SERVICE MANUAL

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SERVICING NOTES

1. When performing electrical check or replacement of some components on preamplifier/power supply board without removing the board, remove the dial lamp shade by straighten the tab as shown in Fig. A.
2. In this set, "wire-wrap" connections are employed as shown in Fig. B. In case a wire breakes, simply solder the lead wire directly to the terminal post.
   Wire-wrap connection cannot be properly made by hand. Care should be taken not to cut too deep when removing the insulation from wire.
   Even the slightest nick in the copper wire will weaken the wire enough to eventually cause a break at that point. Use a soldering iron to remove the insulation.
3. In the power amplifier, the thermistor Th801 (Th701) and posistor Po801 (Po701) are fixed to the R814 (R714) (series resistors of power transistors) respectively with contact cement ensuring the overload protection of power transistors as shown in Fig. C.
   When replacing any of these components, mount them precisely as before.

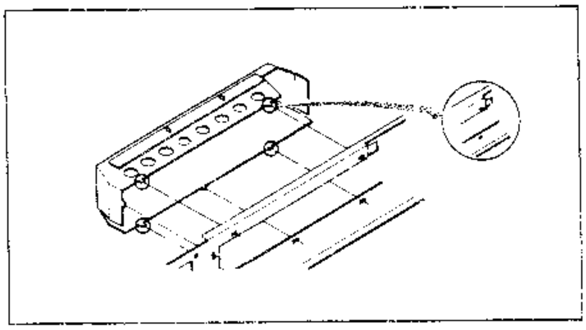


Fig. A. Dial lamp shade removal

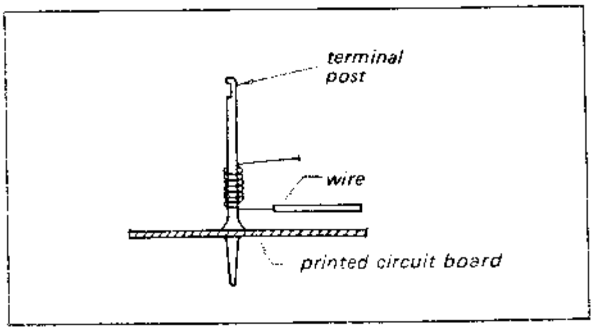


Fig. B. "Wire-wrap" connection

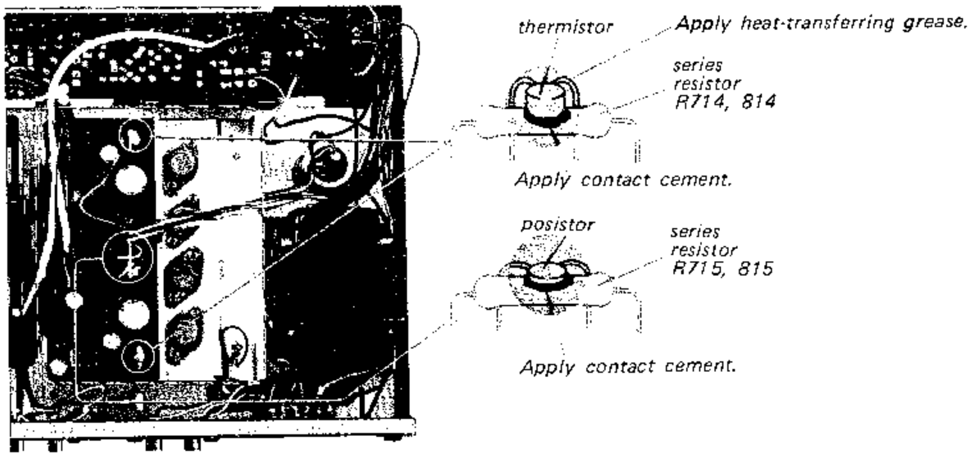


Fig. C. Thermistor and posistor installation

SECTION 1
TECHNICAL DESCRIPTION

1-1. TECHNICAL SPECIFICATIONS

Technical specifications for the HST-139 are listed in Table 1-1.

TABLE 1-1. HST-139 TECHNICAL SPECIFICATIONS

Fm Tuner Section

Antenna:	300 ohms balanced
Frequency range:	87.5 to 108 MHz
Intermediate frequency:	10.7 MHz
Usable sensitivity:	2.2μV (S/N = 30 dB)
Signal-to-noise ratio:	65 dB, IHF
Capture ratio:	4 dB, IHF
Selectivity:	35 dB, IHF
Image rejection:	45 dB
I-f rejection:	90 dB
A-m suppression:	45 dB
Frequency response:	20 to 15,000 Hz ± 3 dB
Harmonic distortion:	Mono: 0.5% at 400 Hz Stereo: 1.0% at 400 Hz
FM-stereo separation:	Greater than 35 dB at 400 Hz
19-kHz, 38-kHz suppression:	45 dB

A-m Tuner Section

Frequency range:	530 to 1,605 kHz
Intermediate frequency:	455 kHz
Sensitivity:	48 dB/m, built-in antenna 20μV, external antenna
Signal-to-noise ratio:	50 dB
Image rejection:	40 dB at 600 kHz 35 dB at 1,400 kHz
I-f rejection:	40 dB at 1,000 kHz
Harmonic distortion:	0.8%

Audio Amplifier Section

Music power output: (EIA)	40 watts total
Continuous RMS power:	12 watts, per channel, both channels operating, 8 ohms
Harmonic distortion:	Less than 5.0% at 1 kHz at rated output
Frequency response:	30 Hz to 50 kHz (±3 dB) at 1-watt output
Input sensitivity and impedance:	PHONO (CERAMIC): 400 mV, 3.6 M ohms PHONO (MAGNETIC): 3.5 mV, 47 k ohms TAPE: 400 mV, 100 k ohms REC/PB (input): 400 mV, 100 k ohms
Signal output:	REC OUT: 400 mV, 10 k ohms REC/PB (output): 30 mV, 80 k ohms
Signal-to-noise ratio (IHF (B) network):	PHONO: greater than 60 dB TAPE: greater than 65 dB
Tone controls:	BASS: ±10 dB at 100 Hz TREBLE: ±10 dB at 10 kHz

General

Power consumption:	88 watts
Power requirement:	110, 127, 220, 240V 50/60 Hz ac
Dimensions:	21⅝" (width) x 5¼" (height) x 12$\frac{9}{16}$" (depth) 550 mm (width) x 133 mm (height) x 325 mm (depth)
Net weight:	18 lb (8.2 kg)
Shipping weight:	24 lb (11.2 kg)

Cassette Player Section (TC-119A)

Tape speed:	4.8 cm/sec (1⅞ inch/sec)
Frequency response:	40 Hz to 10 kHz (−15 dB down)
Flutter and wow:	less than 0.35% WRMS
Load impedance:	100 k ohms
Record bias frequency:	85 kHz
Input sensitivity impedance:	MIC: 0.775 mV (−60 dB), 220Ω

1-2. ANALYSIS FOR NEWLY ADOPTED CIRCUIT

1. Fm/A-m I-f Strip

Notice that the RC coupled amplifier Q202 and tuned amplifier Q203 form an fm/a-m i-f amplifier stage. Changeover for tuned circuit is not necessary because of the wide difference in the intermediate frequencies. But dc bias changeover circuit for these amplifiers is provided to permit the proper operation both at fm and a-m i-f signal amplification. Referring to partial schematic diagram Fig. 1-1, dc bias changeover operation is performed by switching S1 ~ 6 (FUNCTION switch). In A-M mode, bias voltage is supplied through R237, R242. This holds the collector current of Q202 to 0.3 mA and Q203 to 2 mA, permitting proper amplification for a-m i-f signals. In FM mode, bias voltage is now supplied through paralleled circuit of R237/R238, R242/R244. This increases bias current ensuring limiter response in fm mode.

2. MPX Decoder Circuit

(a) Subchannel boost circuit
R302 and C301 form a subchannel signal boost circuit (high pass filter) and are inserted between SCA trap and base circuit of Q301 (19 kHz amplifier). This upgrades the channel separation without employing negative-feedback type cancellation circuit. See Fig. 1-2.

(b) Frequency doubler circuit
Q302 and tuned circuit in the collector circuit form a frequency doubler circuit. Input 19 kHz signal is rectified between base-emitter junction and amplified at Q302 since it operates as class "C" amplifier. As 19 kHz pulses in the base circuit include its higher-order harmonics, tank circuit tuned to 38 kHz is inserted in the collector to restore 38 kHz sinusoidal waveform. This signal is transformer coupled to bridge-type demodulator to supply sampling drive for the demodulator. See Fig. 1-2.

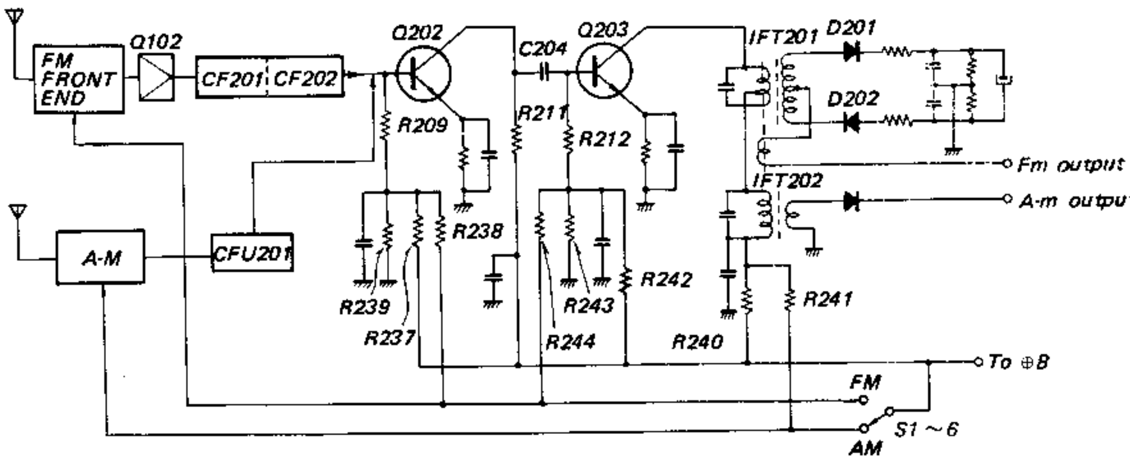


Fig. 1-1. Partial schematic diagram of fm/a-m i-f strip

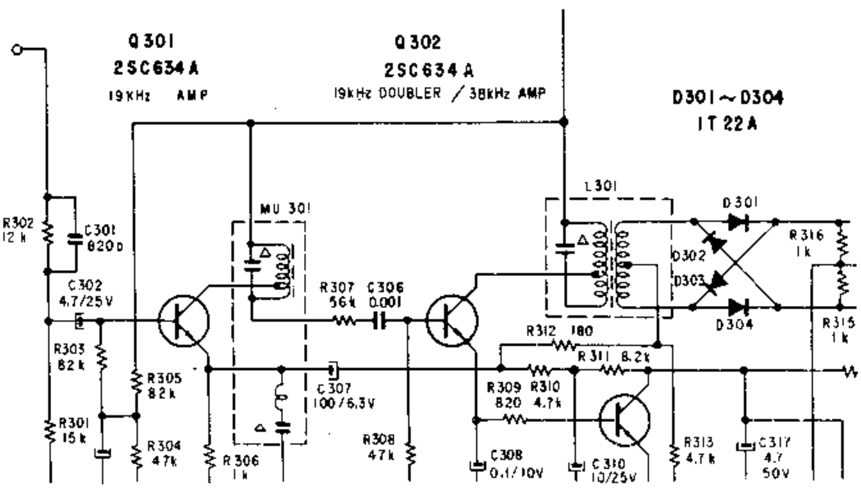


Fig. 1-2. Partial schematic diagram of MPX decoder

3. Power Amp. Circuit

(a) Dc Bias Power Supply: Q803 (power amplifier)
Q803 is forced to conduct and operates as a small resistance providing the necessary forward bias on the two cascaded emitter-followers (complementary and power amplifier stages). R808 and R809 determines the impedance between the emitter and collector of Q803 and thereby determines the dc bias voltage for the following complementary circuit.
This circuit has the advantage of compensating a lack of idling current at high output power.

(b) Power Amplifier: Q806, Q807
The output transistors Q806 and Q807 are cascaded supplying power to the speaker system. Q806 supplies power to the load during the positive half cycle and Q807 operates during the negative half cycle. Output is coupled to the speakers through C806.

(c) Overload Protection Circuit
Overload protection circuit is employed in the power amplifier. With reference to the simplified circuit diagram (Fig. 1-3), the protection circuit operates as follows:
When output terminal is shorted to ground, excessive current flows in the power transistors for the amount of drive voltage supplied, causing the power transistors and series resistors (R814 and R815) to overheat.
The heat caused by excessive current flow is sensed by the thermistor and posistor which has a negative and positive temperature-efficient respectively and attached to the series resistors as shown in Fig. C on page 1.
Since the thermistor (Th801) is one of the components determining the idling current in the driver stages, while the posistor (Po801) is inserted in series at the base circuit of power transistor (Q807), the heat causes the idling current and the drive voltage to decrease, protecting power transistors effectively.

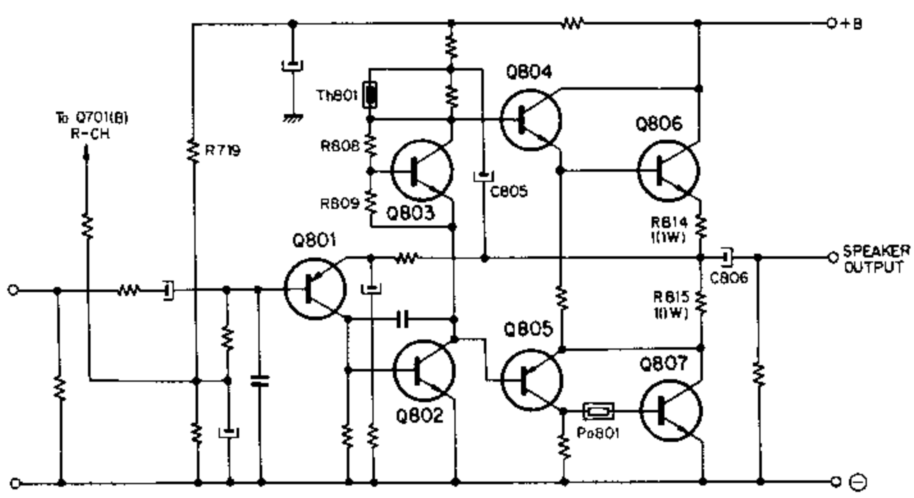
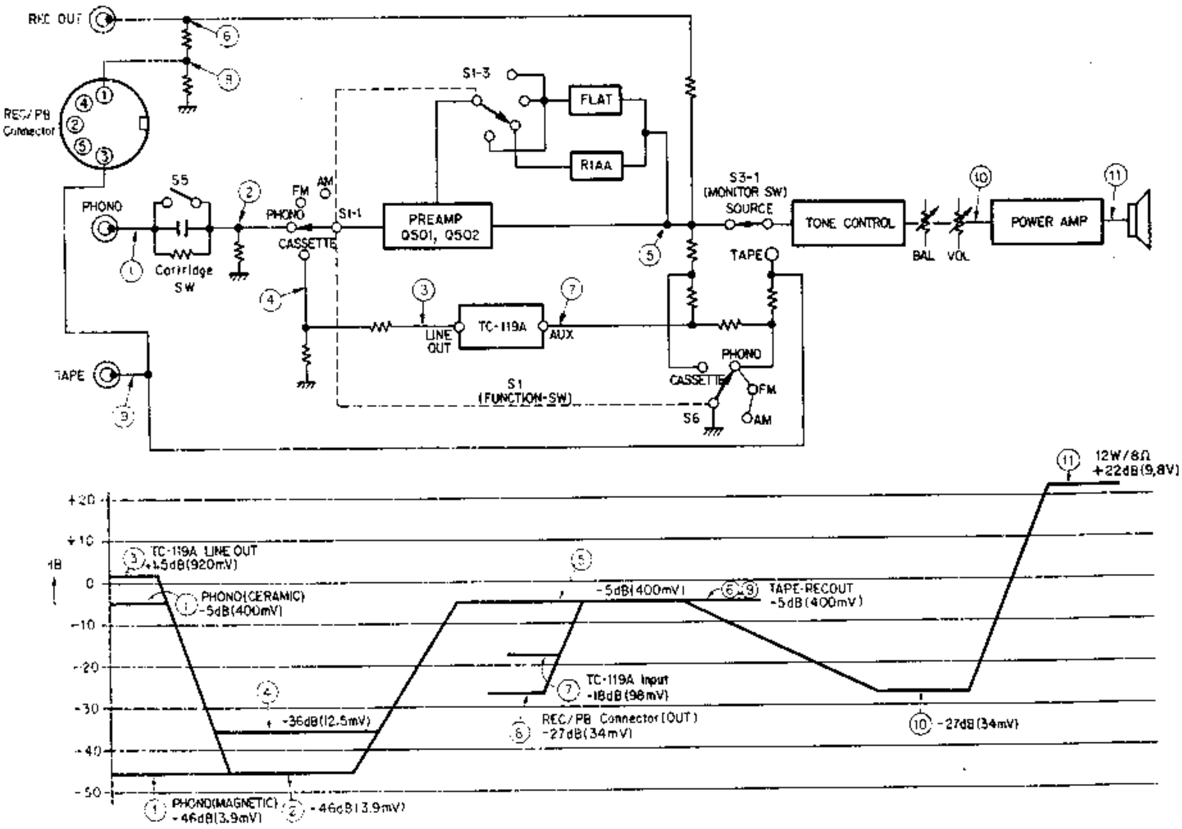


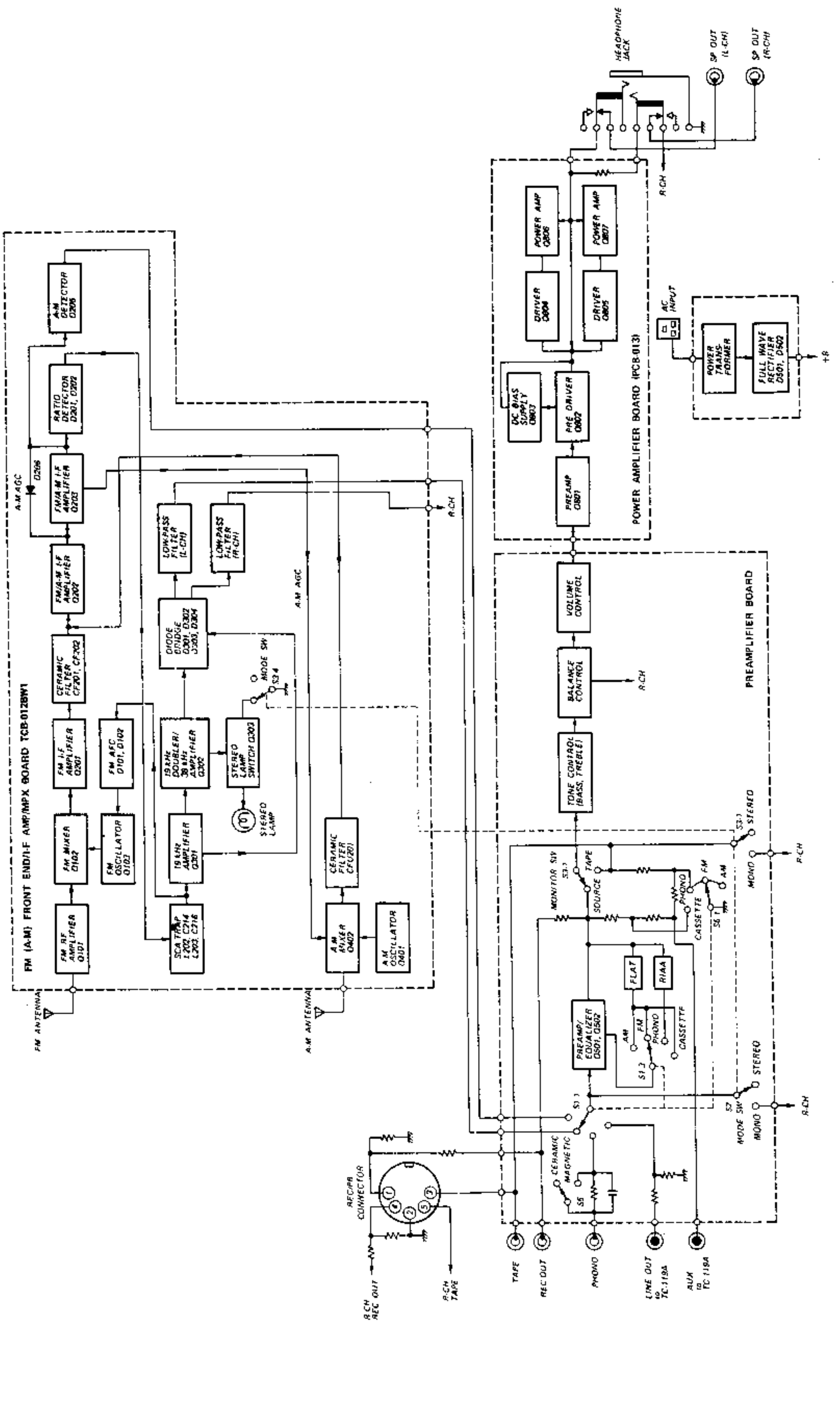
Fig. 1-3. Power amplifier circuit

1-3. LEVEL DIAGRAM

Note: Signal voltage are measured with ac VTVM and expressed in dB referred to 0.775V, 1 kHz.



1-4. BLOCK DIAGRAM



SECTION 2
DISASSEMBLY AND REPLACEMENT PROCEDURES

WARNING

Unplug the ac power cord before starting any disassembly or replacement procedures.

2-1. TOOLS REQUIRED

The following tools are required to perform disassembly and replacement procedures on the HST-139.

- Screwdriver, Phillips-head
- Screwdriver, 4-inch cabinet
- Wrench, 6-inch adjustable
- Cardboard, 3-inch-square
- Protective pad
- Cellophane tape
- Soldering iron, 40 to 150 watts
- Cement, contact
- Cement solvent
- Diagonal cutters
- Pliers, long-nose
- Soldering tool, wire-brush end
- Tweezers, 6-inch
- Tape, electrical
- Silicone grease
- Nutdriver, 3-mm
- Solder, rosin-core

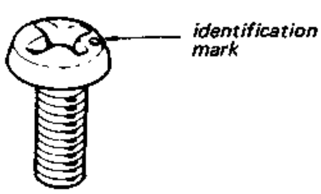


Fig. 2-1. ISO screw

2-2. HARDWARE IDENTIFICATION GUIDE

The following chart will help you to decipher the hardware codes given in this service manual.

Note: All screws in the HST-139 are manufactured to the specifications of International Organization for Standardization (ISO). This means that the new and old screws are not interchangeable because ISO screws have a different number of threads per mm compared to the old ones. The ISO screws have an identification mark on their heads as shown in Fig. 2-1.

– Hardware Nomenclature –

P	Pan Head Screw
PS	Pan Head Screw with Spring Washer
K	Flat Countersunk Head Screw
B	Binding Head Screw
RK	Oval Countersunk Head Screw
T	Truss Head Screw
R	Round Head Screw
F	Flat Fillister Head Screw
SC	Set Screw
E	Retaining Ring (E Washer)

W – Washer
SW – Spring Washer
LW – Lock Washer
N – Nut

– Example –

⊕ P 3×10
- Type of Slot (⊕)
- Type of Head (P)
- Diameter in mm (D) (3)
- Length in mm (L) (10)

2-3. RECEIVER UNIT REMOVAL

1. Remove the two screws (⊖B3x8) from the rear hardboard as shown in Fig. 2-2, and then tilt it toward you and down.
   This frees the rear hardboard.
2. Disconnect the two pair of phono plugs, 4-pin connector from the cassette deck as shown in Fig. 2-3.

   Note: When reconnecting the phono plugs, refer to the wiring diagrams sticked inside the wooden case as shown in Fig. 2-3.
3. Remove the five screws (⊕B3x14) and one screw (⊕B4x14) from the bottom as shown in Fig. 2-2.
4. Remove the receiver unit out of the wooden case by pushing it out in the direction shown by the arrow in Fig. 2-2.
   This frees the receiver unit.

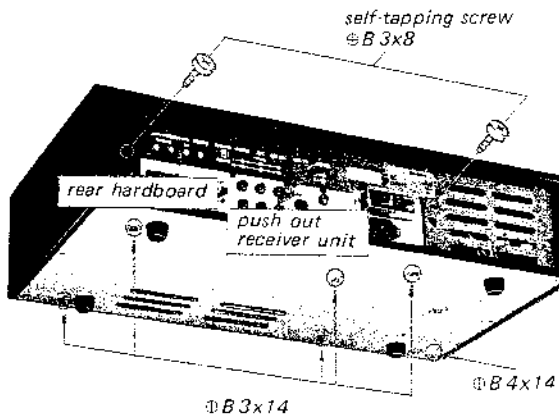


Fig. 2-2. Receiver unit removal

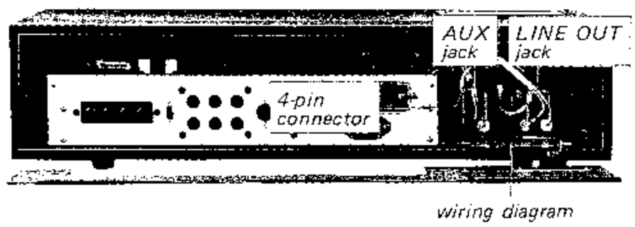


Fig. 2-3. Connector removal

2-4. FRONT PANEL REMOVAL

1. Remove the receiver unit as described in Procedure 2-3.
2. Remove all the control knobs by pulling them off.
3. Remove the four self-tapping screws securing the front panel to the front subchassis as shown in Fig. 2-4.

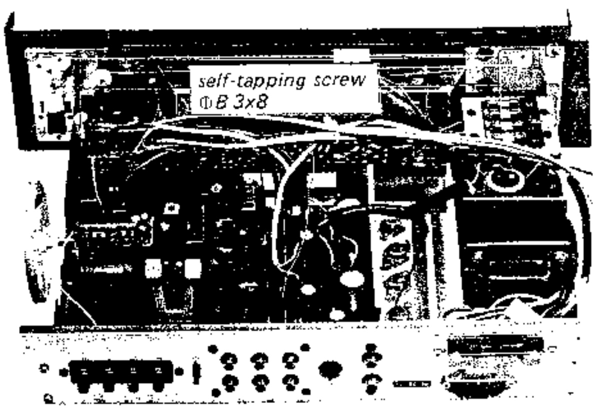


Fig. 2-4. Front panel removal

2-5. DIAL-CORD RESTRINGING

Preparation

1. Remove the receiver unit as described in Procedures 2-3.
2. Cut a 63 inch (1,600 mm) length of 1/64-inch (0.3 mm) diameter dial cord.
3. Tie the end of the cord to a spring as shown in Fig. 2-5.
4. Rotate the tuning-capacitor drive drum fully counterclockwise (maximum capacitance position).

