

# Service Manual

Radio

10-BAND  
COMMUNICATION RECEIVER

## RF-4800LBS



### ■ SPECIFICATIONS

Frequency Range:	FM	87.5~108 MHz
	LW	145~410 kHz (2060~732m)
	MW	520~1610 kHz (577~186m)
	SW <sub>1</sub>	1.6~3 MHz (187~100m)
	SW <sub>2</sub>	3~7 MHz (100~42.9m)
	SW <sub>3</sub>	7~11 MHz (42.9~27.3m)
	SW <sub>4</sub>	11~15 MHz (27.3~20m)
	SW <sub>5</sub>	15~19 MHz (20~15.8m)
Intermediate Frequency:	SW <sub>6</sub>	19~23 MHz (15.8~14.7m)
	SW <sub>7</sub>	23~27.3 MHz (14.7~11m)
	FM	10.7 MHz
	LW/MW/SW <sub>1</sub>	455 kHz
	SW <sub>2</sub> ~7	1st IF 2 MHz
		2nd IF 455 kHz
Sensitivity:	FM	6 $\mu$ V (S/N 26 dB)
	LW	100 $\mu$ V/m (S/N 10 dB)
	MW	60 $\mu$ V/m (S/N 10 dB)
	SW <sub>1</sub>	1 $\mu$ V (S/N 10 dB)
	SW <sub>2</sub>	1.3 $\mu$ V (S/N 10 dB)
	SW <sub>3</sub>	0.8 $\mu$ V (S/N 10 dB)
	SW <sub>4</sub>	1.2 $\mu$ V (S/N 10 dB)
	SW <sub>5</sub>	1.2 $\mu$ V (S/N 10 dB)
	SW <sub>6</sub>	1.2 $\mu$ V (S/N 10 dB)
	SW <sub>7</sub>	1.3 $\mu$ V (S/N 10 dB)

Power Output:	DC Max. 3W (60% Mod. 400 Hz)
Power Source:	AC 110~125/220~240V 50/60 Hz or 12V (Eight "D" Size Flash-light Batteries) (National UM-1 or equivalent)
Power Consumption:	10W (AC Only)
Speaker:	10 cm (4") PM Dynamic Speaker
Dimensions:	18 $\frac{3}{8}$ " (Wide) x 7 $\frac{7}{8}$ " (High) x 13 $\frac{15}{16}$ " (Deep) (482 x 200 x 354 mm)
Weight:	8 kg (17 lb 10 oz) without batteries
Impedance:	Speaker .....4 $\Omega$ AUX Jack Din Type .....500k $\Omega$ (50mV) Miniature Type ...300k $\Omega$ (20mV) REC OUT Jack Din Type .....80k $\Omega$ (100mV) Miniature Type ...4k $\Omega$ (400mV) Earphone Jack .....4~8 $\Omega$ FM EXT ANT .....300 $\Omega$ SW <sub>1</sub> /LW/MW .....75 $\Omega$ SW <sub>2</sub> ~7 .....75 $\Omega$

Specifications are subject to change without notice for further improvement.

 **National Panasonic**

**Matsushita Electric Trading Co., Ltd.**  
P.O. Box 288, Central Osaka, Japan



## ■ TO REMOVE CABINET COVER

1. Remove the four (4) covers for the handle in the direction of arrow, as shown in fig. 1.
2. Remove the six (6) screws (nos. 1~6) for the handle and cabinet cover, as shown in fig. 2.
3. Remove the six (6) screws (nos. 1~6) for the handle and cabinet cover, as shown in fig. 3.
4. Remove the eight (8) screws (nos. 1~8) for the cabinet cover, as shown in fig. 4.
5. Remove the nine (9) screws (nos. 1~9) for the cabinet cover, as shown in fig. 5.
6. Remove the cabinet cover.
7. To reassemble, reverse the above procedure.

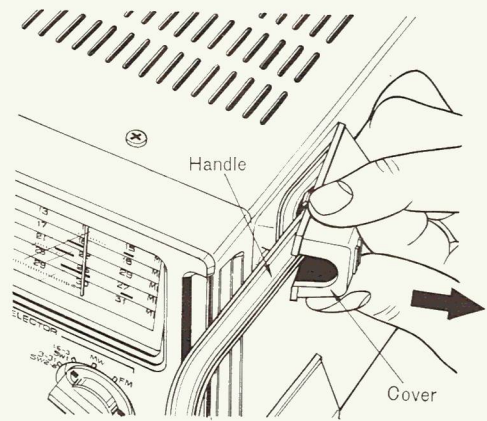
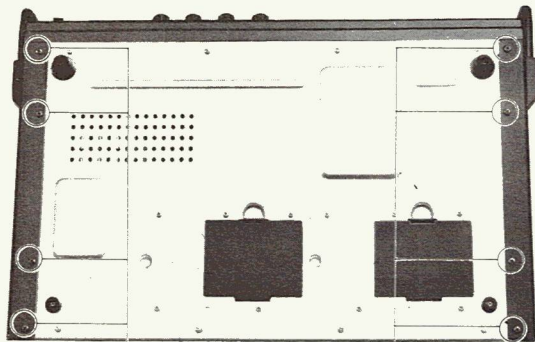


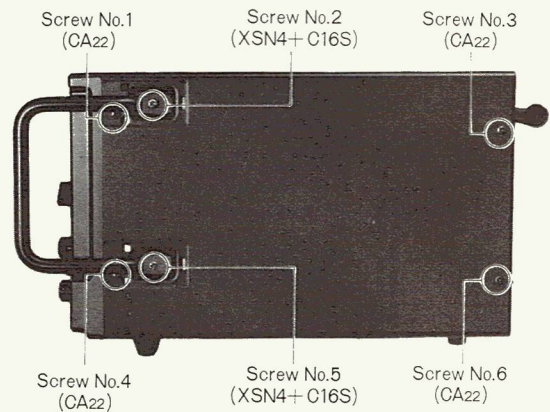
Fig. 1



Screw No.1~4  
(XYN3+C8S)

Screw No.5~8  
(XYN3+C8S)

Fig. 4



Screw No.1  
(CA22)

Screw No.2  
(XSN4+C16S)

