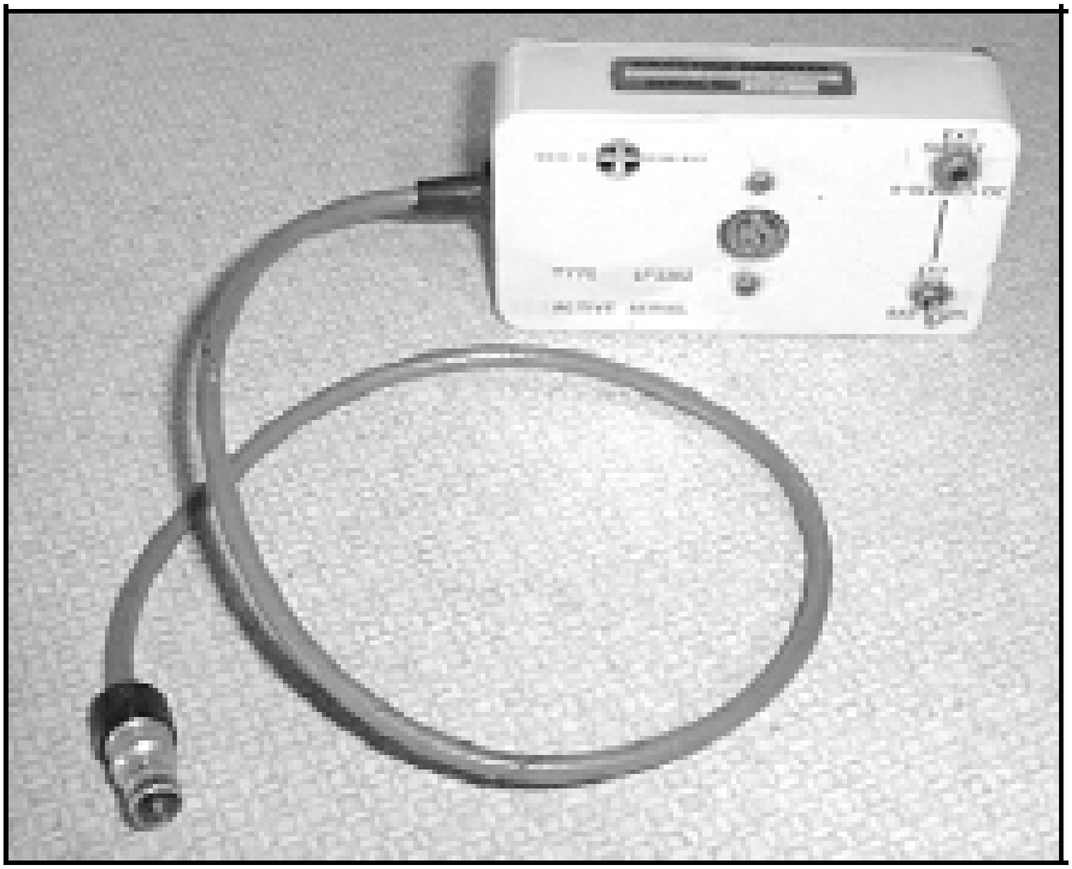


Eddystone Active Aerial Type LP3382

EDDYSTONE ACTIVE AERIAL

LP3382

You may recall that in our last edition of 'Lighthouse' I promised to let you have the circuit of the Eddystone Active Aerial which featured in the latest QRG. This appeared quite fortuitously in a handful of scrap papers being thrown out of the Selly Oak factory last year. It was only a rough sketch so I've re-drawn it here. ***(even rougher . . .)***

by Graeme Wormald – G3GGL

This is the one Eddystone item you can actually replicate for yourself and use. As you will see from the illustration in QRG it is built into a small 6cm. by 11cm. by 3cm. *'Eddystone'* die-cast box. All you need to do is fix an on/off switch; an external power socket (if you wish); a 50cm. telescopic aerial and a clip for a PP3 9-volt battery.

I would think your next rally should provide all the slightly vintage parts for under a fiver. (the cct is dated 17/2/75). If you are wondering why two of the capacitors are 4mfd and the other is a 4.7mfd, that's just how it is on the original drawing! I shouldn't think it matters in the slightest if they are anywhere from 2.2mfd to 10mfd.

The two OA200 are general purpose silicon diodes to protect the gate of the 2N3819 from excessive input (from a 50cm whip?) and the one in the 9-volt line presumably to stop reverse voltage accidentally zapping the whole thing.

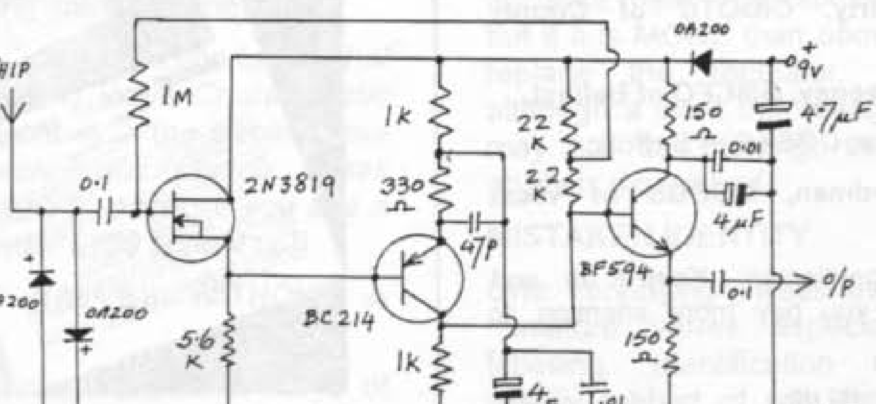
A couple of square inches of Veroboard should provide a perfectly good base and I'm sure that anyone who can change the gain controls on a 730/4 can reproduce this device. It has an extra transistor compared with Peter Lankshear's active aerial and can therefore be expected to have some gain. Compared with a 20ft. whip mounted on the side of the bungalow (my "bench aerial"), the LP3382 gives an increased showing on my AOR 7030 S-meter as follows:-

