# SERVICE MANUAL

## AKAI TAPE DECK

## MODEL X-165D


## TABLE OF CONTENTS



When placing order for parts, please use separate
PARTS LIST or PRICE LIST FOR PARTS.

# I. SPECIFICATIONS

RECORDIING SYSTEM
: In-Line 4 track stereo/manaural Cross-Field Head recording system.

PLAYBACK SYSTEM : In-Line 4 track stereo/monaural playback system.

TAPE SPEED : 1-7/8, 3-3/4, 7-1/2 ips (15 ips optional)

TAPE SPEED DEVIATION
: Within ± 1.5% at all tape speeds.

WOW AND FLUTTER : Less than 0.15% r.m.s at 7-1/2 ips.
(Playback only) : Less than 0.20% r.m.s at 3-3/4 ips.
: Less than 0.30% r.m.s at 1-7/8 ips.

FREQUENCY RESPONSE
: 30 to 22,000 Hz at 7-1/2 ips. (±3 dB)
: 30 to 18,000 Hz at 3-3/4 ips.
: 30 to 9,000 Hz at 1-7/8 ips.

SIGNAL TO NOISE RATIO
: Better than 46 dB

DISTORTION : With in 3% at 1,000 Hz 0VU recording.

CROSS TALK : Less than −65dB (Monaural)
: Less than −43 dB (Stereo)

ERASE RATIO : Less than −70 dB for all tracks

EQUALIZATION : Correct equalization for playback of tapes recorded to the NAB curve.

RECORDING BIAS FREQUENCY
: 60 kHz ± 5 kHz

OUTPUT (LINE) : 1.228 V (+4 dB) at using 250 Hz 0VU recorded tape.
Required Load Impedance . . .
More than 25 k-Ohms

DIN OUTPUT : 0.4 V (−6 dB) using a 250 Hz OVU recorded tape. Impedance 10 k-Ohms.
Required Load Impedance . . .
More than 50 k-Ohms

INPUT LEVEL : Line . . . 20 mV (−32 dB) to 2.5 V (10 dB)
Impedance . . . 390 k-Ohms
Mic 0.5 mV (−64 dB) to 50 mV (−25 dB)
Impedance . . . 50 k-Ohms

DIN INPUT LEVEL : High . . . more than 20 mV (−32 dB)
Impedance . . . 390 k-Ohms
Low . . . more than 5 mV (−44 dB)
Impedance . . . 68 k-Ohms

F.FORWARD AND REWIND TIME
: 90 seconds using a 1,200 ft. tape at 50 Hz, 75 seconds at 60 Hz

HEAD PHONE OUTPUT
: 30 ~ 40 mV
Impedance 8 Ω

POWER SUPPLY : 100 to 240 V AC, 50/60 Hz

POWER CONSUMPTION
: 55 VA

INSULATION RESISTANCE
: More than 50 M-Ohms

MOTOR : Hysteresis synchronous 2 speed motor.
Horse Power . . . 1/100 HP
Power Ratio . . . 85%
Revolution . . . 3,000 and 1,500 r.p.m. at 50 Hz. 3,600 and 1,800 r.p.m. at 60 Hz
Condenser capacity . . .
2.8 μF at 50 Hz
2.0 μF at 60 Hz

HEADS : Recording/playback head
4 Track Gap 2 microns
Impedance . . . 1.2 k-Ohms at 1,000 Hz
Bias head
4 Track . . . Gap 0.2 mm
Impedance . . . 500 Ohms at 60 kHz
ERASE head
4 Track . . . Gap 0.2 mm
Impedance . . . 500 Ohms

RECORD LEVEL INDICATOR
: Vertical indication Model "A"
VU meter x 2

TRANSISTORS USED : 2SC650 (A) x 4
2SC281 (B) x 4
2SC458 (B) x 2
2SC971 (2)(3) x 2

DIODES USED : 1N34A x 2
SW-05-02 x 2

STYLE : Portable

DIMENSIONS : 13-1/2" (H) x 13-1/2" (W) x 9" (D)
(340 H x 340 W x 230 D mm)

WEIGHT : 30.8 lbs (14 kg)

# II. MEASURING METHOD

## TAPE SPEED DEVIATION

1. Method involving use of pre-recorded tape.

For measuring the tape speed deviation, play back a pre-recorded tape at 1,000 Hz ± 0.1%. Connect the appropriate output to a frequency counter meter in order to measure the tape speed deviation from the pre-recorded tape.

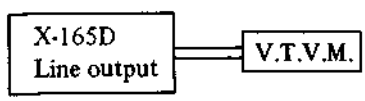
2. Method involving use of timing tape. (designed for tape speed measurement)

This method utilizes a timing tape marked at intervals of 7-1/2". The running time of over 60 marked sections of tape is measured in order to calculate the deviation of the tape speed. In applying this method, however, it should be kept in mind that 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 a 3,000 Hz pre-recorded tape of which the 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 specifications.

## SIGNAL TO NOISE RATIO

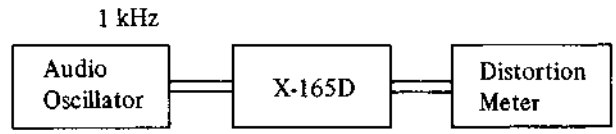



Set the Equalizer Switch to "7-1/2" ips position and playback a tape containing a 250 Hz sine wave recorded at "0" VU level on a standard recorder.

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 each of the measured values into decibels.

## TOTAL HARMONIC DISTORTION FACTOR




Connect the measuring instrument as shown above, and record a 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 can 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

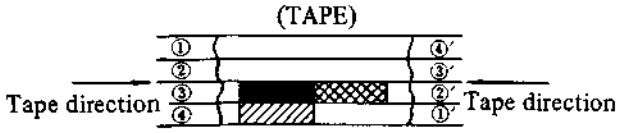
(Note : New tape of particularly good quality should be used for measurement of the distortion factor.)

## POWER OUTPUT

Playback a tape containing a 250 Hz sine wave 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.

## CROSSTALK (Crosstalk between the tracks)

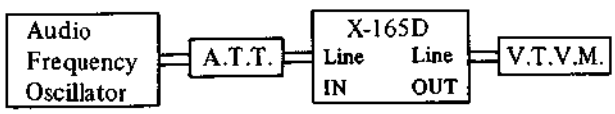



As shown in the figure, first record a 1,000 Hz sine wave on track No. 3 at +3 VU level. Next, remove the 1,000 Hz input signal and record under a non-input condition.
Then, playback the tape on track No. 3 and No. 1 (reversed condition of tape) through the 1,000 Hz B.P.F. (Band Pass Filter, Sensitivity ... 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 crosstalk ratio (dB)
$E_0$ = 1,000 Hz signal output level
$E_2$ = 1,000 Hz crosstalk output level
$E_1$ = No-input signal record level

## FREQUENCY RESPONSE




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

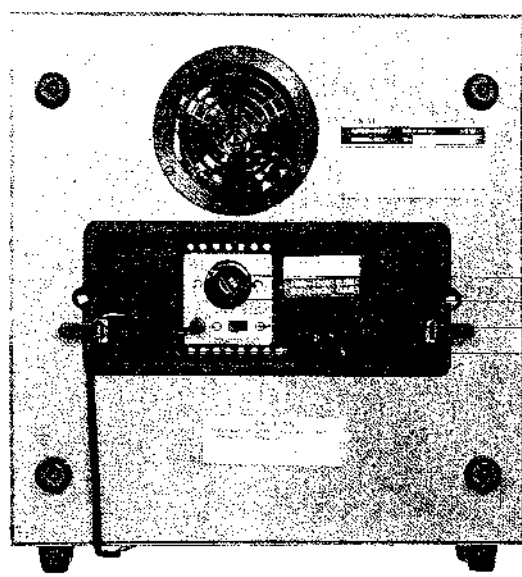
RECORD :

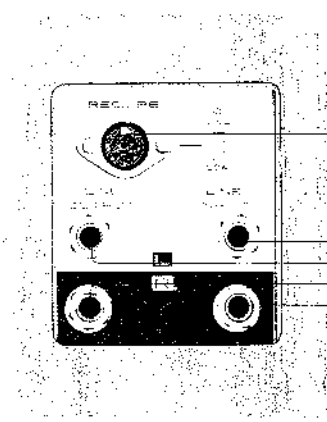
1) Supply a sine wave of 1,000 Hz to the Line Input of the recorder being tested, through an attenuator from an audio frequency generator.
2) Set the Mode/Selector Lever to "Rec" position and adjust the line input volume so that the VU meter needle indicates "0" VU.
3) Under the condition described in (2), lower the input level 16 dB with the attenuator.
4) Record the spot frequency from the audio frequency generator in the range of 30 Hz to 25,000 Hz.

PLAYBACK :

5) Set the Equalizer Switch to 7-1/2" or 3-3/4".
6) Connect a V.T.V.M. to the Line output.
7) Playback the previously recorded tape.
8) Adjust the output level to "0" dBm at 1,000 Hz (indicated on the V.T.V.M. Range selector)
9) Playback the recorded spot frequencies under the conditions in (8), make a memo of Output Level, and plot the value on a graph.

# III. CONTROL LOCATIONS

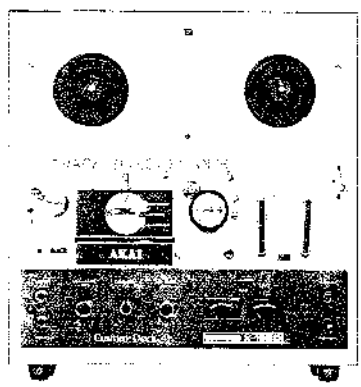



# IV. DISMANTLING OF TAPE TRANSPORT UNITS & AMPLIFIERS

In case of trouble, etc. necessitating disassembly, please disassemble in the order shown in photographs. Reassemble in reverse order.

