



# EDDYSTONE

## COMMUNICATIONS RECEIVER

MODEL "840" for AC/DC MAINS

### Instruction Manual

The "840" receiver is a general purpose model for professional and amateur communications purposes. It employs seven 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. The receiver works equally well off AC or DC mains supplies (110 and 200/250 volts) and special attention has been paid to high insulation.

# 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 receiver should not be connected to the mains until a check has been made of the position of the plug in the voltage selector panel at the rear of the receiver (see Fig. 1). The plug should be in the socket most nearly corresponding to the actual mains supply voltage, a variation of plus or minus 10% from the marked voltage being permissible. The current consumption is 0.275 amperes, irrespective of the mains voltage.

When the Eddystone Cat. 732 Mains Filter Unit is used, the following connections should be made **BEFORE MAKING ANY CONNECTION TO THE MAINS SUPPLY**.

The short flexible lead in the unit is plugged into the mains input socket on the receiver. The earth lead is connected to the socket marked "Earth" on the Filter Unit. A connection is made with a short piece of insulated wire between the "E" socket on the receiver and the socket marked "Receiver Earth" on the Filter Unit. Finally, the mains lead may be plugged into the socket on the Filter Unit. If the Filter Unit is not used, the earth lead is plugged directly into the "E" socket on the receiver.

On AC mains, the receiver will work with the power supply plug either way round, but it may be found that hum will be present with the plug inserted one particular way. If this is so, the plug should be reversed, when the receiver will be found to function normally. On DC mains it will be necessary to ensure correct polarity of the supply leads. In any case, the valve heaters and the dial lamp will glow but if after the normal 30 seconds warming up period the set remains lifeless, the power plug should be reversed.

The mains on/off switch is incorporated on the tone control on the extreme left hand side of the panel.

If it is desired to use a Speaker separate from the one fitted internally the plug should be removed from the rear socket marked "L.S." and the leads from the external speaker (3 ohms impedance) inserted.

The telephone jack on the front panel accepts standard high resistance telephones (2,000 or 4,000 ohms.).

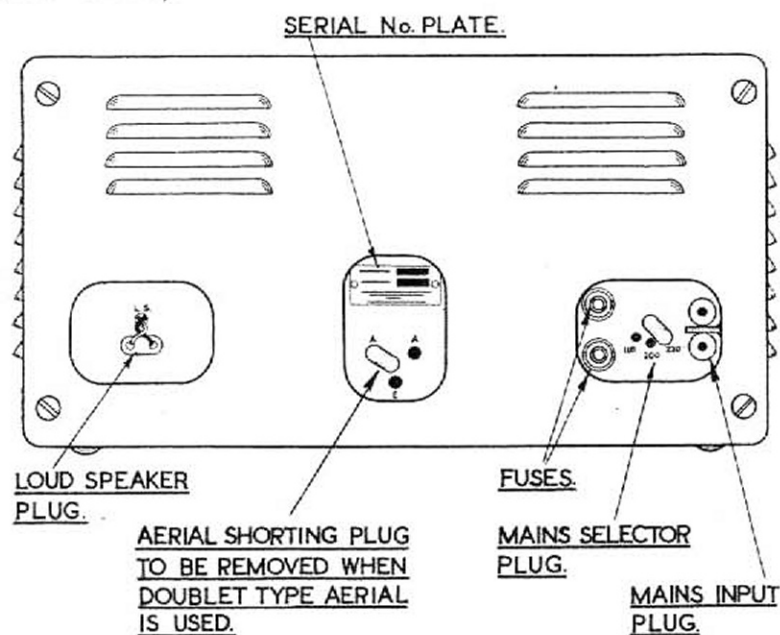


Fig. 1—Rear view of the "840" Receiver in outline.

## AERIAL CONNECTIONS.

If a single long wire aerial is used, connection is made (with the plug provided) to the right hand "A" socket at the rear, the twin plug between the other "A" socket and earth being left in place. With a doublet aerial, or twin feeders of any kind, the twin plug is removed and connection made to the two "A" sockets. A good earth, connected to the "E" socket, is recommended and will probably improve results. (N.B., the earth connection is modified when the Cat. No. 732 Filter Unit is used). The solid plug is used for the purpose.

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.

Band (Metres) ... ..	Broadcast					Amateur				
	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.

