



Aural ID 2.1

System Operating Manual

GENELEC® | UNIO™

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Table of Contents

1	Quick Guide	5
2	Subscription and Authorization	8
3	Monitoring with Aural ID	10
4	Using Aural ID with PRM Solution	18
5	Aural ID Profile	21
6	Aural ID Application	22
7	Creator Mobile App Reference	25
7.1	Installation.....	25
7.2	Subscription Selection and Payment	25
7.3	Creating an Aural ID Profile.....	26
8	Aural ID Application Function Reference	30
8.1	Signal Flow	30
8.2	Main View	31
8.3	On/Off toggle switches	32
8.4	Monitoring Channel-Based and Object Audio	32
8.5	Aural ID Application in DAW Signal Flow.....	33
8.6	Configuring Aural ID Profile	34
8.7	I/O Setup.....	36
8.8	Configuring Virtual Monitor Layout	39
8.9	Virtual Monitor Routing.....	40
8.10	Virtual Monitor Calibrations	41
8.11	HRTF Rendering Bypass.....	42
8.12	HRTF Mode.....	43
8.13	Equalizer and On/Off Control.....	44
8.14	Store EQ and Load EQ.....	46
8.15	Output Gain Control	46
8.16	Low Frequency Envelopment	47
8.17	LFE Channel Controls	48
8.18	Keyboard Shortcuts for Virtual Monitors	49
8.19	Calibrating the Virtual Monitors.....	49
8.20	Calibrating Listener Look Direction.....	50
8.21	Legend	51
8.22	Output Level Meters	52
9	Aural ID Head Tracker Reference	53
9.1	Look Direction Controls	53

9.2	Tracker Settings	55
9.3	Selecting and Switching the Webcam	56
10	Learn More.....	57
10.1	Monitoring of Audio	57
10.2	Mechanisms for Localization of Sound	57
10.3	Directional and Common Transfer Functions.....	59
10.4	HRTF in a SOFA file.....	59
10.5	Advanced Layout Configurations.....	59
10.6	Locations of Applications Executables.....	60
10.7	Location of Your Data.....	60
10.8	Operating System Support	60
10.9	Modifying Aural ID Channel Setup.....	60

1 Quick Guide

This quick guide describes steps to install Aural ID Application, obtaining your own head-related transfer function (HRTF) data using your mobile device and steps to calibrate the Aural ID Application to render audio accurately on headphones using HRTF and personal calibration.

Aural ID Application is an independent software enabling headphones for monitoring multichannel immersive audio. It can be used with any headphones and with any headphone output, including the standard headphone output in a computer. Genelec does recommend using the complete PRM solution as Aural ID Application together with PRM offers reference level sonic quality and integrates all the aspects of binaural headphone-based immersive monitoring seamlessly to loudspeaker-based monitoring.

Aural ID solution comprises of the following system components for the user:

- Aural ID Application, computer rendering software
- Aural ID Bridges, virtual computer sound cards with various channels counts
- Aural ID Head Tracker, computer head tracking software
- Aural ID Creator, mobile app for capturing data needed for personal HRTF production
- Aural ID Profile, Genelec cloud based personal HRTF data

Here are the steps to set up and configure Aural ID solution:

Create MyGenelec Account

1. Create MyGenelec account or log in to your existing account at my.genelec.com.

Install and Configure Aural ID Application

After you have obtained an Aural ID licence in MyGenelec, take the following steps:

2. In your MyGenelec account, download Aural ID Application install package, install the software and run Aural ID application.
3. Configure input and outputs using Routing > I/O Setup. Detailed instructions for routing are in Function Reference section of this manual. Audio will play after the routing is configured in the I/O Setup.
4. Select virtual monitor layout using Routing > Monitor Layout. Select headphone output.

5. Route incoming loudspeaker channel feeds to virtual monitors using Routing > Channel assignment. This is a patch bay panel in Aural ID Application.
6. Using Profile > Import from MyGenelec, log onto your MyGenelec account to import your Aural ID Profiles. Two HATS profiles are immediately available. Processing your own HRTF into an Aural ID Profile takes about two working days. After import, profiles are available on your hard drive.
7. Using Profile > HRTF mode select Aural ID HRTF processing. Start with 'Neutral' or 'Immersive' modes.
8. Go to Aural ID main page. Personally calibrate the binaural rendering for yourself and your headphones. This involves directions of each virtual monitor and the overall sound colour. See Function Reference section for more information.
9. Use File > Save to save your settings. The settings store to a file with extension **.aidset**. Settings can be loaded with File > Open.

Get Your Own HRTF as an Aural ID Profile

Using your own HRTF data will improve accuracy of sound direction and sound colour. To get your own HRTF, take these steps:

1. Purchase Aural ID personal HRTF profile in MyGenelec. In 'UNIO Software & Services' select Shop. Select the Aural ID subscription or perpetual licence and complete your order.
2. Download and install on your mobile device Genelec Aural ID Creator app, either from App Store or Google Play store.
3. Use the Aural ID Creator app to record your head and torso shape. Upload the material for calculation using the Aural ID Creator app. This starts the processing of your own personal HRTF data.
4. You will receive a message when your profile is ready for use. This takes about two working days.

A video describing Aural ID profile data capture process can be found on Genelec official YouTube channel. Use this link to access the video:

<https://www.youtube.com/watch?v=lzzQbFwsqe0>

The profile calculation process takes typically about two working days. Your Aural ID profile will appear on your MyGenelec account, and you will receive an email about this. At this point, you can import your profile to the Aural ID Application running on your computer.

Personal Calibration

Personal calibration is essential for achieving very accurate binaural monitoring. To do a personal calibration play audio and take the following steps:

1. Set listener direction (azimuth and elevation).

2. Calibrate virtual monitor locations (azimuth and elevation). Set virtual monitor playback levels to be the same one by one.
3. Adjust equalizer in Aural ID Application for neutral overall sound character, or to match with your reference loudspeaker-based monitoring system.

Aural ID Application settings are saved automatically. After a few days of use, re-calibrate to obtain maximum accuracy. You can also use File > Save to store the settings.

2 Subscription and Authorization

Aural ID Subscription

Aural ID Application is subscribed at 'my.genelec.com'. After subscribing to Aural ID, download the install packages for Aural ID Application. Depending on the subscription type, the subscription may include

- Installing Aural ID Application on multiple computers and updates of the Aural ID Application.
- Popular dummy head HRTFs of Kemar and KU100.
- For certain subscriptions, calculation of your own HRTF as an Aural ID Profile and cloud access to your HRTF, called Aural ID Profile, when you are using the Aural ID Application.
- For certain subscriptions, download your Aural ID Profile as a SOFA formatted file. This file is useful with software that supports HRTF data in SOFA file format. Note that Aural ID Application does not support SOFA file format for HRTF data.

See your MyGenelec page for more details on the available products and pricing models for using Aural ID.

Personal Aural ID Profile

For the most accurate results in the Aural ID Application, you want to use your own Aural ID Profile. The Aural ID Profile contains your own unique personal head-related transfer function (HRTF) information, describing how you hear sound colour and sound direction.

