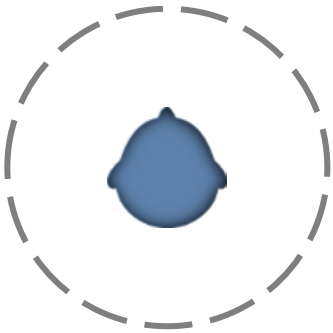
Feature Descriptions

Directionality

Hearing aids with directional microphone systems can focus on speech sounds, providing them with greater amplification than surrounding noise. Thereby improving the patient's speech intelligibility in noise. Ultimately, directional options allow the patient to focus on the sounds they want to hear, while reducing unwanted noise. Depending on the chosen technology level, different directionality options will be available.

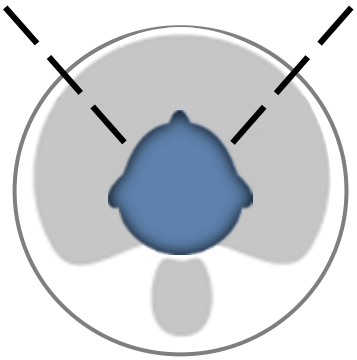
Omni



Omni-directional microphones equally amplify sounds from all directions around the listener. This microphone system provides the maximum environmental awareness, but typically does not improve the signal-to-noise ratio in a given environment.

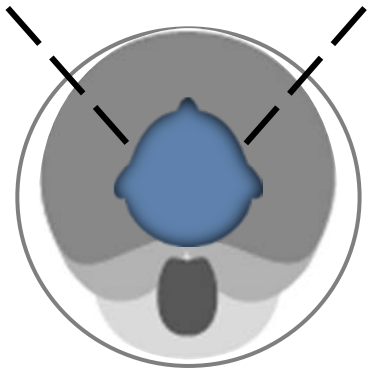
Clinical Tip: Omni-directional microphones may be better in quiet, outdoor setting or other situations when the sound source is coming from all directions. Patients who have difficulty holding conversations in noisy situations may benefit from directionality.

Fixed Hypercardioid



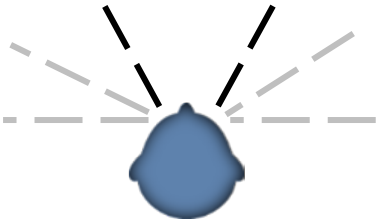
Fixed directionality uses a static directional pattern. Sounds from the front of the listener receive amplification, while sounds coming from behind receive less amplification. This directional pattern will not change even if the noise sources move around the listener. Therefore, the listener may still have difficulty communicating in dynamic listening environments.

Clinical Tip: This setting assumes that the signal of interest is always in front of the patient. Patients should be counseled that sounds coming from the back and sides might be less audible, requiring the patients to turn their head toward the signal of interest.



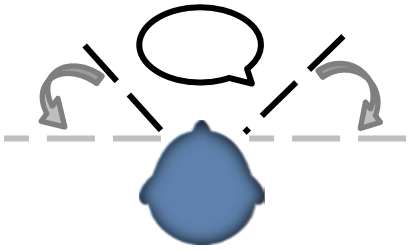
Adaptive Directionality

An adaptive directional system is one in which the directional pattern changes based on the location of the noise sources and the signal-to-noise ratio. Speech signals originating from the front are automatically differentiated from noise originating from behind the listener. In making this distinction, the system determines the directional polar plots that best reduce the surrounding noise, thereby improving the signal-to-noise ratio. Accordingly, the system will track the identified noises as they move to keep them at reduced levels. Depending on the hearing instrument technology level chosen, a greater number of polar plots are used across the frequency range.



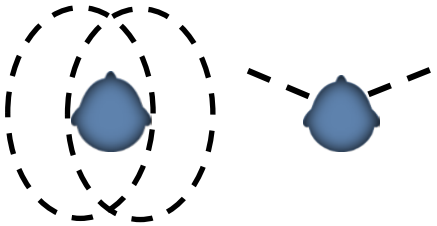
Smart Beam

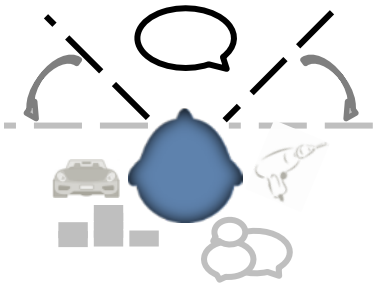
Smart Beam is an advanced version of our adaptive directional system and is generally only available on our 9 and 17 level instruments. In addition to creating different polar plots to attenuate the greatest number or noise sources, Smart Beam also allows for further customization of the front beam that provides amplification of signals originating in front of the listener. The additional beam width options provided by Smart Beam include Narrow, Medium, Wide, and Smart Beam Steering.



