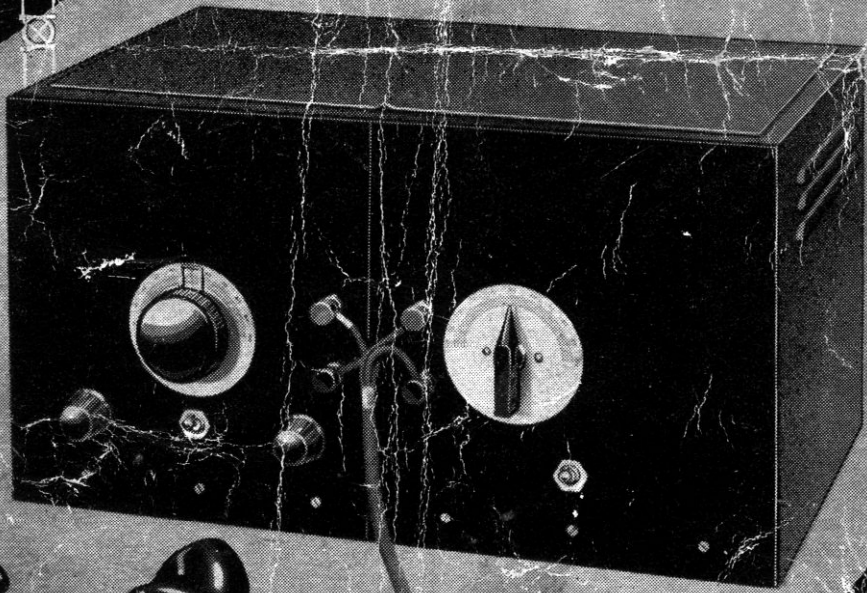


№ 3

EDDYSTONE

Short Wave MANUAL



ULTRA SHORT WAVE
RADIO TELEPHONE

PRICE
1

CONSTRUCTIONAL
ARTICLES for

SHORT WAVE RECEIVERS AND TRANSMITTERS

THE ordinary broadcast side of wireless on the medium and long waves under existing circumstances, has lost much of its early appeal to the real radio enthusiast. This is due to the range of these wavelengths being limited and the general reception conditions a known quantity.

Short wave radio, on the other hand, offers the World as a field for reception with that unknown factor, the ether, to add to the thrill of the game. Further, on the ultra short waves, which are coming into greater prominence and use, there exists a whole field for genuine experiment at present comparatively unexplored.

We hope that this third number of the Eddystone Short Wave Manual will prove of help and interest to those who wish to join the ranks of radio enthusiasts who find this the most interesting side of wireless.

Stratton & Co. Ltd.,
Eddystone Works,
Bromsgrove Street,
BIRMINGHAM 5

EDDYSTONE

SHORT WAVE MANUAL

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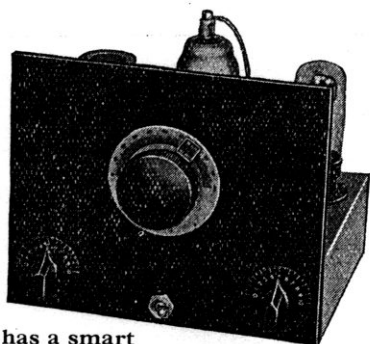
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THE ALL WORLD TWO

15.5 TO 52 METRES.

A POWERFUL 2 VALVE SHORT WAVE BATTERY RECEIVER
WITH BANDSPREAD TUNING.



The set has a smart front appearance—

The Eddystone All World Two receiver is designed to give adequate world wide head-phone reception with a minimum expenditure. It is the outcome of considerable research in our laboratory and during extensive tests results were highly satisfactory; America, Australia and other long distant stations being consistently received with good volume and quality.

The set is inexpensive and easy to build; simple to operate and has small current consumption. It is equally suitable for short wave broadcast or amateur band reception since it is fitted with the special Eddystone Bandspread Tuning unit, which allows continuous bandspreading on all wavebands. The waverange covered by the two coils supplied with the receiver is 15 to 52 metres, but if it is wished to receive on intermediate bands between 50 and 200 metres, extra coils are available and no structural or wiring alterations necessary.

There is a high degree of sensitivity combined with low noise level, and careful design of the aerial input circuit has completely eliminated tuning blind spots. Constant and smooth reaction has negligible effect on tuning and complete stability of handling is assured. A rigid die-cast chassis houses the component parts and provides ample screening.

The theoretical circuit embodies a screened H.F. Pentode valve followed by an audio stage which can use either triode or pentode valve as desired. The aerial input circuit, although simple in design, was only satisfactorily developed after protracted experiments on many different types of aerials.

It ensures complete freedom from tuning blind spots, thus saving the extra cost of an H.F. stage which is the generally accepted medium for overcoming such trouble. Regeneration is obtained by a modified Reinartz circuit, feedback current being controlled by varying the S.G. voltage with a potentiometer. The high tension battery is suitably isolated to prevent current leakage through the potential divider circuit.

CONSTRUCTION.

Proceed as follows:

The sockets for the aerial and earth and 'phone strips should be mounted and the strips finally screwed on the back of the chassis by the $\frac{1}{4}$ " 6BA roundhead screws provided.

All holes in the chassis marked "E" on the practical wiring diagram *must* be carefully scraped above and below the chassis as earth connections are made at these points.

Mount the 1+1 mfd. condenser on the front of the chassis with countersunk screws, and fix the two valveholders and coil base in position. Do not forget the soldering tags "E" under some of the fixing screws.

The reaction trimmer is now mounted in its appropriate fixing holes. The reaction potentiometer, on-off switch and tank condenser should be assembled on the chassis, the panel and 0-10 scales fitted, and the panel held in position by the switch, condenser and potentiometer fixing nuts.

To ensure absolutely noiseless reaction control the specified variable potentiometer should be used.



and a tidy, attractive chassis lay out.

ALL WORLD TWO—continued

The tank condenser spindle should be turned until the moving plates are fully out of mesh with the fixed plates and the pointer knob fixed opposite the 0 division on the scale by screwing up the small grub screw. By turning the knob clockwise, the condenser will rotate in 10 steps up to the maximum capacity.

Turn the reaction spindle as far anti-clockwise as it will go, and fix the pointer knob so that the pointer is placed at the position which the small hand of a clock points to at eight o'clock.

It is advisable to leave the tuning condenser off the panel until all the wiring is finished. This enables the chassis to be mounted upside down on the edge of a table to facilitate wiring. Wires Nos. 9 and 10 may be connected at one end, but the free ends left until the rest of the wiring is completed.

Certain condenser and resistances not already assembled are automatically supported by their connections, so the wiring may now be commenced, and should be carried out without difficulty with the aid of the wiring plan on centre pages and point to point connection list on pages 4 and 5 overleaf.

RESISTANCE COLOUR CODE.

Resistance	Body	Tip	Dot
40,000 ohms	Yellow	Black	Orange
100,000 ohms	Brown	Black	Yellow
1 meg. ohms	Brown	Black	Green
3 meg. ohms	Orange	Black	Green
1,000 ohms	Brown	Black	Red

VALVES.

The kit has been designed around the Mullard SP2 Screened Grid and Mazda P220 Triode valves. The constructor may use any of the two other triode valves specified or alternatively one of the three pentode valves listed below.

The average total number of milliamps for any of the pentodes or triodes are given in the right-hand column below, from which it will be seen that the use of the pentode type of output does not increase the consumption of the receiver, but does in practice considerably add to the signal strength.

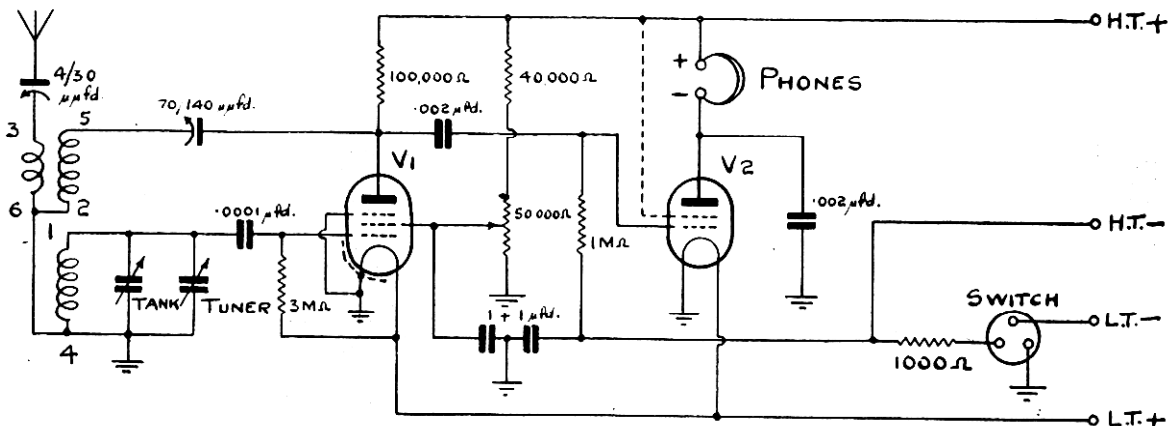
A five-pin valveholder is fitted in the output stage, the centre pin automatically connecting the auxiliary grid to the H.T. supply when a pentode is used.

An automatic bias resistance is incorporated in this receiver, and it has been calculated to be equally suitable for the following output valves :

(a)	(b)	Total Milliamps with Detector Valve	
TRIODE VALVE (7/-)	PENTODE VALVE (13/6)	(a)	(b)
Mazda P220	Mazda Pen. 220	4.5	4.8
Osram LP2	Osram PT2	4.55	5.1
Mullard PM2A	Mullard PM22A	4.55	3.95

CONNECTING UP.

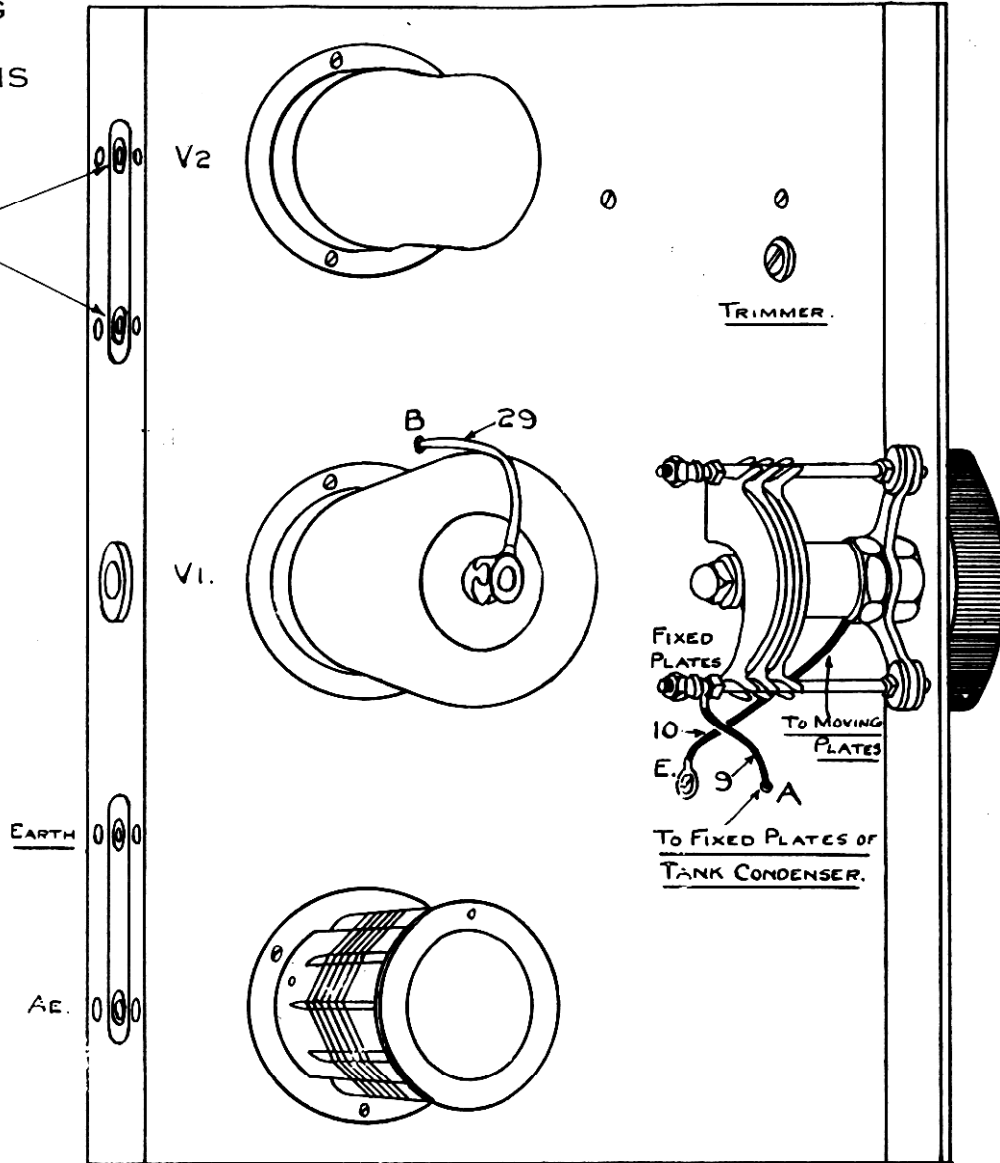
Place the desired Coil in the coil base, a Mullard SP2 Valve in the first valveholder V1, and the appropriate Output Valve in V2. Use a pair of 2,000 ohm headphones in the 'phone sockets and connect aerial and earth leads. Put the on-off switch in the "off" position (turned left) and connect up the H.T. and L.T. batteries.



THEORETICAL CIRCUIT.

WIRING
PLAN—
CHASSIS
TOP

PHONES



EARTH

AE.

TRIMMER.

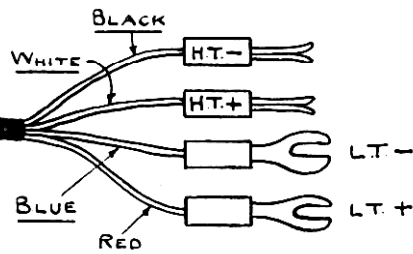
FIXED
PLATES

10

E

To MOVING
PLATES

To FIXED PLATES OF
TANK CONDENSER.



BATTERY LEADS.

The end of the battery cable should be stripped of its braiding for about 6 inches and the leads placed through the hole in the back of chassis and wired up as follows:—

- L.T.+ (Red) to No. 5 Socket of V1.
- L.T.- (Blue) to Top Tag of On-Off Switch.
- H.T.+ (White) to + Phone Socket.
- H.T.- (Black) to Condenser Block.

The end of the braiding may be bound with twine to make a neat ending.

ALL WORLD TWO

Point to Point Connections—cont'd.

- *27 One end of .002 mfd. Condenser to Grid Socket of V2.
 - *28 Other end of this Condenser to Reaction Trimmer.
 - *29 Same Connection of Trimmer, through B in chassis, to Top Cap of V1.
 - *30 One end of 100,000 ohms Resistance to same Side of Trimmer.
 - *31 Other end of 100,000 ohms Resistance to + Phone Socket.
 - *32 End Tag of Reaction Control to Soldering Tag E.
 - *33 Tag of Reaction Control to 40,000 ohms Resistance.
 - *34 Remaining end of 40,000 ohms Resistance to Connection No. 31.
 - *35 Filament Socket of V2 to Soldering Tag E.
 - *36 Centre Socket of V2 to Connection No. 31.
 - *37 Anode Socket of V2 to - Phone Socket.
 - *38 One end of .002 mfd. Condenser to Anode Socket of V2.
 - *39 Other end of .002 mfd. Condenser to Boss E.
- *No wire is necessary on these connections as contact is automatically made by the tags or wire ends of the components concerned.

ALL WORLD TWO—continued OPERATION.

Unscrew aerial trimmer to nearly minimum capacity and put tuning dial at 0° and the tank condenser at position 0. Switch on by turning the switch to the right, and adjust reaction trimmer until a faint rushing sound is heard in the phones when the reaction control is turned three-quarters of the way clockwise. It will generally be found that the reaction trimmer has to be screwed fully clockwise for correct oscillation. Stations may now be tuned in. Leaving the tank condenser at 0, turn the tuning dial from 0 to 100 degrees, keeping the set just off the verge of oscillation for telephony and weakly oscillating for C.W. signals. Stations will now be heard. Turn tank condenser to No. 1 position and again tune from 0 to 100 degrees, and so on until the whole 10 positions of the tank condenser have been explored. *The receiver should not be calibrated until the optimum setting of the aerial trimmer has been found.* Proceed likewise with other coil.

For the best results with any aerial, the aerial trimmer screw should be turned half a turn clockwise at a time until a blind spot is found on one of the two coils. Then reduce the setting of this condenser until the blind spot disappears. This position will give maximum selectivity and sensitivity. *In short, use as much capacity as possible for the aerial trimmer, consistent with freedom from blind spots.* The set may now be calibrated, but the aerial trimmer should not be re-adjusted again since this would alter calibrations.

To achieve maximum efficiency however, a larger value condenser (our Catalogue No. 1013 being quite suitable) may be used in place of the aerial trimmer. Blind spots may be present but can usually be moved to a part of the band which does not matter. If this alteration is made the wave range charts on page 7 will not apply.

If no signals are heard, check the receiver with a milliammeter and a voltmeter. The following voltages and currents should obtain with 115 volt H.T. supply :

SP2—

Anode Current (approx.) 0.25 m.a.
Anode Voltage 90 volts.

P220—

Anode Current 3 m.a.
Anode Voltage 115 volts.

Potentiometer Current 1.25 m.a.

Total Current 4.5 m.a. at 115 volts.

These figures are for an average kit and will vary slightly for individual receivers.

CONTINUOUS BANDSPREADING.

Tuning is accomplished by means of two parallel condensers. The band required is selected by the large condenser which is variable in ten equal steps only and is called the tank condenser. A small vernier condenser slightly larger in capacity than the capacity difference between the steps on the tank condenser, is used for final tuning.

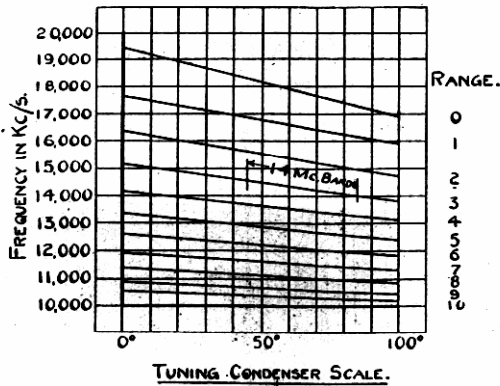
Suppose the coils were tuned in the normal way with a .00016 mfd. variable condenser. Then the 6LB coil would tune from approximately 19,350 kc/s. at 0° on the dial to 10,100 kc/s. at 100°. Thus, a frequency bandwidth of 9,250 kc/s. is obtained by turning the condenser through 100 degrees on the dial. With the bandspreading system employed in this receiver the band required is selected by putting the tank condenser knob on, say, No. 5 position, and the small tuning condenser then tunes a frequency bandwidth of only 855 kc/s. approximately, as the dial is rotated from 0 to 100 degrees. Since we have only covered a 1/10th of the previous waveband tuning is ten times as easy as with a normally tuned receiver. As the tuning condenser has a 9:1 slow motion head incorporated in its movement, it will be appreciated that tuning difficulties are still further decreased.

To give the constructor an idea of how the various bands are "spread" the curves on page 7 were taken on a specimen receiver. These show the effect of bandspreading, the numbers on the curves indicating the position of the pointer knob on the tank condenser, while the figures on the horizontal line refer to the degrees on the tuning condenser dial.

