Mike Richards looks at the Wellbrook ALA1530LN magnetic loop antenna

Wellbrook ALA1530LN

Mike Richards looks at a new version of the well-respected ALA1530 magnetic loop antenna that has undergone a significant design change to improve its signal to noise ratio on the long, medium and short wave bands.

Wellbrook Communications has been undertaking some major improvements to its, now famous, active loop antennas and this time I take a close look at the new ALA1530LN low noise variant. The ALA1530LN covers 50kHz to 30MHz and, like its predecessors, utilises a 1m diameter aluminium loop.

The Wellbrook ALA1530LN low noise magnetic loop antenna.

Fig. 1: The ALA1530LN matching amplifier.

Development

The Wellbrook ALA1530S+ Imperium antenna I reviewed back in August 2013 (*Wellbrook ALA1530S+ Imperium*, *RadioUser*, August 2013: 8-10) was the first of the new series of Wellbrook loop antennas and delivered a useful performance improvement while keeping all the key benefits of the previous compact loop design. The LN suffix to the model reviewed this time indicates a low noise variant and is the result of a complete rethink of the antenna's electronics. At the heart of the changes is the use of eight high gain junction field effect transistors (JFET) connected in parallel push-pull with a bipolar cascade stage to extend the bandwidth. This combination is used with a transformer feedback system to produce a very low noise, low impedance amplifier. Because JFETs are quieter than bipolar transistors at low frequencies, the new ALA1530LN claims to offer up to 10dB lower noise at these lower frequencies. The transformer feedback of the amplifier design is used to provide an impedance that rises with frequency to match the characteristics of the loop element. As a result, the loop offers extended frequency coverage without any need for manual tuning.

The mechanical design of the new antenna has also been improved by separating the antenna electronics from the loop. In all previous designs, the loop and matching amplifier were permanently connected and the electronics were 'potted' in a resin compound. This systems has worked well and produced a very robust design. My original Wellbrook loop receives very little maintenance and is still working more than 20 years after installation! While the fully integrated design has a great track record, in cases where physical damage did occur, the only option was to replace the entire loop. The new design separates the matching amplifier electronics from the loop as you can see in **Fig. 1.** The new matching amplifier module is mounted directly on the loop but is easily replaced in the event of damage. The electrical connections to the loop use externally rated, silicone insulated, flying leads with crimp connectors.

Erecting the Antenna

As with most antennas, the best location for the ALA1530LN is up in the clear and well away from sources of electrical interference. However, one of the useful characteristics of the Wellbrook loop is its sensitivity to the magnetic component of radio waves, combined with an inherent

rejection of the electric field. This makes the antenna less susceptible to locally radiated noise and it often produces good results in locations where other antennas might struggle.

I usually mount my Wellbrook loops on a short mast about 3m above the ground. If you are unable to do that, you will find that the ALA1530LN will also work remarkably well at ground level.

The ALA1530LN is supplied with mounting hardware in the form of a short stub mast that fixes to the bottom of the loop, **Fig. 2**. The stub mast was 19mm in diameter and I fixed this to a short wooden mast using a couple of conduit fixing clips.

Power for the ALA1530LN is supplied via the antenna's coaxial feeder cable. Hence, I only needed a single cable feed to the antenna.

The RF connector on the amplifier is a standard BNC socket and a black PVC protection boot is supplied with the antenna. To make the most of the antenna, particularly if you have a long feeder run, you should use a low loss coaxial cable. The commonly available large diameter transmitting type cables are a bit cumbersome for a receive only system. However, the much smaller RG-8X foam insulated, low loss cable is now available at reasonable prices from many suppliers. I used RG-8X for the review and purchased matching BNC connectors to ensure a good fit. For added weatherproofing, I packed the external connector and the loop connections with Contralube 770 contact gel. This excellent compound was originally designed to protect vehicle electronics but can be used to protect any contact from moisture and corrosion. Its dielectric strength is good for 10kV and it has a proven track record in RF and satellite applications.

Back in the shack, the ALA1530LN is supplied with a compact antenna interface base unit that houses the power feed control electronics along with the bias tee. Mixing the power and RF down a single cable is common practice. I show a simplified example of how this works in **Fig. 3**. In its simplest form, a bias tee comprises a radio frequency (RF) choke inductor and a capacitor. The easy way to understand its operation is to assume that an inductor has zero DC resistance but opposes the flow of RF, whereas the capacitor does the opposite and passes RF but has an infinitely high DC resistance. The flow of RF and DC is shown by the coloured arrows.

