



ORDER NO. RD-613

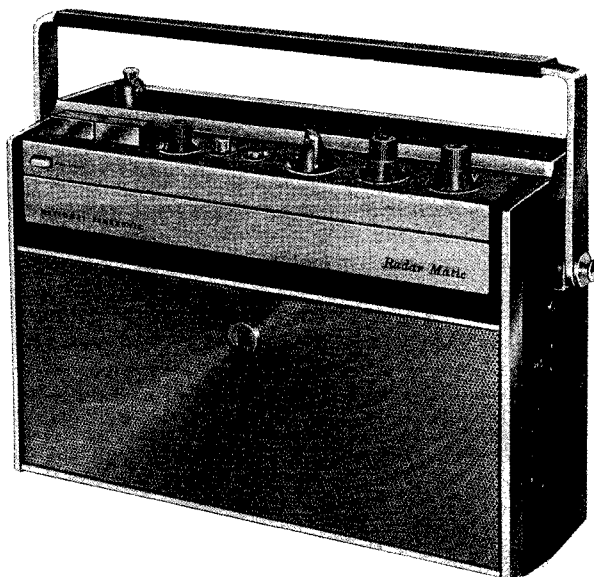


NATIONAL PANASONIC

Service Manual

4-BAND RADAR-MATIC AUTOMATIC TUNING RADIO

MODEL **RF-980L**



SPECIFICATIONS

Frequency Range :	FM 87~108 MHz		1S1211 } Operation Compensator
	LW 150~300 kHz (2000~1000 m)		1S1211 }
	MW 525~1605 kHz (571~187 m)		1S1211 } Operation Compensator
	SW 5.95~6.2 MHz (5.04~48.4 m)		1S1211 }
Intermediate Frequency :	FM 10.7 MHz		1N34A AM Detector & AGC
	AM (LW, MW & SW) 455 kHz		1N34A FM Detector
Transistors :	2SC429 FM RF Amplifier		1N34A Trigger Detector
	2SC185 FM Converter		1N34A ANL
	2SC183 Switching		1N34A Operation Compensator
	2SC645 FM 1st IF Amp. & AM Converter		1N34A Operation Compensator
	2SC469 FM 2nd IF Amp. & AM 1st IF Amp.		1S1211 Operation Compensator
	2SC469 FM 3rd IF Amp. & AM 2nd IF Amp.		FM 1 μ V for 50mW Output
	2SC469 FM 4th IF Amplifier		LW 100 μ V/m for 50mW Output
	2SC469 FM & AM Trigger IF Amplifier		MW 50 μ V/m for 50mW Output
	2SC183 Control Signal Forming		SW 30 μ V/m for 50mW Output
	2SC183 Control Signal Forming		FM 1 μ V for 50mW Output
	2SB324 Electronic Brake		LW 10 μ V for 50mW Output
	2SB324 Motor Driver		MW 20 μ V for 50mW Output
	2SC183 Control Signal Amplifier		SW 10 μ V for 50mW Output
	2SC183 Control Signal Amplifier		
	2SB173 Squelch & 1st AF Amplifier		
	2SB175 2nd AF Amplifier		
	2SB324 } Power Amplifier (push-pull)		
	2SB324 }		
Diodes :	SC-15 FM AFC		
	1N34A FM AGC		

Sensitivity :	FM 1 μ V for 50mW Output	
	LW 100 μ V/m for 50mW Output	} Portable
	MW 50 μ V/m for 50mW Output	
	SW 30 μ V/m for 50mW Output	
	FM 1 μ V for 50mW Output	
	LW 10 μ V for 50mW Output	} Car
	MW 20 μ V for 50mW Output	
	SW 10 μ V for 50mW Output	
Power Output :	1.5mW Maximum (Portable)	
	2.5mW Maximum (Car)	
Power Source :	6V (Four "D" Size Flashlight Batteries)	
	(NATIONAL UM-1 or equivalent)	
	or Car Battery 6V/12V	
Speaker :	12cm (5") PM Dynamic Speaker, Imp. 5 Ω	
Cabinet Dimensions :	266 (Wide) $\times$ 184 (High) $\times$ 86 (Deep) mm	
	(10 $\frac{1}{2}$ " $\times$ 7 $\frac{1}{4}$ " $\times$ 3 $\frac{3}{8}$ ")	
Weight :	2.6 kg. (5 lb. 12 oz.) with batteries	

<EXPORT DIVISION>

MATSUSHITA ELECTRIC TRADING CO., LTD.
P. O. Box 288, Central Osaka, Japan

MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.
RADIO and STEREO DIVISION

DISASSEMBLY INSTRUCTIONS

To Remove Chassis (Refer to Figs. 1 & 2)

1. Remove four (4) control knobs from cabinet.
2. Remove seven (7) cabinet back cover mounting screws, Nos. 1~7, as illustrated in Fig. 1.
3. Remove six (6) red chassis-mounting screws, Nos. 1~6, as illustrated in Fig. 2.

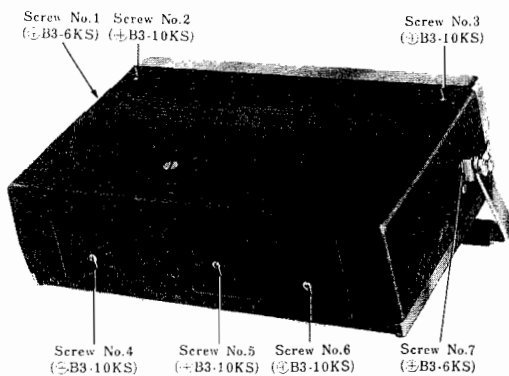


Fig. 1

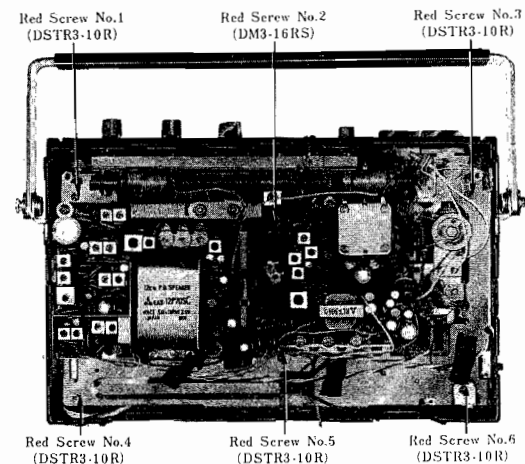


Fig. 2

4. To remove chassis completely, unsolder leadwires to speaker & dial light terminals.
5. To reassemble, reverse the above procedure.
When mounting chassis to the cabinet, make certain that the Radar-Matic sensitivity switch does not contact the stay shaft of the chassis holder located at the center of the cabinet.

To Remove Motor & Auto-tuning Switch

1. Unsolder leads, ①, ③, ⑤, ⑥, ⑦, as illustrated in Fig. 3.
2. Unsolder leads, ①, ②, as illustrated in Fig. 4.
3. Remove four (4) motor & reversing switch mounting screws, Nos. 1~4, as illustrated in Fig. 3.
4. Cut dial cord.

By the above procedure, motor and auto-tuning switch come off together.

When it is necessary to remove either the motor or the auto-tuning switch, refer to the following procedure.

5. Cut auto-tuning cord.
6. Unsolder leads, ②, ④, as illustrated in Fig. 3.
7. Remove the motor & auto-tuning switch mounting screw, No. 5, as illustrated in Fig. 3.
8. Remove two (2) auto-tuning motor mounting screws, Nos. 1, 2, as illustrated in Fig. 4.

By the above procedure, motor and auto-tuning switch come off completely. When removing auto-tuning switch, remove screws for pulley bracket Nos. 4, 5, as illustrated in Fig. 4.

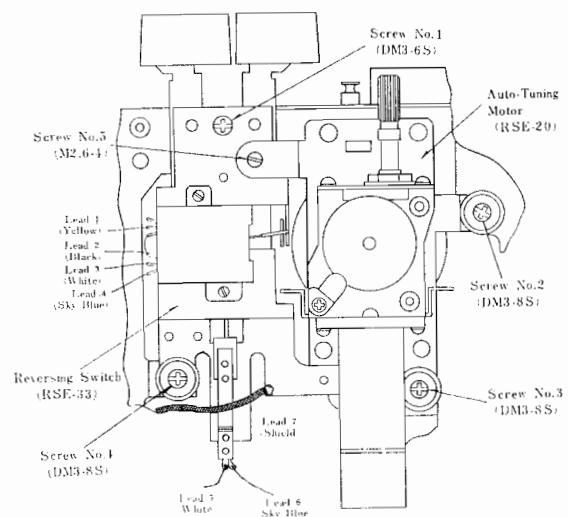


Fig. 3

To Reassemble Motor & Auto-tuning Switch

Reverse the removal instructions, noting the following:

1. When restringing dial cord, refer to dial cord stringing guide on page 3.
2. Set the protuberance of the tuning drum to the hole of automatic tuning drum as illustrated in Fig. 4.

