

# SERVICE MANUAL

**AKAI TAPE RECORDER**

**MODEL X-1810**

ALSO APPLICABLE TO MODEL X-1810D



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# I. SPECIFICATIONS

STYLE	: Portable	MONITOR SYSTEM	: Program being recorded can be monitored through Stereo Headphones.
WEIGHT	: 21.4 kg. (47 lbs.)	MOTORS	: Capstan Motor: Hysteresis Synchronous 3-speed (2-4-8 pole) motor. Condenser capacity 3 $\mu$ F (50 Hz), 2 $\mu$ F (60 Hz). Revolutions 3,000, 1,500, 750 rpm (50 Hz); 3,600, 1,800, 900 rpm (60 Hz). Reel Motor: Two 6-pole eddy current outer-rotor motors. Revolutions 930 rpm at 50 Hz, 100V; 1,120 rpm at 60 Hz, 110V.
DIMENSIONS	: 17.4(W) x 18(H) x 9.6(D)" (435 x 450 x 240 mm)	HEADS	: Rec/Playback Head: In-Line 4-track 2-channel stereo/monaural recording/playback. Gap: 2/1000 mm, Impedance: 1,200 $\Omega$ at 1,000 Hz. Bias Head: In-Line 4-track 2-channel stereo/monaural. Gap: 0.2 mm, Impedance: 500 $\Omega$ at 65 KHz. Erase Head: In-Line 4-track 2-channel stereo/monaural. Gap: 0.2 mm, Impedance 500 $\Omega$ at 65 KHz.
POWER SUPPLY	: AC 100 to 240V; 50/60 Hz.	(Reel)	: Rec/Playback Head: In-Line 8-track 2-channel stereo. Gap: 1/1000 mm, Impedance: 750 $\Omega$ $\pm$ 15% at 1,000 Hz. Erase Head: In-Line 8-track 2-channel stereo. Gap: 0.1 mm, Impedance: 210 $\Omega$ $\pm$ 10% at 65 KHz.
RECORDING SYSTEM	: Reel ..... In-Line 4-track 2-channel stereo/monaural CROSS-FIELD HEAD Recording System Cartridge ..... In-Line 8-track stereo recording system Transfer ..... Pre-recorded conventional reel tape can be transferred (dubbed) to cartridge tape.	(Cartridge)	: Rec/Playback Head: In-Line 8-track 2-channel stereo. Gap: 1/1000 mm, Impedance: 750 $\Omega$ $\pm$ 15% at 1,000 Hz. Erase Head: In-Line 8-track 2-channel stereo. Gap: 0.1 mm, Impedance: 210 $\Omega$ $\pm$ 10% at 65 KHz.
PLAYBACK SYSTEM	: Reel ..... In-Line 4-track 2-channel stereo/monaural playback system Cartridge ..... In-Line 8-track 2-channel stereo playback system	RECORDING LEVEL INDICATOR	: Vertical twin type VU Meters
TAPE SPEED	: Reel ..... 3 speeds (1-7/8, 3-3/4, and 7-1/2 ips) Cartridge ..... 3-3/4 ips	RECORDING CAPACITY	: Reel ..... 8 hours monaural recording at 1-7/8 ips using a 1,200 ft. tape. 4 hours stereo recording at 1-7/8 ips using a 1,200 ft. tape. Cartridge ..... 1 hour stereo recording using a 300 ft. cartridge tape.
TAPE SPEED DEVIATION	: Reel ..... $\pm$ 0.8% Cartridge ..... $\pm$ 2%	BIAS FREQUENCY:	: 65 KHz $\pm$ 5 KHz.
WOW AND FLUTTER (Fwd and Reverse Playback only)	: Reel ..... Less than 0.12% at 7-1/2 ips Less than 0.25% at 3-3/4 ips Less than 0.35% at 1-7/8 ips Cartridge ..... Less than 0.35%	MUTING TIME	: 2.5 to 5 seconds.
FREQUENCY RESPONSE	: Reel ..... 30 to 22,000 Hz. $\pm$ 3 dB at 7-1/2 ips 30 to 18,000 Hz. $\pm$ 3 dB at 3-3/4 ips 30 to 9,000 Hz $\pm$ 3 dB at 1-7/8 ips Cartridge ..... 50 to 16,000 Hz $\pm$ 3 dB	TRANSISTORS USED	: 2SC1060 (B) (C) ..... 4 2SC650 (A) ..... 4 2SC945 (Q) (R) ..... 2 2SC968 (3) (4) ..... 2 2SD223 (Y) ..... 1 2SC281 (B) ..... 4 2SC458 (C) ..... 3 2SC458 (B) ..... 2 SC971 (3) (2) ..... 2 2SC1211 (C) (D) ..... 1
EQUALIZATION	: Correct equalization for playback of tapes recorded to NAB curve.	SILICON DIODES USED	: 10D1 (or V06B) ..... 2 10DC-1 (B1k) ..... 1 RD24A (or 1S339A) ..... 1 10D1 ..... 3 10D2 ..... 2 10D4 ..... 1
SIGNAL TO NOISE RATIO	: Reel ..... Better than 46 dB Forward Operation at all speeds. Better than 44 dB Reverse Operation at all speeds. Cartridge ..... Better than 41 dB.	GERMANIUM DIODES USED	: IN34A ..... 7
CROSS-TALK	: Reel ..... Better than 65 dB (monaural) Better than 43 dB (stereo) Cartridge ..... Better than 50 dB	REEL CAPACITY	: 5 or 7" reels
ERASE RATIO	: Reel ..... Better than 70 dB Cartridge ..... Better than 65 dB	CARTRIDGE	: AKAI 8-track cartridge (Lear Jet type)
INSULATION RESISTANCE	: More than 50 M Ohms	POWER CONSUMPTION	: 110W (X-1810D 95W)
INSULATION DURABILITY	: 1,000V AC for more than 1 minute duration		
OUTPUT			
LINE OUTPUT (or Din Output)	: 1.228V (OVU. + 4 dB $\pm$ 2 dB) with a 250Hz OVU Recorder tape. Required Load Impedance more than 20 K $\Omega$ . Forward $\longleftrightarrow$ Reverse $\pm$ 2 dB		
MAIN OUTPUT:	: 5W maximum per each channel at music power. (Total 10W). Impedance 8 $\Omega$ .		
INPUT			
LINE INPUT	: 60 mV, Impedance 150 K $\Omega$ .		
MIC INPUT	: 0.5 mV, Impedance 100 K $\Omega$ .		
DIN INPUT	: 20 mV, Impedance 68 K $\Omega$ .		
FAST FORWARD AND REWIND TIME	: 80 seconds for a full 1,200 ft. tape at 50 Hz. 65 seconds for a full 1,200 ft. tape at 60 Hz.		

## II. MEASURING METHOD

### TAPE SPEED DEVIATION

1. Method involving use of pre-recorded tape.  
Playback a tape pre-recorded at 1,000 Hz ( $\pm 0.1\%$ ) on recorder to be tested. Connect the appropriate output to a frequency counter meter in order to measure the tape speed deviation.

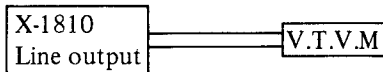
2. Method involving use of timing tape  
(designed for tape speed measurement)

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 back 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.

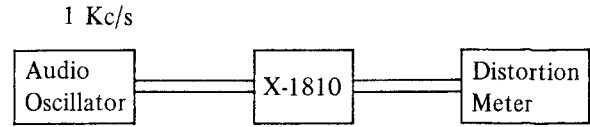
### SIGNAL TO NOISE RATIO



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 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.

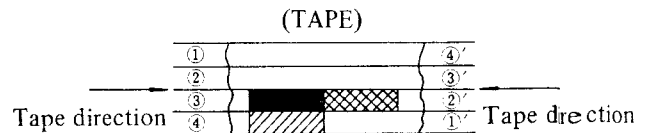
Measure the Voltage at the output of the recorder to be tested when terminated with 8  $\Omega$ .

Then use the following formula:

$$P = \frac{E^2}{R}$$

$P$  = Desired output (W)  
 $E$  = Measured Voltage (R.M.S.)  
 $R$  = 8  $\Omega$

### 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 no-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)

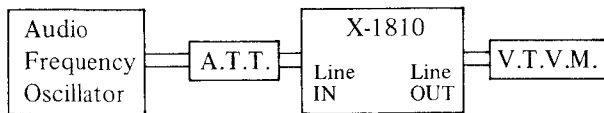
$E_0$  = 1,000 Hz signal output level

$E_2$  = 1,000 Hz crosstalk output level

$E_1$  = No-input signal record level

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## FREQUENCY RESPONSE



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

### RECORD :

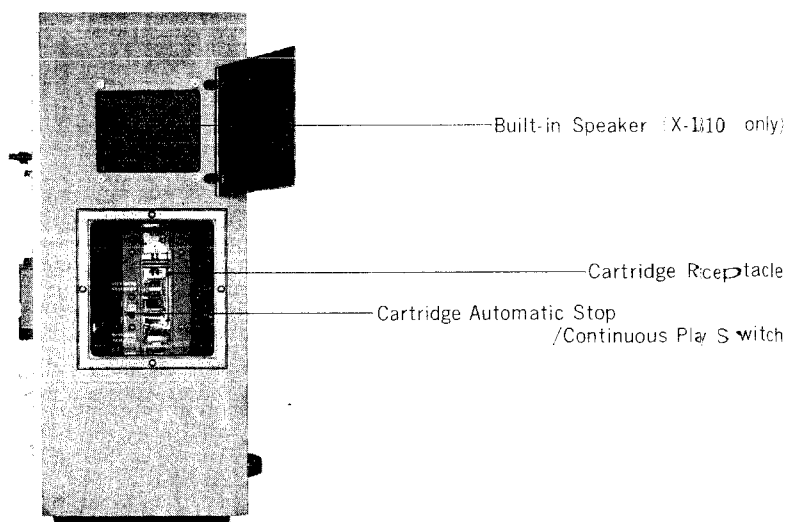
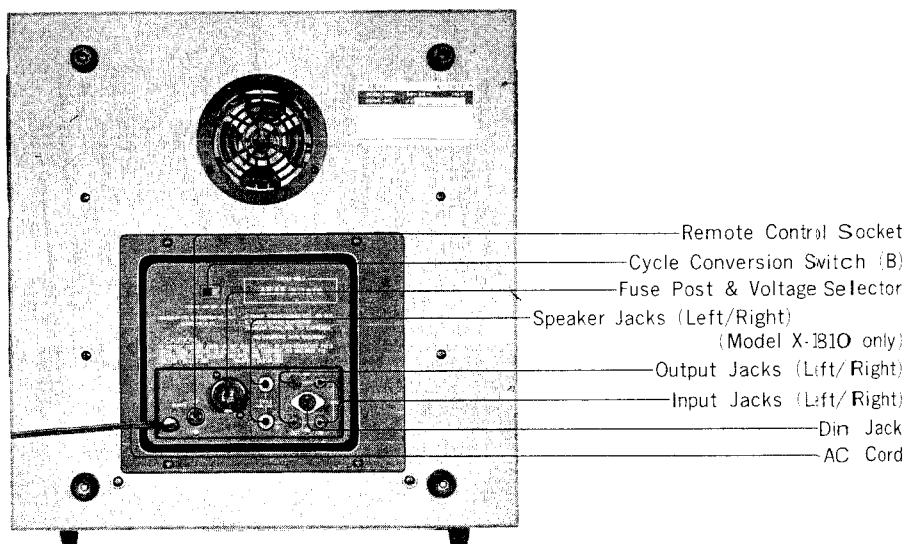
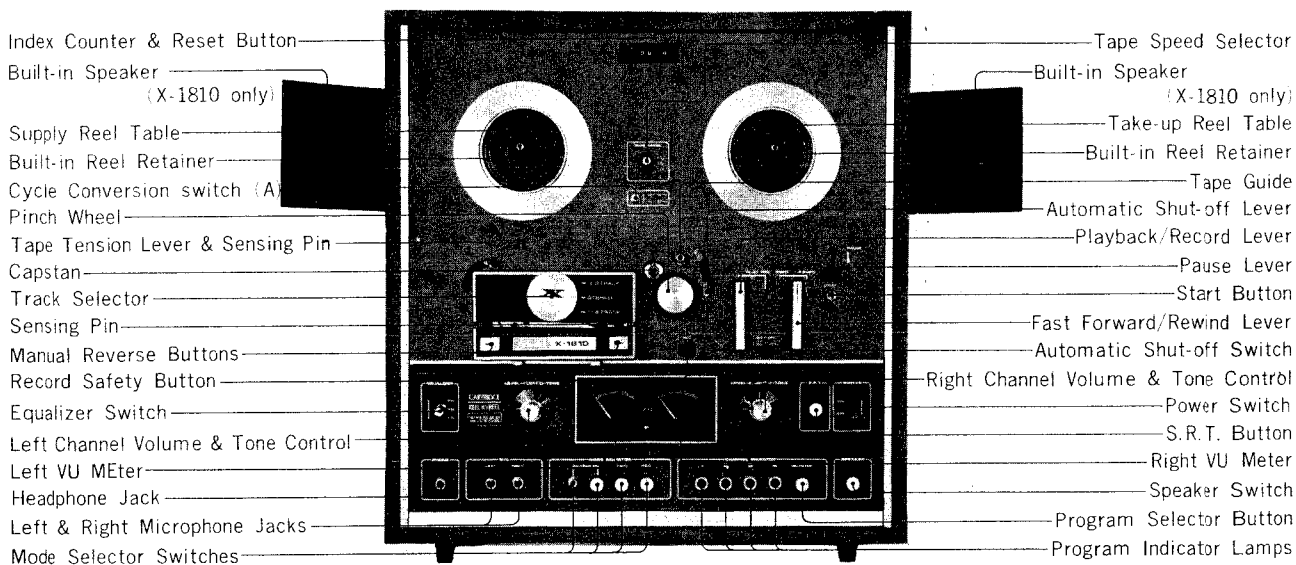
- 1) Introduce a sine wave of 1,000 Hz to the Line Input of the recorder to be tested, through an attenuator from an audio frequency generator.
- 2) Set the Record/Playback Knob in to "Rec" position and adjust the line input volume so that the VU meter needle indicates "0" VU.
- 3) Under the condition described in (2), lower the input level 16 dB (cartridge 20 dB) by means of the attenuator.
- 4) Record the spot frequency in the range of 30 Hz to 23,000 Hz from the audio frequency generator.

### PLAYBACK:

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

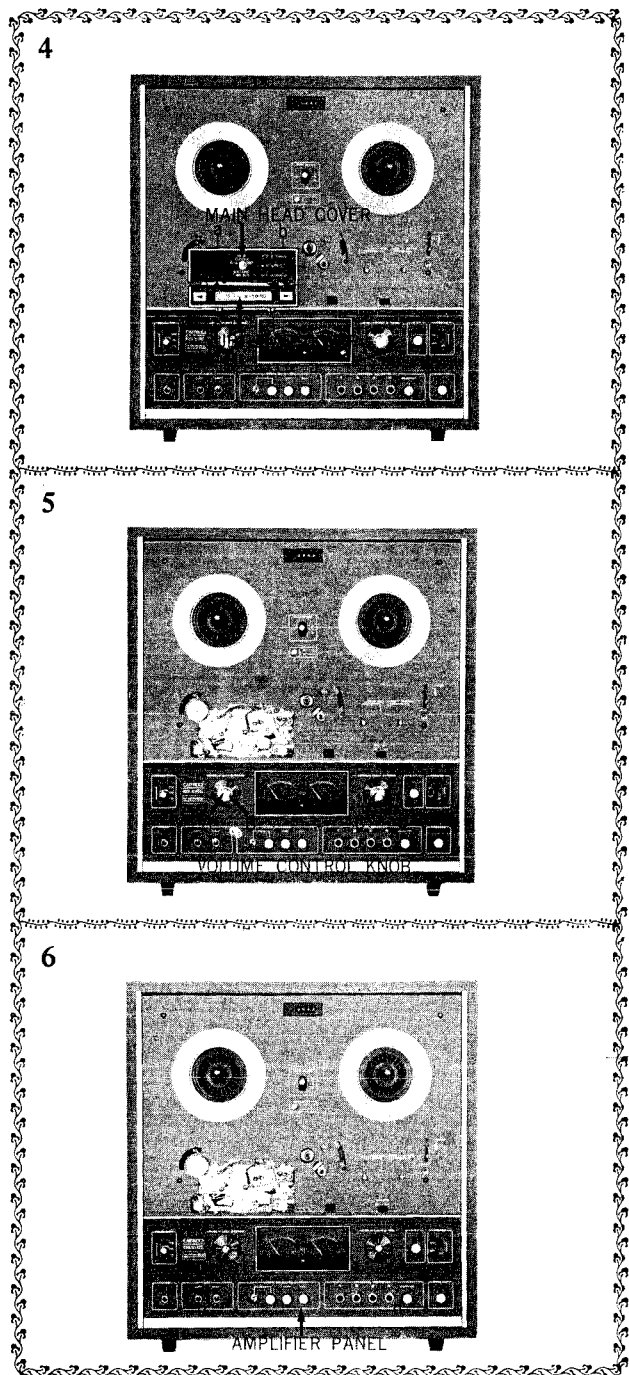
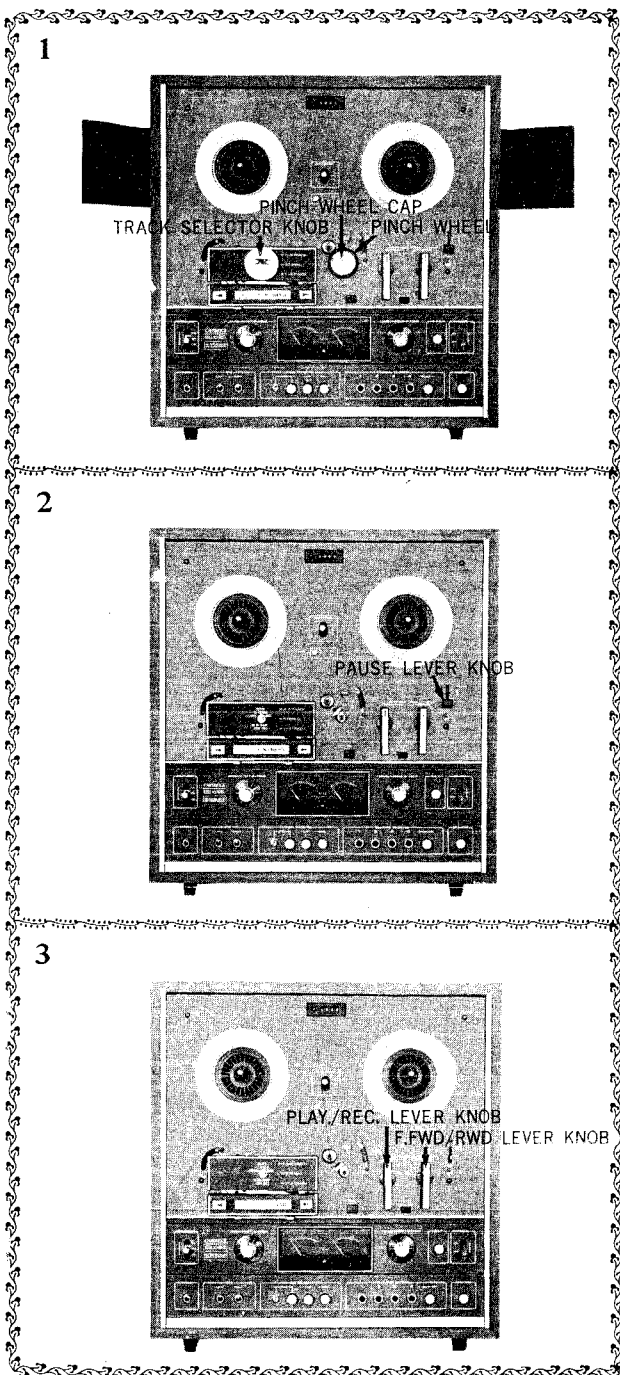
(Note: New tape of particularly good quality should be used for measurement of the frequency response. AKAI 100F tape is recommended).

