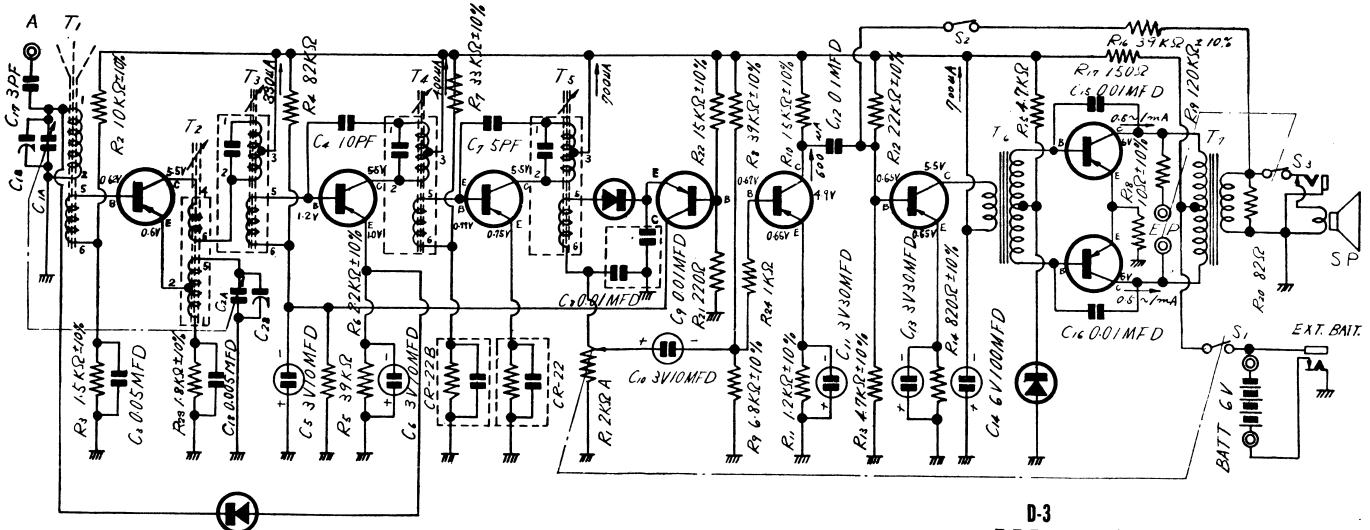
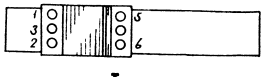
SCHEMATIC DIAGRAM

TR-1	TR-2	TR-3	D-2	TR-4	TR-5	TR-6	TR-7 & TR-8
MC101	OC45	OC45	OA70	OC71	OC71	OC71	2OC72
CONV.	1ST IF AMP.	2ND IF AMP.	DET & A.G.C.	A.G.C. AMP.	1ST AF AMP.	2ND AF AMP.	POWER OUTPUT



CR-22 ---- 0.025MFD+1.2KΩ±10%
CR-22B ---- 0.025MFD+10KΩ±10%

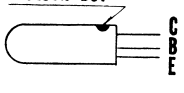


T_1
FERRITE ROD ANT COIL

T_2
OSC COIL

T_3 T_4 & T_5
IF TRANS.

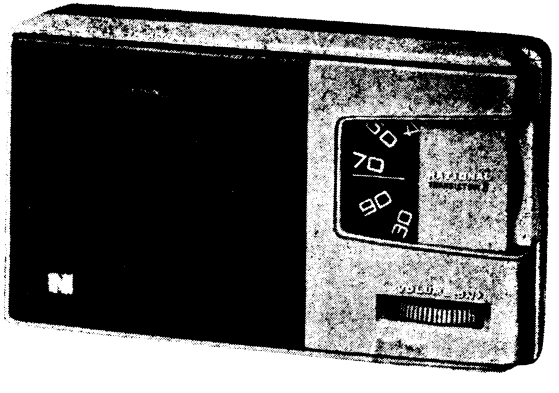
(BOTTOM VIEW)



TRANSISTOR

Notes :

1. Measurements of voltage and current should be made at minimum volume and at no signal.
2. Voltages indicated in the schematic diagram are given as standard values measured by Vacuum-tube Volt Meter. When 1 KΩ / 1 V Tester is used for voltage measurement, please note that you will get lower values (-0.1 V on Collector, -0.2 V on Base and -0.1 V on Emitter respectively) than the abovementioned standard values obtained by Vacuum-tube Volt Meter.
3. Please make your current measurement within the range of 1 mA. Collector current of both transistors TR-1 (Ic1) and TR-2 (Ic2) are to be measured at the points, as illustrated on the printed circuit board removing solder on them.
   Those of other transistors can be measured by means of cutting the printed copper on the board.
4. Values of resistors R_2 (10KΩ), R_4 (82KΩ) and R_{15} (4.7KΩ) given in the schematic diagram may be variable according to radio receivers.



