Published by

STRATTON & CO. LTD.
BIRMINGHAM 31
ENGLAND

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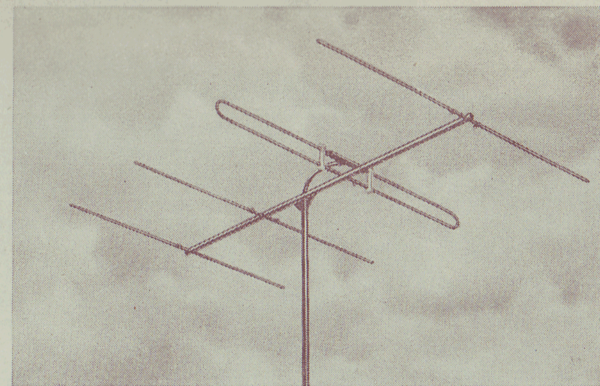


THE

EDDYSTONE
145 Mc/s GUIDE

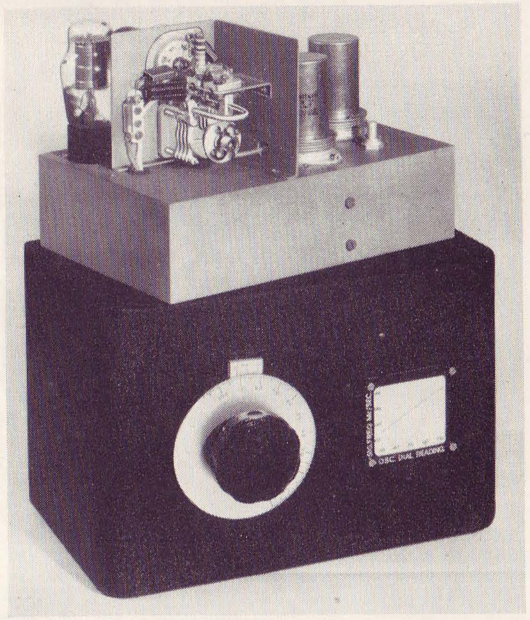
Price 1/6

THE EDDYSTONE 145 Mc/S CONVERTER

INTRODUCTION.

The majority of amateurs, when they commence activity on the 145 Mc/s. band, will want to use a receiver possessing reasonably high sensitivity. Obviously, one cannot expect much in the way of performance — sensitivity in particular — from a very simple converter, such as could be built around a single double-triode valve. On the other hand, many will not wish to go to the trouble and expense of a very advanced design — at least, not to start with.

The Eddystone 145 Mc/s. Converter has therefore been designed with two factors in mind. One is that it must provide a consistently good performance, the other that it should not be unduly complicated or difficult to construct.



POINTS ABOUT THE CIRCUIT.

The valves used are of the B9G type and have been chosen because they are readily available and because they are capable of giving excellent results at V.H.F.

The complete circuit of the Converter is shown in Fig. 1. An R.F. stage is essential, and the EF54 valve employed performs well at 145 Mc/s. giving a worth while degree of amplification. For the sake of compactness, a coil is used in the grid circuit, tuned by a small " butterfly " condenser. C1 is included to balance out the valve input capacity.

The output of the R.F. stage is shunt-fed to the grid circuit of the frequency-changer, which is another EF54 valve. This grid circuit consists of another coil/condenser combination. Both these circuits are of the balanced type, with split-stator tuning condensers, so minimising the effect of stray capacities and enabling a higher L/C ratio to be used, with consequent improvement in the stage gain.

No particular advantage is gained by ganging the R.F. and F.C. tuning condensers, and to arrange for this would only add complications to the construction. The tuning of the first two stages is not critical and, once set for the mid-band frequency, no further adjustment will usually be found necessary.

The oscillator circuit employs a Cat. No. 709 Tuner Unit, the inductance loop being considerably reduced in length, to permit the use of a comparatively high value of parallel capacity. The latter is provided by the trimmer condenser C13, which serves also as a band set condenser. The butterfly tuning condenser incorporated in the Tuner Unit then gives good band-spread — the two megacycles between 144 and 146 Mc/s. occupy the major portion of the 90 degree swing of the condenser.

The inherent frequency stability is excellent. Variations of frequency due to fluctuations of the supply voltage are prevented by the use of a stabiliser valve, which

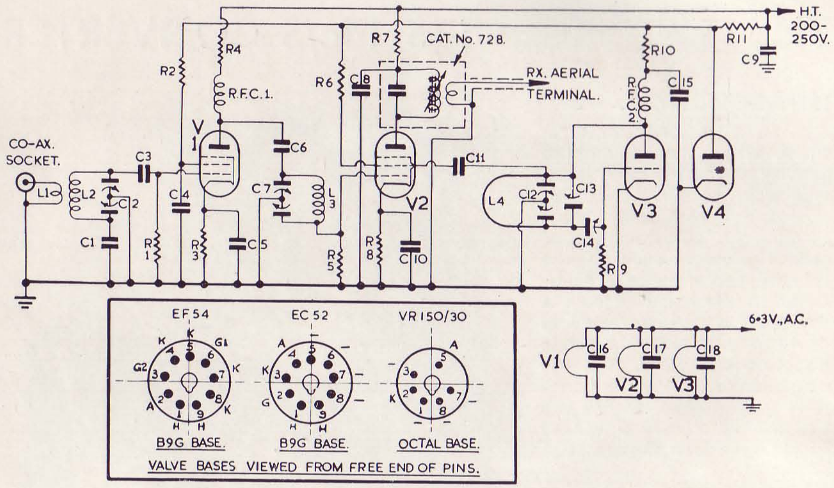


Fig. 1. Circuit Diagram of the 145 Mc/s. Converter.

also regulates the voltage applied to the screen-grids of the R.F. and frequency-changer valves.

Oscillator injection is *via* the screen grid of the frequency changer valve. This method gives good conversion efficiency and shows some advantage as regards signal-to-noise ratio over other methods of injection.