### III. CONTROL LOCATIONS

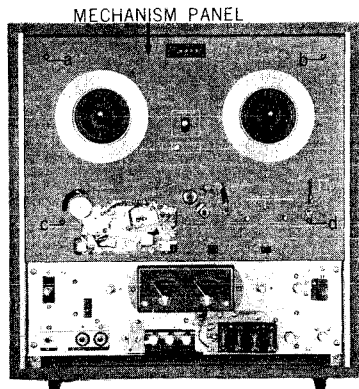


# IV. DISMANTLING OF TAPE TRANSPORT UNIT & AMPLIFIERS

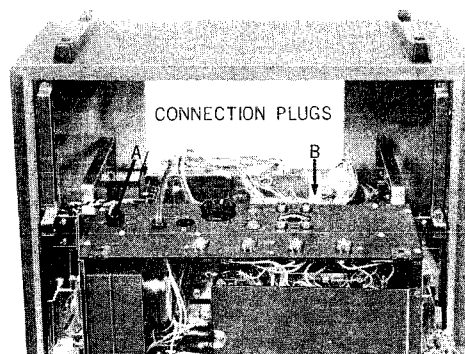
In case of trouble, etc. necessitating disassembly, please disassemble in the order shown in photographs. Reassemble in reverse order.



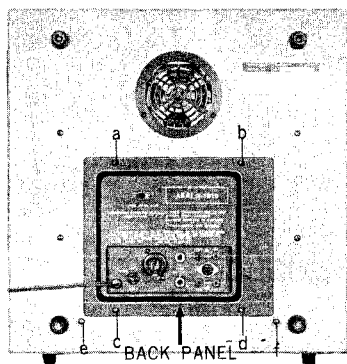
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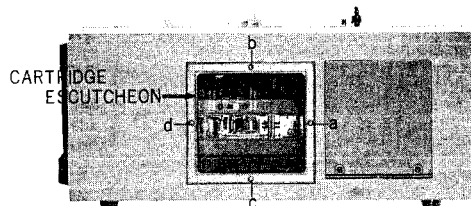
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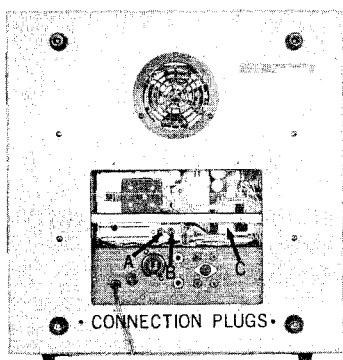
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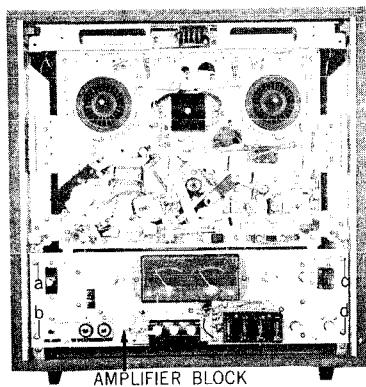
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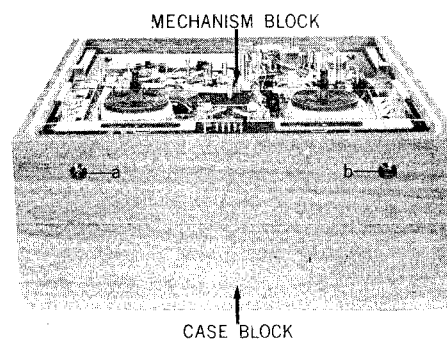
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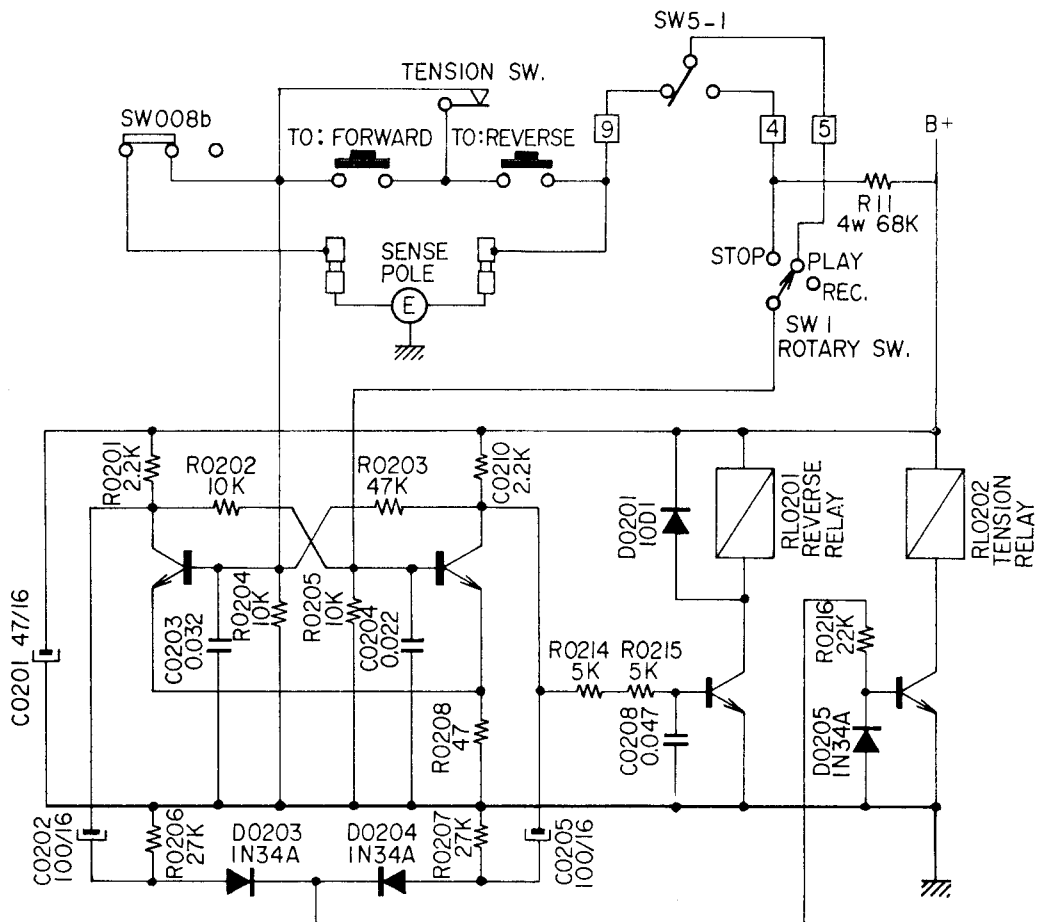


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# V. TRANSPORT MECHANISM



	TR0201 2SC945(Q)(R)	TR0202 2SC945(Q)(R)	TR0203 2SC1211(C)	TR0204 2SC458(C)
FORWARD PLAY	OFF	ON	OFF	FWD. → REV. ON (AFTER 2.5 TO 5 SEC. OFF)
REVERSE PLAY	ON	OFF	ON	REV. → FWD. ON (AFTER 2.5 TO 5 SEC. OFF)

Fig. 1 SYSTEM CONTROL CIRCUIT

## 1. FORWARD PLAY (Recording) (Pinch Roller Pressure 1.5 Kgr. to 1.8 Kgr.)

When Recording/Playback Lever is set to PLAY position, the Pinch Roller Presses against Capstan to move the tape at the rated speed. The Brake Levers free the Brake, and Lever Spring (G) turns "on" Micro SW (SW 006 operation switch). System control TR0201 is turned "off", TR0202 "on", and TR0203 & TR0204 "off". About a 60V current is supplied to the take-up motor and about 30V to the supply motor, so that the torque motors become operative. (See Fig. 2)

### System Control and Motor Circuit Block Diagram

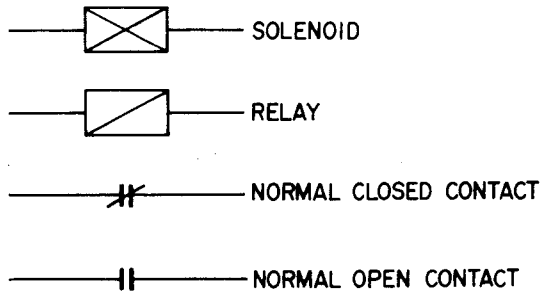
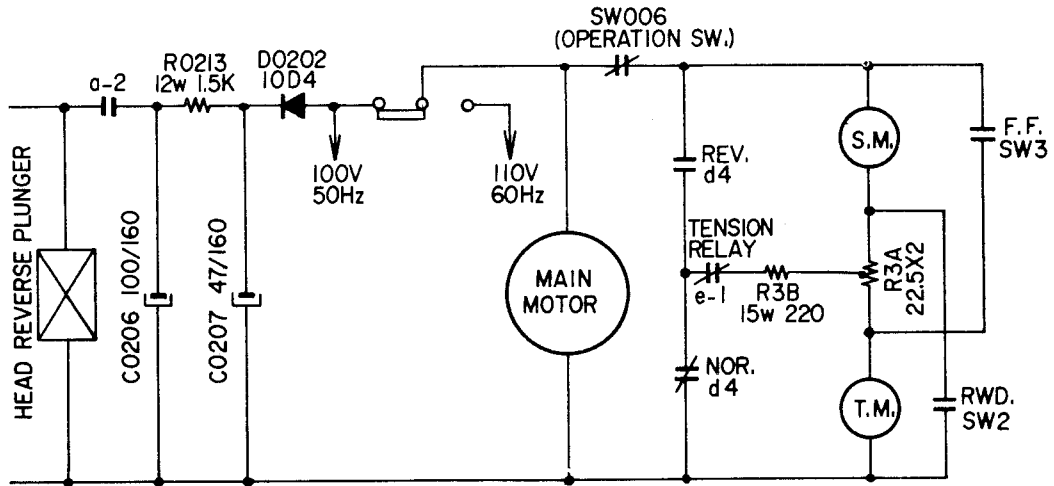


Fig. 2 FORWARD PLAY

### SUPPLY VOLTAGE OF BOTH TORQUE MOTORS DURING RECORDING/PLAYBACK

	SUPPLY MOTOR	TAKE-UP MOTOR
Forward Play	30V (50 to 70gr)	60V (210gr)
First 2.5 to 5 sec. of normal or reverse	47V (100gr)	47V (100gr)
Reverse Play	60V (210gr)	30V (50 to 70gr)
RWD. or F. Fwd.	100V	100V

Fig. 3

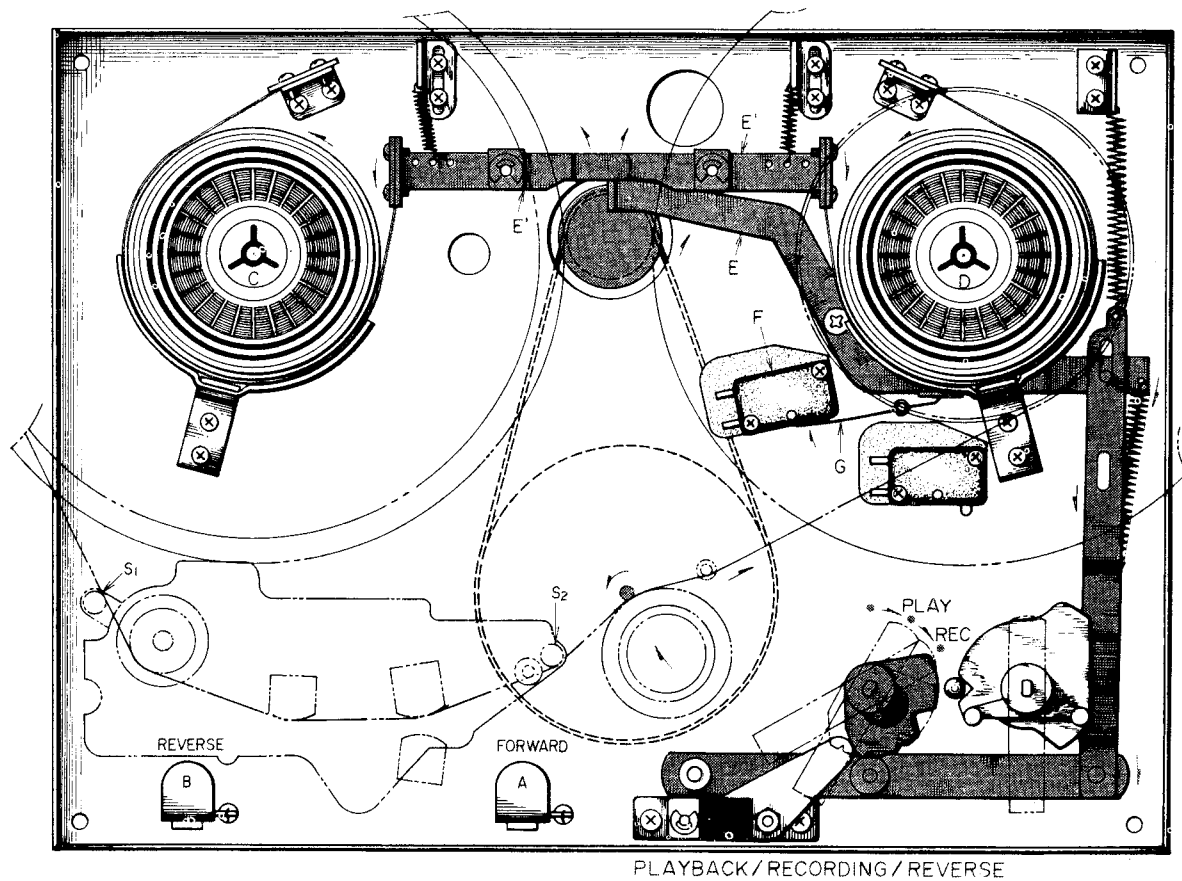


Fig. 4

## 2. FROM FORWARD PLAY TO REVERSE PLAY

At Playback Mode, if Reverse Button (B) is depressed or the Sensing Tape passes the Sensing Pole (S<sub>1</sub>), the base of TR0202 is grounded. The operation of TR0202 is turned off and the voltage is sent to the base of TR0203 and operates it. Reverse Relay RL0201 is activated and reverse is effected. Because RL0201 is turned "on", about a 60V current is supplied to the left motor and about 30V to the right motor (Refer to Figs. 3 and 5). At the same time, the charge current flows to C0205 (100/16) and is supplied to the base of TR0204, and TR0204 is turned "on". Complete charging of C0205 (100/16) takes only about 2.5 to 5 seconds, supplying 110V to the main motor (See RL0202-e-1). A voltage of about 47 volts is supplied to the supply and take-up motors respectively (See RL0202-f-2) and the mute relay (See RL0202 g-4, h-3) works to mute the playback output signal. After 2.5 to 5 sec. TR0204 is turned "off", and also RL0202 is turned "off".

At the same time, a discharge current of C0206 (100/160) momentarily flows and about a 140V current is supplied to the Reverse Plunger.

Upon completion of discharge of C0206, about a 35V current becomes constant, and a lowered playback head position is maintained.

