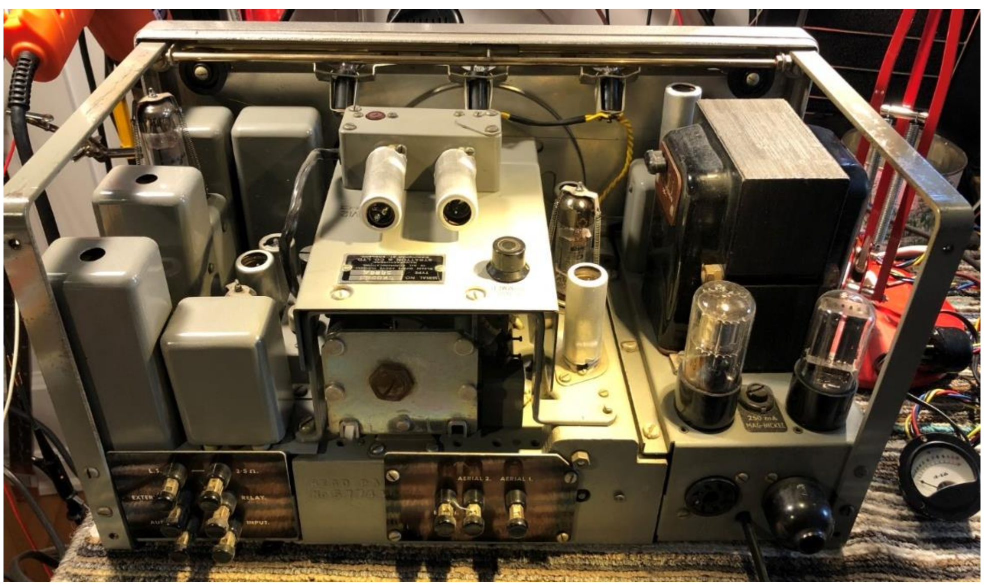
My Eddystone S.888A Re-visited – Gerry O'Hara VE7GUH

Although I have owned this set for almost a decade since I bought it from someone in the UK, it has not had much use compared with my other Eddystone sets. Although I am a licensed radio amateur (and have been since 1972), I have not been really active on the ham bands for several years. I bought the set mainly because I was curious as to how the 'standard' Eddystone tube technology and build quality had been adapted for the amateur radio market, and how well such a set performed, without paying the relatively 'big bucks' for an EA12, the successor to the S.888A. I didn't even give this set my usual thorough 'once-over' on arrival as it was in very good cosmetic condition, the dial mechanism worked well (probably the best I have ever tried), it performed well, and it had several critical components changed the year before I bought it by the previous owner. I never even wrote an



article about it – I thought I had (a 'portrait' type rather the restoration), but hadn't! – the only one on the Eddystone User Group (EUG) website is one on the earlier S.888 by Wendy Mott, here. So I felt now was the time to give it a more through check-out, tune-up and spruce-up.

Electronic Check-over

At first I was intending to just check everything was still working ok after the set had not been operated for a few years, and likely a re-alignment, as I never did one of those either after I bought it. First though, I re-checked what components had been replaced: a few resistors, the power supply filter caps and tubular paper caps under the chassis, though the metal-bodied RF/IF bypass caps bolted to the chassis had all been left in place – fair enough, as these have usually been ok in my experience (yes, I

know they can fail). Several of the tubes are Russian-made equivalents, including the two ECH81s (6AJ7s) – photo, right. I recalled the previous owner mentioning that to me, and that he found them to work well. Then I noticed that whoever had done the work had missed a tubular paper cap that was hiding beneath two large resistors in the IF/AF compartment. Then I took a look in the coilbox, and noted that they had missed a few paper caps in there also – these are ones that I refer to as 'ratshit' caps as that is what they look like – small ovoid caps, sometimes with colour code bands, sometimes not – just brown. The photo, below left, shows a colour-coded one and also the internal construction. They are usually lower-capacitance values (500pF – 0.01uF is typical) and are low voltage, maybe rated up to 150vDC or so. They are often used as heater circuit RF bypass caps, snug against the tube bases (as in the S.888A RF section), but sometimes are used for screen or cathode bypass also. From experience I know these caps are invariably 'leaky' (measuring between a few tens to a few hundreds of Kohms), or open circuit, and their capacitance can vary

