

**AUSTRALIAN MILITARY FORCES**

Master-General of the Ordnance

Instruction No.

**D.M.E. Technical Instruction 2102-48**

**TELECOMMUNICATION INFORMATION**

**EQUIPMENT:-** COMMUNICATION RECEIVER TYPE AR12 (R.A.A.F.)

**SUBJECT:-** Description, Specification, alignment procedure and parts list.

**REFERENCE:-**

**GENERAL:**

The abovementioned receiver may be employed for reception of CW, MCW and RT within the following frequency bands:-

A -	7.5	to	16	MCs
B -	3.5	to	7.5	MCs
C -	480	to	980	KCs
D -	150	to	420	KCs

Receiver is operated from dry batteries; Fil voltage from one dry cell type 'A' (1.5V) and HT voltage from two Heavy Duty 45V 'B' batteries in series, and will be on limited issue to certain AMF Units.

Antenna Input - Receiver will operate from either dipole aerial or aerial and earth.

Power Consumption - Voltages and current drawn by Receiver as follows:-

(Fil heating supply - 1.5V dry cell Type 'A'  
(Current drain - 350 milliamps

(Plate supply - 2 - 45 Heavy Duty 'B' batteries in series  
(Current drain - 8.5 milliamps av.

Meter Switch - Selects meter range to check 'A' and 'B' battery voltages on load.

Crystal Phasing Control and Crystal Filter Switch - Used for phasing of the crystal circuit. Turned extreme right crystal filter is switched out of circuit.

Receiver consists of (a) Receiver unit (b) Battery box unit

- |                    |                         |
|--------------------|-------------------------|
| (1) RF Stage       | (5) Second Detector     |
| (2) HF Convertor   | (6) Beat Oscillator     |
| (3) Crystal Filter | (7) Audio Output Stage. |
| (4) IF Stages      |                         |

RF Stage - High gain circuit; coils of low loss construction; air type trimmers used, giving stability under operating conditions. Antennae generally used is the Marconi type, single wire and ground connection. A jumper wire between ground socket (blue) and nearest aerial socket (red) is used. Antennae lead-in connects remaining aerial socket (red) and earth lead to earth socket (blue). To reduce noise level, noise reducing aerial is used having concentric or twisted pair feeders connected to the two aerial sockets (red) jumper wire and earth socket being removed.

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IF Stage - IF is 455 KCs, two stages: IF Transformers iron core type.

Crystal Filter - allows continuously variable selectivity with balanced phasing control. Sharp selectivity characteristic obtained with crystal in operation allows copying of a signal when frequency of an interfering signal is removed from the desired signal by only a few hundred cycles.

Audio Circuits - consists of low gain resistance coupled triode 1H5 detector coupled to a 1A5 pentode output valve.

Valve Complement -

1P5GT	RF Amplifier	1H5G	Second detector and first audio.
1A7G	Oscillator mixer	1A5G	Audio Output Stage.
1P5OT	First IF Amplifier	1H5G	Beat Frequency Oscillator.
1P5OT	Second IF Amplifier		

Performance Characteristic -

Sensitivity - MCW sensitivity over the HF bands = 2/a volts i.e. I/F sig of 5/u volts or less, mod 30% at 400 c.p.s. and fed to receiver aerial through a dummy antenna will deliver into a 12,000 ohm load an O/P of 6 MW with a sig to noise ratio of 1 : 1 in watts.

Dummy antennae used are -

Band A) 400 ohms non inductive resistor.  
" B)

Band C) L - 20 /u H ) all connected  
" D) C - 200 /uuF ) in  
" H - 25 ohm ) series.

Selectivity - (varying I/P voltage to give a constant O/P voltage )  
5.25 KCs off resonance 20 db down.  
9.25 " " " 40 " "  
18.5 " " " 60 " "

With crystal filter in operation, overall bandwidth is 200 cycles.

Overall Fidelity - flat to within  $\pm 5$  db over a frequency of 200-3000 c.p.r.

Power O/P - audio power 100MW  
For telephones 6 MW

ALIGNMENT PROCEDURE -

If it should become necessary to re-align the receiver, the following procedure should be followed -

A signal generator with a low impedance output and an output meter with an impedance of 12,000 ohms are the essential equipment to correctly align the receiver.

The out put meter should be connected by means of a plug to one of the telephone jacks.

For monitoring the adjustments a pair of headphones may be used in the other jack, but should be disconnected to obtain accurate loading when the voltage across the output meter is being measured.

The signal generator should be adjusted on all tests to produce a six milliwatt output as indicated by the output meter.