### INSULATION.

When servicing this receiver, it is well to check, preferably with a 500 volt Megger, the insulation resistance between the inner chassis and the metal panel—the figure obtained should be at least 100 megohms. When replacing any control (and particularly the AF gain control), ensure the insulating washers are in sound condition and are correctly assembled.

### 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 "840" 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, whilst an Eddystone Filter Unit will help materially. 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.

## 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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Printed in England.

## VOLTAGE VALUES.

The voltages are between the points indicated and the chassis (except Point U). Set switch to Band 4, short out aerial to earth. Set Tone, Volume and RF Gain controls to Maximum (fully clockwise), BFO "on."

Two sets of figures are given for an AC Input of 110 Volts using different meters as shown. It will be evident that the actual voltage indicated depends upon the particular meter employed. A tolerance of plus or minus 5% should be allowed on the values given. All voltages are DC except at points "T" and "U," which will be AC when mains are A.C.

CIRCUIT REF.	WESTON		AVO	
		1,000 ohms/volts.	Model 40	
A ...	100	100	100	
B ...	60	55	55	
C ...	0.7	0.8	0.8	
D ...	100	100	100	
E ...	44	42	42	
F ...	1	1.1	1.1	
G ...	64	62	62	
H ...	100	100	100	
J ...	60	55	55	
K ...	0.7	0.7	0.7	
L ...	13	4	4	
M ...	12	3	3	
N ...	0.6	0.4	0.4	
O ...	96	96	96	
P ...	5.3	5.3	5.3	
Q ...	100	100	100	
R ...	114	114	114	
S ...	60	60	60	
T ...	105	105	105	
U ...	15	15	15	

Total Input Current :—0.275 amperes approx.  
Total H.T. Current :— 53mA. with BFO "On."

## ALIGNMENT INSTRUCTIONS

**WARNING.**—The "840" is a Universal model and the chassis may be at high potential to earth.

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  $\mu$ 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 the operator. Connect the output meter across the speaker sockets, 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.

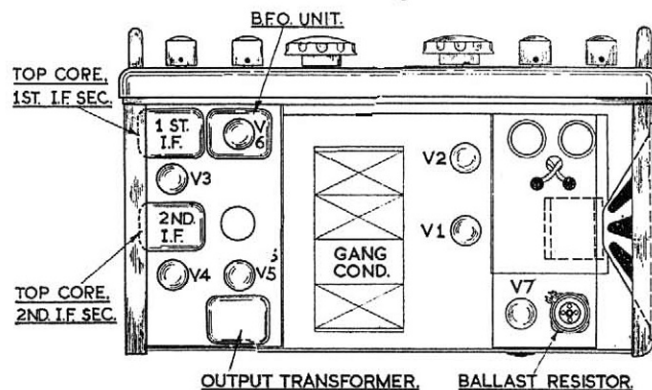


Fig. 2.—Plan view of the "840" Receiver showing valve positions.

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 60 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.

