Tale of an Eddystone S.770R – by Gerry O'Hara, G8GUH

Looking For 'Eddy'…*

As I mentioned in my S.740 restoration article, I live in Vancouver and have found that there are not too many Eddystones available locally and the problem with EBay is the shipping cost for sets from the UK (where most seem to be located, not surprisingly), on top of the purchase price and import duty, is really prohibitive, and stateside sets are few and far between (I drooled recently at a 680X that sold for CDN$211, but the shipping was going to be another $280! and I would have paid another $36 in duties on top). I also mentioned that I was checking out local 'flea markets' (radio and otherwise) and 'swap meets' (aka 'car boots') for other Eddystone sets to give some TLC to. All to no avail since the one 'SPARC' had a stall at way back in February where I bought my 830/4 (SPARC is the local radio museum – the Society for the Preservation of Antique Radio in Canada (http://www3.telus.net/radiomuseum/). I then recalled that the other Eddystone for sale on the stand that day was an S770R. I declined buying it at the time as I thought I would get a hard enough time when I showed up at home with the 830/4 (also, I thought the 770R would be of less use, being VHF and I recalled Gordon, G3MNL ('Mike-Nan-Love' – he was a whiz at phonetics) cursing his 770R at times for various reasons, so I thought 'no' to buying it at the time, even though it was going for a very reasonable $70).

Over 4 months later, on a visit to SPARC, I was checking out the communications receivers section of the museum a bit more closely than in previous visits and noticed that a number of Eddystones were 'on the racks', including an EC10, a 680X, a 840/4, a 770U and two 770/R's, as well as a 640 in very nice condition, the latter located in 'pride of place' in the display cabinets near the entrance to the museum. As there were two 770R's, I thought perhaps the 770R had not sold at the flea market in February, so I enquired if that was the case and whether I could make a donation to the museum in exchange for increasing their shelf space by one 770R… I offered to take the rougher one of the two in exchange for a suitable donation, leaving the better one for the museum. A deal was done…

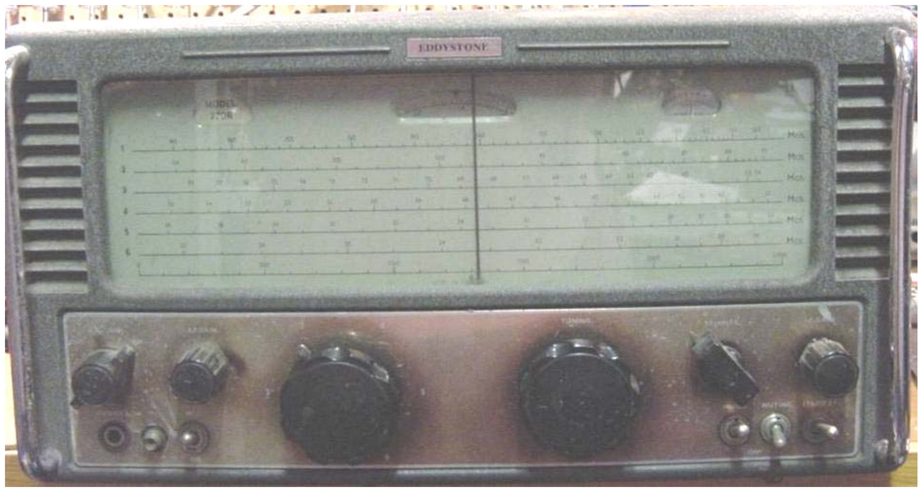
A corner of SPARC – its 'Find Eddy' time (at least three Eddystones are visible in this photo from the SPARC website – can you spot them and identify them?)**

*After the US kids book series 'Where's Waldo'

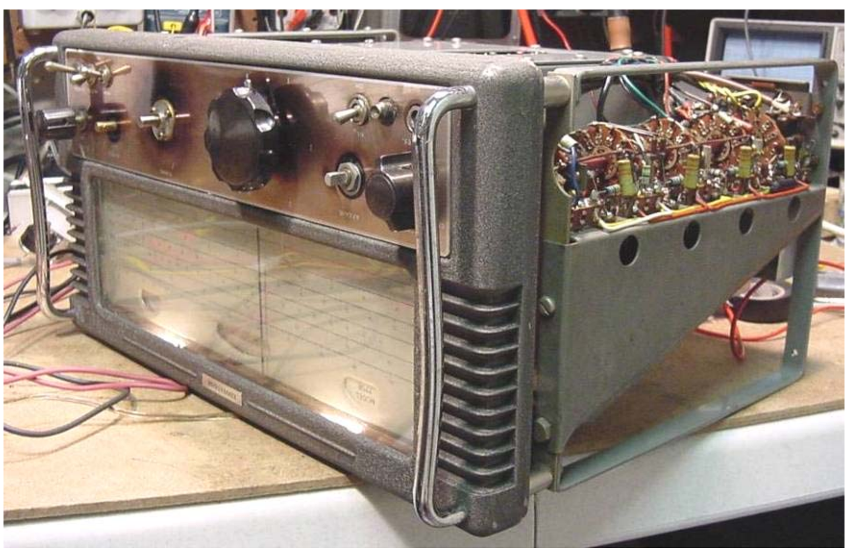
**EC10 Mk1 (upper left), 770R (lower left) and an 830/4 (bottom right)

Home Safe and Sound

As I said, the 770R was the ‘ropier’ of the two – fair enough. On close inspection, amongst other things, it sported bent handles (dented in towards the front panel), a bent internal front chassis plate (the front panel aluminium casting was ok though – phew!), chipped dial glass, mongrel knobs, a scratched vernier dial (from catching on the scale plate when rotating due to poor re-assembly in the past and/or the impact) and a little note inside saying ‘IF gain control broken?’. I removed the case and two bits of wood fell out – they had been chocking the front panel phones jack socket in place (wedged between it and the chassis) as the retaining nut had been sheared off. I thought there might be a bit of a challenge ahead…



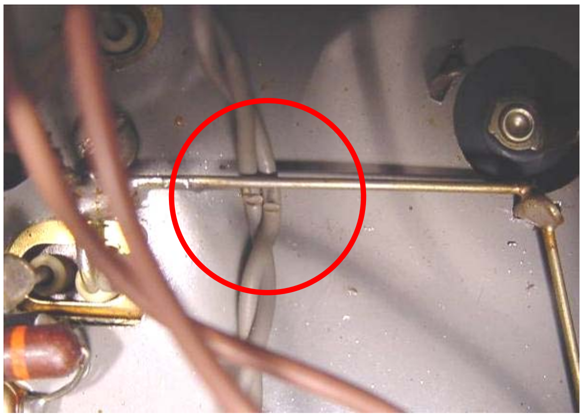
The 770R on arrival – looking a bit ‘tatty’ and forlorn… “help me!”



Basic Preparation and Safety Checks

- I removed the case and was pleasantly surprised at how clean the chassis and components were – no signs of scorching in the psu compartment or mains transformer, also, no signs of any ‘mods’ – apart from an ‘F’-type RF socket on the front panel to the right of the phones socket (looked professionally done though). However, on close inspection, a ‘waiting-to-happen’ short circuit was spotted – nasty: the two wires leading to the mains switch were noted as passing under a wire linking the psu filter cap earths together. Over the years, the insulation on these wires had become ‘dinted’, possibly exacerbated by heat in the psu, and were almost shorting out (see photo). These wires were insulated and the retaining wire bent upwards slightly to relieve the pressure.

The mains wires where their insulation had become worn/dinted – pulled out slightly to expose the 'nasty'.

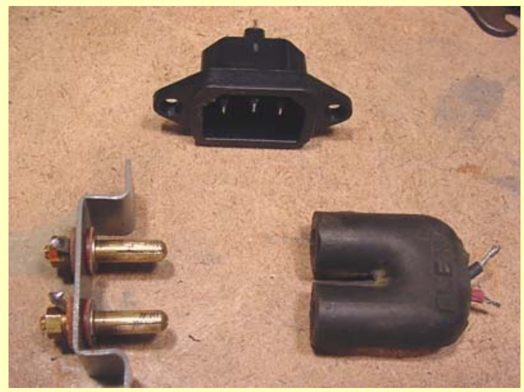


- Vacuum-cleaned the chassis and case, using a small paintbrush to penetrate nooks and crannies. I wiped the case and front panel with cotton wool wipes and warm soapy water, and wiped the chassis with alcohol (using Q-tips and cloths) to remove grime.
- Removed the knobs: some of the grub screws were very tight, especially in the tuning and band selector knobs. I applied penetrating oil and left for a day. The screws were then removed with much careful effort and selection of well-fitting screwdriver tip. However, the band selector knob also has a tapered cotter pin that stubbornly refuse to be drifted out.

The grub screws were found to be rusty and some were gnarled. I cleaned them with wire brush, applied light oil and reinstalled. The gnarled grub screws were filed down and their slots re-cut. Desperate measures were required with the cotter-pin

Replacement Mains Connector

I do not like using older electrical connections if they are the least suspect (eg. frayed or perished insulation). The photo below shows the original mains connector parts (bottom), together with a modern mains 'euro' connector (computer type).



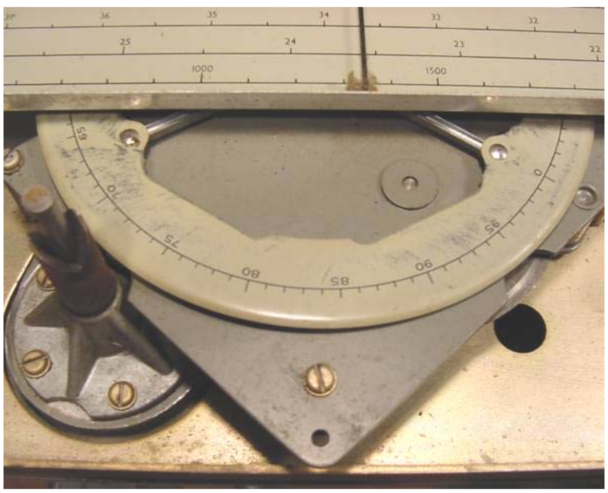
The modern connector (male socket) can be fitted into some Eddystone sets directly behind the chassis cut-out for the older ('kettle') connector. Simply unsolder and remove the old connector and fit the replacement with a 4BA nut and bolt at the bottom and similar at the top, the latter with a large washer or plate cut to cover the small gap. Solder in the new male socket and that's it. You will find that the female connector (plug) fitted to the mains lead will fit snugly through the chassis cut-out and mate with the chassis connector.

however: I tried cutting a slot through the knob into the wide end of the cotter pin to try rotating it. The slot cut ok, but the pin would not rotate. I had to resort to carefully drilling the pin out and avoid shattering the knob – it worked – thank goodness. The pin was replaced with a bolt and the slot was filled with epoxy putty.