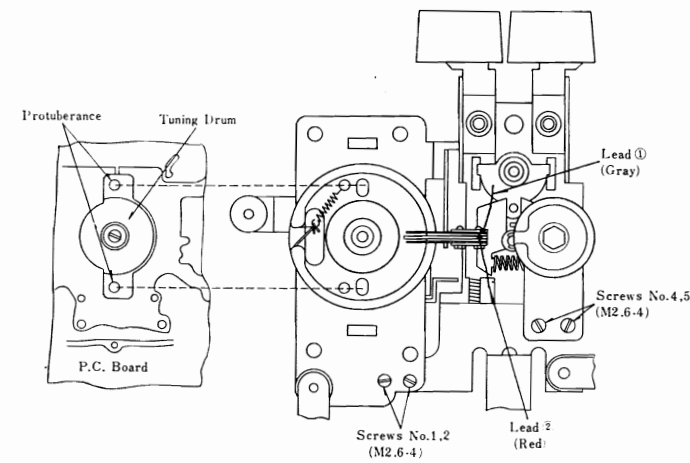


Fig. 4

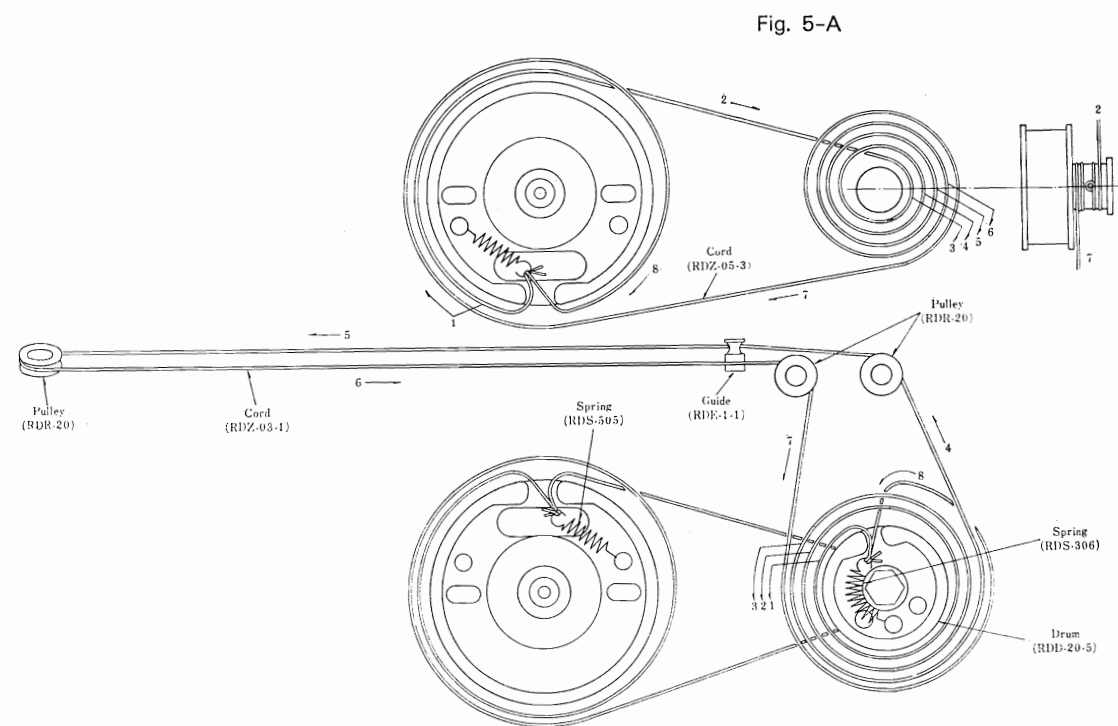


Fig. 5-B

Notes: (Refer to Fig. 5-A)

1. Dial cord length is 50 cm (20").
2. Refer to the removal instructions for the motor and automatic tuning switch (steps 1~3).
3. Set auto-tuning drum and dial drum as illustrated in Fig. 5-A.
4. Arrow marks (1~8) indicate correct order and direction of stringing dial cord.
5. Cement dial cord ends.

Notes: (Refer to Fig. 5-B)

1. Dial cord length is 110 cm (43 $\frac{5}{16}$ ").
2. Refer to removal instructions for the motor and auto-tuning switch (Step 1~3).
3. Set dial drum as illustrated in Fig. 5-B.
4. Arrow marks (1~8) indicate correct order and direction of stringing dial cord.
5. Cement dial cord ends.

Fig. 5 Dial Cord Stringing Guide

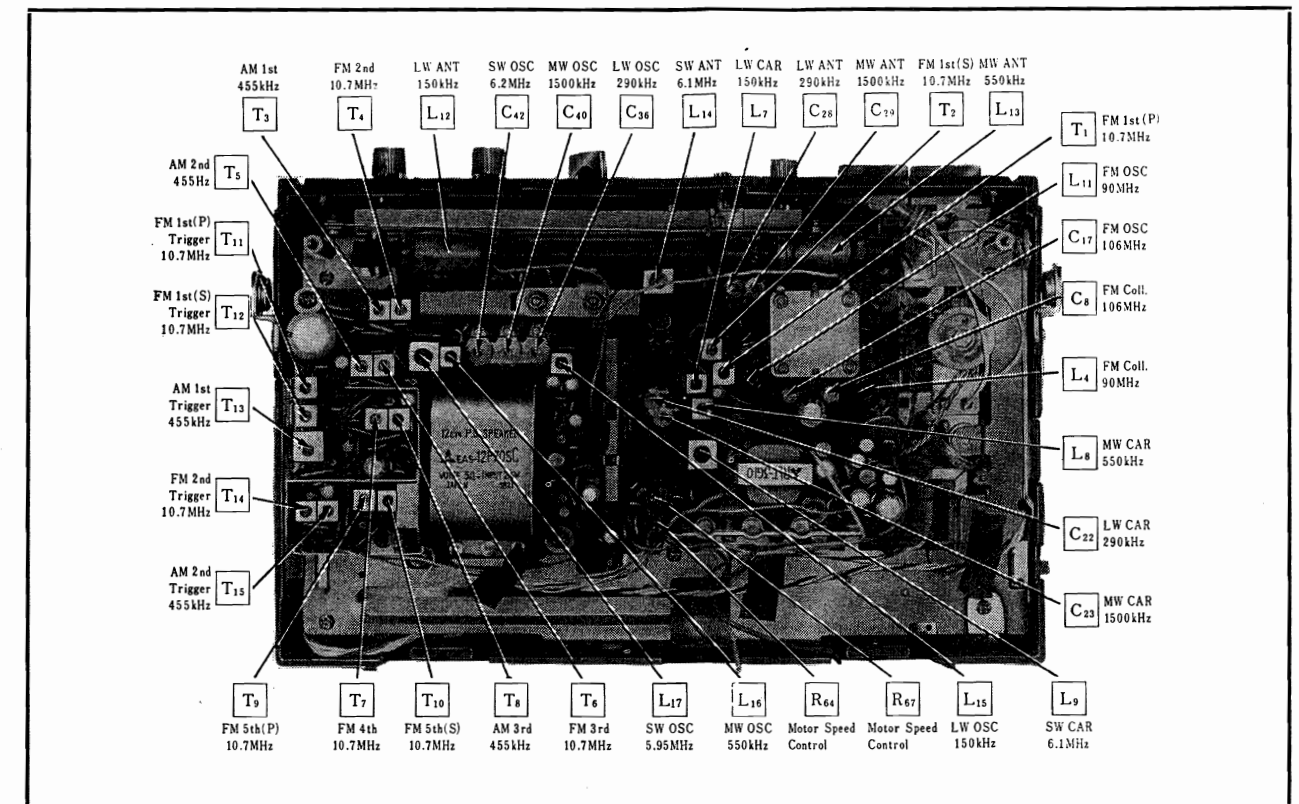
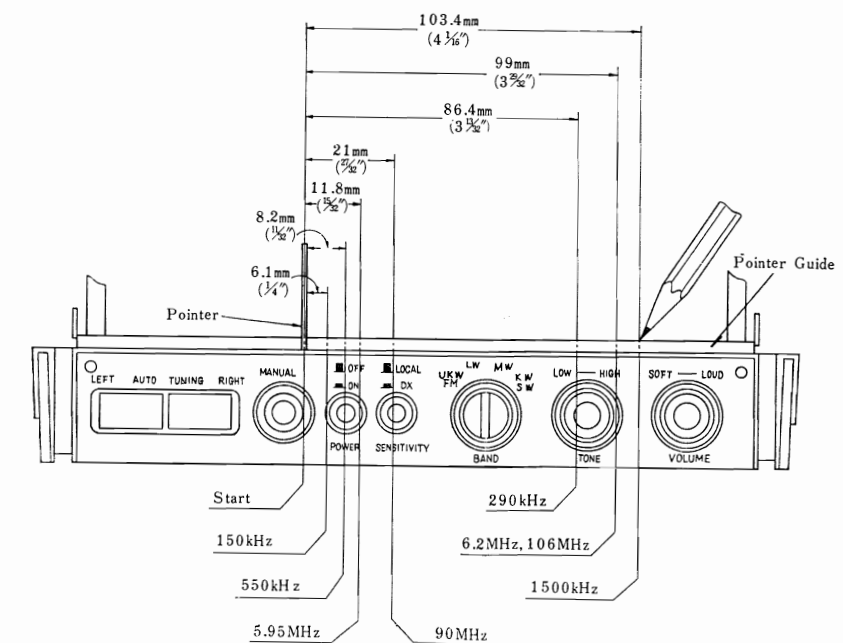


Fig. 6 Top View—Disassembly Points.



Notes :

1. Set tuning gang to fully closed position.
2. Mark alignment points on pointer guide with a pencil by measuring distance from starting point to each alignment point illustrated above.

Fig. 7 Frequency & Distance on Dial Scale



- Fig. 8 Schematic Diagram**

ALIGNMENT INSTRUCTIONS

MOTOR ROTATION SPEED ADJUSTMENT

Unsolder lead of resistor R ₄₇ 470Ω at point B before alignment and use it as test point TP_a . Resolder it after alignment.		
POSITION OF BAND SELECTOR	ADJUSTMENT	REMARKS
1 MW	R ₆₇ 1 KΩ (Motor Speed Control)	Adjust R ₆₇ so that dial pointer runs from low end to high end of dial scale in 5~6 seconds.
2	R ₆₄ 50 KΩ (Motor Speed Control)	Adjust R ₆₄ so that dial pointer runs from low end to high end of dial scale in 5~6 seconds.

AM IF ALIGNMENT

Set sweep selector of oscilloscope to "External Sweep". Apply 60Hz sweep generator to horizontal input terminals of oscilloscope.
 Signal generator that provides 455 Hz marker.
 Sweep generator that provides 455 Hz center frequency, and $\pm 10 \sim 15$ kHz sweep width.
 Set band selector switch to MW.
 Set volume control to minimum.
 Set Radar-Matic sensitivity switch to DX.
 Set tone control to high.
 Set power source switch to ON (6V DC).

Note: Unsolder lead of D₁₀ (1N34A) when aligning, and resolder it after alignment.

SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	INDICATOR	ADJUSTMENT	REMARKS
1 Fashion loop of several turns of wire and radiate signal into loop of receiver.	455 kHz	Point of non-interference (on/about 600 kHz)	Connect VTVM to point TP₇ . Common to chassis.	T ₁₃ (AM 1st Trigger IFT) T ₁₅ (AM 2nd Trigger IFT)	Refer to notes below.
2 "	"	"	"	T ₃ (AM 1st IFT) T ₅ (AM 2nd IFT) T ₈ (AM 3rd IFT)	"

- Notes:** 1. Because the resonant frequency of the ceramic filter (T₁₃) is set to 455 kHz ± 5 kHz, keep the signal generator's frequency within 455 kHz ± 5 kHz.
 2. Adjust T₁₃, T₁₅, T₃, T₅ and T₈ for maximum VTVM reading.
 3. The output of the signal generator should be no higher than necessary to obtain VTVM reading.

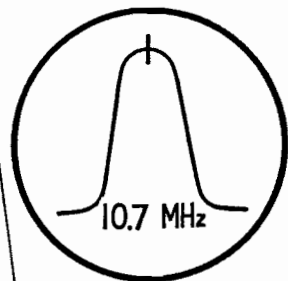


Fig. 10

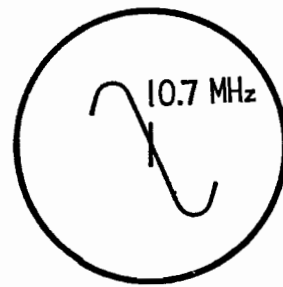


Fig. 11

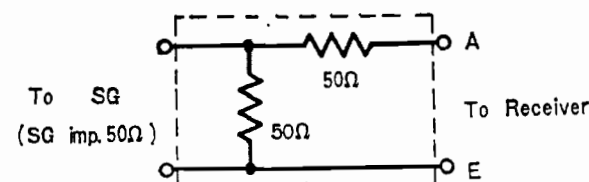


Fig. 12 FM Dummy Antenna

FM IF ALIGNMENT WITH OSCILLOSCOPE

EQUIPMENT REQUIRED

Signal generator that provides 10.7 MHz marker.
 Sweep generator that provides 10.7 MHz center frequency and 400 kHz sweep width.

OSCILLOSCOPE

Set sweep selector of oscilloscope to "External Sweep". Apply 60 Hz sweep signal from sweep generator to horizontal input terminals of oscilloscope.

Set band selector switch to FM.
 Set volume control to minimum.
 Set Radar-Matic sensitivity switch to DX.
 Set tone control to high.
 Set AFC switch to OFF.
 Set power source switch to ON (6V DC).

- Notes:** 1. Unsolder lead of diode D₁₀ (1N34A) when aligning, and resolder it after alignment.
 2. When step 1 aligning, unsolder lead between test point **TP₂** and point **A** before alignment and resolder it after alignment.

SWEEP GENERATOR COUPLING	SIGNAL GENERATOR COUPLING	RADIO DIAL SETTING	INDICATOR	ADJUSTMENT	REMARKS
1 High side thru. .001 μF to point TP₁ . Common to chassis.	High side thru. .001 μF to point TP₁ . Common to chassis.	Point of noninterference. (on/about 90 MHz)	Connect vert. amp. of scope to point TP₂ . Common to chassis.	T ₁ (FM 1st IFT) (P) T ₂ (FM 1st IFT) (S) T ₄ (FM 2nd IFT) T ₆ (FM 3rd IFT) T ₇ (FM 4th IFT) T ₉ (FM 5th IFT) (P)	Adjust for maximum amplitude and proper linearity between ± 100 kHz markers. (Refer to Fig. 10)
2 "	"	"	Connect vert. amp. of scope to point TP₃ . Common to chassis.	T ₁₀ (FM 5th IFT) (S)	Adjust T ₁₀ so that 10.7 MHz marker is at the center (Refer to Fig. 11)
3 "	"	"	Connect vert. amp. of scope to point TP₇ . Common to chassis.	T ₁₁ (FM 1st Trigger IFT) (P) T ₁₂ (FM 1st Trigger IFT) (S) T ₁₄ (FM 2nd Trigger IFT)	Adjust for maximum amplitude and symmetrical curve (Refer to Fig. 10).

Note: When aligning the Ratio Detector circuit, the wave form may appear as in Figs. 10 & 11 or upside-down.

LW, MW & SW PORTABLE RF ALIGNMENT

Output of signal generator should be no higher than necessary to obtain an output reading.
 Set volume control to maximum.
 Set Radar-Matic sensitivity switch to DX.
 Set tone control to high.
 Set power source switch to ON (6V DC).

Band Switch Position	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	INDICATOR	ADJUSTMENT	REMARKS
1 LW	Fashion loop of several turns of wire and radiate signal into loop of receiver.	150 kHz (400~ Mod.)	150 kHz	Output meter across earphone jack. (Load 5Ω)	L ₁₅ (LW OSC Coil) L ₁₂ (LW ANT Coil)	Adjust for maximum output by sliding coil (L ₁₂) along ferrite core.
2	"	290 kHz (400~ Mod.)	290 kHz	"	C ₃₆ (LW OSC Trimmer) C ₂₈ (LW ANT Trimmer)	Adjust for maximum output. Repeat steps (1) and (2).
3 MW	"	550 kHz (400~ Mod.)	550 kHz	"	L ₁₆ (MW OSC Coil) L ₁₃ (MW ANT Coil)	Adjust for maximum output by sliding coil (L ₁₃) along ferrite core.
4	"	1500 kHz (400~ Mod.)	1500 kHz	"	C ₄₀ (MW OSC Trimmer) C ₂₉ (MW ANT Trimmer)	Adjust for maximum output. Repeat steps (3) and (4).
5 SW	Connect to point TP₆ through SW dummy antenna. Common to chassis.	5.95 MHz (400~ Mod.)	5.95 MHz	"	L ₁₇ (SW OSC Coil)	Adjust for maximum output.
6	"	6.10 MHz (400~ Mod.)	6.10 MHz	"	L ₁₄ (SW ANT Trimmer)	"
7	"	6.20 MHz (400~ Mod.)	6.20 MHz	"	C ₄₂ (SW OSC Trimmer)	Adjust for maximum output. Repeat steps (5), (4) and (7).

Note: Cement antenna bobbin with wax after completing alignment.

FM RF ALIGNMENT

Output of signal generator should be no higher than necessary to obtain an output reading. Set volume control to maximum. Set power source switch to ON (6V DC). Set tone control to high. Set Radar-Matic sensitivity switch to DX. Set AFC switch to OFF. Set band selector switch to FM. Note: Unsolder lead between test point TP4 and Point ☐ before alignment and resolder after alignment.					
SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	INDICATOR	ADJUSTMENT	REMARKS
Connect to point TP4 through FM Dummy antenna. Common to chassis. (Refer to Fig. 12)	90 MHz (400~ Mod.)	90 MHz	Output meter across earphone jack. (Load 5Ω)	L11 (FM OSC Coil) L4 (FM Collector Coil)	Adjust for maximum output.
"	106 MHz (400~ Mod.)	106 MHz	"	C17 (FM OSC Trimmer) C8 (FM Collector Trimmer)	Adjust for maximum output. Repeat steps (8) and (9).

Note: As three output responses will be present, proper tuning is the center frequency.

MW, LW & SW CAR RF ALIGNMENT

Output of signal generator should be no higher than necessary to obtain an output reading. Set volume control to maximum. Set tone control to high. Set power source switch to ON (7.5V DC). Set Car-Portable antenna selector switch to CAR. Set Radar-Matic sensitivity switch to DX.						
Band Switch Position	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	INDICATOR	ADJUSTMENT	REMARKS
1 MW	Refer to Fig. 13	550 kHz (400~ Mod.)	550 kHz	Output meter across voice coil.	L8 (MW ANT Coil)	Adjust for maximum output.
	"	1500 kHz (400~ Mod.)	1500 kHz	"	C23 (MW ANT Trimmer)	Adjust for maximum output. Repeat steps (1) and (2)
3 LW	"	150 kHz (400~ Mod.)	150 kHz	"	L7 (LW ANT Coil)	Adjust for maximum output.
	"	290 kHz (400~ Mod.)	290 kHz	"	C22 (LW ANT Trimmer)	Adjust for maximum output. Repeat steps (3) and (4).
5 SW	"	6.10 MHz (400~ Mod.)	6.10 MHz	"	L9 (SW ANT Coil)	Adjust for maximum output. Repeat step (5)

Note: Remove leads to terminals of multi-connector socket (S8). Then connect hot side of signal generator to blue lead, and ground lead to chassis.

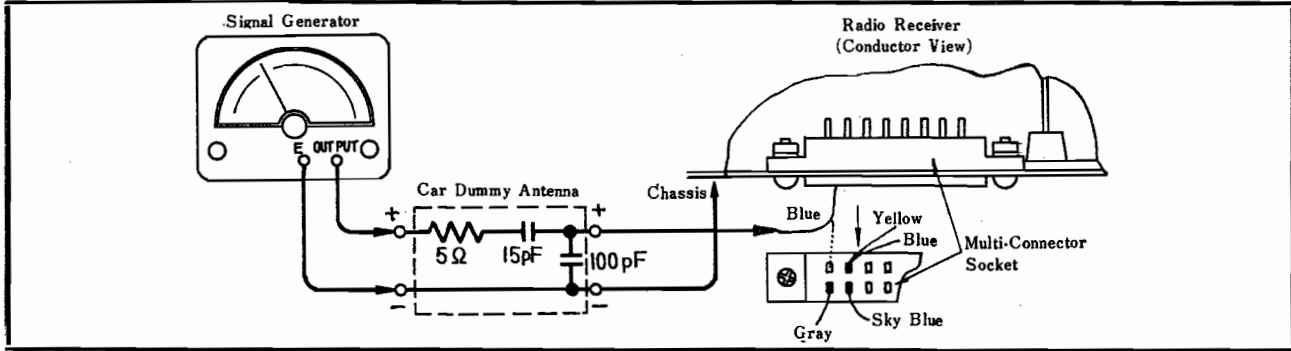


Fig. 13 Recommended Equipment Connection for MW, LW & SW Alignment (Car).

