213

SERVICE MANUAL

AKAI TAPE RECORDER

MODEL 4000D

213

TABLE OF CONTENTS

I. SPECIFICATIONS

STYLE	:	Portable
WEIGHT	:	25.3 lbs (11.5 kg)
DIMENSIONS	:	11-7/8"H x 15-3/4"W x 5-1/2"D (300H x 400W x 140D mm)
POWER SUPPLY	:	AC 100 to 240V, 50/60 Hz
RECORDING SYSTEM	:	Inline 4-track stereo, monaural recording.
TAPE SPEED	:	2 speeds .....7-1/2 ips and 3-3/4 ips (19 and 9.5 cm/s)
TAPE SPEED DEVIATION	:	Less than ±3% at all tape speeds.
WOW AND FLUTTER	:	Less than 0.15% R.M.S. at 7-1/2 ips. Less than 0.20% R.M.S. at 3-3/4 ips.
FREQUENCY RESPONSE	:	30 to 22,000 Hz ± 3 db at 7-1/2 ips. 30 to 14,000 Hz ± 3 db at 3-3/4 ips.
S/N RATIO	:	Better than 50 db
DISTORTION (TOTAL HARMONICS)	:	Within 2% at 1,000 Hz "0" VU Recording
CROSS-TALK	:	Less than −65 db (Monaural) Less than −40 db (Stereo)
INSULATION RESISTANCE	:	More than 50M. ohms.
INSULATION DURABILITY	:	AC 1,000V for more than one minute
ERASE RATIO	:	Less than −70 db for all tracks.
POWER CONSUMPTION	:	30 VA
EQUALIZATION	:	Correct equalization for playback of tapes recorded to the NAB curve.
FAST FORWARD AND REWIND TIME	:	180 seconds using 1,200 foot tape at 50 Hz. 150 seconds at 60 Hz.
LINE OUT-PUT LEVEL	:	1.228V (0 VU) at 1,000 Hz "0" VU recorded tape used.
LINE OUT-PUT IMPEDANCE	:	1.5K. ohms
DIN OUT-PUT LEVEL	:	250 mV (−10 VU at 600 ohms load)
STEREO HEADPHONE'S OUT-PUT LEVEL	:	30−40 mV (Impedance−8 ohms)
LINE INPUT LEVEL	:	50 mV
LINE INPUT IMPEDANCE	:	330K ohms
DIN INPUT LEVEL	:	20 mV
DIN INPUT IMPEDANCE	:	100K ohms
MIC. INPUT LEVEL	:	0.5 mV
MIC. INPUT INPEDANCE	:	30K ohms
MONITOR SYSTEM	:	With REC/PLAY Monitor Switch at "Playback" – Can be monitored the recorded signals from the playback head by using { Stereo Headphone / External Amplifier With REC/PLAY Monitor Switch at "Record" – Can be monitored the program being recorded by using { Stereo Headphone / External Amplifier
MOTOR	:	Induction motor Revolution : 1,450 R.P.M. at 50 Hz 1,740 R.P.M. at 60 Hz Condenser capacity : 2.5 MF at 50 Hz 2.0 MF at 60 Hz
HEADS RECORDING HEAD	:	Inline 4-track stereo and monaural. Impedance : 120 ohms at 1,000 Hz
PLAYBACK HEAD	:	Inline 4-track stereo and monaural. Impedance : 1,200 ohms at 1,000 Hz
ERASE HEAD	:	Inline 4-track stereo Impedance : 300 ohms at 60 KHz
RECORD LEVEL INDICATOR	:	Vertical indication model "A" VU meter
TRANSISTOR USED	:	2SC650-Ⓑx2, 2SC281-Ⓑx4, 2SC458-Ⓑx2 } Record Amp. 2SC650-Ⓐ, Ⓑ x4, 2SC281-Ⓑx4 } Playback Amp. 2SC696-Ⓙx1 } Bias Oscillator
SILICON DIODE USED	:	SW-05-01 x 2
GERMANIUM DIODE USED	:	1N-34A x 2
REELS USED	:	7", 5", 3" reels

II. MEASURING METHOD

TAPE SPEED DEVIATION

1. Method involving use of pre-recorded tape.

Playback on the tape recorder to be tested tape pre-recorded at 1,000 Hz ± 0.1% for measuring tape speed deviation. Connect the appropriate output to a frequency counter meter in order to measure the tape speed deviation from the resulting deviation of the measured frequency.

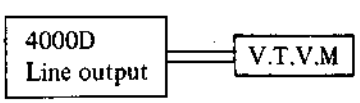
2. Method involving use of timing tape (designed for tape speed measurement).

This method utilizes a timing tape marked at intervals of 7-1/2". The running time of the tape over 60 marked section is measured in order to calculate the deviation of the tape speed. In application of this method, however, it should be born in mind that the timing tape stretch or contract, measurement error is inevitable, so that it is necessary to measure the total length of the tape in advance.

WOW AND FLUTTER

Playback the 3,000 Hz pre-recorded tape whose wow and flutter level is guaranteed to be smaller than 0.07% for measurement by means of a wow meter. It is also possible for a 3,000 Hz sine wave to be recorded and played for measurement by means of the wow meter. In this case, however, the wow meter indicates a value as much as twice the value given in the specification on the first page.

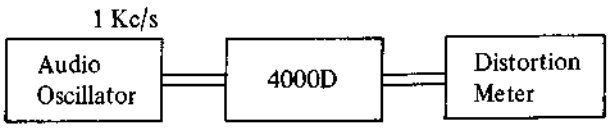
SIGNAL TO NOISE RATIO



Set the Equalizer Switch on "7-1/2" ips position and playback a tape containing a 250 Hz sine wave recorded at "0" VU level on a standard recorder. Connect a V.T.V.M. to the line output jack of the recorder and measure its output.

Then remove the tape and measure the noise level under the same condition. Convert into decibels each of the measured values.

TOTAL HARMONIC DISTORTION FACTOR



Connect the measuring instrument as shown above, and record the 1,000 Hz sine wave at "0" VU. Playback the resultant signal and measure the overall distortion factor. Measure the noise level of the tape recorder with the tape removed ; connect the audio oscillator directly to the distortion meter for measurement of the distortion factor of the oscillator.

The required distortion factor may be obtained from the results of the above measurement by the following formula.

$$d_0 = d - d_1 - d_2$$

where, d_0=Required
d =Overall distortion factor
d_1=Noise level
d_2=Distortion factor of the oscillator

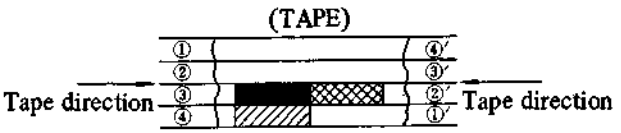
(Note : New tape of particularly good quality should be used for measurement of the distortion factor).

POWER OUTPUT

Playback a tape containing a sine wave of 250 Hz recorded at "0" VU on a standard recorder.

Connect a V.T.V.M. to the line output jack of the recorder and measure the voltage at the output of the recorder to be tested.

CROSS-TALK (Cross-talk between the tracks)

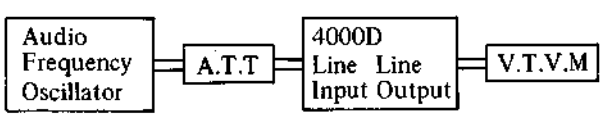


As shown in the figure, first record a 1,000 Hz sine wave on track No. 3 at + 3 VU level. Next, remove the 1,000 Hz input signal and record under a non-input condition.
Then, playback the tape on track No. 3 and No. 1 (reversed condition of tape) through the 1,000 Hz B.P.F. (Band Pass Filter, Sensitivity .... 1:1) and obtain a ratio between the two from the following formula.

$$C = 20 \log \frac{E_0}{E_2 - E_1} \text{ (db)}$$

C =Desired cross-talk ratio (db)
E_0=1,000 Hz signal output level
E_2=1,000 Hz cross-talk output level
E_1=No-input signal record level

FREQUENCY RESPONESE



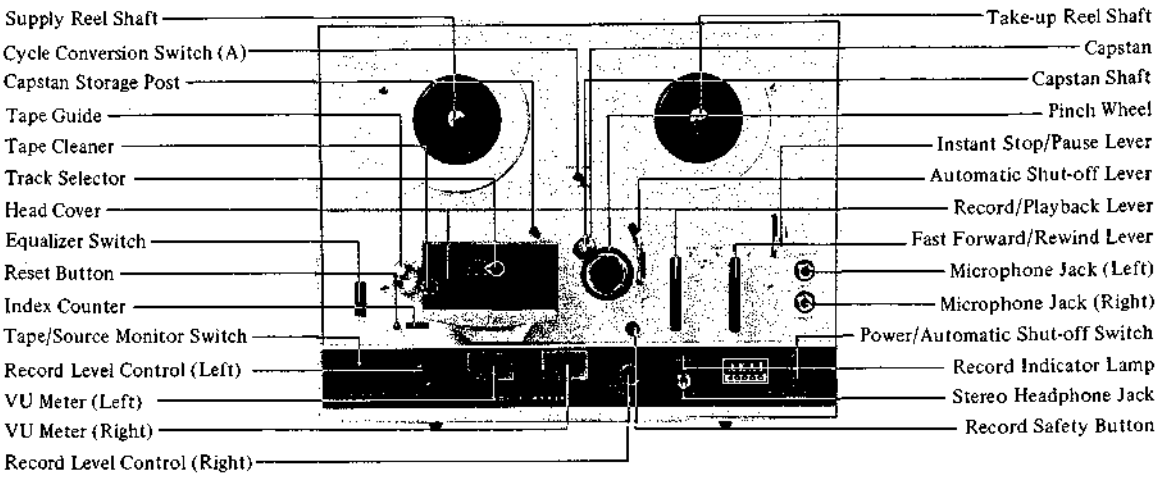
Connect the measuring instrument as in the above diagram, and measure the frequency response in the following sequence :
RECORD :

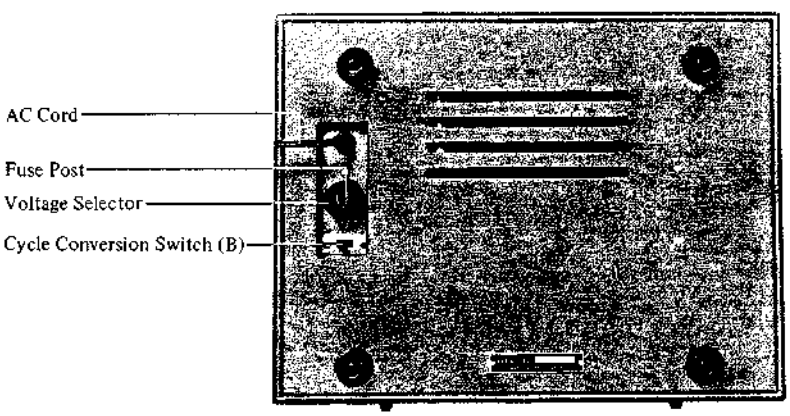
1) Give a sine wave of 1,000 Hz to the Line Input of the recorder to be tested through an attenuator from an audio frequency generator.
2) Set the Record/Playback Monitor Switch to "Rec." position and adjust the line input volume so that the VU meter needle indicates "0" VU.
3) Under the condition described in (2), lower the input level 16 db by means of the attenuator.
4) Record the spot frequency in the range of 30 to 25,000 Hz from the audio frequency generator.

