

SANYO

**All-transistorized 2-track capstan drive
EXTRA-COMPACT TAPE RECORDER**

MODEL MR-225 SERVICE MANUAL

SANYO ELECTRIC CO., LTD.

INTERNATIONAL DIVISION: SANYO ELECTRIC TRADING CO., LTD.
OSAKA, JAPAN



SPECIFICATIONS

Recording System	Automatic recording level control AC biasing, double track
Erasing System	DC erasing
Tape Speed	1-7/8 ips (4.5 cm/sec.)
Recording Time	80 minutes (double trip)
Rewind Time	Up to 2 minutes
Tape Reel	Maximum 2½ inch reel
Input Jack	Microphone : 1 Radio : 1 (100K ohms)
Output Jack	Earphone monitor (while recording) or extension speaker (while play-back) jack (8 ohms)
Loudspeaker	1¾" × 2¾" permanent dynamic speaker
Microphone	Dynamic type

Power Requirement	9 volt DC (6 penlight batteries)
Output Power	Undistorted 350mW Maximum 400mW
Frequency Response	150-3000 cps
Transistors	2SB346 1st amplifier 2SB185 2nd amplifier 2SB186 3rd amplifier 2SB187 × 2 Power amplifier (pushpull) 2SB187 Bias oscillator 2SB22 × 2 Electronic motor speed control 2SB186 Electronic motor speed control
Dimensions	6" wide × 6¼" high × 2" deep
Weight	2 lbs. (900 grams) (excl. batteries)

DISASSEMBLY INSTRUCTIONS

To remove the amplifier and mechanism from the cabinet:

1. Take off supply and take-up reel bases. Remove pinch roller by loosening its screw and pull off knob of operating rod after removing its screw.
2. Place the unit upside down and loosen 3 screws on the bottom as well as 1 screw inside battery compartment. Then you have

bottom cabinet free from mechanism.

3. Loosen 3 philips screws and stud nut. Front control panel will then be freed from mechanism except wiring connections.
4. Remove head housing and pinch roller in order to disassemble the tape deck panel.

HOW TO ADJUST MECHANISM

When tape recorder fails to respond to the movements of operating rod, for example, insufficient functioning, of rewinding or forwarding, slackening of tape at change of mode from "STOP" to "PLAYBACK", or excessive tension is applied to tape at every function, then following adjustments should be taken.

TOOLS AND GAUGES REQUIRED

To make adjustment of mechanism no tools are practically needed. However, in order to increase the reliability of mechanism and assure as if it is operating as accurately as originally designed, the following gauges are recommended to use.

Type of Gauges	Scale Coverage of Measurement
Tester	DC 10V, DC 10mA range
Tension Gauge	0-300grs. 0-100grs.
	0-1Kgrs. 0-3Kgrs.

ADJUSTING OF FORWARDING MECHANISM

Function of the switch (S7) should work effectively and the lead from this switch to electronic governor circuit should have electrically perfect connection. If you find short circuit point or poor connection or soldering, eliminate these defects by soldering new lead line. If function of switch is unstable, clean the contact points or replace with new part.

Check if the supply reel plate rotates smoothly and, if not, check lubrication and tension of coil spring.

After check and adjustment mentioned above, confirm the proper operation at both modes of "PLAYBACK" and "REWIND" without any unfavorable trouble.