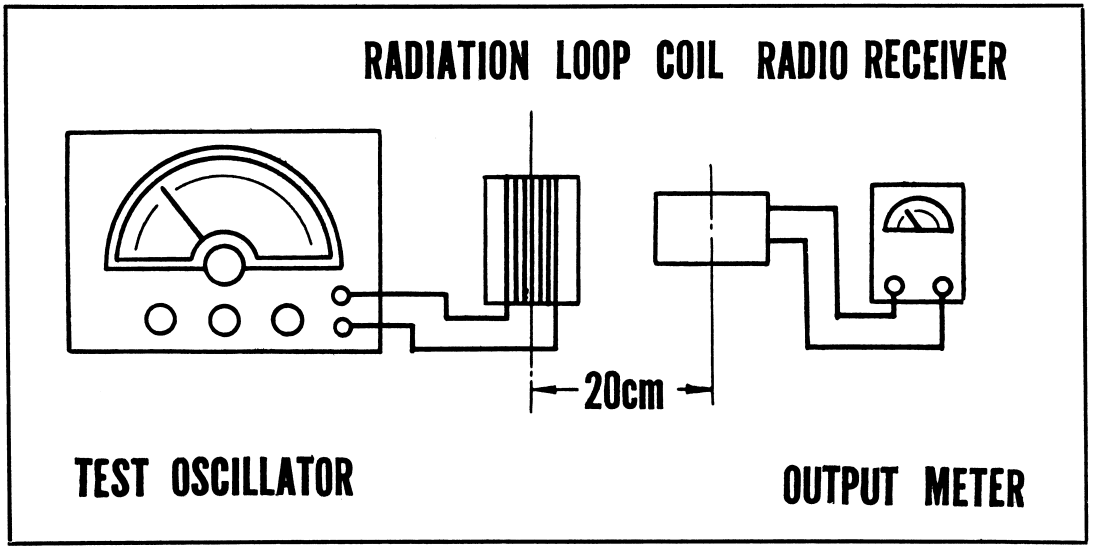
SPECIFICATIONS

Frequency Range :	540～1600Kc/s (556～187.5m)
Intermediate Frequency	455Kc/s
Sensitivity :	100μV/m/10mW
Power Output :	200mW undistorted 250mW maximum
Battery :	Four No. 3 Penlight Cells, 6V (NATIONAL UM-3 or equivalents)
Speaker :	3″ PM dynamic speaker Voice coil impedance 10Ω

