Refurbishment of an Eddystone EA12

by Victor Jenkins

Introduction

By the summer of 2022, I had built up a small collection of Eddystone receivers and one or more of them would be in use most days, as I listened to the HF bands in my wooden radio shack in the middle of my garden. In the centre of my operating bench was the 888A that I had just finished refurbishing, as described in my Eddystone 888A article on the EUG website. This was flanked on the left by my 730/4 and on the right by my S940. I had chosen Eddystone receivers - with the valves and multiple tuned circuits in their front ends – because of their ability to cope with higher levels of RF interference than my more modern receivers. This combination of three receivers was working well and I was content. Also, I was satisfied that I would be able to keep these receivers operational for as long as I wanted, because of the ready availability of replacement components; unlike a lot of newer equipment where a faulty chip can be terminal.

However, there was a problem; I like refurbishing Eddystone receivers as much as I like operating them. So, I started asking myself the question: which receivers would provide better performance than the ones I had, but not contain any chips or digital electronics? As a result, I decided to look for an EA12 and/or an 830 and approached members of the User Group for offers. By the end of 2022, I had selected one of each from the many kind offers I received (Thank you to all those members who made me offers) based largely on ease of collection from where I live.

On 11th January 2023, I met Phil Ashton (G3XAP) and purchased EA12 S/N FT 0289 from him. Before completing the purchase, I was able to try the receiver on the 20-metre band. It sounded a bit noisy, appeared to lack sensitivity and there was some backlash in the tuning mechanism, but it was working, and Phil was able to tell me that it had been refurbished professionally a few years earlier. I decided that refurbishing this EA12 would be my first project of 2023, ahead of refurbishing my newly acquired 830 because, although in good condition, it was not working.

Purpose

The purpose of this paper is to provide information and advice to anybody else who has an Eddystone EA12 in need of refurbishment. I have not included any of the detailed information on how to tune and align the receiver or how to operate it, that is included in the original Eddystone user manual available from the User Group website. All I would say on this matter is that, when it comes to tuning and aligning a receiver like the EA12, the Eddystone procedure must be followed slowly, carefully and to the letter; otherwise, the receiver will not perform at its best.

The paper describes what I did in the order that I did it but, it is not a ‘blow by blow’ account. In some places, where I think it might be helpful, I have included extra detail on how I performed a particular task. However, I have assumed that nobody would try to refurbish an EA12 without previous experience of working on simpler Eddystone receivers and without having read the Eddystone manual and several of the relevant papers available on the User Group website. Therefore, I have not described in detail how most of the work was done.

First Steps

As usual, I started slowly by reading everything that I could find on the User Group website that related directly to the EA12 and/or provided other useful information. In this regard, I include the articles on the 830 receiver because there is quite a lot of similarity between the two receivers and some circuit elements are identical. Also, I discovered a good description of the EA12 in the Radio Enthusiast Magazine. This is well worth reading for the information contained in it and for the link to a very clear version of the circuit diagram. The description is available here

Then, unusually, I put the receiver on the test bench, made the required connections and applied mains power. In order to be clear, I did this only because I had seen it under power and working a few days earlier. Normally, I would have used a variac and increased the mains voltage slowly. Within an hour, I had confirmed the following:

1. The EA12 was working, and all its operating controls were functioning correctly.
2. There was some backlash in the main tuning mechanism; between the tuning-knob/tuning-dial assembly and the actual tuned frequency.
3. There was a lot more noise coming out of the loudspeaker than is normal for an Eddystone receiver under the same test conditions.
4. The sensitivity of the set was low but roughly constant across the bands; an RF input signal of -60dBm produced a reading of S4/S5 on the signal level meter on all bands.
5. The tuning was very good across the full range and the IF amplifier was well aligned.

I was pleased with the external condition of the receiver – it is a shame that EA12 signal strength meters always appear to have the mandatory crack across the front – so it was time to look inside. First impressions were good, the internal condition was just like the external condition; a light clean would be sufficient. The only surprise was the large number of spiders wandering about inside, apparently impervious to 250 Volts.

Finally, I sat down with a copy of the circuit diagram, a large notepad and a bright light. Then I slowly worked my way through the complete receiver making copious notes of all the repairs that had been made to it over the years, the various modifications that had been incorporated – such as the incorporation of an IEC mains socket, the state of the lubrication on the numerous moving parts and the identity/location of those components that looked doubtful. For example, there were several resistors and some capacitors that looked as if they had been running at high temperature, particularly in the power supply section.

General Observations

As soon as I removed all the internal covers and started looking inside the receiver, some significant issues became clear. The first thing I observed was that the foam rubber pad which keeps the crystals properly located in their respective sockets was badly decomposed and the crystal cans were covered in corrosion. This is shown in **Photo 1.** Next, I examined all the mechanical aspects of the receiver, to check the operation of the controls and the state of the lubrication. All the controls appeared to be working correctly, although several felt a bit stiff, and there were still some signs of a little lubrication. I examined the main tuning mechanism very carefully; looking for possible causes of the backlash detected while tuning the receiver. I determined that the main tuning capacitor did not have sufficient lubrication and was quite stiff to turn. Also, there was some wear in the rolling pinion which connects the drive arm to the linearising arm of the main tuning mechanism. This is shown in **Photo 2.** This movement was visible as the main tuning knob was rocked from side to side.

