6-pole induction motors for the reels and a 3-speed DC servo motor (Direct drive) for the capstan.

Speed selection is made by a front panel push-button switch which also switches the equalizer.

The transport accommodates tape reels of 10-1/2 inches, 7 inches, and 5 inches in diameter with NAB or EIA hub configurations. A solenoid-actuated tape lifter lifts the tape away from the heads in the fast forward and rewind modes, in addition to the stop mode, to increase head and tape life.

In addition to the editing controls, a tape-splicing block (Fig. 3-3) mounted on the head cover holds the tape for ease of editing.

Momentary contact push-button switches on the transport are used to select operational modes: record, play, stop, rewind, and fast forward. These modes may be controlled from a remote location by means of an optional remote control unit (page 1-5).

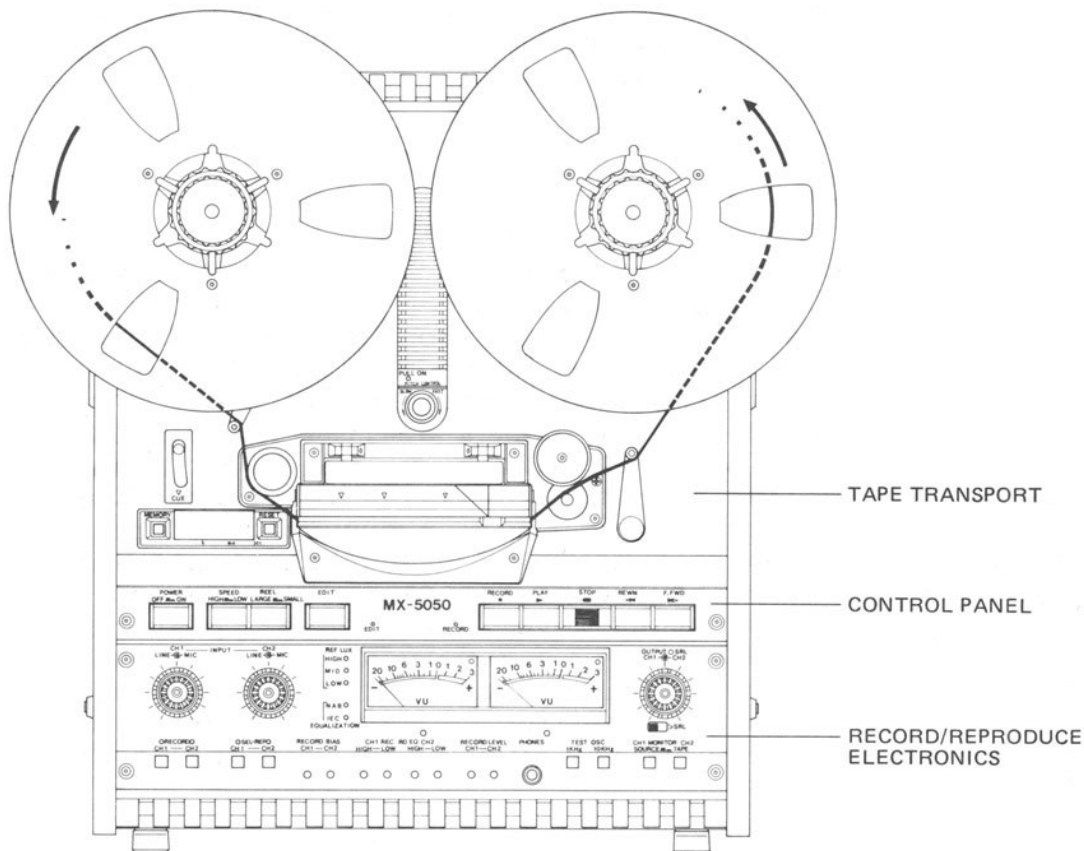


Fig. 1-1 MX-5050BII Major Components

1.1.2 RECORD/REPRODUCE ELECTRONICS

FEATURES

- (1) The RECORD/REPRODUCE amplifier unit is connected to the transport unit only by the connectors and therefore can be easily removed for ease in servicing.
- (2) This machine contains a SEL. REP. function for overdubbing: for example, SOUND WITH SOUND, SOUND ON SOUND, carried out by the PUNCH-IN and PUNCH-OUT functions of the transport control.
- (3) This machine provides both NAB and IEC equalizers, switchable on the rear panel. However, when the equalizer position is changed, fine tuning the record and reproduce equalizer adjustment controller is necessary.
- (4) In order to give optimum performance for different types of recording tapes, record bias, level, and equalization controls on the front panel can be adjusted to meet any requirements.
- (5) To improve the signal to noise ratio and increase the head room, the record/reproduce electronics have been designed with a high-fidelity amplifier.

1.1.3 HEAD ASSEMBLIES

As viewed from the front of the recorder, the configuration of the head assembly of each model MX-5050BII is shown in Table 1-2.

Table 1-2 Head Assembly Configuration

Model No.	Head Structure				Record Head
	H1 Erase	H2 Playback	H3 Record	H4 Playback	
MX-5050BII-2	2T, 2CH	4T, 2CH	2T, 2CH	2T, 2CH	2T, 2CH Stereo
MX-5050BII-4	4T, 2CH	2T, 2CH	4T, 2CH	4T, 2CH	4T, 2CH Stereo
MX-5050BII-F	FT, MONO	2T, 2CH	FT, MONO	FT, MONO	FT Monoaural
MX-5050BII-2E	2T, 2CH DIN	4T, 2CH	2T, 2CH DIN	2T, 2CH DIN	2T, 2CH Stereo

NOTE: The head assemblies of these models contain two playback head stacks. A head change-over switch located in the head assembly permits selection of either head stack.

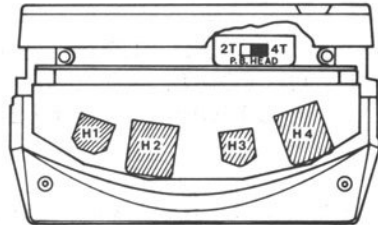


Fig. 1-2 Head Arrangement

1.2 STANDARD ACCESSORIES

The MX-5050BII is supplied with the standard accessories listed below.

STANDARD ACCESSORIES (*ZA-12W)

1.	NAB Hub Reel Hold Down Knob	KW0HO	2 pcs.
2.	NAB Empty Reel 10-1/2 inch	ZA-51A	1 pc.
3.	Reel Adjusting Disc (Shim)**	KW0C005	2 pcs.
4.	Instruction Manual	OS3-038	1 pc.
5.	Power Cord	PZ9D003	1 pc.

* This part number includes all parts described in numbers 1 through 5.

** The reel-adjusting disc (shim) is placed between a metal reel and the turntable to compensate for the difference in thickness between metal reels and plastic reels.

1.3 OPTIONAL ACCESSORIES

Optional accessories available are listed below.

OPTIONAL ACCESSORIES

- | | |
|--------------------------------------|--------|
| 1. Remote Control Unit | CB-102 |
| 2. Cleaning Kit | ZA-51B |
| 3. Balanced Input Transformer Ass'y | ZA-53T |
| 4. Balanced Output Transformer Ass'y | ZA-53S |

1.4 SERVICE AND REPLACEMENT PARTS

For service and replacement parts, or for technical support, please contact your nearest service center, Otari dealer, or write directly to Otari. (See page iii for complete addresses.)

1.5 SPECIFICATIONS

The specifications of the MX-5050BII Series are as listed in Table 1-3.

NOTE: Specifications are based on tape speeds of 7-1/2 and 15 ips. Specifications, although obtainable when serviced by qualified service personnel, are not guaranteed when using lower tape speeds.

Table 1-3 Specifications of the MX-5050B Series

Tape Width and Tracks	1/4 inch (6.3 mm) tape: 2 tracks (0.079 in. or 2.0 mm track width) 4 tracks (0.040 in. or 1.0 mm track width) Full tracks (0.24 in. or 6.1 mm track width)
Tape Speeds	7-1/2 and 15 ips (19 and 38 cm/sec) or 3-3/4 and 7-1/2 ips (9.5 and 19 cm/sec) Maximum deviation: $\pm 0.2\%$ measured with 1.5 mil (0.038 mm) tape.
Reel Sizes	7 inch or 10-1/2 inch plastic or metal, EIA or NAB.

Heads	Model MX-5050BII-2: Half-track configuration Model MX-5050BII-4: Quarter-track configuration Model MX-5050BII-F: Full-track configuration Model MX-5050BII-2E: Half-track configuration Four head stacks: MX-5050BII-2: 2T erase, 4T reproduce, 2T record, 2T reproduce. MX-5050BII-4: 4T erase, 2T reproduce, 4T record, 4T reproduce. MX-5050BII-F: FT erase, 2T reproduce, FT record, FT reproduce. MX-5050BII-2E: 2T DIN erase , 4T reproduce, 2T DIN record, 2T DIN reproduce.
Motors: Capstan	DC servo controlled motor. (Pitch control limits $\pm 7\%$)
Reels	Two induction torque motors.
Operating Position	Vertical or horizontal.
Power Requirements	50/60 Hz , 100/117/220/240 V $\pm 10\%$ Single phase AC , 100 W
Operating Environment	40° to 104°F (5° to 40°C) 20 to 80 % RH
Storage Environment	-5° to 113°F (-20° to 45°C)
Dimensions and Weight	Height 527 mm (20.7 inch) Width 430 mm (16.9 inch) Depth 225 mm (8.8 inch) 24 kgs (53 lbs.)
Mounting	Dark grey leather-finished cabinet.
Standard Accessories	One empty 10-1/2 inch NAB reel, two NAB reel hold down knobs, two NAB reel-adjusting discs (shims), and one instruction manual, one power cord.

Remote Control Unit	An optional remote control unit is used to control the record, play, stop, rewind, and fast forward modes.
Connectors	Line input, line output, and microphone, standard three-pin XLR.
Inputs: Line	Minimum -15 dBm, active balanced 10 k ohms. (Floating type). Minimum -15 dBm, balanced 10 kohms with optional transformer.
Microphone	Minimum -70 dBm, active balanced, adaptable microphone's impedance: 150 to 10 kohms. The microphone attenuator switch may be set to the 0 dB, -20 dB, or Off position depending on the circumstances.
Outputs: Line	Level: +4 dBm or -10 dBm, rear panel switch selectable. Active balanced (Floating type), Source impedance: 5 ohms. Load impedance: More than 600 ohms. Maximum line output: +27 dBs with a 600 ohm load.
Headphone	Level: -24 dBm with an 8 ohm load. Load impedance: 8 ohms or greater.
Equalization	NAB or IEC for 3-3/4, 7-1/2, and 15 ips. Switchable on the rear panel, but calibration is necessary.
Frequency Response	15 ips: 30 Hz to 20 kHz \pm 2 dB 7-1/2 ips: 20 Hz to 18 kHz \pm 2 dB 3-3/4 ips: 20 Hz to 10 kHz \pm 2 dB Specifications refer to a 1 kHz reference when recorded on 3M 226.
Signal to Noise Ratio	Over-all measured at the level of 520 nWb/m.

