

HANDBOOK OF:-

COMMUNICATIONS RECEIVER

R. A. A. F. TYPE AR7

MAKERS TYPE NO. K/CR/11

IDENTIFICATION NO. Y10D/55219

AND

POWER SUPPLY UNIT

FOR

RECEIVER TYPE A.R.7

KINGSLEY RADIO PTY. LTD.  
330 ST. KILDA ROAD,  
MELBOURNE. S.C.1.

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Section A.

1. MECHANICAL CONSTRUCTION - RECEIVER.

The Receiver is constructed of No. 18 gauge sheet metal. The frame is a spot-welded fabrication heavily reinforced with angle pieces and gusset plates to ensure durability and complete rigidity.

On completion of fabrication the frame is given a heavy coat of copper plating of not less than one thousandth of an inch. This plating is to provide a path for complete grounding throughout the chassis.

As a safeguard against corrosion the whole is then Cadmium plated. Moisture will have no effect on this final coating. The electrical contacts on the Coil Acceptor Unit are constructed of phosphor bronze, heavily silver plated. These contacts are self cleaning.

2. POWER SUPPLY UNIT.

The frame of this Unit is fabricated and plated in the same manner as that of the receiver. Both Units are fitted with Dust Covers thoroughly ventilated and finished with Grey Crackle Lacquer.

Section B.

1. DESIGN.

The basis of design of this Receiver is to provide stable operation at all frequencies between 138 K.C. and 25 M.C. with an R/F input of 1 microvolt absolute or better. The Receiver is designed to operate from standard 230V. A.C. mains supply, or in an emergency from a 12V. Accumulator. The Power Unit Selection Switch provides instant selection of either of the above supplies on its front panel.

2. ELECTRICAL CHARACTERISTICS.

The following measurements are an average as measured on test:-

- (a) Frequency Coverage - 138 K.C. to 25 M.C. in 5 bands with a gap of 45 K.C. on either side of the I/F channel, which is 455 K.C.
- (b) Sensitivity - The absolute sensitivity is such that an input voltage of 1 microvolt modulated to a depth of 30% at 400CPS. applied through a standard dummy antenna to the receiver aerial terminals, gives 6 milliwatts in a 600 ohm non-inductive load with a signal-to-noise ratio of 1 : 1 in watts.
- (c) Selectivity - by a variation of input voltage against constant output:-

6 K.C.	off resonance	20 db down
10 K.C.	" "	40 db "
15 K.C.	" "	60 db "

With Crystal Filter in a selectivity of 100 CPS may be

- (d) Automatic Volume Control - The output remains constant to within  $\pm 3$ db for variations of input voltage between 10 microvolts and 1 volt.
- (e) Stability - Every precaution has been taken in the design to achieve stability of operation. Regulation of the power supply when working on the standard A.C. supply is such as to take care of variations of line fluctuations of  $\pm 10\%$ .
- (f) Power Output - the Receiver delivers the following power output :-
- |                                  |            |
|----------------------------------|------------|
| To Headphone Circuit             | 100M/Watts |
| To 600 ohm output                | 100M/Watts |
| To Speaker of 1750 ohm impedance | 1.8 Watts. |
- This measurement is made with 100% modulation at 400 CPS.
- (g) Radio Frequency Amplifier - two stages of R/F. amplification are employed in this Receiver.

The signal to image ratio thus provided is as follows:-

Band.

- A. > 2000 to 1  
B. > 2000 to 1  
C. > 2000 to 1  
D. > 2000 to 1  
E. At 22 MC. 500 to 1, at 12MC. 2000 to 1.

Section C.1.

1. Controls. The front panel on to which the Controls are terminated is clearly marked. In order that the Controls may be identified from this description reading from left to right read in three rows as follows :-

Top Row.

Signal Meter, Tone Control, Tuning, Noise Limiter.

Middle Row.

BFO. Note Control, AVC/BFO Switch, Meter Adjust, Variable Selectivity, Crystal IN/OUT Switch, Crystal Phasing Control.

Bottom Row.

Manual R/F. Gain Control, Coil Box Acceptor, Audio Gain.

Left Hand Bottom. Phone Jack 1.

Right Hand Bottom. Phone Jack.2.

Functions of Controls.

Signal Meter. An indicator of carrier strength of the received signal.

Tone Control. Arranged to reduce high frequency response to

minimise static or other interference.

Tuning Control. Controls 4 gang Condenser, effects band spread on all bands - equals pointer travel on a scale approximately 12 feet long.

