Part No. OS3-135

OTARI®

MX-80

PROFESSIONAL RECORDER

OPERATION AND MAINTENANCE MANUAL

NINTH EDITION

Otari, Inc.

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Ed 9 (GK)

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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 so that 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 outlet 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 any 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 a 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 what is 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.

Table of Contents

Appendix Modification and Field Upgrades

Schematic Diagrams

Section 1 Introduction

This section contains general information about the MX-80 Series Multichannel Tape Recorder and about this manual.

1.1 Otari MX-80 Series Tape Recorders

The Otari MX-80 series machines are extremely versatile, high performance 8, 16, or 24 track recorder/reproducers using 1" or 2" wide tape and 10-1/2" NAB reels. The MX-80 series consists of eight machines, each having a different combination of tape speed pairs (7.5 and 15 ips or 15 and 30 ips) and track configurations (8 tracks, 16 tracks, or 24 tracks). **Table 1-1** describes the various configurations and model numbers.

Table 1-1
MX-80 Series Configurations

Tape Width	Tape Speed	Track Configuration	Model Number
1"	30 & 15 ips	8 tracks	MX-80-8-H
		16 tracks	MX-80-1-16H
	15 & 7.5 ips	8 tracks	MX-80-8-L
		16 tracks	MX-80-1-16L
2"	30 & 15 ips	16 tracks	MX-80-16-H
		24 tracks	MX-80-24-H
	15 & 7.5 ips	16 tracks	MX-80-16-L
		24 tracks	MX-80-24-L

The MX-80 series tape transport is fully microprocessor controlled to provide precision tape handling characteristics while maintaining the high degree of reliability long associated with the Otari line of professional tape recorders. The transport controls (PLAY, F.FWD, REWIND, STOP, CUE, EDIT/UNLOAD, etc.) direct commands to the microprocessor which, in turn, controls the activities of the capstan and reel servo circuits to provide the desired operating mode or function. The microprocessor provides two-level illumination for the transport control buttons, dim when "off", flashing when "ready" to perform a function, and bright when "active" after a function has been selected, giving confirmation of the operating mode to the operator.

The plug-in multi-track head assembly allows replacement of a head assembly without having to perform time-consuming height, wrap, and zenith adjustments. Only the azimuth adjustment need be verified whenever changing heads, or optimizing the alignment for a tape recorded on another tape recorder. The head assembly is equipped with a scrape flutter roller located between the record and reproduce head stacks. A head shield, which is manually moved up and down, is provided in front of the head stacks. The head shield rises automatically in PLAY and RECORD modes.

The capstan shaft is driven directly by a DC servo motor which is controlled by a quartz crystal-based phase-locked-loop servo system. A switch on the transport selects between the two operating speeds (7.5, 15 ips or 15, 30 ips). The speed mode switch on the Remote Control Unit (CB-140 or CB-151) selects between the three available speed modes; FIX — crystal controlled speed selected by the speed switch on the transport, VARI — variable speed +50%, and EXT — variable speed controlled by an external speed reference signal (9,600 Hz nominal).

Constant tape tension is provided by the reel motor servo circuit. The tape tension arms utilize non-contact photo-optical sensors to generate feedback signals for the Reel Control Printed Circuit Board (PCB). Constant tension is applied to the tape in all but Edit/Unload mode to insure fast, accurate, stress free tape handling. Motion sensing and accurate tape speed information are provided by the tachometer roller to the transport control circuits in the form of tach pulses. These tach pulses are also used to control the fast forward and rewind speeds, and to provide tape length information to the direct-reading Tape Timer.

Located in the pedestal portion of the MX-80, the audio section contains the Audio Control PCB, the Serial Remote Control PCB, the Audio Amplifier PCBs (8, 16, or 24), and the power supplies for; the various sections of the tape recorder. The Audio Control PCB contains the test signal jack (for application of a test signal to all channels simultaneously), a selector switch for high or low reference flux density and indicators showing the level selected, the bias switch which allows bias setting for two different tape formulations, EQ switch for selecting IEC or NAB equalizer, high/low select switch for output and input level, gapless function on/off switch, Dolby HX Pro* on/off switch and VU meter sensitivity selector switch.

The Serial Remote Control PCB contains two on/off switches for the selection of Stop Standby and Fast Standby modes (Refer to **§2.2.3**).

The Audio Amplifier PCBs each contain the record, reproduce, sel·rep, and bias electronics for one audio channel. Front panel adjustments are provided for record and reproduce equalization at both currently selected speeds, record, reproduce and sel·rep gain, record phase compensation and reproduce low frequency compensation for each speed of the current speed pair, and individual channel bias adjustment. Each channel is provided with an individual **LINE OUTPUT** Jack on the front panel, for test purposes, in addition to the XL type **OUTPUT** connector provided on the rear of the machine.

A VU meter is provided for each channel. In each VU meter are two LED indicators, one to indicate signal level peaks that are too short to cause the VU meter to indicate accurately, and another to indicate the channel's Record status.

Each MX-80 series tape recorder includes either the CB-140 (16 or 24 tracks) or the CB-151 (8 tracks) full function Remote Control Unit.

The Remote Control Unit provides control of monitor (Input/Sel·Rep/Repro) and Record Ready switching and indication; transport mode, Search-to-Cue, Search-to-Zero, Repeat, and Speed Control functions.

The CB-140 Remote Control Unit also features four Channel Status memories to store and recall the mode status (Ready/Safe, Mute/Input/Sel·Rep/Repro) of all the channels simultaneously.

* HX Pro headroom extension originated by Bang and Olufsen and manufactured under license from Dolby Laboratories Licensing Corporation. "Dolby", the Double-D symbol and HX Pro are trademarks of Dolby Laboratories Licensing Corporation.

1.2 Using this Manual

This manual is intended for use with any of the models and configurations listed above. The descriptions and references refer to the MX-80-24-H model (the 24 track, high speed-pair version). If any differences exist between the referenced machine and another model, those differences will be explained fully.

1.2.1 Organization

This manual is divided into eight sections beginning with this **Introduction** which contains general information about the machine and about the manual.

Section two, **Installation**, contains the information required when uncrating and installing the MX-80 for the first time, or when interfacing the machine to a recording mixer or other equipment.

The third section, **Controls and Indicators**, contains a keyed guide to the controls and indicators. This reference guide provides detailed information about each control and its functions. You should use this section of the manual when you have a question about the function of a particular control or indicator.

Fourth is the **Operation** section which describes the operation of the machine. This section is divided into two parts, first, a list of all the operating modes of the machine, and second, “Recording with the MX-80”, a tutorial organized by task, starting with threading tape on the machine and recording basic tracks, and continuing through overdubs, punch-ins, etc. You should use this section when you wish to learn “how to” perform a task or operation (like spot erase or spooling).

The fifth section of this manual covers **Alignment and Calibration** including the information needed to perform the routine alignments and calibrations associated with normal operation of the machine (like head azimuth, bias adjustment, or output level adjustment). You should refer to this section of the manual when you are performing the normal maintenance and calibration routines that must be done to keep the recorder operating at peak performance.

Section six contains **Printed Circuit Board Layouts**, with two-color “x-ray” views of each printed circuit board showing the component locations and foil traces.

Section seven, **Exploded Views and Parts Lists**, contains assembly drawings of the machine “exploded” to show internal parts and hardware, and the order of assembly. Each exploded view is keyed to an accompanying parts list showing Otari part numbers for all mechanical components.

The final section of the manual contains the **Schematics** for all electronics and printed circuit boards.

1.2.2 Conventions within this Manual

The use of terms channel and track may require some clarification. This manual refers to the signal, or the path of the signal, recorded on the tape as a TRACK, and the electronics or controls for that path are referred to as a CHANNEL.

Generally, this manual uses all upper case type to describe a switch or control when that item is similarly labeled on the machine (e.g., the **PLAY** button). Where a switch or button is not labeled, or the reference is less clear, only the first letter of the item is capitalized (e.g., the Cue lever near the **CUE** button). Machine status or operating modes are described with an upper case first letter (e.g., you press the **PLAY** button to place the machine in PLAY mode). Normal parentheses ( ) are used for examples and parenthetic comments. Square brackets [ ] are used for reference to callouts in certain illustrations. The square brackets in a particular sub-section are either all referenced to the same figure, as noted in that sub-section, or are individually referenced (e.g., [Fig. 2-1,3], meaning callout “3” in Figure 2-1).

The information and procedure in **Section 2**, Installation should be followed very carefully when the machine is first uncrated and installed. Performing the inspection steps will familiarize you with the machine and its component parts if this is your first contact with the MX-80 series of tape recorders.

Please read **Sections 3** and **4** carefully before using the machine. In the future, after you are more familiar with the machine, if you need information about a specific operation, or instructions on how to perform a particular function, refer to the tutorial instructions in **Section 4**.

1.3 Specifications

1.3.1 Tape Transport

Track Configuration	MX-80-24-H, -24-L 2" (50.8 mm) wide tape 24 channel MX-80-16-H, -16-L 2" (50.8 mm) wide tape 16 channel MX-80-1-16H, 16-L 1" (25.4 mm) wide tape 16 channel MX-80-8-H, -8-L 1" (25.4 mm) wide tape 8 channel
Tape Speeds	Switchable for speed version change. High speed version: 30 ips (76.2 cm/s) 15 ips (38.1 cm/s) Low speed version: 15 ips (38.1 cm/s) 7.5ips (19.05 cm/s)
Fast Wind Time	80 s for 2,500 ft
Reel Size	10.5” diameter (26.8 cm)
Heads	Plug-in head blocks with full access to independent head azimuth adjustment.
Motors	Capstan Motor: Servo controlled Quartz PLL Direct drive DC motor Reel Motor: CPU controlled Tension servo DC motor
Library Wind Speed	120 ips
Fast Wind Speed	450 ips
Pitch Control	±50% continuously variable control.
External Speed Control Range	30 ips = +50% to -50% 15 ips = +100% to -50% 7.5ips = +100% to -50%
Start Time	Play 30 ips max. 0.8 s 15 ips max. 0.6 s 7.5 ips max. 0.5 s Fast Wind max. 8 s
Stop Time	Play 30 ips max. 0.7 s 15 ips max. 0.6 s 7.5 ips max. 0.5 s Fast Wind max. 5 s
Tape Speed Accuracy	±0.1%
Tape Speed Deviation	Within 0.07%
Wow & Flutter (CCIR (DIN) WTD.)	30 ips max. ±0.04% 15 ips max. ±0.06% 7.5 ips max. ±0.08%
Tape Time Counter	Five digit LED readout from tachometer/logic measurement circuit; indicates tape time in hours, minutes, and seconds.

1.3.2 Electronics

NOTE: All specifications are measured with AMPEX 456 (0 dBu = 0.775 V).

Line Input
Active balanced (transformerless), 10kΩ impedance, Input level +4/-8 dBu switchable, maximum +30 dBu

Line Output
Active balanced, BAL/UNBAL switchable, Less than 5 Ω source impedance, +4 dBu output for 0 VU, maximum +28 dBu

Line Output (though front panel Jack) impedance
BAL/UNBAL switchable 1 kΩ source

Equalization

30 ips	AES
15 ips	IEC or NAB switchable
7.5 ips	IEC or NAB switchable

Bias & Erase Frequency
192 kHz

Calibration Levels
Switchable, 320 nWb/m or 250 nWb/m

Peak Indicator Level
1040 nWb/m adjustable

Frequency Response

Overall (2")

30 ips	50 Hz to 22 kHz ±2 dB
15 ips	30 Hz to 20 kHz ±2 dB
7.5 ips	20 Hz to 18 kHz ±2 dB

Overall (1")

30 ips	50 Hz to 22 kHz +2, -3 dB
15 ips	30 Hz to 20 kHz +2, -3 dB
7.5 ips	20 Hz to 18 kHz +2, -3 dB

Rec/Sel·Rep (2")

30 ips	60 Hz to 22 kHz ±2 dB
15 ips	35 Hz to 20 kHz ±2 dB
7.5 ips	25 Hz to 18 kHz ±2 dB

Rec/Sel·Rep (1")

30 ips	60 Hz to 16 kHz ±3 dB
15 ips	30 Hz to 16 kHz ±3 dB
7.5 ips	30 Hz to 16 kHz ±3 dB

Distortion (THD)
max. 0.5% at 1 kHz 320 nWb/m

Crosstalk
min. 55 dB at 1 kHz (24ch)
min. 48 dB at 1 kHz (16ch)
min. 55 dB at 1 kHz (8ch)

Depth of Erasure
min. 75 dB (24ch)
min. 72 dB (8 & 16ch)

Signal-to-Noise Ratio
Unweighted with audio filter (30 Hz – 18 kHz) at 320 nWb/m

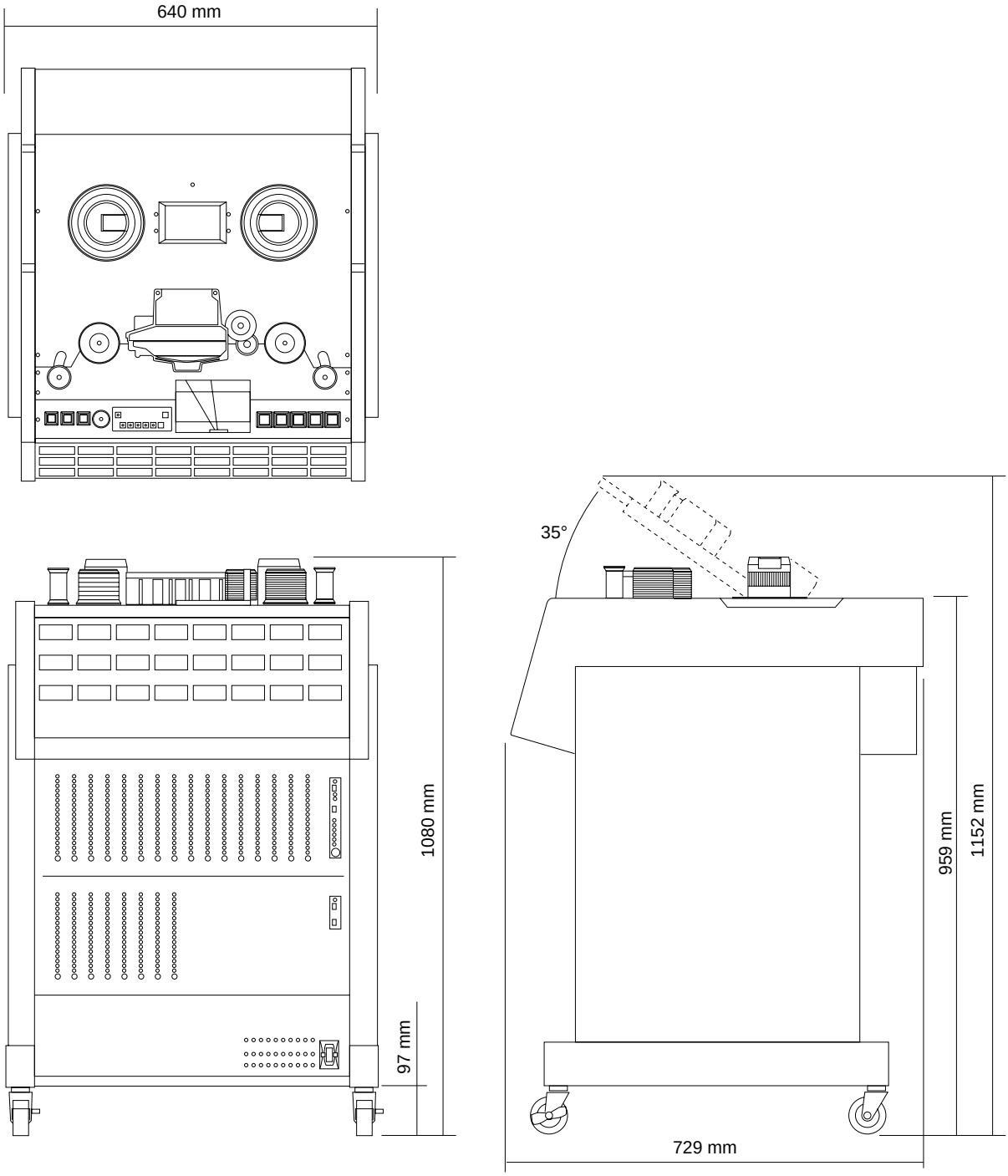
24ch	IEC	NAB	AES
30 ips	—	—	57 dB
15 ips	57 dB	55 dB	—
7.5 ips	55 dB	57 dB	—

16ch	IEC	NAB	AES
30 ips	—	—	56 dB
15 ips	56 dB	54 dB	—
7.5 ips	53 dB	55 dB	—

8ch	IEC	NAB	AES
30 ips	—	—	59 dB
15 ips	59 dB	57 dB	—
7.5 ips	56 dB	58 dB	—

1.3.3 Physical

Power Requirements	100, 117, 200 or 240 volts, Single phase AC, 50 or 60 Hz
Power Consumption	550 VA (24 ch)
Operating Environment	40˚ to 104˚F (5˚ to 40˚C), 20–80% RH
Storage Environment	-5˚ to 113˚F (-20˚ to 45˚C), 20–80% RH
Mounting	All models are in floor console.
Weight	approx. 130 kg
Dimensions (W x D x H)	640 x 729 x 1080 mm



1.3.4 Accessories

Standard Accessories	Remote Control Unit with cable ass'y (CB-140 or CB-151) Operation Manual Fuses Power Cable Lamps
Optional Accessories	Extension PCB Assembly (PB-7JEA) CB-120 Series Auto Locators

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

Section 2 Installation

This section contains the necessary information for unpacking, inspecting, and installing the MX-80, and includes procedures for customizing the MX-80.

2.1 Uncrating the Machine

MX-80 series recorders are shipped fully assembled (including casters) on a wood pallet, with a heavy cardboard carton containing a form-fitting foam packing insert surrounding the machine, strapped to the pallet. A separate box, under the machine, contains an AC power cord, spare lamp assemblies for control buttons, and a spare fuse. We recommend that you open the carton carefully and retain the packing materials at least until proper operation of the machine has been established.

NOTE: MX-80 machines delivered in the United States have been uncrated and checked by Otari Corporation and the dealer, making these steps necessary only if the machine has been recrated for delivery to your facility. Even so, you may wish to perform the checks and inspections in this section to become familiar with the machine.

2.2 Inspection

Before you make any electrical connections, the MX-80 should be inspected visually. If there is any evidence of damage due to rough handling in shipping, you must notify the transportation carrier and submit a claim. Do not connect or use the MX-80 until you have successfully completed this inspection.

2.2.1 Audio Control PCB

Release the six nylon latches that hold the amplifier panel in place on the front of the machine by pulling out on the buttons. The buttons will "pop" out about 3 mm (1/8"), releasing their hold on the chassis behind the panel. The panel will then remove to reveal the AUDIO CONTROL and AUDIO AMPLIFIER PCBs.

Grasp the edges of the PCB front panel at the top of and bottom of the AUDIO CONTROL PCB (the leftmost PCB), and pull straight out to extract the board.

- **SW3 EQ IEC/NAB SWITCH:** It should be set to the EQ position required for the type of machine you ordered.
- **SW4 OUTPUT LEVEL +4/-8 dBu SWITCH:** It is set to +4 dBu at the time of shipment from the factory.
- **SW5 INPUT LEVEL +4/-8 dBu SWITCH:** It is set to +4 dBu at the time of shipment from the factory.
- **SW6 GAPLESS RECORD ON/OFF SWITCH:** It is set to the "ON" position at the time of shipment from the factory.
- **SW7 DOLBY HX PRO ON/OFF SWITCH:** It is set to the "ON" position at the time of shipment from the factory.
- **SW8 VU +10 dB ON/OFF SWITCH:** It is set to the "OFF" position at the time of shipment from the factory.

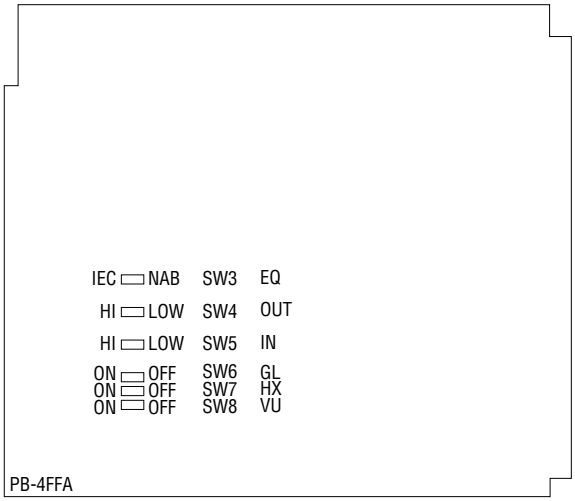


Figure 2-1
Location of Switches on Audio Control PCB

2.2.2 Audio Amplifier PCBs

Grasp the intermost edge of the white extractor tab at the top of the channel 1 **AUDIO AMPLIFIER** PCB and pull outward to extract the board. Refer to **Figure 2-2** for the location of the various controls on the **AUDIO AMPLIFIER** PCB. Check the following switches on the PCB:

■ **SW1 BAL/UNBAL SWITCH:** Set to "BAL" at the factory.

■ **SW2 GAPLESS PUNCH-IN SWITCH:**

a. Erase/Record Head Distance Compensation; **SW2-1 ON**, **SW2-2 ON**

b. Punch-Out Timing; **SW2-3 ON**, **SW2-4 ON**, **SW2-5 OFF**

c. Punch-In Timing; **SW2-6 ON**, **SW2-7 ON**, **SW2-8 OFF**

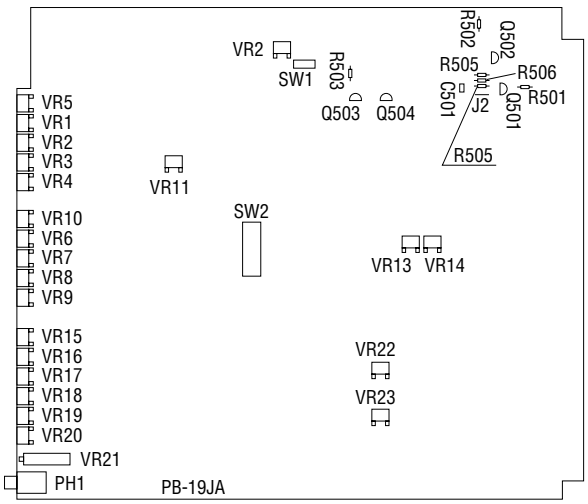


Figure 2-2
Audio Amplifier PCB

2.2.3 Serial Remote Control PCB

This PCB is located at the right-hand end of the lower card cage. The following controls are located on this PCB. Contact Otari for detailed information regarding external control of the recorder with RS-232C or RS-422A.

Table 2-1
Switches on the Serial Remote Control PCB

SW No.	Function	Initial position
SW1	CPU Reset switch.	—
SW2	Test switch which should be normally on.	ON
SW3	MX-80 becomes the system's terminal (S) or the host (M) (RS-232C).	S
SW4	MX-80 becomes the system's terminal (S) or the host (M) (RS-422A).	S
SWs5-1–3	Baud Rate Selection.	All ON

SW5-1	SW5-2	SW5-3	Baud Rate	Frequency at TP2
OFF	OFF	OFF	110	1.76 kHz
ON	OFF	OFF	300	4.8 kHz
OFF	ON	OFF	1200	19.2 kHz
ON	ON	OFF	2400	38.4 kHz
OFF	OFF	ON	4800	76.8 kHz
ON	OFF	ON	9600	153.6 kHz
OFF	ON	ON	19200	307.2 kHz
ON	ON	ON	38400	614.4 kHz

SW5-4	2 bit (ON), 1 bit (OFF) Stop Bit.	OFF
SW5-5	8 char (ON), 7 char (OFF) length.	ON
SW5-6	Parity Enable (ON), disable (OFF)	ON
SW5-7	Even (ON), odd (OFF) Parity.	ON
SW5-8	Multipoint or RS-422-A (ON), point-to-point or RS-232-C (OFF).	OFF
SW6	RS-422-A Machine Address Selection (two-digit).	0
SW7	RS-422-A Machine Address Selection (one-digit). Maximum value: 32.	0
SW8	Input Data Selection. RS-422-A (ON), RS-232-C (OFF).	ON
SW9	All Channels' Ready/Safe Switch (for test).	—
SW10	All Channels' Monitor Mode Switch (for test).	—
SW11	ON/OFF switch for Stop Standby.	OFF
SW12	ON/OFF switch for Fast Standby.	OFF
CN3	Tachometer pulses output in the Serial I/O connector Jumper 1-2: No Tachometer pulse, Jumper 2-3: Tachometer pulse.	Jumper 1-2
J1/J2	ROM Size (256 kB = J1, 128 kB = J2).	J1 Jumpered
SW1*	With (ON) or without (OFF) termination resistor.	OFF

*On Piggy Back PCB assembly (PB-4EZA) on this PCB assembly.

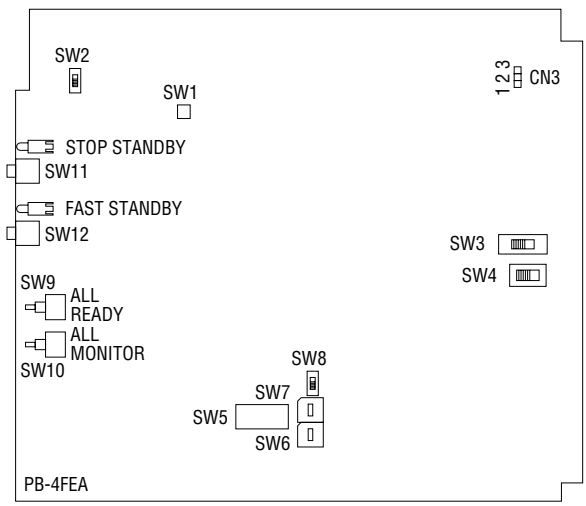


Figure 2-3
Serial Remote Control PCB

2.2.4 Transport Control PCB

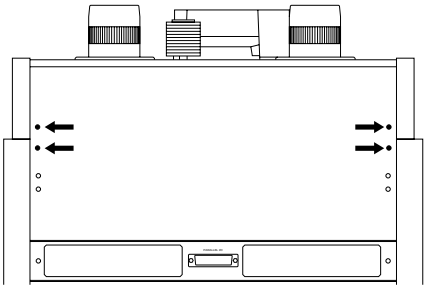


Figure 2-4
Screws to Remove for Access to Transport Control PCB

Open the upper rear panel of the MX-80 by removing two philips head screws on each side of the panel and hinging it down to a horizontal position. Check the following PCB assemblies for loose or damaged connectors or components:

a. TRANSPORT CONTROL PCB

b. REEL CONTROL PCB

c. CAPSTAN CONTROL PCB

d. REEL MOTOR DRIVE AMPLIFIER PCBs

There are many function selection switches on the TRANSPORT CONTROL PCB assembly as described in **Table 2-2**. Check each switch's allocation or reset them as you like. Close the rear panel and secure it with the four screws removed earlier.

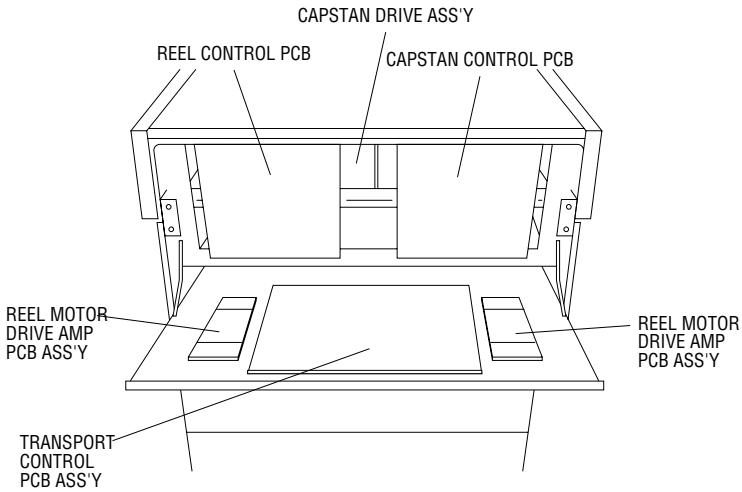


Figure 2-5
Inside View of Rear MX-80

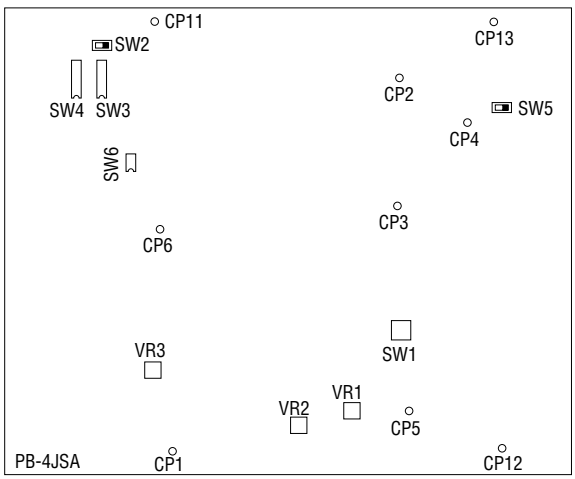


Figure 2-6
Transport Control PCB

NOTE: Some of the function selection switches on the **TRANSPORT CONTROL** PCB assembly are also provided on the Remote Control Unit PCB assembly, so some functions can be selected differently at each location.

