ISO
Set using ISO screws

ST-5140

GEP and NEP Model

SONY®

SERVICE MANUAL

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SECTION 1
TECHNICAL DESCRIPTION

1-1. TECHNICAL SPECIFICATIONS

Technical specifications for the ST-5140 are given in Table 1-1.

TABLE 1-1. TECHNICAL SPECIFICATIONS

FM Tuner Section

Antenna:	300 ohms balanced 75 ohms unbalanced
Tuning range:	87.5 to 108 MHz
Sensitivity:	1.8 μV (IHF usable sensitivity) 1.5 μV (S/N 30 dB)
S/N ratio:	70 dB
Capture ratio:	1.0 dB
Selectivity:	80 dB
Image rejection:	75 dB
I-f rejection	90 dB
Spurious rejection:	100 dB
A-m suppression:	56 dB
Frequency response:	20 Hz to 15 kHz ± 1 dB
Separation:	40 dB at 400 Hz
Harmonic distortion:	Mono: 0.2%, IHF (400 Hz 100% Mod) Stereo: 0.5%, IHF (400 Hz 100% Mod)
19 kHz, 38 kHz suppression:	60 dB
Muting level:	less than 5 μV

A-m Tuner Section

Antenna:	Built-in ferrite bar antenna with external antenna terminal
Tuning range:	530 to 1,605 kHz
Sensitivity:	50 dB/m, built-in antenna (S/N: 20 dB) 30 μV, external antenna
I-f rejection:	41 dB at 1,000 kHz
Harmonic distortion:	0.6%
Image rejection:	45 dB at 1,000 kHz
S/N ratio:	50 dB
Outputs:	FIXED 750 mV, 10 k VARIABLE: 0 ~ 2 V, 1.8 k MULTIPATH: 150 mV, 18 k (VERTICAL/HORIZONTAL)

General

Power consumption:	Approx. 15 watts
Power requirement:	100, 120, 220, 240 volts 50/60 Hz, ac
Dimensions:	400 mm (width) × 149 mm (height) × 344 mm (depth) 15 3/4"(width) × 5 7/8"(height) × 13 9/16"(depth)
Net weight:	7.5 kg (16 lb 8 oz)
Shipping weight:	10.1 kg (22 lb 4 oz)

1-2. CIRCUIT ANALYSIS DIGEST

The following description of newly-adapted or complicated circuits might help you in your repair work. Since stages are listed by transistor reference designation, refer to the schematic diagram on page 25 to 26.

1. Front End Section

(RF Amp)

Input signal is coupled to the rf amplifier Q101 through antenna tank circuit. MOS FET is employed in this stage as it has a low noise figure, wide dynamic range and large input impedance.

A double-tuned circuit is employed between the rf amplifier and mixer. This passive coupling circuit contains no active amplifiers, so it is perfectly linear and cannot produce distortion and overload components.

An automatic frequency control circuit is also incorporated in the oscillator circuit to eliminate frequency drift completely and the difficulty of exact tuning. Referring to Fig. 1-1, the principle of afc operation is as follows:

When the tuner is correctly tuned, the intermediate frequency is 10.7 MHz and no dc component is produced by the ratio detector as shown in the "S" curve response. So the voltage applied to diode D101 is determined solely by the positive fixed reverse bias voltage supplied by zener diode D102.

Now, assume that the local oscillator frequency changes by + Δf. This means that the new intermediate frequency is 10.7 MHz +Δf. See Fig. 1-1.

As the result, a positive dc component is fed back to the anode of D101, decreasing the reverse voltage to it, and making D101's barrier capacitance increase. This decreases the local oscillator's frequency, since the series circuit composed of C120 and D101 is connected in parallel with the tank circuit of the local oscillator. Conversely, if the local oscillator frequency decreases a negative dc voltage is fed back to D101 increasing the local oscillator frequency.

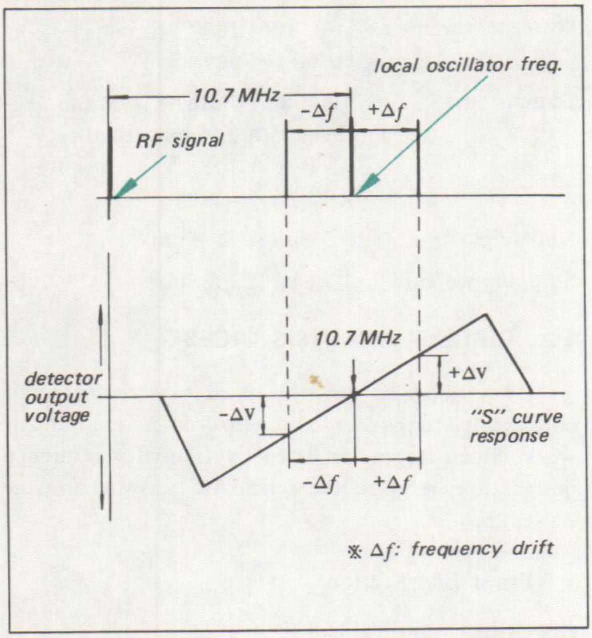


Fig. 1-1. Local oscillator's frequency drift and afc voltage relationship

2. FM I-F STRIP

(I-f Signal Detectors)

I-f signal is extracted from collector circuit of Q203 and Q204, and then fed to the rectifier/voltage doublers consisting of D214-D215 and D216-D217 respectively. (See Fig. 1-2)

Notice that they provide two dc outputs each of which is related to a transistor's operating point and input signal level. By using the output signal level difference at each transistor, these circuits act as an input level detector or an a-m component detector which is utilized for multipath display.

Notice that the rectified and combined dc voltage at this circuit is proportional to the r-f signal strength for all but very-strong input signals. Therefore, the filtered dc output voltage is used to drive TUNER INPUT meter M802. Note that RT202 calibrates the TUNER INPUT meter.

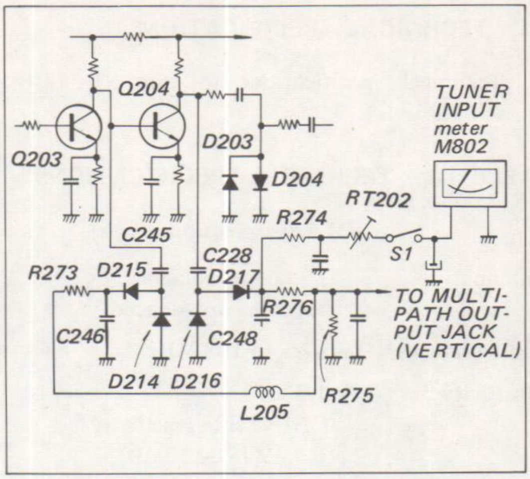


Fig. 1-2. I-f signal detectors

(Muting Circuit)

Referring to Fig. 1-3, it operates as follows:

The i-f signal is extracted from the output circuit of Q204 and fed to Q208 through C229. Q208 amplifies the extracted i-f signal large enough to drive voltage doubler D211 and D212 through tuned transformer T202. Note that D213 simply provides positive fixed bias to Q209 through D211 and D212.

T202 determines the bandwidth (about 150 kHz) necessary to control the muting circuit without generate interstation noise. The output of the voltage doubler is a positive dc voltage proportional to the carrier level of weak rf signals.

Q209 and Q210 form a switching circuit and drive switching transistor Q207 through MUTING switch S3.

Q209 is normally cut off, thus forcing Q210 into conduction. The collector of Q210 is connected to the gate of FET Q207 through MUTING switch S3.

FET Q207 acts as an electronic switch which is inserted between the ratio detector and MPX decoder, and is controlled by the applied gate voltage.

With the MUTING switch ON, fm signals of average strength keep Q209 saturated, thus cutting off Q210. This causes Q207 to conduct and maintain normal operation.

Weak stations and interstation noise cannot produce sufficient dc voltage at the base of Q209 to keep it conducting. As a result, Q209 is cut off. This saturates Q210 and cuts off Q207. Accordingly, the audio output is muted. With the MUTING switch OFF, Q207 is kept conducting regardless of the input signal since a positive bias voltage is applied to its gate. RT201 adjusts the muting level.

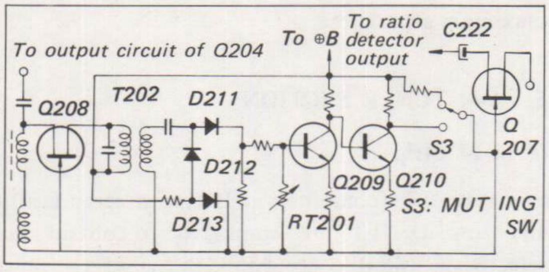


Fig. 1-3. Simplified muting circuit

(Fm TUNING Meter)

A center-zero meter assures correct tuning by utilizing the ratio detector's dc output characteristic.

As indicated in Fig. 1-1, no dc voltage is produced at the junction of R243 and R244, when the tuner is correctly tuned. Deflection on the meter indicates the amount of deviation from the carrier frequency. Note that the meter will also indicate zero-reading when the tuner is not receiving any off-the-air signal.

3. MULTIPATH OUTPUT

Multipath reception will be displayed on the CRT connecting the conventional oscilloscope or multipath indicator to these outputs. Multipath reception causes the increase in back-ground noise level, distortion at high frequency or stereo separation reduction. The a-m component of fm i-f signal detected by voltage doublers is extracted, and then applied to the VERTICAL terminal, while the audio signal is extracted from the ratio detector output, and fed to the HORIZONTAL terminal. Fig. 1-4 shows typical CRT displays.

Multipath reception will be corrected by using a directional fm antenna or coaxial cable. Rotating the antenna is very effective.

4. MPX DECODER SECTION

(STEREO Lamp Circuit)

The STEREO lamp lights when an fm-stereo signal is received. The emitter of Q402 is connected to the base Q403, which is normally cut off.

When a composite stereo signal is applied to the multiplex decoder, the 38-kHz pulses produced at the output of the frequency doubler yield a higher-average current flow through Q402. This forces Q403 into conduction, lighting the STEREO lamp PL7.

(Multiplex Demodulator)

T401 (switching transformer) and four diodes form a balanced bridge arrangement. This system has the advantage of cancelling residual rf components (38-kHz signal, some 19-kHz signal, and higher-order harmonics of these frequencies). Notice that the 38-kHz switching signal is transformer-coupled to the diode bridge to supply sampling drive for demodulator while a composite stereo signal is applied to the center tap of the secondary winding of T401.

"L" and "R" components are developed at each side of the bridge as the result of demodulation, see Fig. 1-5.

In the monaural mode, diodes D405 and D408 are forward biased by supply voltage through R405, STEREO lamp, R412, R414 and R413 so these diodes merely act as small resistances. Under this condition, the monaural signal is applied to both "L" and "R" audio amplifiers.

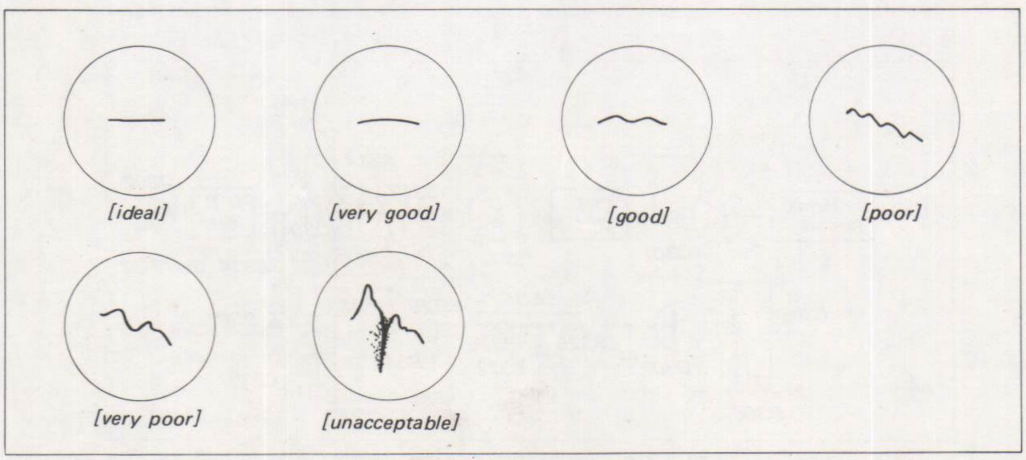


Fig. 1-4. Typical multipath display

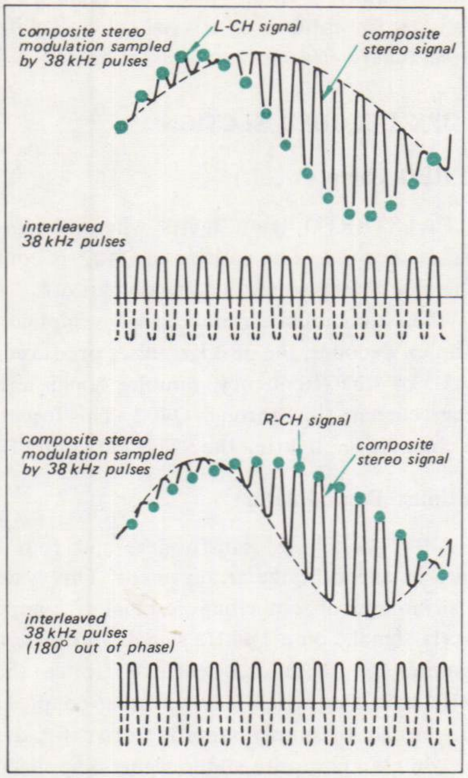


Fig. 1-5. Stereo demodulation operation

(Separation Adjustment Circuit)

The network that connects the emitters of Q404 and Q405 provides a form of negative feedback between left and right channels for fm stereo signals. Any residual "R" signal in the "L" channel (which is about 180° out of phase) is cancelled out by the "R" channel. The same is true of residual "L" signal in the "R" channel. RT401 is therefore set for maximum separation.

5. A-M TUNER SECTION

(A-m I-f Strip)

The CFT (combination IFT with ceramic filter) and low Q IFT are employed to obtain sharp selectivity (35 dB at 455 kHz ±10 kHz) causing superior spurious response.

Note that no adjustment is required on CFT and IFT in the field even if they are replaced.

(AGC Circuit)

There are two feedback loops ensuring proper agc operation. Referring to Fig. 1-6, it works as follows:

The a-m i-f signal is extracted from the collector circuit of Q304 through C314 and rectified by diode D301. The output of diode D301 is a positive dc voltage roughly proportional (not exactly due to agc action) to the carrier levels of the input signal. This is fed to the base circuit of Q304 through a filter circuit controlling the bias current of Q304 thereby its emitter voltage. The emitter voltage of Q304 is fed back to the base circuit of Q302 through filter circuit. As the Q302 is in series with the emitter resistor of mixer Q301, it controls the emitter current of Q301.

The emitter current vs hfe characteristic of Q301 is such that current gain (hfe) decrease due to current flow increase.

Thus a strong signal increases the current flow at the mixer stage, thereby decreasing the overall gain and vice versa.