Intermediate Frequency Alignment -

- (a) Remove the grid clip on 1A70 mixer.
- (b) Connect the generator to the grid through a .01 microfarad condenser.
- (c) Connect a .5 megohm resistor from grid to earth to furnish bias return.
- (d) Turn the RF gain control and audio volume control to maximum (clockwise).
- (e) Turn the BFO Switch to 'Off' position.
- (f) Turn the main tuning dial to 150 kilocycles.
- (g) Turn the automatic volume control switch to the 'Off' position.
- (h) Connect output meter and headphones.
- (i) Accurately set the signal generator to 455 kilocycles and adjust the modulation to 30% at 400 cycles.
- (j) Carefully adjust the trimmers at the back of the crystal filter box, also trimmers on the side of second and third intermediate frequency transformers.

As the transformers used are of the low drift type it should not be necessary to alter the adjustments greatly.

When making the above adjustments keep the signal from the generator as low as possible at all times. Once these adjustments have been made tune the generator dial to maximum output as indicated on the output meter. If any alteration in frequency has taken place reset the generator again to 455 kilocycles and repeat the above procedure.

**IMPORTANT** - As this receiver is fitted with a crystal filter, it is important that the frequency of the intermediate transformers be adjusted exactly to the frequency of the crystal, i.e. 455 kilocycles; otherwise the operation of the crystal filter will be seriously impaired. It is therefore essential that adjustments should not be made UNLESS ABSOLUTELY NECESSARY.

Adjusting of Beat Frequency Oscillator - With the generator still connected as in the previous test, turn switch marked "B.F.O." to 'On' position, set beat note control to centre line, and adjust screw on top of B.F.O. transformer (see Valve Placement Diagram) until zero beat is heard in the telephones.

Alignment of Antenna, Radio Frequency and Oscillator Circuits -

The RC 17 Receiver has four separate frequency bands. It is essential when making any adjustments to see that the correct trimmers are adjusted for the frequency which is being aligned.

All trimmers which have their adjustments on top of the trimmer box, are clearly designated, and a thorough study should be made of Circuit Diagram and the general arrangement of the dial before any aligning procedure is adopted. The dummy antennae used for adjustments are as follows:-

Band A) Dummy Antenna 400 ohm non-inductive resistor.  
" B)

Band C) Standard inductance capacitance resistive dummy antenna of the  
" D) following values:-

L - 20 Microhenries	) connected in series.
C - 200 Micromicrofarads	
R - 25 ohms	

- (a) Connect the signal generator to the receiver through the correct dummy antenna for the band which requires aligning:

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- (b) Turn the Audio and RF volume controls to their maximum (clock-wise).
- (c) Turn the B.F.O. switch to 'Off' position.
- (d) Connect output meter and phones as in IF adjustments.
- (e) Set the dial just inside the high frequency end of the band.
- (f) Set the generator to the frequency which the receiver is tuned with 30% modulation at 400 cycles.
- (g) Adjust the oscillator trimmer for the particular band until the frequency of the generator corresponds to the FREQUENCY of the dial. This is necessary only when the dial calibration is found to be incorrect.
- (h) Adjust antenna and RF trimmers to indicate maximum output on output meter.

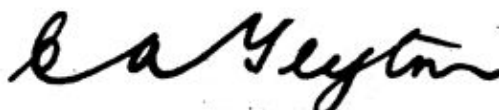
The receiver should require no further adjustments on bands A and B (i.e., the high frequency ranges). However on the low frequency bands C and D, padding condensers are provided for correct alignment on the low frequency ends of these bands.

The padder should be slowly adjusted until the maximum output on the meter is indicated. During this procedure the receiver tuning dial should be rocked back and forth to obtain correct alignment. All of the above operations should be repeated two or three times to obtain adjustment and calibration of the tuning dial.

Voltage Analysis at Socket Terminals - In the following chart Tube Socket Terminal Numbers are according to Socket connections shown on Circuit Diagram -

	1	2	3	4	5	6	7	8
RF Amplifier	0	+1.4	+90	+90	+90	+90	0	0
Convertor	0	+1.4	+90	+50	0	+75	0	0
First IF	0	+1.4	+90	+90	0	0	0	0
Second IF	0	+1.4	+90	+90	0	0	0	0
2nd Detector & 1st Audio	0	+1.4	+40	0	0	0	0	0
Audio	0	+1.4	+90	+90	0	0	0	0
B.F.O.	0	+1.4	+75	0	0	0	0	0

Voltages taken to earth with 1000 ohms per volt meter and are of the order shown above.



(C.A. GREYTON)  
Brigadier,  
Director of Mechanical Engineering.