Table 2-2
Switches on the Transport Control PCB

SW No.	Function	Initial position
SW1	CPU Reset	—
SW2	Speed Pair Selection	H or L
SW3-1	Record Punch-In.	OFF
	OFF Pressing the RECORD button, when in Play mode, causes the MX-80 to enter Record.	
	ON Pressing the RECORD and PLAY buttons simultaneously, when in Play mode, causes the MX-80 to enter Record.	
SW3-2	Record Punch-Out.	OFF
	OFF Pressing the PLAY button, when in Record mode causes the MX-80 to leave Record.	
	ON Holding the RECORD button pressed and pressing the STOP button causes the MX-80 to leave Record.	
SW3-3	Lifter Defeat.	OFF
	OFF The tape lifters do not retract when the CUE button is pressed.	
	ON The tape lifters retract when the CUE button is pressed.	
SW3-4	Tach Pulse Rate Switch.	OFF
	OFF The Tach Pulse rate at the Parallel I/O connector is 240 pulses per second at 30 ips (SMPTE rate).	
	ON 200 pulses per second at 30 ips (EBU rate).	
SW3-5	Play-to-Stop Audio Mute	OFF
	OFF The audio output is briefly muted when the tape is stopped from Play mode.	
	ON The audio output is not muted when the tape is stopped from Play mode.	
SW3-6	Stop-to-Play Audio Mute	OFF
	OFF The audio output is muted until the tape reaches play speed when entering Play from Stop mode.	
	ON The audio output is not muted when entering Play from Stop mode.	
SW3-7	Auto Memory for Play Start	OFF
	ON The location at the transport was last placed in Play is automatically stored in Cue point 3.	
	OFF The location is not stored.	
SW3-8	Add Channel into Record	OFF
	OFF You can add channels into Record by setting the channel's Ready/Safe switch to the Ready Position, when in Record mode.	
	ON You must press RECORD (or RECORD and PLAY depending on the position of SW3-1) to add channels into Record.	
SW4-1	Parallel I/O Rehearsal Enable	OFF
	OFF Command Type. While Rehearse Rec on the Parallel I/O is on, the MX-80 enters Rehearse REC. This is setting for CB-120.	
	ON Mode Type. While Rehearse Rec on the Parallel I/O is on, the MX-80 is in Rehearse mode. Actual Rehearse Rec starts when the MX-80 receives the Record command.	
SW4-2	Automatic Memory Back-up	OFF
	OFF The Cue Locations stored will be lost whenever the Power to the MX-80 is turned Off or disconnected.	
	ON The Cue Locations stored will remain in memory even when the Power to the MX-80 is turned off or disconnected.	

SW No.	Function	Initial position
SW4-3	Head Shield OFF The Head Shield plate is manually operated. ON The Head Shield Plate will "pop up" automatically each time the MX-80 enters Play or Record mode, if it was retracted.	OFF
SW4-4	Monitor Mute OFF The Monitor Mute function is defeated. ON The Monitor Mute function is activated and in Stop mode, tape monitor signal (Repro or Sel-Rep) is muted.	OFF
SW4-5	All Channels' Sync/Replay (function selection of Pin 29 in the Parallel I/O connector. For optional console interface) OFF Sync/Replay (Make = Replay). ON Tape/Input (Make = Input).	OFF
SW4-6	Record Tally OFF The Record tally on the Parallel I/O connector is disabled when in Rehearse mode. ON The Record tally on the Parallel I/O connector is not disabled when in Rehearse mode.	ON
SW4-7	Time Display Mode OFF The Tape Timer display figure on the CB-140 is HH:MM:SS.S. ON The Tape Timer display figure on the CB-140 is HH:MM:SS:FF.	OFF
SW4-8	Not Used	OFF
SW5	Watch Dog Timer	always ON
SW6	Pinch Roller Timing setting	all ON

2.2.5 Power Supply Panel

Open the lower rear power supply panel (containing the regulator heat sinks) by removing two philips head screws on each side of the panel and hinging it down to a horizontal position.

Check the connectors and wiring leading to the power supply PCB located on the panel. Also check the connectors on the Voltage Select PCB.

Close the lower rear power supply panel and secure it with the four screws removed earlier.

2.2.6 Transport Assemblies

Remove any tape reels from the machine. Open the VU meter panel by removing two philips head screws located in the upper corners of the panel. Open the transport by removing the two socket head screws on the left and right sides under the deck plate, that attach the transport to the chassis. Lift the transport, and carefully check the following items:

1. **SWITCH** PCB Ass'y #1 (PB-7AJB) — Connected to the transport control switches (**PLAY**, **RECORD**, **F.FWD**, **REWIND**, **STOP**).
2. **SWITCH** PCB Ass'y #2 (PB-7AKA) — Connected to the **2nd FUNCTION**, **CUE**, and **EDIT/UNLOAD** switches.
3. **TAPE TIMER** PCB Assemblies (PB-7HTA, -7HUA) — Connected to the tape timer mechanism, and the **SEARCH**, **SET**, **REPEAT**, **CLR**, and **TIME·IPS·%** keys.
4. Check the connectors on the **TACH** PCB assemblies #1 (PB- 7DRA) and #2 (PB-7DSA).
5. Check the connectors coming from both tension sensor assemblies (left and right).
6. Check the connectors coming from the safety switch assemblies (left and right) (PB-4FHA).
7. Check the connectors coming from each of two **REEL DRIVE** PCBs (PB-4FCA) and from the **REEL CONTROL** PCB (PB-4FBA).
8. Check the connectors coming from the **CAPSTAN CONTROL** PCB (PB-4FAA).
9. Check the connectors from the five solenoids; one each for the pinch roller and tape lifters, one for each of the reel brakes, and one for the head shield plate mechanism.

If all connections are correct, close the transport, reinstall the four screws that hold the transport to the chassis, and close the VU meter panel and secure it with the two screws removed earlier.

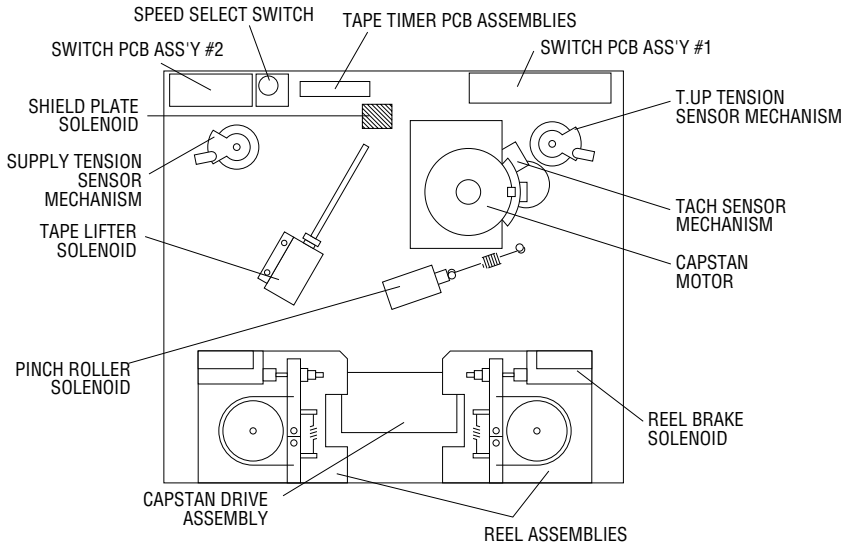


Figure 2-7
Location of Transport Assemblies

2.2.7 Remote Control Unit

There are several function selection switches and jumpers on the CPU PCA in the CB-140 (PB-4FGA) as described in **Table 2-3**. Check each switch's allocation or reset them as you like.

Table 2-3
Switches and Jumpers on the CPU PCA (PB-4FGA)

SW No.	Function	Initial position
SW1-1	Record Punch-In Mode Selection Same as SW3-1 on Transport Control PCB. Refer to page 2-10.	OFF
SW1-2	Record Punch Out Mode Selection Same as SW3-2 on Transport Control PCB. Refer to page 2-12.	OFF
SW1-3	Monitor SW Mode Selection OFF Amplifier Monitor mode can be changed directly when you press the button. ON Monitor mode can be only changed by pressing the button twice within one second.	OFF
SW1-4	Auto set-up Selection OFF Channel set-up for the Audio channels is automatically stored when selection keys are controlled. ON Channel set-up is not stored automatically.	ON
SW1-5	Error Message Display OFF Error Message is not displayed on malfunction. ON Error Message will be displayed when malfunction has occurred (Refer to Table 2-4).	ON
SW1-6	Not used.	OFF
SW1-7	Not used.	OFF
SW1-8	Not used.	OFF
SW2	CPU reset.	—

Table 2-4
AMP Remote Control Unit Error Code

Code	Meaning
00	ROM Check SUM Error
01	RAM READ/WRITE Error
04	Back Up Error
90	Initial Communication Error
91	Time-out Error in Communication with Transport
92	Undefined Error
93	Check SUM Error on Receiving Command
94	No Acknowledge Signal was received
95	Parity Error
96	Double Data Error
97	Framing Error
98	Buffer Error
99	STX Signal is not found

2.3 Hooking up the MX-80

2.3.1 Hooking up the AC Power

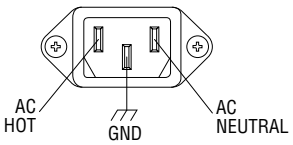


Figure 2-8
AC Power Connector

The AC power is supplied to the MX-80 via a three-conductor IEC standard connector. Insure that voltage and frequency supplied to the MX-80 agree with the machine's power requirements printed on the serial number label on the rear panel of the machine, before applying power. Use the power cord supplied with the machine. **Figure 2-8** describes the wiring of the AC input connector.

2.3.2 Hooking up the Audio Inputs and Outputs

Connect the bus or track outputs from the mixing console to the Inputs of the MX-80. Connect the Outputs from the MX-80 to the monitor or tape inputs of the mixing console.

The Input to each channel of the MX-80 is transformerless balanced and has an input impedance of 10 kΩ. Pin 1 of the connector is connected to the shield or drain, Pin 2 is connected to the "cold" side of the signal, and Pin 3 is connected to the "hot" side of the signal. If unbalanced input wiring is desired, connect to Pin 1 (shield) and Pin 3 (hot). And connect Pin 2 to Pin 1. See **Figure 2-9** and **2-10** for details of input connector wiring.

The output from each channel is transformerless, balanced or unbalanced, and has an output impedance of less than 5 Ω. Pin 1 of the connector is connected to the shield or drain, Pin 2 is connected to the signal "cold" or "low" conductor, and Pin 3 is connected to the signal "hot" or "high" conductor. When the unbalanced operation is required, set the BAL/UNBAL switch (SW1) on the AUDIO AMPLIFIER PCB to the "UNBAL" position. The OUTPUT connector for unbalanced operation is wired with Pin 1 connected to the shield, and Pin 3 connected to the signal "hot" or high side (center conductor). Do not connect Pin 2 to either Pin 1 or Pin 3. The level of the output signal will be approximately 6 dB lower than normal if the BAL/UNBAL switch is incorrectly set to the "BAL" position.

NOTE: To avoid ground loop induced hum, it is a good practice to follow a single point grounding plan, in which the cable shields are connected only at one end (usually at the console) and a single ground or drain wire connects the tape machine to the mixing console.

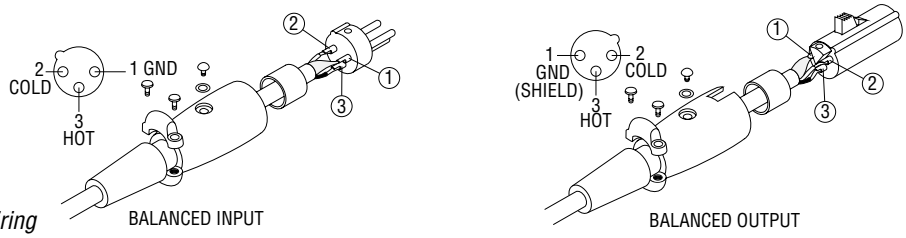


Figure 2-9
Balanced Input and Output Connector Wiring

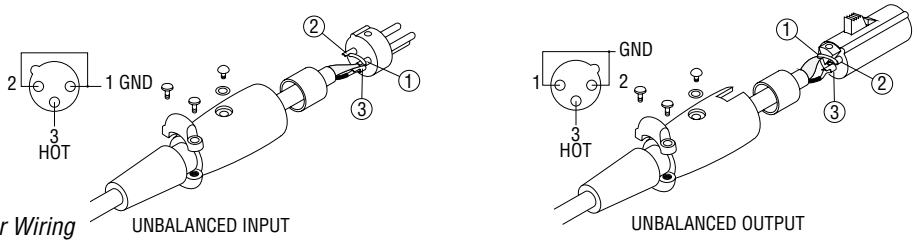


Figure 2-10
Unbalanced Input and Output Connector Wiring

2.3.3 Hooking up the Remote Control Unit (CB-140 or CB-151)

Connect the MX-80 and the Remote Control Unit together using the cable supplied with the machine.

NOTE: Make sure the Power to the machine is turned off before connecting the Remote Control Unit to the MX-80. **Table 2-5** describes the pin assignments for the REMOTE CONTROL connector on the MX-80 and TO TAPE RECORDER connector on the CB-140.

Table 2-5a
REMOTE CONTROL Connector Pin Assignments

Pin No.	Description	Pin No.	Description
1.	FRAME GROUND	14.	FRAME GROUND
8, 9.	GROUND	16, 17.	+24 V UNREG.
10.	TRANSMIT COMMON	19.	TACH PULSE
11.	TRANSMIT A	21.	FWD/REV (Fwd = Low)
12.	RECEIVE B	24.	TRANSMIT B
13.	RECEIVE COMMON	25.	RECEIVE A

Table 2-5b
TO TAPE RECORDER Connector Pin Assignments

Pin No.	Description	Pin No.	Description
1.	FRAME GROUND	14.	FRAME GROUND
8, 9.	GROUND	16, 17.	+24 V UNREG.
10.	TRANSMIT COMMON	19.	TACH PULSE
11.	RECEIVE A	21.	FWD/REV (Fwd = Low)
12.	TRANSMIT B	24.	RECEIVE B
13.	RECEIVE COMMON	25.	TRANSMIT A

2.3.4 Using the Parallel I/O Connector

This 37-pin D-sub type connector is used to interface the optional CB-120 series Auto Locator or another synchronizer/controller to MX-80. The connector contains "tally" signals, indicating machine status, in addition to transport control, tachometer pulses, and capstan speed reference signals. Refer to **Table 2-6** for a complete description of the signals and controls available at this connector.

Table 2-6
Parallel I/O Connector Pin Assignments

No.	Functions	Level	I/O	No.	Functions	Level	I/O
1.	Record Switch	Low	In	20.	Capstan Clock 9.6 kHz (Nom)	—	In
2.	Play Switch	Low	In	21.	Tape Speed A (Note 2)	H/L	Out
3.	Stop Switch	Low	In	22.	Tape Speed B (Note 2)	H/L	Out
4.	F.Fwd Switch	Low	In	23.	Ext. Pitch Control Enable	Low	In
5.	Rewind Switch	Low	In	24.	Ext. Pitch Control Tally	Low	Out
6.	Lifter Defeat Command	Low	In	25.	Amp Rec Ready Tally	Low	Out
7.	2nd Func Switch	Low	In	26.	NC	—	—
8.	NC —	—	—	27.	NC	—	—
9.	Shut Off Switch	Low	Out	28.	NC	—	—
10.	Record Tally	Low	Out	29.	NC	—	—
11.	Play Tally	Low	Out	30.	Time Code Cue	Low	In
12.	Stop Tally	Low	Out	31.	NC	—	—
13.	F.Fwd Tally	Low	Out	32.	Rec Rehearsal Command	Low	In
14.	Rewind Tally	Low	Out	33.	+5V +10% Reg. (max 150 mA)		—
15.	2nd Func Tally	Low	Out	34.	+24V Unreg. (max 500 mA)	—	
16.	Signal Ground	—	—	35.	+24V Unreg. (max 500 mA)	—	
17.	Tach Pulse (Note 1)	—	Out	36.	Power Ground	—	—
18.	Tape Direction (Fwd = L)	H/L	Out	37.	Power Ground	—	—
19.	Capstan Clock	—	Out				

NOTE:

1. Output Tach Pulse Rate (pulse/s)

	SMPTE	EBU
7.5 ips	60	50
15 ips	120	100
30 ips	240	200

2. TAPE SPEED → SPEED A/SPEED B: 7.5 ips → Low/High. 15 ips → High/Low. 30 ips → High/High

3. Type of Connector: D-sub 37-pin Female

4. Output Signal
   Output Type = Open Collector
   V_{OL} = 0–0.5 V
   I_{OL} = 20 mA (max)
   V_{IL} = TTL Level
   Leakage Current = 20 µA (max)
   Pull Up = 10 kΩ (Terminated to +5 V)
   V_{OH} (High Level) = +30 V (max)

5. Input Signal
   Fan-in = 1.5
   V_{IL} = 0–0.5 V (-2.4 mA)
   V_{IH} = 2.5–5.25 V (60 µA)

6. Cable Length : 10 m (32 ft)

7. Input Command Pulse Width: 10 ms (min)

8. Duty Cycle of Tach Pulse : 20–80%

2.3.4.1 Rehearse Mode on the MX-80

The following items relate to the CB-140 Remote Control Unit.

When REHEARSE mode is enabled at the MX-80, the standard parallel I/O, or the optional console interface, REHEARSE mode cannot be disabled from the CB-140 Remote Control Unit. In other words, Rehearse command on the MX-80, standard parallel I/O, or console interface has priority over commands from the CB-140 or other remote controllers.

The MX-80 parallel I/O has two types of Rehearse function, i/e/, "Mode" and "Command", both being selectable using SW4-1 on the TRANSPORT CONTROL PCB. The switch setting must be same on both MX-80 and CB-120 Auto Locator (parallel interface version).

NOTE: If interfacing the MX-80 to a version of the CB-120 which has no "Mode"/"Command" selection switch, set SW4-1 on the MX-80 to "Command".

2.3.4.2 Enabling "Time Code Cue"

Also see Appendix for wide band modification on time code channel.

CAUTION! These modifications and changes in set up require proficiency in electronics adjustment. If required, please contact your local Otari dealer or qualified service personnel.

NOTE: "Time Code Cue" can only be enabled on machines with parallel I/O ROM number versions PG08211G, I, J, K to PG16611.

Since a time code signal is recorder on the tape, "Time Code Cue" enables the MX-80 to stay in Input Monitor mode (while reading TC) and mutes all the outputs other than the time code channel.

Two foil traces on the back (dip side) of the AUDIO AMPLIFIER PCB which are used for the time code channel must be cut. This modification changes the function of Pin 30 on the parallel I/O connector. See the attached figure.

1. Cut the foil trace between pin 2 of RA4 and pin 32A of the PCB edge connector.

2. Cut the foil trace between pin 3 of RA4 and pin 32B of the PCB edge connector.

2.3.4.3 Speed Mode Selection with no Remote Control

The MX-80 was originally designed to select its speed mode (INT/EXT/VARI) from the CB-140 or CB-151 Remote Control Unit. If the CB-140 or CB-151 is disconnected or is not used, the speed mode on the MX-80 is automatically set to "EXT" mode. Thus, after "Enable" is set on the parallel I/O Pin 23 (Pitch Control Enable) MX-80 Capstan speed can be externally controlled though pin 20, the external capstan clock.

2.3.5 Noise Reduction System Control

The **NOISE REDUCTION** connectors provide input/repro switching signals to control the encode/decode modes of a remote noise reduction unit such as Dolby "A" or dbx 216. Simultaneous encode/decode systems such as dbx 180 or dbx 208 do not require connection to the MX-80 switching. Refer to **Table 2-7** for pin assignments for these connectors. The MX-80 provides a "dry-contact" closure for each channel. This contact is closed when that channel is in Record or Input mode, and is open when the channel is in SEL·REP, or REPRO modes. Some noise reduction units may require logic level signals to function properly. In this case you must provide any logic voltage supply and any external connections required.

Table 2-7
Noise Reduction Control Connector Pin Assignments

Ch.	Pins	Ch.	Pins	Ch.	Pins
1	1 & 2	**9**	19 & 20	**17**	1 & 2
2	3 & 4	**10**	21 & 22	**18**	3 & 4
3	5 & 6	**11**	23 & 24	**19**	5 & 6
4	7 & 8	**12**	25 & 26	**20**	7 & 8
5	9 & 10	**13**	27 & 28	**21**	9 & 10
6	11 & 12	**14**	29 & 30	**22**	11 & 12
7	13 & 14	**15**	31 & 32	**23**	13 & 14
8	15 & 16	**16**	33 & 34	**24**	15 & 16

2.3.6 Serial I/O (Optional)

A pair of optional interface PCBs are available that allow control of the MX-80 transport functions through a serial interface meeting RS-232C or RS-422 (SMPTE/EBU) interface standards. The baud rates of the serial data is selectable by switches on the PCB. The baud rates available for the RS-232C interface are 110, 1200, 2400, and 4800. The baud rates available for the RS-422 (SMPTE/EBU) interface are 9600, 19,200, and 38,400. Contact Otari for a list of the ASCII codes used for function control.

Table 2-8
Serial I/O Connector Pin Assignments

RS-232C SERIAL PORT

No.	Name	I/O	Function
1.	FRAME GND	—	FRAME GROUND
2.	TXD	In	TRANSMIT DATA
3.	RXD	Out	RECEIVE DATA
4.	RTS	In	REQUEST TO SEND
5.	CTS	Out	CLEAR TO SEND
6.	DSR	Out	DATA SET READY
7.	SGND	—	SIGNAL GROUND
8–18.	NC	—	—
19.	TACH	Out	TACH PULSE
20.	DTR	In	DATA TERMINAL READY
21–25.	NC	—	—

NOTE 1. I/O specification conform to EIA-RS232C
NOTE 2. Baud Rate: 2.4–19.2 k (110–1200 Baud is option)
NOTE 3. Type of Connector: D-sub 25 Female (System side)

SMPTE/EBU BUS (RS-422) SERIAL PORT

No.	Name	I/O	Function
1.	FRAME GND	—	FRAME GROUND
2.	TXD A	Out	TRANSMIT A
3.	RXD B	In	RECEIVE B
4.	R. COM	—	RECEIVE COMMON
5.	TACH	Out	TACH PULSE
6.	T. COM	—	TRANSMIT COMMON
7.	TXD B	Out	TRANSMIT B
8.	RXD A	In	RECEIVE A
9.	FRAME GND	—	FRAME GROUND

NOTE 1. I/O specification conform to SMPTE/EBU BUS (RS-422A)
NOTE 2. Baud Rate: 2.4–38.4k
NOTE 3. Type of Connector: D-sub 9 Female (System side)

2.4 Level Matching

It is important that the input and output level of the mixing console match those of the tape recorder, to insure the best balance of headroom and signal-to-noise ratio. The input and output levels of the MX-80 are switch selectable to match systems using either +4 dBu or -10 dBV signal levels.

NOTE: The MX-80 reference level and VU meter calibration must be adjusted properly in accordance with the instructions in section 5 before proceeding with level matching.

Thread the machine with a reel of the tape normally used for sessions.

1. Determine the nominal input and output levels of your mixing console. This can usually be found in the specifications section of the mixing console instruction manual.
2. Set the input and output level switches (SW5 and SW4 respectively) on the AUDIO CONTROL PCB to match the mixing console input and output levels.
3. Using the mixing console's test oscillator, or an external test oscillator connected to one of the mixing console's inputs, adjust the mixing console controls so that the console's output VU meter reads 0 VU.
4. Extend the MX-80's channel 1 AUDIO AMPLIFIER PCB.
5. Patch or route the test signal to the MX-80's channel 1 INPUT connector.
6. Press the ALL INPUT button on the Remote Control Unit, and adjust the INPUT trimmer (VR14) on the channel 1 AUDIO AMPLIFIER PCB until the channel 1 VU meter indicates 0 VU.
7. Connect the oscillator to the TEST SIGNAL input on the AUDIO CONTROL PCB, press the ALL INPUT button on the Remote Control Unit, and adjust the TEST SIGNAL trimmer (VR13) on the AUDIO AMPLIFIER PCB until the channel 1 VU meter reads 0 VU.
8. Repeat steps 4 through 7 for all remaining channels.
9. Press the PLAY and RECORD buttons to place the transport in RECORD mode.
10. Record several minutes of signal.
11. Rewind the tape, and press the ALL REPRO button.
12. Press the PLAY button.
13. Put the mixing console into "mix-down" mode or connect the channel 1 OUTPUT connector to a mixing console line input.
14. Adjust the mixing console input trim control so that the channel fader reaches the desired position when the mixing console VU meter indicates 0 VU.

Section 3 Controls and Indicators

This section contains general information about the MX-80 Series Multichannel Tape Recorder and about this manual.

NOTE: Numbers in brackets refer to the callouts in each figure of this section.

3.1 Transport Controls and Indicators

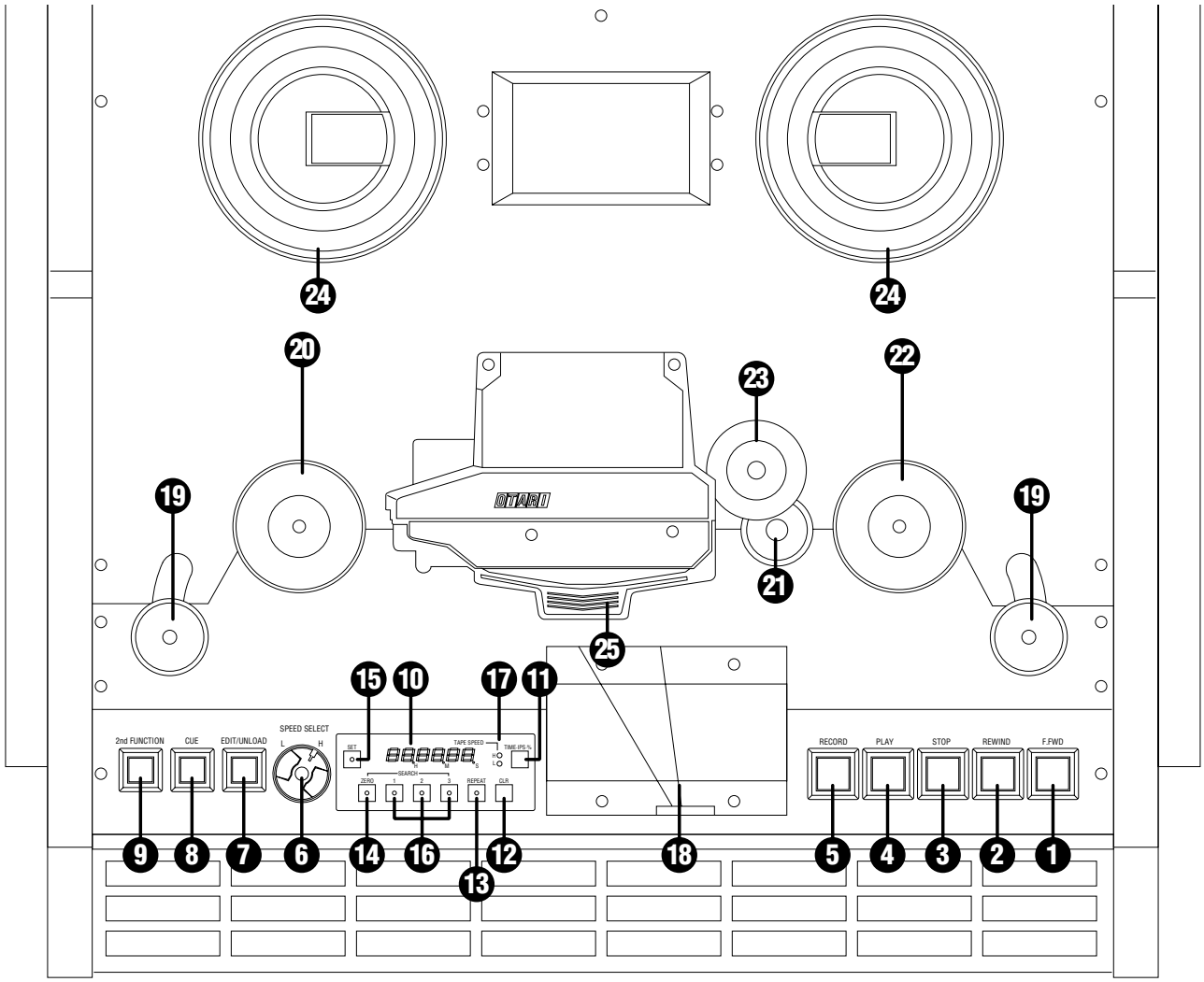


Figure 3-1
Transport Control Panel

[1] F.FWD BUTTON

Pressing this button places the transport in FAST FORWARD mode. Holding the **F.FWD** button pressed, and then pressing the **2nd FUNCTION** button places the transport in FORWARD SPOOL mode for winding tape onto the take-up reel with a smoother tape pack than is achieved at full wind speed.

[2] REWIND BUTTON

Pressing this button places the transport in REWIND mode. Holding the **REWIND** button pressed, and then pressing the **2nd FUNCTION** button places the transport in REVERSE SPOOL mode for winding tape onto the supply reel with a smoother tape pack than is achieved at full wind speed.

[3] STOP BUTTON

Pressing the **STOP** button causes the tape motion to stop. Pressing this button when the transport is in UNLOAD mode and the **STOP** button is flashing, (such as when tape has just been threaded, and the slack has been removed by turning the reels by hand) causes the transport to apply tension to the tape in preparation for other transport modes. The button will become brightly illuminated. Pressing the **2nd FUNCTION** button simultaneously with the **STOP** button causes the capstan motor to reverse direction in preparation for REVERSE PLAY mode (there is a slight delay while the capstan motor achieves crystal-locked speed, when reversing).

[4] PLAY BUTTON

Pressing this button places the transport in PLAY mode. Pressing this button while the transport is in EDIT READY mode (with the **EDIT/UNLOAD** button flashing) causes the transport to enter DUMP EDIT mode. Pressing this button while the transport is in SEARCH CUE or SEARCH TO ZERO mode causes **PLAY** button to flash and the transport to enter PLAY mode upon reaching the end of the search. Pressing the **PLAY** and **2nd FUNCTION** buttons simultaneously causes the machine to enter REVERSE PLAY mode.

[5] RECORD BUTTON

When a channel is in RECORD READY mode the **RECORD** button will flash. You may select one of two methods of entering RECORD mode: a) pressing this button simultaneously with the **PLAY** button; b) pressing the **RECORD** button while the transport is in PLAY mode. The MX-80 is factory preset for method b. Similarly, you may select between two methods of exiting from RECORD mode: a) holding the **RECORD** button pressed and pressing the **STOP** button; b) pressing the **PLAY** button while in RECORD mode. The MX-80 is factory preset for method b. The selection of Punch-In and Punch-Out methods is made via switches **SW3-1** and **SW3-2** on the **TRANSPORT CONTROL** PCB.
Pressing this button simultaneously with **2nd FUNCTION** button causes the transport to enter SPOT ERASE mode. Pressing the **RECORD** button again, and holding it, while slowly moving the tape by hand, causes the erase circuitry to be activated to erase the tape at the erase head. Releasing the **RECORD** button will deactivate the erase signal. Pressing this button while the transport is in REVERSE PLAY mode causes the MX-80 to enter REVERSE ERASE mode.

