OTARI®

MX-5050 BII

AND

MX-5050 MKIII-2

ALIGNMENT PROCEDURES

Edition No. 2

January 1988

TABLE OF CONTENTS

OTARI MX-5050 BII and MX-5050 MkIII-2

Speed Calibration, Head Alignments and Audio Record and Reproduce Alignments

1.0 INTRODUCTION

These instructions contain the procedures for Head Zenith, Wrap, and Azimuth adjustment, Speed Calibration, and Audio Record and Reproduce Alignment on the MX-5050 BII and MkIII-2 Series Tape Recorders. Speed Calibration and Audio Record/Reproduce procedures are performed at 7-1/2 and 15 ips with NAB equalization at 250 nWb/m reference fluxivity, biased for Ampex 456 tape.

1.1 TOOLS AND EQUIPMENT REQUIRED

- AC Millivolt meter calibrated in dB, capable of measurement to +16 dBm
- Audio Oscillator - manually sweepable from 20 Hz to 20 kHz, capable of +16 dBm output into 600 Ohm load
- Dual Trace Oscilloscope with X-Y inputs
- Frequency Counter with 1 Hz resolution
- 15 ips Reproduce Alignment Tape - MRL Catalog # 21J205
- 7.5 ips Reproduce Alignment Tape - MRL Catalog # 21T204 (This tape is necessary only if aligning at 7.5 ips)
- 7.5 ips 3150 Hz Speed and Flutter Test Tape - MRL Catalog #231-570-480-110
- 7.5 ips 500 Hz to 20 kHz Fast Sweep Tape (1/4" MRL Cat # 23T136; 1/2" MRL Cat # 33T139)
- Hand-Held Demagnetizer (Han-D-Mag by R. B. Annis Co. is recommended)
- Isopropyl Alcohol - 70% pure or greater (Do Not use Rubbing Alcohol)
- Cotton Swabs
- 10.5" Reel of 1/4" Ampex 456 Tape (virgin tape)
- Reel of used recording tape which can be discarded after use
- High Intensity Lamp
- Small white card approximately business card size
- OTARI Head Inker or dry erase marker
- Insulated alignment tool

- #2 Vessel Screw Driver (OTARI P/N ZA-53A)
- 3mm and 4mm Hex Keys (OTARI P/N ZA-51C)

NOTE: *MRL Reproduce Alignment Tapes are available from*

Magnetic Reference Labs
229 Polaris Suite 4
Mt. View, CA 94043
(415)965-8190

2.0 SPEED CALIBRATION AND CAPSTAN SERVO OFFSET ADJUSTMENT

2.1 MX-5050 BII SPEED CALIBRATION

With the Power to the machine turned **OFF**:

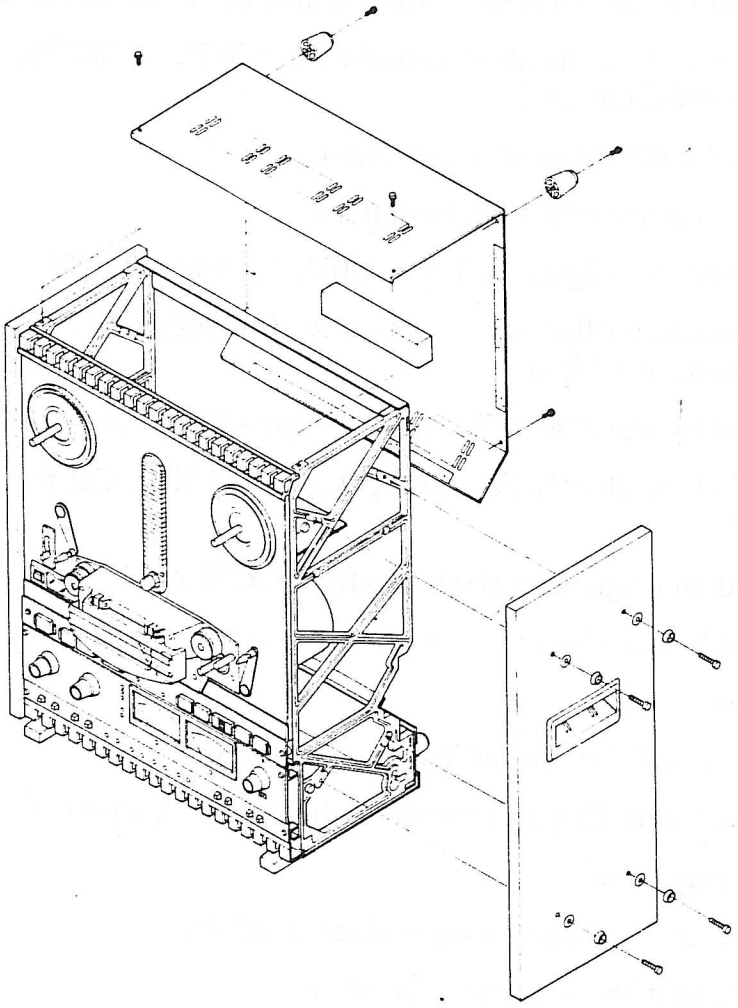


Figure 1 Rear Panel Removal

1. Clean and demagnetize the Heads, Lifters, and Tape Guides.
2. Remove the Rear Cover (refer to Figure 1).
3. Remove the 6 screws (3 on each side) which attach the Control PCB (PB-46Q) to the chassis and swing the PCB down to horizontal.

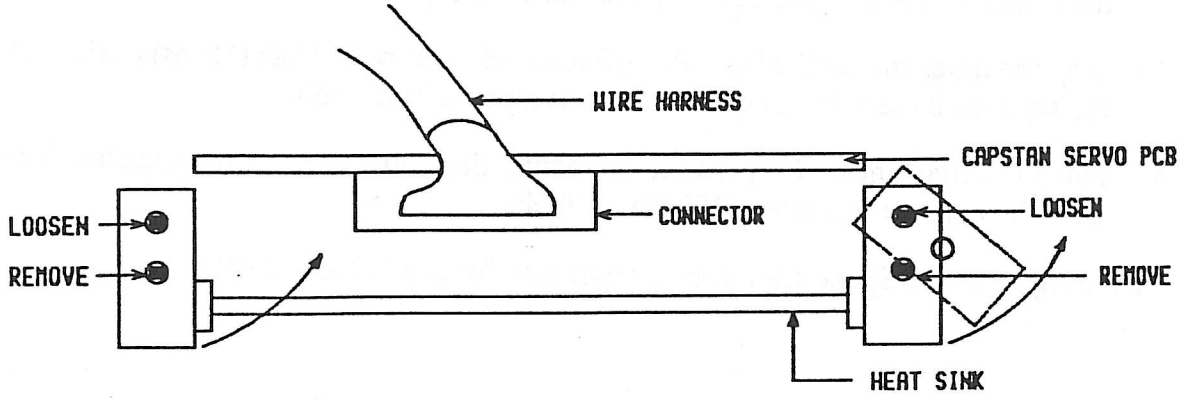


Figure 2 Capstan Servo PCB Removal

4. Remove the 2 screws which attach the bottom of the Capstan Servo PCB brackets, and loosen the 2 top screws to allow the brackets to be rotated up out of the way, and slide the Capstan Servo PCB out of its Card Guides enough to gain access to the adjustment trimmers (refer to Figure 2).