Noise Limiter. This control is arranged to limit the noise peaks so that in no case can they exceed the signal level particularly useful to adjust the signal - noise ratio when receiving C.W.

B.F.O. Note Control. Arranged to shift the note of the beat frequency oscillator  $\pm$  2000CPS. either side of zero beat.

AVC/BFO Switch. Used in AVC. position for reception of telephone signals - when turned to BFO. brings BFO. and eliminates AVC. for reception of C.W. signals. in

Meter Adjust. Used to adjust signal meter to zero under no signal conditions.

Variable Selectivity Control. This control is used only in conjunction with the crystal filter. With the filter inactive the control has no effect. When the control is on 0 the receiver is in the broad position, 10 provides maximum selectivity.

Crystal IN/OUT Switch. With this switch on the IN position the crystal filter functions. Fine adjustments are then made on "Selectivity".

Phasing. The Crystal Phasing Condenser should be in the Zero position for normal operation and should not be used unless an interfering signal appears. The method of operation for rejection of an interfering signal is to adjust the Phasing Condenser right or left of Zero until the interfering signal is eliminated or reduced. The tuning dial should be adjusted to exactly the desired signals frequency.

Manual R/F. Gain Control. This controls the sensitivity of the Receiver irrespective of the A.V.C.

Coil Box Acceptor. In the space provided the operator inserts the coil box unit required. Each unit is marked with its band letter:-

Band	Tuning Range.
A.	138K.C. to 409K.C.
B.	495K.C. to 1430K.C.
C.	1420K.C. to 4.32 M.C.
D.	4.25M.C. to 12.6M.C.
E.	12.5 M.C. to 25 M.C.

The curve engraved on each coil box front is Frequency versus, Dial degrees.

Audio Gain - Stand By Control. A combined Stand By Switch and Audio Gain control - when turned to "Stand By" H.T. is switched off but the valve heaters remain on. When the Pointer is advanced to "on" the Receiver is active and further advance of the pointer towards 10 increases audio gain.

Phone Jacks 1 and 2. When telephones are plugged into Phones 1. the speaker is automatically silenced - Phones 2. is a jack provided for a second pair of operators telephones, but no audio power is available in Phones 2 unless a headset is plugged into phones 1.

Section C.2.

ALIGNING PROCEDURE.

I.F. Amplifier. Extreme accuracy is required in the alignment of the I/F. circuits. Unless there is very good reason to suspect incorrect alignment and the operator has all the necessary facilities for this work it should not be attempted.

Slight misalignment of these transformers will have a marked effect on the sensitivity and selectivity of the Receiver, and as they are of the extremely stable type using permeability tuning and silver plated mica fixed condensers, it will be found that one or two turns in or out of the iron core slug is all that is necessary to bring them to their original adjustments.

Procedure. The following instructions should be read through carefully and fully understood before starting adjustments:-

Disconnect aerial leads and power and speaker cables. Take dust cover off and remove Receiver from rack. Stand on side with underneath facing right and away from rack. Reconnect power and speaker cables, but not the aerial leads. Connect an output meter adjusted for 600 ohms across the 600 ohm output terminals. (See circuit). An ordinary 0-5 volt copper oxide rectifier type A.C. meter with a 600 ohm, 1 watt carbon resistance across it is quite suitable for this purpose.

Remove the grid lead from the top cap of the 6K8G valve. Connect the output of a calibrated signal generator to the grid cap of the 6K8G, preferably through a condenser of approximately .005mfd. capacity and return the grid to earth through a 100,000 ohms, 1 watt carbon resistor.

Connect the grounded side of the signal generator output to chassis Set "S" meter to zero no signal.

Set controls as under:-

Crystal switch in the OUT position. Selectivity control on 0. Phasing condenser to centre scale. BFO-AVC Switch to A.V.C. Tone control on 10. Noise limiter on 10. Audio Gain control on approximately 3.

Adjust signal generator to exactly 455 kilocycles, modulated 30% at 400 cycles, and turn attenuator until a reading of approximately 6 milliwatts or 1.9 volts appears on the 0 - 5V. output meter.

Adjust the iron core slug screws which appear through top and bottom of the I/F transformers. Those appearing above chassis are the grid circuits and underneath chassis, plate circuit, except in the case of T.2. crystal filter grid circuit, which appears also underneath chassis, and is the nearest screw to the chassis side (farthest away from 6K8G valve). This should not be touched until later.

