Induction Loop Array Systems

AMPETRONIC
Listen to the difference

An induction loop array system provides a solution where a simple loop around the room perimeter will not work. Arrays are the standard solution for buildings with metal structure or reinforcements, or for covering large areas. Arrays can also dramatically decrease the 'spill' of the magnetic signal outside of the room, allowing induction loops to be installed in adjacent rooms, and providing an improved level of confidentiality. Arrays can also be used to change the way two loops interfere with each other, providing ways of solving even the most complex installation problems. Used for:

Areas with metal structures:

- Metal tiled flooring
- Reinforced concrete floors
- Metal suspended ceilings
- Retractable seating

Reducing spill in:

- Boardrooms
- Council chambers
- Classrooms / lecture halls
- Courtrooms

Large systems e.g.:

- Airport terminals
- Shopping centres
- Exhibition halls
- Theatres

Benefits of an Ampetronic Array System

- Even field strength and frequency response in the presence of metal structures
- Even field strength over very large areas
- Can reduce spill to 1-2m from the loop edge for adjacent rooms or confidentiality
- Minimises interactions between complex systems such as theatres with balconies

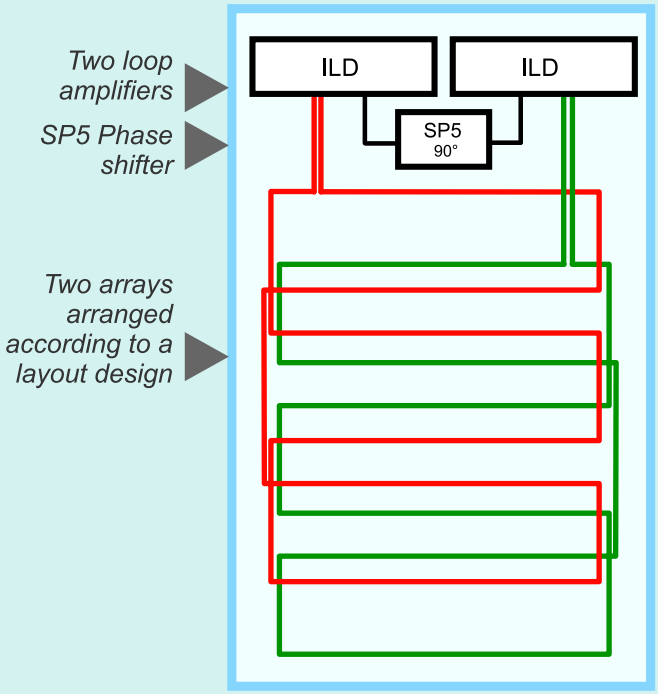
What is an Array System?

An Array System consists of two different conductive arrays of cable arranged in a pattern, with the two arrays running the same signal but phase shifted by 90 degrees. This prevents interaction between the two magnetic field patterns allowing creation of very even field coverage with a good loop design.

An Array System comprises:

- Two loop amplifiers
- A phase shifter (SP5)
- An array layout design
- Two arrays of cable or conductive tape

Typical equipment is shown in the picture above, and a schematic for an array system is shown on the right.



Uses for an Array System

1. Compensating for metal structures

Metal present in a building's structure affects an induction loop magnetic field in three ways:

- **Reduced signal strength**
- **Poor frequency response, causing loss of higher frequencies**
- **Variation in field strength and frequency response over the area**

The larger the loop, the greater the effect. Perimeter loops can suffer dramatic loss of signal strength, and high frequencies can be lost all together, resulting in a total loss of intelligibility. Even with a mild loss, intelligibility can be poor and often a low signal 'hole' is found in the middle of the loop area.

These issues are all corrected by use of an Ampetronic Array System. The narrow loops in the array are much less susceptible to the effects of metal. The phase shift allows two arrays to be superimposed achieving even field strength. Metal losses are hard to predict. For certainty, we recommend a **site survey** which you can carry out following our instructions, or we can carry out on your behalf.

Magnetic field patterns from perimeter loops and arrays

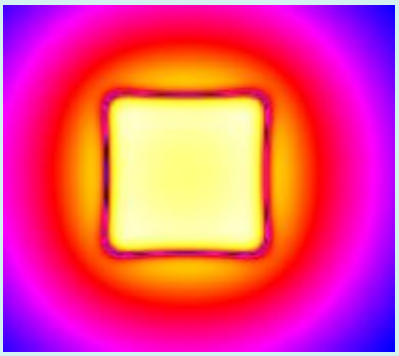


Figure 1: the pattern of spill from a square perimeter loop with no metal loss (yellow = good signal, black =<- 40dB). Field spills over 3 times the loop width.

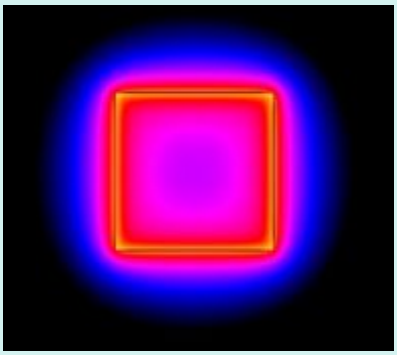


Figure 2: a typical pattern for a perimeter loop with metal loss, with a low signal 'hole' in the centre of the loop. This is similar to the pattern for a very large area perimeter loop.

