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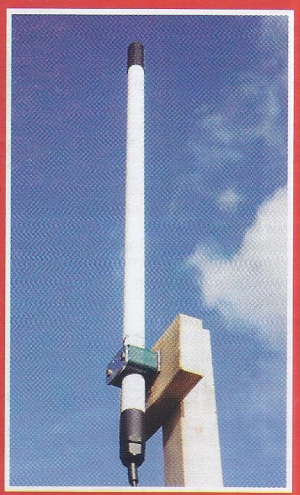
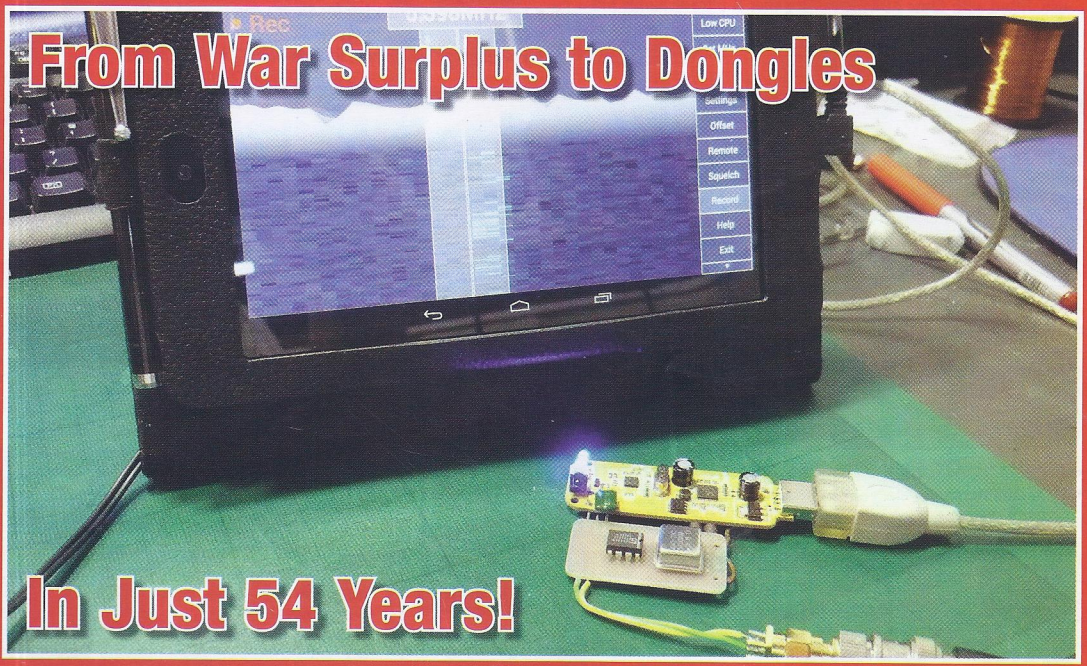
PRODUCT REVIEW

Cross Country Wireless Broadband Active Antenna





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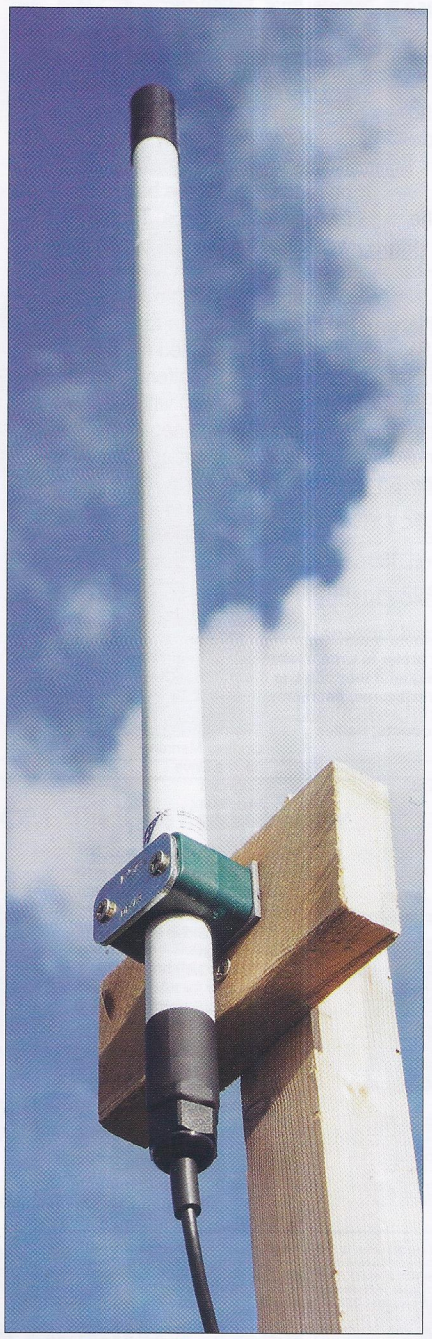
Mike Richards takes the opportunity to review the new Broadband Active Antenna from Cross Country Wireless, a UK-based company that has created a number of interesting antennas recently.