The intermediate frequency is 10 Mc/s., a value which gives freedom from image interference, freedom from oscillator "pulling" and interaction, and an adequate degree of selectivity. It is important to match the output of the Converter into the aerial terminals of the associated receiver and the Cat. No. 728 I.F. Output Transformer, fitted in the anode circuit of the F.C. valve, ensures optimum transfer of energy. Connection to the receiver is made through a short length of low impedance feeder cable.

The circuits are thoroughly decoupled, to ensure that no stray R.F. currents cause trouble, and each stage is separately screened.

CONSTRUCTION.

The foundation of the Converter is a Cat. No. 643 Chassis, which is housed in a Cat. No. 644 Steel Cabinet. Your Eddystone Registered Dealer is in a position to supply the Chassis, in a special finish (sandblasted and lacquered) with all the holes made and complete with the necessary top and lower screens and brackets. A lot of work will be saved thereby and an immediate start can be made with the mounting and wiring up of the components.

For those who prefer to do their own metal work, full information is provided on the chassis, screens and brackets, in the accompanying illustrations (Figs. 2, 3 and 4). The screen marked V1 runs lengthwise to the chassis and crosses the V1 valveholder in line with the spigot. It is cut away to give clearance to the spigot. By mounting in this fashion, the input and the output leads are well screened from each other and the stability thereby improved. Similarly, the other screen (marked V2 in Fig. 3) crosses over the spigot of the V2 valveholder.

The coils L2 and L3 are self-supporting, each consisting of 5 turns 18 S.W.G. wire wound on a $\frac{3}{8}$-in. diameter mandrel, the spacing being such that the total length is $\frac{1}{2}$-in. The coils are soldered directly on to the (opposing) lugs of their respective tuning condensers. L1 is a single turn of flexible insulated wire of approximately $\frac{1}{8}$-in. diameter, inserted at the centre of L2.

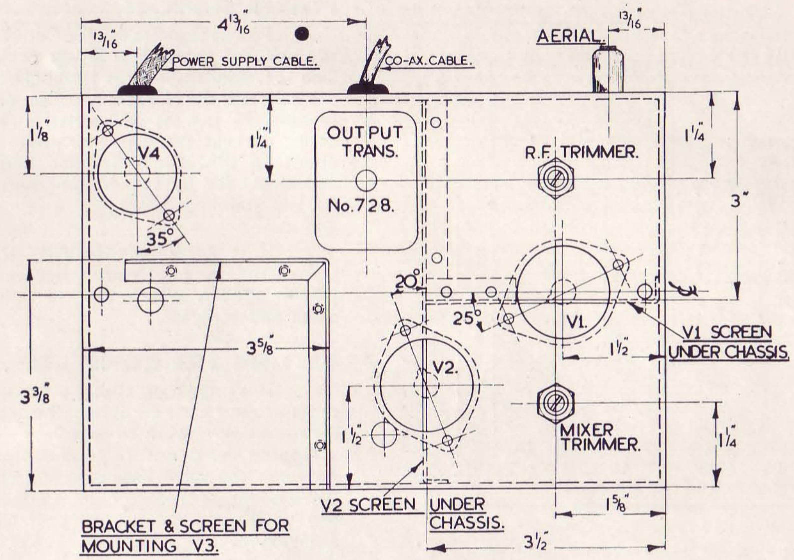


Fig. 2. Chassis Lay-out of the 145 Mc/s. Converter.

Choke RFC1 consists of 20 turns 20 S.W.G. enamelled wire, $\frac{1}{4}$-in. internal diameter, self-supporting and held between the anode tag on the valveholder and a tag fitted to a Cat. No. 749 Ceramic Strip. The latter also holds resistor R4, from which a lead to the H.T. positive line is taken through a hole in the screen.

Tag Nos. 4, 5, 7 and 8 on the EF54 valveholders are connected together, the by-pass condensers (C5 for V1 and C10 for V2) being wired between tag 5 and an earth point located beneath a valveholder fixing bolt.

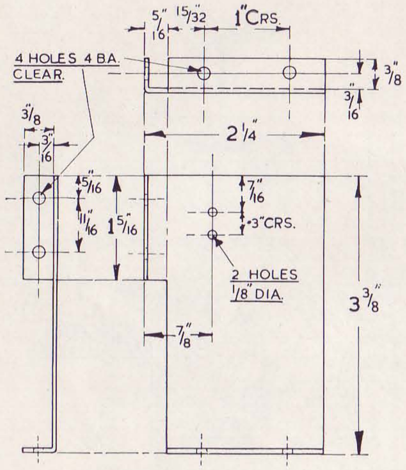
Above the chassis, the major item calling for attention is the oscillator section of the Converter. The oscillator valve — a *Mullard* EC52 — projects horizontally from the supporting screen and all parts of the circuit come conveniently together, so that all leads are kept very short.

The tuning condenser is a Cat. No. 739, fitted with a pair of clamps (Cat. No. 751) which hold the inductance loop L4. The latter is made of $\frac{1}{8}$-in. copper and measures $1\frac{3}{4}$in. overall from clamps to tip. In actual fact, this circuit is a cut-down Cat. No. 709 Tuner Unit.

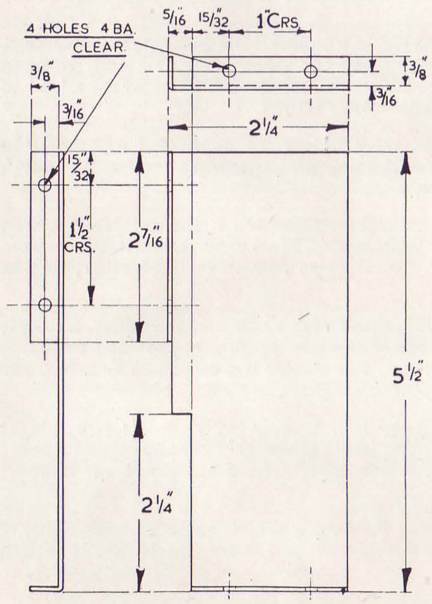
Immediately above the inductance loop is a bracket which holds two midget air-dielectric condensers — C13 and C14. The latter is the grid condenser and a short lead is taken direct to the grid tag on the valveholder. The other condenser is wired across the inductance loop.