Procedure

While referring to Fig. 2-6 proceed as follows:

1. Hook the spring to one hole of the drive drum as shown in Fig. 2-7, and then squeeze it.
2. Run the cord through the slot in the rim of the drum and wrap a counterclockwise turn in the inner side groove. See Fig. 2-8.
3. Run the cord over pulleys "A", "B", "C" and then wrap two clockwise turns around the tuning shaft.
4. Run the cord over pulley "D" and then wrap half turn around the drum from outer groove to inner groove as shown in Fig. 2-6 and Fig. 2-8.
5. Pass the doubled end of the cord through the eyelet (See Fig. 2-9), then hook it to the spring as shown in Fig. 2-10.
6. Tighten the cord, then squeeze the eyelet so that the spring is under tension.
   Make a knot in the cord end to keep it from slipping out of the eyelet. See Fig. 2-9.
7. After completing the dial-cord stringing, make sure that the tuning system works properly. Apply a drop of contact cement to the knots. Perform the mechanical dial calibration.

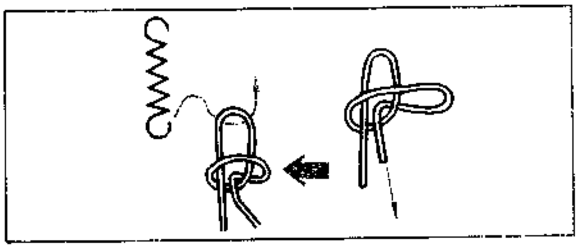


Fig. 2-5. Tying square knot at the coil spring

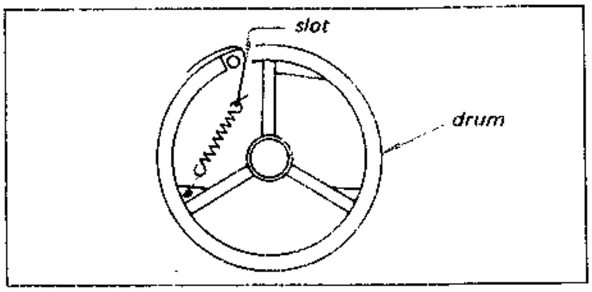


Fig. 2-7. Coil spring installation

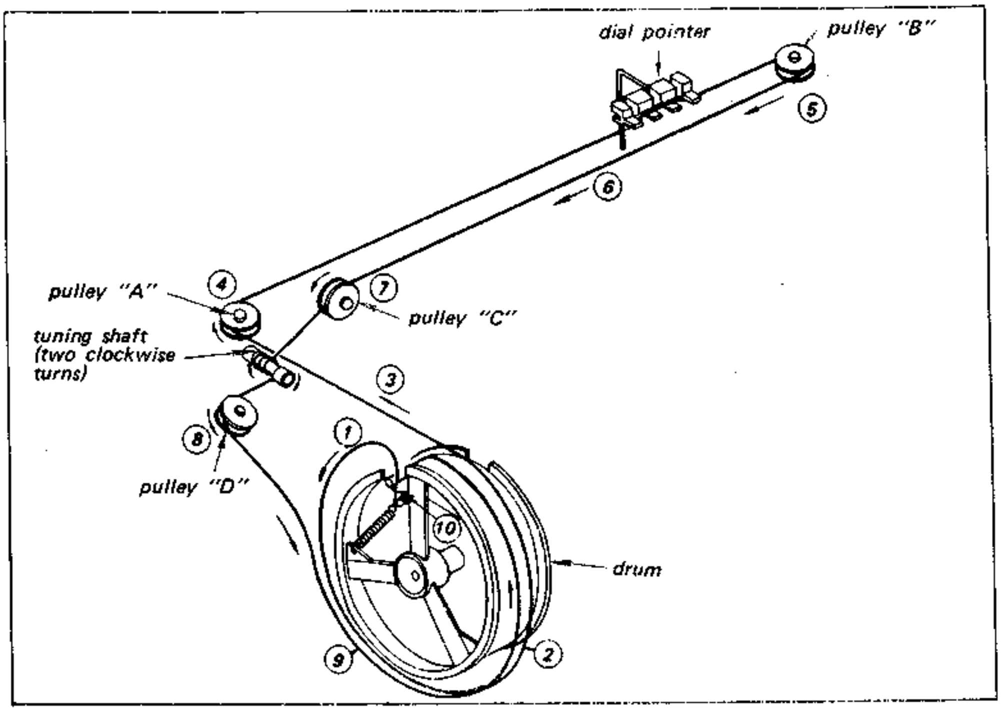


Fig. 2-6 Dial cord stringing

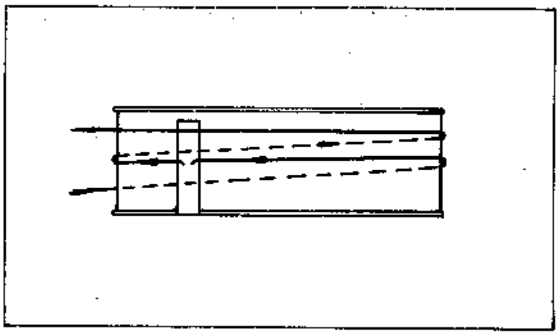


Fig. 2-8. Wrapping the dial cord

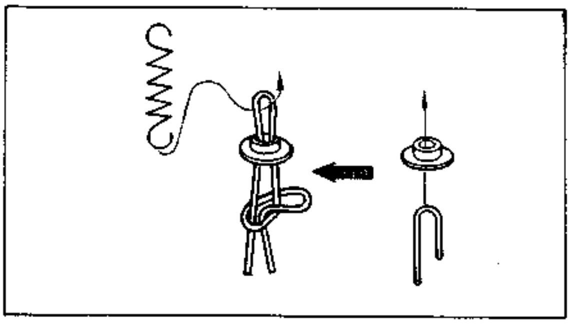


Fig. 2-9. Detail of dial cord finish

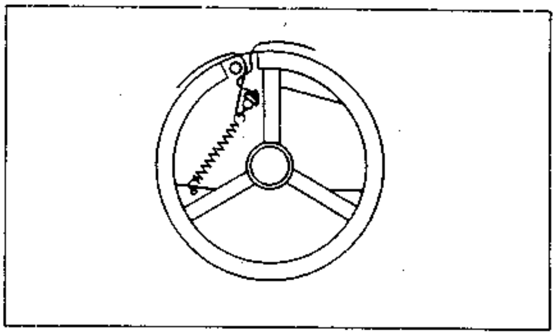


Fig. 2-10. End of dial cord stringing

2-6. MECHANICAL DIAL CALIBRATION

Note: This is required after replacing the dial cord.

1. Put the dial pointer on the cord as shown in Fig. 2-11, and move it to a position where the pointer coincides with the 530 kHz mark on the dial scale in the front subchassis as shown in Fig. 2-12, when the tuning capacitor is set to the maximum capacitance position.

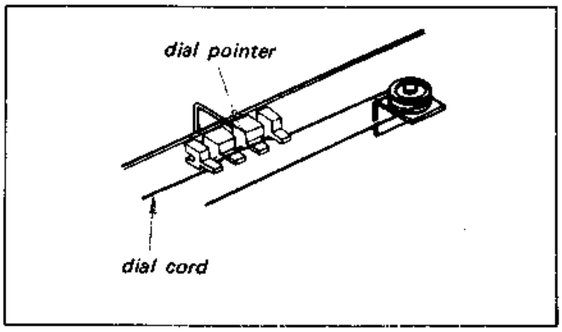


Fig. 2-11. Dial pointer installation

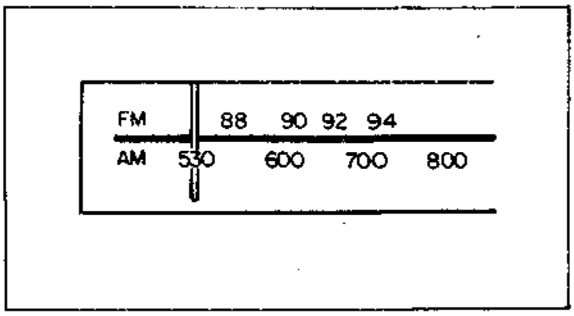


Fig. 2-12. Mechanical dial calibration

2-7. DIAL LAMP REPLACEMENT

1. Straighten the tab of the dial lamp shade to permit to removal of 3-p lamp holder as shown in Fig. 2-13. This frees dial lamp holder.
2. Remove the defective dial lamp, and then install the new one.

2-8. REPLACEMENT OF COMPONENTS SECURED TO THE REAR PANEL BY NYLON RIVETS

1. Remove the nylon rivets securing the defective component by pushing its end with a tweezers as shown in Fig 2-14.
2. Remove the defective component and then install a new one.
3. To reinstall the rivet, insert the flared part into the opening first, and then push the head as far as it goes as shown in Fig. 2-15.

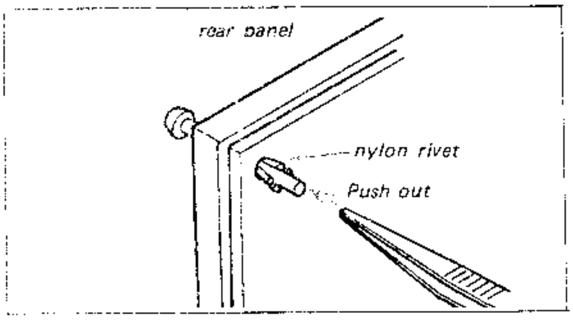


Fig. 2-14. Nylon rivet removal

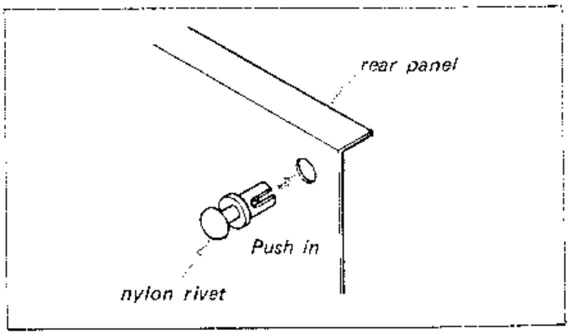


Fig. 2-15. Nylon rivet installation

2-9. SWITCH AND CONTROL REPLACEMENT

Preparation

1. Remove the front panel as described in Procedure 2-4.
2. Fasten the dial cord to the drum or pulleys with cellophane tape.

Procedure

1. Remove the five self-tapping screws (⊕B3×6) securing the front subchassis to the chassis as shown in Fig. 2-16.
2. Remove the two self-tapping screws (⊕B3×6) securing the 4-P fuse holder to the chassis as shown in Fig. 2-17.
3. Carefully raise lower part of front subchassis in the direction shown by the arrows as shown in Fig. 2-18.
   The preamplifier/power supply board can be now checked.

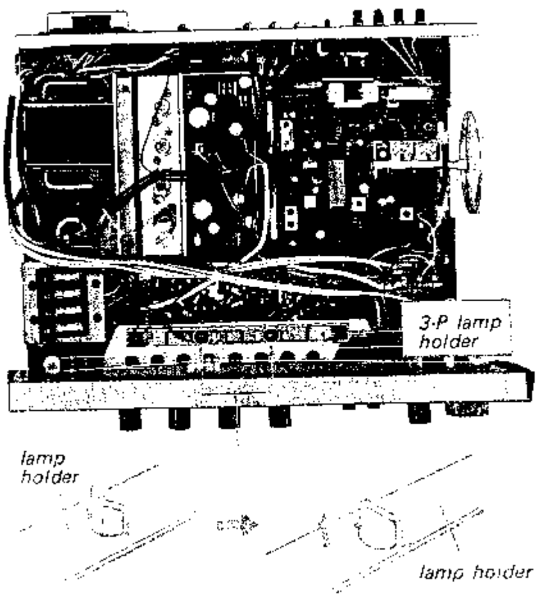


Fig. 2-13. Dial lamp replacement

4. Remove all the hex nuts and screws securing switches or controls to the front subchassis. This frees the preamplifier/power supply board.
5. With a soldering iron having a solder-sucking tip, clean the solder from each lug of the defective switch or control and the printed board.
6. Remove the defective component and then install a new one.

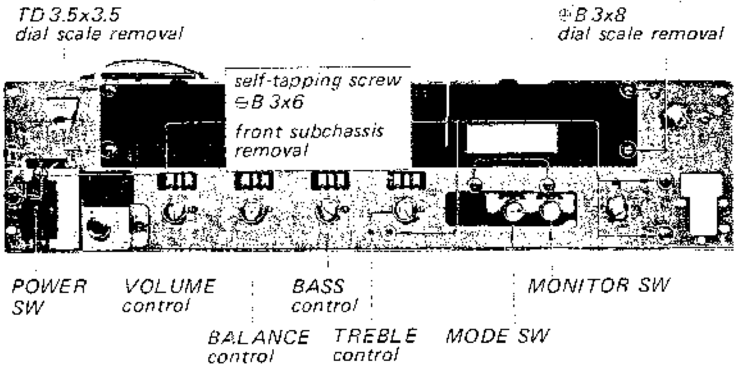


Fig. 2-16. Switch and control replacement

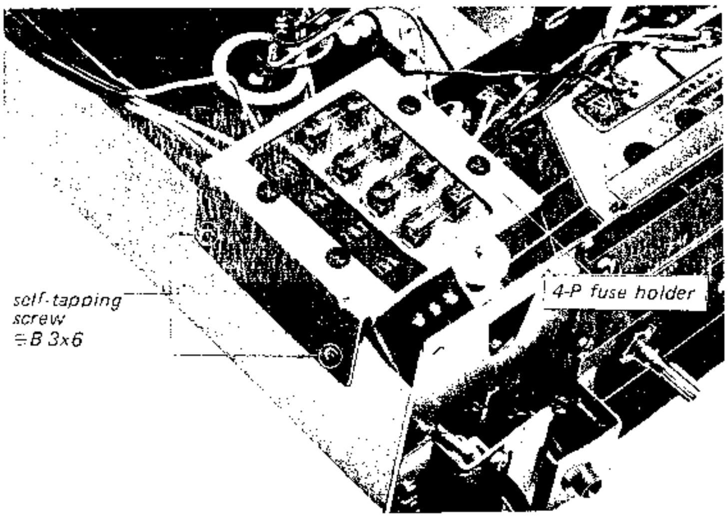


Fig. 2-17. 4-P fuse holder removal

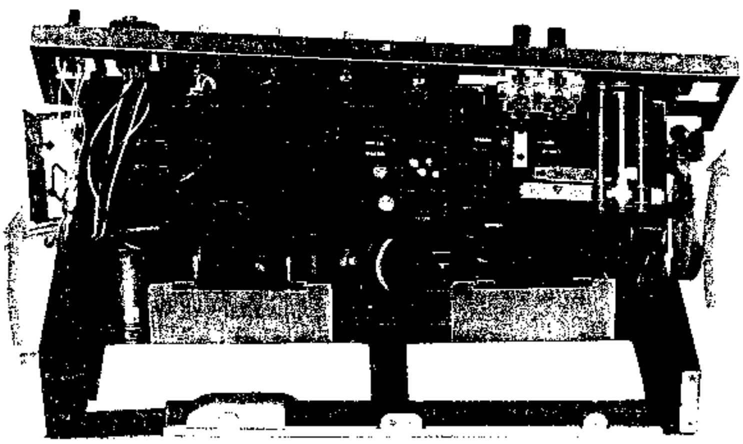


Fig 2-18 Front subchassis removal

2-10. POWER TRANSISTOR REPLACEMENT

1. Remove the two screws and retaining bracket securing the defective power transistor to the heat sink and printed board as shown in Fig. 2-19.
2. Unsolder the leads of power transistor, and then install the new one.
3. When replacing the power transistor, apply a coating of a heat-transferring grease to both sides of the insulating mica insulator. Any excess grease squeezed out when the mounting screws are tightened should be wiped off with a clean cloth. This prevents it from accumulating conductive dust particles that might eventually cause a short.

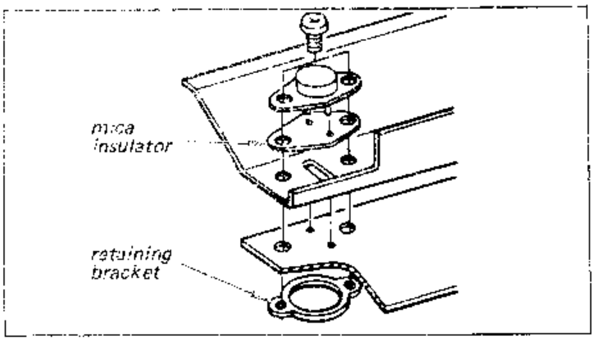
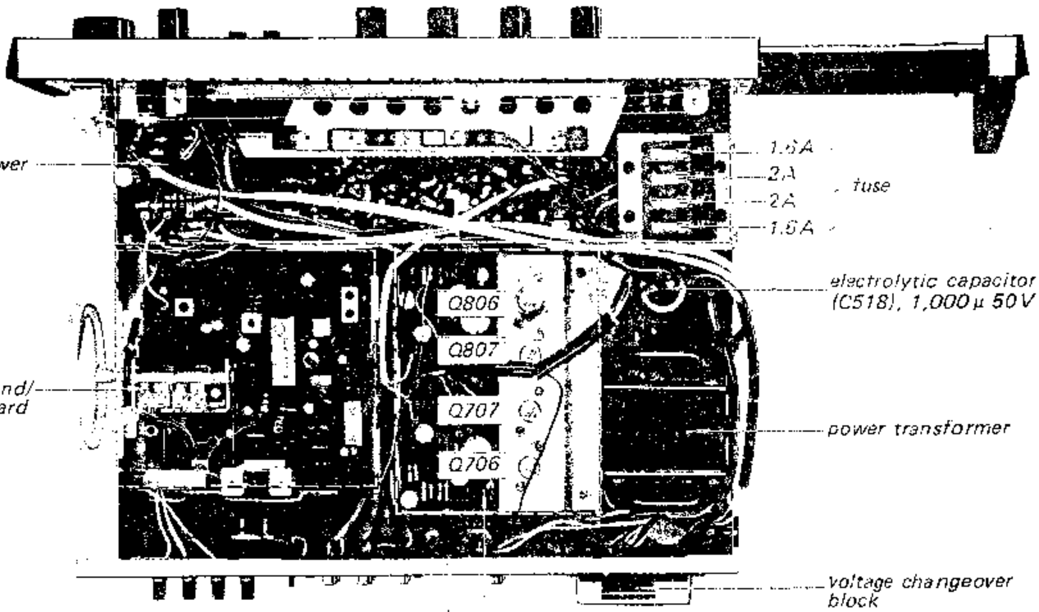


Fig. 2-19. Power transistor replacement

2-11. CHASSIS LAYOUT



SECTION 3
ALIGNMENT AND ADJUSTMENT PROCEDURES

3-1. FM I-F AND DISCRIMINATOR ALIGNMENT

CAUTION

The ceramic filters in the fm i-f circuit are selected according to their specified center frequencies and color coded as shown in Fig. 3-1 and listed in Table 3-1. Check the color code of the filters to identify the same center frequency when replacing any of these filters.

TABLE 3-1.
FM I-F CERAMIC FILTERS

Part No.	*Color*	*Specified Center Freq.*
1-403-562-11	red	10.70 MHz
1-403-562-21	black	10.66 MHz
1-403-562-31	white	10.74 MHz
1-403-562-41	green	10.62 MHz
1-403-562-51	yellow	10.78 MHz

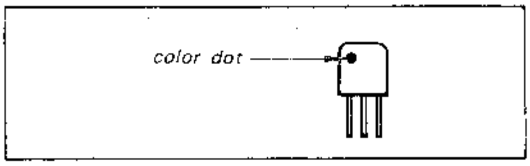


Fig. 3-1. Color dot on ceramic filter

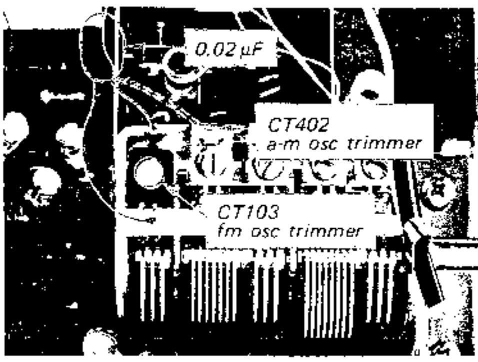


Fig. 3-2. Interruption of fm or a-m local oscillator operation

Note: Local oscillator should be killed when performing this alignment. To kill the local oscillator's operation, shunt the oscillator capacitor with a 0.02μF capacitor. See Fig. 3-2.

Signal Generator Alignment

Test Equipment Required

1. Standard signal generator which can generate a 10.7-MHz a-m/fm signal.
2. Oscilloscope
   Vertical sensitivity .... 100 mV/cm minimum
3. Alignment tools

Preparation

1. Connect the input cable of the oscilloscope with alligator clips to C217 and ground on the fm (a-m) front end/i-f amp/MPX board, and solder a 0.02μF capacitor across these clips, as shown in Fig. 3-3.
2. Connect the output cable of the generator across CV102 on the fm (a-m) front end/i-f amp/MPX board. Use alligator clips and make the connection through a 0.02μF coupling capacitor as shown in Fig. 3-4.

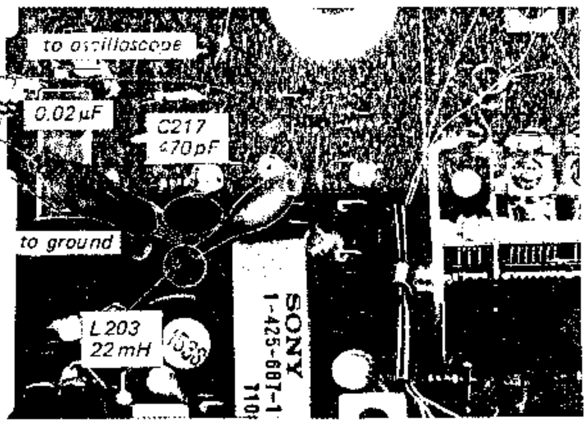


Fig. 3-3. Fm discriminator output connection

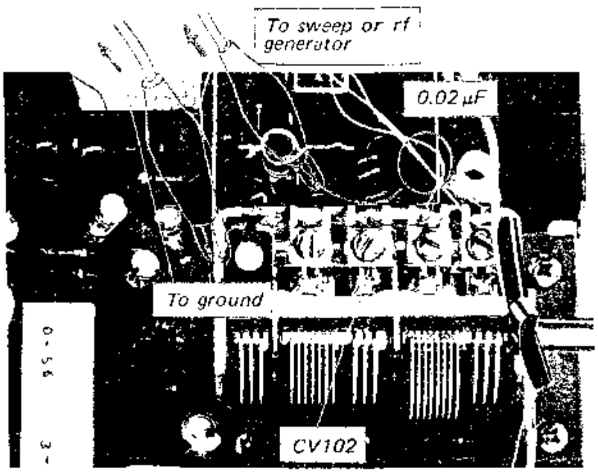


Fig. 3-4. 10.7 MHz signal injection

Procedure

1. With the equipment connected as shown in Fig. 3-5, set the signal-generator's controls as follows:

   Frequency .... Specified frequency of ceramic filter. See Table 3-1.
   Modulation .... Fm, 400 Hz, 100% (75 kHz)
   Output level .... 1,000μV (60 dB)

2. Set the receiver's controls as follows:

   FUNCTION switch ..... FM AUTO ST
   VOLUME control .... Minimum

3. Adjust the signal generator's frequency slightly to obtain a maximum output, and then change the signal generator's modulation to a-m, 400 Hz 30%.
4. If the discriminator transformer IFT201 is not aligned correctly, 400-Hz ripple will be observed as shown in Fig. 3-6.
5. Turn the secondary side core (green) of discriminator transformer IFT201 (see Fig. 3-12) with an alignment tool to obtain a minimum indication on the oscilloscope as shown in Fig. 3-6.

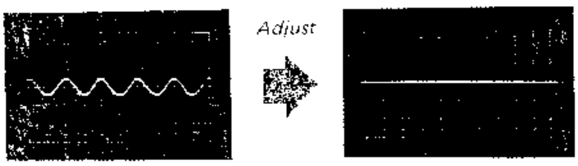


Fig. 3-6. Fm discriminator alignment output response

Note: Turn the core carefully and slowly because the output appearing on the oscilloscope jumps up and down when turning the core. This might cause difficulty in determining the point of minimum output.
Also, at both extreme positions of the secondary core, decreased output will be observed. The real null point should be obtained in the middle of the core thread length, and maximum output occurs at each side of the true null point.

6. Change the signal generator's modulation to fm, 400 Hz 100% (75 kHz).
7. Turn the core of fm IFT101 and primary side core (brown) of discriminator transformer IFT201 (see Fig. 3-12), to obtain the maximum output.

3-2. FM FREQUENCY COVERAGE AND TRACKING ALIGNMENT

Note: Before starting this alignment, the fm i-f and discriminator alignment should be performed.

Signal Generator Alignment

Test Equipment Required

1. Standard fm signal generator
2. Ac VTVM
3. Alignment tools

Preparation

1. Connect the equipment as shown in Fig. 3-3.
2. Set the receiver's controls as follows:

   FUNCTION switch .... FM AUTO ST
   VOLUME control .... Minimum

3. Short the connection point of R114 and C118 (AFC circuit) to ground as shown in Fig. 3-7.

Follow the procedures given in Table 3-2 when performing this alignment with an fm signal generator. Be sure that the dial is mechanically calibrated.

Off-the-Air Signal Alignment

Accurate dial calibration and a frequency-coverage test can also be performed by utilizing off-the-air local fm signals. However, before performing this alignment, be sure that the dial is mechanically calibrated and AFC circuit is shorted to ground.