The Cross Country Wireless Broadband Active Antenna outdoor vertical unit.

■ Mike Richards reviews the Cross Country Wireless Broadband Active Antenna
■ All images supplied by the author

Cross Country Wireless Broadband Active Antenna

The Cross Country Wireless (CCW) Broadband Active Antenna is a compact, vertically mounted antenna with a very wide frequency range spanning 200kHz through to 1.4GHz. The antenna uses a powered base unit that has two isolated outputs, thus allowing two receivers to be used simultaneously.

In the Box

The outdoor vertical unit comprises a weather sealed 800mm plastic tube fitted with a 400mm flying lead terminated with an N-Type connector. The plastic tube contains the antenna element and an internal low-noise matching preamplifier. The outdoor vertical unit can be easily erected using the supplied mounting clamp.

Power to the outdoor vertical unit is supplied via a bias tee power feed unit that is built into the base unit. The Broadband Active Antenna requires a standard 12V DC power feed – this is not included because most users are likely to have a 12V supply in the shack. However, a 2.5mm coaxial power plug is included, which is helpful. Also in the box was a handy CD-ROM that contained manuals for all the CCW product range along with a useful selection of software.

Setting Up

The first task was to mount the outdoor vertical unit using the supplied Stauff clamp. Although not perhaps the normal way to mount an antenna, the Stauff clamp (**Fig. 1**) worked well and provided a firm fixing without creating the pressure points that would occur with a conventional antenna mounting kit. I initially opted to mount the outdoor vertical unit on a wooden mast, so the supplied wood screws replaced the bolts in the mount.

Although the outdoor vertical unit has a built-in masthead preamplifier, it is still worth using decent feeder cable because the losses at the high end of the frequency range can be significant. The choice of an N-Type connector for the external connection was a good idea because N-Type connectors provide the best impedance match and are standard use for most serious VHF/UHF work. The N-Type also offers much better weather protection than the more common BNC or UHF connectors. Nevertheless, I always go the extra mile and pack my antenna

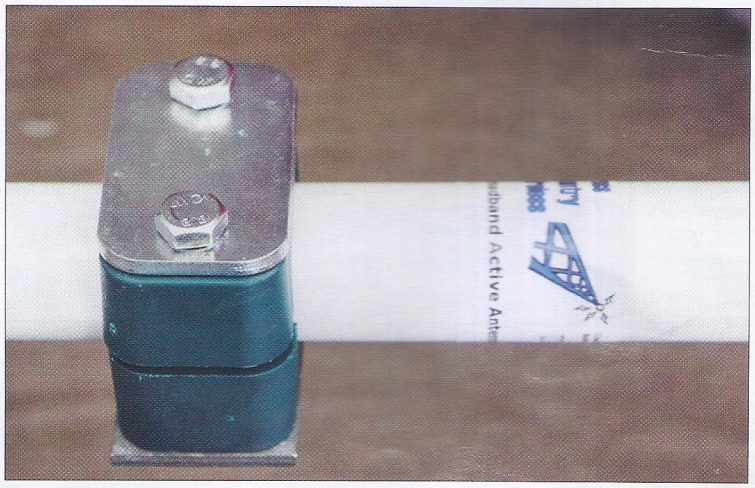


Fig. 1: The CCW Broadband Active Antenna mounting system.

