

Serial No. 11,537 and later

TC-650

USA Model



Set using ISO screws

SPECIFICATIONS

Power Requirements: AC 117V, 60 Hz, 90W

Track System: Four-track stereo and mono
Two-track stereo and mono

Reel Size: 7" (18 cm) maximum

Tape Speed: $7\frac{1}{2}$ ips and $3\frac{3}{4}$ ips
(19 cm/s and 9.5 cm/s)

Recording Time:	4-track	
	<u>Tape speed</u>	<u>stereo mono</u>
(with 1,800 ft. tape)	$7\frac{1}{2}$ ips (19 cm/s)	1.5 hrs 3 hrs
	$3\frac{3}{4}$ ips (9.5 cm/s)	3 hrs 6 hrs

Frequency Response: 20 ~ 22,000 Hz at $7\frac{1}{2}$ ips (19 cm/s)
(with standard tape) 20 ~ 18,000 Hz at $3\frac{3}{4}$ ips (9.5 cm/s)

Signal-to-Noise Ratio: 54 dB (at peak level recording)
(with standard tape)

Flutter and Wow: 0.04% at $7\frac{1}{2}$ ips (19 cm/s)
0.1% at $3\frac{3}{4}$ ips (9.5 cm/s)

Recording Bias Frequency: Approx. 120 kHz

Inputs: Four MIC inputs
Impedance: 600 Ω
Maximum sensitivity: 0.2 mV (-72 dB)
Two LINE INputs
Impedance: 100 k Ω
Maximum sensitivity: 70 mV (-22 dB)

Outputs: Two LINE OUTputs
Impedance: 100 k Ω or more
Output level: 0.775 V (0 dB)
HEADPHONE output
Impedance: 8 Ω load
Output level: 0.038 V (-26 dB)
with 8 Ω load
(When line output level is 0 dB)

Semiconductors: 44 transistors and 51 diodes

Dimensions: $16\frac{3}{8}$ (W) x $9\frac{1}{2}$ (H) x $17\frac{1}{4}$ " (D)
(420 x 246 x 446 mm)

Weight: 46 lb (21 kg)

SONY®

SERVICE MANUAL

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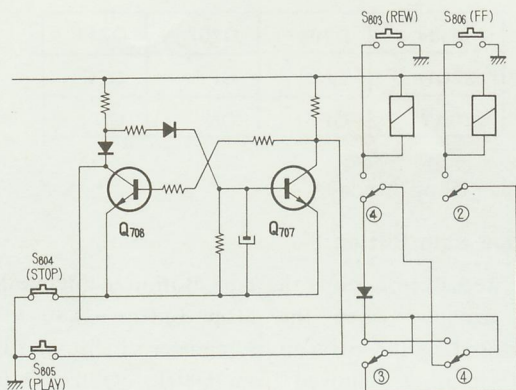


Fig. 1-1-3. FF & REW circuit

1-1-5. Instant Stop Circuit (Delay Circuit)

In changing a mode from the fast forward (or the rewind) to the play, a pause state for two seconds is employed by the instant stop circuit. This system affords a saving in tape.

As +23 V power voltage is applied to the base of Q710 through D720 and R724 in Fast Forward (rewind) mode, Q710 turns on. Q709 also turns on. When the Play Button is depressed the Fast Forward (or Rewind) relay is turned off as described in 1-1-4 on Page 3. Q710 and Q709 turn on during discharging time of C709. The delay time is determined by the time constant of C709 and R724. After discharging of C709, Q711 turns on and the Play relay is energized to set the unit in the play mode.

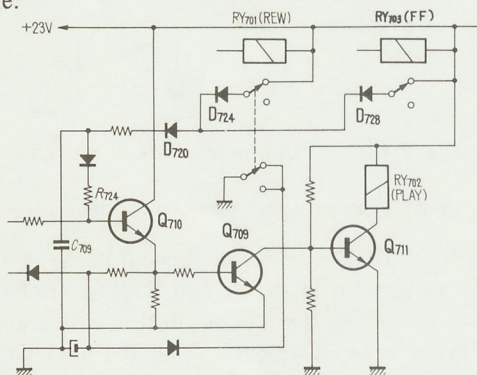


Fig. 1-1-4. Instant stop circuit

1-1-6. Brake, Pinch Roller, and Tape Shifter Solenoids

When the Play relay is on in the play mode, the brake, pinch roller, tape shifter solenoids will operate.

In the fast forward (or rewind) mode, only the brake solenoid works. When the TAPE SHIFT Button is pushed, Q804 turns on and the tape shifter solenoid will operate.

To avoid a rise in temperature of solenoids caused from a long time use, the following circuit is employed. When the Play (Rewind or Fast Forward) Button is pushed, first approximately +23 V is applied to the solenoid as +23 V is applied to the base of transistor Q805 (Q803 or Q804) through capacitor C711 (C712 or C713). When the capacitor is charged, +23 V is applied to the base through resistor R730 (R733 or R736). The voltage across of the solenoid decreases, as the voltage at the base is lowered by the resistor. The characteristic curve and the normal terminal voltage is shown in Fig. 1-1-6.

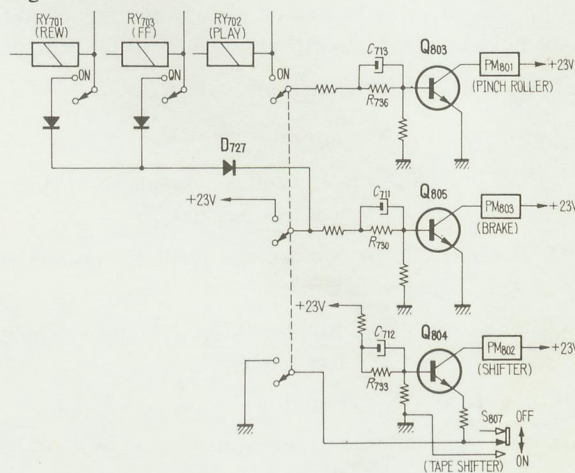


Fig. 1-1-5. Solenoid driving circuit

Terminal Voltage of Solenoids in normal state

Pinch Roller Solenoid	Approx. 18 V
Brake Solenoid	Approx. 14 V
Tape Shifter Solenoid	Approx. 15 V

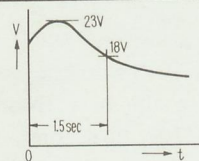


Fig. 1-1-6. Terminal voltage characteristics of solenoids

1-1-7. Tape Speed Selector

When the tape speed is 7½ ips, Q712 is cut off and the Speed Selector relay does not operate. When changing a speed from 7½ ips to 3¾ ips by pushing the TAPE SPEED Selector button, Q712 turns on after the delay time of 0.5 seconds due to the time constant of C714 and R741. It eliminates a click noise caused by the relays when changing a speed. R743 adjusts the delay time made by C714 and R743, when returning the speed from 3¾ ips to 7½ ips.

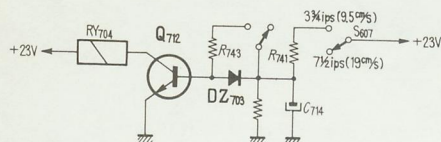


Fig. 1-1-7. Tape speed selector circuit

1-1-8. Muting

Muting circuit is employed to prevent a click noise in changing a tape speed or a mode from the fast forward (or rewind) to the play. It is applied to the playback amplifier circuit to prevent a click noise. When the tape speed is changed from 7 1/2 ips (19 cm/s) to 3 3/4 ips (9.5 cm/s) in the play mode, the circuit operates as follows. The voltage charged at C605 is applied to the base of Q710 through D713. Q710 thus turns on, and the emitter voltage of Q710 is applied to the base of the muting transistor Q306 (Q406) in the playback amplifier circuit through D714 and R723. Therefore Q306 (Q406) turns on and then the playback signal is grounded. Muting time is determined by the time constant of C605 (C606) and R621. In the fast forward (or rewind) mode, Q710 is on because +23V is applied to the base of Q710 through D720, D721, etc. Though muting transistor Q306 in the playback amplifier turns off, with the base grounded by the Fast Forward (RY701) or the Rewind (RY703) relay. The playback signal thus can be obtained by pushing the TAPE SHIFT Button in the fast forward or the rewind mode. When changing a mode from the fast forward (rewind) to the play, Q709 and Q710 are cut off as base bias voltage to Q710 through D720 is disconnected. But the voltage charged at C709 in the rewind or the fast forward mode is applied to the base of Q710 during discharging time of C709. Therefore the playback signal is grounded while Q306 (Q406) is conducting.

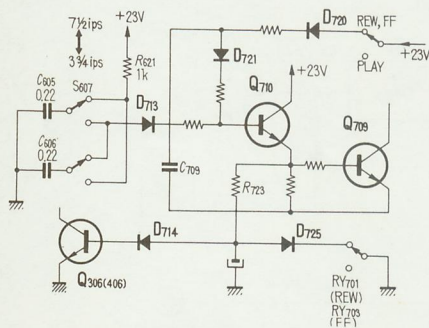


Fig. 1-1-8. Muting circuit

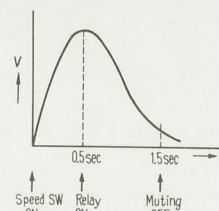


Fig. 1-1-9. Muting characteristics curve

1-1-9. Power Supply

In the power supply circuit there are two separate voltage regulators, one for the system control circuit and the other for the amplifier circuit. D709 blocks dc current to flow from load to power supply, and the ripple filter (Q706) operates to turn on D304 in the playback equalizer circuit at the tape speed of 7 1/2 ips.

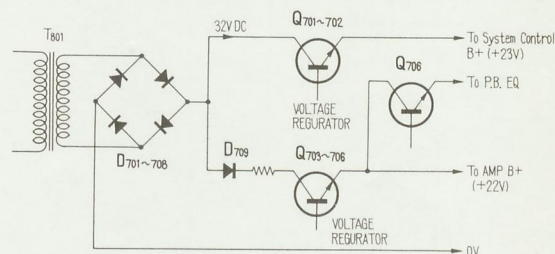


Fig. 1-1-10. Power supply circuit

1-1-10. Reel Motor

When the Play Button is pushed, the Play relay (RY702) is energized. 55V is supplied to M802 (supply reel motor) through R802 (back-tension torque adj.), and M803 (take-up reel motor) through R803 (take-up torque adj.). When the Rewind Button is pushed, the Rewind relay (RY701) is energized. 100V is applied to M802 directly, and M803 through R801. When the Fast Forward Button is pushed, the Fast Forward relay (RY703) is energized. 100V is applied to M803 directly and M802 through R801.

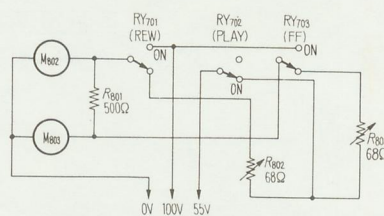
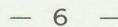
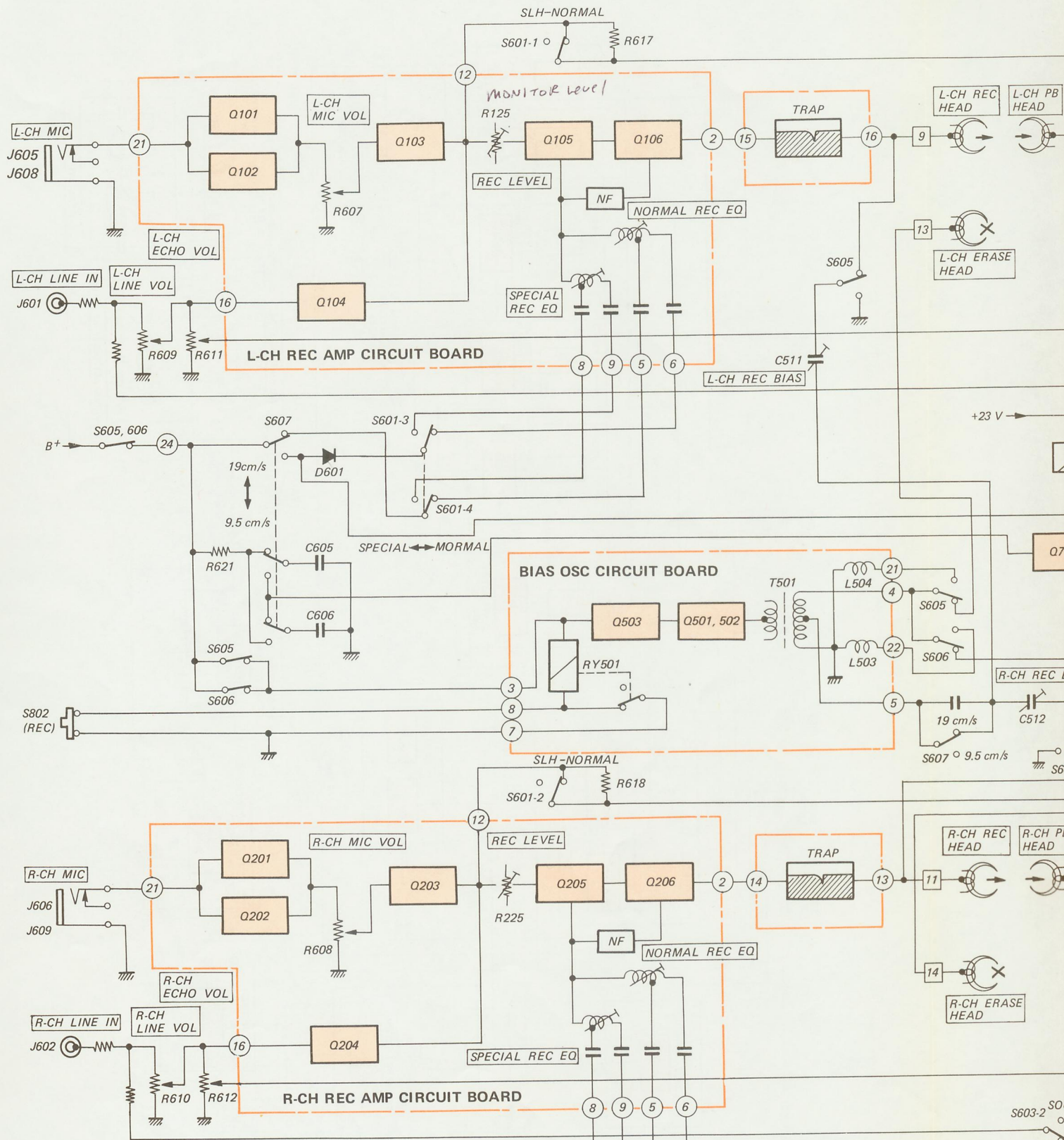


Fig. 1-1-11. Motor circuit



1-2-2. Audio Amp. & Bias OSC Circuit



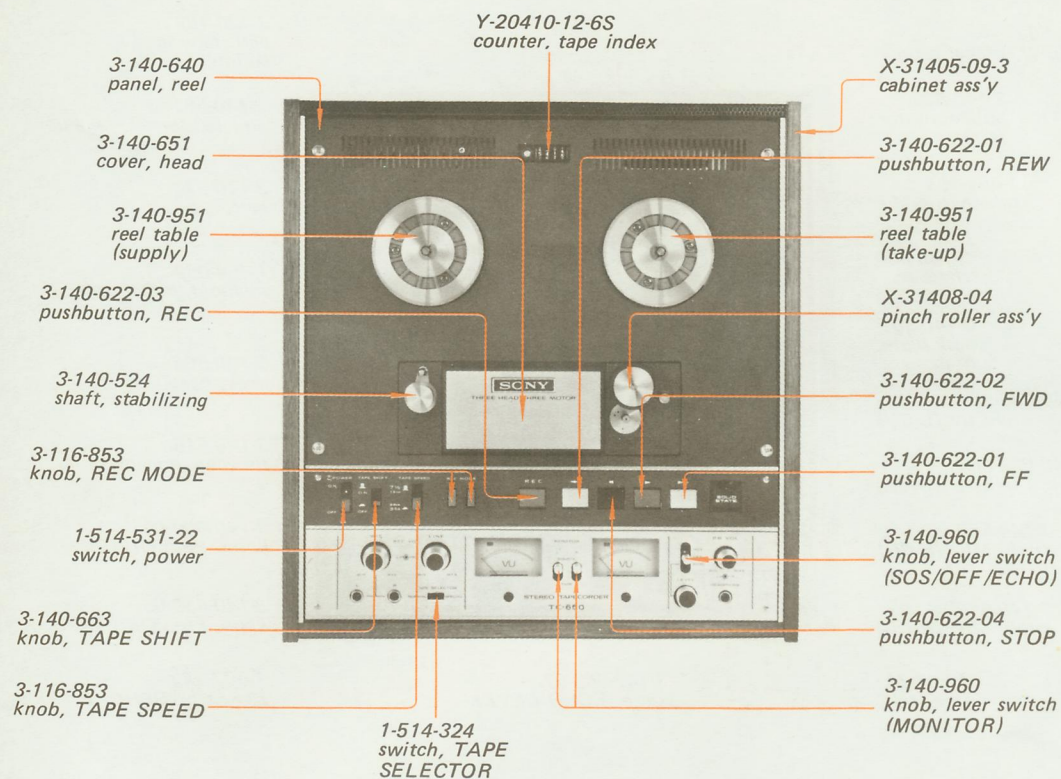
Note:

S601 (TAPE SELECTOR SW) S605 (L-CH REC MODE SW) Q101~106 (REC AMP) Q301~304 (PB AMP) Q305 (METER AMP) Q306 (MUTING) Q501 (STABILIZER) Q502 (METER AMP) Q503 (MUTING)
 S602, 603 (MONITOR SW) S606 (R-CH REC MODE SW) Q201~206 (REC AMP) Q401~404 (PB AMP) Q405 (METER AMP) Q406 (MUTING)
 S604 (SOS/OFF/ECHO SW) S607 (TAPE SPEED SW)

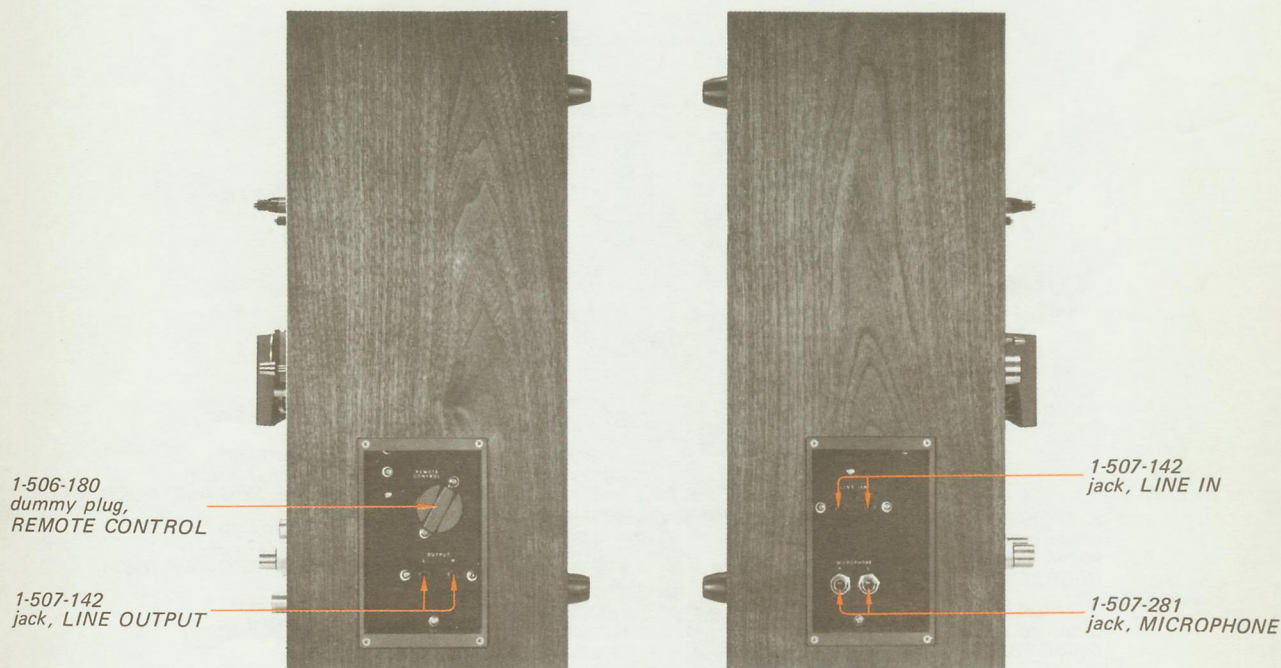


1-3. MAJOR PARTS LOCATIONS

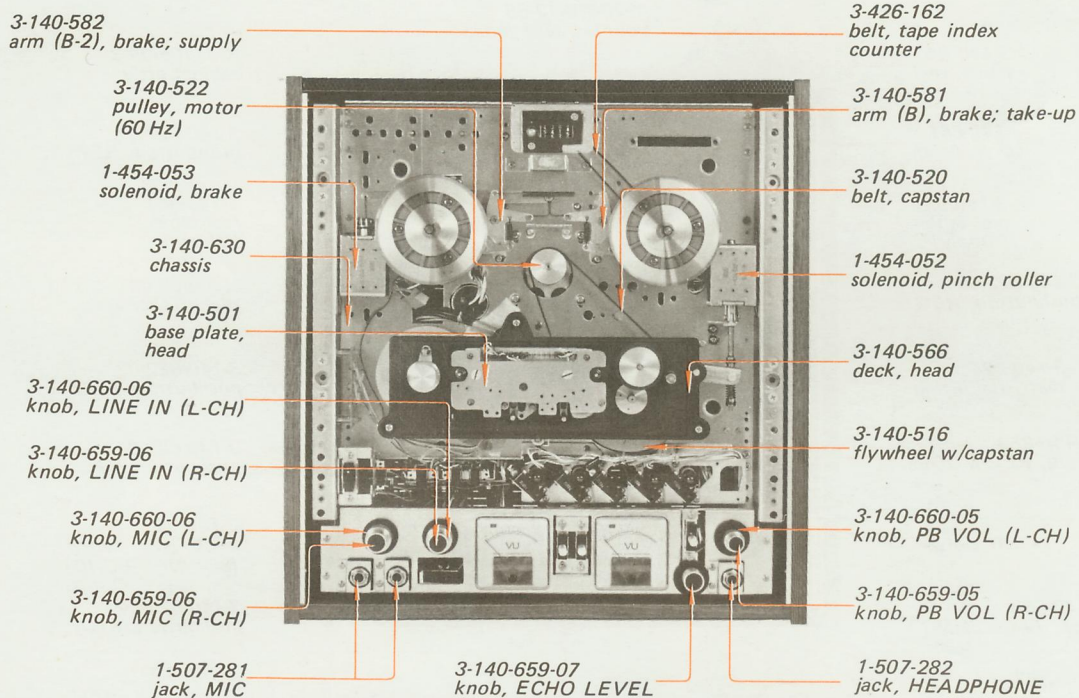
Cabinet — Top View —



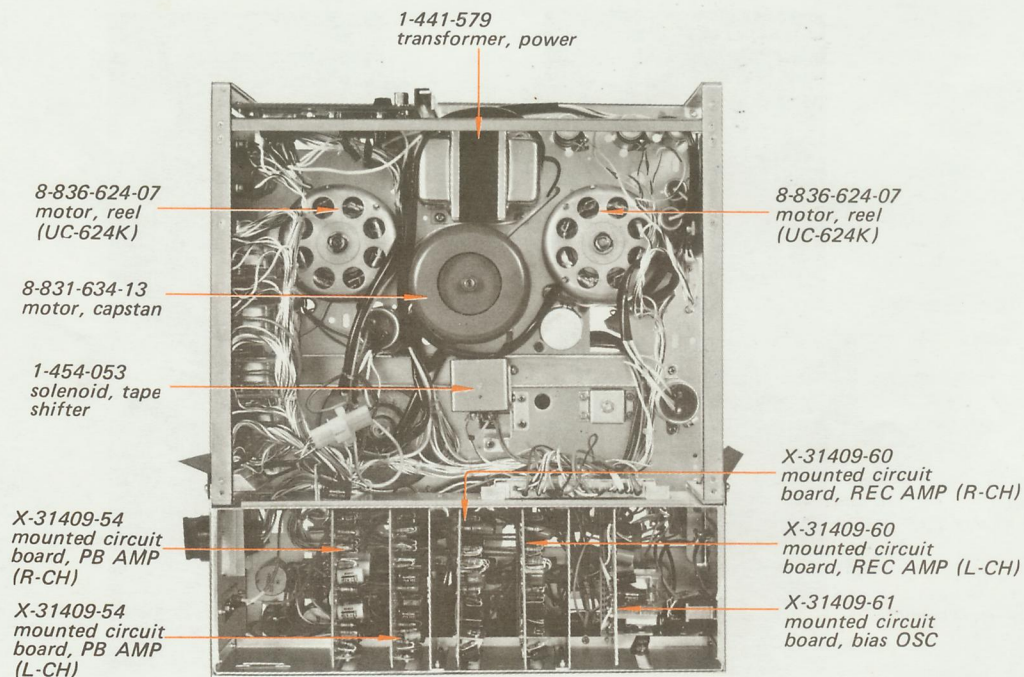
Cabinet — Side Views —



Chassis — Top View —



Chassis — Bottom View —



SECTION 2 DISASSEMBLY

2-1. REEL PANEL REMOVAL

- (1) Remove the four reel panel holding screws shown with ▲ in Fig. 2-1.
- (2) Remove the reel panel.