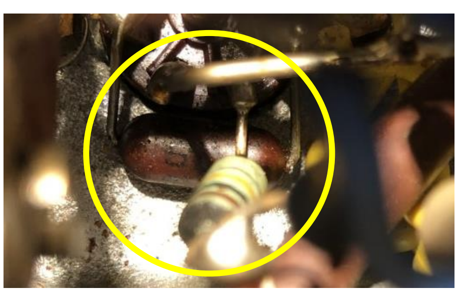
quite a bit from the marked value to almost zero. I think their ageing behaviour depends on many factors – including manufacturer, batch, and environmental conditions. Examining the AF/IF compartment again revealed another such cap (AGC bypass on the 2nd converter tube), connected across a couple of pins on the 1st IF transformer. Checking the schematic, I identified that there were likely a few more of these types in the above-chassis Product Detector and 2nd converter units.

Component Replacements

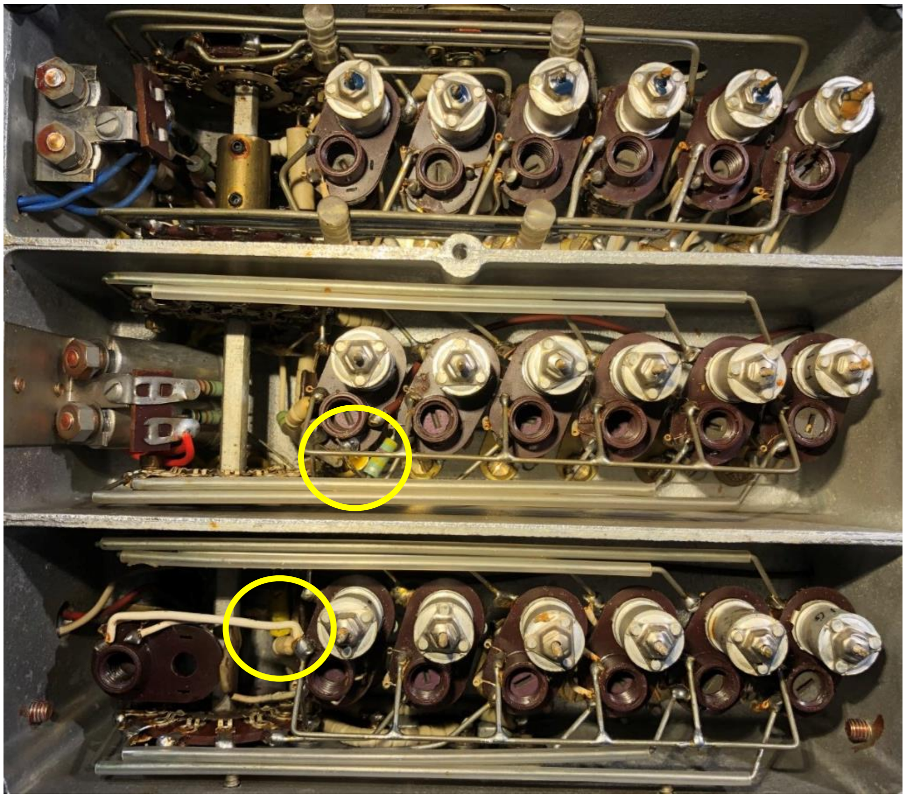
IF/AF Compartment and Coilbox

First, I changed the larger paper capacitor in the IF/AF compartment (circled yellow in the photo, right), hidden by the two resistors.

I then moved onto the coilbox. Here, the 'ratshit' caps are used for heater bypass on the local oscillator tube (one either side of the heater, tight against the tube socket – circled yellow in photo, below). These are extremely