[6] SPEED SELECT SWITCH

Selects between the high or low speed of the speed pair selected internally. On high speed-pair machines the H setting is 30 ips and the L setting is 15 ips. On low speed-pair machines the H setting is 15 ips and the L setting is 7.5 ips.

[7] EDIT/UNLOAD BUTTON

Pressing this button while the transport is in STOP mode causes the transport to enter EDIT READY mode and the button will flash. Pressing the **EDIT/UNLOAD** button again causes the transport to enter UNLOAD mode and remove the tension from the tape. Pressing this button when the transport is in PLAY mode causes the machine to enter DUMP EDIT mode in which the take-up reel motor stops, allowing tape to "dump" over the side of the machine. In EDIT PLAY mode the button will be brightly illuminated.

[8] CUE BUTTON

Holding the **CUE** button pressed causes the tape lifters to remain retracted only as long as the button is held pressed. Tapping the **CUE** button causes the tape lifters to remain retracted until the next time the **CUE** button is pressed. When the lifters are retracted, the audio output is attenuated and the high frequencies rolled-off to prevent damage to the monitor speakers. Press the **CUE**, **STOP**, or **PLAY** button to leave CUE mode. Depending upon the setting of **SW3-3** on the **TRANSPORT CONTROL** PCB, the lifters will remain retracted, and the audio attenuated, as described above, or the lifters will not retract, and the audio is unmuted and not attenuated.

[9] 2ND FUNCTION BUTTON

Pressing the **2nd FUNCTION** button with other buttons provides access to additional functions, such as REVERSE PLAY, which are not labeled on the machine. Each function is described with the appropriate button.

[10] TAPE TIMER

Displays the current tape time. If the tape is located behind the 0.00.00 position the Tape Timer will display the time as negative (or -) time, relative to 0.00.00.

[11] TIME·IPS·% KEY

Pressing this key causes the Tape Timer to show the tape time, the selected play speed in ips, or the percentage of play speed, in turn.

[12] CLR KEY

Pressing this key simultaneously with another key clears the selected function as follows:

CLR + SET	SET mode is canceled.
CLR + TIME·IPS·%	The Tape Timer is cleared to 0.00.00.
CLR + SEARCH 1–3	The stored cue point is cleared.

[13] REPEAT KEY

Pressing the **REPEAT** key, and then pressing any two illuminated cue keys (**ZERO**, **1**, **2**, **3**), places the machine in REPEAT mode. Then pressing the **PLAY** button, causes the machine to play from the first location to the second, rewind to the first location and play again, repeating until REPEAT mode is deactivated.

[14] SEARCH ZERO KEY

Pressing this key causes the transport to wind the tape, stopping when the tape timer reads 0.00.00. Pressing the **PLAY** button while in SEARCH TO ZERO mode causes the **PLAY** button to flash and when the tape reaches 0.00.00, the transport enters PLAY mode. Pressing the **STOP**, **F.FWD**, or **REWIND** button while in SEARCH TO ZERO mode causes the machine to leave SEARCH TO ZERO mode and take the action directed by the button.

[15] SET KEY

Pressing this key causes the MX-80 to enter SET mode, which is indicated by the flashing of the display's decimal points. SET mode allows the tape times for three cue points to be entered in the following manner:

SEARCH ZERO key	+ or - sign
SEARCH CUE 1 key	Hours digit
SEARCH CUE 2 key	Tens of minutes digit
SEARCH CUE 3 key	Units of minutes digit
REPEAT key	Tens of seconds digit
CLR key	Units of seconds digit

The selected digit will increment each time the corresponding button is pressed. To store the entered time as a cue point, press and hold the **SET** key, and then press the desired **SEARCH CUE** key. Simultaneously press the **CLR** and **SET** keys for clearing the SET mode.

After entering a tape time in SET mode, that tape time can be used as an offset, being automatically subtracted from or added to all cue locations, by holding the **SET** key pressed and pressing the **TIME·IPS·%** key.

[16] SEARCH 1, 2, 3 KEYS

If a key is not illuminated, no tape location is stored for that cue point. Pressing an unlit **SEARCH 1–3** key causes the current time shown on the Tape Timer to be stored as that cue point, and that key to become illuminated. If a **SEARCH 1–3** key is illuminated, a tape location has been stored for that cue point. Pressing that key causes the transport to search to the location stored as that cue point. The location will be displayed for approximately 2 seconds at the beginning of the search. Pressing the **PLAY** button while in SEARCH mode causes the **PLAY** button to flash, and when the tape reaches the location being searched to, the transport will enter PLAY mode. Pressing the **STOP** button together with any **SEARCH 1–3** key causes the Tape Timer to show the location stored for that key. Pressing the **CLR** key simultaneously with any **SEARCH 1–3** key clears the location stored for that cue point.

NOTE: There are different **SEARCH 1–3** keys on the Remote Control Unit which store the different cue points from those on transport control panel. In other words, all together 6 cue points can be stored.

[17] TAPE SPEED INDICATOR

This LED indicates the position of the **SPEED SELECT** switch.

[18] TAPE SPLICING BLOCK

This conveniently located splicing block has been provided to make tape editing easier. Lay the magnetic tape in the slot and cut it using the groove to guide your blade.

[19] TAPE TENSION ARMS

These swing arms are connected to the sensor mechanisms that provide tension feedback information to the capstan and reel control circuits. The arms also activate the safety switches which stop all transport functions if too much slack develops in the tape path or if the tape becomes unthreaded from the reel. After threading the tape, the take-up and supply reels should be turned by hand to remove the slack in the tape path, and to move the tape tension arms away from the bottom of their travel.

[20] GUIDE ROLLER

This rotating tape guide provides tape guidance and acts as an impedance roller to help damp out any fluctuations in tape speed caused by irregularities in the supply reel tape pack.

[21] CAPSTAN SHAFT

The capstan shaft is driven by a DC servo motor which is controlled by a quartz crystal reference in a phase-locked-loop circuit located on the **CAPSTAN CONTROL** PCB.

[22] TACHOMETER ROLLER

Tape motion across this roller causes it to rotate, generating tach pulses for accurate measurement of the tape length and speed by the microprocessor and tape timer circuits. In STOP mode you can move the tape by turning the top of the tachometer roller by hand. The tape will follow the motion of the roller. Do not "jerk" the tachometer roller when moving tape by hand or the tape may slip against the roller.

[23] PINCH ROLLER

The tape is driven by the rotation of the capstan shaft against the pinch roller.

[24] REEL TABLES

Reel tables with quick-release levers and locating pins.

[25] HEAD SHIELD

The head shield is manually retracted by pushing it down until it latches. When in the retracted position, pressing it down causes the latch to be released and the shield will rise into position. The head shield will automatically rise, if retracted, whenever the MX-80 enters RECORD or PLAY mode if **SW4-3** on the **TRANSPORT CONTROL** PCB is in the On position.

3.2 VU Meters (Upper Front Panel)

Each VU meter is calibrated to indicate 0 VU at the selected reference level (250 or 320 nWb/m). Each meter incorporates two LED indicators, the **PEAK** indicator, which is set to illuminate if a signal peak reaches a level equivalent to 1040 nWb/m (approximately 3% THD), and the **RECORD** indicator, which flashes when the channel is in RECORD READY mode, and is steadily illuminated when the channel is in RECORD or SPOT ERASE modes.

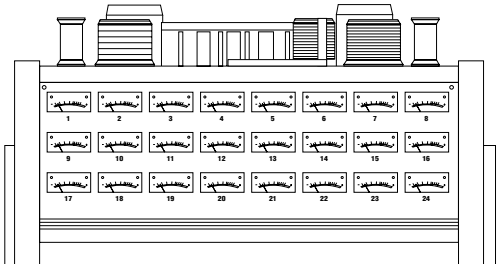


Figure 3-2
VU Meter Panel

3.3 Amplifier Controls (Lower Front Panel)

3.3.1 Audio Control PCB

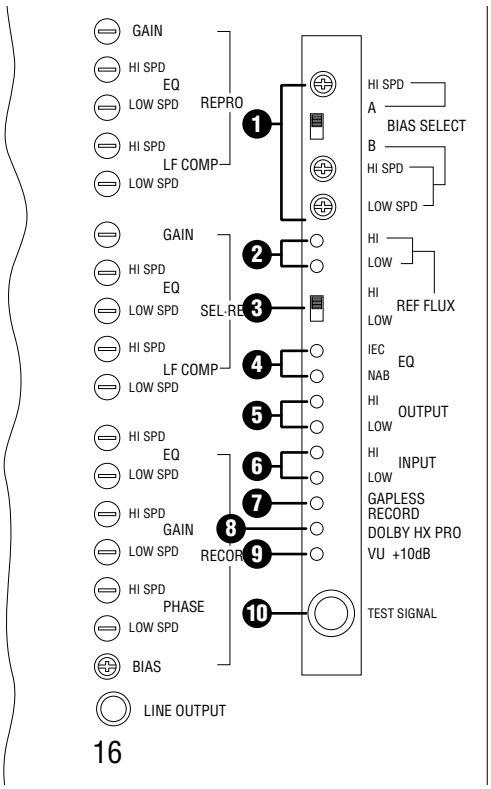


Figure 3-3
Audio Control PCB

[1] MASTER BIAS SELECT SWITCH (SW1) AND TRIMMERS

This switch selects between two preset bias levels to facilitate changing the bias level for two different tape formulations. The associated trimmers adjust the bias level for each switch position.

TYPE	HI SPEED	LOW SPEED
TAPE A	VR 1	fixed
TAPE B	VR 2	VR 3

The **A HI SPD** trimmer (**VR1**) adjusts the bias for the **A** position of the **BIAS SELECT** switch at high tape speed. The bias level for the **A** position at the Low tape speed is fixed for AMPEX 456 tape.
The **B HI SPD** trimmer (**VR2**) adjusts the bias for the **B** position of the **BIAS SELECT** switch at high tape speed. The **B LOW SPD** trimmer (**VR3**) adjusts the bias for the **B** position of the **BIAS SELECT** switch at high tape speed.

[2] REFERENCE FLUX LEVEL INDICATORS

These LEDs indicate the position of the **REF FLUX** switch. The **HI** LED is illuminated when the selected reference level is 320 nWb/m*. The **LOW** LED indicates that the selected reference level is 250 nWb/m*.

[3] REF FLUX SWITCH (SW2)

This switch selects either **HI** (320 nWb/m*) or **LOW** (250 nWb/m*) reference flux level (the magnetic flux density applied to, or playing from the tape when operating at 0 VU). Selection of reference level does not affect the input or output signal level.
* These values are default values at the time of shipment from the factory. They may be changed as required.

[4] EQUALIZATION INDICATORS (SELECT SWITCH: SW3)

Selection of IEC or NAB equalization is made with **SW3** on the **AUDIO CONTROL** PCB. The indicator corresponding to the selected switch position will be illuminated.

[5] OUTPUT LEVEL INDICATORS (SELECT SWITCH: SW4) Selection of the output level is made by SW4 located on the AUDIO CONTROL PCB. At the time of shipment from the factory, the "HI" position corresponds to +4 dBu and the "LOW" position corresponds to -8 dBu. These values can be changed as required. The indicator corresponding to the selected switch position will be illuminated.

[6] INPUT LEVEL INDICATORS (SELECT SWITCH: SW5) Selection of the input level is made by SW5 located on the AUDIO CONTROL PCB. At the time of shipment from the factory, the "HI" position corresponds to +4 dBu and the "LOW" position corresponds to -8 dBu, but these values can be changed as required. The indicator corresponding to the selected switch position will be illuminated.

[7] GAPLESS RECORD INDICATOR (SELECT SWITCH: SW6)

This switch controls the gapless record function. At the time of shipment from the factory, the switch is set to the "ON" position. The indicator corresponding to the selected switch position will be illuminated.

[8] DOLBY HX PRO INDICATOR (SELECT SWITCH: SW7)

This switch controls the Dolby HX Pro head room expansion function. At the time of shipment from the factory, the switch is set to the "ON" position. The indicator corresponding to the selected switch position will be illuminated.

[9] +10 dB VU INDICATOR (SELECT SWITCH: SW8) When this switch is ON, the sensitivity of the VU meters is increased by +10 dB. At the time of shipment from the factory, the switch is set to the "OFF" position. The indicator corresponding to the selected switch position will be illuminated.

[10] TEST SIGNAL JACK (PH1) Any signal applied to this connector (1/4" phone jack) will appear at a test signal input to each audio channel. This connector is used to apply a test signal to all channels simultaneously for adjustment of gain, EQ, etc. The level of the signal applied to the TEST SIGNAL input should be the same as that applied to the rear panel input connectors (e.g., if the input level select switch is set to "LOW", an input signal of -8 dBu* will cause the VU meter to indicate 0 VU, if the switch is set to "HI", the test signal input must be +4 dBu* for the VU meters to indicate 0 VU. (*Or a value set elsewhere)

3.3.2 Serial Remote Control PCB

[11] STOP STANDBY SWITCH AND INDICATOR Setting this switch to the "ON" position causes the output of any channel that is in RECORD READY mode to be fed from the input whenever the tape stops, regardless of the position of the monitor switches. The indicator is illuminated when STOP STANDBY mode is selected.

[12] FAST STANDBY SWITCH AND INDICATOR Setting this switch to the "ON" position causes the output of any channel that is in RECORD READY mode to be fed from the Input whenever the machine is in F.FWD, REWIND, or SPOOL mode, regardless of the position of the monitor switches.
Pressing the CUE button during wind temporarily overrides the STANDBY function. The indicator is illuminated when FAST STANDBY mode is selected.

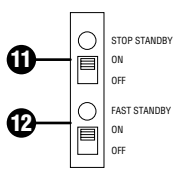


Figure 3-4
Serial Remote Control PCB

3.3.3 Audio Amplifier PCBs

The controls described here apply to one Audio Amplifier channel. Each audio channel has a corresponding set of controls.

[13] REPRO TRIMMERS

These trimmers provide the following functions.

REPRO GAIN (VR5)	Adjusts playback output level.
REPRO EQ HI SPD (VR1)	Adjusts high speed playback equalizer.
REPRO EQ LOW SPD (VR2)	Adjusts low speed playback equalizer.
REPRO LF COMP HI SPD (VR3)	Compensates the low frequency band characteristics at high speed.
REPRO LF COMP LOW SPD (VR4)	Compensates the low frequency band characteristics at low speed.

[14] SEL·REP TRIMMERS

SEL·REP GAIN (VR10)	Adjusts sel·rep output level.
SEL·REP EQ HI SPD (VR6)	Adjusts high speed sel·rep equalizer.
SEL·REP EQ LOW SPD (VR7)	Adjusts low speed sel·rep equalize.
SEL·REP LF COMP HI SPD (VR8)	Compensates for the sel·rep low frequency band characteristics (at high speed).
SEL·REP LF COMP LOW SPD (VR9)	Compensates for the sel·rep low frequency band characteristics (at low speed).

[15] RECORD TRIMMERS

RECORD EQ HI SPD (VR15)	Adjusts record equalizer for high speed.
RECORD EQ LOW SPD (VR16)	Adjusts record equalizer for low speed.
RECORD GAIN HI SPD (VR17)	Adjusts record level for high speed.
RECORD GAIN LOW SPD (VR18)	Adjusts record level for low speed.
RECORD PHASE HI SPD (VR19)	Adjusts phase compensation for high speed.
RECORD PHASE LOW SPD (VR20)	Adjusts phase compensation for low speed.
RECORD BIAS (VR21)	Adjusts bias current.

[16] LINE OUTPUT CONNECTOR

This 1/8" (3 mm) 2-circuit (Tip-Ring-Sleeve) phone jack connector provides a "front panel" line output in parallel with the rear panel **OUTPUT** connector. The output is either balanced or unbalanced as selected by the **BAL/UNBAL** switch (**SW1**) on the **AUDIO AMPLIFIER** PCB. This connector is most useful as a test connector when making Phase Comp adjustments.

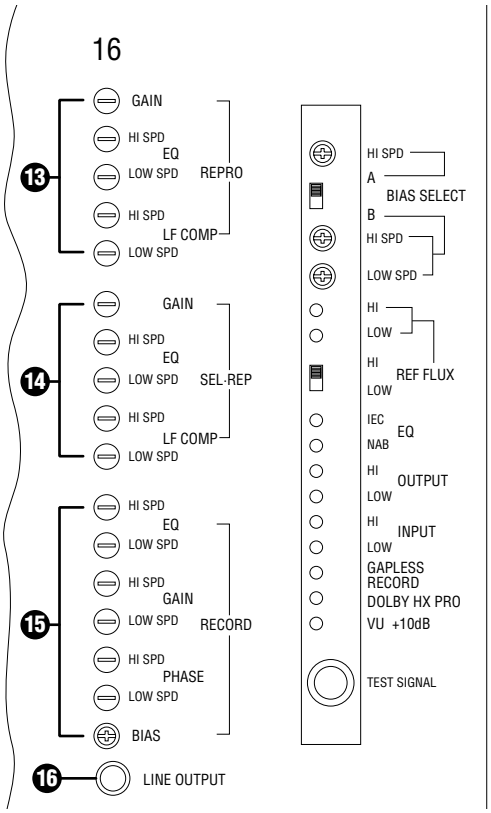


Figure 3-5
Audio Amplifier PCB

3.4 Power Supply Panel

This panel contains the **POWER** switch, the Power Indicator, and the power supply circuit breakers. There is one circuit breaker for each of the supply voltages. When power is applied to the machine, and the **POWER** switch is in the On position, the VU Meters are illuminated. The Power Indicator changes color from Red to Green shortly after the Power is turned On, indicating that the power supply circuits are functioning normally.

The circuit breakers have been provided to protect the circuitry in case trouble should develop. If a circuit breaker should trip, turn off the machine, wait 30 seconds, press the circuit breaker to reset it, and turn the machine back on. If the problem reoccurs or continues, contact your Otari dealer or Otari. See page vii for Otari's location nearest you.

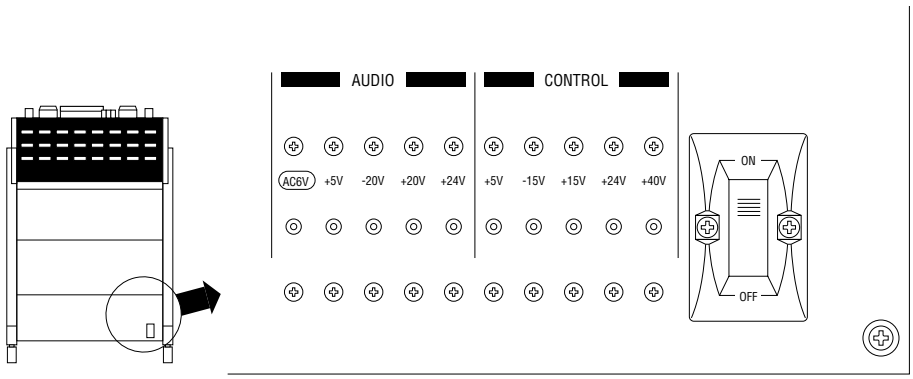


Figure 3-6
Power Supply Panel

3.5 Input and Output Connectors

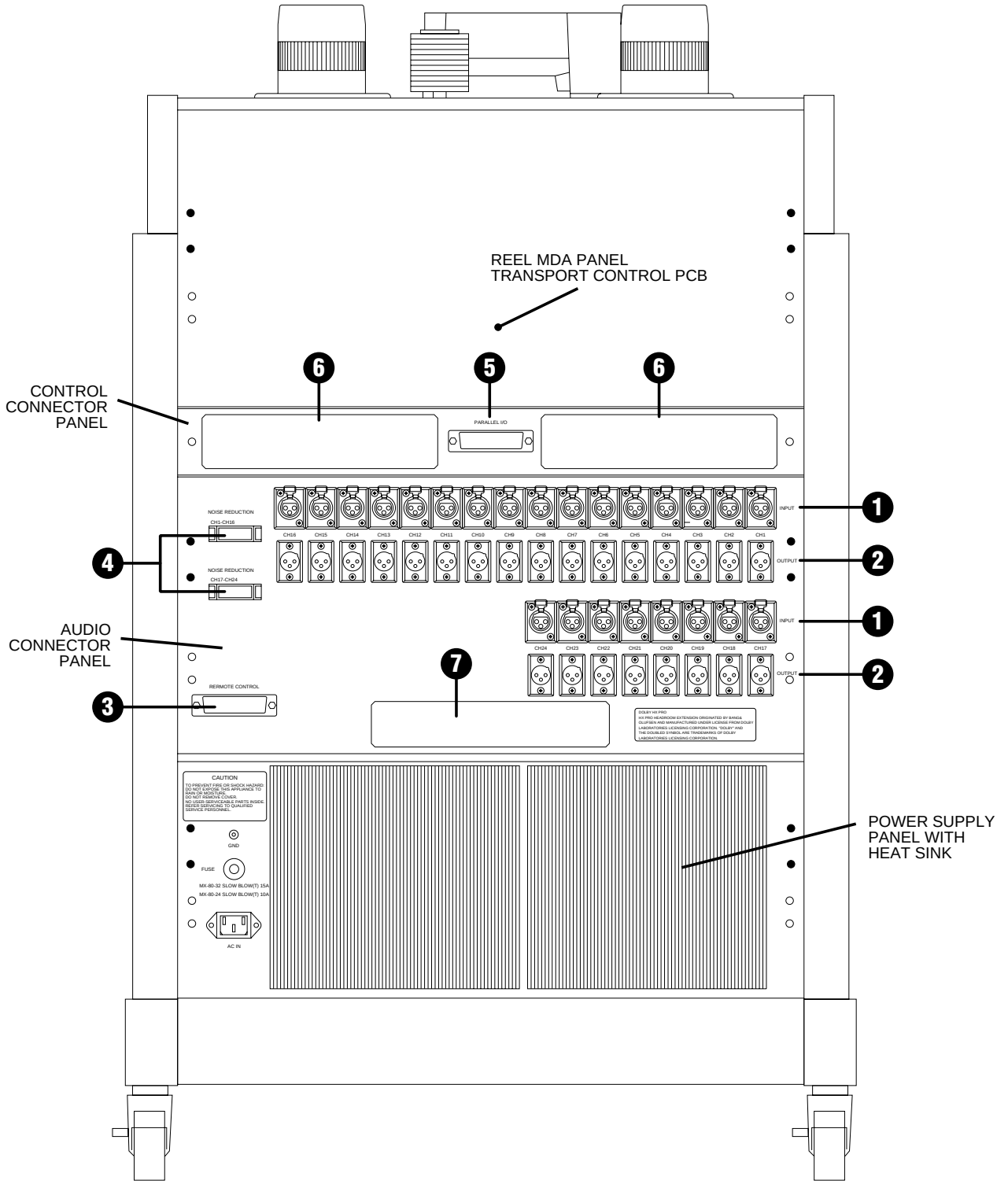


Figure 3-7
Rear Panel I/O connectors

NOTE: Refer to **§2.3** for further information about I/O connectors and pin assignments.

[1] INPUT CONNECTORS

These 3-pin XL type connectors are the audio signal inputs to each channel of the recorder. Connect the bus or track outputs of the mixing console to these INPUT connectors. The MX-80 inputs are designed for use with "line level" signals at either -8 dBu (-10 dBV) or +4 dBu (selectable via a switch on the AUDIO CONTROL PCB).

[2] OUTPUT CONNECTORS — These 3-pin XL type connectors are the audio signal outputs from each channel of the recorder. Connect the track or monitor inputs of the mixing console to these **OUTPUT** connectors. The output from these connectors is at "line level", either -8 dBu (-10 dBV) or +4 dBu.

[3] REMOTE CONTROL CONNECTOR — Used to connect the CB-140/CB-151 Remote Control Unit to the MX-80.

[4] NOISE REDUCTION CONNECTOR — These 34-pin connectors are used to provide mode control of any non-simultaneous external noise reduction system which requires machine control of encode/decode modes. These connectors provide a "dry-contact" relay closure when the channel is in INPUT MONITOR or RECORD mode.

[5] PARALLEL I/O CONNECTOR — This 37-pin connector is used to provide interface signals to the optional CB-119 Auto Locator or machine controller (e.g., synchronizer or resolver).

[6] SERIAL I/O INTERFACE PANEL (Optional) — This optional Interface panel is used to connect the transport to control signals meeting RS-232C or RS-422A (SMPTE/EBU BUS) standards.

[7] (OPTIONAL I/O PANEL)

3.6 Remote Control Unit

3.6.1 Controls, Indicators, and Connectors

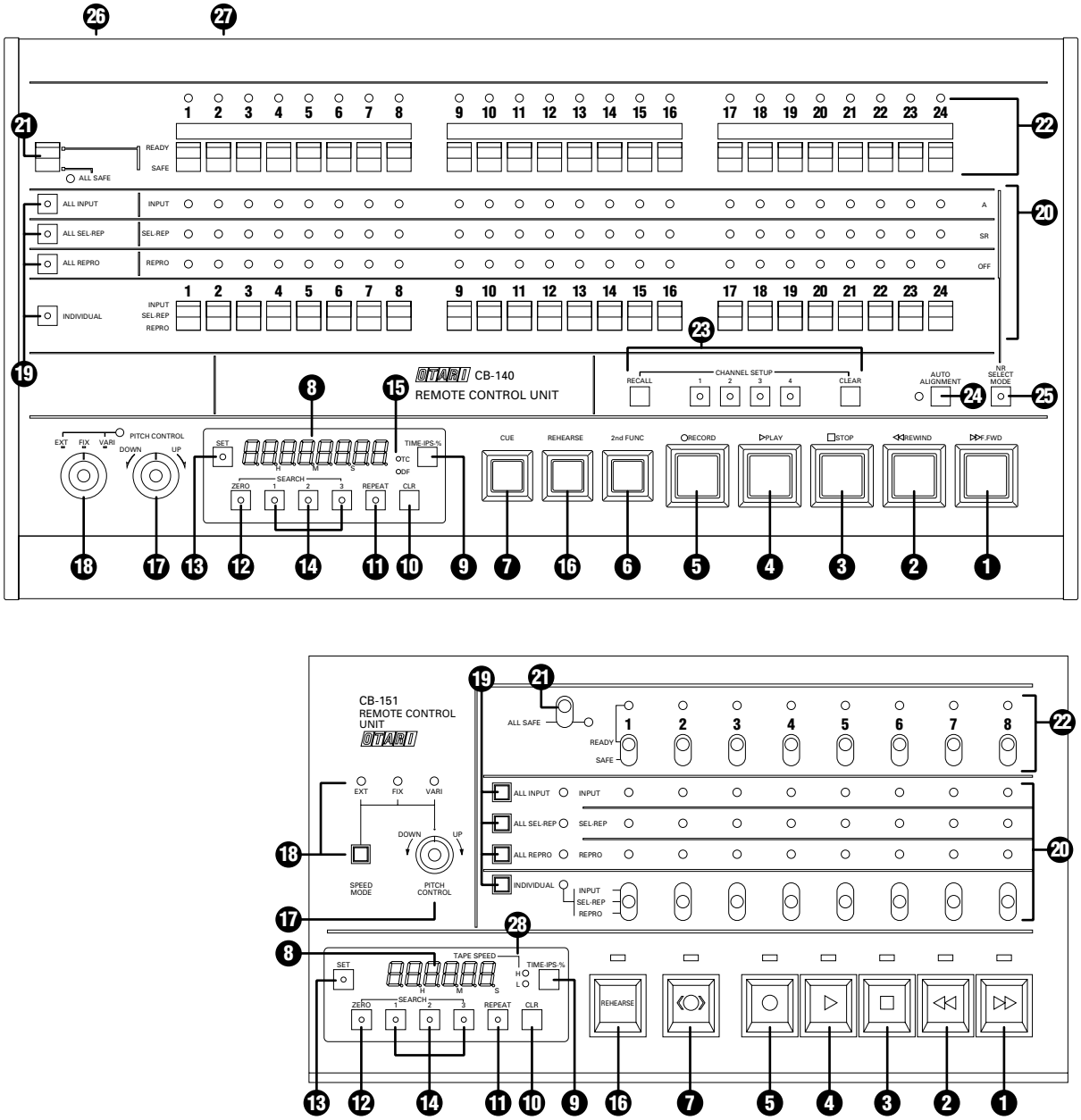


Figure 3-8
Remote Control Unit Front Panel

[1] F.FWD BUTTON, [2] REWIND BUTTON, [3] STOP BUTTON, [4] PLAY BUTTON, [5] RECORD BUTTON, [6] 2ND FUNC BUTTON, [7] CUE BUTTON*, [8] TAPE TIME DISPLAY, [9] TIME-IPS-% KEY, [10] CLR KEY, [11] REPEAT KEY, [12] SEARCH ZERO KEY, [13] SET KEY, [14] SEARCH 1–3 KEYS*

The functions of the above controls and indicators are duplicates of the similarly labeled controls and indicators on the MX-80 transport with the following exceptions. Refer to **Section 3.1** for information about these controls and indicators.
*Fast Wind Cue mode only, **SEARCH 3 key: No Search Play mode. These cue points are separate from those on the MX-80 transport control panel.

[15] TC AND DF INDICATORS These indications are invalid when connected to the MX-80.

[16] REHEARSE BUTTON

Pressing this button places the MX-80 in REHEARSE mode. When a punch-in is performed in REHEARSE mode, the monitor circuit of any channel which is in RECORD READY will be switched to Input monitor at the moment that the **RECORD** button is pressed, even though actual recording does not take place. In REHEARSE mode, the **REC** and **READY** indicators remain flashing. To leave REHEARSE mode press the **REHEARSE** button again.