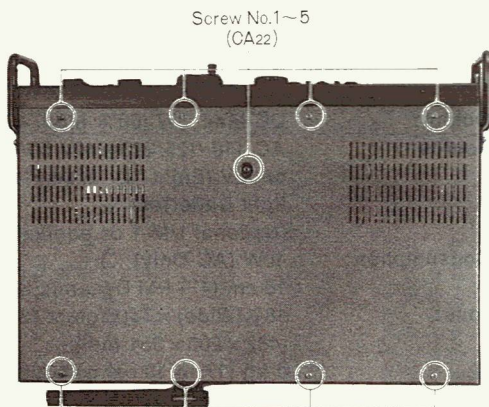
Screw No.3  
(CA22)

Screw No.4  
(CA22)

Screw No.5  
(XSN4+C16S)

Screw No.6  
(CA22)

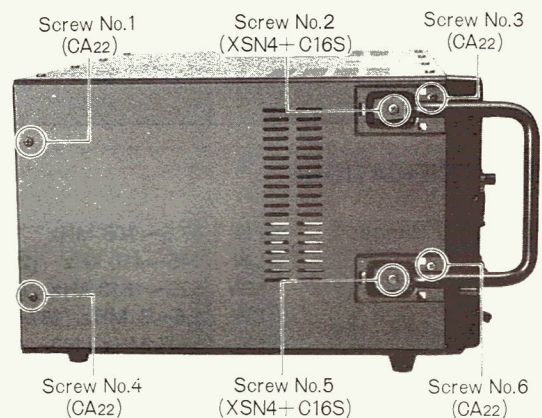
Fig. 2



Screw No.1~5  
(CA22)

Screw No.6~9  
(CA22)

Fig. 5



Screw No.1  
(CA22)

Screw No.2  
(XSN4+C16S)

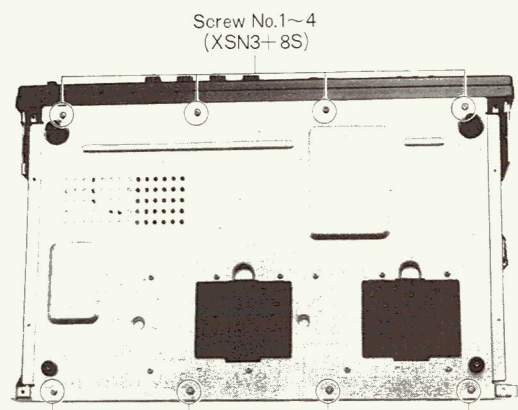
Screw No.3  
(CA22)

Screw No.4  
(CA22)

Screw No.5  
(XSN4+C16S)

Screw No.6  
(CA22)

Fig. 3



Screw No.1~4  
(XSN3+8S)

Screw No.5~8  
(XSN3+8S)

Fig. 6

## ■ TO REMOVE BOTTOM COVER

1. Remove the cabinet cover. (Refer to cabinet cover removal instruction.)
2. Remove the eight (8) screws (nos. 1~8) for the bottom cover as shown in fig. 6.
3. Remove the bottom cover.
4. Remove the socket from power source PC board.
5. To reassemble, reverse the above procedure.



## ■ TO REMOVE FREQUENCY COUNTER

1. Remove the cabinet cover. (Refer to cabinet cover removal instruction.)
2. Remove the socket from PC board.
3. Remove the three (3) screws (nos. 1~3) for the frequency counter, as shown in fig. 7.
4. Remove the frequency counter.
5. To reassemble, reverse the above procedure.

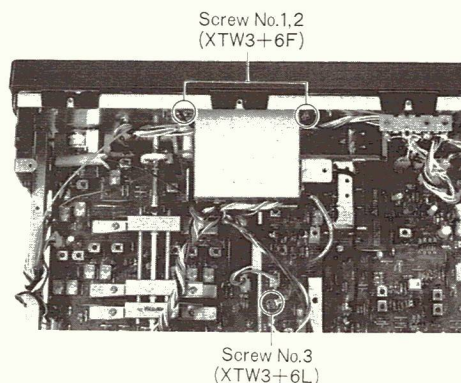


Fig. 7

## ■ TO REMOVE PC BOARD (Frequency Counter)

1. Remove the frequency counter.
2. Remove the two (2) screws (nos. 1 & 2) for the shield cover, as shown in fig. 8.
3. Remove the two (2) screws (nos. 1 & 2) for the PC board, as shown in fig. 9.
4. Remove the PC board.
5. To reassemble, reverse the above procedure.

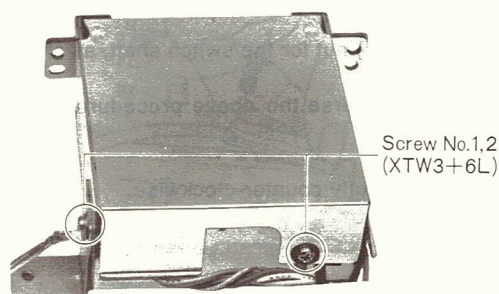


Fig. 8

## ■ TO REMOVE PC BOARD (VFO Circuit)

1. Remove the bottom cover. (Refer to bottom cover removal instruction.)
2. Loosen the two (2) screws (nos. 1 & 2) for the tuning capacitor shaft, as shown in fig. 10.
3. Remove the one (1) screw for the PC board, as shown in fig. 11.
4. Remove the three (3) screws (nos. 1~3) for the PC board, as shown in fig. 12.
5. To remove PC board completely unsolder lead wires from the other PC board.
6. To reassemble, reverse the above procedure and read the following notes.

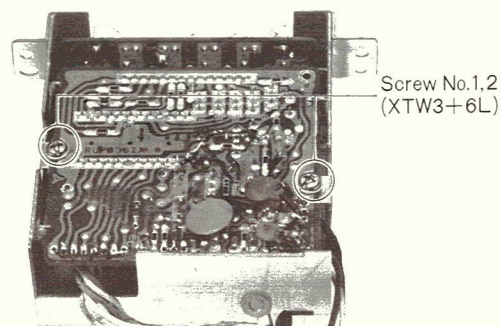


Fig. 9

### Notes:

1. Set tuning capacitor to maximum capacity.
2. Turn tuning shaft fully counter-clockwise.

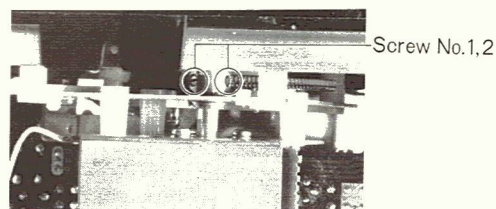


Fig. 10

## ■ TO REMOVE FERRITE ANTENNA

1. Remove the bottom cover. (Refer to the bottom cover removal instruction.)
2. Unsolder lead wires from PC board.
3. Push the catches in the direction of arrows, as shown in fig. 13 and remove the holder.
4. Push the holder in the direction of arrows ① and ② and open the holder in the direction of arrow ③ and ④, as shown in fig. 14.
5. Remove the ferrite antenna.
6. To reassemble, reverse the above procedure and read the following note.

