COMMUNICATIONS CORNER

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Infrared communications

ASK ANY TEN PEOPLE TO DEFINE "COMmunications" and you'll probably get 11 correct answers. Communications is simply the way we convey information. (And everyone has his own specific needs when it comes to information.)

Many can remember when communications meant things like radio, telephone, teletype, telegraph, etc.

Somewhere along the way, the term communications came to mean almost anything. For example, no longer do we teach grade schoolers to read and write; instead, we teach them to communicate. And later, it's off to college where they study communications: how to produce TV and radio shows, and films, write scripts, edit films, and most important, criticize the work of others who show even less promise.

I still believe communications has to have some element of magic, and that it must do its thing in real time. Of course, the computer has added some truly magical quality to real-time communications, but every once in a while we find that the latest breakthrough in the state-of-the-art is nothing more than an old idea resurrected from obscurity.

Back in the golden age of electronics projects, I, as did many others, experimented with infrared devices. We made *invisible light* beams and detectors, which sounded a bell or alarm if someone interrupted the beam. We even built projects that enabled us to talk on a beam of light. Later, we used LED's and solid-state infrared detectors to once again talk via light beam (for a distance of about two feet).

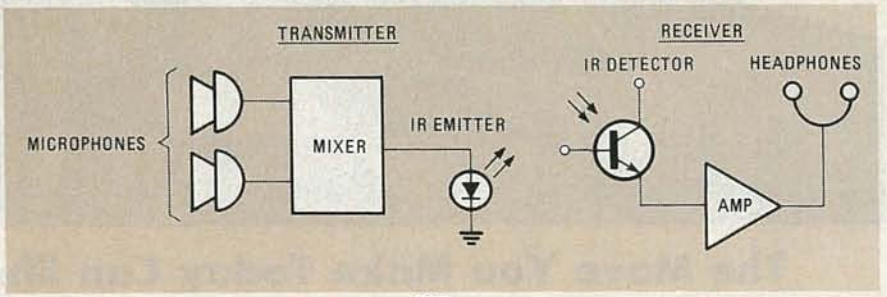

FIG. 1

Two feet became five feet, then ten feet, and finally someone designed a gadget for connection to a TV or Hi-Fi that sent an invisible beam of sound across the room to headphones that had infrared detectors in each earpiece. The gadget worked, but was not cost-effective.

However, as is common to our world, technology eventually reduces the price of just about everything. While the Hi-Fi sound transmitted to a headphone by light beam wasn't a commercial success, the same idea is now being resurrected to provide personal amplification in many theaters—a way for the actors to communicate directly with individuals in the audience. The old *talk-on-a-light-beam* construction project is now being used to bring real-time entertainment to the hard of hearing.

How it works

Figure 1 shows a block diagram of the talk-on-a-light-beam system. There's nothing spectacular about the design. Other than solid-state circuits, which make the combined receiver and headphone unusually light, it's the same old light beam project that we used to build for the science fair.

What's different about the system is that it's almost interference free. It's even possible to place your fingers in front of the detector and, if there is the slightest space between your fingers, the system still works. Because several transmitters are used to send the signal, the light beams strike the detector from every possible angle. A little energy manages to sneak past any opening, no matter how small.

Microphones spread across the stage pick up the stage sounds (signals). The signals are mixed and fed to several transmitters mounted at the front of the theater on each side of the stage. One pair is mounted low for the orchestra and the other pair is mounted high for the balcony. The transmitter is really nothing more than a box containing an infrared emitter, a power supply for the infrared emitter, and a small audio power

amplifier that drives the infrared emitter.

Whether the person seated in front of the user is small, large, wearing a hat, or has an over-done hair style makes no difference. If the beam from one transmitter is obstructed, the beam from another is there to take its place. In testing the system, we even turned around and faced the rear of the auditorium. As you might expect, the signal eventually dropped out, but we had good reception for better than 300-degrees because the input signal originated from several well-spaced transmitters.

The receiver looks very much like the headphones you get on an airplane (with a transducer at the center from which "pipes" lead to each ear). But unlike the airplane headphones, the infrared headphones have a small receiver at the center, and the pipes terminate in real sound transducers, like those used for cassette players.

At the bottom of the receiver is a small rechargeable battery, about 1 × 0.5 × 0.25 inches, that plugs into the receiver. It really hangs below the receiver so it can be simply pulled out and plugged into any convenient outlet for recharging.

On the front of the receiver is a volume control, power switch, and an infrared detector, feeding what can easily be described as a high-fidelity amplifier and headphone. And the sound quality is as good as the best of the *Walkmen* tape players.

Infrared communications works very well over a relatively short, direct path. Because it's inherently a high-fidelity system (in the sense it can transmit a wide spectrum without special equalization), it's useful for much more than just wireless sound, as witnessed by TV remote controls.

There is no reason why the two functions (control and sound) cannot be multiplexed on the same carrier beam. Just imagine an infrared light-beam gizmo in the base of a communications microphone. The sound and control switching would go to the transceiver without intervening wires to snag around the legs: Probably the safest way to operate a mobile radio short of parking. **R-E**