It will be seen that the 14 megacycle amateur band is "spread" over 40 degrees on the 6LB coils, while the 6Y coil brings in the 7 megacycle band over 80 degrees on the dial. These figures clearly show why this receiver is suitable for amateur reception. The overlaps between the various settings of the tank condenser have been designed so that no stations will be missed.

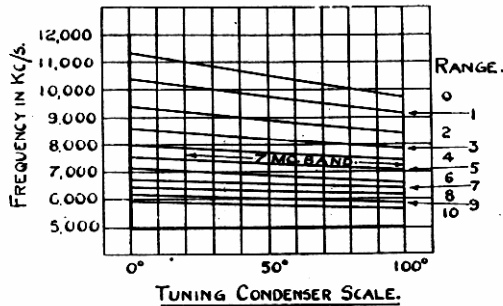
ALL WORLD TWO—continued

COIL 6LB.



Waverange: 19,350 Kc/s - 10,100 Kc/s.
(1.5m.—29.7m.)

COIL 6Y.



Waverange: 11,350 Kc/s—5,650 Kc/s.
(26.45m.—52.7 m.)

NOTE :

It must be emphasised that the curves shown are for an average receiver and are drawn to give the listener some knowledge of the wavelengths covered by each position of the tank condenser. Individual receivers will vary somewhat, due to different valve and circuit capacities, and the effect of aerial load, although minimised in this receiver, will influence the wavelengths covered to a small degree.

AS S.W. ADAPTOR.

This receiver provides an efficient alternative to the super-het type of short wave converter. Its output can easily be connected to the pickup terminals of a broadcast receiver by a 1-1 transformer.

EDDYSTONE PARTS.

	Price
1 6-pin Low Loss Coil, type 6LB	4/-
1 6-pin Low Loss Coil, type 6Y	4/-
1 Patented Tank Condenser with Knob and Graduated Dial Plate, Cat. No. 1042	6/-
1 Bandsread Condenser Unit with Slow Motion Head, Knob, Dial and Cursor, Cat. No. 1043	6/6
1 Short Wave Mica Trimmer Condenser, Cat. No. 1023	1/-
1 Low Loss Valveholder, Cat. No. 954 ..	1/-
1 Low Loss Valveholder, Cat. No. 964 ..	1/3
1 Low Loss Valveholder, Cat. No. 985 ..	1/4
1 1 x 1 mfd. Fixed Condenser	4/-
1 Aluminium Die-Cast Chassis, drilled all necessary holes, finished inside and out battleship grey cellulose ..	12/9
1 Burr Walnut Bakelite Panel, drilled necessary holes	2/9
2 Bakelite Terminal Panels	6d.
1 Scale and Pointer Knob, 1 1/4" dial ..	1/-
1 Special 50,000 ohm Variable Potentiometer	5/-
1 Welded Steel Cabinet, finished dark crystalline brown, Cat. No. 1061 ..	9/6

MISCELLANEOUS PARTS.

1 70/140 m.mfd. Trimmer Condenser ..	
1 3-point Switch	
2 Dubilier Condensers, .002 mfd. ..	
1 Dubilier Condenser, .0001 mfd. ..	
1 Erie Resistor, 1,000 ohms, 1 watt ..	
1 Erie Resistor, 40,000 ohms, 1 watt ..	
1 Erie Resistor, 100,000 ohms, 1 watt ..	
1 Erie Resistor, 3 megohm, 1 watt ..	
1 Erie Resistor, 1 megohm, 1 watt ..	
Length 4-way Cable	
4 Clix Parallel Plugs and Sockets (2 red and 2 black)	
1 pair Clix Spades, red and black ..	
1 pair Clix Wander Plugs, red and black	
Valves. Mullard SP2	
Output valve as detailed in instructions (Triode or Pentode).	
Connecting Wire, Screws, Tags, Nuts, Thimble Clip, etc.	
Approximate Total Cost of Complete Kit, 67/6 (less valves).	

ADDITION OF H.F. AMPLIFIER.

The performance of the All World Two can at any time be extended by the use of the H.F. amplifier unit described on page 34. In this case the output of the amplifier should be connected to end 1 of the grid coil in the All World Two. If a common battery supply is used, note special remarks in H.F. amplifier article, otherwise automatic G.B. of All World Two will be shorted.

THE "EVERYMAN" SHORT WAYER

A 4-VALVE BATTERY RECEIVER WITH BANDSPREAD TUNING.

15 - 100 METRES.

Here is a specially designed short wave receiver which is simple to construct and relatively inexpensive. An ideal set capable of giving loud speaker results that will satisfy the ardent short wave enthusiast.

The circuit has been based on that of the Eddystone "Kilodyne Four," a set which has already achieved a world-wide reputation for performance and reliability. The patented method of bandspread tuning makes the receiver easy to handle and facilitates the thrill of world-wide reception on the short wave bands. The circuit consists of a high frequency amplifier, detector and two low frequency stages. It is free from "blind spots" or hand capacity, and has smooth and gentle reaction control. The set does not re-radiate and can be used without any interference to the general domestic receiver.

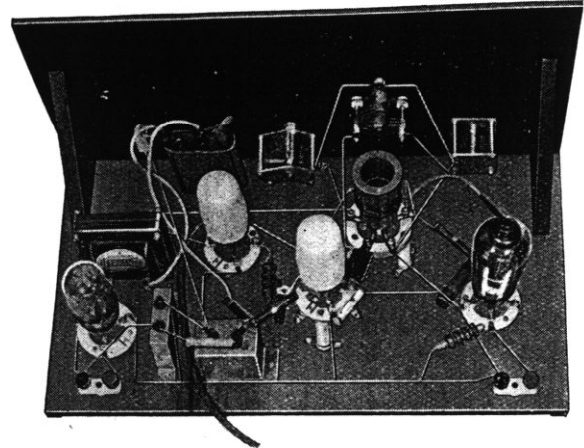
CONSTRUCTION.

The wiring plan and point to point connection details make this quite straightforward. It is best to proceed as follows:—

Make up panel and baseboard as shown in sketch on page opposite. Only simple tools are needed and plywood will be most suitable. The chassis or panel can, of course, be polished to suit individual choice. A metal panel is not recommended, it may cause hand capacity. The assembly comes next; but first for ease of wiring, it will be advantageous to tin or give the connecting points a coat of solder before parts are fixed in place.

Lay out components as shown in wiring plan and proceed to fasten them down. It should be noted that the coil base and valve-holder of V2 are mounted on insulating pillars. When fixing variable condensers to panel take care to bed down squarely otherwise pointer may foul panel.

Make sure in the wiring that all joints are strongly made. One poor or high resistance joint can adversely affect the set's performance, or alternatively may give the set a very high background noise level which is most undesirable.



Baseboard view showing general lay out of components.

BATTERIES.

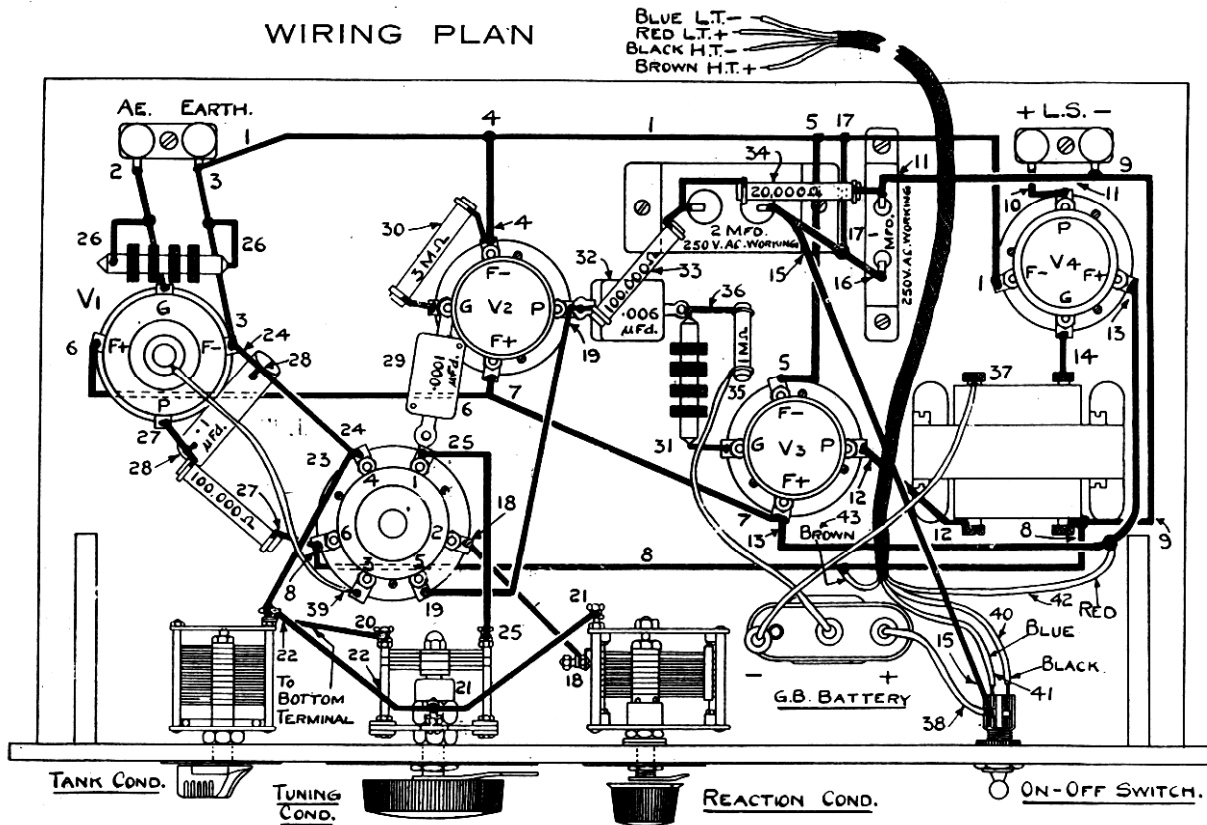
A 2-volt low-tension is needed, the Exide D.F.G. or larger capacity being suitable. High-tension should be a minimum of 120 volts. This can, with some advantage to quality, be increased to 150 volts. The grid bias battery should be $4\frac{1}{2}$ volts. G.B. - 1 from the 1 meg. leak goes to the $1\frac{1}{2}$ volt tapping, G.B. - 2 from the transformer to 3 or $4\frac{1}{2}$ volts according to anode voltage used. L.T. current is .55 amperes and H.T. 12-m/a at 120 volts. On the battery leads there are two spade connections to L.T. battery and two wander plugs for H.T. battery.

TRYING OUT AND OPERATING THE SET.

Insert a coil, and then starting with both tuning, tank, and reaction condenser at minimum, switch on the receiver. Increase the reaction control slowly by means of the vernier knob until at a certain point the set will begin to oscillate; this will be noticeable immediately, since a low "rushing" sound will be heard. Throughout the whole tuning operations, this reaction control should be so adjusted that the set is always only just in the oscillating condition. The reaction control should never be turned any more than is necessary for the first reaction sound to be

"EVERYMAN" SHORT WAVE—continued

WIRING PLAN



POINT TO POINT CONNECTIONS.

- | | |
|--|---|
| <p>1—Earth Terminal to F neg. of V4.
 2—Aerial Terminal to G of V1.
 3—Earth Terminal to F neg. of V1.
 4—Wire No. 1 to F neg. of V2.
 5—Wire No. 1 to F neg. of V3.
 6—F + of V1 to F + of V2.
 7—F + of V2 to F + of V3.
 8—No. 6 of Coil Holder Socket to Plate Terminal of Transformer.
 9—Plate Terminal of Transformer to L.S. neg. Terminal.
 10—L.S. + Terminal to "P" of V4.
 11—L.S. neg. Terminal to 1 mfd. Condenser.
 12—"P" of V3 to H.T. + of Transformer.
 13—F + of V3 to F + of V4.
 14—G. of V4 to GRID of Transformer.
 15—On-Off Switch to 2 mfd. Condenser.
 16—2 mfd. Condenser to 1 mfd. Condenser.
 17—Wire No. 1 to Wire No. 16.
 18—No. 2 Socket of Coil Holder to Fixed Plates of Reaction Condenser.
 19—No. 5 Socket of Coil Holder to "P" of V2.
 20—Fixed Plates of Tuning Condenser to Fixed Plates of Tank Condenser.
 21—Moving Plates of Reaction Condenser to Moving Plates of Tuning Condenser.
 22—Moving Plates of Tuning Condenser to Moving Plates of Tank Condenser.
 23—Moving Plates of Tank Condenser to No. 4 Socket of Coil Holder.
 24—No. 4 Socket of Coil Holder to F neg. of V1.</p> | <p>25—No. 1 Socket of Coil Holder to Fixed Plates of Tuning Condenser.
 26—H.F. Choke across Aerial and Earth Terminal.
 27—100,000 ohm Resistance :—From No. 6 Socket of Coil Holder to "P" of V1.
 28—One End of .1 mfd. Condenser to "P" of V1. Other End to "F" neg. of V1.
 29—One End of .0001 mfd. Condenser to No. 1 Socket of Coil Holder. Other End to "G" of V2.
 30—One End of 3 meg. Resistance to "F" neg. of V2. Other End to "G" of V2.
 31—One End of H.F. Choke to "G" of V3.
 32—Other End of H.F. Choke to .006 mfd. Condenser. Other End of .006 Condenser to "P" of V2.
 33—100,000 ohm Resistance to "P" of V2. Other End to 2 mfd. Condenser.
 34—One End of 20,000 ohm Resistance to 2 mfd. Condenser. Other End to 1 mfd. Condenser.
 35—Solder G.B. neg. 1 Lead to One End of 1 meg. Resistance.
 36—Other End of 1 meg. Resistance to junction of H.F. Choke and .006 Condenser.
 37—G.B. neg. 2 Lead to G.B. Terminal of Transformer.
 38—G.B. + Lead to On-Off Switch.
 39—Lead from No. 3 Socket on Coil Base to Top Terminal of S.G. Valve.
 40—Black Lead of 4-way Battery Cable to On-Off Switch.
 41—Blue Lead of 4-way Battery Cable to On-Off Switch.
 42—Red Lead of 4-way Battery Cable to No. 13 Wire.
 43—Brown Lead of 4-way Battery Cable to No. 8 Wire.</p> |
|--|---|

“EVERYMAN” SHORT WAVE—continued

It must be emphasized that the curves shown are for an average receiver and are drawn to give the listener some knowledge of the wavelengths covered by each position of the Tank Condenser. Individual receivers will vary somewhat, due to different valve and circuit capacities, and the effect of aerial load, although minimised in this receiver, will influence the wavelengths covered to a small degree.

EDDYSTONE PARTS.

	Price
1 Tank Condenser, No. 1042	6/0
1 Bandsread Condenser, No. 1043	6/6
1 Reaction Condenser, No. 957	6/1
2 H.F. Chokes, No. 1010, 2/- each	4/1
4 949 Valveholders, 1/5 each	5/8
2 1046 Terminal Blocks, 1/- each	2/1
6 1028 Pillars, 4½d. each	2/3
1 6-pin Base, 969	2/3
3 Coils, 6LB, 6Y, 6R	12/0

MISCELLANEOUS PARTS.

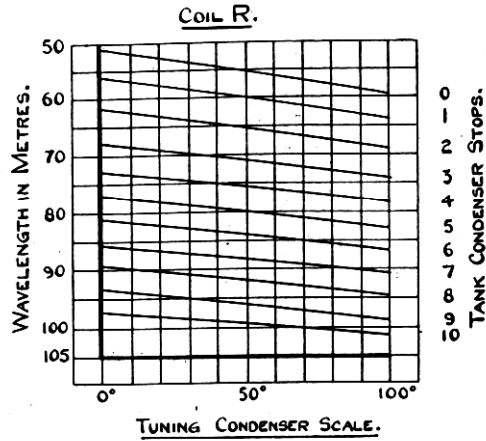
- 1 .0001 Fixed Condenser
- 1 .006 Fixed Condenser
- 1 .1 mfd. Condenser
- 4 Erie Resistances
- 1 3-point Switch
- 1 Ferranti AF4 Transformer
- 1 2 mfd. Condenser
- 1 1 mfd. Condenser
- 1 G.B. Battery, 4.5 volts
- 1 G.B. Battery Clip
- Set of Leads
- 5 Plugs
- 2 Spade Terminals

This set is not supplied as a complete kit, but for reference the approximate cost of the parts is 83/6 less valves.

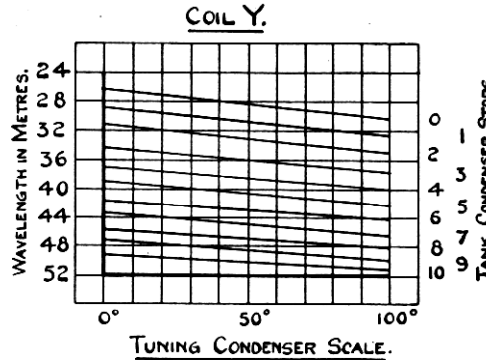
The following valves have been selected as most suitable for this set :—

V.1 (H.F. Position)—	
Mazda SG. 215	11/-
V.2 (Detector)—	
Mazda H.L.2. Metallised	4/9
V.3 (L.F.)—	
Mazda H.L.2. Metallised	4/9
V.4 (Output)—	
Mazda P.220	6/-

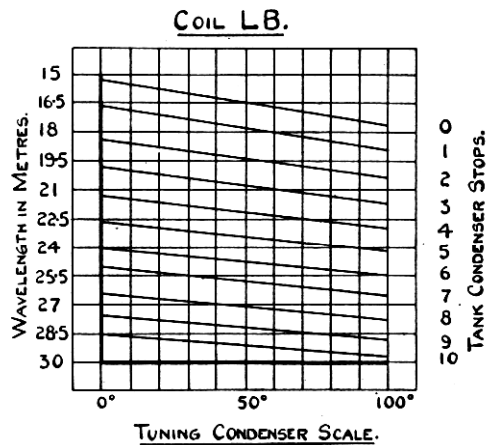
Other makes can be used provided they have similar characteristics and are free from microphonic noises.



WAVE RANGE :- 51.0 M.—101.8 M.
(5,880 Kc/s.—2,947 Kc/s.)



WAVE RANGE :- 26.3 M.—51.6 M.
(11,407 Kc/s.—5,800 Kc/s.)



WAVE RANGE :- 15.25 M.—29.8 M.
(19,670 Kc/s.—10,067 Kc/s.)

SHORT WAVE AERIALS

An efficient short wave aerial should have the following characteristics:—

- (a) Good pick-up.
- (b) High signal to noise ratio.
- (c) Resonate on certain desired frequencies and be semi-aperiodic on other frequencies.
- (d) Its impedance must be matched to the input impedance of the receiver.

PICK-UP.

The first condition is easily attainable provided high conductivity copper wire is used in the installation and the aerial is erected in a position where dielectric losses are at a minimum, *i.e.*, well away from buildings and trees and particularly metal objects, such as drainpipes, gutters, metal roofs, and telephone or power lines. Since the current induced in an aerial is directly proportional to the effective height of the latter it is essential to erect the aerial as high as circumstances permit.

HIGH SIGNAL/NOISE RATIO.

The signal to noise ratio is one of the most important factors to be considered in the design of an aerial. Due to thermal agitation, shot effect and Johnson noise, there is always a considerable amount of noise present in a radio receiver, and it is a problem to reduce this to a minimum. It is in the first stage that these effects are troublesome since the noise level developed is amplified by each succeeding valve. Therefore, no radio signal of less intensity than this noise level will be reproduced in the loud speaker and if the strength of the weak signals can be increased *before* they reach the receiver input then many more stations will be heard.

In practice the strength of the weak signals is increased by the use of resonant aerials, and the man-made static present in densely populated areas is reduced by using transposed lead-in wires.

