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High-Stability Communication Receivers

EC958 Series

General Description The Eddystone Model EC958 is a professional-class receiver for general-purpose use in the band 10kHz to 30MHz. Several variants are available for specialised applications and all versions have outputs for use with ancillary equipment. Internal power units are fitted for operation from standard 40-60Hz voltages and DC/AC Converter Type 978 is available as an accessory to permit use with 12 or 24V DC.

Reception facilities cater for A1, A2 & A2H telegraphy, plus A3, A3A, A3H & A3J telephony, with upper or lower sideband selectable in the SSB mode. F1 (FSK) capability can be included on most variants by incorporating an optional module within the receiver which then becomes a self-contained FSK terminal. One version of the receiver is available with special provision for A3A working in conjunction with Lincompex equipment, while others include additional specialised facilities for CW reception and surveillance.

10kHz to 30MHz in ten ranges

Continuous tuning or 100kHz incremental facility above 1.6MHz.

CW, MCW, AM, USB & LSB. Optional FSK

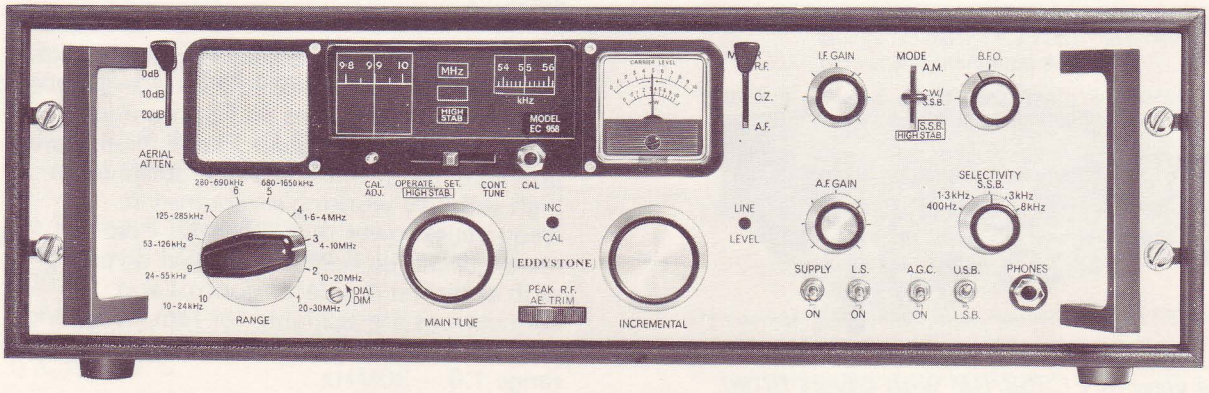
Protected FET/MOSFET front-end

Oven-controlled Master Oscillator with 1 in 10^7 stability

The extremely wide frequency coverage is split into ten ranges, six of which cover frequencies up to 1.6MHz using conventional single- or double-conversion techniques. In the band 1.6 to 30 MHz, provision is made for high-stability working and a triple-conversion arrangement is then introduced having a tunable 1st IF facility with close-tolerance, temperature-compensated low frequency 2nd Oscillator. The latter forms part of a narrow-bandwidth double-conversion drift cancelling loop which allows the 1st Oscillator to be locked at intervals of 100kHz by reference to harmonics derived from an internal Master Oscillator. This is oven-controlled and has a long-term stability of the order 1 part in 10^7. Tuning between adjacent 100kHz points is achieved by use of the incremental control which tunes the low frequency oscillator and the 1st IF. For search tuning, the drift-cancelling loop can be disabled to permit continuous tuning over any selected range with the incremental facility still available for fine tuning if required.

Frequency readout is by means of a light-projection system with separate displays for the main scale and incremental calibration. The latter is marked at 200Hz intervals, can be easily interpolated to within 50Hz and is projected only when using Ranges 1-4. Illuminated legends indicate whether the main scale calibration is in kHz or MHz. High-grade drive mechanisms are utilised for both tuning controls which are flywheel-loaded to permit rapid change of frequency: ratios of 100:1 are employed.