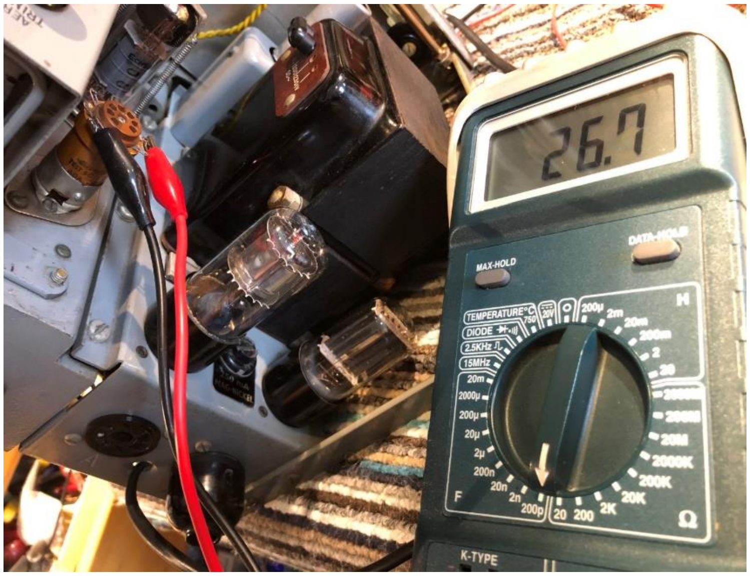


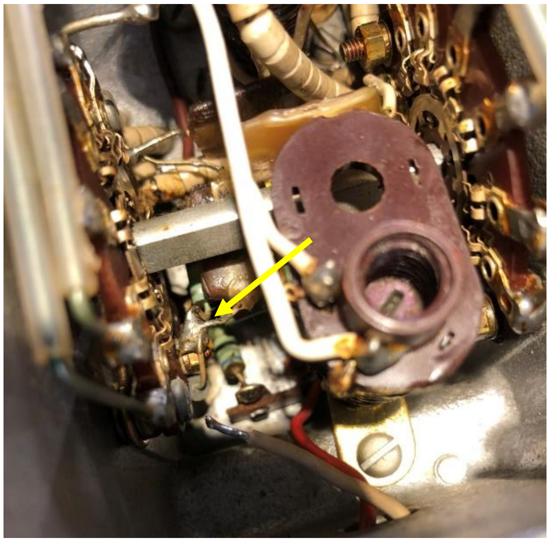
difficult to get to and, given they only have a few volts across them and leakage is not an issue, unless there is cause for concern,

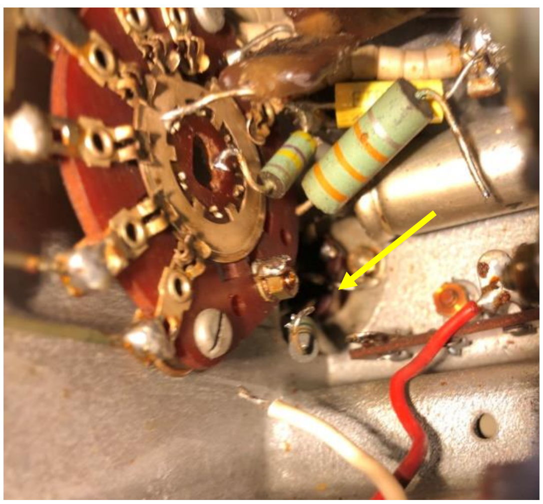


ie. a fault traced to these, eg. a short or instability, they are best left alone as there is a high chance of disturbing/damaging something else getting to them. I have changed these out on other Eddystone sets, but is very time-consuming, ie. it's a 'needs must' type of job in my book. Unfortunately, these cap types are also used for AGC bypass to the RF amplifier and 1st and 2nd converter tubes. The AGC line is a high impedance circuit and leakage in these caps can severely degrade AGC performance. So I changed these three bypass caps out: two in the coilbox and moderately difficult to access – circled yellow in photo, above, and one in the IF compartment and much easier as noted earlier, circled green in the photo at the bottom of page 2.

One of these 'ratshit' caps (0.01uF) is also used as the cathode bypass cap in the RF amplifier stage – again, very difficult to access and an application where leakage of a few hundred Kohm resistance would not be an issue, though loss of capacitance could be. It is possible in this set to disconnect the 'cold' (chassis) end of the 68 Ohm cathode resistor and then, with a tube socket test adapter plugged into the RF amplifier tube socket, test both the resistor and capacitor in-situ. The resistor tested within tolerance, but the capacitor tested as <14pF (allowing for 13pF capacitance of the test leads – photo, left) – so that needed to be replaced as it could result in instability (though none was evident) and/or loss of RF gain. This necessitated some 'dental' work, ie. working in a confined space. To make better-access, I first moved the IF trap coil out of the way – this can be done without disconnecting it. Next, I loosened one of the bandchange switch coupler set screws and slid the shaft out through the hole on the rear apron of the set. I then disconnected some

