

# The Access Board

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*a federal agency committed to accessible design*

*ADA Accessibility Guidelines for Buildings and Facilities (ADAAG)*

## ASSISTIVE LISTENING SYSTEMS

### BULLETIN #9A: FOR CONSUMERS

#### Why is it hard to hear in some spaces?

The farther you are from a sound source, whether it's someone talking or a loudspeaker, the lower the sound volume will be at your ears.

While this distance effect can be overcome by increasing the volume, loudness is not all that is needed for good listening.

A hearing loss reduces or eliminates many of the acoustical cues that we use to discriminate between sounds. So people with hearing loss must listen carefully to context, apply lipreading skills when they can, and look for visual clues to speech content. This can be very tiring and difficult. And if the room acoustics have not been designed with speech perception in mind, it can be impossible. Two acoustical characteristics of enclosed spaces - background noise and reverberation - affect speech perception.

**Background noise** is unwanted sound that competes with and masks the sounds you want to hear. The noise may be coming from air conditioning or heating ducts, from various kinds of equipment, or from other occupants and their activities. Who has not complained about the difficulty of hearing and understanding in a noisy restaurant or party? We live in a noisy world that seems to get noisier as the years go by!

In **reverberation**, the sound signals are reflected off the various surfaces of a room, bouncing around so that different parts of it get to your ears at different times. What this overlapping of sound does is blur the clarity of what you are trying to hear. The amount of reverberation is a product of room proportions and the nature of the surfacing material. Hard surfaces reflect more sound, soft ones absorb it. Excessive reverberation causes the difficulty we have in understanding public address announcements in places like transit stations, airports, and arenas. While the sound signals may be loud enough, the acoustical conditions in these spaces make comprehension difficult or impossible.

Simply turning up the volume of a hearing aid is not the answer. This just increases the loudness of both the desired sounds and the background noise and reverberation. So a different approach is needed for people who have hearing loss. An **assistive listening system** can bridge the gap between a sound signal and a listener's ears, delivering the sounds you want to hear unaffected by room acoustics.

#### How can an assistive listening system help?

An assistive listening system - an ALS or ALD (D for device) - makes a wireless, electronic connection between the sound source and your ear.

This "bridging" effect eliminates the effects of distance, background noise and reverberation so that you can hear and understand better. Because an ALS transmits the sound directly from the source to your ears, it's like having the sound source right next to you. You no longer have to be concerned about how far your seat is from the speaker or loudspeakers. Even if you are in the back of the room, the sound volume of an ALS can be adjusted at your ear to be as loud as you want, without at the same time increasing the loudness of the background noise in the room. Even if the room is noisy or very reverberant, you should still be able to hear clearly, since the listening system is bypassing all the acoustical conditions in the room.

Many people who don't wear hearing aids use an ALS in assembly areas like movie theaters, live stage productions, and auditoriums and sports arenas to make the listening task easier and more effective.

ALSs are also used to supplement hearing aids and cochlear implants. Because ALSs work by improving the signal-to-noise ratio, they are most often used by people who have mild to moderate hearing loss. They can also provide direct audio input to listeners who have cochlear implants. However, ALS may not provide effective communications for people who rely on captioning or ASL (American Sign Language) interpreting. For more information on effective communications, see the *Fact Sheet on Effective Communications* published by Adaptive Environments, Inc. at [www.adaptenv.org/neada/fact2.asp](http://www.adaptenv.org/neada/fact2.asp).

The Americans with Disabilities Act (ADA) requires that certain kinds of public and private facilities that normally provide amplification systems for their audiences - such as theaters, movie houses, arenas and stadiums, auditoriums, meeting and lecture rooms, concert and performance halls, and courtrooms - must have assistive listening systems installed for people who want to use them. Clearly visible signs must be posted that indicate the availability of the ALS and the location in the facility where the appropriate receivers can be obtained.

### **How does an ALS work?**

Usually, an assistive listening system simply piggybacks on a standard public address (PA) or sound amplification system. In such instances, the sound sources (either from microphones or the audio track of a movie) are amplified and then broadcast through loudspeakers to the audience. Specialized equipment integrated into this system transmits the same signals to the ears of the person wearing an ALS receiver. There are three general types of systems, named for the method of signal transmission: induction loop (IL), FM (frequency modulation), as in FM radio, and infrared (IR).

**Induction loop (IL)** systems use a wire around the room to transmit an electromagnetic signal that is picked up by a small device - called a telecoil -- in the hearing aid. Users simply switch on this telecoil (the "T" setting) and adjust the volume of the hearing aid, if necessary. However, not all hearing aids - particularly the very small ones - have telecoils, which are mainly used for improved telephone access. For those people whose hearing aids do contain telecoils, an IL system is the most convenient one of all - the special "receiver" being their own hearing aids.

If your hearing aid doesn't have a telecoil, or if you don't wear a hearing aid, you can still use an IL system by wearing a receiver that has a telecoil in it. An earpiece or headset delivers the sound to your ears or through your hearing aid.

**FM systems** are variations on the commercial FM radio.

Radio signals are broadcast by an FM transmitter connected to the sound system used in the facility. These signals are received by individual "radios" - small (usually pocket-size) receivers tuned to the specific frequency used in the transmission (see Figure 3). There are a number of alternative ways to make the receiver-to-ear connections; these will be fully discussed below.

