



EDDYSTONE

COMMUNICATIONS RECEIVER

Model "740"

Instruction Manual

The "740" receiver is a general purpose model for professional and amateur communications purposes. It employs eight miniature valves and is capable of an excellent all-round performance. The tuning mechanism incorporates high reduction ratio gearing, bandspread being provided by an auxiliary scale.

The four tuning ranges are as follows :

Band 1	...	30.6 Mc/s.	to	10.5 Mc/s.
Band 2	...	10.6 Mc/s.	to	3.7 Mc/s.
Band 3	...	3.8 Mc/s.	to	1.4 Mc/s.
Band 4	...	205 metres	to	620 metres.

The first three ranges are calibrated in frequency and the fourth in wavelength, to an accuracy better than 0.5%. The Amateur bands are distinctively marked in blue and the shortwave broadcast bands in red, both on the basis of the International allocations made at the 1947 Atlantic City Conference. It is of interest to note that range 4 covers the 600 metre (500 Kc/s.) shipping and distress band.

INSTALLATION and OPERATION

After careful calibration and alignment (carried out with instruments specially designed for the purpose), the receiver has been thoroughly tested before despatch. The mains input lead is normally connected to the 230 volt primary tap on the transformer and no adjustment is called for providing the mains voltage is not outside the limits of 210 and 250 volts. When the receiver is used on 110 volt supplies, the cable lead should be changed over from the blue tag to the yellow, as indicated in Fig. 3. A 200 volt tap is also available. It is covered with a rubber sleeve and, when used, should be anchored to the tag strip in place of one of the other leads. The power consumption is 45 watts. The receiver must not be connected to DC mains.

Ensure that the octal plug is in place, as shown in Fig. 1. Without it, only the rectifier valve heater will glow. The mains on/off switch is incorporated in the tone control on the extreme left of the front panel.

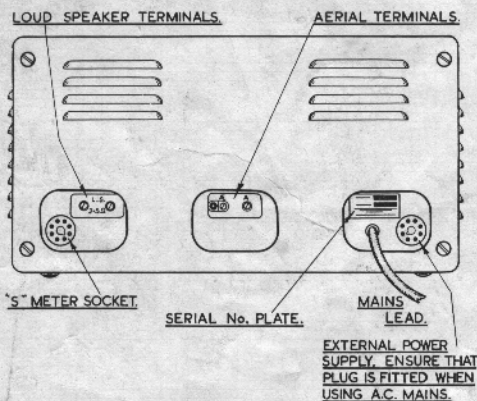
A loudspeaker of 2.5 to 3 ohms impedance should be connected to the terminals at the rear — the Eddystone Cat. No. 688 speaker is recommended for use with the "740" receiver. Alternatively high resistance telephones (2,000 to 4,000 ohms) may be plugged into the jack on the front panel.

AERIAL CONNECTIONS

If a single long wire is used or any aerial with a single wire type of feeder, connection is made to the rear terminal marked "A," the other terminal marked "AE" remaining strapped to the chassis. A good earth connected by a short lead to the second terminal will improve results, particularly on the lower frequencies, but if there is any doubt about the efficiency of the earth, it may be better to leave it off.

For optimum performance, both as regards bringing in weak signals and for keeping noise down to a minimum, an aerial cut to resonate over the frequency band in which the user is mainly interested is strongly recommended. The lengths for dipole aerials to give optimum results at certain frequencies are tabulated below. For details of other types of aerials and feeder systems, the reader is advised to consult the various Handbooks which deal with these specialised subjects.

	Broadcast							Amateur		
Wavelength (Metres) ...	49	31	25	19	16	13	11	40	20	10
Frequency (Megacycles) ...	6.1	9.6	11.8	15.1	17.8	21.5	26	7	14	28
Length of each arm (feet)	40	26	20	15.5	13	10.5	9	33	16.5	8.25



RECEPTION OF TELEPHONY

With the BFO switch in the "off" position, the automatic gain control becomes operative and, for full effectiveness, the RF gain control should be advanced to the maximum position. The volume is adjusted by the audio gain potentiometer on the right. On very strong signals, such as may be received with a large aerial and on medium waves, it may be necessary to reduce the RF gain to prevent overloading. When the main interest lies in the reception of telephony and short wave broadcast stations, the Eddystone Cat. No. 669 Signal Strength Meter will be found a valuable adjunct to correct tuning and also gives a comparative indication of the strength of the received carrier.