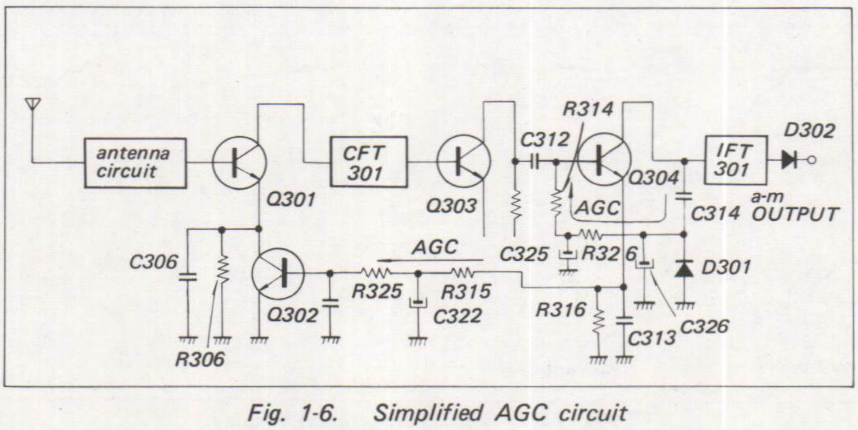
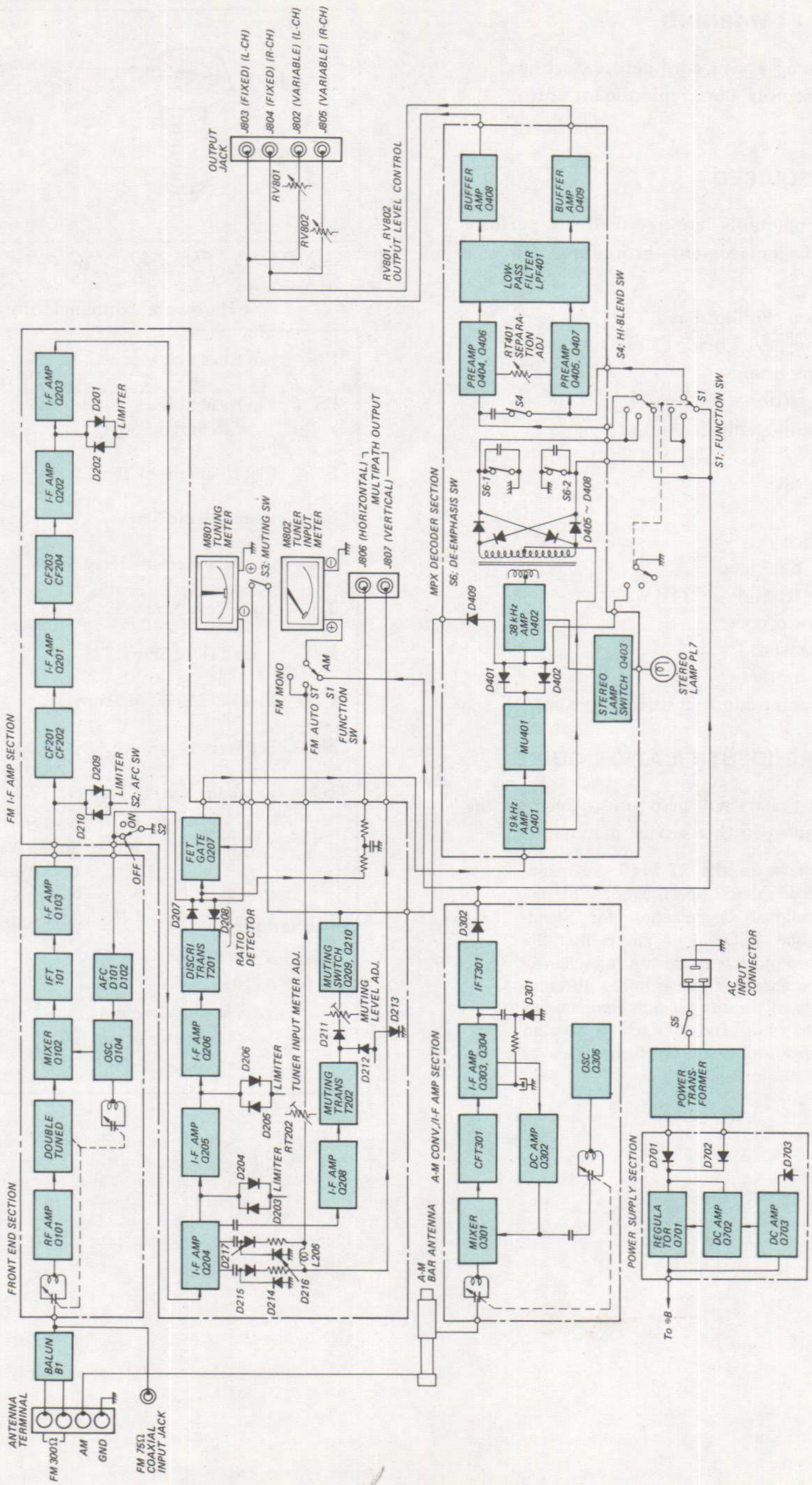


Fig. 1-6. Simplified AGC circuit

1-3. 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 ST-5140.

1. Screwdriver, Phillips-head
2. Screwdriver, 1/8″ blade (3 mm)
3. Pliers, long-nose
4. Diagonal cutters
5. Wrench, adjustable
6. Tweezers
7. Electric drill
8. Drill bits
9. Prick punch
10. Hammer, ball-peen
11. Soldering iron, 40 ~ 150 watts
12. Solder, rosin core
13. Cement solvent
14. Cement, contact
15. Thermal compound or silicone grease

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 ST-5140 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.

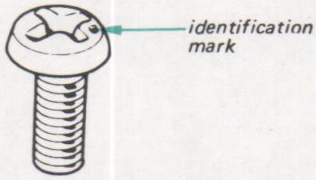


Fig. 2-1. ISO screw

– Hardware Nomenclature –

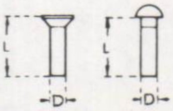
P	–	Pan Head Screw
PS	–	Pan Head Screw with Spring Washer
K	–	Flat Countersunk Head Screw
B	–	Binding Head Screw
RK	–	Oval Countersunk Head Screw
T	–	Truss Head Screw
R	–	Round Head Screw
F	–	Flat Fillister Head Screw
SC	–	Set Screw
E	–	Retaining Ring (E Washer)

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

– Example –

⊕ P 3×10

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



2-3. TOP COVER AND BOTTOM PLATE REMOVAL

1. Top cover can be freed by removing two machine screws at both sides.
2. Bottom plate can be freed by removing the five self-tapping screws as shown in Fig. 2-2.

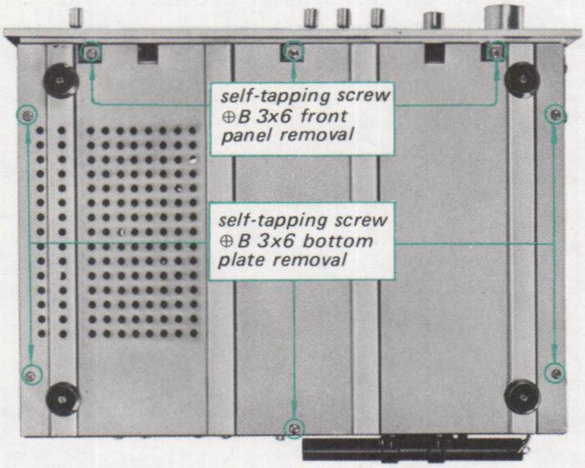


Fig. 2-2. Bottom view

2-4. FRONT PANEL REMOVAL

1. Remove all the control knobs by pulling them off.
2. Remove the three self-tapping screws at the front bottom of the chassis as shown in Fig. 2-2.
3. Remove the three screws securing the front panel to the front subchassis from the back as shown in Fig. 2-3. This frees the front panel.

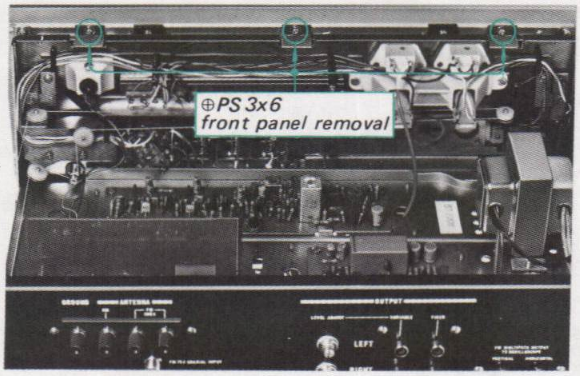


Fig. 2-3. Front panel removal

2-5. DIAL CORD RESTRINGING

Preparation

1. Cut a 1,700 mm (70 inch) length of 0.3 mm (1/64 inch) diameter dial cord.
2. Tie one end of the cord to the coil spring as shown in Fig. 2-4.
3. Rotate the tuning-capacitor drive drum fully clockwise (minimum capacitance position).

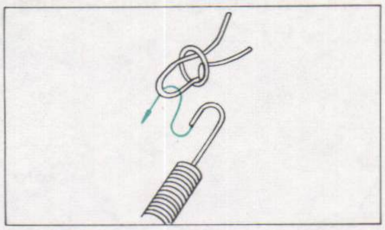


Fig. 2-4. Tying square knot to the coil spring

Procedure

While referring to Fig. 2-8, proceed as follows:

1. Hook the spring to one hole of the drum as shown in Fig. 2-5.

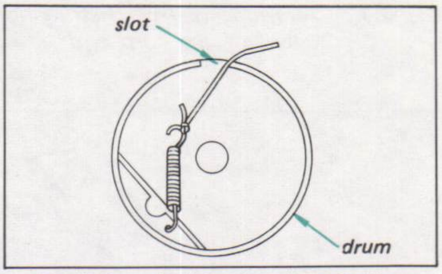


Fig. 2-5. Coil spring installation

2. Run the cord through the slot in the rim of the drum and wrap a clockwise turn as shown in Fig. 2-6.

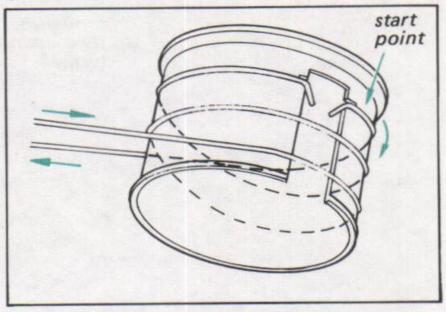


Fig. 2-6. Wrapping the dial cord

3. Run the cord over pulley "A", and then wrap two counterclockwise turns around the tuning shaft.

4. Run the cord over pulleys "B", "C" and "D", then wrap two clockwise turns around the drum from outer groove to inner groove as shown in Fig. 2-8.
5. Pass the doubled end of the cord through the eyelet, then hook it to the coil spring as shown in Fig. 2-8.
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. 2-7.
7. After completing the dial cord stringing, make sure that the tuning system works properly. Apply a drop of contact cement to the finish point.
8. Put the dial pointer on the cord as shown in Fig. 2-9, and then tune the set to the local fm station. Move the dial pointer to the position where the dial indication coincide with the local station's carrier frequency.
Apply a drop of contact cement to it.

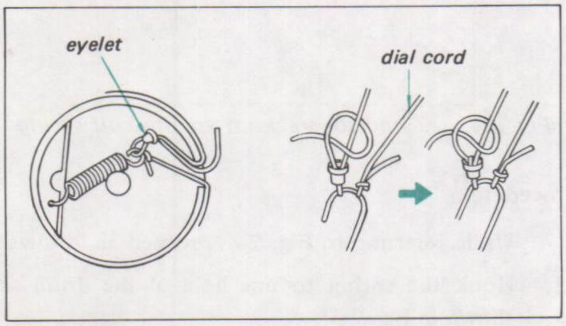


Fig. 2-7. Finishing dial cord stringing and detail of the cord end

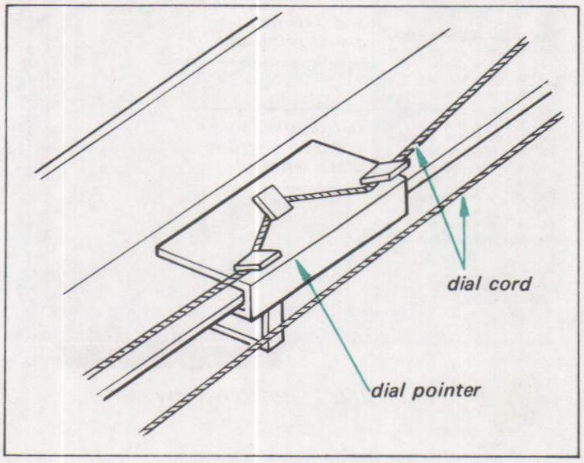


Fig. 2-9. Dial pointer installation

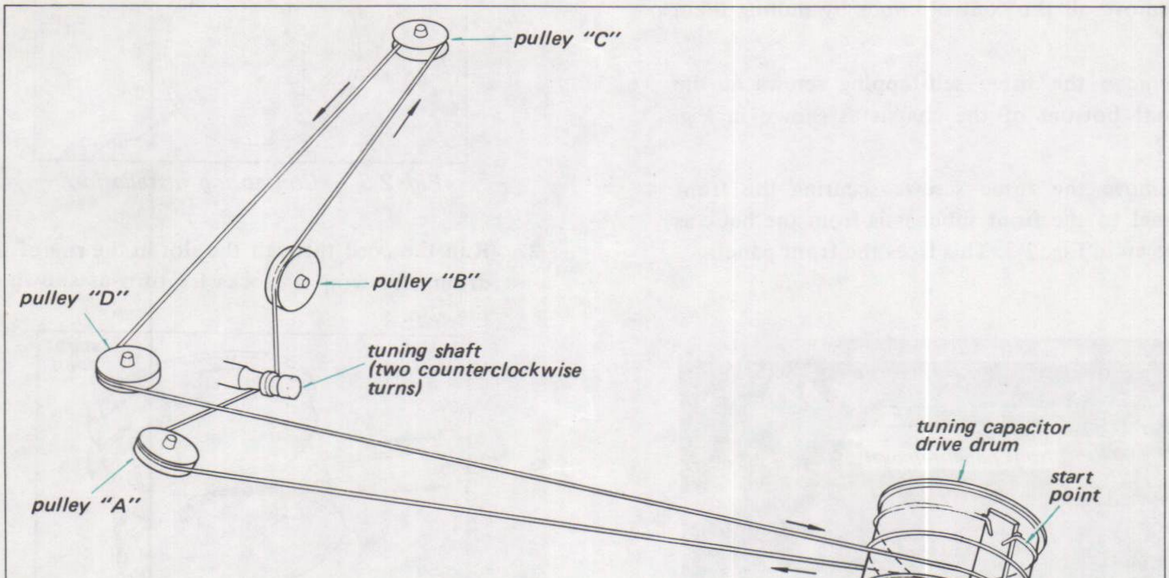


Fig. 2-8. Dial cord stringing

2-6. PILOT LAMP REPLACEMENT

Prepare for replacing any of the pilot lamps by removing the top cover as described in Procedure 2-3.

Stereo Lamp

1. Pull the lamp from its rubber holder.
2. Unsolder the defective lamp leads from the connecting terminals as shown in Fig. 2-10, and then install a new one.

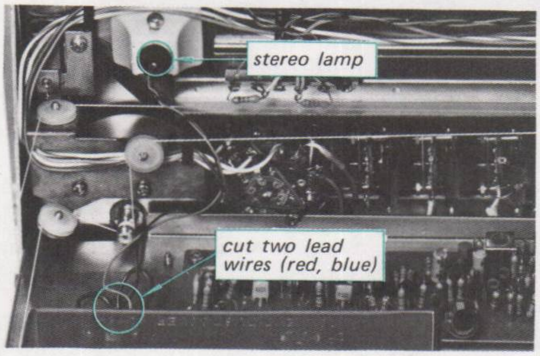


Fig. 2-10. Stereo lamp replacement

Meter Lamp

1. Remove the meter-lamp sockets by pulling them off, and then install the replacement lamp.

Dial Lamp

1. Remove the front panel as described in Procedure 2-4.
2. Pry out the defective dial lamp as you would a cartridge fuse.
3. Install the replacement dial lamp.

2-7. METER REPLACEMENT

1. Remove the two screws securing the meter lamp shade as shown in Fig. 2-11.
   This frees the shade and the meters.
2. Unsolder the leads from the defective meter, and then install a new one.

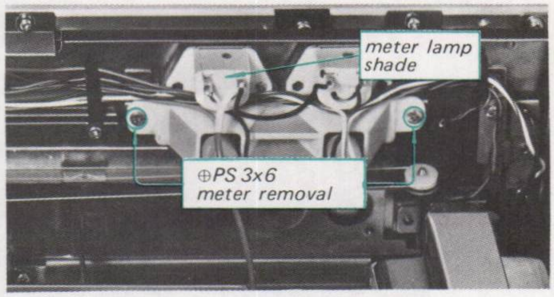


Fig. 2-11. Meter replacement

2-8. DIAL GLASS REPLACEMENT

1. Remove the front panel as described in Procedure 2-4.
2. Remove the six screws securing the dial glass holder to the dial glass escutcheon as shown in Fig. 2-12.
   This frees the dial glass.
3. Install the replacement dial glass.

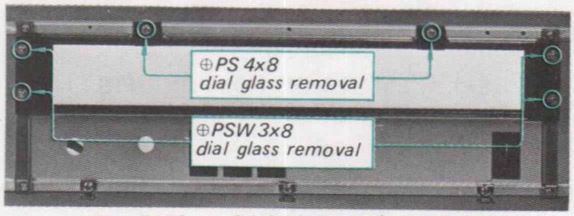


Fig. 2-12. Dial glass replacement

2-9. DIAL SCALE REPLACEMENT

1. Remove the front panel as described in Procedure 2-4.
2. Remove the screws securing the dial scale holder at both sides of the front subchassis as shown in Fig. 2-13. This frees the dial scale.
3. Install the replacement dial scale.

