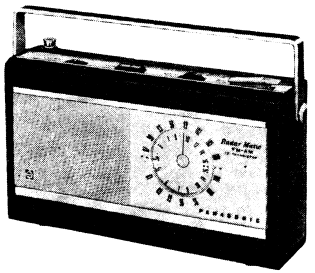


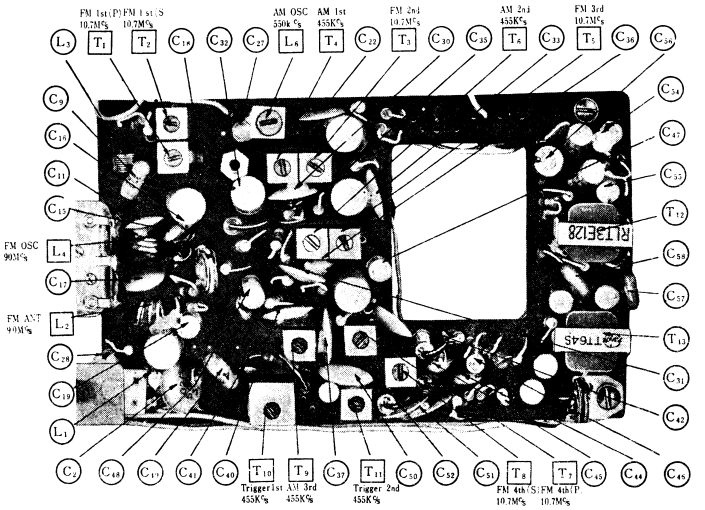
MODEL RF-2000

FM-AM RADAR-MATIC AUTO-TUNING 12-TRANSISTOR PORTABLE RADIO

SPECIFICATIONS

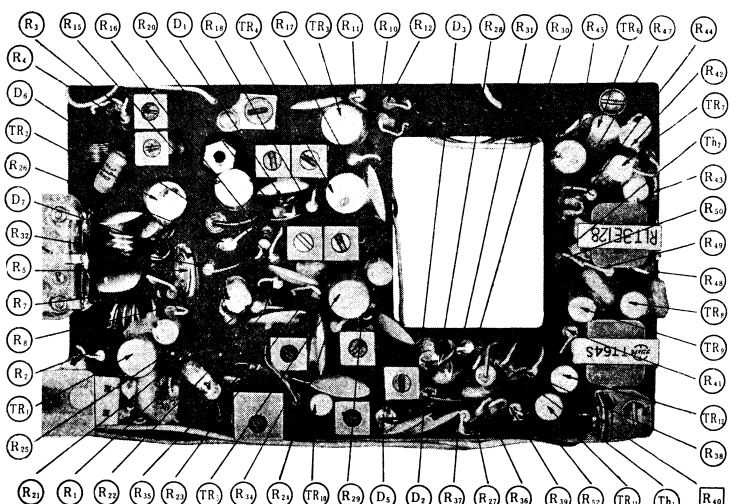
Frequency Range :	FM 87 ~ 108Mc/s
	AM 525~1605kc/s (571 ~ 187 m)
Intermediate Frequency :	FM 10.7Mc/s
	AM 455 kc/s
Transistors :	2SA377 FM RF Amplifier
	2SA377 FM Converter
	2SA70 FM 1st IF Amp. & AM Converter
	2SA70 FM 2nd IF Amp. & AM 1st IF Amp.
	2SA70 FM 3rd IF Amp. & AM 2nd IF Amp.
	2SB173 1st AF Amplifier
	2SB175 2nd AF Amplifier
	2SB176 } Output (push-pull)
	2SB176 }
	2SA102 Trigger 1st IF Amplifier
	2SB175 Trigger 2nd IF Amplifier
	2SB176 Relay Control
Diodes :	OA90 D.AGC
	OA79 } FM Detector
	OA79 }
	OA70 AM Detector & AGC
	OA70 Trigger Detector
	OA70 Relay Control
	SC15 FM AFC
Sensitivity :	FM 1μV for 50mW Output
	AM 70μV/m for 50mW Output
Power Output :	300mW Undistorted
	500mW Maximum
Batteries :	6V (Four "C" size flashlight batteries)
Speaker :	9cm (3½") PM dynamic speaker
Cabinet Dimensions :	246(wide)×140(High)×67(Deep) mm
	(9 9/16"×5½"×2⅝")
Weight :	1.7kg. (3¾ lb.) with batteries

Capacitors, Transformers & Coils



Component View - Parts Identification, Alignment Points.

