It's A Classic The Eddysto Amateur Ba

● It's A Classic! The Eddystone EA12 receiver. The small control above the S-meter is the calibrator On-Off push button. The knurled spindle on the right hand opposite side, is the cursor adjustment for calibration purposes (see text).
Photographic facilities courtesy of Ken O'Brien.

Ben Nock G4BXD, takes a look at the Eddystone EA12 Amateur Bands only receiver...a receiver which many of us viewed as the 'ultimate' in the 1960s. Now very much collectable... what does Ben think of the design?

The recent demise of the once famous Eddystone name (latterly part of the Marconi Group and specialising in Broadcasting equipment) is certainly a sad event for radio communications. In their time Eddystone produced some memorable receivers for all aspects of radio, marine, commercial and of course amateur operating.

One of the few receivers **specifically designed** by Eddystone for the Amateur Radio operator was the EA12. This set, produced between 1964 and 1969 costing £178 at the time, covered what at that time were the Amateur Bands, i.e. the 1.8 to 28MHz (160, 80, 40, 20, 15 and 10 metre bands) before the advent of the WARC bands. The receiver used the high performance double conversion principle, was given a tuning scale large enough to read from across the room and a styling that was very eye-catching and still looks very smart today.

Many refinements were incorporated into the EA12 receiver, including filters for both radio and audio frequencies. It was also provided with a built-in calibrator, tuneable notch filter, separate detectors for a.m. and c.w./s.s.b., a large S-meter and fitted loudspeakers to name just a few.

Crystal Controlled

In total 13 valves and five silicon diodes are used in the EA12's double conversion superhet, which employs a crystal controlled front end. This converts the incoming antenna signal to a 60kHz wide intermediate frequency (i.f.), and a second tuneable mixer then converts this to a fixed tuned 100kHz second i.f. stage.

The front-end of the receiver comprises three valves, V1, 2 and 3, as a crystal controlled unit with an output of 1.1 to 1.7MHz. To provide better cross modulation reduction and signal blocking on strong stations a cascade type radio frequency (r.f.) amplifier circuit is used.

Bandpass coupling of tuned circuits between the antenna and r.f. amplifier ensure excellent front end selectivity. Next, a third section, coupled to the first two, connects the amplifier to the first mixer. The input circuitry includes a high-pass filter, providing better than -90dB attenuation below 1.7MHz.

The r.f. amplifier stage has both manual and automatic (when selected) gain control applied to it. There's a facility to mute the r.f. stage, and also on the last (100kHz) i.f. stage during transmissions, the mute level being adjustable to allow the monitoring of any outgoing transmissions.

The crystal oscillator operates on the fundamental crystal frequency on all but the 21 and 28MHz bands. On these bands its output is doubled in frequency. The oscillator frequency is on the high side of the signal frequency on all bands, which produces 'reverse tuning' on the main dial.

Stabilised Supply

A stabilised 150V supply is provided for the oscillator and buffer/doubler circuit. The first mixer stage uses the heptode section of V2, combining the amplified antenna signal and the crystal oscillator output, the other half of V2 acts as a buffer to the oscillator on all bands except 21 and 28MHz, where, as previously mentioned, it has to work as frequency doubler.

Band-pass coupled tuned circuits feed the signal to the second mixer stage and tune the range 1.1 to 1.7MHz utilising two sections of a three-gang capacitor unit. The second mixer, the heptode section of V4, is fed from its triode section, which acts as a buffer to V5, the tuneable oscillator. This light coupling allows automatic gain control (a.g.c.) to be applied to the 2nd mixer without pulling the second oscillator frequency.

The third section of the main variable capacitor unit forms the tuning circuit for the 2nd oscillator, V5. This oscillator operates on the low side of the i.f. range.

Unusually, the h.t. feed to the 2nd oscillator is from the unregulated supply. The idea behind this is that any variation in a.c. line voltage would cause the h.t. to vary but the tendency towards drift would be compensated by the opposite reaction due to the heater voltage change. If the stabilised h.t. was used then the change in heater voltage would not be compensated for.