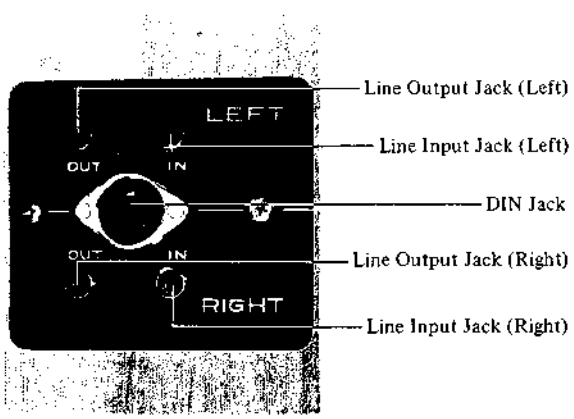
PLAYBACK :

5) Set the Record/Playback Monitor Switch to "Play" position.
6) Set the Equalizer Switch on 7-1/2 or 3-3/4 position.
7) Connect a V.T.V.M. to the Line output. (V.T.V.M. with Millivolt Scale)
8) Playback the tape previously recorded.
9) Adjust the output level to "0" dbm at 1,000 Hz as indicated on the V.T.V.M. by the range selector of a V.T.V.M.
10) Playback the recorded spot frequencies with the conditions in (9) ; make a memo of output level and plot the value on a graph.

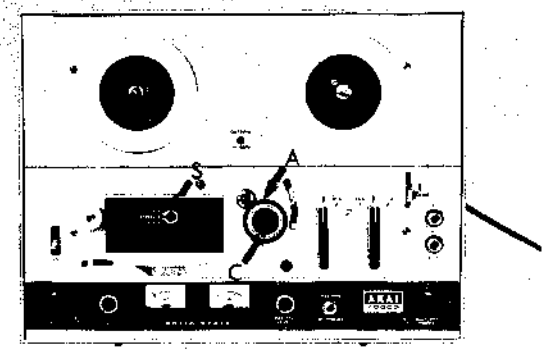
III. LOCATION OF CONTROLS



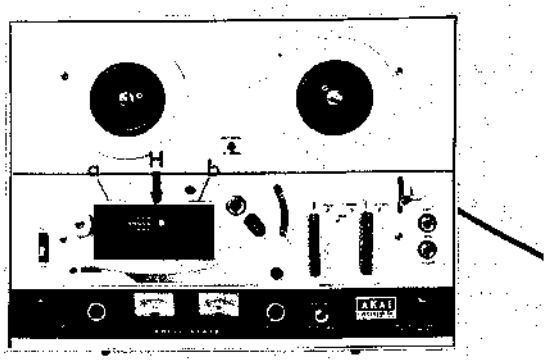




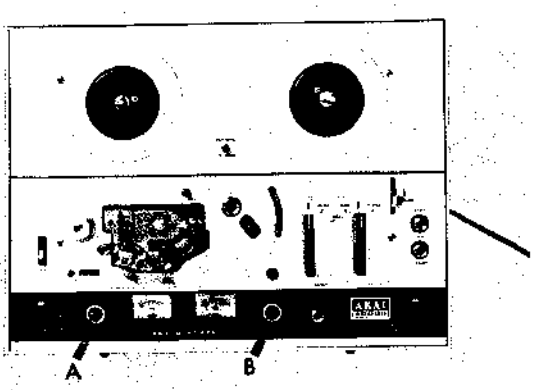
IV. DISASSEMBLY OF TAPE TRANSPORT UNIT & AMPLIFIERS



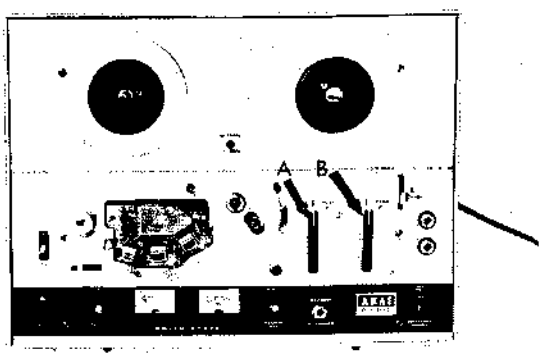
(1) Loosen the Pinch Wheel Cap (C) and remove the Pinch Wheel (A) by hand. Loosen the Retaining Screw using a Philips head screw driver and remove the Track Selector Knob (S) by hand.



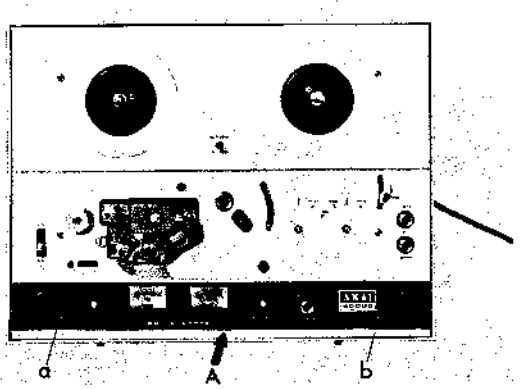
(2) Loosen the Retaining Screws ((a) and (b)) of the Head Cover (H) using a Philips head screw driver and remove the Head Cover by hand.



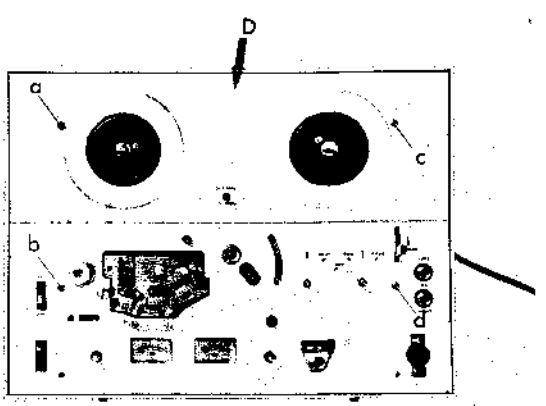
(3) Loosen the Retaining Screws of the Record Level Knobs ((A) and (B)) by using a Philips head screw driver and remove the Knobs by hand.



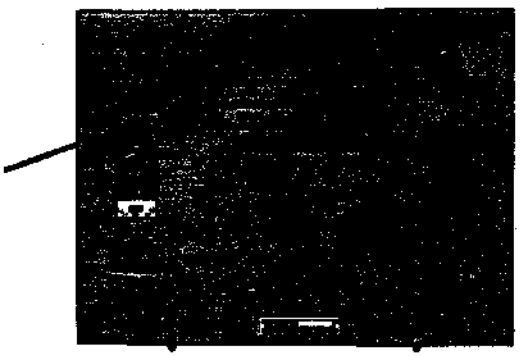
(4) Loosen the Retaining Screws ((a) and (b)) of the Deck Control Knobs ((A) and (B)) by using a Philips head screw driver and remove the Knobs by hand.



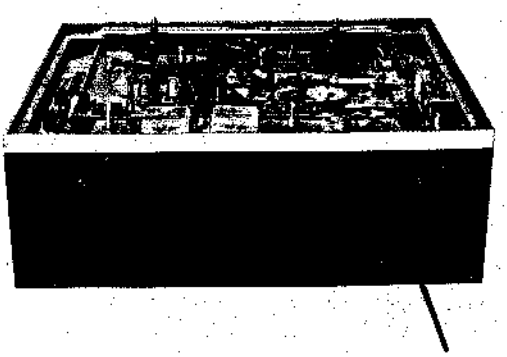
(5) Loosen the Screws ((a) and (b)) by using a Philips head screw driver and remove the Amplifier Panel (A) by hand.



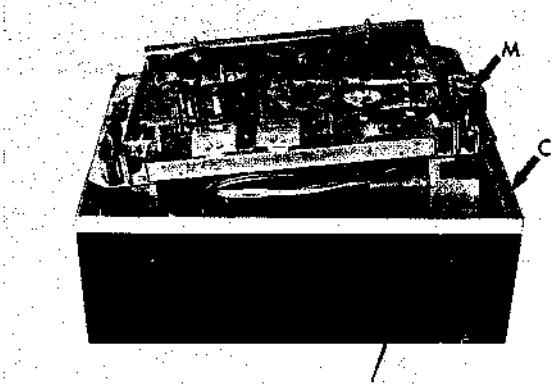
(6) Loosen the Screws (marked from (a) to (d)) by using a Philips head screw driver and remove the Deck Panel (D) by hand.
Then, any front mechanism control adjustment is now accessible.



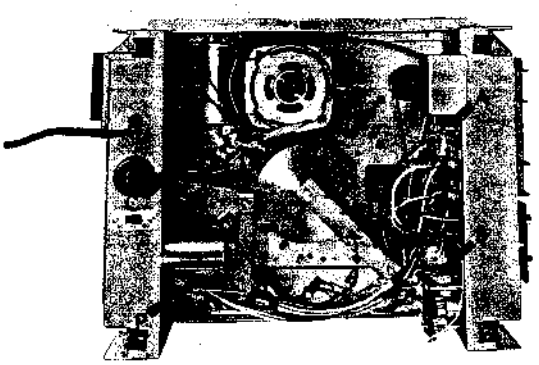
(7) Loosen the Screws (marked from (a) to (d)) by using a Philips head screw driver and remove the Rubber Feet (marked (A) to (D)).



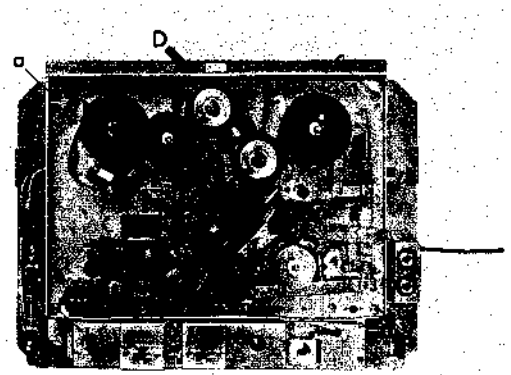
(8) Loosen the Screws ((a) and (b)) by using a Philips head screw driver.



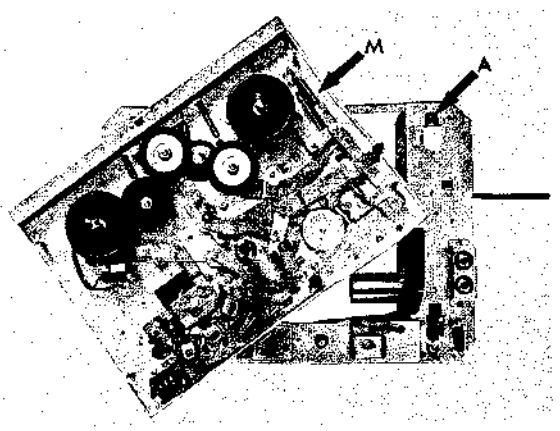
(9) Remove the Tape Transport Mechanism and Amplifier Assemblies (M) by slowly lifting it from the Case (C) as shown in picture.



(10) Disconnect the Plugs (marked (A) to (C)) and Record/Playback Conversion Pin (P) carefully by hand.



(11) Loosen the Screws (marked from (a) to (d)) of the Deck Frame (D) by using a Philips head screw driver.



(12) Separate the Tape Transport Mechanism Assembly (M) from the Amplifier Assembly (A) carefully by hand.

V. TRANSPORT MECHANISM

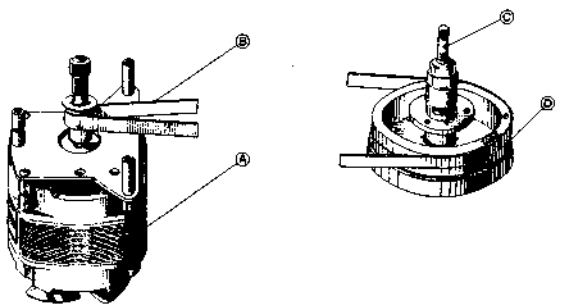


Fig. 1

DRIVING OF CAPSTAN

Figure 1.