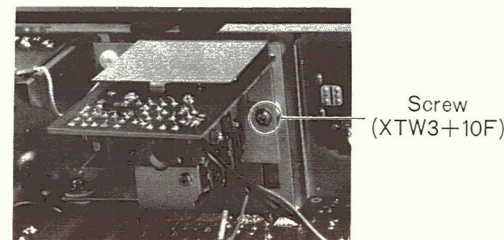


Fig. 11

### Note:

1. Insert the lead wires in the slit of holder, as shown in fig. 15.



## ■ TO REMOVE FRONT PANEL

1. Remove the bottom cover. (Refer to the bottom cover removal instruction.)
2. Pull out sockets from speaker.
3. Pull out socket from PC board.
4. Remove the eleven (11) knobs.
5. Remove the three (3) red screws (nos. 1~3) for the front panel, as shown in fig. 16.
6. Remove the three (3) red screws (nos. 1~3) for the front panel, as shown in fig. 17.
7. To reassemble, reverse the above procedure.

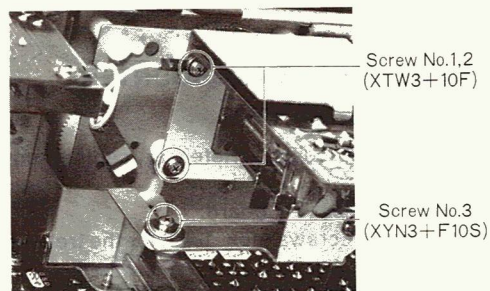


Fig. 12

## ■ TO REMOVE BAND SWITCH SHAFT (SW<sub>2</sub> ~ 7, SW<sub>1</sub>, MW, FM, LW)

1. Remove the front panel. (Refer to the front panel removal instruction.)
2. Set band switch to "SW<sub>2</sub>~7" position.
3. Remove the switch wire in the direction of arrow, as shown in fig. 18.
4. Remove the one (1) nut for the switch shaft, as shown in fig. 19.
5. To reassemble, reverse the above procedure and read the following note.

Note:

1. Turn switch shaft fully counter-clockwise.

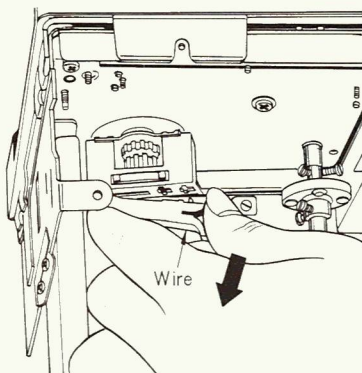


Fig. 18

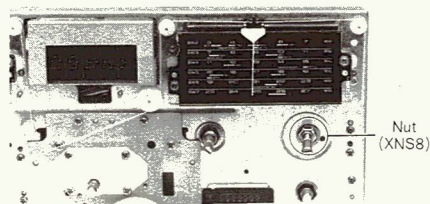


Fig. 19

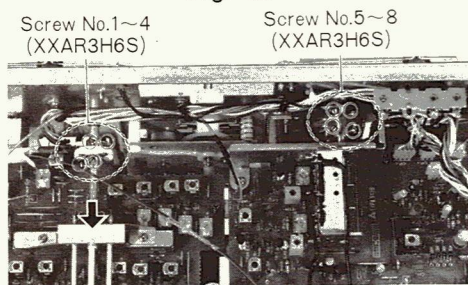


Fig. 20

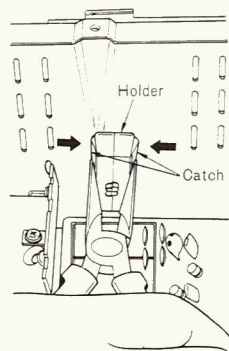


Fig. 13

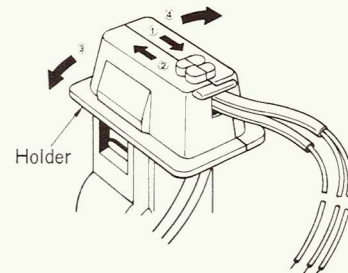


Fig. 14

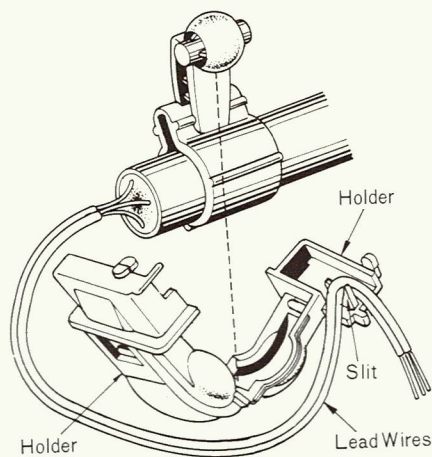


Fig. 15

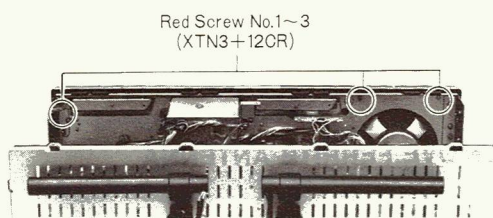


Fig. 16

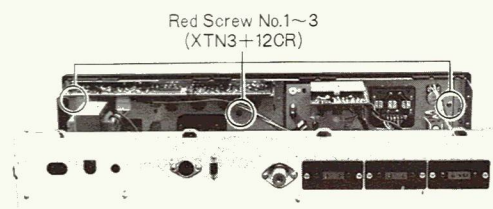


Fig. 17



## ■ TO REMOVE BAND SWITCH SHAFT (SW<sub>2</sub> ~ 7)

1. Remove the frequency counter. (Refer to the frequency counter removal instruction.)
2. Loosen the four (4) screws (nos. 1~4) for the joint, as shown in fig. 20.
3. Slide the joint in the direction of arrow, as shown in fig. 20.
4. Remove the six (6) screws (nos. 1~6) for the shaft, as shown in fig. 21.
5. Remove the shaft.
6. To reassemble, reverse the above procedure and read the following notes.

