WIRELESS SET

A.R.E.C. MARK I.

INSTRUCTION MANUAL

TO BE USED IN CONJUNCTION WITH

SET SERIAL NO. 044

AREC MK 1 TRANSMITTER - RECEIVER

INSTRUCTION MANUAL

INDEX

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5. RANGE, BATTERY LIFE & TRANSMITTER INPUT POWER

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AREC MARK 1

WORKING INSTRUCTIONS

1. GENERAL DESCRIPTION

(a) Circuit Details

The equipment consists of a fully transistorised receiver, a transmitter using tubes for the oscillator and power amplifier stages with transistor speech amplifier, driver and modulator stages.

A transistorised power supply (operating from twelve volts input, 8.5V under load) is used to supply HT to operate the transmitter tubes.

Printed circuitry and miniaturisation are used to a large extent.

Tube and Transistor complement:

(i) Receiver

Function	Transistor/Tube Type
Oscillator Converter	OC170
1st & 2nd IF Stages	OC45
Detector Diode Stage	OA79
1st Audio Stage	OC71
AVC Diode	OA70
Output Stage	OC71
Beat Frequency Oscillator	OC45

(ii) Transmitter

Electron coupled Oscillator	DL70
Power Amplifier	DL73
Speech Amplifier	OC71
Driver	OC72
D.C. Amplifier	OC72
Sliding Bias Modulator	OC22

(iii) Power Supply Unit

(DC Converter Type)

Oscillator (2½Kc/s)	OC29
HT Rectifier	OA211
Filament Rectifier	OA31

NOTE: In addition two diodes (Type OA51) are wired across the filaments to prevent filament voltage reaching a high level during the period when the transmitter is off tune.

CIRCUIT DIAGRAM is shown on page ..6...

(b) Construction

The unit is mounted in a hiduminium case with a snap fitting watertight lid to prevent ingress of moisture. Removal of the set from the case is by means of four screws located in each corner of the front panel.

CAUTION: Care should be taken in removing the set or damage to the receiver printed circuit board may result.

(c) Facilities and Controls

A frequency range from 3 to 6 Mc/s is covered in one band, separate dials for transmitter and receiver calibrated in 100 Kc/s steps being provided. Dial locks are incorporated to ensure that the dials do not change settings during operation or transport. Aerial Loading is by means of a pi coupler system. A Function Switch marked "OFF" "REC" "SEND" & "BFO" is provided. The System Switch is marked "MIC" "NET" "KEY".
BFO Pitch and Receiver Aerial Tuning controls are also installed. "LT" (Battery Voltage) and "PA ANODE CURRENT" may be read on the meter. The former is read by depressing the "Push to read LT" switch while the latter is read in the normal position of the switch.
A Battery Reading on any portion of the scale from 7 - 9 Volts under load is an indication that the batteries are satisfactory. The graduation mark at 18 ma on the current scale is the correct loading position for correct operation.

(d) Battery Supply

Four type 744 six volt batteries wired in series parallel provide the 12 volts nominal supply. NOTE: Under load on transmitt this voltage will drop to between 7 and 9 volts.

CAUTION: Should it be necessary in an emergency to operate from a car battery tap off from the 8 volt strap, NOT 12 volts.

(e) Weights & Dimensions

Size $9\frac{1}{2}$" by 5" by 5".
Weight (with lid) 7lbs. 8 ozs.
Total Battery Weight 5lbs. 2 ozs.

(f) Serial Number

This is located on the mid-left hand edge of the front panel.

2. PREPARATION FOR USE

(a) Aerial A wire 60 to 100 ft. in length is the normal requirement and is connected to the aerial terminal marked "A".

(b) Earth An earth or counterpoise may be connected to the terminal marked "E", but has not been found necessary in trials.

(c) Microphone, Key and Headphones. Plug these accessories into the appropriate jacks in the lower centre of the panel.
NOTE: WSZC1 type plugs will NOT fit these jacks.

(d) Battery Lead Connect lead from set to four 744 batteries wired in series parallel.

3. OPERATION

(a) Set System Switch to "MIC"

(b) Set Function Switch to "REC"

(c) Turn "REC VOL" fully clockwise and noise from the receiver headphones should be heard. Adjust "REC ANT TUNE" for the maximum noise.
NOTE: Provision has been made so that "REC VOL" control, when fully anticlockwise does not completely cut off the receiver output. This should reduce the possibility of leaving the receiver accidentally switched "on" over long periods.

(d) Set "TRANSMITTER" and "RECEIVER" dials to the desired frequency.

(e) Set "ANT TAP" to position "1" (Maximum inductance)

(f) Set "ANT LOAD" and "PA TUNE" fully clockwise (Maximum capacity)

(g) Set Function Switch to SEND and dip meter reading to resonance by adjusting "PA TUNE" control. This should be below the 18 ma graduation on the current scale. If NOT reduce the inductance of the loading coil by setting "ANT TAP" control to position 2, and repeating resonance tuning as above. Proceed as with normal pi coupling to load the PA stage to the 18 ma graduation on the current scale.

