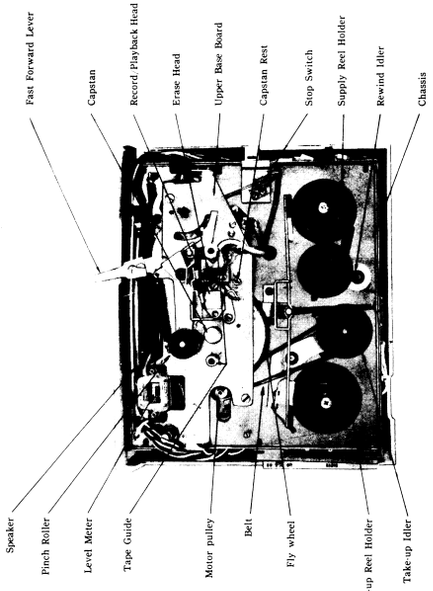


Fig. 2

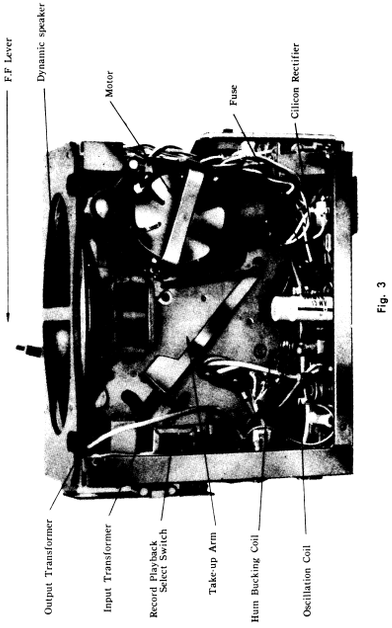


Fig. 3

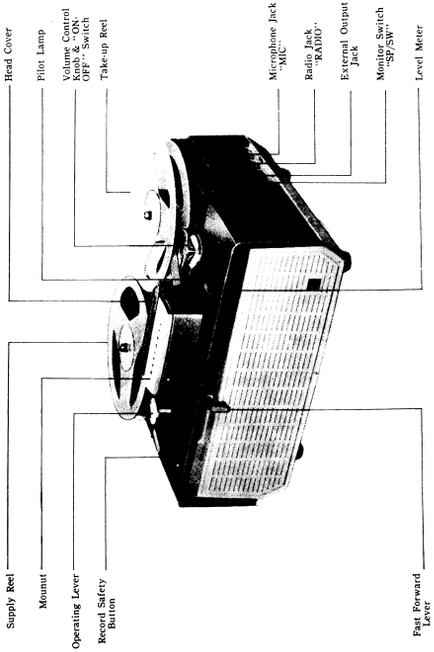


Fig. 1

SPECIFICATION

Power Source:	Voltage of Setting / Local Voltage 110V / 105V, 110V, 115V 220V / 220V
Power Consumption:	About 20w
Output:	1.5W
Transistors:	2SB173 (1) 2SB324 (2) 2SB175 (3) 2SB172 (1)
Diode:	OA-70 (1)
Thermistor:	MT-8T (1)
Rectifier:	MP-01 (1)
Recording System:	AC Bias 35 KC
Erasure System:	DC Erasure
Track System:	Double Track Recording System
Operation:	Level Operation
Tape Speeds:	33/4 ips. (9.5 cm/sec) and 17/8 ips. (4.75 cm/sec)
Playing Time:	1 Hour at 33/4 ips. with 5" Reel Tape 2 Hours at 17/8 ips. with 5" Reel Tape
Frequency Response:	70–7,000 c/s at 33/4 ips. 70–4,000 c/s at 17/8 ips.
Wow and Flutter:	0.4% down (at 33/4 ips.)
Input Imedance:	(Unbalance) Microphone 20 KΩ (1 Circuit) Radio 1.5 MΩ (1 Circuit)
Output Impedance:	(Unbalanced) 8Ω (1 Circuit) External Speaker Output
Fast Forward & Rewind time:	Within 3 Minutes
Build-in Speaker:	6"×3"
Dimension:	91/2"×5"×74/5"
Weight:	About 8 lbs

DESCRIPTION OF MECANICAL PARTS

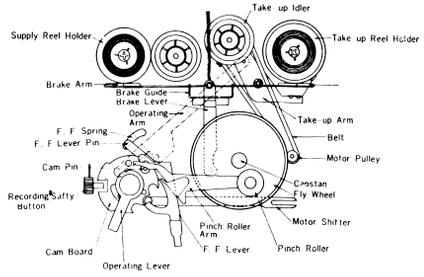


Fig. 6

Operating Lever

Model RQ-500 is operated with Operating Lever and Fast Forward (F.F.) Lever only. By turning Operating Lever, each mechanical part is controlled around Cam-plate.

Speed Change

By attaching or detaching Capstan-sleeve, tape speed can be changed

Frepuency of Power Source

By attaching or detaching Sleeve for Motor-pulley, frequency can be changed as required.

Power Source

By turning Volume Control Knob clockwise, the recorder can be switched ON. when it is ON, the pilot lamp lights. With Model RQ-500, Operating Lever does not automatically return to STOP position even when the recoder is switched OFF, so when operation is finished, turn off the recorder and return the Lever to STOP.

TRANSMISSION OF MECHANICAL MOVEMENT

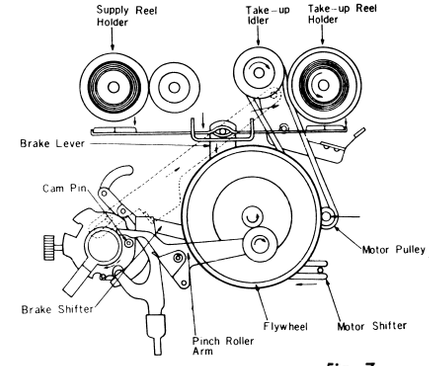


Fig. 7

Recording & Playback

Electric circuit is set in recording mode when RECORD button is pressed, and it is in playback mode as long as RECORD button is not pressed. Operating Lever is set in the same direction both for recording and playback.

When Operating Lever is turned to RECORD or PLAYBACK position, Motor shifter is pulled in the direction of "arrow" mark by the rotation of Cam-plate, and Motor-pulley is pressed against Flywheel, thus transmitting rotation to Capstan.

By the movement of Brake-lever and Brake-shifter, Brake comes off Reel-holder.

By the movement of Operating-arm, Take-up Idler approaches Reel-holder, Rubber-belt touches Reel-holder and it rotates. Pinch-roller arm is freed by the pressure of Cam-pin, and Pinch-roller is pressed gainst Capstan. tape is thus advanced. All these movements occur simultaneously by turning Operating Lever which rotates Cam-plate.

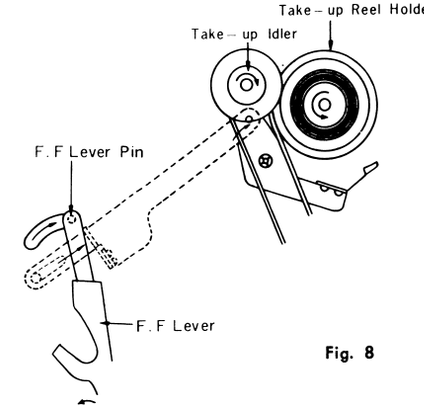


Fig. 8

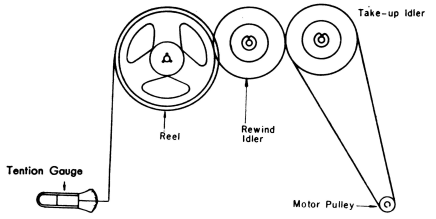


Fig. 16

Pressure of Tape Pads

Measurement

Set the unit in Playback Mode.
Press Tension Gauge on the center of tape pads.
Sparate lightly. Tape Pads from Head (Fig.18)
Read the gauge when Tape Pads are released.
Normal pressure at the point of pin at the center of pads shall be 30~40g.

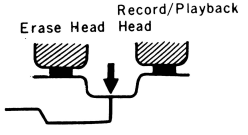


Fig. 17

ADJUSTMENT OF HEAD

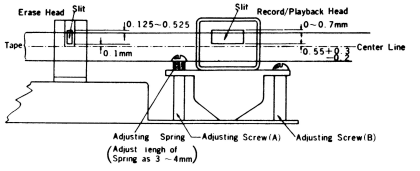


Fig. 18

Erase Head

Set the tape in advancing condition and pull down Tape-pads, and adjust the relative position of Head-core and tape as shown above.
If the position of Head-core is too low, raise it by means of spacers.