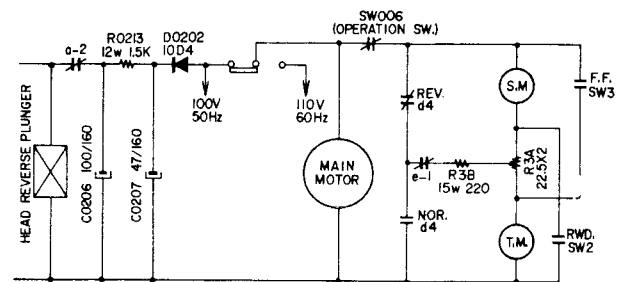


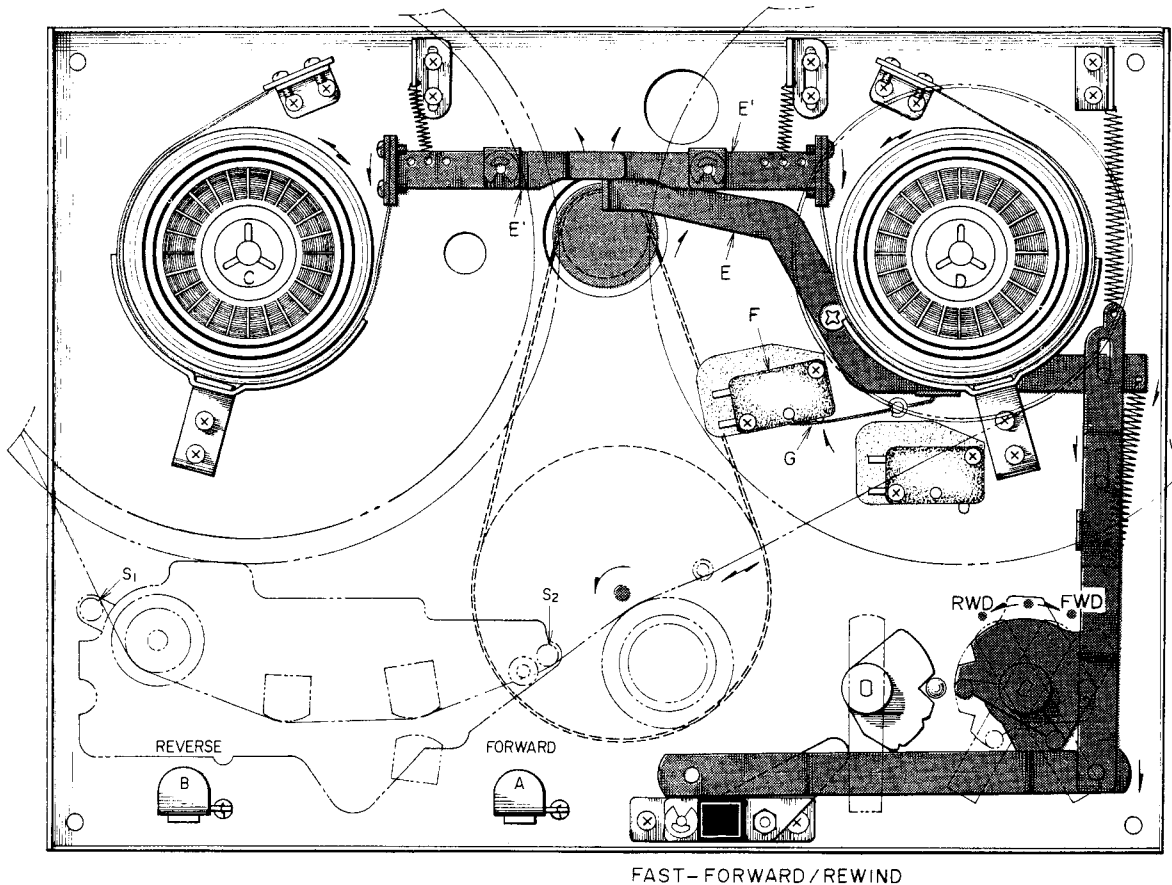
Fig. 5

## 3. FROM REVERSE TO FORWARD PLAY

During Reverse Playback, if manual reverse Forward Button "A" is depressed or the sensing tape passes the sensing pole "S<sub>2</sub>" the base of TR0201 is grounded, TR0201 is turned "off", voltage is supplied to the base of TR0202, TR0202 is turned "on", and TR0203 is turned "off".

RL0201 is "off", a-2 is turned "off" and the flow of voltage to the Reverse Plunger is cut, the Recording Playback Head is raised to upper position, a voltage of 30V is supplied to the left motor, and about 60V to the right motor (Refer to Figs. 1, 2, and 3).

TR0204 is turned on within 2.5 to 5 seconds, supplying 110V to the main motor (See RL0202 e-1). 47V is supplied to the Supply and Take-Up Motors respectively and the Mute Relay (See RL0202 h-3) works to mute the playback output signal.



FAST-FORWARD/REWIND

Fig. 6

#### 4. FAST FORWARD

When Fast Forward/Rewind Lever is set to "F. Fwd", Lever Spring "G" turns on SW006 Operation Switch F (Micro Sw) and Brake Levers (E) (E') free Brake. Further, SW-3 (Slide Switch) is turned "on", a 100V current is supplied to the Take-Up Motor and the Take-Up Motor rotates. (Refer to Fig. 7).

#### 5. REWIND

When Fast Forward/Rewind Lever is set to "RWD", Lever Spring "G" turns on SW006 Operation Switch (Micro Sw) and Brake Levers (E) (E') free Brake. Further SW-2 (Slide Switch) is turned "on", a 100V current is supplied to the Supply Motor and the Supply Motor rotates. (Refer to Fig. 8).

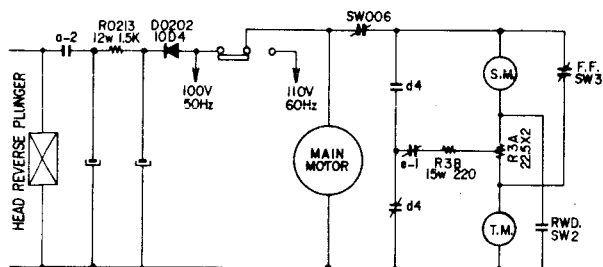


Fig. 7

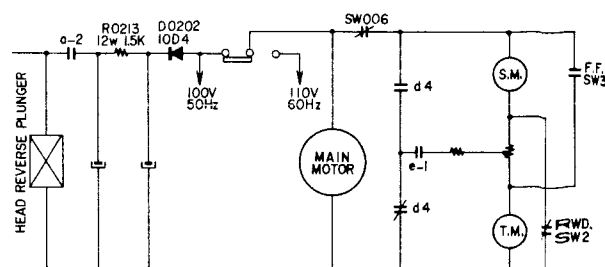


Fig. 8

## 6. AUTOMATIC STOP MECHANISM

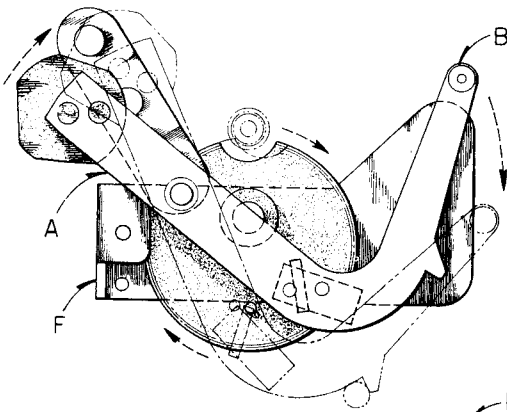


Fig. 9

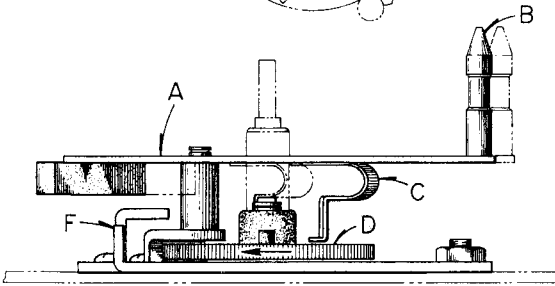


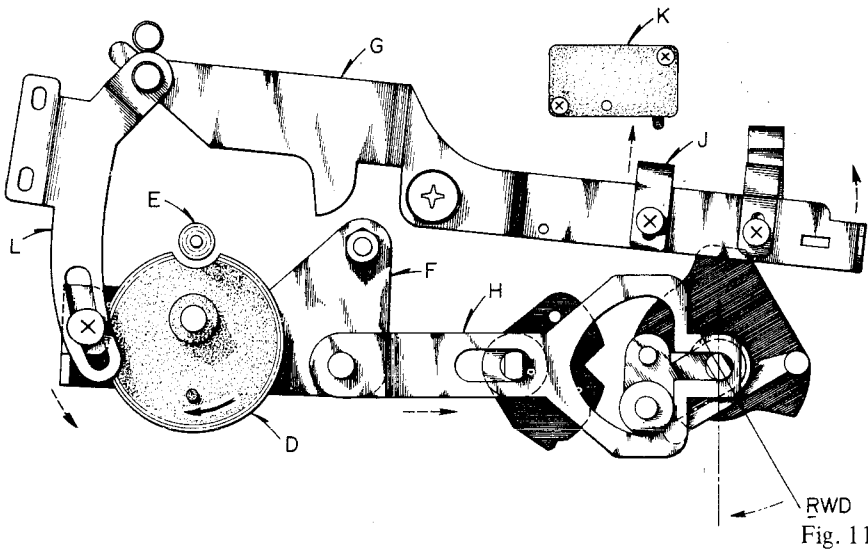
Fig. 10

When the tape is threaded on pin (B), if the tape is accidentally broken or comes to the end, Automatic Stop Lever (A) drops to its original position.

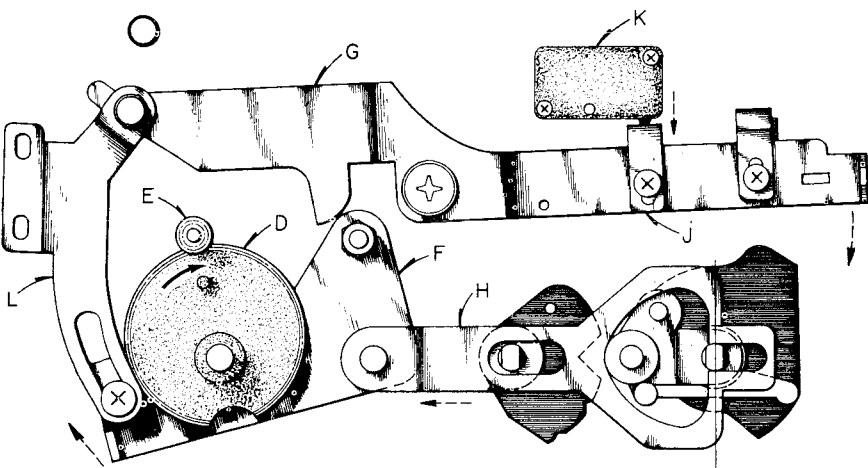
When the tape is broken or comes to the end, Plate Spring (C), located below the Automatic Stop Lever, depresses a projected pin on Eccentric Gear (D). Eccentric Gear (D) gears into Flywheel (E) to begin rotation of the Eccentric Gear. This rotating action operates Lever (L), which is connected to the base of the Eccentric Gear, and Pushes up Instant Stop Lever (G). When Instant Stop Lever (G) is lifted, Shut-Off Lever (J) contacts Micro Switch (K) and the current supply is cut off. Thus, automatic stop control is provided in Recording and Playback modes.

In Fast Forward and Rewind modes, the same operation takes place except that Lever (H) works to push back the FF, Rewind Shaft to "Stop" position.

(See Figs. 9 to 12)



RWD  
Fig. 11



STOP Fig. 12

## 7. RECORD/PLAYBACK CHANGING MECHANISM

When REC/PLAYBACK LEVER (N) is turned to REC position, CAM (a) pushes Recording Levers (b), (c), and (d) as illustrated by the dotted lines in Fig. 13. Then the RECORD/PLAYBACK CHANGE SWITCHES SW4-1 and SW2-1 a, b assume recording position.

If Levers (b) and (c) do not move Lever (d) properly, SW4-1 and SW2-1 a, b, do not operate properly, abnormal oscillation may occur. Also the inability to record may occur.

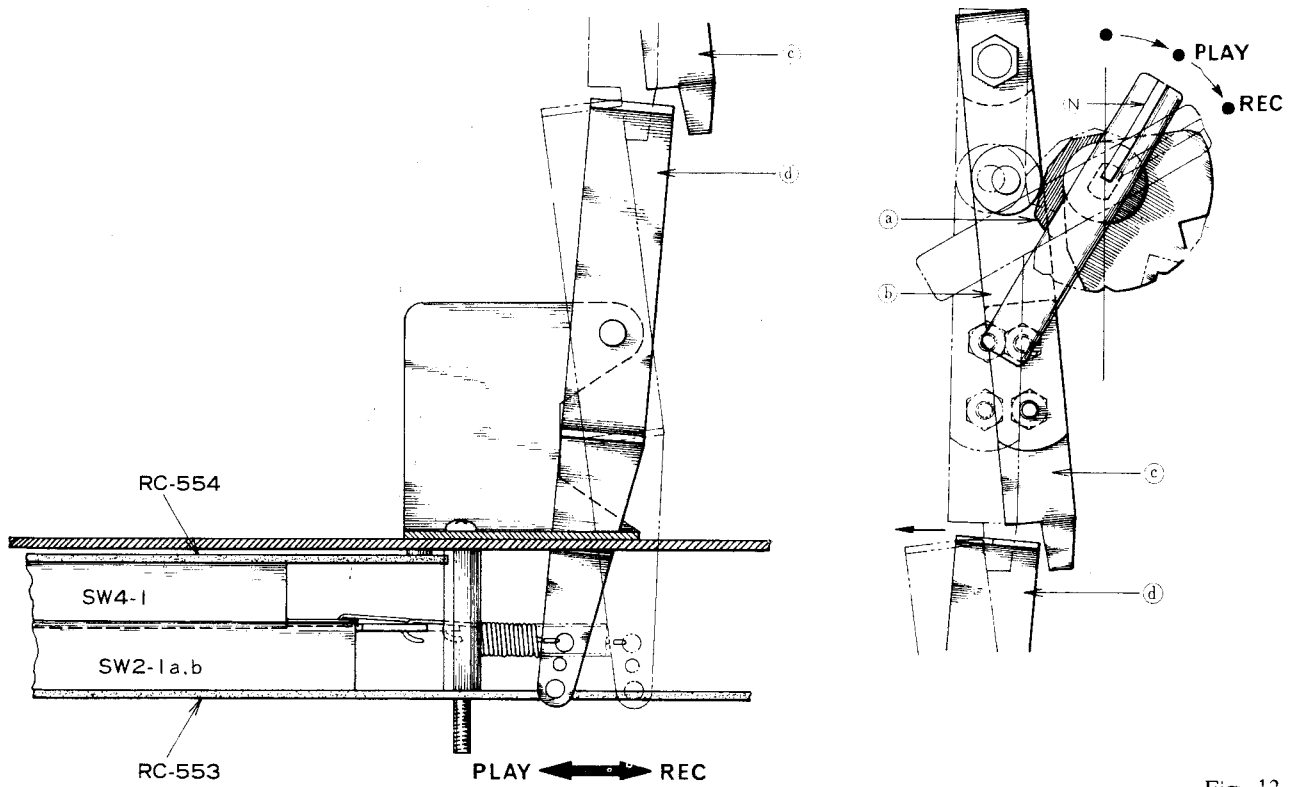


Fig. 13

## 8. CARTRIDGE AUTOMATIC STOP OPERATING PRINCIPLES (See Fig. 14)

When Cartridge Auto Stop/Cont. Play Switch (SW-4) is set to "Auto Stop", when the Program Selector comes to Program "4" position, the voltage passes through Program Selector and Relay (RL5-1) (1) and voltage is applied to D5-1 and RL5-1 as shown in Fig. 14, point "A" is grounded by the Program Selector or Sensing Tape, RL5-1 is activated, and the motor stops. At the same time, Solenoid Coil SL5-1 is also activated and Program Selector is returned to Program 1 position. Relay RL-1 is held by the voltage supply from P15 (16) Multi-Jack which passes RL-1.

In order to return to normal mode after Cartridge Automatic Stop has been effected, the voltage supply to RL5-1 must be cut. When this is done, SW-4 (Automatic Stop/Continuous Play Switch) returns to "Cont Play". This can also be accomplished by turning the Power Switch ON-OFF-ON.