Adjustments. 1. Using a lining up tool e.g. screwdriver of insulating material or at least only a small portion of the tip metal, start from T.1. (See Photostat) turn iron slug screws in or out, until a maximum reading on the output meter appears with the minimum input from the generator.

2. Switch in crystal, set selectivity control on 10 and phasing control to centre scale:-

Adjust attenuator until a reading of approximately half scale appears on the "S" meter, at the same time keeping the audio gain a position where approximately 6 milliwatts appears on the output meter.

3. Rotate generator slowly over 455 kilocycles, noting the peak on "S" meter. If one sharp peak only is observed the I/F alignment is correct; should however, two peaks appear, this will show incorrect calibration or inaccurate setting of generator, and it should be set again on the centre of the peak which appears the sharper. This being 455 kilocycles - the crystal frequency.

Again readjust the iron slugs, excepting grid circuit in T.2. and T.4. for maximum peak on "S" meter with minimum input from generator. Adjust T.4. grid circuit for maximum peak on output meter. After carefully checking these circuits several times, only one sharp peak should appear on the "S" meter and the sensitivity of these circuits should be in the order of 10 microvolts. That is to say, with a microvolt input and 6 milliwatts output, on switching the generator modulation off, the output should drop to 3 milliwatts due to noise with the crystal in the "OUT" position.

REMEMBER THE I.F. CIRCUITS MUST BE EXACTLY THE CRYSTAL FREQUENCY.

With the crystal IN, the signal to noise ratio should be improved and again further improved as the selectivity is increased after aligning T.2. crystal filter grid circuit, which is done as follows

Unit  
Insert Coil, "B" and tune in a broadcast station. Switch crystal and set selectivity control on 0. Adjust T.2. for the best tonal qualities of music, taking no notice of loudness. When the dial rotated slowly over the station the effect noticed should be the same as with the crystal out, except for an additional sharpness. On either side of the correct position of the iron slug, the tone

a distinct hollowness, due to the crystal filter cutting the side band, will appear on either side of the station. This adjustment is to obtain a symmetrical and variable crystal selectivity curve and should be done with a frequency modulated signal generator and cathode ray oscillograph, although the above instructions are satisfactory for normal service use:

**B.F.O. Adjustment.** The Beat Frequency Oscillator should be set at exactly 455 K.C. when the note control is at centre scale.

A simple method to check the setting is to switch off the signal generator and switch in the crystal filter with selectivity control at 10. Rotating the B.F.O. note control a distinct sound will be heard as the oscillator passes over the crystal frequency to an apparent zero beat. This should appear when the B.F.O. Note is at centre scale. Should this setting be out, it may be corrected by adjusting the iron core slug through the hole in the B.F.O. shield under chassis (See Fig.A.).

Having perfectly aligned the I/F circuits, remove generator connections and replace 6K8G lead on the top cap of the valve, and remove 100,000 ohm 1 watt carbon resistor.

**R/F and H/F Oscillator Circuits.** As with the I/F Amplifier extreme accuracy is required for the R/F and H/F Oscillator circuit alignment. As the components employed in these circuits are of extremely stable type, having been thoroughly baked and treated with trolitol solution, using air trimming condensers, high quality insulating materials etc. only a fraction of a turn of the trimming condensers and small adjustment of the coil inductance is all that is necessary to restore the circuits to original efficiency. These adjustments should be made only if the operator is certain it is necessary through valve replacements, rough handling or extreme temperature changes, and he has the facilities and experience to do so.

**Adjustments.** The adjustments are made through the holes in the coil acceptor housing and are marked Lk to 4, C1 to 8 as shown in Fig.A.

- |      |  |
|------|--|
| L.1. | Inductance adjustment on aerial coil.  |
| L.2. | Inductance adjustment on first R/F coil.   |
| L.3. | Inductance adjustment on second R/F coil.  |
| L.4. | Inductance adjustment on H/F Oscillator coil.  |
| C.1. | Trimmer condenser on aerial coil.  |
| C.2. | Series trimmer Coil E.   |
| C.3. | Trimmer condenser on second R/F. Coil.   |
| C.4. | Series trimmer Coil E.   |
| C.5. | Trimmer condenser on second R.F. coil.   |
| C.6. | Series trimmer Coil E.   |
| C.7. | Trimmer condenser on H/F Oscillator coil.  |
| C.8. | Padder series condenser on H/F Oscillator coil.<br>Bands A,B,C, series trimmer Coil E. |