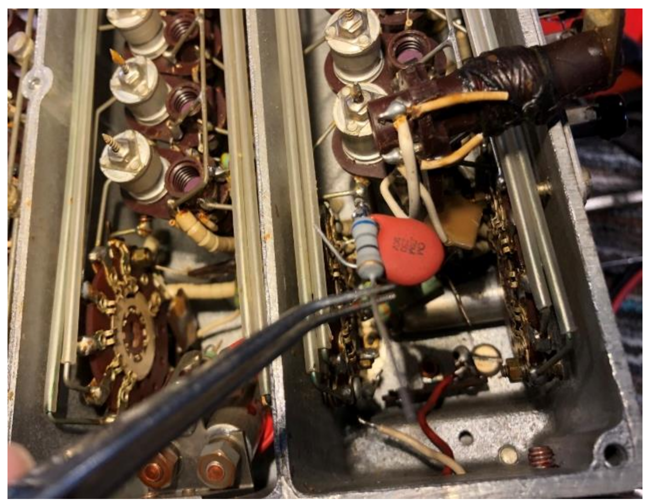






resistors and a silver mica capacitor that hindered access. Pin 7 (cathode) of the RF amplifier tube socket was now accessible. The photos, left, show access before (top) and after (below) better access was made. Pin 7 of the tube socket is marked with an arrow in both photos.

I unsoldered the 68 Ohm cathode resistor and 'ratshit' bypass cap – the cap tested open-circuit. I decided to use a ceramic disc cap in its place – these are good for RF bypass applications and its thin shape allowed it to be tucked away neatly against the chassis. I pre-formed a new 68 Ohm resistor and the new disc ceramic bypass cap prior to installation (photo, below). I also decided to replace the screen dropper and AGC resistor while I had access to do so, even though these components tested ok. Once this was done, the other components were re-installed, then the bandchange switch shaft, and finally the IF trap coil. The work took me about 1.5 hours (to change out 4 components! – photo, below right) – worth it though as I noticed an improvement in RF gain after these changes.



Product Detector Unit

Next, I disconnected and removed the Product Detector unit. On opening this up, I saw that the caps had been changed already, however, incorrect values had been used for the IF filter caps and the AF coupling cap – the IF filter caps should be 500pF parts (these would have certainly have been 'ratshit' parts), and they had been replaced with 1000pF (0.001uF) disc ceramics, and the 5000pF audio coupling cap with a 0.01uF part rated at 160vDC. This cap has 200vDC on it from the anode of the product detector tube, so not good... The larger IF bypass caps would account for slightly dull-sounding audio during SSB reception.

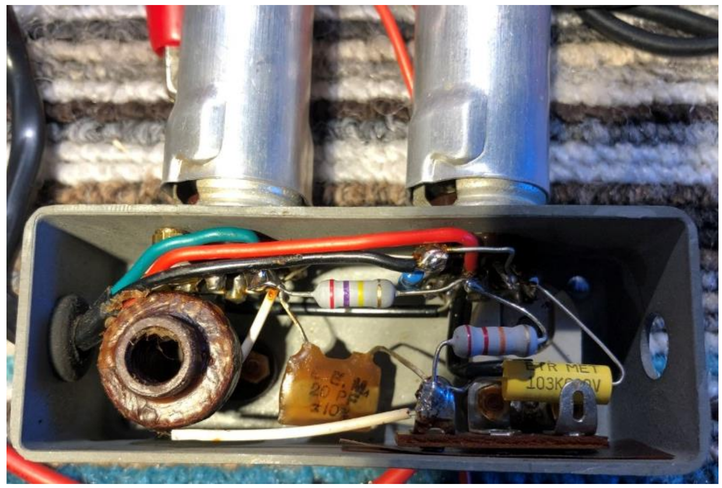
I replaced the IF filter caps with ones of the correct values and the coupling cap with a 0.047uF cap rated at 630vDC. The small electrolytic had been changed, for one of the correct value, and this checked out ok. Only one resistor had been changed-out (for one of an incorrect value). On testing the others, only one was significantly out of tolerance. However, I went ahead and replaced them all anyway – this will save time in the long-run as removing/replacing this unit is a bit of a pain. The photos, above, show the refurbished Product Detector unit before refitting the screening can.

