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ROTEL®

Technical Manual

STEREO CASSETTE DECK RD-20

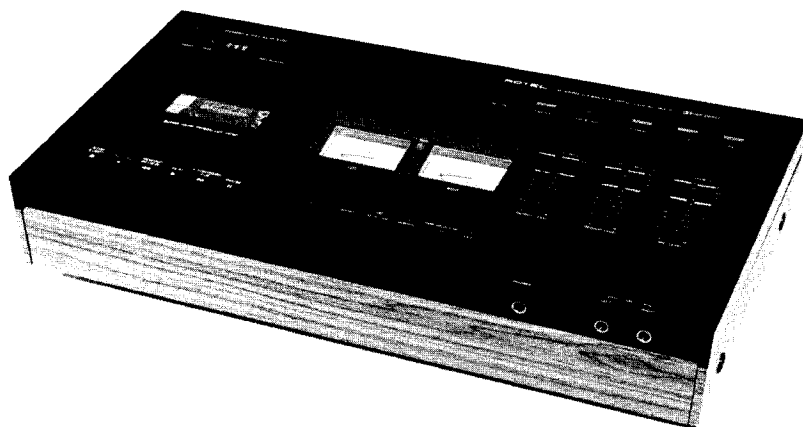
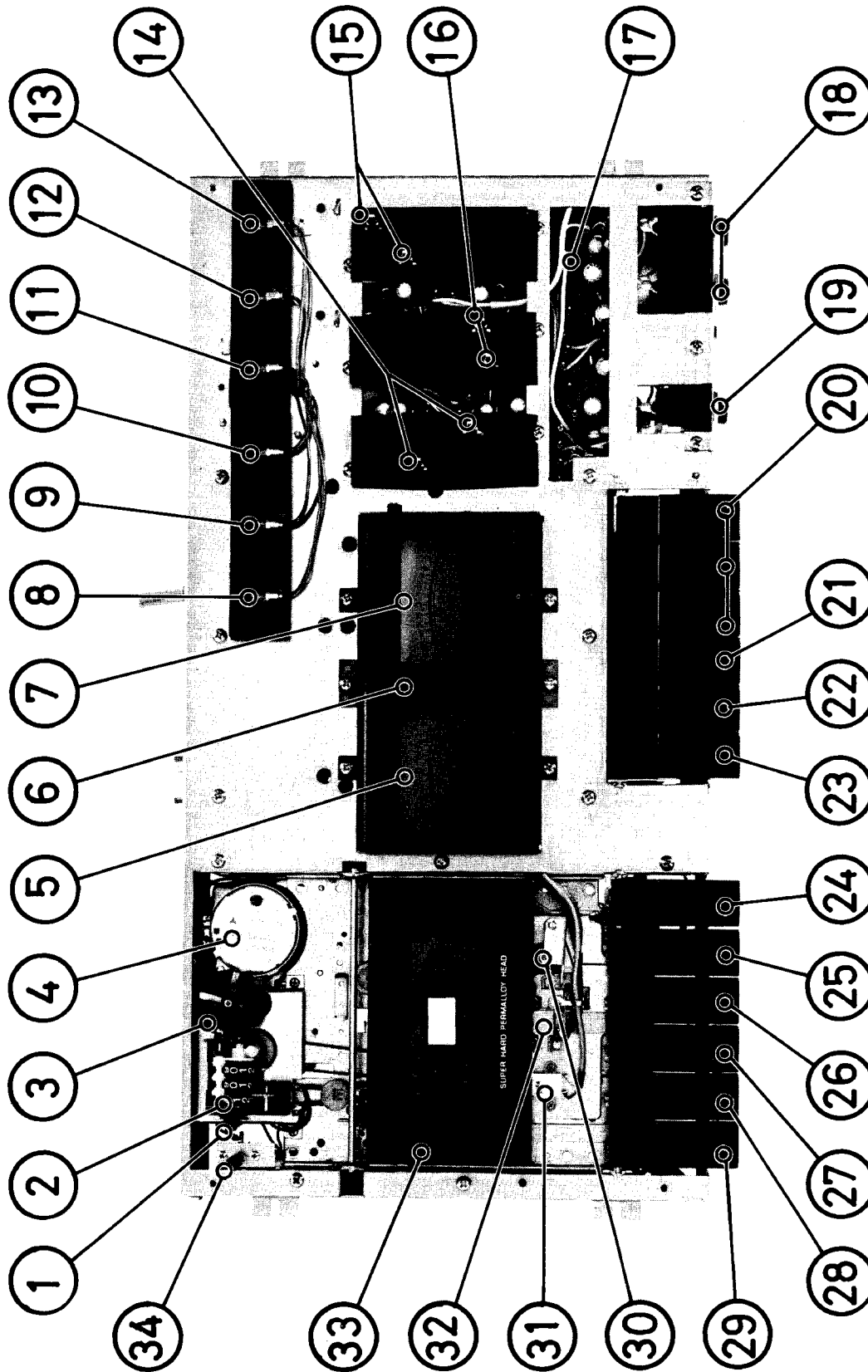


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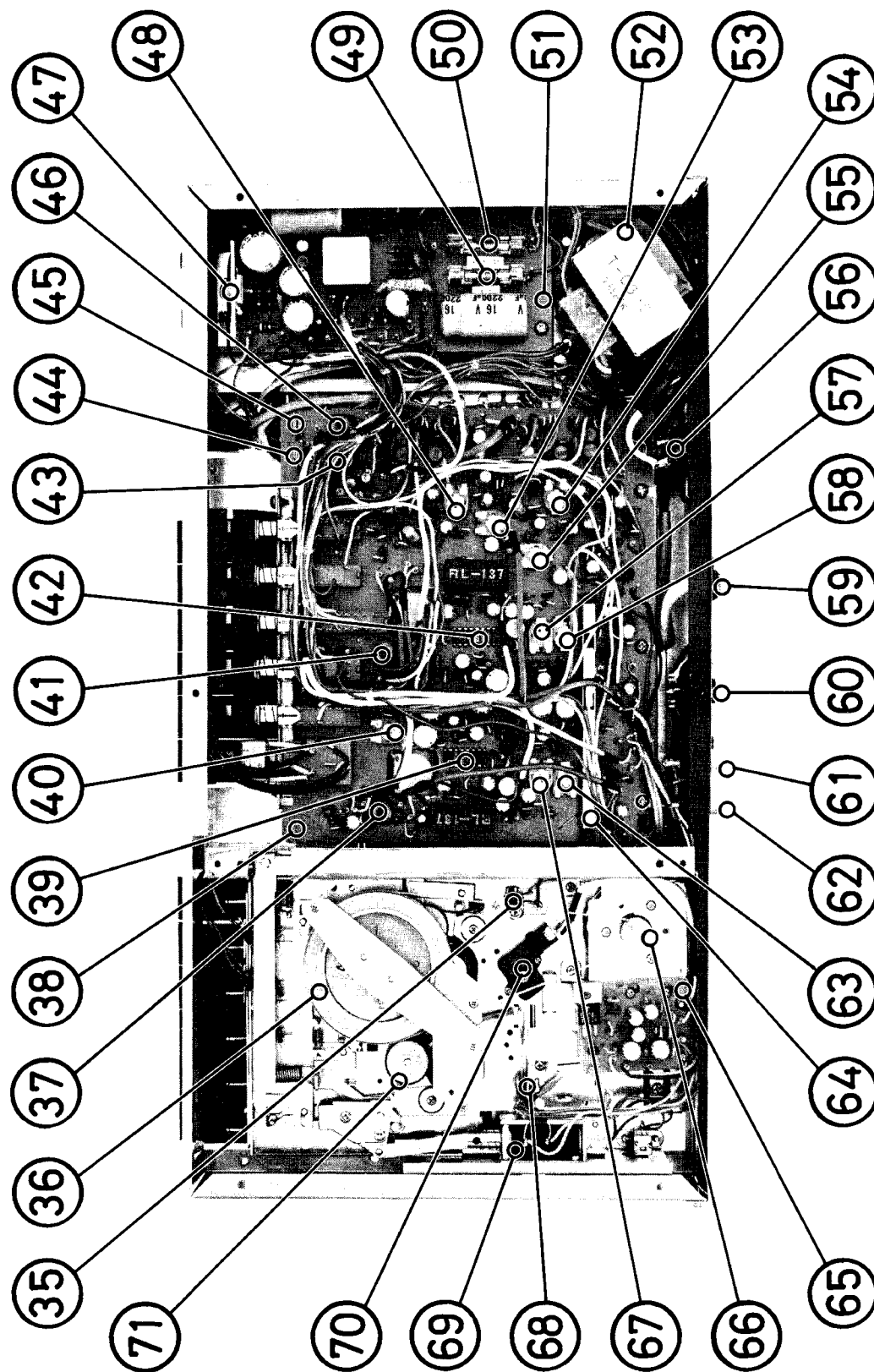
Serial Nos. Beginning
NA-30836

CHASSIS LAYOUT (TOP VIEW)



- | | | |
|-------------------------------------|-------------------------------|---------------------------|
| 1. Counter Reset Button | 13. FeCr Tape Indicator | 25. FF and Cue Button |
| 2. Tape Counter | 14. Output Level Control | 26. Play Button |
| 3. Tape-Run Indicator | 15. Mic Level Control | 27. Rew and Review Button |
| 4. Motor | 16. Record Level Control | 28. Record Button |
| 5. L-ch VU Meter | 17. Headphone and Mic Amp pcb | 29. Stop and Eject Button |
| 6. Peak Indicator | 18. Mic Jacks | 30. Pinch Roller |
| 7. R-ch VU Meter | 19. Headphone Jack | 31. Erase Head |
| 8. Rec Indicator | 20. Tape Bias Selector | 32. Rec and PB Head |
| 9. Limiter Indicator | 21. Dolby NR Switch | 33. Cassette Case |
| 10. Dolby Indicator | 22. Limiter Switch | 34. Memory Button |
| 11. Normal Tape Indicator | 23. Power Switch | |
| 12. CrO ₂ Tape Indicator | 24. Pause Button | |

CHASSIS LAYOUT (BOTTOM VIEW)