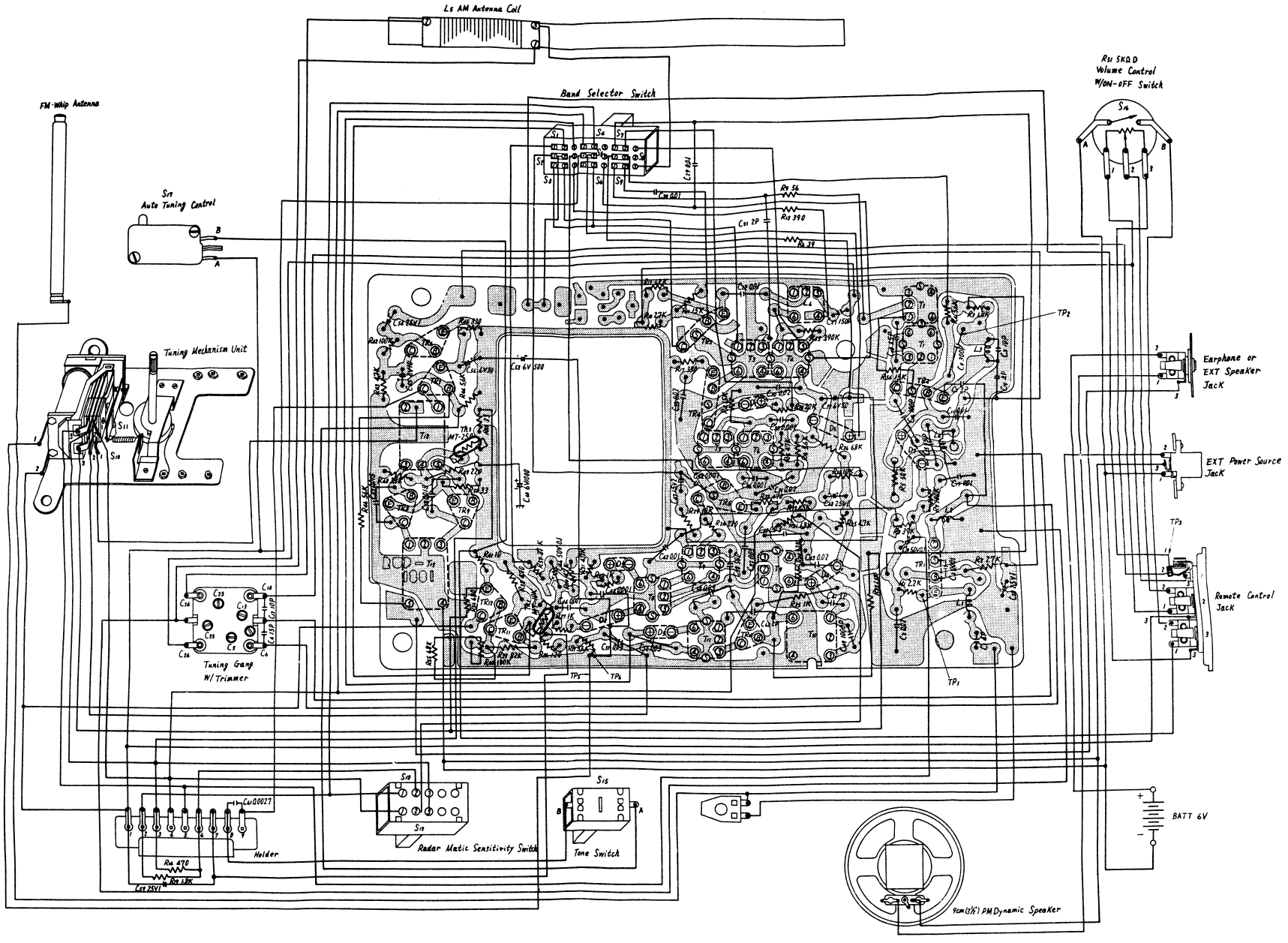
Resistors, Transistors, Diodes & Thermistors