2nd Converter Unit

With the Product Detector back in place and function tested, I moved on to the 2nd converter unit. This is sandwiched between the 1st IF transformer (1.62MHz) and the 2nd IF transformer (85KHz). Removal is a similar process to removing the Product Detector – unsoldering several wires and noting where they go/taking a photo, etc., removing a couple of screws and it pulls out. Once removed and the screening can taken off it was obvious that nobody had been in there since the set was manufactured. It contained three 'ratshit' caps: two functioning as heater bypass and one as the screen bypass cap (with around 55vDC on it). The 10Kohm screen dropper resistor looked ok though, so it was not leaking excessively (it measured 400Kohms when removed). I replaced all the paper caps and resistors (photos, right) before reassembling the

unit and fitting back into the chassis. It function tested ok once installed and wired-up. I noticed that one of the resistors that someone had replaced previously (the 27Kohm screen dropper connecting to the 2nd converter unit in the IF/AF compartment) was also an incorrect value, so I replaced that also.

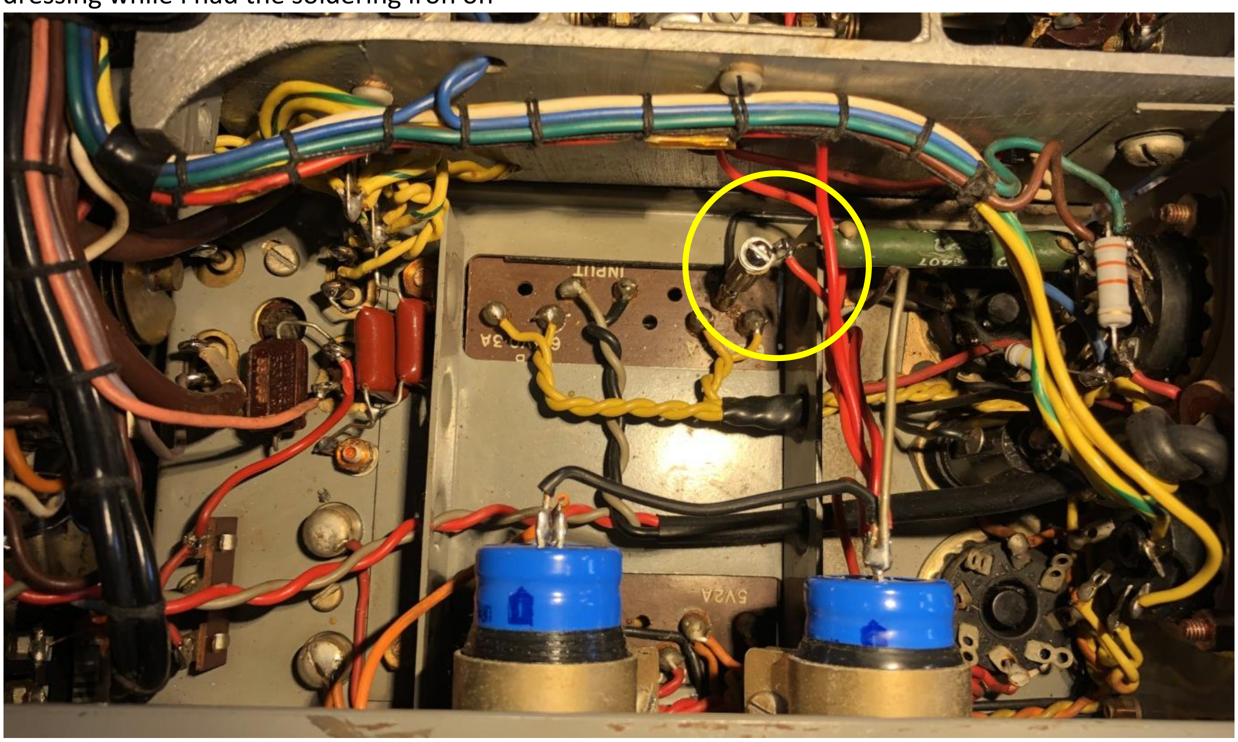
Crystal Calibrator



Next-up was the crystal calibrator: this is very similar to the one I refurbished recently for the S.940 (ex. S.730/4) – I replaced the single paper cap and the three resistors in this unit (photo, right).