Fig. 1.—Rear view of the "740" Receiver in outline.

RECEPTION OF CW SIGNALS

Switching on the BFO (thereby also cutting out AGC) applies HT to the beat oscillator valve and places the receiver in a condition to accept CW signals. Only when the incoming signal is very weak or if the aerial is poor will it usually be necessary to employ full RF gain. Experience with the handling of the "740" receiver will enable a fine balance to be struck between RF and AF gain, to give maximum intelligibility with minimum noise.

The BFO pitch control varies the beat note 3 Kc/s. either side of zero. A note between 800 and 1,000 cycles is usually selected and when interference is present, it is well to try the effect of swinging from one side of zero beat to the other, as this procedure may minimise the interference.

NOISE LIMITER

In a quiet situation, it will not be necessary to make use of the noise limiter but when electrical interference of a staccato nature is experienced (on telephony or CW), switching on the noise limiter will effectively remove a high percentage of the interfering noise, with little effect on the strength of the signal and without introducing distortion. The noise limiter must not be expected to act effectively with noise of a mushy type as generated by vacuum cleaners and other electrical equipment incorporating motors — these should be filtered with suppressors at the source.

In a noisy location, it is well to erect an aerial well in the clear and as far as possible from electric light wiring. The stronger the incoming signal, the more the gain of the receiver can be reduced (automatically on telephony, manually on CW) thereby reducing also the effect of any interference being picked up.

STANDBY SWITCH

When in the "off" position, the standby switch desensitises the receiver very considerably. The oscillator valve continues to operate under steady conditions, thereby minimising any tendency for the frequency to vary during standby periods.

The receiver is also available as a monitor of the outgoing signal. It is necessary to prevent an excessive RF voltage being applied to the aerial terminals during the operation of an associated transmitter and the leads to these terminals should be kept as short as possible. If a separate aerial is employed for reception, arrangements should be made (e.g., by the provision of a suitable relay) for disconnecting or earthing the aerial during transmission periods.

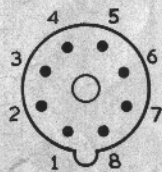
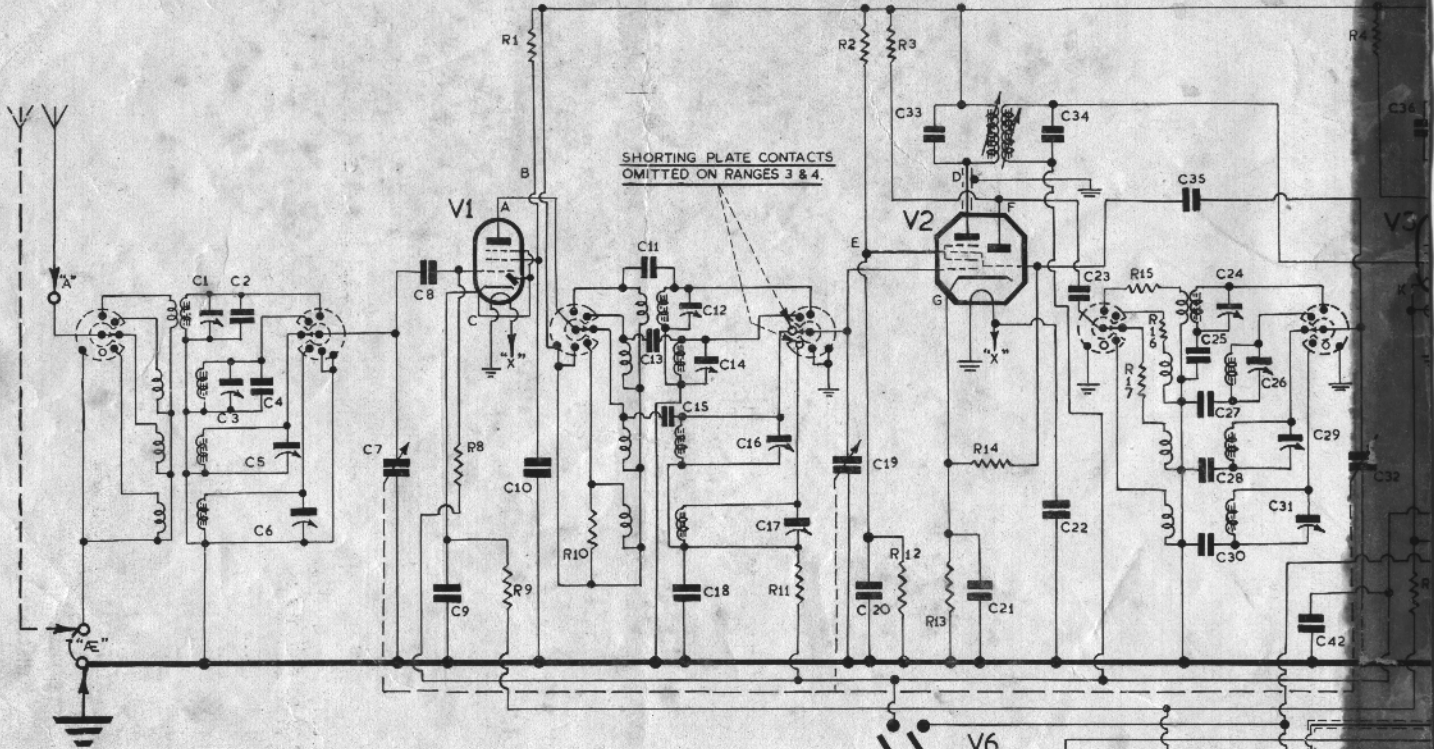
CONNECTION OF SIGNAL STRENGTH METER