[17] PITCH CONTROL KNOB

Adjusts the tape speed from -50% to +50% when the Speed Mode selector is set to the Vari position. The pitch control is velocity sensitive, so that turning the knob quickly produces a large pitch change and turning it slowly produces a small pitch change. By turning the knob slowly, the pitch can be changed in increments of 0.01%.
The amount of pitch change can be viewed directly by pressing the **TIME·IPS·%** button until "PC" is displayed, indicating that the display is showing the Percent of speed change from the currently selected speed.

[18] SPEED MODE SELECTOR SWITCH

Selects the speed reference for the capstan motor from three options.
FIX: The tape speed is fixed at the speed selected by the **SPEED SELECT** button on the MX-80 transport. The speed is locked to the MX-80's internal crystal controlled speed reference.
EXT: The tape speed is determined by the frequency of an EXTernal speed reference signal applied to pin 20 of the **PARALLEL I/O** connector on the rear panel. External control is used whenever the tape speed is to be controlled by a synchronizer, resolver or other similar device. The signal should be 9,600 kHz for nominal tape speed. If the speed mode selector is set to Ext, and the PITCH ENABLE line (pin 23) of the **PARALLEL I/O** connector is set to low logic level, the speed of the capstan motor will be controlled by the external speed reference signal. Refer to **§2.3.4** for more information about controlling the MX-80 from an external device.
VARI: The tape speed is determined by the setting of the **PITCH CONTROL**.

[19] INDIVIDUAL/ALL INPUT/ALL SEL·REP/ALL REPRO BUTTONS

When the **INDIVIDUAL** button is pressed, the monitor mode (INPUT, SEL·REP, or REPRO) of each channel can be selected individually with the output selector switches.
Pressing the **ALL INPUT** (**ALL SEL·REP**, or **ALL REPRO**) button changes all channels to INPUT (SEL·REP, or REPRO) MONITOR mode regardless of the position of the output selector switches. **SW2-3** on the **CPU** PCB in the CB-140 selects the method of simultaneously changing all channels' monitor mode: a) press the selected **ALL** button = **SW2-3 OFF**; b) press the selected **ALL** button twice quickly = **SW2-3 ON**.

[20] OUTPUT SELECTOR SWITCHES (INPUT/SEL·REP/REPRO)

When the **INDIVIDUAL** button has been pressed, setting one of these switches to the **INPUT** position causes the corresponding channel's output to be the signal present at that channel's input (INPUT MONITOR mode).
When the **INDIVIDUAL** button has been pressed, setting one of these switches to the **SEL·REP** position causes the corresponding channel's output to be the signal present on tape played back by the record head (SEL·REP MONITOR mode) if the channel is in RECORD SAFE.
When the **INDIVIDUAL** button has been pressed, setting one of these switches to the **REPRO** position causes the corresponding channel's output to be the signal present on tape played back by the reproduce head (REPRO MONITOR mode) if the channel is in RECORD SAFE.
The mode indicators show each channel's output monitor status. **Table 3-1** shows the relationship between RECORD mode, switch position, and indicator condition.

Table 3-1
Monitor Mode Indicators

Switch Position	Mode	Indicator
INPUT	Record	INPUT (Yellow)
SEL·REP	Record	INPUT (Yellow)
	Safe	SEL·REP (Green)
REPRO	——	REPRODUCE (Orange)

[21] ALL SAFE SWITCH AND INDICATOR

Setting this switch to the All Safe position puts all channels into Record Safe mode, and illuminates the green **ALL SAFE** indicator. In All Safe mode, the channel **READY/SAFE** switches have no effect. When All Safe is not selected, the Record Ready status of each channel is determined by that channel's **READY/SAFE** switch.

[22] READY/SAFE SWITCHES AND MODE INDICATORS

When the **ALL SAFE** switch is not engaged, these switches determine the Record Ready status of each channel. If a channel's **READY/SAFE** switch is in the Ready position, the associated indicator will flash, the **RECORD** button will flash, and that channel will enter Record when the **RECORD** (or **RECORD** and **PLAY**) button on the transport or Remote Control Unit is pressed. When a channel is in Record mode, its indicator will be steadily illuminated. **Table 3-2** describes the condition of the channel indicator and **RECORD** button for various combinations of switch position and transport mode.

Table 3-2
Record Indicator and Modes

Switch Position	Transport mode	Indicator (red)	RECORD button Lamp (red)
SAFE	Not Recording	Off	Off
	Recording	Off	On
READY	Not Recording	Flashing	Flashing
	Recording	On	On

[23] CHANNEL SET UP BUTTONS

Pressing one of these buttons, when it is not illuminated, causes the current READY/SAFE and INPUT/SEL·REPRO/REPRO status of all the channels to be stored that memory and that button to become illuminated.
Pressing one of these buttons, when it is illuminated, causes the channel status stored in that memory to be displayed, but the channels will not assume the stored status.
Holding the **RECALL** button pressed while pressing one of these buttons causes all the channels to be set to the READY/SAFE and INPUT/SEL·REP/REPRO status which was stored in that memory, and that button to flash.
Holding the **CLEAR** button pressed and then pressing any of the illuminated **CHANNEL SET UP** buttons causes the channel status stored in that memory to be cleared.
SW2-4 on the CB-140 **CPU** PCB Assembly selects NORMAL or PROTECTED mode for channel setup memories.
SW2-4 ON: Protected mode - channel setup memory contents cannot be changed.
SW2-4 OFF: Normal mode - channel setup memory contents are changed whenever the contents are recalled and a switch position is changed.

[24] AUTO ALIGNMENT BUTTON AND INDICATOR
[25] NR SELECT MODE BUTTON

These controls are not used on MX-80.

[26] TO TAPE RECORDER CONNECTOR

This multiconductor connector provides the serial interface between the CB-140 and the MX-80. Refer to **§2.3.3**.

[27] AUX POWER CONNECTOR

This connector can be used to provide DC power to an external device connected to the CB-140.
Pin Assignment (Connector Type: HONDA MR-8S (Female))

No.	Description
1–4.	Not Used
5, 6.	+24V Unregulated (max. 500mA)
7, 8.	Power Ground

[28] TAPE SPEED H/L INDICATOR

Shows the current position of the **SPEED SELECT** switch.

3.6.2 Controls on the CB-140 CPU PCB Assembly

There are DIP switches on the CB-140 **CPU** PCB assembly that control user-selectable functions such as punch-in/out type select.

Control	Function	Setting from Factory
SW1	CPU Reset	
SW2-1	Punch In Select ON Press the PLAY and RECORD buttons simultaneously to enter RECORD mode while in PLAY. OFF Press the RECORD button to enter RECORD while in PLAY.	ON
SW2-2	Punch Out Select ON Hold the RECORD button pressed and press the STOP button to leave RECORD without stopping the tape. OFF Press the PLAY button to leave RECORD without stopping the tape.	OFF
SW2-3	All Channel Mode Change Select ON Press the ALL INPUT/SEL·REP/REPRO button twice to change the mode of all channels. OFF Press the ALL INPUT/SEL·REP/REPRO button once to change the mode of all channels.	OFF
SW2-4	Channel Setup Mode select ON The channel setup memory contents cannot be changed. OFF The channel setup memory contents are changed whenever it is recalled and a switch position changed.	ON
SW2-5	Error Display ON Error codes are not shown on the CB-140 Tape Timer. OFF Error codes are shown on the CB-140 Tape Timer.	ON
SW2-6	Not Used	Off

NOTE: SW2-7 and 2-8 are not used for MX-80 operation.

SW2-7	Remote Control Priority Select ON CB-140 and Console Interface (option) have equal priority when changing channel status. OFF CB-140 has priority over Console Interface (option) when changing channel status.	OFF
SW2-8	Auto Alignment Enable/Disable ON Full Automatic Record Alignment from the CB-140 is disabled. OFF Full Automatic Record Alignment from the CB-140 is enabled.	ON

Section 4 Operation

This section contains, first, a list and an accompanying explanation of each of the many operating conditions (or modes) of the MX-80, and second, a tutorial covering the tape recorder-related tasks involved in making recordings. You should read both parts of this section when first becoming familiar with the machine, and again as a guide while you are learning to operate the machine. The portion describing the Operating Modes provides a quick reference, while the Tutorial portion provides hands-on instructions about how to operate the machine. Information regarding Installation and hooking up of the machine is contained in Section 2 of this manual. If you are uncrating and hooking up the machine for the first time, please refer to the information in Section 2 before continuing with this section.

4.1 Modes of Operation

Mode	Control	Operation
Play	PLAY	Tape moves from Supply to Take-up at the currently selected speed.
Reverse Play	PLAY + 2nd FUNC	Tape moves from Take-up to Supply at the currently selected speed.
Record	RECORD (or REC & PLAY)	Any channel in Record Ready begins to record.
Ready	READY/SAFE	The selected channel will enter Record when the RECORD button is pressed.
Safe	READY/SAFE	The selected channel will not enter Record.
Stop	STOP	Tape motion stops.
Reverse Stop	STOP + 2nd FUNC	Tape motion stops and the Capstan reverses its rotation.
F.Fwd	F.FWD	Tape moves from Supply reel to Take-up at wind speed.
Rewind	REWIND	Tape moves from Take-up reel to Supply reel at wind speed.
Edit Ready	EDIT + STOP	Transport is prepared for next Edit mode.
Dump Edit	EDIT + PLAY	Tape moves toward the Take-up reel but the Take-up motor does not turn.
Unload	EDIT/UNLOAD Twice	The tension on the tape is released.
Stop Cue	STOP + CUE	The lifters move out in preparation for another Cue mode.
Spooling Cue	Stop Cue + F.FWD or REW	Tape moves at 120 ips and audio can be monitored.
Fast Winding Cue	F.Fwd or Rew + CUE	The lifters retract and the tape contacts the heads for monitoring audio.
Spooling Wind	2nd FUNC + F.FWD or REW	Tape is wound in the direction selected at approximately 120 ips for library winding for storage. Audio is muted.
Input Monitor	ALL INPUT or INDIVIDUAL + INPUT	The signal at the MX-80 Output is the signal at the Input.
Sel·Rep Monitor	ALL SEL·REP or INDIVIDUAL + SEL·REP	The signal at the MX-80 Output is the signal on tape reproduced by the Record Head.
Repro Monitor	ALL REPRO or INDIVIDUAL + REPRO	The signal at the MX-80 Output is the signal on tape reproduced by the Repro Head.
Search to Zero	SEARCH ZERO	Tape is moved at wind speed to the location corresponding to 0.00.00 on the Tape Timer.
Search Cue	SEARCH 1–3	Tape is moved at wind speed to the location corresponding to the Tape Timer reading stored with the SEARCH 1–3 key.
Search Play	SEARCH CUE + PLAY	Tape is moved at wind speed to the stored location, where the tape enters Play.
Spot Erase	2nd FUNC + RECORD Twice	The Erase head for the channel in Record Ready will be activated and move the tape by hand for erasing.
Reverse Erase	2nd FUNC + PLAY + REC	The erase head for the channel in Record Ready will be activated and the tape will move from take-up to supply.
Stop Standby	STOP STANDBY On	All channels in Record Ready will be set to Input Monitor whenever tape stops.
Fast Standby	FAST STANDBY On	All channels in Record Ready will be set to Input Monitor whenever tape is in F.Fwd or Rewind.

4.2 Recording with the MX-80 — A Tutorial

4.2.1 Threading the Tape on the Machine

1. Set the POWER switch [**Figure 3-6**] to the "ON" position. It is located on the power supply panel at the bottom of the machine pedestal. The VU meter lamps will become illuminated.

2. Lift up the clamp levers on the top surface of the reel turntables to unlock them so they will accommodate the reels. Place an empty reel on the machine. If the tape is "heads" out, place the empty reel on the take-up reel turntable. If the tape is "tails" out, place the empty reel on the supply reel turntable.
   NOTE: There is a locating pin near the bottom of each reel turntable. In order for the reel to be seated firmly against the reel turntable, be sure one of the slots in the reel hub is aligned with the locating pin. When the reel is seated, push down on the clamp lever causing the clamp ring to expand and firmly grip the reel hub. Check to be sure the reel is seated firmly against the reel turntable.

3. Pull about 4 feet of tape from the reel, and thread it around the left tension arm and guide roller, across the head assembly, between the capstan and pinch roller, around the tachometer roller and the right tension arm, and onto the take-up reel, exactly as shown in **Figure 4-1** and on the transport of the MX-80.

4. Rotate the take-up reel counterclockwise, and the supply reel clockwise, by hand, to take up any slack in the tape and to lift the tension arms up toward the center of the transport. The STOP button will begin to flash.

5. Press the STOP button [**Figure 3-1, 3**] to apply tension to the tape and prepare the transport for further functions. The STOP button will become brightly illuminated. It is not necessary to perform this step, (you can go directly from UNLOAD to PLAY or WIND), but we recommend that you develop the habit of pressing the STOP button to insure there is no slack in the tape before proceeding to other operations to prevent any possible damage to the tape or machine caused by sudden movement of the tape.

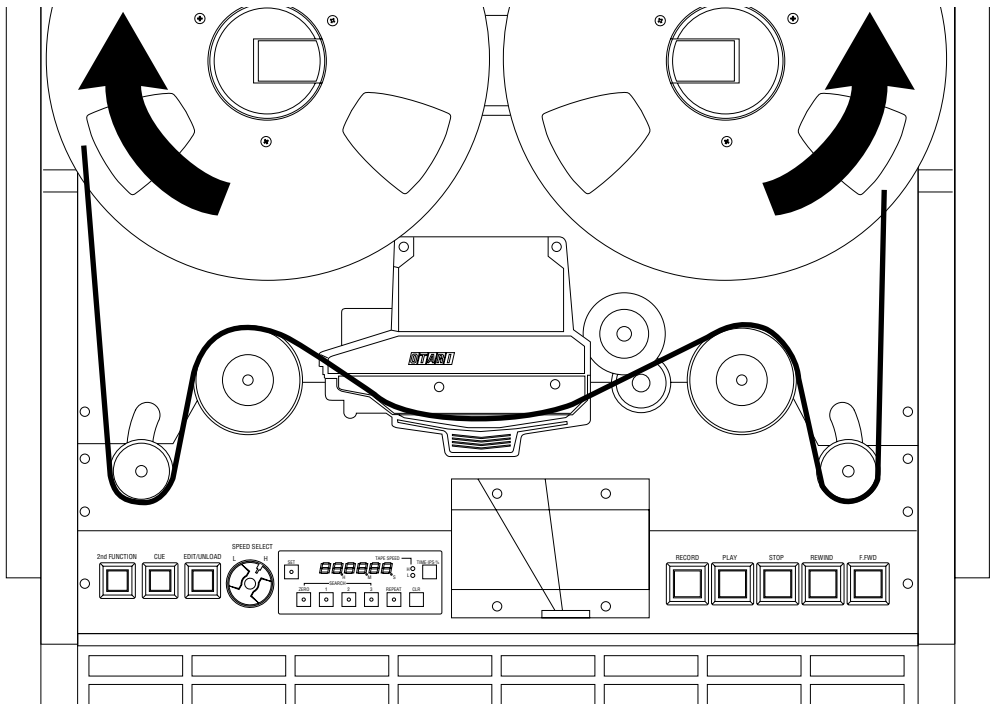


Figure 4-1
Tape Threading

4.2.2 Recording the Basic Tracks

1. Thread the tape on the transport as described in **§4.2.1**.
2. Set the SPEED SELECT switch [**Figure 2-1, 6**] to the desired tape speed. On high speed-pair machines L is 15 ips and H is 30 ips. On low speed-pair machines, L is 7.5 ips and H is 15 ips. Set the Speed Mode Selector switch [**Figure 2-9, 18**] to the "FIX" position.
3. Press the CLR and TIME·IPS·% keys simultaneously to reset the Tape Timer to 0.00.00.
4. Set the ALL SAFE switch on the Remote Control Unit to the "READY" position.
5. Set the READY/SAFE switch(es) for the track(s) on which you wish to record to the "READY" position. The READY LED above that switch will be illuminated, and the RECORD button will flash indicating that the channel is in RECORD READY mode.
6. Set the Output Selector switches [**Figure 2-9, 20**] for the selected channel(s) to the "INPUT" position, or press the ALL INPUT button. The corresponding INPUT indicator(s) will become illuminated.
7. Adjust the signal level at the mixing console or signal source. The output of the console should be set for the same level range as the input of the MX-80. Refer to **§2.4** for more information about setting console and MX-80 levels.
8. It is good practice to record reference tones at the head of every session tape for later level matching. If you use reference tones, adjust the level at the console for a meter indication of 0 VU.
9. Press the PLAY and RECORD buttons simultaneously to cause the MX-80 to begin recording on the selected tracks. See **§3.1** for more information about selecting the method of entering and leaving Record mode.
10. There are several ways to end recording. To end the recording and stop the tape, press the STOP button. To end the recording on all tracks and have the tape continue in PLAY (punch-out), press the PLAY or PLAY and RECORD buttons (depending upon the setting of SW1 on the TRANSPORT CONTROL PCB, see **§3.1**), or set the ALL SAFE switch to the "ALL SAFE" position. To end the recording on one or more tracks, while other tracks continue to record, move the READY/SAFE switches for those tracks to the "SAFE" position.

4.2.3 Playing Back the Basic Tracks

1. Rewind the tape to the beginning of the recording by pressing **SEARCH ZERO** (if the Tape Timer was reset at the beginning), or by pressing the **REWIND** button.
2. Set the **ALL SAFE** switch to the "**ALL SAFE**" position to avoid accidentally erasing recorded tracks. The **ALL SAFE** LED will become illuminated.
3. Set the Output Selector switches [**Figure 3-9, 20**] for the selected channel(s) to the "**REPRO**" position, or press the **ALL REPRO** button. The corresponding **REPRO** indicator(s) will become illuminated.
4. Press the **PLAY** button. The signal on the tape will be reproduced by the reproduce head and fed to the **OUTPUT** connectors.
5. Adjust the monitor level at the mixing console.

4.2.4 Recording Overdubs Using Sel·Rep Playback

Overdubs are performed when it is necessary to add additional tracks in sync with material already recorded on some of the tracks. During SEL·REP playback the previously recorded material is reproduced by the record head making it possible to add (overdub) tracks without the delay caused, during normal playback, by the space between the record and reproduce heads. When overdubs are recorded, the previously recorded tracks are played in Sel·Rep and monitored by the performer through the mixing console. The new material is then recorded in sync with the existing tracks.

1. Rewind the tape to the beginning of the section to be overdubbed.
2. Set the **ALL SAFE** switch to the "**READY**" position, and set the **READY/SAFE** switches to "**SAFE**" for the all the tracks on which no new material will be recorded.
3. Set the **READY/SAFE** switches to "**READY**" for the tracks on which new material is going to be recorded. The **READY** LEDs for those tracks will flash.
4. Set the Output Selector switches [**Figure 3-9, 20**] to the "**SEL·REP**" position for all the channels, or press the **ALL SEL·REP** button. The **INPUT** indicator(s) will be illuminated for the channels which are in RECORD READY mode, if the **STOP STANDBY** switch [**Figure 3-5, 11**] is On.
5. Press the **PLAY** and **RECORD** buttons simultaneously to begin overdubbing. Adjust the recording and monitor levels at the mixing console.

4.2.5 Recording Punch-In Overdubs

Punch-in overdubs are performed when it is necessary to insert new material into a track that has already been recorded, without re-recording the entire track. Punch-in overdubbing allows you to monitor the previously recorded material on the tracks selected for recording, right up to the instant the track is put into Record. At the moment that the track(s) enter Record mode, the MX-80 switches the outputs of the tracks being recorded to Input monitor to allow you to listen to the new material as it is being recorded in sync with the material recorded earlier.

1. Rewind the tape to the beginning of the section to be overdubbed.
2. Set the **ALL SAFE** switch to the "**READY**" position, and set the **READY/SAFE** switches for all the tracks that are not going to be recorded to "**SAFE**".
3. Set the **READY/SAFE** switches for the tracks that are going to be overdubbed to "**READY**". The **READY** LEDs for those tracks will be illuminated.
4. Press the **ALL SEL·REP** button. The **SEL·REP** LEDs for the tracks that are not being recorded will be illuminated. The **INPUT** LEDs for the tracks to be recorded will be illuminated if the **STOP STANDBY** switch is On.
5. Press the **PLAY** button to listen to the existing tracks. At the moment that the new material is to be inserted, press the **RECORD** button (or the **PLAY** and **RECORD** buttons, depending upon the setting of **SW1** on the **TRANSPORT CONTROL** PCB) to begin the punch-in. Adjust the recording and monitor levels at the mixing console.
6. Press the **PLAY** button (or **RECORD** and **STOP** buttons, depending on the setting of **SW1** on the **TRANSPORT CONTROL** PCB) to punch-out (end the punch-in). The output signal for the tracks being overdubbed will return to SEL·REP mode (e.g., being played back by the record head), and the MX-80 will continue in PLAY.
7. To hear the results of the punch-in, rewind the tape to the beginning of the section, set the **ALL SAFE** switch to the "**ALL SAFE**" position. Press the **PLAY** button and adjust the monitor level at the console.

Repeat the punch-in until you are happy with the results. Otari's gapless punch-in provides the capability to insert new material onto a previously recorded track without a gap or overlap being recorded on the tape. Actually producing perfect punch-ins requires patience and practice to achieve accurate results.

4.2.6 Rehearsing the Punch-In

To rehearse a punch-in without actually recording anything on the tape:

1. Rewind the tape to the beginning of the section to be overdubbed.
2. Press the REHEARSE button.
3. Set the ALL SAFE switch to the "READY" position, and set the READY/SAFE switches for all channels which are not going to be recorded to "SAFE".
4. Set the READY/SAFE switches for the channels that are going to be overdubbed to the "READY" position. The READY LEDs for those channels will flash.
5. Press the ALL SEL·REP button. The SEL·REP LEDs for the tracks which are not being overdubbed will be illuminated. The INPUT LEDs for the channels which are being overdubbed will be illuminated if the STOP STANDBY switch is On.
6. Press the PLAY button to listen to the existing tracks. At the moment that the new recording is to begin, press the RECORD button (or the PLAY and RECORD buttons, depending upon the setting of SW3 on the TRANSPORT CONTROL PCB) to begin the punch-in rehearsal.

4.2.7 Bouncing or "Ping-Ponging" Tracks

Bouncing or "ping-ponging" tracks involves recording several original tracks, mixing those tracks and recording them back on to other tracks of the same tape, and then, adding more tracks to the mixed tracks. In order to maintain the highest signal quality during "ping-ponging", the recorded material should be played back from the reproduce head. This means that the mixed tracks will not be in sync with the rest of the tracks. It is possible to bounce tracks using SEL·REP playback from the record head, but the quality will not be as good as it will be when using the reproduce head. However, using SEL·REP to bounce tracks leaves the resulting mixed track(s) in sync with the rest of the tracks. When bouncing tracks using SEL·REP we recommend that you leave a blank (empty) track between the tracks being recorded and the tracks being mixed. For example, if you have already recorded on tracks 1 through 12, and wish to mix and bounce them to another track, it is advisable to record the mixed tracks on tracks 14 and 15, leaving track 13 empty as a guard track. You can then come back and record additional tracks in sync with the mixed material on tracks 14 and 15.

To "ping-pong" or bounce tracks:

1. Rewind the tape to the beginning of the section of tape to be mixed, and determine which tracks will be mixed and which tracks will be recorded onto.
2. Set the **ALL SAFE** switch to the "**READY**" position.
3. Press the **INDIVIDUAL** button.
4. Set the individual **INPUT/SEL·REP/REPRO** switches to "**REPRO**" for those tracks to be mixed, and to "**INPUT**" for those tracks to be recorded onto. The mixing console controls should be set to mix the tracks that are in REPRO and send the resulting mix to the tracks that are in RECORD READY.
5. Reset the Tape Timer so that Search to Zero can be used to quickly return the tape to the beginning of the section.
6. Press the **PLAY** button, and adjust the mixing console for the desired mix of tracks and for a suitable recording level.
7. Press the **SEARCH ZERO** key to return the tape to the beginning.
8. When the desired mix has been achieved, begin recording by pressing the **PLAY** and **RECORD** buttons simultaneously.

The previously recorded tracks will be played by the reproduce head, mixed together, and recorded on the tape at the record head. You may now go back and record over (thereby erasing) the original tracks with new material in sync with the "ping-ponged" tracks, giving you the ability to record many more channels of material than the tape recorder has tracks.

4.2.8 Using the Spot Erase Feature

The spot erase feature utilizes time-ramp bias switching to enable you to erase small areas of the tape without leaving the usual assortment of clicks, pops, and chirps that are caused by short bias turn-on and turn-off times. To spot erase a small section of one track:

1. Mark the head (or beginning) and tail (or end) of the area to be erased using grease pencil or china marker. Position the tape so that the head mark is several inches to the left of the erase head.
2. Set the **ALL SAFE** switch to the "**READY**" position.
3. Set the **READY/SAFE** switches for the tracks to be erased to the "**READY**" position.
4. Press the **2nd FUNCTION** button and begin to move the tape toward the marked points, then press the **RECORD** button to enter SPOT ERASE mode without leaving a pop or thump recorded on the tape.
5. Move the tape by hand from the head mark to the tail mark. When the tail mark reaches the erase head, release the **RECORD** button to terminate the function.

NOTE: The spot erase feature cannot be used through the Remote Control Unit CB-140 or CB-151.

4.2.9 Playing Back the Tracks for Mixdown

The basic tracks, overdubs, and punch-ins must all be played back into the mixing console to be combined and balanced for the final master tape. To play the tracks that have been recorded:

1. Rewind the tape to the beginning of the section of tape to be mixed.
2. Reset the Tape Timer to 0.00.00.
3. Set the **ALL SAFE** switch to the "**ALL SAFE**" position.
4. Press the **ALL REPRO** button.
5. Press the **PLAY** button to begin playback.
6. Adjust the level and balance of the individual tracks at the mixing console.
7. To return to the beginning of the tape for another pass, press the **SEARCH ZERO** key.

4.2.10 Library Winding the Tape

At the completion of a session the tape is generally stored "tails" out, for two good reasons, 1) to avoid audible "pre-echoes" resulting from tape print-through, and 2) to lessen the possibility of edge damage because the just played tape is wound much smoother than would result from fast winding the tape. The MX-80 includes a SPOOL mode which provides a smooth library wind in only 1/4 the time required to play the tape onto the reel.

1. To spool the tape onto the take-up reel, press the **F.FWD** button, and then, keeping the **F.FWD** button pressed, press the **2nd FUNCTION** button.
2. To spool the tape onto the supply reel, press the **REWIND** button, and then, keeping the **REWIND** button pressed, press the **2nd FUNCTION** button.
3. To end the spool operation, press the **STOP** button.

4.2.11 Moving the Tape by Hand for Editing

The constant tape tension system used in the MX-80 allows the tape to be moved from one reel to the other by hand very easily. When the transport is in Stop mode, the tape lifters are retracted and the audio is not muted, making it possible to simply move the tachometer roller manually to locate the correct place on the tape.

To monitor the tape at the reproduce head, press the **ALL REPRO** button, to monitor the tape at the record head press the **ALL SEL-REP** button.

4.2.12 Editing the Tape

Often it is necessary to cut the tape to remove unwanted material. This involves selecting two points on the tape, separated by the segment to be removed, cutting the tape at those "edit points", removing the unwanted piece of tape, and rejoining the cut ends of the tape with adhesive splicing tape. The MX-80 constant tension system does not allow you to pull the tape away from the head assembly and cut it, as on some older machines, so the MX-80 features an edit mode for releasing the reel brakes and dumping unwanted tape.

1. Press the **ALL REPRO** button, and wind the tape to the beginning of the section to be edited.
2. Press the **STOP** button, and move the tape by hand to locate the exact edit point at the head of the segment.
3. Mark the head edit point with grease pencil or china marker. Press one of the **SEARCH 1–3** keys to store this location.
4. Move the tape to the tail edit point, and carefully locate and mark the point.
5. Rewind the tape to the head edit point. If you stored the location using the **SEARCH 1–3** key, press the **SEARCH 1–3** key to quickly go to that point on the tape. Move the tape to place the head edit point between the Tachometer roller and the take-up reel.
6. Press the **EDIT/UNLOAD** button and the **PLAY** button.
7. Allow the tape to "dump" to the tail edit point. When the tail edit point reaches the heads, stop the tape.
8. Pull the tape out away from the head assembly, and fit it into the splicing block. Position the tail edit point over the groove in the splicing block, and carefully cut the tape with a sharp blade.
9. Pull the head edit point from the take-up reel to the splicing block, position it over the groove in the splicing block, and carefully cut the tape and join the ends with splicing tape.

CAUTION: When in the DUMP EDIT mode, direct the tape off the side of the transport with your hand to prevent the tape from being caught in the pinch roller.

4.2.13 Using the Variable Speed Feature

The MX-80 allows you to change the speed of the tape, as it is being Recorded or Played, by ±50% (about ± two whole tones). This feature makes it possible to compress or extend material to fit it into a time slot, or to change the pitch for special effects, etc.

To manually adjust the speed of the MX-80:

1. Set the Speed Mode selector switch on the Remote Control Unit to the "VARI" position.
2. Use the PITCH CONTROL knob on the Remote Control Unit to vary the capstan speed as desired. Turning the PITCH CONTROL knob counterclockwise causes the speed to decrease, turning it clockwise causes the speed to increase.

Also using the SET key on the tape time display, Varispeed amount is presettable.

4.2.14 Controlling the Capstan Speed with an External Device

The capstan speed of the MX-80 can be controlled by an external device such as a resolver or synchronizer. The PARALLEL I/O connector on the rear panel provides an input for an external speed reference signal. This signal should be a square wave, TTL level (+5 V when on, 0 V when off), or a sine wave of 10 V peak to peak from a generator having a source impedance of less than 50 Ω at 9600 Hz for nominal speed. Refer to **Table 2-4** for the PARALLEL I/O connector pin assignments and signal descriptions.

To use an external speed reference signal connected to the PARALLEL I/O connector, set the Speed Mode Selector switch on the Remote Control Unit to the "EXT" position. If the external reference signal is lost, or falls below 6 V (sine wave signal) the machine will revert to its Fix speed mode. The range of speed control possible from the PARALLEL I/O connector is -50%, +100% at 15 ips and +40, -50% at 30 ips.