One lead of the tiny ceramic coupling condenser C11 is soldered to one side of C12 and a short lead passes down through a hole provided in the chassis to connect to the screen grid of V2.

The chassis is fixed to the cabinet, through the holes provided, with two $2\frac{5}{8}$-in. lengths of 2BA brass rod. The position of the front panel for the slow motion dial should be carefully marked out and the necessary $\frac{13}{16}$-in. diameter hole made in the panel to take the driving head. The latter is attached to the rear extension spindle of the tuning condenser through the medium of the flexible coupler.



V1 SCREEN.



V2 SCREEN.

Fig. 3. V1 and V2 (sub-chassis) Screens. Material is 16 S.W.G. Aluminium.

POWER SUPPLIES.

Power supplies for the Converter are fed through a 3-way cable. The L.T. consumption is 1 ampere at 6·3 volts and the H.T. current approximately 35 mA at 250 volts. The actual current taken by the valves is about 16 mA, the difference being accounted for by the current taken by the stabiliser valve.

It is recommended that the Converter be fed from a separate power supply, which can be quite small and compact.

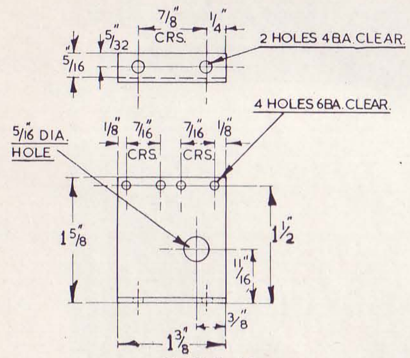
TESTING THE CONVERTER.

It is important that the locking rings around each B9G valve be well screwed down, both to complete the screening and to ensure good contact between the valve base pins and the valveholder sockets. Poor contacts can impair the performance of the Converter.

In operation a pale blue glow should be seen inside the anode of the VR150/30 Stabiliser valve and the voltage appearing on the oscillator anode should be a steady 150.

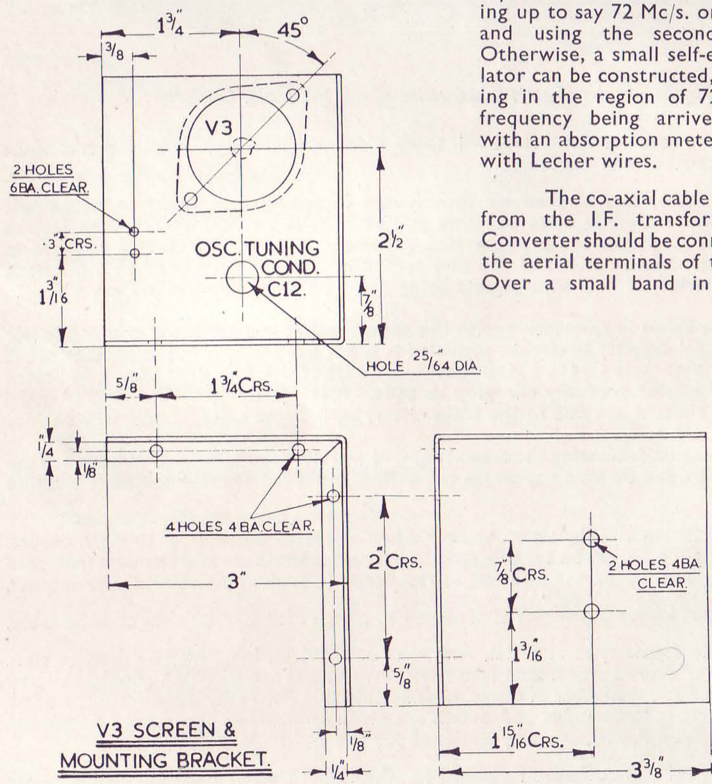
The first check will be to ensure that the oscillator valve is functioning correctly and the second, to set the oscillator tuned circuit to cover the required frequency range. The simplest way of doing the former is to insert a milliammeter (reading up to 10 mA or more) between R10 and the stabilised H.T. line. The reading shown, under normal conditions, should be approximately 6 mA and touching the tuning condenser should result in a variation of anode current. If this circuit is not oscillating, the anode current will be considerably greater than 6 mA.

Space does not permit going into methods of measuring the frequency and the reader is referred to "V.H.F. Technique" and "The Amateur Radio Handbook" both published by The Radio Society of Great Britain. An absorption wavemeter is the simplest answer. One can be easily constructed, but co-operation from other enthusiasts, already working on the 145 Mc/s.



C 13 & 14

TRIMMER MOUNTING BRACKET



V3 SCREEN & MOUNTING BRACKET.

Fig. 4. Oscillator Screen and Bracket.

band, may be necessary when it comes to calibration, the alternative being the setting up of a Lecher Wire system, as described in the publications mentioned.

With the specified length for L4 and with C13 at practically maximum capacity, the operating frequency will be in the region of 135 Mc/s., but some adjustment of both L4 and C13 will probably be necessary in individual cases to get the bandspread just right.

A test signal of some sort is practically essential since, until the Converter has been properly adjusted, it is unlikely that actual signals will be received. The source of the test signal can be the early stages of a crystal controlled transmitter, working up to say 72 Mc/s. on low power and using the second harmonic. Otherwise, a small self-excited oscillator can be constructed, again working in the region of 72 Mc/s., the frequency being arrived at either with an absorption meter or by tests with Lecher wires.