(h) Pi Coupling Procedure. Adjust "ANT LOAD" control slightly in an anticlockwise direction and resonate "PA TUNE" when the reading at resonance should be slightly higher than that previously obtained at resonance. Repeat this procedure in steps until the reading at resonance is up to the correct loading figure. IMPORTANT: Always ensure that the final adjustment is made to the "PA TUNE" control for resonance.

Should the reading be too high or low at resonance irrespective of the position of the "ANT LOAD" control adjust the "ANT TAP" to a different setting and repeat the above procedure to secure correct loading figure.

(i) Netting. This is carried out in the normal way. Set Function Switch to "SEND" and System Switch to "NET". (This applies HT to the MO and LT to the BFO).
NOTE: Do NOT set Function Switch to "BFO" during netting operation as this will remove HT from the master oscillator stage.

A 2/½ Kc/s whistle from Power Supply Unit may be heard in the receiver in this position but will not complicate the netting procedure. It is possible to obtain other beat signals across the dial but the correct one is the strongest and will be found nearest to the correct calibration point.

NOTE: Netting Signal must be Zero Beat with BFO "ON" before netting proceedure commenced.

(j) CW Operation. This is obtained by setting the system switch to "KEY" and the function switch to "BFO".

(k) Send/Receive switching is obtained by switching the Function Switch between these two positions.

4. CAUTION

(a) Frequency Doubling in PA Stage. If the procedure outlined in para 3 (f) to (h) above is not followed it is possible to double the output frequency in the PA stage on the low frequency end of the range (3 to 5 Mc/s). IN ANY CASE THE FIRST "dip" ON THE "PA TUNE" CONTROL FROM THE MAXIMUM CAPACITY POSITION IS THE CORRECT ONE. (Max. capacity See Sec. 3F)

(b) Hand Capacity Effect. When operating without an earth connection the set should be placed on a bench or parka to eliminate this effect.

5. RANGE, BATTERY LIFE & TRANSMITTER INPUT POWER

RANGE is a difficult matter to define. However during Field Trials the set was heard over distances of up to 500 miles in daylight on phone. It has compared favourably with the performance of the WSZC1 under similar conditions.

The maximum drain from the batteries is 1.1 amp on transmit, while on receive, this falls to 11 ma. Under normal AREC use one set of batteries should last 6 - 7 days. This means that one set should be satisfactory for the duration of a normal SAR operation.

When correctly loaded the transmitter has an input of 2.7 watts, the output being determined by the efficiency of the aerial system. Approx. 1 watt o/p.

6. MAINTENANCE

Apart from replacement of batteries and self evident running repairs such as microphone, headphones cords, plugs, loose knobs, no maintenance is to be carried out by sections. Faulty sets are to be returned to the Communications Manager for replacement. Batteries must not be stored in the satchel provided.