1



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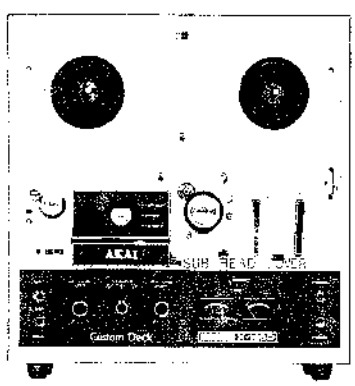

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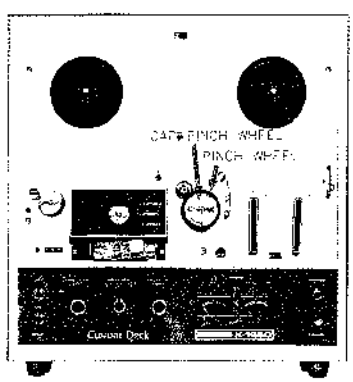

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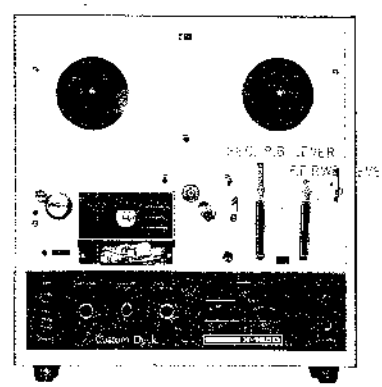

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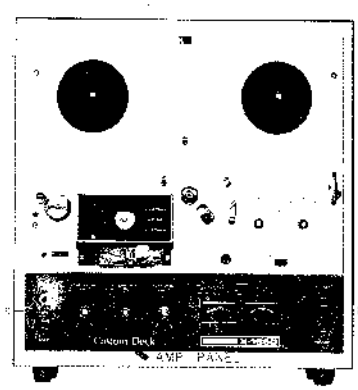

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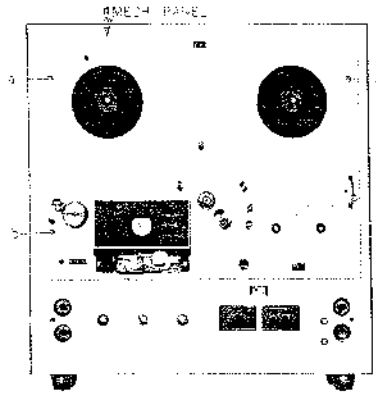


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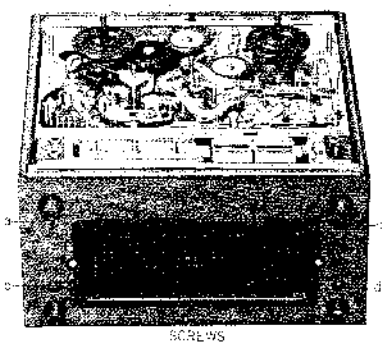


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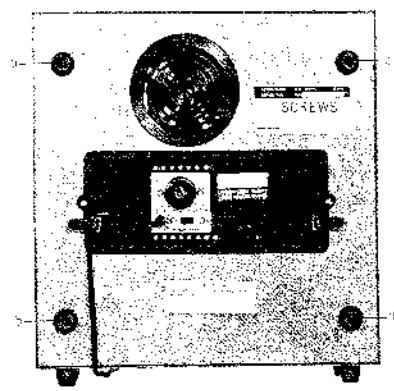


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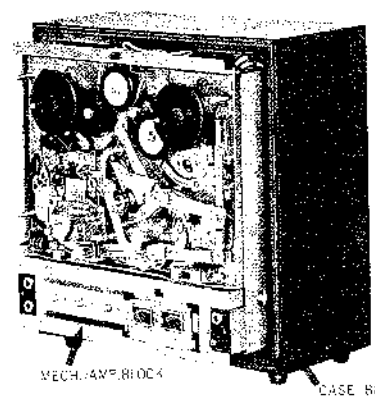


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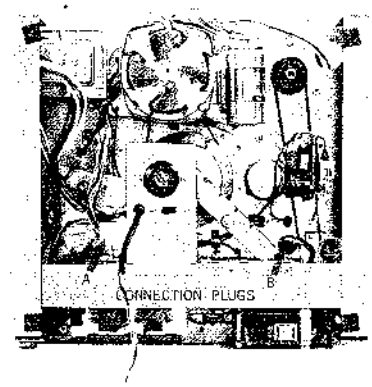


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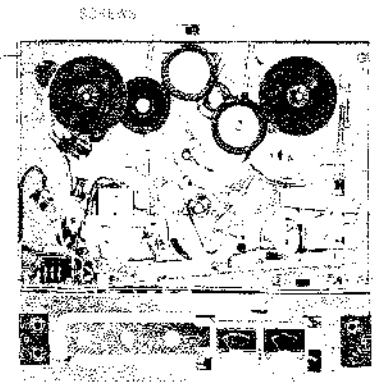


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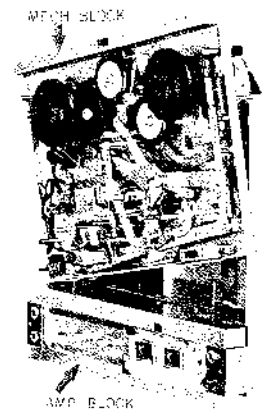


# V. TRANSPORT MECHANISM

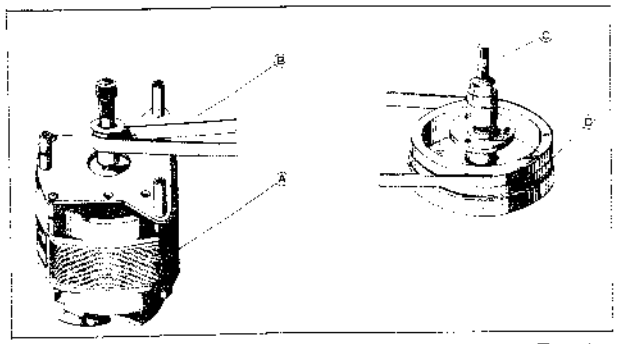


Fig. 1

## 1. CAPSTAN DRIVE

Figure 1.

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

High-speed rotation of Motor (A) is transmitted by Drive Belt (B) to Capstan (C), which is connected to a flywheel that provides necessary inertia. This flywheel maintains the rated rotation and absorbs minor rotation variations of the motor.

Capstan Rotation :

606 R.P.M. at 7-1/2" (19 cm) per sec.
303 R.P.M. at 3-3/4" (9,5 cm) per sec.
151.5 R.P.M. at 1-7/8" (4.74 cm) per sec.

Motor Rotation :

3,000 to 1,500 R.P.M. at 50 Hz
3,600 to 1,800 R.P.M. at 60 kHz

## 2. PINCH WHEEL DRIVE

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

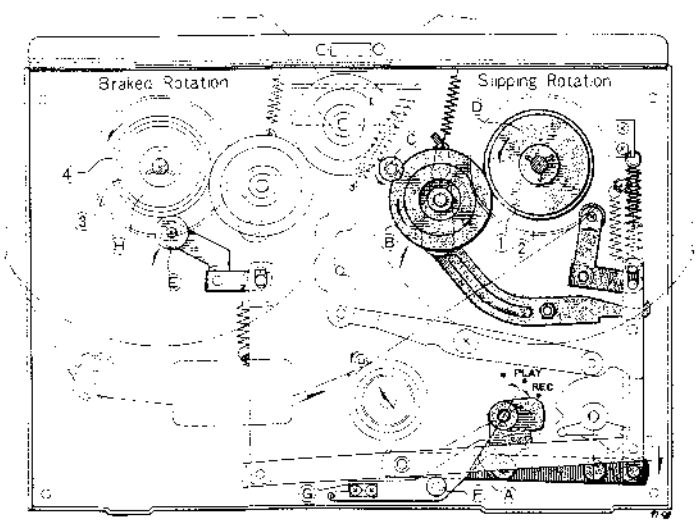



Fig. 2

## 3. RECORD AND PLAYBACK MECHANISM

Turning the RECORD/PLAYBACK LEVER (A) to "PLAY" position causes the pinch wheel to press against the capstan and move the tape at the rated speed. At the same time, *Idler* (B) moves between *Motor Bushing* (C) and the *Take-Up Reel Spindle* (D) to transmit *the motor rotation to* (D) so that the tape is moved and wound on the take-up reel. The Take-up Reel Spindle Base, composed of two plastic wheels (discs) (1 and 2) with a felt clutch between, is rotated from below by the idler. Tape-winding friction is adjusted by the slipping of the felt and maintains rated winding of the tape. *The Supply Reel Spindle* (H) has a *Brake Roller* (E) contacting plastic wheel (disc) (4) from below which provides appropriate back tension by the slipping of the felt clutch to the rotation of the Pulley (3) above. To prevent accidental erasure, *the Record Interlock Button* (F) must be depressed before the RECORD/PLAYBACK LEVER can be moved to the "REC" position. *Safety device* (G) is depressed to operate the recording mechanism.