The Smart Beam Steering option allows the system to automatically switch between Medium and Wide beam widths depending on the location of the speech and signal-to-noise ratio in the environment.

Clinical Tip: The Wide setting will encompass most of the area in front of the patient and is therefore a very good starting point. If the patient has complaints regarding hearing in noise, it may be advantageous to reduce the beam width to a Medium setting.
The Narrow setting is recommended when the listener only regularly communicates with a single speaker who is located in front of the listener.



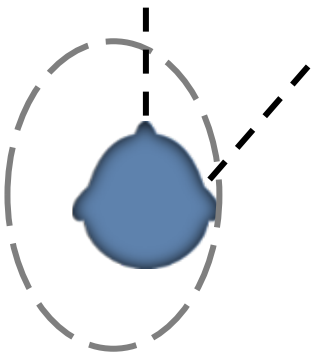


Synchronized Speech Spotter Pro

Speech Spotter Pro allows the hearing aids to change automatically between omni and adaptive directionality. The hearing aid analyzes the surrounding environment, as a result the instruments will automatically choose the best microphone mode to improve communication for that environment. This means that in an environment where the signal to noise ratio is deemed to be poor, the system will switch to an adaptive directional pattern with variable beam widths (Narrow, Medium, Wide and Smart Beam Steering). The hearing aid will then return to the omni-directional mode once the noise subsides or is no longer detected. Speech Spotter Pro allows the hearing aid wearer to have a natural listening experience without having to remember to push a button.

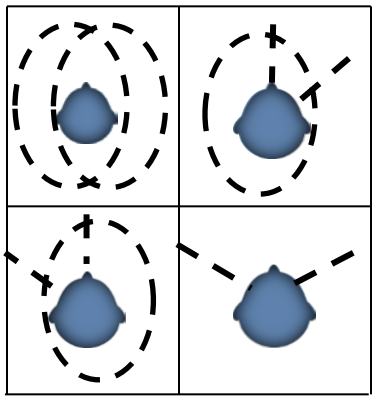
With Ear to Ear Communication enabled, the change in directional mode is now synchronized between the two instruments. This synchronization is built into the Speech Spotter Pro directional option. Accordingly, the Directionality drop down menu will have “Synchronized Speech Spotter Pro” among the options.

Clinical Tip: It is important to counsel your patients that the hearing instrument may occasionally self-adjust in a manner that is different from the patient’s wants or expectations. If the patient finds this directional option unsatisfactory, but still only wants one program, then consider switching to a version of CrossLink Directionality.



Spatial Directionality

Spatial Directionality is a binaural fitting strategy where the calculated “Focus” ear receives directional input and the “Monitor” ear receives omni-directional input. Using these two microphone modes in coordination provides the brain the input required to process sounds similar to how it is processed in a healthy hearing system. Spatial Directionality allows the hearing aid wearer to receive the directional benefit required for better hearing in noise, while experiencing the environmental awareness necessary to fully engage in one’s surroundings.



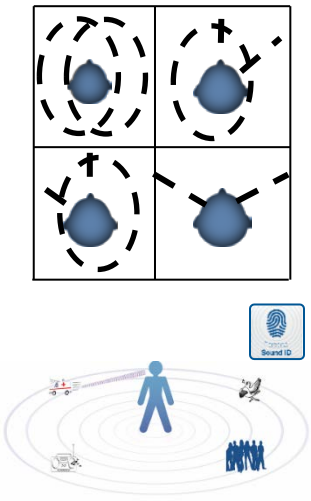
CrossLink Directionality

CrossLink Directionality is a binaural fitting strategy that takes advantage of Ear to Ear Communication, or wireless communication between hearing instruments. The hearing instruments together monitor the environment using speech and noise detectors. Each instrument has a front and rear detector to evaluate the presence of speech in front and behind the hearing instrument wearer, and a noise detector to evaluate the presence of noise in the environment. The set of instruments calculates the focus ear and monitor ear based on the signal-to-noise ratio, word recognition scores, and degree of hearing loss. The speech and noise detectors in both the hearing aids communicate with each other continually using Ear to Ear Communication to identify situations in which a different microphone configuration may be more beneficial. The possible combinations are omni/omni, omni/directional, directional/omni, and directional/directional. This option is for 17 and 9 level products with directional microphones and Ear to Ear.

CrossLink Directionality with Personal Sound ID

This directionality option available for 17 level BTEs and RIEs, builds on CrossLink Directionality and introduces Personal Sound ID when in a bilateral omnidirectional mode. Personal Sound ID integrates two technologies to preserve the acoustic cues for spatial hearing, pinna restoration and binaural compression. Pinna restoration reproduces the monaural spectral cues of the open ear that are disrupted by positioning the hearing aid microphone outside of the pinna. Binaural compression helps to preserve the natural loudness difference between the ears using Ear to Ear information.

