

Microphone selection for hearing loops

Application guide

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An audio frequency induction loop (AFIL), commonly referred to as a hearing loop, induction loop or T-Loop, is an assistive listening system that provides access to facilities for those with a hearing impairment. The system takes a sound source and transfers it directly to a hearing aid without background noise, interference or acoustic distortion.

Over the last 30 years hearing loops have become the default assistive listening solution in Scandinavia, Europe and Australasia, and are now becoming increasingly prevalent in America. Due to their benefits and ease of use, advocacy groups are mandating their installation in locations as diverse as taxis, kiosks, schools, houses of worship, concert halls and stadiums.

"One in seven people have a hearing disability"

"Simply increasing the volume does not help – it's all about separating the signal from the noise"

"Customers remember the experience – not that you were first to tick the compliance box"

For more information on assistive listening and hearing loops please contact our friendly and knowledgeable team on **+44 (0)1636 610062** or email **sales@ampetronic.com**



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The importance of microphone selection and positioning



The majority of assistive listening systems, including hearing loops, are designed to increase the 'signal to noise' ratio for the user, amplifying the sound of what someone wants to hear, whilst reducing any unwanted background noise and acoustic distortion.

Professional hearing loop amplifiers are designed to drive a loop of wire, or series of loops, to produce a magnetic field. The field consists of an accurately reproduced audio signal of the sound introduced via the line or microphone inputs.

A clear input signal, with the minimum of background noise and distortion is critical to producing good quality, intelligible sound that is of genuine benefit to the hearing aid user. However, if the microphone selection or placement is not suitable then the signal provided will not

be intelligible. This is commonly known as the 'garbage in = garbage out' principle.

Microphone selection and placement are the vital first steps in ensuring that the audio input into any hearing loop system provides a good quality audio signal that can then be amplified and reproduced. Any microphone used needs to be situated as close to the sound source as possible, for example near a performers mouth.

If there is an existing sound reinforcement system with microphones picking up a suitable direct sound signal then this is often the best choice of input to the loop system.

There are a vast array of microphone types available today, each servicing a very specific requirement. Selecting the correct microphone can be a bewildering task. This guide presents the types of microphones available and their suitable applications.

- Boundary Microphones
- Suspended Microphones
- Gooseneck Microphones
- Shotgun Microphones
- Beamforming microphone arrays
- Wireless (RF, IR, DECT)



Microphone selection guide

	Page	Presentation / Teaching (one to many)	Meeting / Collaboration (many to many)	Performance
Directional Boundary (desk/lectern/floor mount)	6-7	✓	✓ (multiple)	✓
Omnidirectional Boundary (desk mount)	6-7	x	✓ (small rooms)	x
Omnidirectional Boundary (ceiling mount)	6-7	x	x	x
Hanging / Suspended	8	✓	✓ (multiple)	✓
Gooseneck	9	✓	✓ (multiple)	x
Shotgun	10	✓	x	✓
Beamforming	10	x	✓	x
Wireless (lapel or handheld)	11	✓	x	✓

The table above represents a summary of the types of microphone that are available and the applications that they are suitable for. It may be possible to utilise other microphone types in certain scenarios, but if you are in any doubt please contact us for advice. It is important to also consider the environmental conditions, for example a gooseneck mic or boundary mic may, in theory, be suitable for a desk in a multipurpose room; however, in reality, it may be impractical when the furniture is moved. In this situation a suspended ceiling mic may be more suitable.

