Hearing Loops – The Basics

Presentation by:
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How they work

MICROPHONE

INDUCTION LOOP

AMPETRONIC
Listen to the difference
Magnetic field

Only Considering the Vertical Component
Where can loops be used? - *One-to-one communications*

Portable systems are often purchased, but with omni-directional microphones they are no better than the hearing aid itself, even when they are positioned correctly.
Where can loops be used? – **Transport environments**

Loops are installed in many public transport environments:

- Trains
- Buses
- Taxis
- Trams
- Subways
- Airports
- Stations
Where can loops be used?  *Public spaces*

Loops can be installed in many public spaces

- Universities
- Lecture halls
- Theatres
- Conference centers
- Cinemas
- Museums
- Sports Arenas
- Amusement Parks
- Places of Worship
Where can loops be used?  The home and office
When are hearing loops not suitable?

Hearing loops are the first choice for Assistive Listening in all of the applications in some cases they are the only option.

They should not be used where:

- Background magnetic noise is too high
- The room is used for secret meetings
Simulation Software

Too Loud

Green is good

Too Quiet
When can I install a perimeter loop? - *Not Here!*

**Loop is too close to the Listening Plane (ear height)**

This Loop is 20m x 50m. The loop has been installed at floor level.

The coverage is not uniform.

The vertical distance between the loop and listening plane must increase as the room width increases

Position the loop further away from the listening plane or use smaller, multiple loops
When can I install a perimeter loop?  *Not Here!*

Adjacent Rooms

The Spill Field of a perimeter loop is approx 3 x width of loop in both the horizontal and vertical planes.

Use Ultra-Low Spill™ Technology
When can I install a perimeter loop? - *Not Here!*

**Metal Structures**

This Loop is only 10m x 15m but the coverage is not uniform and the signal is very weak.

There is too much metal in the same plane as the loop.

Use multiple narrow width loops.

E.g. figure 8 loops or a phased array system.
When can I install a perimeter loop? Here

<table>
<thead>
<tr>
<th>Type</th>
<th>Metal structure</th>
<th>Loop widths (m)</th>
<th>Rule of Thumb</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>MINIMUM</td>
<td>MAXIMUM</td>
</tr>
<tr>
<td>1</td>
<td>Old buildings with stone and brickwork only&lt;br&gt;Heating pipes&lt;br&gt;Isolated re-bar only</td>
<td>2</td>
<td>22</td>
</tr>
<tr>
<td>2</td>
<td>Moderate mesh reinforcement (e.g. A142 or &lt;3kg/m2)</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>Heavy mesh reinforcement (e.g. A393 or &gt;3kg/m2)</td>
<td>2</td>
<td>3.5</td>
</tr>
<tr>
<td>4</td>
<td>Steel deck floor (floor level loop)</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>Metal system floor (floor level loop)</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>Suspended ceiling tiles with metal grid</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>7</td>
<td>Metal cage / solid metal floors, e.g. lifts, cruise ships</td>
<td>2</td>
<td>?</td>
</tr>
</tbody>
</table>
A Perimeter loop is not suitable - Now What?

- Overspill Loop
- Perimeter Loop
- Cancellation Loop
- Single Array
- Low Loss Phased Array
- Low Spill Phased Array
Over-spill loop
Over-spill loop – Practical installation

Angle loop

Fold loop to fit under desk
Cancellation Loop
Figure 8 – Single array

Metal Loss Example 2
Phased Array

Phase Shifter

Loop A
Loop B
Standard Phased Array
Ultra-Low Spill™ Design
**Voltage versus Current Drive**

**The Theory**

- The magnetic field is proportional to the current in the loop.
- The loop impedance is dependent on the loop length.
- Loop Impedance is dependent on frequency.
- \( V = IR \)
- Therefore the current in the loop from a constant voltage source will change with frequency, cable type & cable length (loads).
- Whereas the current in the loop from a constant current amplifier will be constant.

Put simply, it is easier to design a loop Amplifier capable of driving a variety of cable lengths and types using constant current control.
What is best- Voltage or Current Drive?

Is not the question

What has it been designed for?

I could cut the loaf with any one of these knives – but using a bread knife would be easier, quicker, safer and consistently give the better result.
What has it been designed for?  *Is not the question*

To Drive Speakers

Premium Voltage drive Amplifier costing $5000, but designed to power speakers

To Drive a Loop

Current drive amplifier designed to drive a hearing loop
Voltage versus Current Drive – *So what is the question?*

Does the installed system meet the performance standard IEC 60118-4:2006?

**That Is the question**

If it does, you can be confident that it will provide a benefit to the users.

So who cares whether it is a Voltage or Current drive Amplifier?
Installing a Perimeter Loop – Check List

Before You start

- Check background noise is <-32dB
- Check the perimeter loop has been correctly designed for the space.
- Check Metal loss, Loop Displacement & Spill control have been considered.
- Check the loop amplifier is capable of driving the loop
- Check that appropriate signal inputs are available
- Check that there is a suitable location with a power outlet to install the Loop Amplifier
- Check you have the right tools including a Field Strength Meter
Installing a Perimeter Loop – Check List

Starting from the position of the loop amplifier and leaving a few feet of cable for connection start installing the cable around the room

- Tack to Skirting board / run in plastic conduit / lay under floor finish.
- Run the cable over door frames if this is easier and acceptable to the owner.
- Once you reach the starting point, the 2 cable ends should be twisted together from the point that they leave the floor/ceiling to the point that they connect to the amplifier.
Installing a Perimeter Loop – Making the connections

Before turning on the amplifier

Turn all controls down to minimum (Input levels, loop current, metal loss)

Connect the supply cable

Connect the loop cables to the loop terminals on the Amplifier

Connect the input sound signals to the amplifier (mic, line inputs) Input signals should be off
Installing a Perimeter Loop – Setting up the Amplifier

Turn on the Amplifier

- Follow the set-up procedure for the Amplifier you are installing
Connecting to the TV – Older TV’s

Install the loop amplifier and loop as described

Connect the audio from the TV ‘Audio Out’ to the ‘Line Input’ of the loop amplifier. This will minimise any problems with video/speech synchronisation.

Audio Output is labelled ‘Audio Out’ or this symbol is used.
Connecting to the TV – New TV’s

The latest TV’s may only have a digital Audio output or an optical digital audio output

In this case, you will need an Audio Digital to Analogue Converter

Connectors on back of a Typical TV
Connecting to the TV – *New TV’s*

1. Insert your digital audio source cable.
   - COAXIAL (S/PDIF)
   - TOSLINK (OPTICAL)
2. Insert your stereo analog audio cables.
   - LEFT RCA
   - RIGHT RCA
3. Insert the 5V DC power adapter.

Choose either Optical (TOSLINK) or Coax (S/PDIF)

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**TOSLink Cable**

**RCA Cables**
Summary

- How loops work
- Where hearing loops are being installed
- Where perimeter loops should not be used
- 5 other loop configurations that we can use instead
- How to install a perimeter loop
- How to connect to a TV
Further Training

Webinar 1  An introduction to Assistive Listening
Webinar 2  Hearing Loops – Technical Basics
Webinar 3  How to perform a site survey and prepare a specification
Webinar 4  Loop design
Webinar 5  System Installation and Commissioning
Webinar 6  Compliance Testing

Pick up a leaflet and sign up
Loop Types and Spill Control

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