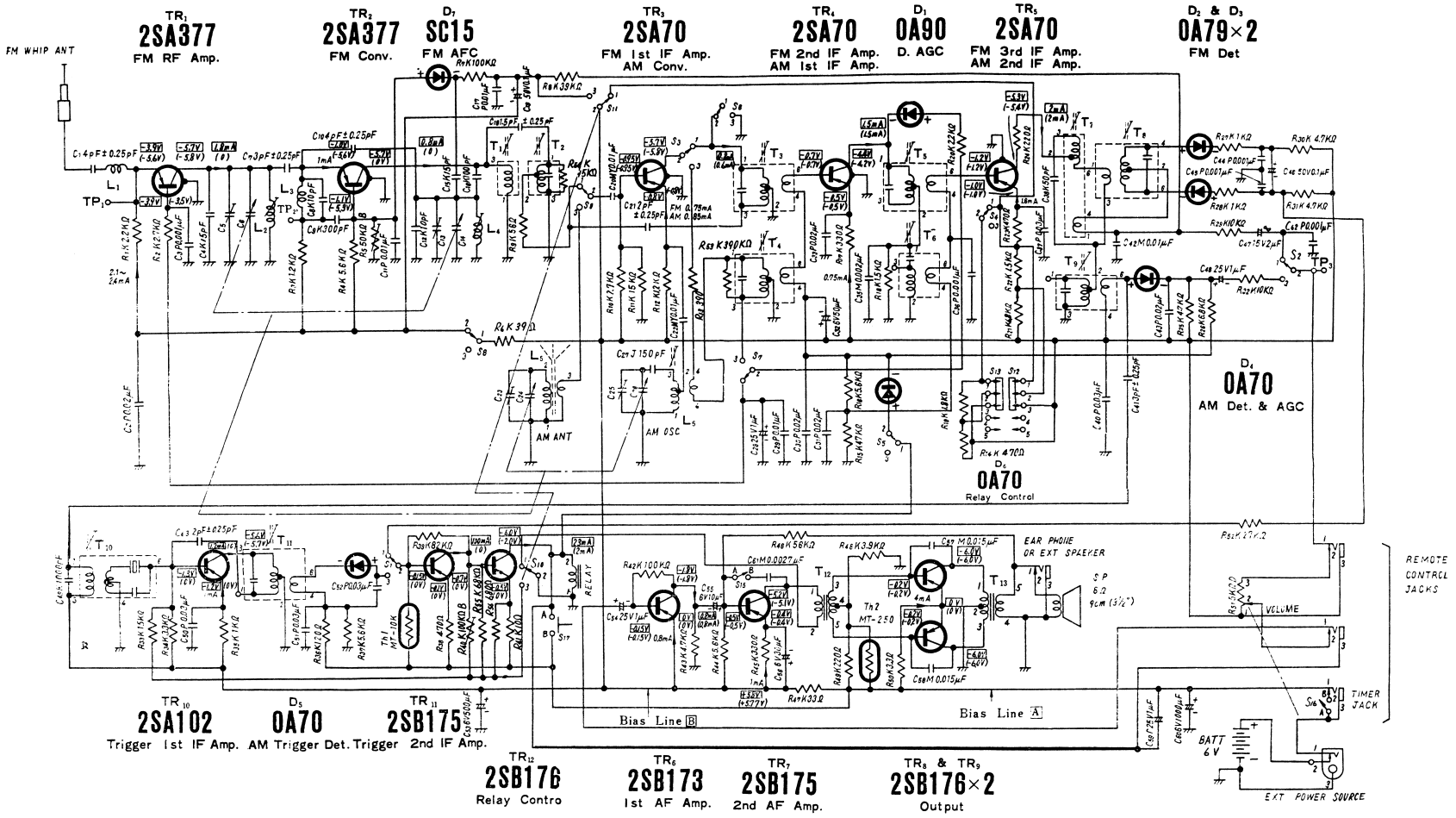


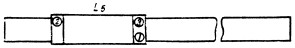
Relay Current Adj

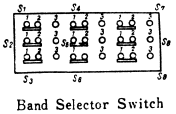
Component View - Parts Identification, Alignment Points.