   Connect the Power cord and turn ON the power to the machine:

5. Thread the machine with the 7.5 ips 3150 Hz Speed and Flutter Test tape.
6. Set the REEL SIZE selector to the **Large** Reel position, set the TAPE SPEED selector to the **Low** (7-1/2 ips) position, and set the SOURCE/TAPE selectors to **Tape** monitor.

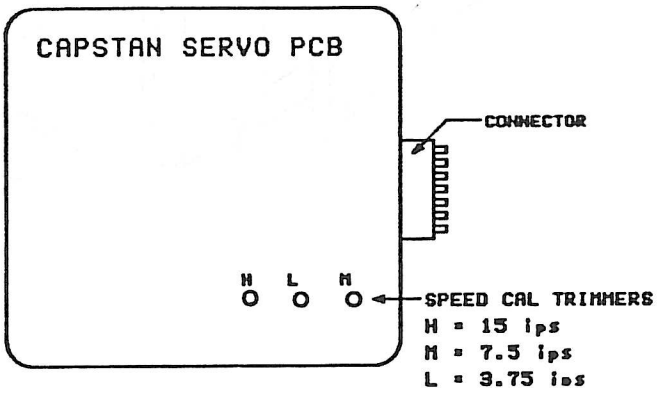


Figure 3 Location of Trimmers on Capstan Servo PCB

7. Wind the tape until there is an equal amount of tape on Supply and Take-Up reels.
8. Connect the Frequency Counter to either channel Audio Output connector on the rear panel.
9. Place the machine in **Play** mode, and adjust the **M** trimmer on the Capstan Servo PCB until the counter indicates 3150 Hz ± 5 Hz. Refer to Figure 3 for the location of the trimmer.
10. Stop the tape, and set the front Panel Speed selector to the **High** (15 ips) position. Rewind the tape until there is an equal amount of tape on both reels.
11. Place the machine in **Play** mode, and adjust the **H** trimmer on the Capstan Servo PCB until the counter indicates 6300 Hz ± 10 Hz.

This completes the Speed Calibration procedure for the MX-5050 BII.

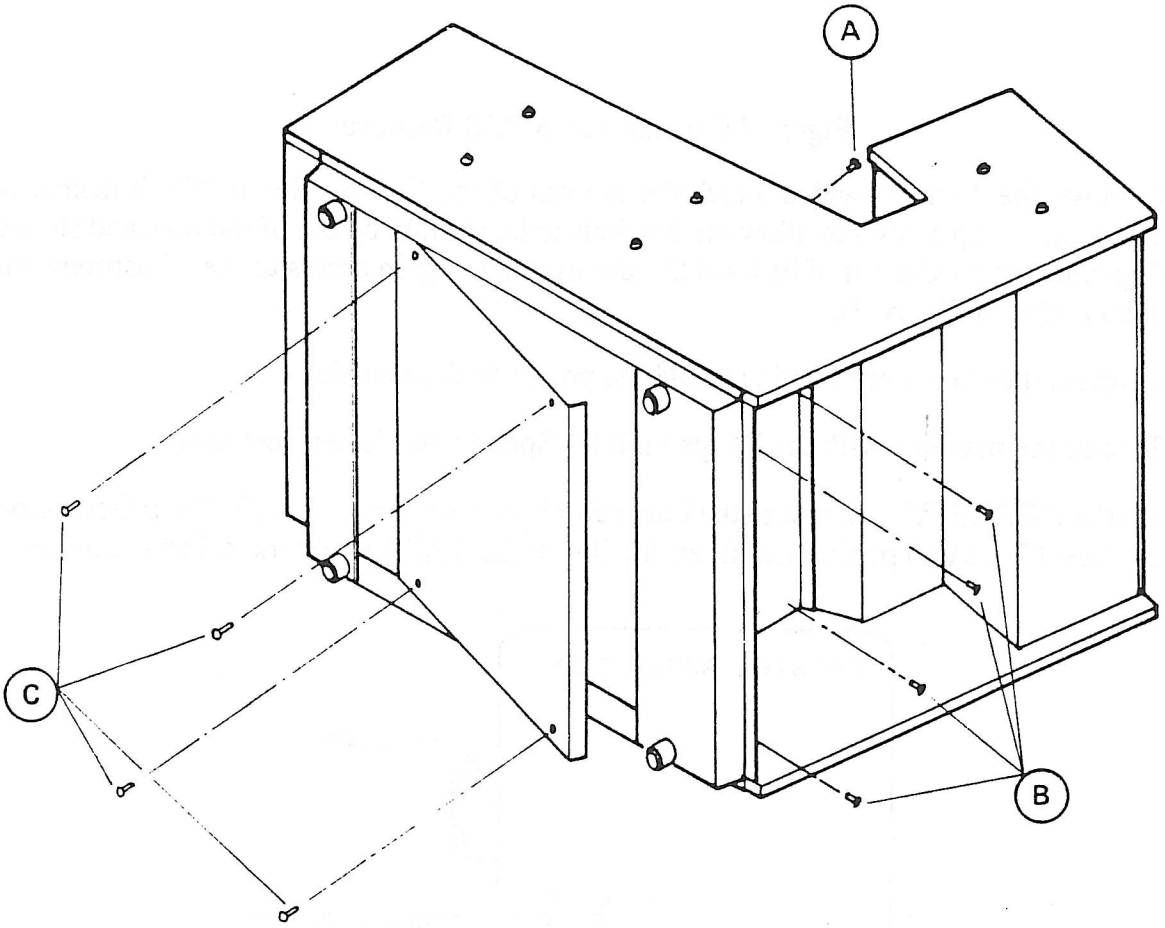


Figure 4 Opening the Transport

2.2 MX-5050 MkIII-2 SPEED CALIBRATION

With the Power to the machine turned **OFF:**

1. Lay the machine on its left side (as shown in Figure 4) so that the left (Supply) reel can rotate freely when an empty reel is mounted.
2. Remove the 4 screws marked "C" in Figure 4, and swing the bottom panel out.
3. Clean and demagnetize the Heads, Lifters and Tape Guides.