1.4 MHz- 4 S-points

14 MHz- 2 S-points

24 MHz- 1 S-point

Not too bad, eh? ♠

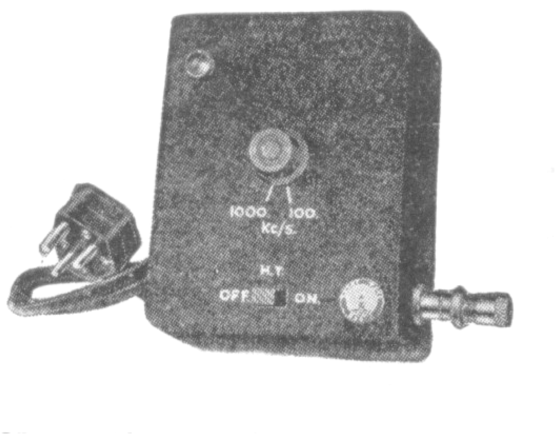


MODULE FOR ACTIVE AERIAL LP3382

Model 732 Mains Filter

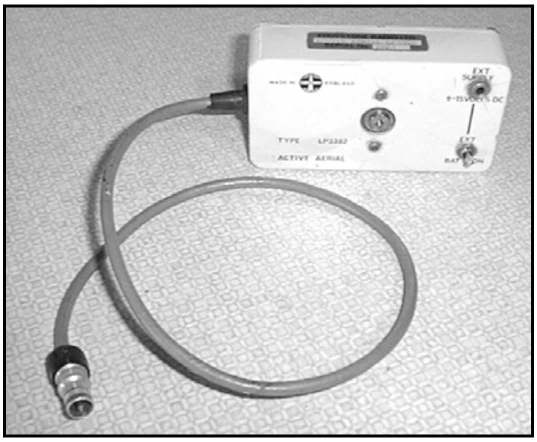
EDDYSTONE Model 732 Mains Filter

C.1948-58. Designed specially to reduce interference on board ship where the sparking at the dynamo commutator was notoriously ‘dirty’. Intended especially for the model 670 and 670A but suitable for all the earlier models with the non-polarised connector shown. Price in 1954: £2 15s. Rare. ♠



Crystal Calibrator Model 690

c.1949. Fitted into a diecast box (4½” x 3½” x 3”) and operates from 210/230V AC mains. The circuit uses ‘a miniature valve’ (unspecified). Harmonics from the 100 kc/s oscillator are usable up to 30 Mc/s and those from the 1000 kc/s oscillator up to 60 Mc/s. 0.01% tolerance. Price £12. Very rare. ♠



Eddystone Active Aerial Type LP3382

1975. Price unknown *(still searching for an advert!).* Combined aerial and aperiodic amplifier for use with any receiver having a low-impedance aerial input connection. It provides a useful voltage step-up over the range 10 kHz to 30 MHz. Internal PP3 battery or external supply (9-15V DC). The amplifier and battery are contained in a diecast metal box and a 21.5” telescopic rod is fitted *(missing on the picture!).* Uses one Field Effect Transistor (2N3819), one amplifier (BC214) and one emitter-follower (BF594).

Very rare. ♠

POST-SCRIPT

As a little afterthought I think I should mention the current status of the Eddystone ‘Lighthouse’ logos (as shown on the front cover of this work).

The 1925-65 version was essentially the “Stratton” logo and although invested in Marconi when the Company was sold, the new owner lost no time in adopting a more modern stylised version (1965-200?).

This version is currently licensed to Hammond Industries of Canada (with bases also in USA and UK) for use on Eddystone Diecast Boxes.

It is also licensed to SBS of Hastings for use with “Eddystone Broadcasting”. “Eddystone Radio” is now owned by “Ring Communications”. Confusing, isn’t it?

ACTIVE AERIALS

BY PETER LANKSHEAR

A typical active aerial consists of a whip or metal rod, about 1 metre long, coupled by means of a matching amplifier at its base, to a coaxial feeder. The aerial is mounted in an as clear and electrically quiet location as possible whilst the receiver can be located where convenient. Such a system has obvious domestic advantages, and can be very satisfactory for M.F. and lower H.F. DX reception.

The ultimate limitation on the ability of a receiving system to produce a readable signal is noise. Noise is picked up by the aerial and is also generated in electronic equipment. In a well-designed system, at frequencies below about 5MHz, atmospheric noise generated in the aerial is predominant. Ideally the only aerial noise will be atmospheric, producing a steady hiss, and, unlike man-made noise, this cannot be reduced.