**Infrared (IR)** systems operate on infrared light that is beamed from one or several IR transmitters to small, specialized receivers. There are several types of IR receivers: stethoscope-style that dangle from the ears, a headset type that fits over the ears, and a small pocket-size type similar to the FM receiver. With the first two, the receiver-to-ear connections are straightforward; they are placed directly in or on the ear (see Figure 4). The alternative ways to make the receiver-to-ear connections with the third, pocket-style IR, is the same as with FM receivers and will be discussed below.

Each system has its advantages and disadvantages. A system that works well in a multiplex theater would not be appropriate for a courtroom; an outdoor facility needs a different system than an indoor venue. Differences in confidentiality, interference, cost, installation requirements, and operability make it impossible to simply use one type of ALS in every place. Before choosing an ALS, an installer will consult with the location managers and do a site analysis to determine the most appropriate ALS type.

### **What kind of receivers and connections will work for me with IR and FM systems?**

**Non-hearing aid users** can use headphones, earphones, or earbuds - either monaural (not recommended) or stereo (preferred) - connected to a pocket-type receiver for FM or IR systems. IR systems can also connect through a stethoscope-type receiver or use specialized headphones in which all the necessary electronics are contained in the headset itself.

For **hearing aid users**, the choices are more varied and depend upon the type of hearing aid (in the canal in the ear, and behind the ear) and whether the hearing aid incorporates a telecoil or not. If your hearing aid has a **telecoil**, you can set it on the T-setting and then plug a neckloop or silhouette inductor directly into a pocket-type receiver. A neckloop fits around the neck like a loose necklace. A silhouette inductor is embedded in a thin plastic shape similar to a behind-the-ear hearing. Silhouettes can be very useful for people with severe hearing loss.

Neckloops and silhouette inductors work the same for both FM and IR systems. As with a room IL system, the neckloop or silhouette inductor transmits an electromagnetic signal to the telecoils within the hearing aids (the "T" switch must be in the "on" position). A major advantage of using this mode of transmitting audio signals is that it utilizes the individualized adjustments made in the person's own hearing aids.

If your hearing aid **does not contain a telecoil**, then you may remove the hearing aid to use headphones or earbuds, as a **non-hearing aid user** would do. This does not work well if hearing loss is severe. Headphones can sometimes be worn over the hearing aid; it will be necessary to adjust the hearing aid volume downward and the ALS volume up to avoid interference. People who wear behind-the-ear hearing aids will have more difficulty placing

headphones over their ears than those who use in-the-ear hearing aids. Aids fitted with telecoils provide a better connection.

Some hearing aid users may prefer to do both: headphones over their ears while turning the aids to the T-coil position. This will work with headphones that also emit an electro-magnetic signal in addition to sound, similar to the way that hearing-aid compatible telephones operate.

**Cochlear implant users** are advised to bring their own patch cord to connect the implant to the ALS receiver provided by the facility (see Figure 7). This would also be necessary for people who prefer to use direct audio input (DAI) into their behind-the-ear hearing aids.

### **What is involved in obtaining and returning ALS receivers?**

The specific place within a facility where receivers can be obtained should be noted on a sign posted in a conspicuous location, often at the box office. A facility employee should provide the ALS and instruct you on its use, if necessary. All you have to do is check one out, usually by leaving a picture ID as surety. The facility may not ask a rental charge for the receiver. At the conclusion of the event, your ID will be returned when you return the receiver.

When planning to attend a particular event, it is a good idea to call ahead to determine what kind of system is installed and what connecting devices are offered. Facilities may not provide the kind of system, receiver, and/or connector that you need or prefer. Some facilities may be willing to stock a range of connecting devices or even acquire a particular type given a sufficient number of requests. If for some reason your particular needs cannot be accommodated, you may want to consider purchasing your own connector (such as a neckloop).

### **Every place I go has a different system, with some working well, while others are awful. Is there anything I can do?**

There are lots of reasons why a particular installation may not work for you, among them:

- the staff doesn't know how to use the system or how to demonstrate it;
- the batteries in the receiver are either dead or weak;
- the receiver/ear connection is not right for you;
- the equipment is poor quality and does not provide the acoustic quality you need;
- the ALS transmitters were not installed properly or need servicing.
- Or

If you find that a system does not work for you, advise the management. Insist that a staff member troubleshoot the system to determine the cause of the problem. This could be because of any of the reasons listed above. While the ADA requires that the operators of movie houses, theaters, auditoriums, and similar large assembly places provide such systems, national standards regulating their use are just being developed. You can suggest that facilities that need guidance on system selection, use, and maintenance log on to the Access Board website at [www.access-board.gov](http://www.access-board.gov) for a copy of the ALS/ALD Technical Assistance Bulletin for Providers (Bulletin No. 9C). A Bulletin for installers is also available.

The Rehabilitation Engineering Research Center on Hearing Enhancement, website [www.hearingresearch.org](http://www.hearingresearch.org), has a great deal of useful information on assistive listening systems. Other resources include the technical assistance center at Gallaudet University, [www.tap.gallaudet.edu](http://www.tap.gallaudet.edu), and the Access Board, [www.access-board.gov](http://www.access-board.gov). The Access Board also provides a toll-free technical assistance number at 1-800 872-2253 (V) or 1-800 993-2822

(TTY). If you wish to file a complaint about the lack of functioning ALS/ALD, contact the US Department of Justice at 1-800 514-0301 (V) or 1-800 514-0384 (TTY).

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***The technical assistance provided in this Bulletin is intended solely as informal guidance; it is not a determination of the legal rights or responsibilities of entities subject to titles II or III of the ADA.***

***Related Bulletins on Assistive Listening Systems:***

- [Bulletin 9B: For Installers](#)
- [Bulletin 9C: For Providers](#)