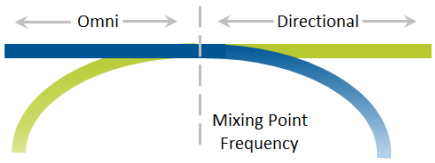
Clinical Tip: Personal Sound ID can be selected as a program for patients wanting to hear from all directions with the advantage of pinna restoration and binaural compression technologies.

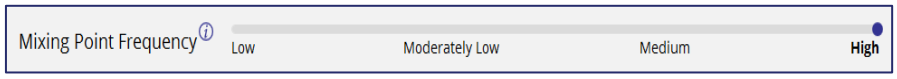


CrossLink Directionality 2 with Personal Sound ID

This directionality option for 17 level BTEs and RIEs, builds on CrossLink Directionality with Personal Sound ID, which uses Ear to Ear communication to determine the best directionality mode for the environment. With CrossLink Directionality 2, the hearing aids are optimized when in the asymmetrically mode. This creates better speech recognition as well as improved localization, by allowing the wearer to hear more of the sound coming from their back and side (over the shoulder). CrossLink Directionality 2 works with Personal Sound ID to provide the cues that permit wearers to focus on speech without losing the important environmental sound.

Mixing Point Frequency

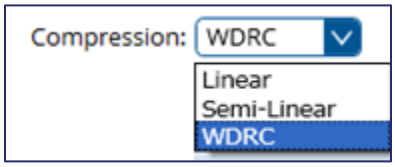




Many directional processing systems require a trade-off between low frequency noise and audibility of low pitch sounds. All of Beltone's directional options process low and high frequencies separately, with directionality being applied to high frequencies, while low frequencies always remain in omni, providing the best possible sound quality. Beltone allows for the adjustment of the mixing point frequency which blends omni-directional and directional processing. In most situations, adjusting the mixing point frequency is unnecessary.

Clinical Tip: A high mixing point frequency means that most of the signal is processed in an omni-directional fashion. A low mixing point frequency indicates mostly directional processing. Mixing point frequencies are calculated based upon the individual hearing loss and the hearing aid style.

Fitting Mode Options

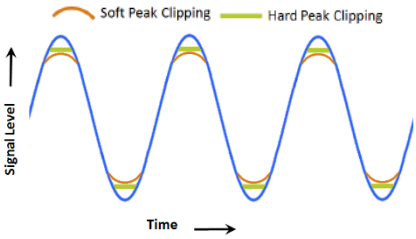


Compression Mode

For super and ultra power hearing aids, there are three compression modes available, Wide Dynamic Range Compression (WDRC), Semi-linear and Linear.

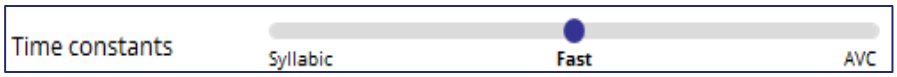
WDRC provides higher amplification for softer sounds and can be used with any type of hearing loss.
Semi-linear compression might be preferable for those hearing aid wearers who require more amplification for loud sounds than WDRC provides, but less amplification for loud sounds than linear compression provides. Semi-linear mode provides a compromise between audibility for soft sounds and loudness. At the same time, it can reduce the tendency to feedback.
Linear provides more amplification for loud input signals, which might be preferable for some hearing aid users with profound hearing loss who are experienced with this type of amplification.

Compression Limit Mode



When linear compression mode is chosen, an output limiting feature called Compression Limit Mode is available. It offers two options for limiting the output, soft peak clipping and hard peak clipping. Soft peak clipping is the defaulted setting and adds less distortion to the sound signal. Hard peak clipping should be used with previous analog wearers who want more power. Hard peak clipping allows maximum output, but introduces some distortion.

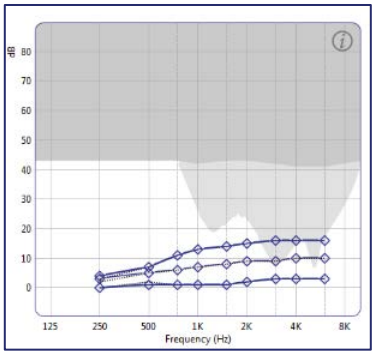
Time Constants



These are the attack and release compression times. The attack time is the delay that occurs between the onset of compression and the resulting reduction of gain. The release time is the delay that occurs between the offset of compression and the increase of gain, back to normal. The three options are syllabic, normal and AVC. In most situations, adjusting the time constant is unnecessary.
Syllabic has a fast 10 msec attack and release time, so that each syllable can be heard above the noise in the environment.
Normal has a fast attack time and a variable release time between 30 and 60 msec.