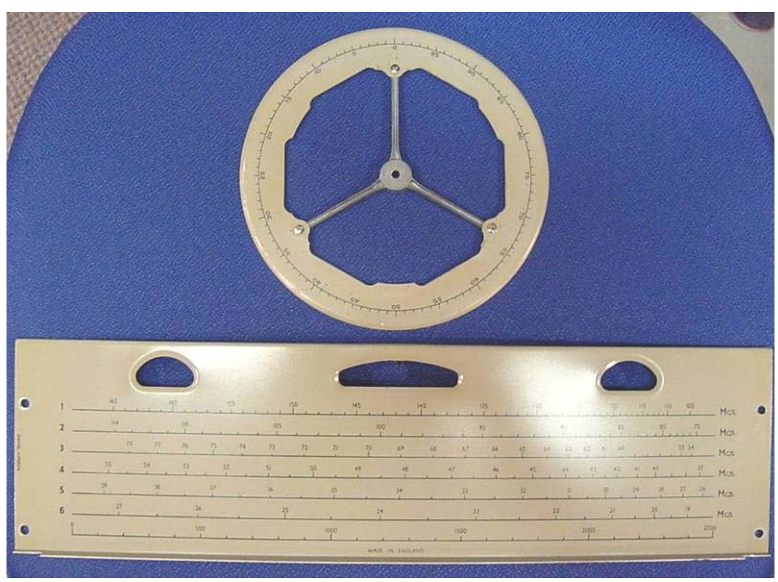
- Having removed the knobs, I removed the front panel. To do this, simply remove the four bolts retaining the handles and a nut on a stand-off post, then loosen the switch bezel and phones socket nuts. I then cleaned the dial glass with alcohol and then lens-cleaner.

- Removed the scale plate and vernier scale. I cleaned these gently using warm soapy water and cotton wool pads (there was an amazing build-up of grime: cleaning revealed they were a ‘greenish-mushroom’ colour underneath). However, the vernier scale was badly marked and the soapy water was not making any headway. I tried a little alcohol on a part not visible through the scale plate slot - no use, it removed the paint. I then tried using neat washing-up liquid and this worked for most of the marks except the scuffs caused by catching on the scale plate – it looked acceptable now.

- Cleaned dial drive train gears with alcohol and more Q-tips. Applied light machine oil (<u>not</u> ‘3-in-One’) to the various metal bearings (very sparingly), avoiding plastic pulleys and the metal dial cord.



Scale and vernier looking very grubby and worn…



…and looking much better

- Checked the power cord and found it to be open-circuit. I chased the open circuit all the way to the ‘kettle plug’ at the set-end (use a darning needle on one test probe to penetrate the insulation along the wire at intervals working from one end, with the other probe connected to the conductor). Close inspection revealed that the wires had broken and the insulation was cracked and brittle at that point. I do not like taking any chances with safety, so I decided

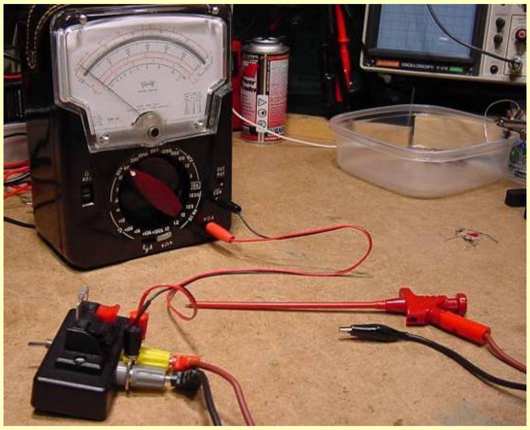
to install a similar solution as I had on my 830/4, ie. removal of the chassis part of the 'kettle plug' and installation of a 'modern' standard mains power connector (as found on modern rigs and computer psu's, sometimes called a 'euro' connector). This can be done with no butchering of the chassis (see sidebar) and works very well – it can also be reversed in the future quite easily. I also re-wired one of the two mains fuseholders into the mains transformer centre-tap as an extra protection for the power transformer.
- Checked the general electrical safety of the remainder of the psu unit and the power transformer for continuity and insulation (all good).
- Removed all valves, wiped them clean and cleaned up their pins with crocus paper and 'De-Oxit'.
- Cleaned up the valve sockets using 'De-Oxit'.
- Applied power to the set, slowly increasing to 117v through a variac. Checked the mains transformer secondary voltages - all good.
- Time to see if the set works…

Electronic Testing and Repairs

- Resistance checks on the psu filter caps indicated some leakage – but not too bad. I decided to try to re-form these rather than install replacements (for authenticity). The caps were re-formed over a half day period by slowly increasing voltage from variac supply, monitoring HT current draw (all valves still removed except the rectifier and voltage stabilizer) - increasing the voltage in stages, holding for up to an hour and also switching off/on a couple of times at each stage. As current draw fell off at each voltage increment, I increase the applied voltage by 25v, up to the full HT volts of ~250v. I noted a 'step' in the current draw at around the 160v mark as the VR150 stabilizer 'kicked in' (glowing a nice mauve colour). Leakage current at the end of re-forming was acceptably low on the two 50 muf filter caps.
- Undertook resistance checks on random by-pass caps - all appeared ok.
- Cleaned up the contacts in the turret coil packs using 'De-Oxit' and Q-Tips.

An Instant 1000 ohm/volt Meter

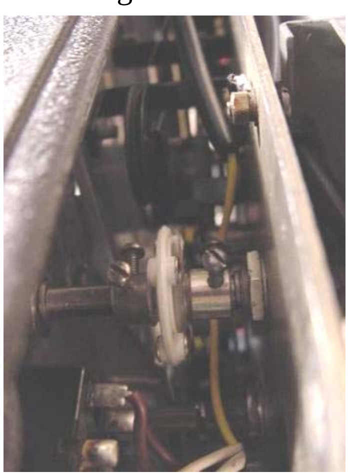
Many older radios (including Eddystones) have voltage tables in their manuals or on their circuit diagrams. These, together with standard signal tracing and resistance checking techniques can be of great use in quickly finding a problem stage and then isolating a component(s) that have caused a fault. The problem is that many meters in use several decades ago used a lower sensitivity movement than even fairly inexpensive analogue meters today, with a resulting lower ohms/volt value. Therefore in many cases using, say, a modern 20kohm/volt meter (or worse, a DVM or VTVM with several Mohms/volt), will result in a significantly higher voltage reading than shown in the voltage table values. The simple way to resolve this is to shunt your 20kohm/volt (or higher) meter with a suitable resistance on each range to give the required sensitivity – eg, for a 250v scale, use a 250kohm (or 247kohm) resistor. I made up a little connector box for this purpose (photo below), but a switched unit would be ideal. Having said all that, the 770R manual I have includes for a 20kohm/volt meter…



That 'De-Oxit' at work!!

- I then re-installed the remaining valves and slowly brought the set up on the variac over around 15 minutes. Dead as a dodo…. Hmmm, then I remembered that some sets had a need for a link in an octal socket on the rear of the set to connect the valve heaters. Sure enough, all the valves except the rectifier and stabilizer were stone cold! I checked the circuit diagram (this being for a 'generic 770R, dating from 1952 – my set was built around mid-1960, judging by the labels on the filter caps, as the serial number plate is missing) and no such wiring was indicated. I traced the heater wiring in the psu and sure enough, a link was needed in the octal socket. Inserted a link and hey-presto, after a few seconds audio was heard – well, a lot of noise and crackling. Using a signal generator, I found that the set tuned on all bands, though a bit weak, with all controls working – except for the IF gain, which just caused the set to crackle loudly when turned.

- The IF gain control was removed and dismantled (there was no convenient hole to spray the innards with 'De-Oxit'), cleaned and re-fitted. It now worked ok and the set was much more sensitive (if I couldn't have dismantled it I would have drilled a small hole in its case to allow spraying of its innards with 'De-Oxit' before considering replacing. These IF and RF gain controls are often 'specials – a



Straightening Handles

As you can see from the unrestored photos, the chrome plated handles were rather bent on arrival at the G8GUH QTH.

Straightening these needed a bit of careful 'jigging': I used my trusty old Record woodworking vice and three bits of scrap wood (two of which fell out of the set when I removed the case! – I knew they would come in handy…). The jig comprised locating the three bits of wood such that when the vice closed, on piece was at the convex apex of the bent part of the handle, with the other two located at the end of the bent section on the opposite side of the handle.

Closing the vice further encouraged the handle back to its original shape. This action was repeated several times to obtain the correct amount of 'persuasion' at all angles. Half an hour later they were looking much better and were re-installed on the set.

pseudo log-law wirewound pot made from several different values of resistance wire. Replacing with a standard liner-law wirewound pot makes the control act a bit like a switch). The IF gain pot is fitted to the inner chassis and connects through to the front panel via a coupling and bushing. The coupling fitted was a 'barrel' type that did not allow for any slight misalignment of the shaft through the panel. I replaced it with a flexible type – much smoother.

- The set was then configured for voltage checks as per the handbook. I found most within tolerance –or very close (amazing!).
- Checked HT current draw at ~155mA. I could not find a reference to HT current in the manual I have, but this seemed reasonable for 17 tubes connected to HT (excluding the VR150).
- Soak tested the set for 1 day. All seemed to be ok, though the quality of broadcast FM stations was poor (they actually sounded better on the NBFM setting of the mode switch!). Also, the combined S-meter/tuning indicator (centered when tuned into an FM station) was functioning fine as an S-Meter but was not working properly as a tuning indicator (it was 'peaking' when the station was tuned in 'on the nose'). I tried adjusting the pre-set pot for this, located on the top of the turret box, but this did not help.
- Undertook more circuit checks (voltage ad resistance), especially around the last IF/discriminator stages and found nothing obviously untoward.

Preliminary Alignment Checks

- I checked the dial calibration accuracy using a signal generator and frequency meter – close enough to use for general listening without adjustment, so I decided not to re-align the RF section (for now) - the set was functioning reasonably well and appeared quite sensitive/selective. However, I decided to try to improve the quality of FM reception.
- I read up a bit on valve FM detector circuits and their adjustment first (see references at the end of the article).
- First I checked the IF alignment as described in the manual, followed by the discriminator transformer settings - without using a wobbulator (you guessed it, mine is in my mother-in-law's garage in the UK… and I have not purchased or built one yet – one day soon). Great improvement and the tuning indicator now worked properly, but still some distortion present (though the set was now 'listenable' on FM). I checked out the audio section and found that the cathode by-pass cap on the 1st audio was open circuit – I replaced this and the audio was much improved (the audio strip is a nightmare to work in – see photo above – I felt like a dentist working on someone's back molars). I decided to leave things alone for now – until I have a wobbulator to play with…

Cosmetic Touches

- I washed the outer case in warm soapy water and dried it with a hairdryer. Slight scratches and scuffs on the front panel and case were touched-up with metallic coloured markers and the case was buffed up slightly with metal polish.
- The finger plate is a strange colour – not sure if it was originally black, faded to copper-colour, or originally a copper-colour with black discolouration (if some one can shed light on this I would be grateful). The finger plate was cleaned with alcohol and the scuffs toned-down with a marker pen.
- Cleaned the knobs (with alcohol) and polished them using "Armor-All' (plastic polish for car interiors). Re-installed knobs and lubricated the band chage switch key mechanism with lithium grease.
- The bent handles were annoying me, so before re-installing them, I decided to straighten them out – see the sidebar for details.
- Replaced the phones socket retaining nut.

That's about it I guess.. For now at least - the set is used mainly as an FM broadcast band receiver as shack background music/talk – working on the proverbial 'bit of wet string' in my basement. I intend to obtain a discone-type wideband VHF aerial at some point and listen to the other bands covered by the set. I also intend to attempt a more thorough re-alignment and component check at some point, as well as check the valves (I will probably replace the front end EF95s before I attempt any re-alignment of the turret).

