

6 Steps to Embed RIC Hearing Aids

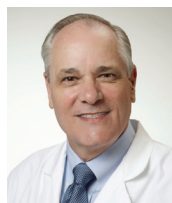
By Dennis Colucci, AuD, MA

The coupling of sound from the hearing aid to the ear canal is a primary step in the fitting process. Poor hearing aid choice, fitting designs, and decisions on programming are the primary reasons why patients fail to use or return their hearing aids. These errors may harm patients and result in negative perceptions of the benefits of hearing aids and the value of audiology services. Compounded by the high price of hearing aids, these adverse views push the public away from the standard clinical model and into the sales model. While over-the-counter hearing aids may help many patients, these devices cannot accommodate patients with impossible-to-fit ears or those with various hearing disorders.

One area that requires special attention is the coupling of the hearing aid to the ear canal. Various issues could influence the outcome—too deep, not deep enough, too much venting, not enough venting, and/or lack of stability. The acoustic properties of hearing aids can be impaired by a poorly fitted dome or ear mold. Some ears are difficult to fit, such as those with convoluted shapes and different sizes like the 90-degree bend, small isthmus, hook, curved funnel, zigzag, and upward bend. In these cases, a receiver-in-canal (RIC) with a dome can be difficult to fit or stabilize, especially when mid- or low-frequency gain is needed. Although a standard ear mold with a mini-tube or soft material may be a viable alternative, fitting a RIC can still be done by obtaining a solid, custom acrylic ear mold and embedding the receiver.

Although the embedded receiver made by some manufacturers is a great idea, it is impractical for some patients with cerumen issues and torturous canals. A clogged receiver that cannot be evacuated in the office will need frequent factory repair, which is inconvenient, expensive, and disruptive to care. One solution is to embed your own RIC into an acrylic mold in such a way that it can be easily removed, cleaned, or replaced. In an in-office retrospective review of 100 hearing aid fittings using an office modified embedded receiver, this protocol has been found to be successful, and without oversights in comfort, acoustic anomalies as measured by ear probe microphone, or skin reactions to the added silicone or acrylic.

For professionals accomplished at fitting hearing aids, doing acoustic modifications on ear molds and acrylic work is straightforward. Here are the steps for embedding any receiver:



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1. PREPARE THE MATERIALS

In addition to the materials used in an office laboratory, the list below contains silicone and acrylic materials that require a properly vented room. Check the Material Safety Data Sheet (MSDS) for use instructions. Use rubber surgical gloves to protect the skin throughout the process.

- Rubber surgical gloves and dust mask
- Fine-tipped marker
- Custom acrylic ear mold
- Receiver-in-canal
- Silicone glue or adhesive (hardware store, must cure in 24 hours)
- Acrylic nail mix (beauty supply)
- Hairdryer
- UV light source (optional)

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2. EAR MOLD DESIGN

The shape and size of the ear mold are critical to patients. It is important to keep cosmetics in mind, along with maximized performance. The ear molds should be made of solid acrylic in any style, including those with canal locks, helix locks, or skeleton design. When ordering a custom product from an ear mold laboratory, an impression that extends beyond the second bend will allow for a variety of modifications in the office. If the ear mold can use a #13 tubing and accommodate the appropriate vent size, the factory should drill the mold, but not glue the tubing in place. If using a #13 tubing is not possible, order a mini-tube instead. Once the ear mold is received, several modifications can be done: the depth of the canal and the concha area can be adjusted, the sound port can be enlarged, the vent can be changed, and the ear mold can be polished before the receiver is embedded.

3. RECEIVER CHOICE AND PREPARATION

Shapes and sizes of receivers vary based on power level and manufacturer. Some are round or square, but many are rectangular. When deciding which receiver to use for custom embedding, consider the patient's degree of hearing loss (at and below 1,000 Hz) as well as the venting in the devices. Once the size is determined, it can be matched to the available space.

Manufacturers have designed receiver systems that are pressed and placed into a sock at the tip of the ear mold.

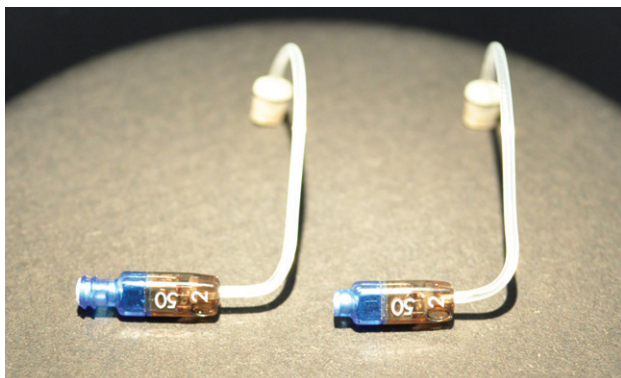


Figure 1. Receiver-in-canal

This requires a receiver neck to keep the receiver in place. However, in many cases, this prevents the use of RICs in ear canals that are difficult to fit. As shown in Figure 1, the receiver neck is removed at the point of the metal casing. This will vary among different manufacturers. In the case of round receivers, no modification is necessary, although the wax guard should be removed.

Depending on the size of the vent and the receiver, the available space and placement needs to be determined. To prepare the ear mold for modification, draw out the receiver size onto the ear mold using a fine-tipped marker to mockup the correct position.

4. EAR MOLD MODIFICATIONS

Starting from the factory drilling or from drilling the sound path in the office, carefully enlarge the area needed to accommodate the selected receiver using a 1/16 inch burr or larger. Cut the drawn outline of the receiver using the burr and gradually cut deeper into the ear mold. During this process, make multiple attempts to fit the receiver into the ear mold while making small modifications. Keep the cut area as smooth as possible until the receiver fits as deep as desired. Drill out the vent size and sound board for easy access and cleaning.

5. GLUE THE RECEIVER INSIDE THE EAR MOLD

Using a small amount of silicone glue, attach and push the receiver into the ear mold. Start from the tip of the receiver and build up the glue on the outside. Remove the excess glue, clean the receiver wire, push the receiver into the mold, and place the mold in a dry area for curing. Using a UV dryer can speed up this process to approximately 20 minutes. The glue should not come in contact with the patient when this process is complete. Once the silicone has hardened, the receiver will need to be pushed out using a probe, and cannot be removed by the patient without damage. This allows for the receiver to be replaced multiple times.


6. FINISHING OFF THE RECEIVER

Although the receiver and wire do not need to be finished, a small amount of acrylic can be floated over the back of the



Figure 2. Ear mold with embedded receiver

receiver up the wire using the acrylic mix and a small probe. A cool hairdryer should be used immediately following the application. Once the acrylic is semi-hardened, leave it for 30 minutes in a dry room or 12 minutes under a UV light source to harden prior to cleaning up excess acrylic and polishing. When the receiver needs to be removed or replaced, the thin coat of acrylic used to cover the receiver can be burred away and cleaned (Fig. 2).

Modern technology has allowed audiologists to provide more accurate fittings than ever before. It is not uncommon to fit a dome in RIC hearing aids for high-frequency hearing loss and get excellent results. However, domes and custom ear molds do not fit every ear canal. For complex cases like convoluted ear canals with chronic cerumen, having the ability to remove, clean, and replace the receiver is paramount. Embedding receivers is a simple process that should be considered when ear molds or domes fail to benefit patients. 

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