NAB Equalization

Tape Speed	2 Track		4 Track		Full Track	
	Weighted	Unweighted	Weighted	Unweighted	Weighted	Unweighted
15 ips	66 dB	64 dB	62 dB	60 dB	68 dB	66 dB
7-1/2 ips	68 dB	66 dB	63 dB	61 dB	68 dB	66 dB
3-3/4 ips	66 dB	64 dB	62 dB	60 dB	66 dB	64 dB

IEC Equalization

Tape Speed	2 Track		4 Track		Full Track	
	Weighted	Unweighted	Weighted	Unweighted	Weighted	Unweighted
15 ips	66 dB	62 dB	62 dB	58 dB	62 dB	60 dB
7-1/2 ips	64 dB	62 dB	62 dB	58 dB	62 dB	60 dB
3-3/4 ips	64 dB	62 dB	62 dB	58 dB	62 dB	60 dB

Crosstalk

With a 1 kHz signal on adjacent tracks:
 2 tracks: greater than 55 dB
 4 tracks: greater than 55 dB

Wow and Flutter

(NAB weighted):

Tape Speed	
15 ips	less than 0.06 %
7-1/2 ips	less than 0.08 %
3-3/4 ips	less than 0.12 %

Distortion

Less than 0.5% at 1 kHz at 250 nWb/m.

Erase Efficiency

Greater than 75 dB.

Test Oscillator Frequency	Nominal 1 kHz and 10 kHz			
Bias and Erase Frequency	133 kHz			
Peak Indicator	Trigger level: 1040 nWb/m (15 dB above Ampex operating level) recorded flux level.			
Record Level (SRL)	3-position switchable on the rear panel.			

Position	Flux	Relative Level	Test Tape	Recording tape to be used
Low	185 nWb/m*	0 dB	Ampex Operating Level	Scotch 177, Ampex 641
Medium	250 nWb/m*	+2.6 dB	MRL NAB Reference Flux	Scotch 206, 207, 226, 250 Ampex 406, 407, 456
High	320 nWb/m**	+3.8 dB	BASF or MRL IEC Standard	IEC Equalization

* Short circuit flux
** Open circuit flux

- NOTES: 1. Signal to noise ratio is measured with respect to a recorded level of 520 nWb/m to biased tape noise when using Scotch 226 magnetic tape.
 Unweighted: Using a 30 to 18 kHz RC filter to attenuate noise outside the audio spectrum.
 Weighted : Using an NAB or ASA "A" weighting filter and a 1 kHz reference.
2. Otari reserves the right to change specifications without notice and/or obligation.

SECTION II. INSTALLATION

This section of the manual provides information on unpacking and inspection, location and environment, and power and signal connections.

2.1 UNPACKING AND INSPECTION

The MX-5050BII Series system is shipped from the factory in a single cardboard packing case. Upon receipt, examine the case for any signs of damage. Unpack the equipment and inspect for any signs of damage. Use great care when unpacking the equipment and removing packing materials to prevent damage to critical components such as the capstan, head assembly, and tension arms.

Referring to the lists in Secs. 1.2 and 1.3 (as applicable), verify that all items have been received. Report any shortage or damage to the carrier and your local Otari dealer. Save the packing case for possible reshipment. Other packaging may cause damage during transportation and will void the warranty.

Please refer to the illustration which is attached to flap of the packing box regarding the repacking method.

2.2 LOCATION AND ENVIRONMENT

The area chosen for operation should be adequately ventilated and dust free. Since recording is by an electromagnetic process, it is possible that strong electromagnetic fields may affect the system adversely. Common sources of interference are fluctuating loads on nearby high-voltage lines, heavy duty transformers, and transmitting equipment.

It is recommended that the equipment be used in an environment where the surrounding temperature does not exceed limits of 40° to 104°F (5° to 40°C), with the relative humidity between 20 and 80%. Allow at least a 4 inch (10 cm) clearance behind the rear-panel ventilation grill.

2.3 DIMENSIONS

Equipment dimensions of the MX-5050BII Series are shown in Fig. 2-1.

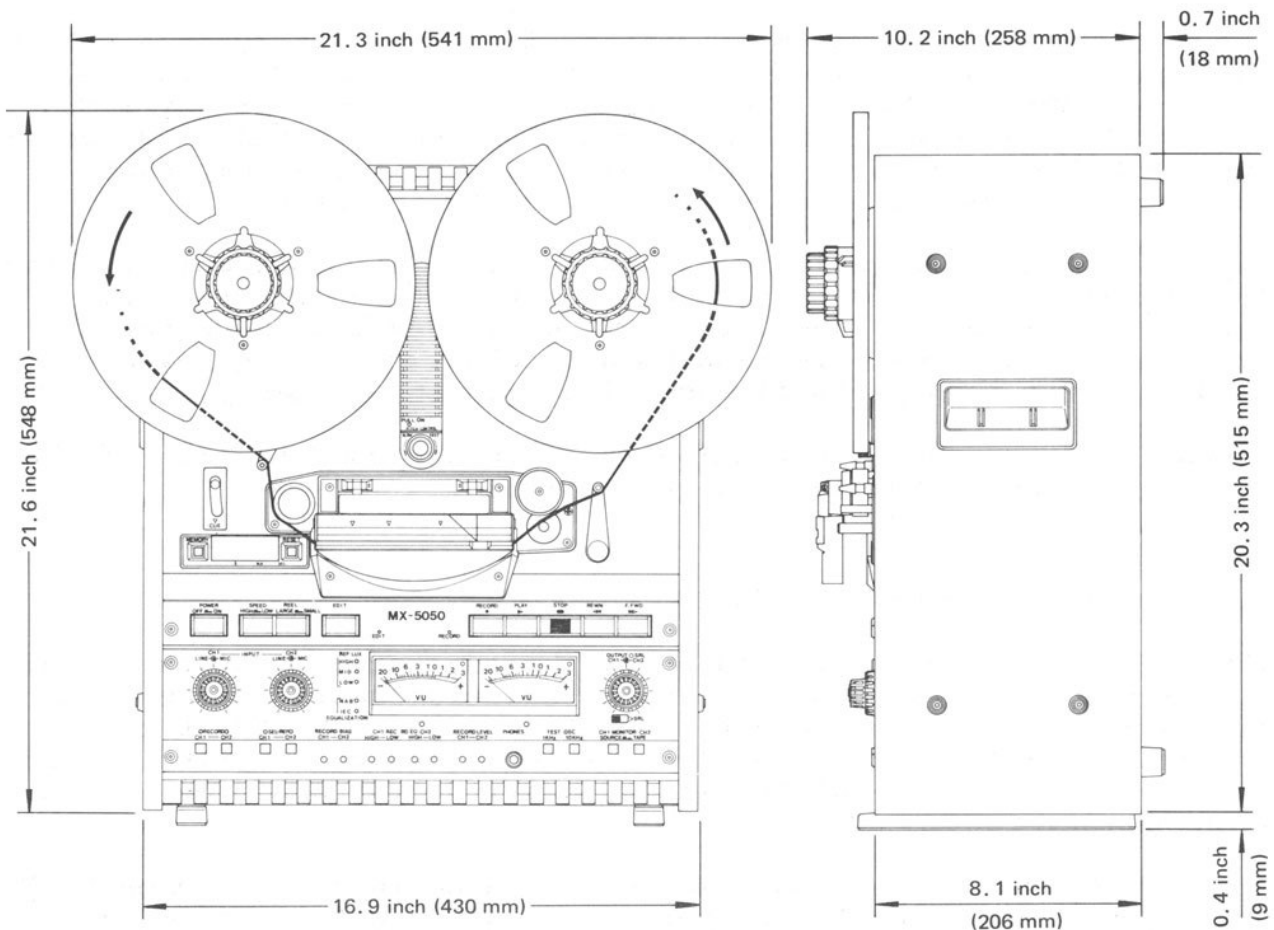


Fig. 2-1 Equipment Dimensions

2.4 STANDARD SWITCH POSITION ON SHIPMENT

Either the NAB standard or the IEC standard of equalization, recording level, etc. may be used with the Otari MX-5050BII series. These units have been provided with a slide switch on the back panel which selects one of these two standards; to change standards, merely slide the switch to the desired position.

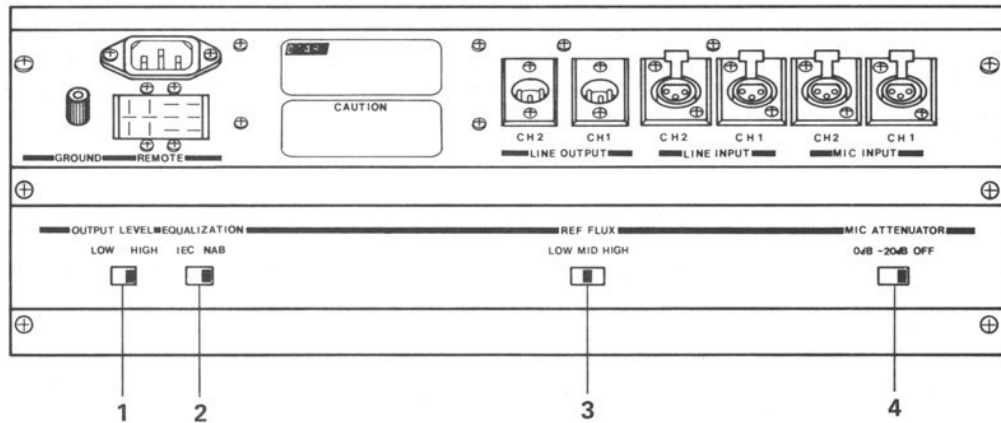


Fig. 2-2(a) Standard Switch Position on Shipment (NAB)

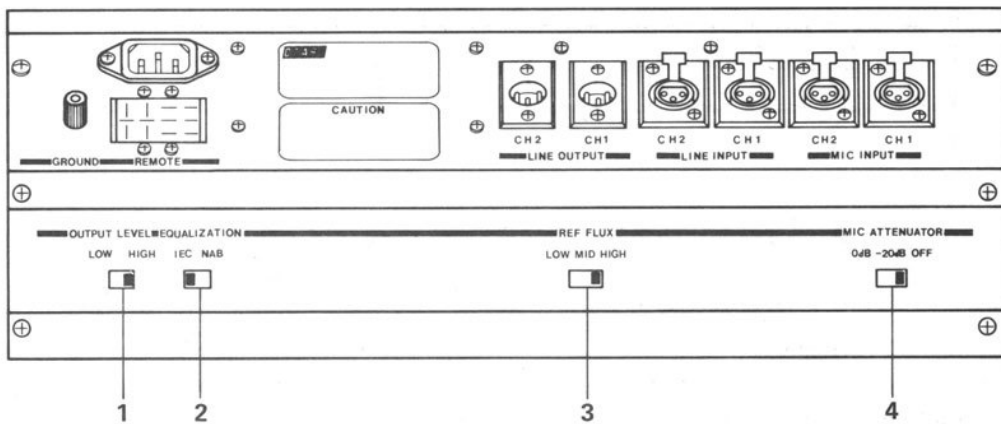


Fig. 2-2(b) Standard Switch Position on Shipment (IEC)

Table 2-1 Standard Switch Position on Shipment

Switch	Ref. No.	Type	
		NAB	IEC
OUTPUT LEVEL	1	HIGH	HIGH
EQUALIZER	2	NAB	IEC
RECORD LEVEL	3	M	H
MIC. ATT	4	OFF	OFF

2.5 POWER AND SIGNAL CONNECTION

All power and signal connections are made on the connector panel of the MX-5050BII. Table 2-2 shows the function of each connector and component on the rear panel.