   Connect the Power cord and turn **ON** the power to the machine:

4. Thread the machine with the 7-1/2 ips 3150 Hz Speed/Flutter Test tape.
5. On the Transport, set the REEL SIZE selector to the **Large** Reel position, set the TAPE SPEED selector to the **Low** (7-1/2 ips) position, and, on the Overbridge, set the SOURCE/TAPE selectors to **Tape** monitor.
6. Wind the tape until there is an equal amount of tape on Supply and Take-Up reels.
7. Connect the Frequency Counter to either channel Audio Output connector on the rear panel.
8. Place the machine in **Play** mode, and adjust the **M** trimmer on the Capstan Servo PCB until the counter indicates 3150 Hz ± 5 Hz. Refer to Figure 3 for the location of the trimmer.
9. Stop the tape and set the front panel TAPE SPEED selector to the **High** (15 ips) position. Rewind the tape until there is an equal amount of tape on both reels.
10. Place the machine in **Play** mode, and adjust the **H** trimmer on the Capstan Servo PCB until the counter indicates 6300 Hz ± 10 Hz.

This completes the Speed Calibration procedure for the MX-5050 MkIII-2

2.3 MX-5050 MkIII-2 SERVO OFFSET ADJUSTMENT

This procedure is necessary only when the MX-5050 MkIII-2 is to be used with a device such a Synchronizer or Resolver which externally controls the speed of the capstan motor using an external DC control voltage. Refer to the Transport Wiring diagram in the MX-5050 MkIII Manual, or the OTARI Synchronizer Interface Information booklet for information regarding the connector pinout for the LOCATOR connector on the rear panel. Refer to Figure 5 for Location of Switches and Trimmer.

1. If the machine is not already open from the previous procedure, refer to Steps 1 and 2 in Section 2.2 to gain access to the Transport Control PCB.

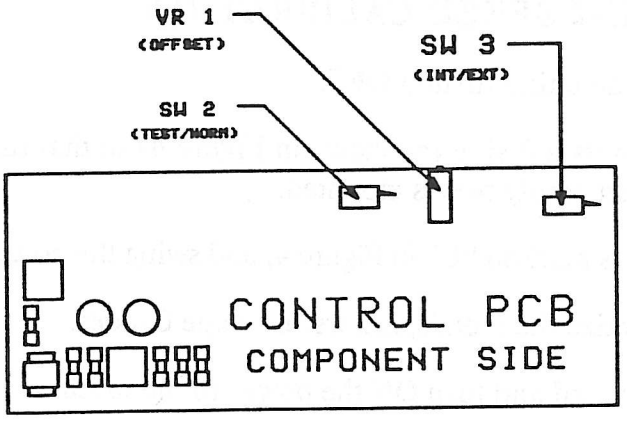


Figure 5 Location of Switches and Trimmer on Control PCB

2. Set the SPEED switch to the **High** position, set the REEL SIZE switch to the **Large** position, and set the SOURCE/TAPE switch to the **Tape** position.

3. Connect the Frequency Counter to either channel OUTPUT connector on the rear panel.

4. On the Transport Control PCB, set **SW 2** to the **Test** position, and set **SW 3** to the **Internal** position. Thread the machine with the 7.5 ips Speed/Flutter Test tape.

5. Place the machine in **Play** mode and note the reading on the Frequency Counter (it should read **6300 Hz**).

6. Set **SW 3** to the **External** position and adjust **VR 1** (DC Offset Adjustment) so the counter reads the same as in Internal position ± 2 Hz.

7. After adjustment is complete, set **SW 2** to the **Normal** position and set **SW 3** to the **External** position for operation with the synchronizer.

NOTE: *It is necessary to set* **SW 3** *to the* **Internal** *position for Normal operation without the synchronizer.*

3.0 AUDIO CHANNEL REPRODUCE AND RECORD ALIGNMENT

The Audio Alignment procedures are identical for the MX-5050 BII and the MX-5050 MkIII-2 Tape Recorders. The machines differ only in the location of the Amplifier assembly.

If you are aligning an MX-5050 BII, then perform the procedure in Section 3.1 and then perform the adjustments in Section 3.3.

If you are aligning an MX-5050 MkIII-2, then perform the procedure in Section 3.2 then continue with the adjustments in Section 3.3.

3.1 ACCESS TO THE MX-5050 BII AMPLIFIER

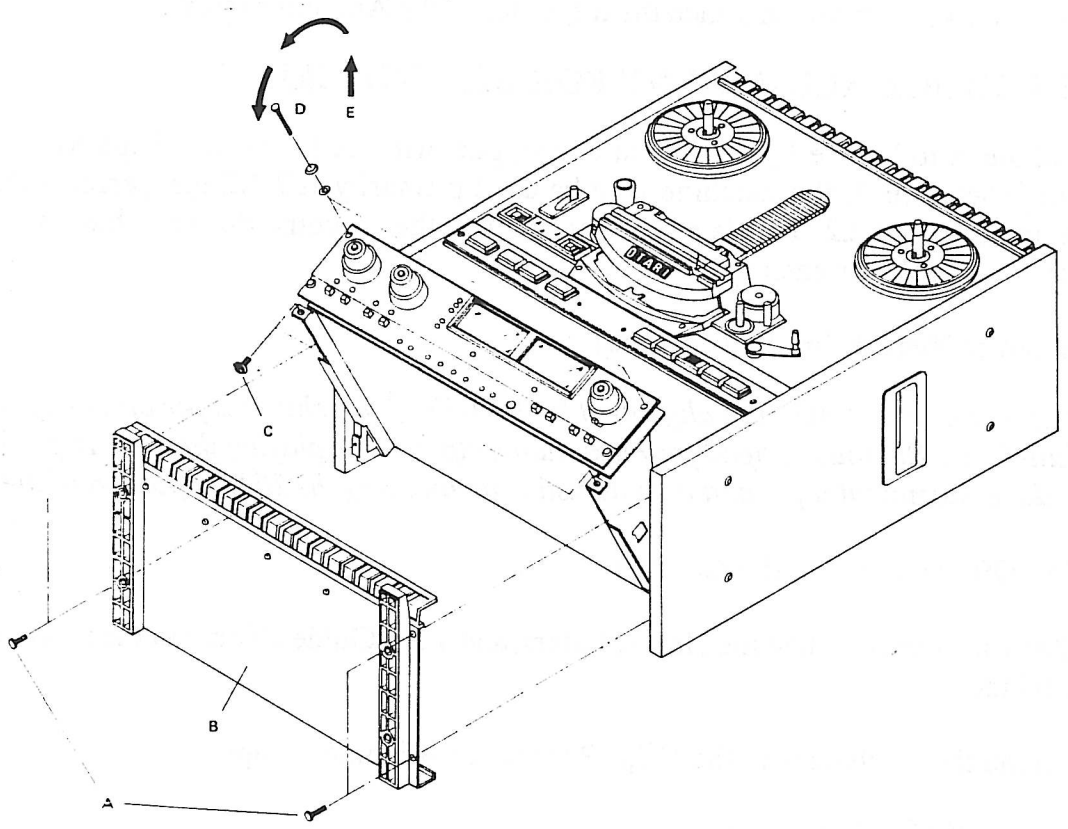


Figure 6 Opening the Bottom Panel

To gain access to the Amplifier;