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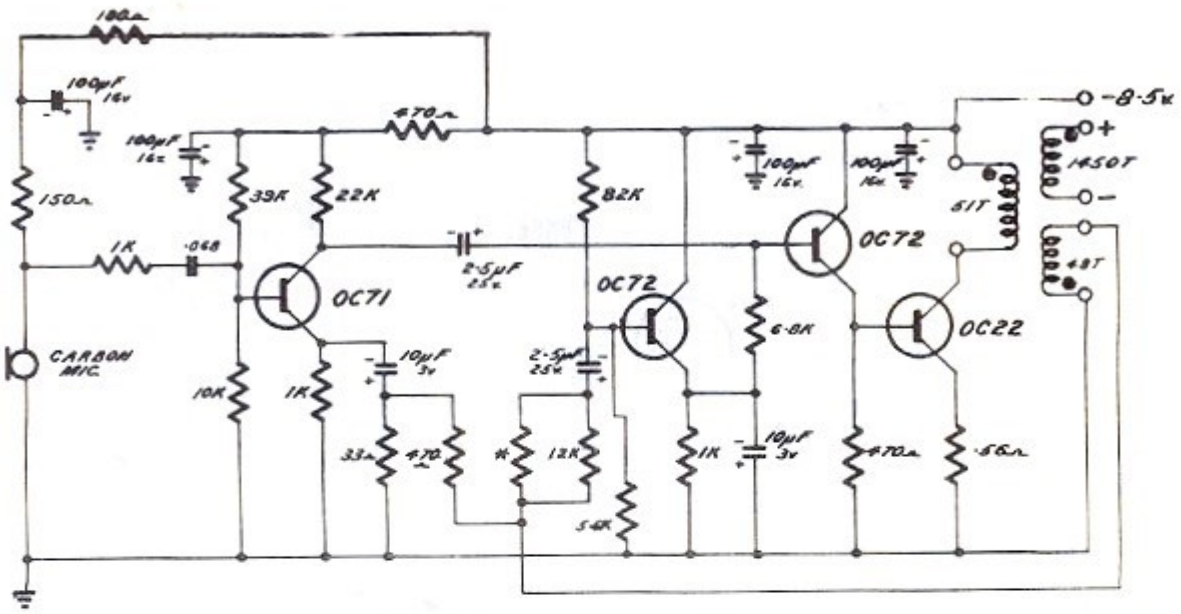
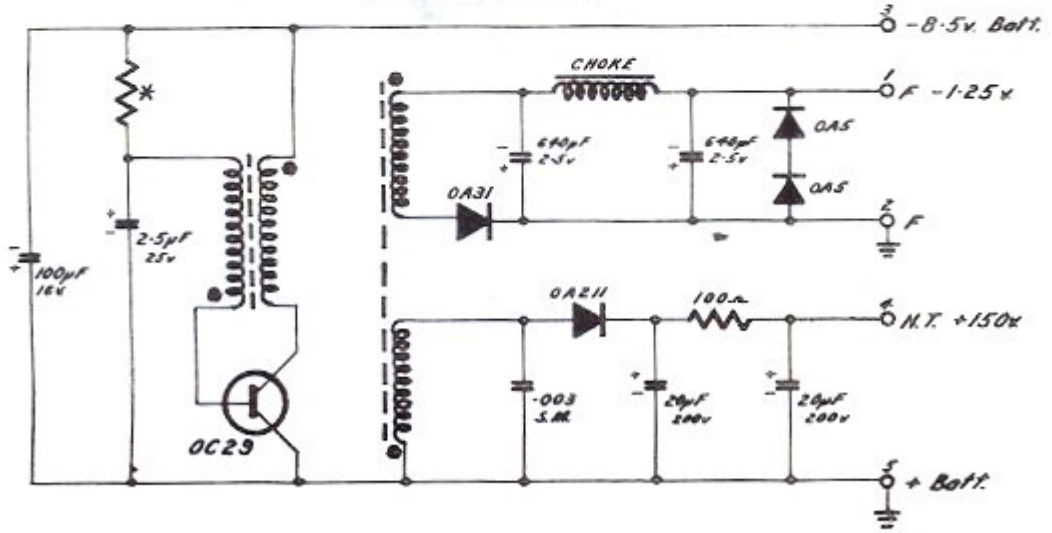