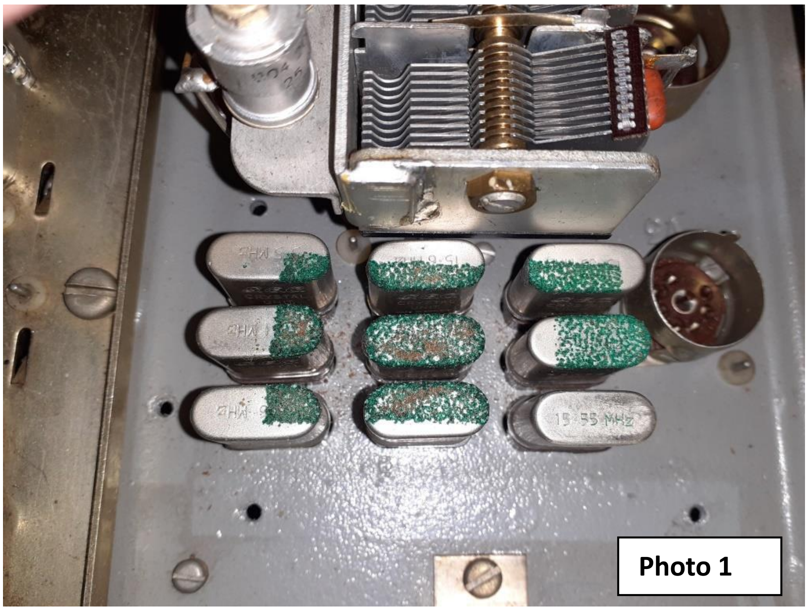

Photo 1

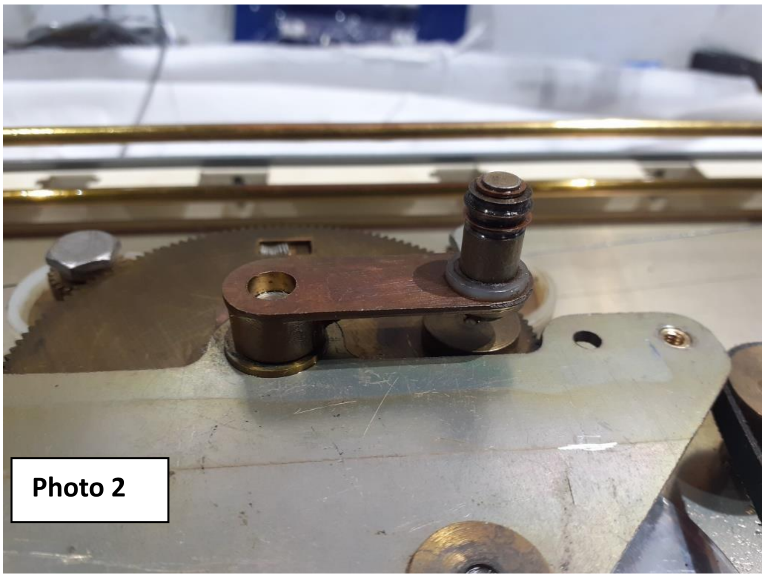
Photo 2

Otherwise, the receiver showed all the usual signs of repair and maintenance over the years. Most of the passive components were the original ones in their original positions. As mentioned above, the mains power input socket had been changed to an IEC three-pole version and some interference filtering had been added. The RF amplifier and crystal calibrator circuits had been rebuilt with new/modern components and there was a sprinkling of other new components throughout the set where, it is assumed, failures had occurred.

When running the receiver earlier I had noticed that it runs significantly hotter than my other Eddystone receivers. This reminded me about comments Gerry O'Hara had made when describing the work he had done on an 830 receiver and the steps he had taken to improve the cooling of that receiver. Therefore, I was not surprised that there were clear signs of some components in the power supply section had been operating at a very high temperature.

A Specific Observation

When carefully examining the receiver, as reported above, I was thinking ahead to the work that I was starting to plan, including how best to disassemble and re-assemble the receiver. I noted that the main tuning capacitor is bolted to the back of the front-panel assembly and not to the top of the coil-box assembly; as is the case for receivers like the 730, 940 etc. This can be seen in **Photo 3.**