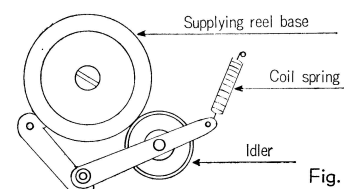


Fig. 1

PARTS LIST

Symbol No.	Stock No.	Description
	R-A31677a -R-31677a -R-39312 -R-39313 -R-S81225 -R-41547 R-A31675a -R-31675a -R-261348 -R-261394a - R-29022 R-12334 R-A39311 -R-39311 -R-261349 -R-261350 -R-261351 -R-112756 -R-112819 -R-39345 R-A31676a -R-31676a -R-23811 -R-23812 -R-261404 - - -R-25268 -R-25269 -R-471070a -R-43146 -R-471141 -R-26691 R-32577a R-32578 R-S81228 R-241183 R-28124b R-39314 R-39315 R-25145 R-148001 R-112432 R-12088 R-44288 R-S6384 R-S6396 R-S2123 R-S2124 R-S2149 R-261193 R-26879b	Assembly, Cabinet Top Lid Top Lid Tape Reel Window, Transparent Plastic Grille, Mic Constraining Hinge Cushion Plane, Mic Container Assembly, Tape Deck Panel Deck Plastic Aluminum Panel Jack Identify Metal, Mic Radio Speaker Net Shielding Plate, Motor Noise Lock Spring, Cabinet Top Lid Rubber Washer, Lock Spring Philips Self Tapping Screw Assembly, Front Control Panel Control Panel, Vacuum Metal Coating Metal panel, SANYO Mark Metal Panel, No Letters Strip Metal, REW. STOP PLAY Mtg. Angle, L Type Left End Mtg. Angle, U Type Middle Sect. Cloth, Operating Rod Assembly, Cabinet Bottom Cabinet bottom Metal ribbon, Righthand Metal ribbon, Lefthand Jack Identify Metal, PC9V Monitor Cloth Fiber Sheet, Battery Terminal Insulating Battery Terminal, Having Two Contacts Battery Terminal, Having One Contact Battery Instruction Sheet Cloth Ribbon, Battery Take-out Circuit Diagram Manufacturer Metal, SANYO Battery Compartment Lid Cushion Felt Head Housing Handle Handle Mtg. Stud Nut Nylon Washer, Handle Mtg. Polyethylene Washer, Handle Mtg. Knob, Operating Rod Knob, Volume Control Knob, Record & Forward Speaker Mtg Metal Stud Nut, Lead Clamp Lug, Speaker Clamp Metal, Mic Lead Rubber Sleeve, Mic Lead Strain Proof Microphone, Dynamic Type with Switch Speaker, Permanent Dynamic Type 1-1/2" x 2-1/2" 8ohms Jack, Extension Speaker Jack, Radio Input Socket, DC 9V Heat Sink Metal, Power Transistor Heat Sink Metal, Oscillator
VARIABLE RESISTORS		
	R-R11655 R-R11014	T-10K ohms, Volume Control 1K ohms, Semi-fixed
TRANSFORMERS AND COILS		
	R-W6301 R-W6302 R-W8193	Output Transformer Input Transformer Oscillator Coil
SWITCHES		
	R-S4350 R-S4339 R-S4340	Slide Switch, MIC-RADIO Select Slide Switch, Record/Playback Mode Change Push Switch, Forward Operation
TRANSISTORS AND OTHER ELEMENTS		
Tr-1 Tr-2 Tr-3 Tr-4, 5 Tr-6 Tr-7 Tr-8 Th-1 Th-2, 3 D-1		2SB346 1st Audio Amplifier 2SB185AA, 2nd Audio Amplifier 2SB186, 3rd Audio Amplifier 2SB187, Audio Power Amplifier 2SB187AA, Bias Oscillator 2SB22, Electronic Motor Governor 2SB186, Electronic Motor Governor SDT-20, Power Amp. Stage SDT-09, Motor Circuit DS-32, Zener Diode
CAPACITORS		
C16, C17 C22, C23 C24 C26 C1, C10 C2, C5, C6, C8 C3 C4, C7		600pF ±10% 125WV, Styrol 0.005μF +80-20% 35WV, Ceramic Disc 0.01μF ±20% 35WV, Ceramic 0.02μF +80-20% 25WV, Ceramic Disc 100μF 10WV, Electrolytic 5μF 6WV, // 10μF 3WV, // 30μF 3WV, //