Head-on view of EC958 in cabinet



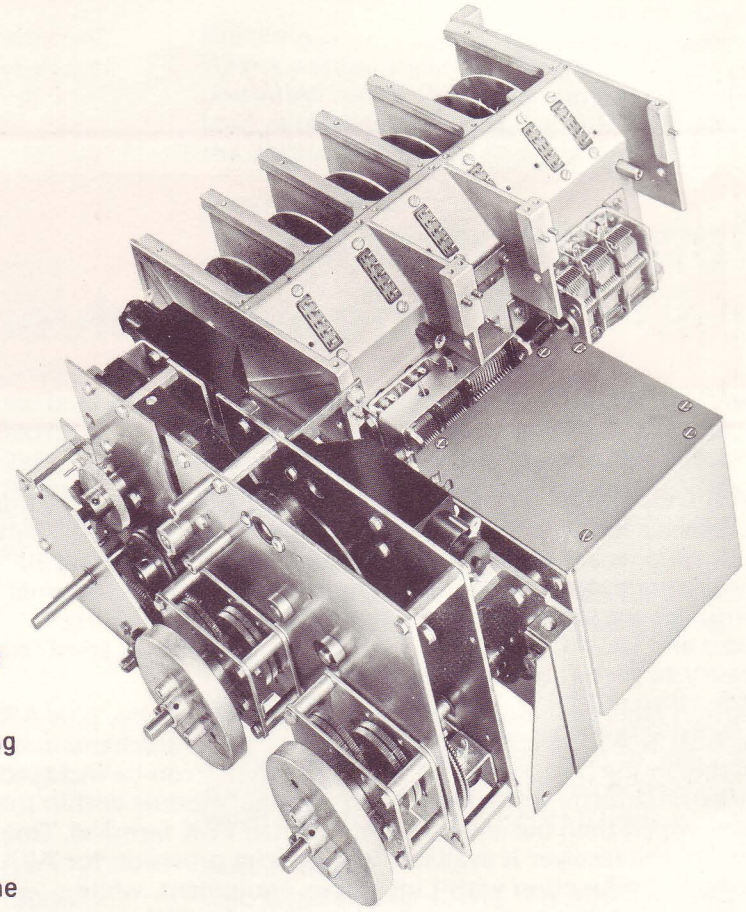
EC958 receivers can be installed directly in standard equipment racking and are also available complete with cabinet for bench-mounted installations. Cabinet receivers can be equipped with shock-absorbent mounts for mobile use and can also be supplied with a detachable plinth loudspeaker unit. Rack-mounting receivers are fitted with protective dust covers and are designated EC958/RM.

Brief Circuit Details All variants of the EC958 employ the same basic circuit configuration using solid-state techniques and integrated circuits throughout: construction follows current modular practice. FET's and MOSFET's are used almost exclusively in the RF, Mixer and IF stages, input protection being included to permit safe operation in close proximity to associated transmitting equipment. Desensitizing facilities are incorporated as a standard feature.

The receiver operates with single, double or triple-conversion to suit the frequency range selected. In double- or triple-conversion mode, the final stage of frequency conversion derives its oscillator injection from a dual-frequency crystal oscillator which permits upper/lower sideband switching for SSB and mark/space reversal in FSK-equipped receivers. A high order of stability is maintained by suitable choice of the crystals used in the oscillator position.

Five degrees of selectivity are provided at the final IF (100kHz), ranging from 400Hz to 8kHz to suit all normal signal modes. A multi-pole crystal filter is introduced for SSB and some variants include a dual-crystal filter having a bandwidth of 150Hz for narrow-band CW working. IF output is available for use with ancillary equipment and two independent AGC systems provide separate control for the RF and IF stages: the IF control line is brought out for diversity use.

3/4 view of EC958/RM with covers fitted.

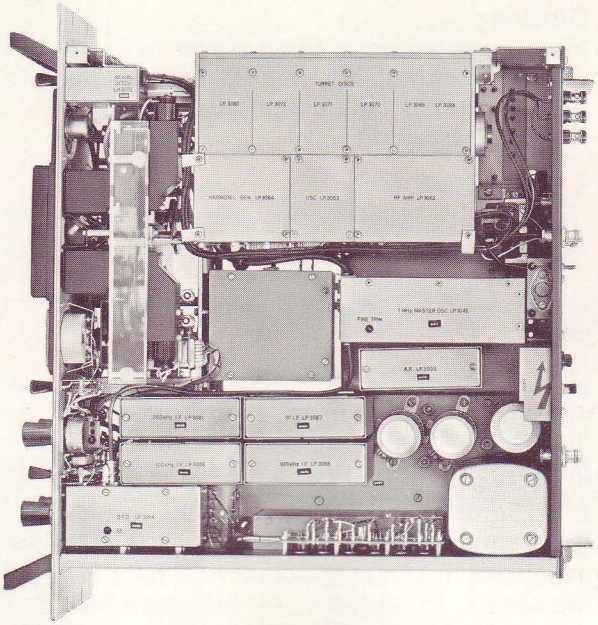


Tuning drives, RF Assembly and Incremental Oscillator Unit.