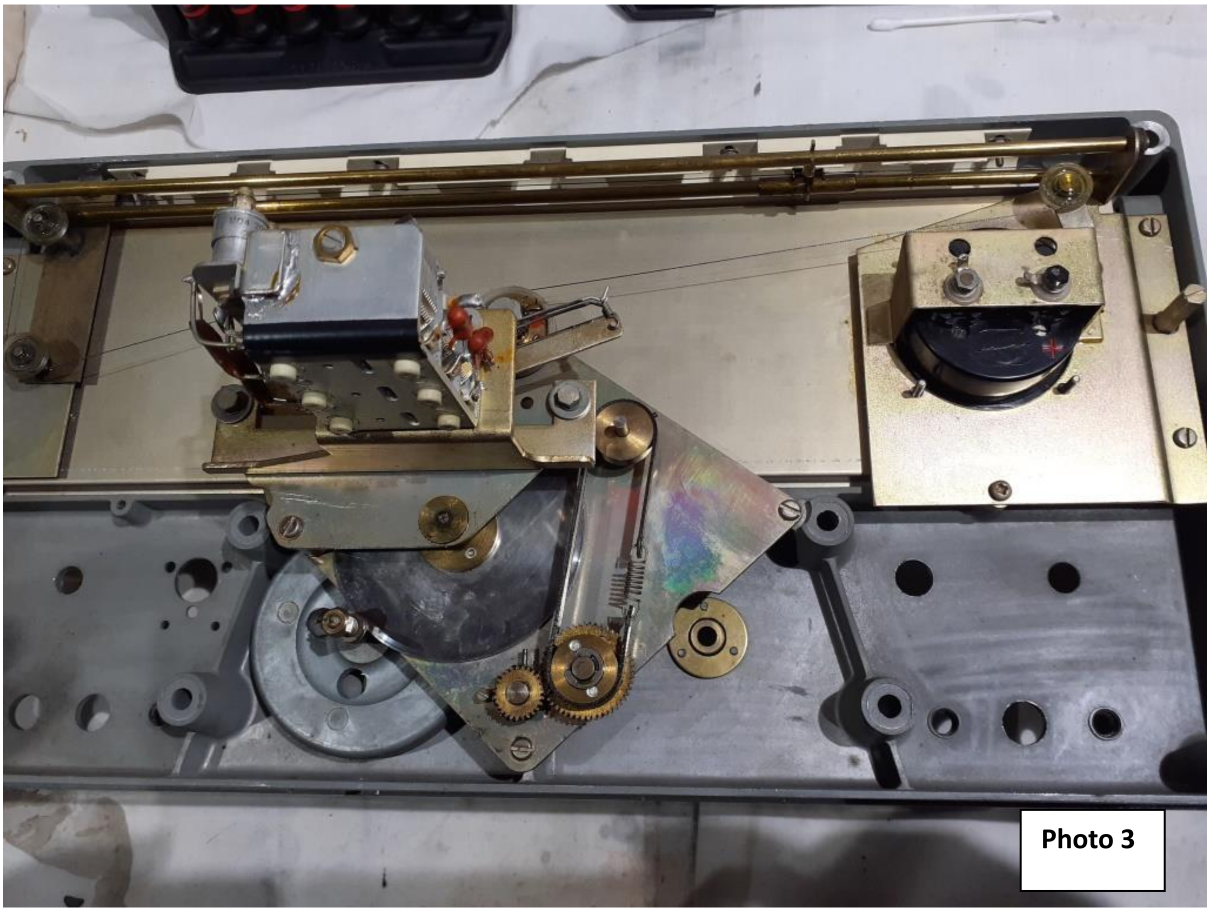

Photo 3

There is a warning note in the Eddystone User Manual for the EA12 against touching these bolts because any adjustment to their positions can have serious consequences for the accuracy of the main tuning linearity. Therefore, I planned to disconnect the six wires which connect the tuning capacitor to the coil box; leaving the tuning capacitor firmly attached to the front panel, when removing it from the rest of the chassis. This approach has the advantage of giving easy access to the three fixed capacitors - C43, C45 and C66 – which are mounted between the bottom of the tuning capacitor and the top of the coil box.

In addition, I noted that most of the controls on an EA12 are attached to the main chassis with control rods passing through glands in the front panel, to their respective knobs. Thus, it looked quite easy to remove the knobs, undo a few bolts and pull the front panel forwards away from the rest of the receiver. However, I could see it being much more difficult to slide the front panel back onto all those control rods at the same time, while keeping it aligned and square to the front of the chassis. I suspected that Eddystone probably had some sort of jig to make this task easier.

Finally, I spotted that the gap between one of the terminals on the back of the signal strength meter and the nearest IF transformer can was very small indeed. So small that I measured it and found it to be only 0.008 inches. A gap that small between a live terminal and the chassis was not going to be good for my nerves, so I made a note of the need to find a way of making it bigger/safer.

The Plan

When I was reading Gerry O'Hara's papers on refurbishing an 830 receiver, I was struck by his comment regarding the benefit of changing all the capacitors at one go instead of looking for and fixing problems as they are found. Also, I had my 888A working well on the operating bench – after a long hard slog, finding and fixing faults - so I was not in desperate need of additional amateur band coverage and not too keen on repeating my experience with the 888A. Therefore, I developed a plan, as follows:

A. Give the receiver a good clean inside and out, removing any residue from the spiders.
B. Refurbish all the mechanical parts to ensure that everything works properly and is well lubricated, including removal of the backlash from the main tuning mechanism.
C. Rebuild the power supply section to incorporate an EMC-filtered IEC mains socket, improvements to the insulation and changes to improve air flow and assist cooling.
D. Develop some sort of jig to facilitate the removal and re-attachment of the front panel.
E. Find a way of fixing the clearance problem between the signal strength meter and the nearby IF transformer can.
F. Rebuild the complete receiver, using new components throughout.