The Eddystone Cat. No. 669 "S" Meter is recommended for use with the "740" receiver. It incorporates a sensitive moving-coil meter of 200 microamperes full scale deflection.

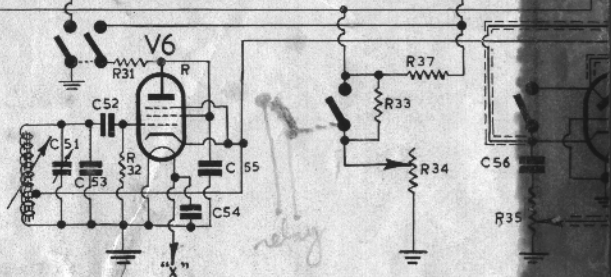
The flexible lead from the meter terminates in an octal plug which should be inserted in the socket near the loudspeaker terminals as indicated in Fig. 1. Reference to the circuit diagram of the receiver will show that one half of the double-diode V7 is in series with the meter movement. This prevents reverse current flowing through the meter when the balance is disturbed and the meter can be left in circuit under all conditions of operation without likelihood of damage. The bottom bend characteristic of the diode results in sluggish action at low signal strengths and, to overcome this, the needle of the meter is purposely offset below the zero mark on the scale by means of the mechanical adjuster. With the receiver controls set for reception of telephony, the aerial and earth terminals (or doublet terminals) should be shorted and the "S" Meter needle made to coincide with zero by adjustment of the electrical balance control at the rear of the meter. On removing the short, the meter will indicate comparative carrier strength.