AVC has a slow attack and release time and is used when speech is not the primary listening signal, or with patients who have processing difficulties.

Feedback Calibrations System



Maximum Stable Gain (MSG) calibration

Feedback Eraser, a digital feedback suppression system eliminates the annoying high-pitch whistle from hearing aids. In order for this technology to work in the real world, it first needs to be calibrated in the office. Calibration provides a reference tone for which the hearing aid can make filters to eliminate feedback waves. Running the MSG calibration will reduce the risk of whistle and improve patient satisfaction. To obtain the best MSG curves the hearing aids need to be placed in the patient's ears, otherwise there is increased risk for feedback.

Clinical Tip: Make sure to run the MSG calibration every time the instrument is repaired or there are changes to the instrument's physical properties. These changes include, but are not limited to, new tubing, new earmolds, and vent adjustments. Be sure to calibrate in a quiet environment to ensure the most accurate calibration possible.

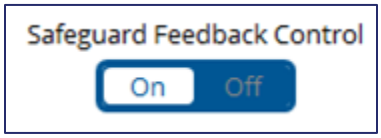
Feedback Eraser

Feedback is that annoying, sometimes embarrassing high-pitched whistle produced by a patient's hearing aids. Poor physical fit, high gain settings and objects in too close proximity to the hearing aids are all possible causes of feedback. Feedback Eraser measures the pathway sound travels around the hearing aid and creates a digital signal opposite in phase to cancel the feedback. It is initiated by the MSG calibration and automatically activated after the calibration is completed. The Feedback Eraser offers several levels (Mild, Moderate, Strong) of reduction to achieve the elimination of feedback in both static and dynamic situations without impacting gain or sound quality.

The music mode setting is designed for feedback and artifact free music listening. In this mode the input sound is analyzed over a longer period of time to better distinguish feedback from other tonal sounds. The Music Mode option is available in all environmental programs and is the default in the “Music” program.

WhistleStop is our most aggressive Feedback Eraser setting and is only available on 17 level products. While WhistleStop reduce feedback most of the time, this most aggressive level may impact audibility and sound quality for very severe losses. This setting is especially useful for acoustic telephone use.

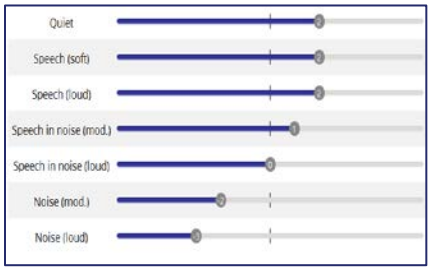
Safeguard Feedback Control



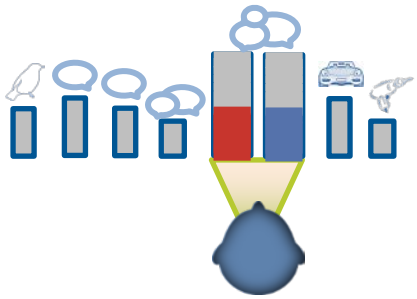
Safeguard Feedback Control is a convenient option in cases when an MSG calibration is not possible. Safeguard Feedback Control learns the feedback path of the individual to efficiently cancel feedback, it’s like a feedback safety net. Safeguard Feedback Control is defaulted “On” and active for all programs in the instrument once it is connected to the software. This setting is global, so one program cannot have safeguard Feedback Control set to “On” while another program has it set to “Off”. Once the MSG Calibration for Feedback Eraser is complete, the safeguard Feedback Control is automatically turned off.

Clinical Tip: While the Safeguard Feedback Control will

Smart Gain Pro



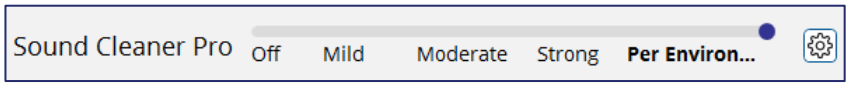
Smart Gain Pro helps customize listening situations to the patient’s preferred gain. The gain in seven environments: quiet, speech, loud speech, speech in moderate noise, speech in loud noise, noise and loud noise, can be adjusted to optimize the patient’s listening environment. The hearing aid will recognize the type of listening environment based on the acoustic features present in the signal and apply the adjustments for that environment. The seven environments can be applied across programs to give the patient the best sound level no matter the type of listening situation. The addition of Ear to Ear Communication now allows for the synchronization of the volume changes controlled by Smart