The Jig

The initial ideas for some sort of jig or other apparatus to assist with the removal and subsequent re-attachment of the front-panel assembly were overly complex and, probably, difficult to make. The final solution comprises some pieces of wood, four pieces of threaded steel rod – 4 inches long and threaded in 2BA – along with four matching nuts and plate washers. As shown in **Photo 4.**

These items now reside with my other specialist Eddystone tools, ready for my next refurbishment project. The steel rods were procured from www.ba-bolts.co.uk who also can supply a range of replacement bolts for Eddystone receivers, such as grub screws for control knobs.

Dismantling the EA12

After the receiver had been given a good clean, both inside and out, the necessary dismantling work was done. This commenced with desoldering the six wires which connect the main tuning capacitor to the coil box; so that the tuning capacitor could be slid forward with the front panel away from the chassis. As a result of previous work on the receiver, all the various bolts and screws had been freed before and relubricated, so the work to remove the complete front panel assembly was done quite quickly and without major problems. The first surprise was that several of the grub screws in the control knobs had been replaced with new ones and that these were Tork/Star Drive in Size T7; unusual but available from specialist tool suppliers. The second surprise was that the finger plate was very firmly stuck in place. I had to gently bend it and dribble a solvent in behind – which was left soaking for a couple of hours – to soften the glue. The lesson here is never to use large patches of modern double-sided sticking tape to fix a finger plate. After 10/12 years clamped between two sheets of metal it had no intention of being separated.

Once the finger plate had been removed, the set was rolled onto its back and supported by three of my newly-made pieces of wood. These kept it horizontal and firmly in position, without any of the rear-panel knobs and sockets touching the work bench. Then I removed the four large bolts which fix the front panel to the coil box; replacing them one at a time with pieces of my newly-acquired threaded steel rod. With these rods in place, I was then able to gently lift the front panel assembly away from the main chassis. I did this in small steps; two blocks of wood were used at each step to support the front panel assembly while I used a bright light to check that nothing was snagging or otherwise preventing the next stage of the lift. When doing this, it is important to remember:

1. The connections to the signal strength meter.
2. To disconnect the drive to the RF Peaking Control.
3. The small circlip on the control rod of the Selectivity/Bandwidth Control.
4. It is easier to leave the BFO Pitch Control and the Slot Filter Control both attached to the front panel assembly and to unsolder their respective connecting wires. This is especially true when it comes to re-attaching the front panel assembly to the main chassis.
5. It is crucial to check the number and location of the washers on each bolt that is removed during the dismantling process; this should be written down so that everything can be put back exactly as it was when re-attaching the front panel assembly to the main chassis.

Working on the Front Panel Assembly

Once the front panel assembly had been lifted clear of the rest of the receiver, it was given a thorough clean and re-lubricated. This set was in good condition and required nothing more than fine brushes, cotton buds and methylated spirits to do the cleaning. On other sets, where the lubrication and dirt had mixed and set hard, I have found that the careful and controlled use of carburettor cleaner was very effective.

I observed that the flywheel was incorrectly adjusted and was applying side-ways pressure to the friction-drive disc. Therefore, I adjusted the position of the flywheel, sideways on its shaft, to remove this pressure and then gave the disc a thorough clean with methylated spirits to leave it shiny and dry. My next task was to remove the rolling pinion from the linearising mechanism, in order to fix the back-lash problem. But I could not do this without separating the main tuning capacitor from the front-panel assembly; despite the warning against doing this that I had found in the Eddystone manual. Therefore, I carefully drew around the mounting bracket with a marker pen, before undoing its mounting bolts and separating it from the front-panel assembly; watching closely that the two little tension springs did not go flying. At this point the cause of the backlash became clear; the tuning capacitor was very stiff to turn and in need of some serious lubrication. As a result, there was an indentation worn in the nylon washer that is located between the pinion and the linearising arm. I solved the wear issue by turning the washer over and lubricated the tuning capacitor. Once the tuning capacitor was re-mounted on the front-panel assembly, it became clear that the backlash problem had been fixed and the main tuning control was much freer in use.

The next task before completing the lubrication work was to increase the clearance between the positive terminal of the signal strength meter and the IF transformer can. I found that I could dispense with one of the two washers, fit a thinner nut and gently file about two mm off the length of the bolt. When this was done, I put a spot of epoxy-based paint on the end of the bolt and covering the nut. After the receiver was re-assembled, I found that I had about one mm of clearance instead of 0.008 of an inch.

Power Supply Section

I began the serious work on this receiver by removing the loudspeaker unit and putting it away in a safe place. Then I stripped the power supply section back to a bare chassis. I was struck by how many of the components in this section of the receiver were showing serious signs of heat damage. Therefore, I decided to follow and adapt Gerry O'Hara's lead and improve the airflow through the power supply section of the receiver. I did this by lifting the mains transformer and the electrolytic smoothing capacitors up off the chassis using longer mounting bolts and spacers about 1cms long. Also, I took the decision to remove the loudspeaker and mount it in an external enclosure. These two simple steps massively increased the airflow up through the power-supply section of the receiver.