2-10. SWITCH AND CONTROL REPLACEMENT

Prepare for replacing any switches or controls by removing the front panel as described in Procedure 2-4.

1. Remove the hex nuts or the screws securing the defective components to the front subchassis as shown in Fig. 2-13.
2. Install the replacement components.

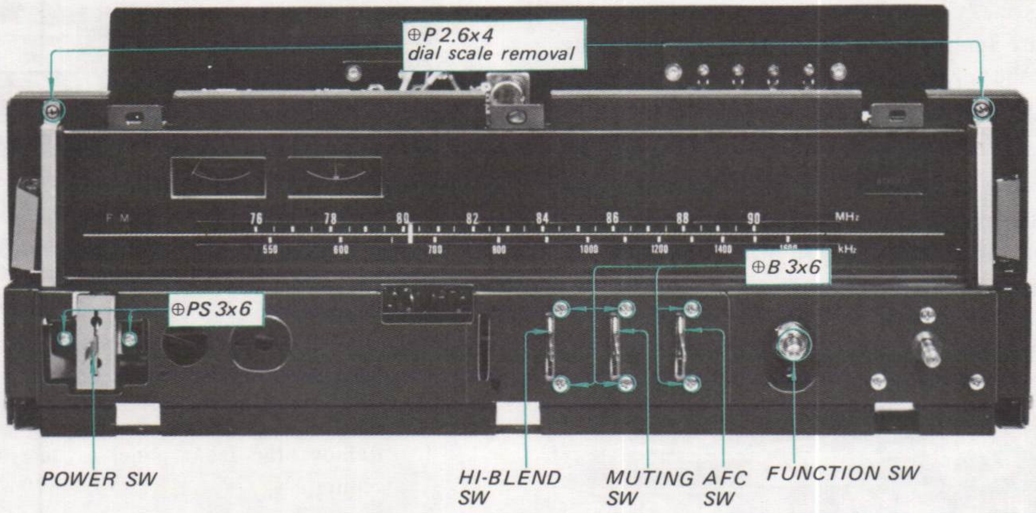


Fig. 2-13. Dial scale, switch and control replacement

2-11. REAR PANEL REMOVAL

1. Remove the two self-tapping screws at each side of the rear panel securing it to the chassis as shown in Fig. 2-14.

2-12. REPLACEMENT OF COMPONENTS SECURED TO THE REAR PANEL BY RIVETS

1. Remove the rear panel as described in Procedure 2-11.
2. Bore out the rivets using a drill bit slightly larger in diameter than the rivet. See Fig. 2-15.
3. Punch out the remainder of the rivet with a nail set or prick punch.
4. Remove the defective component, and then install a new one.
5. Secure the new component with a suitable screw and nut, or repair rivet screw (Part Number 3-701-402).

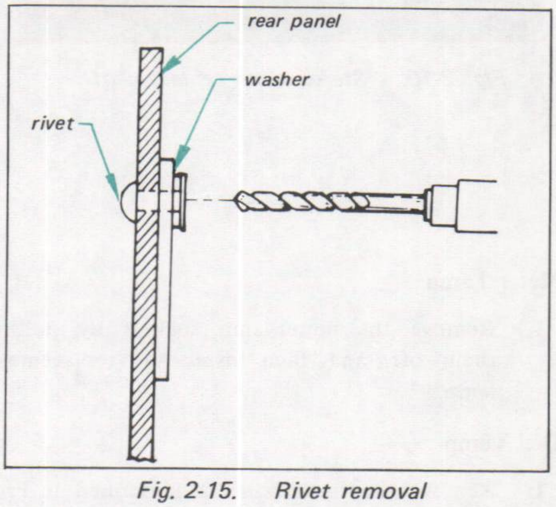


Fig. 2-15. Rivet removal

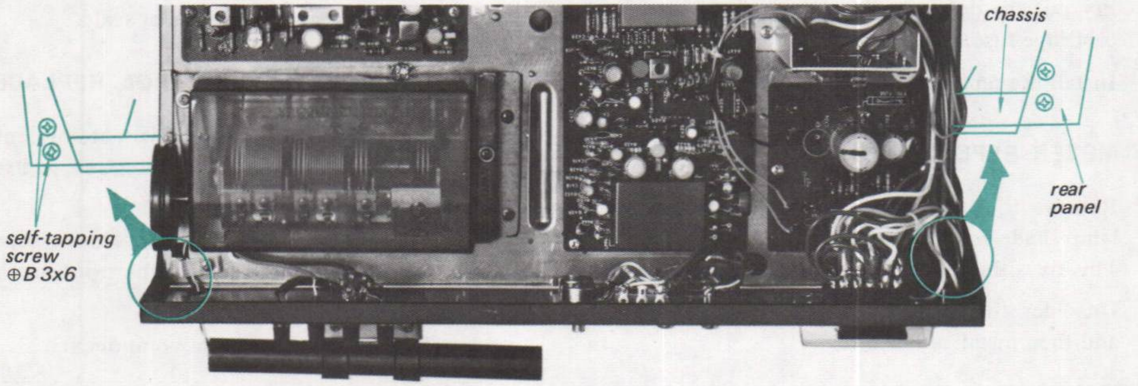
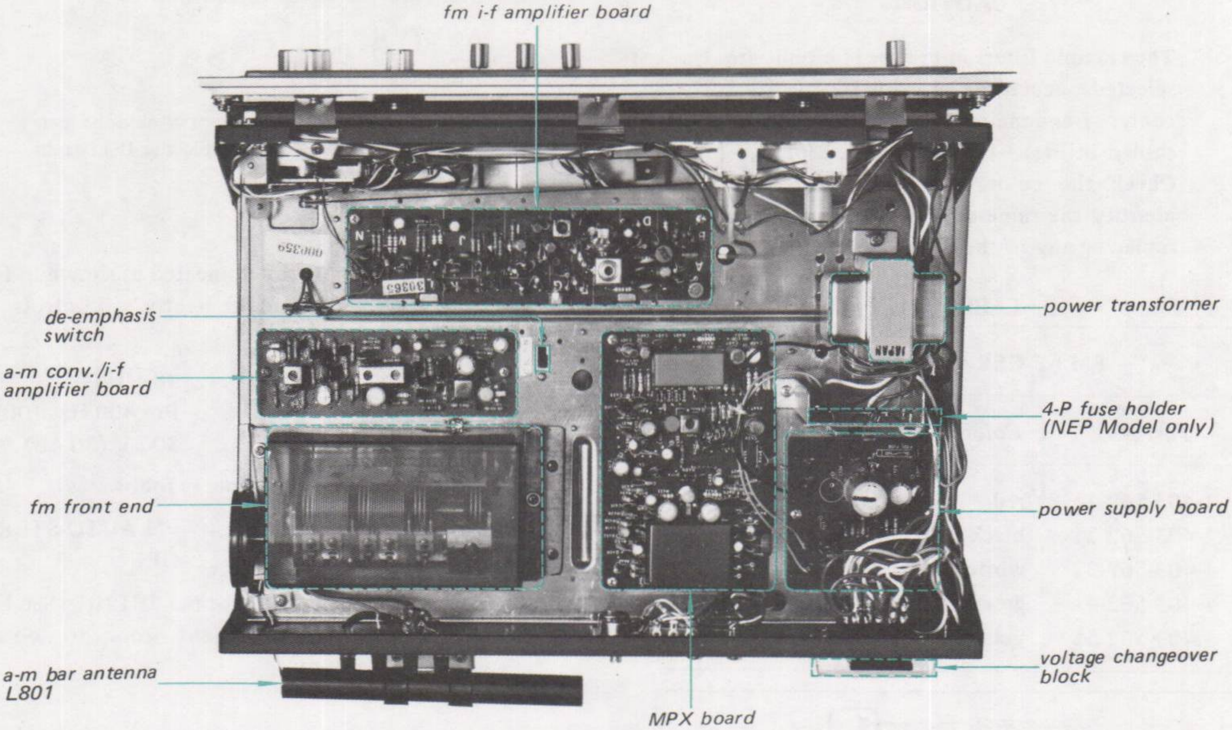


Fig. 2-14. Rear panel removal

2-13. CHASSIS LAYOUT



SECTION 3
ALIGNMENT AND ADJUSTMENT PROCEDURES

3-1. FM I-F STRIP 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

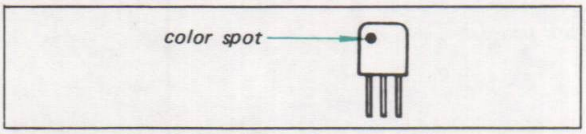


Fig. 3-1. Fm i-f ceramic filter

Test Equipment Required

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

Note: Fm i-f strip alignment should be performed only after replacing IFT101 in the front end.

Procedure

1. With the equipment connected as shown in Fig. 3-2, set the signal-generator's controls as follows:

   Carrier frequency .... 98 MHz
   Modulation .... Fm,400 Hz, 100%
   Output level .... 30 μV (30 dB)

2. Set the receiver's controls as follows:

   FUNCTION switch ...... FM AUTO STEREO
   AFC switch .... OFF

3. Turn the core of transformer IFT101 (See Fig. 3-5) with the alignment tool to obtain maximum output.

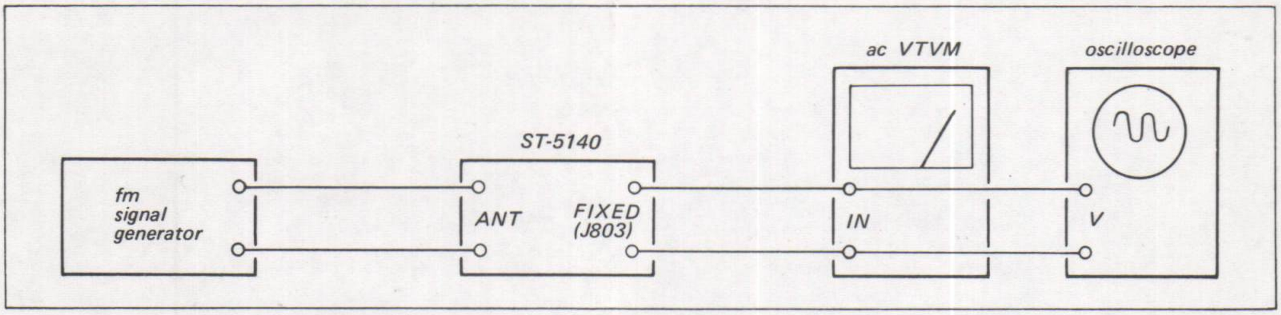


Fig. 3-2. I-f, muting and frequency coverage alignment test setup

3-2. FM DISCRIMINATOR ALIGNMENT

Note: There are two or three methods of discriminator alignment, but only the simplified method using the tuner's TUNING meter is described here.

Test Equipment Required

1. Oscilloscope
2. Alignment tools

Preparation

1. Remove the top cover as described in Procedure 2-3.
2. Connect the input cable of the oscilloscope to J803 (FIXED jack).

Procedure

1. With the equipment connected as shown in Fig. 3-3, set the tuner's control as follows:

   FUNCTION swtich ..... FM AUTO ST
   AFC switch .... OFF

   No signal should be received.

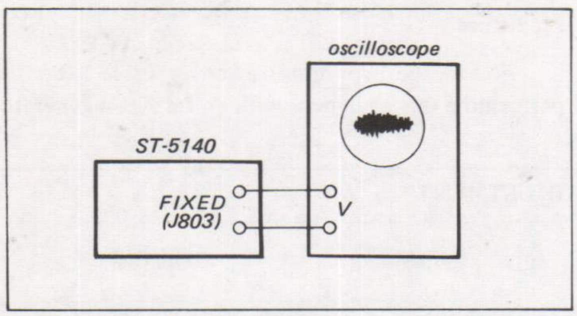


Fig. 3-3. Discriminator alignment test setup

2. Adjust the controls of the oscilloscope to provide a visible indication of noise.
   Always watch the oscilloscope to confirm that the tuner is not receiving any off-the-air signal.
3. Turn the top core (secondary side) of discriminator transformer T201 (see Fig. 3-4.) with a hex-head alignment tool to obtain a null-point reading on the tuning meter.
   If the discriminator transformer (T201) is not aligned correctly, some deviation on the tuning meter will be observed.

Note: Turn the core carefully and slowly. At both extreme positions of the top core, a null point will be observed. The real null point should be obtained in the middle of the core thread length.

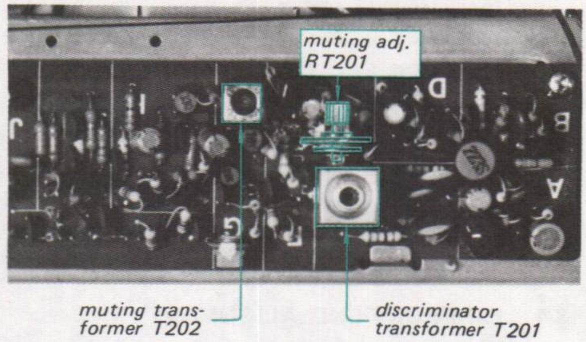


Fig. 3-4. Adjusting parts location

3-3. MUTING ADJUSTMENT

Note: Two methods of muting alignment are available, signal generator alignment and alignment by using an off-the-air signal. You can use either of them.

Signal Generator Alignment

Test Equipment Required

1. Fm standard signal generator
2. Ac VTVM or oscilloscope
3. Alignment tools

Preparation

1. Remove the top cover as described in Procedure 2-3.
2. Turn the knob of RT201 (see Fig. 3-4) fully clockwise on the fm i-f amplifier board.

Procedure

1. With the equipment connected as shown in Fig. 3-2, set the tuner's controls as follows:

FUNCTION switch ...... FM AUTO STEREO
AFC switch .... OFF
MUTING switch .... ON

2. Follow the procedure given in Table 3-2. Note that the muting circuit should begin to operate at the symmetrical deflection point on the TUNING meter when detuning the tuner to higher or lower than the reference carrier frequency.

Off-the-Air Signal Alignment

Accurate muting circuit adjustment can also be performed by utilizing off-the-air local fm signals instead of the fm SSG.
Note that a weak signal is best for this purpose.

3-4. FM FRONT-END ALIGNMENT (Frequency coverage)

Never attempt alignment of the front-end section except for the frequency-coverage and dial-calibration adjustments. The front-end section of the tuner has been carefully adjusted at the factory, so very little adjustment is necessary in the field.

Alignment need not be performed when the front-end FET is replaced since changes in FET parameters have little effect upon tuning. If an rf-stage adjustment is required, ask your nearest SONY Service Station to send your unit to the Factory Service Center for a complete front-end alignment. Exercise caution when returning the faulty unit so that it is not damaged in transit. The warranty will not cover damage incurrent in transit to the Factory Service Center.

Note: Before starting this alignment, the discriminator transformer T201 alignment should be performed.

Signal Generator Alignment

Test Equipment Required

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

Preparation

1. Remove the top cover as described in Procedure 2-3.
2. Connect the equipment as shown in Fig. 3-2.
3. Set the tuner's controls as follows:

FUNCTION switch ...... FM AUTO STEREO
AFC switch .... OFF

Procedure

Follow the procedures given in Table 3-3 when performing this alignment with an fm signal generator.

TABLE 3-2. MUTING ADJUSTMENT

SSG Frequency and Output Level	Tuner Dial Indication	Scope Connection	Adjust	Remarks
98 MHz 400 Hz. 30% Mod 30 μV (30 dB)	98 MHz	FIXED J803	T202	Turn the core of T202 (See Fig. 3-4) to obtain proper muting operation.

