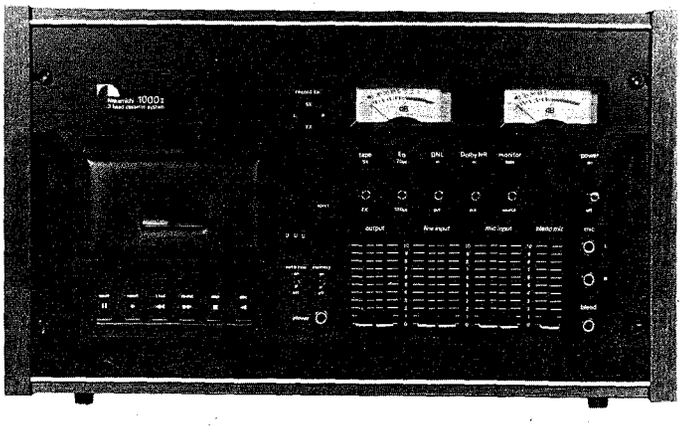
Nakamichi

Service Manual

Nakamichi 1000II

3 Head Cassette System



CONTENTS

1. GENERAL

Nakamichi 1000II control functions are shown with reference to the following explanations.

To maintain the optimum performance of the Nakamichi 1000II, maintenance such as cleaning of head, capstan shaft and pressure roller, and demagnetization of head, lubrication, etc. are required.

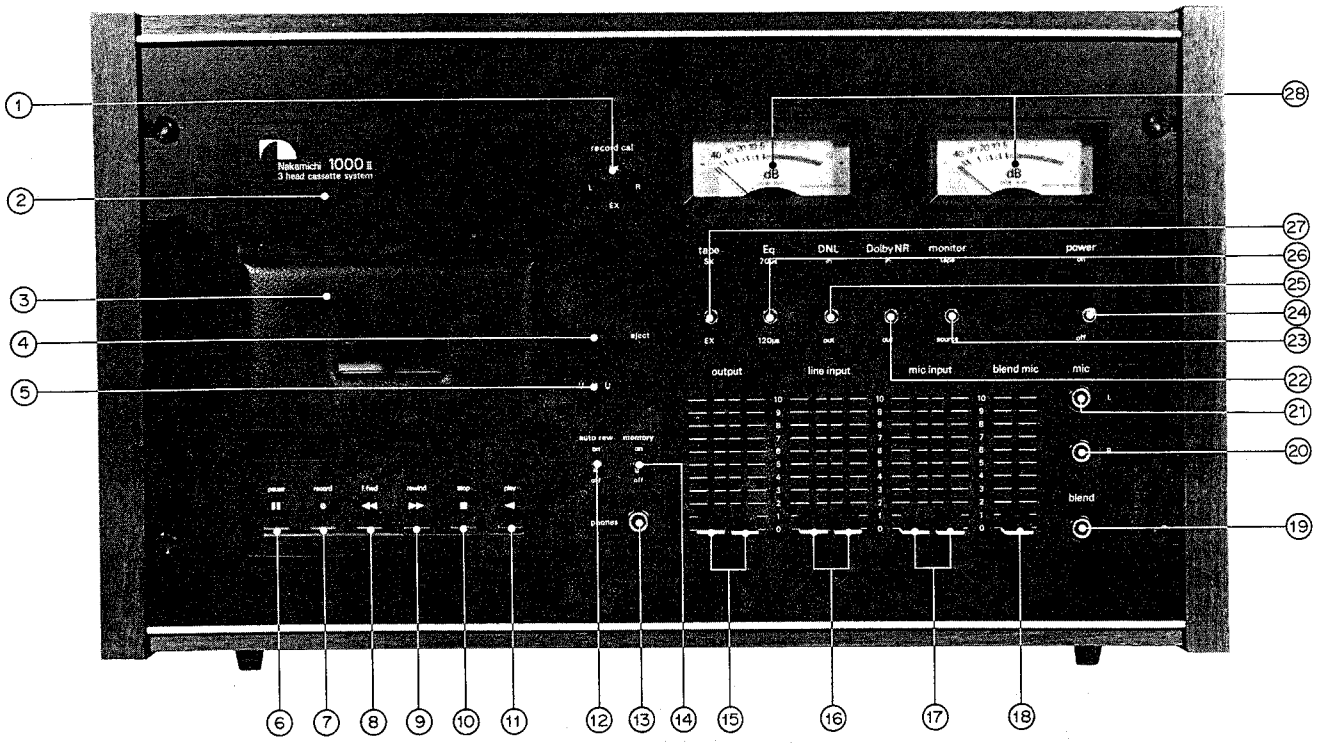


Fig. 1.1 Front View

1. Record Level Calibration Controls
2. Adjust Lid
3. Cassette Lid
4. Eject Button
5. Tape Counter
6. Pause Button
7. Record Button
8. Fast Forward Button
9. Rewind Button
10. Stop Button
11. Play Button
12. Auto Rewind Switch
13. Headphone Jack
14. Tape Start Memory Switch
15. Line Output Level Controls
16. Line Input Level Controls
17. MIC Input Level Controls
18. Blend MIC Input Level Control
19. Blend MIC Input Jack
20. MIC Input Jack R
21. MIC Input Jack L
22. Dolby NR Switch
23. Monitor Switch
24. Power Switch
25. DNL (Dynamic Noise Limiter) Switch
26. Eq Selector Switch
27. Tape Selector Switch
28. Peak Level Meter

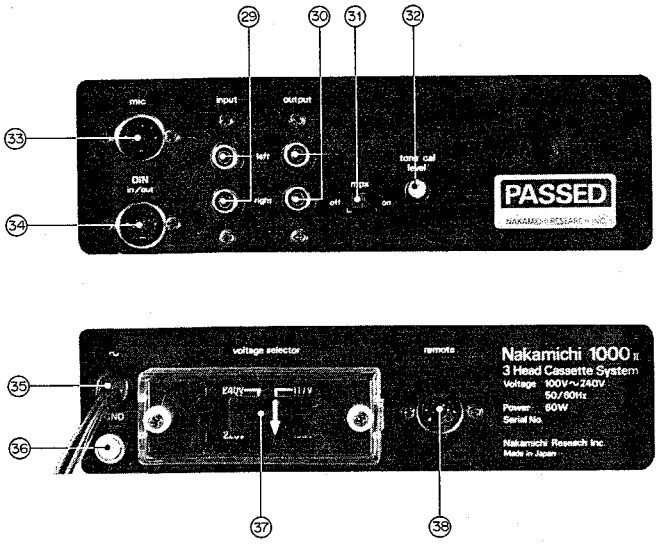


Fig. 1.2 Rear View

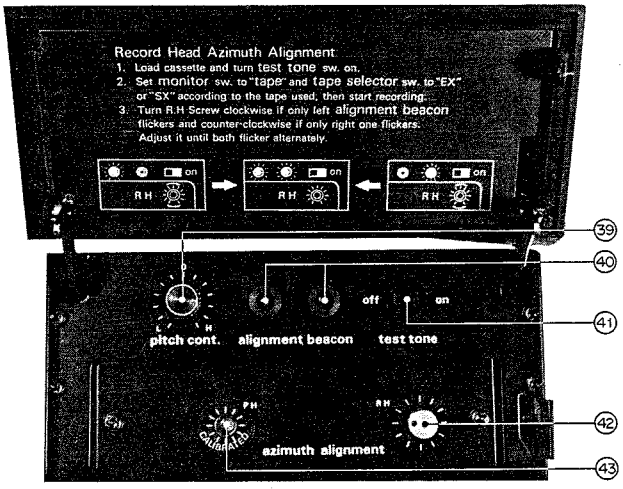


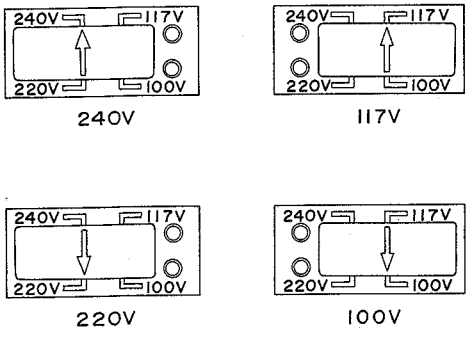
Fig. 1.3 Adjustment Panel

29. Line Input Jacks
30. Line Output Jacks
31. 19 kHz MPX Filter Switch
32. Test Tone Level Calibration
33. DIN MIC Input Socket
34. DIN In/Out Socket
35. AC Power Supply Cord
36. Ground Terminal
37. Voltage Selector Plug
38. Remote Control Socket

39. Pitch Control
40. Alignment Beacon
41. Test Tone Switch
42. Record Head Azimuth Alignment
43. Playback Head Azimuth Alignment

Voltage Selector

Change-over either to 100, 117, 220, or 240 V.



240V 117V

220V 100V

Fig. 1.4 Voltage Selector

Note: When a check is made on amp., etc. by means of an extension cord, re-adjustment shall be made without fail after final installation to the model chassis. The check without removal of an extension cord will cause inaccurate adjustments.

2. PRINCIPLE OF OPERATION

2.1. Mechanisms

2.1.1. 3-Head Configuration

Basically there are five openings in the cassette housing, and the both sides of openings are being used for left and right capstans and pressure rollers and the remaining three openings are for the two reference pins and the playback head in between. Nakamichi 1000 II and 700 II incorporate the 3-head system, and the playback head has a very narrow gap of 0.7 micron. In order to ensure the best possible frequency response particularly at the high-end the playback head should be positioned against the opening which will take advantage of the felt pad in the cassette housing as well as the shielding plate incorporated.

The record head gap is 5 micron for achieving the best bias and signal flux penetration to the tape and wide dynamic range in recording. The record head is of an exceptionally hard durable hi-Mu ferrite. With this configuration only the openings available for the separate erase and record heads are the openings of the take-up pressure roller side and the take-up reference pin side. One of the critical factors in the 3-head system is the adjustment of track width for the three independent heads. Instead of mounting the heads on the base plate of the mechanism the Nakamichi 1000 II and 700 II use quite a unique head mounting method; the three heads are hanged from the top of the head housing so that it enables an independent azimuth alignment on the three heads and the alignment becomes much easier since it can be performed with a screwdriver from the top of the head housing. See Fig. 2.1.1. If readjustment of the heads is necessary, it is highly recommendable to do the adjustment, referring to the Adjustment Procedures.

2.1.2. Double Capstan Tape Drive

As shown in Fig. 2.1.2, the double capstan system consists of two capstan shafts (a) and (b) connected to the two flywheels which are driven with a belt.

Against these capstans two pressure rollers (a) and (b) are engaged to run the tape with an adequate holdback tension created by the double capstan and pressure rollers. When the two capstan flywheels start rotating as shown in Fig. 2.1.2 the belt tension at side A becomes stronger than that of the side B belt and the rotation of capstan (a) becomes slightly faster than that of the capstan (b). With the pressure rollers (a) and (b) pressed against the capstans (a) and (b) it creates a tension over the tape between the capstans in proportion to the difference in capstan rotation.

As the double capstan system always creates a constant and stable holdback tension between the two capstans, the condition of the tape between two capstans will not be affected by any external conditions such as irregular take-up and supply torque, irregular loading of cassette tape, undesirable mechanism vibration, etc., thus assuring the superior wow and flutter characteristic.

The double capstan system provides a constant holdback tension on the tape and maintains the stable pressure on the tape against the heads, therefore, the tape maintains the stable contact with the erase and record head surfaces even without the pads.

The only critical factor in the double capstan system is to be considered; the two capstans have to be positioned perfectly in parallel and to be precisely vertical against the heads base, the pressure rollers have to be evenly pressed against the capstan shafts and the head surface must be positioned perfectly vertical to the tape surface. Otherwise, the running tape might become out of the tape guide resulting in the irregular tape movement.

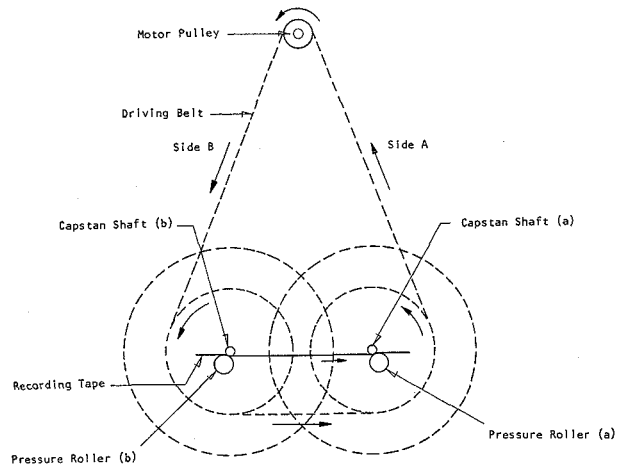


Fig. 2.1.2 Double Capstan Tape Drive

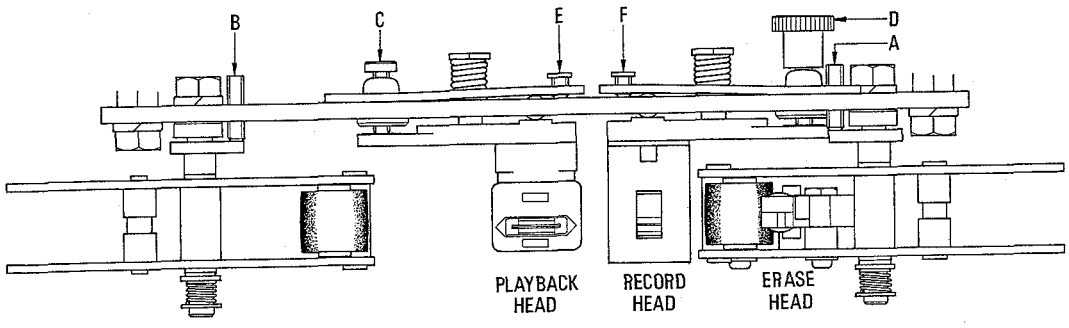


Fig. 2.1.1 3-Head Configuration

2.1.3. Ball Drive Mechanism

The Take-up Reel Hub and Supply Reel Hub are driven by a Reel Motor through the Ball Drive Mechanism.
Fig. 2.1.3 shows torque delivery, Fig. 2.1.4 shows the construction of the Ball Drive Mechanism, and Fig. 2.1.5 shows a cross-sectional view of the Take-up/Supply Block.

(1) Play Mode:
The Reel Motor is controlled by a governor and rotates at a constant speed. Through a belt, the torque of the Reel Motor is delivered to the Center Gear which will then rotate to the direction of "a" to communicate the torque to the Gears of both Take-up and Supply Blocks.
The Ball Clutch functions to rotate the Take-up Reel Hub to the direction of "c" at the Take-up Block as shown in the item (3). Namely, since the Ball in the Block is held between Clutch Pulley and Gear, the Clutch Pulley rotates to the same direction as the Gear does (to "c") and accordingly the Brake Drum Ass'y (i.e. Reel Hub) rotates through the Clutch Plate (a friction clutch) fitted to the Clutch Pulley. The Supply Reel Hub while in Play mode will become free as the gear torque of the Supply Block is not delivered to the Clutch Pulley.

(2) FF and REW Modes:
+12 V is directly fed to the Reel Motor, and the Center Gear rotates to the direction of "a" while in FF mode and to "b" direction while in REW. When the Center Gear rotates to the direction "a", the Ball Clutch of the Take-up Block functions to rotate the Take-up Reel in the same manner as in the Play mode. This way, a tape travels forwardly.
When the Center Gear rotates the other way round (to direction "b"), the Ball Clutch of the Supply Block functions to rotate the Supply Reel to the direction of "d". This way a tape is rewound. Meantime the Take-up Reel is released.

(3) Ball Clutch Mechanism:
Refer to Fig. 2.1.6. As shown in Fig. 2.1.5, a magnet ring is incorporated in the Take-up/Supply Block.
Since the magnetic force at the periphery is greater than that at the inner part, the Ball will stop in the state of being pushed to the Base B (Reel Hub Gear) (Fig. A).
When the Base B moves to the left hand side, the Ball will forcedly come in between the Bases A (having an angle of θ) and B, since the Ball have an appropriate friction against the Base B, as a result of which the Base A also commences to move (Fig. B).
When the Base B moves to the right direction, the Ball will part from the Base A, and this way the Bases A and B will become released (Fig. C).

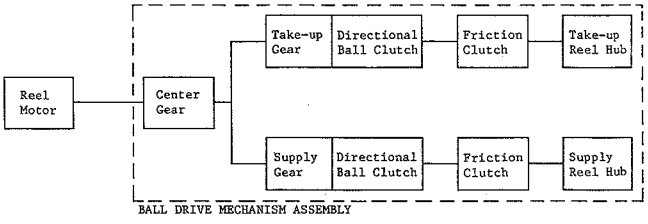


Fig. 2.1.3 Torque Delivery

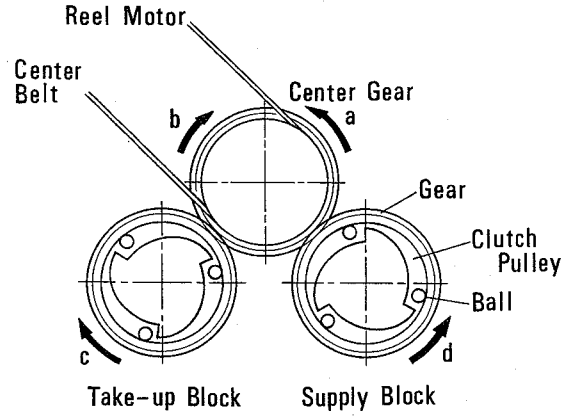


Fig. 2.1.4 Construction

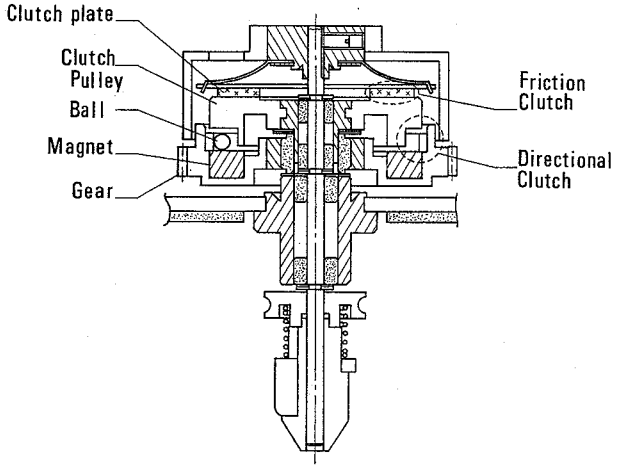


Fig. 2.1.5 Take-up/Supply Block Cross-sectional View

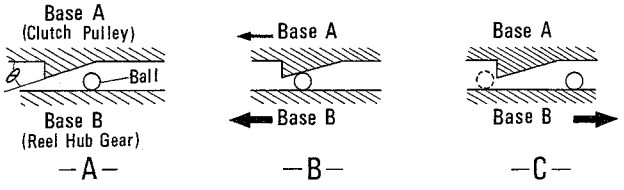


Fig. 2.1.6 Ball Clutch Model

2.2. Amp. Circuits

2.2.1. Record Dolby NR Circuit

Fig. 2.2.1 shows a recording mode Dolby NR processor circuit. The circuit input signal is applied through terminal 11 (4), while the signal applied through terminal 12 (3) is fed to the MONITOR switch and is only subjected to impedance conversion by Q101 and is not boosted by the Dolby NR processor. Terminal 10 (5) is the circuit output terminal and is linked with the REC. EQ. AMP via REC. CAL. VR and TAPE selection switches. Terminal 13 (2) is connected with the DOLBY NR switch. For DOLBY NR IN, this terminal becomes open and a feedback current is applied to the base of Q102. For DOLBY NR OUT, this terminal is grounded and the output via the emitter of Q102 is cut from the Dolby NR processor.

A detailed explanation of the Dolby NR processor can be found in other references, however, it is also briefly described here.

Fig. 2.2.2 compares input vs. output characteristics of the Dolby NR processor, where curve A shows the recording mode Dolby NR circuit and curve B the playback mode. The symmetry of these two characteristics with respect to line 0-0', bisecting the right corner, is highly significant.

Curve A for recording exhibits a linear relationship between the input and output signal levels from the high level down to −5 dB, under which the input level gradually bends. For input levels under −30 dB, the output level is boosted by 10 dB with respect to the input level. The action of the recording mode Dolby NR circuit is that the output level is boosted from 0 to a maximum of 10 dB according to the input level.

With curve B for playback, in contrast to that for recording, the output level decreases with a decrease in the input level and, for an input level of less than −30 dB, becomes a further 10 dB lower than this input level. According to this characteristic, noise generated in the playback system, such as hiss noise, playback amplifier noise, etc., is reduced by 10 dB. Combination of the above for recording and playback mode results in a linear characteristic. For example, for a −40 dB recording input, point b on curve A is recorded at −30 dB since the input is boosted by 10 dB in the recording mode Dolby NR circuit. When the signal reproduced from a recorded magnetic tape enters the playback mode Dolby NR circuit, the −30 dB input level is reduced by 10 dB to −40 dB; point b' on curve B. Thus, the 1:1 proportional relation is valid for any input level.

This action is explained using a system diagram of the recording mode Dolby NR processor as shown in Fig. 2.2.3.

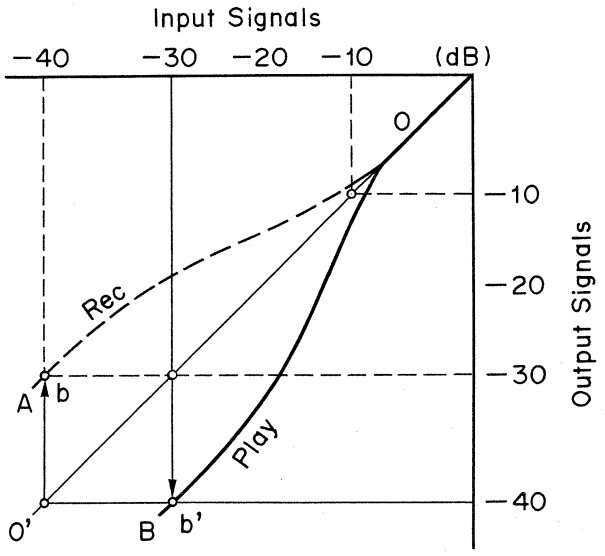


Fig. 2.2.2 Working Principle of Dolby NR Circuit

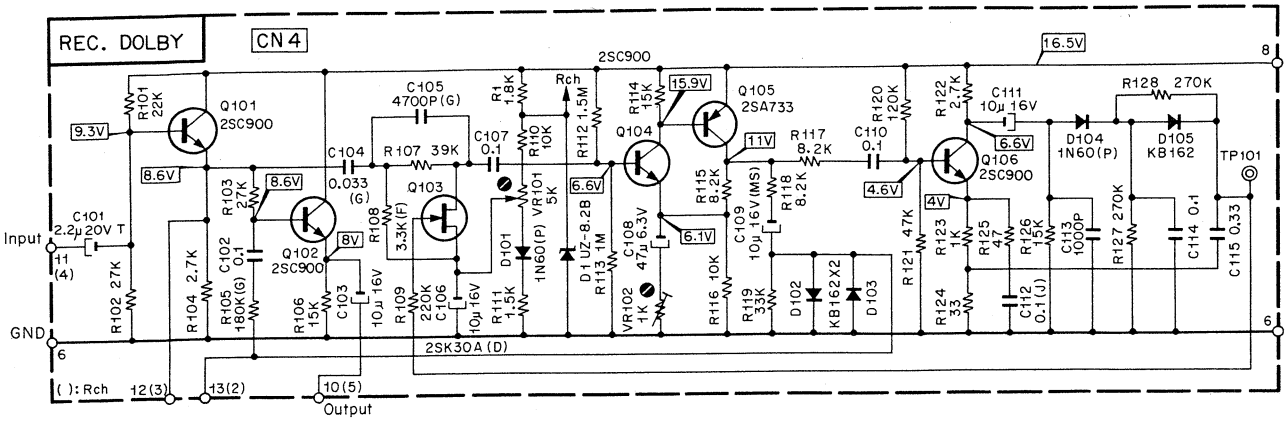


Fig. 2.2.1 Record Dolby NR Processor Circuit Diagram

The input signal enters the input of amplifier 4 (Q102) via amplifier 1 (Q101). Another signal from amplifier 1 is amplified by amplifier 2 (Q104 and Q105) after passing through a high-pass filter and enters amplifier 4. This signal is superposed by another signal as previously mentioned and this added signal is supplied to the output terminal through amplifier 4. The signal amplified by amplifier 3 (Q106) is fed back to an FET (Q103) after being rectified by diode D (D104). A circuit including the high-pass filter, amplifiers 2 and 3, and the FET in Fig. 2.2.3 is called a compressor, and the signal which appears at the point between the output of amplifier 2 and the input of amplifier 4 is called the compressor output signal (E_2). On the other hand, the output (E_1) of amplifier 1 is called the direct signal, and the FET is used as an electronic attenuator.

Indications such as 8.6 V, etc. in the circuit diagram show DC voltages when a zero signal is applied. The standard input signal level to the recording mode Dolby NR processor is 100 mV at 400 Hz. The recording output signal level is about 85 mV (r.m.s.).

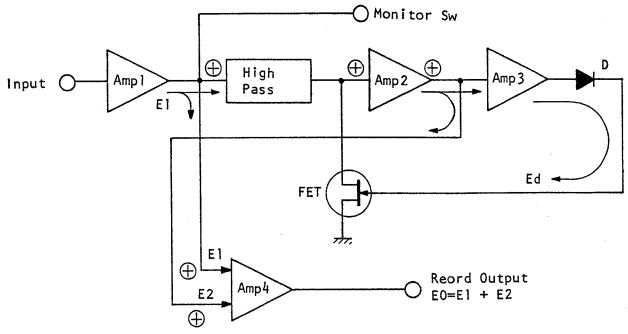


Fig. 2.2.3 Record Dolby NR Processor System Diagram

2.2.2. Playback Dolby NR Circuit

Fig. 2.2.4 shows a circuit diagram for a playback mode Dolby NR processor. The input for this circuit is applied through terminal 12 (3) where the output of the playback head amplifier is connected. Terminal 10 (5) is the output of the playback mode Dolby NR processor which becomes the input of the DNL circuit via the MONITOR switch. An input signal through terminal 13 (2) is applied to the DOLBY NR switch. For DOLBY NR IN, this line is open and the signal is fed back to the base of Q101. For DOLBY NR OUT, this line is grounded and no signal is fed back.

Since the general action of the Dolby NR processor is described in the preceding section, Rec. Dolby NR Circuit, only the action of the playback mode Dolby NR processor will be explained here, using its system diagram. The input signal applied through amplifier 1 (Q101, Q102) via a high-pass filter, is amplified in amplifier 2 (Q104, Q105), and is then fed back to the input of amplifier 1 in opposite phase to the phase of the input signal. Since this results in the subtraction of the feedback signal from the input signal, the resultant signal appears at the amplifier 1 output, i.e., the playback mode Dolby NR processor. Meanwhile, an output signal which has been amplified by amplifier 3 (Q106) controls the FET (Q103) after being rectified by diode D (D104).

The difference between playback and record is, as is obvious from the above explanation, that the phase of the compressor signal is opposite to that of the direct signal because of the changed signal path. Fig. 2.2.6 shows typical record and playback mode frequency characteristics for the Dolby NR processor. According to this figure, it is obvious that frequency components higher than about 200 Hz are subjected to the Dolby NR process at levels less than about −10 dB.

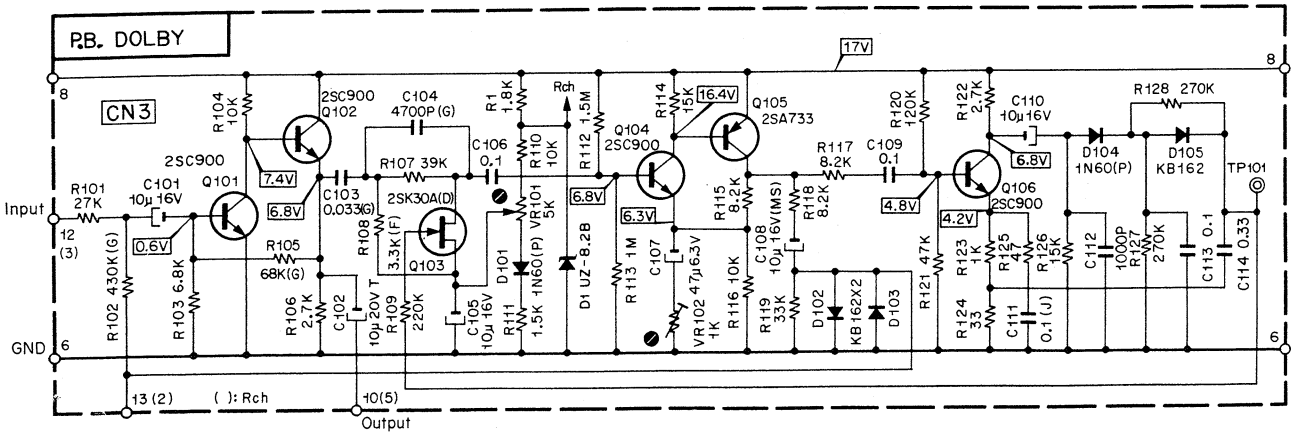


Fig. 2.2.4 Playback Dolby NR Processor Circuit Diagram

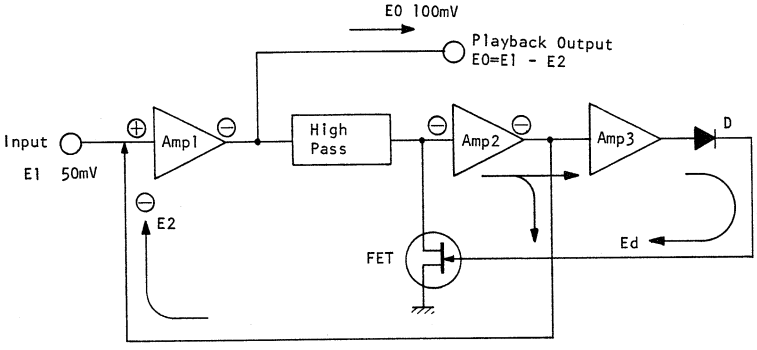
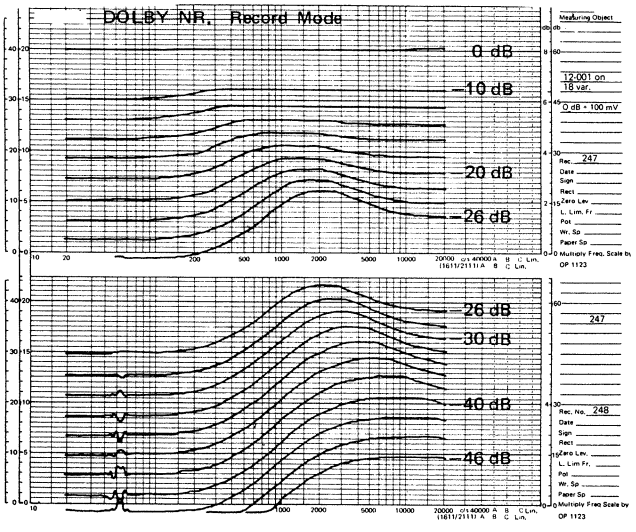


Fig. 2.2.5 Playback Dolby NR Processor System Diagram



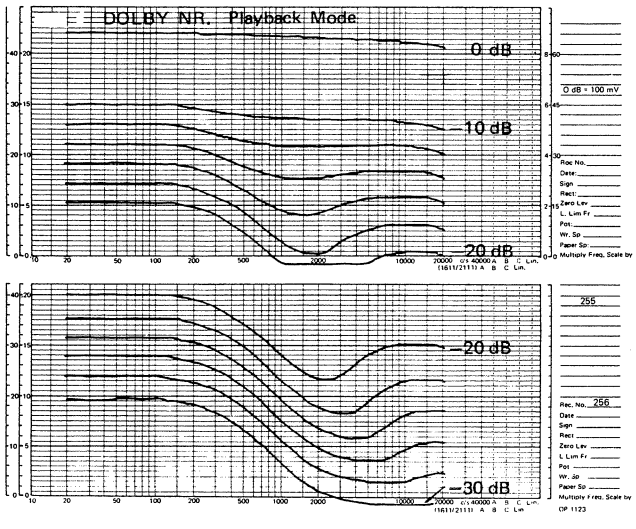


Fig. 2.2.6 Dolby NR Processor Record/Playback Frequency Response

2.2.3. DNL Circuit

Fig. 2.2.7 shows the circuit for the dynamic noise limiter (DNL). Its system diagram is shown in Fig. 2.2.8. Input terminal 14 (1) can be connected with the output of the mixing amplifier or that of the playback mode Dolby NR processor by the selection of MONITOR switch. The output of dynamic noise limiter 10 (5), and the other output independent of it, 12 (3) are applied to the DNL switch and becomes the input for METER AMP. A signal selected by this switch becomes the input to LINE AMP. In this system, noise reduction is performed only in the playback mode.

The input signal is amplified by amplifier 1 (Q101, 102, 103) and is branched into two paths at Q104; in branch [I], the signal is divided by the collector and emitter of Q104 and its high and low-frequency components appear at the output terminal as voltage V1 after passing through C108 and R116, respectively. Meanwhile, in branch [II] the signal enters amplifier 2 (Q106 and Q107) via the high-pass filter composed of C110 and R119. The attenuator formed by diodes D103 to D106 and other components is controlled by the output signal level and signal frequency. The output voltage of this attenuator, V2, is synthesized with the output voltage of branch [I], V1. In other words, frequency components of the signal within a band centering around 10 kHz are filtered out for playback levels at about −45 dB or above.

Fig. 2.2.9 shows the typical characteristics, and Fig. 2.2.10 is the frequency analysis data for the noise component by a 1/3 octave filter which shows results for three cases; (1) without noise reduction, (2) with only the Dolby noise reduction system, and (3) with the Dolby noise reduction system plus the dynamic noise limiter.

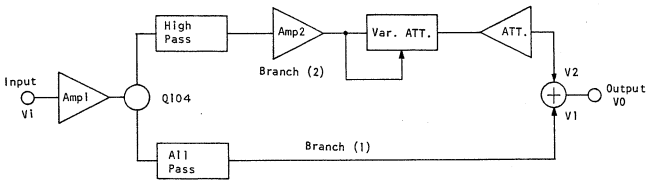


Fig. 2.2.8 Dynamic Noise Limiter System Diagram

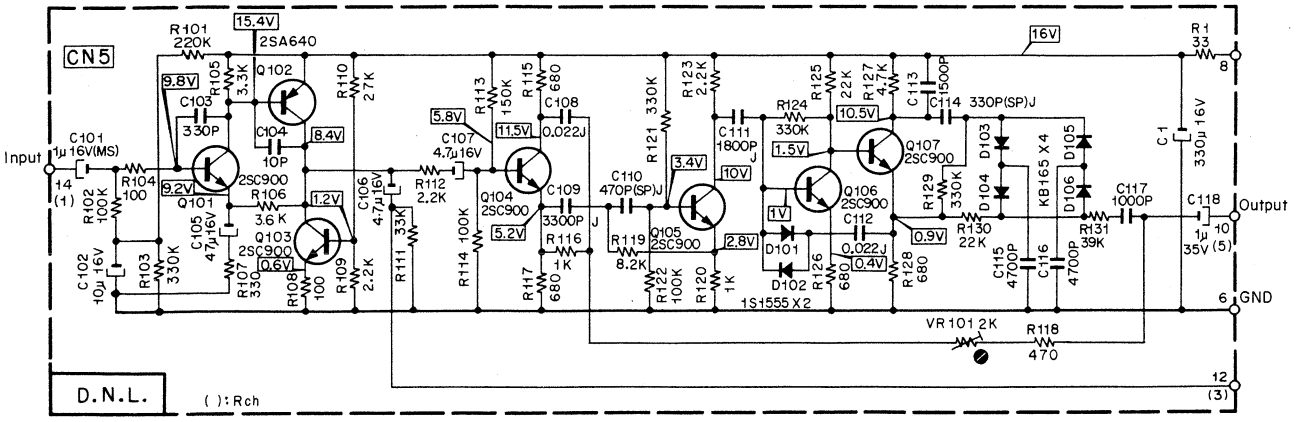
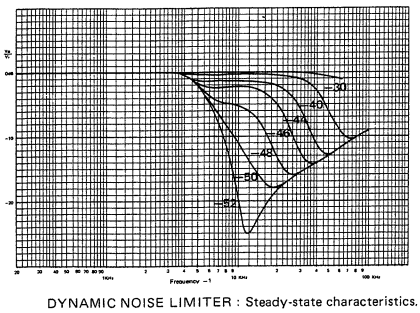


Fig. 2.2.7 Dynamic Noise Limiter Circuit Diagram



DYNAMIC NOISE LIMITER : Steady-state characteristics.
Parameter : Level Vi in dB, 0 dB = 780mV.

Fig. 2.2.9 DNL Characteristics

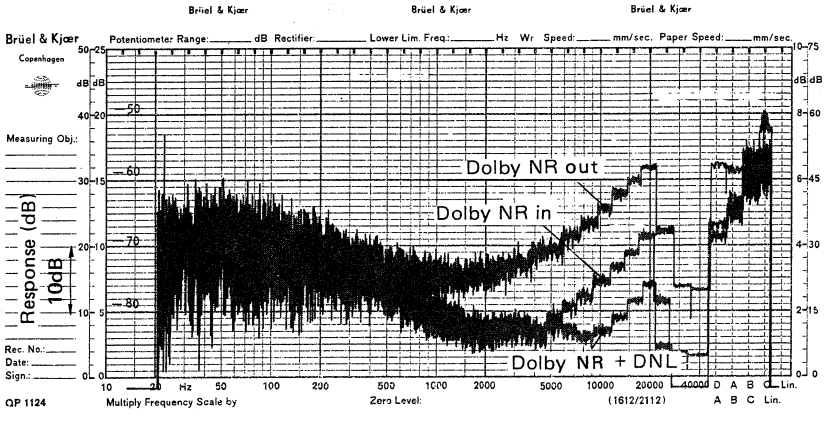


Fig. 2.2.10 Noise Figure

2.2.4. Playback Head Amp.

Fig. 2.2.11 shows the playback amplifier circuit, and Fig. 2.2.12 is its system diagram. The playback head is connected with terminals 13 (11) and 14 (12). Terminal 4 is provided for the mute signal. Terminal 9 (7) is connected with the EQ switch which is used to select a time constant according to the characteristics of the magnetic tape used.

Amplifier 1 (Q101 and Q102) is an equalizer amplifier. With the selection of the equalizer constants of its feedback circuit by means of a jumper wire, its time constant on the high frequency side can be varied in 10 μs steps from 110 μs to 140 μs and its gain in 1 dB steps. This selection is provided for compensation of playback head characteristics, however, the time constant of 120 μs is usually selected by short-circuiting R108 (10 kΩ) and opening R109 (22 kΩ).

Time constants of the time constant circuit are selected by 120 μs and 70 μs positions of the EQ switch so that the frequency characteristics of the circuit will fit to those of the magnetic recording tape used as follows (the time constant at low frequency is fixed to 3180 μs):

EXII ..... 3180 μs (50 Hz) + 120 μs (1326 Hz)

SX ..... 3180 μs (50 Hz) + 70 μs (2274 Hz)

The FET (Q103) acts to prevent transference of the amplifier 1 output signal to phase-shifter (Q104) by reducing its gate voltage below the pinch-off voltage for the mute signal.

Phase-shifter (Q104) acts to compensate the phase delay characteristics of the frequency response, reducing the modulation for the complex wave.

The playback amplifier gain is adjusted by VR101 in amplifier 2 (Q105, 106) so that, when the 400 Hz 20 mM/mm recorded tape is played back the output voltage of the playback mode Dolby NR processor at terminal 10 (5) becomes 100 mV and that of the playback head amplifier at terminal 3 (2) about 50 mV. The L and C in the amplifier 2 output provide a filter for bias-trapping which prevents disturbance of the Dolby NR action due to mixing bias frequencies in the Dolby NR processor.

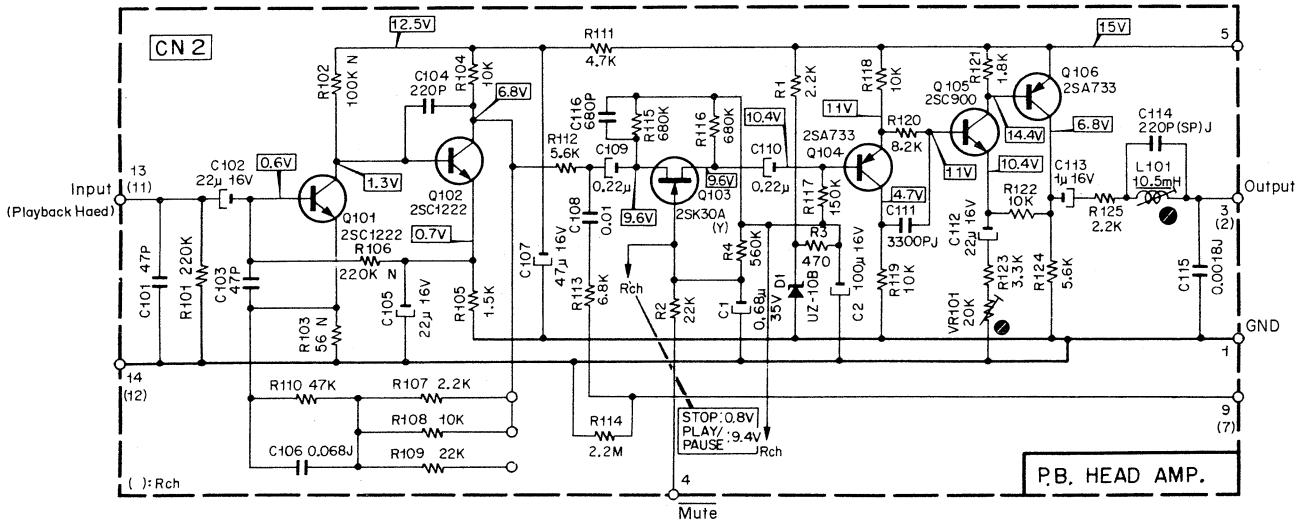


Fig. 2.2.11 Playback Head Amp. Circuit Diagram

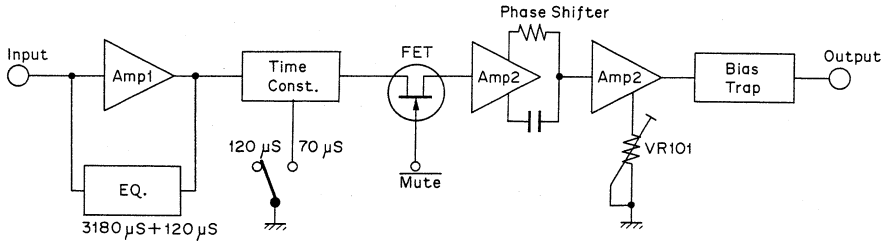


Fig. 2.2.12 Playback Head Amp. System Diagram

2.2.5. MIC Amp.

Fig. 2.2.13 shows a microphone amplifier circuit. This circuit board carries a DIN amplifier (DIN AMP), a input amplifier (INPUT AMP), a microphone amplifier (MIC AMP), a blending microphone amplifier (BLEND MIC AMP) and a mixing amplifier (MIX AMP). The input signal applied through the DIN connector is amplified by Q103 and that from the pin connector reaches the LINE VOLUME directly, and it is amplified by Q108 and Q109. The signal is fed to the pin connector if no DIN connector is plugged in, but becomes independent of the pin connector by plugging in the DIN connector.

Microphone amplifier (MIC AMP): Since the signal level of this input is usually low, Q101, Q102 and Q103 are provided to broaden the dynamic range. Q103 is a constant current source which provids a high MIC amp. output impedance.

For a large microphone output, this circuit is used at a reduced MIC VOLUME. In this case, however, the voltage gain of Q102 decreases because the load resistance of Q102 is reduced. Since voltage gain of the conventional microphone amplifier is constant, its amplification characteristics are not good for large input signals and its dynamic margin is about 40 dB. However, the microphone amplifier described here can be used without distortion for input voltages up to 2V because of its broad dynamic margin which is greater than approximately 80 dB. Thus, no microphone attenuator is necessary. If neither a DIN microphone nor a microphone plug is connected, the output of this circuit is grounded.

The blending microphone circuit (BLEND MIC) is the same as the microphone amplifier.

The voltage values indicated as 0.2 mV, 5 mV, etc., at the input terminals of the circuit board show that when each VOLUME control on the panel concerned is set at its maximum position, the LEVEL METER indicates 0 dB for each of these values. The output of this circuit is combined with the input of the mixing amplifier.

The output signal from the mixing amplifier is fed to the LC filter. This filter normally operates the Dolby NR by removing the leakage of the bias signals for recording and the FM broadcast multicarrier signals. L102 is adjusted to minimize the 19 kHz signal level for MPX switch IN. The output of this circuit, 100 mV, becomes the input of the recording mode Dolby NR processor.

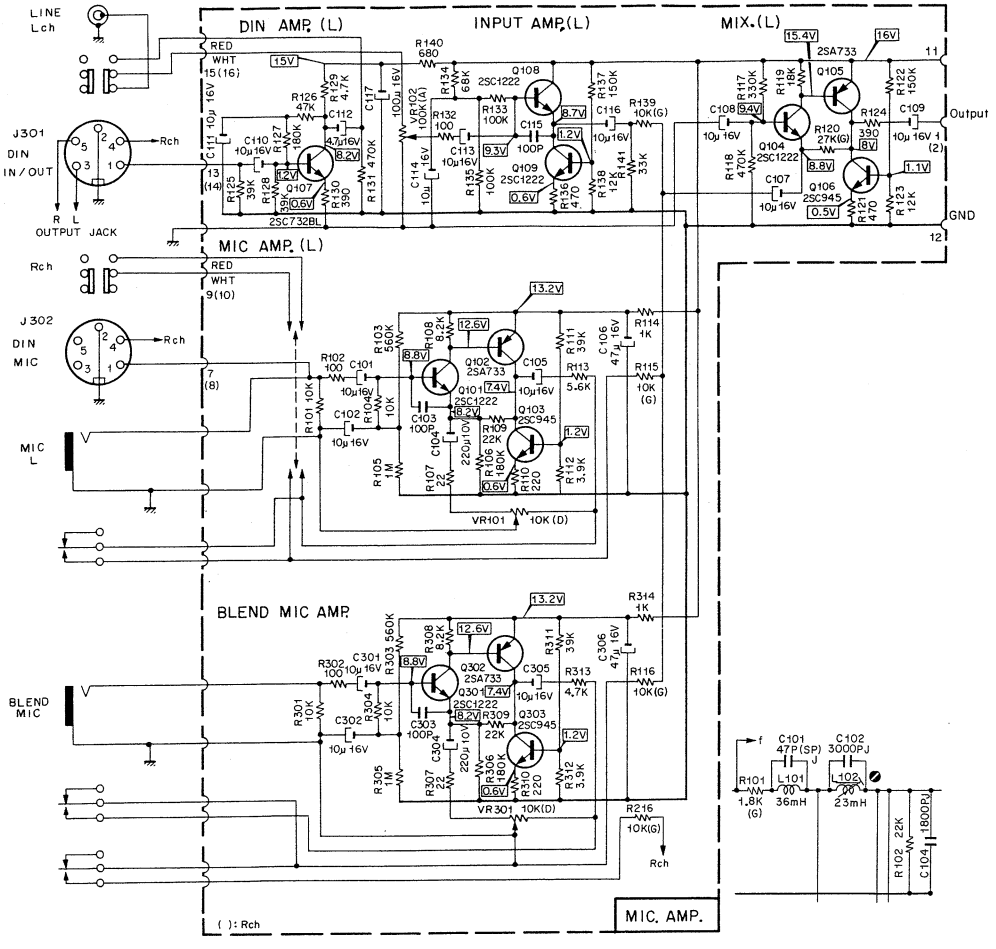


Fig. 2.2.13 MIC Amp. Circuit Diagram.

2.2.6. Record Equalizer Amp.

Fig. 2.2.14 shows the recording calibrator variable resistor circuit (REC CAL VR) and the recording equalizer amplifier circuit (REC EQ AMP).

This signal from the output of the recording mode Dolby NR processor becomes the input of this RECORDING CALIBRATOR circuit. The recording head (REC HEAD) is connected between the output terminal of this circuit and the ground.

The VR 702 line is prepared for EX tape and that of VR 701 for SX tape. The time constant is selected by changeover of this EQ switch. This selection, coupled with the time constant selection in the Playback Head Amplifier (PB HEAD AMP), makes it possible to obtain characteristics suitable for tape types. With respect to the details of this part, the section on the playback head amplifier should be referred to.

Since the FET (Q101) is in the OFF state for mute, the signal is cut here and no signal exists in the equalizer amplifier circuit. Without the mute signal, Q101 is in the ON state. Thus, the signal from the RECORDING CALIBRATOR is amplified by Q102 and enters Q103. A constant DC current flows in Q103 by way of Q104 and raises the output impedance, therefore, a constant current flows through the RECORDING HEAD over all frequencies used. L104 and C105 compose the recording equalizer. Compensation for the high frequency range is made by building a resonance frequency at about 23 kHz by means of adjusting L104. L103 and C109 construct a bias trap.

Figs. 2.2.15 and 2.2.16 show the frequency characteristics for recording and playback.