* SELECTED DURING MANUFACTURE

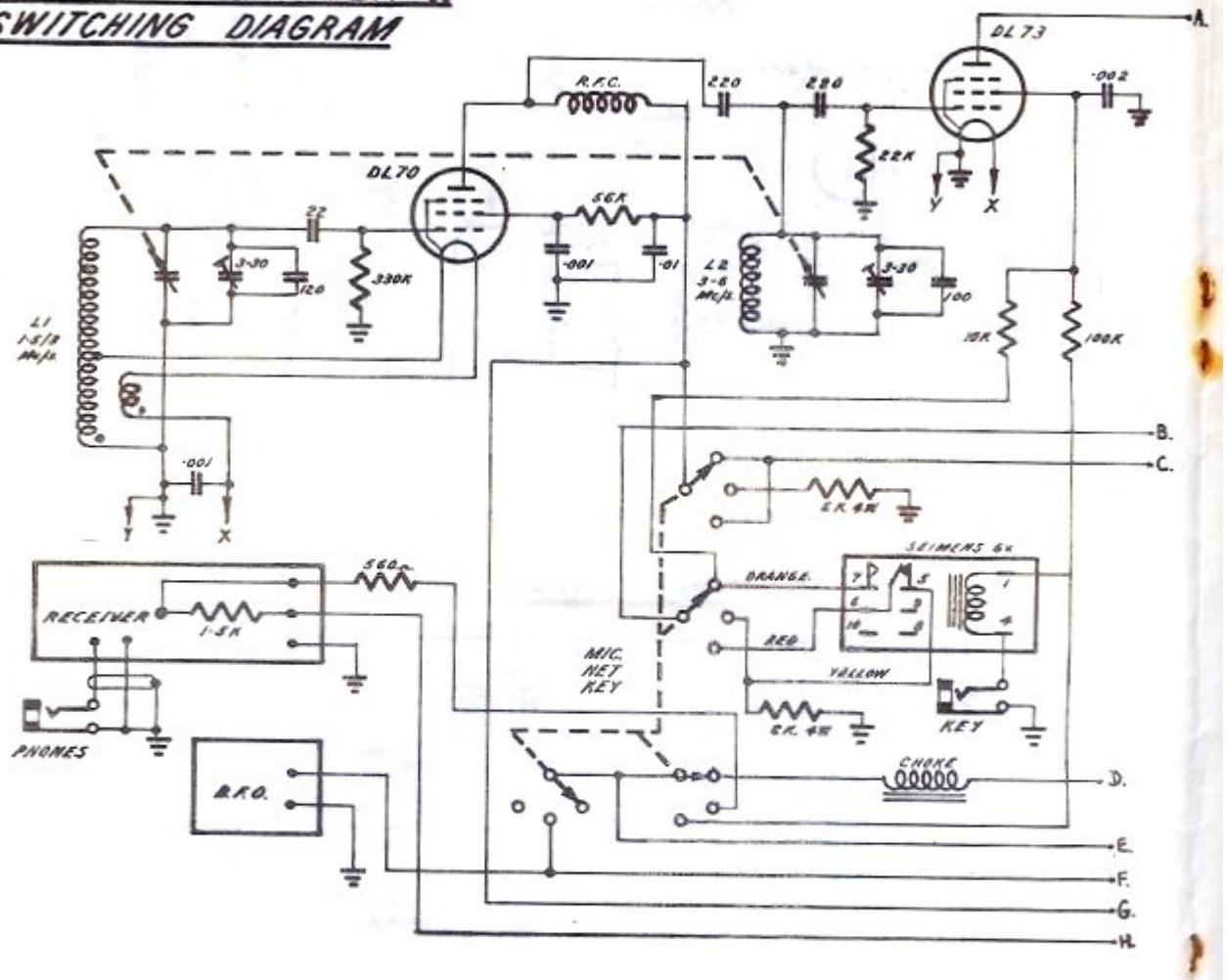
MODULATOR



* SELECTED DURING MANUFACTURE

POWER SUPPLY