TABLE 3-3. FM FREQUENCY COVERAGE ALIGNMENT

FREQUENCY COVERAGE ALIGNMENT

Step	Coupling Between Receiver and SSG	SSG Frequency and Output Level	Tuner Dial Indication	Adjust	Indication
1.	Direct coupling	87.5 MHz 400 Hz 100% mod. 10μV (20 dB)	lowest position	OSC coil L104 See Fig. 3-5	Maximum VTVM reading
2.	Same as above	108.4 MHz 400 Hz 100% mod. 10μV (20 dB)	highest position	OSC trimmer CT104 See Fig. 3-5	Same as above

Adjusting Parts Location

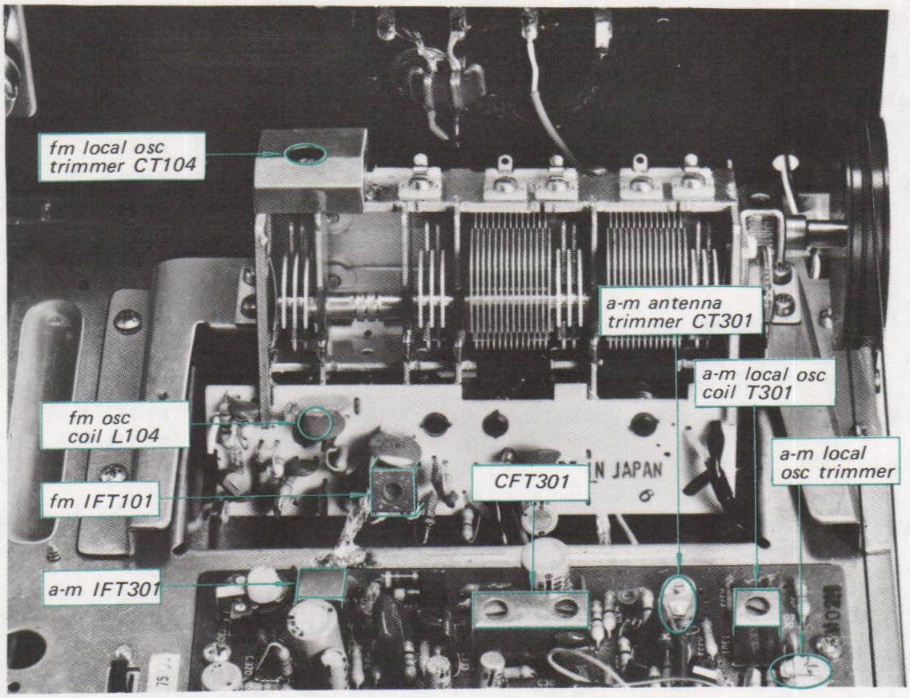


Fig. 3-5. Adjusting parts location

3-5. 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

1. 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:

   (a) With the equipment connected as shown in Fig. 3-6, set the MPX and audio signal generator's controls as follows:

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

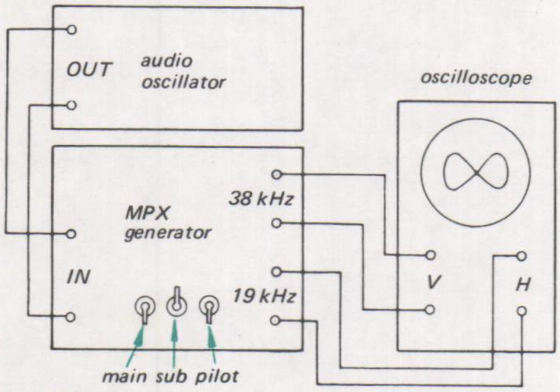


Fig. 3-6. MPX generator preadjustment

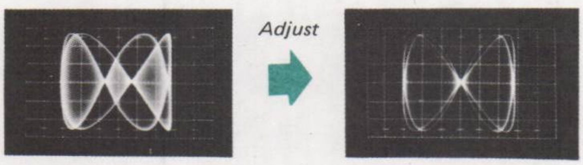


Fig. 3-7. Lissajous pattern

   (b) Adjust the oscilloscope controls to obtain a visible indication. Be sure the scope's horizontal display switch is set for external input.

   (c) Turn the pilot-signal (19 kHz) phase control to obtain an in-phase and stable lissajous pattern as shown in Fig. 3-7.

Procedure

1. Connect the equipment as shown in Fig. 3-8. 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. 3-8. 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 the ON position.

2. Precisely tune the set to the SSG's carrier frequency, then turn the top core of switching transformer T401 (see Fig. 3-9) to obtain maximum output at the left channel. Note that this adjustment has a close relationship with stereo distortion.

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. Adjust separation adj. control RT401 (see Fig. 3-9) for minimum residual level. Check the right channel for separation. Usually, about an 8 to 9 dB difference in channel separation exists. Readjust RT401 for minimum difference between left- and right-channel separation. While doing this, remember that the output level also changes according to the setting of RT401.

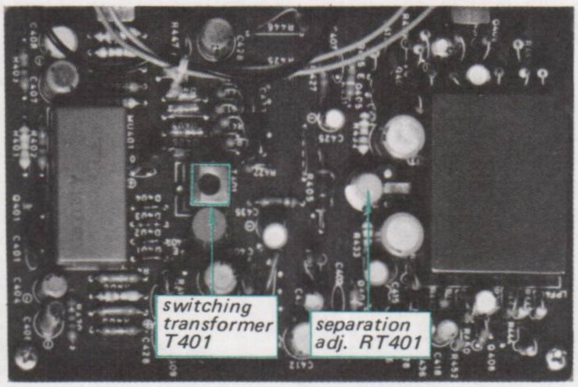


Fig. 3-9. Adjusting parts location

3-6. A-M I-F STRIP ALIGNMENT

Note: The i-f transformers (CFT301, see Fig. 3-5 and IFT301) in the a-m i-f amplifier circuit are adjusted at the factory, so very little adjustment is necessary in the field even if replacing any of these i-f transformers.

3-7. A-M FREQUENCY COVERAGE AND TRACKING ALIGNMENT

Preparation

Connect the input cable of ac VTVM or oscilloscope to FIXED jack's output terminal as shown in Fig. 3-10.

Signal Generator Alignment

Test Equipment Required

1. Standard a-m signal generator
2. Loop antenna
3. Ac VTVM or oscilloscope

Procedure

With the equipment connected as shown in Fig. 3-10, follow the procedures given in Tables and when performing this alignment with an a-m signal generator.

Off-the-Air Signal Alignment

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 pointer is correctly positioned, as in the Procedure 2-5.

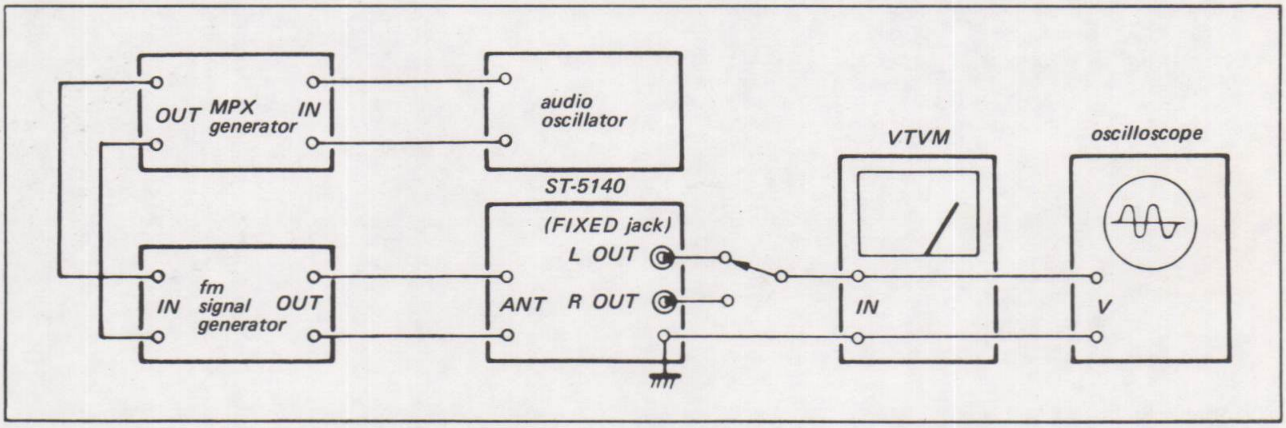


Fig. 3-8. Fm stereo separation adjustment test setup

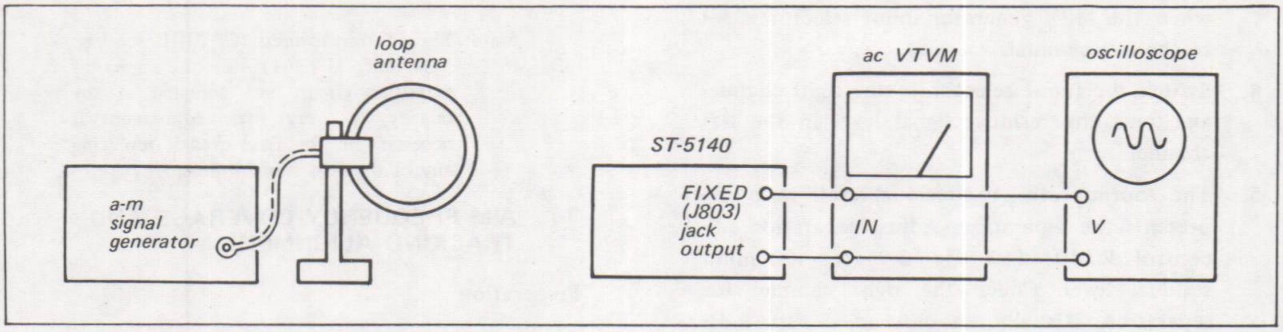


Fig. 3-10. A-m frequency coverage and tracking alignment test setup

TABLE 3-4. A-M FREQUENCY COVERAGE AND TRACKING ALIGNMENT

Step	Coupling Between Tuner and SSG	SSG Frequency and Output Level	Tuner Dial Indication	Adjust	Indication
Frequency Coverage					
1	Loop antenna	550 kHz (400 Hz, 30% mod) 1,000μV (60 dB)	550 kHz	OSC coil T301 See Fig. 3-5	Maximum VTVM reading
2	Same as above	1,600 kHz Same as above	1,600 kHz	OSC trimmer CT302 See Fig. 3-5	Same as above
Tracking					
1	Loop antenna	600 kHz (400 Hz, 30% mod) Output level as low as possible	Tune to the SSG signal	Antenna coil L801 See Fig. 3-5	Maximum VTVM reading
2	Same as above	1,400 kHz Same as above	Tune to the SSG signal	Antenna trimmer CT301 See Fig. 3-5	Same as above

SECTION 4
REPACKING

The ST-5140's original shipping carton and packing materials are the ideal containers for shipping the unit. However to secure the maximum protection, the ST-5140 must be repacked in these materials precisely as before. The proper repacking procedures are shown in Fig. 4-1.

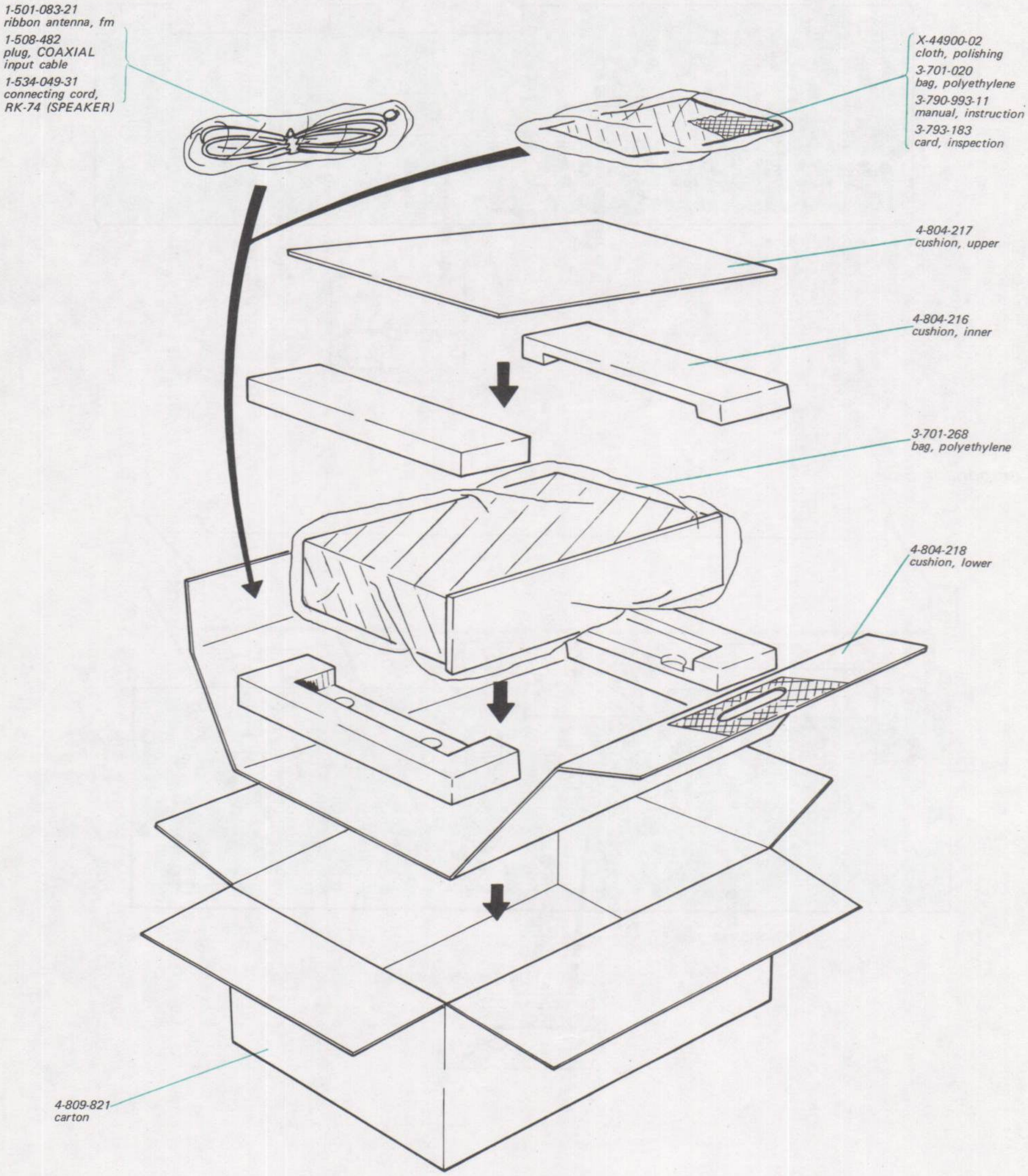
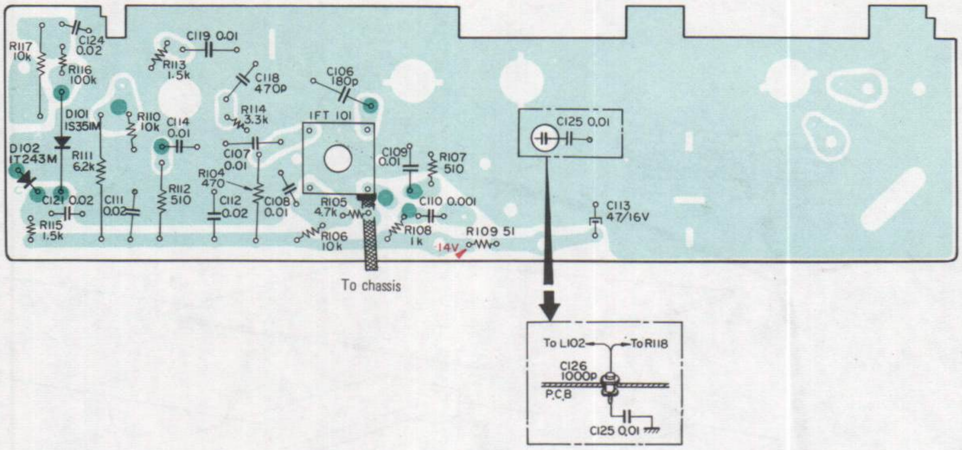