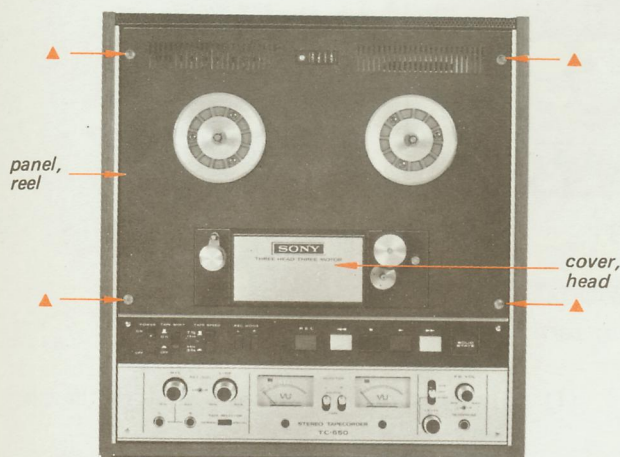


Fig. 2-1. Reel panel removal

2-2. CABINET REMOVAL

- (1) Remove the six screws shown with ● in Fig. 2-2.
- (2) Remove the dummy plug for the remote control by pulling straight up.
- (3) Remove the chassis from the cabinet.

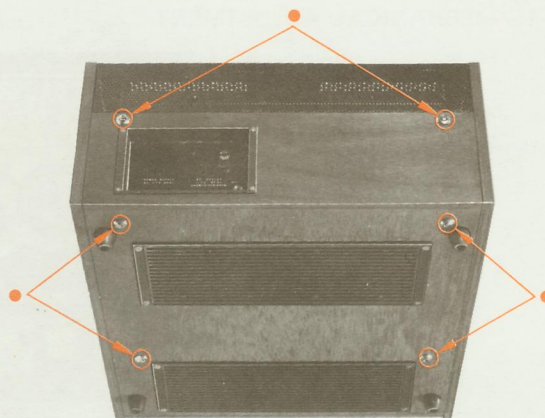


Fig. 2-2. Cabinet removal

2-3. PRINTED CIRCUIT BOARD REMOVAL

Remove the ventilator by taking off four wood screws (⊕K 4×16). See Fig. 2-3. Pull off the printed circuit boards, PB AMP, REC AMP and BIAS OSC. Here the voltage check can be made by removing the cabinet or by using the special jig without the cabinet removed. Remove other printed circuit boards, referring to the cabinet removal.

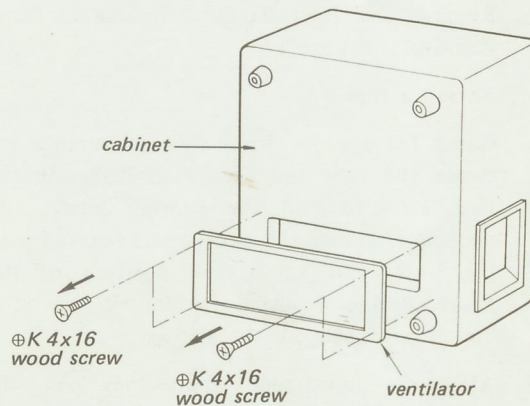


Fig. 2-3. Printed circuit board removal

SECTION 3 ADJUSTMENT PROCEDURES

3-1. MECHANICAL ADJUSTMENT

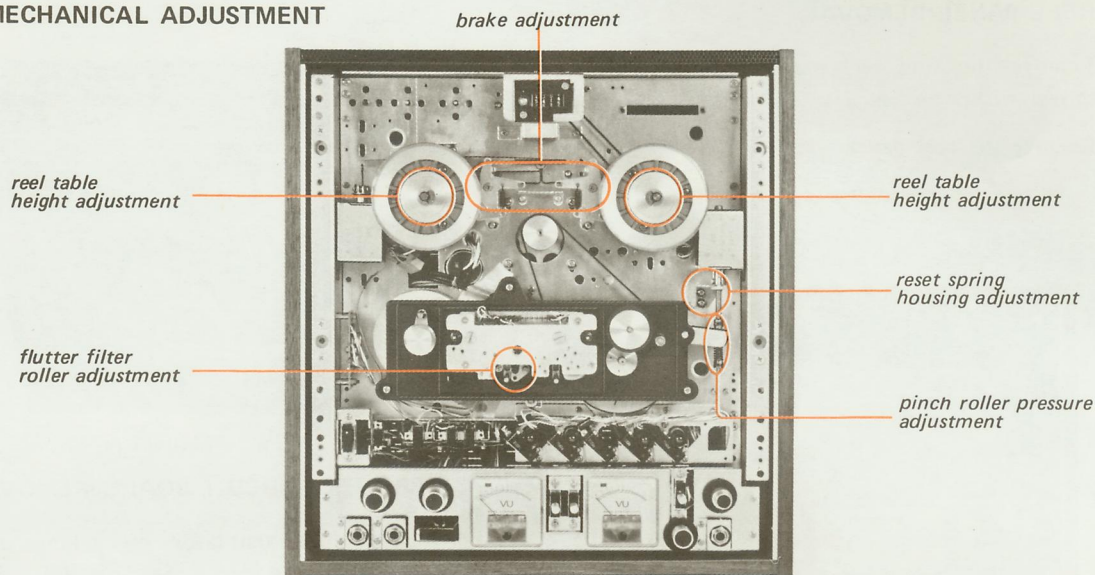


Fig. 3-1-1. Adjusting parts location

3-1-1. Reset Spring Housing Adjustment

See Fig. 3-1-2.

- (1) Remove the Reel Panel. See "Reel Panel Removal" in page 11.
- (2) Thread a tape.
- (3) Check for approx. 1 mm ($\frac{3}{64}$ ") clearance between the tape and the Pinch Roller in the Fast Forward and the Rewind mode. If necessary, loosen the two screws marked ▲ in Fig. 3-1-2, and adjust the position of the Reset Spring Housing by moving in the directions shown by the arrows.
- (4) After the adjustment, apply lock paint to the adjusting screws.

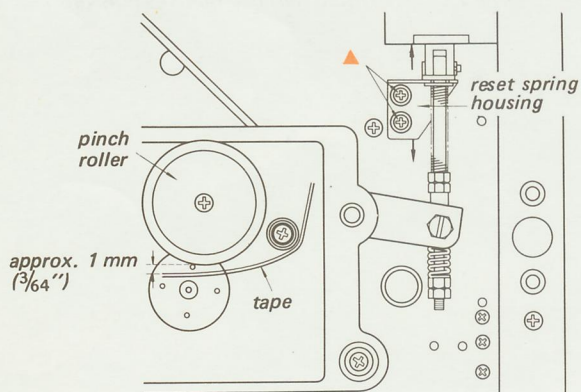


Fig. 3-1-2. Reset spring housing adjustment

3-1-2. Flutter Filter Roller Adjustment

See Fig. 3-1-3.

Remove the Reel Panel and the Head Cover.

- (1) Thread a tape and set the unit to the play mode.
- (2) Adjust the height of the Flutter Filter Roller by the screws marked ▲ and ● in Fig. 3-1-3 so that the tape runs through the middle of the Flutter Filter Roller.
- (3) Turn the screw marked ● in Fig. 3-1-3 to perform the azimuth adjustment of the Flutter Filter Roller.
- (4) For zenith adjustment turn the two screws marked ▲ in Fig. 3-1-3 to contact the tape uniformly with the record and playback heads.
- (5) Make sure that the Flutter Filter Roller smoothly rotates during tape running. Apply lock paint to the adjusting screws.

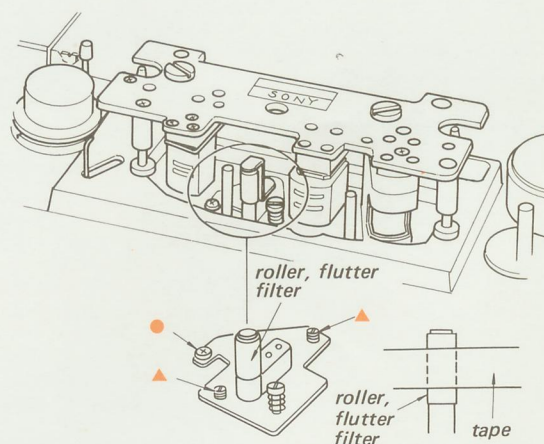


Fig. 3-1-3. Flutter filter roller adjustment

3-1-3. Pinch Roller Pressure Adjustment

See Fig. 3-1-4 and 3-1-5. This adjustment should be made after the Reset Spring Housing Adjustment.

- (1) Remove the Reel Panel.
- (2) Set the unit to the play mode.
- (3) Adjust the adjusting nut (A) for 1 mm ($\frac{3}{64}$ "") clearance between the Link Shaft and the adjusting nut (A). See Fig. 3-1-4.
- (4) Make a loop with a piece of string and attach the spring scale to the Pinch Roller Shaft with the loop of string. See Fig. 3-1-5. Pull the scale horizontally in the direction shown by the arrow. The Capstan Shaft, Pinch Roller and the spring scale should be in a line. Check the reading when the Pinch Roller just leaves the Capstan Shaft.
- (5) Adjust the adjusting nut (B) for 2.5 ± 0.2 kg (5 to 6 lb).
- (6) Repeat steps 3 to 5 several times.
- (7) After adjustment lock the adjusting nut (B) by the lock nut (B), and the adjusting nut (A) by the lock nut (A). (Be careful not to move the adjusting nuts.)

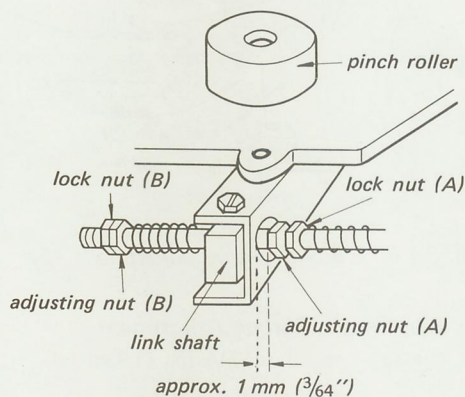


Fig. 3-1-4. Pinch roller pressure adjustment (1)

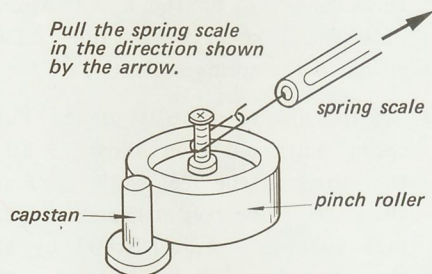


Fig. 3-1-5. Pinch roller pressure adjustment (2)

- (8) Make sure that the unit operates normally when a mode is changed from the play to the stop and vice versa several times. If the tape slips, readjust the above steps.

3-1-4. Reel Table Height Adjustment

- (1) Remove the Reel Panel.
- (2) Place a 7-inch reel onto the Reel Table, and thread a tape.
- (3) Set the unit to the play mode.
- (4) Check both reels to see that tape does not touch either flange of the reels. If the tape is not taken up on the mid portion between the upper and the lower flanges of the reel, loosen the set screws with an allen wrench (hexagon socket), and adjust the reel table height.
- (5) Check for the reel table height in the rewind mode.
- (6) Exchange the reels. Check for the reel table height.
- (7) After the adjustment, apply lock paint to the adjusting screws.

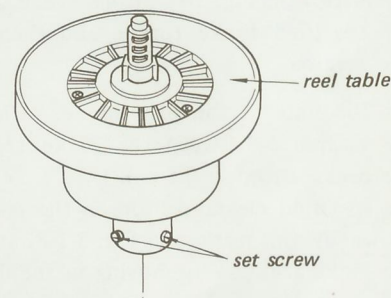


Fig. 3-1-6. Reel table height adjustment

3-1-5. Brake Torque Adjustment

See Fig. 3-1-7 and 3-1-8. Brake torque adjustment is required if:

The reel pays out and slackens tape when going from the record, play, fast forward or rewind mode to the stop.

The following adjustment is required for both sides, take-up and supply reel table brakes. Words in $< >$ are applied to the supply reel table brake torque adjustment.

Setup

- (1) Remove the Reel Panel, referring to the "Reel Panel Removal" in page 11.
- (2) Take off the two screws shown by the mark ■ in Fig. 3-1-7, and remove the Reel Table.

Counterclockwise < Clockwise > Brake Torque Adjustment

- (1) Set the unit to the stop mode.
- (2) Loosen the two screws shown by the mark ▲ in Fig. 3-1-7.
- (3) Adjust by positioning the Brake Arm horizontally so that the one-fourth part of the Brake Lining from the end of bent portion contacts with the Brake Drum (See Fig. 3-1-7).
- (4) Fix the two screws shown by the mark ▲ in Fig. 3-1-7, tentatively.
- (5) Place an empty reel with string wound several turns counterclockwise < clockwise > on the hub (44 mm dia) onto the reel table. Tie the string to the spring scale. Pull the spring scale horizontally and at a constant speed. Check the reading for brake torque. It should be 300 g-cm to 500 g-cm (4.2 oz-inch to 7.0 oz-inch). Adjust the position of the Brake Arm by loosening the two screws shown by the mark ▲ in Fig. 3-1-7, if necessary, to obtain the specified brake torque and then fix the two screws.
- (6) Set the unit to the play mode. Check that the clearance between the Brake Lining and the Brake Drum is 0.5 mm ($\frac{1}{64}$ "). To obtain the specified clearance, loosen the two screws shown by the mark ● in Fig. 3-1-8, and adjust the brake arm (A) by moving in the directions shown by the arrows in Fig. 3-1-8.
- (7) If necessary, bend the Link Rod (B) in the directions shown by the arrows in Fig. 3-1-8.

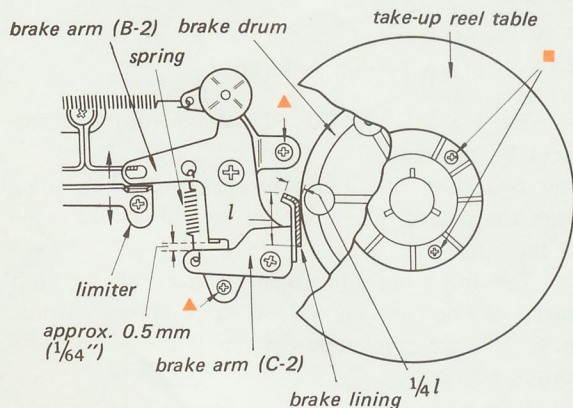


Fig. 3-1-7. Brake torque Adjustment (1)

Clockwise < Counterclockwise > Brake Torque Adjustment

- (1) Set the unit to the stop mode.
- (2) Place an empty reel with string wound several turns clockwise < counterclockwise > on the hub (44 mm dia) onto the reel table. Tie the string to the spring scale. Pull the spring scale horizontally and at a constant speed. Check the reading for brake torque. It should be 1,000 g-cm to 1,400 g-cm (14 oz-inch to 19 oz-inch). Bend the Limiter in the direction shown by the arrows in Fig. 3-1-7 to obtain the specified brake torque.
- (3) Make sure that the Brake Arm (B-2) contacts with the Limiter and that the clearance between the convex part of the Brake Arm B-2 < B > and the Brake Arm C-2 < C > is 0.5 mm ($\frac{1}{64}$ ") or more as shown in Fig. 3-1-7 & Fig. 3-1-8.
- (4) If the clearance is less than 0.5 mm ($\frac{1}{64}$ "), expand the spring shown in Fig. 3-1-7 & Fig. 3-1-8.

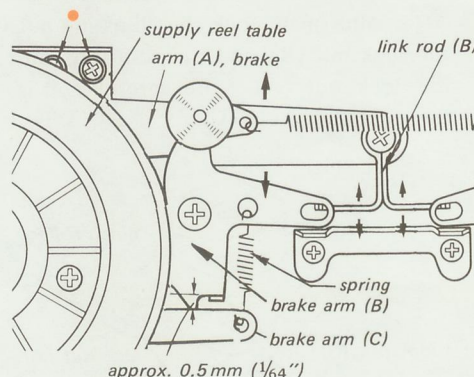


Fig. 3-1-8. Brake torque adjustment (2)

3-1-6. Reel Motor Torque Adjustment

Set the tape speed to $7\frac{1}{2}$ ips (19 cm/s).

1. Take-Up Motor Torque Adjustment

- (1) Place the reel with string wound several turns clockwise on the hub (44 mm dia) onto the Take-up Reel Table. Tie the string to the spring scale.
- (2) Set the unit to the play mode. Pull the spring scale and then allow to take up the string on the reel while approaching the scale to the reel at the same speed of tape running. Adjust R803 by sliding the band for 260 to 280 g-cm (3.6 to 3.9 oz-inch) on the spring scale. See Fig. 3-1-9.

Note: Read the scale while moving it.

2. Back Tension Torque Adjustment

- (1) Place the empty hub with string wound several turns counterclockwise on the hub (44 mm dia) onto the Supply Reel Table. Tie the string to the spring scale.
- (2) Set the unit to the play mode. Pull the spring scale at the same speed of tape running. Adjust R802 by sliding the band for 240 to 280 g-cm (3.3 to 3.9 oz-inch) on the spring scale. See Fig. 3-1-9.

Note: Read the scale while pulling it.

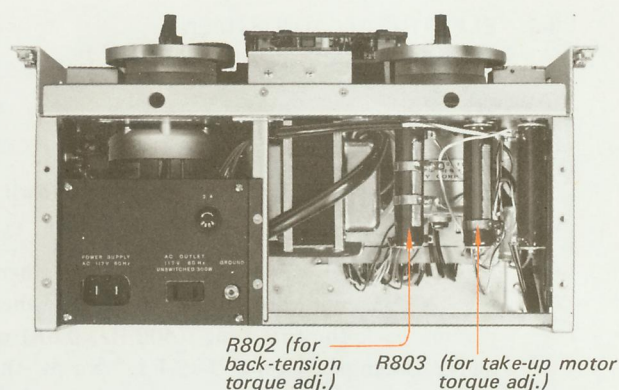


Fig. 3-19. Adjusting parts location for reel motor torque adjustment

3-2. MAINTENANCE

3-2-1. Lubrication

Use light machine oil and lubricate the pinch roller shaft and capstan drive motor lubricating hole. Avoid excessive lubrication. It will cause slippage of the mechanism. If the oil should spill on the pinch roller or the rubber belt, wipe it off immediately with denatured alcohol. To lubricate them, proceed as follows:

- (1) Remove the head cover and the screw securing pinch roller and then lubricate the pinch roller shaft with one drop of light machine oil.
- (2) Remove the reel panel and lubricate the motor lubricating hole with several drops of light machine oil.

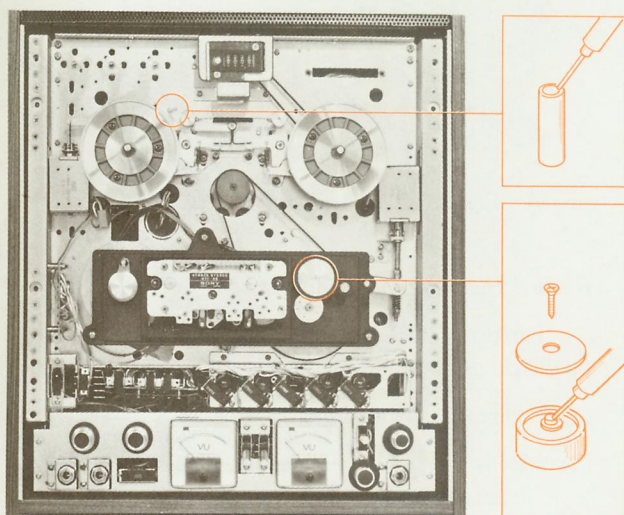


Fig. 3-2-1. Lubrication

3-2-2. Cleaning

Dusts and dirt which were brought by tape may stick to the core of the record, playback or erase head, and they may deteriorate performance of the playback head. So wipe off the surface of head which contacts tape, with a clean and soft

cloth dampened with denatured alcohol. To insure proper operation, the heads should be cleaned at least once during each ten hours of actual operation.

CAUTION

Do not use any other solvent on the head as some will damage the material which binds the head laminations together. Also do not use any metallic device which will scratch the head.

At the same time, clean capstan, rubber belt, pinch roller, tape guide, flutter filter roller and stabilizing shaft.

3-3-3. Demagnetizing

The record and playback heads may occasionally acquire a degree of permanent magnetization, which will result in an increase of noise level, distortion of any recorded signal, and a gradual erasure of high frequency on any recorded tape which passed over them. These heads may be easily demagnetized with a SONY head demagnetizer HE-2 (optional accessory) or equivalent.

To demagnetize the heads, proceed as follows:

- (1) Remove the head cover.
- (2) Make sure that power switch on the TC-650 is in the OFF position.
- (3) Connect the demagnetizer to ac power source.
- (4) Bring the tips of the demagnetizer in close proximity to, but not in contact with, the heads so that the tips straddle the gap in the center of the head, run the tips up and down the heads several times, and then slowly withdraw the demagnetizer.

CAUTION

Do not bring magnet close to heads.

3-3. ELECTRICAL ADJUSTMENT

Precaution:

Before making the adjustment, read the following carefully.

- (1) Set the PB VOL control to the position where the VTVM indicates 0 dB (0.775 V) when playing back the first tone (400 Hz, 0 dB) of SONY alignment tape J-19-F₂, except the dummy coil and the bias trap coil adjustments.
- (2) Set the switches to the position indicated below, unless otherwise specified.

TAPE SPEED switch 19 cm/s (7½ ips)
 SOS & ECHO switch OFF
 MONITOR switch TAPE
 TAPE SELECTOR switch NORMAL

- (3) Clean the heads with soft cloth dampened with denatured alcohol and also demagnetize them with a demagnetizer.
- (4) A new tape or a sufficiently-demagnetized tape should be used as a blank test tape.
- (5) The test equipments needed for the adjustment are as follows:

Audio oscillator
 Attenuator
 600Ω and 100 kΩ resistors
 VTVM
 Non-magnetic screwdriver
 SONY alignment tapes, J-19-F₂ and J-9-F₁
 Blank tape
 SONY SLH blank tape

- (6) Connect the VTVM and the 100 kΩ resistor in parallel with LINE OUT jack, except the dummy coil adjustment.
- (7) SONY alignment tapes contain the following information in the sequence indicated.

tone tape	1st	2nd	3rd	4th	5th	6th	7th
J-19-F ₂	400 Hz 0 dB	400 Hz -10 dB	10 kHz -10 dB	12.5 kHz -10 dB	7 kHz -10 dB	80 Hz -10 dB	40 Hz -10 dB
J-9-F ₁	5 kHz -10 dB	400 Hz 0 dB	400 Hz -10 dB	5 kHz -10 dB	3 kHz -10 dB	200 Hz -10 dB	80 Hz -10 dB

- (8) Reference No. in the parentheses are applied to R-CH adjustment.

3-3-1. Head Adjustment

Avoid making any adjustment other than azimuth adjustment, as special equipments are required for any other head-adjustment.

Playback Head Azimuth Adjustment

- (1) Thread the SONY alignment tape (J-19-F₂) onto the unit.
- (2) Set the tape speed to 7½ ips (19 cm/s).
- (3) Make the connections as shown in Fig. 3-3-1.
- (4) Loosen the azimuth adjusting screws of A block (or B block) equally.
- (5) Play back the third tone (10 kHz) of the alignment tape. Adjust the azimuth adjusting screws (⊖ SC 2×3) of B block (or A block) for maximum reading on the VTVM at both channels by tightening or loosening equally. Tighten the screws of A block (or B block) after the correct azimuth angle has been obtained.
- (6) Apply lock paint to the screws.

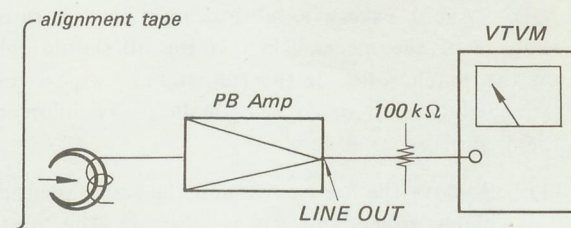


Fig. 3-3-1. Head adjustment setup

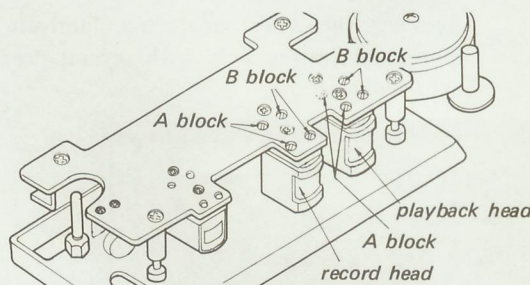


Fig. 3-3-2. Adjusting parts location

Record Head Azimuth Adjustment

Perform this adjustment after that for the playback head was done.

- (1) Thread a blank tape.
- (2) Deliver a 15 kHz signal of -20 dB (77.5 mV) from the audio oscillator to the LINE IN jack, and then set the unit to the record mode.
- (3) Adjust the azimuth adjusting screws for maximum reading on the VTVM at both channels in the same way as in the Playback Head Azimuth Adjustment.
- (4) Apply lock paint to the screws.