To obtain your HRTF you use the Aural ID Creator mobile device app, running in Apple iOS and Android phones. This app scans your head, upper torso and external ears and submits the data for the calculation of your HRTF.

Need for Internet Connectivity

An Internet connection is needed to import Aural ID data. After this the Aural ID is loaded on the local computer hard drive. After the first import, the Internet connection is only needed at the start of new subscription periods.

Managing Your Subscription

You can make changes to your subscription in your MyGenelec account.

Authorization

Aural ID Application downloads and stores the Aural ID Profile onto the local computer hard drive with licensing information. An Internet connection is needed at the start of every subscription period. Aural ID licence is then refreshed to the hard drive to enable continued use of Aural ID technology.

Installing Aural ID Application to Offline Devices

Aural ID Application can be run on a computer that is not connected to the Internet. To do this, download Aural ID install package file and Aural ID Profiles into a memory device using a computer connected to the Internet. Export your Aural ID Profiles onto a memory device, such as a USB stick, and transport these along with the Aural ID Application install file to the offline computer. First, install the Aural ID Application onto the offline computer, then import your Profile(s). At the start of each subscription period, transfer fresh copies Aural ID Profile(s) to keep the offline Aural ID working.

Using Multiple Computers

Your subscription entitles use of the Aural ID Application on several Mac computers.

Changing to a New Computer

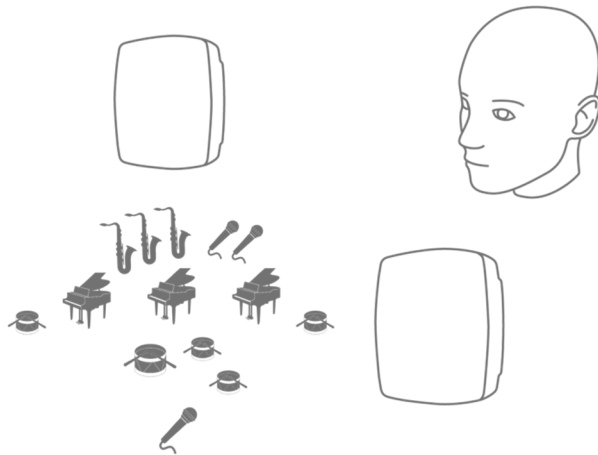
When you start using a new computer, use your MyGenelec account to install Aural ID Application and then access your Aural ID profiles. Alternatively, you can use the Installing to Offline Devices method.

3 Monitoring with Aural ID

Aural ID offers you a personally accurate and truthful monitoring experience using headphones, in essence similar to monitoring on loudspeakers.

Purpose of Audio Monitoring

Audio mixes employ virtual sound images created on the sound stage between two or more loudspeakers. Level panning is the typical method used for placing the virtual sources. For the same purpose, on-site recordings use microphone positioning to generate the virtual sound image placements and acoustic space. All of these, the experiences of the sound stage, locations and character of the virtual sound images, and acoustic space, are created exploiting the mechanisms of human directional hearing, and become audible using loudspeakers.



Loudspeaker-based monitoring enables work with virtual sound images to create a sound stage.

Monitoring Using Headphones

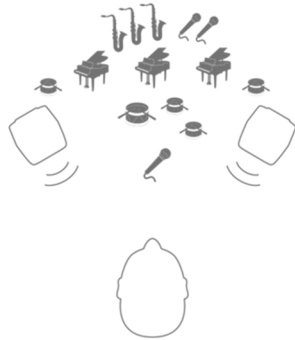
Headphones offer excellent signal-to-noise ratio and isolation for noises in the environment, enabling low-level audio to be audible. Headphones are also used for checking how mixes translate over headphones since today music is increasingly experienced using headphones.

Headphones deliver sound directly into your ears. This eliminates directional hearing because head-related changes to sound that depend on direction sound arrival cannot occur. For this reason, headphone sound typically seems to happen inside the head.

What does Aural ID Add to Monitoring Using Headphones

The personal Aural ID Profile represents your way of hearing direction of audio. It describes how your head, external ear and upper body affect audio arriving from a given direction. This effect is called the Head-Related Transfer Function (HRTF) and is totally unique to you.

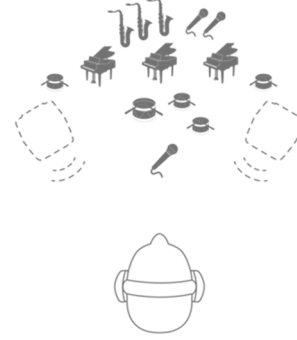
Using Aural ID enhances headphone experience by bringing back your directional hearing. When your HRTF contained in your Aural ID Profile is used in rendering audio presented in headphones, audio appears to arrive in the desired direction and no longer appears to happen inside your head. This enables creation of virtual loudspeakers outside your head, enables you to perceive the sound stage, and get a sense of space and direction similar to those presented by loudspeaker-based monitoring.



Loudspeakers offer a sound stage with virtual sound sources



With standard headphone listening, virtual sound sources appear 'inside' the listener's head

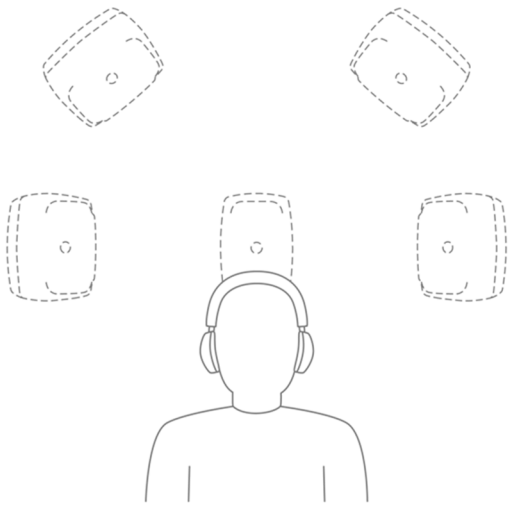


Aural ID can recreate the correct sense of imaging for headphone listening

Who Uses Aural ID

Aural ID Application is aimed primarily at audio professionals working with immersive audio, for example in music, film, broadcast, and game audio design. Naturally, Aural ID Application can also be used in monitoring standard stereo audio. It provides a headphone listening experience similar to using loudspeakers without room colouration and enables high accuracy.

Aural ID Application enables mobility and flexibility, assisting the creative process by giving a more natural sense of imaging and enabling mix decisions than have ever been possible before using headphones. Your workflow can become flexible, allowing switching between headphones and loudspeaker-based monitoring. Aural ID can also be a useful tool for reliable remote collaboration.



Aural ID enables you to hear the sound stage similar to that delivered by loudspeaker-based monitoring.

Aural ID is Your Personal Tool

Aural ID can represent your unique hearing, as embedded in your personal HRTF perfected by your personal calibration. In a listening room, several people can simultaneously hear the sound. Because Aural ID implements your personal way of hearing, you cannot share headphones with your friends or colleagues and expect them to hear the same presentation of sound (unless they are identical twins with you).