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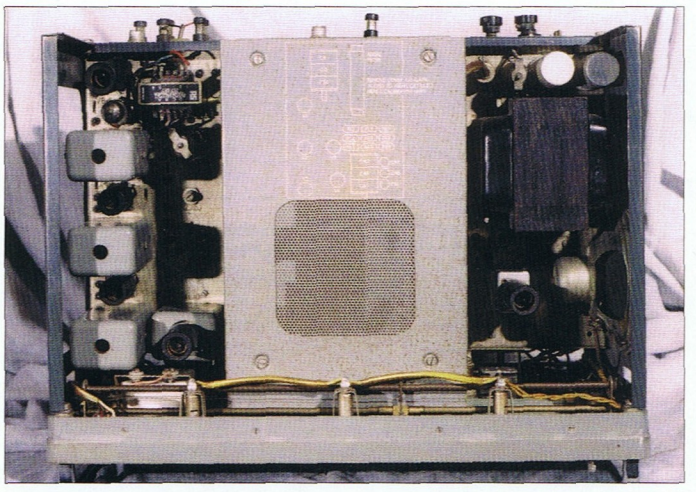

Fig. 1: Inside (above chassis) view of the EA12. The receiver can clearly seem to be substantially built (see text). Photograph G4BXD.

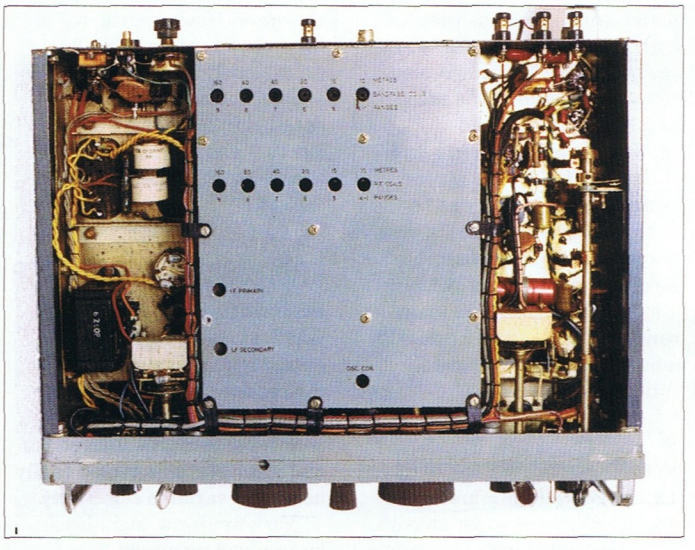

Fig. 2: Under chassis view of the EA12 receiver. Note coil and range details, necessary for calibration purposes (see text). Photograph G4BXD.

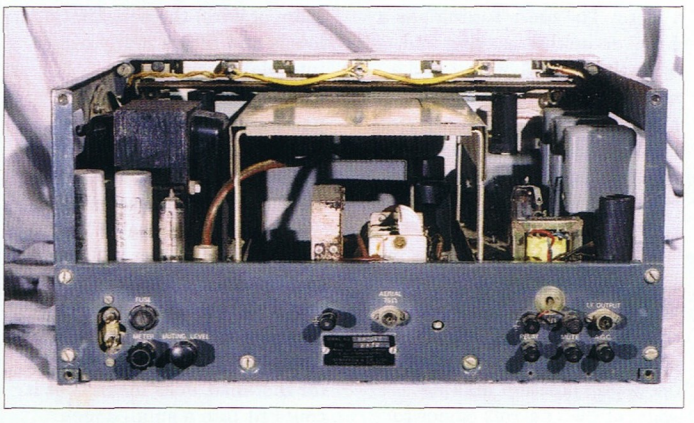

Fig. 3: Eddystone equipment is built to last! The rear panel view f the EA12 receiver showing. r.f., i.f. (for spectrum analyser 'Pan Adapter' unit) a.f. outputs, etc. (See text). Photograph G4BXD.

Valves 6 and 7 are employed as i.f. amplifiers with both stages being a.g.c. controlled with the addition of manual control of the first stage. This section of the receiver also includes the crystal filter unit and the notch filter.

Notch Filter

The tuneable notch filter can impart up to 40dB of very sharp rejection to the pass-band. The design uses the (much favoured by Eddystone) variable/adjustable secondary windings on the three i.f. transformers, which allow continuously variable selectivity.

