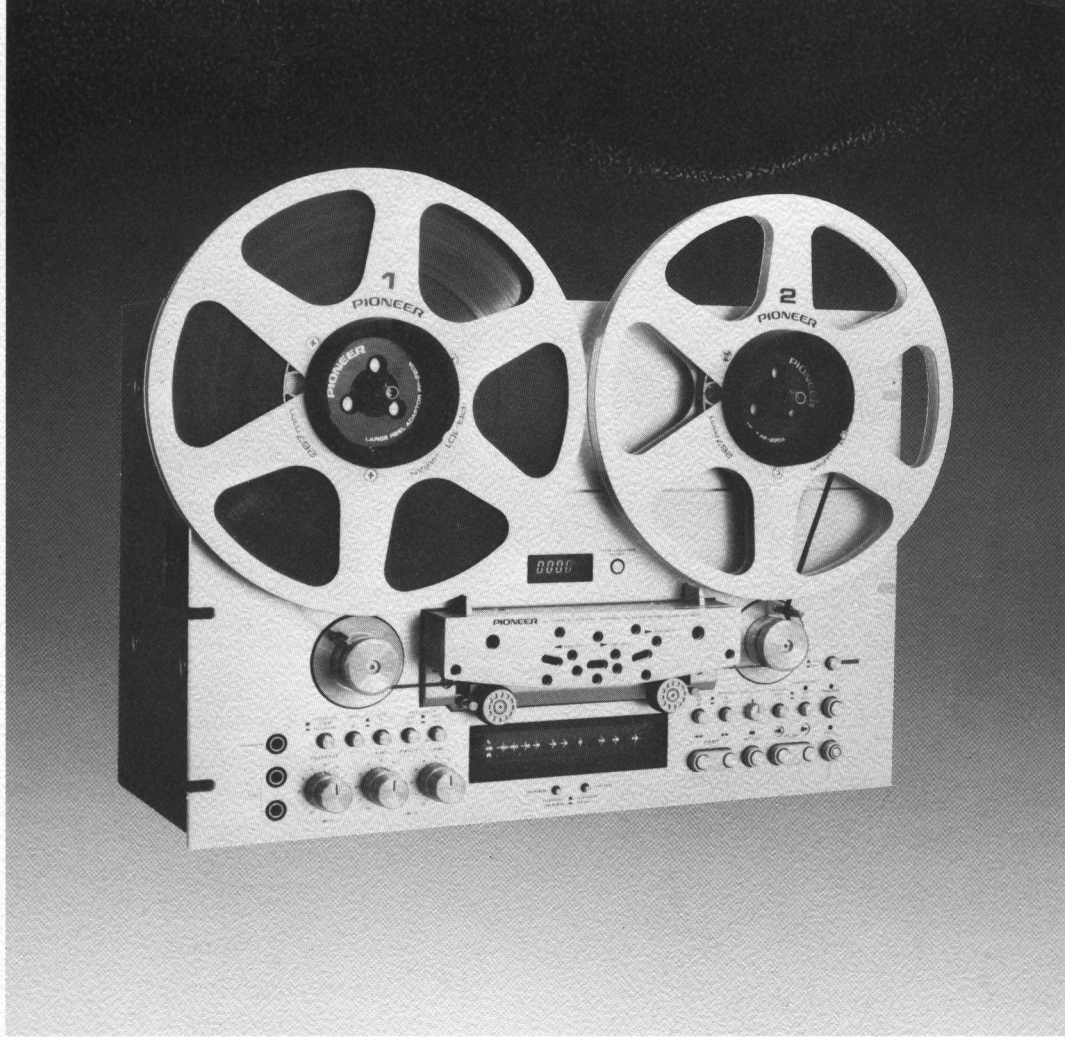




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Service Manual

3-MOTOR 4-HEAD
TAPE DECK
RT-909

MODEL RT-909 COMES IN TWO VERSIONS DISTINGUISHED AS FOLLOWS:

| Type | Voltage | Remarks |
|------|----------------------------------|---------------------|
| KU | 120V only | U.S.A. model |
| D/G | 120V, 220V and 240V (Switchable) | U.S. Military model |

This service manual is applicable to the RT-909/KU. When repairing the RT-909 D/G, please see the additional service manual.

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1. SPECIFICATIONS

| | |
|--|---|
| Type | 4-track, 2-channel stereo tape deck (Recording, forward playback with reverse playback) |
| Operation system | Solenoid drive, direct switchable function buttons and pre-set function buttons for timer recording and playback. |
| Heads | Hard permalloy recording head ; 1 Ferrite erasing head ; 1 Hard permalloy forward playback head ; 1 Hard permalloy reverse playback head ; 1 |
| Motors | Capstan drive motor ; 1 (FG Servo DC motor) Reel base drive motors ; 2 (6-pole inner-rotor special induction type) |
| Maximum Reel Size | 10-1/2-inch reel (26cm) |
| Tape Speed | 19cm/s (7-1/2ips), 9.5cm/s (3-3/4ips) ±0.6% |
| Fast Forward/Rewind Times | Less than 120sec. with 10-1/2-inch reel and 720m tape |
| Wow and Flutter | No more than 0.04% WRMS (19cm/s) No more than 0.08% WRMS (9.5cm/s) |
| Signal-to-Noise Ratio | More than 60dB |
| Total Harmonic Distortion | Less than 1% (19cm/s) |
| Frequency Response | 19cm/s 20Hz to 30,000Hz (20Hz to 28,000Hz ±3dB) 9.5cm/s 20Hz to 20,000Hz (20Hz to 18,000Hz ±3dB) |
| Crosstalk | More than 50dB |
| Channel Separation | More than 50dB |
| Erasing Coefficient | More than 60dB |
| Recording Bias Frequency | 125kHz |
| Equalization | NAB standards |
| Inputs (Sensitivity/Maximum allowable level/Input impedance) | MIC x 2; 0.316mV/100mV/27kΩ, 6mm diam. jacks (suitable microphone, 250Ω to 10kΩ) LINE x 2; 50mV/25V/50kΩ |
| Outputs (Reference level/Maximum level/Load impedance) | LINE x 2; 450mV/900mV/50kΩ, HEADPHONES x 1; 50mV/8Ω, 6mm diam. jack |
| Semiconductors | 123; transistors (4; FET's), 43; IC's, 111; diodes (including 5; LEDs and 6; zener diodes) 2; Photo Interrupters. |

Accessory Functions

- Automatic repeat play (Automatic reverse)
- Fluorescent display level meter with peak/average switch (−30dB to +8dB)
- 4-digit fluorescent tape counter
- Height-adjustable reel base
- Timer aid recording/playback device
- Pause switch
- Independent Bias/EQ selectors
- Pitch control (±6% only in playback mode)
- MIC/LINE mixing
- Add-on recording
- Independent Left/Right recording mode switches
- Output level control (clicked for reference level; Left/Right Coupled)

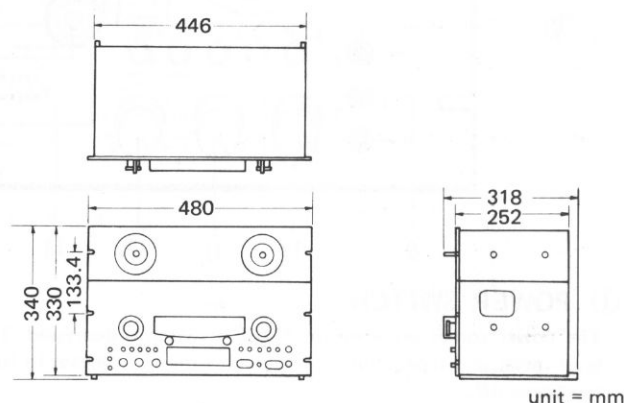
- Reel clamps
- Dimmer switch
- EIA rack mounting

| | |
|--------------------|--|
| Power Requirements | AC 120V 60Hz |
| Power Consumption | 166 watts, Max. (UL) |
| Dimensions | 480(W) x 340(H) x 318(D)mm 18-7/8 x 13-3/8 x 12-1/2in |
| Weight | Without package; 21kg/46lb 5oz With package; 25.5kg/56lb 4oz |
| Accessories | <ul style="list-style-type: none"> • 10in metal reel (Pioneer PR-101) x 1 • 10-1/2in reel adapters x 2 [PP-220] • Connecting cord with pin plugs x 2 • Head cleaning swabs x 3 • Sensing tape x 1 • Splicing tape x 1 • Operating instructions x 1 • Blank panel x 1 |

Note:

Specifications and the design subject to possible modification without notice due to improvements.

Dimensions

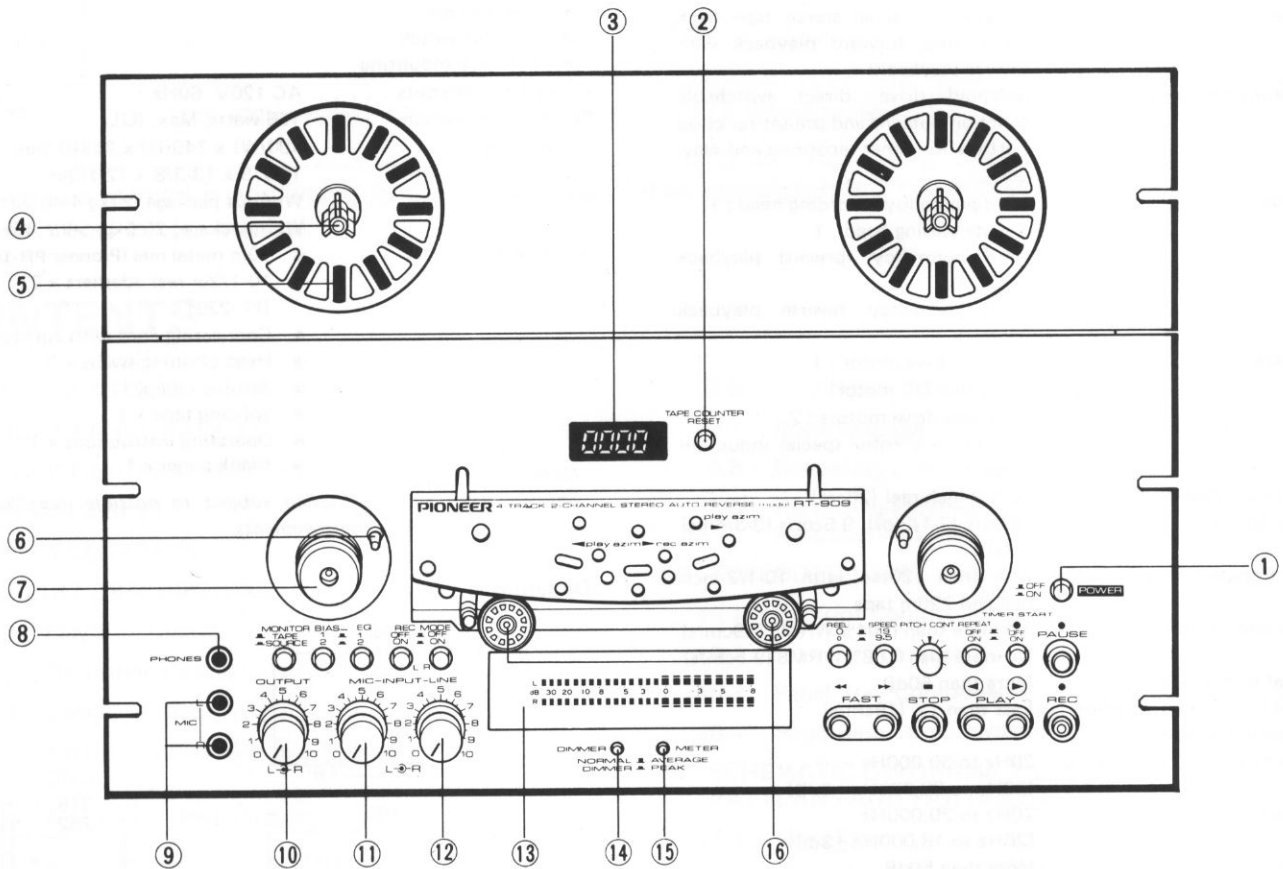


unit = mm

Test Conditions:

1. Reference tape: Scotch #206
2. Reference recording level: meter 0dB level (NAB standard reference level)
3. Reference signal: 1,000Hz
4. Wow & Flutter: at 3,000Hz weighted RMS
5. Frequency response: measured at −20dB level (19cm/s)
6. Signal-to-Noise ratio: measured at the signal level where 3rd harmonic distortion is 3%, and noise level is corrected by A curve.
7. Total Harmonic Distortion: measured at reference recording level
8. Channel separation: measured at reference recording level
9. Channel crosstalk: measured at 0dB level (reference recording level)
10. Sensitivity: Input level (mV) for reference recording measured with input (recording) level control set at maximum position.
11. Maximum allowable input level: measured at the point where the output signal wave is clipped while gradually turning the input control.
12. Reference output level: meter 0dB level.
13. Maximum output (playback) level: Output level to reference recording level, measured with output (playback) level control set at maximum position.

2. FRONT PANEL FACILITIES



① POWER SWITCH

The power comes on when the POWER switch is depressed. The level meter and tape counter, will then come on. Release to turn the power off.

② COUNTER RESET BUTTON

Push this button to reset the tape counter to "0000."

③ TAPE COUNTER

This indicates how much tape has been recorded or played back and how much there is left over.

④ REEL CLAMPER

⑤ REEL BASE

⑥ TENSION ARM

Push down the arm and lock it while threading the tape. Release the lock after the tape has been threaded.

⑦ GUIDE ROLLER

⑧ HEADPHONE JACK

Plug your stereo headphones into this jack to hear the sound from the signals selected by the MONITOR switch. Use headphones to monitor a recording or listen to a performance directly taped from the RT-909. The output level of the headphones can be adjusted by the OUTPUT level controls.

NOTES:

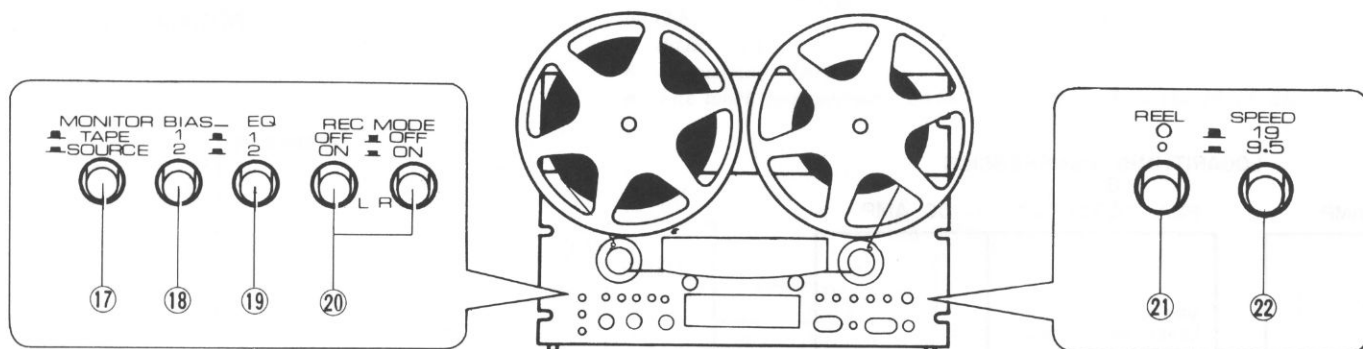
- Please use low impedance-type headphones. If you use high impedance-type headphones, you may not obtain sufficient volume.
- Do not connect a microphone to this jack, as the microphone may be damaged.

⑨ MIC JACKS (L, R)

These are the input jacks for microphone recording. The L (left) and R (right) channels can be used independently. As long as the microphones have a standard 6mm diameter plug, you can use either a low impedance (600-ohms) or high impedance (10 — 50 kohms) type.

⑩ OUTPUT CONTROLS

Use these controls to adjust the output signal level. Turning the controls to the right increases the level. The controls are coupled when turned but it is also possible to adjust the right channel (outer) and the left channel (inner) independently. When playing back a reference tape, a reference playback level (0dB) is obtained with these controls set to the center click stop position.



⑪ MIC-INPUT (RECORDING LEVEL) CONTROLS

Use these controls to adjust the recording level when you are recording with a microphone (or microphones). Use the inner control for the left channel and the outer control for the right channel.

⑫ LINE-INPUT (RECORDING LEVEL) CONTROLS

These controls adjust the recording input level from the LINE INPUT terminals on the rear panel. The level increases as the controls are turned to the right. The inner control is for the left channel and the outer control for the right channel.

⑬ FL METER

This indicates the input level during recording and the output level during playback.

By operating the METER switches, it can be made to function as a peak meter, or as a (AVERAGE) meter.

The input signal level is indicated when the MONITOR switch has been depressed, and the playback output level is indicated when the MONITOR switch has been released.

⑭ DIMMER SWITCH

Use this switch to select the brightness of the level meters and tape counter.

NORMAL (■): When using the tape deck in daylight or other bright locations.

DIMMER (▲): At night or in dark locations when the existing brightness is too high.

⑮ METER SWITCH

AVERAGE (■): When the switch is released to AVERAGE, the meter functions as an ordinary level meter.

PEAK (▲): When this switch is depressed to PEAK, the meter functions as a peak meter.

⑯ PINCH ROLLER

⑰ MONITOR SWITCH

This switch is used to select the output signal which is made available at the output and headphone jacks. Since the indication of the level meter can be switched over at the same time, always make it a rule to depress this switch when adjusting the recording level (set to SOURCE position).

For playback: Set the switch to the released (TAPE) position. If it is set to the depressed (SOURCE) position, you will not be able to hear the playback sound.

For recording: Set the switch to the released (TAPE) position and you will then be able to hear the signals (playback sound) immediately after you have recorded the sound source.

If the switch is set to the depressed (SOURCE) position, you will be able to hear the signals (recording input) immediately before you record the sound source.

⑱ BIAS SWITCH

This selects the recording bias current according to the type of tape used for recording. Push for 2; released for 1.

1: For standard tapes.

2: For low noise and high output tapes.

⑲ EQ SWITCH

This selects the recording equalization characteristics according to the type of tape used. Push for 2; released for 1.

1: For standard tapes.

2: For low noise and high output tapes.

⑳ REC MODE SWITCHES (L, R)

Make absolutely sure that these switches are depressed and set to ON for recording.

L: For recording on the left (L) channel.

R: For recording on the right (R) channel.

Depress both switches (L and R) for stereo recording. Do not select these switches during actual recording.

㉑ REEL SIZE SELECTOR

Set this selector to the corresponding to the size (diameter) of the reel being used.

○ mark: Set the switch to the depressed position when using a 7-inch (17cm) reel.

○ mark: Set the switch to the released position when using a 10-inch (26cm) reel.

NOTES:

• Always use two reels of the same size.

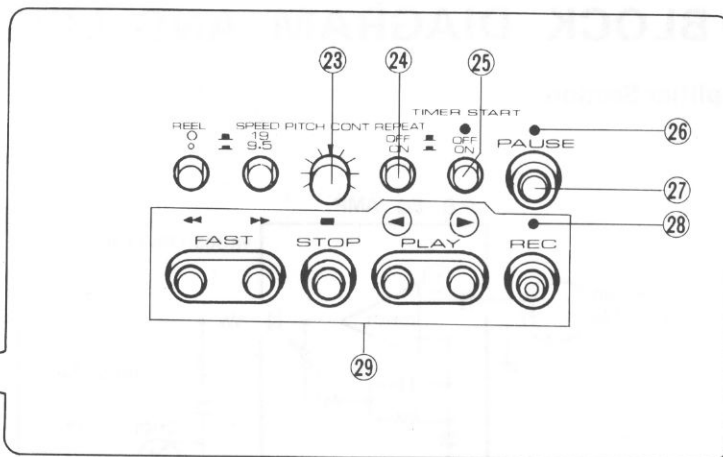
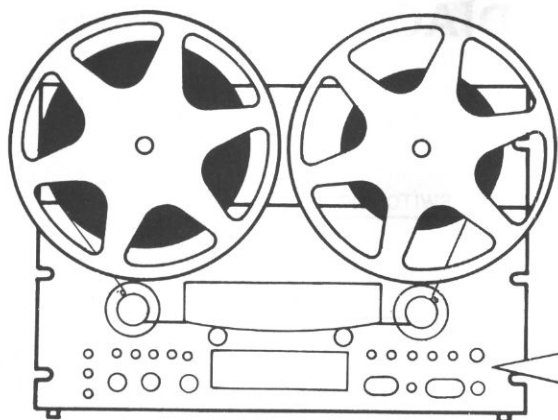
• Do not use reels with a diameter of 5 inches (12cm) or less.

㉒ SPEED SWITCH

This switch selects the tape speed. Push for a 9.5cm/s speed; release for a 19cm/s speed (released position).

■ 19cm/s: Used for recording music programs, etc.

▲ 9.5cm/s: Used for recording lengthy conversations, etc.