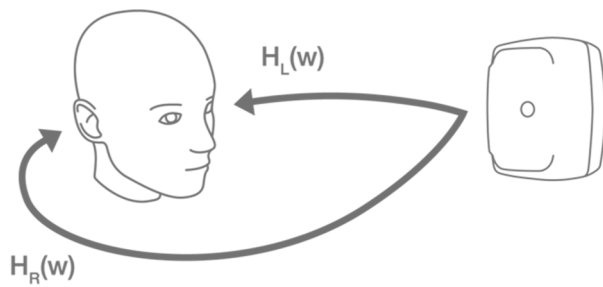
Aural ID Models How You Hear

Aural ID models the way your head, external ears and upper body affect the sounds that you hear around you. Your body colours audio differently depending on the sound source direction and distance, and this effect is totally unique to every person (because we all have slightly different shapes). This effect enables you to localize sound and is called the Head-Related Transfer Function (HRTF).

HRTF is frequently divided into two parts – Common Transfer Function and Directional Transfer Function.

The Directional Transfer Function is different in any direction and is significant in creating the sense of where the audio source is located. The Common Transfer Function is the part of the HRTF that is the same in all directions and contributes to creating the personal experience of sound colour.

Aural ID Application renders audio signals so that they appear outside your head and arrive from the correct directions. To do this, you select the HRTF rendering method and perform personal calibration to account for the interaction of headphones and your hearing system.



Left and right ear Head-Related Transfer Functions (HRTFs) are captured individually by Aural ID.

Aural ID System Components

Aural ID is a complete system for binaural monitoring that supports acquiring and using your own HRTF in an easy way. The Aural ID system includes:

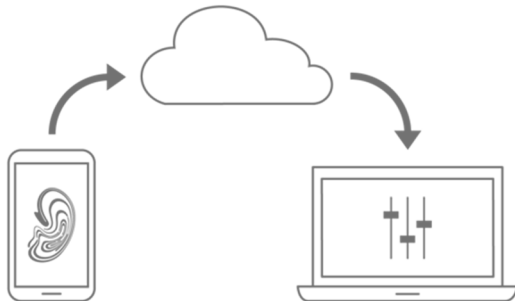
- Aural ID Creator – a mobile device app for capturing your personal head and external ear shape data and placing an order for Aural ID.
- Aural ID Application – a computer virtual soundcard app for rendering multichannel audio presentations over headphones using your personal Aural ID Profile.
- Aural ID Head Tracker – a software using the webcam to adjust the listener orientation in real time, resulting in the virtual loudspeaker system to remain stationary when the listener direction changes.
- The Aural ID Profile – this data contains your personal HRTF information. The Profile is maintained in the Genelec Cloud and is downloaded into Application for use.
- Management of Aural ID subscription and services in MyGenelec website.



Components of the Aural ID system: Creator and Manager enable handling of your Profile. App maintains your Profile within the Genelec Cloud and enables rendering for headphones in your DAW.

Aural ID Application

The Aural ID Application uses your HRTF data and accepts the loudspeaker monitoring channels from your DAW and processes them to create a two-channel binaural signal intended to be used on headphones. The Aural ID Application renders audio to appear in any direction and can create a virtual model of your loudspeaker layout.



Data from the Creator app is processed in the Genelec Cloud to generate your Aural ID data containing your HRTF. This HRTF is applied to audio via the Aural ID Application, generating the virtual monitor layout and enabling headphone-based monitoring.

The Aural ID Application installs to your computer as a virtual sound card. Using Aural ID Application software avoids routing audio outside of the computer and offers a user interface integrated to the DAW working process.

Aural ID is intended as your personal monitoring system for headphones. It is not an effect and should not be processed into an audio recording.

The Aural ID Application creates the layout of the virtual monitors according to the channel layout you select and assigns the input channels to virtual monitors audible on headphones. You can adjust the virtual monitor locations and level alignments to make your experience accurate on a given pair of headphones. You can also solo and mute virtual monitors in an intuitive way, similar to working with any monitor system. The Aural ID Application offers an equalizer for adjusting the overall sound character, to suit your personal expectation on the monitoring sound and your working process.

What Headphones to Use

The Aural ID Application works with any high-quality professional headphones. The use of wireless headphones with Aural ID Application is discouraged as wireless transmission may compress audio and this may change the audio affecting the accuracy of the HRTF-related information and causing unpredictable changes in localization and sound colour.

Aural ID HRTF Mode Setting

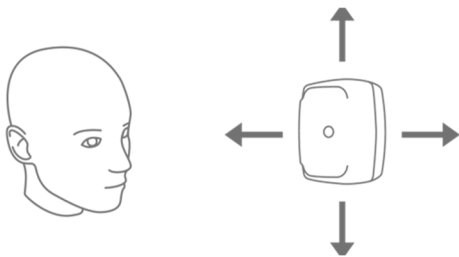
There are several ways you can configure the Aural ID Application with headphones. 'HRTF Mode' setting selects how the HRTF data is used in rendering. 'Immersive HRTF' implements directional cues while allowing the natural sound character of the headphones and is particularly suitable for immersive audio monitoring. 'Neutral HRTF' preserves the sound character of headphones for stereo monitoring. For both of these, the characteristics of the headphones will influence both sound colour as well as the sound direction.

The 'Raw HRTF' mode offers access to the complete content Aural ID Profile HRTF, but the use of this requires separate equalization of the headphones. For this mode, equalizers are provided in the 'Headphone Type'. This equalization may not be accurate for all listeners because of personal differences.

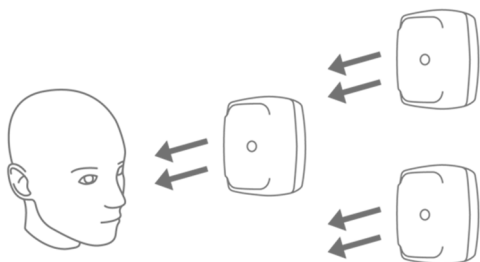
Personal Calibration

Different headphones have slightly different frequency responses, and each listener is also slightly different. Personal calibration is useful to ensure the most accurate monitoring. The steps to take are:

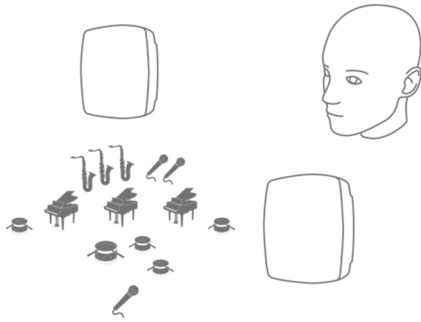
- Run an audio signal and listen to each virtual monitor in 'solo' mode. Adjust azimuth and elevation so that the virtual location is accurate.



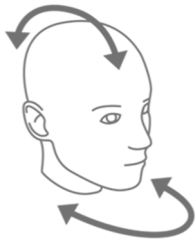
- Adjust the levels of all the monitors to be the same.