- | | | |
|-------------------------------------|---|---|
| 35. Pause Switch | 48. VR103, VU Meter Level Adj, L-ch. | 61. Line-out Jacks |
| 36. Flywheel | 49. F902, DC Fuse, 1A | 62. Line-in Jacks |
| 37. L101, Trap Coil, L-ch | 50. F901, DC Fuse, 500mA/T/0.5A | 63. VR102, Playback Level Adj, L-ch |
| 38. PB/Rec Amp pcb | 51. Power Supply and Rec Bias Osc pcb | 64. PB/Rec Switch |
| 39. IC101, Dolby NR Amp IC, L-ch | 52. Power Supply Transformer | 65. Auto-Stop Sensing pcb |
| 40. VR206, Peak Indicator Level Adj | 53. VR104, Rec Level Adj, L-ch | 66. Motor Pulley |
| 41. L201, Trap Coil, R-ch | 54. VR203, VU Meter Level Adj, R-ch | 67. VR101, Playback Equalizer Adj, L-ch |
| 42. IC201, Dolby NR Amp IC, R-ch | 55. VR204, Rec Level Adj, R-ch | 68. Play Switch |
| 43. L103, Trap Coil, L-ch | 56. Voltage Selector | 69. Plunger Solenoid |
| 44. VR105, Rec Bias Level Adj, L-ch | 57. VR201, Playback Equalizer Adj, R-ch | 70. Sensor |
| 45. VR205, Rec Bias Level Adj, R-ch | 58. VR202, Playback Level Adj, R-ch | 71. Rewind Idler Pulley |
| 46. L203, Trap Coil, R-ch | 59. Power Supply Cord | |
| 47. Q901, Stabilizer | 60. PB/Rec DIN Socket | |

ALIGNMENT PROCEDURES

Instruments: High Sensitivity AC VTVM, Oscilloscope, Wow & Flutter Meter, HD Analyzer, Audio Generator, Attenuator, Test Tapes (LCT-3001, LCT-3013, LCT-3031-C, LCT-7001, etc.)

I. RUNNING TEST

To check for stable, steady, trouble-free operation of mechanism and motor.

First, apply rated voltage into power supply. Depress PLAY button and make a test run for 10 ~ 30 minutes.

II. CHECKING AUTO-SHUTOFF OPERATION

To make certain that the shutoff device works normally at rated voltage -15%.

A. Checking with Memory Switch

Insert blank tape into deck. Set Memory Switch to ON and depress REW button to start the mechanism. Make certain the mechanism stops operation and the button is released when the tape counter reaches "999".

B. Checking Operation at End of Tape

With 10 seconds* after tape is wound up and winding stops, shutoff device should automatically stop all mechanical action, at which point the button is released.

Note:

1. *The shutoff device should begin to work in 3 ~ 5 seconds.
2. This test is carried out by depressing REW button instead of inserting tape into deck. At this time, set Memory Switch to OFF.

III. TAPE SPEED ADJUSTMENT AND WOW AND FLUTTER MEASUREMENT

A. Connect Wow and Flutter Meter to LINE-OUT jack. Output Level control should be set to maximum.

B. Insert test tape LCT-3001 and depress PLAY button. Adjust potentiometer inside the motor so that the tape speed counter on Wow and Flutter Meter indicates 3,000.

Note: Allowable margin of deflection at the beginning, at the middle or at the end of winding is in the range of $\pm 1\%$ (at 3,000Hz allowable margin of deflection of speed is 3,030 ~ 2,970).

C. Check to see that Wow and Flutter Meter reads as follows:

1. JIS Weightedunder 0.15%
2. CCIR Weightedunder 0.25%

Note:

Prior to making Tape Speed Adjustment, be sure to complete running test in I.

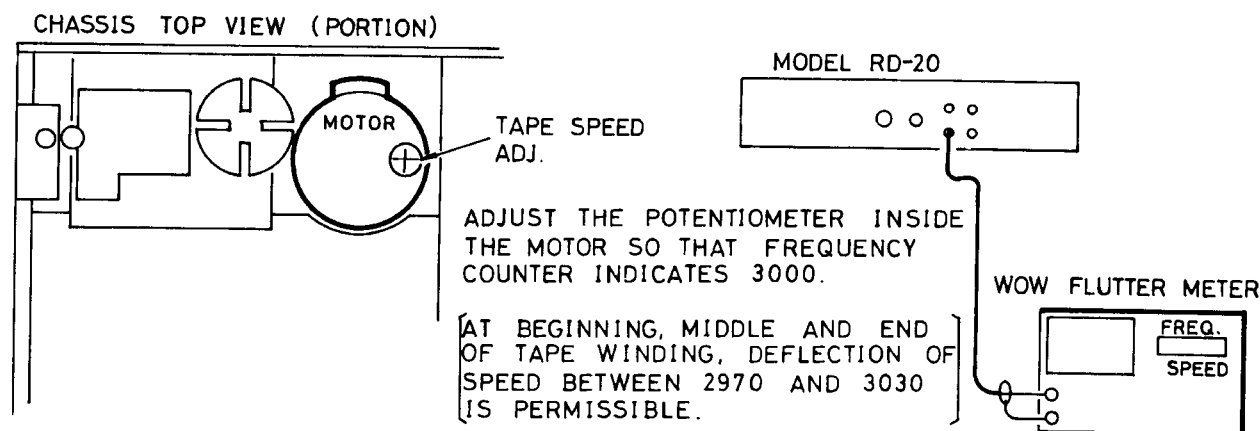


FIG. 1. TAPE SPEED ADJUSTMENT

IV. AZIMUTH ADJUSTMENT

- Connect oscilloscope to LINE-OUT jack. And insert test tape LCT-3013 and depress PLAY button.
- Turn adjusting screw of PB/Rec Head while switching oscilloscope from left to right or vice versa to obtain maximum deflection.

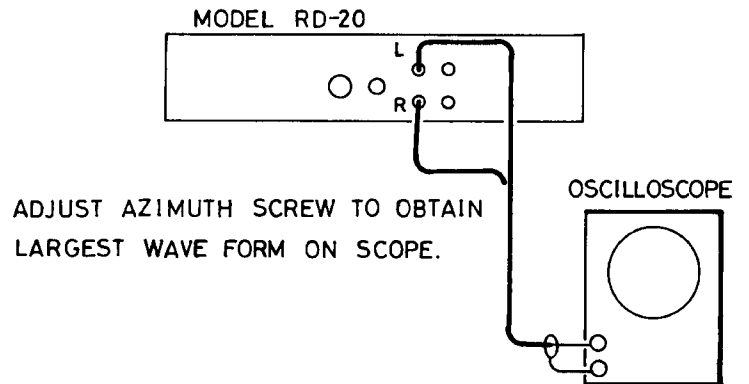
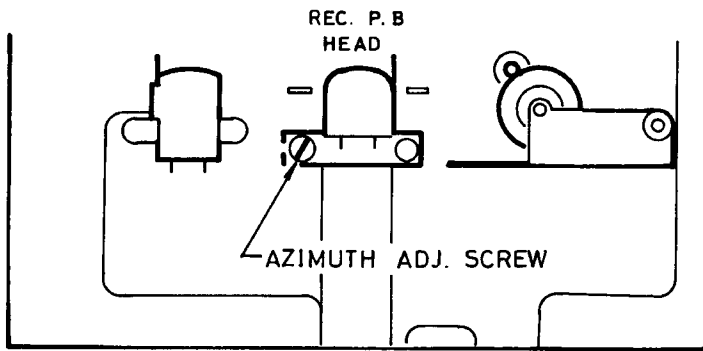


FIG. 2. AZIMUTH ADJUSTMENT

V. PLAYBACK EQUALIZER FREQUENCY RESPONSE ADJUSTMENT

- Plug oscilloscope and AC VTVM into LINE-OUT jack. Insert test tape LCT-3031-C into deck and depress PLAY button.
- Adjust potentiometer VR101 (VR201 for R-ch) on PB/Rec Amp pcb so that 1kHz signal level and 10kHz signal level at playback are equal. Allowable margin of difference between 40Hz signal level and 1kHz level is 5dB.

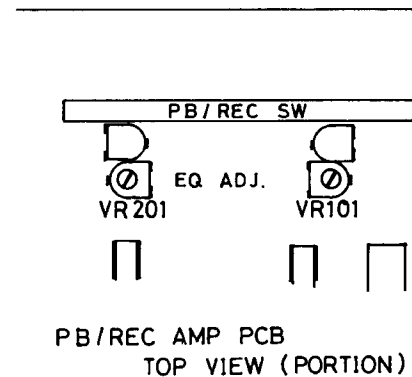


FIG. 3. PLAYBACK EQUALIZER RESPONSE ADJUSTMENT

VI. PLAYBACK LEVEL ADJUSTMENT AND VU METER CALIBRATION

- Connect AC VTVM to test pin TP5 (j17) of PB/Rec Amp pcb (TP6 for R-ch).
- Insert test tape LCT-7001 and depress PLAY button.
- Adjust potentiometer VR102 (VR202 for R-ch) of PB/Rec Amp pcb so that output level is 580mV.
- Adjust potentiometer VR103 (VR203 for R-ch) of PB/Rec Amp pcb so that VU meter indicates +3dB point.

