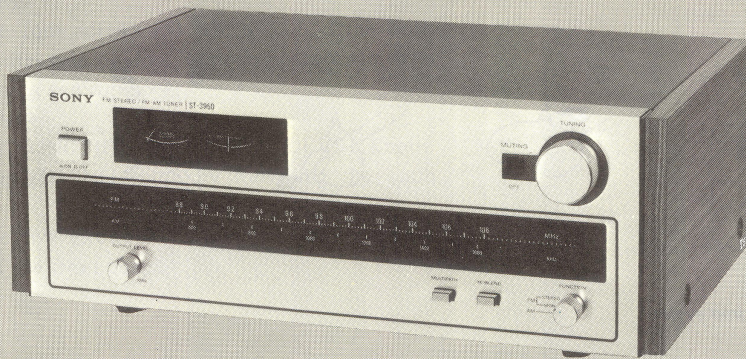


# ST-3950

*AEP Model*

*UK Model*



## FM STEREO/FM-AM TUNER

### SPECIFICATIONS

#### GENERAL

**Outputs:** FIXED: 750 mV, 10 k $\Omega$   
VARIABLE: 0–1.5 V, 1.5 k $\Omega$   
FM DISCRI: 150 mV, 2.5 k $\Omega$

**Power Requirements:** 110, 127, 220 or 240 V ac  
selectable, 50/60 Hz

**Power Consumption:** 29 W (UK model)  
27 W (AEP model)

**Dimensions:** Approx. 460 (w) x 170 (h) x 335 (d) mm  
18  $\frac{1}{8}$  (w) x 6  $\frac{5}{8}$  (h) x 13 (d) inches  
including projecting parts and controls

