



Improving Hearing Aid Performance with Bourns® Trimpot Trimming Potentiometers

APPLICATION NOTE



3312

INTRODUCTION

Hearing aids are devices that amplify sound for people who have hearing impairments. Sound is converted to an electrical signal, amplified and then reconverted to acoustic energy in the inner ear. Hearing aids can be small enough to fit behind the earlobe or within the ear canal. The level of amplification that a person needs will determine the operating range of the hearing aid.

SYSTEM COMPONENTS:

- **Microphone** – converts acoustic energy to electrical energy
- **Amplifier** – makes the sound louder by increasing the electrical signal strength; maintains the frequency response of the microphone
- **Volume (Gain) Control** – controls the overall signal after the amplifier
- **Earphone** – acts as the receiver by converting electrical energy to acoustic energy
- **Sound Hook** – delivers sound from the receiver to the ear mold
- **Battery** – supplies power to the amplifier contained in the shell
- **Internal Controls** – act as the receiver by converting electrical energy to acoustic energy
- **Shell** – outer casing that contains all internal circuit components

As shown in figure 1, the incoming signal goes through the microphone, where it is filtered to obtain the respective frequency response, and amplified to create a louder sound. The receiver, or earphone, converts the signal back into an acoustical form that can be heard by the ear.

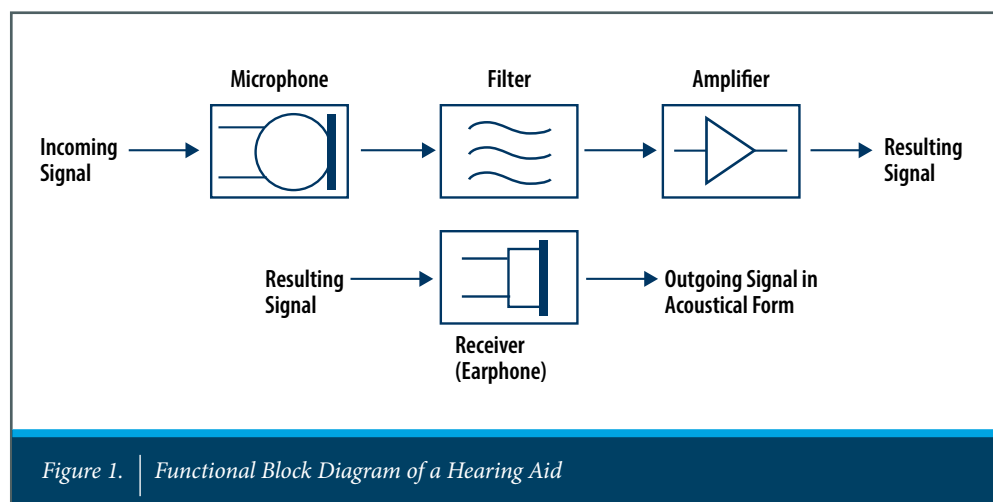


Figure 1. | Functional Block Diagram of a Hearing Aid



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WHERE THE TRIMMER IS LOCATED AND HOW IT FUNCTIONS:

- The trimmer can be used in the internal controls, where the fine tuning adjustment is done by the audiologist.
- The trimmer can be used as a rheostat, in the volume control to alter the current going through the microphone and the amplifier.
- In the amplifier circuit, the trimmer can help to offset the distortion of the input signal from the microphone. This provides for better sound performance.

WHY MODEL 3312 TRIMMERS ARE THE BETTER CHOICE:

During the assembly of the electronic hardware, the microphone, amplifier, battery compartment and volume control are soldered into place and put through a wash process. The Bourns® Models 3312 is sealed to withstand standard wash processes, unlike open frame trimmers. These 2 mm sealed trimmers are ideal for smaller hearing aids, such as Behind-The-Ear (BTE), In-The-Ear (ITE) and In-The-Canal (ITC) aids.

ADDITIONAL RESOURCES

For more information on the 3312, including engineering files and other resistive products from Bourns, please visit:

www.bourns.com

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MODEL 3312 SPECIFICATIONS

Electrical Characteristics

| | |
|---------------------------|----------------------|
| Standard Resistance Range | 10 Ω to 2 MΩ |
| Resistance Tolerance | ±20 % std. |
| Adjustability | |
| Voltage Divider | ±0.4 % |
| Rheostat | ±0.8 % |
| Resolution | Essentially Infinite |
| Adjustment Angle | 255 ° nom. |

Environmental Characteristics

| | |
|------------------------------|--------------------------|
| Power Rating (50 volts max.) | |
| 70 °C | 100 mW |
| 125 °C | 0 watt |
| Operating Temperature Range | -55 °C to +125 °C |
| Temperature Coefficient | ±100 PPM/°C |
| Vibration | 20 G TRS ±1 %; VRS ±1 % |
| Shock | 100 G TRS ±1 %; VRS ±1 % |
| Rotational Life | 25 cycles TRS ±3 % |