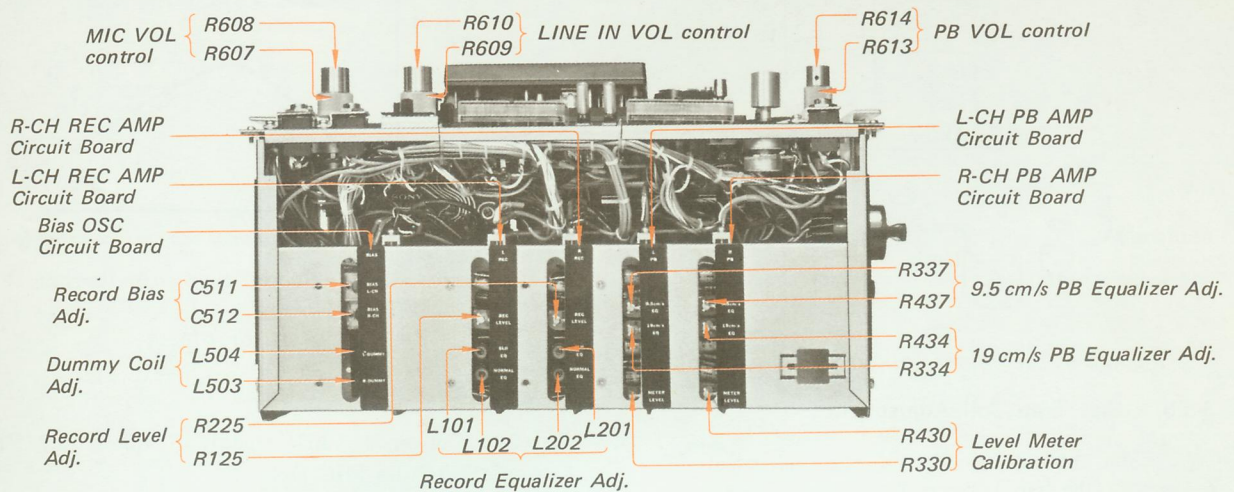


Fig. 3-3-3. Adjusting parts locations

3-3-2. Level Meter Calibration

- (1) Place the unit in FWD mode.
- (2) Set the PB VOL control to the position indicated in the Precaution on page 16.
- (3) Play back the first tone (400 Hz, 0 dB) of SONY alignment tape J-19-F₂.
- (4) Adjust R330 (R430) so that the level meter indicates 0 VU.
- (7) Play back the third tone (400 Hz, -10 dB) of SONY alignment tape J-9-F₁.
- (8) Be sure that the VTVM indicates -10 dB (0.775 V).
- (9) Play back the fourth tone (5 kHz, -10 dB) of SONY alignment tape J-9-F₁.
- (10) Adjust R337 (R437) so that the VTVM indicates -10 dB (0.775 V).

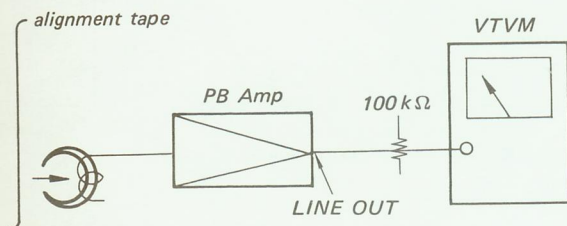


Fig. 3-3-4. Level meter calibration setup

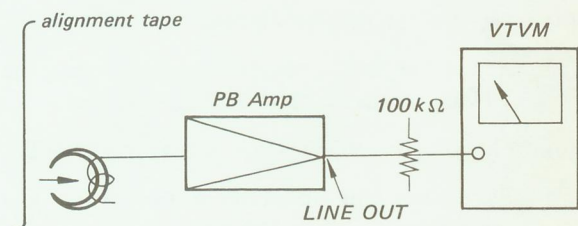


Fig. 3-3-5. PB equalizer adjustment setup

3-3-3. PB Equalizer Adjustment

- (1) Set the TAPE SPEED switch to 19 cm/s (7½ ips).
- (2) Play back the second tone (400 Hz, -10 dB) of the SONY alignment tape J-19-F₂.
- (3) Be sure that the VTVM indicates -10 dB (0.775 V).
- (4) Play back the third tone (10 kHz, -10 dB) and the fourth tone (12.5 kHz, -10 dB) of SONY alignment tape J-19-F₂.
- (5) Adjust R334 (R434) so that the VTVM indicates -10 dB (0.775 V) against each frequency.
- (6) Change the TAPE SPEED switch to 9.5 cm/s (3¾ ips).

3-3-4. Dummy Coil Adjustment

- (1) Pull out the head cover upwards.
- (2) Connect the VTVM across the terminal No. ③ and ⑤ (No. ④ and ⑤) of the head connector (CNJ804) as shown in Fig. 3-3-6.
- (3) Place the unit in stereo-record mode.
- (4) Memorize the VTVM reading.
- (5) Set L-CH (R-CH) only in record mode.
- (6) Adjust L503 (L504) so that the VTVM reading across the terminal No. ③ and ⑤ (No. ④ and ⑤) is the same as the value obtained in the step (4).

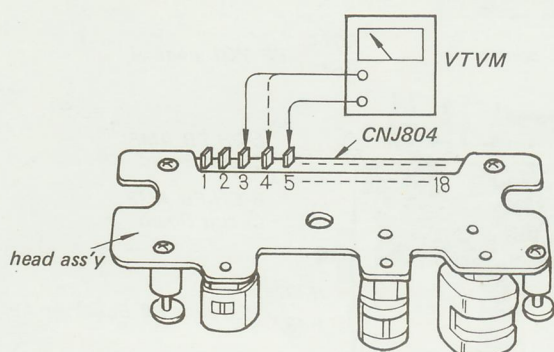


Fig. 3-3-6. Dummy coil adjustment setup

3-3-5. Bias Trap Coil Adjustment

Note: This adjustment is necessary only when the trap coil is replaced.

Turn the core until the head surface of the core is even with the upper edge of the bobbin.

3-3-6. Record Bias Adjustment

- (1) Be sure that the dummy coil adjustment has been made.
- (2) Set the PB VOL control to the position indicated in the Precaution on page 16 and thread a blank tape.
- (3) Deliver a 1 kHz signal of -60 dB (0.775 mV) into the MIC jack.
- (4) Set the MONITOR switch to "SOURCE".
- (5) Adjust the MIC volume control so that the VTVM indicates 0 dB (0.775 V).
- (6) Change the MONITOR switch to "TAPE".
- (7) Place the unit in stereo-record mode and record the signal on the blank tape.
- (8) Turn the trimmer capacitor C₅₁₁ (C₅₁₂) clockwise to the full and return it several times.
- (9) Turn C₅₁₁ (C₅₁₂) clockwise slowly, then the VTVM reading will go up and reaching a maximum, and then falling again. Continue to turn C₅₁₁ (C₅₁₂) until the VTVM reads 0.5 dB below the maximum reading.

Note: After this adjustment, do not fail to make the record equalizer adjustment.

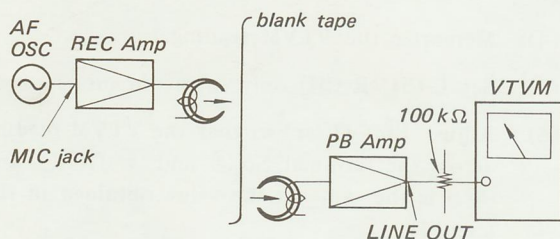


Fig. 3-3-7. Record bias adjustment setup

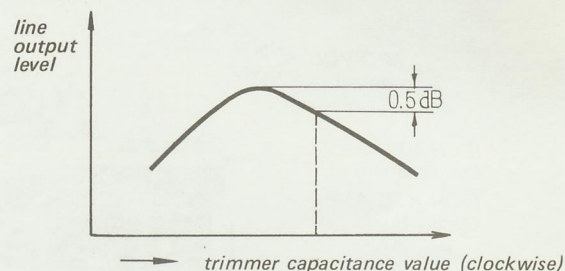


Fig. 3-3-8. Record bias characteristics

3-3-7. Record Level Adjustment

- (1) Thread a blank tape.
- (2) Deliver a 1 kHz signal of -60 dB (0.775 mV) into the MIC jack.
- (3) Set the MONITOR switch to "SOURCE".
- (4) Adjust the MIC volume control so that the VTVM indicates 0 dB (0.775 V).
- (5) Change the MONITOR switch to "TAPE".
- (6) Place the unit in stereo-record mode.
- (7) Adjust R₁₂₅ (R₂₂₅) so that the VTVM indicates 0 dB (0.775 V).

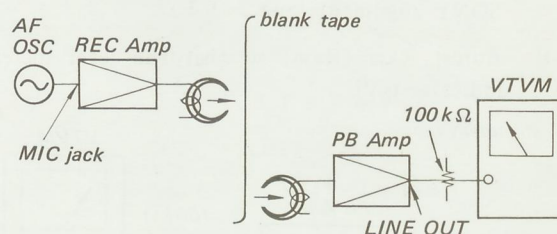


Fig. 3-3-9. Record level adjustment setup

3-3-8. Record Equalizer Adjustment

- (1) Set the TAPE SELECTOR switch to "NORMAL".
- (2) Thread a blank tape.
- (3) Deliver a 1 kHz signal of -20 dB (77.5 mV) into the LINE IN jack.
- (4) Place the unit in stereo-record mode.
- (5) Adjust the LINE IN volume control so that the VTVM indicates -20 dB (77.5 mV).
- (6) Change the signal continuously from 1 kHz to 20 kHz.
- (7) Adjust L₁₀₂ (L₂₀₂) so that the VTVM indicates -20 dB (77.5 mV) everywhere within the range indicated.
- (8) Change the TAPE SELECTOR switch to "SLH".

- (9) Thread the SLH (SONY Low-noise High-output) tape as a blank tape.
- (10) Deliver a 1 kHz signal of -20 dB (77.5 mV) into the LINE IN jack.
- (11) Place the unit in stereo-record mode.
- (12) Adjust the LINE IN volume control so that the VTVM indicates -20 dB (77.5 mV).
- (13) Change the signal continuously from 1 kHz to 20 kHz.
- (14) Adjust L101 (L201) so that the VTVM indicates -20 dB (77.5 mV) everywhere within the range indicated.

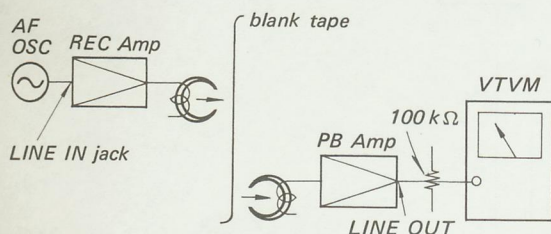


Fig. 3-3-10. Record equalizer adjustment setup

3-4. CHANGING FROM 4-TRACK TO 2-TRACK RECORDING AND VICE VERSA

In the TC-650 the recording system can be changed from 4-track to 2-track and vice versa, by replacing a head assembly. Proceed as follows referring to the figures.

Note: After the head assembly has been replaced, never fail to make the record bias adjustment.

Head Assembly Replacement

- (1) Lift the Head Cover by hand.
- (2) Remove two screws which secure the Head Assembly as shown in Fig. 3-4-1.
- (3) Lift the 4-track (2-track) Head Assembly out of the Head Deck.
- (4) Install the 2-track (4-track) Head Assembly.
- (5) Secure the Head Assembly with the two screws.

- (6) Install the Head Cover.

Part No.

2-track head ass'y: H17-2S

4-track head ass'y: H17-4S

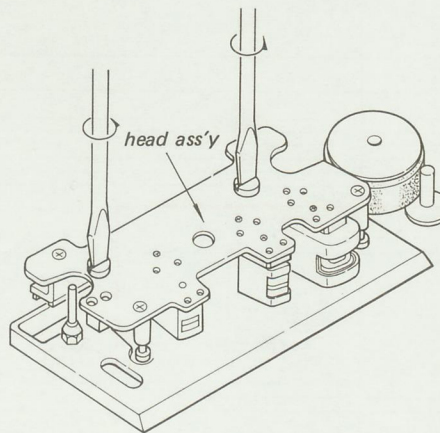


Fig. 3-4-1. Head ass'y removal

Record Bias Adjustment

- (7) Remove the Ventilator horizontally by taking off the four screws as shown in Fig. 3-4-2.
- (8) Perform the record bias adjustment (See page 18).

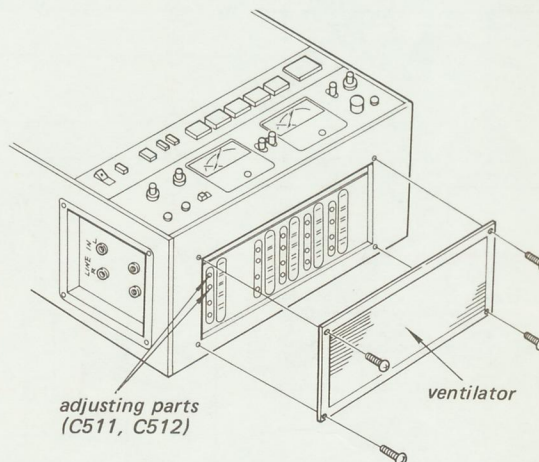
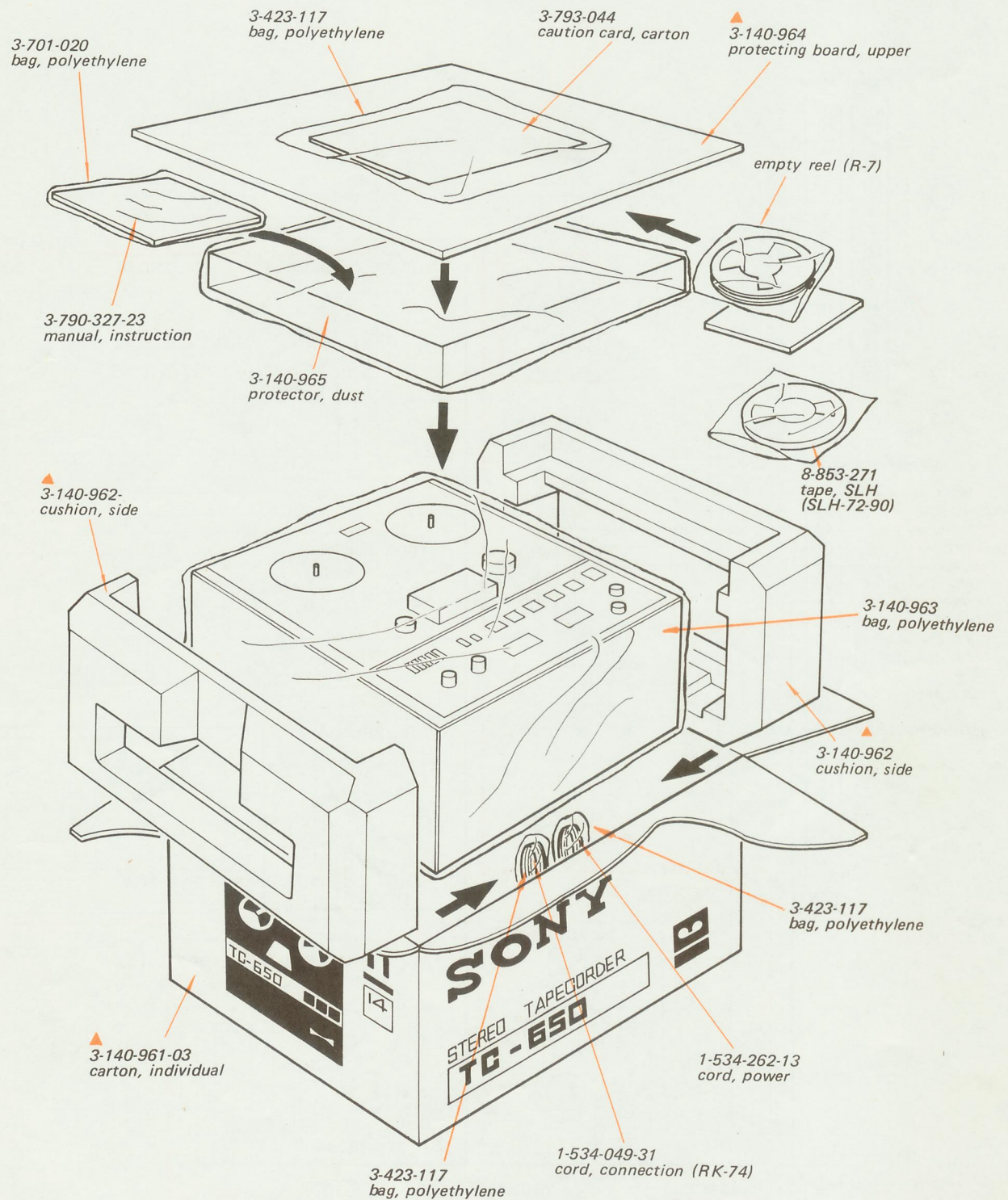


Fig. 3-4-2. Ventilator removal

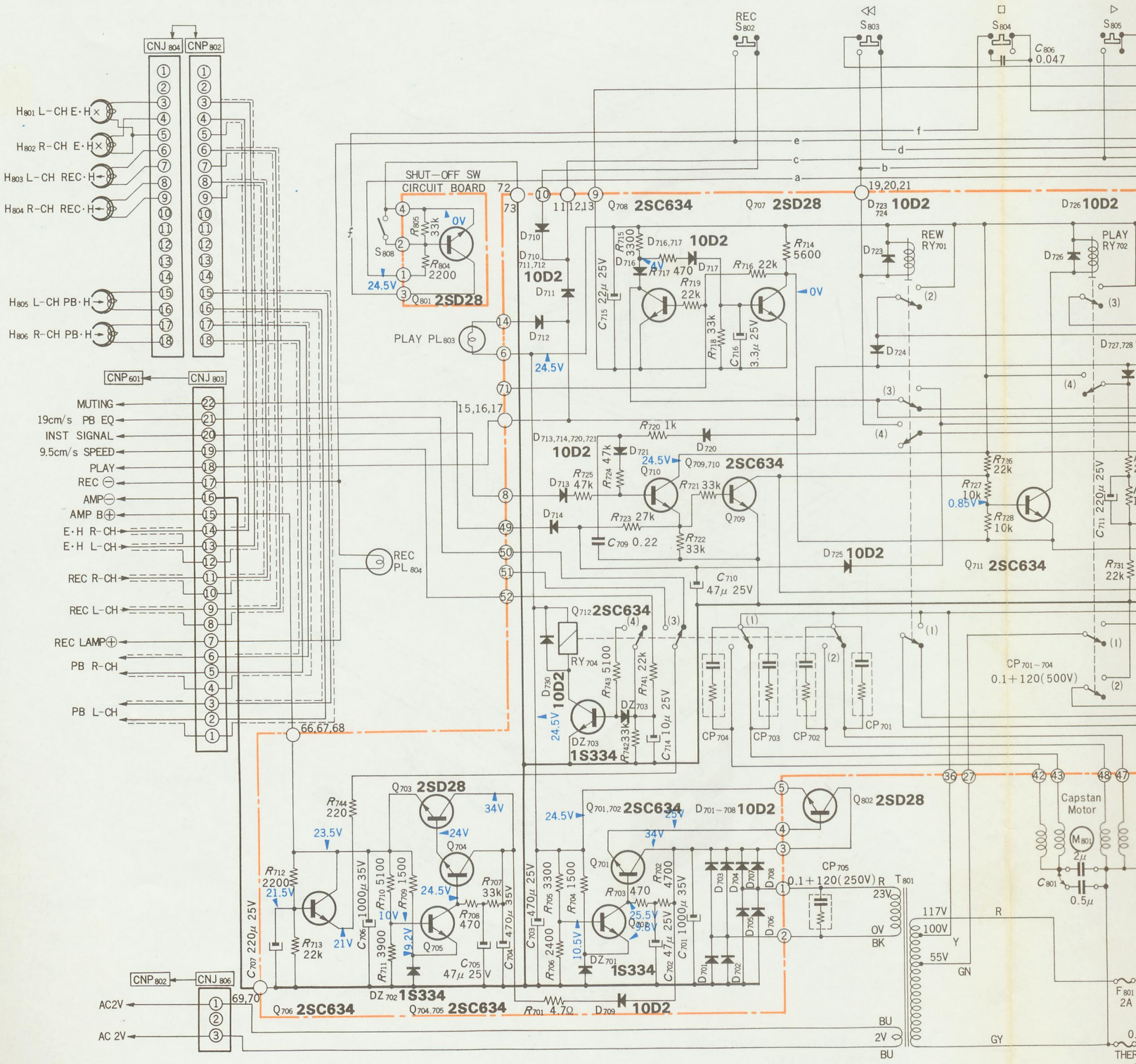
SECTION 4 REPACKING



Parts marked with ▲ are included in carton ass'y (X-31428-19).