Fig. 4-1. Repacking

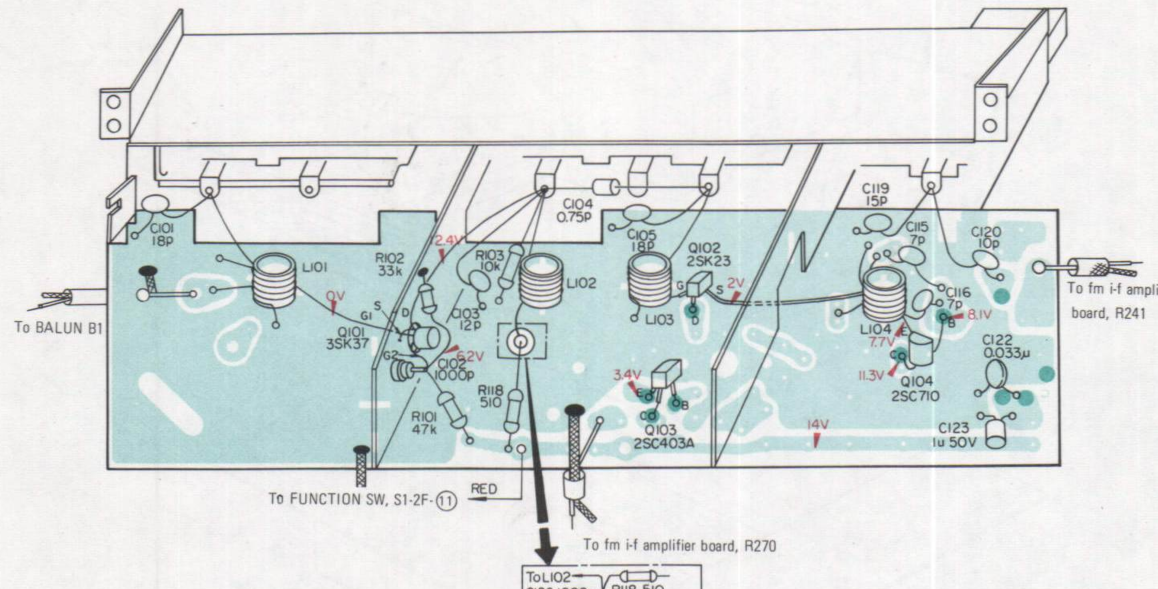
SECTION 5
DIAGRAMS

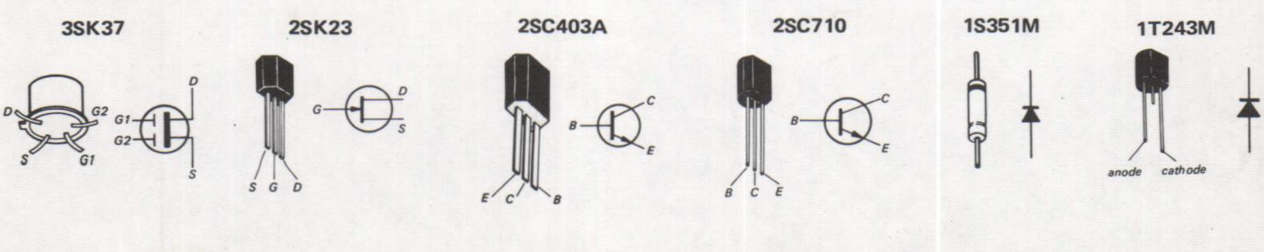
5-1. MOUNTING DIAGRAM –Fm Front End –

– Conductor Side –



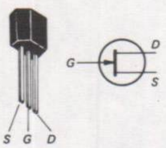
– Component Side –



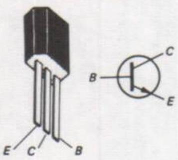


5-2. MOUNTING DIAGRAM
– Fm I-f Amplifier Board –

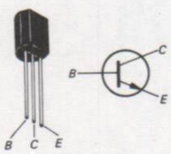
2SK23



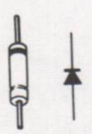
2SC633A
2SC403A

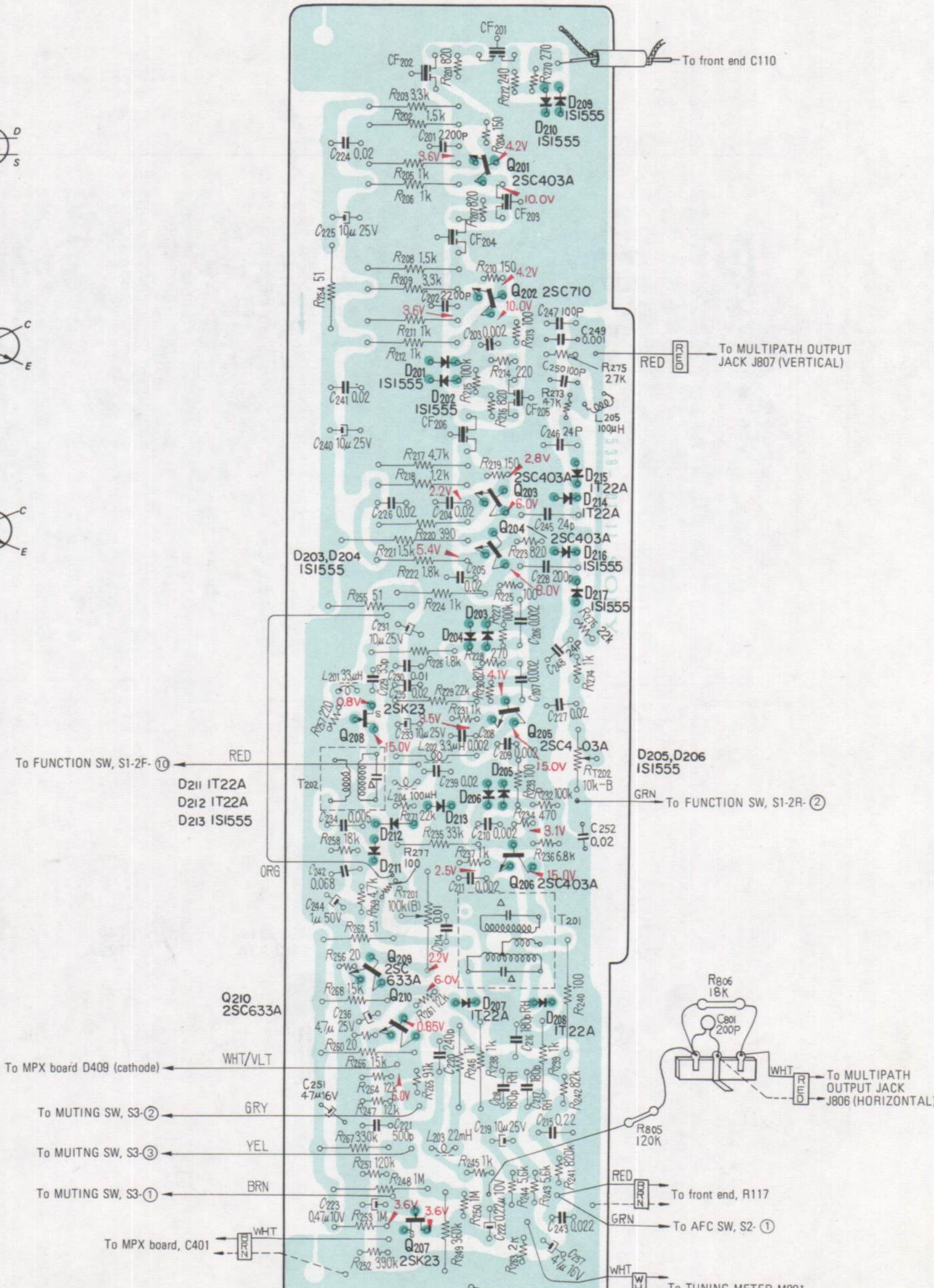


2SC710

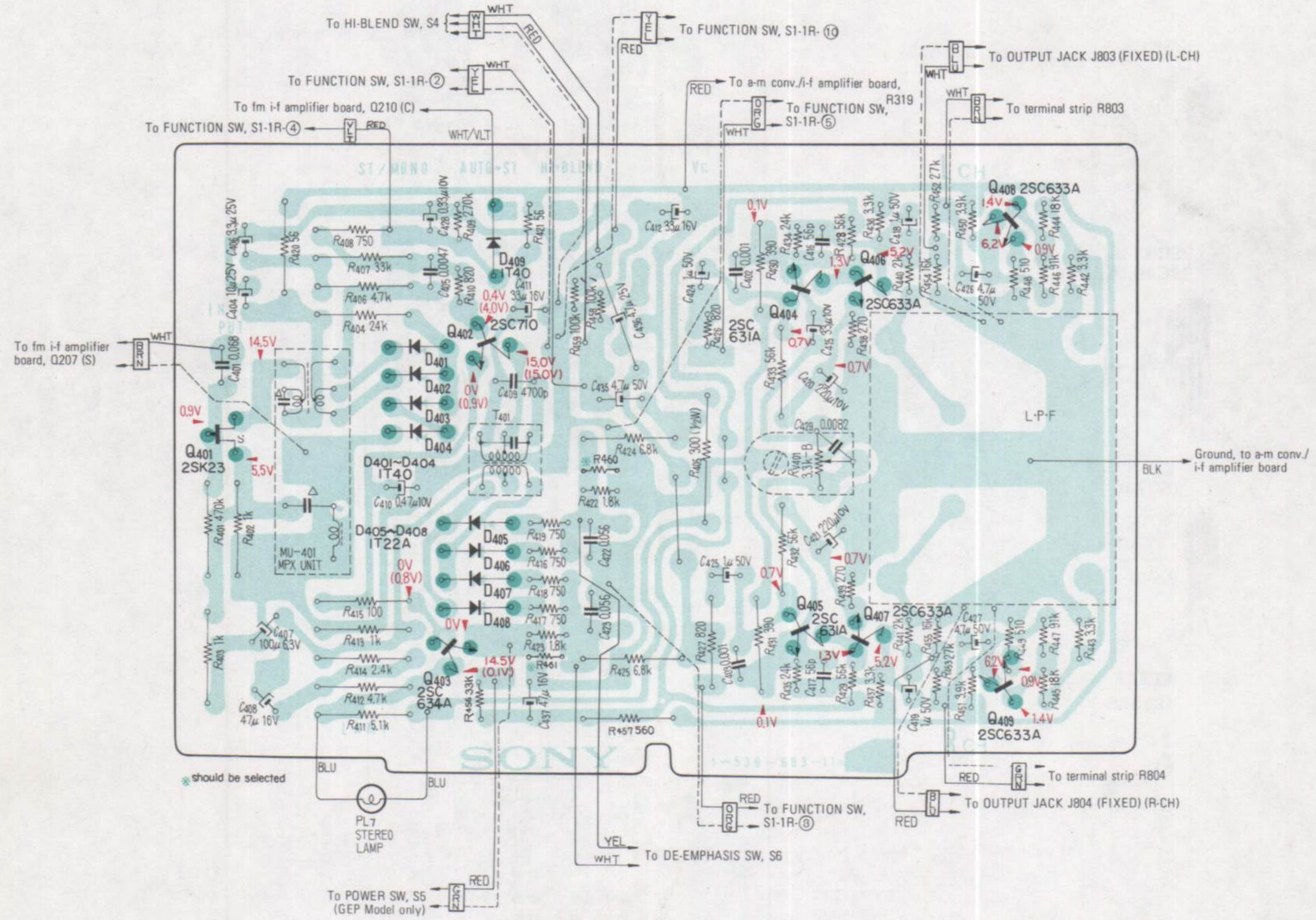


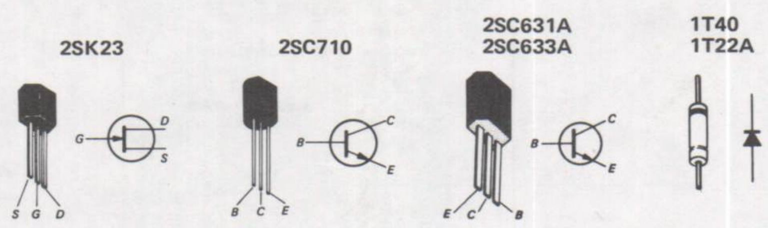
1T22A
1S1555



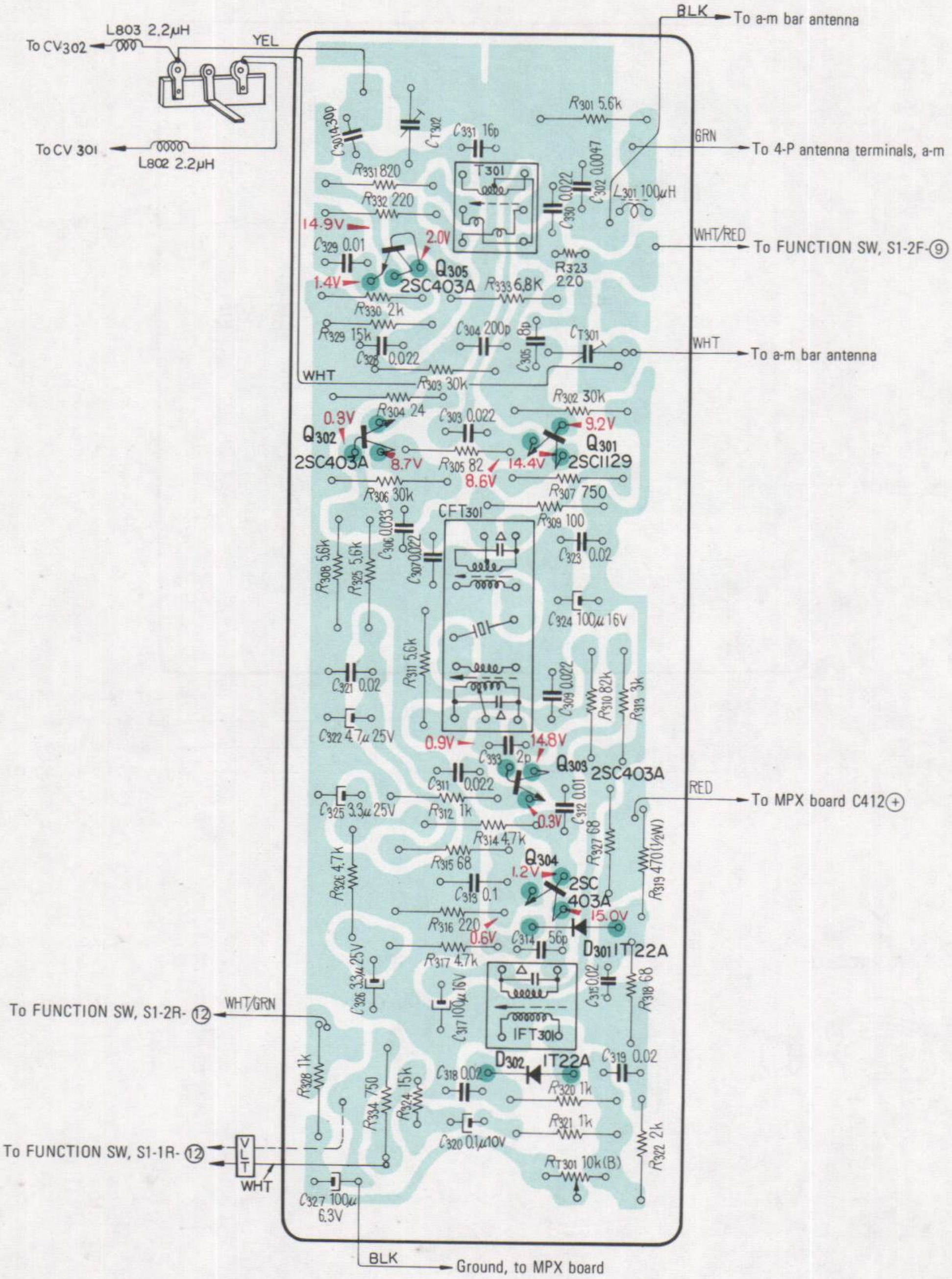


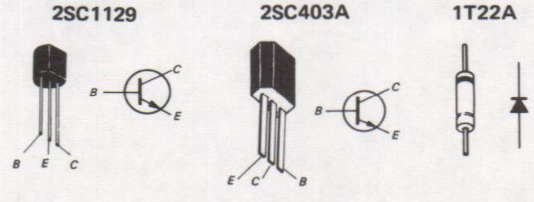
5-3. MOUNTING DIAGRAM
– MPX Decoder Board –



