

# AMPEX

MAINTENANCE MANUAL FOR AX-50

# TABLE OF CONTENTS

	Page
GENERAL INFORMATION . . . . .	1
Scope . . . . .	1
Description . . . . .	1
Specifications . . . . .	1
Location of Controls and Indicators . . . . .	2
Identification of Controls and Indicators . . . . .	2
Description of Controls and Indicators . . . . .	3
FUNCTIONAL MECHANICAL OPERATION . . . . .	5-7
Rewind Mode . . . . .	5
Stop Mode . . . . .	5
Play Mode . . . . .	5-6
Pause Mode . . . . .	6
Fast Forward Mode . . . . .	6
Speed Shift . . . . .	6
Braking . . . . .	7
FUNCTIONAL ELECTRICAL OPERATION . . . . .	7-12
Playback . . . . .	7
Record . . . . .	7
Echo Effect . . . . .	7
Sound-on-Sound/Sound-with-Sound . . . . .	7
Tape/Source Noise Filter . . . . .	7
DISASSEMBLY . . . . .	13
Special Equipment Required . . . . .	13
Removing the Trim and Front Cover . . . . .	13
Removing and Replacing the Cabinet . . . . .	13
MECHANICAL CHECKS AND ADJUSTMENTS . . . . .	14-16
Flutter . . . . .	14
Pressure Roller Force . . . . .	14
Take up Torque . . . . .	14-15
Hold Back Tension . . . . .	15
Braking Check . . . . .	15
Tape Lifter Adjustment . . . . .	16
Capstan Shaft Thrust Load Adjustment . . . . .	16
Lubrication . . . . .	16
ELECTRICAL CHECKS AND ADJUSTMENTS . . . . .	17-23
Equipment Required . . . . .	17
Preliminary Instructions . . . . .	17
Play Head Azimuth Alignment . . . . .	17
Record Head Azimuth Alignment . . . . .	17
Erase Head Alignment After Replacement . . . . .	18
Head Replacement Procedure . . . . .	18
Play Head Alignment After Replacement . . . . .	18-19
Record Head Alignment After Replacement . . . . .	19
Bias and Erase Voltage Measurements . . . . .	19
Gain Adjustment . . . . .	19
Record Calibrate . . . . .	19-20
Bias Leakage . . . . .	20
Noise and Erasure at Peak Record Level . . . . .	20
Playback Frequency Response . . . . .	21
Overall Record-Play Frequency Response . . . . .	21
Cross Talk (Stereo) . . . . .	22
Cross Talk (Mono) . . . . .	22
Noise (Static Test) . . . . .	22
PARTS LIST . . . . .	24-28
Ordering Parts and Using the Parts List . . . . .	24
Mechanical Parts List . . . . .	24-26
Electrical Parts List . . . . .	26-28
Capacitors . . . . .	26-27
Circuit Boards . . . . .	27
Diodes . . . . .	27
Lamps . . . . .	27
Jacks . . . . .	27
Coils . . . . .	27
Meters . . . . .	27
Transistors . . . . .	27
Resistors . . . . .	27-28
Switches . . . . .	28
Transformer . . . . .	28
EXPLODED VIEWS . . . . .	29-30
SCHEMATIC DIAGRAM . . . . .	31



# GENERAL INFORMATION

## SCOPE

This manual provides technical functional information and service instructions for the AX-50 Recorder Reproducer Deck. Adjustment information is supplied to help you maintain the proper level of performance. Cabinet Removal and component replacement are outlined in the procedures. Computer techniques are used to compile the parts lists. This necessitates a change of nomenclature in the reference letters of the parts. To avoid any confusion, please refer to the following list. These letters are used in the text as well as the parts list.

CAPACITOR	C	PLUG	P
COIL	L	RELAY	K
DIODES	D	RESISTORS	R
FUSE	F	SOLENOID	L
HEADS	H	SPEAKER	U
JACKS	J	SWITCH	S
LAMPS	I	TRANSFORMER	T
LEAD EX. FROM		TRANSISTOR	Q
CIRCUIT BOARD	E	VARIABLE RESISTOR	R
MICROPHONE	U	VU METER	M
MOTOR	B	CIRCUIT BOARD	X

TABLE 1. Reference Letters

Throughout the manual, numbered callouts are used in illustrations to show location of parts. Numbered callouts, which are listed in conjunction with text, but do not appear in a specific illustration, may be found in an exploded view at the rear of the manual.

## NOTE

The variable resistors are shown as RV in the parts list because this nomenclature is marked on the circuit boards.

## DESCRIPTION

The model AX-50 is solid-state, three speed, 1/4 inch tape recorder/reproducer deck with separate record-play magnetic heads and pre-amplifiers. Its features include; Stereo Play/Record, Monaural Play/Record, Automatic Equalization.  
DIRECT TAPE MONITOR: Separate reproduce head allows direct off-tape monitoring while recording to assure "clean" recordings. Tape/Source switch allows comparison between input signal and actual recording.

# SPECIFICATIONS

Characteristic	Mean	Min. Performance
Voltage:	120 v, 60 Hz	105-125 v, 60 Hz.
Power Consumption:	100 watts	100 w
Tape Speeds (ips):	7-1/2, 3-3/4, 1-7/8	
Signal-to-Noise-Ratio		
Playback: @7-1/2 ips	55 dB UNWTD	50 dB
@3-3/4 ips	50 dB UNWTD	48 dB
Overall: @7-1/2 ips	50 dB	50 dB
@3-3/4 ips	45 dB	45 dB
@1-7/8 ips	40 dB	40 dB
Record-Playback		
Distortion:	2.5%	2.5%
Playback Sensitivity		
(0 dlm):	±2 dB	±2 dB
Crosstalk		
Between Channels:	45 dB	40 dB
Between Tracks:	45 dB	40 dB
Erase Ratio:	65 dB	60 dB
Headphone Output		
8 Ohm Load:	-21 dbm ±3 dB	±3 dB
Noise Filter: (6 dB)	±2 dB	±3 dB
Frequency Response		
(Overall):		
@7-1/2 ips	20-20,000 Hz (50-15kHz ±5dB)	
@3-3/4 ips	20-14,000 Hz (50-10kHz ±5dB)	

Characteristic	Mean	Min. Performance
Flutter and Wow		
(UNWTD NAB):		
@7-1/2 ips	0.15%	0.18%
@3-3/4 ips	0.20%	0.22%
@1-7/8 ips	0.25%	0.33%
Fast Wind Time		
Forward: (1200 ft.)	110 seconds	115 seconds
Rewind:	100 seconds	105 seconds
Speed Accuracy		
@ Mid Reel	7-1/2 ips 0.3%	1%
	3-3/4 ips 0.7%	2%
	1-7/8 ips 1.5%	2%
Equalization:	Separate NAB for 7-1/2 ips, 3-3/4 ips and 1-7/8 ips automatically selected by speed change.	
Bias Oscillator Frequency:	95kHz ±7%	±7%
Input Sensitivity		
Line Input:	-23 dBm ±3dB	±4dB
MIC Input:	-58 dBm ±2dB	±3dB
Output Impedance:	200 Ohms max.	
Pre-Amp Output Level:	1 V	
Overall Size:	9" (H) x 14-13/16 (D) x 16-15/16 (W)	
Weight:	28 lbs., 9 oz.	



# IDENTIFICATION OF CONTROLS AND INDICATORS

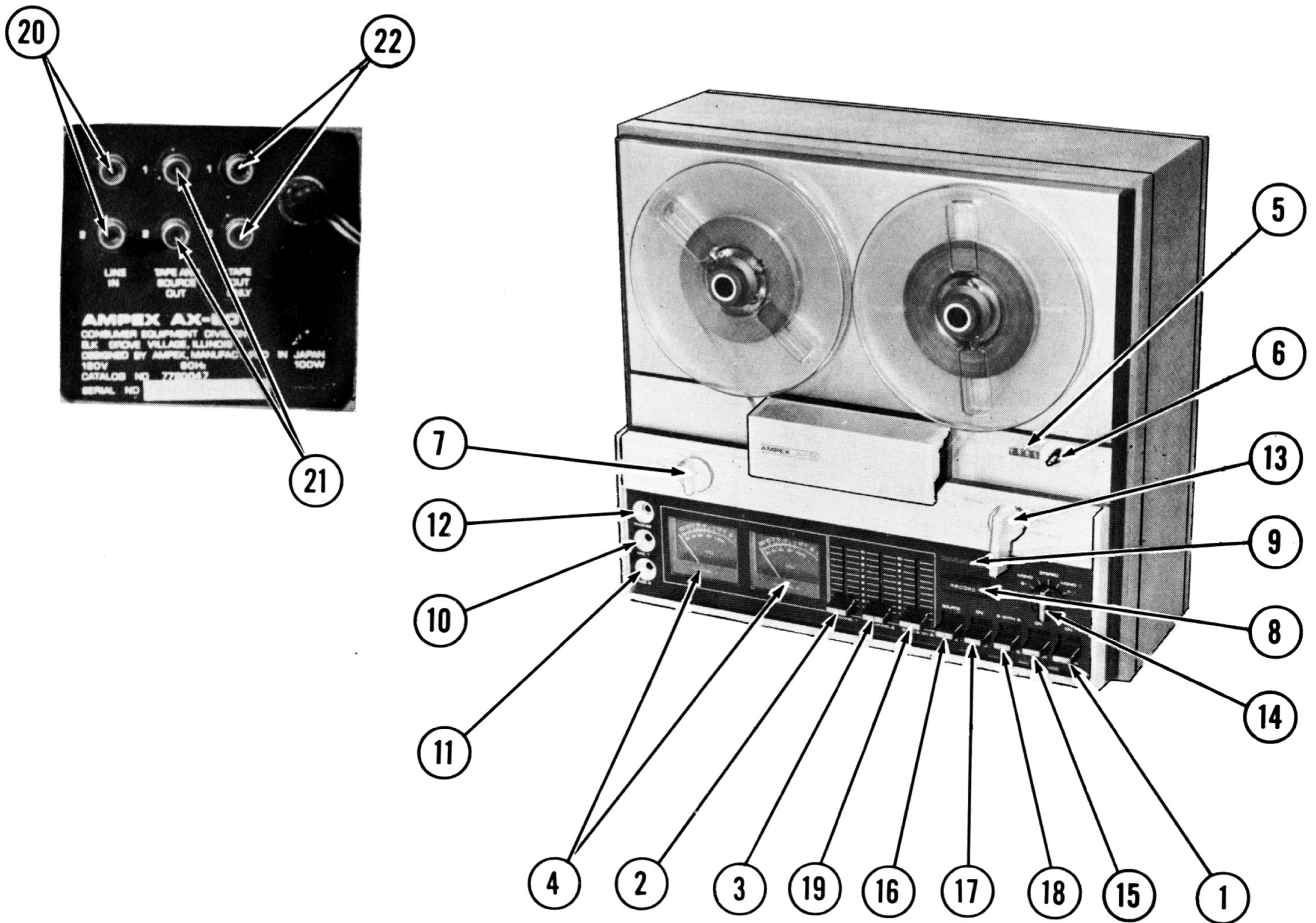


Figure 1. Location of Controls and Indicators

- |                              |  |
|------------------------------|--|
| 1. POWER ON/OFF SWITCH       | 12. HEADPHONE JACK                             |
| 2. CH 1 RECORD LEVEL CONTROL | 13. FUNCTION SELECTOR (Shown in STOP position) |
| 3. CH 2 RECORD LEVEL CONTROL | 14. MODE SELECTOR                              |
| 4. RECORD PLAY METERS        | 15. FILTER ON/OFF SWITCH                       |
| 5. TAPE COUNTER              | 16. SOURCE/TAPE SWITCH                         |
| 6. RESET                     | 17. ECHO ON/OFF SWITCH                         |
| 7. SPEED SELECTOR            | 18. S. ON S./S. WITH S. SWITCH                 |
| 8. RECORD PUSH BUTTON        | 19. ECHO S. ON S. LEVEL CONTROL                |
| 9. RECORD INDICATOR          | 20. LINE IN JACKS                              |
| 10. MICROPHONE INPUT JACK 1  | 21. TAPE AND SOURCE OUT JACKS                  |
| 11. MICROPHONE INPUT JACK 2  | 22. TAPE OUT JACKS                             |



# DESCRIPTION OF CONTROLS AND INDICATORS

## 1. POWER ON/OFF SWITCH

Switch is slide type: slide up to "ON" or down to "OFF". The RECORD-PLAY INDICATORS light when the power is ON.

## 2. CH 1 RECORD LEVEL CONTROL

Adjusts the recording level for channel 1 sound signal.

## 3. CH 2 RECORD LEVEL CONTROL

Adjusts the recording level for channel 2 sound signal.

## 4. RECORD-PLAY INDICATORS

Indicates the tape signal level in TAPE monitor position and the signal level at the record head in the SOURCE monitor position.

## 5. TAPE COUNTER

Indicates tape position, enables operator to return to predetermined place on tape.

## 6. RESET BUTTON

Returns counter to 0000. It may be depressed at any time.

## 7. SPEED SELECTOR/AUTOMATIC EQUALIZATION

Sets the speed of tape travel. Speed is changed by turning the SPEED SELECTOR knob. Because the operating speed affects the record and play fidelity, use 7-1/2 IPS (inches per second) speed when it is necessary to obtain the best fidelity. The 3-3/4 IPS setting increases the record-play time with some sacrifice of fidelity. The 1-7/8 IPS speed is used when making voice recordings.

The equalization switch is connected to the speed selector and is changed automatically to balance the amplifier for the proper frequency response at the operating speed of the recorder.

### NOTE

Change speed only when the tape is stopped and Function Selector is in STOP position (between REWIND and PLAY)

## 8. RECORD PUSH BUTTON

Places electronics in record mode. This control is interlocked with FUNCTION SELECTOR to prevent accidental erasure of previously recorded tapes. The recorder will not fully engage in record mode unless

RECORD PUSH BUTTON is held in the depressed position while turning the FUNCTION SELECTOR to PLAY position from the STOP position.

## 9. RECORD INDICATOR

This lamp lights when the RECORD PUSH BUTTON is depressed; it indicates that the recorder is in record mode.

## 10. MIC 1 INPUT JACK

Used for recording on channel 1 (left channel) either monaurally or in stereo. When the microphone is plugged in, LINE IN of Channel 1 is automatically disconnected.

## 11. MIC 2 INPUT JACK

Used for recording on channel 2 (right channel) either monaurally or in stereo.

LINE IN of Channel 2, is automatically disconnected when the microphone is plugged in.

### NOTE

Microphones should be plugged into the jacks when making a recording or setting levels with microphones.

## 12. HEADPHONE JACK

For connecting low impedance stereo headphones (8 ohms) for private listening.

## 13. FUNCTION SELECTOR

This selector has 5 positions: REWIND, STOP (vertical position), PLAY, PAUSE and FAST FWD. Three of the five positions provide tape motion. PAUSE is used to provide a noiseless stop of the tape while the recorder is engaged in the record mode. It does not release the RECORD button, recording is resumed when moved to the PLAY position. CAUTION — Do not move through STOP without allowing the tape to come to a stop.

## 14. MODE SELECTOR

Selects the mode of operation of the recorder. Modes can be changed during PLAY but not during RECORD.

### A. STEREO POSITION

In this position the recorder will play or record stereophonically. The RECORD-PLAY indicators, RECORD LEVEL controls, INPUT JACKS and OUT-



PUT JACKS will be active individually for their own channels.

#### **B. MONO 1 POSITION**

In the MONO 1 position, the recorder will record on channel 1 (left channel) and also playback channel 1 signal through both speakers. Both RECORD-PLAY INDICATORS indicate channel 1 level. The signal from channel 1 playback head or the signal from channel 1 INPUT JACK will be available from both outputs. Channel 1 INPUT JACKS (MIC and LINE IN) are active, those of channel 2 are dead.

#### **C. MONO 2 POSITION**

In the MONO 2 position, the recorder will record on channel 2 (right channel) and also playback channel 2 signal through both speakers. Both RECORD-PLAY INDICATORS indicate channel 2 level. The signal from channel 2 playback head or the signal from channel 2 INPUT JACKS will be available from both outputs. Channel 2 INPUT JACKS (MIC and LINE-IN) are active; those of channel 1 are dead.

#### **D. 2-1 POSITION/1-2 POSITION**

These positions are used when making a Sound with Sound or Sound on Sound recording.

#### **15. FILTER ON/OFF SWITCH**

Eliminates tape hiss when turned to ON position. Operates only in PLAY mode.

#### **16. SOURCE/TAPE-SWITCH**

Changes the mode of monitoring. In the SOURCE position the LINE INPUT or MICROPHONE signal is the monitored signal. The RECORD-PLAY INDICATORS indicate this source level at record head. In the TAPE position the monitored sound is from the playback head, the RECORD-PLAY INDICATORS indicate the recorded signal level on the tape, during the RECORD or PLAY mode.

#### **17. ECHO ON/OFF SWITCH**

Is used to record the signal with echo effect, and will operate when the MODE SELECTOR is switched to

MONO 1 or MONO 2. To make an echo recording, the SOURCE/TAPE SWITCH must be in the TAPE POSITION.

#### **18. S. ON S./S. WITH S. SWITCH**

Used in conjunction with MODE SELECTOR to make sound-on-sound or sound-with-sound recordings. It operates when the MODE SELECTOR is switched to 2-1 or 1-2 position, regardless of SOURCE/TAPE SWITCH position. In the S. On S. position, new monaural material can be added directly to a previous recording. In the S. with S. position, a monaural recording can be made on one channel while the other channel is played.

#### **19. ECHO/S. ON S. LEVEL CONTROL**

Adjusts the level of ECHO effect or SOUND ON SOUND depending on the position of the MODE SELECTOR, the ECHO ON/OFF switch and the S. ON S./S. with S. switch.

#### **20. LINE IN JACKS**

Pin type jacks for recording directly from a tuner, phonograph (with ceramic cartridge) or another tape recorder. Will accept dual pin plugs. Input impedance is 330k, use signal level between 55mV and 6V.