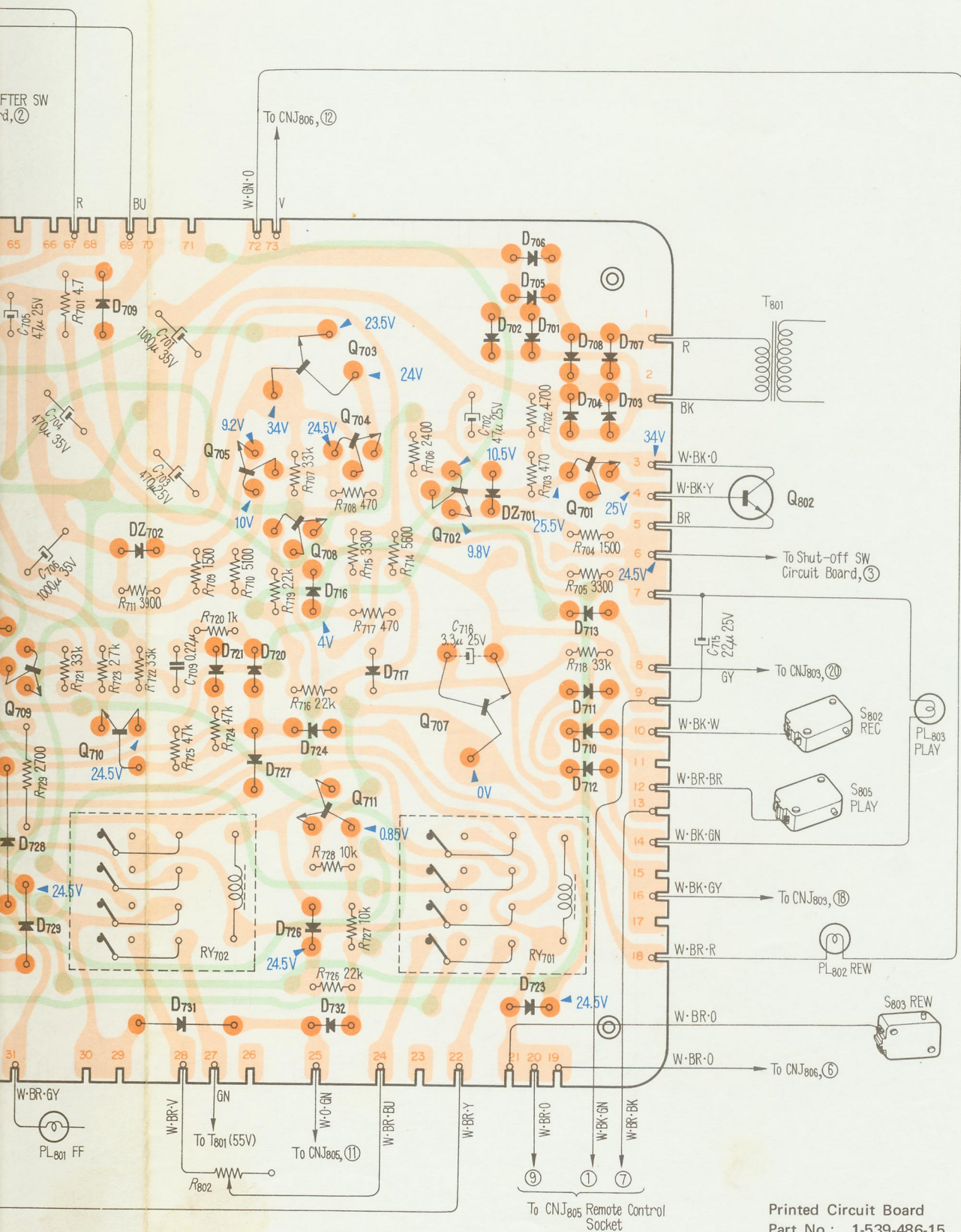
SECTIONS 5 DIAGRAMS

SYSTEM CONTROL CIRCUIT 5-1. SCHEMATIC DIAGRAM





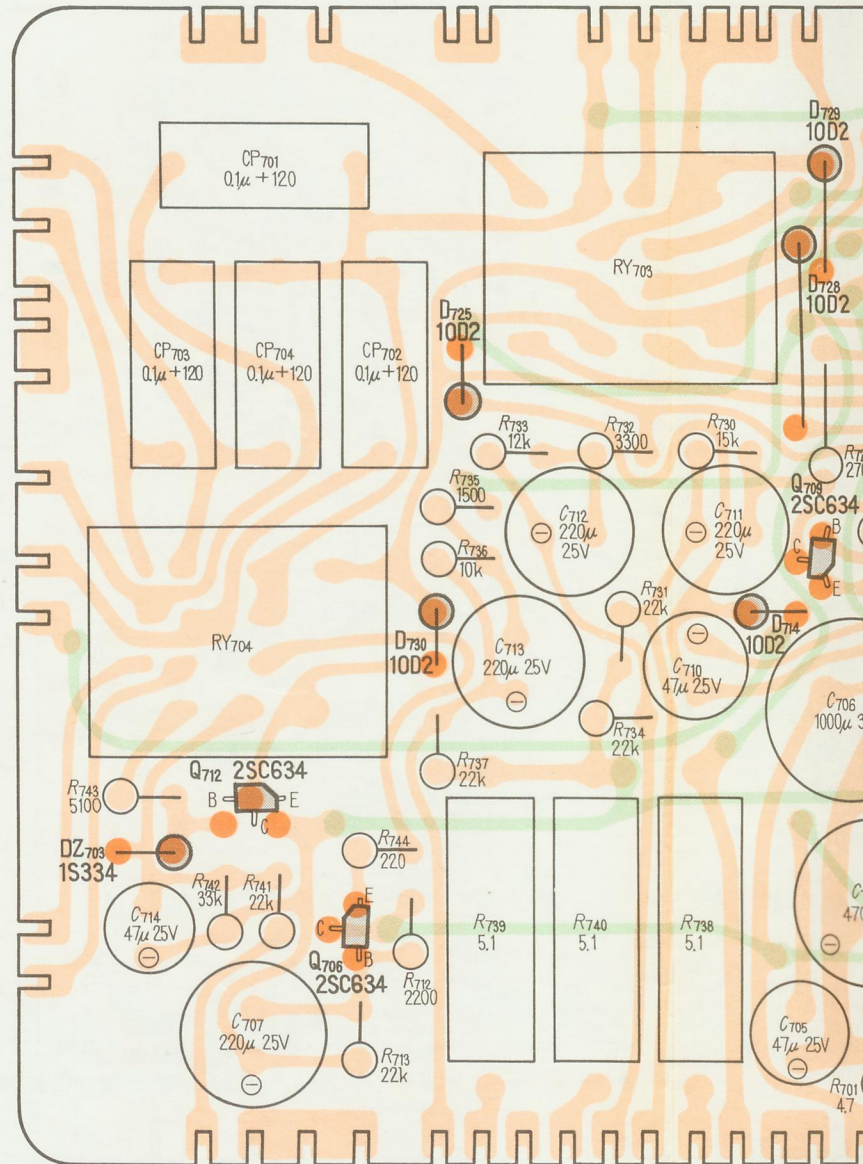
- 22 —

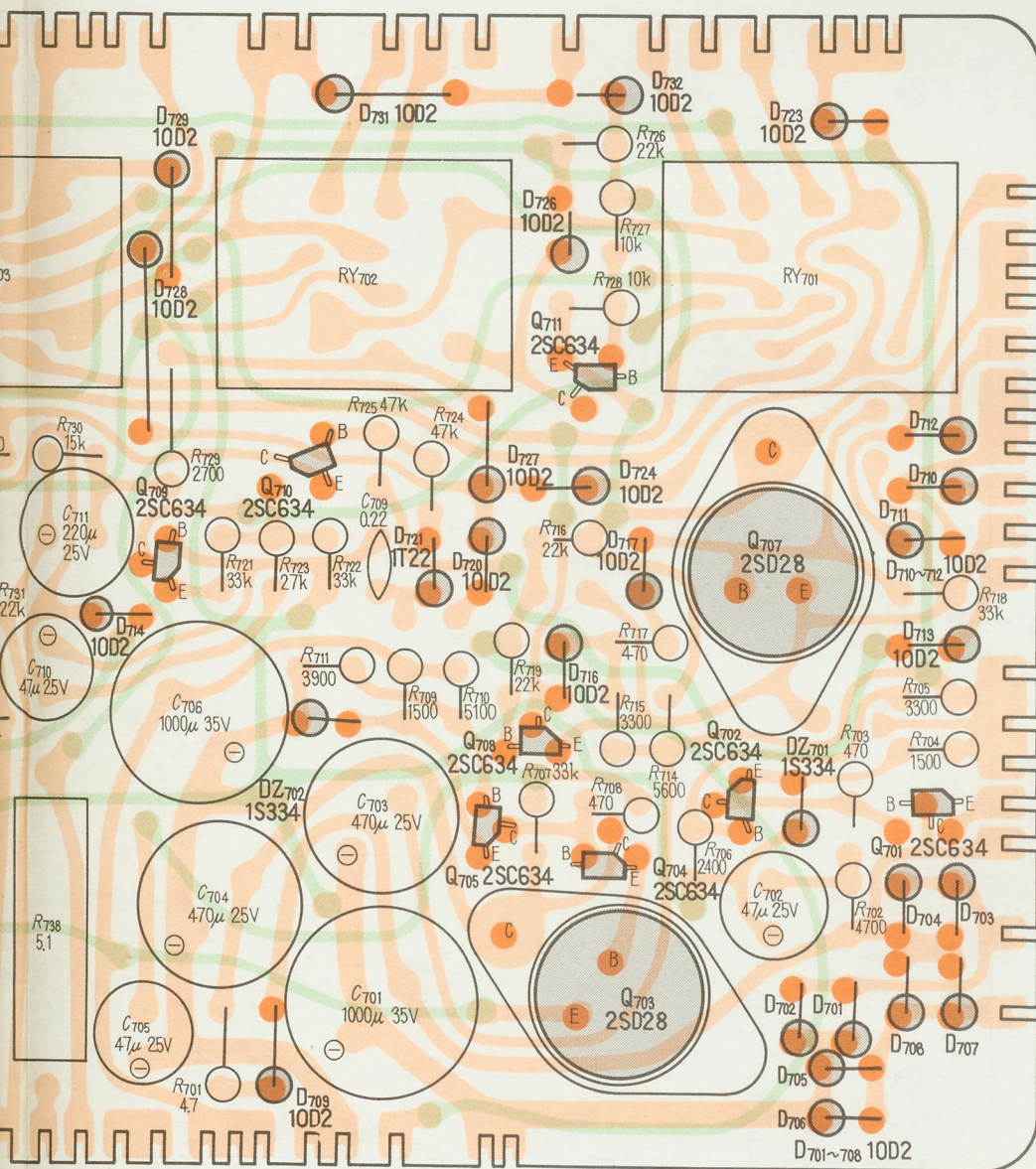


Printed Circuit Board
Part No.: 1-539-486-15

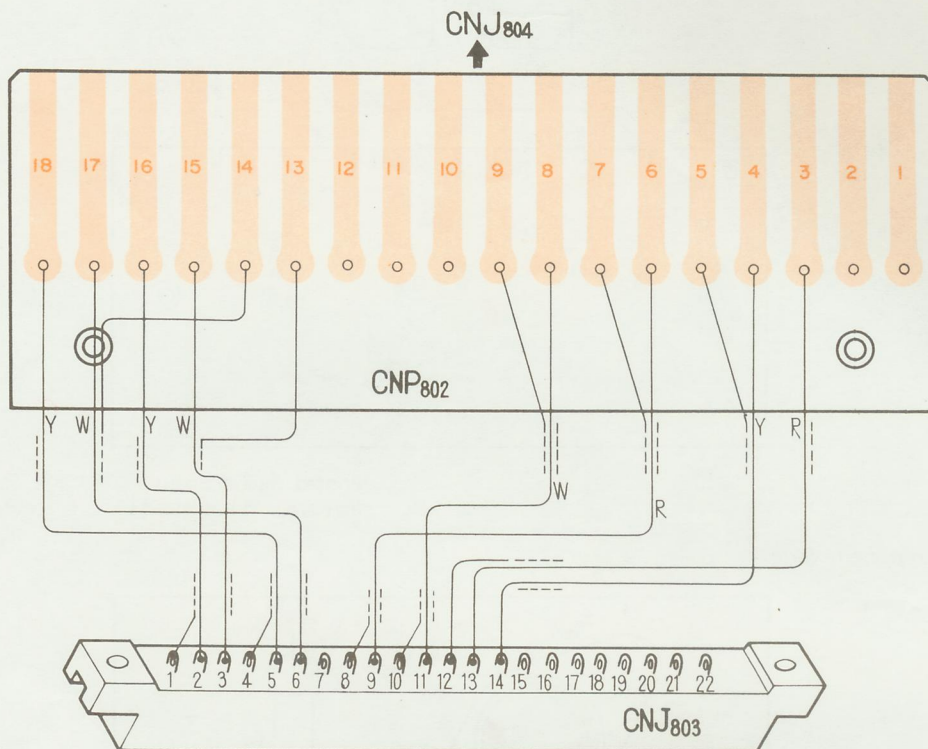
5-2-1. System Control Circuit Board

— Component Side —





5-2-4. Head Connector Circuit Board

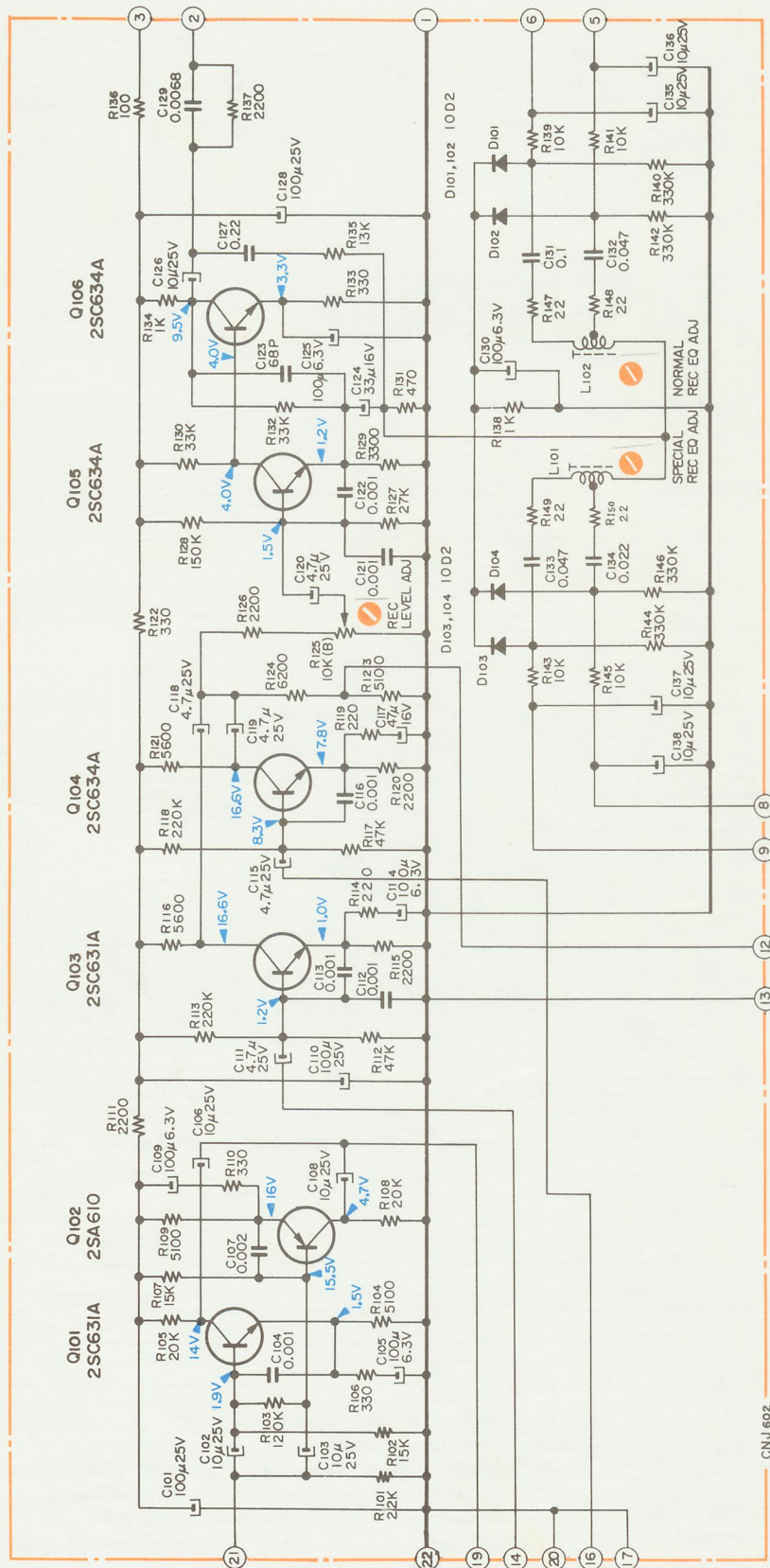


Printed Circuit Board
Part No.: 1-539-436-11



- 30 —

5-4. SCHEMATIC DIAGRAM REC AMP Circuit



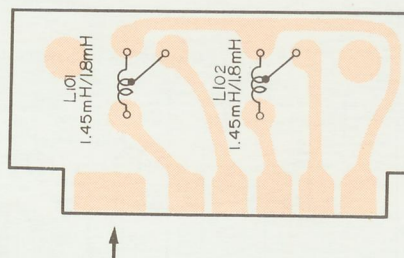
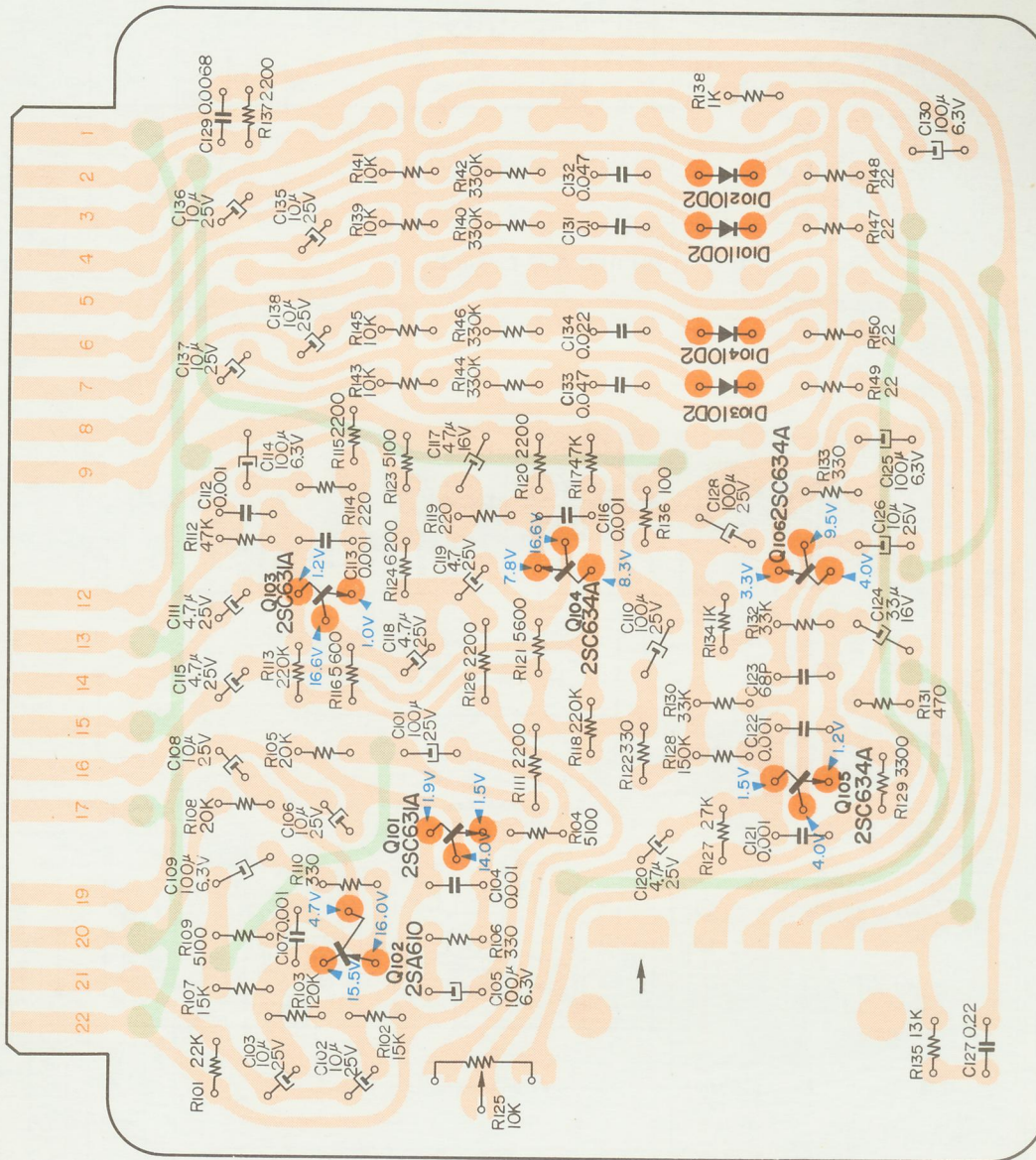
Note:

1. All resistors and capacitors are rated in Ω and μF unless otherwise specified.
2. The letter (B) suffixed to rating value of semi-fixed resistor indicates its characteristic.
3. Voltage values shown are measured with a voltmeter (20k Ω/V) with no signal input in record mode.
4.  : adjustable.

5-5. MOUNTING DIAGRAM

REC AMP Circuit Board

— Conductor Side —

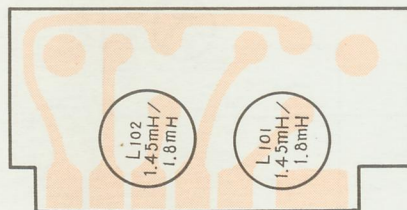
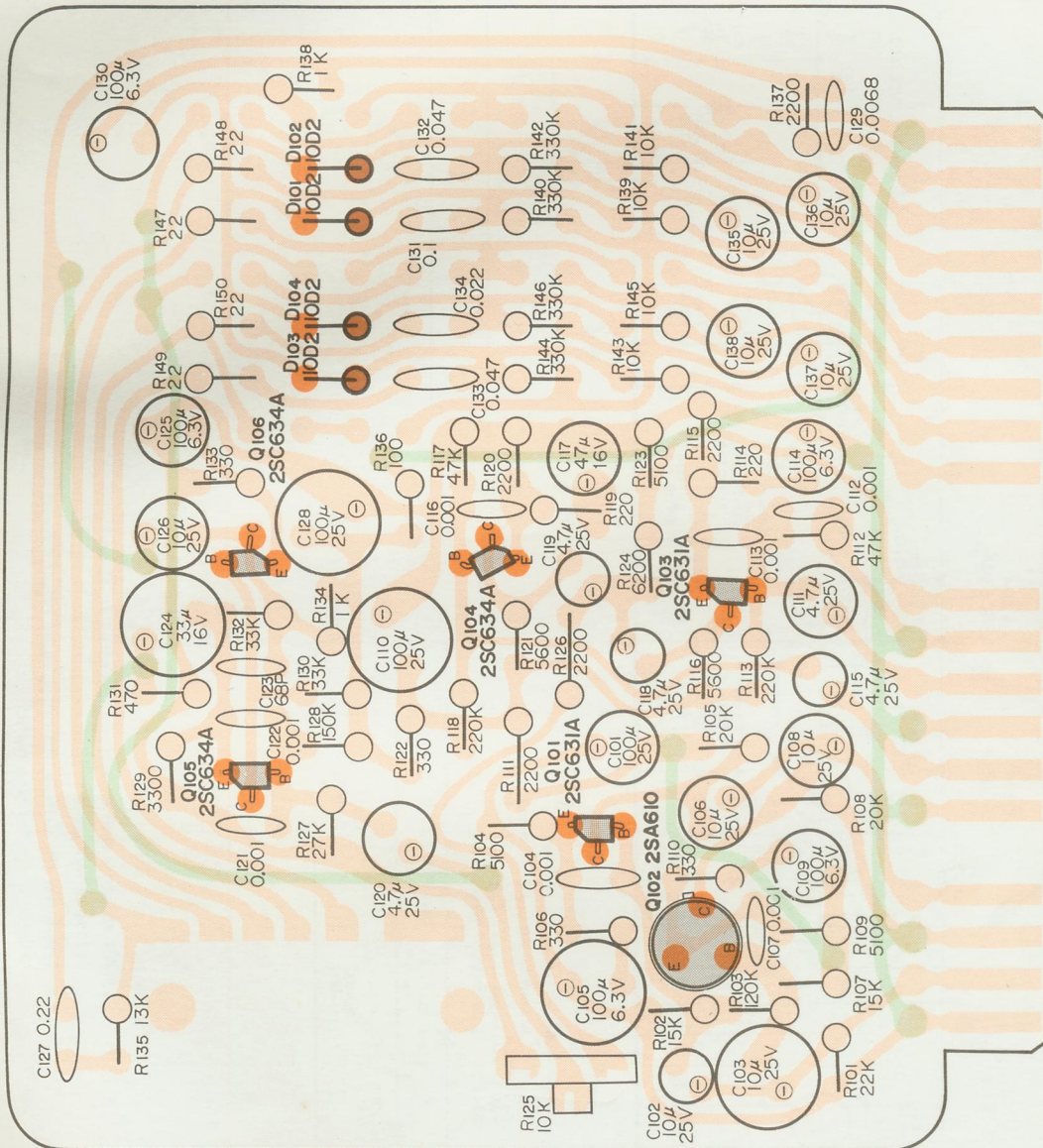


Printed Circuit Board
Part No.: 1-539-432-12

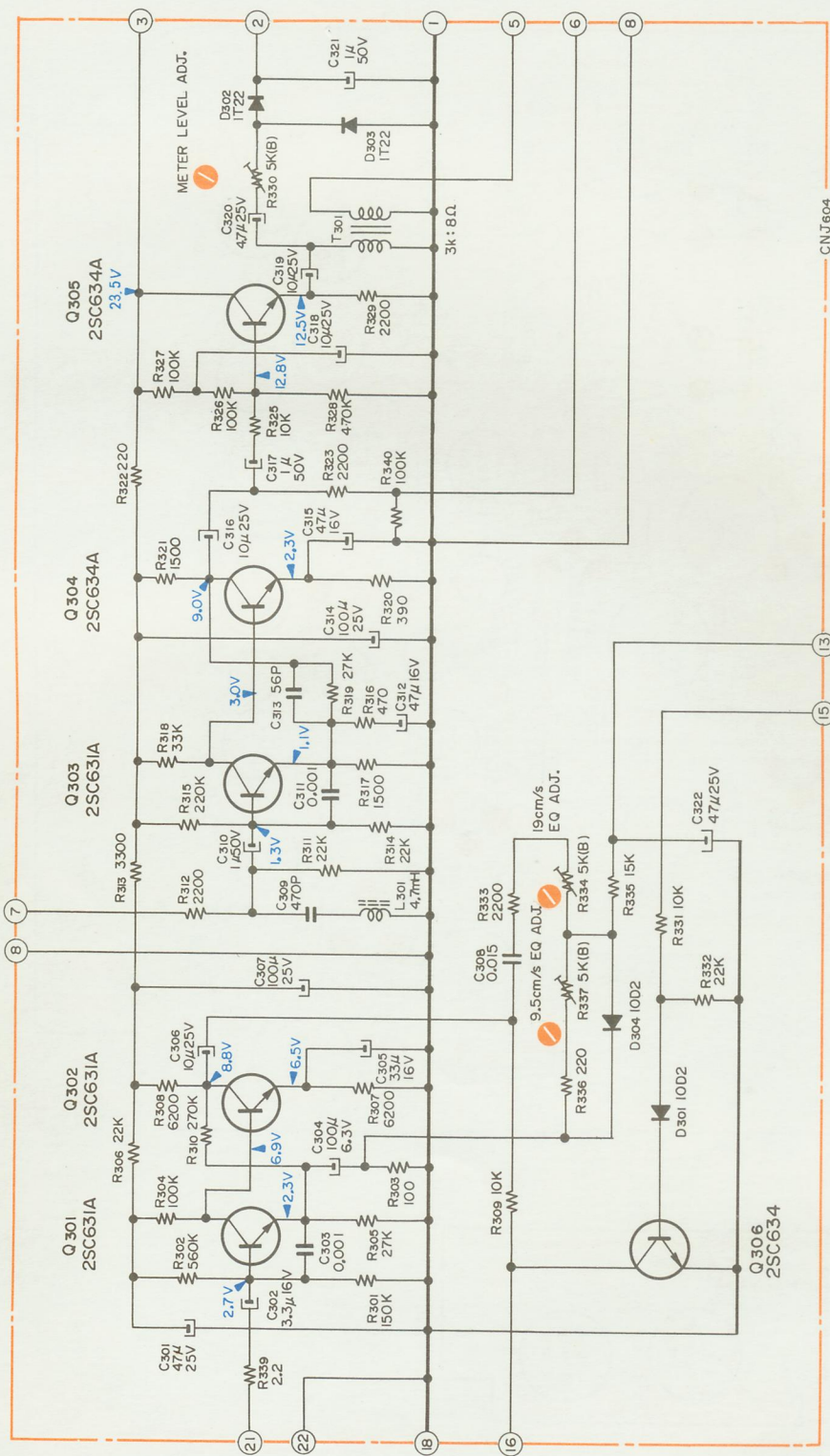
Printed Circuit Board
Part No.: 1-539-431-14

REC AMP Circuit Board

— Component Side —



5-6. SCHEMATIC DIAGRAM PB AMP Circuit

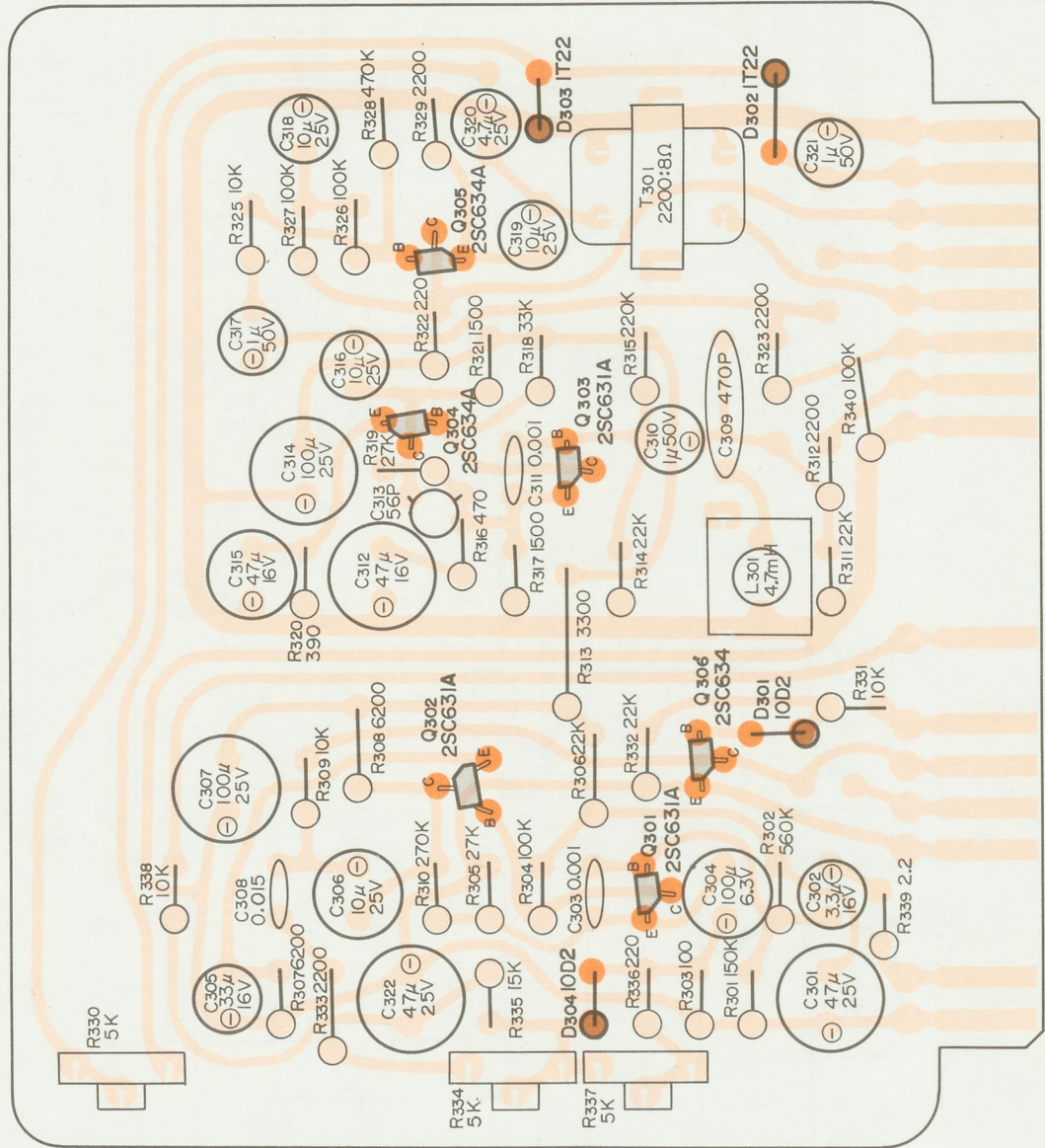


Note:

1. All resistors and capacitors are rated in Ω and μF unless otherwise specified.
2. The letter (B) suffixed to rating value of semi-fixed resistor indicates its characteristic.
3. Voltage values shown are measured with a voltmeter (20 k Ω /V) with no signal input in playback mode.
4. : adjustable.