(See figure 2)

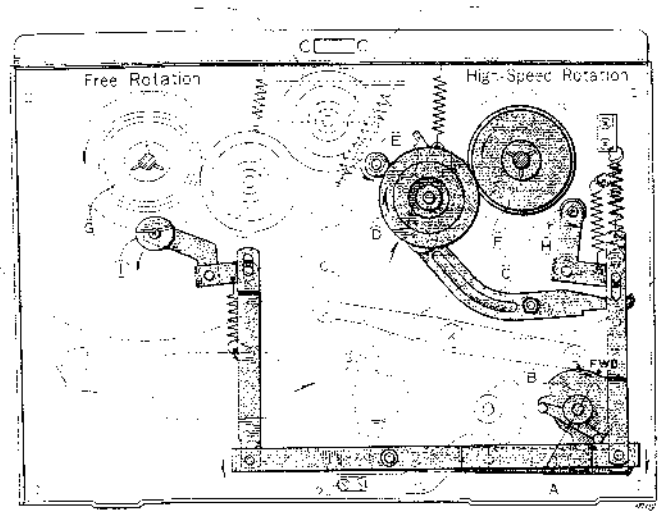



Fig. 3

## 4. FAST-FORWARD MECHANISM

Turning *the FAST FWD-REWIND knob* (A) to "FAST FWD" position, causes *the cam* (B) under the knob to push up *Lever* (C). *Idler* (D) moves into the space between *Plastic Roller* (F) 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* (H) and (I) comes off the reel spindle to free *the Supply Reel Spindle* (G), thereby allowing fast winding of the tape onto the take-up reel.
(See figure 3)

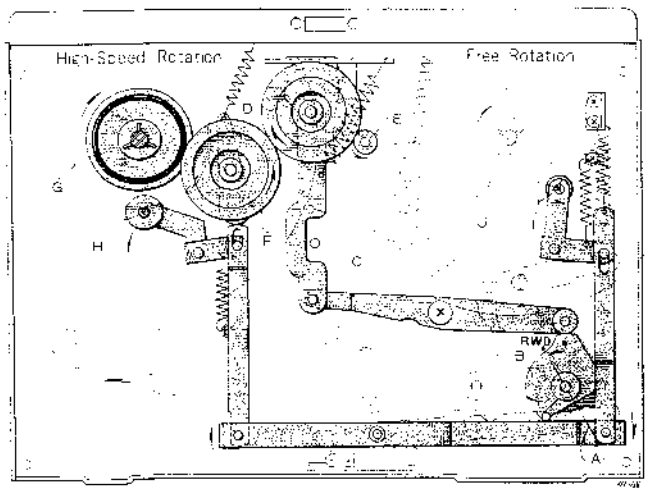



Fig. 4

## 5. REWIND MECHANISM

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

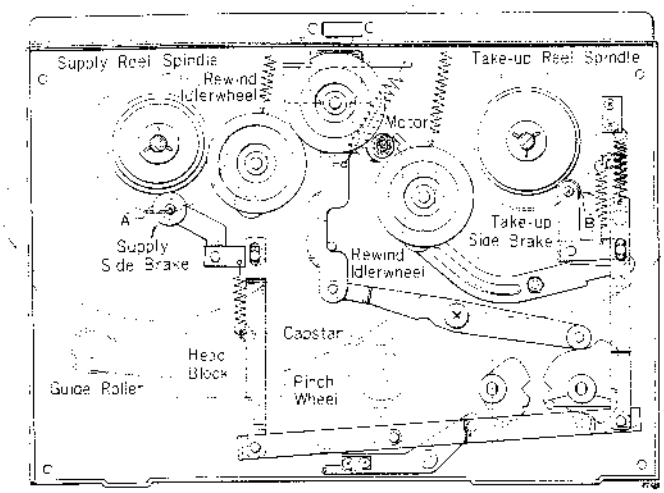



Fig. 5

## 6. STOP CONTROL

Turning the stop lever to the "STOP" position, causes *Brake Rollers* (A) and (B) to depress the reel spindles and stop rotation.
As the brake rubbers depress the plastic rollers below the reel spindles, no friction is applied to the tape.
(See figure 5)

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

NOTES : X-Marks indicate "open" and -marks "engaged"

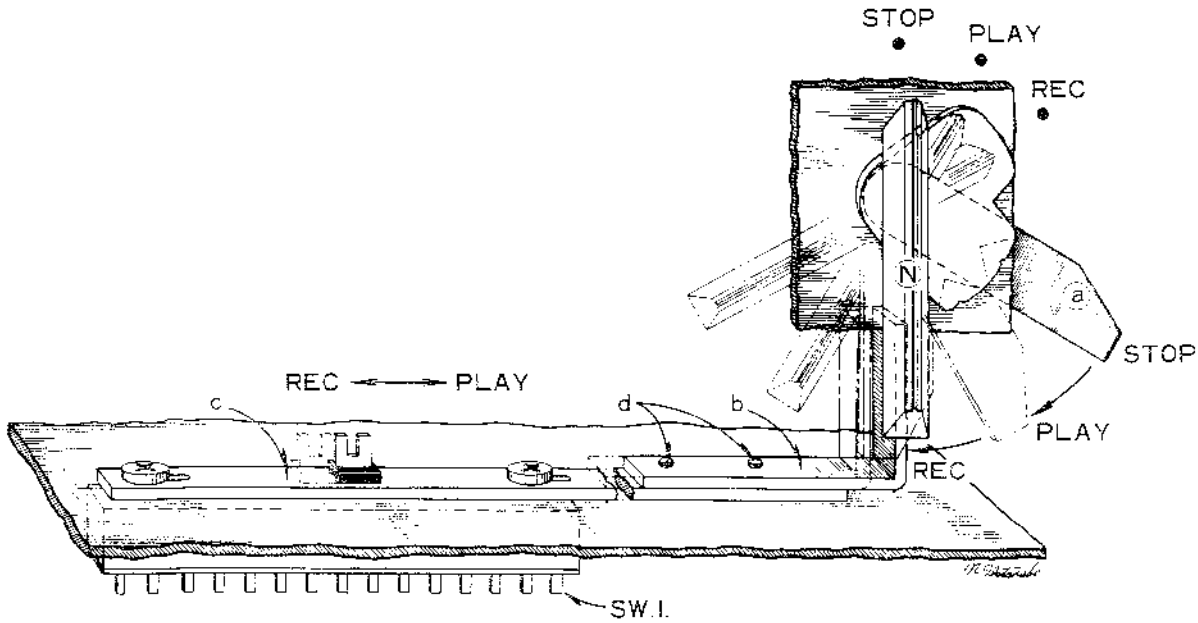



Fig. 6

## RECORD/PLAYBACK CHANGING MECHANISM

Turning the RECORD/PLAYBACK LEVER (N) to recording position causes LEVER (a) to push RECORDING LEVERS (b) and (c) as illustrated by the dotted lines. The RECORD/PLAYBACK CHANGING SWITCH (SWI) then turns to recording position. If LEVER (b) does not push LEVER (c) properly, abnormal oscillation may occur and also the inability to record. Should this be the case, adjust LEVER (b) by loosening SCREW (d).

# VI. MECHANISM ADJUSTMENT

## 1. PINCH WHEEL ADJUSTMENT

It is important that the pinch wheel shaft be kept in perfect alignment with the capstan shaft. 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 with a spring scale, and if necessary, adjust the pinch wheel load spring.

## 2. TAKE-UP IDLER WHEEL ADJUSTMENT

The take-up idler wheel must be kept in perfect alignment with the take-up reel shaft. In fast forward operation, the idler wheel contacts the upper knurled wheel of the take-up reel shaft assembly, and conversely contacts the lower knurled wheel during record or play operation. Adjust idler wheel load spring so that the idler wheel pressure is kept between 50 and 80 grams. The idler wheel wears rapidly if the pressure is excessive. Slippage occurs if the pressure is less than specified.

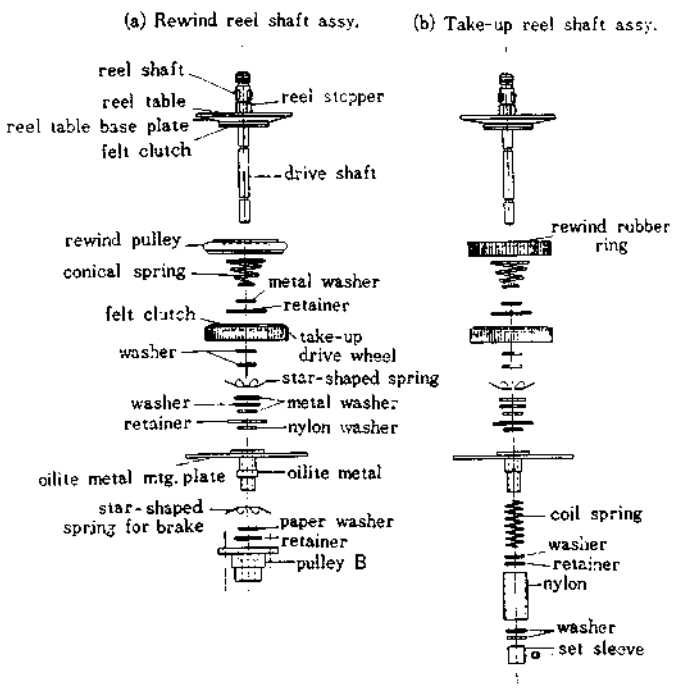



Fig. 1

## 3. REWIND IDLER WHEEL ADJUSTMENT

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

## 4. INTERMEDIATE WHEEL ADJUSTMENT

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. In rewind condition, it contacts these parts while simultaneously transmitting motor torque. An adequate pressure is 50 grams. Adjust the load spring of the intermediate wheel if the pressure is not sufficient.