Postscript

Well, that's the fourth Eddystone in my humble collection (including the abomination of an EC10 sitting in my mother-in-law's garage in the UK). Of course I am on the look-out for more sets – whatever the condition, as long as the price is right - and I will 'write 'em up' as and when they arrive on my doorstep. I just love the relative simplicity of the circuitry, quality (and sometimes idiosyncrasy) of construction – very 'British', as well as the relative ease of restoration, repair and maintenance of the older valve models compared to solid state sets. And, of course, once working and 'boxed-up' you have the real benefit of that distinctive 'feel' when operating and listening to a valve radio of this pedigree – though I suppose I am preaching to the converted here…

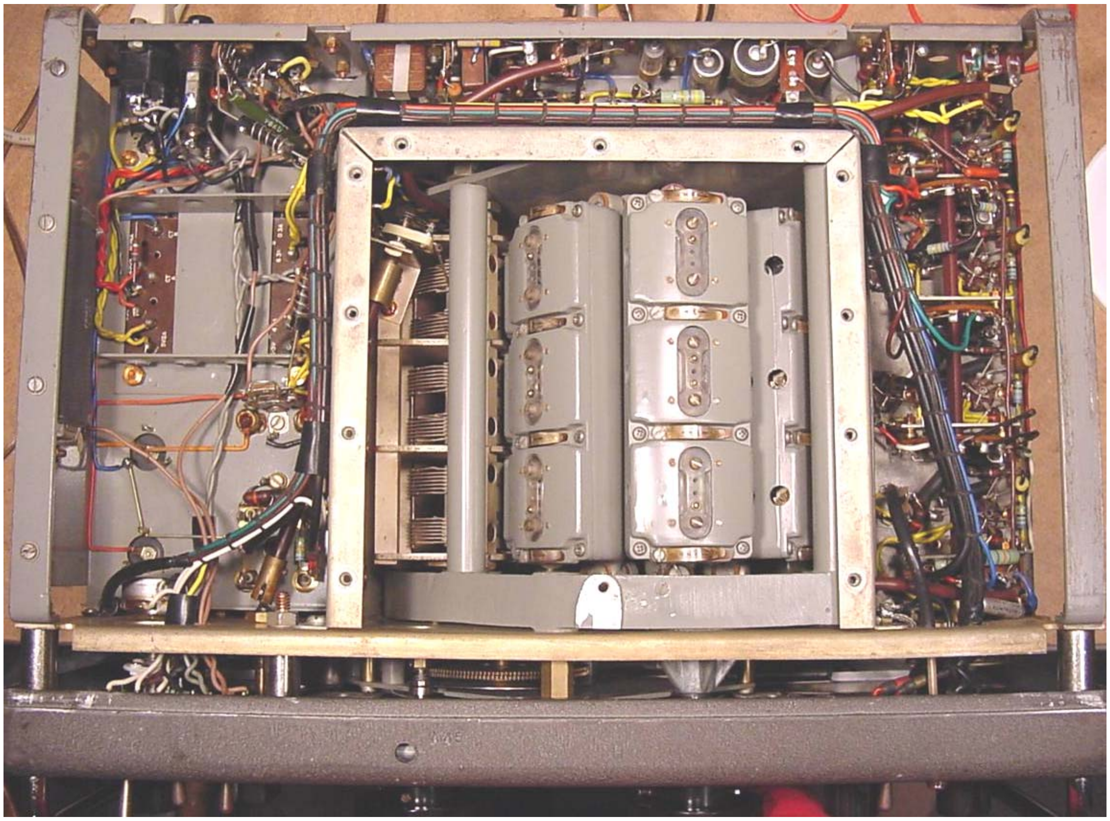
I have included a few more shots of the 770R with some annotation below for information. Also, I intend to prepare a sequel when I get around to aligning it properly and undertake more thorough circuit checking. Watch this space…

73's

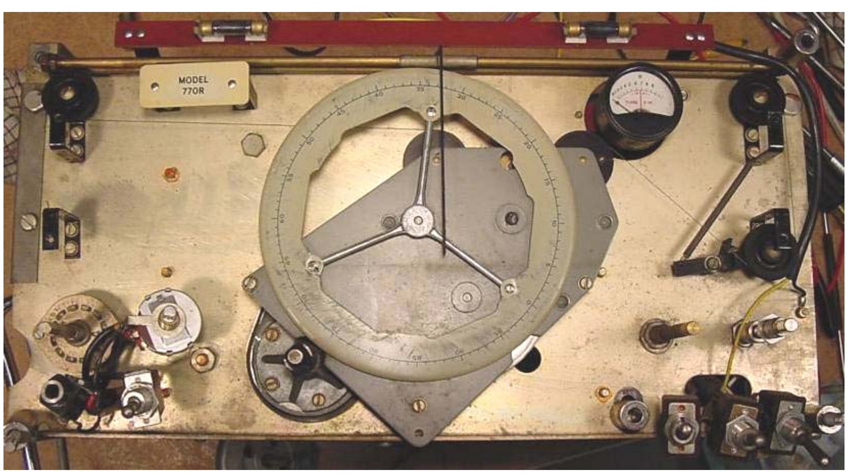
Gerry O'Hara, G8GUH (gerryohara@telus.net), Vancouver, BC, Canada, July, 2006

Exposed! - the secret of that famous Eddystone 'feel'…

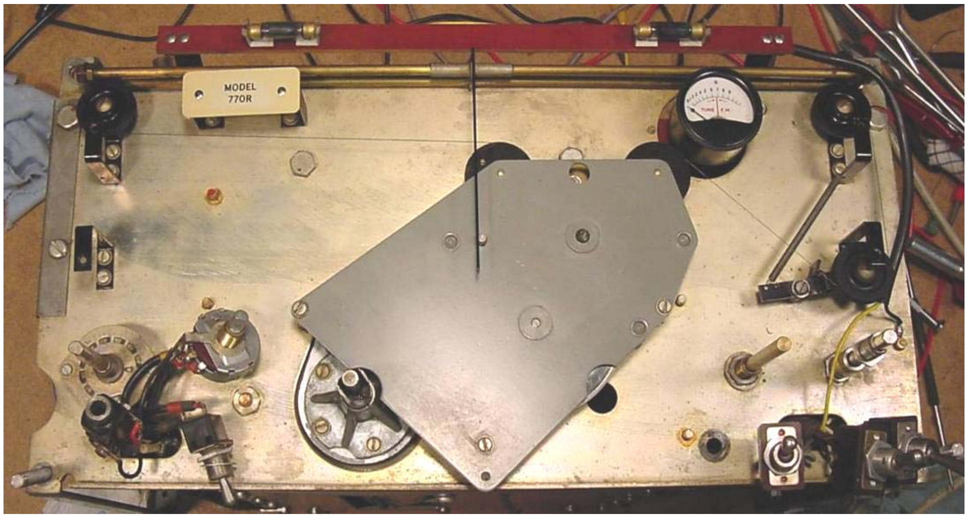
‘Belly-up’ – underneath the chassis with lower turret box cover removed. Pretty clean and untouched for a 46 year old: - nothing scorched or melted – indeed, I could not find one replacement component or re-soldered joint! The turret covers had obviously been off a few times, so I guess the coil packs had their fair share of tweaking over the years.



I noticed some minor fracturing in the clear plastic surrounding the turret contacts (hopefully not too serious in the long-term). The phenolic plate used as part of the locking mechanism had some hardened grease around the locating holes – this was carefully removed and a light coating of lithium grease applied to the locking spigot and the shaft bearings were sparingly lubricated with high-quality light-grade machine oil (<u>not</u> 3-in One).

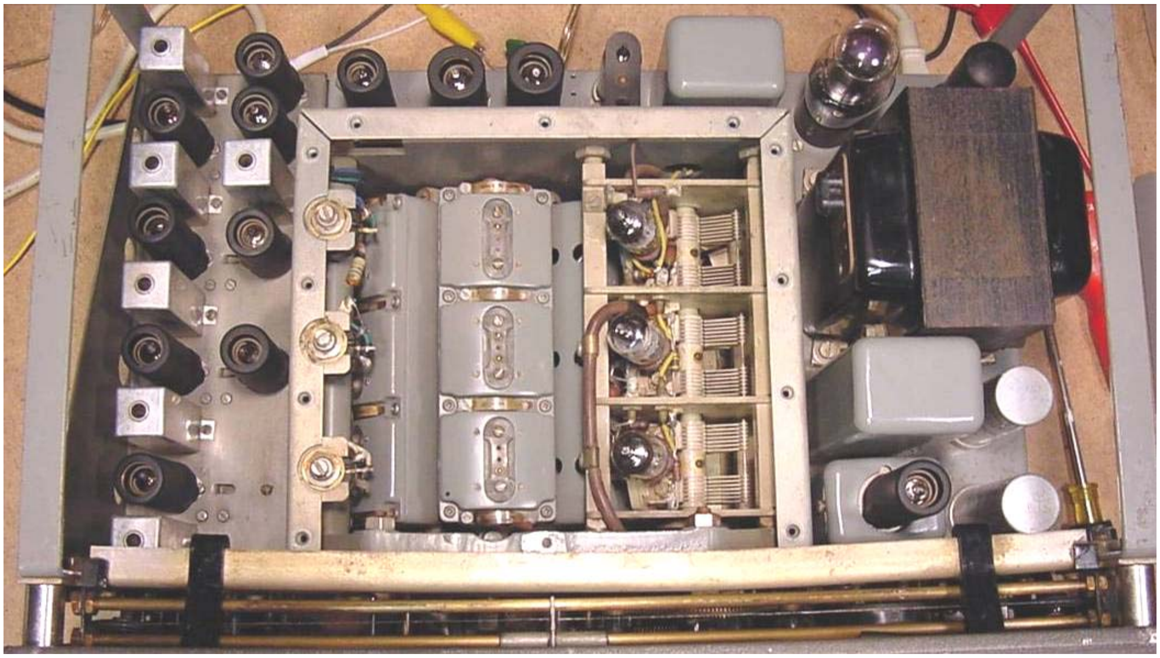


Here is a view ‘behind the scenes’ – the set with the front panel and scale plate removed (before clean-up). This chassis panel is bent outwards slightly (towards the front panel) at the top, but I did not attempt to straighten it as nothing was binding or (seemingly) out of physical alignment – I thought I might do more harm than good trying to make it flat again, unless it was



completely removed from the set and all components attached to it removed also (maybe another day…). The photo to the left follows the removal of the vernier dial and some preliminary cleaning. It would help if you had 6 pairs of hands when replacing the front panel – getting the switches re-installed was rather like 'herding cats' as they say (http://www.easycall.net/fun/herding-cats.shtml) – I eventually managed to get all the little critters to go back into their correct holes.

The next photo shows the top of the chassis with the turret box cover removed (after preliminary cleaning) – looks pretty good – just minor surface rust on the top of the mains transformer laminations (this will clean up nicely). You can just make out the slight bend on the top edge of the chassis front panel on this shot.