Figure 1 shows the detector input of a radio receiver during a period of short wave listening. The set is being used in a densely populated area where the interference noise is high, approximately 30 db, above the noise level of the receiver. A weak station giving 20 db input is therefore not heard in the speaker since it is 10 db below the level of the interference.

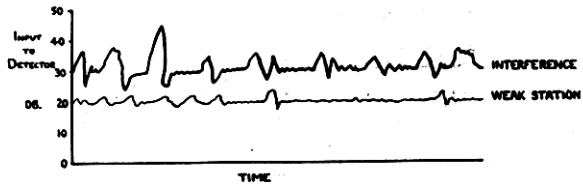


FIG. 1

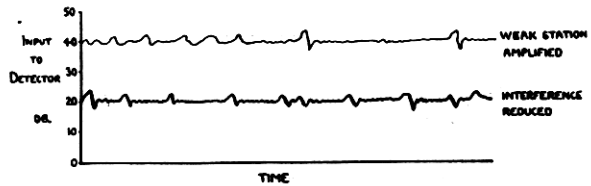


FIG. 2

By using a resonant aerial adjusted to the station being received, the strength of the weak station may be increased to say 40 db as shown in Figure 2. A crossfeeder lead-in system will reduce both the intensity and level of the man-made interference to 20 db. It will be seen that the radio signal is now heard clearly above the interference level which previously drowned the weak signal.

RESONANT AERIALS.

The use of resonant aerials on short waves is a practical proposition since the wavelengths are small and aerials whose physical dimensions are $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, or a full wavelength long, do not occupy too much space. For example, a half-wave doublet tuned to 30 metres only requires a top span of 45 feet.

IMPEDANCE MATCH.

If an aerial of 400 ohms impedance is connected to a feeder line of equal value, no voltages will be impressed in the feeders. The maximum output from any generator is obtained when the impedance of the load equals the internal impedance of the generator. If an inverted "V" aerial has a terminating impedance of 400 ohms, the feeder line should have a corresponding value. Half-wave aerials have an extremely high impedance when measured across their ends, but by feeding the line near the centre the impedance is reduced to a few hundred ohms and maximum transference of energy will take place. The sets described in this Manual are so arranged that the aerials mentioned here can be successfully used.

SHORT WAVE AERIALS—continued

TYPES OF AERIALS.

- There are two types of short wave aerials :
- (1) Non-resonant.
 - (2) Resonant.

In the first category there is the conventional Inverted L and T aerials, which are quite efficient, particularly in districts where little interference is present. Small space is required for their erection.

Where plenty of ground space is available and interference is negligible, the "Inverted V" aerial is suggested. This aerial has to be resonant on the desired wavelengths if maximum efficiency is desired.

For town and general use the Crossfeeder type of aerial with transposed lead-in is recommended since not only is an improved short wave performance obtained, but the interference due to man-made static is reduced, as Figures 1 and 2 show.

This short discussion on aerials will help the reader to decide which aerial best suits his own conditions and the above types of aerials will be dealt with in detail.

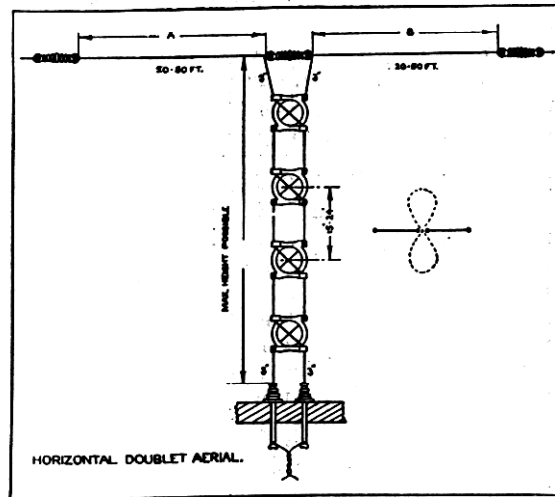
1. "INVERTED L" OR "T" AERIAL.

This type of non-resonant aerial for general short wave reception is made about 60 feet long from the free end of the aerial to the set. The down-lead is kept well away from buildings and not allowed to run close to the wall of the house. In the case of the "T" aerial the down-lead should be taken from the centre and soldered. The best method of obtaining the down-lead for the "Inverted L" aerial is to continue the horizontal portion by securely twisting it at the insulator and so avoiding the necessity of making a soldered joint.

2. CROSSFEEDER DOUBLET AERIAL.

The Eddystone Crossfeeder Doublet is a static-free, large signal to noise ratio aerial. Basically, it is a form of Hertz aerial, and as such, the two top sections can be cut to a definite length to give maximum response at certain frequencies. The top section is cut to the length corresponding to a half-wavelength of the station which it is desired to receive consistently.

To cut the lengths A and B of Figure 4 for any given frequency or wavelength, their combined length should be approximately



Figs. 4 and 4a.

one half of the wavelength of the desired station.

The formula for working out the length A+B for any given frequency is :

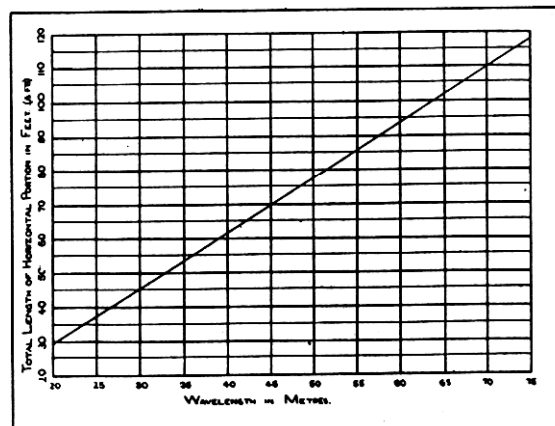
$$(A+B) \text{ ft.} = \frac{468,000}{\text{kc/s.}}$$

Remembering that

$$\text{Frequency in kc/s.} \times \text{Wavelength in metres} = 300,000,$$

it is easy to work out the length required for any given wavelength.

For the convenience of readers not wishing to work out these figures, the curve of Graph No. 2 has been prepared. An aerial designed for a frequency of 4,000 kc/s. (75 metres) will also resonate at its second harmonic 8,000 kc/s. (37.5 metres) and at its third harmonic on 16,000 kc/s. (18.75 metres).



Graph No. 2.

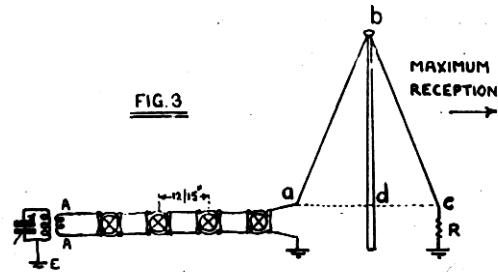
SHORT WAVE AERIALS—continued

The length of feeder line from the receiver to the aerial should be not less than a quarter of a wavelength, *i.e.*, greater than $\frac{1}{4}(A+B)$. The inset, Fig. 4(a), shows the directional property of the doublet, the aerial receiving the most energy from a direction at right angles to its own plane.

3. "INVERTED V" AERIAL.

When used on wavelengths above 25 metres the physical dimensions of this aerial become large and it has, therefore, become popular on lower wavelengths. It has the advantage of being semi-resonant over a wide waveband either side of the resonant frequency. For example, an aerial designed for 15 metres will give five times the performance of an ordinary aerial on this wavelength, on 20 metres a gain of three times, falling off gradually until about 40 metres, when no gain is obtained over the standard aerial systems.

Figure 3 illustrates the aerial, which consists of a wooden pole (bd) with the aerial wires (ab) and (bc) forming two sides of an

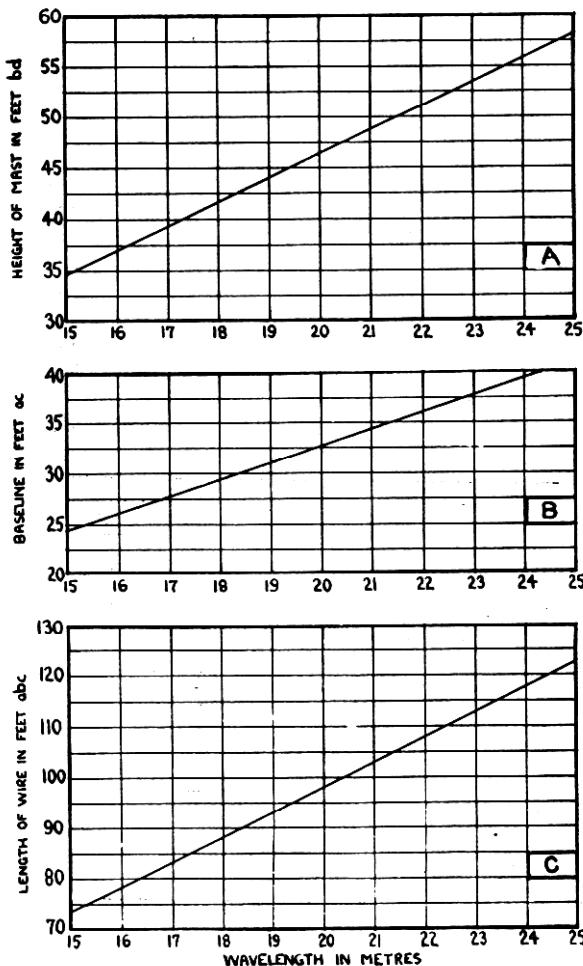


isosceles triangle (abc). The length (abc) is one continuous wire and the aerial is directional, receiving signals which are arriving parallel to the line joining the feeder and aerial in the direction nearest the matching resistance R. Resistance R should be about 400 ohms and of the non-inductive type. A metallised composition resistance is perfectly satisfactory but should be enclosed in a glass tube or waterproof box since it will be exposed to all kinds of weather. The earth lead should be fitted to the earth terminal of the receiver and the far end of the feeder line also earthed to the nearest point. Eddystone transposition blocks, Cat. No. 1041, may be used. 16 gauge wire is advised for the feeder line.

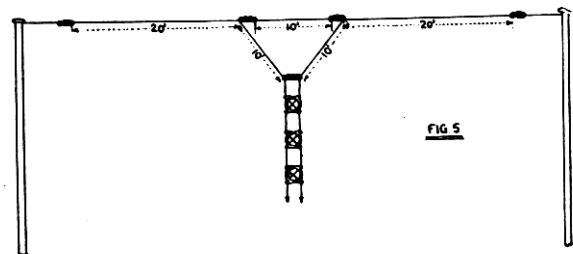
The length of wire (abc) should equal the length ac plus 1 wavelength, *i.e.* :

$$abc = ac + \lambda$$

It is not advisable to make ab a wavelength long as maximum signal to noise ratio occurs when ab or bc are an odd number of quarter wavelengths long. Graph 1 shows the correct length of the aerial wires for $ab=bc = \frac{\lambda}{4}$ as this enables the installation to be erected in a reasonably small space.



Graph No. 1.



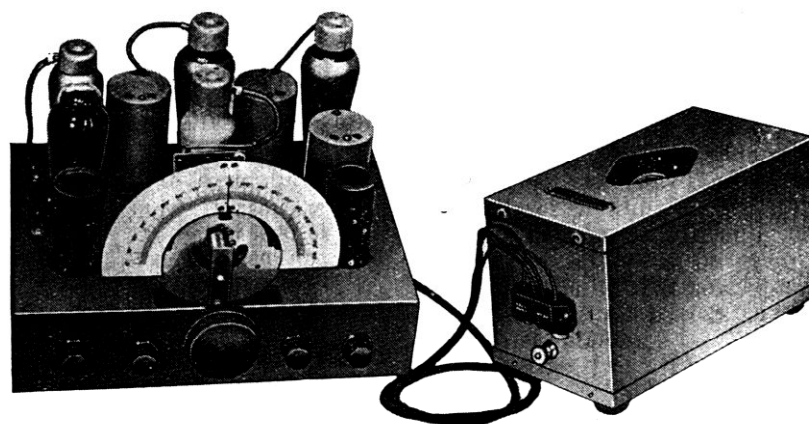
A simple all wave aerial, which can be coupled to the receiver without any form of matching transformer, is shown in Fig. 5. The dimensions given are for general short wave use.

Both the "Inverted V" and Doublet aerials are coupled magnetically to the receiver by means of the coupling coil provided in each range, and the earth terminal of the receiver taken to earth proper. The lead-in must be duplicated in order to connect both the feeder lines to the receiver.

5 VALVE SHORT WAVE SUPER-HETERODYNE RECEIVER

FOR A.C. MAINS

13.6 TO 80 METRES



This set, which has a first-class all round performance, is the result of our wish to produce at moderate cost a powerful and efficient A.C. super-heterodyne receiver, combining the advantages of automatic volume control, and a degree of selectivity adequately capable of meeting present-day demands.

As with the battery model, the avoidance of complicated design presents some difficulty, but here we have a simple yet powerful set, which is not difficult to build, and is easy to trim and gang without the necessity of elaborate equipment.

The short wave performance is proved, and the set can be adapted by interchangeable coils for medium and long waves without loss in efficiency.

The newcomer to constructional radio is not recommended to tackle this set as a first effort. The "Everyman's Short Waver," battery model on pages 8 to 11, is preferable as it is an extremely simple set for the beginner and no special technical knowledge is necessary.

The circuit of the A.C. super-heterodyne receiver embodies an X41 triode heptode valve as frequency changer, followed by two I.F. stages tuned to 465 K/cs. Then comes a double diode triode valve, one diode for detection, the other for automatic volume control.

The triode portion is used as a low frequency amplifier, resistance capacity coupled into a steep slope pentode output valve. The coils are easily interchangeable so that the receiver can be used on any wavelength between 13.6 and 2,000 metres.

To avoid complications, no H.F. stage is built into the receiver circuit. The H.F. pre-selector unit, described on page 34, can be added to the receiver at a later date if desired.

The performance is very good on all wavelengths, the set covering both medium and long wave-bands without any loss of efficiency on the short waves.

CONSTRUCTION.

The views of top and underside of chassis show the lay out of the parts, and the point to point wiring is easy to follow.

The metal chassis affords rigid and robust assembly which means complete stability of operation. The drawings give a clear general outline of assembly but the following points are of guidance. First mount valveholders, scraping paint from chassis at all points of earthing. The terminal panels are fixed with 6BA screws, earth connections being obtained from one screw on each of these panels. The

5 VALVE A.C. S.W. SUPER-HETERODYNE RECEIVER—continued.

resistors should be soldered to the special bakelite panel provided, this being mounted from chassis on 2" pillars. When set has been assembled, refer to lay out plan and circuit diagram to continue assembly and wiring.

It will be noticed that one end of the .1 mfd. tubular condensers is marked "outside foil" and this end must be connected to earth.

The power supply unit is separate from the set and is made by Messrs. Parmeko Ltd., of Leicester. It is suitable for inputs from 100 to 250 volts A.C. 40/60 cycles. Its output is 250 volts 40 milliamps for H.T., and 4 volts 5 amps. for L.T. winding. The rectifier valve is an Osram U10. The price of the complete unit is £4 2s. 6d. Parmeko Cat. No. RU6.

CONTROLS.

Taking front view facing set and working from left to right they are as follows:— Volume control, tone control, tuning dial which has a dual ratio of 22 : 1 and 115 : 1, local/distance switch (clockwise for reception of local stations and anti-clockwise for distance reception). Finally, at the right hand end of the set is the tuner trimming control.

CONNECTING UP.

The 4-way cable should be connected to terminal block on power unit as marked on wiring plan B. Attach aerial, earth and speaker, and the set is ready for trial. Although the intermediate frequency transformers are adjusted when leaving the Works, a slight re-adjustment may be necessary, owing to small variations in valves and circuit capacities. This is done by tuning in a station at low volume, and adjusting the sunken trimmer screws at the top of each I.F. transformer until the signal comes to maximum strength. The following sequence should be used—No. 2, No. 1, No. 3.

Greater ease and accuracy of trimming is obtained if a 465 K/c oscillator is available.

A simple and cheap oscillator for this purpose and its application is described on page 20.

The set has been designed to use with ordinary or doublet aerial. If the former is used it will be necessary to connect one of the aerial sockets to earth as shown in adjoining sketch.

COILS.

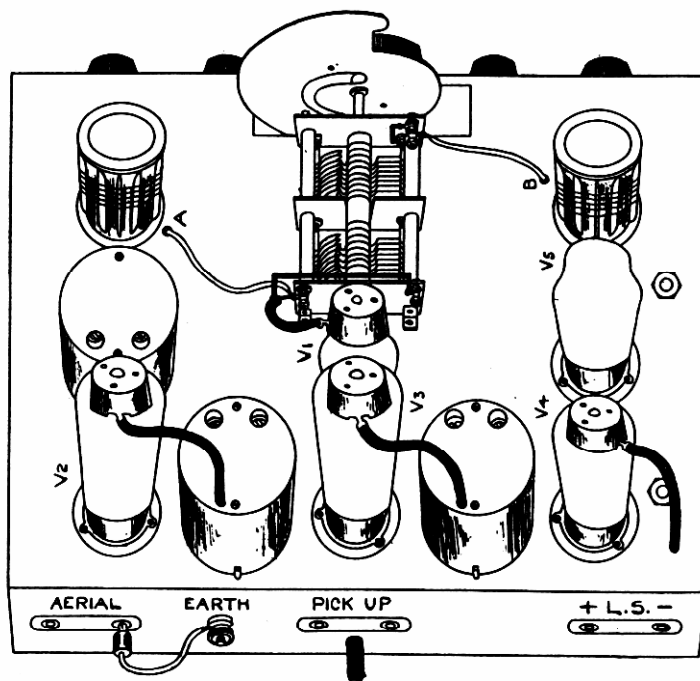
The standard kit of coils, Cat. No. 1065, comprises 3 pairs of coils tuning as follows:—

Blue Spot pair, 15.3 to 25.5 metres.
Yellow Spot pair, 23.25 to 46 metres.
Red Spot pair, 41.8 to 87.8 metres.

Additional coils for higher wavelengths are available as follows:—

Cat. No. 1065W. White Spot pair, 85.8 to 182.5 metres, at	7/6 per pair
Cat. No. 1065P. Pink Spot pair, 160 to 354 metres, at	8/6 per pair
Cat. No. 1065G. Green Spot pair, 250 to 560 metres, at	8/6 per pair
Cat. No. 1065GY. Grey Spot pair, 1,080 to 2,100 metres, at	10/6 per pair

The aerial coil in each pair is distinguished by two coloured spots and is fitted in the coil holder on the right hand side of the set when viewed from the front. The oscillator coil, which in each pair is marked with three coloured spots, is placed in the left hand coil holder.



Top View of Chassis showing lay out of Parts and Connections.