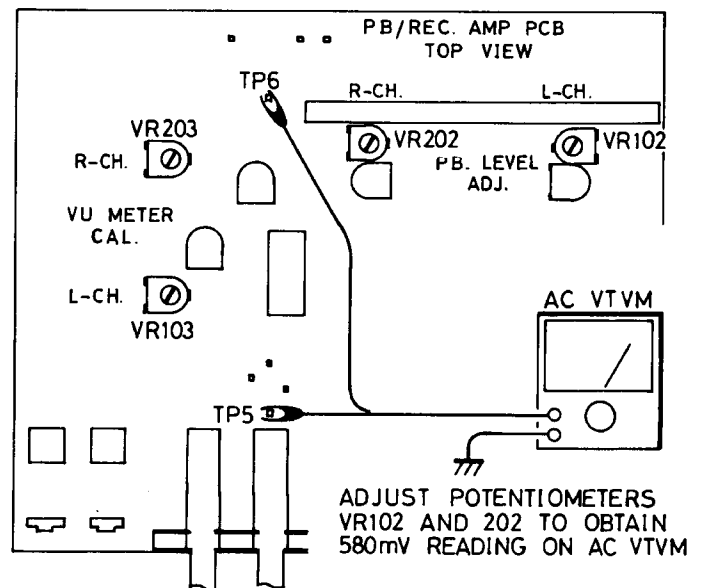
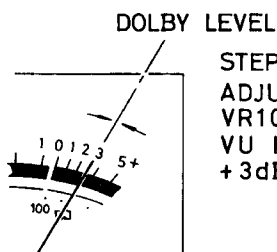


FIG. 4. PLAYBACK LEVEL ADJUSTMENT HOOK-UP

VII. REC BIAS CARRIER TRAP ADJUSTMENT

- Connect oscilloscope to test pin TP3 (TP4 for R-ch) on PB/Rec Amp pcb and insert blank tape into deck. Depress REC button.
- Adjust trap coil L101 (L201 for R-ch) to obtain smallest wave form of generated frequency for bias on the oscilloscope.
- Reconnect oscilloscope to test pin TP9 (TP10 for R-ch) on PB/Rec Amp pcb, and adjust coil L103 (L203 for R-ch) to obtain smallest wave form on oscilloscope.

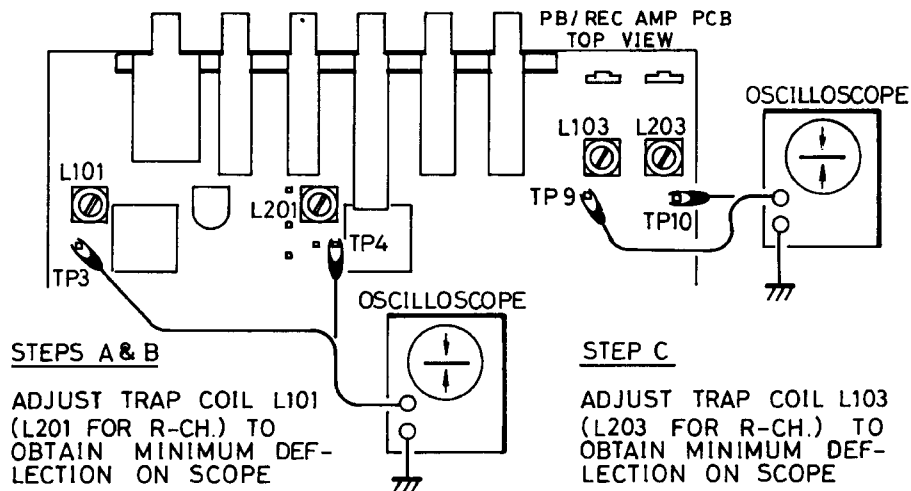


FIG. 5. REC BIAS CARRIER TRAP ADJUSTMENT

VIII. RECORDING LEVEL ADJUSTMENT

- Connect Audio Generator to LINE-IN terminal and apply 400Hz, 0dB (sine wave) signal.
- Insert blank tape and simultaneously depress REC and PLAY buttons. Adjust recording level using potentiometer VR104 (VR204 for R-ch) to get output signal level of 0dB at playback. Repeat action until output signal level is precisely 0dB.
 - Adjust LINE-OUT level control so that AC VTVM connected to LINE-OUT reads 0dB when recording. Note the difference of output levels at recording and at playback of tape which has recorded 400Hz (0dB) signal.
 - Next, connect AC VTVM to Test Point TP7 (TP8 for R-ch) and depress REC button. Adjust potentiometer VR104 (VR204 for R-ch) to eliminate difference in levels. (If output signal level at playback is higher than 0dB, turn potentiometer counter-clockwise, and if it is lower, turn clockwise.)
 - Finally, record and play back tape, making certain that output level at playback is 0dB.

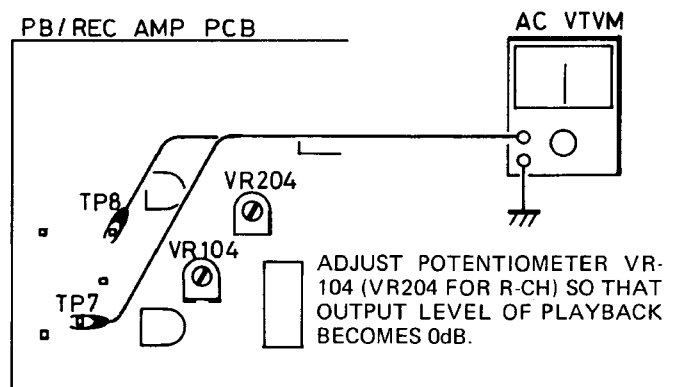


FIG. 6. PLAYBACK/REC LEVEL ADJUSTMENT

IX. REC BIAS ADJUSTMENT

- A. Connect AC VTVM and oscilloscope to LINE-OUT terminal and connect Audio Generator to LINE-IN terminal.
- B. Insert chromium tape (Sony CR, etc.) and set Tape Selector to CrO₂.
- C. Record 400Hz (−20dB) signal from Audio Generator, then switch frequency to 10kHz (−20dB) and record the signal.

Repeat recording and playback until output levels of 400Hz and 10kHz both reach −20dB at time of playback of the recorded tape. This level is obtained by adjusting potentiometer VR105 (VR205 for R-ch) on PB/Rec pcb.

- D. Next insert normal tape into deck and set Tape Selector to NORMAL.

Apply 10kHz (−20dB) signal from Audio Generator and record and play it back. If output level at playback is lower than the level at recording, remove fixed resistors R158, R159 and R160 in that order as necessary, while checking the effect by repeating recording and playback. Maximum permissible difference between recording and playback levels is ± 3 dB. (DO NOT remove R161.)

- If output level at playback for 10kHz is still lower, even after removing all the above three fixed resistors which are placed in parallel with R161, head must be replaced. Even after new head is inserted, if the output level at playback for 10kHz is higher than the level at recording, insert the above three resistors one at a time, as necessary, in the reverse order from above, and check the effect.

- E. Next, set Tape Selector to FeCr and insert Ferri-chrome Tape (Sony Duad, etc.) into deck. Record 10 kHz (−20dB) signal and play back the recorded tape as in Phase D. If output level at playback is lower, remove fixed resistor R162, R163, and R164 in that order, as necessary, and check by repeated recording and playback. (DO NOT remove R165.)

X. DISTORTION CHECK

- This test should be carried out after completing IX Bias Adjustment.

- A. Connect oscilloscope and HD Analyzer to LINE-OUT terminal and connect Audio Generator to LINE-IN terminal.
- B. Record and play back 400Hz (0dB) signal and make certain distortion is:
 - 1) under 1.5% for normal tape.
 - 2) under 2.5% for chromium tape.
 - 3) under 1.5% for ferri-chrome tape.

If the distortion factor exceeds the above values, either bias is inadequate or there is a fault in the tape or PB/Rec head.

XI. SIGNAL-TO-NOISE RATIO MEASUREMENT

- A. Connect AC VTVM to LINE-OUT terminal, and insert test tape (MTT-112S) into recorder.
- B. Depress PLAY button to reproduce 333Hz signal and note the output level on AC VTVM. Then note the level on AC VTVM at a time when no signal is reproduced. The difference between the two levels should be 40dB or over.

XII. ERASING FACTOR MEASUREMENT

- A. Connect AC VTVM to LINE-OUT terminal via noise filter.
- B. Connect Audio Generator (employing ATT) to LINE-IN terminal.
- C. Insert normal blank (virgin) tape and record 2,000Hz, +20dB signal from Audio Generator. Suppose reading on AC VTVM at the time of playback is 0dB.
- D. Erase the recorded tape and play back. The reading on AC VTVM should be under −48dB from supposed 0dB point at Phase C. (i.e. the difference between the output level of 2,000Hz signal at the time of playback and the output level after erasing should be 48dB or over.)

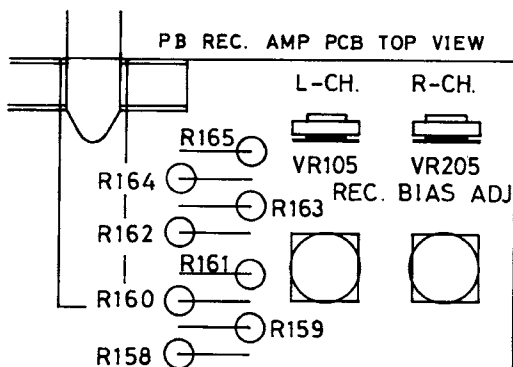


FIG. 7. REC BIAS ADJUSTMENT

XIII. DOLBY NR CHECK

- A. Connect AC VTVM to LINE-OUT terminal through CCIR Filter, and connect Audio Generator to LINE-IN terminal. See Fig. 8.
- B. Apply 400Hz (sine wave), 100mV signal to LINE-IN terminal from Audio Generator. (Note: Using DIN input terminal, connect Audio Generator as shown in Fig. 8 and adjust output of Audio Generator so that input terminal voltage is 0.5V.)
- C. Set CCIR Filter to WEIGHTED and depress RECORD button. Then, adjust RECORD LEVEL Control so that VU meter needle falls on Dolby Level (+3dB position).
- D. Set output of Audio Generator to zero. (If signal continues, short-circuit output terminal of Audio Generator.)

- E. Rewind recorded tape until the counter returns to zero. Play back and read noise level.
 - 1. Play back portion recorded with NR switch set at OFF, keeping NR switch at OFF. Read noise level.
 - 2. Play back portion recorded with NR switch set at ON, keeping NR switch at ON. Read noise level.The difference between Phase 1 and Phase 2 should be 8.5dB or over.