Ⓐ Motor
Ⓑ Driving Belt (flat belt)
Ⓒ Capstan
Ⓓ Flywheel

High-speed rotation of *Motor* Ⓐ is reduced by *Driving Belt* Ⓑ and transmitted to Capstan Ⓒ, which is connected of flywheel with ample inertia and enables rated rotation by absorbing minor rotation distortion of motor itself.

Capstan Rotation : 227 R.P.M.
Motor Rotation : 1450 R.P.M. at 50 Hz
1740 R.P.M. at 60 Hz

DRIVING OF PINCH WHEEL

Put tape between rotating capstan and pinch wheel and push pinch wheel against capstan, this will transport the tape at rated speed. The appropriate pressure of pinch wheel is between 1,000 to 1,150 grams at the tape speed of 7-1/2" (19 cm) per second.

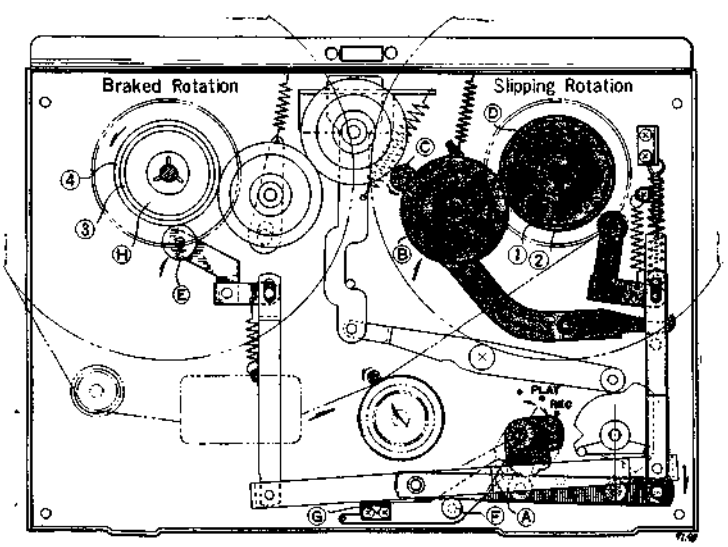


Fig. 2

RECORDING AND PLAYBACK

Turn the *RECORD/PLAYBACK KNOB* Ⓐ to "PLAY" position, and pinch wheel presses against capstan to move tape at the rated speed. At the same time, *Idler* ⓑ moves between *Motor Bushing* Ⓒ and the *Take-Up Reel Spindle* Ⓓ to transmit *the motor rotation to* Ⓓ so that the tape is moved and wound on the take-up reel.

The Take-up Reel Spindle Base is made up of two plastic rollers (1 and 2) with a clutch felt in between. The Idler is rotating *the plastic roller* ② under. Therefore, the tape-winding friction is adjusted by the slipping of the felt to enable rated winding of the tape.

On the other hand, *the Supply Reel Spindle* Ⓗ has *a Brake Roller* Ⓔ hung on the Plastic Roller ④ under which provides appropriate back tention by the clutch felt slipping to the rotation of the Pulley ③ above.

To prevent accidental erasure, *the Record Interlock Button* Ⓕ must be depressed before the RECORD/ PLAYBACK KNOB can be moved to the "REC" position. The *Safety device* Ⓖ is depressed to enter the record mode.

(See figure 2)

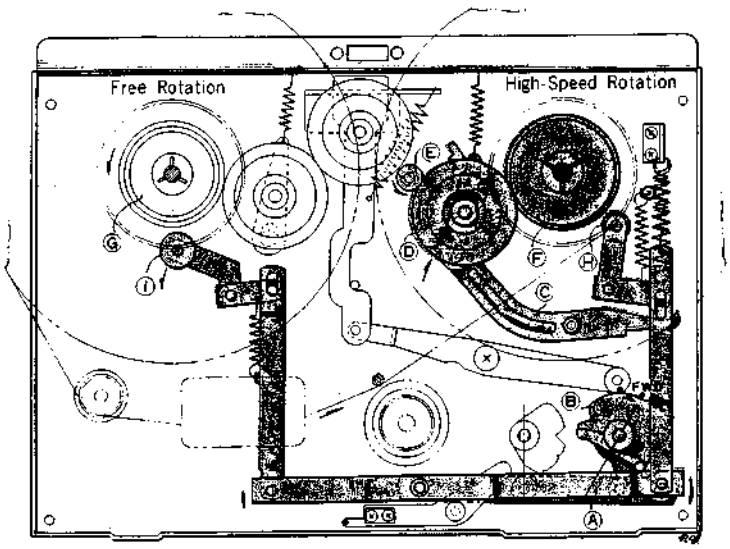


Fig. 3

FAST-FORWARD MECHANISM

Turn *the FAST FWD-REWIND knob* Ⓐ to "FAST FWD" position, and *the cam* Ⓑ under the knob pushes up *the Lever* Ⓒ. *The Idler* Ⓓ moves into the space between *the Plastic Roller* Ⓕ above the Take-Up Reel Spindle and the upper part of the rotating motor drive bushing to transmit the motor rotation to the take-up reel spindle. At the same time, *Brake Rollers* Ⓗ and Ⓘ come off the reel spindle to free *the Supply Reel Spindle* Ⓖ, thereby allowing fast winding of the tape onto the take-up reel.
(See figure 3)

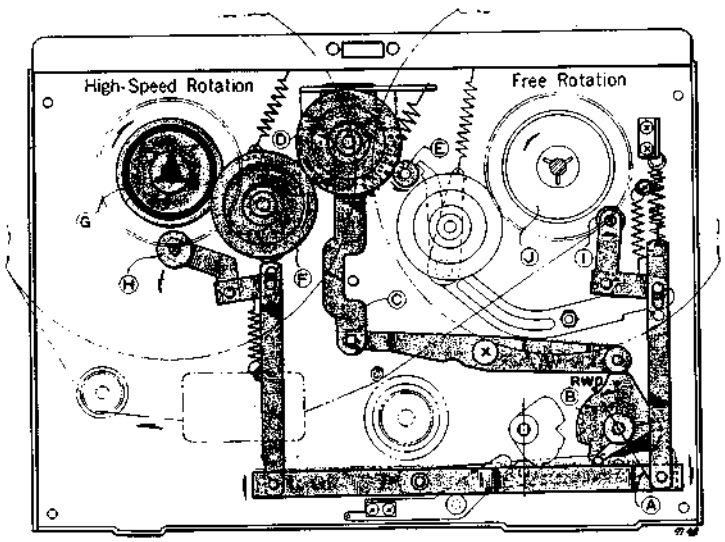


Fig. 4

REWIND MECHANISM

Turn *the FAST FWD-REWIND knob* Ⓐ to "REWIND" position, and *the cam* Ⓑ under the knob pushes *the Lever* Ⓒ up. *The Idler* Ⓓ moves into the space between the upper part of the rotating *Motor drive bushing* Ⓔ and *the Intermediate Pulley* Ⓕ to transmit the high-speed rotation of the motor through the intermediate pulley to *the Supply Reel Spindle* Ⓖ. At the same time, *Brake Rollers* Ⓗ and Ⓘ come off the reel spindle to free *the take-up reel spindle* Ⓙ, thereby rewinding the tape into the supply reel at a fast speed. (See figure 4)

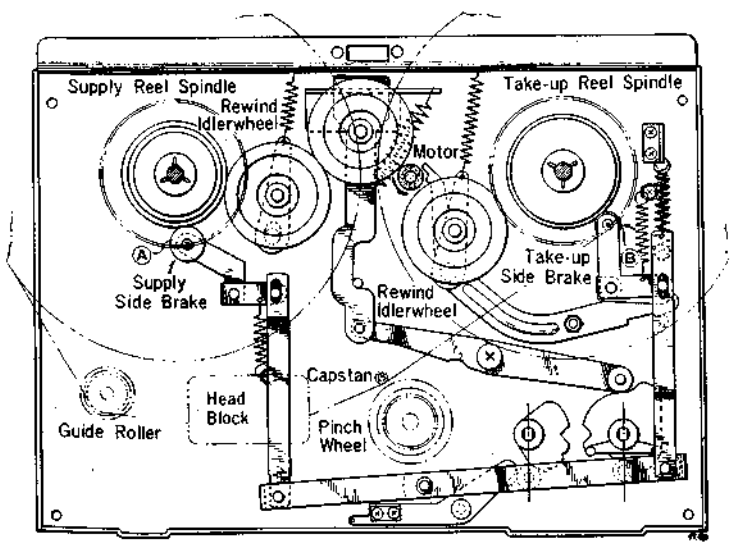


Fig. 5

STOP CONTROL

Push the stop lever to "STOP" position, *Brake Rollers* Ⓐ and Ⓑ depress reel spindles to stop rotation of the reel spindles.
As the brake rubber depresses the plastic rollers under the reel spindles, no friction works on the tape itself.

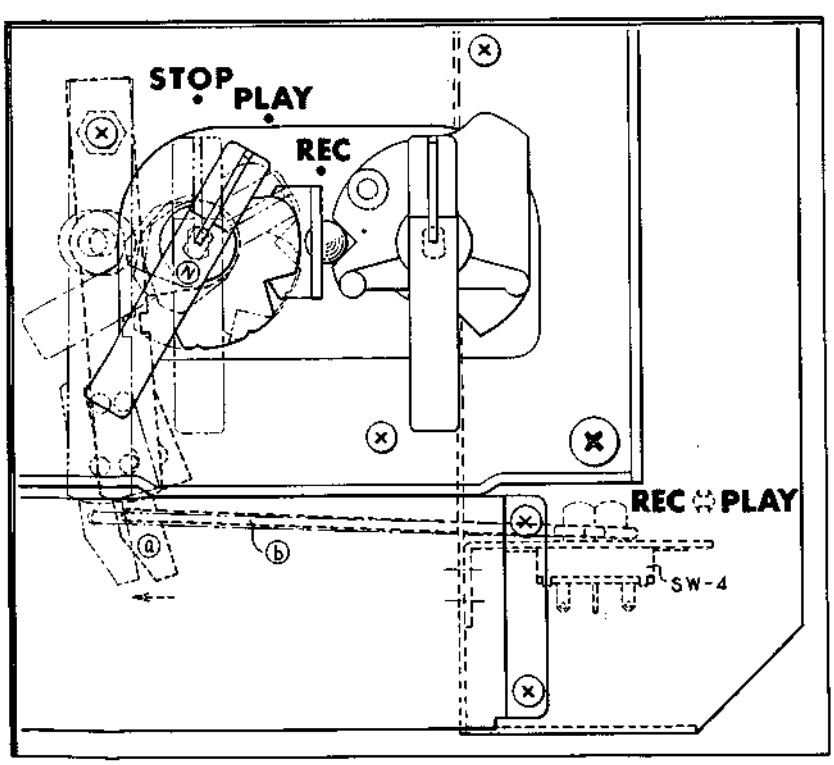
Modes of Operation	Pinch Wheel	Take-up Idler Wheel	Rewind Idler Wheel	Take-up Side Brake	Supply Side Brake
(a) STOP	X	X	X	O	O
(b) FAST-FORWARD	X	O	X	X	X
(c) REWIND	X	X	O	X	X
(d) RECORDING PLAYBACK	O	O	X	X	O

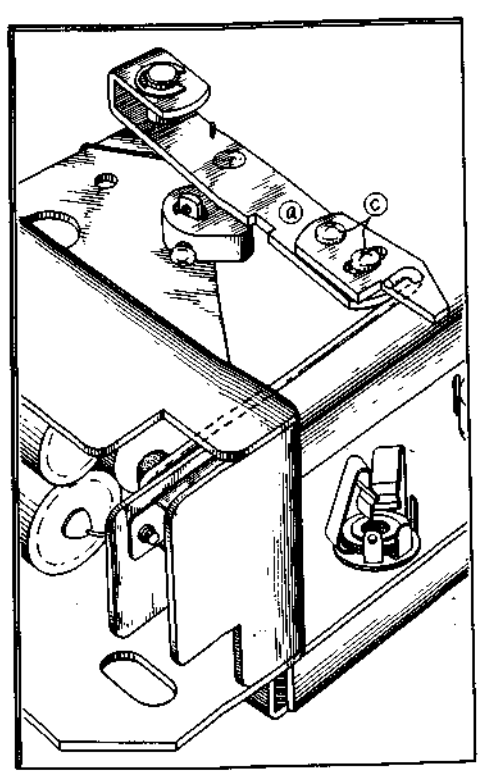
NOTES : X-marks indicates "open" and
O-marks "engaged"

RECORD/PLAYBACK CHANGING MECHANISM

By turning the Record/Playback Knob Ⓝ to the recording position, the Lever ⓐ pushes the Recording Lever ⓑ, as illustrated in dotted line, then the Record/Playback Changing Switch (SW-4) turns to recording position.