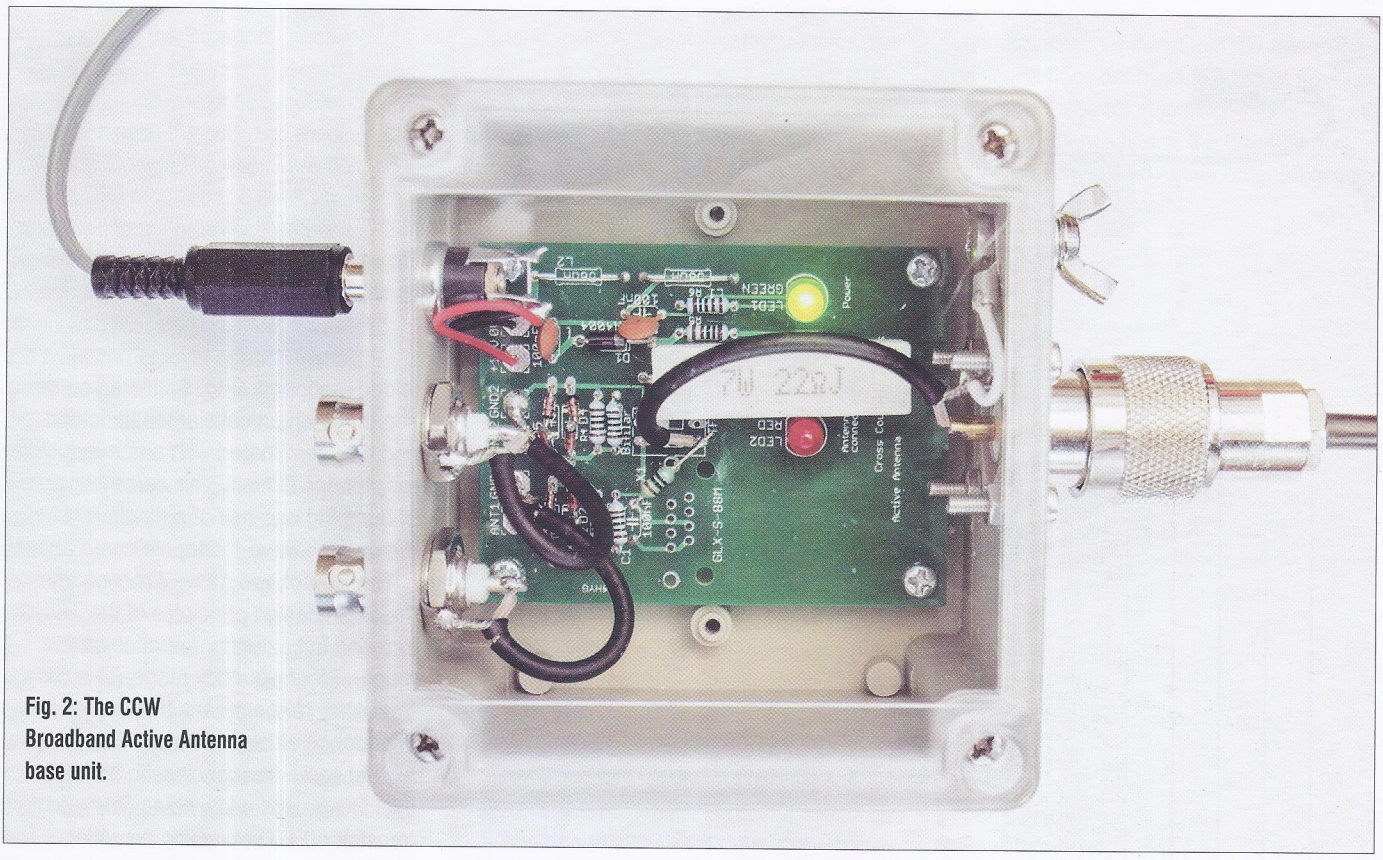


Fig. 2: The CCW Broadband Active Antenna base unit.

connections with Contralube 770 and a layer of self-amalgamating tape. There is not much that will get through that lot!

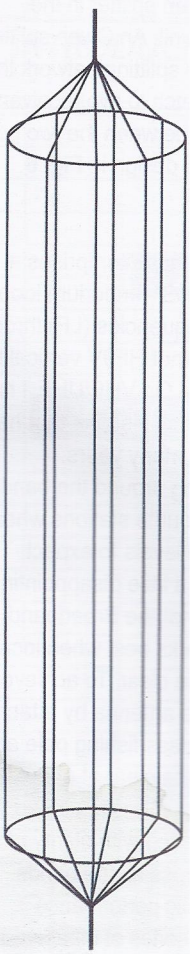


Fig. 3: Using a wire cage to emulate fat antenna wires.