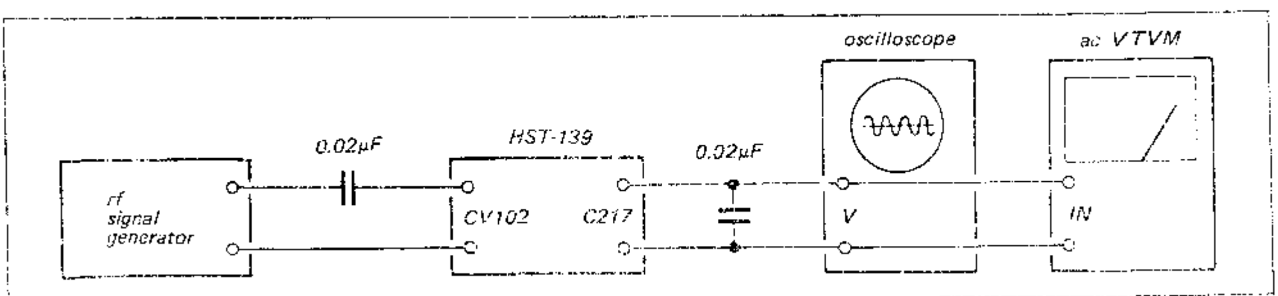


Fig. 3-5. Test setup for fm discriminator alignment by rf signal generator

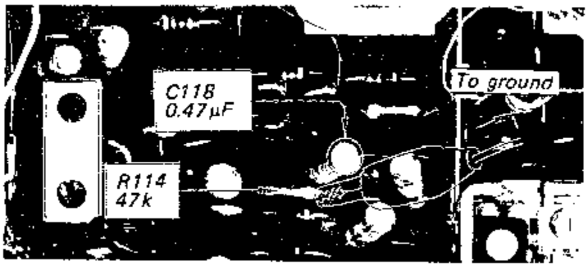


Fig. 3-7. Interruption of AFC circuit

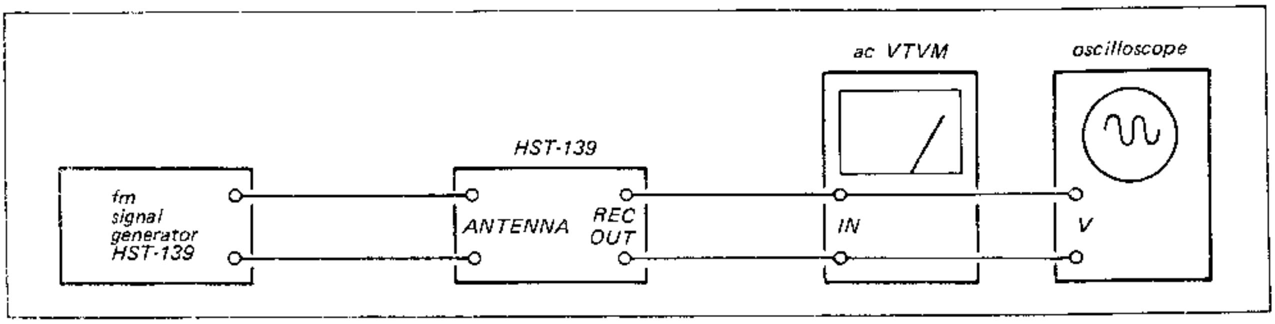


Fig. 3-8. Fm frequency coverage and tracking alignment test setup

TABLE 3-2. FM FREQUENCY COVERAGE AND TRACKING ALIGNMENT

Step	Coupling Between Receiver and SSG	SSG Frequency and Output Level	Tuner Dial Indication	Ac VTVM Connection	Adjust	Indication
	FM FREQUENCY COVERAGE ALIGNMENT					
1.	Direct coupling	87.2 MHz (* 87.5 MHz) 400 Hz 100% mod. 10μV (20 dB)	lowest position	REC OUT	OSC coil L103 See Fig. 3-12.	Maximum VTVM reading
2.	Same as above	108.4 MHz (* 108 MHz) 400 Hz 100% mod. 10μV (20 dB)	highest position	Same as above	OSC trimmer CT103 See Fig. 3-12.	Same as above
	FM TRACKING ALIGNMENT					
1.	Direct coupling	87.2 MHz (* 87.5 MHz) 400 Hz 100% mod. 10μV (20 dB)	lowest position	REC OUT	Antenna coil L101 RF coil L102 See Fig. 3-12.	Maximum VTVM reading
2.	Same as above	108.4 MHz (* 108 MHz) 400 Hz 100% mod. 10μV (20 dB)	highest position	Same as above	Antenna trimmer CT101 RF trimmer CT102 See Fig. 3-12.	Same as above

* West Germany Model only

3-3. FM STEREO SEPARATION ADJUSTMENT

Test Equipment Required

1. MPX generator
2. Fm signal generator
3. Audio oscillator
4. Ac VTVM
5. Oscilloscope
6. Alignment tools

Preparation

Before starting the stereo-separation adjustment, check and adjust the phase between the 19-kHz pilot signal and the sub-channel signal in the MPX stereo generator as follows:

1. With the equipment connected as shown in Fig. 3-9. set the MPX and audio signal-generator's control as follows:

   MAIN CHANNEL .... OFF
   SUB CHANNEL .... ON
   PILOT (19 kHz) .... OFF
   AUDIO OSCILLATOR
   OUTPUT .... 400 Hz, 250 mV

2. Adjust the oscilloscope controls to obtain a visible indication. Be sure the scope's horizontal display switch is set for external input.
3. Turn the pilot-signal (19 kHz) phase control to obtain an in-phase and stable lissajous pattern as shown in Fig. 3-10.

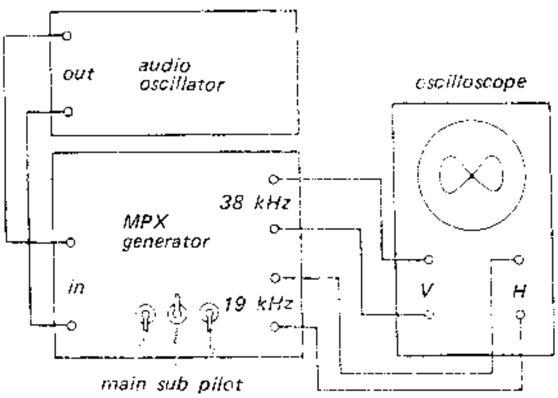


Fig. 3-9. MPX generator preadjustment setup

Fig. 3-10. Lissajous pattern

Procedure

1. Connect the equipment as shown in Fig. 3-11. Set the fm signal-generator's control as follows:

   Carrier frequency .... 98 MHz
   Output level .... 1,000μV (60 dB)
   Modulation:
   Main channel (400 Hz) .... 33.75 kHz (45%)
   Sub channel (38 kHz) ..... 33.75 kHz (45%)
   Pilot (19 kHz) .... 7.5 kHz (10%)

   The above mentioned modulation levels can be set as follows:

   (a) With the equipment connected as shown in Fig. 3-11 set the MPX stereo generator controls as follows:

   MAIN CHANNEL .... OFF
   SUB CHANNEL .... OFF
   19 kHz (PILOT) .... ON

   (b) Adjust the 19-kHz signal level to obtain a 7.5-kHz deviation on the FM SSG modulation indicator.

   (c) Reset the MPX stereo-generator's control as follows:

   MAIN CHANNEL .... ON
   SUB CHANNEL .... OFF
   19 kHz (PILOT) .... OFF
   INPUT SELECTOR .... L-CH

   (d) Adjust the audio-oscillator output (400 Hz) to obtain a 33.75-kHz deviation on the FM SSG modulation indicator.

   (e) Set all controls to ON.

2. Precisely tune the set to the SSG's carrier frequency then turn the top core of switching transformer L301 (see Fig. 3-12) to obtain maximum output at the left channel.
3. Record the output level of the left channel when the MPX generator input selector is set to the left channel.
4. Switch the input selector to the right channel and read the residual signal level in the left channel.
5. The output-level to residual-level ratio represents the separation. Turn the top core of switching transformer L301 (see Fig. 3-12) for minimum residual level. Check the right channel for separation.
6. Readjust switching transformer L301 for minimum difference between left- and right-channel separation.

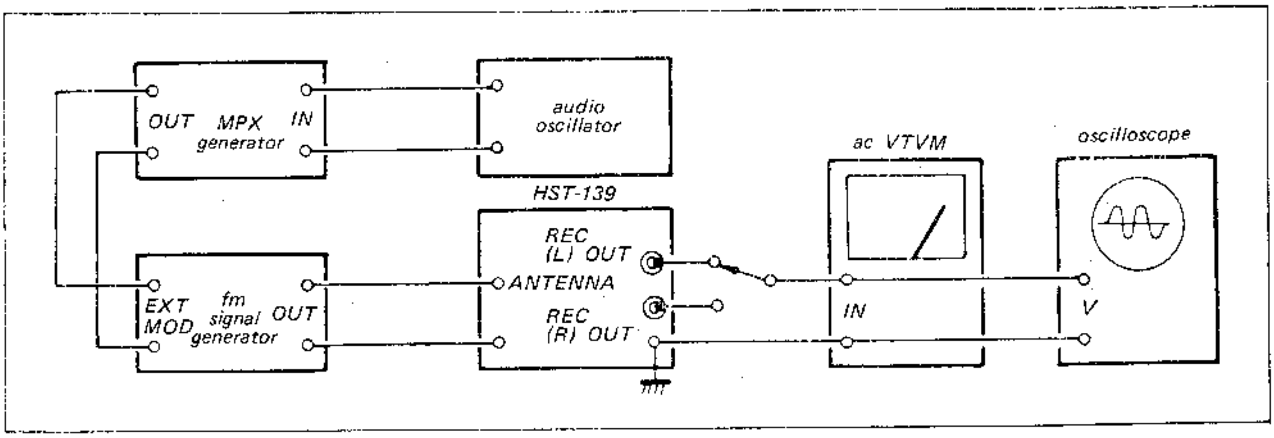


Fig. 3-11. Fm stereo separation adjustment test setup

Adjusting Parts Location

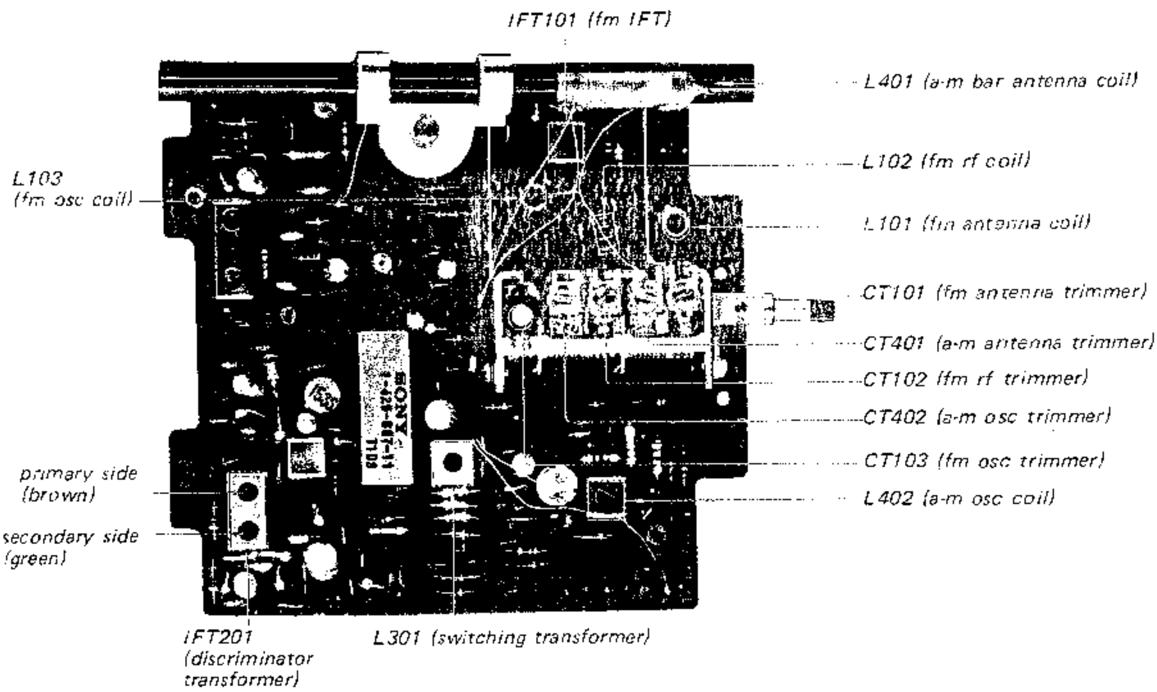


Fig. 3-12. Adjusting parts location

3-4. A-M I-F STRIP ALIGNMENT

Note: The a-m i-f transformers (CFU201 and IFT202) are shipped from the factory with all adjustment set for correct operation. Therefore no adjustment is required in field service.

3-5. A-M FREQUENCY COVERAGE AND TRACKING ALIGNMENT

Preparation

Remove the receiver unit as described in Procedure 2-3. Then, set the receiver's Function switch to AM.

Signal Generator Method

Test Equipment Required

1. Signal generator
2. Loop antenna
3. Ac VTVM

Procedure

With the equipment connected as shown in Fig. 3-13, follow the procedures given in Table 3-3 when performing this alignment with an a-m signal generator.

Off-the-Air Signal Method

Accurate dial calibration, and a frequency-coverage and tracking test can also be performed by utilizing off-the-air local a-m signals. However, before performing the following procedure, be sure that the dial is mechanically calibrated.

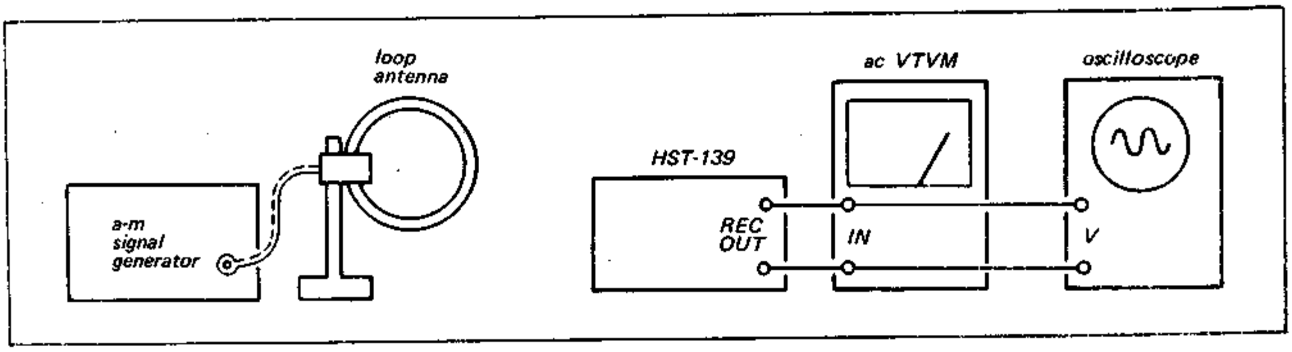


Fig. 3-13. Am frequency coverage and tracking alignment test setup

TABLE 3-3. A-M FREQUENCY COVERAGE AND TRACKING ALIGNMENT

SSG Coupling	SSG Frequency and Output Level	Tuner Dial Indication	Ac VTVM Connection	Adjust	Indication
	A-M FREQUENCY COVERAGE ALIGNMENT				
Loop antenna	520 kHz 400 Hz 30% mod. 1,000μV (60 dB)	lowest position	REC OUT	OSC coil L402 See Fig. 3-12.	Maximum VTVM reading
Loop antenna	1,680 kHz Same as above	highest position	Same as above	OSC trimmer CT402 See Fig. 3-12.	Same as above
	A-M TRACKING ALIGNMENT				
Loop antenna	600 kHz 400 Hz 30% mod. Output level as low as possible	Tune to the SSG signal	REC OUT	Position of antenna coil L401 See Fig. 3-12.	Maximum VTVM reading
Loop antenna	1,400 kHz Same as above	Same as above	Same as above	Antenna trimmer CT401 See Fig. 3-12.	Same as above

SECTION 4
REPACKING

The HST-139's original shipping carton and packing materials are the ideal containers for shipping the unit. However to secure the maximum protection, the HST-139 must be repacked in these materials precisely as before. The proper repacking procedures are shown in Fig. 4-1.

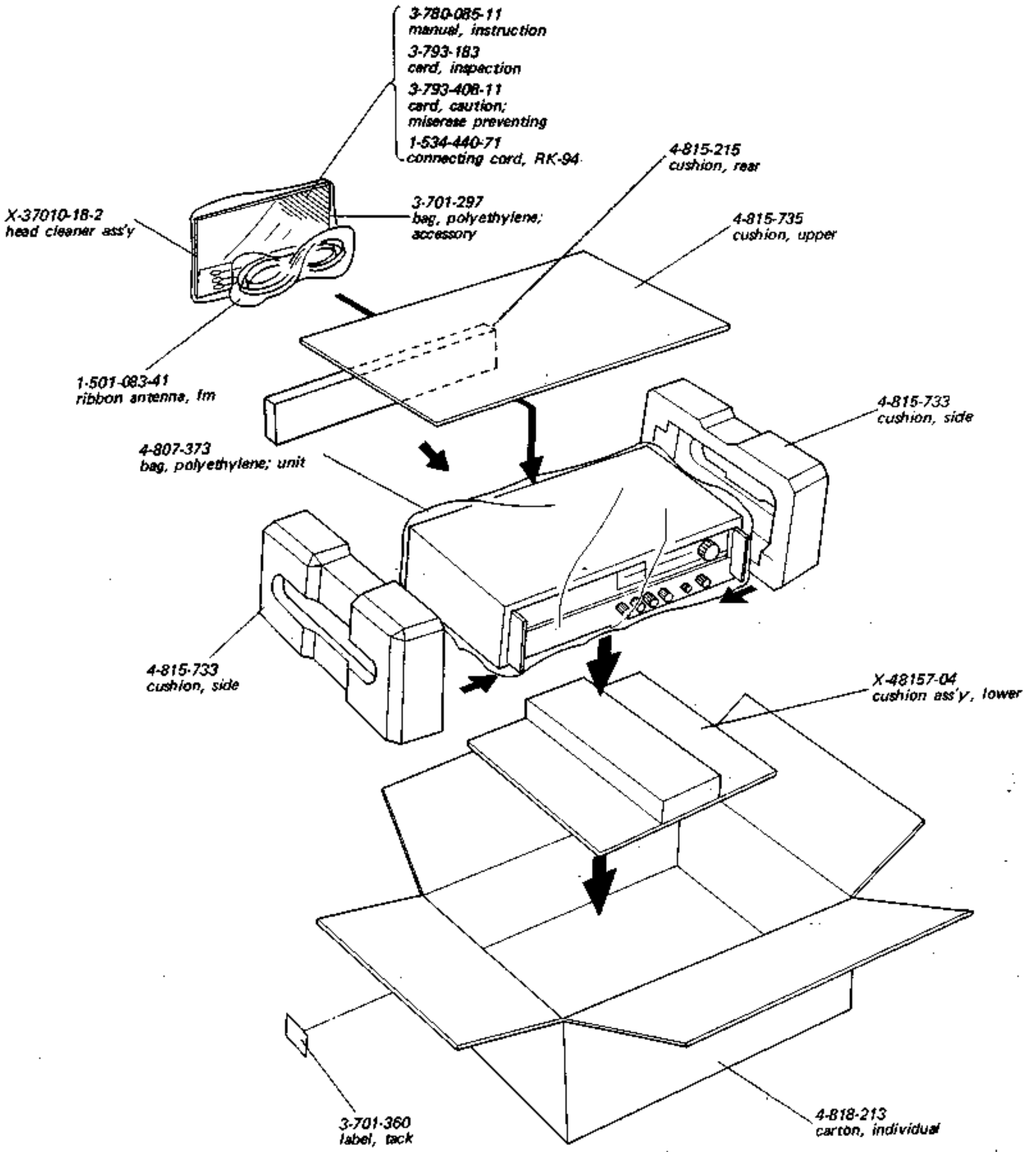
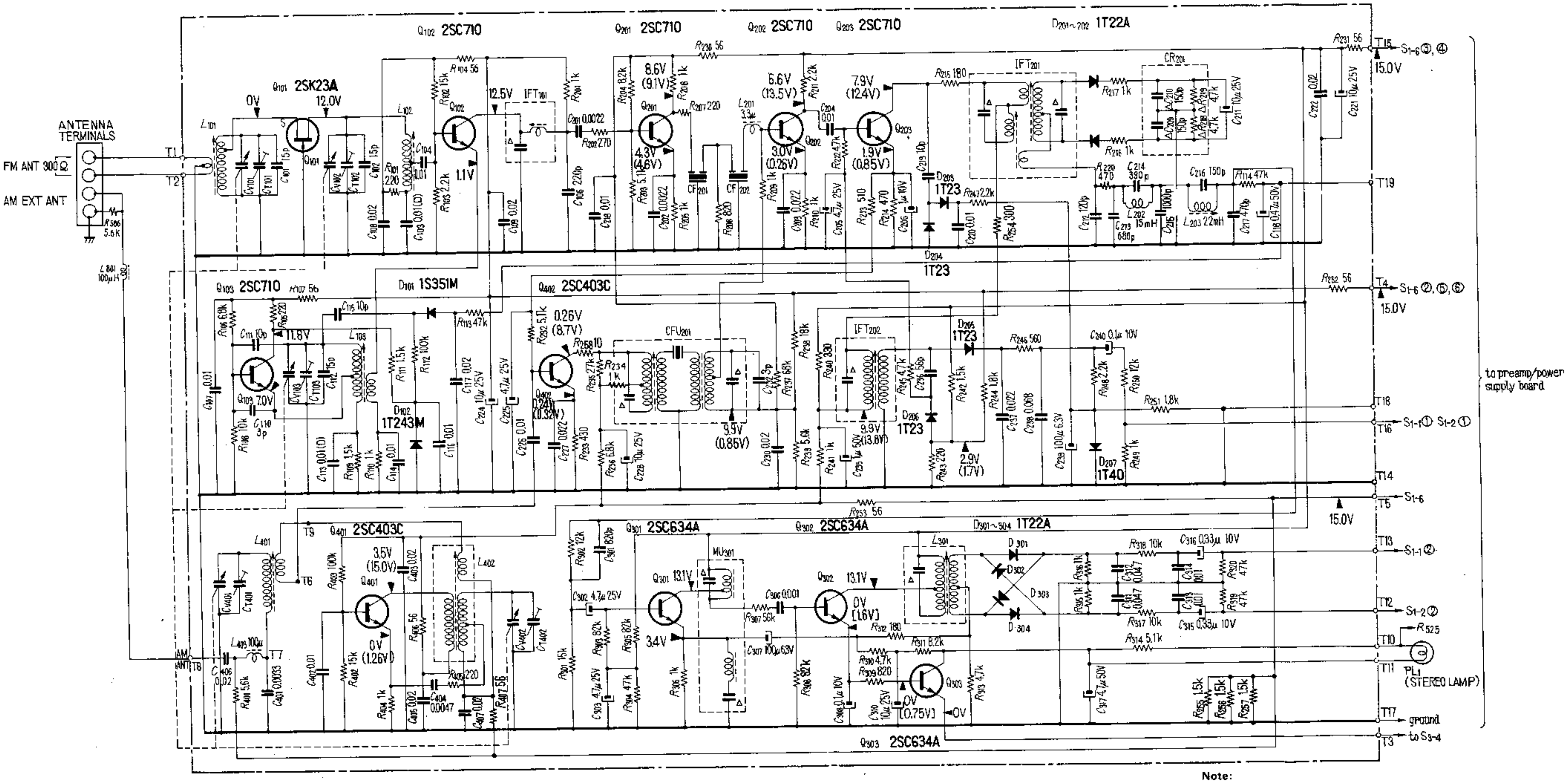


Fig. 4-1. Repacking

SECTION 5
DIAGRAMS

5-1. SCHEMATIC DIAGRAM – Fm (A-m) Front End/I-f Amp/MPX Section –



Note:

All resistance values are in ohms. k = 1,000, M = 1,000 k

All capacitance values are in μF except as indicated with p, which means μμF.

All voltages represent an average value and should hold within ±10%.

All voltages are dc measured with a VOM which has an input impedance of 20 k ohms/volt. No signal in.

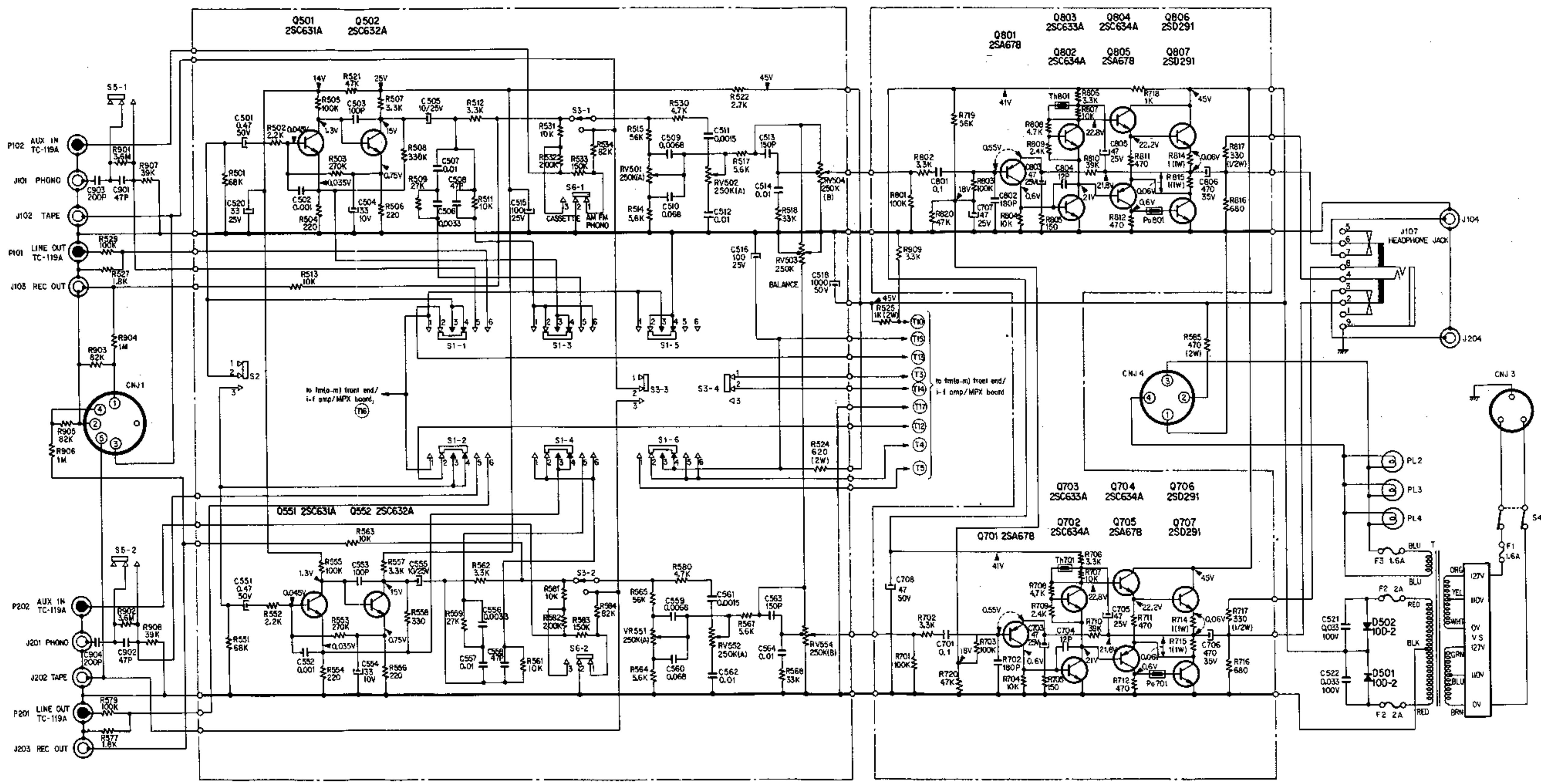
Voltages in ( ) are measured in a-m mode.