Table 2-2 Rear Connector Panel

Index No.	Name	Function
1	REMOTE Control Connector	Remote control connector for use with the optional remote control unit to control the record, play, stop, rewind, and fast forward modes.
2	GROUND Terminal	Auxiliary ground connection for use with equipment not connected to a common AC ground.
3	AC Power Connector	Three-contacts socket for connection to AC power and ground.
4	Label	Indicates model number, production lot number (serial number), power requirement, and place of manufacture.

9 (Continued) When a microphone is not used, this switch should be placed in the "OFF" position to avoid noise from the microphone amplifier being placed on the tape.

10 RECORD LEVEL Selector Switch
This switch is used for setting the recording level: "High", "Medium", and "Low". Located on the Amplifier front panel are 3 LED Record Level Selector Indicator displays which indicate the position of the switch. (185/250/320)

Position	Flux	Relative Level	Test Tape	Recording tape to be used
Low	185 nWb/m*	0 dB	Ampex Operat-	Scotch 177 Ampex 641
Medium	250 nWb/m*	+2.6 dB	MRL NAB Reference Flux	Scotch 206, 207, 226, 250 Ampex 406, 407, 456
High	320 nWb/m**	+3.8 dB	BASF or MRL IEC Standard	IEC Equaliza- tion

* Short circuit flux

** Open circuit flux

11 EQUALIZER Selector Switch
The two-position EQUALIZER selector switch is used to select either LEC or NAB equalization. The equalizer of this unit has five settings. These have already been adjusted before shipment. These settings may be changed, but it is necessary to tune them finely.

- 1 NAB 15 ips (3180 + 50 μsec)
- 2 NAB 7.5 ips (3180 + 50 μsec)
- 3 IEC 15 ips (∞ + 35 μsec)
- 4 IEC 7.5 ips (∞ + 70 μsec)
- 5 Both NAB and IEC 3.75 ips
(3180 + 90 μsec)

11	(Continued)	Located on the amplifier front panel are 2 LED EQ Selection Indicator displays which indicate the position of this switch (NAB or IEC).
12	LINE OUTPUT LEVEL Selector Switch	A two-position output level switch used to select either the +4 dBm or -10 dBm output standard reference level (SRL).

2.5.1 AC POWER CONNECTION

The MX-5050BII Series is factory set to operate at the line voltage and frequency indicated on the packing case and on the rear connector panel of the equipment. AC power is connected by means of a three-wire power cable which also provides a common ground connection.

If a change of line voltage and/or frequency is desired to accommodate different power requirements, please refer to followings or contact your nearest Otari dealer.

VOLTAGE CONVERSION PROCEDURE:

Remove the back panel (refer to Fig. 5-1 for access information). From the top of the unit near the supply reel motor, please note the small P.C.B. assembly with the various voltage listings, i.e. 100/117/220/240 (refer to Fig. 2-3). Unsolder the wire from its present setting and resolder it to the desired position. Replace the back panel.

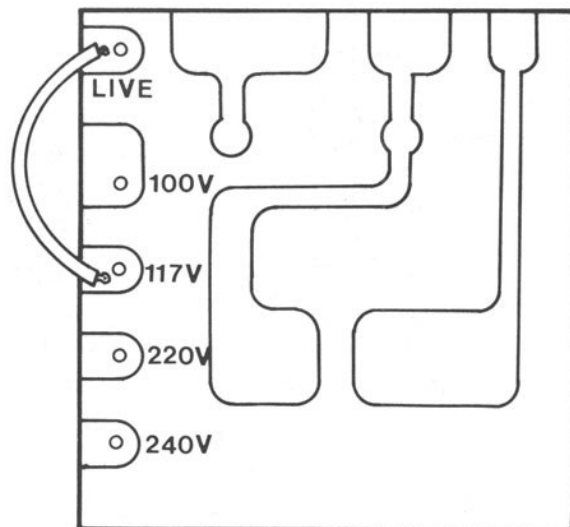


Fig. 2-3 Voltage Selection Terminal

2.5.2 SIGNAL CONNECTIONS

The microphone input (female), line input (female) and line output (male) connectors are XLR-type connectors. To wire the mating plugs, refer to Fig. 2-4 and proceed as follows.

LINE AND MIC INPUT CONNECTOR WIRING:

For balanced inputs, wire the male XLR-connector as follows:

- (1) Connect the signal leads of a two-conductor shielded cable to pin 3 (high) and pin 2 (low) of the connector.
- (2) Connect the cable shield to pin 1.

For unbalanced inputs using two-conductor shielded cable, wire the male XLR-connector as follows:

- (1) Connect the signal leads of a cable to pin 3 (high) and pin 2 (low) of the connector.
- (2) Connect the cable shield to pin 1 of the connector.
- (3) Connect a jumper from pin 1 to pin 2 of the connector.

For unbalanced inputs using single-conductor shielded cable, wire the male XLR-connector as follows:

- (1) Connect the center conductor of the single-conductor shielded cable to pin 3 of the connector.
- (2) Connect the cable shield to pins 1 and 2.

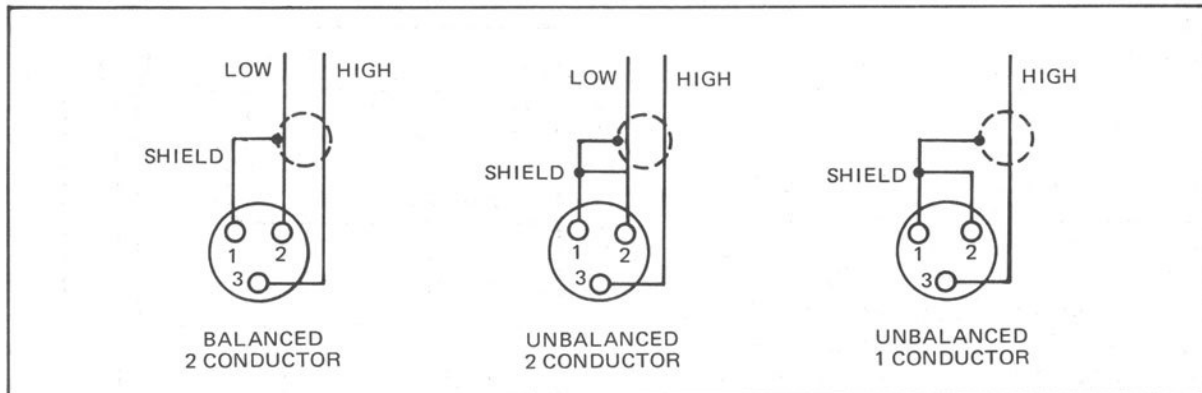


Fig. 2-4 Input/Output Assembly Connector Wiring

LINE OUTPUT CONNECTOR WIRING:

For balanced outputs, wire the female XLR-connector as follows:

- (1) Connect the signal leads of a two-conductor shielded cable to pin 3 (high) and pin 2 (low) of the connector.
- (2) Connect the cable shield to pin 1.

For unbalanced outputs using two-conductor shielded cable, wire the female XLR-connector as follows:

- (1) Connect the signal leads of the cable to pin 3 (high) and pin 2 (low) of the connector.
- (2) Connect the cable shield to pin 1 of the connector.
- (3) Connect a jumper from pin 1 to pin 2 of the connector.

For unbalanced outputs using single-conductor shielded cable, wire the female XLR-type connector as follows:

- (1) Connect the center conductor cable to pin 3 of the connector.
- (2) Connect the cable shield to pin 2 of the connector.
- (3) Connect a jumper between pins 1 and 2 of the connector.

UNBALANCED CONNECTION:

MX-5050BII series have active balanced input and output circuits. However both balanced and unbalanced connections will operate with no problems.

TRANSFORMER BALANCE CIRCUITS:

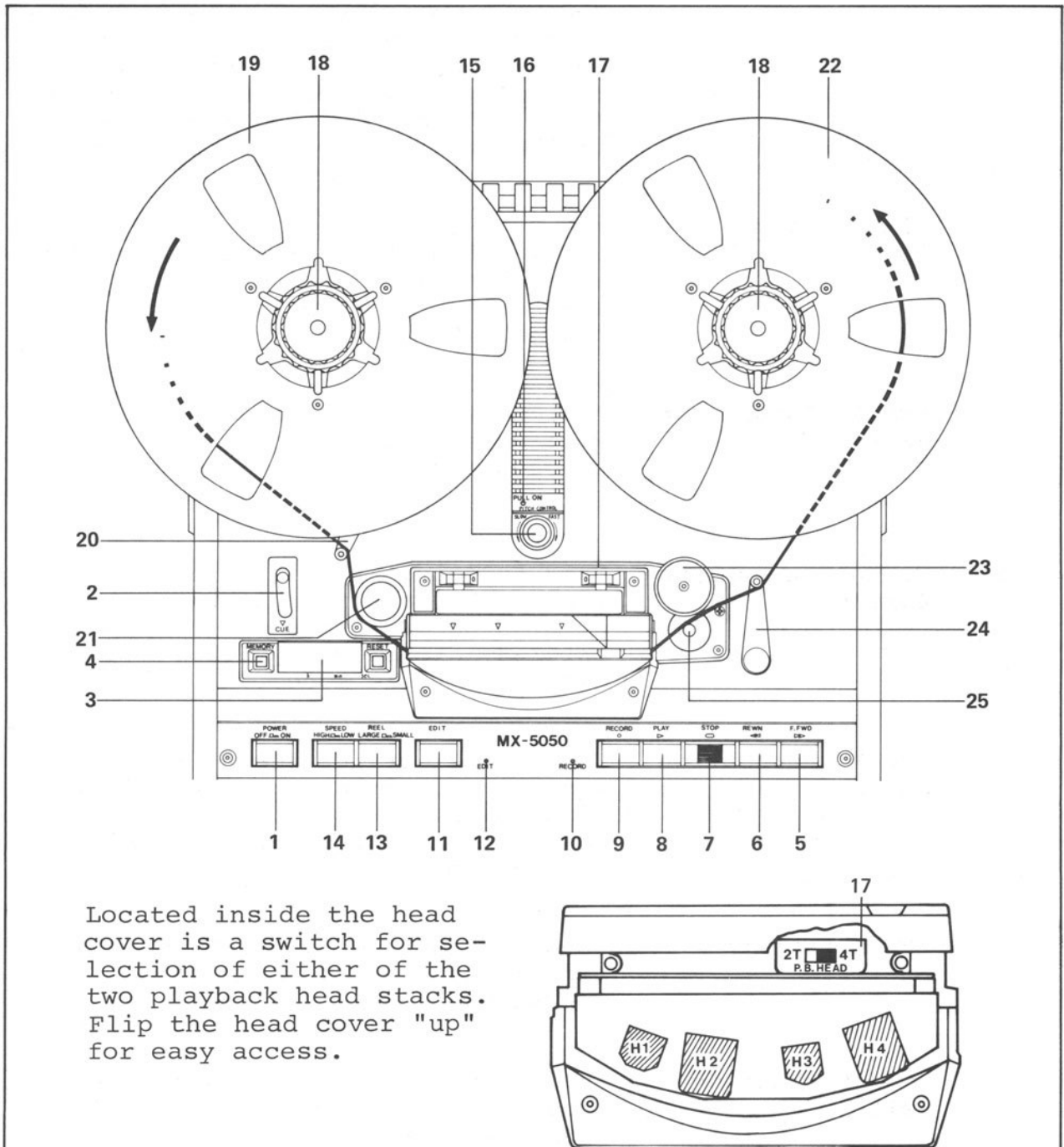
If you prefer "transformer type balanced circuits" optional accessories ZA-53T (input) and ZA-53S (output) are available. Contact your nearest OTARI dealer or OTARI for further details.

SECTION III. OPERATION

This section of the manual provides a description of all operating controls and indicators and their use in the system, and step-by-step procedures for the various modes of operation.

3.1 CONTROLS AND INDICATORS

Table 3-1 Tape Transport Controls and Indicators



Index No.	Name	Function
1	POWER Pushbutton Switch	In the depressed position, power is applied to the equipment, and the VU meters illuminate.
2	CUE Lever	In the up position, the system operates normally. In the fast forward and rewind modes, moving the lever downward permits variable control of the tape lifter to enable audio monitoring. The lever locks in the full down position.
3	Elapsed Time Indicator	A C.P.U. controlled LED display of elapsed tape time in hours, minutes, and seconds, ± 9 hr. 59 min. 59 sec. max. The pushbutton resets the display to (0.00.00).
4	MEMORY Pushbutton Switch	Depress this switch and the MX-5050B will enter the STOP mode when the elapsed time indicator displays (-0.00.00) in the rewind mode.
5	F. FWD Pushbutton Switch	Used to select the fast forward mode to run the tape from left to right at high speed. This mode may be entered into from any other mode except the edit mode.
6	REWIND Pushbutton Switch	Used to select the rewind mode to run the tape from right to left at high speed. This mode may be entered into from any other mode except the edit mode.
7	STOP Pushbutton Switch	Used to stop the tape transport and cancel the existing mode of operation.
8	PLAY Pushbutton Switch	Used to select the play mode, or used in conjunction with the RECORD pushbutton switch.

- 8 (Continued) Pressing the PLAY pushbutton during the fast forward or rewind modes stops the tape, then automatically starts the play mode.
- 9 RECORD Pushbutton Switch Used in conjunction with the PLAY pushbutton switch and the RECORD channel selector. With the desired channel pushbutton switches depressed, simultaneously pressing the PLAY and RECORD pushbuttons initiates the record mode and the red indicator illuminates. In the play mode, when the RECORD pushbutton is pushed, the unit enters the record mode. (This is called "Punch in".) In the record mode, when the PLAY pushbutton is pushed, the unit enters the reproduce mode. (This is called "Punch out".) Punch in and Punch out are used for overdubbing in conjunction with the sel. rep. function.
- 10 Record Indicator (red) Used to indicate the record mode.

Transport record indicator	Amplifier record indicator	Transport	Recording
dark	dark	non rec. mode	x
blinks	illuminated	non rec. mode	x (ready)
remains illuminated	dark	rec. mode	x
	illuminated	rec. mode	o

Blinking means that the amplifier is in the record-ready mode. Recording is being carried out when the record indicators of both the amplifier and the transport remain illuminated.

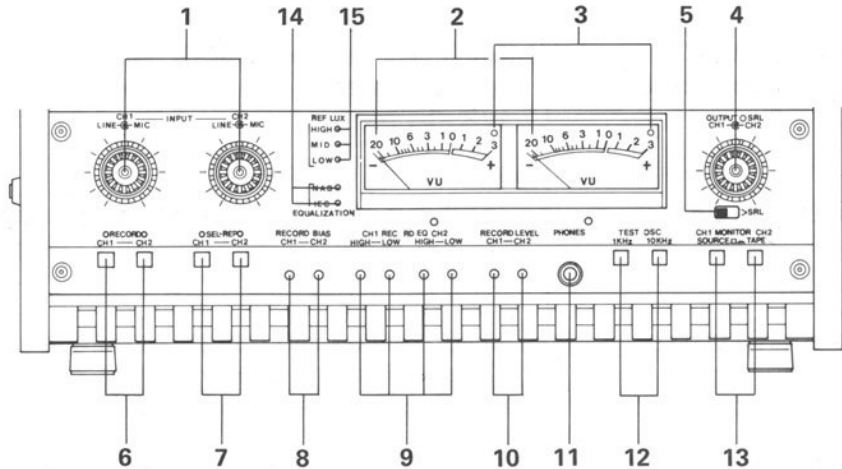
- 11 EDIT Pushbutton Switch Used to initiate the edit mode to aid in cutting out unwanted tape.

11	(Continued)	When the EDIT pushbutton is depressed the green indicator illuminates and power is disconnected to the takeup reel. When the play pushbutton switch is then depressed it causes the supply reel to rotate and tape to spill off on the takeup side of the transport. Other operations are halted.
12	EDIT Indicator (green)	Illuminates when the EDIT pushbutton switch is depressed.
13	Large/Small REEL Pushbutton Switch	An alternate-action pushbutton switch used to select the supply and takeup-reel tape tension for either large or small reel-diameter hubs. Place the pushbutton in the "in" (Small position) for reels with EIA hubs (2-1/4 inch hubs). Place the pushbutton in the "out" (Large position) for reels with NAB hubs (4-1/2 inch diameter hubs). (THE SAME SIZE REELS SHOULD BE USED ON BOTH TURNTABLES.)
14	HIGH/LOW Speed Pushbutton Switch	An alternate-action pushbutton switch used to select operating speeds. (15/7.5 ips) When machine is converted to a low speed version, this switch selects tape speeds of 7-1/2 ips or 3-3/4 ips. Refer to page 5-1 for conversion procedure.
15	PITCH CONTROL	Used to control tape speed. The capstan's speed can be controlled within $\pm 7\%$ of the selected speed. When the PITCH CONTROL knob is pulled out and turned clockwise, capstan speed increases. When pulled out and turned counterclockwise, capstan speed decreases. PITCH CONTROL FUNCTIONS IN BOTH THE RECORD AND PLAY MODES.
16	PITCH CONTROL Indicator (red)	Lights when the PITCH CONTROL switch is pulled out (Variable).

17	Reproduce Head Selector Switch	Used to select the appropriate reproduce head stack to conform to the type of tape to be reproduced. (Refer to Sec. 1.1.3.)
18	NAB Hub Reel Hold Down Knobs	Used to attach EIA or NAB hub reels to the reel table. (Refer to Sec. 3.2.1.)
19	Supply Reel	Used to supply tape for reproduction or recording.
20	Tension Arm	Used to eliminate tape tension fluctuations.
21	TACHO Pulse Generator Roller	Used to generate the pulses for the elapsed time indicator.
22	Takeup Reel	Used to take up tape.
23	Pinch Roller	Used to correctly transmit the rotation of the capstan to the tape.
24	Tension Arm with Safety Switch	Used to eliminate tape tension fluctuations. When tape is exhausted, supply and takeup reel rotation is automatically stopped by the safety switch attached to the tension arm.
25	Capstan Shaft	The shaft used to keep speed constant while in the reproduce and record modes.

Table 3-2 shows the location and function of each control and indicator on the record/reproduce electronics control panel.

Table 3-2 Record/Reproduce Electronics Controls and Indicators



Index No.	Name	Function
1	LINE/MIC INPUT Level Control	Used to control the recording level line input (outside knob) and microphone (inside knob) of the corresponding channel.
2	VU Meters	Indicate the record and playback level of the corresponding channel depending on the mode of operation and position of the MONITOR SOURCE/TAPE switch (Index No. 13 in this table). The meters are illuminated when the recorder is turned on.
3	Peak Indicators (red)	Used to show signal peaks. When the input signal exceeds the standard level by 15 dB, the peak indicator lights. At a frequency of 700 Hz, the magnetic flux at the standard level is 185 nWb/m. When the peak indicator lights, the level is 1040 nWb/m. This trigger level may be adjusted.

4	OUTPUT Level Controls	Used to control the playback level of the corresponding channel. (Control is deactivated when the SRL switch is in the "SRL" position.)														
5	SRL Switch and Indicator (red)	<p>In the "SRL (Standard Reference Level)" position, the red indicator is illuminated. The playback level is then determined by an internal preset potentiometer. The SRL can be selected by the Record level switch on the rear panel as follows:</p> <table border="1" data-bbox="776 676 1451 1104"> <thead> <tr> <th rowspan="2">RECORD LEVEL</th> <th colspan="2">Standard Reference Level</th> </tr> <tr> <th>Flux Level</th> <th>Based on</th> </tr> </thead> <tbody> <tr> <td>L</td> <td>185 nWb/m</td> <td>Ampex Operating level</td> </tr> <tr> <td>M</td> <td>250 nWb/m</td> <td>MRL reference fluxivity of 250 nWb</td> </tr> <tr> <td>H</td> <td>320 nWb/m</td> <td>BASF or MRL IEC reference level</td> </tr> </tbody> </table> <p>In the normal position, the reproduce level is controlled by the OUTPUT controls of the corresponding channel.</p> <p>DO NOT TURN THIS SWITCH OFF UNLESS YOU TURN THE LINE OUTPUT LEVEL CONTROLS (INDEX NO. 4 IN THIS TABLE) DOWN TO THE MINIMUM LEVEL WHILE A SIGNAL IS BEING OUTPUT TO OTHER EQUIPMENT, TO PREVENT POSSIBLE DAMAGE.</p>	RECORD LEVEL	Standard Reference Level		Flux Level	Based on	L	185 nWb/m	Ampex Operating level	M	250 nWb/m	MRL reference fluxivity of 250 nWb	H	320 nWb/m	BASF or MRL IEC reference level
RECORD LEVEL	Standard Reference Level															
	Flux Level	Based on														
L	185 nWb/m	Ampex Operating level														
M	250 nWb/m	MRL reference fluxivity of 250 nWb														
H	320 nWb/m	BASF or MRL IEC reference level														
6	RECORD Selector Switch and Indicator (red)	Used to select channels for recording, and used in conjunction with the PLAY and RECORD pushbutton switches (Index Nos. 8 and 9 of Table 3-1). In the "out" position this switch prevents activation of the channel record mode.														