Other Work

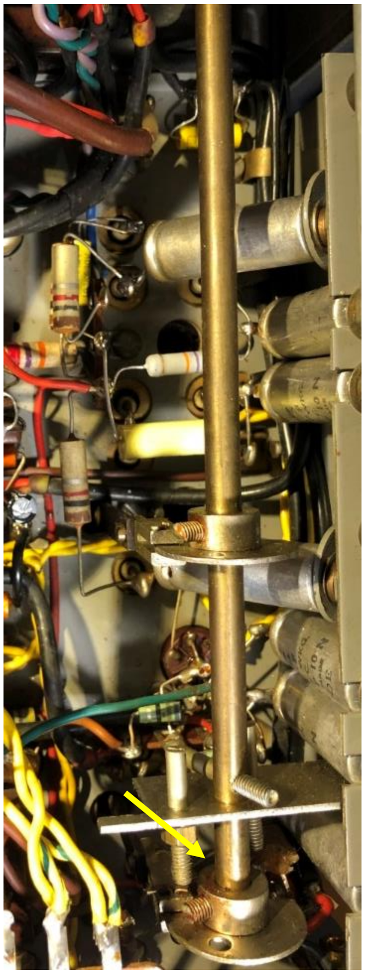
While most of the previous component replacement showed a high standard of workmanship (apart from using 'near enough' value parts!), I tidied-up a few sections of wiring and component dressing while I had the soldering iron on



and I was 'in the mood'. This included installing an insulated standoff to support one end of the 2.7Kohm wire wound dropper resistor feeding the voltage stabilizer tube (circled in photo, above) – this had been left 'hanging in the breeze' after someone had replaced the filter caps. I also replaced a couple more resistors in the power supply chassis where they tested out of tolerance.

I then spent time cleaning and lubricating the tuning gang and dial mechanism, cleaning the chassis , testing the tubes (several Russian equivalents fitted by the previous owner, including the two 6AJ7/ECH81 frequency changers) – all tested very good, cleaning the front panel, fingerplate and knobs, and giving the toggle switches a going-over with 'Autosol' to bring back their chrome lustre. Once that was done, I left the chassis running on 'soak test' for a couple of days before re-aligning.

Re-alignment

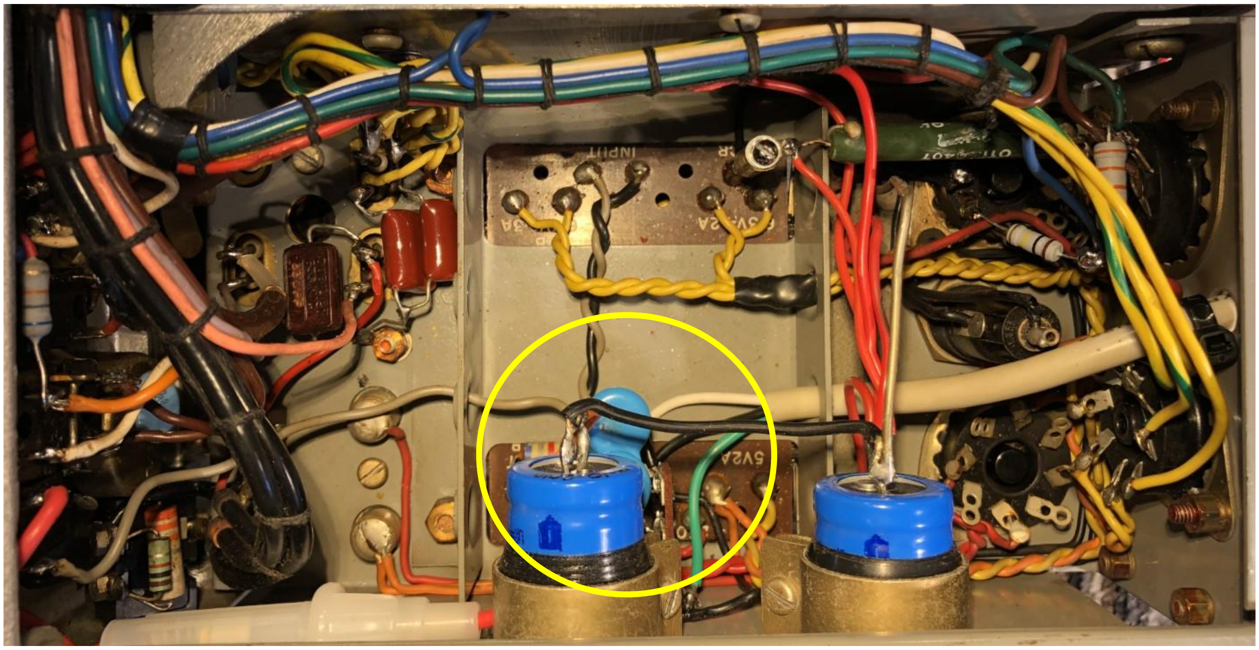


The dial was out a little on all bands – at least 5KHz and up to 15KHz, which is very noticeable on a dial with such good bandspread, eg. 350KHz for the entire 12" scale length on the 14m band. I also noted that the knobs on 'Oscillator Low-High' adjustment and BFO pitch control had not been set correctly with their respective variable caps. I set these correctly first, then checked that the tuning pointer and tuning gang were set correctly before starting the alignment.