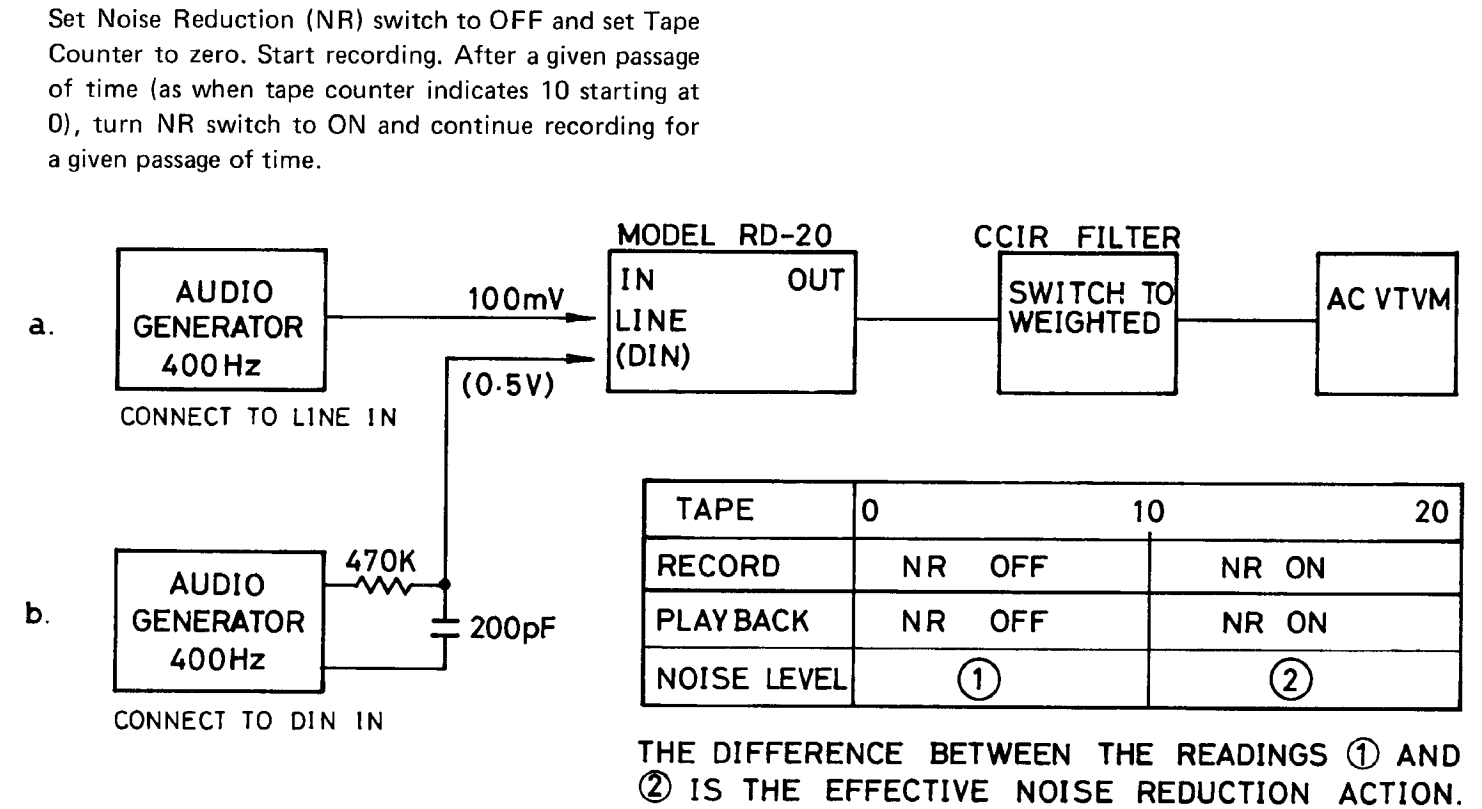


FIG. 8. DOLBY NR CHECK

TROUBLESHOOTING GUIDE

A. Tape does not feed at constant speed on PLAY.

1. Failure of pinch roller, or
2. Pinch roller is dirty with oil, dirt or other foreign matters, or
3. Inadequate pressure from pinch roller,
 - a. Failure of pressure spring, or
4. Capstan or drive belt is oily, or
5. Take-up reel pulley is dirty or the clutch torque is too small.

B. Too much wow on PLAY.

1. Check each item from 1 to 4 in Phase A.
2. Capstan is bent, or
3. Driving belt deformation, or
4. Excessive back tension of supply reel, or
5. Excessive load on counter and/or tape-run indicator, or
6. Failure of motor

C. Memory-stop does not work.

1. Failure of memory switch or counter switch, or
2. Failure of plunger solenoid.

D. Auto-stop does not work.

1. Transistor Q801, 802, 803 or 804 may be faulty, or
2. Capacitor C802 or 805 may be faulty.

E. Tape is wound around the capstan.

1. Take-up reel bed does not rotate,
 - a. Slippage of take-up idler pulley, or
2. Failure of cassette tape.

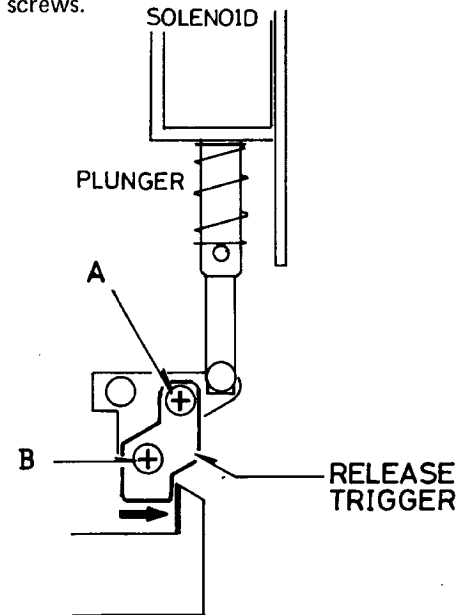
Note:

If PLAY lock is not released when plunger solenoid is working at Memory-stop and Auto-stop, the possible causes are:

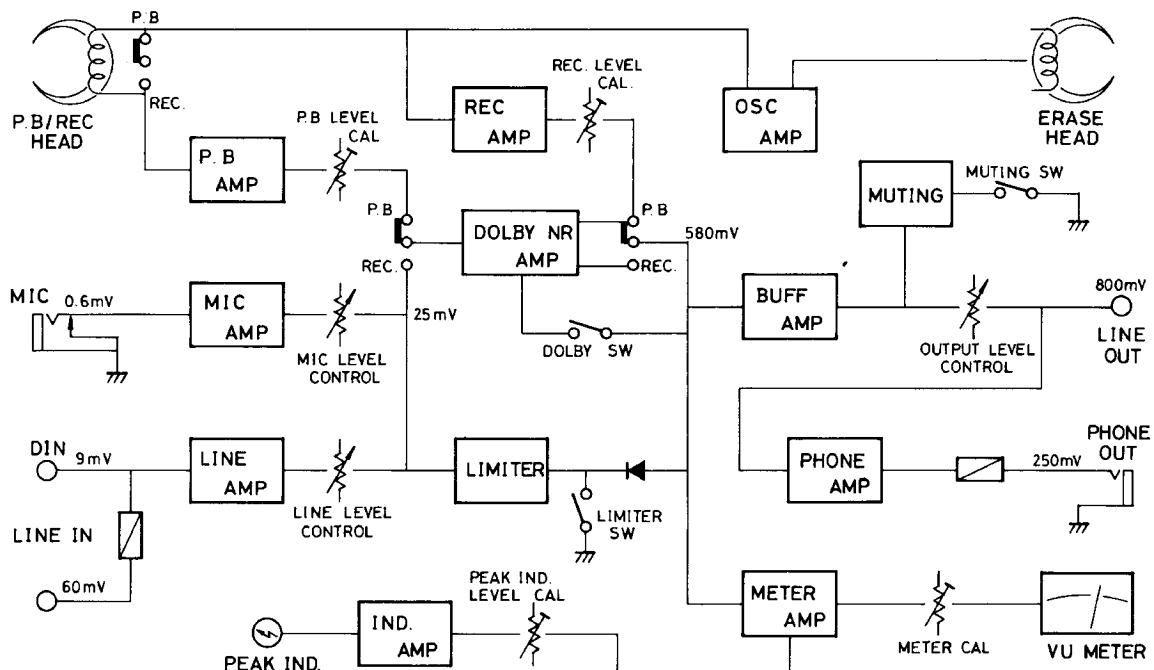
1. Failure of solenoid (inadequate magnetic attraction under normal B voltage.)
2. Position of plunger joint plate is wrong.

Action

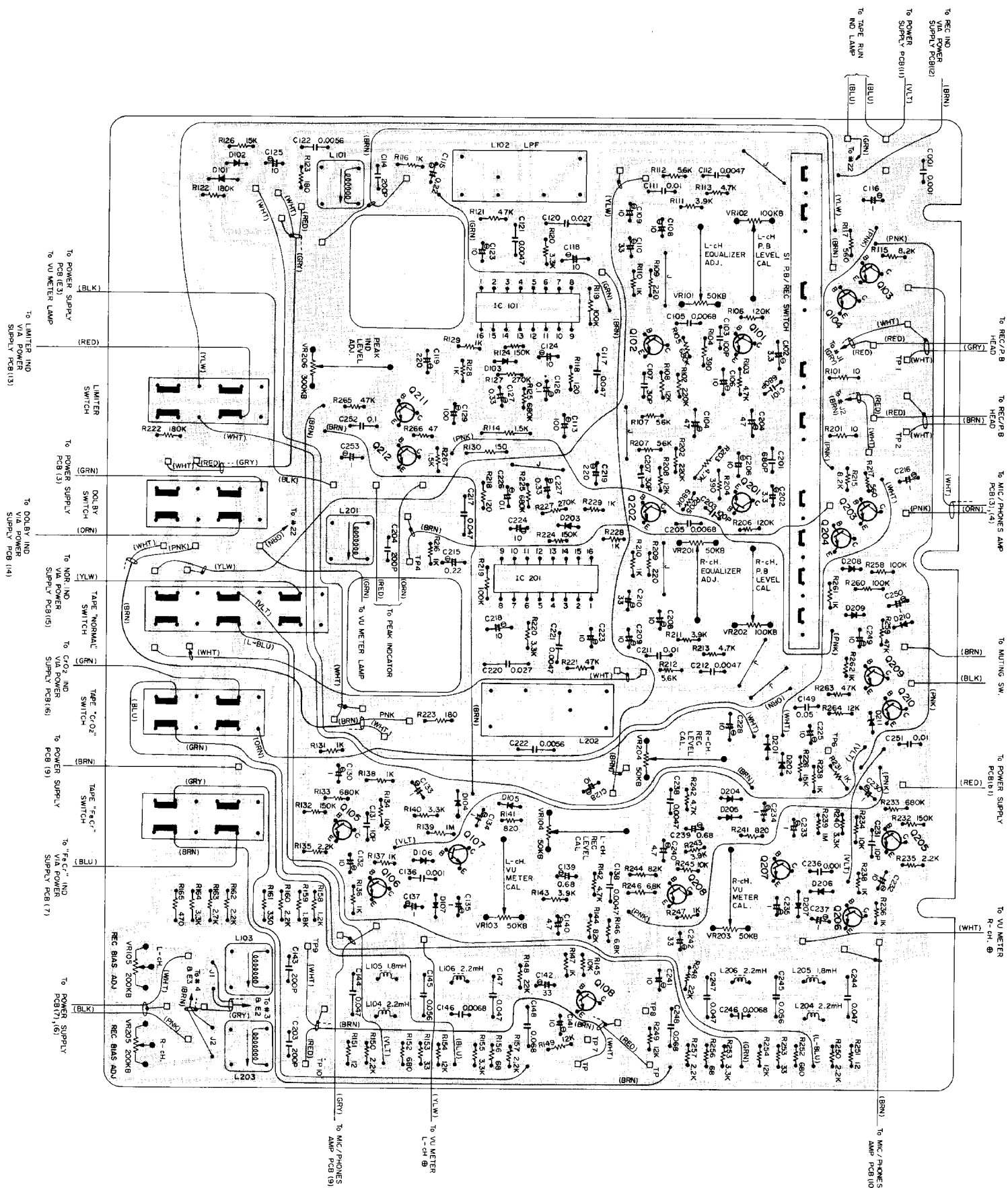
1. Replace solenoid with new one.
2. Loosen Release Trigger mounting screws A and B. Move the plate in direction of arrow until PLAY lock is released completely. Finally, secure the plate with the screws.