A.R.E.C. TRANSMITTER & SWITCHING DIAGRAM



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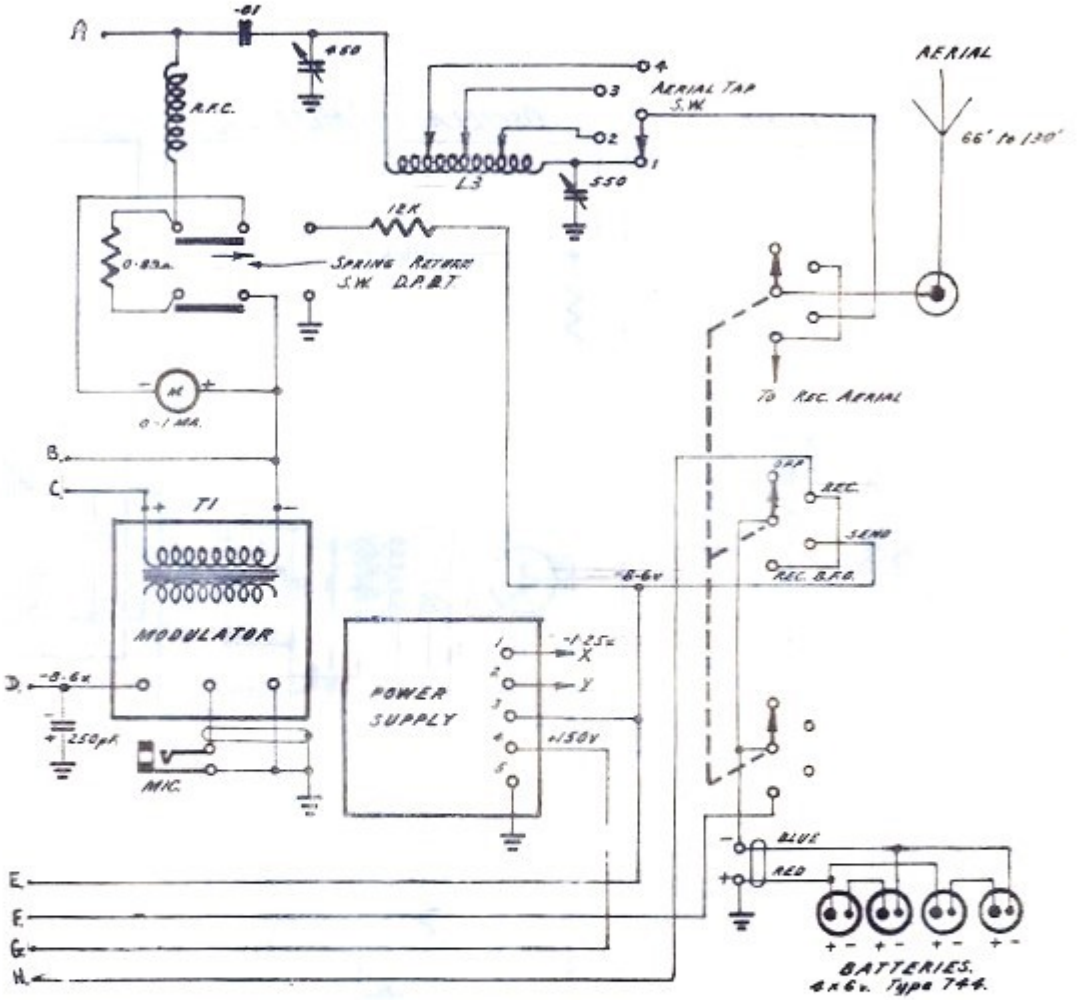