[ ] : STEREO OPERATION

HST-139 TC-119A

5-2. SCHEMATIC DIAGRAM

– Audio Amplifier Section –



Ref. No.	Description	Position
S1, S6	FUNCTION switch (AM-FM-PHONO-CASSETTE)	FM
S2, S3-3, 3-4	MODE switch (STEREO-MONO)	STEREO
S3-1, 3-2	MONITOR switch (SOURCE-TAPE)	STEREO
S4	POWER switch	ON
S5	CARTRIDGE switch (MAGNETIC-CERAMIC)	CERAMIC

Note:

All resistance values are in ohms. k=1,000, M=1,000k

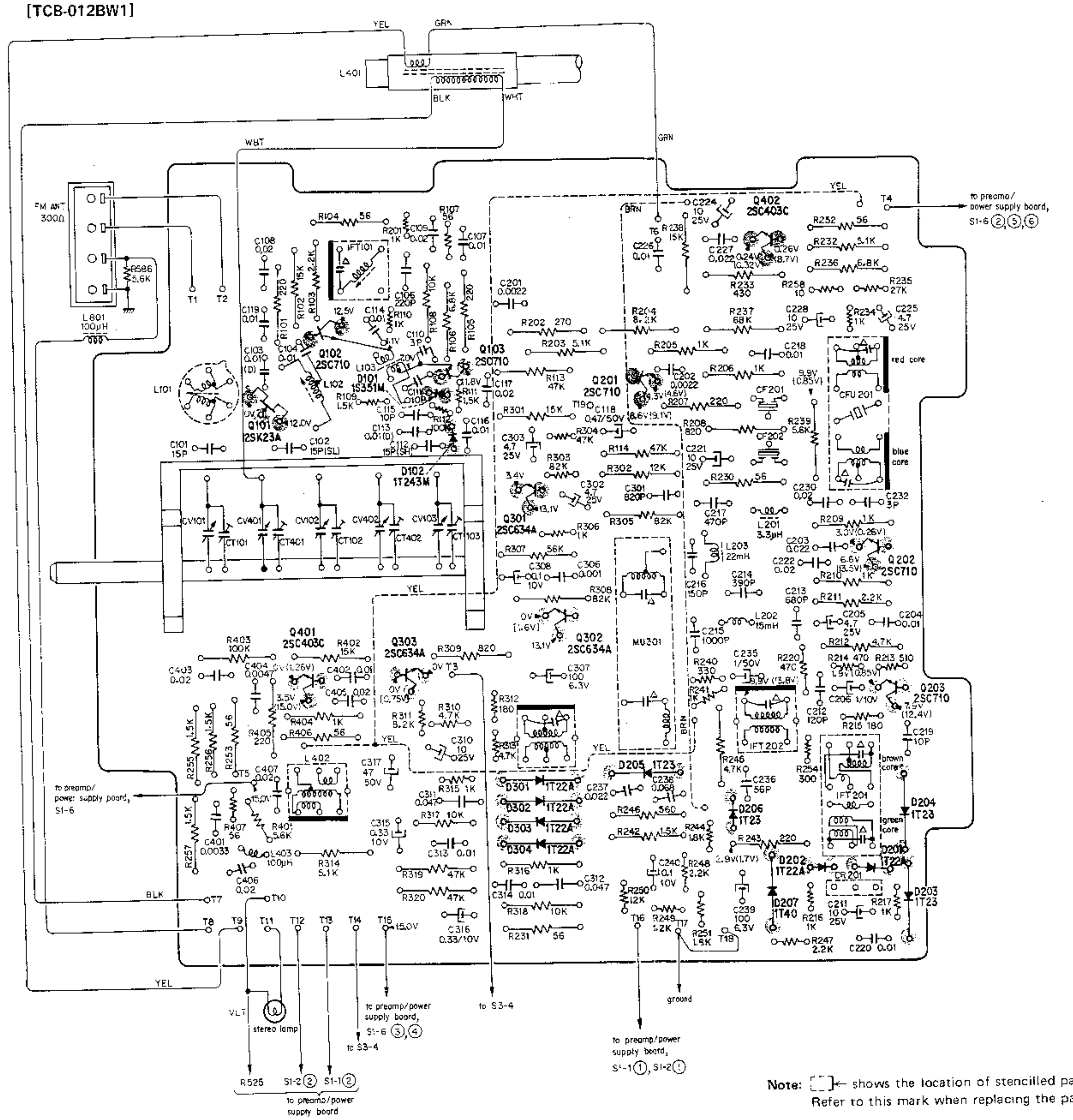
All capacitance values are in μF except as indicated with p, which means μμF.

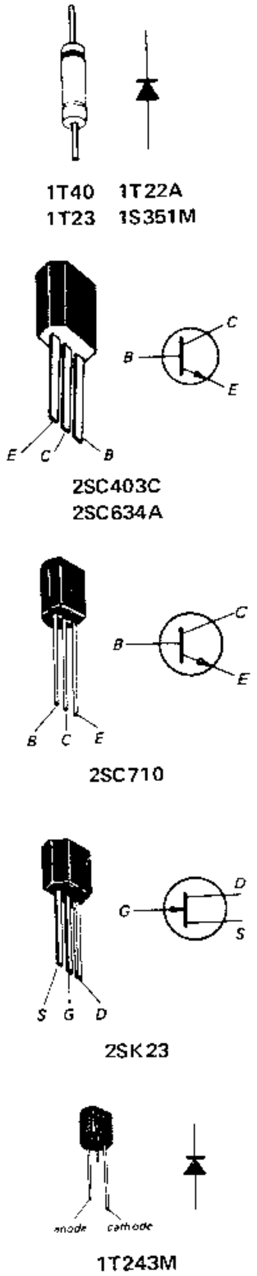
All voltages represent an average value and should hold within ±10%.

All voltages are dc measured with a VOM which has an input impedance of 20 k ohms/volt. No signal in.

5-3. MOUNTING DIAGRAM – Fm (A-m) Front End/I-f Amp/MPX Board – [TCB-012BW1]

– Conductor Side –



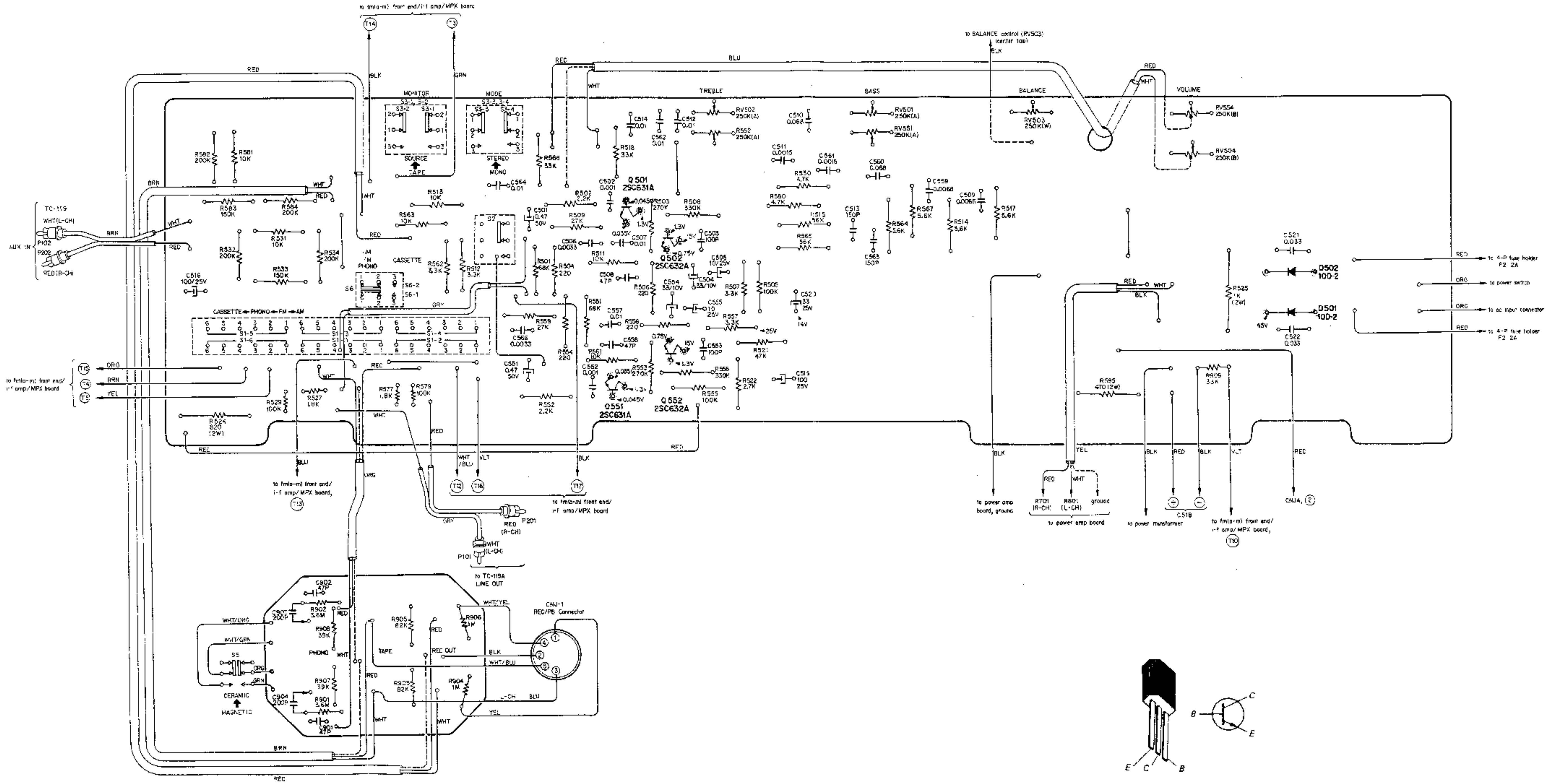


Note: [ ]← shows the location of stencilled part number. Refer to this mark when replacing the part.

HST-139 TC-119A

5-4. MOUNTING DIAGRAM – Preamplifier/Power Supply Board –

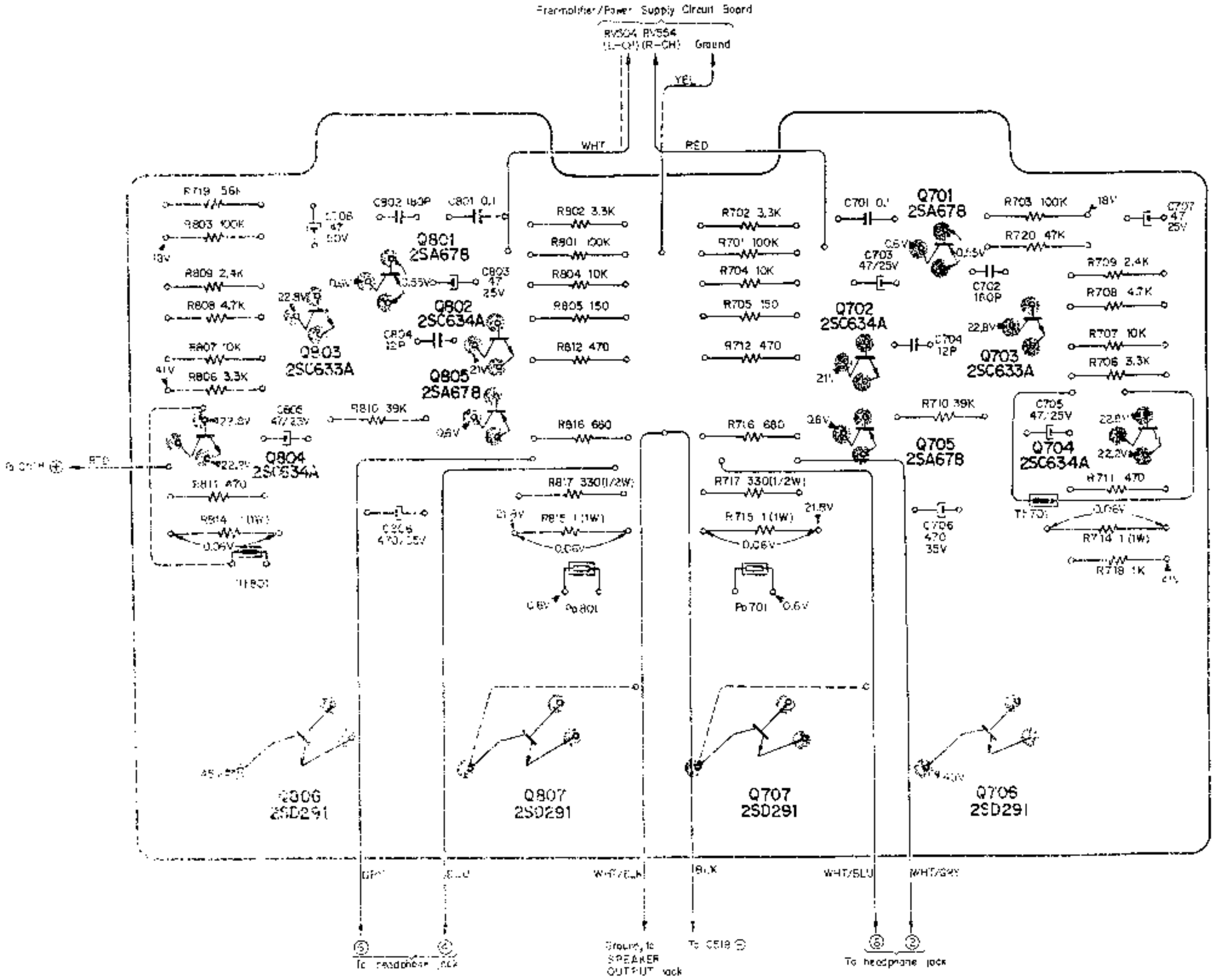
– Conductor Side –

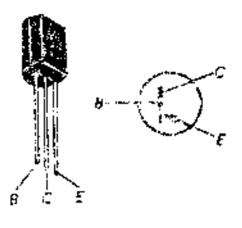


2SC631A
2SC632A

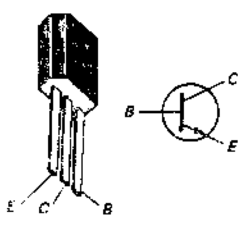
5-5. MOUNTING DIAGRAM -- Power Amplifier Board -- [PCB-013]

-- Conductor Side --

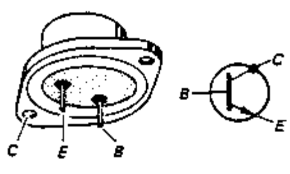




2SA678



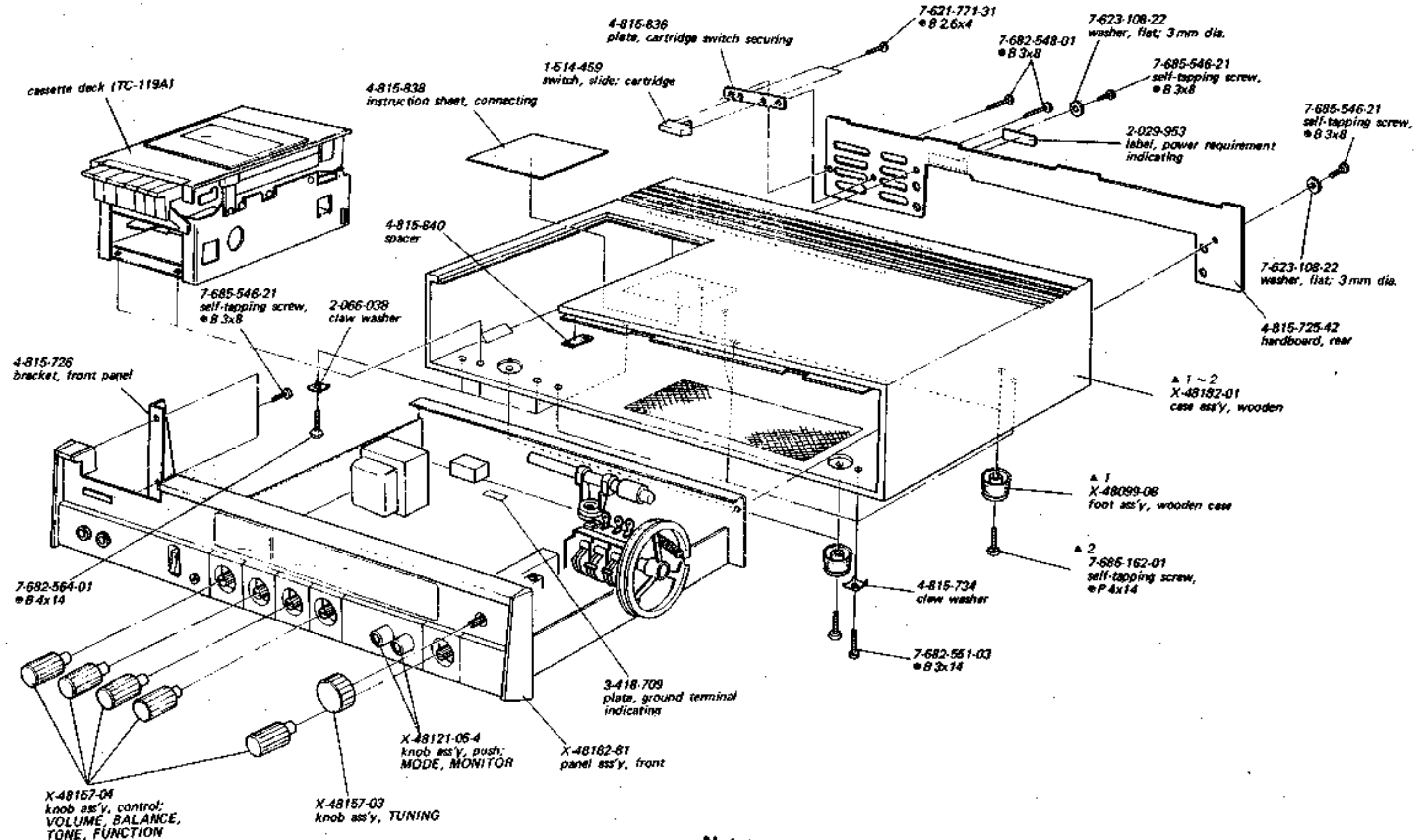
2SC633A
2SC634A



2SD291

(1)

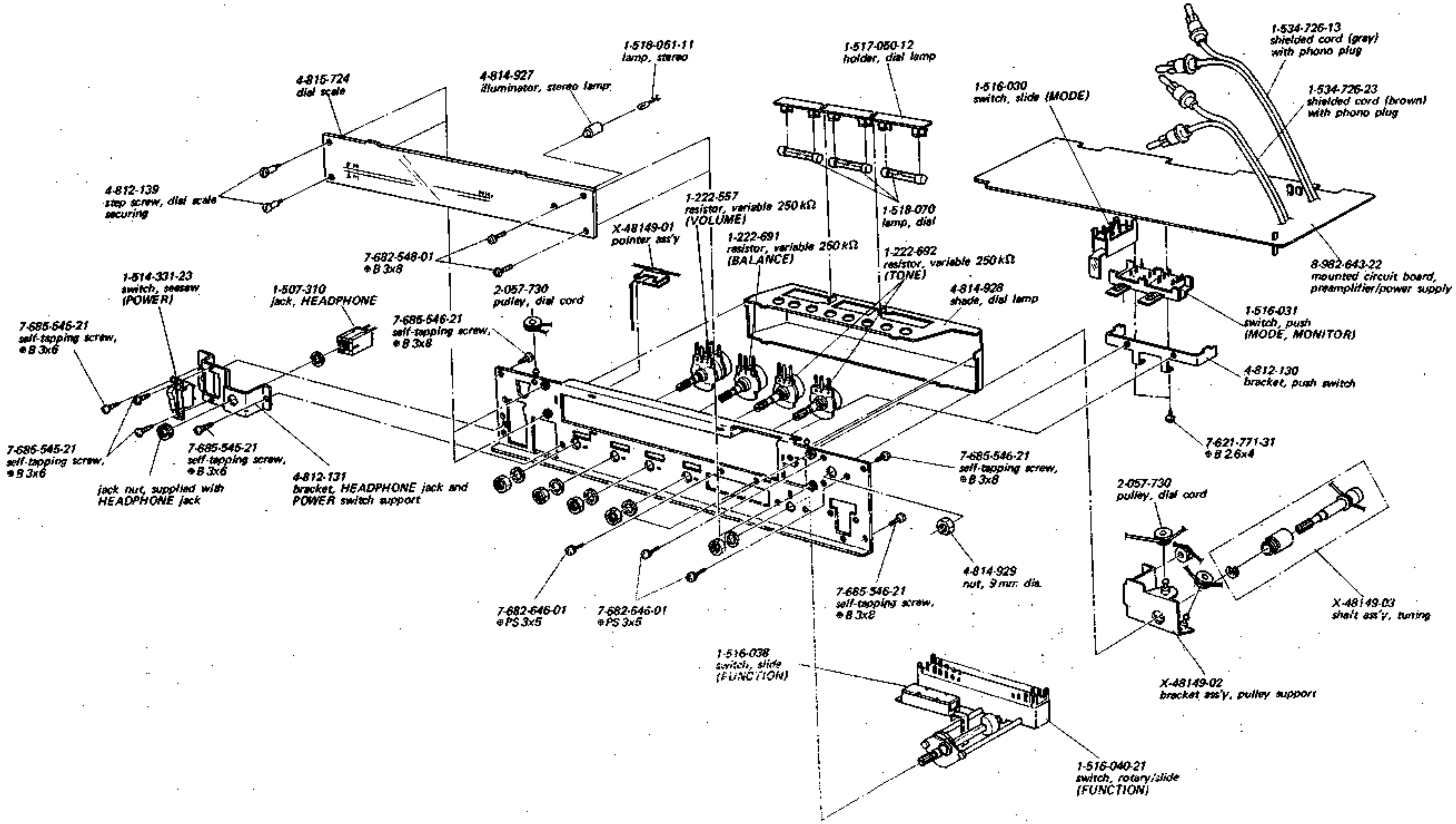
SECTION 6 EXPLODED VIEWS



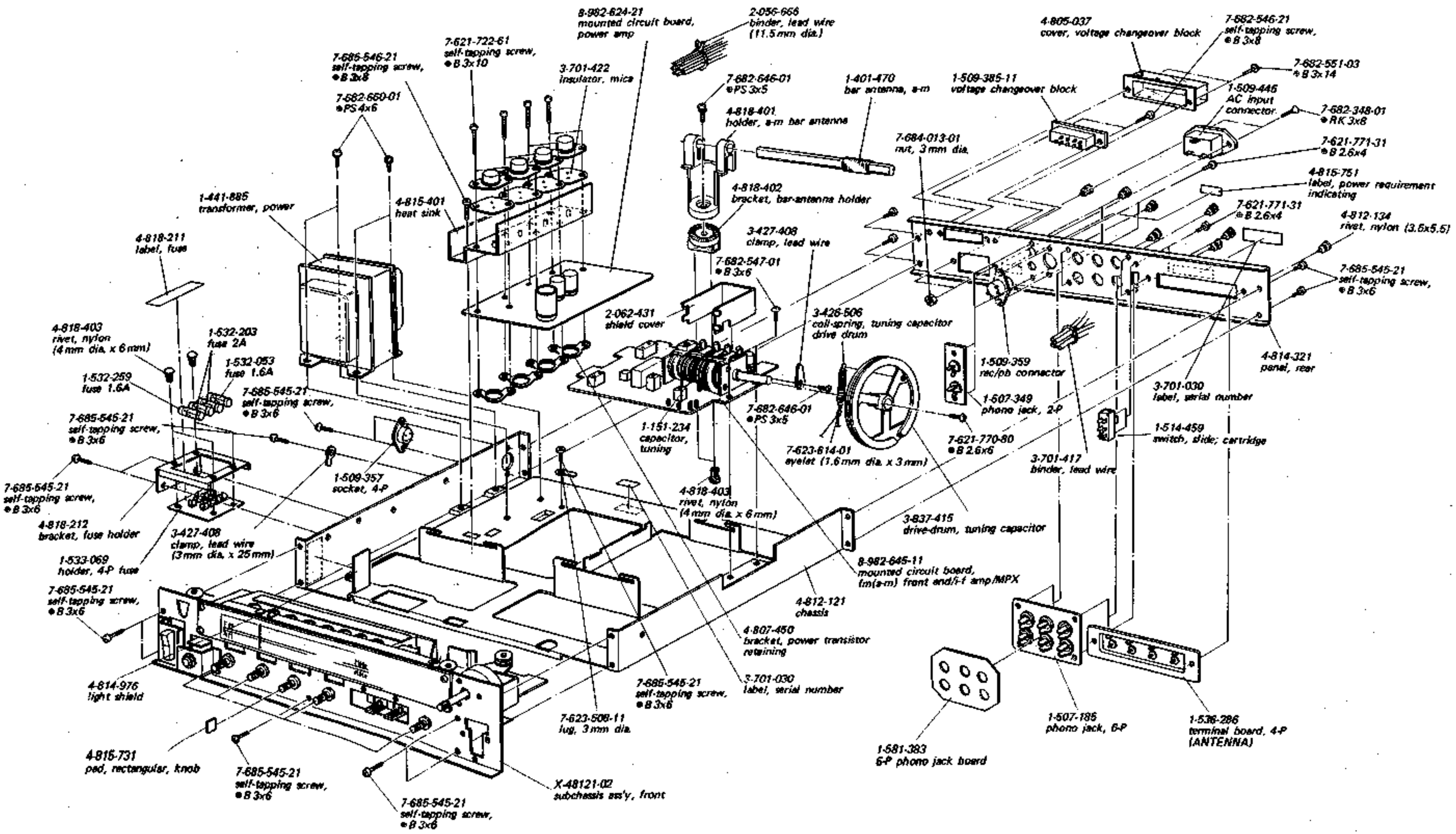
Note:

▲ 1 ~ 2: Wooden case ass'y (X-48182-01) includes all the parts marked ▲.