A front mounted control gives three positive 'click' stops at 6, 3 and 1.3kHz bandwidth and if the same control is advanced further the crystal is introduced into the signal path, reducing the amazing bandwidth to 50Hz, all quoted to the -6dB points.

The 2nd amplifier stage also drives the S-meter but this is disconnected when the **AGC Off** position of the relevant switch is selected.

Muting voltages are obtained from the first stage and fed to a control on the rear panel of the set. External muting, from a transmitter relay for example, can also be applied.

A double diode in V8 is used as the a.m. detector and a.g.c. rectifier. Noise limiting in the a.m. mode is achieved with a silicon diode. Two speed a.g.c. response times are available, when the **AGC Off** condition is selected.

Valve 10 functions as product detector and beat frequency oscillator (b.f.o.). Switched fixed capacitors are used to select between upper and lower sideband and a pre-set offset, these capacitors are in series with the main b.f.o. tuning capacitor. The result is that on c.w. the b.f.o. can be varied by ±3.5kHz, whilst on s.s.b., only ±100Hz adjustment is available.

Detection Audio & Power

The product detector's audio output is taken through a diode noise clipper that can be switched out of circuit. The threshold of clipping can be manually set while a low-pass filter follows the clipper or detector output, giving a response of 500Hz at -10dB and 5kHz at -30dB.

A bandwidth of 300Hz at -6dB can be obtained when the c.w. filter is switched into circuit. Indeed as I've already mentioned, with the selectivity control settings of between 1.3kHz and just 50Hz are available to the listener.

Audio amplification is provided by half of V9 and then by V11, the output valve. An internal low impedance speaker is fitted to the set, but connections are also available for external speakers. Inserting high impedance headphones via the provided standard jack socket disconnects the internal speaker.

The power supply is fairly standard and uses a full wave rectifier circuit giving the main 250V h.t. rail. An OA2 regulator valve is used to provide a stabilised 150V rail. The low-tension side powers the valve heaters and also the plentiful and well thought-out dial illumination.

A 100 kHz crystal oscillator circuit is provided by V13. When required it's switched on by depressing a button at the

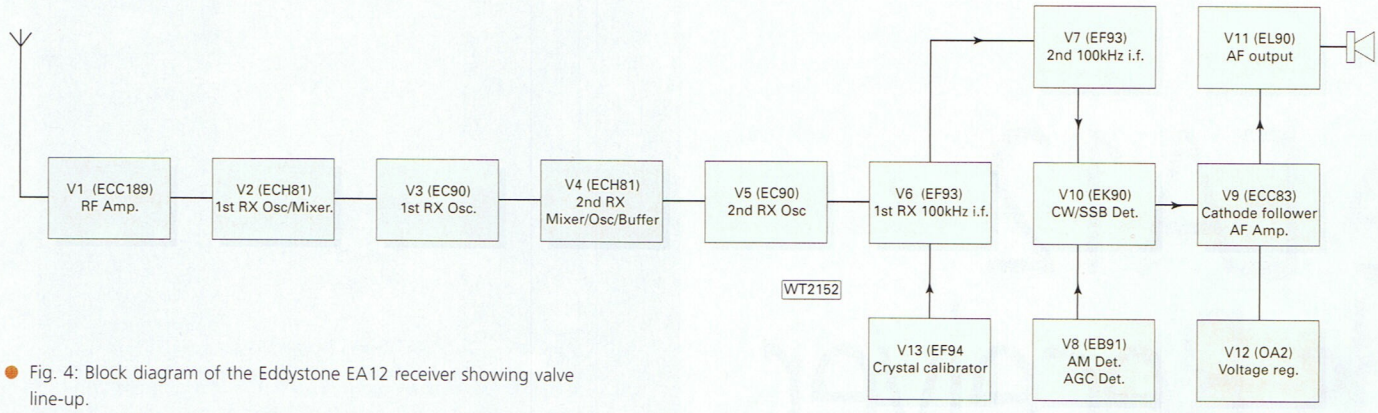

Fig. 4: Block diagram of the Eddystone EA12 receiver showing valve line-up.

top left of the receiver front panel, which grounds the cathode of the valve and starts the oscillator. Cleverly it also reduces the gain of the r.f. amplifier...making the calibration pips easier to find.