Procedure. Remove receiver from rack and connect output meter as described in I/F procedure. Connect the output of standard signal generator, through the standard dummy antenna supplied with the signal generator, to the antenna terminal A.1, the earth terminal of the dummy antenna being connected to terminal A.2. of the receiver. Bridge antenna terminal A.2. and earth terminal together, and ground earth terminal. Plug in coils in turn. Check the calibration of coils, preferably using an unmodulated test signal of approximately 10 microvolts, and the B.F.O. on, with B.F.O. note control set at centre scale i.e. exactly on 455 kilocycles. Observe that zero beat occurs on the correct dial setting. Should this be so the calibration is correct and there will be no need for adjustments to the H/F. oscillator circuit. If not, a small adjustment of C.7. will correct at high frequency end, or adjustment of L.4 at low frequency end, except in Band E, where there is no inductance adjustment, but a series trimmer. Here C.8. is adjusted as L.4. To check R.F. grid circuits switch off B.F.O. on receiver, and using 400 cycle modulated signal from the signal generator tune in signal at approximately 15 degrees on the dial. Adjust trimmer condensers C.1, C.3, C.5 for maximum peak on "S" meter with minimum input from generator. As there is a certain amount of interlocking between the R/F circuits and H/F oscillator circuit at the highest frequencies, it will be necessary to rotate the tuning dial to and fro over the signal to obtain the correct setting (greatest peak), rechecking the oscillator calibration several times.

After checking at the highest frequency of each band adjust inductances L.1, L.2 and L.3 on band A, B, C and D, and C.2, C.4 and C.6 of Band E for maximum peak at lowest frequencies.

After rechecking each and several times, and the operator is satisfied the adjustments are correct, the receiver should have a sensitivity of approximately 1 microvolt when modulated 30% with a signal to noise ratio of 1 - 1 in watts or better, and a signal to image ratio of not less than 400 to 1 at highest frequencies.

Band A. If Band A will not follow calibration C.8 series padder may be adjusted, resetting C.7 and L.4. As these two settings mutually affect each other, they may have to be rechecked several times.

Some difficulty may be experienced on this band with oscillation, if far out of alignment. This is because the R/F circuits are resonating at too high a frequency or near the intermediate frequency, causing instability and difficulty to align. If the oscillator section is corrected as above, and grid circuits adjusted individually by connecting the generator to grid cap of the second and first R/F valve, taking care not to set at a higher frequency than 409 K.C., the difficulty may be overcome.

MAINTENANCE

In designing the K/CR/11 a very wide margin of safety in components has been maintained and years of satisfactory service should be received without having to tamper with the receiver. Should troubles occur these may be classified as under : -

Valves. Check by replacement or on the standard type V.C.T. valve tester.

Condensers. May be located by point to point continuity test.

Resistors. May be located by point to point continuity and voltage test.

Other components and intermittent defects. These may be found by localising the trouble to some particular circuit and making test or by a process of elimination.

Hereunder is a list of D.C. voltages which should appear at socket points. These are read with a 1000 ohm per volt meter using the scale indicated in brackets under voltages (The multimeter associated with the standard type V.C.T. valve tester should normally be used).

With controls set as under:-

R/F gain control on 10.

Noise Limiter on 10.

BFO/AVC Switch on AVC.

Aerial removed and 6K8G grid shorted to earth so that no noise or signal will work A.V.C. read as follows:-

Socket Pin num- bor to Ground	6U7G 1st R/F.	6U7G 2nd R/F.	6K8G Osc 1 Det.	6U7G 1st I/F.	6U7G 2nd I/F.	6G8G 2nd. 1st.	6V6 Det.Out- Aud.put	6G8G S.Met. BFO.	6X5G Rect.	6X5G Rect.
3	200	200	205	200	200	32	215	240	-	-
	(Set Meter to 0-1000 volts D.C. Scale) for 6G8G Reading									350V A.C.
4	95	80	100	95	80	-	240	-	-	-
6	-	-	120	-	-	18	-	Scale	-	-
	(Set meter to 0-1000 volts D.C. for 6G8G reading)									
8	2.5	2	3	2.5	2	.8 (10)	13	-	-	-
										275 D.C.

Section D.

OPERATION.

In order to bring the Receiver to an operating condition, observe the following procedure:-

- (a) Insert the appropriate Coil unit.