(2)



4-815-724
dial scale
4-814-927
illuminator, stereo lamp
1-518-061-11
lamp, stereo
1-517-050-12
holder, dial lamp
1-516-030
switch, slide (MODE)
1-534-726-13
shielded cord (gray)
with phono plug
1-534-726-23
shielded cord (brown)
with phono plug
4-812-139
step screw, dial scale
securing
1-222-557
resistor, variable 250 kΩ
(VOLUME)
1-518-070
lamp, dial
X-48149-01
pointer ass'y
1-222-691
resistor, variable 250 kΩ
(BALANCE)
1-222-692
resistor, variable 250 kΩ
(TONE)
7-682-548-01
⊕B 3x8
8-982-643-22
mounted circuit board,
preamplifier/power supply
1-514-331-23
switch, seesaw
(POWER)
1-507-310
jack, HEADPHONE
2-057-730
pulley, dial cord
4-814-928
shade, dial lamp
1-516-031
switch, push
(MODE, MONITOR)
7-685-545-21
self-tapping screw,
⊕B 3x6
7-685-546-21
self-tapping screw,
⊕B 3x8
4-812-130
bracket, push switch
7-621-771-31
⊕B 2.6x4
7-685-545-21
self-tapping screw,
⊕B 3x6
7-685-545-21
self-tapping screw,
⊕B 3x6
jack nut, supplied with
HEADPHONE jack
4-812-131
bracket, HEADPHONE jack and
POWER switch support
7-685-546-21
self-tapping screw,
⊕B 3x8
2-057-730
pulley, dial cord
4-814-929
nut, 9 mm dia.
X-48149-03
shaft ass'y, tuning
7-682-646-01
⊕PS 3x5
7-682-646-01
⊕PS 3x5
7-685-546-21
self-tapping screw,
⊕B 3x8
1-516-038
switch, slide
(FUNCTION)
X-48149-02
bracket ass'y, pulley support
1-516-040-21
switch, rotary/slide
(FUNCTION)


8-982-624-21
mounted circuit board, power amp
2-056-666
binder, lead wire (11.5mm dia.)
7-621-722-61
self-tapping screw, ● B 3x10
7-685-546-21
self-tapping screw, ● B 3x8
3-701-422
insulator, mica
7-682-660-01
● PS 4x6
7-682-646-01
● PS 3x5
1-401-470
bar antenna, a-m
4-818-401
holder, a-m bar antenna
1-509-385-11
voltage changeover block
4-805-037
cover, voltage changeover block
7-682-546-21
self-tapping screw, ● B 3x8
7-682-551-03
● B 3x14
1-509-446
AC input connector
7-682-348-01
● RK 3x8
7-684-013-01
nut, 3mm dia.
7-621-771-31
● B 2.6x4
4-815-751
label, power requirement indicating
7-621-771-31
● B 2.6x4
4-812-134
rivet, nylon (3.5x5.5)
1-441-885
transformer, power
4-815-401
heat sink
4-818-402
bracket, bar-antenna holder
3-427-408
clamp, lead wire
7-682-547-01
● B 3x6
7-685-545-21
self-tapping screw, ● B 3x6
4-818-211
label, fuse
2-062-431
shield cover
3-426-506
coil-spring, tuning capacitor drive drum
4-818-403
rivet, nylon (4mm dia. x 6mm)
1-532-203
fuse 2A
1-532-053
fuse 1.6A
1-532-259
fuse 1.6A
7-685-545-21
self-tapping screw, ● B 3x6
1-509-359
rec/pb connector
4-814-321
panel, rear
1-507-349
phono jack, 2-P
3-701-030
label, serial number
7-685-546-21
self-tapping screw, ● B 3x6
1-151-234
capacitor, tuning
7-682-646-01
● PS 3x5
7-621-770-80
● B 2.6x6
1-514-459
switch, slide; cartridge
7-623-614-01
eyelet (1.6mm dia. x 3mm)
3-701-417
binder, lead wire
7-685-545-21
self-tapping screw, ● B 3x6
1-509-357
socket, 4-P
4-818-403
rivet, nylon (4mm dia. x 6mm)
4-818-212
bracket, fuse holder
3-427-408
clamp, lead wire (3mm dia. x 25mm)
3-837-415
drive-drum, tuning capacitor
1-533-069
holder, 4-P fuse
8-982-645-11
mounted circuit board, fm(a-m) front end/i-f amp/MPX
7-685-545-21
self-tapping screw, ● B 3x6
4-812-121
chassis
4-807-450
bracket, power transistor retaining
3-701-030
label, serial number
4-814-976
light shield
7-685-545-21
self-tapping screw, ● B 3x6
7-623-508-11
lug, 3mm dia.
1-507-186
phono jack, 6-P
1-536-286
terminal board, 4-P (ANTENNA)
4-815-731
pad, rectangular, knob
7-685-545-21
self-tapping screw, ● B 3x6
1-581-383
6-P phono jack board
X-48121-02
subchassis ass'y, front
7-685-545-21
self-tapping screw, ● B 3x6

SECTION 7
ELECTRICAL PARTS LIST

MOUNTED CIRCUIT BOARDS

Ref. No.	*Part No.*	*Description*
	8-982-645-11	fm (a-m) front-end/i-f amp/ MPX circuit board (TCB-012BW1)
	8-982-624-21	power amplifier circuit board (PCB-013)
	8-982-643-22	preamplifier/power supply circuit board

SEMICONDUCTORS

Ref. No.	*Part No.*	*Description*
D101		diode, 1S351M
D102		diode, 1T243M
D201		diode, 1T22A
D202		diode, 1T22A
D203		diode, 1T23
D204		diode, 1T23
D205		diode, 1T23
D206		diode, 1T23
D207		diode, 1T40
D301		diode, 1T22A
D302		diode, 1T22A
D303		diode, 1T22A
D304		diode, 1T22A
D501 (D502)		diode, 10D-2
Q101		FET, 2SK23A
Q102		transistor, 2SC710
Q103		transistor, 2SC710
Q201		transistor, 2SC710
Q202		transistor, 2SC710
Q203		transistor, 2SC710
Q301		transistor, 2SC634A
Q302		transistor, 2SC634A
Q303		transistor, 2SC634A
Q401		transistor, 2SC403C
Q402		transistor, 2SC403C
Q501 (Q551)		transistor, 2SC632A
Q502 (Q552)		transistor, 2SC632A
Q503		transistor, 2SC634A
Q701 (Q801)		transistor, 2SA678
Q702 (Q802)		transistor, 2SC634A
Q703 (Q803)		transistor, 2SC633A
Q704 (Q804)		transistor, 2SC634A
Q705 (Q805)		transistor, 2SA678
Q706 (Q806)		transistor, 2SD291
Q707 (Q807)		transistor, 2SD291
Th701 (Th801)	1-800-077	thermistor

TRANSFORMERS, COILS AND INDUCTORS

Ref. No.	*Part No.*	*Description*
CFU201	1-403-150	CFU, 455 kHz
IFT101	1-403-821	IFT, 10.7 MHz
IFT201	1-403-822	transformer, discriminator
IFT202	1-403-820	IFT, 455 kHz
L101	1-401-471	coil, fm antenna
L102	1-425-547	coil, fm rf
L103	1-405-434	coil, fm osc
L201	1-407-184	inductor, micro 3.3 μH
L202	1-407-585-12	inductor, micro 15 mH
L203	1-407-418-11	shielded inductor 22 mH
L301	1-425-688	transformer, switching
L401	1-401-470	bar antenna, a-m
L402	1-405-486	coil, a-m osc
L403	1-407-169	inductor, micro 100 μH
L801	1-407-169	inductor, micro 100 μH
MU301	1-425-687	MPX unit
T	1-441-885	transformer, power
T701 (T751)	1-423-164	transformer, phase-splitter

CAPACITORS

All capacitance values are in μF except as indicated with p, which means μμF.

C101	1-102-951	15p	±5%	50V	ceramic
C102	1-102-951	15p	±5%	50V	ceramic
C103	1-101-118	0.01	$\pm^{100}_{0}$%	50V	ceramic
C104	1-101-923	0.01	$\pm^{80}_{20}$%	25V	ceramic
C105	———				
C106	1-102-978	220p	±5%	50V	ceramic
C107	1-101-923	0.01	$\pm^{80}_{20}$%	25V	ceramic
C108	1-101-924	0.02	$\pm^{80}_{20}$%	25V	ceramic
C109	1-101-924	0.02	$\pm^{80}_{20}$%	25V	ceramic
C110	1-102-862	3p	±0.25p	50V	ceramic
C111	1-102-947	10p	±5%	50V	ceramic
C112	1-101-971	15p	±5%	50V	ceramic
C113	1-101-118	0.01	$\pm^{100}_{0}$%	50V	ceramic
C114	1-101-923	0.01	$\pm^{80}_{20}$%	25V	ceramic
C115	1-102-947	10p	±5%	50V	ceramic
C116	1-101-923	0.01	$\pm^{80}_{20}$%	25V	ceramic
C117	1-101-924	0.02	$\pm^{80}_{20}$%	25V	ceramic
C118	1-121-434	0.47	$\pm^{75}_{10}$%	50V	electrolytic
C119	1-101-118	0.01	$\pm^{100}_{0}$%	50V	ceramic
C201	1-101-919	0.0022	$\pm^{80}_{20}$%	25V	ceramic
C202	1-105-665-12	0.0022	±10%	50V	mylar
C203	1-105-677-12	0.022	±10%	50V	mylar
C204	1-101-923	0.01	$\pm^{80}_{20}$%	25V	ceramic

Ref. No.	Part No.	Description			
C205	1-121-395	4.7	$^{+150}_{-10}$%	25V	electrolytic
C206	1-127-023	1	±20%	10V	solid aluminum
C207	———				
C208	1-101-923	0.01	$^{+80}_{-20}$%	25V	ceramic
C209	———				
C210	———				
C211	1-121-398	10	$^{+100}_{-10}$%	25V	electrolytic
C212	1-101-340	120p	±10%	50V	ceramic
C213	1-102-116	680p	±10%	50V	ceramic
C214	1-102-822	390p	±5%	50V	ceramic
C215	1-102-074	1,000p	±10%	50V	ceramic
C216	1-101-361	150p	±5%	50V	ceramic
C217	1-102-824	470p	±5%	50V	ceramic
C218	1-101-923	0.01	$^{+80}_{-20}$%	25V	ceramic
C219	1-102-947	10p	±5%	50V	ceramic
C220	1-101-923	0.01	$^{+80}_{-20}$%	25V	ceramic
C221	1-121-398	10	$^{+100}_{-10}$%	25V	electrolytic
C222	1-101-924	0.02	$^{+80}_{-20}$%	25V	ceramic
C223	———				
C224	1-121-398	10	$^{+100}_{-10}$%	25V	electrolytic
C225	1-121-395	4.7	$^{+150}_{-10}$%	25V	electrolytic
C226	1-101-923	0.01	$^{+80}_{-20}$%	25V	ceramic
C227	1-105-677-12	0.022	±10%	50V	mylar
C228	1-121-398	10	$^{+100}_{-10}$%	25V	electrolytic
C229	———				
C230	1-101-924	0.02	$^{+80}_{-20}$%	25V	ceramic
C231	———				
C232	1-102-940	3p	±5%	50V	ceramic
C233	———				
C234	———				
C235	1-121-391	1	$^{+150}_{-10}$%	50V	electrolytic
C236	1-101-884	56p	±5%	50V	ceramic
C237	1-105-677-12	0.022	±10%	50V	mylar
C238	1-105-683-12	0.068	±10%	50V	mylar
C239	1-121-413	100	$^{+100}_{-10}$%	6.3V	electrolytic
C240	1-127-019	0.1	±20%	10V	solid aluminum
C301	1-102-117	820p	±10%	50V	ceramic
C302	1-121-395	4.7	$^{+150}_{-10}$%	25V	electrolytic
C303	1-121-395	4.7	$^{+150}_{-10}$%	25V	electrolytic
C304	———				
C305	———				
C306	1-105-661-12	0.001	±10%	50V	mylar
C307	1-121-413	100	$^{+100}_{-10}$%	6.3V	electrolytic
C308	1-127-019	0.1	±20%	10V	solid aluminum
C309	———				
C310	1-121-398	10	$^{+100}_{-10}$%	25V	electrolytic
C311	1-105-681-12	0.047	±10%	50V	mylar
C312	1-105-681-12	0.047	±10%	50V	mylar
C313	1-105-673-12	0.01	±10%	50V	mylar
C314	1-105-673-12	0.01	±10%	50V	mylar
C315	1-127-021	0.33	±20%	10V	solid aluminum
C316	1-127-021	0.33	±20%	10V	solid aluminum
C317	1-121-411	47	$^{+50}_{-10}$%	50V	electrolytic

Ref. No.	Part No.	Description			
C401	1-105-667-12	0.0033	±10%	50V	mylar
C402	1-101-923	0.01	$^{+80}_{-20}$%	25V	ceramic
C403	1-101-924	0.02	$^{+80}_{-20}$%	25V	ceramic
C404	1-105-669-12	0.0047	±10%	50V	mylar
C405	1-101-924	0.02	$^{+80}_{-20}$%	25V	ceramic
C406	1-101-924	0.02	$^{+80}_{-20}$%	25V	ceramic
C407	1-101-924	0.02	$^{+80}_{-20}$%	25V	ceramic
C501 (C551)	1-121-726	0.47	$^{+150}_{-10}$%	50V	electrolytic
C502 (C552)	1-102-977	200p	±5%	50V	ceramic
C503 (C553)	1-102-975	100p	±10%	50V	ceramic
C504 (C554)	1-121-402	33	$^{+100}_{-10}$%	10V	electrolytic
C505 (C555)	1-121-398	10	$^{+100}_{-10}$%	25V	electrolytic
C506 (C556)	1-105-667-12	0.0033	±10%	50V	mylar
C507 (C557)	1-105-673-12	0.01	±10%	50V	mylar
C508 (C558)	1-101-880	47p	±5%	50V	ceramic
C509 (C559)	1-105-671-12	0.0068	±10%	50V	mylar
C510 (C560)	1-105-683-12	0.068	±10%	50V	mylar
C511 (C561)	1-105-663-12	0.0015	±10%	50V	mylar
C512 (C562)	1-105-673-12	0.01	±10%	50V	mylar
C513 (C563)	1-107-135	150p	±10%	50V	silvered mica
C514 (C564)	1-105-673-12	0.01	±10%	50V	mylar
C515	1-121-416	100	$^{+100}_{-10}$%	25V	electrolytic
C516	1-121-416	100	$^{+100}_{-10}$%	25V	electrolytic
C517	———				
C518	1-121-907	1,000	$^{+100}_{-10}$%	50V	electrolytic
C519	———				
C520	1-121-404	33	$^{+100}_{-10}$%	25V	electrolytic
C521 (C571)	1-105-719-12	0.033	±10%	100V	mylar
C701 (C801)	1-105-685-12	0.1	±10%	50V	mylar
C702 (C802)	1-102-976	180p	±5%	50V	ceramic
C703 (C803)	1-121-410	47	$^{+100}_{-10}$%	25V	electrolytic
C704 (C804)	1-102-946	12p	±5%	50V	ceramic
C705 (C805)	1-121-410	47	$^{+100}_{-10}$%	25V	electrolytic
C706 (C806)	1-121-361	470	$^{+100}_{-10}$%	35V	electrolytic
C707	1-121-410	47	$^{+100}_{-10}$%	25V	electrolytic
C708	1-121-411	47	$^{+100}_{-10}$%	50V	electrolytic
C901	1-101-880	47p	±5%	50V	ceramic
C902	1-101-880	47p	±5%	50V	ceramic
C903 (C904)	1-202-977	200p	±5%	50V	ceramic
CV101, CV102, CV103, CV401, CV402	1-151-234	capacitor, tuning			

RESISTORS

All capacitors are in ohms ±10%, ¼W and composition type unless otherwise indicated.

R101	1-202-367	220
R102	1-202-411	15k
R103	1-202-391	2.2k

Ref. No.	Part No.	Description			
R104	1-202-343	56			
R105	1-202-367	220			
R106	1-202-403	6.8 k			
R107	1-202-343	56			
R108	1-202-407	10 k			
R109	1-202-387	1.5 k			
R110	1-202-383	1 k			
R111	1-202-387	1.5 k			
R112	1-202-431	100 k			
R113	1-202-423	47 k			
R114	1-202-423	47 k			
R201	1-202-383	1 k			
R202	1-202-369	270			
R203	1-202-400	5.1 k			
R204	1-202-405	8.2 k			
R205	1-202-383	1 k			
R206	1-202-383	1 k			
R207	1-202-367	220			
R208	1-202-381	820			
R209	1-202-383	1 k			
R210	1-244-673	1 k	±5%	¼W	carbon
R211	1-202-391	2.2 k			
R212	1-202-399	4.7 k			
R213	1-202-376	510			
R214	1-242-665	470	±5%	¼W	carbon
R215	1-202-365	180			
R216	1-202-383	1 k			
R217	1-202-383	1 k			
R218	—				
R219	—				
R220	1-202-375	470			
R230	1-202-343	56			
R231	1-202-343	56			
R232	1-202-400	5.1 k			
R233	1-244-664	430	±5%	¼W	carbon
R234	1-202-383	1 k			
R235	1-202-417	27 k			
R236	1-202-403	6.8 k			
R237	1-244-717	68 k	±5%	¼W	carbon
R238	1-244-703	15 k	±5%	¼W	carbon
R239	1-244-691	5.6 k	±5%	¼W	carbon
R240	1-202-371	330			
R241	1-202-383	1 k			
R242	1-244-677	1.5 k	±5%	¼W	carbon
R243	1-244-657	220	±5%	¼W	carbon
R244	1-202-389	1.8 k			
R245	1-202-399	4.7 k			
R246	1-202-377	560			
R247	1-202-391	2.2 k			
R248	1-202-391	2.2 k			
R249	1-242-675	1.2 k	±5%	¼W	carbon
R250	1-202-409	12 k			
R251	1-202-389	1.8 k			
R252	1-202-343	56			
R253	1-202-343	56			
R254	1-202-370	300			
R255	1-202-387	1.5 k			
R256	1-202-387	1.5 k			

Ref. No.	Part No.	Description			
R257	1-202-387	1.5 k			
R258	1-202-325	10			
R301	1-202-411	15 k			
R302	1-202-409	12 k			
R303	1-202-429	82 k			
R304	1-202-423	47 k			
R305	1-202-429	82 k			
R306	1-202-383	1 k			
R307	1-202-425	56 k			
R308	1-202-429	82 k			
R309	1-202-381	820			
R310	1-202-399	4.7 k			
R311	1-202-405	8.2 k			
R312	1-202-365	180			
R313	1-202-399	4.7 k			
R314	1-202-400	5.1 k			
R315	1-202-383	1 k			
R316	1-202-383	1 k			
R317	1-202-407	10 k			
R318	1-202-407	10 k			
R319	1-202-423	47 k			
R320	1-202-423	47 k			
R329	1-202-423	47 k			
R401	1-202-401	5.6 k			
R402	1-202-411	15 k			
R403	1-202-431	100 k			
R404	1-202-383	1 k			
R405	1-202-367	220			
R406	1-202-343	56			
R407	1-202-343	56			
R501 (R551)	1-244-717	68 k	±5%	¼W	carbon
R502 (R552)	1-244-681	2.2 k	±5%	¼W	carbon
R503 (R553)	1-244-731	270 k	±5%	¼W	carbon
R504 (R554)	1-244-657	220	±5%	¼W	carbon
R505 (R555)	1-244-721	100 k	±5%	¼W	carbon
R506 (R556)	1-244-657	220	±5%	¼W	carbon
R507 (R557)	1-244-685	3.3 k	±5%	¼W	carbon
R508 (R558)	1-244-733	330 k	±5%	¼W	carbon
R509 (R559)	1-244-707	27 k	±5%	¼W	carbon
R510 (R560)	—				
R511 (R561)	1-244-697	10 k	±5%	¼W	carbon
R512 (R562)	1-244-685	3.3 k	±5%	¼W	carbon
R513 (R563)	1-244-697	10 k	±5%	¼W	carbon
R514 (R564)	1-244-691	5.6 k	±5%	¼W	carbon
R515 (R565)	1-244-715	56 k	±5%	¼W	carbon
R516 (R566)	—				
R517 (R567)	1-244-691	5.6 k	±5%	¼W	carbon
R518 (R568)	1-244-709	33 k	±5%	¼W	carbon
R519 (R569)	—				
R520 (R570)	—				
R521	1-244-713	47 k	±5%	¼W	carbon
R522	1-244-683	2.7 k	±5%	¼W	carbon
R523	—				
R524	1-206-659	620	±5%	2W	metal oxide
R525	1-206-664	1 k	±5%	2W	metal oxide
R526	—				

Ref. No.	Part No.	Description			
R527	1-244-677	1.8 k	±5%	¼W	carbon
R528	———				
R529	1-244-721	100 k	±5%	¼W	carbon
R530 (R580)	1-244-689	4.7 k	±5%	¼W	carbon
R531 (R581)	1-244-697	10 k	±5%	¼W	carbon
R532 (R582)	1-244-728	200 k	±5%	¼W	carbon
R533 (R583)	1-244-725	150 k	±5%	¼W	carbon
R534 (R584)	1-244-719	82 k	±5%	¼W	carbon
R577	1-242-679	1.8 k	±5%	¼W	carbon
R579	1-242-721	100 k	±5%	¼W	carbon
R585	1-206-656	470	±5%	2W	metal oxide
R586	1-244-691	5.6 k	±5%	¼W	carbon
R701 (R801)	1-202-431	100 k			
R702 (R802)	1-202-395	3.3 k			
R703 (R803)	1-202-431	100 k			
R704 (R804)	1-202-407	10 k			
R705 (R805)	1-202-363	150			
R706 (R806)	1-202-395	3.3 k			
R707 (R807)	1-202-407	10 k			
R708 (R808)	1-244-689	4.7 k	±5%	¼W	carbon
R709 (R809)	1-244-682	2.4 k	±5%	¼W	carbon
R710 (R810)	1-202-421	39 k			
R711 (R811)	1-202-375	470			
R712 (R812)	1-202-375	470			
R713 (R813)					
R714 (R814)	1-212-385	1	±10%	1W	metal oxide
R715 (R815)	1-212-385	1	±10%	1W	metal oxide
R716 (R816)	1-202-379	680			
R717 (R817)	1-202-561	330			
R718	1-202-383	1 k			
R719	1-202-425	56 k			
R720	1-202-423	47 k			
R901 (R902)	1-202-468	3.6 M	±5%		
R903 (R905)	1-244-719	82 k	±5%	¼W	carbon
R904 (R906)	1-244-745	1 M	±5%	¼W	carbon
R907 (R908)	1-244-711	39 k	±5%	¼W	carbon
R909	1-244-685	3.3 k	±5%	¼W	carbon
RV501 (RV551)	1-222-692	50 k (A),	variable (BASS control)		
RV502 (RV552)	1-222-692	50 k (A),	variable (TREBLE control)		
RV503	1-222-691	250 k (W),	variable (BALANCE control)		
RV504 (RV554)	1-222-557	250 k (B),	variable (VOLUME control)		

SWITCHES

Ref. No.	Part No.	Description
S1	1-516-040-21	rotary/slide (FUNCTION)
S2	1-516-030	slide (MODE)
S3	1-516-031	push (MODE, MONITOR)
S4	1-514-331-23	seesaw (POWER)
S5	1-514-459	slide (CARTRIDGE)
S6	1-516-038	slide (FUNCTION)

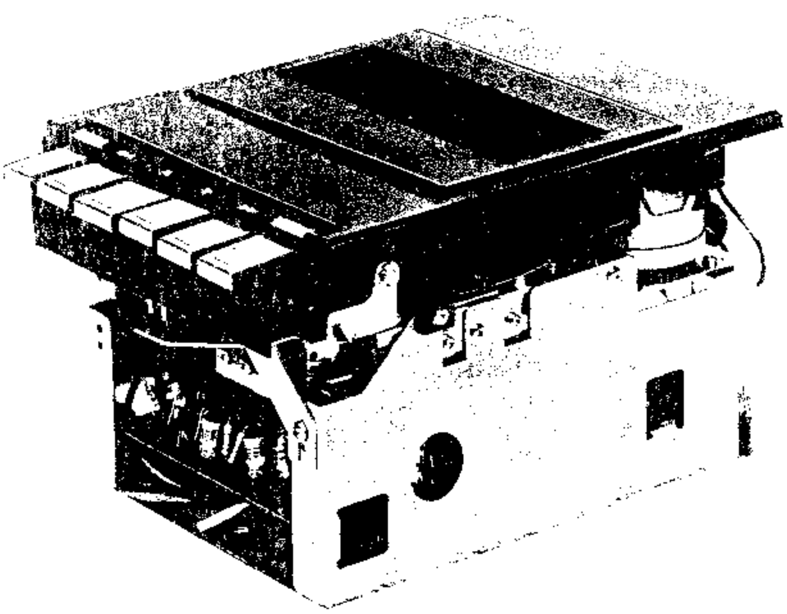
FILTERS

Ref. No.	Part No.	Description
CF201	1-403-562-11	fm i-f, ceramic 10.70 MHz (red)
	1-403-562-31	fm i-f, ceramic 10.74 MHz (white)
	1-403-562-51	fm i-f, ceramic 10.78 MHz (yellow)

MISCELLANEOUS

Ref. No.	Part No.	Description
CP801	1-231-057-12	encapsulated component 120Ω + 0.033 μF
CR201	1-231-175	encapsulated component 4.7 kΩ + 150 pF
J101 (J201), J102 (J202), J103 (J203)	1-507-185	phono jack, 6-P
J104 (J204)	1-507-349	phono jack, 2-P
J107	1-507-310	jack, HEADPHONE
CNJ1	1-509-359	connector, REC/PB
CNJ3	1-509-445	AC input connector
CNJ4	1-509-357	socket, 4-P
	1-517-050-12	holder, dial lamp
PL1	1-518-051-11	lamp, stereo 4.5 V/40 mA
PL2, 3, 4	1-518-070	lamp, dial 8V/0.3 A
VS	1-509-385-11	voltage changeover block
F1	1-532-259	fuse 1.6A
F2	1-532-203	fuse 2A
F3	1-532-053	fuse 1.6A
	1-536-286	terminal board, 4-P (ANTENNA)
	1-581-383	6-P phono jack board
	1-533-069	holder, 4-P fuse
P101 (P201)	1-534-726-13	shielded cord (gray) with phono plug
P102 (P202)	1-534-726-23	shielded cord (brown) with phono plug

STEREO CASSETTE DECK
(TC-119A)



Note: TC-119A is a stereo cassette deck installed in HST-139.