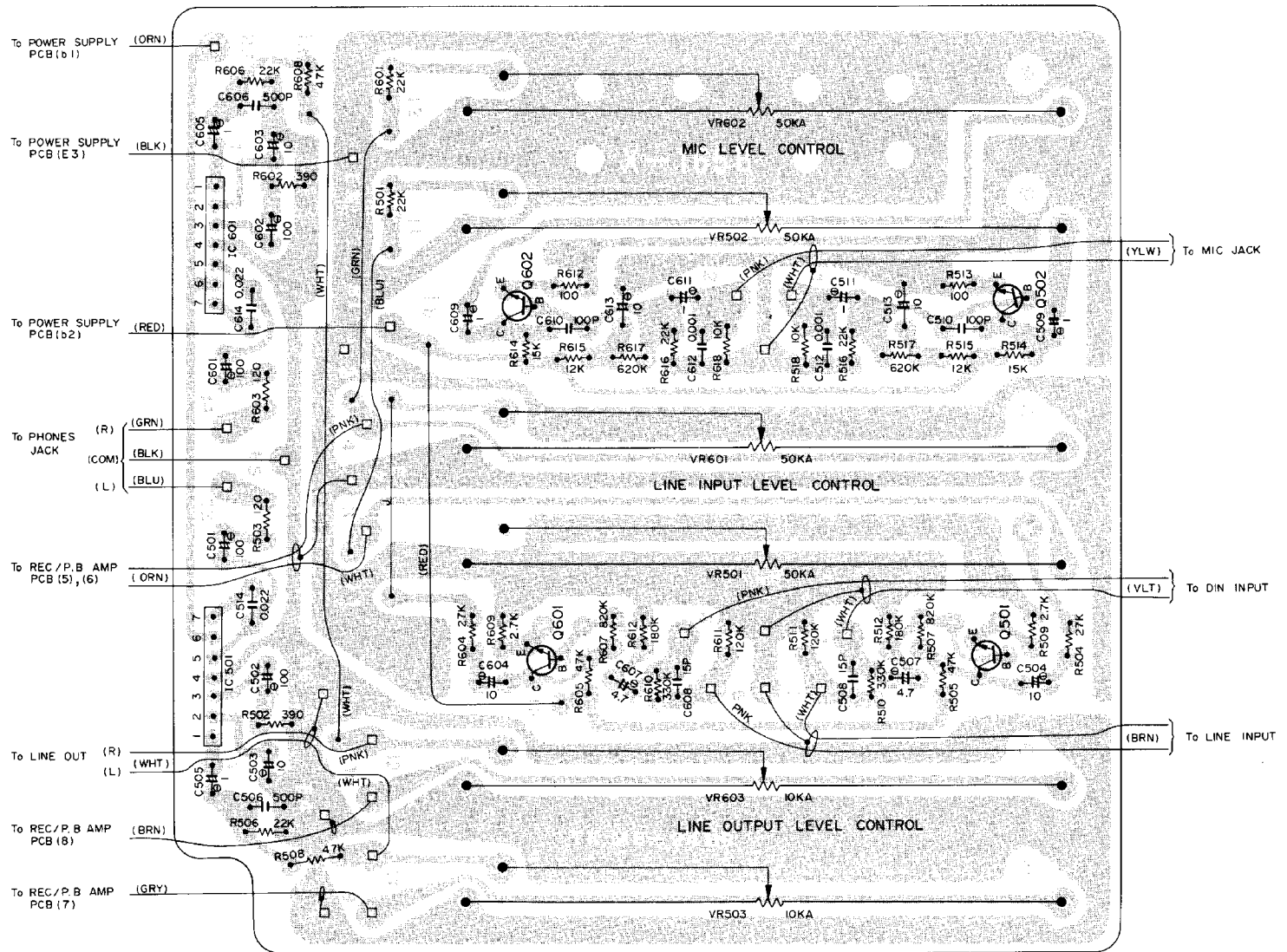
BLOCK DIAGRAM



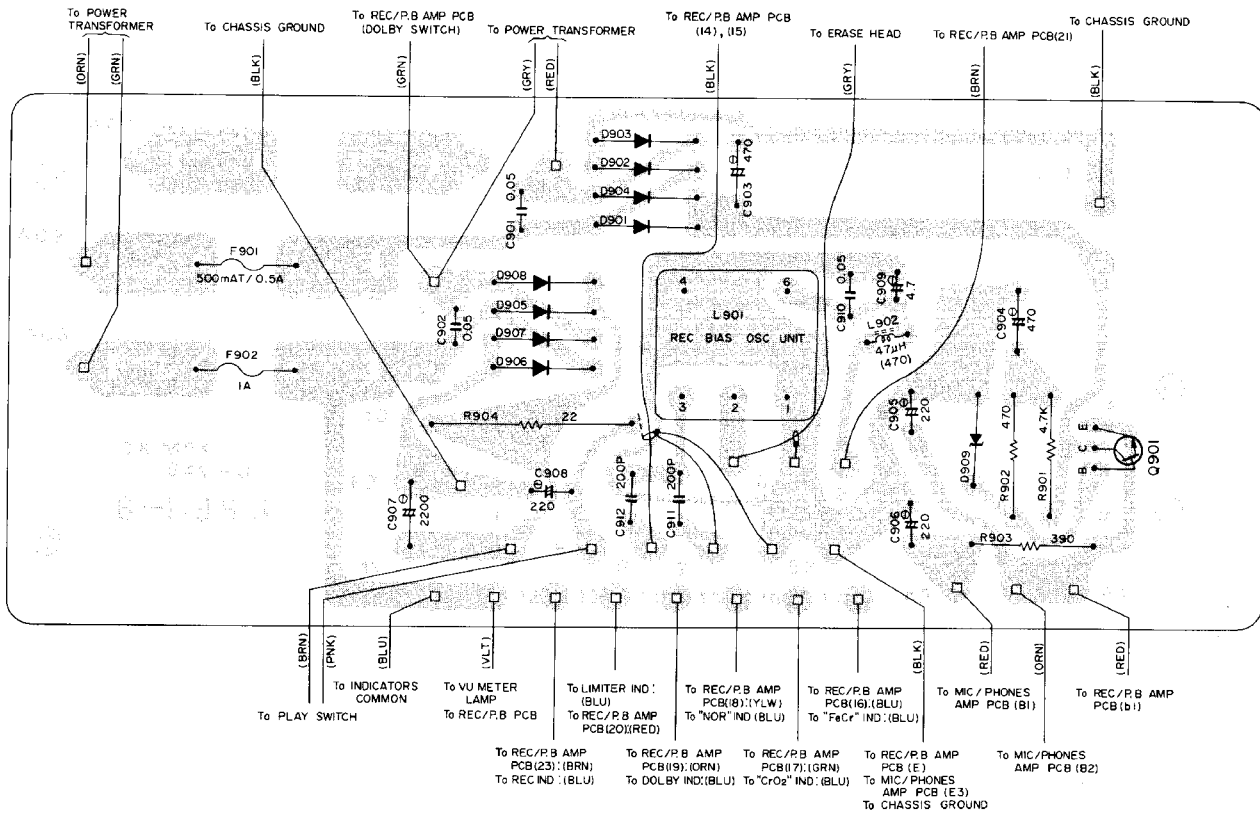
PLAYBACK/REC AMP CIRCUIT BOARD DIAGRAM



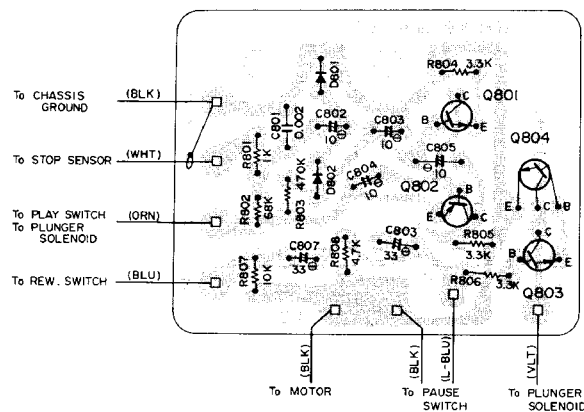
MIC LINE & PHONES AMP CIRCUIT BOARD DIAGRAM