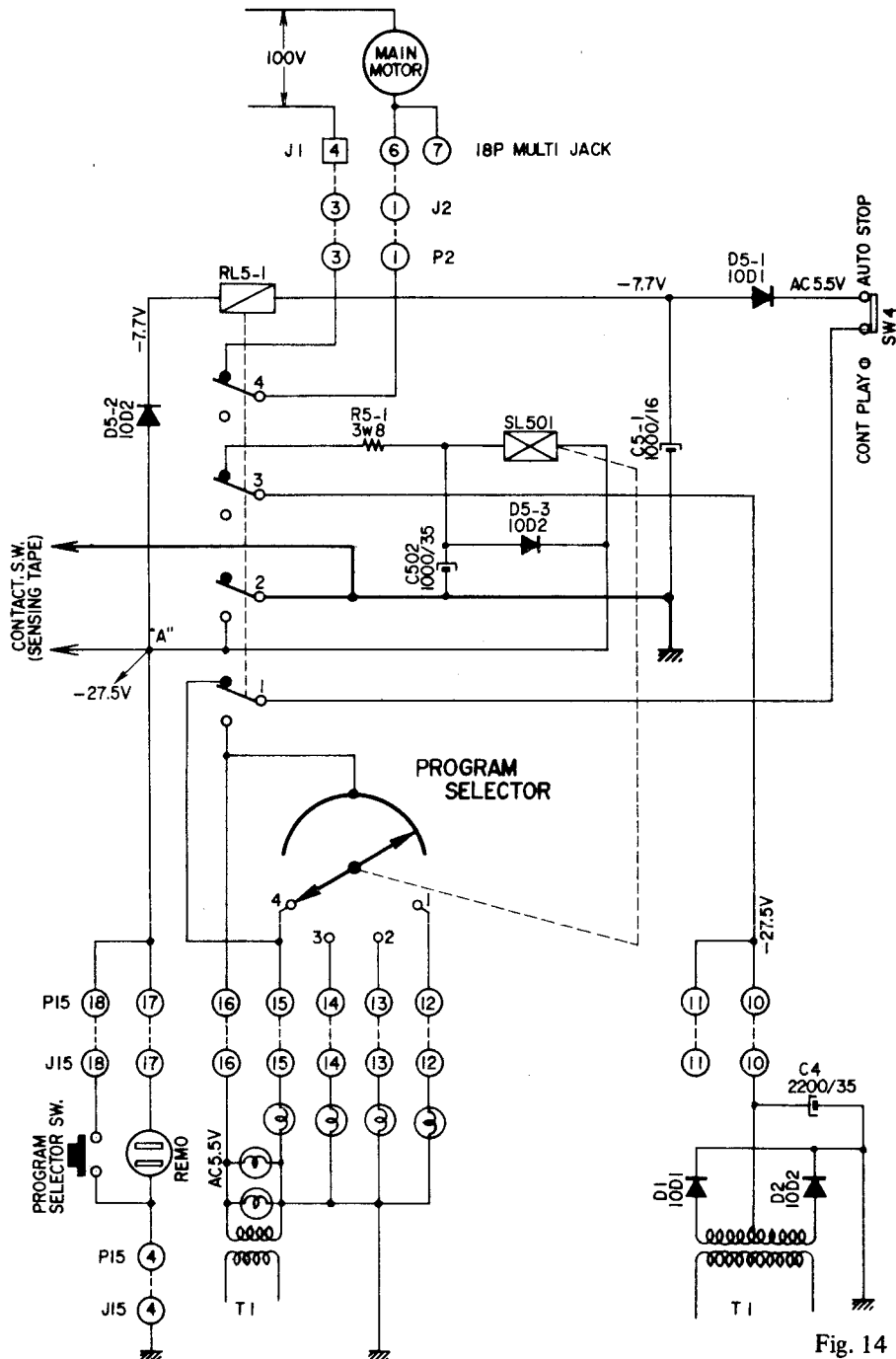


Fig. 14

## VI. MECHANISM ADJUSTMENT

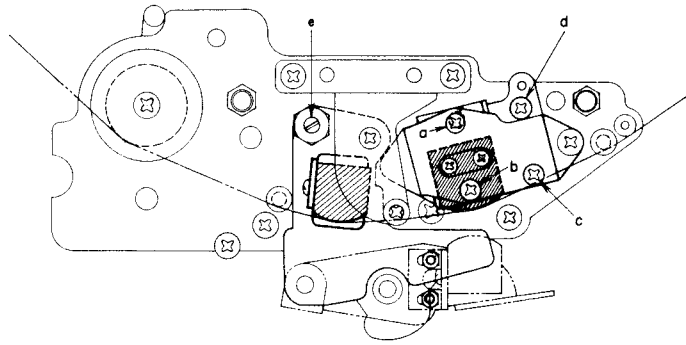


Fig. 1

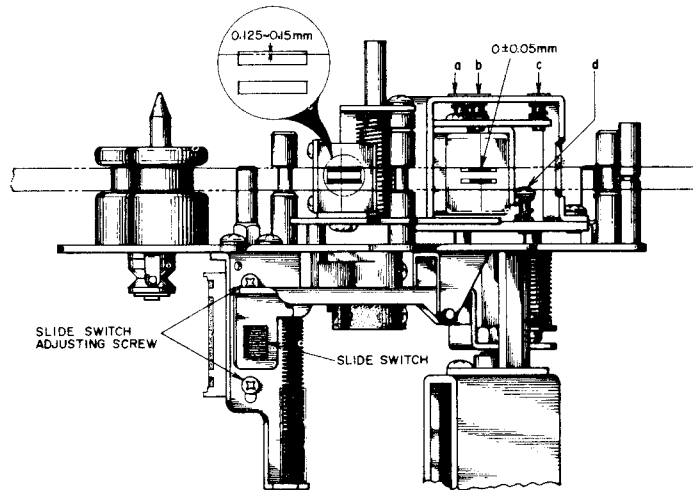


Fig. 2

### 1. HEAD HEIGHT ADJUSTMENT (See Figs. 1 and 2)

#### A. Recording Playback Head

During normal (Forward) play, adjust Screws (a) and (b) so that the upper edge of the Rec/Playback Head's upper core is the same height as the upper edge of the tape.

During reverse play, adjust Screw (d) so that the lower edge of the Rec./Playback Head's lower core is the same height as the lower edge of the tape.

#### B. Erasing Head

Adjust screw (e) so that the upper edge of the upper core is 0.125 to 0.15 mm higher than the upper edge of the tape. In adjusting Head Height, make sure that the front of the Head is at right angles to the Chassis and that the upper and lower part of the Head firmly contacts the tape.

### 2. ADJUSTMENT OF AZIMUTH ALIGNMENT

#### A. Playback/Rec Head (See Fig. 1, 2)

Use a pre-recorded tape (16 kHz, 7-1/2 ips), and connect a high sensitivity V.T.V.M. to the line output jack. Adjust screws (c) so that line output voltage is maximum.

#### B. Erasing Head

Visually check to assure that the center line of the Erasing Head is at right angles to the Head Chassis.

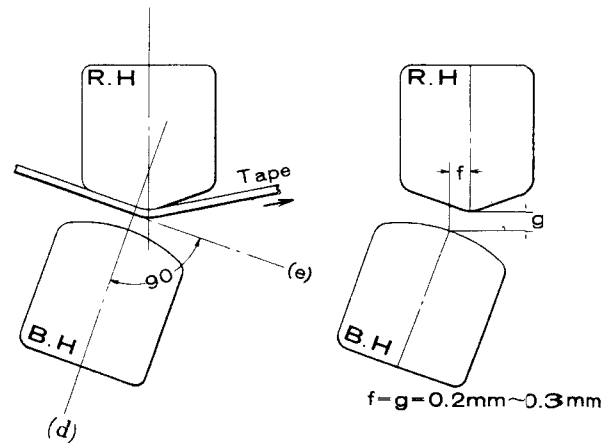


Fig. 3

Fig. 4

#### C. Clearance of the Bias Head (See Fig. 3, 4)

Unfasten two screws and move the Bias Head by hand until the clearance (f) and (g) reaches 0.2 to 0.3 mm. Then fasten 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 Characteristic will be too high, but Distortion will increase.



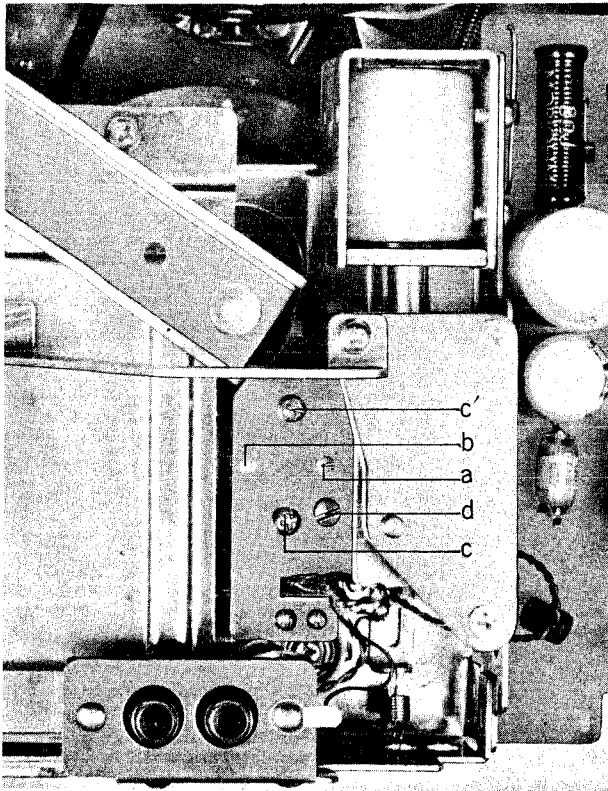


Fig. 5

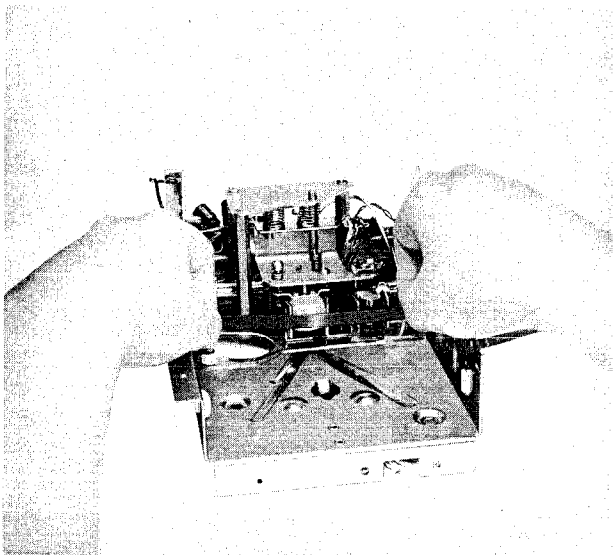


Fig. 6

### 3. HEAD ADJUSTMENT (CARTRIDGE) (PART I)

#### 3-1. Adjustment of azimuth alignment (See Fig. 5)

Playback an azimuth alignment Test Tape (8,000 Hz recorded tape) and set the azimuth alignment of head assembly by turning screw (c') until maximum playback output of program 2 or 3 is obtained.

#### 3-2. Height adjustment (See Fig. 5)

A. Playback \*a test tape and turn screw (d) until maximum gain of program 1 is obtained.

B. Set \*a blank test tape to recorder, make a recording, and then make an erasing test. If erasing is not complete, adjust as follows:

(I) Turn screws (a) and (b) clockwise simultaneously forty-five degrees and then make erasing test again.

Note: The blank test tape should be demagnetized every time an erasing test is made.

(II) If the erasing is not complete after the above adjustment, turn screws (a) and (b) clockwise again ten to fifteen degrees simultaneously.

(III) If erasing is still not complete, repeat step 2) until complete erasure is accomplished. Playback Azimuth Alignment test tape again and turn screw (c') until maximum program gain of program 2 or 3 is obtained.

(IV) Playback test tape again and turn screw (d) until maximum gain of program 1 is obtained.

#### \*TEST TAPE

This test tape is specially designed by AKAI for Height Adjustment tests.

Program 1 .....	1,000 Hz
Program 2 .....	Blank
Program 3 .....	1,000 Hz
Program 4 .....	3,000 Hz

#### \*BLANK TEST TAPE

This is also a special tape designed by AKAI. Duration of tape is only 15 seconds.

#### 4. HEAD ADJUSTMENT (CARTRIDGE) (PART II)

If head adjustment as outlined in PART I is difficult to perform, separate head block from unit. Cut and thread a short piece of tape by hand and adjust as shown in Fig. 7.

##### 4-1. ADJUSTMENT OF HEAD HEIGHT (See Figs. 6)

###### A. Erase Head

Adjust the Erase Head Height by turning head height screw (d) so that the upper edge of the tape as it passes the erase head is 0.0625 to 0.075 mm below the top edge of Program 1 head core.

###### B. PLAYBACK HEAD

Adjust the Playback Head Height by turning head height screws (a) and (b) in the same manner so that the upper edge of the tape as it passes the playback head is exactly parallel with Program 1 playback head core.

C. After adjustments (A) and (B) have been completed, switch Program Selector to Program 4 and confirm that position of tape is as shown in Fig. 7 (b). If position differs from Fig. 7 (b), carry out adjustments described in (A) and (B) again.

##### 4-2. ADJUSTMENT OF AZIMUTH ALIGNMENT

After (A), (B) and (C) of Head Adjustment (Part II) has been completed, reassemble head block (put back in unit) and carry out Azimuth Alignment as outlined in Head Adjustment Part I, Item 1-1.

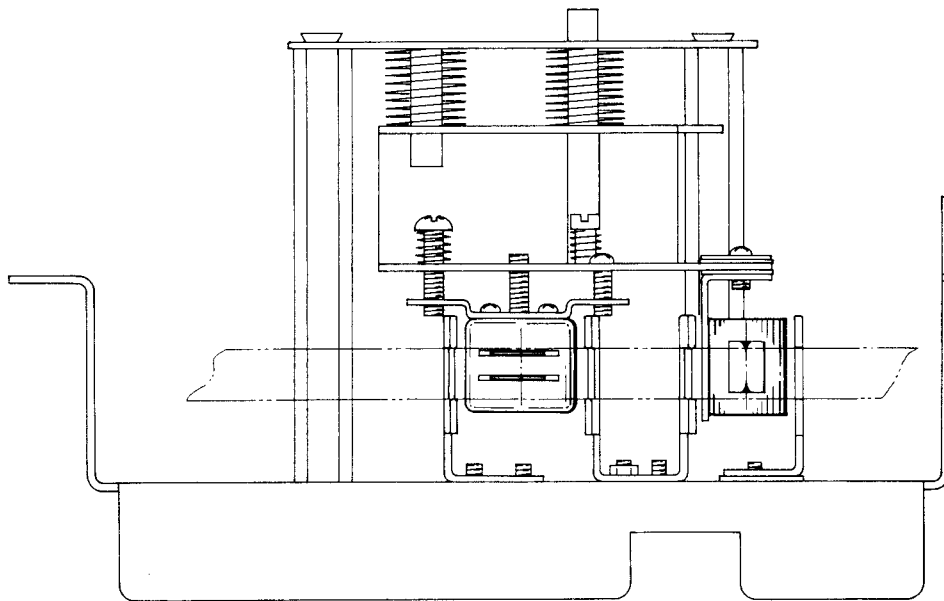


Fig. 7 (a) Program "1"

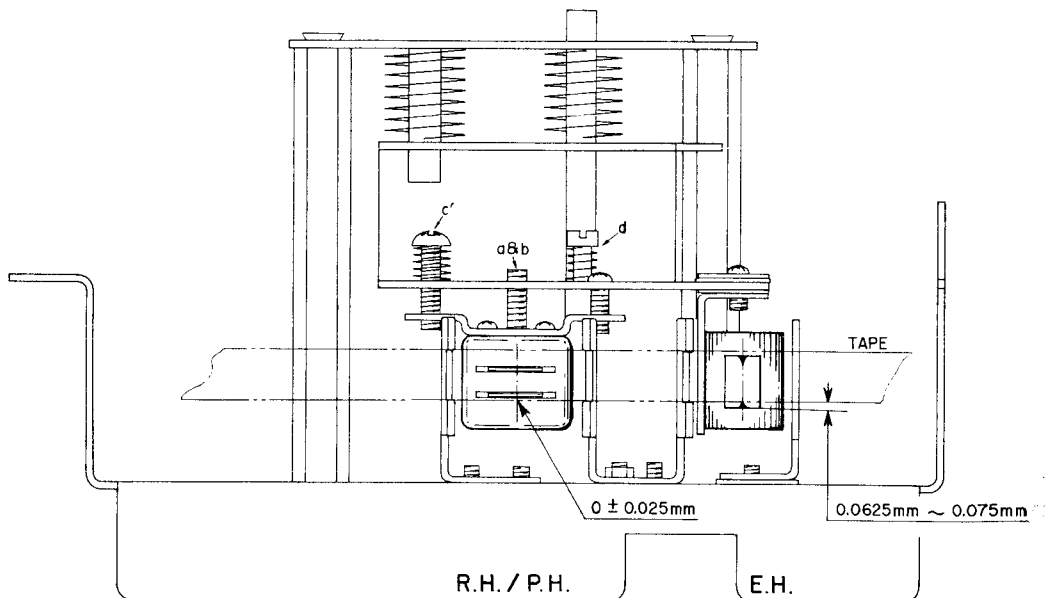


Fig. 7 (b) Program "4"

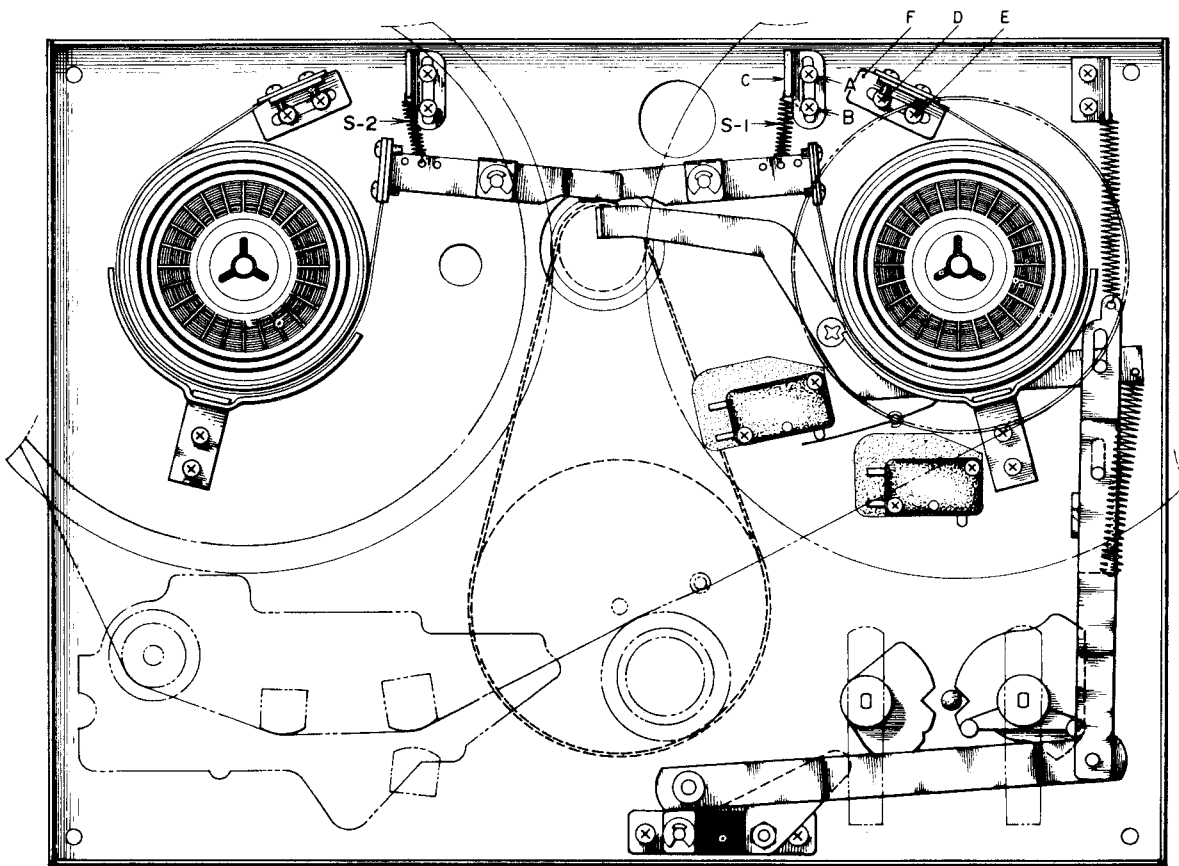


Fig. 8

## 5. BRAKE TENSION ADJUSTMENT (See Fig. 8)

For Brake Tension Measurement, use a 60 mm tape wound on a 5" reel and measure with a Tension Gauge. Standard tension is 280 to 330 grams. Adjust Brake Tension by changing position of suspended springs (S 1 and S 2 in Fig. 8), loosening screws (A) and (B) and changing position of spring suspension metal (C), or loosening screws (D) (E) and changing position of F. Caution: Following Brake Adjustment, confirm that the Brake Band does not touch the cloth tape on brake drum.

