Programming Signia’s Tinnitus Therapy Feature in Connexx®.
The tinnitus therapy feature can function as an independent sound generator or in a mixed mode with both the hearing instrument microphone and sound generator active. The tinnitus feature provides several therapy signal options which can be activated for individuals as needed, including 5 different types of static noise, modulated noise with various timing and intensity options, as well as custom noise shaping by frequency handles, all of which allow for maximum flexibility.

1. **Select a noise type.** The Hearing Care Professional (HCP) can select the noise type that is most comfortable to the wearer and/or offering the greatest relief of symptoms. The six noise types available are:

- **White noise** – a signal with constant spectral density across all frequencies
- **Pink noise** – each octave carries an equal amount of energy
- **Speech noise** – corresponds to the frequency shaping of the Long-Term Average Speech Spectrum (LTASS)
- **High Tone noise** – more intensity in the high frequency region
- **Brownian noise** – power density decreases with increasing frequency
- **Ocean waves†** – modulated noise with various timing and intensity options with sound similar to just that of waves arriving on the shore line

† Ocean sounds have long been felt to have a calming effect on the listener making them a great addition to the therapy options.
2. **Select output level.** If the desire is to utilize a specific noise type, it is necessary to maintain the spectral characteristics of the noise by adjusting all the handles simultaneously. To increase therapy volume in all handles at the same time, utilize the Master Gain control in the tinnitus screen.

If desired, the HCP can create a personalized therapy signal by utilizing frequency shaping via the handles available in Connexx. The number of handles present for adjustment is dependent on technology level of the hearing aid. For example, a 7 level hearing aid has 20 handles for manipulation; the 5 level has 16 handles, the 3 level has 12 handles, and the Orion 2 instrument has 4 handles for therapy noise shaping.
I. General protocol for setting the therapy signal

The following are suggestions for programming the therapy signal if you are not following the guidelines of a specific tinnitus program such as TRT and TAT. Keep in mind that the therapy signal was designed to be flexible and can be adapted to fit the needs of virtually any established protocol including the ability to utilize the signal for the following:

• in one or both ears
• in one or multiple programs
• at different intensities in each ear
• at different intensities in each program
• with different noise types in each program and/or in each individual ear

The HCP may also give the patient a volume control to adjust the therapy signal independently from the hearing instrument gain volume. If you follow set protocols already using a different device, consult your Signia representative for individual instruction on how to program the therapy signal to suit your individual needs.

A. For patients that have tinnitus but no hearing loss:

When treating tinnitus without hearing loss, the Noise Mode should be used. All Signia instruments can be used as a simple masker, when selecting which technology level to utilize (7, 5, 3, or Orion 2) the amount of noise shaping desired is the primary consideration for these patients.

To activate the Noise only mode:

1. Go to the **Fine Tuning** menu, select **Tinnitus Therapy**.

2. Remove the check mark next to **Mix with microphone**. This activates the therapy signal only mode of the instruments.

3. Select type of noise or use a custom noise shape.

4. Gradually increase and decrease output for a comfortable mastering level.

5. If multiple programs with different noise types are desired; add additional programs choosing Tinnitus from the pull down menu in the Program Handling screen. You can even create custom names to each program once the program parameters are chosen as seen in the next screenshot.
B. For patients with tinnitus and hearing loss:

You can activate a therapy signal in the Universal program, if desired. Simply go to the Tinnitus Therapy screen, place a checkmark next to Tinnitus Therapy, select your desired therapy signal and adjust the master volume as needed for each ear. Remember to unlink the left and right ears to make ear-specific individual adjustments.

1. First, fit the hearing instrument.

2. Under **Program Handling**, select **Tinnitus**.

3. Return to **Fine Tuning** and select **Tinnitus Display**.

4. Gradually increase and decrease master output for a comfortable mastering level.

5. Select **Configuration** and then **Hearing Instrument** to configure user control functionality for tinnitus therapy volume.