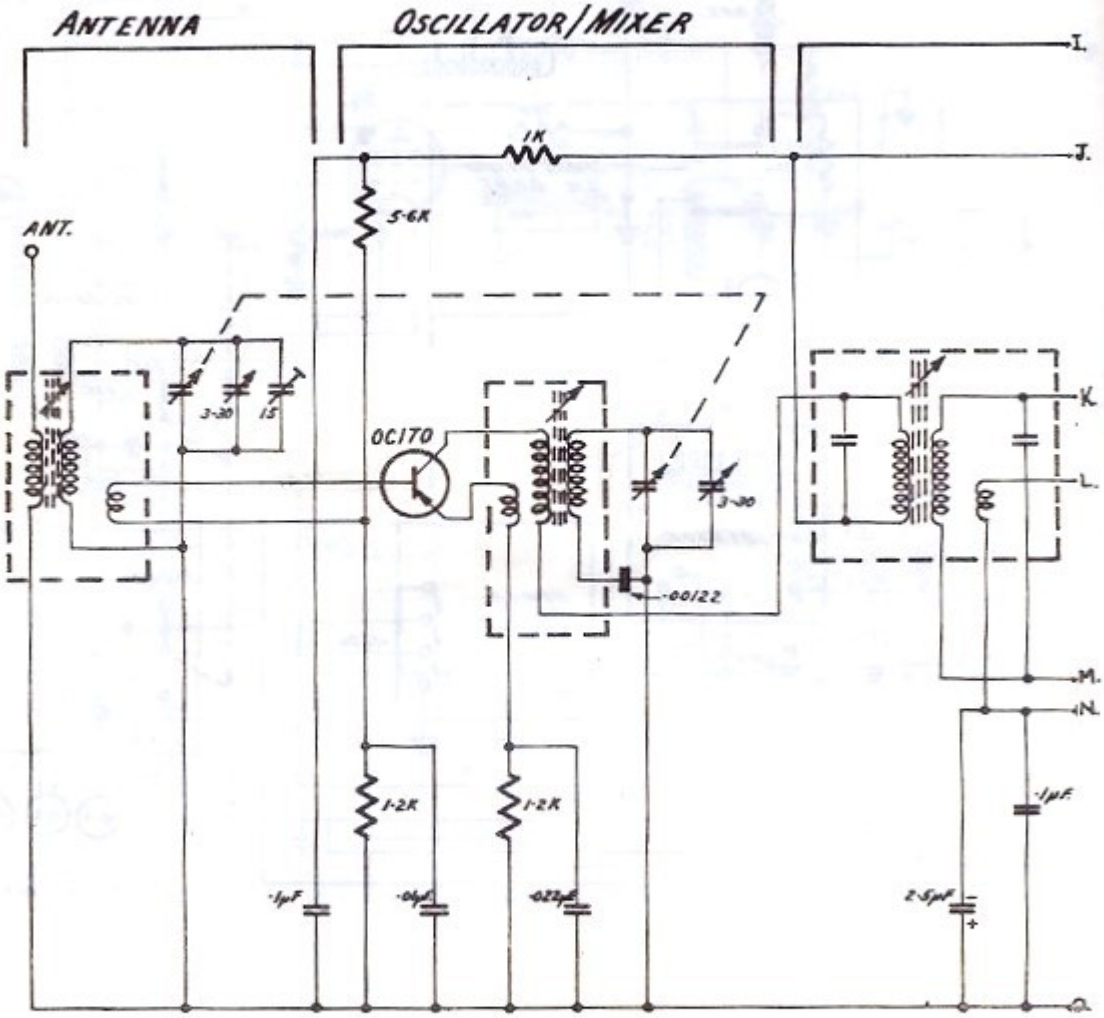
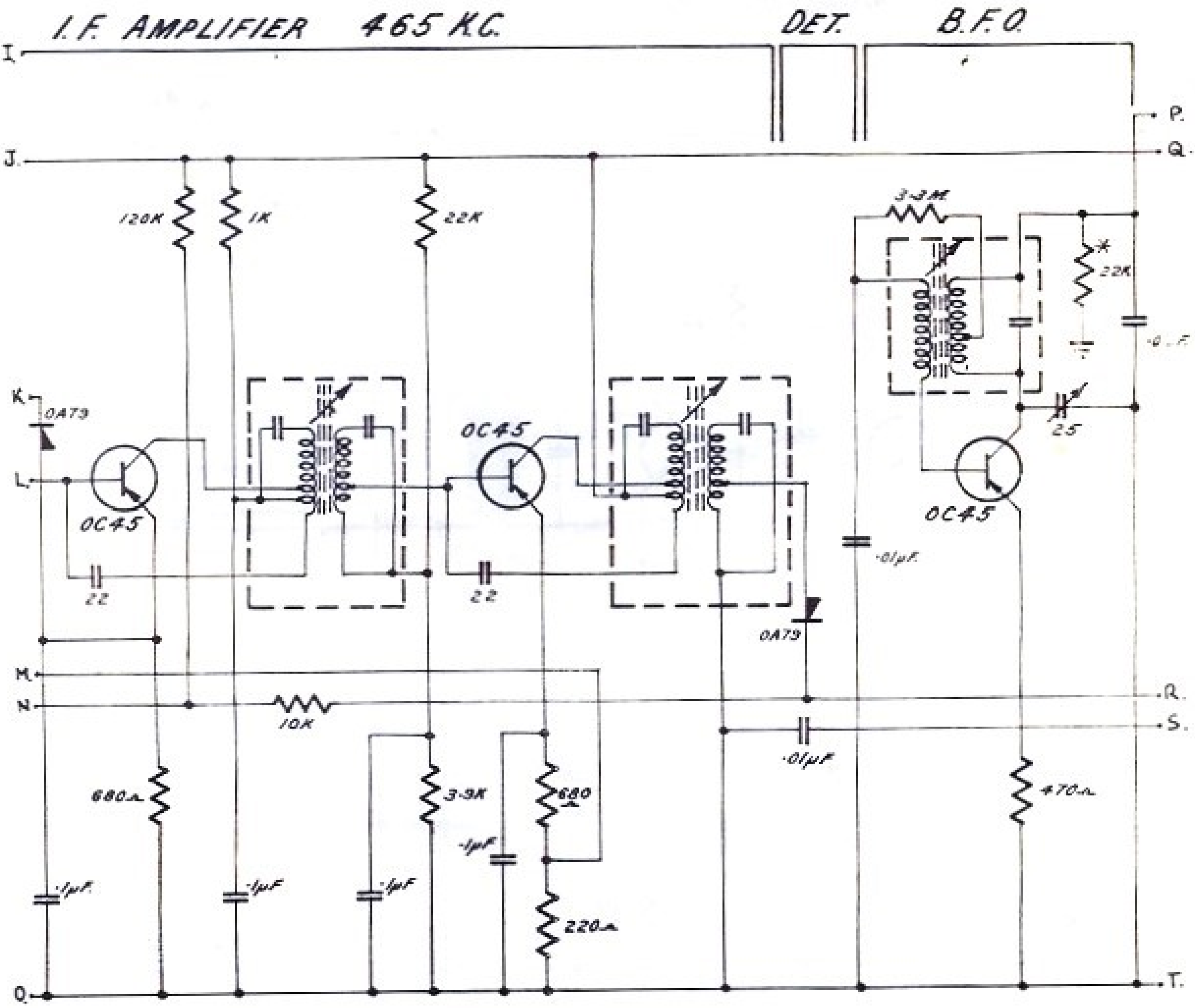
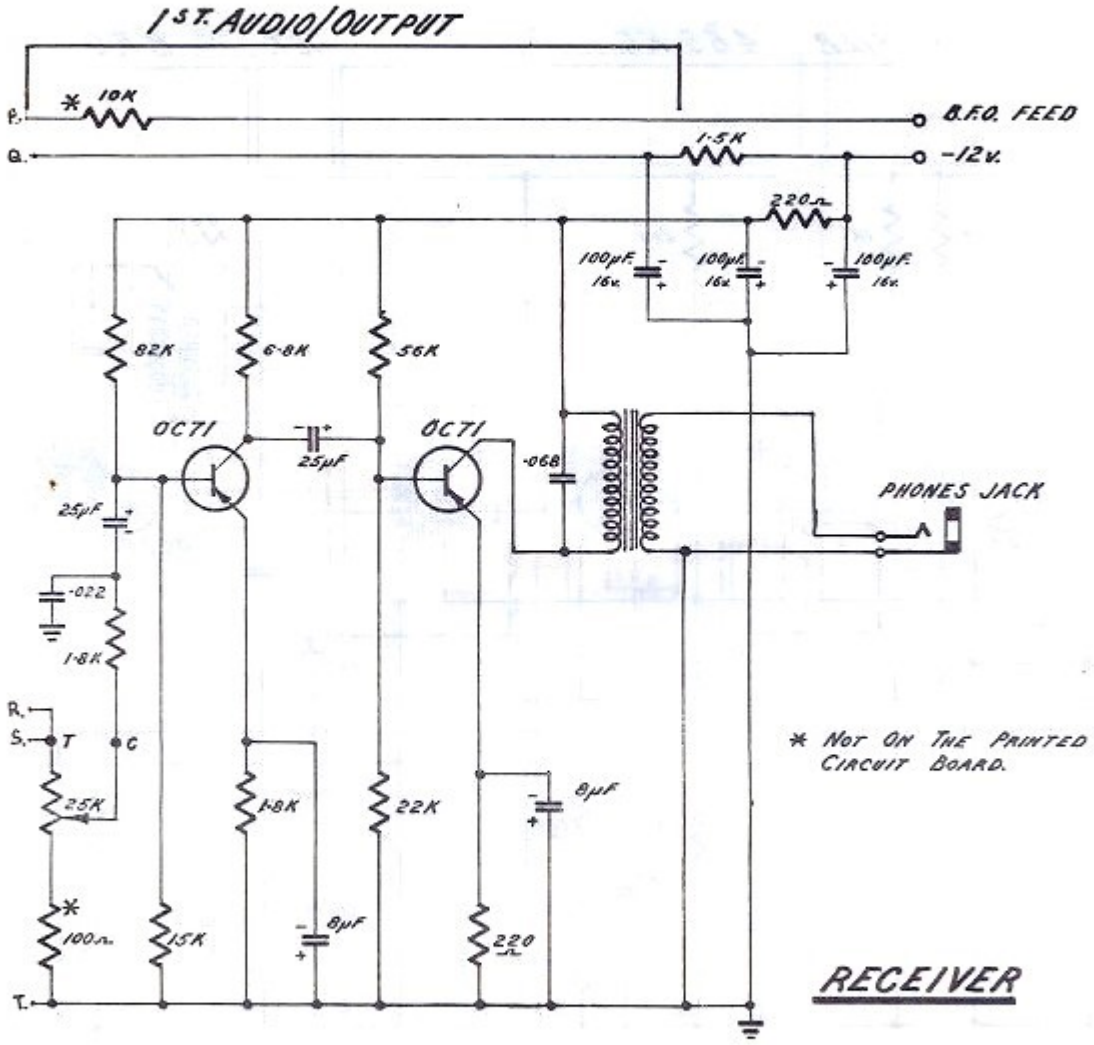