Back in the shack, I positioned the CCW base unit (**Fig. 2**) next to the radios and connected it up to my 12V bench supply, where it drew 100mA. The signal output from the base unit employed standard 50Ω BNC connectors, which was ideal because N-Type patch leads can get a bit cumbersome in the shack. As you can see from the photograph, the base unit has a transparent top so you can see the two internal indicator light emitting diodes (LED). A green LED is used to indicate that power is connected and a red LED is used to monitor the power feed to the preamplifier in the outdoor vertical unit. During normal use, this glows a very dim red. However, if you have a short circuit on the feeder, it will glow brightly. No glow means the feeder is open circuit.

How it Works

The Broadband Active Antenna is derived from the terminated coaxial cage monopole (TC2M) that was designed by **Martin Ehrenfried G8JNJ**. The original design was published in *RadCom* and is well worth a read; it's available to download via the following link.

http://goo.gl/SQGMbH

This interesting design started with some experimentation with the thickness of the antenna elements. Martin's tests showed that the impedance peaks and troughs that occur when using a wire antenna over a wide frequency range tend to flatten-out if the diameter of the antenna wire is significantly increased. Evidently, it's not mechanically practical to have really fat antenna wires. However, the skin effect causes RF energy to flow in the surface of the conductor, so it is possible to use tubes rather than solid connectors. This was taken a step further in the Martin's design, where a cage of conductors was used to emulate a tube (**Fig. 3**).

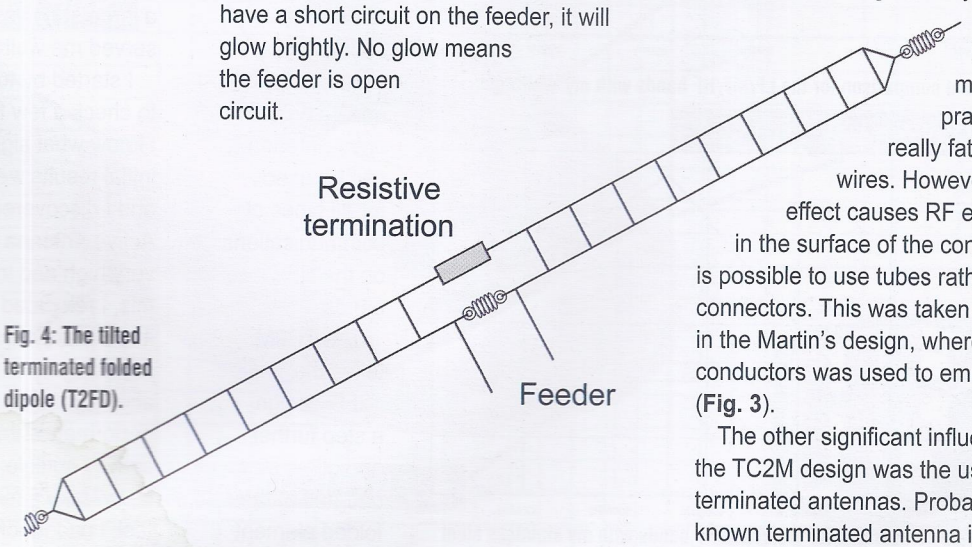
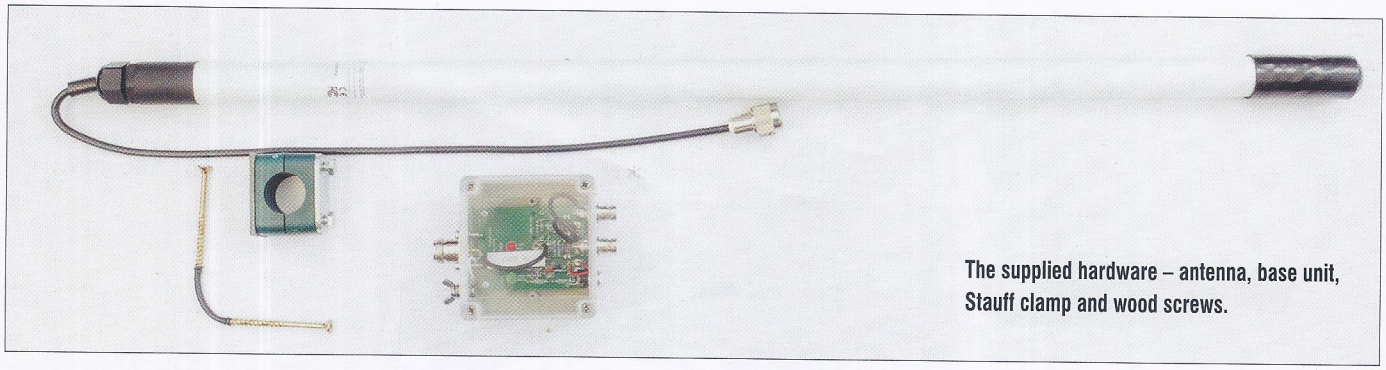