23 PITCH CONTROL KNOB

You can use this to make the tape travel 6% faster or slower than the normal tape speed during playback. When set to the central position (▼), the tape speed is 19cm/s or 9.5cm/s (standard values). Turn the control to the left and the speed drops and the musical steps are lowered; conversely, turn it to the right, and the speed rises and the musical steps are raised. This control cannot be used during recording.

24 REPEAT BUTTON

This button allows you to reverse the tape forward for reverse playback automatically. If you remember to work the tape counter and REPEAT button, then the tape will automatically be reversed and the tape deck will be set to forward playback when the "0000" display on the tape counter gives way to "9999" during reverse playback. Be sure to release this button when you do not require repeated playback.

25 TIMER START SWITCH

When unattended recording or wake-up playing back a tape with the help of a timer, depress this switch and then select the REC MODE switches as in the table below. When this switch is set to ON, the green indicator will come on. The TIMER START switch works only when the tape is traveling in a forward direction.

| Application | TIMER START switch | REC MODE switch |
|--------------------------|--------------------|-------------------------|
| For unattended recording | Depress to ON. | Depress L and R to ON. |
| For wake-up playback | Depress to ON. | Release L and R to OFF. |

26 PAUSE INDICATOR

This green lamp lights up when the PAUSE button is pressed to indicate the tape has stopped temporarily.

27 PAUSE BUTTON

Depress this button to stop the tape temporarily during recording and playback. Once the button is depressed, the green indicator lights up to indicate that the deck is now set to the pause mode. Depress the button again to allow the tape to resume traveling. This button does not work in the fast forward and rewind modes.

When the fast forward (▶▶) or rewind (◀◀) button is depressed from the tape playback (forward or reverse) pause mode, the pause function is released and the tape is set to the fast forward or the rewind mode.

The pause mode can also be released with the STOP button.

28 RECORDING INDICATOR (REC)

This red lamp lights up during recording. Check that it has lit up before recording.

29 FUNCTION BUTTONS

◀◀ (REW): Depress this button to rewind the tape. (The tape will travel at high speed from right to left.)

▶▶ (FF): Depress this button to send the tape forward at top speed. (The tape will travel from left to right).

PLAY: Depress the forward (▶) or reverse (◀) PLAY button to play back (forward playback or reverse playback) or record the tape. When this button is depressed, the lamp lights up to indicate the direction of the tape.

▶ Forward playback: The tape travels from left to right.

◀ Reverse playback: The tape travels from right to left.

REC: Depress the REC button and the forward (▶) PLAY button for tape recordings (and the tape travels from left to right).

If the reverse (◀) PLAY button is depressed during recording while the tape is traveling in the forward direction, the recording mode will be released and the deck is set to the reverse playback mode.

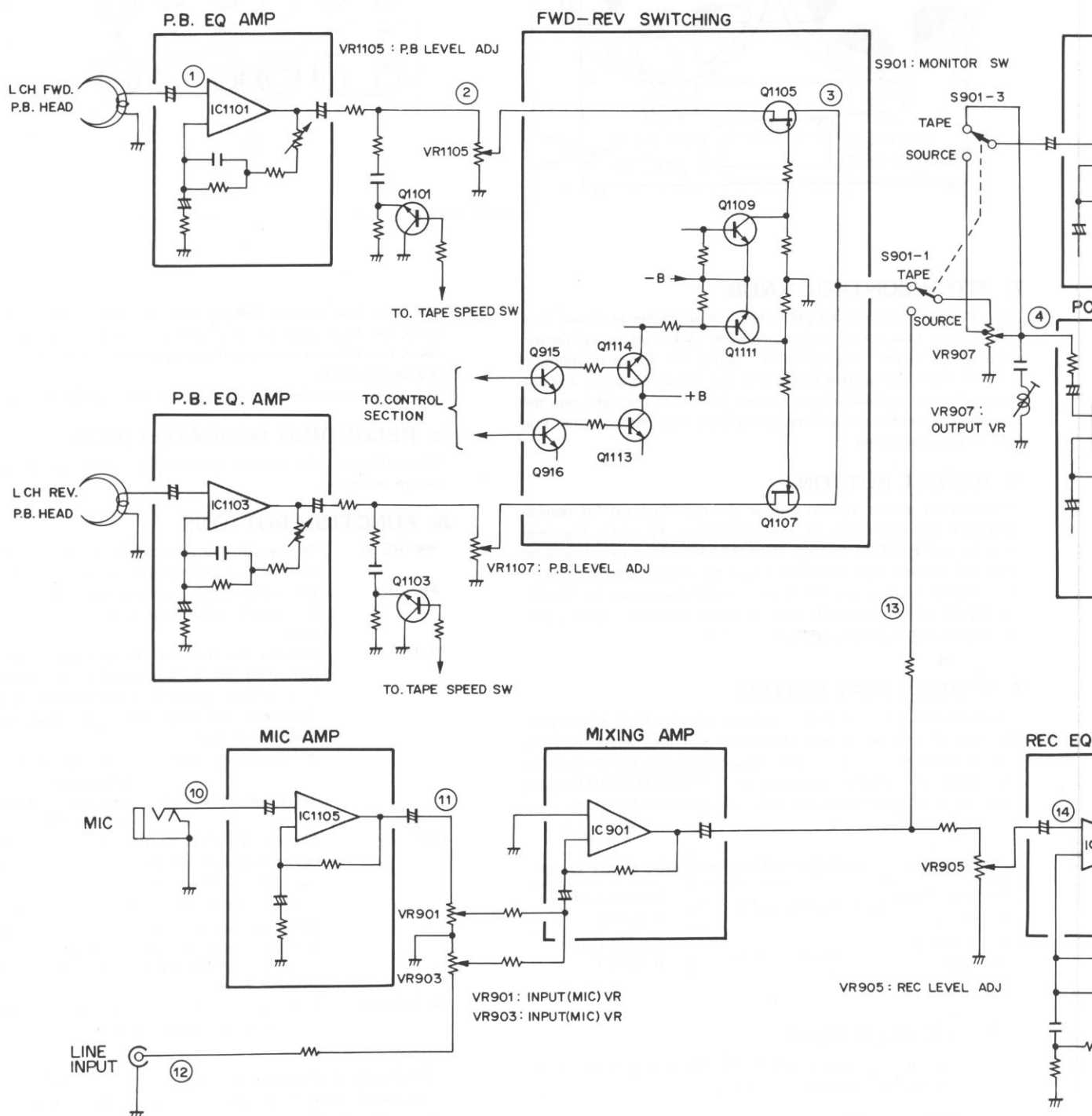
■ (STOP): Depress this button to stop the tape run and to release the operating buttons.

NOTE:

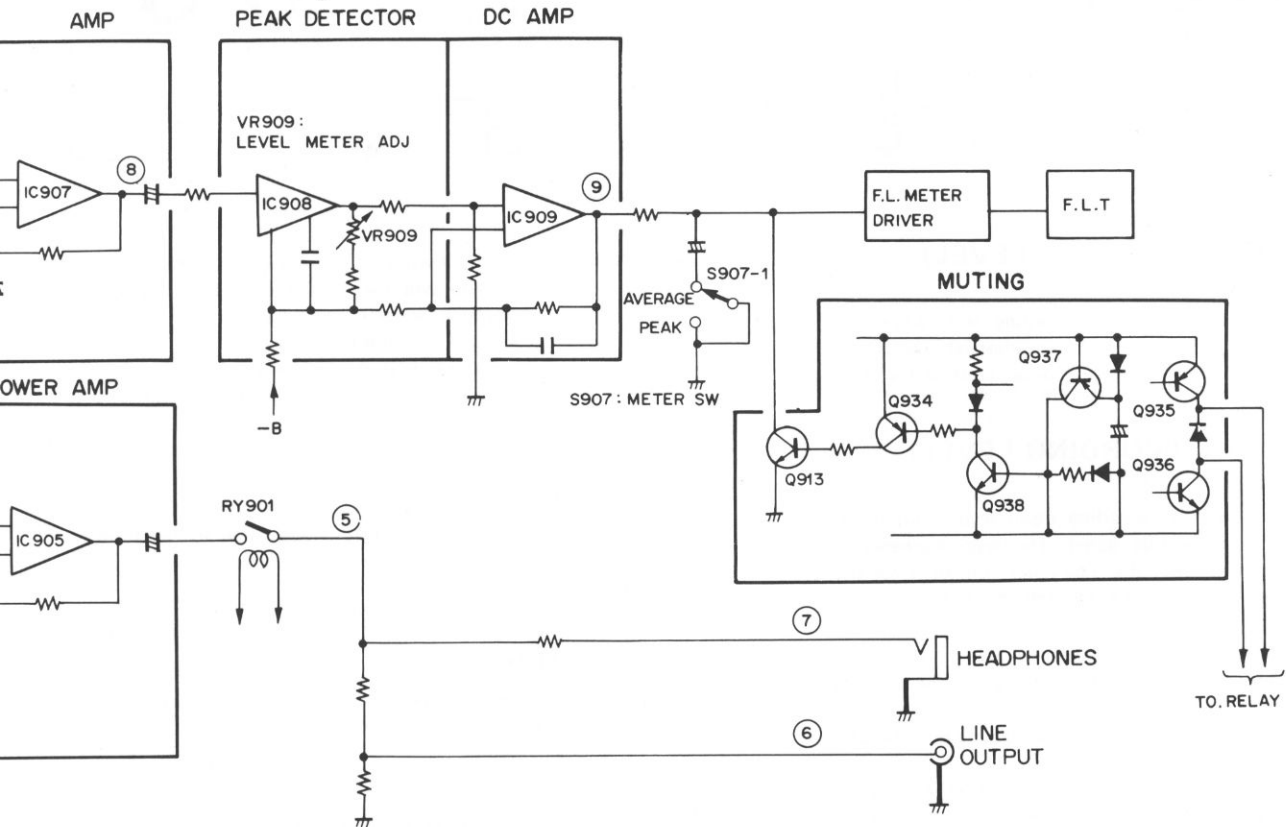
- When the shut-off switch which is coupled to the tension arm is at OFF, none of the function button indicators come on.
- All the operating buttons are released (OFF) to stop mode when the POWER switch is turned OFF.
- The tape deck will be forward mode when the POWER switch is re-depressed to the ON position.
- There is no need to press the (■) stop button if you want to change over from one function to another.

3. BLOCK DIAGRAM AND LEVEL DIAGRAM

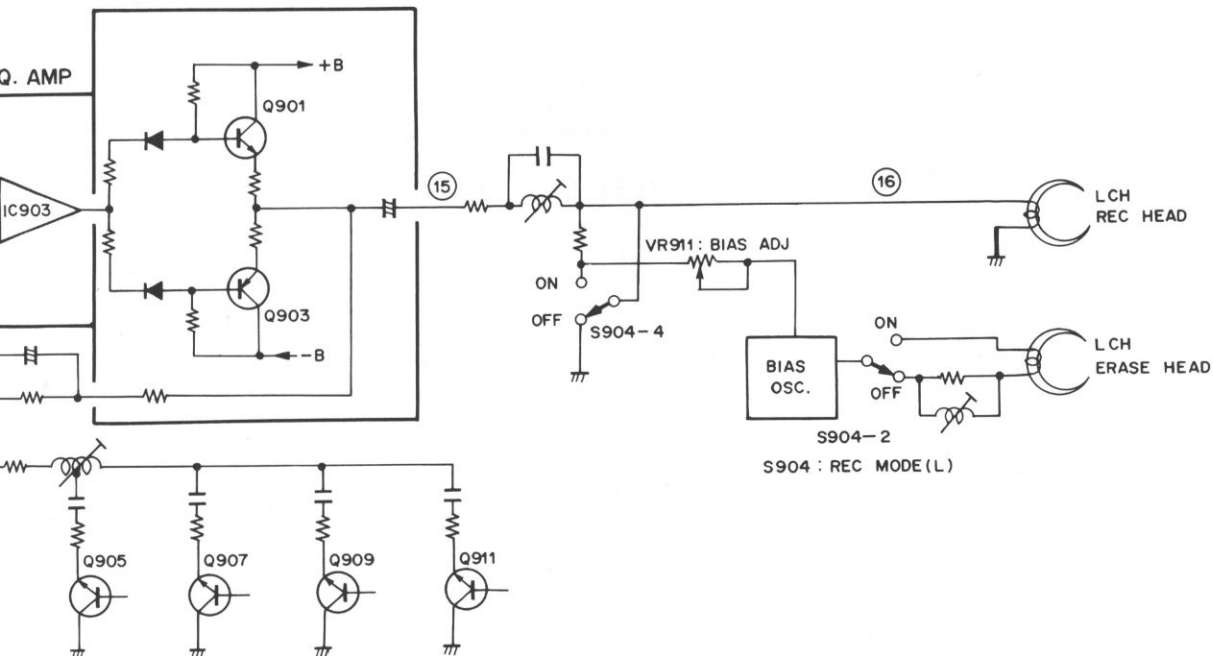
Amplifier Section



LOGARITHMIC COMPRESSION



BOOSTER

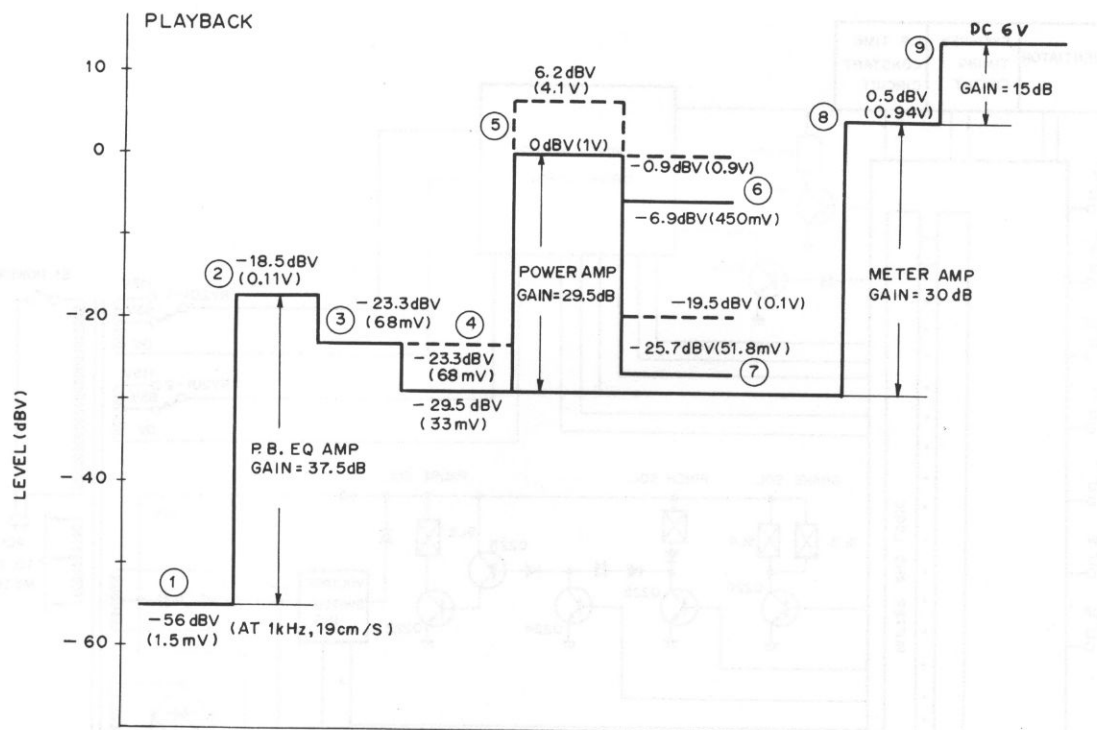


LEVEL DIAGRAM

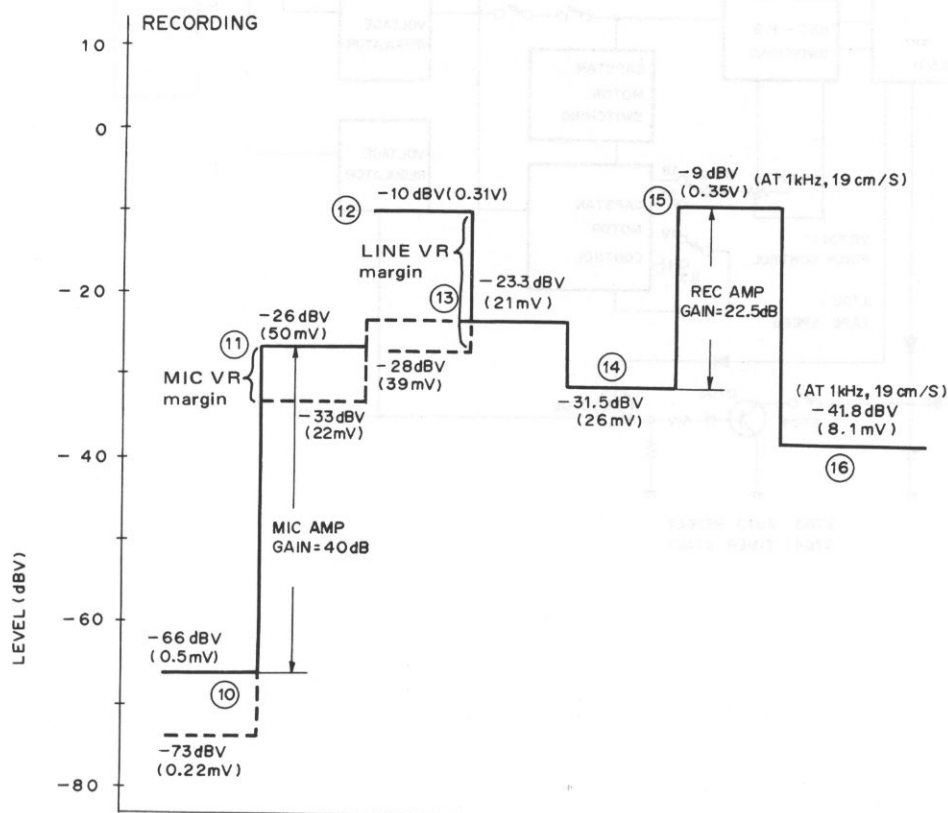
Playback

NOTES:

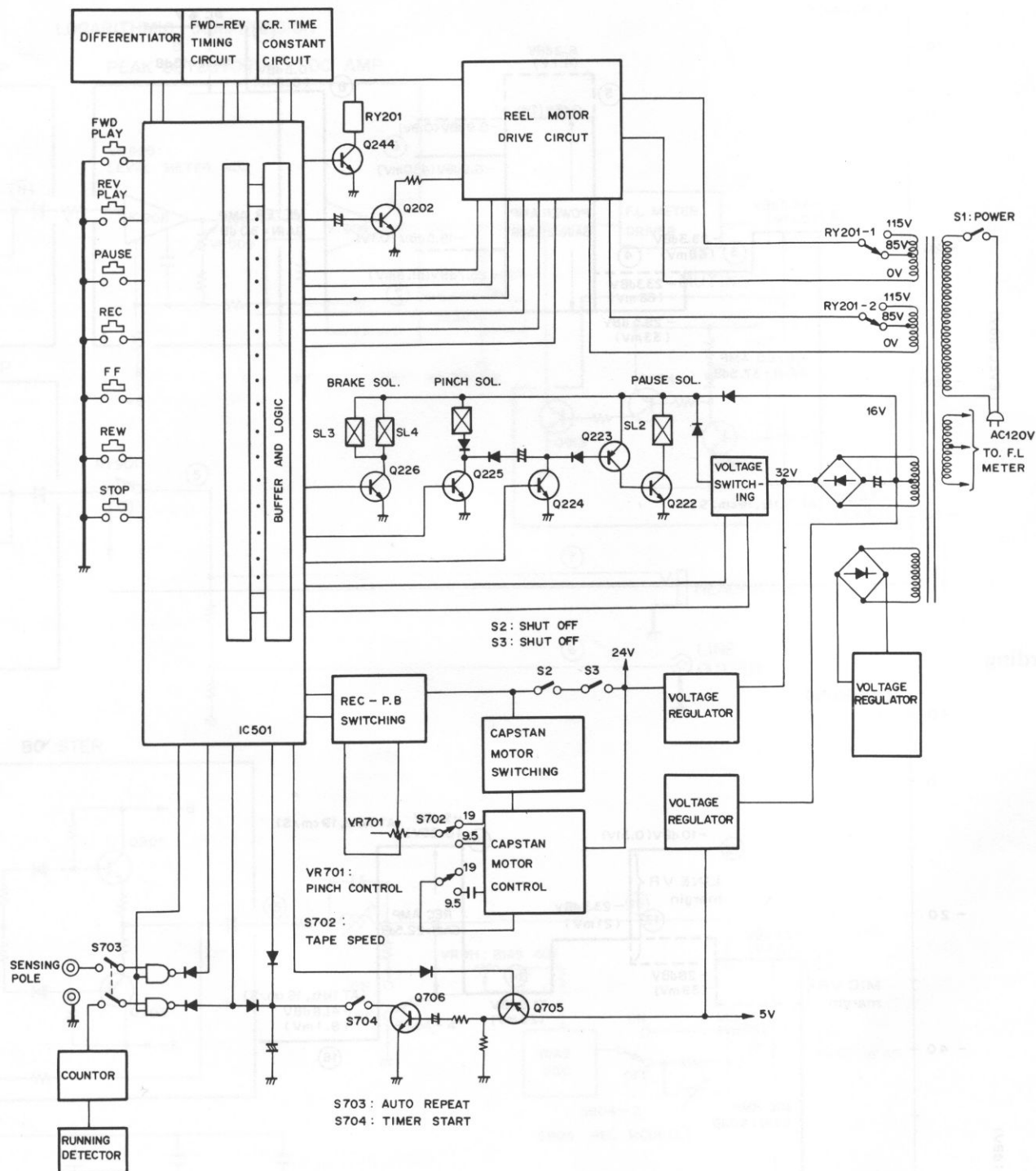
- $0\text{dBv} = 1\text{V}$
- Frequency: 1kHz
- The level measurement points are indicated on the block diagram.