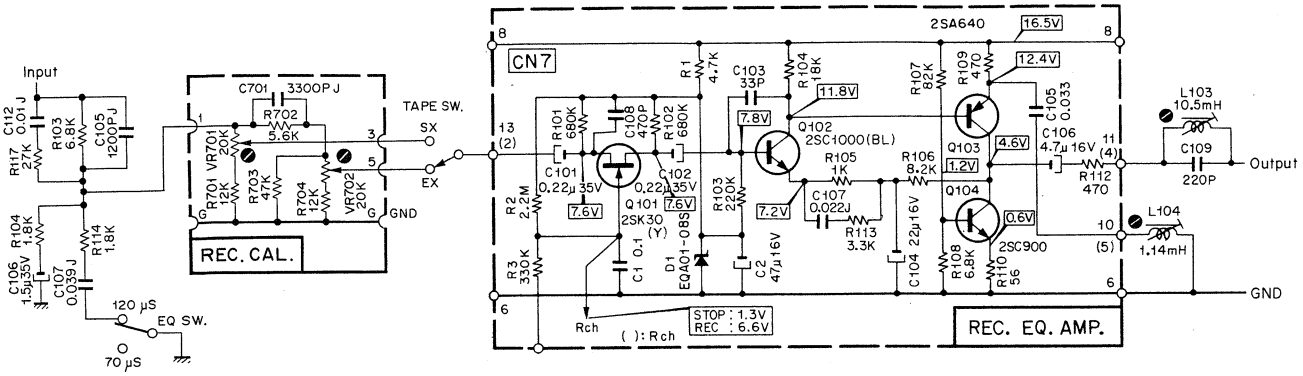


Fig. 2.2.14 Record Eq. Amp. Circuit Diagram

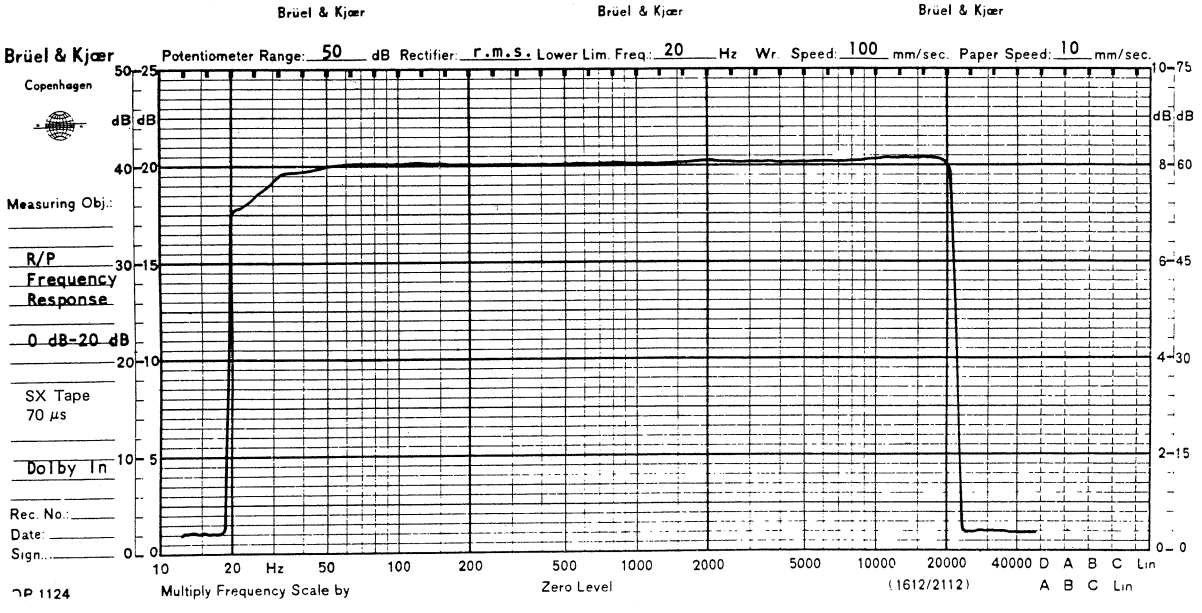


Fig. 2.2.15 Record/Playback Frequency Response (Dolby NR: IN)

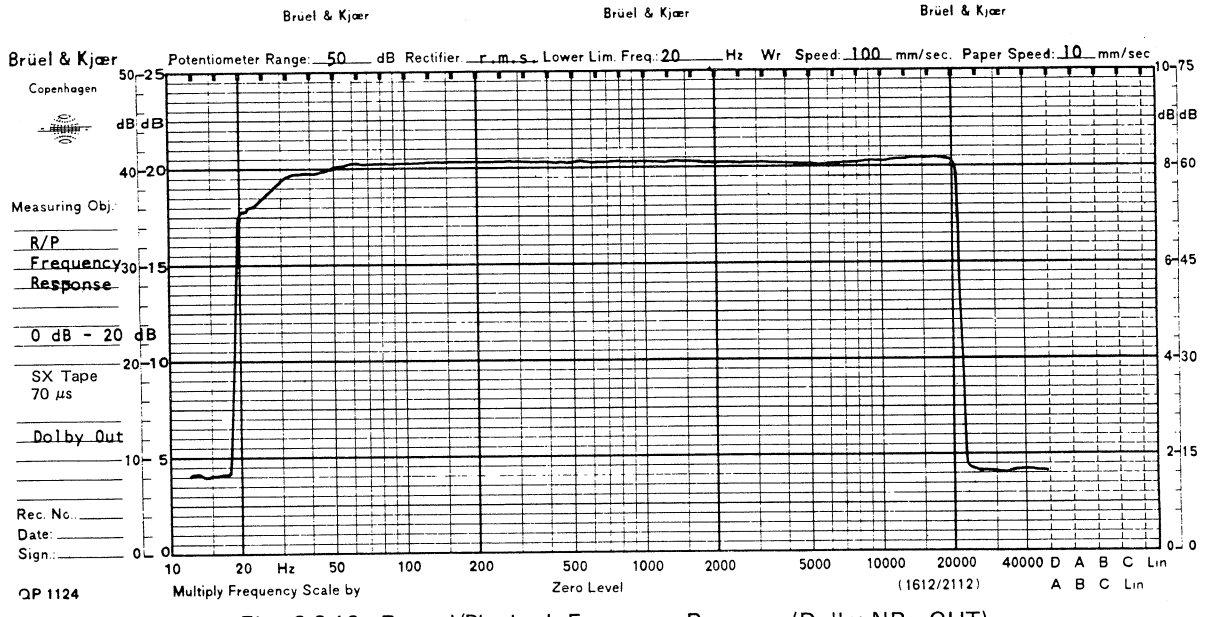


Fig. 2.2.16 Record/Playback Frequency Response (Dolby NR: OUT)

2.2.7. Bias Osc. and 400 Hz Osc.

Fig. 2.2.17 shows a push-pull oscillator with an oscillation frequency of 105 kHz which is constructed by capacitors C309 and C310 decoupling the collectors and bases of two transistors.

This is used to provide recording bias and as an erase signal.

By touching on the REC button, the record signal turns to high through the logic board, Q307 is put in the ON state, the bias oscillator power supply is activated, and oscillation begins. When the record mode is released, oscillator output is damped by the discharge of C313. This prevents magnetization of the head.

Fig. 2.2.18 shows a 400 Hz oscillator circuit using an RC circuit. Its signal output is used to check record and playback levels and as an alignment beacon. VR301 is used for adjusting oscillation amplitude and VR203 for matching R and L channel levels.

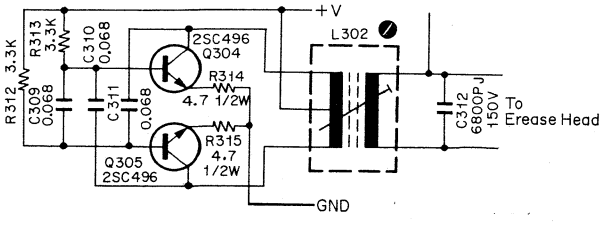


Fig. 2.2.17 Bias Osc. Circuit Diagram

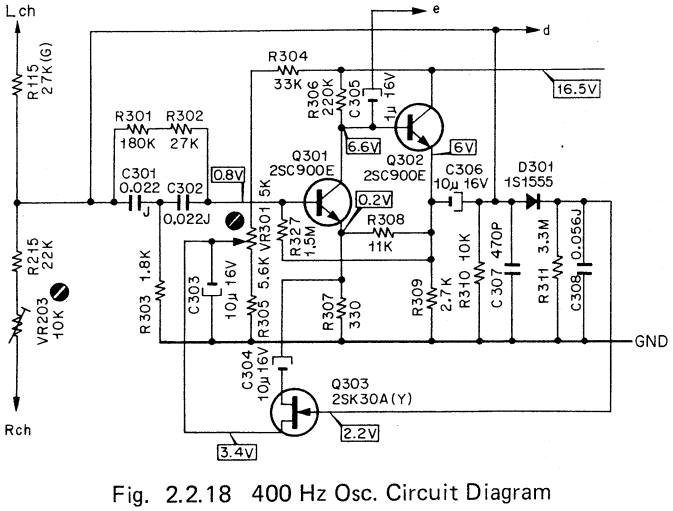


Fig. 2.2.18 400 Hz Osc. Circuit Diagram

2.2.8. Line Amp.

Fig. 2.2.19 shows the level meter amplifier circuit and the line output amplifier.

Terminal 12 (11) is the input of the level meter amplifier through which signals enter from terminal 12 (3) of the DNL circuit board. This input signal is not influenced by the DNL (dynamic noise limiter) regardless of the position of the DNL switch. Terminal 14 (13) is the meter output. The level meter is connected between this terminal and ground.

Q107 and Q108 form a directly coupled feedback amplifier and for a low input level, feedback occurs through R121. For high input levels which exceed the Zener voltage of diode D103, feedback magnitude increases by adding a feedback through R122 to that through R121, and the output gain decreases. That is that, the high input signals are subjected to compression during amplification. This circuit is so designed that its attack time is about 44 μs and its release time is about 105 ms, thus, even if sharp peaks such as those encountered in live music exist, the level meter indicates correct peak values.

The input of the line output amplifier is connected to the DNL switch and its level is controlled by the OUTPUT VOLUME control. The signal amplified by Q101 and Q102, and a maximum output of 1100 mV is obtained from line terminal 5 (4).

Since the output impedance is about 600 Ω, long cords are available for connection and no deterioration of characteristics occur due to multiple connections to recorders, etc. Q103, Q104 and Q105 consist of a headphone amplifier, and its input is connected to Q101 emitter and output is conducted to headphone jack via terminal 1 (2).

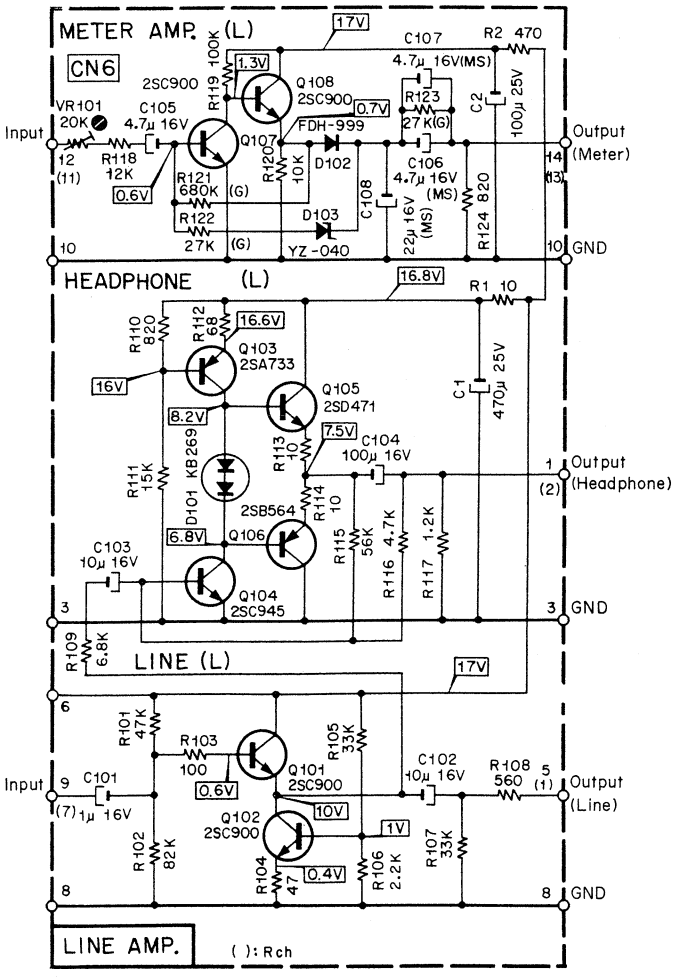


Fig. 2.2.19 Line Amp. Circuit Diagram

2.2.9. Power Supply

Fig. 2.2.20 shows the power supply circuit. This power supply is designed so that a constant voltage is obtained at the output on the secondary side of transformer [T1] for 100/117/220/240 V AC inputs by changing the VOLTAGE SELECTOR plug.

The 18 V DC, 0.5 A output is used as a power supply for the amplifier system, and the 12 V DC, 1.5 A output for the mechanism control. The 6 V AC, 0.3 A output is the power supply for illuminating the level meter.

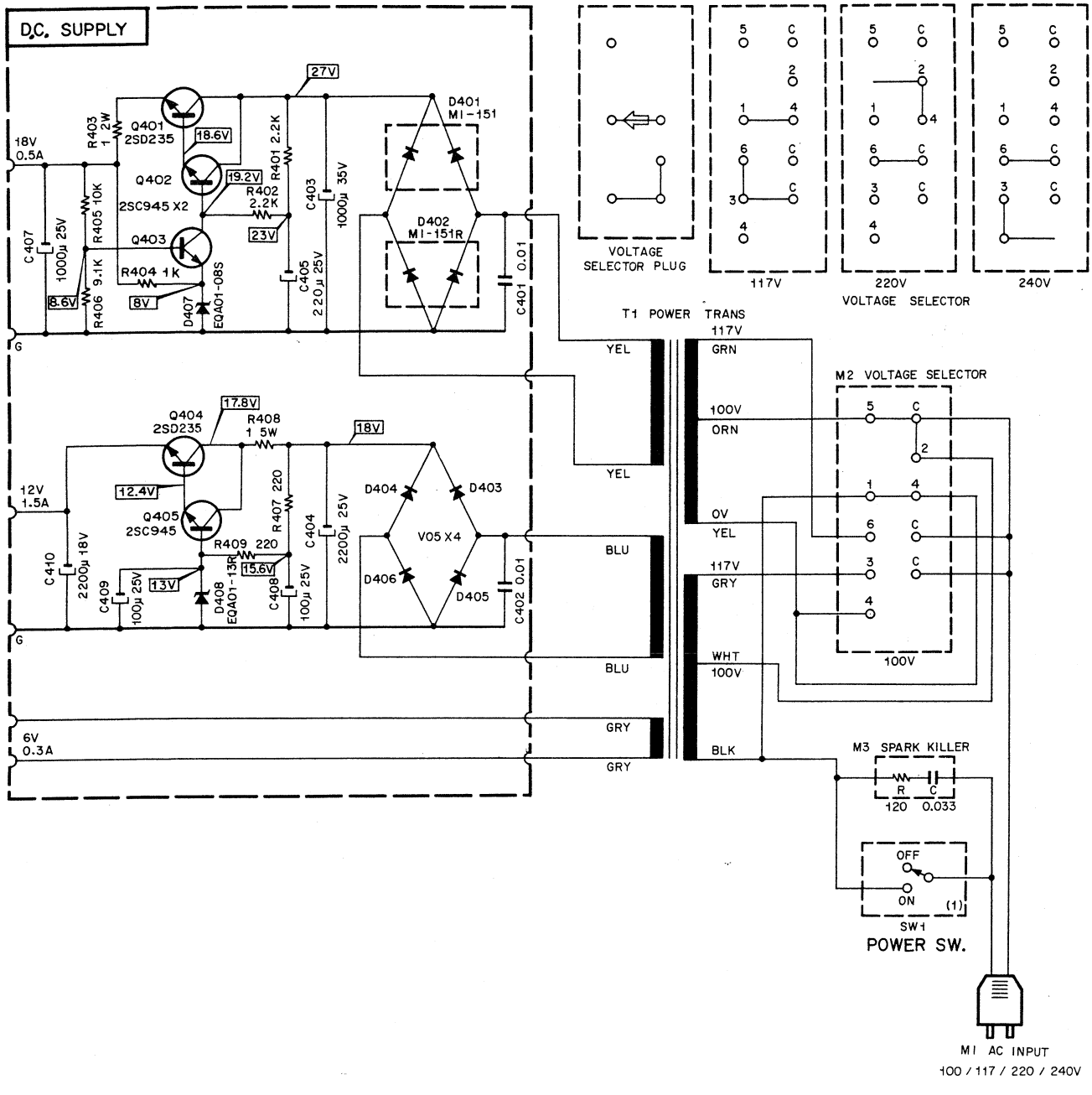


Fig. 2.2.20 Power Supply Circuit Diagram

2.3. Mechanism Control Circuits

The Mechanism Control Circuits consist of a logic control, shut-off control, azimuth alignment detector, motor governor, etc. Refer to Fig. 11.2 "Mechanism Control Block Diagram".

2.3.1. Logic Control

(1) General

The commands from touch control switches are communicated to the logic control circuits. Logic outputs are connected to the delay circuits and drivers for control of mechanisms.

Logic circuits consist of TTL ICs, the details of which are as follows:

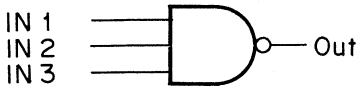
a. Main characteristics of TTL IC

Supply voltage	5 V
Logical L output voltage	less than 0.5 V
Logical H output voltage	3 V to 4 V
Noise immunity	1 V
Temperature range	0° to 70°C

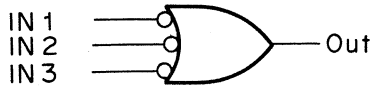
b. Gate Logic

The inputs are IN1, IN2 and IN3, and the output from the gate is shown below:

The output will be an L only if IN1 and IN2 and IN3 are all H's, and the output will be an H if IN1 is an L or IN2 is an L or IN3 is an L.



$Out = \overline{IN1 \cdot IN2 \cdot IN3}$



$Out = \overline{IN1} + \overline{IN2} + \overline{IN3}$

$Out = \overline{IN1 \cdot IN2 \cdot IN3} = \overline{IN1} + \overline{IN2} + \overline{IN3}$

Fig. 2.3.1

Truth Table 1

IN1	IN2	IN3	Out
L	L	L	H
H	L	L	H
L	H	L	H
H	H	L	H
L	L	H	H
H	L	H	H
L	H	H	H
H	H	H	L

The construction of the foregoing 2 Logic Symbols is identical and intended to show the use of either AND or OR.

c. Gated Flip-Flop

The two NAND gates can be used to form flip-flop.

The inputs operate as follows:

When both S and R are H's, the flip-flop will remain in its present state, i.e., will not change states.

If however, the R input goes to an L, the NAND gate connected to R will have an H output regardless of the other feedback input to the NAND gate, and this will force the flip-flop to the L state (provided the S input is kept H). Similar reasoning shows that making the S input an L will cause the NAND gate at the S input to have an L output, forcing the flip-flop to the H state (again provided the R input is kept H).

If both inputs R and S are made L's, the next state will depend on which input is returned to H first, and if both are returned to H simultaneously, the resulting state of the flip-flop will be indeterminate. As a result, this is a "forbidden" or "restricted" input combination.

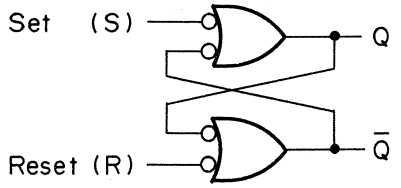


Fig. 2.3.2

Truth Table 2

Set	Reset	Q	$\overline{Q}$	Remarks
L	L	H	H	*: To maintain the previous
H	L	L	H	state, but indefinite if
L	H	H	L	both of the previous inputs
H	H	*	*	S and R are made L's.

In the actual use, the activation speed of the Flip-Flop is managed to be delayed in order to prevent erroneous movements caused by noise with details being as follows:

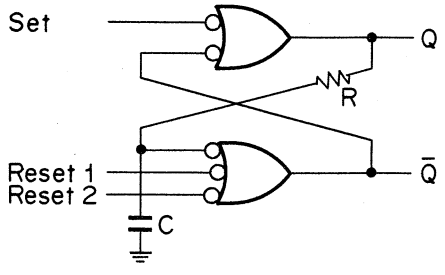


Fig. 2.3.3

d. Schematics and Block Diagrams

SN7400N (Quadruple 2-input positive NAND GATE)

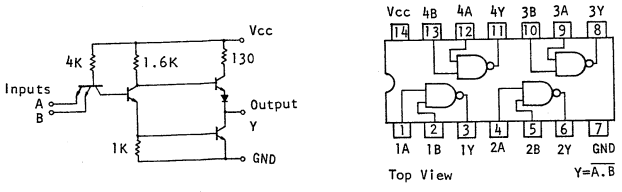


Fig. 2.3.4 SN7400N

SN7410N (Triple 3-input positive NAND GATE)

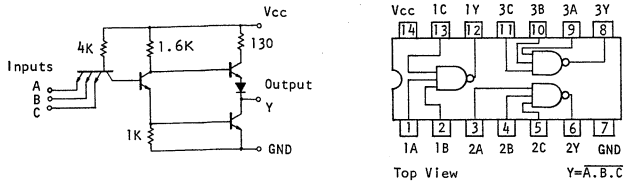


Fig. 2.3.5 SN7410N

SN7420N (Dual 4-input positive NAND GATE)

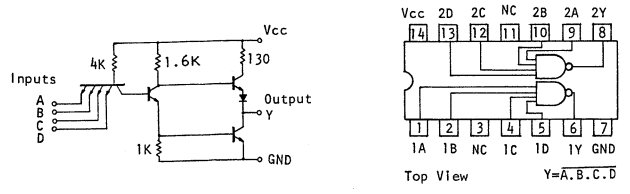


Fig. 2.3.6 SN7420N

e. Compatible ICs

The following ICs belong to the same group which can be replaced:

L601, L603, L605:		N7400A, SN7400N, M53200P, HD2503, TD3400P
L602, L606	:	N7410A, SN7410N, M53210P, HD2507, TD3410P
L604	:	N7420A, SN7420N, M53220P, HD2504, TD3420P

(2) Logic Control

A foolproof operation will be done by logic control.

For example, when command the playback mode while fast winding or command fast-forward mode while rewinding, it is guaranteed that no abnormal tape tension will happen by passing through the stop mode. This is also guaranteed even when the buttons are touched on simultaneously.

a. Logic Signal

How to read the signals is referred to the following:

The signal H shows the condition that the signal is executing, and in case there is a — on the signal, signal L shows the condition that the signal is executing.

$\overline{\text{K stop}}$ (control stop button signal)

$\overline{\text{K stop}}$ becomes L when the stop button is touched on, and $\overline{\text{K stop}}$ is H while button is open.

$\overline{\text{PLY}}$ (Play flip-flop $\overline{\text{Q}}$ output signal)

$\overline{\text{PLY}}$ = L shows at play mode, and H shows out of play mode.

PLY (Play flip-flop Q output signal)

PLY = H shows at play mode, and L shows out of play mode.

$\overline{\text{HB}} = \text{PLY} \cdot \overline{\text{Fst DL}} \cdot \overline{\text{PAU}}$

$\overline{\text{HB}}$ = L drives the head base solenoid.

$\overline{\text{HB}}$ signal becomes L when PLY = H AND Fst DL = L AND PAU = L.

b. Logic Operating Status

Refer to Fig. 2.3.7 (Logic Status). Each stage of logic status is shown for the sequential control button command.

c. + 5 V Power Supply for ICs

+ 5 V DC power supply is made by regulated + 12 V DC from the Power Supply Unit. The transistor Q610 acts as a regulator, being controlled by zener diode ZD601.

d. Initial Reset

At power switch ON, + 12 V DC comes up gradually then the transistors Q609 and Q608 turn to ON for only a certain period while Q609 base voltage is low with respect to the emitter (+ 5 V).

And $\overline{\text{K stop}}$ = L pulse is generated.

At power switch OFF, + 12 V discharges gradually, and $\overline{\text{K stop}}$ = L pulse is also generated. $\overline{\text{K stop}}$ = L pulse clears each flip-flop and keeps at the initial condition, stop mode.

e. Stop Mode

The stop button when touched on and the cassette well when opened make $\overline{\text{K stop}}$=L and resets each of the flip-flop. $\overline{\text{K stop}}$=L pulse is generated when shut-off is detected and when + 12 V is lowered about by 70%.

f. Play Mode (Playback or Record Mode)

The play button when touched on makes $\overline{\text{K play}}$=L and sets the PLY Flip-Flop, (PLY=H,L605-8), and head base solenoid will be activated.

g. Record Mode

REC Flip-Flop (REC,L603-6) will be set to H when record button ($\overline{\text{K rec}}$=L) and play button ($\overline{\text{K play}}$=L) are touched on simultaneously, or record button and pause button ($\overline{\text{K pau}}$=L) are touched on and then play button is touched on.

REC=H commands the bias oscillation of Amp.

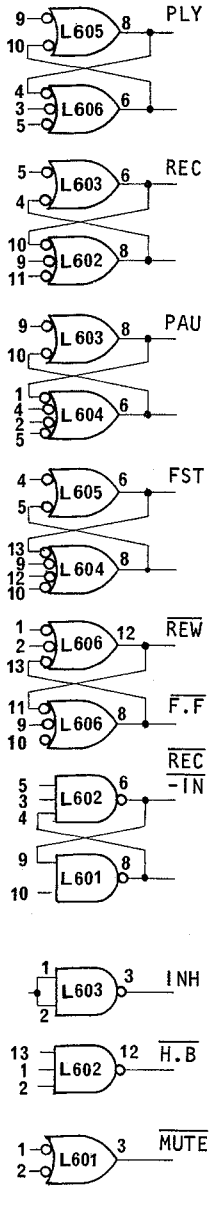
Note: To close record protect switch is required.

h. Pause Mode

While recording or playback, the pause button when touched on sets the PAU Flip-Flop, PAU=H (L603-8).
Then $\overline{HB}$ signal turns to H and head base solenoid will be released.

i. Fast Wind Mode

The rewind ($\overline{K\,rew}$=L) or fast forward button ($\overline{K\,ff}$=L) when touched on sets the FST Flip-Flop.
While the $\overline{REW}$ / $\overline{FF}$ Flip-Flop is set to $\overline{REW}$=L(L606-12) or $\overline{FF}$=L(L606-8), $\overline{REW}$ or $\overline{FF}$=L will drive the REW or FF Relay, and Reel Motor will turn backward or forward.



MODE / CONTROL BUTTON	STOP	RECORD				PLAY BACK	FAST WIND	
	STOP	RECORD	RECORD PAUSE	PLAY	PAUSE	PLAY	F.FWD	REWIND
PLY	L	L	L	H	H	H	L	L
	H	H	H	L	L	L	H	H
REC	L	H	H	H	H	L	L	L
	H	H	L	L	L	H	H	H
PAU	L	L	H	L	H	L	L	L
	H	H	L	H	L	H	H	H
FST	L	L	L	L	L	L	H	H
	H	H	H	H	H	H	L	L
$\overline{REW}$	H	H	H	H	H	H	H	L
F.F	H	H	H	H	H	H	L	H
$\overline{REC-IN}$	H	L	H	H	H	H	H	H
	H	H	L	L	L	H	H	H
INH	H	H	H	L	H	L	L	L
H.B	H	H	H	L	H	L	H	H
$\overline{MUTE}$	L	L	L	H	H	H	L	L

Fig. 2.3.7 Logic Status

j. Mute Signal
$\overline{HB}$=L or $\overline{PAU}$=L makes Mute signal (L601-3) to H and will release the mute of the Amp.
(The mute of record Amp. is released only at record mode, and playback Amp. are released at record and playback modes).

k. Memory Stop
While memory switch is ON and rewinding, stops tape travel when the tape counter comes to "999".
At counter "999", L606-12 ($\overline{REW}$=L) and capacitor C624 are connected, therefore the differentiated pulse is generated at L604-10.
This pulse resets Fst Flip-Flop turning to $\overline{REW}$=H, and stops rewinding.

l. Auto Rewind
While auto-rewind switch is ON and in record or playback mode, $\overline{K\,rew}$=L pulse is generated by transistor Q627 ON when the tape comes to an end, then rewinding will start.
The reasons why shut-off signal does not generate at a tape end are as follow:
When tape comes to an end, shut-off condition will be detected, and transistor Q607 turns to ON.
As a result, base current flows in the Q627 and turns ON, while the base voltage of the Q608 is less than that of the Q627 by deviding resistors R627 and R626, therefore Q608 cannot turn ON.
And after Q627 turns ON completely the Q607 collector voltage falls to the ground through Q627 and Q628.

(3) Drivers and other Signals

a. Touch Switch
This is of electronic-control switch and will become ON when you place a finger on the while metal strips running in parallel along the Control Switch Board.
In Fig. 2.3.8, when you touch the metal strips A, B, base current will be applied to transistor Q1 through R1, R (your finger) and R7, and thus Q1 will be activated, thereby collector current is fed to the Q7 base from Q1 and Q7 will therefore become saturated.

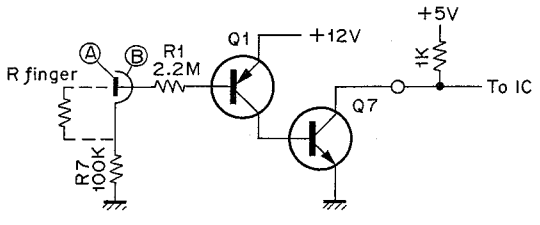


Fig. 2.3.8 Touch Switch Circuit

b. Lamps
Play Lamp — Lights on when head base solenoid is set to ON.
Record and Pause Lamps — Light on in the memory state of REC and PAU Flip-Flop respectively.
Rewind Lamp — Illuminates at Rew Relay ON.
F.Fwd Lamp — Illuminates at F.Fwd Relay ON.
Stop Lamp — Illuminates in the state other than the above.

c. Head Base solenoid
While set the PLY Flip-Flop, the head base solenoid will be driven by the $\overline{HB}$(L602-12)=L.
However while in pause mode, the $\overline{PAU}$(L602-2)=L will inhibit the $\overline{HB}$=L signal.
The $\overline{Fst\,DL}$ (L602-1) signal will serve to drive the head base solenoid after a certain period for stopping Fast Wind, when the play button is set to ON during Fast Wind.
In this regard, the resistor (R680 15 ohms) connected in series to the solenoid will be shorted by the Q627 and Q626 on the base switch P.C.B. ass'y before the drive of head base and limit switch ON.

d. Reel Motor
The FF Relay will drive while the $\overline{REW}$ / $\overline{FF}$ Flip-Flop is $\overline{FF}$=L and REW Relay being $\overline{REW}$=L.
One side of the Reel Motor is connected to the REW Relay and the other to the FF Relay, and the Relay is connected while OFF the ground and while ON + 12 V.
Rewind = REW Relay ON · FF Relay OFF
F. Fwd = REW Relay OFF · FF Relay ON
Stop = REW Relay OFF · FF Relay OFF

e. Brake solenoid
Brake solenoid driver is connected in parallel to the Reel Motor.
Brake Solenoid is released when reel motor runs, and vice versa.

f. Rec Signal
Rec signal connected to the Amp. controls ON/OFF of the bias oscillation. $\overline{Rec}$ signal H conducts the bias oscillation.
The Rec and Rec signals connected to the Pitch Control Volume serve in selecting the speed of the capstan motor for recording and playback.

g. Shut-off Detector Inhibition Signal
Prevents the shut-off signal from entering the Logic while the take-up reel is not turning.
Inhibition signal will be released by $\overline{HB}$ = L or $\overline{FST}$ = L, namely while tape is travelling or in Fast Winding mode.
After $\overline{HB}$ = L or $\overline{FST}$ = L is commanded, it is considered as enough delay time to release shut-off inhibition signal

for assurance of the stable start of the take-up reel movement.

2.3.2. Shut-off Sensor and Detector

Refer to Figs. 2.3.9 and 2.3.10.

Shut-off sensor consists of LED (Light Emitting Diode), photo transistor and slitted disc plate which is rotated by take-up reel.

Through turning disc plate, intermittent LED's lights are generated, while photo transistor is receiving these lights and output sensor signals. A shut-off signal which clears the Logic Flip-Flop will be generated when stop of sensor signals is detected by shut-off detector at a tape end.

(1) The capacitor C611 (0.12 μF) is charged through resistor R622 (1.8 M ohms). While sensor output signals are differentiated by C610 and differentiated positive pulses set a transistor Q605 to ON, then Q605 will discharge quickly.

(2) At a tape end, sensor signal will not generate and C611 will be kept charged. When the voltage of C611 exceeds the Q606 emitter voltage (about 2.3 V), Q606 and Q607 turn to ON, therefore Q608 turns to ON and shut-off signal ($\overline{\text{K stop}}$=L) will be generated.

(3) Shut-off signal resets PLY and Fst Flip-Flops, therefore INHIBIT signal (INH, L603-3) will be set to H. A base current of Q605 flows through INHIBIT signal H and Q605 turns to ON and discharges the C611. Therefore Q605, Q606 and Q608 turn to OFF and shut-off signal will be released.

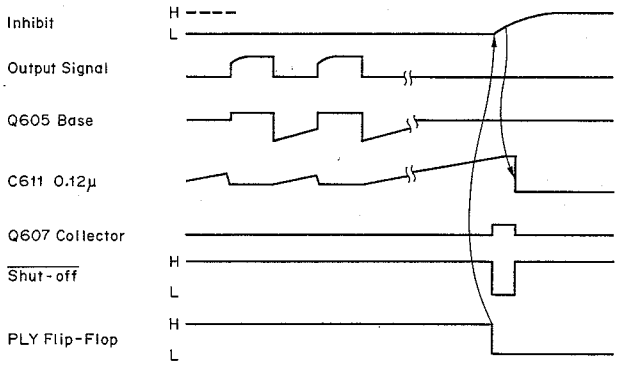


Fig. 2.3.10 Shut-off Timing Chart

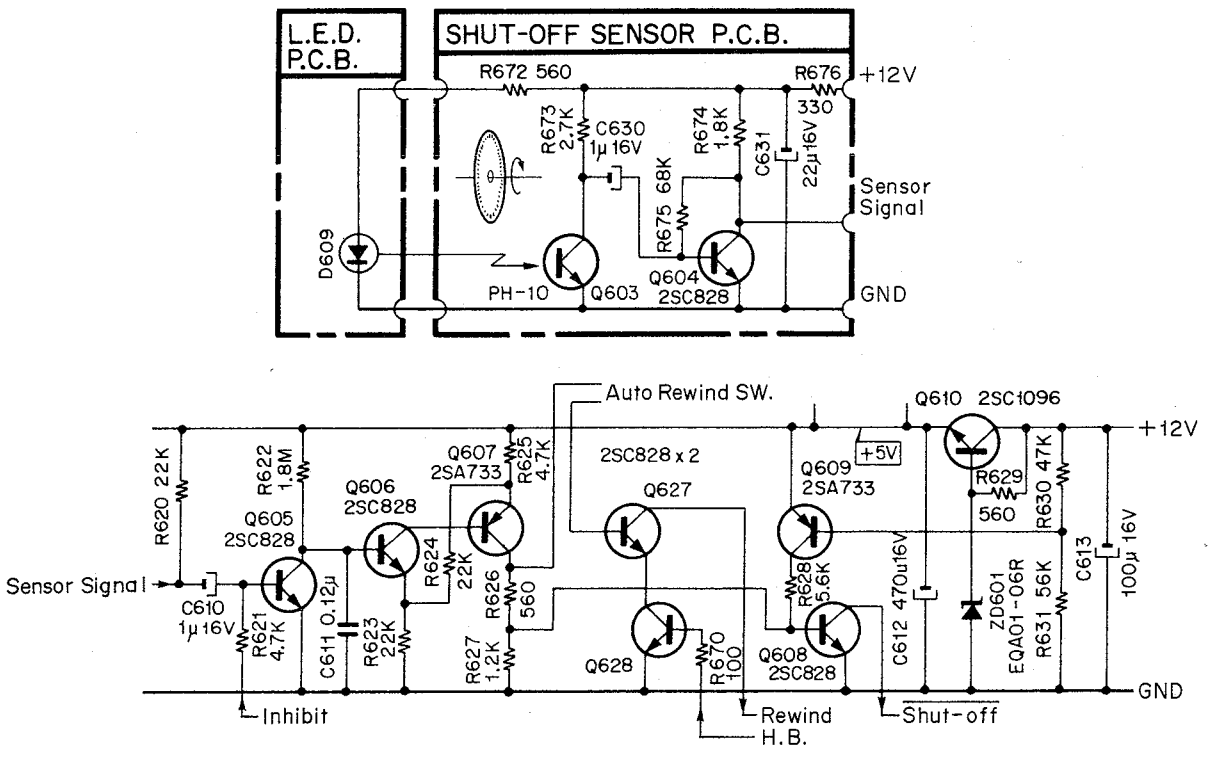


Fig. 2.3.9 Shut-off Sensor and Detector Circuit Diagram

2.3.3. Azimuth Alignment Detector

Refer to Figs. 2.3.13 and 2.3.14.

Prior to recording, it is required that the azimuth alignment be conducted for both sides A/B of a cassette tape to keep the optimum performance, with details being as follows:

Each cassette housing has a distortion for the molded pin locating between record and playback heads, therefore when tape is travelling through the molded pin the travelling of tape is slightly changed by each cassette housing.

And adjustment aims at an accurate azimuth alignment of the record and playback heads through a travelling tape. Adjustment shall be conducted by turning the azimuth alignment screw while record mode and the adjustment panel test tone switch is ON.

When the recorded 400 Hz tape is played back, the difference of the phase between right and left channels indicates the difference of playback and record head azimuth.

Therefore when the difference of the phase equals to zero, playback and record head azimuth is aligned then both of the alignment beacon flickers alternately.

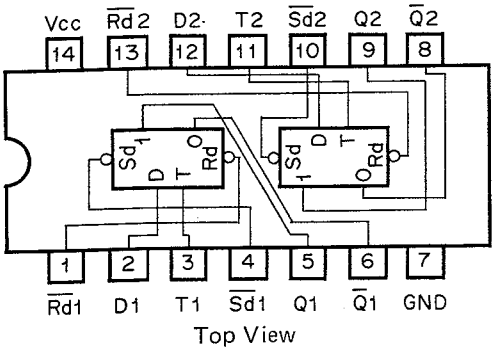
(1) Left and right channel playback signals which are communicated to the operational amplifier terminals 5 and 9 will be amplified to the rectangular waves.

(2) These rectangular waves are converted to the TTL IC voltage level through transistors Q601 and Q602, and communicated to the L607 TTL IC terminals "T" and "D".

(3) The outputs of L607 begin to repeat ON and OFF and conduct to flicker LEDs alternately when same phase signals are conducted to "T" and "D" terminals.

(4) Function of L607:
At transition of "T" terminal from L to H, "D" terminal H conducts output Q to H and $\overline{Q}$ to L and also "D" terminal L conducts output Q to L and $\overline{Q}$ to H.

(5) SN7474N (Dual D-Type Edge-triggered Flip-Flop)



Top View

Fig. 2.3.11 SN7474N

tn	tn+1	
Input D	Output Q	Output $\overline{Q}$
L	L	H
H	H	L

tn: Bit time before clock pulse.
tn+1: Bit time after clock pulse.

Compatible ICs
L607: N7474A, SN7474N, M53274P, HD2510, TD3474P

(6) RC4709 (Dual Operational Amplifier)

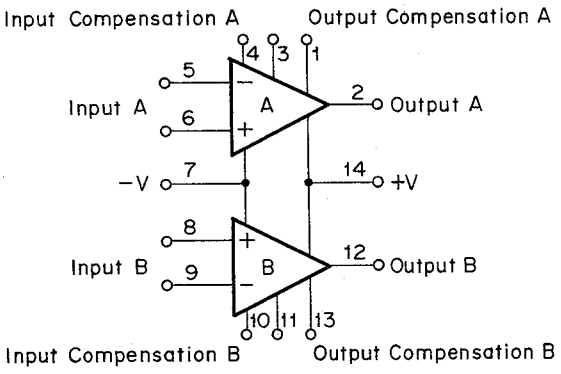


Fig. 2.3.12 RC4709

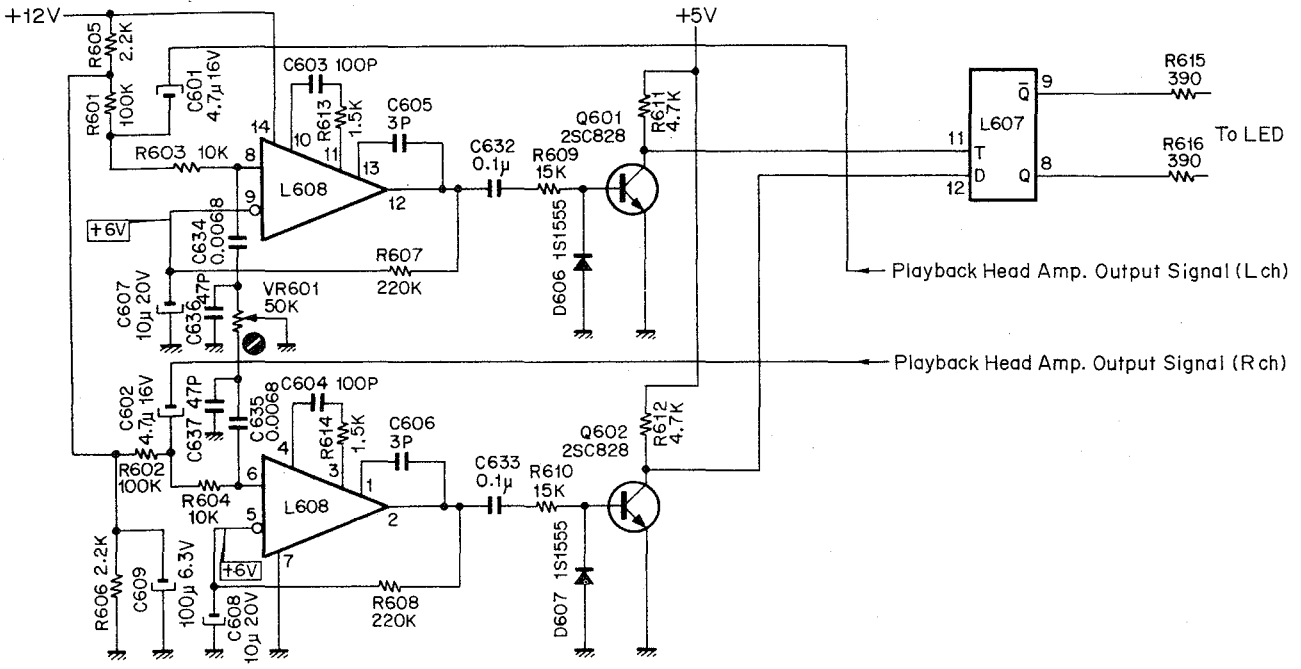
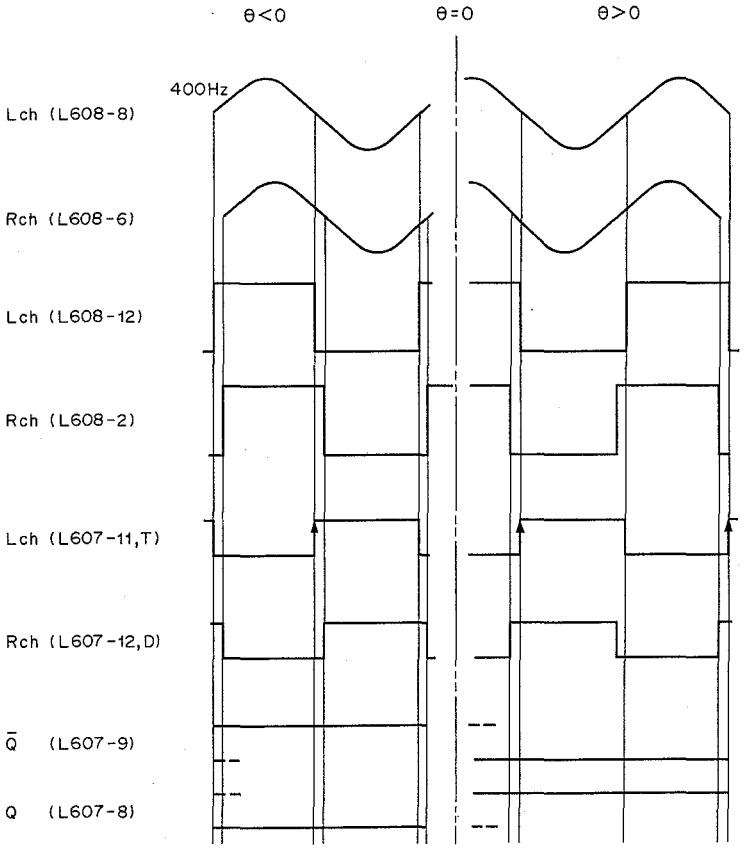


Fig. 2.3.13 Azimuth Alignment Detector Circuit Diagram



θ : difference of phase between L ch and R ch Playback Head Amp. Output signals.

Fig. 2.3.14 Azimuth Alignment Detector Timing Chart

2.3.4. Capstan Motor Governor

Refer to Figs. 2.3.16 and 2.3.17.

Capstan motor governor connects to the Motor Assembly consisting of motor and sensor. Sensor consists of LED (Light Emitting Diode), photo transistor and slitted disc plate which is turned by motor.

When disc plate is turned, intermittent LED's lights are generated, while photo transistor receives these lights and outputs signals to the motor governor.

Sensor generates proportional frequency signals according to the motor speed. Motor governor controls the motor current in order to keep the constant sensor output signal i.e. constant motor speed.

(1) Sensor output signals are amplified to the rectangular waves by IC 501 1/2.

(2) Through transistor Q501 differentiated pulses are generated by capacitor C506 (150 pF).

(3) C507 (3300 pF) (IC501 2/2-6) is charged through resistor R511 (150 k ohms) gradually. While the above operation, the differentiated positive pulse commands to discharge C507 quickly.
Therefore charge and discharge are repeated according to the periodic time of sensor signal.

(4) The voltage of IC 501 2/2-5 is fixed through pitch control volume, and when IC 501 2/2-6 is higher with respect to the 5 pin voltage, IC 501 2/2-7 output falls to ground and turns Q503 to ON.

(5) C509 (1 μF) will charge through Q503 and discharge through R516 (10 k ohms). A base current of Q504 flows through C509, then Q504, Q505 and Q506 amplifiers act to drive a motor.

(6) Q503 turn ON time gets short when periodic time of sensor output signal is shorted, and the voltage of C509 decreases, then motor speed will also decrease. When periodic sensor output signal becomes fast, the voltage of C509 and motor speed will increase.
Motor speed is therefore kept constant.

(7) MC1458 (Dual Operational Amplifier)

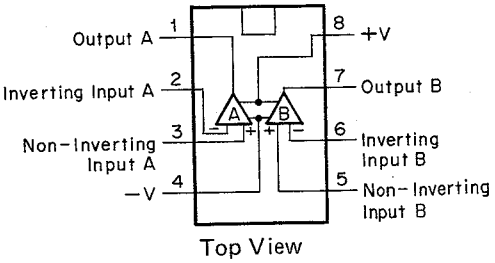


Fig. 2.3.15 MC1458

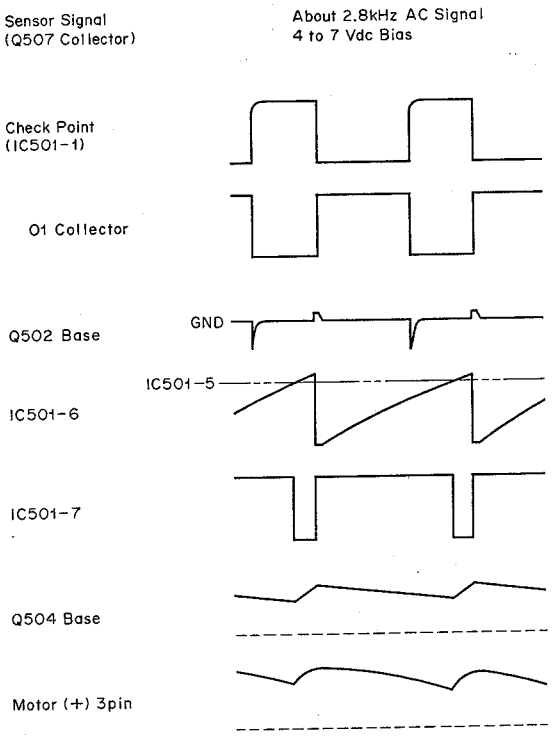


Fig. 2.3.17 Capstan Motor Governor Timing Chart

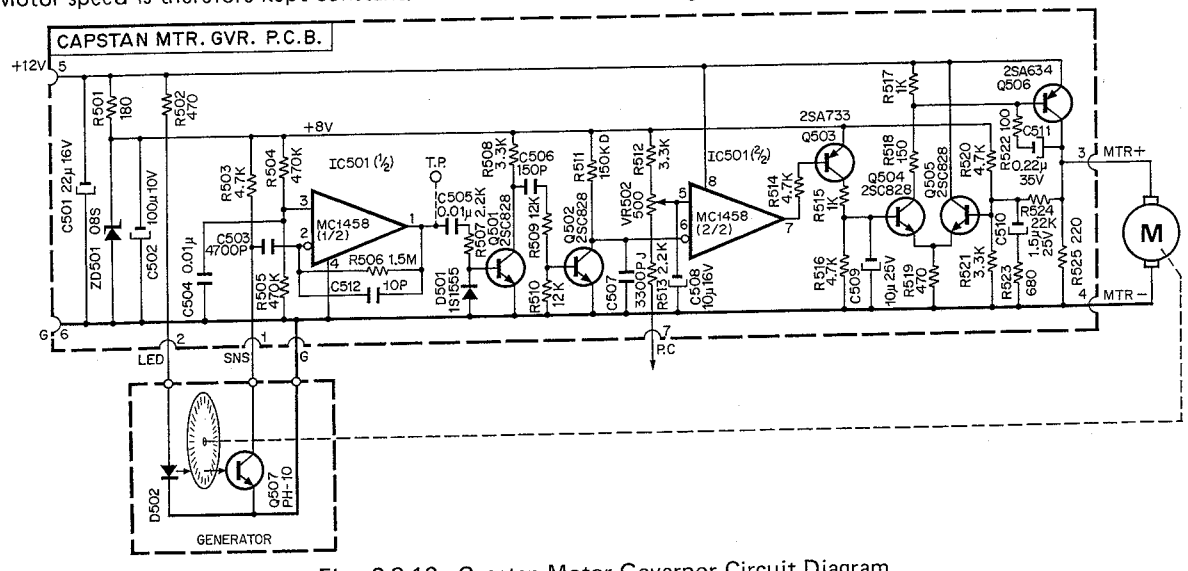


Fig. 2.3.16 Capstan Motor Governor Circuit Diagram

2.3.5. Reel Motor Governor

Refer to Fig. 2.3.18.

