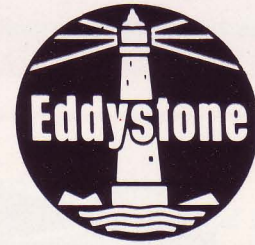


## Eddystone Radio Limited

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# High-Stability Communication Receiver

## Model EC958/7E

### General Description

The Eddystone EC958/7E is an advanced solid-state receiver developed from the well-established EC958 High Stability Receiver which is currently in widespread use with numerous communications agencies throughout the world. The new design retains all standard features of the basic EC958 including the versatile tuning system which allows complete frequency setting with a maximum of two adjustments. Model EC958/7E provides a higher order of stability and incorporates a number of detail improvements which extend its usefulness in many applications. Utilisation of some standard EC958 modules and sub-units in the EC958/7E simplifies spares holding for establishments using a number of receivers of each type.

The EC958/7E covers the frequency band 10kHz to 30MHz with reception facilities for all normal signal modes including FSK. Self-contained circuitry permits high-stability working at all frequencies from 1.6MHz up, and provision is made for connecting an external synthesizer on the lower frequency ranges. The receiver can be powered from any 40 - 60Hz AC supply and is available in basic form for rack-mounting, or complete with cabinet to suit bench installations. Current variants include Model EC958/12 which is specially modified for ISB reception.

The circuit configuration for frequencies below 1.6MHz employs either single-conversion with an IF of 100kHz, or double-conversion using an additional IF of 250kHz. An oven-controlled crystal oscillator provides 350kHz injection for the second conversion stage on those ranges where double-conversion is used.

The 1st Oscillator is continuously tunable for all frequencies from 10kHz to 1.6MHz and provides adequate stability for the types of signal normally encountered in this part of the spectrum. Frequency read-out is by means of a high-resolution optical projection system equipped with a polarised filter to maintain optimum readability in conditions of high ambient lighting. The scale markings are free from parallax and frequencies can be read to 1kHz.

**10kHz - 30MHz coverage**

**Readout to 1Hz with accuracy of >4Hz**

**Maximum of two frequency adjustments**

**Provision for all standard signal modes**

**Special version for ISB**

**Comprehensive output facilities**





3/4 view of EC958/7E/RM with covers removed

At frequencies higher than 1.6MHz, the circuit changes to triple-conversion with a tunable 1st IF ahead of the two IF's used on the double-conversion ranges. The 1st Oscillator becomes part of a narrow-band drift-cancelling loop which can be locked at intervals of 100kHz by reference to an oven-controlled Master Oscillator to give an effective 1st Oscillator stability of  $\pm 0.5$  parts in  $10^7$ . Adjustment of the 1st Oscillator to the appropriate 100kHz point is by use of the Main Tuning Control with frequency read-out provided by the optical projection system in the same manner as on the lower frequency ranges.

Interpolation between adjacent 100kHz points on the main scale is achieved by use of the tunable IF facility which is set by means of the Incremental Tuning Control. Calibration read-out is by a 5-figure digital display which can be read to the nearest cycle of the tune frequency: overall accuracy is within 4Hz under all conditions of operation.

Provision is made for disabling the drift-cancelling loop to permit continuous search tuning over any selected HF range with the incremental facility still available for use as a fine frequency adjuster.

#### Brief Circuit Details

The receiver employs FET's and MOSFET's in almost all the front-end and IF stages, and utilises single, double or triple-conversion according to the frequency range in use. Input protection is included as a standard feature and desensitizing is provided by an internal relay which interrupts the aerial feeder and grounds the input to the RF Stage during periods of transmission. Three signal frequency circuits are used before the 1st Signal Mixer on all except the two lowest ranges where adequate selectivity is provided by two circuits.

The Master Oscillator, Incremental Oscillator and the 350kHz crystal in the final conversion stage are all oven-controlled: provision is made for standardising the Master against an external frequency standard.

Bandwidth in the 1st and 2nd IF is limited to a maximum of the order 15kHz and selectivity is adjustable at the final IF where a 5-section L/C filter can be switched to provide bandwidths of 400Hz, 1.3kHz, 3kHz and 8kHz. Separate upper and lower sideband filters can be introduced for SSB reception with characteristics in accordance with CEPT Specifications. IF output is available at 100kHz for use with ancillary equipment.

The CW/SSB Detector employs a double-balanced mixer with carrier insertion derived from the Master Oscillator. A tunable BFO is used for CW signals, this having a coverage of  $\pm 5$ kHz with a reduction drive for ease of adjustment.

