# THE EDDYSTONE 730/4

## DISCUSSING A USEFUL GENERAL PURPOSE RECEIVER

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DETAILS of some of the well-known Eddystone receivers have appeared in past issues of SHORT WAVE MAGAZINE. These included the S.640 (*Jan.* 66), 740 and 750 (*May '69*), 840A and 840C (*Dec. 69*) and 888A (*April 72*). Now that the 730/4 model has recently become available from several suppliers, it is felt that details of this receiver would be of interest. The 730/4 has features which make it an exceedingly good general-coverage receiver. As is usual with Eddystone receivers, components and mechanical construction are of the highest quality. Indeed, many earlier Eddystone models are still giving good service in numerous shacks after 25 years or more, and the 730/4 is a relatively new and "young" receiver.

**Band Coverage**

There are 5 ranges: (1) 12·3-30 MHz, (2) 5·3-12·5 MHz, (3) 2·5-5·7 MHz, (4) 1·11-2·5 MHz, and (5) 480-1110 kHz. One of five small indicator lamps shows which range is in use. These ranges do of course give coverage of all amateur bands, Top to 10m., as well as general SW coverage for the SWL, or as use with a converter for 4m. or 2m. as IF/AF amplifier.

The familiar Eddystone tuning drive which breaks up the scale into 2500 divisions for logging purposes is again used. Readings on this scale for the various amateur bands are as follows:

1·8-2·0 MHz—254 divisions; 3·5-3·8 MHz—180 divisions; 7·0-7·1 MHz—31 divisions; 14-14·35 MHz—71 divisions; 21-21·45 MHz—45 divisions; 28-29·7 MHz—191 divisions.

It is thus practicable to prepare an individual graph for any amateur band, if wanted, and the reduction ratio of approximately 120:1 allows easy tuning. Calibration and re-set to frequency can be extremely accurate, and the cursor can be set by the small top right hand adjusting knob to agree with pips from the 500 kHz internal calibration oscillator, operated by pressing the topleft hand button. The 500 kHz calibration points throughout all ranges are marked in red. For amateur-band purposes, calibration can be checked by this means at 1·5 and 2·0 MHz, 7 MHz, 14 and 14·5 MHz, 21 and 21·5 MHz, and 28 to 30 MHz. The actual tuning scale length is 12in., with finely calibrated scales.

In terms of reception, this means that a transmitter of known frequency can very nearly be found by dial readings alone.

**Block Diagram**

Fig. 1 is a block diagram. V1 is the 1st RF (6BA6) and V2 the 2nd RF (6BA6). The use of two RF stages reduces 2nd channel interference to an exceedingly low level. V3 is the mixer (6BE6) with separate oscillator V4 (6AM6) operated from the voltage regulated supply from V14 (VR150/30).

V5 and V6 are the two IF amplifiers (6BA6's) and variable selectivity and optional crystal filter are provided. V7 is a double-diode (6AL5) used for AVC and demodulation, and V8 (12AU7) provides two stages of AF amplification. V15 is the output stage (6AM5) and there is an optional audio filter between V8 and V15.

V9 (6AL5) is a cathode follower for S-meter protection, and noise limiting. V11 (6AU6) is a cathode follower giving an optional IF output point at 70-80 ohms impedance.