Although an aerial should therefore be located as far as possible from man-made noise sources in an urban location this is not always practicable.

If atmospheric noise is stronger than a signal, no amount of amplification will improve reception. Nor will a bigger non-directional aerial improve the signal-to-noise ratio.

With modem equipment, there is little point in having an aerial longer than is necessary to raise the atmospheric noise to a level of 15 or 20 db above the receiver noise. At medium frequencies, this length for a vertical aerial is quite short, but there is a catch.

A short aerial cannot be connected directly to a conventional receiver or feeder without serious loading, resulting in a considerable loss of signal. Even if a receiver can operate successfully connected directly to a short aerial, the environment inside a building is unlikely to be electrically quiet, and the structure absorbs the electrostatic component of signals.

Unlike loop aerials, vertical aerials do not work well close to the ground or inside buildings.

One solution is to mount the short aerial in the clear and connect it to the receiver via a coaxial feeder, with an amplifier matching the aerial to the feeder.

At the receiver end of the feeder is a power supply and a means of directing the signal to the receiver .An active aerial amplifier presents a very high resistive load to the aerial and is matched to the coaxial feeder, which can, if required, be of considerable length.

Signals from the aerial are "actively" transferred to the feeder without attenuation. At the receiver end is a small coupling unit and power supply. DC power is fed up to the amplifier through the coaxial cable, with simple networks at each end separating RF and DC voltages.

Active aerial installations can be compact, tidy and efficient. They do, however, have imperfections. One problem is that they can generate their own signals!

Being completely untuned, they respond continuously to every signal in the spectrum. All amplifiers produce distortion and although a well-designed active aerial unit is very linear, strong local signals can produce harmonics and intermodulation.

Harmonics appear as multiples of a station's frequency. For example, harmonics of at transmission on 900kHz will appear on 1800, 2700, 3600, 4500kHz and so on. Intermodulation is the result of two transmissions beating together to produce combination signals, the most likely being sum and difference products.

For example, a 567kHz transmission could beat with a 900kHz signal to produce mixtures of both programmes on 1467kHz and 333kHz. Although active aerials will operate on the shortwave bands, they do not perform as well as larger conventional aerials.

Atmospheric noise steadily decreases with increase in frequency until the noise generated by the aerial amplifier and the receiver dominates. Only a larger aerial can swamp electronic noise and this creates the possibility of overloading discussed previously.

If you do not live near to a transmitter, and there are no high-powered transmissions in the district, it could be worthwhile experimenting with a longer aerial for better shortwave results.

Unfortunately, lightning flashes can damage aerial amplifiers, even with the power disconnected. If the aerial is accessible when it is not in use, it might be possible to earth it with a clip, or even with the aid of a relay. This should be sufficient protection for any lightning short of a direct hit.

Like all vertical aerials, active aerials are susceptible to rain and corona static, and, being non-directional, cannot discriminate against unwanted signals.

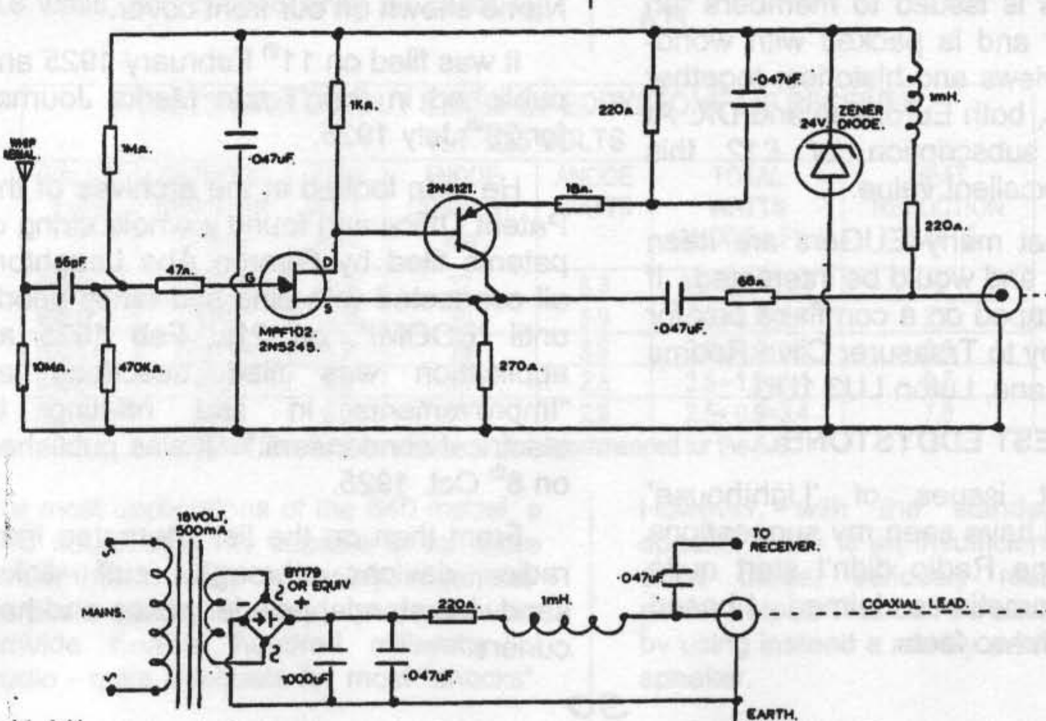
Despite these minor shortcomings, active aerials are justifiably popular, and the combination of a good loop and an active aerial can provide a potent medium wave DX system.