5 VALVE A.C. S.W. SUPER-HETERODYNE RECEIVER—continued

EDDYSTONE PARTS

	Price
1 Dual Ratio Dial, Cat. No. 1045	12/6
1 2-gang Condenser, 150 m.mfd. Sections, Cat. No. 967	17/6
1 Kit I.F. Transformers, complete with Screened Anode Leads and Valve (Cat. No. 1056, 465 K/cs.) Cows ..	30/0
2 4-pin Valveholders, Chassis Type 953, 10d. each	1/8
5 7-pin Valveholders, 985, 1/4 each	6/8
1 Microdenser, Type 900/40	4/3
1 Aluminium Die-cast Chassis, drilled all necessary holes, finished inside and out battleship grey cellulose	18/6
2 2" 6BA Erinoid Pillars, type 8P, 2d. each	4d.
4 1" Black Knobs, 1/4" hole, 6d. each	2/0
3 Terminal Panels (Chassis) with Plugs and Sockets, Cat. No. 1060, 9d. each	2/3
1 Kit of Special Coils in Metal Box, Cat. No. 1065, comprising 3 pairs, Types LB, Y, R	21/0

MISCELLANEOUS PARTS

- 1 Rotary On-off Switch
- 2 Erie 250,000 ohm Potentiometers
- 2 20 mfd. 20 volt Electrolytic Condensers, Dubilier, type 402
- 1 10-way Resistance Strip, Bulgin
- 9 .1 mfd. Wire-end Condensers, B.I., Dubilier or T.C.C.
- 7 Dubilier, type 670, .01 mfd. Condensers
- 5 Dubilier, type 670, .0001 mfd. Condensers
- 1 Dubilier, type 670, .001 mfd. Condenser
- 2 Dubilier, type 670, .002 mfd. Condensers
- 2 100 ohm 1/2 watt Resistors, Erie or Dubilier
- 1 145 ohm 1/2 watt Resistor, Erie or Dubilier
- 3 200 ohm 1 watt Resistors, Erie or Dubilier
- 1 1,000 ohm 1 watt Resistor, Erie or Dubilier
- 3 10,000 ohm 1 watt Resistors, Erie or Dubilier
- 1 15,000 ohm 1 watt Resistor, Erie or Dubilier
- 1 30,000 ohm 1 watt Resistor, Erie or Dubilier
- 1 40,000 ohm 1 watt Resistor, Erie or Dubilier
- 4 50,000 ohm 1 watt Resistors, Erie or Dubilier
- 1 60,000 ohm 1 watt Resistor, Erie or Dubilier
- 1 100,000 ohm 1 watt Resistor, Erie or Dubilier
- 1 100,000 ohm 1/2 watt Resistor, Erie or Dubilier
- 2 250,000 ohm 1/2 watt Resistors, Erie or Dubilier
- 3 500,000 ohm 1/2 watt Resistors, Erie or Dubilier
- 1 10,000 ohm 1/2 watt Resistor, Erie or Dubilier
- 1 2 megohm, one watt Resistor, Erie or Dubilier
- 1 length 4-way Cable, 1 1/2 yds.
- 1 W.O. Terminal
- 27 3/4" x 6BA Nuts and Bolts
- 20 6BA Tags
- 42 6BA Shake-proof Washers
- 7 ft. 16s. w.g. Tinned Copper Wire
- 7 ft. "Slide back" Connecting Wire

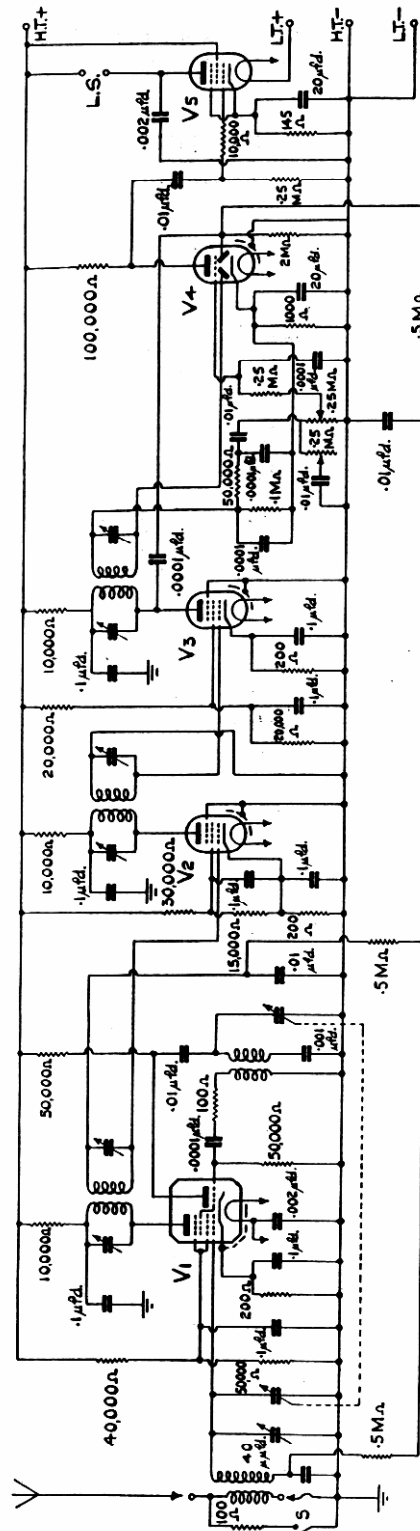
ACCESSORIES

- VALVES.
- 1 Osram X.41 7-pin Metallised
 - 2 Mullard V.P.4 7-pin Metallised
 - 1 Mullard T.D.D.4 7-pin Metallised
 - 1 Mullard PEN, 4 V.B., 7-pin
- Approx. Total Cost with Valves £13 7s. 6d.

POWER UNIT.

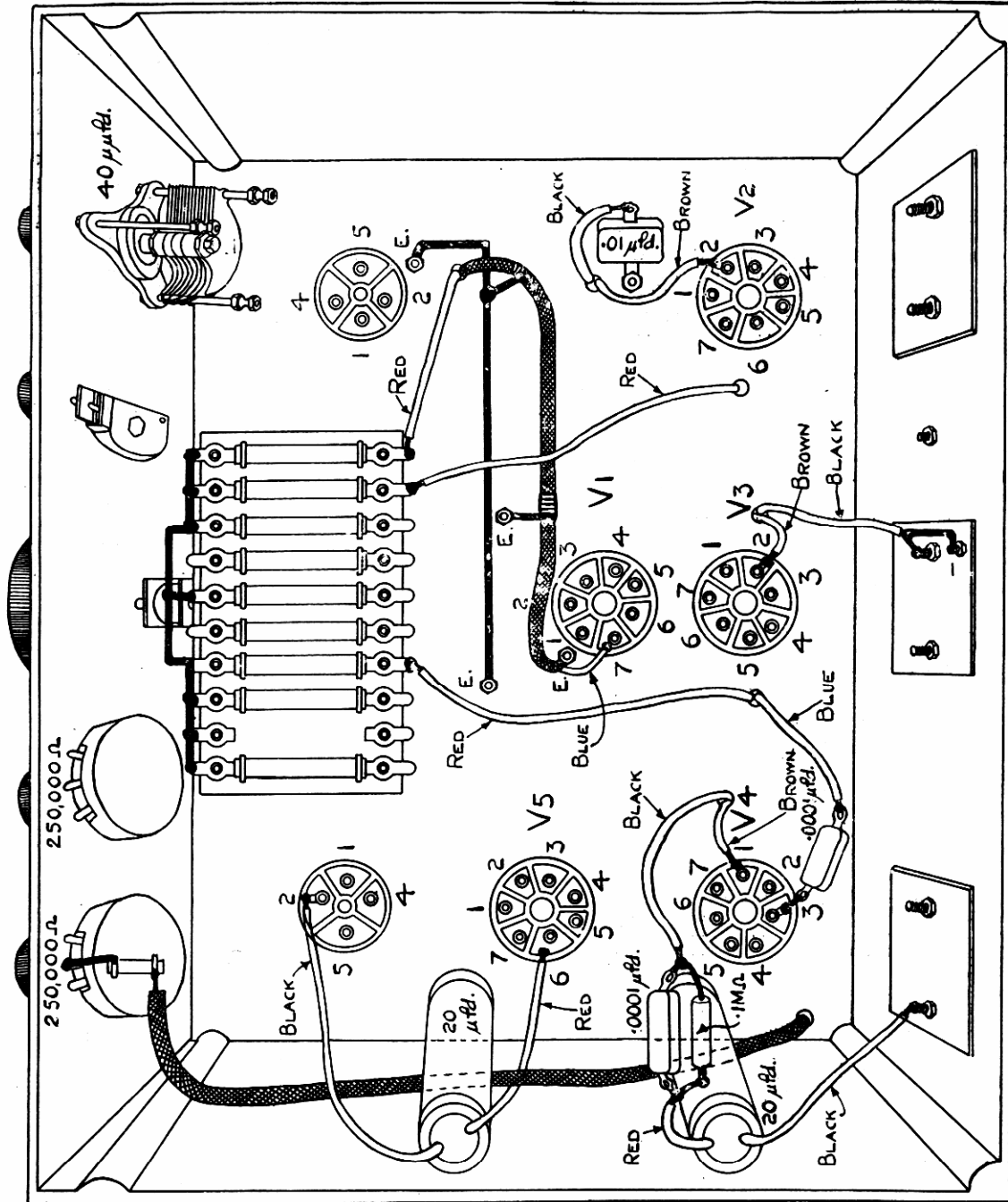
- 1 Supply Unit Type RU.6 (Parmeko) incorporating U.10 Osram Rectifier Valve £4 2s. 6d.

Complete Theoretical Circuit Diagram.



5 VALVE A.C. SHORT WAVE SUPER-HETERODYNE RECEIVER

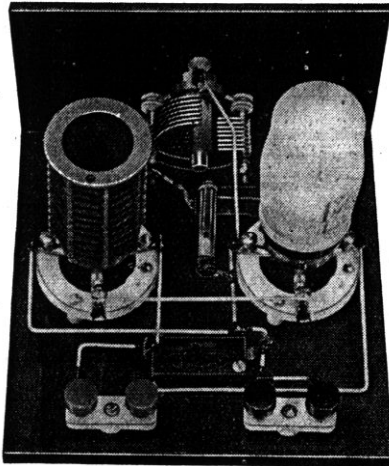
WIRING PLAN A



Under View of Chassis showing general lay out and first Wiring Connections.

SELF MODULATING OSCILLATOR

FOR LINING UP I.F. STAGES



The photograph shows the simplicity of this useful Home Oscillator.

This Oscillator will prove a useful piece of equipment for the experimenter's workshop. It is really a miniature transmitting station using very low power. The principal object of the Oscillator is to simplify the lining up of intermediate frequency stages. For the conventional 450 kc. and 465 kc. intermediate frequencies, an Eddystone 4-pin BR coil is necessary, the dial reading being 47° and 43° respectively. By using suitable coils the Oscillator can be worked on any wave length from 12 to 2,000 metres.

With the many reliable stations now transmitting on advertised frequencies, there will be no difficulty in making an accurate calibration.

CONSTRUCTION.

The photograph, together with circuit diagram, provides a clear insight to the assembly and wiring. It should be noted that the valveholders are mounted with grid terminals pointing towards the panel. The 2 volt valve is an HL2 type and 60 volts high-tension will be sufficient.

CALIBRATING.

Calibration is done by connecting valves, batteries, etc., and placing the oscillator alongside a receiver. Tune receiver to a known

station, and by using in the oscillator a coil which is known to cover the wavelength of the station being received, carefully rotate oscillator control knob until a high-pitched note is heard superimposed on the transmission being received. This indicates the oscillator and transmitter to be in step. Should the note from the oscillator be too loud it can be reduced by moving unit slightly away from the receiver. This also sharpens tuning and ensures more accurate calibration. If a stronger signal is required, it is recommended that the aerial from the receiver be closely coupled to the oscillator coil.

LIST OF PARTS.

EDDYSTONE.

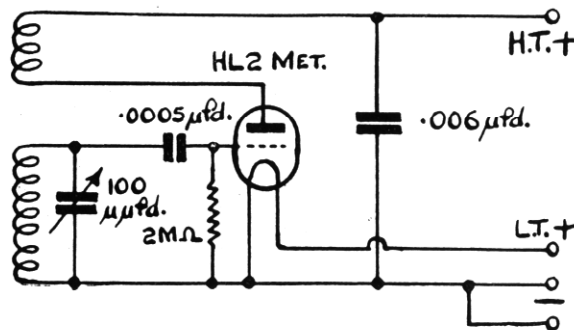
	Price
1 Microdenser, Cat. No. 900/100	5/-
1 Pointer Knob and Dial, Cat. No. 1027 ..	1/3
2 Frequentite Valveholders, Cat. No. 949, 4-pin, at 1/5 each	2/10
2 Frequentite Terminal Saddles, Cat. No. 1046, at 1/- each	2/-
1 4-pin BR Coil, Cat. No. 932	5/-
Total, 16s. 1d., plus coils extra if required.	

MISCELLANEOUS.

1 T.C.C. Condenser, M type, .0005 mfd. ..	
1 Dubilier Condenser, 670 Mica type, .006 mfd.	
1 Erie 1 watt Resistance, 2 megohm ..	
1 Panel, 4" x 6" x 1/8", Ebonite or Bakelite ..	
1 Baseboard, 6" x 6", 3/8" Plywood	
Screws, 8 R.H., 3/8" x 4	
Screws, 5 R.H., 1/2" x 4	
Connecting Wire, Washers, Soldering Tags, etc.	
Approx. price, 5s. 6d.	

VALVE.

1 Mazda HL2 Metallised	4/9
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CIRCUIT DIAGRAM.

A FOUR BAND TRANSMITTER FOR THE AMATEUR FREQUENCIES.

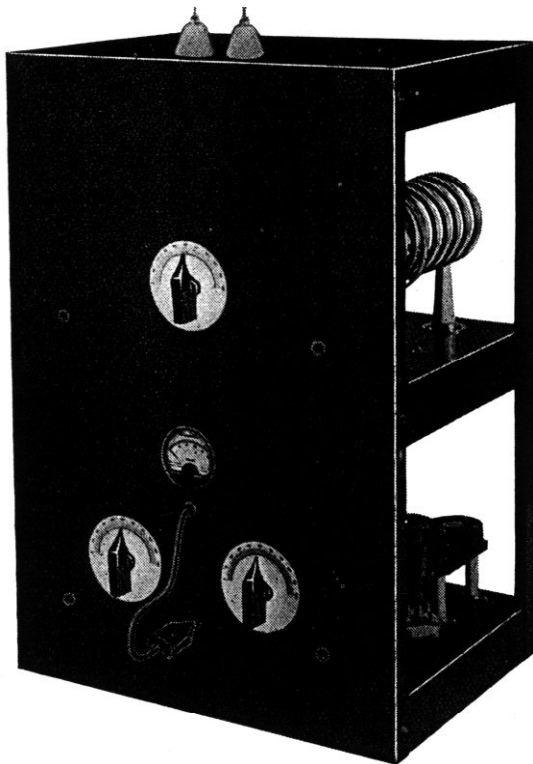
Here we have a low to medium power Transmitting Set built to achieve at reasonable cost, efficient telegraphy and telephony working on the most used amateur bands. The installation is designed around the new screened grid H.F. Pentode Transmitting Valve, which has improved features in that it is low priced, economical to use, easily excited as a driven amplifier and does not have to be neutralised.

It needs only one watt R.F. excitation. Using suppressor grid modulation it can be 100% modulated with only 1 to 2 watts audio input. This feature alone has a special appeal by the saving in cost of the usual high power modulator valve and its associated supply unit. To avoid the cost of individual meters in each valve stage a single current measuring meter is fitted with plug connection, and can be connected to a jack in each circuit.

The crystal controlled circuit is arranged to allow quick change-over from C.W. to Telephony on the 14, 7, 3.5 and 1.7 m/c

amateur frequencies. The change from one band to another being speedy and simple. To provide sufficient output to fully load the modulator an external single stage speech amplifier is recommended; a circuit diagram for this is provided.

The general circuit embodies three valves; pentode Crystal Oscillator, frequency Doubler (Pentode with control and screen grids tied together to function as triode) and the final amplifier. The three-tray welded steel rack provides a solid foundation and the completed transmitter forms a neat and presentable instrument. The power supply unit is built separately and a suitable circuit is shown. This can, of course, be varied to suit the power it is desired to use. Blue prints are available showing the top and underneath view of each tray, clearly illustrating assembly. The point to point wiring there shown makes the wiring quite straightforward. In addition there is the theoretical circuit diagram given herein. With the valves specified an input of 10-50 watts can be obtained according to licence and power unit available.



Front view of completed Transmitter showing panel lay out and rack construction.

TUNING AND OPERATING PROCEDURE.

Select crystal and coils for wave desired by reference to the table shown.

WAVE.	CRYSTAL	CRYSTAL COIL.	DOUBLER COIL.	FINAL COIL.	SWI.
160	160	160	NONE	160	OUT
80	160	160	80	80	IN
40	40	40	NONE	40	OUT
20	40	40	20	20	IN

Example (1). Wave desired, 160 metres.
160 metre crystal and 160 metre coil in plate circuit of V.1.
160 metre coil in plate of V.3.
No doubler coil, as stage is switched out.

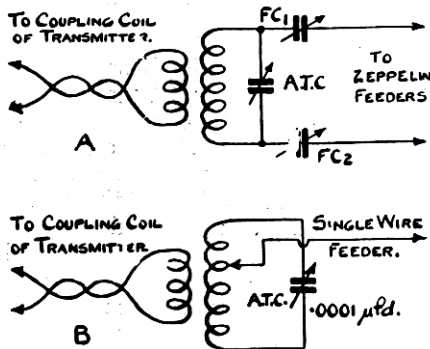
Example (2). Wave desired, 20 metres.
40 metre crystal and 40 metre coil in plate circuit of V.1.
20 metre coil in plate of V.2 (stage switched in) SW1 at rear.
20 metre coil in plate of V.3.

THE FOUR BAND TRANSMITTER—continued

TUNING.

Example (1). 160 metres.

Tune V.1 anode current meter to bottom of sharp dip by inserting the meter plug in jack marked "plate current V.1." Withdraw plug and insert in jack marked "Plate current



V.3" and tune to minimum anode current here. The Transmitter is now ready to be connected to the aerial (two alternative arrangements are shown in sketches "A" and "B"). In each case the Aerial tuning condenser is swung until maximum anode current is shown at V.3. No alteration to the final amplifier (V.3) plate tuning condenser should be necessary after tuning to minimum without aerial load and to maximum with load, as previously mentioned.

Example (2). 20 metres.

See that switch SW1 is switched to bring in doubler stage (V.2). Tune V.1 to bottom of sharp dip. A more accurate tuning point of plate circuit V.1 can be found by inserting the meter plug into grid current jack of V.2 (centre jack below meter) and tuning to maximum grid current. Insert meter plug into plate current jack V.2 and tune *very* carefully to bottom of sudden dip on the meter. Now insert plug into plate current jack of V.3 and tune to minimum current; proceed as before for aerial load. The tuning of 40 and 80 metres is precisely the same as Example (1) and (2).

OPERATION FOR TELEGRAPHY.

By inserting plug attached to morse key into jack marked "Keying Jack" and leave key open. The plate current to final amplifier should be zero and maximum on closing key (with aerial load). If the plate current does not drop to zero, re-check entire tuning operation.

TELEPHONY OPERATION.

The output from speech amplifier can permanently be plugged into the jack on the extreme end of back terminal panel. Telephony is obtained by depressing switch SW2 adjoining jack mentioned above. This automatically cuts out sending key and brings speech amplifier into circuit. The amplifier must, of course, be switched on separately.

AERIAL LOAD.

In view of the large number of different types of Aerial and Feeder systems, the transmitter utilises a 3-turn aperiodic coil coupled to the "dead" end of the plate coil of V.3. This aperiodic coil is connected to the two lead-out insulators on top of rack. From this aperiodic coil an untuned transmission line of twisted flex can be taken to whatever type of Aerial and Feeder system it is desired to use, provided that the untuned line terminates with a further aperiodic coil coupled to centre of Aerial Tuning Inductance. This is shown in sketches "A" and "B."

Approximate total cost of parts for Transmitter portion only, including valves, £16 0s. 0d.

Cost of Power Supply Unit and Speech Amplifier is extra to above.

CONSTRUCTION.

This we leave to the ability of the individual constructor, who will have the necessary technical knowledge which enables him to follow the photographs, diagrams and theoretical circuits.

A set of layout plans, with complete list of parts, can be obtained at a cost of 1/6, post free.