- Using 'Equalizer' adjust the overall sound character to be neutral or to match your reference loudspeaker monitoring system.



- Go to the listener settings (arrow in centre hexagon) and evaluate listener head elevation and azimuth adjustments to calibrate the listening direction to be natural.



Webcam Head Tracking

Aural ID Application supports head tracking using two different methods – using a webcam and Aural ID Head Tracker Application and using standard OSC compliant tracking device.

Webcam support is provided by Aural ID Head Tracker Application. The Aural ID Head Tracker detects the direction of the face in the webcam image. Direction information updates the head direction in real time such that virtual loudspeakers appear to remain fixed around you when you turn your head.

The face direction analysis happens completely inside the computer. No images are stored or transferred outside of the computer.

The head tracking can be calibrated. To do this, look in the direction of the intended zero azimuth, zero elevation and zero head tilt and click the 'Set Zero Direction' button.

The webcam tracking works when more than one half of your face is visible and tracks up the 90 degrees azimuth. The webcam stops tracking when the head turns more and resumes as soon as the face is sufficiently visible.

5. Head Tracking using OSC Interface

Aural ID Application can accept head tracking data on an OSC (Open-source control) standard interface.

The following OSC messages can be sent to the head tracker:

'/euler_x': the head elevation value in degrees. 180 deg for no head elevation, 90 deg with head pointing directly up, and -90 with head pointing directly down. Upward elevation angle range is then [90...180] deg, and downward elevation [-180...-90] deg with a wrap-over from 180 to -180 when moving from upward elevation to downward elevation.

'/euler_y': The head azimuth direction value in degrees [-180,180]. Negative values on the right side. Azimuth directly in front, value 0 deg.

'/euler_z': The head tilt value in degrees [-90,90]. Negative values are to the left. Tilt value with head precisely upright is 0 deg.

4 Using Aural ID with PRM Solution

Genelec Personal Reference Monitoring (PRM) solution is a high-quality headphone-based audio monitoring system designed to operate in parallel with traditional loudspeaker monitoring. PRM delivers accurate, consistent and reliable monitoring experience, whether you are working in a control room, on the move, or in environments where loudspeaker monitoring is impractical.

The core of PRM system are Genelec 9320A SAM Reference Controller and 8550A Reference Headphones. Together, they operate within the broader Genelec UNIO Ecosystem.

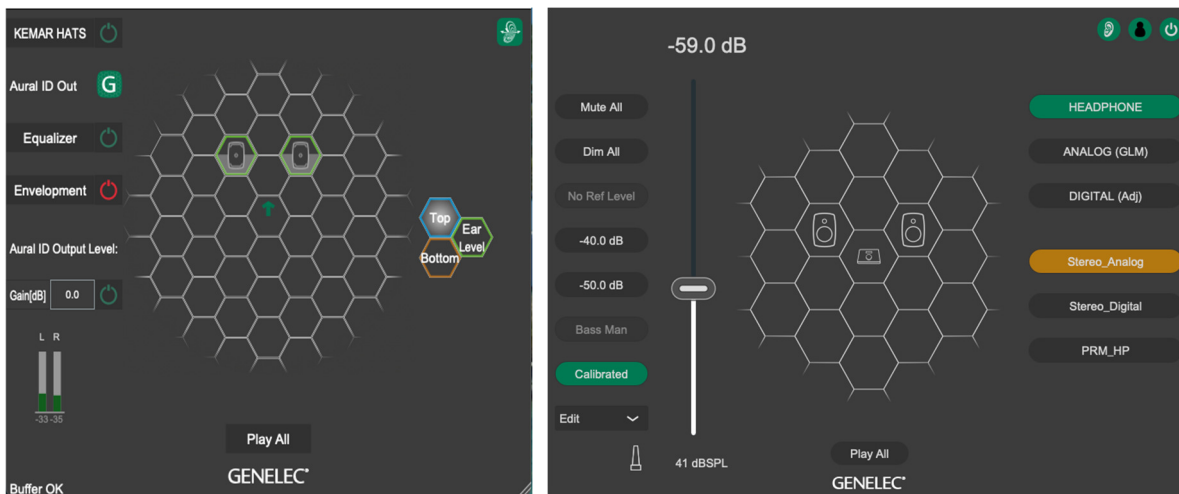
Genelec UNIO concept unifies loudspeaker-based and headphone-based workflows into one reliable and precise monitoring environment. This enables flawless and secure bridging from using loudspeaker-based monitoring to using headphone-based monitoring.



Genelec UNIO concept supports monitoring virtual sound images to create a sound stage equally on loudspeaker-based and headphone-based monitoring systems.

Aural ID technology integrates perfectly with PRM and Genelec Loudspeaker Manager (GLM) software, allowing you to calibrate 8550A headphones and use Aural ID technology, while switching effortlessly between loudspeaker-based monitoring and headphone-based monitoring, with full confidence maintaining consistent monitoring regardless of your working environment or working methods.

PRM, Aural ID and GLM work seamlessly together, enabling precise virtual monitoring using headphones and conventional monitoring using professional loudspeakers setups. After personal calibration, your headphones can deliver the same reliable sound presentation as in-room monitoring.



PRM brings Aural ID Application (left) and GLM loudspeaker management software (right) together, enabling confident monitoring on virtual monitors and loudspeakers.

When used with the reference-grade headphone output of the 9320A and 8550A headphone, Aural ID provides the highest possible standard of spatially accurate headphone monitoring.

To learn all details of the setup and configurations of the PRM solution, consult also the following operating manuals

- Aural ID 2.1 Operating Manual (you are reading right now)
- GLM 5.2 System Operating Manual
- Personal Reference Monitoring System Operating Manual
- 9320A Reference Controller Operating Manual



Core to the PRM solution is the 9320A SAM Reference Controller serves to bridge loudspeaker monitoring (GLM) to binaural headphone monitoring (Aural ID) and makes monitoring control easy.

Consult all these manuals as you configure your complete UNIO system solution.

When using the PRM, both GLM and Aural ID application should be installed to enable all the capabilities in the PRM solution.

While the Aural ID Application is an independent headphone monitoring application and can in principle be used with any headphones and with any headphone output device, including the standard headphone output in a computer, Genelec does recommend using the complete PRM solution as it offers reference level quality and integrates all the aspects of binaural headphone-based immersive monitoring seamlessly to loudspeaker-based monitoring.