SONY
SERVICE MANUAL

TABLE OF CONTENTS

CAUTION

Always connect the main chassis and the cassette deck chassis electrically to provide a ground return when performing an operational check or electrical adjustment.

SECTION 1
TECHNICAL DESCRIPTION

1-1. TECHNICAL SPECIFICATIONS

Technical specifications for the TC-119A stereo cassette tape deck are listed in Table 1.

TABLE 1. TECHNICAL SPECIFICATIONS

Tape speed:	4.8 cm/sec (1⅞ inch/sec)
Frequency response:	40 Hz to 10 kHz (-15 dB)
Recording and erasing bias frequency:	85 kHz
Wow and flutter:	0.35% WRMS
MIC Input:	0.775 mV (-60 dB), 220 ohms

1-2. CIRCUIT ANALYSIS

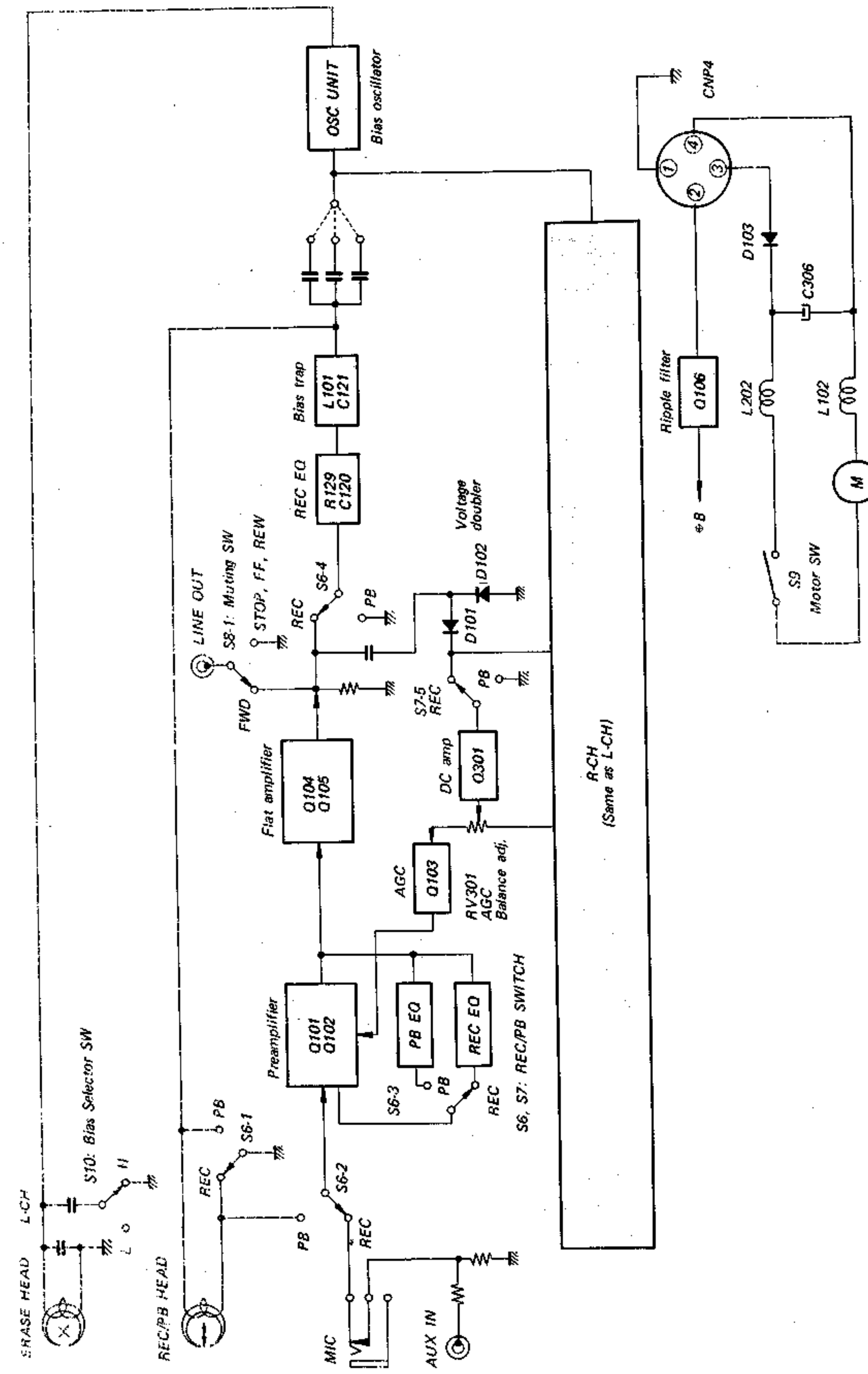
The following text describes the function or operation of all stages and controls. The text sequence follows signal paths. Stages are listed by transistor reference designation at the left margin; major components are also listed in a similar manner. Refer to the block diagram on page 39 and the schematic diagram on page 53.

Since the REC/PB amplifier section contains two identical amplifier chains, only the left channel will be described. The right channel is identical except for reference numbers.

Stage/Control	*Function*
Preamplifier Q101, Q102	This stage has two functions. One is a flat amplifier for recording, the other is a NAB equalizer for playback. The changeover operation is performed by REC/PB switch S6.
REC/PB changeover switch S6	In the playback mode, the voltage induced in the playback head is applied to the base of Q101 through S6-2, and then amplified to the level required for the following flat amplifier Q102. Playback equalization is achieved by means of a negative feedback loop containing C111, R112 and R111. RV202 varies the overall gain of the preamplifier, to compensate for left and right channel differences. In the record mode, this amplifier acts as a flat amplifier, because the negative feedback loop is changed by means of S6-3. In this case the negative feedback loop is changed to R115 and C106.
AGC circuit	Notice that the agc circuit, which is effective only at record mode due to S6-5, is provided at the interstage of Q101 and Q102. This will be described later.
Flat/record amplifier Q104, Q105	This is basically a conventional RC coupled amplifier which delivers signals required at the control amplifier or record head. This also acts as a buffer amplifier between the control amplifier and tape deck. It has a gain of 36 dB.
AGC circuit	The automatic gain control circuit employed is essentially a compressor to prevent overmodulation in the recording system. Although agc restricts the volume range to some extent, it aids in flattening out excessive program peaks. Agc operation is achieved by changing the gain of preamplifier Q101, Q102 by varying the impedance between collector and emitter of Q103. The agc circuit works as follows: In the record mode, output signal from the preamplifier is fed to the voltage doubler (D101, D102) through the flat amplifier.
Agc voltage doubler D101, D102	The signal is rectified by voltage doubler rectifier D101 and D102, and then supplied to the base of Q301. Notice that the left and right channel agc voltage are added at the base of Q301.

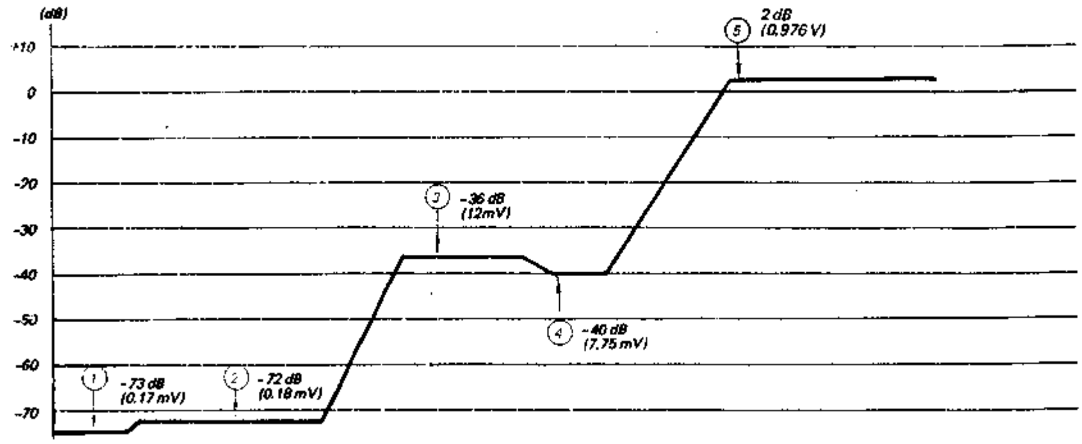
Stage/Control	Function
Dc amplifier Q301	Q301 is a dc amplifier which amplifies the dc component of the rectified signal (which is proportional to the input signal level) to the level required to drive control transistor Q103 (Q203).
Q103, (Q203)	The dc output of Q301 is applied to the base of the control transistor (which acts as shunt resistor between Q101 and Q102) through semi-fixed resistor RV301 (agc balance adj.). RV301 balances the agc response between "L" and "R" channels. The base current of Q103 (Q203) determines the impedance between the collector and emitter of Q103 (Q203), which in turn determines the input impedance of Q102 and hence the preamplifier gain.
Bias current trap L101, C121.	Prevents bias current leak in the record amplifier. This trap is a parallel-tuned circuit.
Bias oscillator unit	This oscillator unit supplies bias current to the record head through coupling capacitors. The circuit is a Hartley oscillator with the feedback applied to the base from the collector circuit.

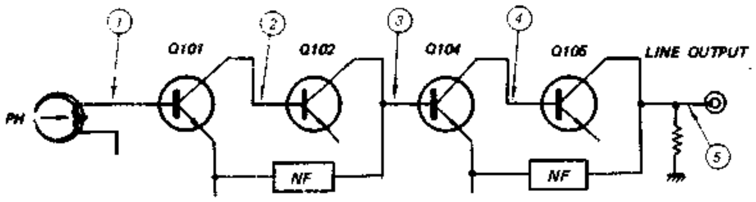
1-3. BLOCK DIAGRAM



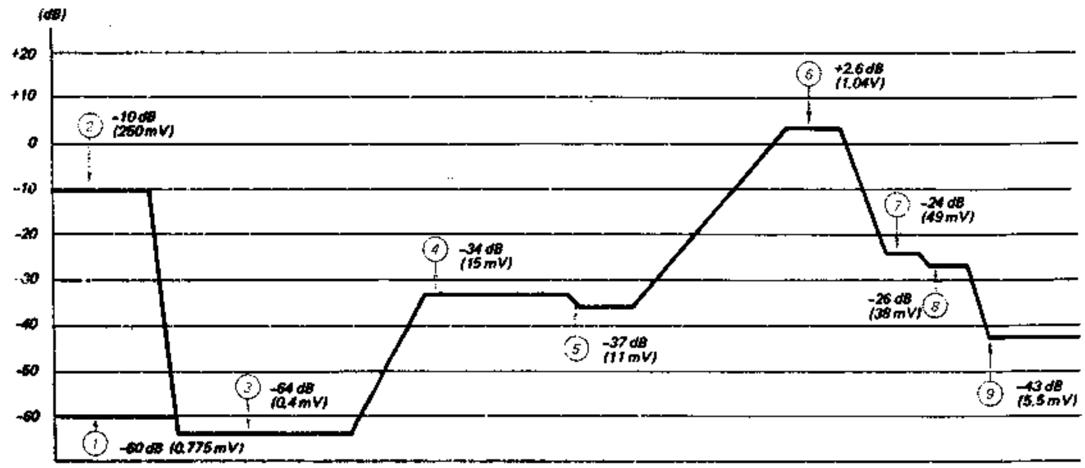
1-4. LEVEL DIAGRAM

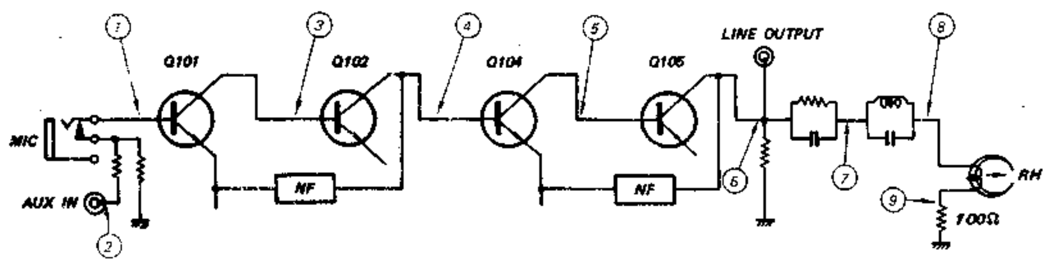
Playback Mode





Record Mode





Note: Signal voltages are measured with an ac VTVM and expressed in dB referred to 0.775V, 1 kHz.

SECTION 2
DISASSEMBLY PROCEDURES

2-1. TOOLS REQUIRED

The following tools are required to perform any disassembly or replacement on TC-119A.

1. Screwdrivers, Phillips head
2. Pliers, long-nose
3. Locking compound
4. Cement solvent

The following chart will help you to decipher the hardware codes given in this service manual.

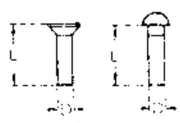
Note: All screws in the TC-119A are manufactured to the specifications of the International Organization for Standardization (ISO). This means that the new and old screws are not interchangeable because ISO screws have a different number of threads per mm compared to the old ones. The ISO screws have an identification mark on their heads as shown in Fig. 2-1.

Hardware Nomenclature

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

– Example –

Type of Slot
⊕ P 3×10
Length in mm (L)
Diameter in mm (D)
Type of Head



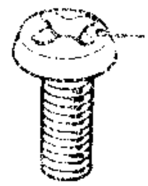


Fig. 2-1. ISO screw

2-2. CASSETTE DECK REMOVAL

1. Remove the two self-tapping screws (⊕B3x8) securing the rear hardboard to the chassis as shown in Fig. 2-2.
2. Remove the two screws (⊕B3x8) securing the bias selector switch to the rear hardboard. This frees the bias selector switch from the rear hardboard.
3. Disconnect the two pairs of phono plugs from the cassette deck as shown in Fig. 2-3.

   Note: When reconnecting them, refer to the wiring diagram sticked inside the wooden case as shown in Fig. 2-5
4. Remove the two MIC jack nuts by using a jack-nutdriver or tweezers as shown in Fig. 2-4.
5. Remove the three screws (⊕B4x14) securing the cassette deck to the wooden case as shown in Fig. 2-2.
6. Carefully lift up the cassette deck from the wooden case in the direction shown by the arrow as shown in Fig. 2-4. This frees the cassette deck.

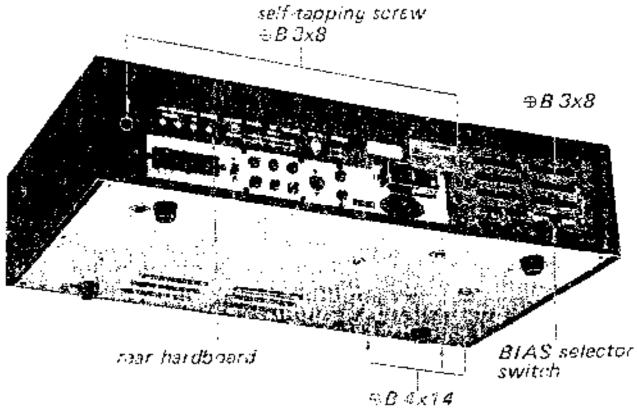


Fig. 2-2. Cassette deck removal

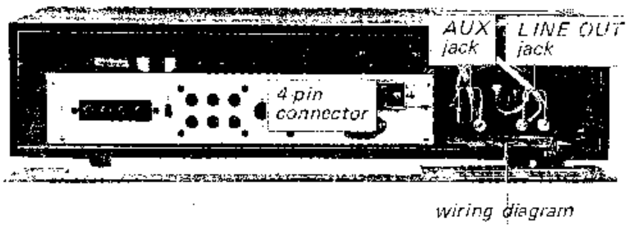


Fig. 2-3. Parts location

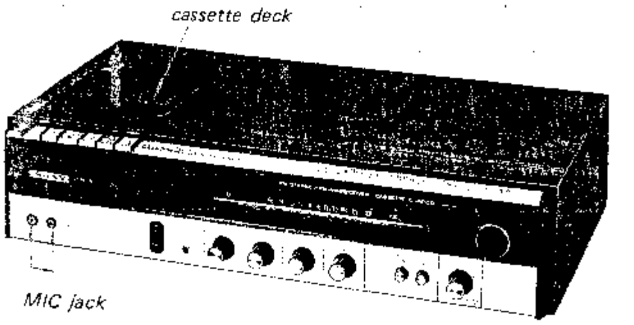


Fig. 2-4. Cassette deck removal

2-3. TOP COVER REMOVAL

1. Remove the screw (⊕B 2.6×8) securing the top cover to the chassis as shown in Fig. 2-5.
2. Remove the screw (⊕B 2.6×6) securing the top cover to the chassis as shown in Fig. 2-6.
3. Remove the screw (⊕B 2.6×6) securing the top cover to the chassis as shown in Fig. 2-7.
4. Remove the self-tapping screw (⊕B 3x6) securing the top cover to the chassis as shown in Fig. 2-8. This frees the top cover.

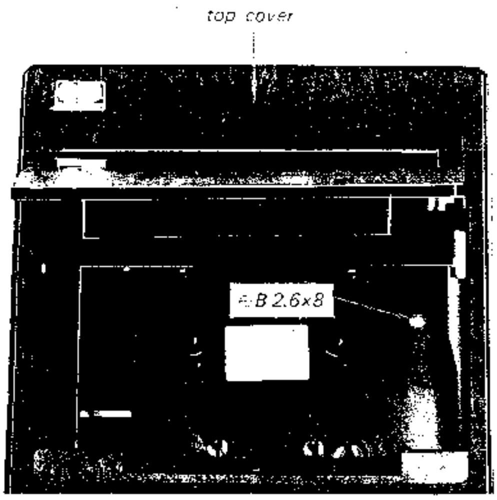


Fig. 2-5. Top cover removal

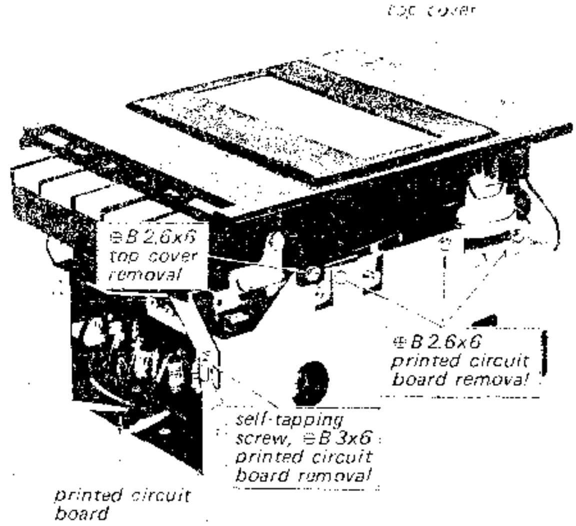


Fig. 2-6. Top cover removal

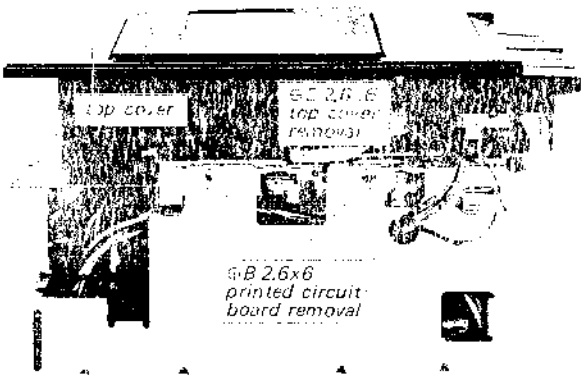


Fig. 2-7. Top cover removal

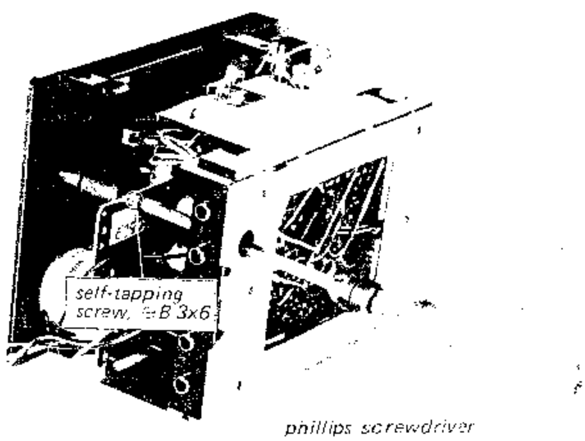
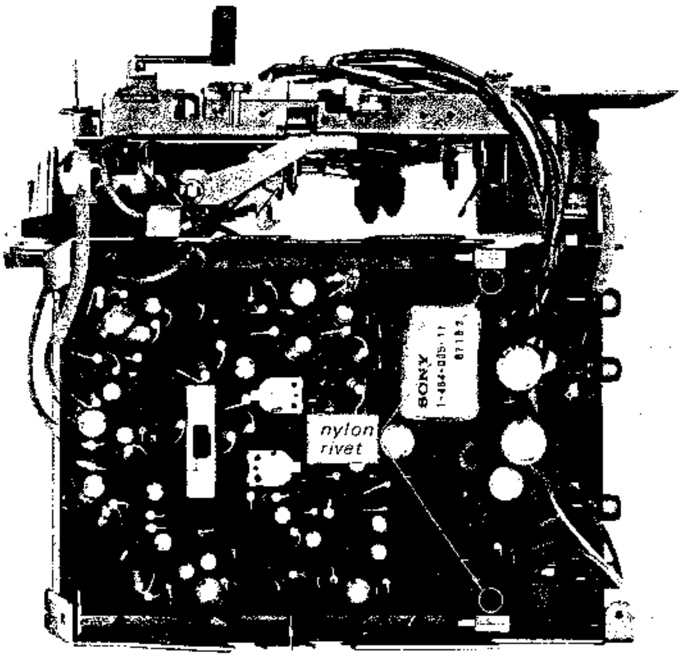


Fig. 2-8. Top cover removal

2-4. PRINTED CIRCUIT BOARD REMOVAL

1. Remove the top cover as described in Procedure 2-3.
2. Remove the three screws (⊕B 2.6×6) and the self-tapping screw (⊕B 3×6) as shown in Fig. 2-6.
3. Remove the two screws (⊕B 2.6×6) as shown in Fig. 2-7. This frees the mechanism as shown in Fig. 2-9.
4. Remove the two nylon rivets securing the printed circuit board to the chassis as shown in Fig. 2-9 (Refer to Procedure 2-8 on page 10). This frees the printed circuit board.

Note: Be careful not to break the lead wires when removing the printed circuit board.



printed circuit board

Fig. 2-9. Printed circuit board removal

2-5. CHASSIS LAYOUT

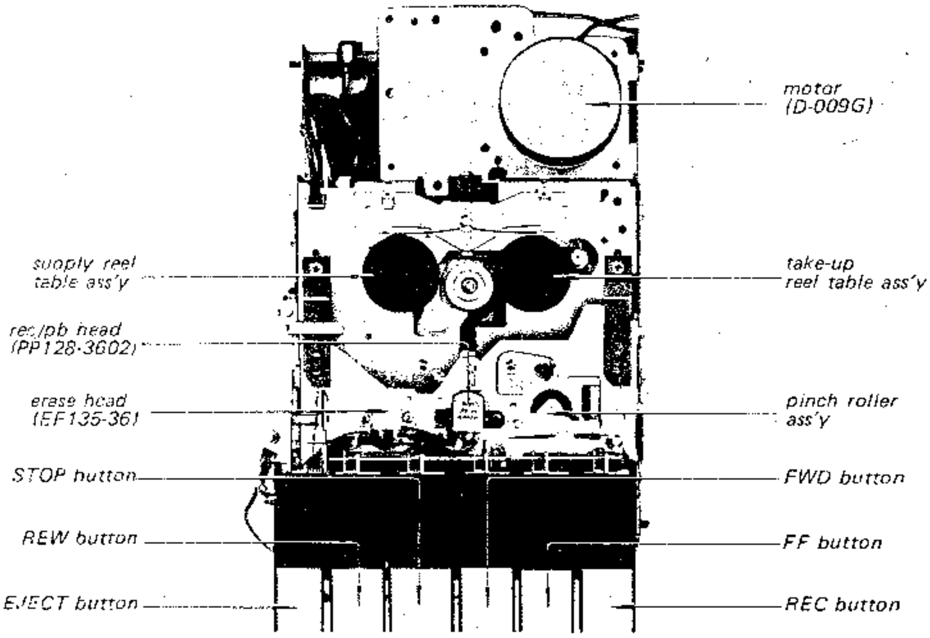


Fig. 2-10. Top view

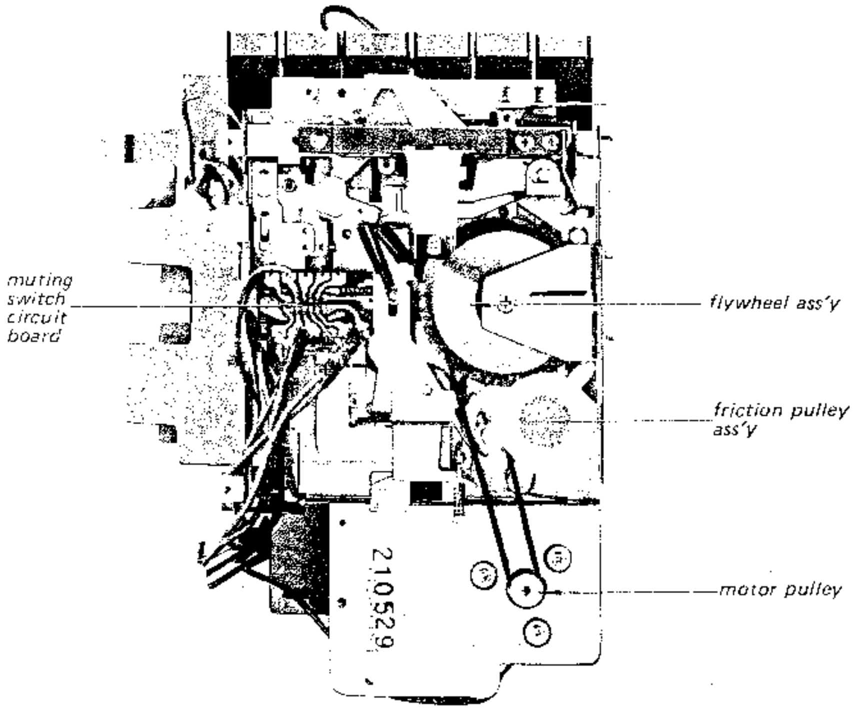


Fig. 2-11. Bottom view

SECTION 3
MECHANICAL ADJUSTMENT

Prepare for performing any mechanical adjustments by removing the cassette deck as described in Procedure 2-2.

Note: It should be unnecessary to change any adjustment before putting the equipment into service, unless shipping damage has occured. In the course of normal service, or in the event of component failure and replacement of parts, some readjustment may be necessary.