**Weight:** Approx. 8.0 kg, 17 lb 10 oz (net)  
9.8 kg, 21 lb 9 oz  
(in shipping carton)

#### FM SECTION

**Tuning Range:** 87.5 – 108 MHz

**Antenna Terminals:** 300  $\Omega$  balanced  
75  $\Omega$  coaxial cable input

**Intermediate Frequency:** 10.7 MHz

**Usable Sensitivity:** 1.7  $\mu$ V (MONO), IHF  
1.5  $\mu$ V, S/N = 26 dB (40 kHz deviation)

**Sensitivity at 50 dB Quieting:** 3.0  $\mu$ V (MONO)  
40  $\mu$ V (STEREO)

**Sensitivity at 46 dB Quieting  
(40 kHz deviation):** 40  $\mu$ V (STEREO)

**Image Rejection:** 80 dB

**IF Rejection:** 100 dB

**Spurious Rejection:** 90 dB

**AM Suppression:** 56 dB

**Capture Ratio:** 1.0 dB

**Selectivity:** 80 dB

**S/N Ratio:** 75 dB (MONO)  
70 dB (STEREO)

**Harmonic Distortion:** at 100 Hz, 1 kHz  
0.15 % (MONO)  
0.25 % (STEREO)  
at 10 kHz  
0.2 % (MONO)  
0.6 % (STEREO)

**Stereo Separation:** 35 dB at 100 Hz  
40 dB at 1 kHz  
35 dB at 10 kHz

**Frequency Response:** 40 Hz – 12.5 kHz  $^{+0.3}_{-0.8}$  dB

**19 kHz, 38 kHz Suppression:** 60 dB

**Muting Level:** Approx. 5  $\mu$ V

#### AM SECTION

**Tuning Range:** 530 – 1,605 kHz

**Antenna:** Built-in ferrite-rod antenna and  
external antenna terminal

**Intermediate Frequency:** 468 kHz

**Usable Sensitivity:** 250  $\mu$ V/m built-in antenna  
100  $\mu$ V external antenna  
at 1,000 kHz

**Image Rejection:** 40 dB at 1,000 kHz

**S/N Ratio:** 50 dB at 50 mV/m

**Harmonic Distortion:** 0.5 % at 50 mV/m, 400 Hz

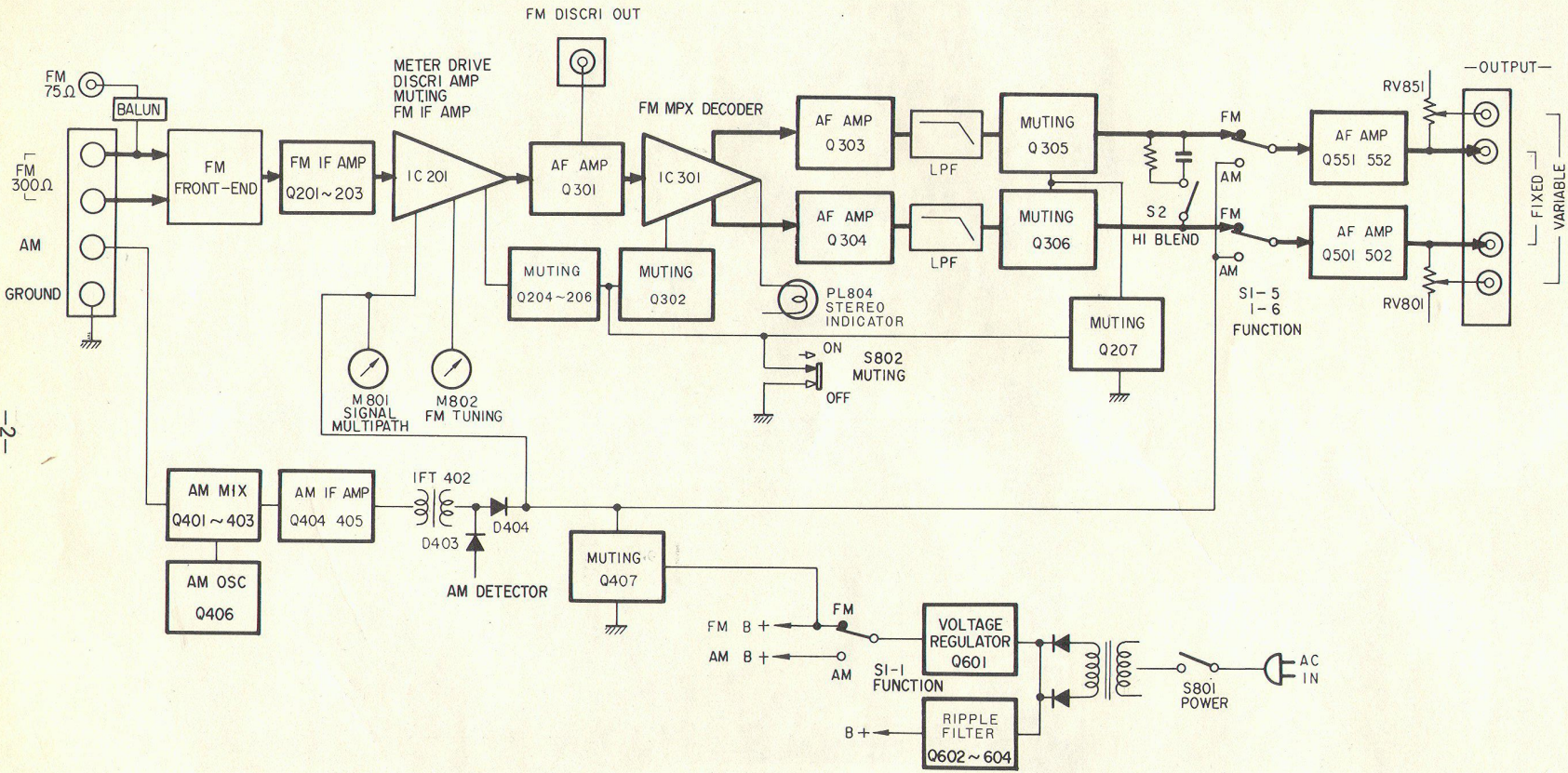
**IF Rejection:** 35 dB at 1,000 kHz

**SONY**  
**SERVICE MANUAL**



1-1. BLOCK DIAGRAM

SECTION 1  
OUTLINE





**1-2. DISASSEMBLY**

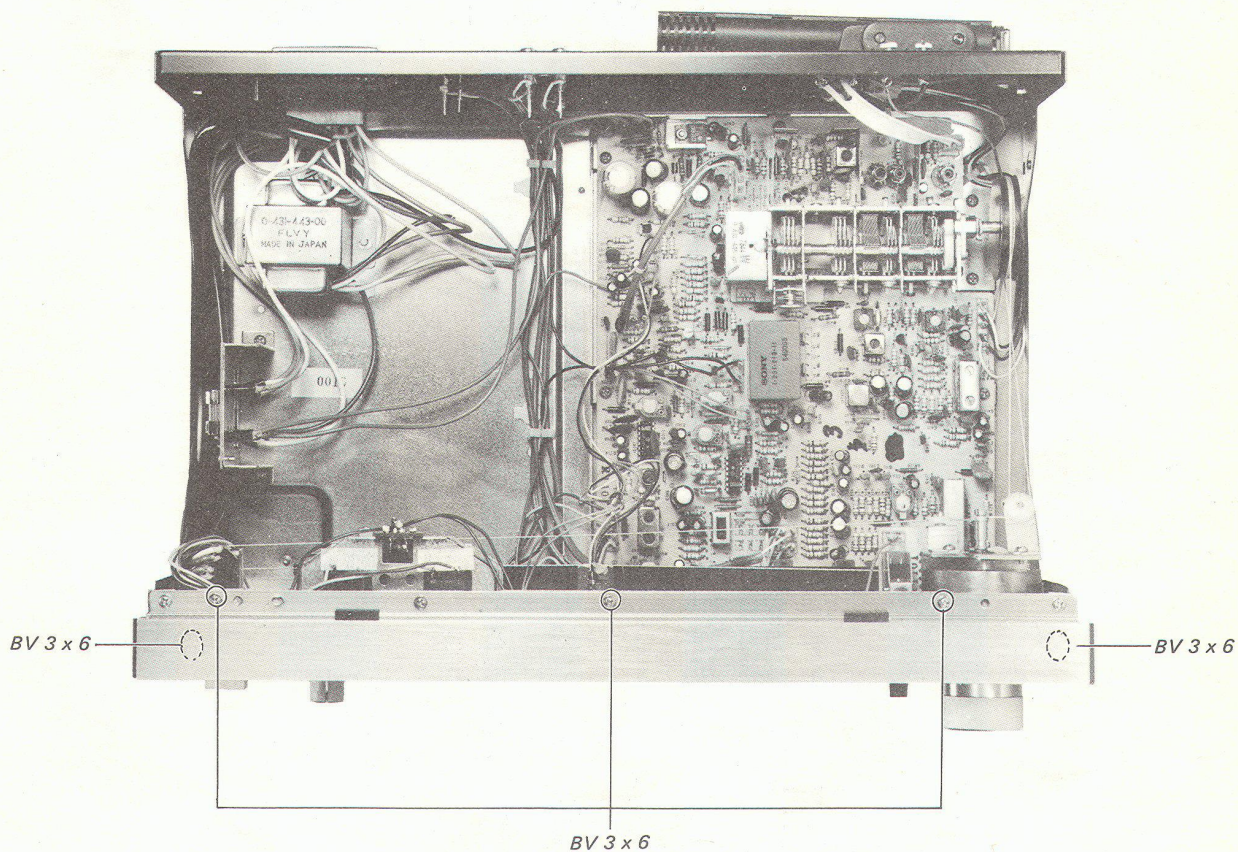
## 1) Top Cover

Remove four screws ( $\pm$ ) BW 4 x 22 from both ornamental side boards. Remove both ornamental side boards and top cover.