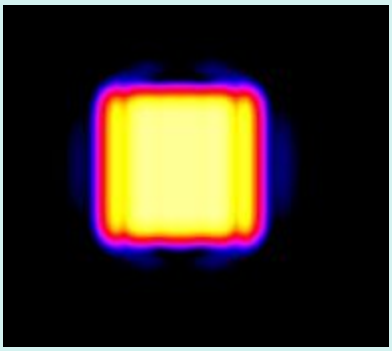


Figure 3: the same area - with metal present - using an Array System. Spill is very well controlled and the signal is even across the loop area.

2. Controlling spill

A perimeter loop 'spills' magnetic field outside of the loop area by 3 or more times the loop width and similar above and below the loop. If systems are to be used independently in adjacent spaces, or if confidential discussions are taking place this 'spill' must be reduced.

Ampetronic Array Systems all exhibit much lower spill than a perimeter loop. Ampetronic can also provide designs for an 'Ultra-Low Spill' system, a special layout which controls the field with great precision. Ultra-Low Spill designs can reduced horizontal spill by 40dB within 1.5m of the loop edge. Ampetronic's sophisticated design software accurately predicts system performance.

3. Interfering loops, large systems etc.

There are many other environments where Array Systems can provide a benefit, such as providing even coverage over very large coverage areas, or preventing interactions between loops such as between loops in the stalls and in the balcony of a theatre. An Array System gives the designer much greater control over field distribution, allowing standard-compliant performance in the most difficult installation environments.

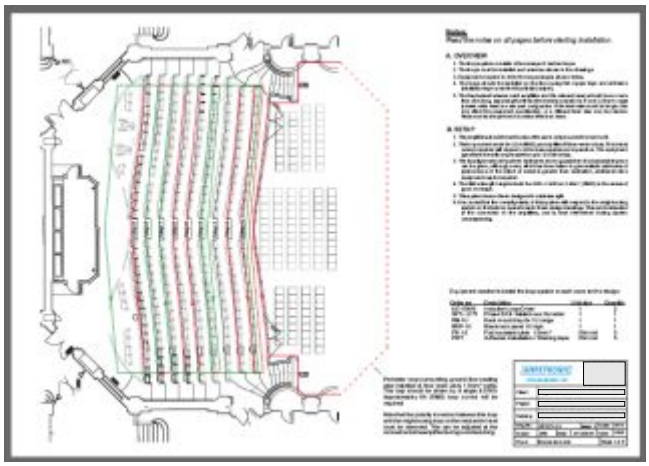
Loop designs for Array Systems

To purchase and use an Array System you *must* have a suitable loop layout design for the two cable arrays. If you provide a design, Ampetronic will check it for free, otherwise Ampetronic or your distributor can supply a design for a nominal charge.

You can carry out your own loop design following Ampetronic guidance (please ask for our loop design guidance notes).

An array needs a loop design specific to the area to be installed. It is very important that this loop design takes into consideration:

- The intended use of the system
- Structural metalwork near to the system
- Requirements for low spill performance
- Dimensions and layout of the area
- Location for installation of the loop cables



Above: Sample of a general layout drawing from a typical Ampetronic design, with extensive installation notes and detailed layout information

Cable installation

Array Systems usually require installation across, within or under the floor surface, or within a ceiling void. It is important to identify the best location for the installation before completing a loop design.

Ampetronic recommends three types of cable for the loop arrays:

Tri-rated copper cable

Suitable for running along skirting boards, inside conduit, ceiling cavities or behind cosmetic features. Gauges commonly used are 1.0 to 2.5mm^2.

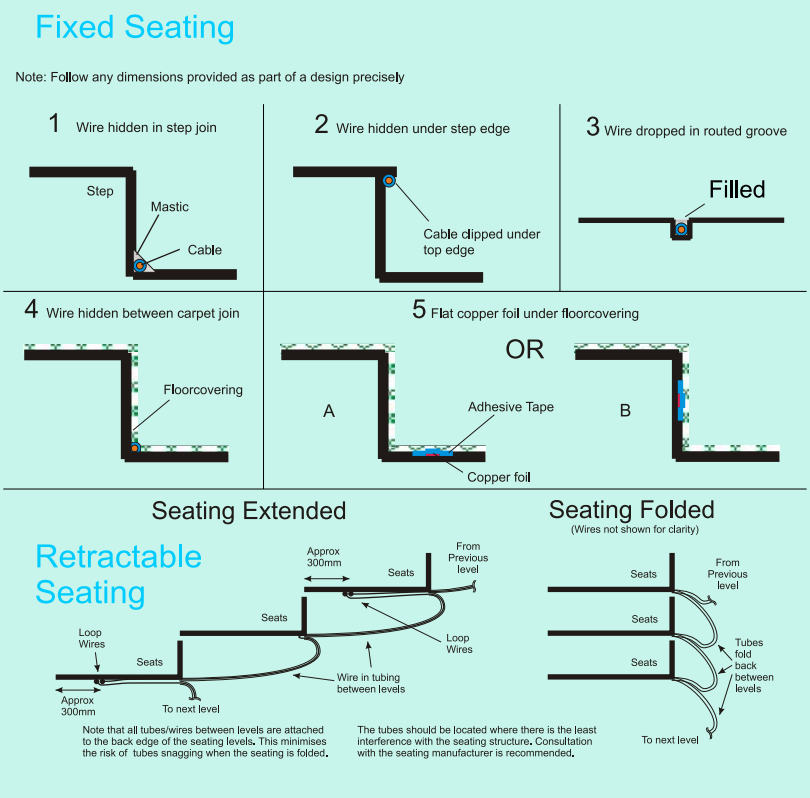
Copper foil tape (FB1.8)

