

I. SPECIFICATIONS

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

RECORDING SYSTEM

: In-line 4-track stereo, monaural recording
by using Cross-field Bias Head.

TAPE SPEED : 1-7/8, 3-3/4, 7-1/2 and 15 ips.

TAPE SPEED DEVIATION

: Within $\pm 0.5\%$ at 7-1/2 ips
Within $\pm 1.0\%$ at 3-3/4 ips
Within $\pm 1.0\%$ at 1-7/8 ips

WOW AND FLUTTER

: Less than 0.10% r.m.s. at 7-1/2 ips
Less than 0.13% r.m.s. at 3-3/4 ips
Less than 0.25% r.m.s. at 1-7/8 ips

FREQUENCY RESPONSE

: 30 to 21,000 Hz ± 3 dB at 7-1/2 ips
30 to 18,000 Hz ± 3 dB at 3-3/4 ips
40 to 9,000 Hz ± 4 dB at 1-7/8 ips

SIGNAL TO NOISE RATIO

(at Line Output) : Greater than 48 dB at 7-1/2 ips
Greater than 45 dB at 3-3/4 ips
Greater than 48 dB at 1-7/8 ips

TOTAL HARMONIC DISTORTION

(at Line Output, 1,000 Hz 0 VU Rec/PB)

: Within 1.7% at 7-1/2 ips
Within 3.0% at 3-3/4 ips
Within 3.0% at 1-7/8 ips

RECORDING INPUTS

MICROPHONE : Above 0.7 mV

LINE INPUT : Above 70 mV

Impedance . . . 166 K ohms

DIN INPUT : High : 70 mV 166 K ohms

Low : 7 mV 16 K ohms

OUTPUTS

LINE OUTPUT : Required Load Impedance :
more than 50,000 ohms
1.23 V (+4 db ± 1.5 db) at 7-1/2 ips
1.03 V (+2.5 db ± 1.5 db) at 3-3/4 ips
0.82 V (+0.5 db ± 1.5 db) at 1-7/8 ips

POWER OUTPUT: External Speaker Jack
More than 10 W at 8 ohms Non-inductive
resistance

NOISE : Less than 5 mV at 8 ohms at External
Speaker Jack
(Volume Control at "Minimum" position)

FAST FORWARD AND REWIND TIME

: 75 seconds for a full 1,200 foot tape
at 50 Hz
60 seconds for a full 1,200 foot tape
at 60 Hz

CROSS-TALK : Less than -70 dB (Monaural)
Less than -43 dB (Stereo)

ERASE RATIO : More than 70 dB

INSULATION DURABILITY

: 500 V AC for more than one minute
duration

BIAS FREQUENCY: 100 KHz

MAIN MOTOR : Hysteresis Synchronous 3 speeds
(2-4-8 pole) motor.

Condenser Capacity 3 μ F (50 Hz), 2 μ F
(60 Hz)

Revolutions :

3,000-1,500-750 r.p.m. (50 Hz)

3,600-1,800-900 r.p.m. (60 Hz)

REEL MOTOR : Two 6-pole eddy current outer-rotor
motors

Revolutions :

930 r.p.m. at 50 Hz, 100 V

1,120 r.p.m. at 60 Hz, 120 V

HEADS

PLAYBACK HEAD

: In-line 4-track stereo and monaural
Impedance . . . 5,000 ohms at 1,000 Hz
Gap . . . 2 microns

RECORDING HEAD

: In-line 4-track stereo and monaural
Impedance . . . 45 ohms at 1,000 Hz
Gap . . . 2 microns

ERASE HEAD : In-line 4-track stereo and monaural
Impedance . . . 380 ohms at 100 KHz
Gap . . . 0.4 mm

CROSS-FIELD BIAS HEAD

: In-line 4-track stereo and monaural
Impedance . . . 430 ohms at 100 KHz
Gap . . . 0.4 mm

INTERNAL SPEAKERS

: 2 4-inch Round Speakers
Nominal Power Input . . . 3 W, 16 ohms

TRANSISTORS USED

15	2SC458LG®/©	} X-360D (without Main Amplifier) 44 ea.
15	2SC372	
1	2SC828Ⓟ	
3	2SC538AⓄ	
2	2SC650®	
1	2SC728	
1	2SB75A	
1	2SB77A®	
4	2SD157	
1	2SD147	
6	2SC828R	} Main Amplifier 16 ea.
2	2SC538RQ	
4	2SC696EB	
4	2SD130R	

DIODE USED

9 IN34A
2 10D2
12 10D4
1 10D6
1 5B2
2 SL-150
2 SL-150d
2 IN759A
1 RD-24A

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 \pm 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 applying 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 specifications on the first page.

FREQUENCY RESPONSE

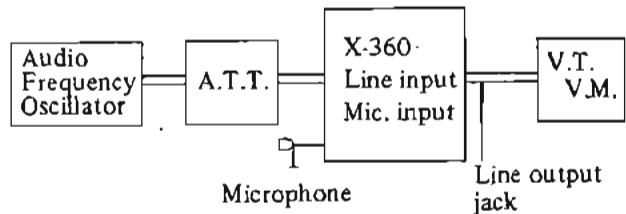
RECORD:

- 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) Push the "Source Button" 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 20 db by means of the attenuator.
- 4) Connect a microphone to the Microphone Input. Push the tape speed selector in 7-1/2" position.
- 5) Start recording. Control the microphone input level and the spot frequency in the range of 30 Hz to 25,000 Hz from the audio frequency generator and record by talking.

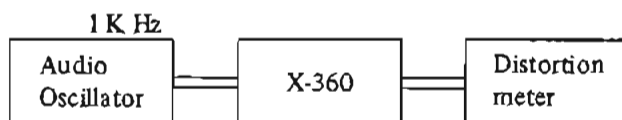
▪ Remarks: After announcing the frequency of each point, the the microphone volume should immediately be rotated back to minimum.

PLAYBACK:

- 6) Push the "Tape Monitor Button" and "Forward Button".
- 7) Set the Tape Speed Selector in 7-1/2" position.
- 8) Connect a Vacuum Tube Volt Meter to the line output jack (V.T.V.M. with milli volt scale).
- 9) Playback the recorded tape.
- 10) Playback the recorded spot frequencies and make a memo of output level and plot the value on a graph.



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:

$$d_0 = d - d_1 - d_2$$

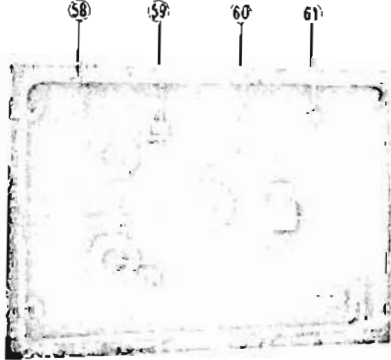
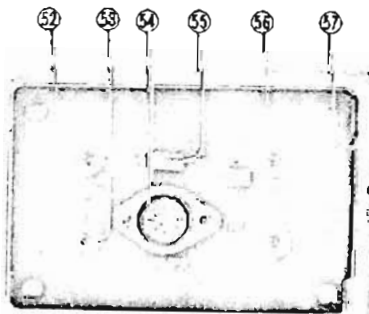
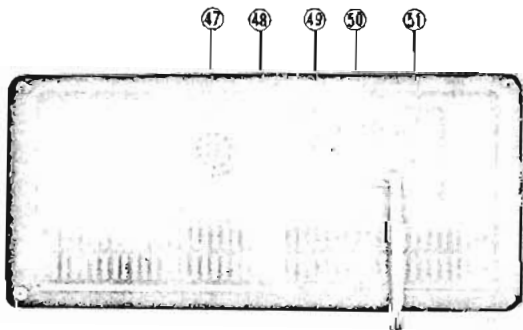
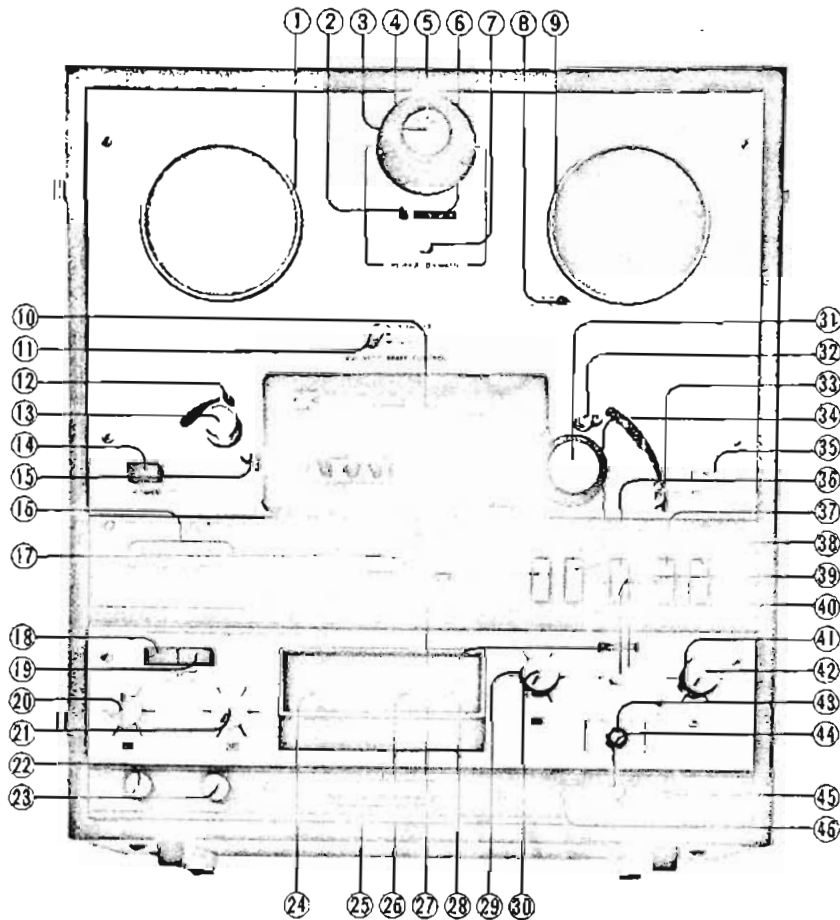
where, d_0 = Required
 d = Overall distortion factor
 d_1 = Noise level
 d_2 = Distortion factor of the oscillator

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

SIGNAL TO NOISE RATIO

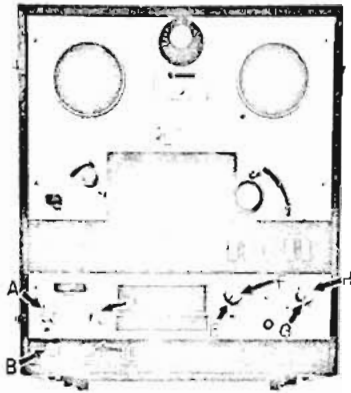
Set the tone Switch on "Flat" position and Playback a tape containing a 250 Hz sine wave recorded at "0" VU level on a standard recorder. Connect a high sensitivity V.T.V.M. to the line output jack and measure its output. output.

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

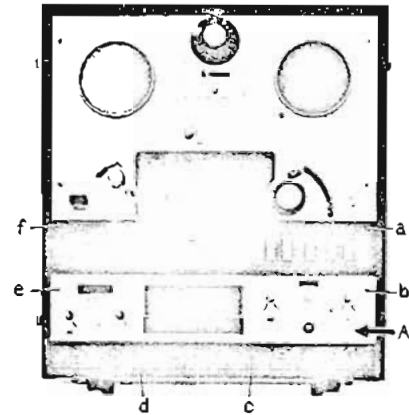


- ① Supply Reel Shaft
- ② Reset Button
- ③ Set Dial
- ④ Tape Count Meter
- ⑤ Tape Count Scale
- ⑥ Tape Counter
- ⑦ REVERSE-O-MATIC Set Button
- ⑧ Cycle Change Switch
- ⑨ Take-up Reel Shaft
- ⑩ Head Cover
- ⑪ Brake Control
- ⑫ Tension Arm
- ⑬ Impedance Roller
- ⑭ Power Switch
- ⑮ Tape Cleaner
- ⑯ Tape Speed Selectors
- ⑰ Indicator Lamp of Dust Minder
- ⑱ "TAPE" Button
- ⑲ "SOURCE" Button
- ⑳ Volume Control (Left)
- ㉑ Volume Control (Right)
- ㉒ Bass Control
- ㉓ Treble Control
- ㉔ VU Meter (Left)
- ㉕ Track Selectors
- ㉖ VU Meter (Right)
- ㉗ Rewind Button
- ㉘ Record Indicator Lamp
- ㉙ Line Record Level Control (Left)
- ㉚ Microphone Record Level Control (Left)
- ㉛ Pinch Wheel (Roller)
- ㉜ Reverse Pins
- ㉝ Take-up Tension Arm
- ㉞ Reverse Button
- ㉟ Shut off Switch
- ㊱ Stop Button
- ㊲ Forward Button
- ㊳ Fast Forward Button
- ㊴ Record Interlock Button
- ㊵ Record Safety Lock
- ㊶ Line Record Level Control (Right)
- ㊷ Microphone Record Level Control (Right)
- ㊸ COMPUT-O-MATIC Record Level Indicator
- ㊹ COMPUT-O-MATIC Set Button
- ㊺ Microphone Jack (Right)
- ㊻ Microphone Jack (Left)
- ㊼ Remote Control Socket
- ㊽ Voltage Selector
- ㊾ Fuse Post
- ㊿ AC Cord
- 1 AC Outlet
- 2 Line Output Jack (Left)
- 3 Line Output Jack (Right)
- 4 DIN Jack
- 5 HIGH/LOW Change Switch
- 6 Line Input Jack (Left)
- 7 Line Input Jack (Right)
- 8 External Speaker Jack (Left)
- 9 External Speaker Jack (Right)
- 0 Stereo Headphone Jack
- 1 Speaker Switch

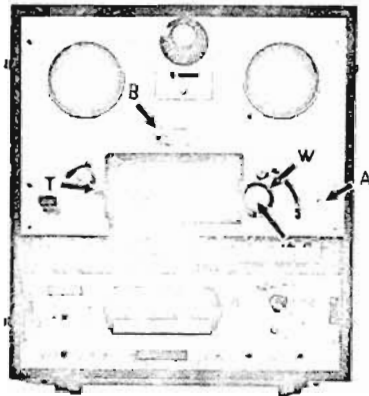
IV. DISMANTLING OF TAPE TRANSPORT UNIT & AMPLIFIERS



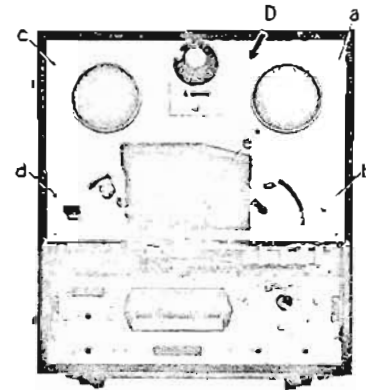
- 1) Remove CONTROL KNOBS (Volume, Line Record Level, Microphone Record Level, Bass & Treble which are marked (A) to (H)) with taking off their RETAINING SCREWS by using a Philips-head screw driver.



- 2) Remove RETAINING SCREWS (marked (a) to (f)) by using a Philips-head screw driver and remove the AMPLIFIER COVER PANEL (A).



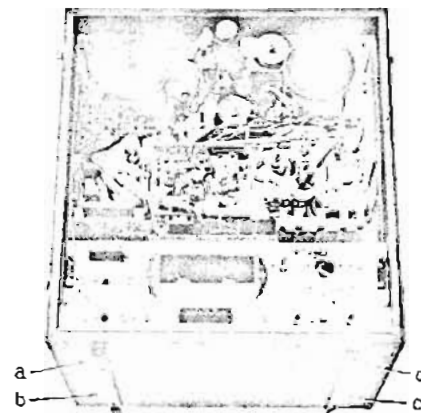
- 3) Remove KNOBS (BRAKE CONTROL & SHUT OFF SWITCH marked (A) and (B)) with taking off the RETAINING SCREWS. PINCH WHEEL (W) is removed with taking off the PINCH WHEEL CAP (C) by hand. Remove TAPE CLEANER (T) by using minus head driver.



- 4) Remove SCREWS (marked (a) to (d)) by using a Philips-head screw driver, and NUT (e) by using a box head driver, and remove the DECK COVER PANEL (D) along with MAIN HEAD COVER.



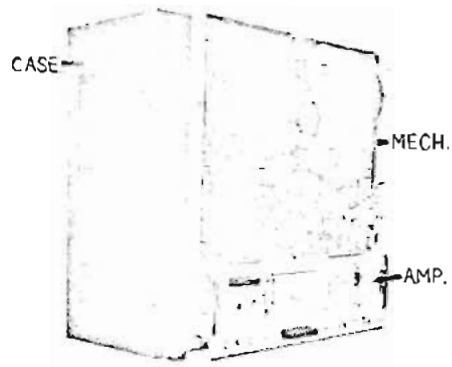
- 5) This picture shows all top cover panels removed making front mechanism control adjustment accessible.



- 6) Remove RETAINING SCREWS (marked (a) to (d)) by using a Philips-head screw driver.



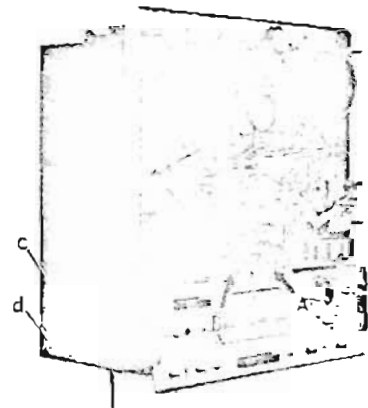
7) Remove RETAINING SCREWS (marked (a) to (d)) by using a Philips-head screw driver and remove the RUBBER FEET (A) and (B).



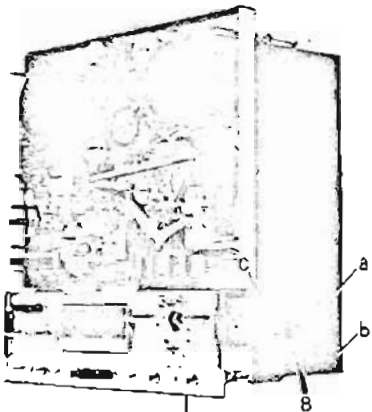
8) This picture shows all components removed from the case. The upper part houses the mechanism, the lower part the amplifiers.



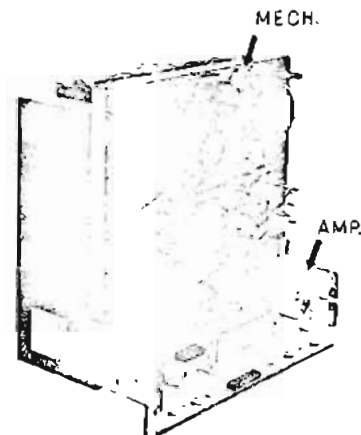
9) Carefully disconnect PLUGS (marked (A) to (C)) and remove RETAINING SCREWS (marked (a) and (b)).



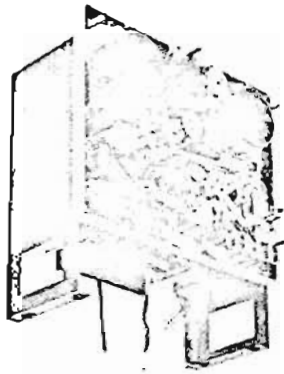
10) Carefully disconnect PLUGS (marked (A) and (B)) and remove SELF TAPPING SCREWS (marked (a) to (d)) by using a Philips-head screw driver.



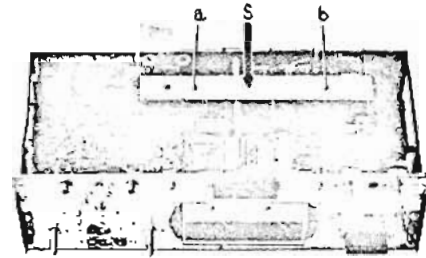
11) Remove SELF TAPPING SCREWS (marked (a) to (d)) by using a Philips-head screw driver. The machine may then be separated into two parts.



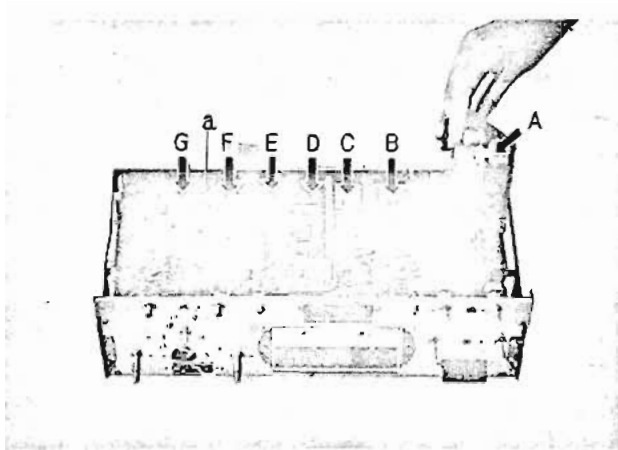
12) The amplifiers can now be removed.



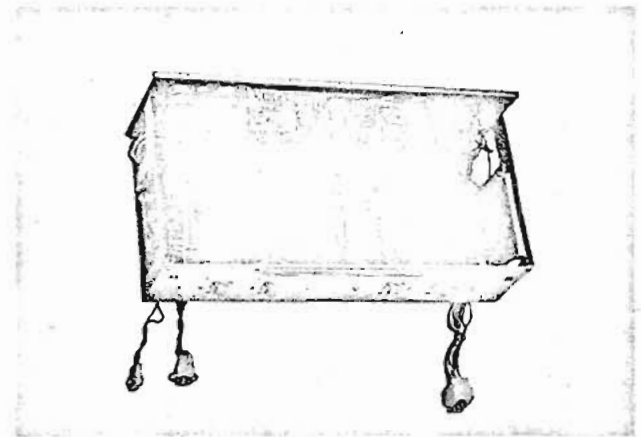
13) This picture shows the entire mechanical assembly. Any mechanical adjustment is now possible.



14) This picture shows the entire amplifier assembly, including PRE-AMPLIFIER & MAIN AMPLIFIER CARD BLOCKS. Remove RETAINING SCREWS ((a) and (b)) in order to remove the supporting plate (S).



15) CARDS (marked from (A) to (F)) are now available to be withdrawn. COM DETECTOR CARD BLOCK (G) will be withdrawn with removing screw (a) by using a Philips-head screw driver.



16) This picture shows the AMPLIFIER CHASSIS after all card blocks have been removed.

1. Adjustment of Magnetic Heads

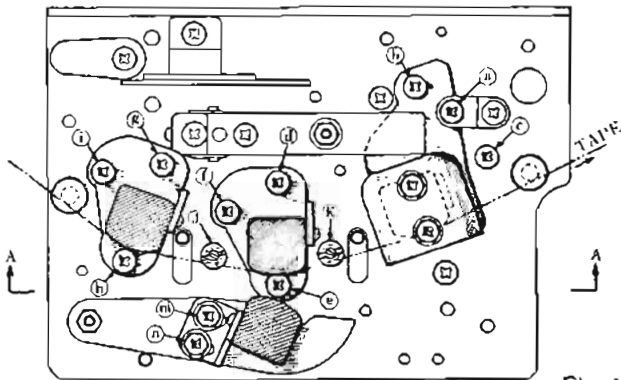


Fig. 1

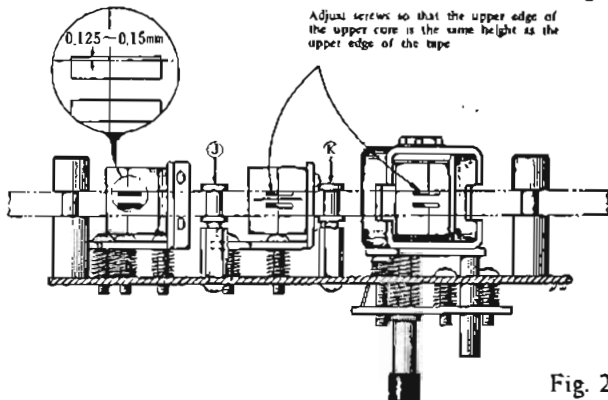


Fig. 2

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.

1.1 Adjustment of Head Height (See Figures 1 and 2)

Whenever replacing the Head Assembly, adjust the Tape Guides (J) and (K) so that they do not contact the edge of the tape, then proceed with Head height adjustment.

1) Playback Head

To adjust, turn Screw (a) (Figure 1) during "Normal Play" position so that the upper edge of the upper core of the Playback Head is the same height as the upper edge of the tape. Adjust by turning Screw (b) (Figure 1) during "Reverse Play" position so that the lower edge of the lower core of the Playback Head is the same height as the lower edge of the tape.

2) Recording Head

Adjust with Screws (d), (e) and (f) (Figure 1) so that the upper edge of the upper core is the same height as the upper edge of the tape.

3) Erasing Head

Adjust Screws (g), (h) and (i) (Figure 1) so that

the upper edge of the upper core is 0.125 to 0.15 mm higher than the upper edge of the tape. (Precaution)

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 contact the tape.

1.2 Adjustment of Azimuth Alignment

1) Playback Head

Use a Pre-recorded tape (16 KHz, 7-1/2 ips), and connect a highly sensitivity V.T.V.M. to the line output jack. Adjust Screw (C) (Figure 1) so that line output voltage is maximum.

2) Recording Head

Connect an Audio Oscillator to the line input jack and record 16 KHz Signals at a -10db recording level and depress the Monitor "TAPE" Button. Adjust Screw (f) (Figure 1) so that the indicated V.T.V.M. value applied to the line output jack is maximum.

3) Erasing Head

Visually check to assure that the centerline of the Erasing Head, is at right angles to the Head Chassis.

4) Bias Head

Loosen Screws (m) and (n) (Figure 1), adjust angulation and clearance of the Bias and Recording Heads, as subsequently described in paragraph 2-5 (Adjustment of Recording Equalization (Balance) Characteristics).

VI. AMPLIFIER ADJUSTMENT

1. PLAYBACK OUTPUT LEVEL (Pre-amplifier) ADJUSTMENT

- a) Connect a High-sensitivity V.T.V.M. to the Line Output Jack
- b) Set the Tape Speed Selector Switch to the "7-1/2" position.
- c) Playback a 250 Hz pre-recorded tape.
- d) Adjust the VR29-1 (semi-fixed resistor, 50 K-B) of the Pre-amplifier so that Line Output Voltage indicates 1.228 V (+4 dbm).

2. VU METER SENSITIVITY ADJUSTMENT

After the above adjustment, adjust the VR26-1 (semi-fixed resistor 2 K-B) of Chassis Print Board (RD-526) so that the VU meter needles indicate exactly 0 VU, denoted by dot.

3. MAIN AMPLIFIER ADJUSTMENT

- a) As shown in Fig. 1, connect the AM Meter (100 mA–150 mA scale) and a resistor (8Ω 20W) to the External Speaker Jack.
- b) Set the Main Amplifier Volume Control to minimum so that VR31-1 and VR31-2 (semi-fixed resistor 200 Ω -B) are wound counterclockwise.
- c) Set the Power Switch to the "ON" position. Adjust VR31-1 and VR31-2 so that the AM meter needle indicates "0".
- d) The foregoing should accomplish adjustment. In this condition Collector Voltage of 2SD130 (Power Output Transistor) should read 26 to 27 V, with Collector Current at 70 to 100 mA.

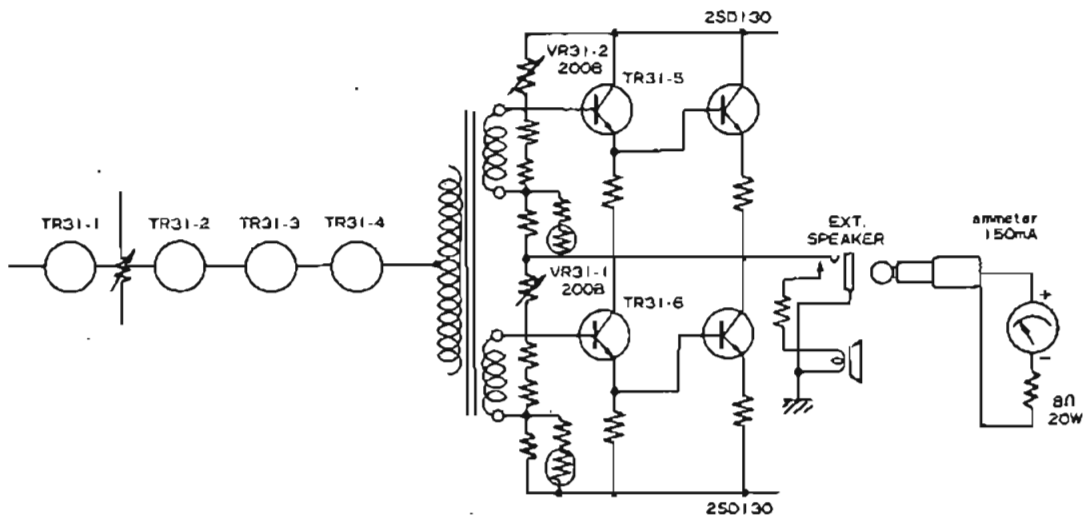


Fig. 1

4. RECORDING AMPLIFIER ADJUSTMENT

Recording Amplifier Adjustment should be made only after Head Adjustment (vertical and horizontal azimuth) and Playback Amplifier Adjustments have been performed.

- Load a blank test tape (Scotch No. 150) on the Tape Recorder.
- As shown in Fig. 2, connect an Audio Oscillator and Attenuator to the Line Input. Connect a High-sensitivity V.T.V.M. to the Line Output.
- Set the Tape Speed Selector to "7-1/2" and the Monitor Switch to "TAPE" position.
- By using the Audio Oscillator, supply a 1,000 Hz signal. Set the tape to transport, and the Record Interlock Button to recording mode.
- Adjust the Line Level Control so that the VU meter needle indicates "0" (white dot).
- Set the Monitor Switch to "SOURCE" position. Adjust the VR28-1 (semi-fixed resistor, 20 K-B) of Recording Amplifier Board (RD-528) so that the VU meter needle indicates "0" (white dot).