And finally, the set re-assembled and working before 'boxing up' - I am now just awaiting a replacement knob (from Dave Simmons, Tel. 01869 347 504) to replace that 'mongrel' one adorning the trimmer control…

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References

770R in EUG Newsletter and Lighthouse (per 'Super Index'):

Web:

http://www.eddystoneusergroup.org.uk/ (the best – of course!)
http://bama.edebris.com/manuals/eddyston/eddy770r/ (hereby acknowledged as the source of the manual attached to this article)
http://www.btinternet.com/~allan.isaacs/770r.html (some good info and tips in this article)
http://www.schimmel.freeserve.co.uk/radios/770r.htm (a bedtime story about alignment trials and tribulations…)

Some Books on FM Circuitry and Repairs:

- Radio and Television Receiver Circuitry and Operation, Ghirardi and Johnson, 1951, Ch 6

- Radio and Television Receiver Troubleshooting and Repair, Ghirardi and Johnson, 1952, Ch 13

- Elements of Radio Servicing, Marcus and Levy, 2nd Ed. 1955, Ch 24 and 25 (the first edition of this book can be downloaded in pdf format from http://www.archive.org/details/Elements_Of_Radio_Servicing)

Have fun!!!

The Eddystone '770R' Communications Receiver for Very High Frequencies

FREQUENCY COVERAGE.

The individual ranges excluding overlaps are as follows :

Range 1	—	114 Mc/s to 165 Mc/s
Range 2	—	78 Mc/s to 114 Mc/s
Range 3	—	54 Mc/s to 78 Mc/s
Range 4	—	39 Mc/s to 54 Mc/s
Range 5	—	27 Mc/s to 39 Mc/s
Range 6	—	19 Mc/s to 27 Mc/s

VALVE SEQUENCE.

The nineteen valves are of the following types and perform the functions indicated :

V1	—	6AK5/EF95	(CV850)	Pentode RF Amplifier
V2	—	6AK5/EF95	(CV850)	Mixer
V3	—	6AK5/EF95	(CV850)	Oscillator
V4	—	6BA6	(CV454)	IF Amplifier AM and FM
V5	—	6BA6	(CV454)	IF Amplifier AM and FM
V6	—	6BA6	(CV454)	IF Amplifier AM and FM
V7	—	6BA6	(CV454)	IF Amplifier AM and FM
V8	—	6AU6	(CV2524)	Limiter FM only
V9	—	6AL5	(CV140)	FM Discriminator
V10	—	6AL5	(CV140)	Noise Limiter and AGC
V11	—	6AU6	(CV2524)	'S' Meter on AM. Tuning Indicator on FM
V12	—	6BA6	(CV454)	Beat Freq. Oscillator
V13	—	6AU6	(CV2524)	Noise Amplifier (Muting)
V14	—	12AU7	(CV491)	Muting Stage
V15	—	12AU7	(CV491)	Push-Pull Drivers
V16 & V17	—	6AM5	(CV136)	Push-Pull Output
V18	—	VR150/30	(CV216)	Voltage Stabiliser
V19	—	5Z4G	(CV1863)	Full Wave Rectifier

Detection on amplitude modulation and also rectification of noise output with Germanium Crystals.

TUNING MECHANISM AND SCALES.

The tuning mechanism is gear driven and has a reduction ratio of approximately 140 to 1. The scale is marked direct in frequency to an accuracy within one per cent on ranges 1 and 2, and within half of one per cent on the other ranges. The vernier bandspread device opens out the length of each scale to the equivalent of 32 feet.

INTERMEDIATE FREQUENCY.

The I.F. is 5·2 Mc/s, the oscillator frequency being higher than the signal frequency on all ranges. The BFO is pre-set to give a beat note of 1000 c.p.s.

INPUT IMPEDANCE.

The nominal input impedance is 72 ohms unbalanced, a coaxial socket being provided for the connection of the feeder cable. A trimmer control on the front panel permits correction being made for variations in aerial and feeder reactance.

OUTPUT IMPEDANCE.

The push-pull output stage delivers a maximum of ~~four~~ three watts to the 2·5 ohm speaker terminals. A jack on the front panel takes high resistance telephones. Pick up terminals are fitted. The audio frequency response is linear within $\pm$ 4 db over the range of 50 to 12000 c.p.s.

POWER SUPPLY.

The mains transformer has a selection panel permitting operation from 110 volt or 200/240 volt, 40/60 cycle supplies. the consumption being 90 volt-amps.

ELECTRICAL CHARACTERISTICS.

Sensitivity :	better than 5 microvolts on all ranges, for a 15 db signal — to — noise ratio and 50 milliwatts output.
Selectivity :	A.M. and C.W. — 40 db down, 50 kc/s off resonance Narrow F.M. — 40 db down, 80 kc/s off resonance Wide F.M. — 40 db down, 175 kc/s off resonance

Noise Factor :	Range 1... ...	not greater than 14 db
	Range 2... ...	„ „ „ 10 db
	Range 3... ...	„ „ „ 8 db
	Range 4... ...	„ „ „ 6 db
	Range 5 & 6...	„ „ „ 5 db

Image Ratio : Better than 20 db at 165 Mc/s and correspondingly greater at lower frequencies.

A.G.C. : The audio level does not change by more than 12 db when the input is varied 60 db above 5 microvolts.

Frequency Stability : Drift is less than ~~·001~~ ·003 of 1% per degree Centigrade, and less than ~~·001~~ ·003 of 1% for a 5% change in mains voltage.

F.M. Deviation : The discriminator is designed for a deviation of 15 kc/s in the narrow position, and 75 kc/s in the wide position.

Muting : The sensitivity of the muting circuit can be varied to operate on signals of a minimum strength of 5 microvolts.

OPERATION.

GENERAL.

The plug on the transformer selector panel is normally in the 230 volt position where it may remain unless the applied mains voltage differs appreciably from 230 volts.

The type of aerial used with the '770R' will be governed by the type of service in which the receiver is employed. In some circumstances ~~the aerial will be a~~ directional beam covering a moderate frequency range, whilst in others a broad-band aerial will be desirable. The polarisation should agree with that of the incoming signals it is required to receive, whilst the impedance should be arranged to match into 72 ohm coaxial cable. The lower end of the latter is attached to the plug supplied and connected to the coaxial socket at the rear of the receiver.

A loudspeaker of 2·5/3 ohms impedance is connected to the speaker terminals at the rear or alternatively a pair of high resistance telephones plugged into the jack on the front panel.

WAVECHANGE.

The large left-hand knob controls the position of the turret, and the figures indicate the six ranges available. A positive lock ensures the turret contacts are in the correct position and movement of the knob automatically disengages the locking mechanism.

MODE.

On the extreme left is a four position switch which controls the type of transmission acceptable.

C.W. Telegraphy : The switch is set at 'C.W.', thereby bringing the B.F.O. into operation, adjusting the selectivity to narrow, making connection to the crystal diode used on AM signals and cutting out of circuit the FM section.

AM Telephony : As with CW, except that the B.F.O. is rendered inoperative. The 'S' meter functions as a tuning indicator and the signal should be tuned to give maximum deflection.

Narrow-Band Frequency Modulated Telephony : The switch is set to 'NFM.' The circuits are thereby set to the appropriate degree of selectivity, the AM diode is cut out and the FM section brought into operation. This position is intended for communications speech reception, with a deviation of 15 kc/s.

Wide-Band Frequency Modulated Telephony : The switch is placed at 'FM.' Further adjustments are automatically made to the gain and band-widths of the circuit, to permit acceptance of high quality frequency modulated transmissions, with deviation of up to 75 kc/s.

In the two FM positions, the milliammeter is used to ensure correct tuning. On passing through a signal, the meter will first swing in one direction, then in the other. The centre position, between the two peaks and with the needle coincident with the special mark on the meter scale, is the correct tuning point.

GAIN CONTROLS.

The RF stage operates at full gain at all times. Gain of the IF stages is adjusted by means of R26 but it is desirable to keep this control well advanced, except on strong CW signals. Audio Gain is controlled by R60 in the usual way.

NOISE LIMITER.

The noise limiter is effective against transient interference which may be experienced when the receiver is set to ' CW ' or ' AM.'

MUTING CONTROL.

With the Switch in the ' Off ' position, the receiver performs normally. The rise and fall of background noise, as a distant carrier is switched off and on, can be disturbing to an operator and this effect can be eliminated by placing the muting switch to ' On.' The receiver is then silent until a signal is received of a strength sufficient to overcome the bias delay. The latter is adjustable for signals of five microvolts upwards.

STANDBY SWITCH.

In the ' On ' position, the standby switch desensitises the receiver and is primarily for use when an associated transmitter is in operation. Leads are taken to a terminal panel at the rear marked ' RELAY,' thus enabling other equipment to be controlled by movement of the standby switch.

~~ALIGNMENT~~ PROCEDURE~~, 770R.~~

I.F. ALIGNMENT.

Switch on receiver and allow to "warm-up". Set controls as follows :

A.F. GAIN...	...	Max.
I.F. GAIN ...	...	Max.
SELECTIVITY	...	to AM
N.L.... ...	...	off
MUTING ...	...	off

Remove R.F. and Oscillator valves and set turret to a neutral position—that is, between ranges.

Set signal generator to 5·2 Mc/s, and modulation to 30%. Connect output meter to 2·5 ohm sockets.

Connect signal generator lead to the grid of V7 (last I.F. Amp) via a ·01 condenser and increase signal generator output until a reading is obtained on output meter. Adjust secondary winding core of last I.F. transformer (i.e. upper core), for maximum reading on output meter, reducing generator input as necessary. Now repeat adjustment of primary winding core. Transfer the generator input to grid of V6 and carry out the same procedure, following on through the other I.F. stages. When the generator lead is transferred to the grid of the mixer valve V2, in the R.F. assembly, adjust secondary winding core (upper) as before, but on trimming the primary core it is necessary to adjust the core to the second peak response, that is, with the core further into the former.

NOTE : Two peaks are obtainable when adjusting the I.F.T. cores, the first peak on screwing the core into the former is the correct one, except for the first I.F.T. primary core—the correct one in this case is the second peak.

The approximate inputs for 50 milliwatts output are as follows :

GRID of V7 ...	...	60 millivolts
GRID of V6 ...	...	4.5 millivolts
GRID of V5 ...	...	600 microvolts
GRID of V4 ...	...	65 microvolts
GRID of V2 (Mixer)	...	6·5 microvolts

B.F.O. ALIGNMENT.

With signal generator still connected to grid of V2 and set to 5·2 Mc/s as for I.F. alignment, switch off signal generator modulation and change switch to C.W. Adjust B.F.O. core for beat note of 1,000 cycles.

DISCRIMINATOR ALIGNMENT.

Controls set as for I.F. Alignment, but selectivity switch to F.M.

Signal generator 5·2 Mc/s unmodulated.

Signal generator output at maximum (1 volt).

Connect generator lead to grid of limiter V8.

Connect a centre zero 0–50 microamps movement across the output of the discriminator double diode with a 100K resistor in series (i.e. from the cathode of the double diode V9 to earth). Should the discriminator be in perfect alignment at 5·2 Mc/s, the centre zero meter will read zero, and if this is so, a check can be made by moving the signal generator frequency either side of 5·2 Mc/s. This should result in equal meter readings on either side. If they are unequal, adjustment of the primary core (lower core) should be made for balanced readings.

Should complete alignment of the discriminator be required, set the secondary core (upper), so that the top of the core is flush with the top of discriminator can, adjust primary core (lower) for maximum deflection on meter—and then adjust secondary core (upper) for zero reading on meter. Move generator frequency either side of 5·2 Mc/s and check balance, if unbalanced adjust primary core.

NOTE : Peak deflection should approximate 25 microamps.

R.F. ALIGNMENT.

Normally the only operation likely to be required is the adjustment of the oscillator and mixer trimmers, and for this the following procedure should be adopted.

Set wavechange to Range 6.