The set had already been fitted with an IEC 3-pin mains socket and an EMC filter made from discrete inductors and capacitors. I removed all of this and replaced it with a new IEC socket that incorporates an EMC filter. This looks much neater and saves space; probably, it works better as well.

Changing the Passive Components in the Main Chassis

My recent experience of refurbishing an Eddystone 888A (referenced above) taught me that, sometimes at least, 60-year-old electronic equipment does not like being disturbed and it can take a long time and a lot of re-work before a receiver is back to working well and reliably. Therefore, I decided to strip this EA12 back to a bare chassis and rebuild it with all new, modern, high-quality components. I did this section at a time, starting with the audio output amplifier and working forward to the input to the IF amplifier. I stopped at this point because it is a convenient point to separate the receiver into two halves to allow testing of the work that has been done so far.

A big advantage of using modern components is that they are significantly smaller than the original ones; even when selecting new ones with a higher performance specification. This makes it possible to re-arrange the components into a single layer around each valve base. This step improves access, should a repair be required in the future. Also, it reduces coupling and heat transfer between components.

High-stability resistors and silver-mica capacitors were used wherever they might yield improved performance. The old paper decoupling capacitors were replaced with pairs of capacitors; one plastic and one ceramic. The HT supply to each valve was given additional decoupling and all the earthing points were scrutinised. Firstly, to make sure that they were sound electrically. Secondly, to make sure that there was not a better way of arranging the earth connections, given the new arrangement of components.

The underside of the chassis after the passive components had been changed is shown in **Photo 5** and **Photo 6** which were taken after the rebuild of the receiver was complete.