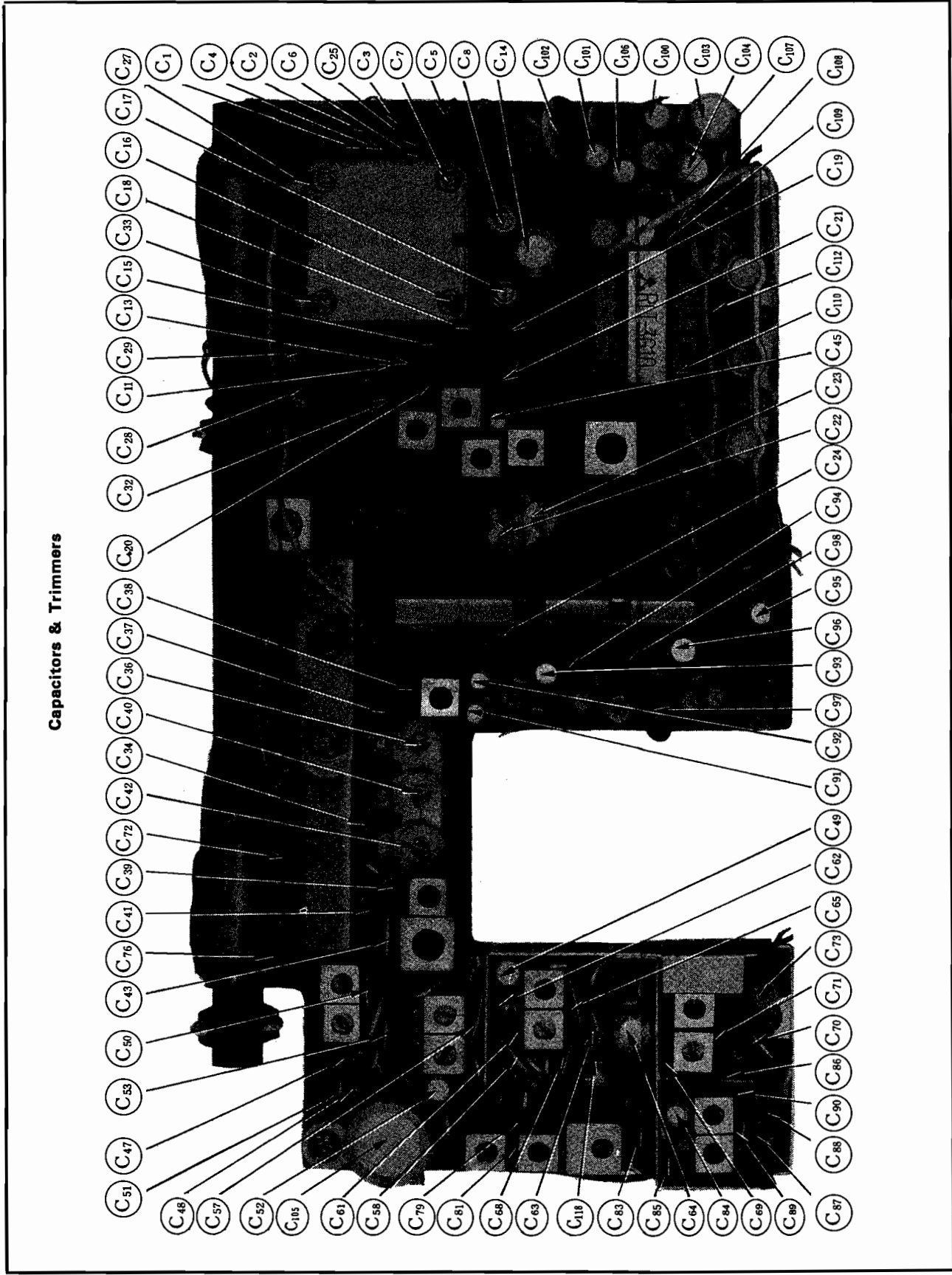


Fig. 14 Component View - Parts Identification

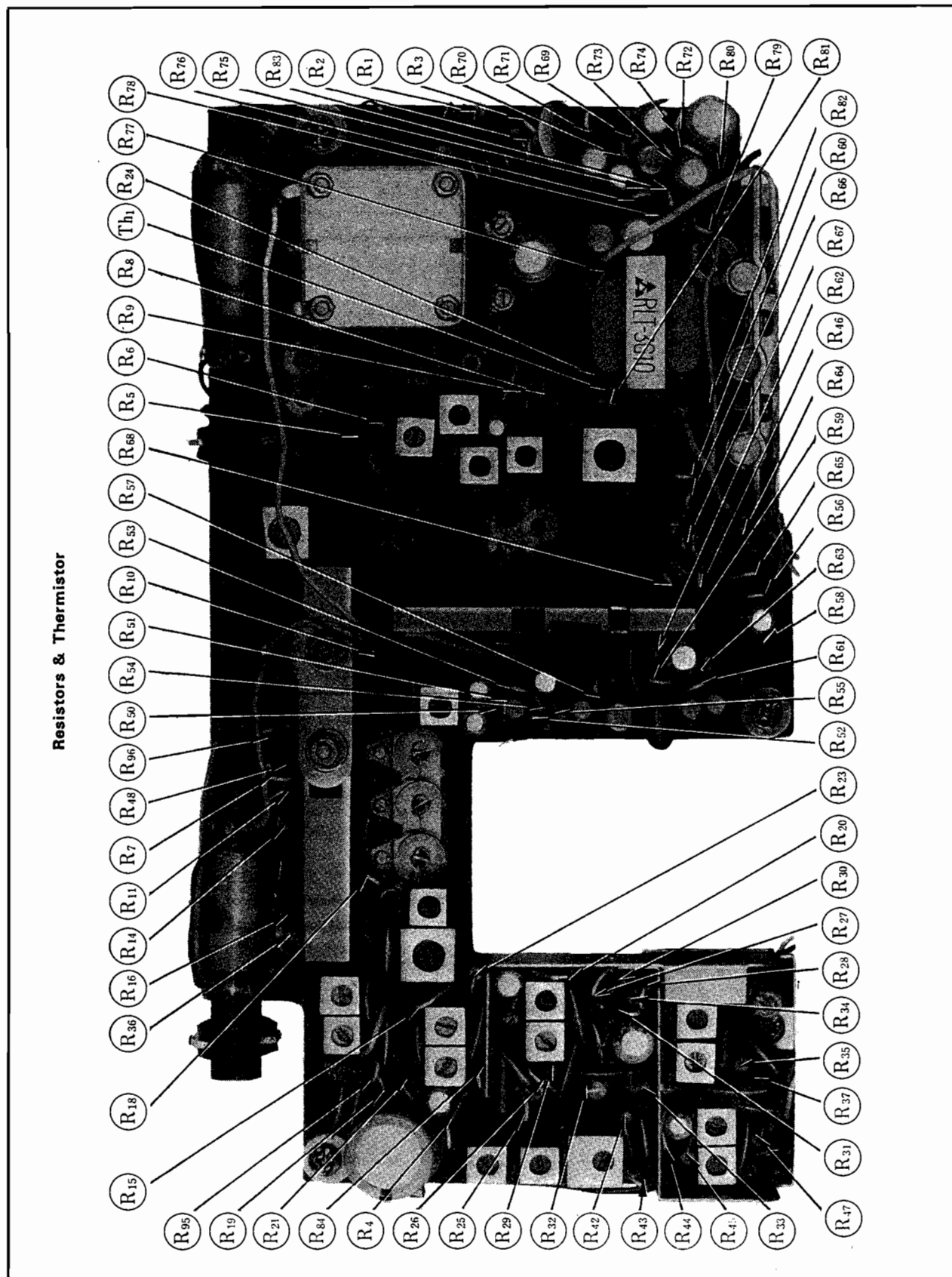


Fig. 15 Component View — Parts Identification

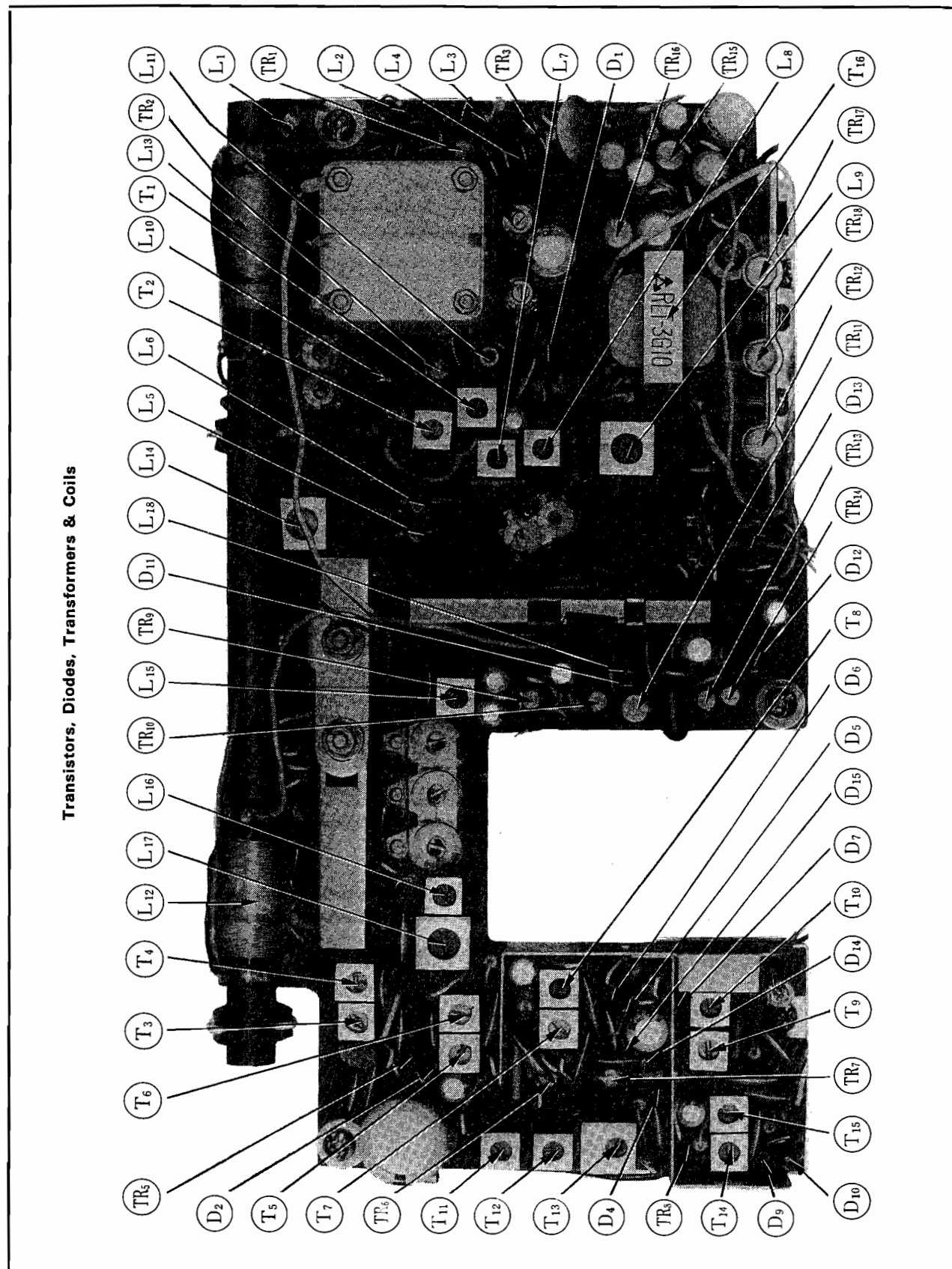


Fig. 16 Component View—Parts Identification

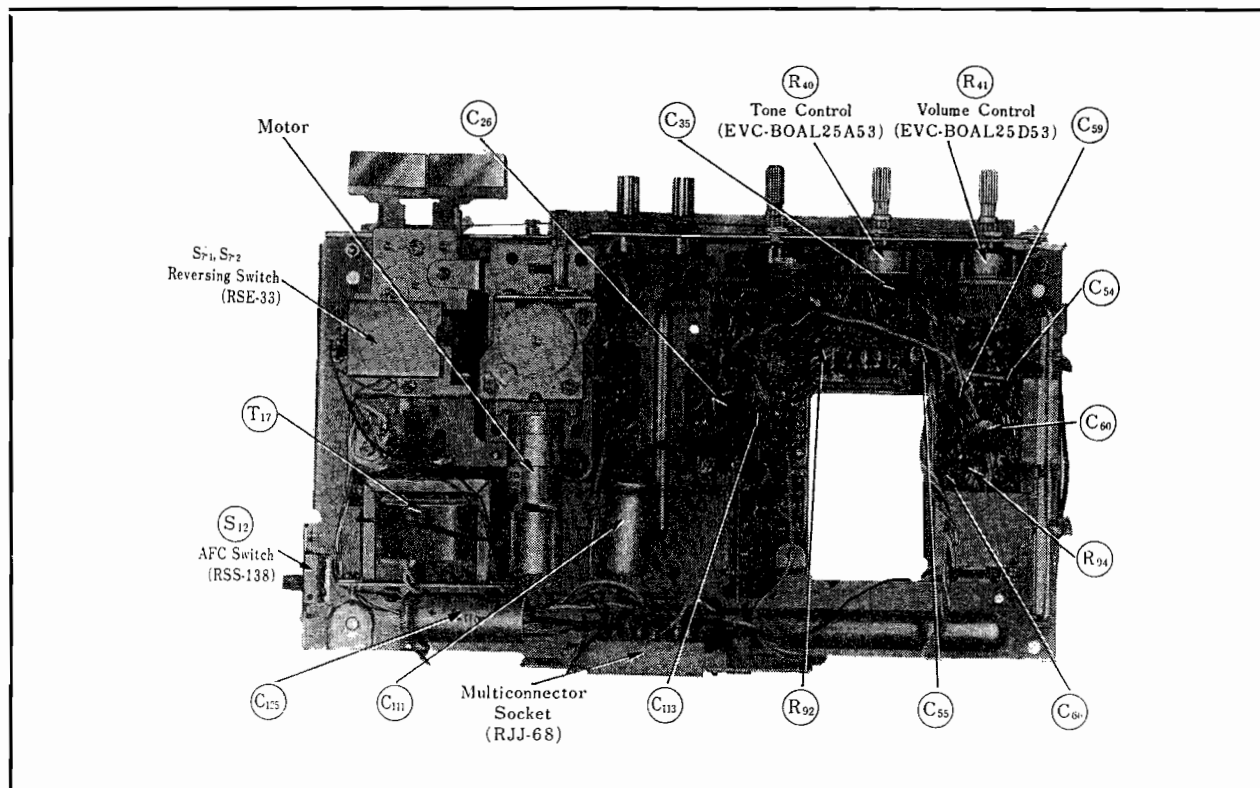


Fig. 17 Component View—Parts Identification

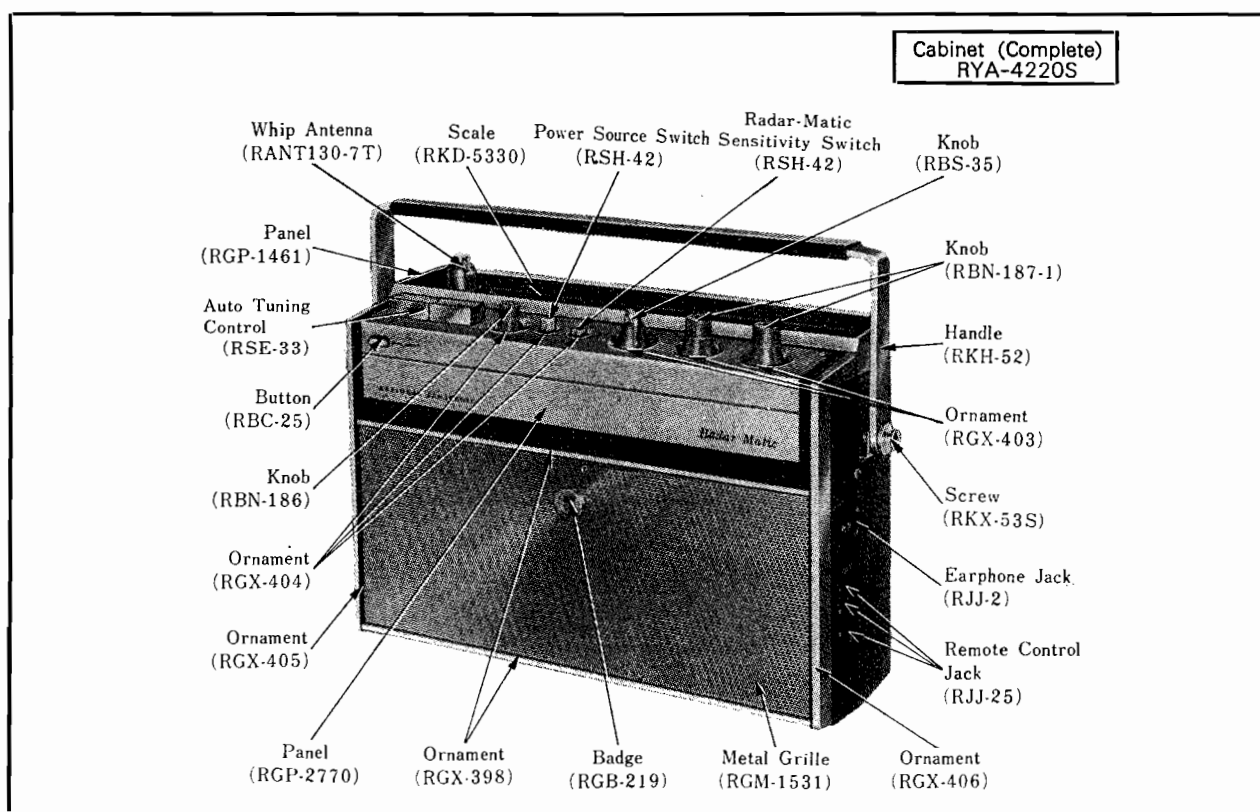


Fig. 18 Cabinet & Appearance—Parts Identification

Major Troubles & Repair of Automatic Tuning Circuits and Mechanism MODEL RF-980L

Note: This table is based on the premise that this radio functions well during manual tuning, and power source voltage is maintained at 6V DC.

	Symptom Noted		Causes	Checks and Remedies
	The motor is not rotating	Voltage is applied to the motor.		
The dial pointer does not move even when the auto-tuning control button is pressed.		Voltage is not applied to the motor.	The motor is defective (Open winding, defective commutator, etc.)	Remove leads from motor and apply DC 4.5V to motor directly to check rotation of motor. Check mechanism contacts between motor and automatic tuning mechanism.
	The motor is rotating	During manual tuning, dial pointer does not run. During manual tuning, dial pointer runs.	Open or defective transistors (TR12, TR13, TR14). Shorted transistor (TR11). Open coil (L17). Defective contact of band switch. Defective semi-fixed resistors (R64, R67). Open transistor (TR5) & shorted transistor (TR10). The gear or idle gear of the auto-matic tuning mechanism is out of order. Loosening of the nut of the automatic tuning mechanism or dial cord tension. Damage to the gear, slippage of the worm gear and the motor shaft.	Press auto-tuning button and make certain that audio sound is obtained from speaker. If audio sound is not obtained transistors (TR9 & TR10) are operating normally. Check bias voltage of transistor in each wave band. Check contact of reversing switch. Replace automatic mechanism. Replace dial cord. Fasten the nut of auto-tuning mechanism. Replace auto-tuning mechanism.
The dial pointer moves when the auto-tuning control button is pressed.		The dial pointer moves only when the auto-tuning control button is pressed.	Defective C94 (25V 0.22μF). Noise is generated because of defective motor. Open transistor (TR9) or shorted transistor (TR10). Open diode (D9 OA70) or capacitor (C67 0.022μF).	Defect in FM is caused by D9 and C94. Check bias voltage of transistors TR9 and TR10. Noise caused by motor can be checked by connecting 10 KΩ resistor between ⊖ line and base of TR15.