Record/Playback Head

Set the tape in advancing condition, and pull down Head-pads.
Adjust the setting of Head on Head-base to level, so that relative position of Head and tape is as shown above.
Use standard alignment tape (with recording of 7,000 c/s at 7½ ips.) and playback the signal on the tape. Find out the maximum output point by adjusting screws (A) and (B).
When standard alignment tape is not available, properly record signal with reliable Tape-recorder and play it back and adjust screw (A) and (B) for the maximum Playback output by hearing.

ADJUSTMENT OF AMPLIFIER

Stop Switch

Install the switch so that the secondary side of the output trasformer is short-circuited, in order to prevent the generation of noise from amplifier through the speaker at the time of stop, F.F. and Rewind.

Oscillation Frequency

Adjust the Dust-core adjusting screw of the oscillation coil so that the oscillation frequency of the recording biasand erasing high frequency oscillation circuit is kept at 35 KC± 5KC connect the resistor with 10Ω or so in series to the ground side of the erase head, and measure the frequency of the voltage at both ends of the resistor and compare it with the frequency of the standard oscillator (lissajous wave-form to be projected on the oscilloscope of the TV picture tube).

Bias Current

Proper bias should be given to optimum Recording. Adjust the oscillation frequency and connect the resistor with 100Ω or so in series to the ground side of the Record/Playback head. Measure the voltage at both ends. Adjust with the trimmer condencer.
Proper AC bias: 0.6mA (voltage at both ends in the case of 100Ω resistor: $0.6 \times 10^{-3} \times 100 = 0.06V$)

Erasing Current

When erasing current is improper, imperfect erasure or over-heating of Erase Head may occur.
Connect a D.C. ammeter to the ground side (black) of Erase Head in series and measure current. If it shows any deviation from the proper erasing current of 8 to 12 mA, adjust current by replacing Resistor R31 820Ω which is connected in series to Erase Head.

Recording Level

Unless recording level is adjusted properly, playback output may be lowered or sound may be distorted.
Adjust the level as follows if it is improper:
First, short-circuit between the base of Oscillating Transistor 2SB-173 and a ground, or between the secondary side of Oscillating Transformer and a ground (thus oscillation being stopped), and adjust semi-fixed volume control VR3 5KΩ so that the signal current to Record Head shows 0.07mA when measured by a D.C. ammeter (refer to the previous item), and that at the same time Level Meter shows zero.

MAINTENANCE

Lubrication & Cleaning

This tape recorder does not, as a rule, require oilling, but it is preferable to oil once in a year or when parts are repaired, as following;

Capstan bearing	1~2 drops
Pinch roller bearing	1~2 drops
Rewind Pulley bearing	1~2 drops
Motor bearing	1 drops
Reel spindles	1~2 drops

Record/Playback Head, & Erase Head

Heads are the essential parts of the recorder, and affect its performance very much.
When Heads get dirty, it is important to wipe off dirt using cloth soaked with alcohol or benzene.
Heads are constantly brushed by tape and gradually wear out. After many hours of use, their characteristics may somewhat deteriorate.
It is desirable to replace Heads after about 1,000 hours of use.

Motor

Motor also has to be oiled...once every 500 hours or so. Use spindle oil or machine oil.

Other Mechanical Parts

Idler

Clean with alcohol the surface of Idler with the bolt.
Also, clean the surface of Idler with the Reel-holders. Oil the central shaft of Idler 1 to 2 drops once every 200 hours. Use spindle or sewing machine oil.

Pinch-roller

Clean with alcohol the surface of Roller with Capstan. Oil the central shaft of Roller 1 to 2 drops once every 200 hours. Use spindle or sewing machine oil.

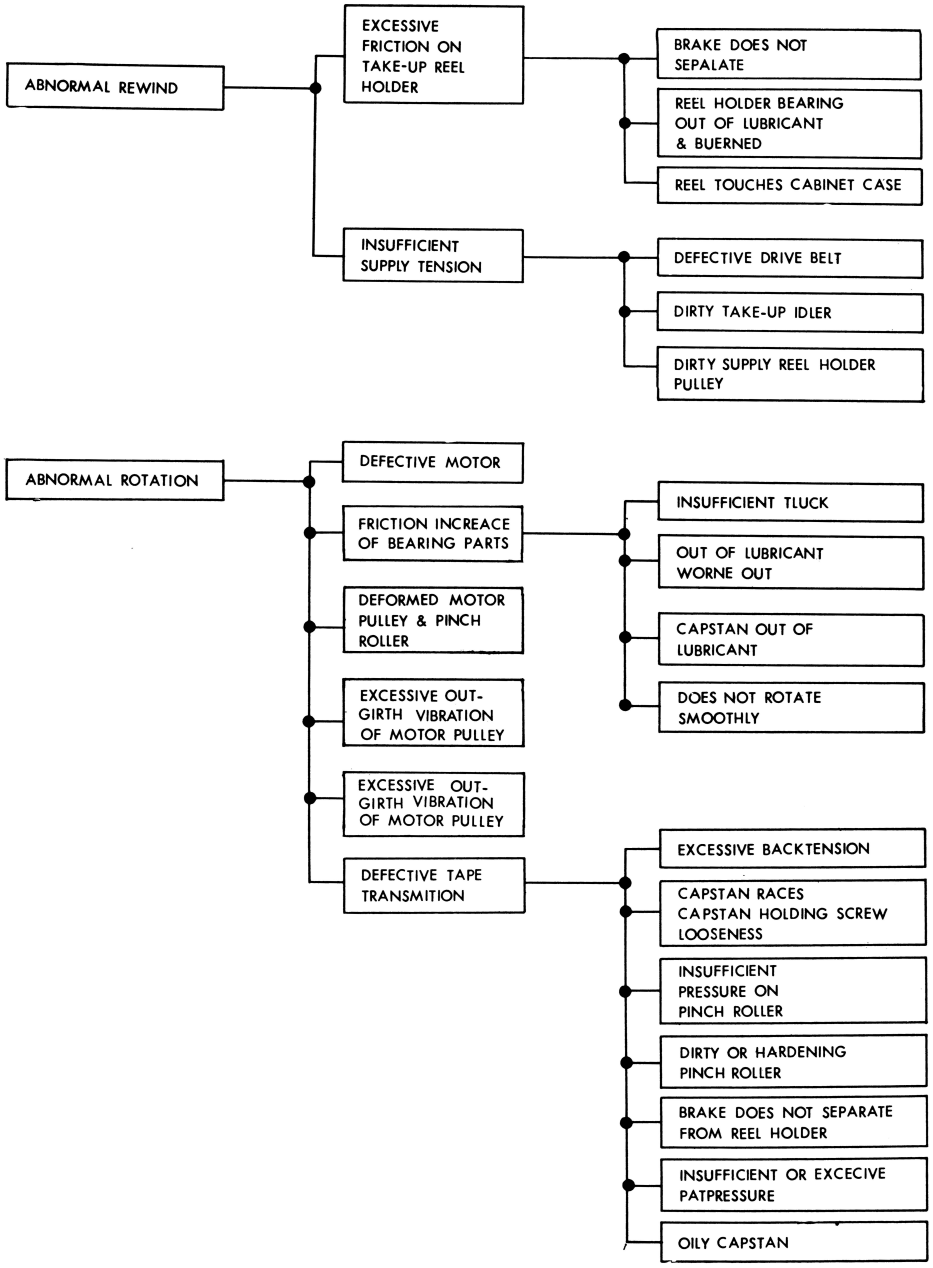
Capstan

Clean with alcohol the surface of Idler. Oil the root of capstan 1 to 2 drops once every 200 hours. Use spindle or sewing machine oil. Any remaining oil or grease on the surface of Capstan with Pinch-roller might cause tape slipping and deterioration of Pinch-roller, so avoid excessive oiling.