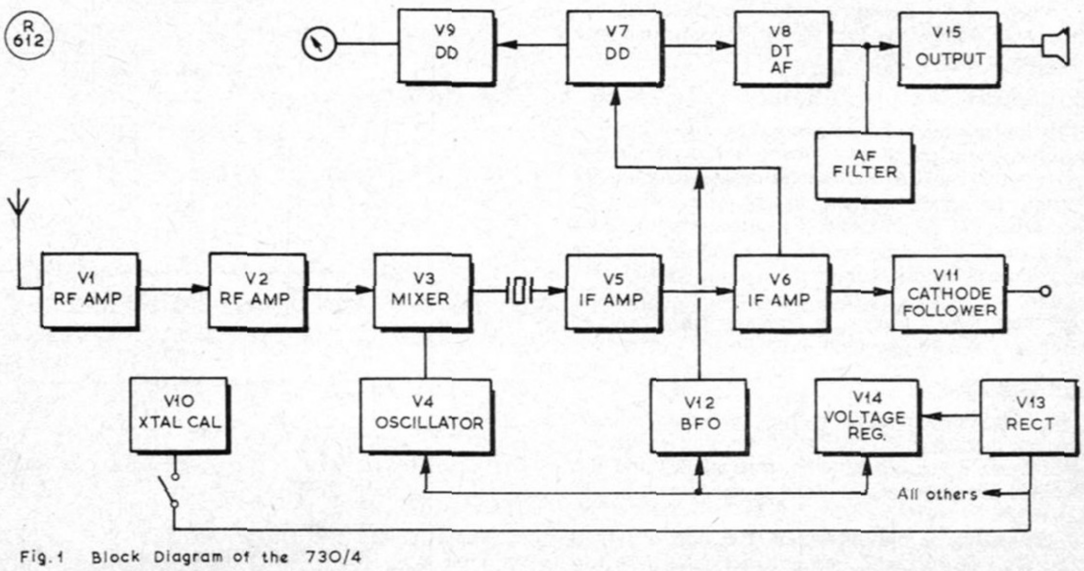
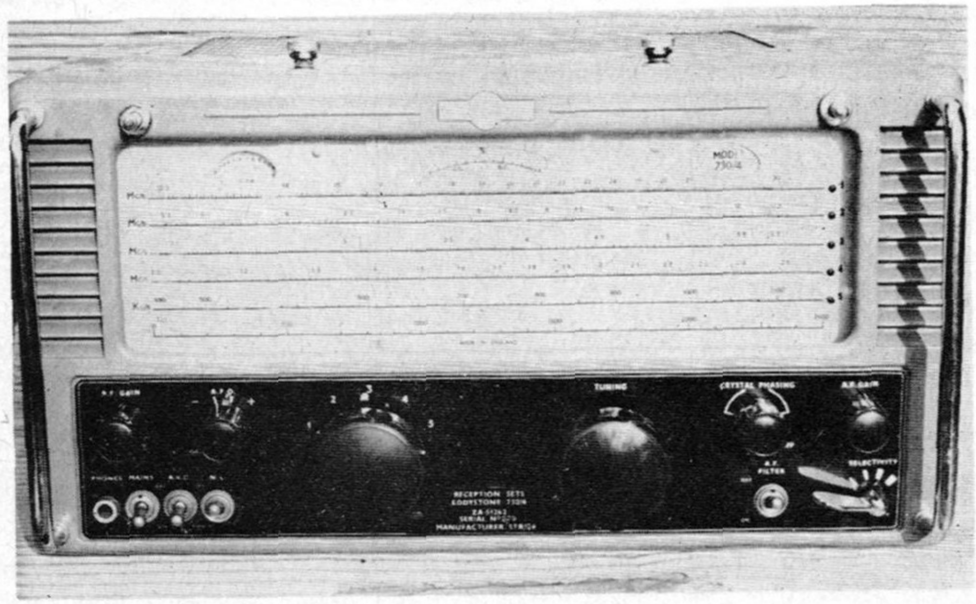



Fig. 1 Block Diagram of the 730/4



**(Front.) The band in use is indicated by the small lamps to the right of the scales. The centre logging scale is read in conjunction with the bottom scale in the manner familiar to users of similar models. Controls are described in the text.**

V10 (6AM6) is the crystal calibrator, with means of adjusting to zero beat with the 2·5 MHz or other standard frequency transmission if required. V12 (6BA6) is the BFO, also receiving regulated HT. V13 (5Z4G) is the full-wave rectifier.

There is provision to use the audio section alone as an AF amplifier, pick-up terminals being provided at the back. Output is for a 2/3 ohm speaker, or 600-ohm line. Other facilities at the back of the receiver include adjustment for the S-meter zero, two aerial inputs, a dial light brilliance control, mains input socket, and socket for alternative supply. Here, the receiver requires 5 amperes at 6v. or 6·3v., with 120 mA at 250v. for HT; or it can be operated from 110v. to 250v. AV mains, by adjustment of taps on the internal mains transformer, these being marked for the various voltages.