## 5. TAKE-UP REEL SHAFT ASSEMBLY ADJUSTMENT

Felt clutch material is attached to the bottom side of the reel table base plate so that recording tape will not stretch during fast forward operation due to excessive tension. To check the amount of friction of this part, install a 5-inch reel with a 60 m/m diameter tape, and gently pull the end of tape upward with a spring scale. Adjust the conical spring so that the amount of tension at this part is kept between 400 and 500 grams. Other felt clutch material is attached to the take-up drive wheel. This is to provide proper slippage during record or play operation. The procedure for checking friction of this part is the same as the foregoing, and between 150 and 200 grams of friction provides the best results. Adjust the star-shaped spring just under the take-up drive wheel. When the unit is set to rewind operation, the amount of friction of this part will decrease to from 15 to 20 grams. Check to see whether this is satisfactory. If not, readjust the star-shaped brake spring and the pressure of the spring retainer washer accordingly. (See figure 1 (b) at right)

## 6. SUPPLY REEL SHAFT ASSEMBLY ADJUSTMENT

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 excessive tension during rewind operation. To check the amount of friction of this part, place onto the supply reel table a 5-inch reel with a 60 m/m diameter tape, and gently pull the end of tape upward with spring scale. Adjust the conical spring so that the tension is between 400 and 500 grams. Other felt clutch material is attached to the rewind drive wheel to provide proper slippage during record or play operation. The procedure for checking friction of this part is the same as the foregoing, and between 100 and 120 grams of friction gives best results. When the unit is set to fast forward operation, the amount of friction will decrease to from 15 to 20 grams. Check to see whether this is correct. If not, readjust coil spring and spring retainer washer. (See figure 1 (a) at left)

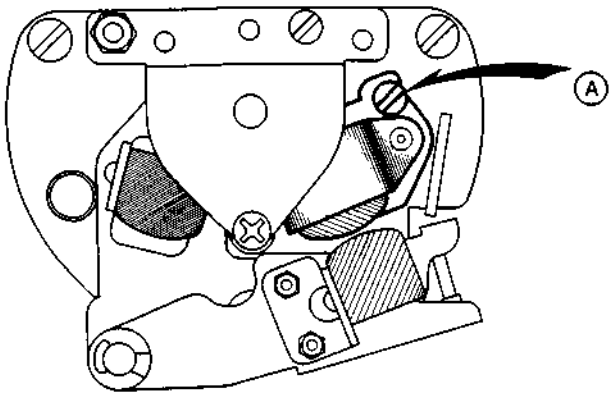



Fig. 2

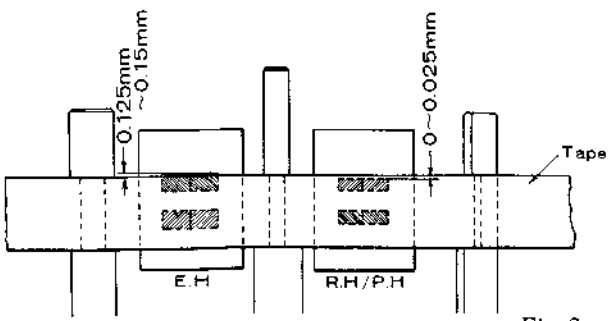



Fig. 3

Clearance of the Bias Head

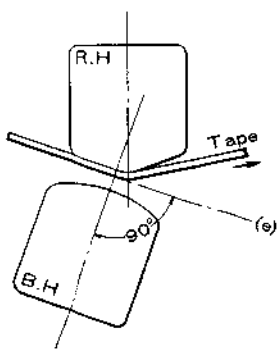



Fig. 4

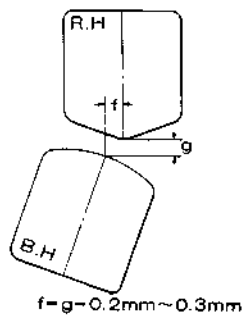



Fig. 5

## 7. HEAD ADJUSTMENT

a) Position the Erase Head about 0.125 mm above the upper edge of the tape by adjusting the height cam provided in the lower part of the head assembly.

b) Adjust the height of the Recording/Playback Head to 0.025 mm above the upper edge of the tape by adjusting the control nut at the lower part of the head assembly.

c) Adjustment of Playback Head Alignment
Playback an Ampex Alignment tape (8,000 Hz) at 7-1/2 ips tape speed and turn alignment screw (A) until the output level of both channels reaches maximum.

d) Clearance of the Bias Head (See Fig. 4, 5)
Loosen the two Bias Head Screws and move the Bias Head by hand until the clearance (f) and (g) is 0.2 to 0.3 mm. Then tighten screws.

Note : If the clearance (f) and (g) becomes less than 0.2 to 0.3 mm, the frequency characteristic will be too low, but distortion will decrease. If the clearance (f) and (g) becomes more than 0.2 to 0.3 mm, the frequency charasteristic will be too high, and distortion will increase.

# VII. AMPLIFIER ADJUSTMENT

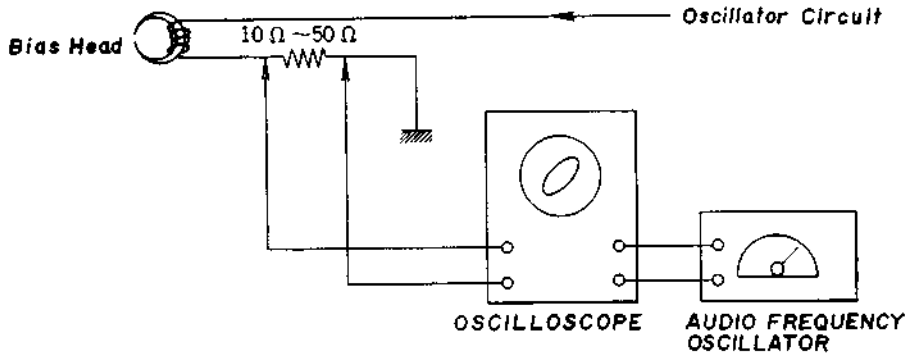



Fig. 1

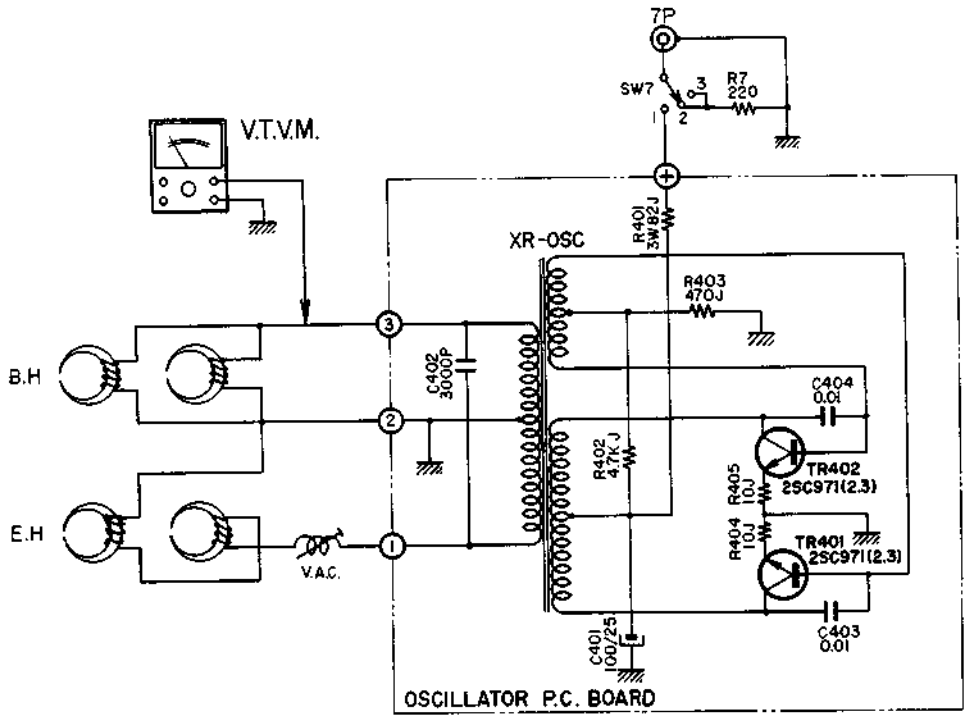



Fig. 2

## 1. RECORDING BIAS FREQUENCY ADJUSTMENT

a) Put a 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.

b) Feed a sine wave signal from an Audio Frequency Oscillator to the Horizontal Input of the Oscilloscope and tune the dial of the Audio Oscillator until the Oscilloscope displays a circular or linear pattern.

c) A reading of 60 kHz ± 5 kHz indicates that the Recording Bias Frequency is correct.

d) If incorrect, it can be adjusted by adjusting the value of condenser C-402 (3000 pF).

## 2. RECORDING BIAS VOLTAGE ADJUSTMENT

a) Connect a V.T.V.M. to the bias head and fix the recording bias voltage by adjusting the V.A.C in the bias oscillator circuit (located near the head assembly) until its reading becomes equal to the bias voltage stamped on the back of the head assembly. Normal bias voltage is between 60 V and 70 V, while acceptable terminal voltage of the erase head is between 12 V and 18 V.

## 3. LINE OUTPUT LEVEL ADJUSTMENT

a) Connect a high sensitivity V.T.V.M. to the Line Output Jack.
b) Playback a 250 Hz pre-recorded test tape at 7-1/2 ips.
c) Adjust VR-201 (LEFT and RIGHT CH. semi-fixed resistor 20 KΩB) of the pre-amplifier (CD-513) so that the Line Output Voltage is 1.228 V (+4 dBm).

## 4. RECORDING LEVEL ADJUSTMENT

a) Recording level adjustment should be made only after "Head Adjustment" and "Line Output Level Adjustment" has been made.
b) As shown in Fig. 3, connect an Audio Signal Generator and Attenuator to the Line Input. Connect a high sensitivity V.T.V.M. to the Line Output.

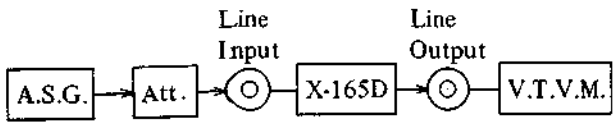



Fig. 3

c) Set Equalizer Switch and Tape Speed Selector to 7-1/2 ips. Load a blank test tape (Fuji FYS-100 or Scotch No. 150).
d) Supply a 1,000 Hz signal from the audio signal generator to the Line Input, and adjust each of the Volume Controls so that each of the Line Output voltages is 1.228 V (+4 dBm).
e) Record the signal on the tape and check playback to see whether Line Output Voltage is 1.228 V (+4 dBm).
f) If Line Output Voltage fails to register 1.228 V (+4 dBm), while repeating recording and playback, adjust semi-fixed resistors VR-101 (LEFT and RIGHT CH, 2 KΩ-B) until 1.228 V (+4 dBm) is obtained both on recording and playback.