The majority of patients seen by HCPs need a form of combination treatment for hearing loss and tinnitus; for these patients, it is suggested to first try amplification only. For many patients with tinnitus (and hearing loss), simply wearing hearing aids mitigates the effects of their tinnitus. Remember, hearing aid use is a form of acoustic therapy. If the amplification of the natural environment is not sufficiently reducing the patient’s reaction to tinnitus, a designated hearing instrument program in a Mixed Mode (microphone+noise) can be activated. Typical set up will include one program with amplification alone and another program with the mixed mode.

When desired, the HCP can set up the instruments to allow the wearer adjustment of the tinnitus therapy volume via the rocker switch on board the instruments (for RICs and BTEs only), with a remote control, or via one of the Signia smartphone Apps.
C. To set up a tinnitus volume control

For on board therapy volume control, go to the Configuration screen and Hearing Instrument. Select **Tinnitus Therapy volume** from the functionality pull down menu. Then choose the therapy volume range under Tinnitus Function.

For remote control of the therapy volume, activate the easyPocket under Remote Controls. The easyPocket allows for configuration of the remote’s right side buttons for Tinnitus volume up and Tinnitus volume down.

The therapy signal volume can also be controlled via the touchControl or easyTek App. The apps work with the Signia instruments and are available for smartphones.
D. Setting the tinnitus therapy signal according to TRT and TAT:

The Tinnitus Retraining Therapy (TRT) is the clinical application of the neurophysiologic model. It uses a precise and individual combination of sound therapy and teaching /demystification / learning about tinnitus and hyperacusis mechanisms, with directions about how to return to normal life without provoking symptoms. It provides relief from tinnitus because it induces habituation to the tinnitus perception. TRT can be done in conjunction with amplification or alone in cases of normal hearing level. Counseling and sound are used to produce an enduring sense of reduced tinnitus after the cessation of sound. The mitigation of the tinnitus is due to the decline in response to familiar auditory stimuli (tinnitus) after to repeated exposure with no emotional reaction. Signia instruments are designed to work well for those HCP's following a TRT approach (Jastreboff 1990)

TRT protocol:

To set the therapy signal, The HCP needs to look for the mixing point: the point where the noise mixes with the tinnitus, without masking it! The HCP can choose one type of the existing sounds and then adjust in an ascendant technique by utilizing the Master Gain handle, decrease the Master Gain until the therapy signal is no longer audible to the patient and then increasing the noise level until the patient says that the sound is mixed to tinnitus. The HCP has to explain to the patient that to achieve habituation, the noise should not cover the tinnitus, but that both sounds should be heard: the therapy sound and the tinnitus itself.

To set the therapy signal, the HCP should also use the ascendant technique and stop when the patient says the sound is audible and comfortable. Many patients report that broadband noise is easier to listen to than their tinnitus. While the goal here is not to find total masking or mixing point, it is possible to use total masking if the patient prefers it. The HCP can try one or two types of noise and at the end, choose what gives more relief at the lowest noise level.

• The Tinnitus Activities Treatment (TAT) was implemented by Dr. Richard Tyler. This approach is also well supported by the Signia solutions. TAT is a treatment for the reaction to tinnitus that also uses counseling, sound therapy and other activities based on cognitive behavioral therapy. In this case, counseling is structured into four topics:
  1. Thoughts and Emotions
  2. Hearing and Communication
  3. Sleep
  4. Concentration.

The sound therapy aims to decrease the prominence of tinnitus and facilitate habituation.
II. Therapy signal alternatives

Acoustic therapy does not always have to result in activating a noise therapy signal in the device or following an established tinnitus treatment protocol. Amplification via hearing instruments alone is a common treatment for tinnitus patients and is often the starting recommendation by the HCP. Although many advanced features improve sound quality and comfort for traditional hearing aid wearers, they may be counterproductive for tinnitus patients resulting in being too quiet in quiet settings.

When the treatment goal for your tinnitus patient is habituation, a standard recommendation is to avoid silence. To help achieve this goal, Signia offers some unique algorithm options for these tinnitus sufferers. We will explore these algorithms in the order that they appear within the Connexx software:

1. **Gain for soft sounds** - Some tinnitus patients will prefer a slight increase in soft level gain. This can be done over all frequencies in the Basic Tuning screen, as seen below, or in a particular frequency region via the Compression tab under Fine Tuning.