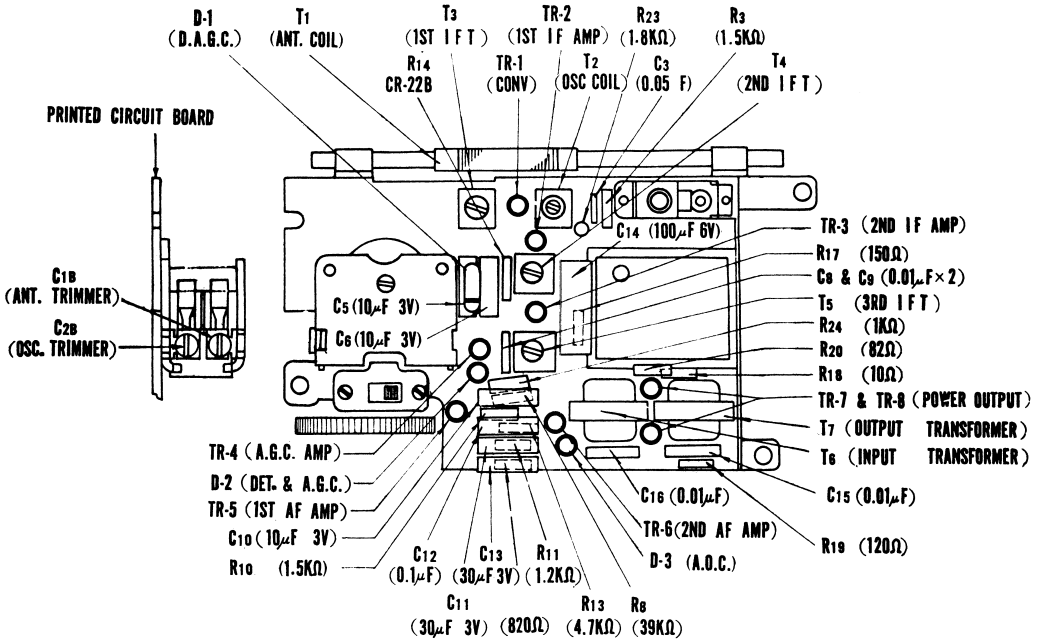
NATIONAL MODEL AT-220

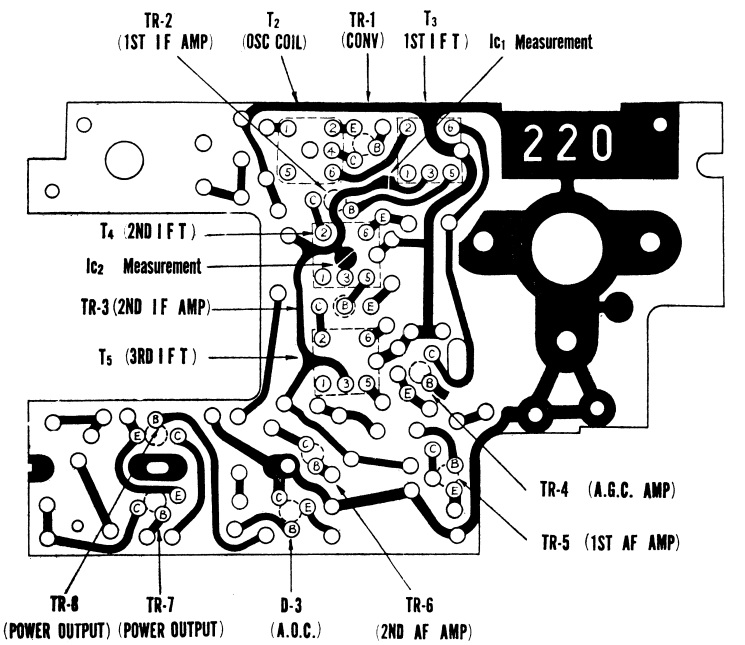
Step	Test Oscillator output	Dial setting	Adjusting to maximum output
1	455 KC	Variable capacitor at maximum capacity	I F transformers (T_3, T_4, T_5)
2	455 KC		Repeat step ①.
3	530 KC		Oscillator coil (T_2)
4	1650 KC	Variable capacitor at minimum capacity	Oscillator trimmer (C_2B)
5	530 KC or 1650 KC	Variable capacitor at max. or min. capacity	Repeat steps ③ and ④.
6	600 KC	600 KC	Antenna coil (T_1)
7	1200 KC	1200 KC	Antenna trimmer (C_1B)
8	600 KC or 1200 KC	600 KC or 1200 KC	Repeat steps ⑥ and ⑦.

Connection of Test Oscillator, Radiation Loop Coil, Radio Receiver and Output Meter.