Connect signal generator to co-axial aerial input and receiver tuning scale to 26 Mc/s. Connect 1000/100 kc/s crystal calibrator in shunt with 75 ohm signal generator load for calibration purposes—should the 26 Mc/s harmonic be appreciably off the 26 Mc/s mark on the scale (accuracy of calibration is better than 0·5% Ranges 6, 5, 4 and 3, and better than 1% on Ranges 2 and 1), adjust oscillator trimmer and check calibration along entire range. If this is correct adjust mixer trimmer at 26 Mc/s for maximum output. Check sensitivity at 26 and 21 Mc/s, ascertaining that it conforms with figure given in the tables. The above procedure is repeated for Ranges 5, 4, 3, 2 and 1, with the alignment points shown in the tables.

COMPLETE RE-ALIGNMENT.

Should complete re-alignment be necessary, the following procedure should be adopted.

Remove all coil boxes with the exception of Range 6 and connect signal generator and calibrator as above. Should the 26 Mc/s and 21 Mc/s harmonics be off the scale marks appreciably, correct the 26 Mc/s with the oscillator trimmer and the 21 Mc/s with the oscillator core. These two adjustments, core and trimmer, are interdependent and it is necessary to repeat the above procedure once or twice to ensure optimum adjustment.

To align the R.F. circuits set aerial trimmer to mid position, set signal generator and receiver to 21 Mc/s and adjust aerial and mixer core for maximum on output meter. Set signal generator to 26 Mc/s and adjust mixer trimmer—also ensure that aerial trimmer is aligned in central position. Continue adjusting core and trimmer until no further improvement can be achieved.

The above method is repeated for Ranges 5, 4 and 3, with the following alignment points :

Range 5	...	29 Mc/s and 38 Mc/s
Range 4	...	42 Mc/s and 53 Mc/s
Range 3	...	60 Mc/s and 76 Mc/s

Ranges 1 and 2 have air cored coils and it is extremely unlikely that the inductance will ever require adjustment—the procedure is similar to Ranges 6, 5, 4 and 3, except that having no dust core, this adjustment must be carried out by altering the pitch of the coil winding necessitating the removal of the coil box lid by taking out the eight Philips head screws. Alignment points for Ranges 1 and 2 are :

Range 2	...	86 Mc/s and 110 Mc/s
Range 1	...	120 Mc/s and 160 Mc/s

When completely aligned correctly, the following sensitivities should be attained for 50 milliwatts output.

Range 1	...	160 Mc/s	...	4 microvolts
		120 Mc/s	...	5 microvolts
Range 2	...	110 Mc/s	...	2 microvolts
		86 Mc/s	...	2.microvolts
Range 3	...	76 Mc/s	...	2 microvolts
		60 Mc/s	...	2 microvolts
Range 4	...	53 Mc/s	...	2 microvolts
		42 Mc/s	...	2 microvolts
Range 5	...	38 Mc/s	...	2 microvolts
		29 Mc/s	...	2 microvolts
Range 6	...	26 Mc/s	...	2 microvolts
		21 Mc/s	...	2 microvolts

ADJUSTMENT OF PRE-SET CONTROLS.

ZERO AM. (Note this control must be adjusted first).

Set controls as follows :

Selectivity	...	A.M.
I.F. Gain	...	Max.
A.F. Gain	...	Max.
N.L. ...	...	Off
Muting	...	Off

Tune to centre of scale Range 4 and short aerial input—adjust " Zero-AM " control so that tuning meter reads zero.

CENTRE ZERO FM.

Connect signal generator to the aerial socket, switch to AM position and tune in an unmodulated signal at any frequency. Tune this signal in by means of the " S " meter, ensuring that signal is tuned for maximum reading—switch to F.M. and without touching the tuning knob, adjust " Centre Zero FM " for a centre zero deflection of the meter.

MUTING LEVEL.

This is set to suit operating conditions and individual requirements.

EXTERNAL POWER SUPPLY.

Provision can be made for the use of alternative types of external power supplies.

Sole Manufacturers : STRATTON & CO. LTD., BIRMINGHAM, 31

Cables : Stratnoid, Birmingham

Printed in England

July, 1954

Voltage Values

The figures given below are obtained with the controls set as follows :

I.F. gain max. A.F. gain min. Muting on N.L. off.
Selectivity at A.M. Turret to range 6. Stand-by off.
Muting level fully clockwise.

Circuit Ref.	20,000 ohms per volt	AVO.40
A.	1·5	1·4
B.	90	71
C.	137	136
D.	~~10~~ 23	~~9~~ 3 (10v range)
E.	146	145
F.	110	100
G.	3·4	3·3
H.	145	120
J.	212	210
K.	3·4	3·3
L.	145	120
M.	212	210
N.	1	1
O.	98	80
P.	207	204
Q.	1	1
R.	98	80
S.	207	204
T.	30	24
U.	30	24
V.	·4	·35
W.	33	16
X.	98	30
Y.	26	2·5
Z.	212	84
A–	35	34
B–	220	163
C–	33	24
D–	4	2
E–	96	66
F–	4	2
G–	96	66
H–	12	11·8
J–	218	216
K–	218	216
L–	224	224
M–	85	55 (BFO "on")
N–	150	150
O–	2·6	2·5
P–	150	150
Q–	262	260
R–	242 A.C.	240 A.C.

Power input 90 watts

COMMUNICATIONS RECEIVER. S.770R

Circuit No. B.P.818

Component Values

CONDENSERS

C1. 90+90 pF Split Stator (R.F. Sect).
C2. 40pF
C3. ·0005 mfd Tub. Paper
C4. ·003 mfd Tub. Paper
C5. ·0005 mfd Tub. Paper
C6. 91 pF Feed Through
C7. ·0005 mfd Tub. Paper
C8. 40 pF
C9. 90+90 pF Split Stator (Mixer Sect.)
C10. 91 pF Feed Through
C11. 91 pF Feed Through
C12. 91 pF Feed Through
C13. 40 pF Ceramic
C14. 91 pF Feed Through
C15. 91 pF Feed Through
C16. 40 pF
C17. 90+90 pF Split Stator (Osc. Sect.)
C18. ·0005 mfd Tub. Paper
C19. ·01 mfd Tub. Paper
C20. 100 pF Silvered Mica
C21. 100 pF Silvered Mica
C22. ·01 mfd Tub. Paper
C23. ·01 mfd. Tub Paper
C24. 100 pF Silvered Mica
C25. 100 pF Silvered Mica
C26. ·01 mfd Tub. Paper
C27. ·01 mfd Tub. Paper
C28. ·01 mfd Tub. Paper
C29. ·01 mfd Tub. Paper
C30. ·01 mfd Tub. Paper
C31. ·01 mfd Tub. Paper
C32. 100 pF Silvered Mica
C33. 100 pF Silvered Mica
C34. ·01 mfd Tub. Paper
C35. ·01 mfd Tub. Paper
C36. ·01 mfd Tub. Paper
C37. ·01 mfd Tub. Paper
C38. 100 pF Silvered Mica
C39. 100 pF Silvered Mica
C40. 10 pF Ceramic
C41. 3 pF Silvered Mica
C42. ·01 mfd Tub. Paper
C43. 100 pF Silvered Mica
C44. 100 pF Silvered Mica
C45. 100 pF Ceramic
C46. ·01 mfd Tub. Paper
C47. 1 pF Silvered Mica
C48. 100 pF Ceramic or Silvered Mica
C49. ·01 mfd Tub. Paper
C50. 50 pF Silvered Mica
C51. ·01 mfd Tub. Paper
C52. ·1 mfd Tub. Paper
C53. ·01 mfd Tub. Paper
C54. 100 pF Silvered Mica
C55. 50 pF Silvered Mica
C56. 50 pF Silvered Mica
C57. 50 pF Ceramic
C58. 100 pF Ceramic
C59. ·0005 mfd Tub. Paper
C60. 100 pF Ceramic
C61. ·01 mfd Tub. Paper
C62. ·01 mfd Tub. Paper
C63. 100 pF Ceramic
C64. ·005 mfd Tub. Paper
C65. ·005 mfd Tub. Paper
C66. ·01 mfd Tub. Paper
C67. ·01 mfd Tub. Paper
C68. .005 mfd Tub. Paper
C69. ·005 mfd Tub. Paper
C70. ·1 mfd Tub. Paper
C71. 4 mfd Tub. Elect 350V D.C. Wkg.
C72. ·01 mfd Moulded Mica
C73. 5 mfd Tub. Elect. 50V. D.C. Wkg.
C74. ·01 mfd Tub. Paper
C75. ·01 mfd Tub. Paper
C76. ·01 mfd Moulded Mica
C77. ·01 mfd Moulded Mica
C78. ~~·01 mfd Tub. Paper~~ 500 pfd Tub Paper
C79. ·01 mfd Moulded Mica
C80. ·01 mfd Moulded Mica
C81. ·01 mfd Tub. Paper
C82. ·01 mfd Tub. Paper
C83. 100 pF Silvered Mica
C84. 100 pF Silvered Mica
C85. ·01 mfd Tub. Paper
C86. 400 pF Silvered Mica
C87. ·01 mfd Tub. Paper
C88. ·01 mfd Tub. Paper
C89. ·01 mfd Tub. Paper
C90. ·01 mfd Tub. Paper
C91. 50 mfd 450V. D.C. Wkg. Tub. Elect.
C92. 50 mfd 450V. D.C. Wkg. Tub. Elect.
C93. 3–12 pF Air Trimmer
C94. 10 pF Ceramic
C95. 2–12 pF Air Trimmer
C96. 1 pF Silvered Mica
C97. 12 pF Silvered Mica
C98. 2–12 pF Air Trimmer
C99. 10 pF Ceramic
C100. 2–12 pF Air Trimmer
C101. 1 pF Silvered Mica
C102. 12 pF Silvered Mica
C103. 970 pF Silvered Mica ± 2%
C104. 2–12 pF Air Trimmer
C105. 500 pF Tub. Paper
C106. 2–12 pF Air Trimmer
C107. 3 pF Silvered Mica
C108. 770 pF Silvered Mica ± 2%
C109. 12 pF Silvered Mica
C110. 2–12 pF Air Trimmer
C111. 40 pfd
C112. 2–12 pF Air Trimmer
C113. 3 pF Silvered Mica
C114. 770 pF Silvered Mica ± 2%
C115. 12 pF Silvered Mica
C116. 2–12 pF Air Trimmer
C117. ·01 Tub Paper
C118. 2–12 pF Air Trimmer

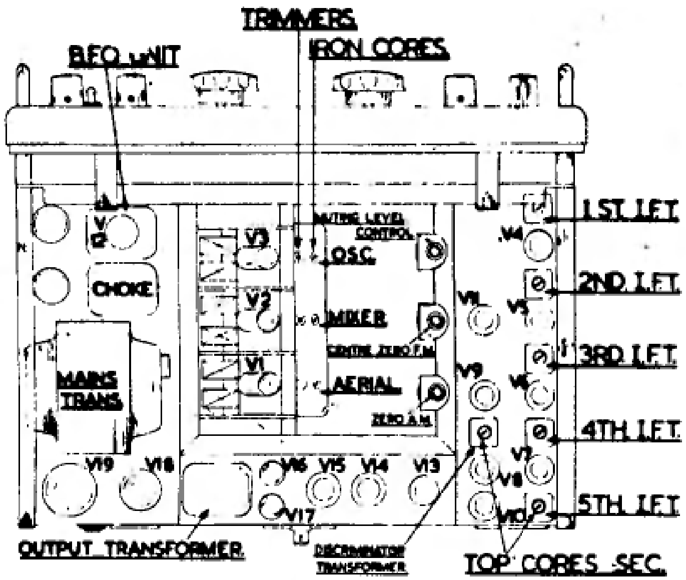
CONDENSERS (continued)