Symbol No.	Stock No.	Description	
C9 C12 C13 C14 C18 C25 C19		50μF 9WV, Electrolytic 200μF 10WV, // 200μF 6WV, // 100μF 3WV, // 0.1μF 10WV, // 1μF 10WV, Alsicon 1000pF Special Cylinder Type	
RESISTORS			
R1 R2 R30 R3 R25 R4 R22 R5	22K ohm ±10% 27K ohm // 5.6K ohm // 390 ohm // 3.9K ohm //	R24 R26 R27 R28 R29	33K ohm ±10% 150K ohm // 330K ohm // 560 ohm // 27 ohm //
R6 R7 R9 R13 R8 R10 R11 R19 R15 R20	10K ohm // 47K ohm // 2.2K ohm // 220 ohm // 10 ohm //	R31 R32 R33 R34 R35	560 ohm ±5% 4.7 ohm ±10% 330K ohm ±5% 350 ohm // 2K ohm //
R16 R17 R18 R21 R23	1K ohm // 120 ohm // 3.9K ohm ±5% 8.2 ohm ±10% 100 ohm //	R37 R38 R39 R40 R41	8.2 ohm ±10% 15K ohm // 1.2K ohm // 180 ohm // 100K ohm //
COMPONENTS OF MECHANISM			
Stock No.	Description		
R-S81208 R-112712	Mechanism Chassis Assembly Mtg. Angle, Forward switch Round Head Machine Screw 2×4, Chassis Washer 2φ, Chassis Pan Head Screw 2×3, Mtg. Angle		
R-S81221 R-S81192 R-112688a R-12329 R-23840 R-S81193 R-241165 R-241166	DC Motor Angle, Motor Embracing Mtg. Angle, L Type Tension Spring, Motor Lug, Tension Spring Hook Flywheel Slotted Screw, Flywheel Mtg. Washer, 4.6φ 0.5t Flywheel Pan Head Screw 2×3, Motor-Angle Round Head Screw 2×3, Motor-Mtg. Angle Spring Washer 2φ, Motor		
R-248001 R-44289 R-44266 R-S81194 R-241150 R-241166	Sleeve Metal, Motor Sleeve Rubber, Motor Pinch Roller Lever Assembly, Pinch Roller Slotted Screw, Pinch Roller Washer 4.6φ 0.5t, Pinch Roller E-ring Washer, Lever Pinch Roller		
R-S81205 R-S81206 R-241165 R-241166 R-44270 R-S81212 R-12321 R-S81207	Supply Reel Base Take-up Reel Base Slotted Screw, Reel Bases Washer 4.6 0.5t, Reel Belt, Take-up Reel Base Pulley Assembly Tension Spring, Pulley Assembly Mtg. Pedestal Assembly, Heads Round Head Screw 2×3, Pedestal Assembly Spring Washer 2φ, //		
R-12362 R-S6375 R-241180	Tape Guide Spindle Erase Head Tube Spacer, E-head Flat Head Screw 2×8, E-head		
R-S6376	RP Head Pan Head Screw 2×4, RP-head		
R-S81211 R-112704	Pad Lever Pad Metal Pad Felt		
R-12322	Tension Spring, Pad Lever E-ring Washer, Pad Lever & Pulley		
R-12319 R-12320	Wire, E-head Side Wire, RP-head Side Round Head Screw 1.7×2, Wires		
R-S81195 R-44267 R-12309a	Idler Lever Assembly Idler Tension Spring, Idler E-ring Washer 2φ, Idler & Lever E-ring Washer 2.5, Idler Lever		
R-81218	Slide Metal, Motor Position Change E-ring Washer 1.5φ, Slide Metal		
R-S81219	Operating Lever E-ring Washer 2.5φ, Operating Lever Vinyl Tube, Operating Lever		
R-241196 R-12328a	Boss, Slide Metal Tension Spring, Idler Lever		
R-112713 R-12335a R-112714	Mtg. Angle, Record Switch Tension Spring, Record Switch Lever, Record Switch		
R-S4338	Pan Head Screw 2.3×5, Record Switch Spring Switch, S8 S9 Pan Head Screw 2×2, Spring Switch		

ADJUSTMENT OF REWIND MECHANISM

If you touch the supply reel base at "REWIND" mode operation, you experience relatively strong torque. If rotation of the reel base is weak and lag, please check the pressure of idler against supply reel base and flywheel and adjust coil spring in order to get pressure of 100 grams. If the pressing force is appropriate, check lubrication and foreign particle between spindle shaft and bearing of supply reel. As no vertical gap on mounting of both reel bases is one of factors causing defective rewinding, you must provide room for each reel base to elevate up and down a little, enabling each reel rotate smoothly, by eliminating a washer or using thinner washer.

ADJUSTMENT OF DRIVE MECHANISM

Pressure between motor shaft and flywheel

Insufficient pressure between motor shaft and flywheel can not provide normal operation at all modes by slippage. The pressure, which is measured in accordance with figure 2, and is the value at the stopping instance of flywheel rotation, should be 80 to 100 grams. Should the force not reach the above mentioned value, coil spring of motor must be properly adjusted.

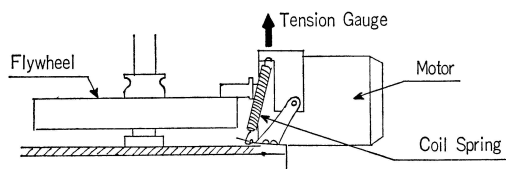


Fig. 2

Pressure between flywheel pulley and drive belt

Insufficient pressure of drive belt against flywheel pulley causes slipping between belt and pulley, being condemned unfavorable fast forward operation and tape loop unrewind at both "PLAYBACK" and "RECORD" mode. Adjust coil spring illustrated in Fig. 3 in order to transmit sufficient torque from flywheel pulley to take up reel base.