The manual provides the alignment method for both IF frequencies and the RF section – this is straightforward, especially as there is no crystal filter to set-up. The main complicating factor is the two IFs and the need for a signal generator that goes down to 85KHz. None of my analogue RF signal generators do, so I used my Heathkit audio signal generator which goes from 1Hz through 100KHz. However, this is not modulated, so I could not use an output meter for this part of the alignment procedure. Instead, I used a 'scope attached to the AM detector diode (a VTVM on the AGC line cannot be used for adjusting the final IF transformer cores as the AGC diode is fed from the anode of the 85KHz IF tube, ie. before the final IF transformer). An output meter was used for the 1.62MHz IF alignment as my signal generators can provide AM modulation at this frequency. All went smoothly and I was surprised at how far out of alignment both the 85KHz and 1.62MHz IFs were given the performance of the set prior to making these adjustments. The lower cores in the IF transformers (T1, T2 and T3) and the second local oscillator core (T4) are a little difficult to access – especially that for T3, which necessitated use of a long thin trim tool fashioned from a plastic knitting needle as my usual trim tools would not quite pass through the components and IF bandwidth control shaft above the core access hole (arrow on photo, above right).

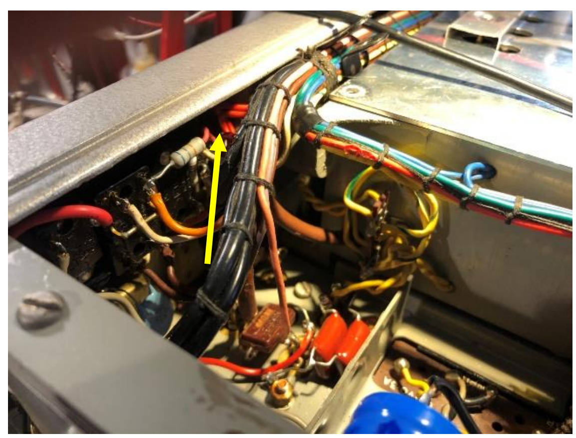
The RF alignment was also very straightforward, though the comment in the manual "*It will be found essential when making all adjustments within the coil box, both with cores and trimmers, to* ***use a most delicate touch,*** *otherwise the calibration might well be 100kc/s. (or more) in error.*" is very apt – a fly farting on the wall behind the set can upset things when adjusting the trimmers and coils on Bands 1-3. Eddystone's use of rubber filaments to resist core movement has pros and cons – it does prevent unwanted movement, but adds some hysteresis to the very small tweaks needed, making adjustment difficult, if a little temperamental. Also, the Philips 'beehive' trimmers are prone to wear and then becoming slack in their adjustment. This can sometimes be improved by removing the 'beehive' and crimping the screw-hole slightly or introducing a small filament, eg. a piece of thin monofilament fishing line, between the hole and the screw. Given this, the trimmers, especially those in the local oscillator compartment, need to be 'locked' with a dab of nail polish or similar once set.

I also found that significant stray RF was entering the set on the 2-wire line cord (no ground). I therefore added a small tagstrip with two 0.01uF Y-Class caps to ground, an line fuse (in-line holder fitted with a 1.5A fuse under the chassis), and a three-wire line cord, grounding the chassis (located beneath one of the replacement power supply filter caps, circled in photo, below). This improved things significantly.



Final Checks and Tweaks

Following re-alignment, the set was left on 'soak test' for a couple of days. I started to notice some intermittent 'static' type noise – most prevalent on the 20M band, but discernable on the other bands also. This was traced to three noisy resistors: the anode load resistors of the RF and 2nd converter stages, and, in particular, the HT bleed resistor to the RF gain pot. The latter is very difficult to change (and hard to spot!) – its located behind the front panel, tucked away behind the crystal calibrator switch and a wiring loom - follow arrow in photo, right (no, its not the resistor you can see – its behind those red wires). I changed these resistors out, plus some others that connected to the same circuit nodes for 'good measure'. That solved the noise problem, and the set was now working well and reliably.