Fig. 4: The tilted terminated folded dipole (T2FD).

The other significant influence on the TC2M design was the use of terminated antennas. Probably the best-known terminated antenna is the tilted terminated folded dipole (T2FD) that



The supplied hardware – antenna, base unit, Stauff clamp and wood screws.

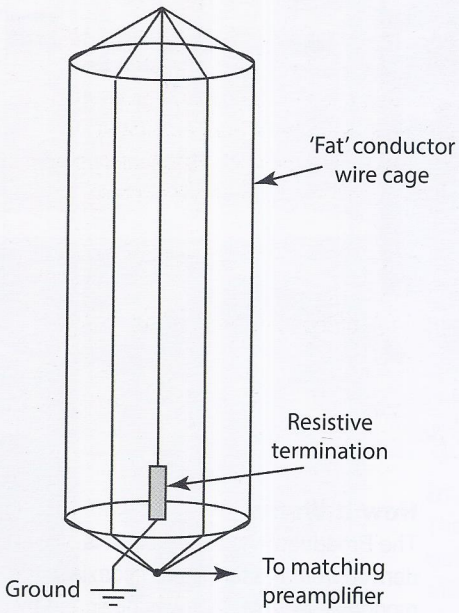


Fig. 5: A simplified illustration of a wideband folded monopole antenna.

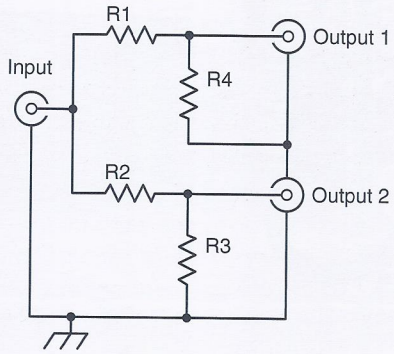


Fig. 6: A schematic for an Owen splitter.

was developed in the 1940s and used extensively by the US military. The T2FD antenna comprised a tilted folded dipole, with a resistive termination opposite the feed-point (**Fig. 4**). Although the resistive termination reduces the efficiency of the antenna, it also smooth's out the impedance variations to produce an antenna that can be used over a very wide frequency range without the need for an antenna matching unit. This is an obvious advantage for military operations because this simple, robust and easy to erect antenna can be used for all types of communications on the HF bands.

The TC2M takes the T2FD design a step further and eliminates one half of the folded element to produce a folded monopole (**Fig. 5**). Here you can see that the vertical element is folded and then terminated with a non-inductive resistor. Incidentally, this same principle of dumping one-half of a dipole is how the quarter-wave monopole came about.

The Broadband Active Antenna uses the basic design principles of the TC2M antenna but extends operation over a much wider frequency range. This wide frequency range means that the feed impedance of the antenna will be very high at some frequencies. To handle this, CCW uses a low noise field effect transistor (FET) matching amplifier. In addition to providing an impedance match to the antenna, the amplifier is set to provide a small gain to help compensate for the feeder loss.

The Broadband Active Antenna also includes a neat **Owen** splitter in the output of the base unit. An Owen splitter is a simple resistive splitting network that provides a good match to two receivers with good isolation between the two ports. I've shown a typical design in **Fig. 6**.