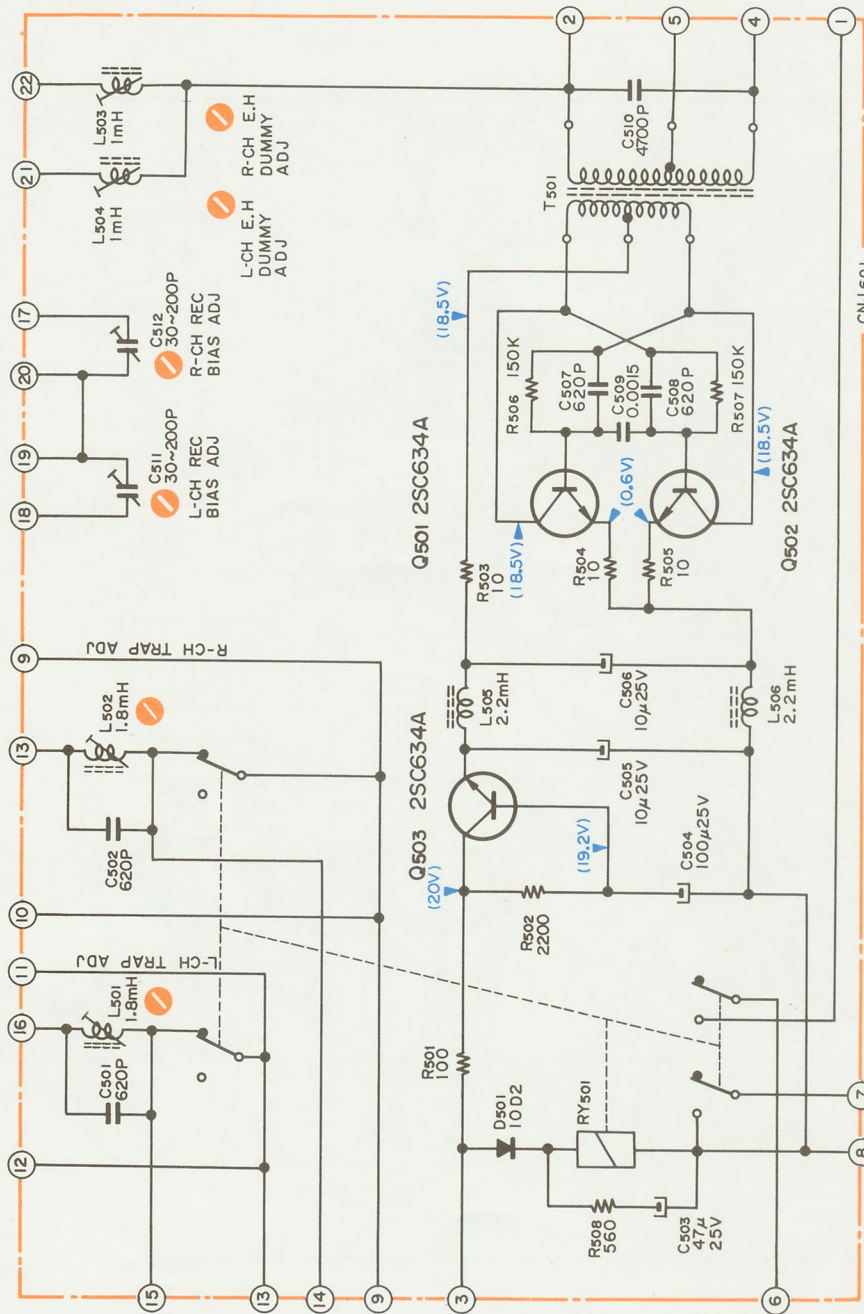
PB AMP Circuit Board

— Component Side —



5-8. SCHEMATIC DIAGRAM

Bias OSC Circuit



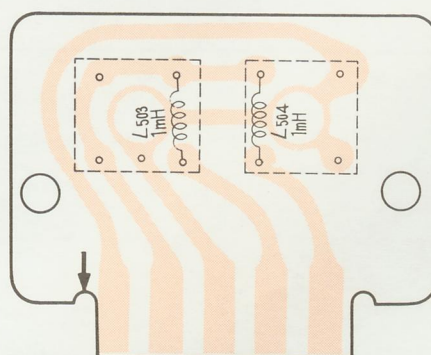
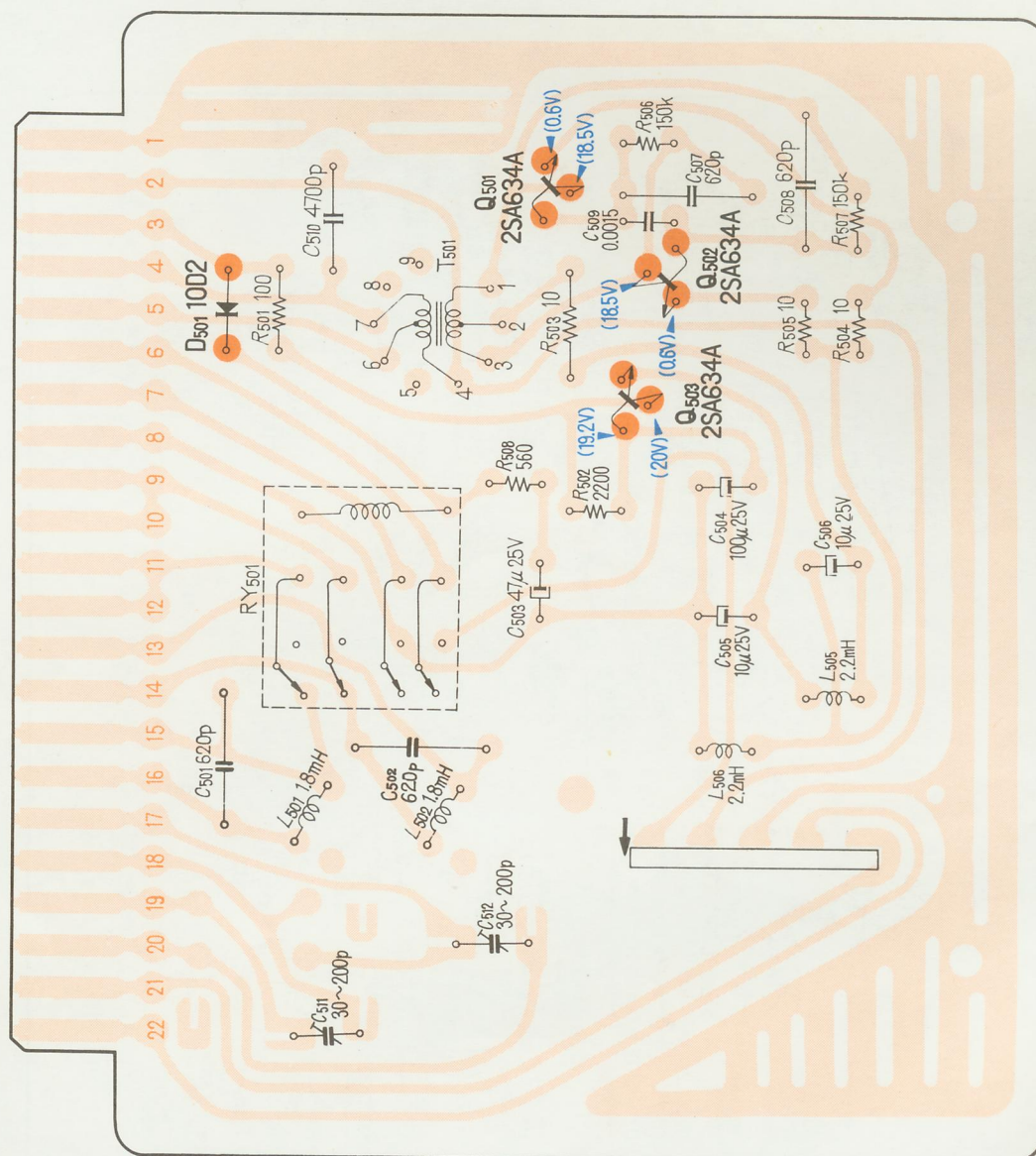
Note:

1. All resistors and capacitors are rated in Ω and μF unless otherwise specified.
2. Voltage values shown are measured with a voltmeter (20 k Ω /V) with no signal input in record mode.
3.  : adjustable.

5-9. MOUNTING DIAGRAM

Bias OSC Circuit Board

Conductor Side —



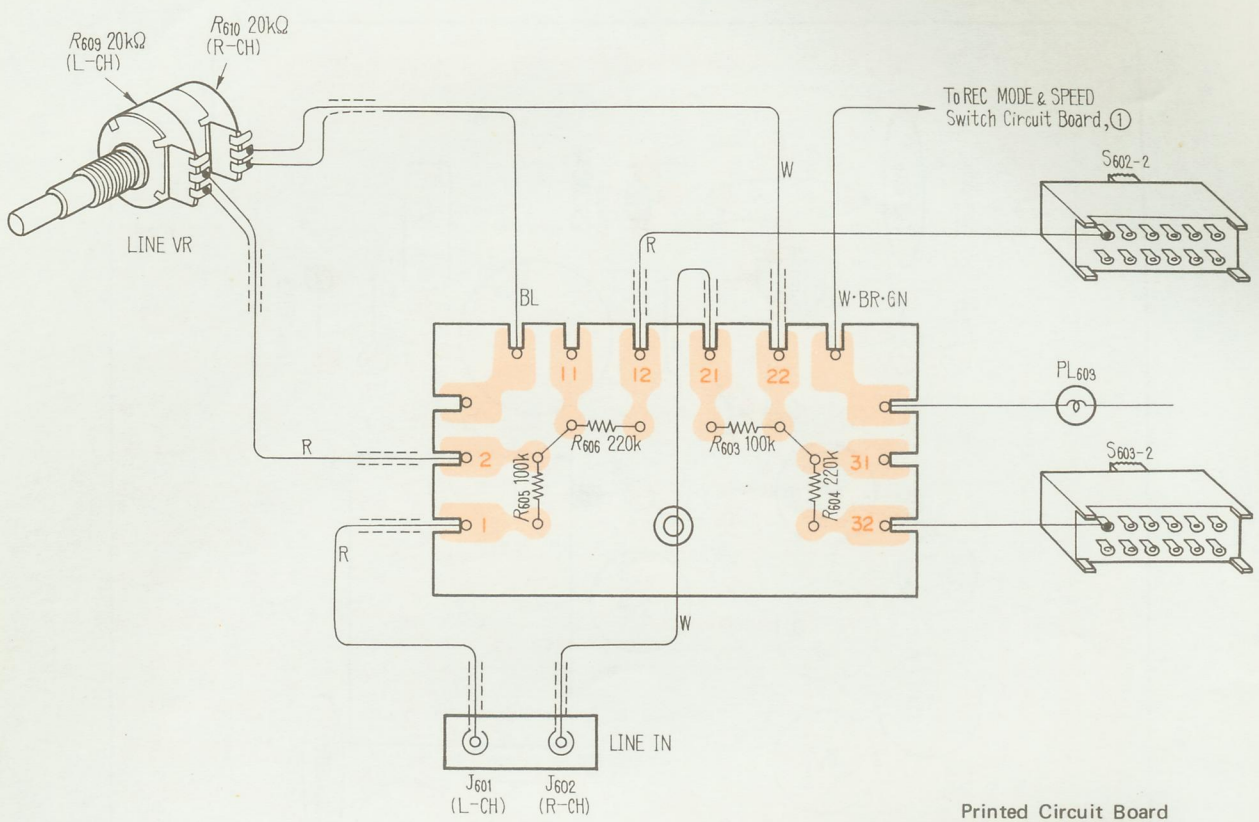
Printed Circuit Board
Part No.: 1-539-563-12

Printed Circuit Board
Part No.: 1-539-558-12

5-10. MOUNTING DIAGRAM

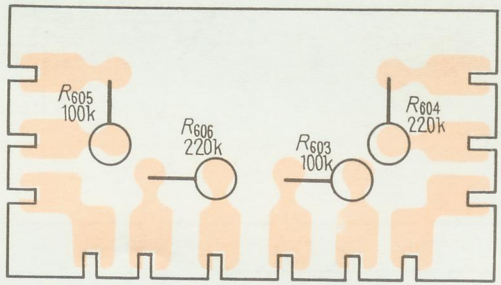
5-10-1. Resistor Terminal Circuit Board (1)

— Conductor Side —



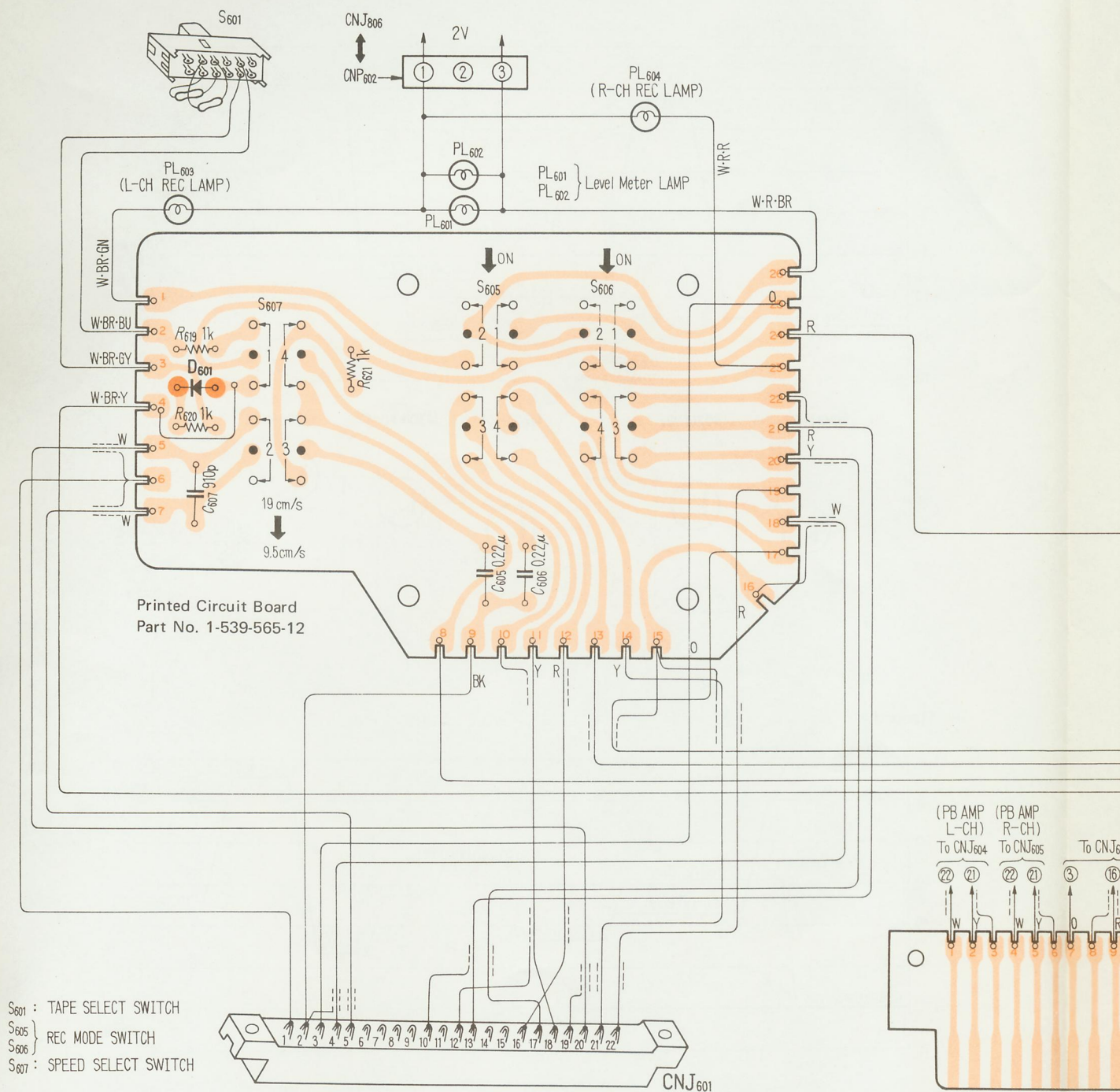
Printed Circuit Board
Part No.: 1-539-435-12

— Component Side —



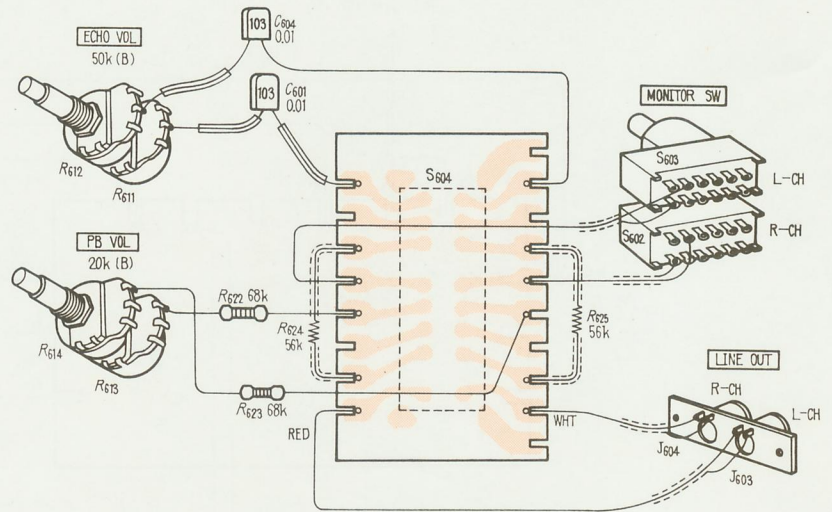
5-10-2. REC MODE & SPEED Selector Switch Circuit Board

— Conductor Side —

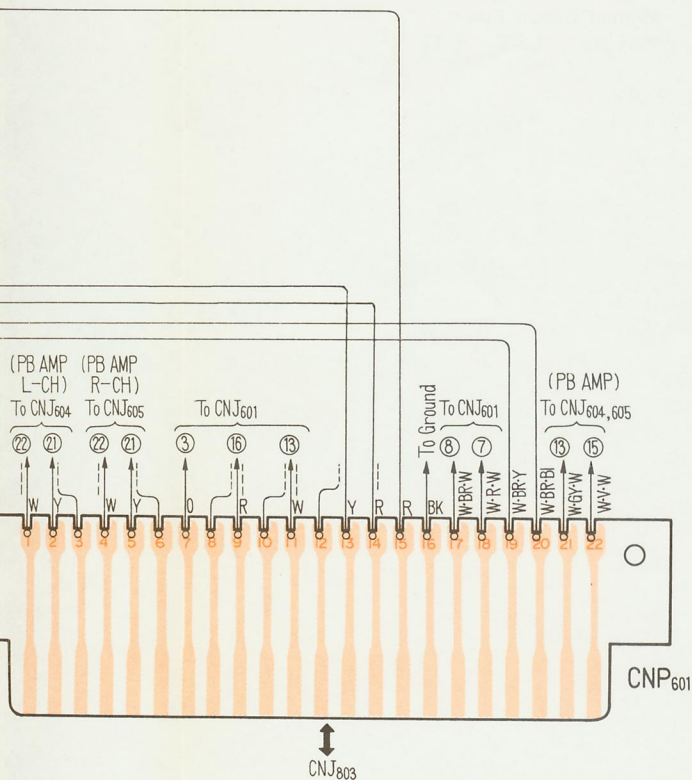


5-10-3. SOS/ECHO Switch Circuit Board

— Conductor Side —

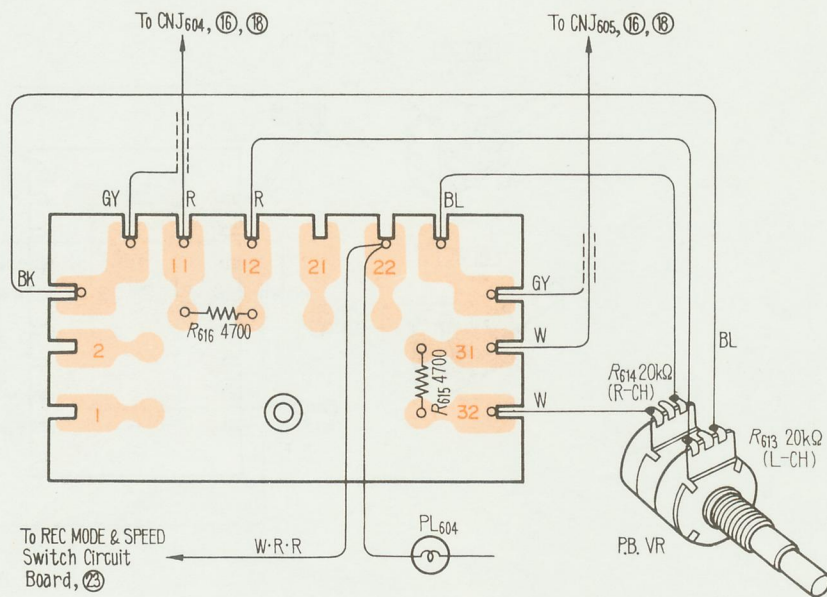


Printed Circuit Board
Part No.: 1-539-443-12



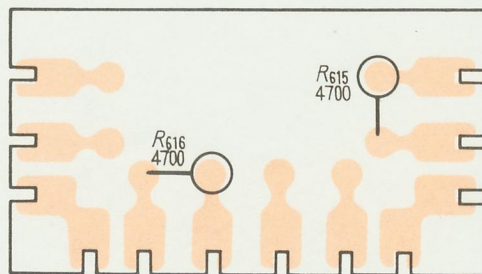
5-10-4. Resistor Terminal Circuit Board (2)