Below are details of a proven circuit which can be assembled readily by an experienced constructor. It consists of a field effect transistor to present a high impedance load to the aerial and a transistor to couple to the coaxial cable, with unity gain overall.

Construction is not critical and the amplifier should be mounted in a waterproof housing at the base of the aerial. (As well as being appropriate, an Eddystone box is ideal).

75 ohm TV feeder is suitable for the coaxial cable. The power supply transformer could be a small "plug pack" and the l000 mfd capacitor should have a rating in excess of 25 volts, whilst the other capacitors should be ceramic. Resistors can be 0.25 watt.

Note that the Zener diode is NOT used as a voltage regulator but as a surge protector. If it conducts, it could produce unwanted noise. The aerial can be a metal rod or similar, and it should be mounted clear of buildings or metalwork. ★



TUNABLE ACTIVE AERIAL

ANOTHER WEAPON IN THE EDDYSTONE USERS' ARMOURY

Have you ever seen a device so simple that you think it's not worth bothering about? Well here's one that's so *KISS** you'll wonder why you never had one years ago.

Wideband active aerials have had a bad press for three perfectly valid reasons. One, they're expensive to buy; two, they're complicated to make; three, they cause birdies and spuriosities from strong signals. So what's the answer? Make it tunable, that's what! OK, I can hear the groans already. "I haven't got enough hands to cope with the matching unit, the set tuning, and now active aerial tuning!" Forget the matching tuning, you don't need it. This machine will go straight into 400 ohms or 75 ohms without turning a hair

It was the culmination of a search for the best aerial for medium-wave DXing with my 680X. (And it can be used for HF as well.) I live ten miles from Droitwich with four MF/LF transmitters powering up to 500kW. My 275ft end fed can pull *4 volts* peak to peak from them. A decent preselector can have up to three controls. All too much. A giant tuned loop was constructed from a hula-hoop and multicore cable. It worked very well but it was suspended on a swivel from the shack ceiling. Turning it to null-out strong stations meant crouching in a corner. It had to shrink, but so did the DX, which wasn't all that strong to start with.

This was the answer:- A ferrite rod aerial with a mosfet amplifier and a bipolar impedance matcher. An aerial is salvaged from an old AM radio. All windings are removed except the medium-wave coil. A rotating unit is then constructed from plastic overflow pipe and a standard jack plug. It's easier to make than to describe, look at the picture. Plugged into a jack socket mounted vertically it rotates easily.

The unit uses a tuning condenser of about 500pf. This may be an old junk-box item, a miniature air-spaced twin-gang from a 'sixties set, or a midget solid dielectric. Each half is usually about 250pf so connect them in parallel. A 40673 (or similar) mosfet is a low noise, high impedance amplifier. Both gates are strapped and the source earthed. High impedance output from the drain is directly coupled to the base of a bipolar emitter-follower (BC109 or similar), giving high-to-low impedance with unity gain. The device is a lot simpler than the description. Just look at it; a tuned circuit, two transistors, two resistances and two condensers, there's nothing to it and it works every time!

It can be constructed 'ugly' style on a couple of stand-offs, or on a piece of five by six *Veroboard* (make it ten by ten if you've big fingers!), or a little etched board if you're into that sort of thing.

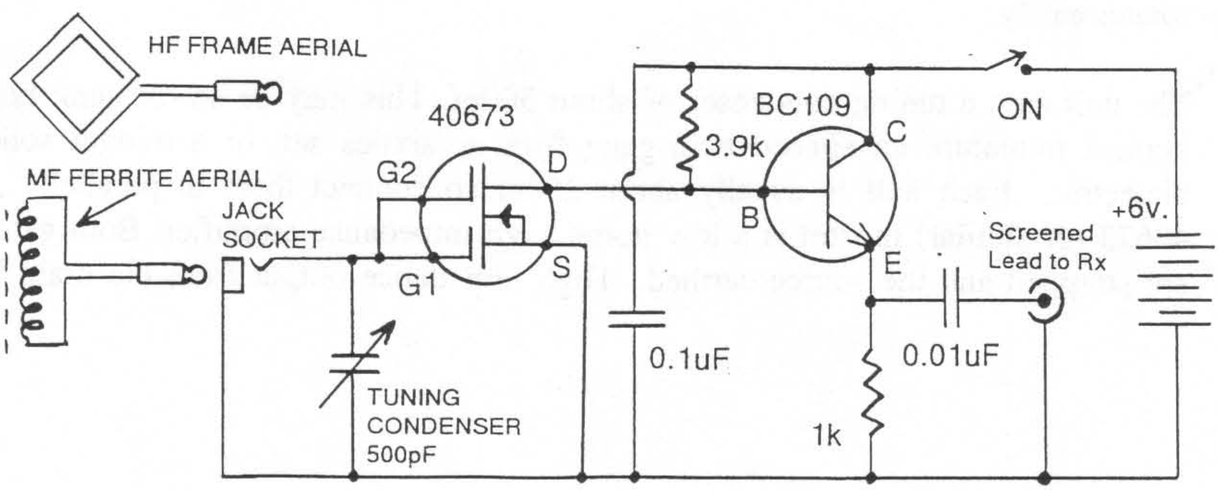
For HF use a mini frame aerial, about six inches square, with a few turns (one to ten) wound in slots in the corners of a plastic or thin plywood sheet. It's effective up to about 20 Megs. You could use one with a dozen or two turns instead of a ferrite rod for MW. For LF beacon-hunting wind some extra turns on a ferrite or fifty or so on a mini-frame. Plenty of room for enjoyable experiment here.