### Notes:

1. Turn switch shaft fully counter-clockwise.
2. Set the switch lever at the position, as shown in fig. 23.

## ■ TO REMOVE PC BOARD (FM, LW, MW RF Circuit)

1. Remove the frequency counter. (Refer to the frequency counter removal instruction.)
2. Remove the front panel. (Refer to the front panel removal instruction.)
3. Remove the dial scale.
4. Remove the dial cord.
5. Turn dial drum fully counter-clockwise.
6. Loosen the four (4) screws (nos. 5~8) for the joint, as shown in fig. 20.
7. Remove the dial drum.
8. Set the band switch to "SW<sub>2</sub>~7" position.
9. Remove the switch wire in the direction of arrow, as shown in fig. 22.
10. Remove the six (6) screws (nos. 7~12) for the PC board, as shown in fig. 21.
11. Remove the PC board.
12. To reassemble, reverse the above procedure and read the following notes.

### Notes:

1. Set the tuning capacitor to maximum capacity.
2. Set the dial drum at the position, as shown in fig. 24.
3. Set the switch lever at the position, as shown in fig. 25.
4. Refer to dial cord installation (SW<sub>1</sub>/MW/LW/FM).

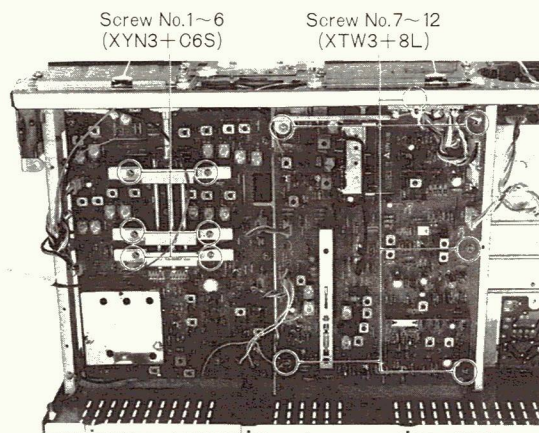


Fig. 21

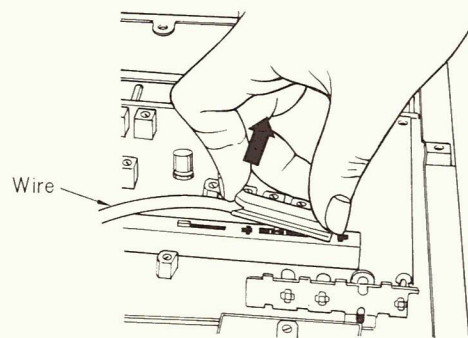


Fig. 22

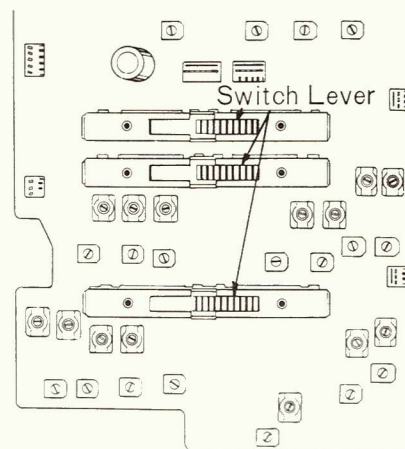


Fig. 23

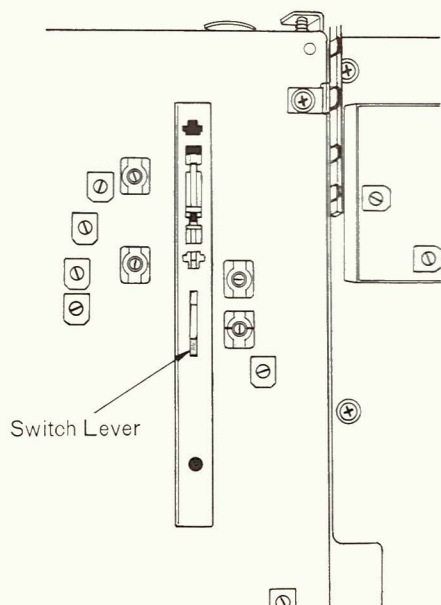


Fig. 25

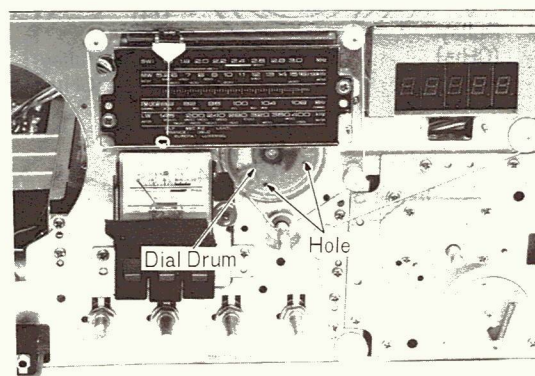


Fig. 24

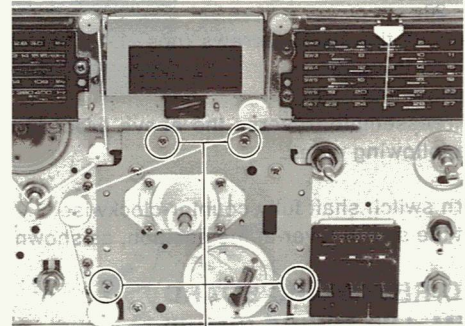


## ■ TO REMOVE DIAL MECHANISM

1. Remove the front panel. (Refer to the front panel removal instruction.)
2. Remove the PC board (VFO circuit). (Refer to PC board removal instruction.)
3. Remove the dial cord.
4. Remove the four (4) screws (nos. 1~4) for the dial mechanism, as shown in fig. 26.
5. Remove the dial mechanism.
6. To reassemble, reverse the above procedure and read the following notes.

Note:

1. Refer to dial cord installation (SW<sub>2</sub>~7).



Screw No.1~4  
(XYN3+C6S)

Fig. 26

## ■ DIAL CORD INSTALLATION GUIDE

### ● SW<sub>1</sub> /MW/LW/FM

1. Remove the front panel. (Refer to the front panel removal instruction.)
2. Remove the dial scale.
3. Turn the dial drum fully counter-clockwise.
4. Cord length is 90 cm (35 $\frac{7}{16}$ "').
5. Arrows (1~10) indicate correct order and direction of cord installation, as shown in fig. 27.
6. Cement cord ends.
7. Turn tuning shaft fully counter-clockwise.
8. Attach pointer to cord.
9. Set pointer to "0" point of dial scale.