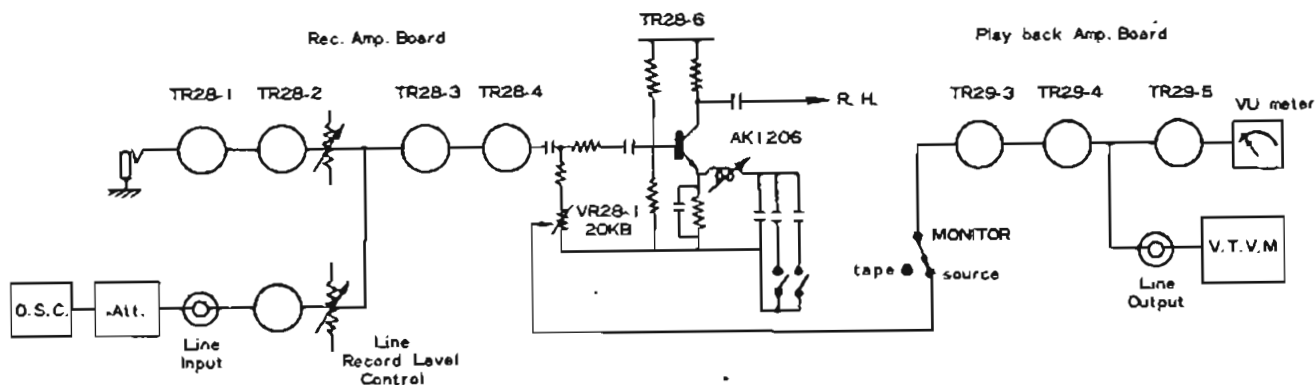


Fig. 2

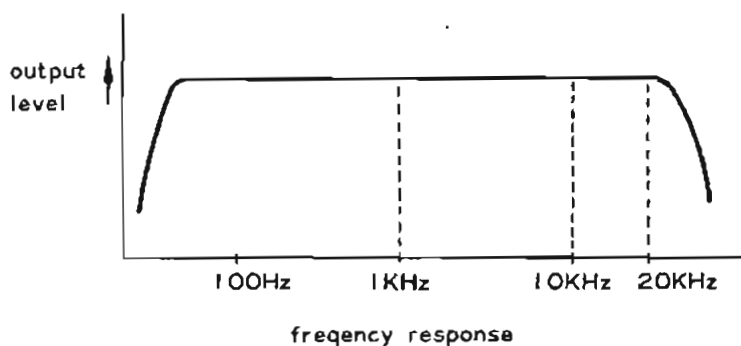


Fig. 3

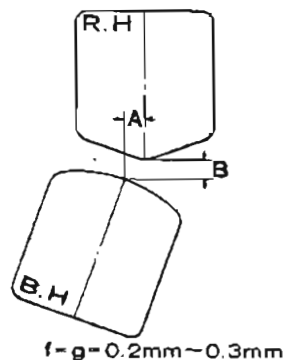


Fig. 4

5. RECORDING EQUALIZATION CHARACTERISTICS ADJUSTMENT

- For tape and meters, follow the procedure used for the adjustment of the recording amplifier.
- Adjust the Recording Level Control by setting the Monitor Switch to "SOURCE" position so that the VU meter needle indicates "0" (white dot).
- Attenuate the Audio Oscillator signal by 20 db.
- Start the tape, by pushing the Forward Button then press the Record Button to record. The Monitor Switch must be set to "TAPE" position.
- As shown in Fig. 3, increase the frequency of the Audio Frequency Oscillator by steps from 1 KHz to 10 KHz. Adjust Bias Voltage and Bias Head angle including the gap between Bias and Recording heads. The V.T.V.M. which is connected to the Line Output, should indicate the same voltage when using 1 KHz to 10 KHz.
- During 7-1/2" operation, the Bias Voltage may be adjusted by turning the white knob VR30-1 (semi-fixed resistor 2K-B) of Bias Oscillator Board (RD-530) clockwise.

This adjustment should begin when VR30-1 is fully wound in the clockwise position.

- As shown in Fig. 4, Gaps A and B, which are between the Recording and Bias Heads, should be about 0.2 mm.
- After completion of the foregoing, observe the Recording Playback Output Voltage at 1 KHz and 10 KHz. If this voltage remains constant, change the frequency response of Audio Oscillator continuously. Check to see that the Output Voltages are within ± 3 dB at any condition up to 20 KHz. If the response around 20 KHz reads more than ± 3 dB difference when compared with response at 10 KHz, adjust the Peaking Coil (AKI206) of the Recording Amplifier to match the High-range response.
- If the frequency response is gained as specified, reset the Attenuator Dial to read "0" VU. Follow the operation as detailed in 4 (e) & (f), and re-adjust the Recording Level of the Recording Amplifier to 0 VU at 1,000 Hz.

- Set the Tape Speed Selector to "3-3/4" and attenuate the Input signal to -20 dB. Adjust the VR30-2 (semi-fixed resistor 5 K-B) of Bias Oscillator Board (RD-530) so that the responses at 1 KHz and 10 KHz in Recording/Playback condition, are at the same level.
- After the same response at 1 KHz and 10 KHz has been gained, increase the Input signal to 18 KHz by steps. Check whether 18 KHz is within -6dB.
- Distortion level at 7-1/2" should be within 2% and 3% at "3-3/4".

6. DM DETECTOR SENSITIVITY ADJUSTMENT

- Before adjustment, remove the solder at point P (Time Delay circuit of 15 seconds) which is shown in Figs. 5 and 6.
- Turn the Microphone Record Level Control (left channel) slightly clockwise from the medium level position. Then, record the non-input signal for 15 seconds.
- Playback that signal. Adjust VR71-1 (semi-fixed resistor 10 K-B) of DM Detector Card so that DM indicator lamp is extinguished.
- Playback a new blank tape. Adjust VR71-1 so that the Indicator lamp lights.
- Check to see that the lamp is lighted when the tape is off the Playback Head during playback operation.
- Solder Point P as shown in Figs. 5 and 6. After soldering, the DM Indicator Lamp should light after 15 seconds following the stoppage of input signal to the DM Detector circuit.

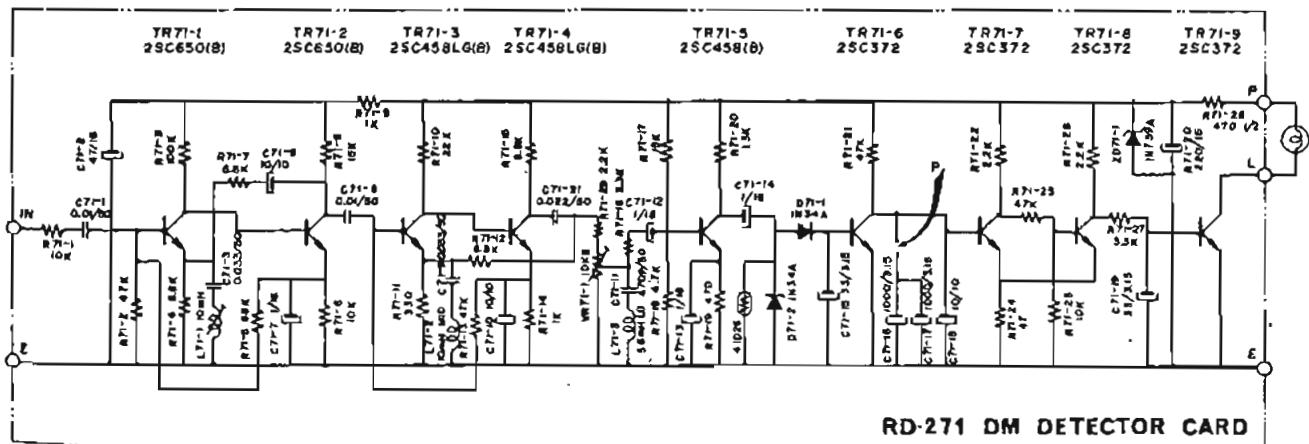


Fig. 5

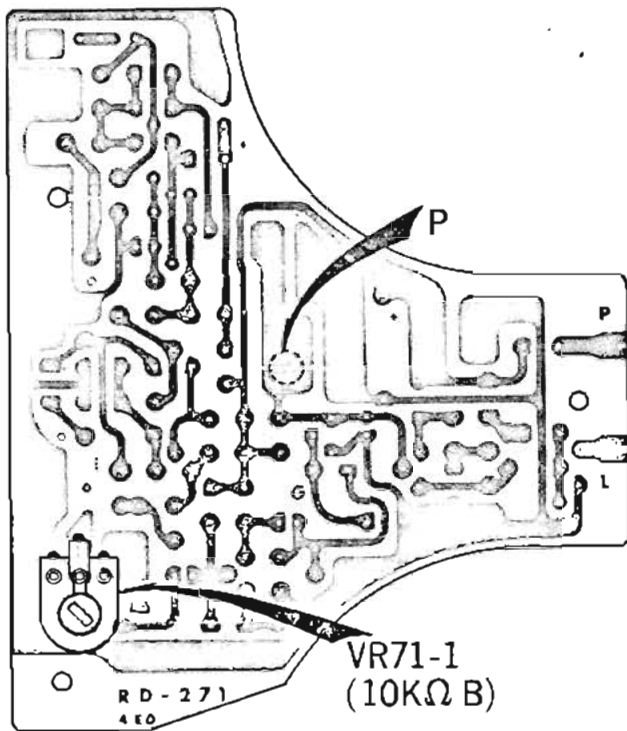


Fig. 6

7. ADJUSTMENT OF COMPUT-O-MATIC RECORDING LEVEL SENSITIVITY

- a) As shown in Fig. 7, connect an Audio Oscillator to the Left Line Input Jack (56) of the tape recorder, and supply a 1,000 Hz signal.
- b) Push the "SOURCE" Monitor Button. Set the Track Selector to "STEREO".
- c) Turn the Line Record Level Control Knob (19) so that the left channel VU meter needle indicates "0" VU (white mark). The COMPUT-O-MATIC should be set to the "OFF" position.
- d) Push the COMPUT-O-MATIC Button to the "ON" position, and the Indicator needle automatically moves from maximum to "0" VU level.
- e) Adjust the semi-fixed resistor VR70-1 (100KB) of COM DETECTOR CARD (RD-570) so that VU meter needle indicates exactly "0" VU.
- f) If the VU meter needle indicates lower than "0" VU, reset the COMPUT-O-MATIC Button to "OFF" position. Readjust the VR70-1 to an increased value, push the button to "ON" and recheck.

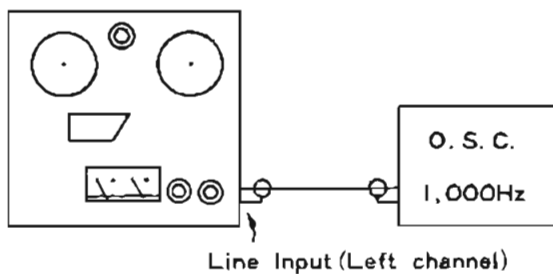


Fig. 7

VII. MECHANISM ADJUSTMENT

6. Mechanism Adjustment

6.1 Alignment of Capstan Drive Mechanism

The Capstan Drive Belt should run in the center of the Motor Pulley and Flywheel, as shown in Figure 1. To position the Capstan Drive Belt, with proper clearance between the Motor Mounting Plate and the Chassis use adjusting Screws (C) and (A), shown in Figure 2. After adjustment, tighten Lock Screws (B) and (D).

- 1) With Motor rotating in the Normal direction, loosen Screws (B) and (D) and adjust Belt position by turning Screw (C).
- 2) With Motor rotating in the Reverse direction, adjust Belt position by turning Screw (A). After Drive Belt position has been properly adjusted to run in the center of the Motor Pulley and Flywheel (according to direction of motor rotation), lock by tightening Screws (B) and (D).

- 3) With the Motor rotating and with the recorder switched from 50 to 60 Hz, verify that the Drive Belt does not contact the Belt Shift Lever.
- 4) If the Drive Belt contacts the Belt Shift Lever, loosen Screw (E), and move the Belt Shift Lever Stopper so that the Belt does not contact the Shift Lever.

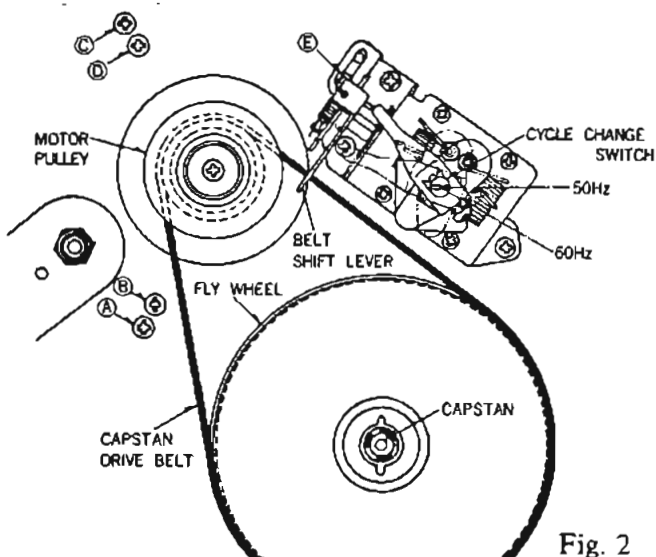


Fig. 2

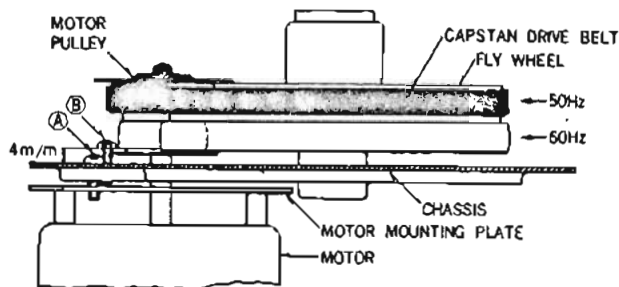


Fig. 1

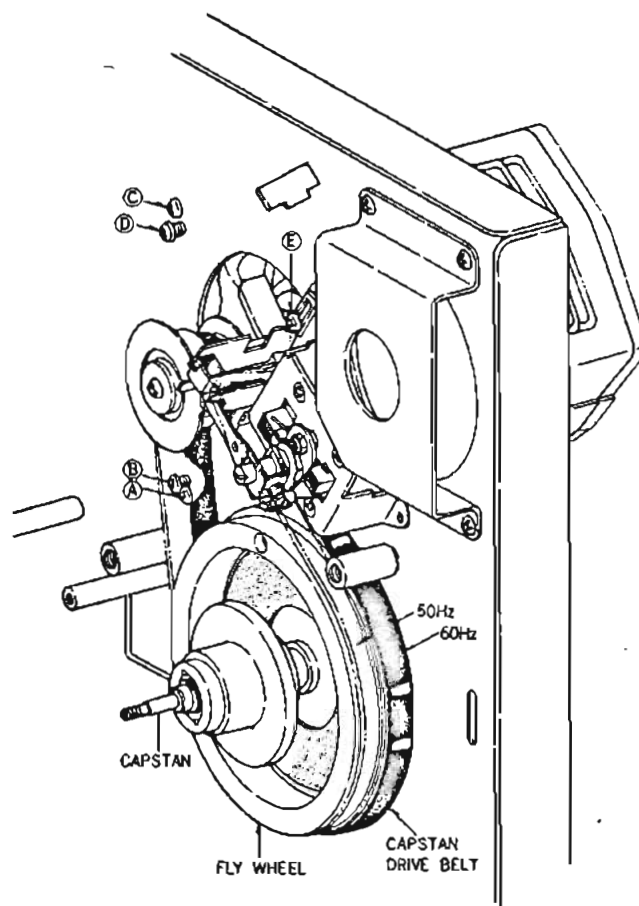


Fig. 1,2

2. Adjustment of Pinch Roller Mechanism

- 1) Pinch Roller Solenoid Position—Set the Solenoid so that there is approximately 0.3 mm clearance between the end of Plunger (b) and the bottom of the Solenoid when the Pinch Roller Shaft is depressed with your finger, and then tighten Screw (a). (See Figure 3a)
- 2) Pinch Roller Pressure—Apply a Tension Gauge to the Pinch Roller Shaft, and adjust Nut (C1) so that pressure is 1.8 kg/cm when set for Playback. Then tighten Nut (C2) and secure with Nut (C1).

- 3) Adjust Nut (e) so that there is approximately 0.5 mm clearance between Shifter Pin (d) and the upper edge of the hole in the Head Mounting Plate when set for Playback.
- 4) Set to Playback with the Pinch Roller contacting the Capstan and verify that the Tape Shifter Lever depresses Microswitch SW-210 and SW-211 Pins, as shown in Figure 3b, and make sure that switches operate correctly. To adjust positions of Microswitches SW-210 and SW-211, loosen Screws (f) and (g).

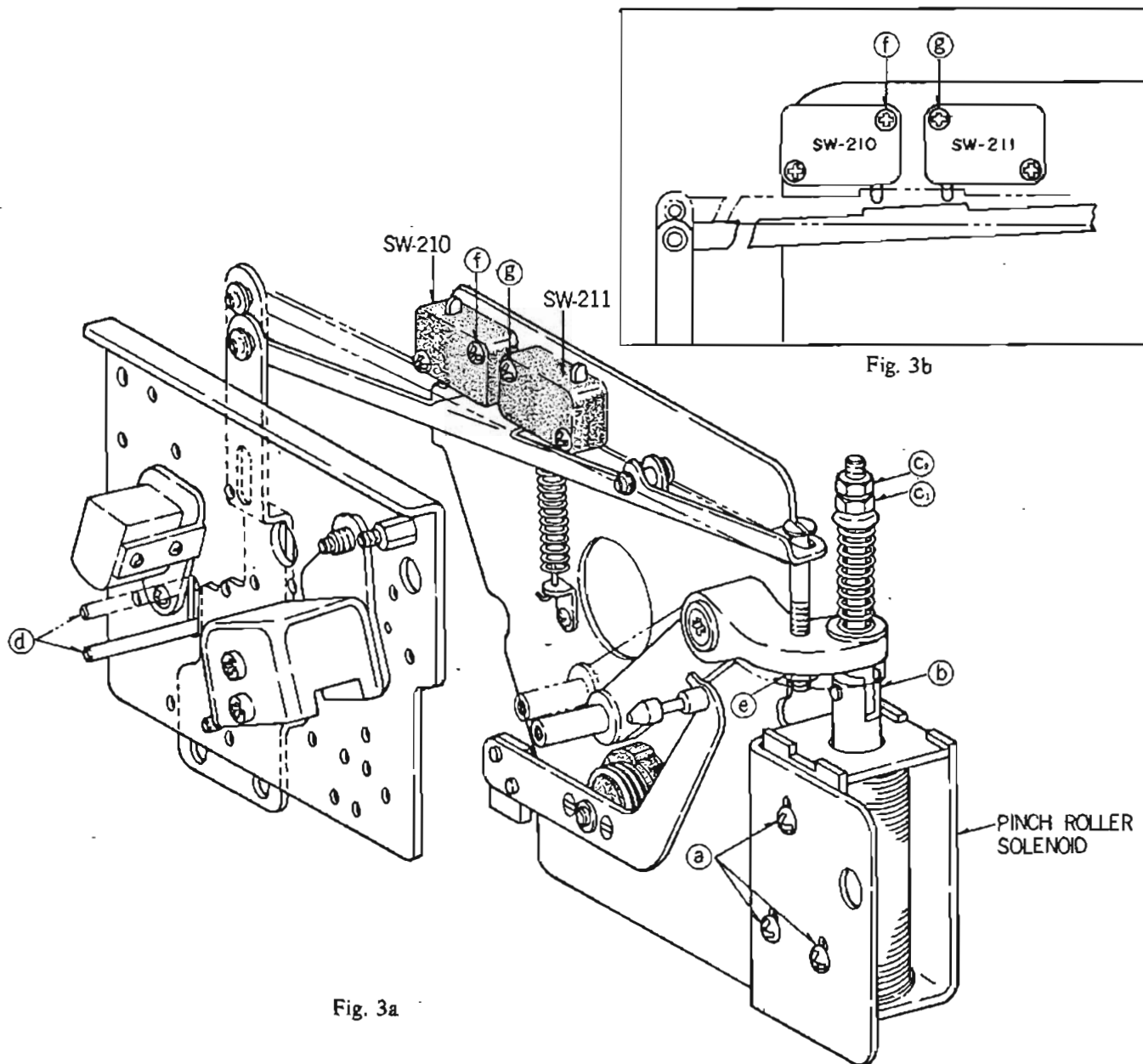


Fig. 3a

Fig. 3b

3. Adjustment Brake Mechanism

- 1) To adjust Brake Solenoid position, align the Left and Right Brake Levers when the Solenoid Plunger is retracted.
- 2) One end of the Brake Band is centered in the elliptical hole in the Brake Band, as shown by (a) (a') in Figure 4a.
- 3) For metal Brake Band Retainer, adjust Screw (b), so that the clearance between the Brake Band and motor circumference is uniform, as shown in Figure 4B.
- 4) Adjust the set position of the Brake Band Spring so that Brake tension is 150 grams (using 60 mm diameter tape and measuring with a Tension Gauge) (See Figure 4a (c) (c')).

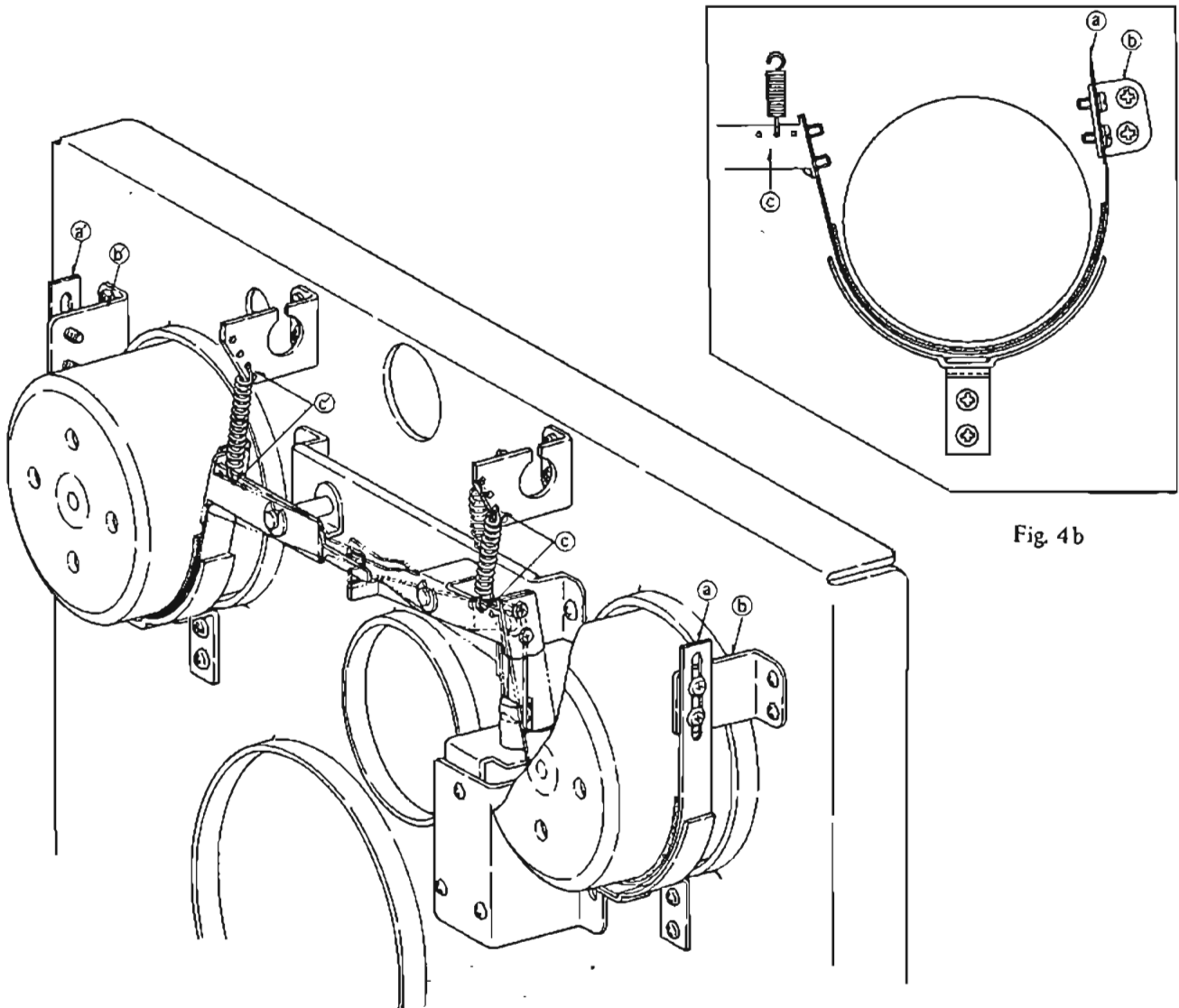


Fig. 4a

Fig. 4b

4. Adjustment of Tape

For all measurements, use 60 mm diameter tape, and measure tape tension with a Tension Gauge.

Set the Magnetic Brake Control Switch to STANDARD.

- 1) Back tension for "Reverse Play" depends upon the torque of Motor B, as shown in Figure 6. Adjust back tension to 60 grams adjusting the 230 Ω Resistor (F), as shown in Figure 5. At this tension setting, voltage applied to Motor B is approximately 29 V.
- 2) Take-Up tension for "Normal Play" depends upon the torque of Motor B, as shown in Figure 6. Adjust take-up tension to 100 grams by adjusting the 120 Ω Resistor (A), as shown in Figure 5. At this tension setting, voltage applied to Motor B is approximately 41 V.

- 3) Back tension for "Normal Play" depends upon the torque of Motor A, as shown in Figure 6. Adjust back tension to 60 grams by adjusting the 230 Ω Resistor (F), as shown in Figure 5. At this tension setting, voltage applied to Motor A is approximately 29V.
- 4) Take-up tension for "Reverse Play" depends upon the torque of Motor A, as shown in Figure 6. Adjust Take-up tension to 220 grams by adjusting the 120 Ω Resistor (A), as shown in Figure 5. At this tension setting, voltage applied to Motor A is approximately 62V.

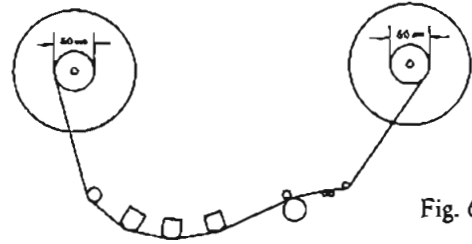


Fig. 6

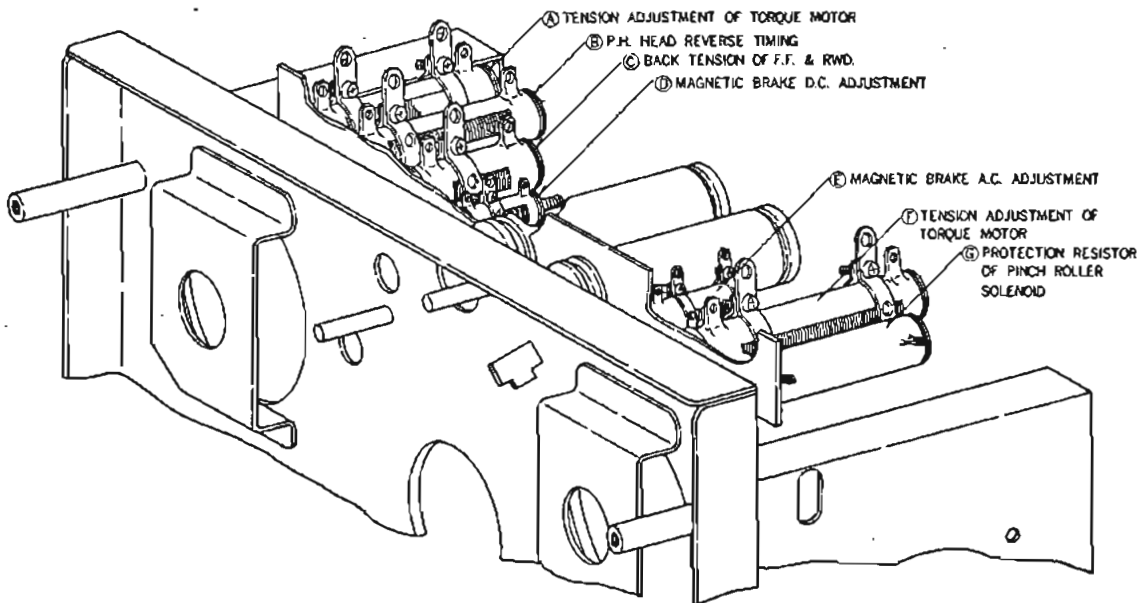
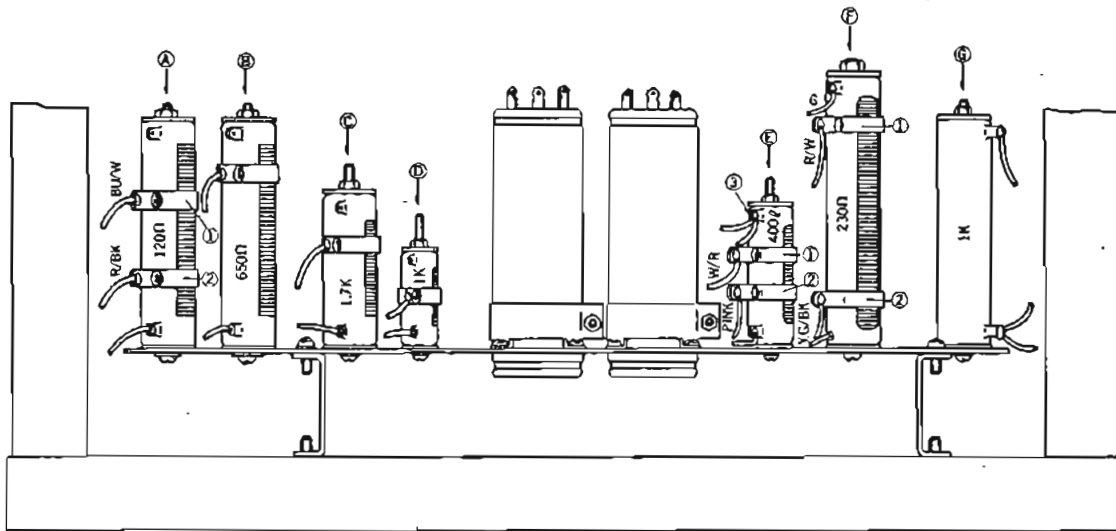


Fig. 5

5. Adjustment of Playback Head Reverse Timing
The Playback Head reproduces on Tracks 1-3 for "Normal Play" and on Tracks 2-4 for "Reverse Play" when using Stereo Tape.

The Playback Head lowers to Track 2-4 position, when switched from Normal to Reverse Play. If the Playback Head lowers with the tape contacting the Head, a loud noise will be heard from the speaker. The Tape Shifter releases the tape from contact with the Playback Head before the Head lowers.