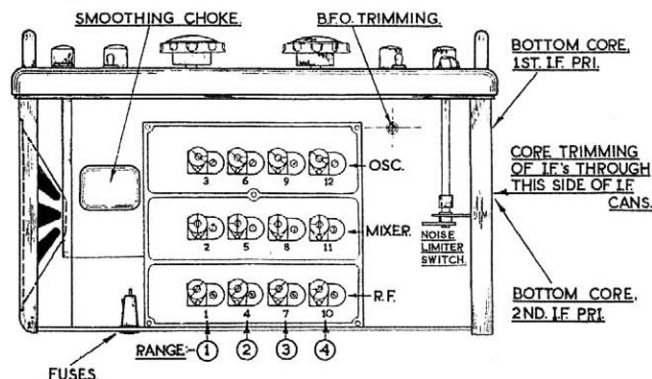
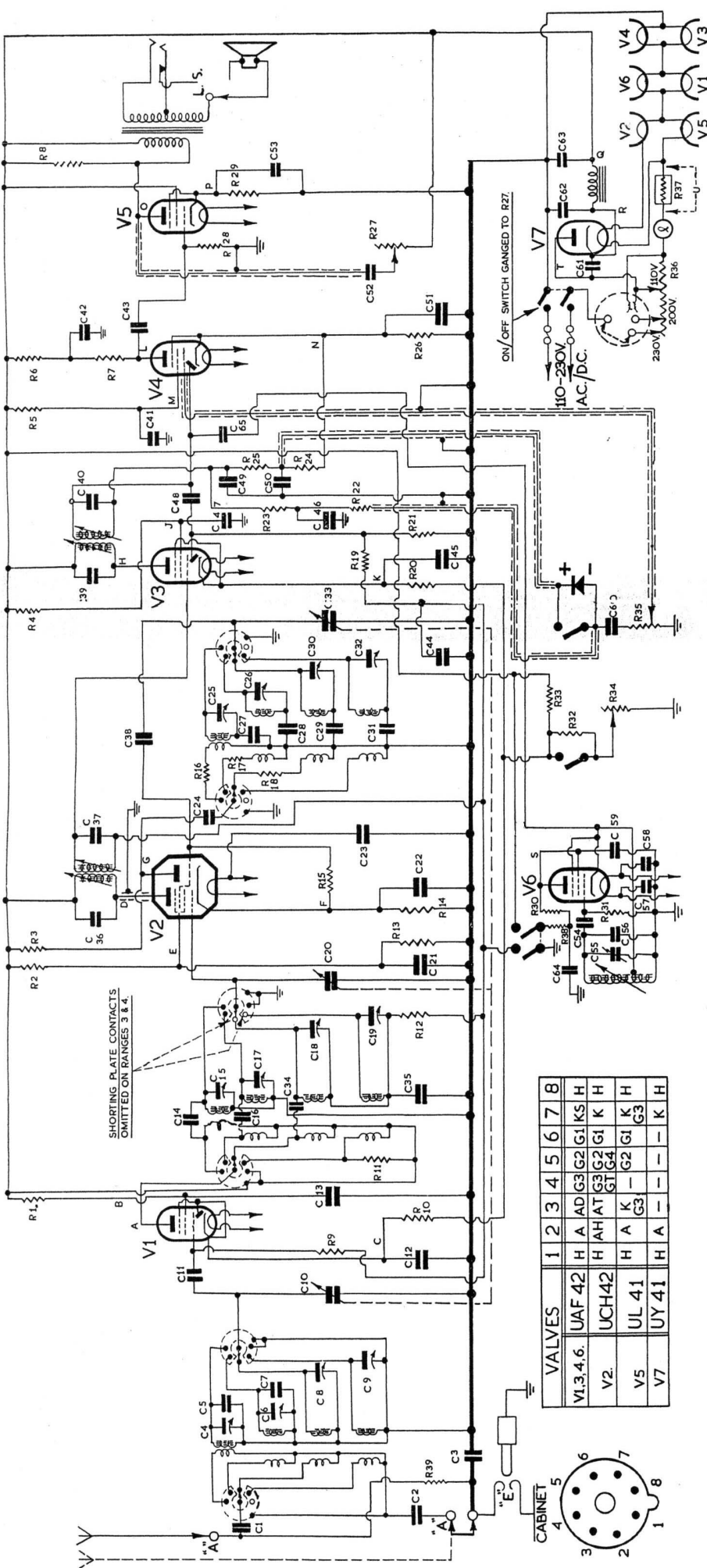


Fig. 3.—Underside view of the Receiver, with details of coil positions and numbers.



N.B. Condensers C66 and C67 are not shown on the circuit diagram. C66 is connected between H, I, line and chassis; C67 from point "L" to chassis.

**CONDENSERS.**

- C1 ... 0.1 mfd. Moulded Mica
- C2 ... 0.1 mfd. Moulded Mica
- C3 ... 0.1 mfd. Tub. Paper A.C./Wkg.
- C4 ... 3-23 pf. Air Trimmer.
- C5 ... 10 pf. Silvered Mica.
- C6 ... 3-23 pf. Silvered Mica. ±1%.
- C7 ... 6 pf. Silvered Mica.
- C8 ... 3-23 pf. Air Trimmer.
- C9 ... 2-23 pf. Air Trimmer.
- C10 ... 11-5-366 pf. R.F. Section 3 Gang.
- C11 ... 100 pf. Silvered Mica.
- C12 ... 3 pf. Tub. Paper.
- C13 ... -1 mfd. Tub. Paper.
- C14 ... 20 pf. Silvered Mica.
- C15 ... 3-23 pf. Air Trimmer.
- C16 ... 6 pf. Silvered Mica.
- C17 ... 3-23 pf. Air Trimmer.
- C18 ... 3-23 pf. Air Trimmer.
- C19 ... 3-23 pf. Air Trimmer.
- C20 ... 11-5-366 pf. F.C. Section 3 Gang.
- C21 ... -1 mfd. Tub. Paper.
- C22 ... -1 mfd. Tub. Paper.