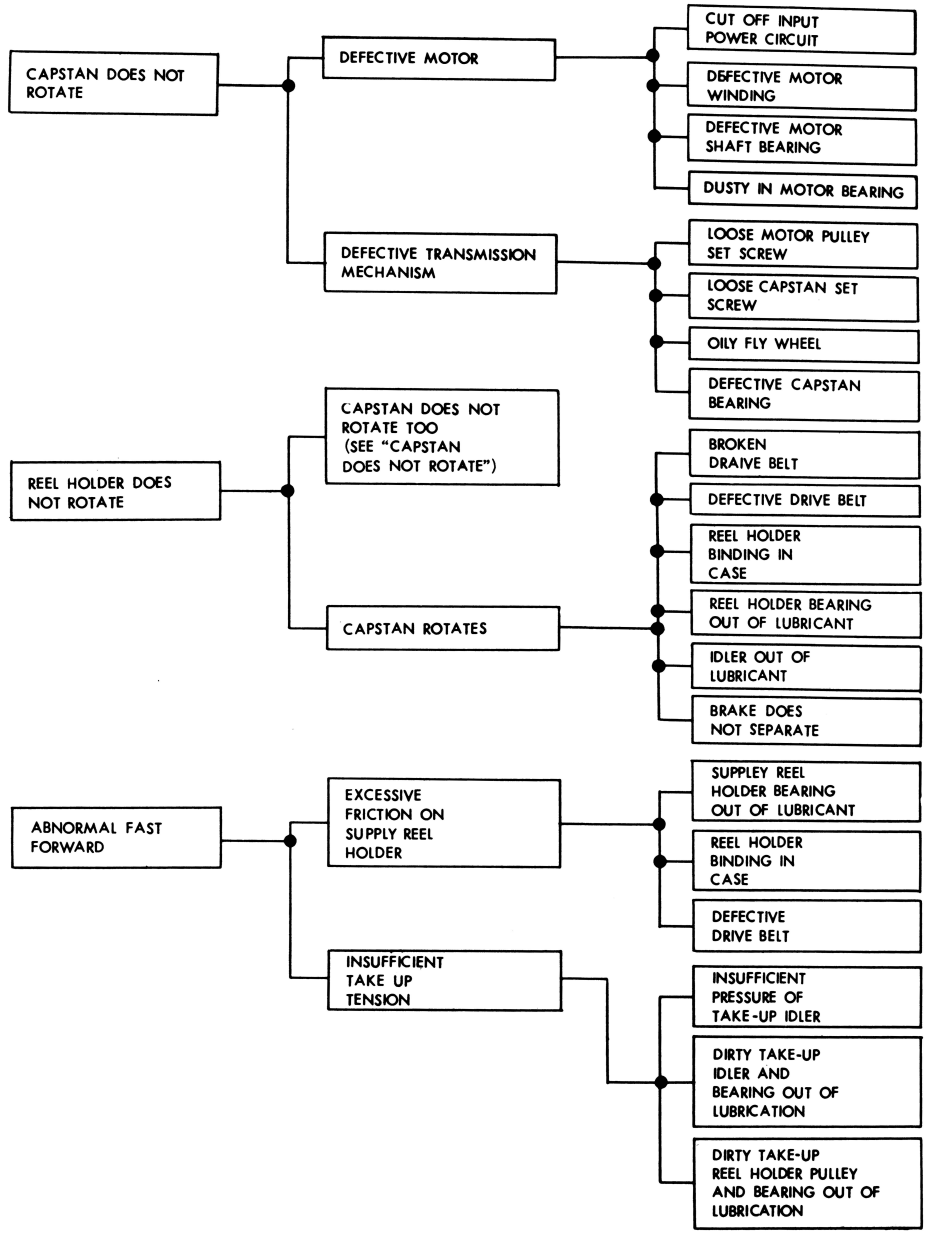
Frequency of Power Source

This tape recorder is designed to operate on 50 c/s or 60 c/s.
The recorder can be matched with either frequency by changing the diameter of Motor-pulley.

TROUBLE SHOOTING GUIDE 2



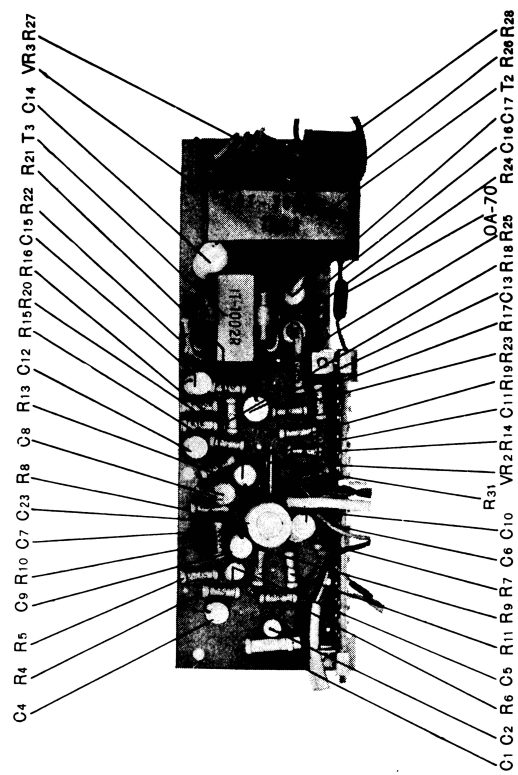
TROUBLE SHOOTING GUIDE 3

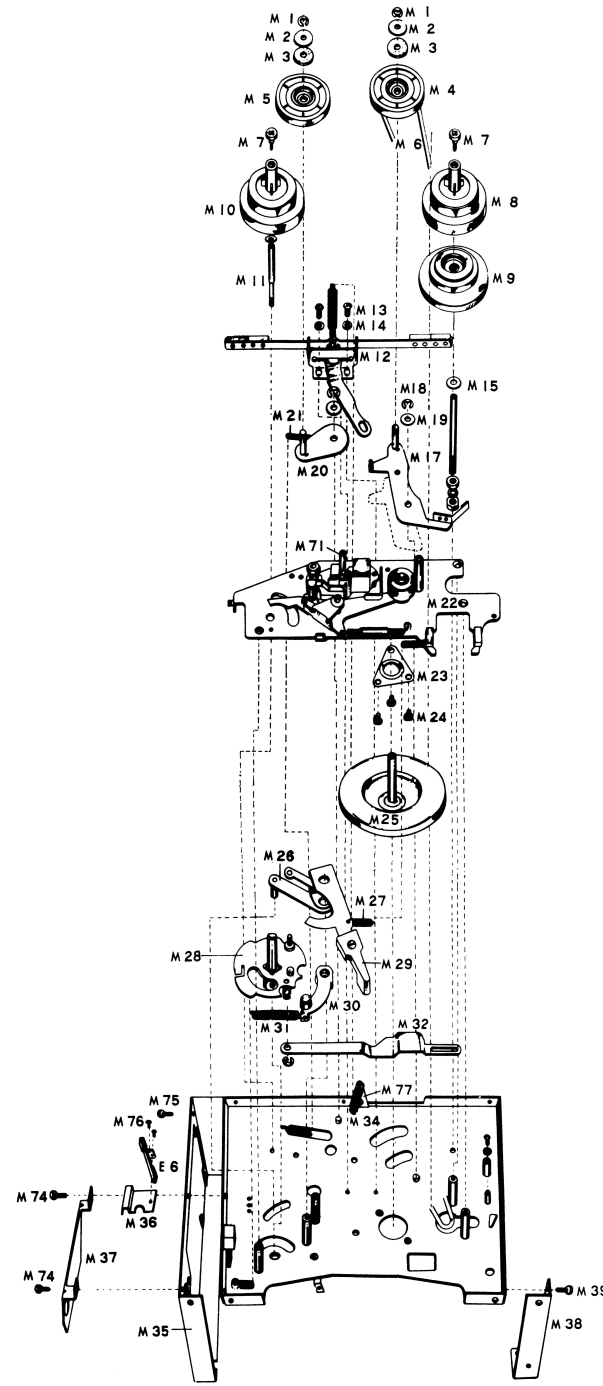


M61	Pinch Roller Lever Shaft	
M62	Screw for Chassis (A)	
M63	Motor Spring	
M64	Brake Spring	
M65	Lever for Record Safty Button	
M66	Brake Lever	
M67	Motor Setting Plate	
M68	Fiber Washer for Brake Lever	
M69	Rubber Cusion for Motor Setting Plate	
M70	Screw for Rubber Cusion	
M71	Capstan Lest	
M72	Hanger for Brake Spring	
M73	Spring Washer for Brake Lever	
M74	Screw for Print Base Board Holder Plate	
M75	Screw for Print Base Board Setting Plate	
M76	Screw for Stop Switch	
M77	Hanger for Brake Spring	
M78	Pilot Lamp Setting Plate	
M79	Spring Washer for Above	
M80	Screw for Above	
M81	Nut for Reel Holder Spindle	
M82	Steel Washer for Reel Holder Spindle	