The co-axial cable which comes from the I.F. transformer in the Converter should be connected across the aerial terminals of the receiver. Over a small band in the region

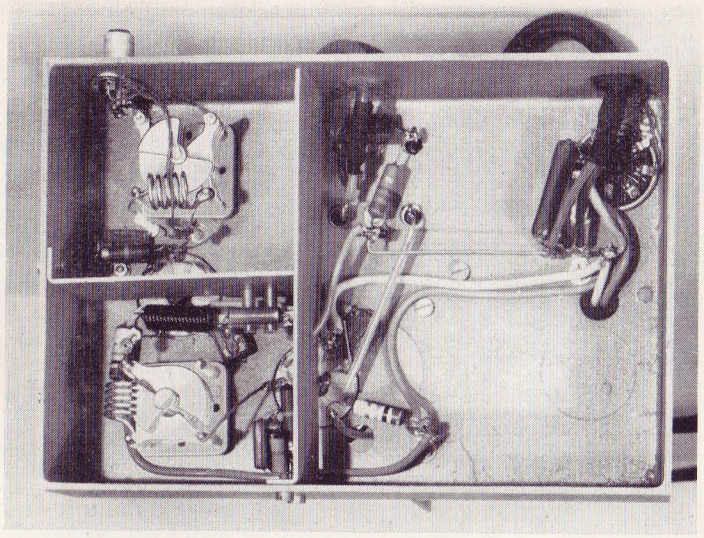


Fig. 5. Under-chassis construction of the 145 Mc/s. Converter.

of 10 Mc/s., the receiver noise level will show a definite increase, indicating resonance with the output of the Converter.

No difficulty should then be experienced in tuning in a signal from the test oscillator. Possibly, fairly close coupling will be required to commence with but, as the R.F. and F.C. stages are brought into alignment, a very considerable increase in signal strength should result and the test oscillator can then be moved to some little distance, to permit of final adjustments being made on a comparatively weak signal.

A point arises in connection with the adjustment of the oscillator grid condenser C14. The actual capacity in circuit, provided it is not too small, is not important but it may be found that, with C14 in a given position, a slight frequency drift occurs, indicated by a received carrier gradually changing its tone. It is necessary, by the way, to make sure that the effect is not due to the transmitter, as, in some cases, it may well be.

Increasing or decreasing the capacity of C14 will alter the speed and direction of the drift and a point can be found at which the drift is cancelled out and complete stability secured.

If breakthrough of signals on or near a fundamental frequency of 10 Mc/s. occurs, the receiver tuning should be set to a spot free from interference and the dust iron core in the I.F. output transformer adjusted to resonance (maximum noise or signal output).

The input of the Converter is arranged to match into a 72/80 ohm co-axial cable.

A simple dipole type of aerial, with each arm $18\frac{1}{2}$-in. long, may be used to start with, the feeder cable being joined into the centre of the aerial, which should be fixed at the top of a mast, well clear of other metallic objects. For really good results, a beam aerial is strongly recommended and details are given on another page of the Eddystone Cat. No. 717 Beam Aerial, specially designed for the 145 Mc/s. band.

In the illustration on page 1 appears (on the right) a small graph of the frequency coverage versus dial reading. This is, of course, somewhat of a refinement, albeit a quite useful one, and it is left to the constructor whether or not this graph is fitted.

List of Components (Converter)

EDDYSTONE.

1	Diecast Chassis	Cat. No. 643
	or	
1	Specially finished and drilled Chassis, Screens and Bracket ...	Cat. No. 761
1	Metal Cabinet	Cat. No. 644
1	Tuner Unit (includes C12). (or 1 Cat. No. 739 Microdenser and 1 pair Cat. No. 751 Clamps)	Cat. No. 709
2	Ceramic Microdensers (C2, 7)	Cat. No. 739
1	I.F. Output Transformer	Cat. No. 728
1	Slow Motion Dial (silver). (or Cat. No. 594—black finish) ...	Cat. No. 637
1	Flexible Coupler	Cat. No. 529
2	Ceramic Mounting Strips	Cat. No. 749

OTHER ITEMS.

3	B9G Ceramic Valveholders	
1	Octal Valveholder	
2	Valves type EF54 (V1, 2)	Mullard
1	Valve type EC52 (V3)	Mullard
1	Stabiliser Valve, type VR150/30 (V4)	Brimar
1	Co-axial Socket (with Plug)	Belling Lee
1	Resistor, 100 ohm, $\frac{1}{2}$ watt (R3)	
3	Resistors, 200 ohm, $\frac{1}{2}$ watt (R4, 7, 10).	
1	Resistor, 3,500 ohm, $\frac{1}{2}$ watt (R8)	
3	Resistors, 10,000 ohm, $\frac{1}{2}$ watt (R2, 6, 9)	
2	Resistors, 100,000 ohm, $\frac{1}{2}$ watt (R1, 5)	
1	Resistor, 2,700 ohm, 5 watt, wire wound (R11)	Welwyn
2	Air Trimmer Condensers, 3/20 pF (C13, 14), Type C3001 ...	Polar
1	Ceramic Condenser 1 pF (C11)	
1	Ceramic Condenser 6 pF (C1)	
2	Ceramic Condensers 10 pF (C3, 6)	
9	Moulded Mica Condensers, ·0005 uF, (C4, 5, 8, 9, 10, 15, 16, 17, 18)	
	Length of $\frac{1}{4}$-in. co-axial cable, etc.	

THE EDDYSTONE 145 Mc/S CRYSTAL CONTROLLED TRANSMITTER

As with the 145 Mc/s. Converter, the aim has been to design a transmitter capable of giving consistent and reliable results, without being unduly difficult for the constructor to build.

A high degree of frequency stability is essential, in view of the fact that receivers for the 145 Mc/s. band will, in almost every case, be of the superheterodyne type, and therefore fairly selective. Crystal control is employed, the fundamental crystal frequency being near 12 Mc/s.

DISCUSSION ON CIRCUIT.

The circuit is given in Fig. 1. The first valve, a 6V6G, is a straightforward crystal oscillator, the anode circuit being tuned to the fundamental frequency. This circuit and the following ones (with the exception of the anode circuit of V4) are of the balanced type, using split-stator tuning condensers. The benefits to be obtained from this type of circuit have been discussed in the Eddystone No. 6 Short Wave Manual. The second valve is a *Mullard* QV04/7 beam tetrode, acting as a trebler to 36 Mc/s. Two further QV04/7 valves follow, both used as doublers, the final frequency appearing at the anode circuit of V4 being within the 145 Mc/s. band, providing the crystal frequency lies between the limits of 12·000 and 12·186 Mc/s.