- (b) See that the Stand By Switch is in the OFF position.
- (c) See that the switch on the power supply unit is in the OFF position.
- (d) Connect A.C. supply to the power supply unit and a 12 volt accumulator to the battery cable.
- (e) Connect an aerial and earth to the terminals marked A1 and E respectively and bridge the terminals marked A2 and E. - or if using a doublet aerial connect the two aerial leads to the terminals marked A1 and A2 and earth E.
- (f) Switch power supply to either of the ON positions, i.e. 230 volt A.C. or 12 volt D.C.
- (g) Wait  $\frac{1}{2}$  minute and then turn stand by switch to ON position with noise limiter control set on about 8.
- (h) In conjunction with the tuning curve on the face of the coil unit and the AVC/BFO switch in the AVC position - tune for phone with Crystal out - or for C.W. signals with Crystal in and variable selectivity control on 0. The B.F.O. switch should be on BFO position and the B.F.O. note control central.
- (i) Having found the desired signal the variable selectivity control may be advanced to the desired selectivity.

NOTE. With the Crystal in and the variable selectivity control on 0 the full sensitivity of the receiver is preserved, i.e. no loss of signal should occur.

When it is desired to change back to phone reception simply turn BFO/AVC switch to A.V.C. position and carry on. Noise limiter control should be adjusted for the best signal to noise ratio in a bad location, but always initially tune in the station with noise limiter control on 8 to 10.

### Section E.1.

#### POWER SUPPLY.

There is only one control on the power supply unit. This is a 3 position switch, the positions being centre off - L/H. 12 V. D.C. - R/H. 230V. A.C. The turning of this control changes the supply instantly.

Section E.2.

VALVES.

Each Receiver is despatched with two complete sets of valves - one in the Receiver and power unit and a spare set included in the case. Each spare valve has stamped inside the flap of its carton the Receiver number and its place in the set.

No. 1 valve is the 1st R/F., No. 2. the 2nd R/F., No. 3. the H/F. Oscillator and so on to the output tube.

PROTECTION FUSE.

As a protection against faulty Rectifier tubes or a breaking down condenser an E.S. miniature lamp is included as a fuse. This is located on the under side of the Power Unit Chassis. Should this lamp blow, tests should be made on condensers and tubes before replacing the fuse.

Replace with miniature E.S. lamp of .45 to .6 amp, 2 to 8 volts.

KINGSLEY RADIO PTY LTD.,  
380 St. Kilda Road,  
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S.C.I.

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KEY TO CIRCUIT AND SCHEDULE OF PARTS.