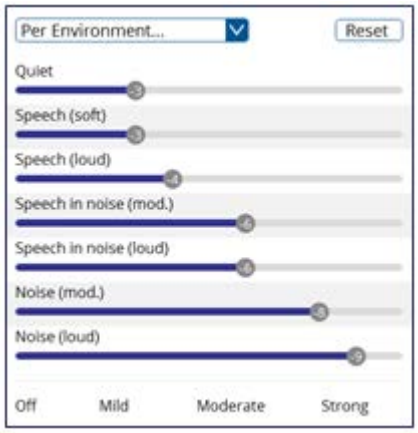


Gain Pro. This synchronization happens seamlessly behind the scenes to prevent any artificial disparity between hearing instruments. This means that once an environment is detected both instruments will apply the appropriate volume setting, set up by the dispenser, for that environment. Smart Gain Pro also combines environmentally controlled noise reduction levels with our 17 level products. As a patient changes environments, higher levels of noise reduction may be preferred in noisy environment, the hearing aid will also automatically implement these noise reduction settings as well.

Clinical Tips: For patients who complain of uncomfortably loud noise, it may prove beneficial to decrease the gain in noise and loud noise environments by adjusting the Smart Gain pro sliders for these environments only.

Sound Cleaner Pro

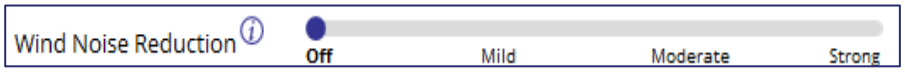


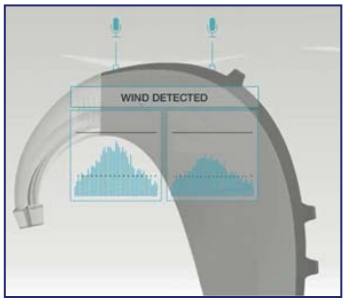


Speech and noise have two different spectrums: speech is highly modulated with rapid changes in amplitude, while noise has less modulation with only small changes in amplitude. Our hearing aids analyze the incoming sounds and recognize when speech is present within the individual bands. A spectral analysis is continuously carried out whenever speech is not present. This allows the noise spectrum to effectively be “subtracted” from the total signal without affecting speech. The amount of noise subtracted is dependent on the setting, and is weighted according to a speech importance. This specificity in detecting noise allows the hearing aids to reduce noise only in those bands where noise is present. Sound Cleaner Pro may improve listeners’ performance and increase comfort in background noise. In addition to the standard Mild, Moderate and Strong settings available in the Sound Cleaner system found in our 9 level instruments, Sound Cleaner Pro in our 17 level instruments, also includes a Per Environment setting. This Per Environment setting allows the noise reduction to be adjusted across the seven environments classified by the Smart Gain system for even greater customizations.

Clinical Tip: When complaints arise regarding too much environmental noise or discomfort due to noise, increase the strength of Sound Cleaner Pro. If the problem is only experienced in certain environments, increase the noise reduction in only the types of environments described by the patient by using the Per Environment setting.

Wind Noise Reduction





Turbulent air flow over the microphone ports caused by even a moderate level of wind can tremendously increase low frequency input into the hearing instruments. Not only does this wind noise create a loud unpleasant listening situation for the hearing aid wearer, but can also detrimentally affect speech understanding. Beltone's Wind Noise Reduction correlates the inputs between the two microphones. In this manner, the wind noise detector will only activate wind noise reduction if there is wind present at the microphones. This system provides a reliable and effective way to rid the patient of troublesome wind noise and allows them to fully enjoy outdoor environments once again. Naturally this two microphone wind noise reduction is only available in dual microphone devices. Depending on the technology level chosen, you will have varying offset options available. Mild offset of 6, Moderate offset of 3, Strong offset of 0.

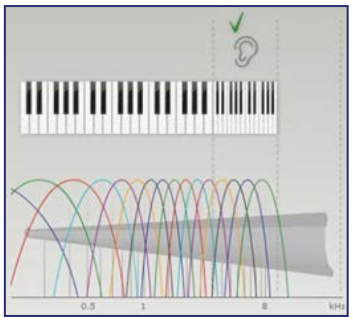
Clinical Tip: Wind Noise Reduction is a key feature in the "Outdoor" program. If wind noise reduction is required in other programs, manually turn it on from the Advanced Features tab.

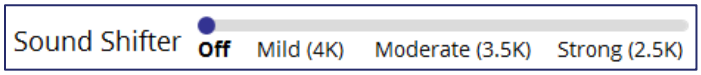
Silencer

Silencer is Beltone's term for expansion. It reduces amplification for very soft sounds which aren't of interest to the wearer, such as very low level environmental sounds or noise generated internally by the hearing aid. Gain is reduced as the sound intensity decreases below a set kneepoint. This provides less gain for sounds that are softer than

conversational speech. The purpose of activating Silencer is to improve the quality of sound in quiet environments by reducing low level noise.