While in Play mode, motor speed is detected by bridging, observing the counter electro motive force of the motor. A bridging consists of a motor to be one side, and the electric potential between A and B (shown in Fig. 2.3.18) should theoretically become proportional to the motor speed if the condition meets the formula;

$$\frac{R}{R2} = \frac{R3//R5}{R4} .$$

In the circuit, a constant motor speed can be secured because the potential between A and B is servo-controlled by Q3 to become constant.

While in FF and REW modes, + 12 V is fed directly to the Reel Motor, and the motor will rotate either clockwise or counterclockwise depending upon the given polarity.

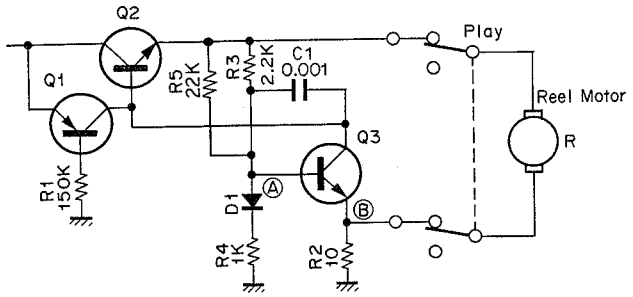


Fig. 2.3.18 Reel Motor Governor Circuit Diagram

2.3.6. Head Base Solenoid Driver

Refer to Fig. 2.3.19.

SW1 is closed while in Stop mode. If the PLAY button is effected, Q614 of the Logic Control Circuit will become ON. Accordingly a base current of Q1 is fed through R1 and SW1, then Q1 and Q2 become ON.

With Q2 ON, R680 (15 ohms) will be shorted and therefore + 12 V will be applied to solenoid.

When the solenoid acted to pull the Head Base inwardly, SW1 will become open. At this time base current will be fed to C1 from Q1 for a while, but Q1, Q2 will become OFF, as a result of which R680 (15 ohms) is connected in series to the solenoid and + 12 V will be supplied thereto. In other words, + 12 V is given to the solenoid while the Head Base is being mechanically pulled inwardly, and to maintain that state of the Head Base, a resistor is added in series so that the power loss can be reduced.

2.3.7. Brake Solenoid Driver

Refer to Fig. 2.3.20.

The brake solenoid releases brake while in REW or FF mode (brake will be mechanically released while in Play mode as the head base itself moves outwardly).

When the relay (RL601/RL602 of the Logic Control Circuit) is turned ON either while REW or FF mode, base current will be applied to Q1 from + 12 V through R1 or R2, as a result of which Q1 becomes ON and Q2 becomes OFF. Capacitor C1 starts charging through R4, and Q3 and Q4 will become ON, when the voltage thus being charged exceeds the total of base-emitter voltage of Q3 and Q4, thereby driving the brake solenoid.

As above, there is a certain time delay until the brake solenoid circuit while in REW or FF mode releases brake.

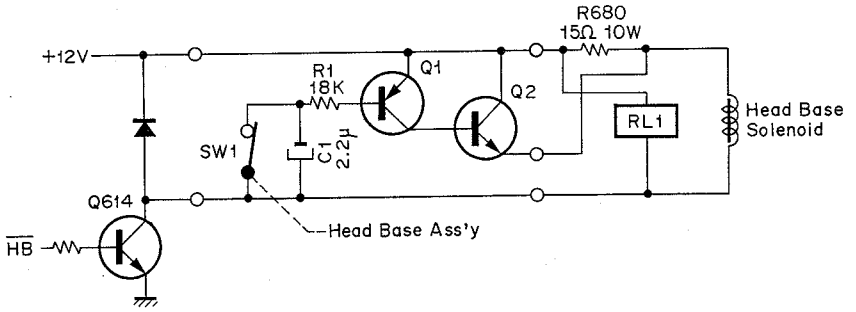


Fig. 2.3.19 Head Base Solenoid Circuit Diagram

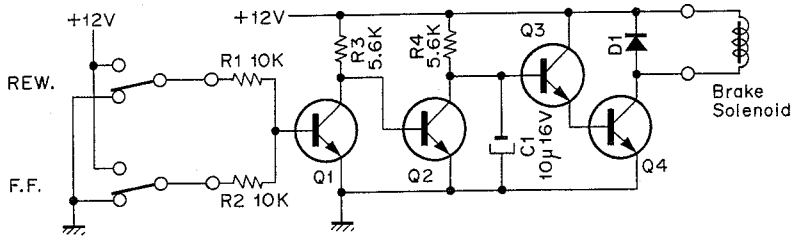


Fig. 2.3.20 Brake Solenoid Circuit Diagram

3. CHECK-OUT PROCEDURES

3.1. Check-Out Procedures for Inspection

3.1.1. Turn on the power switch.

(1) Check to insure whether meter lamps and stop lamp light, and whether the machine is held in stop mode.

3.1.2. Push the eject button.

(1) No control button operates, once cassette lid is opened.

3.1.3. Load a reference tape then touch on the play button

(1) Play lamp turns to on and tape runs at a speed of 1-7/8 ips.
(2) Auto shut-off function operates only a tape end so that machine is set to stop mode.
(3) While tape is travelling check to insure whether stop, fast forward and rewind buttons operate.
When stop button is touched on, machine stops. When fast forward button is touched on, fast forward lamp turns to on and tape travelling is changed to fast forward winding mode. When rewind button is touched on, rewind lamp turns to on and tape travelling is changed to rewind mode.

3.1.4. Touch on the fast forward button.

(1) Fast forward lamp turns to on and tape runs at a speed of about 61 ips.
(2) Auto shut-off function operates only at an end of tape so that machine is set to stop mode.
(3) When play, rewind, or stop button is touched on, fast forward mode is changed to playback mode, rewind mode, or stop mode according to each button.

3.1.5. Touch on the rewind button with memory switch and auto rewind switch off.

(1) Rewind lamp turns to on and tape runs at a speed of about 61 ips.
(2) Auto shut-off function operates only at an end of tape so that machine is set to stop mode.
(3) When play, fast forward, or stop button is touched on, rewind mode is changed to playback mode, fast forward mode, or stop mode according to each button.
(4) For check of memory stop, turn on the memory switch and reset the tape counter to "000". After winding the tape, set to the rewind mode and check to insure that the rewind mode changes to stop mode at counter "999".
(5) For auto rewind check, turn the auto rewind switch to on.
Touch on the fast forward or play button and check whether the tape is rewound automatically at a tape end.

3.1.6. Touch on the pause button.

(1) Pause button operates while playback and recording so that pause mode is set, and tape travelling is stopped by releasing head base solenoid drive. When playback or recording re-starts, mute function operates for about 1 second.
(2) When pause button is touched on at stop mode, pause lamp turns on and stop lamp turns off. When pause button is touched on at fast forward or rewind mode, pause lamp illuminates only while button is touched.

3.1.7. Touch on the record button.

(1) Except for break-out legs of the loaded cassette and without any loaded cassette, record mode operates only when record button is touched on at stop mode.
(2) Touch on the pause button while record mode is functioning. Record/pause mode will operate.
(3) Touch on the play button while record mode is functioning. Recording mode will operate.

3.1.8. Touch on the stop button.

(1) Check to insure whether playback, recording, fast forward and rewind modes are set to stop mode.

3.1.9. Monitor switch ON/OFF.

(1) Check to insure whether monitor outputs can be selected from source to tape monitor by setting monitor switch on and off.

3.1.10. Dolby NR switch IN/OUT.

(1) When playback, hiss noise will reduce at switch IN.

3.1.11. Tape selector switch EX/SX and Eq. selector switch 120 μs/70 μs.

(1) While playback, check to insure whether tape selector switch and Eq. selector switch are operating accurately.

3.1.12. Test tone switch ON/OFF.

(1) Switch on the test tone switch and set the monitor switch to source, and check to insure that 400 Hz test tone is generating by measuring level meters or headphone, etc.
(2) Check to insure whether alignment beacon is illuminating at either one channel or both channels.

3.1.13. Listening test.

(1) Connect music source to the input jacks and amplifier and speakers to the output jacks, and test the performance of playback and record/playback.
Prior to recording, align the record head azimuth by azimuth alignment operation.
(2) Check the wow/flutter, distortion, signal to noise ratio, erasure, etc.

3.2. Check Methods

3.2.1. Check on playback functions:

(1) Check to insure whether the capstan, heads or pressure roller is free from dirts or dust.
(2) Check on tape travel.
(3) Load a 400 Hz tape.
(4) Set the machine in play mode.
(5) Check the output of PB head amp. (both channels).
(6) Check the output of PB Dolby NR (both channels).
(7) Check the output of DNL (both channels).
(8) Check the output of Line amp. (both channels).
(9) Check the output jack (both channels).
(10) Check headphone jack.

3.2.2. Check while recording:

Set each of input level controls to maximum, apply the rated input signal level to input jack and then check indications of the meters.

(1) Check the Mic and DIN amp.
(2) Check MPX functions.
(3) Check Record Dolby NR.
(4) Check Record Eq. amp.
(5) Check the bias oscillator circuit.
(6) Check record head.
(7) Check erase head.
(8) Check monitor switch.

3.2.3. Check on Mechanisms:

(1) Check the track positions of record head and playback head with Track Viewer (DA09012A).
(2) Check to insure whether the capstan motor rotates when the machine is set to On.
(3) Touch on the play button, and check to insure whether the head base solenoid activates and whether the take-up reel rotates.
(4) While in the (3) mode as above, check to insure whether auto shut-off returns the head base and the stop lamp illuminates when take-up reel is stopped by hand.
(5) When the fast forward button is touched on, check to insure whether the FF lamp illuminates and whether the fast forward mode activates.
(6) When the take-up reel is stopped by hand while in (5) mode as above, check to insure whether the auto shut-off activates to set the machine in stop mode.
(7) Touch on the rewind button and check to insure whether the rewind lamp illuminates, rewind mode activates, auto shut-off activates and whether stop lamp lights.
(8) Load a blank cassette tape.
(9) Check to insure whether the unit is free from any abnormality while in fast forward and rewind mode.
(10) Touch on the record and pause buttons simultaneously, and check to insure whether record is paused.
(11) Touch on the play button while in (10) state, and check to insure whether tape starts travelling and recording commences.
(12) Touch on the stop button and check to insure whether the machine is set to stop from any of the modes.
(13) Measure the torque of take-up, fast forward and rewind with torque gauge (DA09013A).
(14) Check the tape speed and wow/flutter with 3 kHz Speed & Wow/Flutter tape (DA09006A).
(15) Check the playback head height and tape travel with 1 kHz Track Alignment tape (DA09007A) and Tape Travelling Cassette (DA09011A).

3.2.4. Overall check:

(1) Check the frequency response (bias adjustment).
(2) Check distortion.
(3) Check signal to noise ratio.
(4) Check channel separation.
(5) Check crosstalk.
(6) Check erasure.

3.3. Check Methods When Part(s) is(are) Replaced

When any part/part ass'y of the Nakamichi 1000II is replaced with new one, please check to insure the following.

3.3.1. When capstan motor is changed:

(1) Tape speed.
(2) Wow/flutter.

3.3.2. When pressure roller is changed:

(1) Tape travelling.
(2) Azimuth/height.
(3) Tape speed.
(4) Wow/flutter.

3.3.3. When erase head is replaced:

(1) Tape travelling.
(2) Azimuth/height.
(3) Bias osc. frequency.
(4) Erasure performance.
(5) Bias adjustment (overall frequency response).
(6) Bias leakage.

3.3.4. When record head is replaced:

(1) Azimuth/height.
(2) Record track position.
(3) Bias adjustment (overall frequency response check).
(4) Adjustment of level at 0 dB with 400 Hz test tone (record calibration).
(5) Check distortion when 1 kHz is recorded and played back at 0 dB.
(6) Bias leakage check.
(7) Phase check (between left and right).

3.3.5. When playback head is replaced:

(1) Azimuth/height.
(2) Tape travelling.
(3) Track position in regard to that of record head.
(4) Adjustment of playback gain (with test tape at 0 dB).
If unable to adjust to 0 dB, please adjust R123,223 at 3.3 k (P.B. Head Amp. P.C.B.) to:
if strong — make R stronger
if weak — make R weaker
(5) Frequency response check by playback with test tapes.
(6) Frequency response check by overall with reference tape.
(7) Gain check by overall with reference tape.
(8) Phase check between left and right.

3.3.6. When flywheel ass'y is replaced:

(1) Tape travelling.
(2) Azimuth/height.
(3) Tape speed.
(4) Wow/flutter.

3.3.7. Ball drive mechanism ass'y is replaced:

(1) Torque check while F/F, Rew. and Play.
(2) Mechanical noise check while F/F, Rew. and play, but without a tape.
(3) Tape speed.
(4) Wow/flutter.

3.3.8. When meters are replaced:

(1) Adjustment of meter level.

3.3.9. When reel motor is replaced:

(1) Torque check while F/F, Rew. and play.
(2) Tape speed.
(3) Wow/flutter.

3.3.10. When drive belt is replaced:

(1) Wow/flutter.
(2) Tape speed.

3.3.11. When capstan motor governor is replaced:

(1) Tape speed.
(2) Wow/flutter.

3.3.12. When tape counter is replaced:

(1) Tape speed.
(2) Wow/flutter.
(3) Memory rewind.
(4) Counter check (sticky, etc.).

3.3.13. When puneumatic damper is replaced:

(1) Damper speed check.

3.3.14. When reel motor governor is replaced:

(1) Tape speed.
(2) Wow/flutter.
(3) Torque check while F/F, Rew. and play.

4. MEASURING INSTRUMENTS, JIGS, TAPES, ETC.

(1) Audio Generator (20 Hz – 200 kHz)
(2) AC Millivolt Meter (with dB measures)
(3) Oscilloscope (DC – 5 MHz)
(4) Distortion Meter
(5) Speed and Wow/Flutter Meter
(6) Frequency Counter (DC – 1 MHz)
(7) Ohm Meter
(8) DC Volt Meter (0 – 30 V)
(9) AC Volt Meter (0 – 400 V)
(10) Audio Analyzer T-100
(Including Distortion, Wow/Flutter, Oscillator, Speed and dB meter)
(11) Tape Travelling Cassette (DA09011A)
(12) Track Viewer (DA09012A)
(13) Torque Gauge (DA09013A)
(14) 15 kHz Azimuth Tape (DA09004A)
(15) 3 kHz Speed and Wow/Flutter Tape (DA09006A)
(16) 1 kHz Track Alignment Tape (DA09007A)
(17) 400 Hz Level Tape (DA09005A)
(18) 20 kHz PB Frequency Response Tape (DA09001A)
(19) 15 kHz PB Frequency Response Tape (DA09002A)
(20) 10 kHz PB Frequency Response Tape (DA09003A)
(21) Reference EXII Tape (DA09021A)
(22) Reference SX Tape (DA09025A)
(23) Information Terminals Model M-300
(For positioning of record/playback head.)
(24) Liquid for Tape Magnetized Development
(MAGNA-SEE, a product of SOUND CRAFT, or equivalent)
(25) Extension Cord (10P) (DA09020A)
(26) Extension Cord (19P-D) (DA09019A)
(27) Extension Cord (14P-PB) (DA09015A)
(28) Extension Cord (19P) (DA09014A)
(29) Extension Cord (14P) (DA09016A)

Note: (10) – (22) and (25) – (29) are the products of NAKAMICHI RESEARCH INC.

5. MECHANICAL ADJUSTMENTS

5.1. Torque Adjustment

5.1.1. Torque Measurement

(1) Using a torque gauge (DA09013A), measure the torque of fast-forward (F.F.), rewind and take-up modes.
(2) F.F. and rewind torque should be 50 to 55 g-cm.
(3) Take-up torque should be 40 ± 5 g-cm.

Note: When the torque is out of these ranges, adjust torque following the adjustment steps. (In case the adjustment is not successful by observing these steps, replacement of ball drive assembly will be required. Refer to following "5.1.4. Ball Drive Assembly Replacement Procedures".)

5.1.2. Torque Adjustment

(1) Remove cabinet assembly, flywheel holder, capstan belt and two sets of flywheel assembly (including washer, flange thrust stud and thrust spring) in that order. (When mounting the flywheel holder, use care to attach it in the correct direction to avoid the change of clearance between the flywheel holder and flywheel assembly.)
(2) Turn on the power.
(3) Load the torque gauge (DA09013A) in the cassette well assembly.
(4) By touching the button of F.F. or rewind, measure torque for each mode. Adjustment should be so made that the torque may become in a range from 50 to 55 g-cm. Adjustment should be made on brake drum assembly of forward side and reverse side, respectively, to regulate the torque of F.F. and rewind modes. Refer to Figs. 5.1 and 5.2.
Loosen screws 1 and 2 indicated in Fig. 5.2 and move up and down the brake drum assembly in order to adjust the torque. When the brake assembly is raised, the value of torque decreases. When lowered, the value is increased. Where specified torque is achieved, securely tighten the screws. Tighten first the screw 1 (with a part of the shaft end being flat) and then tighten the screw 2. Then apply a drip of lock tight paint to the screws.
(5) Mount the flywheel assembly, capstan belt and flywheel holder. Check to insure that the clearance between the flywheel holder and the flywheel assembly is in a range of 0.05 to 0.1 mm. After installing the flywheel, be sure to clean oil off with an alcohol-dipped cloth from capstan which will be in contact with pressure roller.
(6) Touch on the PLAY button to set the device in play mode.
(7) Load the torque gauge to measure the take-up torque. Check whether the torque is in a range of 40 ± 5 g-cm. When the value is out of the range, readjustment of F.F. torque is necessary. Repeat from the step (1) and set the take-up torque to 40 ± 5 g-cm by increasing the adjusted F.F. torque of 50 to 55 g-cm into a range of 45 to 60 g-cm. When doing this, set the rewind torque to almost the same range as that of F.F. torque to balance both of them.

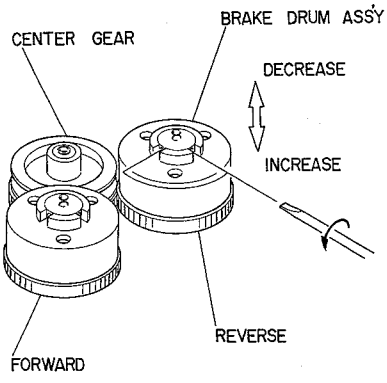


Fig. 5.1 Torque Adjustment

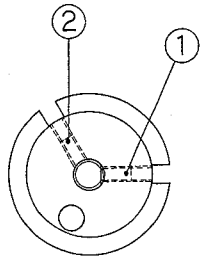


Fig. 5.2

5.1.3. Ball Drive Mechanism Ass'y Adjustment

(1) Check the take-up torque (40 ± 5 g-cm) with a torque gauge.
(2) Check shall be made on rewind and fast forward torque (within 50 to 55 g-cm).
(3) Measure the time length while rewinding and fast forwarding.

Notes: 1. Where rewinding and fast forwarding exceed 60 seconds, adjust the torque of the ball drive mechanism ass'y.
2. Where the take-up torque should be too weak, adjust the ball drive mechanism ass'y referring to preceding 5.1.2. (7).

5.1.4. Ball Drive Mechanism Ass'y Replacement Procedures

(1) Refer to Fig. 5.3. After removing the cabinet assembly, remove the counter belt and shut-off belt from the reel hub and hang them on the studs.
(2) Remove flywheel holder, capstan belt and two sets of flywheel assembly (including washer, flange thrust stud and thrust spring). (When mounting the flywheel holder, use care to attach it in the correct direction to

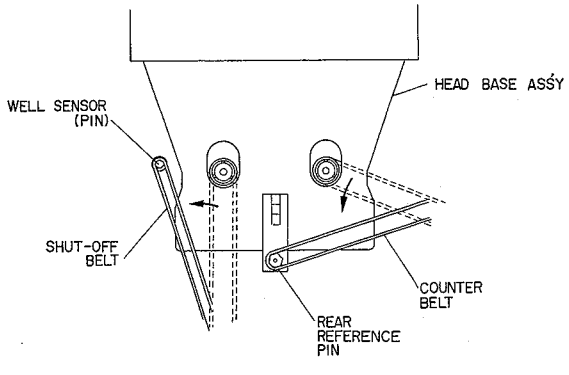


Fig. 5.3 Ball Drive Mechanism Ass'y Replacement

avoid the change of clearance between the flywheel holder and flywheel assembly.)

(3) Referring to Fig. 5.4, remove the belt driven by the reel motor from the groove of the center gear. And remove three sets of screws and washers which fix the ball drive assembly to chassis. Detouch the brake assembly that holds the drum of ball drive assembly, and then remove the ball drive assembly.

(4) Replace with a new ball drive assembly.

(5) Mount the belt driven by the reel motor on the groove of center gear. Check to insure that the belt is clean and placed in a correct position.

(6) Use care to prevent the shut-off belt from interfering with cassette holder assembly. Be sure that the belt is clean, and is placed in a correct position. Make sure not to stick grease on the counter belt. In case grease is stuck on the counter belt, clean it off with an alcohol-dipped cloth.

(7) Without loading a cassette tape, check to insure that the reel hub on supply side and that on take-up side are stopped, respectively in F.F. mode and rewind mode. (In case either one or both of them is not stationary, replacement of ball drive assembly will be necessary.)

(8) Loading the torque gauge in the cassette well assembly, check that F.F. and rewind torque are in a range of 50 to 55 g-cm. After mounting the flywheel assembly, capstan belt and flywheel holder, check to see that take-up torque is in a range of 40 ± 5 g-cm. In case these values are not achieved, adjustment should be made following the "5.1.2. Adjustement."

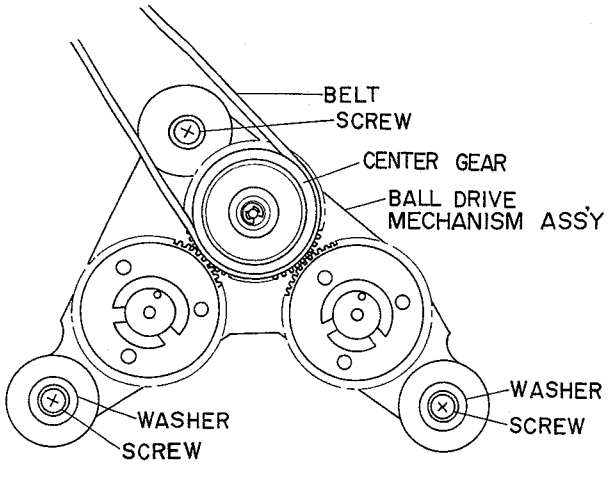


Fig. 5.4 Ball Drive Mechanism Ass'y Replacement

5.2. Tape Speed

Signal Source

3 kHz Speed Wow/Flutter Tape (DA09006A)

Measurement Connection

Frequency Counter to Output Jacks.

Mode

CONTROL BUTTON – Playback
MONITOR SW – TAPE
TAPE SELECTOR SW – SX
EQ SELECTOR SW – 70 μs

Adjustment

(1) Set the Pitch Control Knob to "0" position.

(2) Adjust the Speed Control VR502 to obtain 3 kHz on Frequency Counter.

VR502 Capstan Motor Governor P.C.B.

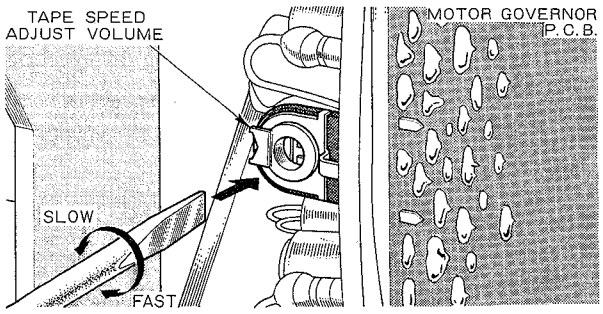


Fig. 5.5 Tape Speed Adjustment

5.3. Head Base Damper Adjustment

(1) Slowly turn the exhaust adjusting screw clockwise repeatedly depressing and releasing the damper piston by hand. Set the screw at such an initial position that the piston cannot be depressed into the inmost end by the decreased damper pressure.

(2) Return the screw approximately 90 degrees counter-clockwise from the set position given in Step (1) above. Check to insure whether the head base is smoothly locked by repeatedly playing back and stopping the tape feed mechanism. If the double motion or associated shock is too strong, further precise adjustment is required.

Note: Do not tighten the exhaust adjusting screw excessively as it may be damaged.

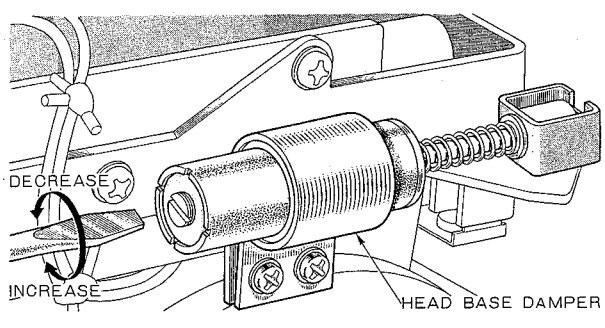


Fig. 5.6 Head Base Damper Adjustment

5.4. Eject Damper Adjustment

Install the cassette compartment lid. Adjust the exhaust adjusting screw at the eject damper ass'y until it takes 0.5 to 1.0 second to stop the lid eject movement after the eject push button is depressed.

Note: Do not tighten the exhaust adjsting screw excessively as it may be damaged.

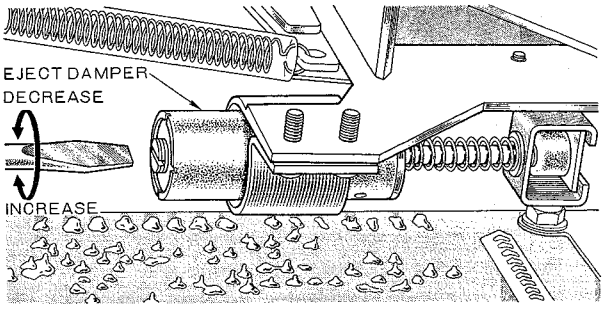


Fig. 5.7 Eject Damper Adjustment

5.5. Headblock

Adjustment should be made in accordance with Fig. 5.12 Flow Chart.

5.5.1. Head Mount Base Ass'y Removal Procedures

(1) Remove the cabinet and separate mechanism ass'y 1000II.
(2) Remove the adjustment lid and cassette lid.
(3) Referring to Fig. 5.8, disassemble the mount base cover (03) by removing screws and washers (01,02).
(4) Remove screws 05 and 06 (two places).
(5) Referring to Fig. 5.9, lift up the head mount base ass'y (07 in Fig. 5.8) for about 3 mm high, then rotate the take-up side of the pressure roller arm ass'y as shown in the figure.
Lift up the head mount base ass'y in such a way that the ass'y will not contact other parts.

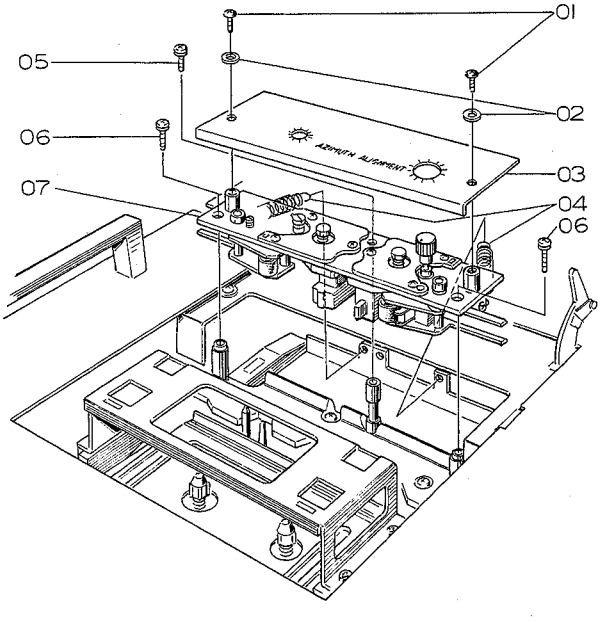


Fig. 5.8 Head Mount Base Ass'y Removal

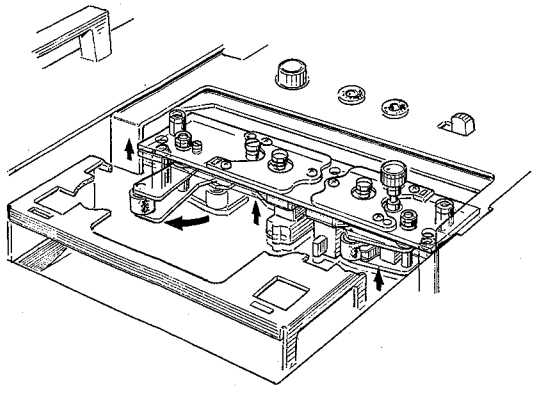


Fig. 5.9 Head Mount Base Ass'y Removal

5.5.2. Head Replacement Procedures

(1) Referring to Fig. 5.10, unfasten screws and springs (12,11) then remove record head (05) and playback head (06) with care not to lose washers or steel balls (L04,08).

(2) Disassemble E-ring, spring and collar (L01,01,02), then remove supply pressure roller arm ass'y (03).

(3) Remove erase head from supply pressure roller arm ass'y (03).

(4) Referring to Fig. 5.11, disconnect signal wires then replace each head.

(5) Fasten screws (12 in Fig. 5.10) of playback and record heads, insuring to keep correct direction, vertically against to the cassette tape.

(6) Fasten a screw fixing an erase head to the chassis of the supply pressure roller arm ass'y without any dust, and pushing erase head toward the pressure roller insuring to keep more than 0.1 mm space. Then apply a drip of lock tight paint to the screw. Check to insure signal wires are not in contact with the chassis.

Notes: 1. Separation of signal wires between record and playback heads will be required for avoiding bias leakage or cross feed caused by interference.

2. When replacing the heads, be careful not to contaminate dust or any other foreign materials on the head surface; otherwise, the head installation angle may deviate, resulting in irregular tape travelling.

3. Handle the heads with care not to give damages on the surface.

(7) After repalcement of each head the following adjustments are required.

Mechanical Adjustment:

Following items from 5.5.3 to 5.5.9 (adjustment of each head).

Electrical Adjustment:

Playback Head

6.5. Playback Level Calibration
6.6. Playback Frequency Response
6.7. Head Azimuth Alignment (Playback Head)
6.12. Record Bias and Record/Playback Level

Record Head

6.10. Recording Equalization Peaking
6.12. Record Bias and Record/Playback Frequency

Erase Head

6.8. Bias Oscillator Frequency

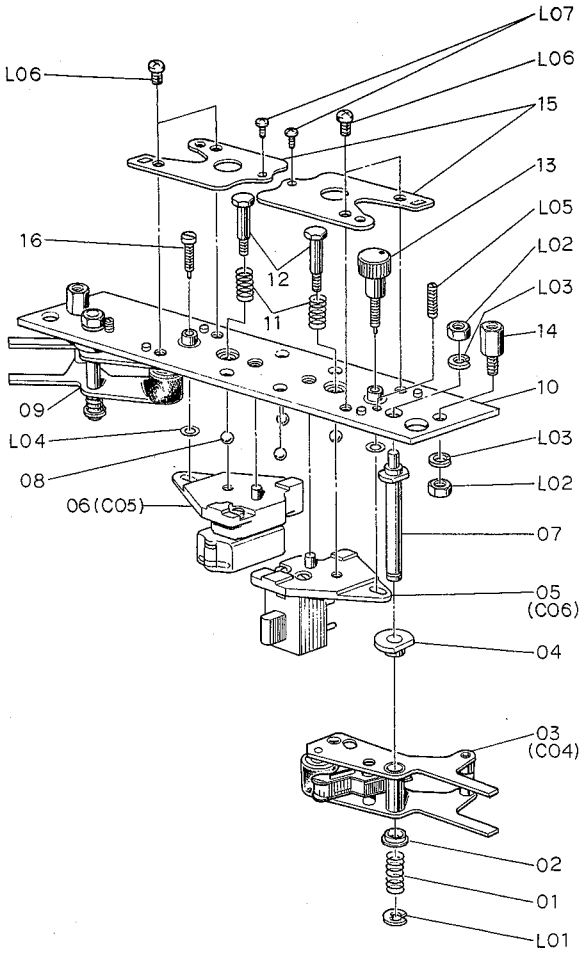


Fig. 5.10 Head Replacement

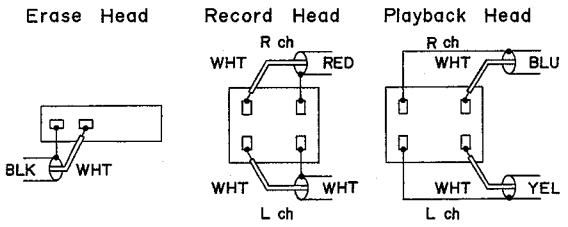


Fig. 5.11 Wiring of Heads (Rear View)

5.5.3. Tape Guide Height Adjustment

(1) Load with care the Tape Guide Height Measurement Jig (Model No. M300 from Information Terminals).

(2) Refer to Fig. 5.13, and adjust the tape guide height adjusting screw A so that the tape guide may become fixed to the jig.
One turning (one rotation) becomes 0.45 mm tape guide height movement.

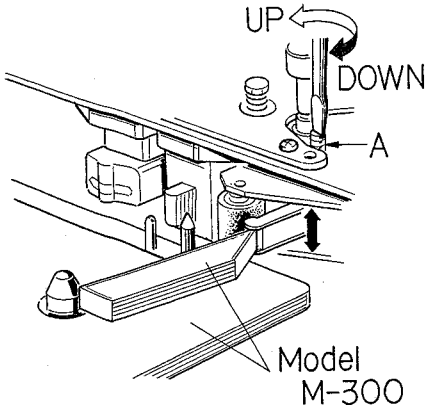


Fig. 5.13 Tape Guide Height Adjustment

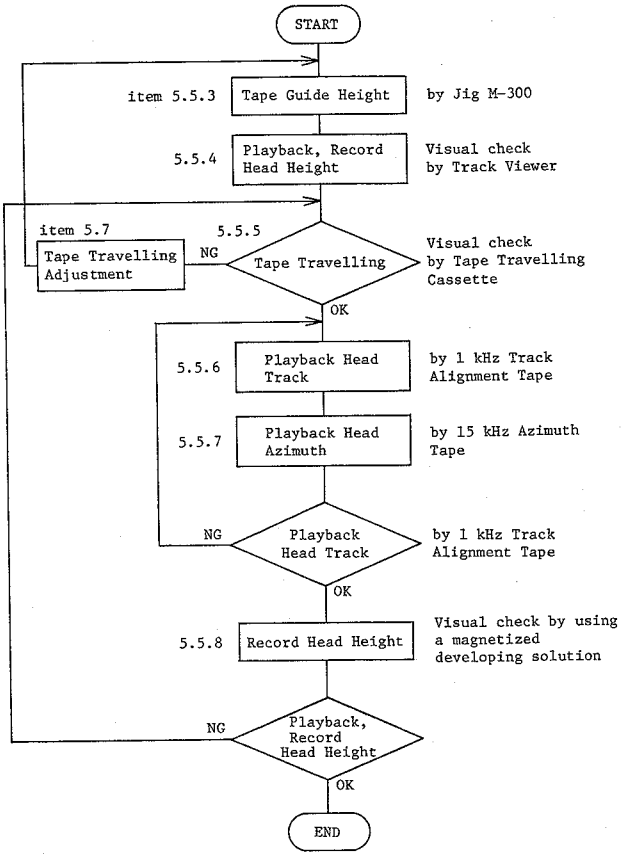


Fig. 5.12 Headblock Adjustment Flow Chart

5.5.4. Head Height Adjustment

(1) Load the Track Viewer (DA09012A), and check the positions of playback and record heads. While adjustment, check to insure that the L-R center of each head coincides in position with the middle point between two lines (0.3 mm distance) on the Track Viewer.

(2) If the L-R center deviates from the middle point, refer to Fig. 5.14 and correct the head height deviation by adjusting screws E and F, together with adjusting C and D for correcting head azimuth.

5.5.5. Tape Travelling Check

(1) Load the Tape Travelling Cassette (DA09011A), and set to the playback mode.

(2) Check to insure that the tape height while running is within ± 0.3 mm at any tape position when measured from the center of a cassette housing.

Note: Observing tape travelling on the playback head, check the following points:

a. Tape travelling does not wave.

b. At a tape starting point, the tolerance of tape travelling fluctuation is within about + 0.3 mm.

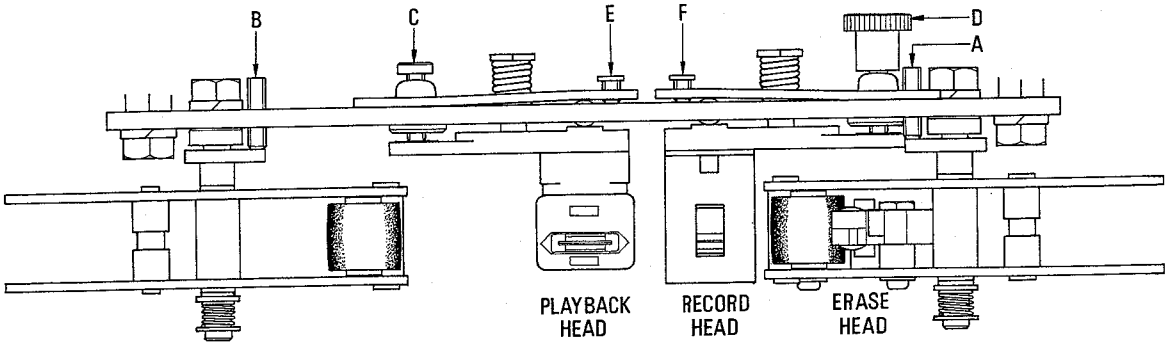


Fig. 5.14 Head Height/Azimuth Adjustment

If not, adjust the pressure roller height by adjusting screw B located at the take-up reel side. After the tape travel is corrected, check to insure that the pressure roller position is within ± 1 mm when measured from the center of a cassette housing. Note that in most cases of playback head adjustment turning of the screw B will not be required for misalignment. If tape travel cannot still be adjusted, adjust the tape travelling referring to "5.7. Tape Travelling".

5.5.6. Playback Head Track Alignment

(1) Load the 1 kHz Track Alignment Tape (DA09007A) and check the head height on the cassette tape deck. Set the MONITOR SW to TAPE and play the tape back.
(2) Adjust the playback head height screw E until each level meter of both channels reads the minimum value.

5.5.7. Playback Head Azimuth Alignment

(1) Load the 15 kHz Azimuth Tape (DA09004A) for adjusting the playback head azimuth. Set the MONITOR SW to TAPE position and playback.
(2) Adjust the playback head azimuth alignment screw C until each level meter of both channels reads the maximum value.
(3) After completion of the adjustment in this step, check the item 5.5.6 "Playback Head Track Alignment" then recheck playback head azimuth.

5.5.8. Record Head Height Alignment

(1) Load the Reference SX tape (DA09025A), set the TEST TONE SW to ON position and TAPE SELECTOR SW to the TAPE position.
Set to record mode and adjust record head azimuth alignment screw D until the alignment beacon started flickering alternately.
(2) Aligning Step (1) as above, align the screw F to obtain maximum reading of both channels.
(3) Record the same portion of the both A and B sides of the tape after record head azimuth is aligned.
(4) Immerse the recorded tape in a magnetized developing solution. In turn, check to insure that the recording head tracks across the center are separated with a distance of 0.4 to 0.6 mm typically 0.5 mm as illustrated in Fig. 5.15.

Note: Liquid for tape magnetized development: "MAGNA-SEE, SOUND CRAFT a product of CBS RECORDS a division of Columbia Braodcasting System, Inc., Danbury, Conn. 06810, or equivalent".

After development, clean the tape otherwise pressure roller will become dirty.
The above development will not be required if the difference of playback and record head heights are within 0.1 mm at "5.5.4. Head Height Adjustment".

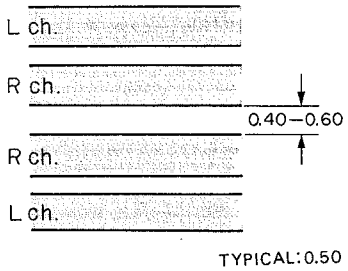


Fig. 5.15 Record Head Track

5.5.9. Erase Head Adjustment

After removal of erase head, refer to "5.5.2. Head Replacement Procedures".

5.6. Flywheel Adjustment

When mounting the flywheel holder, adjust the flywheel clearances should be 0.05 to 0.1 mm.

Caution: When installing the flywheel, be sure to clean oil off with an alcohol-dipped cloth from capstan which will be in contact with pressure roller.

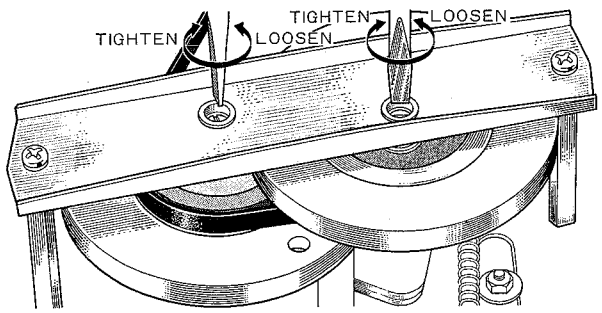


Fig. 5.16 Flywheel Adjustment

5.7. Tape Travelling Adjustment

Inaccurate tape travelling extremely deteriorates the performance of tape decks therefore careful checks are required.

5.7.1. Check-out Method

(1) Check to insure whether the head height is correct.
(2) Load a Tape Travelling Cassette (DA090011A) and play it and check to insure freedom from waving, looseness, etc.
(3) The difference of head height between supply side and take-up side shall not be more than 0.3 mm.
(4) After more than 2 seconds when play button is touched on, tolerance of the tape on the playback head shall not be more than 0.05 mm.
(5) Feed in the test tone signals to the Reference SX Tape (DA09025A) and record and play it back, when the level change shall not be more than 1 dB.

5.7.2. Adjustment

(1) Check to insure whether any of the heads is not in contact with the cassette housing.
(2) Check to insure whether the pressure roller is located in parallel with the capstan shaft (Also check to insure whether the heads are free from dust or dirts, and whether the pressure roller arm is free from bending).
(3) Check to insure whether the surface of the pressure roller is gloubular, not straight. Other than the above, concaved, or oiled surface shall be subject to replacement.
(4) The pressure of the pressure roller shall be 400 g ± 50 g.
(5) Adjustment of Pressure Roller Timing.
   a. Refer to Fig. 5.17.
      Push down the head base by hand while in stop mode till the take-up pressure roller reaches the capstan, and then check to insure whether the gap between the supply pressure roller and the capstan is 0.5 mm.
   b. While in play mode, check to insure whether the gap between the take-up pressure roller arm and the stopper is 1.25 mm, and whether the gap between the supply pressure roller arm and stopper is 0.75 mm.
   Note: If the foregoing requirements are not satisfied, adjustment shall be made by bending the stopper.
(6) The clearance between the capstan shaft and thrust shall be 0.1 — 0.05 mm.
(7) The tape guide on which if any scratches, etc. are noted shall be repalced. Check shall also be made to insure whether the erase head surface is smooth.
(8) The use of defective head base damper will deteriorate the tape travel at the beginning of activation.
(9) The parallelism between both of the capstan axis is one of the most imporatnt factors for an accurate operation. If great shock is given to the capstan, the capstan flange ass'y shall be repalced.
   Note: The cassette house shall also be checked to insure freedom from deformation, bending, etc.

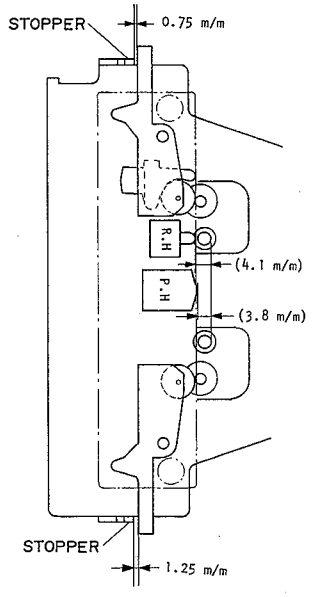


Fig. 5.17 Pressure Roller Adjustment

5.8. Lubrication

Place the deck in a horizontal position and then remove the cassette lid.
Apply a few drops of oil (LAUNA NO. 40) into the oil cap hole of the capstan flange every 500 hours of use.
Note: If the lubricating oil is applied also to the capstan shaft and other drive mechanisms, clean it off with an alcohol-dipped cloth.

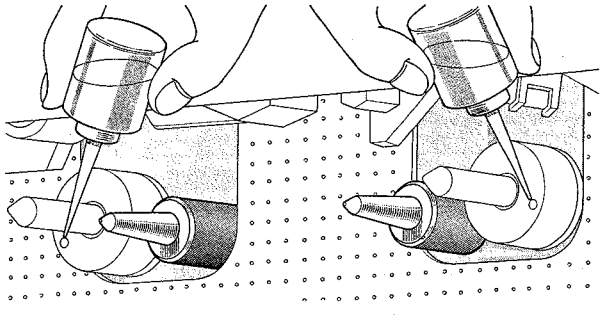


Fig. 5.18 Lubrication

6. ELECTRICAL ADJUSTMENTS AND MEASUREMENTS

Note: Mechanical adjustments have to be performed prior to this adjustment. Refer to Figs. 7.1 – 7.3 position of semi-fixed volume and test point.

6.1. Adjustments and Measurements Table

STEP	ITEM	REMARKS	
1	Fast Forward, Rewind Torque Take-up Torque	As per 5.1. As per 5.1.	50 – 55 g-cm 40 ± 5 g-cm
2	Tape Travelling Check	As per 5.5.5.	by Tape Travelling Cassette
3	Tape Speed	As per 5.2.	1-7/8 ips ± 1%
4	Meter Level Calibration	As per 6.2.	0 dB on level meters, at 100 mV ± 2 mV input to Test Points TP102, TP202
5	400 Hz Test Tone	As per 6.3.	0 dB on level meters
6	19 kHz MPX Filter	As per 6.4.	Minimum reading at 19 kHz
7	Playback Level Calibration	As per 6.5.	0 dB on level meters by 400 Hz level Tape (Adjust when Playback Head is replaced.)
8	Playback Frequency Response	As per 6.6.	-20 dB ± 3 dB against 400 Hz Level Tape by 10, 15 and 20 kHz Playback Reference Tape (Adjust when playback Head is replaced.)
9	Head Azimuth (Playback Head)	As per 6.7.	Maximum reading by 15 kHz Azimuth Tape (Adjust when Playback Head is replaced.)
10	Bias Oscillator Frequency	As per 6.8.	105 kHz ± 3 kHz (Adjust when Erase Head is replaced.)
11	Bias Trap (Record Amp./Playback Amp.)	As per 6.9.1. and 6.9.2.	Minimum reading
12	Recording Equalization Peaking	As per 6.10.	Peak reading at 23 kHz with bias cut mode (Adjust when Record Head is replaced.)
13	Alignment-Beacon Phase	As per 6.11.	
14	Record Bias and Record/Playback Level	As per 6.12.	Frequency Response: -20 dB ± 3 dB Distortion: Less than 1.5% (Adjust when Playback or Record Head is replaced.)
15	Record Dolby NR Playback Dolby NR	As per 6.13. As per 6.14.	
16	DNL	As per 6.15.	
17	Frequency Response Playback Frequency Response Overall Frequency Response	 As per 6.16.1. As per 6.16.2.	
18	Signal-to-Noise Ratio	As per 6.17.	Better than 65 dB (Dolby NR IN, Wrms, CCITT, 400 Hz, 3% distortion)
19	Channel Separation	As per 6.18.	Better than 35 dB at 1 kHz 0 dB
20	Crosstalk	As per 6.19.	Better than 60 dB at 1 kHz 0 dB
21	Erasure	As per 6.20.	Better than 60 dB at 1 kHz saturation level
22	Total Harmonic Distortion	As per 6.21.	Less than 1.5% at 400 Hz 0 dB
23	Wow/Flutter	As per 6.22.	Less than 0.1% (DIN 45507 Weighted Peak)

6.2. Meter Level Calibration

Singal Source

1 kHz 0.3 V to Input Jacks or 1 kHz 0.03 V to DIN input.