3-1. TOOLS REQUIRED

The following tools are required to perform mechanical adjustment procedures on the TC-119A.

1. Pliers
2. Screwdriver, Phillips head
3. Screwdriver, 2 mm (5/32") blade
4. Locking compound
5. Cement solvent
6. Spring scale
7. Torque meter

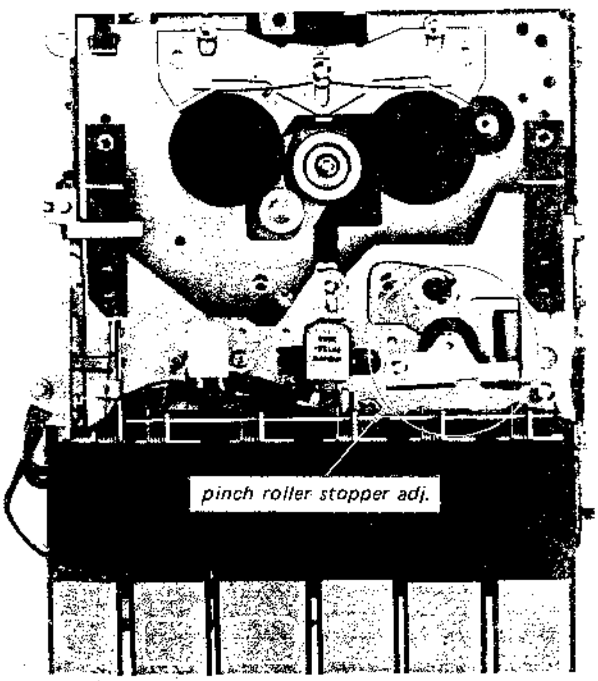


Fig. 3-1. Adjusting parts location (1)

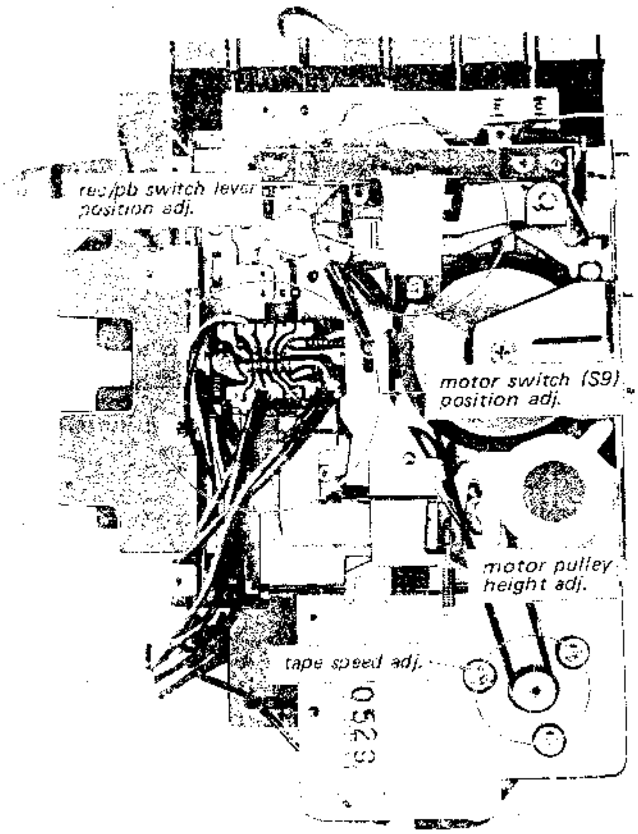


Fig. 3-2. Adjusting parts location (2)

3-2. PINCH ROLLER STOPPER ADJUSTMENT
(See Fig. 3-1 and 3-3)

1. Place the equipment in the FWD mode.
2. Bend the stopper to obtain the 1 to 2 mm (3/64 ~ 5/64") clearance.

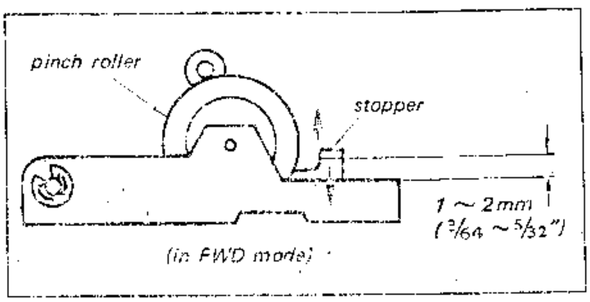


Fig. 3-3. Pinch roller stopper adjustment

3-3. MOTOR SWITCH (S9) POSITION ADJUSTMENT (See Fig. 3-2 and 3-4)

1. Place the equipment in the STOP mode.
2. Loosen the adjusting screw.
3. Adjust the position of the motor switch (S9) so that the clearance between the flat springs of the motor switch is 1 ~ 1.5 mm (3/64 ~ 1/16"), while the brake lever contacts with one side of the motor switch.
4. Slowly pressing the forward button, check to see that the muting switch (S8) is switched over after the motor switch is closed.
5. Apply a drop of locking compound to the screw.

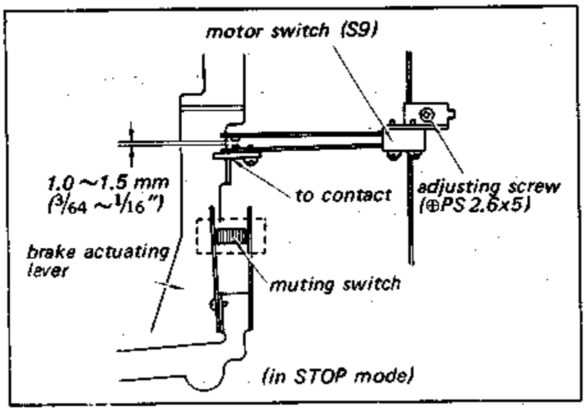


Fig. 3-4. Motor switch (S9) position adjustment

3-4. MOTOR PULLEY HEIGHT ADJUSTMENT (See Fig. 3-2 and 3-5)

Note: This should perform after replacing the motor pulley or flywheel.

1. Loosen the set screw securing the motor pulley.
2. Adjust the height of the motor pulley so that the belt tracks correctly in a straight line.
3. After completing the adjustment, check to see that the belt is not twisted and dirty.

Note: If the drive belt does not track correctly in a straight line, it will result in driving loss, or flutter and wow.

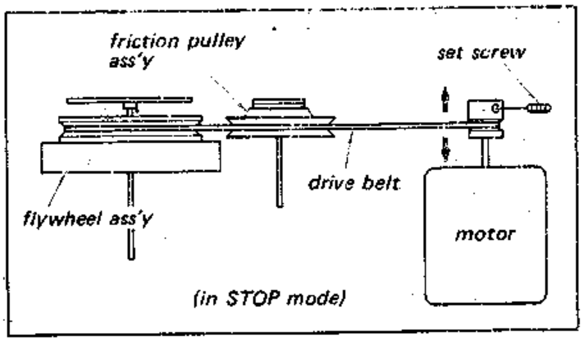


Fig. 3-5. Motor pulley height adjustment

3-5. REC/PB SWITCH LEVER POSITION ADJUSTMENT (See Fig. 3-2 and 3-6)

1. Place the equipment in the STOP mode.
2. Loosen the two adjusting screws securing the rec/pb switch lever ass'y.
3. Set the rec/pb switch to PB position.
4. Move the rec/pb switch lever ass'y in the direction shown by the arrows so that the switch lever ass'y contacts with the rec/pb switch.

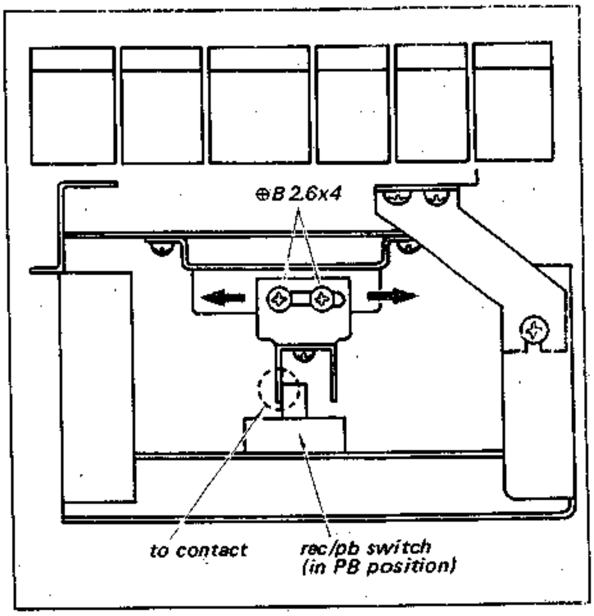


Fig. 3-6. Rec/pb switch lever position adjustment

3-6. OPERATIONAL CHECKS AFTER ADJUSTMENT

1. Pushbutton Operation Check

1) In the STOP mode, all the buttons except EJECT button can be pressed and locked individually.
2) In the FF mode, all the buttons except the REC button can be pressed individually.
3) In the REW mode, all the buttons except the REC button can be pressed individually.
4) In the FWD mode, all the buttons except the REC and EJECT buttons can be pressed individually.
5) In the REC mode, all the buttons except the EJECT button can be pressed individually.
6) In the FWD mode or REC mode, the cassette lid can be opened by pressing the EJECT button.

2. Torque Check

Each torque should meet the following value.

FWD torque	40 to 60 g·cm (0.56 to 0.85 oz·inch)
REW torque	60 to 150 g·cm (0.85 to 2.0 oz·inch)
FF torque	60 to 150 g·cm (0.85 to 2.0 oz·inch)

Note: If the proper reading is not obtained, all mechanism related to take-up motion such as the friction pulley assembly, capstan drive belt, drive-motor and take-up reel table assembly, should be checked and replaced.

3. Pinch Roller Pressure Check

The pinch roller is forced against the capstan by the action of pressure spring.
Insufficient pressure may cause slippage on the capstan while excessive pressure throws an unnecessary load on the capstan bearing causing speed reduction.
Pinch roller pressure should be maintained within the recommended value.

1) In the FWD mode, attach a spring scale to the pinch roller as shown in Fig. 3-7.
2) Take a reading only when the pinch roller is pulled backward by the spring scale and then start to return towards the capstan, because the force required to overcome the static friction will produce a false and excessively high initial readings.
3) The readings should be 280 to 360 g (0.6 to 0.79 oz.). If not, check and replace the pinch roller ass'y.

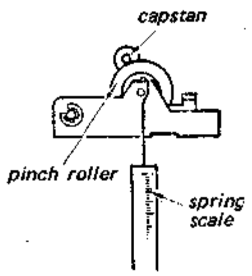


Fig. 3-7. Pinch roller pressure check

4. Cleaning

After completing the adjustments, make sure to clean the following parts with a soft cloth moistened with denatured alcohol.
belts, idlers, rubber rims of reel tables, pinch roller, capstan

SECTION 4
ELECTRICAL ADJUSTMENT

CAUTION

1. Always connect the main chassis and the cassette deck chassis electrically when performing electrical adjustments.
2. Perform head cleaning and demagnetizing procedures before starting electrical adjustments.
3. After replacing the REC/PB head electrical adjustments should be performed in the following sequence:
   (1) Head azimuth adjustment
   (2) Playback level adjustment
   (3) Record bias adjustment
   (4) AGC balance adjustment

4-1. TEST EQUIPMENT AND TOOLS REQUIRED

1. SONY alignment tapes
   P-4-A81 (6.3 kHz, -10 dB) . . . . Head azimuth adj.
   P-4-L81 (333 Hz, 0 dB) . . . . Playback level adj.
   SPC-4 (1 kHz) . . . . Tape speed adj.
2. Audio oscillator
3. Attenuator, 600 ohms unbalanced
4. Ac VTVM or Level Meter
5. 600 ohm and 100 kΩ resistors, ¼ watt
6. Connecting cord
7. Screwdriver, 3 mm blade
8. Frequency counter

4-2. TAPE SPEED ADJUSTMENT

1. With the equipment connected as shown in Fig. 4-1, play back the beginning and the end portions of the SONY alignment tape SPC-4.
2. Measure the frequency through the LINE OUT jack by using a digital frequency counter. The reading should be met the following specifications.

Specifications

Frequency range: 970 to 1,030 Hz
Difference between the beginning and the end: Within 10 Hz
If not, replace the motor pulley with one of those in the following table.

Motor Pulley

Part No.	Identification	Tape Speed
3-489-117-01	no groove	slower (−2%)
3-489-117-31	three grooves	slower (−1%)
3-489-117-11	one groove	standard
3-489-117-21	two grooves	faster (+2%)

Note: After replacing the motor pulley, adjust the Motor Pulley Height as described in Procedure 3-4 on page 48.

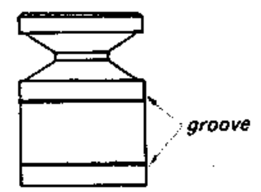


Fig. 4-2. Motor pulley

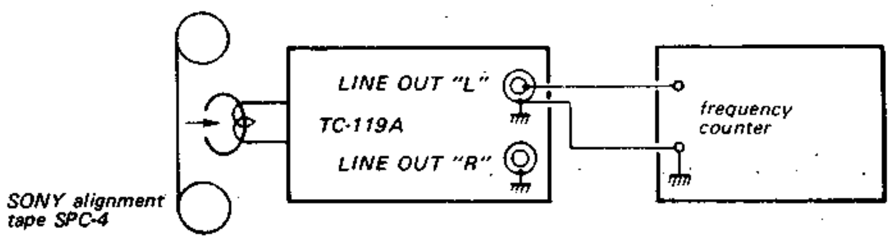


Fig. 4-1. Tape speed adjustment test setup

4-3. HEAD AZIMUTH ADJUSTMENT

1. With the equipment connected as shown in Fig. 4-3, play back the SONY alignment tape P-4-AS1.
2. Adjust the azimuth adjusting screw (see Fig. 4-4) for maximum output on the ac VTVM.

Note: If the maximum output points of both channel's do not coincide, readjust the adjusting screw for minimum difference between left- and right-channel output. If the head azimuth is far out of alignment, minor peaks may observed before maximum peak as shown in Fig. 4-5. The proper setting is the higher of the two peaks.

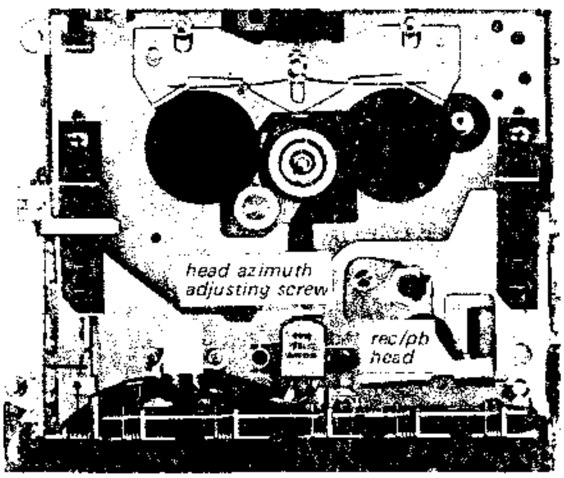


Fig. 4-4. Adjusting parts location

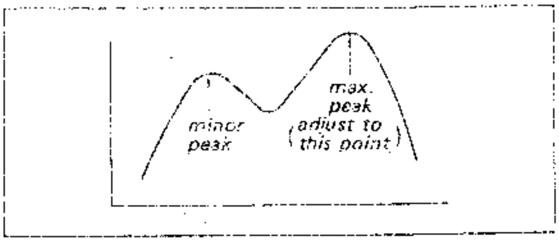


Fig. 4-5. Output response of azimuth adjustment

4-4. PLAYBACK LEVEL ADJUSTMENT

1. With the equipment connected as shown in Fig. 4-3, play back the SONY alignment tape P-4-L81.
2. Measure the L-CH output level. This should be +2 dB±1.5 dB (0 dB = 0.775 volt). If not, check and repair the preamplifier and flat amplifier.
3. Check the output level of R-CH, adjust semifixed resistor RV202 (see Fig. 4-6) to obtain the same output level as in the L-CH.

4-5. RECORD BIAS ADJUSTMENT

1. With the equipment connected as shown in Fig. 4-8, record the 1 kHz and the 6.3 kHz signals of −90 dB (7.7 μV) through the MIC jack.
2. Play back the recorded signals and measure the output levels of the two signals.
   The 6.3 kHz signal should be within 3 dB referred to the 1 kHz signal.

Note: The difference between channels should be also within 3 dB.

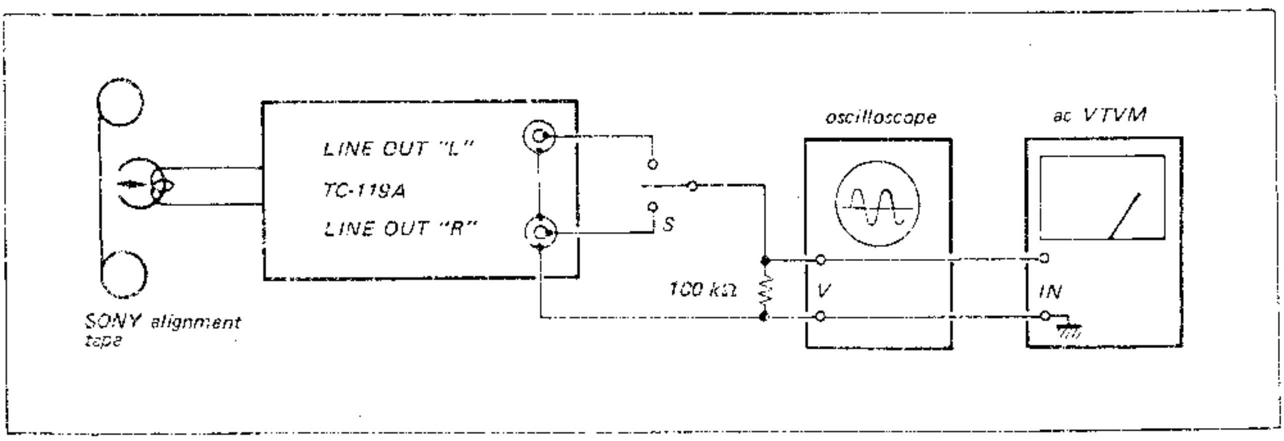


Fig. 4-3. Head-azimuth adjustment and playback-level adjustment test setup

If not, change the value of bias capacitor by bridging the patterns on the printed circuit board as follows (See Fig. 4-7):

(a) In case the output level of 6.3 kHz is higher than that of 1 kHz, increase the capacitance value.

(b) In case the output level of 6.3 kHz is lower than that of 1 kHz, decrease the capacitance value.

L-CH: C122 ~ C124
R-CH: C222 ~ C224

Fig. 4-6. Adjusting parts location

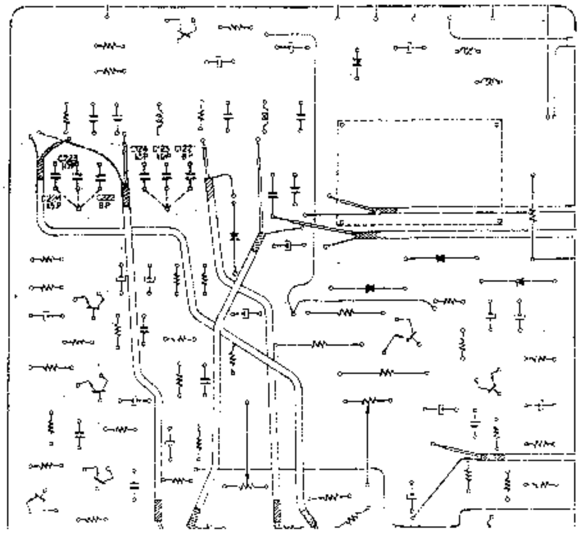


Fig. 4-7. Record bias adjustment

4-6. AGC BALANCE ADJUSTMENT

Note: This adjustment should be performed after completing playback level adjustment.

1. With the equipment connected as shown in Fig. 4-8, record a 1 kHz, −50 dB (2.4 mV) signal, and then play it back.
2. Confirm that both channel output levels are within the limit of 4±1 dB and the channel difference should be 0.5 dB or less. If not, adjust the semifixed resistor RV301 (see Fig. 4-6) to obtain the same output voltage from each channel.

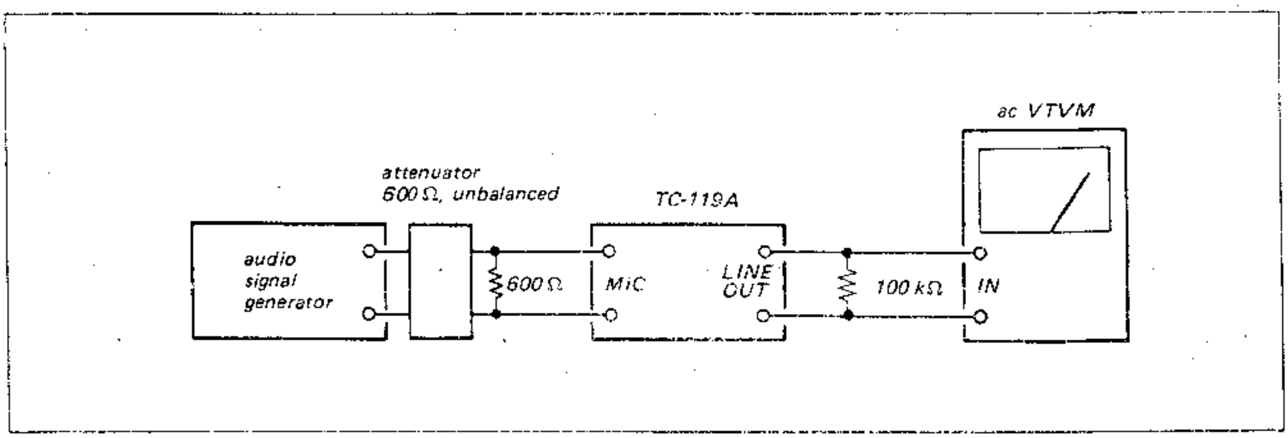
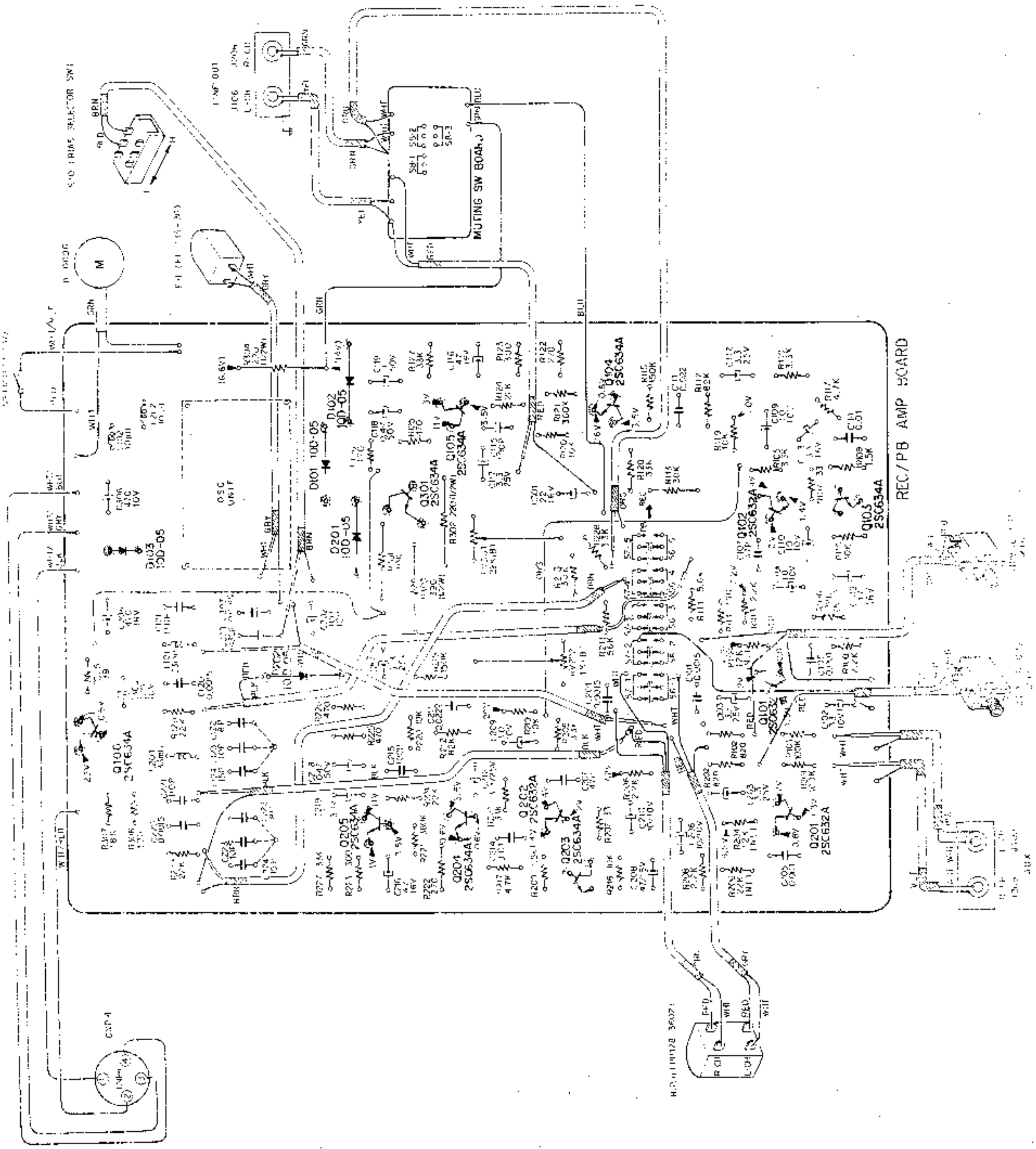


Fig. 4-8. Agc balance adjustment test setup

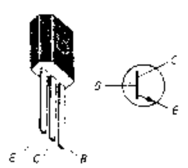
MEMO

SECTION 5
DIAGRAMS

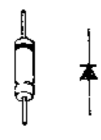
5-1. MOUNTING DIAGRAM -- REC/PB Amplifier Section --



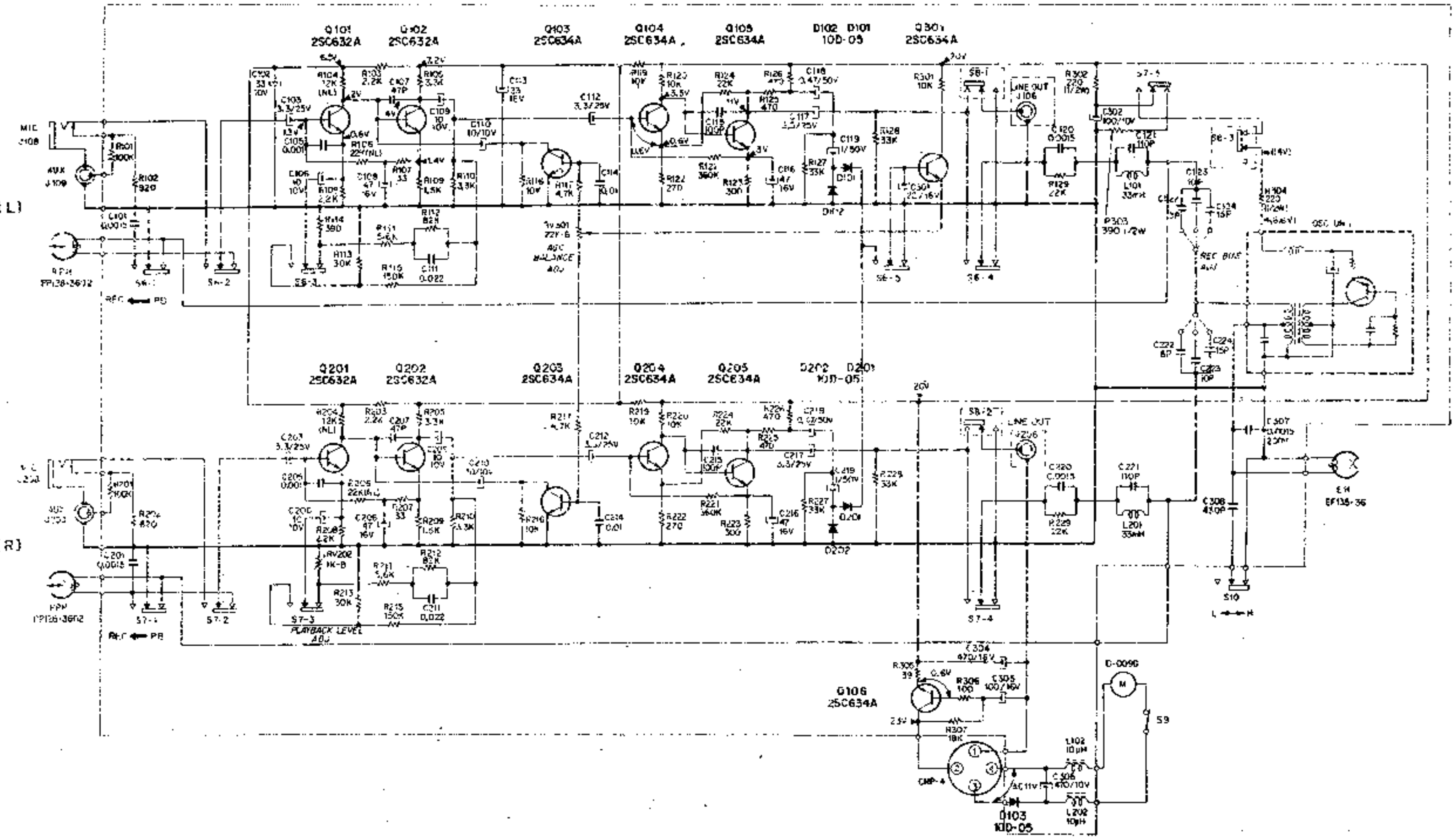
2SC632A
2SC634A



10D-05



5-2. SCHEMATIC DIAGRAM – REC/PB Amplifier Section –



Ref. No.	Description	Position
S6, 7	REC/PB Switch (REC-PB)	PB
S8	Muting Switch	FWD
S9	Motor Switch	ON
S10	Bias Selector Switch	H

Note:

All resistance values are in ohms. k = 1,000, M = 1,000k

All capacitance values are in μF except as indicated with p, which means μμF.