#### **21. TAPE AND SOURCE OUT**

Pin type jacks, for connecting external power amplifier. Use these jacks when connecting to an amplifier that has a tape monitor feature. Output impedance is 200 ohms.

#### **NOTE**

Connecting a microphone to the recorder automatically disconnects the associated LINE IN jack.

#### **22. TAPE OUT ONLY**

Pin jacks, for connecting the recorder to an external power amplifier that does not have a tape monitoring feature. Output impedance is 200 ohms.

## **OPERATION**

### **PLAY PROCEDURES**

1. Thread the tape to be recorded on the recorder.
2. Set the SPEED SELECTOR (7) to the speed of the recorded tape with the FUNCTION SELECTOR (13) in the STOP position.
3. Set the DIGITAL TAPE COUNTER (5) to 0000.
4. Set the MODE SELECTOR switch (14) for the type of recording you wish to play. For stereo tapes, to STEREO: for monaural tapes, to MONO 1 or MONO 2.

5. Set the SOURCE/TAPE switch (16) to TAPE.
6. Turn FUNCTION SELECTOR (13) to PLAY and power "ON".
7. The output from the tape deck is at a fixed level. Adjust the volume and tone controls of the power amplifier to a suitable listening level and tonal quality.
8. To play the remaining two tracks, exchange the two reels on the two spindles; rethread the tape if you have played the entire tape.



## RECORDING STEREO TAPES

(See Operation Manual, Ampex No. 7890233-01 for complete procedures.)

1. Move the POWER ON/OFF switch (1) to ON.
2. Thread the tape on the recorder.
3. Set the SPEED SELECTOR (7) to the desired recording speed.
4. Set the DIGITAL TAPE COUNTER (5) to 0000 by depressing the automatic reset button (6).
5. Set the SOURCE/TAPE switch (16) to SOURCE.
6. Set the MODE SELECTOR switch (14) to STEREO.
7. Apply the input signals and adjust the RECORD LEVEL CONTROLS (2 & 3) so that the RECORD/

PLAY METERS (4) fluctuate below the 0 mark. The indicators should enter the red area only on peak sound levels. If the indicators constantly enter the red area, either the RECORD LEVEL controls are set too high or, if you are recording from microphones, they may be too close to the sound source.

8. Hold RECORD PUSHBUTTON (8) depressed and turn the FUNCTION SELECTOR (13) to PLAY. You are now recording.
9. Monitored sound is the input signal (SOURCE MONITOR). By moving the SOURCE/TAPE switch (16) to TAPE, you can monitor the sound recorded on the tape through the playback head (TAPE MONITOR).

# FUNCTIONAL MECHANICAL OPERATION

## REWIND MODE

When the Function selector is rotated to the Rewind position, the rewind idler (087) engages the motor pulley (109). Torque is transferred from the idler to the rewind belt (170) and from the belt to rewind pulley (111), which is clutched to left turntable (110). The back tension assembly (089) applies drag to the right hand turntable through the take-up pulley section (121). A tape lifter holds the tape off the heads to prevent head wear.

## STOP MODE

When the FUNCTION SELECTOR is turned to the STOP position, all idlers are disengaged and the tape switch arm (166) is mechanically held in the On position. The tape switch arm must be in this position when the tape is threaded so that the tape can support it in all other positions. Although power is applied to the motor, and tape is threaded the tape does not contact the heads, and no idlers are engaged. Brakes are applied to both turntables and the flywheel.

## PLAY MODE

Turning the FUNCTION selector to the PLAY position accomplishes the following operations simultaneously:

1. The play idler (093) engages the motor pulley (109) and the flywheel (161), and is held in place by spring loads (097 & 068). The idler is disengaged by the play arm function plate (103).
2. The take up idler (078) engages the motor pulley and the take up pulley (121) of the right turntable clutch. The idler lever assembly (076) is held in place by a spring load (085). This idler is disengaged by the idler lever function arm (075).

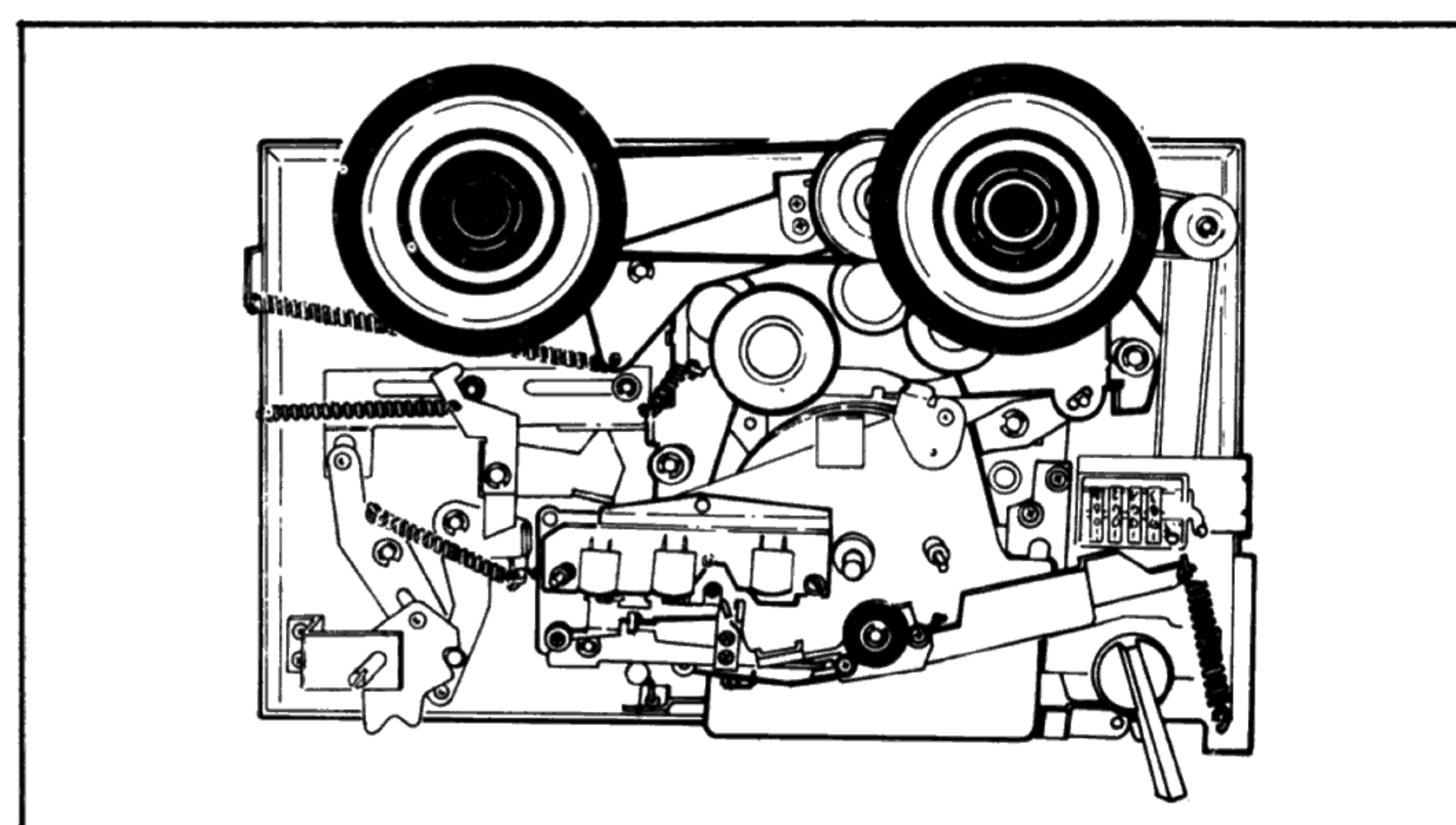


Figure 2. Rewind Mode

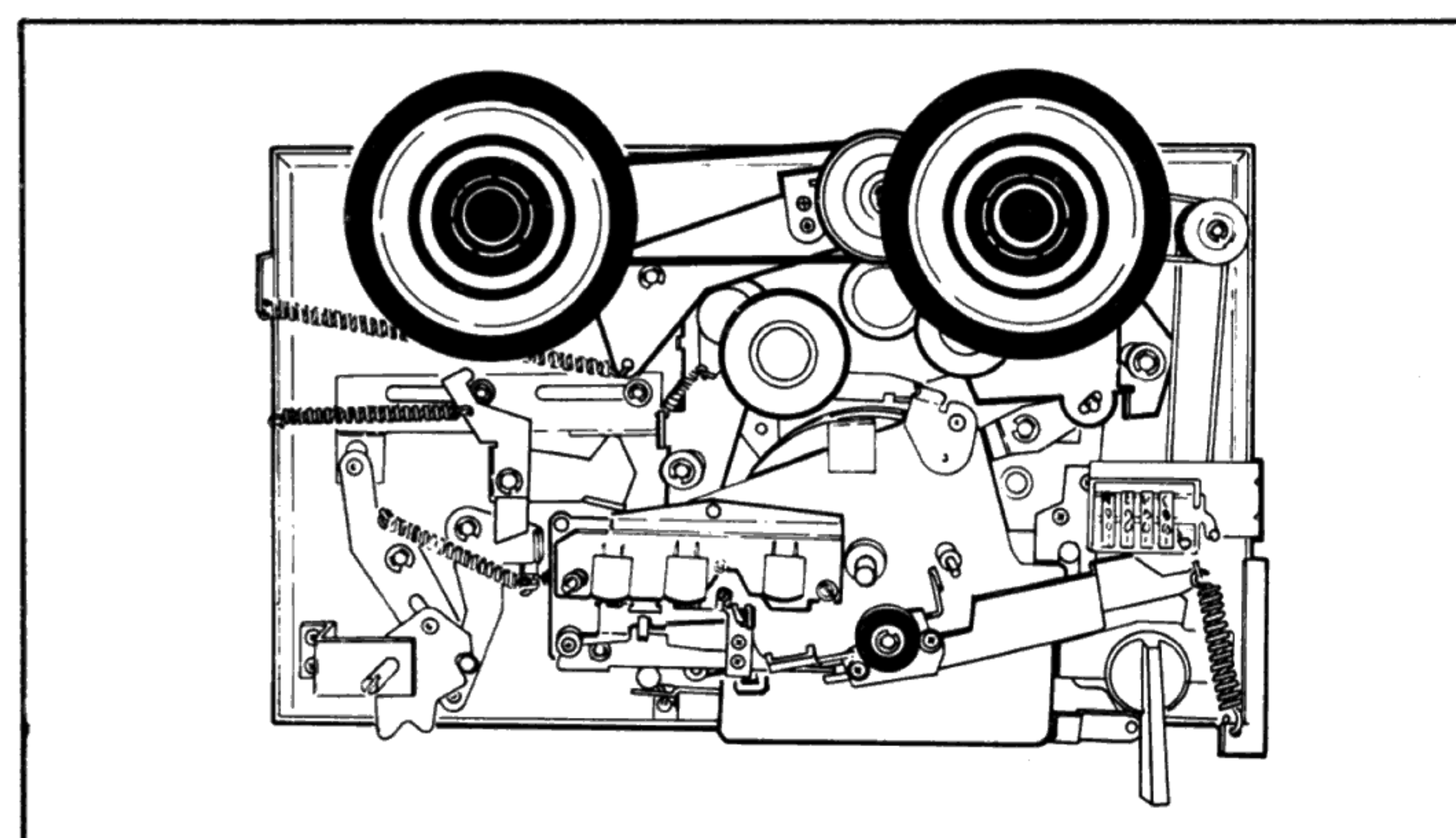


Figure 3. Stop Mode

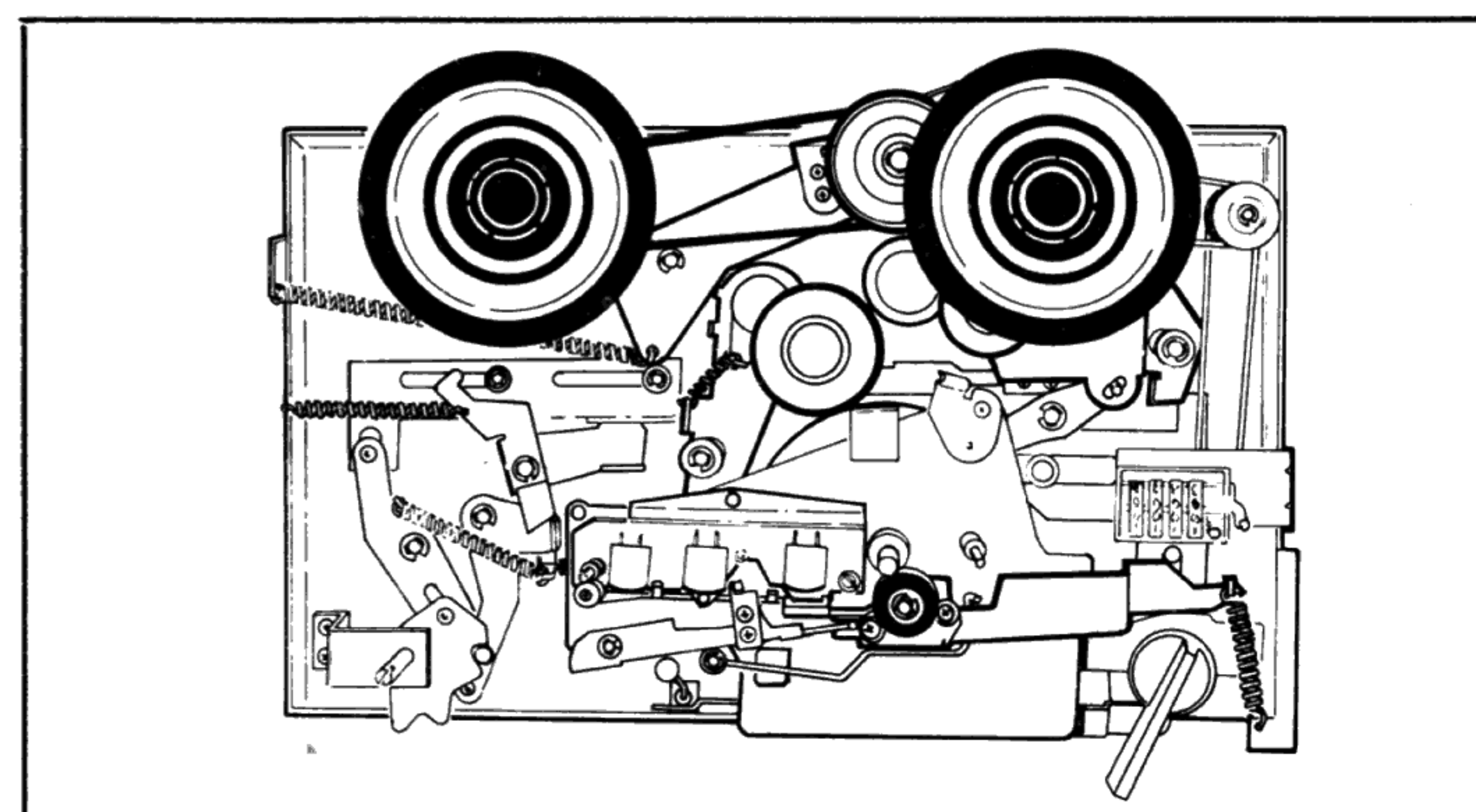


Figure 4. Play Mode



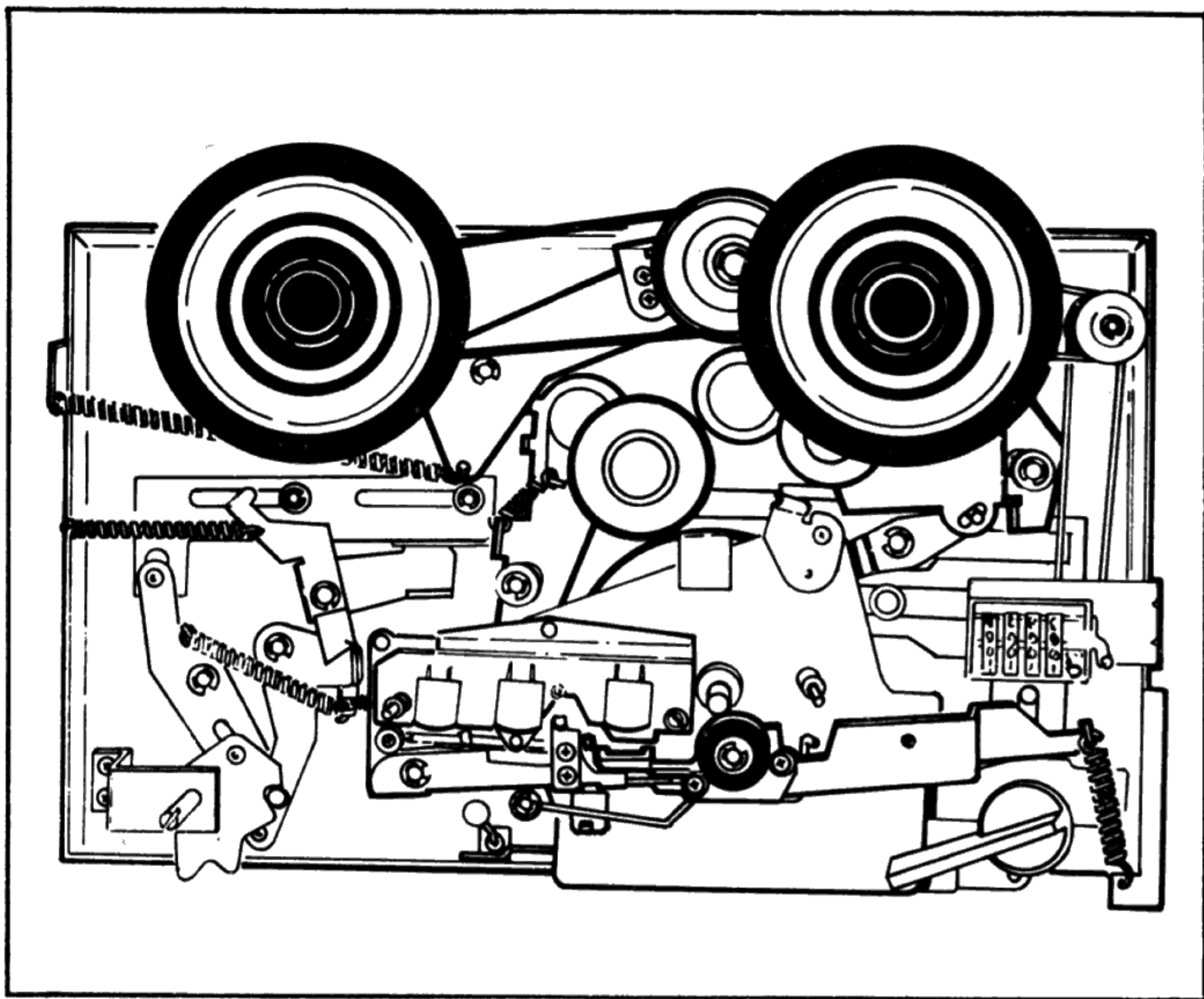


Figure 5. Pause Mode

3. The pressure roller (171) engages the capstan shaft and is held in place by the pressure roller spring (172). The pressure roller arm is disengaged by the function cam (051).
4. The tape lifter plate (147) moves into the tape path and wraps the tape around the head faces. The plate is spring loaded in place. The lifter plate is disengaged by the shifter arm assembly (156) which is activated by the pressure roller arm.
5. The holdback tension regulator (152) and plate assembly (151) holds the tape against the tape guide (139). This assembly is held in place by a torsion spring.
6. The Tape switch shutoff arm (166) is released, and rides on the oxide side of the tape.
7. The flywheel brake (137) is released by an arm on the sub-chassis (136) controlled by the function cam (051).