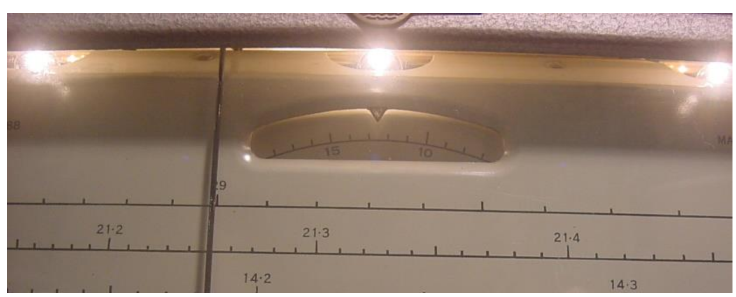
Closure

The S.888A is a nice receiver, and is extremely solidly-built - I would say equaling the 'professional' grade receivers manufactured during the same period by Eddystone - and is substantially more solid than many 'commercial' grade tube receivers. It's performance is quite good too, however, a cascode front end for lower noise and better strong signal handling/cross modulation performance, a crystal filter and an additional 85KHz IF amplifier stage would have helped, as would having the antenna tuner on the front panel. The oscillator trimmer is a bit of a ‘kludge’ in my book, though I found it useful, even after very carful re-alignment, as several minor dial errors still resulted. Perhaps the coil/trimmer/padder design could have been improved to reduce the need for such an extreme ‘*delicate touch*’ during alignment and also improve dial accuracy and linearity. I think some of these lessons were learned and applied to the design of the EA12, which also included a crystal-controlled 1st local oscillator and tunable 1st IF, similar to the ‘Jewel in the Crown’ S.830 series of professional grade receivers. I have never had an EA12 on my bench, or even operated one, but I understand from folks that have used one, when working well, they are an extremely competent receiver.

This S.888A is in very good cosmetic condition, and after the work undertaken as described here, works very well too considering its limitations. Its frequency stability after an hour or so warm-up is remarkable – maybe drifting +/-300Hz or so over an hour, and its dial accuracy is very acceptable once tweaked to the crystal marker points on the band in use using the oscillator trimmer control as advised in the user manual. SSB reception is good and the audio filter makes CW signals very clear. In my opinion through, a crystal filter can still be very useful to null unwanted signals close to the one you want to listen to, and this, combined with the audio filter, would have been a great combination.

“Now, who’s up next? - lets be ‘avin yer…”

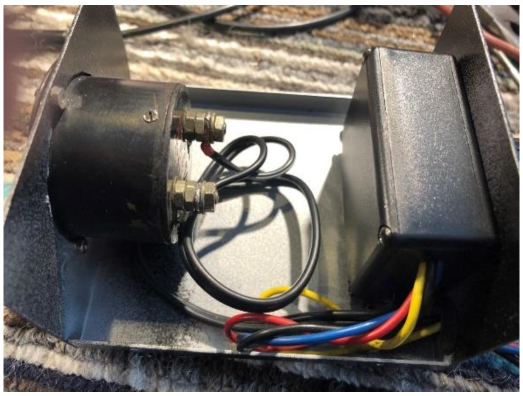
These Eddystones just don’t seem to have heard of ‘social distancing’ in the queue for the workbench – hope they don’t give me Covid-19!!



Postscript

The S.888A came with a homebrew S-Meter. This comprised a small plastic box containing the zero adjustment potentiometer and fixed resistors, a small 'R-Meter'[1] on a (2 wire) flying lead connecting into the box wiring, and another (4 wire) flying lead terminating in an Octal plug. The circuit is that of an Eddystone S-Meter (Type 669)[2].

I tried this out on the S.888A and it worked well. It seemed a shame for it not to be housed in a box as it was not really usable the way it had been constructed. So I found a suitable small metal project box in my seemingly bottomless junk-box and installed the meter and plastic box assembly into it. Maybe not quite as good-looking as a real Type 669 S-Meter, but perfectly acceptable – photos below.



[1] The meter dial notes 1R=6db, and is marked 0 – 9 (R Units), and +6, +12 and +18db, so similar to an 'S-Meter'

[2] See 'Stratton's Enigmatic S-Meter' article by Graeme Wormald in Lighthouse Issue 95, February 2006 (page 10)