1. Place the machine on its back.
2. Remove the 4 screws marked "A" in Figure 6 and remove the bottom panel.
3. Remove the 2 screws marked "C" and the 2 screws marked "D".

3.2 ACCESS TO THE MkIII-2 AMPLIFIER

To gain access to the amplifier:

1. Remove the front screw, on each side, which attaches the Amplifier assembly to the Side Panels.
2. Loosen the rear screw on each side to allow the Amplifier assembly to be pivoted up to give access to the bottom.

3. After pivoting up the Amplifier assembly, tighten the rear screws to hold it in position.

4. Remove the two screws which attach the bottom panel to the Amplifier assembly.

5. Remove the 4 screws which attach the top panel to the Amplifier assembly.

3.3 REPRODUCE ALIGNMENT FOR BII AND MkIII-2

If the machine is to be used primarily at 15 ips, perform the following 15 ips Reproduce Alignment procedure. If the machine is to be used primarily at 7-1/2 ips, perform the adjustments in Section 3.2.2. This is necessary because the machine does not have separate Repro Level controls for each speed.

3.3.1 Reproduce Head Azimuth Alignment

NOTE: *Reproduce Head Azimuth alignment for Full-Track machines is performed by adjusting the Full-Track Reproduce head for maximum output while playing the 10 kHz portion of the Reproduce Alignment tape, and then adjusting again using the 16 kHz portion of the tape.*

1. Turn**Off** the power to the machine.

2. Clean and demagnetize the Heads, Lifters, and Tape Guides. Turn **On** the power to the machine.

3. Thread the machine with the 15 ips Reproduce Alignment Tape.

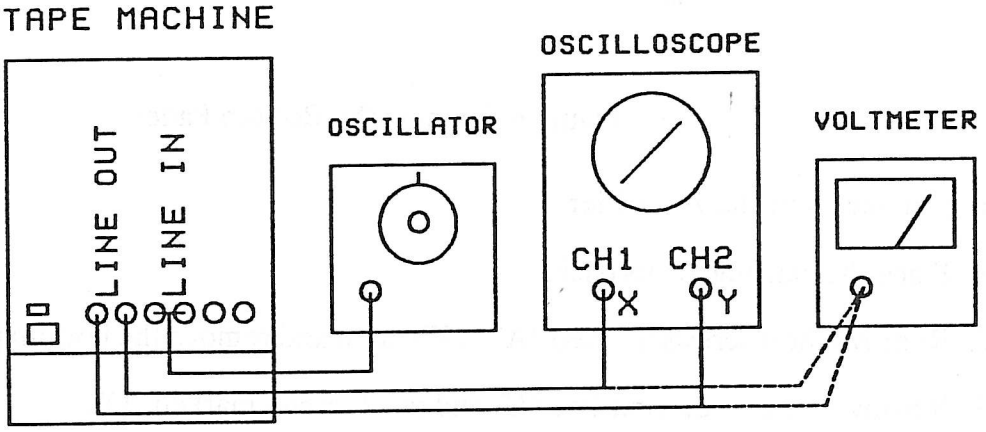


Figure 7 Azimuth Alignment Measurement Method

4. Set the REEL SIZE selector to the **Large** position, set the SPEED selector to the **High** (15 ips) position, and set the SOURCE/TAPE selectors to the **Tape** position. (On MkIII-2 machines the SOURCE/TAPE selectors are located on the overbridge). Set the P.B. HEAD switch, located under the Head Cover, to the position for the primary Repro head.

5. Connect one oscilloscope input channel to the CH 1 LINE OUTPUT connector on the rear panel. Connect the other oscilloscope input channel to the CH 2 LINE OUTPUT connector. Configure the oscilloscope to display the input waveforms as a "lissajous" pattern using the X-Y display function.

6. Turn ON the power to the machine. Adjust the oscilloscope controls so that both signals have equal amplitude when displayed.

7. Locate and play the 1 kHz portion of the Reproduce Alignment tape and adjust the screw marked A4 in Figure 8, until the pattern on the oscilloscope becomes a straight line at a 45 degree angle as shown in Figure 7.

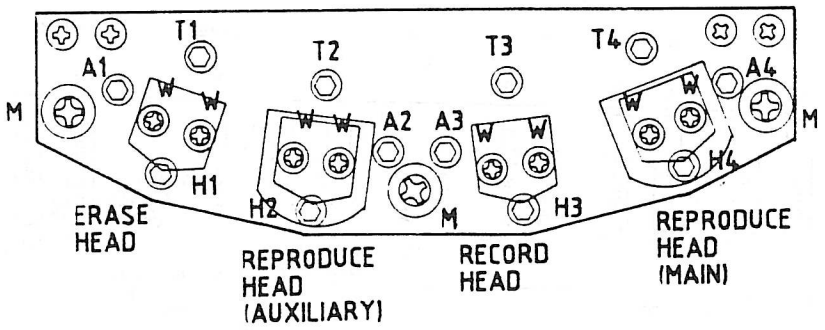


Figure 8 Head Assembly Adjustments

8. Play each increasing frequency section of the Reproduce Alignment tape (2 kHz, 4 kHz, 8 kHz, 10 kHz, 12.5 kHz, 16 kHz, and 20 kHz) and adjust the screw marked A4 until the pattern on the oscilloscope becomes a straight line at a 45 degree angle, at each frequency, as shown in Figure 7.

9. Repeat Steps 1 through 8 for the secondary Reproduce Head (the head in position 2 on the Head Assembly), using screw A2 for adjustment.