Very flat tape designed for running underneath floor coverings e.g. carpet. Very low impedance is ideal for long cable runs and gets more from the amplifier. Supplied by Ampetronic, including plastic conduit and warning tape for installation.

Direct burial cable (DBC)

Specialist cable resistant to degradation from concrete - suitable for direct burial in screed, underground and outside use. Supplied by Ampetronic.

Ampetronic can provide guidance on installation possibilities. You can also consult our guides on designing induction loops, for example the following are suggestions for dealing with stepped areas such as theatre seating:



Array System selection

Array System product codes

Standard	With rackmount	Amplifers
A122	A122-RM	2 x ILD122
A300	A300-RM	2 x ILD300
A500	A500-RM	2 x ILD500
A1000G	A1000G-RM	2 x ILD1000G
Combiners	multiple ILD1000Gs plus ILC4 combiners (customised solution for very large areas)	

Array System kit contents

An Ampetronic Array System contains everything you need for driving an array (cables must be purchased separately).

Contents:

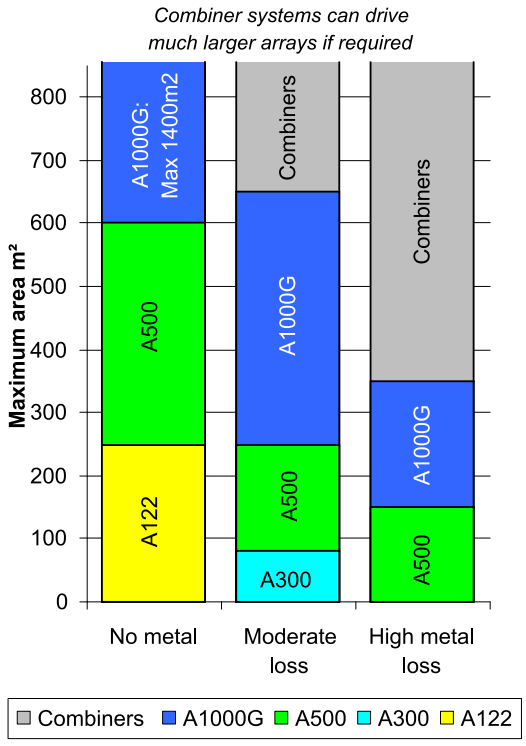
- 2 x ILD Loop Amplifier
- 1 x SP5 Phase shifter
- All interconnecting signal / power cables
- Amplifier handbooks and Array system guide

Each array system is also available with an optional rack mount kit; product codes are suffixed with '-RM' with this kit.

Array System capability

The Array System that you require will depend upon the design of the loop layouts. It will be important to assess the length (and type) of cable required per array, the size of the array elements and the degree of metal loss anticipated or measured. Consult your distributor or the Ampetronic loop design guidance notes for more information.

Approximate area coverage



Specifications

		A122	A300	A500	A1000G
Amplifiers in kit		2x ILD122	2x ILD300	2x ILD500	2x ILD1000G
Amplifier dimensions	Width	215mm	215mm	430mm	430mm
	Depth	220mm	220mm	220mm	220mm
	Height	44mm	44mm	44mm	44mm
Rack space for full system (RM version)		2U	2U	3U	3U
Balanced inputs	Mic	1 x XLR	1 x XLR	1 x XLR	1 x XLR 1 x XLR switchable mic / line
	Line	1 x 6.3mm jack	1 x 6.3mm jack	1 x 6.3mm jack	1 x 6.3mm jack
Maximum drive current:		3.5A RMS	4.9A RMS	6.4A RMS	9.2A RMS
Minimum loop DC resistance:		0.2 ohms	0.2 ohms	0.3 ohms	0.5 ohms
Typical maximum coverage area m² (square room)	No metal	240	220	600	1400
	Moderate loss	-	80	240	650
	High metal loss	-	-	150	320
Maximum length 2.5mm² cable (per array)	no-loss current	160m	140m	315m	700m
	full drive current	100m	65m	110m	175m
Maximum length FB1.8 copper tape (per array)	no-loss current	200m	180m	400m	920m
	full drive current	130m	85m	145m	230m

www.ampetronic.com
sales@ampetronic.com
support @ampetronic.com
phone +44 (0) 1636 610062
fax +44 (0) 1636 610063

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