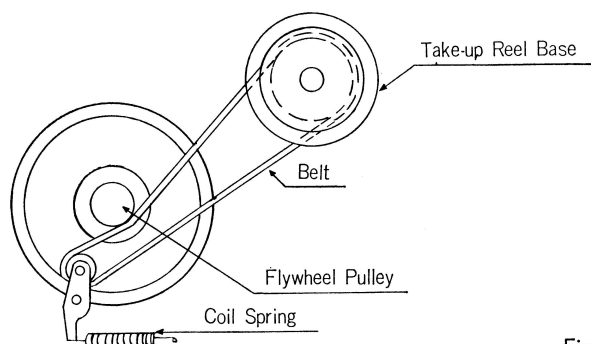


Fig. 3

ADJUSTMENT OF PLAYBACK MECHANISM

Pressure of pinch roller against capstan, measured in accordance with Fig. 4, should be in range of 240 to 360 grams. Measurement should be taken more than three times. Adjustment is made with coil spring.

Tension Gauge (reads 240-360 grams)

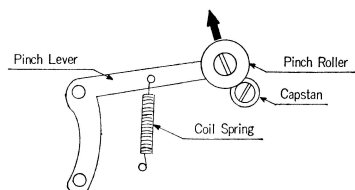


Fig. 4

ADJUSTMENT OF TAPE PRESSING PAD

Felt pad should meet face to face at right angle with the center of core slit and cover the entire breadth of recording tape. The pressure of pad against heads should be 20 to 30 grams. Adjustment is made with coil spring.

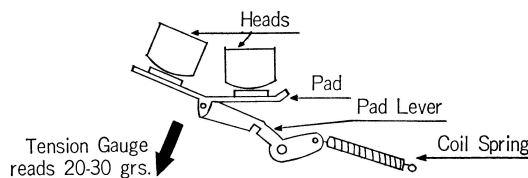


Fig. 5

CORRECT MOUNTING OF HEADS

Wrong mounting of erasing head results in incomplete erasing or unintentional erasing of other half track. Wrong mounting of Record/Playback head results in low level of playback output, poor response of high notes, and unfavorable signal intrusion from the lower track to the upper track being played back. Therefore, careful attention should be paid to mounting heads.

Both heads (i.e. erasing head and playback head) should be mounted on upright position without slanting to any directions and adjusted so that the supposed center line of core slit should face to tape at right angle with direction of tape motion.

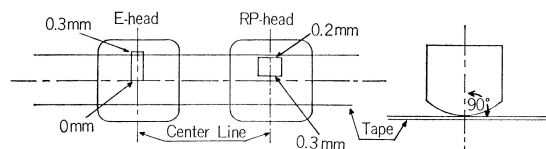


Fig. 6

LUBRICATION

All moving parts in this recorder were lubricated during manufacture and any further lubrication should rarely be needed. If for any reason it is necessary to replace any of the moving parts in this recorder, it is suggested that only the slightest amount of oil be applied to the bearing contacts. A single drop of oil is usually sufficient for most applications. Never permit any type of lubricant to contact the rubber parts of the recorder.

However, following lubrication will be expected after long service or replacement.

(A) Flywheel

Feed one and half drops into top of shaft. If rotation become sluggish after very long service, clean the flywheel shaft and bearing with alcohol and lubricate after completely drying up.

(B) Pinch roller

(C) Idler

(D) Supply and Take-up reel bases

WOW & FLUTTER

Wow and Flutter, due to irregularities in the tape speed during Record and/or Playback, is often caused by an accumulation of lint and dust on the various driving members. Should this condition occur, it is suggested that the following parts be cleaned with a soft cloth dampened with alcohol.