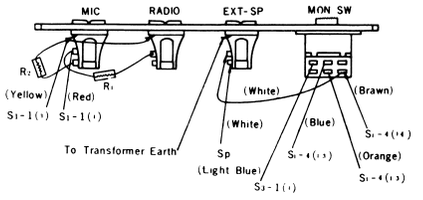
R 1	Carbon Film Resistor	1/4W	1.5MΩ
R 2	Carbon Film Resistor	〃	22KΩ
R 3	Carbon Film Resistor	〃	18KΩ
R 4	Carbon Film Resistor	〃	2.2KΩ
R 5	Carbon Film Resistor	〃	150Ω
R 6	Carbon Film Resistor	〃	10KΩ
R 7	Carbon Film Resistor	〃	3.9KΩ
R 8	Carbon Film Resistor	〃	3.9KΩ
R 9	Carbon Film Resistor	〃	33KΩ
R 10	Carbon Film Resistor	〃	3.3KΩ
R 11	Carbon Film Resistor	〃	2.2KΩ
R 12	Carbon Film Resistor	〃	4.7KΩ
R 13	Carbon Film Resistor	〃	10KΩ
R 14	Carbon Film Resistor	〃	68KΩ
R 15	Carbon Film Resistor	〃	1KΩ
R 16	Carbon Film Resistor	〃	150Ω
R 17	Carbon Film Resistor	〃	2.2KΩ
R 18	Carbon Film Resistor	〃	2.2KΩ
R 19	Carbon Film Resistor	〃	22KΩ
R 20	Carbon Film Resistor	〃	390Ω
R 21	Carbon Film Resistor	〃	47Ω
R 22	Carbon Film Resistor	〃	560Ω
R 23	Carbon Film Resistor	〃	220Ω
R 24	Carbon Film Resistor	〃	100Ω
R 25	Carbon Film Resistor	〃	3.3～4.7KΩ
R 26	Carbon Film Resistor	1/2W	1.5Ω
R 27	Carbon Film Resistor	1/4W	100W
R 28	Carbon Film Resistor	1/2W	10Ω
R 29	Carbon Film Resistor	1/4W	15KΩ
R 30	Carbon Film Resistor	1/4W	100KΩ
R 31	Carbon Film Resistor	〃	820Ω
R 32	Carbon Film Resistor	〃	100KΩ
R 33	Carbon Film Resistor	〃	6.8KΩ
R 34	Carbon Film Resistor	〃	560Ω
R 35	Carbon Film Resistor	〃	1.8KΩ
R 36	Carbon Film Resistor	2 W	150Ω
R 37	Carbon Film Resistor	1/4W	27KΩ
R 38	Carbon Film Resistor	1/4W	47Ω

Tr 1	Transistor	2SB173A
Tr 2	Transistor	2SB175A
Tr 3	Transistor	〃
Tr 4	Transistor	〃
Tr 5	Transistor	2SB324
Tr 6	Transistor	〃
Tr 7	Transistor	2SB 172A
VR 1	Variable Resistor	20KΩ
VR 2	Variable Resistor	2KΩ
VR 3	Variable Resistor	5KΩ
IT-1002R	Input Transformer	
OT-3003R	Output Transformer	
ICO 5	Oscillation Coil	
MP-01	Cilicon Diode	
MT-8T	Thermistor	
OA-70	Germanium Diode	