Recording



Control Section



4. DISASSEMBLY

Bonnet

Remove screws ①

Front Panels

1. Remove knob A, B assembly, and the pitch control knob.
2. Remove screws ② to remove the upper front panel.
3. Remove screws ③ and ④ to remove the lower front panel.

Head Base

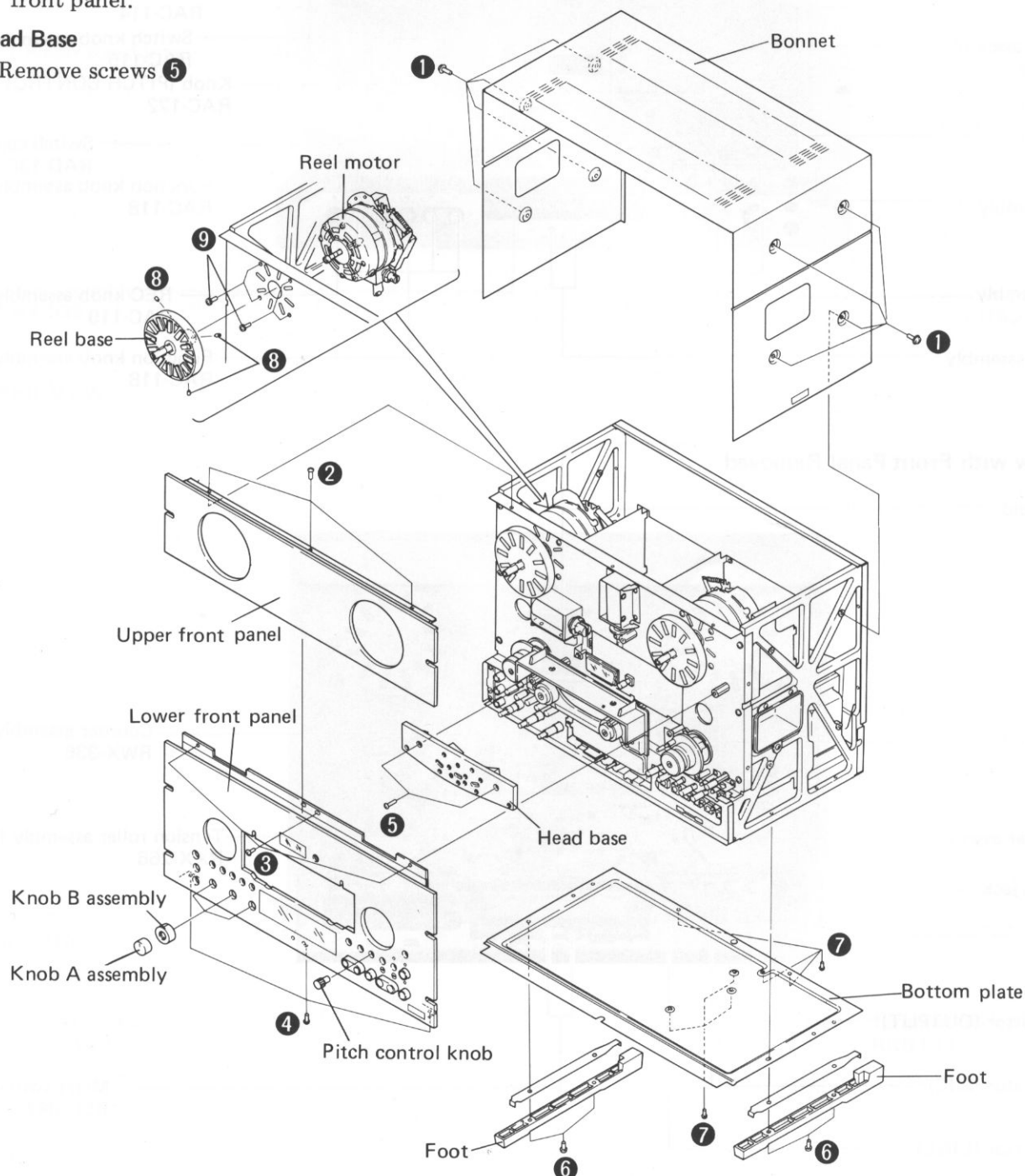
Remove screws ⑤

Foot and Bottom Plate

1. Remove screws ⑥ to remove the foot.
2. Remove screws ⑦ to remove the bottom plate.

Reel Motor

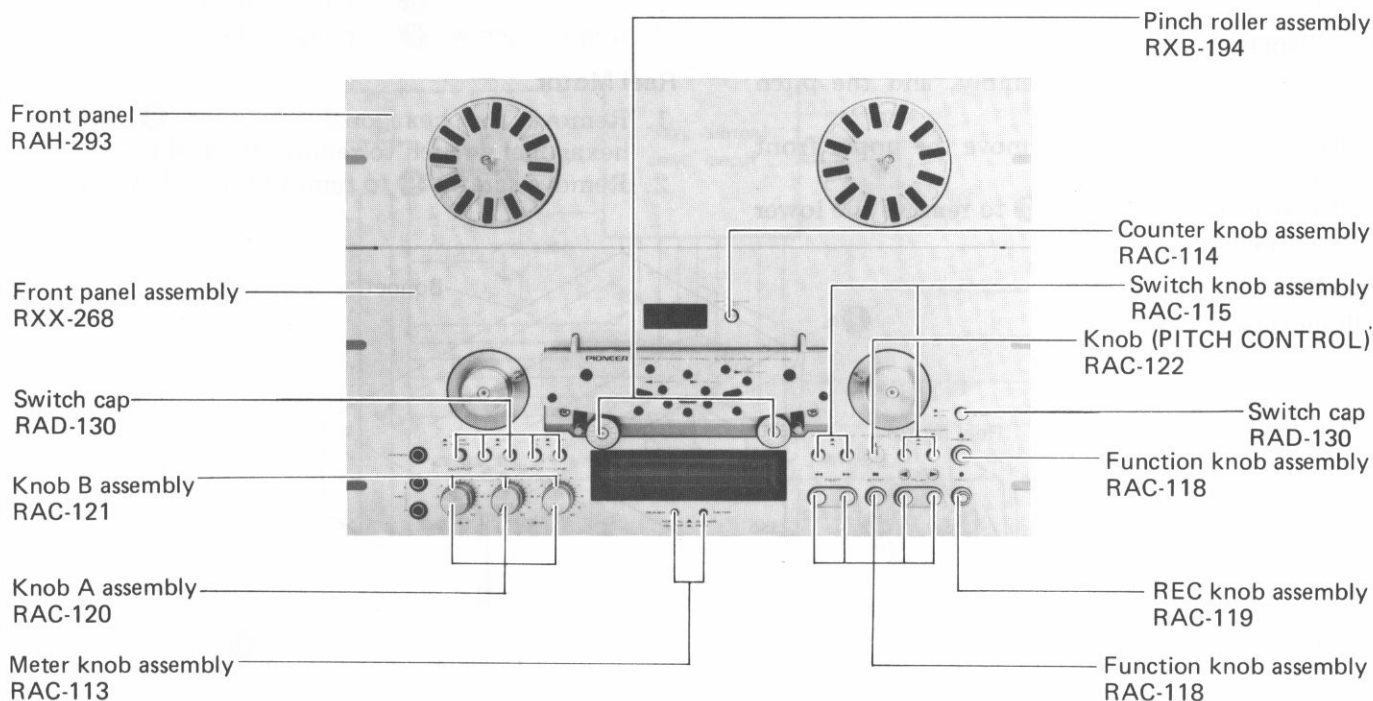
1. Remove the hexagonal setscrews ⑧ with a hexagonal wrench to remove the reel base.
2. Remove screws ⑨ to remove the reel motor.



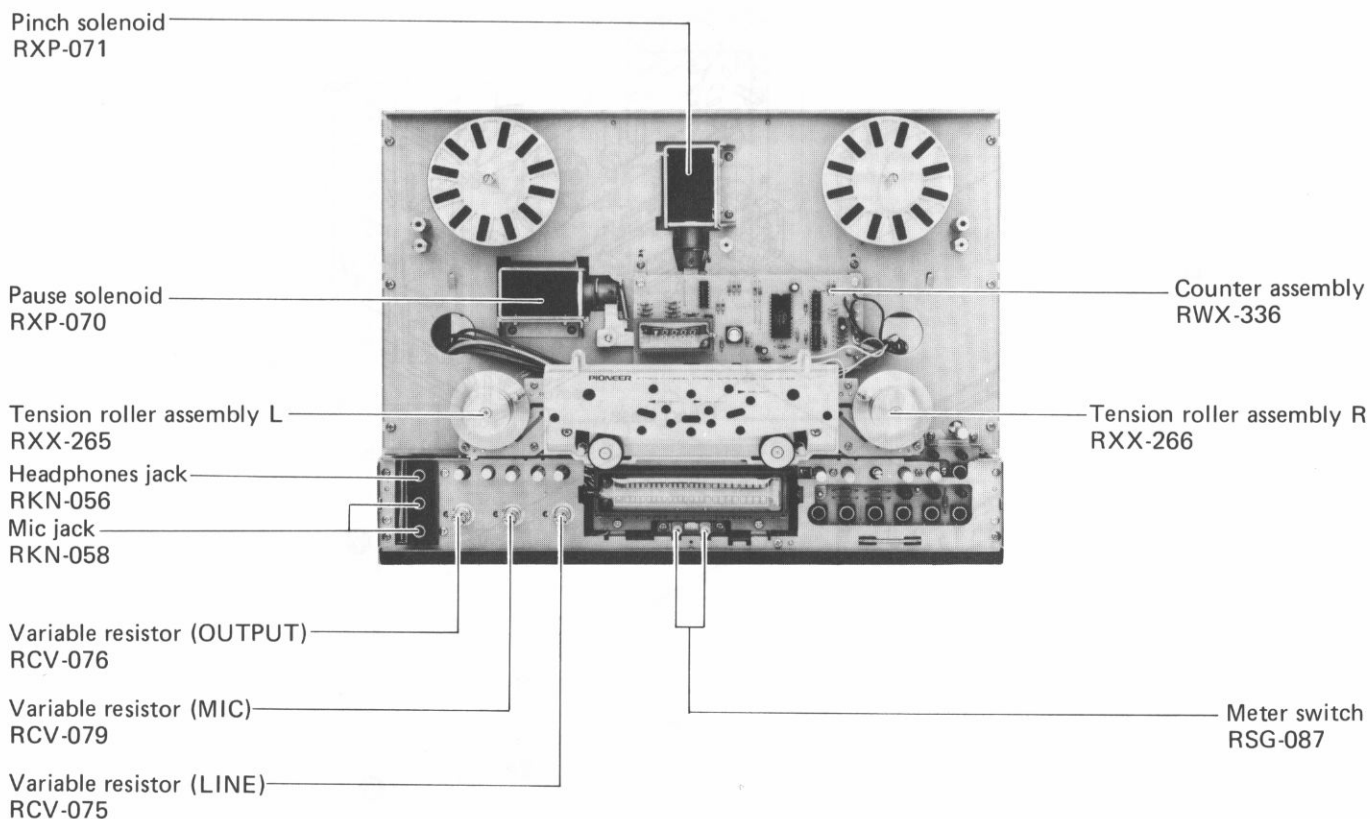
5. PARTS LOCATION

Front Panel View

- The Δ mark found on some component parts indicates the importance of the safety factor of the part. Therefore, when replacing, be sure to use parts of identical designation.

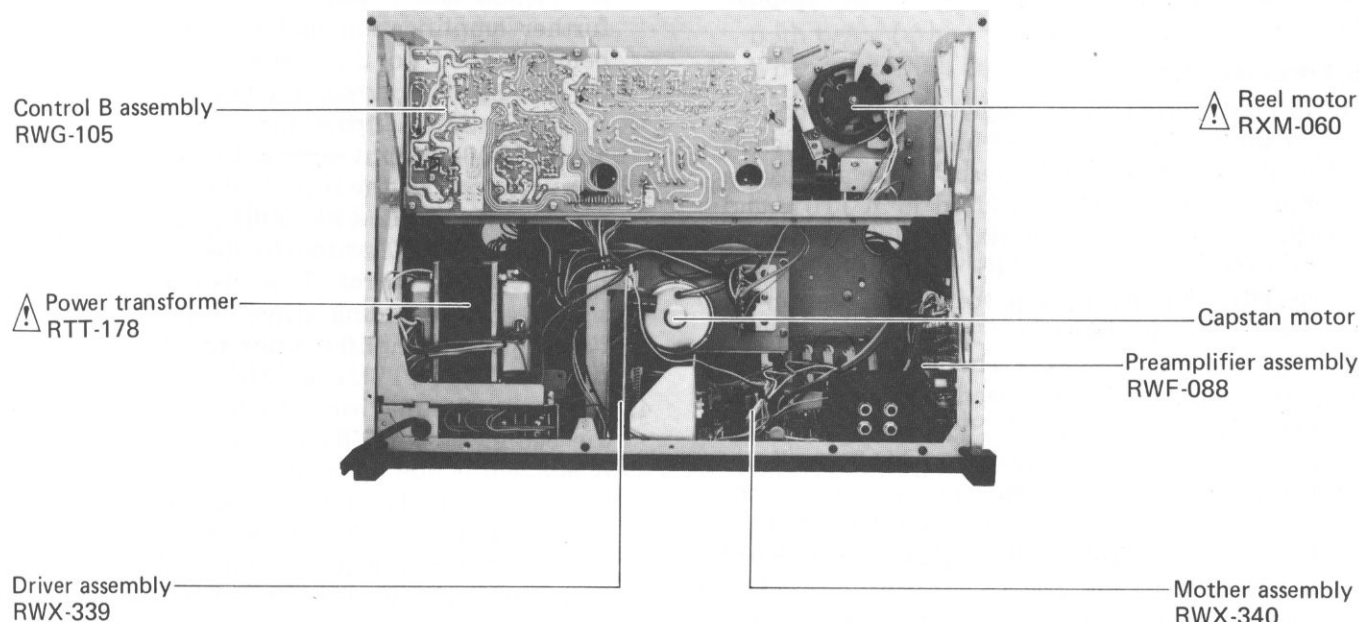


Front View with Front Panel Removed

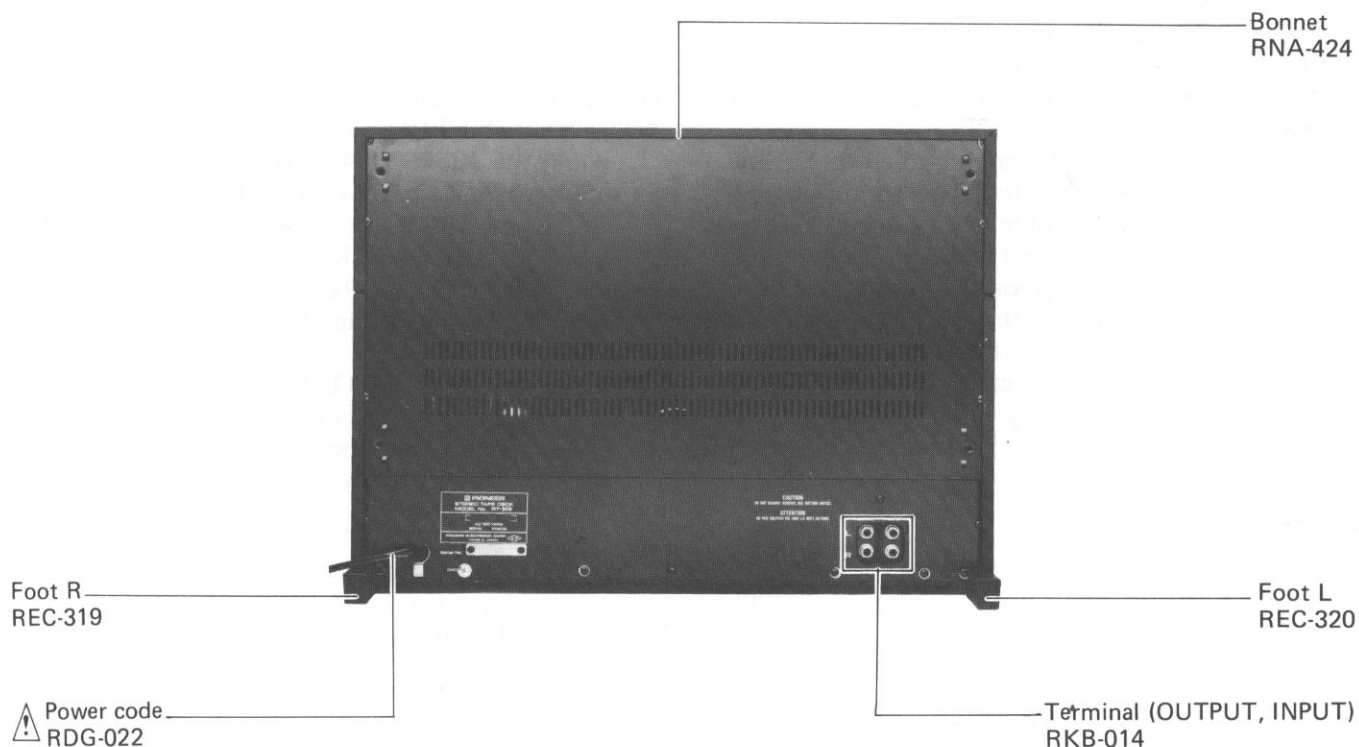


Rear View with Rear Panel Removed

• Parts without part number cannot be supplied.



Rear View



6. CIRCUIT DESCRIPTIONS

Refer to the block diagram on page 7 for an outline of the signal amplifier section circuit composition.

6.1 PLAYBACK CIRCUIT

1. In play mode (FWD) magnetic signals recorded on the tape are converted into electrical signals in the FWD playback head. These signals are then amplified and equalized in IC1101, and the IC output passed via equalizer elements (VR1101, R1115, C1118 and R1109) in a negative feedback loop for compensation of playback characteristics.
2. The different playback characteristics at different tape transport speeds are switched by Q1101. When the TAPE SPEED switch S702 is in the 9.5cm/s position, Q1101 will be turned off, and the high frequency time constant of the NFB loop (VR1101, R1115, C1118 and R1109) will be 90 μ s. When S702 is switched to the 19cm/s position, Q1101 is turned on for a high frequency time constant of 50 μ s.
- 3 The equalized playback signal is then passed via VR1105 — Q1105 (Q1105 described later) and the S901 MONITOR switch to the OUTPUT volume control VR907. This signal is finally passed to the power amplifier stage in IC905 before being applied to the LINE OUTPUT and HEADPHONES.
4. Part of the playback signal applied to VR907 is passed on to IC907 where it is amplified, and then on to IC908 where it is subject to logarithmic compression and peak level detection. The signal is further passed to a DC amplifier stage in IC909 and to the FL meter drive circuit used to average out the playback signal with peak levels detected by IC909, and opened and closed by the S907 METER switch. Q913 is the muting transistor employed when the power switch is turned on and off.

6.2 RECORDING CIRCUIT

1. The MIC input is first amplified by IC1105 and applied to the VR901 MIC level volume control. The LINE input is passed via R901 to the LINE volume control VR903. These signals are then applied to IC901 for mixing and inversion amplification. (With this inversion amplifier stage, the mixing process is free of any mutual interference from volume control operation. For example, when the MIC level volume control is moved while the LINE volume control remains fixed, there is no effect on the LINE input signal whatsoever).

2. This amplified recording signal is then applied to VR905 and IC903 where it is subject to further amplification and equalization before being applied to the recording head via the R935 constant current resistor and the C969, L903 bias trap. Furthermore, Q901 and Q903 at the IC903 output serve as the booster amplifier used to drive the recording head.
3. The signal amplified by Q901 is passed via the S901 MONITOR switch to the VR907 OUTPUT volume control. Then like the playback signal, this recording signal is passed to the IC905 power amplifier prior to being applied to the LINE OUTPUT and HEADPHONES.
4. Again like the playback signal, the signal from the center tap of VR907 is passed via IC907, IC908 and IC909 to the FL meter drive circuit.
5. Hence, in the RT-909, line output and headphones output levels may be both controlled by the OUTPUT volume control. When S901 is in the TAPE position, the line output and headphones output levels are coupled to the FL meter, while in the SOURCE position, the FL meter display is fixed irregardless of the OUTPUT volume control position.