Sound Shifter

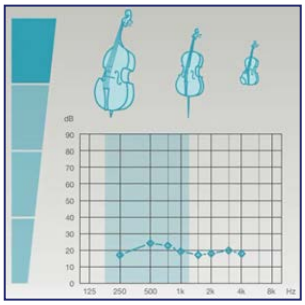




Sound Shifter is a frequency lowering approach that improves high frequency audibility, with minimal degradation of sound quality. Frequency lowering strategies displace signals from higher frequencies to lower frequencies, where beneficial amplification many be achieved. Frequency compression changes the input to a more usable output above a cut-off threshold, or kneepoint. Sound Shifter compresses the frequencies above the kneepoint, effectively moving them closer together. The input frequencies are amplified in a narrower frequency region that is more useable to the hearing aid wearer. Since the need for frequency compression is not easily generalized to particular hearing losses or patient characteristics, the feature is set to a default "off" setting in each program. The recommended setting is based on the patient's audiogram will be indicated in **bold** typeface as either "Mild", "Moderate" or "Strong".

Clinical Tip: Recommendations for Sound Shifter are specific to the ear's audiometric thresholds. It is possible that different settings for each ear may be recommended, as in the case of asymmetric hearing losses. In such cases, it is recommended to set Sound Shifter to the mildest of the recommended settings for both ears. Furthermore, Sound Shifter may be activated in one or more programs, binaurally or monaurally, depending on the hearing aids wearer's needs.

Low Frequency Boost

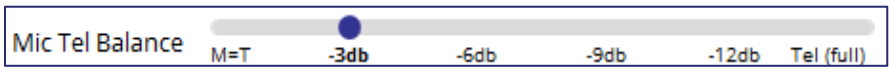


Low Frequency Boost is another feature for super and ultra power hearing aids. This feature adds additional gain in the low and mid frequencies, and can be applied per program. When applied, there will be a visible change in the gain levels of the frequencies that are affected.

Clinic Tip: The Low Frequency Boost will only be applied if the maximum gain for the hearing aid has not been reached.

Phone Options

Telecoil (T-Coil)



A Telecoil is a component inside the hearing aid that picks up magnetic audio signals from hearing aids compatible telephones, inductive loops systems, or assistive listening devices. When the Telecoil is activated in the hearing aid, the telecoil signal bypasses the microphone(s) and the listener hears the audio signal being picked up directly by the telecoil. For customization use the microphone balance sliders within the program to allow the patient to hear some surrounding sound while in the telecoil mode.

Clinical Tip: Given that the telecoil bypasses the microphone(s), the telecoil enables the patient to hear well on the telephone by reducing feedback. In venues that have an induction loop, the signal to noise ratio can be greatly improved through the use of a telecoil.

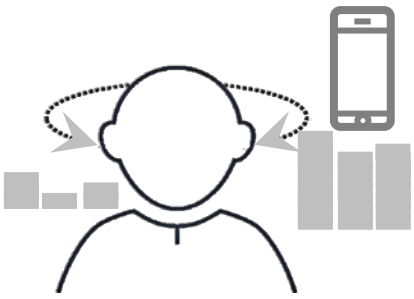
Acoustic Telephone

For those products where a Telecoil is not an option there is an acoustic telephone option. The acoustic telephone program uses the hearing aid microphone(s) frequency shaped to work best with the phone. Since the microphone(s) are on there may be feedback when the phone is placed near the hearing aid.

AutoPhone

The AutoPhone option allows the hearing aid to change to a phone program without the patient having to manually press a button. Telephone programs allow for improved listening on the phone and the elimination of feedback. AutoPhone will automatically switch to the hearing aid's telephone program when the hearing aid enters a magnetic field. Magnets are placed on the wearer's telephone receiver to activate the AutoPhone program. When the hearing aid leaves the magnetic field, the program will change back to the general program set for the user.

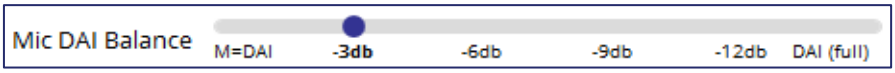
Clinical Tip: Be sure to demonstrate the AutoPhone feature before the patient leaves the clinic to ensure that the patient has the correct phone placement to activate this feature. Also play the acoustic indicator tones for the patient so they are familiar with the sound they will hear when entering and exiting the phone program. The indicator sound can be adjusted or turned off under the manual control tab.