If the Lever ⓐ does not push the Lever ⓑ properly, the SW-4 does not operate properly so, may occur the abnormal oscillation and also can't record. Then must adjust the Lever ⓐ to proper position by loosing the Screw ⓒ





VI. MECHANISM ADJUSTMENT

1. ADJUSTMENT OF PINCH WHEEL

It is important that the pinch wheel shaft is kept in complete alignment with the capstan shaft. A proper pinch wheel pressure is between 1,000 and 1,150 grams when the unit is operated at the tape speed of 7-1/2 ips. Any deviation from this specification will result in wow and flutter. Check pinch wheel pressure by a spring scale, and if necessary, adjust the pinch wheel load spring.

2. ADJUSTMENT OF TAKE-UP IDLER WHEEL

The take-up idler wheel must be kept in complete alignment with the take-up reel shaft. When the unit is set in fast forward condition, the idler wheel will contact to the upper knurled wheel of the take-up reel shaft assembly, and it will contact to the lower knurled wheel during record or play mode. Adjust idler wheel load spring so that the idler wheel pressure is kept between 50 and 80 grams. The idler wheel rapidly wears if the pressure is excessive. The slippage occurs if the pressure is smaller than the specification.

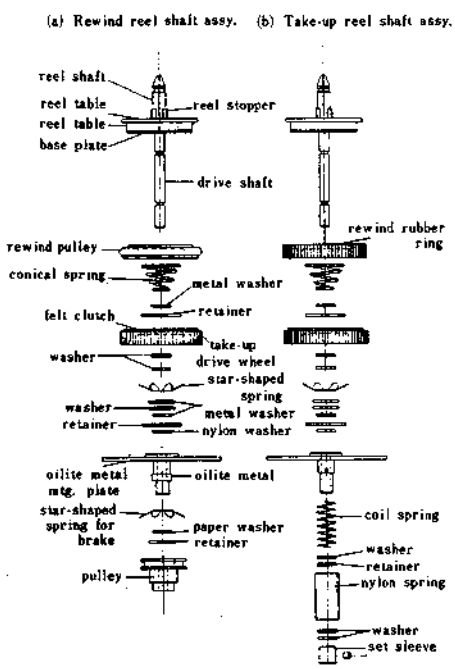


Fig. 1

3. ADJUSTMENT OF REWIND IDLER WHEEL

The rewind idler wheel must be kept in complete alignment with the rewind reel shaft. The amount of pressure to the knurled motor bushing should be maintained about 50 grams during rewind operation. Adjust both the idler load spring and rewind roller.

4. ADJUSTMENT OF INTERMEDIATE WHEEL

The intermediate wheel is located between the rewind idler wheel and the rubber ring which is used on the upper part of the supply reel shaft assembly. When the unit is set in rewind mode, it will contact to these parts simultaneously delivering torque of motor. An adequate pressure is 50 grams. Adjust the load spring of the intermediate wheel if the pressure is not sufficient.

5. ADJUSTMENT OF TAKE-UP REEL SHAFT ASSEMBLY

A felt clutch material is attached to the bottom side of the reel table base plate so that recording tape will not be stretched during fast forwarding operation due to excessive tension. To check the amount of friction of this part, place a 5-inch reel with recording tape wound by 60 m/m in diameter, and gently pull the end of tape upward using a spring scale. Adjust the conical spring so that the amount of tension at this part will be kept between 400 to 500 grams. Another felt clutch material is attached to the take-up drive wheel. It is to provide proper slipping operation during record or play mode. The procedure for checking friction of this part is same as the foregoing, and between 150 and 180 grams of friction will provide the best result. Adjust the star-shaped spring just under the take-up drive wheel. When the unit is set in rewind mode, the amount of friction of this part will greatly be reduced and will become 15 to 20 grams. Check to see whether this is satisfactory or not. If not, readjust the star-shaped spring for Brake, and spring retainer washed accordingly. (See figure 1 ⓑ at left.)

6. ADJUSTMENT OF SUPPLY REEL SHAFT ASSEMBLY

A felt clutch material is used between the lower side of the reel table base plate and the rewind rubber ring to protect recording tape from an excessive tension while rewinding operation. To check the amount of friction of this part, place onto the supply reel table a 5-inch reel with recording tape wound by 60 m/m in diameter and gently pull the end of tape upward by a spring scale. Adjust the conical spring so that the amount of tension is kept between 400 and 500 grams. Another felt clutch is attached to the rewind drive wheel to provide proper slipping operation during record or play mode. The procedure for checking friction of this part is same as the foregoing, and between 80 and 110 grams of friction will give the best result. When the unit is set in fast forward mode, the amount of friction will greatly be reduced and will become 15 to 20 grams.

Check to see whether this is proper, if not, readjust coil spring and spring retainer washer. (See figure 1 ⓐ at left.)

7. ADJUSTMENT OF HEAD

Since adjustment of the Heads critically affects tape recorder performance, it is essential that Heads be carefully adjusted with precision measuring equipment and a suitable recorded tape.

(A) Adjustment of Head Height (See figure 2 and 3)

a. Erase Head
Adjust the height of the Erase Head by turning the height control screws ⓐ, ⓐ′ as the upper edge of the tape passes through until it is just 0.125-0.15 mm under the top edge of the CH-1 erase head's core.

b. Recording Head
Adjust the height of the Recording Head by turning the height control screws ⓑ, ⓑ′ as the upper edge of the tape passes through in the same way as the top edge of the CH-1 recording head's core.

c. Playback Head
Adjust the height of the Playback Head by turning the height control screws ⓒ, ⓒ′ as the upper edge of the tape pass through in the same way as the top edge of the CH-1 playback head's core.

(B) Adjustment of Vertical Azimuth of the Head
Adjust the vertical azimuth of each head (erase, record and playback) by turning the height control screws ⓐ to ⓒ′ until the tape contacts each head properly.

(C) Adjustment of Head Alignment

a. Playback Head
Playback an Ampex Alignment tape (8000 Hz) at 7-1/2" tape speed and turn the alignment control screw ⓕ until the out-put level of both channels reaches the maximum.

b. Recording Head
At recording position, give 8000 Hz sine wave at a −10 db recording level from an Audio Frequency Oscillator to the Line Input of the 4000D, and set the Rec./Play Monitor Switch to "Playback" position.
Then turn the alignment control screw ⓔ until the out-put level of both channels reach the maximum.

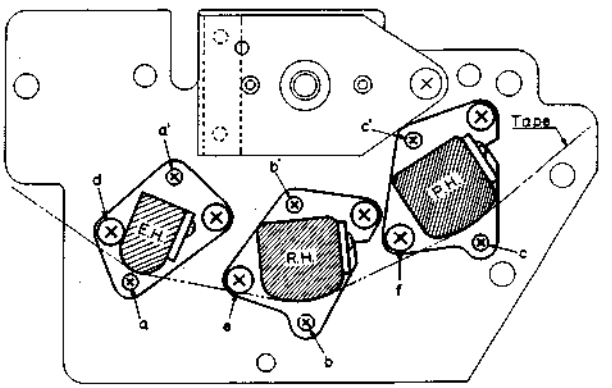


Fig. 2

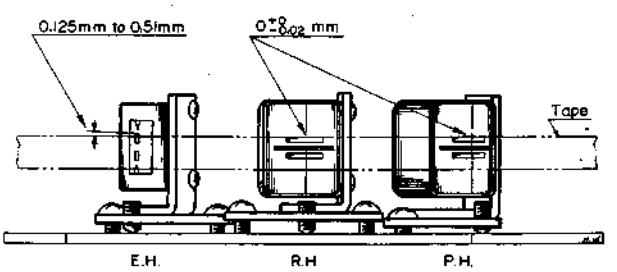


Fig. 3

VII. AMPLIFIER ADJUSTMENT

1. ADJUSTMENT OF RECORDING BIAS FREQUENCY

a) Connect the resistor (10 Ω or 50 Ω) in series with the bias head, and connect the signal from the resistor to the vertical input of the oscilloscope.
The output of the audio frequency oscillator should be connected to the horizontal input of the oscilloscope.
Proper Bias frequency of the recorder 4000D is obtained when the oscilloscope displays a circular or linear waveform with the frequency of the audio frequency oscillator in the neighbourhood of 60 kc/s.
The frequency of the bias oscillator circuit can be adjusted by converting the value of the condenser (C401 5,300 PF).

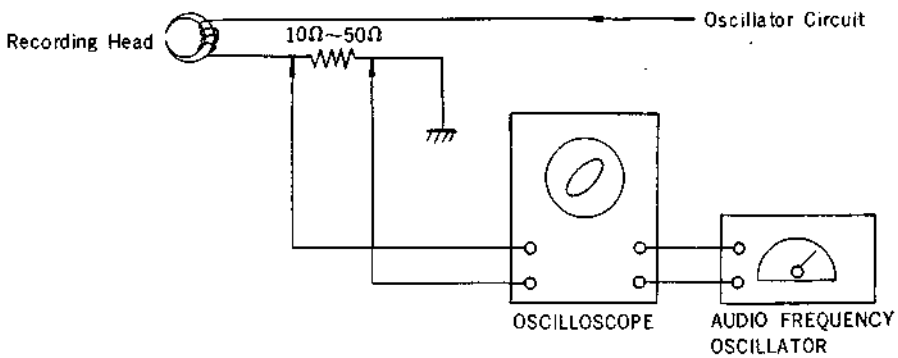


Fig. 1

2. ADJUSTMENT OF RECORDING BIAS VOLTAGE

Connect the V.T.V.M. to the point (A) or (B) and adjust the recording bias voltage by turning the Variable Capacitor C-301, 302 (130 PF) until it reads between AC5 and 10 Volts.

Note : There is no way of adjusting the erasing bias voltage, but the correct bias voltage is between AC 23 and 33 Volts.