6.3 OSCILLATOR CIRCUIT

The RT-909 has been equipped with a constant voltage type oscillator in order to ensure greater bias current stability (see Fig. 6-1).

1. When the IC506 (1/4 — 4) in the control stage (control A ass'y) is switched to low (L) level, Q501 and Q918 are both turned on. If either (or both) of the REC MODE switches S904 and S905 are on, Q917 will also be turned on, resulting in the application of B+ (15V) to the bias oscillator.
2. However, since B- (15V) is normally applied to the oscillator circuit, the oscillator output only appears after a passage of time determined by the R1009/C975 time constant when B+ (15V) is applied.
3. Hence, the output voltage is controlled by Q912 — Q920 — Q919 depending on the difference between the feedback voltage from the C979, R1015, D907, R1013, R1011 and VR913 feedback circuit, and the ZD901 reference voltage, thereby achieving a constant voltage.
4. Once Q917 is turned on, B+ (15V) is applied to Q502 via D921 and R537, thereby turning this transistor on to light up the REC indicator lamp LED601. The Q502 transistor is used to prevent the LED lamp lighting up by mistake

when difference occur upon the rise and fall in the operational control power line B (5V) and signal power line B+ (15V).

6.4 FWD – REV PLAYBACK SIGNAL SWITCHING CIRCUIT

See Fig. 6-2.

1. During FWD play mode, IC505 (3/4) is switched to H level, so Q915 is turned on, and the corresponding current subjected to impedance conversion at Q1114. Q1111 is thereby turned on, and Q1107 turned off.
2. With Q1111 on and Q1107 off, the REV playback amplifier signal is blocked. And since IC505 (4/4) is switched to L level, Q1109 will be turned off, and Q1105 turned on (due to

the zero gate bias), resulting in the FWD playback amplifier signal being passed via Q1105 to the MONITOR switch. During either stop or rewind modes, IC505 (3/4), (4/4) are switched to H level, resulting in Q1105 and Q1107 both being turned off for playback muting.

3. When switching from FWD to REV playback, IC505 (3/4) is switched from H to L level, while IC505 (4/4) is switched from L to H level, resulting in a charge current from the Q1113 emitter being applied to C1147 and C1148, and Q1109 and Q1111 being turned on while Q1105 and Q1107 are turned off. The signals from the FWD and REV playback amplifiers are thereby muted.

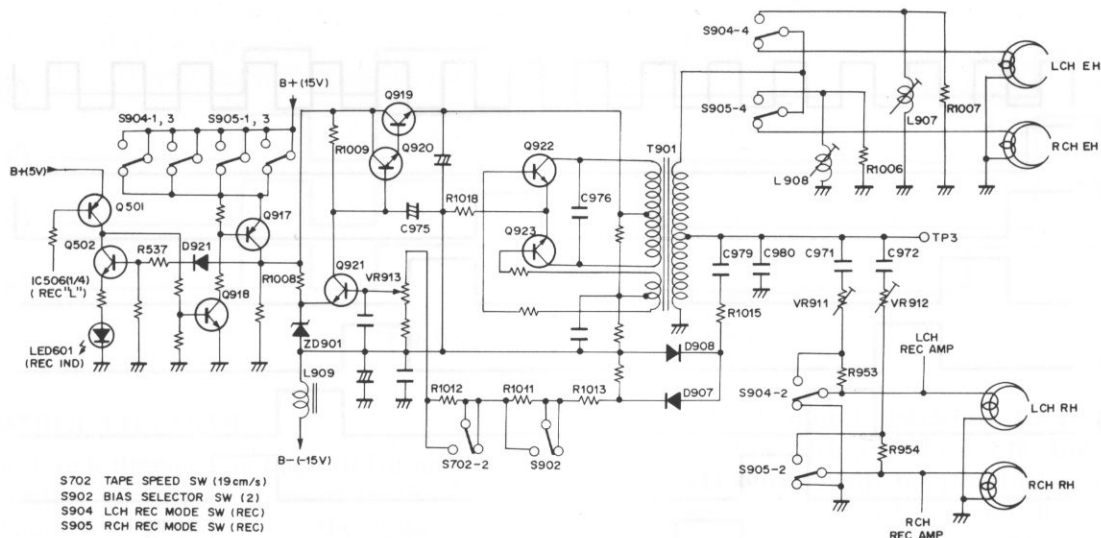


Fig. 6-1 Oscillator circuit

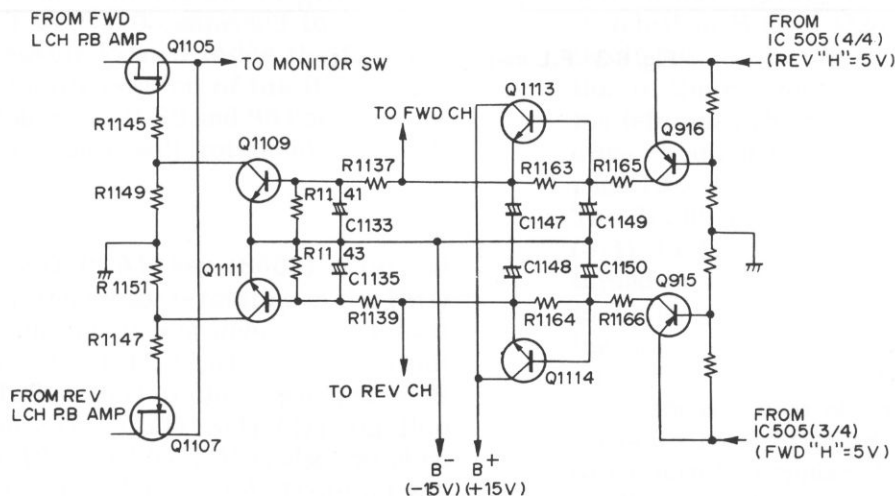


Fig. 6-2 FWD-REW Playback signal switch circuit

6.5 FL METER DRIVE CIRCUIT

Refer to the drive ass'y circuit on page 67.

1. The FL meter employed in the RT-909 is a dynamic lighting type. Clock pulses (approx. 3kHz) prepared by the IC801 (1/6 — 3/6) multivibrator are subsequently divided by 8 in the IC801 octonary Johnson counter.
2. These divided clock pulses are then transferred as output signals from the T0 ~ T7 output terminals (see Fig. 6-3), and used in the generation of time shared reference voltages at points (A), (B), (C) and (D). These reference voltages are then compared with the IC909 output signals (level meter drive analog signals) at IC804 (IC805 for the right channel) where the analog/digital conversion is performed. The FL

meter segments (anode) are then driven via the open-drain type high-resistivity IC806 and IC807. And when the FL meter grid is driven by means of the 6 output pulses T1 — T4, T5 — T7 (and thereby switching both segments and grid to H level), the signal level is also activated when the segments are illuminated.

3. The relation between the reference voltage pulses and the grid pulses is outlined in Fig. 6-0. The reference voltages prepared by the T1 — T6 pulses synchronized with the grid drive pulses, vary in regular order from high to low voltage levels. The reason for not applying the T0 and T4 pulses to the grid is to eliminate segment blurring due to delay of the analog/digital converted signals.

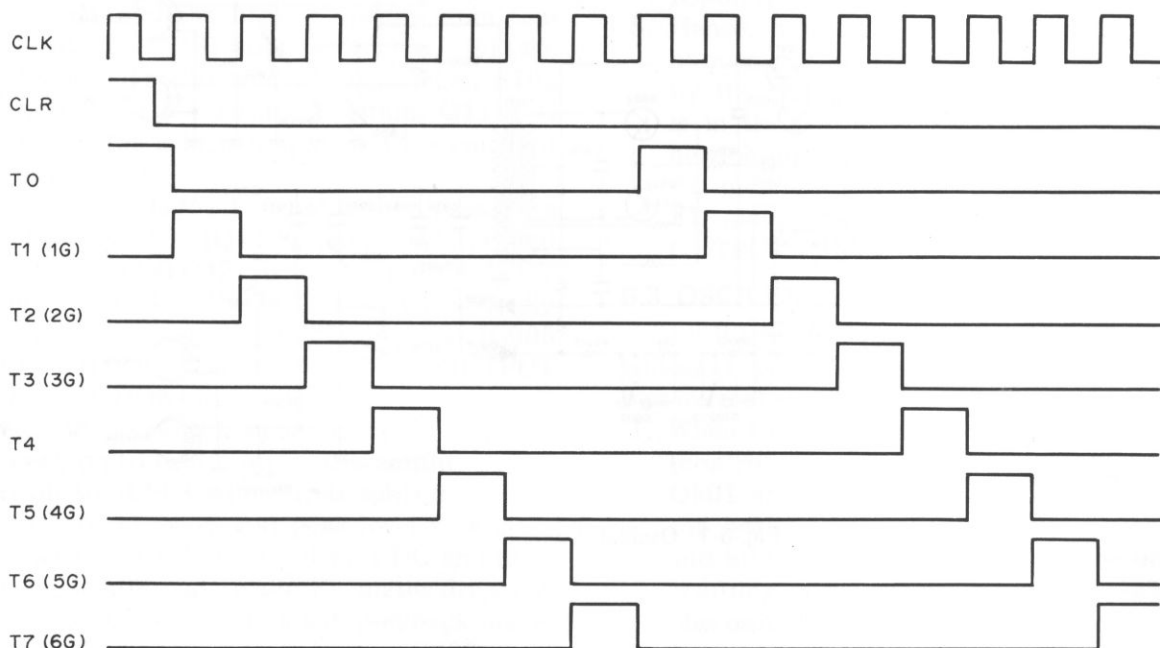


Fig. 6-3 F.L meter drive circuit

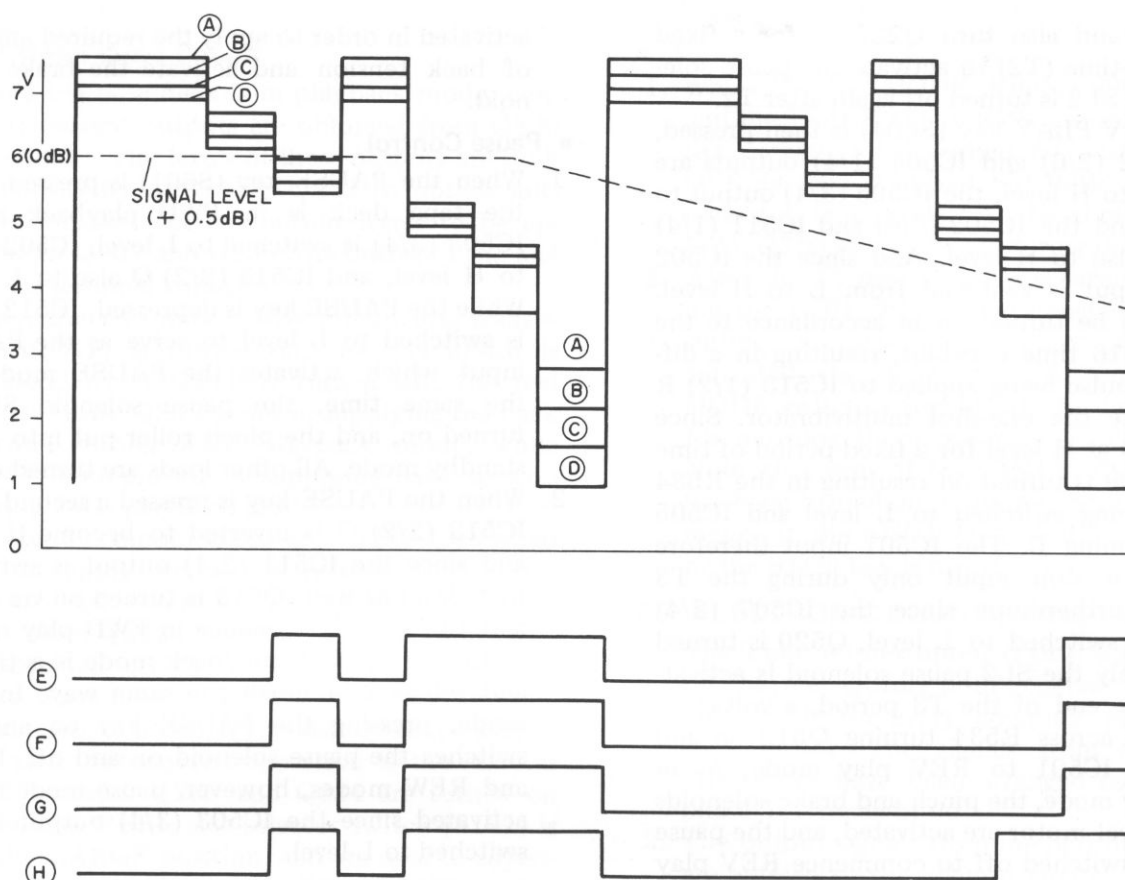


Fig. 6-4 F.L meter drive circuit

6.6 CONTROL CIRCUITS

See the block diagram on page 10 for an outline of the control circuits. Also refer to the general circuit diagram on page 46 for the following descriptions.

■ When the Power Switch is Turned On

When the S1 power switch is turned on, IC501 is locked in stop mode during the T1 period (time constant formed by C520 connected to pin 5 of IC501, and a resistor located inside the IC), regardless of the on/off position of the IC501 shut-off switches S2 and S3. If S2 and S3 happen to be on, the capstan motor will rotate in the FWD direction.

■ Play Mode

1. When the FWD PLAY key (S603) is pressed while the capstan motor is rotating in the FWD direction, IC502 (1/6) is switched from L to H level. The IC504 (1/4), (2/4) flip-flop output (pin 4 of IC504 2/4) is thus switched to H level, and since the IC504 (3/4), (4/4) flip-flop output (pin 10 of IC504 4/4) is also switched to H level. The IC505 (4/4) NAND output will be switched to L level, and the IC502 (4/6)

inversion output switched to H level. If the PAUSE switch (S601) is off, the IC511 (2/4) AND output will be switched to H level, and then differentiated by the R535/C525 time constant to drive the Q513, and be finally applied to pin 8 of IC501.

2. The IC501 outputs (pins 17 and 18) are thus switched to L level, and the IC508 (5/6), (6/6) and IC509 (2/6), (3/6) inversion outputs switched to H level. Q241 is then turned on by the IC508 (5/6) output, resulting in the activation of the reel motor drive circuit to start up the left and right reel motors. (The reel motor drive circuit is described in a later section on page 19).

The IC509 (2/6) output is applied to IC511 (3/4), (4/4), resulting in Q239 or Q243 being turned on by the FWD or REV output in order to obtain the required amount of torque for the appropriate reel motor. The IC508 (6/6) output is applied to Q226, and once this transistor is turned on the left and right brake solenoids (SL3/SL4) are activated. The IC509 (3/6) output is applied to Q225, thereby turning the transistor on to activate the SL1 pinch

solenoid, and also turn Q222 on for a fixed period of time (T2) to activate the pause solenoid SL2. SL2 is turned off again after T2.

3. If the REV PLAY key (S604) is then pressed, the IC502 (2/6) and IC504 (1/4) outputs are switched to H level, the IC505 (3/4) output to L level, and the IC502 (5/6) and IC511 (1/4) outputs also to H level. And since the IC502 (5/6) output is switched from L to H level, Q507 will be turned on in accordance to the R522, C516 time constant, resulting in a differential pulse being applied to IC513 (1/2) R to activate the one-shot multivibrator. Since Q remains at H level for a fixed period of time (T3), Q509 is turned on resulting in the R534 output being switched to L level and IC505 also becoming L. The IC501 input therefore becomes a stop input only during the T3 period. Furthermore, since the IC507 (2/4) output is switched to L level, Q520 is turned on and only the SL2 pause solenoid is activated. At the end of the T3 period, a voltage is generated across R534 turning Q512 on and switching IC501 to REV play mode. As in FWD play mode, the pinch and brake solenoids and the reel motor are activated, and the pause solenoid switched off to commence REV play mode.
4. To reverse the capstan motor, Q208 and Q209 are turned on by the IC504 (1/4), (2/4) output, thereby determining the FWD ↔ REV direction. For example, switching from FWD to REV involves the IC504 (1/4) output being switched to H level, and Q209, Q212 and Q211 being turned on in that order to reverse the direction. For switching from REV to FWD, Q208, Q213 and Q210 are turned on in order.

■ FF and REW Modes

1. When the FF key (S606) is pressed, pin 22 of IC501 is switched to L level, resulting in the IC508 (2/6) and IC510 (2/3) outputs being switched to H level and Q244 being turned on. This activates the RY201 relay, thereby switching the supply voltage for the reel motors being increased from 85V to 115V. At the same time Q242 and Q237 are turned on, resulting in 115V being applied to the right reel motor. The required amount of back tension is applied to the left reel motor (by activation of Q238), and the brake solenoid is also activated.
2. When the REW key (S607) is pressed, Q244 is again turned on, and 115V applied to the reel motors. Q240 and Q238 are both turned on to apply 115V to the left motor, while Q237 is

activated in order to apply the required amount of back tension and activate the brake solenoid.

■ Pause Control

1. When the PAUSE key (S601) is pressed while the tape deck is in FWD playback mode, IC503 (3/4) is switched to L level, IC502 (6/6) to H level, and IC513 (2/2) Q also to L level. While the PAUSE key is depressed, IC512 (1/4) is switched to L level to serve as the PAUSE input which activates the PAUSE mode. At the same time, the pause solenoid SL2 is turned on, and the pinch roller put into pause standby mode. All other loads are turned off.
2. When the PAUSE key is pressed a second time, IC513 (2/2) Q is inverted to become H level, and since the IC511 (2/4) output is switched to H level as well, Q513 is turned on via R535 and C525 to recommence in FWD play mode. Pause during REV playback mode is activated and released in much the same way. In stop mode, pressing the PAUSE key on and off switches the pause solenoid on and off. In FF and REW modes, however, pause mode is not activated since the IC503 (3/4) output is not switched to L level.

■ Solenoid Voltage Control Circuit

The solenoid activation current is increased during initial activation of the solenoid in order to ensure sufficient pull. After the solenoid has been activated, however, the current is reduced to avoid unnecessary heating of the solenoid.

1. The 15V rectified voltage is normally applied to all solenoids via D225. A high 32V rectified voltage is applied to the solenoids only for a fixed period of time T4 (Q219 switching time).
2. Normally, Q219 is turned off while Q218 is on. When playback mode is started from stop mode, for example, IC510 (3/3) is switched to H level, followed by Q217 being turned on according to the R554, C216 time constant. And since Q218 is turned off and Q219 turned on, the 32V voltage is applied.
3. Once C216 is charged up, Q217 is turned off and Q218 turned on, resulting in Q219 being turned off. The 32V supply is consequently stopped, and the 15V voltage supplied via D225.

■ Reel Motor Drive Circuit

1. When the tape deck is in playback mode, constant current outputs are obtained from Q229 and Q230. The levels of these outputs are sunk (reduced) by Q231 and Q232 to obtain suitable constant current output levels to be applied to Q237 and Q238 for control of the reel motor terminal voltage.
2. When the reel motor drive circuit bias transistor (Q241) is turned on, the reel motor is rotated. When Q241 is turned off, the reel motor stops. Q239 serves in supplying the back tension during REV playback mode, while Q243 is employed in supplying back tension during FWD playback mode.
3. During FF mode, Q229 and Q237 are turned on to apply maximum voltage to the reel motors. Q230 supplies a constant current output. When Q242 is turned on, optimum current is obtained and applied to Q238, resulting in back tension being applied to the reel motors. During REW mode, Q230 and Q229 are simply inverted. Subsequent operation is the same as in FF mode. Q223 and Q234 are turned on when the REEL size selector switch (S701) is in the LARGE position, and are used in adjusting take-up tension during FF and REW modes.

■ Timing

When switching from FF or REW mode to playback (FWD or REV) mode, an electromagnetic brake is applied to the reel motors. Furthermore, once the reel base speed is reduced to a particular level, a mechanical brake is also applied (for a fixed period of time T5) prior to switching to playback mode. See Fig. 6-0 for the corresponding time chart. The electromagnetic brake FF/REW switching is controlled by IC501.

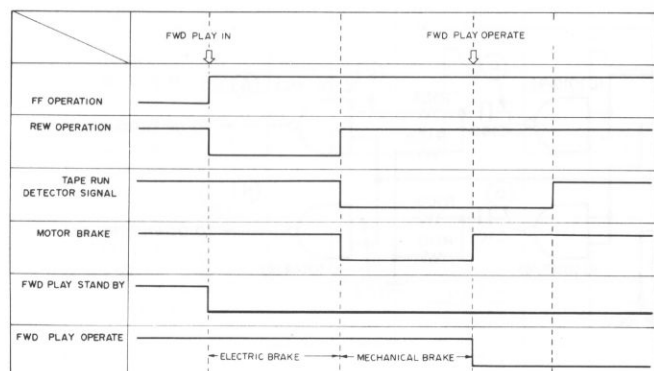


Fig. 6-5 Timing operation

■ Timer Start

1. When the REC MODE switches S904 and S905 and the TIMER switch S704 are turned on, and the power switch turned on with the SHUT OFF switches (S2 and S3) both on, IC501 is locked in stop mode for a fixed period of time (T1). Q705 also stays off during the T1 period.
2. After the T1 period, Q706 is turned on following the C701, R710 time constant period, resulting in recording/playback mode being activated via D501 and D502. If the REC MODE switch is turned off, the deck may be used for morning alarm purposes (playback mode). Note that even if the TIMER START switch has been turned on, normal operation will commence if the SHUT OFF switch is turned off or the STOP key is pressed on.