N175 National RF-2000






AM Antenna Coil


Band Selector Switch

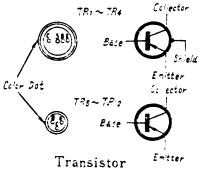
FM, AM IFT

Trigger 1st IFT

Trigger 2nd IFT

AM Oscillator Coil

BOTTOM VIEW



Transistor

Notes:

1. $S_1 \sim S_9$: Band selector switch in "FM" position.
2. S_{10}, S_{11} : Relay in "RECEIVING" position.
3. S_{12}, S_{13} : Radar-Matic sensitivity switch in "DX" position.
4. S_{15} : Tone switch in "HIGH" position.
5. S_{16} : Power source switch in "OFF" position.
6. S_{17} : Auto-tuning control in "OFF" position.
7. Relay operations may stop, when the battery voltage drops to less than 3.2 volts or less.
8. DC voltages indicated are taken with circuit tester (10KΩ/V) in "DX" position of Sensitivity Switch (S_{12}, S_{13}) as follows:
   - $TR_1 \sim TR_7$ & TR_{10}...From bias line B to transistor terminals.
   - TR_8 TR_9, TR_{11} & TR_{12}... From bias line A to transistor terminals.
   - $TR_1 \sim TR_9$..... ▭ FM ( ) AM
   - $TR_{10} \sim TR_{12}$... ▭ When Seeking Signal
     ( ) When Receiving Signal
9. Capital letters (M, K, J, P) in the circuit diagram show allowable tolerances of resistors and capacitors as folloWs.
   M=±20% K=±10% J=±5% P=+100% − 0%
10. PF=pico farad=mmf
    μF=micro farad=MF
11. Battey current:
    No signal..... FM, AM 18mA
    Maximum output..... FM, AM 115mA

ALIGNMENT INSTRUCTIONS

RELAY CURRENT ADJUSTMENTS

1. RADIO RECEIVER SETTING

- Set Volume Control to minimum volume level.
- Set Band Selector Switch to "FM".
- Set Radar-Matic Sensitivity Switch to "DX".
- Maintain power source at 6V DC.
- Un-solder the junction of test points **TP_5** and **TP_6**. (Fig. 6)

2. DC MILLIAMMETER CONNECTION

Set the range of a milliammeter to 100mA and connect the positive side to the test point "**TP_5**", and the negative side to "**TP_6**".

3. RELAY CURRENT INDICATION

Adjust the 100KΩ potentiometer (R_{40}) so that the DC milliammeter indicates 23mA when the Auto-Tuning Control (S_{17}) is pressed.

Notes: 1. This model, RF-2000, is designed to be easily aligned without taking the chassis out of the case.

2. Make certain that the spring of the auto-tuning mechanism is not wound.

3. Refer to Figs. 4,7 and 8 for the alignment points and equipment connections.

AM IF & RF ALIGNMENT

Output of signal generator should be no higher than necessary to obtain output reading.
Set Volume Control to maximum for RF and minimum for IF.
Set Band selector switch to "AM"
Set Tone switch to "H"
Set Radar-Matic Sensitivity switch to "DX"
Set Power Source voltage to 6V DC.