5 Aural ID Profile

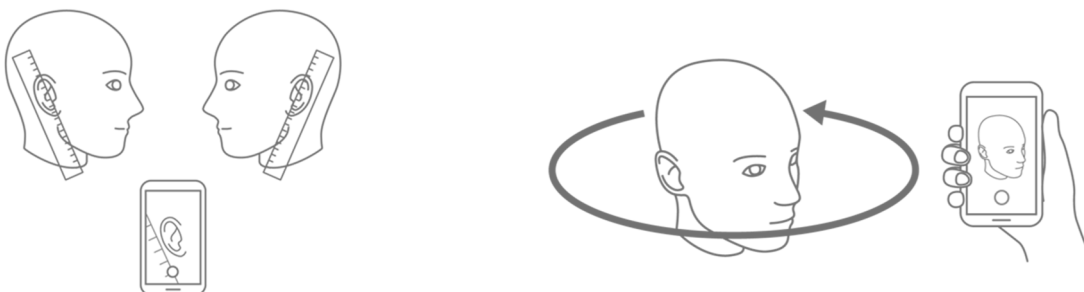
Aural ID Profile contains head-related transfer function (HRTF) data. Your Aural ID Profile is calculated based on your precise shape. The information for the HRTF calculation is collected using the Aural ID Capture App and your mobile phone.



The steps to getting you personal Aural ID.

Briefly, the steps to getting your personal Aural ID Profile are:

- Create an account in 'MyGenelec' or log in to your existing account.
- Select your Aural ID subscription.
- Install the Aural ID Creator mobile app in your mobile device.
- Use Aural ID Creator app to record and upload the material needed for calculating the Aural ID – this includes a video and two photographs.



The Aural ID Creator app collects your personal geometry and enables calculation of your Aural ID (HRTF) in the Genelec Cloud in two steps – two dimension photos of your ears, and a video around your head and shoulders.

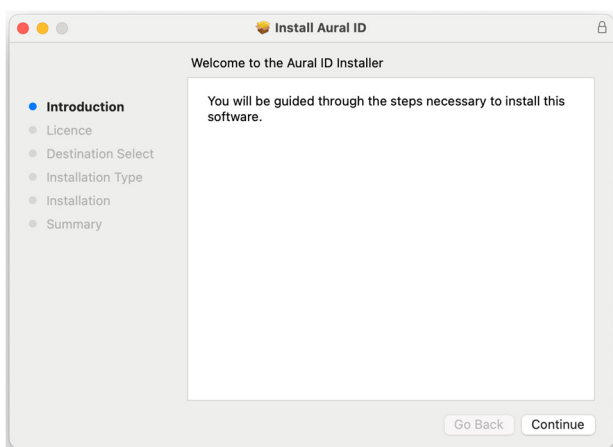
Genelec processes your material to calculate your Aural ID Profile data. Aural ID will then appear on your MyGenelec account. This takes typically about two working days. Once you receive a notification that the Aural ID is completed, go to your MyGenelec account and download the Aural ID Application.

6 Aural ID Application

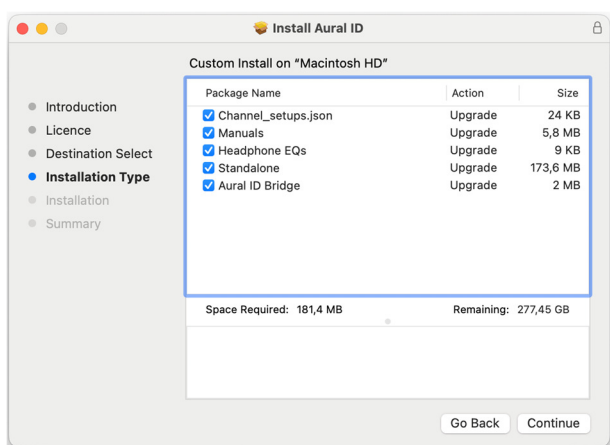
Installing Aural ID Application

After you receive a message from Genelec saying that your Aural ID production has been completed, download and install the Aural ID Application software into your DAW. The Aural ID Application can be downloaded from your MyGenelec account. The Aural ID Application enables smooth and efficient use of your Aural ID Profile for headphone rendering and works with Genelec Cloud based Aural ID subscriptions.

Open the install package 'pkg' file on your Mac. This launches the Head Tracker installer. Click 'Continue' to proceed with installation. Next, you will accept the licence and select the install location. The default location for the install is recommended. Normally all modules are installed.

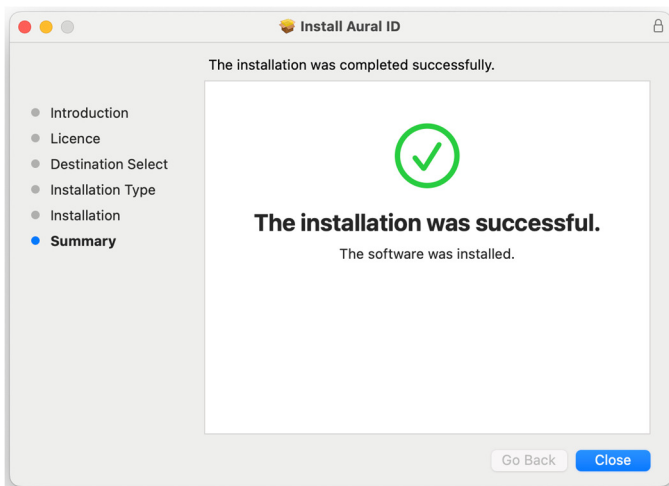


Aural ID Application installer opening screen.



Aural ID Application installer selection screen.

Click Continue. The default location for the installation is recommended. Click Install to start the installation process.



Installer success screen.

The App is now installed. The computer may need a restart prior to working with the Aural ID Application.

Installing Aural ID Head Tracker

The webcam-based head tracking solution is a part of Aural ID, but it is a separate instal package.

When using webcam head tracking, first start the head tracker application (it may take some time to start) and after that the Aural ID application.



Icon for the Aural ID Head Tracker application.

Steps Needed to Configure System

These are the typical installation steps:

- You receive a message from Genelec that your Aural ID is ready for use.
- Log in to your MyGenelec account. Download the Aural ID Application and Head Tracker install packages and run the installers.
- Allow the use of microphone in Mac system settings. This is needed to enable audio input to Aural ID Application.
- When using 9320A Reference Controller, the first time you connect the 9320A to your computer, give the permission to use the 9320A.
- In Aural ID Application, select Aural ID Bridge virtual soundcard, configure the input and outputs I/O Setup. Select the same Aural ID

Bridge virtual soundcard and the channel count in Mac computer audio settings.

- In Aural ID Application I/O Setup, select and configure the audio output device.
- In Aural ID Application, select your Aural ID Profile (HRTF data) in the App. For this, log in using your MyGenelec credentials (username and password).
- In Aural ID Application, select the virtual monitor layout from Routing>Monitor Layout option you want to use and select the HRTF mode from Profile menu.
- In Aural ID Application, perform the personal calibration on virtual monitor layout. Play audio on your DAW and edit the location (azimuth, elevation) and level for every virtual monitor individually, as well as calibrate the listener direction, to make the complete presentation maximally accurate.
- Adjust the Aural ID Application equalizer to obtain neutral sound colour, or to match the sound to your loudspeaker-based reference monitoring system.

Now you are all set. After spending some days with the Aural ID App, you may want to re-calibrate the App to get the maximum accuracy.