6.7 ELECTRONIC COUNTER (See Fig. 6-7)

1. The 2 photo-interrupters (PIR400 and PIR401) on the reel motors both generate 2 pulse output signals for every complete revolution of each motor. The signals from each photo-interrupter have been arranged to maintain a phase difference of 90°.
2. The output signals from the photo-interrupters are applied to the Schmitt circuit composed of the IC100 (1/6), (2/6) and IC100 (4/6), (5/6) inverting buffer amplifiers for formation of waveform signals.
3. These waveform signals are processed by IC100 and IC101, the waveforms at each of the designated points being shown in the time chart in Fig. 6-6.
4. When the up-input terminal of the up/down counter LSI (IC102) is switched from L to H level with the down-input terminal at H level, the counter will count up. When the up-input is at H level and the down-input terminal is switched from L to H level, the counter will count down. Therefore, when a waveform signal (processed as shown in Fig. 6-6) is applied to the up (pin 18) or down (pin 17) input terminals of IC102, the counter will automatically commence to count up or down accordingly.
5. The (G) and (H) signals applied to the up/down counter LSI (IC102) inputs are processed into signals used for numerical display (single digit, 7 segment dynamic display), and consequently passed to the outputs as digit (grid for FL) and segment (anode for FL) drive signals. These output signals are then passed through the high resistivity buffer amplifiers IC103 and IC104 (open drain type high resistivity ICs used as FL drive buffer amplifiers, and which have been

designed not to break down if a minus output voltage is applied following failure of the FL lamp to light up), thereby driving the FL counter.

6. When the up/down counter LSI (IC102) counts down, a bollow signal is generated during the 0.5 bit period just prior to the FL counter display switching from 0000 to 9999. This bollow signal is then applied to IC507 via the AUTO REPEAT switch (S703) in order to switch the tape transport direction from REV to FWD.
7. The IC100 (6/6) output (the signal resulting from inversion of the point B signal) is applied to Q204, and is used as the magnetic brake rotating frequency detector signal when the deck is switched from FF or REW mode to stop or playback (or recording) mode.

8. The R114 resistor is used in the preparation of clock pulses for the up/down counter LSI. In the RT-909, this resistor is 330k Ω , the oscillator frequency thus becoming 55kHz. The C105 capacitor prevents mis-operation of the counter when the power switch is turned on, this being achieved by resetting the counter and setting the FL display to 0000.

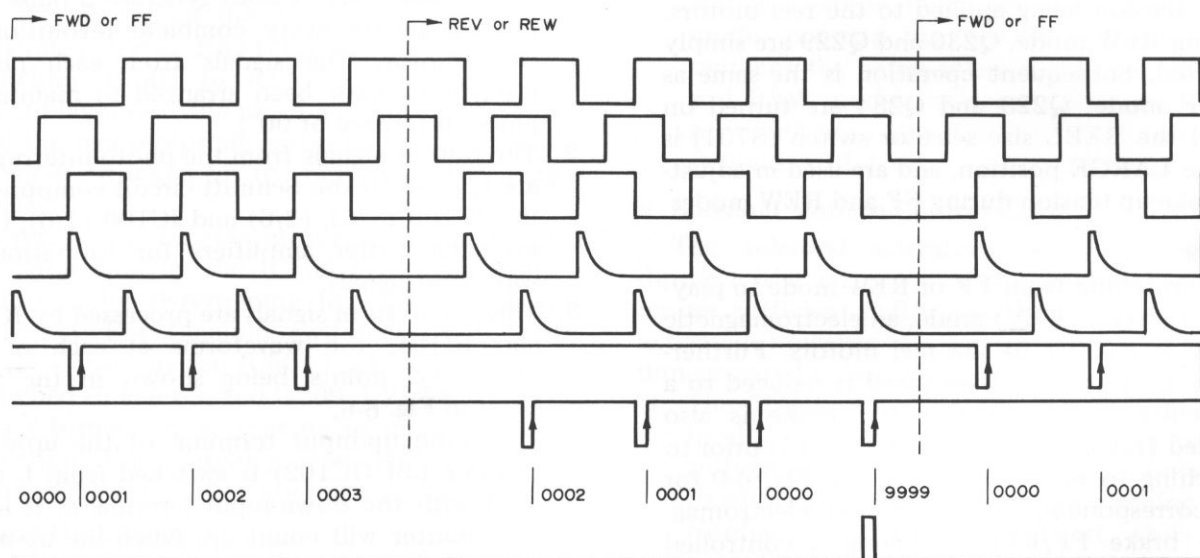


Fig. 6-6 Electronic counter

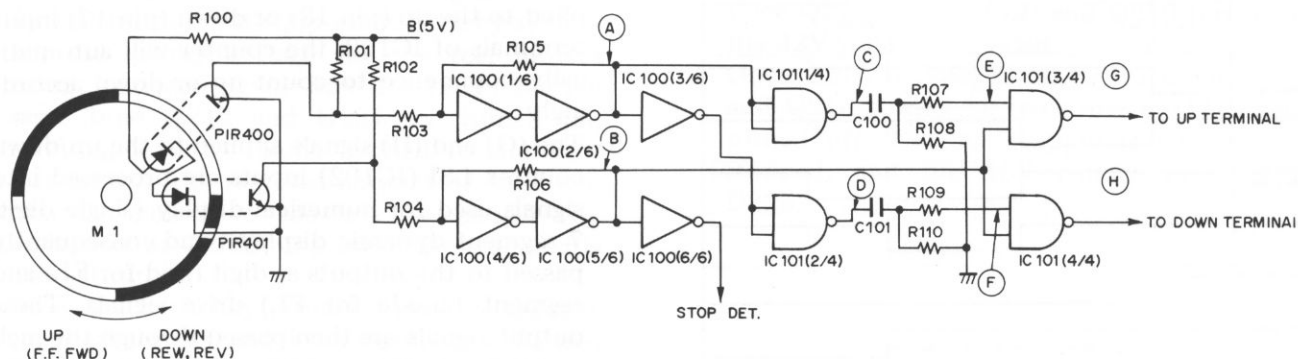


Fig. 6-7 F.L meter drive circuit

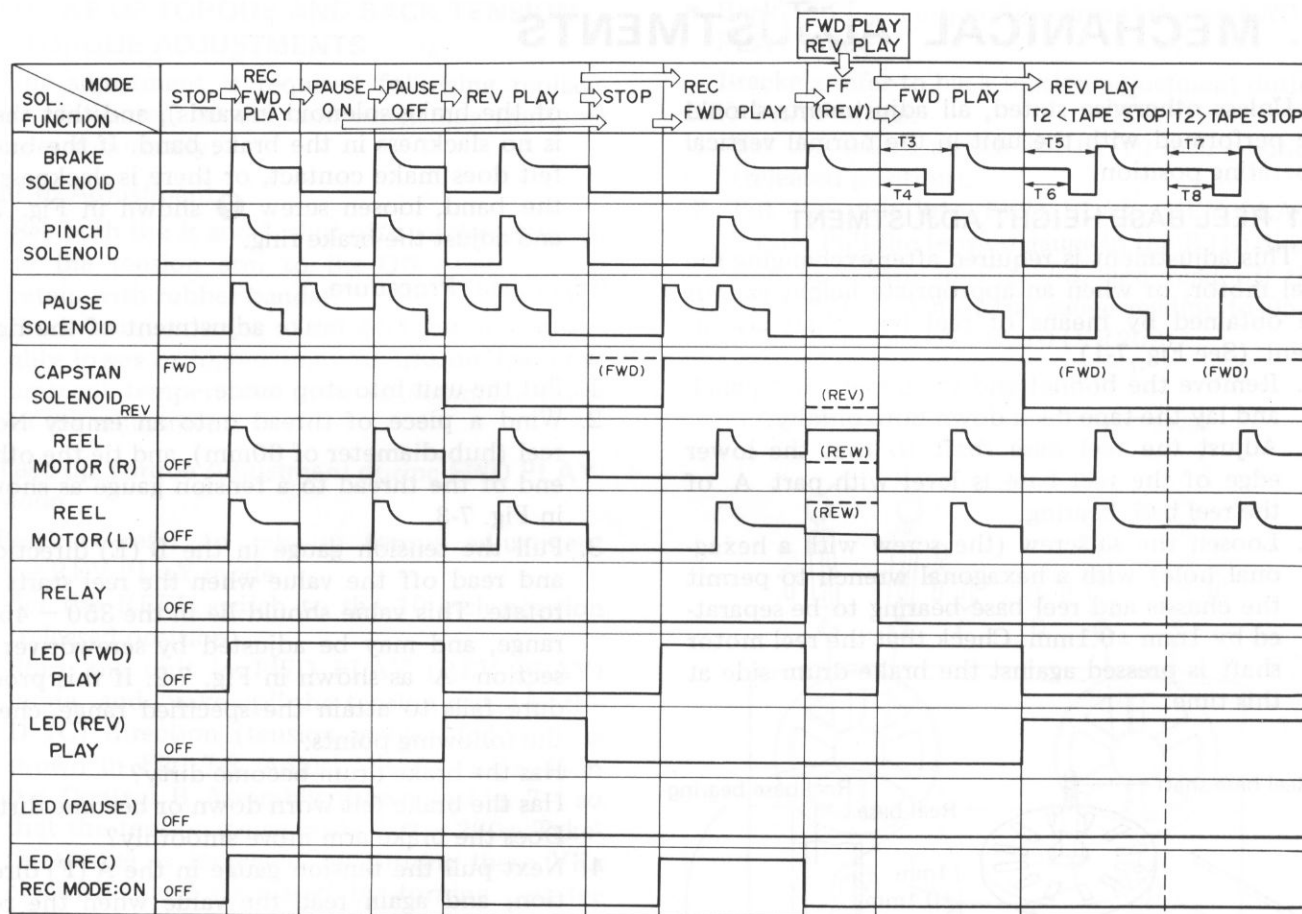


Fig. 6-7 Timing chart

T4, T6, T8: SOL. BRAKE OFF
T3, T5, T7: TAPE RUNNING STOP

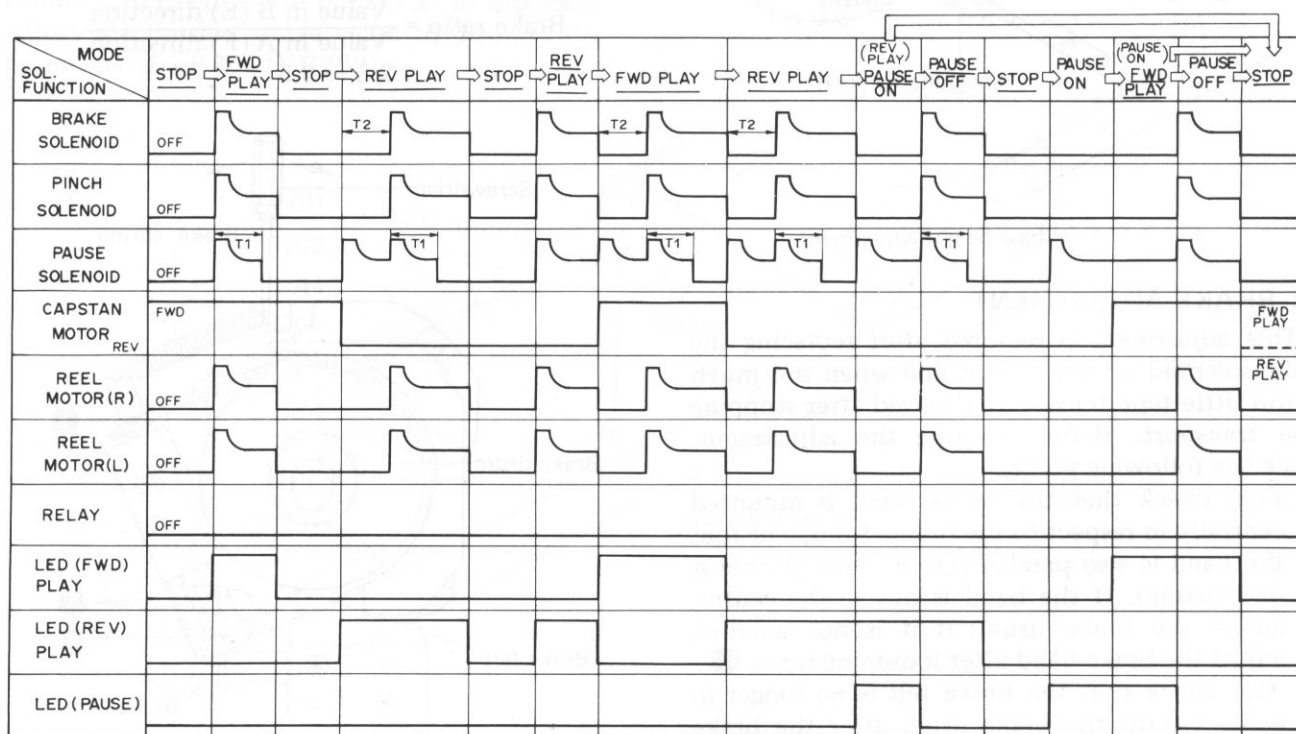


Fig. 6-8 Timing chart

T1: PAUSE SOL. ON
T2: FWD - REV

7. MECHANICAL ADJUSTMENTS

Unless otherwise stated, all adjustments should be performed with the unit in the normal vertical operating position.

7.1 REEL BASE HEIGHT ADJUSTMENT

This adjustment is required after exchanging the reel motor, or when an appropriate height cannot be obtained by means of reel base shaft adjustment. (See Fig. 7-1).

1. Remove the bonnet and the upper front panel, and lay the tape deck down horizontally.
2. Adjust the reel base shaft so that the lower edge of the reel base is level with part A of the reel base bearing.
3. Loosen the setscrew (the screw with a hexagonal hole) with a hexagonal wrench to permit the chassis and reel base bearing to be separated by $1\text{mm} \pm 0.1\text{mm}$. Check that the reel motor shaft is pressed against the brake drum side at this time.

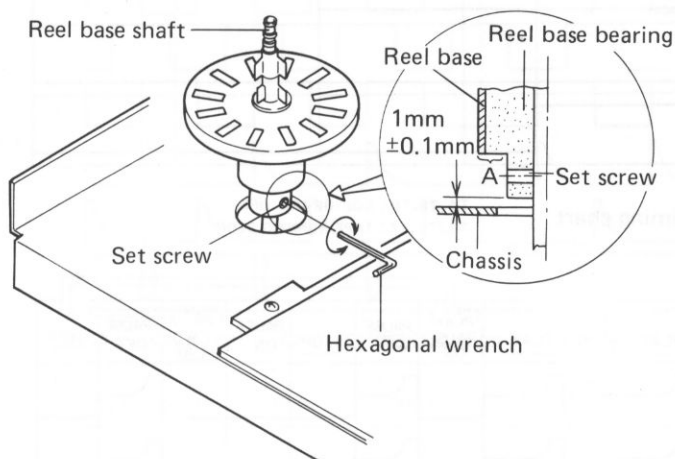


Fig. 7-1 Reel base height adjustment

7.2 BRAKE ADJUSTMENT

This adjustment is required after replacing the brake solenoid or reel motor, and when too much or too little tape tension is achieved after stopping tape transport. Before starting the adjustment, check the following points.

1. First check that the brake band is mounted centrally in respect to the brake drum, and that the band is also parallel (i.e. no tape slackness or twisting). If the band is not in the center, adjust the brake drum; if it is not parallel, adjust the brake band after loosening screw ①.
2. Also check that the brake felt is no longer in contact with the brake drum after the brake has been released (by pressing the movable core

of the brake solenoid inwards), and that there is no slackness in the brake band. If the brake felt does make contact, or there is slackness in the band, loosen screw ② shown in Fig. 7-2 and adjust the brake ring.

Adjustment Procedure

Brackets refer to brake adjustment of the right hand reel motor.

1. Put the unit into stop mode.
2. Wind a piece of thread onto an empty No.7 reel (hub diameter of 60mm), and tie the other end of the thread to a tension gauge as shown in Fig. 7-3.
3. Pull the tension gauge in the B (E) direction, and read off the value when the reel starts to rotate. This value should lie in the 350 — 450g range, and may be adjusted by screwdriver at section A as shown in Fig. 7-2. If this procedure fails to attain the specified range, check the following points.

Has the brake drum become dirty?

Has the brake felt worn down or become dirty?

Does the brake arm move smoothly?

4. Next pull the tension gauge in the A (F) direction, and again read the value when the reel starts to rotate. This value and the previously measured value (in step 3) should be related according to the following expression:

$$\text{Brake ratio} = \frac{\text{Value in B (E) direction}}{\text{Value in A (F) direction}} = 2.5 - 3.5$$

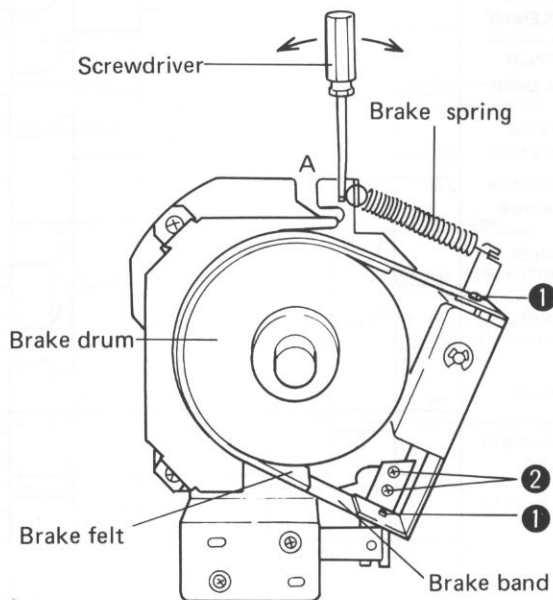


Fig. 7-2 Brake adjustment

7.3 TAKE-UP TORQUE AND BACK TENSION TORQUE ADJUSTMENTS

This adjustment is required following replacement of the reel motor, and when tape transport behaves abnormally.

Prior to Adjustment

1. Set both the R and L shut-off switches coupled to the tension arm to the ON position (and retain with rubber bands).
2. Since torque varies at temperatures considerably lower or higher than 20°C, also check the ambient temperature prior to commencement of the adjustment.

■ Take-up Torque Adjustment during FWD PLAY Mode

Brackets refer to take-up torque adjustment during REV PLAY mode.

1. Set the REEL switch to the 10 inch position (released position).
2. Start the unit in FWD PLAY (REV PLAY) mode, and "take-up" the tension gauge in the D (C) direction (tension gauge "fed in") as shown in Fig. 7-3. Adjust VR203 (VR204) in the Control B Assembly shown in Fig. 7-4 so that the tension gauge reads 240 – 260g. Take-up torque is increased by turning these VRs clockwise, and decreased by turning counter clockwise.
3. Next set the REEL switch to the 7 inch position (depressed position), and repeat the procedure described above in step 2. In this case, adjust the tension gauge value to 140 – 160g by means of VR201 (VR202).

■ Back Tension Torque Adjustment during FWD PLAY Mode

Brackets refer to back tension adjustment during REV PLAY mode.

1. Set the REEL switch to the 10 inch position (released position).
2. Put the unit into FWD PLAY (REV PLAY) mode. Pull the tension gauge in the B (E) direction as shown in Fig. 7-3, and read off the gauge value. Adjust the gauge reading to 95 – 105g by means of VR210 (VR209).