### PAUSE MODE

When the Function selector is placed in the PAUSE Position, the idler puck assembly (093) remains in contact with the motor pulley and flywheel and the capstan continues to be driven. However, the pressure roller (171) is moved away from the capstan shaft so the tape is not driven. The Take-up idler assembly (078) moves away from the right turntable so no take up action occurs. A cam on the function bar assembly (056) moves the idler up while moving the idler away through the action of the idler function arm (075). Brakes are applied to both turntables. The pressure roller and take-up idler move back into operation position when the Function selector is returned into the PLAY position and it will resume either the PLAY or RECORD function that was in operation when it was placed in PAUSE.

### FAST FORWARD MODE

When the FUNCTION selector is moved to the Fast Forward position the take-up idler (078) contacts the motor pulley and right turntable. It also moves outward so it contacts a larger diameter of the motor pulley to give a faster speed, and by passes the play clutch. It engages the take-up pulley (117) of the fast wind clutch. The motor is only energized as long as the tape switch is closed.

### SPEED SHIFT

When the speed selector knob is rotated to change speed, a detent cam (107) pivots the change over plate assembly (101), which drives the speed cam slide (059). The slide raises the play idler lever assembly (092) to the correct idler elevation.

The speed selector knob should be rotated only in the STOP mode. A locking action to prevent rotation in PLAY or PAUSE is provided by the tabs on the detent lever assembly (099) and the play arm function plate (103).

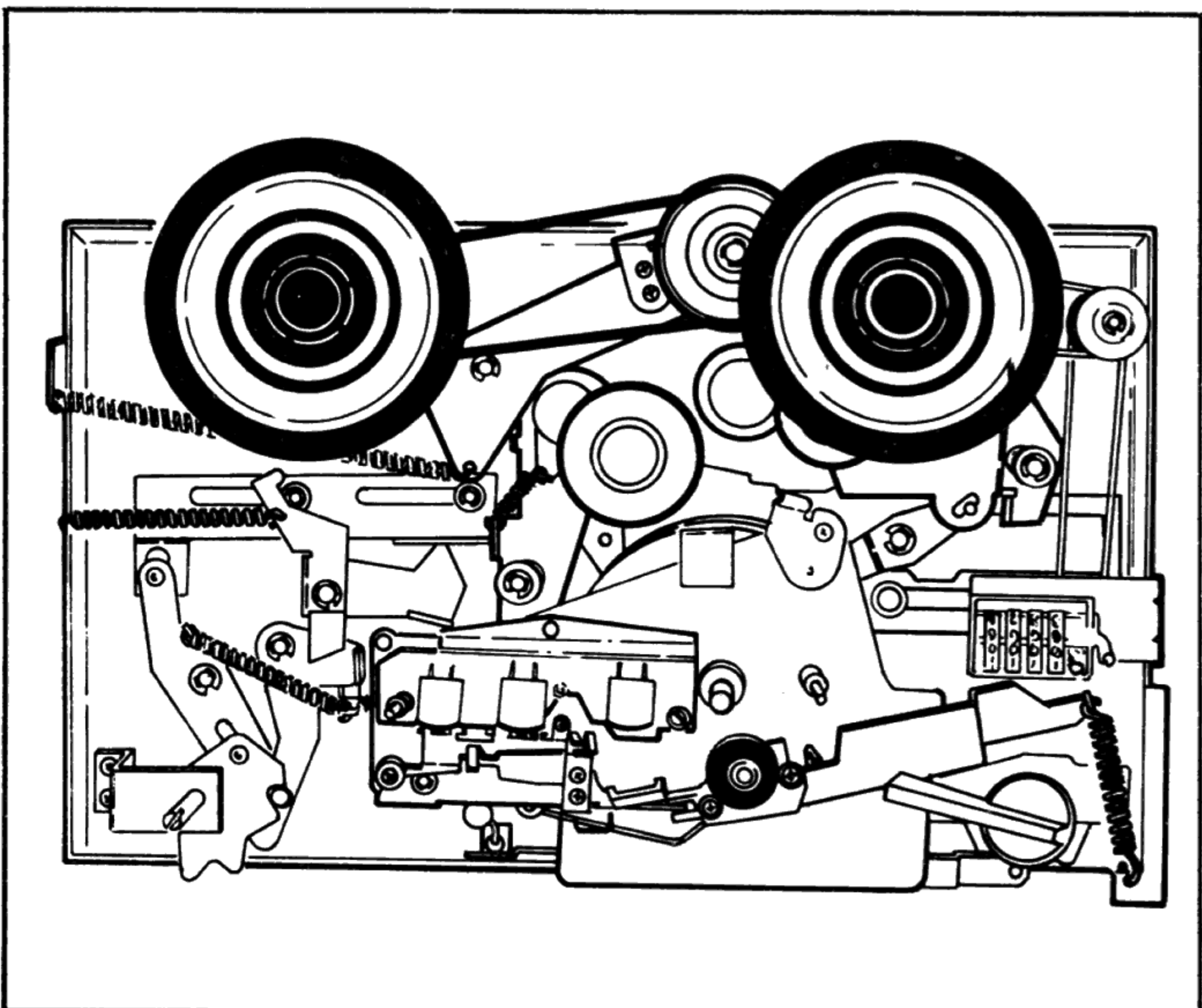


Figure 6. Fast Forward Mode

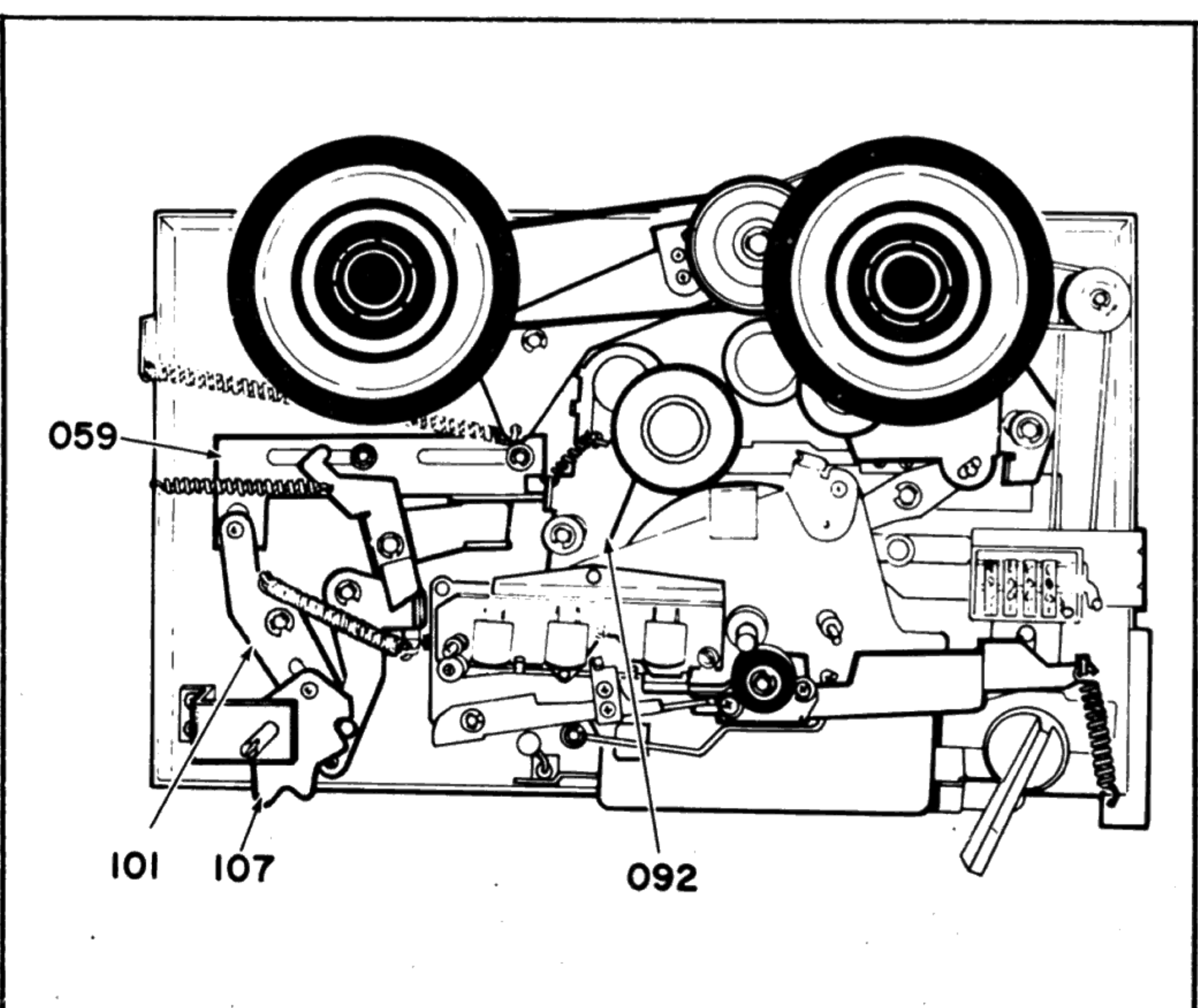


Figure 7. Speed Shift



## BRAKING

Brakes are applied to both turntables in STOP and PAUSE. Brake lever assemblies (069 & 071) are spring loaded (070 & 072) into clutched portions of turntables (117 & 111), which provide a safety level of maximum braking torque.

The brakes are removed by cams on the function bar (056), which is driven from the function knob.

A flywheel brake is provided in STOP to reduce flywheel coast. It is mounted on a pivot arm, which is activated by a cam (051) from the function knob.

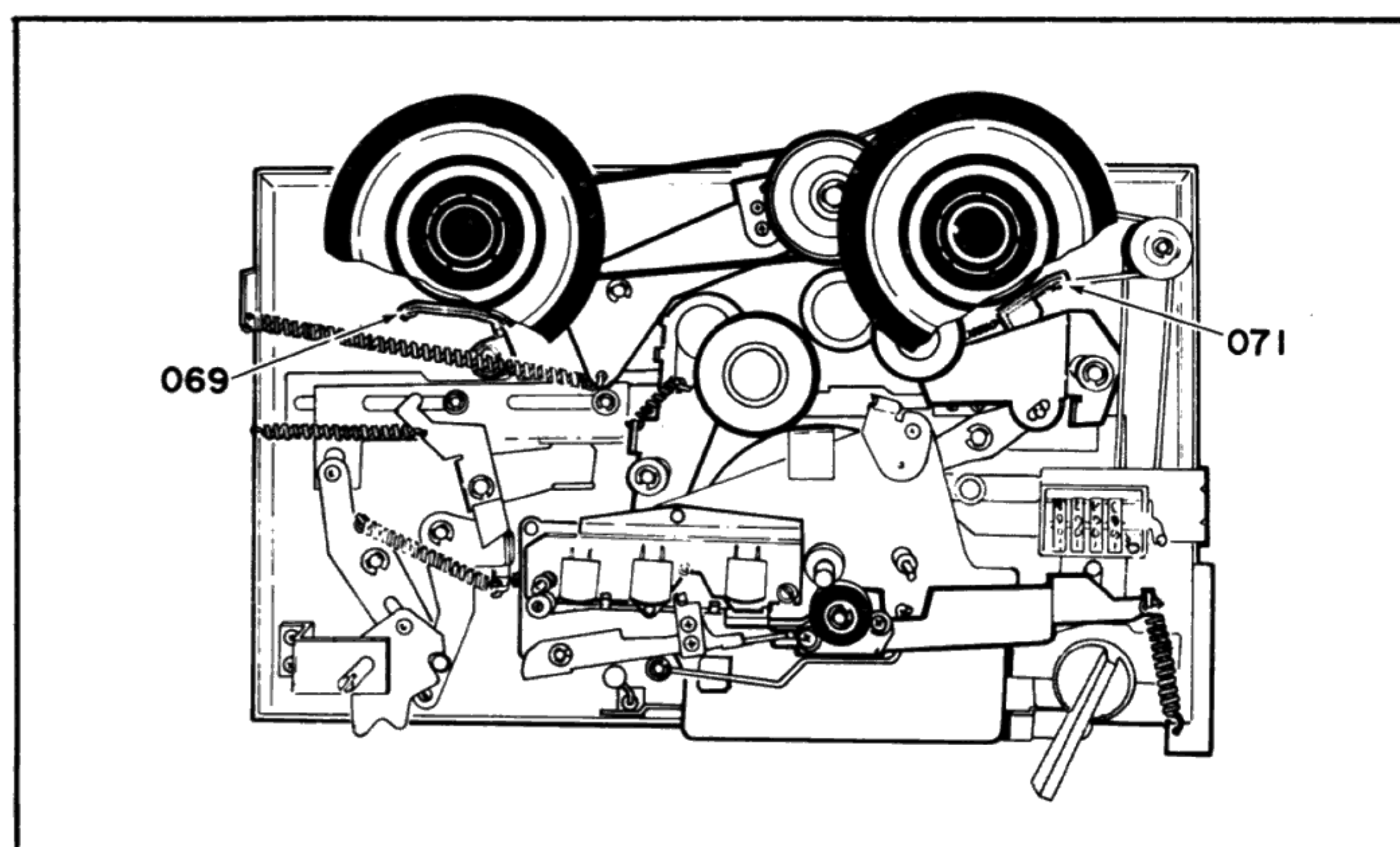


Figure 8. Braking

# FUNCTIONAL ELECTRICAL OPERATION

## PLAYBACK

The playback signal from the left play head is coupled to a preamplifier circuit. Direct coupling is used to transfer the signal from the collector to the base of another stage, which provides further amplification. These stages are equalized for tape playback for each speed. Correct equalization is automatically selected by S2, which is operated by the speed selection lever. Output from this stage couples to the playback gain control; see the Electrical Section for adjustment procedure. Output from the gain control is fed to switch S3 (the select switch) and then back to the line amplifier consisting of three direct coupled stages. The tape output is taken off the emitter of the 3rd stage (Q10) thus low output impedance is assured. This point also drives the VU meter as well as an additional stage for the headphone output. Both play channels have the same circuit construction and operate in the same manner. During monaural operation only one preamplifier is in operation but the mode selector switch connects its output to both line amplifiers.

## RECORD

A separate record amplifier is employed for each channel. Signals from the microphone jacks or line in jacks couple to the base of a flat record preamplifier, which consists of two direct coupled stages. The output from the preamplifier goes to an equalized two-stage amplifier through the record gain control. The equalization, S2, is mechanically coupled to the speed change switch and is automatically changed to match the speed. See the Electrical Section for the equalizer adjustment procedures. The output of Q4 is coupled to a single, common-emitter stage having additional record equalization. The output from the collector of this stage is fed to the record head through the record gain adjustment control and the bias traps. In monaural positions of the selector switch only one channel is recorded.

## ECHO EFFECT

This mode of operation is a combination of the record and play functions. Echo effect can only be recorded monau-

rally, so the mode in use determines which record and play amplifiers are operational. The output from either play amplifier is fed back to a record amplifier of the same channel through the echo sound on sound control VR201 and contacts on switch S3. Switch S3 completes the circuit to either resistor R73 or R173 and then to Q3 or Q103 and the signal is then rerecorded. The amount of echo delay is determined by the time interval required for a segment of tape to travel between the record and play heads and as such is a function of tape speed. Because echo sound is reinforcing, echo build-up will occur if the echo control is adjusted to allow too much signal to be fed back to the record amplifier.

## SOUND-ON-SOUND

A play and record amplifier of opposite channels is used in this mode. The output of a play amplifier is fed to the opposite channel record amplifier and echo/sound-on-sound control. This control is used to adjust the record level of the signal that is fed back. The input of the microphone or line of the record amplifier is mixed with signal that is fed back from the play amplifier, thus a monaural recording may be mixed with new source material and rerecorded on the opposite track. Careful adjustment of each control is necessary for a proper recording.

## SOUND-WITH-SOUND

If the mode selector switch is in either the 1-2 or 2-1 position, operation is as described in Sound-On-Sound; one channel is in the record mode, however, the re-record function is disabled (the signal is not fed from one channel to the other), tape/source monitoring is only available on the channel that is in the record mode; the other channel remains in the tape monitoring mode. See page 30 for a simplified functional diagram.