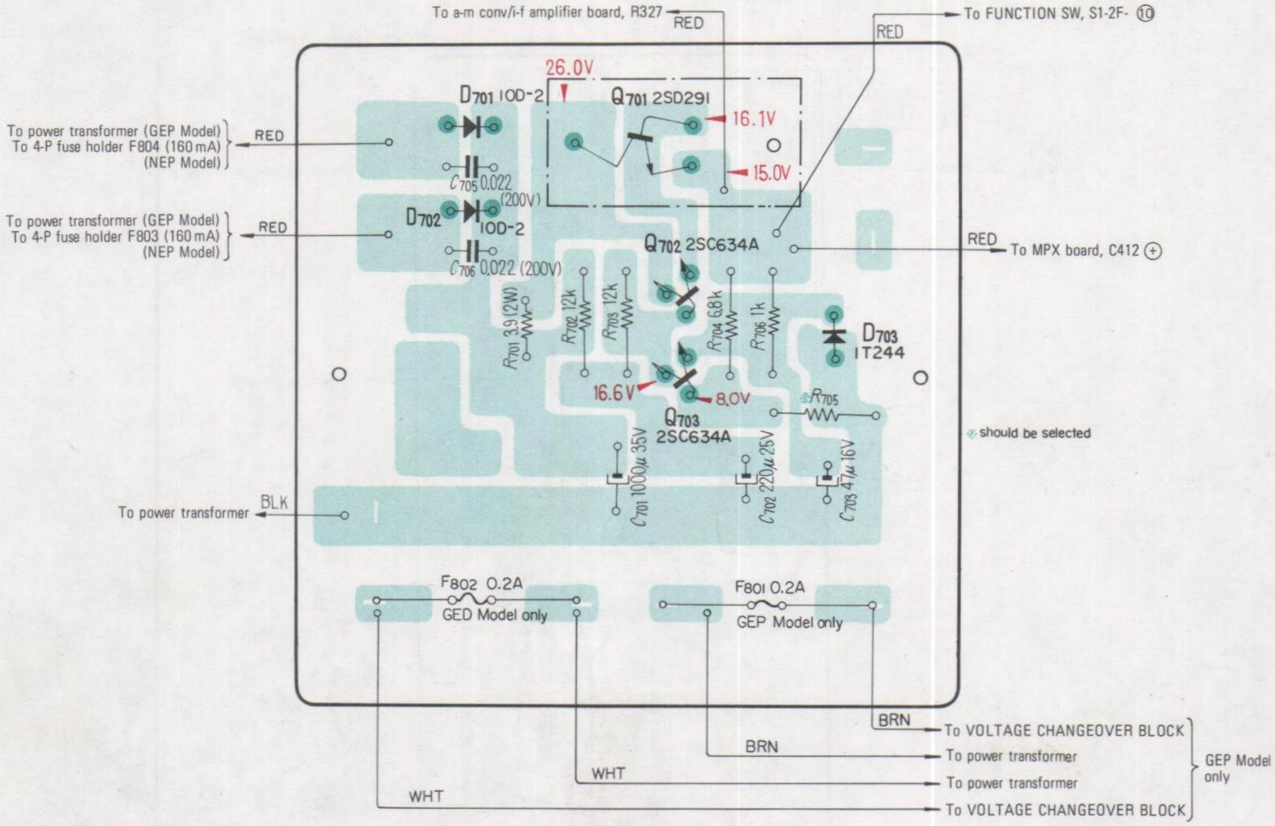


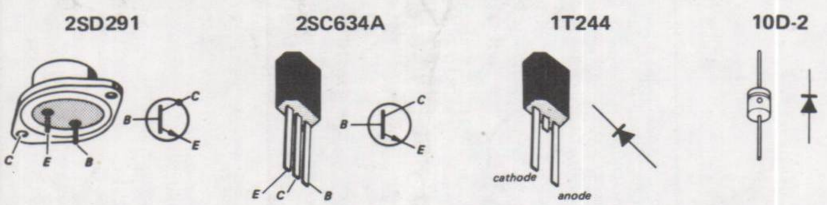
5-4. MOUNTING DIAGRAM
– A-m Conv./I-f Amplifier Board –



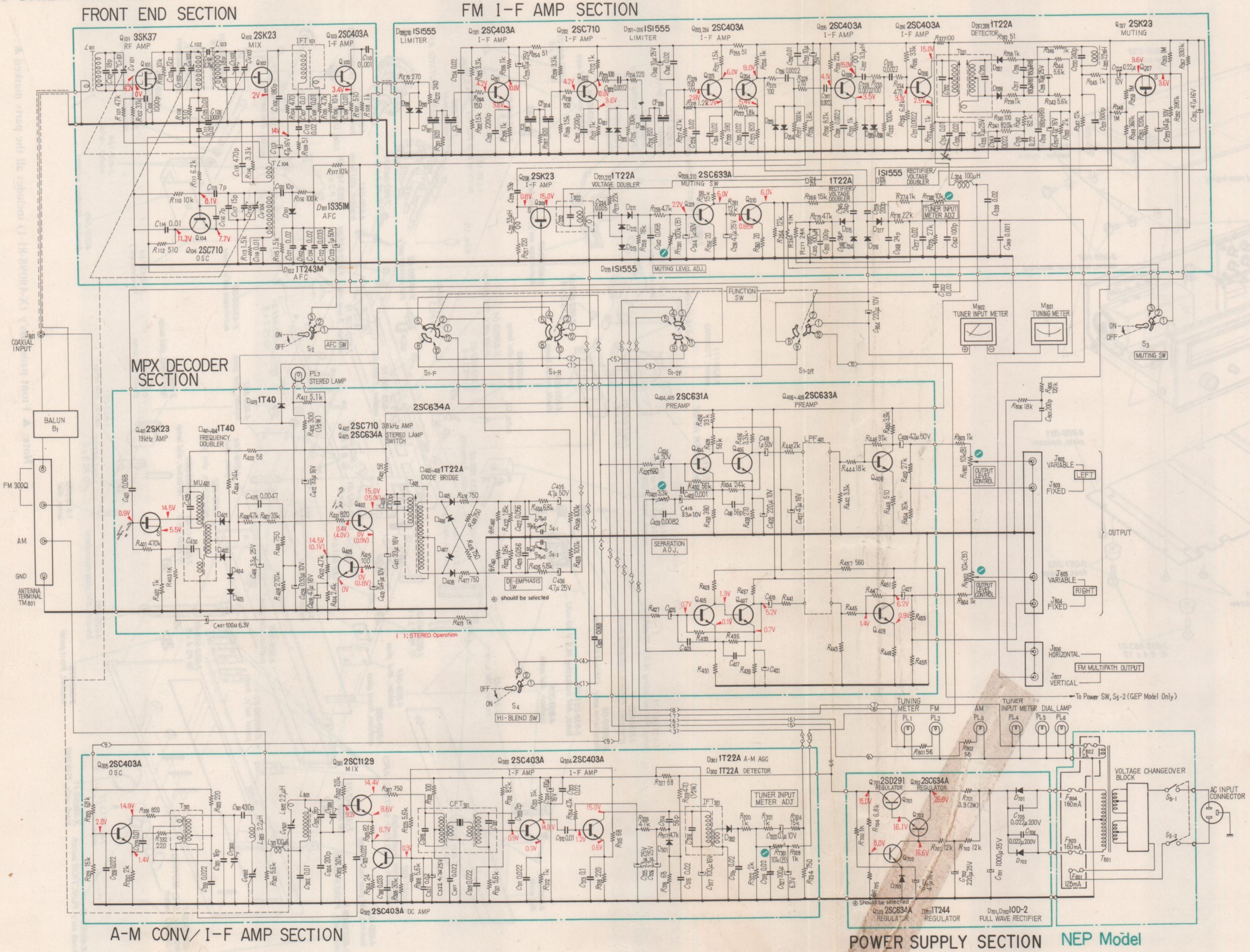


5-5. MOUNTING DIAGRAM
— Power Supply Board —

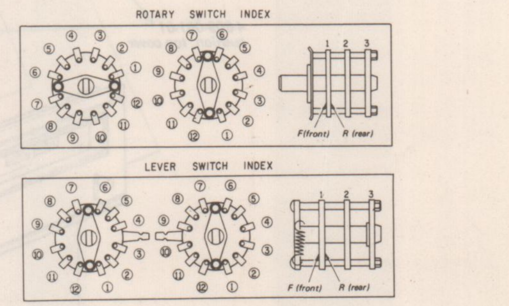




5-6. SCHEMATIC DIAGRAM



Ref. No.	Description	Position
S1	FUNCTION SW (AM–FM AUTO STEREO–FM MONO)	AM
S2	AFC SW (ON-OFF)	ON
S3	MUTING SW (ON-OFF)	ON
S4	HI-BLEND SW (ON-OFF)	OFF
S5	POWER SW (ON-OFF)	OFF
S6	DE-EMPHASIS SW (50μs – 75μs)	50μs



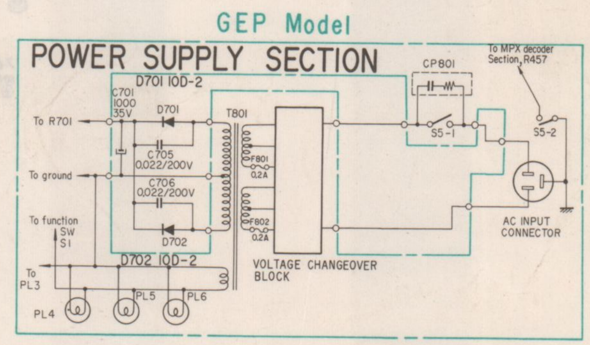
Note:

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 ±20%.

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



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ST-5140
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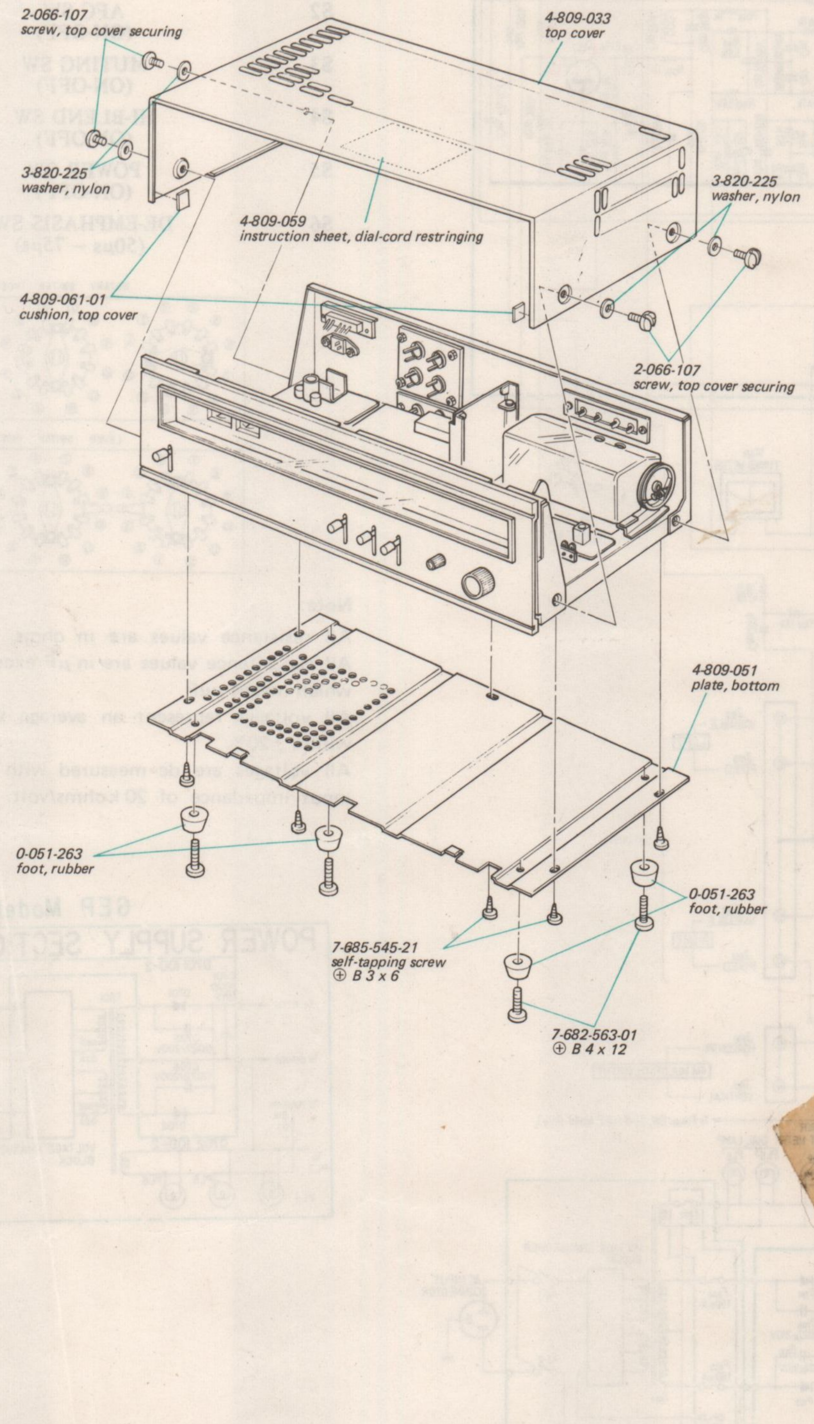
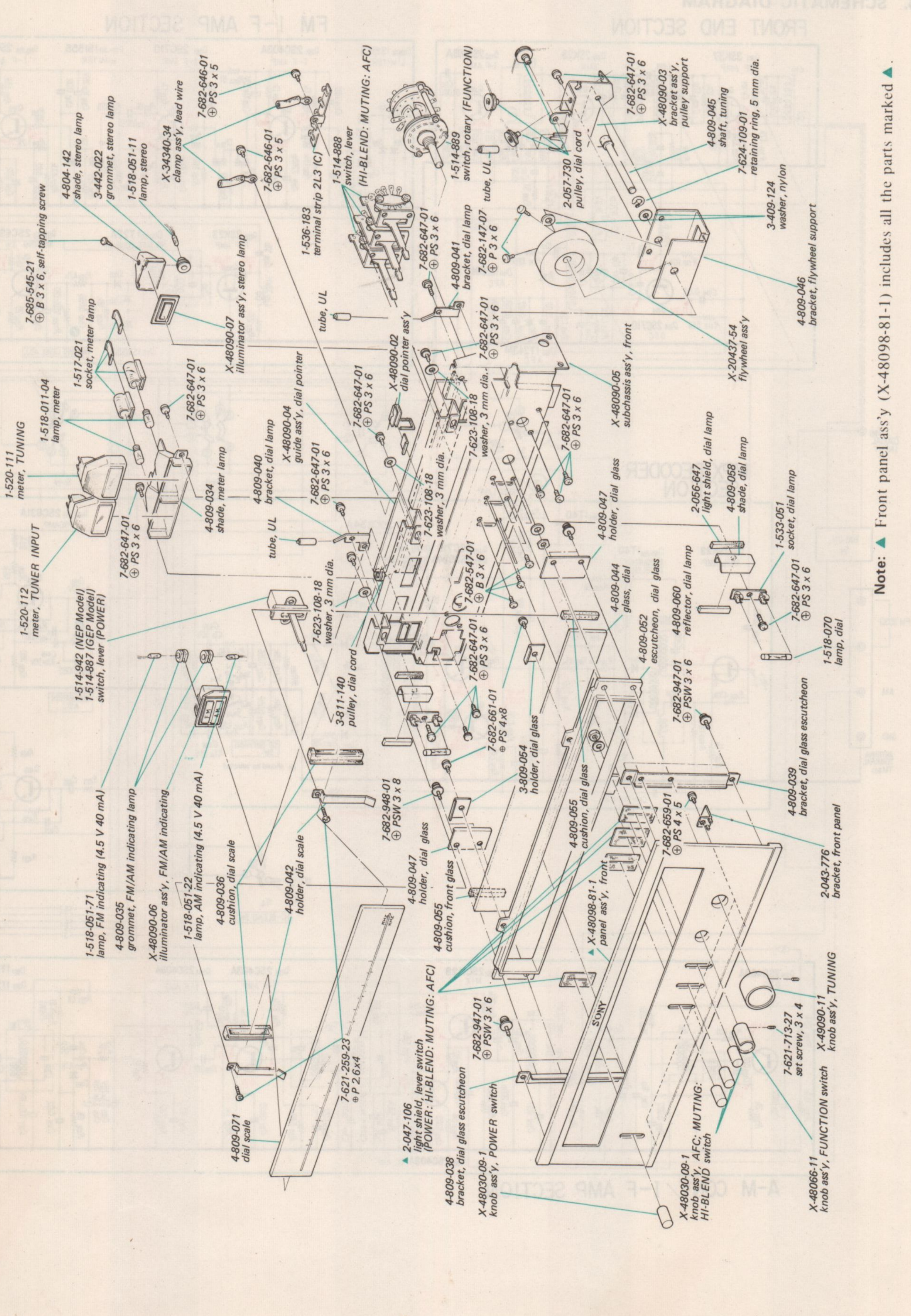
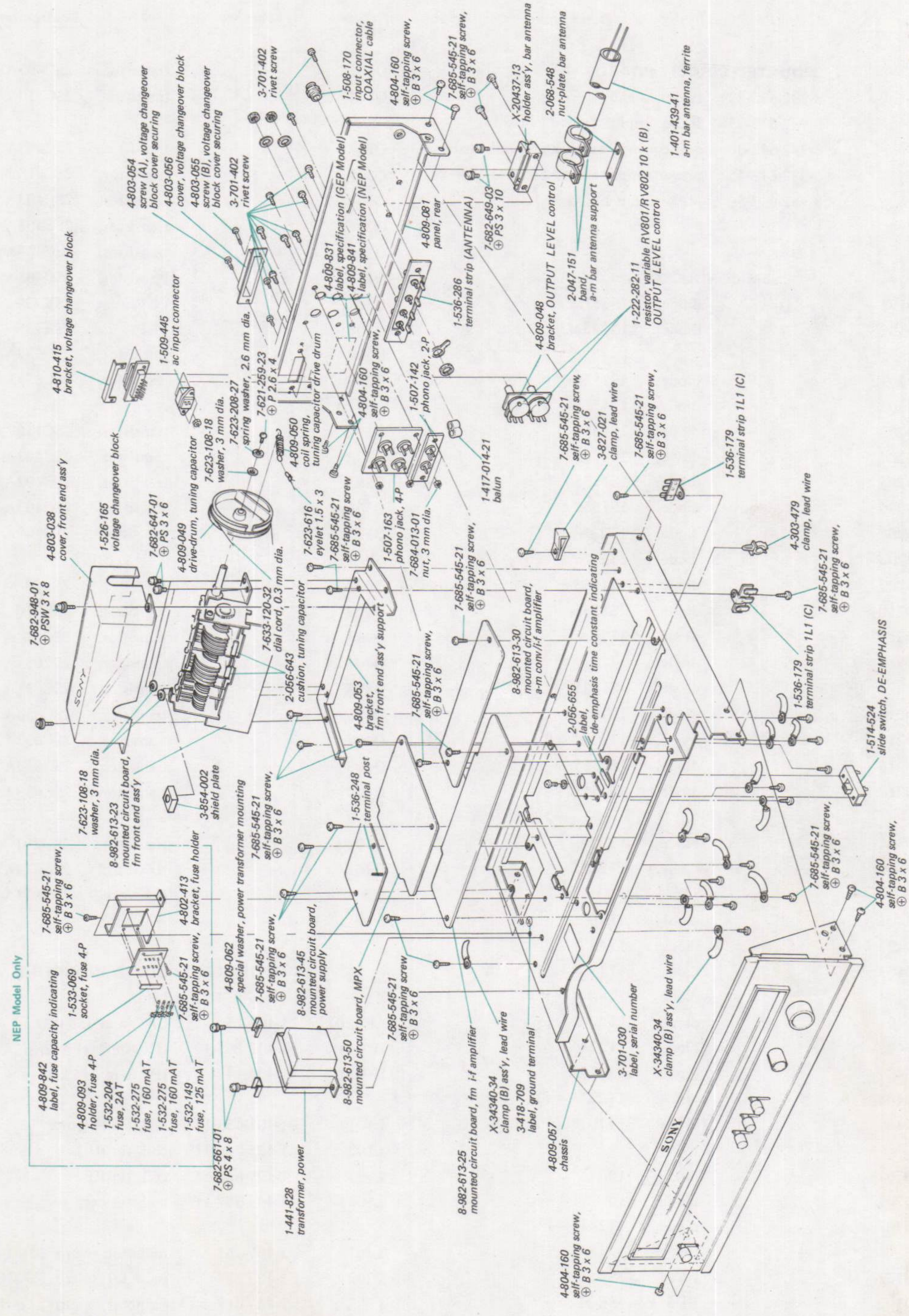
SECTION 6
EXPLODED VIEW