The anode circuit of V4 utilises an Eddystone Cat. No. 709 Tuner Unit, with the inductance loop much reduced in size, since, in this case, the circuit is of the single-ended type. It is inductively coupled to the grid circuit of the power amplifier valve, which is a *Mullard* QV04/20 twin beam tetrode (equivalent to the American 815).

Other similar valves may be used in the final stage — the *Mullard* QV07/40 (equivalent to the American 829B), or the 832. The inductance lengths will vary from those quoted when a different valve is employed.

Both the grid and the anode circuits of V5 utilise the Cat. No. 709 Tuner Unit, the lengths of the inductance loops being suitably adjusted. Details of the latter are

given in Fig. 1. It is necessary to neutralise the P.A. valve and details are provided later on the construction of the very small condensers required for this purpose.

The hairpin coupling loop, which forms part of the Tuner Unit, is connected to a co-axial socket, from which the R.F. energy is fed to the aerial through co-axial cable.

Bias for each stage is derived from a combination of cathode and grid resistors. The values of the cathode resistors are such that no damage can occur to the valves if the excitation is removed.

Amplitude modulation is effected by applying modulated H.T. to both screen and anodes of the P.A. valve. A jack in the cathode of the final doubler valve V4 is provided for the insertion of a key, when C. W. transmission is desired. Jacks are also fitted to enable the grid and anode currents of the final stage to be checked.

CONSTRUCTION.

The foundation of the transmitter is a Cat. No. 727 diecast aluminium chassis. This chassis, and the various brackets, with the holes already made, are available from your Eddystone Registered Dealer in a specially finished form (sandblasted and lacquered) and much time will be saved if these are used. For those who wish to carry out the metal work themselves, Fig. 2 gives details of the locations and sizes of holes required, and Fig. 3 dimensions of the bracket, which holds the QV04/20 valve.

Coil L1 consists of 32 turns 22 S.W.G. enamelled

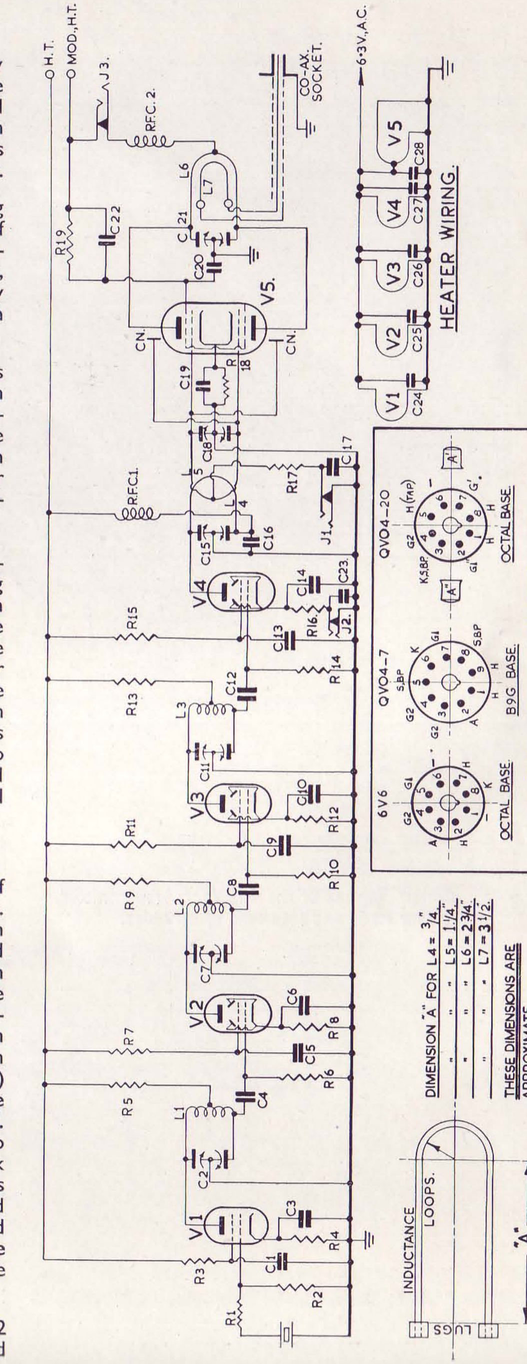


Fig. 1. Circuit diagram of the 145 Mc/s. Transmitter.

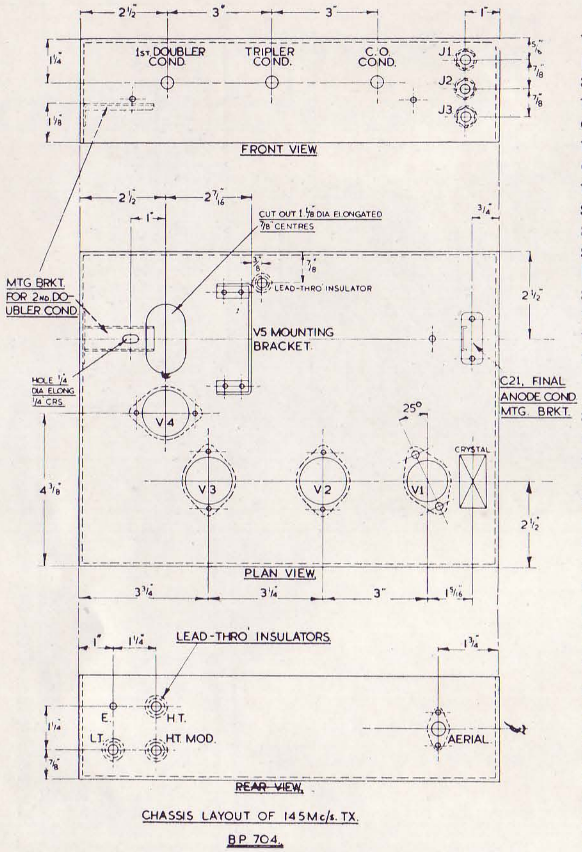


Fig. 2. Chassis lay-out of the 145 Mc/s. Transmitter, showing sizes and locations of all holes.

wire close wound on a plain Cat. No. 647 former, and provided with a centre tap. Coil L2 has 14 turns of the same wire on a threaded former, Cat. No. 648, and again centre tapped. These formers are soldered directly across the associated tuning condensers (C2 and C7). Coil L3 is self-supporting. It consists of 6 turns 14 S.W.G. wire, spaced to occupy 1-in., the ends being soldered to the lower lugs of C11.