Adjust the 650 Ω Resistor (B), as shown in Figure 5, so that 38 Volts is applied between the terminals (white and gray wire) (Reverse Head Solenoid Coil).

6. Adjustment of Magnetic Brake

1) Adjust the 400 Ω Resistor (E) (in Figure 5) so that the terminals on each end of the Resistor are equidistant.

2) Center the Slider of the 1K Ω Resistor (D), as shown in Figure 5. (D.C. Brake)

3) Set the Magnetic Brake Control Switch to STANDARD. Depress the STOP Button near the outer end of a 7" reel of tape at FAST FORWARD to determine whether the tape turns in the rewind direction.

4) If the tape turns in the rewind direction, increase D.C. Brake voltage by adjusting the Slider (1) of the 1K Ω Resistor (D) to decrease resistance or adjust slider (1) toward terminal (3) of the 400 Ω Resistor (E), as shown in Figure 5. Also verify that Brake Band tension is accurately adjusted to 150 grams.

5) Set the Magnetic Brake Control Switch to 1.0 or 0.5 mil and check the following: FAST FORWARD \rightarrow STOP, REWIND \rightarrow STOP. If the tape loses its tension and becomes slack at STOP, move the Slider (2) of 400 Ω Resistor (E) toward Slider (1), as shown in Figure 5.

After the foregoing adjustments, verify (with the Magnetic Brake operating) that torque motor tension is as follows:

Standard	:	approx. 300 ~ 330 gram.
1.0 or 1/2 mil	:	approx. 250 gram.

7. Adjustment of Back Tension for FAST FORWARD and REWIND.

1) Adjust the slider of the 1.7 K Ω Resistor (C), shown in Figure 5, so that overall resistance is 1.3 K Ω . If Resistor (C) itself is 1.3 K Ω , no adjustment is required.

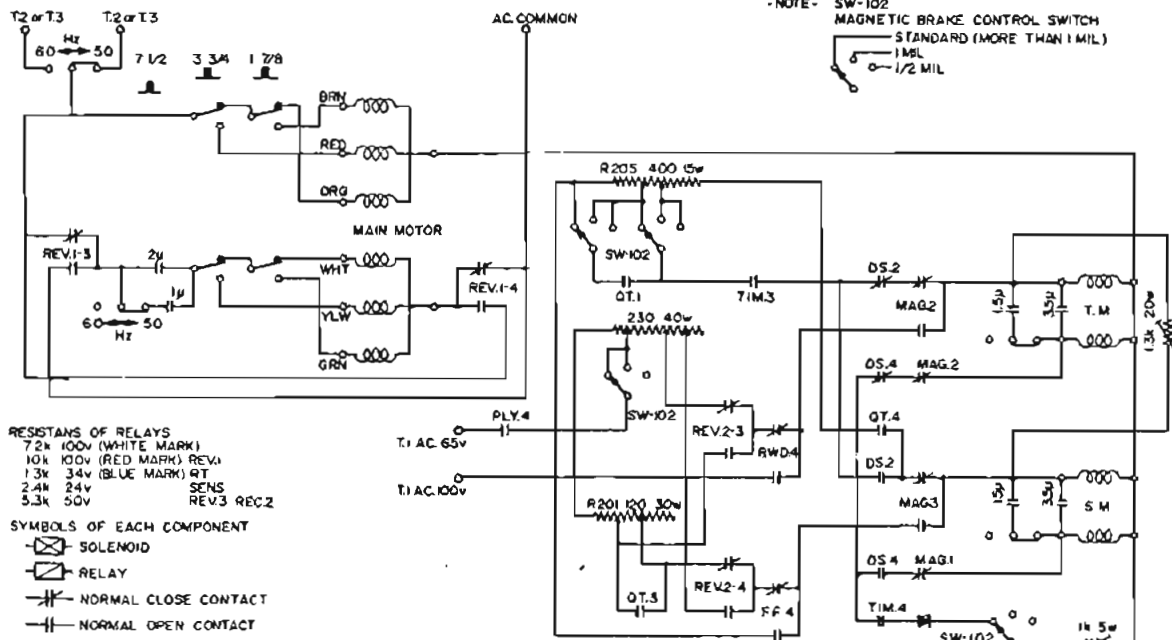
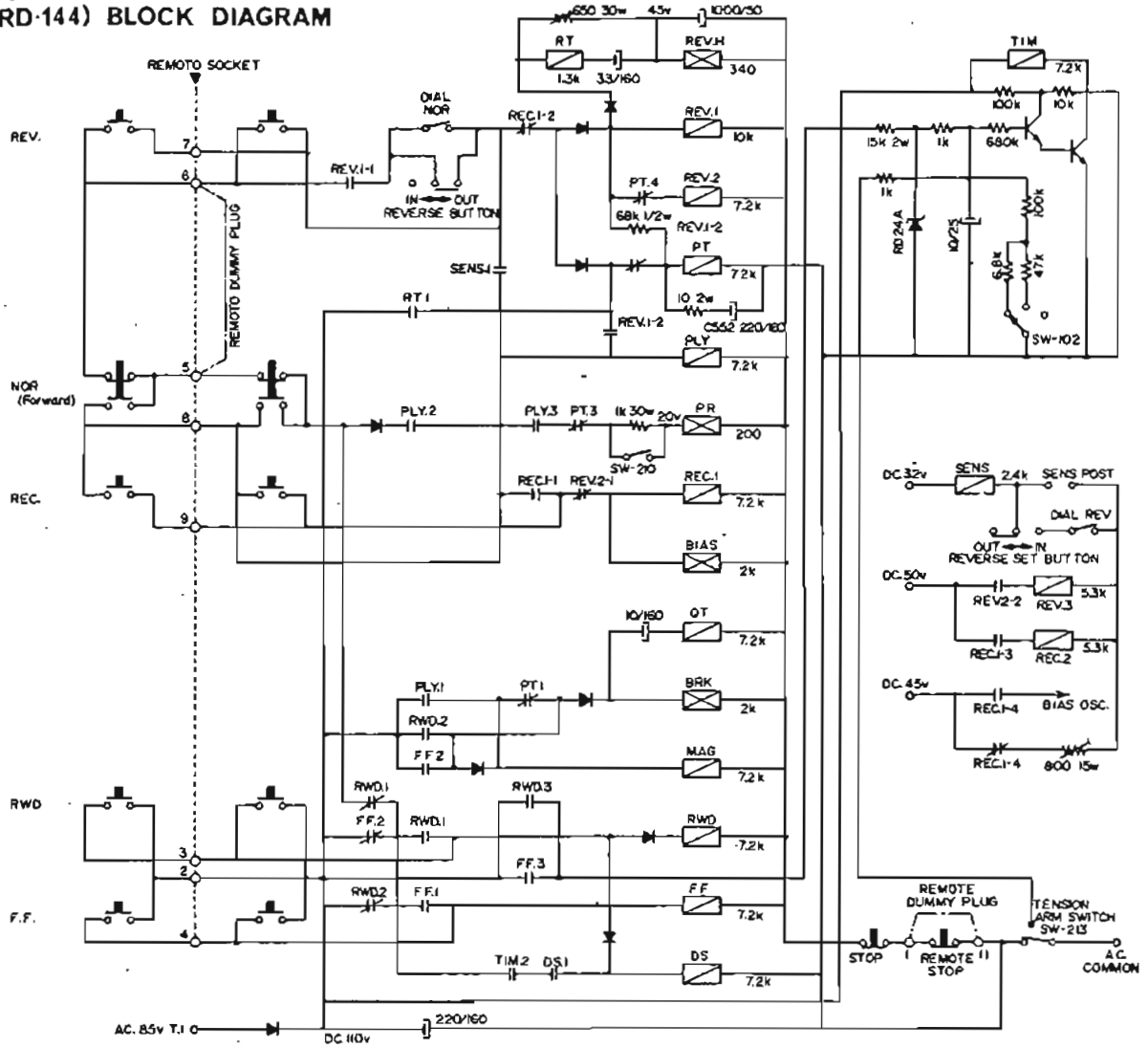
8. Adjustment of Reel Table Height

To adjust Reel height, loosen the two screws on the bottom of the Reel Table and adjust so that height from the Chassis to the upper edge of the Reel Table is 53.5 mm.

Explanation of Relays and Solenoids included in X-360.

- REC 2 : Recording Relay 2
Actuated by REC Relay 1.
Switches Recording Head to ON/OFF.
- RT : Reverse Timing Relay
Charges at 220 μ when changing from
Reverse to Normal operation.
- REV H : Head Reverse Solenoid
Depresses Playback Head to Reverse
position in the reverse mode.
- REV 1 : Reverse Relay 1
Reverses motor rotation. Locks Reverse
circuit. Controls PLY Relay.
- REV 2 : Reverse Relay 2
Switches the Reel Motor Tension
during Reverse operation.
- REV 3 : Reverse Relay 3
Switches the Playback Head connection
(L.ch. R.ch.) during Reverse operation.
- PT : Pinch Roller Timing
Stops tape in 4 seconds while changing
Normal and Reverse.
- PLY : Play Relay
Locks BRK., QT., PR. control & PLY
circuit.
- PR : Pinch Roller Solenoid
- REC 1 : Recording Relay 1
Locks REC Relay 2 control and
Recording circuit.
- BIAS : Bias Head Control Solenoid
- QT : Quick Tension
Used under all operations and at starting
time, operates to provide Reel. Motor a
high force.
- BRK : Brake Solenoid
- MAG : Magnetic Brake Relay
Constantly ON during normal operation.
In Off position Magnetic Brake circuit
operates.
- TIM : Time Constant Relay
ON during Fast Forward and Rewind
operations. Controls Magnetic Brake
operation.
- RWD : Rewind Relay
- FF : Fast Forward
- DS : Direction Switch Relay
Operates only during Rewind mode.
Controls the direction of the Magnetic
Brake operation.
- SENS : Sensing Relay
Operated by Sensing Tape or Reverse
Dial. Also sets Reverse circuit to ON.

SYSTEM CONTROL BOARD (RD-144) BLOCK DIAGRAM



1. Relays & Solenoids Actuated for Each Operation

Function	R.T.	REV1	REV2	REV3	P.T.	PLY	REC1	REC2	SENS	Q.T	MAG.	RWD.	F.F.	DS	TIM.	Solenoid			
																REV.R	P.R	RIAS	BRK
Normal Play						○				○	○							○	
Reverse Play	○	○	○	○	○	○			○	○	○						○	○	
Recording						○	○	○		○	○							○	○
Fast Forward										○	○		○		○				○
Rewind										○	○	○		○	○				○

○ mark indicates "engaged".

Fig. 1

2. STOP

Load a tape and depress the Power Switch. Current flows as indicated by the red line in Figure 2, driving the Main Motor in the normal direction, and lights the VU Meter Lamp.

3. PLAY

With the Recorder set to STOP, depress the FORWARD Button. Current flows as indicated in Figure 3, actuating the PLY, QT, and MAG Relays and the P.R. and BRK Solenoids. Tape is fed in the normal (forward) direction at a constant speed as current is supplied through R201 and R206 to Left and Right Reel Motors. To provide increased starting torque for the Reel Motors, the QT Relay is actuated approximately 0.2 second after the FORWARD Button is depressed, partially shorting R201 and applying higher voltage to the Take-up Motor. The Block Diagram clearly show the operation of the individual relays.

4. FAST FORWARD

When the FAST FORWARD Button is depressed, current flows as indicated in Figure 4, actuating the FF, MAG, QT, and TIM Relays and the BRK Solenoid. 100V is supplied to the Take-up Motor, and 13V is fed to the Supply Motor through R203, for back tension application during FAST FORWARD feed.

5. REWIND

When the REWIND Button is depressed, current flows as indicated in Figure 5, actuating the RWD, QT, MAG, DS, and TIM Relays and the BRK Solenoid. 100V is supplied to the Supply Motor and 13V is fed to the Take-up Motor through R203, for back tension application during REWIND.

6. Magnetic Brake

When the STOP Button is depressed during FAST FORWARD or REWIND, the Magnetic Brake smoothly and quickly stops the fast moving tape.

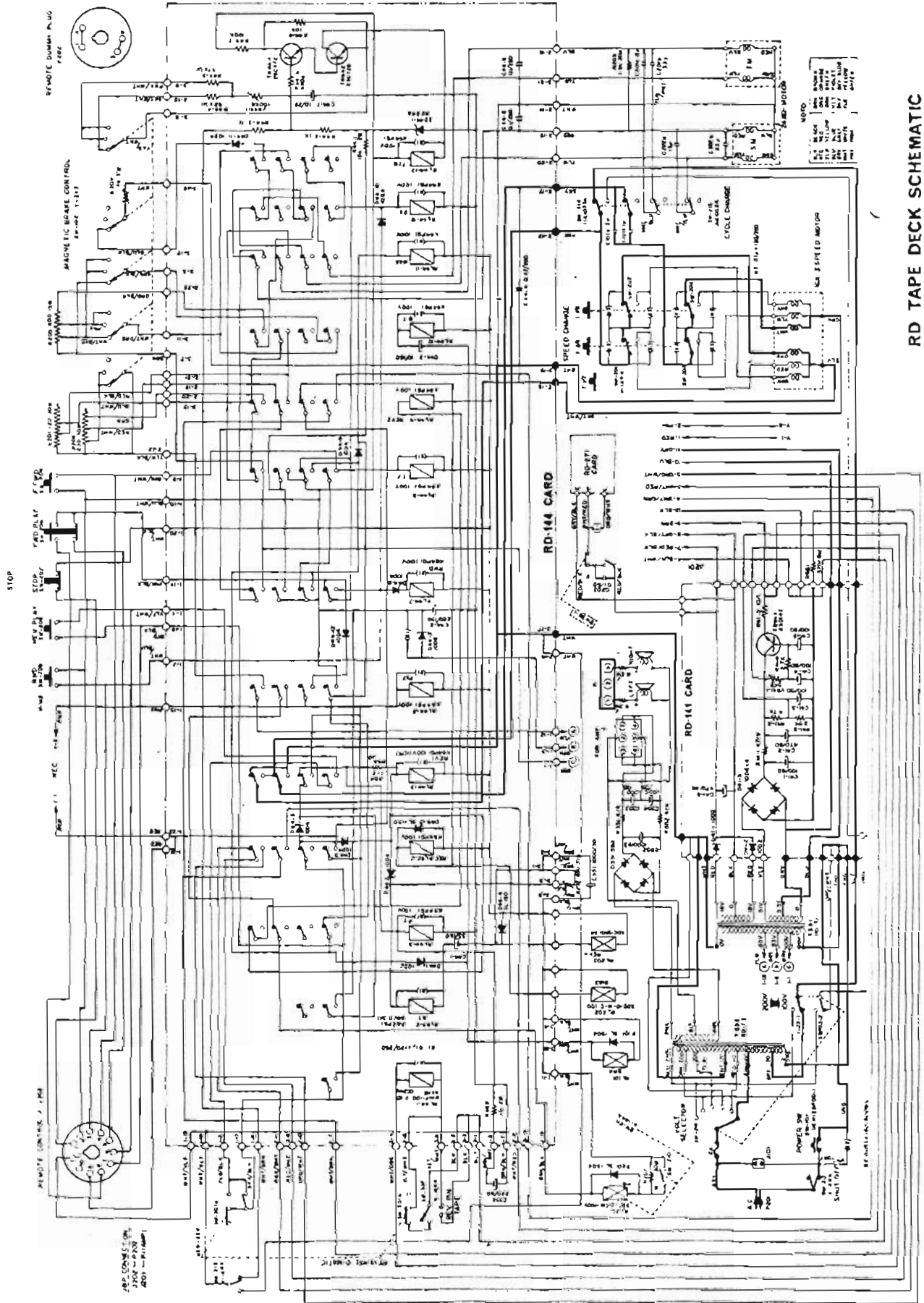
a) When the STOP Button is depressed during REWIND, Condenser C44-7 (10 μF) is discharged through VR44-1 (100K Ω) and R44-4 (6.8K Ω), as shown in Figure 6.

Discharge Time Constant is 2 seconds with SW102 set to STANDARD, or 4 seconds when set to 1 or 1/2 mil. During discharge Tr44-1 (2SC372) and Tr44-2(2SC728), as well as TIM and DS Relays remain engaged. 65V AC is supplied to the Take-up Motor through R205 (400 Ω) and DC current is supplied to the Take-up Motor Sub Coil through R205(1K Ω) and Diode (10D4), allowing the Take-up Motor to serve as a Brake.

b) When the STOP Button is depressed during FAST FORWARD, the TIM Relay remains engaged, and supplies both AC and DC to the Supply Motor which serves as a Brake for the fast moving tape. When the Magnetic Brake Control Switch SW-102 is set to 1 or 1/2 mil, D44-11 and R204 are cut out from the circuit and AC only is supplied to the Motor.

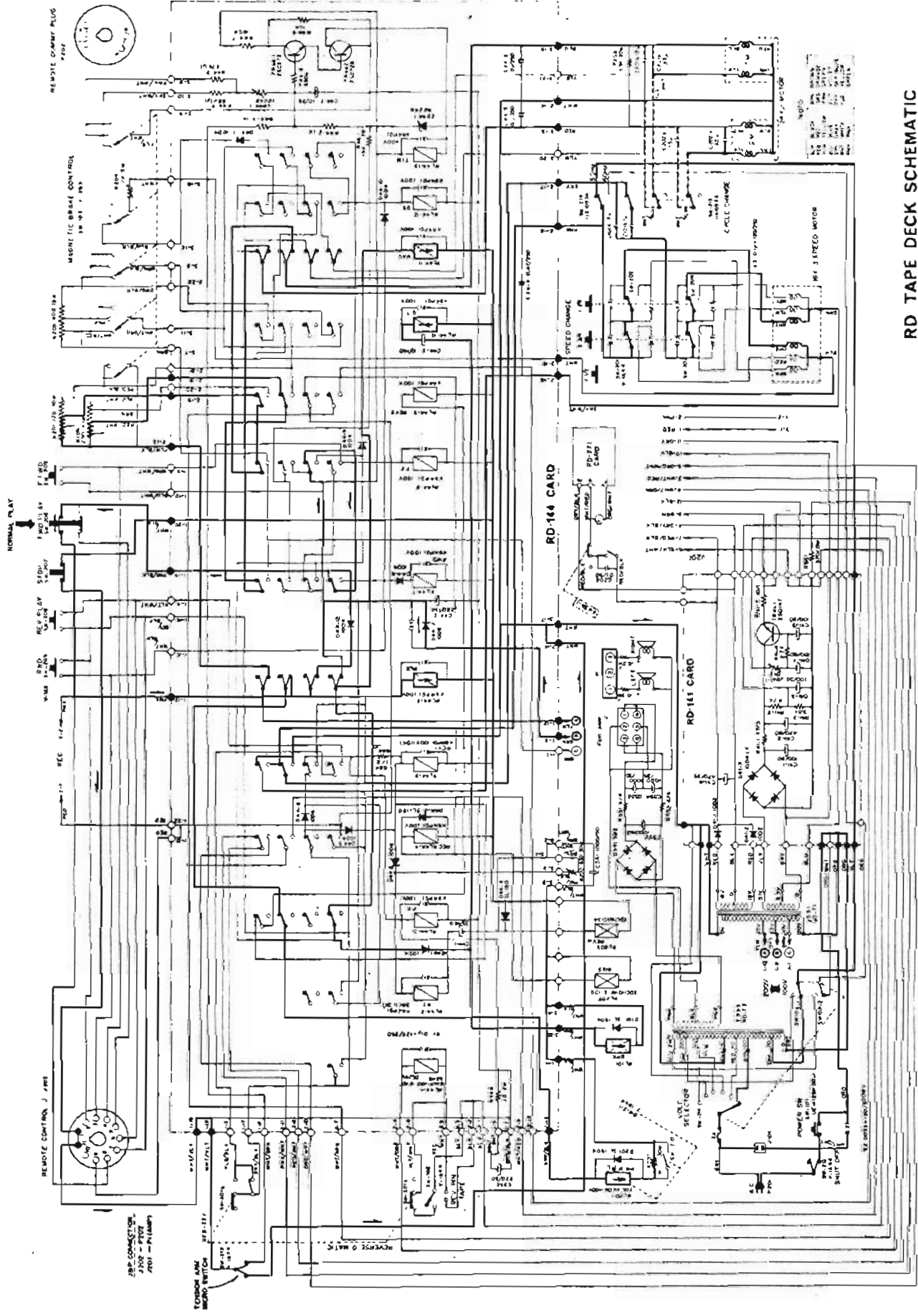
Because the Brake Band only assists the Magnetic Brake, Brake Tension (Braking Power) applied by the Brake Band can be of a comparatively smaller value than usual.