— Conductor Side —



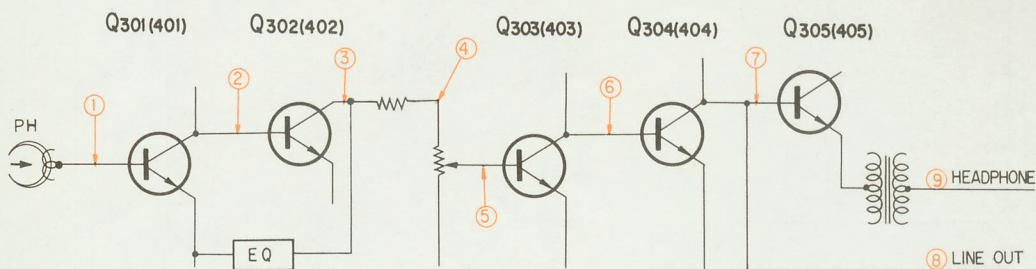
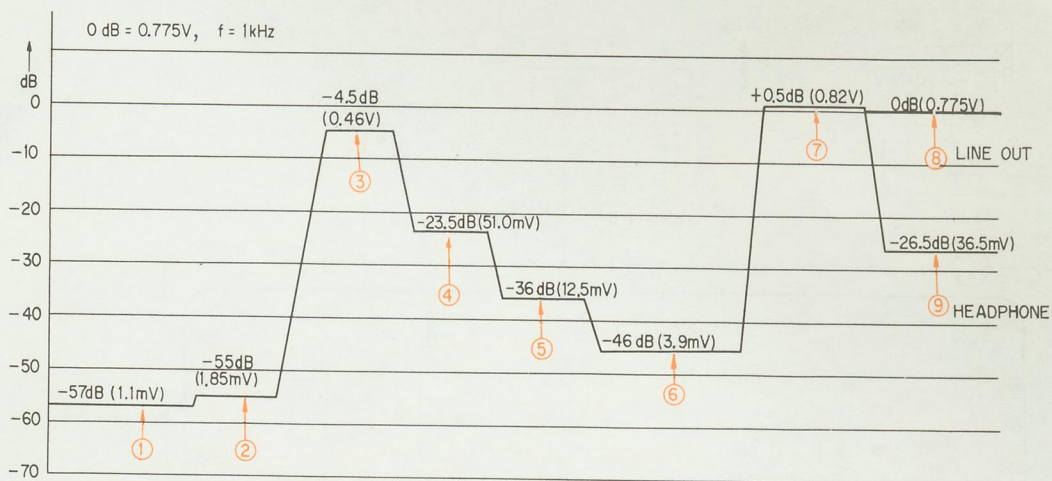
Printed Circuit Board
Part No.: 1-539-435-12

— Component Side —

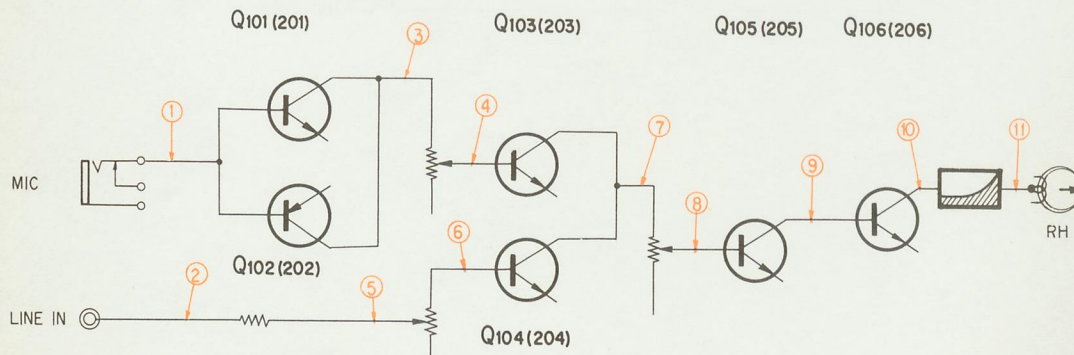
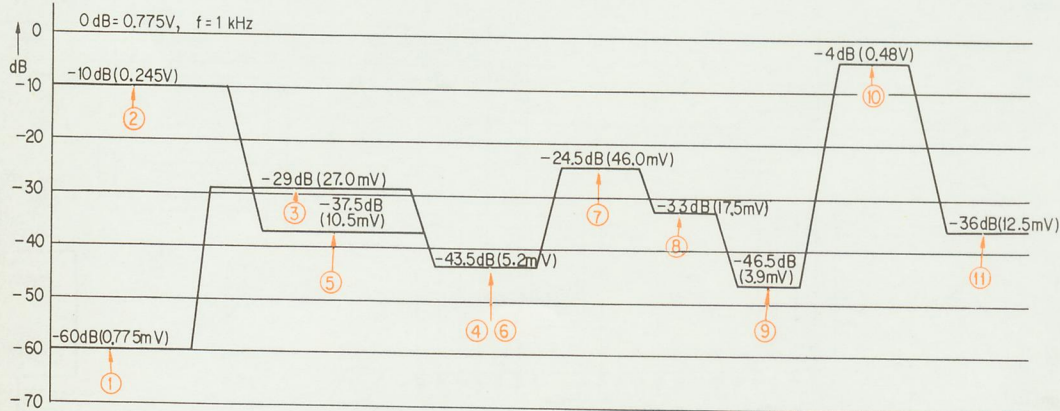


5-11. LEVEL DIAGRAM

Playback



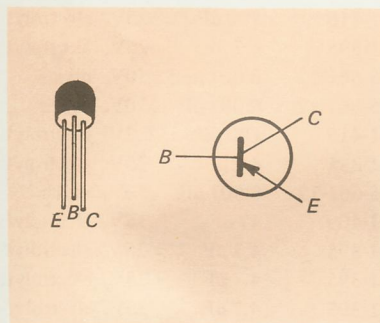
Record



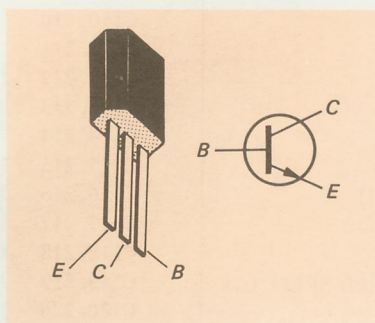
SECTION 6 SEMICONDUCTOR ELECTRODES

Transistor

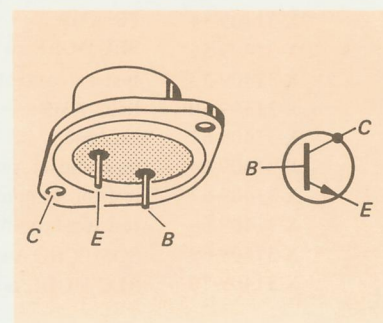
2SA610



2SC631A, 2SC634, 2SC634A

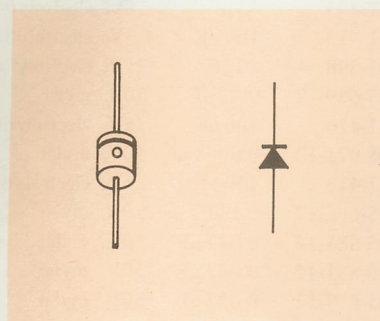


2SD28

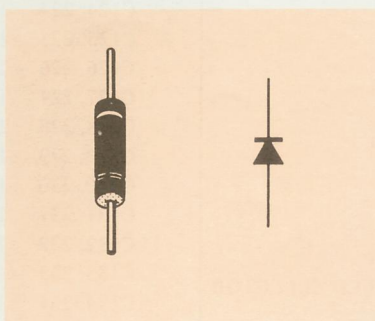


Diode

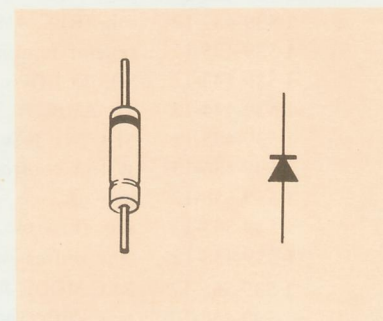
10D2



1S334



1T22



SECTION 7

ELECTRICAL PARTS LIST

<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>	<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>
MOUNTED CIRCUIT BOARDS					
	X-31409-54	PB AMP	C108, 208	1-121-398	10 μ F 25V, electrolytic
	X-31409-56	SHUT-OFF switch	C109, 209	1-121-413	100 μ F 6.3V, electrolytic
	X-31409-59	system control	C110, 210	1-121-416	100 μ F 25V, electrolytic
	X-31409-60	REC AMP	C111, 211	1-121-395	4.7 μ F 25V, electrolytic
	X-31409-61	bias osc.	C112, 212	1-105-661-12	0.001 μ F 50V, mylar
	X-31409-64	tape shifter switch	C113, 213	1-105-661-12	0.001 μ F 50V, mylar
	X-31409-67	resistor terminal (1)	C114, 214	1-121-413	100 μ F 6.3V, electrolytic
	X-31409-68	resistor terminal (2)	C115, 215	1-121-395	4.7 μ F 25V, electrolytic
	X-31409-69	SOS/ECHO switch	C116, 216	1-105-661-12	0.001 μ F 50V, mylar
	X-31409-70	REC MODE & SPEED SELECTOR	C117, 217	1-121-409	47 μ F 16V, electrolytic
PRINTED CIRCUIT BOARDS			C118, 218	1-121-395	4.7 μ F 25V, electrolytic
	1-539-431-14	REC AMP	C119, 219	1-121-395	4.7 μ F 25V, electrolytic
	1-539-432-12	sub. (REC AMP)	C120, 220	1-121-395	4.7 μ F 25V, electrolytic
	1-539-435-12	resistor terminal	C121, 221	1-105-661-12	0.001 μ F 50V, mylar
	1-539-443-12	SOS/ECHO switch	C122, 222	1-105-661-12	0.001 μ F 50V, mylar
	1-539-444-13	PB AMP	C123, 223	1-107-127	68 pF 50V, silvered mica
	1-539-485-11	SHUT-OFF switch	C124, 224	1-121-403	33 μ F 16V, electrolytic
	1-539-486-15	system control	C125, 225	1-121-413	100 μ F 6.3V, electrolytic
	1-539-558-12	bias osc.	C126, 226	1-121-398	10 μ F 25V, electrolytic
	1-539-563-12	sub. (bias osc.)	C127, 227	1-105-689-12	0.22 μ F 50V, mylar
	1-539-438-12	tape shifter switch	C128, 228	1-121-416	100 μ F 25V, electrolytic
	1-539-565-12	REC MODE & SPEED SELECTOR	C129, 229	1-105-671-12	0.0068 μ F 50V, mylar
	1-539-438-12	tape shifter switch	C130, 230	1-121-413	100 μ F 6.3V, electrolytic
	1-539-436-11	head connector	C131, 231	1-105-685-12	0.1 μ F 50V, mylar
	1-539-437-11	DOCKING, 22P	C132, 232	1-105-681-12	0.047 μ F 50V, mylar
			C133, 233	1 105-681-12	0.047 μ F 50V, mylar
			C134, 234	1-105-677-12	0.022 μ F 50V, mylar
			C135, 235	1-121-398	10 μ F 25V, electrolytic
			C136, 236	1-121-398	10 μ F 25V, electrolytic
			C137, 237	1-121-398	10 μ F 25V, electrolytic
			C138, 238	1-121-398	10 μ F 25V, electrolytic
REC AMP UNIT			RESISTORS		
SEMICONDUCTORS			All resistors are $\frac{1}{4}$ W and carbon type, unless otherwise indicated.		
Q101, 201		transistor, 2SC631A	R101, 201	1-242-705	22 k Ω
Q102, 202		transistor, 2SA610	R102, 202	1-242-701	15 k Ω
Q103, 203		transistor, 2SC631A	R103, 203	1-242-723	120 k Ω
Q104, 204		transistor, 2SC634A	R104, 204	1-242-690	5,100 Ω
Q105, 205		transistor, 2SC634A	R105, 205	1-242-704	20 k Ω
Q106, 206		transistor, 2SC634A	R106, 206	1-242-661	330 Ω
D101, 201		diode, 10D2	R107, 207	1-242-701	15 k Ω
D102, 202		diode, 10D2	R108, 208	1-242-704	20 k Ω
D103, 203		diode, 10D2	R109, 209	1-242-690	5,100 Ω
D104, 204		diode, 10D2	R110, 210	1-242-661	330 Ω
COILS			R111, 211	1-242-681	2,200 Ω
L101, 201	1-231-069	equalizer, 1.45/1.8 mH	R112, 212	1-242-713	47 k Ω
L102, 202	1-231-069	equalizer, 1.45/1.8 mH	R113, 213	1-242-729	220 k Ω
CAPACITORS			R114, 214	1-242-657	220 Ω
C101, 201	1-121-416	100 μ F 25V, electrolytic	R115, 215	1-242-681	2,200 Ω
C102, 202	1-121-398	10 μ F 25V, electrolytic	R116, 216	1-242-691	5,600 Ω
C103, 203	1-121-398	10 μ F 25V, electrolytic	R117, 217	1-242-713	47 k Ω
C104, 204	1-105-661-12	0.001 μ F 50V, mylar	R118, 218	1-242-729	220 k Ω
C105, 205	1-121-413	100 μ F 6.3V, electrolytic	R119, 219	1-242-657	220 Ω
C106, 206	1-121-398	10 μ F 25V, electrolytic	R120, 220	1-242-681	2,200 Ω
C107, 207	1-105-661-12	0.001 μ F 50V, mylar	R121, 221	1-242-691	5,600 Ω
			R122, 222	1-242-661	330 Ω
			R123, 223	1-242-690	5,100 Ω

<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>
R124, 224	1-242-692	6,200 Ω
R125, 225	1-221-383	10 k Ω (B) semi-fixed
R126, 226	1-242-681	2,200 Ω
R127, 227	1-242-707	27 k Ω
R128, 228	1-242-725	150 k Ω
R129, 229	1-242-685	3,300 Ω
R130, 230	1-242-709	33 k Ω
R131, 231	1-242-665	470 Ω
R132, 232	1-242-709	33 k Ω
R133, 233	1-242-661	330 Ω
R134, 234	1-242-673	1 k Ω
R135, 235	1-242-700	13 k Ω
R136, 236	1-242-649	100 Ω
R137, 237	1-242-681	2,200 Ω
R138, 238	1-242-673	1 k Ω
R139, 239	1-242-697	10 k Ω
R140, 240	1-242-733	330 k Ω
R141, 241	1-242-697	10 k Ω
R142, 242	1-242-733	330 k Ω
R143, 243	1-242-697	10 k Ω
R144, 244	1-242-733	330 k Ω
R145, 245	1-242-697	10 k Ω
R146, 246	1-242-697	330 k Ω
R147, 247	1-242-633	22 Ω
R148, 248	1-242-633	22 Ω
R149, 249	1-242-633	22 Ω
R150, 250	1-242-633	22 Ω

PB AMP UNIT

SEMICONDUCTORS

Q301, 401	transistor,	2SC631A
Q302, 402	transistor,	2SC631A
Q303, 403	transistor,	2SC631A
Q304, 404	transistor,	2SC634A
Q305, 405	transistor,	2SC634A
Q306, 406	transistor,	2SC634
D301, 401	diode,	10D2
D302, 402	diode,	1T22
D303, 403	diode,	1T22
D304, 404	diode,	10D2

TRANSFORMER

T301, 401	1-427-284	headphone
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CAPACITORS

C301, 401	1-121-410	47 μ F	25V, electrolytic
C302, 402	1-127-304	3.3 μ F	16V, electrolytic, alox
C303, 403	1-105-661-12	0.001 μ F	50V, mylar
C304, 404	1-121-413	100 μ F	6.3V, electrolytic
C305, 405	1-121-403	33 μ F	16V, electrolytic
C306, 406	1-121-398	10 μ F	25V, electrolytic
C307, 407	1-121-416	100 μ F	25V, electrolytic
C308, 408	1-105-675-12	0.015 μ F	50V, mylar
C309, 409	1-107-244	470 pF	50V, silvered mica
C310, 410	1-121-391	1 μ F	50V, electrolytic

C311, 411	1-105-661-12	0.001 μ F	50V, mylar
C312, 412	1-121-409	47 μ F	16V, electrolytic
C313, 413	1-107-125	56 pF	50V, silvered mica
C314, 414	1-121-416	100 μ F	25V, electrolytic
C315, 415	1-121-409	47 μ F	16V, electrolytic
C316, 416	1-121-398	10 μ F	25V, electrolytic
C317, 417	1-121-391	1 μ F	50V, electrolytic
C318, 418	1-121-398	10 μ F	25V, electrolytic
C319, 419	1-121-398	10 μ F	25V, electrolytic
C320, 420	1-121-395	4.7 μ F	25V, electrolytic
C321, 421	1-121-391	1 μ F	50V, electrolytic
C322, 422	1-121-410	47 μ F	25V, electrolytic

RESISTORS

All resistors are $\frac{1}{4}$ W and carbon type, unless otherwise indicated.

R301, 401	1-242-725	150 k Ω
R302, 402	1-242-739	560 k Ω
R303, 403	1-242-649	100 Ω
R304, 404	1-242-721	100 k Ω
R305, 405	1-242-707	27 k Ω
R306, 406	1-242-705	22 k Ω
R307, 407	1-242-692	6,200 Ω
R308, 408	1-242-692	6,200 Ω
R309, 409	1-242-697	10 k Ω
R310, 410	1-242-731	270 k Ω
R311, 411	1-242-705	22 k Ω
R312, 412	1-242-681	2,200 Ω
R313, 413	1-242-685	3,300 Ω
R314, 414	1-242-705	22 k Ω
R315, 415	1-242-729	220 k Ω
R316, 416	1-242-665	470 Ω
R317, 417	1-242-677	1,500 Ω
R318, 418	1-242-709	33 k Ω
R319, 419	1-242-707	27 k Ω
R320, 420	1-242-663	390 Ω
R321, 421	1-242-677	1,500 Ω
R322, 422	1-242-657	220 Ω
R323, 423	1-242-681	2,200 Ω
R324, 424		- discarded -
R325, 425	1-242-697	10 k Ω
R326, 426	1-242-721	100 k Ω
R327, 427	1-242-721	100 k Ω
R328, 428	1-242-737	470 k Ω
R329, 429	1-242-681	2,200 Ω
R330, 430	1-221-311	5 k Ω (B) semi-fixed
R331, 431	1-242-697	10 k Ω
R332, 432	1-242-705	22 k Ω
R333, 433	1-242-681	2,200 Ω
R334, 434	1-221-311	5 k Ω (B) semi-fixed
R335, 435	1-242-701	15 k Ω
R336, 436	1-242-657	220 Ω
R337, 437	1-221-311	5 k Ω (B) semi-fixed
R338, 438	1-242-697	10 k Ω
R339, 439	1-242-609	2.2 Ω
R340, 440	1-242-721	100 k Ω
R341, 441	1-242-709	33 k Ω

Ref. No. Part No. Description

BIAS OSC UNIT

SEMICONDUCTORS

Q501		transistor,	2SC634A
Q502		transistor,	2SC634A
Q503		transistor,	2SC634A

D501		diode,	10D2
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COILS

L501	1-231-069	equalizer,	1.45/1.8 mH
L502	1-231-069	equalizer,	1.45/1.8 mH
L503	1-409-038	dummy,	1 mH
L504	1-409-038	dummy,	1 mH

MICRO INDUCTORS

L505	1-407-198	2.2 mH
L506	1-407-198	2.2 mH

TRANSFORMER

T501	1-433-145	bias osc.
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CAPACITORS

C501	1-107-188	620 pF	500V, silvered mica
C502	1-107-188	620 pF	500V, silvered mica
C503	1-121-410	47 μ F	25V, electrolytic
C504	1-121-416	100 μ F	25V, electrolytic
C505	1-121-398	10 μ F	25V, electrolytic
C506	1-121-398	10 μ F	25V, electrolytic
C507	1-107-188	620 pF	500V, silvered mica
C508	1-107-188	620 pF	500V, silvered mica
C509	1-105-663-12	0.0015 μ F	50V, mylar
C510	1-109-507	4,700 pF	500V, dipped mica
C511	1-141-076	30 $\sim$ 200pF,	trimmer
C512	1-141-076	30 $\sim$ 200pF,	trimmer

RESISTORS

All resistors are $\frac{1}{4}$ W and carbon type, unless otherwise indicated.

R501	1-242-649	100 Ω
R502	1-242-681	2,200 Ω
R503	1-242-625	10 Ω
R504	1-242-625	10 Ω
R505	1-242-625	10 Ω
R506	1-242-725	150 k Ω
R507	1-242-725	150 k Ω
R508	1-242-667	560 Ω

RELAY

RY501	1-515-127	650 Ω	24V
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AMP CHASSIS UNIT

CAPACITORS

C601	1-105-673-12	0.01 μ F	50V, mylar
C602	1-103-863	330 pF	50V, styrol
C603	1-103-863	330 pF	50V, styrol
C604	1-105-673-12	0.01 μ F	50V, mylar
C605	1-105-689-12	0.22 μ F	50V, mylar

Ref. No. Part No. Description

C606	1-105-689-12	0.22 μ F	50V, mylar
C607	1-109-501	910 pF	500V, dipped mica

RESISTORS

All resistors are $\frac{1}{4}$ W and carbon type, unless otherwise indicated.

R601	1-242-669	680 Ω
R602	1-242-669	680 Ω
R603	1-242-721	100 k Ω
R604	1-242-729	220 k Ω
R605	1-242-721	100 k Ω
R606	1-242-729	220 k Ω
R607	1-222-314	20 k Ω (B) variable (L-CH MIC)
R608	1-222-314	20 k Ω (B) variable (R-CH MIC)
R609	1-222-314	20 k Ω (B) variable (L-CH LINE)
R610	1-222-314	20 k Ω (B) variable (R-CH LINE)
R611	1-222-313	50 k Ω (B) variable (L-CH ECHO)
R612	1-222-313	50 k Ω (B) variable (R-CH ECHO)
R613	1-222-314	20 k Ω (B) variable (L-CH PB)
R614	1-222-314	20 k Ω (B) variable (R-CH PB)
R615	1-242-689	4,700 Ω
R616	1-242-689	4,700 Ω
R617	1-242-684	3 k Ω
R618	1-242-684	3 k Ω
R619	1-242-673	1 k Ω
R620	1-242-673	1 k Ω
R621	1-242-673	1 k Ω
R622	1-242-717	68 k Ω
R623	1-242-717	68 k Ω
R624	1-242-715	56 k Ω
R625	1-242-715	56 k Ω

CONNECTORS

CNJ601	1-507-300	22P, circuit board; BIAS OSC
CNJ602	1-507-300	22P, circuit board; REC AMP (L-CH)
CNJ603	1-507-300	22P, circuit board; REC AMP (R-CH)
CNJ604	1-507-300	22P, circuit board; PB AMP (L-CH)
CNJ605	1-507-300	22P, circuit board; PB AMP (R-CH)
CNP601	1-539-437-11	22P, DOCKING
CNP602	1-509-371	3P, LEVEL METER

JACKS

J601	1-507-142	2P-pin; LINE INPUT (L-CH)
J602	1-507-142	2P-pin; LINE INPUT (R-CH)
J603	1-507-142	2P-pin; LINE OUTPUT (L-CH)
J604	1-507-142	2P-pin; LINE OUTPUT (R-CH)
J605	1-507-281	upper panel; MIC INPUT (L-CH)
J606	1-507-281	upper panel; MIC INPUT (R-CH)
J607	1-507-282	binaural; HEADPHONE
J608	1-507-281	side; MIC INPUT (L-CH)
J609	1-507-281	side; MIC INPUT (R-CH)

SWITCHES

S601	1-514-324	slide; TAPE SELECTOR
S602	1-514-692	lever; MONITOR (L-CH)
S603	1-514-692	lever; MONITOR (R-CH)
S604	1-514-693	lever, 3 position; SOS/ECHO
S605	1-514-728	2 key; REC MODE (L-CH)
S606	1-514-728	2 key; REC MODE (R-CH)
S607	1-514-482	1 key; TAPE SPEED

Ref. No. Part No. Description

METERS

ME601 1-524-067 level
ME602 1-524-067 level

LAMPS

PL601 — built in level meter (L-CH) —
PL602 — built in level meter (R-CH) —
PL603 1-518-093-11 REC, 0.1A (L-CH)
PL604 1-518-093-11 REC, 0.1A (R-CH)

MISCELLANEOUS

1-509-372 terminal, pin

MECHANICAL SYSTEM CONTROL**SEMICONDUCTORS**

Q701 transistor, 2SC634
Q702 transistor, 2SC634
Q703 transistor, 2SD28
Q704 transistor, 2SC634
Q705 transistor, 2SC634
Q706 transistor, 2SC634
Q707 transistor, 2SD28
Q708~712 transistor, 2SC634

D701~714 diode, 10D2
D716 diode, 10D2
D717 diode, 10D2
D720~732 diode, 10D2
DZ701~703 diode, zener 1S334

CAPACITORS

C701 1-121-388 1,000 μ F 35V, electrolytic
C702 1-121-410 47 μ F 25V, electrolytic
C703 1-121-733 470 μ F 25V, electrolytic
C704 1-121-361 470 μ F 35V, electrolytic
C705 1-121-410 47 μ F 25V, electrolytic
C706 1-121-388 1,000 μ F 35V, electrolytic
C707 1-121-422 220 μ F 25V, electrolytic
C708 — discarded —
C709 1-105-689-11 0.22 μ F 50V, mylar
C710 1-121-410 47 μ F 25V, electrolytic
C711 1-121-422 220 μ F 25V, electrolytic
C712 1-121-422 220 μ F 25V, electrolytic
C713 1-121-422 220 μ F 25V, electrolytic
C714 1-121-398 10 μ F 25V, electrolytic
C715 1-121-480 22 μ F 25V, electrolytic
C716 1-121-392 3.3 μ F 25V, electrolytic

RESISTORS

All resistors are $\frac{1}{4}$ W and carbon type,
unless otherwise indicated.