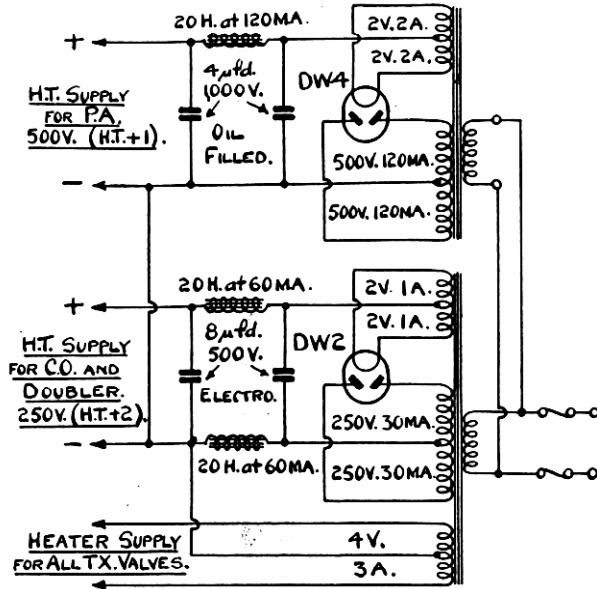
VALVES.

Crystal Oscillator - Mullard P.M.24M.
Frequency Doubler - Mullard P.M.24M.
Final Amplifier - R.F.P. 15.

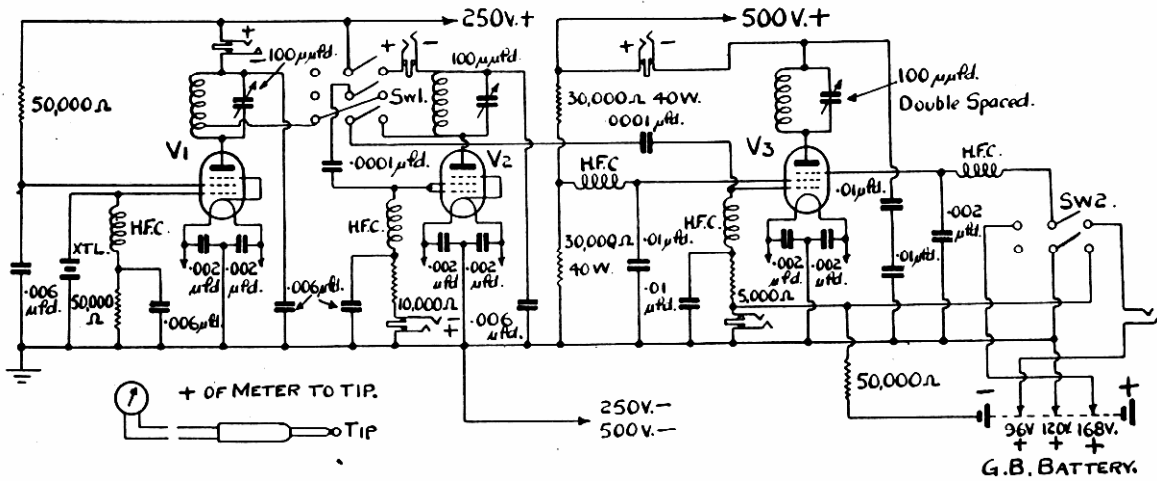
COIL DATA.

COIL	FORMER	WIRE	TURNS	TAP FROM CENTER	WINDINGS
160 Metre X'Val.	Plain. Cat. 935.	22 Enam.	63 1/4	5 Turns.	Close.
40 Metre X'Val.	Threaded. Cat. 936	"	13 3/4	2 1/8 "	Spaced.
80 Metre Doubler	" "	"	28 1/4	"	"
20 Metre Doubler	" "	"	6 1/4	"	Double Spaced
160 Metre Final.	3" diam.	16 D.C.C.	52	"	Close.
80 Metre Final.	3" diam.	16 D.C.C.	28	"	"
40 Metre Final.	3/16" Copper Tube.	See Text.	16	"	"
20 Metre Final.	3/16" Copper Tube.	" "	7	"	"

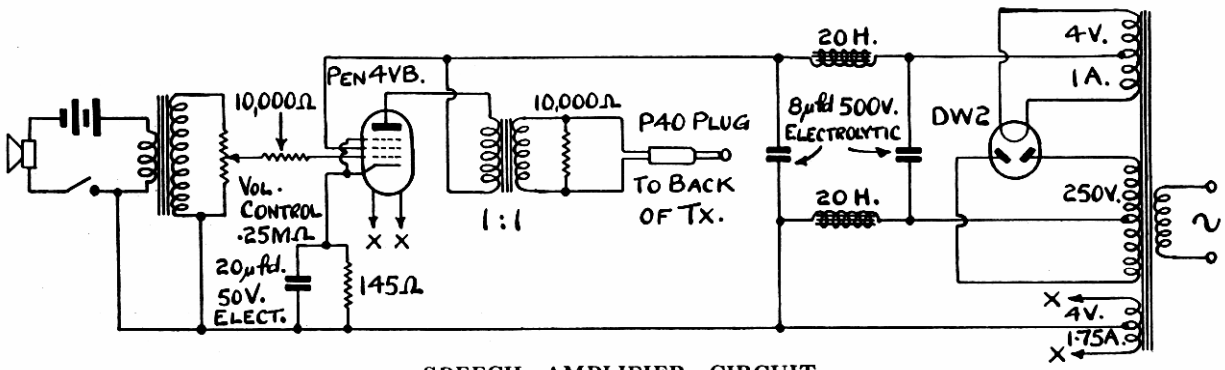
CIRCUIT DIAGRAMS FOR FOUR BAND TRANSMITTER



CIRCUIT FOR POWER UNIT.



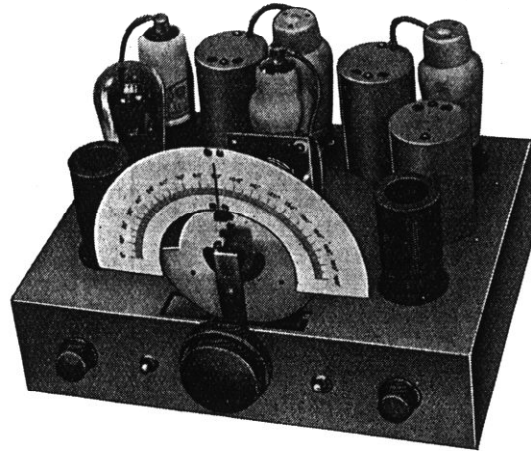
TRANSMITTER CIRCUIT.



SPEECH AMPLIFIER CIRCUIT.

5 VALVE SHORT WAVE SUPER-HETERODYNE RECEIVER

BATTERY MODEL — 13.6 TO 87 METRES



In response to an increasing demand for a reliable and up-to-date short wave Super-Heterodyne Receiver for home construction, this set is the answer. It adequately deals with the existing problem of selectivity and its appeal is further enhanced by the incorporation of effective automatic volume control.

The design of a short wave super-heterodyne receiver presents some difficulty for home construction since it must not be too complicated to build or too difficult to gang and adjust the intermediate frequency stages without elaborate equipment.

This receiver admirably fulfils such conditions and has a consistently good and proved all round performance. It is simple to construct, easy in adjustment, and the short wave range can be extended by the use of additional coils for the broadcast waves.

By way of avoiding complications an H.F. stage has been omitted in the receiver itself but if afterwards it is wished to take advantage of the benefit from an H.F. stage, the H.F. Amplifier, described on page 34 is quite suitable for this purpose.

To achieve best results from the set, some previous constructional radio knowledge is required. For the absolute beginner the more simple "Everyman Shortwaver" is advised (see pages 8 to 11).

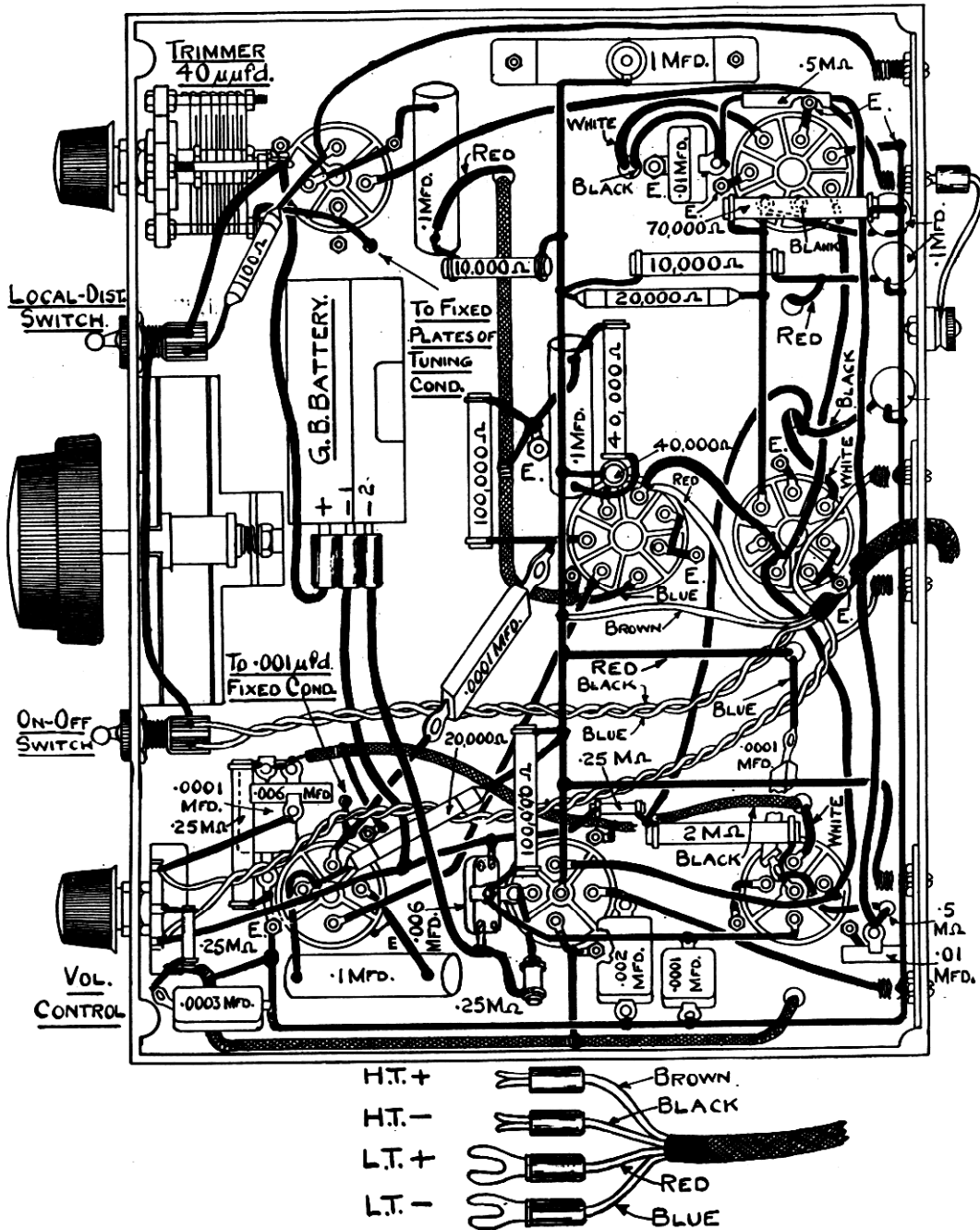
CONSTRUCTION.

The views of top and underside of chassis show layout of parts, and the point to point wiring is easy to follow.

PROCEED TO BUILD AS FOLLOWS :

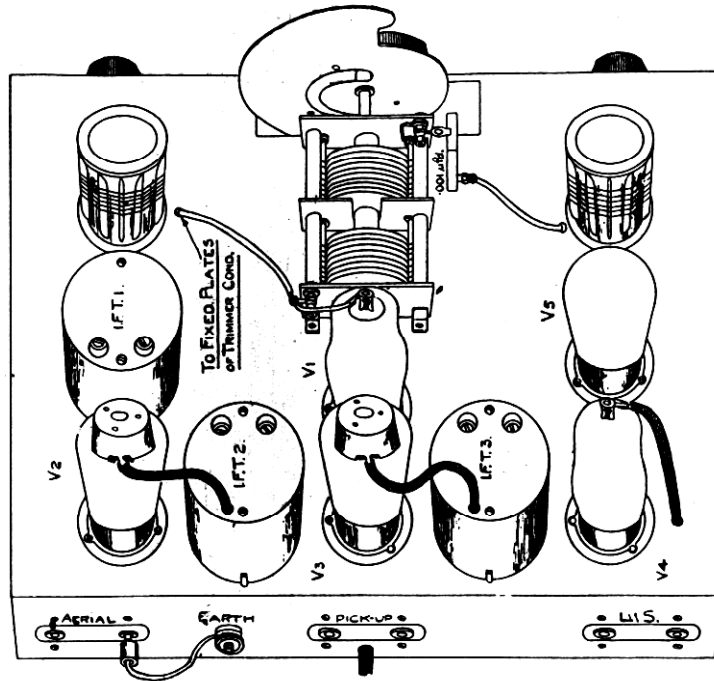
Scrape paint from chassis for all earth connections (see wiring plan). Fit valve-holders and terminal strips by using 6BA screws and nuts provided. A 6BA soldering tag is fitted under the nuts on each of the lower right-hand screws, fixing the terminal strips in position. These are to anchor the stout (16 gauge) wire which runs along back of set, and left-hand side, finally going down to point "E" on coil. This wire should be placed approximately $2\frac{1}{4}$ " from underside of chassis. Next fit the 1 mfd. condenser making sure paint is removed from chassis to provide good contact with case of condenser. A 16 gauge wire should be taken horizontally from this condenser and bent down vertically over V5, connection being made to centre pin. This lead should be about $2\frac{1}{2}$ " above chassis. The advantage of putting in these wires first is that one end of most of the resistances and condensers is attached to one of them, thus simplifying assembly. Then fit and wire in position the intermediate frequency transformers, noting that the metal braid on leads is well earthed to chassis. The remainder of the components can then be fitted, and wiring continued, as shown on wiring plan.

5 VALVE S.W. SUPER-HETERODYNE RECEIVER—continued



UNDER VIEW OF CHASSIS AND WIRING PLAN.

5 VALVE S.W. SUPER-HETERODYNE RECEIVER—continued



Top View of Chassis showing Lay out and Connections.

EDDYSTONE PARTS

	Price	
1 Dual Ratio Dial, Cat. No. 1045	12/6	1 Dubilier, type 670, .0003 mfd. Condenser
1 2-gang Condenser, 150 mfd. Sections, Cat. No. 967	17/6	1 Dubilier, type 670, .002 mfd. Condenser ..
1 Kit I.F. Transformers, complete with screened Anode leads and Valve Covls (Cat. No. 1055, 465 K/cs)	27/0	1 Dubilier, type 670, .001 mfd. Condenser ..
2 4-pin Valveholders, Chassis type 953, 10d. each	1/8	1 100 ohm ½ watt Resistor, Erie or Dubilier
2 5-pin Valveholders, chassis type 954, 1/- each	2/0	2 10,000 ohm 1 watt Resistors, Erie or Dubilier
3 7-pin Valveholders, chassis type 985, 1/4 each	4/0	2 20,000 ohm 1 watt Resistors, Erie or Dubilier
1 Microdenser, 40 m.mfd., type 900	4/3	2 40,000 ohm 1 watt Resistors, Erie or Dubilier
1 1.0 mfd. Single Terminal Condenser, Cat. No. 989	3/0	1 70,000 ohm 1 watt Resistor, Erie or Dubilier
2 1" Black Knobs, ¼" hole, Cat. No. 903, 6d. each	1/0	2 100,000 ohm 1 watt Resistors, Erie or Dubilier
1 Aluminium Die-cast Chassis, drilled all necessary holes, finished inside and out battleship grey cellulose, Cat. No. 1053	18/6	3 250,000 ohm ¼ watt Resistors, Erie or Dubilier
3 Terminal Panels (Chassis) with Plugs and Sockets, Cat. No. 1060, 9d. each	2/3	1 250,000 ohm 1 watt Resistor, Erie or Dubilier
1 Kit of Special Coils in metal box, Cat. No. 1064, comprising 3 pairs of coils, types LB, Y, R	21/0	2 500,000 ohm ½ watt Resistors, Erie or Dubilier
		1 2 megohm 1 watt Resistor, Erie or Dubilier
		1 3-point Switch
		1 2-point Switch
		1 250,000 ohm potentiometer, Erie
		5 ft. 16 s.w.g. Tinned Copper Wire
		7 ft. "Slide back" Connecting Wire
		1 W.O. Terminal
		1 length 4-way Cable, 1½ yds.
		1 each Red and Black Spade Tags
		1 each Red and Black Plugs
		2 Black and 1 Red Bias Plugs
		27 ¾" x 6BA Bolts and Nuts
		20 6BA Tags
		30 6BA Shake-proof Washers
		ACCESSORIES
		1 Osram X.21 7-pin Metallised Valve
		2 Mazda V.P.210, 7-pin Metallised Valves
		1 Mazda L.21.D.D. 5-pin Metallised Valve
		1 Osram P.T.2 5-pin (or) Mazda PEN 220 5-pin
		1 4.5 volt Grid Bias Battery with Clip
		Approx. Total Cost with Valves, £11 5s. 0d.

MISCELLANEOUS PARTS

6 .1 mfd. Wire-end Condensers, B.I., Dubilier or T.C.C.	
2 Dubilier, type 670, .006 mfd. Condensers ..	
2 Dubilier, type 670, .01 mfd. Condensers ..	
4 Dubilier, type 670, .0001 mfd. Condensers	

ULTRA SHORT WAVE RADIO TELEPHONE



View of combined Transmitter and Receiver with handset ready for Duplex working.

This apparatus we have called an Ultra Short Wave radio telephone since it can be used together with a similar equipment for duplex telephony working over a distance of several miles. The actual range is governed by circumstances such as the efficiency of the aerial due to location and the character of the intervening country.

To give examples which not only apply to this apparatus, but to all low powered ultra short wave equipment in general, the following remarks are offered as a guide :—

From hill top to hill top with intervening lower lying land, 10 to 25 miles range.

From one aerial erected some 15 to 20 feet high, clear of surrounding or screening objects across flat wooded country, 5 to 10 miles.

Under the same circumstances, but with aerials on the ground, 5 miles, or if with hilly country in between, 2 to 5 miles.

In towns or cities with the aerials erected 20–25 feet high and unscreened, 3 to 5 miles.

With aerials at ground level, $\frac{1}{2}$ mile to 2 miles.

These figures are based on actual experience; greater ranges are sometimes obtained, but they are not reliable.

This apparatus consists of two compact individual units, the receiver and the transmitter. Either of these can be built and used separately. The receiver is suitable for all ultra short wave reception and both it and the transmitter fit separately into the small Eddystone metal cabinet No. 1033. Alternatively the two units together fit into the larger Eddystone metal cabinet No. 1034, as shown in the top photograph when they form a complete equipment for portable use, yet can be taken apart and used as transmitter and receiver when required.

The combination of the two separate units is superior to the alternative transceiver construction, where the valves serve one function for receiving and another function on transmit. In this case proper efficiency for both functions is impossible. Further, the present arrangement permits of Duplex working since frequency adjustments of both receiver and transmitter can be left set, whereas the transceiver has a common tuning circuit which must be switched and retuned each time.