An H.T. bus-bar, supported on tag strips, runs along the front of the chassis — it is clearly visible in Fig. 4 — anode and screen connections to the earlier valves are thereby simplified. Soldering tags are bolted to spare holes on the tuning condenser end plates to take one end of the relevant decoupling resistor (R5, R9 or R13). The mica condensers C1, C5, C9 and C13, which decouple the screen grids, are wired across the valveholders in an upright position, to form a partial screen between the control grid and anode tags and leads.

The connections to the grids and anodes of the various valves are taken from the top lugs of the tuning condensers, so that all leads are kept short.

Chassis connections associated with each valve are taken to a common point (one of the valveholder fixing screws) to prevent circulatory R.F. currents in the chassis itself.

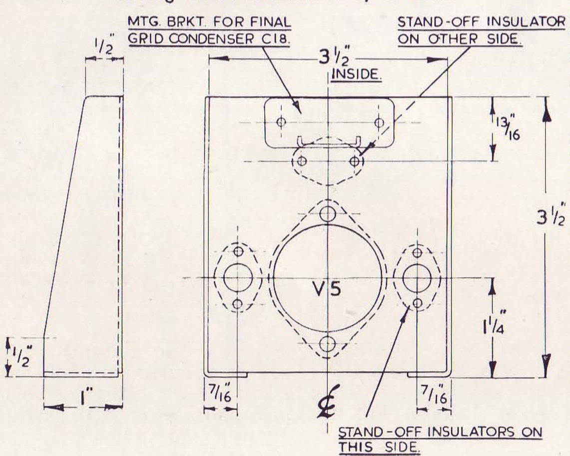


Fig. 3. Details of the bracket which supports the QVO4/20 valve. The material is 16 S.W.G. aluminium.

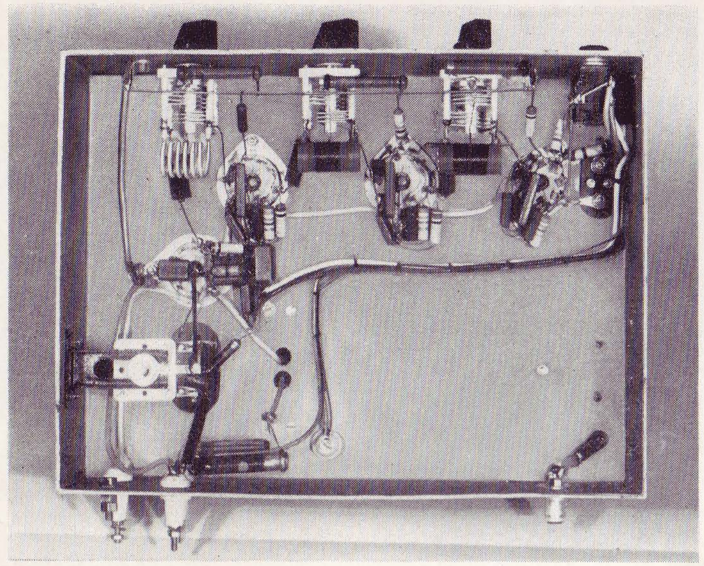


Fig. 4. Under-chassis view of the 145 Mc/s. Transmitter

The anode tuning condenser (C15) of V4 is mounted on a bracket fixed to the side of the chassis in a position which permits the anode inductance loop to project upwards through the hole in the chassis. The by-pass condenser C16 is connected between one lug of C15 and the centre (rotor) soldering tag, a further lead (of copper tape) being taken from the latter to the earth point associated with V4.

THE P.A. CIRCUIT.

The valveholder of V5 is mounted on a metal screen, the dimensions of which are shown in Fig. 3. Short springy pieces of metal are fitted underneath the holding bolts and arranged to press on the metal shell of the output valve — it is essential to earth this metal shell.

Above the valveholder is fixed the bracket which holds the grid tuning condenser C18 in a position which locates one pair of lugs near the control grid tags, and the other pair of lugs over the hole in the chassis. The slotted bracket enables C18 to be moved so that optimum coupling is obtained between L4 and L5. The grid connections are crossed over so that each neutralising wire comes out, in effect, against the opposite anode.

Each neutralising condenser consists of $\frac{3}{4}$-in. diameter brass disc soldered to a 4-in. length of 14 gauge copper wire. The latter is passed through a ceramic insulator (Cat. No. 1019 with metal parts removed) and is then soldered to the lug on the tuning condenser. The close-up photograph of the P.A. stage, Fig. 5, shows the construction and position of these condensers.

The anode tuning circuit is a Cat. No. 709 Tuner Unit, positioned so that the main inductance loop lies above the valve, the anode caps of the latter coming conveniently close to the lower lugs of the tuning condenser. High tension is fed into the mid-point of the loop *via* a small R.F. choke (12 turns 20 S.W.G. enamelled wire, $\frac{1}{4}$-in. internal

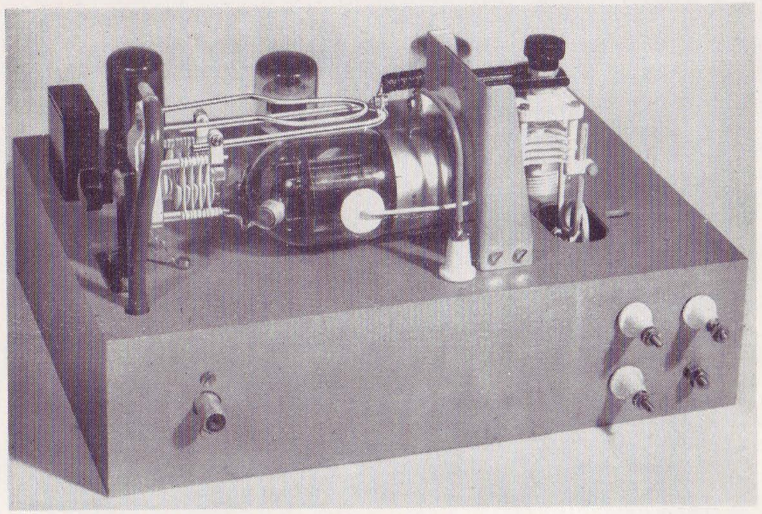


Fig. 5. Close-up view of the Power Amplifier Stage. Note particularly the relative positions of the inductance loops L.4 and L.5, and the positions of neutralising condensers.

diameter, self-supporting), the other end of which is held by a miniature stand off insulator, from whence an insulated lead is taken down through the chassis.