## NOISE FILTER

A filter circuit is incorporated in the emitter follower output. It provides an AC feedback to Q9 (or Q109).



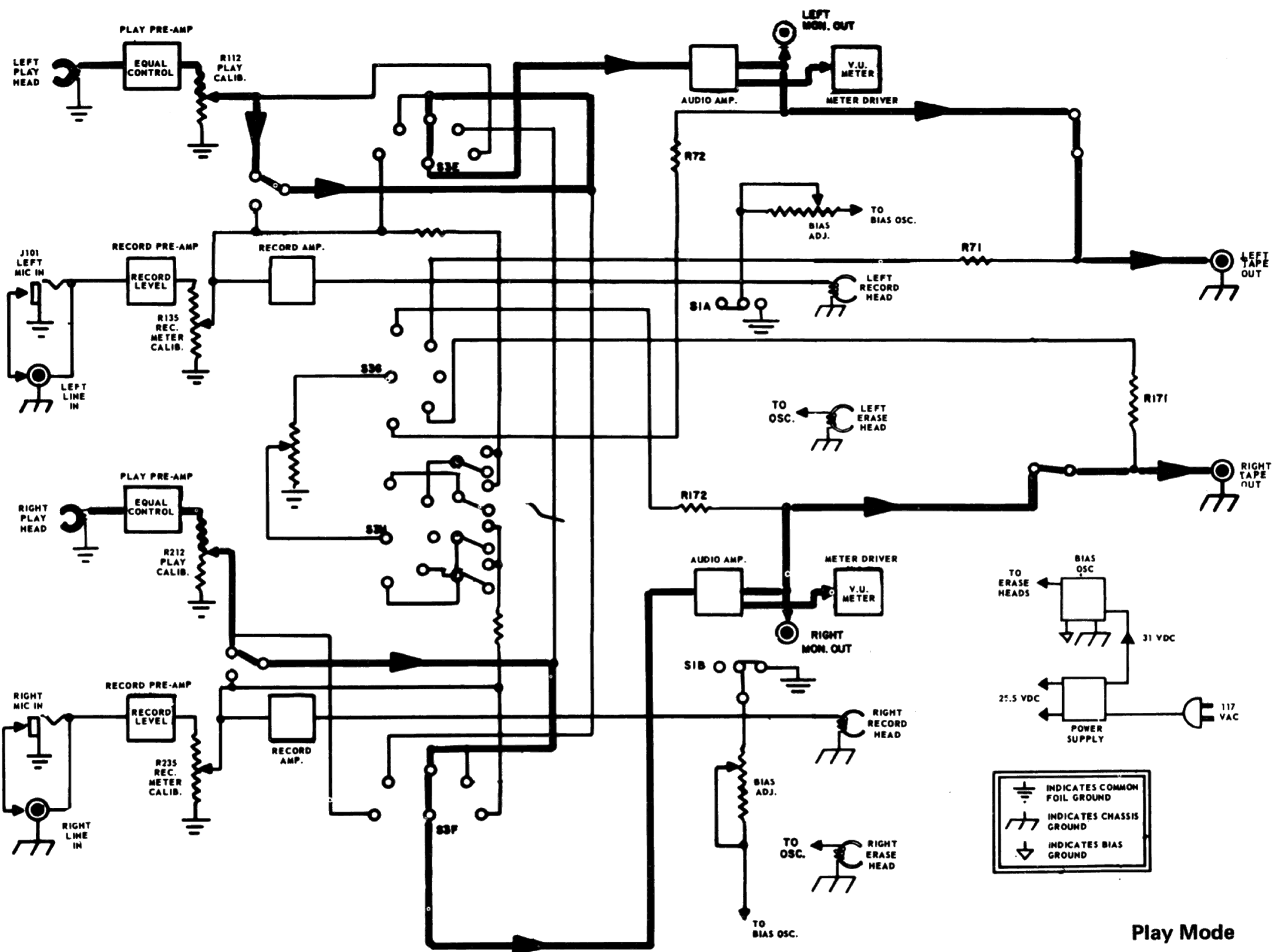
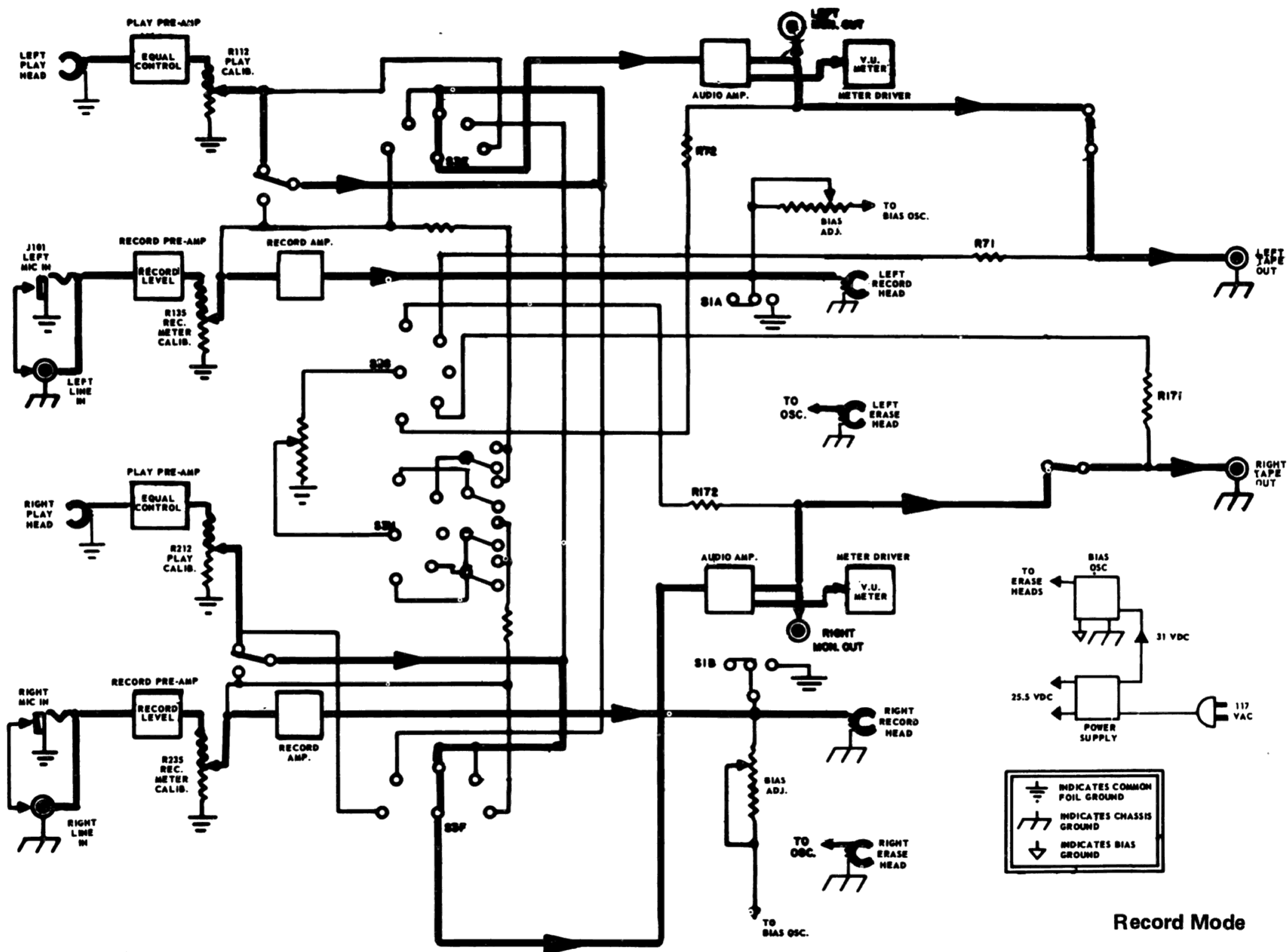


Figure 9. Functional Signal Flow, Stereo Record & Play



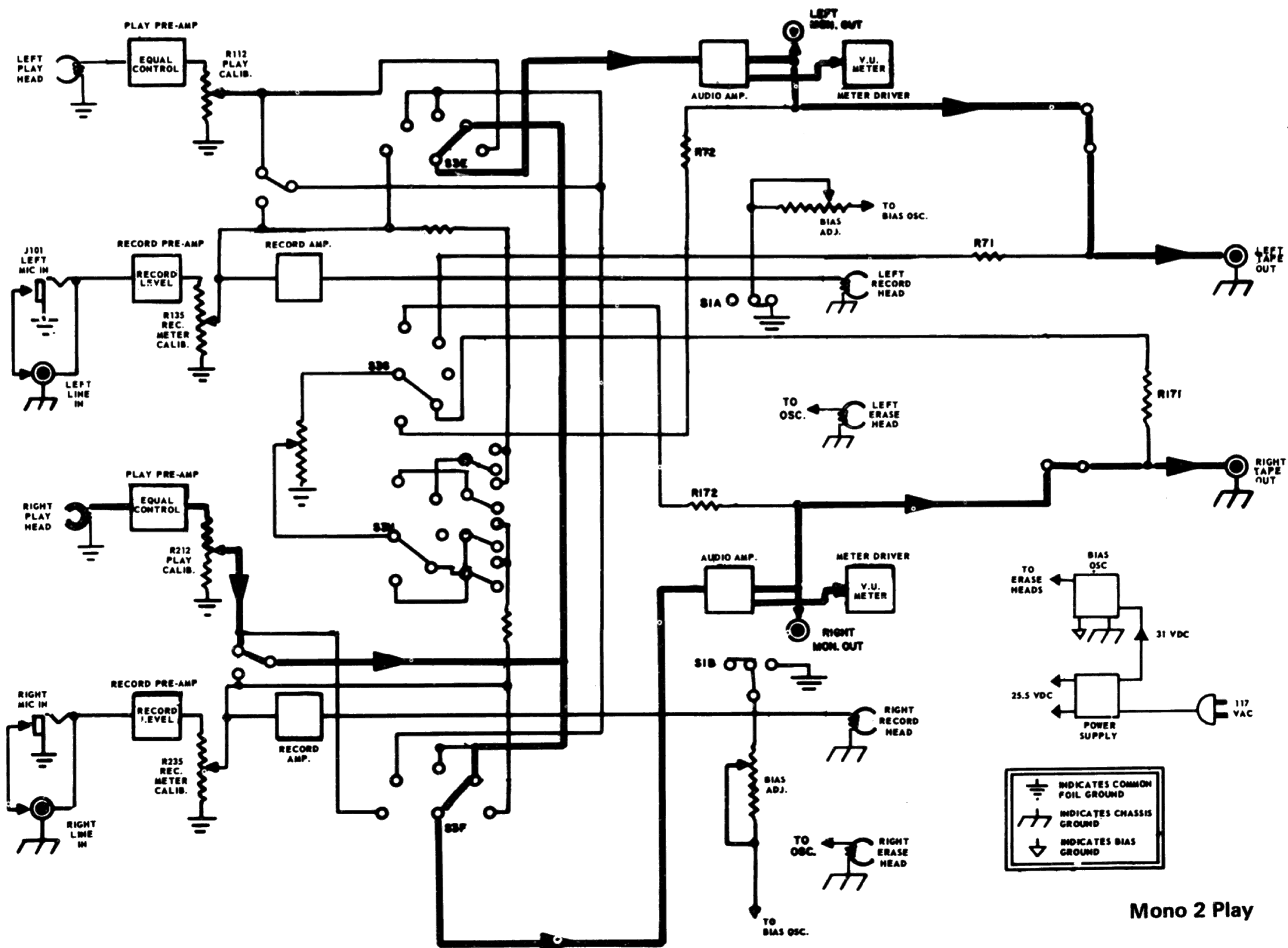
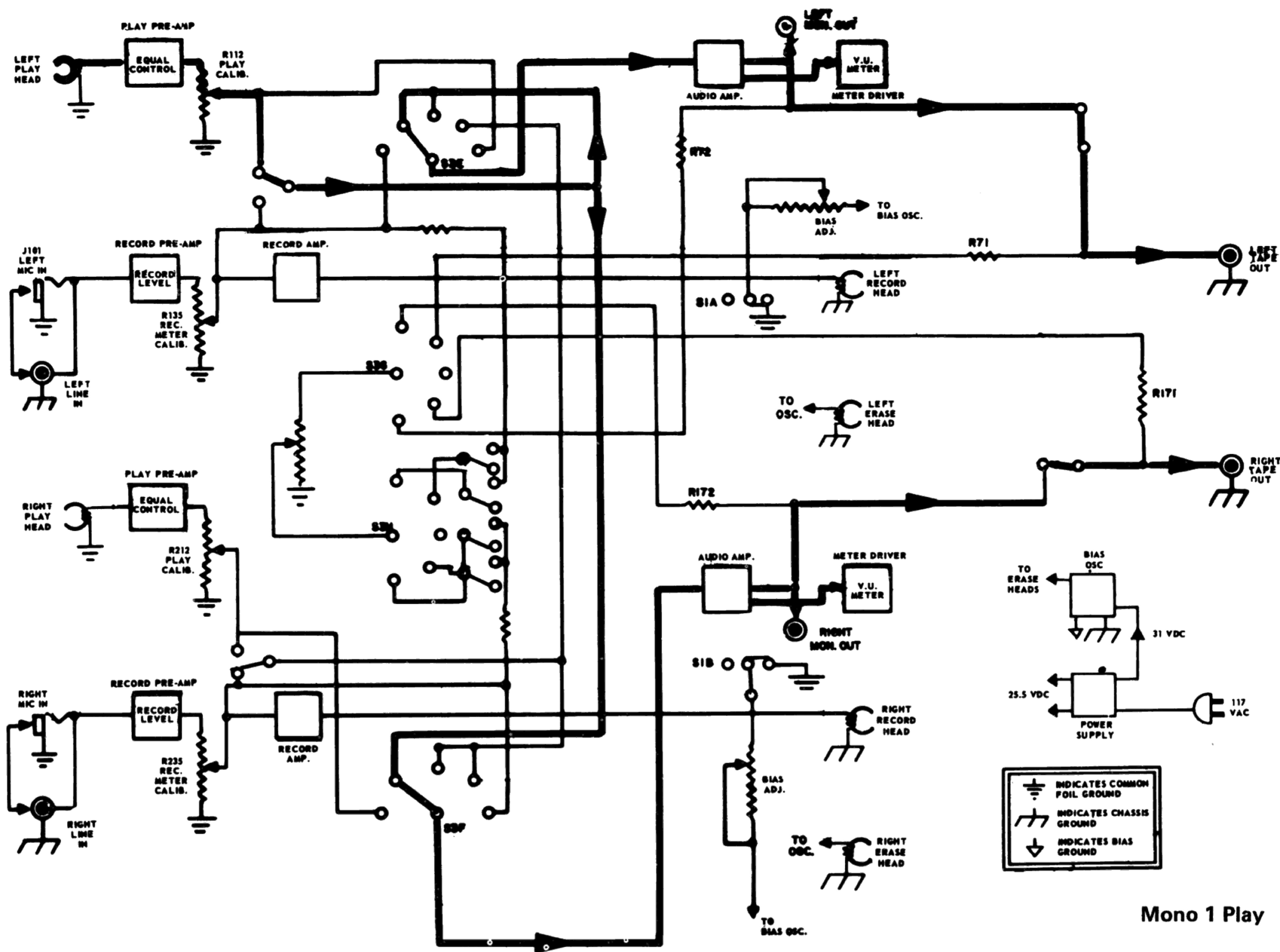