6	(Continued)	In the "in" position it permits the channel record mode to be entered into and the red indicator is illuminated.
7	SEL/REP Selector Switch and Indicator	In the SEL. REP. (Selective Reproduction) "out" position, the signal on the tape is reproduced normally. In the SEL/REP "in" position, the green indicator is illuminated and the signal on the tape is reproduced by the record head (rather than by the reproduce head) to permit recording on one channel to synchronize with the other channel.
8	RECORD BIAS Adjustment Control	Used to adjust the amplitude of the bias current in accordance with the tape being used for optimum performance. Used in conjunction with the Test OSC function (Index No. 12 in this table).
9	RECORD EQ Adjustment Control	Used to adjust record equalization of corresponding channels and speed modes (HIGH or LOW).
10	RECORD LEVEL Adjustment Control	Used to make fine adjustments when different types of tape are to be used.
11	PHONES Jack	Receptacle for headphones. Used to monitor the input or output signal as selected by the Monitor SOURCE/TAPE selector switch (Index No. 13 in this table). (Load impedance: 8 ohms or greater)
12	TEST OSC Push-button Switch	When the left button is held down, a 1 kHz Test tone is generated and fed to the line input circuit. The right button (which locks down) generates a 10 kHz tone. These tones are used for cue tone recording and Record Bias adjustment (Index No. 8 of the table).

13	MONITOR SOURCE/ TAPE Switch	In the "out" (SOURCE) position, the input signal is fed to the LINE OUT connectors, the PHONES jack, the VU meters, and the peak indicators. In the "in" (Tape) position, the signal being reproduced is fed to the LINE OUT connectors, the PHONES jack, VU meters, and the peak indicators.
14	EQ Selection Indicator	Located on the amplifier front panel are 2 LED EQ Selection Indicator Displays which indicate the position of the NAB or IEC EQ switch which is located on the back of the unit.
15	Record Level Selection Indicator	Located on the front amplifier front panel are 3 LED Record Level Selector Indicator Displays which indicate the position of the Record Level Selector switch which is located on the back of the unit.

3.2 OPERATING INFORMATION

3.2.1 USE OF THE REEL HOLD DOWN KNOBS

NAB hub reel hold down knobs are used as follows:

When an EIA hub (2-1/4 inch diameter hub) is used;

- (1) Remove the NAB reel hold down knob by turning the inner knob counterclockwise.
- (2) Place the reel on the reel table.
- (3) Place the reel hold down knob on the reel and fix it by turning the inner knob clockwise.

When an NAB hub (4-1/2 inch diameter hub) reel is used;

- (1) Place the reel hold down knob on the reel table and lock it by turning the inner knob clockwise.
- (2) Place the NAB hub reel on to the reel table and fix it by pulling and turning the outer knob.

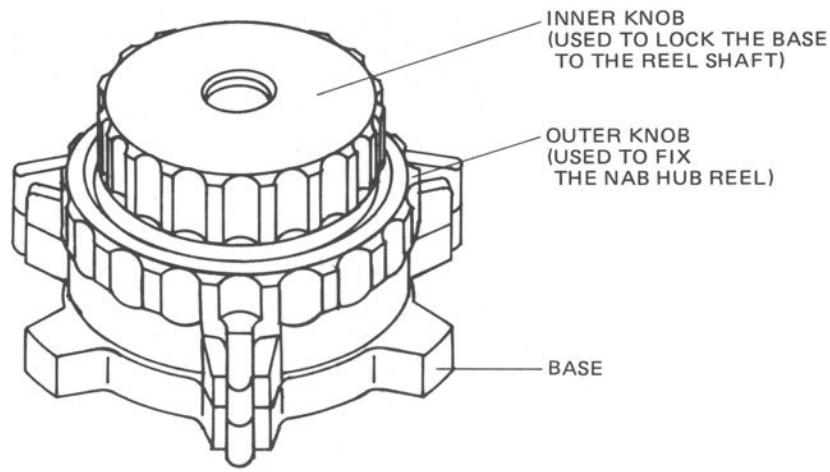


Fig. 3-1 Reel Hold Down Knobs

3.2.2 PRE-OPERATING PROCEDURE

After the equipment has been installed, as described in Sec. 2 of this manual, and the operator has become familiar with all the operating controls and indicators, described in Tables 3-1 and 3-2, prepare the recorder for operation as follows.

- (1) Place the POWER switch in the "on" position. The VU meter lights will illuminate.
- (2) If metal reels are to be used, use reel-adjusting discs (shims) between the reels and the turntables. Place a reel of tape on the supply (left-hand) turntable. Note that the reel must turn counterclockwise as tape is pulled off the reel. Place the same size empty reel on the takeup (right-hand) turn-table.
- (3) Thread the tape as shown in Fig. 3-2, and place the end of the tape in the slot of the empty reel.
- (4) Set the HIGH/LOW SPEED switch to the desired tape speed.
- (5) Set the LARGE/SMALL REEL switch to conform to the size of the reel hub diameter being used. Place the switch to the "out" (LARGE position) for NAB hubs (4-1/2 inch diameter) or to the "in" (SMALL position) for EIA hubs (2-1/4 inch diameter). (THE SAME SIZE REELS SHOULD BE USED ON BOTH TURN-TABLES.)

- (6) Set the reproduce head selector switch (Index No. 17 in Table 3-1) to the appropriate position as determined by the track format of the tape to be reproduced.
- (7) If desired, connect a headset or monitor speaker/amplifier to the PHONE jack.

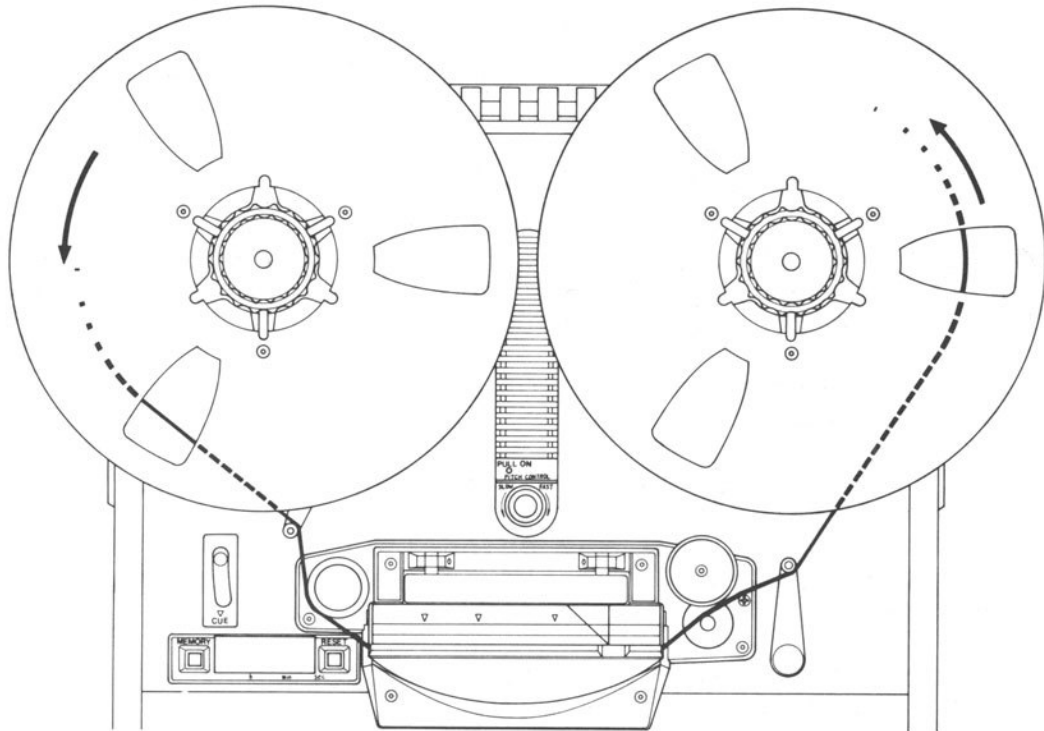


Fig. 3-2 Tape Threading

3.2.3 REPRODUCTION

To reproduce, proceed as follows:

- (1) Perform all steps in the pre-operating procedure.
- (2) Set the channel RECORD selector switch(es) to the "out" position.
- (3) Set the reproduce head selector switch to its appropriate position.
- (4) Set the channel MONITOR selector switches to their TAPE "in" positions.
- (5) Press the PLAY pushbutton to begin reproducing the pre-recorded tape.

- (6) Adjust the channel OUTPUT level control(s) for the desired output level or set the SRL switch to the "SRL" position.
- (7) When the desired program has been reproduced, press the STOP pushbutton.

3.2.4 NORMAL RECORDING

To record normally, proceed as follows:

- (1) Perform all steps in the pre-operating procedure.
- (2) Set the desired RECORD selector switches to the "in" position for the channel(s) selected for recording. The corresponding red indicator(s) will illuminate to indicate the selected channel(s). Simultaneously the tape transport RECORD indicator will begin to blink.
- (3) Set the corresponding MONITOR SOURCE/TAPE switch to the "out" (SOURCE) position.
- (4) Adjust the corresponding LINE/MIC INPUT level control(s) so that the VU meter(s) indicates 0 for most audio peaks. (It is advisable to adjust the channel input levels so that the peak indicator lamps, located in the VU meter housings, blink occasionally.)
- (5) Push the elapsed time indicator pushbutton to reset the display to (0.00.00).
- (6) Press the PLAY and RECORD pushbuttons simultaneously to start recording on the selected channel(s). The tape transport RECORD indicator will cease blinking and instead will remain illuminated.
- (7) While recording, the input signal of each channel can be compared with the signal reproduced on each channel by pressing the MONITOR switch to the "in" (TAPE) position.
- (8) After recording is completed, but while still in the record mode, once again press the PLAY pushbutton to enter directly into the play mode without stopping the tape transport (punch out).
After punching outs, if desired, press the RECORD pushbutton to enter directly into the record mode without stopping the tape transport (punch in). If further recording is not necessary, press the STOP pushbutton to stop tape motion and deactivate the record mode.