In practice, as the second i.f. is the same frequency as the calibrator fundamental, a beat note is heard even when the receivers is operating in the a.m. mode. Finally, the main tuning cursor can be physically moved to achieve accurate calibration settings.

Super Smooth Tuning

The large well illuminated tuning scale, the super smooth slow motion tuning and various variable pass-bands make the EA12 one of the nicest and easiest receivers to operate on the air. The main tuning has a 140:1 reduction gearing and with the large flywheel and a scale of over 254mm (10 inches) there's a 12kHz frequency shift per revolution of the tuning control which, with no backlash, makes for high resetting accuracy.

The EA12 was available in table top and rack mounted versions. An additional plate could be fitted under the front of the table version to raise its operating position making some of the controls easier to use.

The large knob style controls on the receiver all give a positive feel, are easy to operate and finish off the general appearance very effectively. Matching chrome levers are used on the a.g.c., selectivity and mode controls.

The internal layout of the receiver is very clean, r.f. sections in the centre, i.f. and the audio stages down one side, and the p.s.u. and b.f.o. down the other. However, the p.s.u. filter choke seems to be precariously close to the **Mode** switch! Incidentally, very detailed information on coil location and alignment points is carried on the base plate of the set.

Impressive Performance

Even when I've only used the EA12 on a short length of antenna, just five metres or so, the receiver has provided an impressive performance. Interference can be filtered out, and weak stations copied easily using the variable selectivity.

Very weak c.w. signals can be resolved using the adjustable selectivity and the various filters. On the my station's main outside antenna (35m of wire) the selectivity levels and filters really came into play. Incidentally, Eddystone also produced a panoramic display unit, the EP20, that could be used with the set to provide a visual display of the received signals.

The EA12 is heavy! It weighs nearly 23kg (50lbs or so in old money), but its relatively small 'footprint' - the space it occupies on the table - compared to an AR88 or RA 17 for instance, does mean that it could fit into a small shack.

In its day the EA12 must have been a quantum leap on other sets around at the time. For Radio Amateurs used to operating outdated war surplus it really must have been a futuristic set. Finally, my thanks to **Graeme Wormald G3GGL** for letting me photograph the inside of his EA12 which is in a better condition than that in my own collection. *pw*

Manufacturer's Specifications

Frequency range:	1.8-2.5, 3.4-4.0, 6.9-7.5, 13.9-14.5, 20.9-21.5, 27.9-30MHz (in four bands)
Intermediate freq:	1st i.f. 1.1-1.7MHz, 2nd i.f. 100kHz
Stability:	<100Hz drift per hour after 20 min. warm up <100Hz per hour drift for ±10% line voltage variation
Reception modes:	a.m., c.w., l.s.b., u.s.b.
Sensitivity:	2μV for 10dB SN/N for s.s.b., 0.5V for c.w.
Selectivity:	Variable 6kHz to 1.3kHz, 50 Hz with crystal filter (all -6dB)
Image rejection:	50dB or better
Dial accuracy:	Within 0.5% on all bands, 1kHz when using built-in calibrator
Power requirements:	105-125V or 210-250V a.c. 50/60Hz at 85VA
Rear panel connections:	h.f. antenna (75Ω unbalanced), i.f. o/p, 250Ω, Speaker 8Ω, headphones (2kΩ impedance), S-meter zero, mains input socket
Dimensions:	425 x 222 x 346mm
Weight:	approx.23kg (49lbs)

Valve compliment: V1: ECC189 (r.f. Amp). **V2**: ECH81 (1st receiver mixer/osc buffer). **V3**: EC90 (1st receiver osc). **V4**: ECH81 (2nd receiver mixer/osc buffer). **V5**: EC90 (2nd receiver osc). **V6**: EF93 (1st 100kHz IF). **V7**: EF93 (2nd 100kHz i.f.). **V8:** EB91 (a.m. det/a.g.c. det. **V9:** ECC83 (cathode follower and a.f. amp. **V10:** EK90 (c.w., s.s.b., detector). **V11**: EL90 (a.f. output). **V12**: OA2 (voltage regulator).**V13:** EF94 (crystal calibrator).

Diodes: D1 - DD006 : a.m. noise limiter. **D2/3 DD006**: c.w./s.s.b. noise clipper. **D4/5 DD058**: h.t. rectifier.