Asymmetrical Phone Handling

Wireless Ear to Ear Communication can be applied to phone usage by allowing one instrument to let the other know that it's on the phone. Once an instrument communicates that it is listening to a phone, the microphone input in the opposite ear is reduced by 6 dB. This is called "Asymmetrical Phone Handling". This feature allows the instrument wearer the ability to comfortably hear their phone conversation while reducing the competing environmental noise. This reduction in gain is automatically built into the AutoPhone functionality. Therefore, whenever an AutoPhone program is activated in a fitting, the patient will experience a 6 dB reduction in gain in the instrument that is not in contact with the phone. This feature is available for both Acoustic Telephone and Telecoil programs.

Direct Audio Input

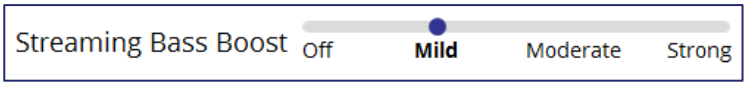


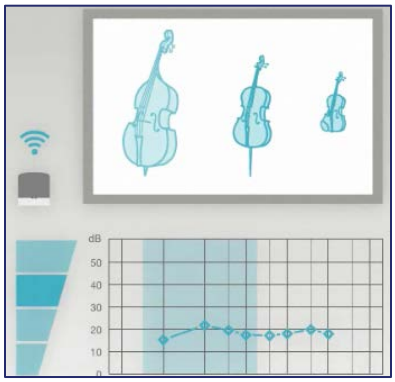
Direct Audio Input (DAI) is an alternative audio signal to the hearing aid. When the DAI is activated, the hearing aid microphone(s) or telecoil is bypassed, allowing the patient to hear the audio signal being delivered directly through the DAI input. The routing is accomplished through a specially designed audio shoe that automatically engages the DAI when connected to the external case. The DAI allows for connections to devices such as the TV, radio, or external microphones (like an FM system). Use the microphone balance sliders within the program to allow the patient to hear some surrounding sound while using a DAI device.

Clinical Tip: Using the DAI can improve sound quality for these devices and improve hearing in noise, as room reverberation and/or ambient noise are not amplified along with the desired signal.

Accessory Adjustments

Streaming Bass Boost

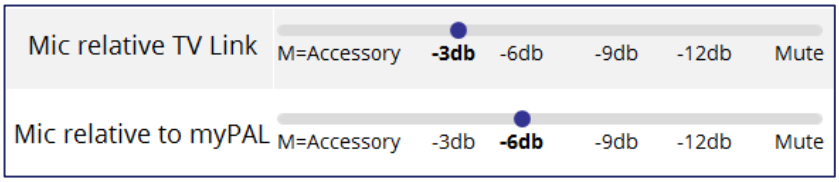




Streaming Low Frequency Boost provides low frequency enhancement to audio signals streamed through wireless hearing aids from the Direct Line Accessories or direct from MFi. This useful feature can be used to enrich the sound quality of the streamed audio that may otherwise be perceived as thin or tinny sounding.

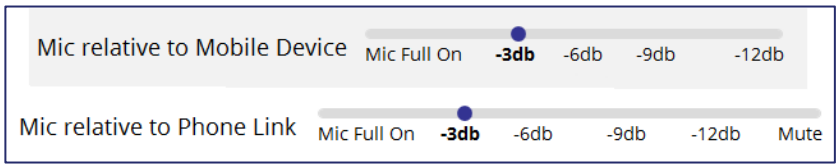
Clinical Tip: The low frequency enhancement can provide a much richer sound quality much like being able to increase the bass on a home stereo system. The low frequency enhancement many be less noticeable for open fittings, as the low frequency energy is not retained in the ear canal due to the natural effects of the large open vent.

Microphone Balance Sliders



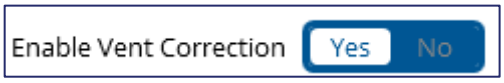
The microphone sliders allows for adjusting the input of the microphones versus other inputs, like the telecoil or accessories, in a particular program. For instance in a TV Link program, the hearing aid wearer needs to hear the television, but might still also want to hear what's happening in the surrounding environment. In this situation, it would be advantageous to have some input from the hearing aid microphone at a lower level than the TV Link input. There are individual sliders for the TV Link and the Personal Audio Link. In the example above, the bolded default of -3 dB means that the hearing instrument microphone will have 3 dB less gain than the TV Link.

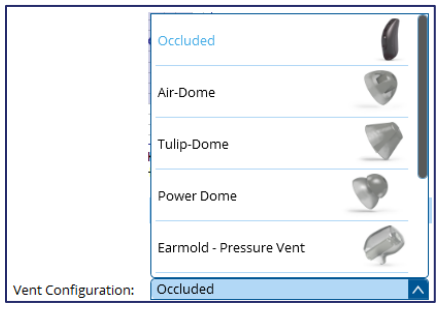
Phone Link/Smart Device Microphone Balance



This feature allows you to set a dB reduction for the hearing aid microphones when streaming to a smart device, whether using a Phone Link or direct streaming with MFi. Now the environmental sounds can be turned down so your patient will not miss important streamed information.