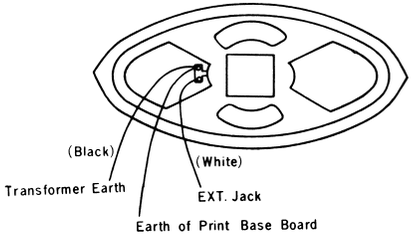




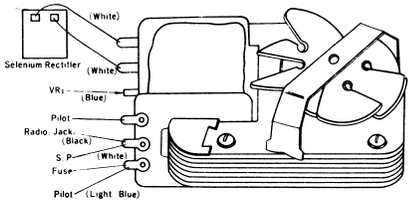
Jack Board Circuit

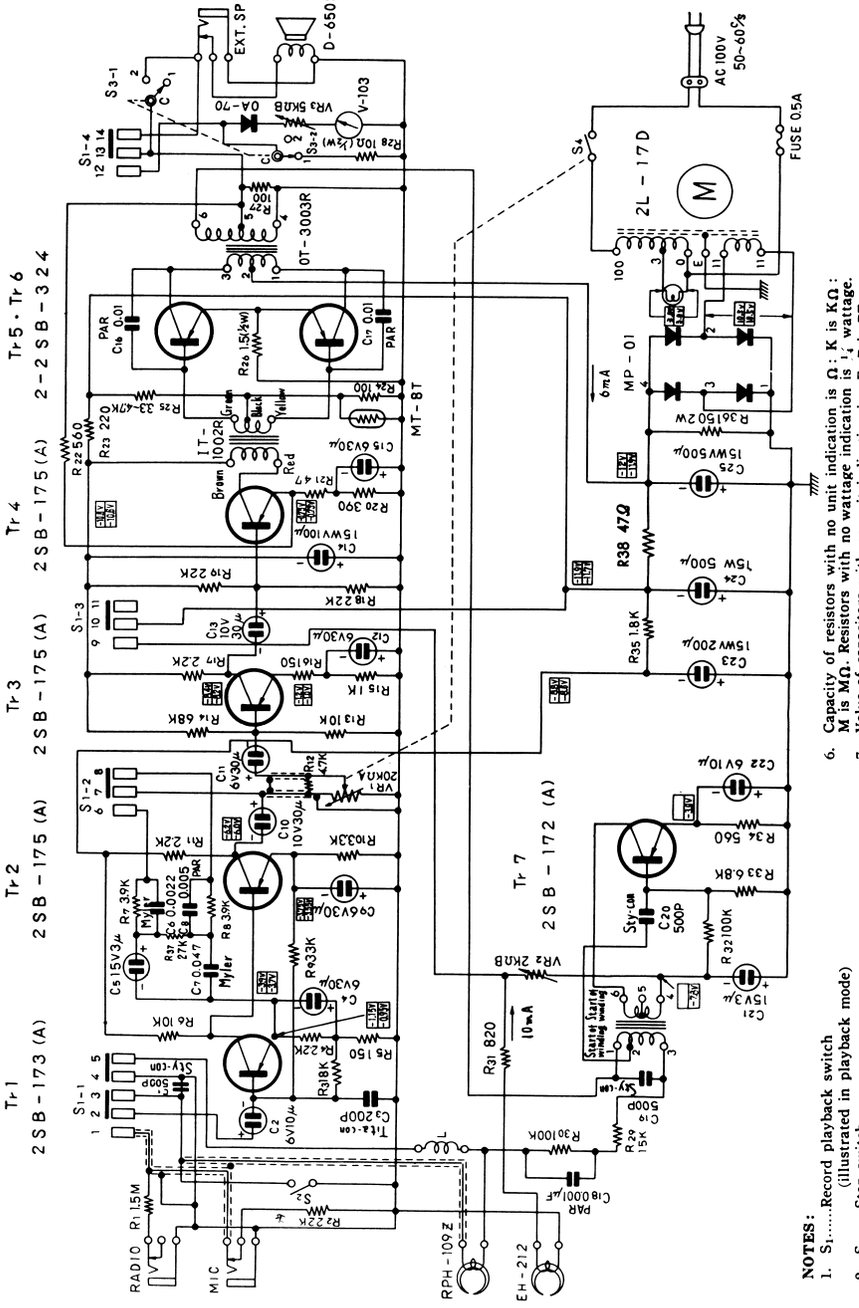


Speaker Circuit



Motor Circuit



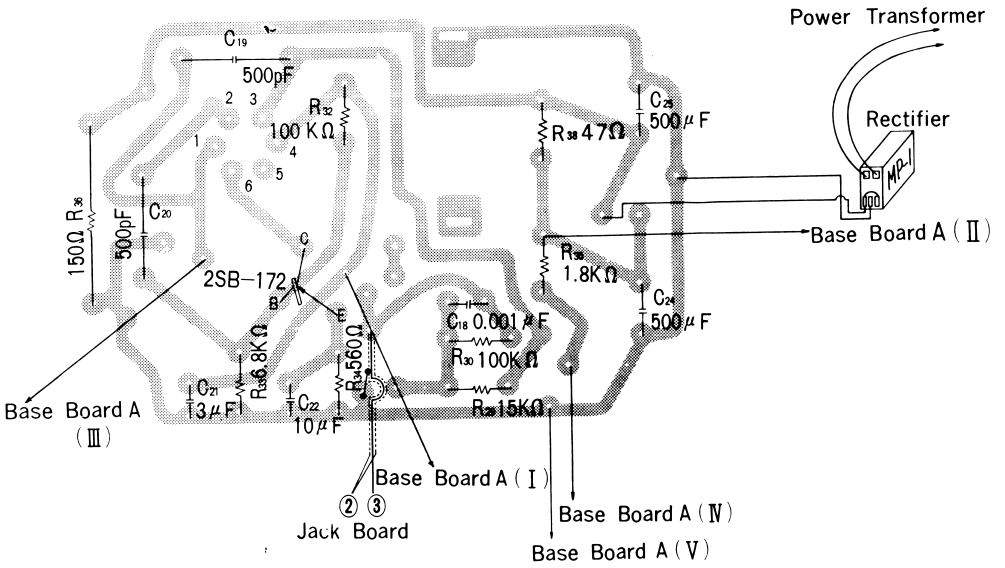


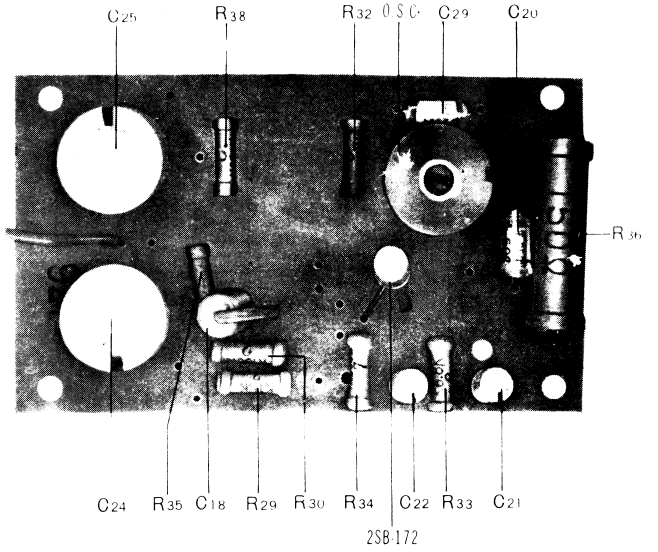
NOTES:

1. S_1.....Record playback switch (illustrated in playback mode)
2. S_2.....Stop switch (when the recorder is kept off. the switch is ON)
3. S_3.....Record monitor switch
4. S_4.....On/off switch (ganged with the volume control VR_1)
5. S_5.....Voltage select switch (illustrated for use at 220 Voltage)
6. Capacity of resistors with no unit indication is Ω : K is KΩ : M is MΩ. Resistors with no wattage indication is ¼ wattage.
7. Volue of capacitors with no unit indication is μF: P is PF.
8. Voltage volue indicated in parentheses shows the DC voltage between the chassis and a point at the time of no signal operation. The upper and lower figures in the parentheses show the playback voltage and the record voltage respectively.
9. Current value in the diagram shows the DC current at the time of the time of no signal operation.