![Basic Tuning screen adjustment to increase soft sound gain](image)

2. **Sound Equalizer (Performance level 7 only)** - Under Personalization > Sound Equalizer, select Quiet and increase gain. This change would happen automatically when a quiet situation is detected and can help ensure that the patient has adequate environmental stimulation at all times.

![Sound Equalizer setting](image)
3. **Sound Management** - If the desire is for the environment to provide natural masking noise for your patient, you may choose to reduce or eliminate some of the noise reduction features.

- All Signia instruments provide some level of noise reduction as a default. Consider reducing the level of noise reduction for patients with tinnitus.
• In some cases, it may be advantageous to give the patient a second dedicated program where digital noise reduction (DNR) suggests that the patient switch to this second program when in quiet situations and speech is not the primary focus. They can then return to their regular Universal program when communication is the priority.

  a. Select **Program Handling**.
  b. In Program 2 select **Universal**.
  c. While in Program 2 go to **Fine Tuning** and then **Sound Management**.
  d. Deselect **Speech and Noise Management**.

![Simulation](image)

*Disable Speech and Noise Management in second Universal program.*

4. **Microphone/Audio** - The microphone array chosen for patients whose primary concern is tinnitus may vary from a patient that does not have tinnitus. Hearing impaired patients without tinnitus tend to prefer a quiet world with primarily speech amplified. As mentioned earlier, for a tinnitus patient, this can be counterproductive. The HCP may choose alternative trigger points for the directional microphone modes and varying levels of directionality.

  • The settings menu in the directional microphone section allows a HCP to set the hearing aids to three levels of soft level directivity:
    
    a. Select **Fine Tuning** and then **Microphone Audio**.
    
    b. In the directional box select **Settings** via the wrench icon.
    
    c. **Low** - less noise than standard is needed to move the hearing instrument into a full directional pattern (Full directionality is achieved in lower noise level).
    
    d. **Standard** - the default level of noise needed to move a hearing instrument into a full directional pattern.
    
    e. **High** - Higher noise level is required for the hearing aid to change into a directional pattern. For tinnitus patients this higher trigger point may be preferred.
Changing the Soft Level Directivity sensitivity to High meaning more noise is needed to activate directionality

- A wearer with tinnitus may find they prefer the hearing instrument to stay in an omnidirectional mode when their tinnitus is more intense. This can also be achieved easily by adding a second program and disabling the directional processing.

While in **Program 2**, select **Fine Tuning** and then **Microphone Audio**. Deselect all microphone options except TruEar.

There is no right or wrong combination of the aforementioned features as the patient’s reaction to the configuration of a particular hearing instrument is subjective when it comes to tinnitus treatment. It is recommended that the HCP try different combinations of features at various settings to find the preference of each patient using a multiple program technique.
III. The use of accessories for Tinnitus relief and relaxation

With advancements in hearing instruments came the age of connecting to ancillary devices. Signia’s easyTek™ can turn a set of hearing instruments into a wireless headset. Streaming audio signals from a television, DVD player, MP3 player, Bluetooth-enabled cell or landline phone are commonly considered. However, the functionality of the streamers, the miniTek™ and easyTek, can be increased in other ways, too.

To help manage tinnitus or enhance relaxation

Download Apps to the wearer’s Smartphone, iPod, iPad, tablet and/or computer and stream these relaxing sounds to the hearing instruments.

A quick search in the App stores for “Tinnitus”, “Relax”, or “Audio” will direct you to some interesting Apps:

1. Bloom: “Zen”-sounding tones, but presented in stereo

2. Relax Noise 3: Masks nerving ambient noise and also your tinnitus with white noise ... In nature, it sounds similar to waterfalls, heavy rainfalls or the sounds of the sea.

3. Nature space: A holographic audio journey (free, but extra tracks may be purchased)

4. Relax melody samples: relaxing sounds of nature

5. Ambiance: A huge catalog of sounds, everything from white, pink, and blue noise to fan noise, animal sounds, and crowd noise

6. Easy relax ultimate: Allows the user to choose a base background sound and then layer up to three additional sounds, all with adjustable volume and durations; plus, one can add a binaural beat in the background.

The App stores offerings change regularly so you never know what kinds of sounds a new search will bring!

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