R701 1-244-817 4.7 Ω $\frac{1}{2}$ W
R702 1-242-689 4,700 Ω
R703 1-242-665 470 Ω
R704 1-242-677 1,500 Ω
R705 1-242-685 3,300 Ω
R706 1-242-682 2,400 Ω
R707 1-242-709 33 k Ω
R708 1-242-665 470 Ω

Ref. No. Part No. Description

R709 1-242-677 1,500 Ω
R710 1-242-690 5,100 Ω
R711 1-242-687 3,900 Ω
R712 1-242-681 2,200 Ω
R713 1-242-705 22 k Ω
R714 1-242-691 5,600 Ω
R715 1-244-885 3,300 Ω
R716 1-242-705 22 k Ω
R717 1-242-665 470 Ω
R718 1-242-709 33 k Ω
R719 1-242-705 22 k Ω
R720 1-242-673 1 k Ω
R721 1-242-709 33 k Ω
R722 1-242-709 33 k Ω
R723 1-242-707 27 k Ω
R724 1-242-713 47 k Ω
R725 1-242-713 47 k Ω
R726 1-242-705 22 k Ω
R727 1-242-697 10 k Ω
R728 1-242-697 10 k Ω
R729 1-242-683 2,700 Ω
R730 1-242-701 15 k Ω
R731 1-242-705 22 k Ω
R732 1-242-685 3,300 Ω
R733 1-242-699 12 k Ω
R734 1-242-705 22 k Ω
R735 1-242-677 1,500 Ω
R736 1-242-697 10 k Ω
R737 1-242-705 22 k Ω
R738 1-207-273 5.1 Ω 1.5W, wire wound
R739 1-207-273 5.1 Ω 1.5W, wire wound
R740 1-207-273 5.1 Ω 1.5W, wire wound
R741 1-242-705 22 k Ω
R742 1-242-709 33 k Ω
R743 1-242-690 5,100 Ω
R744 1-242-657 220 Ω

ENCAPSULATED COMPONENTS C-R

CP701 1-101-534 0.1 μ F + 120 Ω 500V
CP702 1-101-534 0.1 μ F + 120 Ω 500V
CP703 1-101-534 0.1 μ F + 120 Ω 500V
CP704 1-101-534 0.1 μ F + 120 Ω 500V
CP705 1-101-528 0.1 μ F + 120 Ω 250V

RELAYS

RY701 1-515-127 650 Ω 24V
RY702 1-515-127 650 Ω 24V
RY703 1-515-127 650 Ω 24V
RY704 1-515-127 650 Ω 24V

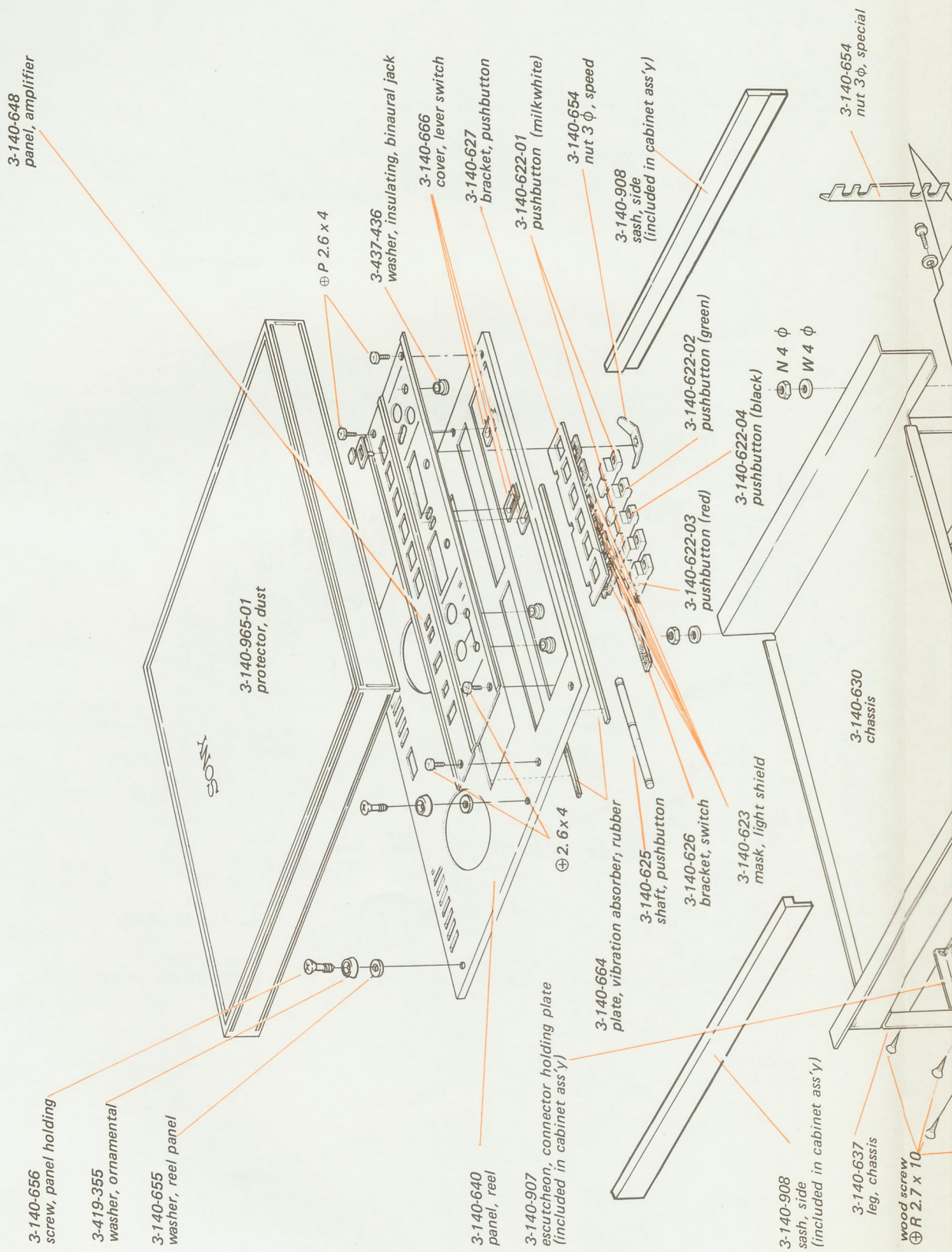
MECHANICAL CHASSIS UNIT**SEMICONDUCTORS**

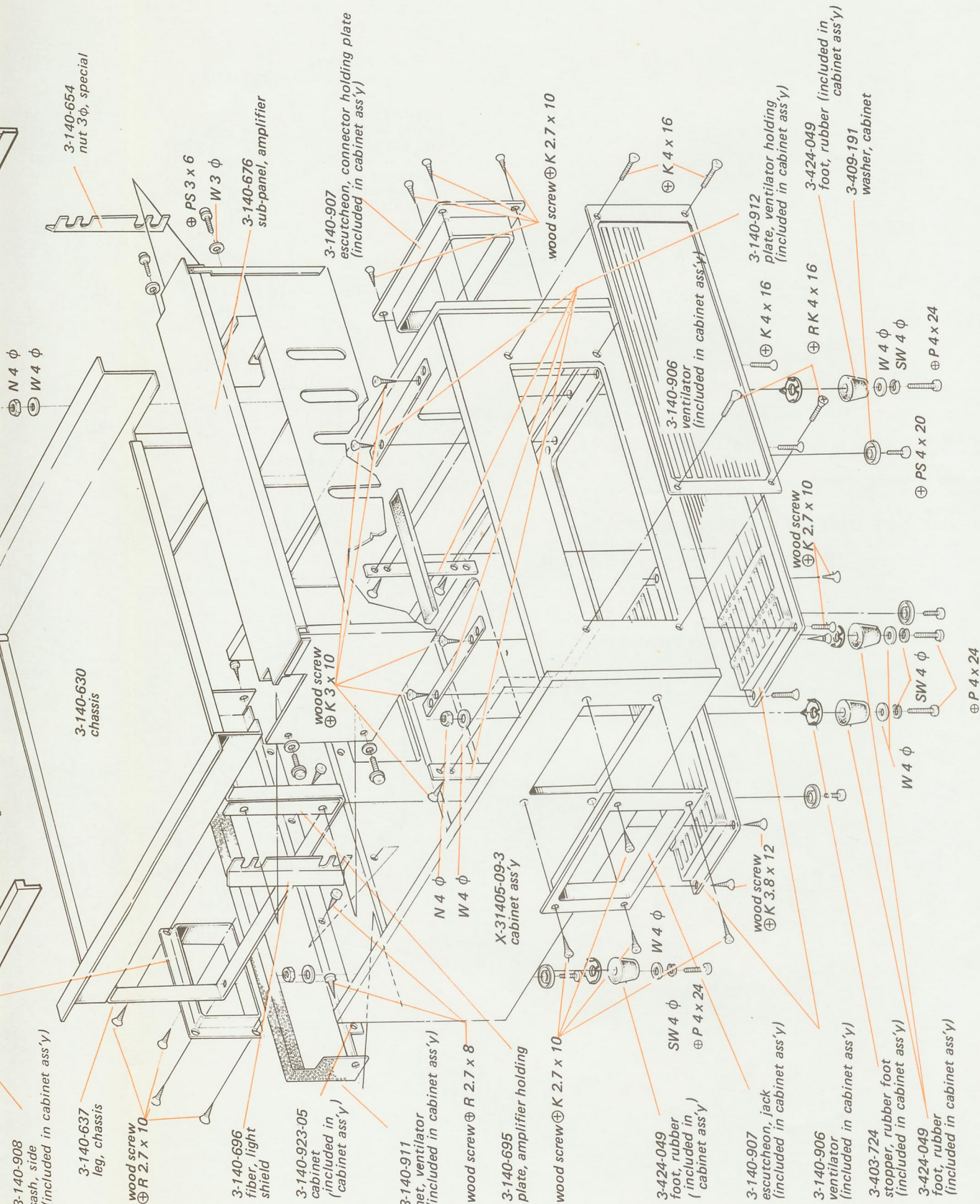
Q802 transistor, 2SD28
Q803 transistor, 2SD28
Q804 transistor, 2SD28
Q805 transistor, 2SD28

<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>	<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>
D801		diode, 10D2	LAMPS		
D802		diode, 10D2	PL801	1-518-053	FF 0.04 A
TRANSFORMER			PL802	1-518-053	REW 0.04 A
T801	1-441-579	power	PL803	1-518-053	PLAY 0.04 A
CAPACITORS			PL804	1-518-053	REC 0.04 A
C801	1-117-040	2 μ F + 0.5 μ F 300V, MP	SOCKETS		
C802	1-117-082	4 μ F 300V, MP	PLB801	1-517-018	lamp
C803	1-117-054	0.47 μ F 350V, MP	PLB802	1-517-018	lamp
C804	1-117-054	0.47 μ F 350V, MP	PLB803	1-517-018	lamp
C805	1-117-082	4 μ F 300V, MP	PLB804	1-517-018	lamp
C806	1-105-681-12	0.047 μ F 50V, mylar	ENCAPSULATED COMPONENTS C-R		
RESISTORS			CP801	1-101-528	0.1 μ F + 120 Ω 250V
R801	1-205-506	1 k Ω 30W, wire wound	CP802	1-101-534	0.1 μ F + 120 Ω 500V
R802	1-205-503	68 Ω 40W, wire wound	MISCELLANEOUS		
R803	1-205-503	68 Ω 40W, wire wound	FB801	1-533-048	holder, fuse
CONNECTORS				1-536-213	terminal strip, 5 P
CNJ801	1-509-062	power supply; AC INPUT	HEAD UNIT		
CNJ802	1-509-341	power supply; AC OUTLET	HEADS		
CNJ803	1-507-300	22P; AMP (for CNP601)	RECH	8-824-629-20	record (RP102-2902)
CNJ804		— discarded —	PBH	8-829-142-20	playback (PP102-4202) (for 4-track)
CNJ805	1-507-255	11P; REMOTE CONTROL	EH	8-826-629-25	erase (EF18-2902A)
CNJ806	1-509-372-11	3P; LEVEL METER lamp (for CNP602)	RECH	8-824-122-20	(RP30-2202)
CNP801	1-506-180	11P; REMOTE CONTROL dummy	PBH	8-822-528-21	(PP77-2802A) (for 2-track)
CNP802	1-539-436-11	head connector	EH	8-828-522-20	(EF85-2202)
CNP803	1-508-400	3P	HEAD ASSEMBLY		
SWITCHES			H17-4S	4-track	
S801	1-514-531-22	seesaw; POWER	H17-2S	2-track	
S802	1-514-057	micro; REC	CONNECTOR		
S803	1-514-057	micro; REW	CNJ804	1-507-301	18 P, heads
S804	1-514-057	micro; STOP	SHUT-OFF UNIT		
S805	1-514-057	micro; FWD	SEMICONDUCTOR		
S806	1-514-057	micro; FF	Q801		transistor 2SD28
S807	1-514-680	key; TAPE SHIFTER	RESISTORS		
S808	1-514-530	micro; SHUT-OFF	R804	1-206-161	2,200 Ω 3W, wire wound
MOTORS			R805	1-242-709	33 k Ω ¼W, carbon
M801	8-831-634-13	capstan, synchronous (HC-634D5)			
M802	8-836-624-07	reel, induction (UC-624K)			
M803	8-836-624-07	reel, induction (UC-624K)			
SOLENOIDS					
PM801	1-454-052	pinch roller			
PM802	1-454-053	tape shifter			
PM803	1-454-053	brake			

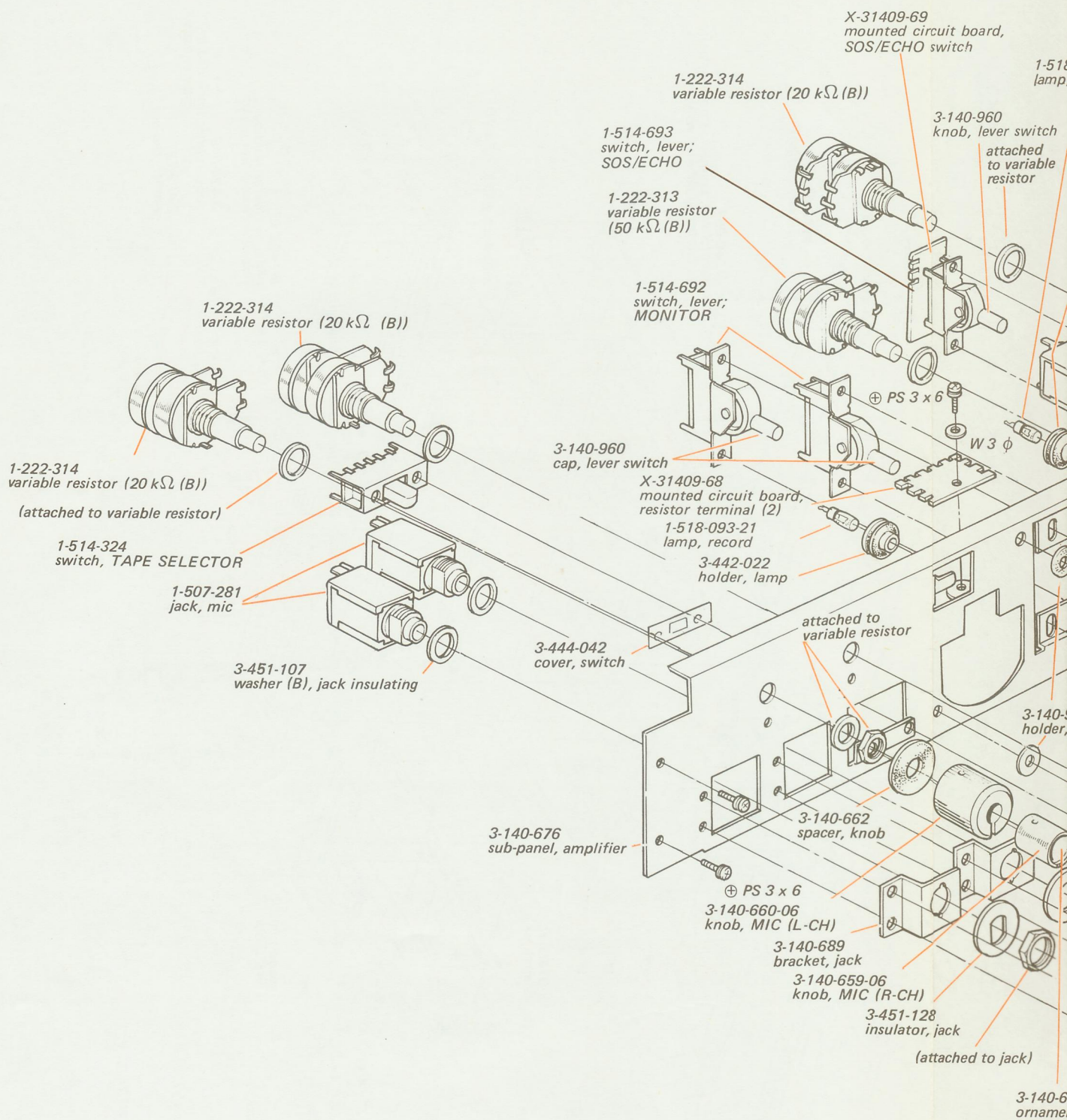
When ordering replacement parts, you should use **PART NUMBER** listed on the Parts Lists or shown in the Exploded View.
The symbol number should not be used for ordering purposes.