# VIII. MAINTENANCE PROCEDURE

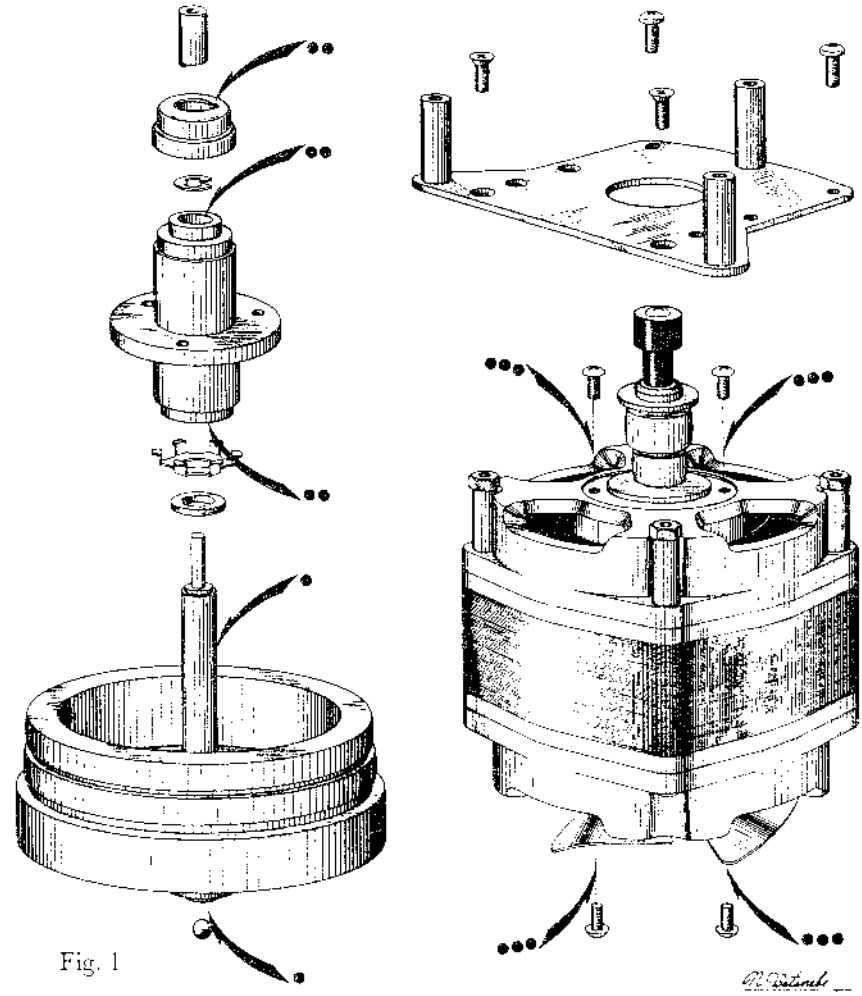


Fig. 1

FLYWHEEL ● 1 drop MOTOR

## 1. LUBRICATION INSTRUCTIONS

For maximum service life and optimum performance, lubricate the following parts 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 cams.

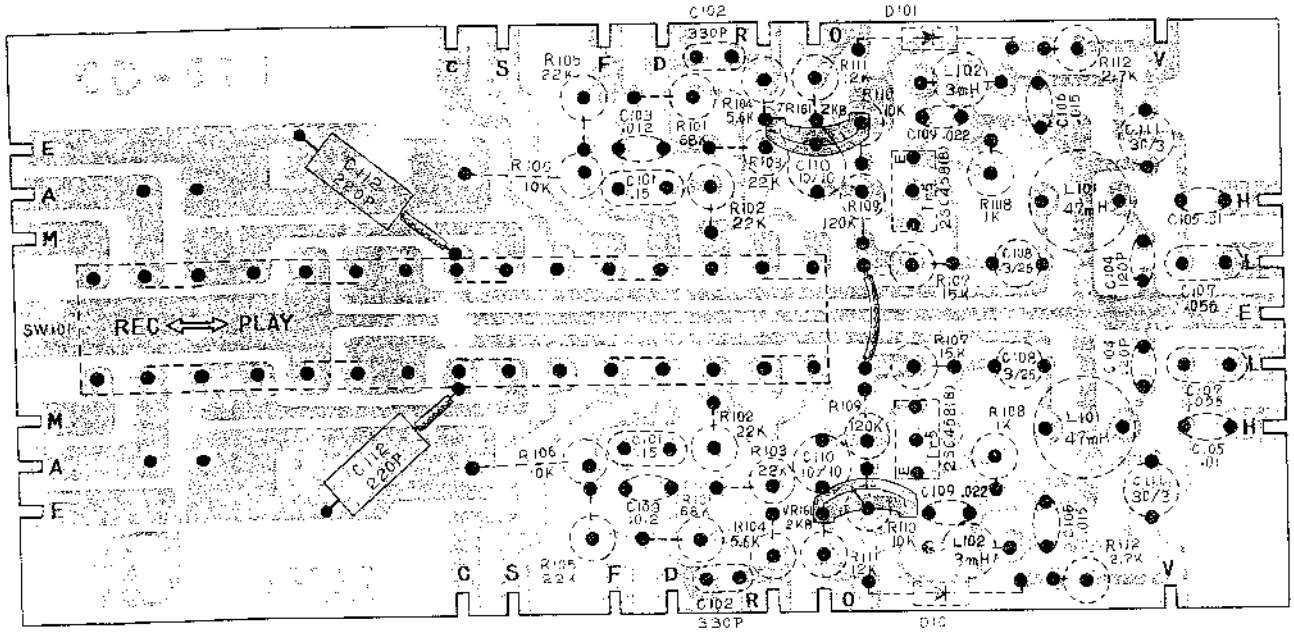
CAUTION : DO NOT OVER-LUBRICATE, AND WIPE OFF EXCESS OIL WITH A COTTON SWAB SOAKED IN ALCOHOL. OTHERWISE, EXCESS LUBRICANT MAY BE SCATTERED DURING OPERATION AND THE RUBBER COMPONENT PARTS WILL DETERIORATE.

## 2. CLEANING TAPE HEADS AND OTHER PARTS

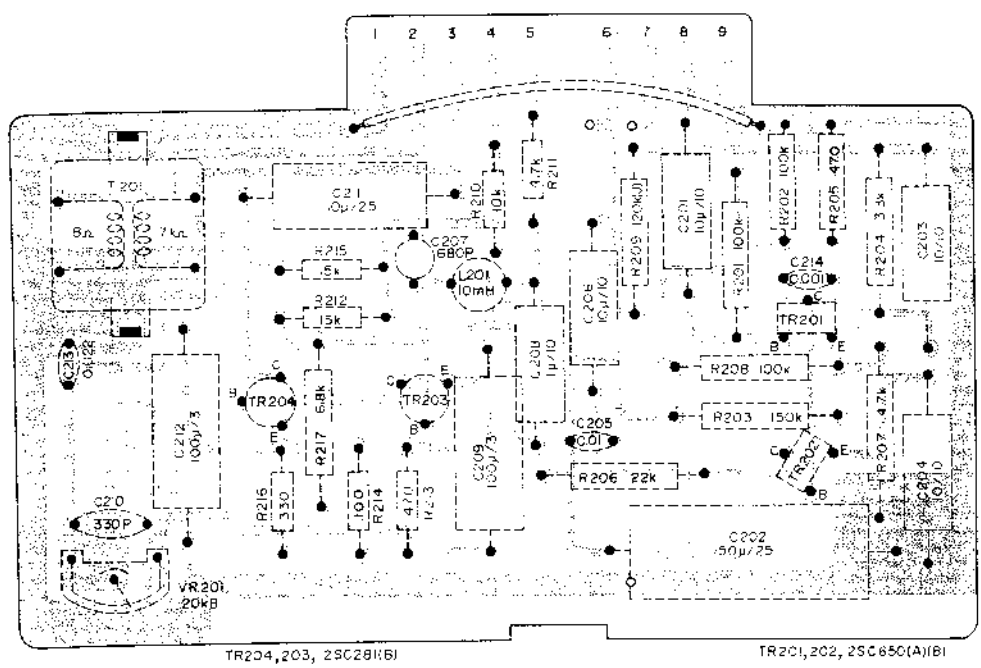
Wipe surface of tape heads, guide roller bearing, capstan bushing and pinch wheel periodically with a soft cloth soaked in alcohol.