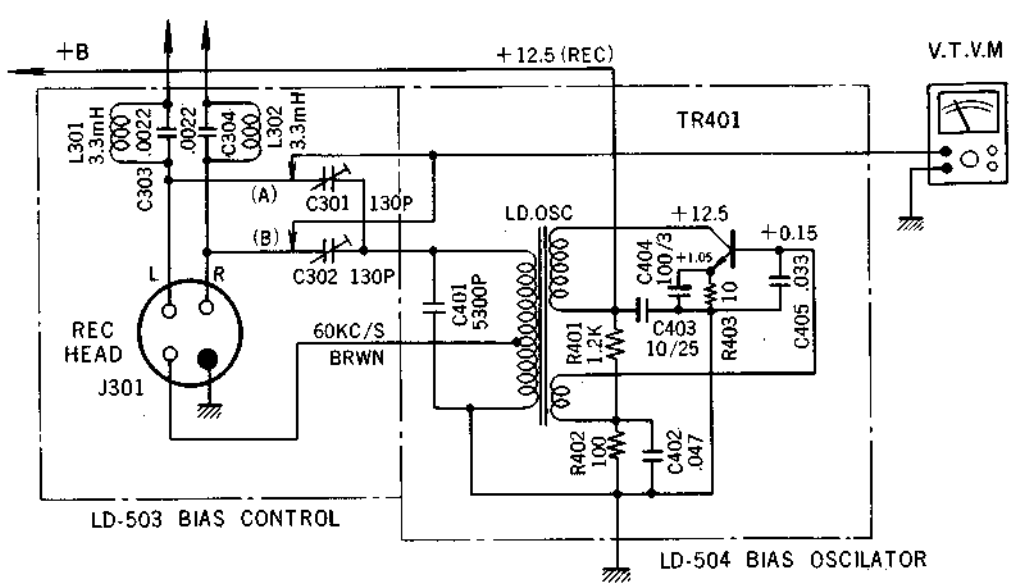


Fig. 2

3. ADJUSTMENT OF LINE OUTPUT LEVEL

1. Playback (See Fig. 3)
   a. Set the Rec./Play Monitor Switch to "Playback" position and the Equalizer Switch to 7-1/2.
   b. Connect V.T.V.M. (use one with Milli-Volt scale) to the Line Output Jack.
   c. Playback the test tape (250 Hz "0" VU recorded) at 7-1/2 ips tape speed and turn the volume VR-201 (20 KB) until the Line Output level reaches "0" VU 1.228 V (+4 dB).

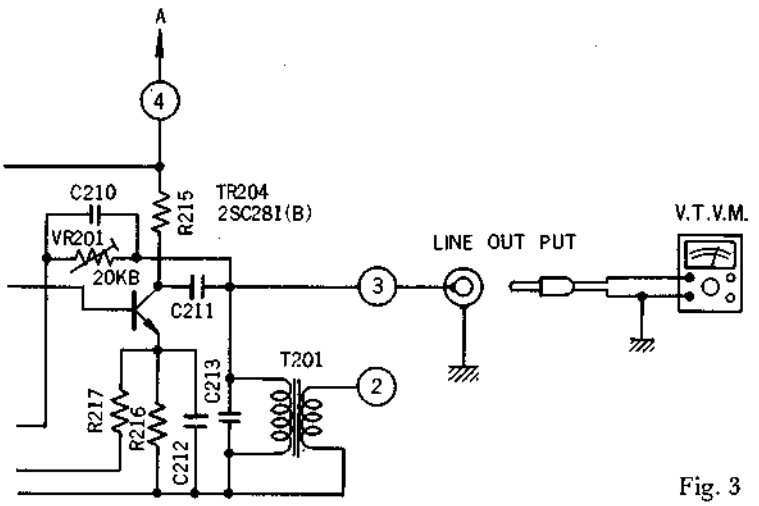


Fig. 3

2. Recording and Playback (See Fig. 4)
   a. Connect V.T.V.M. to the Line Output Jack.
   b. Set the Rec/Play Monitor Switch to "Record" position and the Equalizer Switch to 7-1/2.
   c. Put on a Scotch-150 blank tape and set the Record/Playback Knob to the recording position.
   d. Feed in a 1,000 Hz sine wave signal from an Audio Frequency Oscillator to the Line Input of the 4000D and turn the Recording Level Volume Control (10 KA) until the Line Output Level reaches "0" VU 1.228 V (+4 dB).
   e. Set the Rec/Play Monitor Switch to "Playback" position and turn the Recording Level Volume Control again until the Line Output Level reaches "0" VU.
   f. Set the Rec/Play Monitor Switch to "Record" position again and turn the Volume Control VR-ld (2 KB) until the Line Output Level reaches "0" VU.
   g. Repeat 2 times in the same way as indicated in items e. and f. above.

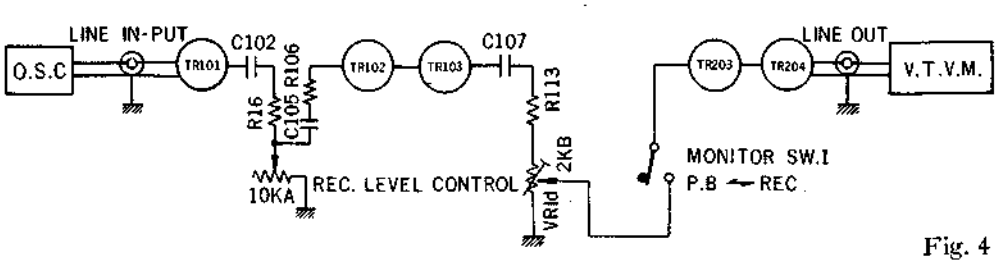


Fig. 4

VIII. MAINTENANCE PROCEDURES

1. LUBRICATION INSTRUCTION

For maximum service life and optimum performance, lubricate the parts identified below after each 500 hours of operation. Use only light machine oil of good quality.

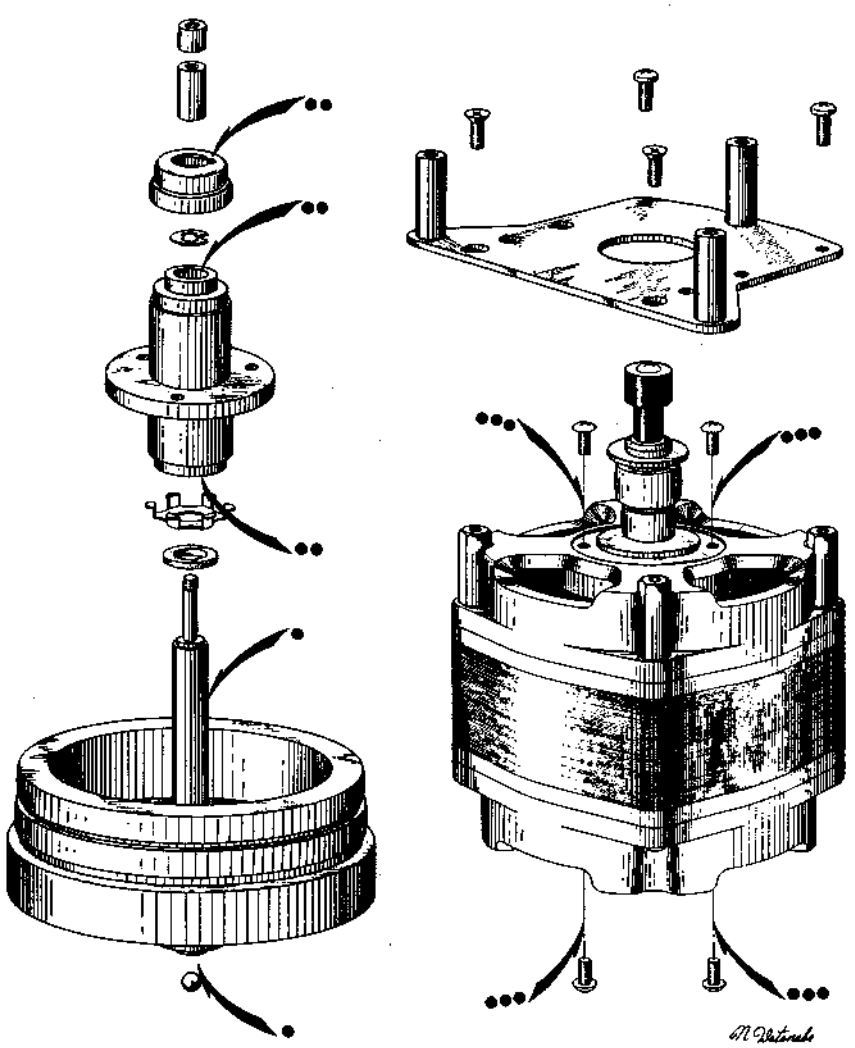
Motor	
Flywheel Assembly	
Rewind Idler Wheel and Wind Take-Up Idler	1 drop
Intermediate Idler	1 drop
Pinch Wheel	1 drop

Also apply a liberal film of light machine grease to each roller surface of all levers and cames.

CAUTION : DO NOT OVER-LUBRICATE, AND WIPE OFF EXCESS OIL BY A COTTON SWAB SOAKED IN ALCOHOL. OTHERWISE, THE OVER-FLOWED LUBRICANT MAY BE SCATTERED DURING OPERATION. THE RUBBER COMPONENT PARTS WILL BE DETERIORATED.

2. CLEANING TAPE HEADS AND OTHER PARTS

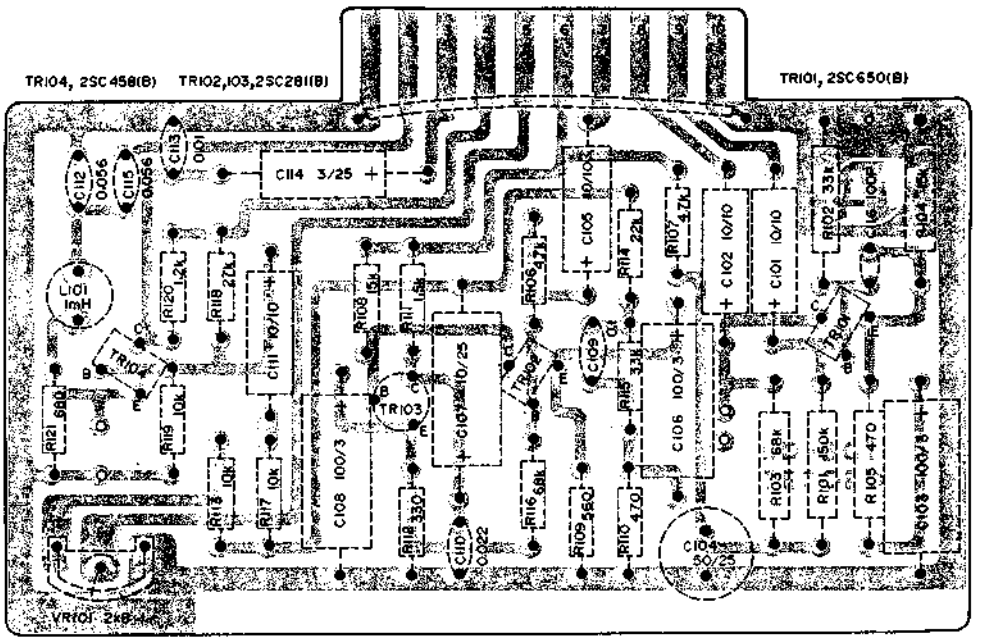
Wipe surface of tape heads, guide roller bearing, capstan bushing and pinch wheel periodically with a soft cloth soaked in alcohol or carbon-tet.



