

Assistive Listening Systems

Why use an Assistive Listening System?

Background noise and reverberation, or simply distance to the sound source, degrade intelligibility and comprehension for all people. The negative effects of noise and distance are more pronounced for the hard of hearing people, whether they wear hearing aids or not. Thus, people who are hard of hearing cannot participate on equal terms with hearing people - especially in larger assembly areas - if these areas are not equipped with an effective assistive listening system. Even the best acoustical environments and the best sound systems combined with the best in digital hearing aid technology, leave the hard of hearing with an intelligibility problem. Can this signal to noise ratio deficiency be improved with the technology available to us today? Thankfully, yes, through the use of an **assistive listening system**.

In recognition of this, the Canadian Building Code Act (1992) requires that assistive listening systems and devices be made available in rooms or buildings of assembly occupancy larger than 100 square meters in area. Provincial and local building codes may add additional requirements.

An assistive listening system serves to transmit sound as directly as possible from its source to the hard of hearing person's ear. The simplest way to achieve this might be to use a small personal amplifier with a microphone and a set of earphones. Though simple, hardwired systems like this are very impractical in public venues. Apart from personal body-worn systems, they have been replaced by modern wireless systems.

Wireless Technologies, How They Work, Advantages and Disadvantages

Today there are three basic wireless technologies available that use different methods of sound transmission: Audio Frequency Induction Loop Systems (AFILS), FM broadcast technology, and Infrared light technology (IR). Each method has its own advantages and disadvantages. All three types of assistive listening technologies can easily and successfully be used for home and commercial applications alike, subject to their individual limitations.

Audio Frequency Induction Loop Systems (AFILS)

This technology is based on magnetic induction transmission and has the unique advantage that the signal is received directly by the user's hearing aid (i.e. without any additional devices) if it is equipped with a telecoil (telemagnetic pickup coil). It is most often referred to as a T-coil. An audio loop system consists of an amplifier and a hidden wire (the loop) that is placed around the perimeter of the room or listening area. When the loop amplifier is connected to an audio source such as a TV or PA system, the sound is received invisibly by the user's hearing aid without the need for an additional receiver as is required by all other technologies. The sound is also tuned to the need of the user by the hearing aid. Loop receivers are available for listeners who do not use hearing aids or whose hearing aids are not equipped with the telecoil feature. Properly designed audio loop systems comply with the IEC 60118-4 international standard for

assistive systems. In Canada, amplifiers are also required to conform to CSA, ULc or ETLc safety standards.

Advantages:

- Transmits directly to hearing aids equipped with T-coils, no receiver required
- Invisible use with T-coil hearing aids and cochlear implants
- Sound is tuned to the listeners hearing loss by the hearing aid
- Only non T-coil listeners require receivers
(For all the above reasons, loop systems are much more likely to be used by people with hearing loss)
- Fewer receivers required than for FM & IR systems
- Less money spent on receivers

Disadvantages:

- Simple perimeter loops spill signal outside of the loop (spill can be contained with alternate loop designs)

FM Broadcast Systems

In principle, FM systems designed for hearing assistance applications work just like commercial FM radio systems operating in the 88 to 108 MHz range. In Canada, FM hearing systems operate in the 72 to 76 MHz range. Since each system may use its own broadcast frequency, several systems can operate simultaneously at one location without interfering with one another. Unlike the loop system however, FM systems requires a special receiver for each person, whether s/he has a hearing aid or not. There are several listening options available for FM receivers including under-the-chin type steto-clip headsets, Walkman style headsets, ear buds and neckloops for telecoil users.

Advantages:

- Highly portable – can be used by tour groups
- Easy to install
- Transmission range up to 1,000 feet
- Several channels available for multiple systems

Disadvantages:

- Receivers required for everyone
- Both headphone output and neckloop listening devices must be available at public facilities
- For multiple applications (e.g. multiple languages), receivers must be able to operate on different channels.
- Signal spills beyond the listening area cannot be contained
- Facility owners are required to maintain, clean, dispense and collect receivers and keep receiver batteries charged

Infrared Light Systems (IR)

Infrared systems use light for signal transmission. An infrared system consists of three basic components: a transmitter (base station), an emitter, and a receiver. The audio signal is converted into infrared light by the transmitter and emitter. The receiver detects the IR signal and converts it back into the original audio signal. Unlike FM transmission and induction loop technology, infrared light cannot pass through walls. Therefore, infrared light transmission is

ideal for facilities operating several systems simultaneously in different rooms in that all receivers can be identical with no need for frequency coordination.