N17-9. NATIONAL MODEL RQ-500

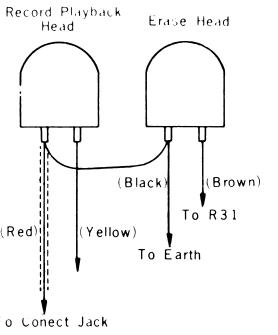
PRINT BASE BOARD 〔2〕



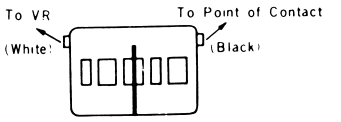


MAIN PARTS CIRCUIT DIAGRAN

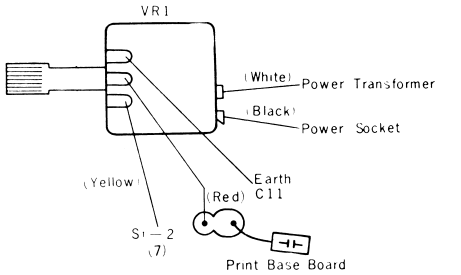
Head Circuit



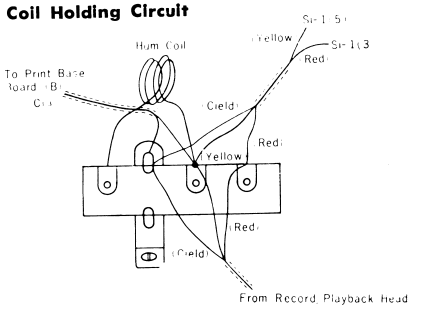
Level Meter Circuit



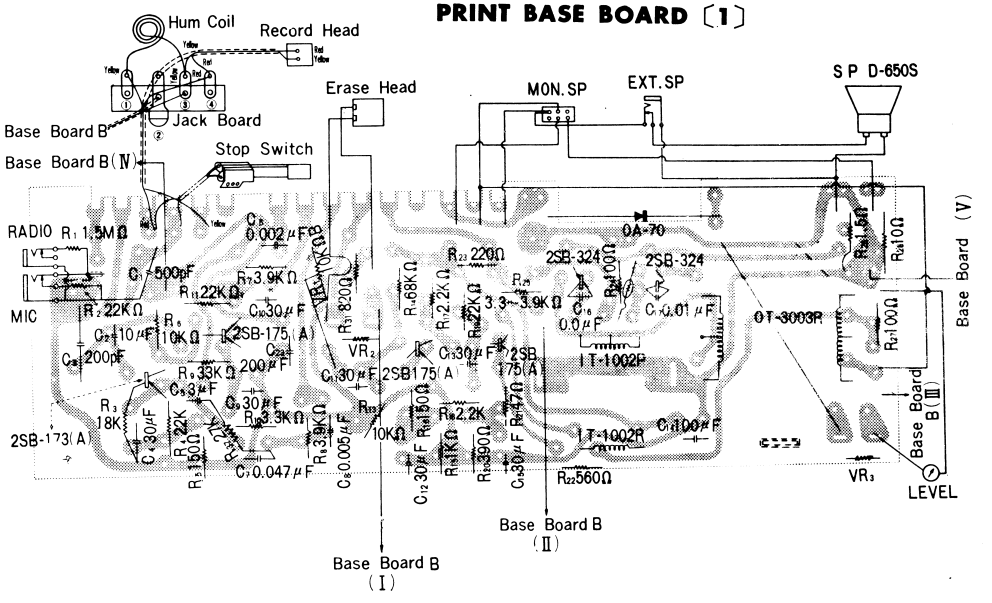
Power Source, Volume Circuit



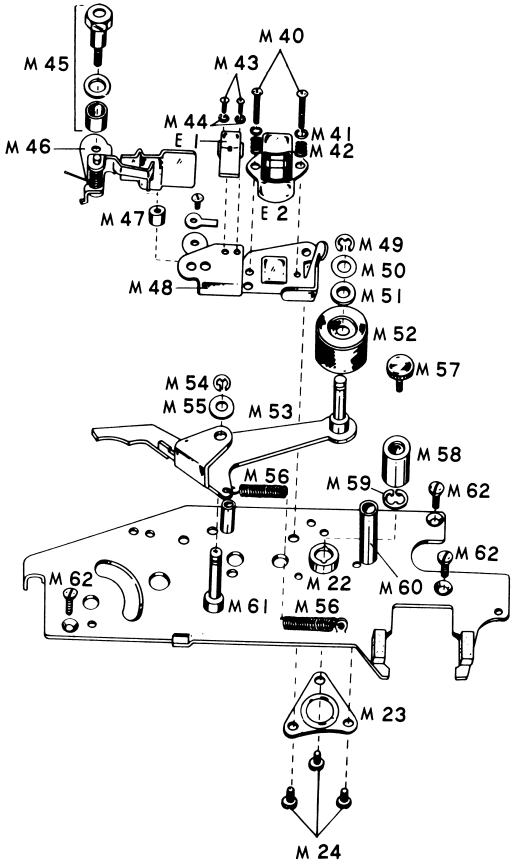
Hum Coil Holding Circuit

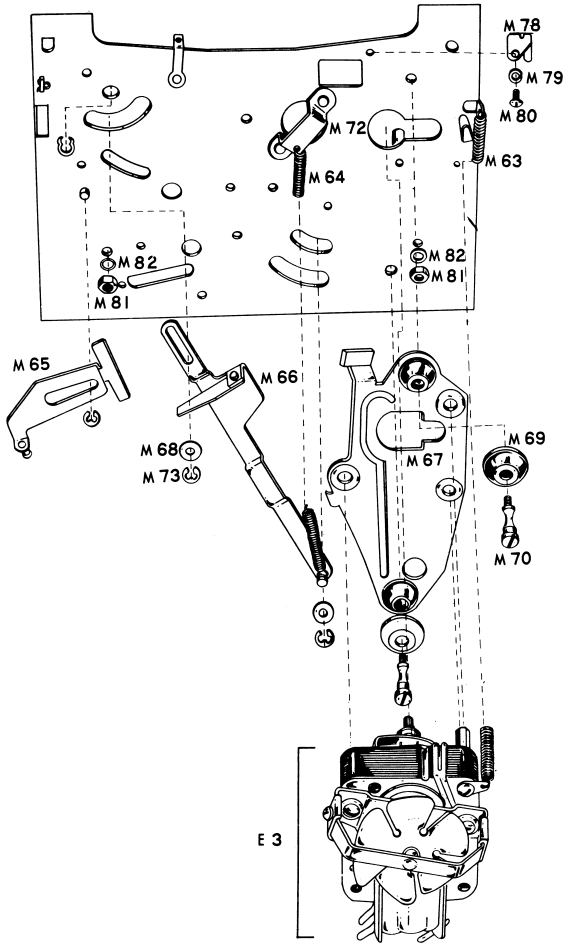


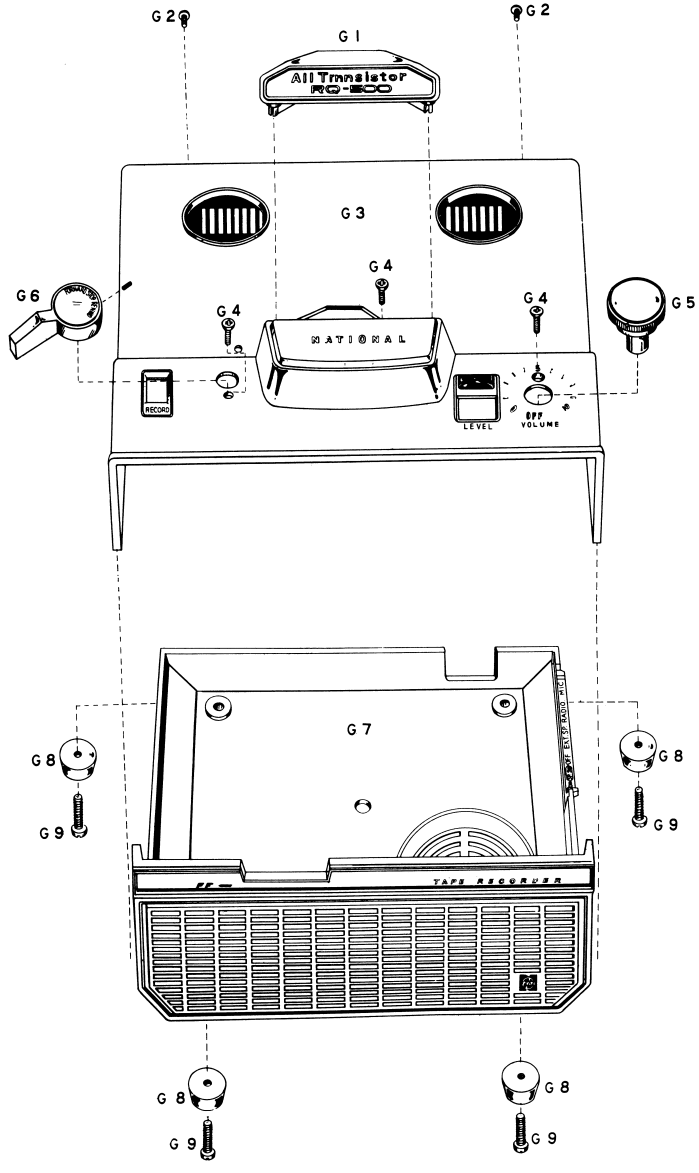
PRINT BASE BOARD 〔1〕



N17-7. NATIONAL MODEL RQ-500

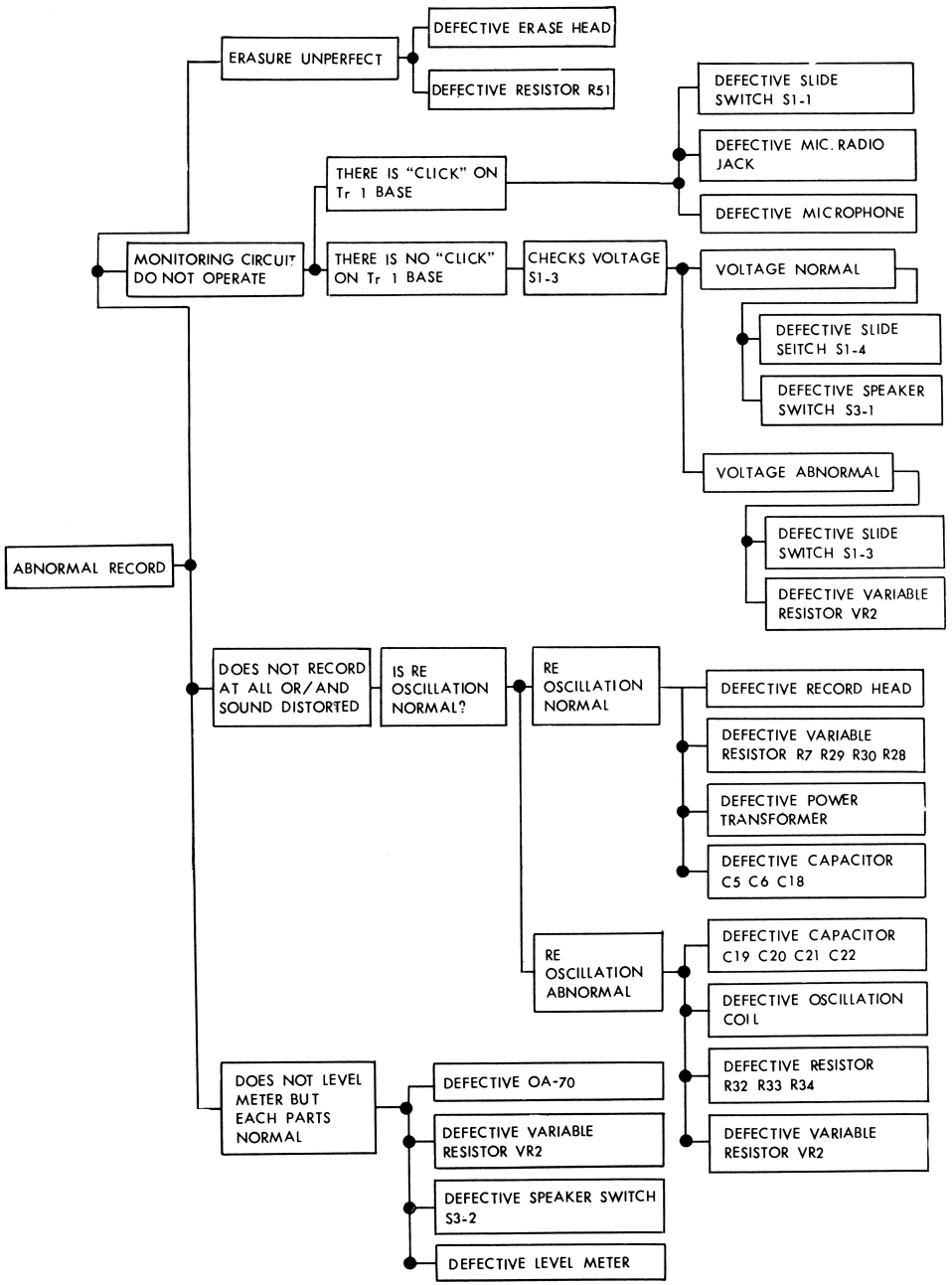






N17-5. NATIONAL MODEL RQ-500

TROUBLE SHOOTING GUIDE 4



REPLACEMENT PARTS

C 1	Titanium Capacitor	500PF
C 2	Electrolytic Capacitor	10μF 6V
C 3	Titanium Capacitor	200PF
C 4	Electrolytic Capacitor	30μF 6V
C 5	Electrolytic Capacitor	3μF 15V
C 6	Myler Capacitor	0.0022μF
C 7	Myler Capacitor	0.047μF
C 8	Paper Capacitor	0.005μF
C 9	Electrolytic Capacitor	30μF 6V
C10	Electrolytic Capacitor	30μF 10V
C11	Electrolytic Capacitor	30μF 6V
C12	Electrolytic Capacitor	30μF 6V
C13	Electrolytic Capacitor	30μF 10V
C14	Electrolytic Capacitor	100μF 15WV
C15	Electrolytic Capacitor	30μF 6V
C16	Paper Capacitor	0.01μF
C17	Paper Capacitor	0.01μF
C18	Paper Capacitor	0.001μF
C19	Titanium Capacitor	500PF
C20	Titanium Capacitor	500PF
C21	Electrolytic Capacitor	3μF 15V
C22	Electrolytic Capacitor	10μF 6V
C23	Electrolytic Capacitor	200μF 15WV
C24	Electrolytic Capacitor	500μF 15WV
C25	Electrolytic Capacitor	500μF 15WV
E 1	Erase Head	EH 21Z
E 2	Record/playback Head	RPH 109Z
E 3	Motor	
E 4	Speaker	VC 8Ω D-650S
E 5	Level Meter	
E 6	Stop Switch	
E 7	Pilot Lamp	
G 1	Head Cover	
G 2	Case Holding Screw	
G 3	Top Cover Case	
G 4	Set Screw for Cabinet Case	
G 5	Volume Control Knob & Power Source Switch	
G 6	Operating Lever	
G 7	Bottom Cover Case	
G 8	Rubber Foot	
G 9	Screw for Rubber Foot	
G10	Jack Board	
G11	Shield	
G12	MIC Jack	
G13	Radio Jack	
G14	EXT. SP Jack	
G15	SP. Switch Knob	
G16	Jack Board Metal	
M 1	Spring for Idler	
M 2	Fiber Washer for Idler	
M 3	Felt Washer for Idler	
M 4	Take-up Idler	
M 5	Rewind Idler	
M 6	Take-up Belt	
M 7	Screw for Reel Holder	
M 8	Take-up Reel Holder	
M 9	Reel Holder Pulley	
M10	Supply Reel Holder	
M11	Reel Holder Shaft	
M12	Brake (Assembly)	
M13	Screw for Brake Guide	
M14	Steel Washer for Brake Guide	
M15	Fiber Washer	
M16	Reel Holder Shaft (Right)	
M17	Take-up Guide Arm	
M18	Spring Washer for Take-up Guide Arm	
M19	Fiber Washer for Take-up Guide Arm	