Measurement Connection

VTVM to Test Point

TP102 (Main P.C.B.) – GND (Lch),
TP202 (Main P.C.B.) – GND (Rch).

Mode

MONITOR SW – SOURCE

Adjustment

(1) Adjust the line input level controls to obtain 100 mV ± 2 mV on VTVM.
(2) Adjust the Meter Calibration VR101, 201 to obtain 0 dB on Level Meters.

VR101 (Lch)
VR201 (Rch) Line Amp. P.C.B.

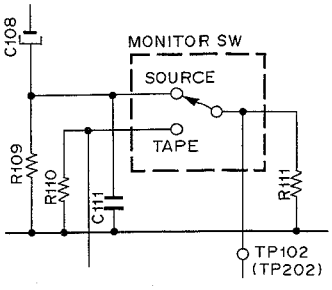


Fig. 6.1 Test Point

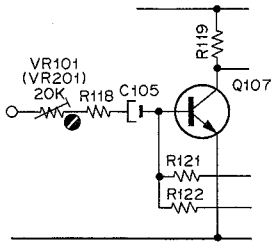


Fig. 6.2 Level Calibration

6.3. 400 Hz Test Tone

Mode

MONITOR SW – SOURCE
400 Hz TEST TONE SW – ON

Adjustment

Adjust the Tone Calibration VR301 so that the level meter of the L channel indicates 0 dB. If the level meter of the R channel is not balanced to L channel, adjust VR203 till the R channel meter indicates 0 dB.

VR301 (Lch)
VR203 (Rch) Main P.C.B.

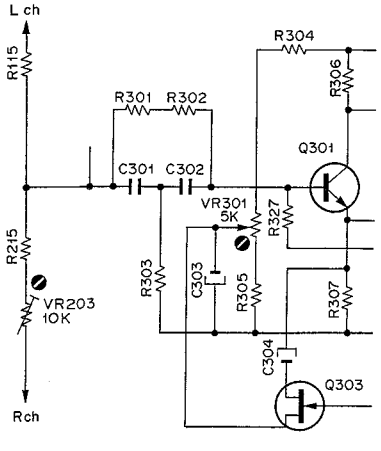


Fig. 6.3 400 Hz Test Tone

6.4. 19 kHz MPX Filter

Signal Source

19 kHz 0.3 V to Input Jacks or 0.03 V to DIN Input.

Measurement Connection

VTVM and Frequency Counter to Output Jacks or DIN Output.

Mode

MONITOR SW – SOURCE
MPX SW – OFF
DOLBY NR SW – OUT
DNL SW – OUT

Adjustment

(1) Adjust the line input level controls to obtain 0 dB (1 V) on Level Meters and VTVM.
(2) Set the MPX SW to ON.
(3) Adjust MPX Filter Coils L102, 202 to obtain the minimum reading on VTVM.

L102 (Lch)
L202 (Rch) Main P.C.B.

Note: Frequency has to be 19 kHz ± 100 Hz on Frequency Counter.

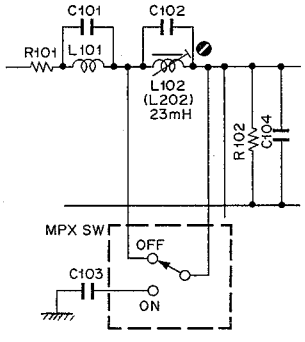


Fig. 6.4 19 kHz MPX Filter

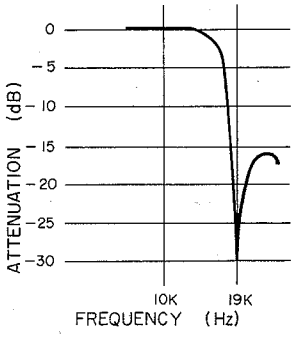


Fig. 6.5 Characteristics

6.5. Playback Level Calibration

Signal Source

400 Hz Level Tape (DA09005A)

Mode

CONTROL BUTTON – Playback
MONITOR SW – TAPE
TAPE SELECTOR SW – SX
EQ SELECTOR SW – 70 μs

Adjustment

Adjust the Playback Amp. Potentiometers VR101, 201 till the level meters indicate 0 dB.

VR101 (Lch)
VR201 (Rch) PB Head Amp. P.C.B.

Note: "6.2. Meter Level Calibration" to be completed prior to 6.5 as above.

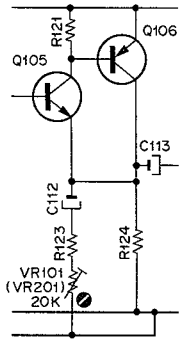


Fig. 6.6 Playback Level Calibration

6.6. Playback Frequency Response

Measurement Connection

VTVM to Output Jacks or DIN Output.

Mode

MONITOR SW – TAPE
TAPE SELECTOR SW – SX
EQ SELECTOR SW – 70 μs
DNL SW – OUT
DOLBY NR SW – OUT

Adjustment

(1) Load a 400 Hz Level Tape (DA09005A) and play it back.
Adjust the line output level controls to a certain level (example 0 dB).

(2) Load a 10 kHz PB Frequency Response Tape (DA09003A), 15 kHz PB Frequency Response Tape (DA09002A) and 20 kHz PB Fequency Response Tape (DA09001A), and adjust the playback head azimuth to give the maximum levels on VTVM with each Tape.
Check to insure level would be within −20 dB ± 3 dB against 400 Hz Level Tape.

(3) If above level cannot be satisfied.
Refer to "6.16.1. Playback Frequency Response Adjustment".

(4) Load a 15 kHz Azimuth Tape (DA09004A).
Adjust the playback head azimuth to give the maximum levels on VTVM.

6.7. Head Azimuth Alignment (Playback Head)

Signal Source

15 kHz Azimuth Tape (DA09004A)

Measurement Connection

VTVM to Output Jacks.

Mode

CONTROL BUTTON – Playback
MONITOR SW – TAPE
TAPE SELECTOR SW – SX
EQ SELECTOR SW – 70 μs
DOLBY NR SW – OUT

Adjustment

Adjust the Playback Head Azimuth Alignment Screw to obtain the maximum reading on VTVM. Be sure to check both channels. The maximum reading should be more than 70 mV on VTVM when Playback Level Calibration described in 6.5 is adjusted correctly.

6.8. Bias Oscillator Frequency

Measurement Connection

Frequency Counter to Test Point CN1–9 (Main P.C.B.) – GND

Mode

CONTROL BUTTON – Record/Pause

Adjustment

Adjust the Bias Oscillator Coil L302 to obtain a reading of 105 kHz on Frequency Counter.
L302 Main P.C.B.

Note: Measurement shall be made by use of a low capacity probe.

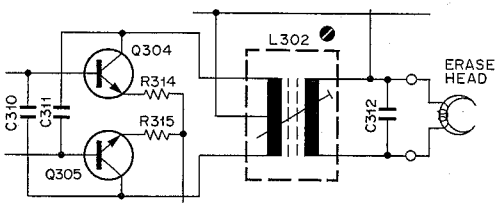


Fig. 6.7 Bias Oscillator

6.9. Bias Trap (Bias Leakage)

Measurement shall be made by use of a low capacity probe.

6.9.1. Record Amp. Bias Trap

Measurement Connection

VTVM to Q104 Collector (Rec. Eq. Amp. P.C.B.) – GND (Lch), Q204 Collector (Rec. Eq. Amp. P.C.B.) – GND (Rch).

Mode

CONTROL BUTTON – Record /Pause

Adjustment

Adjust the Bias Trap Coils L103, 203 to obtain the minimum reading on VTVM.

L103 (Lch)
L203 (Rch) Main P.C.B.

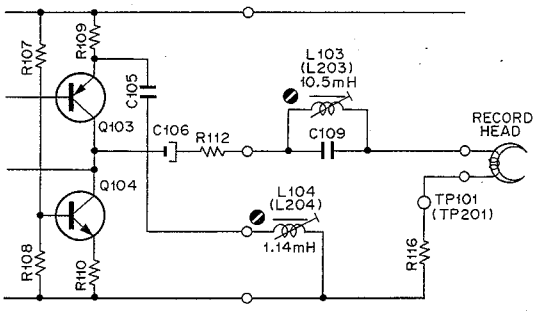


Fig. 6.8 Record Amp. Bias Trap

6.9.2. Playback Amp. Bias Trap

Measurement Connection

VTVM to Test Point

TP102 (Main P.C.B.) – GND (Lch),
TP202 (Main P.C.B.) – GND (Rch).

Mode

CONTROL BUTTON – Record /Pause
MONITOR SW – TAPE

Adjustment

Adjust the Bias Trap Coils L101, 201 to obtain the minimum reading on VTVM.

L101 (Lch)
L201 (Rch) PB Head Amp. P.C.B.

6.10. Recording Equalization Peaking

Signal Source

400 Hz and 23 kHz 0.3 V to Input Jacks or 400 Hz and 23 kHz 0.03 V to DIN Input.

Measurement Connection

VTVM to Test Point

TP101 (Main P.C.B.) – GND (Lch),
TP201 (Main P.C.B.) – GND (Rch).

Mode

CONTROL BUTTON – Record/Pause
MONITOR SW – SOURCE
TAPE SELECTOR SW – SX
EQ SELECTOR SW – 70 μs
DOLBY NR SW – OUT
MPX SW – OFF
Bias Cut (disconnect Bias-Cut Jumper accessing from the component side of the Main P.C.B. Refer to "7. Parts Location for Electrical Adjustment".)

Adjustment

(1) Adjust the line input level controls to obtain 0 dB on Level Meters at 400 Hz input signals.
(2) Feed in 23 kHz instead of 400 Hz then adjust L104, 204 to obtain peak reading (about 13 dB rise at 20 kHz). L104, L204 Main P.C.B.

Note: Refer to Fig. 6.11, frequency response curve.

6.11. Alignment Beacon Phase Adjustment

Before starting adjustment, be sure to adjust the record head azimuth by Record Head Azimuth Alignment Beacon whenever cassette tapes are changed (even when cassette tape is changed from A-side to B-side).

Signal Source

15 kHz 0.03 V to Input Jacks or 15 kHz 3 mV to DIN Input.

Mode:

CONTROL BUTTON – Record/playback
MONITOR SW – TAPE
TAPE SELECTOR SW – SX
EQ SELECTOR SW – 70 μs
400 Hz TEST TONE SW – OFF

Adjustment

(1) Load a Reference SX Tape (DA09025A) then set to record/playback mode.
(2) Adjust the Record Head Azimuth Alignment Screw to obtain the maximum reading on VTVM.
Be sure to check both channels.
(3) Set 400 Hz TEST TONE SW to ON.
(4) Adjust VR601 so that Alignment Beacon will flicker alternately.
VR601 Logic Control P.C.B.

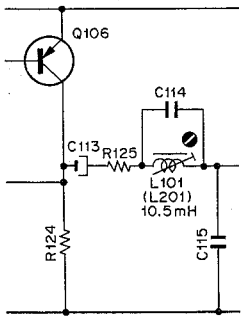


Fig. 6.9 Playback Amp. Bias Trap

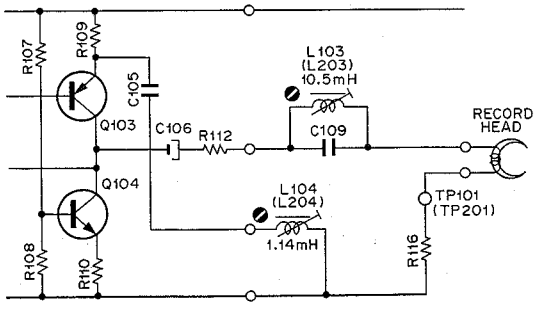


Fig. 6.10 Recording Equalization Peaking

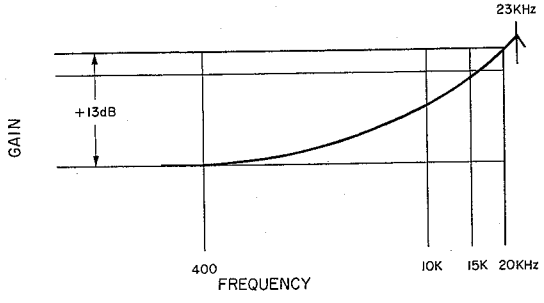


Fig. 6.11 Recording Equalization Peaking Characteristics

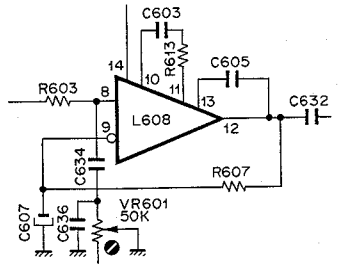


Fig. 6.12 Alignment Beacon Phase Adjustment

6.12. Record Bias and Record/Playback Level

Signal Source

1 kHz 0.3 V, 20 kHz 0.03 V (−20 dB), or 1 kHz 0.03 V (−20 dB) to Line Input Jacks.

Measurement Connection

VTVM and Distortion Meter to Output Jacks or DIN Output.

Mode

CONTROL BUTTON – Record/Playback
MONITOR SW – SOURCE/TAPE
TAPE SELECTOR SW – EX (SX)
EQ SELECTOR SW – 120 μs (70 μs)
DOLBY NR SW – OUT
DNL SW – OUT
MPX SW – OFF

Adjustment

(1) Load a Reference EXII Tape (DA09021A) (Reference SX Tape (DA09025A)) and set TAPE SELECTOR SW to EX (SX) and EQ SELECTOR SW to 120 μs (70 μs).
(2) Set to TEST TONE SW ON and set to record mode, and adjust the record head azimuth alignment.
(3) Set MONITOR SW to TAPE, and adjust the Bias Adj. VR101, 201 (VR102, 202) to obtain the maximum reading on VTVM.
(4) Adjust the Record Calibration VR702, 802 (VR701, 801) on the Rec. Cal. P.C.B. to obtain same level on Level Meters (0 dB) at MONITOR SW SOURCE and TAPE.
(5) Set MONITOR SW to SOURCE and TEST TONE SW to OFF. Feed in 1 kHz 0.3 V to Input Jacks and adjust the line input level controls to obtain 0 dB on Level Meters.
(6) Set MONITOR SW to TAPE. Set Audio Generator Output Level to 20 kHz −20 dB (EXII/SX).
Adjust the Bias Adj. VR101, 201 (VR102, 202) so that level would become within ± 3 dB against 1 kHz.
(7) Set MONITOR SW to TAPE. Feed in 1 kHz 0.3 V to Input Jacks and adjust the line input level controls to obtain 0 dB on Level Meters. And check whether the Total Harmonic Distortion (T.H.D.) is under 1.5%. If T.H.D. exceeds 1.5%, adjust the Bias Adj. VR101, 201 (VR102, 202) again to obtain T.H.D. of less than 1.5%, then set Audio Generator Output Level to 20 kHz −20 dB (EXII/SX) and check to insure whether the level becomes within ± 3 dB against 1 kHz −20 dB.
(8) For correction of Record Calibration after above adjustment, set to TEST TONE SW ON and set to record mode. Then adjust Record Calibration VR702, 802 (VR701, 801) on the Rec. Cal. P.C.B. to obtain same level on Level Meters (0 dB) at MONITOR SW SOURCE and TAPE.

Notes:

1. "6.11. Alignment Beacon Phase Adjustment" has to be conducted.
2. In case of defective Frequency Response, the following causes can be considered:
Defective Record Head, defective "6.6. Playback Frequency Response" check and Playback Head, defective "6.10. Recording Equalization Peaking" check, defective Mechanical Adjustments (Head Height Adjustment, Tape Travelling).
Refer to "6.16. Frequency Response Adjustment".
Main P.C.B.:
VR101 (EXII Bias Adj. VR – Lch)
VR201 (EXII Bias Adj. VR – Rch)
VR102 (SX Bias Adj. VR – Lch)
VR202 (SX Bias Adj. VR – Rch)
Rec. Cal. P.C.B.:
VR702 (EXII Rec. Cal. VR – Lch)
VR802 (EXII Rec. Cal. VR – Rch)
VR701 (SX Rec. Cal. VR – Lch)
VR801 (SX Rec. Cal. VR – Rch)

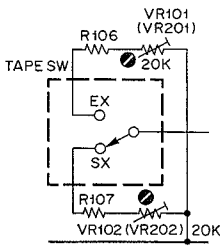


Fig. 6.13
Bias Current Adjustment

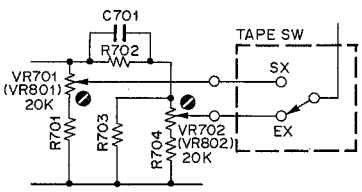


Fig. 6.14
Record Level Calibration

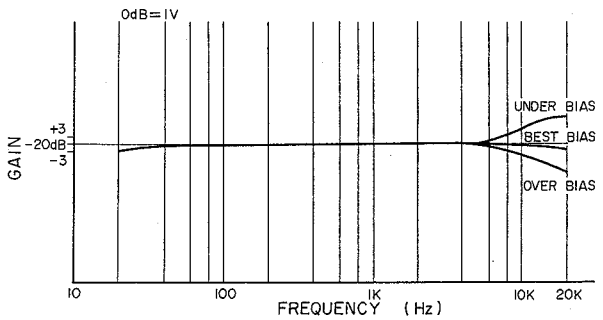


Fig. 6.15 Frequency Response

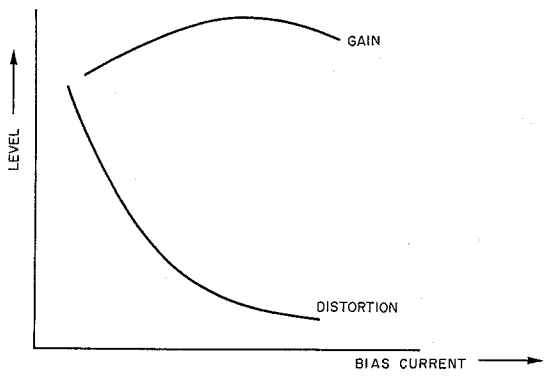


Fig. 6.16 Bias Characteristics

6.13. Record Dolby NR Alignment

Adjust only if Record Dolby NR P.C.B. is repaired.

(1) Set Law Control VR101 (VR201) fully clockwise, viewed from top side.
(2) Set Gain Control VR102 (VR202) fully counter-clockwise.
(3) Set DOLBY NR SW to OUT and short FET gate Test Pin Lch (Rch) to ground.
(4) Feed in 5 kHz at a level to give 3 mV at Metering terminal.
(5) Note signal level obtained at Output terminal.
(6) Set DOLBY NR SW to IN and adjust Gain Control for a 10 dB rise at Output terminal.
(7) Note output level with DOLBY NR SW IN.
(8) Remove FET gate Test Pin short and adjust Law Control for a 2 dB drop at Output terminal.

Note: Pin numbers of Record Dolby NR P.C.B.

	Right	Left
DOLBY NR SW terminal	2	13
Metering terminal	3	12
Output terminal	5	10
Input terminal	4	11

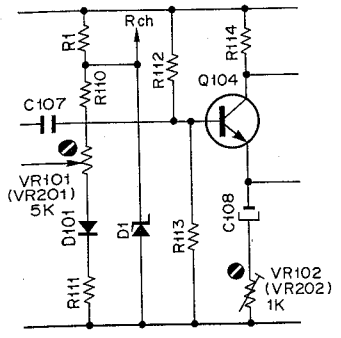


Fig. 6.17 Record Dolby NR Alignment

6.14. Playback Dolby NR Alignment

Adjust only if Playback Dolby NR P.C.B. is repaired.

(1) Set Law Control VR101 (VR201) fully clockwise, viewed from top side.
(2) Set Gain Control VR102 (VR202) fully counter-clockwise.
(3) Set DOLBY NR SW to OUT and short FET gate Test Pin Lch (Rch) to ground.
(4) Feed in 5 kHz at a level to give 7.6 mV at Metering terminal.
(5) Set Gain Control for a 10 dB drop at Metering terminal as DOLBY NR SW is set to IN.
(6) Set DOLBY NR SW to OUT and remove FET gate Test Pin short and adjust Law Control to give a reading of 3 mV at Metering terminal.

Note: Pin numbers of Playback Dolby NR P.C.B.

	Right	Left
DOLBY NR SW terminal	2	13
Metering or Output terminal	5	10
Input terminal	3	12

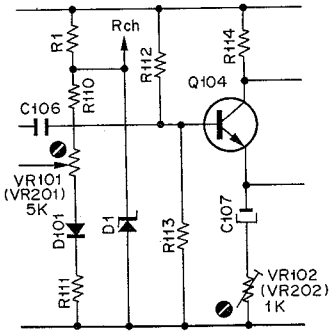


Fig. 6.18 Playback Dolby NR Alignment

6.15. DNL Alignment

(1) Set MONITOR SW to SOURCE, DNL SW to OUT and output level controls to maximum position.
(2) Feed in 10 kHz at a level to give 4 mV at Output Line Jacks.
(3) Set DNL SW to IN mode.
(4) Adjust VR101 (VR201) on the DNL P.C.B. for a 8 dB drop at Output Line Jacks.

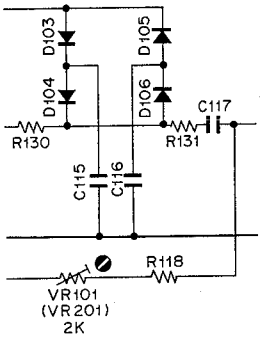


Fig. 6.19 DNL Alignment

6.16. Frequency Response Adjustment

6.16.1 Playback Frequency Response

Measurement Connection

VTVM to Line Output Jacks.

Mode

MONITOR SW – TAPE
TAPE SELECTOR SW – SX
EQ SELECTOR SW – 70 μs
DNL – OUT
DOLBY NR SW – OUT

Adjustment

(1) Open 22 kΩ of R109,209 of the PB Head Amp. P.C.B. (EQ and time constant shall show 120 μs).

(2) Load a 400 Hz Level Tape (DA09005A) to playback, and turn the output level controls till the indication of the VTVM shows 0 dB (for example) or easy reference of value.
(3) Load a 10 kHz PB Frequency Response Tape (DA09003A) and play it back.
(4) Check the output of 10 kHz and then, referring to Fig. 6.20, adjust EQ in the range of 110 μs – 140 μs, the result of which shall be 0 to + 3 dB.
(5) Load a 15 kHz PB Frequency Response Tape (DA09002A) and play it back.
(6) If the output of 15 kHz shows the value within ± 2 dB against 400 Hz Level Tape, it is considered satisfactory.
(7) Load a 20 kHz PB Frequency Response Tape (DA09001A) and play it back.
(8) If 15 kHz at (5) shows the value within ± 2 dB and 20 kHz being less than −3 dB, replace the playback head.
(9) Adjustment shall be made so that the level at 10 kHz, 15 kHz and 20 kHz will become flat when compared with 400 Hz.
(10) If the results are shown to belong to high, set R101,201 to open – 100 kΩ. Refer to Fig. 6.21.
(11) Adjust the azimuth alignment to the maximum output with a 15 kHz Azimuth Tape (DA09004A).

Notes: 1. If adjustment is made on the jumper resistor, the alignment beacon phase shall also be adjusted.
2. If the foregoing adjustments do not suffice the requirements, the playback head shall be replaced.

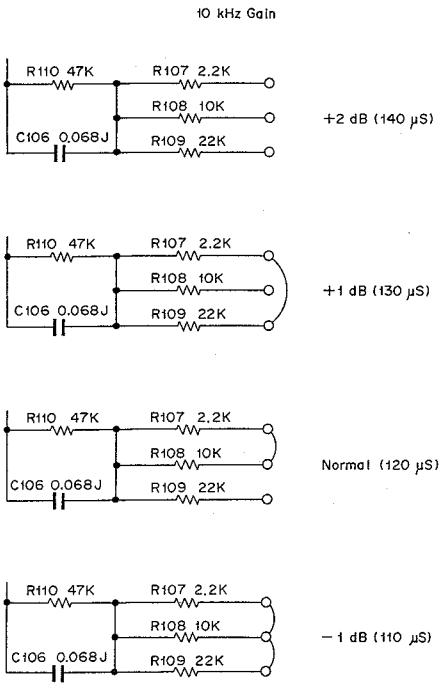


Fig. 6.20 Playback Equalizer Adjustment

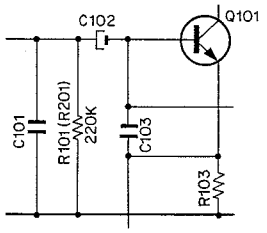


Fig. 6.21 PB Head Amp. Peaking Compensation

6.16.2. Overall Frequency Response

Signal Source

1 kHz 0.3 V to Line Input Jacks.

Measurement Connection

VTVM, Oscilloscope and Distortion Meter to Line Output Jacks.

Mode

MONITOR SW – SOURCE/TAPE
TAPE SELECTOR SW – EX (SX)
EQ SELECTOR SW – 120 μs (70 μs)
DNL – OUT
DOLBY NR SW – OUT

Adjustment

(1) Set TAPE SELECTOR SW to SX and EQ SELECTOR SW to 70 μs then load a Reference SX Tape (DA09025A).
(2) Set to record/pause mode.
(3) Set MONITOR SW to SOURCE and adjust line input level controls till the meters indicate 0 dB at 1 kHz 0.3 V input.
(4) While in the above state, lower the output of the Generator by 30 dB.
(5) Set MONITOR SW to TAPE then set to record/playback mode. Set the Generator to 15 kHz from 1 kHz and then adjust the azimuth alignment of the record head.
(6) Adjustment shall be made on bias till the response at 10 kHz becomes 0 dB (± 1 dB).
(7) Adjustment shall be made on peaking coils L104,204 till the response at 20 kHz becomes 0 dB (± 2 dB).
(8) Waving with a SX tape at 1 kHz – 20 kHz shall be not more than 3 dB.
(9) Set TAPE SELECTOR SW to EX and EQ SELECTOR SW to 120 μs, then load a Reference EXII Tape (DA09021A).
(10) Set to record/playback mode, then adjust the azimuth alignment of record head.
(11) Bias shall be adjusted till the response at 10 kHz becomes 0 dB (± 1 dB).
(12) Measure the response at 20 kHz (± 2 dB).
(13) Change the output of the Generator from −30 dB to −20 dB and check the frequency response.
(14) Measure the distortion at 1 kHz 0 dB Overall.
SX/EXII – less than 1.5%
(15) In case of excessive distortion, change the record head.

6.17. Signal-to-Noise Ratio Measurement

(1) Connect a VTVM, Oscilloscope and Distortion Meter to Line Output Jacks, and then connect an Audio Generator to Line Input Jacks.
(2) Set both of DOLBY NR and DNL switches to OUT.
(3) Record and playback 400 Hz and adjust the line input level controls till the distortion becomes 3%.
(4) Set both of DOLBY NR and DNL switches to IN at the recording level in (3) as above.
(5) Disconnect the Generator from Line Input Jacks.
(6) After rewound, playback once again and check the output difference between (4) and (5).

Note: The filter of CCITT Curve shall be used in the measurement.

6.18. Channel Separation Measurement

6.18.1. Left Channel to Right Channel

(1) Connect a VTVM and Oscilloscope to Output Jacks, and connect an Audio Generator to Line Input Jack of L channel.
(2) Set both of DOLBY NR and DNL switches to OUT.
(3) Load a blank cassette tape.
(4) Set MONITOR SW to SOURCE and adjust the L channel line input level control till the meter indicates 0 dB at 1 kHz. Set the R channel line input level control to maximum.
(5) Set MONITOR SW to TAPE and record it.
(6) After rewound, play it back.
(7) Measure the difference between L and R channels.

6.18.2. Right Channel to Left Channel

(1) Connect an Audio Generator to Line Input Jack of R channel.
(2) Set MONITOR SW to SOURCE and adjust the R channel line input level control till the meter indicates 0 dB at 1 kHz.
(3) The L channel line input level control shall be set to maximum.
(4) Set MONITOR SW to TAPE and record it.
(5) After rewound, play it back.
(6) Measure the output difference between R and L channels.

6.19. Crosstalk Measurement

(1) Connect a VTVM, Oscilloscope and 1 kHz Band Pass Filter to Output Jacks, and then connect an Audio Generator to Line Input Jacks.
(2) Load a blank cassette tape.
(3) Set MONITOR SW to SOURCE, and then adjust the line input level controls till the meters indicate 0 dB at 1 kHz.
(4) Set MONITOR SW to TAPE and record it.
(5) Turn the cassette tape the other way round and play it back, when measurement shall be made at 1 kHz Band Pass Filter.
(6) Measue the output difference between (4) and (5) (R channel of A (or B) side to R channel of B (or A) side).

6.20. Erasure Measurement

(1) Connect a VTVM and Oscilloscope to Output Jacks and connect an Audio Generator to Line Input Jacks.
(2) Set MINITOR SW to SOURCE, and adjust the line input controls till the meters indicate 0 dB at 1 kHz.
(3) Load a blank cassette tape.
(4) Set MONITOR SW to TAPE and record it.
(5) Then rewind it.
(6) Disconnect the Audio Generator from the Line Input Jacks.
(7) Record it once again (erase).
(8) Then rewind.
(9) Measure the output difference between (4) and (7).

6.21. Total Harmonic Distortion Measurement

(1) Connect a Distortion Meter to Line Output Jacks, and connect an Audio Generator to Line Input Jacks.
(2) Set to the following mode:
MONITOR SW – SOURCE/TAPE
TAPE SELECTOR SW – EX (SX)
EQ SELECTOR SW – 120 μs (70 μs)
DOLBY NR SW – OUT
DNL SW – OUT
OUTPUT LEVEL CONTROLS – Max.
(3) Load a blank tape (EXII/SX).
(4) Set MONITOR SW to SOURCE and adjust the line input level controls till the meters indicate 0 dB at 400 Hz.
(5) Set MONITOR SW to TAPE and record then play it back.
(6) Measure the reading of the Distortion Meter.

Note: Before the above measurement, record level calibration with 400 Hz Test Tone should be performed.

6.22. Wow/Flutter Measurement

(1) Connect a Wow/Flutter Meter to Output Jack.
(2) Load a 3 kHz Speed-Wow/Flutter Tape (DA09006A) and play it back.
(3) Check the reading of Wow/Flutter Meter.

Note: DIN weighted peak shall be measured (playback only).

7. PARTS LOCATION FOR ELECTRICAL ADJUSTMENT

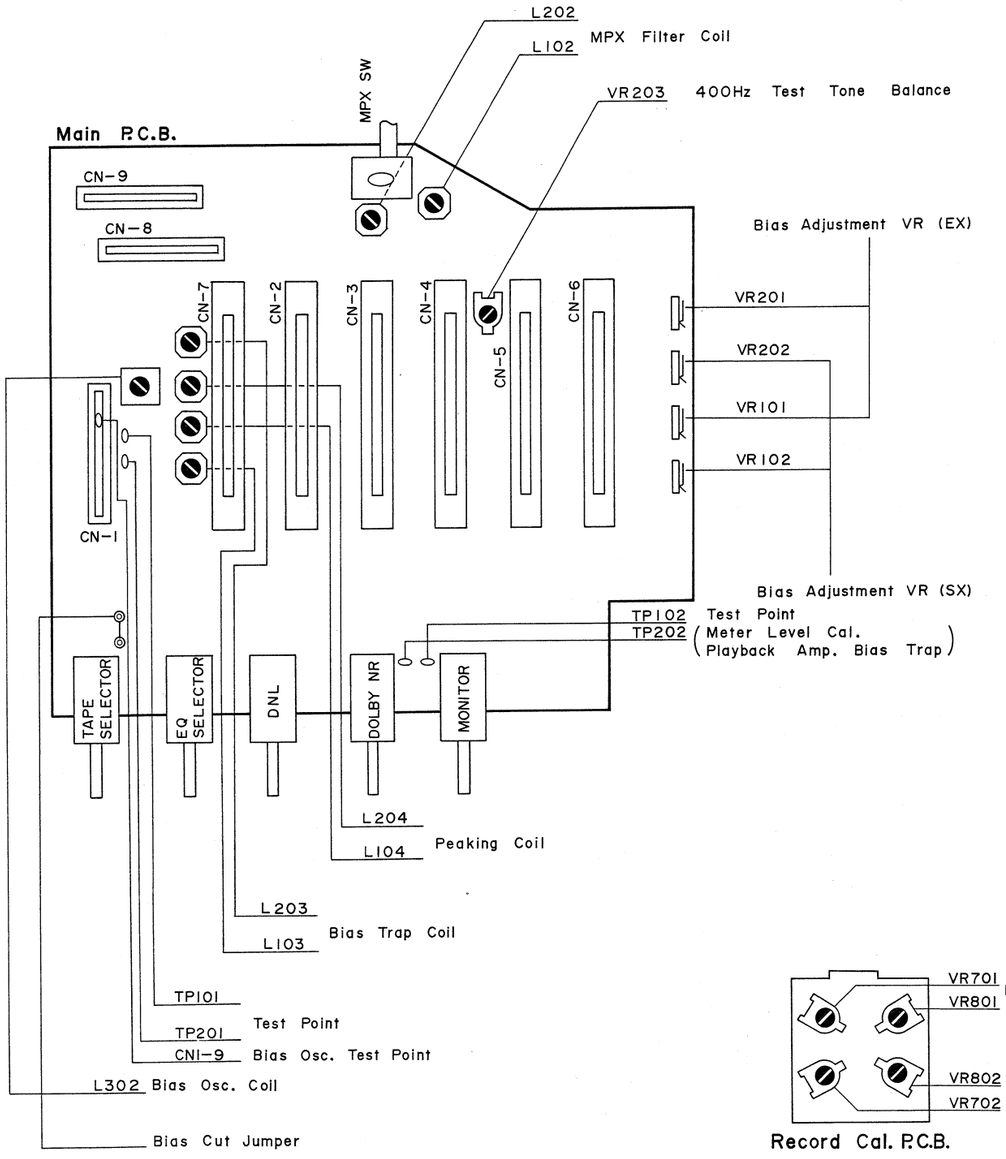


Fig. 7.1

Fig. 7.2

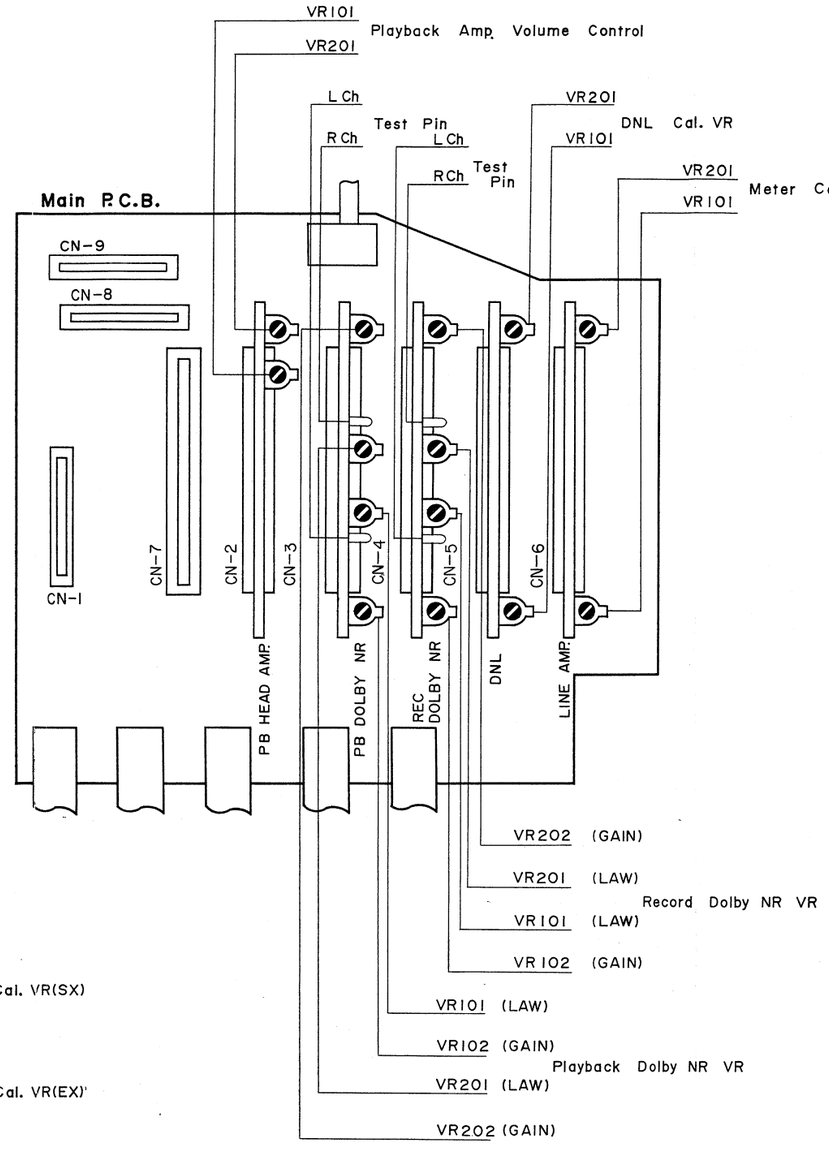


Fig. 7.3

8. MOUNTING DIAGRAM AND PARTS LIST

Notes: 1. Mounting Diagram shows a dip side of the printed circuit board.
2. Diode FDH-999 is compatible with 1S1555.

8.1. Main P.C.B. Ass'y

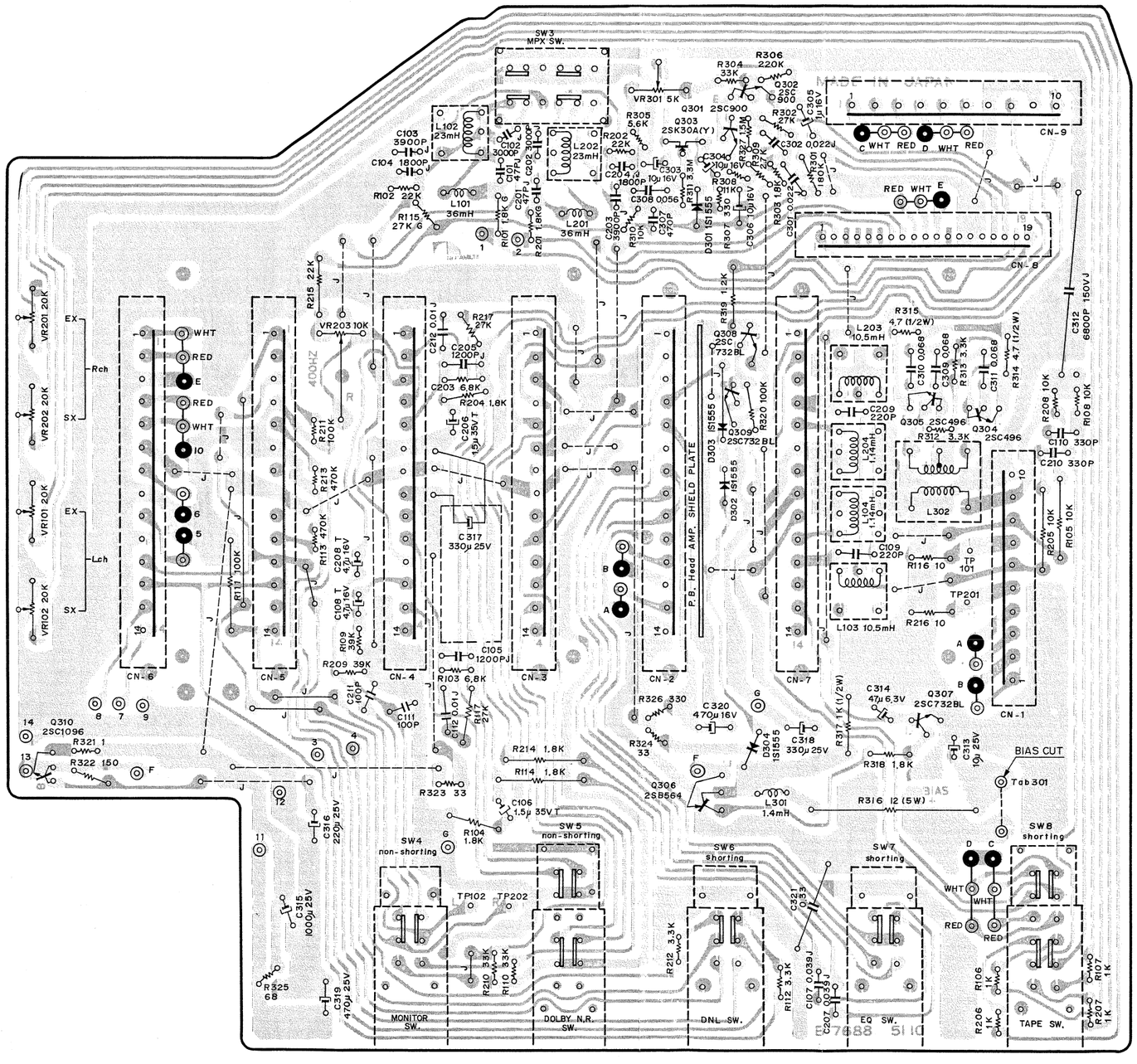


Fig. 8.1

Schematic Ref. No.	Part No.	Description
	BA03881A	**Main P.C.B. Ass'y**
	– Rec. Amp. –	
L101,201	0B03919A	Inductor 36mH
L102,202	0B03563A	19KHz Coil 23mH
L103,203	0B00068A	Trap Coil 10.5mH
L104,204	0B01434A	Peaking Coil 1.14mH
R101,201	0B05896A	Metal Film Resistor 1.8K ER0-25VK G
R102,202	0B05661A	Carbon Resistor 22K ERD-25V J
R103,203	0B01877A	Carbon Resistor 6.8K ERD-25V J
R104,204	0B01830A	Carbon Resistor 1.8K ERD-25V J
R114,214	0B05614A	Carbon Resistor 1.8K ERD-25T J
R117,217	0B05538A	Carbon Resistor 27K ERD-25V J
C101,201	0B05789A	S.P. Capacitor 47P 50V J
C102,202	0B01803A	Mylar Capacitor 3000P 50V J
C103,203	0B01804A	Mylar Capacitor 3900P 50V J
C104,204	0B01913A	Mylar Capacitor 1800P 50V J
C105,205	0B05687A	Mylar Capacitor 1200P 50V J
C106,206	0B05639A	Tantalum Capacitor 1.5μ 35V
C107,207	0B05660A	Mylar Capacitor 0.039μ 50V J
C108,208	0B05657A	Tantalum Capacitor 4.7μ 16V
C109,209	0B01289A	Ceramic Capacitor 220P 50V
C112,212	0B05681A	Mylar Capacitor 0.01μ 50V J
SW3	0B07012A	MPX Switch
	– 400Hz Osc. –	
Q301,302	0B01910A	Transistor 2SC900 (E)
Q303	0B01600A	FET 2SK30A (Y)
D301	0B01909A	Silicon Diode 1S1555
VR203	0B01595A	Semi-fixed Volume 10K
VR301	0B07140A	Semi-fixed Volume 5K
R115	0B01588A	Metal Film Resistor 27K ER0-25VK G
R215	0B05661A	Carbon Resistor 22K ERD-25V J
R301	0B05669A	Carbon Resistor 180K ERD-25V J
R302	0B05538A	Carbon Resistor 27K ERD-25V J
R303	0B01830A	Carbon Resistor 1.8K ERD-25V J
R304	0B01879A	Carbon Resistor 33K ERD-25V J
R305	0B05673A	Carbon Resistor 5.6K ERD-25V J
R306	0B05596A	Carbon Resistor 220K ERD-25V J
R307	0B01789A	Carbon Resistor 330 ERD-25V J
R308	0B05826A	Carbon Resistor 11K ERD-25V J
R309	0B01782A	Carbon Resistor 2.7K ERD-25V J
R310	0B01833A	Carbon Resistor 10K ERD-25V J
R311	0B05775A	Carbon Resistor 3.3M ERD-25V J
R327	0B05601A	Carbon Resistor 1.5M ERD-25V J
C301,302	0B05582A	Mylar Capacitor 0.022μ 50V J
C303,304 306	0B01412A	Electrolytic Capacitor 10μ 16V
C305	0B01405A	Electrolytic Capacitor 1μ 16V
C307	0B01716A	Ceramic Capacitor 470P 50V
C308	0B05813A	Mylar Capacitor 0.056μ 50V J
	– Bias Osc. –	
Q304,305	0B01790A	Transistor 2SC496 (Y)
Q306	0B06069A	Transistor 2SB564
Q307	0B06005A	Transistor 2SC732 (BL)
L301	0B03861A	Inductor 1.4mH
L302	0B06515A	Osc. Coil
VR101,102 201,202	0B01922A	Semi-fixed Volume 20K
R105,205	0B01888A	Carbon Resistor 10K ERD-25T J
R106,107 206,207	0B01781A	Carbon Resistor 1K ERD-25V J
R108,208	0B01833A	Carbon Resistor 10K ERD-25V J
R116,216	0B05663A	Carbon Resistor 10 ERD-25V J
R312, 313	0B01793A	Carbon Resistor 3.3K ERD-25V J
R314,315	0B05662A	Carbon Resistor 4.7 ERD-12V J
R316	0B05761A	Cement Resistor 12 5W
R317	0B00346A	Carbon Resistor 1K ERD-12V J
R318	0B01830A	Carbon Resistor 1.8K ERD-25V J
C110,210	0B01180A	Ceramic Capacitor 330P 50V
C309,310 311	0B05586A	Mylar Capacitor 0.068μ 50V K
C312	0B05634A	S.P. Capacitor 6800P 150V J
C313	0B01674A	Electrolytic Capacitor 10μ 25V
C314	0B01404A	Electrolytic Capacitor 47μ 6.3V
	– Miscellaneous –	
Q308,309	0B06005A	Transistor 2SC732 (BL)
Q310	0B06020A	Transistor 2SC1096
D302,303 304	0B01909A	Silicon Diode 1S1555
R109,209	0B01885A	Carbon Resistor 39K ERD-25V J
R110,210	0B01879A	Carbon Resistor 33K ERD-25V J
R111	0B01889A	Carbon Resistor 100K ERD-25T J
R112,212	0B01792A	Carbon Resistor 3.3K ERD-25V J
R113,213	0B05700A	Carbon Resistor 470K ERD-25V J
R211,320	0B01920A	Carbon Resistor 100K ERD-25V J
R319	0B05565A	Carbon Resistor 1.2K ERD-25V J
R321	0B05695A	Carbon Resistor 1 ERD-25V J
R322	0B05649A	Carbon Resistor 150 ERD-25V J
R323,324	0B05567A	Carbon Resistor 33 ERD-25V J
R325	0B01788A	Carbon Resistor 68 ERD-25V J
R326	0B01789A	Carbon Resistor 330 ERD-25V J
C111,211	0B01288A	Ceramic Capacitor 100P 50V
C315	0B01870A	Electrolytic Capacitor 1000μ 25V
C316	0B01391A	Electrolytic Capacitor 220μ 25V
C317,318	0B05793A	Electrolytic Capacitor 330μ 25V
C319	0B01401A	Electrolytic Capacitor 470μ 25V
C320	0B01392A	Electrolytic Capacitor 470μ 16V
C321	0B01602A	Mylar Capacitor 0.33μ 50V K
SW4	BA03806A	Lever Switch Ass'y 2 (Monitor Sw.)
SW5	BA03775A	Lever Switch Ass'y 4 (Dolby NR Sw.)
SW6,7	BA03773A	Lever Switch Ass'y 2S (DNL, Eq. Sw.)
SW8	BA03800A	Lever Switch Ass'y 4S (Tape Sw.)
CN1,9	BA03807A	10P Connector Ass'y
CN2,3,4 5,6,7	BA03809A	14P Connector Ass'y
CN8	BA03808A	19P Connector Sub Ass'y
TP101,102 201,202	0B03924A	Gate Pin
	0B05107A	Separate Plug Cord E (1 pce.)
	0B05108A	Separate Plug Cord F (1 pce.)
	0B05171A	Osc. Cord (1 pce.)
	0B08001A	Tab (1 pce.)
	0B08280A	PB Amp. Shield Mylar (2 pcs.)
	0E00021A	Nut Hex. M2.6 (6 pcs.)
	0E00670A	Screw M2.6 x 12 Philips Pan Head (6 pcs.)
	0J03080A	Connector Holder (2 pcs.)
	0J03081A	Connector Stud (6 pcs.)
	0J03578A	Playback Head Amp. Insulator (1 pce.)
	0B05187A	Insulating Tube 1.2mm (2 pcs.)
	0B07688C	Main P.C.B. 1000

