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THE PROPER SELECTION

By Steve Harris

Since the institution of the ADA, wireless sound transmission has grown from near obscurity to a major source of income for sound contractors. Both radio frequency (RF) and infrared (IR) systems have found a multitude of venues and applications. Originally, each had its distinct application and market. Now, the line between IR and RF has blurred; the principal difference between the two systems boils down to the method used to transport the audio signal to the end user. An RF system uses radio waves, while IR systems use infrared light. Each system has its own special benefits based on the properties of each signal.

Theater Applications

For the sake of this exercise, we will divide legitimate theaters into four separate categories. The large theater seats between 1,000 and 2,000 people. It will typically contain several seating areas-an orchestra level, mezzanine, loge, dress circle balcony. This is the type of theater found on Broadway or where major national tours are housed in other cities.

Using RF for the ALS immediately creates certain problems. Communication from the stage manager to the lighting board, spot operators and sound console is accomplished with RF systems, and where even the sets and lights dance and move about the modern stage, the airwaves are more crowded because each set piece and light is controlled by RF signals. Especially on Broadway, RF could become a nightmare for the production stage manager and the patrons using an ALS. The most reliable choice in this situation would be an IR system.

The most difficult part of installing an IR system is the design. Emitter placement is important to get the maximum coverage of the space. Two emitters specified to fill 6,000 ft2 (557 m2) to 12,000 ft2 (1,115 m2) can be placed on either side of the proscenium to give a nice fill. Angling each emitter slightly toward the center of the seating area will also give coverage if a patron should turn his head. If a balcony covers more than three or four rows beneath it, place two smaller emitters covering 2,000 ft2 (186 m2) to 4,000 ft2 (372 m2) under the balcony to give a strong signal to the orchestra level.

Higher levels typically require their own set of emitters. The size of emitter required is related to the size of the area. Smaller theaters like the Helen Hayes Theater in New York City, with only 200 seats in the mezzanine, require small emitters like the ones used for under-balcony coverage. The Broadway Theater, on the other hand, has approximately 700 seats on the mezzanine. The IR designer used four emitters – two in the front and two in the rear, on the side walls, facing toward the center. The seating area was long and narrow. If the space had been more wide than deep, it could have been covered just as well with two larger emitters. Some theaters have both a mezzanine and a balcony. New York City's Walter Kerr Theater has a shallow mezzanine and a shallow balcony. Two large emitters cover both areas nicely.

Additionally, most first-class touring houses will seat more than 2,000 to 3,000. The North Carolina Blumenthal Performing Arts Center, Charlotte, NC, consists of 2,100 seats on four levels. To get the coverage required, Blumenthal's head sound engineer, Rossi Craft, chose IR because of "its clarity and minimal chance of interference".

Another factor to consider in the type of IR system to use is flexibility. Unless your theater is lucky enough to get *Cats* or *The Fantastiks*, which will both run for years, chances are you will have to move the emitters at least once. Consider the lighting designer who hangs a lamp right in front of your emitter or the set designer who wants to extend the set past the proscenium arch and tells you the emitters detract. Reinstalling new AC outlets at each emitter location can be costly, and running AC cable through the audience is unsightly. The solution is choosing a system that offers DC –powered emitters. A system that allows both AC and source signal to run through the same cable would be ideal. One less cable to each emitter is one less part to malfunction.

Theater venues that seat up to 300 people on one level are fairly easy to design. The same rules would apply for larger theaters, with one additional consideration. Quite often, these smaller theaters are referred to as black box theaters because they are rooms painted black with a playing area in the front. There is frequently no real proscenium arch. If this is the case, placement of a large-area emitter may seem sufficient. The black box theater, we must remember, is painted black, and since IR light has the same properties as any other light, lighter colors can bounce the light around, thereby increasing the coverage area, but darker colors absorb the light. Therefore, it might be wiser to use two medium-area emitters, one on each side of the stage for wider spaces or one in the front and another midway back for narrower ones.

In theaters like the Vivian Beaumont at Lincoln Center, New York City, where the audience sits on three sides of the stage, typical rules for focusing IR cannot be applied. Hanging emitters on the side of the stage and cross-focusing will put the highest concentration on the thrust of the stage. Angling them to cover the sides of the stage will leave a dead area in the center. Focusing the main emitters on the center area with a slight intersection and supplementing the seating areas to the side of the stage with an additional emitter on each side will achieve the desired coverage. If interference is minimal, this type of theater could also use an RF system to avoid multiple angles.

When the seating area completely surrounds the playing area, each section should be covered as if it were the only section. Emitters should be hung from the ceiling, preferably off lighting batons. Emitters are then hung at the corner of each section and cross-focused. If the playing area is not symmetrical, like Circle in the Square, New York City, which is really more of a rectangle, hanging and focusing takes a slightly different approach. In this instance, six emitters were used- one emitter on each short side and two emitters on each long side. The two emitters on the long sides are focused across the stage to the opposing seating area, giving a wider angle of coverage. The two remaining emitters on the short side are focused directly at the seating area in front of them.