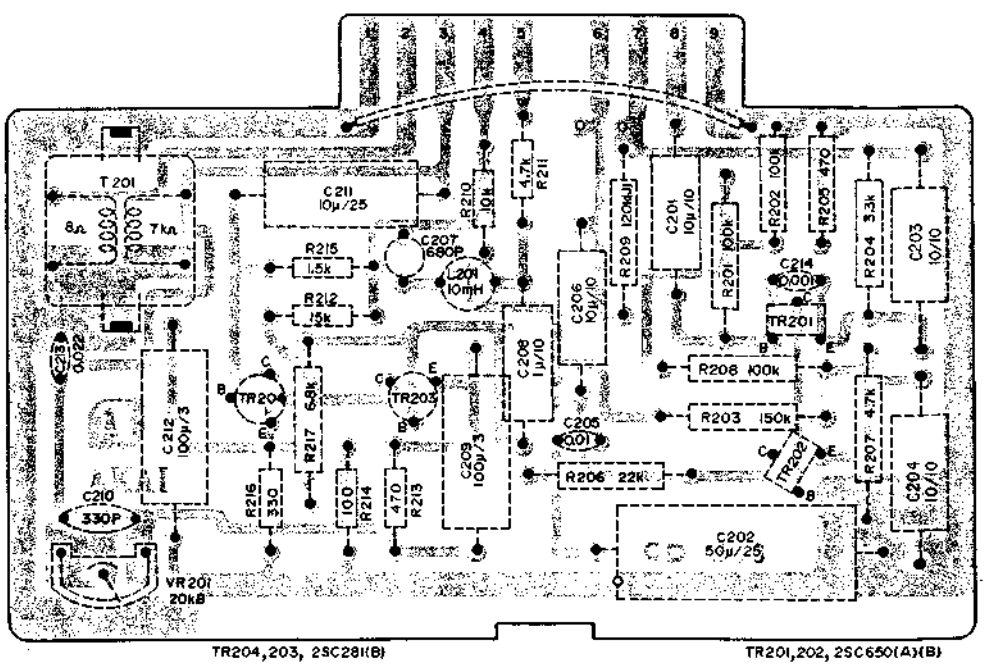
FLYWHEEL ● 1 drop MOTOR

IX. COMPOSITE VIEWS OF COMPONENTS

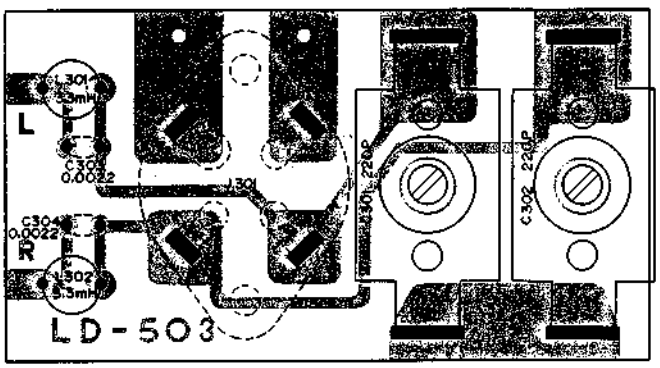
RECORD AMPLIFIER CARD (LD-501)



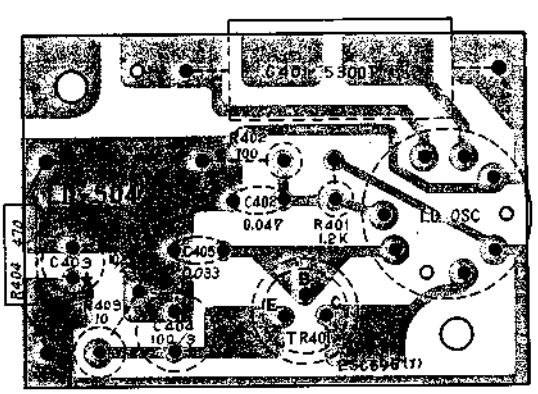
PLAYBACK AMPLIFIER CARD (LD–513)



BIAS ADJUSTMENT CARD (LD–503)



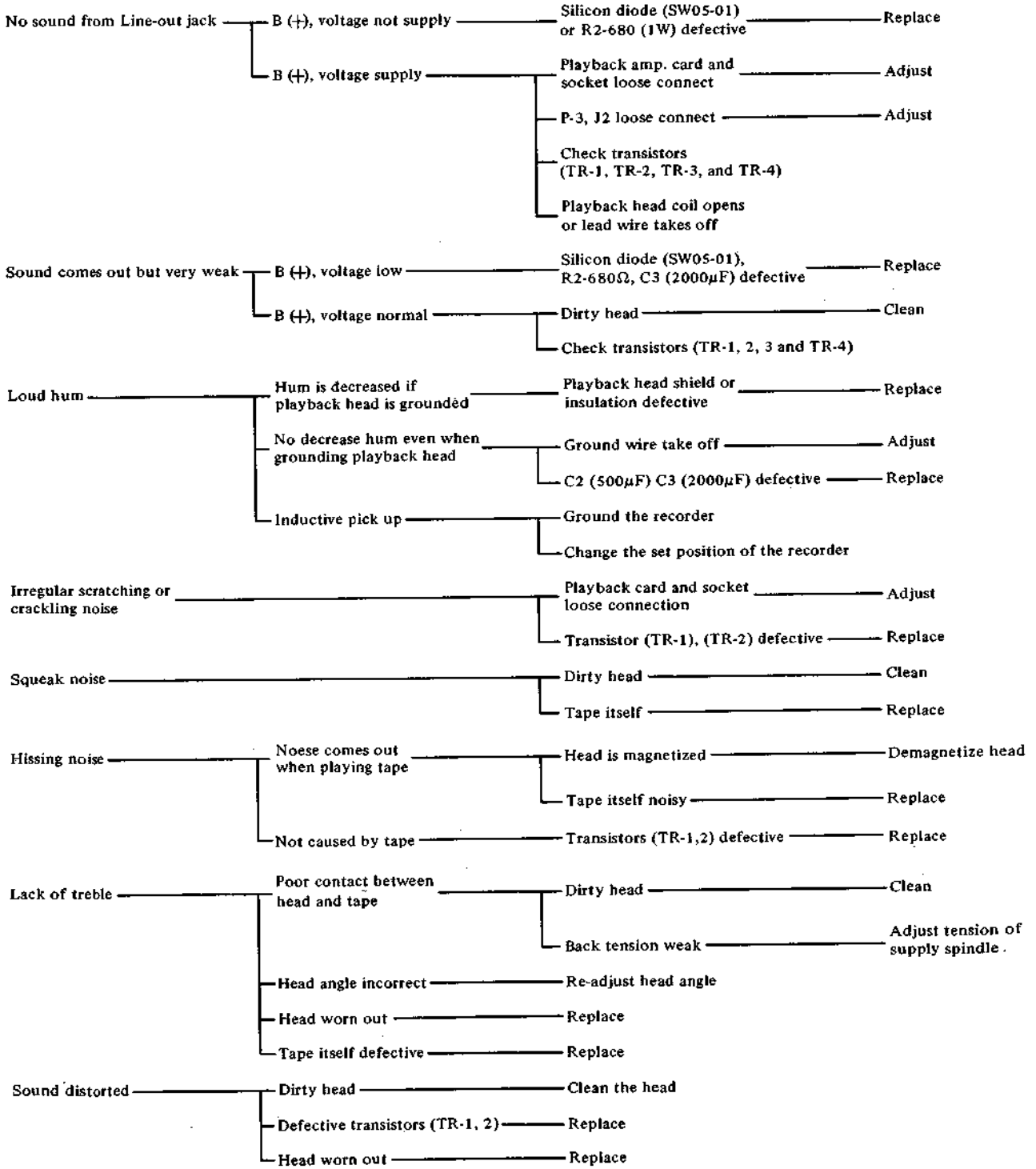
OSCILLATOR CARD (LD–504)