STOP



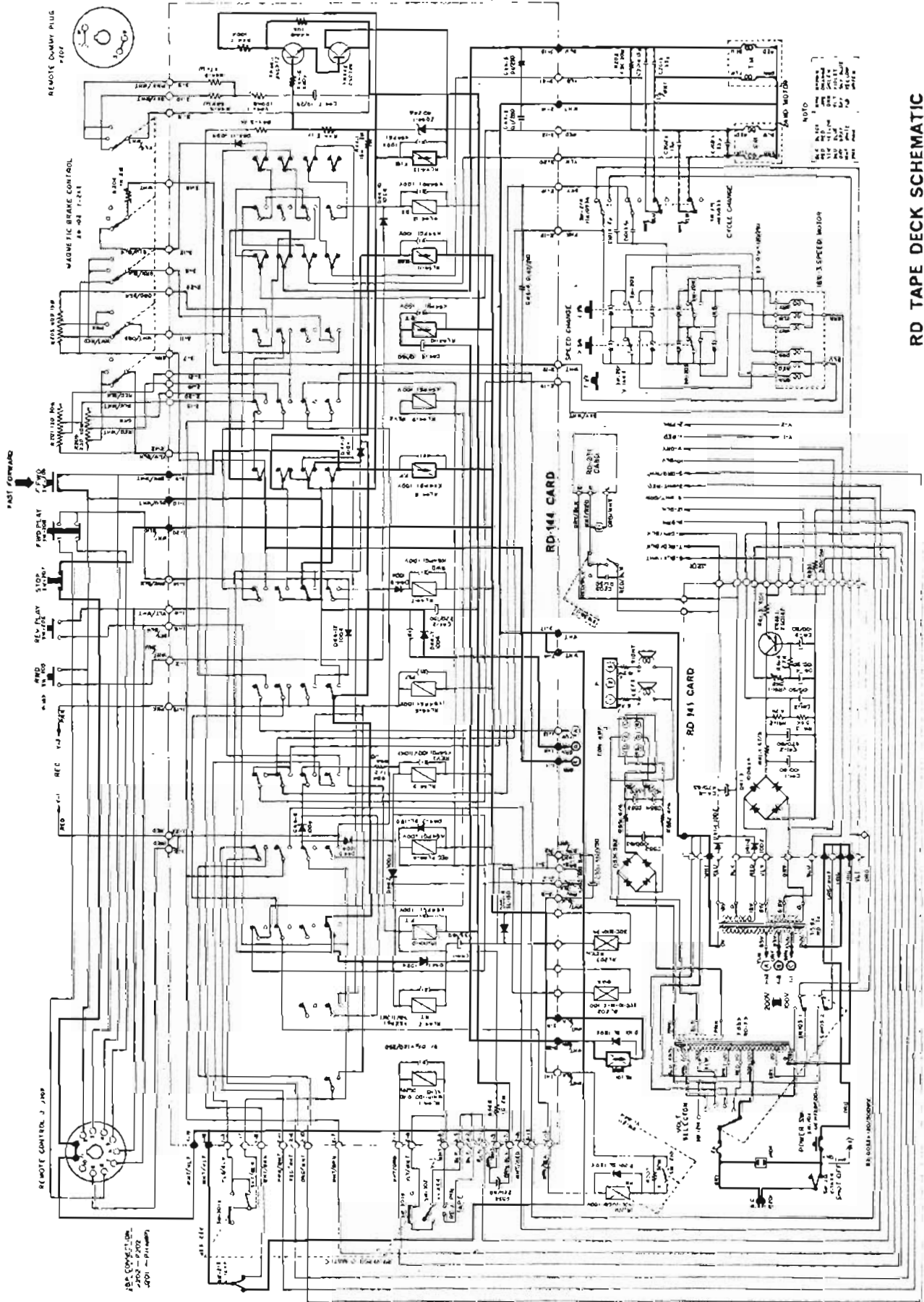
RD TAPE DECK SCHEMATIC

Fig. 2



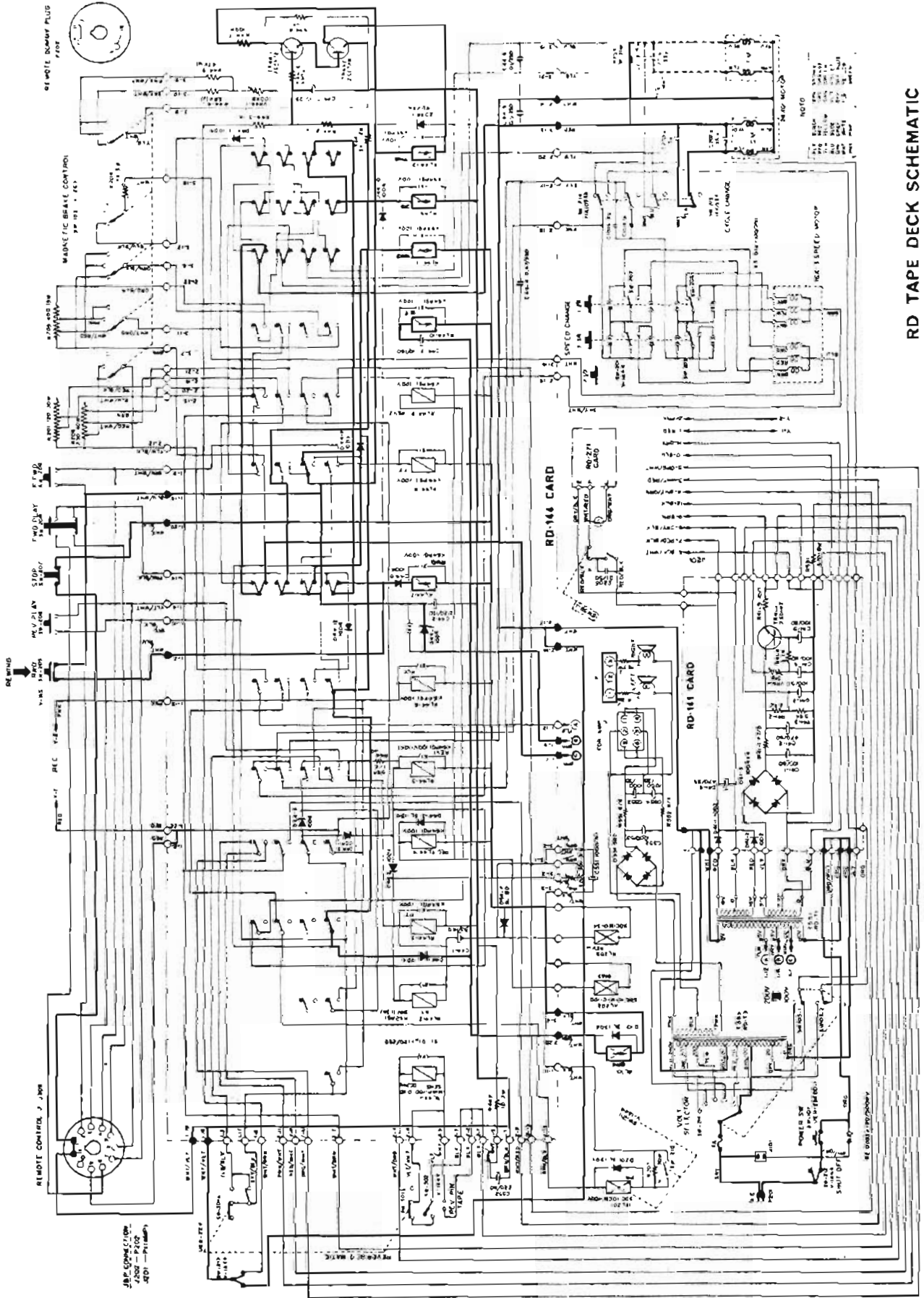
RD TAPE DECK SCHEMATIC

Fig. 3



RD TAPE DECK SCHEMATIC

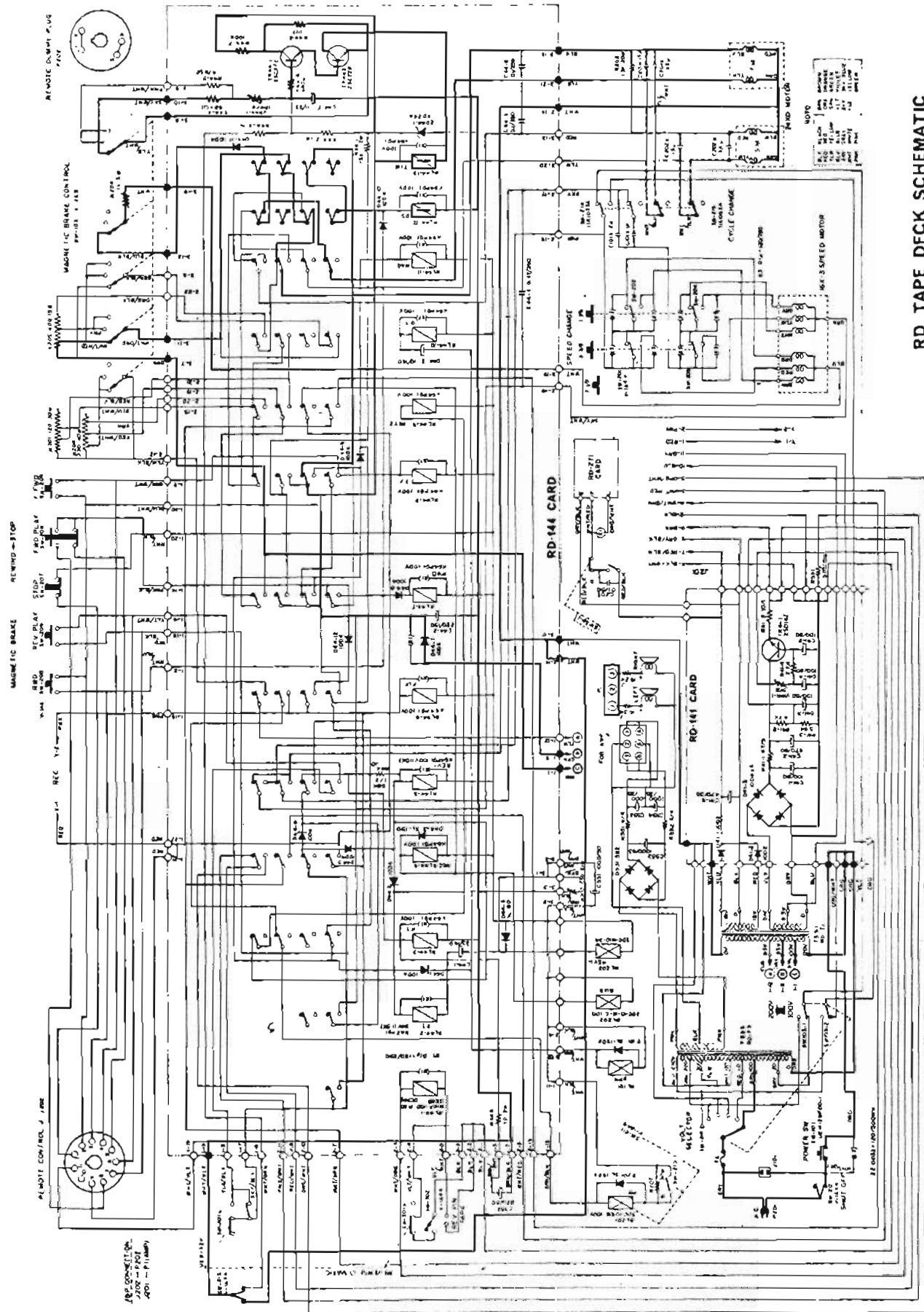
Fig. 4



RD TAPE DECK SCHEMATIC

Fig. 5

MAGNETIC BRAKE



RD TAPE DECK SCHEMATIC

Fig. 6

7. REVERSE PLAY

a) Normal-----Reverse

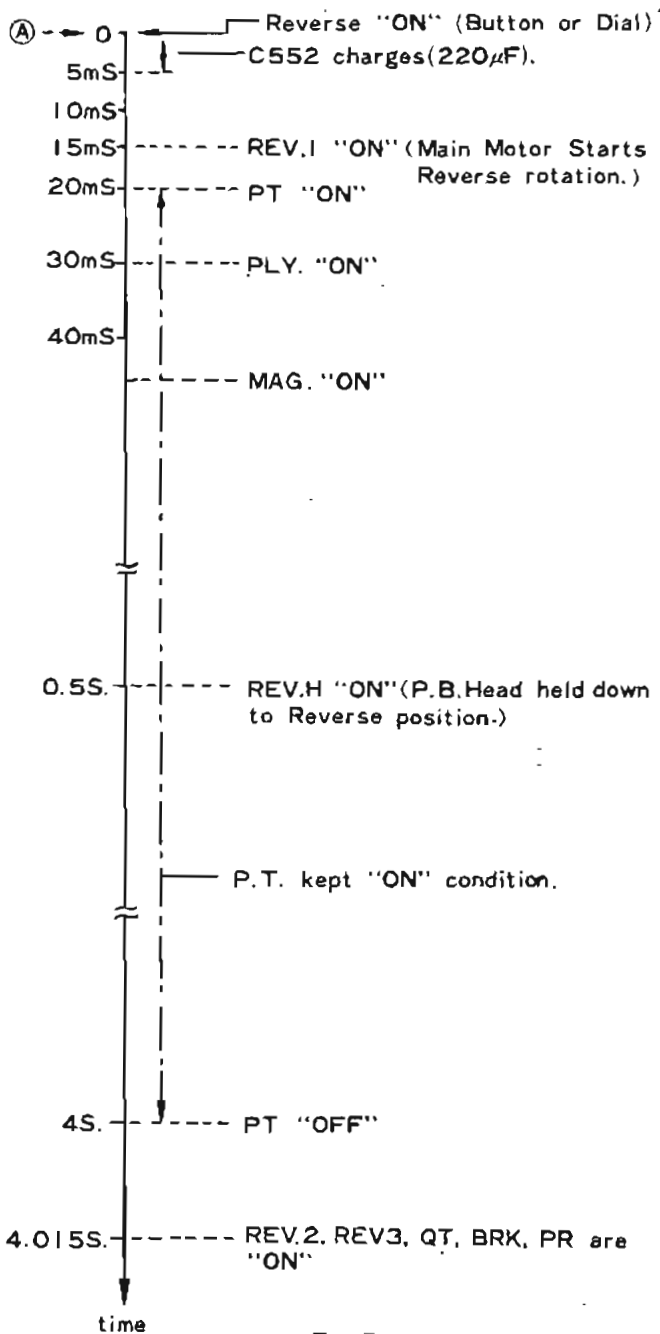
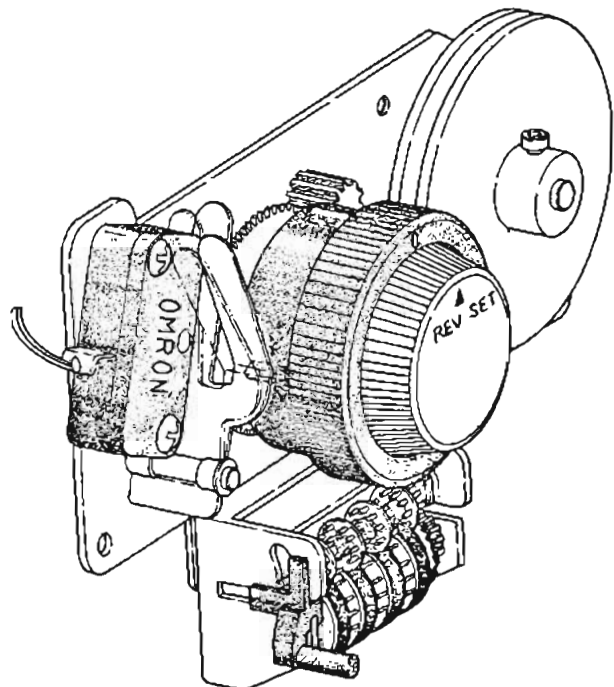


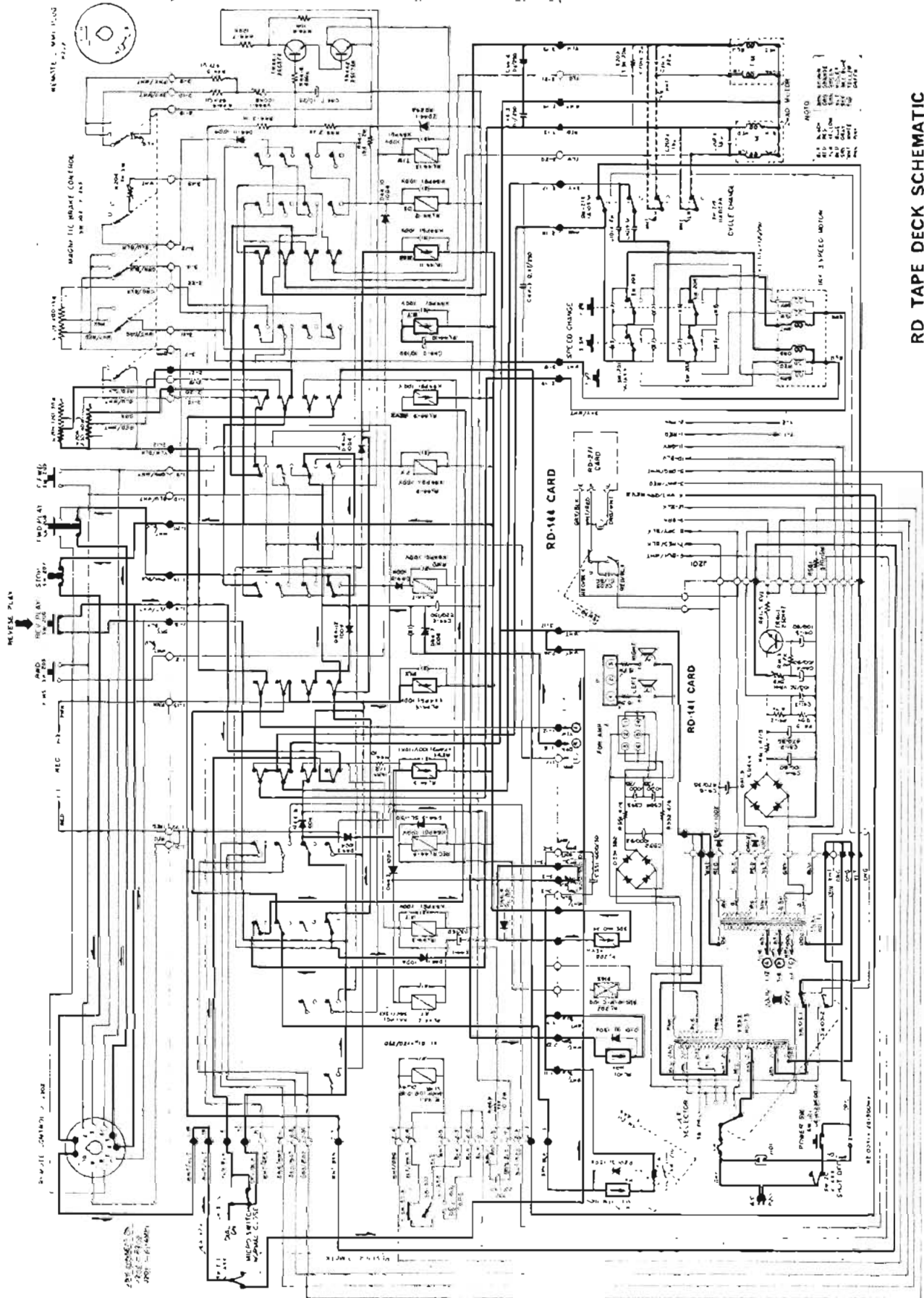
Fig. 7

Sequence of operation when the REVERSE Button is depressed, or when the White Mark on the Tape Count Meter reaches the Black Arrow of the Reverse Set Dial as follows for Automatic Reverse. Assuming this is point (A), Figure 7 shows Relay and Solenoid operating sequence beginning at this point.

Relay operation can be clearly understood by referring to the System Control Board Block Diagram (Figure 8.). As soon as REVERSE is actuated ("ON") at point (A), current begins to flow in the Reverse Circuit. Since it takes about 15 milliseconds before the contact is operative, C552 (220 μ F) is charged within approximately 5 milliseconds through REV1-2 (normally closed contact).

15 milliseconds later, REV1 Relay is actuated ("ON") and the normally closed contact of REV1-2, is opened, 220 μ F is discharged through the 10 Ω Resistor and the PT Relay. The PT Relay remains engaged and the pinch roller disengages during the 4-second Discharge Time. The REV1 Relay is actuated ("ON") during this 4 seconds, starting the Main Motor rotating in the reverse direction. PLY and MAG Relays are actuated ("ON"), permitting current to flow to the Left and Right Reel Motors. The REV. H Solenoid is actuated ("ON"), the Playback Head lowers to its REVERSE position. The PT Relay is now cut off, and the pinch roller engages. Approximately 15 milliseconds later the REV2, REV3, and QT Relays and the BRK and PR Solenoids are actuated ("ON"), causing the tape travel to REVERSE.





RD TAPE DECK SCHEMATIC

Fig. 8

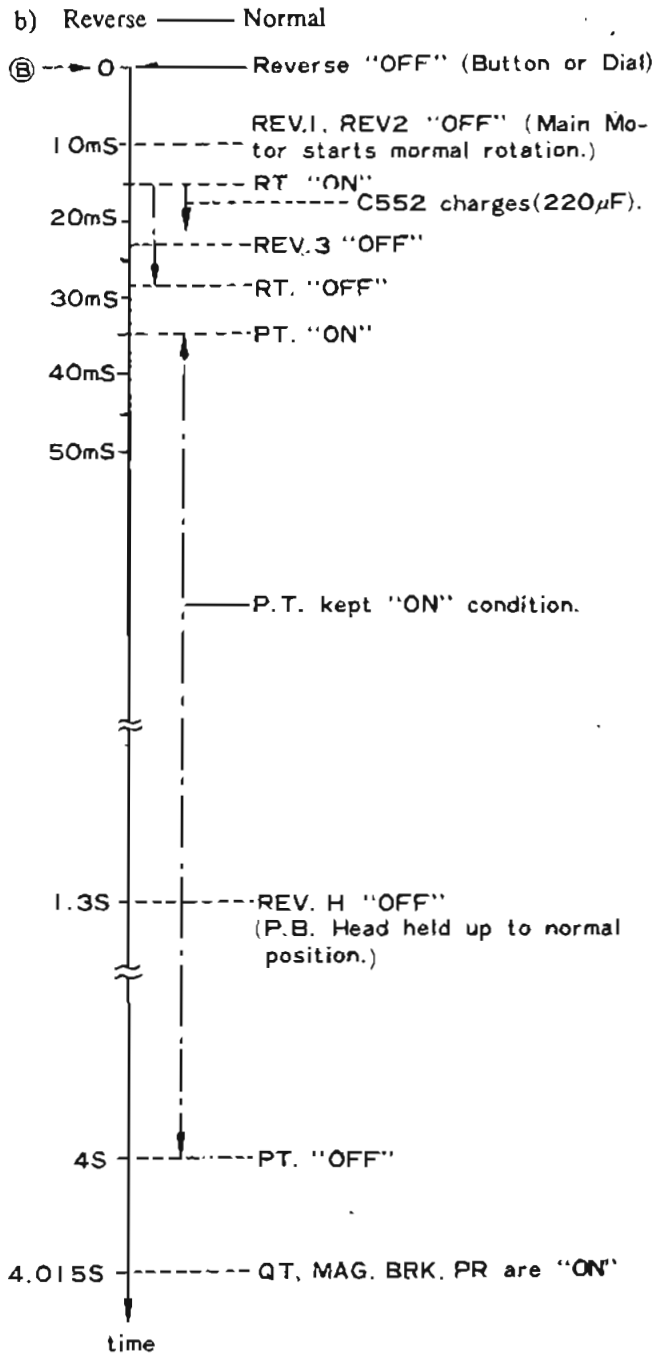


Fig. 9

Sequence of operation when the FORWARD Button is depressed during REVERSE PLAY, or when the White Mark on the Tape Count Meter reaches the "O" Mark on the Tape Count Scale used for Automatic Reverse is as follows, assuming this is point "B".

Reverse Circuit current is cut off at point(B), but REV1 and REV2 remain engaged for approximately 10 milliseconds. As REV1 is disengaged, the Main Motor starts rotating in the Normal direction. When the current in the Reverse Circuit is cut off, the 33 μ F Condenser, which is series connects to the RT Relay and charged during Reverse Play, is discharged through the RT Relay Coil and the 650 Ω Resistor. The Discharge Time is about 28 milliseconds. Thus, the RT Relay remains engaged approximately 13 milliseconds. (See Figure 9)

RT1 normally open contact is closed and Condenser C552 (220 μ F) is charged in approximately 5 milliseconds.

As RT1 closes, current starts flowing to the PT Relay Coil. As RT1 opens, C552 discharges and the PT Relay is engaged 35 milliseconds later, and continues to be operative for about 4 seconds, after which it is engaged. C551 (1000 μ F) discharges current to the REV.H Solenoid Coil, in approximately 1.3 seconds after point (B), the REV.H is disengaged and the Playback Head raises to its Normal Play position.

As the PT Relay is disengaged, current flows to QT and MAG Relays and to BRK and PR Solenoids through the normally closed contacts. After approximately 15 milliseconds, the QT and MAG Relays and the BRK and PR Solenoids are actuated ("ON"), and tape travel starts in the Normal direction.

8. Comput-O-matic

- a) By depressing the Set Button (SW25-1) with no input signal applied to Line Input or Microphone Jacks, current flows to the Comput-O-Matic Motor through the Relay (MH2PM-0) (a normally closed contact) and the Microswitch (SW92-1), causing the Motor to rotate in the direction indicated by the blue line in Figure 10.

The Motor Shaft is connected to the Comput-O-Matic Volume Control Shaft by gear mechanism. When the Motor rotates in the direction indicated by the blue line, the Volume Control turns toward the upper limit (maximum). When the Volume Control reaches the upper limit, Microswitch SW92-1 is cut off by the cam attached to the Volume Control Shaft, cutting the flow of current to the Motor, thus, stopping the Motor.

As current is cut off, Bias Voltage is applied to Transistor TR70-8, through R70-23 and R70-22, actuating TR70-8. As TR70-8 is actuated ("ON") collector current flows through the Relay Coil MH2PM-0, engaging the Relay. However, when no input signal is applied, current does not flow to the Motor because Transistor TR70-7 is inoperative (OFF), as shown in Figure 10.

- b) Under conditions as described above, but when input signals are applied to the Line Input or Microphone Input Jacks (for input signals level of 0 VU or greater) the function of Transistors are as shown by the red print in Figure 10. As TR70-7 is actuated, TR70-7 collector current flows through the Motor, causing the Motor to rotate in the direction indicated by the red arrow in Figure 10.

As the Motor rotates in the direction indicated by the red arrow, the Volume Control rotates from the upper limit toward the lower limit (minimum). The input signals applied to the

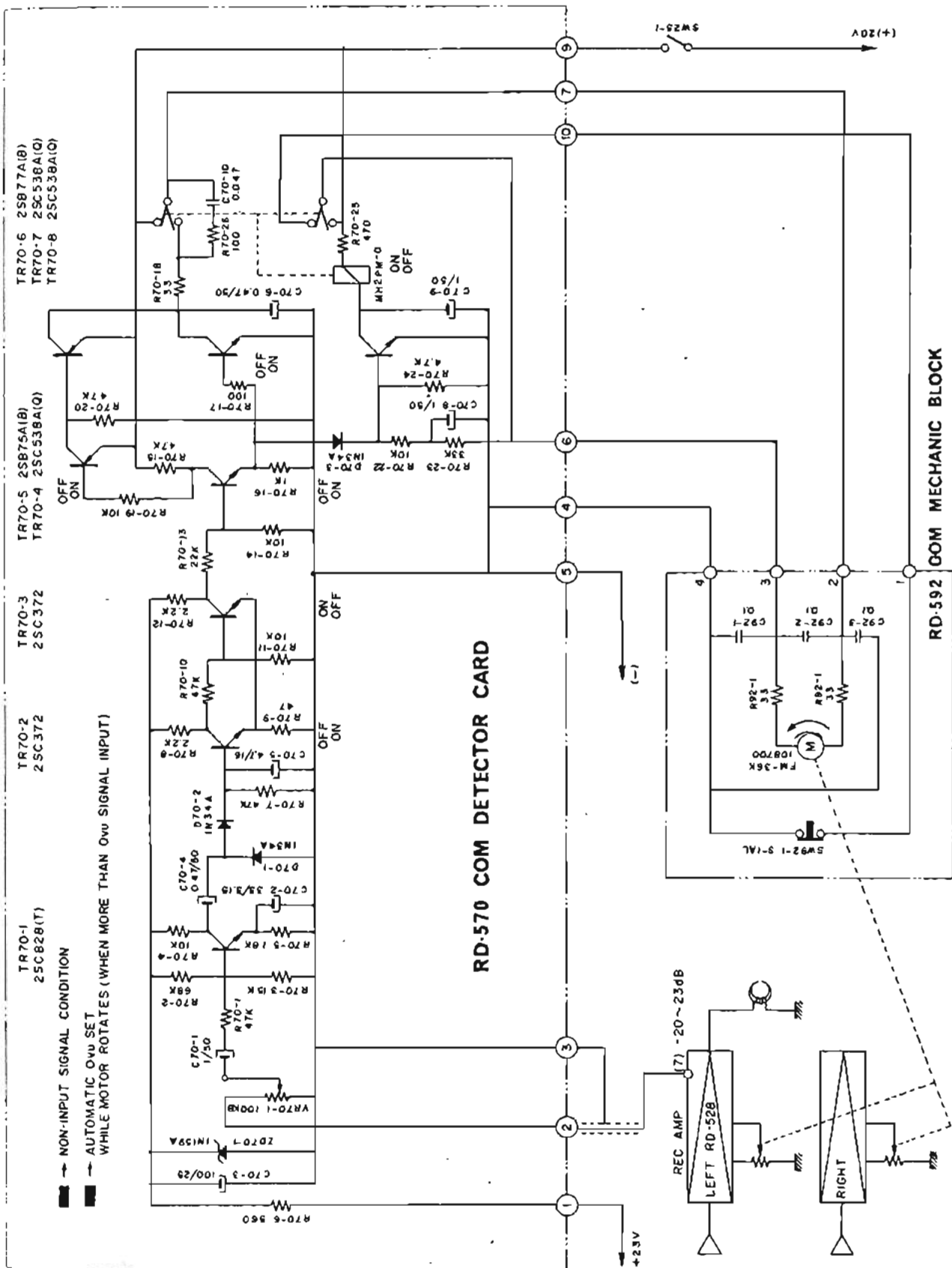


Fig. 10

Recording Amplifier are decreased by the Volume Control, and the COM Detector Card input signal level is reduced accordingly.

When the signal level to the Recording Amplifier is reduced to 0 VU, the conditions of the COM Detector Card Transistors are again as indicated in blue print in Figure 10, TR70-7 is cut off and the Motor stops.

TR70-5 and TR70-6 insure that the Motor stops immediately when signal level reaches 0 VU.

- c) Since the Comput-O-Matic Motor operates only in the direction for decreasing the signal level (with input signals applied), if the input signal becomes too low, Comput-O-Matic recording level must be reset by depressing the Set Button "OFF" and then back "ON". At this time, Relay MH2PM-0 is cut off (as described in (a) above). Thus, the Volume Control rotates toward the upper limit, automatically stopping when the VU Meter Indicator Needle registers 0 VU.

9. DM Detector

The DM Detector Circuit automatically detects the quality of recorded sound, and when Playback level deteriorates during recording and playback (due to dirt, magnetic oxide, etc. on the Recording or

Playback Heads), the D.M. Indicator Lamp lights. 9 KHz is used as a drive signal for the DM Detector Circuit. The DM Detector Card is connected to the 1st Stage of the Playback Amplifier, as shown in Figure 11.

The 1st through the 5th Stages of the DM Detector Circuit serve as a 9 KHz Filter Amplifier. A 90 KHz Bias Trap Circuit is inserted between the 4th and 5th Stages to prevent operational error from Magnetic Bias Flux during recording.

The circuitry from the 6th through the 9th Stages serve as switching circuits. Presence of the 9 KHz component in Playback output signals results in the condition printed in blue in Figure 11, Transistor TR71-9 stops functioning and the DM Indicator Lamp is extinguished. If the Playback Head is dirty and no 9 KHz component is included in the playback output signals, conditions will be as indicated in red print in Figure 11, TR1-9 will be actuated ("ON") and the Indicator Lamp will light. Also, if the Recording Head is dirty during recording and no 9 KHz component is included in the playback output signals, the Lamp will light.

At 1-7/8 ips tape speed, power is cut to the DM Detector by the Speed Selector Switch SW39-1, thus DM Detector circuit won't function. During STOP, as there is no need for the Lamp, so power is cut to the DM Detector Circuit by Microswitch SW207.

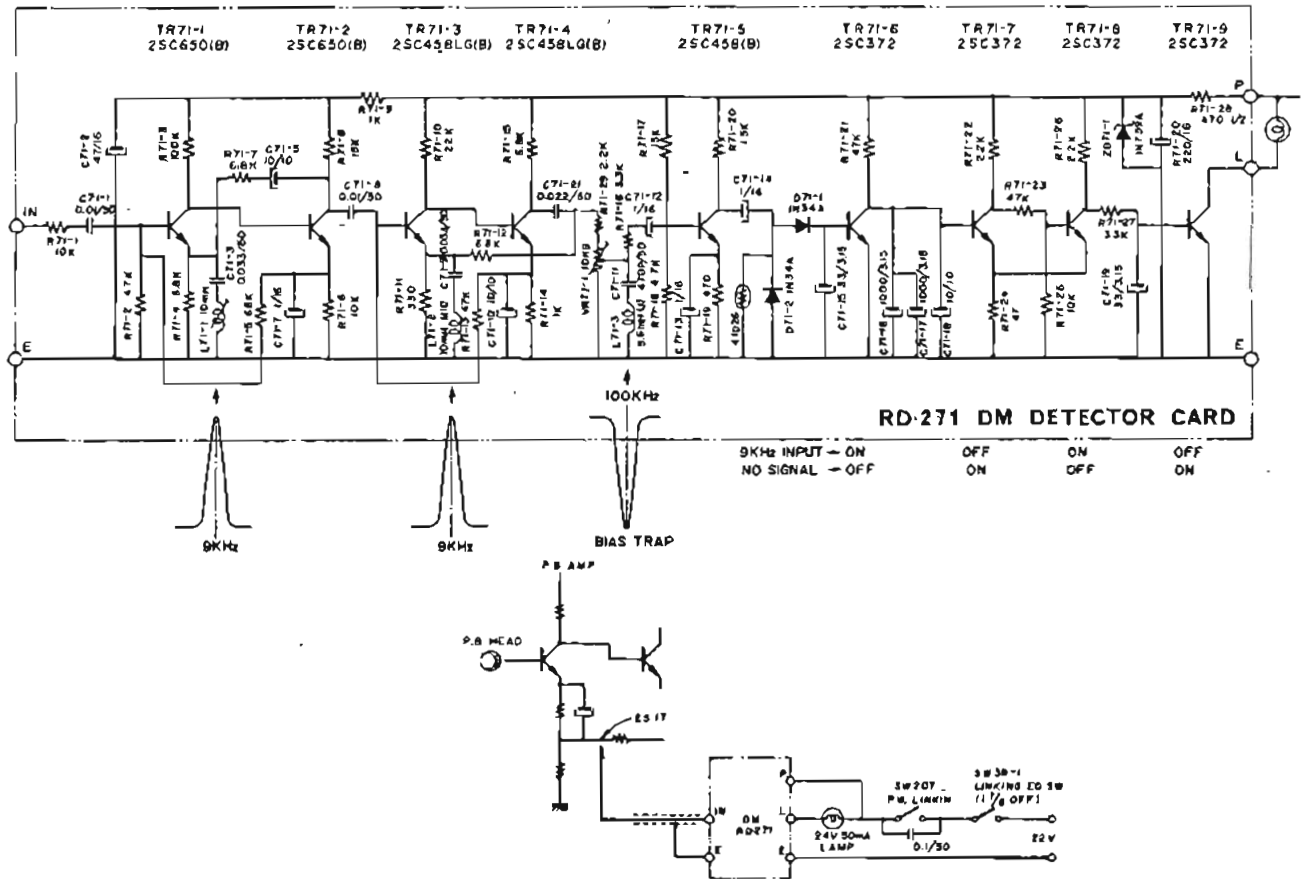


Fig. 11

IX. MAINTENANCE PROCEDURES

1. LUBRICATION INSTRUCTION

For maximum service life and optimum performance, lubricate the parts identified below after each 1,000 ~ 1,500 hours of operation. Use only light machine oil of good quality.

Main Motor

Capstan Shaft

Pinch Wheel Shaft

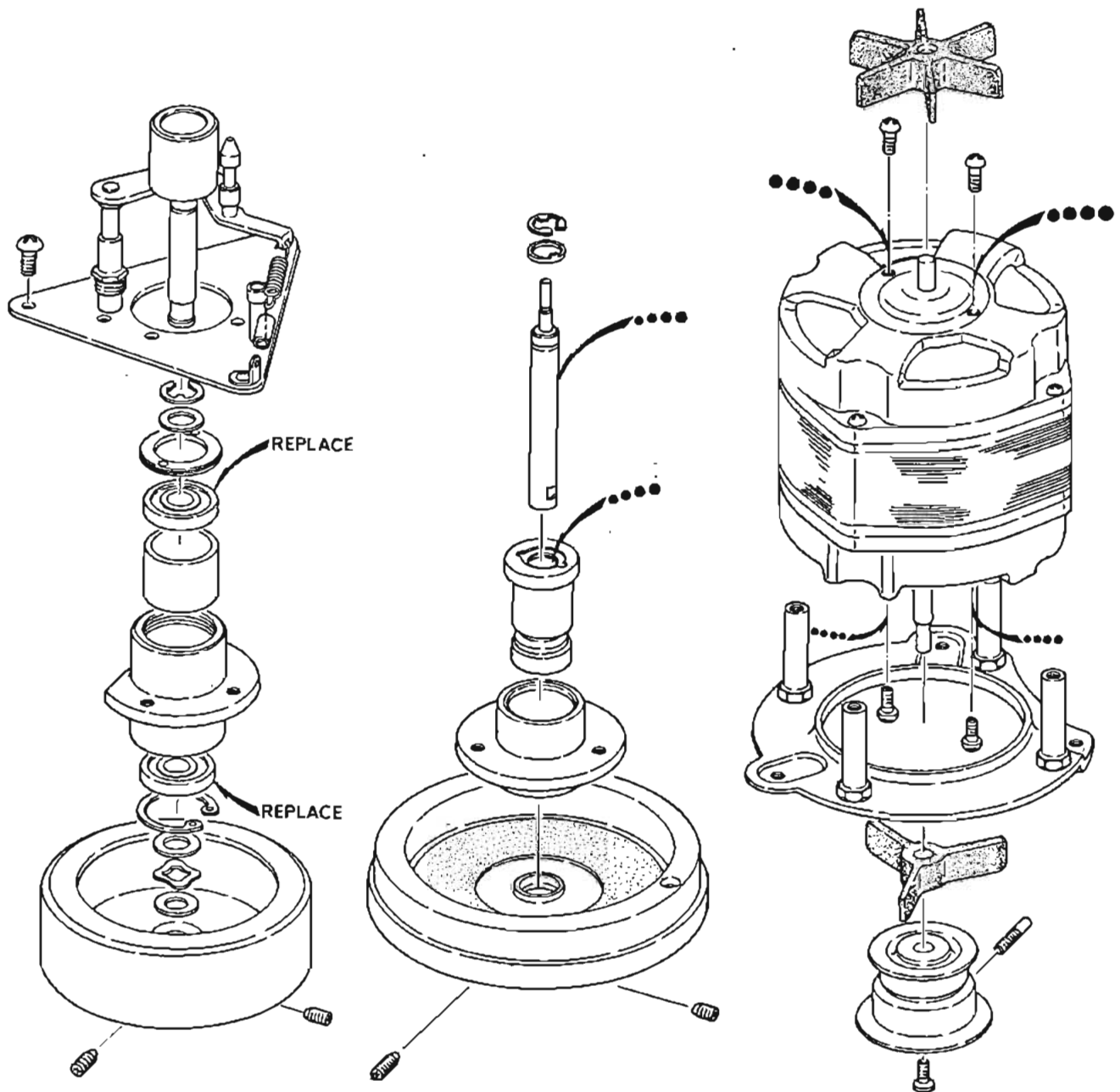
Tape Counter

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

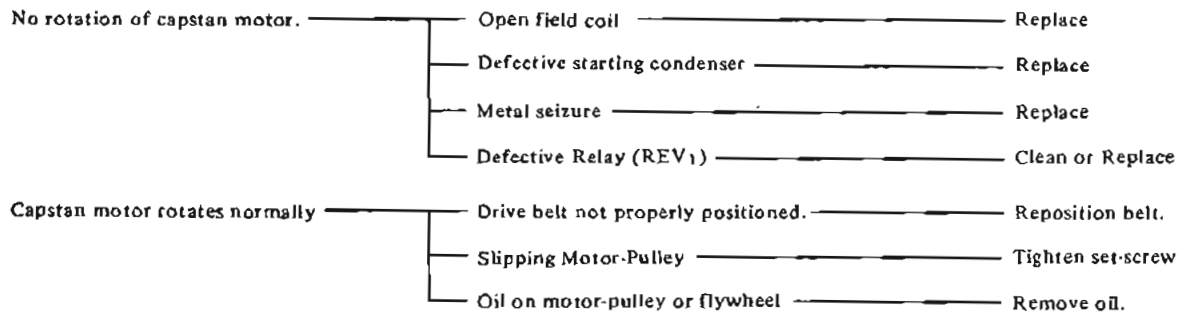
Wipe surface of tape heads, guide roller bearing, capstan bushing and pinch wheel periodically with a soft cloth soaked in alcohol or carbon-tet.