NOTE: The capstan motor will stop when the external control signal (9600 Hz) is lost, unless the pitch enable line (pin 23 of the PARALLEL I/O connector) returns to the logic high state.

Section 5 Alignment and Calibration

This section contains the instructions and information required to perform the routine reel control, tape tension, head alignment, audio channel calibration, bias and erase adjustments associated with normal maintenance of the MX-80.

When you are performing these procedures for the first few times, proceed slowly and carefully. Soon you will be familiar with them, but initially it is better to be cautious and avoid accidents.

5.1 Transport Alignment

The MX-80 transport should not require frequent adjustment of tape tension and wind speeds, but these procedures should be performed whenever track format or tape width is changed, or if any mechanical component in the tape path has been replaced.

5.1.1 Tools and Equipment Required

a. DC voltmeter capable of 0.05 V resolution while measuring +5 V.

b. Frequency counter capable of 50 Hz resolution while measuring 9.6 kHz.

c. A general purpose dual-trace oscilloscope such as those made by Tektronics, Leader, Hitachi, Hewlett-Packard, etc. The oscilloscope is necessary for tachometer pulse quadrature, and capstan duty cycle adjustments.

d. A wow and flutter meter capable of 0.01% resolution, DIN 45504 weighted.

e. A reel of tape of the type normally used for sessions.

f. A small non-magnetic alignment screwdriver with a blade small enough to fit the trimmers on the REEL CONTROL and TRANSPORT CONTROL PCBs.

g. 1.5 mm, 2 mm, 2.5 mm, and 4 mm hex keys (allen wrenches).

h. A calibrated, direct reading tape tension meter such as Tentelometer Model T2-H2O-2.

5.1.2 Opening the Transport and Removing the Deck Skin Panels

1. Turn off the power to the machine and wait 30 seconds to allow the power supply capacitors to discharge, Remove any tape and/or empty reels from the transport.

2. Open the upper rear panel to gain access to the REEL CONTROL PCB by removing the uppermost two screws on each side of the panel, and folding it down to a horizontal position.

3. Open the VU meter panel by removing the outer two screws from the top of the panel, and folding it down to a horizontal position.

4. Remove the splicing block by removing the four socket head screws which attach it to the transport deck top.

5. Loosen the capstan shaft dust cap by turning it counterclockwise.

6. Remove the four socket head screws which attach the front deck skin panel, and while holding the tension arm rollers at their uppermost position, carefully remove the panel.

7. Remove the pinch roller assembly from its shaft by removing the socket head screw in the center of the top of the roller assembly and lifting the pinch roller assembly off its shaft.

8. Remove the head assembly cover by removing the two socket head cap screws which attach it to the transport deck, and lifting the head assembly cover off the machine.

9. Remove the rear deck skin panel by first removing the five socket head screws from the perimeter of the rear deck skin. Then lift the rear of the panel and carefully slide it toward the rear of the machine until it can be lifted off the machine.

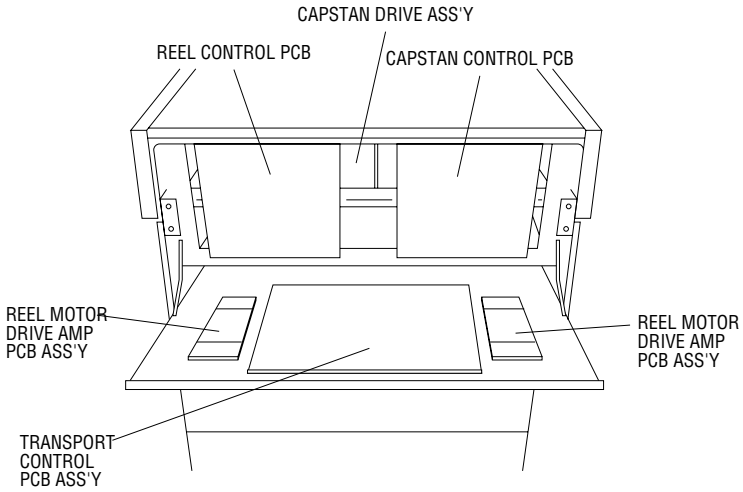


Figure 5-1
Location of Transport, Capstan, and Reel Control PCBs

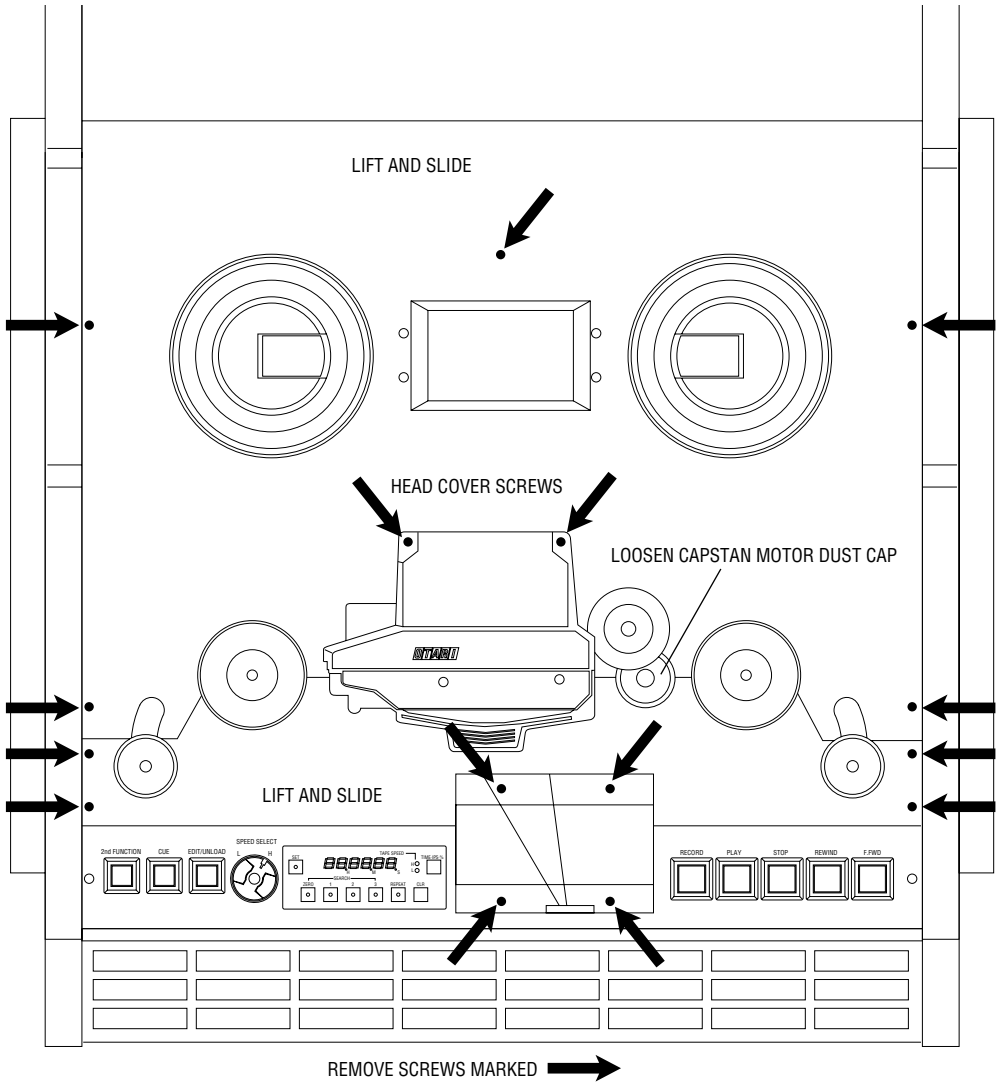


Figure 5-2
Deck Skin Panel removal

5.1.3 Reel Tension Servo Adjustment

The constant tape tension system employed on the MX-80 utilizes tension arms in the tape path to provide feedback information to the REEL CONTROL PCB. These circuits adjust the torque and speed of the take-up and supply reel motors to keep the tension on the tape constant regardless of operating mode, tape speed, and amount of tape on the reels.

5.1.3.1 Tension Arm Spring Tension Adjustment

The running tape tension is set by the balance of reel motor torque against the tension of the tension arm springs. Therefore it is important that the tension arm spring tension be set accurately.

1. Attach the 0–2000 gram spring scale to the tension arm roller with a loop of string.
2. Pull the spring scale toward the rear of the machine until the tension arm is in the middle of its travel, and measure the spring tension. Refer to **Figure 5-3**.
3. If the spring tension is not 500 (for 1" tape width, 320 grams) grams ±10%, then loosen the lock nut on the spring adjusting screw by holding the portion closest to the anchor bracket and unscrewing the outer portion. Adjust the inner nut as necessary to obtain 500 (or 320 for 1" tape width) grams ±10% tension reading on the spring scale. It is good practice to adjust both supply and take-up tension arms to the same tension within ±10 grams.
4. Tighten the outer portion of the double nut to lock the adjusting screw in place.

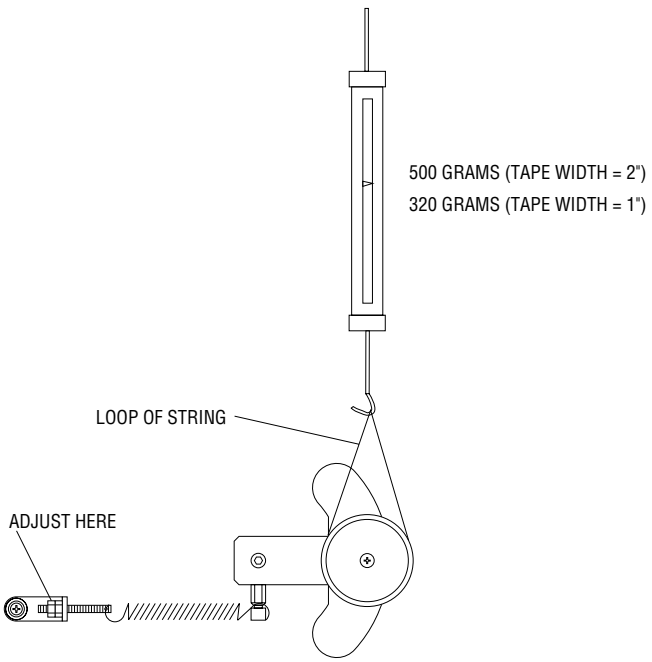


Figure 5-3
Tension Arm Spring Tension Measurement

5.1.3.2 Tachometer Quadrature/Phase Adjustment

1. Connect channel 1 of the dual channel oscilloscope to **TP2** on the **TRANSPORT CONTROL** PCB.
2. Connect channel 2 of the oscilloscope to **TP3**. Use **TP1** for ground for the oscilloscope.
3. Connect the tachometer roller to the capstan shaft with a rubber band, so that the tachometer roller turns when the capstan shaft turns.
4. Secure both tension arms at the top of their travel.
5. Adjust the position of the **TACHO I** PCB (the PCB with two sensors) so that the waveform at **TP3** leads the waveform at **TP2** by 90 degrees.

NOTE: The waveforms do not have a 50% duty cycle. Refer to **Figure 5-5**. Remove the rubber band when adjustment is completed.

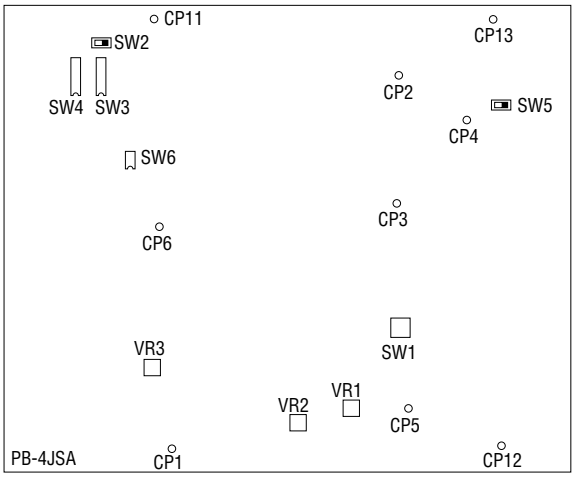


Figure 5-4
Location of Trimmers and Check Points on Transport Control PCB

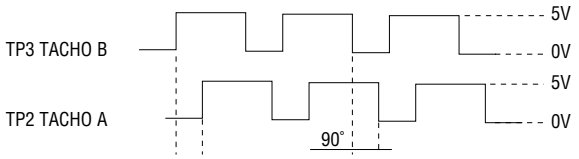


Figure 5-5
Tach Waveforms

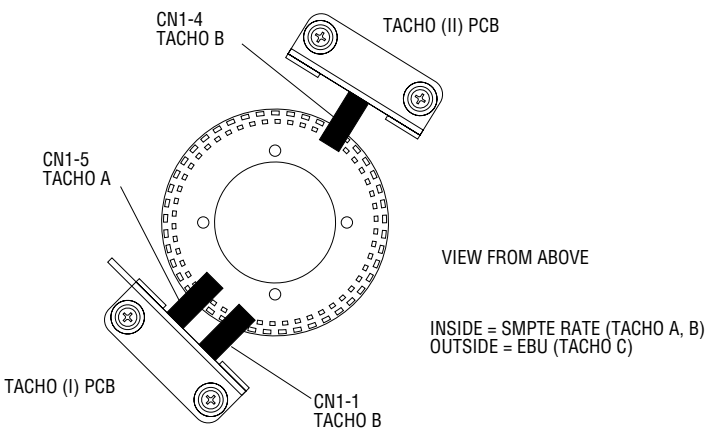


Figure 5-6
Location of Tacho I and Tacho II PCBs

5.1.3.3 Fast Wind Speed Reference Voltage Adjustment

1. Adjust **VR2** for 0.0 V at **TP5** on the **TRANSPORT CONTROL** PCB in UNLOAD mode.
2. Secure both tension arms at the top of their travel.
3. Adjust **VR1** for 7.0 V at **TP5** on the **TRANSPORT CONTROL** PCB in FAST FORWARD mode.

5.1.3.4 Tension Sensor Position

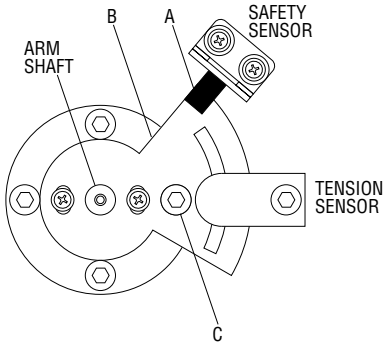


Figure 5-7
Location of Tension Sensor Adjustments

1. Remove tape and reels from the transport, and raise the transport to its open position. Turn on the power to the machine.
2. With the supply tension arm at the bottom of its travel, adjust the position of the safety sensor so that its centerline is aligned with the center of the tension arm shaft.
3. With the supply tension arm at the bottom of its travel, adjust the position of the sensor vane, by loosening the two screws which attach the vane to the mounting collar, so that the edge of the vane lines up with the edge of the safety sensor. Tighten the vane mounting screws.
4. Adjust the position of the supply tension sensor so that its centerline is aligned with the center of the "C" screw. Tighten its mounting screw securely.
5. Connect the DC voltmeter to **CP1** (**SUPPLY**) and **CP11** (**GROUND**) on the **REEL CONTROL** PCB.
6. Slowly move the supply tension arm from the bottom to the top of its travel while observing the voltage on the DC voltmeter. The voltage will decrease as the tension arm is raised. If the voltage reaches its minimum before the tension arm reaches its upper limit, then the tension sensor position must be adjusted. Repeat the observation and adjustment until the sensor voltage is linear with tension arm travel. Refer to **Figure 5-9**.
7. Repeat steps 1 through 6 for the take-up tension arm sensor assembly using **CP5** on the **REEL CONTROL** PCB.

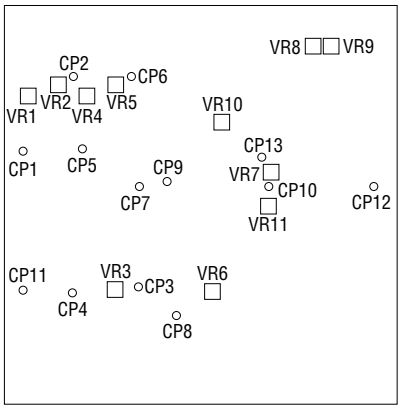


Figure 5-8
Location of Trimmers and Check Points on Reel Control PCB

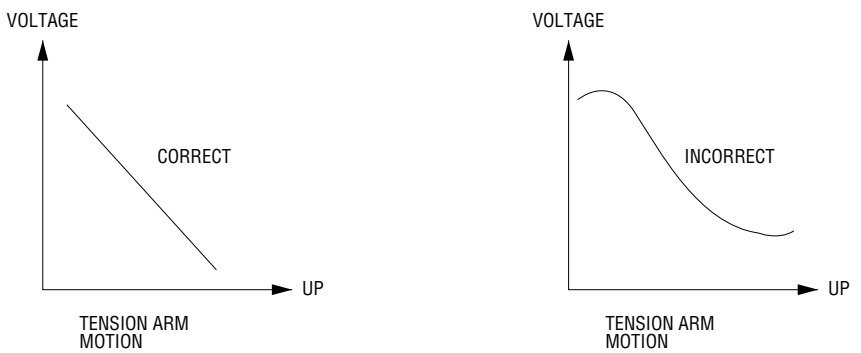


Figure 5-9
Tension Sensor Voltage Adjustment

5.1.3.5 Tension Arm Sensor Gain Adjustment

1. Hold the take-up tension arm at the top of its travel and adjust **VR4** on the **REEL CONTROL** PCB for 0.0 V at **CP6**. Let the take-up tension arm return to the bottom of its travel and adjust **VR5** for 10.0 V at **CP6**.

2. Hold the supply tension arm at the top of its travel and adjust **VR1** for 0.0 V at **CP2**. Let the supply tension arm return to the bottom of its travel and adjust **VR2** for 10.0 V at **CP2**.

5.1.3.6 Play Acceleration Preliminary Adjustment

1. Hold both tension arms at the top of their travel.

2. Adjust **VR11** of the **REEL CONTROL** PCB for 7.0 V at **CP10** in PLAY mode.

NOTE: Adjust **VR11** within the first two seconds after pressing the **PLAY** button because the voltage will decrease rapidly after a short time.

5.1.3.7 Fast Forward and Rewind Torque Adjustment

1. Remove tape and reels from the transport and secure both tension arms at the top of their travel.

2. Connect the DC voltmeter to the top of **R27** (or **IC4** pin 1) on the **REEL CONTROL** PCB, and place the MX-80 in REWIND mode.

3. After about 10 seconds (after the voltage has stabilized), adjust **VR8** to obtain a reading of -8.0 V +0.5/-0.25 V on the DC voltmeter. Press the **STOP** button.

4. Connect the DC voltmeter to the top of **R71** (or **IC10** pin 1), and place the MX-80 in FAST FORWARD mode.

5. After about 10 seconds (after the voltage has stabilized), adjust **VR9** to obtain a reading of -8.0 V +0.5/-0.25 V on the DC voltmeter. Press the **STOP** button.

5.1.3.8 Reel Motor Torque Adjustment

1. Secure both tension arms at the top of their travel. Connect the DC voltmeter to **CP4** on the **REEL CONTROL** PCB.

2. Hold the supply reel firmly by hand to prevent it from turning, and place the MX-80 in REWIND.

3. After about 10 seconds (after the voltage has stabilized), adjust **VR3** to obtain a reading of +7.5 (for 1" tape width, +9 V) ±0.5 V on the voltmeter. Press the **STOP** button.

4. Connect the DC voltmeter to **CP8**.

5. Hold the take-up reel firmly by hand to prevent it from turning, and place the MX-80 in Fast Forward.

6. After about 10 seconds (after the voltage has stabilized), adjust **VR6** to obtain a reading of +7.5 (or +9 V for 1" tape width) ±0.5 V on the voltmeter. Press the **STOP** button.

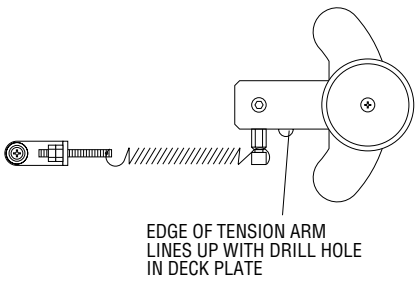


Figure 5-10
Tension Arm Position Adjustment

5.1.3.9 Tension Arm Position Adjustment

1. Thread the machine with tape and wind until there is an equal amount of tape on each reel.
2. Adjust VR4 on the REEL CONTROL PCB until the front edge of the take-up tension arm is even with the drill mark in the deck plate, while in LOAD mode. Refer to **Figure 5-10**.
3. Place the machine in PLAY briefly to confirm the position of the tension arm.
4. Adjust VR1 until the front edge of the supply tension arm is even with the drill mark in the deck plate, while in LOAD mode.
5. Place the machine in PLAY briefly to confirm the position of the tension arm.

5.1.3.10 Fast Wind and Spooling Wind Speed Adjustment

1. Connect the frequency counter to CP13 on the REEL CONTROL PCB.
2. Thread the machine with tape and wind until there is an equal amount of tape on each reel.
3. Place the machine in FAST FORWARD mode.
4. After the frequency has reached its maximum (about 10 seconds), adjust VR10 to obtain a frequency reading of 3000 ±30 Hz.
5. Rewind the tape until there is an equal amount on each reel.
6. Place the machine in FORWARD SPOOL mode (by pressing the 2nd FUNCTION and F.FWD buttons).
7. Readjust VR7 to obtain a frequency reading of 1000 ±10 Hz.
8. Place the machine in FAST FORWARD mode and note the frequency reading.
9. Place the machine in REWIND and note the frequency reading. If the FAST FORWARD and REWIND readings are not within 60 Hz of each other adjust VR3 and VR6 until they are.

5.1.3.11 Tape Tension Check

Thread the machine with tape and wind until there is an equal amount of tape on each reel. With the MX-80 in STOP mode, measure the tape tension between the take-up tension arm roller and the take-up reel, using a calibrated Tentelometer (or equivalent). The tape tension should be 320 (for 1" tape width, 210) ±20 grams. If the tape tension is not correct, check the tension of the tension arm springs (**§5.1.3.1**), and check the setting of the tension arm position trimmers VR1 (SUPPLY) and VR4 (TAKE-UP). Refer to **§5.1.3.9**.

5.1.4 Capstan Servo Adjustment

Refer to **Figure 5-1** for the location of the CAPSTAN CONTROL PCB. If you have just completed adjustments to the REEL CONTROL PCB, the necessary panels will already be open, and you may disregard any instructions relating to opening the panels to gain access to the PCBs. These procedures should be performed in the order presented here because the correct adjustment of one parameter may depend upon the previous correct adjustment of another parameter.

5.1.4.1 Preliminary Adjustment

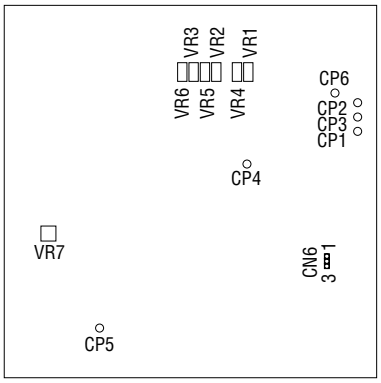


Figure 5-11
Location of Trimmers and Test Points on Capstan Control PCB

1. Turn off the power to the machine and wait 30 seconds to allow the power supply capacitors to discharge. Remove any tape and/or empty reels from the transport.
2. Open the upper rear panel to gain access to the CAPSTAN CONTROL PCB by removing the uppermost two screws on each side of the panel, and folding it down to a horizontal position.
3. On the CAPSTAN CONTROL PCB, turn VR1, VR2, VR3, VR4, VR5, and VR6 fully counterclockwise until the trimpot clicks on each revolution (**NOTE:** These are 30-turn trimpots), then turn each trimmer clockwise 15 full revolutions.
4. Set VR7 on the CAPSTAN CONTROL PCB to the center of its rotation.

5.1.4.2 Phase Locked Loop Duty Cycle Adjustment

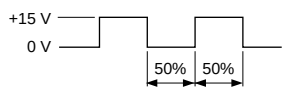


Figure 5-12
Capstan Waveforms

1. Connect an oscilloscope to CP3 and GND on the CAPSTAN CONTROL PCB.
2. Set the SPEED switch on the transport control panel to the "H" position. Set SW2 (H/L SPEED PAIR) on the TRANSPORT CONTROL PCB to the "H" position. Set the SPEED MODE switch on the Remote Control Unit to the "FIX" position.
3. Secure both tension arms at the top of their travel.
4. Turn on the power to the MX-80.
5. Adjust VR7 so that the waveform displayed on the oscilloscope has a duty cycle of approximately 50%.

5.1.4.3 Gain Adjustment

1. With the oscilloscope still connected to CP3 on the CAPSTAN CONTROL PCB and the SPEED switch still set for 30 ips, adjust VR4 (30 IPS GAIN) so that the waveform displayed on the oscilloscope has a duty cycle of exactly 50%.
2. Set the SPEED switch on the transport control panel to the "L" position (15 ips).
3. Adjust VR5 (15 IPS GAIN) so that the waveform displayed on the oscilloscope has a duty cycle of exactly 50%.
4. Set SW2 (H/L SPEED PAIR) on the TRANSPORT CONTROL PCB to the "L" position.
5. Adjust VR6 (7.5 IPS GAIN) so that the waveform displayed on the oscilloscope has a duty cycle of exactly 50%.

5.1.4.4 Capstan Servo Damping Adjustment

NOTE: If a wow and flutter meter is not available, do not change the setting of VR1, VR2, or VR3 (CAPSTAN DAMPING trimmers).

1. Thread the MX-80 with tape and wind until there is less than 1/2" (1.25 cm) of tape pack remaining on the supply reel.
2. Connect the 3150 Hz output of the wow and flutter meter to the TEST SIGNAL input on the AUDIO CONTROL PCB. Connect the input of the wow and flutter meter to the channel 8 rear panel OUTPUT connector.
3. Set SW2 (H/L SPEED PAIR) on the TRANSPORT CONTROL PCB to the "H" position. Set the SPEED switch on the transport control panel to the "H" position (30 ips).
4. Set the channel 8 READY/SAFE switch on the Remote Control Unit to the "READY" position. Set the ALL SAFE switch to the "READY" position and press the ALL REPRO button.
5. Place the machine in RECORD mode. Adjust VR1 a small amount (one or two revolutions) and observe the wow and flutter meter. If a change in wow and flutter performance is observed, continue adjusting VR1 until the best performance is observed. If no change is observed in the first one or two revolutions of the trimmer, return the trimmer to its initial position and continue with the next step.
6. Set the SPEED switch to the "L" position (15 ips). Repeat step 5 using VR2 for adjustment.
7. Set SW2 (H/L SPEED PAIR) on the TRANSPORT CONTROL PCB to the "L" position. Repeat step 5 using VR3 for adjustment.

The capstan motor should lock (as indicated by the bi-color LED on the CAPSTAN CONTROL PCB changing from red to green) quickly and smoothly when the capstan motor speed or direction is changed.

5.1.5 Tape Lifter Adjustment

Adjustment of the tape lifter position should not be necessary unless a tape lifter is changed or a head is replaced.

1. Turn off the power to the machine and wait 30 seconds to allow the power supply capacitors to discharge. Open the VU meter panel by removing the outer two screws from the top of the panel, and folding it down to a horizontal position.
2. Thread a reel of the tape on the machine.
3. Remove the 4.5 mm socket head cap screw from the underside of each side of the deck plate, and carefully lift the deck plate until it latches in the open position.
4. Loosen the four screws which attach the lifter solenoid to the deck plate, and move the solenoid as far toward the left side of the machine as it will go. Refer to **Figure 5-14**.

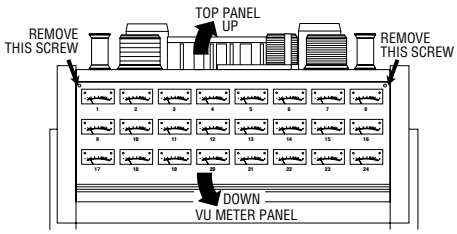


Figure 5-13
Opening the Transport

5. Push the right tape lifter toward the front of the machine, and adjust stopper “A” so that the right tape lifter (between the reproduce head and the flutter filter roller) moves the tape 0.5 mm (0.02 in) away from the reproduce head. Be sure that the tape lifter arm does not hit the head shield plate, when the shield plate is in its retracted position.

6. Hold the right tape lifter so that it is extended fully (against stopper “A”), and adjust the length of the connecting arm so the left tape lifter (between the left tape guide and the impedance roller) holds the tape 0.5 mm (0.02 in) away from the record head.

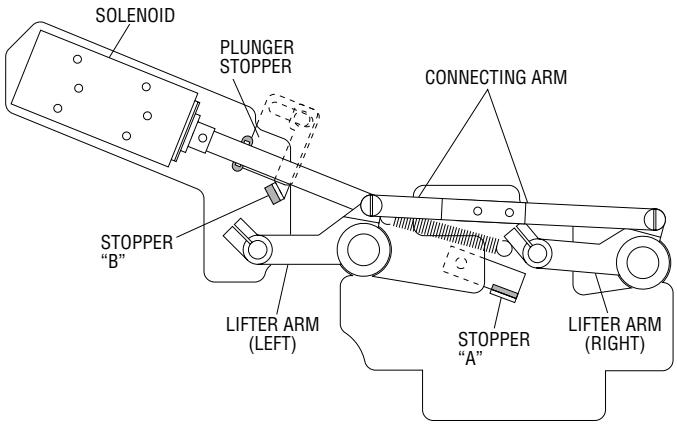


Figure 5-14
Tape Lifter Adjustments

7. Push the solenoid plunger into the solenoid body, and adjust the position of the solenoid until the left tape lifter holds the tape 0.5 mm from the record head when it is extended. Tighten the screws to hold the solenoid in position.

8. Secure both tension arms at the top of their travel.

9. Set **SW3-3** on the **TRANSPORT CONTROL** PCB to the “**ON**” position.

10. Apply power to the MX-80. Press the **STOP** button to place the transport in LOAD mode. Press the **CUE** button to cause the tape lifters to be extended.