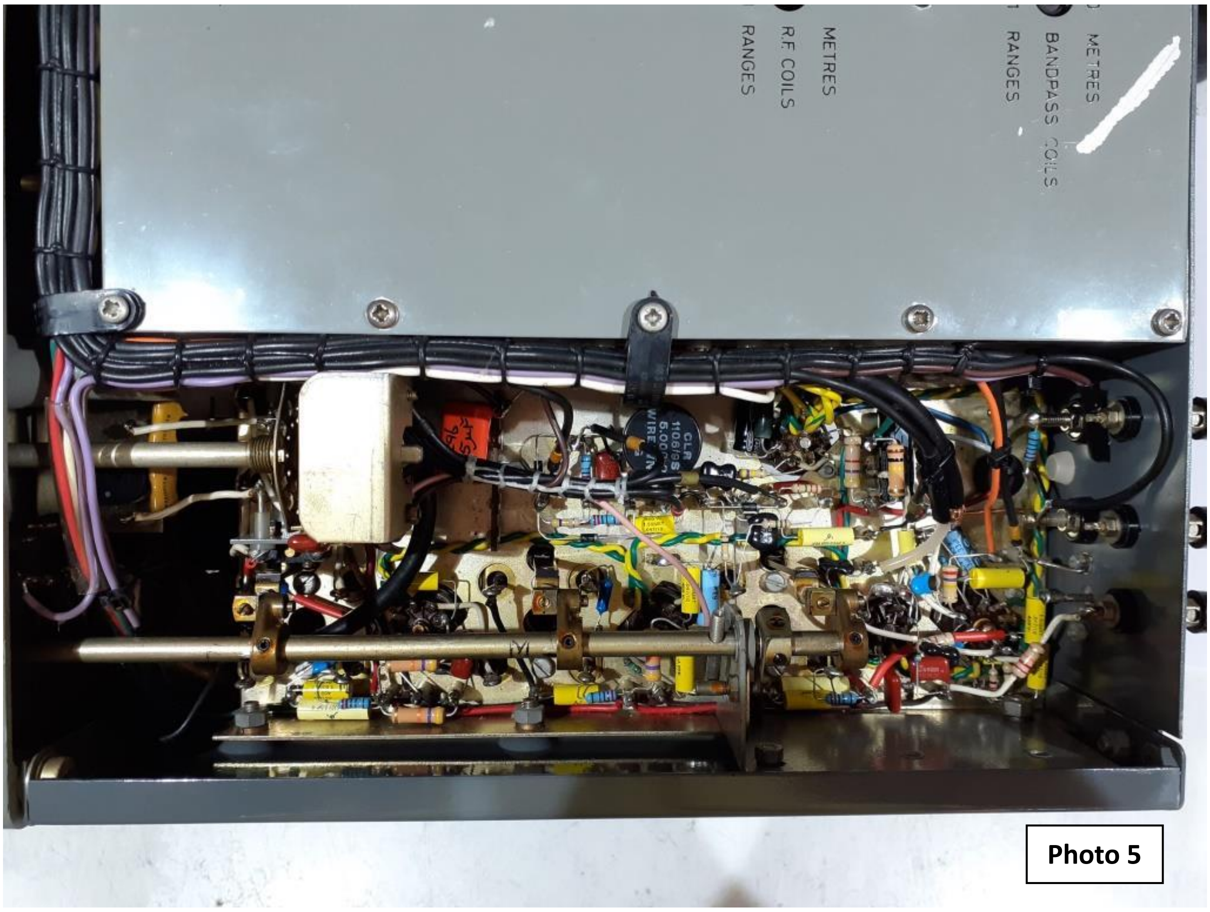

Photo 5

Photo 6

Other Refurbishment Work on the Main Chassis and Front-panel Assembly

Each of the separate sub-assemblies, such as the Mode Switch, AGC Switch, Notch Filter etc, were extracted from the receiver, stripped down, cleaned, lubricated and then rebuilt with new passive components. Just as in the case of the front panel assembly, it was found that all these controls needed some extra lubrication. The timing and sequencing of this work was adjusted to improve access when changing the passive components mounted on the chassis. This was particularly the case regarding the Bandwidth/Selectivity Control. Firstly, detailed photographs of the mechanical linkages were taken and stored in a safe place. Then, every joint was marked carefully so that it could be re-assembled exactly as it had been before being stripped, cleaned and lubricated. As soon as the mechanical linkage was removed, it became clear that there were problems in all three IF transformers. In each case the moveable winding was very stiff and/or binding. Therefore, each transformer was stripped and cleaned. Then the tuning capacitors were replaced with selected silver-mica ones. Finally, the carrier and track on which the moveable winding slides, was polished and lubricated with a PTFE-loaded lubricant. Once the transformers were back in the chassis and the mechanical linkage was re-assembled, it was found that the control was silky smooth and much lighter in operation.

Re-assembly

Once all the passive components had been changed and the various switch assemblies and controls had been put back and re-connected, it was time to re-fit the front panel to the chassis. First though, there are the three capacitors which connect the main tuning capacitor to the top of the coil box; that is C43, C45 and C60. These were replaced with new silver-mica components and carefully positioned ready for re-connection once the front-panel assembly was back in place.

With my four special bolts in place to guide it, the front panel assembly was slid into position and it, along with all the controls, was re-attached both mechanically and electrically. My EA12 was starting to look like a receiver again and all the controls were now silky smooth.

During the re-assembly, I had re-fitted the finger plate to the front-panel assembly. Before doing this, I wrote a little note summarising what I knew about the history of this receiver and tucked it in behind the finger plate. Who knows when or even if it will ever be found by another owner but, if it is, they may appreciate it.

In order to refit the internal covers, I had to deal with the issue of the corrosion on the crystal cans. I was lucky because it looked much worse than it was. The corrosion was caused by hydrochloric acid which is a known by-product of the long-term degradation of a lot of the foam rubber produced during the 1960s. Which makes sense given that my crystal cans were covered in a mixture of green and black crystals, copper chloride and copper oxide, perhaps. Fortunately, the damage to the cans was not serious and I was able to clean it off with warm water and a brush. The contact pins were cleaned and polished and the crystals were put back in their respective holders. Then I made a new foam rubber pad to hold them in place. I used new, medical-grade foam which has adhesive on one side and a pure cotton sheet bonded onto the other side. This is manufactured by Hapla and I obtained some small sheets of it from www.medicalsupplies.co.uk . I fitted it inside the cover so that the cotton sheet would press onto the crystal cans.

First Stage of Testing and Alignment

At this stage, the receiver was back in one piece although there was still a lot of planned work to be done. Therefore, I connected the required test gear and a loudspeaker before applying mains power via a variac; just in case I had made a mistake, and something was about to catch fire. I had not and the receiver came to life and started working. I left it to warm through for a couple of hours and then worked my way through the full alignment process for the IF stages. Next, I conducted all the sensitivity and frequency response checks specified for these stages of the receiver and it passed with flying colours. Therefore, it was time to start on the RF amplifier and mixer sections in the coil box.

Changing the Passive Components in the Coil Box

All the resistors and capacitors in the coil box were changed for new, modern, high-performance devices. As in the case of the main chassis, the opportunity was taken to change to a flat layout around the valve bases so that access was much improved; should a repair be required in the future. Again, the opportunity was taken to improve the decoupling.

Other Refurbishment Work within the Coil Box

An important first step was to clean and lubricate all the switch contacts and then to lubricate the mechanical parts of the switches. As with other Eddystone receivers, there are a lot of bolted earth connections inside the coil box. Therefore, I followed my own advice in my article on RF Earthing of Eddystone Receivers and made sure that all of these bolted connections were sound and working properly. The underside of the coil box, after refurbishment, is shown in **Photo 7**.