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

3.3.2 15 ips Reproduce Alignment

NOTE: *Perform the Reproduce Azimuth Alignment procedure in Section 3.3.1 before performing the following adjustments.*

1. Turn **Off** the power to the machine, and connect the millivoltmeter to the rear panel Line Output connector.

2. Clean and demagnetize the Heads, Lifters, and Tape Guides.

3. Connect the power cord, and turn **On** the power to the machine.

4. Set the REEL SIZE selector to the **Large** Reel position, set the TAPE SPEED selector to the **High** (15 ips) position, and set the SOURCE/TAPE selector to **Tape** monitor.

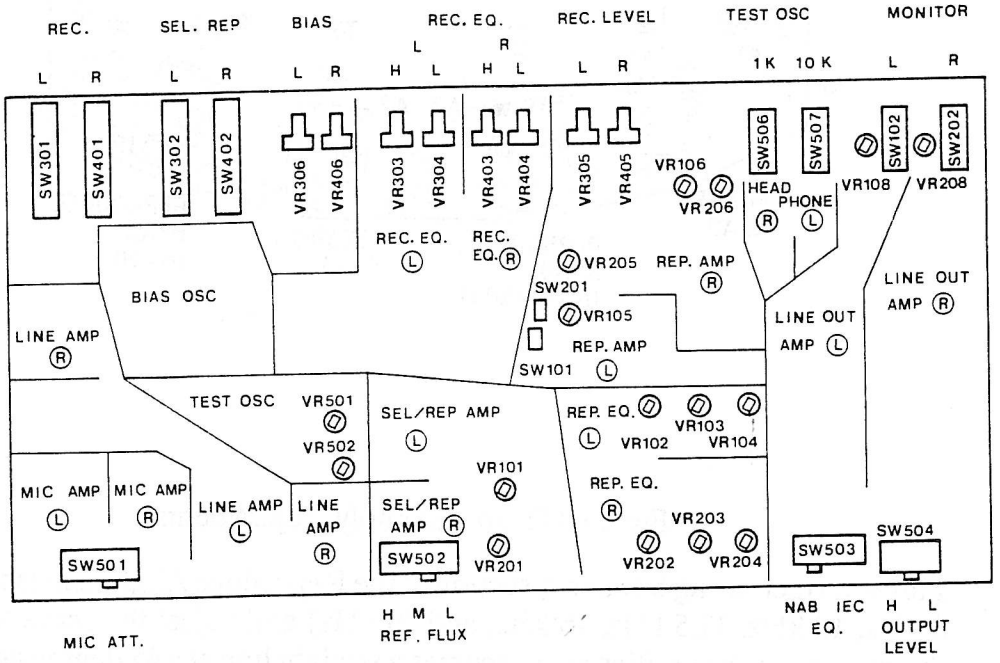


Figure 9 Location of Trimmers on the Audio PCB

5. Set the SRL slide switch to the **SRL** position (the SRL indicator will become illuminated).

6. On the rear panel, set the OUTPUT LEVEL switch to the **High** position, set the EQUALIZATION switch to the **NAB** position, and set the REF FLUX switch to the **MID** position.

7. Flip up the Head Cover, and set the Repro Head selector switch to the appropriate position:

   1/2 Tr Rec/Repro - **2T** position
   1/4 Tr Rec/Repro - **4T** position
   Full Tr Rec/Repro - **FT** position

NOTE: *Reproduce Alignment of* **Full Track** *machines requires that only the CH 1 trimmers be adjusted.*

8. Thread the machine with the 15 ips Reproduce Alignment Tape and locate the 1 kHz tone at the Reference Level.

9. While playing the 1 kHz portion of the tape, adjust **VR 106** (Repro SRL level) for +4 dBm at the rear panel Output connector.

10. Repeat Step 9 for Channel 2, adjusting **VR 206** for +4 dBm at the Channel 2 rear panel Output connector.

11. Play the 10 kHz portion of the tape and adjust **VR 102** (High Speed High Frequency Eq) for +4 dBm at the Channel 1 Output connector.

12. Repeat Step 11 for Channel 2, adjusting **VR 202** for +4 dBm at the Channel 2 rear panel Output connector.

13. Play the remaining tones (from 10 kHz to 20 kHz) and make sure that the output level does not change more than -2 dB up to 20 kHz.

14. On the front panel (Overbridge on MkIII-2), set the SEL- REP switches to the **On** (Sel-Rep) position.

15. Play the 1 kHz tone at Reference level and adjust **VR 101** for +4 dBm at the Channel 1 Output connector.

16. Repeat Step 15 for Channel 2, adjusting **VR 201** for +4 dBm at the Channel 2 Output connector.

3.3.3 7-1/2 ips Reproduce Alignment

NOTE: *Perform the Reproduce Azimuth Alignment procedure in Section 3.3.1 before performing the following adjustments.*

1. With the Power to the machine turned **Off**, clean and demagnetize the Heads, Lifters, and Tape Guides.

2. Turn**On** the power to the machine, thread the machine with the 7-1/2 ips Reproduce Alignment Tape and locate the 1 kHz tone at the **Reference Level.** NOTE: Make sure the SOURCE/TAPE switches are in the **Tape** position, and the SEL-REP switches are in the **Off** position.

3. On the rear panel, set the OUTPUT LEVEL switch to the **High** position, set the EQUALIZATION switch to the **NAB** position, and set the REF FLUX switch to the **Mid** position.

4. Flip up the Head Cover, and set the Repro Head selector switch to the appropriate position:

   1/2 Tr Rec/Repro - **2T** position
   1/4 Tr Rec/Repro - **4T** position
   Full Tr Rec/Repro - **FT** position

NOTE: *Reproduce Alignment of* **Full Track** *machines requires that only the CH 1 trimmers be adjusted.*

5. While playing the 1 kHz at Reference Level portion of the tape, adjust **VR 106** (Repro SRL level) for +4 dBm at the rear panel Output connector.

6. Repeat Step 5 for Channel 2, adjusting **VR 206** for +4 dBm at the Channel 2 rear panel Output connector.

7. Play the 10 kHz portion of the tape and adjust **VR 103** (Low Speed High Frequency Eq) for -6 dBm at the Channel 1 Output connector. (+4 dBm if the 10 kHz tone is at Reference level).

8. Repeat Step 7 for Channel 2, adjusting **VR 203** for -6 dBm at the Channel 2 rear panel Output connector.

9. Play the remaining tones (from 10 kHz to 20 kHz) and make sure that the output level does not change more than -2 dB up to 16.5 kHz.

10. On the front panel, set the SEL-REP switches to the **On** (Sel-Rep) position.

11. Play the 1 kHz tone at Reference level and adjust **VR 101** (Sel-Rep Level) for +4 dBm at the Channel 1 Output connector.

