

Eddystone

AMATEUR BAND COMMUNICATIONS RECEIVER MODEL EA12



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Eddystone EA12 Receiver

The EDDYSTONE "EA12" is a model specially designed for use by amateur radio operators and covering the six major amateur bands from 1.8 Mc/s to 28 Mc/s. It possesses an exceedingly good electrical performance and will produce first-class results with all modes of signal. To this end, many modern refinements are included and these are discussed in the following paragraphs. Mechanically the "EA12" is built to the high engineering standards common to all Eddystone products and will give years of trouble-free service, irrespective of climate.

SPECIAL FEATURES OF THE "EA12" RECEIVER

Among features essential in a modern receiver for use on the amateur bands are adequate bandwidth, correct degrees of selectivity for the various modes of signal, ease of tuning sideband signals, and frequency stability of a high order. The "EA12" possesses all these advantages and a number of others, leading to outstanding performance and ease of control.

Principle of Operation

To achieve the necessary degree of frequency stability, the first oscillator in the double superheterodyne circuit is crystal controlled. The tunable second oscillator operates over a range — actually 1.0 Mc/s to 1.6 Mc/s — where very high stability is readily achieved. Hence the total frequency drift is extremely small. The second intermediate frequency is 100 kc/s and, at this frequency, using modern components and techniques, it is possible to obtain high gain and, more important, the correct degrees of selectivity for optimum performance.

Bandspread

The tuning range is restricted to 600 kc/s, which, taking into account the wide scales, gives a more than adequate degree of bandspread. Further, the calibration of the scales is linear and, after standardisation against the built-in crystal calibrator, a frequency can be read to within a kilocycle or so. Also, of course, an equal degree of bandspread is obtained on each band, four ranges being provided for complete coverage of the 28/30 Mc/s band.

R.F. Circuits

The tuned RF amplifying stage utilizes a frame-grid double triode valve, designed essentially for cascade operation. Since also the circuit is of the band-pass type, very good protection against cross-modulation and blocking by strong signals is obtained.

The signal frequency circuits are kept in proper alignment by a separate control which permits the circuits to be accurately peaked, ensuring optimum performance on all the frequencies covered. A two-to-one reduction drive makes for ease of adjustment.

Selectivity

Continuously variable selectivity is available in the 100 kc/s second intermediate frequency stages. The control is clearly marked to enable ready selection to be made of the bandwidths appropriate to amplitude modulated (A3) signals, c.w. (A1) signals and s.s.b. (A3a) signals. A crystal filter can be switched in to give an extremely narrow band for the reception of c.w. when interference is present. A low-pass audio filter is permanently in circuit when receiving c.w. s.s.b., but can be switched to become a sharply peaked filter to aid clear reception of c.w. signals.

The narrow "T" notch filter can be tuned across the i.f. pass-band, the deep slot effectively removing an interfering heterodyne.

Reception of S.S.B.

The "EA12" receiver performs extremely well in this mode of signal. The correct bandwidth can be positively selected on the selectivity switch and the mode switch set to the upper or lower sideband, automatically selecting the appropriate carrier insertion frequency. To achieve maximum intelligibility with an s.s.b. signal it helps considerably to have available a very fine tuning control. The BFO pitch control in the "EA12" is arranged to give this facility when the mode switch is in either the "USB" or "LSB" position.

A product detector is also brought into use, and a separate double-diode noise clipper is available when required, effective on s.s.b. and c.w. A long or short AGC time constant can be selected as desired.

Muting

The receiver can be muted during transmission either by a panel switch or by an external switch or relay connected to terminals at the rear. As necessary particularly with s.s.b., the muting can be made very deep. A pre-set control at the rear allows the muting level to be adjusted to suit local circumstances.

Other Controls

Separate controls are provided for independent control of RF, IF and AF gain. The BFO pitch control is fitted with a 5 to 1 reduction drive and this assists considerably in selecting a given signal with others present. The crystal calibrator is brought into action with a press switch and a small knurled knob permits adjustment of the cursor, over a small but adequate range of movement, to allow standardisation of the scale against the crystal calibrator signal.

Carrier Level Meter

A large "S" meter is fitted on the front panel, and is clearly calibrated in "S" units from 1 to 9, each division corresponding to a 6 dB change of level. Above "S9", the meter is calibrated directly in decibels. The meter is controlled by the AGC level and is out of action when AGC is switched off.