## 2) Front Panel

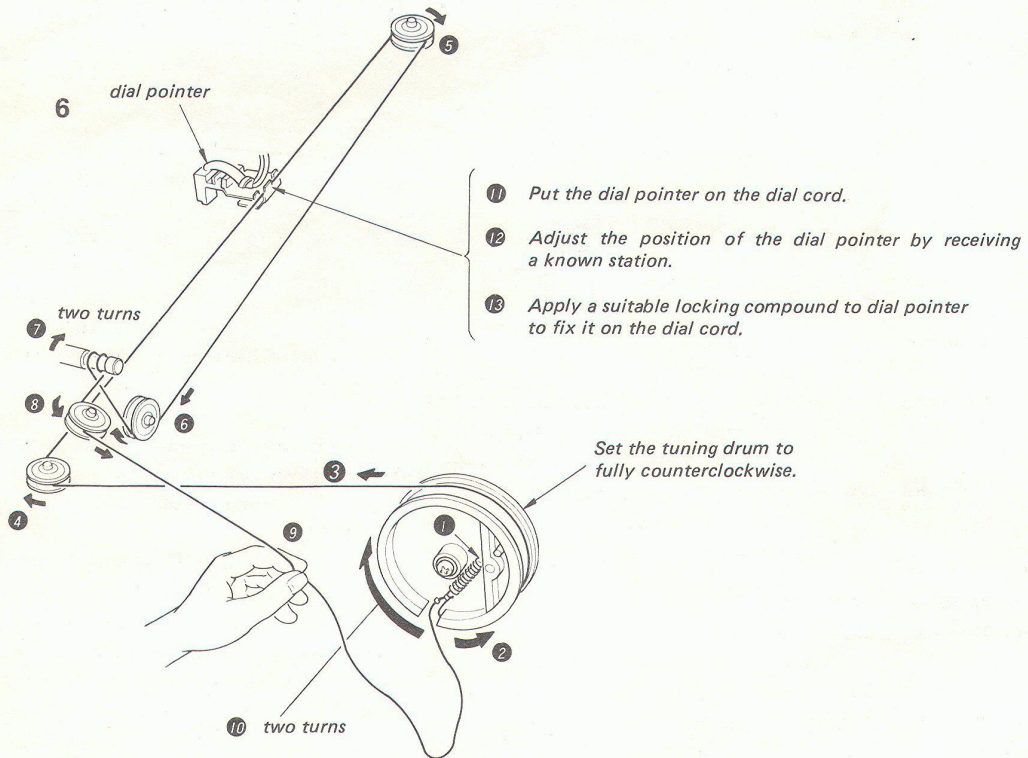
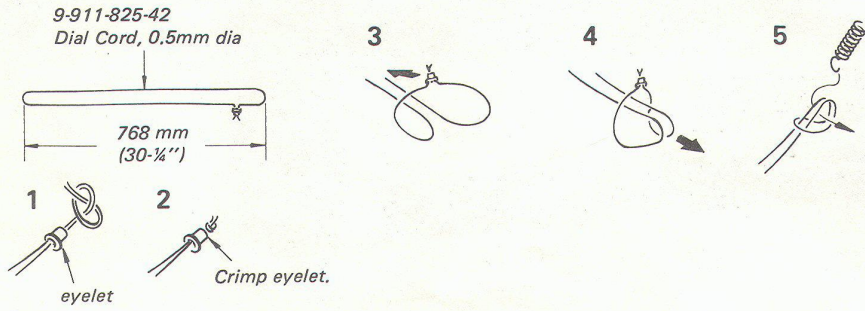
Pull off FUNCTION and OUTPUT LEVEL knobs. Remove TUNING knob by loosening the knob screw.

Remove five screws BV 3 x 6 from top and both sides of the front panel.





1-3. DIAL CORD STRINGING





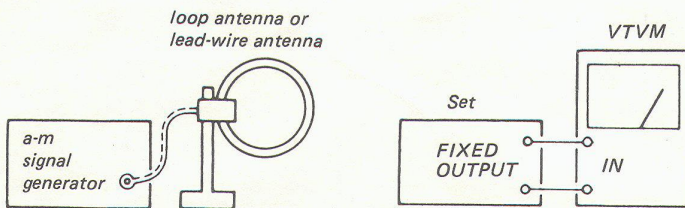
## SECTION 2 ADJUSTMENTS

### 2-1. FM FREQUENCY COVERAGE AND TRACKING ADJUSTMENTS

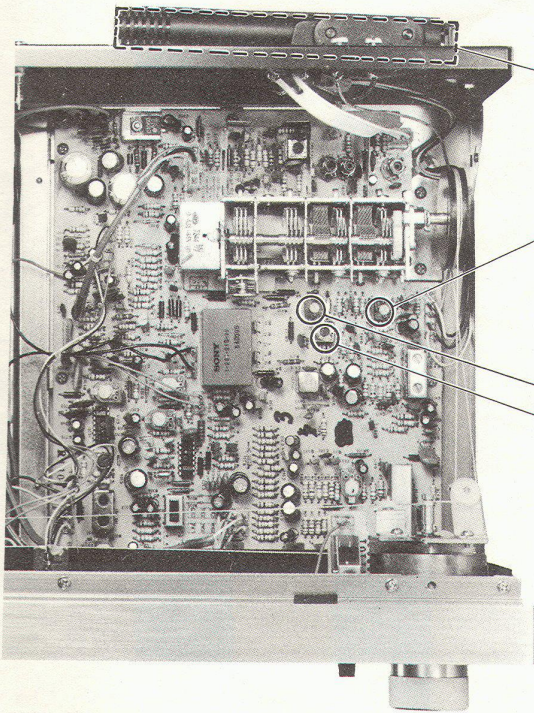
Never attempt alignment of the fm front-end section for the fm frequency coverage and tracking adjustment. If the fm frequency coverage adjustment is required, replace the fm front-end ass'y. In the case of tracking alignment, ask your nearest SONY Service Station to send your unit to the Factory Service Center.

### 2-2. AM FREQUENCY COVERAGE AND TRACKING ADJUSTMENTS

Test setup:



Adjust for maximum reading.



AM TRACKING	
L801	600kHz(modulated)
CT401	1,400kHz(modulated)

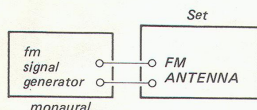
AM FREQUENCY COVERAGE	
CT402	1,605kHz(modulated)
L402	530kHz(modulated)



2-3. FM ADJUSTMENTS

**SIGNAL METER ADJUSTMENT**

Test setup:

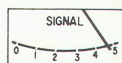


**FM Signal Generator Setting:**

Carrier frequency: 98 MHz  
 Modulation: 400 Hz, 75 kHz deviation (100 %)  
 Output level: 1 mV (60 dB)

**Procedure:**

Tune the tuner to 98MHz and adjust RT202 for the pointer deflection of 4.6 (See figure below.) on the SIGNAL meter.