		The dial pointer moves automatically after ON-OFF switch is turned.	Open transistor (TR10). Open diode (D11). Leads of electronic components (C67, R49) shorted to chassis.	If the motor stops rotating by shorting emitter and collector of TR10, transistor TR10 is defective.
The radio does not tune automatically. (The dial pointer does not stop)			Improper alignment of IF & Trigger circuits.	Tuning frequency of both radio and trigger is different.
		The dial pointer does not stop even when the DX-LOCAL switch is in DX position.	Improper alignment of RF circuits. Defective trigger circuits (open TR9 and D9). Defective DX-Local switch.	Poor reception sensitivity caused by tracking error. If the correct wave form is not obtained, check bias voltages and current. Check contact of DX-Local selector switch.
The radio tunes automatically.		The radio tunes automatically, but the frequency drifts seriously.	Open or shorted electronic components (R50, C117). Frequencies of trigger and radio stages are different.	If R50 is broken, the dial pointer may start to move depending on input signal level. Repeat alignment in accordance with alignment instruction.
		The frequency drifts seriously especially in FM position. FM broadcasting signal is tuned automatically, but no audio sound obtained. The dial pointer doesn't return at the low or high end of dial scale.	Defective motor braking circuits. Defective automatic tuning mechanism or motor rotates too fast. Defective AFC circuits. Defective AFC switching transistor (TR3).	Check bias voltage of TR11. Readjust the dial position running speed by semi-fixed resistors (R64, R67). Check operation of AFC circuits (diode and AFC switch etc.). Only FM section becomes inoperative.
Abnormal Operation		The dial pointer doesn't run smoothly.	Bad contact of switch (S6). Broken lead to switch (S6). Open diode (D12). Defective C95 or C92.	Check reversing lever and screw.
		Running time of dial pointer changes each wave. The dial position runs in one direction only.	Defective electronic component (R59, C96). Defective semi-fixed resistors (R64, R67) shorted S1-1 ~ S1-12. Bad contact of switch (S7-1 or S7-2).	The dial pointer runs back and forth slightly. Check voltage across motor leads in MW, FM, LW and SW. Check voltage of transistors (TR13, TR14). Be careful that coil (L17) is heated if switches (S7-1 and S7-2) are left in bad contact.

