

APPLICATION NOTE

3312

Hearing Aid

Bourns® Model 3312 trimmer. A better choice.

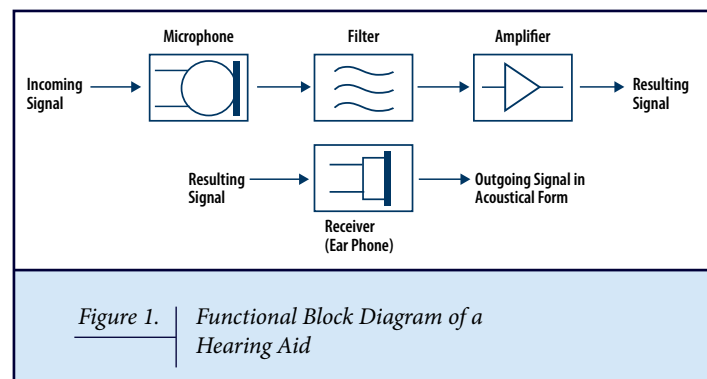


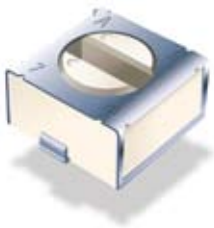
Hearing aids are devices that amplify sound for people with hearing impairments. Sound is converted to an electrical signal, amplified and then reconverted to acoustic energy in the inner ear. They can be small enough to fit behind the earlobe or within the ear canal. The level of amplification that 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. Energy maintaining the eddy currents becomes too great for the oscillator and stops. This condition triggers the detection circuit to signal the switch to change state. When the metal target exits the sensing range, the oscillator will resume functioning in its normal state. The normal state is either 'Normally Open' or 'Normally Closed.'





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.
- Used as a rheostat, it can also be in the volume (gain) 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.

Why Bourns® 3312 trimmer is the better choice:

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

For more information on the 3312 and other resistive products from Bourns, please visit

www.bourns.com

SPECIFICATIONS

Electrical Characteristics

Standard Resistance Range	10 Ω to 2 M Ω
Resistance Tolerance	± 20 % std.
Adjustability	
Voltage Divider	± 0.2 %
Rheostat	± 0.4 %
Resolution	Essentially Infinite
Adjustment Angle	240° nom.

Environmental Characteristics

Power Rating (50 volts max.)	
70 °C	0.1 watt
125 °C	0 watt
Operating Temperature Range	-55 °C to +125 °C
Temperature Coefficient	$\leq 100 \Omega$ ± 150 PPM/°C; $> 100 \Omega$ ± 100 PPM/°C
Vibration	20 G TRS ± 1 %; VRS ± 1 %
Shock	100 G TRS ± 1 %; VRS ± 1 %
Rotational Life	25 cycles TRS ± 3 %