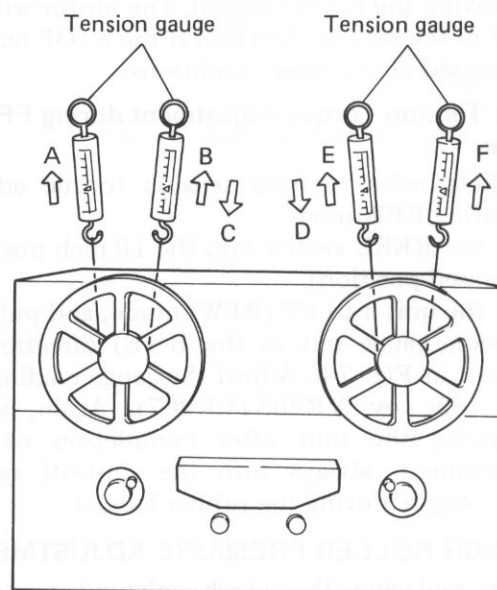


Fig. 7-3 Torque and tension adjustment

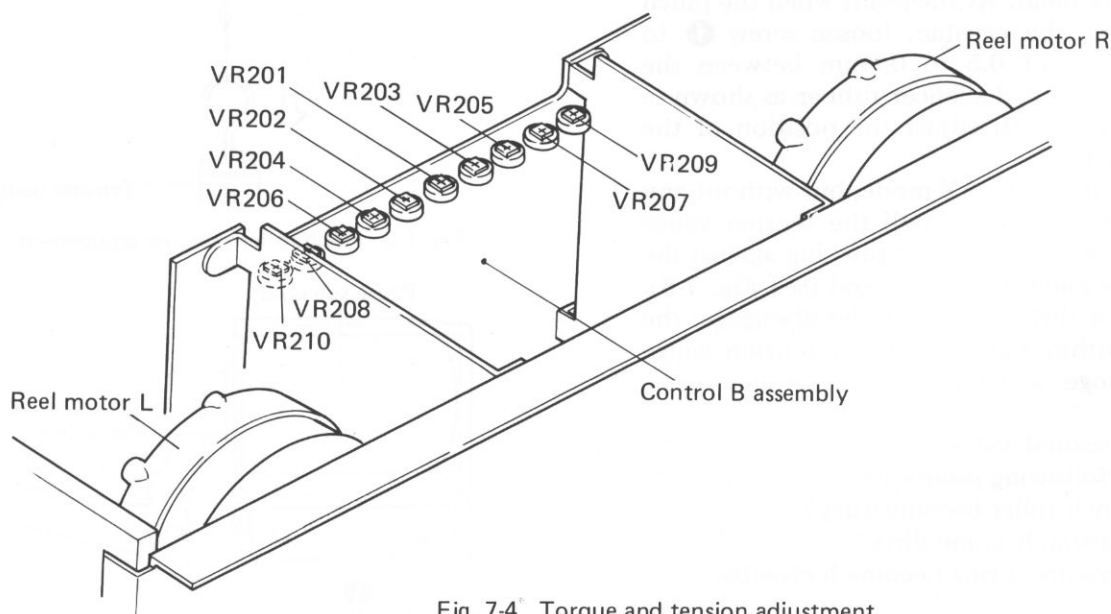


Fig. 7-4 Torque and tension adjustment

■ Take-up Torque Adjustment during FF Mode

Brackets refer to take-up torque adjustment for REW mode.

1. Set the REEL switch to the 7 inch position (depressed position).
2. Put the unit into FF mode, and have the tension gauge "taken up" (i.e. "fed in") in the D (C) direction as shown in Fig. 7-3. Adjust the tension gauge reading to 440—460g by VR205 (VR206). When switching the unit over to stop mode after completing the adjustment, set the shut-off switch to the OFF position (by removing the rubber bands). The motor will rotate in the reverse direction if the STOP button is pressed under these conditions.

■ Back Tension Torque Adjustment during FF Mode

Brackets refer to back tension torque adjustment during REW mode.

1. Put the REEL switch into the 10 inch position (released position).
2. Put the unit into FF (REW) mode, and pull the tension gauge out in the B (E) direction as shown in Fig. 7-3. Adjust the gauge readings to 60—65g by VR208 (VR207). Again, when stopping the unit after completion of the adjustment, always turn the shut-off switch OFF (by removing the rubber bands).

7.4 PINCH ROLLER PRESSURE ADJUSTMENT

After replacing the pinch solenoid or pinch rollers, or if the tape tends to slip during tape transport, adjust the pinch roller pressure as described below.

1. Push the movable core of the pinch solenoid upwards by hand. At the point when the pinch roller meets the capstan, loosen screw ① to obtain a gap of 0.5 to 0.8mm between the pinch solenoid and silencer rubber as shown in Fig. 7-5, and then adjust the position of the pinch solenoid.
2. Put the unit into PLAY mode, but without any tape in the reels, and pull the tension gauge straight down while gently pressing against the cap of the pinch roller by hand (see Fig. 7-6). Then check that the pinch roller disengages the capstan within the 1.2—1.4kg tension gauge reading range, and that the pinch roller ceases to rotate.
3. If the measured value lies outside this range, check the following points and then readjust.
Has the pinch roller become dirty?
Has the capstan become dirty?
Has the pressure spring become ineffective?

7.5 PAUSE ADJUSTMENT

Pause adjustment is required following replacement of the pause solenoid, and when switching the pause switch on and off during recording and playback modes results in imperfect recording. Note, however, that the pinch roller pressure adjustment must be completed before commencing the pause adjustment.

1. Put the unit into PAUSE mode.
2. Loosen screw ① as shown in Fig. 7-7 to obtain a gap of 0.5—1mm between the capstan and pinch roller, and then adjust the mounting position of the pause solenoid.

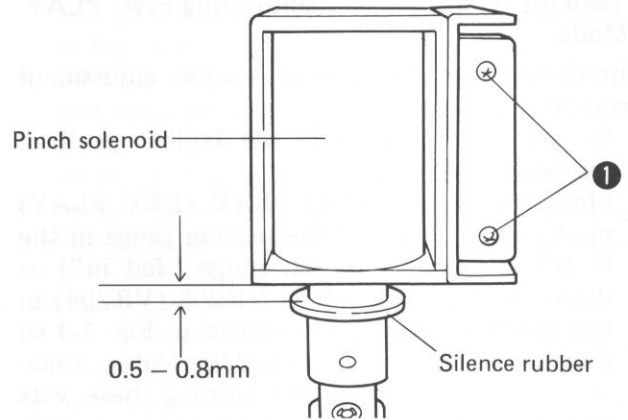


Fig. 7-5 Pinch roller pressure adjustment

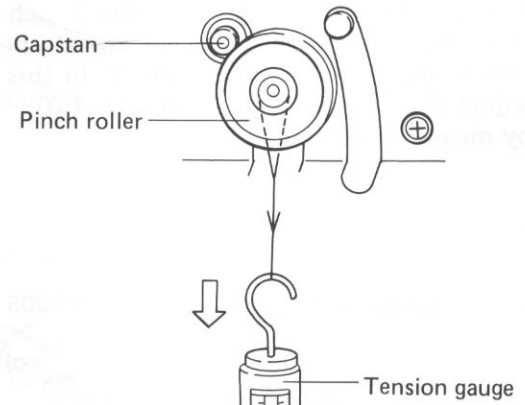


Fig. 7-6 Pinch roller pressure adjustment

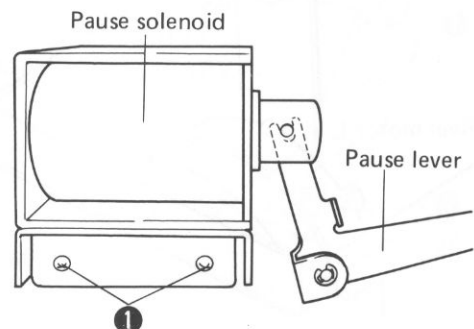


Fig. 7-7 Pause adjustment

7.6 TAPE SPEED ADJUSTMENT

Check the following points before commencing to adjust tape speed.

1. Set the pitch controls to their center click-stop positions.
2. Clean the capstan shaft and pinch rollers with anhydrous alcohol.
3. Use the same size reels on the supply and take-up sides.
4. Complete the take-up torque, back tension torque, and pinch roller pressure adjustments before commencing tape speed adjustment.

Adjustment Procedure

1. Set the SPEED switch to the 19 position (released position), and load the STD-101 test tape used in wow and flutter measurements. Play the tape until approximately equal amounts are on both reels.
2. Connect a frequency counter to the OUTPUT terminals, and start up the unit in PLAY mode. If the frequency counter fails to register 3,000Hz, adjust VR21 in the servo assembly as shown in Fig. 7-8.
3. Next set the SPEED switch to 9.5 (depressed position), and adjust VR22 (also shown in Fig. 7-8) to obtain a frequency counter reading of 1,500Hz.

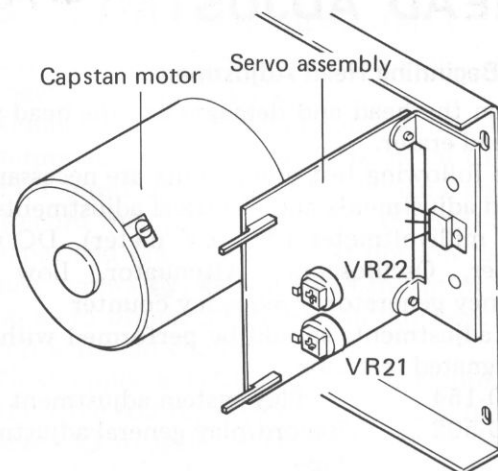


Fig. 7-8 Tape speed adjustment

8. HEAD ADJUSTMENTS

Before Beginning Head Adjustment

1. Clean the head and demagnetize the head with a head eraser.
2. The following test equipments are necessary in head adjustments and electrical adjustments.
AC millivoltmeter (AC mV meter), DC voltmeter, Oscilloscope, Attenuator, Low frequency generator, Frequency counter
3. All adjustments should be performed with the designated test tape.
STD-154 Play system adjustment tape
STD-502 Record/play general adjustment tape
4. Position the switches as follows unless otherwise specified.
SPEED switch 19
BIAS switch 2
EQ switch 1
MONITOR switch TAPE
METER switch PEAK
DIMMER switch NORMAL
OUTPUT volume Central position
(Center click stop)

8.1 APPROXIMATE ADJUSTMENT

■ Height Adjustment

Adjust the following screws (see Fig. 8-2) to attain the dimensions as shown in Fig. 8-1 for each head during tape transport.

| | | | |
|-----------------------------|----|----|----|
| FWD playback head | 1 | 2 | 3 |
| Recording head | 6 | 7 | 8 |
| REV playback head | 11 | 12 | 13 |
| Erase head | 16 | 17 | |

Note:

If the Fig. 8-1 dimensions for the height of the erase head cannot be obtained, remove screws 16 and 17 and also the head base, loosen screws 16 and 17, and replace the E head spacer.

E head spacer C (0.1t) RNF-638

E head spacer D (0.2t) RNF-639

■ Tilt Adjustment

Adjust the following screws shown in Fig. 8-2 so that both the top and bottom of the head surface make uniform contact with the tape during tape transport.

| | | |
|-----------------------------|----|----|
| FWD playback head | 1 | 2 |
| Recording head | 6 | 7 |
| REV playback head | 11 | 12 |

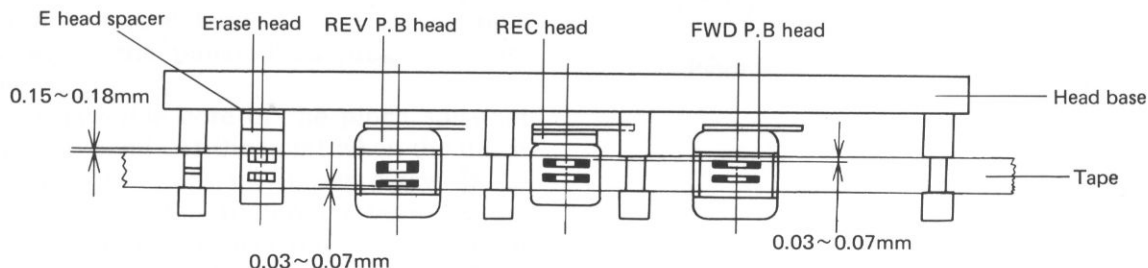


Fig. 8-1 Dimensions for the height of heads

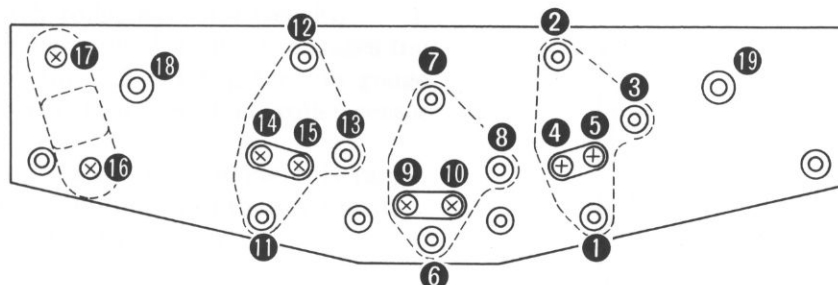


Fig. 8-2 Adjustment points

■ Azimuth Adjustment

Adjust the following screws shown in Fig. 8-2 so that the head gap is at an exact right angle to the direction of the tape.

| | |
|-------------------------|---|
| FWD playback head | ③ |
| Recording head | ⑧ |
| REV playback head | ⑬ |

8.2 PLAYBACK HEAD ADJUSTMENT

■ FWD Playback Head Adjustment

The brackets refer to adjustments for the REV playback head.

1. Connect an AC millivoltmeter to the OUTPUT terminals, and play the 15kHz section of the STD-154 test tape at 19cm/s in FWD (REV) mode.
2. Adjust screw ③ (⑬) shown in Fig. 8-2 until the AC millivoltmeter gives a maximum reading. As long as there is no big difference in output between left and right channels, this may be disregarded.
3. Check that there is no change in output when the tape is pressed in slightly by hand (near the head gap) during tape transport. If the output does vary, loosen screws ④ and ⑤ (⑭ and ⑮) shown in Fig. 8-2, and move the head around in a horizontal plane (i.e. in either left or right directions) to find the most suitable position.

8.3 RECORDING HEAD ADJUSTMENT

This adjustment should always come after the playback head adjustments.

1. Connect an AC millivoltmeter to the OUTPUT terminals, and apply a 2kHz signal to the INPUT terminals (at any suitable signal level).
2. Record this 2kHz signal onto the STD-502 test tape, and play the recorded portion back. Adjust screws ⑥, ⑦ and ⑧ as shown in Fig. 8-2 so as to obtain maximum output level in both left and right channels.
3. Next apply a 15kHz signal and record it onto the same test tape. During playback, fine adjust screw ⑧ to again obtain maximum output level in both channels.
4. Then gently press against the tape (by finger) during transport at a spot near the head gap, and check for any change in output level. If the level does vary, loosen screws ⑨ and ⑩ as shown in Fig. 8-2, and move the head around in a horizontal plane (either to left or right) to find the optimum position.

9. ELECTRICAL ADJUSTMENTS

Proceed as Follows before Beginning Adjustment of the Electrical System.

1. Confirm that the mechanism section has been properly adjusted.
2. When making measurements, make the level $0\text{dBv}=1\text{V}$, and connect a $50\text{k}\Omega$ ($47-52\text{k}\Omega$) dummy load to the OUTPUT terminals.
3. Furthermore, adjustment will also apply to both left and right channels unless otherwise indicated.
4. Always perform adjustment in the following sequence. If this sequence is not followed, complete adjustment will be impossible, and the set will not display its full performance.
 1. Supply Voltage Adjustment
 2. Playback Level Adjustment
 3. Playback Equalizer Adjustment
 4. Oscillator Voltage Adjustment
 5. Bias Trap and Dummy Coil Adjustment
 6. Level Meter 0dB Adjustment
 7. Recording Bias Adjustment
 8. Recording Level Adjustment
 9. Record/Play Frequency Response

9.1 POWER SUPPLY VOLTAGE ADJUSTMENT

1. Connect a DC voltmeter between terminal no.69 on the mother assembly and ground.
2. Adjust VR914 so as to obtain a meter reading of $15 \pm 0.2\text{V}$.

9.2 PLAYBACK LEVEL ADJUSTMENT

1. Connect an AC millivoltmeter to the OUTPUT terminals.
2. Play the $700\text{Hz}/0\text{dB}$ portion of the STD-154 test tape.
3. Adjust VR1105 (L ch) and VR1106 (R ch) during FWD mode, and VR1107 (L ch) and VR1108 (R ch) during REV mode in order to obtain a millivoltmeter reading of -7dBv (450mV).

9.3 PLAYBACK EQUALIZER ADJUSTMENT

1. Again connect the AC millivoltmeter to the OUTPUT terminals.
2. Play the $700\text{Hz}/-10\text{dB}$ and $10\text{kHz}/-10\text{dB}$ portions of the STD-154 test tape.
3. The AC millivoltmeter should show a level difference of no more than 0 ± 0.5 between these two portions of tape. If the meter readings exceed this specification, adjust VR1101 (L ch) and VR1102 (R ch) during FWD mode, and VR1103 (L ch) and VR1104 (R ch) during REV mode.

9.4 OSCILLATOR VOLTAGE ADJUSTMENT

1. Turn the REC MODE switch for both left and right channels, and also the PAUSE switch on, and then press the REC and PLAY switches (i.e. REC/PAUSE mode).
2. Connect an AC voltmeter (with either 50 or 100V range) between GND and TP3 on the mother assembly with a connector cord of low distribution capacitance. Adjust VR913 to obtain a meter reading of $30 \pm 0.5\text{V}$.

Note:

- Because of the high oscillator frequency (125kHz) be careful not to introduce any error during the measurement or adjustment stages.
 - Do not forget to disconnect the AC voltmeter from the TP terminal after completing the adjustment. (Distribution capacitance in the measuring equipment may lead to change in oscillator frequency, resulting in error in the following adjustment).
-

9.5 BIAS TRAP AND DUMMY COIL ADJUSTMENTS

1. Connect an oscilloscope to the TP4 and TP5 terminals on the mother assembly. Turn on the REC MODE switch for both left and right channels to put the unit into recording mode. Adjust L903 and L904 to obtain minimum bias voltage at TP4 and TP5.
2. Put the unit into MONO (L ch) recording mode, and adjust L908 (right channel dummy coil) to again obtain minimum bias voltage at TP4.
3. Then put the unit into MONO (R ch) recording mode, and adjust L907 (left channel dummy coil) to obtain minimum bias voltage at TP5.
4. After completion of the above adjustments, connect an AC millivoltmeter and oscilloscope to the OUTPUT terminals, and turn the REC MODE switches for both left and right channels on to put the unit into recording mode. Adjust L901 (L ch) and L902 (R ch) to minimize the bias leak waveform shown in the oscilloscope. When the point of minimum bias leak is not clear, remove the base plate, and adjust from the top side of the mother assembly.

9.6 LEVEL METERS 0dB ADJUSTMENT

1. Connect an AC millivoltmeter to the OUTPUT terminals.
2. Set the MONITOR switch to SOURCE, and the OUTPUT level control to the center click-stop position. Adjust the INPUT (LINE) level controls to obtain a millivoltmeter reading of -7dBv (450mV).
3. Then adjust VR909 (L ch) and VR910 (R ch) to positions where the FL meter [0dB] segment just lights up.

9.7 RECORDING BIAS ADJUSTMENT

1. Connect the AC millivoltmeter to the OUTPUT terminals again.
2. Apply an input signal of $1\text{kHz}/-10\text{dBv}$ (316mV) to the INPUT terminals.
3. Set the OUTPUT level control to the center click-stop, and the MONITOR switch to SOURCE. Adjust the INPUT (LINE) level controls to obtain a meter reading of -7dBv (450mV).
4. Turn both the left and right channel REC MODE switches on, and set the MONITOR switch to the TAPE position. Then record a $1\text{kHz}/-10\text{dBv}$ (316mV) signal onto the

STD-502 test tape. Turn VR911 (L ch) and VR912 (R ch) from minimum to maximum positions (clockwise rotation), and locate the VR settings at which the AC millivoltmeter exceeds the maximum reading by up to 0.2dB . (See Fig. 9-2).

Note:

VR911 and VR912 influence each other, so this adjustment will have to be repeated several times.