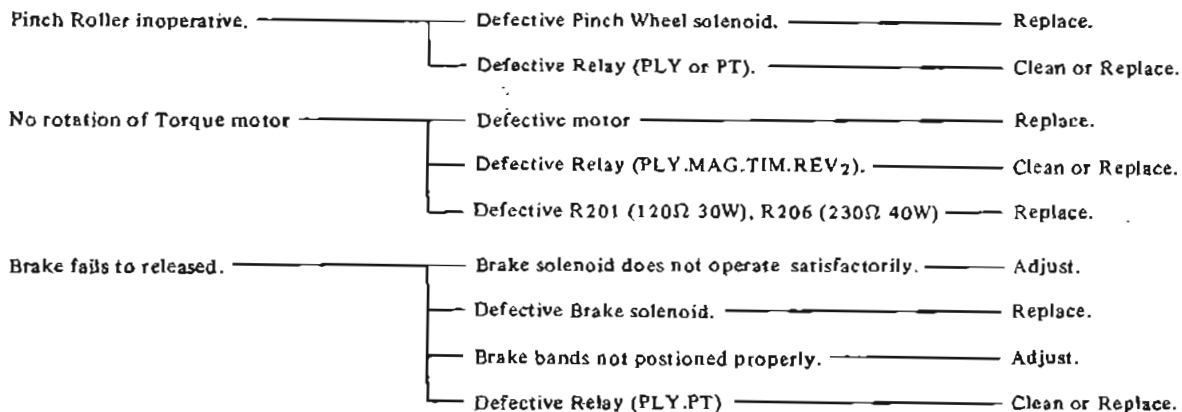
SECTION "A" TAPE TRANSPORT MECHANISM TROUBLES

- * If all relays do not operate, first, check the REMOTE DUMMY PLUG (P202).
- * Next, check D10D (D44-7) (Relay, Power Supply) and Condenser 220 μ F or 100 μ F 150V.
- * Check the Relay Print Circuit Board as shown in Fig. First, check each connection point (blank point).
- * When there are no troubles that relays and diodes have the normal resistances and distortions.

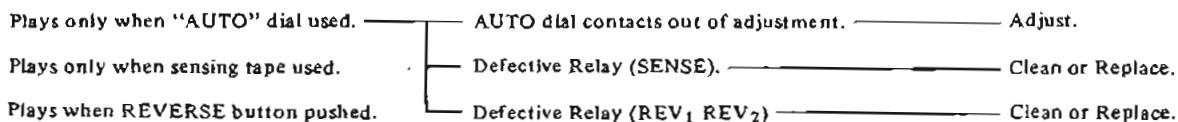
1. Capstan fails to rotate.



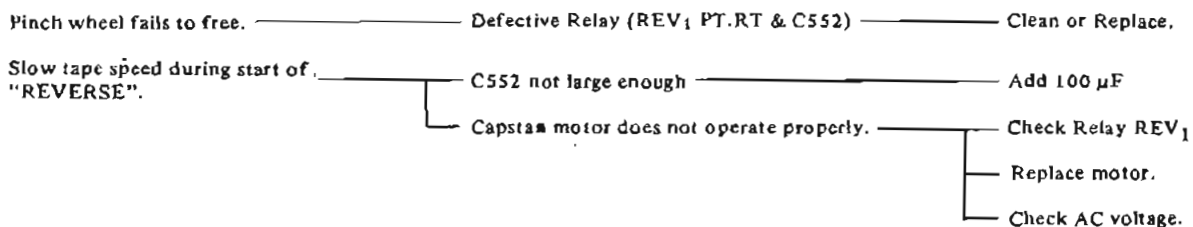
2. No tape movement in "Play" mode.



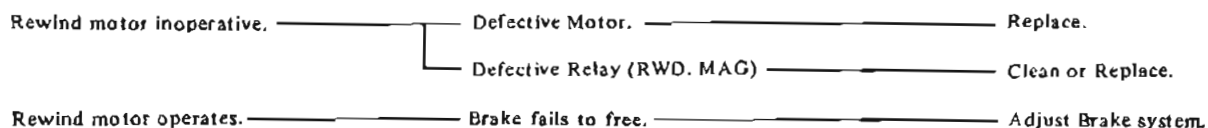
3. No "Reverse Play"



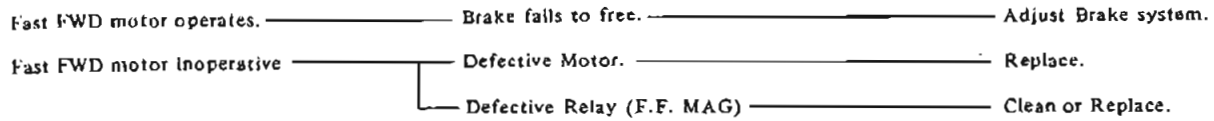
4. Inproper Reverse Operation



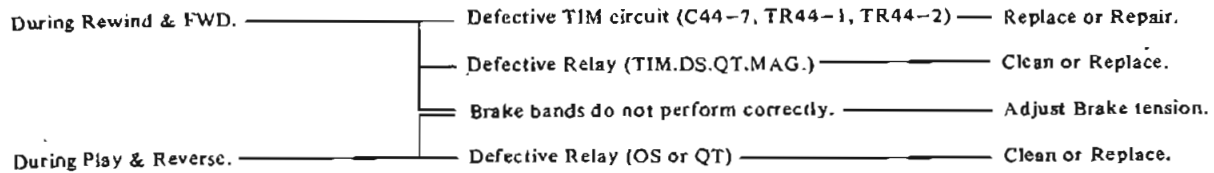
5. No rewind.



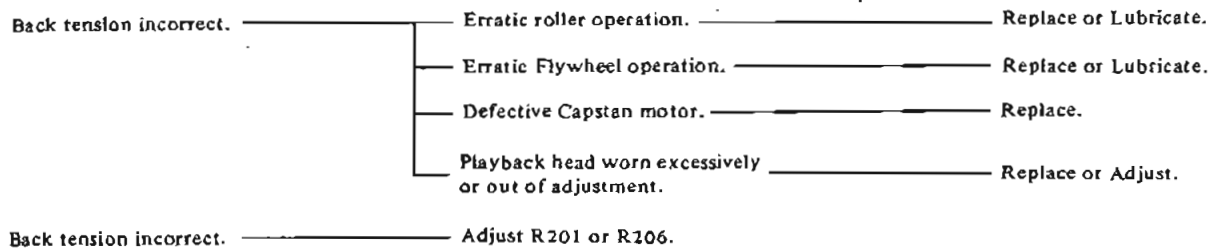
6. No "Fast FWD"



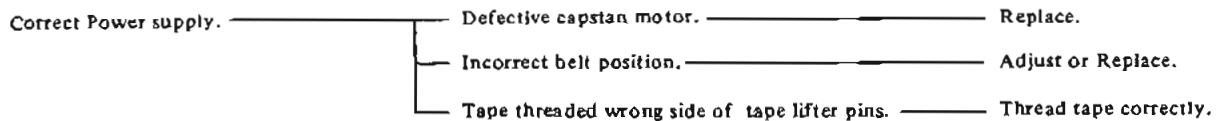
7. Improper Brake operation.



8. Wow, Flutter excessive.



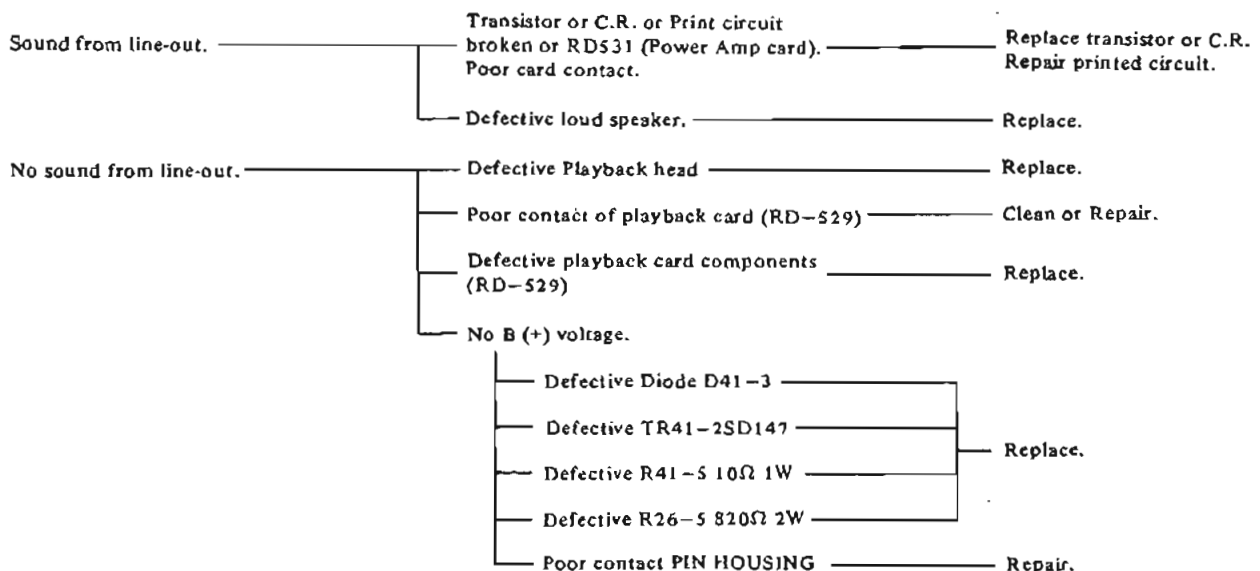
9. Tape speed too slow.



SECTION "B" TROUBLES WITH AMPLIFIER

A. Playback system troubles.

1. No sound from loud speaker.



Intermittent sound cut out. ——— Defective Relay (REV. PL22-2) ——— Clean or Replace.
 ——— Poor contact on Track Selector Card (RD-522) ——— Repair

2. Distorted sound

Satisfactory sound from Line-out. ——— Defective transistor or C.R. on RD-531. ——— Replace.

Sound distorted from Line-out. ——— Defective playback card components (RD-529). ——— Replace.
 ——— Excessive playback head wear. ——— Replace.

3. Excessive Hum

Hum decreased when playback head shorted. ——— Defective playback head. ——— Replace.

Hum not due to playback head. ——— Defective power supply circuit parts. ——— Replace.
 ——— Broken or disconnected ground wire. ——— Repair.

4. Scratching or cracking sounds.

Noise during tape operation. ——— Magnetized head. ——— Demagnetize head.
 ——— Noisy tape. ——— Replace tape.

Not due to tape. ——— Defective transistors on the playback card. ——— Replace.

5. Normal Reverse sound unequal

Head alignment. Incorrect height. adjustment. ——— Readjust or Replace head.

6. Improper function of dust minder

Lamp keeps lighting or remains lit. ——— Transistor or C7-2 defective on the Detector Card ——— Replace.

————— Incorrect adjustment of VR71-1 10K ——— Readjust.

Lamp fails to light. ——— Defective lamp ——— Replace.

B. Recording system troubles.

* Before any trouble shootings, clean and demagnetize heads first.

1. Recording not possible.

Recording lamp fails to light. (OSC does not work.) ——— Defective relay RL-44-4 (REC₁) ——— Clean or Replace.
 ——— Defective transistors or the OSC card (RD-530) ——— Replace.

Recording lamp lights. ——— Defective relay RL2201 (REC₂) ——— Clean or Replace.
 ——— Bias head does not shift to correct position. ——— Replace or Adjust bias solenoid.
 ——— VU meter indicates normal. ——— Defective head. ——— Replace.
 ——— Defective transistors on the record card. ——— Replace.
 ——— No VU meter indication.. ——— Defective transistors on the record card (RD-528) ——— Replace.

2. No VU meter indication.

Recording possible. _____ Defective VU meter. _____ Replace.
|
| Playback possible. _____ Defective connection between Record & _____ Repair.
| | Play Card (RD-529)
| Playback impossible. _____ Defective transistors 2SC372 on the _____ Replace.
| | Play Card (RD-529)

3. Distorted sound.

Record source SW. "IN". _____ Excessive input signal level. _____ Adjust level, check
| | | VU meter sensitivity.
| | Defective TR 28-1, 28-2, 28-3, 28-4, 28-5. _____ Replace.
| | Other parts on the Record Card (RD-528) _____ Replace.
Recording source monitor functions. _____ Defective Record or Bias head. _____ Replace.
| | Incorrect Bias voltage. _____ Readjust.

4. Faulty Erasing

Recording lamp lights. _____ Defective Erase head. _____ Replace.
Recording lamp fails to light. _____ Defective TR30-1, other component on the _____ Replace.
| | OSC card (RD-530)

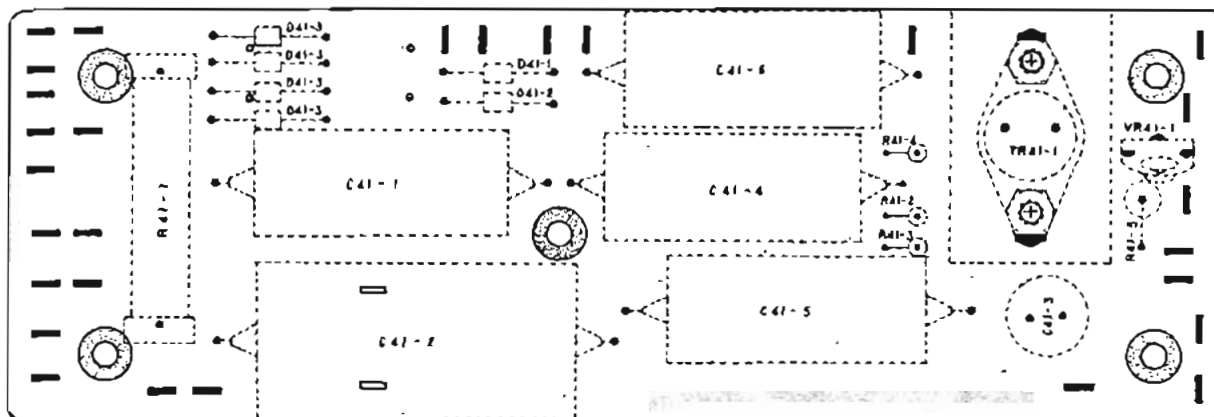
5. Inproper function of Auto VR

Volume control moves. _____ Defective relay, Transistor, other parts _____ Replace.
| | of the RD-592.
| | Incorrect VR70-1 adjustment. _____ Readjust.
VR fails to move. _____ Defective DC motor. _____ Replace.
| | Motor block gears out of adjustment. _____ Readjust or Replace
| | motor block.

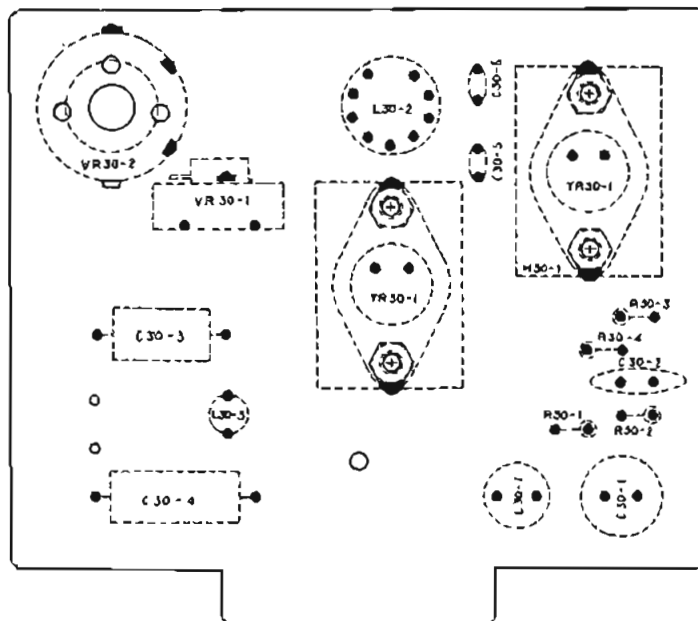
XI. COMPOSITE VIEWS OF COMPONENTS

	Page
SYSTEM CONTROL P.C. BOARD	RD-144 38
POWER SOURCE P.C. BOARD	RD-141 39
OSCILLATOR P.C. BOARD	RD-530 39
AUTOMATIC DUST MINDER P.C. BOARD	RD-271 40
PLAYBACK P.C. BOARD	RD-529 40
RECORDING P.C. BOARD	RD-528 41
MAIN AMP. P.C. BOARD	RD-531 41
MONITOR SWITCH P.C. BOARD	RD-523 42
TRACK SELECTOR P.C. BOARD	RD-522 42
COM. P.C. BOARD	RD-570 43
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COM. MECHANIC P.C. BOARD	RD-529 43
SPARK QUENCHER P.C. BOARD	RD-150B 44
SPEED SELECTOR SWITCH P.C. BOARD	RD-139B 44
HEADPHONE P.C. BOARD	RD-524 45
CHASSIS P.C. BOARD	RD-526 45
MAIN AMP SOCKET P.C. BOARD	RD-532 45

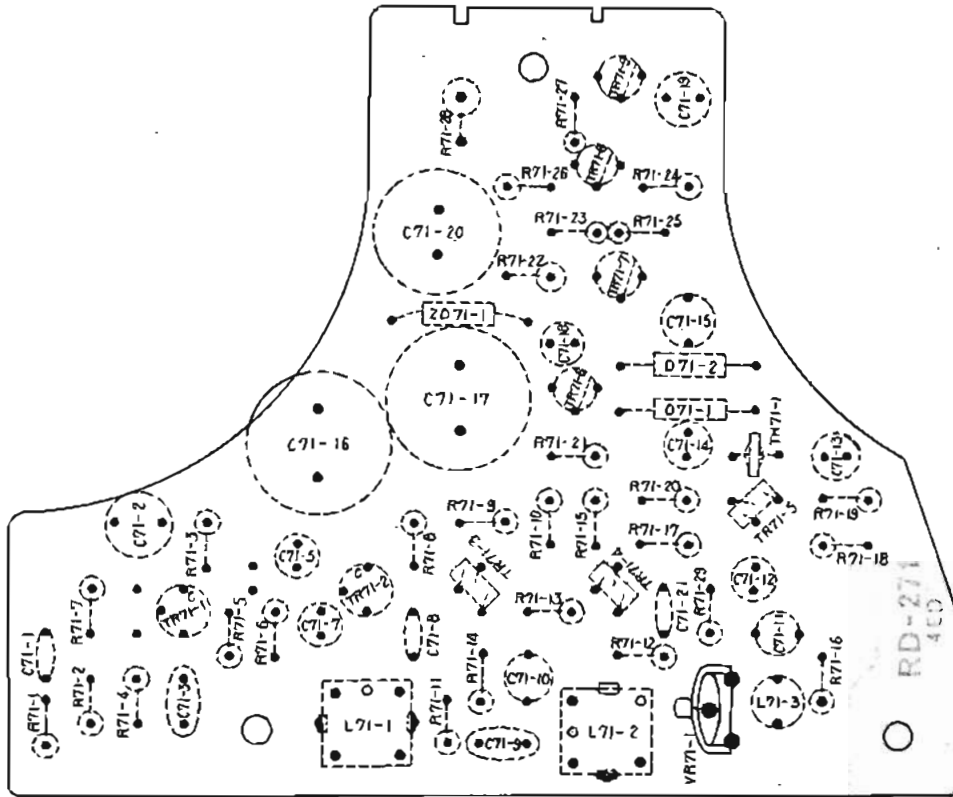
POWER SOURCE P.C. BOARD (RD-141)



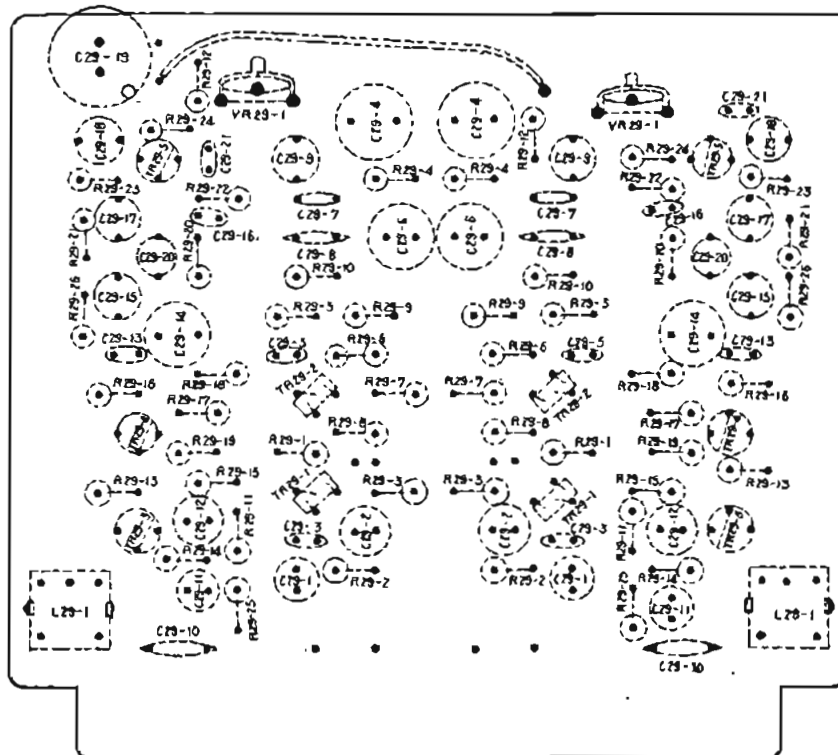
OSC. P.C. BOARD (RD-530)



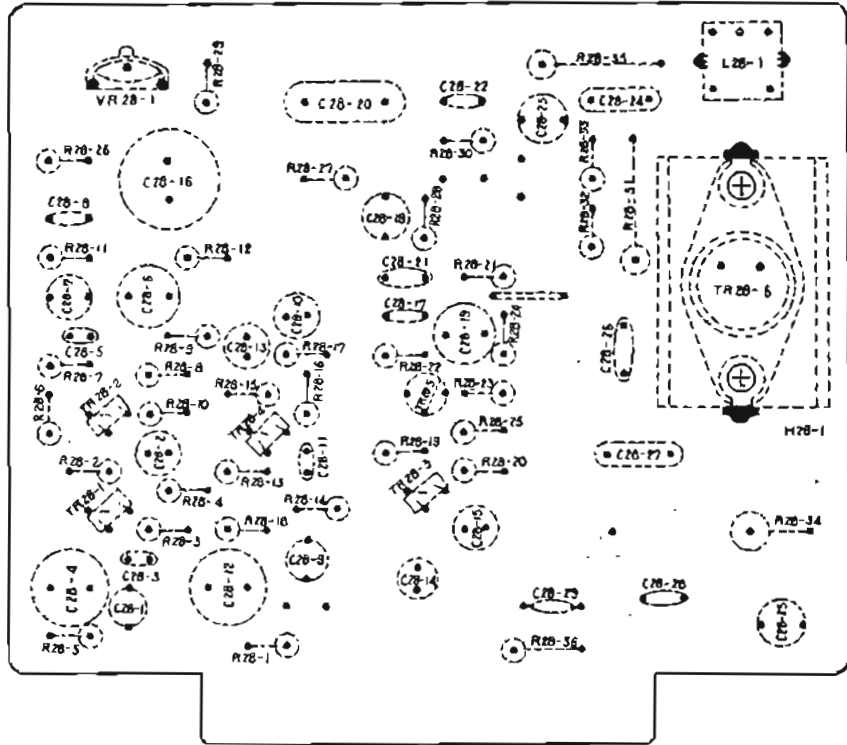
AUTOMATIC DUST MINDER P.C. BOARD (RD-271)



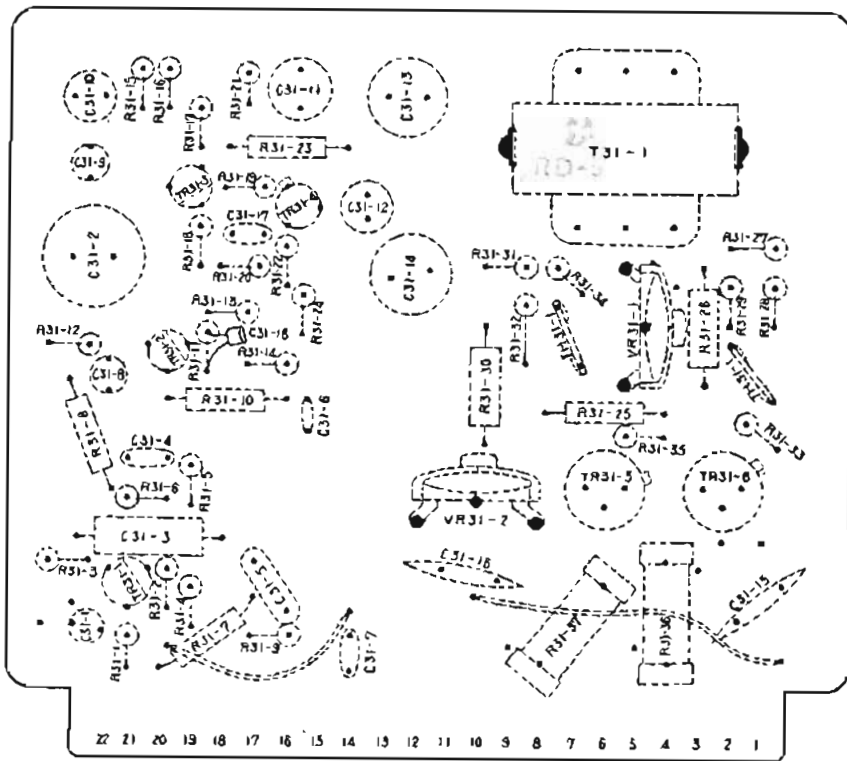
PLAYBACK P.C. BOARD (RD-529)



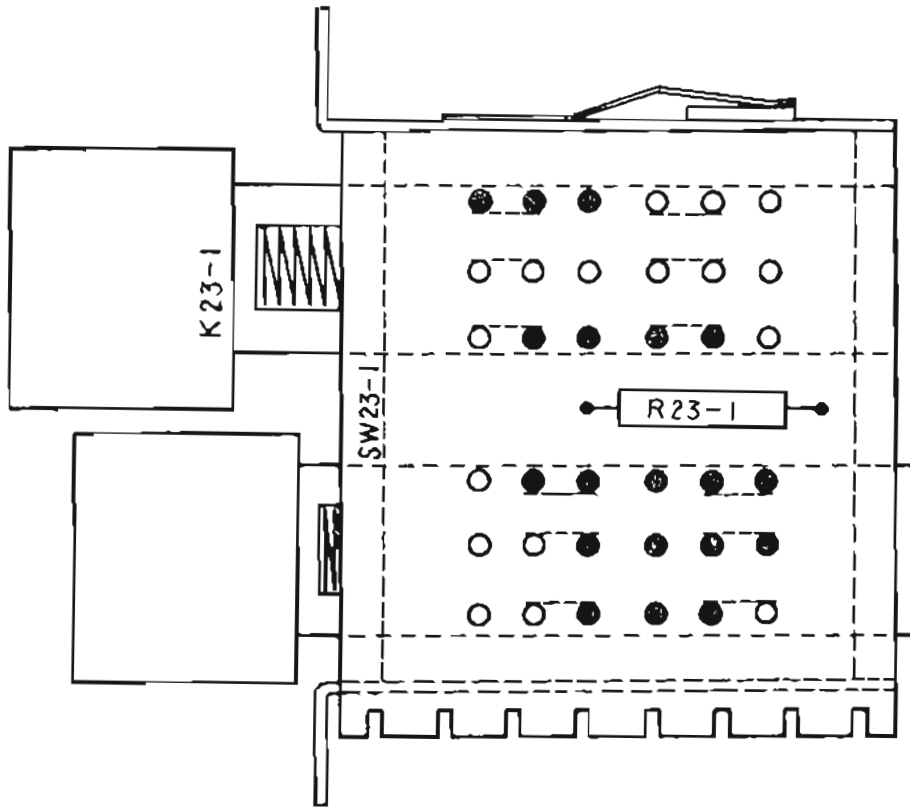
RECORDING P.C. BOARD (RD-528)



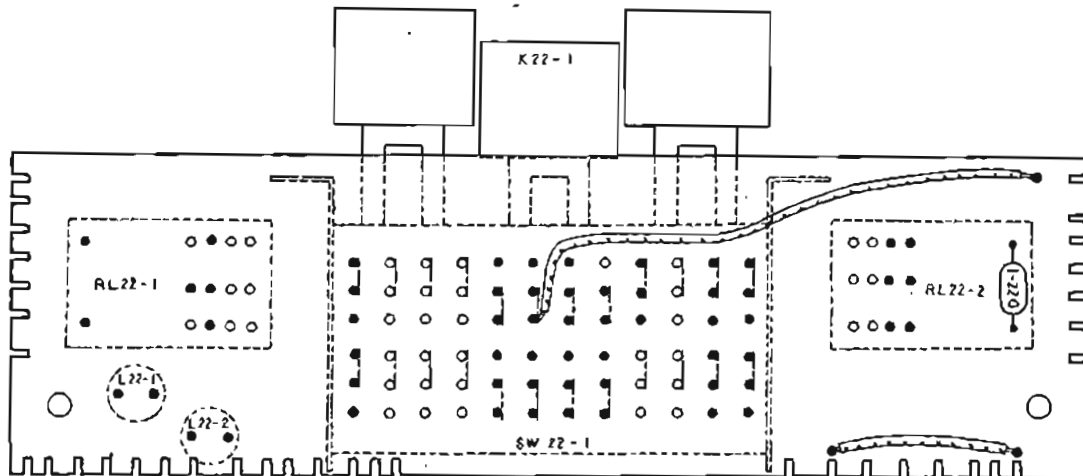
MAIN AMP. P.C. BOARD (RD-531)