Un-Installing Aural ID Application

If there is a need to un-install Aural ID Application and Head Tracker you need to remove following:

- Delete ~/Documents/Genelec/AuralID -folder
- Delete /Applications/Aural ID.app and /Applications/Aural ID Head Tracker.app
- Delete ~/Library/Application Support/Genelec/AuralID -folder
- Delete /Library/Application Support/Genelec/AuralID -folder
- Delete /Library/Audio/Plug-Ins/HAL/Aural_ID_Bridge *.driver -folders

7 Creator Mobile App Reference

The Creator app enables you to order your personal Aural ID profile. The order process includes these steps:

- Create a MyGenelec user profile in <https://my.genelec.com/>. If you already have a MyGenelec account, log in with your account credentials.
- Select and pay for your chosen Aural ID subscription.
- Take the video and photos using the Aural ID Creator app using your MyGenelec credentials. Ask a friend to help here and follow the app instructions. The 360-degree video of your head and shoulders, including detailed footage of both your ears is the key material in creating the Aural ID data.
- Upload the video and photos to the MyGenelec using the Aural ID Creator App.

In the following sections we discuss these steps in more detail.

7.1 Installation

The Aural ID Creator is a mobile device application, available via Apple App Store and Google Play.

Look for 'Genelec' and 'Aural ID Creator'. Follow the usual methods install the app.



App icon of the Aural ID Creator application.

7.2 Subscription Selection and Payment

After log in to MyGenelec, navigate to Shop under UNIO Software and Services and to select your Aural ID subscription.

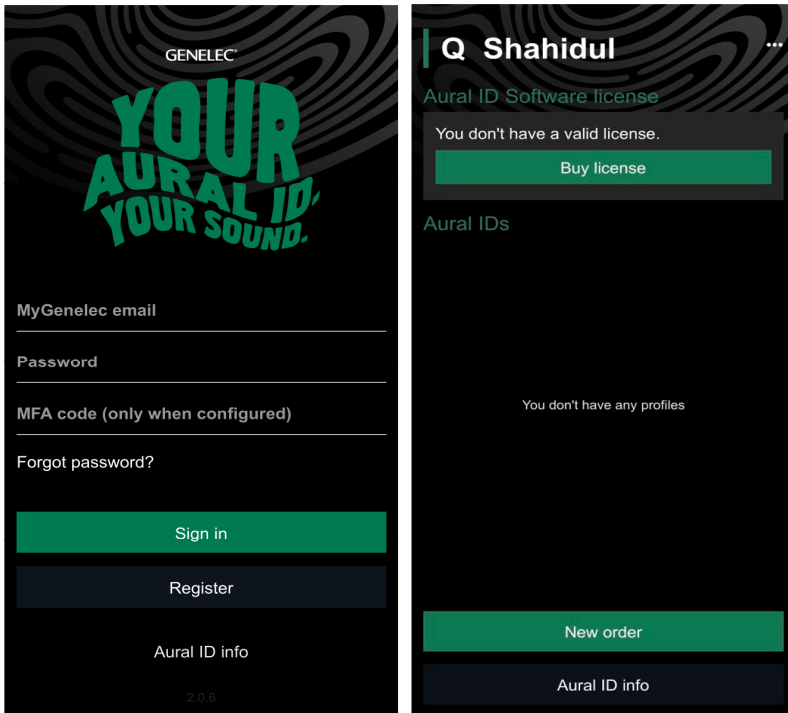
Choose the subscription. The payment is made using the payment service. Subscription will bill you automatically again at the start of every new payment period.

Later, you can switch between subscriptions and make other changes. When you make changes to your subscription, the changes come into effect at the end of the current subscription period.

7.3 Creating an Aural ID Profile

In the app, log in to your MyGenelec account. If you don't have a MyGenelec account, you can create one directly in the Creator app ('Register' button) or you can create an account by visiting <https://my.genelec.com/>

Click 'New Order' to start creating an Aural ID Profile. Follow the instructions in the app. Please note that the Aural ID profile name you choose at this point cannot be changed later.

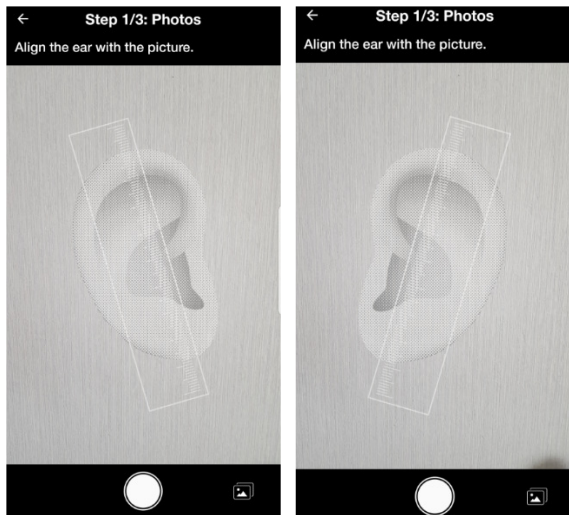


Login screen (left) and New order for own profile (right) of Aural ID Creator app.

Taking Photos of Your Ears

After entering the name for your Aural ID profile, the app instructs you to take photos of both your ears with a ruler placed in contact with the skin and placed either in front of or next to the ear. The Creator app will turn on the mobile phone camera. These photos ensure correct dimensions and accuracy of the HRTF data. A graphic overlay of an ear is shown in the app. Match the ear to this overlay by moving the camera close to the ear. Take the photo when the ear is at the center of the camera view and matching the overlay.

If you already have these ear images in your mobile device photo gallery, there is an option in the bottom right corner of the screen to select and upload these images.



Creator app screen for taking pictures of right and left ears.



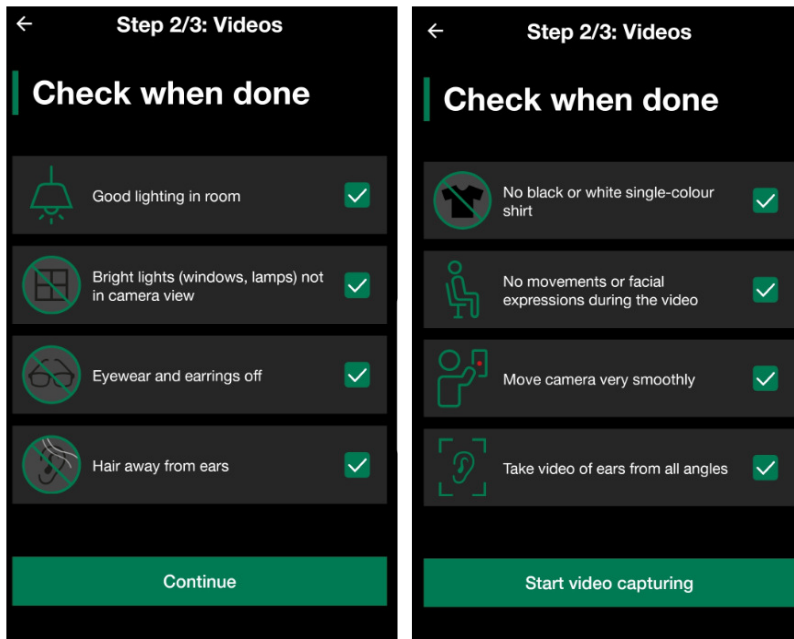
Sample photos showing the location of the ruler next to your ears.