All voltages represent an average value and should hold within ±20%.

All voltages are dc measured with a VOM which has an input impedance of 20k ohms/volt. No signal in.

Voltages in ( ) are measured in record mode.

SECTION 6
EXPLODED VIEWS

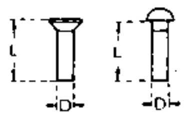
(1) The following chart will help you to decipher the hardware codes given in the exploded view.

– 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 –

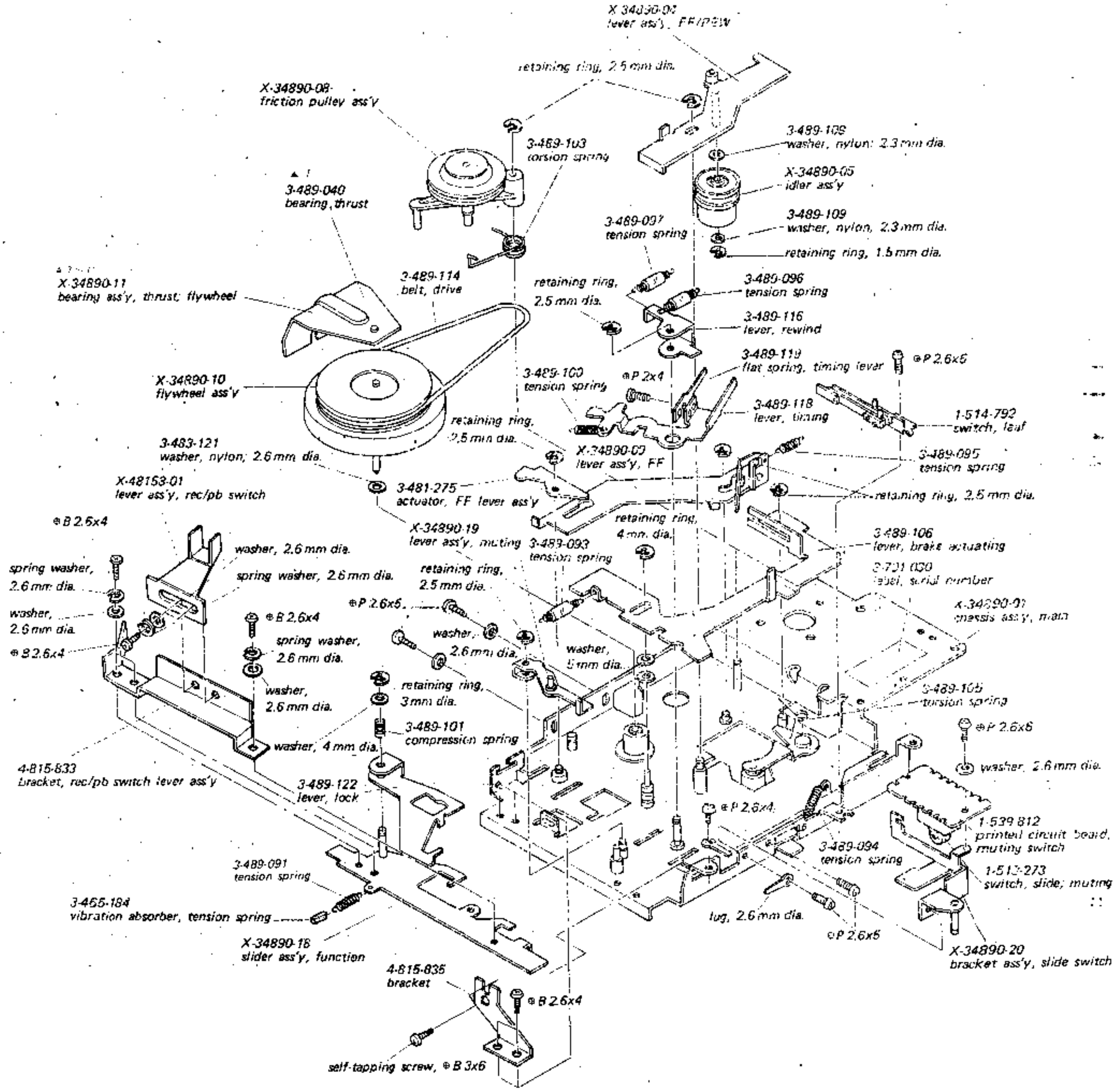
⊕ P 3×10
- Type of Slot
- Length in mm (L)
- Diameter in mm (D)
- Type of Head



(2) To simplify the exploded view, the part numbers of normal screws, nuts, washers, and retaining rings are not expressed but summarized in the table below.

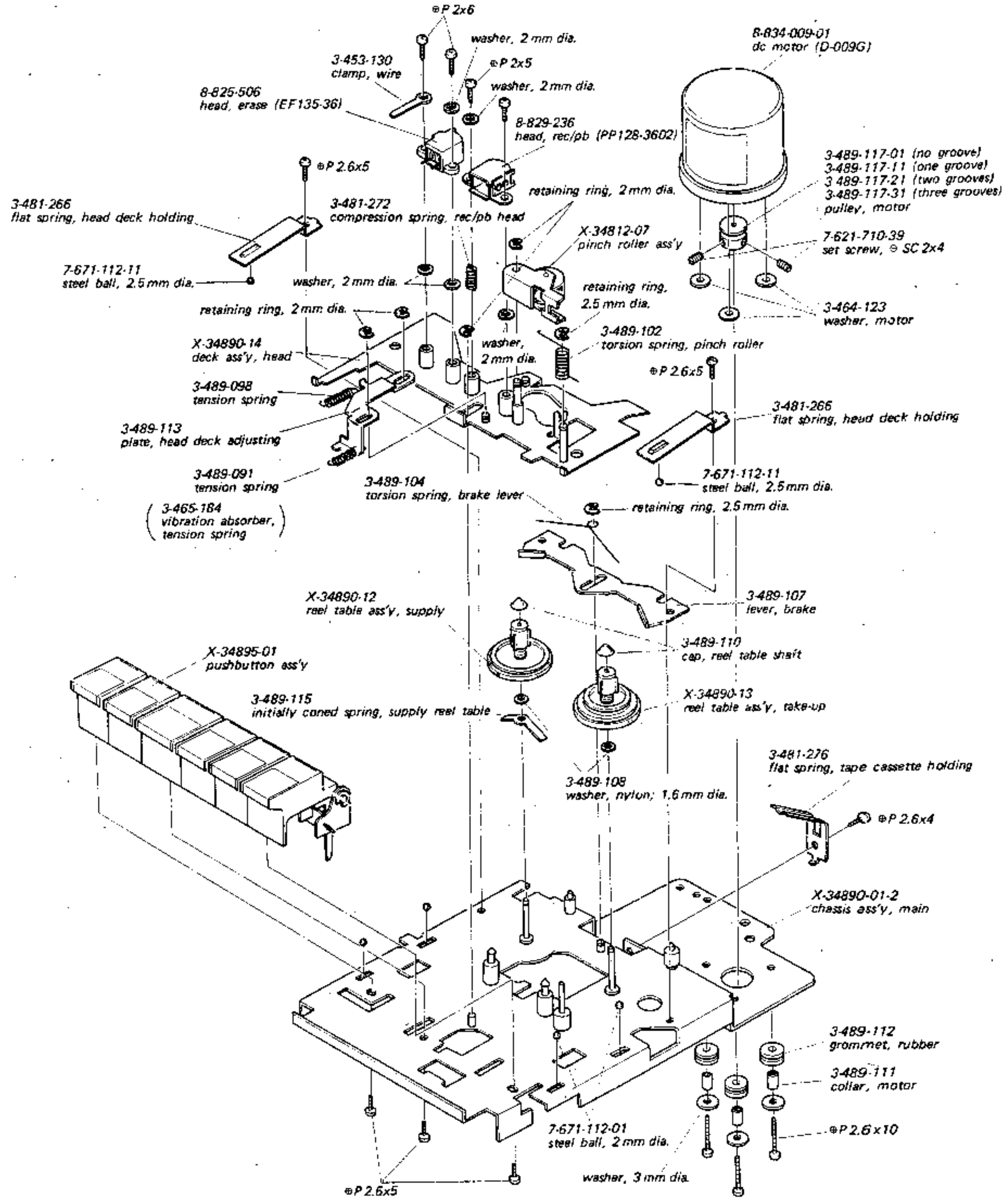
Part No.	*Description*
7-621-255-25	screw, ⊕ P 2 x 4
7-621-255-45	screw, ⊕ P 2 x 6
7-621-259-25	screw, ⊕ P 2.6 x 4
7-621-259-35	screw, ⊕ P 2.6 x 5
7-621-259-45	screw, ⊕ P 2.6 x 6
7-621-259-65	screw, ⊕ P 2.6 x 10
7-621-305-35	screw, set; ⊖ SC 2 x 5
7-621-710-39	screw, set; ⊖ SC 2 x 4
7-623-105-02	washer, flat; 2 mm dia. (small)
7-623-105-12	washer, flat; 2 mm dia. (middle)
7-623-107-02	washer, flat; 2.6 mm dia. (small)
7-623-107-12	washer, flat; 2.6 mm dia. (middle)
7-623-110-02	washer, flat; 4 mm dia. (small)
7-623-112-12	washer, flat; 5 mm dia. (t = 0.8 mm)
7-623-112-18	washer, flat; 5 mm dia. (t = 0.4 mm)
7-623-205-22	washer, spring; 2 mm dia.
7-623-207-22	washer, spring; 2.6 mm dia.
7-624-102-01	ring, retaining; 1.5 mm dia.
7-624-104-01	ring, retaining; 2 mm dia.
7-624-106-01	ring, retaining; 3 mm dia.
7-624-108-01	ring, retaining; 4 mm dia.
7-624-118-01	ring, retaining; 2.5 mm dia.
7-671-112-01	ball, steel; 2 mm dia.
7-671-112-11	ball, steel; 2.5 mm dia.

(1)

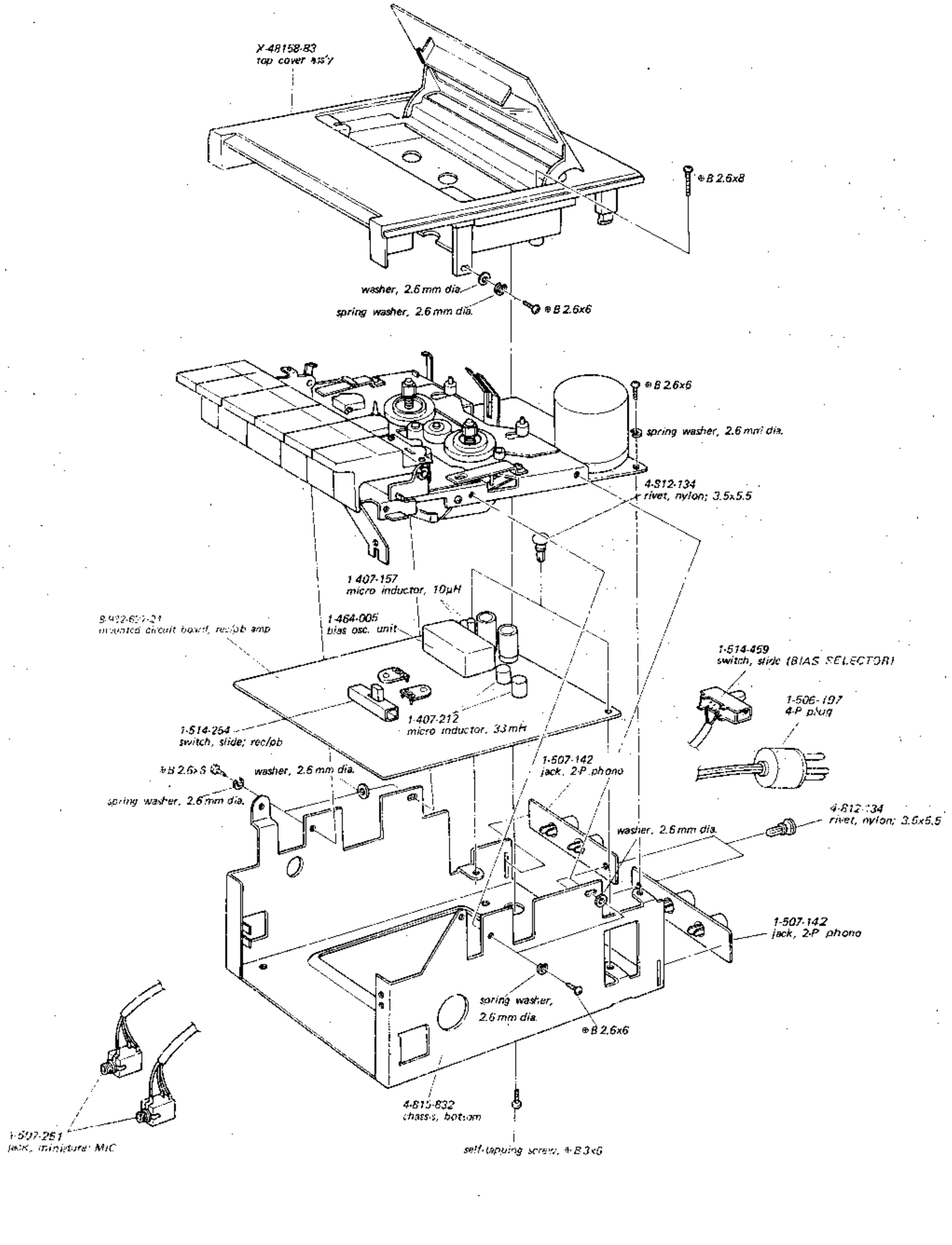


Note: ▲ 1 ~ 1 flywheel thrust bearing ass'y (X-34890-11) includes all the parts marked ▲ .

(2)


⊕P 2x6
washer, 2 mm dia.
3-453-130
clamp, wire
⊕P 2x5
washer, 2 mm dia.
8-825-506
head, erase (EF135-36)
8-829-236
head, rec/pb (PP128-3602)
8-834-009-01
dc motor (D-009G)
⊕P 2.6x5
3-481-266
flat spring, head deck holding
3-481-272
compression spring, rec/pb head
retaining ring, 2 mm dia.
X-34812-07
pinch roller ass'y
3-489-117-01 (no groove)
3-489-117-11 (one groove)
3-489-117-21 (two grooves)
3-489-117-31 (three grooves)
pulley, motor
7-621-710-39
set screw, ⊖ SC 2x4
7-671-112-11
steel ball, 2.5 mm dia.
washer, 2 mm dia.
retaining ring, 2.5 mm dia.
3-464-123
washer, motor
retaining ring, 2 mm dia.
3-489-102
torsion spring, pinch roller
X-34890-14
deck ass'y, head
washer, 2 mm dia.
⊕P 2.6x5
3-489-098
tension spring
3-481-266
flat spring, head deck holding
3-489-113
plate, head deck adjusting
3-489-091
tension spring
3-489-104
torsion spring, brake lever
7-671-112-11
steel ball, 2.5 mm dia.
retaining ring, 2.5 mm dia.
3-465-184
vibration absorber,
tension spring
X-34890-12
reel table ass'y, supply
3-489-107
lever, brake
3-489-110
cap, reel table shaft
X-34895-01
pushbutton ass'y
X-34890-13
reel table ass'y, take-up
3-489-115
initially coned spring, supply reel table
3-481-276
flat spring, tape cassette holding
3-489-108
washer, nylon; 1.6 mm dia.
⊕P 2.6x4
X-34890-01-2
chassis ass'y, main
3-489-112
grommet, rubber
3-489-111
collar, motor
⊕P 2.6x10
7-671-112-01
steel ball, 2 mm dia.
washer, 3 mm dia.
⊕P 2.6x5

(3)


X-48158-83
top cover ass'y
⊕B 2.6x8
washer, 2.6 mm dia.
spring washer, 2.6 mm dia.
⊕B 2.6x6
⊕B 2.6x6
spring washer, 2.6 mm dia.
4-812-134
rivet, nylon; 3.5x5.5
1-407-157
micro inductor, 10μH
1-464-005
bias osc. unit
mounted circuit board, rec/pb amp
1-514-459
switch, slide (BIAS SELECTOR)
1-506-197
4-P plug
1-514-264
switch, slide; rec/pb
1-407-212
micro inductor, 33mH
1-507-142
jack, 2-P phono
washer, 2.6 mm dia.
spring washer, 2.6 mm dia.
4-812-134
rivet, nylon; 3.5x5.5
washer, 2.6 mm dia.
1-507-142
jack, 2-P phono
spring washer,
2.6 mm dia.
⊕B 2.6x6
4-815-832
chassis, bottom
1-507-251
jack, miniature MIC
self-tapping screw, ⊕B 3x6

SECTION 7
ELECTRICAL PARTS LIST

MOUNTED CIRCUIT BOARD

Ref No.	Part No.	Description
	8-982-627-24	record/playback amp

SEMICONDUCTORS

Ref No.	Part No.	Description
D101 (D201)		diode, 10D-05
D102 (D202)		diode, 10D-05
D103		diode, 10D-05
Q101 (Q201)		transistor, 2SC632A
Q102 (Q202)		transistor, 2SC632A
Q103 (Q203)		transistor, 2SC634A
Q104 (Q204)		transistor, 2SC634A
Q105 (Q205)		transistor, 2SC634A
Q106		transistor, 2SC634A
Q301		transistor, 2SC634A

CAPACITORS

All capacitance values are in μF except as indicated with p, which means μμF.

Ref No.	Part No.	Description
C101 (C201)	1-105-663-12	0.0015 μF ±10% 50 V mylar
C102	1-121-402	33 μF $^{+100}_{-10}$% 10 V electrolytic
C103 (C203)	1-121-392	3.3 μF $^{+150}_{-10}$% 25 V electrolytic
C104 (C204)	———	
C105 (C205)	1-105-661-12	0.001 μF ±10% 50 V mylar
C106 (C206)	1-121-469	10 μF $^{+100}_{-10}$% 10 V electrolytic
C107 (C207)	1-101-881	47 pF ±10% 50 V ceramic
C108 (C208)	1-121-409	47 μF $^{+100}_{-10}$% 16 V electrolytic
C109 (C209)	1-121-469	10 μF $^{+100}_{-10}$% 10 V electrolytic
C110 (C210)	———	
C111 (C211)	1-105-677-12	0.022 μF ±10% 50 V mylar
C112 (C212)	1-121-392	3.3 μF $^{+150}_{-10}$% 25 V electrolytic
C113	1-121-403	33 μF $^{+100}_{-10}$% 16 V electrolytic
C114 (C214)	1-105-673-12	0.01 μF ±10% 50 V mylar
C115 (C215)	1-101-975	100 pF ±10% 50 V ceramic
C116 (C216)	1-121-409	47 μF $^{+100}_{-10}$% 16 V electrolytic
C117 (C217)	1-121-392	3.3 μF $^{+150}_{-10}$% 25 V electrolytic
C118 (C218)	1-121-726	0.47 μF $^{+150}_{-10}$% 50 V electrolytic
C119 (C219)	1-121-391	1 μF $^{+150}_{-10}$% 50 V electrolytic
C120 (C220)	1-105-663-12	0.0015 μF ±10% 50 V mylar
C121 (C221)	1-102-815	110 pF ±5% 50 V ceramic
C122 (C222)	1-102-810	8 pF ±1 pF 50 V ceramic
C123 (C223)	1-102-954	10 pF ±10% 50 V ceramic
C124 (C224)	1-102-956	15 pF ±10% 50 V ceramic
C301	1-121-511	22 μF $^{+100}_{-10}$% 16 V electrolytic
C302	1-121-414	100 μF $^{+100}_{-10}$% 10 V electrolytic
C303	1-105-743-12	0.0015 μF ±10% 200 V mylar
C304	1-121-426	470 μF $^{+100}_{-10}$% 16 V electrolytic
C305	1-121-415	100 μF $^{+100}_{-10}$% 16 V electrolytic
C306	1-121-425	470 μF $^{+100}_{-10}$% 10 V electrolytic
C307	1-105-743-12	0.0015 μF ±10% 200 V mylar
C308	1-107-200	430 pF ±10% 500 V silvered mica

RESISTORS

All resistors are in ohms, ±5%, ¼W and carbon type unless otherwise indicated.

Ref No.	Part No.	Description
R101 (R201)	1-242-721	100 kΩ
R102 (R202)	1-242-671	820 Ω
R103 (R203)	1-242-681	2.2 kΩ
R104 (R204)	1-242-699-09	12 kΩ, low noise
R105 (R205)	1-242-685	3.3 kΩ
R106 (R206)	1-242-705-09	22 kΩ, low noise
R107 (R207)	1-242-637	33 Ω
R108 (R208)	1-242-681	2.2 kΩ
R109 (R209)	1-242-677	1.5 kΩ
R110 (R210)	1-242-685	3.3 kΩ
R111 (R211)	1-242-691	5.6 kΩ
R112 (R212)	1-242-719	82 kΩ
R113 (R213)	1-242-708	30 kΩ
R114	1-242-663	390 Ω
R115 (R215)	1-242-725	150 kΩ
R116 (R216)	1-242-697	10 kΩ
R117 (R217)	1-242-689	4.7 kΩ
R118 (R218)		
R119 (R219)	1-242-697	10 kΩ
R120 (R220)	1-242-697	10 kΩ
R121 (R221)	1-242-734	360 kΩ
R122 (R222)	1-242-659	270 Ω
R123 (R223)	1-242-660	300 Ω
R124 (R224)	1-242-705	22 kΩ
R125 (R225)	1-242-665	470 Ω
R126 (R226)	1-242-665	470 Ω
R127 (R227)	1-242-709	33 kΩ
R128 (R228)	1-242-709	33 kΩ
R129 (R229)	1-242-705	22 kΩ
R301	1-242-697	10 kΩ
R302	1-202-557	220 Ω ½W composition
R303	1-202-563	390 Ω ½W composition
R304	1-202-557	220 Ω ½W composition
R305	1-242-639	39 Ω
R306	1-242-649	100 Ω
R307	1-242-703	18 kΩ
RV202	1-222-771	resistor, semifixed; 1 kΩ (B)
RV301	1-222-775	resistor, semifixed; 22 kΩ (B)

COILS

Ref No.	Part No.	Description
L101, L201	1-407-212	trap coil, 33 mH
L102, L202	1-407-157	choke coil, 10 μH

SWITCHES

Ref No.	Part No.	Description
S6, 7	1-514-254	slide, rec/pb
S8	1-513-273	slide, muting
S9	1-514-792	leaf, motor
S10	1-514-459	slide, bias selector

Ref. No.	Part No.	Description
		MISCELLANEOUS
CNP4	1-506-197	4-P connector
J106 (J206)	1-507-142	jack, 2-P phono; LINE OUT
J108 (J208)	1-507-251	jack, miniature; MIC
J109 (J209)	1-507-142	jack, 2-P phono; AUX IN
RPH	8-829-236	head, rec/pb (PP128-3602)
EH	8-825-506	head, erase (EF135-36)
M	8-834-009-01	dc motor (D-009G)
OSC UNIT	1-464-005	bias oscillator unit
	1-539-812	printed circuit board, muting