# IX. COMPOSITE VIEWS OF COMPONENTS

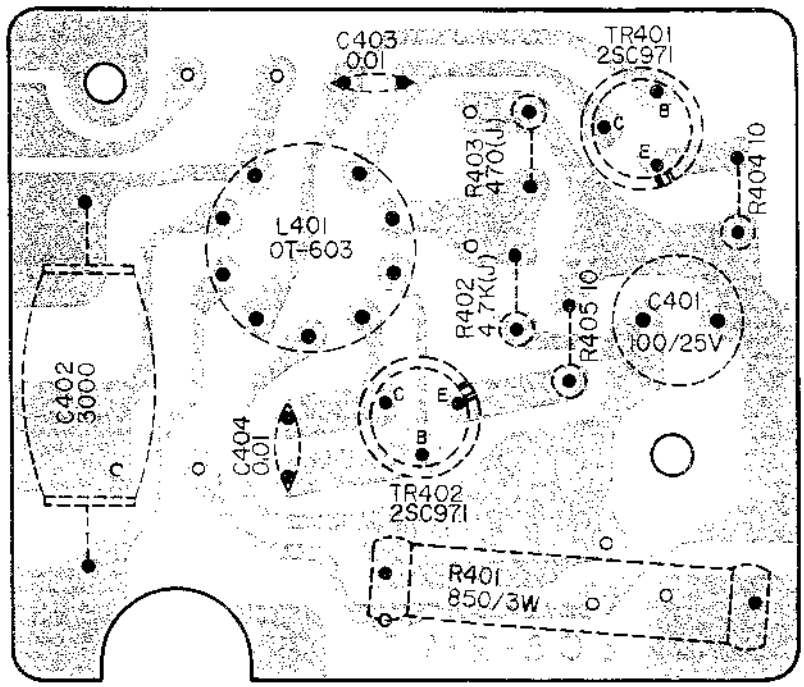
## 1. SWITCH P.C. BOARD (CD-511)




## 2. PRE-AMP. P.C. BOARD (CD-513)



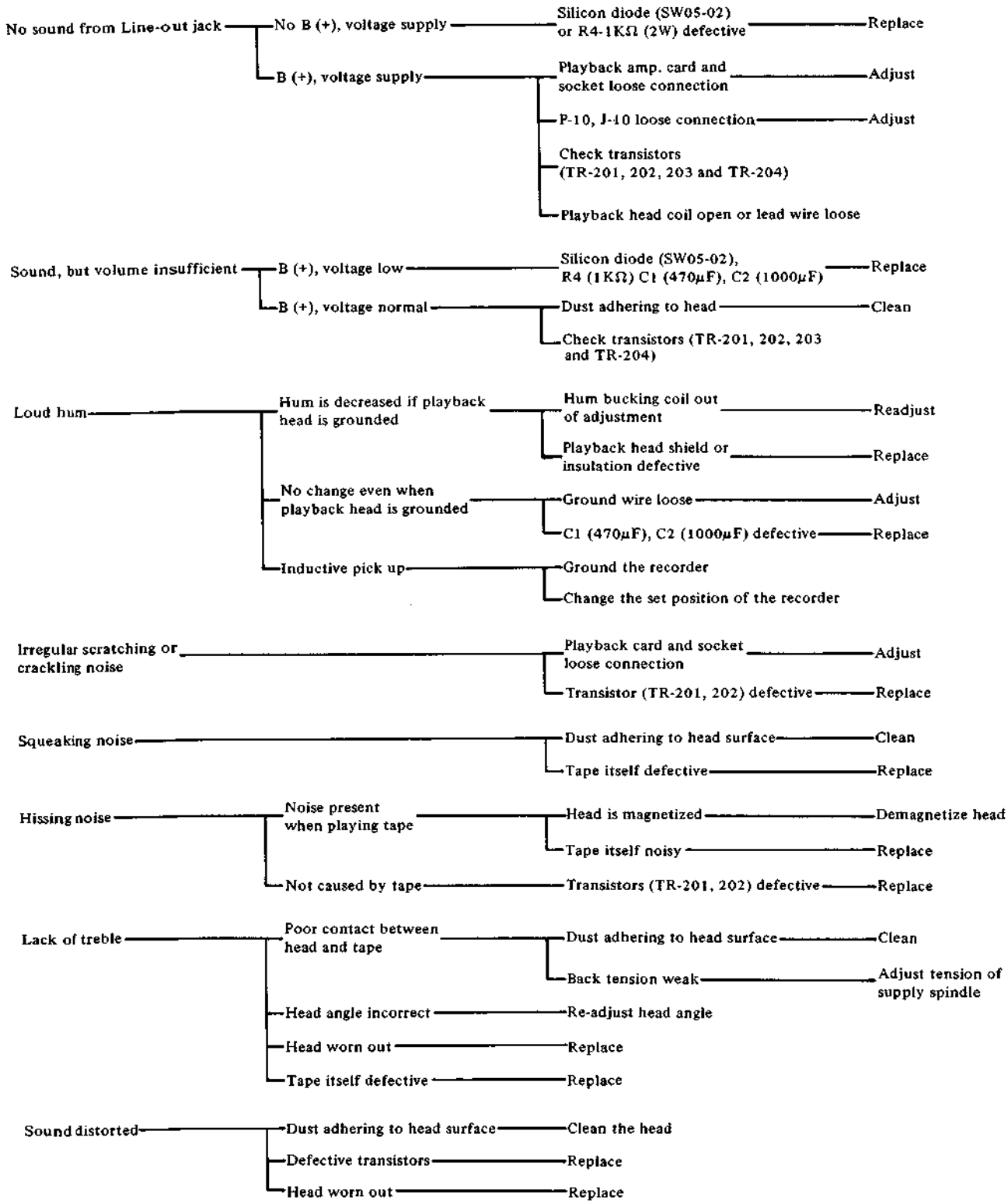
3. OSC. P.C. BOARD (MR-505)