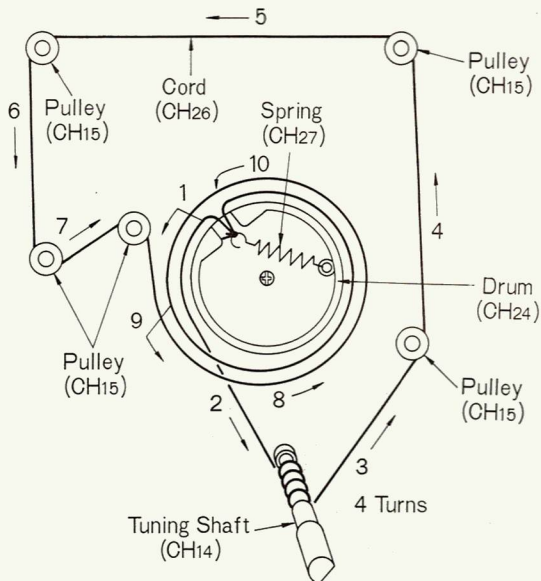


Fig. 27

### ● SW<sub>2</sub> ~SW<sub>7</sub>

1. Remove the front panel. (Refer to the front panel removal instruction.)
2. Turn tuning shaft fully clockwise.
3. Cord length is 115 cm (47 $\frac{1}{4}$ "').
4. Arrows (1~9) indicate correct order and direction of cord installation, as shown in fig. 28.
5. Turn tuning shaft fully counter-clockwise.
6. Attach pointer to cord.
7. Set pointer to start point of dial scale.

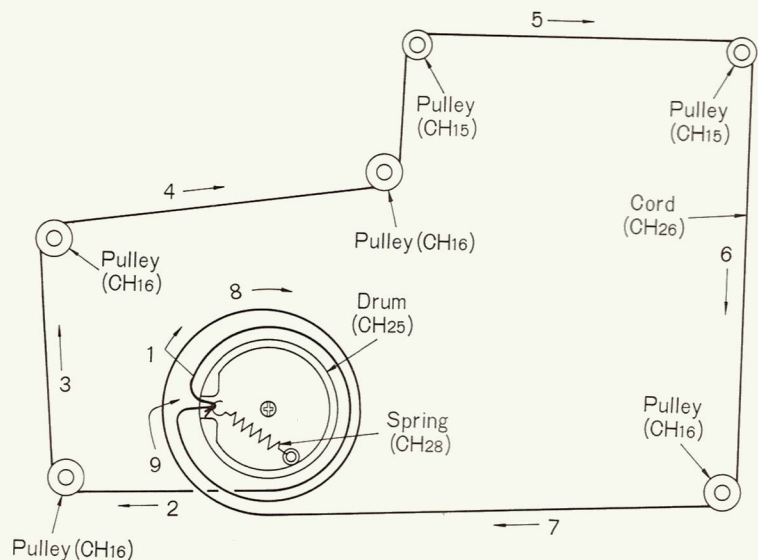


Fig. 28



## ■ HOW TO REPLACE CHIP

1. Remove solder for chip completely.
2. Remove chip by nippers, as shown in fig. 29.
3. Use tube for service parts as shown in fig. 30 and solder service parts according to following table. (please refer to Circuit Board Wiring View for the value of resistor and capacitor).

Color	Original Parts Name	Service Parts Name
Black	Chip Resistor	Carbon Resistor
Brown	Chip Capacitor	Ceramic Capacitor
Blue	Chip Jumper	Lead Wire