As with FM technology, each person must use a receiver, whether or not s/he has a hearing aid. Receiver types include lightweight under-the-chin style, over-the-head receivers for 360-degree reception and lavalier style. Similar to FM systems, the listening options receivers include under-the-chin type steto-clip headsets, Walkman style headsets, ear buds and neckloops for telecoil users.

Advantages

Multiple applications (e.g. multiple languages) can run simultaneously without interfering with one another

Insures confidentiality (cannot be listened to outside the room)

Personal systems easy to install

No limitation of area size as emitter panels may be interconnected

Disadvantages

Receivers required for everyone

Both headphone output and neckloop listening devices must be available at public facilities.

Not practical for outdoor applications (sunlight interference)

Most expensive system

Facility owners are required to maintain, clean, dispense and collect receivers and keep receiver batteries charged

Information Sources:

1. Large Area Assistive Listening Systems, Cynthia Compton-Conley, Ph.D. Gallaudet University, Washington, DC, USA, 2008

2. Comparison Chart for Three Basic Types of Wide Area Assistive Listening Systems, Curtis Dickinson, CEO, Hearing Loss Help Company, Worcester, MA, USA

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A Comparison Chart of Assistive Listening Systems

	Audio Frequency Induction Loop System	FM System	Infrared System
How it works	Sound is transmitted from a sound source (radio, tv, microphone) by magnetic induction via a wire loop directly to the hearing aid or cochlear T-coil	Sound is transmitted from a sound source (radio, tv, microphone) via FM radio frequency to a receiver worn by the listener. Sound is delivered from the receiver to the ear via a headset or to the hearing aid or cochlear T-coil via a neckloop	Sound is transmitted from a sound source (radio, tv, microphone) via infrared light to a receiver worn by the listener. Sound is delivered from the receiver to the ear via a headset or to the hearing aid or cochlear T-coil via a neckloop
Advantages	T-coil users receive sound invisibly and directly to the hearing aid No receiver maintenance for facility providing assistance to T-coil users Only non T-coil users require receivers Can be used outdoors Well suited for walk up / walk through (transient) locations	Relatively simple installation Flexible listening locations Can be used outdoors	Relatively simple installation Sound signal does not transmit through walls (provides privacy) Requires "line of sight" between transmitter and receiver
Limitations	T-coils can pickup electromagnetic interference Sound privacy requires proper loop design	Receivers required for all users Facility owner required to provide, retrieve and maintain receivers Neckloop users can pickup electromagnetic interference Not suited for walk up / walk through locations No privacy possible	Receivers required for all users Facility owner required to provide, retrieve and maintain receivers Neckloop users can pickup electromagnetic interference Not suited for walk up / walk through locations
Typical Applications	Service counters Airport, bus & train station waiting areas Taxis & busses Classrooms & courtrooms Conference & meeting rooms Auditoriums & theatres Houses of worship Arenas & stadiums Museums & theme parks Hospitals, retirement & nursing homes TV & home theatre lounges	Classrooms & courtrooms Conference & meeting rooms Auditoriums & theatres Houses of worship Arenas & stadiums Museums & theme parks Hospitals, retirement & nursing homes TV & home theatre lounges Tour groups	Classrooms & courtrooms Conference & meeting rooms Auditoriums & theatres Houses of worship Arenas & indoor stadiums Museums & theme parks Hospitals, retirement & nursing homes TV & home theatre lounges

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1. Large Area Assistive Listening Systems, Cynthia Compton-Conley, Ph.D. Gallaudet University, Washington, DC, USA, 2008
2. Comparison Chart for Three Basic Types of Wide Area Assistive Listening Systems, Curtis Dickinson, CEO, Hearing Loss Help Company, Worcester, MA, USA