8.2. Playback Dolby NR P.C.B. Ass'y

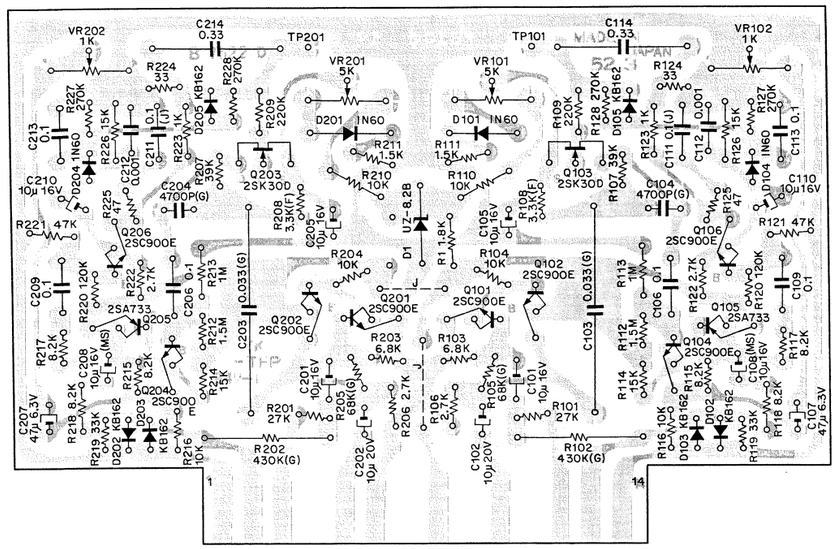


Fig. 8.2

Schematic Ref. No.	Part No.	Description	Schematic Ref. No.	Part No.	Description
	BA03588A	**Playback Dolby NR P.C.B. Ass'y**	R113,213	0B05564A	Carbon Resistor 1M ERD-25V J
	0B07522D	Playback Dolby NR P.C.B.	R114,126 214,226	0B05591A	Carbon Resistor 15K ERD-25V J
Q101,102 104,106 201,202 204,206	0B01910A	Transistor 2SC900 (E)	R115,117 118,215 217,218	0B01878A	Carbon Resistor 8.2K ERD-25V J
Q103,203	0B06001A	FET 2SK30A (D)	R119,219	0B01879A	Carbon Resistor 33K ERD-25V J
Q105,205	0B06013A	Transistor 2SA733	R120,220	0B05568A	Carbon Resistor 120K ERD-25V J
D1	0B01808B	Zener Diode UZ-8.2B	R121,221	0B05562A	Carbon Resistor 47K ERD-25V J
D101,104 201,204	0B00030A	Germanium Diode 1N60 (P)	R123,223	0B01781A	Carbon Resistor 1K ERD-25V J
			R124,224	0B05567A	Carbon Resistor 33 ERD-25V J
			R125,225	0B05569A	Carbon Resistor 47 ERD-25V J
D102,103 105,202 203,205	0B01599A	Silicon Varistor KB162	R127,128 227,228	0B05600A	Carbon Resistor 270K ERD-25V J
			C101,105 110,201 205,210	0B01412A	Electrolytic Capacitor 10μ 16V
VR101,201	0B01470A	Semi-fixed Volume 5K			
VR102,202	0B01428A	Semi-fixed Volume 1K	C102,202	0B05581A	Tantalum Capacitor 10μ 20V
R1	0B01830A	Carbon Resistor 1.8K ERD-25V J	C103,203	0B01786A	P.P. Capacitor 0.033μ 50V G
R101,201	0B05538A	Carbon Resistor 27K ERD-25V J	C104,204	0B01608A	P.P. Capacitor 4700P 50V G
R102,202	0B05536A	Metal Film Resistor 430K ER0-25VK G	C106,109 113,206 209,213	0B01603A	Mylar Capacitor 0.1μ 50V K
R103,203	0B01877A	Carbon Resistor 6.8K ERD-25V J			
R104,110 116,204 210,216	0B01833A	Carbon Resistor 10K ERD-25V J	C107,207	0B01404A	Electrolytic Capacitor 47μ 6.3V
			C108,208	0B05840A	Electrolytic Capacitor 10μ 16VM (MS)
R105,205	0B05535A	Metal Film Resistor 68K ER0-25VK G	C111,211	0B01780A	Mylar Capacitor 0.1μ 50V J
R106,122 206,222	0B01782A	Carbon Resistor 2.7K ERD-25V J	C112,212	0B00091A	Mylar Capacitor 1000P 50V
R107,207	0B01885A	Carbon Resistor 39K ERD-25V J	C114,214	0B01602A	Mylar Capacitor 0.33μ 50V K
R108,208	0B01585A	Metal Film Resistor 3.3K ER0-25VK F	TP101,201	0B03924A	Gate Pin
R109,209	0B05596A	Carbon Resistor 220K ERD-25V J		0M03345B	Playback Dolby NR Indication Label (2 pcs.)
R111,211	0B05505A	Carbon Resistor 1.5K ERD-25V J			
R112,212	0B05601A	Carbon Resistor 1.5M ERD-25V J			

8.3. Record Dolby NR P.C.B. Ass'y

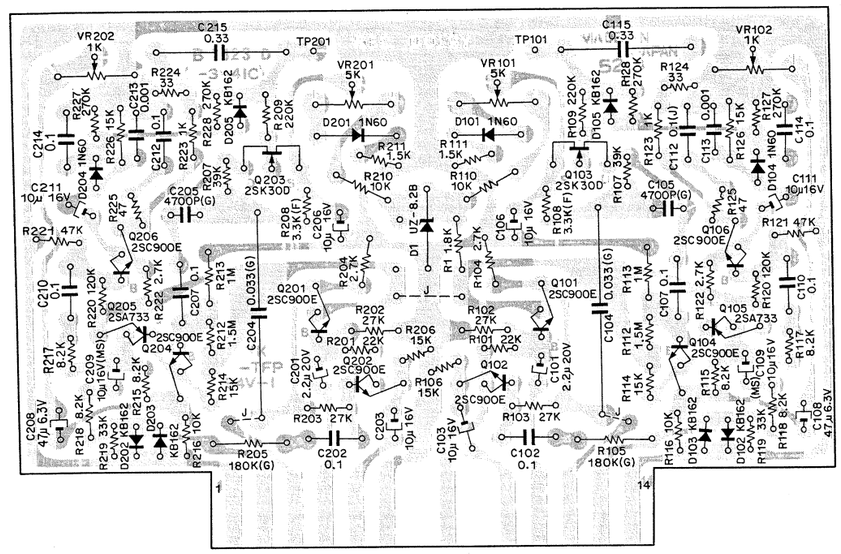


Fig. 8.3

Schematic Ref. No.	Part No.	Description	Schematic Ref. No.	Part No.	Description
	BA03589A	**Record Dolby NR P.C.B. Ass'y**	R111,211	0B05505A	Carbon Resistor 1.5K ERD-25V J
			R112,212	0B05601A	Carbon Resistor 1.5M ERD-25V J
	0B07523D	Record Dolby NR P.C.B.	R113,213	0B05564A	Carbon Resistor 1M ERD-25V J
Q101,102	0B01910A	Transistor 2SC900 (E)	R115,117	0B01878A	Carbon Resistor 8.2K ERD-25V J
104,106			118,215		
201,202			217,218		
204,206			R119,219	0B01879A	Carbon Resistor 33K ERD-25V J
Q103,203	0B06001A	FET 2SK30A (D)	R120,220	0B05568A	Carbon Resistor 120K ERD-25V J
Q105,205	0B06013A	Transistor 2SA733	R121,221	0B05562A	Carbon Resistor 47K ERD-25V J
D1	0B01808B	Zener Diode UZ-8.2B	R123,223	0B01781A	Carbon Resistor 1K ERD-25V J
D101,104	0B00030A	Germanium Diode 1N60 (P)	R124,224	0B05567A	Carbon Resistor 33 ERD-25V J
201,204			R125,225	0B05569A	Carbon Resistor 47 ERD-25V J
D102,103	0B01599A	Silicon Varistor KB162	R127,128	0B05600A	Carbon Resistor 270K ERD-25V J
105,202			227,228		
203,205			C101,201	0B05598A	Tantalum Capacitor 2.2μ 20V
VR101,201	0B01470A	Semi-fixed Volume 5K	C102,107	0B01603A	Mylar Capacitor 0.1μ 50V K
VR102,202	0B01428A	Semi-fixed Volume 1K	110,114		
R1	0B01830A	Carbon Resistor 1.8K ERD-25V J	202,207		
R101,201	0B05661A	Carbon Resistor 22K ERD-25V J	210,214		
R102,103	0B05538A	Carbon Resistor 27K ERD-25V J	C103,106	0B01412A	Electrolytic Capacitor 10μ 16V
202,203			111,203		
R104,122	0B01782A	Carbon Resistor 2.7K ERD-25V J	206,211		
204,222			C104,204	0B01786A	P.P. Capacitor 0.033μ 50V G
R105,205	0B01590A	Metal Film Resistor 180K ER0-25VK G	C105,205	0B01608A	P.P. Capacitor 4700P 50V G
R106,114	0B05591A	Carbon Resistor 15K ERD-25V J	C108,208	0B01404A	Electrolytic Capacitor 47μ 6.3V
126,206			C109 209	0B05840A	Electrolytic Capacitor 10μ 16V M (MS)
214,226			C112,212	0B01780A	Mylar Capacitor 0.1μ 50V J
R107,207	0B01885A	Carbon Resistor 39K ERD-25V J	C113,213	0B00091A	Mylar Capacitor 1000P 50V
R108,208	0B01585A	Metal Film Resistor 3.3K ER0-25VK F	C115,215	0B01602A	Mylar Capacitor 0.33μ 50V K
R109,209	0B05596A	Carbon Resistor 220K ERD-25V J	TP101,201	0B03924B	Gate Pin
R110,116	0B01833A	Carbon Resistor 10K ERD-25V J		0M03346B	Record Dolby NR Indication Label (1 pce.)
210,216					

8.4. DNL P.C.B. Ass'y

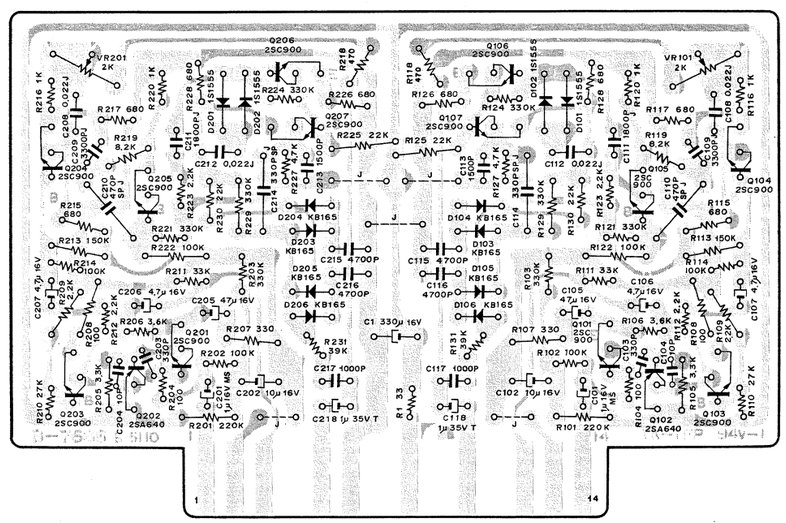


Fig. 8.4

Schematic Ref. No.	Part No.	Description		Schematic Ref. No.	Part No.	Description	
	BA03880A	**DNL P.C.B. Ass'y**		R111,211	0B01879A	Carbon Resistor	33K ERD-25V J
				R113,213	0B05593A	Carbon Resistor	150K ERD-25V J
	0B07686B	DNL P.C.B.		R115,117	0B05559A	Carbon Resistor	680 ERD-25V J
Q101,103	0B01910A	Transistor	2SC900 (E)	126,128			
104,105				215,217			
106,107				226,228			
201,203				R116,120	0B01781A	Carbon Resistor	1K ERD-25V J
204,205				216,220			
206,207				R118,218	0B01792A	Carbon Resistor	470 ERD-25V J
Q102,202	0B06021A	Transistor	2SA640	R119,219	0B01878A	Carbon Resistor	8.2K ERD-25V J
D101,102	0B01909A	Silicon Diode	1S1555	R125,130	0B05661A	Carbon Resistor	22K ERD-25V J
201,202				225,230			
D103,104	0B06007A	Silicon Diode	KB165	R127,227	0B01795A	Carbon Resistor	4.7K ERD-25V J
105,106				R131,231	0B01885A	Carbon Resistor	39K ERD-25V J
203,204				C1	0B01502A	Electrolytic Capacitor	330μ 16V
205,206				C101,201	0B05853A	Electrolytic Capacitor	1μ 16V M (MS)
VR101,201	0B05958A	Semi-fixed Volume	2K	C102,202	0B01412A	Electrolytic Capacitor	10μ 16V
R1	0B05567A	Carbon Resistor	33 ERD-25V J	C103,203	0T04026A	Ceramic Capacitor	330P 50V
R101,201	0B05596A	Carbon Resistor	220K ERD-25V J	C104,204	0B05798A	Ceramic Capacitor	10P 50V K
R102,114	0B01920A	Carbon Resistor	100K ERD-25V J	C105,205	0B01403A	Electrolytic Capacitor	47μ 16V
122,202				C106,107	0B01389A	Electrolytic Capacitor	4.7μ 16V
214,222				206,207			
R103,121	0B01921A	Carbon Resistor	330K ERD-25V J	C108,112	0B01916A	Mylar Capacitor	0.022μ 50V J
124,129				208,212			
203,221				C109,209	0B01914A	Mylar Capacitor	3300P 50V J
224,229				C110,210	0B05612A	S.P. Capacitor	470P 50V J
R104,108	0B05558A	Carbon Resistor	100 ERD-25V J	C111,211	0B01913A	Mylar Capacitor	1800P 50V J
204,208				C113,213	0B01711A	Mylar Capacitor	1500P 50V K
R105,205	0B01793A	Carbon Resistor	3.3K ERD-25V J	C114,214	0B05611A	S.P. Capacitor	330P 50V J
R106,206	0B05957A	Carbon Resistor	3.6K ERD-25V J	C115,116	0B01915A	Mylar Capacitor	4700P 50V K
R107,207	0B01789A	Carbon Resistor	330 ERD-25V J	215,216			
R109,112	0B05566A	Carbon Resistor	2.2K ERD-25V J	C117,217	0B00091A	Mylar Capacitor	1000P 50V
123,209				C118,218	0B05638A	Tantalum Capacitor	1μ 35V
212,223					0M03860A	DNL Label C	(1 pce.)
R110,210	0B05538A	Carbon Resistor	27K ERD-25V J				

8.5. Playback Head Amp. P.C.B. Ass'y

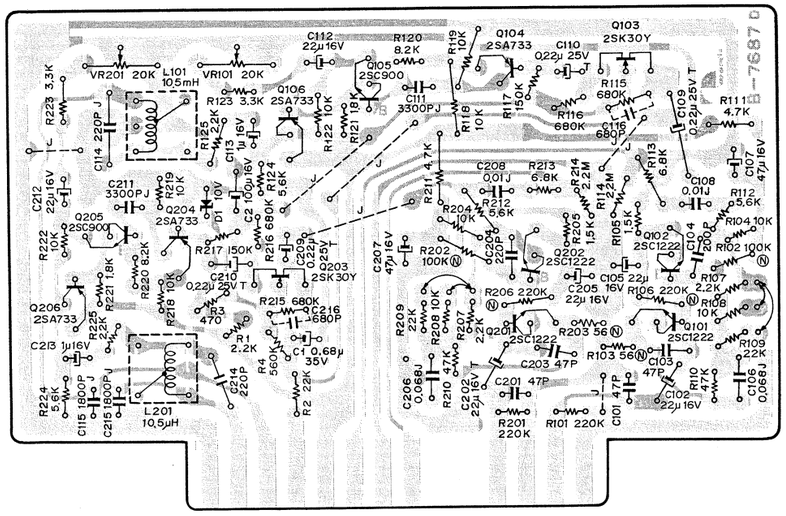


Fig. 8.5

Schematic Ref. No.	Part No.	Description	Schematic Ref. No.	Part No.	Description
	BA03802A	**Playback Head Amp. P.C.B. Ass'y**	R112,124 212,224	0B05673A	Carbon Resistor 5.6K ERD-25V J
	0B07687D	Playback Head Amp. P.C.B.	R113,213	0B01877A	Carbon Resistor 6.8K ERD-25V J
Q101,102	0B06062A	Transistor 2SC1222 (2)	R114,214	0B05672A	Carbon Resistor 2.2M ERD-25V J
201,202			R115,116	0B05597A	Carbon Resistor 680K ERD-25V J
Q103,203	0B01600A	FET 2SK30 (Y)	215,216		
Q104,106	0B06013A	Transistor 2SA733	R117,217	0B05593A	Carbon Resistor 150K ERD-25V J
204,206			R120,220	0B01878A	Carbon Resistor 8.2K ERD-25V J
Q105,205	0B01910A	Transistor 2SC900 (E)	R121,221	0B01830A	Carbon Resistor 1.8K ERD-25V J
D1	0B06116A	Zener Diode UZ-10B	R123,223	0B01793A	Carbon Resistor 3.3K ERD-25V J
L101,201	0B00068A	Trap Coil 10.5mH	C1	0B05773A	Tantalum Capacitor 0.68μ 35V
VR101,201	0B01922A	Semi-fixed Volume 20K	C2	0B01400A	Electrolytic Capacitor 100μ 16V
R1	0B05566A	Carbon Resistor 2.2K ERD-25V J	C101,103	0B01456A	Ceramic Capacitor 47P 50V
107,125			201,203		
207,225			C102,202	0B05636A	Tantalum Capacitor 22μ 16V
R2	0B05661A	Carbon Resistor 22K ERD-25V J	C104,204	0B01289A	Ceramic Capacitor 220P 50V
109,209			C105,112	0B01862A	Electrolytic Capacitor 22μ 16V
R3	0B01792A	Carbon Resistor 470 ERD-25V J	205,212		
R4	0B05665A	Carbon Resistor 560K ERD-25V J	C106,206	0B05682A	Mylar Capacitor 0.068μ 50V J
R101,201	0B05596A	Carbon Resistor 220K ERD-25V J	C107,207	0B01403A	Electrolytic Capacitor 47μ 16V
R102,202	0B01931A	Carbon Resistor 100K ERD-14VS J	C108,208	0B05681A	Mylar Capacitor 0.01μ 50V J
		(Noiseless)	C109,110	0B05772A	Tantalum Capacitor 0.22μ 25V
R103,203	0B05642A	Carbon Resistor 56 ERD-14VS J	209,210		
		(Noiseless)	C111,211	0B01914A	Mylar Capacitor 3300P 50V J
R104,108	0B01833A	Carbon Resistor 10K ERD-25V J	C113,213	0B01405A	Electrolytic Capacitor 1μ 16V
118,119			C114,214	0B05532A	S.P. Capacitor 220P 50V J
122,204			C115,215	0B01913A	Mylar Capacitor 1800P 50V J
208,218			C116,216	0T04027A	Ceramic Capacitor 680P 50V
219,222				0M03713A	Playback Head Amp. Label B (1 pce.)
R105,205	0B05505A	Carbon Resistor 1.5K ERD-25V J			
R106,206	0B05517A	Carbon Resistor 220K ERD-14VS J			
		(Noiseless)			
R110,210	0B05562A	Carbon Resistor 47K ERD-25V J			
R111,211	0B01795A	Carbon Resistor 4.7K ERD-25V J			

8.6. Line Amp. P.C.B. Ass'y

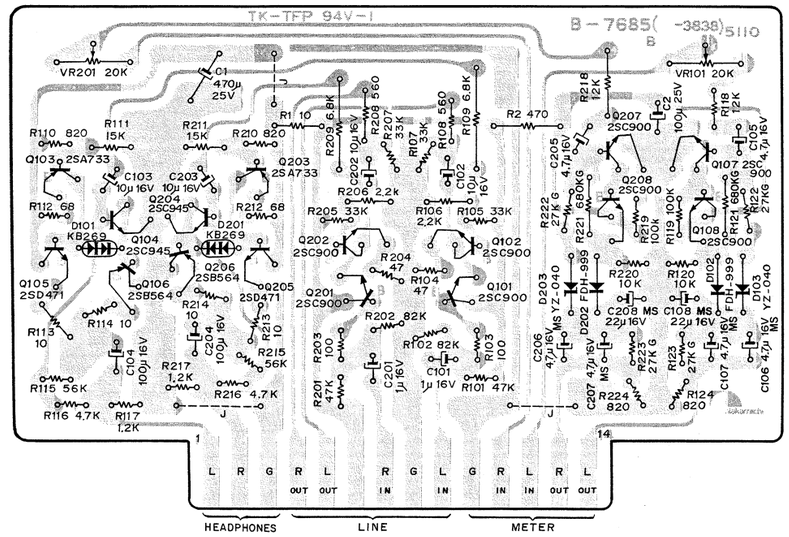


Fig. 8.6

Schematic Ref. No.	Part No.	Description		Schematic Ref. No.	Part No.	Description	
	BA03804A	**Line Amp. P.C.B. Ass'y**		R115,215	0B05563A	Carbon Resistor	56K ERD-25V J
				R116,216	0B01795A	Carbon Resistor	4.7K ERD-25V J
	0B07685B	Line Amp. P.C.B.		R117,217	0B05565A	Carbon Resistor	1.2K ERD-25V J
Q101,102	0B01910A	Transistor	2SC900 (E)	R118,218	0B05650A	Carbon Resistor	12K ERD-25V J
107,108				R119,219	0B01920A	Carbon Resistor	100K ERD-25V J
201,202				R120,220	0B01833A	Carbon Resistor	10K ERD-25V J
207,208				R121,221	0B05822A	Carbon Resistor	680K ER0-25VK G
Q103,203	0B06013A	Transistor	2SA733	R122,123	0B05901A	Carbon Resistor	27K ER0-25CK G
Q104,204	0B01872A	Transistor	2SC945 (L)	222,223			
Q105,205	0B06066A	Transistor	2SD471	C1	0B01401A	Electrolytic Capacitor	470μ 25V
Q106,206	0B06069A	Transistor	2SB564	C2	0B01272A	Electrolytic Capacitor	100μ 25V
D101,201	0B01702A	Silicon Varistor	KB269	C101,201	0B01405A	Electrolytic Capacitor	1μ 16V
D102,202	0B06091A	Silicon Diode	FDH-999	C102,103	0B01412A	Electrolytic Capacitor	10μ 16V
D103,203	0B06063A	Zener Diode	YZ-040B	202,203			
VR101,201	0B01922A	Semi-fixed Volume	20K	C104,204	0B01400A	Electrolytic Capacitor	100μ 16V
R1,	0B05663A	Carbon Resistor	10 ERD-25V J	C105,205	0B01389A	Electrolytic Capacitor	4.7μ 16V
113,114				C106,107	0B05819A	Electrolytic Capacitor	4.7μ 16V M (MS)
213,214				206,207			
R2	0B01792A	Carbon Resistor	470 ERD-25V J	C108,208	0B05820A	Electrolytic Capacitor	22μ 16V M (MS)
R101,201	0B05562A	Carbon Resistor	47K ERD-25V J		0M03714A	Line Amp. Label (1 pce.)	
R102,202	0B01564A	Carbon Resistor	82K ERD-25V J				
R103,203	0B05558A	Carbon Resistor	100 ERD-25V J				
R104,204	0B05569A	Carbon Resistor	47 ERD-25V J				
R105,107	0B01879A	Carbon Resistor	33K ERD-25V J				
205,207							
R106,206	0B05566A	Carbon Resistor	2.2K ERD-25V J				
R108,208	0B05678A	Carbon Resistor	560 ERD-25V J				
R109,209	0B01877A	Carbon Resistor	6.8K ERD-25V J				
R110,124	0B05511A	Carbon Resistor	820 ERD-25V J				
210,224							
R111,211	0B05591A	Carbon Resistor	15K ERD-25V J				
R112,212	0B01788A	Carbon Resistor	68 ERD-25V J				

8.7. MIC Amp. P.C.B. Ass'y

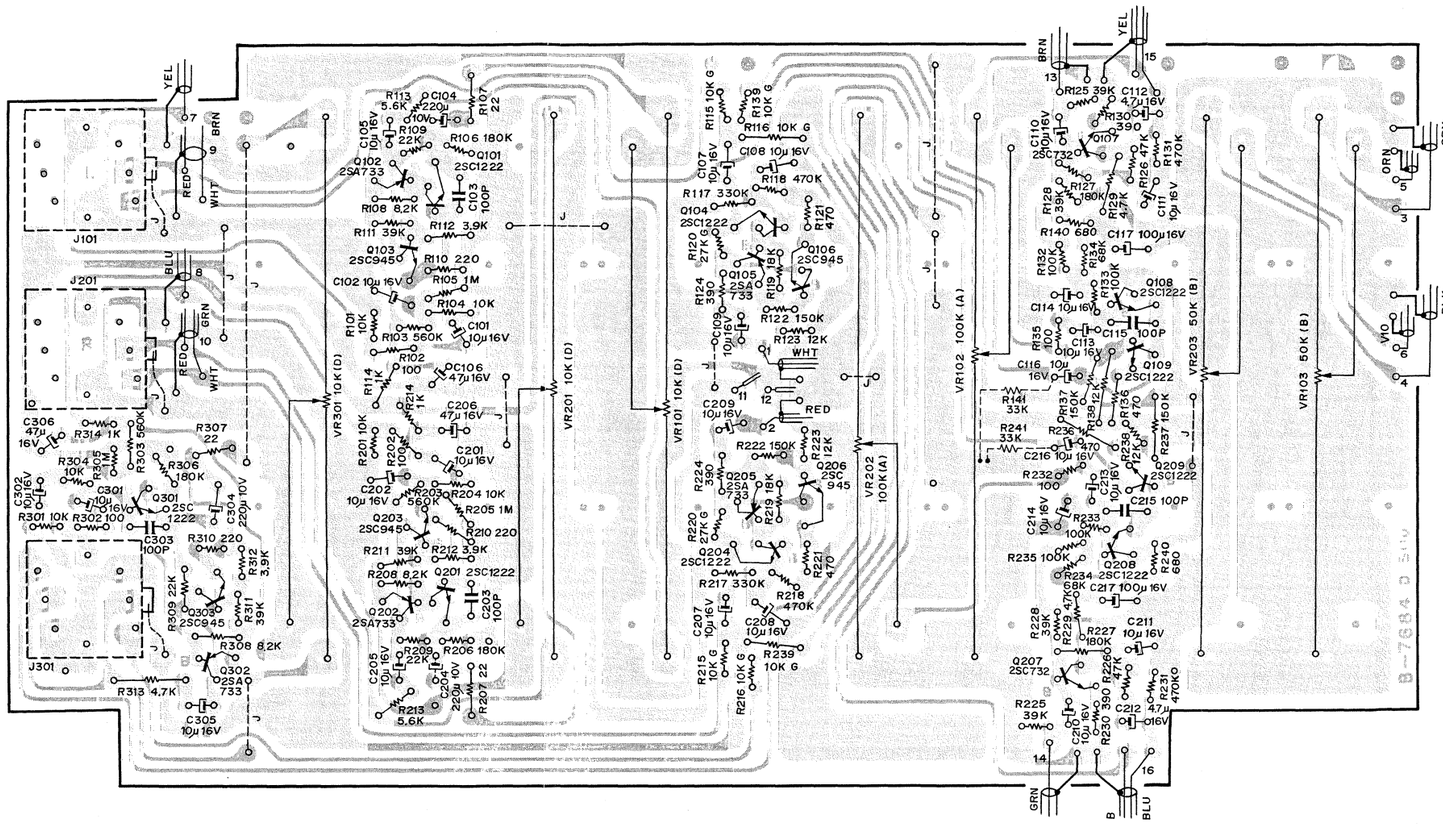


Fig. 8.7

Schematic Ref. No.	Part No.	Description
	BA03805A	**MIC Amp. P.C.B. Ass'y**
	0B07684D	MIC Amp. P.C.B.
Q101,104 108,109 201,204 208,209 301	0B06062A	Transistor 2SC1222 (2)
Q102,105 202,205 302	0B06013A	Transistor 2SA733
Q103,106 203,206 303	0B01872A	Transistor 2SC945 (L)
Q107,207	0B06005A	Transistor 2SC732 (BL)
VR101,201 301	0B07138A	Slide Volume 10K (D)
VR102,202	0B07137A	Slide Volume 100K (A)
VR103,203	0B07139A	Slide Volume 50K (B)
R101,104 201,204 301,304	0B01833A	Carbon Resistor 10K ERD-25V J
R102,132 202,232 302	0B05558A	Carbon Resistor 100 ERD-25V J
R103,203 303	0B05665A	Carbon Resistor 560K ERD-25V J
R105,205 305	0B05564A	Carbon Resistor 1M ERD-25V J
R106,127 206,227 306	0B05669A	Carbon Resistor 180K ERD-25V J
R107,207 307	0B05606A	Carbon Resistor 22 ERD-25V J
R108,208 308	0B01878A	Carbon Resistor 8.2K ERD-25V J
R109,209 309	0B05661A	Carbon Resistor 22K ERD-25V J
R110,210 310	0B05608A	Carbon Resistor 220 ERD-25V J
R111,125 128,211 225,228 311	0B01885A	Carbon Resistor 39K ERD-25V J
R112,212 312	0B05664A	Carbon Resistor 3.9K ERD-25V J
R113,213	0B05673A	Carbon Resistor 5.6K ERD-25V J
R114,214 314	0B01781A	Carbon Resistor 1K ERD-25V J
R115,116 139,215 216,239	0B05895A	Metal Film Resistor 10K ER0-25VK G
R117,217	0B01921A	Carbon Resistor 330K ERD-25V J
R118,131 218,231	0B05700A	Carbon Resistor 470K ERD-25V J
R119,219	0B05561A	Carbon Resistor 18K ERD-25V J
R120,220	0B01588A	Metal Film Resistor 27K ER0-25VK G
R121,136 221,236	0B01792A	Carbon Resistor 470 ERD-25V J
R122,137 222,237	0B05593A	Carbon Resistor 150K ERD-25V J
R123,138 223,238	0B05650A	Carbon Resistor 12K ERD-25V J
R124,130 224,230	0B05688A	Carbon Resistor 390 ERD-25V J
R126,226	0B05562A	Carbon Resistor 47K ERD-25V J
R129,229 313	0B01795A	Carbon Resistor 4.7K ERD-25V J
R133,135 233,235	0B01920A	Carbon Resistor 100K ERD-25V J
R134,234	0B01902A	Carbon Resistor 68K ERD-25V J
R140,240	0B05559A	Carbon Resistor 680 ERD-25V J
R141,241	0B01879A	Carbon Resistor 33K ERD-25V J
C101,102 105,107 108,109 110,111 113,114 116,201 202,205 207,208 209,210	0B01412A	Electrolytic Capacitor 10μ 16V
211,213 214,216 301,302 305	0B01412A	Electrolytic Capacitor 10μ 16V
C103,115 203,215 303	0B01288A	Ceramic Capacitor 100P 50V
C104,204 304	0B05899A	Electrolytic Capacitor 220μ 10V
C106,206 306	0B01403A	Electrolytic Capacitor 47μ 16V
C112,212	0B01389A	Electrolytic Capacitor 4.7μ 16V
C117,217	0B01400A	Electrolytic Capacitor 100μ 16V

8.8. Record Eq. Amp. P.C.B. Ass'y

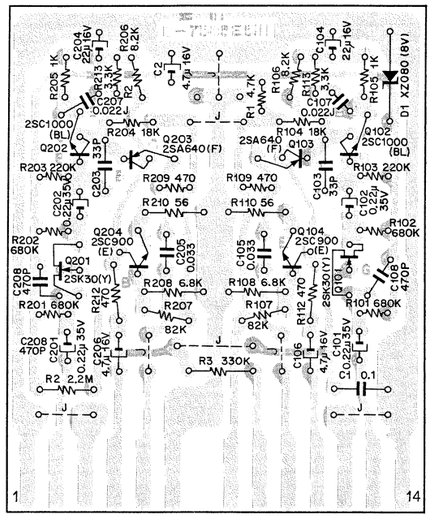


Fig. 8.8

8.9. Record Cal. P.C.B. Ass'y

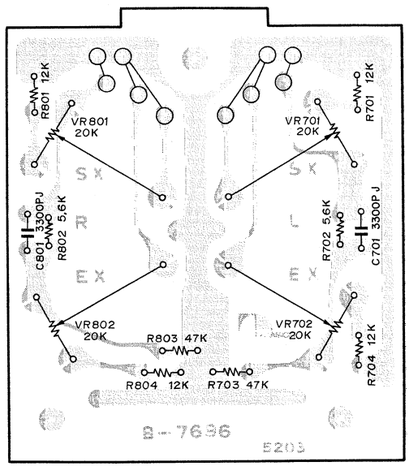


Fig. 8.9

8.10. Capstan Motor Governor P.C.B. Ass'y

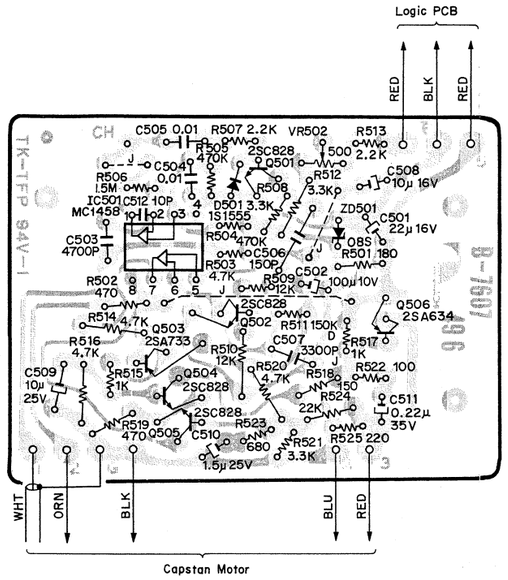


Fig. 8.10

8.11. Reel Motor Governor P.C.B. Ass'y

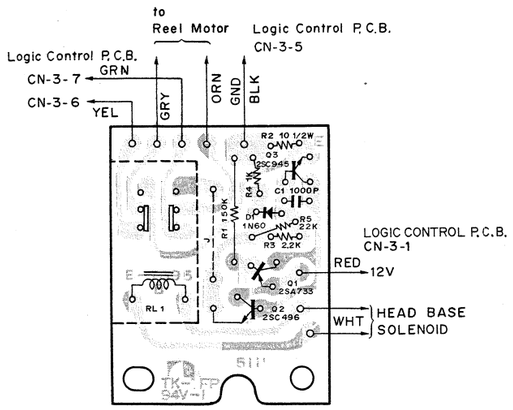


Fig. 8.11

Schematic Ref. No.	Part No.	Description	Schematic Ref. No.	Part No.	Description
	BA03645B	**Record Eq. Amp. P.C.B. Ass'y**	R507,513	0B05566A	Carbon Resistor 2.2K ERD-25V J
			R508,512	0B01793A	Carbon Resistor 3.3K ERD-25V J
	0B07585E	Record Eq. Amp. P.C.B.	521		
Q101,201	0B01600A	FET 2SK30 (Y)	R509,510	0B05650A	Carbon Resistor 12K ERD-25V J
Q102,202	0B06003A	Transistor 2SC1000 (BL)	R511	0B05628A	Metal Film Resistor 150K ERD-25VK D
Q103,203	0B06021A	Transistor 2SA640 (F)	R515,517	0B01781A	Carbon Resistor 1K ERD-25V J
Q104,204	0B01910A	Transistor 2SC900 (E)	R518	0B05649A	Carbon Resistor 150 ERD-25V J
D1	0B06090A	Zener Diode XZ080 8V	R522	0B05558A	Carbon Resistor 100 ERD-25V J
R1	0B01795A	Carbon Resistor 4.7K ERD-25V J	R523	0B05559A	Carbon Resistor 680 ERD-25V J
R2	0B05672A	Carbon Resistor 2.2M ERD-25V J	R524	0B05661A	Carbon Resistor 22K ERD-25V J
R3	0B01921A	Carbon Resistor 330K ERD-25V J	R525	0B05608A	Carbon Resistor 220 ERD-25V J
R101,102	0B05597A	Carbon Resistor 680K ERD-25V J	C501	0B01862A	Electrolytic Capacitor 22μ 16V
201,202			C502	0B05885A	Electrolytic Capacitor 100μ 10V
R103,203	0B05596A	Carbon Resistor 220K ERD-25V J	C503	0B01915A	Mylar Capacitor 4700P 50V
R104,204	0B05561A	Carbon Resistor 18K ERD-25V J	C504,505	0B01609A	Mylar Capacitor 0.01μ 50V K
R105,205	0B01781A	Carbon Resistor 1K ERD-25V J	C506	0B05599A	Ceramic Capacitor 150P 50V
R106,206	0B01878A	Carbon Resistor 8.2K ERD-25V J	C507	0B05552A	S.P. Capacitor 3300P 100V J
R107,207	0B01564A	Carbon Resistor 82K ERD-25V J	C508	0B01412A	Electrolytic Capacitor 10μ 16V
R108,208	0B01877A	Carbon Resistor 6.8K ERD-25V J	C509	0B05581A	Tantalum Capacitor 10μ 25V
R109,112	0B01792A	Carbon Resistor 470 ERD-25V J	C510	0B05639A	Tantalum Capacitor 1.5μ 25V M
209,212			C511	0B05772A	Tantalum Capacitor 0.22μ 35V M
R110,210	0B05587A	Carbon Resistor 56 ERD-25V J	C512	0B05798A	Ceramic Capacitor 10P 50V K
R113,213	0B01793A	Carbon Resistor 3.3K ERD-25V J		0B08069C	Heat Sink (1 pce.)
C1	0B01603A	Mylar Capacitor 0.1μ 50V K		0B08077B	Capstan Motor Governor P.C.B. Holder (1 pce.)
C2	0B01403A	Electrolytic Capacitor 47μ 16V			
C101,102	0B05772A	Tantalum Capacitor 0.22μ 35V		0E00071A	Fiber Washer 3mm (2 pcs.)
201,202				0E00507A	Nut Hex. M3 (1 pce.)
C103,203	0B05744A	Ceramic Capacitor 33P 50V		0E00510A	Screw M3 x 8 Philips Pan Head (2A) (2 pcs.)
C104,204	0B01862A	Electrolytic Capacitor 22μ 16V			
C105,205	0B05531A	Mylar Capacitor 0.033μ 50V K		0E00597A	Washer 3mm 3 x 8 x 0.5 (1 pce.)
C106,206	0B05657A	Tantalum Capacitor 4.7μ 16V		0E00608A	Screw M3 x 10 Philips Pan Head (3A) (1 pce.)
C107,207	0B05582A	Mylar Capacitor 0.022μ 50V J			
C108,208	0B01716A	Ceramic Capacitor 470P 50V		0E00606A	Screw M 3 x 6 Philips Pan Head (3A) (1 pce.)
	0M03452A	Record Eq. Amp. Label (1 pce.)			
	BA03814A	**Record Cal. P.C.B. Ass'y**		**BA03813A**	**Reel Motor Governor P.C.B. Ass'y**
	0B07696B	Record Cal. P.C.B.		0B07695B	Reel Motor Governor P.C.B.
VR701,702	0B07153A	Semi-fixed Volume 20K	Q1	0B06013A	Transistor 2SA733
801,802			Q2	0B01790A	Transistor 2SC496
R701,704	0B05650A	Carbon Resistor 12K ERD-25V J	Q3	0B01872A	Transistor 2SC945
801,804			D1	0B00030A	Germanium Diode 1N60 (P)
R702,802	0B05673A	Carbon Resistor 5.6K ERD-25V J	R1	0B05593A	Carbon Resistor 150K ERD-25V J
R703,803	0B05562A	Carbon Resistor 47K ERD-25V J	R2	0B05913A	Carbon Resistor 10 1/2W
C701,801	0B01914A	Mylar Capacitor 3300P 50V J	R3	0B05566A	Carbon Resistor 2.2K ERD-25V J
	0B07551B	10P Plug P.C.B. (1 pce.)	R4	0B01781A	Carbon Resistor 1K ERD-25V J
			R5	0B05661A	Carbon Resistor 22K ERD-25V J
	BA03662B	**Capstan Motor Governor P.C.B. Ass'y**	C1	0B04059A	Mylar Capacitor 1000P 50V K
	0B07607C	Capstan Motor Governor P.C.B.	RL1	0B07149A	Relay DC12V MIS2
IC501	0B06049B	IC MC1458		0J03583B	Governor Heat Sink (1 pce.)
Q501,502	0B01824A	Transistor 2SC828		0E00121A	Screw M2.6 x 6 Philips Pan Head (1 pce.)
504,505				0E00026A	Washer 2.6mm Spring (1 pce.)
Q503	0B06013A	Transistor 2SA733		0E00142A	Washer 2.6mm (1 pce.)
Q506	0B06012A	Transistor 2SA634		0E00612A	Screw M3 x 6 Philips Pan Head (2A) (2 pcs.)
D501	0B01909A	Silicon Diode 1S1555			
ZD501	0B06004A	Zener Diode 08S			
VR502	0B01883A	Semi-fixed Volume 500Ω			
R501	0B05607A	Carbon Resistor 180 ERD-25V J			
R502,519	0B01792A	Carbon Resistor 470 ERD-25V J			
R503,514	0B01795A	Carbon Resistor 4.7K ERD-25V J			
516, 520					
R504,505	0B05700A	Carbon Resistor 470K ERD-25V J			
R506	0B05601A	Carbon Resistor 1.5M ERD-25V J			

8.12. Shut-off Sensor P.C.B. Ass'y and Shut-off Luminous P.C.B. Ass'y

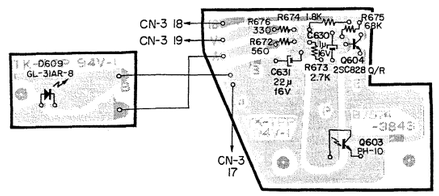


Fig 8.12

8.13. 400 Hz Osc. P.C.B. Ass'y

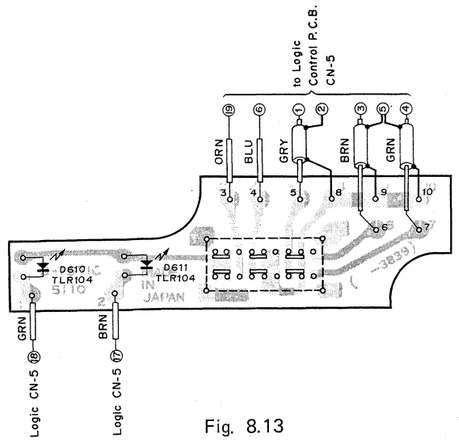


Fig. 8.13

8.14. Head Base Switch P.C.B. Ass'y

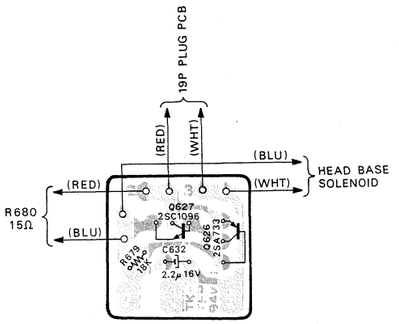


Fig. 8.14

8.15. Brake Solenoid P.C.B. Ass'y

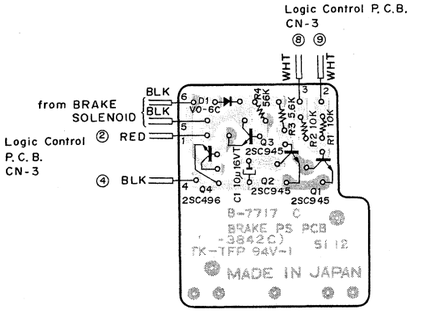


Fig. 8.15

Schematic Ref. No.	Part No.	Description
	BA03664A	**Shut-off Sensor P.C.B. Ass'y**
	0B07574C	Shut-off Sensor P.C.B.
Q603	0B06040A	Photo Transistor PH10
Q604	0B01824A	Transistor 2SC828
R672	0B05678A	Carbon Resistor 560 ERD-25V J
R673	0B01782A	Carbon Resistor 2.7K ERD-25V J
R674	0B01830A	Carbon Resistor 1.8K ERD-25V J
R675	0B01902A	Carbon Resistor 68K ERD-25V J
R676	0B01789A	Carbon Resistor 330 ERD-25V J
C630	0B01405A	Electrolytic Capacitor 1μ 16V
C631	0B01862A	Electrolytic Capacitor 22μ 16V
	BA03663A	**Shut-off Luminous P.C.B. Ass'y**
	0B07575C	Shut-off Luminous P.C.B.
D609	0B06039A	LED (1 pce.)
	BA03665B	**400Hz Osc. P.C.B. Ass'y**
	0B07571D	400Hz Osc. P.C.B. B
D610,611	0B04120A	LED TLR104
	0B07045A	400Hz Osc. Switch SL262A2

Schematic Ref. No.	Part No.	Description
	BA03666A	**Head Base Switch P.C.B. Ass'y**
	0B07578B	Head Base Switch Sub P.C.B.
Q626	0B06013A	Transistor 2SA733
Q627	0B01895A	Transistor 2SC1096
R679	0B05561A	Carbon Resistor 18K ERD-25V J
C632	0B05512A	Electrolytic Capacitor 2.2μ 16V
	BA03836A	**Brake Solenoid P.C.B. Ass'y**
	0B07717C	Brake Solenoid P.C.B.
Q1,2,3	0B01872A	Transistor 2SC945 (L)
Q4	0B01790A	Transistor 2SC496
D1	0B01501U	Silicon Diode V0-6C
R1,2	0B01833A	Carbon Resistor 10K ERD-25V J
R3	0B05673A	Carbon Resistor 5.6K ERD-25V J
R4	0B05563A	Carbon Resistor 56K ERD-25V J
C1	0B05667A	Tantalum Capacitor 10μ 16V M

Schematic Ref. No.	Part No.	Description	Schematic Ref. No.	Part No.	Description
	BA03688A	**Logic Control P.C.B. Ass'y**	R652,653 654,655	0B01781A	Carbon Resistor 1K ERD-25V J
	0B07593B	Logic Control P.C.B.	656,658		
L601,603 605	0B06041B	IC N7400A	659,663 665,667		
L602,606	0B06042B	IC N7410A	R660	0B01679A	Carbon Resistor 100 ERD-25T J
L604	0B06043C	IC N7420A	R668	0B01877A	Carbon Resistor 6.8K ERD-25V J
L607	0B06044C	IC N7474A	R670	0B05558A	Carbon Resistor 100 ERD-25V J
L608	0B06027A	IC RC4709	R679	0B05663A	Carbon Resistor 10 ERD-25V J
Q601,602 605,606 608,611 612,613 616,618 622,626 627,628 629,630	0B01824A	Transistor 2SC828	C601,602	0B05657A	Tantalum Capacitor 4.7μ 16V M
			C603,604	0B01288A	Ceramic Capacitor 100P 50V
			C605,606	0B05745A	Ceramic Capacitor 3P 50V
			C607,608	0B05581A	Tantalum Capacitor 10μ 20V M
			C609	0B01411A	Electrolytic Capacitor 100μ 6.3V
			C610,623	0B01405A	Electrolytic Capacitor 1μ 16V
			C611	0B01772A	Mylar Capacitor 0.12μ 50V K
			C612	0B01392A	Electrolytic Capacitor 470μ 16V
Q607,609	0B06013A	Transistor 2SA733	C613	0B01400A	Electrolytic Capacitor 100μ 16V
Q610,614	0B06020A	Transistor 2SC1096	C614, 618 624	0B01412A	Electrolytic Capacitor 10μ 16V
Q615,617 619	0B01910A	Transistor 2SC900	C615, 622 625	0B01863A	Electrolytic Capacitor 3.3μ 16V
Q620,621 623,624 625	0B01338A	Transistor 2SC735	C616, 619	0B01404A	Electrolytic Capacitor 47μ 6.3V
			C617	0B01609A	Mylar Capacitor 0.01μ 50V K
D601,602 603	0B01501U	Silicon Diode V06C	C620, 621 629	0B01862A	Electrolytic Capacitor 22μ 16V
D604,605	0B00030A	Germanium Diode 1N60 (P)	C626, 628	0B05638A	Tantalum Capacitor 1μ 35V M
D606,607	0B01909A	Silicon Diode 1S1555	C632, 633	0B01603A	Mylar Capacitor 0.1μ 50V K
D608	0B01599A	Silicon Varistor KB162	C634, 635	0B05530A	Mylar Capacitor 6800P 50V K
ZD601	0B06014A	Zener Diode 06R	C636, 637	0B01456A	Ceramic Capacitor 47P 50V
VR601	0B07058A	Semi-fixed Volume 50K	RL601,602	0B07001A	Relay LC1-C
R601,602	0B01920A	Carbon Resistor 100K ERD-25V J		0B03067A	Wiring Holder (2 pcs.)
R603,604 641,649 664,666	0B01833A	Carbon Resistor 10K ERD-25V J		0B08001A	Tab (3 pcs.)
				0B07535D	19P Plug Board (D) (1 pce.)
				0B07629B	19P Plug Board (1 pce.)
R605,606 657	0B05566A	Carbon Resistor 2.2K ERD-25V J		0E00174A	Earth Lug B-4 (1 pce.)
				0E00607A	Screw M3 x 8 Philips Pan Head (3A) (3 pcs.)
R607,608	0B05596A	Carbon Resistor 220K ERD-25V J			
R609,610	0B05591A	Carbon Resistor 15K ERD-25V J		BA03808A	19P Connector Ass'y (3 pcs.)
R611,612 621,625 632,633 636,678	0B01795A	Carbon Resistor 4.7K ERD-25V J		0C05157C	P.C.B. Holder A (2 pcs.)
				0E00507A	Nut Hex. M3 (4 pcs.)
				0E00518A	Screw M 3 x 8 Philips Flat Head (1 pce.)
R613,614	0B05505A	Carbon Resistor 1.5K ERD-25V J		0E00581A	Washer 3mm Spring (1 pce.)
R615,616	0B05691A	Carbon Resistor 390 ERD-25T J		0B05110A	HP Separate Plug Cord (1 pce.)
R620,623 624,645	0B05661A	Carbon Resistor 22K ERD-25V J			
R622	0B05670A	Carbon Resistor 1.8M ERD-25V J		**BA03858A**	**Touch Switch P.C.B. Ass'y**
R626,629	0B05678A	Carbon Resistor 560 ERD-25V J		0B07726B	Touch Switch P.C.B.
R627	0B05565A	Carbon Resistor 1.2K ERD-25V J	Q1,2,3 4,5,6	0B06013A	Transistor 2SA733
R628, 643 651,681 682	0B05673A	Carbon Resistor 5.6K ERD-25V J	Q7,8,9 10,11,12	0B01872A	Transistor 2SC945
R630,662 669	0B05562A	Carbon Resistor 47K ERD-25V J	R1,2,3 4,5,6	0B05672A	Carbon Resistor 2.2M ERD-25V J
R631,642 650	0B05563A	Carbon Resistor 56K ERD-25V J	R7	0B01920A	Carbon Resistor 100K ERD-25V J
R634	0B01830A	Carbon Resistor 1.8K ERD-25V J	R8,9,10	0B05805A	Fail Safe Type Resistor 22 ERD-14F J
R635,638 648	0B01933A	Carbon Resistor 220 ERD-25T J	C1	0B01403A	Electrolytic Capacitor 47μ 16V
				0J03670A	Contact Spring (7 pcs.)
R637	0B05572A	Carbon Resistor 470 ERD-12V J		0J03686B	Lamp Holder (1 pce.)
R639	0B01682A	Carbon Resistor 6.8K ERD-25T J		0B03884A	Pilot Lamp (6 pcs.)
R640, 661 671	0B05608A	Carbon Resistor 220 ERD-25V J		BA03808A	19P Connector Ass'y (1 pce.)
				0B05187A	Insulating Tube 1.2mm (6 pcs.)