12. Repeat Step 11 for Channel 2, adjusting **VR 201** for +4 dBm at the Channel 2 Output connector.

3.3.4 Peak Indicator Calibration

1. Set the SOURCE/TAPE switches to the **Source** position, and set the oscillator to produce 1 kHz. Adjust the front panel LINE INPUT controls, and the oscillator level control, to produce + 16 dBm at the rear panel Line Output connector.

2 Adjust **VR 701** (Channel 1) and **VR 801** (Channel 2) until the PEAK indicators (in each VU Meter) just become illuminated. NOTE: These trimmers are located on the PCB adjacent to the VU Meters inside the Amplifier Assembly. On BII models only it will be necessary to rotate the amplifier assembly down to gain access to these controls.

3.4 RECORD ALIGNMENTS

NOTE: *If Record Alignment is performed at 7-1/2 ips, perform procedures 3.4.3 through 3.4.5 using -6 dBm input level, instead of + 4 dBm, to avoid tape saturation.*

With the Power **OFF**:

1. Set the REEL SIZE and SPEED switches to the desired positions. Set the SOURCE/TAPE switches to the **Tape** position. Set the RECORD switches for both channels to the **On** position.

2. On the rear panel, set the REF FLUX switch to the **Mid** position. Set the OUTPUT LEVEL switch to the **High** position, and set the EQUALIZATION switch to the **NAB** position.

3. Clean the heads, lifters, and tape guides carefully with 70% isopropyl alcohol and cotton swabs.

4. Demagnetize the heads, lifters, and tape guides.

5. Thread the machine with a full 10.5" reel of virgin Ampex 456 recording tape.

6. Connect the oscillator to the Channel 1 rear panel INPUT connector.

7. Connect the AC millivoltmeter to the Channel 1 rear panel OUTPUT connector.

   Connect the Power cord and turn **On** the power to the machine.

3.4.1 Bias Adjustment

1. Set the SOURCE/TAPE switch to the **Source** position and adjust the oscillator to produce 10 kHz at approximately -3 VU (for 7-1/2 ips use 5 kHz at -5 VU). (Any level up to 0 VU can be used for Bias adjustment at 15 ips, up to -3 VU at 7- 1/2 ips).

2. Set **VR 306** fully counterclockwise.

OTARI MX-5050 SERIES BIAS TABLE

		AGFA 468	AMPEX 456	SCOTCH 226	SCOTCH 250	SCOTCH 806	SCOTCH 808
BII	15	+2	+3	+3	+2	+2.5	+5.5
	7.5	+2	+3	+3	+2	+3	+6
	3.75	+1	+2.5	+2	+1	+1.5	+4
III-2	15	+3	+3	+3	+3	+3	+6
	7.5	+3	+3	+3	+3	+3	+6
	3.75	+1	+3	+2	+1	+1.5	+3.5
BQII	15	+2.5	+3	+3	+3	+3	+2.5
	7.5	+3	+3.5	+3	+3	+3.5	+2.5
III-4	15	+3	+4	+3	+3	+3	N/A
	7.5	+3	+4	+3	+3	+4	N/A
III-8	15	+3	+3	+3	+3	+3	N/A
	7.5	+3.5	+3	+3	+2.5	+3.5	N/A

	BIAS FREQ	NOMINAL RECORD LEVEL
15 ips	10 kHz	0 dB
7.5 ips	5 kHz	-10 dB
3.75 ips	1 kHz	-20 dB

3. Press the CH 1 and CH 2 RECORD buttons. The adjacent LEDs will flash.

4. Place the machine in **Record** mode. Set the SOURCE/TAPE switch to the **Tape** position.

5. Turn **VR 306** (Bias Level) clockwise until the signal level on the millivoltmeter reaches a peak, then continue turning **VR 306** clockwise until the level decreases 3.5 dB below the peak level. (This sets the bias for 3.5 dB "overbias").

6. Connect the millivoltmeter and oscillator to the Channel 2 Output and Input, respectively.

7. Set **VR 406** fully counterclockwise. Perform Step 11 using **VR 406.**

3.4.2 Record Head Azimuth Alignment

NOTE: *Record Head Azimuth alignment on* **Full Track** *machines requires that the Record Head Azimuth be adjusted for* maximum *output while monitoring from the* Full Track *Reproduce head while recording a 1 kHz signal, and then repeating the adjustment at 10 kHz and 16 kHz.*

1. Connect the oscillator to both CH 1 and CH 2 LINE INPUT connectors, in parallel. Set the oscillator to produce 1 kHz at +4 dBm (-6 dBm for alignment at 7-1/2 ips).

2. Connect one oscilloscope input channel to the CH 1 LINE OUTPUT connector on the rear panel. Connect the other oscilloscope input channel to the CH 2 LINE OUTPUT connector. Configure the oscilloscope to display the input waveforms as a "lissajous" pattern using the X-Y display function.

   Adjust the oscilloscope controls so that both signals have equal amplitude when displayed with the machine in SOURCE monitor.

3. Set the SOURCE/TAPE selectors to the **Tape** position.

4. Thread the machine with a full reel of blank tape.

5. Place the machine in **Record** mode.

6. Adjust the screw marked **A3** in Figure 7 until the pattern on the oscilloscope display becomes a straight line at a 45 degree angle as shown in Figure 8.

7. Change the frequency setting of the oscillator to 10 kHz, and repeat Step 6.

8. Change the frequency setting of the oscillator to 18 kHz, and repeat Step 6.

9. Stop the tape.

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

3.4.3 Input and Record Level Calibration

1. Connect the Oscillator to the Channel 1 Input, and connect the millivoltmeter to the Channel 1 Output.

2. Set the SOURCE/TAPE switches to **Source**. On the rear panel, set the REF FLUX switch to the **Mid** position. Set the OUTPUT LEVEL switch to the **High** position, and set the EQUALIZATION switch to the **NAB** position.

3. Set the oscillator to produce 1 kHz at +4 dBm at the machine input.

4. Adjust the front panel **Channel 1 LINE INPUT** control to the "11 o'clock" position.

5. Adjust **VR 108** until the millivoltmeter indicates +4 dBm.

6. Connect the Oscillator to the Channel 2 Input, and connect the millivoltmeter to the Channel 2 Output.

7. Adjust the front panel **Channel 2 LINE INPUT** control to the "11 o'clock" position.

8. Adjust **VR 208** until the millivoltmeter indicates +4 dBm.

9. Set the SOURCE/TAPE switches to **Tape** position.

10. Place the machine in **Record** mode, and adjust **VR 405** (Rec Level) until the millivoltmeter indicates +4 dBm.

11. Connect the Oscillator to the Channel 1 Input, and connect the millivoltmeter to the Channel 1 Output.

12. Place the machine in **Record** mode, and adjust **VR 305** (Rec Level) until the millivoltmeter indicates +4 dBm.

3.4.4 High Frequency Equalization Adjustment

1. While still in **Record** mode from Section 3.4.3, set the oscillator to produce 10 kHz at +4 dBm, and connect it to the Channel 1 Input connector. Connect the millivoltmeter to the Channel 1 Output connector.