Figure 10. Functional Signal Flow, Mono 1 & 2 Play



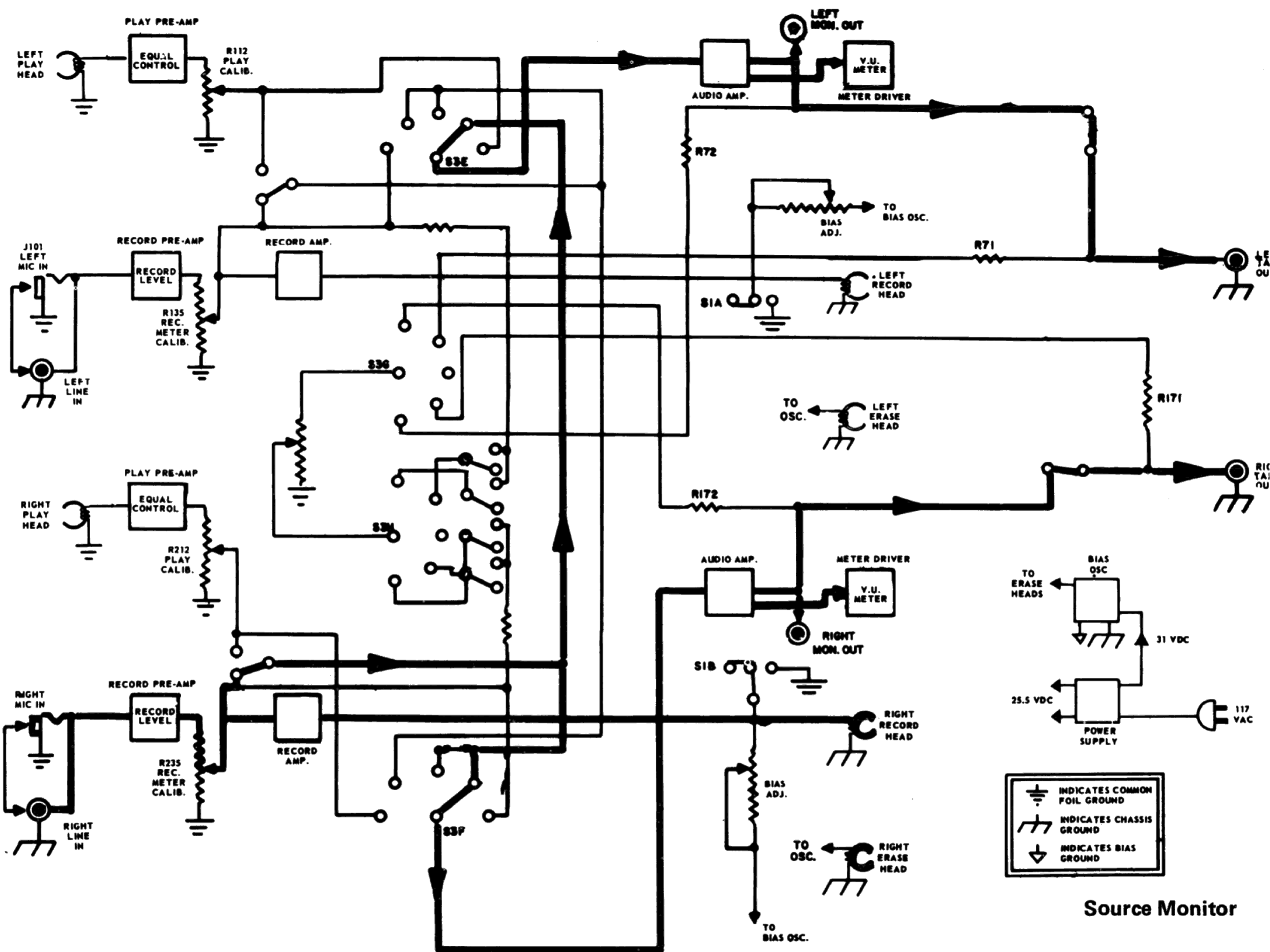
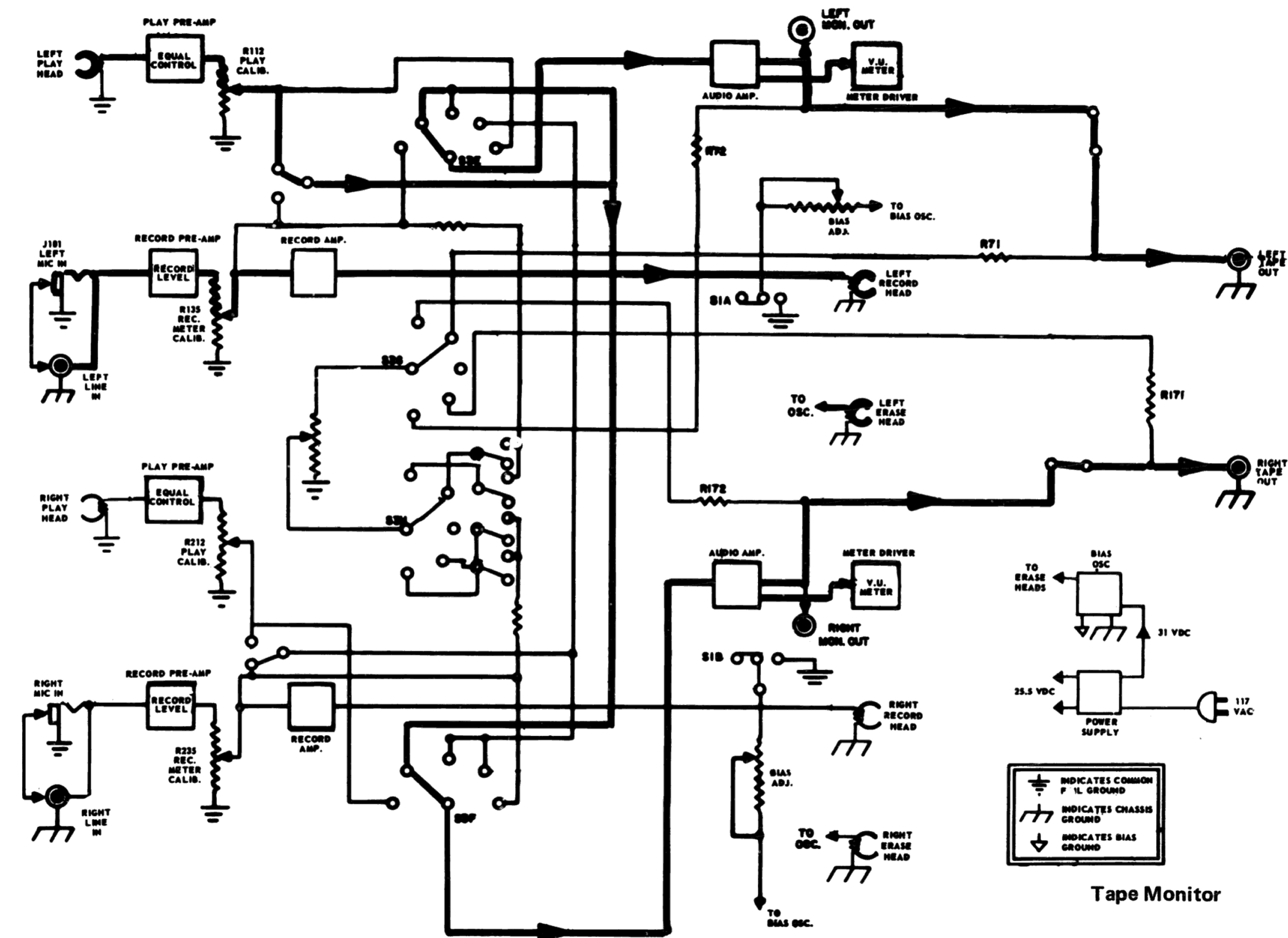


Figure 10A. Functional Signal Flow, Mono 1 & 2 Record



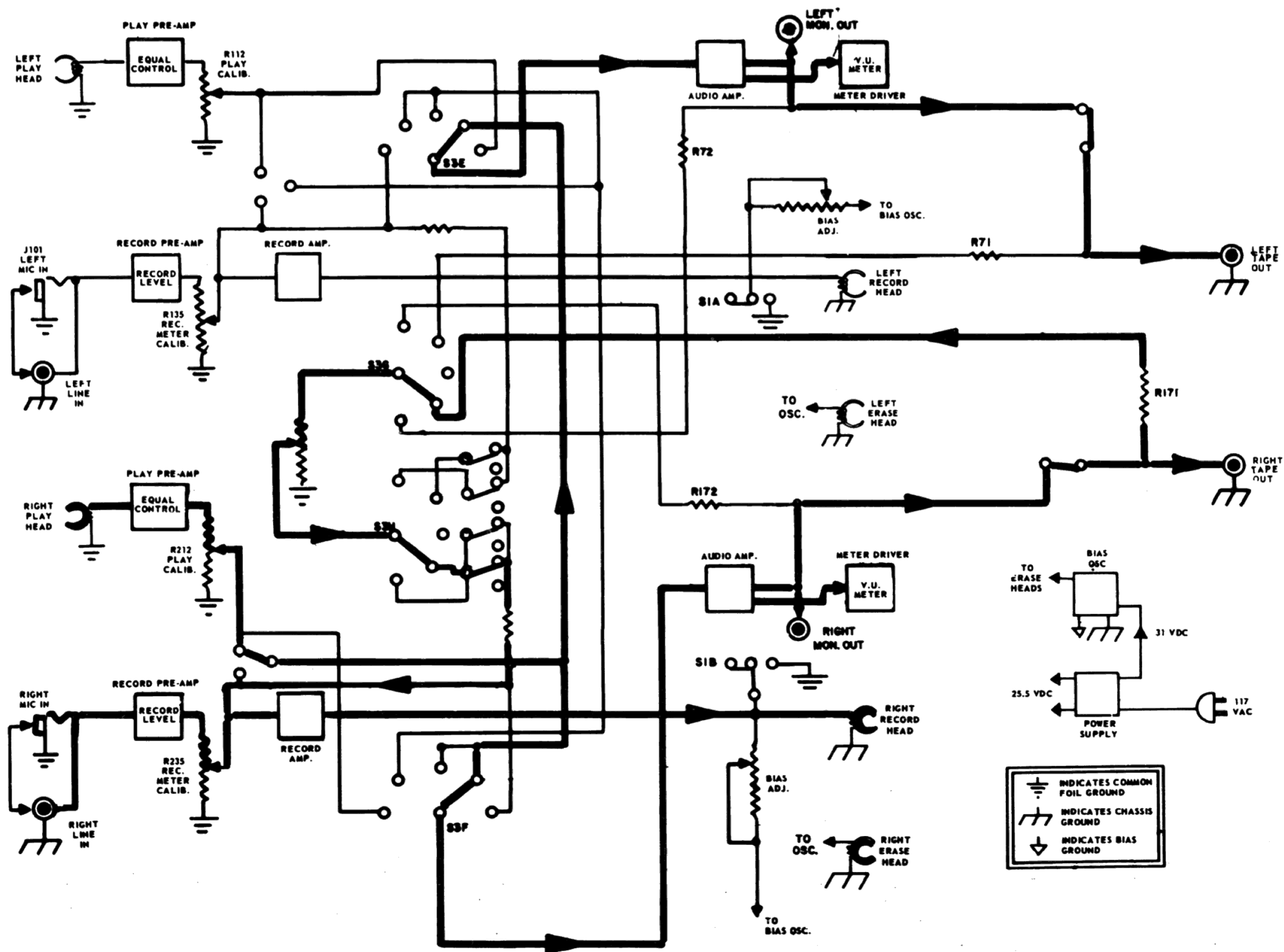
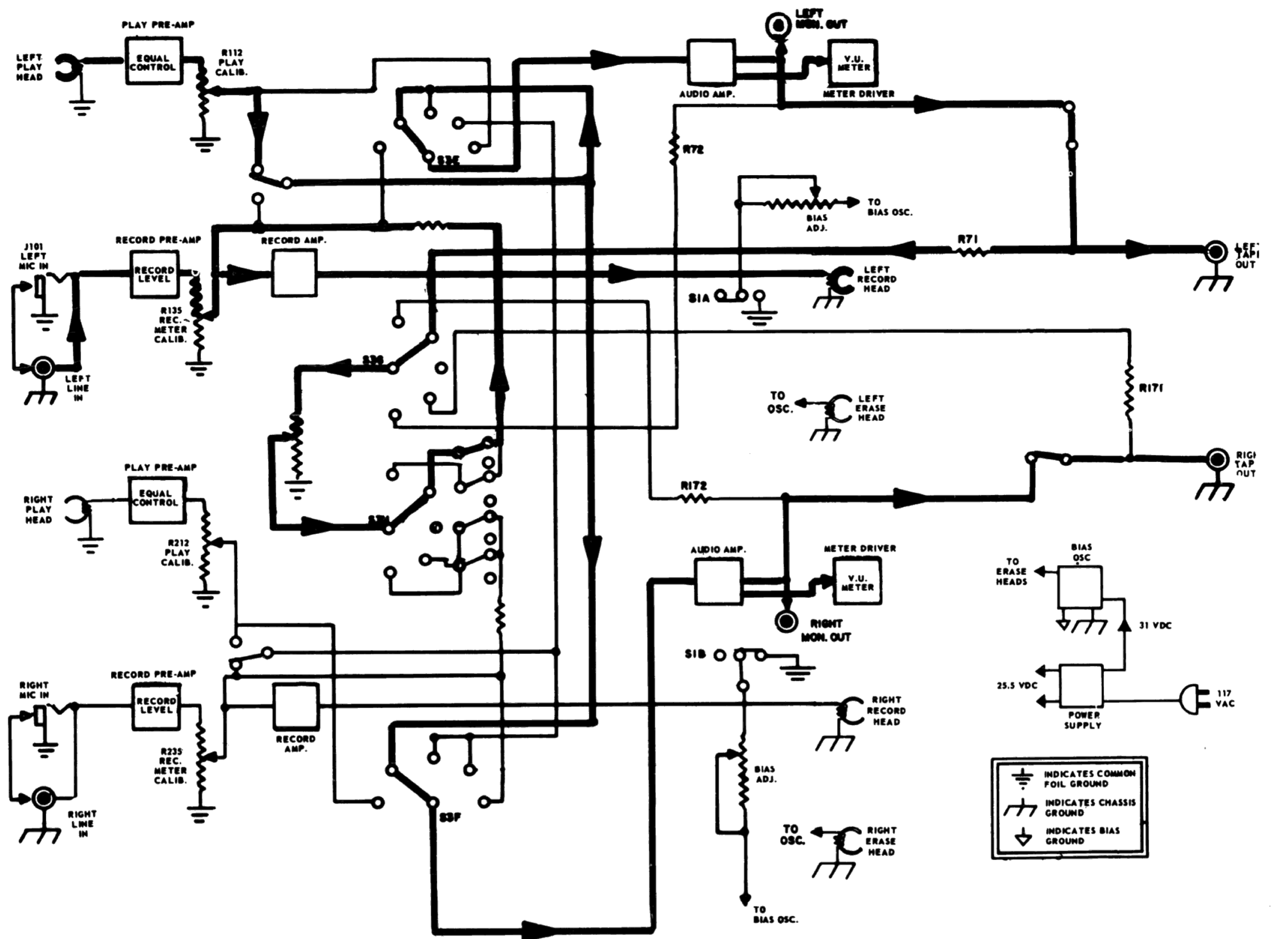


Figure 11. Functional Signal Flow, Echo Record Mono 1 & 2



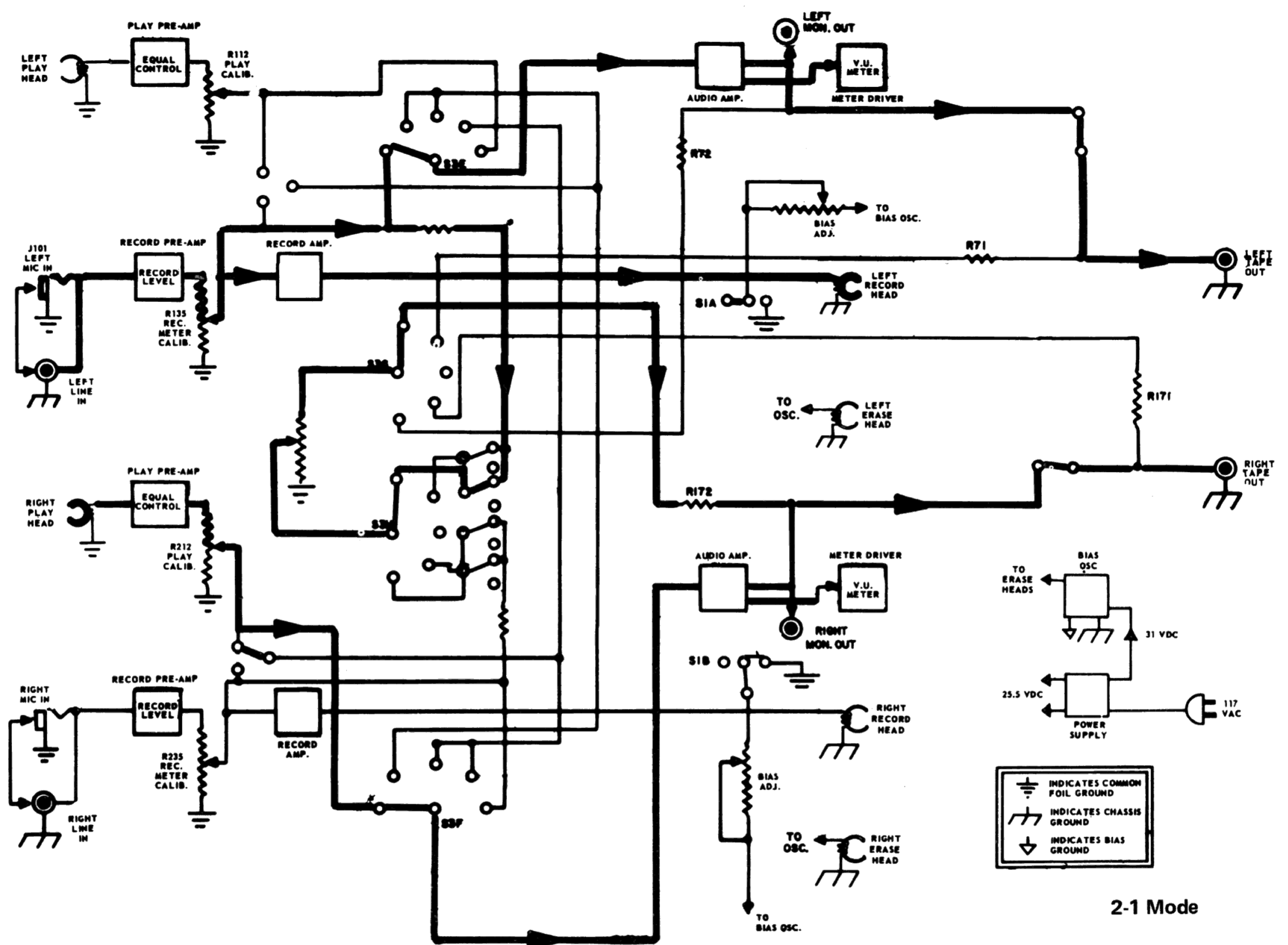
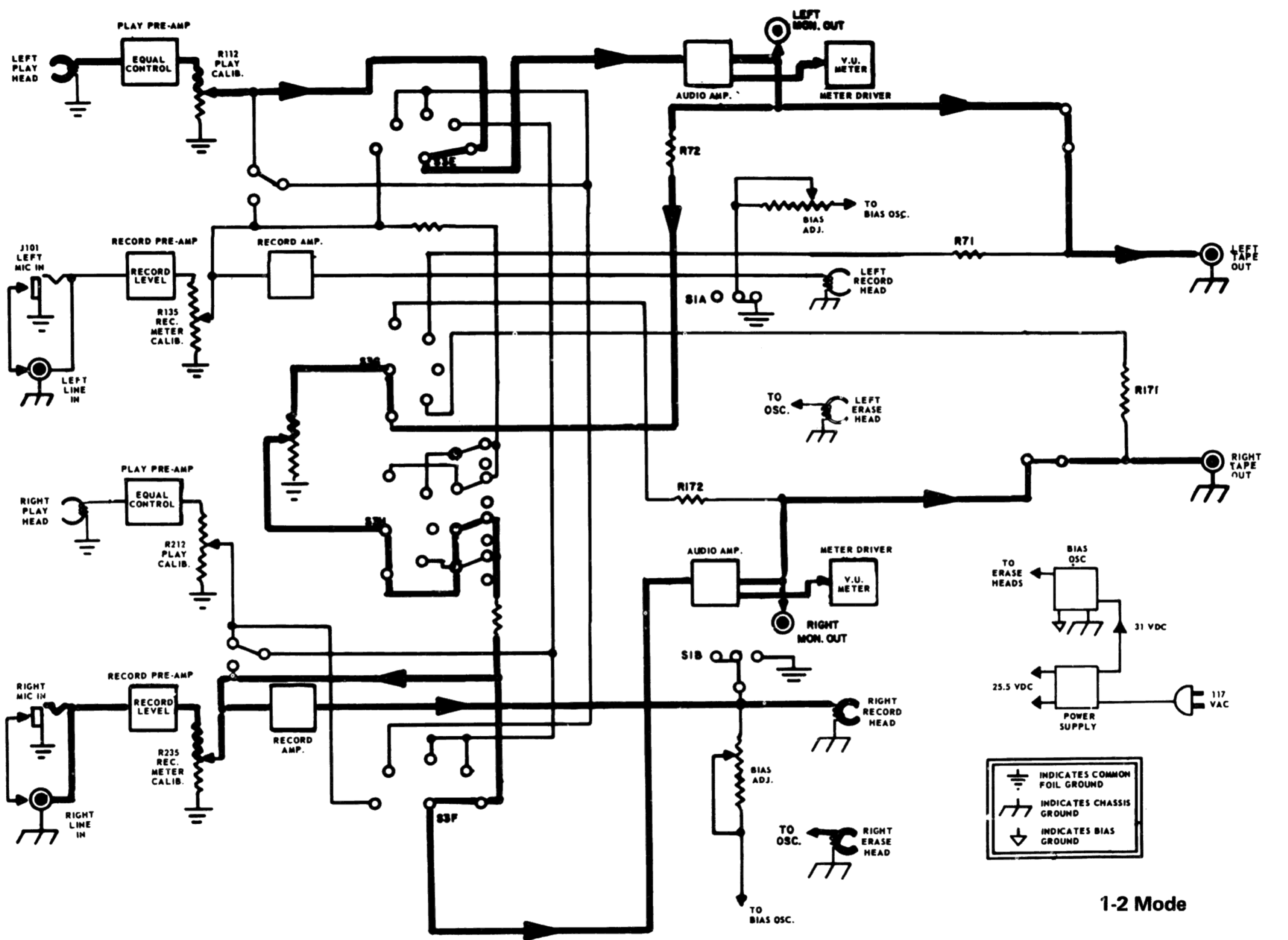