Note: To obtain audio sound from speaker when the motor is rotating, connect 10KΩ resistor between ⊖ line and base of TR15, and, at the same time, short between collector and emitter of TR3 only in FM position.



REPLACEMENT PARTS LIST

- Notes:** 1. ※ indicates parts for the complete cabinet which are included when the cabinet is ordered.
2. Parts numbers are indicated on most mechanical parts. Please use this number, therefore, when ordering parts.
3. ISO metric thread screws & parts which employ ISO metric thread screws are identified by ISO marking.

Ref. No	Part No.	Description
TRANSISTORS AND DIODES		
TR ₁	2SC429	FM RF Amplifier
TR ₂	2SC185	FM Converter
TR ₃	2SC183	AFC Switching
TR ₄	2SC645	FM 1st IF Amp. & AM Converter
TR ₅	2SC469	FM 2nd IF Amp. & AM 1st IF Amp.
TR ₆	2SC469	FM 3rd IF Amp. & AM 2nd IF Amp.
TR ₇	2SC469	FM 4th IF Amplifier
TR ₈	2SC469	FM & AM Trigger IF Amplifier
TR ₉	2SC183}	Control Signal Forming
TR ₁₀	2SC183}	
TR ₁₁	2SB324	Electronic Brake
TR ₁₂	2SB324	Motor Driver
TR ₁₃	2SC183}	Control Signal Amplifier
TR ₁₄	2SC183}	
TR ₁₅	2SB173	Squelch & 1st AF Amplifier
TR ₁₆	2SB175	2nd AF Amplifier
TR ₁₇	2SB324}	Power Amplifier (push-pull)
TR ₁₈	2SB324}	
D ₁	SC-15	FM AFC
D ₂	1N34A	FM AGC
D ₄	1S1211}	Operation Compensator
D ₅	1S1211}	
D ₆	1N34A	AM Detector & AGC
D ₇	1N34A}	FM Detector
D ₈	1N34A}	
D ₉	1N34A	Trigger Detector
D ₁₀	1N34A	ANL
D ₁₁	1N34A}	Operation Compensator
D ₁₂	1N34A}	
D ₁₃	1S1211}	Operation Compensator
D ₁₄	1S1211}	
D ₁₅	1S1211}	
THERMISTOR		
Th ₁	MT-080	Temperature Compensator
CAPACITORS		
C _{20, 59, 81}	ECC-D05010C	1PF, 50WV, ±0.25PF, Ceramic
C _{46, 85}	ECC-D05020C	2PF, 50WV, ±0.25PF, Ceramic
C ₆₇	ECC-D05030C	3PF, 50WV, ±0.25PF, Ceramic
C _{1, 10, 79}	ECC-D05040C	4PF, 50WV, ±0.25PF, Ceramic
C _{54, 118}	ECC-D05050C	5PF, 50WV, ±0.25PF, Ceramic
C ₆₀	ECC-D05100K	10PF, 50WV, ±10%, Ceramic
C _{2, 5}	ECC-D05220KC	22PF, 50WV, ±10%, Ceramic
C ₉	ECC-D05120K	12PF, 50WV, ±10%, Ceramic
C ₃	ECC-D05180K	18PF, 50WV, ±10%, Ceramic
C ₁₁₇	ECC-D05390K	39PF, 50WV, ±10%, Ceramic
C _{61, 69}	ECC-D05470K	47PF, 50WV, ±10%, Ceramic
C _{12, 71}	ECC-U05331K	330PF, 50WV, ±10%, Cylinder
C ₁₁	ECM-S05270K-H	27PF, 50WV, ±10%, Mica
C ₁₈	ECC-D05070DC	7PF, 50WV, ±0.5PF, Ceramic
C ₁₅	ECC-D05100KC	10PF, 50WV, ±10%, Ceramic
C ₁₉	ECC-D05150KC	15PF, 50WV, ±10%, Ceramic
C _{24, 41}	ECM-S05680J-H	68PF, 50WV, ± 5%, Mica
C ₂₆	ECM-S05301J-H	300PF, 50WV, ± 5%, Mica
C ₃₈	ECM-S05121J-H	120PF, 50WV, ± 5%, Mica
C ₃₁	ECM-S05101K-H	100PF, 50WV, ±10%, Mica
C ₄₃	ECM-S5321G-H	320PF, 500WV, ± 2%, Mica
C _{4, 13, 25, 30, 32, 82, 88, 116}	ECC-D05102P	0.001μF, 50WV +100%, Ceramic - 0%,
C _{6, 21, 50, 55, 63, 98, 113, 118}	ECC-E05103P	0.01μF, 50WV, +100%, Ceramic - 0%,