**DISCRIMINATOR ALIGNMENT**

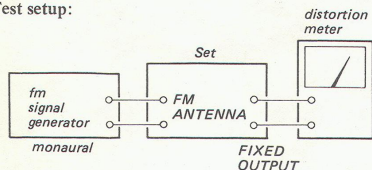
Procedure:

1. Detune the tuner.
2. Adjust the secondary-side core (blue) of IFT201 for zero center on the TUNING meter.



**MONAURAL DISTORTION ADJUSTMENT**

Test setup:



**FM Signal Generator Setting:**

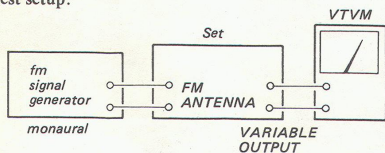
Carrier frequency: 98 MHz  
 Modulation: 400 Hz, 75 kHz deviation (100 %)  
 Output level: 1 mV (60 dB)

**Procedure:**

Tune the tuner to 98MHz and adjust the primary-side core (black) of IFT201 for minimum reading on the distortion meter.

**FM OUTPUT LEVEL ADJUSTMENT**

Test setup:



**FM Signal Generator Setting:**

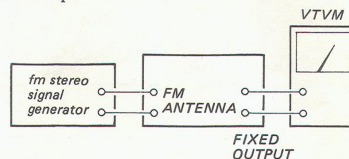
Carrier frequency: 98 MHz  
 Modulation: 400 Hz, 75 kHz deviation (100 %)  
 Output level: 1 mV (60 dB)

**Procedure:**

Set OUTPUT LEVEL control to max and adjust RT201 for 1.6V (6dB) on the VTVM.

**FM STEREO SEPARATION ADJUSTMENT**

Test setup:



**FM Stereo Signal Generator Setting:**

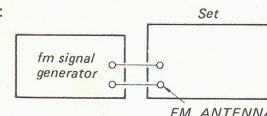
Carrier frequency: 98 MHz  
 Mode: Stereo  
 Audio (400 Hz) Mod: 67.5 kHz (90 %)  
 Pilot (19 kHz) Mod: 7.5 kHz (10 %)

**Procedure:**

1. Tune the tuner to 98 MHz.
2. Adjust RT501 for maximum output on the VTVM at the left channel, and record the output level.
3. Record the residual signal level when the stereo signal generator input selector is to the right.  
**Note:** The output level to residual-level ratio represents the separation.
4. Measure the separation at the right channel.
5. Readjust RT501 for minimum difference between left and right channel separation.

**MUTING ADJUSTMENT**

Setup:

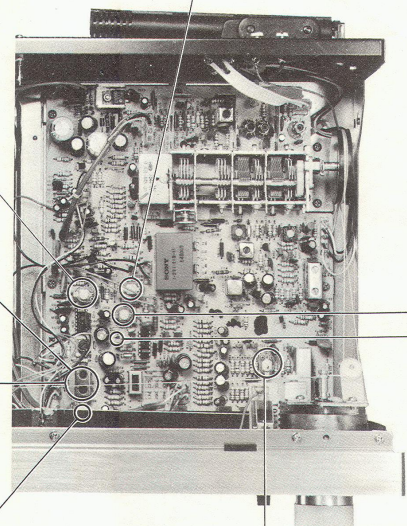


**FM Signal Generator Setting:**

Carrier frequency: 98 MHz  
 Modulation: 400 Hz, 75 kHz deviation (100 %)  
 Output level: 1 mV (60 dB)

**Procedure:**

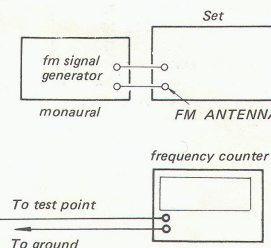
1. Turn the MUTING switch ON.
2. Adjust RT203 so that the muting circuit begins to operate at the symmetrical deflection point of TUNING meter when detuning the tuner to higher or lower frequencies than 98 MHz.



**19 kHz ADJUSTMENT**

**A) With Frequency Counter**

Setup:



**FM Signal Generator Setting:**

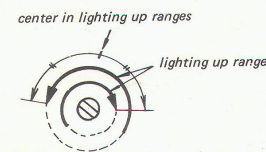
Carrier frequency: 98 MHz  
 Modulation: 400 Hz, 75 kHz deviation (100 %)  
 Output level: 1 mV (60 dB)

**Procedure:**

1. Tune the set to 98 MHz.
2. Adjust RT301 for 19kHz ± 100Hz on the counter.

**B) Without Frequency Counter**

1. Tune the set to FM stereo signals.
2. Turn RT301 clockwise or counterclockwise and secure RT301 at the center in lighting-up range of stereo lamp as shown below.