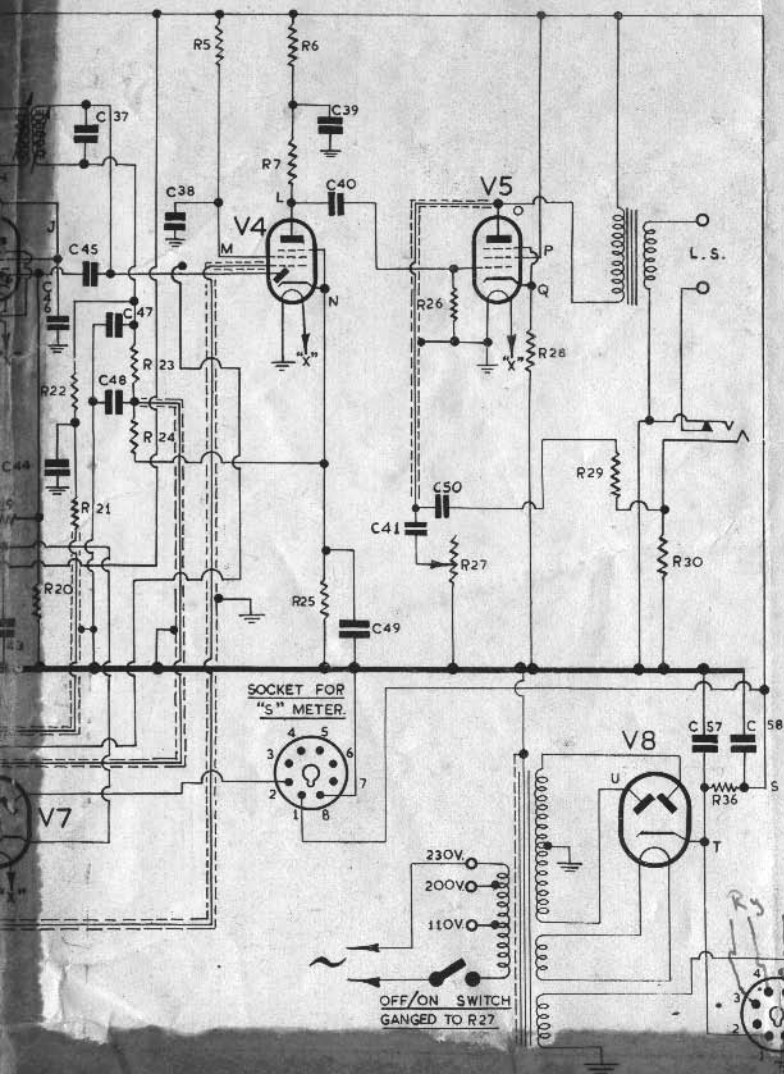
OPERATION FROM 6 VOLT ACCUMULATOR

The "740" receiver may be operated from a 6 volt accumulator supply in conjunction with an Eddystone Cat. No. 687 Vibrator Power Unit. The latter has been specially designed for the purpose, is free from hash and matches the "740" in appearance. The consumption from the accumulator is between 5 and 6 amperes. Full installation details are provided with the Power Unit.



VALVES		1	2	3	4	5	6	7	8
V1, 3, 4, 6	EAF 42	H	A	AD	G3	G2	G1	KS	H
V2.	ECH42	H	AH	AT	G3 G1	G2 G4	G1	K	H
V5.	EL 42	H	A	K G3	-	G2	G1	K	H
V7.	EB41	H	-	K2	D2	S	D1	K1	H
V8.	EZ 40	H	A1	-	-	-	A2	K	H





VOLTAGE VALUES

The voltages are between the point indicated and the chassis. Set the receiver at 28 Mc/s. on Range 1 with the aerial shorted out, tone, RF and AF gain controls turned fully clockwise. Two sets of values are given using different meters, as shown. It will be evident that the actual voltage indicated depends on the meter employed. A tolerance of plus or minus 5% should be allowed on the values given.

NOTE.—When checking Point R, "AVC" Switch must be set to "BFO."

CIRCUIT REF.	"AVO" (Model 40)	WESTON (1,000 ohms/volt)
A ...	240.0	240.0
B ...	70.0	83.0
C ...	2.0	2.0
D ...	238.0	240.0
E ...	84.0	92.0
F ...	77.0	93.0
G ...	2.0	2.0
H ...	238.0	240.0
J ...	72.0	87.0
K ...	2.4	2.5
L ...	32.0	35.0
M ...	15.0	18.0
N ...	0.7	0.9
O ...	233.0	235.0
P ...	240.0	240.0
Q ...	10.5	10.5
R ...	75.0	80.0
S ...	240.0	240.0
T ...	260.0	260.0
U ...	250.0 AC	250.0 AC
HT CURRENT	57mA	57mA
AC CURRENT	0.188 amps.	0.185 amps.

CONDENSERS

C1	...	3-23 pf.	Air Trimmer.
C2	...	10 pf.	Silvered Mica.
C3	...	3-23 pf.	Air Trimmer.
C4	...	6 pf.	Silvered Mica.
C5	...	3-23 pf.	Air Trimmer.
C6	...	3-23 pf.	Air Trimmer.
C7	...	11.5-366 pf.	RF Sect. 3 gang.
C8	...	100 pf.	Silvered Mica.
C9	...	.1 mfd.	Tub. Paper.
C10	...	.1 mfd.	Tub. Paper.
C11	...	20 pf.	Silvered Mica.
C12	...	3-23 pf.	Air Trimmer.
C13	...	6 pf.	Silvered Mica.
C14	...	3-23 pf.	Air Trimmer.
C15	...	3 pf.	Silvered Mica.