ULTRA SHORT WAVE RADIO TELEPHONE—continued

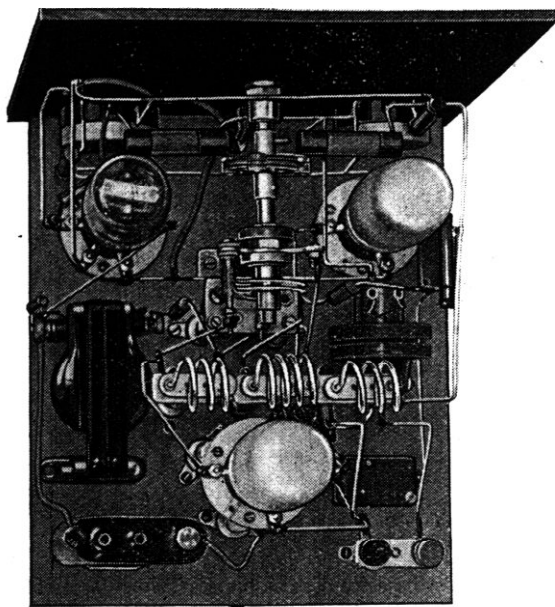


Fig. 2 The Receiver Unit.

The possibilities and advantages of such a radio telephone, as described, are considerable and offer much pleasure in their exploitation.

THE RECEIVER.

The receiver unit employs a three valve super regenerative circuit. This arrangement possesses many advantages in that it is simple to build and easy to get working properly. The sensitivity and efficiency of the detector is high and the receiver is not critical to handle, since with super regeneration the tuning is comparatively flat. Its one disadvantage is the quench noise background on very weak signals, but this noise is non-existent when the signal is fairly strong and it must be remembered that when the signal is too weak to kill the quench noise it would generally be too weak to be picked any more intelligently on a different type of receiver.

In the super-regenerative arrangement, the detector valve is made to oscillate, under which condition it gives tremendous gain. As this arrangement does not permit of reception of telephony signals, a super imposed frequency generated in the quench circuit is applied and the resultant output causes the oscillations to be broken up into audible groups which are then passed on to the later stages of the set for amplification. The quench frequency in this receiver is approximately 20 kc/s, which

we have found to be best in practice, and the quench noise is always heard except when a signal is received. A signal of sufficient amplitude reduces the amount of quench noise to zero and as the signal strength becomes weaker, the quench noise is more pronounced. It is of great advantage, therefore, in this type of receiver to have a minimum amount of quench noise so that the weaker signals can be received. It is usual practice in quench receiver design to have the anodes of the detector and quench valves in parallel and to use a common H.T. supply. Although this arrangement works quite well, it has the disadvantage that when the quenching is reduced for weak signal reception, the voltage on the detector anode is also dropped so that the sensitivity and efficiency of this part of the set suffer. In this present design, the circuit has been modified so that both quench and detector valves receive separate high tension supply and the quench frequency is fed to the detector stage by grid modulation. Separate potentiometer controls are fitted so that the anode voltage of the quench and detector valves can be adjusted. The detector can then be operated at the point of maximum sensitivity with the minimum amount of quench necessary for reception purposes.

The circuit diagram is shown in figure 3, and the view of the general lay out in figure 2. The receiver is built on a plywood baseboard, with a bakelite or ebonite panel. The baseboard is raised about 1/8" from the bottom of the panel to allow for the battery leads to be carried underneath. A small packing piece of plywood is needed to support the back-end of the baseboard. The components should be laid out as shown in figure 3.

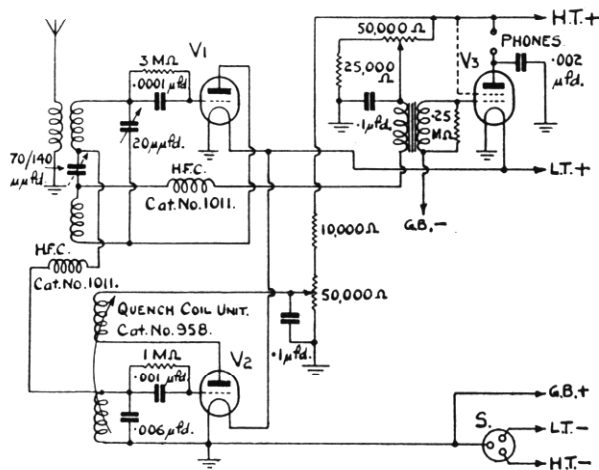


Fig. 3. Circuit Diagram of Receiver.

ULTRA SHORT WAVE RADIO TELEPHONE—continued

The detector valveholder at the back-centre, the interchangeable coil units and the aerial and earth terminals are raised up on pillars. The valve on the right-hand side near the panel is the "quench" valve, and on the left is the low-frequency amplifier.

Grid terminals on the valveholders should point to the right-hand side of the receiver when viewed from the rear.

The pre-set condenser which is also mounted on small pillars underneath the tuning condenser, is set to a capacity so that correct control of the detector oscillations can be carried out with the 50,000 ohm potentiometer. The high frequency chokes should be mounted vertical so that their turns are at right-angles to the tuning coils. The tuning condenser is mounted by means of an adjustable bracket and is fastened to the slow-motion head control by means of a flexible coupler.

The quench and detector oscillator valves are Osram or Mazda HL2, and the output valves Osram LP2 or Mazda P220, which need three volts grid bias with 120 volts H.T. or if a pentode output is desired, a Mazda Pen.220 may be used with 4½ volts grid bias.

The frequency range of the set can be extended from 4.8 metres to 12.4 metres, since interchangeable coils are fitted. Each of the three coils for a particular wave band consists of the same number of turns, and the wave range of the different coils is as follows :

3-turn coils.	4.8 to 6.35 metres
4-turn coils.	5.65 to 7.4 metres
5-turn coils.	6.62 to 8.72 metres
6-turn coils.	7.55 to 9.8 metres
8-turn coils.	9.5 to 12.4 metres

The receiver having been finished and checked, it can be put into service. Insert valves, connect high, low tension and grid bias battery, which should be 120 volts, 2 volts, and 3 to 4½ volts respectively. Insert suitable coils as shown in Coil Table. Set tuning dial at "zero." Turn left-hand control knob (quench) to minimum setting, anti-clockwise. To set reaction, the pre-set condenser should be screwed well out. Turn right-hand control knob about one-third on. Screw pre-set condenser down until receiver just oscillates. Then check by turning knob anti-clockwise when oscillation should cease. By turning clockwise oscillation should take

place again. To check "quench" keep receiver oscillating and advance quench control knob until receiver stops oscillating. The right-hand knob can then be advanced slightly until receiver is coming into oscillation again. Repeat by turning left-hand knob until

LIST OF PARTS.

EDDYSTONE

	Price
1 Microdenser, Cat. No. 900/20	3/9
1 Slow Motion Driving Head, Cat. No. 1036 ..	4/6
1 Flexible Coupler, Cat. No. 1009	1/6
1 Adjustable Insulated Bracket, Cat. No. 1007	1/6
2 Frequentite Valveholders, 4-pin, Cat. No. 949, at 1/5 each	2/10
1 Frequentite Valveholder, 5-pin, Cat. No. 950	1/8
1 Quench Coil Unit, Cat. No. 958	4/6
2 Ultra Short Wave H.F. Chokes, Cat. No. 1011, at 1/3 each	2/6
3 Insulating Pillars, 2¼", Cat. No. 1028, at 6d. each	1/6
6 Insulating Pillars, 1½", Cat. No. 1029, at 4½d. each	2/3
1 Frequentite Terminal Saddle, Cat. No. 1046	1/0
3 U.S.W. Coil Bases, Cat. No. 1051, at 1/- each	3/0
1 Set of 3 turn U.S.W. Coils, Cat. No. 1050 ..	4/6
2 Black Knobs, ¼" hole, Cat. No. 903, at 6d. each	1/0
Total, £1 16s. 6d., plus Coils extra as required.	

MISCELLANEOUS

1 Ferranti A.F.4 Transformer	
2 Reliance 50,000 ohm Potentiometers	
2 T.C.C. 0.1 mfd. Tubular Condensers (Wire Ends type)	
1 Cylidon 70-140 Trimmer	
1 3-point On-Off Switch	
1 Dubilier .006, Type 670	
1 Dubilier .001, Type 670	
2 Dubilier .0001, Type 670	
1 4½ volt G.B. Battery and Clip	
1 Erie 10,000 ohms 1 watt Resistor	
1 Erie 1 megohm 1 watt Resistor	
1 Erie .25 megohm 1 watt Resistor	
1 Erie .25 megohm ¼ watt Resistor	
1 Erie 3 megohm 1 watt Resistor	
1½ yards 4-way Cable	
2 Red Wander Plugs	
2 Black Wander Plugs	
1 Red Spade Terminal	
1 Black Spade Terminal	
2 Insulated Terminals	
1 Panel, 9¼" × 8½" × ¼", Ebonite or Bakelite	
1 Baseboard, 9¼" × 7¼", ½" Plywood	
1 Wood Strip, 7¼" × ¼" × ¼"	
30 ¾" × 4 R.H. Wood Screws	
6 ¾" × 4 R.H. Wood Screws	
3 ¾" × 6BA R.H. Screws	
6 ¾" × 6BA R.H. Screws	
Approx. Total Cost, £2 10s. 0d.	

VALVES.

2 Mazda HL2 Valves, Metallised, at 4/9 each	
1 Mazda P220 Valve	6/-
Approx. Total Cost, £5 1s. 6d.	

ULTRA SHORT WAVE
RADIO TELEPHONE—continued

oscillation again ceases. This operation can be repeated to a point where back-ground noise comes, too unpleasant for listening. When such setting is reached maximum sensitivity has been achieved, but it is sometimes necessary to reduce gain slightly otherwise background noises may be excessive.

To tune signals, turn quench and tuning dial to "zero." Increase reaction until receiver just oscillates, then by gently turning tuning control and slightly increasing reaction so that oscillation is maintained until a station is heard. This will appear in the form of a whistling note. The quench control can then be increased to suppress the whistle and the station proper will be heard. Afterwards by slightly advancing the quench and reaction control, maximum sensitivity can be obtained.

THE TRANSMITTER UNIT.

The transmitter unit consists of a push-pull oscillator with a Class B modulator, and a driver valve. The first two valves are Osram, type B21, and the driver valve is a Mazda P220. The advantage of a Class B modulator is that until modulated with speech it practically takes no high-tension current, but this rises when modulated to a maximum of 20 m.a.

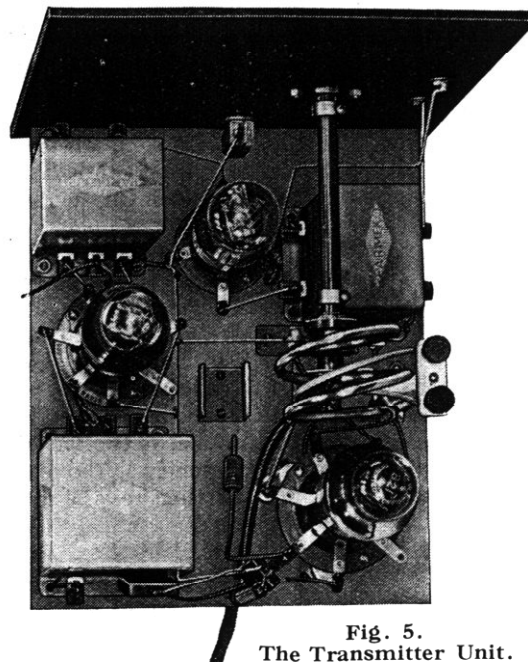


Fig. 5.
The Transmitter Unit.

The Class B push-pull oscillator, and the driver valve, need a further 17 to 18 m.a., so that the total current consumption of the transmitter is 18 m.a. when quiescent, to 38 m.a. when modulated.

A 120 volt battery supply is suitable. Slightly better results can be obtained using 150 volts. The capacity of the battery naturally depends upon the amount of use. A 2 volt accumulator is necessary for filament supply.

The circuit arrangement of the transmitter is shown in figure 4, and the component lay out in figure 5.

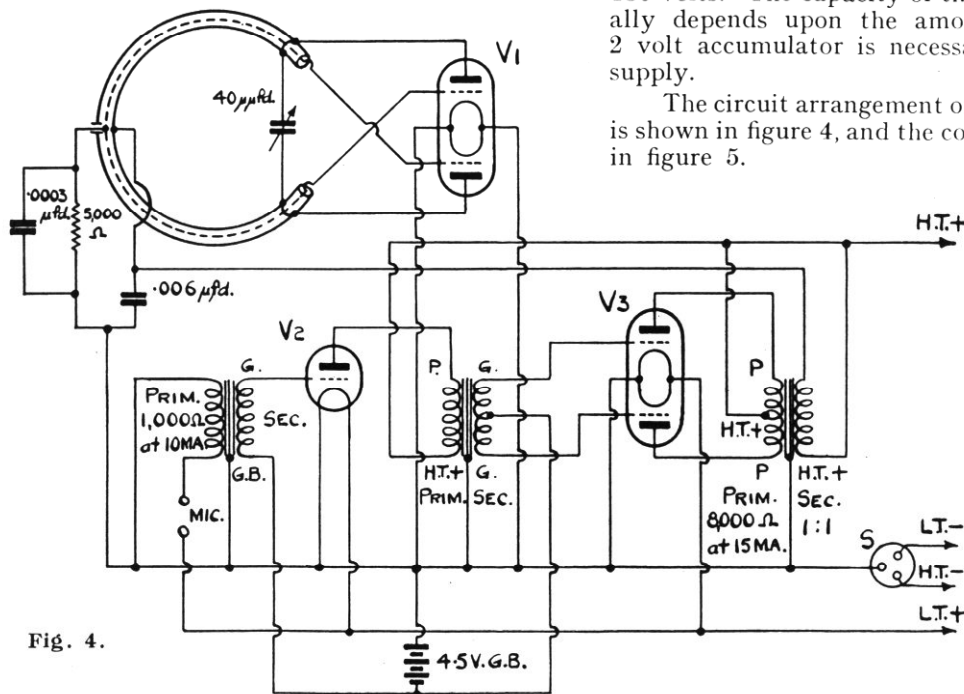


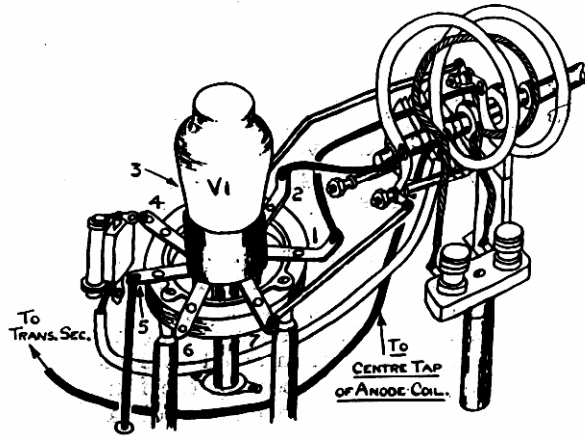
Fig. 4.

Theoretical
Circuit
Diagram
for
Transmitter
Unit.

ULTRA SHORT WAVE RADIO TELEPHONE—continued

TRANSMITTER LAY OUT.

Viewing photograph, the microphone transformer is shown on right, and driver transformer on left, nearest panel. On the right-rear of baseboard is output transformer. The oscillator valve is furthest from panel and is mounted on insulating pillars. The Class B valve is on left between driver and output transformer. Driver valve is nearest panel. The baseboard is raised on battens to allow underneath wiring to battery cable and filament leads. In front of the oscillator valve mounted on adjustable bracket is the variable condenser, of 20 m.mfd. capacity. Above the condenser are the transmitting coils.



CONSTRUCTION OF COILS.

The plate coil is made from 20 gauge $\frac{3}{16}$ " outside diameter copper tube. The inside diameter of the coil is 2" and has $2\frac{1}{4}$ turns, a tapping being taken from the electrical centre to secondary of output transformer. The ends are flattened and drilled 6BA so they may be slipped over terminals of microdenser to facilitate wiring. The grid coil consists of light gauge rubber covered flexible wire and is worked through the inside of the plate coil tube, the ends and also centre tap being brought out through holes drilled in walls of copper tube. The aerial coupling consists of one turn $1\frac{1}{2}$ " diameter, and is made from 12 gauge copper wire with a systoflex covering for insulation. This coil is mounted on a terminal saddle, which is raised from the baseboard on pillars and provides anchorage for the feeder line to the aerial.

THE AERIAL.

Most of the conventional types of ultra short wave aerials can be used with the transmitter as described. These include the 2-wire matched impedance or the Zepp fed Hertz aerials, the only necessity is to have a suitable coupling line between the output coupling coil and the aerial. Full information about U.S.W. aerials has already been published in the Eddystone Ultra S.W. Guide. The aerial itself, which for the amateur 5 metre wavebands needs to be one length between 8 feet and 8 feet 6 inches long. The Eddystone telescopic aerial No. 1038 makes an excellent radiator and is easily erected anywhere, while portable if required.

LIST OF PARTS
TRANSMITTER

EDDYSTONE.

	Price
1 Microdenser, Cat. No. 900/20	3/9
1 Universal Valveholder, 4-pin, Cat. No. 1015	1/3
2 Universal Short Wave Valveholders, 7-pin, at 1/8 each	3/4
1 Extension Control Outfit, Cat. No. 1008	1/3
1 Adjustable Insulated Bracket, Cat. No. 1007	1/6
1 Frequentite Terminal Saddle, Cat. No. 1046	1/0
1 Pointer Knob and Dial, Cat. No. 1027	1/3
4 Insulating Pillars, $2\frac{1}{2}$ ", Cat. No. 1028, at 6d. each	2/1
Total, 15s. 4d.	

MISCELLANEOUS.

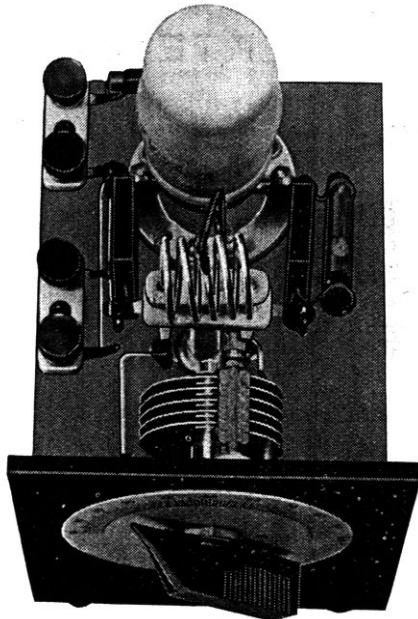
1 Parmeco Microphone Transformer, Type MT2	
1 Parmeco Driver Transformer, Type D2A	
1 Parmeco Output, Type O2B	
1 Dubilier .006, Type 670	
1 Dubilier, .0003, Type 670	
1 Erie 5,000 ohms 1 watt	
2 Terminals	
$1\frac{1}{2}$ yards of 4-way Cable	
4 Wander Plugs	
2 Spade Terminals	
1 3-point On-Off Switch	
1 $4\frac{1}{2}$ volt G.B. Battery and Clip	
1 16" length $\frac{3}{16}$ " Copper Tube	
1 Panel, $9\frac{1}{2}$ " x $8\frac{1}{2}$ " x $\frac{1}{8}$ " Ebonite or Bakelite	
1 Baseboard, $9\frac{1}{2}$ " x $7\frac{1}{2}$ " x $\frac{1}{8}$ " Plywood	
1 Wood Strip, $7\frac{1}{2}$ " x $\frac{1}{2}$ " x $\frac{1}{4}$ "	
2 or 3 yards Connecting Wire	
4 1" x 6BA R.H. Screws	
2 $\frac{3}{4}$ " x 4 R.H. Wood Screws	
2 $\frac{3}{4}$ " x 6BA Screws and Nuts	
Approx. Cost Miscellaneous Parts, £2 12 6	

VALVES.