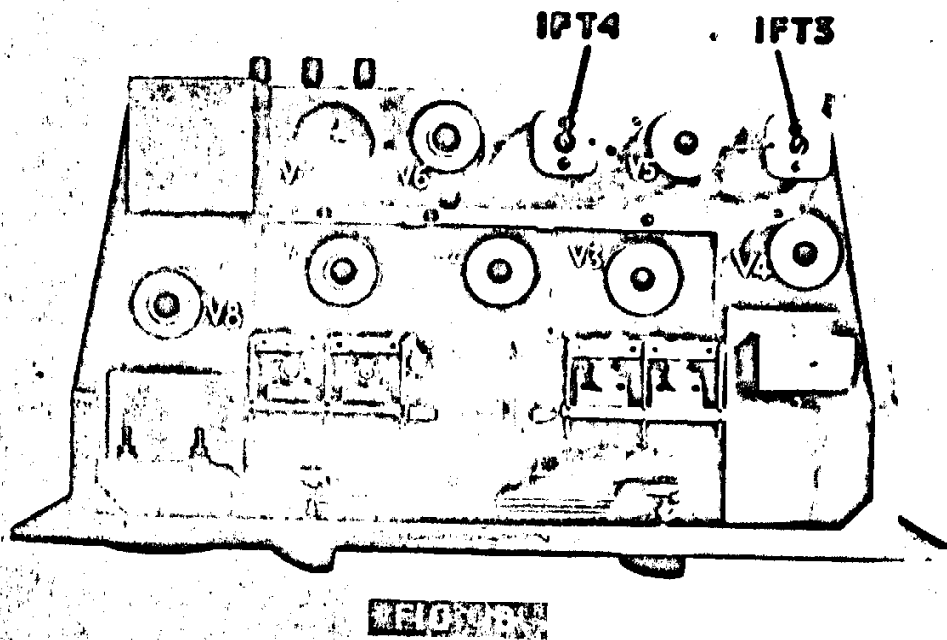
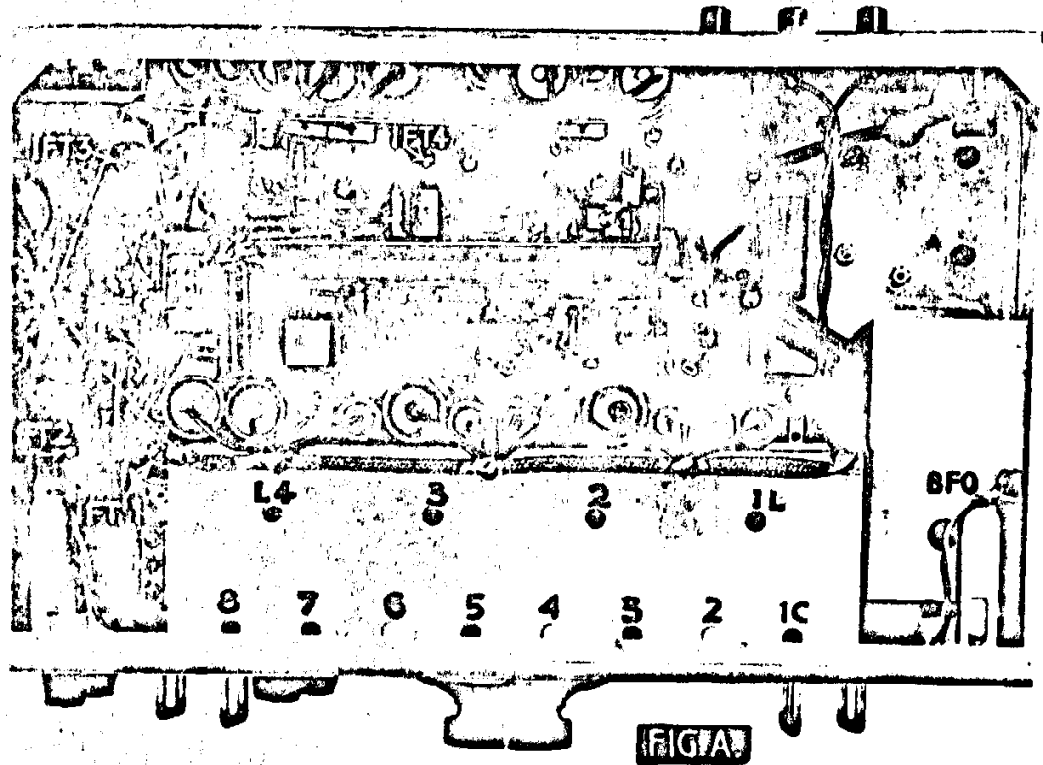
Part No. on Drawing	Value	Description	Part No. on Drawing	Value	Description
C1, C2, C3, C4	Figure 1. 11-420 mfd 4 gang	Kingsley Special Tuning Assembly	C35.	100 mfd	Mica Chanex
C5.	.05 mfd	600 V paper Chanex	C36.	.1 mfd	600 V Paper Chanex
C6.	.1 "	" "	C37.	.01 "	" "
C7.	.1 "	" "	C38.	.1 "	600 V. "
C8.	.5 "	400 V "	C39.	25 "	40 V Electro Aerovox
C9.	.05 "	600 V "	C40.	.005 "	Mica Chanex
C10.	.1 "	" "	C41.	2-15 mmfd	Variable Kingsley
C11.	.1 "	" "	C42.	3-30 "	Trimmer R.C.S.
C12.	.5 "	400 V "	C43.	.5 mfd	400V Paper Chanex
C13.	.1 "	600 V "	C44.		
C14.	100 mmfd	Mica	C45.		
C15.	.05 mfd.	600 V paper	Resistors. Figure 1.		
C16.	.5 "	400 V "	R1.	100,000	watt Carb. Chanex
C17.	.1 "	600 V "	R2.	30,000	" "
C18.	.05 "	" Electro Aerovox	R3.	50,000	" "
C19.	.1 "	" paper Chanex	R4.	5,000	" "
C20.	.1 "	" "	R5.	100,000	" "
C21.	.5 "	" "	R6.	250	" "
C22.	.05 "	400 V "	R7.	40,000	" "
C23.	.1 "	600 V "	R8.	50,000	" "
C24.	.05 "	" "	R9.	5,000	" "
C25.	.05 "	" "	R10.	250	" "
C26.	.1 "	" "	R11.	50,000	" "
C27.	.5 "	400 V "	R12.	12,500	" "
C28.	100 mmfd.	Mica	R13.	10,000	" "
C29.	250 "	" "	R14.	100,000	" "
C30.	25 mfd.	40 V Electro Aerovox	R15.	3,500	"Pot. Kingsley
C31.	100 mmfd.	Mica	R16.	300	" Chanex
C32.	.01 mfd.	" "	R17.	50,000	" "
C33.	.1 "	600 V. paper "	R18.	5,000	" "
C34.			R19.		" W.N. Pot Marquis

KEY TO CIRCUIT AND SCHEDULE OF PARTS.