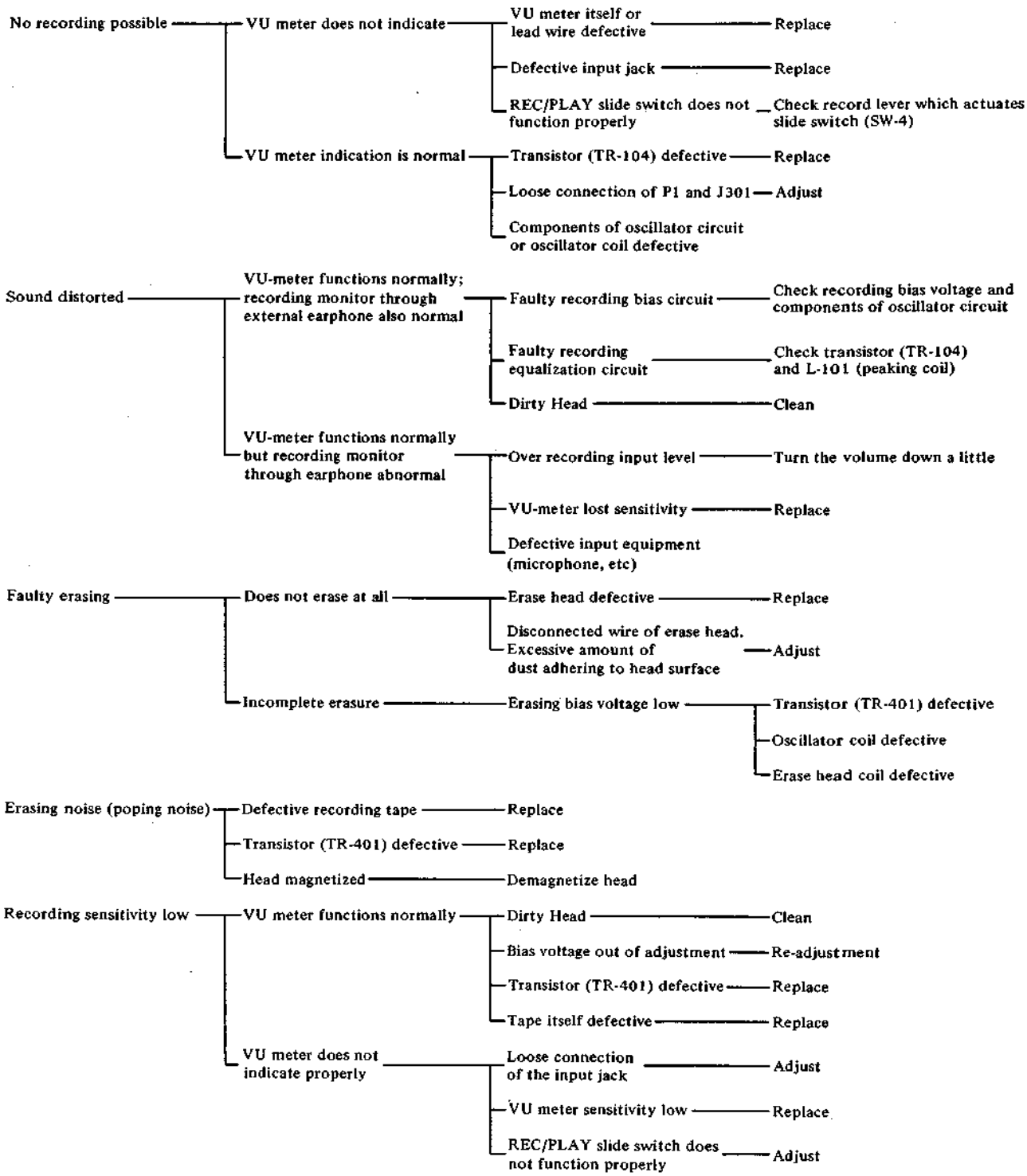
X. TROUBLE SHOOTING CHART

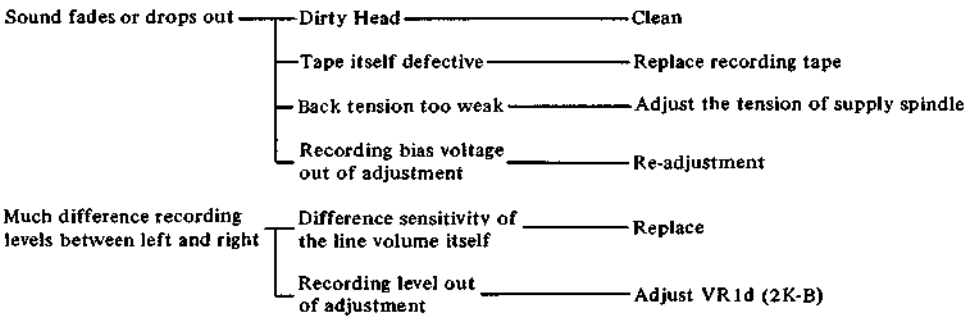
SECTION "A" TROUBLES WITH AMPLIFIER

1. Playback problems. (Unit set in play position.)

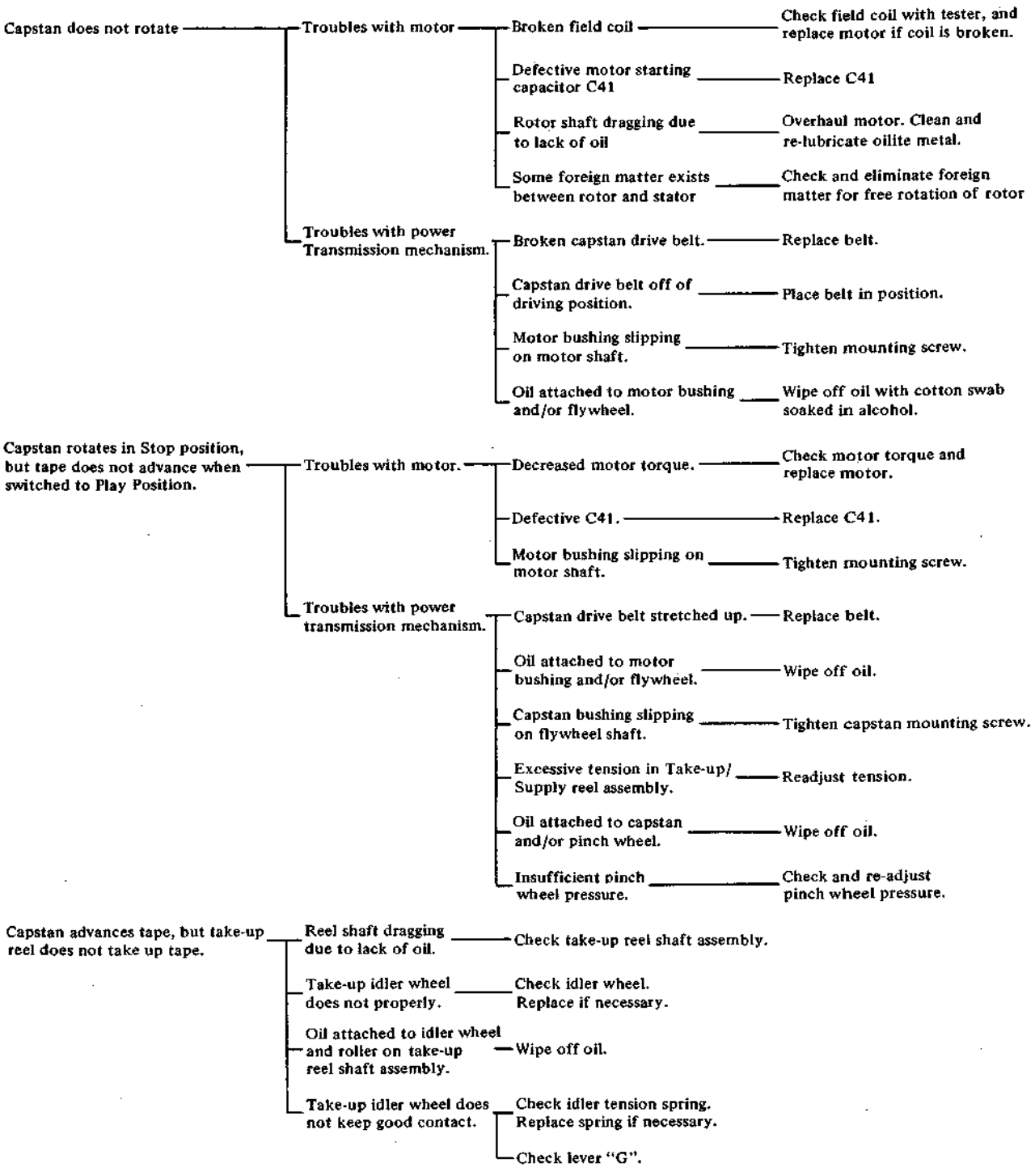


2. Recording problems.
(Unit plays back pre-recorded tapes okay, but recording not satisfactory.)




Sound fades or drops out
Dirty Head
Clean
Tape itself defective
Replace recording tape
Back tension too weak
Adjust the tension of supply spindle
Recording bias voltage out of adjustment
Re-adjustment
Much difference recording levels between left and right
Difference sensitivity of the line volume itself
Replace
Recording level out of adjustment
Adjust VR1d (2K-B)

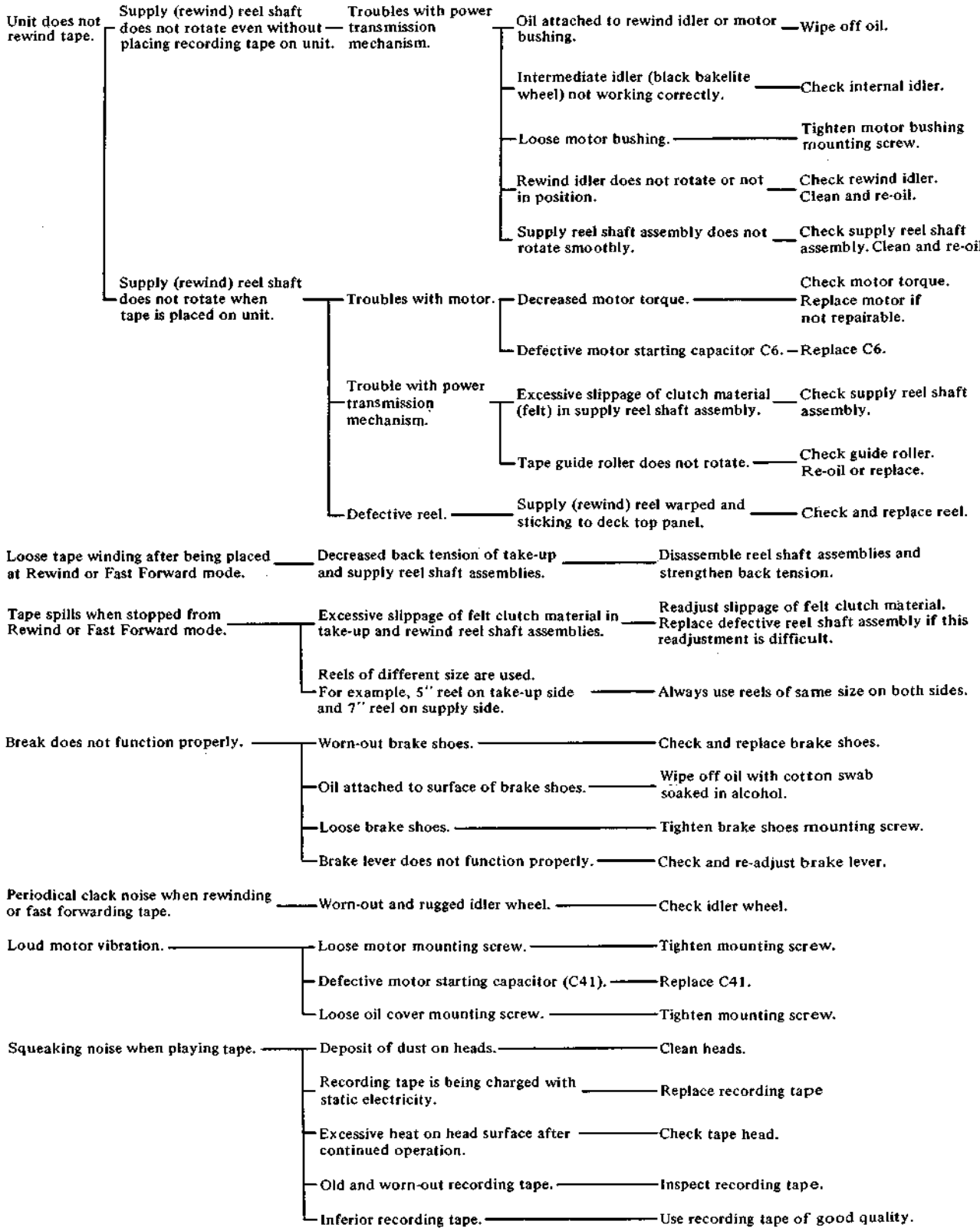
SECTION "B" TROUBLES WITH TAPE TRANSPORT MECHANISM

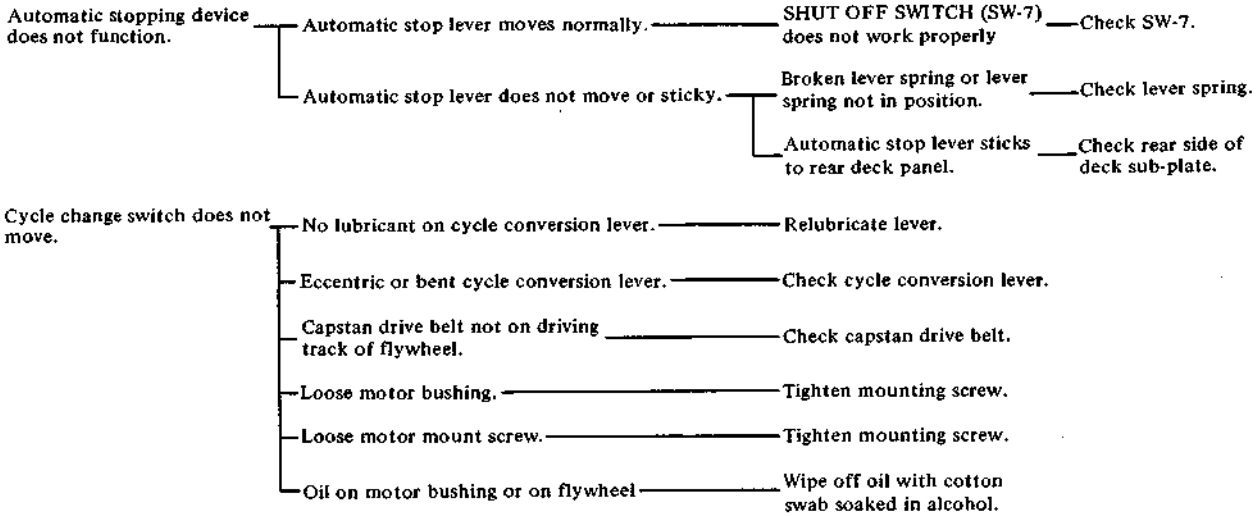


- Take-up functions normally, but tape speed lower than regular speed.
  - Troubles with motor.
    - Rotor shaft dragging due to lack of oil. → Overhaul motor. Clean and re-lubricate oilite metal.
    - Defective motor starting capacitor (C41). → Replace C41.
  - Fluctuation in power supply. → Check line voltage and cycle. Use voltage regulator if line voltage is lower than standard.
  - Troubles with power transmission mechanism.
    - Capstan drive stretched up and slipping on motor bushing. → Replace belt.
    - Capstan drive belt not in correct driving position. → Place belt in position.
    - Oil attached to motor bushing and/or flywheel. → Wipe off oil.