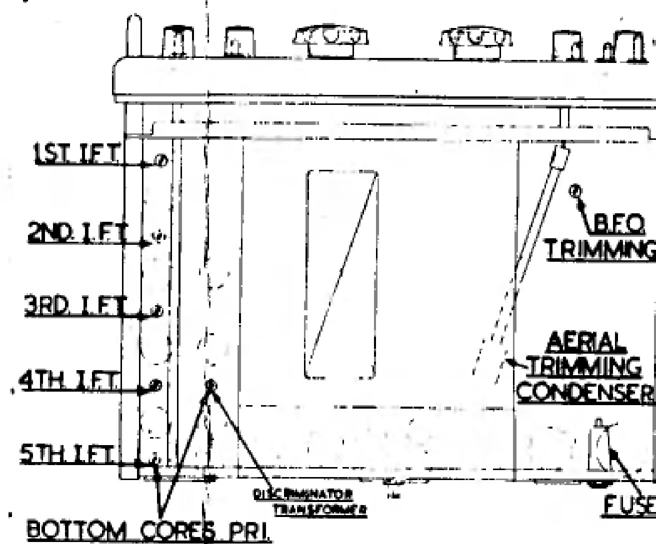
C119. 3 pF Silvered Mica
C120. 500 pF Silvered Mica ± 2%
C121. 12 pF Silvered Mica
C122. 2–12 pF Air Trimmer
C123. ·0005 Tub Paper
C124. 2–12 pF Air Trimmer
C125. 3 pF Silvered Mica
C126. 200 pF Silvered Mica ± 2%
C127. 12 pF Silvered Mica
C128. 2–12 pF Air Trimmer
C129. 10 pF Ceramic
C130. ·01 mfd Tub Paper

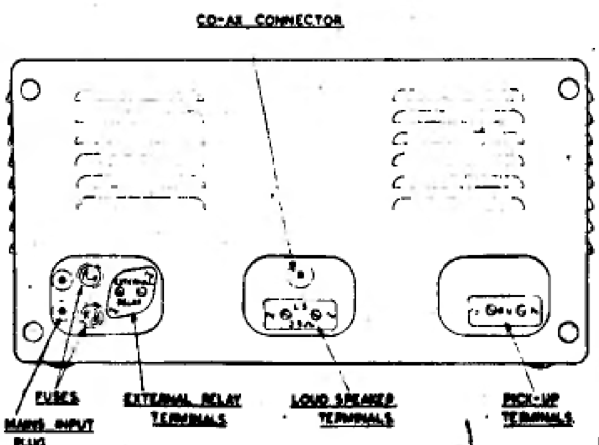
RESISTORS

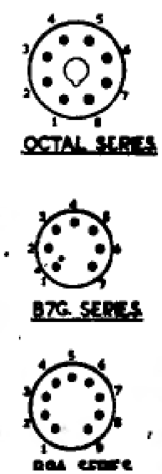
R1. 12 ohms
R2. 200 ohms
R3. 33,000 ohms
R4. 1,000 ohms
R5. ~~47,000 ohms~~ 1 Megohm
R6. ~~3,000 ohms~~ non. existent
R7. ·47 Megohm
R8. 22,000 ohms
R9. 10,000 ohms
R10. 1,000 ohms
R11. 1,000 ohms
R12. 33,000 ohms. 1W
R13. 1,000 ohms
R14. 22 ohms
R15. ·47 Megohm
R16. 68 ohms
R17. ·47 Megohm
R18. 1,000 ohms
~~R19. 33,000 ohms. 1W~~
R20. ·27 Megohm
R21. 68 ohms
R22. 390 ohms
R23. 120 ohms
R24. Value determined during test
R25. 47,000 ohms
R26. 10,000 Pot.
R27. 68 ohms
R28. ·47 Megohm
R29. 1,000 ohms
R30. 33,000 ohms. 1W
R31. 22 ohms
R32. ·47 Megohm
R33. ·47 Megohm
R34. ·47 Megohm
R35. 68 ohms
R36. 1,000 ohms
R37. 33,000 ohms. 1W
R38. 200 ohms
R39. 200 ohms
R40. ·1 Megohm
R41. ·1 Megohm
R42. 1 Megohm
R43. 2 Megohm
R44. ·27 Megohm
R45. 22,000 ohms
R46. ·47 Megohm
R47. 68,000 ohms
R48. 68,000 ohms
R49. ·1 Megohm
R50. ·1 Megohm
R51. ·1 Megohm
R52. 1 Megohm
R53. ·27 Megohm
R54. 47,000 ohms. 1W
R55. ·82 Megohm
R56. 1 Megohm
R57. 1 Megohm
R58. 150 ohms
R59. 5,000 ohms. Pot.
R60. ·5 Megohm. Pot.
R61. 10,000 ohms
R62. ·47 Megohm
R63. 1 Megohm
R64. 1 Megohm
R65. 27,000 ohms
R66. 47,000 ohms. 1W
R67. ·1 Megohm
R68. ·1 Megohm
R69. ·1 Megohm
R70. 3,300 ohms
~~R71. ·27 Megohm~~
R72. 6,800 ohms
R73. ·47 Megohm
R74. 3,300 ohms
R75. 3 Megohm
R76. ·47 Megohm
R77. 3 Megohm
R78. 620 ohms
R79. 3,300 ohms
R80. 68,000 ohms
R81. ·47 Megohm
R82. 47,000 ohms. 1W
R83. 4,700 ohms
R84. ~~2,700~~ ohms 68,000 ohms
R85. 2,700 ohms
R86. 22,000 ohms
R87. 47,000 ohms
R88. 2 Megohm
R89. 600 ohms. Pot.
R90. 560 ohms
R91. 600 ohms. Pot.
R92. 47,000 ohms. 1W
R93. 1,800 ohms. Wire Wound
R94. ·27 Megohm
R95. 6,800 ohms
R96. ·27 Megohm
R97. 10,000 ohms
R98. 220 ohms
R99. 22,000 ohms
R100. 150 ohms
R101. 22,000 ohms
R102. ·27 Megohm
R103. ·47 Megohm
R104 200 ohms

5776



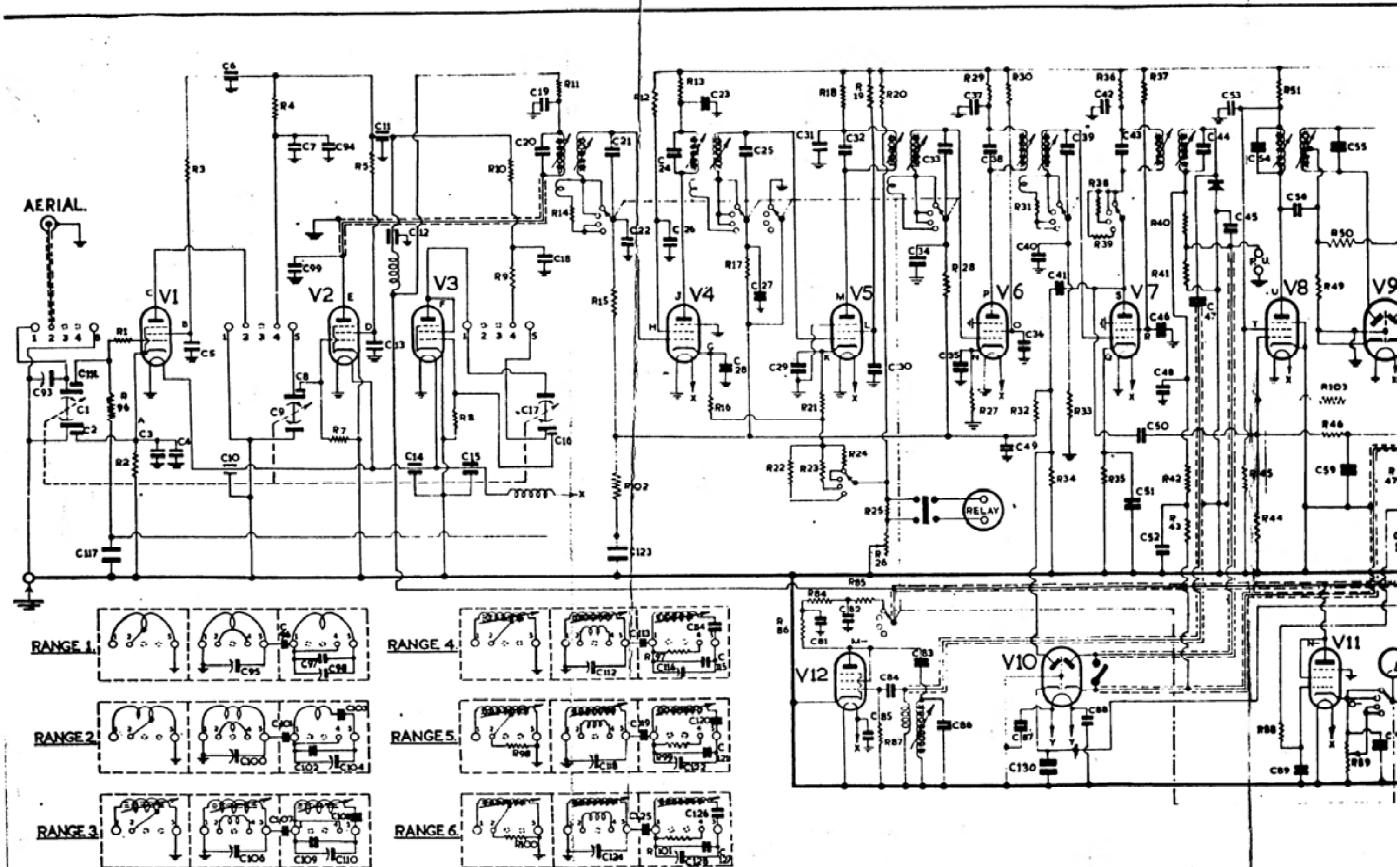






VALVE	V. No.	PIN CONNECTIONS 1	2	3	4	5	6	7	8	9	SERIES.	SERVICE NUMBERS.
6AK5 (EF95)	V1,2&3	G1	K	H	H	A	G2	K	–	–	B7G	CV850
6BA6	V4,5,6 7&12	G1	G3 S	H	H	A	G2	K	–	–	B7G.	CV454
6AU6	V8,11& 13	G1	G3 S	H	H	A,	G2	K	–	–	B7G.	CV2524
6AL5	V9&10	K1	A2	H	H	K2	S	A1			B7G	CV140
12AU7	V14&15	A2	G2	K2	H	H	A1	G1	K1	H TAP	B9A (NOVAL)	CV491
6AM5	V16&17	G1	K G3	H	H	A	–	G2	–	–	B7G	CV136
VR150/30	V18	–	K	–	–	A	–	–	–	–	OCTAL	CV216.
5Z4G	V19	–	H	–	A2	–	A1	–	K H	–	OCTAL	CV1863

FOR USE WITH CIRC NUMBER BP 818.