11. Carefully check the position of the tape lifters. If the tape is not 0.5 mm from the repro and record heads, repeat the adjustment procedure.

12. Press the **CUE** button to retract the tape lifters, and check to see that the left tape lifter is approximately 1 mm behind the tape. If it is not, adjust the position of stopper “B” until the retracted position is correct.

13. Adjust the position of the plunger stopper so that the solenoid plunger contacts it at the same time that the left tape lifter arm contacts stopper “B”.

5.1.6 Pinch Roller Position and Pressure Adjustment

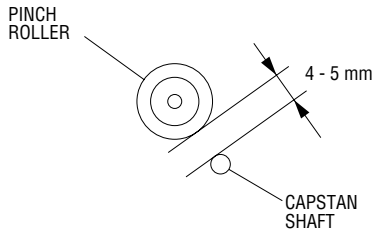


Figure 5-15
Pinch Roller Pressure Measurement

1. Adjust the position (from beneath the transport deck plate) of the solenoid stopper so the pinch roller is 4–5 mm from the capstan shaft when it is in its disengaged position.
2. Secure both tension arms at the top of their travel.
3. Attach the 0–4000 gram spring scale to the pinch roller with a loop of string.
4. Place the MX-80 in PLAY mode.
5. Pull the spring scale toward the rear of the machine until the pinch roller just loses contact with the capstan shaft (and stops turning), and measure the pinch roller pressure.
6. If the pinch roller pressure is not 2500 grams ±300 grams, adjust the position of the pinch roller solenoid slightly and repeat the measurement.

Pinch Roller Timing: Switch **SW6** on the **TRANSPORT CONTROL** PCB adjusts the delay time between pressing the **PLAY** button and the pinch roller pulling in against the capstan shaft. These switches have been preset at the Otari factory and do not require adjustment.

5.1.7 Brake Adjustment

Some of these adjustments can be performed with the reel motor assembly installed in the MX-80, or with the reel motor assembly on the work bench. If the adjustments are performed at the bench, the final adjustments for tension must be made after the assembly is re-installed in the MX-80.

1. Loosen the screws marked “B” in **Figure 5-16** and adjust the brake assembly on the motor so that there is 0.5 mm clearance between arm “D” and stopper “E”. Securely tighten the screws.
2. Adjust the double-nut “F” so that 5–6 mm of plunger body protrudes from the solenoid body, while pushing in on “G” to remove any slack in the linkage.
3. Adjust bracket “C” for 1 mm clearance between the fiber washer “F” and the arm “D” while pulling out on “G” to remove any slack in the linkage.
4. Loosen the screws marked “H” and adjust the guide so that the band does not rub on the brake drum when the solenoid is energized (push “G” all the way in to check).
5. Check the holdback tension by winding the free end of a piece of string or twine around an NAB reel hub (clockwise for the supply reel, counterclockwise for the take-up reel), and pulling on the string with a spring scale to unwind the string. Since the reading on the spring scale is dependent on the speed at which the string is pulled, it is recommended that two or three readings be made and the results averaged.

6. If the tension is not approximately 1200–1500 grams, loosen the tension bracket locking screw and adjust the screw marked “A” so that the tension in the “holdback” direction is within that range.
NOTE: Adjust the brake tension so that both take-up and supply sides show the same tension +100 grams in the “holdback” direction.

7. Check the feed tension by repeating the above procedure with the string wound on the hub in the opposite direction.

The brake tension in the feed direction is not separately adjustable, and should be approximately one-half of the value measured in the “holdback” direction (i.e., 600–750 grams).

If correct holdback tension cannot be obtained after replacing brake bands, it may be necessary to rotate the drum against the brake band to “wear in” the brake bands.

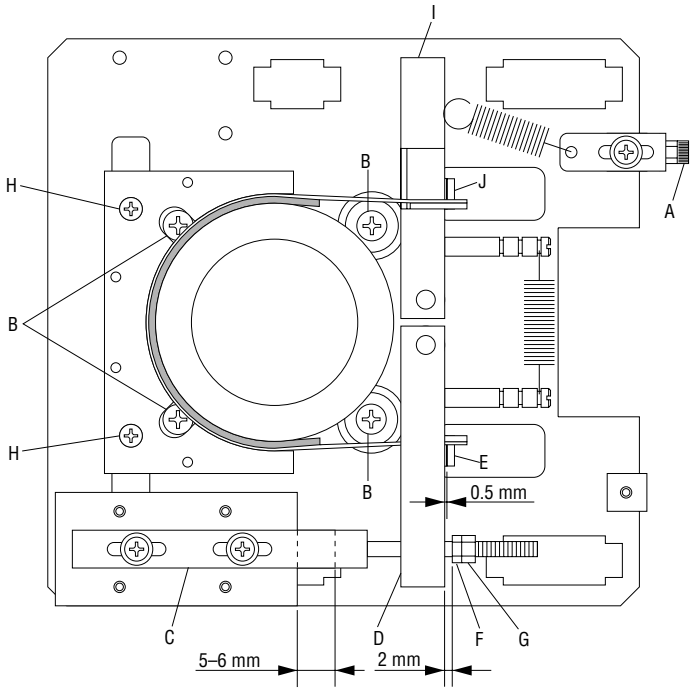


Figure 5-16
Brake Adjustments

5.1.8 Variable Speed Range Criterion Setting

Variable speed range in the EXT and VARI mode has been set at the factory so that the FIX speed is set at the middle of the variable range. If this setting shifts, adjust **VR3** on the **TRANSPORT CONTROL** PCB as follows.

1. After extending the **TRANSPORT CONTROL** PCB, connect the voltmeter at pin 11 of **IC40**.

2. If the Remote Control Unit has been connected, set the Speed Mode Selector to the “**FIX**” position.

3. Adjust **VR3** on the **TRANSPORT CONTROL** PCB so that the voltmeter indicates +2.5 V.

5.2 Routine Audio Alignment

5.2.1 Tools, Materials, and Test Equipment Required

a. 2" Calibration Tape

Speed	EQ	Ref. Flux	MRL Cat. No.
30 ips	AES	250 nWb/m	51L214
15 ips	NAB	250 nWb/m	51J213
7.5 ips	NAB	250 nWb/m	51T212
15 ips	IEC	320 nWb/m	51J323
15 ips	IEC	250 nWb/m	51J223
7.5 ips	IEC	320 nWb/m	51T322
7.5 ips	IEC	250 nWb/m	51T222

b. 1" Calibration Tape

Speed	EQ	Ref. Flux	MRL Cat. No.
30 ips	AES	250 nWb/m	41L217
15 ips	NAB	250 nWb/m	41J216
7.5 ips	NAB	250 nWb/m	41T215
15 ips	IEC	320 nWb/m	41J326
15 ips	IEC	250 nWb/m	41J226
7.5 ips	IEC	320 nWb/m	41T325
7.5 ips	IEC	250 nWb/m	41T225

NOTE: Standard equalization at 15 and 7.5 ips is NAB. Standard equalization at 30 ips is AES for all track formats.

c. Audio signal generator (test oscillator).

d. AC voltmeter.

e. A general purpose dual-trace oscilloscope such as those made by Tektronics, Leader, Hitachi, Hewlett-Packard, etc. The oscilloscope is necessary for tachometer pulse quadrature, and capstan duty cycle adjustments.

f. A reel of tape of the type normally used for sessions.

g. A small non-magnetic alignment screwdriver with a blade small enough to fit the trimmers.

h. 1.5 mm, 2 mm, 2.5 mm, and 4 mm hex keys (allen wrenches).

5.2.2 Demagnetizing the Heads and Tape Path

Demagnetizing (sometimes called degaussing, although that term is more often applied to bulk tape erasure) is a necessary procedure, and should be performed prior to every alignment and before every recording session. Demagnetizing should always be done with extreme caution:

DEMAGNETIZING CAUTION: To avoid damage to the MX-80, always make sure the power switch is Off before proceeding. Make sure that all recording tapes, especially alignment tapes, are removed from the vicinity of the MX-80. The AC field created by the demagnetizer is extremely powerful and could seriously damage the electronics if they are On.

Never turn On or Off the power to the demagnetizer unless it is at least 3 feet (1 meter) away from the MX-80. This would cause an extremely strong moving magnetic field which could possibly place a permanent magnetic charge on parts of the machine. The demagnetizer would not be powerful enough to remove these charges under normal circumstances, and the parts might have to be removed and discarded.

USE ONLY A DEMAGNETIZER WITH HIGH FLUX DENSITY, INEXPENSIVE "HI-FI" TYPE DEMAGNETIZERS CAN LEAVE RESIDUAL FIELDS THAT WILL CAUSE MORE HARM THAN BENEFIT.

1. Turn off the MX-80 POWER switch.
2. With the demagnetizer at least 3 feet (1 meter) from the MX-80, plug the demagnetizer into the AC mains and turn it on.
3. Slowly move the demagnetizer toward the supply swing arm roller until the tip is approximately 1/8" (3 mm) away from the roller.
4. Slowly move the tip of the demagnetizer up and down along the roller so that the entire roller surface is exposed to the demagnetizing field. DO NOT TOUCH ANY PART OF THE MX-80 WITH THE DEMAGNETIZER.
5. Slowly move the demagnetizer at least 3 feet (1 meter) away from the MX-80.
6. Working from left to right repeat steps 3, 4, and 5 for each of the following metal parts in the tape path:
   A. Tension Arm Guide Roller (left)
   B. Guide Roller (Impedance Roller)
   C. Tape Lifter (left)
   D. Fixed Tape Guide (left)
   E. Erase Head
   F. Record Head
   G. Flutter Filter Roller
   H. Tape Lifter (right)
   I. Reproduce Head
   J. Fixed Tape Guide (right)
   K. Capstan Shaft
   L. Tension Arm Guide Roller (right)
7. When all the above parts have been demagnetized, slowly move the demagnetizer at least 3 feet (1 meter) away from the MX-80 and turn it off or unplug it.

5.2.3 Cleaning the Tape Path and Lubrication

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 slipping, 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.

You should clean and demagnetize the entire tape path before performing any adjustments in this section.

1. Moisten a cotton swab in pure isopropyl alcohol, and wipe the entire surface of the supply tension arm roller. Allow the roller to dry by evaporation.

2. Moisten additional swabs and clean the following parts:
   A. Tension Arm Guide Roller (left)
   B. Guide Roller (Impedance Roller)
   C. Tape Lifter (left)
   D. Fixed Tape Guide (left)
   E. Erase Head
   F. Record Head
   G. Flutter Filter Roller
   H. Tape Lifter (right)
   I. Reproduce Head
   J. Fixed Tape Guide (right)
   K. Capstan Shaft
   L. Tension Arm Guide Roller (right)

CAUTION: Don't use alcohol moistened swabs to clean the tachometer roller or the pinch roller. To avoid embedding dust and lint particles in the surface of these rollers, use only an alcohol moistened Lint-Free cloth to gently clean the rollers.

LUBRICATION: The only component requiring lubrication is the capstan motor. Lubricate the capstan every four months, or after each 1000 hours of operation (whichever occurs first), or as required using the lubricating oil (use only Otari oil PZ9E003). For lubrication, proceed as follows, referring to **§7.2**, pinch roller assembly.

1. Remove the pinch roller cap by turning, the hex socket head screw counterclockwise.

2. Remove the pinch roller from the pinch roller shaft.

3. Remove the metal dust cap from the capstan shaft by turning it counterclockwise.

4. The foam ring surrounding the oilite bearing should now be visible. Apply 3 drops of oil to the foam ring. Do not over lubricate, and be careful not to apply oil to the portion of the capstan shaft which contacts the tape.

5. Reinstall the dust cap, pinch roller and pinch roller cap.

5.2.4 Input Level, Output Level and Peak Indicator Adjustment

NOTE: The MX-80 outputs are set at the factory for balanced operation. If unbalanced operation is desired, set the BAL/UNBAL switch (SW1) on each AUDIO AMPLIFIER PCB to the "UNBAL" position.

1. Set the test oscillator to produce a 1 kHz sine wave at +4 dBu, using the AC voltmeter.
2. Connect the oscillator to the channel 1 INPUT connector on the rear panel. Connect the AC voltmeter to the channel 1 OUTPUT connector.
3. Extend the channel 1 AUDIO AMPLIFIER PCB using the EXTENDER PCB (PB-7JEA). Turn on the power to the MX-80.
4. Adjust VR14 (INPUT LEVEL) on the AUDIO AMPLIFIER PCB until the channel 1 VU meter indicates 0 VU.
5. Adjust VR12 (OUTPUT LEVEL) until the AC voltmeter indicates +4 dBu at the OUTPUT connector.
6. Connect the oscillator to the TEST SIGNAL input on the AUDIO CONTROL PCB, and adjust VR13 (TEST SIGNAL LEVEL) until the channel 1 VU meter indicates 0 VU.
7. Adjust the test oscillator to produce 1 kHz at +12 dBu.
   NOTE: This level causes the PEAK indicator to become illuminated at a level corresponding to 1040 nWb/m.
8. Adjust VR11 (PEAK INDICATOR LEVEL) on the AUDIO AMPLIFIER PCB until the PEAK indicator in the channel 1 VU meter is steadily illuminated.
9. Repeat steps 2 through 8 for each remaining channel.

Preliminary Record and Erase Transformer Peaking Adjustment: This procedure is necessary only when a semi-permanent head format conversion is made, or if the record or erase head are changed. It is not necessary to perform this procedure as part of the routine maintenance procedures.

10. Disconnect the test oscillator, and thread the machine with tape.
11. Connect the AC voltmeter to CP1 and CP2 (GND), and place the channel under alignment into RECORD mode.
12. Adjust TF1 (RECORD BIAS TRANSFORMER) on the AUDIO AMPLIFIER PCB for a peak reading on the AC voltmeter.
    NOTE: Use a non-metallic alignment tool for these adjustments.
13. With the machine still in RECORD mode, connect the AC voltmeter to CP3 and CP4 (GND), and adjust TF2 (ERASE BIAS TRANSFORMER) for a peak reading on the AC voltmeter. For 24 channel machine the voltage at the peak should be 100–130 mV.
14. Repeat steps 11 through 13 for all remaining AUDIO AMPLIFIER PCBs. Reinstall PCBs when completed.

5.2.5 Reproduce Head Azimuth Alignment

Refer to **Figure 5-17** for the location and reproduce azimuth adjustment screws.

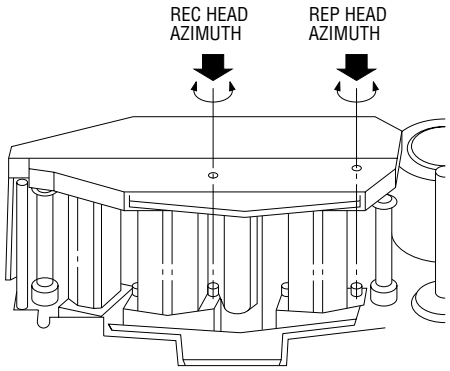


Figure 5-17
Record and Reproduce Azimuth Adjustment Screws

1. Set the Speed Mode Selector on the Remote Control Unit to the "FIX" position, and set the SPEED selector on the MX-80 transport to the "L" position. Set the ALL SAFE switch to the "ALL SAFE" position. Press the ALL REPRO button on the Remote Control Unit.

2. Thread the MX-80 with an appropriate reproducer calibration tape for the "L" speed setting. Refer to **§5.2.1** for suggestions.

3. Connect one vertical input of the oscilloscope to the channel 2 OUTPUT connector. Connect the other vertical input of the oscilloscope to the channel 23 OUTPUT connector. Adjust the oscilloscope vertical sensitivity so that the output signal from the MX-80 produces a usable display on the oscilloscope.

4. Insert the 2.5 mm hex key through the right hand hole in the head cover to the azimuth adjustment screw below. Locate and play the 1 kHz portion of the reproducer calibration tape. Adjust the oscilloscope controls until at least two complete cycles are displayed for each channel.

5. Adjust the reproduce head azimuth adjustment screw (**Figure 5-17**) until the two signals displayed on the oscilloscope are in phase.
   NOTE: The azimuth adjustment screw is on the right side of the head, and has a hex socket head. The slotted screw should not be adjusted.

6. Locate and play the 2 kHz portion of the calibration tape. Adjust the reproduce head azimuth adjustment screw until the two signals on the scope are in phase.

7. Repeat step 5 for each frequency on the calibration tape up to 16 kHz. The adjustment of the screw becomes more critical as the frequency increases.

5.2.6 Record Head Azimuth Adjustment

It is not possible to establish proper record head azimuth as a function of record/playback phase response due to the record phase compensation circuits in the MX-80. The procedure given here adjusts the azimuth of the record head in SEL·REP mode, thus ensuring that the azimuth of the record head is exactly matched to that of the reproduce head.

1. Press the **ALL SEL·REP** button on the Remote Control Unit.
2. Locate and play the 1 kHz portion of the reproducer calibration tape.
3. Adjust the record head azimuth adjustment screw (the left hand hole in the head cover) until the two signals displayed on the oscilloscope are in phase.
4. Repeat step 3 for each frequency on the calibration tape up to 16 kHz. The adjustment of the screw becomes more critical as the frequency increases.

5.2.7 Reproduce Level Adjustment

NOTE: The MX-80 does not provide separate REPRO GAIN controls for each speed, therefore perform the reproduce level adjustment at the speed (H or L) which you will use most often. After performing the adjustments in **§§5.2.7–5.2.15**, when the tape speed is changed only the reproduce level adjustment needs to be re-adjusted. The reproduce equalization adjustments will track the level adjustments.

1. Press the ALL REPRO button on the Remote Control Unit.
2. Make sure the REF FLUX switch on the AUDIO CONTROL PCB is set to correspond to the reference level of the reproducer calibration tape you are using. The "H" setting corresponds to 320 nWb/m, the "L" setting corresponds to 250 nWb/m.
3. Locate and play the portion of the calibration tape containing the 1 kHz tone at reference level. Adjust the REPRO GAIN trimmer on the front of the channel 1 AUDIO AMPLIFIER PCB until the channel 1 VU meter indicates 0 VU.
4. Repeat step 3 for each remaining AUDIO AMPLIFIER PCB.

5.2.8 Low Speed Reproduce Equalization Alignment

1. Set the SPEED selector on the MX-80 Transport to the "L" position. Press the ALL REPRO button on the Remote Control Unit.
2. Thread the MX-80 with an appropriate reproducer calibration tape for the reference flux level and equalization you are using.
3. Locate and play the 1 kHz portion of the calibration tape. If the VU meter does not indicate 0 VU (it might not if reproduce gain was set at high speed), note the level which is indicated.
4. Play the equalization adjustment tones and adjust the REPRO EQ LOW SPD trimmer at 10 kHz for the same level as the 1 kHz tone in step 3. You should adjust all the channels at the same time (writing down the results) to save wear on the reproducer calibration tape.

5.2.9 High Speed Reproduce Equalization Alignment

1. Set the SPEED selector on the MX-80 Transport to the "H" position. Press the ALL REPRO button on the Remote Control Unit.
2. Thread the MX-80 with an appropriate reproducer calibration tape for the reference flux level and equalization you are using.
3. Locate and play the 1 kHz portion of the alignment tape. If the VU meter does not indicate 0 VU (it might not if reproduce gain was set at low speed), note the level which is indicated.
4. Play the equalization adjustment tones and adjust the REPRO EQ HIGH SPD trimmer at 10 kHz for the same level as the 1 kHz tone in step 3. You should adjust all the channels at the same time (writing down the results) to save wear on the reproducer calibration tape.

5.2.10 Sel·Rep Level Adjustment

NOTE: The MX-80 does not provide separate SEL·REP GAIN controls for each speed, therefore perform the sel·rep level adjustment at the speed (H or L) which you will use most often.

1. Press the ALL SEL·REP button on the Remote Control Unit.
2. Make sure the REF FLUX switch on the AUDIO CONTROL PCB is set to correspond to the reference level of the reproducer calibration tape you are using. The "H" setting corresponds to 320 nWb/m, the "L" setting corresponds to 250 nWb/m.
3. Locate and play the portion of the calibration tape containing the 1 kHz tone at reference level. Adjust the SEL·REP GAIN trimmer on the front of the channel 1 AUDIO AMPLIFIER PCB until the channel 1 VU meter indicates 0 VU.
4. Repeat step 3 for each remaining AUDIO AMPLIFIER PCB.

5.2.11 Low Speed Sel·Rep Equalization Adjustment

1. Set the SPEED selector on the MX-80 Transport to the "L" position. Press the ALL SEL·REP button on the Remote Control Unit.
2. Thread the MX-80 with an appropriate reproducer calibration tape for the reference flux level and equalization you are using.
3. Locate and play the 1 kHz portion of the calibration tape. If the VU meter does not indicate 0 VU (it might not if sel·rep gain was set at high speed), note the level which is indicated.
4. Play the equalization adjustment tones and adjust the SEL·REP EQ LOW SPD trimmer at 10 kHz for the same level as the 1 kHz tone in step 3. You should adjust all the channels at the same time (writing down the results) to save wear on the reproducer calibration tape.

5.2.12 High Speed Sel·Rep Equalization Alignment

1. Set the SPEED selector on the MX-80 transport to the "H" position. Press the ALL SEL·REP button on the Remote Control Unit.
2. Thread the MX-80 with an appropriate reproducer calibration tape for the reference flux level and equalization you are using.
3. Locate and play the 1 kHz portion of the alignment tape. If the VU meter does not indicate 0 VU (it might not if sel·rep gain was set at low speed), note the level which is indicated.
4. Play the equalization adjustment tones and adjust the SEL·REP EQ HIGH SPD trimmer at 10 kHz for the same level as the 1 kHz tone in step 3. You should adjust all the channels at the same time (writing down the results) to save wear on the reproducer calibration tape.

5.2.13 Low Speed Record Bias, Equalization, and Level Adjustment

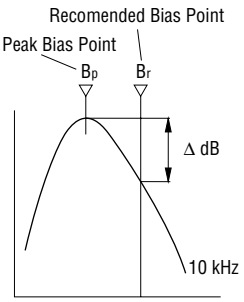
The MX-80 provides switch selectable bias settings for two different tape formulations. At the low tape speed, the bias level for switch position "A" is fixed for AMPEX 456 tape. The bias level for switch position "B" is adjustable for both speeds. Once the BIAS control on each AUDIO AMPLIFIER PCB has been properly adjusted, a single control can reset the bias for all channels simultaneously.

NOTE: If the low speed is 7.5 ips, set the oscillator level for -6 dBu and use 5 kHz for adjustment instead of 10 kHz.

1. Thread the MX-80 with the tape; you will use for sessions. Set the BIAS SELECT switch on the AUDIO CONTROL PCB to the "A" position.
2. Set the test oscillator to produce a 10 kHz sine wave at +4 dBu, or whatever standard operating level you have chosen for your system, e.g., -10 dBv (-8 dBu). Connect the oscillator to the TEST SIGNAL input on the AUDIO CONTROL PCB. Connect the AC voltmeter to the channel 1 OUTPUT connector.
3. Press the ALL INPUT button on the Remote Control Unit. Set the ALL SAFE switch to the "READY" position. Set the READY/SAFE switch to the "READY" position for all channels. Set the SPEED SELECT switch on the Transport to the "L" position, and set the Speed Mode Selector switch on the Remote Control Unit to the "FIX" position.
4. Press the RECORD and PLAY buttons simultaneously to begin recording. Press the ALL REPRO button on the Remote Control Unit.
5. Turn the RECORD BIAS trimmer on the channel 1 AUDIO AMPLIFIER PCB counterclockwise until the level on the AC voltmeter begins to decrease.
6. Turn the RECORD BIAS trimmer clockwise until the indication on the AC voltmeter peaks; then continue clockwise rotation until the voltmeter reading decreases (overbias). Refer to **Table 5-1** the amount of overbias that is appropriate for the tape type and speed.
7. Set the oscillator to 1 kHz and adjust the RECORD GAIN LOW SPD trimmer for 0 VU (-10 VU for 7.5 ips). Set the oscillator to 10 kHz and adjust the RECORD EQ LOW SPD trimmer for 0 VU (-10 VU for 7.5 ips).
8. Repeat steps 5 through 7 for all remaining channels.

NOTE: If you wish to use a different tape formulation at low speed, set the BIAS SELECT switch on the AUDIO CONTROL PCB to the "B" position, thread the machine with the desired tape, and adjust the LOW SPD B trimmer for the desired bias level. This trimmer will adjust the bias for all channels simultaneously.

Table 5-1
Recommended Record Bias Setting (Unit: dB)



Speed (ips)	3.75	7.5	15	30
Frequency (Hz)	10k	10k	10k	10k
AGFA PEM468	—	—	—	—
AGFA PEM169	—	—	—	—
AMPEX 406/407	—	—	—	—
AMPEX 456	—	7.0	3.5	1.7
BASF LGR50P	—	—	—	—
BASF SPR50LH/50LHL	—	—	—	—
SCOTCH (3M) 206/207	—	—	—	—
SCOTCH (3M) 226/227		7.0	3.5	1.7
SCOTCH (3M) 250	—	—	—	—

5.2.14 High Speed Record Bias, Equalization, and Level Adjustment

1. Reset the BIAS SELECT switch on the AUDIO CONTROL PCB to the "A" position, set the SPEED SELECT switch on the transport to the "H" position, thread the machine with a reel of the desired tape, and repeat steps 3 through 8 of **§5.2.13** (low speed record bias adjustment) using the HIGH SPD A trimmer on the AUDIO CONTROL PCB for the desired amount of overbias.

2. Repeat steps 3 through 8 of **§5.2.13** using the RECORD GAIN HIGH SPD and RECORD EQ HIGH SPD trimmers.

To set the machine for an alternate tape type, having different bias requirements, at high speed, set the BIAS SELECT switch on the AUDIO CONTROL PCB to the "B" position and repeat step 2 above for all channels. Thereafter, whenever that tape type is to be used, set the BIAS SELECT switch to the "B" position, and the bias level for all channels is automatically adjusted for that tape type.

5.2.15 Low Frequency Compensation Adjustment

1. Connect the test oscillator to the TEST SIGNAL input on the AUDIO CONTROL PCB. Set the oscillator to produce 100 Hz at +4 dBu.

2. Set the SPEED SELECT switch on the transport to the "H" position.

3. Press the ALL REPRO button on the Remote Control Unit. Set the ALL SAFE switch to the "READY" position.

4. Set the READY/SAFE switches for all channels to the "READY" position.

5. Press the RECORD and PLAY buttons simultaneously to begin recording.

6. Adjust the REPRO LF COMP HI SPD trimmer for 0 VU on the MX-80 VU meter. Repeat for each channel.

7. Rewind the tape to the beginning of the recorded section.

8. Press the ALL SEL·REP button on the Remote Control Unit.

9. Play the tape and adjust the SEL·REP LF COMP HI SPD trimmer for 0 VU on the MX-80 VU meter. Repeat for each channel.

10. Set the SPEED SELECT switch on the transport to the "L" position.

11. Repeat steps 3 through 9 using the REPRO and SEL·REP LF COMP LOW SPD trimmers.

5.2.16 Record Phase Compensation Adjustment

1. Set the SPEED SELECT switch on the transport to the "H" position. Press the ALL REPRO button on the Remote Control Unit.
2. Set the test oscillator to produce a 10 kHz square wave, and connect it to the TEST SIGNAL input on the AUDIO CONTROL PCB.
3. Connect the oscilloscope to either the channel 1 OUTPUT connector on the rear panel, or to the 1/8" mini-jack LINE OUTPUT connector on the front of the channel 1 AUDIO AMPLIFIER PCB.
4. Press the RECORD and PLAY buttons to begin recording.
5. While recording the square wave, adjust the RECORD PHASE HI SPD trimmer for the best square wave response shown on the oscilloscope. (Refer to **Figure 5-18**).
6. Repeat for all remaining channels.
7. Set the SPEED SELECT switch on the transport to the "L" position and repeat steps 3 through 6 using the RECORD PHASE LOW SPD trimmers. **NOTE:** Use 5 kHz for 7.5 ips adjustment.

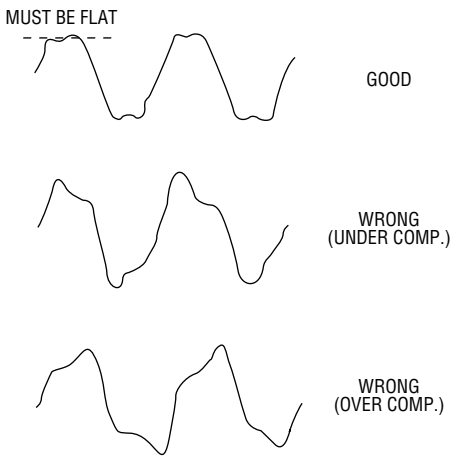


Figure 5-18
Record Phase Compensation Waveform

5.2.17 Erase and Record Bias Symmetry Adjustment

■ **Erase Bias Symmetry Adjustment:** This adjustment is necessary only to minimize Punch-In/Punch-Out noise. It is not necessary to perform this procedure as part of normal maintenance procedures.

1. Clean and demagnetize the heads and tape path.
2. Turn off the power to the MX-80 and wait 30 seconds for the power supply capacitors to discharge.
3. Remove the head assembly cover.
4. Unplug the record head connectors. The left-hand connector is for the upper tracks.
5. Thread the machine with a reel of the tape which is usually used for sessions. Set the SPEED SELECT switch on the transport for 15 ips operation.
6. Extend the channel 1 AUDIO AMPLIFIER PCB with the EXTENDER PCB (PB-7JEA). Turn on the power to the machine.
7. Press the ALL REPRO button on the Remote Control Unit, set the ALL SAFE switch to the "READY" position, and set the channel 1 READY/SAFE switch to the "READY" position.
8. Connect an amplifier and monitor speaker to the channel 1 OUTPUT connector on the rear panel.
9. Press the PLAY and RECORD buttons to begin recording.
10. While listening to the monitor speaker, repeatedly punch-in and punch-out of Record. If any click or thump noise is heard, adjust VR23 (ERASE SYMMETRY) on the AUDIO AMPLIFIER PCB to minimize the noise.
11. Repeat steps 6 through 10 for each remaining channel.
12. Reconnect the record head connectors and replace the head assembly cover when the procedure is completed.