M20	Setting Plate for Rewind Idler	
M21	Rewind Idler Spring	
M22	Chassis (A)	
M23	Flywheel Bearing	
M24	Screw	
M25	Flywheel	
M26	F.F Lever	
M27	F.F Lever Spring	
M28	Cam Plate	
M29	F.F Lever Knob	
M30	Operating Arm	
M31	Operating Arm Spring	
M32	Operating Lever	
M33	Chassis (B)	
M34	Brake Guide Spring	
M35	Setting Plate for Print Base Board	
M36	Stop Switch Setting Plate	
M37	Print Base Board Holder Plate	
M38	Front Angle Plate	
M39	Screw for Above	
M40	Screw for Record/Playback Head Adjust plate	
M41	Spring Washer for Record/Playback Head Adjust Plate	
M42	Spring for Record/Playback Head Adjust Plate	
M43	Screw for Erase head Adjust Plate	
M44	Spring Washer for Erase Head Adjust Plate	
M45	Tape Guide (Left) (Assembly)	
M46	Tape Pad (Assembly)	
M47	Tape Guide Spacer	
M48	Head Adjust Plate	
M49	Pinch Roller Spring	
M50	Fiber Washer for Pinch Roller	
M51	Felt Washer for Pinch Roller	
M52	Pinch Roller	
M53	Pinch Roller Lever	
M54	Spring Washer	
M55	Fiber Washer	
M56	Pinch Roller Spring	
M57	Capstan Screw	
M58	Capstan	
M60	Tape Guide (Right)	

N17-3. NATIONAL MODEL RQ-500

DISASSEMBLING

Bottom Cover Case

1) Turn over the body
2) Remove 4 metal screws.
3) Pull out bottom cover.

Tope Cover Case

To check and clean mechanical parts and amplifier, remove Top Cover Case as follows:

1) Pull out Head Cover upward.
2) Pull out Power Switch/Volume Control Knob.
3) Remove metal serew of Operating Knob.
4) Remove 5 screws on the top and sides of Top Cover Case.
5) Carefully take off Top Cover Case upwar[d].

Other PartS

Motor

1. Remove Belt from Motor-pulley.
2. Unsolder lead wires from Terminal Board of Motor.
3. Remove Motor Spring.
4. Remove 2 screws on Motor-holding plate.
5. Move Operating Lever to PLAY position.
6. Remove Motor together with Motor-holding plate.
7. Remove Motor from Motor-holding plate.

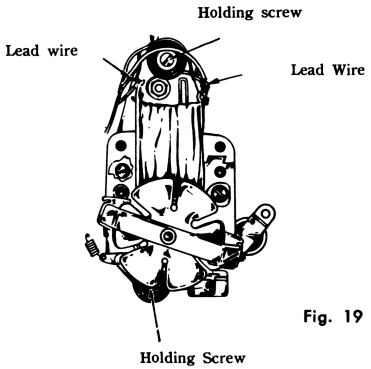


Fig. 19

UL-type Transistor 2SB-324

1. Remove Transistor Radiator Cap.
2. Remove 2 screws of Shieled-plate.
3. Unsolder 2 transistors.

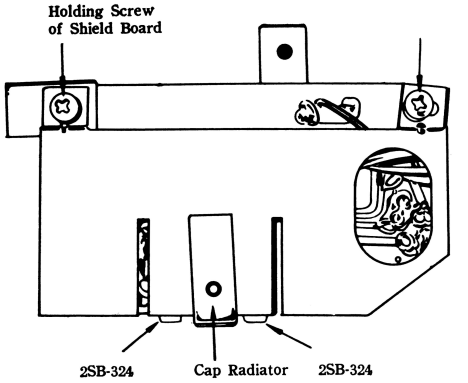


Fig. 20

Belt

1. Move Operating Lever to STOP position.
2. Remove Belt from Motor-pulley.
3. Remove Belt by turning Take-up idler.

Brake

1. Remove Brake-spring.
2. Loosen screw of Supply-reel holder, and remove Reel-holder.
3. Loosen screw of Takeup-reel holder, and remove Reel-holder.
4. Move Operating Lever to STOP position.

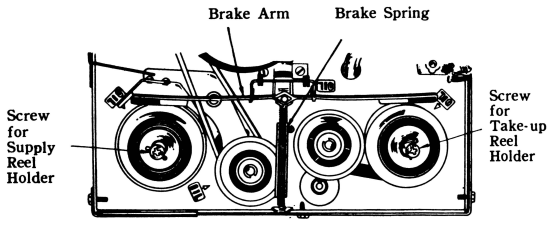
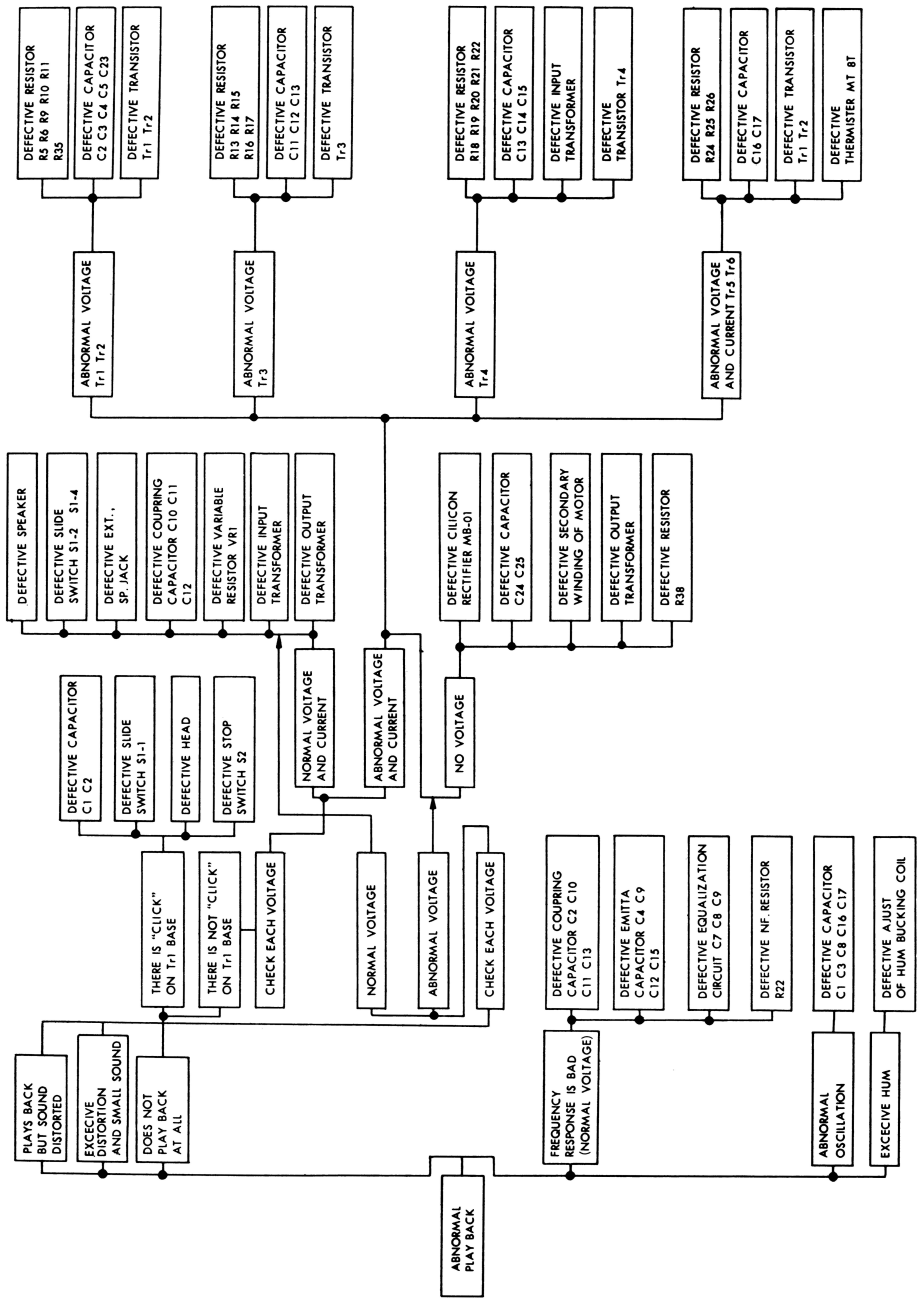