Capturing Video

Next, the Creator app collects a 360-degree video around you.

A demo video of the capture is available inside the app. We recommend that you watch the demo video first as it demonstrates the steps required and the correct method of capturing the video.

Before starting the video capture, work through the two-page checklist to make sure you have the best chance of capturing a high-quality video. Check all the points to continue to the video capture.



Creator app checklist for video capture. The check list has two pages.

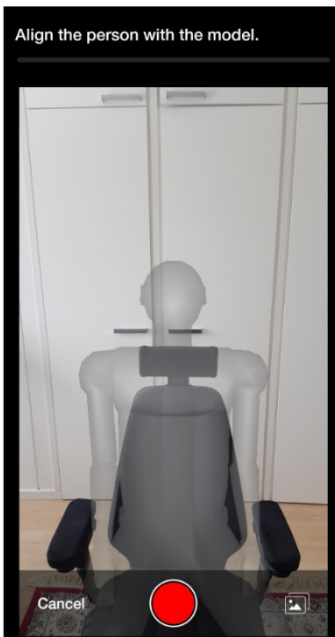
After checking all the items, the app is ready for video capture. Click 'Start video capturing'. The Aural ID Creator app turns on the mobile device camera and light. A graphical template appears at the centre of the screen. Click the camera release button on your screen to start capturing video. Once you start the capture, the graphic template starts to turn. Move your mobile device so that the camera image matches the template image position on the screen.

When the video capture starts, the camera starts moving to the right for the person holding the camera. The graphical template rotates 360 degrees. Keep the person being filmed aligned with the graphical template during the video capture.

When you reach the person's ear, the template asks you to move close to the ear slowly and smoothly. When you are close to the ear, point the camera towards the ear continuously, and move the camera smoothly so that the ear is seen from all directions – from the front, back, above and below. Do this twice. After this, keep the camera aimed at the ear, and slowly move back until the person is matched with the template again.

After you have completed the full 360-degree video capture, and you arrive again in front of the person. Keep the camera still and end the capture by pressing the red button on the screen.

The video capturing process takes about 3 minutes. A bar on top of the screen shows the planned progression of the video capture. During the video capturing, text instructions and arrows appear on the screen to explain the next step in the process and the direction of movement or pointing of the camera.



View for capturing the video in the Creator app. Note the graphical template of the person. The template will move automatically.

If you have already captured this video and the video is in the mobile device gallery as a file, there is an option on the bottom right corner of the screen to select a video file in the device library instead of shooting one.

Reviewing and Uploading the Photos and Video

After the video capture is completed, a summary page enables a review of the photos and the video. Use the review to check that the video stays focused on the person at all times and that the image does not become too dark preventing clear visibility to the person.

Finally, press the “Confirm and Upload” button to send the photos and video to the Genelec Cloud for processing. Progress of the upload is shown. Uploading will take some time since the video file is large.

8 Aural ID Application Function Reference

8.1 Signal Flow

The Aural ID Bridge is a virtual sound card and accepts, together with Aural ID application, the monitoring audio channels typically intended for loudspeakers from your DAW or other audio source. These channels are then mapped to virtual monitors in the Routing Matrix and the virtual monitors are rendered in correct locations using the Aural ID Profile HRTF data.

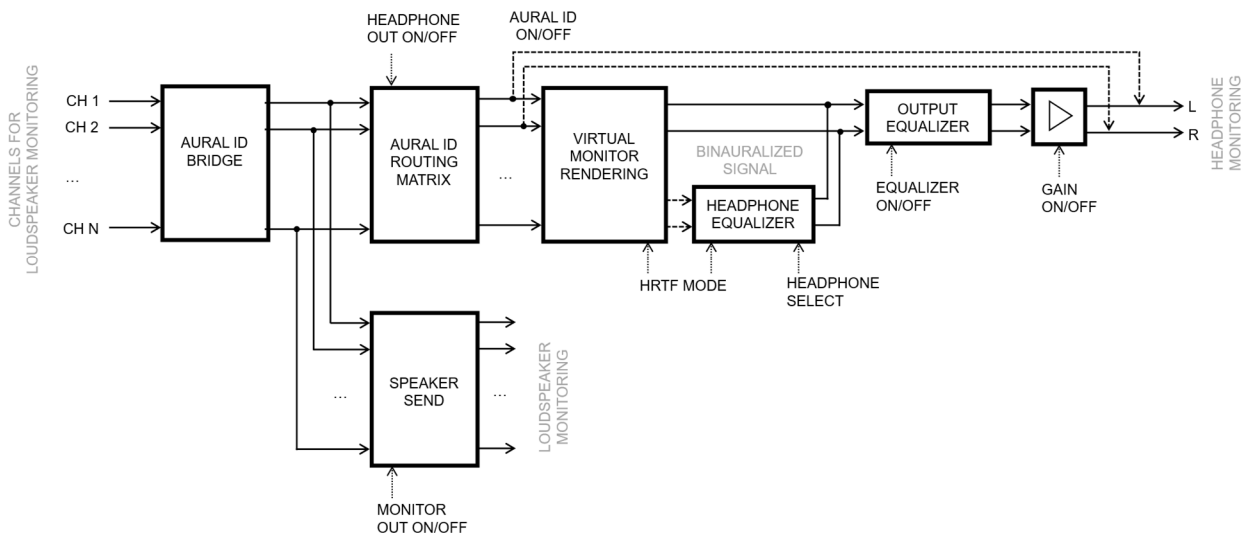
Select the virtual monitor set you want to use in the Channel Format drop-down. Virtual monitors can be calibrated using the App controls.

Aural ID processing can be bypassed in the App. When Aural ID rendering is bypassed, the first two incoming audio channels are the left and right channel feeds to the headphone.

A six-band parametric Output Equalizer is available for achieving neutral sound character or sound character similar to a reference loudspeaker system.

The Gain adjustment helps aligning level when Aural ID processing is bypassed and enables transitioning between headphone and loudspeaker monitoring.