Figure 12. Functional Signal Flow, S-on-S Record



# DISASSEMBLY

## SPECIAL EQUIPMENT REQUIRED

1. A.C. VTVM
2. Frequency counter
3. Reproduce Alignment Tape, Ampex part number 31321-04 (¼ track) and 31321-01 (full track).
4. Flutter tapes, Ampex part number 31326-01 (7-1/2 ips), 31336-01 (3-3/4 ips), and 31346-01 (1-7/8 ips).
5. Reel of blank or bulk erased tape, Scotch "190" or type to be used with recorder.
6. A. Noise Filter, unweighted - 7830062-01  
B. Noise Filter, weighted - 7830062-02.
7. Thickness gauges
8. Flutter meter
9. Torque test reel.
10. Bulk tape demagnetizer
11. Head Cleaner
12. Head Demagnetizer
13. Tension gauges (with full scale ranges from 0-1000 grams)

## REMOVING THE TRIM AND FRONT COVER

1. Pull off all knobs and pull off head cover.
2. Remove the screw (017) Holding the trim panel.
3. Carefully release the trim from all corners while pulling forward.
4. Lift off the front panel.

### NOTE

The meters are held in place by the front panel and can easily be damaged when the panel is removed. They can be taped in place while servicing.

5. When replacing trim carefully align the meters.

## REMOVING AND REPLACING THE CABINET

1. Unplug the LINE IN and LINE OUT cables.
2. Remove the trim and front cover as described in the previous procedure.
3. Remove the four (4) front screws that hold the mechanism to the cabinet. Also remove four (4) screws from rear of cabinet. See Fig. 15.
4. Pull the transport forward and away from the cabinet while lifting the bottom end upward.
5. To replace the cabinet, feed the line cord through opening in rear of the cabinet tilt the bottom of chassis upward and slide the mechanism back into the cabinet.
6. Replace the four (4) screws that hold the mechanism to the cabinet, and replace cover plate and trim. Also replace the four rear screws.

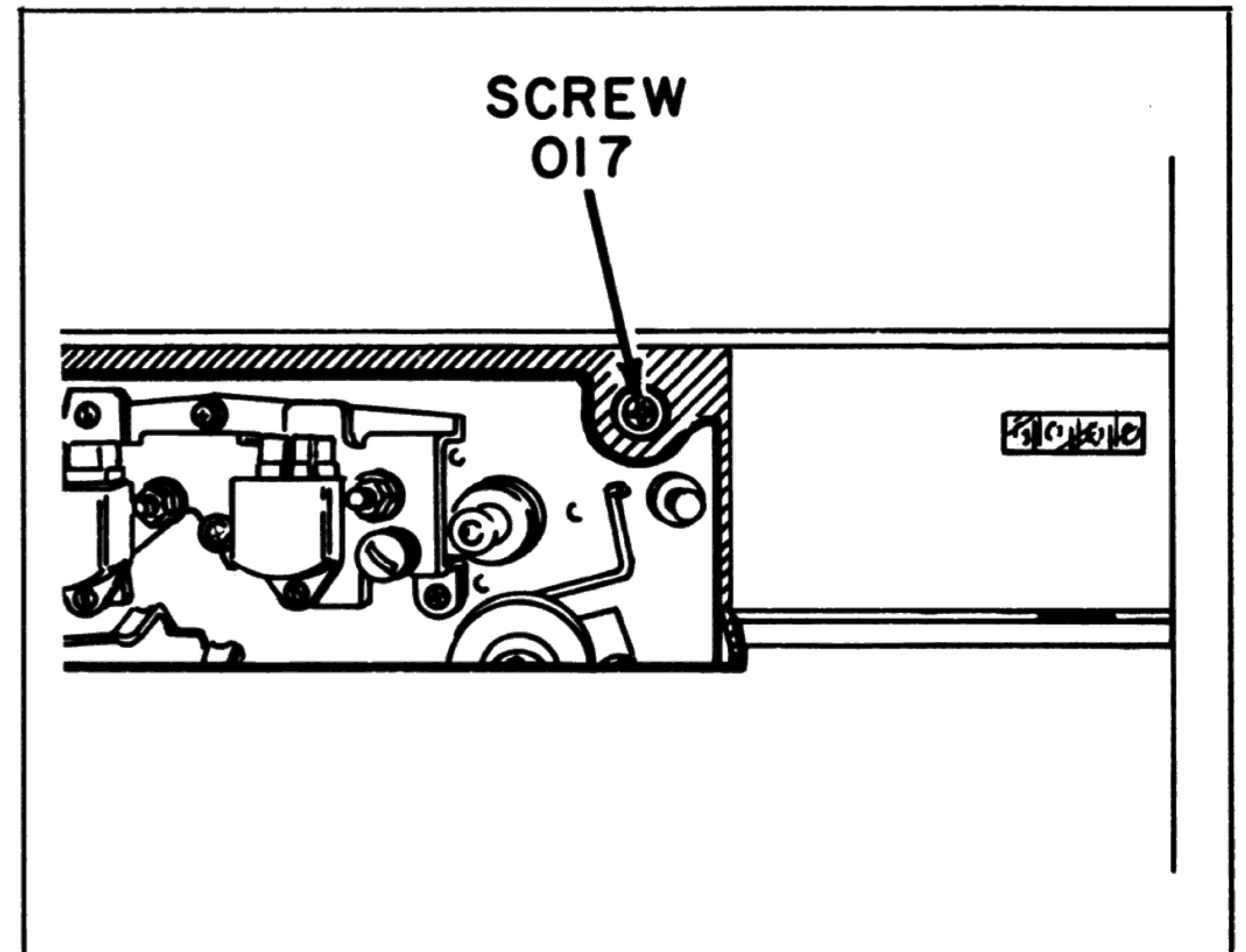


Figure 13. Panel Screw (017)