Fig. 2: The 19mm diameter stub mast.

The ALA1530LN's stub mast mounted on a wooden post using a couple of conduit fixing clips.

The ALA1530LN's antenna interface base unit.

The ALA1530LN's base unit has a 50Ω BNC socket for the coaxial cable feed from the antenna and a coaxial cable flying lead with another BNC connector for the RF output to the receiver. The supplied power supply is a 12V, low noise, analogue (not switch-mode) unit. Avoiding a switch-mode supply is good practice because they have the potential to ruin the low noise benefits of the antenna.

Performance

Wellbrook antennas have a formidable reputation and are in use throughout the world by professionals and hobby radio enthusiasts alike. Because a full review of the ALA1530S+ Imperium was published in the August 2013 issue of *RadioUser*, I won't cover that ground again. However, **Fig. 4** shows a graph that demonstrates the improvement you could expect to see if you upgraded from a simple 10m random wire to the previously reviewed ALA1530S+.

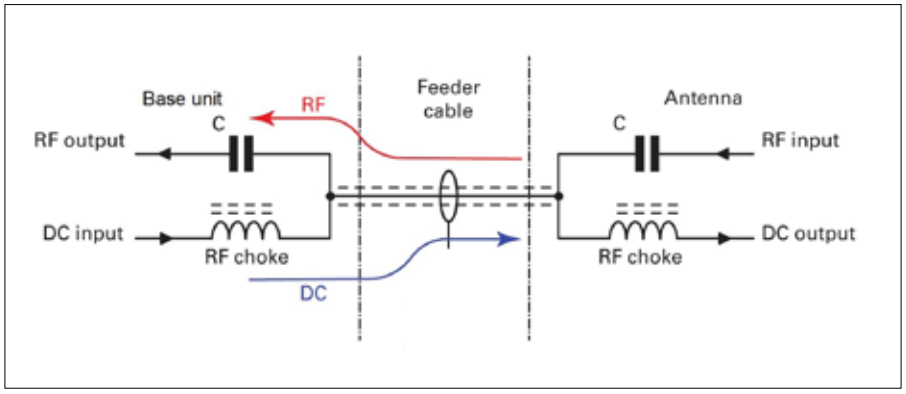

Fig. 3: How both power and RF can be transferred using a single length of feeder.

In this review, I focus on the performance changes provided by the new ALA1530LN over the ALA1530S+. For the performance tests, both antennas were mounted at the same height but about 10m apart to minimise any interaction. I also rotated the antennas, so they were orientated in the same direction during the comparison tests.

I ran the tests with a number of receive systems including the excellent SunSDR2 PRO transceiver, which has a very good 16-bit, direct sampling receiver. The measurement technique employed the same method I used for other antenna comparisons in *RadioUser*.

For those not familiar with this approach, here's a brief run-through. I start by identifying a number of radio signals spread throughout the coverage of the test antenna. For each station, I measure and record the amplitude of the signal and the amplitude of the noise immediately adjacent to the signal. These two values are used to provide a signal to noise ratio (SNR) in decibels (dB) between the wanted signal and the adjacent noise. I then repeat the measurement with the reference antenna. The difference between the two SNR figures indicates which antenna delivers the best SNR at the test frequency. In the comparison graphs, a positive value means the test antenna is better. I repeat the tests throughout the frequency range of the antenna and produce a graph to show the differences.

The result of my comparison between the ALA1530S+ Imperium and the new low noise ALA1530LN antenna is shown in **Fig. 5.** As you can see, there was a clearly measurable difference between the two antennas. I was expecting the low noise version to deliver a better SNR at the lower frequencies but to fall slightly behind the ALA1530S+ at the higher frequencies. As you can see from the graph in Fig. 5, there was indeed a dip between 9 and 17MHz. Nevertheless, the SNR performance of the LN variant improved again and was consistently 3 to 4dB better than the ALA1530S+ for the remainder of the HF band. This was an impressive result and makes the low noise version a very attractive proposition.

The other noteworthy point with the ALA1530LN is its lower output level. For most of us, that is a good thing because the standard ALA1530S+ Imperium delivers signal levels that can be too high for many of the mid to lower priced software defined radio (SDR) receivers. The new antenna is much kinder to your front-end. If you do need the higher output level of the ALA1530S+ Imperium, this is available with the Pro version of the ALA1530LN.