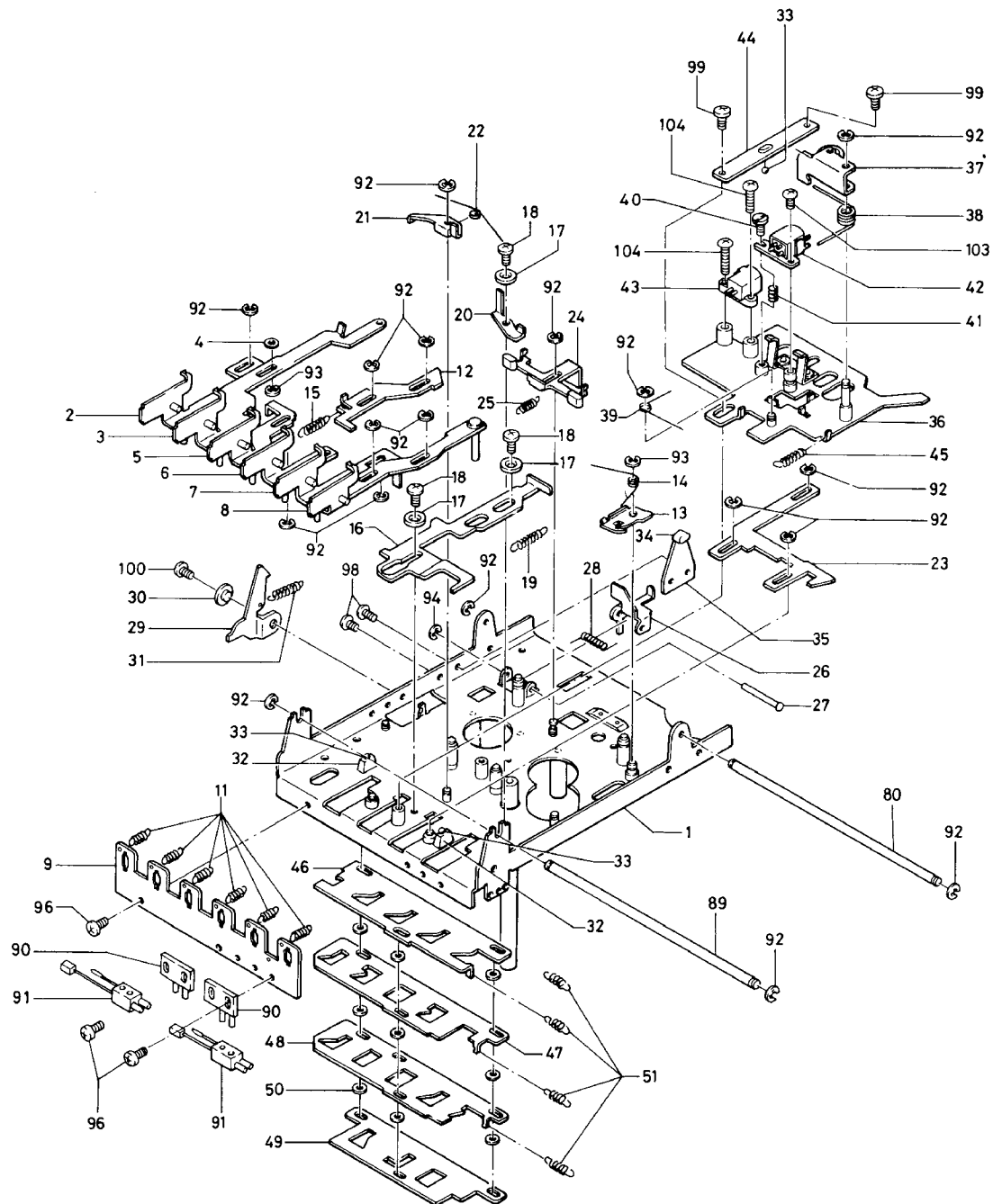
POWER SUPPLY & REC BIAS OSC CIRCUIT BOARD DIAGRAM