3.2.5 RECORDING WITH SELECTIVE REPRODUCTION

The selective reproduction function causes the reproduced audio to be derived from the record head rather than from the reproduce head. This permits a recording to be made on another channel synchronized (in phase) with the channel being reproduced. To record with selective reproduction, proceed as follows.

- (1) Perform all steps in the pre-operating procedure.
- (2) Perform all steps in the normal recording procedure for the channel to be recorded.
- (3) Rewind the tape to the point where selective reproduction is to begin.
- (4) Set the selective reproduction (SEL/REP) switch to the "in" position for the channel to be monitored while the recording is being made.
- (5) Set the RECORD selector switch to the "in" position for the channel to be recorded.
- (6) Set the MONITOR selector switch to the "in" (Tape) position for the channel being monitored.
- (7) Set the MONITOR selector switch to the "out" (Source) position for the channel to be recorded.
- (8) Adjust the LINE/MIC INPUT level control so that the VU meter indicates 0 for most audio peaks. (It is advisable to adjust the channel output levels so that the peak indicator lamps, located in the VU meter housings, blink occasionally.)
- (9) Press the PLAY pushbutton to start tape motion. At the point where overdub is desired press the RECORD pushbutton to start recording on the selected channel(s).
- (10) When recording is complete, press the STOP pushbutton to stop tape motion and deactivate the record mode, or punch-out by pressing the PLAY pushbutton.

- NOTES:
1. If this unit is a full-track model, the SEL. REP. function is not included.
 2. The pitch control is used to finely adjust one track with another track(s). It can be used in both the Record and Reproduce modes.
 3. The SEL. REP. mode has priority over the Record mode in this unit. (While the SEL. REP. pushbutton(s) is (are) pushed, the corresponding channel(s) can not enter the record mode.)

3.2.6 FAST WINDING

For fast-winding operations, and for editing or cueing, press the F. FWD. or REWIND pushbutton as appropriate. These pushbuttons can be pressed alternately without having to press the STOP pushbutton between fast-winding operations. These modes may be entered into from any other mode except the edit mode. Pressing PLAY during a fast-winding mode causes the tape to automatically come to a stop and then enter into the play mode. In a fast-winding mode, the tape lifters are automatically actuated and lift the tape away from the heads. To monitor the tape in a fast-winding mode, the position of the tape lifters can be varied by operation of the CUE lever. Thus the distance of the tape from the heads may be varied to control the signal level from the tape.

3.2.7 EDITING AND SPLICING TAPE

For editing and splicing operations, the CUE lever can be used in fast-winding modes to quickly locate the desired program material. In addition, there is an EDIT mode of operation, used as follows:

Depressing the EDIT pushbutton while in the play mode removes power from the takeup reel and causes the tape to be spilled off on the takeup side of the transport. This mode is used to facilitate cutting out unwanted tape. The edit mode can also be entered into from the stop mode by pressing the PLAY pushbutton while the EDIT pushbutton is in its depressed position.

The tape-splicing block (Fig. 3-3) mounted on the head cover can be used to hold the tape for ease in cutting the tape with a single-edged razor blade and applying splicing tape. Use 7/32-inch wide splicing tape (3M Co., No. 41). Never use cellophane tape. The tape splicing block has the following features:

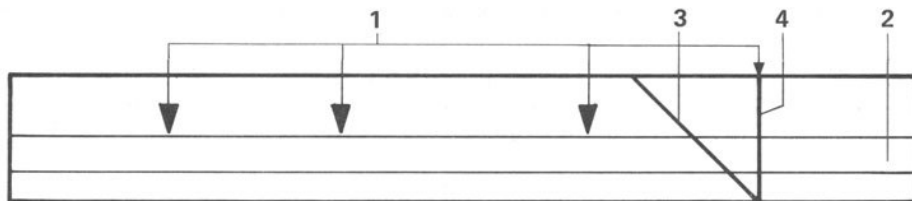


Fig. 3-3 Tape Splicing Block

- 1 Head-stack indicator marks: Indicates location of the individual head stacks.
- 2 Tape-guide channel: Holds the tape for ease of cutting and splicing.
- 3 45° cutting guide : Used to guide tape cutter for a diagonal cut.
- 4 90° cutting guide : Used to guide tape cutter for a vertical cut.

SECTION IV
PREVENTIVE MAINTENANCE AND ADJUSTMENTS

This section provides information on preventive maintenance and adjustments, including routine maintenance and normal mechanical/electronic adjustment procedures which should be carried out at the recommended times to maintain optimum performance.

4.1 TEST AND MAINTENANCE EQUIPMENT REQUIREMENTS

The test and maintenance items listed in Table 4-1 are required for the performance of the maintenance procedures. Equivalent items may be substituted for the ones suggested in the table.

Table 4-1 Test and Maintenance Items

Item	Suggested Model	Used for
Head Cleaner	Otari ZA-51B	Cleaning the heads.
Isopropyl Alcohol	Any (Otari Cleaning Kit ZA-51B contains the above cleaning materials.)	Cleaning the tape guides, capstan, and capstan pinch roller.
Head Demagnetizer	Any	Demagnetizing the heads and tape guides.
Lubricating Oil	Otari Lubricating Oil PZ9E003	Lubricating the capstan of the DC servo control motor.
Reproduction Alignment Tape	NAB 3-3/4 ips: MRL 21T204 7-1/2 ips: MRL 21J205 15 ips: MRL 21L221 IEC 7-1/2 ips: MRL 21T102 15 ips: MRL 21J103	Setting the operating standard reference levels, and adjusting frequency response.

Audio Oscillator 20 to 20 kHz	Hewlett-Packard 204C or 209D	Setting record equalization
AC Voltmeter	Hewlett-Packard 400L or 400FL	Setting record and playback frequency response

4.2 PREVENTIVE MAINTENANCE

For optimum performance, cleaning and demagnetizing should be performed after every eight hours of operation, and lubrication should be carried out at the recommended times as indicated below.

4.2.1 CLEANING

Oxide particles from the magnetic tape tend to collect on components in the tape path and degrade the performance of the recorder. The heads and all other components in the tape path must be cleaned after every eight hours of operation, or more frequently if visual inspection indicates cleaning is required. To clean the head assembly, proceed as follows:

- (1) Lift the head cover as illustrated in Fig. 4-1.
- (2) Clean each head stack thoroughly with a cotton-tipped applicator dampened with head cleaner.

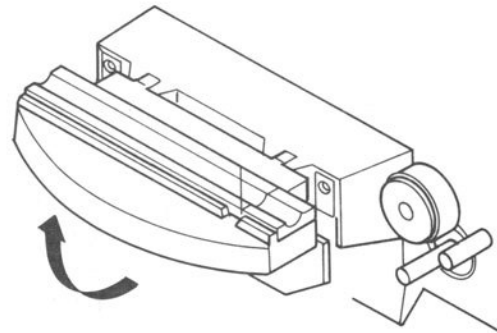


Fig. 4-1 Lifting the Head Cover

CAUTION: WHEN CLEANING THE HEADS, USE ONLY THE RECOMMENDED SOLVENT (HEAD CLEANER) TO AVOID DAMAGING THE HEADS. KEEP THE HEAD CLEANER AWAY FROM PLASTIC FINISHES AND THE CAPSTAN PINCH ROLLER. DO NOT USE METAL TOOLS THAT CAN SCRATCH THE HEADS.

- (3) Use isopropyl alcohol to clean all tape guiding components including the capstan shaft and the rubber capstan pinch roller.

4.2.2 DEMAGNETIZING

The heads and tape guiding components in the tape path should be demagnetized after every eight hours of operation. These components can acquire permanent magnetization that increases signal noise and distortion, and partially erase high frequencies on recorded tape. Use a hand-held demagnetizer to demagnetize all components in the tape path as follows:

(1) Turn the unit's power off and remove any recorded tape near the transport. The tape could be partially erased by the demagnetizer.

(2) Lift the head cover as illustrated in Fig. 4-1.

(3) Cover the demagnetizer tips with adhesive tape to prevent scratching the head stacks.

(4) With the demagnetizer held away from the transport, connect the demagnetizer to a power source.

(5) Move the demagnetizer tips slowly close to the head, lightly touch the face of one head stack and slowly move the tips up and down the stack several times. Then slowly withdraw the demagnetizer as shown in Fig. 4-2.

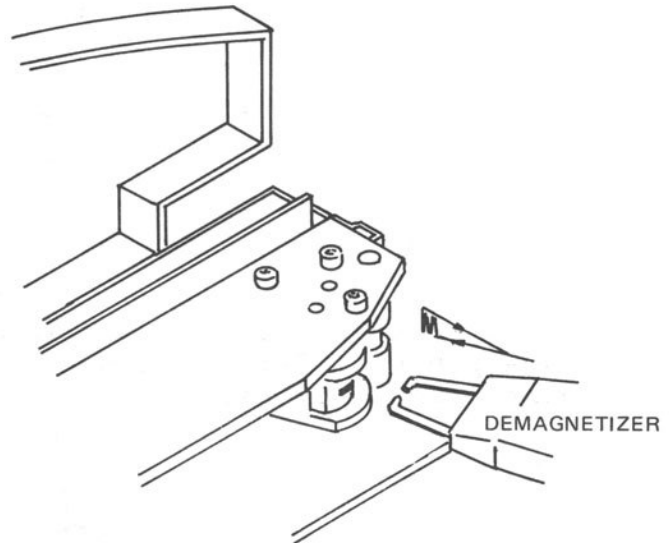


Fig. 4-2 Demagnetizing

(6) Repeat step (5) for each head stack.

(7) Repeat the procedure in step (5) for each guide and other metallic parts in the tape path.

(8) Move the demagnetizer slowly away from the transport at least three feet, and then disconnect the power from the demagnetizer.

4.2.3 LUBRICATION

The only component requiring lubrication is the capstan.

Lubricate the capstan every four months, or after each 1,000 hrs. of operation (whichever occurs first), or as required using the recommended lubricating oil (Table 4-1). For lubrication, proceed as follows, referring to Fig. 4-3:

- (1) Remove the pinch roller cap by turning the cross-head screw counterclockwise.
- (2) Remove the pinch roller from the pinch roller shaft.
- (3) Remove two screws attaching the head housing cover to the tape deck. Remove the head housing cover.
- (4) Remove three screws that hold the lower head cover (skirt) to the deck panel. Remove the cover.
- (5) Remove the metal dust cap from the capstan shaft by turning it counterclockwise.
- (6) The felt collar should now be visible. Apply two or three drops of oil onto this felt collar. Please do not over-lubricate.
- (7) Wipe off any excess oil and replace the dust cap. Also replace pinch roller and pinch roller cap after replacing lower head cover (skirt) and head housing cover.