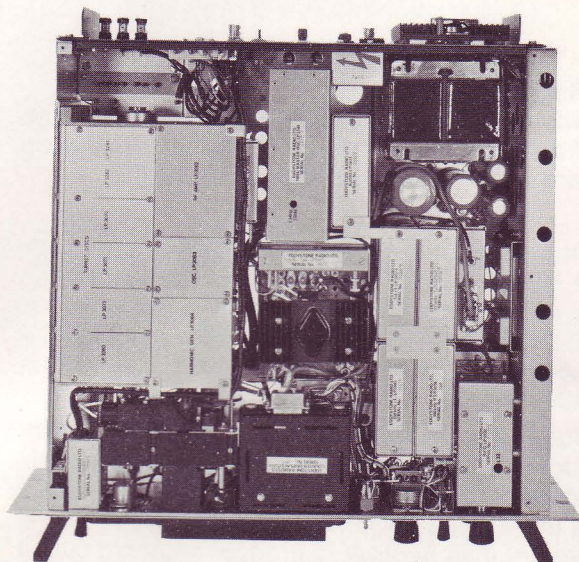
Audio outputs are provided for external loudspeaker, telephones and lines, the line output being fed from a totally independent amplifier with separate level control. A miniature monitor speaker fed from the main channel is fitted behind the front panel.

Other standard features include a meter which indicates carrier or line level (and also serves as a tuning monitor in receivers equipped with the optional FSK Module Cat. No. 1533), provision for dual-diversity working (with or without common oscillator control) and an input for synthesized working at frequencies lower than 1.6MHz.

#### Construction

Mechanical and electrical design of the EC958/7E have been closely integrated and the receiver can be subjected to extremes of environmental conditions with only minor degradation in performance.

All front-end circuitry is built into a diecast aluminium-alloy frame to ensure optimum screening and maximum rigidity. The basic chassis is of steel cadmium plated and passivated which provides a strong rigid assembly. Most circuitry, apart from the power supply, is housed in detachable modules or units to facilitate servicing and inspection.



Plan view of EC958/7E  
showing modular construction.

## General Specification

### Application

High-grade professional-class receiver suitable for fixed, mobile or maritime use where wide frequency coverage and high-stability are of paramount importance.

### Reception Modes

A1, A2 & A2H telegraphy (and F1 telegraphy when optional FSK Module Cat. No. 1533 is fitted).

A3, A3A, A3H & A3J telephony with separate filters for upper, lower and double-sideband working.

### Frequency Coverage

Continuously tunable 10kHz to 30MHz in ten ranges.

Ranges 1 - 4: 1.6 - 30MHz with internal facilities for high-stability working and digital frequency read-out to 1Hz.

Ranges 5 - 10: 10kHz - 1650kHz with provision for use with external synthesizer if high-stability working is required.

### Circuit Configuration

Ranges 1 - 4: Triple-conversion with tunable 1st IF and drift-cancelling loop.

Ranges 5 - 10: Single-conversion, or double-conversion with oven-controlled crystal in second conversion stage.

### Intermediate Frequencies

IF1: 1235 - 1335kHz (Incremental Tuning).

IF2: 250kHz (high-grade ceramic filter).

IF3: 100kHz (L/C and crystal filters).

BFO: 100kHz  $\pm$ 5kHz (reduction drive).

### Aerial Input

Ranges 1 - 3: 75 $\Omega$  unbalanced.

Range 4: Suitable for an aerial of impedance equivalent to 200pF in series with 10 $\Omega$ .

Ranges 5 - 10: Suitable for an aerial of impedance equivalent to 200pF to 600pF in series with 10 $\Omega$ .

### Input and Output Facilities

1. 100kHz IF Output (low - Z).
2. External Loudspeaker (4 - 8 $\Omega$ ).
3. Input to internal loudspeaker.
4. Lines (600 $\Omega$ , bal. or unbal.).
5. Headset (low/medium - Z).
6. FSK output (Internal switch).
7. Diversity AGC.
8. Incremental Oscillator (550 - 650kHz) for common oscillator working and corresponding mixer input.
9. Sidetone input.
10. External final oscillator input.
11. Muting, internal h/s reed relay input controlled from associated transmitter interrupts aerial feeder and grounds input circuit during transmission.

### Environmental

The receiver conforms generally to the climatic and shock/vibration requirements of DEF-133. (When shock mounting LP 3455 is fitted).

Operational Temperature Rating: -15°C to +55°C (+40°C, 95% relative humidity).

### Power Supply

105/130V or 210/260V (40 - 60Hz) single-phase AC. Consumption of the order 80VA max.

Approved DC/AC Converter can be supplied to special order to permit operation from 12V or 24V supply. Cat. No. 979.

### Mounting Styles

Standard version is in rack-mounting form to suit 483mm (19in) racking. Also available with cabinet (and shock mounts) for bench-mounting.