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Tuning Mechanism and Scales

The gear-driven, flywheel loaded tuning mechanism is precision made and extremely smooth in operation. It has a reduction ratio of 140 to 1. The scales are 10½" long, clearly marked in frequency, and the combination of long scale and fine driving movement allows exceedingly close control of tuning.

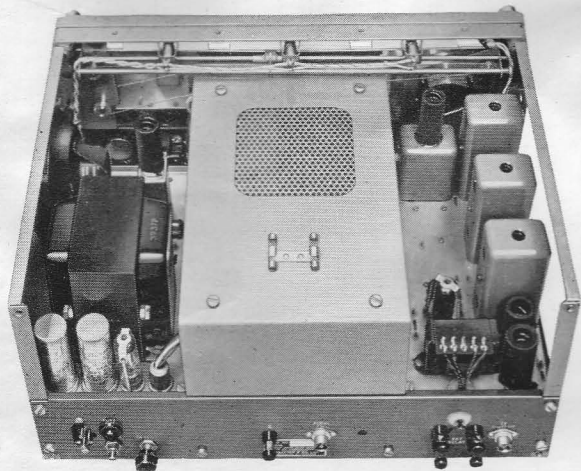
Noise Limiter

Two noise limiters are incorporated, one of the series A type for use on a.m., the other a double diode which is operative with c.w. and s.s.b. The switch forms part of the AGC switch assembly.

Other Points

A loudspeaker is fitted internally but it is a simple matter to connect an external speaker where this is preferred. A jack on the front panel accepts telephones of medium to high impedance and an outlet is provided at the second i.f. of 100 kc/s for operation of auxiliary equipment such as FSK adaptor, panoramic display unit, or other special device.

Operation is from standard AC mains and the receiver is supplied complete with all necessary crystals, leads and a comprehensive instruction manual.



TECHNICAL INFORMATION

Frequency Coverage

The "EA12" receiver covers the six major amateur bands in nine ranges as follows:—

Range 1	.....	29.4 — 30.0 Mc/s (10 metres)
Range 2	.....	28.9 — 29.5 Mc/s (10 metres)
Range 3	.....	28.4 — 29.0 Mc/s (10 metres)
Range 4	.....	27.9 — 28.5 Mc/s (10 metres)
Range 5	.....	20.9 — 21.5 Mc/s (15 metres)
Range 6	.....	13.9 — 14.5 Mc/s (20 metres)
Range 7	.....	6.9 — 7.5 Mc/s (40 metres)
Range 8	.....	3.4 — 4.0 Mc/s (80 metres)
Range 9	.....	1.8 — 2.4 Mc/s (160 metres)

Intermediate Frequencies

1st IF. Tunable over the range 1.1 — 1.7 Mc/s. The local oscillator tracks on the "low" side covering the band 1.0 — 1.6 Mc/s.

2nd IF. 100 kc/s with crystal filter, slot filter and continuously variable selectivity. The BFO provides a swing of ± 3.5 kc/s in the c.w. positions and ± 100 c/s on s.s.b.

Valve Complement

The double conversion circuit uses a total of thirteen valves and five silicon diodes, two of the latter being power rectifiers.

Ref.	Type	Circuit Function
V1	ECC189 (CV5331)	RF amplifier
V2	ECH81 (CV2128)	1st mixer and 1st osc. amp/doubler
V3	EC90 (CV133)	1st oscillator (crystal controlled)
V4	ECH81 (CV2128)	2nd mixer and 2nd osc. isolation amplifier
V5	EC90 (CV133)	2nd oscillator (VFO)
V6	EF93 (CV454)	1st 100 kc/s IF amplifier
V7	EF93 (CV454)	2nd 100 kc/s IF amplifier
V8	EB91 (CV140)	AM detector and AGC rectifier
V9	ECC83 (CV492)	Cathode follower and audio amp
V10	EK90 (CV453)	CW/SSB detector
V11	EL90 (CV1862)	Audio output
V12	150C2 (CV1832)	HT stabiliser
V13	EF94 (CV2524)	Crystal calibrator
D1	DD006 —	AM noise limiter
D2/3	DD006 —	CW/SSB Noise Clipper
D4/5	DD058 —	HT rectifier

(Direct equivalents may be fitted in some instances).