Part No. on Drawing	Value	Description	Part No. on Drawing	Value	Description.
<u>Resistors</u>			<u>Condensers</u>		
R20.	30,000	Watt Carb. Chanex	C1.	.01 mfd.	Mica Chanex
R21.	50,000	"	C2.	.01	"
R22.	5,000	"	C3.	.01	"
R23.	100,000	"	C4.	.01	"
R24.	300	"	C5.	.01	"
R25.	50,000	"	C6.	.5	400 V Paper Chanex
R26.	40,000	"	C7.	.5	"
R27.	50,000	"	C8.	.1	600 V "
R28.	5,000	"	C9.	.01	Mica "
R29.	250,000	"	C10.	.1	600 V "
R30.	500,000	"	C11.	.1	"
R31.	500,000	"	C12.	.1	"
R32.	5,000	W.W. Pot. Marquis	C13.	.01	E.V. Mica "
R33.	100,000	Carb. Chanex	C14.	.01	E.V. "
R34.	1 meg	Carb.Pot.&switch Stackpole	C15.	8	600 V Electro-Aerovox "
R35.	1,000	Carb. Chanex	C16.	8	"
R36.	500,000	"	C17.	8	"
R37.	500,000	" Pot. Stackpole	C18.	.1	Paper Chanex
R38.	1 meg	Chanex	C19.	.1	"
R39.	250,000	"	C20.	.1	"
R40.	50,000	"	F.	Fuse 2.V. to 8.V.	.45 to .6 amp Min.
R41.	500,000	"			F.S. Lamp.
R42.	300	W.W. Kingsley			
R43.	50,000	Carb.Pot. Stackpole			
R44.	500	Chanex			
R45.	2,000	"			

Fig. 3.  
PA6.

42 ohm 3 watt W.W. Kingsley



# COMMUNICATION RECEIVER TYPE K/CR/II

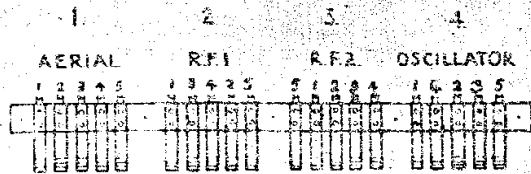
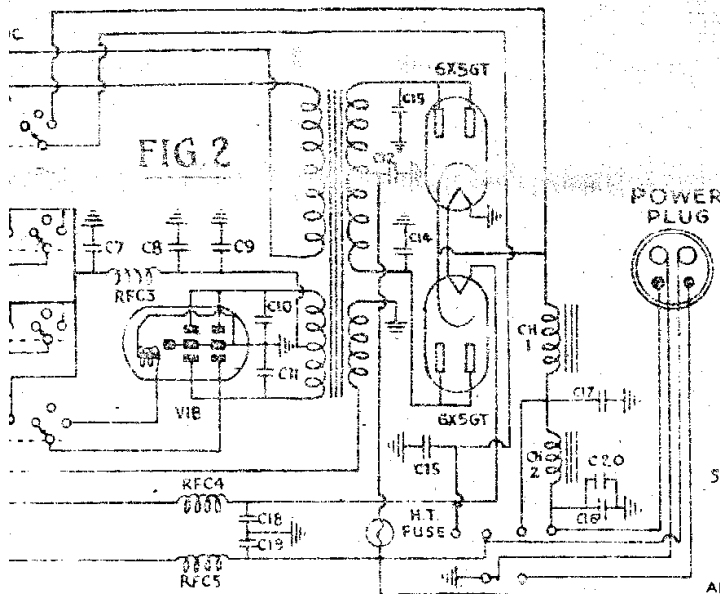


FIG. 4.

BANDS A.B.C.D.

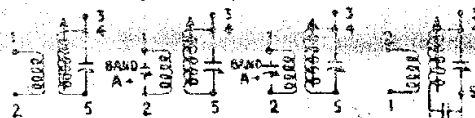


FIG. 5.