C16	...	...	Air Trimmer.
C17	...	1-23 pf.	Air Trimmer.
C18	...	.01 mfd.	Tub. Paper.
C19	...	11.5-366 pf.	FC Sect. 3 gang.
C20	...	.1 mfd.	Tub. Paper.
C21	...	.1 mfd.	Tub. Paper.
C22	...	.0005	Moulded Mica.
C23	...	100 pf.	Silvered Mica.
C24	...	3-23 pf.	Air Trimmer.
C25	...	3625 pf.	Silvered Mica.
C26	...	3-23 pf.	Air Trimmer.
C27	...	2825 pf.	Silvered Mica.
C28	...	1040 pf.	Silvered Mica.
C29	...	3-23 pf.	Air Trimmer.
C30	...	400 pf.	Silvered Mica.
C31	...	3-23 pf.	Air Trimmer.
C32	...	11.5-366 pf.	Osc. Sect. 3 gang.

C33	...	100 pf.	Silvered Mica.
C34	...	100 pf.	Silvered Mica.
C35	...	100 pf.	Silvered Mica.
C36	...	100 pf.	Silvered Mica.
C37	...	100 pf.	Silvered Mica.
C38	...	.1 mfd.	Tub. Paper.
C39	...	8 mfd. or 12 mfd.	Elect.
C40	...	.01 mfd.	Moulded Mica.
C41	...	.1 mfd.	Tub. Paper.
C42	...	.01 mfd.	Tub. Paper.
C43	...	.1 mfd.	Tub. Paper.
C44	...	.1 mfd.	Tub. Paper.
C45	...	20 pf.	Silvered Mica.
C46	...	.1 mfd.	Tub. Paper.
C47	...	100 pf.	Silvered Mica.
C48	...	100 pf.	Silvered Mica.

The following instructions are based on the assumption that normal routine re-alignment is to be carried out. Although minor adjustments may be made without them, it is much more satisfactory, for proper alignment, to use test instruments, the following being essential :

1. A Signal Generator, fitted with a calibrated attenuator and having internal modulation. The frequency range should cover that of the receiver and the intermediate frequency. The Signal Generator should preferably be isolated with .01 μ F condensers, a 1 megohm resistor being connected across the leads, on the receiver side, to ensure DC continuity. For the sake of brevity the Signal Generator is referred to in the following notes as the Sig. Gen. When aligning the RF stages, a dummy aerial, suitable for high frequencies, should be interposed between the direct output of the generator and the aerial terminals of the receiver. Should no dummy aerial be supplied with the generator, a 400 ohm carbon resistor will serve, fitted in series with the high potential lead.
2. An audio output meter, calibrated in milliwatts and decibels to match an impedance of 2.5 ohms.
3. A non-metallic trimming tool, with a screwdriver shaped end, for adjusting coil cores, etc. The Eddystone Cat. No. 122T tool is suitable.

The receiver should be removed from its cabinet (by unscrewing the four screws at the rear) and stood on its left-hand end, face to

ALIGNMENT

the operator. Connect the output meter across the speaker terminals, leaving the speaker connected, as this is helpful.

IF CIRCUITS

The controls should be set as follows :

RF Gain	...	Maximum.
Tone Control	...	Fully Clockwise.
AF Gain	...	Maximum.
BFO	...	Off.
N.L.	...	Off.
Selector Switch	...	Range 4.

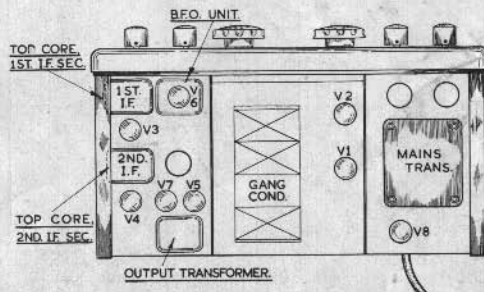


Fig. 2.—Plan view of the "740" Receiver showing valve positions.

C49 ...	30 mfd.	Elect. at 15v.
C50 ...	01 mfd.	Moulded Mica.
C51 ...	BFO	Pitch Control
C52 ...	100 pf.	Silvered Mica.
C53 ...	100 pf.	Silvered Mica.
C54 ...	01 mfd.	Tub. Paper.
C55 ...	01 mfd.	Tub. Paper.
C56 ...	01 mfd.	Moulded Mica.
C57 ...	50 mfd.	Elect.
C58 ...	50 mfd.	Elect.