### Dimensions and Weight

Rack-mounting (with dust covers)

Width: 483mm (19in)

Height: 133mm (5.25in)

Intrusion into rack: 411mm (16.2in)

Weight (approx): 19.6kg (43.5lb)

Bench-mounting (with cabinet)

Width: 502mm (19.75in)

Height (with feet): 165mm (6.5in)

Depth (overall): 457mm (18in)

Weight (approx): 22.7kg (50lb)

### Accessories

Plinth Loudspeaker Unit Cat. No. 989.

Cabinet Loudspeaker Unit Cat No. 935A/3.

Shock Absorber Mounting Kit and Drip Proof

Cowl Cat No. 1537.

## Performance Specification

**Note:** Image and IF rejection, cross modulation and intermodulation and blocking are measured with aerial impedances equivalent to that shown under "Aerial Input" on previous page. (Otherwise use generator with 50 $\Omega$  source impedance).

### Sensitivity

AM: 3 $\mu$ V for 10dB S+N/N ratio  
(3kHz B/W)  
CW/SSB: 1 $\mu$ V for 10dB S+N/N ratio  
(3kHz B/W)  
CW (10-100kHz): 1 $\mu$ V for 20dB SINAD (1.3kHz B/W)

### IF Selectivity

Four selectable bandwidths using switched L/C filter plus separate multi-pole crystal filters for upper and lower sideband.

**L/C Filter** (6dB/60dB): Posn. (1) 400Hz/2.4kHz; (2) 1.3kHz/4.5kHz; (3) 3kHz/12kHz; (4) 8kHz/18kHz.

**SSB Filters** 2.4kHz B/W at -3dB, 3.9kHz at -60dB assymmetrical, meeting CEPT Specification.

### Image Rejection

10kHz - 24kHz	greater than 65dB
24kHz - 1.6MHz	greater than 80dB
1.6MHz - 15MHz	greater than 75dB
15MHz - 30MHz	greater than 60dB

### IF Rejection

10kHz - 54kHz	greater than 60dB
54kHz - 1.6MHz	greater than 80dB
1.6MHz - 4MHz	greater than 90dB
4MHz - 30MHz	greater than 100dB

### Frequency Stability

1.6MHz - 30MHz: Tune frequency will remain within 4Hz of Master Osc. stability\* for any 20°C change in the range of 0°C to +60°C.

160kHz - 1.6MHz: Better than 1 part in 10<sup>4</sup> in any 5-min. period with constant ambient.

10kHz - 160kHz: Better than 50Hz in any 5-min. period with constant ambient.

(\*)  $\pm 0.5$  parts in 10<sup>7</sup> over the range -0 to +60°C.

### Cross Modulation

With a wanted signal 60dB $\mu$ V producing standard output, unwanted output will be at least 30dB below this level with an interfering signal 20kHz off-tune and of level 85dB $\mu$ V.

(†) The above figures are typical only and do not form the basis of a contractual test specification.

Our equipment is designed generally to meet "British Defence Specification 133 Class L2".

As we are always seeking to improve our products, the information in this document gives only general indications of product capacity, performance and suitability, none of which shall form part of any contract. The information herein is subject to confirmation at the time of ordering.

### Blocking

With a wanted signal 60dB $\mu$ V, output will be affected by less than 3dB with an interfering carrier 20kHz off-tune of level 100dB $\mu$ V.

### Intermodulation

**In Band:** The level of third-order intermodulation products produced by two signals of equal strength lying at **carrier + 1kHz** and **carrier + 1.6kHz** will be at least 30dB below the level of either signal.

**Out of Band:** With a wanted signal 30dB $\mu$ V producing standard output, two unwanted signals adjusted to produce an intermodulation product at the wanted frequency, must each be of a level greater than 80dB $\mu$ V to produce standard output (neither signal closer than 30kHz to the wanted frequency).

### AGC Characteristic

Output is maintained within 6dB for a change in input of 90dB from 3 $\mu$ V reference level.

### AGC Time Constant

Governed by Mode Switch. Of the order 40ms attack and 1 sec, decay at 'AM' & 'CW/SSB': increased to 200ms and 10 secs when switched to 'SSB HIGH-STAB'.

### Audio Output

Ext. Loudspeaker (4 $\Omega$ ):	1W at 5% distortion
Line (600 $\Omega$ ):	greater than 10mW

### Audio Stage Response

Level within 3dB over the range 300Hz to 4kHz.

### IF Output

Greater than 20mV into 75 $\Omega$  for 3 $\mu$ V signal.

### Radiation

Less than 400pW (typically 20pW).

### Scale Resolution

10kHz - 1650kHz:	Readable to 1kHz
1.6MHz - 30MHz:	Readable to 1Hz.

### FSK Performance

Keying speeds up to greater than 300 Bauds and shifts 85Hz upwards can be accommodated when FSK module Cat. No. 1533 is fitted.