MAIN PARTS LOCATION & PRINTED CIRCUIT BOARD





ALIGNMENT PROCEDURE

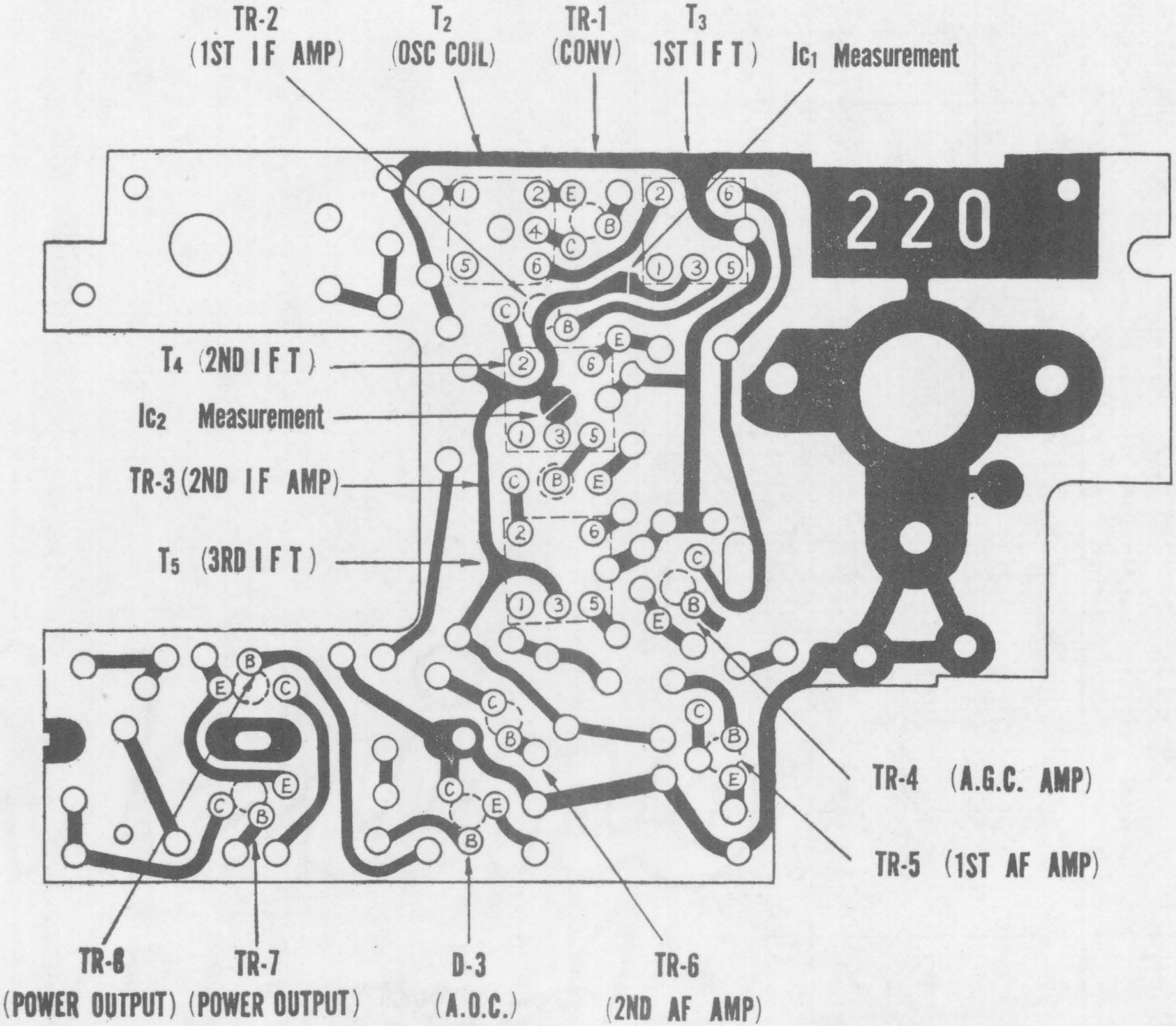
OUTPUT METER ..... Connect Output Meter across speaker voice coil.

OUTPUT LEVEL ..... Attenuate Test Oscillator output always maintain 0.5 volt on Output Meter to prevent overloading of the receiver.

TEST OSCILLATOR ..... Modulate Test Oscillator at 1000c/s and connect the lead wires of Test Oscillator output to Radiation Loop Coil.

RADIO RECEIVER..... Place the radio receiver 20cm away from Radiation Loop Coil. Set volume control to maximum and DX-LOCAL switch to DX.

RADIATION LOOP COIL... Make up a 20 turn, 15cm diameter bobbin, using 1mm copper wire.


TR-2
(1ST IF AMP)
T2
(OSC COIL)
TR-1
(CONV)
T3
1ST IFT)
Ic1 Measurement
220
T4 (2ND IFT)
Ic2 Measurement
TR-3 (2ND IF AMP)
T5 (3RD IFT)
TR-4 (A.G.C. AMP)
TR-5 (1ST AF AMP)
TR-8
(POWER OUTPUT)
TR-7
(POWER OUTPUT)
D-3
(A.O.C.)
TR-6
(2ND AF AMP)