

A guide to Assistive Listening Devices (ALDs)

Guy Peppiatt discusses why in certain situations hearing aids are not enough and why the way forward is an ALD, you just have to decide which one

What are they?

ALDs enhance the quality of a sound source through amplification and directionality. They can be used either independently, with headphones or ear buds, or in conjunction with a hearing aid to increase the clarity of a sound source which is remote from the listener or where there is excessive background noise.

Why do we need ALDs?

While a hearing aid amplifies the sounds which reach its microphone, in general, there is little or no discernment of different sound sources and it can be difficult for a wearer to select the sound source they want to hear.

Digital hearing aids process the sound source by compressing each frequency and modulating it to suit the user's hearing and frequency loss. The hearing aid raises the volume of quieter sounds, frequency by frequency, and ensures louder sounds aren't over amplified, many digital hearing aids can be programmed to cut out background noise. However this sound processing takes its toll on sound quality, and the quality of the original sound source is paramount – you can't make a second rate back-up vocalist sound like Tina Turner.

For individuals with moderate to severe hearing loss, feedback becomes an issue. Feedback occurs when there is less than a perfect seal in the ear canal between the hearing aid microphone and the receiver (the speaker), whether an ITE (In-The-Ear) hearing aid, or a BTE (Behind-The-Ear) hearing aid where the sound is transmitted down the tube into the ear.

The loud whistling noise heard is the result of the receiver interacting with the microphone which then distorts the sound signal. The higher the amplification of the aid, the more likely feedback will occur.

Digital hearing aids can suppress or eliminate feedback using algorithms, but often at a cost to sound quality and a drained battery.

So why are hearing aids not enough in certain situations?

Even with the background noise cancellation capabilities of modern digital aids, listening to a speaker in a crowded or noisy environment can be difficult. Individuals with hearing loss are affected by poor acoustical conditions, and a combination of noise from behind a hearing aid wearer, and noise and reverberation from the space between the listener and the speaker will render a speech message virtually unintelligible.

Imagine trying to listen to a speaker at the front of a convention hall and a group in front are chatting away to each other. Even a digital hearing aid will be unable to screen the noise from this group as it is coming from between you and the sound source you want to hear.

Even watching television can be fraught. Most modern flat screen TVs have speakers located at their back and the bottom, resulting in diffuse sound quality. Very few TVs have decent sound systems, so the only way to hear better is to

turn the volume up to unacceptable levels or spend the same again on a proper sound system. With a hearing loss this becomes even more of an issue, whether the listener wears a hearing aid or not.

What can an ALD do for hearing loss?

An ALD takes the microphone away from the hearing aid and places it next to the required sound source or plugs directly into the output from the TV or audio source.

Many ALDs have directional microphones that can be pointed directly at the sound source, which eliminates a large proportion of background noise.

An ALD does not compensate for hearing loss, and is therefore equally as good for mild as for severe hearing loss. With the microphone placed next to the sound source, the hearing aid continues to compensate for the wearers hearing profile. Background sounds, noise and reverberation which can occur between the listener and the speaker will be cut out, thus reducing feedback.

There is no need for filtering, noise reduction or processed noise in an ALD since the hearing aid will do this for the user. An ALD will present as uncoloured a sound as possible to the hearing aid amplifier.

Remember the earlier example of a speaker at a convention hall with the group chatting in front of you? If the ALD microphone is pointed at the speaker, or is worn around his neck, the sound quality of his speech rises dramatically as does the intelligibility of the speech. The closer the microphone is located to the actual speech or sound source the greater the benefit of the ALD.

Dr Mark Ross of the Rehabilitation Engineering Research Centre at Gallaudet University in Washington refers to personal FM systems, a type of ALD, as the "third ear", that can be placed close to the desired sound source, thus increasing the level of the signal relative to the background noise.

As testament to the benefit of ALDs, and an admission that hearing aids cannot do everything, major hearing aid companies including Siemens, Phonak, Phonic Ear and Widex have a range of ALD products to improve the performance of their hearing aids in noisy or crowded environments.

How does an ALD work?

Most ALD's comprise a transmitter or a transmitter/microphone and a receiver. The transmitter/microphone is placed next to the sound source which requires amplification, or is physically connected by means of a connector lead to the sound source, whether it be a television, hi fi or sound system.

Research over the last 40 years has indisputably proven that speech to noise ratio is significantly improved by placing the microphone close to a sound source.

In directional mode, the ALD can also be pointed at the sound source; however the further away the sound source is located, the less effective the ALD will become as noise between the speaker and the user will also be picked up.