BAND E

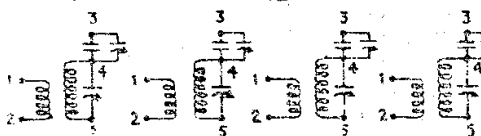


FIG. 6.

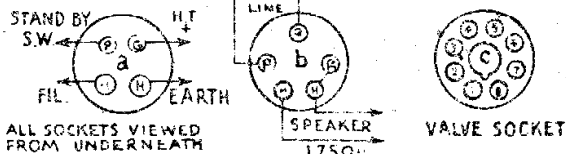
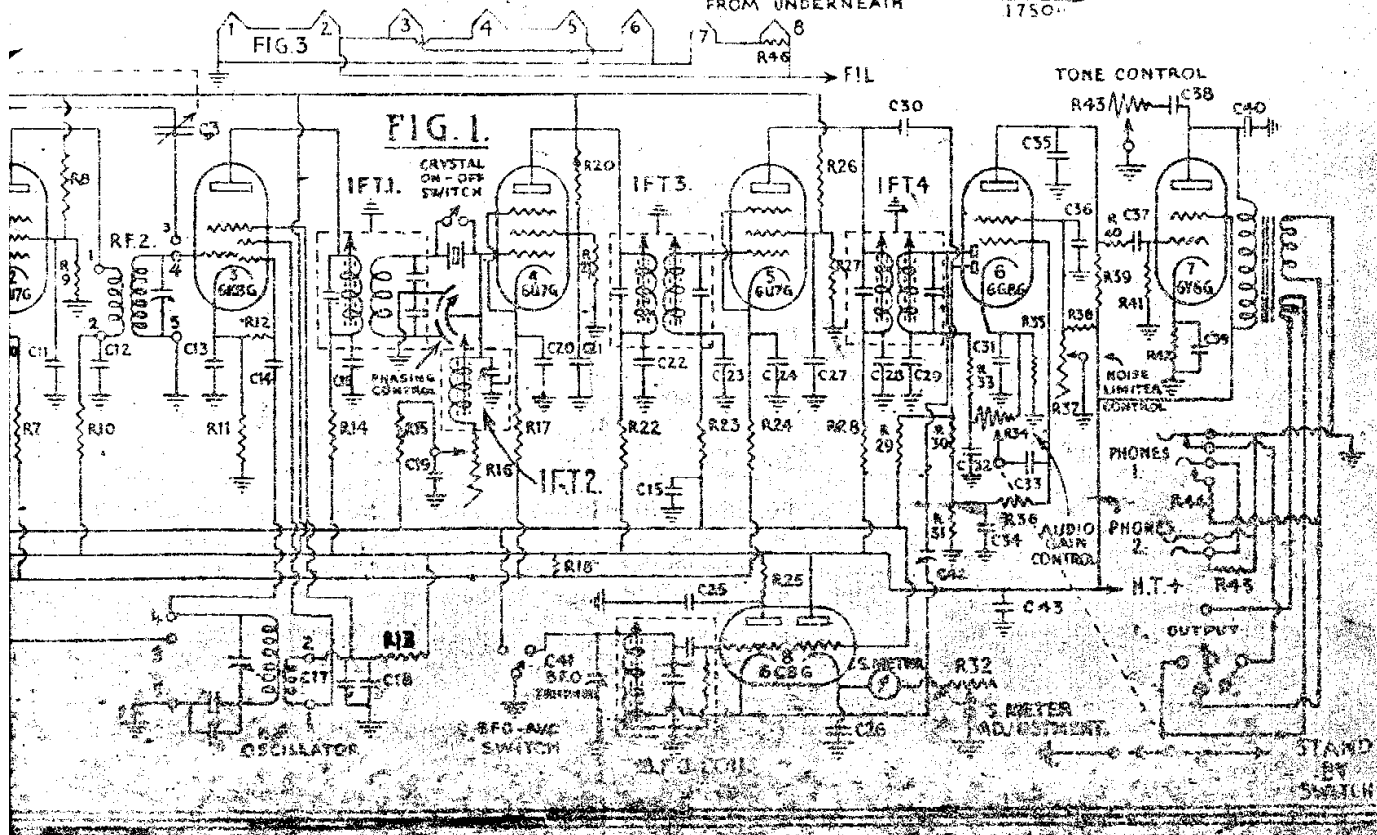


FIG. 7.





# KINGSLEY - COMMUNICATION RECEIVER TYPE K/CR/11