2. Make sure the SOURCE/TAPE switches are still set for **Tape** monitor mode and adjust **VR 303** (High Speed High Frequency Rec Eq) until the millivoltmeter indicates +4 dBm.

3. Sweep the oscillator frequency up to 20 kHz and make sure that the output level does not change more than -2 dB.

4. Connect the oscillator and millivoltmeter to Channel 2, and adjust **VR 403** until the millivoltmeter indicates +4 dBm.

5. Repeat Step 3 for Channel 2.

3.4.5 Low Frequency Compensation Adjustment

NOTE: *The LOW COMP trimmers (VR 105/205) have no effect unless the LOW COMP switches SW 101 and SW 201 are set to the On position. These switches are set to the Off position at the OTARI factory.*

1. Set the oscillator to produce approximately 20 Hz at +4 dBm, and connect it to the Channel 1 Input. Connect the millivoltmeter to the Channel 1 Output.

2. Set the LOW COMP switches **SW 101** and **SW 201** to the **On** position. NOTE: The LOW COMP switches are located inside the Amplifier Assembly adjacent to the LOW COMP trimmers. On BII models only it will be necessary to rotate the amplifier assembly down to gain access to these switches. Rotate the amplifier assembly back up to its normal position to make the adjustment.

3. Set the SOURCE/TAPE monitor switches to the **Tape** position.

4. Press the CH 1 and CH 2 REC buttons, and place the machine into **Record** mode.

5. Manually sweep the oscillator from 20 Hz to 200 Hz and adjust **VR 105** (Low Frequency Compensation) for flattest frequency response.

6. Connect the oscillator and millivoltmeter to Channel 2.

5. Manually sweep the oscillator from 20 Hz to 200 Hz and adjust **VR 205** for flattest frequency response.

3.4.6 Oscillator Adjustment

IMPORTANT: The Input and Record Level adjustment in Section 3.4.3 must be performed before performing this adjustment.

NOTE: *The internal test oscillator feeds both channels simultaneously, therefore the oscillator adjustment affects both channels.*

1. Connect the AC millivoltmeter to the rear panel CH 1 LINE OUTPUT connector.
2. Press the 1 KHZ - TEST OSC button to activate the internal Test Oscillator.
3. Set both front panel LINE INPUT level controls to the "11 o'clock" position.
4. Adjust **VR 502** until the millivoltmeter indicates +4 dBm.
5. Press the 10 KHZ - TEST OSC button to set the internal Test Oscillator to 10 kHz.
6. Adjust**VR 501** until the millivoltmeter indicates +4 dBm.

This completes the record alignments.

4.0 Head Alignment Procedures

PERFORM THIS PROCEDURE ONLY AFTER REPLACING HEADS

This procedure describes the adjustment of Head Height, Zenith, Azimuth, and Wrap.

Adjustment of head height determines the location of the actual recording tracks in relation to the edges of the tape.

The head zenith adjustment sets the face of the head to be absolutely parallel with the plane of the tape. When the zenith is correctly adjusted, the amount of tape contact is the same for all channels of the head.

Adjustment of head azimuth makes the head gaps perpendicular to the tape travel, insuring that the tracks are in phase.

Head wrap determines the location and amount of head penetration into the tape. Correct adjustment insures that the head gap is centered on the tape, so that as the head wears, the frequency response will remain consistant, throughout the life of the head.

HEAD ADJUSTMENT SCREWS (Refer to Fig. 10)

1. Socket head screws labeled "T" adjust zenith when the bottom of the head is to be moved in or out.
2. Socket head screws labeled "H" adjust zenith when the top of the head is to be moved in or out.
3. Adjust "T" and "H" screws simultaneously for head height adjustment.

4. Socket head screws labeled "A" adjust the azimuth of the head.

5. Phillips head screws labeled "W" attach the head to the Head Base, and are used for wrap (side to side) adjustment.

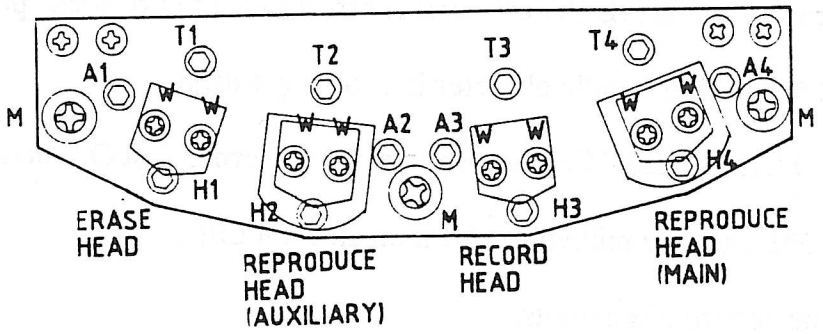


Figure 10 Head Adjustment Screws

6. Phillips head screws labeled "M" attach the head assembly to the machine.

4.1 Head Height and Zenith Adjustment

1. Position the machine upside down on the workbench, with the reels hanging over the edge, so they can turn freely.

2. Apply Power to the machine and thread it with waste tape (tape which can be discarded after this use). Select 15 ips and the Reel Size appropriate for the reels in use.

3. Pull the tape away from the heads, and apply a thin, even, layer of Head Ink (or dry erase marker) to the face of the Reproduce Head. Carefully place the tape back in its normal position. NOTE: Make sure the machine is <u>not</u> in Cue mode.