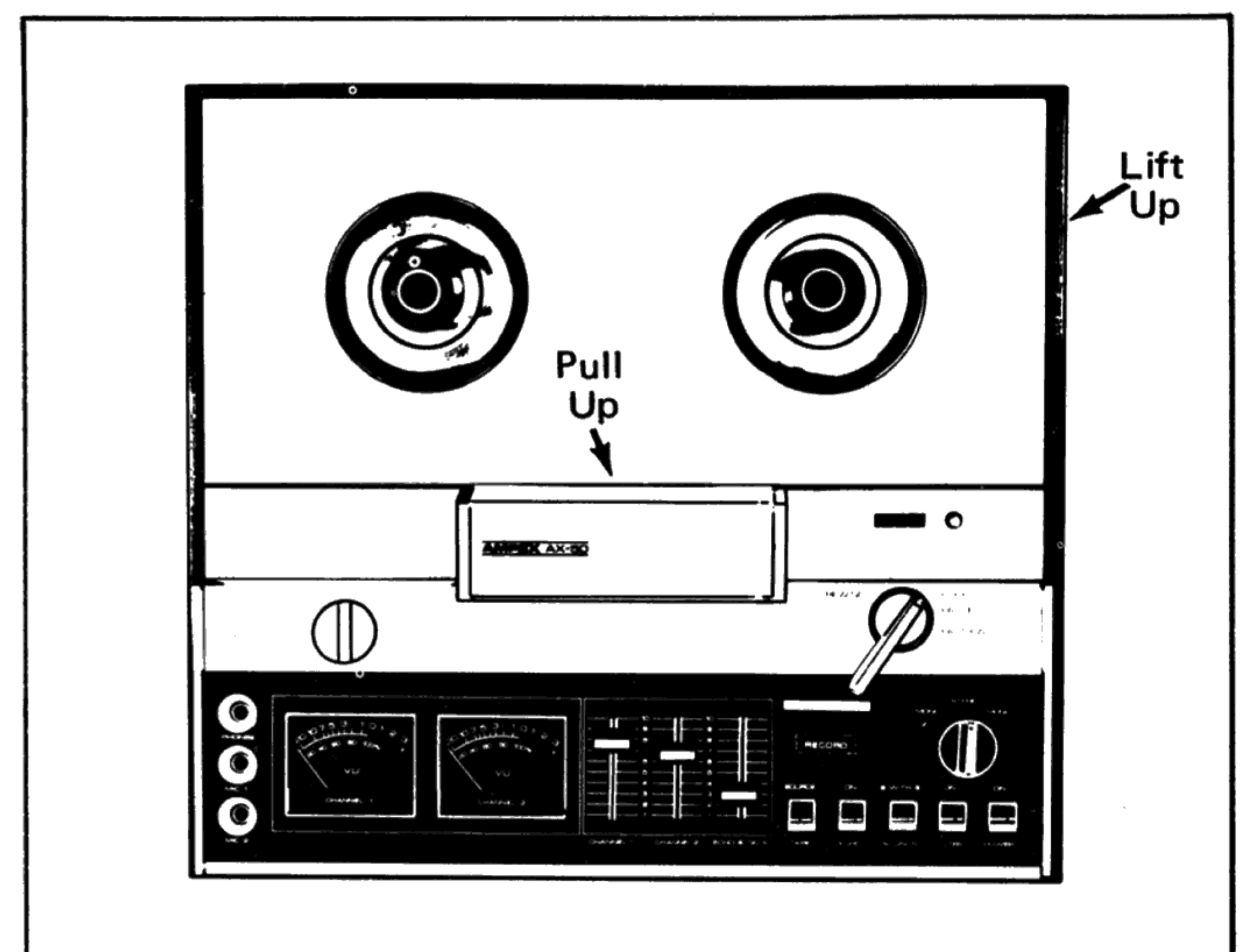


Figure 14. Front Cover & Trim

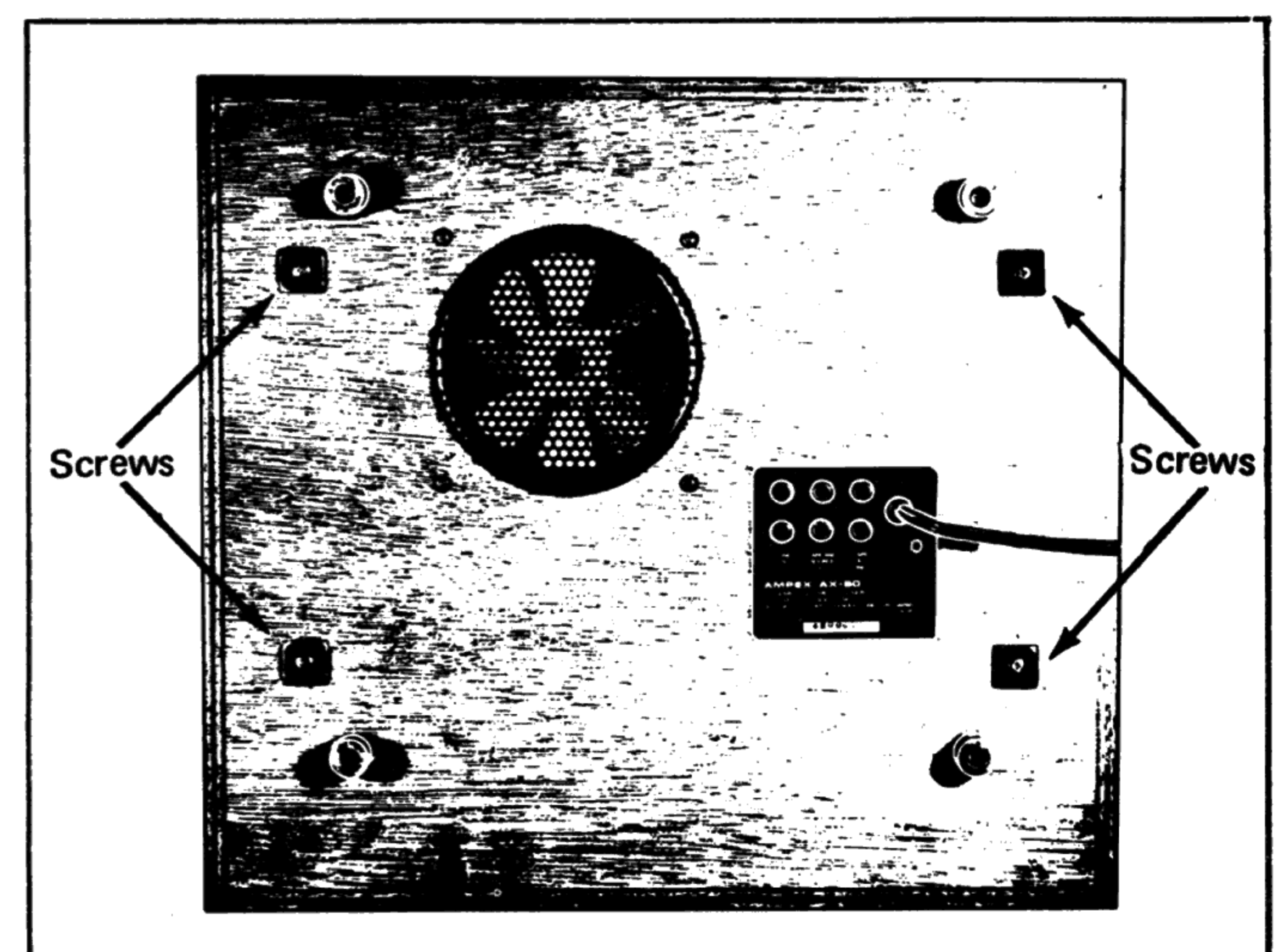


Figure 15. Screw Locations



# MECHANICAL CHECKS

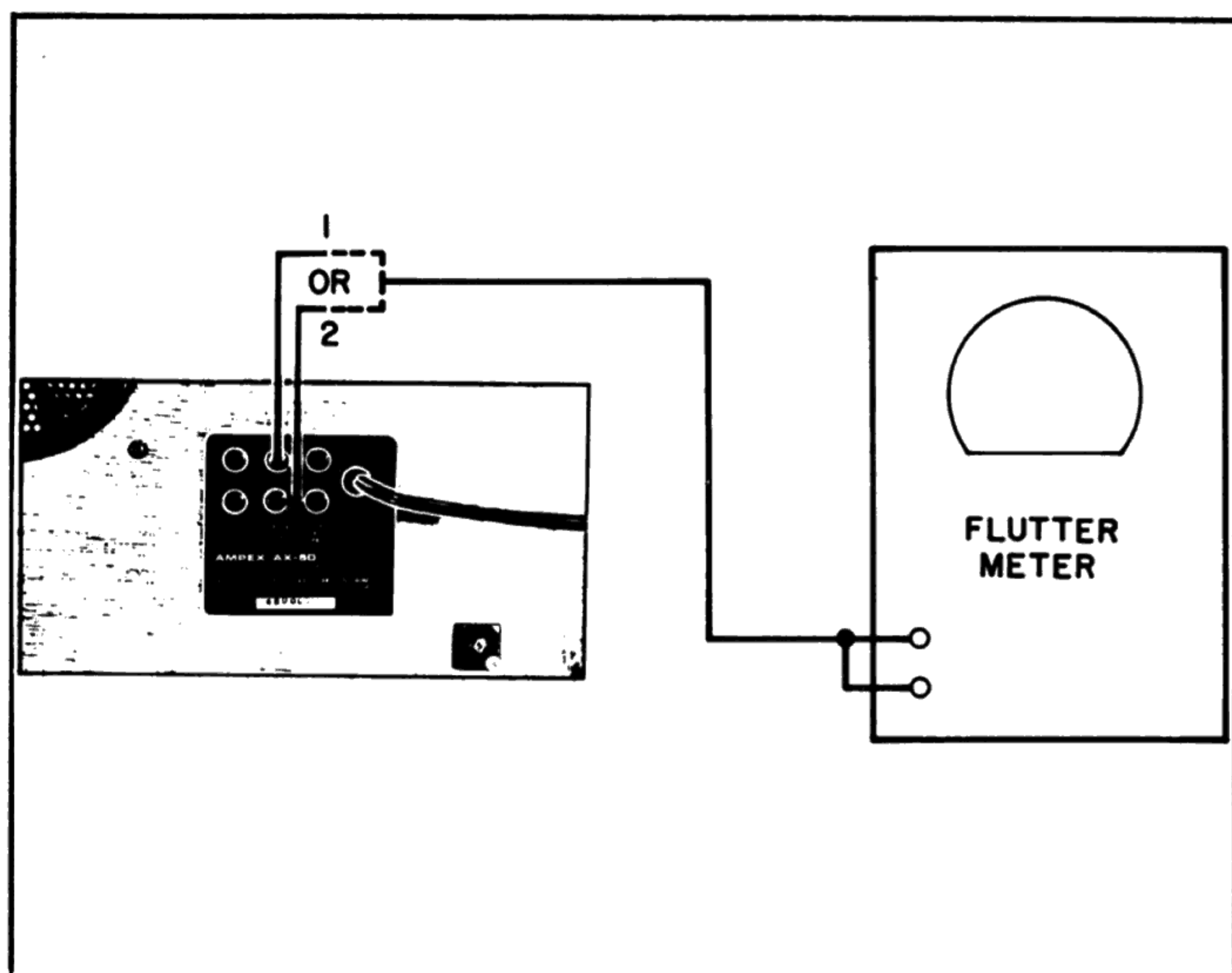


Figure 16. Test Set Up, Flutter

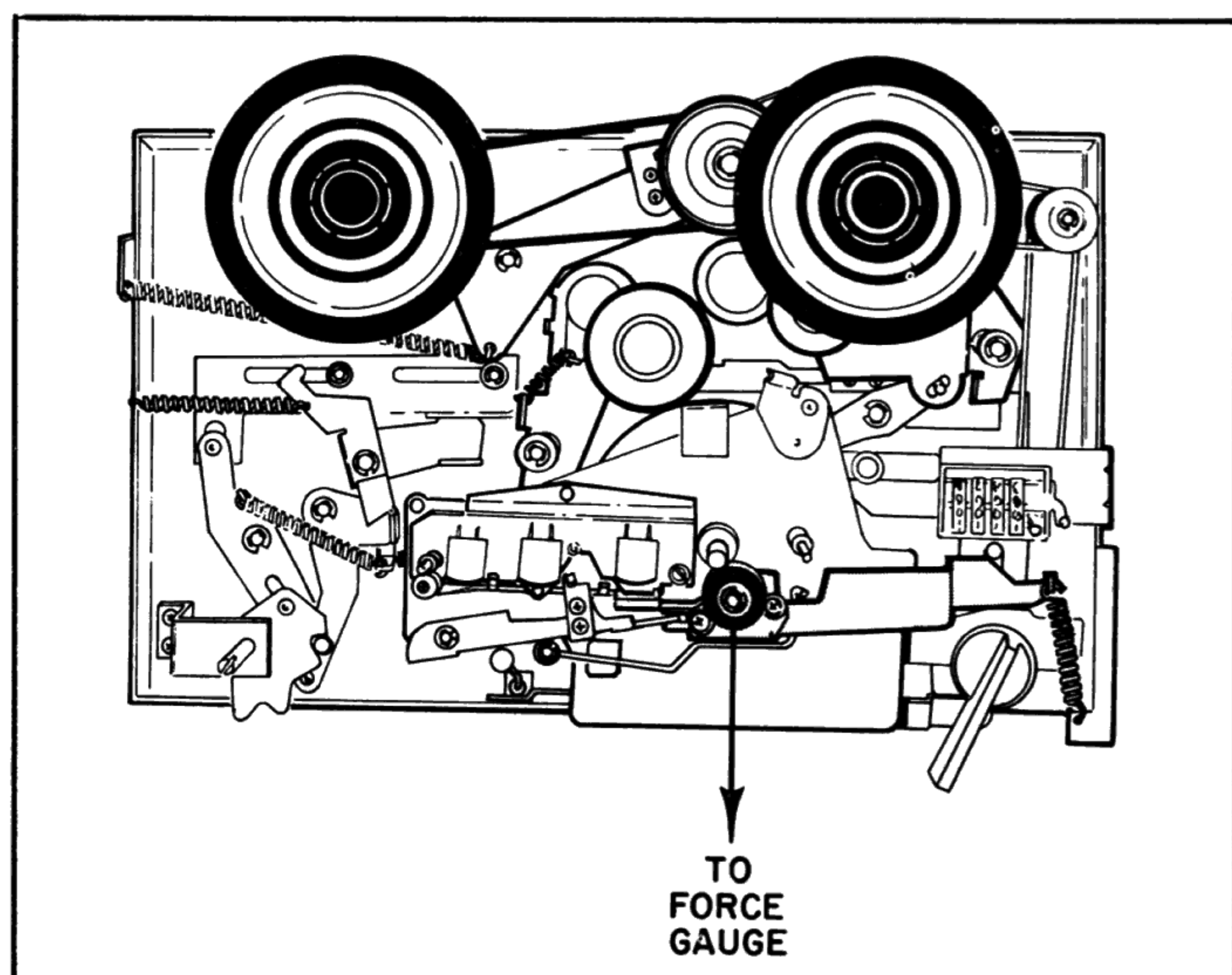


Figure 17. Measuring Pressure Roller Force

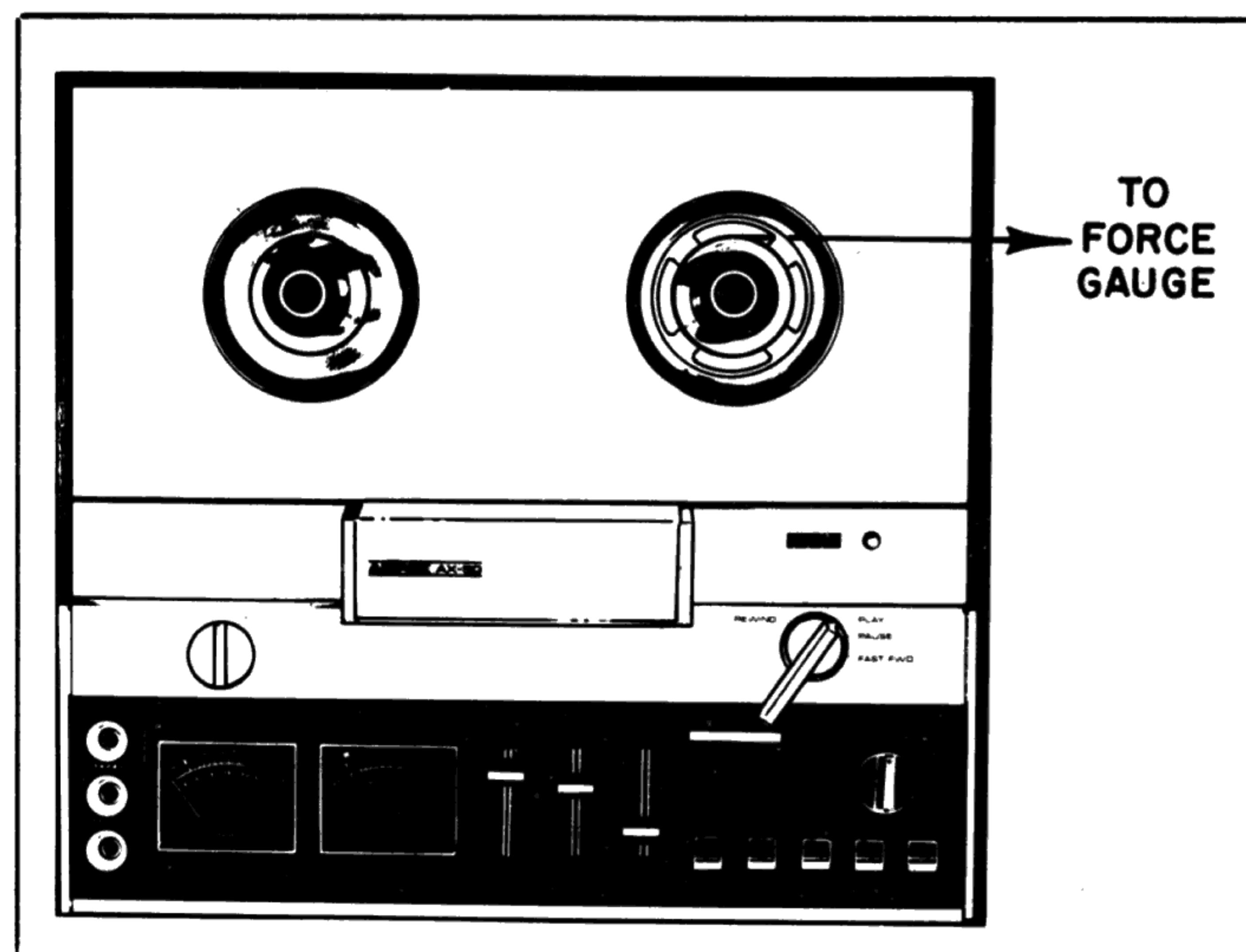


Figure 18. Measuring Take Up Torque

## FLUTTER

1. To check flutter, use AMPEX P/N 31326-01 (7-1/2 ips), P/N 31336-01 (3-3/4 ips) and P/N 31346-01 (1-7/8 ips) test tapes and a flutter meter. DMC model 8155, 8150, 8100 or 8100-W is acceptable.
2. Thread the Flutter Test Tape on the transport.
3. Connect the Flutter Meter to the left or right SOURCE and TAPE OUT jack. Not both.
4. Set the flutter meter selector switch to the NAB unweighted position.
5. Set the flutter meter signal input selector switch to the appropriate line position.
6. Play the test tape at its respective speed.
7. Set the meter range switch so that meter is not pinned and is readable.
8. Read the average of the peak meter excursions, but excluding those peaks which do not recur more than 3 times in 10 seconds.
9. Take readings at random places in the tape pack.
10. Test the unit in vertical and horizontal positions.

### NOTE

If the flutter is notably higher vertically than horizontally, particularly in 1-7/8 ips. See section Capstan Thrust Load Adjustments.

## PRESSURE ROLLER FORCE

Loop a string around the pressure roller shaft under the pressure roller. Using a force gauge pull the string back along a line passing through the pressure roller center and the capstan center. Measure the force required to just lift the pressure roller clear of the capstan. This force should be 1.1 to 1.5 Kgm.

## TAKE UP TORQUE

With the transport in a normal forward direction (play or record mode), take-up torque should be 250 g.cm. with a maximum of 360 g.cm. and a minimum of 150 g.cm.

The amount of take-up torque in this position is controlled by a friction clutch. This clutch is part of the right turntable assembly. The take up pulley (121) slips, at the required torque level, with respect to the felt ring which is bonded to the take up pulley (117). The torque level is controlled by the amount of spring (122) compression, and may be increased by adding washers (124).

If the clutch torque is not smooth or if the clutch is noisy, disassemble and clean (with alcohol) the lower play clutch assembly. Replace any parts indicating high wear. Reassemble and lubricate the bearing in the take up pulley with a



small amount of grease (087-665). Also lubricate the bore and the E ring side of the collar washer (123), spring (122) should not be lubricated. There should be at least one washer (124) between the E-ring (120) and the collar washer.

#### NOTE

The compression load of the play clutch spring (122) also loads the upper clutch spring (118). This upper clutch is used to prevent an overload on the tape during wind start up and rewind braking. See section on Brake adjustment.

To measure take-up torque place a small reel (3" or 5" diameter) with a tape fill of 6 cm. (2.36 inch) diameter. Make a loop on the end of the tape and secure it with a clear adhesive tape. Place the reel on the right (take-up) turntable. Holding the tape loop place the unit in PLAY; pull out a few feet of tape. At about play speed allow the tape to be reeled in while measuring the tension with a spring force gauge in grams. Take up torque in g.cm. is that tension times three.

#### HOLD BACK TENSION

Since the AX-50 has no pressure pads on the heads, proper overall and playback response can only be had by correct hold back tension. Low tension will produce loss of high end frequency response. Very low tension will also cause apparent flutter. High tension will cause speed error and/or speed variations.

Hold back tension should be measured with the trim removed. See Fig. 20.

1. Place a full reel of Ampex Centerline tape (6.8 to 7.0 inch dia.) on the left turntable. Thread the tape through the first tape guide, place the unit in Play.
2. Hook a loop of tape on a force gauge. Smoothly pull some tape from the reel in a direction close to the normal tape path. Note the force; this is the hold back tension.
3. Repeat steps (1) & (2) with a near empty reel (2-1/4 to 2-3/8 inch dia.).

**Hold back tension should be:**

30gm (25gm min.) with a full reel  
50gm (60gm max.) with a near empty reel.

The hold back tension pad (152) contributes most of the hold back by pressing the tape against the tape guide with a force of 35 grams  $\pm$  7 grams.