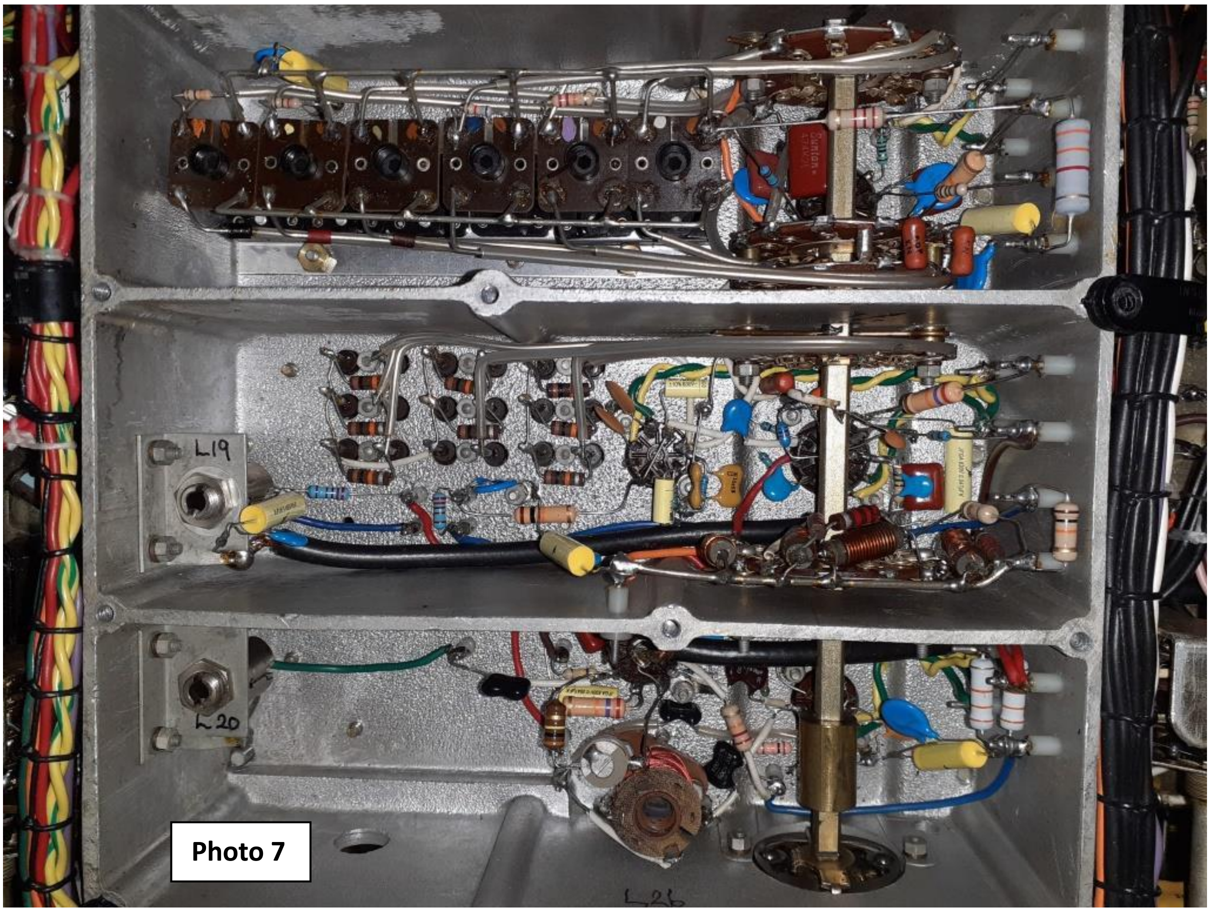

Photo 7

It should be noted that this photograph includes the two additional filters described below.

A set of new of valves were fitted after cleaning and polishing their pins.

This completed the planned work on the receiver, and it was time to complete the full tuning and alignment procedure as specified by Eddystone.

First Performance Evaluation

Once all the refurbishment work was completed, the receiver was set up on the test bench for its performance to be evaluated. Even before any measurements were taken, it was clear that all the controls were much better to use and the backlash in the Main Tuning Control had been fixed.

The detailed results of all the measurements of tuning and alignment accuracy, and frequency response need not be reported here; suffice to say the receiver was well within specification and all the controls were working properly. However, one big improvement is worthy of note. Before refurbishment, the receiver lacked sensitivity; indicated by the need for an input signal of -60dBm to produce a signal strength meter reading of S4/5 across the bands. After refurbishment, the signal level required to produce a meter reading of S9 varied from -87dBm to -84dBm across the bands; an improvement of some 30-40dBs; making the receiver significantly more sensitive than is required in normal operation.

On-air Testing Exposes a Problem

As soon as the EA12 was connected to my Miller HF antenna, the impact of the refurbishment was obvious, no longer was it lacking sensitivity. It was very much alive and very sensitive. It was detecting signals across all its bands. Unfortunately, a lot of these signals were unwanted noise/interference. For example, on Range 6 (20-metre) and Range 7 (40-metre) the signal strength meter was reading over S9 + 12dBs from noise-like interference across the full band. No wanted signals could be received. On the other hand, the receiver was working well on Bands 1-5 where the levels of interference were much lower.

As a quick check, two of my other receivers – a 730 and a 940 – were brought into use and connected to the same antenna. These gave signal strength readings of S3-4 from the interference on the 20-meter and 40-meter bands, but numerous wanted signals could be received without difficulty.

The Search for a Solution to the Problem

Firstly, I spent several weeks searching for a fault in the EA12 and testing every part of it in every way that I could think of. I found nothing. The receiver was working exactly as it was designed to work and doing this very well. I concluded that, the design of the filters in front of its RF amplifier and first mixer is such that, where I live, too much RF noise and other interfering signals are reaching the first mixer for the receiver to cope. Probably, the Eddystone design team did not envisage the levels of noise/interference that are commonplace on the amateur bands today.