**Panel Controls**

The crystal calibrator switch and cursor adjuster have been mentioned. Knob controls, from left to right, are (1) RF Gain, (2) BFO Pitch with "Off" position, (3) bandswitch, (4) main tuning, (5) crystal phasing control with "Off" position, and (6) AF Gain.

Lower, at the left, is an outlet for phones, and toggle switches for mains, AVC, and noise limiter. At the right is a toggle switch for the audio filter, and a 4-position selectivity switch.

The S-meter is fitted at the top left of the tuning scales.

**Aerial Input**

There are two co-axial sockets in parallel, and either may be used for the aerial. The input impedance is 70-80 ohms. This means that a conventional dipole with co-axial or twin feeder will automatically provide best matching. So will an end-fed or other type of transmitting aerial used with a tuner or Z-match adjusted to present a load of about 75 ohms to the transmitter, and switched to the receiver for reception.

DX reception is of course possible with a random length of end-connected wire, taken directly to the inner pin of the aerial socket, though the use of a matching device will improve results, in the customary manner. A terminal allows a "silent" (non-mains) earth to be connected.

**Calibration and Alignment**

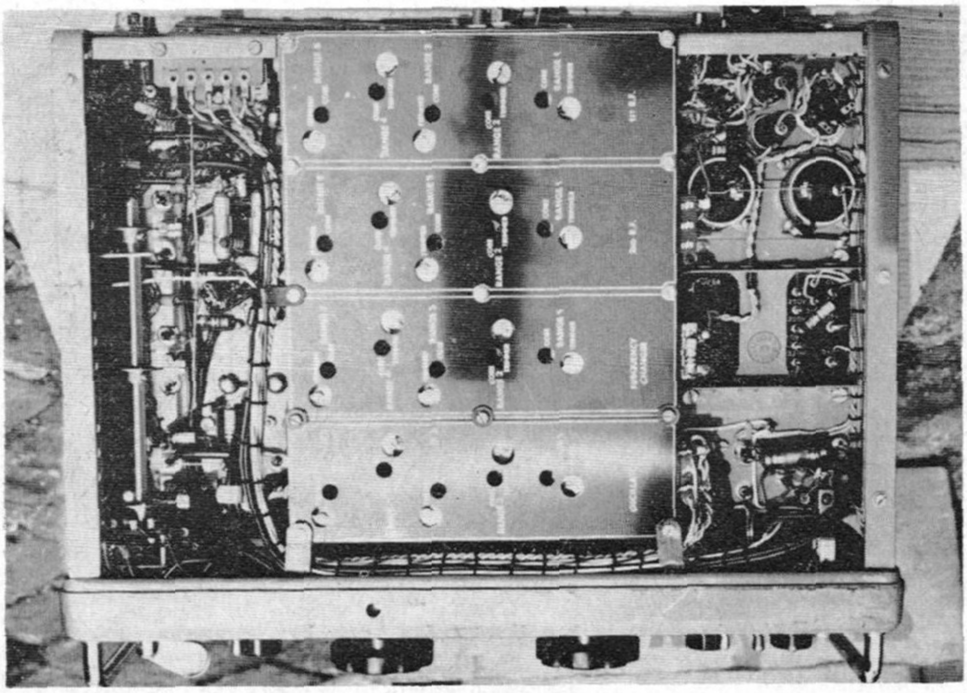
Any adjustment to the IF, signal-frequency or oscillator circuits should only be made with appropriate equipment and a full knowledge of procedure. The IF is 450 kHz, with a 1·5 kHz latitude to suit the individual crystal.

The setting points for the oscillator trimmers and cores are; *Range* **1,** 28/14 MHz; **2,** 12/6 MHz; **3,** 5·6/2·5 MHz; **4,** 2·5/1·2 MHz; and **5,** 1,000/1500 kHz. The cursor adjuster should be at its middle position. Trimmers are always adjusted at the HF end of a band, and cores at the LF end.