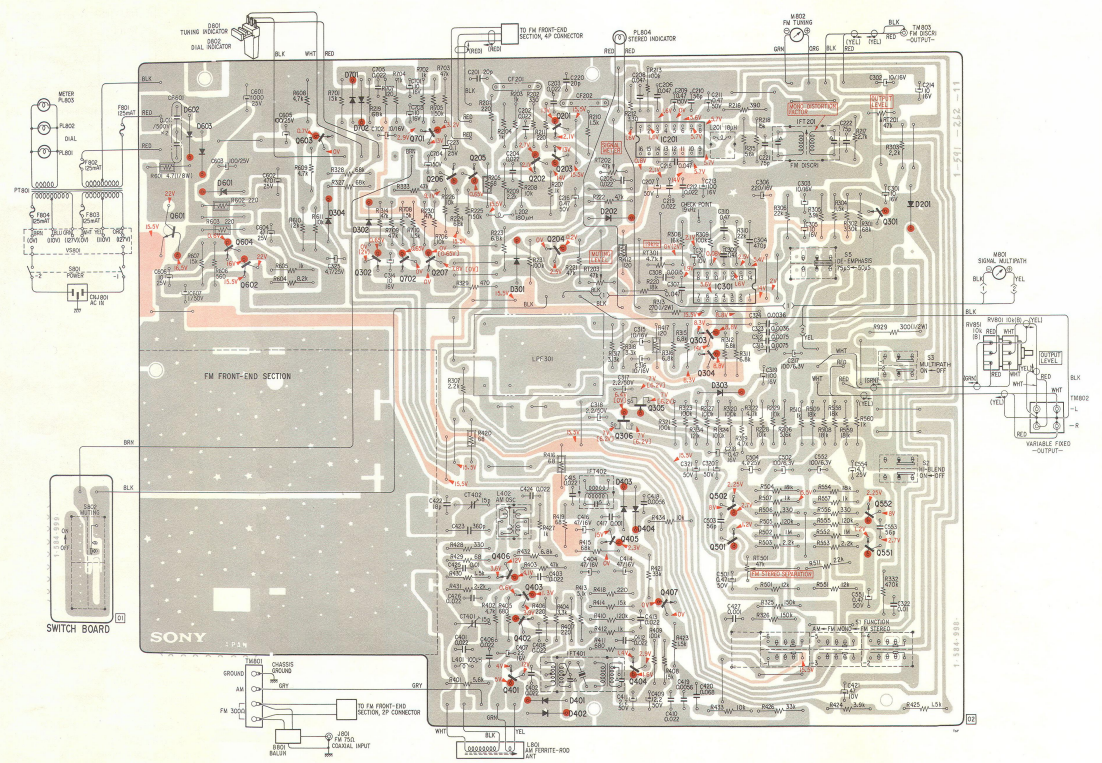




SECTION 3  
DIAGRAMS

3-1. MOUNTING DIAGRAM  
— Conductor Side —

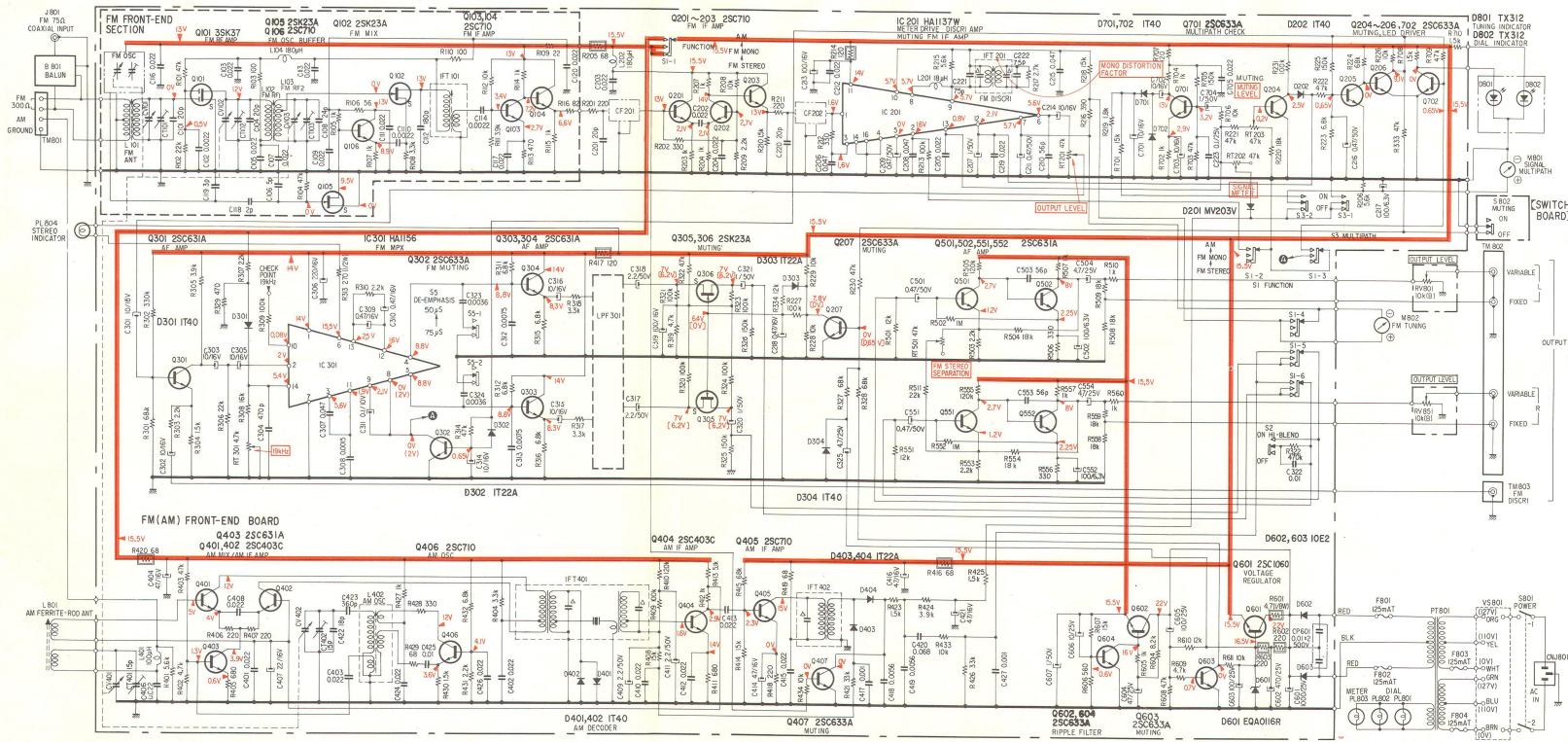
- Q101: 3SK37
  - Q102, 105  
305, 306: 2SK23A
  - Q301, 303, 304  
501, 502, 551  
552: 2SC631A
  - Q401, 402, 404:  
2SC403C
  - Q204~207, 302, 407  
602~604, 701, 702:  
2SC633A
  - Q103, 104, 106,  
201~203, 405  
406: 2SC710
  - D601: EQA01-16R
  - D601, 802: TX312
  - IC201: HA1137W
  - IC301: HA1156
  - D202, 301, 304  
401, 402, 701,  
702: 1T40
  - D302, 303, 403,  
404: 1T22A
  - D802, 603: 10E2
  - D201: MV203V
- : nonflammable resistor  
B : B + pattern



Q, IC	D
704	702
603	602
201	
1C201	
203	
305, 206	
603	
601	201
301	202
604	302
705, 507	204
602	301
1C301	
303	
304	303
305	
306	
502	403, 404
552	
405, 506	
406	
401	
407	
402	
404	
401	
402	