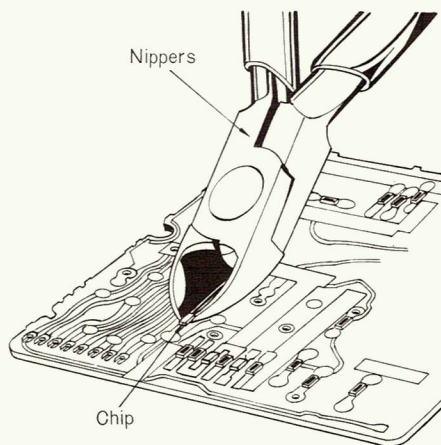


Fig. 29

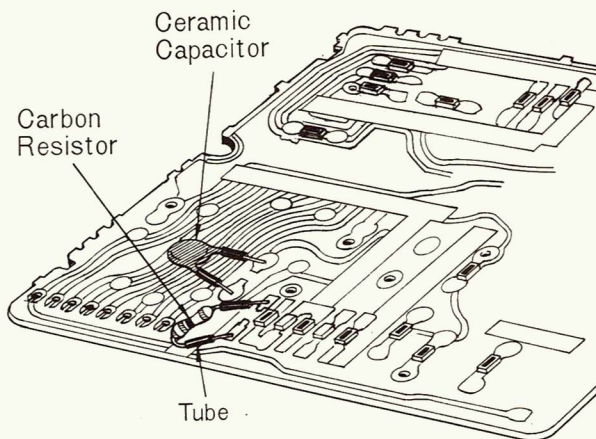


Fig. 30

## ■ CABINET PARTS LOCATIONS

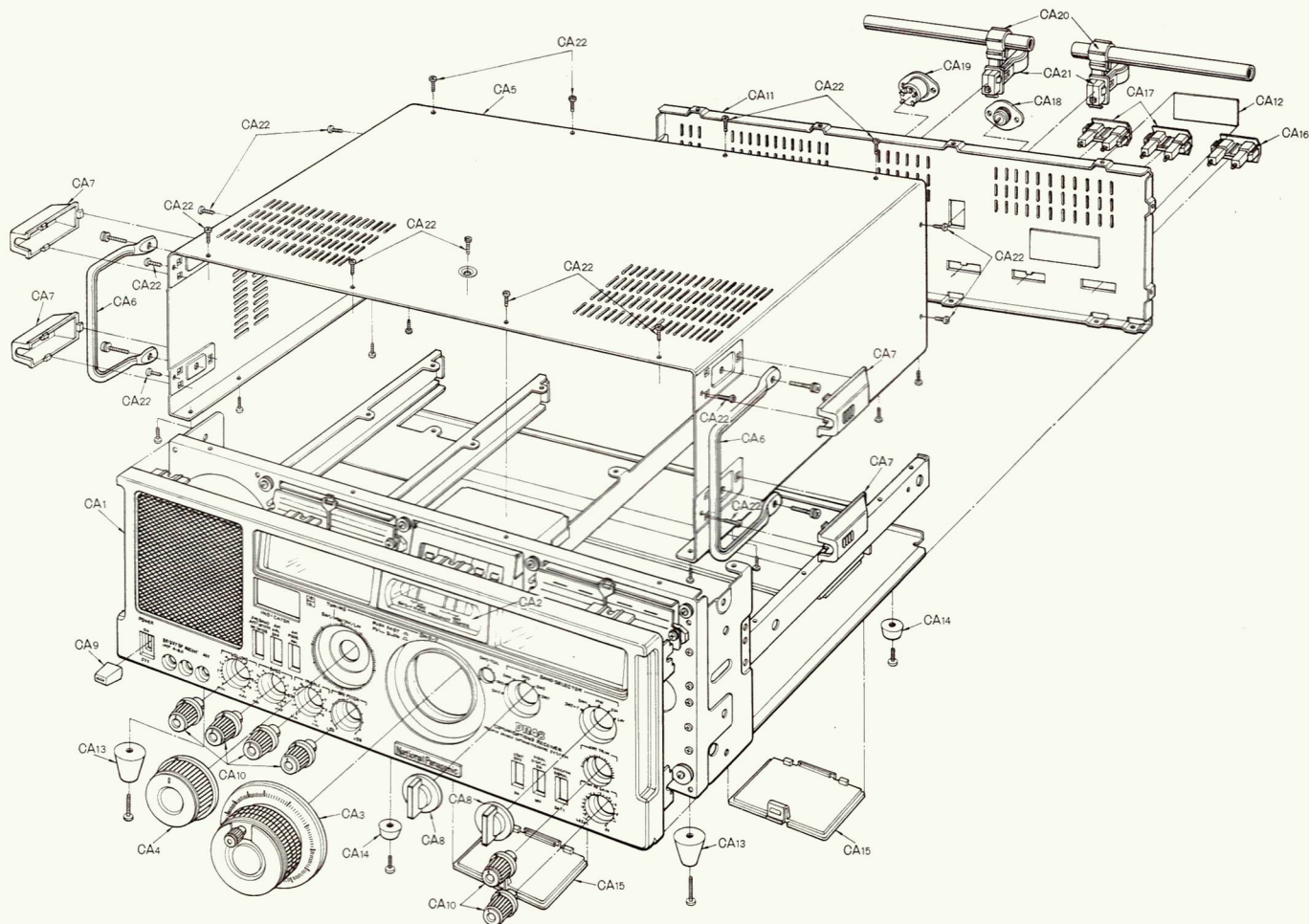


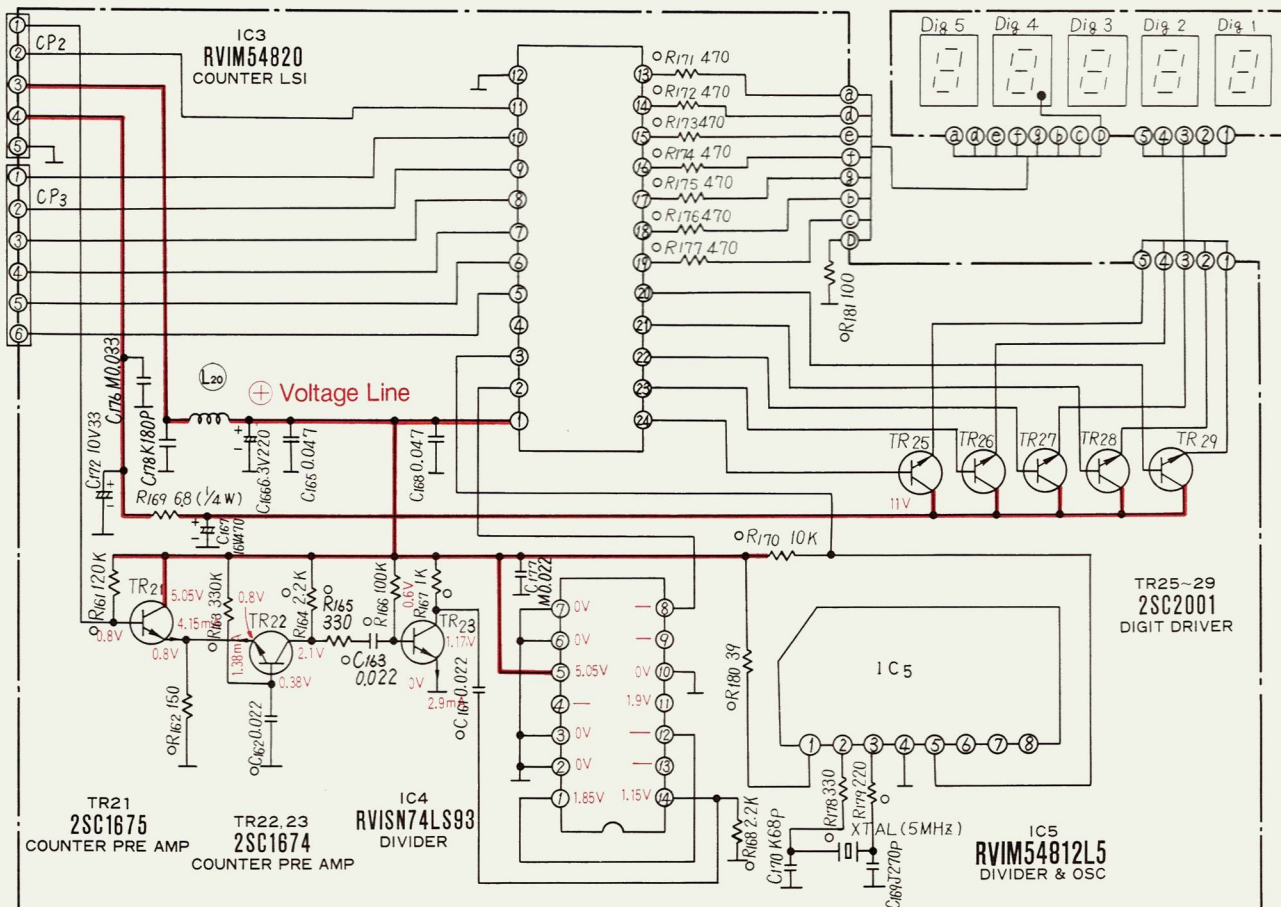
Fig. 31



## VOLTAGE

<b>TR1</b> SW2-7 C 0V B 0V E 1.6V Ie 2.5mA	<b>TR2</b> SW2-7 C 0V B 4.1V E 5V Ie 1mA	<b>TR3</b> SW2-7 C 1.25V B 3.7V E 4.6V Ie 1.3mA	<b>TR4</b> SW4-8 C 0V B 4.1V E 5V Ie 0.4mA	<b>TR5</b> SW2-7 C 0V B 4.1V E 5V Ie 0.4mA	<b>TR6</b> SW2-7 C 0V B 4.1V E 5V Ie 0.7mA
<b>TR7</b> SW4 C 5.5V B 1V E 0.7V Ie 0.34mA	<b>TR8</b> SW5,6 C 5.5V B 1V E 0.6V Ie 0.33mA	<b>TR9</b> SW7,8 C 5.2V B 0.95V E 0.55V Ie 0.36mA	<b>TR10</b> SW4-8 C 0.75V B 4V E 5V Ie 0.36mA	<b>TR11</b> SW4-8 C 5.4V B 0.95V E 0.6V Ie 0.36mA	<b>TR12</b> SW2-7 COUNTER "ON" C 11V B 5.5V E 4.9V Ie 68mA
<b>TR13</b> SW4-8 C 0V B 4V E 5V Ie 0.34mA	<b>TR14</b> SW2-7 C 0V B 4.2V E 5.2V Ie 1.1mA	<b>TR15</b> SW2-7 C 0V B 4.4V E 5.1V Ie 0.33mA	<b>TR16</b> FM C 0V B 0V D 3.8V Ie 0.2mA	<b>TR17</b> FM C 0V B 1V E 2V Ie 0.2mA	<b>TR18</b> MW, SW1 C 0.2V B 0V D 2.15V Ie 0.3mA
<b>TR19</b> MW, SW C 4.8V B 2.7V E 2.15V Ie 0.3mA	<b>TR20</b> SW2 SW3 C 0V 0V B 0.7V -0.1V E 0V 0V Ie —	<b>TR21</b> C 5.05V B 0.8V E 0.8V Ie 4.15mA	<b>TR22</b> C 2.1V B 0.38V E 0.8V Ie 1.38mA	<b>TR23</b> C 1.17V B 0.6V E 0V Ie 2.9mA	<b>TR24</b> FM C 0V B 4V E 5V Ie 0.8mA
<b>TR25-29</b> C 11V B — E —	<b>TR30</b> FM C 1.6V B 4V E 5V Ie 0.8mA	<b>TR31</b> FM C 1.5V B 4V E 5V Ie 0.76mA	<b>IC1</b> FM MW 1 0V 4.8V 2 0.65V 0V 3 0V 0V 4 3.4V 0V 5 3.8V 0V 6 5V 0V 7 5V 0V 8 3.8V 0V 9 0V 0.6V 10 0V 4.8V 11 0V 0.65V 12 0V 0.4V 13 0V 4.8V 14 0V 4.8V 15 0V 0.75V 16 0V 0V	<b>IC2</b> 1 12V 2 9.5V 3 9V 4 7V 5 1.4V 6 5.5V 7 4.5V 8 2.8V 9 2.8V 10 4.6V 11 1.15V 12 0V 13 0V 14 6V	<b>IC4</b> 1 1.85V 2 0V 3 0V 4 — 5 5.05V 6 0V 7 0V 8 — 9 — 10 0V 11 1.9V 12 — 13 — 14 1.15V