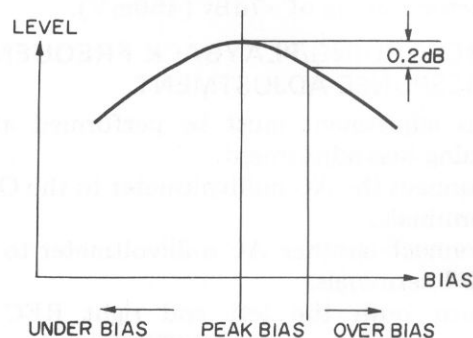


Fig. 9-2 Recording bias adjustment

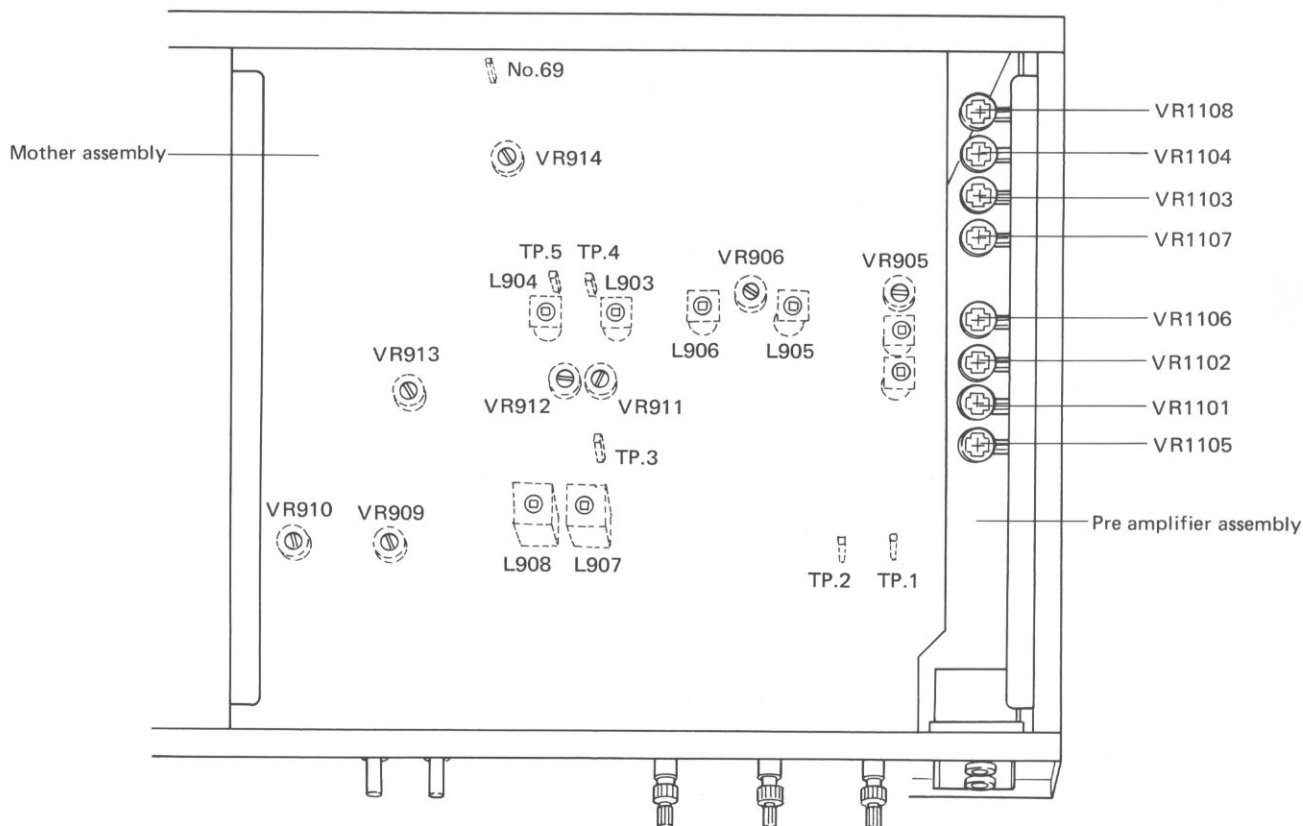


Fig. 9-1 Adjustment points

9.8 RECORDING LEVEL ADJUSTMENT

1. Again connect the AC millivoltmeter to the OUTPUT terminals.
2. Apply a 1kHz/-10dBv (316mV) signal to the INPUT terminals.
3. Set the OUTPUT level control to the center click-stop, and the MONITOR switch to the TAPE position. Record the 1kHz/-10dBv signal onto the STD-502 test tape, and adjust VR905 (L ch) and VR906 (R ch) to obtain a meter reading of -7dBv (450mV).

9.9 RECORDING/PLAYBACK FREQUENCY RESPONSE ADJUSTMENT

This adjustment must be performed after the recording bias adjustment.

1. Connect the AC millivoltmeter to the OUTPUT terminals.
2. Connect another AC millivoltmeter to the INPUT terminals.
3. Turn both the left and right REC MODE switches on, set the OUTPUT level control to the center click-stop position and the MONITOR switch to SOURCE. Adjust the INPUT (LINE) level controls to give a -7dBv (450mV) reading in the AC millivoltmeter.

4. Without changing the INPUT (LINE) level control, drop the input level by 20dB by attenuator, and record the 1kHz portion and all the other frequencies indicated in Fig. 9-3 onto the STD-502 test tape. Then set the MONITOR switch to the TAPE position, and check that the level differences between the 1kHz playback output level and the playback output levels at all other frequencies satisfy the specified ratings. If the output levels fail to satisfy the specifications, adjust L905 (L ch) and L906 (R ch).

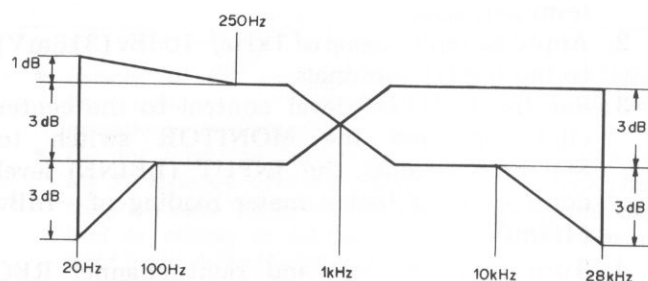


Fig. 9-3 REC/PB frequency response adjustment

10. EXPLODED VIEWS AND PARTS LIST

10.1 EXTERIOR COMPONENTS

- The Δ mark found on some component parts indicates the importance of the safety factor of the part. Therefore, when replacing, be sure to use parts of identical designation.
- Parts without part number cannot be supplied.

Parts List

| Key No. | Part No. | Description | Key No. | Part No. | Description |
|---------|----------|--|---------|----------|------------------------|
| 1. | ABA-010 | Frang screw M4x5 | 21. | RNG-230 | Head base |
| 2. | RNA-424 | Bonnet | 22. | REC-320 | Foot L |
| 3. | RAH-293 | Front panel | 23. | | Bottom plate |
| 4. | | Panel cushion | 24. | REC-319 | Foot R |
| 5. | RNK-829 | Counter lens | 25. | RED-167 | Foot felt |
| 6. | | Escutcheon C | 26. | RXX-268 | Front panel assembly |
| 7. | RNK-831 | Meter lens | 27. | REB-220 | Cover cushion A |
| 8. | | Escutcheon | 28. | RAC-118 | Function knob assembly |
| 9. | | Escutcheon A | 29. | RAC-119 | REC knob assembly |
| 10. | | Escutcheon B | 30. | RBH-622 | Knob return spring |
| 11. | | Escutcheon | 31. | RRW-112 | UL caution label A |
| 12. | | Front panel | 32. | REB-221 | Cover cushion B |
| 13. | RAC-120 | Knob A assembly | 33. | | UL caution label C |
| 14. | RAC-121 | Knob B assembly | 34. | RBA-057 | Screw |
| 15. | RAC-122 | Knob (PITCH CONTROL) | | | |
| 16. | | Rear panel | | | |
| 17. | | Rear panel | | | |
| 18. | | Rivet | | | |
| 19. | | Serial no. plate | | | |
| 20. | RBA-017 | Countersink screw with hexagon hole M4x8 | | | |

1

2

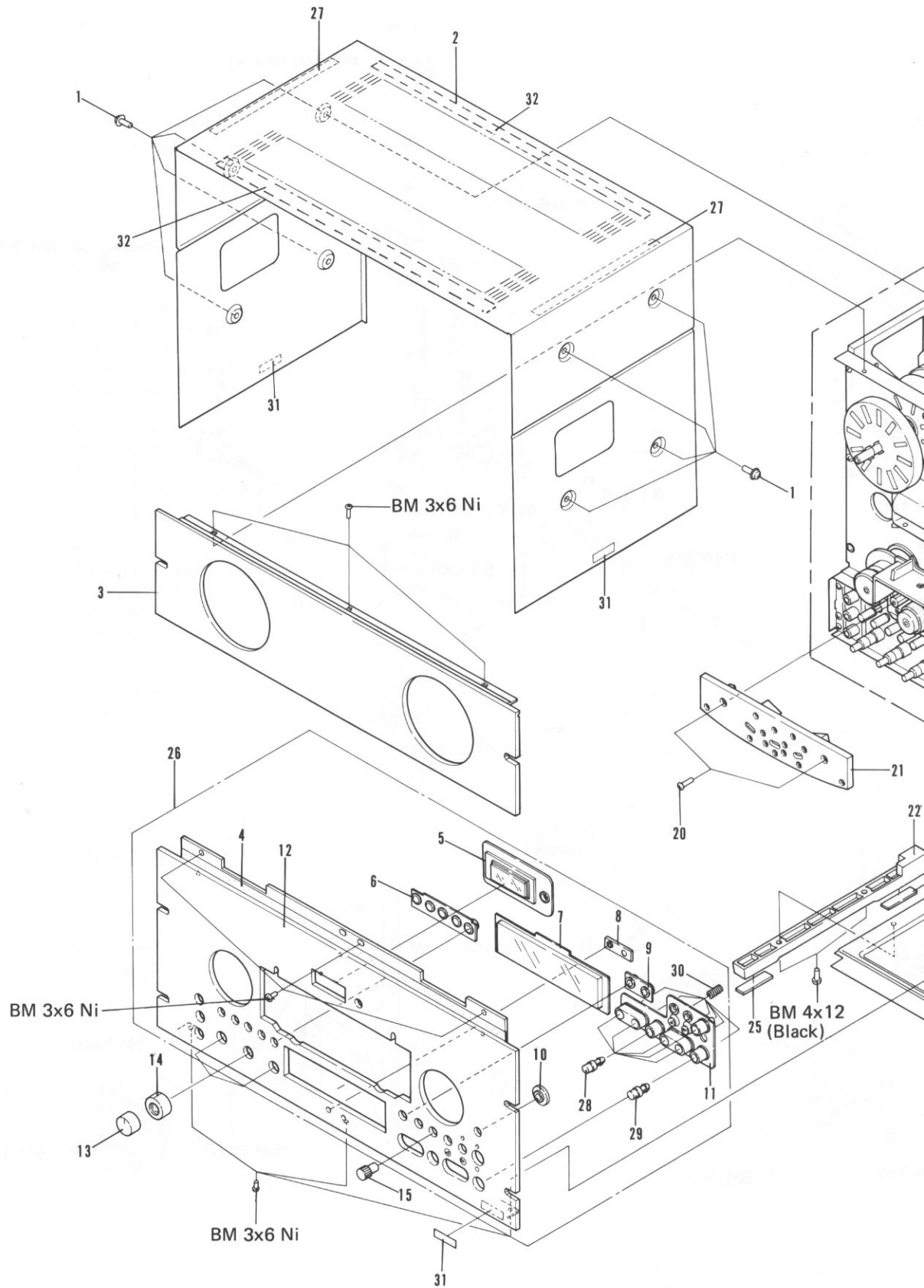
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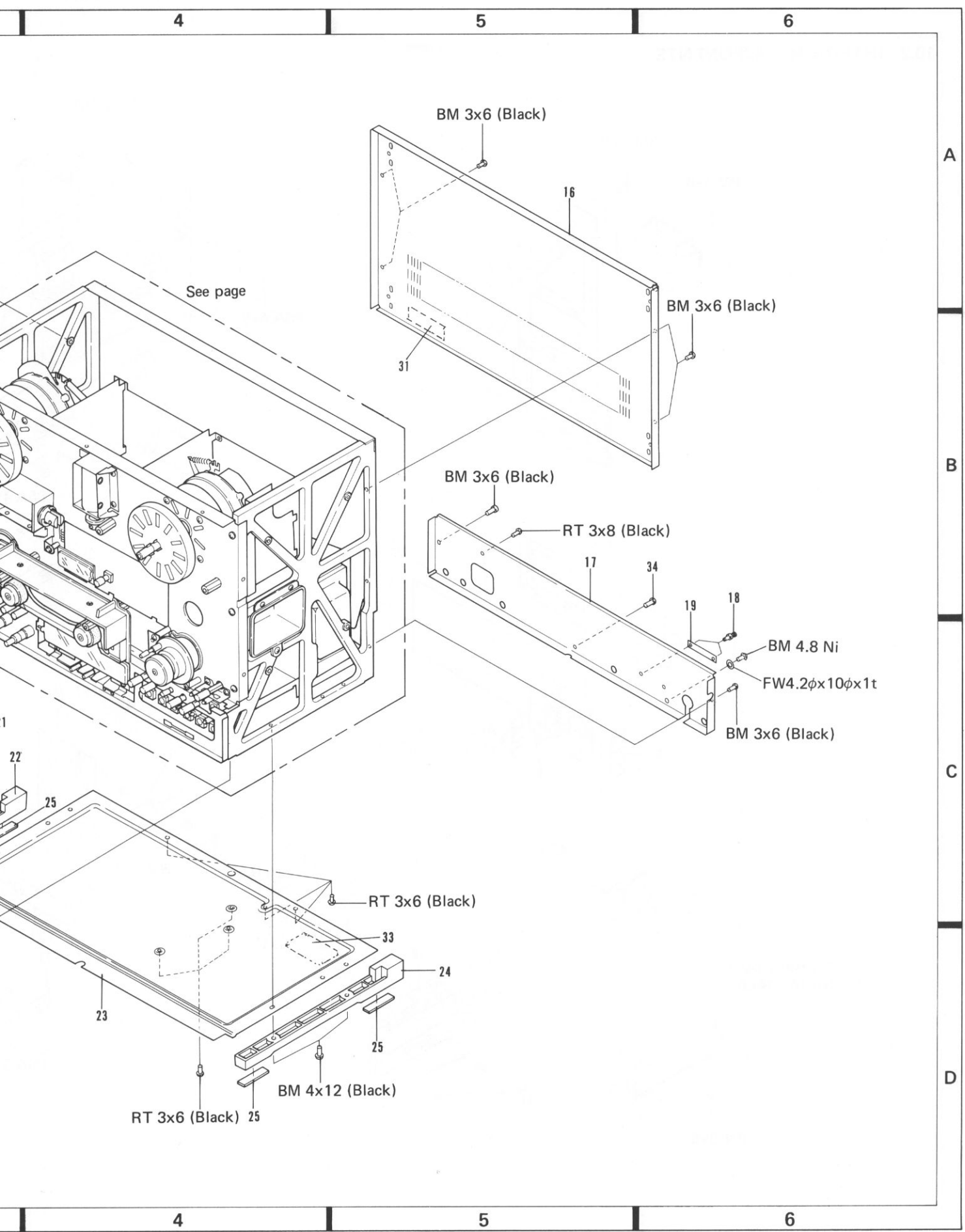
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B

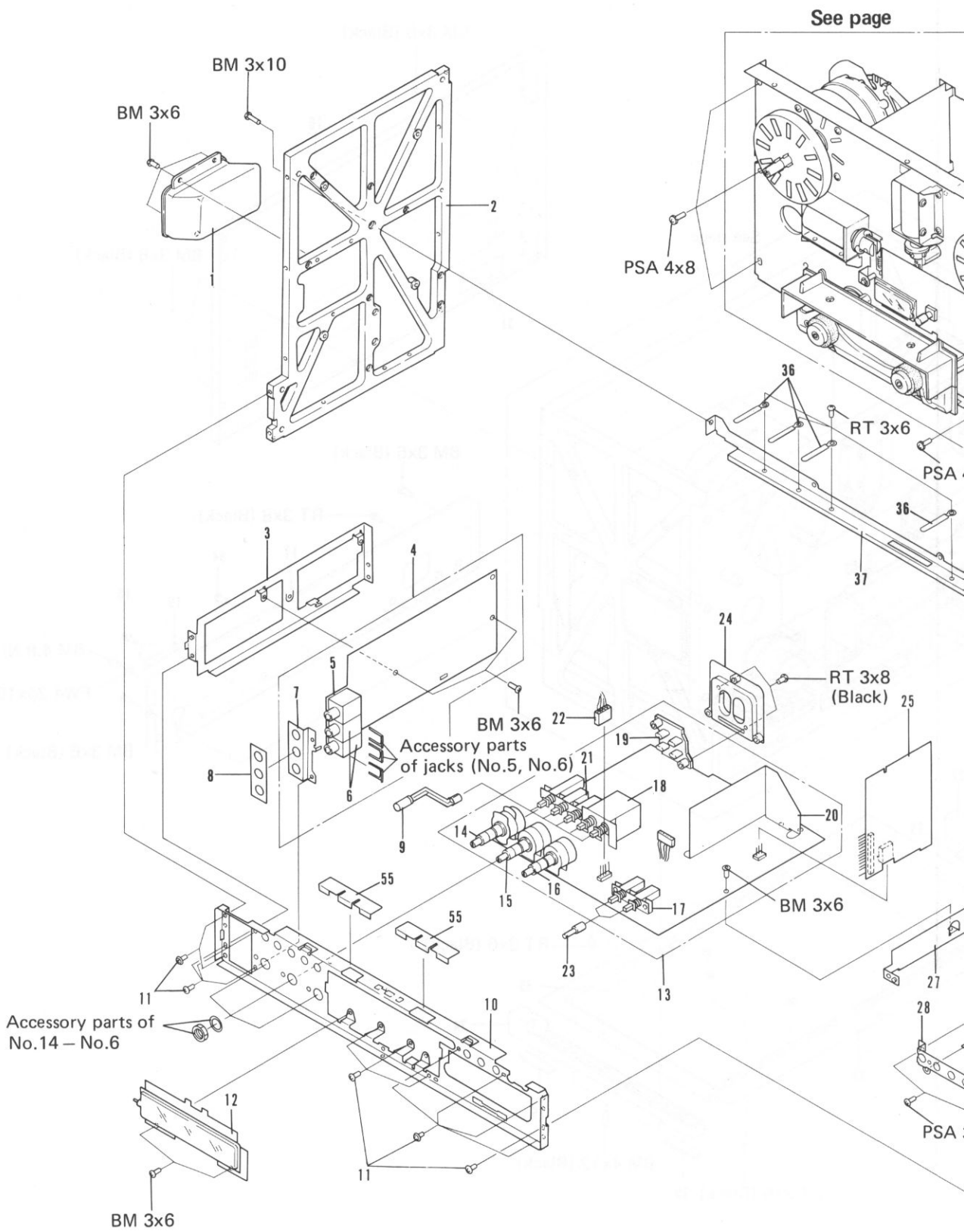
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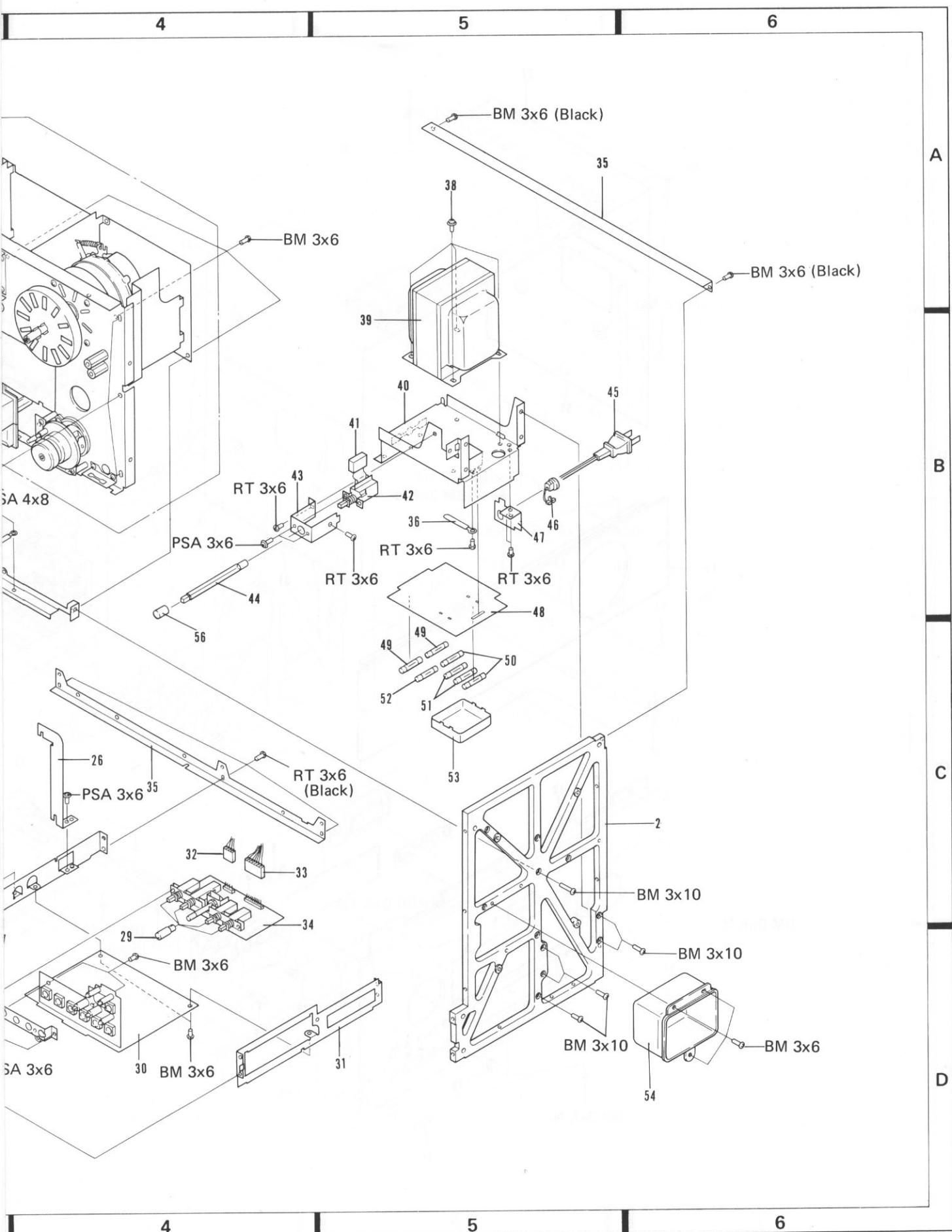
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10.2 INTERIOR COMPONENTS