Record/Playback head, Erase head, Pressure pad, Pinch roller and Capstan

SPECIFICATIONS OF MECHANISM

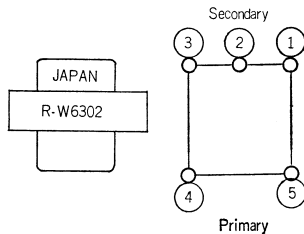
Current Drain	Playback	70mA (4V developed across motor)
	Fast Forward	80mA (8V developed across motor)
	Rewind	110mA (8V developed across motor)
Force necessary to operate	Rewind to Stop mode	400– 800 grams
	Stop to Rewind mode	300– 600 grams
	Stop to Playback mode	600– 900 grams
	Playback to Stop mode	650–1000 grams
	Stop to Record mode	600– 900 grams
	Record to Stop mode	700–1100 grams
Pressure of Pad	20–30 grams	
Pressure of Pinch roller	240–360 grams	
Tape Speed	Deviation	less than $\pm 3\%$
	Variation	less than $\pm 2\%$
Wow & Flutter	less than 0.5% at 4.75 cm/sec	
Fast Forward & Rewind Time	less than 2 minutes (2½" tape reel)	
Starting Voltage	6V (with maximum load)	
DC Motor	Rating voltage	4V
	Working voltage	3.5–4V
	Rating load current	less than 90mA

SPECIFICATION OF ELECTRIC CIRCUIT

Record/Playback head	Direct current resistance	500 ohms $\pm 20\%$
	Impedance (at 1kc)	1.8 Kohms $\pm 20\%$
	Optimum bias current	600 μ A $\pm 25\%$
	Standard recording current	40 μ A $\pm 20\%$
	Overall sensitivity	2.0–4.0mV
Erase head	Overall frequency response	3kc –10dB ± 5 dB (1kc=0dB)
	(R-S6375)	
	Direct current resistance	500ohms $\pm 20\%$
Recording bias current	Maximum tolerable erasing current	12mA DC
	Erasing ratio	less than -55dB (Erasing current: 5mA)
	Set the unit at "RECORD" mode and measure the voltage developed across RP head or secondary winding of oscillator coil. Then calculate the bias current from measured voltage. 600 μ A $\pm 25\%$ is desirable. Unproper current causes poor recording sensitivity or distorted sound.	
Erasing head	Measure the voltage across Erase head and calculate. Value around 5mA is desirable.	

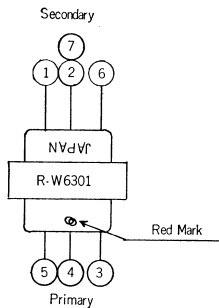
PARTS TERMINAL IDENTIFICATION

INPUT TRANSFORMER (R-W6302)



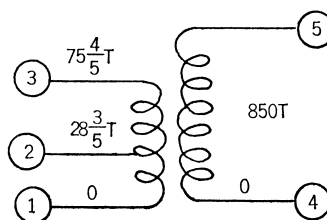
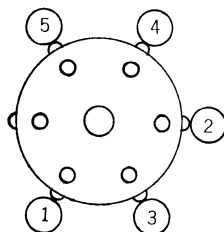
IMPEDANCE	DIRECT CURRENT RESISTANCE
Primary 5K Ω $\pm 10\%$ (1Kc 1V 0mA)	430 Ω $\pm 20\%$
Secondary 2K Ω	148 Ω $\pm 20\%$
Frequency Response 0.1Kc~10Kc (± 3 dB 1V 0mA)	

OUTPUT TRANSFORMER (R-W6301)



IMPEDANCE	DIRECT CURRENT RESISTANCE
Primary 200 Ω $\pm 10\%$ (1Kc 1V DC 0mA)	12.2 Ω $\pm 20\%$
Secondary 8 Ω	1.8 Ω $\pm 20\%$
Tertiary 5K Ω	570 Ω $\pm 20\%$
Frequency Response 0.1Kc~10Kc (± 2.5 dB)	

OSCILLATOR COIL (R-W8193)