2 B.21 Valves, 7-pin, Osram, at 11/- each	
1 P220, Mazda	6/6
Approx. Total Cost, including Valves, £4 16 0	

A MODULATED OSCILLATOR

4.5 METRES TO 8 METRES.



General lay out showing disposition of Components.

This oscillator will be of great value to the ultra short wave experimenter in testing and lining up ultra short wave receivers. It radiates a continuous note at a constant level over a variable frequency band of 67 to 37.5 Mc/s from 15° to 100° on the dial.

The oscillator valve functions in the usual way, an electron-coupled circuit being used. A time constant arrangement, consisting of a suitable value grid leak and condenser is, however, incorporated which breaks the oscillations up into groups of about 300 per second, thus giving an audible output. The high tension supply necessary is 60 volts, and it should be noted that a variation of high tension will slightly alter the pitch of the audible note. It is also interesting to note that in this case a triode valve has been successfully used as electron-coupled oscillator, although it is general practice to use a screened grid valve for this purpose. The present triode arrangement works extremely well and there is a considerable saving in cost between the price of the two valves.

The frequency range, which gives a complete overlap each side of the 5-metre amateur band and the television wavebands, is covered by a 40 m.mfd. condenser tuning a 5-turn silver plated coil. A tapping from one side of the filament is taken to the centre of the coil. The high frequency choke used in the filament lead must be of low resistance so that no appreciable drop of filament voltage occurs. The Cat. No. 1021 H.F.C. is specially made for this purpose.

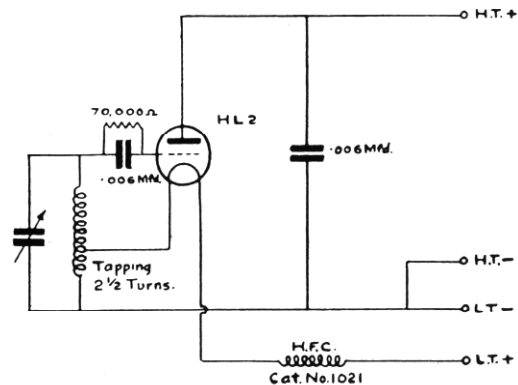
The unit is mounted on a small panel and baseboard, an illustration of the lay out being given, and the assembly is one which can be completed without difficulty in a very short time.

EDDYSTONE PARTS.

	Price
1 4-pin Frequentite Valveholder, No. 949 ..	1/5
1 Ultra S.W. Choke, No. 1021 ..	1/3
2 2-way Frequentite Terminal Saddles, No. 1046, 1/- each ..	2/0
1 1½" Insulating Pillar, No. 1029 ..	4½d.
1 Microdenser, 40 m.mfd., No. 900 ..	4/3
1 5-turn Coil and Base, No. 1050/1 ..	2/7
1 Pointer Knob and Dial, No. 1027 ..	1/3

MISCELLANEOUS PARTS.

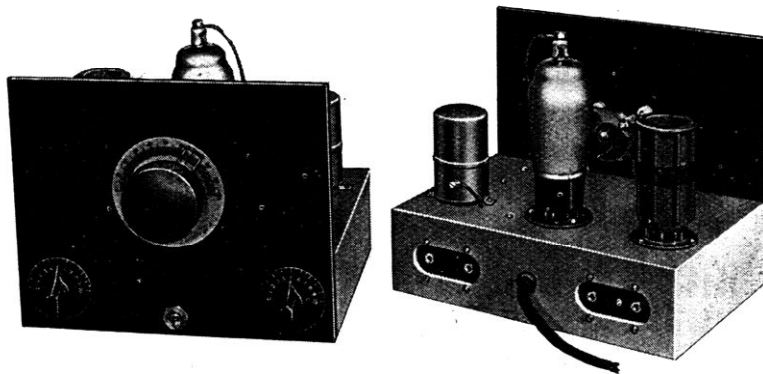
- 2 Fixed Condensers, .006 mfd., Dubilier or T.C.C., 1/6 each ..
- 1 ½ watt Resistor, 70,000 ohms, Mullard, Erie or Dubilier ..
- 1 Baseboard, 6" x 4", ¾" Plywood ..
- 1 Panel, 5" x 4" x ¼", Wood or Bakelite ..
- Connecting Wire, Screws, etc. ..
- 1 Osram Valve, type HL2 ..



CIRCUIT DIAGRAM.

ONE VALVE SHORT WAVE HIGH FREQUENCY AMPLIFIER OR SHORT WAVE CONVERTER.

BATTERY MODEL.



Showing panel and chassis views of this neat assembly.
Models for either battery or A.C. mains use are described.

This simple and inexpensive unit can be used in two important ways. With an existing broadcast receiver it can be employed as a short wave converter for obtaining reception of short wave signals; secondly, with an all-wave set or a specially designed short wave receiver it can be used in front of either as an additional high frequency amplifier with considerable gain in performance and selectivity.

The unit is simple to build and no change of construction is necessary for use in either form. If, therefore, it is used at first as a converter it need not be scrapped if an all wave set is later purchased, but can be used in front of this as a high frequency amplifier.

The unit is built on a die-cast chassis with metal panel which makes up into an attractive assembly. A smart metal container cabinet is also available, if required. The circuit includes a screened grid high frequency pentode valve with associated coil and tuning condenser. The wave length of 13.75—99 metres is covered by three interchangeable coils as follows: Range 1, 13.75—26.5; Range 2, 25.0—51.8; Range 3, 49.0—99.0. This method is highly efficient since there are no switch losses and the tuning capacity is small.

The circuit, when the unit is used as a converter, becomes an electron coupled oscillator, and since a battery valve has no independent cathode as in the A.C. type, the special iron cored filament choke, Cat. No. 1062, must be used. Oscillation is controlled by a 50,000 ohm potentiometer. When using the set as an H.F. amplifier, naturally the valve is never used in an oscillating condition, and this control is used to obtain regeneration with greatly improved results. Another feature of the unit is the Eddystone patented Bandsread Tuning device, which greatly facilitates the ease of tuning and general operation of the set.

BATTERY SUPPLY AND CONNECTIONS.

A separate set of batteries or the existing batteries of the broadcast set may be utilised. In this latter case, however, it will not be necessary to connect leads L.T. neg. or H.T. neg. to the batteries as these connections will be made automatically by the earth connection to the receiver. Therefore, join L.T. + and H.T. + only. If common batteries are used the switch on the unit will be inoperative.

ONE VALVE SHORT WAVE H.F. AMPLIFIER—continued

Low tension should be 2 volts, and H.T. between 100—150 volts.

CONSTRUCTION.

The complete construction should take only 2 or 3 hours and is easy to do by the help of the lay out and wiring plan on page 36. It is important that the actual components specified should be used and the wiring should closely follow that of the plan.

CONNECTING UP.

The unit has been designed so that a crossfeeder or interference reducing type of aerial can be used. In this case the two leads from such an aerial are connected to the two sockets in the aerial terminal panel. The unit also works perfectly with a standard aerial. The only alteration when this is used is that the aerial is plugged in the outside socket and the other socket is connected to earth. The remaining terminal panel contains two sockets which are connected to the broadcast receiver aerial and earth, as shown. The connections are exactly the same when the unit is used as a converter or H.F. amplifier.

OPERATION AS HIGH FREQUENCY AMPLIFIER.

The wave lengths of the existing set being known, it is only necessary to tune the broadcast receiver to the desired frequencies, plug in a suitable coil to the H.F. unit and then tune unit until it is in resonance with the main

EDDYSTONE PARTS.

Battery Model.

	Price
1 Aluminium Die-Cast Chassis, drilled all necessary holes, finished inside and out battleship grey cellulose, Cat. No. 1059	12/9
1 Metal Panel, finished Dark Crystalline Brown, Cat. No. 1058	2/9
1 Bandsread Condenser Unit, with Slow Motion Head, Knob, Dial and Cursor, Cat. No. 1043	6/6
1 Patented Tank Condenser with Knob and Graduated Dial Plate, Cat. No. 1042	6/-
1 Chassis Type Valveholder, 7-pin, Cat. No. 985	1/4
1 Chassis Type Coil Base, 6-pin, Cat. No. 964	1/3
1 Screened H.F. Choke, Cat. No. 982	5/-
1 Small Pointer Knob and Dial, Cat. No. 1044	1/-
1 Filament Choke, Cat. No. 1062	3/6
2 Terminal Panels with Plugs and Sockets at 9d. each	1/6
1 Metal Cabinet, Cat. No. 1061	9/6
1 Set 6-pin Type Coils, Cat. No. 1064. Set of 3 Coils	12/-

Total, £3 3s. 1d.

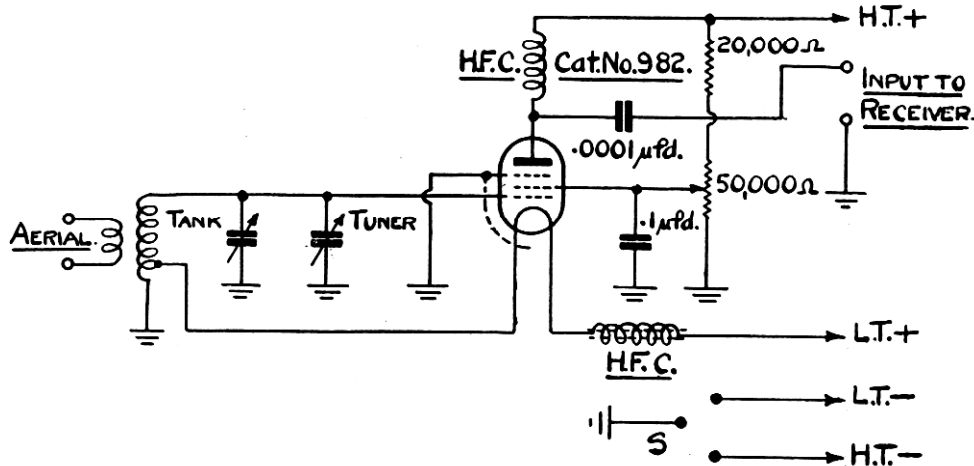
MISCELLANEOUS PARTS.

1 T.C.C. 0.1 mfd. Tubular Condenser, wire ends	
1 Dubilier .0001 mfd. Type 670 Condenser	
1 Erie 50,000 ohm Potentiometer	
1 Erie 20,000 ohm Resistor	
1 3-point On-Off Switch	
18 1/4" x 6BA R.H. Screws and Nuts	
1 1/2 yards 4-way Cable	
1 pair Red and Black Spade Terminals	
1 pair Red and Black Wander Plugs	
1 Anode Clip (Clix)	
2 yards 18 gauge Tinned Copper Wire	
1 yard 3 mm. Flex Wire, Soldering Tags, Washers, etc.	

Approx. Price, 13s. 6d.

VALVE.

Mazda SP.210, 7-pin, Metallised	11/-
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THEORETICAL CIRCUIT DIAGRAM FOR BATTERY UNIT.

ONE VALVE SHORT WAVE H.F. AMPLIFIER—continued

receiver ; then the two sets of controls should be worked in step. As before mentioned, the 50,000 ohm potentiometer control is used for regeneration.

OPERATION AS SHORT WAVE CONVERTER.

In this case the existing broadcast receiver should be tuned to a silent part of the wave-band above 1,000 metres. The converter unit is then made to oscillate by the potentiometer control, and the whole of the tuning is carried out on the controls of the converter unit. The actual wave range at the station that is received will be that at which the unit itself is functioning.

A.C. MODEL.

The use and application of the battery unit described, covers the A.C. model in full. The circuit is slightly modified to take an A.C. valve. It will be noted, however, that the A.C. unit incorporates a filament heating transformer and no H.T. supply. This is done because the necessary rectifier valve and consequent smoothing and transformer arrangements are unnecessarily expensive when H.T. supply sufficient for the one valve in use can easily be obtained from the broadcast receiver. The H.T. lead on the unit should be taken to a point on the receiver where a voltage of 120—150 volts is obtainable. A convenient point of tapping is usually at the speaker or output valve of the main receiver.

EDDYSTONE PARTS.

A.C. Model.

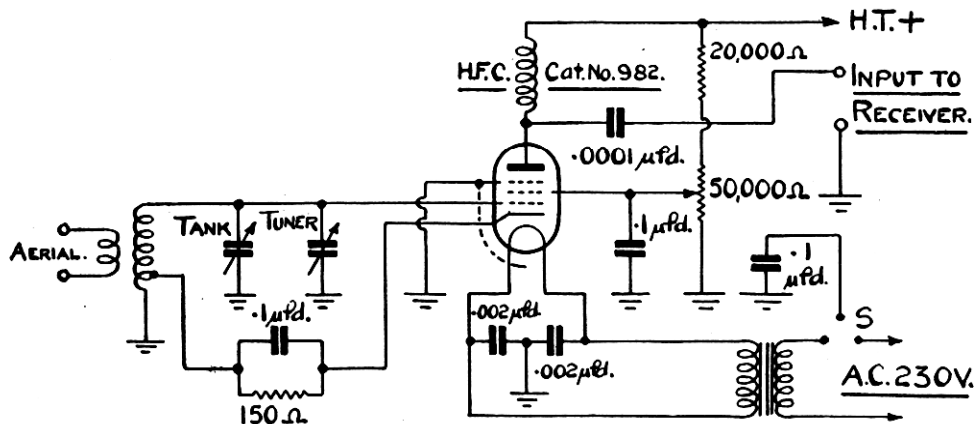
	Price
1 Tank Condenser with Knob and Graduated Dial Plate, Cat. No. 1042	6/-
1 Bandsread Condenser Unit with Slow Motion Head, Knob, Dial and Cursor, Cat. No. 1043	6/6
1 Screened H.F. Choke, Cat. No. 982	5/-
1 Pointer Knob and Dial, Cat. No. 1044	1/-
1 Base, 6-pin, Cat. No. 964	1/3
1 Valveholder, 7-pin, Cat. No. 985	1/4
1 Filament Transformer, 220/240 volts, A.C.	10/6
1 Aluminium Die-Cast Chassis, drilled all necessary holes, finished inside and out battleship grey cellulose, Cat. No. 1057	12/9
2 Terminal Panels, drilled, with Plugs and Sockets at 9d. each complete	1/6
1 Metal Panel, finished dark Crystalline Brown, Cat. No. 1058	2/9
1 Set Special 6-pin Coils, Cat. No. 1065, Set of 3 coils	12/-
1 Metal Cabinet, finished Dark Crystalline Brown, Cat. No. 1061	9/6
Total, £3 10s. 1d.	

MISCELLANEOUS PARTS.

3 T.C.C. .1 mfd. Tubular Condensers with wire ends	
1 Dubilier .0001 mfd. Condenser, type 670	
2 Dubilier .002 mfd. Condensers, type 670	
1 Dubilier 150 ohm 1 watt Resistor	
1 Erie 50,000 ohm Potentiometer	
1 Erie 20,000 ohm 1 watt Resistor	
1 3 point On-Off Switch	
24 $\frac{1}{2}$ " x 6BA R.H. Screws and Nuts	
4 yards 3 mm. Rubber Flexible Wire	
1 Anode Clip (Clix)	
2 yards 18 gauge tinned Copper Wire, Soldering Tags, Washers, etc.	
Total Price, approx. 18s. 6d.	

VALVE.

1 Mullard SP4B Metallised, 7-pin, or Mazda AC/52 PEN. Metallised, 7-pin	12/6
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THEORETICAL CIRCUIT DIAGRAM FOR A.C. UNIT.

SOLDER YOUR WIRELESS SET

THIS ARTICLE WILL HELP YOU.

For noiseless and consistent short wave reception it is advisable to employ soldered joint connections wherever possible in the receiver.

Connections screwed together often become loose and cause erratic performance or noise; another point usually overlooked is that after a time oxidation occurs under locking down nuts and what was originally a good connection develops into a high resistance joint.

To secure best results all sets described in this Manual employ soldered joints, and this article is written to aid those who find soldering difficult.

Many people experience difficulty simply because the job they are working on is dirty and will not allow the solder to run perfectly on the two surfaces, or the iron they are using is dirty or not tinned.

If the instructions given below are closely followed, they require only a few seconds to carry out and when thoroughly mastered soldering will be found the quickest way of wiring a set. Furthermore, there are many occasions in the home when a soldering iron is useful.

The essentials for soldering are the iron, the solder, and a soldering flux. For radio work most fluxes are corrosive and for this reason soldering spirit should never be used. Resin is a good non-corrosive flux and resin cored solder which contains the right amount of resin to make a good joint is strongly advocated. Resin sets hard and after the joint is made can be scraped off with a pen-knife. Flux should not be left, it aids corrosion and collects dust. If ordinary solder is used a tin of good paste flux, such as Coraline or Fluxite is next recommended, and in any case a tin of one of these is wanted for cleaning and tinning the soldering iron.

If electric supply is available an electric iron is of great advantage. When once hot the current keeps it at a constant heat and it cannot overheat as an ordinary iron. To prepare a new electric iron bit for soldering, let the bit heat up, dip into the paste flux and apply solder to the end of the bit until it is nicely tinned all over. When soldering, keep the end of the bit clean and always tinned. A piece of rag for wiping the bit should always be kept handy. The bit of an electric iron should very rarely need filing.

An ordinary iron must be heated externally with a gas ring or fire. Naturally it is more difficult to keep the bit clean. In the first place warm the bit up until the solder runs easily when touched, remove any oxide from the bit end with a file, dip it into the flux and tin end of bit as before. The bit of an ordinary iron must always be kept clean and well tinned to solder easily. If the bit is allowed to become red hot the solder will burn off and the bit must be retinned. Unlike the electric iron, the bit will have to be filed from time to time.

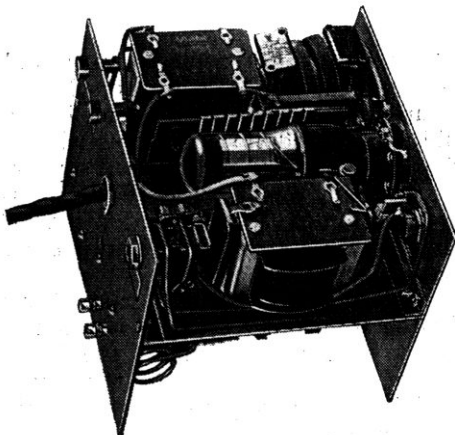
Now, with the iron nicely warm and the bit well tinned, you are ready to solder. The two surfaces or wires to be joined together should be cleaned if necessary with a file or glass paper, if nice clean tinned copper wire is being used this is usually unnecessary. Apply the iron to each connection separately, as the iron heats each part apply the resin cored solder so that each is coated with solder, then place the two parts together, apply the iron and a little more solder and when the solder runs remove the iron, but take care to see that the two wires or parts being joined remain perfectly still until the solder becomes dull and solidifies. Your joint is then made, test thoroughly to make sure; if it comes apart it isn't, and you must try again. As stated before, after a little practice soldering is quick and easy and a useful accomplishment.

TWO VALVE TRANSCEIVER

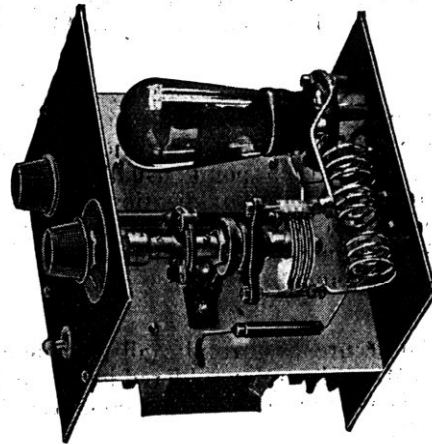
COVERING THE 56 TO 60 Mc/s BAND.