A short piece of co-axial cable is soldered to the terminations of the coupling loop and taken through the chassis to the co-axial socket, mounted on the rear of the chassis. Also, on the rear are lead-through insulators to which are connected the modulated and unmodulated H.T. supplies and one lead from the 6·3 volt heater supply. The other L.T. lead and the H.T. negative lead are connected to a terminal bolted to the chassis.

Small knobs are fitted to the spindles of C18 and C21. A screwdriver is used to adjust C15, through the hole provided in the chassis. Pointer knobs and scales are fitted to the other three tuning condensers. The three jacks are conveniently placed on the front of the chassis.

TESTING THE TRANSMITTER.

The exciter stages require 100 to 120 mA at 300 volts. The P.A. stage can easily be loaded up to take a total of 100 mA anode and screen current, at an anode voltage of 300. A single power pack may be used, provided it is capable of supplying the total current, with good regulation. The latter is especially important when C.W. is employed and it is better practice to use two separate power packs which should, in any case, incorporate choke input filters. The heater consumption is 4 amperes at 6·3 volts.

The simplest way of tuning up the earlier stages is to connect a voltmeter (using the 50 or 100 volt range) across each of the anode decoupling resistors, in turn.

Initially, the reading across R5 may be 30 volts. On rotating C2 to bring the anode circuit into resonance, the reading will drop to about 15 volts, indicating an anode current of about 15 mA.

Similarly, the voltage drop across R9 with C7/L2 resonant to the third harmonic of the crystal, will be approximately 28 and across R13 (with C11/L3 tuned to 72 Mc/s.) about 32. (These figures all assume an applied voltage of 300).

The current through V4 is measured by plugging a meter (50 or 100 mA full scale) into the keying jack. In this case, the dip on tuning through resonance will be quite small, the total cathode current being in the region of 32 mA.

The constants of each tuned circuit are such that the tuning range is fairly small and there is little likelihood of the wrong harmonic being chosen. At the same time, it is very desirable to check that each harmonic selected is correct and this can most conveniently be done with the aid of a calibrated absorption wavemeter.

Turning to the P.A. stage, it is first necessary to ensure that the stage is properly neutralised. With H.T. applied only to the final stage, and with suitable meters plugged in to read grid and anode currents, the grid and anode tuning condensers (C18 and C21) should be rotated. Any tendency to self-oscillate will be indicated by the variation of anode current and by a reading on the grid current meter. Should this occur, the spacing of the neutralising condensers, relative to the valve anodes, should be varied. Moving them in the wrong direction will increase the instability — moving them in the correct direction will result in absolute stability, irrespective of the positions of the tuning condensers.

With the meters still plugged in, the H.T. supply to the driver stages should be connected up. The correct degree of coupling between L4 and L5 can be judged from Fig. 5, although slight variation in individual transmitters may produce some improvement.

To avoid damage to the P.A. valve, it is essential to connect a dummy load across the output and this load can take the form of a 24 watt car headlamp bulb, fitted directly across the output socket or to a length of co-axial cable.

On rotating C18, grid current in the P.A. stage should be indicated, with an accompanying increase of anode current. C21 should be tuned to resonance, shown by a dip in anode current and by the dummy load lighting up. Further adjustments should be carried out with C15, C18 and C21, and possibly with the lengths of the associated inductance loops, until maximum grid current and maximum output are obtained. The grid current, with the P.A. stage properly loaded, should be between 1·5 and 2 mA.

The aerial feeder may now be connected in place of the dummy load and the coupling loop adjusted so that the final anode current is in the region of 80 to 85 mA. The transmitter is then ready for operation, either on C.W. or telephony.

No key click filter is included in the design and, if found necessary, one should be fitted externally.

The impedance of the P.A. stage, presented to the modulator, under the specified operating conditions, will be approximately 3,000 ohms and the output matching should be arranged accordingly. A modulator with an output of up to 15 watts will give full modulation of the carrier.

List of Components (Transmitter)

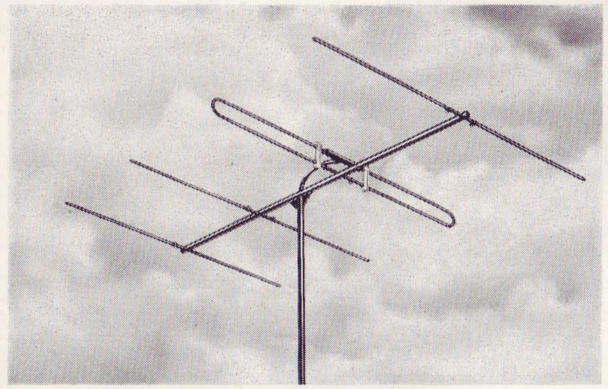
EDDYSTONE.

1	Diecast Chassis	Cat. No. 727
	or	
1	Specially finished and drilled diecast chassis and screen	Cat. No. 759

3	Ceramic Microdensers, 25 x 25 *p*F (C2, 7, 11)	Cat. No. 583
3	Tuner Units (includes C21, also C15 and C18)	Cat. No. 709
	or	
1	Tuner Unit, (for V5 anode), 2 Cat. No. 739 Microdensers, 8 x 8 *p*F (C15, 18), 2 pairs Clamps Cat. No. 751 and 2 metal Brackets Cat. No. 708	
1	R.F. Choke	Cat. No. 1011
1	Coil Former Plain	Cat. No. 647
1	Coil Former Threaded	Cat. No. 648
4	Lead-Through Insulators	Cat. No. 695
3	Stand-off Insulators	Cat. No. 1019
2	Instrument Knobs	Cat. No. 593
3	Pointer Knobs and Dials	Cat. No. 425

OTHER ITEMS.