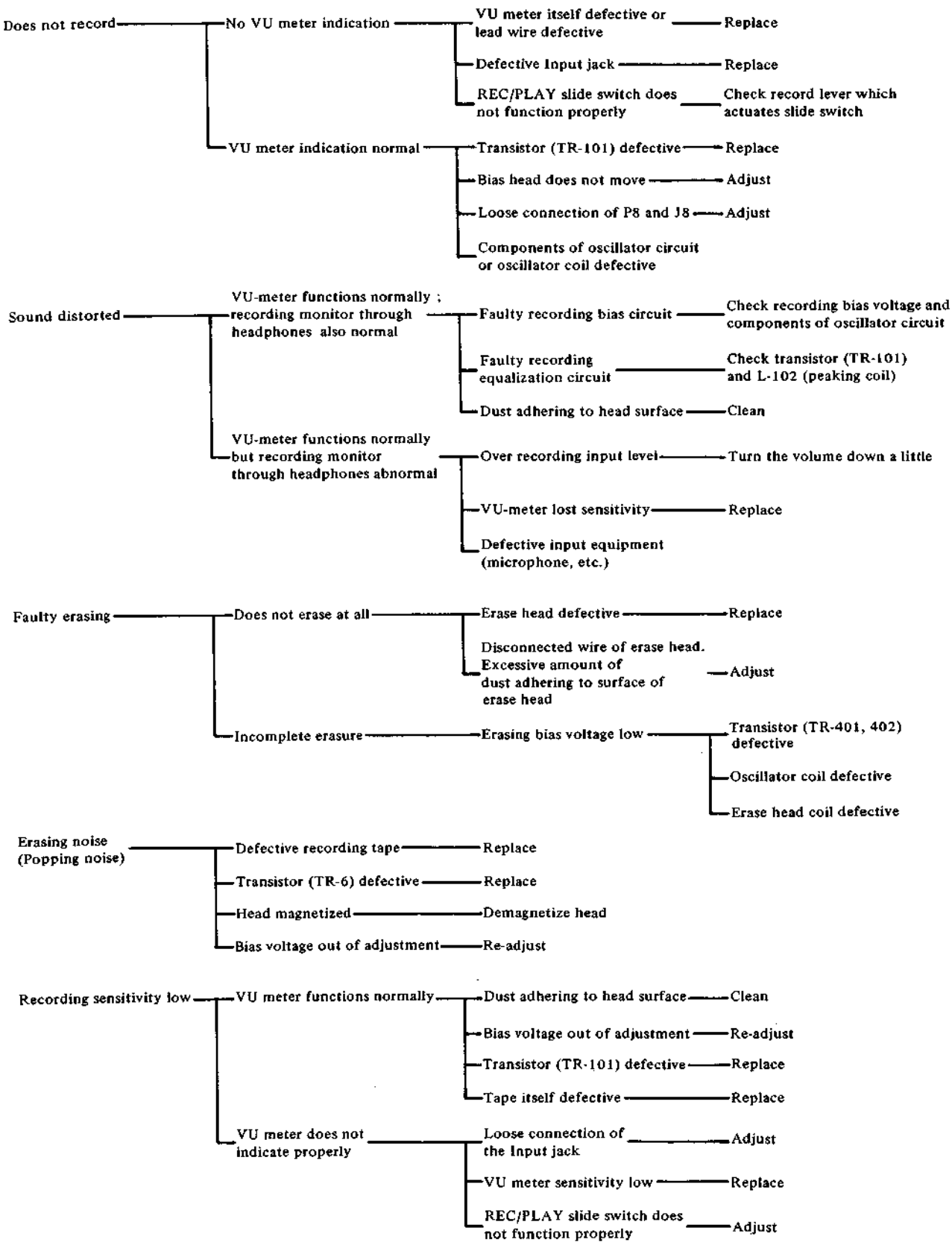
# X. TROUBLE SHOOTING CHART

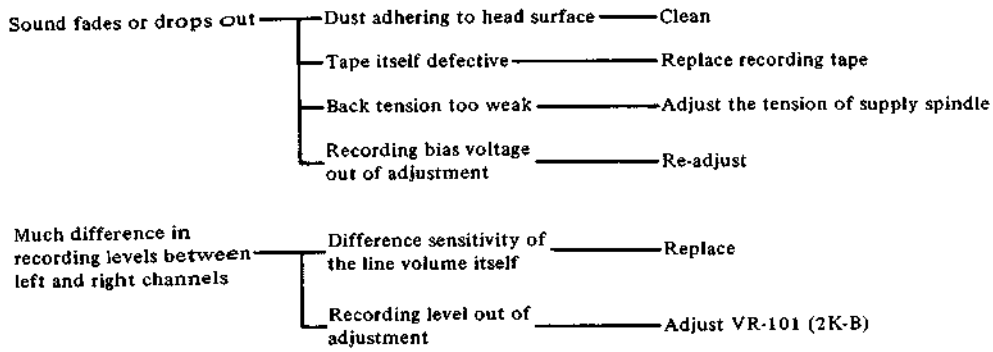
## SECTION "A" TROUBLE WITH AMPLIFIER

### 1. Playback problems. (Unit set to play position.)

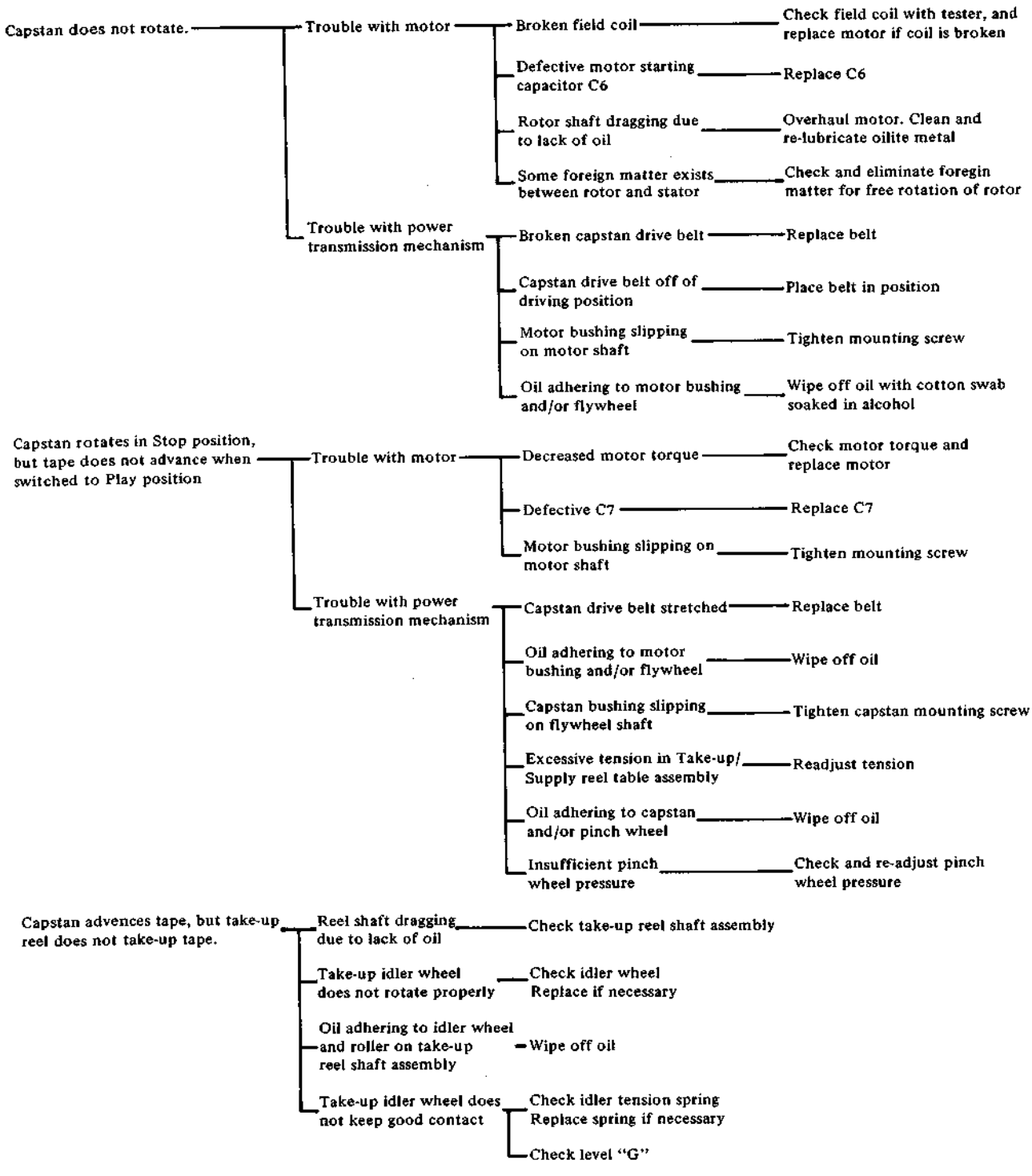


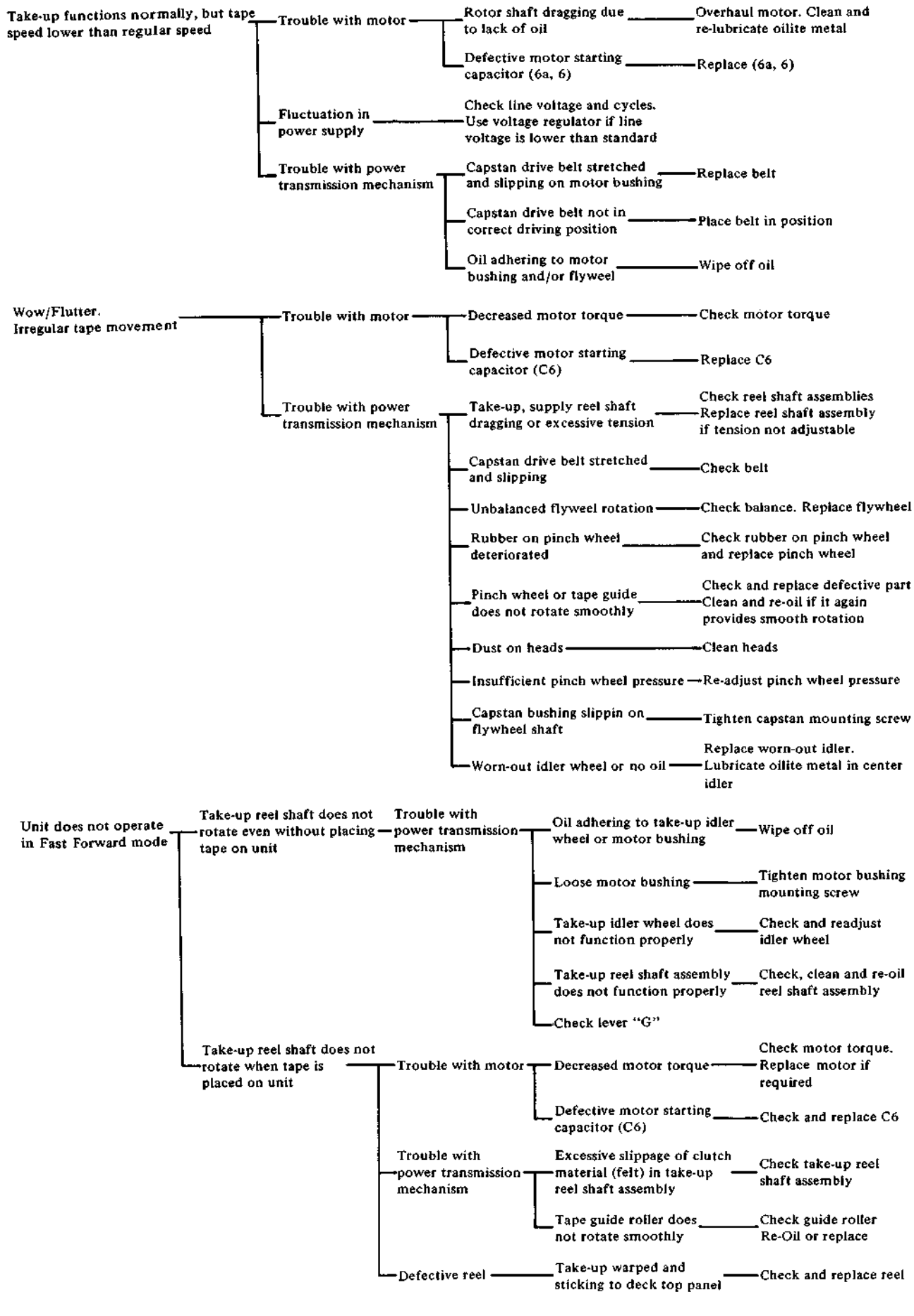
## 2. Recording problems.
## (Unit plays back pre-recorded tapes satisfactorily, but recording unsatisfactory.)