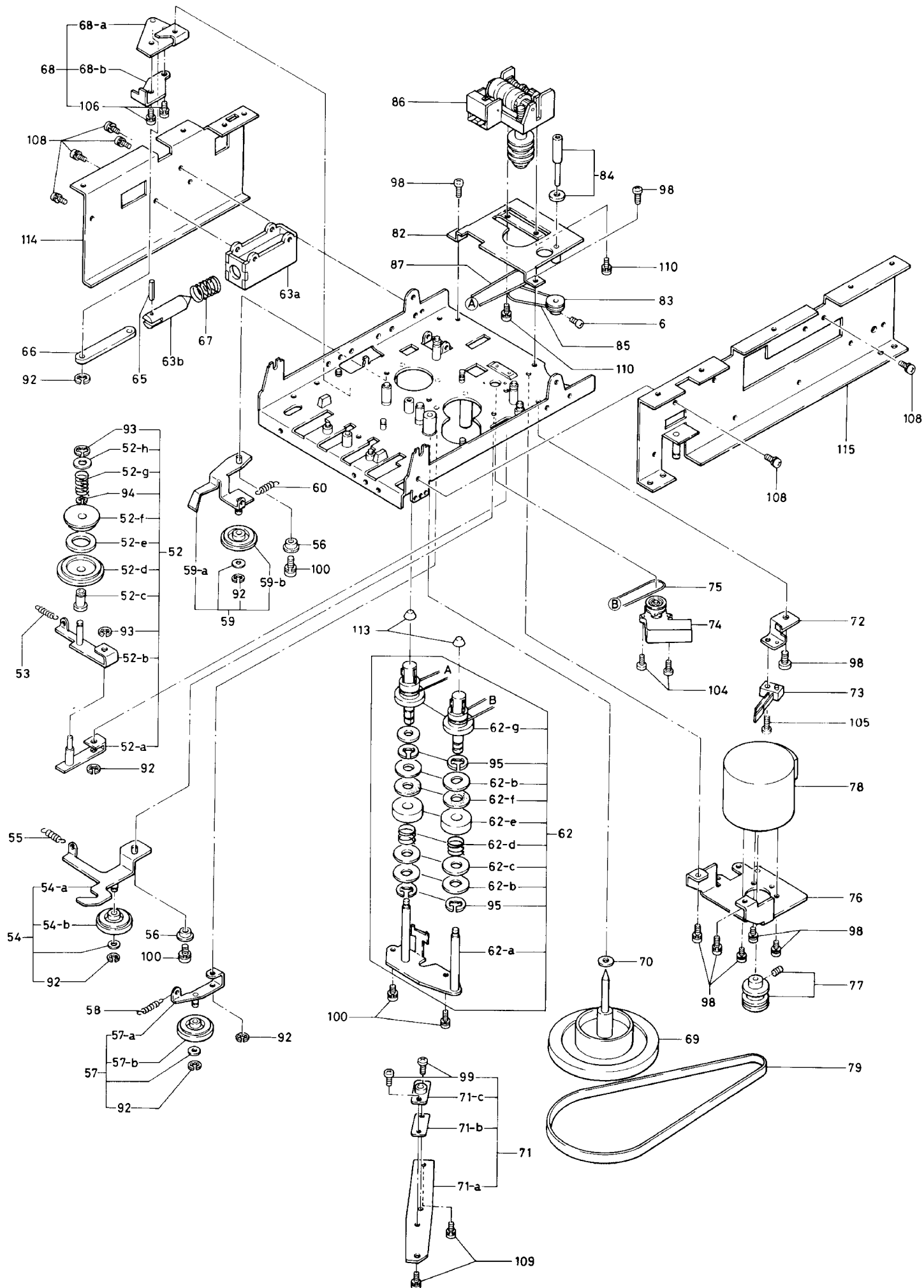


TAPE STOP SENSING CIRCUIT BOARD DIAGRAM



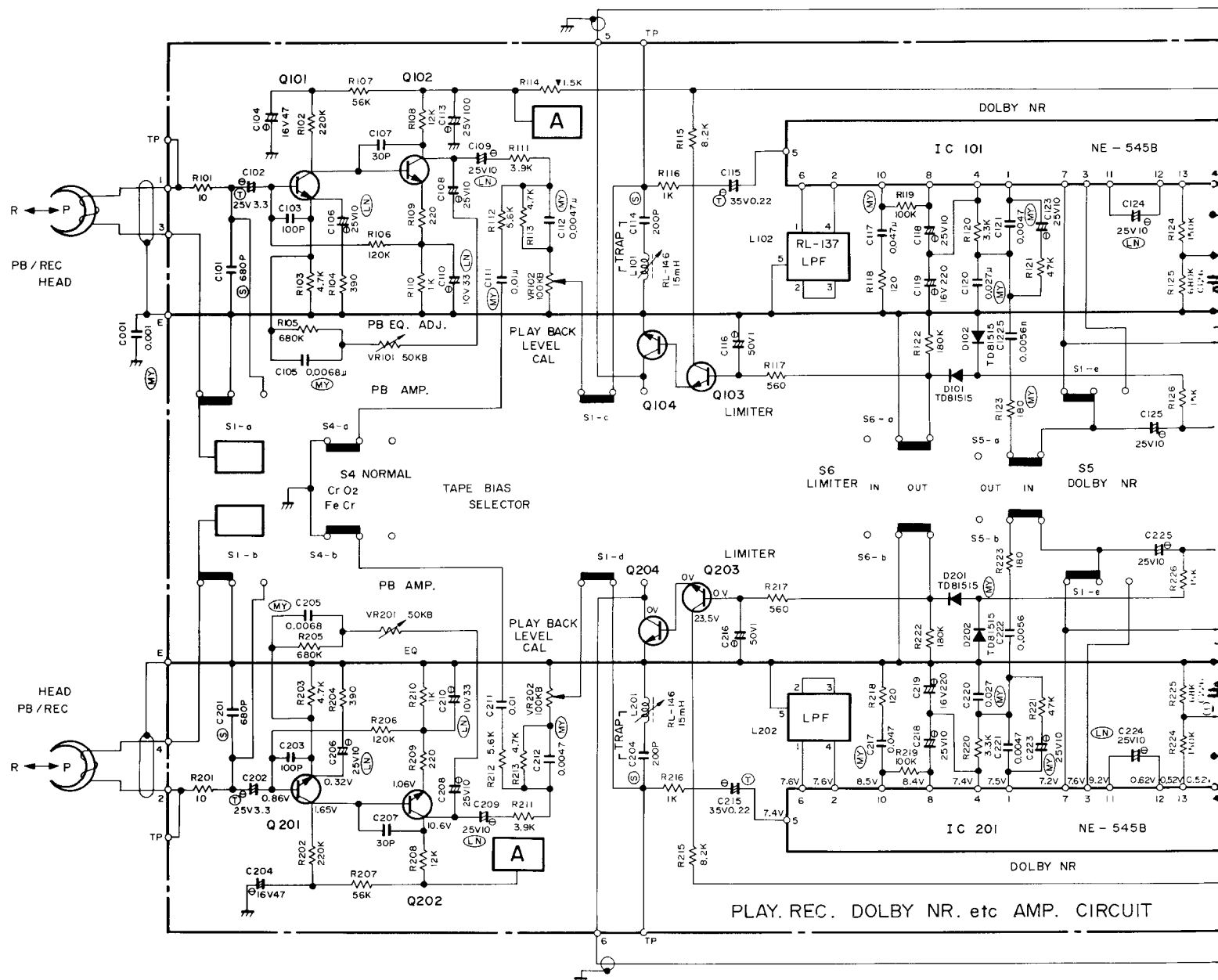
MECHANISM DISASSEMBLY DIAGRAM





Key No.	Part No.	Description	Key No.	Part No.	Description
1.	090161111	Chassis Sub-assembly	60.	090136158	Spring
2.	090131124	Stop Lever Sub-assembly	61.	—	Not used.
3.	090131125	Record Lever Sub-assembly	62.	090166905	Reel Tables Assembly
4.	090137149	Mylar Washer, 4 x 8 x 0.25	63.	240111231	Solenoid with Plunger
5.	090131126	Rewind Lever Sub-assembly	64.	—	Not used.
6.	090161112	Play Lever Sub-assembly	65.	761911174	Spring Pin, 3 x 15mm
7.	090131128	FF Lever Sub-assembly	66.	090161115	Plunger Link
8.	090131129	Pause Lever Sub-assembly	67.	090166601	Plunger Spring
9.	090131162	Push Lever Guide	68.	090161116	Lock Release Arm
10.	—	Not used.	69.	090136118	Flywheel
11.	090136139	Spring	70.	090137121	Flywheel Spacer
12.	090131130	Pause Arm	71.	090161117	Flywheel Supporter
13.	090131154	Pause Button Lock Cam	72.	090161118	Pause Switch Holder
14.	090136133	Pause Lock Cam Spring	73.	090166602	Pause Switch
15.	090136122	Spring	74.	090166603	Stop Sensor
16.	090131153	Brake Link	75.	090166605	Sensor Belt
17.	090137112	Guide	76.	090131150	Motor Bracket
18.	090137138	Screw, $\oplus$ 2.6 x 4mm	77.	090136150	Motor Pulley
19.	090136130	Spring	78.	260101113	Motor, 12VDC
20.	090131122	Pause Lever (B)	79.	090136116	Flywheel Belt
21.	090131121	Review/Cue Lever	80.	090136129	Cassette Case Shaft
22.	090136119	Review/Cue Lever Spring	81.	—	Not used.
23.	090131152	Review/Cue Link	82.	090131113	Tape Counter Bracket
24.	090161113	Brake Arm Assembly	83.	090136115	Tape-Run Ind Pulley
25.	090136120	Brake Spring	84.	090136114	Tape-Run Ind Shaft
26.	090131157	Rec Lock Lever	85.	671011011	Tape-Run Belt
27.	090136136	Lock Lever Shaft	86.	650901111	Tape Counter
28.	090136131	Rec Lock Spring	87.	090136111	Counter Belt
29.	090131158	Cassette Case Lock Lever	88.	—	Not used.
30.	090137129	Bushing	89.	090131116	Push Button Shaft
31.	090136122	Spring	90.	090161119	Operation Switch Holder
32.	090131135	Supporter	91.	090166604	Operation Switch
33.	090131118	Ball Bearing, 2 ϕ	92.	090137148	E Ring, 2.5 ϕ
34.	090136121	Rubber Cushion	93.	090137140	E Ring, 3 ϕ
35.	090131156	Cassette-up Stopper	94.	090137139	E Ring, 1.5 ϕ
36.	090161114	Heads Chassis Sub-assembly	95.	090137122	E Ring, 5 ϕ
37.	090136169	Pinch Roller Assembly	96.	090137137	Screw, 2.6 x 3mm
38.	090136124	Pinch Roller Spring	97.	—	Not used
39.	090136132	Spring	98.	090137142	Screw, 2.6 x 4mm with Spring Washer
40.	090137134	PB/Rec Head Azimuth Adjusting Screw	99.	090137143	Screw, 2.6 x 5mm with Spring Washer
41.	090136134	PB/Rec Head Spring	100.	090137141	Screw, 2.6 x 6mm with Spring Washer
42.	227211111	PB/Rec Head	101.	—	Not used.
43.	227211112	Erase Head	102.	—	Not used.
44.	090136123	Spring	103.	090137147	Screw, 2 x 4mm
45.	090136127	Spring	104.	090137146	Screw, 2 x 6mm
46.	090131132	Stop Cam	105.	090167210	Screw, 2 x 10mm
47.	090131165	Play/Rec Lock Cam	106.	090167304	Screw, 3 x 4mm with Spring Washer
48.	090131164	FF, Rew Lock Cam	107.	—	Not used.
49.	090131163	Review Cue Cam	108.	090137136	Screw, 3 x 5mm with Spring Washer
50.	090137133	Mylar Washer	109.	090167308	Screw, 3 x 8mm with Spring Washer
51.	090136142	Spring	110.	090167306	Screw, 3 x 6mm with Spring Washer
52.	090166901	Take-up Idler Arm Assembly	111.	—	Not used.
53.	090136142	Spring	112.	—	Not used.
54.	090166902	FF Idler Lever Assembly	113.	090136157	Reel Table Cap
55.	090136142	Spring	114.	090161120	Plunger Solenoid Bracket
56.	090137129	Bushing	115.	090131170	Side Chassis
57.	090166903	Idler Arm Assembly	116.	090167265	Screw, 2.6 x 5mm
58.	090136149	Spring			
59.	090166904	Rew Idler Lever Assembly			

**This Schematic Diagram is applicable to the unit with following Serial Nos.
Serial Nos. NA-30836 and onward.**



Q 101, 102 } : 2SC1222E
Q 201, 202 }

Q 103, 104, 105, 106, 107, 108 } : 2SC828 Ror S
Q 203, 204, 205, 206, 207, 208 }
Q 209, 210, 211, 212 }

RCUIT

SI : PLAY / REC (PLAY)

S2-4 : TAPE · BIAS · SELECTOR (Cr O2)

S5 : DOLBY NR (IN)

S6 : LIMITER (OUT)

S7 : POWER SW.

S8 : MUTING

S9 : MEMORY SW. (ON)

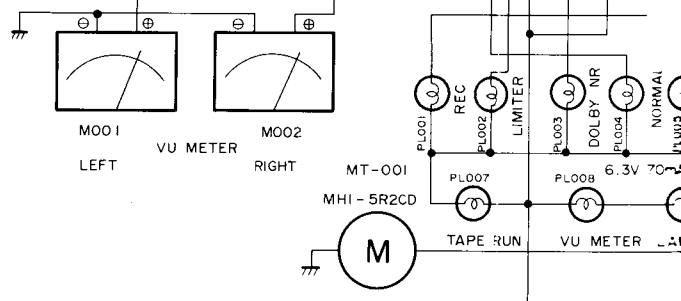
SIO : COUNTER SW.

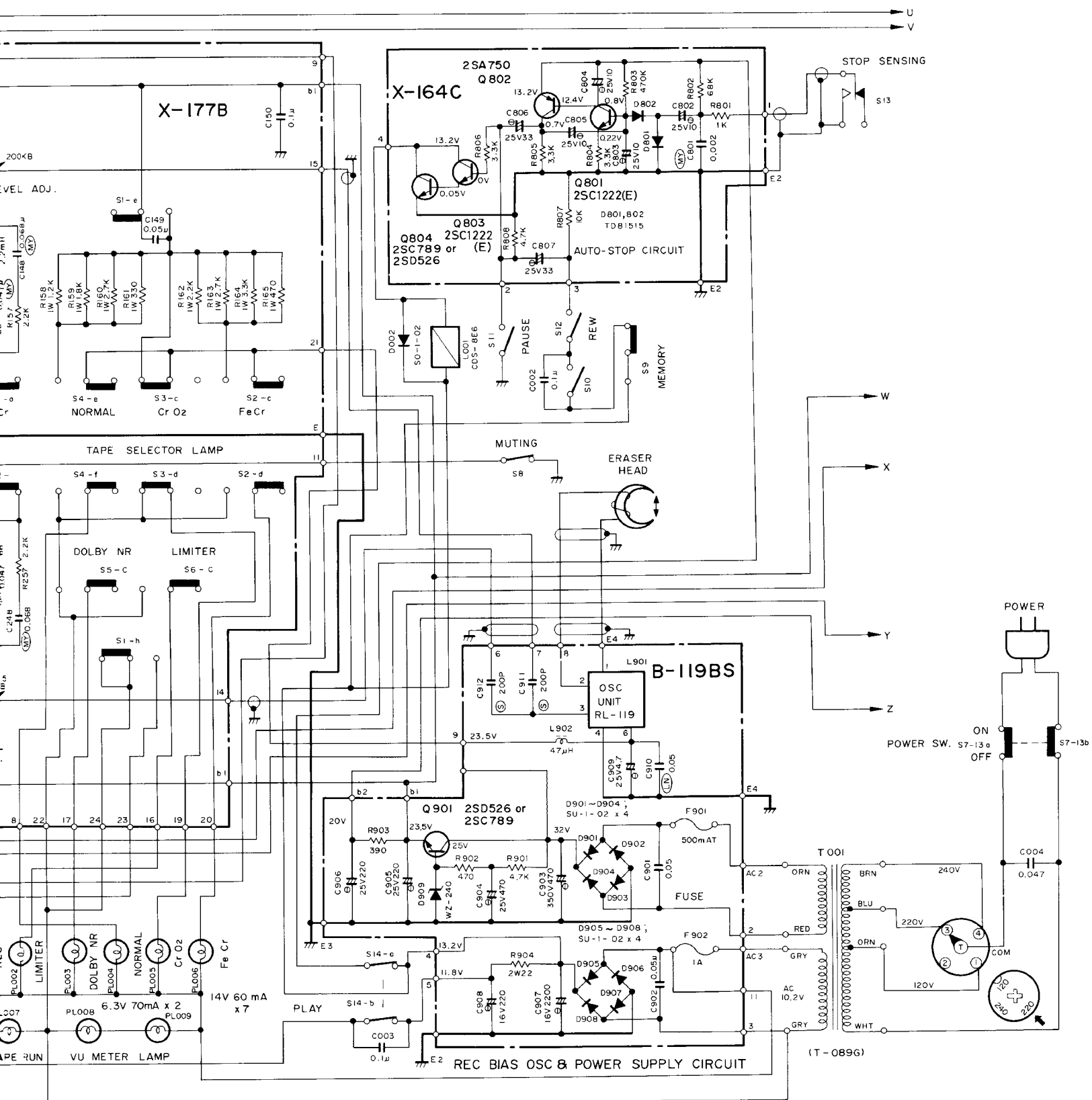
SII : PAUSE SW.