3-2. SCHEMATIC DIAGRAM



- Note:**
- All capacitors are in  $\mu\text{F}$  unless otherwise noted. 50 or less working volts are omitted except for electrolytic type. p = p.p.F.
  - All resistors are in  $\Omega$ ,  $\text{k}\Omega$ ,  $\text{M}$  = 1,000k.
  - $\square$  indicates non-flammable resistor.
  - $\Delta$  indicates internal components.
  - $\text{---}$  indicates chassis ground.
  - $\text{---}$  indicates B+ circuit.
  - Voltages are DC with respect to ground unless otherwise noted. Readings are taken under no-signal conditions with a VOM (20k  $\Omega/\text{V}$ ).
  - no mark: common
  - ( ): STEREO
  - ( ): MUTING ON
  - Voltage variations may be noted due to normal production tolerances.
  - Switch Model

Ref. No.	Switch	Position
S1-1 ~ 6	FUNCTION	FM STEREO
S2	HI-BLEND	OFF
S3, 2	MULTIPATH	OFF
S5	DE-EMPHASIS	50 $\mu\text{S}$
S801	POWER	OFF
S802	MUTING	OFF



MEMO

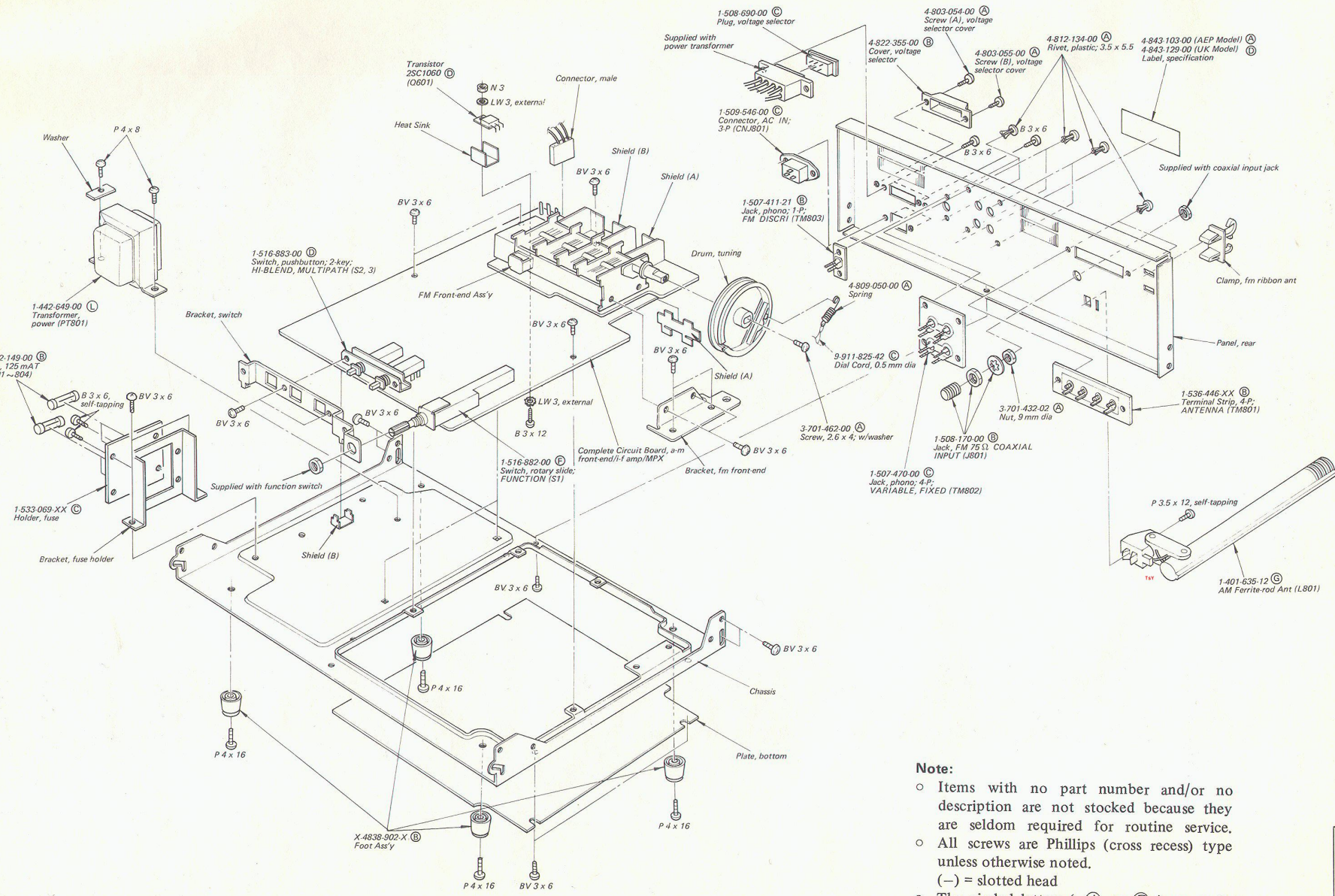
---

Dotted lines for writing.









**Note:**

- Items with no part number and/or no description are not stocked because they are seldom required for routine service.
- All screws are Phillips (cross recess) type unless otherwise noted.  
(-) = slotted head
- The circled letters (A to Z) are applicable for European models only.



Note: The circled letters (A to Z) are applicable for European models only.

**SECTION 5  
ELECTRICAL PARTS LIST**

Ref. No.   Part No.   Description

**SEMICONDUCTORS**

**Transistors**

Q101	(E)	3SK37
Q102	(C)	2SK23A
Q103, 104	(B)	2SC710
Q105	(C)	2SK23A
Q106	(B)	2SC710
Q201 ~ 203	(B)	2SC710
⇒Q204 ~ 207	(B)	2SC634A
⇒Q301	(B)	2SC632
⇒Q302	(B)	2SC634A
⇒Q303, 304	(B)	2SC632
Q305, 306	(C)	2SK23A
Q401, 402	(B)	2SC403C
⇒Q403	(B)	2SC632
Q404	(B)	2SC403C
Q405, 406	(B)	2SC710
Q407	(B)	2SC634A
Q501, 551	(B)	2SC632A
Q502, 552		
Q601	(D)	2SC1060
Q602 ~ 604	(B)	2SC634A
Q701, 702	(B)	2SC634A
<b>ICs</b>		
IC201	(H)	HA1137W
IC301	(J)	HA1156

**Diodes**

D201		MV203V
⇒D202	(B)	1S1555
⇒D301	(B)	1S1555
D302, 303		1T22A
⇒D304	(B)	1S1555
⇒D401, 402	(B)	1S1555
D403, 404	(B)	1T22A
D601	(B)	EQA0116R
D602, 603	(B)	10E2
⇒D701, 702	(B)	1S1555
D801, 802	(H)	TX312

⇒ Due to replacement parts, the values are different from the diagrams.