RESISTORS

R1 ...	100,000 ohms.	$\frac{1}{2}$ W.
R2 ...	22,000 ohms.	1W.
R3 ...	33,000 ohms.	1W.

R4 ...	100,000 ohms.	$\frac{1}{2}$ W.
R5 ...	2.0 megohm	$\frac{1}{2}$ W.
R6 ...	25,000 ohms.	$\frac{1}{2}$ W.
R7 ...	270,000 ohms.	$\frac{1}{2}$ W.
R8 ...	470,000 ohms.	$\frac{1}{2}$ W.
R9 ...	330 ohms.	$\frac{1}{2}$ W.
R10 ...	3,000 ohms.	$\frac{1}{2}$ W.
R11 ...	470,000 ohms.	$\frac{1}{2}$ W.
R12 ...	22,000 ohms.	$\frac{1}{2}$ W.
R13 ...	220 ohms.	$\frac{1}{2}$ W.
R14 ...	33,000 ohms.	$\frac{1}{2}$ W.
R15 ...	22 ohms.	$\frac{1}{2}$ W.
R16 ...	47 ohms.	$\frac{1}{2}$ W.
R17 ...	560 ohms.	$\frac{1}{2}$ W.
R18 ...	470 ohms.	$\frac{1}{2}$ W.
R19 ...	470,000 ohms.	$\frac{1}{2}$ W.
R20 ...	470,000 ohms.	$\frac{1}{2}$ W.

R21 ...	1.0 megohm.	$\frac{1}{2}$ W.
R22 ...	1.0 megohm	$\frac{1}{2}$ W.
R23 ...	100,000 ohms.	$\frac{1}{2}$ W.
R24 ...	100,000 ohms.	$\frac{1}{2}$ W.
R25 ...	1,400 ohms.	$\frac{1}{2}$ W.
R26 ...	470,000 ohms.	$\frac{1}{2}$ W.
R27 ...	50,000 ohms.	Potentiometer.
R28 ...	400 ohms.	$\frac{1}{2}$ W.
R29 ...	33,000 ohms.	$\frac{1}{2}$ W.
R30 ...	2,200 ohms.	$\frac{1}{2}$ W.
R31 ...	47,000 ohms.	$\frac{1}{2}$ W.
R32 ...	47,000 ohms.	$\frac{1}{2}$ W.
R33 ...	51,000 ohms.	$\frac{1}{2}$ W.
R34 ...	10,000 ohms.	Potentiometer.
R35 ...	500,000 ohms.	Potentiometer.
R36 ...	400 ohms.	3W.
R37 ...	100,000 ohms.	$\frac{1}{2}$ W.

INSTRUCTIONS

The intermediate frequency is 450 Kc/s. The I.F. Transformers are well designed and constructed and are unlikely to drift off frequency over long periods. Before commencing alignment, allow the receiver and the Sig. Gen. to warm up for at least ten minutes, to minimise frequency drift.

The Sig. Gen. leads should be clipped, one to the stator of the centre section of the gang condenser, the other to the coil box casting. The Sig. Gen. should be adjusted to a frequency of 450 Kc/s., 30% modulated, with the attenuator set to give an output in the region of 100 microvolts.

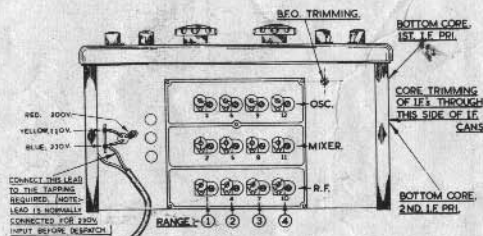
Then proceed to adjust, with the insulated trimming tool, the cores in the I.F. Transformers. The Sig. Gen. output should be reduced as necessary. When maximum output has been secured the attenuator should indicate less than 80 microvolts for a 50 milliwatt output, as shown on the meter with the speaker disconnected. Should the attenuator reading be higher than this, it is possible that the valve emission is beginning to fail.