Y10D/55259

RECEIVER TYPE AR12 COMPLETE

Consisting of

Y10D/77028

Case, Metal

Quantity 1

Y10D/77025

Cover Front Case Metal

" 1

COMPONENTS OF RECEIVER AR12

(Numbers refer to Circuit Diagram)

No.	Component, Rating and Make	Qty
1	.5 Mfd Paper Condenser, 200V Chanex	2
2	.1 Mfd Paper Condenser, 200V Chanex	5
3	.05 Mfd Paper Condenser, 200V Chanex	3
4	.01 Mfd Paper Condenser, 600V Chanex	2
5	8 x 8 Mfd Electrolytic Condenser, 350V Ducon	1
6	25 Mfd Electrolytic Condenser 40V Ducon	1
7	25 Mmfd Silver Mica Condenser 1000V Radio Corporation	1
8	50 Mmfd Mica Condenser 1000V Simplex	1
9	100 Mmfd Mica Condenser, 1000V Simplex	3
10	.0005 Mfd Mica Condenser 1000V Simplex	3
11	.0002 Mfd Mica Condenser 1000V Simplex	1
12	.001 Mfd Mica Condenser 1000V Simplex	3
13	.02 Mfd Mica Condenser 1000V Simplex	2
14	100 Mmfd Silver Mica Condensers 1000V Radio Corporation In	(3
15	50 Mmfd Silver Mica Condensers 1000V Radio Corporation Cryst-	(1
16	75 Mmfd Silver Mica Condensers 1000V Radio Corporation al	(1
17	33 Mmfd Air Trimmer, Stromberg Carlson	File-
18	12 Mmfd Midget Condenser and Switch, Radio Corporation ter.	(1
19	50 Mmfd Midget Condenser, Radio Corporation	(1
20	100 Mmfd Silver Mica Condensers T.C.C. In 1FT	5
21	33 Mmfd Air Trimmer Stromberg Carlson	1
22	Silver Mica Condenser 1000V, Radio Corporation	1
23	.0005 Variable Series Padder, Radio Corporation	1
24	.002 Mica Condenser 1000V T.C.C.	1
25	.004 Mica Condenser 1000V Simplex	2
26	3 Gang S.L.F. Condenser, Radio Corporation	1
27	33 Mmfd Air Trimmer, Stromberg Carlson	12
28	12 Mmfd Midget Condenser, Radio Corporation	1
29	700 ohm Carbon Resistor 1/2 Watt I.R.C.	1
30	5000 ohm Carbon Resistor 1/2 Watt I.R.C.	6
31	10,000 ohm Carbon Resistor 1/2 Watt I.R.C.	1
32	30,000 ohm Carbon Resistor, 1/2 Watt I.R.C.	1
33	150,000 ohm Carbon Resistor 1/2 Watt I.R.C.	1
34	250,000 ohm Carbon Resistor 1/4 Watt I.R.C.	1
35	500,000 ohm Carbon Resistor 1/4 Watt I.R.C.	2
36	50,000 ohm Carbon Resistor 1/2 Watt I.R.C.	1
37	1 Megohm Carbon Resistor 1/4 Watt I.R.C.	5
38	1.75 megohm Carbon Resistor 1/4 Watt I.R.C.	1
39	250,000 ohm Potentiometer	2
40	1 megohm Volume Control Centralab	1
41	Toggle Switch 2-way Amplifiers	3
42	2 x 3 Meter Switch Mfrs Spec Products	1
43	Single Circuit Telephone Jacks	2
44	0-2.5 0-100V Battery Meter Triplett	1
45	3 pye HF Choke, Radio Corporation	3
46	4-pin Battery Socket	1
47	Crystal Filter Unit	1
48	455 Kc IF Transformer	1

No.	Component, Rating and Make	Qty
49	455 Kc IF Transformer	1
50	20,000 ohms Output Transformer	1
51	Antenna Coil, Band D	1
52	Antenna Coil, Band C	1
53	Antenna Coil, Band B	1
54	Antenna Coil, Band A	1
55	RF Coil Band D	1
56	RF Coil Band C	1
57	RF Coil Band B	1
58	RF Coil Band A	1
59	Oscillator Coil Band D	1
60	Oscillator Coil Band C	1
61	Oscillator Coil Band B	1
62	Oscillator Coil Band A	1
63	Wave Change Switch Mfrs Special Products	1
64	8 Pin Octal Sockets, Radio Corporation	14
65	Antenna Terminal Strip, Radio Corporation	1
	Instruction Book	1
	Wireless Eqpt History Sheet	1
	<u>ACCESSORIES</u>	
	Batteries Dry, 45 Volt, HD Vertical	2
	Cells, Dry 1.5 Volt, Type 'A'	1
	Y10D/70027 Leads connecting with 2 only 4 pin plugs	1
	<u>VALVES</u>	
	Type 1A5G	2
	" 1A7G	2
	" 1H5G	4
	" 1P5G	6

**FIG. 1.**