(See Fig. 10)

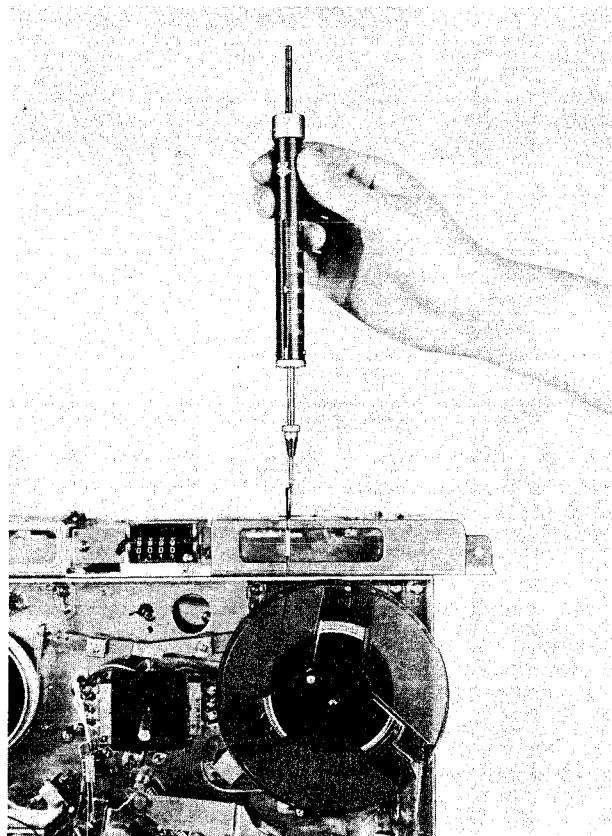


Fig. 9

6. REEL HEIGHT ADJUSTMENT (SEE DIAGRAM ILLUSTRATION)

Loosen Reel Table Screws and regulate height.

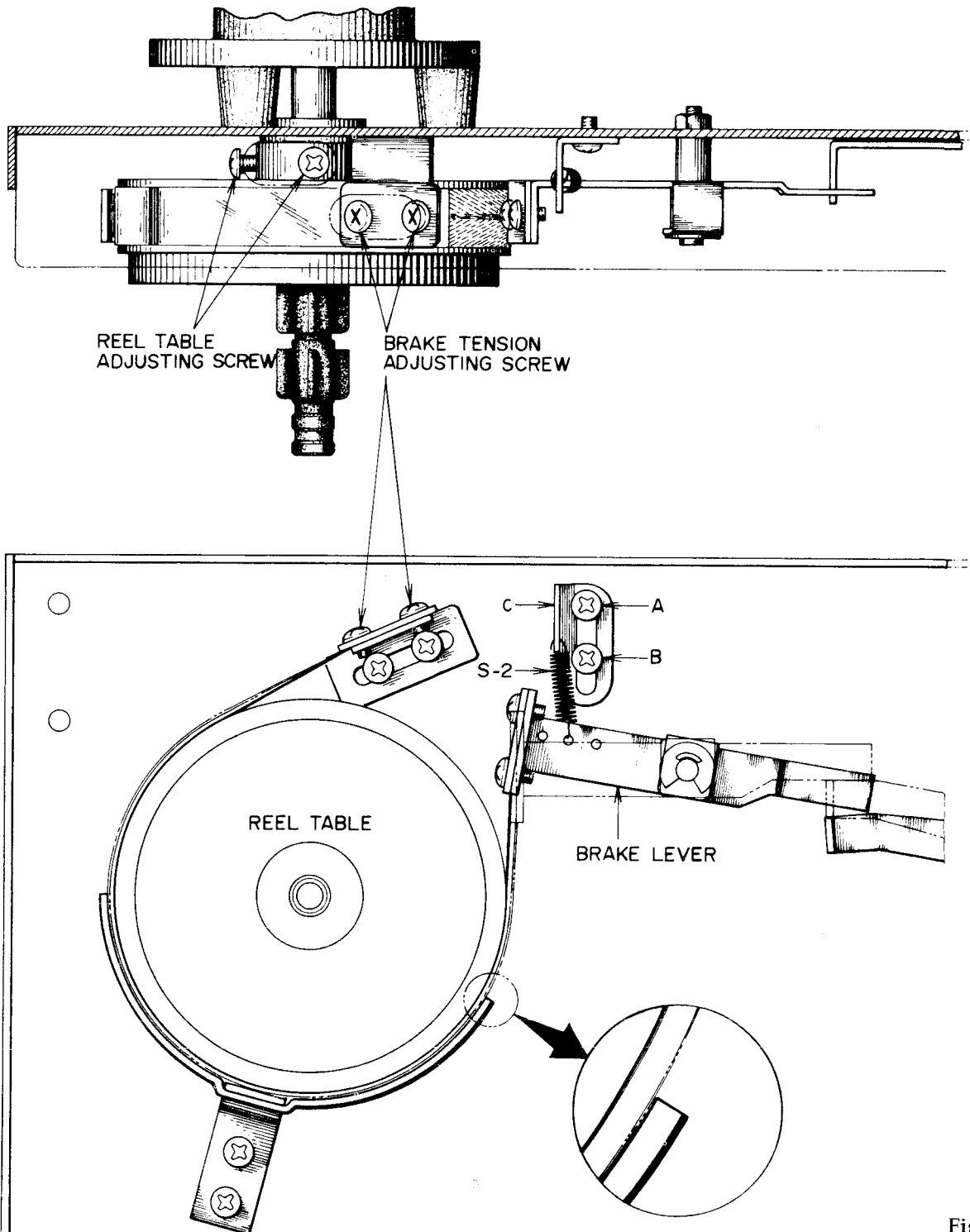


Fig. 10

# VII. AMPLIFIER ADJUSTMENT

## 1. ADJUSTMENT OF RECORDING BIAS FREQUENCY (See Fig. 1)

- A-1. Put on the resistor 1 or 2 Ohms in series with the Bias Head and connect the Vertical Input Terminal of the Oscilloscope to points (a) and (b).
- A-2. Feed in a sine wave signal from an Audio Frequency Oscillator to the Horizontal Input of the Oscilloscope and tune the Dial of the Audio Frequency Oscillator until the Oscilloscope displays a circular or linear pattern. Then read the figure on the Dial of the Audio Frequency Oscillator.
- A-3. If it reads 65 KH  $\pm$ 5 KH, the Recording Bias Frequency is correct.
- A-4. In case the recording bias frequency is incorrect, it can be adjusted by changing the value of C402 (1700p).

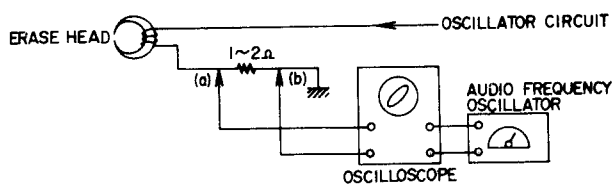


Fig. 1

- B. In certain instances, Bias Frequency is measured by connecting the Frequency Counter, leader wire to points (a) (b) as shown in Fig. 1 and reading the Frequency Counter indication.

## 2. ADJUSTMENT OF RECORDING BIAS VOLTAGE

- A. Reel Only (Ref. Fig. 2)  
Connect a V.T.V.M. to point (a) and Ground and adjust the recording bias voltage by turning L1 in the bias oscillator circuit until the V.T.V.M. reading is the same as is stamped on the rear side of the head assembly.

Note: There is no way of adjusting the erasing bias voltage, but the correct voltage is AC 65V  $\pm$ 5V. (Check point: Both sides of erase head).  
(Ideal Adjustment of Recording Bias voltage is determined by Frequency Response and distortion)

- B. Cartridge  
There is no way of adjusting cartridge Recording Bias Voltage, but Bias Voltage is about 8 to 10V.

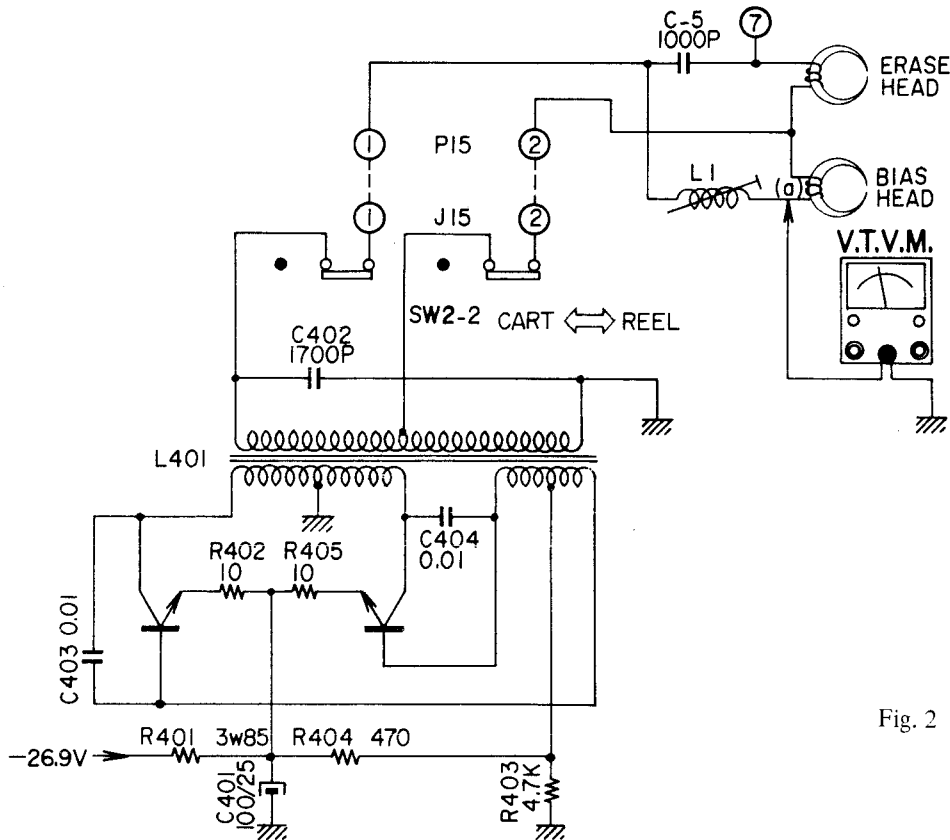


Fig. 2

### 3. ADJUSTMENT OF LINE OUTPUT LEVEL

#### (A) Playback (See Fig. 3) (Reel only)

1. Depress Mode Selector REEL Button and turn Volume Control VR1a or VR2a (10KA) up to maximum.
2. Set Record/Playback Lever to "Play" and the Equalizer to "7-1/2".
3. Connect a V.T.V.M. (use one with Milli-Volt Scale) to the Line Output Jack.
4. Playback a test tape (250 Hz "0" VU recorded) at 7-1/2 ips tape speed and turn semi-fixed resistor VR1-1 (20 KB) until the Line Output Level reaches 1.228V ( $\pm 2$  dB).

#### (B) Recording and Playback (See Figs. 4 and 5) (Reel)

1. Connect V.T.V.M. to the Line Output Jack and load an AKAI 100L Tape.
2. Set machine to Recording Mode.
3. Feed in a 1,000 Hz. Sine Wave Signal from an Audio Frequency Oscillator to the Line Input of the X-1810 and turn Volume Control VR1a or VR2a (10KA) until the Line Output Level reaches "0" VU 1.228V (+4 dB).
4. After a few seconds of recording, rewind the tape back to the starting position. Then play back the tape.
5. If the Line Output Level does not reach "0" VU, turn Volume VR-202 (2 KB) until the Line Output reaches "0" VU ( $\pm 2$  dB). Repeat this process 2 or 3 times (from item 3).

#### (C) Recording and Playback for Cartridge (See Fig. 4 and 5)

1. Load a blank test tape (AKAI 15 Sec. Test Tape is recommended).
2. Depress the Cartridge Function Switch and set Record/Playback Lever to "REC".
3. Feed in a 1,000 Hz. sine wave signal from an Audio Frequency Oscillator to the Line Input of the X-1810 and turn Volume VR1a or VR2a until the Line Output Level reaches "0" VU 1.228V (+4 dB).
4. Record for a few seconds and then play back the tape.
5. With Volume Controls (VR1a or VR2a) at maximum, adjust VR1 (3KB) so that the Line Output Value is +2 dB ( $\pm 2$  dB). Repeat this process 2 or 3 times (from item 3).

Note: Recording/Playback level difference varies depending upon the tape being used.

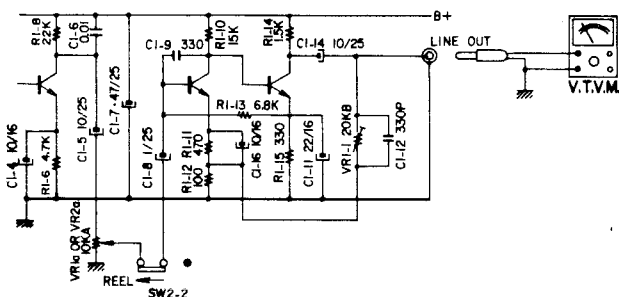


Fig. 3

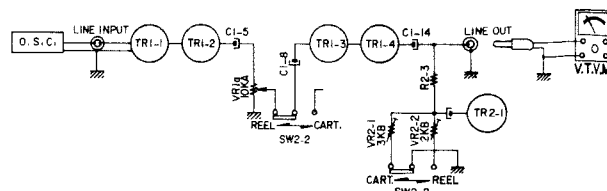


Fig. 5

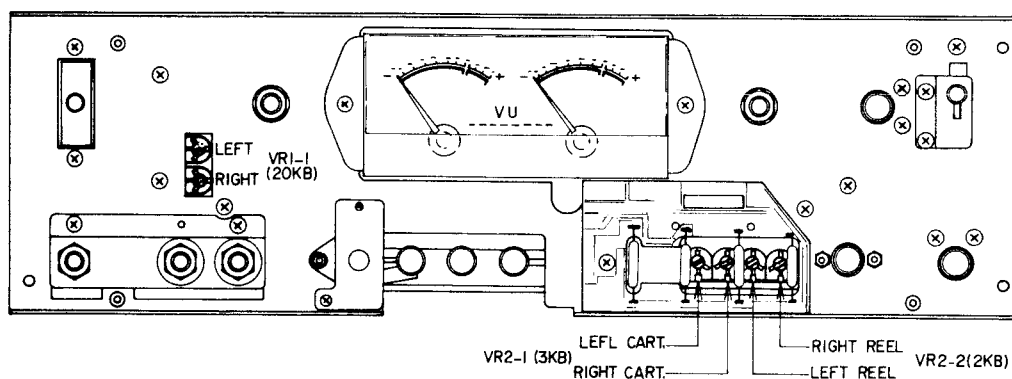


Fig. 4

# 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

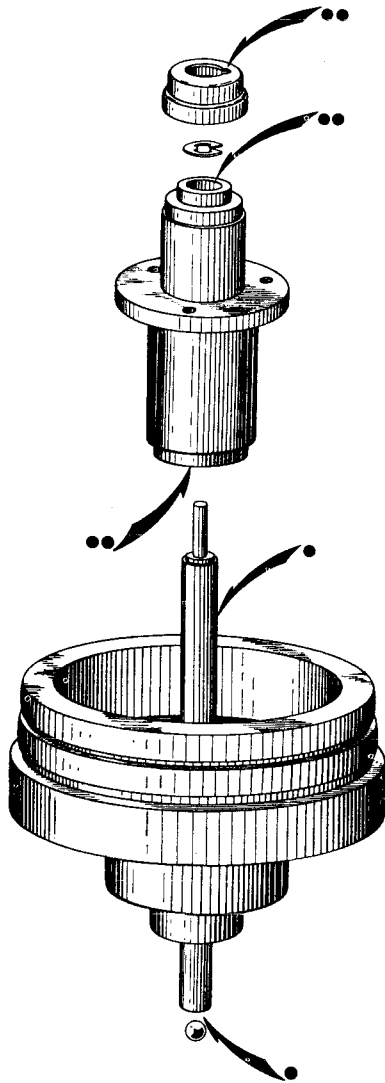
Pinch Wheel ..... 1 drop

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

## 2. CLEANING TAPE HEADS AND OTHER PARTS

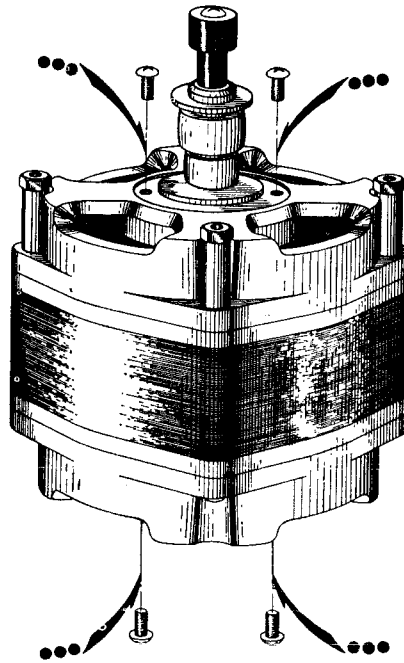
Wipe surface of tape heads, guide roller bearing, capstan bushing and pinch wheel periodically with a soft cloth soaked in alcohol.