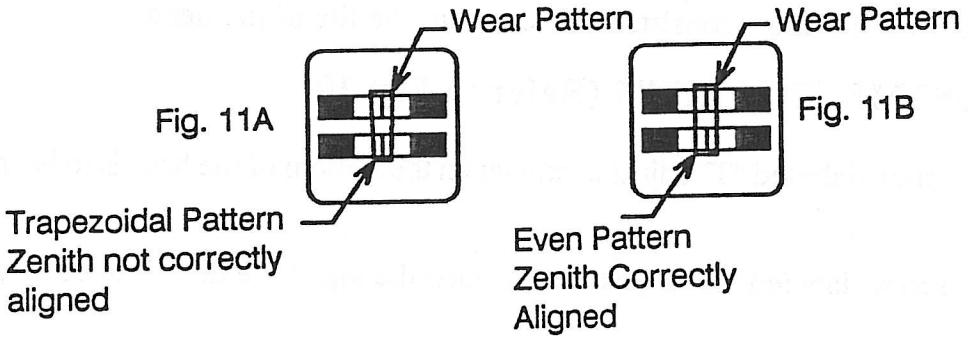


Figure 11 Zenith Adjustment Wear Patterns

4. Place the machine in Play for 10 seconds then Stop the tape.

5. Carefully pull the tape away from the heads. Shine the high intensity lamp onto the heads and use the white card as a reflector to inspect the wear pattern on the face of the Reproduce head. The tape will have removed the marking ink from a small area on the head, as shown in Figure 11.

6. If the wear pattern does not resemble the one shown in Figure 11B, then the Reproduce Head requires adjustment. Figure 11A shows a head with a trapezoidal wear pattern, which indicates that the head height is correct but that the zenith must be adjusted.

   If the trapezoidal wear pattern is as shown in Figure 11A, then turn screw T4 (in Figure 10) counterclockwise to bring the lower portion of the head forward.

   If the trapezoidal wear pattern is inverted from that shown in Figure 11A, then turn screw T4 (in Figure 10) clockwise to bring the top of the head forward.

7. Repeat Steps 3 through 6 until the wear pattern is symmetrical and approximately the same width at top and bottom.

8. Once the wear pattern is symmetrical, repeat Steps 3 - 6 and inspect the wear pattern for correct head height adjustment. The pattern should be centered over the pole pieces of the head, as shown in Figure 12. If necessary adjust screws T4, H4, and A4 (in Figure 10) simultaneously, and by the same amount, until the wear pattern is correct. If the wear pattern is high on the pole pieces, then the head is too low. In that case turn screws T4, H4, and A4 clockwise until the correct wear pattern is obtained.

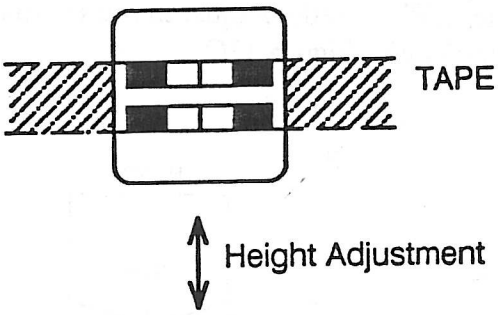


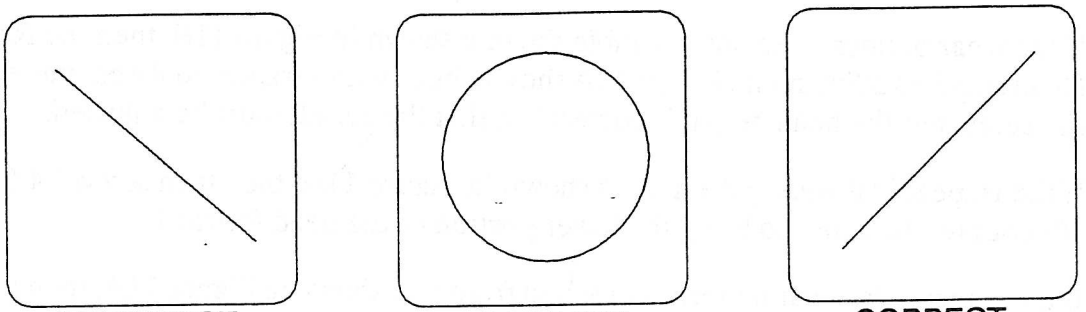
Figure 12 Head Height Adjustment

Remember that each time that an adjustment is made, you must re-ink the head and play the tape to create a new wear pattern!

9. Repeat the entire procedure for each head in the head Assembly.

4.2 Head Wrap and Azimuth Adjustment

1. Clean and demagnetize the heads, guides, and rollers carefully.
2. Thread the machine with the 7-1/2 ips Fast Sweep Tape, select 7-1/2 ips, Repro Monitor, and the appropriate reel size. Apply Power to the machine.



INCORRECT
180° OUT OF
PHASE
Fig 13A

INCORRECT
90° OUT OF
PHASE
Fig 13 B

CORRECT
IN PHASE

Fig 13 C

Figure 13 Azimuth Adjustment Oscilloscope Displays

3. Connect the Audio Outputs to the AC Voltmeter and to the X and Y inputs of the Oscilloscope. Set the oscilloscope controls to produce lissajous figures. NOTE: On 4 and 8 channel machines, use the outside tracks i.e., 1 and 4 or 1 and 8.
4. Place the machine in Play mode. Adjust the screw marked A4 in Figure 10 until the oscilloscope display looks like Figure 13C.

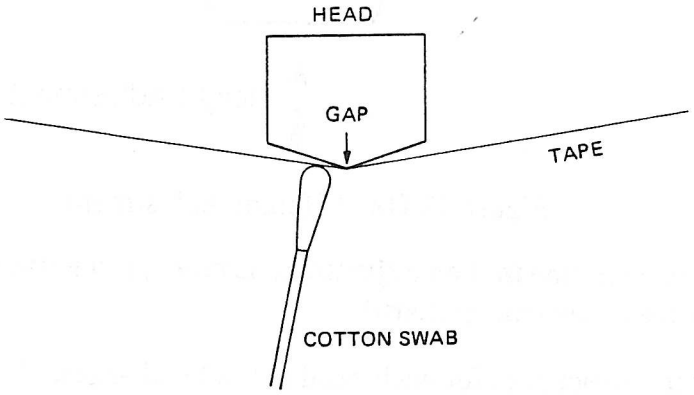


Figure 14 Tape Wrap Test Method

5. When the Azimuth is correctly adjusted, set the oscilloscope controls so that the entire Fast Sweep burst from both channels are displayed.

6. While the tape is playing, gently press on the tape with a cotton swab on first one side of the gap, and then the other side of the gap, while observing the AC Voltmeter and Oscilloscope.

7. If the level increases when you press on the Left side of the gap, then loosen the screws marked "W" in Figure 10 slightly, and turn the head slightly to the Left. Try to loosen both "W" screws by the same amount to maintain the Head Azimuth. If the level increased when you pressed on the right side of the Gap, then turn the head to the right.

8. Tighten the screws and repeat until there is no level increase when touching the tape on either side of the gap.

9. Repeat the Azimuth adjustment in Steps 3 and 4 to confirm that it was not changed during the wrap adjustment.