■ **ERASE CURRENT ADJUSTMENT:** Erase current should be set to the value as explained in the table below for the serial number suffix B and after.

Parts No. of Erase Head		Erase Current Setting for suffix B and after.
1" 8CH	GH1E020A	100 +5/-0 mA
1" 16CH	GH1E021A	80 +5/-0 mA
2" 16CH	GH6E020A	100 +5/-0 mA
2" 24CH	GH6E021A	90 +5/-0 mA

NOTE: VR24 on the AUDIO AMPLIFIER PCB assembly is assigned for erase current setting. When this PCB assembly is used for an "A" lot machine, turn VR24 all the way clockwise.

■ **Record Bias Symmetry Adjustment:** This adjustment is necessary only to minimize Punch-In/Punch-Out noise. It is not necessary to perform this procedure as part of normal maintenance procedures.

1. Clean and demagnetize the heads and tape path.
2. Turn off the power to the MX-80 and wait 30 seconds for the power supply capacitors to discharge.
3. Remove the head assembly cover.
4. Unplug the erase head connectors. The left-hand connector is for the upper tracks.
5. Thread the machine with a reel of the tape which is usually used for sessions. Set the SPEED SELECT switch on the transport for 15 ips operation.
6. Extend the channel 1 AUDIO AMPLIFIER PCB with the EXTENDER PCB (PB-7JEA). Turn on the power to the machine.
7. Press the ALL REPRO button on the Remote Control Unit, set the ALL SAFE switch to the "READY" position, and set the channel 1 READY/SAFE switch to the "READY" position.
8. Connect an amplifier and monitor speaker to the channel 1 OUTPUT connector on the rear panel.
9. Press the PLAY and RECORD buttons to begin recording.
10. While listening to the monitor speaker, repeatedly punch-in and punch-out of Record. If any click or thump noise is heard, adjust VR22 (RECORD SYMMETRY) on the AUDIO AMPLIFIER PCB to minimize the noise.
11. Repeat steps 6 through 10 for each remaining channel.
12. Reconnect the erase head connectors and reinstall the head assembly cover when the procedure is completed.

NOTE: If it is not possible to totally eliminate the thump or click noise, additional demagnetization might be necessary. Use a demagnetizer rated at 40–60 watts minimum.

5.2.18 Gapless Punch-In/Out Test and Adjustment

NOTE: It is very important that the erase current and record bias adjustments be correctly performed prior to adjusting the gapless timing.

1. Record a 1 kHz tone at 0 VU at 15 ips on all channels for 10 minutes, and Rewind to the beginning of the recorded section.

2. Set the GAPLESS RECORD switch (SW6) on the AUDIO CONTROL PCB to the "OFF" position.

3. Connect the channel 8 OUTPUT connector to the channel 1 INPUT connector. Press the INDIVIDUAL button on the Remote Control Unit. Set channel 8 to Sel·Rep mode. Set channel 1 to Reproduce mode. Set the channel 1 READY/SAFE switch to the "READY" position, and set the ALL SAFE switch to the "READY" position.

4. Connect the oscilloscope to the channel 1 OUTPUT connector on the rear panel. Adjust the oscilloscope for a usable display (either 0.5 or 1.0 s/div).

5. Repeatedly punch in and out of Record on channel 1 while observing the oscilloscope. The oscilloscope should display a 100–200 ms overlap when punching in, and a 100–200 ms gap when punching out.

6. Repeat steps 3 through 5 for all remaining channels. The results should be the same on all channels ±20 ms.

7. Set the GAPLESS RECORD switch (SW6) on the AUDIO CONTROL PCB to the "ON" position, and repeat steps 3 through 5. Set the oscilloscope timebase for 5 or 10 ms/div. The oscilloscope should display a maximum overlap of 15 ms on punching in, and a maximum gap of 15 ms on punching out. If correct results are not obtained, adjust the position of SW2-3, SW2-4, and SW2-5 on each AUDIO AMPLIFIER PCB, to adjust the punch out gap, and adjust SW2-6, SW2-7 and SW2-8 to adjust the punch in overlap. The factory settings of SW2 are shown in **§2.2.2**.

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 schematics attached to the machine, so to find out the correct parts number of those parts you need, refer to the schematics.

NOTE: Reference number for the parts which are many used on a PCB assembly such as capacitor diode, transistor and IC are only few given in the lists instead of being described all.

NOTE: In the parts lists, descriptions for capacitors have following meanings.

F-capacitor	Maylar film type capacitor
B-capacitor	Bipolar chemical capacitor
P-capacitor	Polypropylen film capacitor
M-capacitor	Mica capacitor
L-capacitor	Low leakage current chemical capacitor
T-capacitor	Tantalum electrolytic capacitor

6.1 Capstan Control PCB Assembly

Ref. No.	Description	Parts No.	Notes
IC10, 15–17	IC	I-0067	
D1	LED	PNSLP520	Red/Blue
D3, 5, 7, 13, 14	Diode	PN-0230	
D4, 6	Diode	PN-0038	12 V
D9	Diode	PNVD1222	
D10	Diode	PN-0026	8.2 V
Q1–14	Transistor	Q-0008	
L1, 2	Inductor	IN19073	470 µH
VR1–6	Potentiometer	RV414312	10 k
VR7	Potentiometer	RV453206	5 k
R80	Resistor	R8CJ621M	620 Ω 2 W
R92	Resistor	R8CJ101M	100 Ω 2 W
C1	F-Capacitor	CFF3103	50 V/0.1uF
C3	B-Capacitor	C11R067M	50 V/1
C4, 15, 19	B-Capacitor	C110062M	25 V/10 µ
C6	F-Capacitor	CFF3471	50 V/470 pF
C7, 9	F-Capacitor	CFF3563	50 V/0.056 µF
C12	B-Capacitor	C133053M	10 V/33 µ
C16, 17 ,21, 22	F-Capacitor	CFF3333	50 V/0.33 µF
RL1	Relay	RY2DC090	24 V
RL2	Relay	RY1DC051	DC 24 V
CP1–4	Check Pin	CN901149	Red
CP5, 6	Check Pin	CN901157	Black
CN1	Connector	CN408356	8P
CN2	Connector	CN402350	2P
CN3	Connector	CN411379	11P
CN4	Connector	CN410358	10P
CN5	Connector	CN409357	9P
CN6	Connector	CN402306	

Capstan Control PCB Assembly

Reel Control PCB Assembly

6.2 Reel Control PCB Assembly

Ref. No.	Description	Parts No.	Notes
IC14, 23	IC	I-0053	
D2, 7	Diode	PN-0230	
D5, 10	Diode	PN-0035	
D13, 15	LED	PNTLR124	Red
Q1–5, 7–9	Transistor	Q-0008	
Q6, 17	Transistor	Q-0004	
L1, 2	Inductor	IN19073	470 µH
VR1, 2, 4, 5, 7, 10	Potentiometer	RV414207	10 k
VR3, 6	Potentiometer	RV453206	5 k
VR8, 9	Potentiometer	RV454210	50 k
VR11	Potentiometer	RV415257	100 k
C1, 2, 7, 8	F-Capacitor	CFF3102	50 V/0.001 µF
C3, 9	B-Capacitor	C110052M	16 V/10 µF
C4, 10, 11	F-Capacitor	CFF3103	50 V/0.01 µF
C5	P-Capacitor	CGI3151	100 V/150 pF
C15	F-Capacitor	CFF3472	50 V/0.0047 µF
CP1–10, 13	Check Pin	CN901149	Red
CP11, 12	Check Pin	CN901157	Black
CN1	Connector	CN326220	26P
CN2	Connector	CN410358	10P
CN3	Connector	CN408356	8P
CN4	Connector	CN405353	5P
CN5	Connector	CN406354	6P
CN6	Connector	CN407355	7P

6.3 Reel Drive PCB Assembly

Ref. No.	Description	Parts No.	Notes
D3, 4	Diode, Zener	PN1Z18	
D5	Diode	PNMA650	
Q3, 4	Insulator	PZ4B068	
Q7	Insulator	PZ4B055	
L1, 2	Ferrite Core	PZ4Z003	
L3, 4	Inductor	IN19080	140 µH
R12, 13	Resistor	R4DKR22M	0.22 Ω 7W
C2	F-Capacitor	CFF3102	50 V/0.001 µF
CN1	Connector	CN405353	5P
CN2	Connector, Header	CN402081	2P
CN3	Connector, S Header	CN404083	4P
	Heat Sink	CB73802	

Reel Drive PCB Assembly

Transport Control PCB Assembly

6.4 Transport Control PCB Assembly

Ref. No.	Description	Parts No.	Notes
IC15	IC	I-0002	
IC18	IC	I-0112	
IC23	IC	I-0075	
IC38	IC	I-0145	
DA1, 2	Diode Array	PNNAL8CS	
Q1, 10, 11, 14–37, 40-47, 54-56	Transistor	Q-0008	
Q2–9	Transistor	Q-0011	
L1	Inductor	IN19069	47 µH
VR1	Potentiometer	RV424208	20 k
VR2	Potentiometer	RV414207	10 k
VR3	Potentiometer	RV453206	5 k
RA1, 3	Resistor Array	R94-132	4.7 k x 8
RA2	Resistor Array	R94-079	10 k x 4
RA4–13	Resistor Array	R94-136	10 k x 8
C12	Capacitor	C1105184	5 V/1 F
C13, 15, 22, 24, 42	F-Capacitor	CFF3103	50 V/0.01 µF
C18, 27, 33, 901–904, 949, 950	T-Capacitor	C622307M	50 V/0.022 µF
CN1	Connector	CN326220	26P
CN2	Connector	CN412380	12P
CN3	Connector	CN334222	34P
CN4	Connector	CN404352	4P
CN5	Connector	CN410358	10P
CN6	Connector	CN409357	9P
CN7	Connector	CN406354	6P
CN8	Connector	CN320219	20P
CN9	Connector	CN407355	7P
CN10	Connector	CN316218	16P
CN11	Connector	CN408356	8P
CN12	Connector	CN405353	5P
CN13	Connector	CN340223	40P
LED1	LED	PNTLG124	Green
LED2	LED	PNTLG124	Red
SW1	Switch	WH0B104R	Red
SW1	Switch	WH11181	Reset
SW2	Switch	WH31031	
SW3, 4	Switch	WH98012	
SW5	Switch	WH91023	
SW6	Switch	WH94008	
X1	Crystal	PZ4C021	6.144MHz

6.5 Serial Remote Control PCB Assembly

Ref. No.	Description	Parts No.	Notes
IC19	IC	I-0021	
Q1–15, 20–25	Transistor	Q-0008	
Q16–19	Transistor	Q-0004	
L1	Inductor	IN19069	470 µH
RA1–6	Resistor Array	R94-136	10 k x8
RA7	Resistor Array	R94-079	10 k x4
C9, 34	F-Capacitor	CFF3103	50 V/0.01 µF
CP0, 1	Connector	CN901157	Black
CP2–4	Connector	CN901150	Orange
	Connector	CN402328	2P for LED
CN1	Connector	CN3A0305	
CN2	Connector	CN412349	12P
CN3	Connector	CN402306	2P
CN3	Connector	CN403310	3P
CN16	Connector	CN628152	28P
CN27	Connector	CN640153	40P
LED1, 10–19	LED	PNTLR124	Red
LED2–7, 9	LED	PNLN2G	
LED8	LED	PNTLG124	Green
LED	LED	PNTL1024	Orange
SW1	Switch	WH0B104R	Red
SW1	Switch	WH11181	
SW2, 8	Switch	WH91023	
SW3, 4	Switch	WH360441	
SW5	Switch	WH98012	
SW6	Switch	WH91059	
SW7	Switch, Dip	WH91058	
SW9, 10	Switch	WH11253	
SW11, 12	Switch, Slide	WH31032	
X1	Crystal	PZ4C033	
X2	Crystal	PZ4C017	
	Card Puller	PZ4E068	
	Front Panel	PB4FE01	

Serial Remote Control PCB Assembly

Audio Control PCB Assembly

6.6 Audio Control PCB Assembly

Ref. No.	Description	Parts No.	Notes
IC1–3	IC	I-0067	
IC4, 5	IC	I-0053	
D1	Diode	PN-0011	
Q1–3, 5, 24	Transistor	Q-0004	
Q6–23	Transistor	Q-0008	
L1–3	Inductor	IN19078	470 µH
VR1–3	Potentiometer	RV454174	50 k
C1, 3, 8, 10	B-Capacitor	C14R761M	25 V/4.7
C5	B-Capacitor	C110165M	25 V/100
C13, 17, 18	F-Capacitor	CFF3222	50 V/0.0022 µF
C14, 20, 26	F-Capacitor	CFF3822	50 V/0.0082 µF
RL1	Relay	RY2DC089	
SW1, 2	Switch, Slide	WH31032	
SW3–8	Switch	WH31022	
LD1–11	LED	PNTL0124	Orange
CN1–11	Connector	CN402328	
PH1	Connector	CN601174	
	Front Panel	PB4FF01	
	Card Puller	PZ4E068	

6.7 Audio Amplifier PCB Assembly

Ref. No.	Description	Parts No.	Notes
IC1–6, 15–19	IC	I-0067	
IC7	IC, Line Out Amp.	I-0125	
IC8	IC	ITC9164N	
IC9, 10, 12, 13	IC	I-0133	
IC11, 20, 23	IC, Analog Switch	I-0053	
IC21, 29	IC, Analog Switch	I-0051	
IC22	IC	ITC9163N	
IC24	IC	I-0126	
IC33	IC, Mode Controller	I-0056	
D6–9, 19, 22	Diode	PN-0011	
D14	Diode	PN-0044	
Q3, 14, 25–30	Transistor	Q-0008	
Q6, 15, 31–38	Transistor	Q-0004	
L1, 4	Inductor	IN19085	1.8 MH
L2, 3	Inductor	IN19112	
L5	Inductor	IN19123	1 MH
VR1, 2, 6, 7, 15	Potentiometer	RV454285	50 k
VR3–5, 8–10	Potentiometer	RV424284	20 k
VR11–14, 24	Potentiometer	RV424297	20 k
VR21	Potentiometer	RV454174	50 k
VR22, 23	Potentiometer	RV413293	1 k
RA1, 5, 6	Resistor Array	R94-091	100 k x4
RA2, 7	Resistor Array	R94-095	220 k x4
RA3	Resistor Array	R94-079	
RA4	Resistor Array	R94-144	47 k x8
R29, 45	1/4 W 1% Resistor	R7HF1742	17.4 k
R30, 46	1/4 W 1% Resistor	R7HF3743	374 k
R31, 47	1/4 W 1% Resistor	R7HF2671	2.67 k
R32, 48	1/4 W 1% Resistor	R7HF6981	6.98 k
R33, 49	1/4 W 1% Resistor	R7HF1182	11.8 k
R69, 70	Resistor	R7HF472M	
R72	Resistor	R7HF362M	
R84, 94	1/4 W 1% Resistor	R7HF7680	768 Ω
R85	1/4 W 1% Resistor	R7HF752M	7.5 k
R86, 290	1/4 W 1% Resistor	R7HF912M	9.1 k
R87	1/4 W 1% Resistor	R7HF203M	20 k
R91, 92, 98	1/4 W 1% Resistor	R7HF273M	27 k
R93	1/4 W 1% Resistor	R7HF182M	1.8 k
R97	1/4 W 1% Resistor	R7HF392M	3.9 k
R120, 121	1/4 W 1% Resistor	R7HF103M	10 k
R122–125	1/4 W 1% Resistor	R7HF332M	3.3 k
R143	1/4 W 1% Resistor	R7HF104M	100 k
R249	1/2 W 1% Resistor	R7AJ1ROM	1 Ω
C3,15	L-Capacitor (25 V)	C110019M	10 µF
C11, 28, 72	B-Capacitor (25 V)	C110062M	10 µF
C23, 62, 85	B-Capacitor (25 V)	C14R761M	4.7 µF
C26, 37, 59	P-Capacitor (100 V)	CGI3271	270 pF
C27, 38	F-Capacitor (50V)	C3103168	0.01 µF 2%
C33, 44	B-Capacitor (50V)	C11R067M	1 µF
C50	B-Capacitor (25 V)	C110165M	100 µF
C65, 70, 134	B-Capacitor (25 V)	C122077M	22 µF
C66	P-Capacitor (100 V)	CGI3391	390 pF
C104, 105	P-Capacitor (100 V)	CGI3621	620 pF
C106	F-Capacitor (50V)	C3334169	0.33µF 2%
C115	P-Capacitor (100 V)	CGI3471	470 pF
C123	P-Capacitor (100 V)	CGI3182	1800 pF
C137	P-Capacitor (100 V)	CGI3821	820 pF
C138	P-Capacitor (630 V)	CGP3681S	680 pF
C169	P-Capacitor (630 V)	CGP3332S	3300 pF
C174, 175	T-Capacitor (35 V)	C71R012M	1
RL1, 3	Relay	RY1DC051	DC 24 V
RL2	Relay	RY2DC089	
SW1	Switch, Bal/Unbal	WH31022	
SW2	Switch	WH98095	
CP1, 3, 5, 6	Check Pin, Orange	CN901150	
CP2, 4, 7, 8	Check Pin Black	CN901157	
CN	Connector	CN3A0305	50P DIN
LD1	LED	PNTLY124	Yellow
LD2	LED	PNTLG124	Green
LD3	LED	PNTLO124	Orange
TF1, 2	Transformer	TF31022	Bias
J1	Register	PZ4E001	0 Ω
	Stud	KZ71A101	for LED

Audio Amplifier PCB Assembly

Power Supply PCB Assembly

6.8 Power Supply PCB Assembly

Ref. No.	Description	Parts No.	Notes
IC1, 8	IC	I-0062	
IC2, 6	IC	I-0063	
D2	Diode	PN-0044	
D3, 5, 6, 9, 11	LED	PNTLG124	Green
D4, 15, 17	Diode, Bridge	PND5FB20	
D8	Diode	PNU05C	
D12–14	Diode	PN-0264	
R1	Resistor	R8CJ242M	2.4 k
R2	Resistor	R8BJ512M	5.1 k
R3, 4	Resistor	R8BJ122M	1.2 k
R5, 10	Resistor	R7CJR33M	0.33 Ω
R14	Resistor	R7HF243M	24 k
R15, 25, 41	Resistor	R7HF332M	1/4 W 3.3 k
R16, 17, 67	Resistor	R7HF153M	15 k
R20, 35	Resistor	R8BJ202M	2 k
R21	Resistor	R7CJR39M	0.39 Ω
R24, 40	Resistor	R7HF393M	1/4 W 39 k
R36, 48, 49	Resistor	R7DJR22M	0.22 Ω
R46, 47	Resistor	R8BJ152M	1.5 k
R65	Resistor	R7HF3402	34 k
C8, 21, 37	F-Capacitor	CFF3103	50 V/0.01 µF
CN1, 18	Connector	CN402350	2P
CN2	Connector, Header	CN409085	
CN3	Connector, S Header	CN404083	
CN4	Connector, Header	CN403082	
CN5	Connector, Header	CN402081	
CN6	Connector, Plug	CN409078	
CN7	Connector	CN405295	
CN8, 16, 17	Connector	CN406354	6P
CN9, 21	Connector	CN403351	3P
CN10, 13	Connector	CN410358	10P
CN11	Connector	CN407355	7P
CN12	Connector	CN409357	9P
CN14	Connector	CN412380	12P
CN15	Connector	CN408356	8P
CN19	Connector	CN404352	4P
CN20	Connector	CN405353	5P
CN22, 23	Connector	CN405296	
CN24, 25	Connector, Header	CN406084	
CN26, 27	Connector	CN402074	

6.9 CB-140 Display PCB Assembly

Ref. No.	Description	Parts No.	Notes
	P.C.B., LED	PB9A932A	
LED3–10, 12–19	LED	PNTLR124	Red
LED35–42, 44–51	LED	PNTLY124	Yellow
LED67–74, 76–83	LED	PNTLG124	Green
LED99–106, 108–115	LED	PNTLO124	Orange
SW3–10	Lever, Switch	KN3002	Vermilion
SW3–10	Switch	WH42057	
SW35–42	Lever, Switch	KN3004	Light Gray
SW65	Switch	WH340463	
SW66	Switch	WH340433	
SW67	Stopper, Switch	PB7JA02	
CN3	Connector	CN403351	3P
RE1	Encoder	SR3Z030	50 Pulse
	Spacer	KZ71A110	
	Angle	PB7JA01	
	Plate, Shield	PB7JA03	

CB-140 Display PCB Assembly

CB-140 CPU PCB Assembly

6.10 CB-140 CPU PCB Assembly

Ref. No.	Description	Parts No.	Notes
	P.C.B., CPU	PB9A931A	
IC10	IC	IC-0075	
IC14	ROM Assembly	PG-0841	
Q1–8	Transistor	Q-0004	
Q9–16	Transistor	Q-0011	
Q17	Transistor	Q-0008	
RA1	Resistor	R94-136	10 k
RA2, 3	Resistor Array	R94-132	
C1, 19–43	Capacitor	C622307M	50 V/0.022 µF
C3, 4, 6	F-Capacitor	CFF3103	50 V/0.01 µF
C5	Capacitor	C1105184	5 V/1 F
C10, 11	Capacitor	C656142M	50 V/560 pF
C12, 13	Capacitor	C622134M	50 V/220 pF
SW1	Switch, Dip	WH98137	
SW2	Switch	WH11181	
TP0	Connector	CN901157	Black
TP1, 2, 3	Connector	CN901149	Red
CN1	Connector	CN326211	26P
CN2	Connector	CN330212	
CN3, 4	Connector	CN412368	12P
CN5, 9	Connector	CN320210	20P
CN6	Connector	CN403360	3P
CN7	Connector	CN404361	4P
CN8	Connector	CN406363	
X1	Crystal	PZ4C033	
X2	Crystal	PZ4C017	

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 by a 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-80, 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. New exploded view drawings were not prepared for parts which differ from those for the MX-80, please refer to the parts list in which you will find the proper information. Following are the lists of the edited exploded view drawings attached hereto.

7.1 Reel Assembly

KW-6E (2"), KW-1K (1")

No.	Description	Parts No.	Notes
1.	Reel Table Assembly	KW0HG	2"
		KWAHG	1"
2	Screw, Reel Location	KW0E042	
3	Motor, DC Reel	MR5A040	
4	Base, Brake Assembly	KW-6E-B	
5	Brake Drum	KW0A056	
6	Brake Band	KW-6B-A	
7	(not assigned)	————	
8	Guide, Brake Band	KW-1G-A	
9	Tach Disk	SR3Z024B	
10	Bracket, Tach Sensor PCB	KZ3A143	
11	PCB Assembly, TACH SENSOR	PB-7BTD	
12	Solenoid, Brake	GP1B02	
13	Stopper, Solenoid Plunger	KZ2A015	
14	Link, Brake Adjustment	KZ6A063	
15	Pin, Solenoid Plunger	KZ5A003	
16	(not assigned)	————	
17	Lever, Brake	KW6B014	
18	(not assigned)	————	
19	(not assigned)	————	
20	Post, Spring Anchor	KZ5B010	
21	Spring	GS1088	
22	Spring	GS1089	
23	(not assigned)	————	
24	Link, Adjustment	KW6B006	
25	Retaining Ring, E-Type	F7502.0	
26	Retaining Ring, E-Type	F74TE18	
27	Nut, Adjustment	F517-4	
28	Connector, Plug Housing	CN402030	
29	Connector, Plug Contact	CN7B-041	
30	Solenoid Cable Assembly	ZA-6JN	
31	Cover, Slit	KW1G002	
32	Adjustment Screw	KZ6A099	
33	Cushion	PZ1C089	

Reel Assembly

7.2 Capstan and Pinch Roller Assemblies

Capstan Assembly KC-6C (2"), KC-1L (1")
Pinch Roller Assembly KP-6A (2"), KP-1E (1")

No.	Description	Parts No.	Notes
1	Cap, Capstan Dust	KC6C001	
2	Motor, DC Capstan	MR-1H	2"
		MR-11E	1"
3	Bracket, Heat Sink	ZA93G01	
4	Heat Sink	KZ1A071	
5	PCB, Transistor	PB9A906	
6	Insulator, Transistor	PZ4B068	
7	Transistor	QD1436K	
8	Transistor	QB1032K	
9	Capacitor	CFF3102	
10	Cap, Pinch Roller	KP0C023	
11	Spacer	KP6A008	2"
		KZ7C119	1"
12	Retaining Ring, C-Type	F712207	
13	Bearing	BA1Z028	
14	Roller Assembly, Pinch	KP0A037	2"
		KP0A044	1"
15	Shaft, Pinch Roller	KP0B050	2"
		KP0B065	1"
16	Arm, Pinch Roller	KP6A005	
17	Boss	KP6A006	
18	Bearing	BA2-608A	
19	Shaft, Pinch Roller Arm	KP6A012	
20	Base, Solenoid	KP6A010	
21	Bracket, Damper	KP6A001	
22	Stopper, Solenoid Plunger	KP6A002	
23	Tube, Rubber	KR6B011	
24	Damper, Pinch Roller	AS5096	
25	Solenoid	GP1B12	
26	Link, Solenoid	KP1D007	
27	Spring	GS1141	
28	Post, Spring Anchor	KP6A007	
29	Pin, Solenoid Plunger	KZ5A003	
30	Retaining Ring, E-Type	F7502.0	
31	Bracket, Solenoid	KP6A009	
32	Base	KP6A013	

Capstan and Pinch Roller Assemblies

7.3 Tachometer Roller, Impedance Roller, and Tension Arm Assemblies

Tachometer Roller Assembly KI-6B (2"), KI-1K (1")
Impedance Roller Assembly KI-6C (2"), KI-1L (1")
Tension Arm Assembly KA-6D (2"), KA-1N (1")

No.	Description	Parts No.	Notes
1	Cap, Roller	KP0C023	
2	Retaining Ring, C-Type	F7208.0	
3	Bearing	BA1Z028	
4	Washer, Cup Type	F953A001	
5	Retaining Ring, C-Type	F7022.0	
6	Roller Assembly, Counter	KI0A059	2"
		KI0A071	1"
7	Tachometer Disk	SR3Z024B	
8	Shaft, Counter Roller	KI0A060	2"
		KI0A072	1"
9	Bracket, Tach Sensor PCB	KI6B002	
10	PCB Assembly, TACH SENSOR	PB-7DSA	
11	PCB Assembly, TACH SENSOR	PB-7LAA	
12	Retaining Ring, C-Type	F7212.0	
13	Bearing	BA1Z011W	
14	Washer, Cup Type	F953A005	
15	Retaining Ring, C-Type	F7028.0	
16	Roller, Impedance	KI0A061	2"
		KI0A073	1"
17	Shaft, Impedance Roller	KI0A062	2"
		KI0A074	1"
18	Roller Assembly, Tension	GR-6R	2"
		GR-1P	1"
	Roller, Tension	GR6R002	2"
		GR01008	1"
	Cap, Roller	KP0C023	
	Shaft, Tension Roller	GR6R001	2"
		GR1P001	1"
	Spring	GS2115	2"
		GS2087	1"
	Bearing	BA1Z028	
	Washer	KZ6C055	
	Retaining Ring	F7022.0	
	Retaining Ring C-Type	F7208.0	
19	Shield, Tension Arm	KA6D006	
20	Arm, Tension Roller	KA6D001	
21	Shaft, Tension Arm	KA6D002	
22	Bearing	BA2-608A	
23	Housing, Tension Arm	KA1E003	
24	Collar, Tension Vane	KA1E004	
25	Vane, Tension	SR3Z028A	
26	Post, Spring Anchor	KA6D004	
27	Spring	GS1133	
28	Screw, Tension Adjusting	KZ6A003	
29	Bracket, Spring	KA6D005	
30	Post, Cushion	KA6D003	
31	Cushion	CY5006	
32	Bracket, Damper	KP6A001	
33	Damper, Tension Arm	AS5096	
34	Holder, Tension Sensor	SR1W001	
35	PCB Assembly, TENSION SENSOR	PB-7AVA	
36	PCB Assembly, SAFETY SWITCH	PB-4FHA	

Tachometer Roller, Impedance Roller, and Tension Arm Assemblies

7.4 Head Shield and Tape Lifter Assemblies

Head Shield Assembly ZA-73Z (2"), ZA-75P (1")
Tape Lifter Assembly KR-6C (2"), KR-1G (1")

No.	Description	Parts No.	Notes
1	Base, Shield Plate Assembly	ZA73Z18	
2	Shaft	ZA73Z02	
3	Bracket, Shield Plate	ZA73Z19	
4	Spring	GS2116	
5	Damper, Shield Plate	PZ1Z011	
6	Bracket, Damper	ZA73Z17	
7	Hook	ZA73Z07	
8	Cover, Shield	ZA73Z01	
9	Plate, Shield	ZA73Z10	
10	Arm Assembly, Lock	ZA-73ZA	
11	Washer	ZA73Z06	
12	Collar	ZA73Z05	
13	Spring	GS2117	
14	Nut, Adjustment	F517-3	
15	Stopper, Solenoid Plunger	ZA73Z03	
16	Solenoid	GP1M04	
17	Bracket, Solenoid	ZA73Z08	
18	Link, Solenoid	ZA73Z04	
19	Pin, Solenoid Plunger	F62208	
20	Tapping Screw	F31206SB	
21	Lifter	KR6C002	2"
		KR0A020	1"
22	Arm, Lifter	KR6C001	
23	Stopper, Bearing	KR6C004	
24	Bearing	BA11260L	
25	(not assigned)	———	
26	Screw	KR6C005	
27	Link, Solenoid	KR6C008	
28	Solenoid, Shifter	GP1B12	
29	Pin, Solenoid Plunger	KZ5A003	
30	Bracket, Solenoid	KR6C021	
31	Stopper, Solenoid Plunger	KP6A002	
32	Tube, Rubber	KR6B011	
33	Stopper	KR-6C-A	
34	Arm, Connector B	KZ3A156	
35	Collar	KR6C006	
36	(not assigned)	———	
37	Arm, Connector A	KZ3A155	
38	Spring	GS1144	
39	Bracket, Spring	CN7D-003	
40	Retaining Ring, E-Type	F75020	
41	Switch	WH51002	
42	Stopper	KR-6C-C	
43	Spark Arrester	CZ20001W	
44	Shaft, Shifter	KR6C019	
45	Base Plate	KR6C020	
46	Spacer	ZA75P01	
47	Dumper A	ZA73Z20	
48	Cushion	PZ1C117	