One of the advantages of 5-metre work is the small power necessary to obtain results, and so practical apparatus which is quite portable can be built. Here, we describe a complete 5-metre band transmitter and receiver combined, built from standard parts into what is probably the smallest bulk possible, consistent with efficiency. A 120 volt H.T. battery, a 2 volt L.T. accumulator, microphone, phones and a telescopic aerial, form a complete equipment which can be carried anywhere by one person.

The transceiver has given good and consistent results over a prolonged test period and has achieved R9 2-way working over a distance of above 10 miles under favourable outdoor conditions. In the centre of a city, its range is reduced according to circumstances, but 2 mile working has been accomplished consistently under ordinary conditions and 2-way communication has been carried out between two travelling cars.



Underside view of chassis. The modulation choke, modulator valve, send, receive switch, quench coil unit and microphone transformer are all clearly seen.



Top view of Transceiver showing oscillator valve, tuning control and condenser, and coils L1, L2 and L3, which are each 3 turns of 14g. copper wire, wound on a $\frac{1}{4}$ " core. The coils are supported in the wiring except the aerial coupling (centre) which is fastened on the paxolin panel to the feed out terminals.

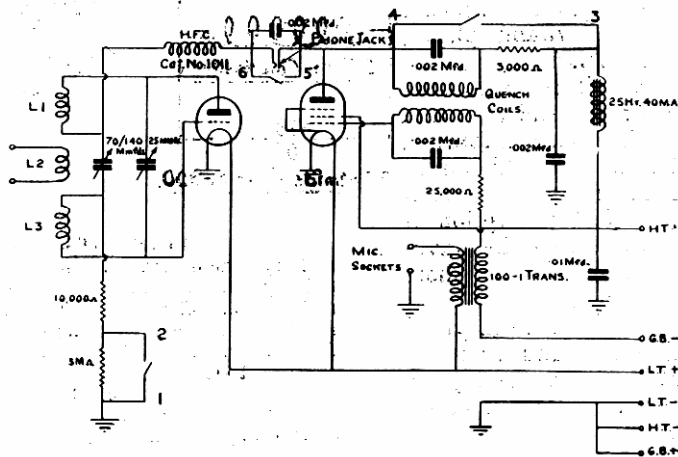
Most transceivers employ the squegging grid leak self-quench detector for reception, but in this model, the detector is not called upon to do both operations, the pentode modulator being utilised as a separate quench valve using quench coils. Change over to send or receive is made by a 3-pole shorting switch. A Mazda P220 small power valve is used as an oscillator for transmission and a detector for reception. The second valve is a Mullard PM22 pentode, used as a modulator for sending and as quench valve for receiving. The action of the switch is as follows. In the receive position, all points are open, the grid leak value being 3 megohms plus 10,000 ohms, phones in circuit, quench coils operative with drop resistance in H.T. feed. On send position, the grid leak value is 10,000 ohms, phones and quench coils short circuited, full H.T. in use. A microphone transformer is fitted, the microphone being plugged straight into back of set and the L.T. battery is used for energising it.

TWO VALVE TRANSCEIVER—continued

The construction of the receiver presents no great difficulty. A paxolin panel 6" x 5" is used at the back, a front panel 6" x 5" of 060" aluminium and a sub-baseboard of the same, 5 1/4" x 6". The top and bottom views illustrated show the position of the component parts. An Eddystone Slow Motion Head with Flexible Coupler is used for tuning control. The

Adjustable Bracket must be cut down suitably in height.

The power output with 120 volts H.T. is about 1.5 watts. A half-wave aerial is recommended and this can be of the Zepp fed, Windom, Impedance matched, or Johnson Q type. The third named was the one used in our experiments.



LIST OF PARTS.

EDDYSTONE

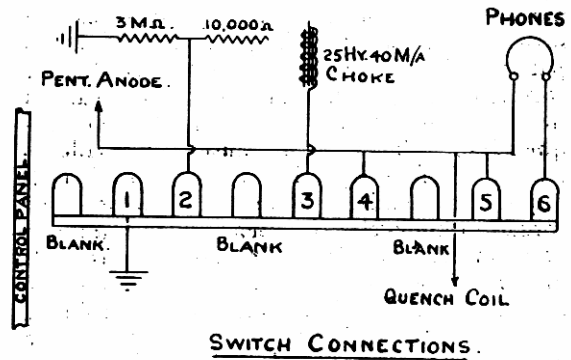
	Price
1 Valveholder, No. 1015	1/3
1 Microdenser, No. 900, 20 m.mfd.	3/9
1 U.S.W. H.F. Choke, No. 1011	1/3
1 Adjustable Bracket, No. 1007	1/6
1 Flexible Coupler, No. 1009	1/6
1 S.M. Driving Head, No. 1012	3/-
1 Quench Coil Unit, No. 958	4/6
1 Knob, No. 903	6d.
Paxolin and Aluminium Panels (drilled), with Coils, Wire, Leads, etc.	18/-

MISCELLANEOUS

1 each 'Erie 1-watt Resistors, 3,000, 10,000, 25,000 ohms, 3 meg.
1 Cyldon 70/140 m.mfd. Capacitor
1 Igranic Jack
2 Belling Lee Plugs and Sockets
1 T.C.C. "M" type Condenser, .01 mfd.
3 T.C.C. "M" type Condensers, .002 mfd.
1 Keston 25 hr. 40 m/a. Choke, No. 204a
1 Keston Mic. Transformer 100:1, No. W44
1 On-Off Switch
1 Utility Switch, No. W342/3
1 W.B 5-pin Valveholder

The set is not supplied as a complete kit, but for reference the approximate total cost with valves is

£4 0 0



SWITCH CONNECTIONS.

VALVES.

Mazda P220 Oscillator, Detector	6/-
Mullard PM22 Modulator, Amplifier	11/-

ABSORPTION WAVEMETER

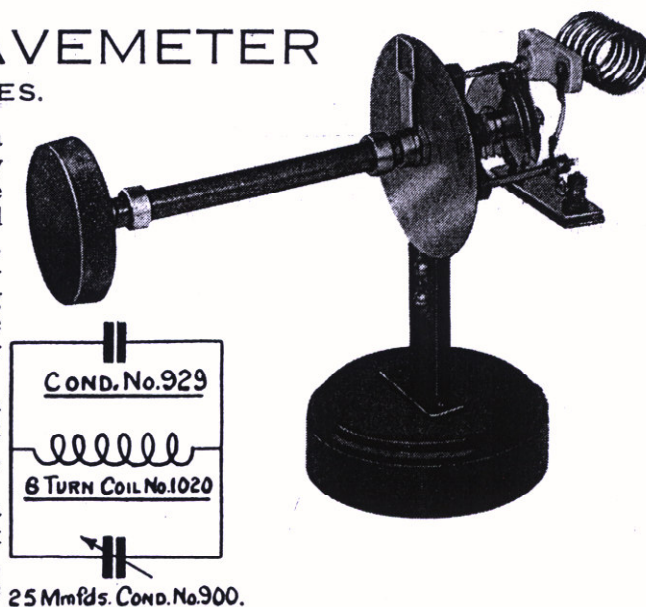
4.5 METRES TO 7.7 METRES.

An absorption wavemeter for the ultra short wavelengths is a most useful accessory and can be quickly and cheaply built. The construction consists of a 6-turn silver plated coil mounted on a 25 m.mfd. condenser, which is variable and provided with an engraved scale and cursor. A small padding condenser is connected in parallel with the main capacity, to give a somewhat straighter wavelength curve.

The assembly in this case has been mounted on an Eddystone adjustable bracket fastened to an ordinary 3 $\frac{1}{4}$ " round plinth, as commonly used by electricians.

The instrument covers all the uses of a wavemeter for receiver or transmitter work and is easily portable. When once calibrated, however, it is essential that it should not be dropped or roughly handled since the calibrations may be upset. A full description of the method to be used to calibrate the wavemeter is given in the article on ultra short wave frequency measurements.

The frequency range, 67 to 39 megacycles, covers the 5-metre amateur band and the proposed television services with overlap on each side. For higher wavelengths, a larger coil can be substituted.



LIST OF PARTS

	Price
1 Eddystone 6 turn Coil, No. 1020	1/8
1 Eddystone 10 m.mfd. Condenser, No. 929 ..	1/-
1 Eddystone Microdenser, 20 m.mfd., No. 900	3/9
1 Eddystone Knob Dial and Cursor, No. 1026	2/-
1 Eddystone Extension Control Outfit, No. 1008	1/3
1 Eddystone Adjustable Bracket, No. 1007..	1/6
1 Round Wood Block
Connecting Wire, Screws, etc.	..

WAVELENGTH OR FREQUENCY?

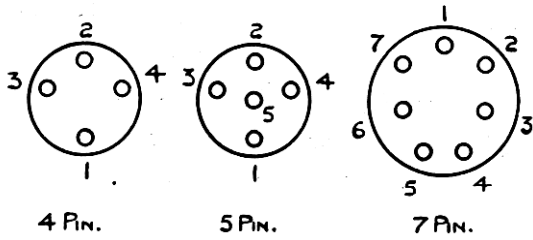
The term "wavelength" as applied to broadcast transmissions does not convey such a true picture of the actual position as the lesser used word "frequency." This is particularly true in connection with the "short wavelengths," which can always be regarded much more profitably as the "high frequencies." This is because a broadcast transmission irrespective of its wavelength requires a definite amount of room or band spread in kilocycles (frequency). The amount of room necessary in order that stations shall not interfere with or heterodyne each other is about 10 kilocycles. But a station using a band-spread of this amount will spread over 3 metres at the wavelength used by the Midland Regional transmitter, operating on 298.8 metres, over 30 metres in the case of Droitwich National programme on 1,500 metres, while turning to the short waves, only about .0198 metres will be covered if the English short wave station at Daventry on 25.53 metres is taken as an example. The significance of these figures is perhaps better

realised if it is pointed out that with the frequency range that exists between 20 and 21.2 metres, it is possible for all the European broadcast stations on both the medium and long wavebands to work with the same kilocycle separation as at present.

When the ultra short waveband is considered, a difference of 1 metre wavelength, which does not sound very much, can instantly be appreciated when considered in terms of frequency, the frequency difference between 5 and 6 metres being 10,000,000 cycles or 10,000 kilocycles, or 10 megacycles. Enough room for all the broadcast stations in the world to work comfortably with a 10 kilocycle separation. Thus only by using the term "frequency" instead of "wavelength" do we begin to get a clear idea of the fundamental difference between medium, short and ultra short wavelengths. This is the reason that the use of megacycles instead of metres is now adopted for short wave stations.

Divide 300,000 by the wavelength in question to obtain the frequency in kilocycles.

BASE CONNECTIONS FOR 4 PIN, 5 PIN & 7 PIN VALVES.



4 PIN. 5 PIN. 7 PIN.
Valve bases viewed from free ends of sockets.

NOTE :-

- A = Anode
- A_o = Oscillator Anode
- C = Cathode
- D₁ = Diode No. 1
- D₂ = Diode No. 2
- F = Filament
- G₁ = Control Grid
- G₂ = Screen Grid
- G₃ = Suppressor Grid
- G_o = Oscillator Grid
- H = Heater
- M = Metallising

4-PIN BASE

DESCRIPTION	MAKER	VALVE TYPE	PIN NUMBER				TOP CAP
			1	2	3	4	
General Purpose Battery Triode	Mazda	HL2	A	G ₁	F&M	F	—
Battery Power Valve	Mazda Osram Mullard	P220 LP2 PM2A	A	G ₁	F	F	—
Battery Screen-Grid Valve	Mazda	SG215	G ₂	G ₁	F	F	A

5-PIN BASE

DESCRIPTION	MAKER	VALVE TYPE	PIN NUMBER					TOP CAP
			1	2	3	4	5	
Battery Double Diode Triode	Mazda	L21/DD	A	D ₁	F&M	F	D ₂	G ₁
Battery L.F. Pentode	Osram Mazda Mullard	PT2 Pen. 220 PM22A	A	G ₁	F	F	G ₂	—
General Purpose Mains Triode	Mullard	354V	A	G ₁	H	H	C&M	—

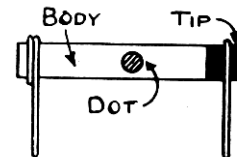
7-PIN BASE

DESCRIPTION	MAKER	VALVE TYPE	PIN NUMBER							TOP CAP
			1	2	3	4	5	6	7	
Mains V M H.F. Pentode	Mullard	VP4	M	G ₁	G ₂	H	H	C	G ₂	A
		VP4B	M	A	G ₂	H	H	C	G ₂	G ₁
Battery V M H.F. Pentode	Mazda	VP210	M	G ₁	G ₂	F	F	—	G ₂	A
Mains H.F. Pentode	Mullard	SP4	M	G ₁	G ₂	H	H	C	G ₂	A
Battery H.F. Pentode	Mazda	SP210	M	G ₁	G ₂	F	F	—	G ₂	A
	Mullard	SP2	M	G ₁	G ₂	F	F	—	G ₂	A
Mains Triode Hexode Freq. C. Battery	Osram	N41	A _o	G _o	G ₂	H	H	C&M	A	G ₁
		N21	A _o	G _o	G ₂	F	F	M	A	G ₁
Mains Double Diode Triode	Mullard	TDD4	D ₁	M	D ₂	H	H	C	A	G ₁
I.H. Mains Output Pentode	Mullard	Pen 4VB	—	G ₁	G ₂	H	H	C	A	—
Class B Double Triode Valve	Osram	B21	G ₁ (a)	G ₁ (b)	A(b)	F	F	—	A(a)	—

R.M.A. RESISTANCE COLOUR CODE CHART.

Fig.	Colour	Fig.	Colour
0	Black	5	Green
1	Brown	6	Blue
2	Red	7	Violet
3	Orange	8	Grey
4	Yellow	9	White

RESISTANCE VALUE	BODY	TIP	DOT
100 ohms	Brown	Black	Brown
1,250 ohms	Brown	Red	Red
10,000 ohms	Brown	Black	Orange
250,000 ohms	Red	Green	Yellow
7 Megohms	Violet	Black	Green



BODY COLOUR.
First figure of resistance value.

TIP COLOUR.
Second figure.

DOT COLOUR.
No. of O's following first two figures.

Examples are shown in table to left

SHORT WAVE BROADCAST STATIONS

m.	kc/s	Station	Dial Reading	m.	kc/s	Station	Dial Reading
50.26	5969	Vatican City (Italy) HVJ. Daily 20.00-20.15; SUN., 11.00		31.09	9650	Lisbon (Portugal) CTIAA. TUES. and THURS., 22.00-00.00	
50	6000	Moscow (U.S.S.R.) RW59		31	9677	Lisbon (Portugal) CTICT. THURS., 21.00-23.00; SUN., 12.00-14.00	
49.83	6020	Zeesen DJC. 18.00-22.30; 23.05-04.30		30.43	9860	Madrid (Spain) EAQ. 23.15-01.30; SAT., 19.00-21.00 also	
49.67	6040	Boston (Mass.) W1XAL. SUN. 22.00-00.00. MON., TUES., & THURS., 00.00-02.00		25.6	11.720	Radio-Colonial(Paris) TPA4. 23.15-05.00	
49.59	6050	Daventry GSA.		25.53	11,750	Daventry GSD.	
49.5	6060	Cincinnati W8XAL. Daily, 12.30-02.00; 05.00-08.00		25.49	11,770	Zeesen (Germany) DJD. 18.00-22.30	
49.5	6060	Skamlebaek (Denmark) OXY. 19.00-00.30. SUN., from 17.00		25.45	11,790	Boston (Mass.) W1XAL. SUN. 15.45-17.00; 20.30-22.00; MON., TUES., THURS. & FRI., 22.30-23.00; WED., 22.00-23.00	
49.41	6072	Vienna Experimental OER2. MON. to FRI., 15.00-23.00. SAT. to 00.00		25.4	11,810	Rome (Italy) 2RO. Daily, 14.15-15.00; 15.15-17.00; 18.00-19.00; 19.45-23.15	
49.31	6083	Nairobi (Kenya) VQ7LO. SUN., 17.00-20.00. MON., to FRI., 11.45-12.15; 17.30-20.30. TUES. & THURS., 14.30-15.30. SAT. 17.00-21.00		25.38	11,820	Daventry GSN.	
49.18	6100	Bound Brook(N.J.)W3XAL. MON., WED., SAT., 23.00-06.00		25.29	11,860	Daventry GSE.	
49.1	6110	Daventry GSL.		25.27	11,870	Pittsburgh W8XK. 22.00-00.00	
49.1	6110	Calcutta (India) VUC. Daily 08.06-09.06; Irreg., 14.06-17.36; SUN., 05.36-08.36		25.23	11,880	Radio-Colonial (Paris) TPA3. 06.00-09.00; 22.30-23.00	
48.86	6140	Pittsburgh W8XK. 00.00-06.00		25	12,000	Moscow (U.S.S.R.) RW59. SUN., 04.00-05.00; 16.00-17.00	
42.4	7074	Georgetown(British Guiana) VP3MR		24.52	12,235	Reykjavik (Iceland) TFJ. SUN., 19.40-20.00	
39.95	7510	Tokio (Japan) JVP. TUES. & FRI., 20.00-21.00		19.84	15,121	Vatican City HVJ. Daily, 16.30-16.45	
38.48	7797	Radio-Nations HBP. SAT., 23.30-00.15		19.82	15,140	Daventry GSF.	
34.29	8750	Hong Kong ZCK3. Daily, 05.30-07.15		19.76	15,180	Daventry GSO.	
31.55	9510	Daventry GSB.		19.74	15,200	Zeesen DJB. 14.00-17.30; 18.30-08.00	
31.55	9510	Melbourne (Australia) VK3ME. MON. to SAT., 10.00-13.00		19.72	15,210	Pittsburgh W8XK. 14.00-00.00	
31.48	9530	Schenectady(N.Y.)W2XAF 21.00-05.00		19.71	15,220	Eindhoven PCJ., Exp. SUN. 13.00-14.00; TUES. 09.00-12.00; WED., 23.00-17.00	
31.45	9540	Zeesen DJN. 09.45-13.15; 23.05-04.30		19.68	15,243	Radio-Colonial (Paris) TPA2. 11.00-16.00	
31.38	9560	Zeesen (Germany) DJA. 06.30-08.15; 14.00-17.30; 23.05-03.15		19.66	15,260	Daventry GSI.	
31.36	9565	Bombay VUB. SUN., 07.00-08.30; TUES., 17.00-18.30; SAT., 17.30-18.30		19.60	15,310	Daventry GSP.	
31.35	9570	Millis (Mass.)W1XK. Daily, 11.00-05.00		19.56	15,330	Schenectady W2XAD. Daily, 15.00-19.00	
31.32	9580	Daventry GSC.		16.88	17,770	Huizen (Holland) PHI. SUN., 14.00-17.00; 19.00-20.00; MON., THURS., FRI., 14.00-16.00; SAT., 14.00-17.00	
31.28	9590	Sydney (Australia) VK2ME SUN., 07.00-09.00; 11.00-15.00; 16.30-18.30		16.87	17,780	Bound Brook W3XAL. 14.00-22.00	
31.28	9590	Eindhoven PCJ. MON., 01.00-02.00		16.86	17,790	Daventry GSG.	
31.27	9595	Radio-Nations HBL. SAT., 11.30-12.15		15.93	18,830	Bandoeeng (Java) PLE. TUES., THURS., SAT., 16.00-16.30	
31.13	9635	Rome (Italy) 2RO. Daily, 00.00-00.15; MON., WED., and FRI., 00.00-03.00; TUES. and THURS., 23.15-23.30		13.97	21,470	Daventry GSH.	
				13.93	21,530	Daventry GSJ.	
				13.93	21,540	Pittsburgh W8XK. 12.00-14.00	

With acknowledgments to "World Radio." All times are B.S.T. Deduct 1 hour for G.M.T.