Ref. No.   Part No.   Description

**COILS**

L101	1-401-662-00	(B) FM Antenna
L102	1-425-925-00	(B) FM RF
L103	1-425-926-00	(B) FM RF
L104	1-407-172-XX	(A) Microinductor, 180μH
L201	1-459-152-00	(B) Microinductor, 18μH
L202	1-407-172-XX	(A) Microinductor, 180μH
L401	1-407-169-XX	(A) Microinductor, 100μH
L402	1-405-656-00	(B) AM Osc
L801	1-401-635-12	(G) AM Ferrite-rod Ant

**TRANSFORMERS**

B801	1-417-014-21	(A) Balun
IFT101	1-403-295-00	(B) FM IFT
IFT201	1-404-029-00	(C) FM Discriminator
IFT401	1-404-014-21	(D) AM IFT
IFT402	1-403-149-00	(B) AM IFT
PT801	1-442-649-00	(L) Power

**FILTERS**

CF201, 202	1-527-248-00	(H) Ceramic, 10.7 MHz
LPF301	1-231-219-00	(D) Low-pass

**CAPACITORS**

All capacitors are in μF and of ceramic unless otherwise noted.  
(p = μμF, elect = electrolytic)  
50 or less working volts are omitted except for electrolytic type.

C101	1-101-981-11	(A) 20p
C102	1-102-257-11	(A) 0.0022
C103	1-101-924-11	(A) 0.022
C104	1-101-981-11	(A) 20p
C105	1-101-924-11	(A) 0.022
C106	1-102-864-11	(A) 5p
C107	1-101-924-51	(A) 0.022
C108	1-102-642-11	(A) 24p
C109	1-101-924-11	(A) 0.022
C110	1-101-919-11	(A) 0.0022
C111	1-101-924-11	(A) 0.022
C112	1-102-848-11	(A) 180p
C113	1-101-924-11	(A) 0.022
C114	1-101-919-11	(A) 0.0022
C116, 117	1-101-924-11	(A) 0.022



Note: The circled letters (A to Z) are applicable for European models only.

<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>
C118	1-102-406-11	(A) 2p
C119	1-102-503-11	(A) 3p
C120	1-101-924-11	(A) 0.022
C201	1-101-974-11	(A) 20p
C202 ~ 205	1-101-924-11	(A) 0.022
C206	1-101-925-11	(A) 0.047
C207	1-121-391-11	(A) 1 50V elect
C208	1-101-925-11	(A) 0.047
C209	1-121-726-11	(A) 0.47 50V elect
C210	1-101-884-11	(A) 56p
C211	1-121-726-11	(A) 0.47 50V elect
C212	1-101-924-11	(A) 0.022
C213	1-121-415-11	(A) 100 16V elect
C214	1-121-651-11	(A) 10 16V elect
C215	1-101-925-11	(A) 0.047
C216	1-121-726-11	(A) 0.47 50V elect
C217	1-121-413-11	(A) 100 6.3V elect
C218	1-127-204-11	(B) 0.47 16V solid aluminum
C219	1-101-924-11	(A) 0.022
C220	1-101-974-11	(A) 20p
C221, 222	1-102-732-11	(A) 75p
C223	1-161-038-11	(A) 0.1 25V ceramic (boundary layer)
C301 ~ 303	1-121-651-11	(A) 10 16V elect
C304	1-103-717-11	(A) 470p polystyrol
C305	1-121-651-11	(A) 10 16V elect
C306	1-121-421-11	(B) 220 16V elect
C307	1-108-246-12	(A) 0.047 mylar
C308	1-108-228-12	(A) 0.0015 mylar
C309, 310	1-127-204-11	(B) 0.47 16V solid aluminum
C311	1-127-019-11	(A) 0.1 10V solid aluminum
C312, 313	1-106-022-12	(A) 0.0075 mylar
C314 ~ 316	1-121-651-11	(A) 10 16V elect
C317, 318	1-121-450-11	(A) 2.2 50V elect
C319	1-121-415-11	(A) 100 16V elect
C320, 321	1-121-391-11	(A) 1 50V elect
C322	1-108-239-12	(A) 0.01 mylar
C323, 324	1-108-568-12	(A) 0.0036 mylar
C325	1-121-395-11	(A) 4.7 25V elect
C401 ~ 403	1-101-924-11	(A) 0.022
C404	1-121-409-11	(A) 47 16V elect
C406	1-101-924-11	(A) 0.022
C407	1-121-479-11	(A) 22 16V elect
C408	1-101-924-11	(A) 0.022

<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>
C409	1-121-450-11	(A) 2.2 50V elect
C410	1-101-924-11	(A) 0.022
C411	1-121-450-11	(A) 2.2 50V elect
C412, 413	1-101-924-11	(A) 0.022
C414	1-121-409-11	(A) 47 16V elect
C415	1-101-924-11	(A) 0.022
C416	1-121-409-11	(A) 47 16V elect
C417	1-108-227-12	(A) 0.001 mylar
C418, 419	1-108-355-12	(A) 0.0056 mylar
C420	1-108-249-12	(A) 0.068 mylar
C421	1-121-352-11	(A) 47 10V elect
C422	1-102-953-11	(A) 18p
C423	1-103-714-11	(A) 360p 50V polystyrol
C424	1-101-924-11	(A) 0.022
C425	1-108-239-12	(A) 0.01 mylar
C426	1-101-924-11	(A) 0.022
C427	1-108-227-12	(A) 0.001 mylar
C501, 551	1-121-726-11	(A) 0.47 50V elect
C502, 552	1-121-413-11	(A) 100 6.3V elect
C503, 553	1-101-884-11	(A) 56p
C504, 554	1-121-395-11	(A) 4.7 25V elect
C601	1-123-066-11	(B) 1000 25V elect
C602	1-121-940-11	(B) 470 25V elect
C603	1-121-416-11	(A) 100 25V elect
C604	1-121-410-11	(B) 47 25V elect
C605	1-121-416-11	(A) 100 25V elect
C606	1-121-398-11	(A) 10 25V elect
C607	1-121-391-11	(A) 1 50V elect
C701 ~ 703	1-121-651-11	(A) 10 16V elect
C704	1-121-391-11	(A) 1 50V elect
C705	1-101-924-11	(A) 0.022
CP601	1-102-355-11	(A) (0.01 500V) x 2
CT401, 402	1-141-147-11	(A) Trimmer, 15p