A
-01
.460
R.F.C.
L3
550
4
3
2
1
AERIAL TAP S.W.
AERIAL
66' To 130'
12K
0·83m.
SPRING RETURN S.W. D.P.D.T.
To REC. AERIAL
0-1 MA.
B
C
T1
MODULATOR
REC.
SEND
REC. B.F.O.
8·6v
D
-8·6v
250μA
MIC.
POWER SUPPLY
1
2
3
4
5
-1·25v
X
Y
+150V
BLUE
RED
E
F
G
H
BATTERIES.
4×6v. Type 744.


ANTENNA
OSCILLATOR/MIXER
ANT.
1K
5·6K
I.
J.
K.
L.
M.
N.
O.
3-30
15
OC170
3-30
·00122
1·2K
1·2K
·1μF
·04μF
·022μF
·1μF
2·5μF

9


I.F. AMPLIFIER 465 K.C.
DET.
B.F.O.
I.
J.
K.
L.
M.
N.
O.
P.
Q.
R.
S.
T.
120K
1K
22K
3·3M
22K
OA73
OC45
OC45
OC45
22
22
25
·01µF.
·01µF
10K
680Ω
3·3K
680
220Ω
470Ω
·1µF.
·1µF
·1µF
·1µF


1ST. AUDIO/OUTPUT
P.
Q.
* 10K
B.F.O. FEED
-12v.
1·5K
220Ω
100μF. 16v.
100μF. 16v.
100μF. 16v.
82K
6·8K
56K
OC71
OC71
25μF
·068
PHONES JACK
25μF
·022
1·8K
R.
S.
T
C
25K
1·8K
22K
8μF
* 100Ω.
15K
8μF
220Ω.
T.
* NOT ON THE PRINTED CIRCUIT BOARD.
RECEIVER

MODIFICATION TO A.R.E.C. Mk I

This instruction outlines the modification to be made to the A.R.E.C. Mk I trans/rec. to improve receiver front-end rejection of images and spurious responses.

Tools
Screwdriver
Side-cutters
Long-nose pliers
Adjustable spanner
Small soldering iron and solder
Signal generator

Time — The time taken to complete this modification will vary from 1 to 3 hours.

Procedure

1. Disconnect battery and accessories.
2. Unscrew the 4 panel screws and remove set from case.
3. Remove "REC VOL" and "REC ANT" knobs as follows:- Prise off the metal end caps, looosen the screw exposed several turns, and pull the knob off.
4. Unscrew 2 countersunk and 2 round head screws which hold the receiver front-end side shield. Remove the shield, then replace the two round head screws. Cut the piece off the shield in accordance with Figure 5 of the attached diagram.
5. Disconnect the wires to the "REC ANT" condenser and remove it from the set.
6. Disconnect the wires from the 3-30 Phillips trimmer, unscrew it, and remount in the same hole, but from the other side of the receiver sub-panel. Connect it back in circuit as before.
7. Remove the nut holding "REC VOL" potentiometer.
8. Mount the "Polar" C804-100 pf. variable condenser in the "REC ANT" mounting hole. To do this, run the nut supplied with it down to the end of the thread and use the nut removed from "REC VOL" to hold it on the front of the panel.

   NOTE: The potentiometer nut has a slightly different thread, and it may be found easier to tighten the nut supplied with the condenser from the back.