Head Shield and Tape Lifter Assemblies

7.5 Head Assembly

KH-6D (24ch)
KH-1N (16ch)
KH-1M (8ch)

No.	Description	Parts No.	Notes
1	Cover, Head	T003702	2"
		T008001	1"
2	Guide, Tape	KG6A001	2"
		KG1A002	1"
3	(not assigned)	————	
4	Head, 2" 24ch Erase	GH6E021A	
	Head, 1" 16ch Erase	GH1E021A	
	Head, 1" 8ch Erase	GH1E020B	
5	(not assigned)	————	
6	Head, 2" 24ch Record	GH6R017A	
	Head, 1" 16ch Record	GH1R017A	
	Head, 1" 8ch Record	GH1R015A	
7	(not assigned)	————	
8	Head, 2" 24ch Reproduce	GH6P009B	
	Head, 1" 16ch Reproduce	GH1P018A	
	Head, 1" 8ch Reproduce	GH1P023A	
9	Roller Assembly, Flutter Filter	GR-6J	2"
		GR-1E	1"
10	Base, Head Assembly	KH0C066	
11	Shield, Head Base	T003709	
12	Bracket, Head Connector	KH6C001	
13	Cable Ties	PZ1G167	
14	Cable Ties	PZ1G166	
15	(not assigned)	————	
16	(not assigned)	————	
17	Connector, MR-Type	CN234130	
18	Connector, MR-Type	CN234129	
19	Pin, Head Base Location	KZ5G030	

Head Assembly

7.6 Control Panel Assembly

No.	Description	Parts No.	Notes
1	Deck Skin	T0080-A	
2	Deck Skin, Front	T003710	
3	(not assigned)	————	
4	Deck Plate	T003701	
5	Panel, Transport Control	CB20W01	
6	Splicing Block	T003707	2"
		T008003	1"
7	Bracket, Splicing Block	CB20W06	
8	Escutcheon, Switch	PZ4A014	
9	PCB Assembly, Switch	PB-7AKA	
10	Bracket, Control Panel	CB20W02	
11	Bracket, Control Panel	CB20W03	
12	Cap, Knob	KN1058	
13	Knob	KN1059B	
14	Bracket, Switch	CB20W04	
15	Switch, Rotary	WH66067	
16	Lens, Tape Timer	KN5011	
17	PCB Assembly, SWITCH/TIMER	PB-7HTA	
18	PCB Assembly, TIMER DRIVE	PB-7HUA	
19	Spacer	KZ71A109	
20	Escutcheon, Switch	PZ4A013	
21	PCB Assembly, SWITCH	PB-7AJB	
22	Stopper, Blade	T003708	2"
		T70006	1"
23	Cushion	CY4130	

Control Panel Assembly

7.7 VU Meter Panel Assembly

CB-736 (24ch), CB-753 (16ch), CB-70M (8ch)

No.	Description	Parts No.	Notes
1	Panel, VU Meter	CB73510	24ch
		CB75301	16ch
		CB70M01	8ch
2	(not assigned)	————	
3	VU Meter	ME11016	
	Lamp, Meter	LU2065	
4	Cover, VU Meter Panel	CB73606	24ch
		CB75304	16ch
		CB70M03	8ch
5	(not assigned)	————	
6	Holder, Panel Cover	CB73514	
7	Holder, Panel Cover	CB73703	24ch
		CB75305	16ch
		CB75305	8ch
8	Bracket, VU Meter Panel	K108906	
9	Collar, VU Meter Panel	K108935	
10	(not assigned)	————	
11	(not assigned)	————	
12	PCB Assembly, LED, RECORD	PB-7AAA	
13	PCB Assembly, LED, PEAK	PB-7ABA	
14	PCB Assembly, VU METER	PB-7HXA	
15	Harness Assembly, VU Meter	ZA-6RH	
16	Harness Assembly, VU Meter	ZA-6RJ	
17	Base, VU Meter Mounting	CB73511	24ch
		CB75303	16ch
		CB70M02	8ch
18	Stud	KZ9H110B	

VU Meter Panel Assembly

7.8 Amplifier Assembly

A1110 (24ch), A1122 (16ch), A1196 (8ch)

No.	Description	Parts No.	Notes
1	Panel, Amp Assy Front	A111002	24ch
		A112201	16ch
		A119602	8ch
2	(not assigned)	————	
3	Card Cage Assembly	A1110-A	
4	Fastener, Quick Release	CY3036	
5	Collar, Fastener	CY3035	
6	Cushion	K109012	
7	PCB Assembly, AUDIO CONTROL	PB-4FFA	
8	PCB Assembly, SERIAL REMOTE CONTROL	PB-4FEA	
9	PCB Assembly, AUDIO AMPLIFIER	PB-19JA	
10	Angle, PCB Guide	A111004	
11	Angle, PCB Guide	A111001	24ch
		A111001	16ch
		A119601	8ch
12	Angle, PCB Guide	A111003	
13	Angle, PCB Guide	A111001	24ch
		A111003	16ch
		A111003	8ch
14	(not assigned)	————	
15	Guide, PCB	CN7B-014	
16	(not assigned)	————	
17	Cover, Card Cage Top	A111005	
18	Cable Ties	PZ1G167	
19	(not assigned)	————	
20	PCB Assembly, MOTHER A	PB-7HVA	24ch
		PB-7HVA	16ch
		PB-7YZA	8ch
21	PCB Assembly MOTHER C	PB-7KGA	
22	(not assigned)	————	
23	Plate, Shield	A111020	

Amplifier Assembly

7.9 Power Supply Assembly

No.	Description	Parts No.	Notes
1	Heat Sink	KZ1A070	
2	Diode, Bridge	PN-0190	
3	IC	ISTR9005	
4	PCB, Transistor	PB9A622A	
5	Transistor	QB863O	
6	Transistor	QD1148O	
7	IC	IHC7805H	
8	PCB, Transistor (L)	PB9A393A	
9	PCB, Transistor (S)	PB9A385A	
10	Collar, Transistor	PZ4B036	
11	Insulator, Transistor	PZ4B068	
12	Insulator, Transistor	PZ4B055	
13	Insulator, Transistor	PZ4B054	
14	Diode, Bridge	PN0005	
15	IC	ISTR9005	
16	Transistor	QB863O	
17	AC Inlet	CN603221	
18	Fuse Holder	FH1-034	
19	Fuse 10A	FH9-011	
20	(not assigned)	————	
21	Terminal, Ground	CN901040	
22	Panel, Power Supply, Rear	DS3J003	
23	Stand off	KZ9L200A	
24	PCB Assembly, POWER SUPPLY	PB-62ZA	
25	Hinge, Front Panel (L)	CY2015	
26	Hinge, Front Panel (R)	CY2016	
27	Noise Filter	SF5009	
28	Transformer, Power	TF11107	
29	Transformer, Power	TF11109	
30	(not assigned)		
31	Capacitor	C1223180	
32	PCB Assembly, VOLTAGE SELECT	PB-7HYA	
33	Stand Off	KZ9L100A	
34	Cap, Leg	CY5007	
35	Panel, Power Supply, Front	DS3J001	
36	Spacer	DS3J005	
37	Escutcheon	KN5007	
38	Switch, Power	WH92101	
39	Capacitor, Spark Arrester	CZ20001W	
40	PCB Assembly, LED, POWER	PB-7HZA	
41	Spacer	KZ7A183	
42	Spacer	KZ9A075B	
43	Circuit Breaker 10A	WH91092	
44	Circuit Breaker 8A	WH91091	
45	Circuit Breaker 2.5A	WH91086	
46	Circuit Breaker 6.3A	WH91090	
47	(not assigned)	————	
50	Circuit Breaker 3.15A	WH91087	
51	Circuit Breaker 4A	WH91088	
52	Caster, with Brake	CY4082	
53	Caster, without Brake	CY4081	
54	Collar	K108904	
55–58	(not assigned)	————	
59	Circuit Breaker 10A	WH91092	

Power Supply Assembly

7.10 Rear Panel Assemblies

Rear Panel Assembly (CB-738), External I/O Panel Assembly (CB-749)

No.	Description	Parts No.	Notes
1	Panel, I/O	CB78401	
2	Panel, Blank	CB74903	
3	Lock, Connector	CN7B-212	
4	Connector Assembly, Parallel I/O	PZ9D164	
5	Panel, Rear	CB73801	
6	Resistor 150 Ω	R97-002	
7	PCB Assembly, REEL DRIVE	PB-4FCA	
8	PCB Assembly, TRANSPORT CONTROL	PB-4JSA	
9	Stud	KZ9H100A	
10	Plate, Nut	A104412	
11	PCB Assembly, CAPSTAN CONTROL	PB-4FAA	
12	PCB Assembly, REEL CONTROL	PB-4FBA	
13	Hinge R	CY2016	
14	Hinge L	CY2015	
15	Fan	AS1Z022	
16	Cover	K113126	
17	Washer, Nylon	KZ6C043	
18	Stud	KZ7A236	
19	Heat Transfer Sheet	PZ4B088	
20	7K Bushing	PZ4B035	
21	Mini Clamp	PZ1G082	

Rear Panel Assemblies

7.11 Audio I/O Panel Assembly

CB-733 (24ch), CB-752 (16ch), CB-70L (8ch)

No.	Description	Parts No.	Notes
1	Panel, Audio I/O	CB73301	24ch
		CB75201	16ch
		CB70L01	8ch
2	(not assigned)	————	
3	Connector, XL-Type Receptacle	CN103194	
4	Connector, XL-Type Plug	CN103195	
5	(not assigned)	————	
6	Cable Assembly, NR	ZA-6EF	
7	Cable Assembly	ZA-6EG	24ch
8	Lock, Connector	CN7B-061	
9	Hinge R	CY2016	
10	Hinge L	CY2015	
11	Collar	K108904	
12	Blank Panel	CB73204	
13	Edging	PZ1G122	
14	Lock, Connector	CN7B-212	
15	Cable Assembly, Amplifier	ZA-6KF	

Audio I/O Panel Assembly

7.12 Remote Control Assembly CB-140

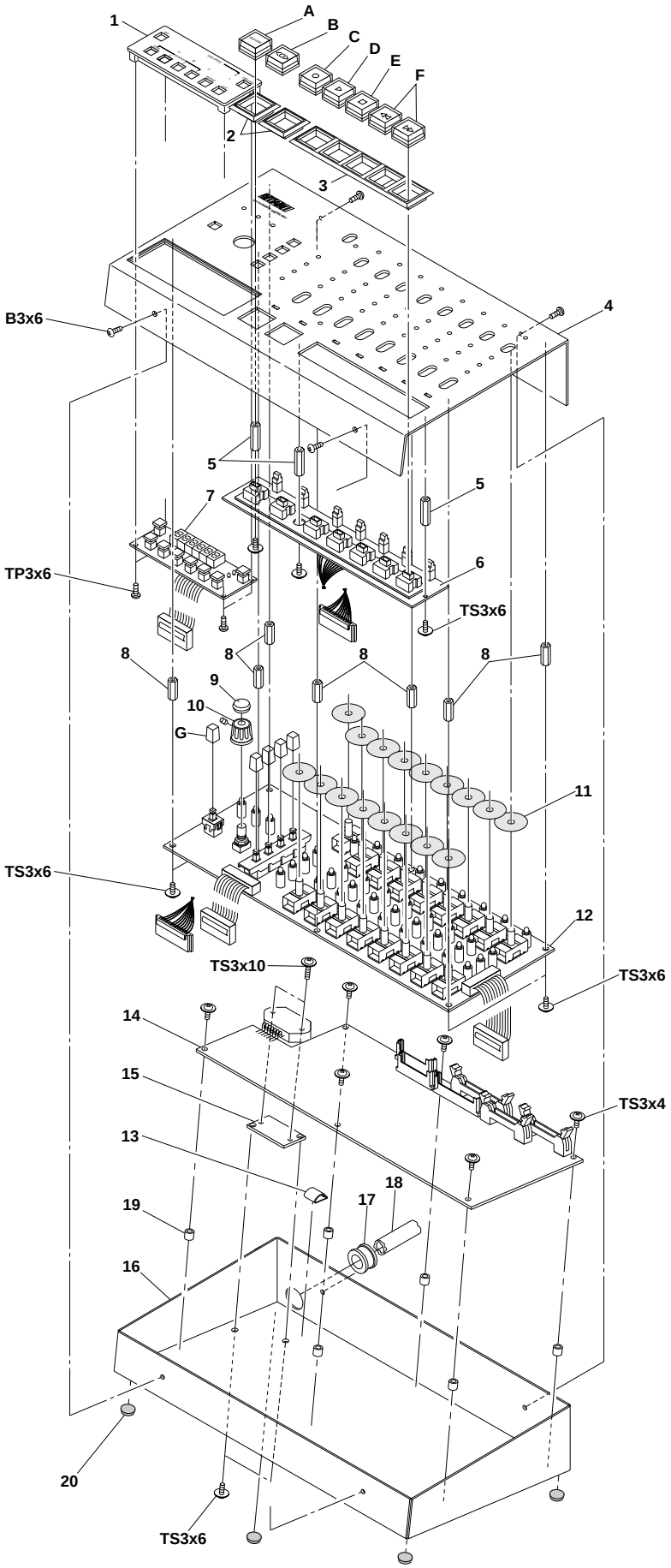
No.	Description	Parts No.	Notes
1	Panel	CB14001	
2	(not assigned)	————	
3	Panel R, Side	CB13902	
4	Panel L, Side	CB13903	
5	Protector Assembly	CB-139C	
6	Cover, Under	CB12304	
7	Bottom Panel Assembly	CB-123C	
8	Hinge	CY2023	
9	Escutcheon, Timer	KN5012	
10	Protector B	PZ4A014	
11	Protector A	PZ4A013	
12	PCB Assembly, MASTER SWITCH	PB-7QBA	
13	PCB Assembly, TIMER INDICATOR	PB-7HTC	
14	PCB Assembly, CHANNEL SET-UP	PB-7QCA	
15	PCB Assembly, DISPLAY	PB-7PUB	
16	(not assigned)	————	
17	Cap	KN1048	
18	Knob B	KN1046	
19	PCB Assembly, TRANSPORT SWITCH	PB-7QDA	
20	PCB Assembly, CPU	PB-4KWA	
21	PCB Assembly, POWER SUPPLY	PB-63AA	
22	Heatsink	CB12305	
23	Bracket, Connector	CB12313	
24	Screw, Lock	CN7B-212	
25	Bracket	CN7B-06I	
26	Cable Assembly A	ZA-6EL	
27	Cable Assembly B	ZA-6EM	
28	Foot	CY4063	
29	Insulation Sheet	CB13907	
30	Number Seal	PT5064	

Remote Control Assembly CB-140

7.13 Remote Control Assembly CB-151

No.	Description	Parts No.	Notes
1	Escutcheon, Timer	KN5020	
2	Escutcheon, Switch	PZ4A026	
3	Escutcheon, Switch	PZ4A027	
4	CAUTION Label, UL	PT4117	
5	CAUTION Label	PT4231	
6	Panel	CB15101	
7	Stud	KZ9H220A	
8	PCB Assembly, TRANSPORT SWITCH	PB-4SZA	
	A REHEARSE Button	KN2240	
	B CUE Button	KN2145	
	C RECORD button	KN2144	
	D PLAY Button	KN2142	
	E STOP Button	KN2141	
	F F.FWD/RWD Button	KN2143	
	G Button	KN2184	
9	PCB Assembly, TIMER INDICATOR	PB-7HTD	
10	Stud	KZ9H140A	
11	Cap, Knob	KN1099	
12	Knob	KN1103	
13	Blind	PZ1B048	
14	PCB Assembly, DISPLAY	PB-7VXA	
15	Shield	PZ1G186	
16	PCB Assembly, CPU	PB-4SYA	
17	Plate, Heatsink	CB12305	
18	Sub Assembly, Bottom	CB-151B	
19	Bushing	PZ1G070A	
20	Cable Assembly, Remote	ZA-6VD	
21	Stud	KZ9H070A	
22	Foot	CY4137	

Remote Control Assembly CB-151



Appendix Modification and Field Upgrades

This section contains general information about the wide band modification for reproducing time code signals and about changing the tape speed pairs. This section also contains installation instructions for the optional overbridge case for a noise reduction system.

A.1 Wide Band Modification

The following modification to the AUDIO AMPLIFIER PCB assembly is required for reproducing SMPTE/EBU time code in FAST WIND and SPOOL modes.

1. Remove J1 (located between IC3 and IC4).

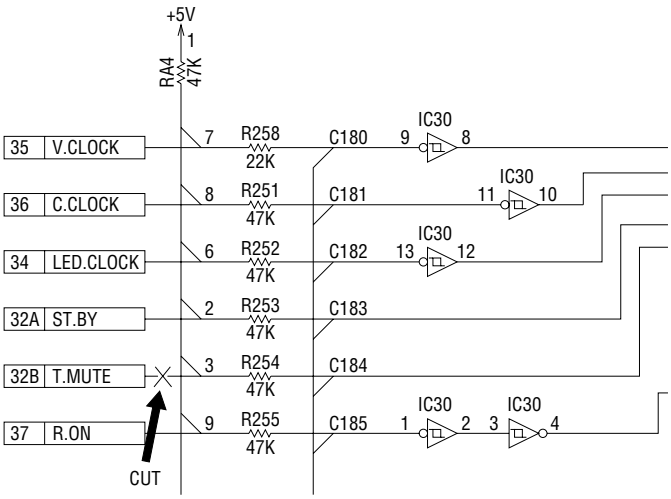
2. Solder a jumper wire to J2 (in the vicinity of IC1).

3. Check the following parts and solder them to the specified positions.

R501: 1/4W, 5%, 8.2 kΩ carbon resistor
R503: 1/4W, 5%, 470 Ω carbon resistor
R505: 1/4W, 5%, 1 MΩ carbon resistor
R506: 1/4W, 5%, 1 MΩ carbon resistor
R507: 1/4W, 5%, 1 MΩ carbon resistor
Q501: 2SK336 (FET switch)
Q503: 2SK336 (FET switch)
C5: 0.001 µF, mylar film capacitor (±5%, 50 V)
C17: 0.001 µF, mylar film capacitor (±5%, 50 V)
C26: 47 pF, polypropylene film capacitor (±5%, 50 V)
C37: 47 pF, polypropylene film capacitor (±5%, 50 V)
C501: 0.1 µF, mylar film capacitor (±5%, 50 V)

R502, R504, Q502, Q504 must be removed.

4. Cut the printed wiring on the PCB as follows.



NOTE: When this modification has been carried out, MX-80 can read time code up to 25 times written speed. Time code written at 30 or 15 ips can be read at maximum speed. Since time code written at 7.5 ips cannot be read at maximum speed, the maximum speed should be reduced (i.e., to use SPOOL mode or reduce speed by changing R125 on REEL CONTROL PCA to 30 kΩ and readjusting VR10 on REEL CONTROL PCA).

A.2 Changing Machine Speed Pairs

The MX-80 is a three speed machine with two of the speeds available for selection by the SPEED switch on the transport. Changing the speed pair involves changing one switch (SW1-1) on the TRANSPORT CONTROL PCB and re-aligning the audio channels.

1. Open the upper rear panel by removing the 2 upper screws on each side of the panel, and allowing it to fold down to a horizontal position.
2. On the TRANSPORT CONTROL PCB, change the setting of SW2. If your machine was initially configured for 15 & 30 ips, the switch will be in the "H" position, if initially configured for 7.5 & 15 ips, the switch will be in the "L" position. Set the switch to correspond to the desired speed pair (H or L).
3. Perform the routine audio alignment procedures described in **§5.2**.
4. Perform the routine transport alignment procedures described in **§5.1**.
5. Close the upper rear panel and replace the four screws removed in step 1.

A.3 Installation of Overbridge Case for Noise Reduction System

1. Install the Foot [12] with the plate [11] (This step is required for any MX-80 having a serial number suffix of C or later, and for the some B suffix machines).
2. Mount trim plates A [4] to the top and bottom of both side trims [2] and [3]. Secure each with two M3x10 hex socket head screws.
3. Mount the parts assembled in step 2 into the overbridge case [1]. Secure with four M4x10 hex socket head screws on each side.
4. Insert two spacers [9] and two casters [10] into the bottom support [8]. Secure side panel L [5] and side panel R [6] to the bottom support [8] with two M4x10 hex socket head screws on each side.
5. Mount the parts assembled in step 4 to the MX-80 case frame from the rear. Secure with five M8x12 hex socket head screws. These screws should not be tightened completely at this time.
6. Mount the cover [7] between side panel L [5] and side panel R [6]. Secure with M3x6 hex socket head screws from the inside of the cover. Completely tighten the M4x10 and M8x12 hex socket head screws form steps 4 and 5.
7. Mount the overbridge case [1] onto side panel L [5] and side panel R [6]. Secure with two M5x8 binding head screws on each side.
8. Attach the floating nuts to the trim plate L [2] and trim plate R [3] as illustrated.
9. Mount the blank panel A [13] and the blank panel B [14] from the front. Secure with eight M5x20 binding head screws.
10. Mount the noise reduction system and power supply unit from the front. Secure with four M5x20 binding head screws.
11. Verify that all screws have been completely tightened.

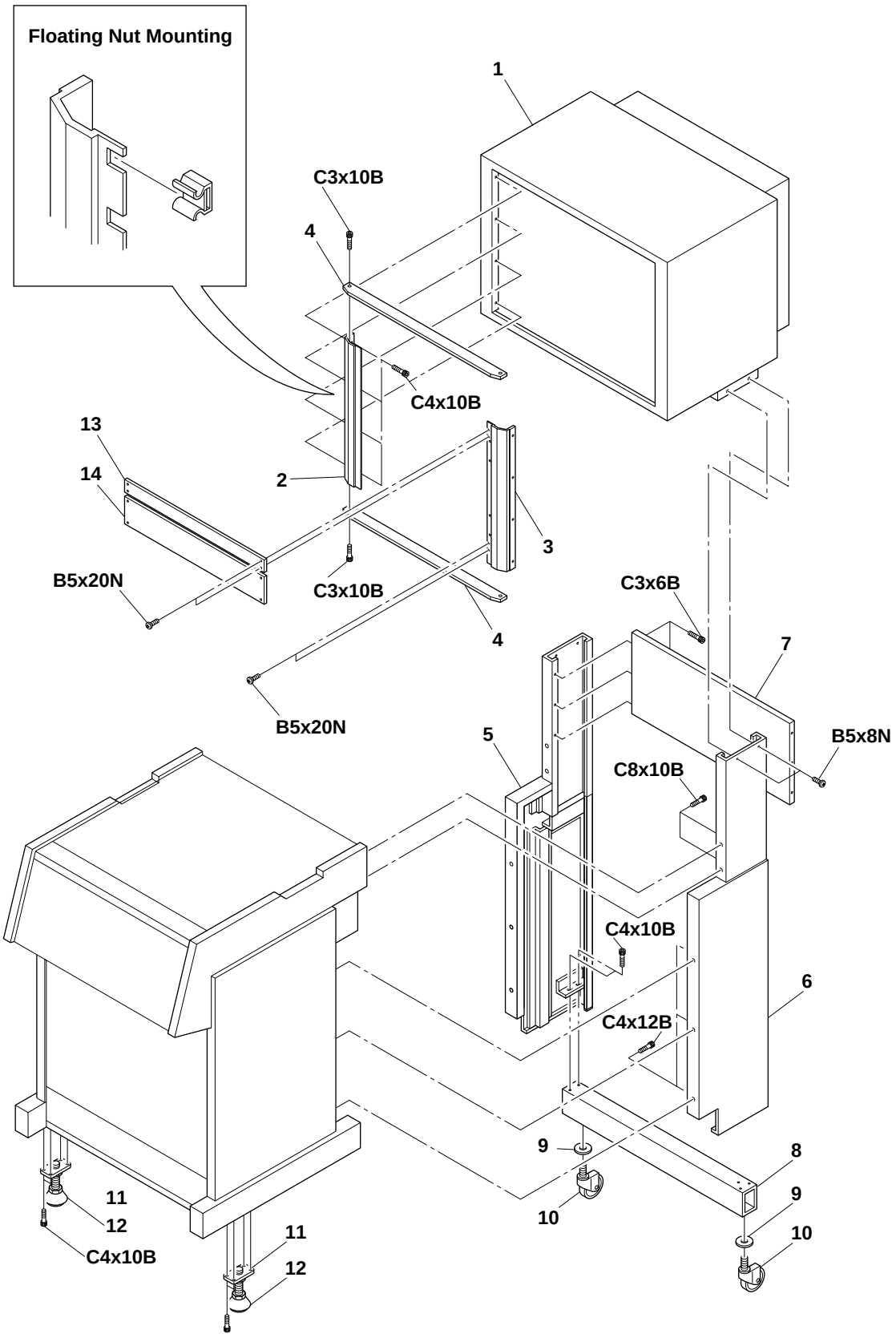
NOTE: Due to weight of this assembly, we suggest that this installation be done with the help of another person.

PARTS LIST

No.	Description	Parts No.	Qty	No.	Description	Parts No.	Qty
1	Overbridge Case	K1134-B	1	8	Bottom Support	K113425	1
2	Side Trim L	K113427	1	9	Spacer	KZ6C120	2
3	Side Trim R	K113428	1	10	Caster	CY4081	2
4	Trim Plate A	K113413	2	11	Plate Adjust	K113430	2
5	Side Panel L	K1134-C	1	12	Foot	CY4129	2
6	Side Panel R	K1134-D	1	13	Blank Panel A	K113416	1
7	Cover	K113424	1	14	Blank Panel B	K113429	1

LIST OF SCREWS

Type	Quantity	Code
M3x 6 Hex Socket Head Screw	6	C3x 6B
M3x10 Hex Socket Head Screw	4	C3x10B
M4x10 Hex Socket Head Screw	20	C4x10B
M5x 8 Binding Head Screw	4	B5x 8N
M5x20 Binding Head Screw	20	B5x20N
Floating Nut	20	F951Z004
M8x12 Hex Socket Head Screw	10	C8x12B



■ *Overbridge Case Assembling*

Schematic Diagrams

TYPE R and later

Part No.	Description	DWG. No.
T00370C	Wiring Diagram (24 ch)	3-15107
T00370D	Wiring Diagram (16 ch)	3-15106
KH6D00B	Head Wiring Diagram (24 ch)	3-12542
KH6E00B	Head Wiring Diagram (16 ch)	3-12543
T00370E	Transport Wiring Diagram	3-12544
CB20W0B	Control Panel Assembly	3-12635
CB20W0C	Control Panel Assembly	3-12637
PB7AJ0A	Switch PCB Assembly (I)	3-12641
PB7AK0A	Switch PCB Assembly (II)	4-37429
ZA93E0A	Timer Display Assembly	3-12645
PB7HT0A	Timer Indicator PCB Assembly	3-14224
PB7HU0A	Timer Drive PCB Assembly	3-14220
SR1W00A	Tension Detect Assembly	4-44454
PB7LA0A	Tach (I) PCB Assembly	4-42942
PB7DS0A	Tach (II) PCB Assembly	4-42330
PB4FH0A	Safety PCB Assembly	4-42934
PB7MV0A	Reel Tach PCB Assembly	4-43028
PB4FD0B	Transport Control Block Diagram	3-12633
PB4JS0A	Transport Control PCB Assembly (1/2)	3-13894
PB4JS0A	Transport Control PCB Assembly (2/2)	3-13895
PB4FC0A	Reel Drive PCB Assembly	3-12617
PB4FB0A	Reel Control PCB Assembly	3-17177
ZA93G0A	Capstan Drive Assembly	4-42937
PB4FA0A	Capstan Control PCB Assembly	3-12607
PB4FE0A	Serial Remote Control PCB Assembly (1/2)	3-14218
PB4FE0A	Serial Remote Control PCB Assembly (2/2)	3-14219
PB4LR0A	422 TRNCV PCB Assembly	4-44612
PB7HX0A	VU Meter PCB Assembly	3-12519
PB7AA0A	Record Indicator PCB Assembly	4-36987
PB7AB0A	Peak Indicator PCB Assembly	4-36989
A11110B	Audio Wiring Diagram (24 ch)	3-12546
A11220B	Audio Wiring Diagram (16 ch)	3-12547
PB4FF0A	Audio Control PCB Assembly (Command)	3-12548
PB4FF0A	Audio Control PCB Assembly (Clock)	3-12549
PB19J0A	Audio Amplifier PCB Assembly (Playback)	3-15518
PB19J0A	Audio Amplifier PCB Assembly (Record)	3-15519
PB19J0A	Audio Amplifier PCB Assembly (Bias)	3-15520
PB19J0A	Audio Amplifier PCB Assembly (Control)	3-15521
PB7HV0A	Mother A PCB Assembly	3-13255
PB7HW0A	Mother B PCB Assembly	3-13256
PB7KG0A	Mother C PCB Assembly	3-12556
DS3J00B	Power Supply Assembly Wiring	3-15108
DS3J00A	Power Supply Assembly	3-13266
DS3J00C	Circuit Protector Assembly	4-42936
PB7HY0A	Voltage Select PCB Assembly	3-15104
PB7HZ0A	Power Indicator PCB Assembly	4-42935
CB1390B	Remote Controller Wiring Diagram	3-14020
PB4KW0A	CPU PCB Assembly (1/4)	3-14016
PB4KW0A	CPU PCB Assembly (2/4)	3-14017
PB4KW0A	CPU PCB Assembly (3/4)	3-14018
PB4KW0A	CPU PCB Assembly (4/4)	3-14019
PB7QB0A	Master Switch PCB Assembly	4-44631
PB7QD0A	Transport Switch PCB Assembly	3-14009
PB7QC0A	Channel Setup PCB Assembly	4-44633
PB7PU0A	Display PCB Assembly (1/2)	3-14010
PB7PU0A	Display PCB Assembly (2/2)	3-14011
PB63A0A	Power PCB Assembly	3-14223