## RESISTORS

All resistors are in ohms. Regular-type ¼W carbon resistors are omitted.

Check the schematic diagram for the resistance values.

k = 1000, M = 1000k

R205	1-211-518-11	(A) 68 ¼W carbon (nonflammable)
R214	1-211-524-11	(A) 120 ¼W carbon (nonflammable)



Note: The circled letters ( A to Z ) are applicable for European models only.

<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>
R313	1-202-559-11	(A) 270 ¼W composition
R416	1-211-518-11	(A) 68 ¼W carbon (nonflammable)
R417	1-211-524-11	(A) 120 ¼W carbon (nonflammable)
R420	1-211-518-11	(A) 68 ¼W carbon (nonflammable)
R601	1-211-401-11	(A) 4.7 1/8W composition (nonflammable)
R602, 603	1-211-538-11	(A) 470 ¼W carbon (nonflammable)
RT201~203	1-224-647-XX	(B) 47k adjustable
RT301	1-224-644-XX	(B) 4.7k adjustable
RT501	1-224-647-XX	(B) 47k adjustable
RV801, 851	1-224-747-00	(C) 10k variable, OUTPUT LEVEL

### SWITCHES

S1	1-516-882-00	(F) Rotary Slide, FUNCTION
S2, 3	1-516-883-00	(D) Pushbutton, 2-key; HI-BLEND, MULTIPATH
S5	1-513-298-00	(B) Slide, de-emphasis
S801	1-516-628-00	(E) Pushbutton, POWER
S802	1-516-481-00	(E) Lever Slide, MUTING

### MISCELLANEOUS

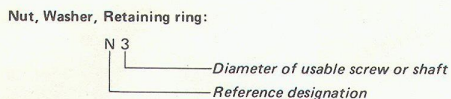
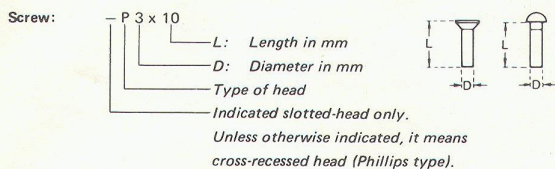
CNJ801	1-509-546-00	(C) Connector, AC IN; 3-p
F801 ~ 804	1-532-149-00	(B) Fuse, 125mAT
J801	1-508-170-00	(B) Jack, FM 75Ω COAXIAL INPUT
M801	1-520-237-00	(H) Meter, SIGNAL/MULTIPATH
M802	1-520-236-XX	(H) Meter, FM TUNING
PL801~803	1-518-116-00	(B) Lamp, 11V 360mA; dial, meter
PL804	1-518-169-XX	(B) Lamp, 4.5V 40mA; STEREO
TM801	1-536-446-XX	(B) Terminal Strip, 4-p; ANTENNA
TM802	1-507-470-00	(C) Jack, phono; 4-p; VARIABLE, FIXED
TM803	1-507-411-21	(B) Jack, phono; 1-p; FM DISCRI
	1-508-690-00	(C) Plug, voltage selector
	1-533-069-XX	(C) Holder, fuse

### ACCESSORIES AND PACKING MATERIALS

<u>Part No.</u>	<u>Description</u>
X-4490-002-2	(B) Cloth Ass'y, polishing
1-501-161-00	(F) Ribbon Antenna, fm
1-508-482-00	(C) Plug, coaxial input jack
1-534-049-61	(E) Cord, connection; RK-74
1-534-819-11	(E) Cord, power (UK Model)
3-429-126-00	Bag, polyethylene
3-780-851-11	(B) Manual, instruction
4-838-952-00	Cushion
4-843-134-00	Carton



HARDWARE NOMENCLATURE



Reference Designation	Shape	Description	Remarks
<b>SCREWS</b>			
P		pan-head screw	binding-head (B) screw for replacement
PWH		pan-head screw with washer face	binding-head (B) screw and flat washer for replacement
PS PSP		pan-head screw with spring washer	binding-head (B) screw and spring washer for replacement
PSW PSPW		pan-head screw with spring and flat washers	binding-head (B) screw and spring and flat washers for replacement
R		round-head screw	binding-head (B) screw for replacement
K		flat-countersunk-head screw	
RK		oval-countersunk-head screw	
B		binding-head screw	
T		truss-head screw	binding-head (B) screw for replacement
F		flat-fillister-head screw	
RF		fillister-head screw	
BV		brazer-head screw	

Reference Designation	Shape	Description	Remarks
<b>SELF-TAPPING SCREWS</b>			
TA		self-tapping screw	ex: TA, P 3 x 10
PTP		pan-head self-tapping screw	binding-head self-tapping (TA, B) screw for replacement
PTPWH		pan-head self-tapping screw with washer face	binding-head self-tapping (TA, B) screw and flat washer for replacement
PTTWH		pan-head thread-rolling screw with washer face	binding-head (B) screw and flat washer for replacement
<b>SET SCREWS</b>			
SC		set screw	
SC		hexagon-socket set screw	ex: SC 2.6 x 4, hexagon socket
<b>NUT</b>			
N		nut	
<b>WASHERS</b>			
W		flat washer	
SW		spring washer	
LW		internal-tooth lock washer	ex: LW3, internal
LW		external-tooth lock washer	ex: LW3, external
<b>RETAINING RINGS</b>			
E		retaining ring	
G		grip-type retaining ring	



ST-3950

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