Note: ▲ Front panel ass'y (X-48098-81-1) includes all the parts marked ▲.



4-810-415 bracket, voltage changeover block
1-509-445 ac input connector
4-803-054 screw (A), voltage changeover block cover securing
4-803-056 cover, voltage changeover block
4-803-055 screw (B), voltage changeover block cover securing
3-701-402 rivet screw
3-701-402 rivet screw
1-508-170 input connector, COAXIAL cable
4-804-160 self-tapping screw, ⊕ B 3 x 6
7-685-545-21 self-tapping screw, ⊕ B 3 x 6
X-20437-13 holder ass'y, bar antenna
2-068-548 nut-plate, bar antenna
1-401-439-41 a-m bar antenna, ferrite
4-809-831 label, specification (GEP Model)
4-809-841 label, specification (NEP Model)
4-809-081 panel, rear
7-682-649-03 ⊕ PS 3 x 10
4-809-048 bracket, OUTPUT LEVEL control
2-047-151 band, a-m bar antenna support
1-536-286 terminal strip (ANTENNA)
1-222-282-11 resistor, variable RV801/RV802 10 k (B), OUTPUT LEVEL control
1-526-165 voltage changeover block
7-623-208-27 spring washer, 2.6 mm dia.
7-621-259-23 ⊕ P 2.6 x 4
7-623-108-18 washer, 3 mm dia.
7-685-545-21 self-tapping screw, ⊕ B 3 x 6
4-804-160 self-tapping screw, ⊕ B 3 x 6
1-507-142 phono jack, 2-P
4-803-038 cover, front end ass'y
7-682-647-01 ⊕ PS 3 x 6
4-809-049 drive-drum, tuning capacitor
4-809-050 coil spring, tuning capacitor drive drum
7-623-616 eyelet 1.5 x 3
7-685-545-21 self-tapping screw ⊕ B 3 x 6
1-507-163 phono jack, 4P
7-684-013-01 nut, 3 mm dia.
1-417-014-21 balun
7-685-545-21 self-tapping screw, ⊕ B 3 x 6
3-827-021 clamp, lead wire
7-685-545-21 self-tapping screw, ⊕ B 3 x 6
1-536-179 terminal strip 1L1 (C)
4-303-479 clamp, lead wire
7-685-545-21 self-tapping screw, ⊕ B 3 x 6
7-682-948-01 ⊕ PSW 3 x 8
7-633-120-32 dial cord, 0.3 mm dia.
2-056-643 cushion, tuning capacitor
4-809-053 bracket, fm front end ass'y support
7-685-545-21 self-tapping screw, ⊕ B 3 x 6
8-982-613-30 mounted circuit board, a-m conv/i-f amplifier
2-056-655 label, de-emphasis time constant indicating
1-536-179 terminal strip 1L1 (C)
1-514-524 slide switch, DE-EMPHASIS
7-623-108-18 washer, 3 mm dia.
8-982-613-23 mounted circuit board, fm front end ass'y
3-854-002 shield plate
7-685-545-21 self-tapping screw, ⊕ B 3 x 6
1-536-248 terminal post
NEP Model Only
7-685-545-21 self-tapping screw, ⊕ B 3 x 6
4-802-413 bracket, fuse holder
4-809-842 label, fuse capacity indicating
1-533-069 socket, fuse 4-P
7-685-545-21 self-tapping screw, ⊕ B 3 x 6
4-809-062 special washer, power transformer mounting
7-685-545-21 self-tapping screw, ⊕ B 3 x 6
8-982-613-45 mounted circuit board, power supply
8-982-613-50 mounted circuit board, MPX
7-685-545-21 self-tapping screw ⊕ B 3 x 6
4-809-093 holder, fuse 4-P
1-532-204 fuse, 2AT
1-532-275 fuse, 160 mAT
1-532-275 fuse, 160 mAT
1-532-149 fuse, 125 mAT
7-682-661-01 ⊕ PS 4 x 8
1-441-828 transformer, power
8-982-613-25 mounted circuit board, fm i-f amplifier
X-34340-34 clamp (B) ass'y, lead wire
3-418-709 label, ground terminal
4-809-057 chassis
3-701-030 label, serial number
X-34340-34 clamp (B) ass'y, lead wire
7-685-545-21 self-tapping screw, ⊕ B 3 x 6
4-804-160 self-tapping screw, ⊕ B 3 x 6
4-804-160 self-tapping screw, ⊕ B 3 x 6
SONY

SECTION 7
ELECTRICAL PARTS LIST

Ref. No.	Part No.	Description
		MOUNTED CIRCUIT BOARDS
	8-982-613-23	fm front-end
	8-982-613-25	fm i-f amplifier circuit board
	8-982-613-30	a-m conv./i-f amplifier circuit board
	8-982-613-45	power supply circuit board
	8-982-613-50	MPX circuit board
		SEMICONDUCTORS
D101		diode, 1S351M
D102		diode, 1T243M
D201		diode, 1S1555
D202		diode, 1S1555
D203		diode, 1S1555
D204		diode, 1S1555
D205		diode, 1S1555
D206		diode, 1S1555
D207		diode, 1T22A
D208		diode, 1T22A
D209		diode, 1S1555
D210		diode, 1S1555
D211		diode, 1T22A
D212		diode, 1T22A
D213		diode, 1S1555
D214		diode, 1T22A
D215		diode, 1T22A
D216		diode, 1S1555
D217		diode, 1S1555
D301		diode, 1T22A
D302		diode, 1T22A
D401		diode, 1T40
D402		diode, 1T40
D403		diode, 1T40
D404		diode, 1T40
D405		diode, 1T22A
D406		diode, 1T22A
D407		diode, 1T22A
D408		diode, 1T22A
D409		diode, 1T40
D701		diode, 10D-2
D702		diode, 10D-2
D703		diode, 1T244
Q101		FET, 3SK37
Q102		FET, 2SK23
Q103		transistor, 2SC403A
Q104		transistor, 2SC710
Q201		transistor, 2SC403A
Q202		transistor, 2SC710
Q203		transistor, 2SC403A
Q204		transistor, 2SC403A
Q205		transistor, 2SC403A
Q206		transistor, 2SC403A
Q207		FET, 2SK23
Q208		FET, 2SK23
Q209		transistor, 2SC633A
Q210		transistor, 2SC633A
Q301		transistor, 2SC1129
Q302		transistor, 2SC403A
Q303		transistor, 2SC403A
Q304		transistor, 2SC403A
Q305		transistor, 2SC403A
Q401		FET, 2SK23
Q402		transistor, 2SC710
Q403		transistor, 2SC634A
Q404		transistor, 2SC631A
Q405		transistor, 2SC631A
Q406		transistor, 2SC633A
Q407		transistor, 2SC633A
Q408		transistor, 2SC633A
Q409		transistor, 2SC633A
Q701		transistor, 2SD291
Q702		transistor, 2SC634A
Q703		transistor, 2SC634A
		TRANSFORMERS, COILS & INDUCTORS
B1	1-417-014-21	balun
CFT301	1-403-150	CFT, a-m 455 kHz
IFT101	1-403-295-12	IFT, fm 10.7 MHz
IFT301	1-403-149	IFT, a-m 455 kHz
L101	1-401-453-11	coil, fm antenna
L102	1-425-446-11	coil, fm RF1
L103	1-425-668-11	coil, fm RF2
L104	1-405-377-11	coil, fm osc.
L201	1-407-163	inductor, micro 33 μH
L202	1-407-184	inductor, micro 3.3 μH
L203	1-407-408	inductor, micro 22 mH

Ref. No.	Part No.	Description
L204	1-407-169	inductor, micro 100μH
L205	1-407-169	inductor, micro 100μH
L301	1-407-169	inductor, micro 100μH
L302	1-407-177	inductor, micro 470μH
L801	1-401-439-41	bar antenna, a-m
L802	1-407-182	inductor, micro 2.2μH
L803	1-407-182	inductor, micro 2.2μH
MU401	1-425-548	MPX unit
T201	1-403-291	transformer, discriminator 10.7 MHz
T202	1-403-299	transformer, muting
T301	1-405-459	coil, a-m osc
T401	1-425-260	transformer, switching 38 kHz
T801	1-441-828	transformer, power

CAPACITORS

All capacitance values are in μF except as indicated with p, which means $\mu\mu$F.

Ref. No.	Part No.	Description			
C101	1-102-893	18p	±5%	50V	ceramic
C102	1-102-217	1,000p	$\pm^{100}_{10}\%$	50V	ceramic
C103	1-102-749	12p	±5%	50V	ceramic
C104	1-102-064	0.75p	$\pm^{80}_{20}\%$	500V	ceramic
C105	1-102-893	18p	±5%	50V	ceramic
C106	1-102-848	180p	±5%	50V	ceramic
C107	1-101-923	0.01	$\pm^{80}_{20}\%$	25V	ceramic
C108	1-101-923	0.01	$\pm^{80}_{20}\%$	25V	ceramic
C109	1-101-923	0.01	$\pm^{80}_{20}\%$	25V	ceramic
C110	1-101-918	0.001	$\pm^{80}_{20}\%$	25V	ceramic
C111	1-101-924	0.022	$\pm^{80}_{20}\%$	25V	ceramic
C112	1-101-924	0.022	$\pm^{80}_{20}\%$	25V	ceramic
C113	1-121-409	47	$\pm^{100}_{10}\%$	16V	electrolytic
C114	1-101-923	0.01	$\pm^{80}_{20}\%$	25V	ceramic
C115	1-102-875	7p	±5%	50V	ceramic
C116	1-102-875	7p	±5%	50V	ceramic
C117	1-102-873	15p	±5%	50V	ceramic
C118	1-102-114	470p	±10%	50V	ceramic
C119	1-101-118	0.01	±20%	50V	ceramic
C120	1-102-986	10p	±0.5p	50V	ceramic
C121	1-101-924	0.022	$\pm^{80}_{20}\%$	25V	ceramic
C122	1-105-679-12	0.033	±10%	50V	mylar
C123	1-121-391	1	$\pm^{150}_{10}\%$	50V	electrolytic
C124	1-101-924	0.022	$\pm^{80}_{20}\%$	25V	ceramic
C125	1-101-118	0.01	±20%	50V	ceramic
C126	1-102-217	1,000p	$\pm^{100}_{0}\%$	50V	ceramic

Ref. No.	Part No.	Description			
C201	1-102-100	2,200p	±20%	50V	ceramic
C202	1-102-100	2,200p	±20%	50V	ceramic
C203	1-101-919	0.0022	$\pm^{80}_{20}\%$	25V	ceramic
C204	1-101-924	0.02	$\pm^{80}_{20}\%$	25V	ceramic
C205	1-101-924	0.02	$\pm^{80}_{20}\%$	25V	ceramic
C206	1-101-919	0.0022	$\pm^{80}_{20}\%$	25V	ceramic
C207	1-101-919	0.0022	$\pm^{80}_{20}\%$	25V	ceramic
C208	1-101-919	0.0022	$\pm^{80}_{20}\%$	25V	ceramic
C209	1-101-919	0.0022	$\pm^{80}_{20}\%$	25V	ceramic
C210	1-101-919	0.0022	$\pm^{80}_{20}\%$	25V	ceramic
C211	1-101-919	0.0022	$\pm^{80}_{20}\%$	25V	ceramic
C214	1-101-118	0.01	±20%	50V	ceramic
C215	1-105-689-12	0.22	±10%	50V	mylar
C216	1-102-848	180p	±5%	50V	ceramic
C217	1-102-848	180p	±5%	50V	ceramic
C218	1-102-848	180p	±5%	50V	ceramic
C219	1-121-398	10	$\pm^{100}_{10}\%$	25V	electrolytic
C220	1-107-140	240p	±10%	50V	silvered mica
C221	1-101-424	500p	±20%	250V	ceramic
C222	1-127-020	0.22	±20%	10V	solid, aluminum
C223	1-127-022	0.47	±20%	10V	solid, aluminum
C224	1-101-924	0.02	$\pm^{80}_{20}\%$	25V	ceramic
C225	1-121-398	10	$\pm^{100}_{10}\%$	25V	electrolytic
C226	1-101-924	0.02	$\pm^{80}_{20}\%$	25V	ceramic
C227	1-101-924	0.02	$\pm^{80}_{20}\%$	25V	ceramic
C228	1-102-977	200p	±5%	50V	ceramic
C229	1-102-963	33p	±5%	50V	ceramic
C230	1-101-118	0.01	±20%	50V	ceramic
C231	1-121-398	10	$\pm^{100}_{10}\%$	25V	electrolytic
C232	–	–	–	–	–
C233	1-121-398	10	$\pm^{100}_{10}\%$	25V	electrolytic
C234	1-101-922	0.005	$\pm^{80}_{20}\%$	50V	ceramic
C235	1-101-924	0.02	$\pm^{80}_{20}\%$	25V	ceramic
C236	1-121-395	4.7	$\pm^{150}_{10}\%$	25V	electrolytic
C237	1-121-409	47	$\pm^{100}_{10}\%$	16V	electrolytic
C238	–	–	–	–	–
C239	1-101-924	0.02	$\pm^{80}_{20}\%$	25V	ceramic
C240	1-121-398	10	$\pm^{100}_{10}\%$	25V	electrolytic
C241	1-101-924	0.02	$\pm^{80}_{20}\%$	25V	ceramic
C242	1-105-683-12	0.068	±10%	50V	mylar
C243	1-105-837-12	0.022	±20%	50V	mylar
C244	1-121-391	1	$\pm^{150}_{10}\%$	50V	electrolytic
C245	1-102-960	24p	±5%	50V	ceramic
C246	1-102-960	24p	±5%	50V	ceramic
C247	1-102-973	100p	±5%	50V	ceramic
C248	1-102-960	24p	±5%	50V	ceramic
C249	1-105-661-12	0.001	±10%	50V	mylar
C250	1-102-973	100p	±5%	50V	ceramic

