The Wellbrook Phased Array is an advanced low noise loop antenna system designed for optimum MW reception. This Antenna system is only Broadband Phased Array to offer a uni-directional pattern similar to the Beverage, over 360 degrees with electronic Null Steering. The design is the result of several years research by Wellbrook’s owner and chief design engineer Andrew H. Ikin. Trials of this new array have been performed in the US by experienced MW Dxers using the phasing system with high performance Active Vertical and Active Loop antennas. These trials demonstrated that the Phased Array equipped with elements made from ALA 100 Large Aperture triangular Loop Antennas (one of the world's best active antennas) provided much lower noise and improved side rejection than an identical array equipped with Active Vertical antenna elements. This finding was particularly important for DXers living in urban areas. Moreover, comparative listening tests indicated that the Phased Array was equally as sensitive and directional as an 800ft Beverage, with the added advantage of delivering a much higher rear and side rejection and deep null steering!

Phased Array Design: The Phased Array provides a reversible uni-directional reception pattern similar to a Beverage with the added ability for the user to steer up to 50dB nulls around the back of the array. The Phased Array consists of a Control Unit and two ALA100 Loop antennas. Each loop is triangular with just one support pole. The Phased Array can be expanded to use four ALA100 loop antennas to provide 360 degree coverage. The Control Unit combines the output of the two antennas using a technique known as “Delay line Anti-phasing” i.e. the antennas are combined in anti-phase plus a variable time delay equal to between 40% and 100% of the spacing of the antennas. This phasing technique provides a uni-directional reception pattern over a very wide bandwidth with only a minor adjustment to the controls. This has a considerable advantage over the majority other phasing systems which require constant adjustment even with small frequency changes. The ALA100 Loops are powered from the Control unit via the antenna feeders.

The Phased Array Control Unit can also phase two ALA100 loop antennas to provide bi-directional pattern with both deep side and high angle nulls just by simple adjustment of the phase control.

The Phased Array Control Unit has an amplitude Balance control plus a Unique Continuously Variable Delay-line for the Phase control, this lets the user optimise the Front to Back ratio and for Null steering. The Control unit has two channels; Phase channel and an Amplitude channel. The Phase channel has the variable delay line and a very high dynamic range amplifier. The Amplitude channel provides the variable gain and also has a very high dynamic range amplifier. Both channels are buffered and are fed to the receiver output via a power combiner. A significant feature of the Phased Array, is complete antenna and receiver isolation. This prevents current from one antenna feeding back to the other antenna or changes in the receiver input impedance degrading the array performance. Most other antenna phased arrays don’t provide any significant antenna/receiver isolation!

The Control Unit is housed in a grey powder coated die-cast enclosure, 6.75” x 4.75” x 2.1” (117x112x56mm).

**PHASED ARRAY KEY FEATURES**

- Uni-directional pattern similar to the Beverage
- High Front to Back ratio
- Up to 50dB null steering
- World class ALA100 loop antennas
- Lower noise than Active Whip arrays
- 360° with 4 Loops
- Simple to erect (no control Lines)
- Min. real-estate; 40m ant. spacing
- High dynamic range amplifiers
- IOP3 +42dBm; IOP2 +75dBm
- Very high antenna isolation
- 12Volt DC power, ideal for Dxpeditions
- Control Unit is compatible with the K9AY Phased Array

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PhasedArray.doc

Design/specification subject to change without notice.
The Phased Array 2 Antenna version is supplied complete with the Control Unit, 2 ALA100 Head Amplifiers. Additional ALA100s can be purchased to upgrade to 4 loop array.

The Phased Array 4 Antenna version is supplied complete with the Control Unit, 4 ALA100 Head Amplifiers.

The user must provide: The Antenna support poles and the Loop antenna wire, the RG58c feeder cable and a 12v 500mA regulated power supply.

The Phased Array is very simple to use, with just 3 controls; Direction, Phase and Balance. The Antenna input and Receiver are 5 BNC and a standard 2.1mm dc connector for the 12 Volt power supply.

**Phased Array Operation:** Connect the Receiver the loop antenna feeders to the respective Control Unit connectors. Also connect the 12volt power supply to the Control Unit. The Phase and Balance control should be set to the middle position.

Tune the receiver to a station (mid band) with a steady signal that is approx. in line with loops selected by the Direction switch. Then change the direction switch for the same loop pair. The signal should be lower by several dB with Direction switch set to the 180 degrees from the station. Then adjust the Balance and the Phase controls to increase the null. Over the MW band the Front to Back ratio should be approx. 30dB, tweaking the controls should allow for station nulling of up to 50 dB. However, some experimentation with all the controls may be required to obtain the best null especially when the signals are fading.

Maximum F/B will normally be +/- 30 degrees off the back of the loops.

**Antenna Positioning:** The basic 2 loop system requires the loops to be spaced at 40m only. The loops are positioned in line relative to each other i.e. one loop is positioned North and the other loop is placed 40m to the South. Where 4 loop system is deployed the other 2 loops are position as above but in East and West direction. The loop antennas should be positioned as far as possible from buildings, and sources of interference In most cases satisfactory results will be obtained by mounting the antennas close to ground level and at least 20m away from buildings.

A triangular wire loop is recommended for the ALA100 Large Aperture antenna. The antenna loop is approx. 7m high with a 7m base. The ALA100 head is connected at the centre of the base wire. A user-provided 7m high pole supports the antenna loop wire. Two 1m user-provided poles, support the ends of the base wire. The base wire should be approx. 0.5 metre off the ground.

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**Diagram**

![Diagram of Phased Array](image)
WELLBROOK
PHASED ARRAY
500kHz to 2MHz

Vertical and Broadside Null
2 loops at 180 degrees
0 Phase setting
WELLBROOK
PHASED ARRAY
500kHz to 2MHz

Uni-direction
2 loops at 138 degrees
Mid Phase setting
WELLBROOK
PHASED ARRAY
500kHz to 2MHz

Uni-direction, max groundwave null
2 loops at 128 degrees
Mid Phase setting