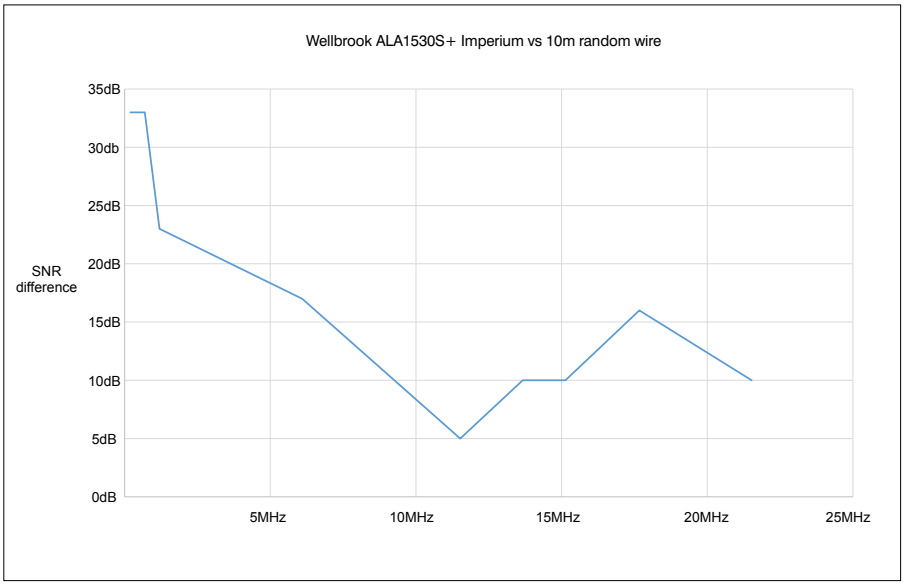

Fig. 4: A graph showing the performance of the ALA1530S+ Imperium versus a 10m random wire antenna.

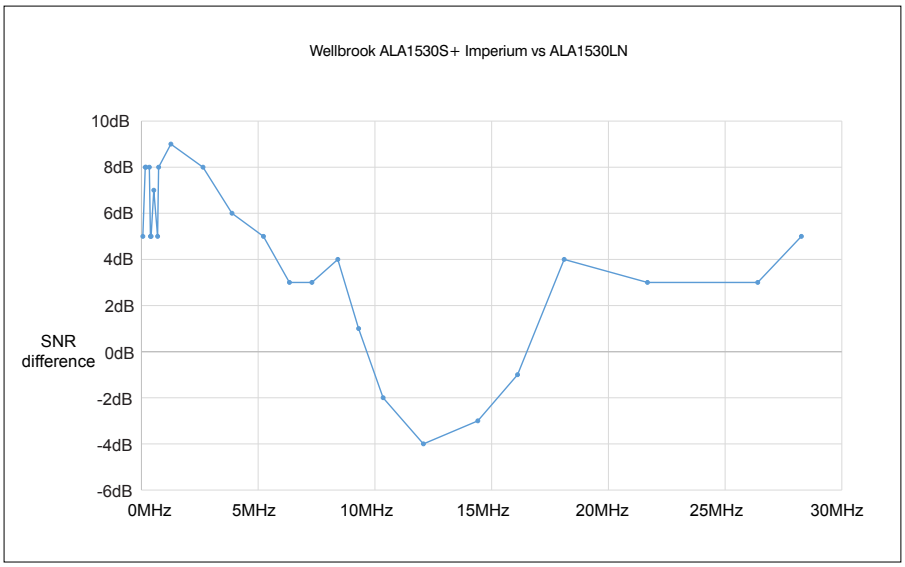

Fig. 5: A graph showing the performance of the ALA1530LN versus my ALA1530S+ Imperium antenna.

summary

The new Wellbrook ALA1530LN continues the excellent line of antennas from Wellbrook Communications and does exactly what it claims, giving you better SNR ratios, particularly in the low and medium frequency (LF/MF) ranges. For fans of non-directional beacons (NDB) and others with an interest in the MF and LF bands, the ALA1530LN looks to be an excellent choice. The antenna's small size and fine performance also make the ALA1530LN a particularly attractive proposition for those with limited space for antennas.

At the time of writing, the ALA1530LN cost £240 and the cost of shipping in the UK was £19.20 (both figures include VAT at 20 per cent).

My thanks to Wellbrook Communications for the loan of the review model.

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