In a typical house the rooms are small enough to use the ALD in this manner and can be used for TV and audio listening by pointing the transmitter /microphone at the sound source.

The transmitter or transmitter/microphone transmits the audio signal to the receiver. The signal is typically transmitted using Infrared or FM radio. Infrared can only be used where there is an uninterrupted line of sight, while FM radio can travel through walls and building structures facilitating freedom of movement, Broadcast ranges are typically up to 100 metres outdoors and 20-50 metres indoors.

There are some ALDs which use Bluetooth as the transmission medium, however they are both expensive and battery intensive and are in the minority at present. Typically Bluetooth has a 10-15 metre range, but by using new protocols it is possible to utilise device hopping Bluetooth which can extend the range.

The ALD user will receive the signal using the Receiver. This will either be a plug-in attachment to the hearing aid, which by definition has to be a BTE, or a neck worn inductive loop which connects to the hearing aid amplifier via the hearing aid telecoil.

Different types of ALD

An induction loop system is a long length of wire placed around the perimeter of a room or space which will be occupied by a hearing aid wearer which induces a response from the hearing aid wearer's telecoil. The loop is plugged into an amplifier which is connected to the sound source, for example a TV or microphone used by a speaker, and conducts the sound from the sound source to the hearing aid wearer. Small portable inductive loops are relatively inexpensive but totally inflexible as the hearing aid wearer cannot move outside of the loop without losing the sound. Room loops are simple to use but can be expensive to install, cannot be moved and cannot always be used in adjacent rooms due to an overspill effect.

Infrared systems transmit the data using infrared signals. These comprise a transmitter which is plugged into the TV or a sound source which then transmits the signal to a receiver with an inductive loop which is worn around the neck of the hearing aid user and connects to the hearing aid via the telecoil, or has earbuds which can be used by the wearer. They can be used for one-to-one or one-to many communication. They are generally used for TV listening devices and single room applications such as theatres and Convention halls where there is line of sight connectivity between transmitter and receiver. Infrared systems cannot be used outdoors because of sunlight reflections on the sensor housing-ever tried using a TV remote control outside?

FM systems operate in exactly the same way as commercial FM broadcast systems but have specifically allocated frequencies in each territory of operation so they do not interfere with/are not interfered with by other broadcast sources. They comprise a transmitter or transmitter microphone which broadcasts a signal which can be received by one or many receivers on the same frequency channel. FM systems are the most versatile ALD and can be used internally as well as externally and have the capability of transmitting signals through walls which can be ideal in the domestic environment.

FM systems are manufactured in two different formats- personal loop systems and direct FM attachments. Personal loop systems use a receiver which has an inductive loop which connects to the hearing aid via its telecoil. FM attachments, or integrated FM receivers, plug into the hearing aid, which has to be a BTE (Behind-The-Ear), using power from the hearing aid battery.

Personal loop systems are cheaper as they can be used with one or two hearing aids at the same time, while an FM attachments for each aid is needed.

What do ALDs cost?

When looking at prices in the UK don't forget that hard of hearing purchasers can apply for VAT relief by signing a simple declaration which the retailer will provide. Accordingly the Prices quoted below do not include VAT.

Under £200 there are many products which can be found and which for the most part address one aspect of daily living – for example TV listeners, portable loop systems, door bell alerters, fire alarms, vibrating clocks and telephones. Most of the systems will utilise visual, or physical alerting systems, or in the case of the listening devices these will be basic infrared systems or wired systems using headphones or ear-buds. There are many manufacturers and devices to choose from with the RNID online shop or catalogue ideal places to browse.

At £200 to £350 we start to see Infrared systems and one or two value for money FM systems which can be used with hearing aids and which are more versatile and portable than many of the devices you can purchase in the Under £200 category.

Over £350 the technology becomes increasingly sophisticated and expensive and comprise FM systems and Bluetooth. There are a range of FM devices in the £399 to £600 price bracket from which all utilise Personal Loops for wireless connection to the hearing aid.

Bluetooth products, which again utilise the Personal Loop for connecting to the hearing aid, retail in the price bracket of £400-£500.

Certain hearing aid manufacturers also provide FM boots or shoes for their own range of hearing aids which work with their own transmitters. However, the cost of the system becomes increasingly expensive if two FM attachments are required for binaural hearing aid wearers. These FM systems can cost between £1,200 and £2,500.

Confused? The only answer is to try one or more devices and find out what suits you and your lifestyle best.

Hold the microphone or place it next to the sound source for the best quality sound.