Oscillating Frequency
33~37Kc

Oscillating Voltage
90V $\pm 10\%$

MECHANICAL TROUBLE SHOOTING CHART

TROUBLES	CAUSES	REMARKS
Capstan fails to rotate	*Defect of Motor 1 Breakage of winding 2 Poor contact between brushes and rotor. 3 Burnt metal bearing 4 Stained motor pulley with oil. *Defect of transmission 5 Burnt flywheel shaft or lack of oil 6 Oil-stained rim-rubber of flywheel 7 Weak tension of motor spring *Defect of switch 8 Poor contact of S8 *Electronic governor circuit	Check if voltage for motor rotation is $4V \pm 0.3V$
Slow rotation	*Defective motor 9 Burnt metal bearing *Defective transmission 12. See items 4 to 7. 13. Lack of oil on take-up reel and pulley shaft. 14. Lack of oil on idler *Electronic governor circuit 15. Poor contact of semifixed resistor	Adjust it to gain 4V output voltage.
Too much wow & flutter	*Defective motor 16. Poor contact between brushes and rotor. *Defective transmission 17. See items 4 to 7. 18. Foreign dust on rim-rubber of flywheel 19. Deformation & quality deterioration of flywheel rubber 20. Deformation and deterioration of belt *Defective tape travel 21. Poor rotation of idler & take-up reel 22. Insufficient pressure of pinch roller to capstan 23. Deterioration and deformation of pinch roller 24. Adherence of foreign material on surfaces tape travels	Continuity test Deformation of shaft, lack of oil, weak idler spring
Unsatisfactory winding	*Take-up reel not rotates 25. Broken belt or belt derailing 26. See items 1 to 7 and 9 & 12. *Take-up reel not rotates with tape loaded. 27. Elongated belt or poor pressing of belt against flywheel 28. Poor lubrication of both reel shafts	
Unsatisfactory rewinding	*Supply reel not rotates 29. Idler not tightly presses against supply reel and flywheel 30. See items 1 to 7, 11 and 28.	Check tension of idler spring.
Unable to record	*Circuit not switches to record mode.	Poor mounting of actuating lever
Partial erasing	*Poor location of E-head *Stained surface of E-head gap. *Weak pressing of tape pad *Adhered dust on tape guide	
Uneven winding of tape	*Both reel shaft not vertical *Pressing force of pinch roller to capstan is not unite at top and bottom of contact surface. *Elongated belt or weak tension of pulley spring.	Pinch roller shaft is not vertical.

TROUBLE SHOOTING CHART OF ELECTRIC CIRCUIT

TROUBLES	CAUSES
Motor fails to rotate at "RECORD"/ "PLAYBACK" mode.	<ol style="list-style-type: none"> 1. No work of switch (S8) 2. Defect of external power socket 3. Defect of motor 4. Trouble in electronic governor circuit.
Motor fails to gain speed in rewinding & rapid winding	<ol style="list-style-type: none"> 5. No make-circuit of switches (S7 and S8) 6. Rated voltage not develops across motor
Cannot record or playback	<ol style="list-style-type: none"> 7. Defect of amplifier (incl. input and output transf.) 8. Bad R/P head 9. Poor contact between tape and R/P head. 10. No make-circuit of switch (S2)
Can playback, but not record	<ol style="list-style-type: none"> 11. Failure of R/P mode select switch
Can record, but not playback	<ol style="list-style-type: none"> 12. Failure of R/P mode select 13. Defective speaker 14. Open or short circuit of output transformer 15. Magnetized E-head
Too much noises	<ol style="list-style-type: none"> 16. Poor contact of VR 17. Poor transistor (Particularly TR-1) 18. Deterioration of circuit element 19. Unintensional contact with adjacent elements or poor soldering 20. Magnetized R/P head 21. Distorted waveform of bias oscillation. 22. Insufficient grounding of printed circuit board
Increased noise by recording with mike	<ol style="list-style-type: none"> 23. Poor microphone 24. Defective C2 (Poor insulation) 25. Lost capacity of Filtor circuit (C1, C10, C12)
Inferior tone quality	<ol style="list-style-type: none"> 26. Deterioration of circuit elements or transistors 27. Inadequate bias current 28. Poor contact between tape and R/P head 29. Worn R/P head 30. Bad microphone 31. Defective speaker
Insufficient high notes	<ol style="list-style-type: none"> 32. Poor azimuth alignment of R/P head 33. Excessive capacity of C22 and C23 34. Poor operation of AC bias oscillation circuit 35. Weak pad pressure to R/P head
Excessive reproduction at high notes	<ol style="list-style-type: none"> 36. Small capacity value of C22 and C23
Cannot erase	<ol style="list-style-type: none"> 37. Poor location of E-head 38. Poor contact between tape and E-head 39. Dificient erasing current 40. Open or short circuit of E-head winding
Cross talk between two tracks	<ol style="list-style-type: none"> 41. Improper position of tape guide or vertical deviation of tape movement 42. Bad location of R/P HEAD
Low output	<ol style="list-style-type: none"> 43. Deteriorated transistors or circuit elements 44. Short circuit, breakage, and poor soldering of elements. (Especially defective by-pass capacitor of emitter circuit) 45. Malfunction of bias oscillator 46. Defective head, mike or speaker
Higher speed than usual, or unsteady tape traval	<ol style="list-style-type: none"> 47. Defective transistor or elements in electronic governor circuit

CIRCUIT DIAGRAM