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



FLYWHEEL

● 1 drop

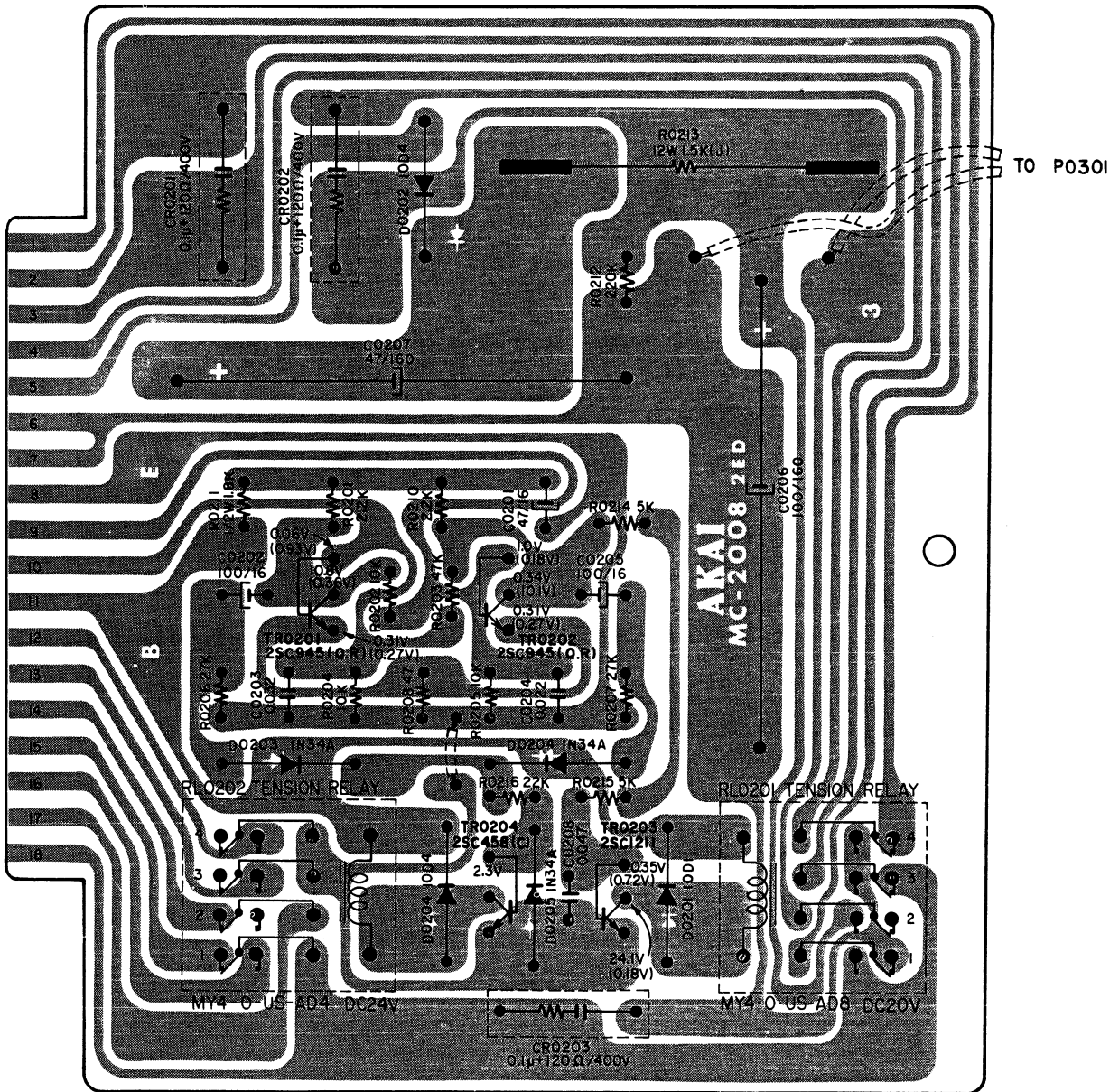


MOTOR

*M. Watson*

# IX. COMPOSITE VIEWS OF COMPONENTS

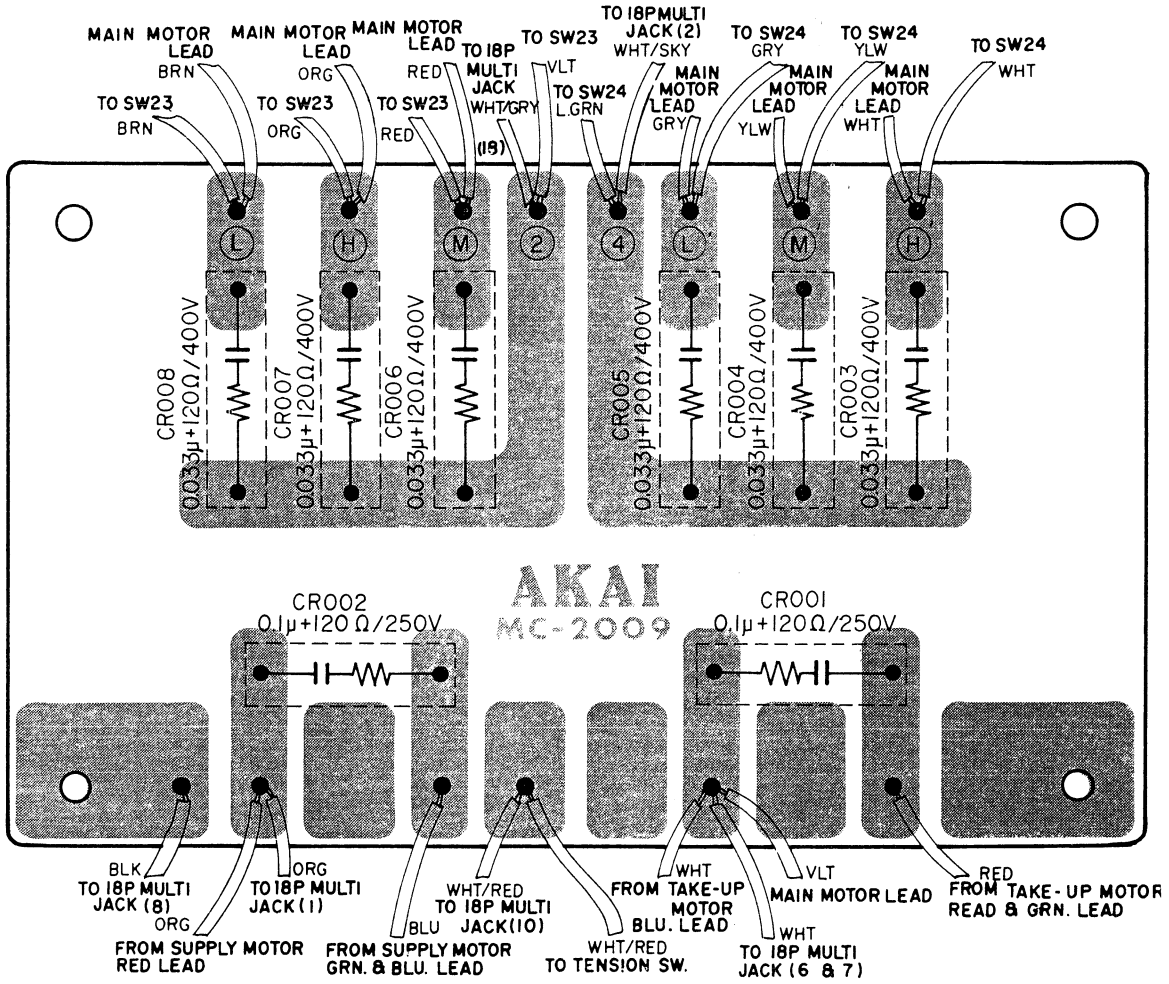
## SYSTEM CONTROL P.C. BOARD (MC-2008)



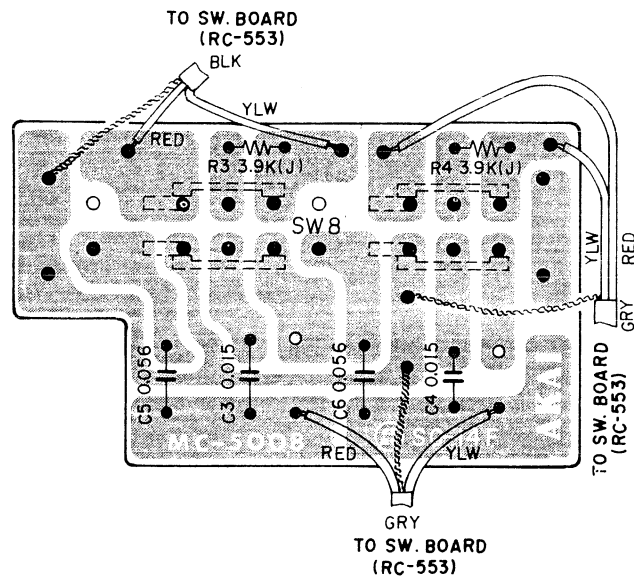
NOTE WHEN SWITCHED TO OR FROM FORWARD ↔ REVERSE, THE 2.3V VOLTAGE AT THE BASE OF TR-0204 IS ATTAINED WITHIN 2.5 TO 5 SECONDS.



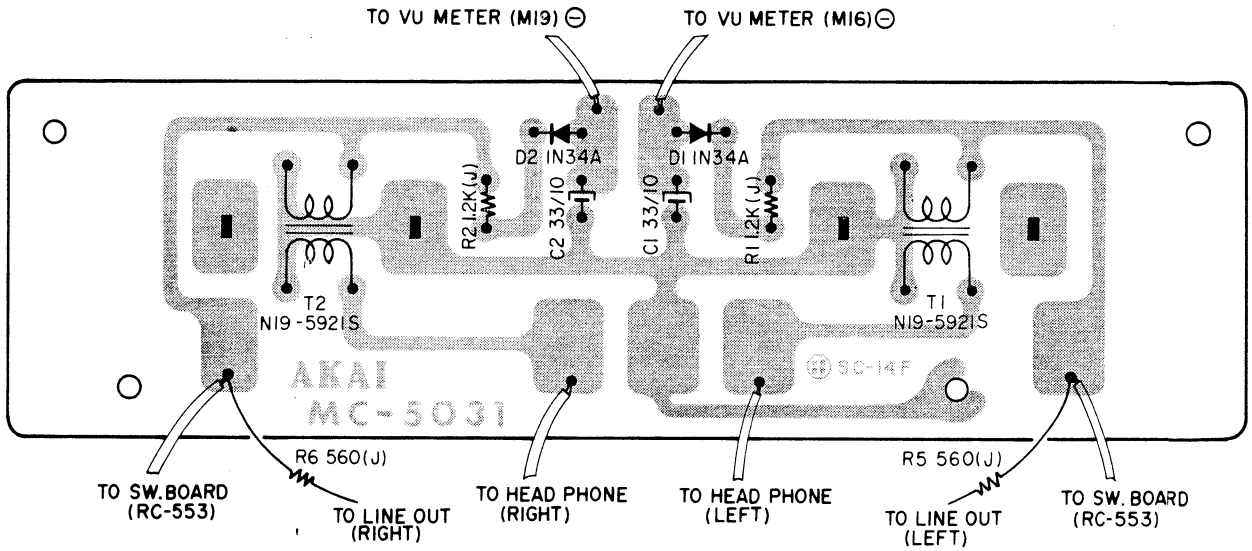
SPARK QUENCHER P.C. BOARD (MC-2009)



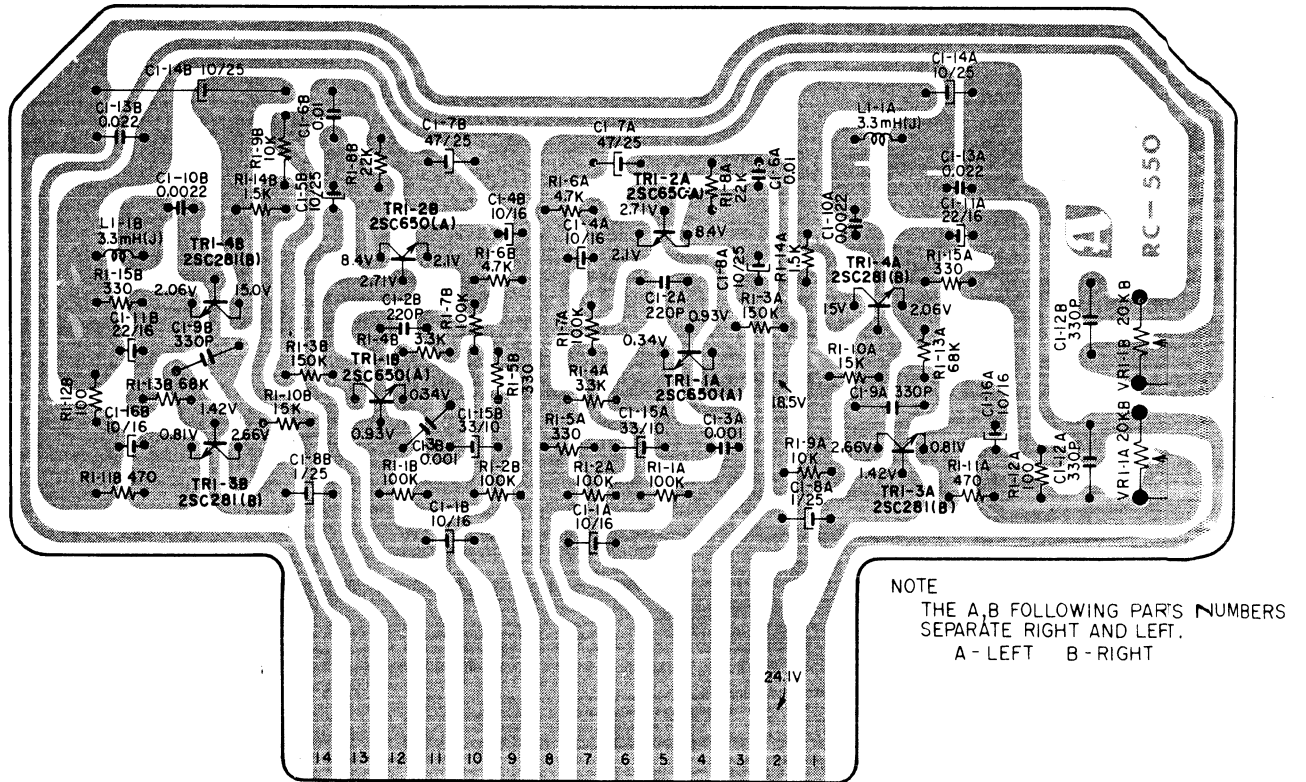
EQUALIZER P.C. BOARD (MC-5008)



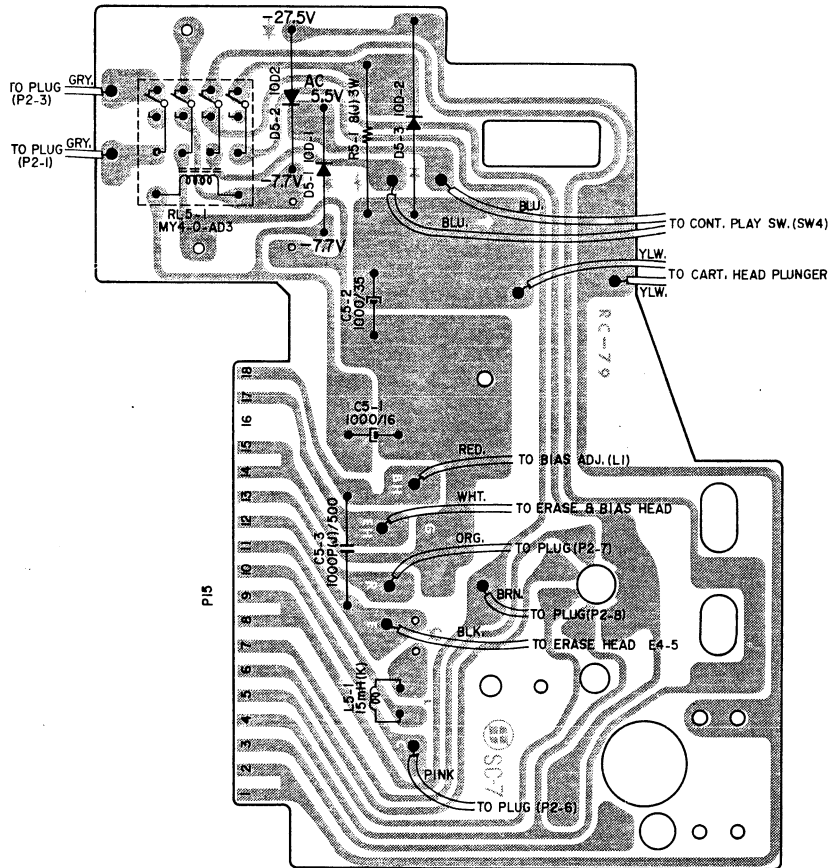
HEADPHONE OUT P.C. BOARD (MC-5031) (FOR DECK)