The current consumption is about 4mA, which means it's easy to run on dry cells and the whole lot can be fitted into an Eddystone die-cast box. The tuning condenser should have a fairly large knob on it, say 2 inches, for easy operation. It doesn't need a scale as long as you can remember which way is HF and which way is LF. (The air-spaced ones usually open to the left and the midget ones *vice versa.*) It takes a few minutes to learn to drive it; an S-meter makes it easier. Beware of tuning to a strong station off the desired frequency. The knack soon comes.

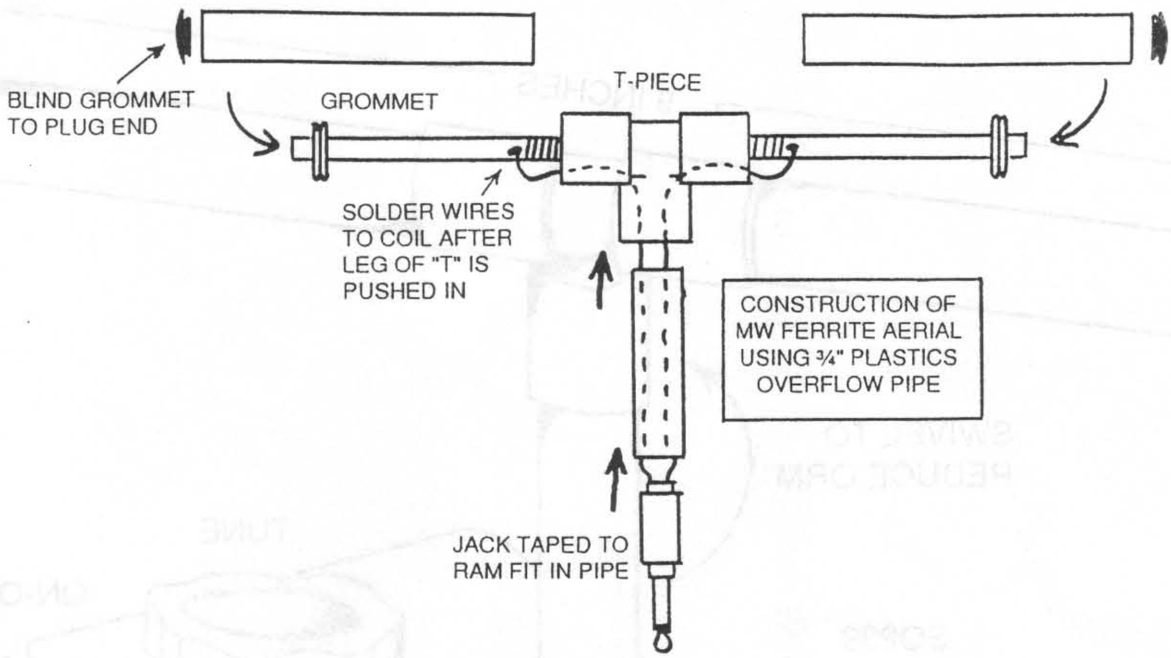
This little wonder has to be heard to be believed. OK, sometimes you'll get better results from your 50 foot vertical, sometimes you'll do better with your rhombic, but by golly, it'll lick the pants off most lesser things and it's the flat-dweller's salvation. . .