SI2 : REW SW.

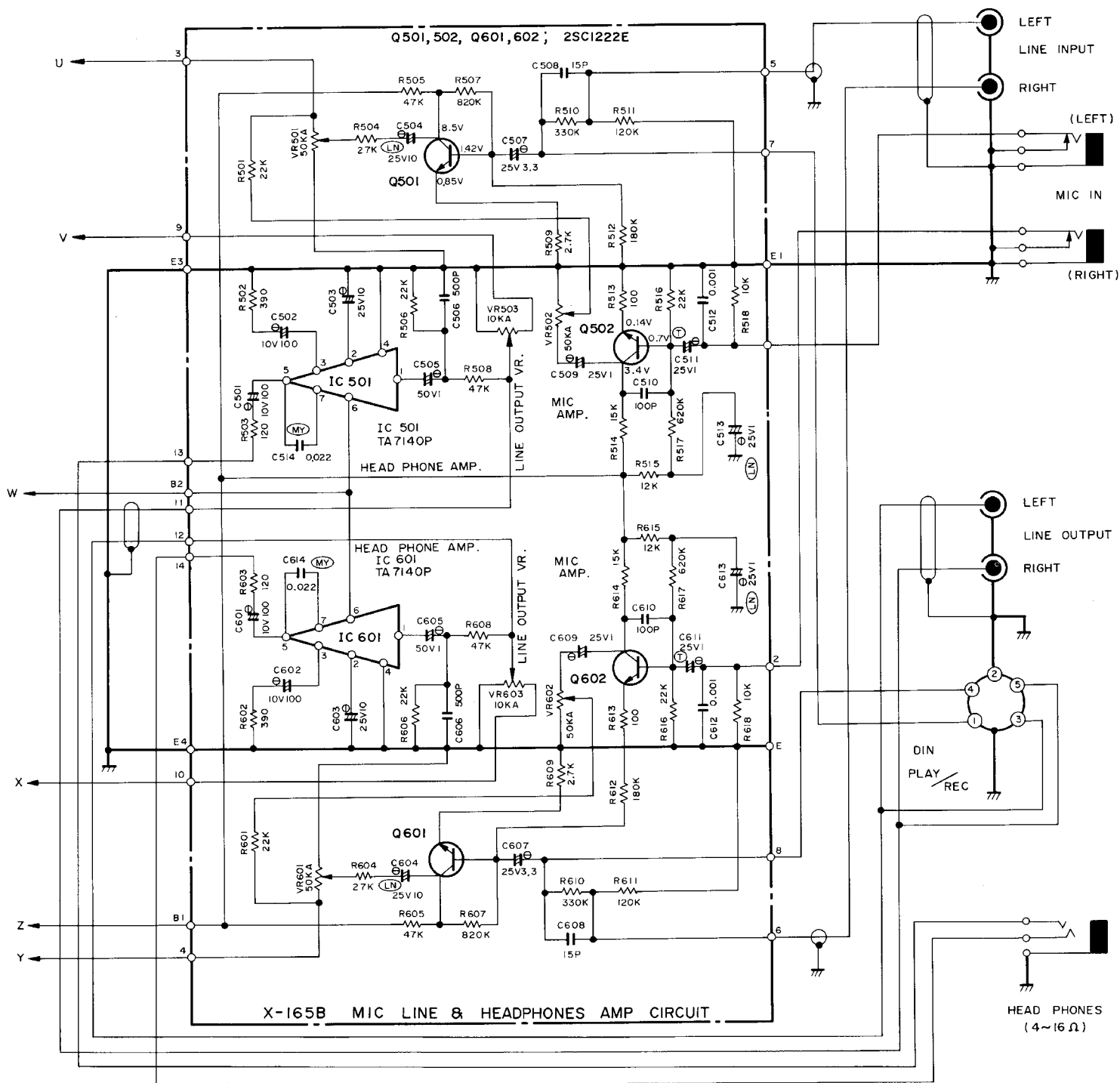
S13 : STOP SENSING

SI4 : PLAY SW.





ITEM	SCHEMATIC LOCATION (LAST)	
PLAY REC DOLBY NR. etc AMP. CIRCUIT	R267	C253
MIC LINE & HEADPHONES AMP. CIRCUIT	R618	C614
REC BIAS OSC & POWER SUPPLY CIRCUIT	R808	C807
AUTOSTOP CIRCUIT	R904	C911
CHASSIS	—	C004



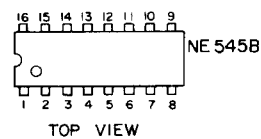
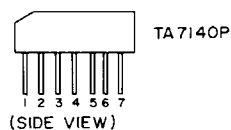
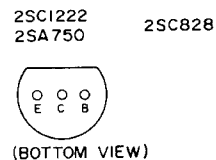
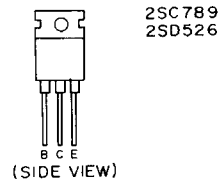
RESISTORS

5% --- TOLERANCE UNLESS OTHERWISE NOTED.
 K --- KILO OHM.
 M --- MEGA OHM.
 ▽ --- COMPOSITION RESISTORS 1/2 WATT.
 NONMARK --- LOW NOISE TYPE CARBON RESISTORS 1/4 WATT.

CAPACITORS

MY --- MYLAR FILM CAPACITORS.
 AL --- SINTERED ALUMINUM SOLID ELECTROLYTIC CAPACITORS (ALSICON).
 S --- POLYSTYRENE FILM CAPACITORS.
 T --- TANTALUM CAPACITORS.
 LN --- LOW NOISE TYPE CAPACITORS.
 # --- ELECTROLYTIC CAPACITORS.
 NONMARK --- CERAMIC CAPACITORS.

● VOLTAGE READING WITH VTVM FROM THE POINT SHOWN TO THE CHASSIS GROUND (LINE VOLTAGE 120VOLT).
 ● VOLTAGE READING MAY VARY $\pm 20\%$



REPAIR PARTS LIST

Schematic Location	Part No.	Description
TRANSISTORS, DIODES AND IC'S		
Q101, 102, 201, 202, 501, 502, 601, 602	301201156	2SC1222(E), Playback Amp, Mic and Line-In Amp
Q103, 104, 105, 106, 107, 108, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 801, 803	301201115	2SC828(R), Rec Amp, Buffer Amp, etc.
Q802	301001133	2SA750(E), Stop Sensing Amp
Q804, 901	301301132	2SD526, Auto-Stop Trigger and Stabilizer
D101, 102, 104, 105, 201, 202, 204, 205, 208, 209, 801, 802	300111012	TD-81515, Limiter Rect, Muting Rect, etc.
D103, 106, 107, 203, 206, 207, 210	300111008	1K188, VU Meter Rect, etc.
D211	300313013	WZ-120, Muting Trigger
D901, 902, 903, 904, 905, 906, 907, 908, 002	300919021	SU-1-02, Power Rectifier
D909	300313025	WZ-240, Zener Regulator
D001	300414009	TLR-104, Peak Indicator
IC101, 201	303452161	NE-545B, Dolby NR Amp
IC501, 601	303452166	TA-7140P, Headphone Amp
VARIABLE RESISTORS		
VR101, 103, 104, 201, 203, 204	510502154	50KB, Playback EQ Adj, Rec Level Cal, etc.
VR102, 202	510502155	100KB, Playback Level Cal
VR105, 205	510502164	200KB, Rec Bias (CrO ₂) Level Adj
VR206	510502156	300KB, Peak Ind Level Adj
VR501, 502, 601, 602	581005043	50KA, Line-In Level and Mic Level Control
VR503, 603	581005041	10KA, Line-Out Level Control

Schematic Location	Part No.	Description
OTHERS		
L101, 103, 201, 203	228641135	Bias Carrier Trap Coil, 15mH
L102, 202	228641134	Low Pass Filter
L104, 106, 204, 206	226501129	Choke Coil, 2.2mH
L105, 205	226501128	Choke Coil, 1.8mH
L901	228641130	Rec Bias and Erase OSC unit
L902	226501123	Choke Coil, 47μH (470)
L001	240111231	Plunger Solenoid
T001	207001408	Power Transformer
S1	613000030	PB/Rec Switch
S2, 3, 4, 5, 6, 7 (1 set)	614061209	Tape Bias, Dolby, Limiter and Power Switch Ass'y
S8, 12	090166604	Muting and Rewind Switch
S9	614010121	Memory Switch
S10	—	See Tape Counter
S11	090166602	Pause Switch
S13	090166603	Stop Sensor
S14	615212256	Play Switch
	650901111	Tape Counter with Memory OFF Switch
	227211111	PB/Rec Head
	227211112	Erase Head
M001, 002	231310054	VU Meter
PL001 to 009	351140006	Indicator Lamp, 14V, 60mA
	900111016	Cassette Mech Sub-ass'y
	141810680	PB/Rec Amp Circuit Board Ass'y with Push Switches
	141810683	Level Control Amp Circuit Board Ass'y
	141810681	Power Supply Circuit Board Ass'y
	141810682	Stop Sensing Circuit Board Ass'y

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