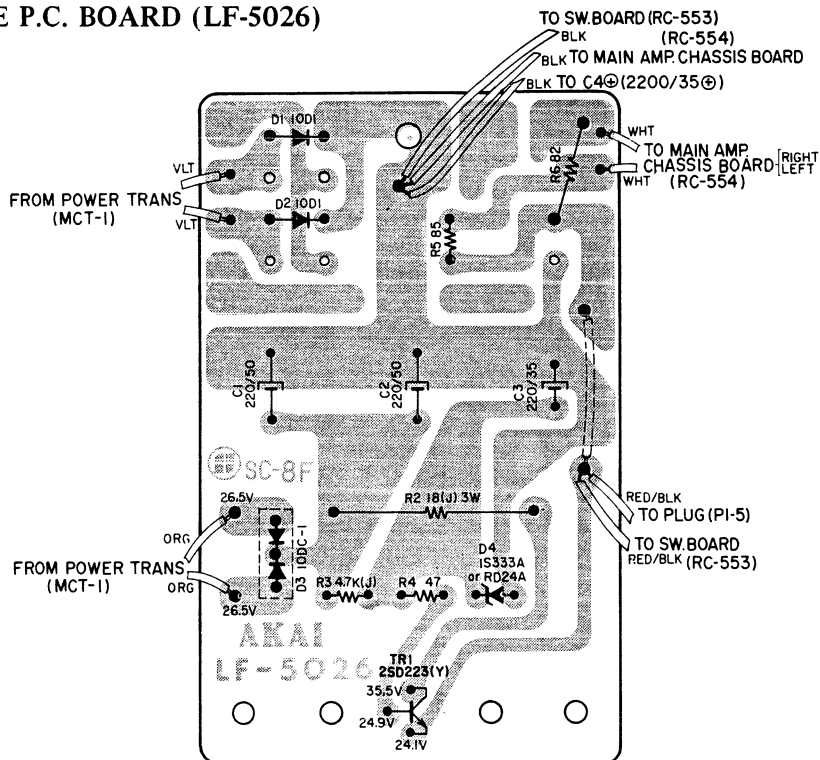
PRE-AMPLIFIER P.C. BOARD (RC-550)



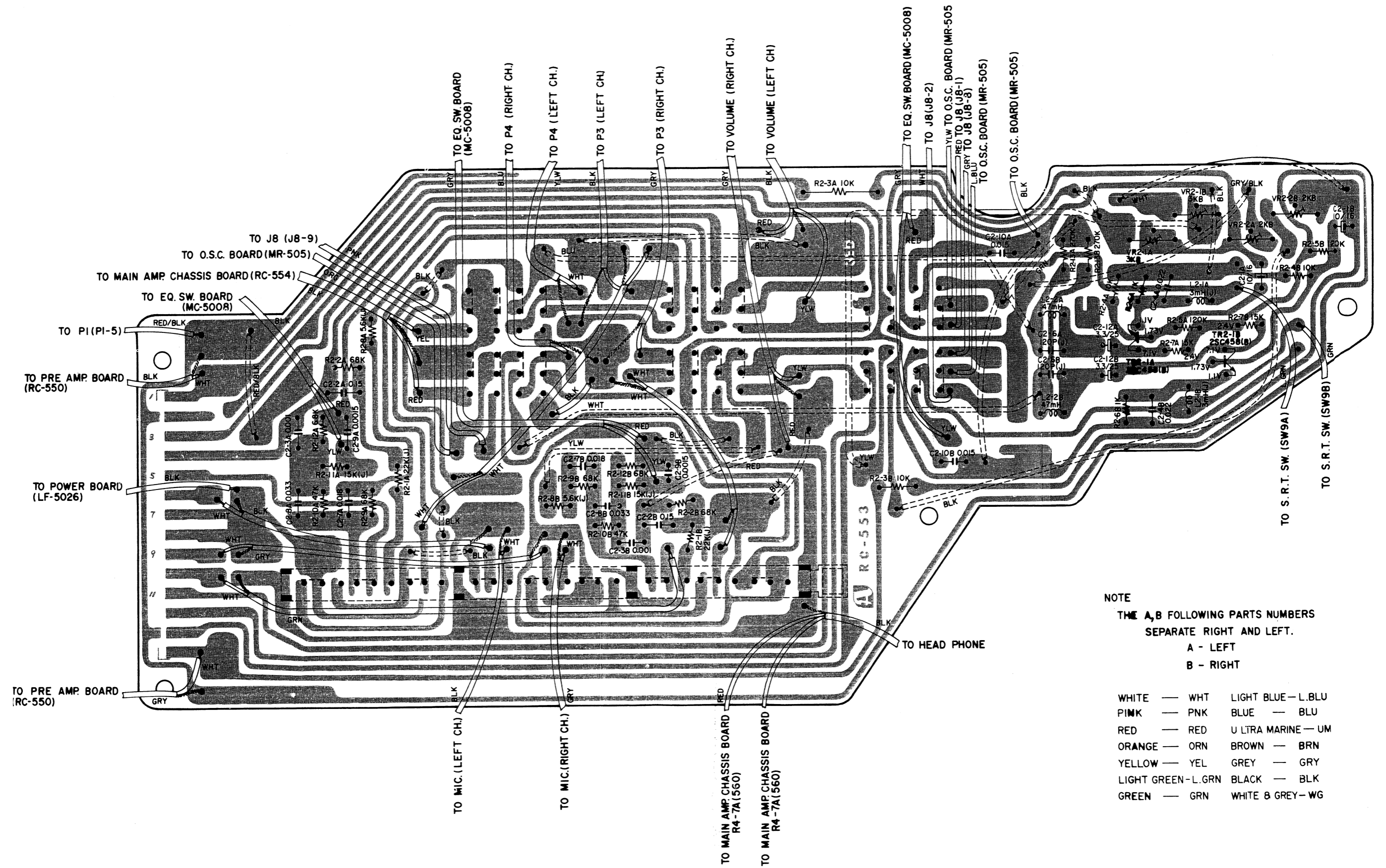
## CARTRIDGE P.C. BOARD (RC-79)



## POWER SOURCE P.C. BOARD (LF-5026)



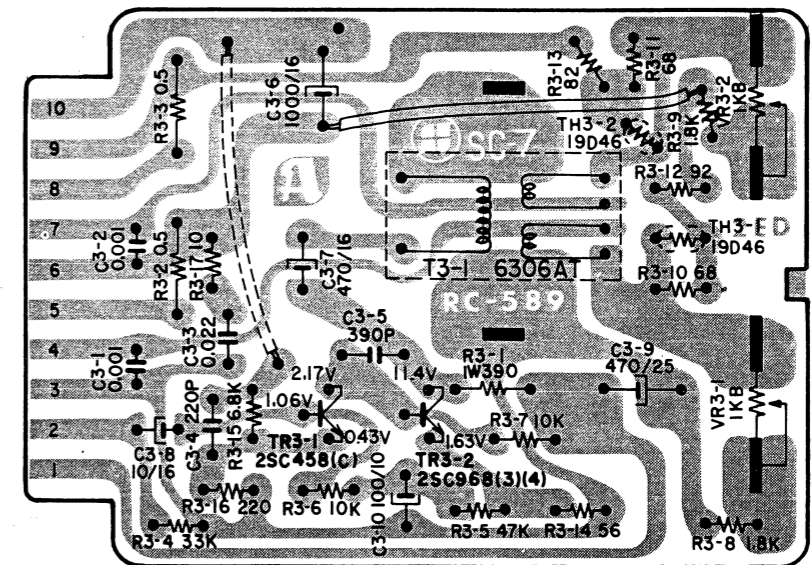
MODE SWITCH P.C. BOARD (RC-553)



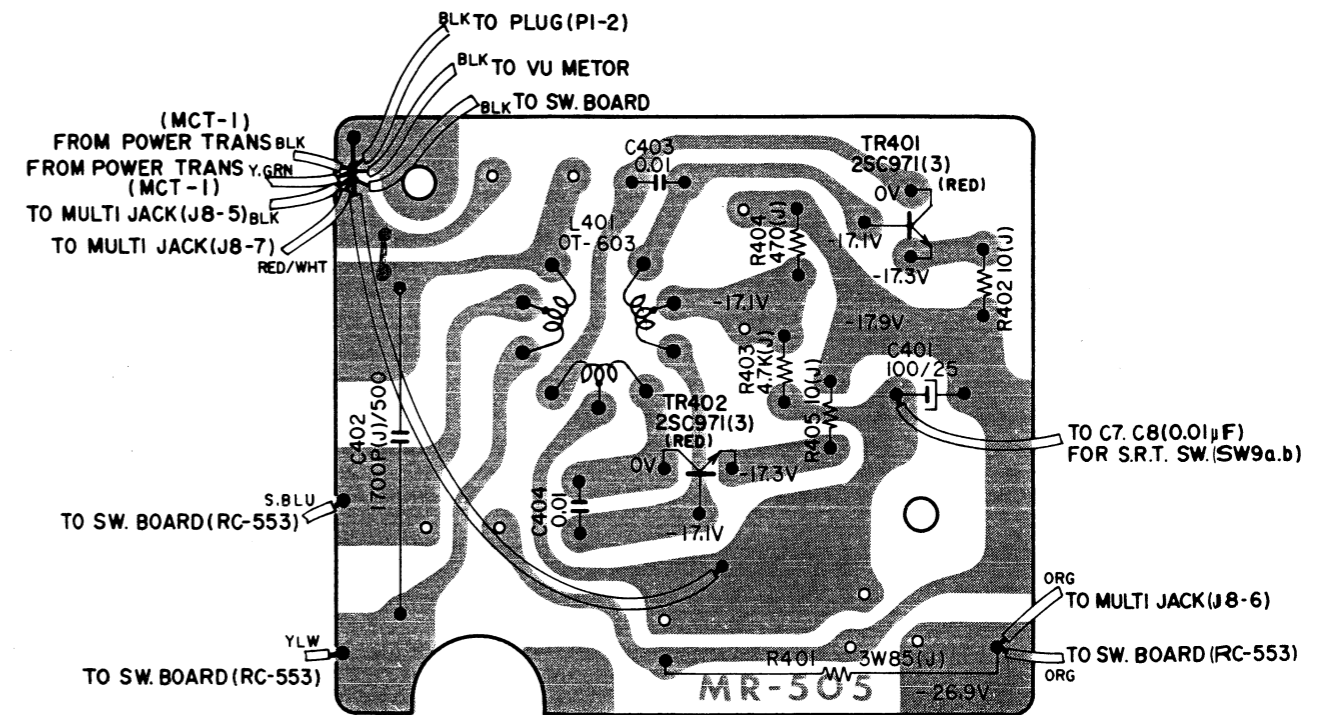
NOTE  
 THE A,B FOLLOWING PARTS NUMBERS  
 SEPARATE RIGHT AND LEFT.  
 A - LEFT  
 B - RIGHT

WHITE — WHT	LIGHT BLUE — L.BLU
PINK — PNK	BLUE — BLU
RED — RED	ULTRA MARINE — UM
ORANGE — ORN	BROWN — BRN
YELLOW — YEL	GREY — GRY
LIGHT GREEN — L.GRN	BLACK — BLK
GREEN — GRN	WHITE & GREY — WG

MAIN AMPLIFIER P.C. BOARD (RC-589)



OSCILLATOR P.C. BOARD (MR-505)





# X. TROUBLE SHOOTING CHART

## SECTION "A" TROUBLE WITH TAPE TRANSPORT MECHANISM

Symptom	Trouble
Power Switch "ON" but capstan motor does not rotate. (VU meter lamp not lit)	<ol style="list-style-type: none"> <li>1. Automatic shut-off Sw at "ON" position.</li> <li>2. Power Fuse blown.</li> <li>3. D1 to D3 defective.</li> <li>4. TR-1 (2SD223(Y)) defective.</li> <li>5. D0202 (10D4) defective.</li> </ol>
(VU meter lamp lit)	<ol style="list-style-type: none"> <li>1. Capstan drive belt has slipped off of flywheel.</li> <li>2. SW-4 Cartridge Auto Stop Continuous Play at "AUTO STOP" position.</li> <li>3. Main motor defective.</li> <li>4. Power condenser defective.</li> </ol>
Capstan rotates at playback position but Reel motor does not rotate.	<ol style="list-style-type: none"> <li>1. SW 006 Operation SW (Micro SW at "OFF" position).</li> <li>2. Brake lever caught.</li> </ol>
Does not Reverse play (Reverse Relay operating)	<ol style="list-style-type: none"> <li>1. Contact of Reverse Relay Contact Point defective.</li> </ol>
(Reverse Relay not operating)	<ol style="list-style-type: none"> <li>1. Check tension Sw, and Reverse Button.</li> <li>2. Tension Arm dropped.</li> <li>3. Check transistors TR-201 to TR-203 of Reverse Switching Circuit.</li> </ol>
Playback head does not lower at Reverse position. (Normal voltage (35V) at lug terminal of Reverse solenoid).	<ol style="list-style-type: none"> <li>1. Reverse solenoid defective.</li> </ol>
(No voltage at lug terminal of Reverse solenoid)	<ol style="list-style-type: none"> <li>1. Connector P0301 and J0301 contact faulty.</li> <li>2. Reverse Relay (RL0201) defective.</li> <li>3. R0213 12W 1.5K open circuit.</li> </ol>
Does not Rewind	<ol style="list-style-type: none"> <li>1. Rewind Change SW (SW 2) Actuator spring defective.</li> <li>2. Supply Reel motor defective.</li> <li>3. Brake Band is touching Brake Drum.</li> </ol>
Tension Arm drops and Tape stops during Rewind operation.	<ol style="list-style-type: none"> <li>1. Tension Arm spring too strong.</li> </ol>
Fast Forward operation does not work.	<ol style="list-style-type: none"> <li>1. Fast Forward Switch Actuator Spring defective.</li> <li>2. Take-Up Reel motor defective.</li> <li>3. Brake Band Touching Brake Drum.</li> </ol>
Tape slack when stopped from Fast Forward or Rewind.	<ol style="list-style-type: none"> <li>1. Brake Tension unbalanced.</li> </ol>
Tension Arm moves up and down (during Fast Forward)	<ol style="list-style-type: none"> <li>1. Reel Table shaft Bent.</li> </ol>
(At playback mode)	<ol style="list-style-type: none"> <li>1. Check to see whether or not the Brake Band is touching the Brake drum.</li> </ol>

Symptom	Trouble
Wow and Flutter	<ol style="list-style-type: none"> <li>1. At playback mode, check to see whether or not the Brake Band is touching the Brake Drum.</li> <li>2. Pinch Roller shaft and flywheel shaft needs oil.</li> <li>3. Oxide has collected on the Tape guide metal inside head Assembly and patches comes off on tape.</li> <li>4. Decreased motor torque.</li> <li>5. Defective motor starting capacitor (C003)</li> <li>6. Pinch wheel or tape guide does not rotate smoothly.</li> </ol>
Squeaking noise when playing tape	<ol style="list-style-type: none"> <li>1. Deposit of dust on head.</li> <li>2. Recording tape is being charged with static electricity.</li> <li>3. Excessive heat on head surface after continued operation.</li> <li>4. Old and worn-out recording tape.</li> <li>5. Inferior recording tape.</li> </ol>



## SECTION "B" TROUBLE WITH AMPLIFIER

### 1. Playback Mode

#### a) Reel

Symptom	Trouble
No sound from Line Out Jack. (No B + voltage supply)	<ol style="list-style-type: none"> <li>1. D3 (10DC-1 BLK), defective.</li> <li>2. R2 3W 18 <math>\Omega</math> open circuit.</li> <li>3. TR-1 (2SD 223 (Y)) defective.</li> </ol>
(B + voltage supply)	<ol style="list-style-type: none"> <li>1. Pre-amp Card (RC-550) and socket loose connection.</li> <li>2. P1 <math>\leftrightarrow</math> J1 loose connection.</li> <li>3. Check transistors TR1-1 to TR1-4.</li> </ol>
No sound from Speaker Out Jack (LINE OUT O.K.) (No B + voltage supply)	<ol style="list-style-type: none"> <li>1. D1, D2 defective.</li> <li>2. R5, or R6 82 <math>\Omega</math> open circuit.</li> </ol>
(B + voltage supply)	<ol style="list-style-type: none"> <li>1. Check Transistor TR3-1, 3-2 TR0-1, TR0-2.</li> </ol>
Sound is emitted, but volume insufficient. (B + voltage supply)	<ol style="list-style-type: none"> <li>1. Check voltage of power source circuit (LF-5026)</li> </ol>
(B + voltage normal)	<ol style="list-style-type: none"> <li>1. Dirty head surface.</li> <li>2. Check voltage of pre-amp and main amp circuit.</li> </ol>
Loud hum (Hum decreases if playback head is grounded)	<ol style="list-style-type: none"> <li>1. Playback head shield or insulation defective.</li> </ol>
(No change even if playback head is grounded)	<ol style="list-style-type: none"> <li>1. Ground wire loose.</li> <li>2. C1, C2 (220/50 ) C4 (2200/35) defective.</li> </ol>
(Inductive pick up)	<ol style="list-style-type: none"> <li>1. Ground the recorder.</li> <li>2. Change the set position of the recorder.</li> </ol>
Irregular scratching or crackling noise	<ol style="list-style-type: none"> <li>1. Pre-amp Card, and socket loose connection.</li> <li>2. Check transistors TR1-1 to TR1-4, TR3-1 and 3-2, TR0-1 and TR0-2.</li> </ol>
Squeaking Noise	<ol style="list-style-type: none"> <li>1. Dirty head surface.</li> <li>2. Tape itself squeaks.</li> </ol>
Hissing noise (Noise present when playing tape)	<ol style="list-style-type: none"> <li>1. Head is magnetized.</li> <li>2. Tape itself noisy.</li> </ol>
(Not caused by tape)	<ol style="list-style-type: none"> <li>1. Check Transistor TR1-1 to 1-4, TR3-1 and 3-2, TR0-1 and TR0-2.</li> </ol>
Lack of Treble	<ol style="list-style-type: none"> <li>1. Poor contact between head and tape.</li> <li>2. Head angle incorrect.</li> <li>3. Head worn out.</li> <li>4. Tape itself defective.</li> </ol>
Sound Distorted.	<ol style="list-style-type: none"> <li>1. Dirty head surface.</li> <li>2. Defective transistors.</li> <li>3. Head worn out.</li> </ol>

b) Cartridge

Symptom	Trouble
No sound from Line Output. (Reel operation is normal)	<ol style="list-style-type: none"> <li>1. Dirty head surface.</li> <li>2. Playback head defective.</li> </ol>
Reverse Rotation of capstan motor when cartridge is loaded.	<ol style="list-style-type: none"> <li>1. Cartridge function SW (SW5-1) does not operate properly.</li> </ol>
Loud Hum (Reel operation is normal)	<ol style="list-style-type: none"> <li>1. Playback head defective.</li> </ol>