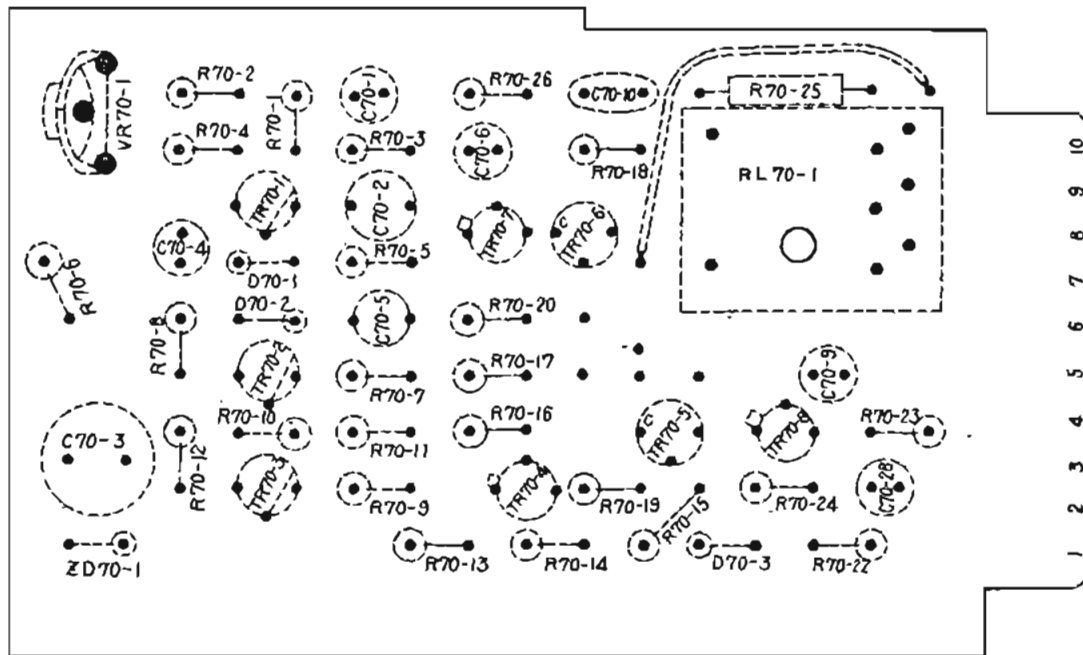
MONITOR SWITCH P.C. BOARD (RD-523)



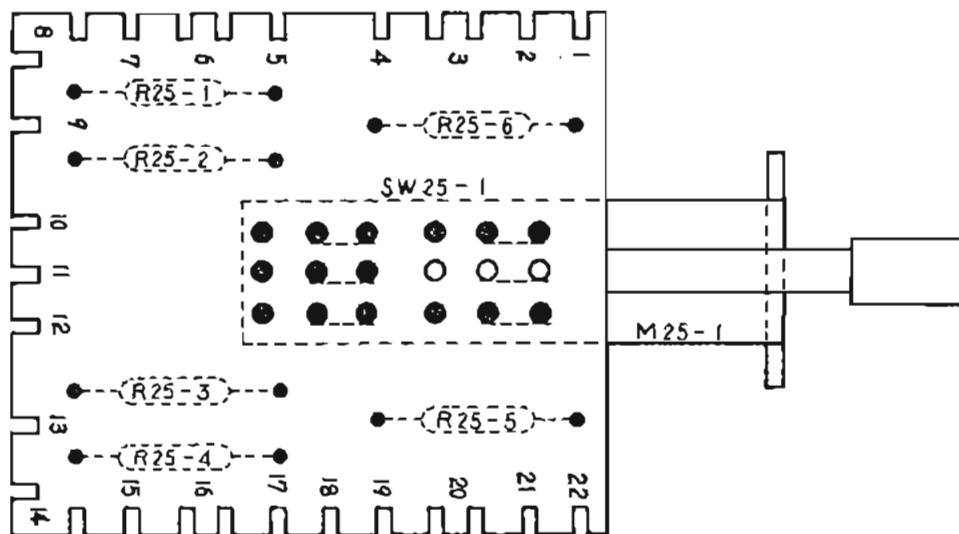
TRACK SELECTOR P.C. BOARD (RD-522)



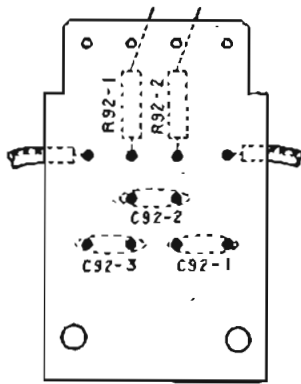
COM. P.C. BOARD (RD-570)



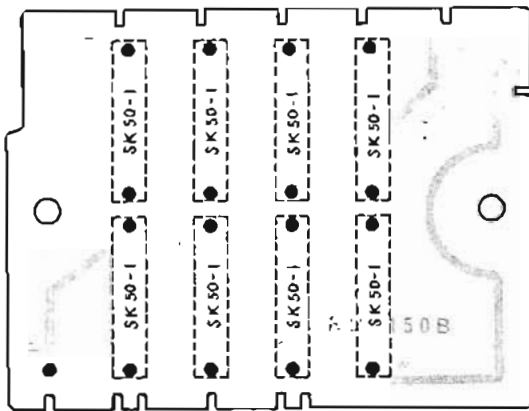
COM. SET SWITCH P.C. BOARD (RD-525)



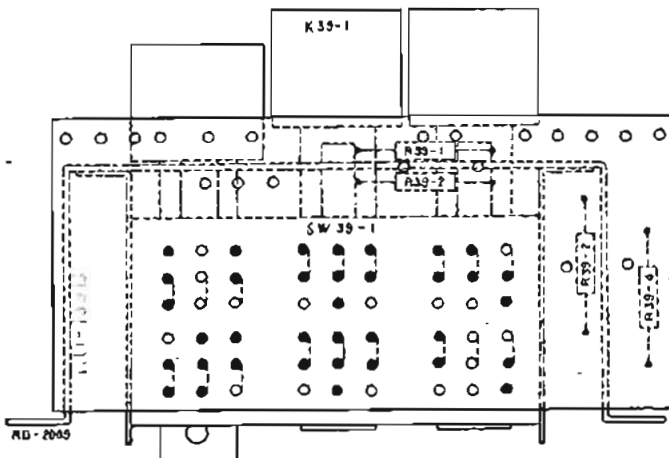
COM. MECHANISM P.C. BOARD (RD-592)



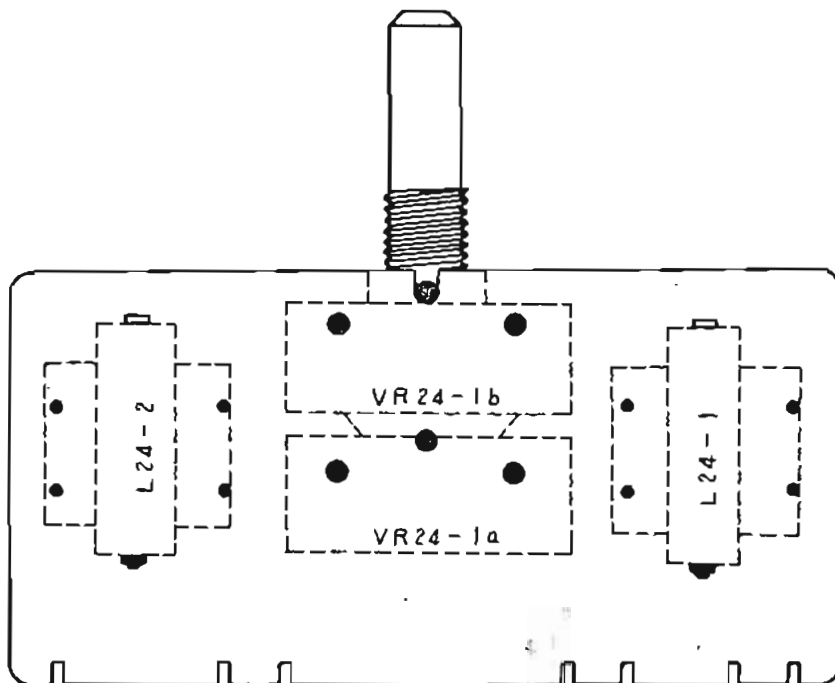
SPARK QUENCHER P.C. BOARD (RD-150B)



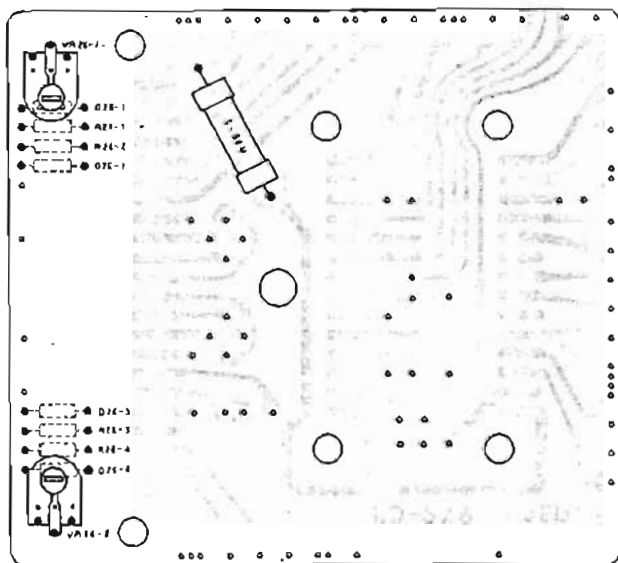
SPEED SELECTOR SWITCH P.C. BOARD (RD-139B)



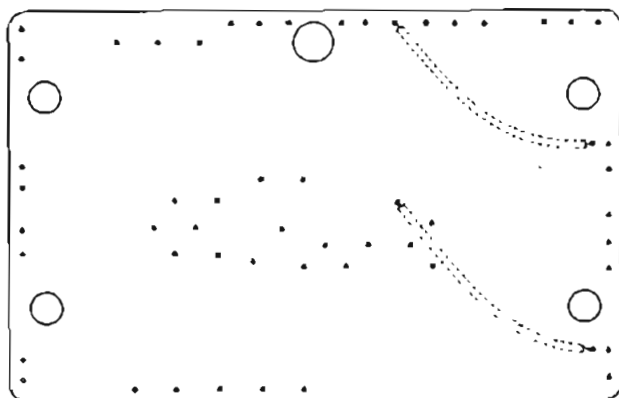
HEADPHONE P.C. BOARD (RD-524) (X-360 D only)



CHASSIS P.C. BOARD (RD-526)



MAIN AMPLIFIER SOCKET P.C. BOARD (RD-532)



CLASSIFICATION

Schematic Diagram Number Classification according to Serial Numbers.

X-360

Serial Number	REC. RD528	P.B. RD529	OSC. RD530	DM RD271	COM RD570	PWR/AMP RD531	SYSCON RD144	AMP CHASSIS
710-0001 - 710-0500	R-1	P-1	O-1	D-1	C-1	W-1	S-1	A-1
808-0001 - 808-0700	↓	↓	↓	↓	↓	↓	↓	↓
808-0701 - 808-1000	↓	↓	↓	D-2	↓	↓	↓	↓
808-1001 - 808-2000	R-2	↓	↓	↓	↓	↓	S-2	A-2
1204-0001 - 1204-1000	↓	↓	↓	↓	↓	↓	S-3	↓
103-0001 - 103-0800	R-3	P-2	O-2	↓	↓	↓	S-4	↓

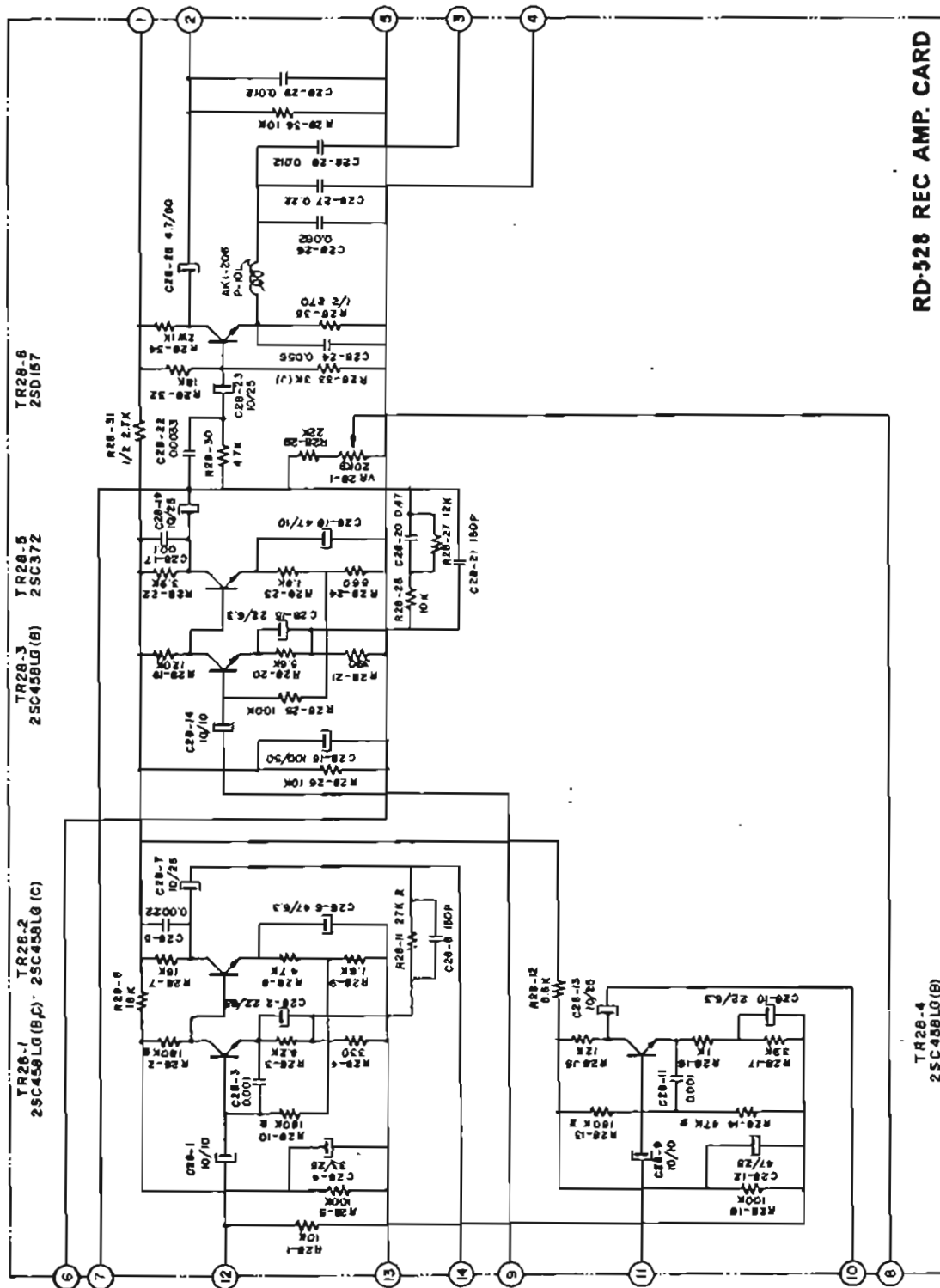
X-360D

Serial Number	REC. RD528	P.B. RD529	OSC RD530	DM RD271	COM RRD570	SYSCON RD144	AMP CHASSIS	
704-0001 - 704-0500	R-1	P-1	O-1	D-1	C-1	S-1	A-1	
807-0001 - 807-1500	↓	↓	↓	↓	↓	↓	↓	
904-0001 - 904-0440	↓	↓	↓	D-2	↓	↓	↓	
1006-0001 - 1006-0200	↓	↓	↓	↓	↓	↓	↓	
1102-0001 - 1102-0500	↓	↓	↓	↓	↓	↓	↓	
1203-0001 - 1203-1000	R-2	↓	↓	↓	↓	S-3	A-2	
102-0001 - 102-1200	R-3	P-2	O-2	↓	↓	S-4	↓	

* NOTE

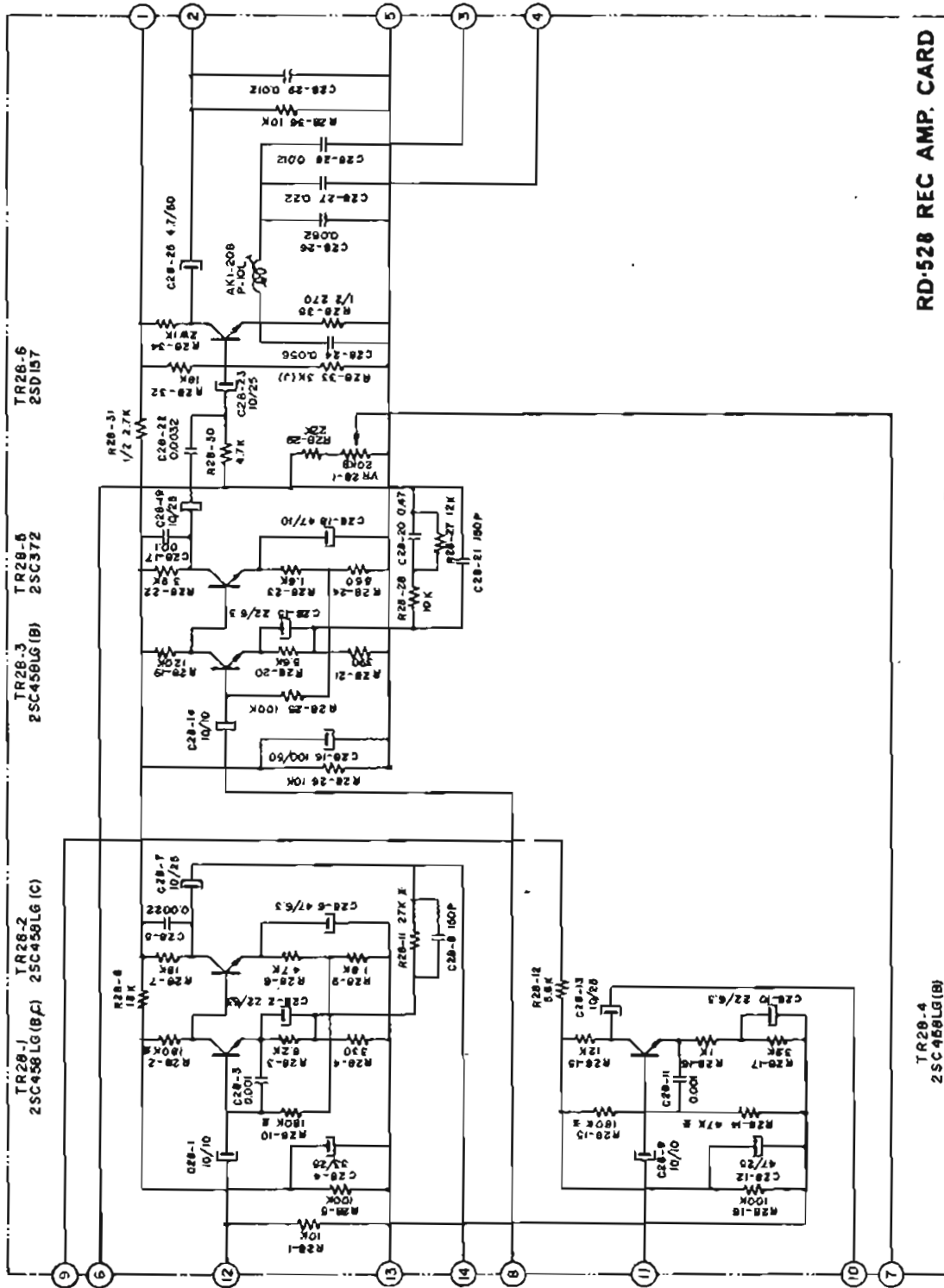
INTERCHANGEABILITY

1. There are three types of Recording Amplifier Boards (RD-528). They are no interchangeable.
2. The SYSCON board (RD-144) is interchangeable only when the new board is installed on an old tape recorder.
3. All other boards are interchangeable.
4. Amp. Chassis is no interchangeable.