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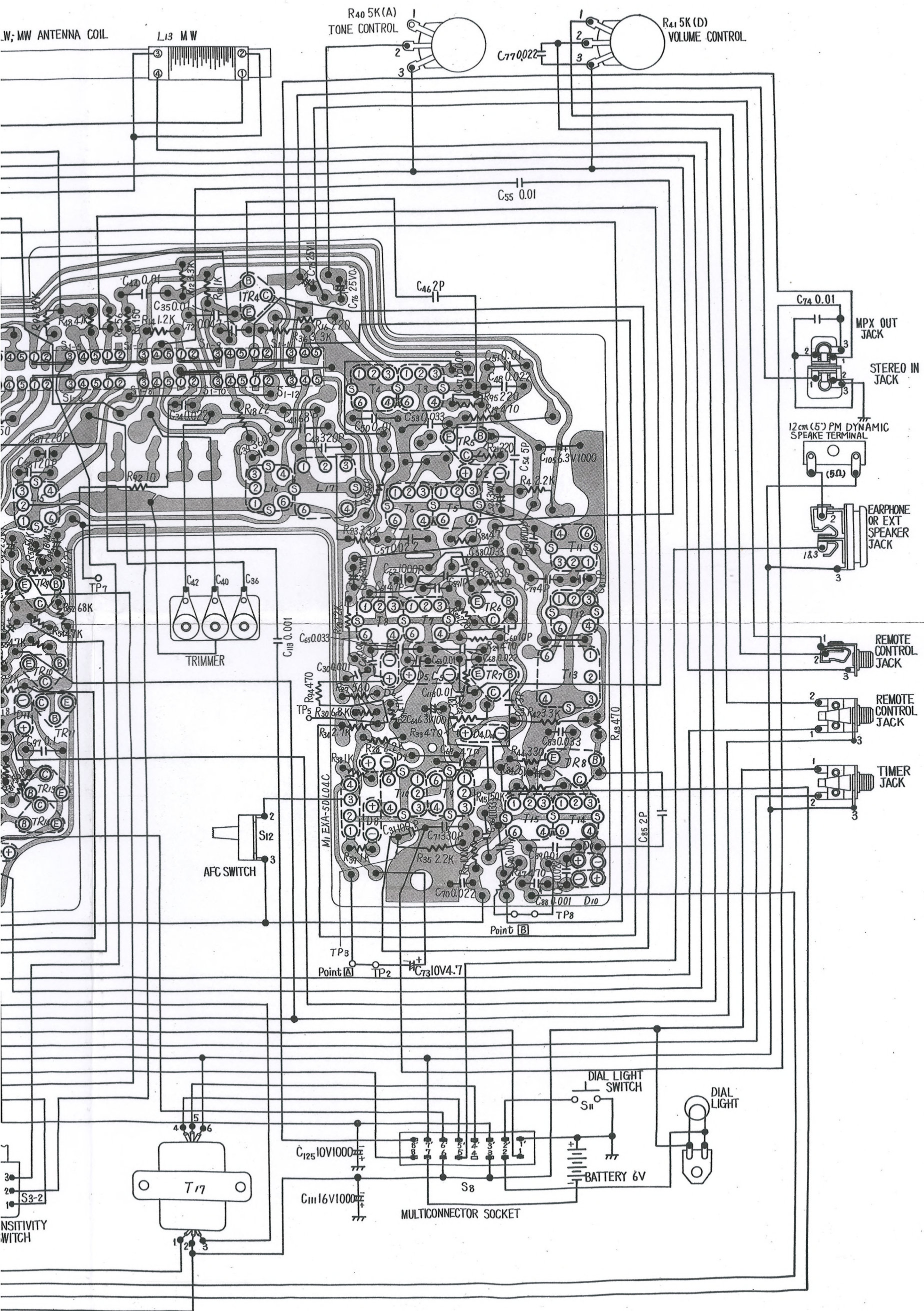
Ref. No.	Part No.	Description
CAPACITORS		
C35, 44, 51, 66, 74, 89, 90 C48, 57, 68, 70	ECK-E05103MY ECK-E05223P	0.01 μ F, 50WV, $\pm$ 20%, Ceramic 0.022 μ F, 50WV, $\pm$ 100%, Ceramic — 0%,
C53, 58, 65, 83, 86, 102, 115	ECK-E05333P	0.033 μ F, 50WV, $\pm$ 100%, Ceramic — 0%,
C37	ECQ-S1221JZ	220PF, 125WV, $\pm$ 5%, Styrol
C39	ECQ-S1361JZ	360PF, 125WV, $\pm$ 5%, Styrol
C62, 80	ECQ-S02102KZ	1000PF, 25WV, $\pm$ 10%, Styrol
C47	ECQ-S1152KZ	1500PF, 125WV, $\pm$ 10%, Styrol
C108	ECQ-M05152MZ }	0.0015 μ F, 50WV, $\pm$ 20%, Polyester
	ECQ-G05152MZ-N }	0.0015 μ F, 50WV, $\pm$ 20%, Polyester
C109, 110	ECQ-G05153MZ-N	0.015 μ F, 50WV, $\pm$ 20%, Polyester
C34, 77, 87	ECQ-G05223MZ-N	0.022 μ F, 50WV, $\pm$ 20%, Polyester
C97, 99, 112	ECQ-G05104MZ-N	0.1 μ F, 50WV, $\pm$ 20%, Polyester
C72	ECQ-G05473MZ-N	0.047 μ F, 50WV, $\pm$ 20%, Polyester
C76	ECA-F25VR1	0.1 μ F, 25WV, Electrolytic
C94	ECA-F25VR22	0.22 μ F, 25WV, Electrolytic
C45, 93	ECA-F25VR33	0.33 μ F, 25WV, Electrolytic
C75, 84, 92, 101	ECE-A25V1	1 μ F, 25WV, Electrolytic
C114	ECE-A16N3R3	3.3 μ F, 16WV, Electrolytic
C91, 95	ECE-A16V4R7	4.7 μ F, 16WV, Electrolytic
C49, 52, 100, 106	ECE-A6V10	10 μ F, 6.3WV, Electrolytic
C96, 104	ECE-A6V33	33 μ F, 6.3WV, Electrolytic
C107	ECE-A6V47	47 μ F, 6.3WV, Electrolytic
C64	ECE-A6V100	100 μ F, 6.3WV, Electrolytic
C14, 103	ECE-A6V220	220 μ F, 6.3WV, Electrolytic
C105	ECE-A6V1000	1000 μ F, 6.3WV, Electrolytic
C73	ECE-B10V4R7	4.7 μ F, 10WV, Electrolytic
C111	ECE-B16V1000	1000 μ F, 16WV, Electrolytic
C125	ECE-B10V1000	1000 μ F, 10WV, Electrolytic
C7, 16, 27, 33	PVC-22R30F	Tuning Gang
C8, 17	ECV-1ZW10P12	Trimmer, FM
C36, 40, 42	ECV-3RW22W11Z	Trimmer, AM Oscillator
C22, 23, 28, 29	ECV-2RW12W52	Trimmer, AM Antenna & Detector
RESISTORS		
R35	ERD-14TK 222	2.2K Ω , $\frac{1}{4}$ Watt, $\pm$ 10%, Carbon
R93	ERD-14TK 101	100 Ω , $\frac{1}{4}$ Watt, $\pm$ 10%, Carbon
R34	ERD-14TK 272	2.7K Ω , $\frac{1}{4}$ Watt, $\pm$ 10%, Carbon
R10	ERD-14TK 151	150 Ω , $\frac{1}{4}$ Watt, $\pm$ 10%, Carbon
R33, 47, 94	ERD-14TK 471	470 Ω , $\frac{1}{4}$ Watt, $\pm$ 10%, Carbon
R49	ERD-14TK 182	1.8K Ω , $\frac{1}{4}$ Watt, $\pm$ 10%, Carbon
R92	ERD-14TK 100	10 Ω , $\frac{1}{4}$ Watt, $\pm$ 10%, Carbon
R5	ERD-14TK 821	820 Ω , $\frac{1}{4}$ Watt, $\pm$ 10%, Carbon
R18	ERD-14VK 220	22 Ω , $\frac{1}{4}$ Watt, $\pm$ 10%, Carbon
R84	ERD-14VK 470	47 Ω , $\frac{1}{4}$ Watt, $\pm$ 10%, Carbon
R7	ERD-14VK 560	56 Ω , $\frac{1}{4}$ Watt, $\pm$ 10%, Carbon
R24	ERD-14VK 820	82 Ω , $\frac{1}{4}$ Watt, $\pm$ 10%, Carbon
R77, 80	ERD-14VK 101	100 Ω , $\frac{1}{4}$ Watt, $\pm$ 10%, Carbon
R58	ERD-14VK 121	120 Ω , $\frac{1}{4}$ Watt, $\pm$ 10%, Carbon
R59	ERD-14VK 680	68 Ω , $\frac{1}{4}$ Watt, $\pm$ 10%, Carbon
R11	ERD-14VK 151	150 Ω , $\frac{1}{4}$ Watt, $\pm$ 10%, Carbon
R16, 21, 26, 95	ERD-14VK 221	220 Ω , $\frac{1}{4}$ Watt, $\pm$ 10%, Carbon
R25, 32, 44, 73	ERD-14VK 331	330 Ω , $\frac{1}{4}$ Watt, $\pm$ 10%, Carbon
R19, 29, 43, 65	ERD-14VK 471	470 Ω , $\frac{1}{4}$ Watt, $\pm$ 10%, Carbon
R15, 27, 61, 74	ERD-14VK 561	560 Ω , $\frac{1}{4}$ Watt, $\pm$ 10%, Carbon
R46, 68	ERD-14VK 681	680 Ω , $\frac{1}{4}$ Watt, $\pm$ 10%, Carbon
R60	ERD-14VK 821	820 Ω , $\frac{1}{4}$ Watt, $\pm$ 10%, Carbon
R13, 38, 39	ERD-14VK 102	1K Ω , $\frac{1}{4}$ Watt, $\pm$ 10%, Carbon
R14	ERD-14VK 122	1.2K Ω , $\frac{1}{4}$ Watt, $\pm$ 10%, Carbon
R81	ERD-14VK 152	1.5K Ω , $\frac{1}{4}$ Watt, $\pm$ 10%, Carbon
R4, 28, 53, 57, 72, 76, 83	ERD-14VK 222	2.2K Ω , $\frac{1}{4}$ Watt, $\pm$ 10%, Carbon
R12, 23, 36, 42	ERD-14VK 332	3.3K Ω , $\frac{1}{4}$ Watt, $\pm$ 10%, Carbon
R54, 55	ERD-14VK 472	4.7K Ω , $\frac{1}{4}$ Watt, $\pm$ 10%, Carbon
R1, 6	ERD-14VK 562	5.6K Ω , $\frac{1}{4}$ Watt, $\pm$ 10%, Carbon
R30, 66, 71	ERD-14VK 682	6.8K Ω , $\frac{1}{4}$ Watt, $\pm$ 10%, Carbon
R2, 69, 70	ERD-14VK 103	10K Ω , $\frac{1}{4}$ Watt, $\pm$ 10%, Carbon