The tracking points to adjust aerial, 2nd RF and mixer signal frequency circuits are: *Range* **1,** 28/13·3 MHz; **2,** 12/6 MHz; **3,** 5·4/2·6 MHz; **4,** 2·3/1·2 MHz; and **5,** 1000/520 kHz. A very high degree of scale accuracy should be obtained on each band.

**Selectivity Controls**

The main selectivity control has four positions, and changes the coupling in the three IF transformers. This



(Inside bottom.) The cast coil box is covered by a plate with trimmers and cores marked for each range. Here, the IF section and associated circuits are to the left, and audio and mains sections to the right.

control also operates a switch which adjusts the gain of the 1st IF stage, to obtain more equal output over the range of selectivity positions.

In addition a single crystal is used with phasing capacitor, as in Fig. 2. This capacitor operates a switch in one position to eliminate the crystal.

These ranges of selectivity will allow good results under bad conditions, for AM, SSB or CW reception.

With selectivity in the minimum position, the response is substantially flat-topped, and is 9 dB down at approximately 7 kHz off resonance, and 50 dB down about 12 kHz off. The next position has 9 dB points at about 3·5 kHz off resonance, and 50 dB points at about 9 kHz off. The next position provides 9 dB points at a little over 2 kHz off resonance, and 50 dB points at 7 kHz off. The sharpest position (without crystal) gives 9 dB

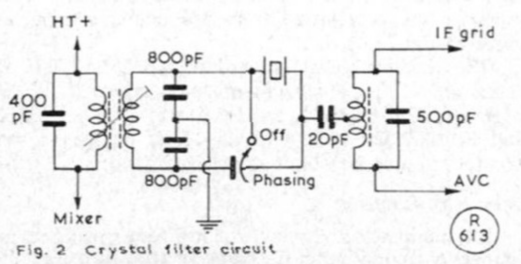



Fig. 2 Crystal filter circuit

points at about 1·8 kHz off, and 50 dB at 6 kHz off. This position is some 30 dB down at 4 kHz off and the sharpest likely to be normally used for AM.

With the crystal in, signals are 30 dB down at about 1 kHz off resonance, results depending on crystal phasing. As is usual with this type of filter, a very deep rejection notch can be moved across the IF passband by adjusting the phasing capacitor. The maximum degree of selectivity available is very high.

**Audio Filter**

This is, of course, only used with CW. In difficult conditions the filter is switched in, and the BFO adjusted to place the audio tone in the filter pass-band. This results in a great clearing up of surrounding mush of other signals.

The filter has tuned inductances, and is resonant at about 1000 Hz, with a pass-band of 100 Hz or so at about 6 dB points. This filter can select a wanted signal out of a background of other signals which normally would be almost impossible to separate.

**S-Meter**

This is calibrated at 6 dB per point, and 6, 12 and 18 dB over S9. Fig. 3 is the S-meter circuit. VR1 allows this arm of the bridge to be adjusted for zero. The presence of a signal causes a rise in voltage at G2, V5,

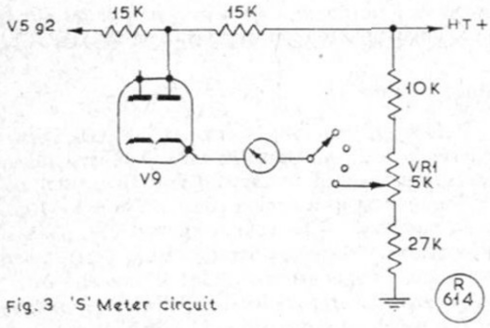



Fig. 3 'S' Meter circuit

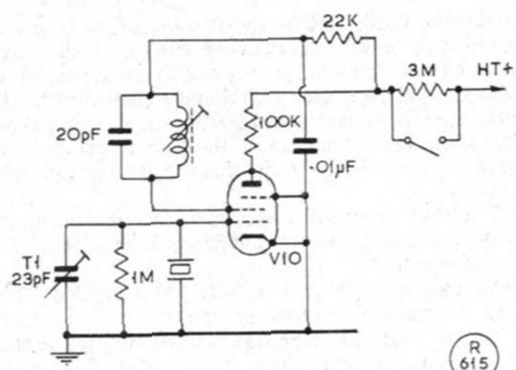



Fig. 4 500kHz Crystal Calibrator

operating the meter. For normal readings RF gain is at maximum (and AVC on). The meter only operates at the maximum selectivity position (but with crystal in or out) as this helps separate the reading from that of adjacent carriers in a congested band.