V.H.F. COMMUNICATIONS RECEIVER. (T

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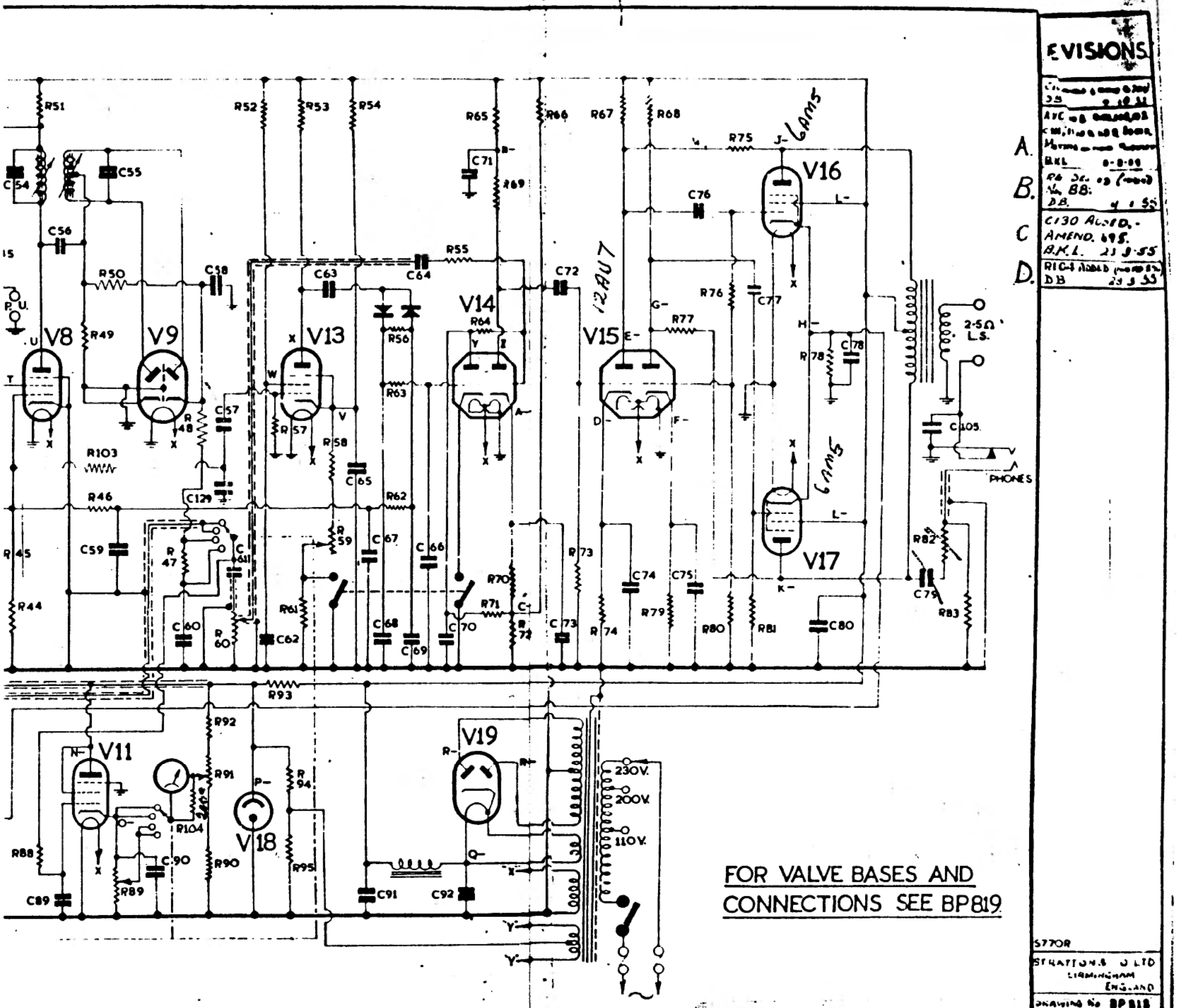
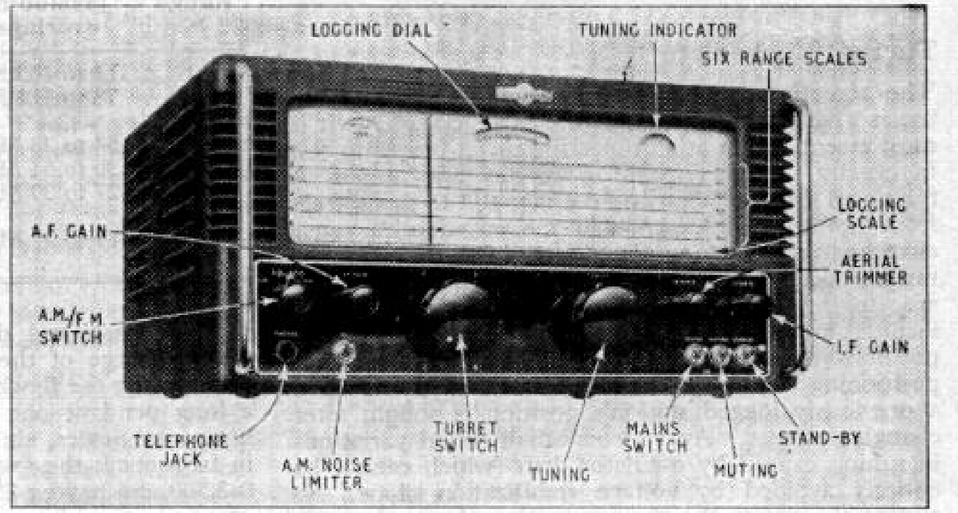


FIVER (TYPE 770R) DP818.

A.M./F.M. Communications Receiver

Review of Eddystone Model 770R, Covering 19 to 165 Mc/s



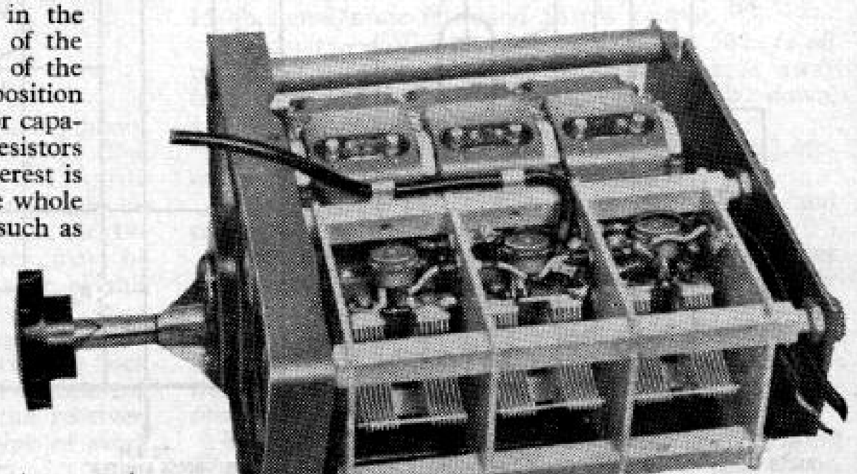
NINETEEN valves, of which all but two are miniature, and three germanium crystal diodes are used in the new Eddystone Model 770R wide range, v.h.f. communications receiver. The types of these valves, their circuit positions and functions will be found in the valve table. This set is believed to be the only British-made receiver now available giving continuous tuning over such a wide v.h.f. range as 19 to 165 Mc/s. There are six ranges and the extent of each, together with some of the services likely to be found in the various bands, are outlined in the frequency tables on the following page.

The 770R has an i.f. of 5.2 Mc/s and provides for the reception of a.m. and f.m. telephony and c.w. telegraphy. No marked departures from well-tried techniques are attempted, but considerable ingenuity is evident in the planning of the circuit and range-changing mechanism of the front-end, comprising the r.f., mixer and oscillator stages. This is, of course, the real heart of a receiver of this kind and its general performance depends almost entirely on the design of this part of the set. Its very satisfactory behaviour on all ranges, but especially on the 114-to-165-Mc/s one, is a tribute to the design of the front-end unit.

The r.f., mixer and oscillator stages in the 770R are a single unit, and a good idea of the general arrangement can be seen in one of the illustrations. The set employs a six-position rotary-coil turret, three ganged split-stator capacitors, valve-holders and sundry small resistors and capacitors. The main feature of interest is that virtually no r.f. wiring is used in the whole unit; the positioning of the main items, such as coil turret, tuning capacitors and valveholders, is such that their interconnecting points fall so close together that the soldering tags alone form the wiring. Moreover, little real wiring is employed inside the coil turret itself. As shown in the

VALVE TABLE

Circuit Position	Type	Function
V1	6AK5/EF95 (CV850)	Pentode r.f. amplifier.
V2	6AK5/EF95 (CV850)	Mixer.
V3	6AK5/EF95 (CV850)	Oscillator.
V4-V7	6BA6 (CV454)	I.F. Amplifier.
V8	6AU6 (CV2524)	F.M. limiter.
V9	6AL5 (CV140)	F.M. discriminator.
V10	6AL5 (CV140)	Noise limiter and a.g.c.
V11	6AU6 (CV2524)	"S" meter valve on a.m. Tuning indicator on f.m.
V12	6BA6 (CV454)	Beat frequency oscillator (BFO)
V13	6AU6 (CV2524)	Noise amplifier (muting).
V14	12AU7 (CV491)	Muting stage.
V15	12AU7 (CV491)	A.F. amplifier and phase inverter.
V16-17	6AM5 (CV136)	Push-pull output stage.
V18	VR150/30 (CV216)	Voltage stabilizer.
V19	5Z4G (CV1851)	Full-wave h.t. rectifier.
CD1	Germanium	A.M. detector.
CD2-3	Germanium	Noise detectors (muting)



Right: Front-end unit of Eddystone 770R showing ganged capacitors, valveholders and (in rear) coil turret.

illustration of two of the turret coil assemblies, the higher-frequency coils are self-supporting and are soldered direct to the inside extensions of the external contact studs. Any trimmers included have the shortest possible leads to their respective points.

Turret Mechanism

The actuating mechanism of a coil turret for v.h.f. use is a vitally important feature of its design, as it is most essential that at all times the turret comes to rest in exactly the same position on any one range. A fractional displacement would either add to or subtract from the total inductance in the circuit and cause changes in tuning of sufficient magnitude to render the range scales, if calibrated directly in frequency as they are in the 770R, quite useless. Moreover, as facilities are provided for accurately logging the tuning positions of stations, any unreliability in the turret positioning would become immediately apparent when a previously logged station's position is sought after changing ranges. Apart from small initial variations in tuning caused by oscillator drift (which cannot be entirely avoided by voltage stabilization alone), no abrupt changes in the tuning position of a station was noticed by going from range to range and back to the original. We looked for these effects most searchingly on the highest frequency range and, finding none, conclude that the coil turret mechanism is above reproach in this respect.