**If hold back tension is erratic check for**

1. Dirty felt ring (152)
2. Ring not making full or even contact with tape.
3. Left turntable bearing dirty or damaged.

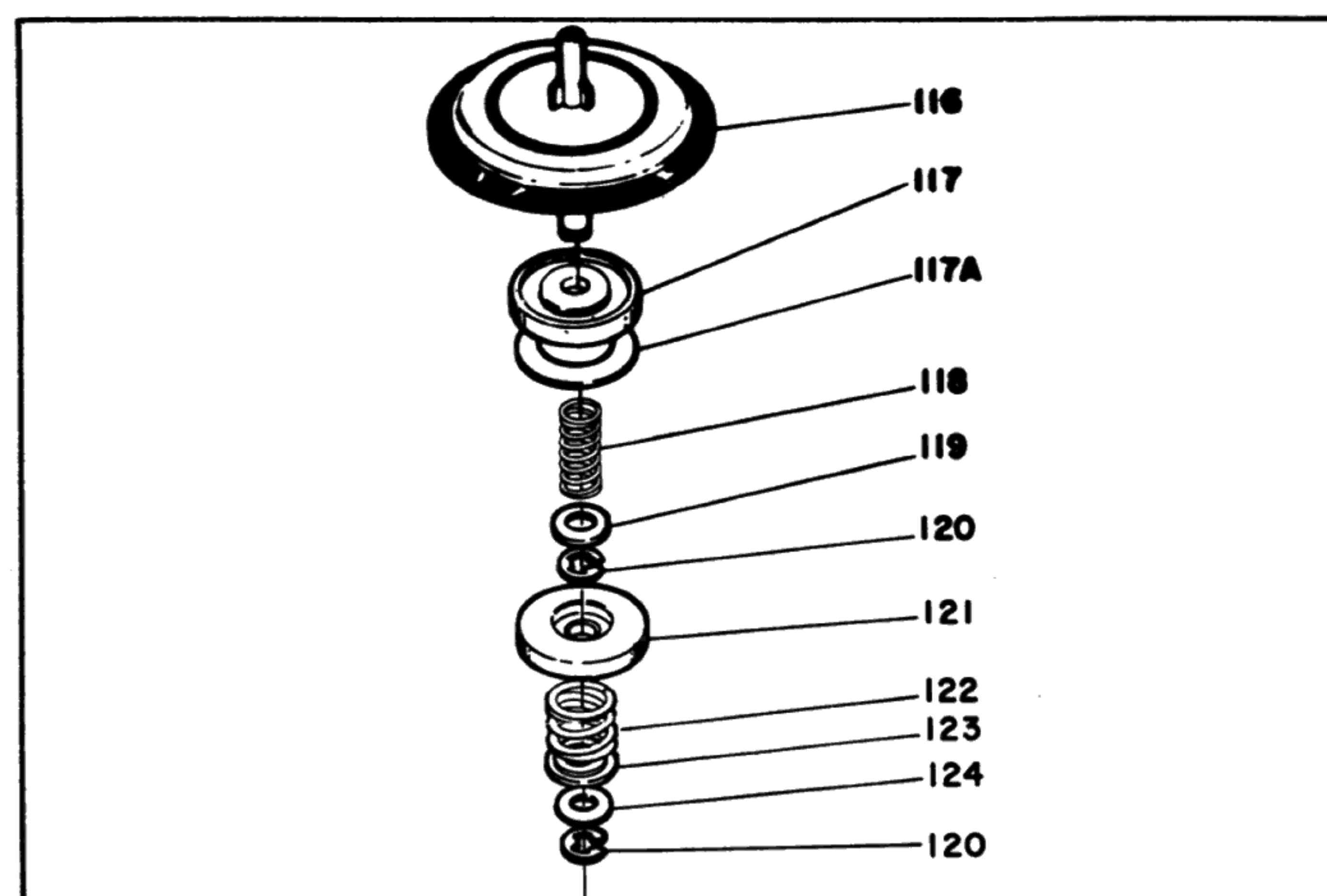


Figure 19. Torque Level Correction

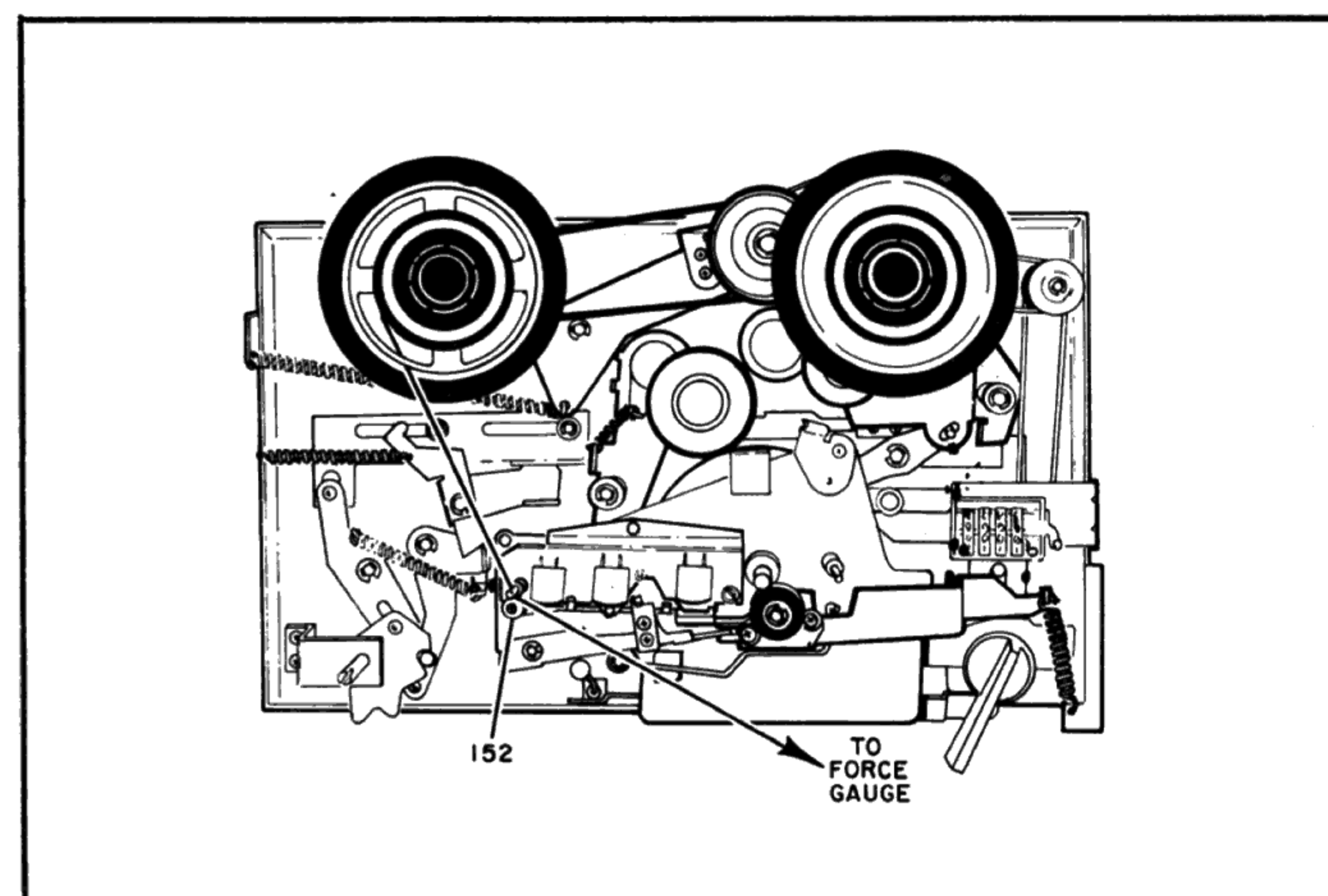


Figure 20. Hold Back Check

4. Rewind belt (170) is damaged.
5. Rewind idler (087) is damaged.
6. Left turntable is eccentric.

#### BRAKING CHECK

Braking torque can be functionally checked by running a full reel of tape:

1. In REWIND, with a full reel on the right turntable, turn selector to stop as soon as the reel comes up to speed; no tape loop should occur. The brakes should effect a stop in less than 2 seconds.
2. In WIND, with a nearly full reel on the right turntable, turn selector to stop (PAUSE) as soon as the reel is up to speed, tape should not stretch or break.
3. Repeat (1) and (2) with full reel on left turntable.

Maximum Braking torque, as controlled by the clutches, should not exceed 90 g.cm. for safe tape handling.

The braking surfaces are cork filled rubber and plastic. If braking is low these surfaces should be cleaned with alcohol and allowed to dry. If braking is still low check to see if the braking surface of the brake arm (069 & 071) is making uniform contact with the cylindrical plastic surface. Carefully reform or replace the arm if contact is poor.



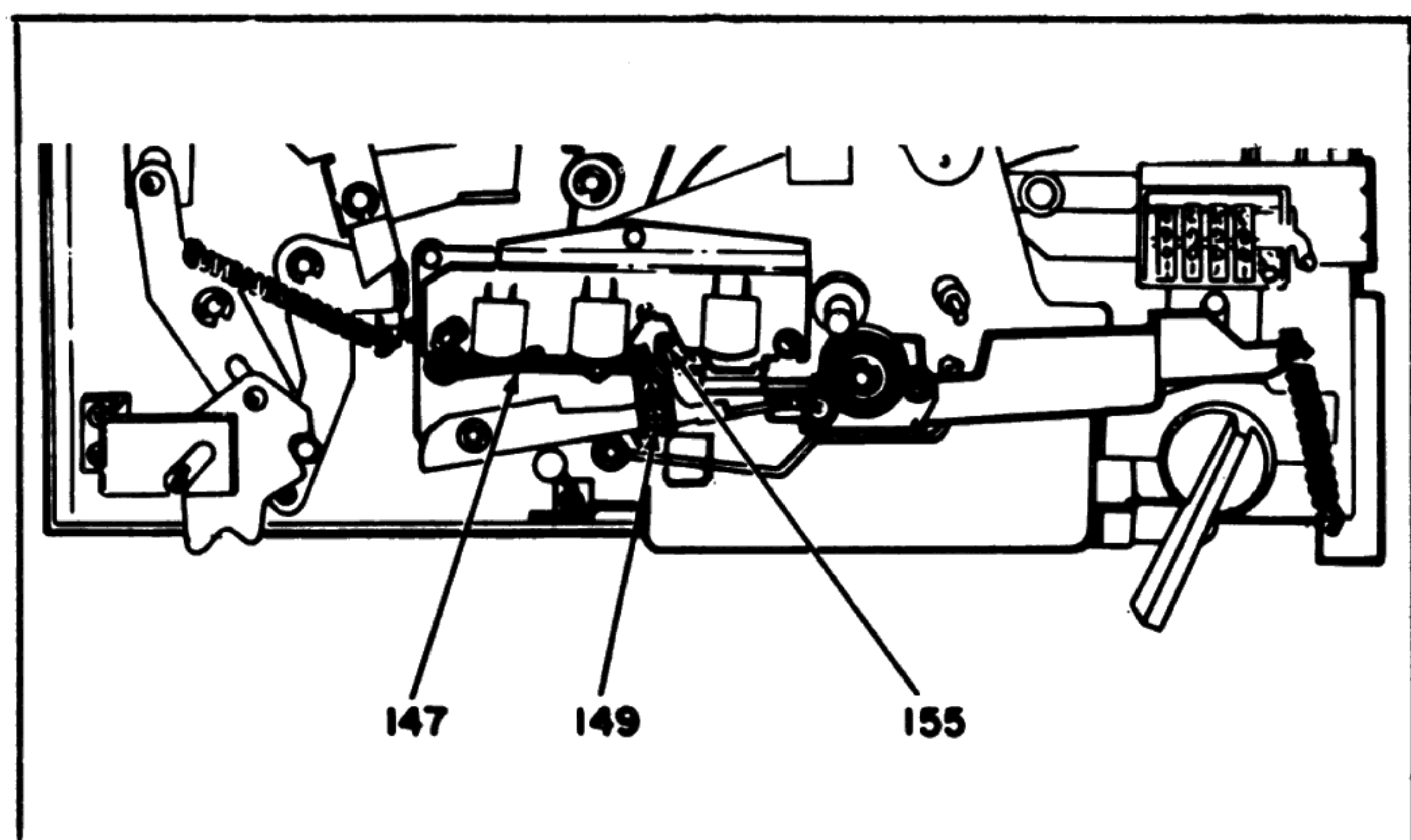


Figure 21. Tape Lifter Adjustment

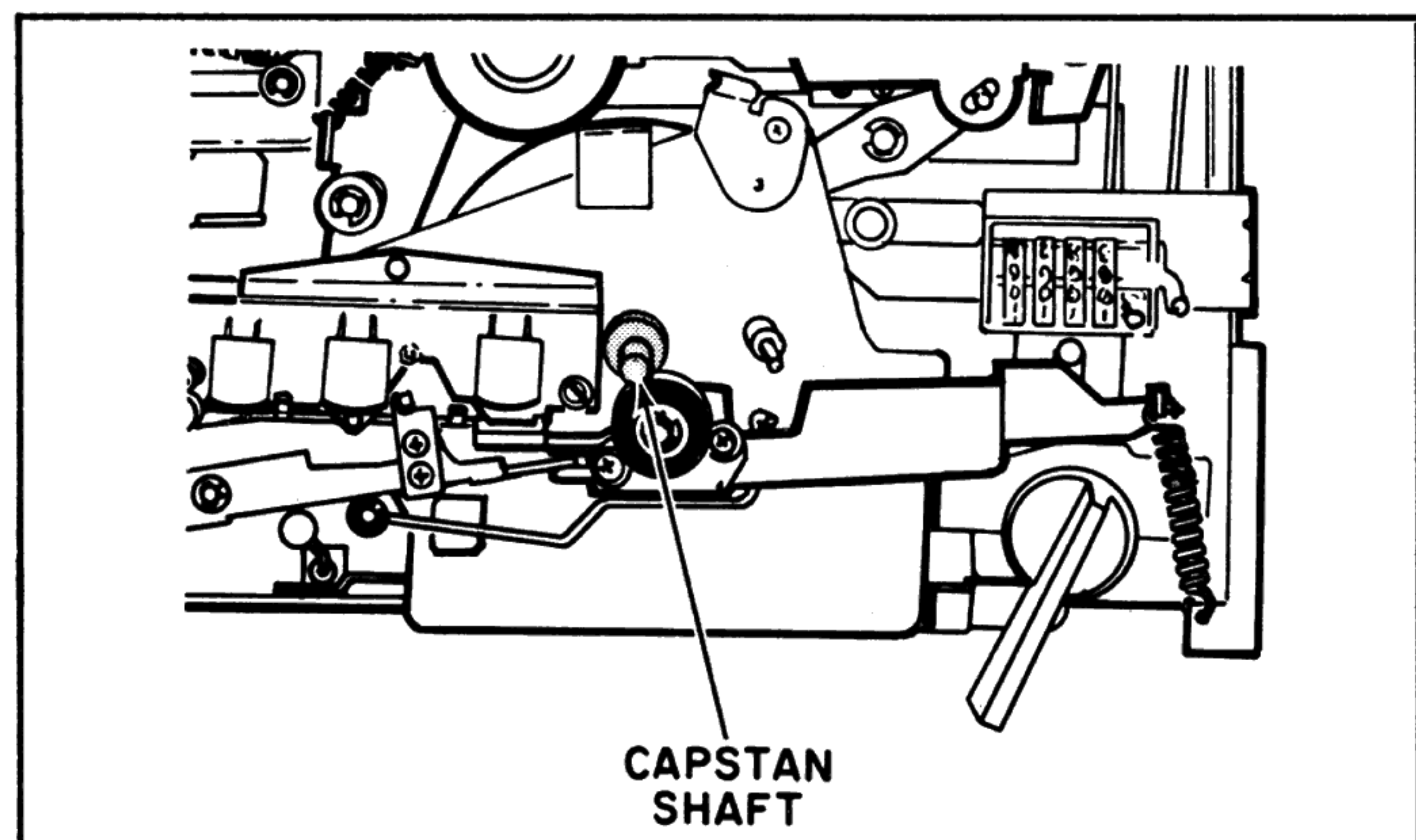


Figure 22. Capstan Shaft Adjustment

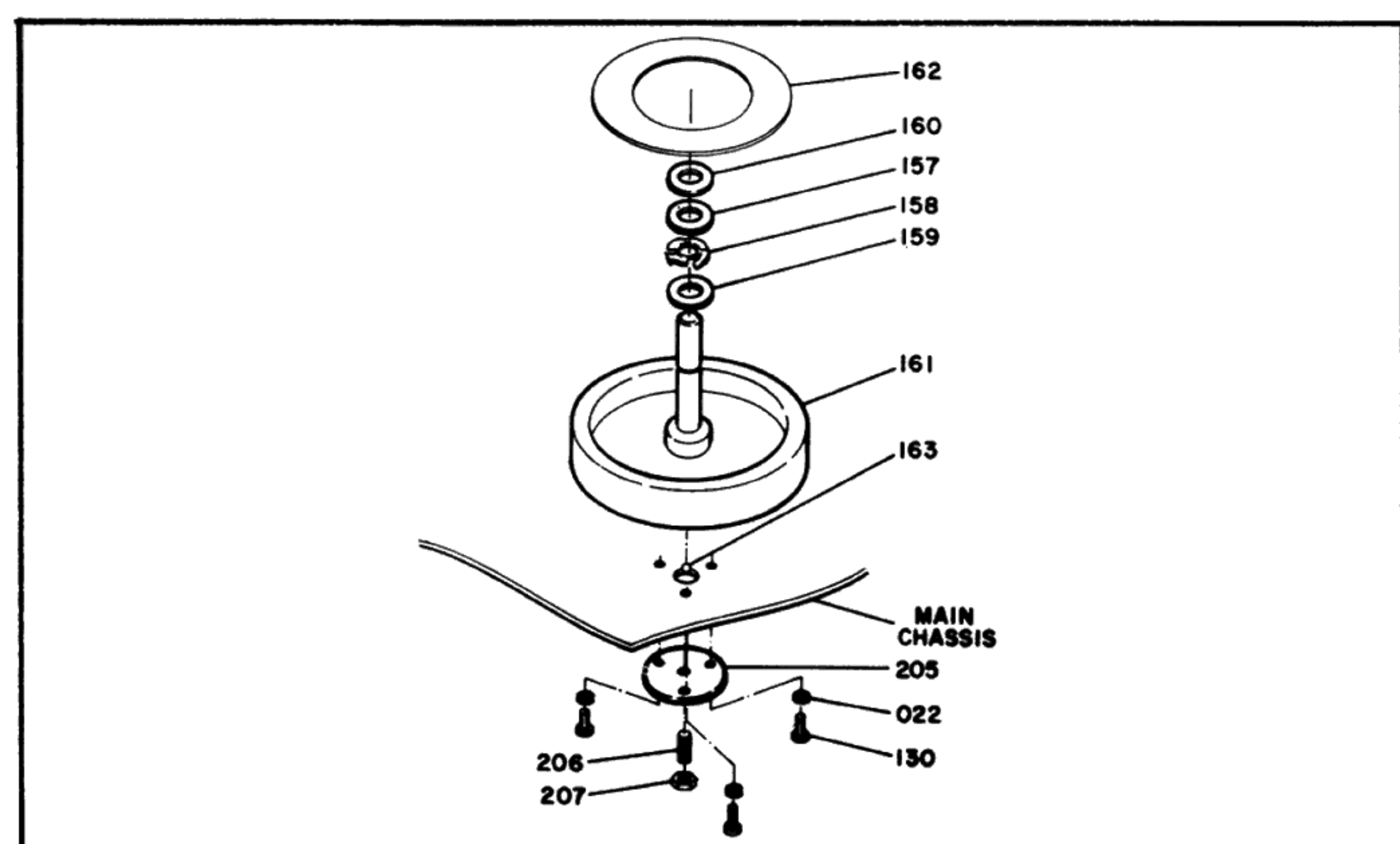


Figure 23. Capstan Parts Location

## TAPE LIFTER ADJUSTMENT

The tape lifter plate (147) alignment is adjustable. The fingers should be parallel to head faces in PLAY. This can be adjusted by turning the screw (155) located on the lifter plate assembly between the record and reproduce heads. See Fig. 21. Misadjustment of this screw causes unequal levels between channels.

The lifter plate is also adjustable for proper tape wrap on the heads. To change the tape wrap loosen the mounting screws (149), one at a time, and move the lifter plate assembly in or out of the tape path as required. When the assembly position is moved it must be realigned for parallelism.

The fast wind lifter mounted on the shifter arm (156) is also adjustable in position. It should be adjusted in the PLAY mode so that it is about 0.030 inch above the tape path. This adjustment can be made by loosening the mounting screws and sliding the lifter to the proper position. It should also be parallel to the head faces, if it is not reform the finger.

## CAPSTAN SHAFT THRUST LOAD ADJUSTMENT

The capstan shaft is axially loaded with a special spring washer (158), its compression is adjustable by a screw (206) on the back of the baseplate. Loosen the lock nut (207) and turn the screw until the spring load can be felt on the capstan shaft by pulling it. The shaft should have no unloaded play, however, the spring must not be compressed solid with no play. The screw should be adjusted between these two extreme conditions. If it cannot be so adjusted, or if when properly adjusted, the flutter is noticeably higher in the vertical position than in the horizontal position, remove the flywheel assembly. Check the condition and arrangement of parts see Fig. 23 for proper position. Thrust surfaces should be lubricated with grease 087-665.

## LUBRICATION

Generally the unit should not require lubrication unless the parts are replaced or contaminated. If lubricated surfaces should become contaminated they should be carefully cleaned with solvent, alcohol for plastic or rubber, naptha for metal parts. Lubricants to be used are:

- |   |   |
|---|---|
| 1. Multipurpose Grease<br>#087-665<br>Molykote BR2S                   | To be used, lightly, on all cams, slides, pivots and thrust surfaces.   |
| 2. Silicone Grease<br>#087-623<br>Dow Corning #33<br>Medium Viscosity | To be used, lightly, on turntable shafts (49 & 50) and head cover mounting bushings in head cover casting (24). |
| 3. Turbine Oil<br>#087-671<br>Standard Non-pariel                     | To be used, lightly, in all sintered bronze bearings i.e., idlers, capstan, motor, and counter bearings.        |

Table 2. Lubrication