Fig. 21

TROUBLE SHOOTING GUIDE 1



Fast Forward (F. F.)

With Operating Lever at STOP position, pull the front F.F. Lever to the left. F.F. Lever pin moves in the direction of "arrow" mark and F.F. spring is pushed up, Take-up Idler is pressed against Reel-holder and tape is wound up speedily by Reel-holder.

Rewinding

Motor shifter is pushed in the direction of "arrow" mark and Motor-pulley comes off Flywheel. By the movement of Operating-arm, Take-up Idler is pressed against Rewinding Idler and rotation is transmitted to Supply-reel holder.
Pinch-roller arm is pressed by Cam-plate, and Pinch-roller arm is pressed by Cam-plate, and Pinch-roller is freed from Capstan. By the movement of Brake-lever and Brake-shifter, Brake comes off Reel-holder.
All these movements occur simultaneously by turning Operating Lever.

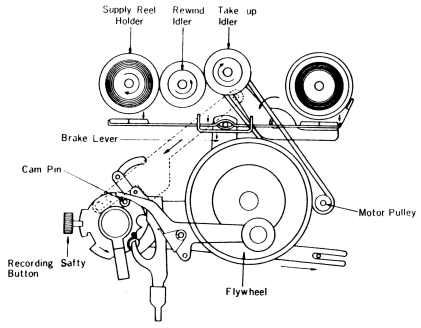


Fig. 9

STOP

When Operating Lever is turned to Stop, Brake is Pressed against the both Reel Holder.
Pinch Roller comes off Capstan and Motor Pulley comes off Flywheel.

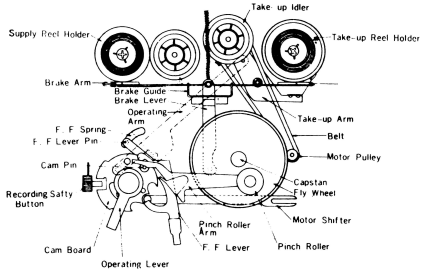


Fig. 10

ADJUSTING GUIDE

Adjustmont of Mechanical Parts

Instruments required : Spring Scale 50g, 150g, 300g, 500g, and 3 Kg.

Pinch-roller

Measurement

Set the unit in Playback or Record mode.
Do not load Tape-reel.
Attach a spring to Pinch-roller.
Hook Spring Scale (3Kg) on Pinch-roller, and pull Pinch-roller in the direction of a line to connect the centers of Capstan and Pinch-roller (See Fig. 11).
Take the reading of Spring Scale at a point where Pinch-roller ceases to rotate.
Pressure of Pinch-roller shall normally be :
320-420 g 33/4 ips (9.5 cm/sec) or
300-340 g 17/8 ips (4.75 cm/sec)

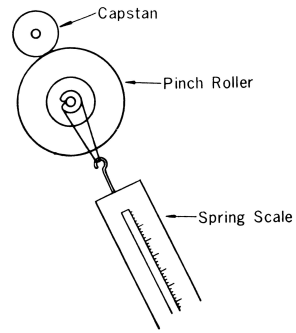


Fig. 11

Adjustment

Adjust Pinch-roller Spring (See Fig. 12).
If pressure is too weak cut shors the spring for 1～2 turns.
If pressure is too strong, stretch the spring throughout the length.

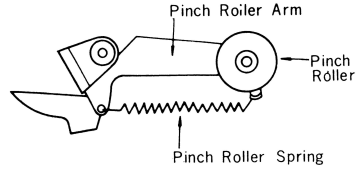


Fig. 12

Pressure of Motor

Measurement

Set the unit in Playback mode with Power Switch turned OFF.
Hang a spring around Motor-pulley in a loop.
Hook Spring Scale (500g) on the string and pull Motor away.
Take reading on the Scale at a point where Motor-pulley comes off Flywheel.
Pressure of Motor shall normally be 600-700 g.

Adjustment

Adjust Motor-spring (See Fig. 13.)
If pressure is too weak cut short the spring for 1-2 turns.
If pressure in too strong, stretch the spring throughout the length.

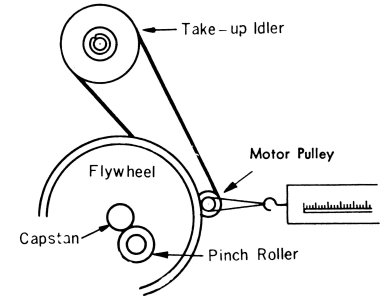


Fig. 13

Take-up Idler

Measurement

Set the unit in Playback mode with Switch turned OFF.
Hang astring around Take-up Idler in a loop.
Hook spring Scale (500g) on the string, and pull it in the direction of a line to connect the centers of Take-up Reel Holder and Take-up Idler.
Take reading on the Scale a point where Take-up Idler comes off Take-up Reel Holder.
Normal pressure of Take-up Idler shall be 150g.

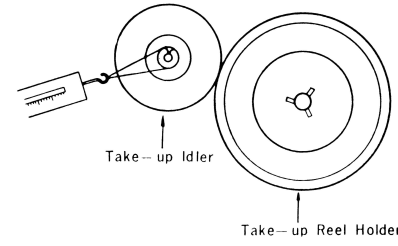


Fig. 14

Rewind Idler

Set the unit in Stop mode with Power Switch turned OFF.
Measure in a manner similar to Take-up Idler.
Normal pressure of Rewind Idler shall be 180～120g.

Winding Torque for Playback

Measurement

Form a loop at the end of No. 5 Tape by sticking tape end with abhesive tape and place the Reel on Take-up Reel Holder as shown Fig. 15.
Hook Tension Gauge, 50g on the loop at the end of Tape.
Set the unit in Playback or Recerd mode.
Let Take-up Reel pull Tension Guage.
Read the gauge where it ceases to swing. (Repeat several times)
Normal torque shall be 3～8 for No. 5 Tape, fully wound up.

Adjustment

Adjust with Tension Spring as shown Fig. 16.
If tension is insufficient, cut short the Spring for one coil or two, and if too strong, strentch the Spring in the whole length.

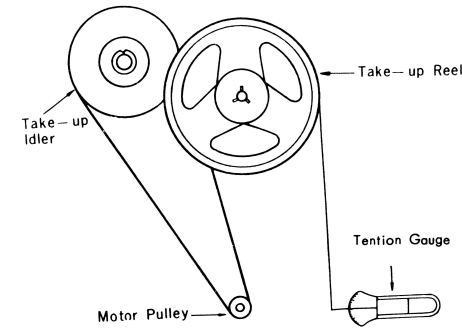


Fig. 15

Winding Torque for Fast Forward

Measurement

Meassure in a manner to Playback (Measure the unit in F.F. mode)
Normal Winding torque in Fast Forward mode shall be over 40g for No. 5 Tape, fully wound up.

Winding Torque for Rewind

Measurement

Measure in a manner similar to Playback, but the unit in Rewind mode.
Normal torque shall be over 40g for No. 5 Tape, fully wound up.