A MOSFET product detector is utilised for CW/SSB reception with carrier insertion derived from the Master Oscillator Unit when taking SSB signals. At CW, this is replaced by a tunable beat oscillator having a control swing of ±5kHz (±8kHz to special order). A reduction drive is fitted for ease of adjustment.

Audio outputs are provided for external loudspeaker, telephones and line, the line output being fed from a totally independent amplifier with separate level control. A miniature internal loudspeaker is fitted on all versions.

Other features include a panel meter which indicates carrier level or line level and can also be switched to serve as an FSK tuning monitor, an internal scale check facility and provision for synthesized operation when high-stability working is required at frequencies lower than 1.6MHz. Two receivers can be operated in dual-diversity with common oscillator control and connections are available for remote tuning over a range of ±100Hz at frequencies in the range 1.6 – 30MHz.



Plan view of EC958 showing modular construction

GENERAL SPECIFICATION

Frequency Coverage
10kHz to 30MHz in ten ranges. Continuous tuning available on all ranges plus provision for incremental tuning in bands of 100kHz at frequencies above 1.6MHz

Frequency Ranges

Range 1	::	20.0MHz – 30.0MHz
Range 2	::	10.0MHz – 20.0MHz
Range 3	::	4.0MHz – 10.0MHz
Range 4	::	1.6MHz – 4.0MHz
Range 5	::	680kHz – 1650kHz
Range 6	::	280kHz – 690kHz
Range 7	::	125kHz – 285kHz
Range 8	::	53kHz – 126kHz
Range 9	::	24kHz – 55kHz
Range 10	::	10kHz – 24kHz

Intermediate Frequencies

1st IF*	::	1335kHz (tunable 1235 – 1335kHz to provide incremental facility above 1.6MHz).
2nd IF**	::	250kHz (ceramic ladder filter)
3rd IF	::	100kHz (variable selectivity)

(*) used on Ranges 1-4 only.
(**) used on Ranges 1-6 and Range 8 only.

Reception Modes
A1, A2 and A2H telegraphy. F1 telegraphy also available when optional module is fitted.

A3, A3A, A3H & A3J telephony with upper or lower sideband selectable in SSB mode.

Aerial Input Impedance
Ranges 1-4 : 75Ω. Ranges 5-10 : 75Ω or 600Ω.

Operational Temperature Rating
0°C to +50°C.

Controls
Range Switch, Main Tuning, Incremental Tuning, Aerial Trimmer/Peak RF Control, Aerial Attenuator, Cal Switch, Cal Adjusters, High Stab/Continuous Tune Switch, Mode Switch, Selectivity Switch, USB/LSB Switch, IF and AF Gains, Meter Switch, Line Level (pre-set), BFO Pitch, AGC Switch, Speaker Switch, Supply Switch, Dial Dimmer.

Power Supplies

AC	::	100/125V or 200/250V (40-60Hz). Consumption of the order 35W.
DC	::	12V or 24V (Eddystone Power Units Types 978/12 or 978/24). Consumption of the order 45W.

Mounting Styles
Available for bench-mounting, rack-mounting and with anti-vibration mounts for mobile use. Matching plinth speaker unit available to order.

Dimensions and Weight

Bench-mounting		
Width:	502mm	(19.75in)
Height (with feet):	165mm	(6.5in)
Depth (overall):	457mm	(18in)
Weight:	22.7kg	(50lb)
Rack-mounting		
Width:	483mm	(19in)
Height:	133mm	(5.25in)
Intrusion into rack:	411mm	(16.2in)
Weight:	19.6kg	(43.5lb)

EC958 VARIANTS

The EC958 variants listed below are available at the time of printing. Other versions are in the course of development and enquiries are invited for further modified versions tailored to satisfy special requirements.