GRAEME G3GGL

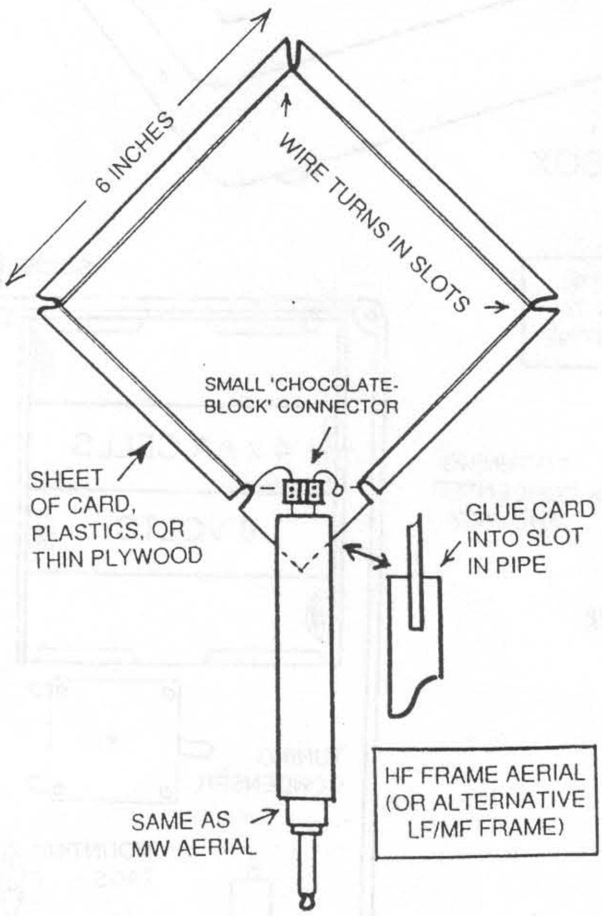
**KISS = Keep It Simple, Stupid!*



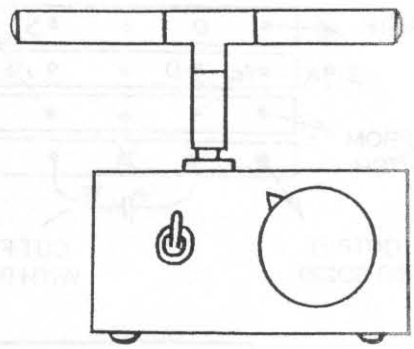
ACTIVE AERIAL
PLUG-IN ROTATING
RESONANT ELEMENTS



CONSTRUCTION OF MW FERRITE AERIAL USING ¾" PLASTICS OVERFLOW PIPE

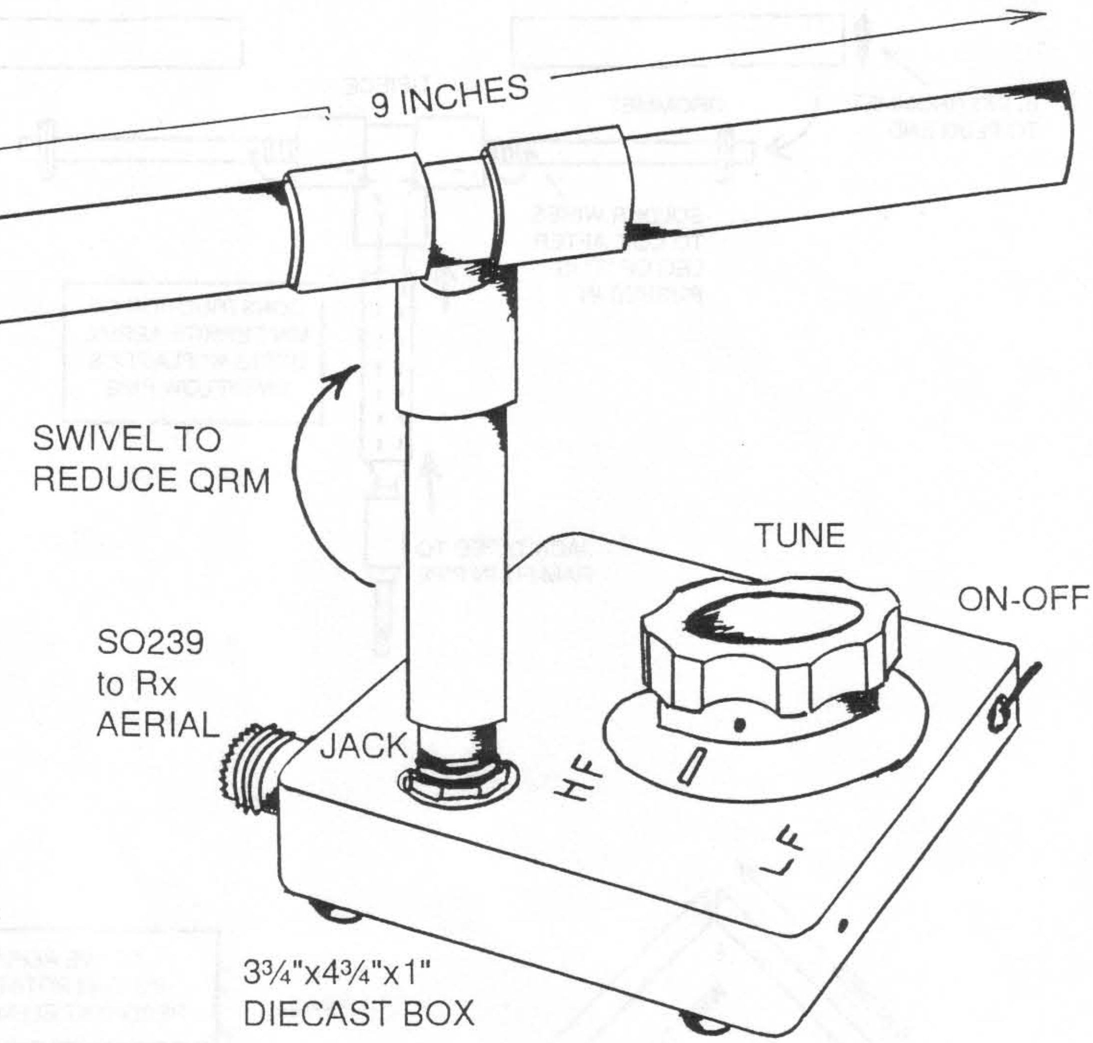


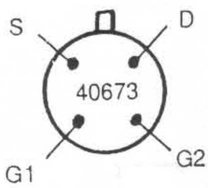
HF FRAME AERIAL (OR ALTERNATIVE LF/MF FRAME)