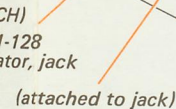
8-1. CABINET – TOP VIEW –



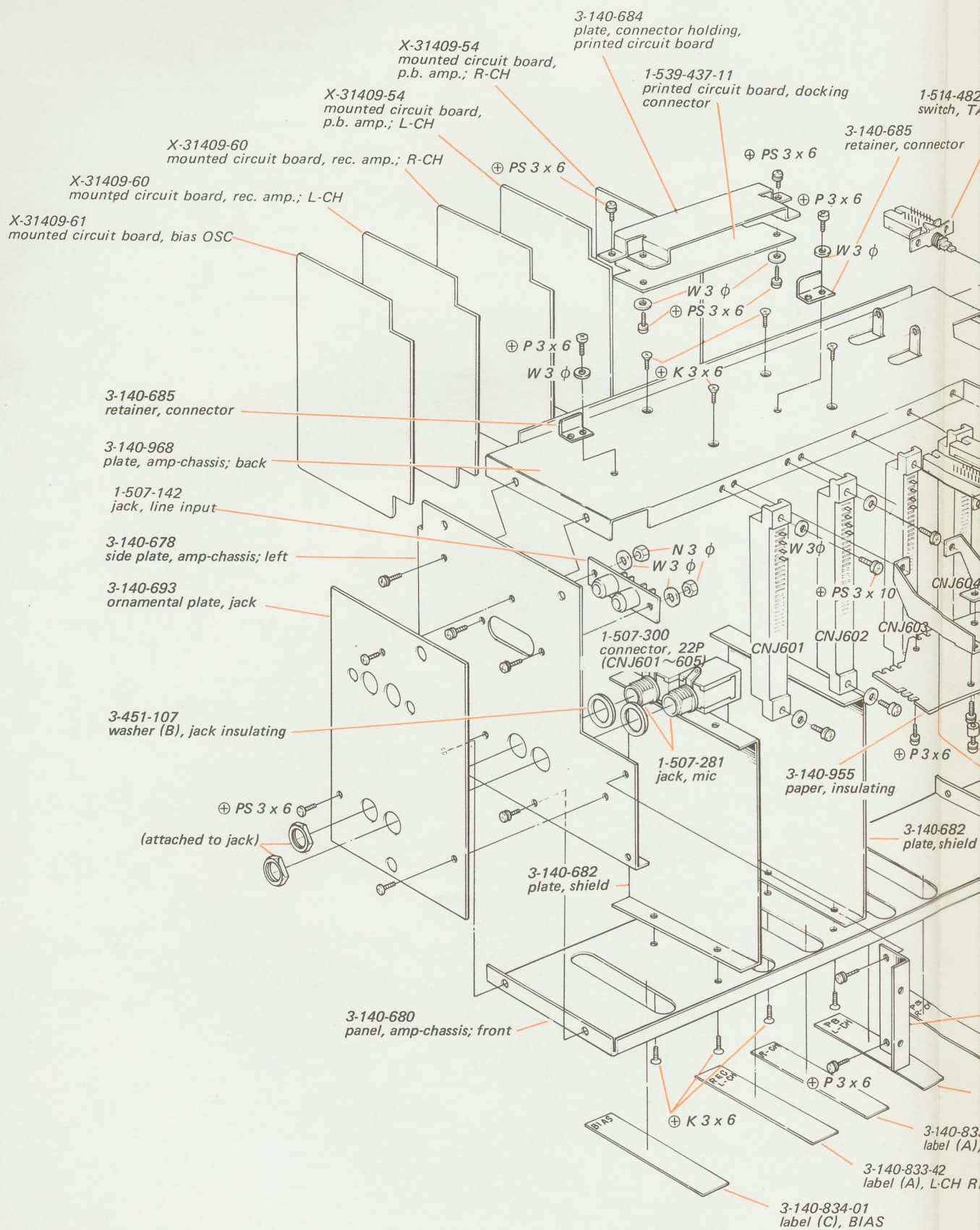


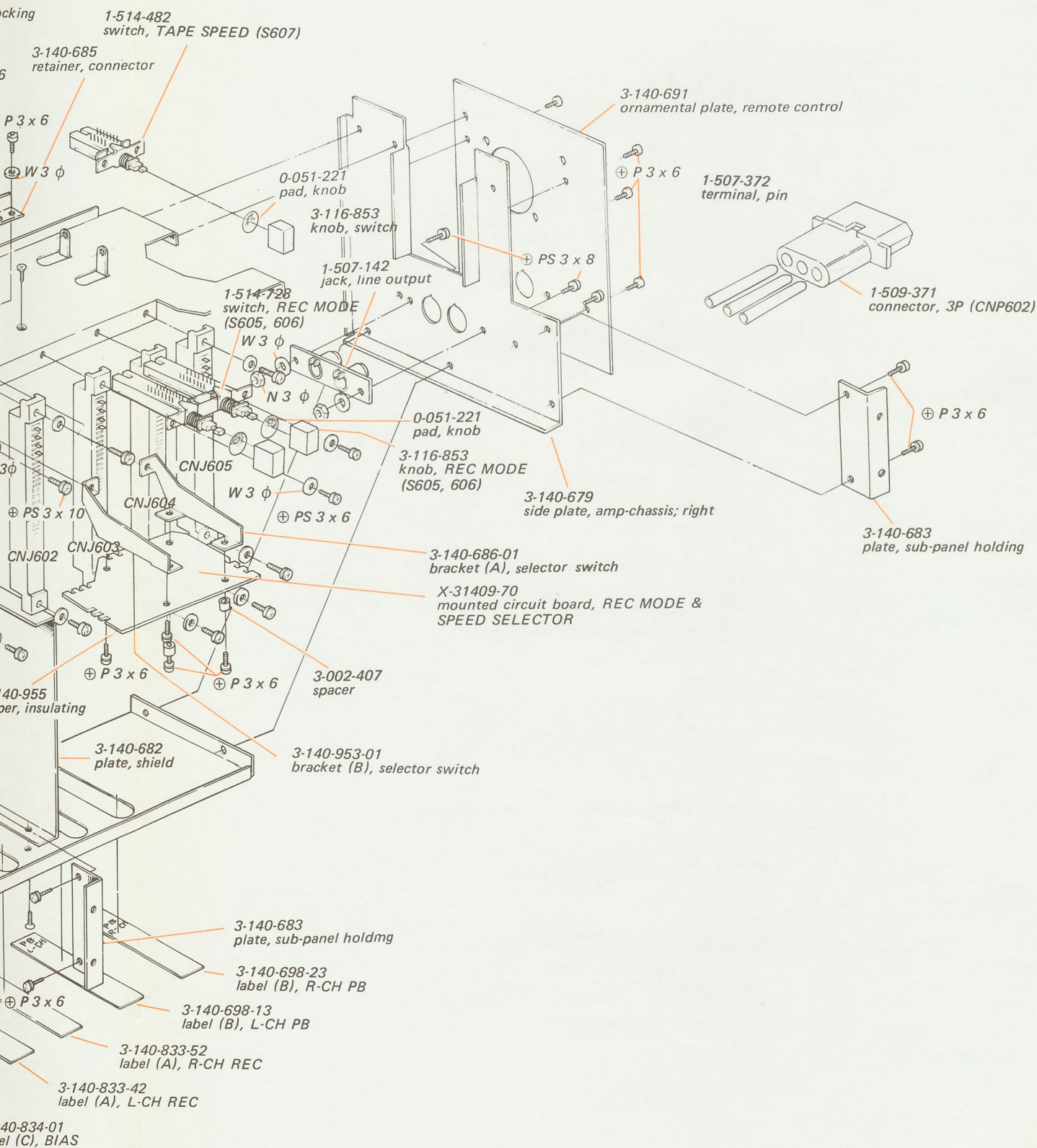
8-2. AMP SUB-PANEL — TOP VIEW —



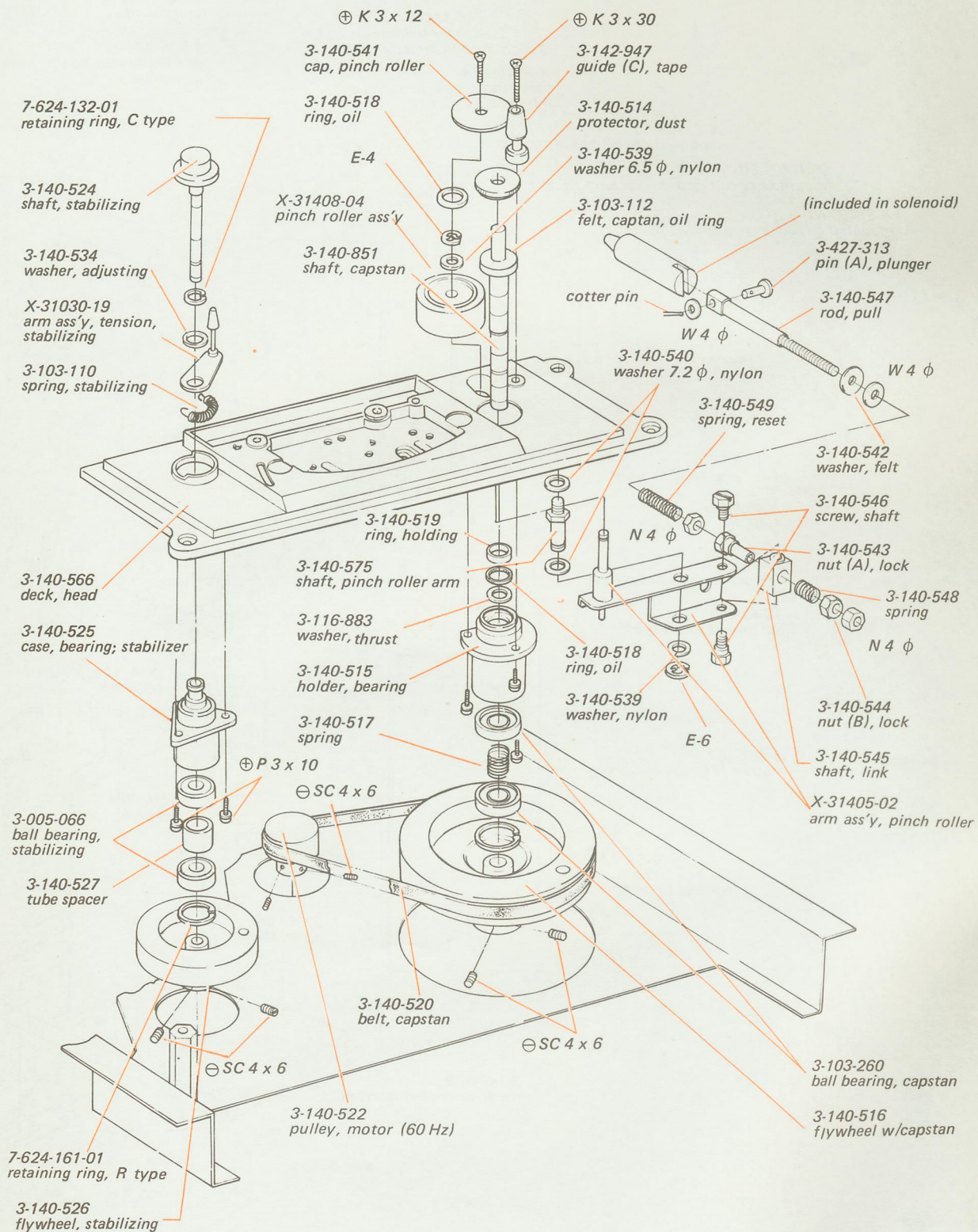


8-3. AMP CHASSIS PANEL – TOP VIEW—

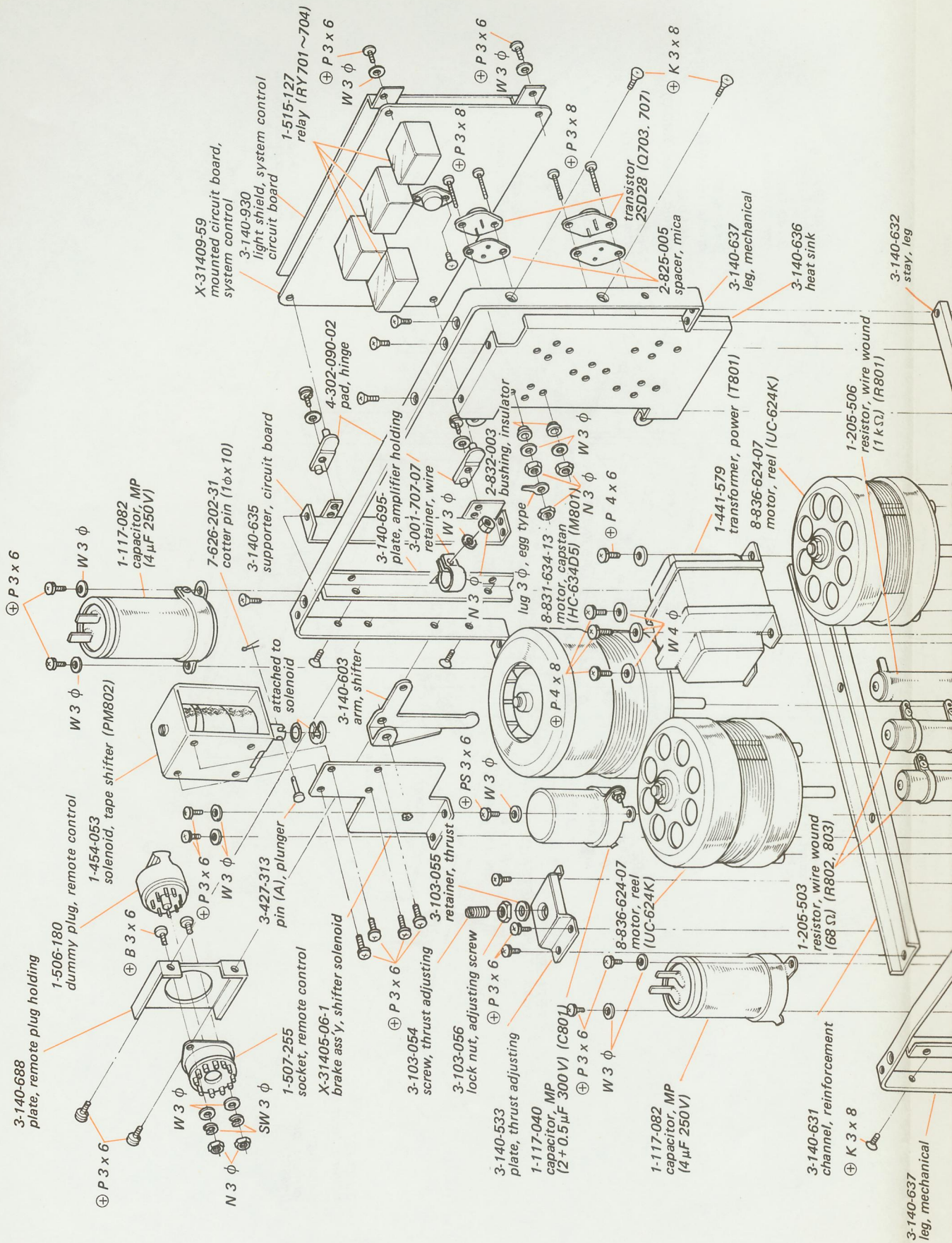


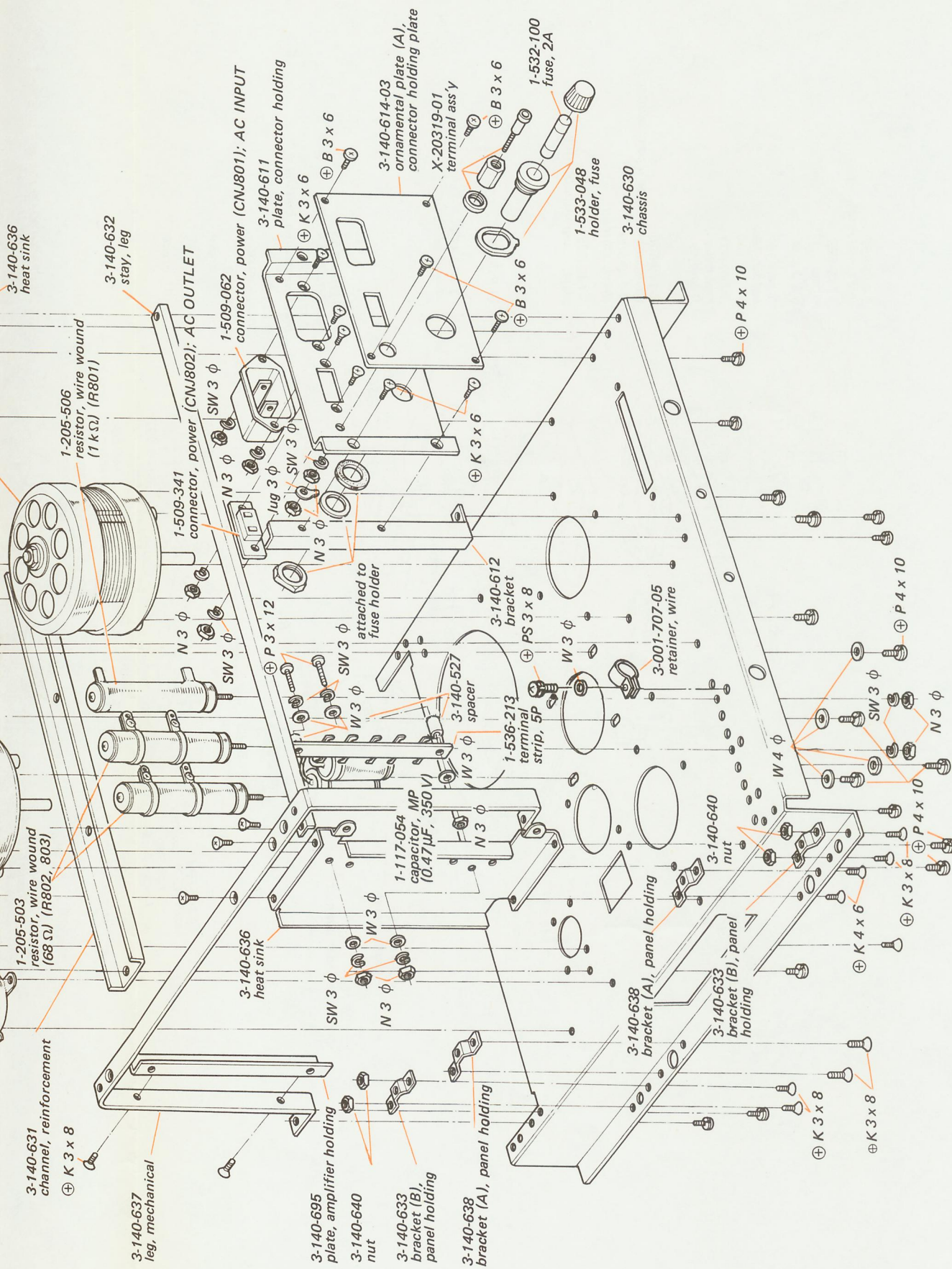


8-5. FLYWHEEL – TOP VIEW –



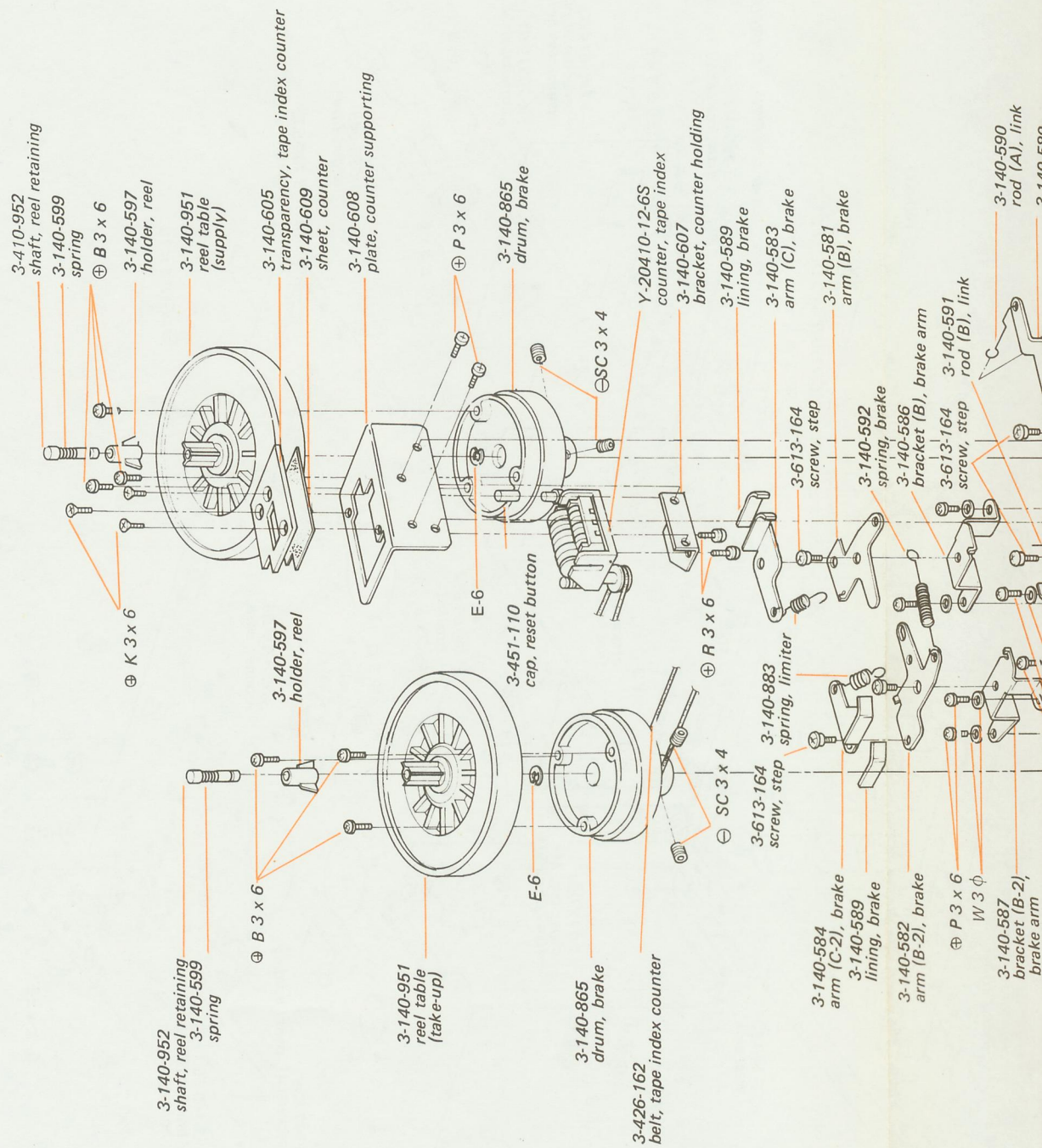
8-6. CHASSIS — BOTTOM VIEW —

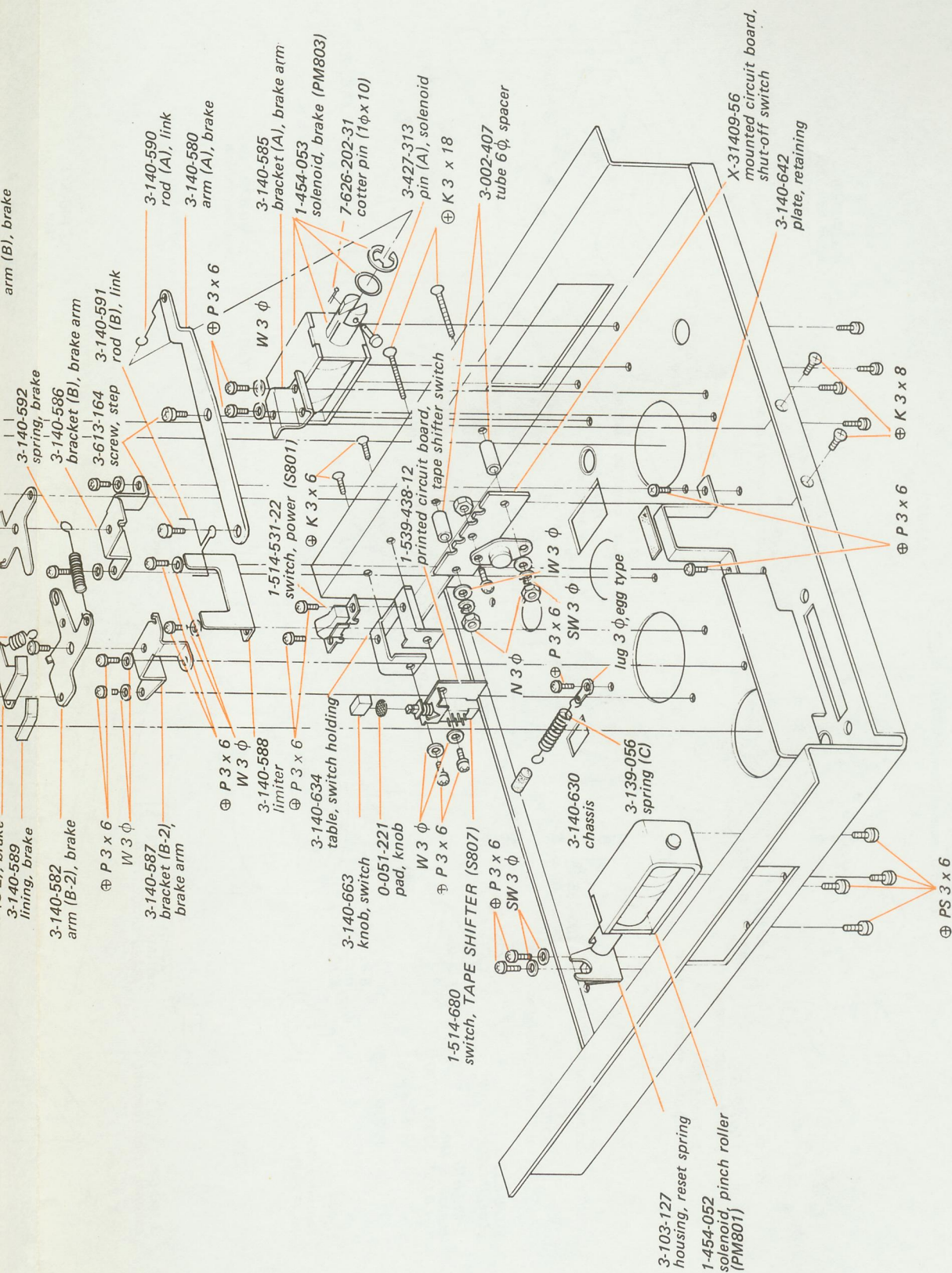




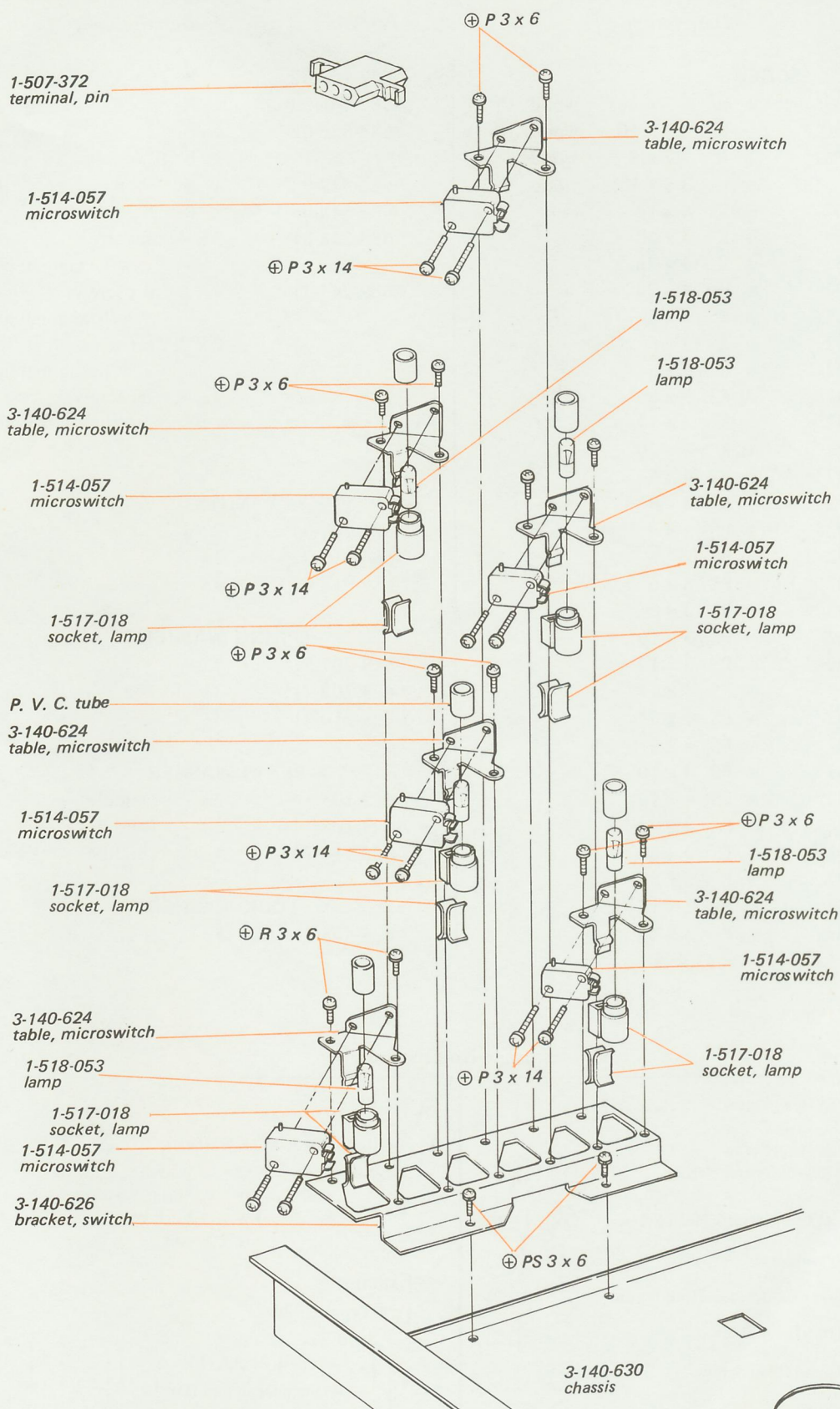
8-7. CHASSIS — TOP VIEW —

(1)





8-8. CHASSIS — TOP VIEW —
(2)



SECTION 9 HARDWARES

Part No. Description

SCREWS

7-621-852-39	⊕ K	2.7 × 10,	wood; Cr
7-621-852-30	⊕ K	2.7 × 10,	wood; Ni
7-621-842-26	⊕ R	2.7 × 8,	wood
	⊕ K	3.8 × 12,	wood
7-621-569-02	⊕ K	4 × 16	
7-621-569-22	⊕ K	4 × 20	
7-621-569-52	⊕ K	4 × 26	
7-682-167-00	⊕ P	4 × 24	
7-682-225-02	⊕ K	2 × 5	
7-682-226-02	⊕ K	2 × 6	
7-682-247-02	⊕ K	3 × 6	
7-682-248-02	⊕ K	3 × 8	
7-682-250-02	⊕ K	3 × 12	
7-682-253-02	⊕ K	3 × 20	
7-682-260-02	⊕ K	4 × 6	
7-682-261-02	⊕ K	4 × 8	
7-682-624-02	⊕ PS	2 × 4	
7-682-625-02	⊕ PS	2 × 5	
7-682-647-02	⊕ PS	3 × 6	
7-682-648-02	⊕ PS	3 × 8	
7-682-649-02	⊕ PS	3 × 10	
7-682-650-02	⊕ PS	3 × 12	
7-682-651-02	⊕ PS	3 × 14	
7-682-659-02	⊕ PS	4 × 5	
7-682-661-02	⊕ PS	4 × 8	
7-682-662-02	⊕ PS	4 × 10	
7-682-663-02	⊕ PS	4 × 12	
7-621-259-48	⊕ P	2.6 × 6	
7-621-261-52	⊕ P	3 × 8	
7-682-126-02	⊕ P	2 × 6	
7-682-150-02	⊕ P	3 × 12	
7-682-153-02	⊕ P	3 × 20	

Part No. Description

7-682-163-02	⊕ P	4 × 12
7-682-248-04	⊕ K	3 × 8
7-682-526-02	⊕ B	2 × 6
7-621-730-31	⊕ B	2.6 × 4
7-682-547-04	⊕ B	3 × 6
7-682-548-05	⊕ B	3 × 8
7-683-238-31	3 × 4,	set screw; w/hexagonal hole
7-682-247-31	4 × 6,	set screw; w/hexagonal hole
	2 × 3,	set screw; w/hexagonal hole
	2 × 4,	set screw; w/hexagonal hole

NUTS

7-622-107-04	2.6φ
7-684-013-02	3φ
7-684-014-02	4φ

SPRING WASHER

7-623-207-21	2.6φ
7-623-208-21	3φ
7-623-210-21	4φ

PLAIN WASHER

7-623-105-14	2φ	(middle)
7-623-108-14	3φ	(middle)
7-623-110-14	4φ	(middle)

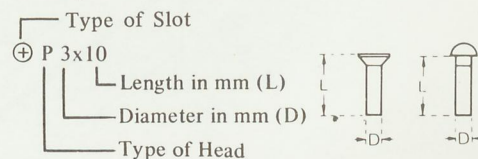
LOCK WASHER

7-623-408-01	3φ
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Hardware Nomenclature

P — Pan Head Screw			SC — Set Screw		
PS — Pan Head Screw with Spring Washer			E — Retaining Ring (E Washer)		
K — Flat Countersunk Head Screw ...			W — Washer		
B — Binding Head Screw			SW — Spring Washer		
RK — Oval Countersunk Head Screw ..			LW — Lock Washer		
T — Truss Head Screw			N — Nut		
R — Round Head Screw					
F — Flat Fillister Head Screw					

— Example —



SONY CORPORATION