8.16. Logic Control P.C.B. Ass'y

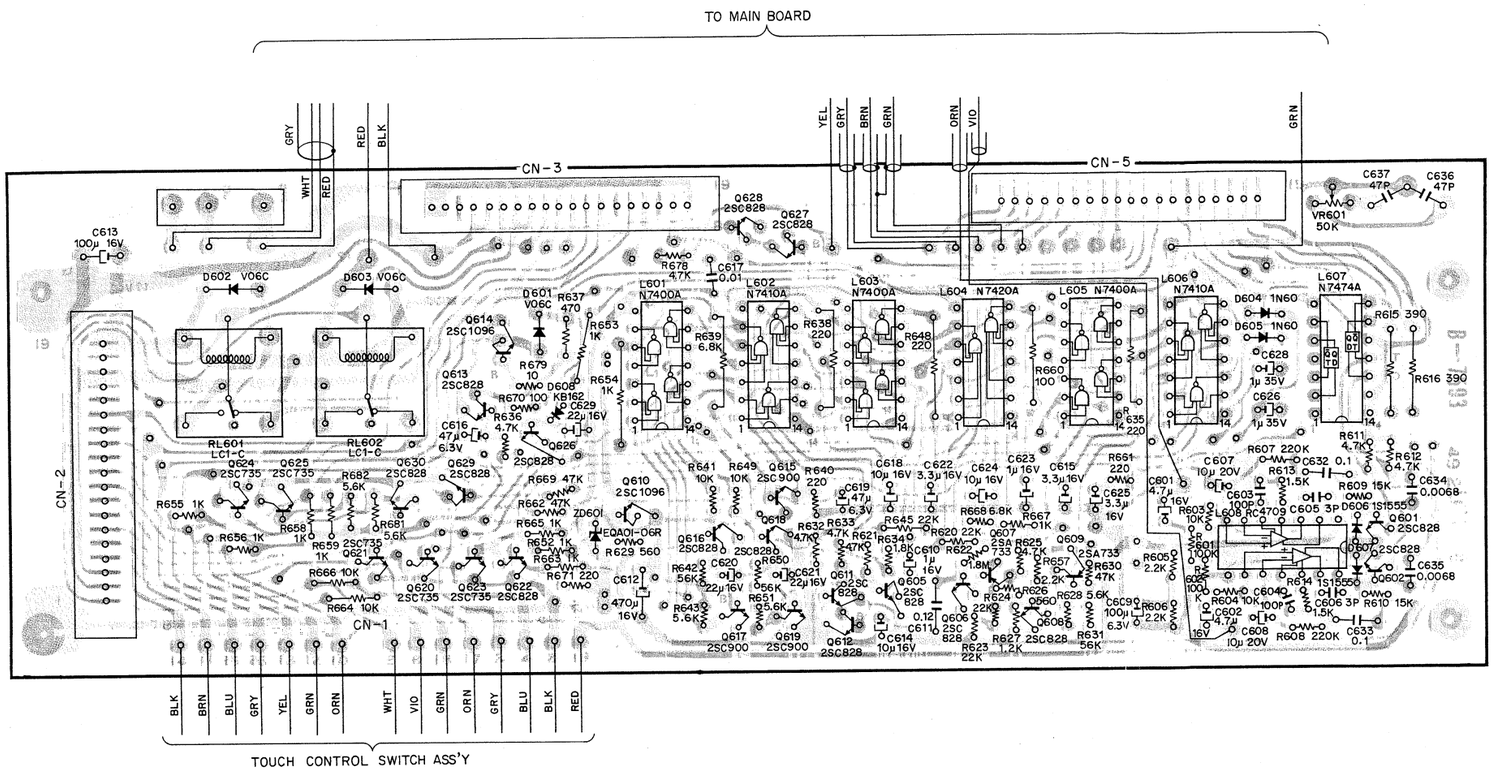


Fig. 8.16

8.17. Touch Switch P.C.B. Ass'y

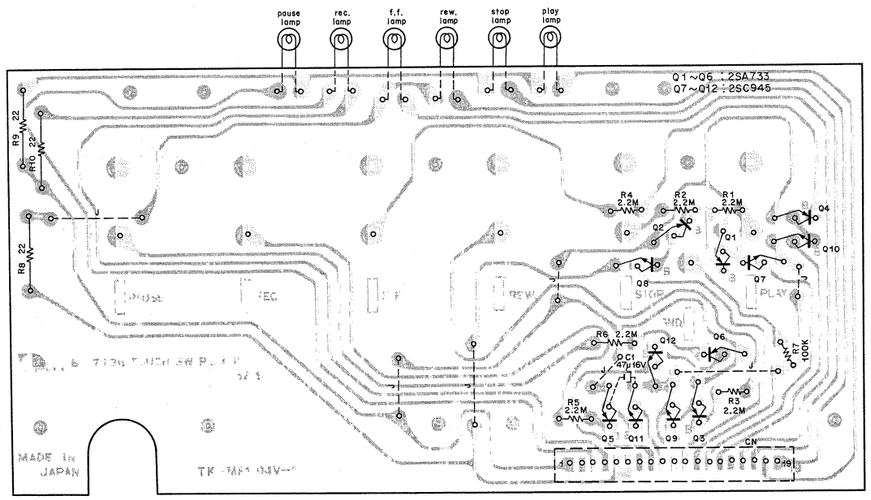


Fig. 8.17

8.18. DC Supply P.C.B. Ass'y

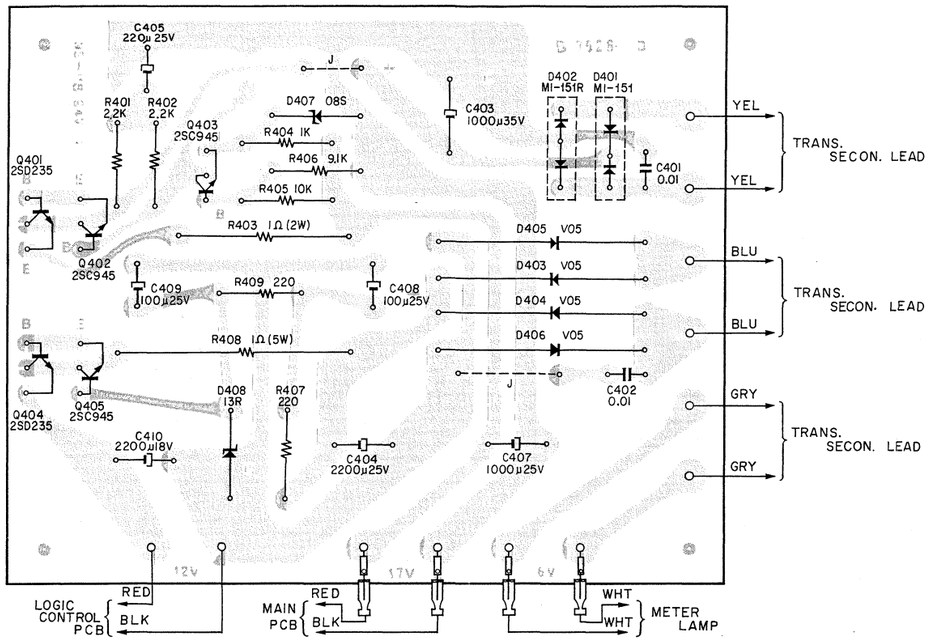


Fig. 8.18

Schematic Ref. No.	Part No.	Description		Schematic Ref. No.	Part No.	Description	
	BA03595A	**DC Supply P.C.B. Ass'y**			0E00507A	Nut Hex. M3	(4 pcs.)
					0E00606A	Screw M3 x 6 Philips Pan Head (3A)	
	0B07526C	DC Supply P.C.B.					(2 pcs.)
Q401,404	0B01823A	Transistor	2SD235		0E00608A	Screw M3 x 10 Philips Pan Head (3A)	
Q402,403	0B01872A	Transistor	2SC945				(4 pcs.)
405					0J03079D	Heat Sink	(1 pce.)
D401	0B06092U	Silicon Diode	MI-151		0J03082A	Supply P.C.B. Holder	(1 pce.)
D402	0B06093U	Silicon Diode	MI-151R		0E00037A	B-5 Earth Lug	(1 pce.)
D403,404	0B06010A	Silicon Diode	V05				
405,406							
D407	0B06004A	Zener Diode	08S				
D408	0B06009A	Zener Diode	13R				
R401,402	0B05622A	Carbon Resistor	2.2K ERD-25T J				
R403	0B05755A	Metal Film Resistor	1 2W				
R404	0B01857A	Carbon Resistor	1K ERD-25T J				
R405	0B01888A	Carbon Resistor	10K ERD-25T J				
R406	0B05694A	Carbon Resistor	9.1K ERD-25T J				
R407,409	0B01933A	Carbon Resistor	220 ERD-25T J				
R408	0B05542A	Cement Resistor	1 5W				
C401,402	0B01290A	Ceramic Capacitor	0.01µ 50V				
C403	0B05540A	Electrolytic Capacitor	1000µ 35V				
C404	0B05654A	Electrolytic Capacitor	2200µ 25V				
C405	0B01391A	Electrolytic Capacitor	220µ 25V				
C407	0B01870A	Electrolytic Capacitor	1000µ 25V				
C408,409	0B01272A	Electrolytic Capacitor	100µ 25V				
C410	0B01835A	Electrolytic Capacitor	2200µ 18V				
	0B08001A	Tab	(4 pcs.)				

Schematic Ref. No.	Part No.	Description	Q'ty
K1		**Synthesis**	
01	HA03568A	Cabinet Ass'y	1
02	BA03594A	DC Power Supply Ass'y	1
03	BA03596C	Amp. Chassis Ass'y	1
04	CA05213B	Mechanism Ass'y N-1000II	1
05	HA03704A	Touch Control Switch Ass'y	1
06	HA03639B	Front Panel Ass'y	1
07	HA03570B	Cassette Lid Ass'y	1
08	HA03646B	AJ Lid Ass'y	1
09	0H03196B	Volume Knob	7
10	0J03635A	P.C.B. Holder	1
11	0J03640A	Connector Stopper D	1
12	BA03814A	Record Cal. P.C.B. Ass'y	1
13	0J03636A	P.C.B. Holder Pad	1
L01	0E00606A	Screw M3x6 Philips Pan Head (3A)	6
L02	0E00634A	Screw M4x10 Philips Pan Head (3A)	7
L03	0E00667A	Screw M4x6 Philips Pan Head (2A)	1
L04	0E00624A	Screw M3x10 Philips Pan Head (2A)	2
L05	0E00660A	Screw M3x12 Philips Pan Head (3A)	2
L06	0H03221B	Set Screw	4
L07	0H03222A	Set Washer	4
L08	0E00046A	Washer 4mm Wave	1
L09	0E00587A	Screw M4x25 Philips Round Head	1
L10	0E00141A	Washer 4mm	1

9. MECHANISM ASS'Y AND PARTS LIST

9.1. Synthesis (K1)

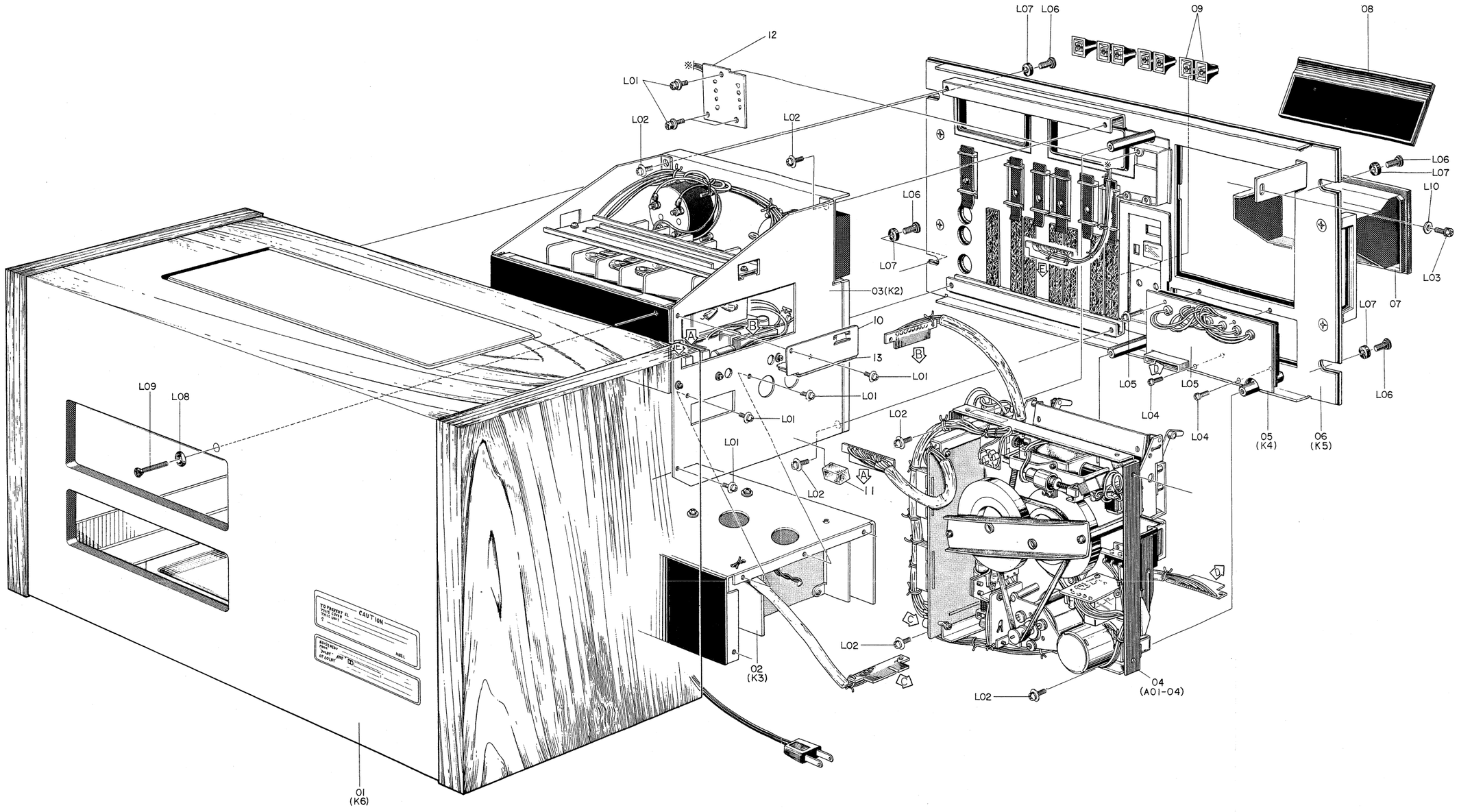


Fig. 9.1

9.2. Amp. Chassis Ass'y (K2)

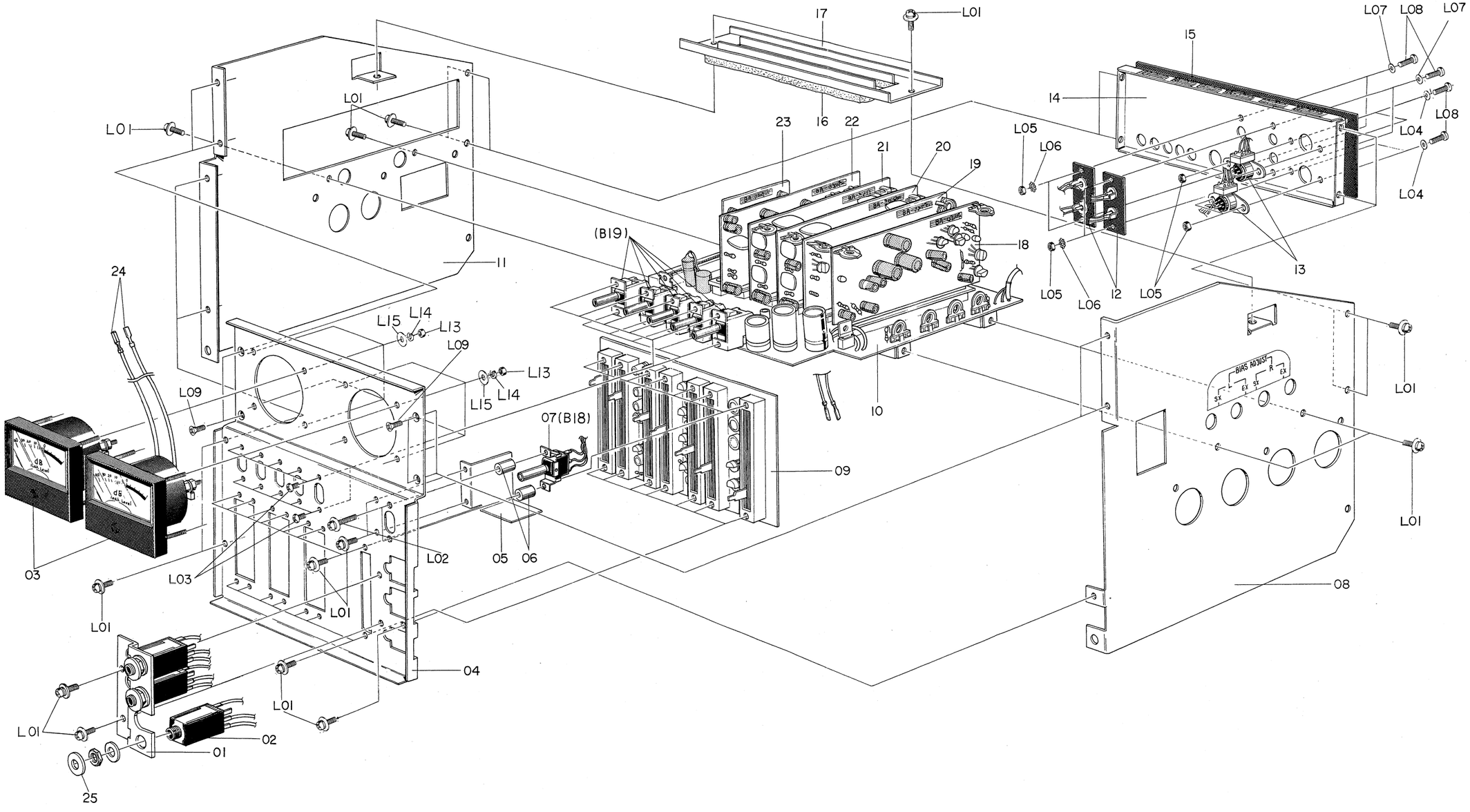


Fig. 9.2

Schematic Ref. No.	Part No.	Description	Q'ty
K2	**BA03596C**	**Amp. Chassis Ass'y**	**1**
01	0J03091A	Mic. Jack Holder	1
02	0B03881A	Mic. Jack	3
03	0B08284A	Level Meter	2
04	0J03084C	Amp. Chassis	1
05	0J03092A	Power Switch Shield Plate	1
06	0J03087A	Power Switch Pipe	2
07	BA03772A	Power Switch Ass'y	1
08	0J03089G	Amp. Side Plate R	1
09	BA03805A	Mic. Amp. Ass'y	1
10	BA03881A	Main P.C.B. Ass'y	1
11	0J03088H	Amp. Side Plate L	1
12	0B03072A	2P Pin Jack	2
13	0B08044A	DIN Socket	2
14	0J03090C	Amp. Rear Chassis	1
15	0M03721A	Rear Chassis Name Plate	1
16	0J03086C	P.C.B. Cushion	2
17	0J03486B	P.C.B. Holder	1
18	BA03804A	Line Amp. P.C.B. Ass'y	1
19	BA03880A	DNL P.C.B. Ass'y	1
20	BA03589A	Record Dolby NR P.C.B. Ass'y	1
21	BA03588A	Playback Dolby NR P.C.B. Ass'y	1
22	BA03802A	Playback Head Amp. P.C.B. Ass'y	1
23	BA03645B	Record Eq. Amp. P.C.B. Ass'y	1
24	0B05109A	Separate Plug Cord G	2
25	0J03236B	Jack Cover	3
	0M03667A	Bias Adjust Label	1
	0M03861A	Module Label E	1
L01	0E00606A	Screw M3x6 Philips Pan Head (3A)	31
L02	0E00610A	Screw M3x12 Philips Pan Head (3A)	2
L03	0E00501A	Screw M3x3 Philips Pan Head	10
L04	0E00677A	Washer 3mm Plastics	4
L05	0E00507A	Nut Hex. M3	8
L06	0E00172A	Washer 3mm Toothed Lock	4
L07	0E00157A	Washer 3mm Plastics	4
L08	0E00588A	Screw M3x8 Philips Pan Head	8
L09	0E00533A	Screw M3x5 Philips Countersunk Head	4

Schematic Ref. No.	Part No.	Description	Q'ty
K3	**0B03594A**	**DC Power Supply Ass'y**	**1**
01	0B07535D	19P Plug P.C.B.	1
02	0J03083G	Transformer Chassis	
03	0B08062A	7P DIN Socket	1
04	0B03877B	Voltage Selector	1
05	0B06513U	Power Transformer	1
06	0B03920B	Ground Terminal	1
07	0B08037U	Cord Bushing C	1
08	0B08350A	Power Cord	1
09	0H03335A	Voltage Selector Cover SO	1
10	0H03366A	Voltage Selector Acrylic Cover	1
11	0B08240U	Spark Killer	1
12	0B03863A	5P Terminal Insulation Plate A	1
13	0B08025U	5P Terminal Strip	1
14	BA03595A	DC Supply P.C.B. Ass'y	1
15	0M03730C	Power Supply Name Plate	1
L01	0E00634A	Screw M4x10 Philips Pan Head (3A)	4
L02	0E00507A	Nut Hex. M3	5
L03	0E00172A	Washer 3mm Toothed Lock	3
L04	0E00037A	Earth Lug B-5	1
L05	0E00612A	Screw M3x6 Philips Pan Head (2A)	1
L06	0E00510A	Screw M3x8 Philips Pan Head (2A)	2
L07	0E00588A	Screw M3x8 Philips Pan Head (Bronze)	2
L08	0E00590A	Screw M3x12 Philips Pan Head (Bronze)	2
L09	0E00157A	Washer 3mm Plastics	2
L10	0E00606A	Screw M3x6 Philips Pan Head (3A)	3
L11	0B03067A	Wire Holder	1
L12	0H03366A	Voltage Selector Cover Washer	2
L13	0E00591A	Screw M3x10 Philips Pan Head (Bronze)	2

Schematic Ref. No.	Part No.	Description	Q'ty
K4	**HA03704A**	**Touch Control Switch Ass'y**	**1**
01	BA03858A	Touch Switch P.C.B. Ass'y	1
02	HA03705A	Control Escutcheon Ass'y	1
L01	0E00195A	Screw M3x6 Philips Pan Head FT	5

9.3. DC Power Supply Ass'y (K3)

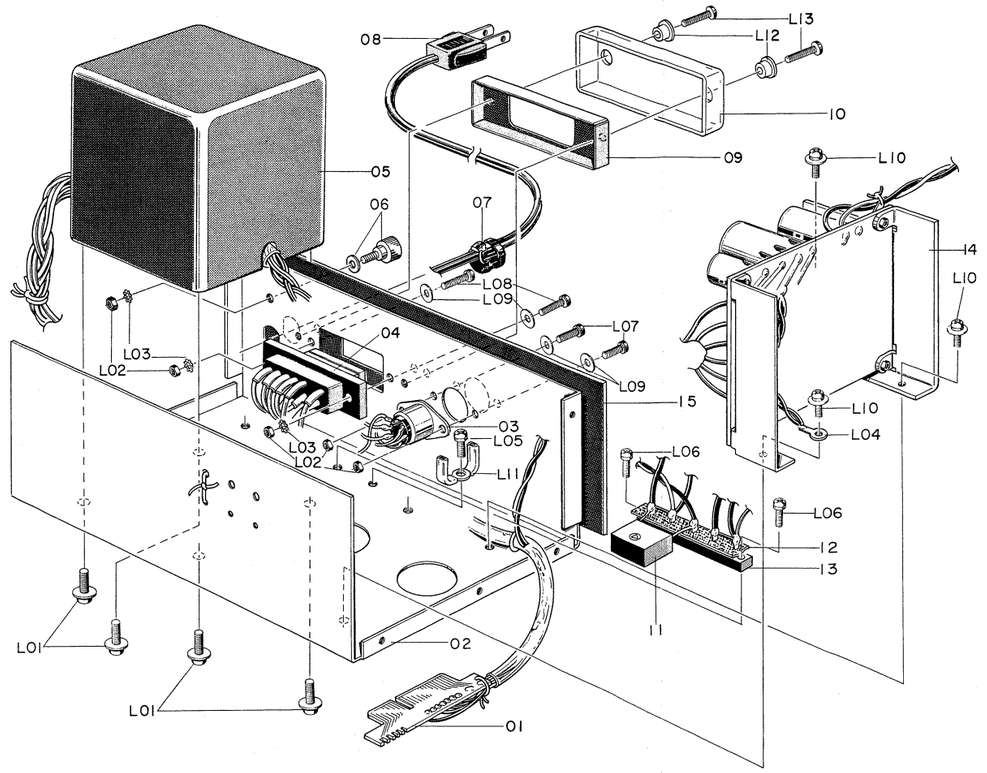


Fig. 9.3

9.4. Touch Control Switch Ass'y (K4)

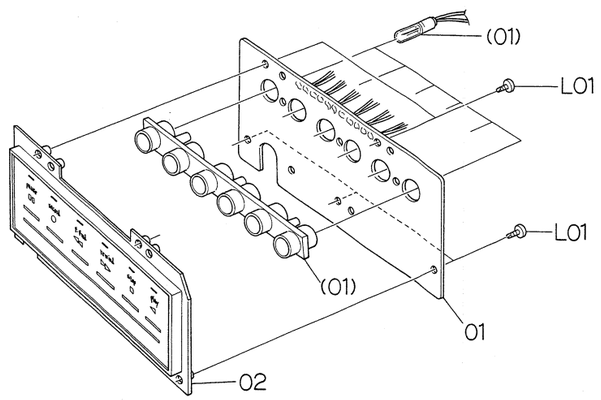


Fig. 9.4

9.5. Front Panel Ass'y (K5)

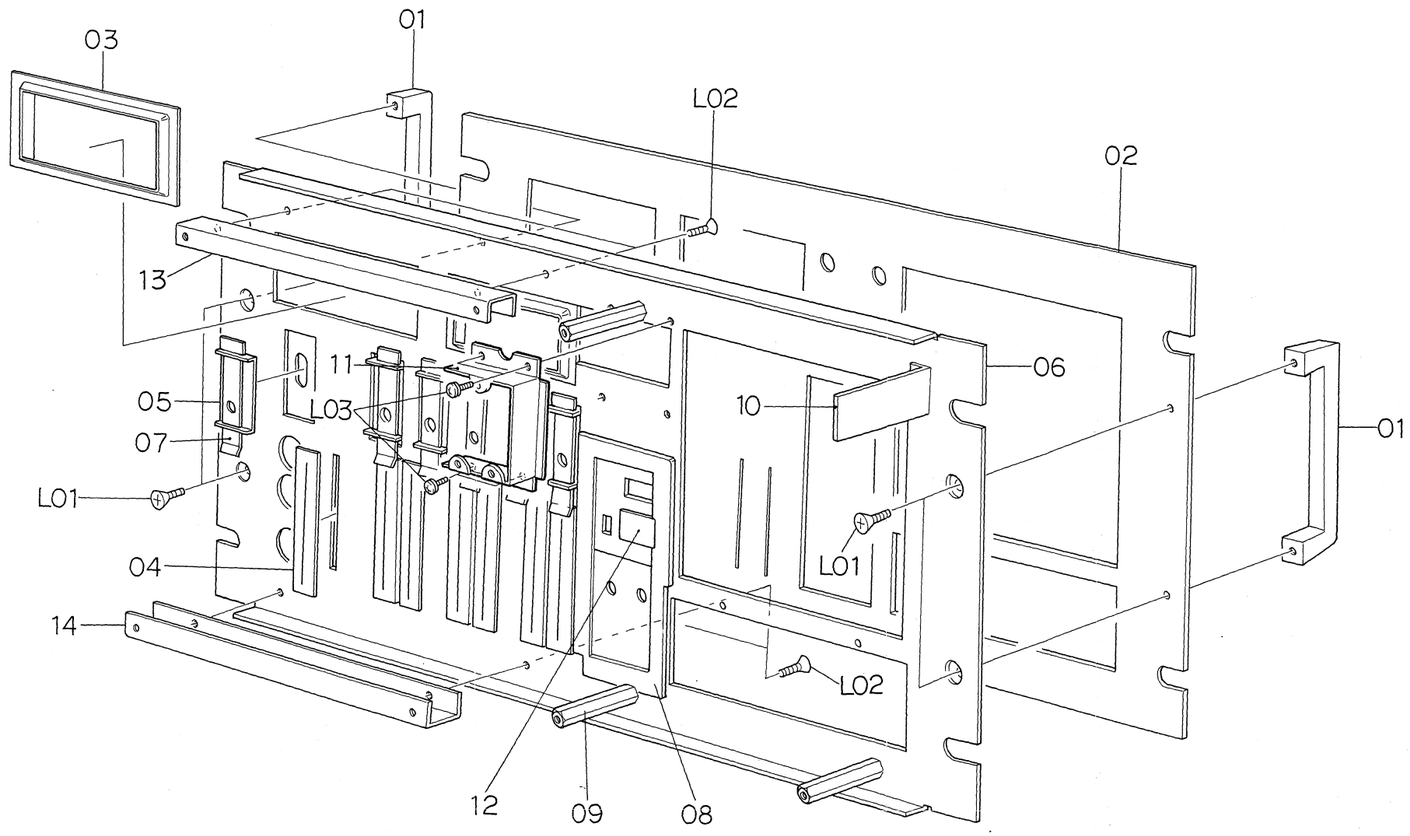


Fig. 9.5

Schematic Ref. No.	Part No.	Description	Q'ty
K5	**HA03639B**	**Front Panel Ass'y**	**1**
01	0H03454A	Handle B	2
02	0H03471B	Front Panel	1
03	0H03203A	Meter Escutcheon	2
04	0H03238A	Volume Himelon	7
05	0H03195C	Switch Escutcheon	6
06	0H03198H	Panel Chassis	1
07	0H03284C	Switch Escutcheon Shade B	6
08	0H03473A	Counter Escutcheon	1
09	0H03199D	Mechanism Stud	3
10	0H03200D	Mechanism Angle	1
11	0J03581A	Cal. P.C.B. Holder	1
12	0H03099A	Counter Lens V	1
13	0H03201C	Amp. Angle A	1
14	0H03202C	Amp. Angle B	1
L01	0E00525A	Screw M4x10 Philips Countersunk Head	4
L02	0E00632A	Screw M4x8 Philips Countersunk Head	4
L03	0E00631A	Screw M5x8 Philips Countersunk Head	4
L04	0E00620A	Screw M3x4 Philips Pan Head (2A)	4
K6	**HA03568A**	**Cabinet Ass'y**	**1**
01	0A03130B	Aluminum Sash	2
02	0A03129F	Cabinet	1
03	0A03168B	Panching Board	2
04	0A03132B	Cabinet Angle B	2
05	0A03131B	Cabinet Angle A	2
06	0A00042A	Leg	4
07	0M03339A	Caution Label	1
08	0M03330A	Dolby NR Label ZT	1
L01	0E00577A	Screw M3x20 Philips Pan Head	4
L02	0E00178A	Washer 3mm	8
L03	0E00172A	Washer 3mm Toothed Lock	4
L04	0E00507A	Nut Hex. M3	4
L05	0E01002A	WS 2.7x10 Philips Round Head	10
L06	0E01005A	WS 2.7x8 Philips Round Head	40
L07	0E01001A	WS 3.1x10 Philips Round Head	28

9.6. Cabinet Ass'y (K6)

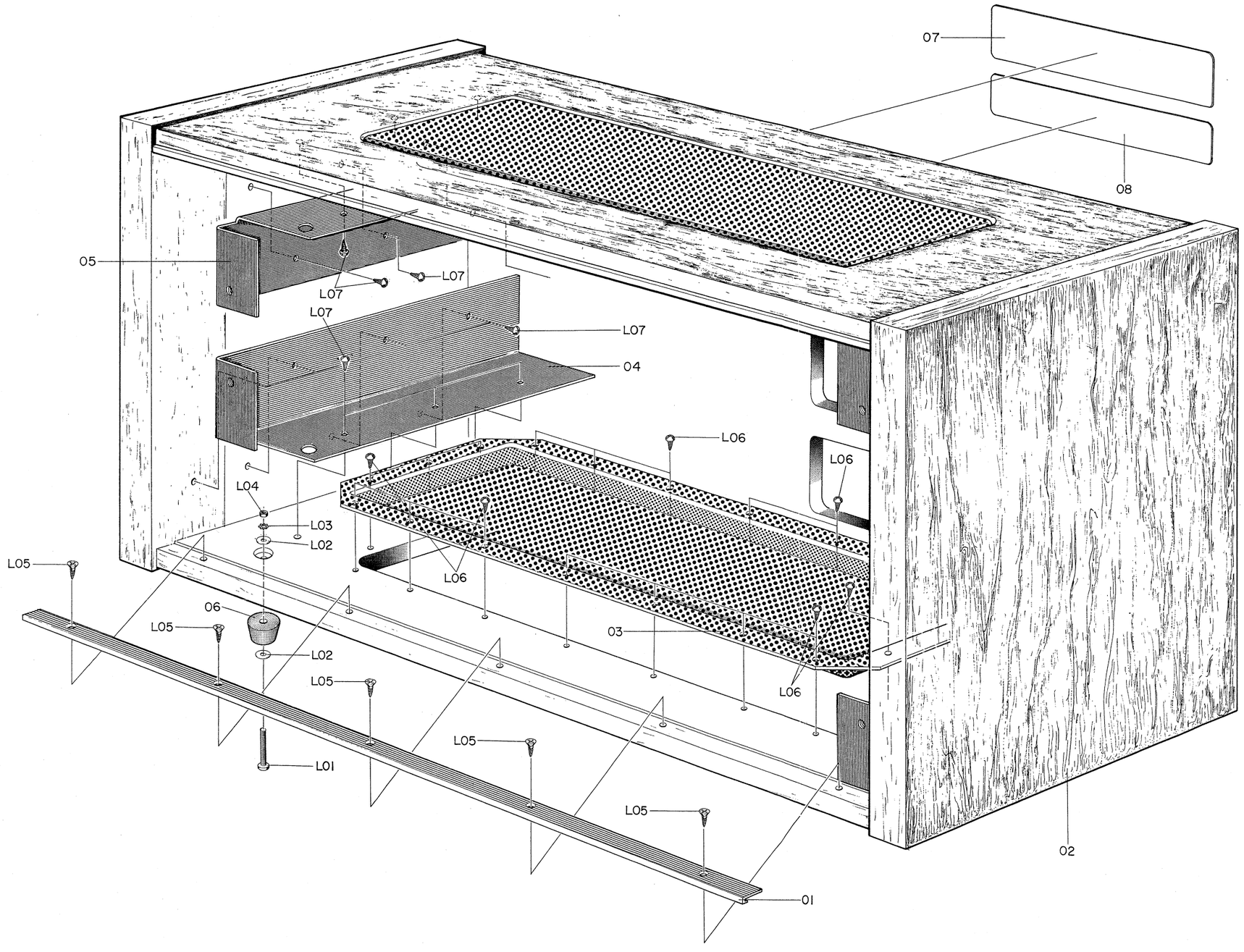


Fig. 9.6

9.7. Mechanism Ass'y N-1000II (1/4) (A01)

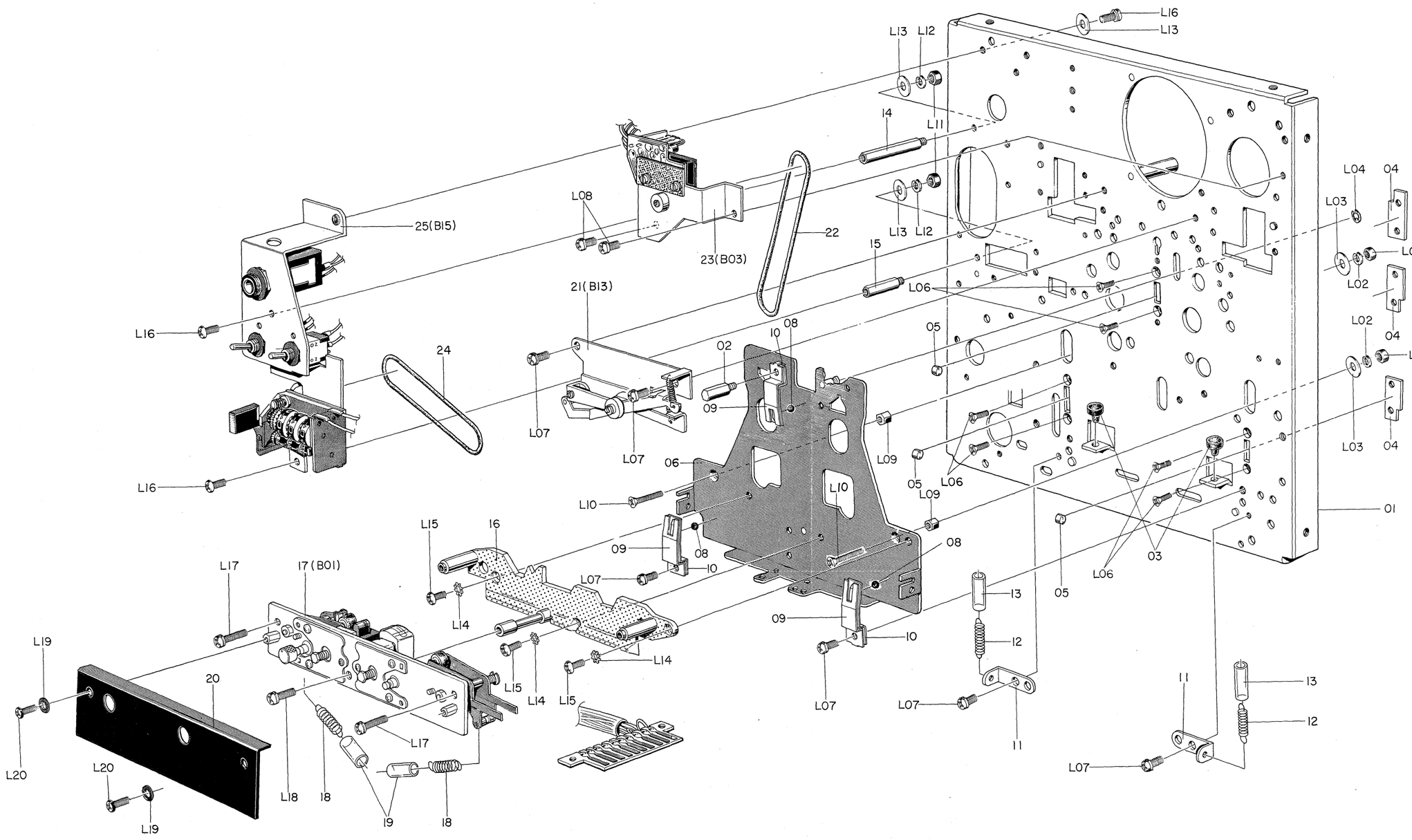


Fig. 9.7

Schematic Ref. No.	Part No.	Description	Q'ty
A02	**CA05213B**	**Mechanism Ass'y N-1000II (2/4)**	**1**
01	0C05126A	Well Stopper Rubber	1
03	CA05172A	Eject Linkage Ass'y	1
04	0C05134A	Stopper Plate	1
05	CA05037A	Eject Bracket Ass'y	1
06	0H03194B	Eject Knob	1
07	CA05144B	Alignment Beacon Ass'y	1
08	0H03297A	Pitch Control Volume Himelon	1
09	0C05369B	Osc. Switch Himelon	1
10	0C05680A	Adjust Cover	1
11	0C05323B	LED Holder	2
12	0H03223D	Pitch Control Knob	1
13	0B07629B	19P Plug P.C.B. (D)	1
15	CA05035A	Case Holder Ass'y R	1
16	CA05135A	Cassette Well Ass'y	1
17	CA05062A	Cassette Well Plate Ass'y	1
18	CA05034A	Case Holder Ass'y L	1
19	0C05116B	Sensor Guide R	1
20	0C05127A	Well Stopper Spring	1
21	0C05123B	Well Spring	1
22	0C05536A	Well Spring Tube	1
L01	0E00622A	Screw M3x5 Philips Pan Head (2A)	5
L04	0C05135A	Center Guide	2
L05	0E00612A	Screw M3x6 Philips Pan Head (2A)	5
L06	0E00510A	Screw M3x8 Philips Pan Head (2A)	1
L07	0E00222A	E-Ring 2mm	1
L09	0E00626A	Screw M2x3 Cup Point	1
L10	0E00677A	Washer 3mm Plastics	4
L11	0E00661A	Screw M3x4 Philips Pan Head (Bronze)	4

Schematic Ref. No.	Part No.	Description	Q'ty
A01	**CA05213B**	**Mechanism Ass'y N-1000II (1/4)**	**1**
01	CA05210A	Mechanism Chassis Ass'y	1
02	0C05570A	Rear Reference Shaft	1
03	0C05101C	Base Stopper Rubber	2
04	0C05457A	Base Roller Holder A	3
05	0C05456B	Base Roller B	3
06	CA05002A	Head Base Ass'y	1
08	0C02024A	Steel Ball 2mm	3
09	0C05459A	Ball Retainer Spring B	3
10	0C05030A	Ball Retainer Spring	3
11	0C05032A	Spring Hock	2
12	0C05426A	Base Return Spring B	2
13	0C05575A	Return Spring Tube	2
14	0C05319B	Counter Holder Stud	1
15	0C05315B	Counter Stud B	1
16	CA05073A	Head Adjust Plate Ass'y	1
17	CA05167B	Head Mount Base D Ass'y	1
18	0C05178F	Pressure Arm Spring	2
19	0C05537A	Spring Tube	2
20	0C05679A	Mount Base Cover	1
21	CA05044A	Cassette Holder Ass'y	1
22	0C05465B	Shut-off Belt	1
23	CA05137A	Auto Shut-off Ass'y	1
24	0C05139B	Counter Belt	1
25	CA05136A	Counter Holder Ass'y	1
L01	0E00021A	Nut Hex. M2.6	2
L02	0E00026A	Washer 2.6mm Spring	2
L03	0C06295A	Washer 3-9-0.5F	2
L04	0E00222A	E-Ring 2mm	1
L06	0E00076A	Screw M2.6x4 Philips Countersunk Head	6
L07	0E00622A	Screw M3x5 Philips Pan Head (2A)	6
L08	0E00612A	Screw M3x6 Philips Pan Head (2A)	2
L09	0C05435B	Head Base Holder Nut B	2
L10	0E00056A	Screw M2.6x10 Philips Countersunk Head	2
L11	0E00507A	Nut Hex. M3	2
L12	0E00581A	Washer 3mm Spring	2
L13	0E00597A	Washer 3mm	3
L14	0E00172A	Washer 3mm Toothed Lock	3
L15	0E00502A	Screw M3x5 Philips Pan Head	3
L16	0E00509A	Screw M3x6 Philips Pan Head	3
L17	0E00624A	Screw M3x10 Philips Pan Head (2A)	2
L18	0E00510A	Screw M3x8 Philips Pan Head (2A)	1
L19	0E00677A	Washer 3mm Plastics	2
L20	0E00661A	Screw M3x4 Philips Pan Head (Bronze)	2