RD-528 REC AMP. CARD

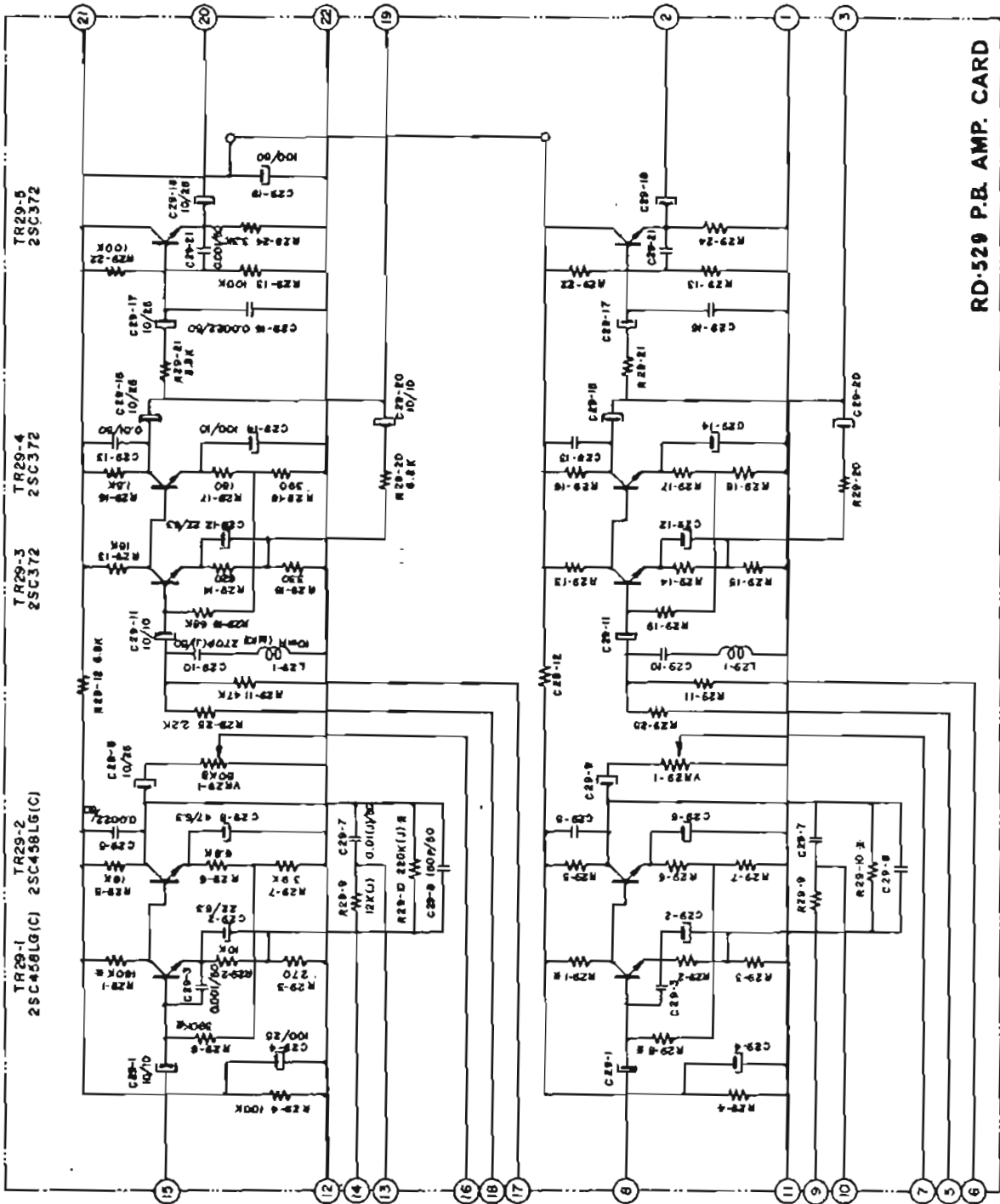
R-1



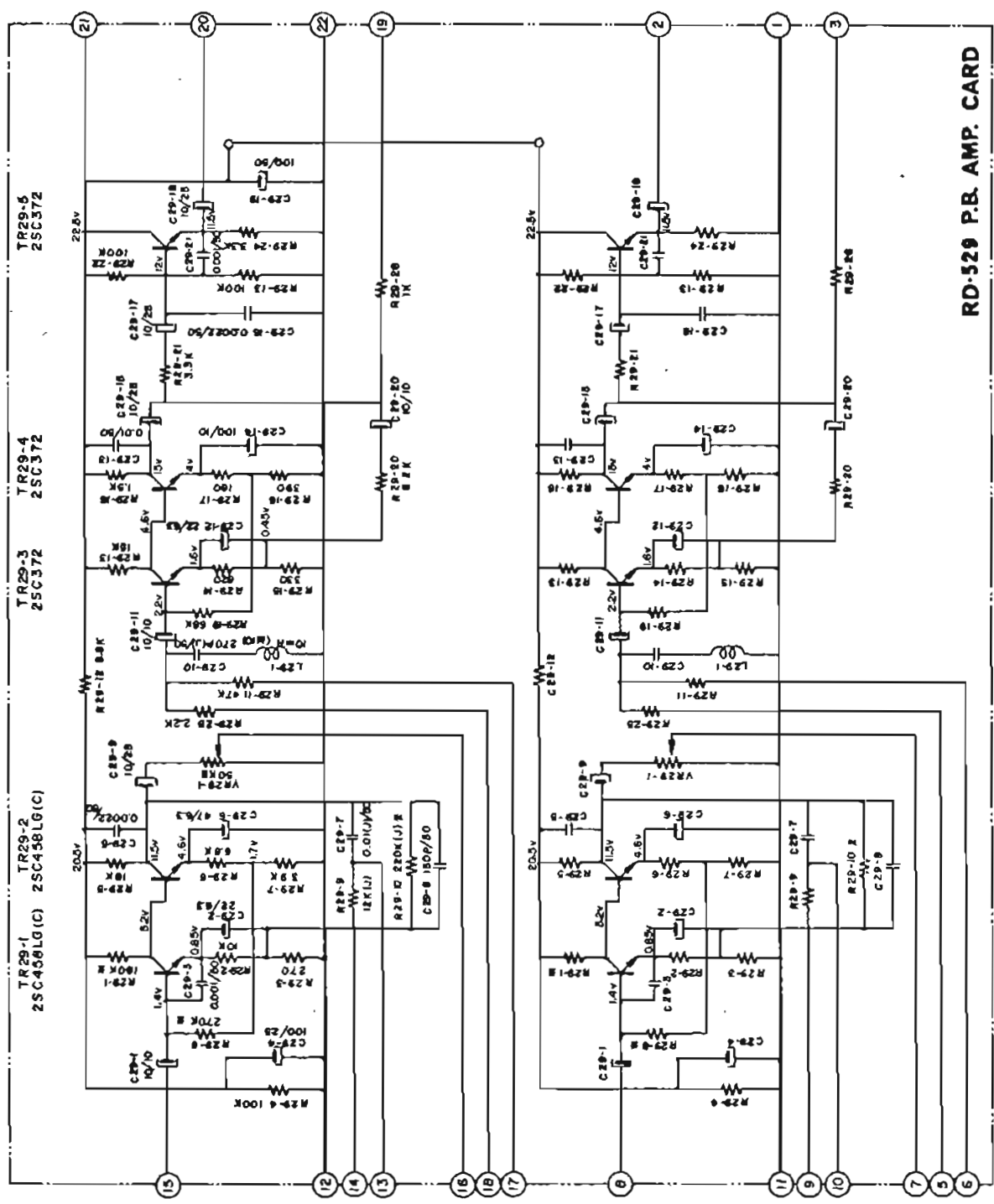
RD-528 REC AMP. CARD

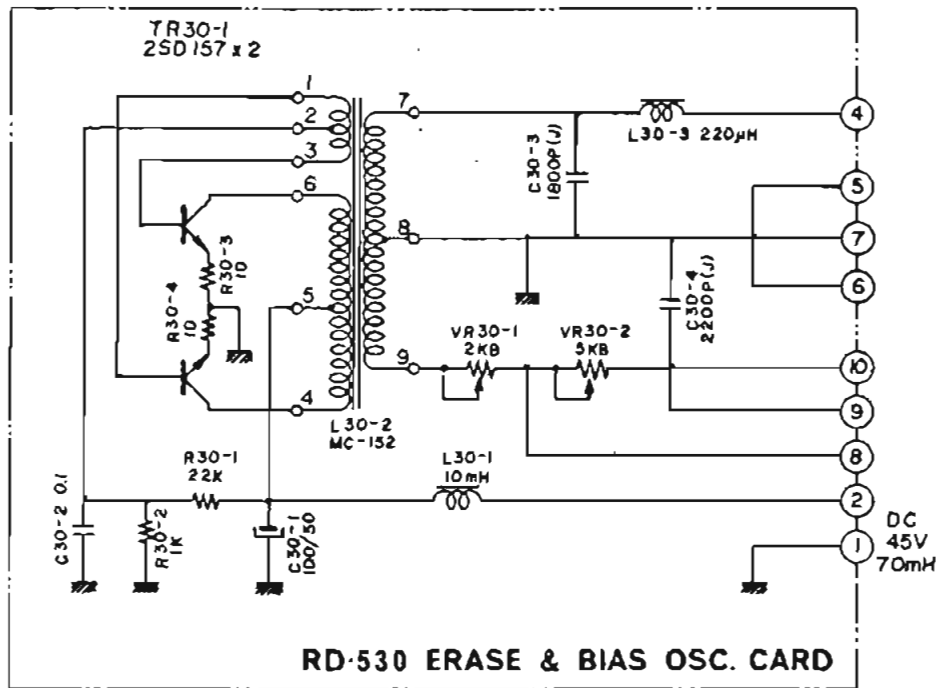
R-2

RD-520 P.B. AMP. CARD

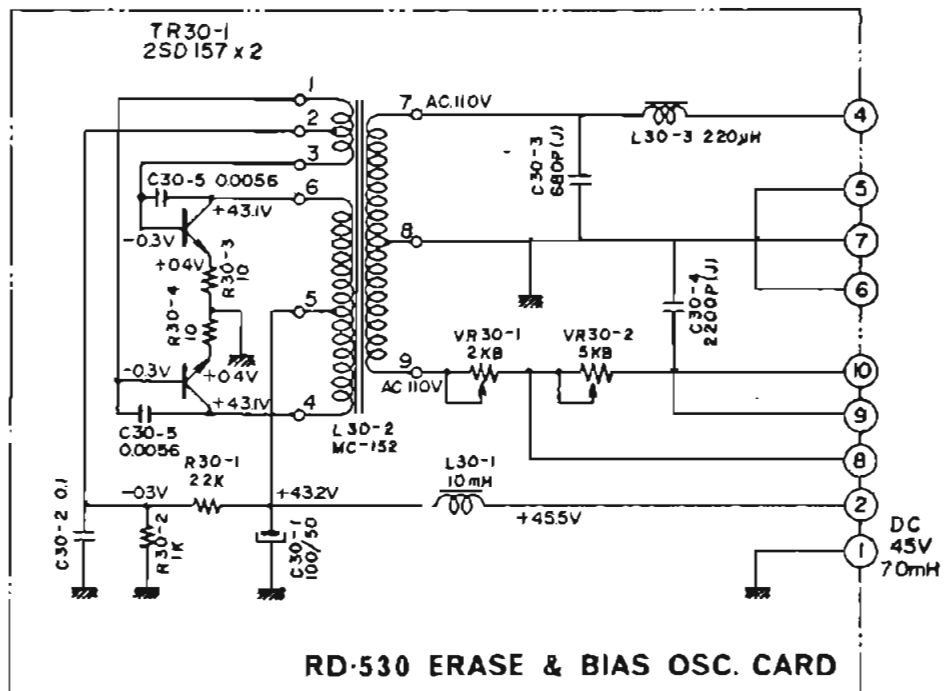


RD-529 P.B. AMP. CARD

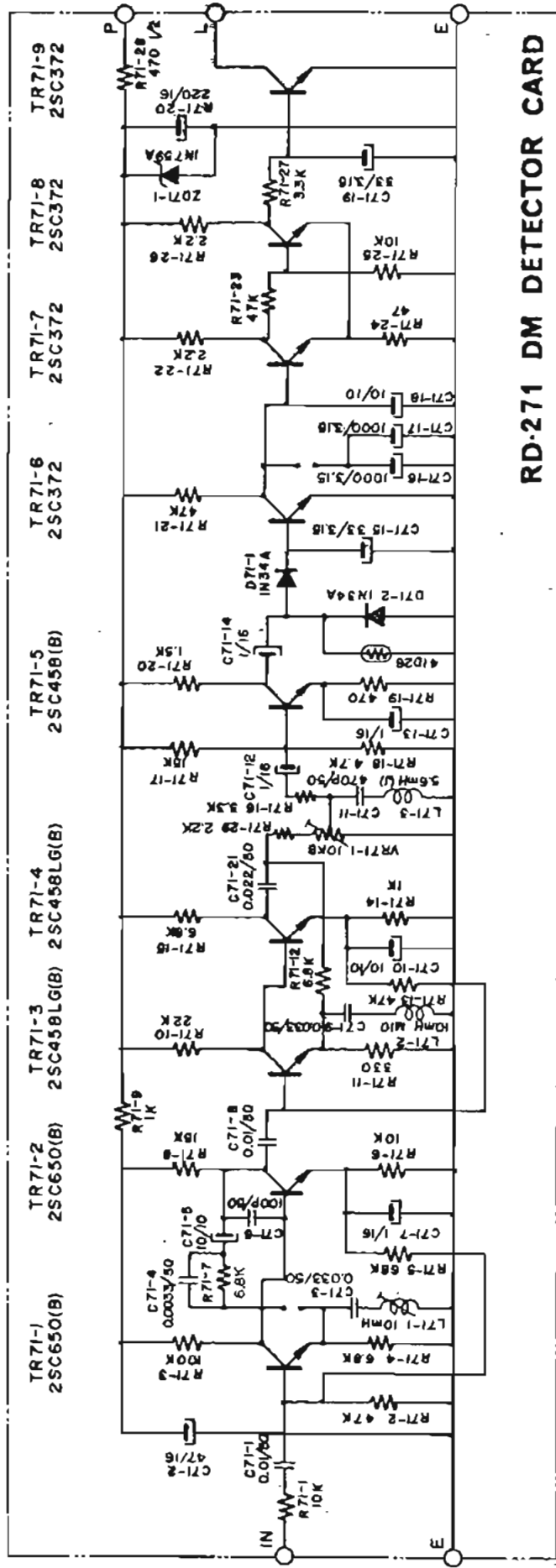




O-1

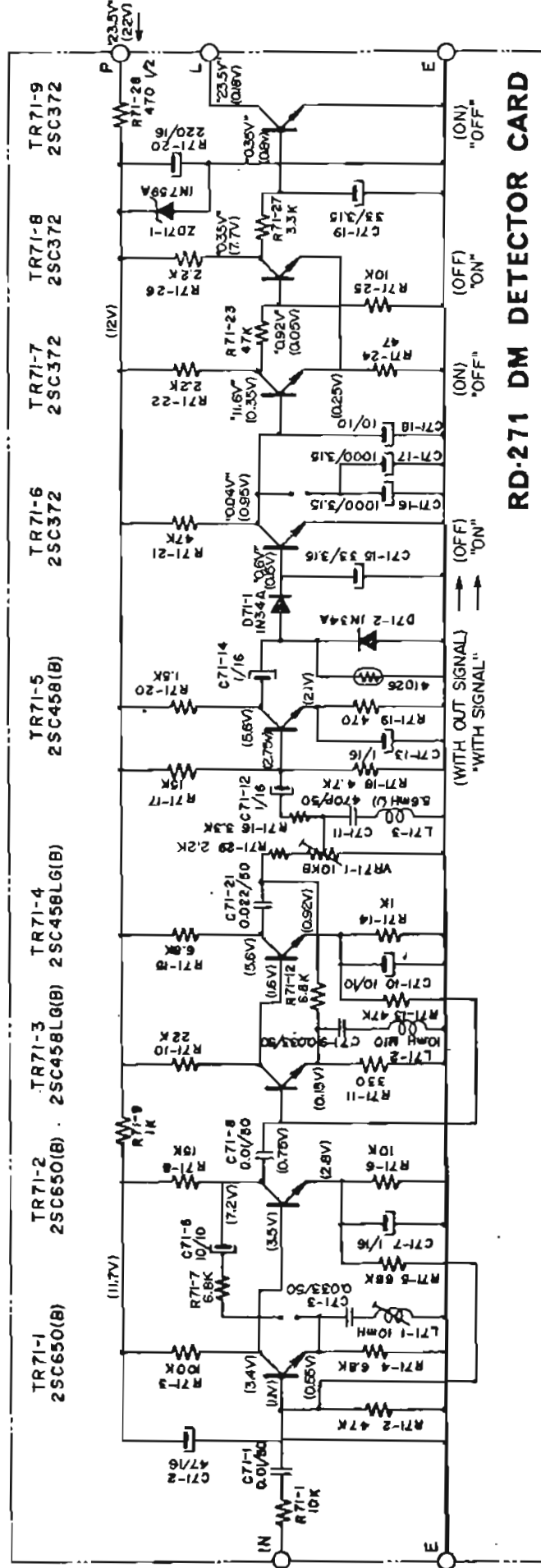


O-2



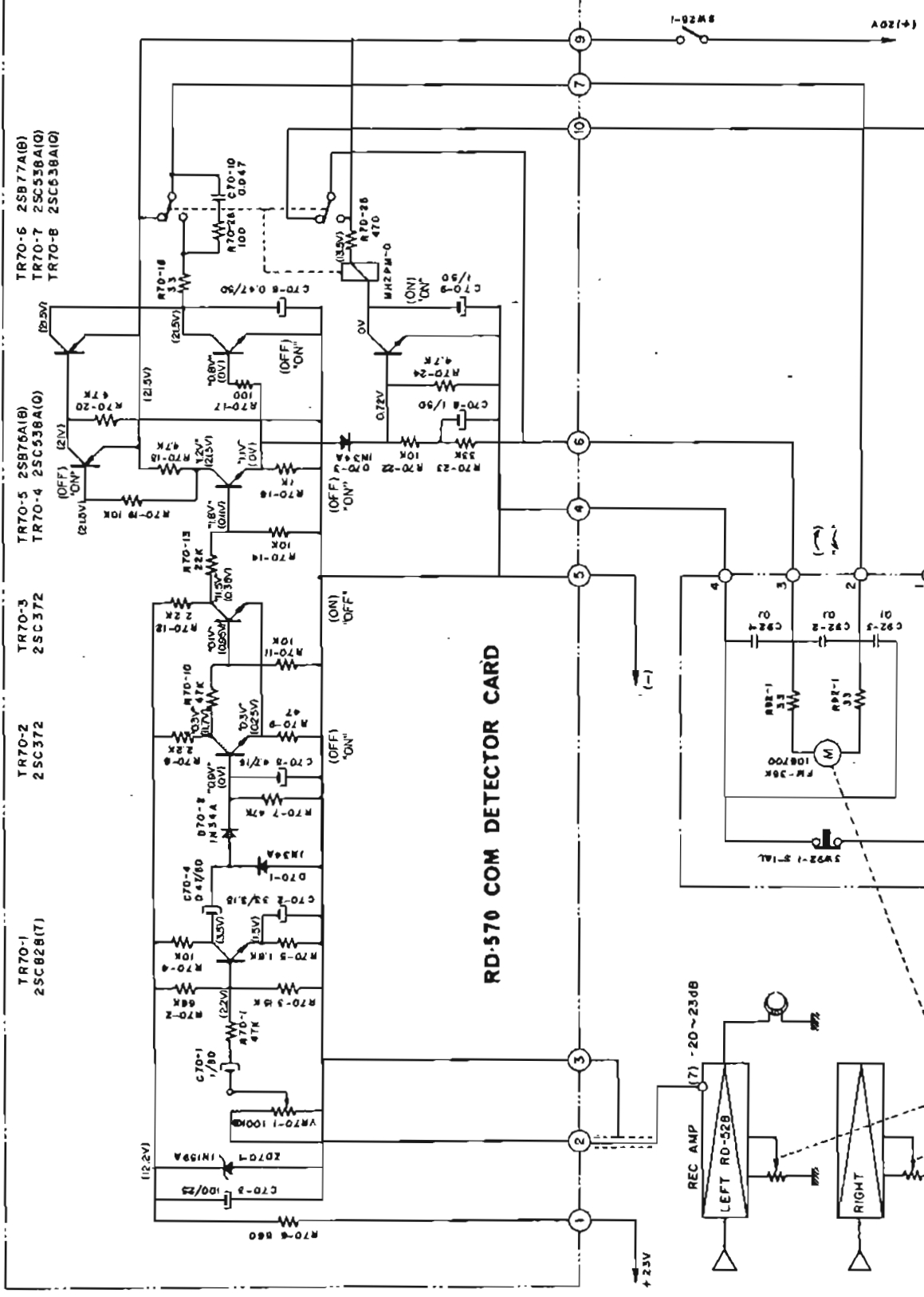
RD-271 DM DETECTOR CARD

D-1



RD-271 DM DETECTOR CARD

() SHOWING LAMP IS ON
 () SHOWING LAMP IS OFF



RD-570 COM DETECTOR CARD

RD-592 COM MECHANIC BLOCK

TR70-1
25C828(7)

TR70-2
25C372

TR70-3
25C372

TR70-4
25C384(O)

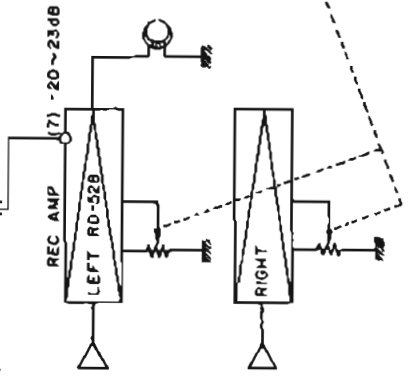
TR70-5
25B76A(B)

TR70-6
25B77A(B)

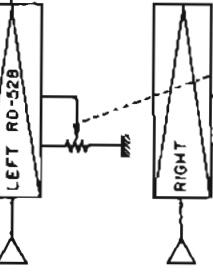
TR70-7
25C38A(O)

TR70-8
25C38A(O)

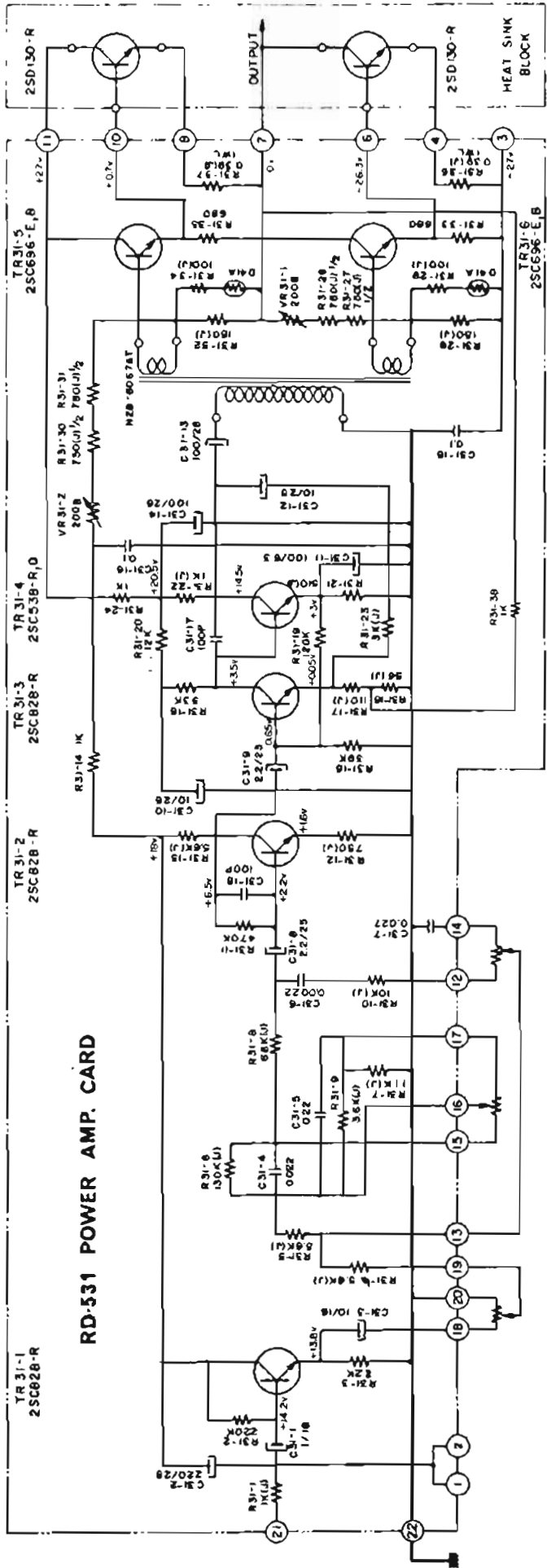
- () SHOWING NON-INPUT SIGNAL CONDITIO
- * SHOWING AUTOMATIC 0 VU SET
- WHILE MOTOR ROTATES (when more than 0vu signal input)