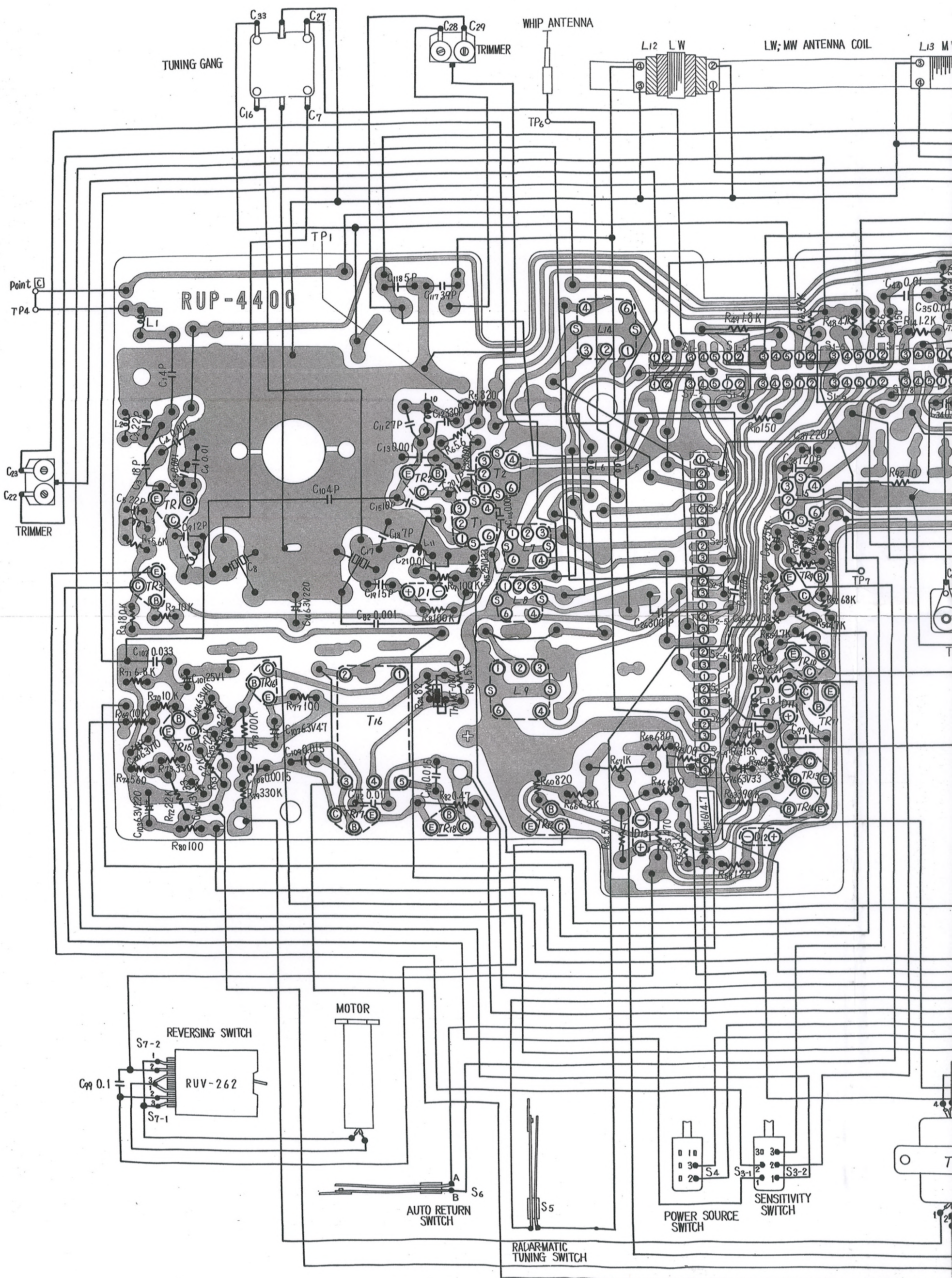
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Ref. No.	Part No.	Description
RESISTORS		
R ₂₀ , 51	ERD-14VK 123	12K Ω , $\frac{1}{4}$ Watt, $\pm 10\%$, Carbon
R ₇₅	ERD-14VK 223	22K Ω , $\frac{1}{4}$ Watt, $\pm 10\%$, Carbon
R ₆₂	ERD-14VK 153	15K Ω , $\frac{1}{4}$ Watt, $\pm 10\%$, Carbon
R ₅₆	ERD-14VK 333	33K Ω , $\frac{1}{4}$ Watt, $\pm 10\%$, Carbon
R ₃₁ , 48	ERD-14VK 473	47K Ω , $\frac{1}{4}$ Watt, $\pm 10\%$, Carbon
R ₅₀	ERD-14VK 563	56K Ω , $\frac{1}{4}$ Watt, $\pm 10\%$, Carbon
R ₅₂	ERD-14VK 683	68K Ω , $\frac{1}{4}$ Watt, $\pm 10\%$, Carbon
R ₉₆	ERD-14VK 393	39K Ω , $\frac{1}{4}$ Watt, $\pm 10\%$, Carbon
R ₈ , 9, 37, 78	ERD-14VK 104	100K Ω , $\frac{1}{4}$ Watt, $\pm 10\%$, Carbon
R ₄₅	ERD-14VK 154	150K Ω , $\frac{1}{4}$ Watt, $\pm 10\%$, Carbon
R ₃	ERD-14VK 184	180K Ω , $\frac{1}{4}$ Watt, $\pm 10\%$, Carbon
R ₇₉	ERD-14VK 334	330K Ω , $\frac{1}{4}$ Watt, $\pm 10\%$, Carbon
R ₆₃	ERD-14VK 394	390K Ω , $\frac{1}{4}$ Watt, $\pm 10\%$, Carbon
R ₈₂	ERW-12LKR47	0.47 Ω , $\frac{1}{2}$ Watt, $\pm 10\%$, Wire
R ₄₀	EVC-BOAL25A53	5K Ω (A), Tone Control
R ₄₁	EVC-BOAL25D53	5K Ω (D), Volume Control
R ₆₇	EVL-SOAA00B13	1K Ω (B), Motor Rotation Speed Control
R ₆₄	EVL-TOAA00B54	50K Ω (B), Motor Rotation Speed Control
COMPONENT COMBINATION		
M ₁	EXA-5DL04C	330PF $\times 3$ & 4.7K $\Omega \times 2$
COILS AND TRANSFORMERS		
L ₁	RLQ-Y50S-5	FM Choke Coil
L ₂	RLQ-Y15S-5	FM Choke Coil
L ₃	RLQ-Y15S-5	FM Choke Coil
L ₄	RLD-4Y54	FM Collector Coil
L ₅	RLQ-X100-1}	Choke Coil
L ₆	RLQ-X100-1}	
L ₇	RLA-1B1	LW CAR Antenna Coil
L ₈	RLA-2B1	MW CAR Antenna Coil
L ₉	RLA-3C16-M	SW CAR Antenna Coil
L ₁₀	RLQ-Y75S-5	FM Choke Coil
L ₁₁	RLO-4N22	FM Oscillator Coil
L ₁₂ , L ₁₃	RLF-6G10	LW-MW FERRITE Antenna Coil
L ₁₄	RLA-3C15-M	SW Antenna Coil
L ₁₅	RLO-1B1-M	LW Oscillator Coil
L ₁₆	RLO-2B56-M	MW Oscillator Coil
L ₁₇	RLO-3C17-M	SW Oscillator Coil
L ₁₈	RLQ-X60G-1	Choke Coil
L ₁₉	RLQ-X100-3}	Motor Choke Coil
L ₂₀	RLQ-X100-3}	
T ₁	RLI-4B152	FM 1st IF Transformer, Primary
T ₂	RLI-4B351	FM 1st IF Transformer, Secondary
T ₃	RLI-2B156	AM 1st IF Transformer
T ₄	RLI-4B351	FM 2nd IF Transformer
T ₅	RLI-2B157	AM 2nd IF Transformer
T ₆	RLI-4B351	FM 3rd IF Transformer
T ₇	RLI-4B208	FM 4th IF Transformer
T ₈	RLI-2B457	AM 3rd IF Transformer
T ₉	RLI-4B551	FM 5th IF Transformer, Primary
T ₁₀	RLI-4B552	FM 5th IF Transformer, Secondary
T ₁₁	RLI-4B152	FM 1st Trigger IF Transformer, Primary
T ₁₂	RLI-4B152	FM 1st Trigger IF Transformer, Secondary
T ₁₃	RLI-7C7	AM 1st Trigger IF Transformer
T ₁₄	RLI-4B507	FM 2nd Trigger IF Transformer
T ₁₅	RLI-2B412	AM 2nd Trigger IF Transformer
T ₁₆	RLT-3G10	Input Transformer P=3.2K Ω : S=3K Ω
T ₁₇	RLT-2J34	Output Transformer P=48 Ω : S=5 Ω
SPEAKER AND EARPHONE		
SP	EAS-12P70SC	12 cm (5") PM Dynamic Speaker, 5 Ω
EP	EAE-1TB	Magnetic Earphone, 8 Ω

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Ref. No.	Part No.	Description
SWITCHES		
S1-1~S1-12	RSS-132	Band Selector Switch
S2-1~S2-9	RSH-61	Portable-Car Antenna Selector Switch
S3-1~S3-2	RSH-42	Radar-Matic Sensitivity Switch
S4	RSH-42	Power Source Switch
S12	RSS-138	AFC Switch
S5, S6, S7-1~S7-2	RSE-33	Radar-Matic Tuning, Auto Return & Reversing Switch
MISCELLANEOUS		
	RJJ-1-1	Jack, MPX OUT & STEREO IN
	RJJ-2	Jack, Earphone or EXT Speaker
	RJJ-25	Jack, Remote Control (3 Req'd)
	RJJ-68	Socket, Multiconnector
	RJT-324	Terminal, Dial Light (large)
	RJT-740	Terminal, Dial Light (small)
	RJC-202	Terminal, Battery
	RJC-502	Spring, Battery
	RUC-199S	Bracket, Back Cover M'tg. (2 Req'd) (150)
	RMS-10	Bracket, Speaker M'tg. (2 Req'd)
	RMK-119	Bracket, Remote Jack M'tg.
	RMY-79	Heat Sink, Transistors (TR12, 17, 18)
	RMY-62S	Heat Sink, Transistors (TR12, 17, 18) (150)
	RDD-20-5	Drum, Dial (small)
	RDE-39S	Shaft, Drum M'tg. (small) (150)
	RSE-20	Motor, Auto Tuning
	RDE-72	Drum, Tuning Drum
	RDE-9003	Shaft, Band Selector
	RDS-505	Spring, Auto-Tuning Drum
	RDS-306	Spring, Antenna Selector & Drum (small)
	RDZ-05-3	Cord, Auto-Tuning Dial, 50cm (20")
	RDZ-03-1	Cord, Dial, 110cm (43 $\frac{5}{16}$ ")
	RHK-9S	Screw, Battery Cover M'tg. (150)
	RHD-3503S	Stay Shaft, Back Cover M'tg. (2 Req'd) (150)
	RHG-109	Rubber Cushion, Core Antenna M'tg. (2 Req'd)
	RHG-211	Rubber Cushion, Dial Light M'tg.
	DM3-16RS	Red Screw, Chassis M'tg. (150)
	DSTR3-10R	Red Screw, Chassis M'tg. (5 Req'd)
	⊕B3-6KS	Screw, Back Cover & Handle M'tg. (4 Req'd) (150)
	⊕B3-10KS	Screw, Back Cover M'tg. (5 Req'd) (150)
	10W-3	Washer, Chassis M'tg.
	SW-3	Spring Washer, Chassis M'tg.
	SW-7T	Washer, Handle M'tg. (2 Req'd)
	RNW-1020	Washer, Handle M'tg. (4 Req'd)
	SW-10	Washer, Whip Antenna M'tg.
APPEARANCE		
	RYA-4220S	Cabinet (Complete) (150)
	RYM-860S	Cabinet Front (Complete), Handle (150)
	RYF-740S	Back Cover (Complete), Battery Cover (150)
	RKK-140	Cover, Battery Compartment
	RANT-130-7T	Whip Antenna
	RSE-20	Motor, Auto-Tuning
	RDP-207-2	Pointer, Dial
	RKH-52	Handle, Cabinet
	RKT-30S	Bracket, Handle M'tg. (right) (150)
	RKT-31S	Bracket, Handle M'tg. (left) (150)
	RKX-13-1S	Screw, Handle M'tg. (2 Req'd) (150)
	RKX-53S	Retaining Screw, Handle M'tg. (2 Req'd) (150)
	RGM-1531	Metal Grille
	RBN-186	Knob, Manual
	RBN-187-1	Knob, Tone & Volume (2 Req'd)
	RBS-35	Knob, Band
	RBC-25	Button, Dial Light





- Notes:
1. All resistor values in ohms (K=1000).
 2. All capacitor values in micro farads (P=mmf).