Ref. No.	Part No.	Description			
C251	1-121-409	47	$^{+100}_{-10}$%	16V	electrolytic
C252	1-101-924	0.02	$^{+80}_{-20}$%	25V	ceramic
C301	1-103-716	430p	±5%	50V	styrol
C302	1-105-673-12	0.01	±10%	50V	mylar
C303	1-105-677-12	0.022	±10%	50V	mylar
C304	1-102-977	200p	±5%	50V	ceramic
C305	1-102-945	8p	±0.5p	50V	ceramic
C306	1-105-679-12	0.033	±10%	50V	mylar
C307	1-105-677-12	0.022	±10%	50V	mylar
C308	–	–	–	–	–
C309	1-105-677-12	0.022	±10%	50V	mylar
C310	–	–	–	–	–
C311	1-105-677-12	0.022	±10%	50V	mylar
C312	1-105-673-12	0.01	±10%	50V	mylar
C313	1-105-685-12	0.1	±10%	50V	mylar
C314	1-101-884	56p	±5%	50V	ceramic
C315	1-101-924	0.02	$^{+80}_{-20}$%	25V	ceramic
C317	1-121-415	100	$^{+100}_{-10}$%	16V	electrolytic
C318	1-101-924	0.02	$^{+80}_{-20}$%	25V	ceramic
C319	1-101-924	0.02	$^{+80}_{-20}$%	25V	ceramic
C320	1-127-019	0.1	±20%	10V	solid, aluminum
C321	1-101-924	0.02	$^{+80}_{-20}$%	25V	ceramic
C322	1-121-395	4.7	$^{+100}_{-10}$%	25V	electrolytic
C323	1-101-924	0.02	$^{+80}_{-20}$%	25V	ceramic
C324	1-121-415	100	$^{+100}_{-10}$%	16V	electrolytic
C325	1-121-456	3.3	$^{+150}_{-10}$%	25V	electrolytic
C326	1-121-456	3.3	$^{+150}_{-10}$%	25V	electrolytic
C327	1-121-413	100	$^{+100}_{-10}$%	6.3V	electrolytic
C328	1-105-677-12	0.022	±10%	50V	mylar
C329	1-105-673-12	0.01	±10%	50V	mylar
C330	1-105-677-12	0.022	±10%	50V	mylar
C331	1-102-952	16p	±5%	50V	ceramic
C333	1-102-935	2p	±0.25p	50V	ceramic
C334	1-103-710	240p	±5%	50V	styrol
C401	1-105-683-12	0.068	±10%	50V	mylar
C402	1-105-661-12	0.001	±10%	50V	mylar
C403	1-105-661-12	0.001	±10%	50V	mylar
C404	1-121-398	10	$^{+100}_{-10}$%	25V	electrolytic
C405	1-105-669-12	0.0047	±10%	50V	mylar
C406	1-121-344	3.3	$^{+150}_{-10}$%	25V	electrolytic
C407	1-121-413	100	$^{+100}_{-10}$%	6.3V	electrolytic
C408	1-121-409	47	$^{+100}_{-10}$%	16V	electrolytic
C409	1-103-575	4,700p	±5%	50V	styrol
C410	1-127-022	0.47	±20%	10V	solid aluminum
C411	1-121-403	33	$^{+100}_{-10}$%	16V	electrolytic
C412	1-121-403	33	$^{+100}_{-10}$%	16V	electrolytic
C415	1-121-402	33	$^{+100}_{-10}$%	10V	electrolytic
C416	1-101-884	56p	±5%	50V	ceramic
C417	1-101-884	56p	±5%	50V	ceramic
C418	1-121-391	1	$^{+150}_{-10}$%	50V	electrolytic
C419	1-121-391	1	$^{+150}_{-10}$%	50V	electrolytic
C420	1-121-420	220	$^{+100}_{-10}$%	10V	electrolytic
C421	1-121-420	220	$^{+100}_{-10}$%	10V	electrolytic
C422	1-105-682-12	0.056	±10%	50V	mylar
C423	1-105-682-12	0.056	±10%	50V	mylar
C424	1-121-391	1	$^{+150}_{-10}$%	50V	electrolytic
C425	1-121-391	1	$^{+150}_{-10}$%	50V	electrolytic
C426	1-121-396	4.7	$^{+100}_{-10}$%	50V	electrolytic
C427	1-121-396	4.7	$^{+100}_{-10}$%	50V	electrolytic
C428	1-127-021	0.33	±20%	10V	solid, aluminum
C429	1-105-672-12	0.0082	±10%	50V	mylar
C435	1-121-396	4.7	$^{+100}_{-10}$%	50V	electrolytic
C436	1-121-915-12	4.7	$^{+100}_{-10}$%	25V	electrolytic
C437	1-121-409	47	$^{+100}_{-10}$%	16V	electrolytic
C701	1-121-388	1,000	$^{+100}_{-10}$%	35V	electrolytic
C702	1-121-422	220	$^{+100}_{-10}$%	25V	electrolytic
C703	1-121-409	47	$^{+100}_{-10}$%	16V	electrolytic
C705	1-105-757-12	0.022	±10%	200V	mylar
C706	1-105-757-12	0.022	±10%	200V	mylar
C801	1-102-977	200p	±5%	50V	ceramic
C803	1-105-671-12	0.068	±10%	50V	mylar
C804	1-121-420	220	$^{+100}_{-10}$%	10V	electrolytic
C805	1-105-677-12	0.022	±10%	50V	mylar
C806	1-105-677-12	0.022	±10%	50V	mylar
CT301	1-141-095	capacitor, trimmer			
CT302	1-141-095	capacitor, trimmer			

RESISTORS

All resistance values are in Ω, ±5%, ¼W and carbon type, unless otherwise indicated.

Ref. No.	Part No.	Description
R101	1-244-713	47k
R102	1-244-709	33k
R103	1-244-697	10k
R104	1-244-665	470
R105	1-242-689	4.7k
R106	1-242-697	10k
R107	1-242-666	510
R108	1-242-673	1k
R109	1-242-642	51
R110	1-242-697	10k
R111	1-244-692	6.2k
R112	1-242-666	510

Ref. No.	Part No.	Description
R113	1-242-677	1.5 k
R114	1-242-685	3.3 k
R115	1-242-677	1.5 k
R116	1-242-721	100 k
R117	1-244-697	10 k
R118	1-244-666	510
R201	1-242-671	820
R202	1-244-677	1.5 k
R203	1-244-685	3.3 k
R204	1-242-653	150
R205	1-244-673	1 k
R206	1-244-673	1 k
R207	1-242-671	820
R208	1-244-677	1.5 k
R209	1-244-685	3.3 k
R210	1-242-653	150
R211	1-244-673	1 k
R212	1-244-673	1 k
R213	1-242-649	100
R214	1-242-657	220
R215	1-242-721	100 k
R216	1-242-671	820
R217	1-244-689	4.7 k
R218	1-244-675	1.2 k
R219	1-242-653	150
R220	1-244-663	390
R221	1-244-677	1.5 k
R222	1-244-679	1.8 k
R223	1-242-671	820
R224	1-244-673	1 k
R225	1-242-649	100
R226	1-244-679	1.8 k
R227	1-242-721	100 k
R228	1-242-659	270
R229	1-244-705	22 k
R230	1-242-695	8.2 k
R231	1-242-673	1 k
R232	1-242-721	100 k
R233	1-242-649	100
R234	1-242-665	470
R235	1-244-709	33 k
R236	1-242-693	6.8 k
R237	1-242-673	1 k
R238	1-244-673	1 k
R239	1-244-673	1 k
R240	1-244-649	100
R241	1-244-743	820 k
R242	1-242-719	82 k
R243	1-242-691	5.6 k

Ref. No.	Part No.	Description
R244	1-242-691	5.6 k
R245	1-242-673	1 k
R246	1-244-673	1 k
R247	1-242-699	12 k
R248	1-244-745	1 M
R249	1-244-734	360 k
R250	1-242-745	1 M
R251	1-242-723	120 k
R252	1-242-735	390 k
R253	1-242-745	1 M
R254	1-244-642	51
R255	1-244-642	51
R256	1-242-632	20
R257	1-242-657	220
R258	1-242-703	18 k
R259	1-242-689	4.7 k
R260	1-242-632	20
R261	1-242-699	12 k
R262	1-242-642	51
R263	1-242-680	2 k
R264	1-242-699	12 k
R265	1-242-720	91 k
R266	1-244-701	15 k
R267	1-244-733	330 k
R268	1-242-701	15 k
R269	–	–
R270	1-242-659	270
R271	1-242-705	22 k
R272	1-242-658	240
R273	1-242-713	47k
R274	1-242-673	1 k
R275	1-242-707	27 k
R276	1-242-705	22 k
R277	1-242-649	100
R301	1-244-691	5.6 k
R302	1-244-704	20 k
R303	1-244-708	30 k
R304	1-244-634	24
R305	1-244-647	82
R306	1-244-708	30 k
R307	1-244-670	750
R308	1-244-691	5.6 k
R309	1-244-649	100
R310	1-244-719	82 k
R311	1-244-691	5.6 k
R312	1-244-673	1 k
R313	1-244-684	3 k
R314	1-244-689	4.7 k
R315	1-244-645	68

Ref. No.	Part No.	Description			
R316	1-244-657	220			
R317	1-244-689	4.7 k			
R318	1-244-645	68			
R319	1-202-565	470	±10%	½W	composition
R320	1-244-673	1 k			
R321	1-244-673	1 k			
R322	1-244-680	2 k			
R323	1-242-657	220			
R324	1-242-701	15 k			
R325	1-244-691	5.6 k			
R326	1-244-689	4.7 k			
R327	1-244-645	68			
R328	1-244-673	1 k			
R329	1-244-701	15 k			
R330	1-244-680	2 k			
R331	1-244-671	820			
R332	1-244-657	220			
R333	1-244-717	6.8 k			
R334	1-244-670	750			
R335	1-244-679	10 k			
R401	1-244-737	470 k			
R402	1-244-673	1 k			
R403	1-244-673	1 k			
R404	1-244-706	24 k			
R405	1-202-560	300	±10%	½W	composition
R406	1-244-689	4.7 k			
R407	1-244-709	33 k			
R408	1-244-670	750			
R409	1-242-731	270 k			
R410	1-242-671	820			
R411	1-244-690	5.1 k			
R412	1-244-689	4.7 k			
R413	1-244-673	1 k			
R414	1-244-682	2.4 k			
R415	1-244-649	100			
R416	1-242-670	750			
R417	1-242-670	750			
R418	1-242-670	750			
R419	1-242-670	750			
R420	1-244-643	56			
R421	1-242-643	56			
R422	1-242-679	1.8 k			
R423	1-242-679	1.8 k			
R424	1-244-693	6.8 k			
R425	1-244-693	6.8 k			
R426	1-242-671	820			
R427	1-244-671	820			
R428	1-242-715	56 k			
R429	1-242-715	56 k			

Ref. No.	Part No.	Description			
R430	1-244-663	390			
R431	1-244-663	390			
R432	1-244-715	56 k			
R433	1-244-715	56 k			
R434	1-242-706	24 k			
R435	1-242-706	24 k			
R436	1-242-685	3.3 k			
R437	1-242-685	3.3 k			
R438	1-242-659	270			
R439	1-242-659	270			
R440	1-242-680	2 k			
R441	1-242-680	2 k			
R442	1-242-685	3.3 k			
R443	1-242-685	3.3 k			
R444	1-242-703	18 k			
R445	1-242-703	18 k			
R446	1-242-715	91 k			
R447	1-242-715	91 k			
R448	1-242-666	510			
R449	1-242-666	510			
R450	1-242-687	3.9 k			
R451	1-242-687	3.9 k			
R452	1-242-707	27 k			
R453	1-242-707	27 k			
R454	1-242-702	16 k			
R455	1-242-702	16 k			
R456	1-244-709	33 k			
R457	1-242-667	560			
R458	1-242-721	100 k			
R459	1-242-721	100 k			
R460	1-242-704	20 k			
	1-242-708	30 k			
	1-242-713	47 k			
	1-242-717	68 k			
	1-242-719	82 k			
R461	1-242-704	20 k			
	1-242-708	30 k			
	1-242-713	47 k			
	1-242-717	68 k			
	1-242-719	82 k			
R701	1-207-723	3.9	±10%	2W	wire-wound
R702	1-244-699	12 k			
R703	1-244-699	12 k			
R704	1-244-693	6.8 k			
R705	1-244-692	6.2 k			
	1-244-693	6.8 k			
	1-244-694	7.5 k			
	1-244-695	8.2 k			

Ref. No.	Part No.	Description		
	1-244-696	9.1 k		
	1-244-697	10 k		
R706	1-244-673	1 k		
R801	1-244-646	56		
R802	1-244-646	56		
R803	1-244-673	1 k		
R804	1-244-673	1 k		
R805	1-244-723	120 k		
R806	1-244-703	18 k		
RT201	1-221-966	100 k (B)	semi-fixed	
RT202	1-222-981	10 k (B)	semi-fixed	
RT301	1-222-951	10 k (B)	semi-fixed	
RT401	1-222-948	3.3 k (B)	±30%	semi-fixed
RV801	1-222-282-11	10 k (B), variable (OUTPUT level control)		
RV802	1-222-282-11	10 k (B), variable (OUTPUT level control)		

SWITCHES

Ref. No.	Part No.	Description
S1	1-514-889	switch, rotary (FUNCTION)
S2	1-514-888	switch, rotary/lever (AFC)
S3	1-514-888	switch, rotary/lever (MUTING)
S4	1-514-888	switch, rotary/lever (HI-BLEND)
S5	1-514-887	switch, seesaw/lever (POWER) (GEP Model)
	1-514-942	switch, seesaw/lever (POWER) (NEP Model)
S6	1-514-524	switch, slide (DE-EMPHASIS)

FILTERS

Ref. No.	Part No.	Description
CF201 CF202 CF203 CF204 CF205 CF206	1-403-562-11	fm i-f, ceramic 10.70 MHz (red)
	1-403-562-21	fm i-f, ceramic 10.66 MHz (black)
	1-403-562-31	fm i-f, ceramic 10.74 MHz (white)
	1-403-562-41	fm i-f, ceramic 10.62 MHz (green)
	1-403-562-51	fm i-f, ceramic 10.78 MHz (yellow)

Ref. No.	Part No.	Description
LPF401	1-231-172	filter, low-pass

MISCELLANEOUS

Ref. No.	Part No.	Description
CP801	1-231-057-12	encapsulated component, 120Ω + 0.033μF (GEP Model only)
	1-507-163	phono jack, 4-P
	1-507-142	phono jack, 2-P
	1-508-170	input connector, COAXIAL cable
	1-509-445	ac input connector, 3-P
	1-517-021	socket, meter lamp
PL1	1-518-011-04	lamp, TUNING meter 8V/0.15A
PL2	1-518-051-71	lamp, FM indicating 4.5V/40 mA
PL3	1-518-051-22	lamp, AM indicating 4.5V/40 mA
PL4	1-518-011-04	lamp, TUNER INPUT meter 8V/0.15A
PL5	1-518-070	lamp, dial 8V/0.3A
PL6	1-518-070	lamp, dial 8V/0.3A
PL7	1-518-051-11	lamp, stereo, 4.5V/40 mA
M801	1-520-111	meter, TUNING
M802	1-520-112	meter, TUNER INPUT
F801	1-532-149	fuse, 125 mAT (NEP Model)
	1-532-242	fuse, 0.2AT (GEP Model)
F802	1-532-204	fuse, 2AT (NEP Model)
	1-532-242	fuse, 0.2AT (GEP Model)
F803 F804	1-532-275	fuse, 160 mAT (NEP Model only)
VS	1-526-165	voltage changeover block
	1-533-051	socket, dial lamp
	1-533-069	socket, fuse; 4-P (NEP Model only)
	1-536-179	terminal strip 1L1 (C)
	1-536-183	terminal strip 2L3
	1-536-248	terminal post
TM801	1-536-286	antenna terminal, 4-P

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