9.8. Mechanism Ass'y N-10001I (2/4) (A02)

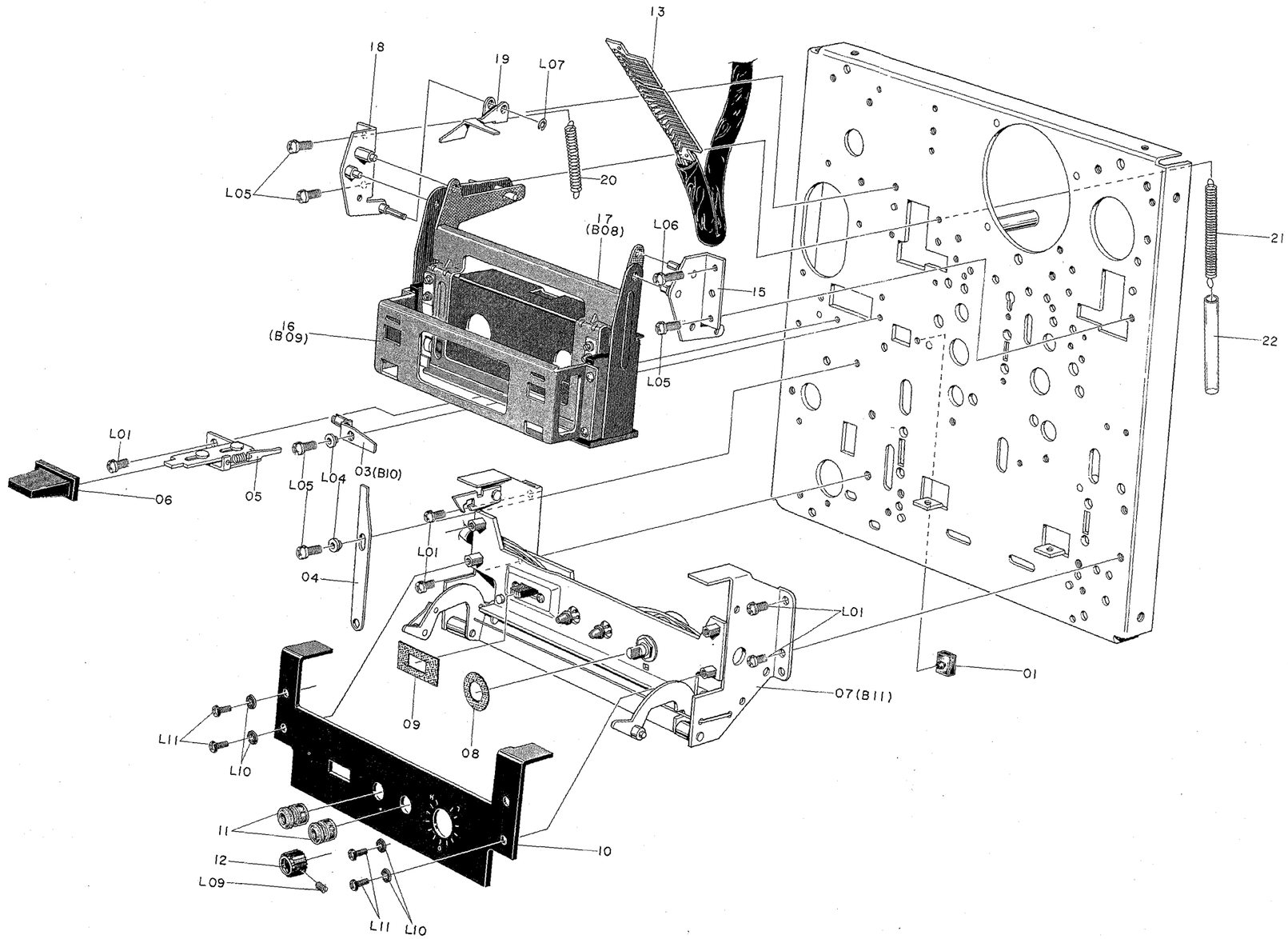


Fig. 9.8

9.9. Mechanism Ass'y N-10001I (3/4) (A03)

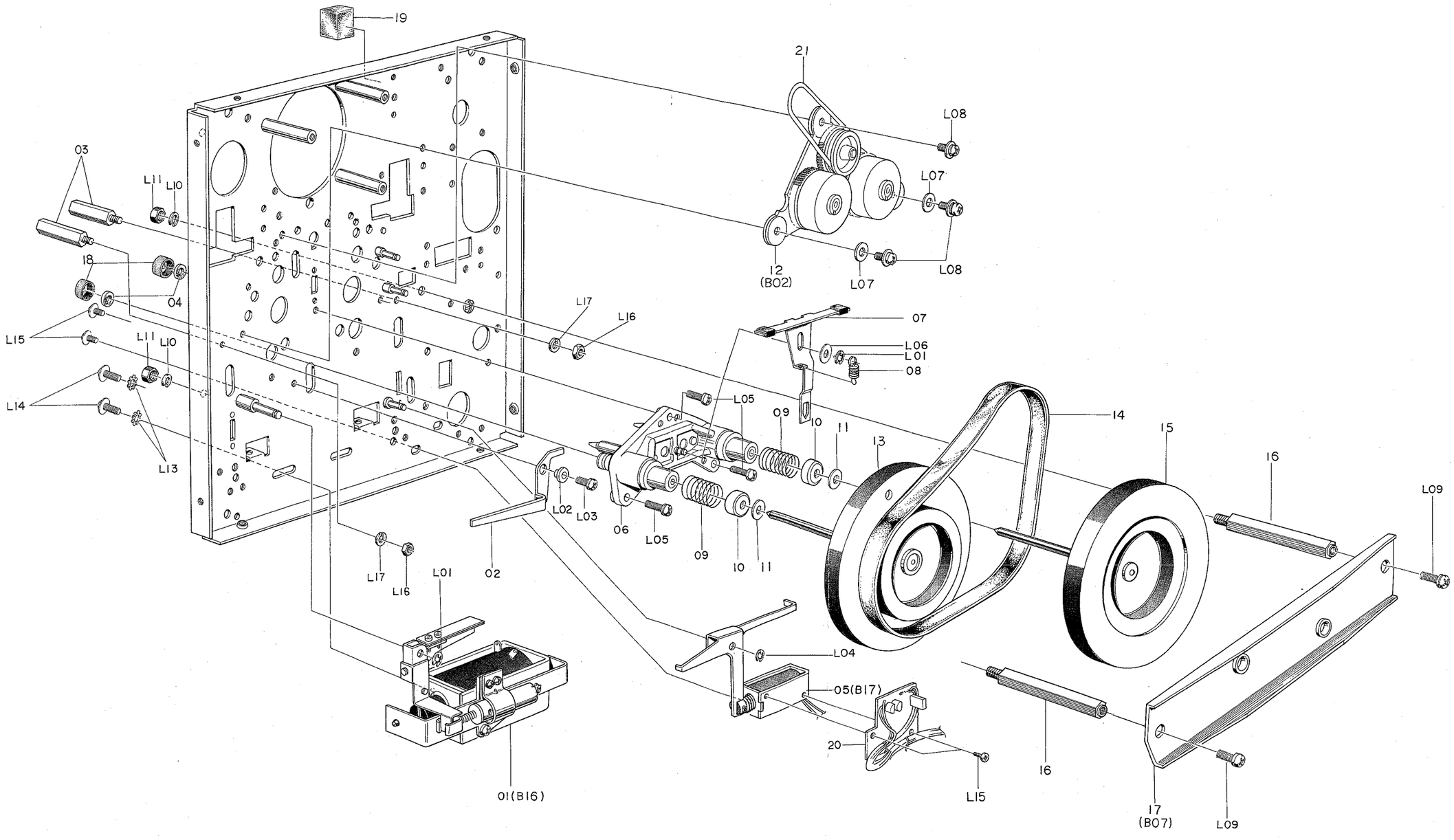


Fig. 9.9

Schematic Ref. No.	Part No.	Description	Q'ty
A03	**CA05213B**	***Mechanism Ass'y N-1000II (3/4)***	**1**
01	CA05145A	Head Base Solenoid Ass'y	1
02	0C05100B	Base Switch Arm	1
03	0C05568A	Front Reference Shaft	2
04	0C05512A	Flange Felt	2
05	CA05053A	Brake Solenoid Ass'y	1
06	CA05212A	Capstan Flange Holder Ass'y D	1
07	CA05222A	Brake Arm Ass'y	1
08	0C05084B	Brake Arm Spring	1
09	0C05514B	Thrust Spring	2
10	0C05495B	Flange Thrust Cap	2
11	0C05552A	Flywheel Thrust Washer	2
12	CA05219C	Ball Drive Mechanism Ass'y	1
13	CA05006H	Flywheel Ass'y A	1
14	0C05104A	Capstan Belt	1
15	CA05007G	Flywheel Ass'y B	1
16	0C05496B	Flywheel Holder Stud B	2
17	CA05171A	Flywheel Holder Ass'y	1
18	0C05511B	Flange Cap	2
19	0J03639A	Connector Stopper C	1
20	BA03836A	Brake Solenoid P.C.B. Ass'y	1
21	0C05699A	Center Drive Belt	1
L01	0E00181A	E-Ring 3mm	2
L02	0C05135A	Center Guide	1
L03	0E00612A	Screw M3x6 Philips Pan Head (2A)	1
L04	0E00222A	E-Ring 2mm	1
L05	0E00510A	Screw M3x8 Philips Pan Head (2A)	3
L06	0E00031A	Washer 4mm	1
L07	0E00597A	Washer 3-8-0.5	2
L08	0E00607A	Screw M3x8 Philips Pan Head (3A)	3
L09	0E00664A	Screw M4x8 Philips Pan Head (2A)	2
L10	0E00574A	Washer 4mm Spring	2
L11	0E00669A	Nut Hex. M4	2
L13	0E00172A	Washer 3mm Toothed Lock	2
L14	0E00614A	Screw M3x6 Philips Pan Head Triple	2
L15	0E00259A	Screw M2.6x4 Philips Pan Head Triple	2
L16	0E00507A	Nut Hex. M3	2
L17	0E00581A	Washer 3mm Spring	2

Schematic Ref. No.	Part No.	Description	Q'ty
A04	**CA05213B**	**Mechanism Ass'y N-1000II (4/4)**	**1**
01	0B05754A	Cement Resistor 15Ω 10W	1
02	CA05132A	Base Switch Ass'y	1
03	CA05026A	Cassette Sensor Ass'y	1
04	CA05221A	Reel Motor Ass'y	1
05	CA05220A	Capstan Motor Ass'y	1
06	CA05134A	Eject Damper Bracket Ass'y	1
07	CA05223A	Back Tension Arm Ass'y	1
08	0C05673A	Back Tension Spring	1
09	CA05031A	Record Sensor Ass'y	1
10	BA03688A	Logic Control P.C.B. Ass'y	1
11	0B07629B	19P Plug P.C.B.	3
12	CA05158A	Motor Cap Ass'y	1
13	BA03813A	Reel Motor Governor P.C.B. Ass'y	1
L01	0E00607A	Screw M3x8 Philips Pan Head (3A)	1
L02	0E00622A	Screw M3x5 Philips Pan Head (2A)	8
L03	0E00222A	E-Ring 2mm	1
L04	0E00612A	Screw M3x6 Philips Pan Head (2A)	5
L05	0E00510A	Screw M3x8 Philips Pan Head (2A)	1
L06	0E00597A	Washer 3mm	1
L07	0E00507A	Nut Hex. M3	1

9.10. Mechanism Ass'y N-1000II (4/4) (A04)

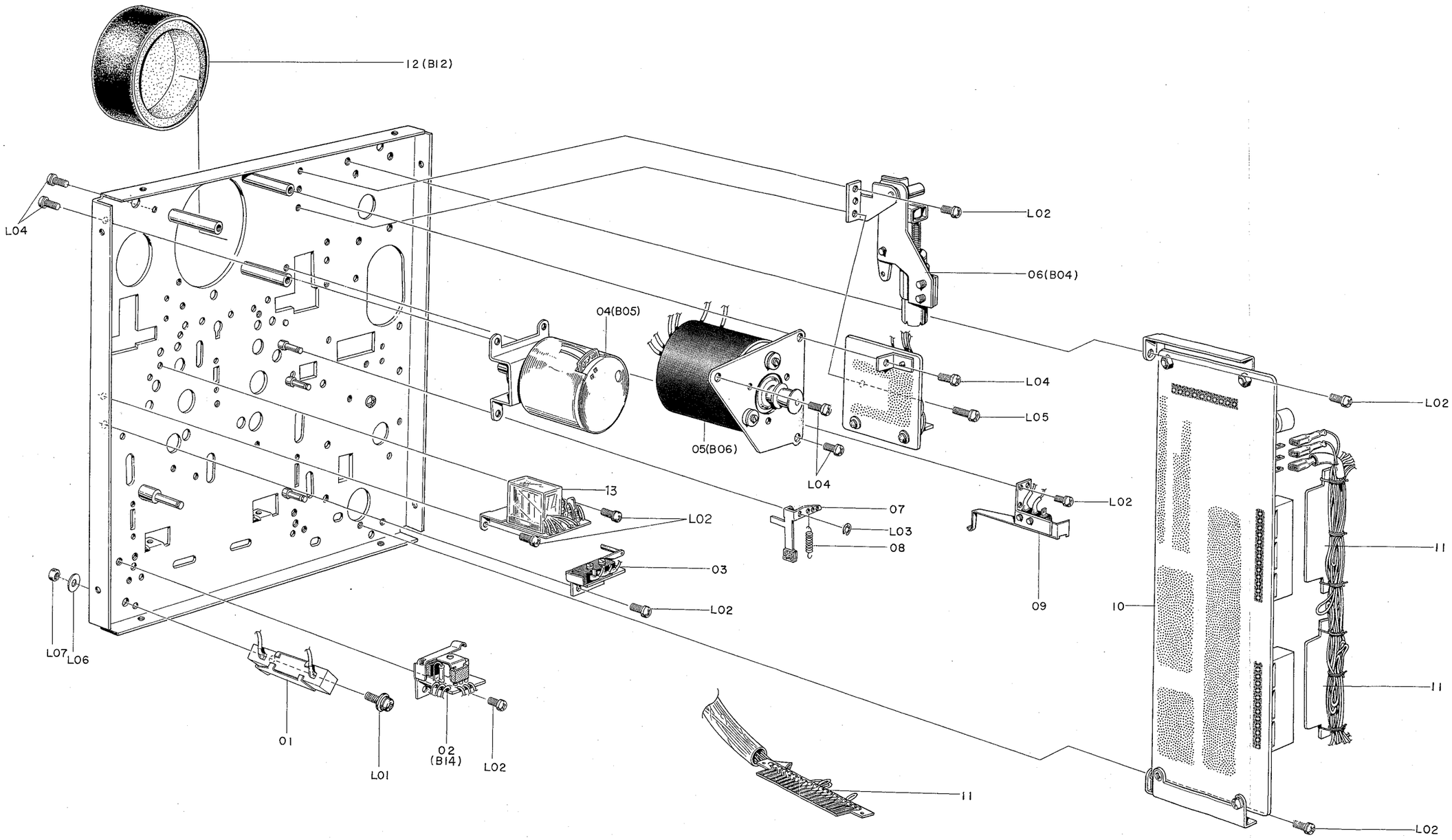


Fig. 9.10

9.11. Head Mount Base D Ass'y (B01)

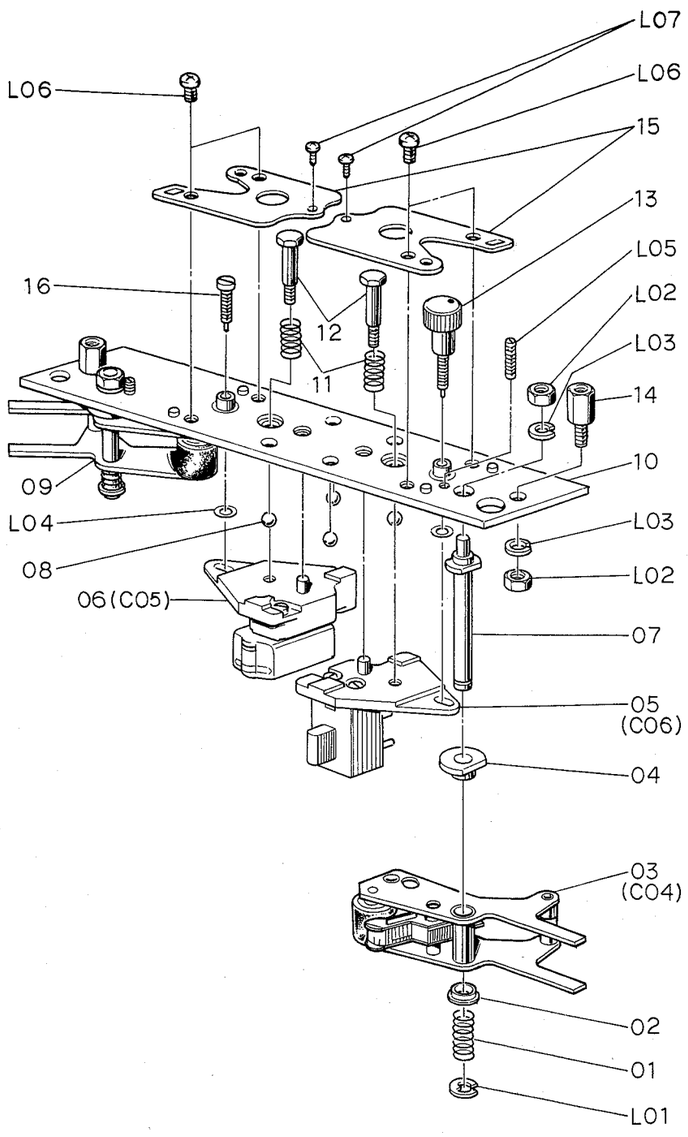


Fig. 9.11

9.12. Ball Drive Mechanism Ass'y (B02)

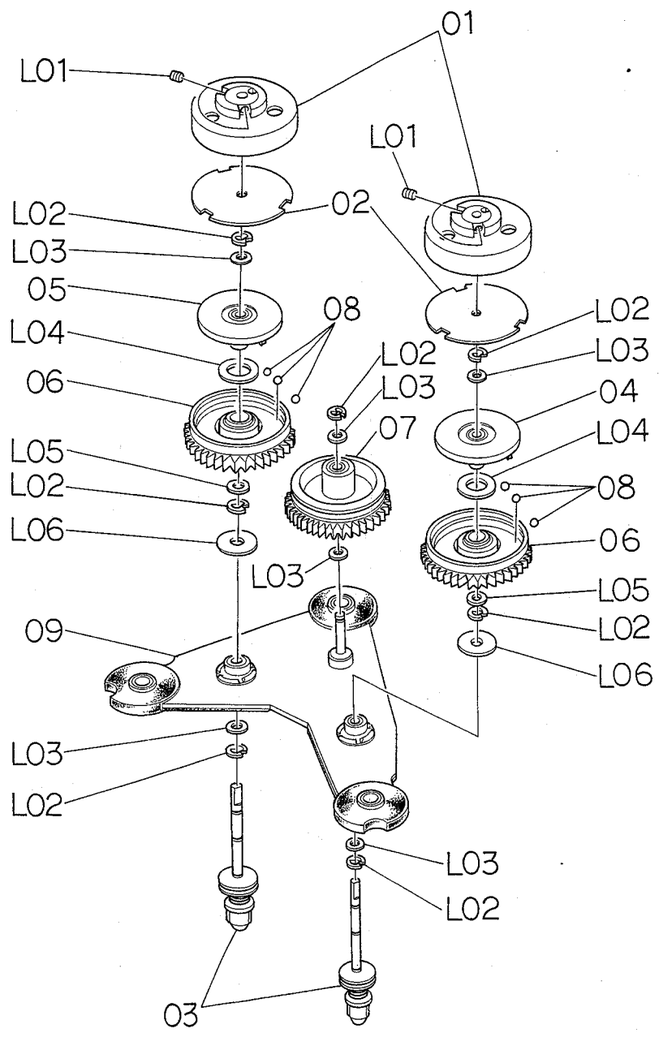


Fig. 9.12

Schematic Ref. No.	Part No.	Description	Q'ty
B01	**CA05167B**	**Head Mount Base D Ass'y**	**1**
01	0C05179C	Pressure Roller Arm Shaft Spring	2
02	0C05175B	Pressure Roller Arm Collar (B)	2
03	CA05208B	Pressure Roller Arm D Ass'y B	1
04	0C05174C	Pressure Roller Arm Collar (A)	2
05	CA05174A	R-52 Record Head Ass'y	1
06	CA05173B	P-53 Playback Head Ass'y	1
07	0C05477B	Pressure Roller Arm Shaft C	2
08	0C03595A	Steel Ball 3mm	4
09	CA05207A	Pressure Roller Arm D Ass'y	1
10	CA05169C	Head Mount Base F Ass'y	1
11	0C05555A	Head Spring B	2
12	0C05559A	Head Spring Shaft A	2
13	0C05561A	Record Head Azimuth Screw 1000	1
14	0C05564A	Plate Stud	2
15	0C05556B	Head Pressure Plate	2
16	0C05558B	Playback Head Azimuth Screw	1
	0B07551B	10P Plug P.C.B.	1
L01	0E00222A	E-Ring 2mm	2
L02	0E00507A	Nut Hex. M3	4
L03	0E00581A	Washer 3mm Spring	4
L04	0C05567A	Washer 1mm Steel	2
L05	0E00629A	Screw M2.6x8 Cup Point	2
L06	0E00120A	Screw M2.6x3 Philips Pan Head	4
L07	0E00692A	Screw M2x2.5 Philips Pan Head (JCIS)	2
B02	**CA05219C**	**Ball Drive Mechanism Ass'y**	**1**
01	CA05217A	Brake Drum Ass'y	2
02	0C05666A	Clutch Plate B	2
	0C05667B	Clutch Felt	2
03	CA05235A	Reel Hub C Ass'y	2
04	CA05230C	Clutch Pulley R Ass'y	1
05	CA05231C	Clutch Pulley F Ass'y	1
06	CA05233A	Reel Hub Gear B Ass'y	2
07	CA05232C	Center Gear Ass'y	1
08	0C02024A	Ball 2mm	6
09	CA05214B	Reel Holder Ass'y	1
L01	0E00626A	Screw M2x3 Cup Point	2
L02	0E00042A	E-Ring 1.5mm	7
L03	0C05672B	Washer 2.15mm	6
L04	0C05687A	Clutch Washer	2
L05	0C05707A	Washer 2.15x0.2mm	2
L06	0C05688A	Washer 5.1mm	2

9.13. Auto Shut-off Ass'y (B03)

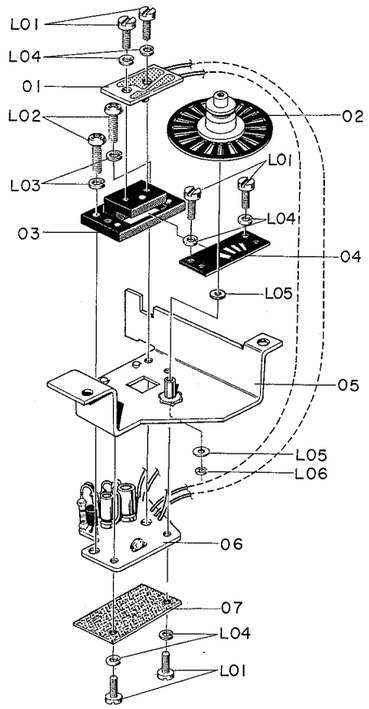


Fig. 9.13

9.14. Eject Damper Bracket Ass'y (B04)

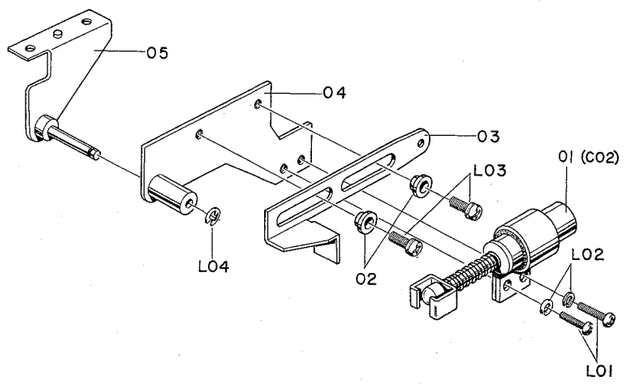


Fig. 9.14

9.15. Reel Motor Ass'y (B05)

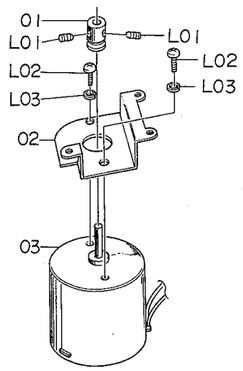


Fig. 9.15

9.16. Capstan Motor Ass'y (B06)

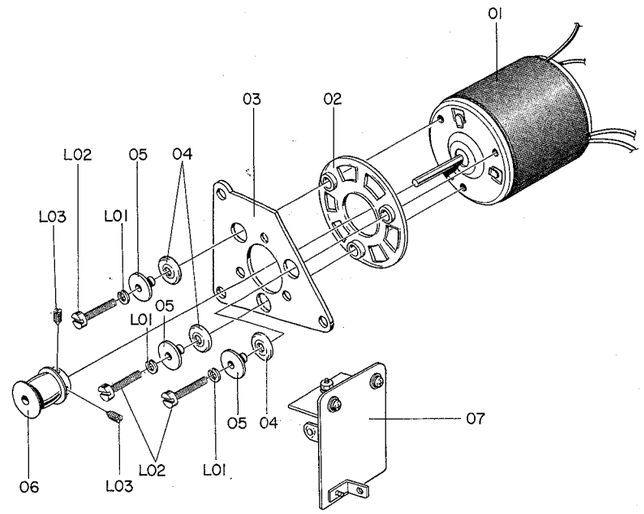


Fig. 9.16

9.17. Flywheel Holder Ass'y (B07)

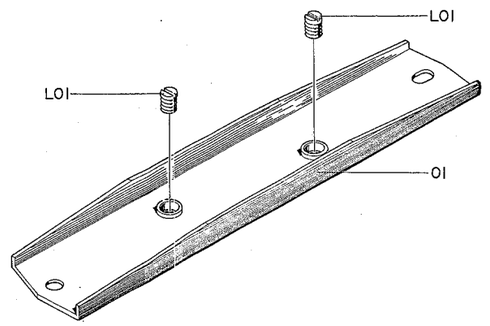


Fig. 9.17

Schematic Ref. No.	Part No.	Description	Q'ty
B03	**CA05137A**	**Auto Shut-off Ass'y**	**1**
01	BA03663A	Shut-off Luminous P.C.B. Ass'y	1
02	CA05156A	Shut-off Blade Ass'y	1
03	0C05461C	Shut-off Holder	1
04	0C05467A	Shut-off Shutter	1
05	CA05138A	Shut-off Base Ass'y	1
06	BA03664A	Shut-off Sensor P.C.B. Ass'y	1
07	0C05476B	Photo Transistor P.C.B. Cover	1
L01	0E00166A	Screw M2x4 Cylinder Head	6
L02	0E00121A	Screw M2.6x6 Philips Pan Head	2
L03	0E00026A	Washer 2.6mm Spring	2
L04	0E00025A	Washer 2mm Spring	6
L05	0C03613A	Washer 1.6mm Plastics	2
L06	0E00165A	E-Ring 1.2mm	1
B04	**CA05134A**	**Eject Damper Bracket Ass'y**	**1**
01	CA05047A	Eject Damper Ass'y	1
02	0C05135A	Center Guide	2
03	0C05232C	Eject Damper Linkage	1
04	CA05068A	Damper Plate Ass'y	1
05	CA05046A	Damper Plate Holder Ass'y	1
L01	0E00220A	Screw M2.6x8 Philips Pan Head	2
L02	0E00026A	Washer 2.6mm Spring	2
L03	0E00612A	Screw M3x6 Philips Pan Head (2A)	2
L04	0E00053A	E-Ring 2.3mm	1
B05	**CA05221A**	**Reel Motor Ass'y**	**1**
01	0C05700A	Reel Motor Pulley A	1
02	0C05702A	Reel Motor Holder A	1
03	0C03771A	Reel Motor (MHI)	1
L01	0E00626A	Screw M2x3 Cup Point	2
L02	0E00120A	Screw M2.6x3 Philips Pan Head	2
L03	0E00026A	Washer 2.6mm Spring	2
B06	**CA05220A**	**Capstan Motor Ass'y**	**1**
01	CA05203A	Motor NSM-2	1
02	0C05509A	Floating Sheet	1
03	0C05198D	Motor Plate	1
04	0C05510A	Floating Bush	3
05	0C05508A	Bush Collar	3
06	0C05671A	Motor Pulley D	1
07	BA03662B	Capstan Motor Governor P.C.B. Ass'y	1
L01	0E00025A	Washer 2mm Spring	3
L02	0E00004A	Screw M2x8 Cylinder Head	3
L03	0E00626A	Screw M2x3 Cup Point	2
B07	**CA05171A**	**Flywheel Holder Ass'y**	**1**
01	CA05008A	Flywheel Holder Sub Ass'y	1
L01	0C05494B	Thrust Screw	2

9.18. Cassette Well Plate Ass'y (B08)

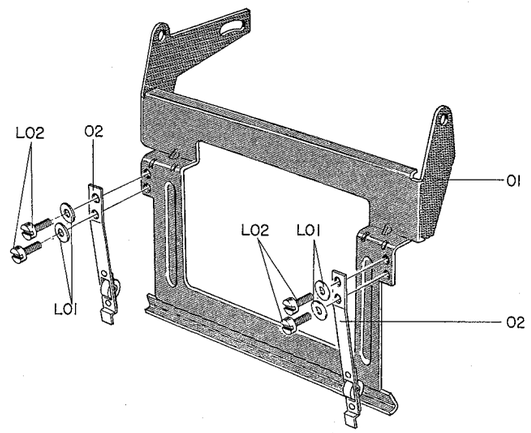


Fig. 9.18

9.19. Cassette Well Ass'y (B09)

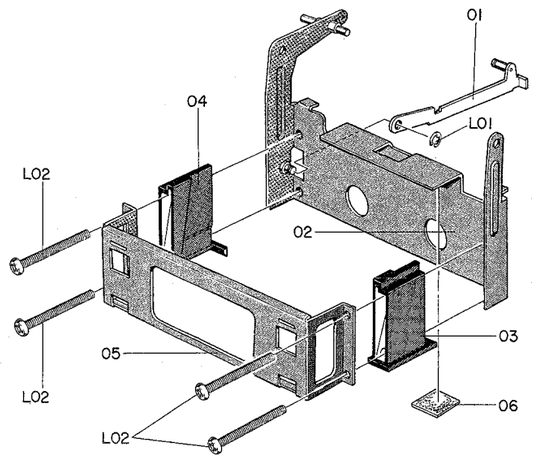


Fig. 9.19

9.20. Eject Linkage Ass'y (B10)

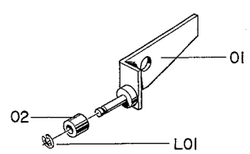


Fig. 9.20

9.21. Alignment Beacon Ass'y (B11)

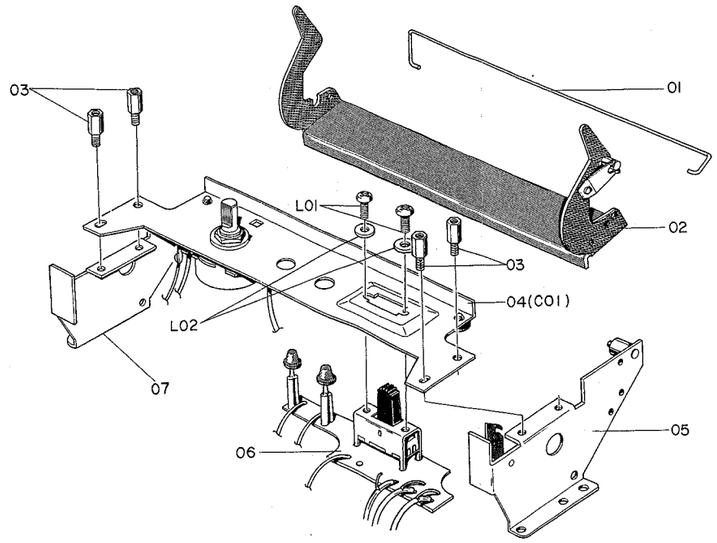


Fig. 9.21

9.22. Motor Cap Ass'y (B12)

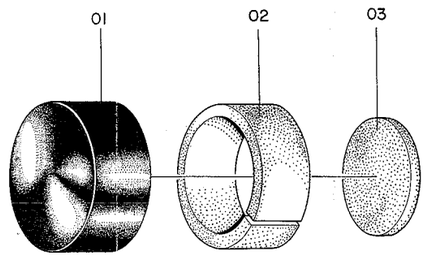


Fig. 9.22

9.23. Cassette Holder Ass'y (B13)

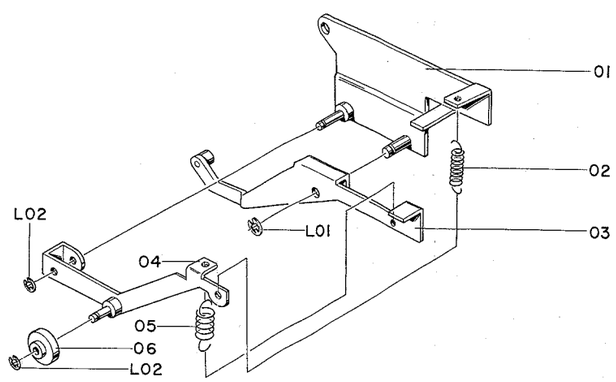


Fig. 9.23

9.24. Base Switch Ass'y (B14)

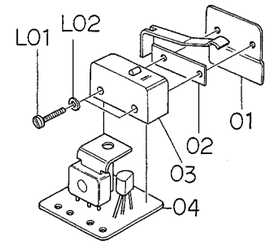


Fig. 9.24

9.25. Counter Holder Ass'y (B15)

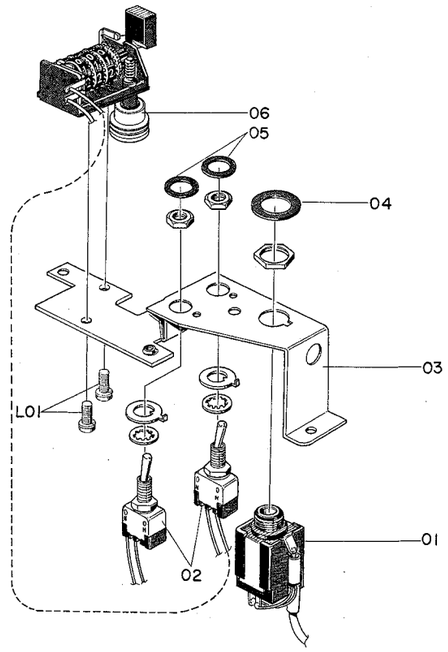


Fig. 9.25

Schematic Ref. No.	Part No.	Description	Q'ty
B08	**CA05062A**	**Cassette Well Plate Ass'y**	**1**
01	0C05335B	Cassette Well Plate B	1
02	CA05153A	Cassette Spring Ass'y	2
L01	0E00025A	Washer 2mm Spring	4
L02	0E00002A	Screw M2x3 Cylinder Head	4
B09	**CA05135A**	**Cassette Well Ass'y**	**1**
01	CA05055A	Well Stopper Ass'y	1
02	CA05061A	Cassette Well Ass'y (B)	1
03	0C05276C	Cassette Case B.R	1
04	0C05277C	Cassette Case B.L	1
05	0C05265C	Lid Holder	1
06	0C05373A	Cassette Rubber	1
L01	0E00222A	E-Ring 2mm	1
L02	0E00245A	Screw M2.6x25 Philips Pan Head	4
B10	**CA05172A**	**Eject Linkage Ass'y**	**1**
01	CA05043A	Eject Linkage Sub Ass'y	1
02	0C05132A	Eject Roller	1
L01	0E00042A	E-Ring 1.5mm	1
B11	**CA05144B**	**Alignment Beacon Ass'y**	**1**
01	0C05261C	AJ Lid Arm Spring	1
02	CA05064A	AJ Lid Arm Ass'y	1
03	0C05311B	AJ Cover Stud	4
04	CA05143B	AJ Plate Ass'y	1
05	CA05063A	AJ Plate Holder Ass'y L	1
06	BA03665B	400Hz Osc. P.C.B. Ass'y	1
07	CA05069A	AJ Plate Holder Ass'y R	1
L01	0E00226A	Screw M2.6x4 Philips Pan Head	2
L02	0E00026A	Washer 2.6mm Spring	2
B12	**CA05158A**	**Motor Cap Ass'y**	**1**
01	0C03796A	Motor Cap	1
02	0C03794A	Motor Cover A	1
03	0C03795A	Motor Cover B	1
B13	**CA05044A**	**Cassette Holder Ass'y**	**1**
01	CA05058A	Cassette Hold Plate Ass'y	1
02	0C05244B	Linkage Spring	1
03	CA05059A	Cassette Arm A Ass'y	1
04	CA05060A	Cassette Arm B Ass'y	1
05	0C05245C	Hold Spring	1
06	0C05217B	Hold Roller	1
L01	0E00222A	E-Ring 2mm	1
L02	0E00042A	E-Ring 1.5mm	2
B14	**CA05132A**	**Base Switch Ass'y**	**1**
01	0C05091A	Base Switch Holder	1
02	0C05092A	Switch Spring A	1
03	0B07086A	Micro Switch (SS-5)	1
04	BA03666A	Head Base Switch P.C.B. Ass'y	1
L01	0E00218A	Screw M2x10 Cylinder Head	2
L02	0E00025A	Washer 2mm Spring	2

Schematic Ref. No.	Part No.	Description	Q'ty
B15	**CA05136A**	**Counter Holder Ass'y**	**1**
01	0B03882A	Headphone Jack	1
02	0B08057A	Memory Switch	2
03	0C05316D	Counter Holder	1
04	0J03236B	Jack Cover	1
05	0B01295A	Jack Insulating Washer	2
06	CA05038A	Tape Counter Ass'y	1
L01	0E00612A	Screw M3x6 Philips Pan Head (2A)	2

Schematic Ref. No.	Part No.	Description	Q'ty
B16	**CA05145A**	**Head Base Solenoid Ass'y**	**1**
01	CA05027A	Base Lock Arm Ass'y	1
02	0C05099A	Head Base Solenoid	1
03	CA05041A	Base Damper Holder Ass'y	1
04	CA05133A	Base Damper Ass'y	1
L01	0E00507A	Nut Hex. M3	1
L02	0E00172A	Washer 3mm Toothed Lock	1
L03	0C05098A	Solenoid Bolt	1
L04	0E00612A	Screw M3x6 Philips Pan Head (2A)	2
L05	0E00026A	Washer 2.6mm Spring	2
L06	0E00220A	Screw M2.6x8 Philips Pan Head	2
B17	**CA05053A**	**Brake Solenoid Ass'y**	**1**
01	0C05086B	Brake Solenoid	1
02	0C05087B	Brake Solenoid Spring	1
03	0C05085A	Brake Linkage	1
L01	0C05419A	Brake Bolt	1
L02	0E00233A	Washer 2.6mm Toothed Lock	1
L03	0E00021A	Nut Hex. M2.6	1
B18	**BA03772A**	**Power Switch Ass'y**	**1**
01	0M03321A	Lever Cover Name Plate B	1
02	0H03391D	Switch Lever Cover C	1
03	0B07080U	Power Switch	1
B19	**BA03773A**	**Lever Switch Ass'y 2S (DNL, EQ SW)**	**2**
01	0M03320A	Lever Cover Name Plate A	1
02	0H03192D	Switch Lever Cover A	1
03	0B07009A	Lever Switch 2S	1
B19	**BA03775A**	**Lever Switch Ass'y 4 (Dolby NR SW)**	**1**
01	0M03320A	Lever Cover Name Plate A	1
02	0H03192D	Switch Lever Cover A	1
03	0B07020A	Lever Switch 4	1
B19	**BA03800A**	**Lever Switch Ass'y 4S (Tape SW)**	**1**
01	0M03320A	Lever Cover Name Plate A	1
02	0H03192D	Switch Lever Cover A	1
03	0B07133A	Lever Switch 4S	1
B19	**BA03806A**	**Lever Switch Ass'y 2 (Monitor SW)**	**1**
01	0M03320A	Lever Cover Name Plate A	1
02	0H03192D	Switch Lever Cover A	1
03	0B07142A	Lever Switch 2	1
C01	**CA05143B**	**AJ Plate Ass'y**	**1**
01	0C05708A	Adjust Plate	1
02	0C05101C	Base Stopper Rubber	2
03	0B07038A	VR 500Ω (Pitch Control)	1
L01	0E00150A	Nut Hex. M8	1

Schematic Ref. No.	Part No.	Description	Q'ty
C02	**CA05047A**	**Eject Damper Ass'y**	**1**
01	0C06258E	Damper Holder	1
02	0C06279A	Damper Holder Ring	1
03	0C05429A	Exhaust Adjust Screw C	1
04	0C05283A	Cylinder B	1
05	0C06278D	Seal	1
06	CA05125A	Piston Ass'y	1
07	0C06277A	Guide	1
08	0C05328A	Damper Spring	1
09	0C05488A	Damper Linkage Plate	1
10	0C06274B	Bush	1
11	0C06335C	Exhaust Bush B	1
L01	0E00253A	Washer 3.3mm	2
L02	0E00053A	E-Ring 2.3mm	1
C03	**CA05133A**	**Base Damper Ass'y**	**1**
01	0C06258E	Damper Holder	1
02	0C06279A	Damper Holder Ring	1
03	0C05429A	Exhaust Adjust Screw C	1
04	0C05283A	Cylinder B	1
05	0C06278D	Seal	1
06	CA05125A	Piston Ass'y	1
07	0C06277A	Guide	1
08	0C05328A	Damper Spring	1
09	0C05513A	Head Base Damper Plate	1
10	0C06274B	Bush	1
11	0C06335C	Exhaust Bush B	1
L01	0E00253A	Washer 3.3mm	2
L02	0E00053A	E-Ring 2.3mm	1
C04	**CA05208B**	**Pressure Roller Arm D Ass'y B**	**1**
01	GA02014A	Erase Head E-54	1
02	CA05207A	Pressure Roller Arm D Ass'y	1
L01	0E00691A	Screw M2x3 Philips Pan Head	2
L02	0E00117A	Washer 2mm	2
C05	**CA05173B**	**P-53 Playback Head Ass'y**	**1**
01	GA02013A	P-53 Playback Head	1
02	GA01017A	PH Plate Ass'y	1
L01	0E00004A	Screw M2x8 Cylinder Head	2
C06	**CA05174A**	**R-52 Record Head Ass'y**	**1**
01	GA02007E	R-52 Record Head	1
02	GA01018A	RH Plate Ass'y	1
L01	0E00004A	Screw M2x4 Cylinder Head	2

9.26. Head Base Solenoid Ass'y (B16)

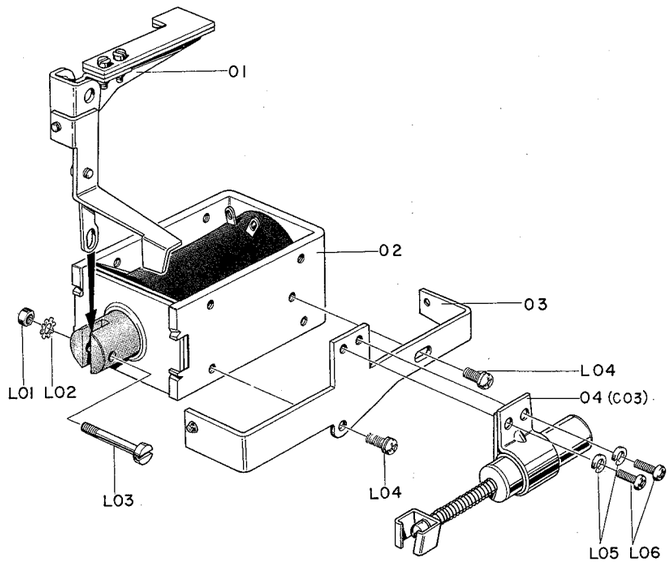


Fig. 9.26

9.27. Brake Solenoid Ass'y (B17)

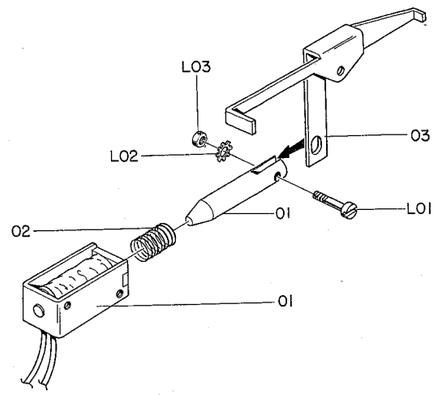


Fig. 9.27

9.28. Power Switch Ass'y (B18)

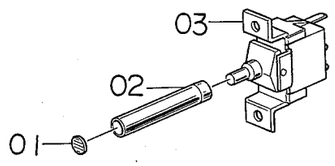


Fig. 9.28

9.29. Lever Switch Ass'y 2S, 4, 4S, 2 (B19)

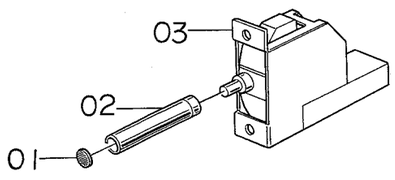


Fig. 9.29

9.30. AJ Plate Ass'y (C01)

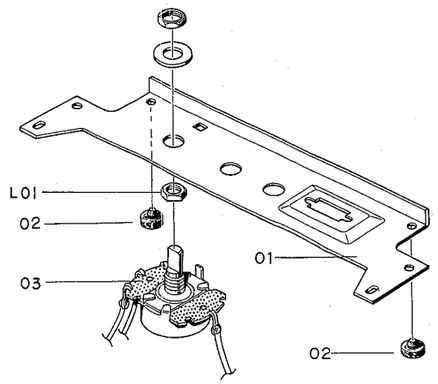


Fig. 9.30

9.31. Eject Damper Ass'y (C02)

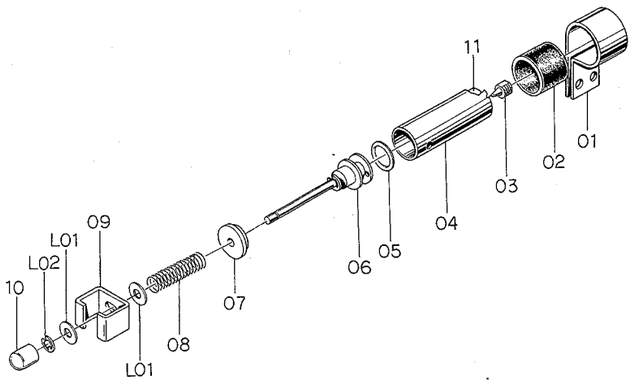


Fig. 9.31

9.32. Base Damper Ass'y (C03)

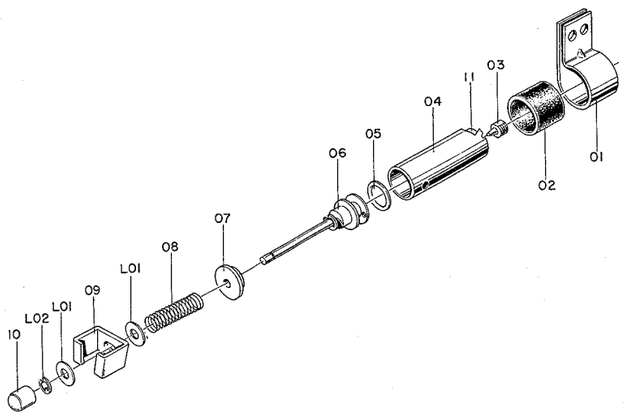


Fig. 9.32

9.33. Pressure Roller Arm D Ass'y B (C04)

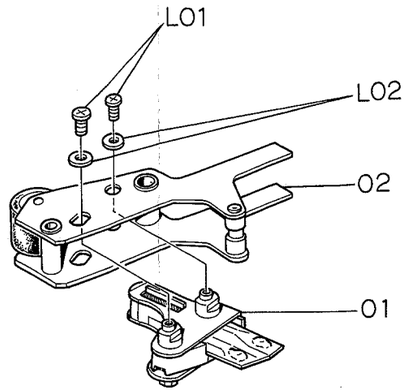


Fig. 9.33

9.34. P-53 Playback Head Ass'y (C05)

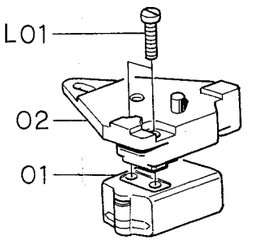


Fig. 9.34

9.35. R-52 Record Head Ass'y (C06)

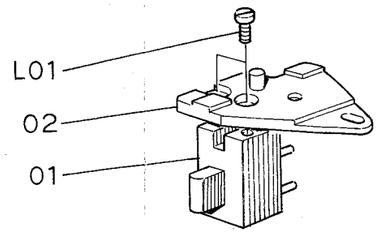


Fig. 9.35

10. WIRING DIAGRAM

10.1. Amplifier

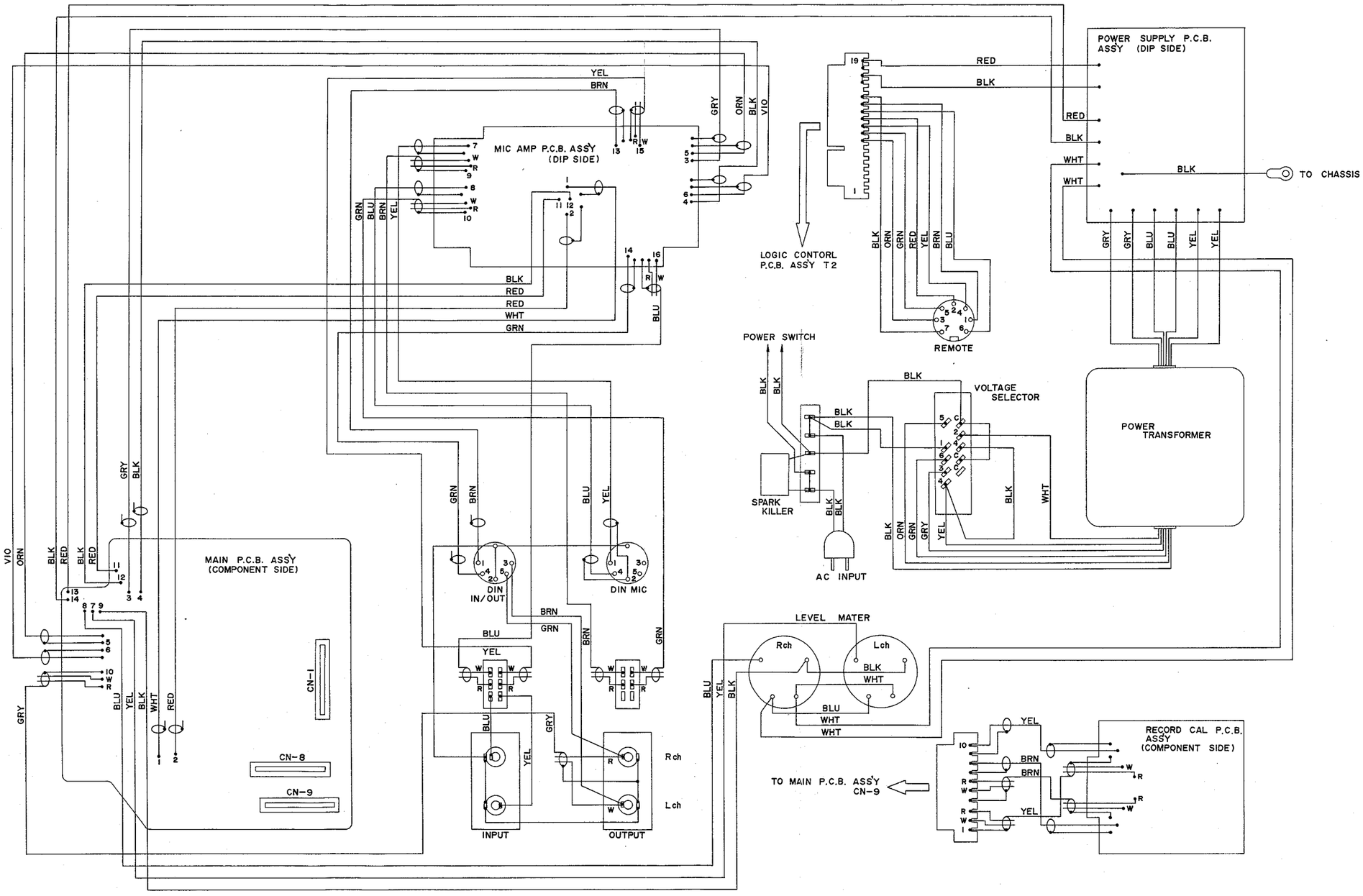


Fig. 10.1

Note: Table of wire colors

BLK - Black	GRY - Gray	BRN - Brown
BLU - Blue	GRN - Green	YEL - Yellow
ORN - Orange	RED - Red	WHT - White