The tuning system of the 770R is the same basic type as used in other Eddystone communications receivers. It provides an overall reduction of 140 to 1, embodies a flywheel to counteract frictional drag of the gears, and gives a smooth and free action. It is heavy enough to carry the pointer some distance along the scales by spinning the knob sharply. The weight is

FREQUENCY TABLE

Range	Frequency coverage (excluding overlaps)	Remarks
1	114 to 165 Mc/s	Aircraft, amateurs.
2	78 to 114 Mc/s	F.M. broadcast, land mobile, aero navaids.
3	54 to 78 Mc/s	Television, aero navaids.
4	39 to 54 Mc/s	Television, U.S. amateurs.
5	27 to 39 Mc/s	Amateurs, aero navaids, meteorological aids.
6	19 to 27 Mc/s	Broadcast, amateur, marine.

nicely chosen and does not give the impression of taking charge of the tuning, as sometimes seems to occur when the flywheel is too heavy. The pointer is a long pendant one and embraces seven 12-in long horizontal scales, six of which are calibrated linearly in frequency; the seventh is the logging scale marked 0-2,500 and having 25 divisions. Each division represents one complete revolution of a subsidiary logging dial which is visible through an aperture in the top centre of the main dial. This dial has a 360-degree scale and is engraved 0-100. In effect it expands every scale to the equivalent of 32 ft. Quite small changes in frequency can thus be observed on the logging dial.

A.M./F.M. Arrangements

Owing to the rather high i.f. used (5.2 Mc/s) four i.f. stages have been included to satisfy the requirements of high sensitivity coupled with a wide band-width for f.m. reception. For f.m. there is in addition a limiter and a Foster-Seeley discriminator. For a.m. reception there are no fewer than 10 tuned circuits and a crystal diode detector. Some interesting features (see Fig. 1) can be found in that part of the circuit, which includes the last i.f. stage V7 limiter V8 and discriminator V9. The switches S_{1a} to S_{1e} are part of a larger switching system, which might be called the "services switch," as it changes over from a.m. to f.m., adjusts bandwidth to suit each type of service and in the "CW" position switches on a BFO. S_{1a} and S_{1b} are for bandwidth adjustment of the i.f. amplifier at this point, the markings on S_{1a} indicating the four positions of the switching system; (1) CW, (2) AM, (3) NFM and (4) FM. NFM is narrow-band f.m. and is used for certain types of transmission for which the frequency deviation need not exceed ±15 kc/s compared to the ±75 kc/s of wide-band f.m.

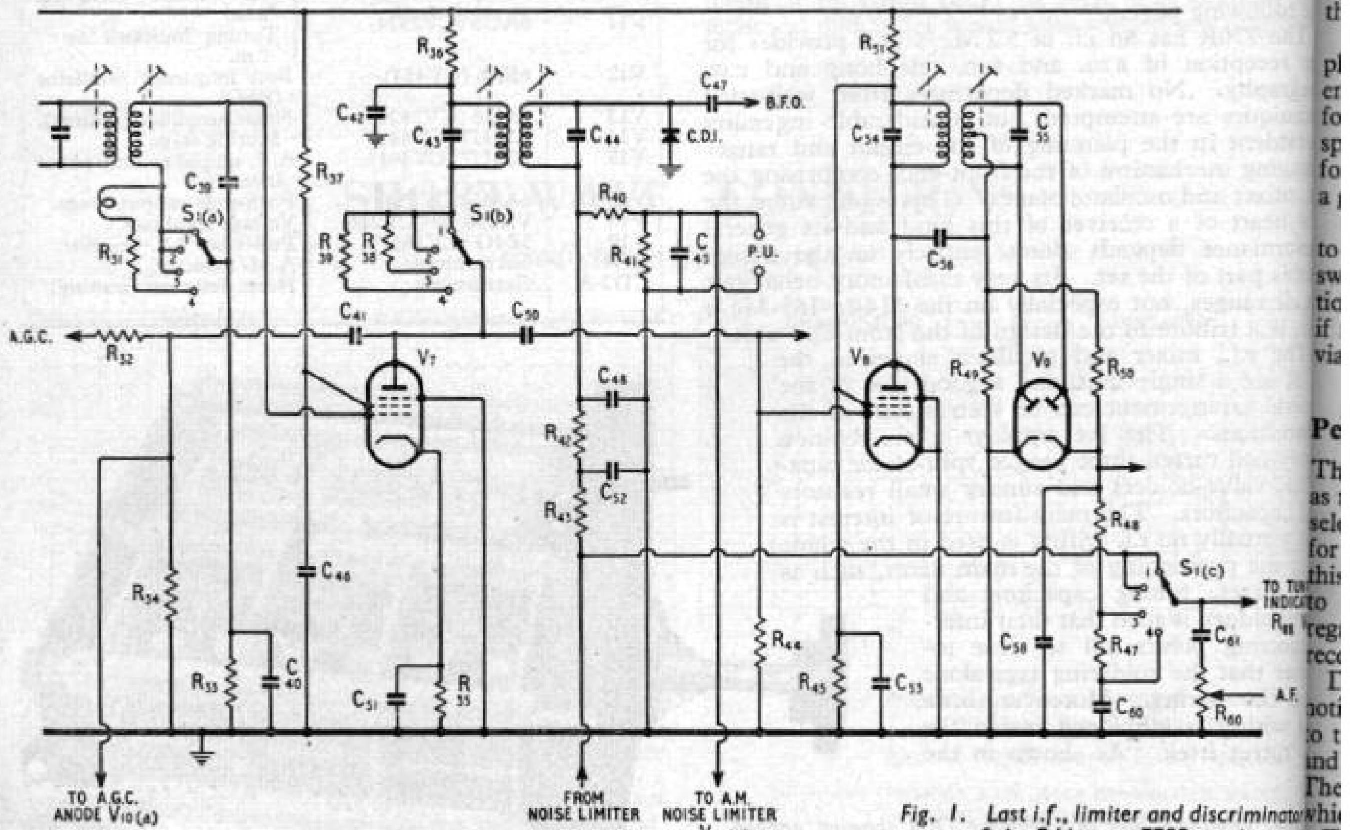


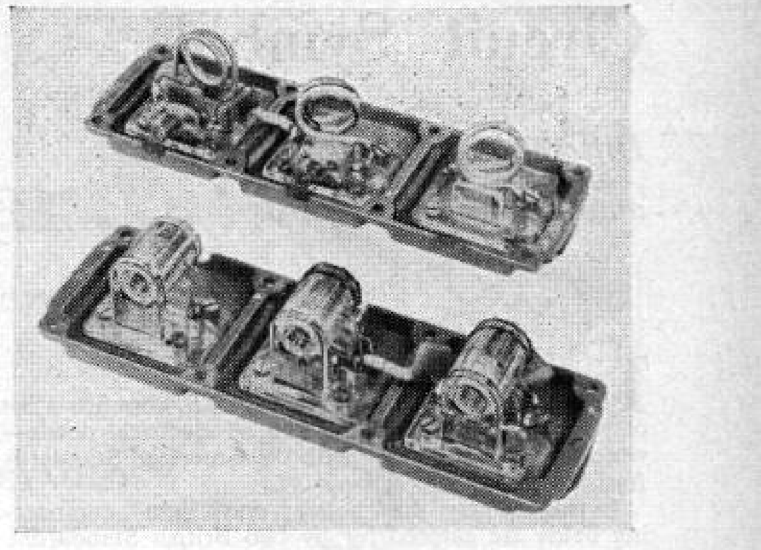
Fig. 1. Last i.f., limiter and discriminator stages of the Eddystone 770R receiver.

In the top right-hand corner of the main dial is a small aperture disclosing a tuning indicator. It serves a twofold purpose; it functions as a single-strength meter for c.w. and a.m. transmissions, registering on the carrier level, and is used as a tuning indicator for f.m. It has a red-line centre zero on which the pointer is aligned for correct tuning on f.m. and a 0-9 "S"-scale for a.m. It is sometimes said that an f.m. signal can be tuned in correctly by adjusting for minimum background noise, but this region is generally far too broad for satisfactory tuning. The meter indicator of the 770R is very sensitive to small changes in tuning and enables the desired accuracy to be achieved in a simple manner.

Details of the circuit associated with this indicator are given in Fig. 2, which includes the switch S_{1d} for changing over the indicator's functions from tuning indicator to "S" meter as required. It forms part of the main S_1 switching system. The remainder of the circuit is reasonably straightforward.

A push-pull output stage is used, preceded by a phase-splitter and a.f. amplifier. Negative feedback is employed. An output transformer provides matching for an external loudspeaker of 2.5 to 3 ohms; a loudspeaker is not included in the set. Provision is made for headphones and—unusual in a set of this kind—for a gramophone pickup.

One other circuit detail, which, however, is common to most communications receivers, is a stand-by switch. It de-sensitizes the set in the stand-by position and also closes a pair of spare contacts to be used, if required, to control a nearby or remote transmitter via a relay.



Two of the coil units removed from the turret.

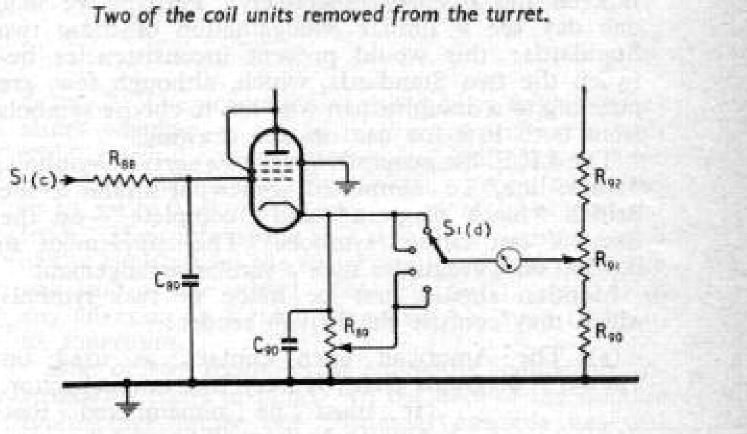


Fig. 2. The f.m. tuning indicator and a.m. "S" meter are combined in one stage.

Performance

The impression given by the set is that it has about as much sensitivity as can usefully be employed. The selectivity in the CW and AM positions is adequate for all v.h.f. requirements; and it must be judged on this basis. It leaves a little to be desired on the 19- to 27-Mc/s band, but these frequencies may be regarded as rather outside the normal scope of this receiver.

During our tests we dodged from range to range, noting station tuning positions and often coming back to them time and again; it was a form of monitoring and covered the whole v.h.f. range of the receiver. The set seems ideally suited for this type of work which could form one of its principal rôles.

The noise limiter suppresses ignition interference on a.m. transmissions quite effectively, but seems to cut rather deeply into the upper frequency response. Indeed, it forms a useful way of suppressing most of the set noise when the full gain is employed and especially so when the BFO is used, which, as seems inevitable, adds considerably to the general background noise. However, this is not peculiar to the 770R.

The following extracts from the maker's specification serve to give some idea of the receiver's qualities.

Sensitivity.—Better than 5 μV on all ranges for a 15-db signal/noise ratio and 50 mW output.

Selectivity.—CW and AM; 40 db down, 50 kc/s off resonance. Narrow band FM; 40 db, 80 kc/s away from resonance. Wide-band FM; 40 db down, 175 kc/s off resonance.

Noise Factor.—Not greater than 14 on Range 1, decreasing to less than 5 on Ranges 5 and 6.

Image Ratio.—Better than 20 db at 165 Mc/s and correspondingly greater at the lower frequencies.

Frequency Stability.—Drift less than 0.001 of 1 per cent C, and less than 0.001 of 1 per cent for a 5-per cent change in mains voltage.

As the receiver covers the 21-, 28- and 145-Mc/s amateur bands it might have some appeal in this direction provided the price does not prove too great an obstacle.

The makers are Stratton and Co., Ltd., Eddystone Works, Alvechurch Road, West Heath, Birmingham, 31.