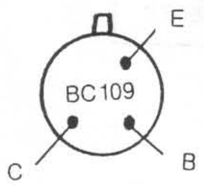


ALTERNATIVE PRESENTATION FOR LARGER TUNING CONDENSER AND/OR BATTERY

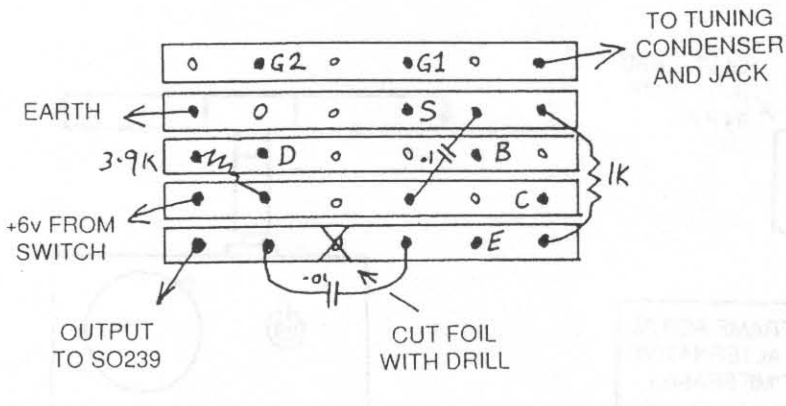
ACTIVE NARROW-BAND LOOP AERIAL



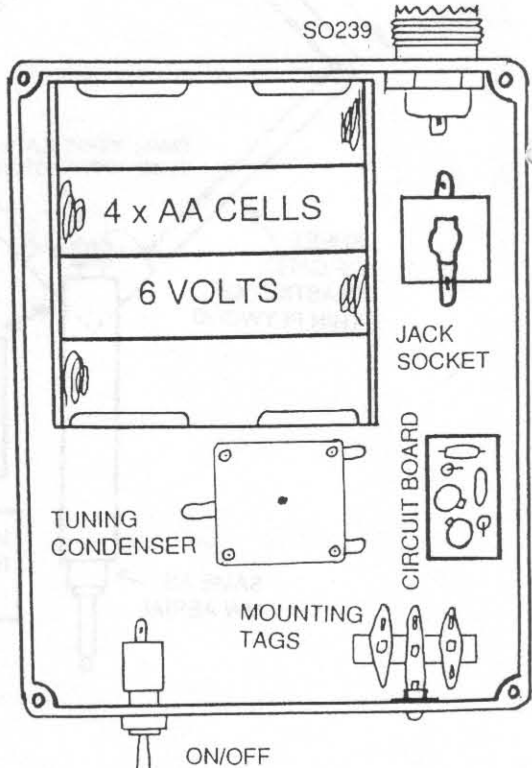




SPRAY THE CASE WITH CAR AEROSOL PAINT TO MATCH YOUR EDDYSTONE



SUGGESTED LAYOUT ON VEROBOARD, FROM FOIL SIDE. COMPONENTS ON OTHER SIDE



GRAEME G3GGL

In the last Issue of Lighthouse, Graeme Wormald described his experiences with a commercial D.S.P. (Digital Signal Processor) to reduce QRN (interference from TV sets, computers, etc.,), inserted between the receiver and the loudspeaker. Geoff Steedman, MØBGS now presents a description of the G4WMX noise reducer, working on an entirely different principle, together with options to acquire the circuit board, the kit, or the complete unit:-

The "Null Steerer"

By Geoff Steedman, MØBGS

I suppose it all started with my lovely "new" Marconi CR-100, although I didn't realise it at the time. It was obviously a bit special, as it had an extra red knob on its front panel, mysteriously labelled "R.I.S.". Surely 1943 was a bit before their time, if we are thinking of the investigating wing of the RA? By now, at least a dozen of you are yelling "Radar Interference Suppression" at the page. It used an extra aerial and an active balancing circuit to get rid of the awful buzz in your headphones from that new-fangled RDF.

Antiphase Mixing Technique

The principle of antiphase noise-cancelling has been used for some time in military and industrial environments to reduce audio background interference. Engine noise shifted 180 degrees and adaptively mixed into the pilot's headset and mic. system makes communication possible in the Harrier jump-jet.

Counterespionage boffins at MI5 were able to produce a crystal-clear recording of a spymaster's conversation in spite of loud music playing in a bugged limousine. They just recorded the car radio output and the bug mic. on separate tracks, and subtracted one from the other! If it had been totally quiet he probably wouldn't have said a word for fear of being overheard

His actual words are of course still subject to the 30-year rule but I can reveal exclusively to "Lighthouse" that he was talking about a gadget called "The Null Steerer" which apparently can do the impossible and get rid of the horrors of local QRM before it gets anywhere near the front end of a receiver; and if you believe that you'll find it easy to accept that I was engaged by a secret research group (on 40m !) to design a PCB for the unit as my contribution to the war on noise.

What the technique will and won't do at RF

The "Null Steerer" for RF local noise reduction has appeared in a number of guises, many using balanced coils and capacitors, but this simple, practical design by Cliff (G4 WMX) is easy to use and highly effective in suppressing local QRM from TV and PC timebase, switch-mode PSUs, local MW Broadcast, general residential "mush", and "spark" from motors & thermostats. The latter are more difficult because they rarely seem to last long enough to find a null in one go, despite being really irritating, but will succumb to patient tweaking. Note that a lot of signals (particularly on Top Band) which sound like TV timebase are really narrowband data signals and as such will not null out. There are a lot of odd noises out there these days, and this system only fixes the local nasties.