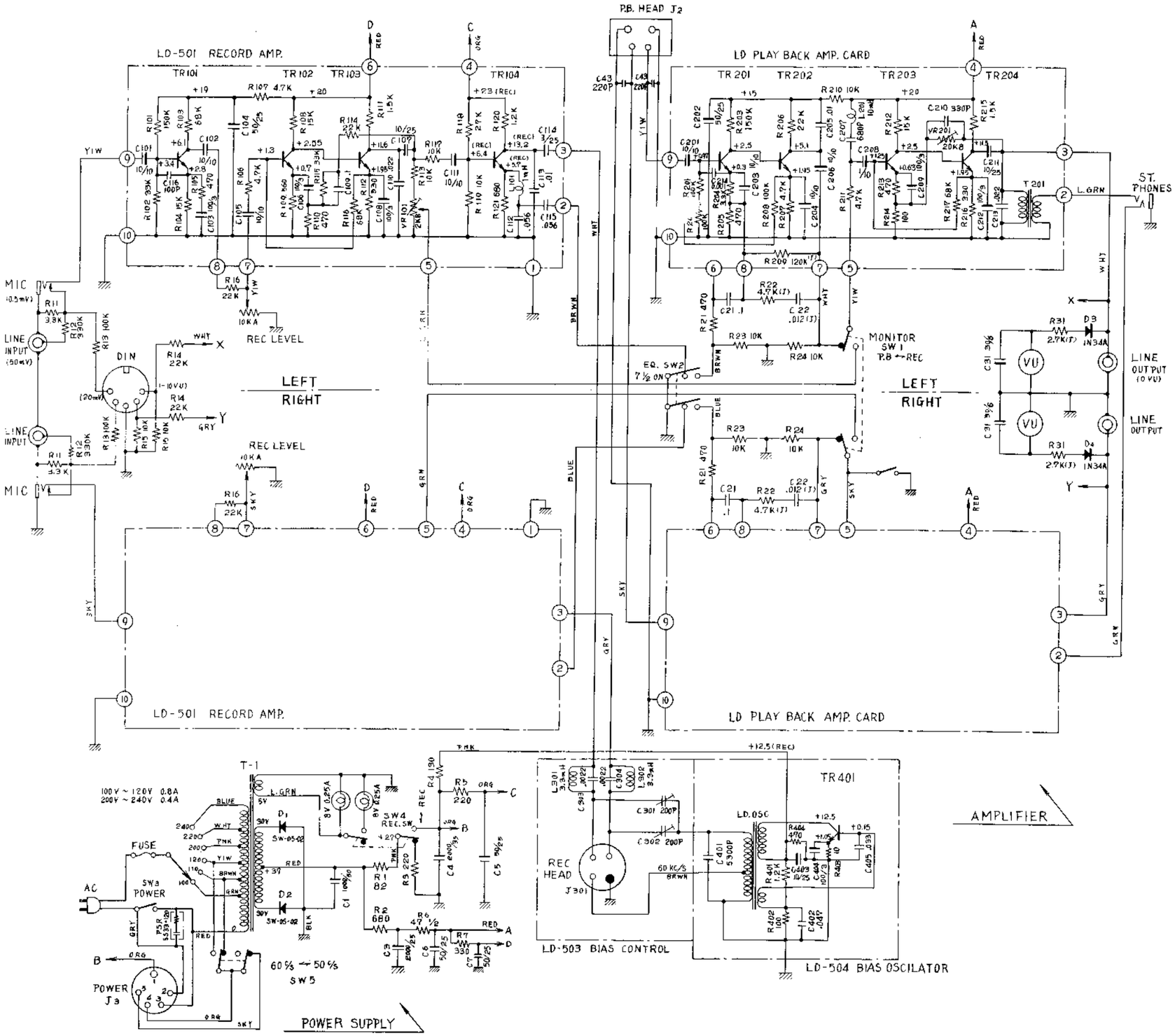
- Wow : flutter. Irregular tape movement.
  - Troubles with motor.
    - Decreased motor torque. → Check motor tarque.
    - Defective motor starting capacitor (C41) → Replace C41.
  - Troubles with power transmission mechanism.
    - Take-up, supply reel shaft dragging or excessive tension. → Check reel shaft assemblies. Replace reel shaft assembly if tension not adjustable.
    - Capstan drive belt stretched up and slipping. → Check belt.
    - Unbalanced flywheel rotation. → Check balance. Replace flywheel.
    - Rubber on pinch wheel deteriorated. → Check rubber on pinch wheel and replace pinch wheel.
    - Pinch wheel or tape guide does not rotate smoothly. → Check and replace defective part. Clean and re-oil if it again provides smooth rotation.
    - Dirty heads surface. → Clean heads.
    - Insufficient pinch wheel pressure. → Re-adjust pinch wheel pressure.
    - Capstan bushing slipping on flywheel shaft. → Tighten capstan mounting screw.
    - Worn-out idler wheel or no oil. → Replace worn-out idler. Lubricate oilite metal in center of idler.

- Unit does not operate in Fast Forward mode.
  - Take-up reel shaft does not rotate even without placing recording tape on unit.
    - Troubles with power transmission mechanism.
      - Oil attached to take-up idler wheel or motor bushing. → Wipe off oil.
      - Loose motor bushing. → Tighten motor bushing mounting screw.
      - Take-up idler wheel does not function properly. → Check and readjust idler wheel.
      - Take-up reel shaft assembly does not function properly. → Check, clean and re-oil reel shaft assembly.
      - Check lever G.
  - Take-up reel shaft does not rotate when recording tape is placed on unit.
    - Troubles with motor.
      - Decreased motor torque. → Check motor torque. Replace motor if required.
      - Defective motor starting capacitor (C41) → Check and replace C41.
    - Troubles with power transmission mechanism.
      - Excessive slippage of clutch material (felt) in take-up reel shaft assembly. → Check take-up reel shaft assembly.
      - Tape guide roller does not rotate smoothly. → Check guide roller. Re-Oil or replace.
    - Defective reel.
      - Take-reel warped and sticking to deck top panel. → Check and replace reel.


Unit does not rewind tape.
Supply (rewind) reel shaft does not rotate even without placing recording tape on unit.
Troubles with power transmission mechanism.
Oil attached to rewind idler or motor bushing.
Wipe off oil.
Intermediate idler (black bakelite wheel) not working correctly.
Check internal idler.
Loose motor bushing.
Tighten motor bushing mounting screw.
Rewind idler does not rotate or not in position.
Check rewind idler. Clean and re-oil.
Supply reel shaft assembly does not rotate smoothly.
Check supply reel shaft assembly. Clean and re-oil.
Supply (rewind) reel shaft does not rotate when tape is placed on unit.
Troubles with motor.
Decreased motor torque.
Check motor torque. Replace motor if not repairable.
Defective motor starting capacitor C6.
Replace C6.
Trouble with power transmission mechanism.
Excessive slippage of clutch material (felt) in supply reel shaft assembly.
Check supply reel shaft assembly.
Tape guide roller does not rotate.
Check guide roller. Re-oil or replace.
Defective reel.
Supply (rewind) reel warped and sticking to deck top panel.
Check and replace reel.
Loose tape winding after being placed at Rewind or Fast Forward mode.
Decreased back tension of take-up and supply reel shaft assemblies.
Disassemble reel shaft assemblies and strengthen back tension.
Tape spills when stopped from Rewind or Fast Forward mode.
Excessive slippage of felt clutch material in take-up and rewind reel shaft assemblies.
Readjust slippage of felt clutch material. Replace defective reel shaft assembly if this readjustment is difficult.
Reels of different size are used. For example, 5" reel on take-up side and 7" reel on supply side.
Always use reels of same size on both sides.
Break does not function properly.
Worn-out brake shoes.
Check and replace brake shoes.
Oil attached to surface of brake shoes.
Wipe off oil with cotton swab soaked in alcohol.
Loose brake shoes.
Tighten brake shoes mounting screw.
Brake lever does not function properly.
Check and re-adjust brake lever.
Periodical clack noise when rewinding or fast forwarding tape.
Worn-out and rugged idler wheel.
Check idler wheel.
Loud motor vibration.
Loose motor mounting screw.
Tighten mounting screw.
Defective motor starting capacitor (C41).
Replace C41.
Loose oil cover mounting screw.
Tighten mounting screw.
Squeaking noise when playing tape.
Deposit of dust on heads.
Clean heads.
Recording tape is being charged with static electricity.
Replace recording tape
Excessive heat on head surface after continued operation.
Check tape head.
Old and worn-out recording tape.
Inspect recording tape.
Inferior recording tape.
Use recording tape of good quality.

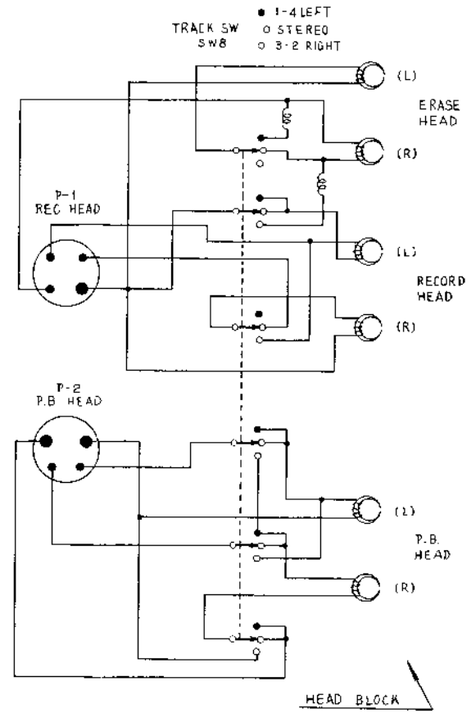

Automatic stopping device does not function.
Automatic stop lever moves normally.
SHUT OFF SWITCH (SW-7) does not work properly
Check SW-7.
Automatic stop lever does not move or sticky.
Broken lever spring or lever spring not in position.
Check lever spring.
Automatic stop lever sticks to rear deck panel.
Check rear side of deck sub-plate.
Cycle change switch does not move.
No lubricant on cycle conversion lever.
Relubricate lever.
Eccentric or bent cycle conversion lever.
Check cycle conversion lever.
Capstan drive belt not on driving track of flywheel.
Check capstan drive belt.
Loose motor bushing.
Tighten mounting screw.
Loose motor mount screw.
Tighten mounting screw.
Oil on motor bushing or on flywheel
Wipe off oil with cotton swab soaked in alcohol.

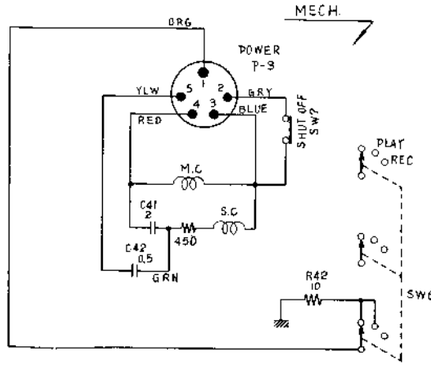
4000D



TRANSISTOR

TR101	2SC650(B,C)	2
102. 103	2SC281(B)	4
104	2SC458(B)	2
TR201, 202	2SC650(A,B)	4
203, 204	2SC281(B)	4
TR401	2SC696(J)	1





4 TRACK HEAD ASSEMBLY · NO.7

4000D SCHEMATIC 13624123