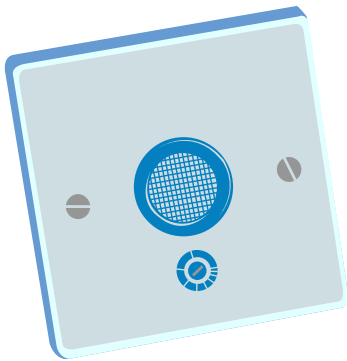
For more information on hearing loops and meeting the standards for hearing loop installations contact our friendly and knowledgeable team on **+44 (0)1636 610062** or email sales@ampetronic.com



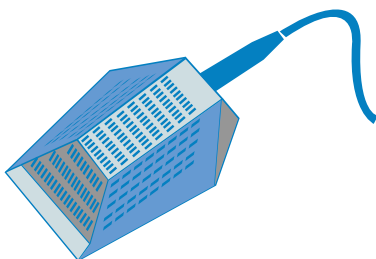
Venue operators can find themselves in an actionable position if there is no service provision that is of a genuine benefit to users, i.e. the installation must be fit for purpose. The measurable performance criteria for hearing loops is defined in the international IEC 60118-4 standard.

Boundary microphones

Boundary microphones are designed to reduce reflections by being positioned directly against a surface, they are often mounted on ceilings, tables or walls and used to capture the entire sound of the room.



PZM or pressure zone microphones are a sub-type of boundary mic where the capsule is facing the boundary or surface plate.



Boundary microphones are available with directional or omni-directional pickup. The choice of directivity, along with positioning, is crucial for use with assistive listening devices.

An omni-directional microphone, by its nature, will pick up all sound in the room, including any ambient noise and any reverberation inherent to the space. The key principal of assistive listening is to provide direct sound to the hearing aid, increasing signal to noise ratio by cutting out background noise, which is often not achieved with an omni-directional boundary microphone mounted at distance from the sound source.

Boundary microphones are only suitable for a limited number of applications where they are placed very close to the desired sound source – such as next to the person talking. They should never be ceiling mounted with the intention of capturing more than one sound source, and are particularly unsuitable for where the desired sound source is more than a metre away.



Boundary mics can sometimes be used as low level ambient microphones in conjunction with close directional microphones or a mixing desk feed, but it is important in this instance to not reintroduce too much of the background noise the system is designed to overcome.

Problems with Omni-Directional Boundary Microphones:

- Often mounted in a ceiling
- Designed to pick up all the ambient sound
- Should only be used at close proximity

Directional boundary microphones are useful for a desk or lectern, where it is placed close to the talker. The directional pickup pattern rejects sound from the rest of the room.

They are suitable in situations where the talker remains largely static, as intelligibility will be significantly compromised with distance from the microphone.

Applications include:

- Counters
- Conference tables and boardrooms
- Lecterns or podiums
- Small musical ensembles or soloists
- Picking up actors' voices on-stage

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Suspended microphones

A suspended microphone is a small, lightweight capsule designed to be mounted to or hung from the ceiling (or other horizontal surface).

This type of microphone usually delivers optimal performance when they are placed low down, typically over a small meeting room table. Using a suspended microphone lower down shortens the acoustic path between the person speaking and the microphone, helping to provide effective coverage of a room for people with hearing loss.

Installed as permanent fixtures, suspended microphones don't interfere with available table top space and once fitted are generally maintenance free.

Although these microphones have a low profile they are unlikely to be accepted in situations where flexibility of room layout is required. Vandalism or accidental damage can also be a concern in some environments.

Applications include:

- Meeting rooms
- Teaching spaces
- Choirs, small musical ensembles or soloists



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Gooseneck microphones

Gooseneck microphones are one of the most commonly used microphone solutions for Hearing Loops in many environments. Their flexible 'neck' and directionality mean that they can be positioned very close to the speaker's mouth, providing an excellent signal to noise ratio and intelligibility.

Gooseneck microphones are commonly found in applications where potential speakers may be of different heights. The capsule should be adjusted by each individual so it is as close to the mouth as possible.

Gooseneck microphones allow easy adjustment and positioning on lecterns and cross-desk/points of sale.

Applications include:

- Speaking podiums, pulpits and lecterns
- Reception desks
- Retail point of sale & customer service desks



Shotgun microphones



Shotgun microphones use a standard directional capsule, usually a super-cardioid, with a long, hollow, slotted interference tube attached to its front surface.