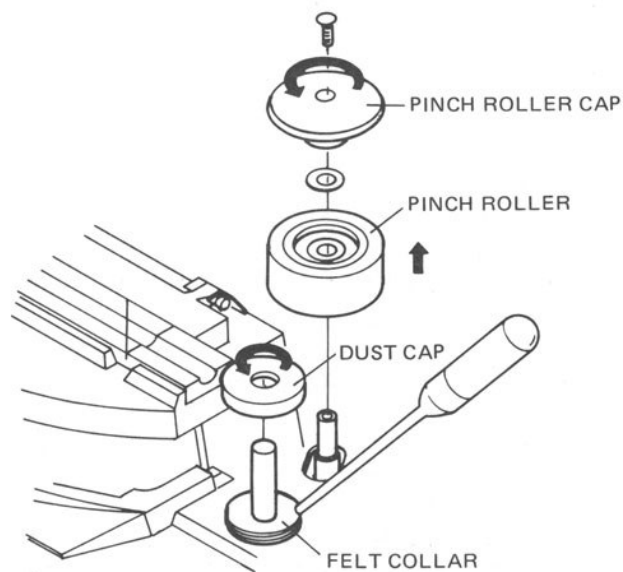


Fig. 4-3 Lubrication

4.3 ELECTRONIC ALIGNMENT

Electronic alignment consists of setting the record bias, and setting the record equalization and record level. Note that the reproduction adjustments must be performed before making the recording adjustments. These electronic adjustments should be performed at regularly scheduled intervals, and when changing from one type of recording tape to another.

4.3.1 RECORD BIAS ADJUSTMENT

For optimum performance, biasing should be done using the type of tape that will normally be used. To set the bias level, carry out the following procedure for each channel.

- (1) Thread bulk-erased tape on to the recorder.
- (2) Set the SRL calibration switch to the SRL position. Set the SPEED switch to the "7-1/2" position.
- (3) Start the tape in the record mode.
- (4) Press the 1 kHz TEST OSC pushbutton and set the record level control for a 0 reading on the VU meters.
- (5) Adjust the RECORD BIAS adjustment trim pot for a maximum reading on the VU meters.

4.3.2 RECORD LEVEL ADJUSTMENT

- (1) Set the Record level switch to the "H", "M", or "L" position according to the tape being used or the equalization standard.
- (2) Thread bulk-erased tape on to the recorder.
- (3) Set the SRL calibration switch to the "SRL" position and the Monitor switch to the "SOURCE" position.
- (4) While pressing the 1 kHz TEST OSC pushbutton, adjust the line input levels so that the VU meters indicate 0 VU.
- (5) Change the mode of the Monitor switch from "SOURCE" to "TAPE".
- (6) Start the tape in the record mode, and adjust the appropriate RECORD LEVEL adjustment trim pot so that the VU meter indicates 0 VU.

4.3.3 RECORD EQUALIZATION ADJUSTMENT

Set the record equalization for each speed and each channel as follows:

- (1) Thread bulk-erased tape on to the recorder.
- (2) Connect an audio oscillator to the INPUT of the recorder and set the oscillator's frequency to 1 kHz.
- (3) Set the SRL switch to the "SRL" position.
- (4) Start the tape in the record mode.
- (5) For the 15 ips tape speed, adjust the record levels so that the VU meters indicate 0 VU. For the 3-3/4 and 7-1/2 ips tape speeds, set the record levels so that the VU meters indicate -10 VU. Next, set the SRL switch to its normal position and adjust the OUTPUT level controls so that the VU meters indicate 0 VU.
- (6) Change the audio oscillator's output to 10 kHz.
- (7) As a preliminary setting, adjust the appropriate low or high speed equalizer so that the VU meters indicate 0 VU.
- (8) Check the response above and below 10 kHz and trim the record equalizer for the response desired.

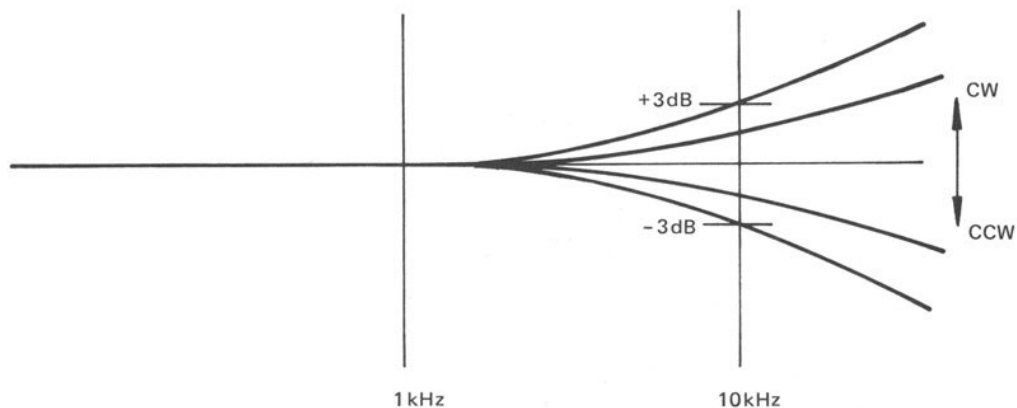


Fig. 4-4 Record Equalization Adjustment

SECTION V. SPEED CONVERSION

The MX-5050BII series units can be operated at 3 tape speeds. The "high" setting is for 15 and 7-1/2 ips, and the "low" setting is for 7-1/2 and 3-3/4 ips. The conversion procedure requires only that you switch the speed selection switch and adjust the tape speed.

We also recommend that you re-adjust the amplifier to obtain optimum performance.

5.1 SPEED CONVERSION PROCEDURE

- (1) Remove the 6 screws attaching the rear panel to the tape deck. Remove the panel.
- (2) Remove the 4 allen screws that hold the right side panel to the frame. Remove the panel.
- (3) The speed selection switch is located on the big P.C.B. Ass'y as illustrated Fig. 5-2.
- (4) Slide the switch to L for 7-1/2 and 3-3/4 or H for 15 and 7-1/2 ips.
- (5) Put a speed reference tape for the speed selected on the transport.
- (6) Play the tape and measure the frequency of the output signal with a frequency counter.
- (7) Adjust the appropriate pot on the servo P.C.B. Ass'y near the capstan motor, as illustrated Fig. 5-3, to obtain the reference speed frequency.
- (8) Re-install the side and rear panels.

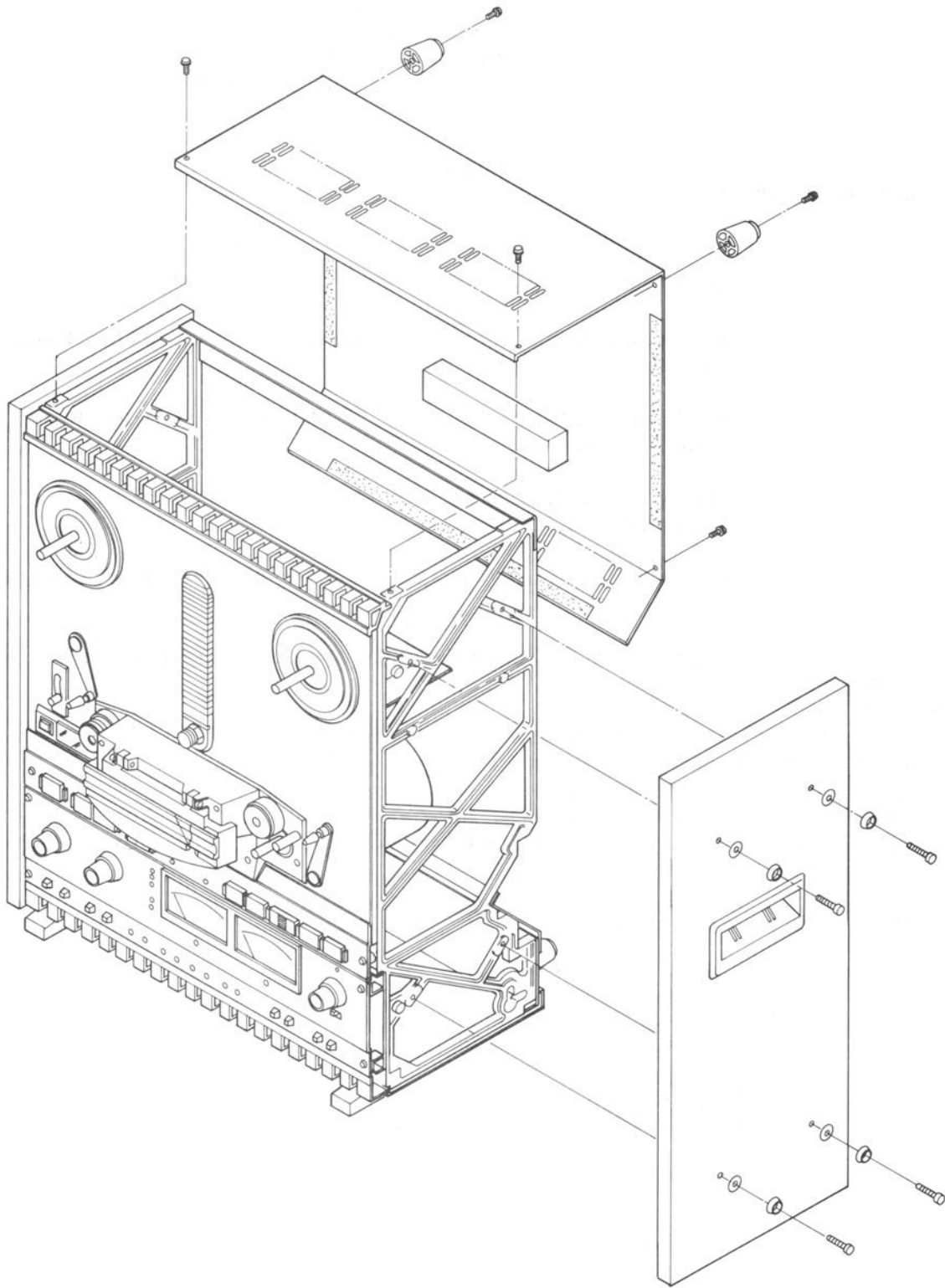


Fig. 5-1 Rear Panel and Side Board Removal

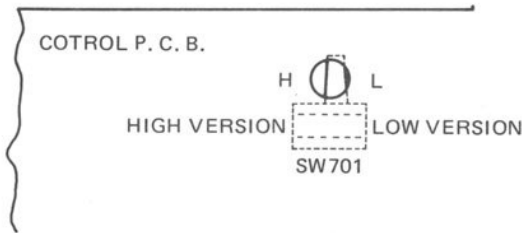


Fig. 5-2 Location of Tape Speed Conversion Switch

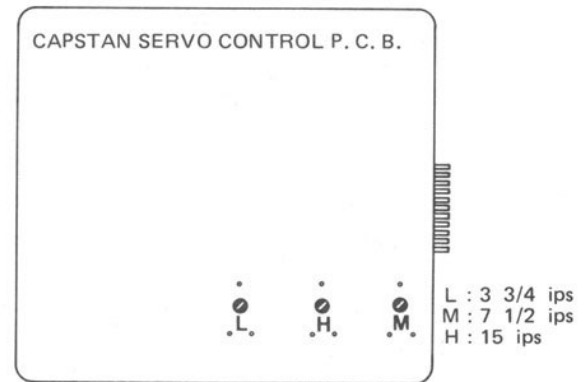


Fig. 5-3 Capstan Servo Control P.C.B.