The circuit works well across the whole HF spectrum and into low VHF bands. It seems to be effective on MW/LW BC, but so far only to the extent that it will totally null out ALL the signals at the tuned frequency! No doubt experiments with type, length and orientation of aerials would yield some useful results on these bands; the vertical/horizontal system described below is less effective at these frequencies but has some interesting effects on the higher HF bands where angle of signal arrival is more likely to be a factor.

If you are plagued by multiple noise sources, you will find that their phase relationships and amplitudes are all different and ii will be more difficult to remove them all. It may be possible to broaden the null by increasing the balance control and finding a compromise setting on the phasing controls but in this case you will have to accept a reduction of noise rather than removal. Tests on multiple phasing networks/ cascaded steerers are so far at an early stage!

I also have a hare-brained scheme in mind to run two of my converted *1650/6* receivers in "parallel" on adjacent channels, taking the two signals out after the 1.4 MHz filters into the Null Steerer circuit and then back in to be detected in the SSB product detector and audio stage. Why on earth would I want to do that, you may well ask? Well, if we suppose that the wanted signal is on one frequency but not 3kHz up/down, and the awful crashing static is just about equal in phase and amplitude on both channels watch this (quiet) space? There's probably a major flaw in this theory, and I haven't tried it yet, so comments would be welcome. I suppose the essential thing is that both receivers should be more or less identical, which they are.

The Null-Steerer Circuit

The Null Steerer works in a similar way to the audio examples, but with received RF signals. Mixing is achieved using a pair of J-FETs with commoned outputs connected to the station receiver or TCVR. The "noise" input has an "un-bal" step-up ferrite transformer feeding a phasing network and the other has an amplitude controlled aerial input. When the Null Steerer is switched on, with no PTT applied, a relay operates to connect the main aerial through the noise cancelling circuit to the Rx. The relay drops back to a straight-through path when the units PTT input is grounded on transmit, or when powered down. The FETs are protected from any slight timing mismatch in TX c/o changeover by clamp diodes and filament lamps used as loads/fuses.

CHECK CORRECT OPERATION OF THE PTT RELAY SWITCHING CIRCUIT BEFORE CONNECTING THE AERIAL AND TRANSCEIVER THROUGH THE UNIT!

Installation

The normal mode of operation is to connect a "noise aerial" to the phase-controlled input, hopefully sited to receive more local noise than wanted signal; the main aerial is routed to the other input, where it will present wanted signal and the unwanted local noise, such as TV timebase, data, S/M power supplies etc. The middle connector is then connected to your transceiver antenna socket (Not to your linear amplifier!). A number of operators have had good results using the braid of an unused VHF coax. feeder as the noise aerial. This will usually be more or less vertical and is ideal for the purpose, as local noise is supposed to be mainly vertically polarised. If the source of the interference is known, position the noise aerial as near as possible to it without annoying the neighbours as much as they may be annoying your Rx. The unit requires a power supply of 12 volts at about 150 mA.

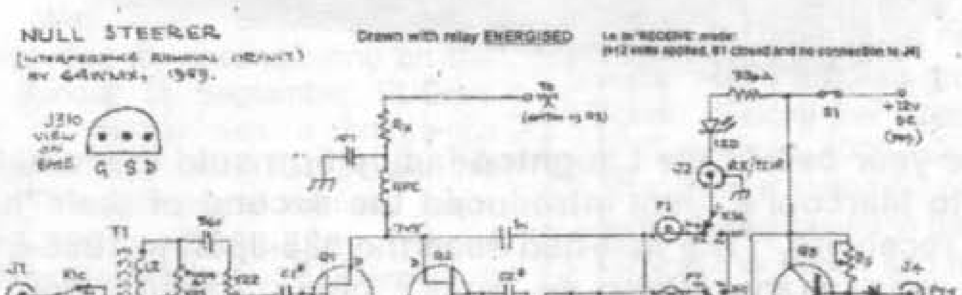
Operation

Start with all the controls at "12 o'clock". (i.e. with the flat on the potentiometer at "6 o'clock).

The A & B "phasing" controls VRI and VR2 are used to invert the noise signal, and the balance control VR3 allows the noise level to be matched, subtracting one signal from the other, plunging the noise into a very deep null and leaving an attenuated but clean wanted signal. The better the noise aerial is at picking up only noise, the more wanted signal will be left after mixing. The receiver AGC will usually take over and compensate once the awful interference has been removed, or manual gain can be wound up if you prefer. AGC will have been flattened by the overridng noise level, and you should hear the wanted signal emerge and take over control as the noise is reduced.

(SIGNAL + noise) - (noise + signal)
= SIGNAL - signal

It seems like magic until you have tried it a few times, after which you feel like a magician! The best bit is that the noise is removed BEFORE it gets into your nice sensitive receiver and messes up the AGC and metering circuits, and there's still nothing stopping you hanging a DSP filter on the speaker output and getting the best of both worlds, although you can probably guess what I think of noise reduction at that point, after the stable door has bolted! ♠



This project is offered to members in the following three forms:-

P.C.B. & diagrams. £7.50.

Or P.C.B. & Kit of parts: £25

Or built, boxed unit, (SO239 /BNC) £58

All plus P&P. Details from Geoff Steedman, MØBGS,
Tel: 0113-2696527
e-mail 100664.3417@compuserve.com