The growing popularity of the multiplex movie house presents a completely different set of problems. A multiplex can have more than four movies playing simultaneously. This means more than four different signals being sent. To use RF, the owner would have to supply a multi-channel receiver. The downside to this is that even though the channel has been chosen and the patron told not to touch it, he will, and when he is sitting in the theater watching *Shakespeare in Love* but hearing *Saving Private Ryan,* he will be upset. A more costly solution would be using single-channel receivers, but it can be more trouble than its worth trying to keep the receivers organized. There is also the possibility of not having enough receivers for a particular theater.

In this situation, IR would be the system of choice. Although each theater would require its own transmitters, just like RF, a single-channel receiver could be used in any theater at any time. Some movie houses will place a medium-area emitter to the side of the screen, which is usually more than enough coverage. Some theaters choose to place the emitter in the rear. Instead of using the typical under-the-chin receiver, a headphone with the receiving diode on top is used.
Although this is sufficient, it can be distracting to the patrons sitting behind the user.

Because churches vary in size as much as theaters, the same design principles apply. Originally, the market was strictly RF, but in the past five to seven years, use of IR for ALS has steadily grown. Assuming the facility is not around the corner from a bus depot, choosing a system really comes down to cost and quality. It may be desirable in houses of worship for the signal to penetrate the walls into such other areas as cry rooms, nurseries or other gathering areas. An RF system would be a good choice in these cases.

Places of Business

The boardroom is one of the last frontiers to get in step with the ADA. Several factors must be taken into account when designing for corporate meeting spaces. Confidentiality is often an issue, and if this is the case, IR is the system to use. Many boardrooms use electronic ballast fluorescent lighting, however, which has been known to interfere with the IR signal modulated at at 95kHz. These new fluorescent bulbs will not cause the same interference with RF, but these channels cannot be secured. The compromise would be an IR system with a higher frequency. Most manufacturers carry a line of IR products at 250kHz, and a few have started making systems with modulated frequencies of 2.3 MHz.

Classrooms can present the same problems as boardrooms in regard to fluorescent lighting, although security is seldom a consideration. IR may not be the practical solution. Quite often, a system is used in the classroom must be portable, as a student travels from classroom to classroom. An RF system where both the receiver and transmitter are portable is ideal. The student can easily transport the system, and the instructor can wear the transmitter with a small lavalier mic, giving the student access in each classroom and lecture hall.

As with boardrooms, confidentiality is often the main consideration. Again, IR will achieve assistive listening while confining the signal within the room. The only other point to consider when choosing a system is confidentiality within the courtroom. Mics should be placed at the prosecution and defendant tables, at the witness box and on the judge's bench. Choosing a system that allows the judge to mute private conversations at his or her bench will keep the jury members wearing ALS devices from hearing things not intended for the jury.

More and more conferences, seminars and conventions are being held at meeting spaces within hotels. The rooms can be as small a classroom or as large as a grand ballroom. Often, these ware-house-type spaces can be divided into smaller spaces by panels hidden within the wall. Fluorescent lights are often used, which means there is a chance of interference if fixtures are electronic ballast. Conferences and seminars may begin as one large meeting, then later break into focus groups, each in a separate room. By using IR, the same receiver can be used in the large meeting and in any of the smaller meetings. The end user can move easily from one meeting to another without switching channels or changing headsets.

Other Venues

Museums often have several different applications for wireless systems. Theaters, lecture halls and movie houses can be laid out in the same manner, but the unique application for museums is the use of wireless to transmit commentary for both assistive listening and foreign translation at a series of exhibits. The first impulse might be to stay away from RF because multiple transmissions on the same frequency cause severe interference. Using a multi-channel system can be awkward, forcing the user to change channels on the receiver constantly. An efficient, practical solution is using a series of IR emitters. The small-area emitters can be focused expressly in the designated area with each emitter connected to a dedicated transmitter. The area between exhibits can be covered with its own emitter. Sending a non-signal down the line to these emitters will keep the signal even while moving from exhibit to exhibit. This allows the facility to use a single channel IR headset/receiver that can be used at all exhibits and any lecture halls or theaters.

Amphitheaters are typically laid out like any other theater, except there are no walls or no ceiling. IR does not function well in direct sunlight. Even on overcast days and nights, it is difficult to get coverage to the seating area. Without walls to contain the light, it simply dissipates. Under these conditions, RF would be the system to choose. The caution would be to choose a frequency that is not close to another already in use.

In the past, guided tours have used a portable amp/loudspeaker with a mic input, packaged in a small case that can be carried on the shoulder. The two drawbacks to this method are weight and the system's inability to eliminate ambient noise. IR is not very portable, and if the tour were outdoors, sunlight would interfere. Most RF manufacturers make a transmitter no larger than a portable receiver. The transmitter can be attached to a belt, hung around the neck or placed in a pocket. A lavalier or headset boom mic to the transmitter will free up the hands of the guide.

Sports arenas and large concert halls with more than 3,000 seats, such as Madison Square Garden and Radio City Music Hall, are both examples of spaces that are so vast, trying to cover every seat with IR would require so many emitters that is almost cost prohibitive. A single-channel RF system will satisfy the ADA requirements.

IR and RF wireless systems have flourished thanks to the ADA, but assistive listening is not the only use for these systems. More and more venues are using it to offer sight description to the visually impaired. There is also increasing multilingual market, and wireless is filling the void using both single and multi-channel systems for simultaneous interpretation. Manufacturers of both IR and RF equipment offer systems ranging in price and quality enough to meet everyone's budget and keep every contractor busy.