- C23 ... -0005 mfd. Moulded Mica.
- C24 ... 100 pf. Ceramic.
- C25 ... 3-23 pf. Air Trimmer.
- C26 ... 3-23 pf. Air Trimmer.
- C27 ... 3625 pf. Silvered Mica. ±1%.
- C28 ... 2825 pf. Silvered Mica. ±1%.
- C29 ... 1040 pf. Silvered Mica. ±1%.
- C30 ... 3-23 pf. Air Trimmer.
- C31 ... 400 pf. Silvered Mica. ±1%.
- C32 ... 3-23 pf. Air Trimmer.
- C33 ... 11-5-366 pf. Osc. Section 3 Gang.
- C34 ... 3 pf. Silvered Mica.
- C35 ... -0.1 mfd. Tub. Paper.
- C36 ... 100 pf. Silvered Mica.
- C37 ... 100 pf. Silvered Mica.
- C38 ... 100 pf. Silvered Mica.
- C39 ... 100 pf. Silvered Mica.
- C40 ... 100 pf. Silvered Mica.
- C41 ... -1 mfd. Tub. Paper.
- C42 ... 50 mfd. Tub. elect.
- C43 ... -0.1 mfd. Moulded Mica.
- C44 ... -0.1 mfd. Tub. Paper.

- C45 ... -1 mfd. Tub. Paper.
- C46 ... -1 mfd. Tub. Paper.
- C47 ... -1 mfd. Tub. Paper.
- C48 ... 20 pf. Silvered Mica.
- C49 ... 100 pf. Silvered Mica.
- C50 ... 100 pf. Silvered Mica.
- C51 ... 30 mfd. Elect. at 15v. D.C.
- C52 ... -1 mfd. Tub. Paper.
- C53 ... 30 mfd. Elect. at 15v. D.C.
- C54 ... 100 pf. Silvered Mica.
- C55 ... B.F.O. Pitch Control.
- C56 ... 100 pf. Silvered Mica.
- C57 ... -0.1 mfd. Tub. Paper.
- C58 ... -0.1 mfd. Tub. Paper.
- C59 ... -0.1 mfd. Tub. Paper.
- C60 ... -0.1 mfd. Moulded Mica.
- C61 ... -0.1 mfd. Tub. Paper A.C. Wkg.
- C62 ... 50 mfd. Elect. 450v. D.C.
- C63 ... 50 mfd. Elect. 450v. D.C.
- C64 ... -0.1 mfd. Tub. Paper.
- C65 ... 3 pf. Silvered Mica.
- C66 ... -0.1 mfd. Moulded Mica.
- C67 ... -0005 mfd. Moulded Mica.

**RESISTORS**

- R1 ... 47,000 ohms.
- R2 ... 20,000 ohms.
- R3 ... 10,000 ohms.
- R4 ... 47,000 ohms.
- R5 ... 0.73 megohm.
- R6 ... 22,000 ohms.
- R7 ... 0.2 megohm.
- R8 ... 0.1 megohm.
- R9 ... 330 ohms.
- R10 ... 3,300 ohms.
- R11 ... 0.47 megohm.
- R12 ... 47,000 ohms.
- R13 ... 220 ohms.
- R14 ... 22,000 ohms.
- R15 ... 22 ohms.
- R16 ... 47 ohms.
- R17 ... 560 ohms.
- R18 ... 0.47 megohm.
- R19 ... 330 ohms.
- R20 ... 0.47 megohm.
- R21 ... 0-47 megohm.

- R22 ... 2.0 megohm.
- R23 ... 1.0 megohm.
- R24 ... 0.1 megohm.
- R25 ... 0.1 megohm.
- R26 ... 2,700 ohms.
- R27 ... 50,000 ohms. Potentiometer.
- R28 ... 0.47 megohm.
- R29 ... 150 ohms.
- R30 ... 10,000 ohms.
- R31 ... 10,000 ohms.
- R32 ... 47,000 ohms.
- R33 ... 0.27 megohm.
- R34 ... 10,000 ohms. Potentiometer.
- R35 ... 0.5 megohm. Potentiometer
- R36 ... 500 ohms. 3 amp. with 3 Variable Taps.
- R37 ... Thermistor.
- R38 ... 1,000 ohms.
- R39 ... 2.0 megohms.

**EDDYSTONE "840" COMPONENT VALUES**