5.2 ACCESS TO THE AMPLIFIER

When capstan speed is converted the amplifier should be re-tuned for the new speeds to obtain optimum performance. Here the access to the amplifier is described. Please refer to the illustration. Also refer to the manual for adjustment.

- (1) Remove the 4 screws marked A from the bottom panel and remove the bottom panel (marked B).
- (2) Remove the 2 screws marked C in Fig. 5-2. Also remove the 2 screws marked D.

* Normally these "D" screws need not be removed for re-adjustment. All adjustments can be made on the bottom of the amplifier.

Then pull the amplifier section up and rotate it toward you.

- (3) Referring to Fig. 5-3, the location of all the pots and switches are illustrated and are explained in the list following.
This gives you convenience in adjusting the amplifier.

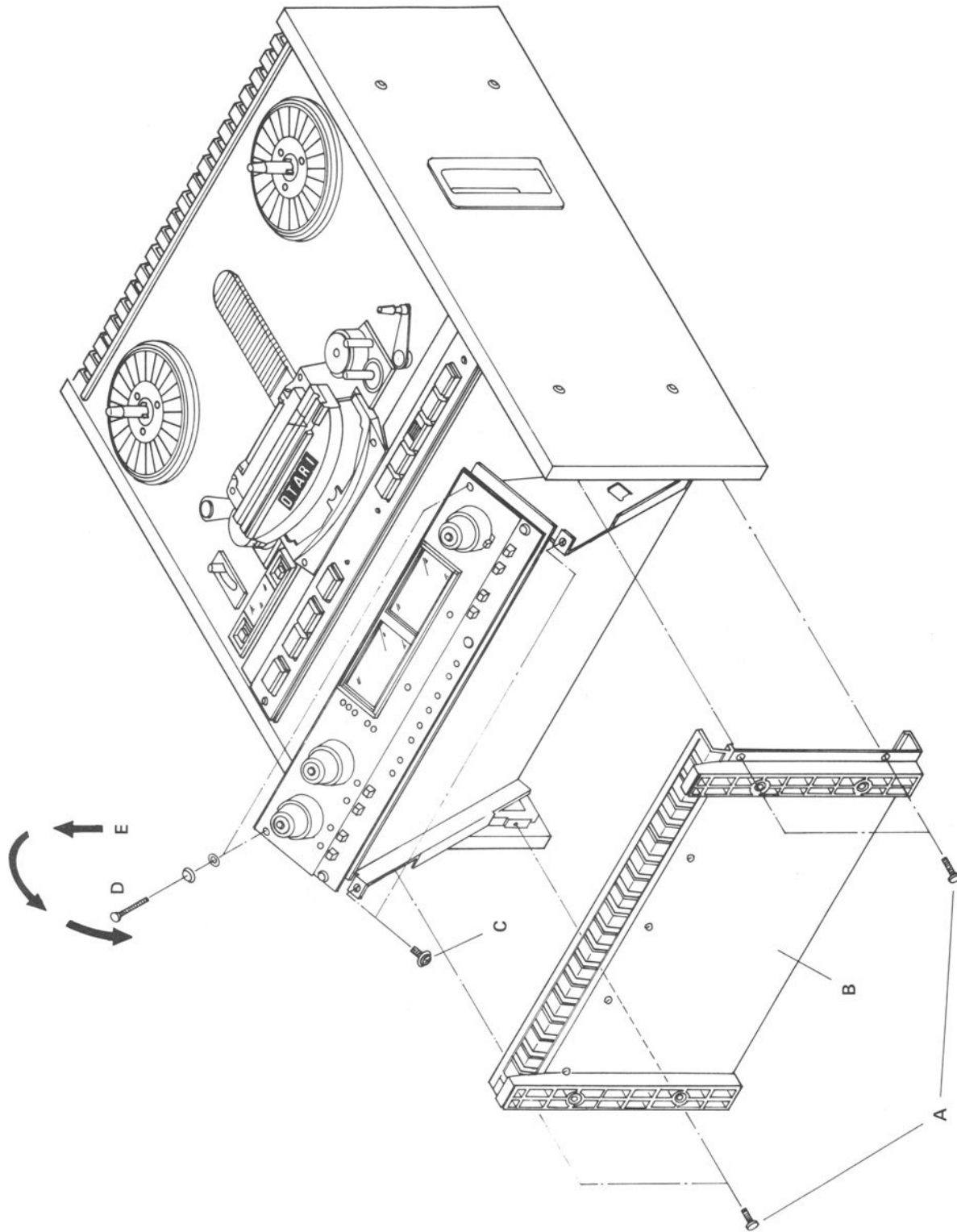


Fig. 5-2 Access to the Amplifier

5.3 PATTERN LAYOUT

The following are the pattern layout and the list of the main parts for adjustment on the amplifier P.C.B. Ass'y. The amplifier P.C.B. Ass'y is accessible as described at Sec. 5.2. This layout gives you the necessary information to adjust the amplifier.

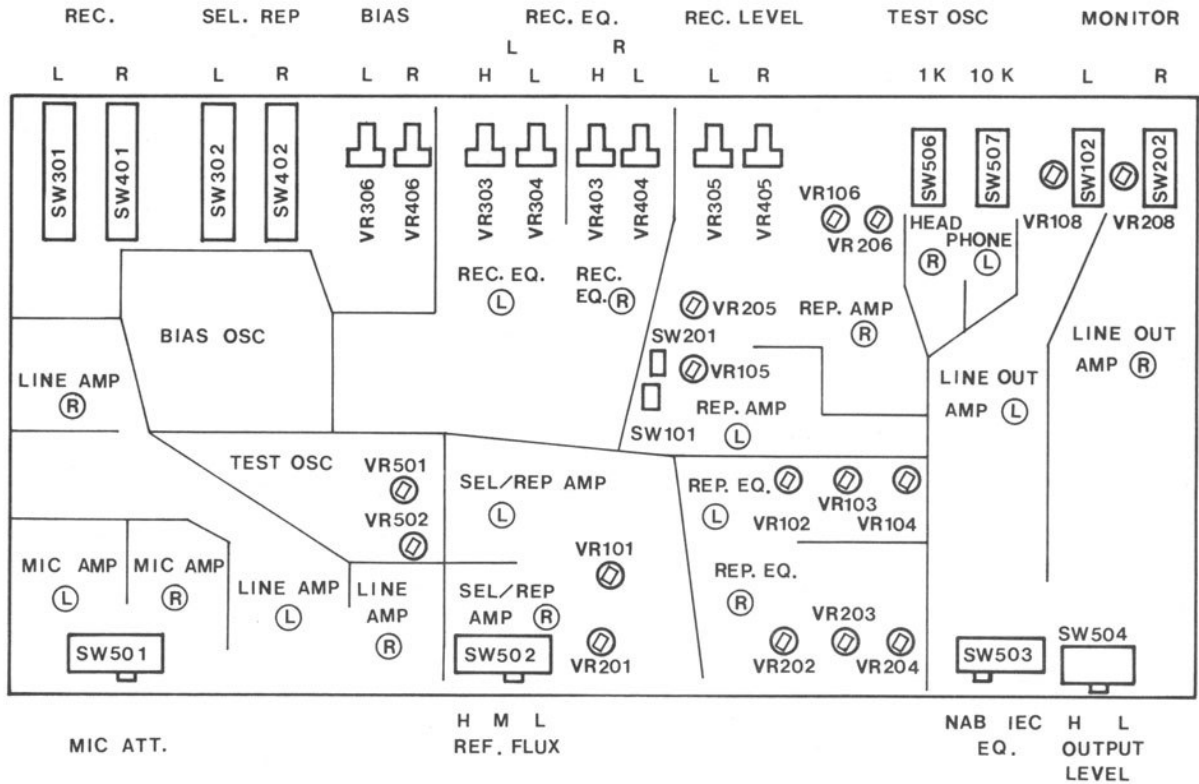


Fig. 5-3 Pattern Layout

LIST OF THE MAIN PARTS FOR ADJUSTMENT OF AMPLIFIER

<u>Ref. No.</u>		<u>Ref. No.</u>	
SW301	RECORD Selection LCH	VR106	SRL LEVEL (REP) LCH
SW401	RECORD Selection RCH	VR206	SRL LEVEL (REP) RCH
SW302	SEL/REP Selection LCH	VR108	SOURCE LEVEL LCH
SW402	SEL/REP Selection RCH	VR208	SOURCE LEVEL RCH
SW506	TEST OSC 1 kHz	VR501	10 kHz TEST OSC LEVEL
SW507	TEST OSC 10 kHz	VR502	1 kHz TEST OSC LEVEL
SW102	MONITOR Selection LCH	VR101	SEL/REP SRL ADJ. LCH
SW202	MONITOR Selection RCH	VR201	SEL/REP SRL ADJ. RCH
SW501	MIC ATTENUATOR	VR205	LOW COMP. Pot RCH
SW502	RECORD LEVEL Selection	SW201	LOW COMP. Selection RCH
SW503	EQ (NAB or IEC) Selection	VR105	LOW COMP. Pot LCH
SW504	OUTPUT LEVEL Selection	SW101	LOW COMP. Selection LCH
VR306	BIAS Adjustment Pot LCH	VR102	REPRODUCE EQ Pot 15 ips LCH
VR406	BIAS Adjustment Pot RCH	VR103	REPRODUCE EQ Pot 7.5 ips LCH
VR303	RECORD EQ Pot LCH High Speed	VR104	REPRODUCE EQ Pot 3-3/4 ips LCH
VR304	RECORD EQ Pot LCH Low Speed	VR202	REPRODUCE EQ Pot 15 ips RCH
VR403	RECORD EQ Pot RCH High Speed	VR203	REPRODUCE EQ Pot 7.5 ips RCH
VR404	RECORD EQ Pot RCH Low Speed	VR204	REPRODUCE EQ Pot 3-3/4 ips RCH
VR305	RECORD LEVEL LCH		
VR405	RECORD LEVEL RCH		