10.2. Mechanism

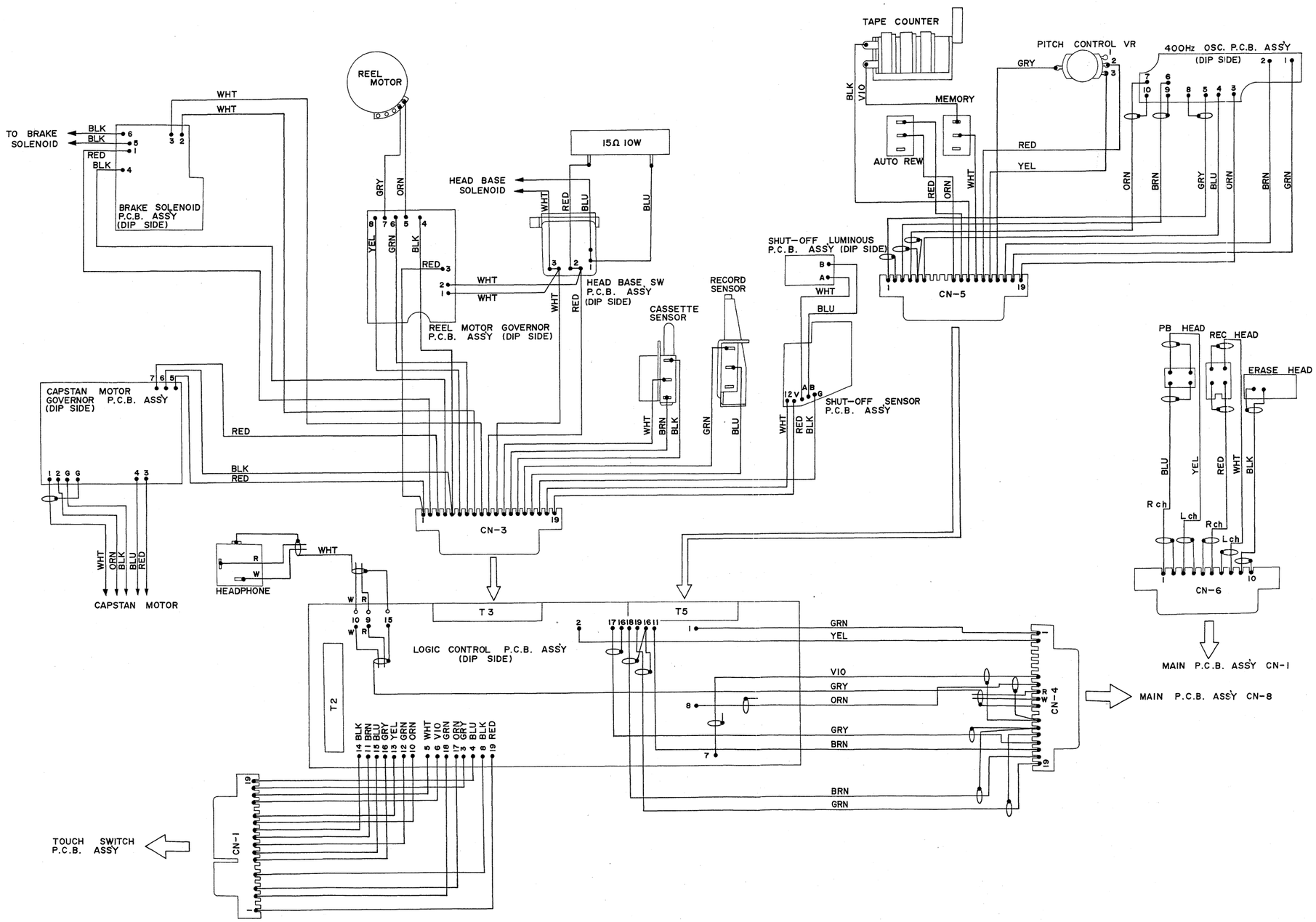


Fig. 10.2

11. BLOCK DIAGRAM

11.1. Amplifier

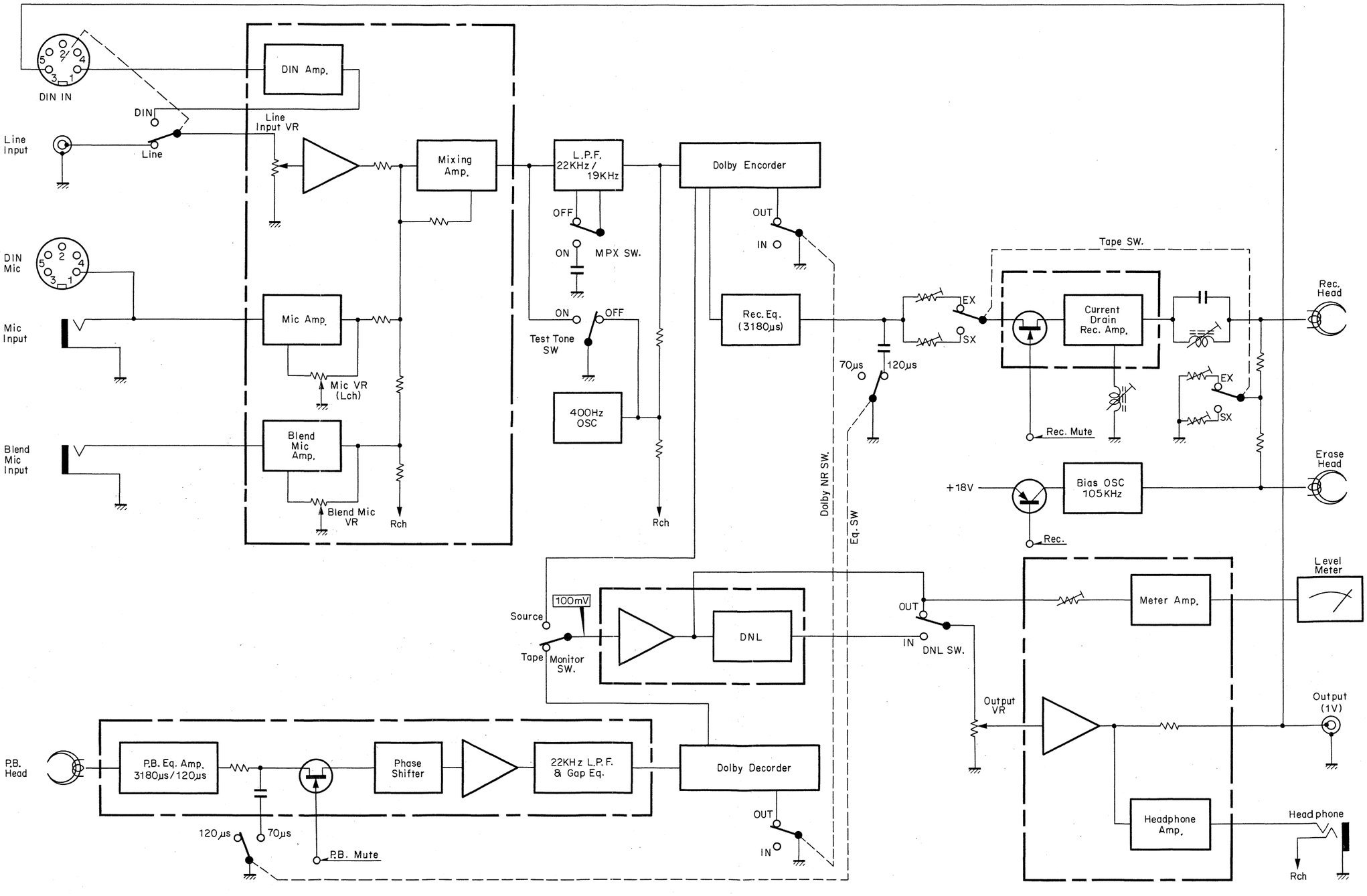


Fig. 11.1

11.2. Mechanism

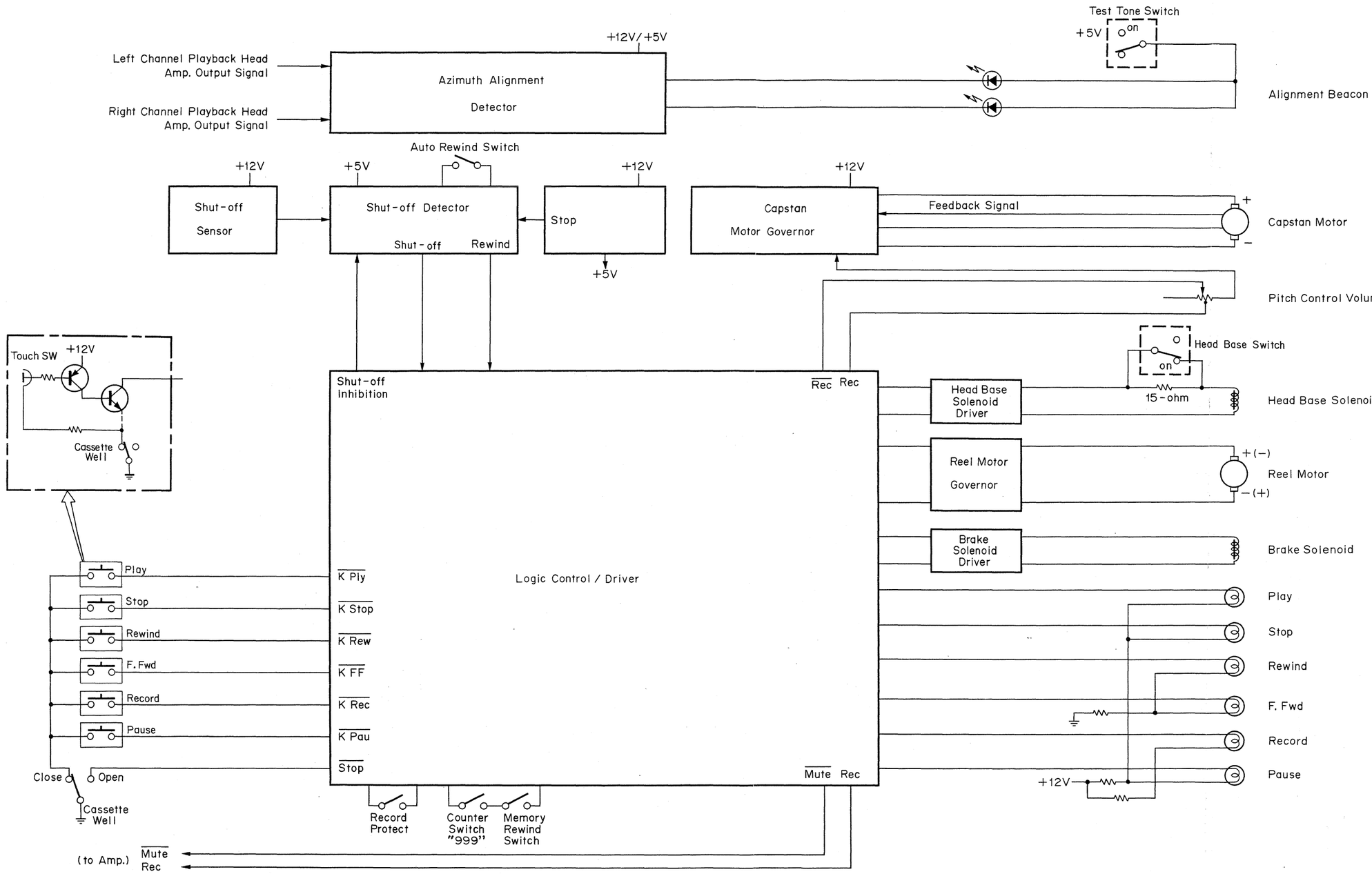
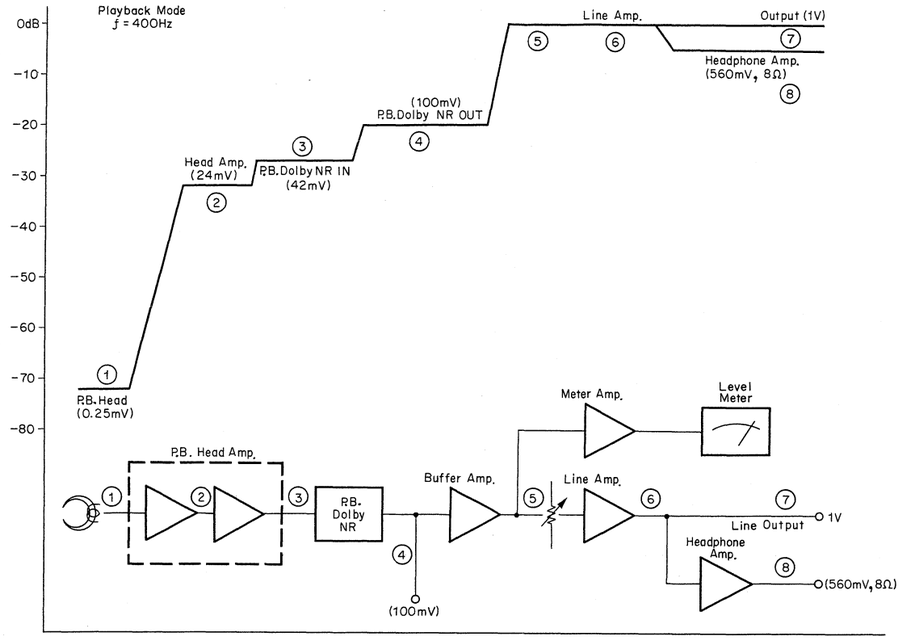


Fig. 11.2

12. LEVEL DIAGRAM



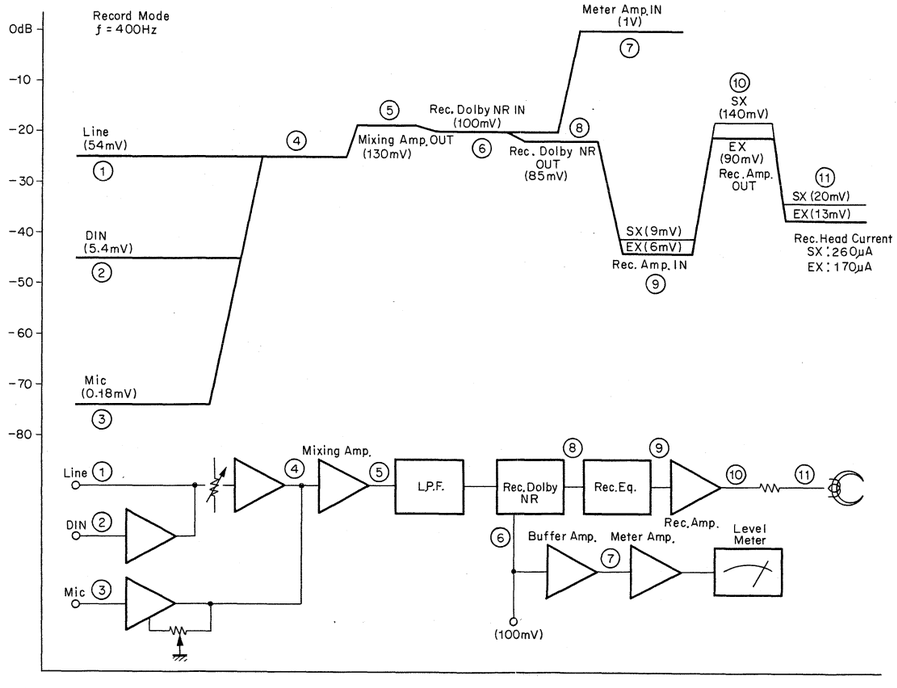


Fig. 12

13. EQ. AMP. FREQUENCY RESPONSE

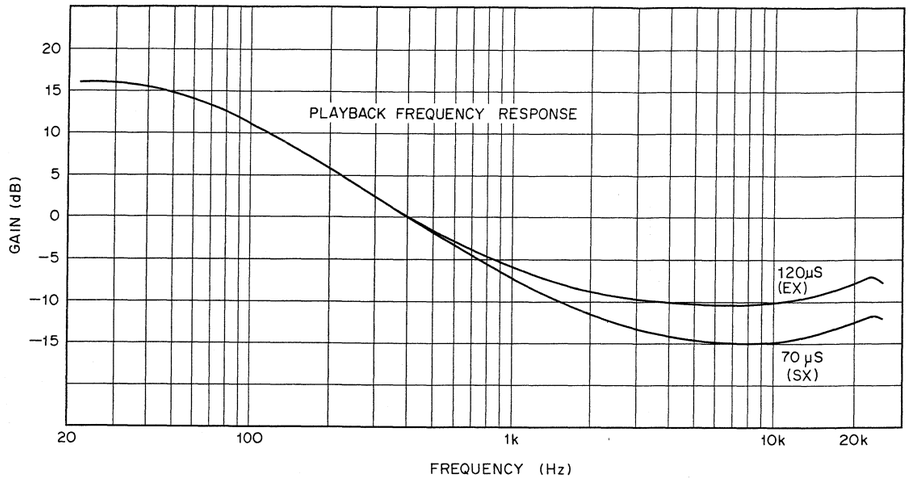


Fig. 13.1

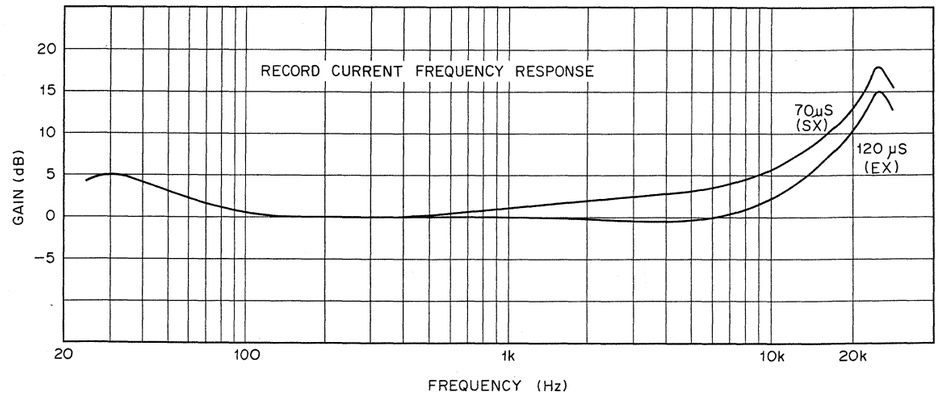


Fig. 13.2

14. SCHEMATIC DIAGRAM

14.1. Amplifier

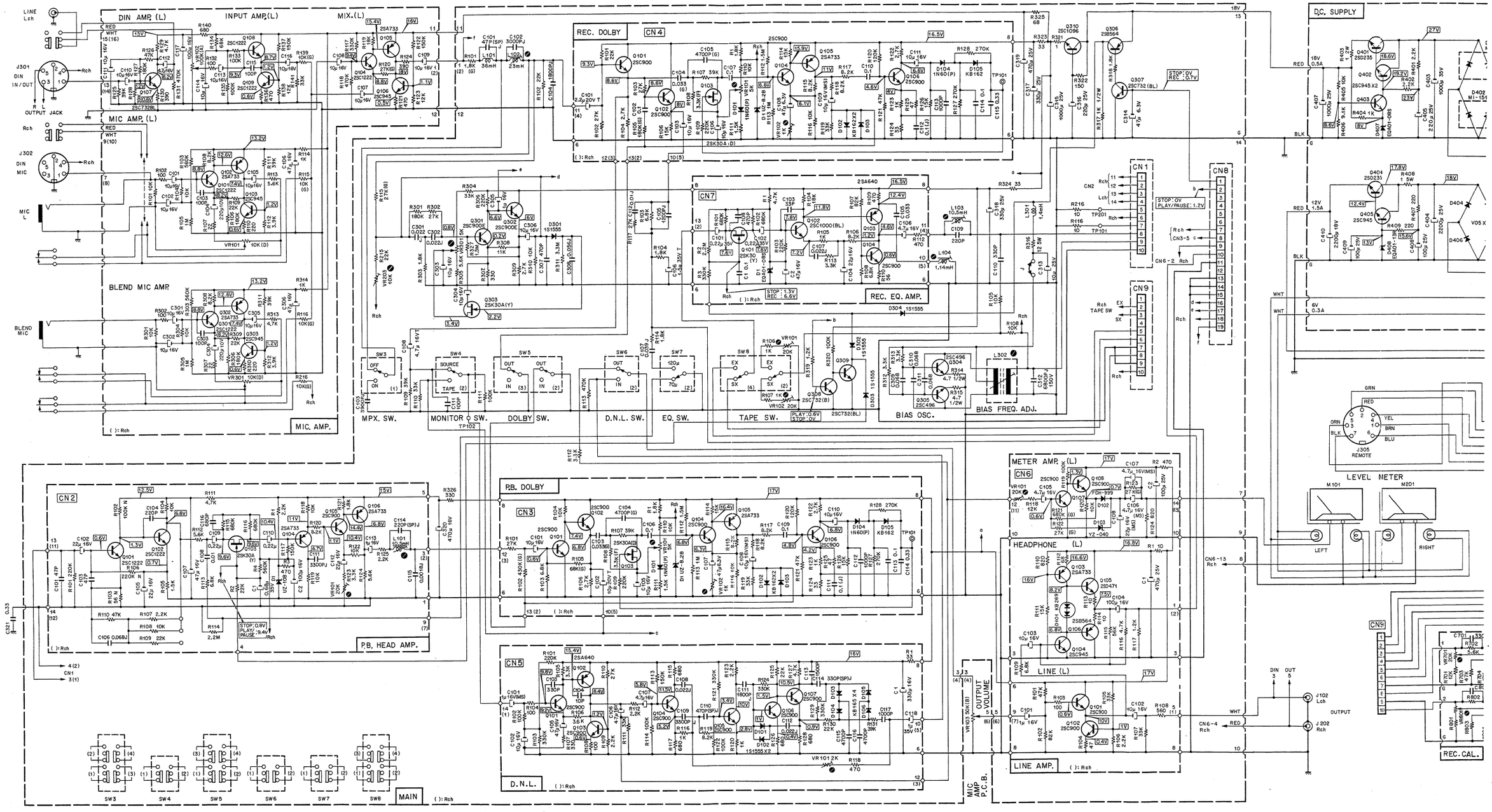


Fig. 14.1

Notes:
1. R channel circuits are omitted when R channel circuits are equal to the L channel. Schematic reference Nos. 100-199, 700-799 show L channel's parts and 200-299, 800-899 show R channel's. (For example, R101 is an L channel's resistor and omitted R201 is an R channel's.)
2. Schematic reference Nos. 300-399, 400-499 show common parts for both L and R channels.
3. ( ) shows an R channel's terminal No.

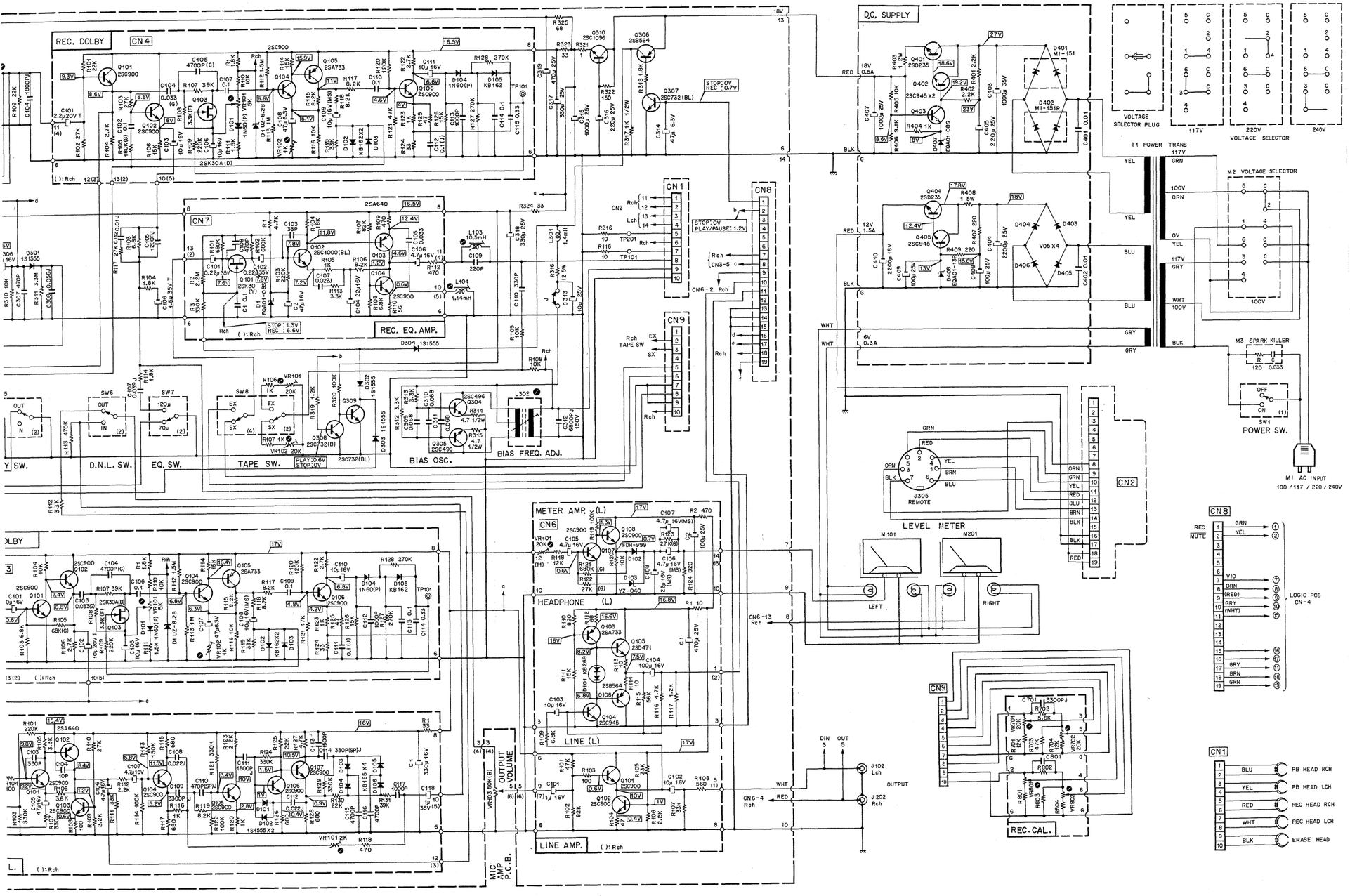


Fig. 14.1

800-899 show R channel's.
.)

2. Schematic reference Nos. 300-399, 400-499 show common parts for both L and R channels.
3. ( ) shows an R channel's terminal No.

14.2. Mechanism

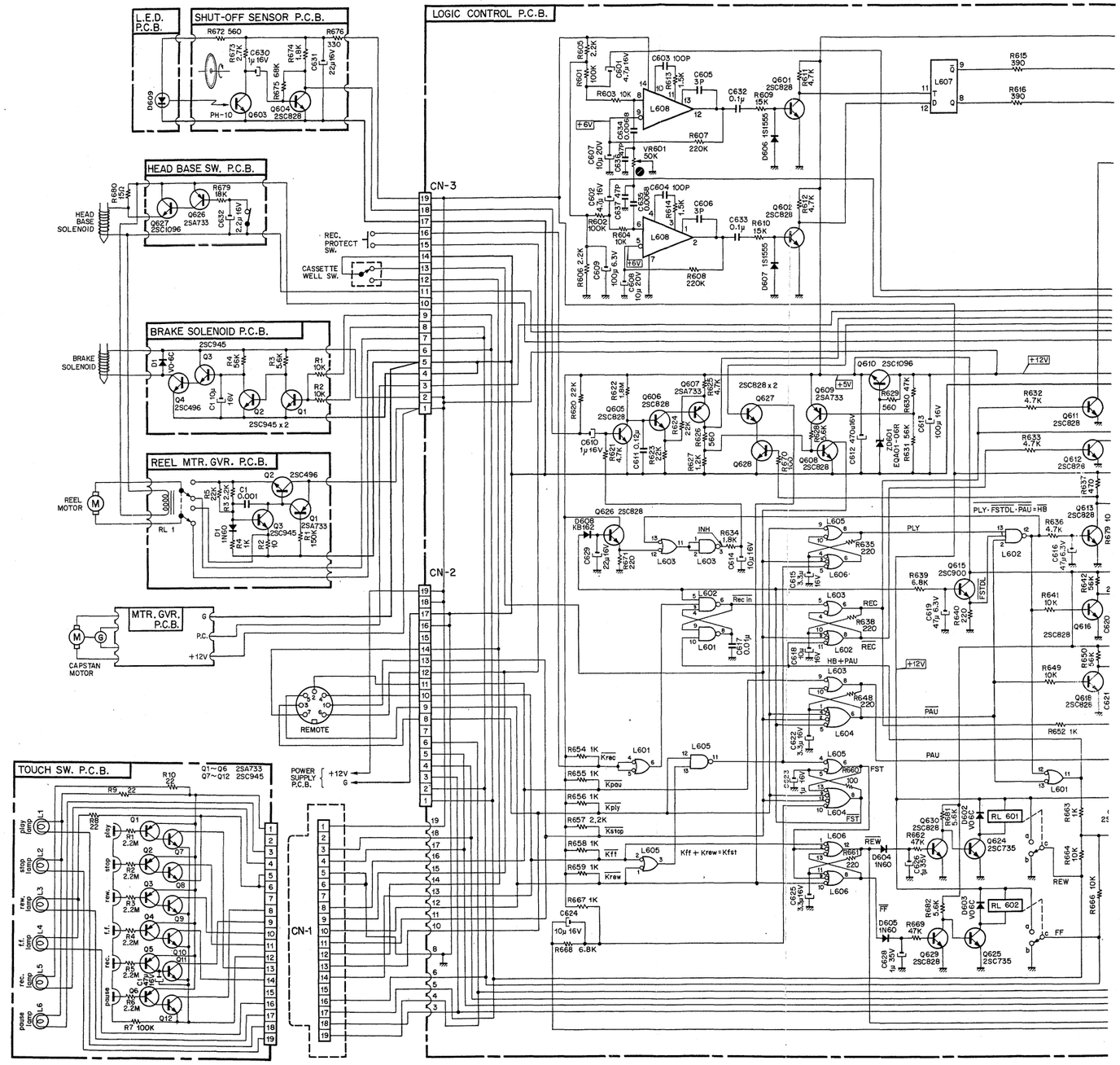
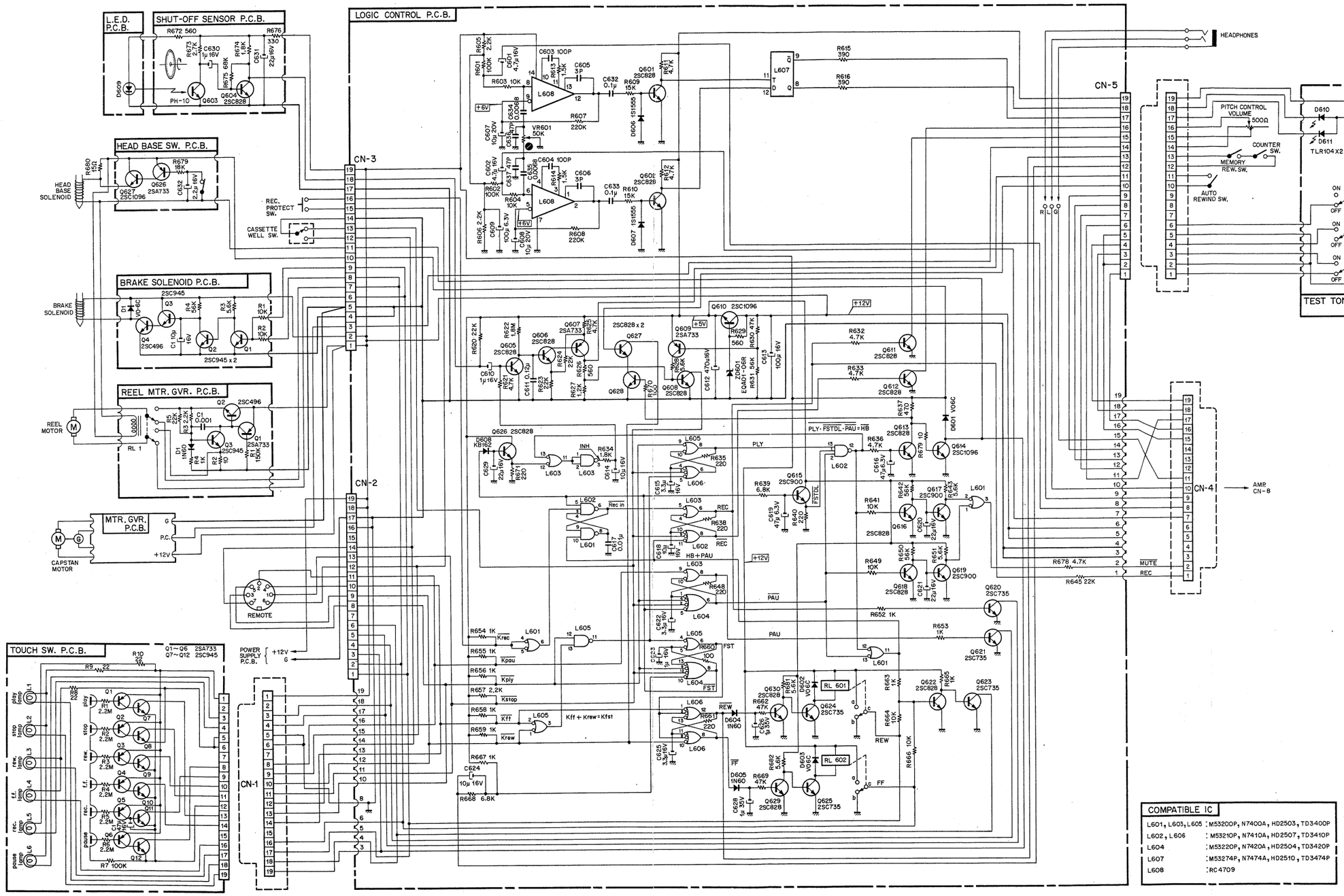


Fig. 14.2

14.2. Mechanism



COMPATIBLE IC	
L601, L603, L605	: M53200P, N7400A, HD2503, TD3400P
L602, L606	: M53210P, N7410A, HD2507, TD3410P
L604	: M53220P, N7420A, HD2504, TD3420P
L607	: M53274P, N7474A, HD2510, TD3474P
L608	: RC4709

Fig. 14.2

14.3. Capstan Motor Governor

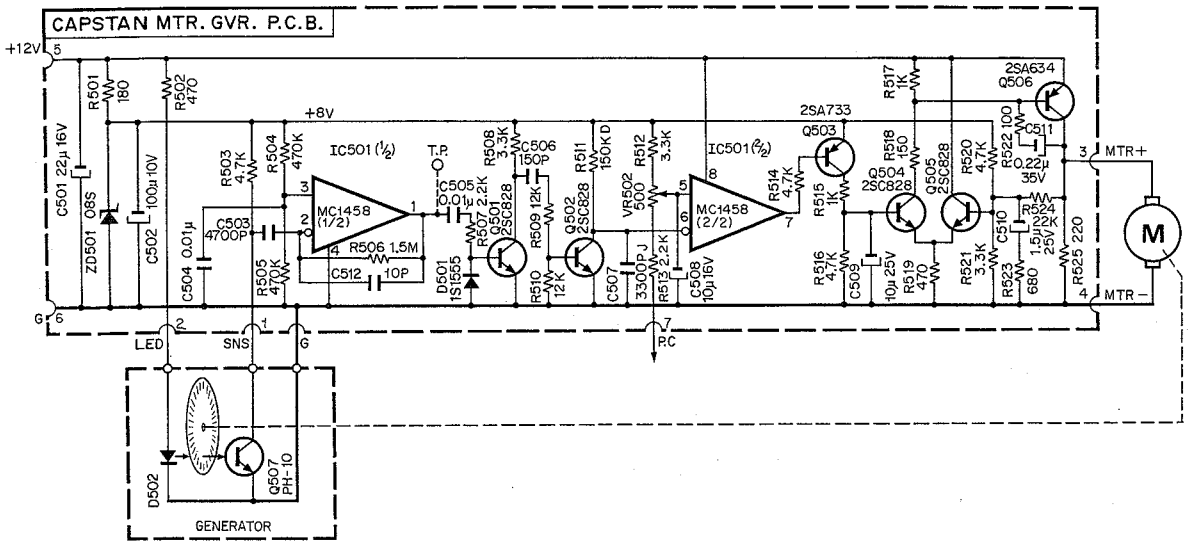


Fig. 14.3

15. TROUBLESHOOTING

15.1. Note

(1) Check to insure whether the outputs + 12 V, + 17 V and + 5 V of the logic control are correct.

(2) In general logics, the output high level is not less than 2.4 V, and output low level not more than 0.4—0.5 V.
The output between 0.4—2.4 V does not belong either to "L " or "H", and is generated if TTL IC is damaged or over-loaded (This voltage is called "Half Level").
The threshold level of the TTL IC is shown to be less than 1.1—0.8 V while "L" level, and more than 1.9 V—2.0 V while "H" level.
Normally, if the input is open, it is regarded as high level.

(3) The logic control board if separated from the chassis does not activate accurately as its grounding is also separated, therefore check thereon shall be made upon connecting the grounding of the PCB control and chassis with a jumper wire both ends of which are provided with a clip (particularly when an extension cord is used).

(4) When a check is made on Amp. etc. by means of an extension cord, re-adjustment shall be made without fail (after final installation to the model chassis).
The check without removal of an extension cord will cause inaccurate adjustments.

(5) Either Nakamichi SX or EXII tape shall be used while adjustments (particularly while adjustments of bias and record/playback level).
Should another difference branded tape be used in its place, the set shall previously be adjusted according to each of the actual tape in use.
However, if low quality tape should be used, optimum quality of a set will not be obtained (such as distortion, S/N, Dynamic Range, etc. will be deteriorated).

15.2. Troubleshoots

15.2.1 Capstan motor does not rotate:

(1) Defective capstan motor governor.
(2) Defective capstan motor.
(3) Pitch control volume is out of accuracy.
(4) The lead wire between capstan motor governor and capstan motor is cut.
(5) The lead wire between the governor and pitch control volume is cut.
(6) + 12 V is not being supplied to the governor.

15.2.2 Auto Shut-off does not work (at tape end):

(1) One of D403 through D406 is defective (excessive ripple of + 12 V)
(2) Shut-off driver is defective.
(3) Shut-off sensor is defective.
(4) + 12 V regulator is defective (excessive ripple of + 12 V).

15.2.3 Auto Shut-off activates (other than tape end):
(1) Shut-off belt is cut.
(2) Shut-off sensor is defective.
(3) Take-up torque is too weak.
(4) Defective shut-off driver.
(5) Pressure roller spring is not at the correct position.

15.2.4 Beacon does not flicker:
(1) IC 607 is defective.
(2) IC 608 is defective.
(3) Defective playback head.
(4) Defective playback head amp.
(5) Defective record head.
(6) Defective beacon LED.
(7) Tape travel is incorrect.
(8) Defective Record Eq. Amp.

15.2.5 Does not Shut-off while FF, Rew (at tape end):
(1) Defective IC603.
(2) Defective IC604.
(3) Defective fast driver (in Q626 circuit).

15.2.6. Remained only in Play mode:
(1) Defective IC605.
(2) Defective IC606.
(3) The driver of the head base solenoid is defective.
(4) Defective touch control switch ass'y.
(5) Defective head base solenoid.

15.2.7. Remained only in Record mode:
(1) Defective IC601.
(2) Defective IC602.
(3) Defective IC603.
(4) Defective touch control switch ass'y.

15.2.8 Remained only in Rewind mode:
(1) Defective touch control switch ass'y.
(2) Defective IC606.
(3) Either RL 601 or driver is defective.

15.2.9. Remained only in Fast Forward mode:
(1) Defective touch control switch ass'y.
(2) Defective IC606.
(3) Either RL 602 or driver is defective.

15.2.10. Remained only Pause mode:
(1) Defective IC601.
(2) Defective IC603.
(3) Defective IC604.
(4) Defective touch control switch ass'y.

15.2.11. Does not change to Play mode:
(1) Defective touch control switch Ass'y.
(2) Defective IC605.
(3) Defective IC606.
(4) Head base solenoid and driver are defective.
(5) Auto shut-off driver is defective.
(6) Head base is not operating accurately (when heavy).
(7) Ball drive mechanism is ont operating accurately.
(8) Defective take-up reel.
(9) Defective cassette tape (hard to rotate, etc.).
(10) Pressure roller spring is out of the correct position.

15.2.12. Does not change to Record mode:
(1) Touch control switch ass'y is not operating accurately.
(2) Defective record protect switch.
(3) Defective IC601.
(4) Defective IC602.
(5) Defective IC603.

15.2.13. Does not rewind:
(1) Touch control switch ass'y is not operating accurately.
(2) Defective IC606.
(3) RL601 and driver are defective.
(4) Defective reel motor.
(5) Pulley of the reel motor is too loose.
(6) Defective ball drive mechanism ass'y.
(7) RL602 and driver are defective.
(8) Defective brake solenoid driver.
(9) Defective brake solenoid.

15.2.14. Does not Fast Wind:
(1) Defective touch control switch ass'y.
(2) Defective IC606.
(3) RL602 and driver are defective.
(4) Defective reel motor.
(5) Pulley of the reel motor is too loose.
(6) Defective ball drive mcehanism ass'y.
(7) RL602 and driver are defective.
(8) Brake solenoid driver is defective.
(9) Defective brake solenoid.

15.2.15. Does not pause:
(1) Touch control switch ass'y is defective.
(2) Defective IC603.
(3) Defective IC604.
(4) Defective IC602.
(5) Head base solenoid and driver are defective.

15.2.16. Brake does not operate:
(1) Defective solenoid.
(2) Defective solenoid driver.
(3) Defective IC606.
(4) RL601 and driver are defective.
(5) RL602 and driver are defective.

15.2.17. Head base solenoid does not operate:
(1) Defective head base solenoid.
(2) Defective head base switch ass'y.
(3) Defective solenoid driver.
(4) Defective IC602.
(5) Defective IC605.
(6) Defective IC606.
(7) Head base is not operating accurately (when heavy).

15.2.18. Record mode operates without cassette tape:
(1) Incorrect adjustment of record protect switch.
(2) Defective IC601.
(3) Defective IC602.
(4) Defective IC603.

15.2.19. Logic Control does not operate:
(1) + 5 V not being induced.
(2) Cassette sensor switch is defective.
(3) Incorrect adjustment of cassette sensor switch.
(4) Defective touch control switch ass'y.
(5) 19P connector is out of contact.

15.2.20. Does not auto rewind:
(1) Auto rewind switch is out of order.
(2) Defective auto rewind driver.
(3) Defective IC606.

15.2.21. Tape speed is too fast:
(1) Defective capstan motor governor.
(2) Defective capstan motor generator.
(3) Lead wire of sensor is cut.
(4) Incorrect adjustment (semi-fixed VR).

15.2.22. Does not playback:
(1) Playback head is defective.
(2) Defective PB head amp. ass'y.
(3) Defective PB Dolby NR Ass'y.
(4) Defective DNL ass'y.
(5) Defective line amp. ass'y.
(6) Dirty PB head.
(7) Mute is not operating.
(8) Wire between playback head and 10P connector is cut.

15.2.23. Does not record:
(1) Defective record Eq. amp. ass'y.
(2) Defective record head.
(3) Defective record Dolby NR Ass'y.
(4) Bias oscillation is not generating.
(5) Defective Mic. amp. ass'y.
(6) Defective 19 kHz MPX filter.
(7) Incorrect tape travel.
(8) Either capstan or pressure roller is dirty.
(9) Dirty playback head.
(10) Remained only in mute.
(11) Cut lead wire between record head and 10P connector.
(12) Defective tape switch.

15.2.24. Bias does not oscillate:
(1) No voltage to bias oscillation circuit.
(2) Defective bias oscillation circuit.
(3) Defective erase head.

15.2.25. Does not erase:
(1) Defective erase head.
(2) Dirty erase head.
(3) Bias is not oscillating.
(4) Incorrect tape travel.

15.2.26. Level variations:
(1) Incorrect tape travel.
(2) Defective pressure roller.
(3) Variation of take-up torque.
(4) Defective erase head guide (including incorrect adjustment).
(5) Dirty capstan or pressure roller.
(6) Defective flywheel ass'y.
(7) Incorrect adjustment of pressure roller.
(8) Record head and playback head are out of correct alignment.
(9) Defective playback head.
(10) Defective record head.
(11) Incorrect adjustment of flywheel thrust screws.

15.2.27. Tape folds:
(1) Tape guide is in incorrect position.
(2) Pressure roller is not in the right position against capstan.
(3) Head mount base is bent.
(4) Dirty capstan.
(5) Defective pressure roller.
(6) Defective cassette tape (non-uniformity of magnetic surface).
(7) Defective cassette housing.

15.2.28. Unable to secure correct level while record/playback:
(1) Distorted.
(2) Defective record head.
(3) Defective playback head.
(4) Defective record eq. amp.
(5) Defective playback amp.
(6) Incorrect adjustment of playback head amp.
(7) Playback head and record head are not in correct alignment.
(8) Incorrect tape travel.

15.2.29. Great mechanical noise:
(1) Defective pressure roller.
(2) Defective ball drive mechanism.
(3) Defective capstan motor.
(4) Flywheel is defective.
(5) Defective counter.
(6) Defective reel motor.

15.2.30. Sound is distorted:
(1) Playback head is dirty.
(2) Record head is dirty.
(3) Head(s) is(are) magnetized.
(4) Record head is defective.
(5) Playback head is defective.
(6) Bias oscillator circuit is defective.
(7) Excessive high level at Record/Playback.

15.2.31. Signal to Noise ratio is deteriorated:
(1) PB Head is magnetized.
(2) Bias leakage.
(3) Excessive ripple from power source.
(4) Either PB head or Rec. Head is defective.
(5) Defective PB head amp. (Noise level is great).
(6) Defective record amp. (Noise level is great).

15.2.32. High frequency is deteriorated:
(1) Misalignment of Record head azimuth.
(2) Record head is dirty.
(3) Playback head is dirty.
(4) Defective Playback head.
(5) Defective Record head.
(6) Head(s) is(are) magnetized.
(7) Incorrect bias adjustment against tape.
(8) Defective 19 kHz MPX Filter.

15.2.33. Induction of Wow/flutter:
(1) Defective capstan belt.
(2) Defective flywheel ass'y.
(3) Defective capstan flange.
(4) Defective pressure roller ass'y.
(5) Defective capstan motor.
(6) Variation of take-up torque.
(7) Abnormality of back tension.
(8) Drive part(s) is(are) dirty.
(9) Slippage between pressure roller and tape.
(10) Defective ball drive mechanism ass'y.

15.2.34. Meters do not flutter:
(1) Meters themselves are defective.
(2) Defective meter amp.
(3) Tape is not played back.
(4) Neither being recorded nor monitored.
(5) Meter lead is shorted.
(6) Meter lead is cut.

15.2.35. No power transmission:
(1) Defective power cord.
(2) Defective power switch.
(3) Defective change-over plug and socket.
(4) Defective main transformer.
(5) Defective DC supply circuit.

15.2.36. Ineffective mute:
(1) No mute signal from logic board.
(2) Defective mute driver.
(3) Defective record eq. amp.
(4) Defective PB Head Amp..

15.2.37. No oscillation of 400 Hz:
(1) Defective oscillation circuit.
(2) Defective test tone switch.
(3) Shorted lead between test tone switch and main P.C.B. ass'y.
(4) Cut lead between test tone switch and main P.C.B. ass'y.

15.2.38. Tape speed is too slow:
(1) Defective capstan motor governor.
(2) Defective capstan motor.

15.2.39. Remained in mute mode:
(1) Continuous generation of mute signals from logic board.
(2) Defective mute driver.
(3) Defective record amp.
(4) Defective playback head amp.

15.2.40. Defective memory rewind:
(1) Defective tape counter.
(2) Defective memory switch.
(3) Defective driver of memory rewind.

15.2.41. No activation of tape counter:
(1) Defective tape counter.
(2) Defective counter belt.

15.2.42. Unsatisfactory sound at Dolby NR IN:
(1) Record/playback level is away from correct level (0 dB).
(2) Incorrect adjustment of Record Dolby NR.
(3) Incorrect adjustment of Playback Dolby NR.
(4) Incorrect bias adjustment against tape.
(5) Defective Record Dolby NR.
(6) Defective Playback Dolby NR.
(7) Incorrect playback gain (400 Hz level tape (DA09005A)).

15.2.43. Pneumatic damper ineffective:
(1) Defective pneumatic damper.
(2) Defective mechanism (heavy or does not work).
(3) Incorrect adjustment of damper.

16. SPECIFICATIONS

Power supply	100, 117, 220, 240 V AC 50/60 Hz
Power consumption	60 W Max.
Tape speed	1-7/8 ips ± 1%
Wow & flutter	less than 0.1% (DIN 45507 weighted peak) less than 0.05% Wrms
Frequency response	35 – 20,000 Hz ± 3 dB (Dolby NR in, SX or EXII tape)
Signal to Noise Ratio	better than 65 dB (Dolby NR in, Wrms, CCITT, 400 Hz, 3% distortion)
Total harmonic distortion	less than 1.5% (at 400 Hz, 0 dB)
Erasure	better than 60 dB (at 1 kHz, saturation level)
Channel separation	better than 35 dB (at 1 kHz, 0 dB)
Crosstalk	better than 60 dB (at 1 kHz, 0 dB)
Bias frequency	105 kHz
Input:	
Mic input	0.2 mV 10 kΩ
Blend mic	0.2 mV 10 kΩ
DIN mic input	0.2 mV 10 kΩ
Line	50 mV 50 kΩ
DIN Radio	5 mV 20 kΩ
Output:	
Line	1.0 V (Max.) variable
DIN line output	1.0 V (Max.) variable
Headphones	40 mW/8 Ω (1 kHz, 0 dB)
Transistors	156 pcs.
Diodes	78 pcs.
ICs	9 pcs.
Dimensions	20-11/16" (W) x 11-11/16" (H) x 8-5/8" (D)
Weight	38 lbs approx.

- Specifications and appearance design are subject to change for further improvement without notice.
- Dolby NR under license from Dolby Laboratories Inc.
- The word "DOLBY NR" and the Double-D-Symbol are trademarks of Dolby Laboratories Inc.

Service Manual

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