An important consideration when using shotgun microphones is that they are much more focussed than near-field microphones. Shotgun microphones have an extremely narrow pickup, so they will provide little benefit if they are not correctly positioned.

Shotgun microphones are commonly used in scenarios where a more locally mounted microphone is not possible such as staged performance areas. They offer a significant improvement over omni-directional boundary microphones.

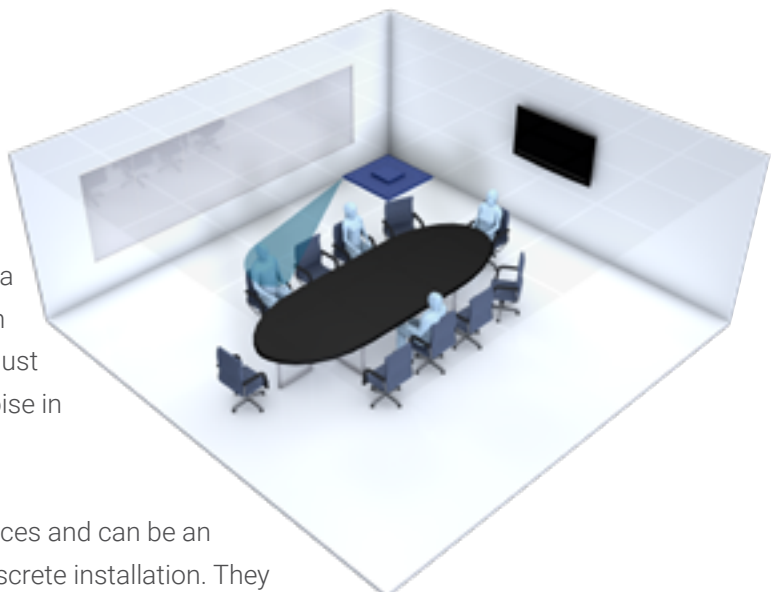
Applications include:

- Covering a performance space from distance, such as a concert hall or auditorium

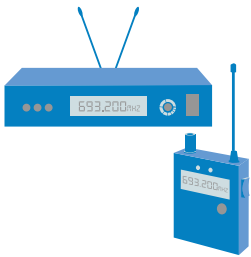
Beamforming microphone arrays

With advances in microphone technology, there are now a range of 'beamforming' microphone arrays on the market. These use a series of microphone capsules fitted within anything from a desktop unit to a full ceiling tile. Using digital signal processing they can dynamically track voices in the room, focussing in on just the people who are speaking, reducing background noise in comparison to a traditional ceiling microphone.

These are often used for meeting or conferencing spaces and can be an effective way to cover a flexible environment with a discrete installation. They do require some expertise to install and configure correctly so an experienced audio-visual company should be used for these types of applications.



Wireless microphones



A wireless microphone is a microphone without a physical cable connecting it directly to the amplifying equipment it is associated with.

When used solely for an induction loop it is important that presenters are aware that the microphone needs to be worn and turned on for the induction loop to provide any benefit. A secondary wired microphone is useful as a backup.

Sometimes known as a radio mic, it has a small battery powered radio transmitter in the microphone body or belt pack which transmits the audio signal from the microphone using radio waves to a nearby receiver unit. Additional audio equipment can be connected to the receiver unit by cable.

Wireless microphones can be used in almost any situation and are often the ideal solution to get clear and direct audio, particularly in multi-purpose venues or when the talker doesn't stay in a fixed position. However, there are some implementation factors to be aware of including:

- licensing
- frequency co-ordination
- management of transmitters

The main advantages of using wireless microphones are that mics can be body-worn, or placed on a table where connection via cables would be impossible; allowing great flexibility of application and excellent performance.

Applications include:

- Any scenario when there is one person speaking to many
- Theatre or stage performances
- Lecture theatres



Providing a genuine benefit.

To find out what we can bring to your project, talk it through with our expert team on +44 (0)1636 610062, or email sales@ampetronic.com

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