9. Push the "REC VOL" back through its mounting hole and remove the back nut. Slip the coil bracket complete with coil on to the bush of the potentiometer and remount in position on the panel with a single nut.

   NOTE: It is not necessary to disconnect the potentiometer while doing this, but it is essential that the wiring be checked to ensure it is intact after remounting.

10. Replace both knobs. With the "REC ANT" plates fully meshed, the pointer should be horizontal pointing towards the meter.
11. Remove the aerial connecting wire from the Send/Rec. switch to the

receiver. Wire L1A, the 2-7 and 15 pf., and the Polar C804-100 pf. as shown in the modified diagram Figure 2. The receiver front-end sub-panel is easily flexed with the side shield removed, and this wiring should be done with care. Replacing the two round head screws, which normally secure the shield, while making this modification will assist in strengthening the panel.

12. Check the wiring and inspect the set for blobs of solder, loose wire, etc.

13. Replace the receiver side shield.

Alignment

Connect the battery and headphones. With the signal generator connected, tune it and the receiver to 6 MC. Set the "REC ANT" to minimum capacity and adjust the Phillips trimmer for maximum output. With the receiver and generator at 3 MC and "REC ANT" at maximum capacity, adjust the slug of L1A and the slug of the original coil for maximum output. At 6 MC check that "REC ANT" peaks at about minimum capacity and readjust the Phillips trimmer. It may be necessary to make further adjustments to the Phillips trimmer and the slug of the original coil before tracking is achieved. In a few cases, it may be found that the Phillips trimmer has insufficient capacity for complete tracking and a 15 p.f. fixed condenser may be added in parallel with it in these cases. Check that the receiver still functions after it is restored to its case. The slugs and condenser should be sealed following the final adjustment.

At the H.F. end, trouble may be experienced with oscillator pulling when making these adjustments. A signal generator with bad F.M. or excessive modulation to give a broad signal will be found advantageous.

A.R.E.C. MK.1 MODIFICATION No1

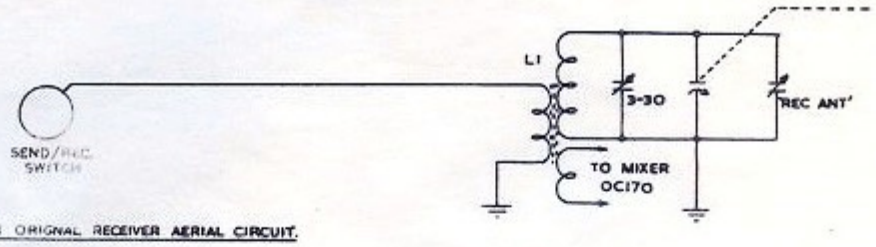


FIG.1 ORIGNAL RECEIVER AERIAL CIRCUIT.

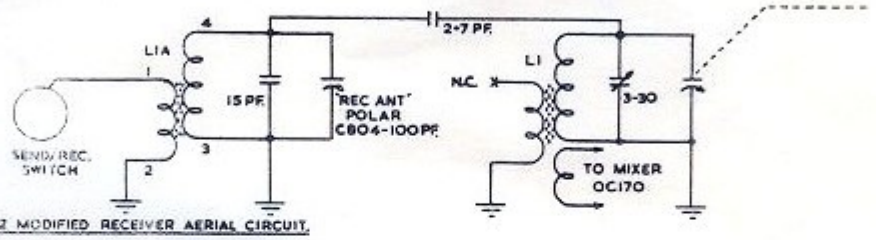


FIG.2 MODIFIED RECEIVER AERIAL CIRCUIT.

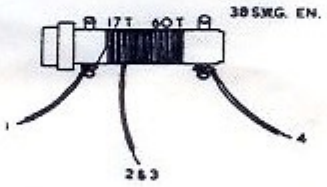


FIG.3 COIL DETAIL L1A

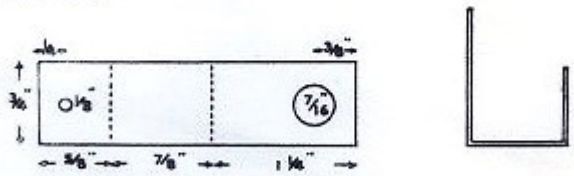


FIG.4 COIL MOUNTING BRACKET

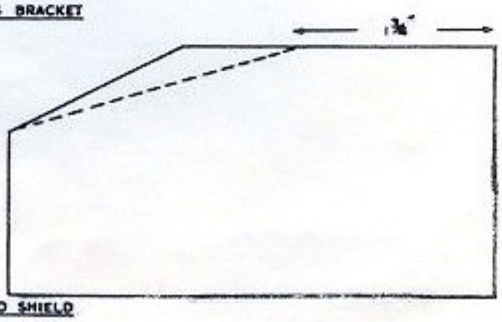


FIG.5 MODIFICATION TO SHIELD

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