<b>TR32</b> MW, SW C 0V B 3.5V E 4.4V Ie 0.6mA	<b>TR33</b> SSB, CW C 0V B 3.4V E 4.2V Ie 1.2mA	<b>TR34</b> SSB, CW C 2.7V B 0.2V E 0.15V Ie 0.7mA	<b>IC3</b> RVIM54820 COUNTER LSI	<b>IC5</b> RVIM54812L5 DIVIDER & OSC	
<b>TR35</b> C 5.2V B 0.25V E 0V Ie 0.04mA	<b>TR36</b> C 2.1V B 0.4V E 0.35V Ie 0.8mA	<b>TR37</b> C 12V B 6.2V E 5.6V Ie 52mA	<b>TR25-29</b> 2SC2001 DIGIT DRIVER		

Schematic Diagram (Counter Circuit)-Model RF-4800LBS



C	172	176	178	166	162	165	163	168	161	170	173	169			
R	161	169	162	163	164	165	166	167	168	171~177	180	170	181	178	179



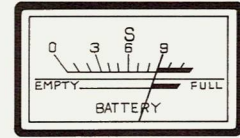
## ■ TUNE/BATT METER ADJUSTMENT

### 1. RADIO RECEIVER SETTING

- Set band switch to MW.
- Set volume control MIN.
- Set indicator switch to BATT.
- Set AM mode switch to AM.
- Set power source voltage to 7.2 volts DC.

### 2. REMARKS

- Adjust  $R_{274}$  so that the pointer of meter stays as shown in figure right.



## ■ ALIGNMENT INSTRUCTIONS

### READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

#### Notes:

1. Set power switch to ON.
2. Set volume control to MAX.
3. Set bass and treble control to center.
4. Set band switch to MW, LW, SW<sub>1</sub>~SW<sub>7</sub> or FM.
5. Set SW cal control to center.
6. Set AM RF gain control to DX.
7. Set FM AFC/Band width switch to WIDE or OFF (FM).
8. Set light switch to OFF.
9. Set AM ANL switch to OFF.
10. Set BFO pitch control to center.
11. Set digital display switch to OFF.
12. Set AM mode switch to AM or SSB/CW.
13. Set indicator switch to signal.
14. Set ANT trim control to center.
15. Set radio-phono switch to RADIO.
16. Output of signal generator should be no higher than necessary to obtain an output reading.