Parts List

| Key No. | Part No. | Description |
|---------|----------|----------------------------|
| 1. | RNK-832 | Handle L |
| 2. | | Frame |
| 3. | | Chassis L |
| 4. | RWF-088 | Preamplifier assembly |
| 5. | RKN-056 | Headphones jack |
| 6. | RKN-058 | Mic jack |
| 7. | | Jack bracket |
| 8. | | Jack mask |
| 9. | RNK-812 | Switch joint |
| 10. | | Chassis |
| 11. | | TP screw 3x6 |
| 12. | | Fluorescent meter assembly |
| 13. | RWX-340 | Mother assembly |
| 14. | RCV-076 | Variable resistor (OUTPUT) |
| 15. | RCV-079 | Variable resistor (MIC) |
| 16. | RCV-075 | Variable resistor (LINE) |
| 17. | RSG-087 | Meter switch |
| 18. | | Switch shield |
| 19. | RKB-014 | Terminal (OUTPUT, INPUT) |
| 20. | | Heat sink |
| 21. | RSG-086 | Mode switch |
| 22. | RKP-126 | Connector assembly (4p) |
| 23. | RAC-113 | Meter knob assembly |
| 24. | | Jack escutcheon |
| 25. | RWX-339 | Driver assembly |
| 26. | | Holder A |
| 27. | | Center bracket |

| Key No. | Part No. | Description |
|---------|----------|-------------------------|
| 28. | | Switch bracket |
| 29. | RAC-115 | Switch knob assembly |
| 30. | RXX-267 | Control A assembly |
| 31. | | Chassis R |
| 32. | RKP-121 | Connector assembly (5p) |
| 33. | RKP-128 | Connector assembly (9p) |
| 34. | RWS-079 | Switch assembly |
| 35. | | Reinforced metal |
| 36. | RNE-605 | UL cord clammer D |
| 37. | | L angle |
| 38. | | TP screw M4x8 |
| 39. | RTT-178 | Power transformer |
| 40. | | Bracket |
| 41. | RWX-109 | Spark killer (UL) |
| 42. | RSA-021 | Power switch (KC, KU) |
| 43. | | Switch holder |
| 44. | RNK-811 | Power switch joint |
| 45. | RDG-022 | Power code |
| 46. | REC-272 | Strain relief |
| 47. | | AC code holder |
| 48. | | Fuse assembly |
| 49. | REK-048 | Fuse 0.5A |
| 50. | REK-055 | Fuse 2A |
| 51. | REK-051 | Fuse 1A |
| 52. | REK-044 | Fuse 4A |
| 53. | | Fuse cover |
| 54. | RNK-834 | Handle R |
| 55. | | Arm mask B |
| 56. | RAD-130 | Switch cap |

10.3 PANEL STAY COMPONENTS

Parts List

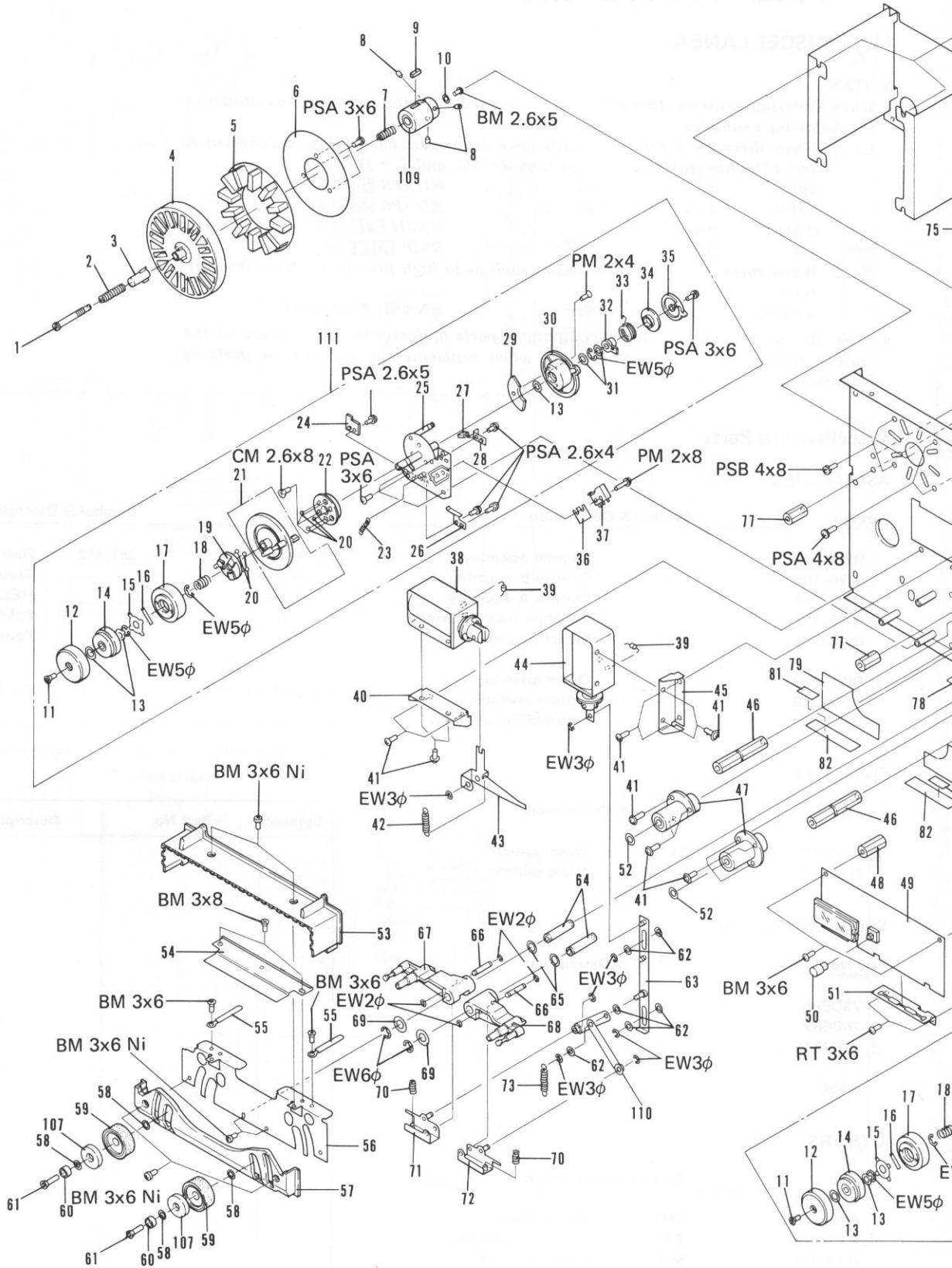
| Key No. | Part No. | Description |
|---------|----------|--|
| 1. | RLB-116 | Reel base shaft |
| 2. | RBH-585 | Reel base spring |
| 3. | RNG-227 | Reel base blade |
| 4. | RNG-209 | Reel base |
| 5. | REB-349 | Reel sheet |
| 6. | | Reel plate |
| 7. | RBH-586 | Reel base adjust spring |
| 8. | | Setscrew with hexagon hole M4x4 |
| 9. | RLB-129 | Sliding key |
| 10. | | Nylon washer 3.2φ x 6φ x 0.5t |
| 11. | | Countersink screw with hexagon hole M4x8 |
| 12. | | Roller cap |
| 13. | | Nylon washer 6.2φ x 12φ x 0.5t |
| 14. | | Guide roller assembly |
| 15. | | Spring |

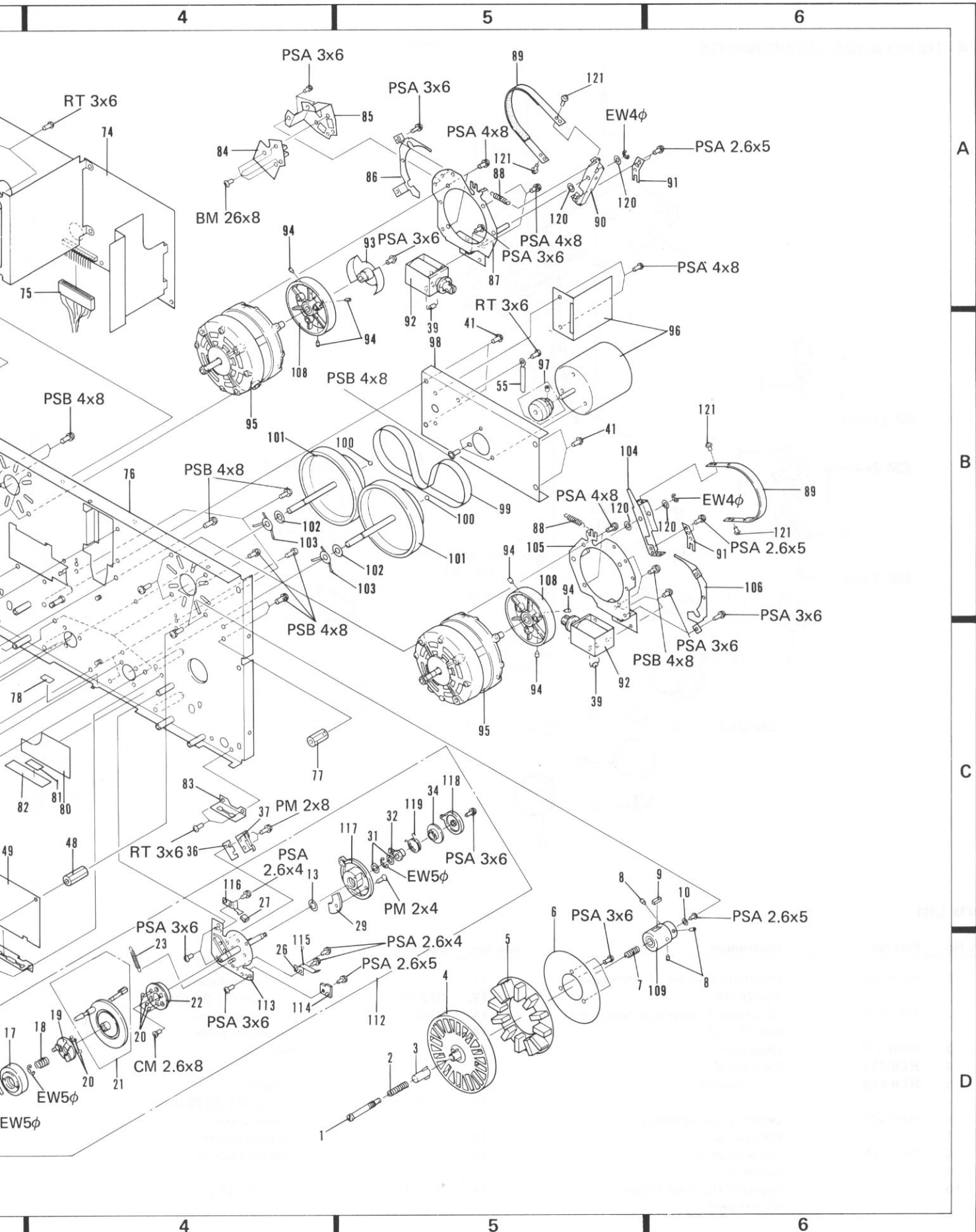
| Key No. | Part No. | Description |
|---------|----------|------------------------|
| 16. | | Parallel pin |
| 17. | | Guide case |
| 18. | | Spring |
| 19. | | Ball holder |
| 20. | | Nylon ball |
| 21. | | Guide table assembly |
| 22. | | Ball tray |
| 23. | | Arm return spring |
| 24. | | Stopper L |
| 25. | | Roller stay L assembly |
| 26. | | Lock plate L |
| 27. | | Stopper |
| 28. | | Stopper bracket L |
| 29. | | Sub balance weight |
| 30. | | Shut-off cam L |

| Key No. | Part No. | Description |
|---------|----------|--|
| 31. | | Nylon washer 6.2 ϕ x 12 ϕ x 0.3t |
| 32. | | Damper plate |
| 33. | | Damper spring L |
| 34. | | Damper cap |
| 35. | | Damper stopper L |
| 36. | REC-278 | Switch spacer |
| 37. | RSF-022 | Micro switch |
| 38. | RXP-070 | Pause solenoid |
| 39. | | Diode W03C |
| 40. | | Solenoid stay |
| 41. | | TP screw M3x6 |
| 42. | RBH-584 | Pause lever spring |
| 43. | | Pause lever |
| 44. | RXP-071 | Pinch solenoid |
| 45. | | Solenoid stay |
| 46. | | Head base stay |
| 47. | RXB-174 | Bearing assembly |
| 48. | | Boss |
| 49. | RWX-336 | Counter assembly |
| 50. | RAC-114 | Counter knob assembly |
| 51. | | Stay |
| 52. | REB-052 | Oil thrower washer A |
| 53. | RNK-835 | Head housing A |
| 54. | | Shield plate |
| 55. | | UL code clamper (D) |
| 56. | | Shield plate |
| 57. | RNK-842 | Head housing B |
| 58. | RBF-033 | Polyethylene washer |
| 59. | RXB-194 | Pinch roller assembly |
| 60. | RLB-105 | Pinch roller collar |
| 61. | RBA-050 | Countersink screw with hexagon screw M3x6 |
| 62. | | Nylon washer 4.2 ϕ x 8 ϕ x 0.5t |
| 63. | | Center link assembly |
| 64. | | Pinch arm shaft |
| 65. | | Nylon washer 8.2 ϕ x 16 ϕ x 0.5t |
| 66. | RLB-108 | Shaft |
| 67. | RXB-195 | Pinch arm L assembly |
| 68. | RXB-196 | Pinch arm R assembly |
| 69. | | Nylon washer 8.2 ϕ x 16 ϕ x 0.5t |
| 70. | RBH-645 | Pressure spring |
| 71. | | Pressure plate L assembly |
| 72. | | Pressure plate R assembly |
| 73. | RBH-583 | Senter link return spring |
| 74. | RWG-105 | Control B assembly |
| 75. | RKP-130 | Connector assembly (19p) |
| 76. | | Chassis assembly |
| 77. | | Panel stud |
| 78. | RED-166 | Stopper felt |
| 79. | | Arm mask L |
| 80. | | Arm mask R |
| 81. | REB-374 | Arm cushion |
| 82. | | Arm mask A |
| 83. | | P.C.B. holder |
| 84. | | Sensing assembly |
| 85. | | Sensing bracket |

| Key No. | Part No. | Description |
|---------|----------|--|
| 86. | | Brake guide L |
| 87. | | Brake bracket L assembly |
| 88. | RBH-591 | Brake spring |
| 89. | RXB-204 | Brake band assembly |
| 90. | | Brake arm L |
| 91. | | Brake link |
| 92. | RXP-075 | Brake solenoid |
| 93. | RNK-827 | Sensor slit |
| 94. | | Setscrew with hexagon hole M4x5 |
| 95. | RXM-060 | Reel motor |
| 96. | | Capstan motor |
| 97. | RXB-239 | Pulley assembly |
| 98. | | Motor stay |
| 99. | REB-361 | Belt |
| 100. | N23-608 | Nylon ball |
| 101. | RXB-283 | Capstan assembly |
| 102. | | Nylon washer 6.2 ϕ x 12 ϕ x 0.5t |
| 103. | RBK-139 | Thrust spring |
| 104. | | Brake arm R |
| 105. | | Brake bracket R assembly |
| 106. | | Brake guide R |
| 107. | REC-305 | Pinch roller cap |
| 108. | RNK-833 | Brake drum |
| 109. | | Reel base bearing |
| 110. | | Joint assembly |
| 111. | RXX-265 | Tension roller assembly L |
| 112. | RXX-266 | Tension roller assembly R |
| 113. | | Roller stay R assembly |
| 114. | | Stopper R |
| 115. | | Lock plate R |
| 116. | | Stopper bracket R |
| 117. | | Shut-off cam R |
| 118. | | Damper stopper R |
| 119. | | Damper spring R |
| 120. | B22-424 | Washer 5 ϕ |
| 121. | | TP screw M2.6x5 |

Panel Stay Components





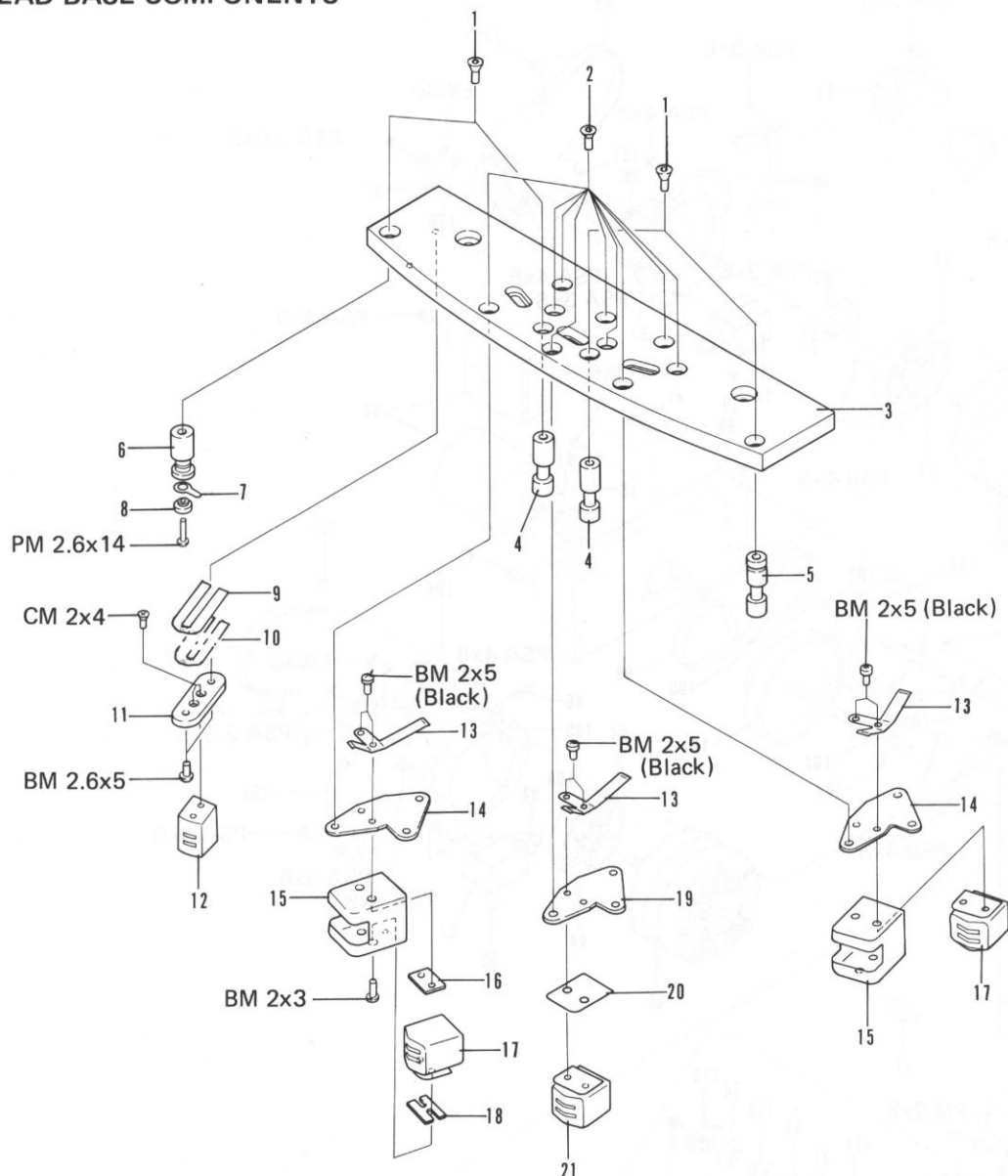
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C

D

10.4 HEAD BASE COMPONENTS



Parts List

| Key No. | Part No. | Description |
|---------|----------|---|
| 1. | RBA-015 | Countersink screw with hexagon hole M3x8 |
| 2. | RBA-016 | Countersink screw with hexagon hole M3x10 |
| 3. | RNG-230 | Head base |
| 4. | RLB-111 | Tape guide |
| 5. | RLB-112 | Tape guide R |
| 6. | RXB-200 | Sensing guide assembly |
| 7. | | Sensing lug |
| 8. | REC-315 | Insulator collar |
| 9. | | Spacer C |
| 10. | | Spacer D (for head height adjustment) |

| Key No. | Part No. | Description |
|---------|----------|-----------------------|
| 11. | | E head mount plate |
| 12. | RPS-047 | Erase head (4T 2C EH) |
| 13. | RBK-137 | Head adjust spring |
| 14. | | Head mount plate |
| 15. | | Shield case |
| 16. | | Tap plate |
| 17. | RPB-065 | P.B head (4T 2C PBH) |
| 18. | | P.B head spacer |
| 19. | | REC head mount plate |
| 20. | | Shield case spacer |
| 21. | RPB-064 | REC head (4T 2C RH) |