BFO ADJUSTMENT

After completion of the IF alignment, the Signal Generator internal modulation should be switched off and the BFO in the receiver switched on. Zero heterodyne beat should occur with the BFO pitch control condenser at half mesh (white spot at the top). If this is not the case, the core in the BFO unit should be adjusted — it is accessible from beneath the chassis.

RF AND OSCILLATOR RE-ALIGNMENT

For the sake of completeness, the instructions which follow give the whole procedure for re-alignment of the radio frequency, frequency changer and oscillator sections. It is emphasised, however, that usually all that will be necessary is slight adjustment of the trimmer condensers and this operation can be carried out without removing the cover of the coil box. In the first place, therefore, only those instructions in the following paragraphs dealing with trimmer adjustment should be attended to. If the alignment is still not wholly satisfactory, the coil cores may be adjusted, but considerable care is called for to ensure that proper tracking is maintained.



UNDERSIDE VIEW OF "740" RX IN OUTLINE.

BP750

Fig. 3.—Underside view of the Receiver, with details of coil positions and numbers.

ALIGNMENT INSTRUCTIONS—continued.

OSCILLATOR STAGES

On each band, the oscillator frequency is 450 Kc/s. higher than the signal frequency.

The Sig. Gen. leads are connected, via the dummy aerial, to the aerial and earth terminals. Remove the lid of the coil box, taking care not to drag it across the small trimmer condensers, to avoid damage to the small vanes.

Adjust the tuning to 12 Mc/s. on Band 1, and set the Sig. Gen. to give an output of 50 microvolts (or less) on the same frequency.

It is desirable to point out here that very few Signal Generators are calibrated to an accuracy of better than 1%, which means in practice that, at a setting of 12 Mc/s. the frequency may be plus or minus 120 Kc/s. in error. If only a small discrepancy is found between the Sig. Gen. calibration and the receiver calibration, it will be well not to readjust the oscillator frequency. To ensure absolutely correct calibration, it is necessary to use a Crystal Calibrator, incorporating a close tolerance 1,000 Kc/s. Crystal, for the final setting of the oscillator circuit.

If found necessary, therefore, proceed to adjust Core No. 3 until the signal is audible and maximum output is indicated. Next, change to Band 2, adjust Sig. Gen. and tuning pointer to a frequency of 4 Mc/s. and trim Core No. 6. Then proceed to adjust Core No. 9 on Band 3 at 1.5 Mc/s., and Core No. 12 on Band 4 with the Sig. Gen. at 550 Kc/s. and Receiver dial at 545.5 metres.

A similar procedure is followed at the higher frequency end of each band, using the frequencies set out in the panel below, but this time adjusting the Trimmer Condensers. On Bands 1 and 2 (at 28 and 9 Mc/s.) it may be possible to find two settings of the trimmers at which the signal is audible—the correct one is with the trimmer capacitance at its lowest i.e. with the black line on the rotor nearest to the front of the receiver.

	Band	Frequency	Osc.	F.C.	R.F.
CORES	1	12 Mc/s.	3	2	1
	2	4 Mc/s.	6	5	4
	3	1.5 Mc/s.	9	8	7
	4	550 Kc/s. (545.5 metres)	12	11	10
TRIMMERS	1	28 Mc/s.	3	2	1
	2	9 Mc/s.	6	5	4
	3	3.2 Mc/s.	9	8	7
	4	250 metres (1,200 Kc/s.)	12	11	10

The adjustments of the cores and trimmers affect each other slightly and it is therefore advisable to repeat the foregoing procedure once or twice.

RF AND FC STAGES

The procedure adopted in trimming the radio-frequency and frequency changer input circuits is very similar to that described above for the oscillator stage. For example, on Band 4, the receiver is tuned for maximum output on the meter with the Sig. Gen. set at 550 Kc/s., the attenuator being adjusted to provide a reasonable reading. Cores No. 11 (FC) and 10 (RF) are then moved until maximum output is indicated.

At the high frequency end of Band 4, a frequency of 1.2 Mc/s. (250 metres) is employed and Trimmers Nos. 11 and 10 adjusted for peak output. As with the oscillator, the process should be repeated.

Replacing the lid of the coil box will cause a very slight alteration of frequency at the high frequency end of the bands but it will only be appreciable on Bands 1 and 2. A further slight re-adjustment of Trimmers 3 and 6 will correct this—the trimmers are accessible through holes in the lid after it has been screwed in position.

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