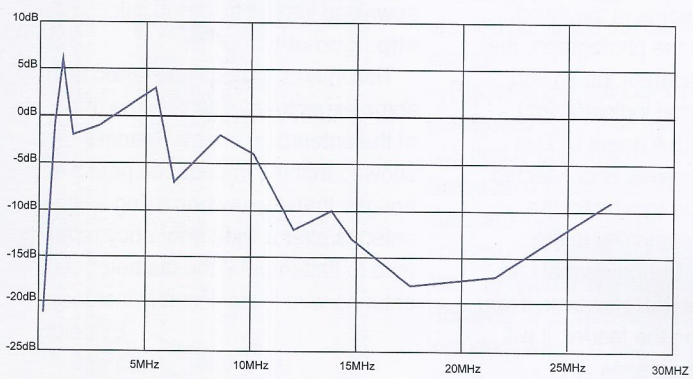


Fig. 7: Performance comparison for the LF/MF/HF bands with my Wellbrook ALA1530S+ Imperium antenna.

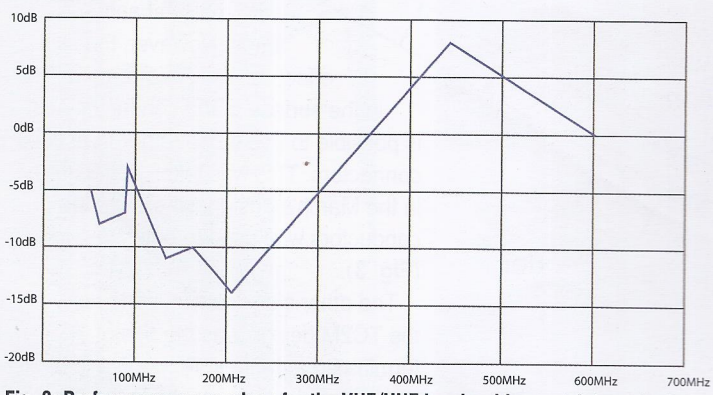


Fig. 8: Performance comparison for the VHF/UHF bands with my stainless steel discone antenna.

In Use

My standard setup here comprises a Wellbrook ALA1530S+ Imperium loop antenna for low frequencies (LF) through to HF, with a Butternut HF9V vertical for the amateur bands. On VHF/UHF, I have a large stainless steel discone that has served me well for many years.

I started by tuning around the bands to check a few favourite stations where I know what signal levels to expect. The initial results were a little disappointing and I discovered that the Broadband Active Antenna works best when located very high and in the clear. To achieve this, I relocated the antenna by attaching it to a sturdy fibreglass fishing pole and mounting it out in the clear at about 25ft above ground level. Once relocated, the performance improved with plenty of activity audible across all the bands.

To make a realistic performance test, I undertook a series of measured comparisons between my reference

antennas and the Broadband Active Antenna. The measurement setup was very simple and comprised a coaxial A/B switch, with the common feeding a FUNcube Dongle Pro+ software defined radio (SDR) receiver and the A input connected to my reference antenna, while the B input was connected to the Broadband Active Antenna. All tests were made with real signals. I first measured the peak carrier level of each test signal and then noted the noise floor, the difference being the simple signal to noise floor ratio. This was done for each antenna system using the A/B switch to select the appropriate antenna. All the results were entered into a spreadsheet to calculate the signal to noise floor and produce the comparison. I then graphed the difference between the signal to noise floor measurement of the test system against my reference system. The results are shown in **Figs. 7** and **8**. In these comparisons, positive results show where the Broadband Active Antenna was better that the reference and vice versa. As you can see the result was a mixed bag, with the Broadband Active Antenna doing well against the Wellbrook on medium frequencies. At the higher frequencies, the performance tailed-off but then returned towards the high end of the HF band. On VHF, the performance comparison was more difficult due to the lack of suitably consistent signals for measurement, combined with the fact that my reference discone does not have a flat response. Despite these shortcomings in the measurement system, the graph shows that the Broadband Active Antenna gave a good account of itself. ●

summary

The Cross Country Wireless Broadband Active Antenna is a very attractive and compact antenna that is a great way to get coverage of just about all the useful bands in a single unit. The antenna is unobtrusive, so is unlikely to attract any complaints and the performance was acceptable for such a wideband unit. It is very important to mount the antenna as high as possible and certainly well clear of any obstructions. The provision of dual, isolated outputs was useful because you could connect an aircraft communications addressing and reporting system (ACARS), automatic dependent surveillance – broadcast (ADS-B), marine automatic identification system (AIS) or other monitoring system on one port and use the other port for general purpose listening.

The Broadband Active antenna costs £161.95 and is available direct from Cross Country Wireless.

My thanks to Cross Country Wireless for the loan of the review model and their technical support.

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