Input Impedance

75 ohms unbalanced to a standard coaxial socket at the rear.

I.F. Output

IF output is taken from a coaxial socket at the rear and is suitable for a terminating impedance of between 75 and 300 ohms. An input of 2 microvolts at the aerial socket produces an output across 75 ohms of 100 millivolts (taken with AGC off, gains at maximum, i.f. bandwidth of 3 kc/s).

Audio Output

Audio output is 1 watt at 5% distortion into 3 ohms, maximum output being 2.5 watts. A 5" diameter speaker is fitted and provision made for connection of an external speaker. The telephone jack is for use with telephone headsets of 2000 ohms nominal impedance but results are satisfactory over a wide range of impedance.

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Audio Response

The response of the audio frequency circuits is controlled to give maximum intelligibility in the various modes of signal. With the *MODE* switch in the "AM" position, the response is within plus or minus 3 dB (relative to 1000 cycles) over the range 400 to 7000 cycles. In the "SSB" and "CW" positions, a low-pass filter is brought into circuit, modifying the response to one less than 10 dB down at 500 cycles and greater than 30 dB down at 5000 cycles.

With the *MODE* switch in the "CW FILTER" position, the filter is tuned to approximately 800 c/s and the bandwidth becomes 300 c/s at the 6 dB points.

Selectivity

The overall bandwidth at 6 dB down is continuously variable within the limits 1.3 kc/s to 6 kc/s and is narrowed to 50 c/s when using the 100 kc/s crystal filter.

The "T" notch filter provides a steep-sided rejection notch, tunable across the IF passband. Notch depth is of the order 40 dB and the filter in addition to its use in rejecting heterodyne interference can be used to steepen the carrier side of the passband when taking s.s.b. signals.

Markings on the selectivity control indicate the appropriate settings for the different signal modes. Typical overall bandwidths are as follows:—

Position	— 6 dB	— 50 dB
Crystal (N)	50 c/s	2 kc/s
CW	1.3 kc/s	5 kc/s
SSB	3 kc/s	8 kc/s
AM	6 kc/s	12 kc/s

Sensitivity

Sensitivity on a.m. signals, with an i.f. bandwidth of 6 kc/s, is 2 microvolts for a 10 dB signal-to-noise ratio. On c.w. the sensitivity is 0.5 microvolts for a 20 dB signal-to-noise ratio and i.f. bandwidth of 1.3 kc/s.

Frequency Stability

Drift does not exceed 100 c/s in any one hour period, after adequate warm-up. Short term drift is unlikely to exceed 20 c/s. A variation of plus or minus 5% in

mains voltage does not affect the tune frequency by more than 100 c/s.

AGC Characteristics

The audio output level does not change by more than 9 dB when the carrier level is increased 90 dB above 5 microvolts. (Taken at 7 Mc/s with an i.f. bandwidth of 3 kc/s).

Two AGC time constants (0.15 and 4.5 seconds) are provided and the AGC delay is automatically reduced when receiving s.s.b. The AGC voltage is available at a separate terminal for recording or control purposes.

Image Rejection

Better than 50 dB at the highest frequency and proportionately greater at lower frequencies.

I.F. Breakthrough

Breakthrough attenuation at the first intermediate frequency is greater than 100 dB, except at 2 Mc/s on Range 9 where it is between 90 and 100 dB. At the second i.f., breakthrough attenuation is greater than 100 dB.

Power Supply

Standard AC mains of voltages 100/125 and 200/250, 40/60 cycles. Consumption is 85 watts. The live side of the mains socket is fused at 1.5 amps.

Physical Construction

Construction is very robust, use being made of a diecast front panel and coil box. The whole is soundly engineered and designed to give years of trouble-free service. Finish is two-tone grey, to a high standard.

Dimensions and Weight

Width	....	16 $\frac{3}{4}$ " (42.5 cm)
Height	....	8 $\frac{3}{4}$ " (22.2 cm)
Depth	....	13 $\frac{3}{8}$ " (34.6 cm)
Weight	....	47 lb. (21.3 kg)

Instruction Manual and Guarantee

A comprehensive instruction manual, containing full technical information, is supplied with the receiver. A twelve-month guarantee is given against faulty workmanship or components (excluding valves and semi-conductors).

In the interests of continued improvement, we reserve the right to amend this specification without notice.

Manufacturers :

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