In order to test my theory, I connected the front end of one of my 730 receivers to the first mixer of my EA12 in a way that allowed me to switch between 730 and EA12 front ends for direct comparison purposes. Then I set up my 940, with a digital display of received frequency, as a search receiver. With this arrangement of equipment, I spent an interesting afternoon hunting for suitable test signals on the 20-metre and 40-metre bands. As soon as I found a suitable signal – often someone calling CQ DX – I would note the frequency on the 940, tune the EA12 to the same frequency and note whether the signal could be heard. Often, it could not be heard at all; let alone be read clearly. Then I would switch over to the 730 front-end and tune it across the frequency of interest. If my tame caller was still calling, their signal would come booming out of the EA12's loudspeaker just like it was from the 940's. This convinced me that my theory is correct and my EA12 was doing all that it could do in its operating environment.

I decided that incorporating a 730 front-end into an EA12 is beyond the scope of refurbishment and that my EA12 is never going to match my 730/940 combination where I live. However, while searching for a solution, I had found and tested some simple modifications that helped, and I had incorporated these into my receiver. The performance improvement was significant and easily measured; but not enough to deal with my interference problem. However, I have incorporated them in my receiver, and they are described below because they may be of interest to other EA12 owners.

Three Simple Modifications to an EA12

During my search, I discovered that there was a significant 100KHz component to the unwanted signals being presented to the first grid of the second mixer (valve V4A) and there is no IF trap at this point. Therefore, I made one out of a 40pF preset capacitor and a 100mH inductor and fitted it at the junction of C49 and R21, down to an earth point. As expected, this modification reduced the level of unwanted signal, but had negligible impact on receiver sensitivity. The circuit diagram of this filter is shown in **Figure 1a.**

When I examined the operation of the first mixer, I discovered significant levels of unwanted and noise-like signals being presented to the first grid at frequencies below 1.5MHz. Therefore, I added another simple filter after C36. Again, this modification reduced the level of unwanted signal, but had negligible impact on receiver sensitivity. The circuit diagram of this filter is shown in **Figure 1b**.

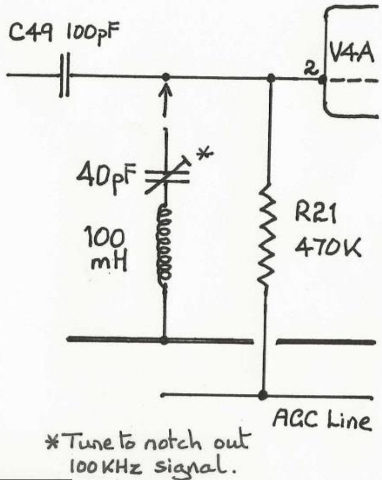

Fig 1a

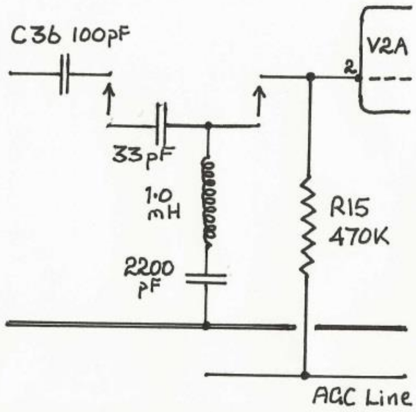

Fig 1b

For both modifications described above, it is not possible to quantify and report on the performance benefit. It depends so much on the nature of the interference and the frequency of the wanted signal. During many hours of testing and operation, I never encountered circumstances where either modification caused a reduction in overall receiver performance. Thus, both remain fitted to my EA12. Unfortunately, they are not enough to enable my EA12 to match the performance of either my 730 or my 940 below about 20MHz, in my operating environment.

The third modification is the simplest of them all. I do not transmit and, consequently, do not require the Muting facility. Therefore, I replaced RV4, the Muting Level potentiometer with one of 1,000 Ohms and set its value so that an RF input of -73dBm produces a reading of S9 on the signal level meter; with both RF Gain and IF Gain set on Maximum and the Muting Switch set on Standby. This is how I operate the receiver, most of the time. But, at the flick of a switch, I have the maximum possible sensitivity available to me.

Conclusion

Photo 8 shows my EA12 on my operating bench, flanked by my 730 and 940 receivers, with its loudspeaker fitted inside an Eddystone diecast box and sitting on top. It is tuned to 21.281MHz and is receiving LZ3TY at S4 and producing good audio. On frequency bands above a 20MHz it works well and is a pleasure to use. On the bands below 20MHz it cannot cope with the high levels of RF interference where I live.

Photo 8

I believe that I have done the best I can to refurbish and maximise the performance of my EA12 and I hope that this paper will be of help to anyone else who has one. I have started an extensive programme of testing and trials to assess and compare the performance of four of my Eddystone receivers – 730, 940, 888A and EA12 – in my local operating environment. If this yields anything new and of potential benefit to EA12 owners, I will publish an addendum to this paper.

Victor Jenkins

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