## ■ MW, SW, LW ALIGNMENT

BAND	SIGNAL GENERATOR or SWEEP GENERATOR		RADIO DIAL SETTING	INDICATOR (VTVM or SCOPE)	ADJUSTMENT	REMARKS
	CONNECTIONS	FREQUENCY				
AM-IF ALIGNMENT						
MW	Fashion loop of several turns of wire and radiate signal into loop of receiver.	455 kHz 30% Mod. at 400 Hz	Point of non-interference.	Output meter across voice coil.	T <sub>4</sub> (AM 1st IFT) T <sub>5</sub> (AM 2nd IFT) T <sub>9</sub> (AM 3rd IFT) T <sub>10</sub> (AM 4th IFT) T <sub>8</sub> (AM 5th IFT)	Adjust for maximum output.
BFO ALIGNMENT <b>Note:</b> Set band width switch to "Narrow".						
MW	"	600 kHz	Tune to signal.	Audio output from speaker.	L <sub>52</sub> (BFO OSC Coil)	1. Cut off modulation after tune signal. 2. Set AM mode switch to CW/SSB. 3. Adjust for zero beat.
SW-1st IF and 2nd OSC ALIGNMENT						
SW2	Connect EXT ANT (SW <sub>2</sub> ~ <sub>7</sub> ) terminal.	2 MHz	Point of non-interference.	Output meter across voice coil.	L <sub>48</sub> (SW 2nd OSC Coil) T <sub>1</sub> (SW 1st IFT) T <sub>2</sub> (SW 1st IFT)	Adjust for maximum output.
SW3	"	"	"	"	L <sub>49</sub> (SW 2nd OSC Coil)	"
MW-RF ALIGNMENT						
MW	Fashion loop of several turns of wire and radiate signal into loop of receiver.	550 kHz	550 kHz 2.4 mm ( $\frac{3}{32}$ " )	Output meter across voice coil	L <sub>50</sub> (MW OSC Coil) L <sub>43</sub> (MW ANT Coil)	Adjust for maximum output.
MW	"	1500 kHz	1500 kHz 57 mm ( $2\frac{1}{4}$ " )	"	C <sub>227</sub> (MW OSC Trimmer) C <sub>201</sub> (MW ANT Trimmer)	Adjust for maximum output. Repeat steps (4) and (5).
LW-RF ALIGNMENT						
LW	"	145 kHz	145 kHz 2.4 mm ( $\frac{3}{32}$ " )	"	L <sub>54</sub> (LW OSC Coil) L <sub>55</sub> (LW ANT Coil)	Adjust for maximum output.
LW	"	400 kHz	Tune to signal	"	C <sub>501</sub> (LW ANT Trimmer)	"
LW	"	415 kHz	Variable capacitor fully open.	"	C <sub>504</sub> (LW OSC Coil)	Adjust for maximum output. Repeat steps (6)~(7).



■ **SW4~7 X' tal ALIGNMENT** Note: Pull out socket **CP<sub>6</sub>**.

BAND	CONNECTIONS	ADJUSTMENT	REMARKS
SW4	Connect RF voltmeter: ⊕ side to <b>TP<sub>1</sub></b> ⊖ side to <b>E</b>	C <sub>101</sub> (Trimmer) L <sub>39</sub> (39 MHz Coil)	1. Turn C <sub>101</sub> to its center position. 2. Adjust L <sub>39</sub> (Turn to upper) until 25 mV ± 1 mV is read on RF voltmeter.
SW4	Connect frequency counter: ⊕ side to <b>TP<sub>1</sub></b> ⊖ side to <b>E</b>	C <sub>101</sub> (Trimmer)	Adjust C <sub>101</sub> until 39, 100 MHz ± 100 Hz is read on RF voltmeter.
SW4	Connect RF voltmeter: ⊕ side to <b>TP<sub>3</sub></b> ⊖ side to <b>E</b>	L <sub>30</sub> (31 MHz Coil)	Adjust L <sub>30</sub> (Turn to upper) until 30 mV ± 1 mV is read on RF voltmeter.
SW5	"	L <sub>31</sub> (27 MHz Coil)	Adjust L <sub>31</sub> (Turn to upper) until 30 mV ± 1 mV is read on RF voltmeter.
SW7	"	L <sub>32</sub> (19 MHz Coil)	Adjust L <sub>32</sub> (Turn to upper) until 30 mV ± 1 mV is read on RF voltmeter.

■ **44~48 MHz BPF ALIGNMENT** Note: Pull out socket **CP<sub>6</sub>**.

BAND	SWEEP GENERATOR		SWEEP SCOPE	ADJUSTMENT	REMARKS
	CONNECTIONS	FREQUENCY			
SW4	Connect to test point <b>TP<sub>1</sub></b> through ceramic capacitor (0.01μF) negative side to point <b>E</b>	44.48 MHz	Connect to test point <b>TP<sub>2</sub></b> negative side to point <b>E</b>	L <sub>35</sub> (BPF Coil) L <sub>36</sub> (BPF Coil) L <sub>37</sub> (BPF Coil)	1. Turn L <sub>35</sub> to lower before adjustment. 2. Adjust L <sub>36</sub> and L <sub>37</sub> for maximum amplitude.

■ **TRAP ALIGNMENT** Note: Pull out socket **CP<sub>6</sub>**.

BAND	CONNECTIONS	ADJUSTMENT	REMARKS
SW4	Connect RF voltmeter: ⊕ side to <b>TP<sub>2</sub></b> ⊖ side to <b>E</b>	L <sub>35</sub> (Trap Coil)	Adjust L <sub>35</sub> for minimum RF voltmeter reading.
SW5	Connect RF voltmeter: ⊕ side to <b>TP<sub>4</sub></b> ⊖ side to <b>E</b>	L <sub>28</sub> (Trap Coil)	Adjust L <sub>28</sub> for minimum RF voltmeter reading.
SW7	"	L <sub>29</sub> (Trap Coil)	Adjust L <sub>29</sub> for minimum RF voltmeter reading.

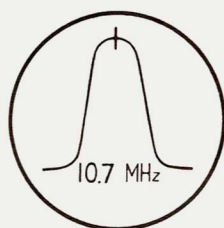


Fig. 32

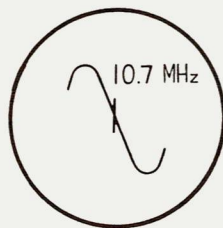


Fig. 33

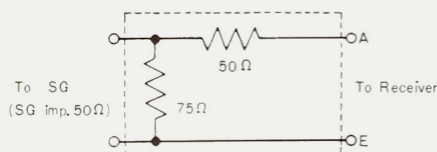


Fig. 34 FM Dummy Antenna