## 2. Recording Problems

(Unit plays back pre-recorded tapes satisfactorily, but recording not satisfactory)

a) Reel

Symptom	Trouble
No recording possible (VU meter does not indicate)	<ol style="list-style-type: none"> <li>1. REC/PLAY slide switch (SW2-1a, b) does not function properly.</li> <li>2. Defective Input Jack.</li> <li>3. VU meter itself or lead wire defective.</li> </ol>
(VU meter indication is normal)	<ol style="list-style-type: none"> <li>1. Check Transistor TR401, 402 (2SC971 ③ ② )</li> <li>2. Bias head does not move.</li> <li>3. Components of oscillator circuit or oscillator coil defective.</li> <li>4. Loose connection of P1 ↔ J1</li> </ol>
Sound distorted (VU meter functions normally recording monitor through external headphone also normal)	<ol style="list-style-type: none"> <li>1. Check recording bias voltage and components of oscillator circuit.</li> <li>2. Faulty recording equalization circuit.</li> <li>3. Dirty head surface.</li> </ol>
(VU meter functions normally but recording monitor through headphone abnormal)	<ol style="list-style-type: none"> <li>1. Over-recording input level.</li> <li>2. Defective input equipment. (microphone, etc.)</li> </ol>
Faulty erasing (Does not erase at all)	<ol style="list-style-type: none"> <li>1. Erase head defective.</li> <li>2. Disconnected erase head wire or excessive amount of dust adhering to surface of erase head.</li> </ol>
(Incomplete erasure)	<ol style="list-style-type: none"> <li>1. Erasing bias voltage low. Check components of oscillator circuit.</li> <li>2. Erase head coil defective.</li> </ol>
Erasing noise (popping noise)	<ol style="list-style-type: none"> <li>1. Defective recording tape.</li> <li>2. Head magnetized.</li> <li>3. Bias voltage out of adjustment.</li> </ol>

Symptom	Trouble
Recording sensitivity low (VU meter functions normally)	<ol style="list-style-type: none"> <li>1. Dirty head surface.</li> <li>2. Bias voltage out of adjustment.</li> <li>3. Rec/Play Head defective.</li> <li>4. Tape itself defective.</li> </ol>
(VU meter does not indicate properly)	<ol style="list-style-type: none"> <li>1. Input Jack Loose connection.</li> <li>2. VU meter sensitivity low.</li> <li>3. REC/PLAY Slide Switch (SW2-1) does not function properly.</li> <li>4. VR1-1 (20KB) VR2-2 (2KB) out of adjustment.</li> </ol>
Sound fades or drops out	<ol style="list-style-type: none"> <li>1. Dirty head surface.</li> <li>2. Tape itself defective.</li> <li>3. Rec/Play head defective.</li> <li>4. Recording bias voltage out of adjustment.</li> <li>5. Back Tension too weak.</li> </ol>
Much difference between left and right recording levels.	<ol style="list-style-type: none"> <li>1. Difference in sensitivity of the line volume itself.</li> <li>2. Recording level (VR2-2 2KB) out of adjustment.</li> <li>3. Rec/Play head defective.</li> </ol>

#### b) Cartridge

Symptom	Trouble
Does not Record. (Reel operation is normal)	<ol style="list-style-type: none"> <li>1. Loose connection of P15 ↔ J15, J2 ↔ P2 and J3 ↔ P3.</li> <li>2. Rec/Play Head defective.</li> <li>3. Recording level (VR2-1 3KB) out of adjustment.</li> </ol>
Much difference between left and right recording levels	<ol style="list-style-type: none"> <li>1. Recording level (VR2-1 3KB) out of adjustment.</li> <li>2. Rec/Play Head defective.</li> <li>3. Dirty head surface.</li> </ol>
Sound distorted. (Reel operation is normal)	<ol style="list-style-type: none"> <li>1. Dirty head surface.</li> <li>2. Over-recording.</li> <li>3. Rec/Play Head defective.</li> </ol>
Faulty Erasure (Does not erase at all)	<ol style="list-style-type: none"> <li>1. Erase Head defective.</li> <li>2. Erase head wire disconnected.</li> </ol>
Incomplete erasure	<ol style="list-style-type: none"> <li>1. Dirty head surface.</li> <li>2. Erase head defective.</li> <li>3. Head Height out of adjustment.</li> </ol>
Erasing noise (popping noise)	<ol style="list-style-type: none"> <li>1. Defective recording tape.</li> <li>2. Head magnetized.</li> </ol>
Sound fades out or drops out.	<ol style="list-style-type: none"> <li>1. Dirty head surface.</li> <li>2. Tape itself defective.</li> </ol>
Does not transfer	<ol style="list-style-type: none"> <li>1. Transfer function sw (SW (SW2-4) does not operate properly.</li> </ol>

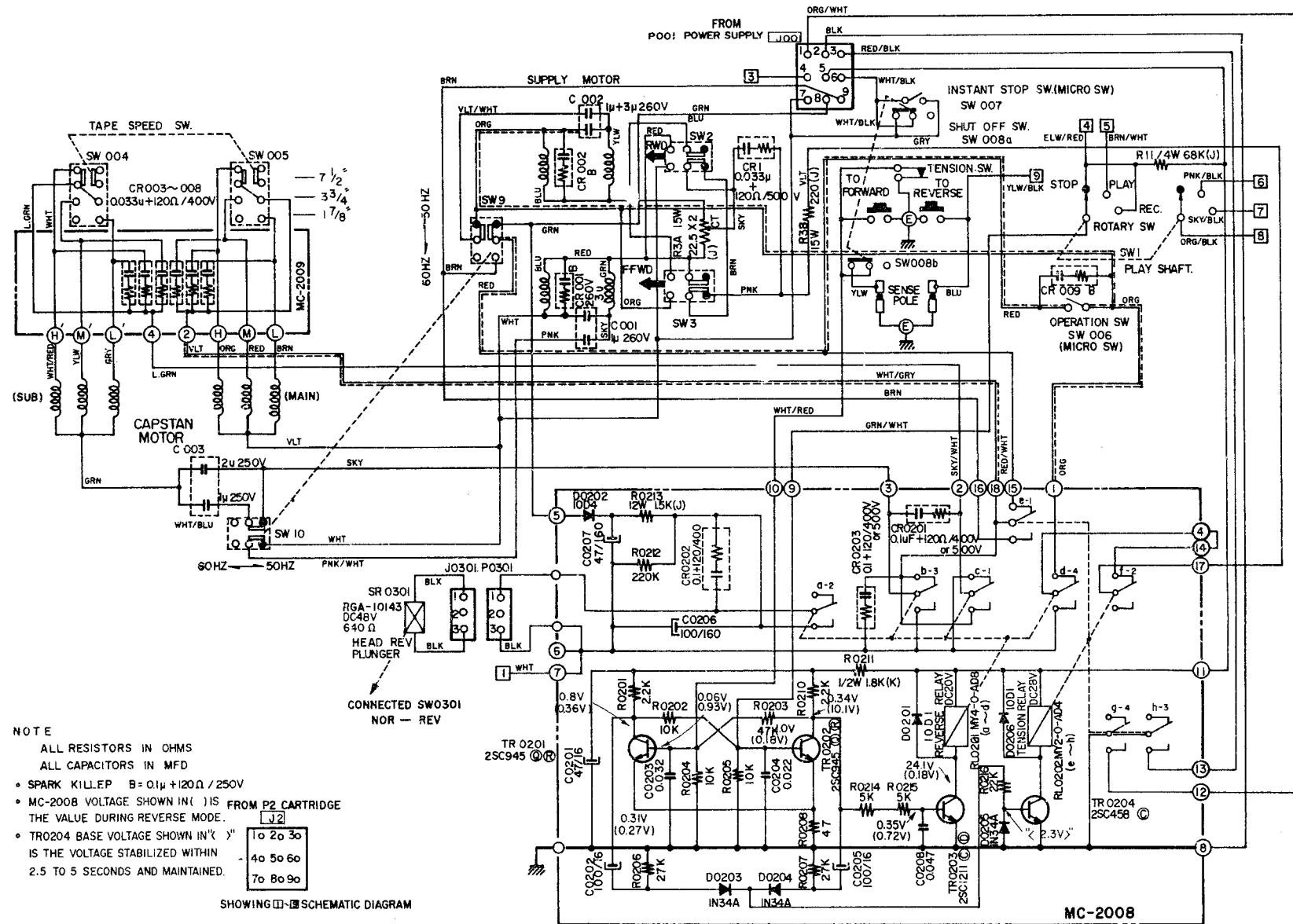
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X-1810(D)



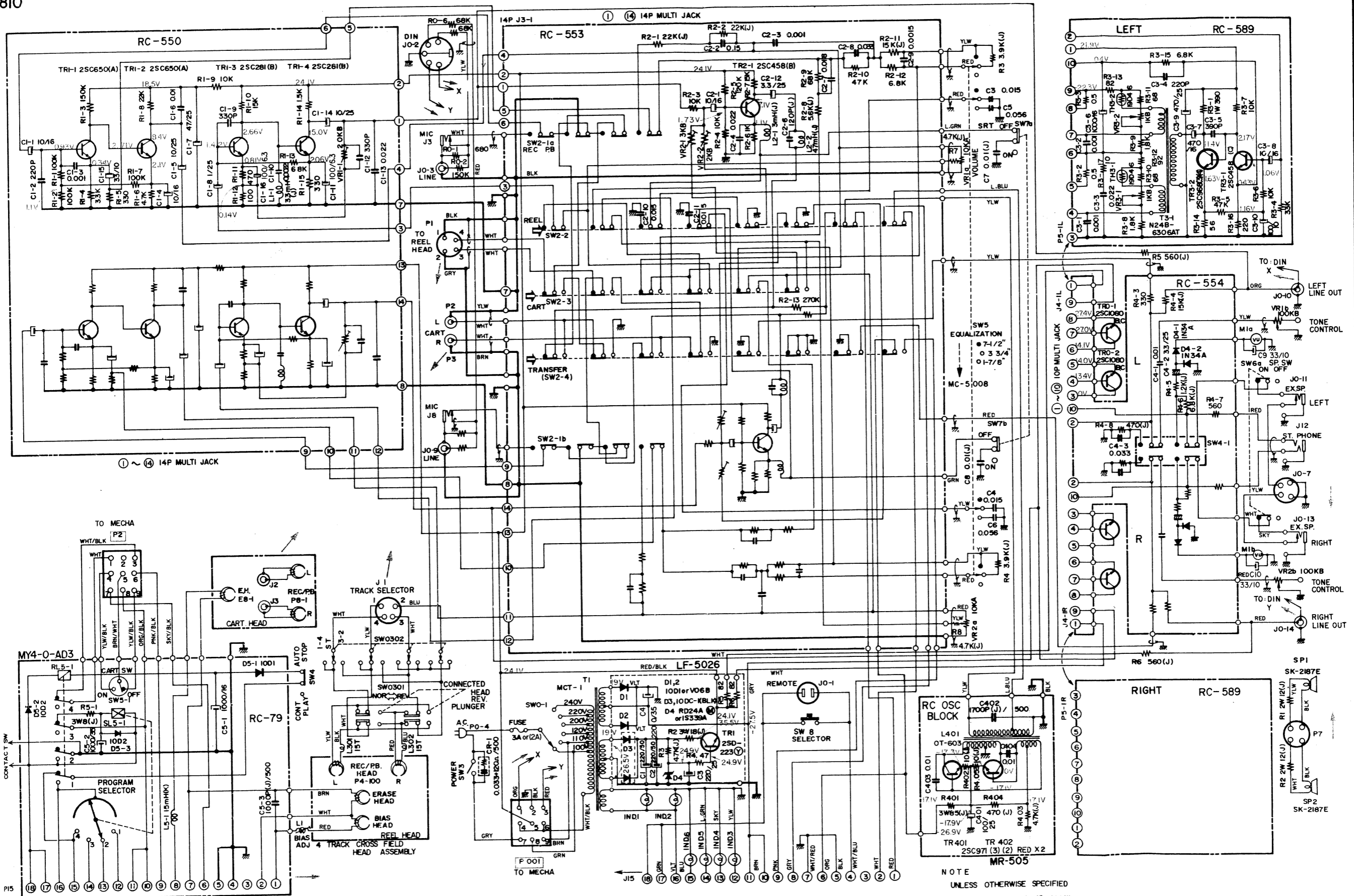
NOTE

- ALL RESISTORS IN OHMS
- ALL CAPACITORS IN MFD
- SPARK KILLER B =  $0.1\mu + 120\Omega / 250V$
- MC-2008 VOLTAGE SHOWN IN ( ) IS FROM P2 CARTRIDGE THE VALUE DURING REVERSE MODE.
- TR0204 BASE VOLTAGE SHOWN IN "x" IS THE VOLTAGE STABILIZED WITHIN 2.5 TO 5 SECONDS AND MAINTAINED.

SHOWING □-□ SCHEMATIC DIAGRAM

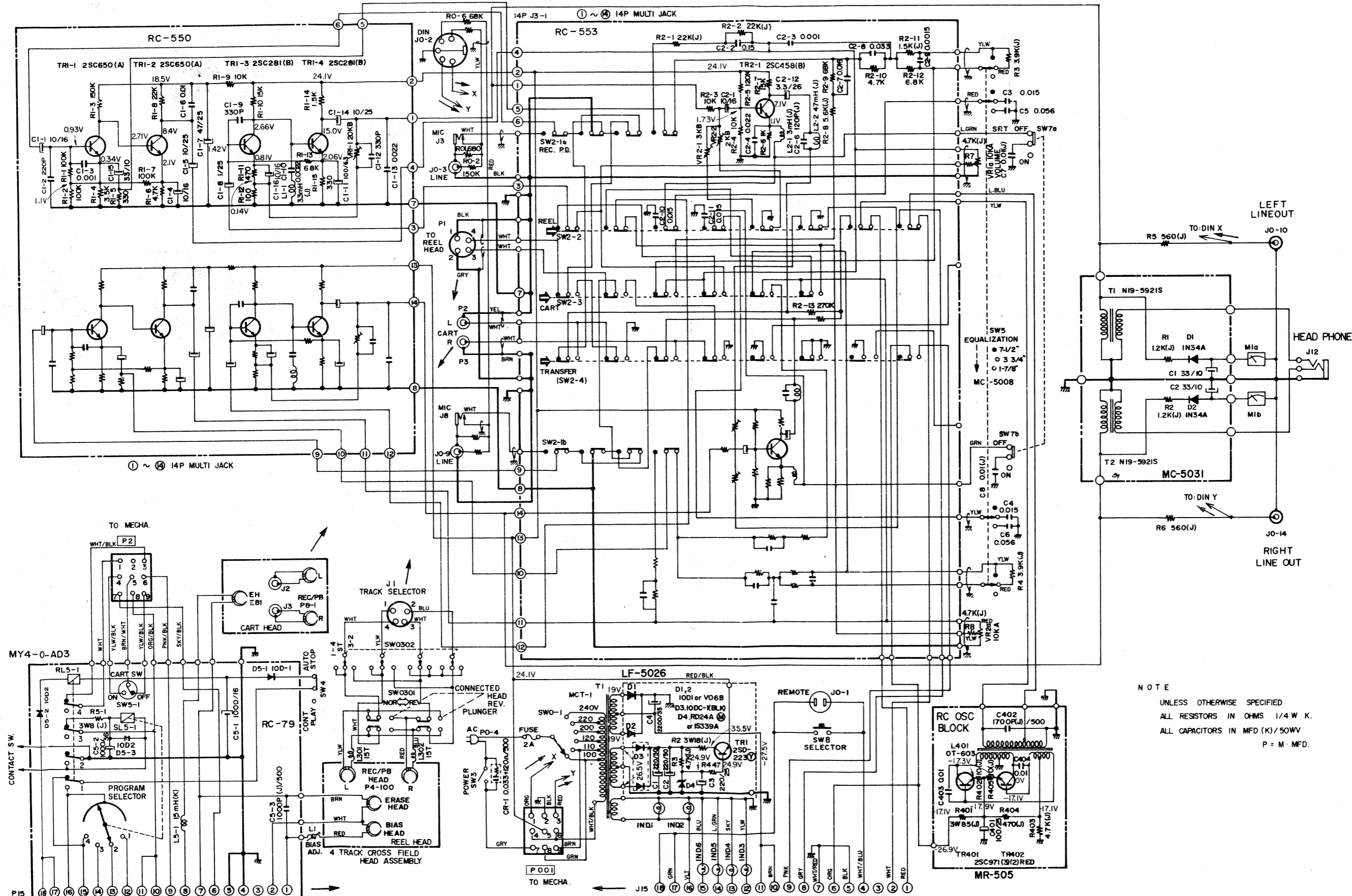
① ~ ⑱ 18P MULTI JACK

X-1810(D) SCHEMATIC DIAGRAM  
(MECHANISM CONTROL) NO.3-3 1421050A



NOTE  
 UNLESS OTHERWISE SPECIFIED  
 ALL RESISTORS IN OHMS 1/4W K.  
 ALL CAPACITORS IN MFD (K)/50WV.  
 P = M MFD.

X-1810  
 SCHEMATIC DIAGRAM  
 NO.3-1 1421048A



NOTE  
 UNLESS OTHERWISE SPECIFIED  
 ALL RESISTORS IN OHMS 1/4 W K.  
 ALL CAPACITORS IN MFD (K) / 50WV  
 P = M · MFD.

X-1810D  
 SCHEMATIC DIAGRAM No.3-2 1421049A