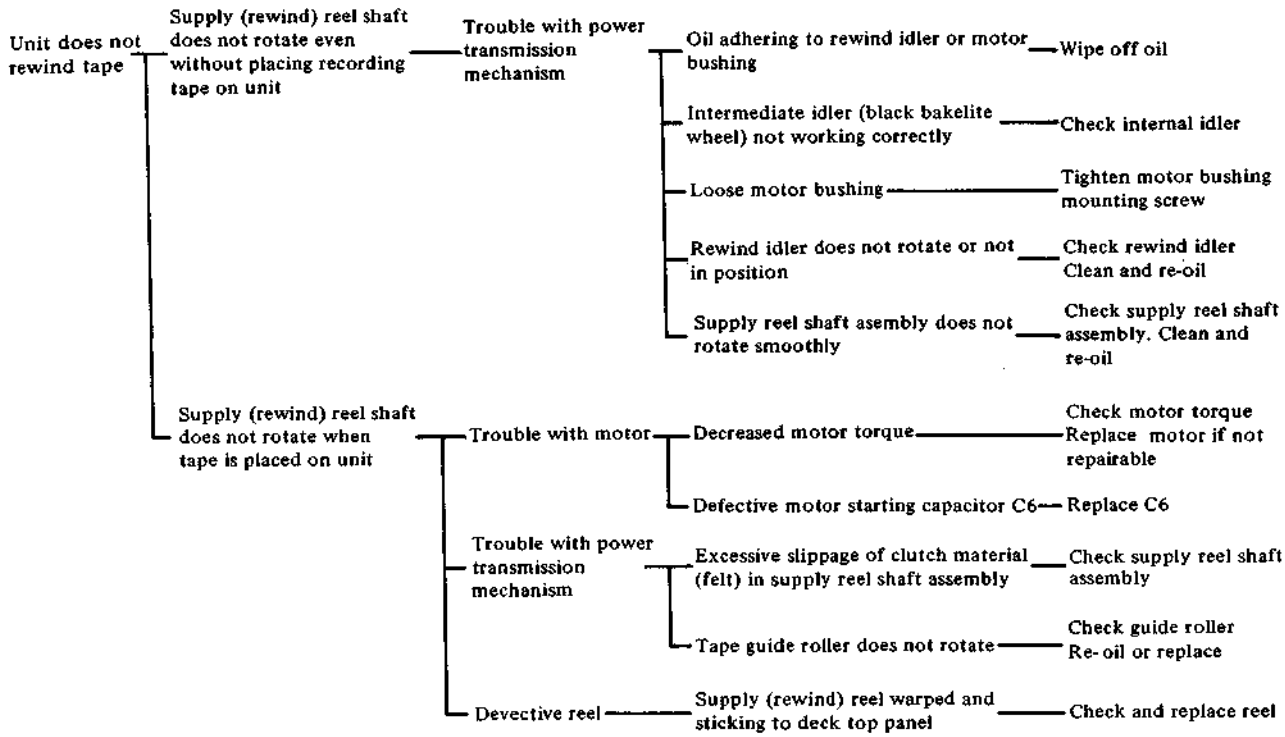


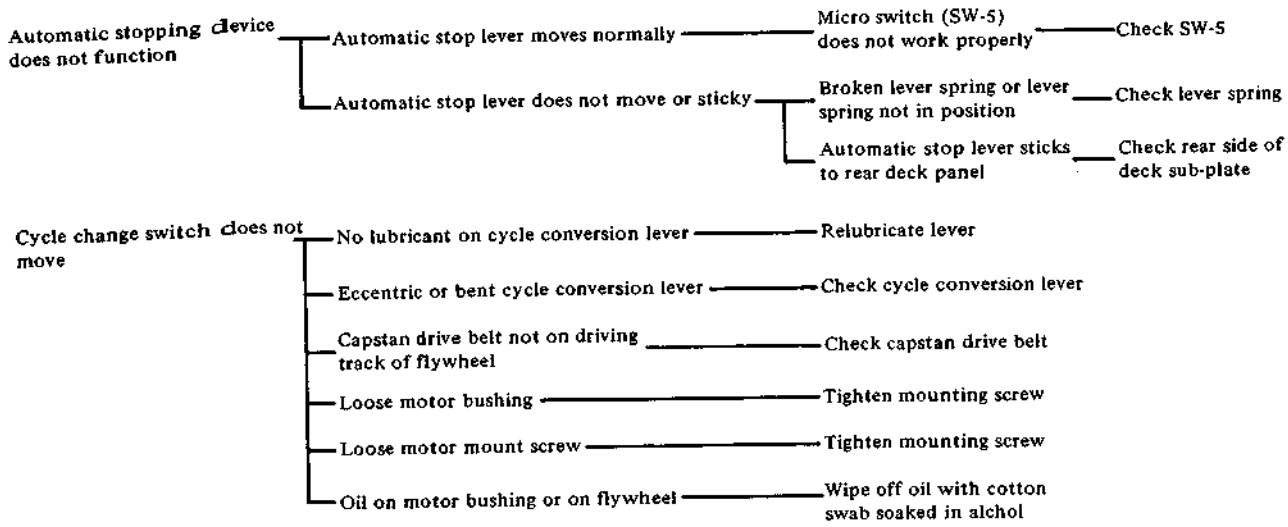

Sound fades or drops out
Dust adhering to head surface
Clean
Tape itself defective
Replace recording tape
Back tension too weak
Adjust the tension of supply spindle
Recording bias voltage out of adjustment
Re-adjust
Much difference in recording levels between left and right channels
Difference sensitivity of the line volume itself
Replace
Recording level out of adjustment
Adjust VR-101 (2K-B)

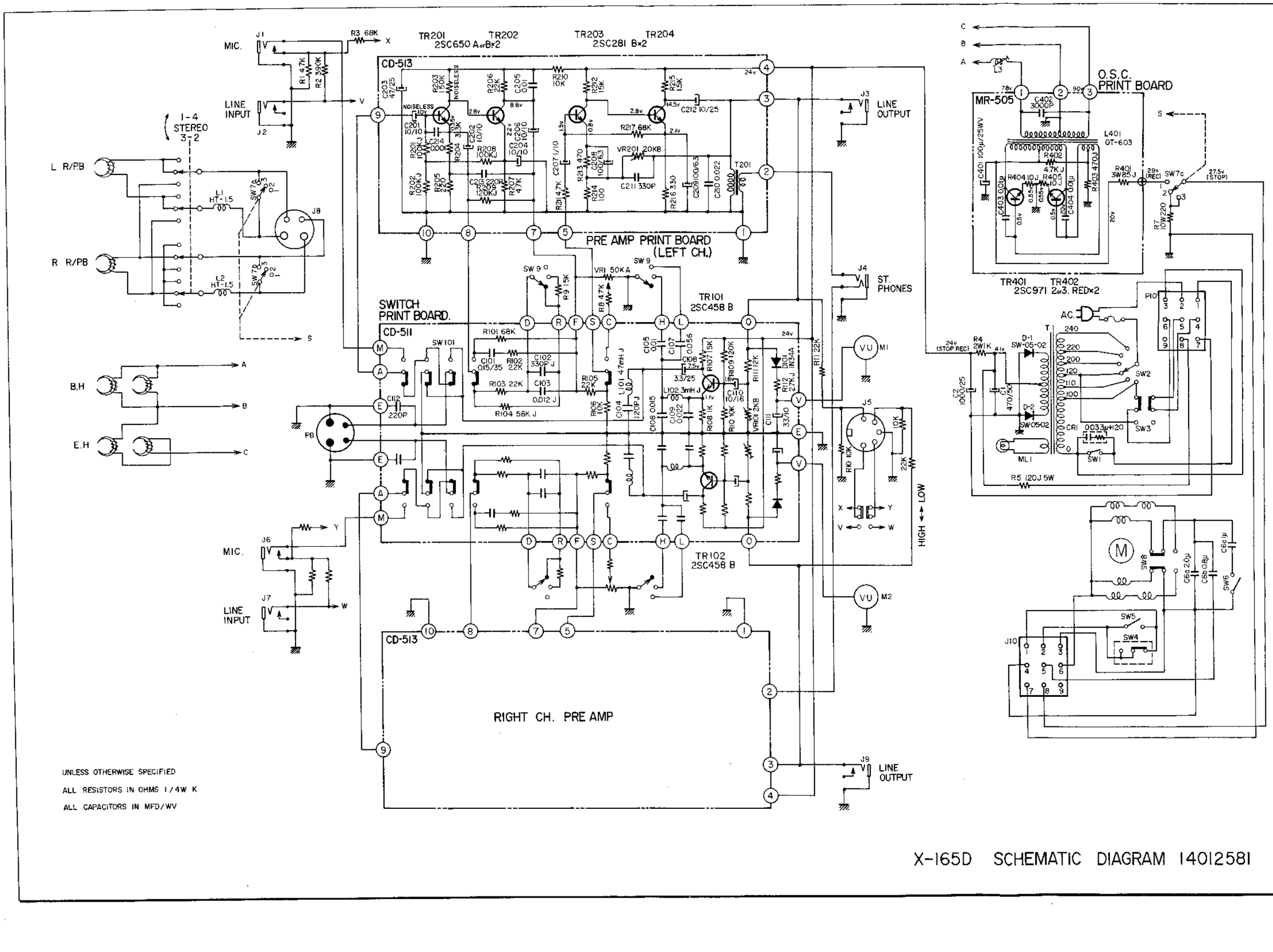
# SECTION "B" TROUBLES WITH TAPE TRANSPORT MECHANISM




Take-up functions normally, but tape speed lower than regular speed
Trouble with motor
Rotor shaft dragging due to lack of oil
Overhaul motor. Clean and re-lubricate oilite metal
Defective motor starting capacitor (6a, 6)
Replace (6a, 6)
Fluctuation in power supply
Check line voltage and cycles. Use voltage regulator if line voltage is lower than standard
Trouble with power transmission mechanism
Capstan drive belt stretched and slipping on motor bushing
Replace belt
Capstan drive belt not in correct driving position
Place belt in position
Oil adhering to motor bushing and/or flyweel
Wipe off oil
Wow/Flutter. Irregular tape movement
Trouble with motor
Decreased motor torque
Check motor torque
Defective motor starting capacitor (C6)
Replace C6
Trouble 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 and slipping
Check belt
Unbalanced flyweel 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
Dust on heads
Clean heads
Insufficient pinch wheel pressure
Re-adjust pinch wheel pressure
Capstan bushing slippin on flywheel shaft
Tighten capstan mounting screw
Worn-out idler wheel or no oil
Replace worn-out idler. Lubricate oilite metal in center idler
Unit does not operate in Fast Forward mode
Take-up reel shaft does not rotate even without placing tape on unit
Trouble with power transmission mechanism
Oil adhering 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 tape is placed on unit
Trouble with motor
Decreased motor torque
Check motor torque. Replace motor if required
Defective motor starting capacitor (C6)
Check and replace C6
Trouble 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-up 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
Trouble with power transmission mechanism
Oil adhering 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 asembly 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
Trouble 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
Devective reel
Supply (rewind) reel warped and sticking to deck top panel
Check and replace reel
Loose tape winding after being placed in 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 sizes 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
Brake does not function properly
Worn-out brake shoes
Check and replace brake shoes
Oil adhering 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 clacking noise when rewinding of 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 C6
Replace C6
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
Micro switch (SW-5) does not work properly
Check SW-5
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 alchol




UNLESS OTHERWISE SPECIFIED

ALL RESISTORS IN OHMS 1/4W K

ALL CAPACITORS IN MFD/WV

X-165D SCHEMATIC DIAGRAM 14012581