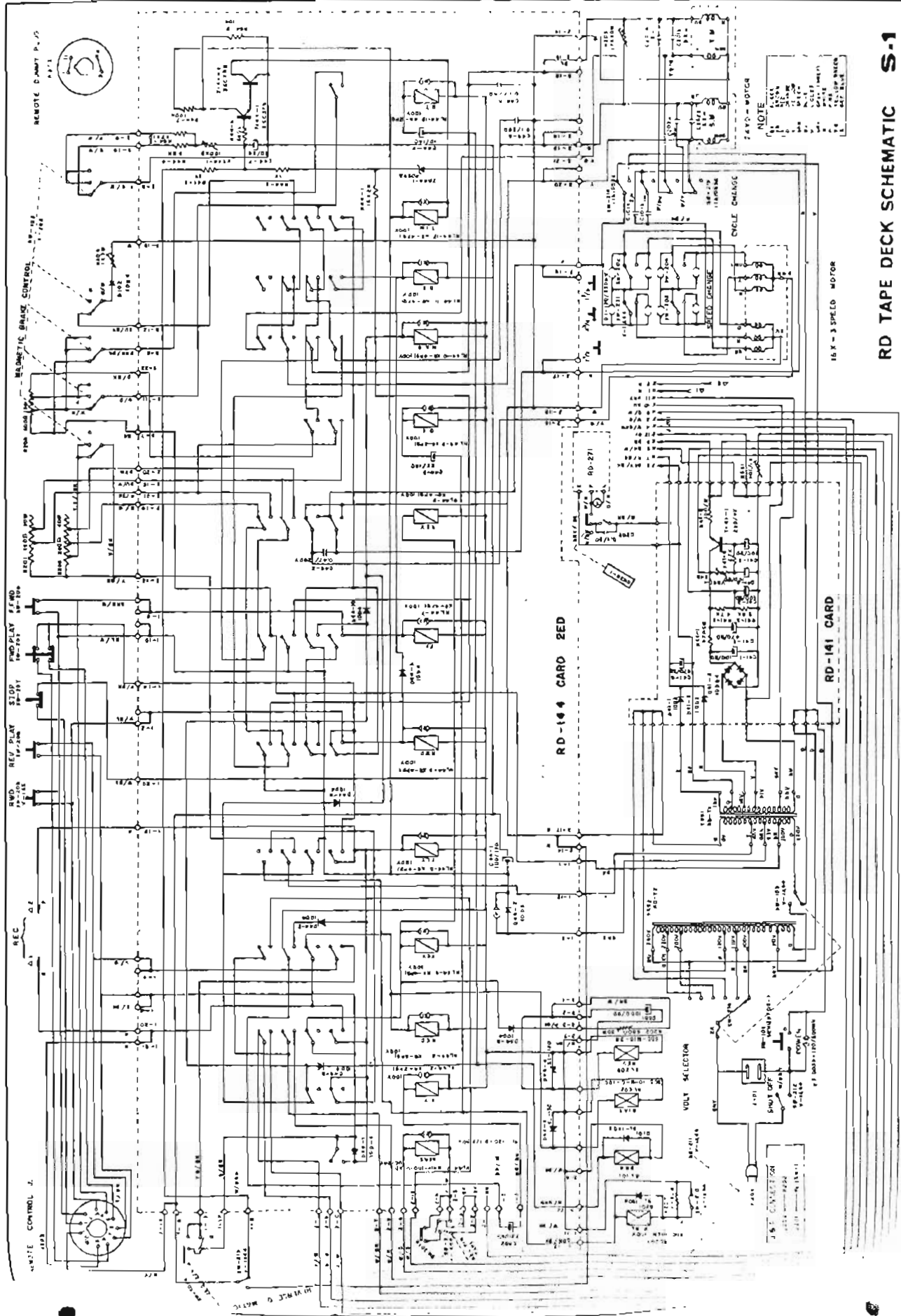
REC AMP (7) -20~23dB



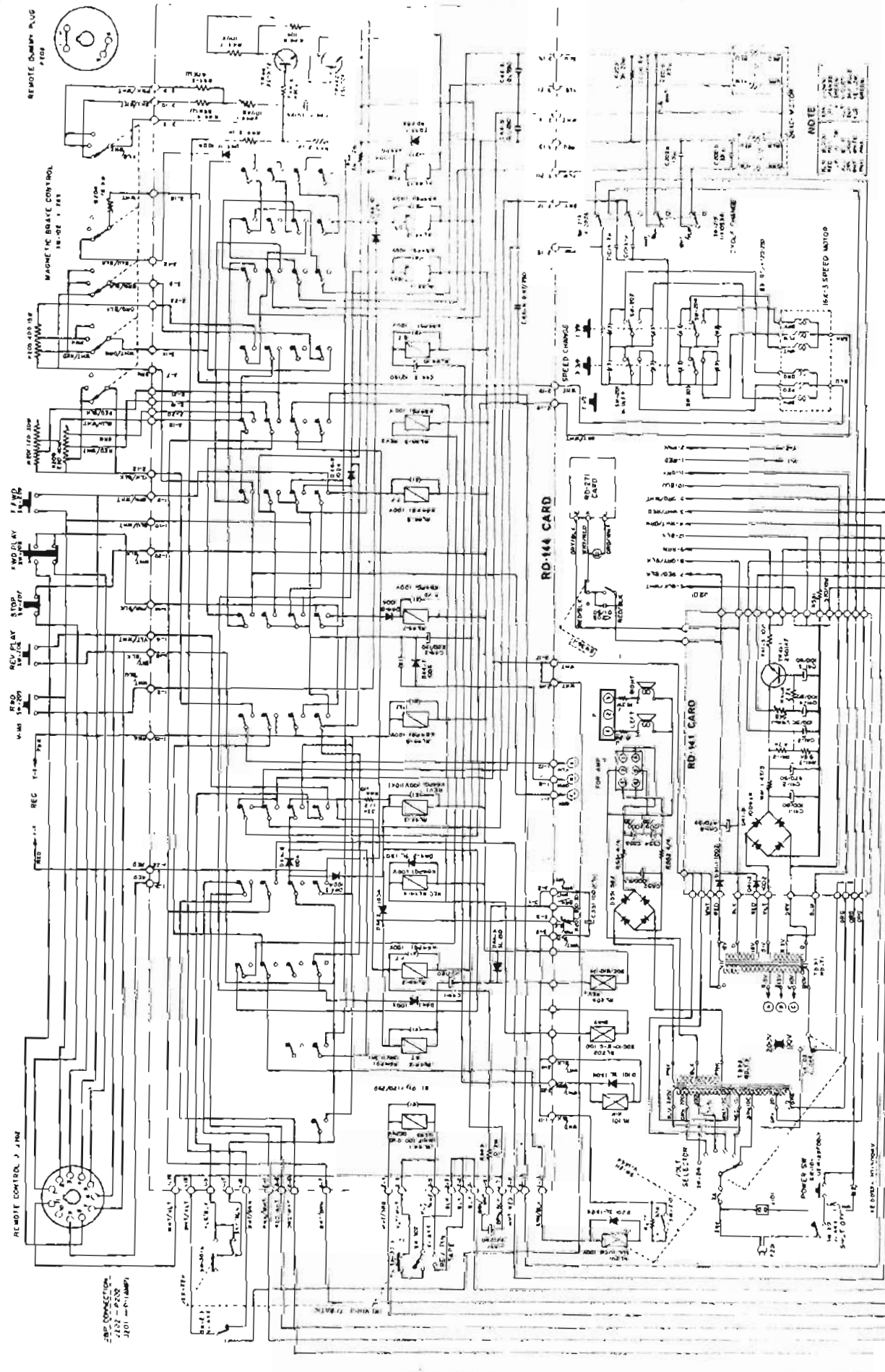
RD-531 POWER AMP. CARD



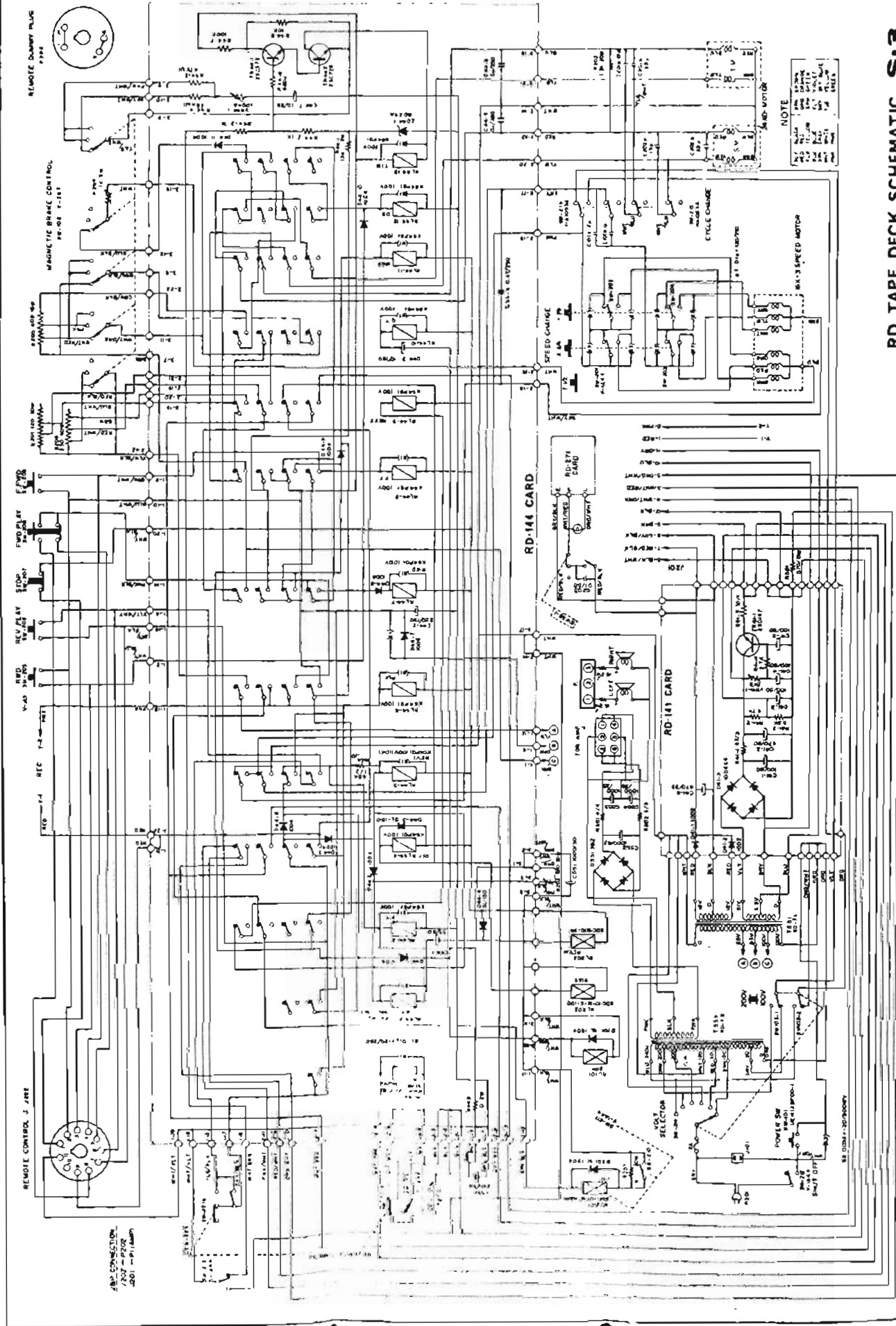
W-1



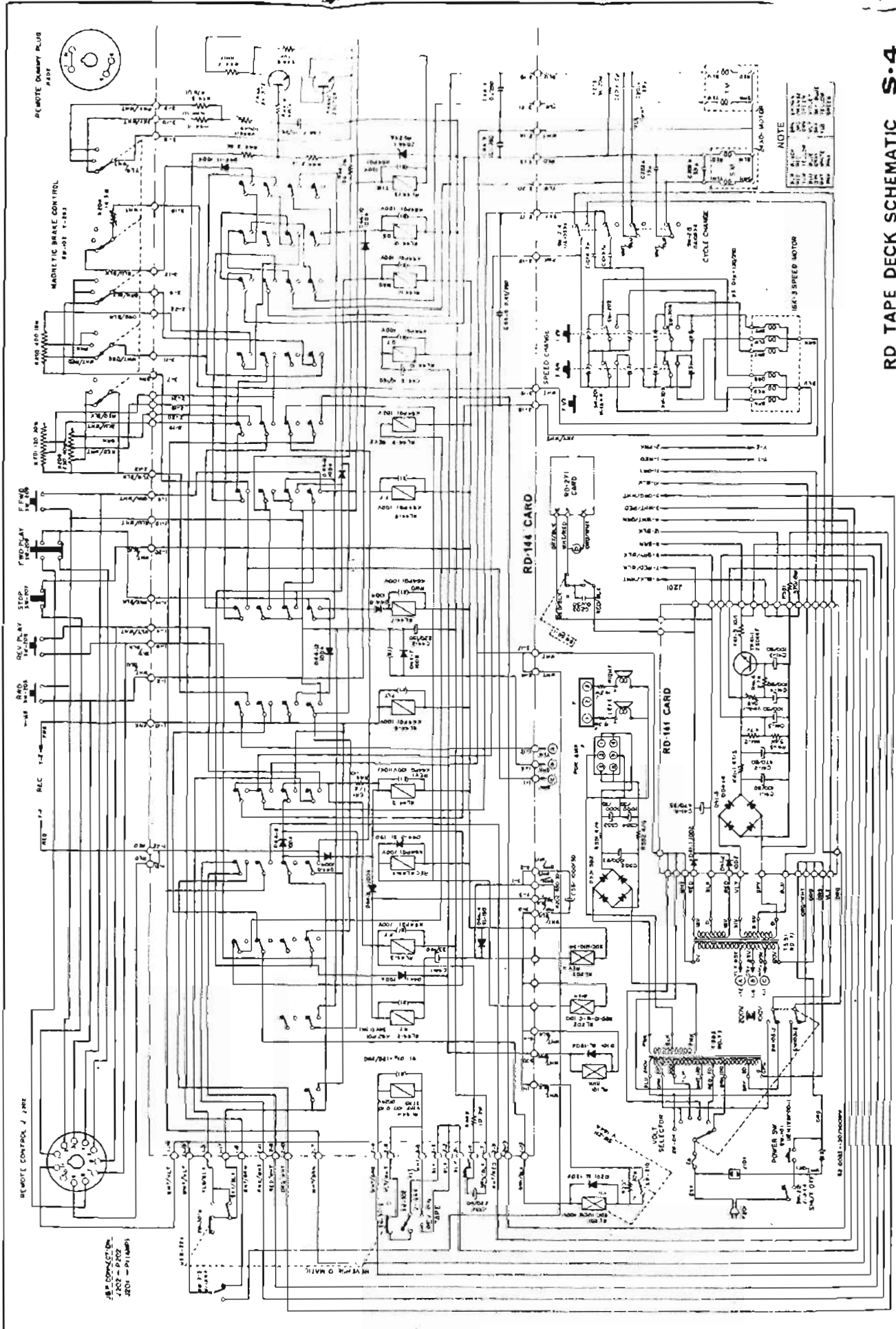
RD TAPE DECK SCHEMATIC S-1



RD TAPE DECK SCHEMATIC S-2



RD TAPE DECK SCHEMATIC S-3



REMOTE DUMMY PLUS
#107

MAGNETIC BRAKE CONTROL
SP-02 1-202

FWD PLAY
STOP
REV PLAY
REC
REC
REC

REC
REC
REC

REC
REC
REC

REC
REC
REC

REC
REC
REC

REC
REC
REC

REC
REC
REC

REC
REC
REC

WIRE CONNECTION
#107 - 202
#201 - #100

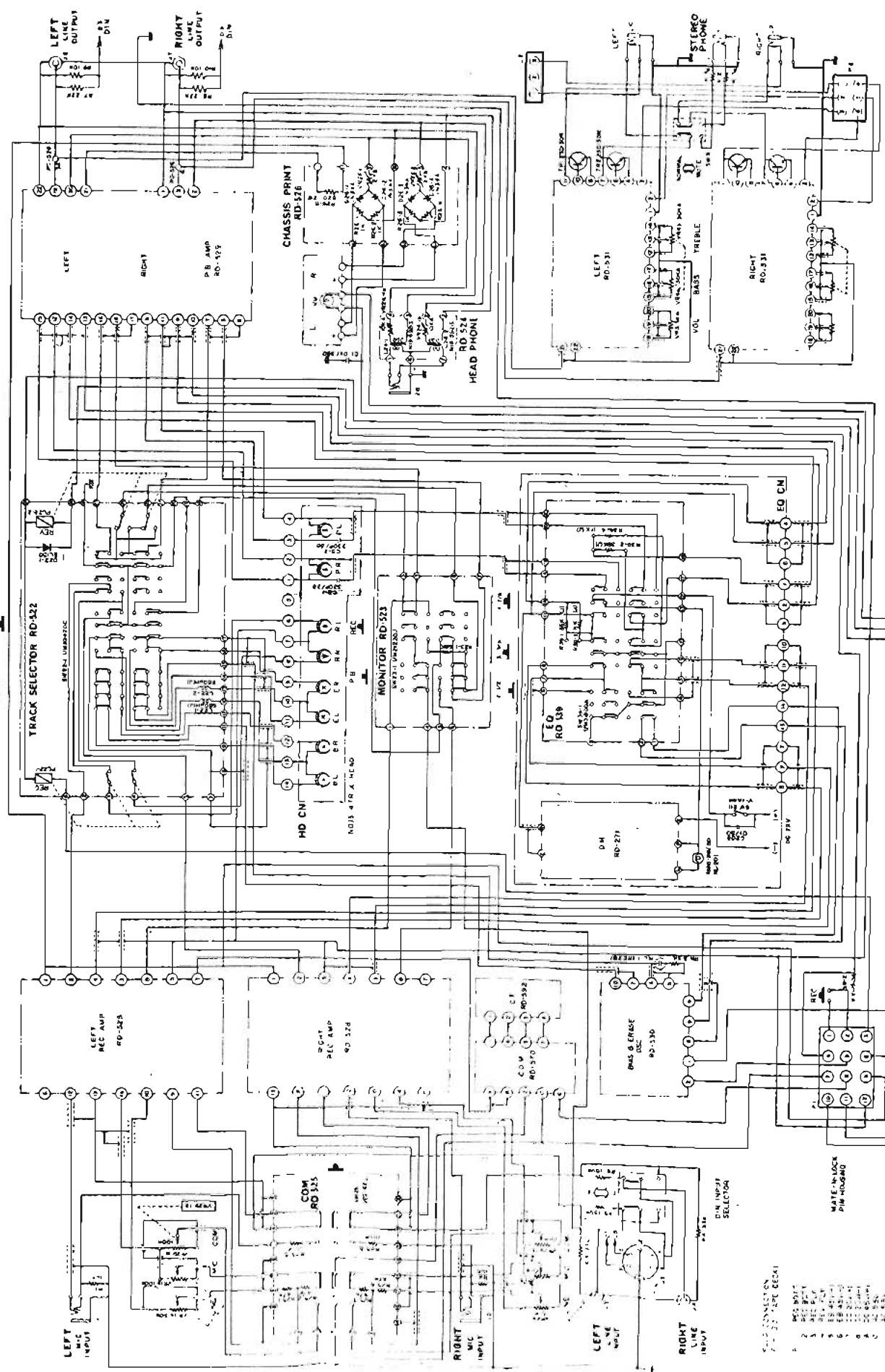
RD-144 CARD

RD-141 CARD

BE-3 SPEED MOTOR

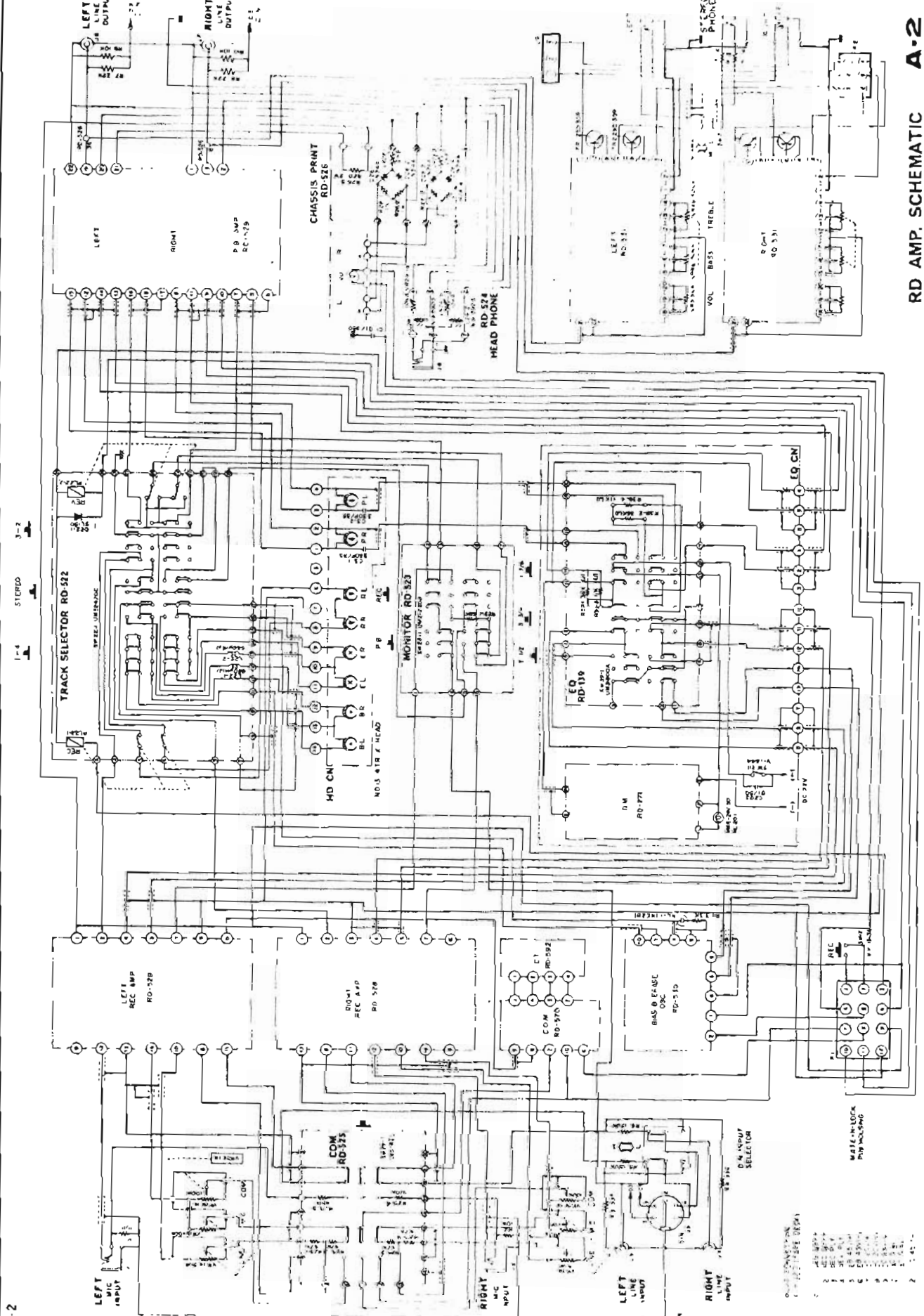
NOTE

RD TAPE DECK SCHEMATIC S-4

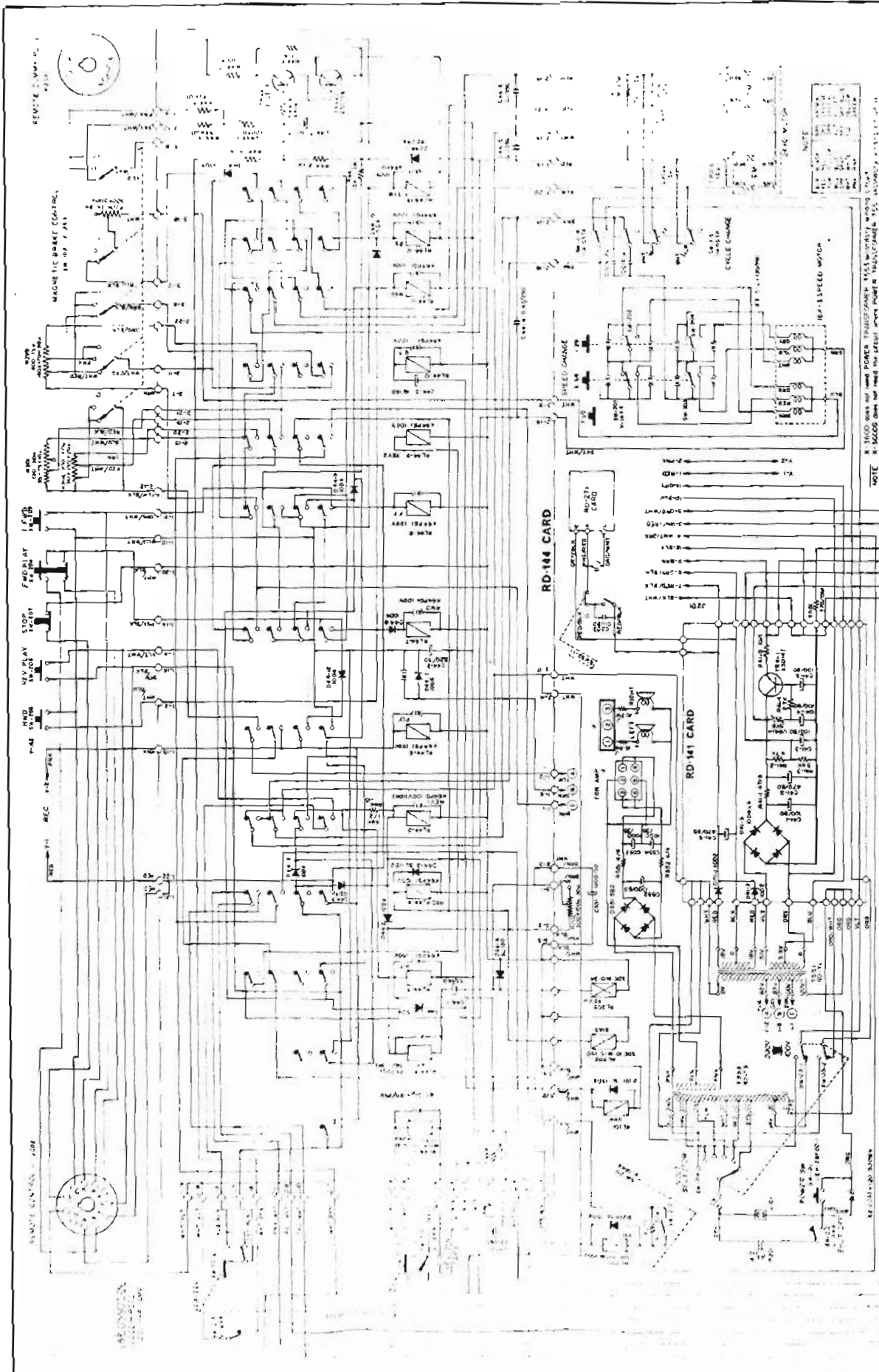


RD AMP. SCHEMATIC A-1

- CONNECTION
 1. REC. INPT
 2. REC. OUT
 3. MIC. INPT
 4. MIC. OUT
 5. LINE INPT
 6. LINE OUT
 7. HEADPHONE
 8. STEREO PHONE
 9. COM. INPT
 10. COM. OUT
 11. DM. INPT
 12. DM. OUT



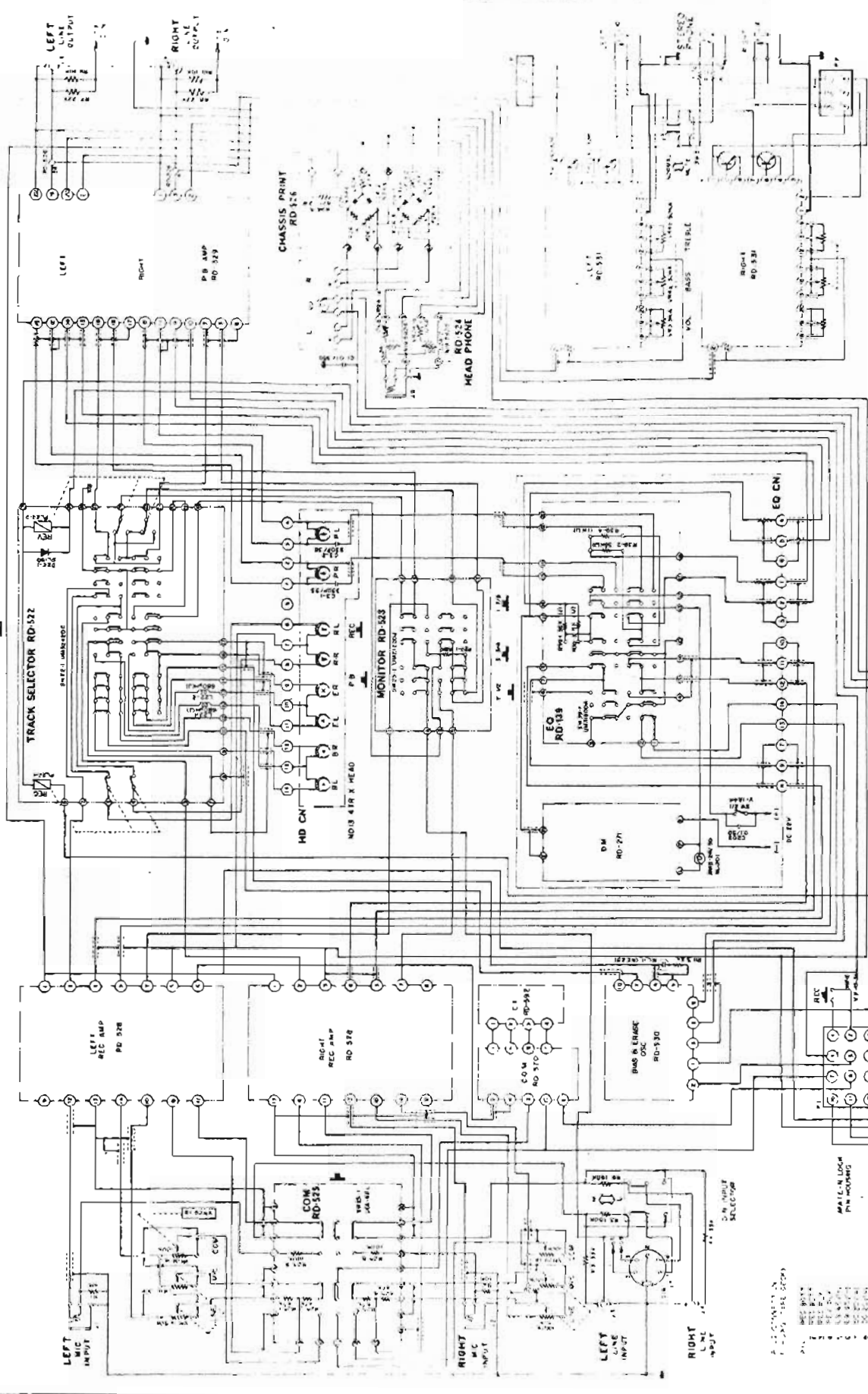
RD AMP. SCHEMATIC A-2



NO. 4.1 X-360, X-360D, X-360DS
TAPE DECK SCHEMATIC 13616205

NOTE: X-3600 does not need POWER TRANSFORMER 155A (155A) unless it is connected to RD-271 CARD.
X-3600 does not need the SPEED MOTOR TRANSFORMER 155, unless it is connected to RD-271 CARD.

1-4 STEREO 5-2



NO 42 X-360, X-360D, X-360DS
AMP. SCHEMATIC 13616224

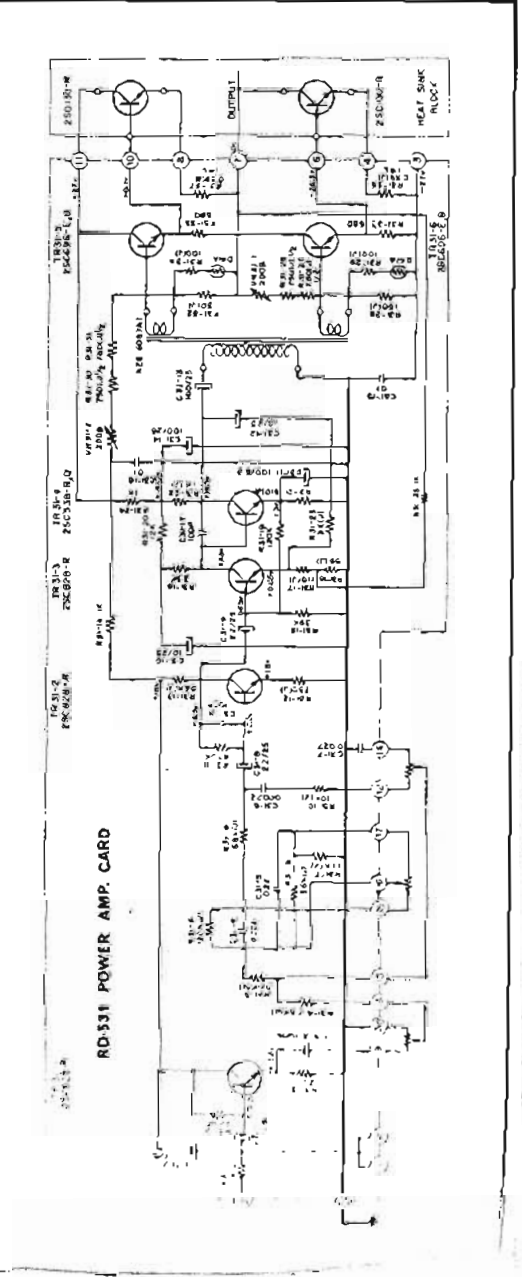
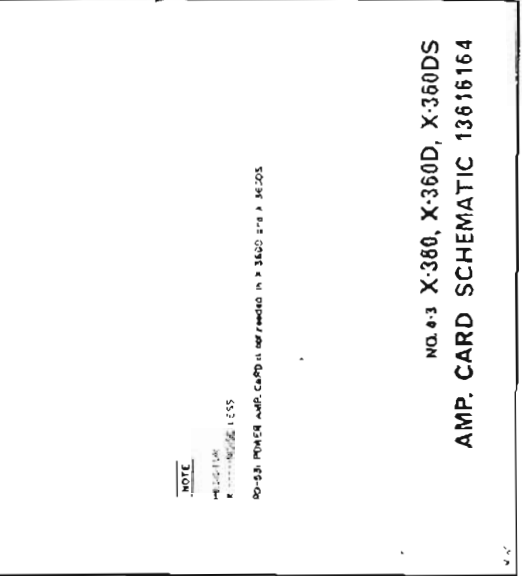
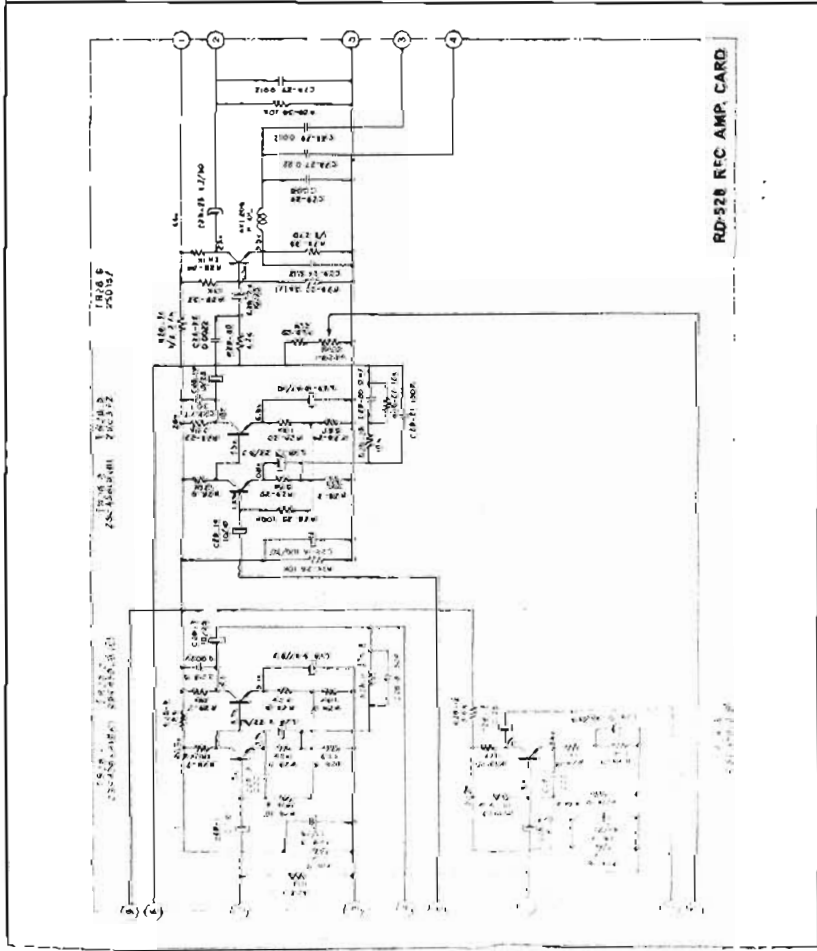
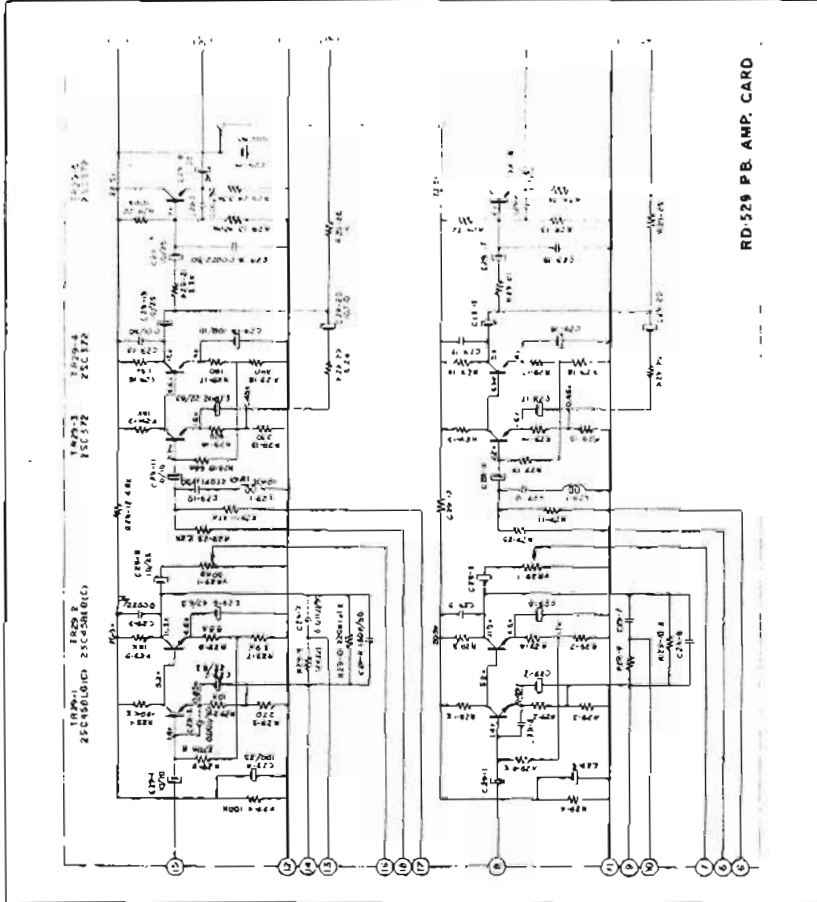
1. 500 Ohm and 100 Ohm resistors, 1/2 watt, 5% tolerance.
2. 500 Ohm and 100 Ohm resistors, 1/2 watt, 5% tolerance.
3. 500 Ohm and 100 Ohm resistors, 1/2 watt, 5% tolerance.
4. 500 Ohm and 100 Ohm resistors, 1/2 watt, 5% tolerance.
5. 500 Ohm and 100 Ohm resistors, 1/2 watt, 5% tolerance.
6. 500 Ohm and 100 Ohm resistors, 1/2 watt, 5% tolerance.
7. 500 Ohm and 100 Ohm resistors, 1/2 watt, 5% tolerance.
8. 500 Ohm and 100 Ohm resistors, 1/2 watt, 5% tolerance.
9. 500 Ohm and 100 Ohm resistors, 1/2 watt, 5% tolerance.
10. 500 Ohm and 100 Ohm resistors, 1/2 watt, 5% tolerance.

NOTE: A-50009 items are used. MAIN AMPLIFIER CARD (RD-530) and A-10004 circuit. COM RD-525, RD-510, CT RD-582 CARD and their assembly circuit.

REC

REC

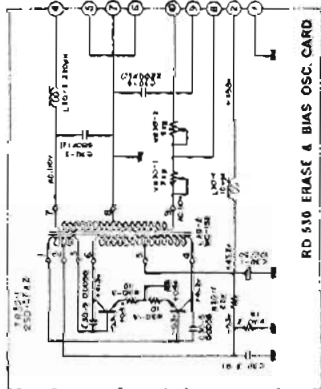
REC



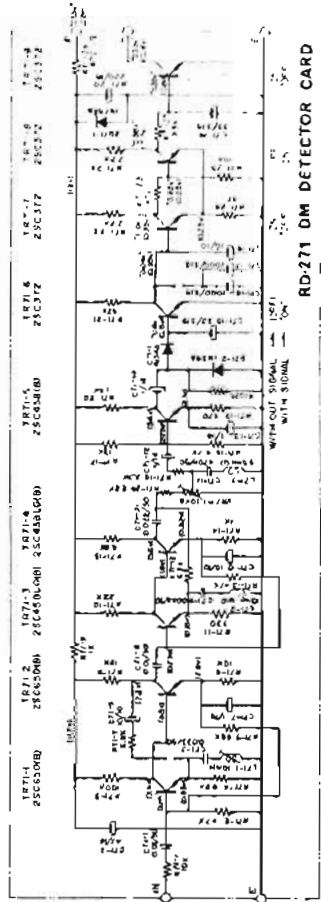
NOTE:
RESISTOR
K = 1000 OHMS LESS

RD-531 POWER AMP. CARD IS REFERRED TO IN 34500 AND 34500S

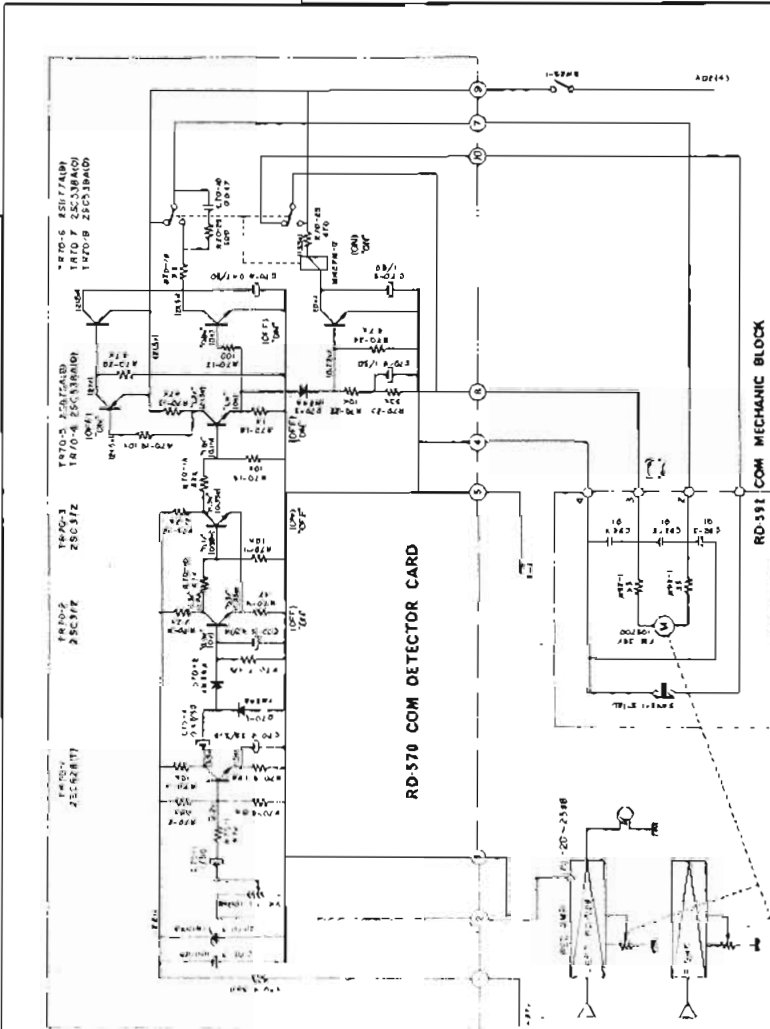
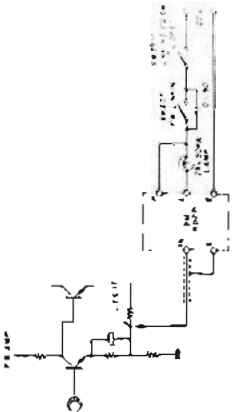
NO. 0-3 X-360, X-360D, X-360DS
AMP. CARD SCHEMATIC 13616164



RD-510 ERASE & BIAS OSC. CARD



RD-271 DM DETECTOR CARD



RD-570 COM DETECTOR CARD

RD-391 COM MECHANIC BLOCK

NOTE: 1. REFER TO THE MECHANIC BLOCK FOR THE LOCATION OF THE MECHANICAL CONTACTS.
2. THE MECHANICAL CONTACTS ARE LOCATED ON THE MECHANIC BLOCK.

NOTE: RD-570 COM DETECTOR CARD USES RD-570 COM MECHANIC BLOCK IN THE MECHANIC BLOCK IN THE MECHANIC BLOCK IN THE MECHANIC BLOCK.

NO. 4 X-360, X-360D, X-360DS
AMP. CARD SCHEMATIC 13616124