	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	INDICATOR	ADJUST	REMARKS
1	Fashion loop of several turns of wire and radiate signal into loop of receiver.	455kc/s (400~ Mod.)	Tuning Gang fully Open	DC milli-ammeter. Positive to **TP_5**. Negative to **TP_6**.	T_9(AM 3rd IFT) T_7(AM 2nd IFT) T_4(AM 1st IFT)	Adjust for maximum indication on DC milliammeter.
2	〃	Set around 455kc/s where indication of DC milli-ammeter is minimum.	〃	DC milli-ammeter across earphone jack.	T_{11} (Trigger 2nd IFT) T_{10} (Trigger 1st IFT)	1. Auto-Tuning Control (S_{17})must be pressed in this step. 2. Adjust for 10mA or more by adjusting T_{10} and T_{11}, keeping signal generator's output lower.
3	〃	550kc/s (400~ Mod.)	550kc/s (Use upper dial scale)	〃	L_4 (AM OSC Coil) L_5 (AM ANT Coil)	Adjust for maximum output by sliding coil (L_5)along ferrite core.
4	〃	1500kc/s (400~ Mod.)	1500kc/s (Use upper dial scale)	〃	C_{25} (AM OSC Trimmer) C_{28} (AM ANT Trimmer)	Adjust for maximum output. Repeat steps (3) and (4)

Note: Resolder **TP_5** and **TP_6** after the completion of the alignment.

FM IF ALIGNMENT WITH OSCILLOSCOPE

EQUIPMENT REQUIRED

Signal generator that provides 10.7Mc/s marker.
Sweep generator that provides 10.7Mc/s center frequency and 400kc/s sweep width.

OSCILLOSCOPE

Set sweep selector of oscilloscope to "External Sweep". Apply 60~ sweep signal from sweep generator to horizontal input terminals of oscilloscope.
Set Band selector switch to FM.
Set Volume control to minimum.
Set Tone Switch to "H"
Set Radar-Matic Sensitivity Switch to "DX".
Set Power Source 6V DC.

	SWEEP GENERATOR COUPLING	SIGNAL GENERATOR COUPLING AND FREQUENCY	RADIO DIAL SETTING	INDICATOR	ADJUST	REMARKS
1	High side thru. .001mfd to point **TP_2**. Common to chassis.	High side thru. .001mfd to point **TP_2**. Common to chassis 10.7Mc/s(Unmod).	Point of non-interference (on/about 100Mc/s)	Connect vert. amp. of scope to point **TP_4**. Common to chassis.	T_7 (FM 4th IFT)(P) T_6 (FM 3rd IFT) T_8 (FM 2nd IFT) T_2 (FM 1st IFT)(S) T_1 (FM 1st IFT)(P)	Adjust for maximum amplitude and symmetrical curve. (Refer to Fig. 1)
2	〃	〃	〃	〃	T_8 (FM 4th IFT)(S)	Adjust T_8 for maximum amplitude & prorer linearity between ±100kc/s markers. Adjust T_8 so that 10.7Mc/s marker is at the center. (Refer to Fig. 2)

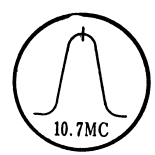


Fig. 1

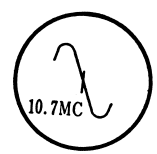


Fig. 2

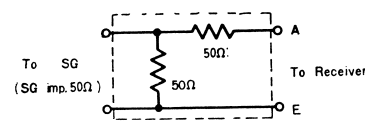


Fig. 3 FM Dummy Antenna

FM RF ALIGNMENT

Output of signal generator should be no higher than necessary to obtain an output reading.
Set Volume Control to naximum.
Set Band selector switch to "FM"
Set Tone Switch to "H".
Set Radar- Matic Sensitivity Switch to "DX".
Set Power Source to 6V DC.

	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	IINDICATOR	ADJUST	REMARKS
3	Connect to Point **TP_1** through FM Dummy antenna. Common to chassis. (Refer to Fig. 3)	90Mc/s (400~ Mod.)	90Mc/s (Use upper dial scale)	Output meter across earphone jack	L_4 (FM OSC Coil) L_2 (FM Collector Coil)	Adjust for maximum output.
4	〃	106Mc/s (400~ Mod.)	106Mc/s (Use upper dial scale)	〃	C_{18} (FM OSC Trimmer) C_6 (FM ANT Trimmer)	Adjust for maximum output. Repeat steps(3) and (4)

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