2	Octal Ceramic Valveholders	
3	B9G Ceramic Valveholders	
1	6V6G Valve (V1)	Brimar
3	QV04/7 Valve (V2, 3 and 4)	Mullard
1	QV04/20 Valve (V5)	Mullard
3	Closed Circuit Insulated Jacks	
1	Co-axial Socket (with plug)	Belling Lee
1	Resistor, 47 ohms, $\frac{1}{2}$ watt (R1)	
1	Resistor, 200 ohms, 3 watt, wire-bound (R18)	
4	Resistors, 330 ohms, $\frac{1}{2}$ watt (R4, 8, 12, 16)	
3	Resistors, 1,000 ohms, 1 watt (R5, 9, 13)	
1	Resistor, 10,000 ohms, $\frac{1}{2}$ watt (R17)	
1	Resistor, 10,000 ohms, 3 watt, wire-wound (R19)	
4	Resistors, 47, 000 ohms, $\frac{1}{2}$ watt (R2, 7, 11, 15)	
4	Resistors, 100,000 ohms, $\frac{1}{2}$ watt (R3, 6, 10, 14)	
5	Condensers, ·002 *u*F Moulded Mica (C1, 5, 9, 13, 23)	
13	Condensers, ·0005 *u*F Moulded Mica (C3, 6, 10, 14, 16, 17, 19, 20, 24, 25, 26, 27, 28)	
1	Condenser, ·01 *u*F Moulded Mica (C22)	
3	Condensers, 85 *p*F Silver Mica (C4, 8, 12)	



THE EDDYSTONE 145 Mc/S BEAM AERIAL ARRAY

BENEFITS OF A BEAM ARRAY.

Any regular user of the V.H.F. amateur bands will confirm that a Beam Aerial Array is a necessity, if results are to be really worthwhile and consistently good.

From the transmitting point of view, the power is concentrated over a comparatively narrow angle. The signal strength at any given distance is thereby increased to a degree which, for equivalent results with a dipole aerial, would require raising the transmitter power several times. On the receiving side, the aerial acts as a tuned circuit and gives added sensitivity and greater freedom from image interference. Interfering signals, unless they originate from a source in line with the beam, are reduced in strength. Wanted signals, on the other hand, are increased in strength — often signals can be heard with a properly orientated beam that cannot be found when using a simple dipole.

THE EDDYSTONE BEAM AERIAL.

The Eddystone Cat. No. 717 Beam Aerial Array has been specifically designed for use on the 145 Mc/s. band. With the exception of the centre and supporting insulators, it is made entirely from brass, finished with weather resisting black stove enamel. The energised element is a folded dipole, arranged to match correctly into 72 to 80 ohm co-axial feeder cable. The special centre insulator includes a gland to hold the cable, and connections can be made quite easily. The length of the folded portion is adjustable.

The positions of the two directors and one reflector are fixed at the optimum distances from the energised element — no benefit is obtained from varying these distances. The length of each element is, of course, adjustable over adequate limits.

The vertical brass tube is split and fitted with a device for fixing the tube to a mast. Also available is a mounting plate (Cat. No. 762) to enable the vertical tube to be fixed to suitable rotating gear.

The aerial should be erected in as clear a spot as possible. Feeder losses at 145 Mc/s. are appreciably greater that at say 60 Mc/s. and the feeder should not be any longer than necessary. Several manufacturers offer suitable co-axial cable, which should not exceed $\frac{5}{16}$" diameter.

METHODS OF ADJUSTMENT.

For preliminary experiments, the folded dipole element should be made about 37½-in. long, the directors somewhat shorter (about 37-in.) and the reflector several inches longer. The coupling loop on the transmitter should be set so that, with the feeder cable plugged in, the P.A. Valve draws between 70 and 80 mA. Further adjustments of the element lengths can then be made, until the anode current reaches a maximum value, indicating resonance of the aerial, as a whole, with the actual operating frequency.

Further tests can be carried out with a field strength meter, if one is available, but care is necessary that the results obtained are not affected by reflections from nearby metal objects, such as guy wires, gutters and pipes.

SWITCHING.

When used for both transmitting and receiving purposes, it will, of course, be necessary to arrange for some means of quickly changing over the aerial feeder from transmitter to receiver and *vice versa*. The best method is to mount a small relay (or two relays), designed for R.F. applications, inside an Eddystone Cat. No. 650 metal box. The latter should be provided with three co-axial sockets, one to take the incoming feeder, and one each for the auxiliary feeder cables to the transmitter and converter.

If the switch for controlling the transmitter is a double pole type, one pole can be employed for the normal A.C. switching and the other for energising the aerial relay in the appropriate direction.

Alternatively, an ordinary change-over toggle switch may be used but some loss at V.H.F. will be inevitable, although, since the impedance is low, the loss will not be serious.

USING THE CONVERTER WITH THE EDDYSTONE " 640 " RECEIVER.

The many excellent features incorporated in, and the high standard of performance possessed by the Eddystone " 640 " Receiver are sufficiently well known as to need no elaboration here. Suffice to say that the 145 Mc/s. Converter and the " 640 " Receiver form an ideal combination, with which first class results are obtainable on the 145 Mc/s. band.

The " 640 " is set up for normal operation — which may be either telephony or C.W. The inner wire of the co-axial cable from the Converter is connected to the " A " terminal and the outer screen to the " AE " terminal. The " 640 " tuning is set to a frequency near 10 Mc/s., as indicated by an increase of noise level. Tuning is then carried out on the dial of the Converter — a very fine adjustment is possible by varying the band-spread tuning of the " 640 " over a small range.

The combination of Converter and " 640 " Receiver gives a very high sensitivity figure and it will rarely be necessary to have full R.F. gain on the " 640." The noise limiter on the latter will be found very useful if interference from car ignition systems is experienced.

The power unit in the " 640 " will not supply the requirements of the Converter, without a certain amount of overheating and a separate power unit is advisable.