There is no adjustment other than temporarily shorting aerial and earth at the back of the receiver, and setting VR1 for zero on the scale.

**Crystal Calibrator**

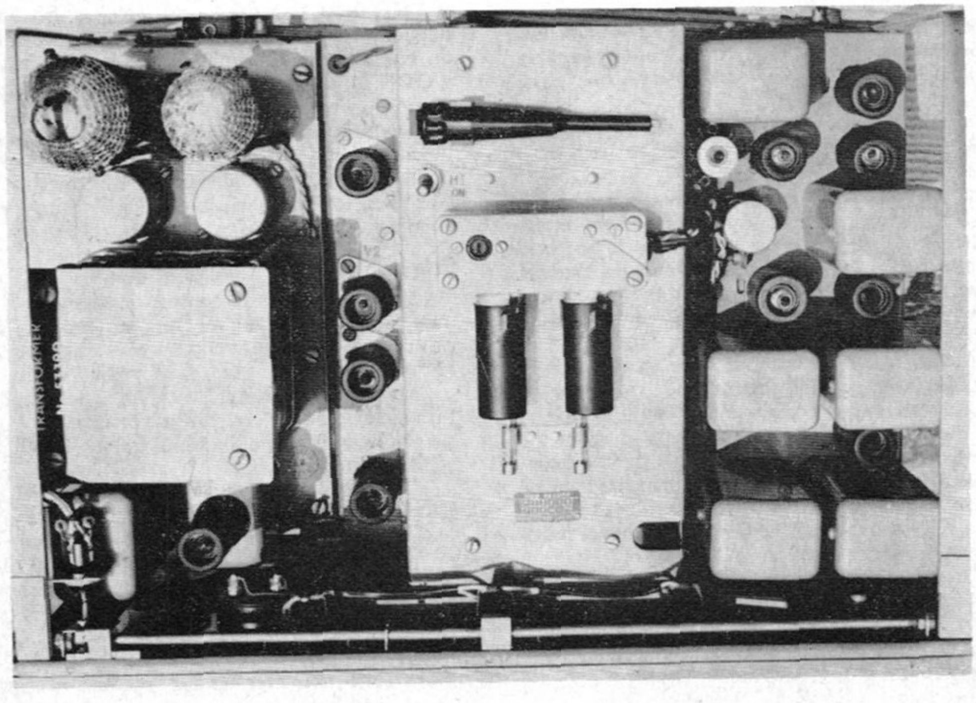
The circuit of this unit is shown in Fig. 4, and it is fitted to the top of the ganged tuning capacitor screen. Adjustment of frequency should rarely be necessary, but is possible by rotating T1 with the tool clipped near the unit.

Assuming the calibrator is to be checked against the standard frequency transmissions of 2·5 MHz or 5 MHz, tune in the latter, and rotate T1 for zero beat of the crystal harmonic.

The 500 kHz marker pips can be located up to 30 MHz, but naturally get weaker as frequency increases. If the BFO is on (white mark on top) a heterodyne is produced at the 500 kHz points.

**CW and SSB**

It will be noted that the receiver has no product or mixer detector (as with the 888A). However, satisfactory SSB reception is readily achieved provided it is remem-



**(Inside top). This clearly shows the calibrator on top of the gang cover, with tool behind. The three IFT's on the right have mechanical adjustment of coupling for selectivity purposes.**

bered that the SSB signal at the detector is kept down to a substantially lower level than the BFO injection. This means that whereas RF gain is usually at or near maximum for AM reception, with volume controlled by the audio gain, the reverse is so for SSB (and probably CW). With audio gain at maximum, RF gain is reduced until rotation of the BFO pitch control gives proper SSB reception.

The BFO is pentode connected, with 8 pF from anode to AM diode demodulator, so there is quite a reasonable level of injection.