EC958	Standard general-purpose receiver with optional internal FSK facility.
***EC958/1**	Fitted with special filter for optimum reception of single-sideband transmissions utilising reduced carrier. Carrier controlled AGC system and beat meter facilitate operation in conjunction with Lincompex equipment.
***EC958/2**	Specialised network monitoring and surveillance receiver—major design changes include 150Hz CW bandwidth in lieu of SSB position, continuous high-stability operation on ranges 1-4 (free-running continuous tune facility not provided), incremental scale-check facility (10kHz markers), low-level BFO output and monitored AFC.
EC958/3	Similar to EC958/2 with additional 10kHz scale-check facility on Ranges 5-10.
EC958/4	Variant of standard receiver for military applications only.
EC958/5	Modified version of EC958 meeting requirements of M.P.T. Specifications TSC87, TSC102 and TSC105. Primarily for shipping installations.

(*) Internal FSK facility not available—external FSK can be provided to order.

TYPICAL PERFORMANCE†

Sensitivity
AM : 3μV (for 10dB S/N ratio
CW/SSB : 1μV with 3kHz B/W)

IF Selectivity
Switched L/C filter provides four selectable bandwidths plus SSB position using crystal filter. Overall bandwidths are as follows:—

Position	−6dB	−60dB
1	400Hz	2.4kHz
2	1.3kHz	4.5kHz
3	3kHz	12kHz
4	8kHz	18kHz
SSB	2.4kHz B/W at −3dB with 60dB points at carrier +400Hz and carrier −3.5kHz	

Note 1 Alternative filters can be fitted to order.

Note 2 Maximum overall bandwidth is governed by the front-end circuits on the very low frequency ranges.

Image and IF Rejection

Freq.	Image	IF
18MHz-30MHz	50dB	90dB
1.6MHz-18MHz	70dB	90dB
10kHz-1.6MHz	60dB	60dB

Frequency Stability
The figures quoted below are indicative of the stability achieved after a 30-minute warm-up period. Those for 1.6-30MHz are for high-stability working in which mode a supply voltage change of ±10% does not affect the tune frequency by more than 2Hz.

Drift with constant ambient temperature

1.6MHz-30MHz	Less than 20Hz (long-term).
160kHz-1.6MHz	Less than 1 part in 10^4 in any 5-minute period.
10kHz-160kHz	Less than 50Hz in any 5-minute period.

Drift with 5°C change in ambient temperature

1.6MHz-30MHz	Less than 20Hz.
160kHz-1.6MHz	Less than 5 parts in 10^4.
10kHz-160kHz	Less than 150Hz.

Cross Modulation
With a wanted signal 60dB above 1μV, the interference produced by an unwanted signal 20kHz off-tune and of level 90dB above 1μV will be more than 30dB below standard output.

Blocking
With a wanted signal 60dB above 1μV, an unwanted carrier 20kHz off-tune must be of a level exceeding 100dB above 1μV to affect the output by 3dB.

Intermodulation
The level of third-order intermodulation products given 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.

With a wanted signal of 30dB above 1μV, two unwanted signals whose sum or difference frequency equals that of the wanted signal, must each be of a level 80dB above 1μV to produce standard output.

AGC Characteristic
Output is maintained within 6dB for a change in input of 90dB from 3μV reference level.

AGC Time Constant
Governed by Mode Switch. Of the order 40 milliseconds charge and 1 second discharge at 'AM' and 'CW/SSB': increased to 200 milliseconds and 10 seconds respectively when switched to 'SSB HIGH-STAB'.

Audio Output

Ext. Loudspeaker (3Ω):	1W at 5% distortion
Line (600Ω):	10mW max.
Telephones:	Low/medium-Z

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

IF Output (100kHz)
20mV into 75Ω for 3μV at aerial input.

Radiation
Less than 400pW (typically 20pW).

Calibration Accuracy
Calibration interval of 200Hz on incremental scale permits frequency setting to within 50Hz: signals can be continuously resolved to within 10Hz.

1MHz markers are provided for scale checking and additional calibration facilities are available on variants of the standard receiver.

Remote Fine Tuning
100Hz above and below local tune frequency. This facility is available on Ranges 1-4 only.

FSK Performance
Keying speeds up to 200 bauds with shifts of 85-850Hz can be accommodated when FSK Module Type LP3058 is fitted.

(†) Not to be interpreted as a 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.