Vent Effect

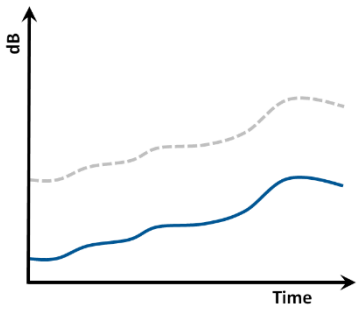




Dome, tube selection and vent configuration can be changed under this feature. Selections in this screen affect only the display of the gains in the Fitting screen not the output of the hearing aid. For example, when venting is changed, the amount of roll-off in the low frequencies will be adjusted to show how this physical change affects the expected real ear response. An option to (re)calibrate Feedback Eraser is provided in the event the change entered accompanies a

physical hardware change of the vent, tube or dome on the hearing aid. To be able to view the estimated effect of the selected vent option the Vent Corrections box under the curve view menu on the Fitting Screen must be checked.

SATISFY/Synchronized SATISFY



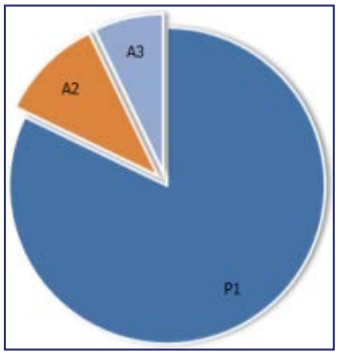
Slow Adaptation To Ideal Settings For You (SATISFY) is a feature that allows gradual changes in gain, compression and frequency response to be made automatically within the hearing aid. These changes are so gradual that they go unnoticed by the hearing aid user. SATISFY is useful for first-time wearers or those with hyperacusis who feel the targeted gains are too loud. The feature will allow these wearers to get used to the amplification and automatically transition from a starting gain level and end as a desired gain level over a period of time without the need of an in-person appointment. As such, SATISFY is helpful when patients cannot return to the clinic regularly for appointments due to distance or illness. SATISFY can be applied to any fitting rule included in Solus Max and is available for fittings with Wide Dynamic Range Compression (WDRC).

Ear to Ear Communication allows for these gain changes to be synchronized between the two hearing aids in a binaural fitting. Synchronization of this feature is recommended in case of a loss of one hearing instrument during the acclimatization time, as this will prevent the remaining hearing instrument from progressing more than 10% past the progression of the lost hearing instrument, in the event it is found. Once activated, the Satisfy progress will appear on the Fitting screen.

Beltone Solus Max Guide (Text Wizard)

The Beltone Solus Max is a tool designed to help dispensers with problems they encounter during a fitting. Once the guide has been opened, select a category, a subsequent issue, then choose from the offered solutions. When applicable, the solution can be applied to the right, left, or both instruments.

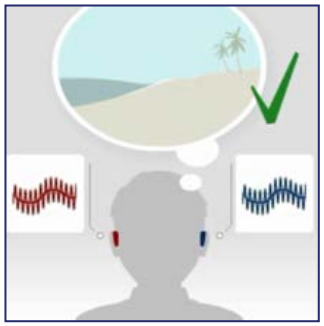
Data Logging



The data logging features is called the Satisfaction Journal. It allows the patient's hearing aid use to be tracked and recorded. The Satisfaction Journal includes information on: total use time, use time per program and environment, and volume control changes made over time. The information obtained can be useful in making hearing aid changes over time, such as volume control settings and program needs. Satisfaction Journal will be reset every time a programming change is made in order to track the patient's use with the new changes.

Clinical Tip: Use the information regarding total use time and program use as a way to make changes to the hearing aid or as a point for discussion when counseling the patient on the important of consistent wear time and the benefits of proper program changes. The lack of program changes may be a good indication that a single program utilizing Speech Spotter Pro or CrossLink Directionality should be considered, rather than multiple manual programs.

Tinnitus Breaker Pro



Tinnitus Breaker Pro is a unique state of the art feature that offers flexibility to address patients' needs for both hearing loss and tinnitus relief. The feature consists of a sound generator that can be used alone or in additions to amplification programs. There are two modes listed under the Tinnitus Breaker Pro: "Standard" mode and "Nature Sounds". "Standard" mode is essentially a white noise generator with several options for customization; such as noise type (frequency shaping), gain level, modulation and modulation speed. These options can be synchronized between the two hearing aids that have ear-to-ear communication. "Nature Sounds" mode provides six different water environments with natural amplitude modulation. When the same environment is selected for both ears the sound generated will be in stereo. Tinnitus Breaker Pro can be used as a component of sound therapy or, simply as a masker to temporarily lessen the perception of the tinnitus.