No particular points arise with CW reception. The makers suggest maximum or intermediate selectivity for normal purposes. The BFO can be adjusted to that side of zero beat which gives best freedom from other signals. Naturally, with the crystal in, and also the audio filter if wanted, the receiver can produce CW which can be copied but which would be almost or quite impossible to read without these features.

### General Points

Removing four large screws at the back allows the receiver to be drawn out of its case. A hinged lid permits valves to be reached, or adjustment to the crystal marker.

The recommended mains fuse is 750 mA Magnickel or 1A standard. The scale lamps are 6·5v. 0·3A, small bayonet cap. There are five miniature lamps for range indication. These are assembled in holders on a strip which can be taken out when a thumbscrew is undone.

The weight is not much over 45 lbs. Dimensions are approximately 17 x 9 x 14 in. including the front handles. On those models so fitted rack-mounting brackets are fixed with screws and easily removed.

# LOW-BAND "CAMBRIDGE" AM.10 CONVERSION FOR TWO METRES

## MODIFYING THE RECEIVER SIDE

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THERE must be many people with a Low-Band Pye Cambridge just lying about doing nothing, simply because it is thought an impossible task to convert it for use in the two-metre band.

This article describes the method employed when converting such a unit so that it could be used as a fixed-channel two-metre mobile.

The mobile which was converted was in Band "E", 68-88 MHz, which may seem ideal for four metre working but is of little use to the owner of a "B" licence.

Once the mobile has been converted to fixed channel on two metres, any of the standard well tried modifications may be used to make it tunable if required.

The first, and often considered the most difficult, task will be to make the receiver tune to a signal at 145 MHz, the mobile calling channel.

For the conversion work the user should have a copy of the "Cambridge" manual by Pye with the original circuit diagram. A glance at this for the front-end shows us that this is nothing more than the familiar "converter," but instead of being followed by an Eddystone or a CR100 as a tunable IF it feeds into a fixed-frequency 10·7 MHz amplifier. As the Cambridge will not tune over a band its "receive" frequency must be controlled by its first local crystal oscillator. This must beat with the received signal at the mixer to produce the 10·7 MHz IF. The crystal frequency is calculated from the formula:

$$\frac{\text{Signal freq.} - 10{\cdot}7}{3} = \frac{\text{Local osc. freq.}}{3}$$

So for the mobile channel,

$$\frac{145{\cdot}0 - 10{\cdot}7}{3} = \frac{134{\cdot}3}{3} = 44{\cdot}766 \text{ MHz}$$

The oscillator in the diagram is VT3 (using the manual nomenclature) with its collector tuned to the third overtone of the crystal, *i.e.* 134·3 MHz, which is fed *via* C24 to a mixer diode MR1 where it mixes with the 145 MHz signal to produce the 10·7 MHz IF.

### Required

The test gear needed before attempting this conversion is VHF signal generator or a signal source at the tune frequency, *e.g.* a transmitter tuned to 145·0 MHz will do with a low level coupling taken from its dummy load; a GDO for checking the coil resonance; and a sensitive absorption wavemeter will be useful.

An RF probe can be simply constructed and used in conjunction with a 50 $\mu$A meter for checking the oscillator injection voltage and a three turn coupling coil fitted to it for detecting the presence of RF in coil windings—*see* Fig. 3.

### Step-by-Step

The procedure is to convert one stage at a time and ensure that it is working before going on to the next—in this way we will not end up with a receiver that does not work and so has many fault possibilities.

All coils to be wound with 20g. enam. copper wire, turn spacing about one wire's diameter.

(1) Remove winding from former of T2 and note position of taps,
(2) Take out C16 and C19, to be replaced later.
(3) Rewind with 4 turns 20g. enam.,
(4) Tap coil at 1 turn and 2½ turns from HT end, connect taps to original positions on former,
(5) Replace C16 and C19. Check for resonance with GDO,
(6) Insert crystal for "receive" channel,
(7) Connect battery supply and switch on.
(8) The oscillator should now be working if the coil has been correctly wound. Check this by use of the absorption wavemeter which will roughly check frequency; in our case it should