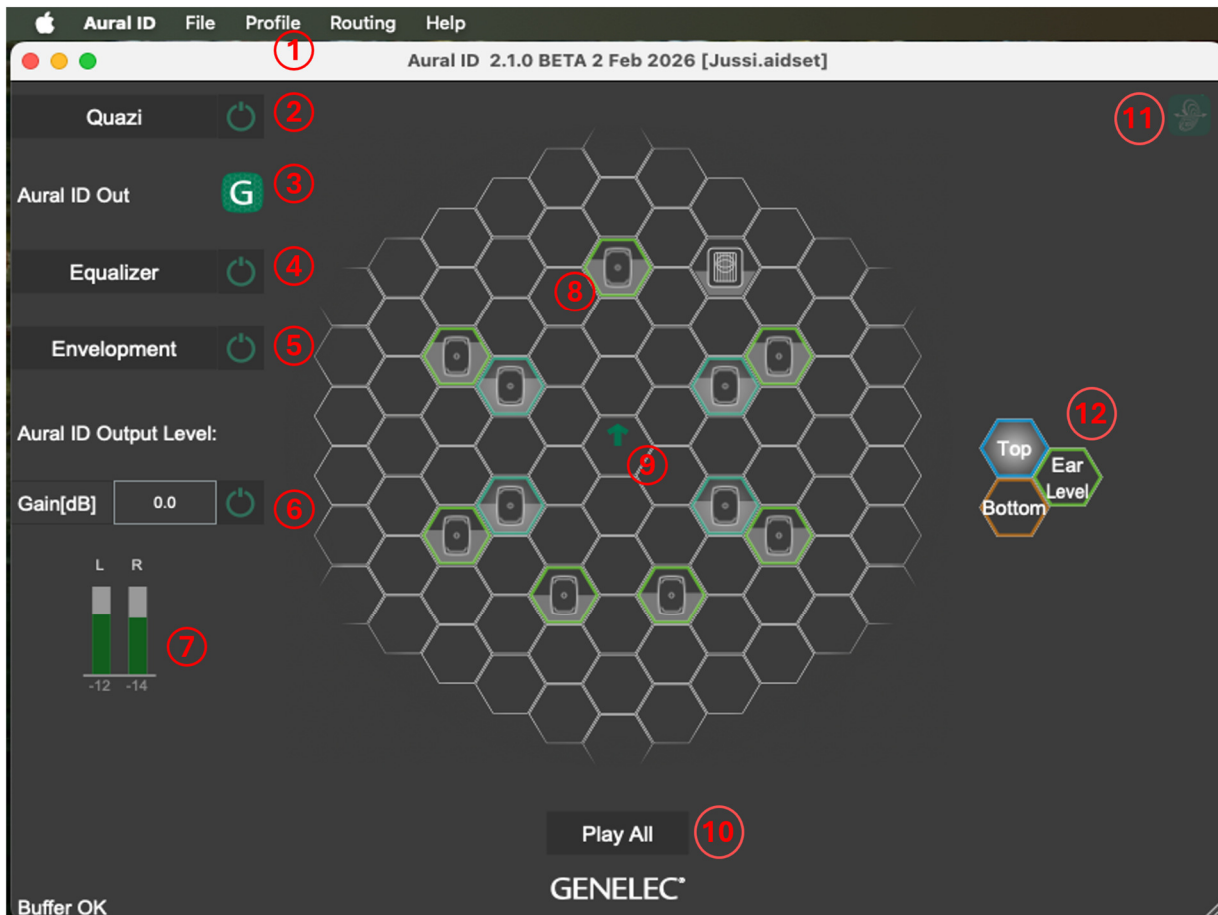
When the 'Raw HRTF' mode is selected, headphone model specific equalizers can be selected to reduce the headphone influence.



Aural ID Application signal flow.

8.2 Main View

This section describes the graphical user interface in detail.



Aural ID Application main view.

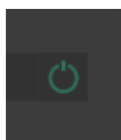
The main page of the Aural ID Application contains the following functionalities. These will be explained in more detail later in this document.

1. Menus for configuring Aural ID Application.
2. Aural ID HRTF profile to use in binaural processing and processing on/off button. Aural ID profile, containing the HRTF data, can be loaded by clicking this or using menu item Profile > Import.
3. Aural ID output is a drop-down where you can select output to headphones or loudspeakers. If using same time with GLM and UNIO PRM this will be controlled from GLM and UNIO PRM and drop-down not available.
4. Equalizer on/off control and access to equalizer settings. Equalizer affects the headphone output.
5. Low frequency envelopment on/off and setting for low frequency enhancement and its frequency limit. This control affects the headphone output.

6. Output gain of headphone output.
7. Level indicators for headphone output signal.
8. Virtual monitor system with personal calibration adjustments and solo/mute. The level in each virtual monitor is shown inside the hexagon containing the monitor as a vertical fill highlight. When the highlight fills the entire hexagon, the virtual channel is at maximum level (0 dB FS).
9. Listener direction personal calibration with head tracking tools.
10. Play all function: removes of all mutes and solos.
11. Camera link to head tracker active/not in use indication.
12. Colour symbol legends for the virtual monitors.

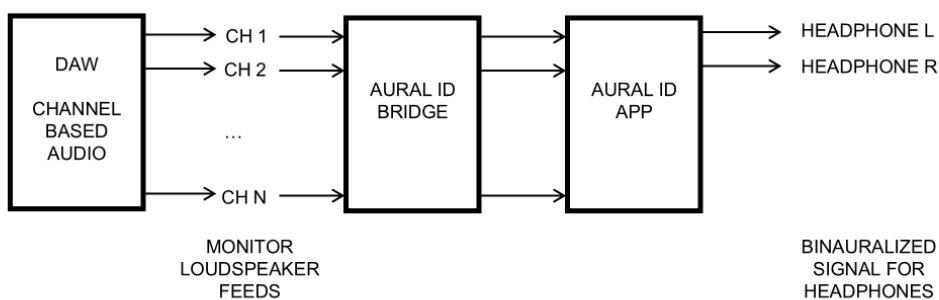
8.3 On/Off toggle switches

The toggle switch icons are colour coded – the green colour indicates the function is ‘on’ (active) and the red colour indicates the function is ‘off’ (not active or is bypassed). Click on the toggle switch icon to operate it.



8.4 Monitoring Channel-Based and Object Audio

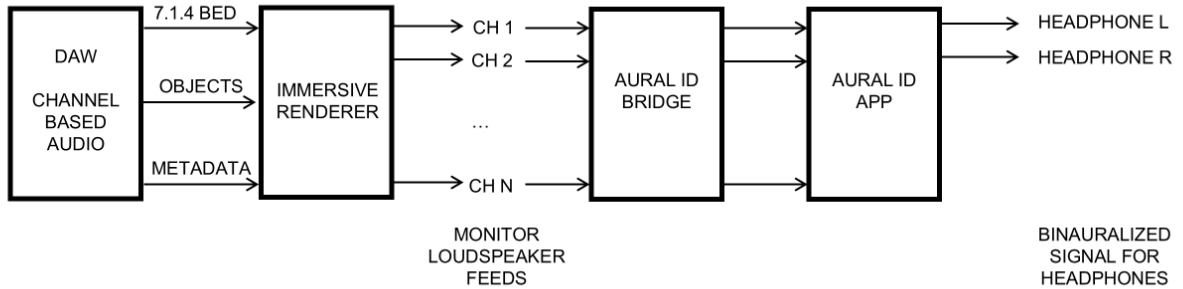
The Aural ID Application inputs the monitoring loudspeaker feed channels and creates a two-channel binaural signal intended for headphones, where all the monitoring loudspeakers appear as virtual loudspeakers around the listener.



Using Aural ID Application with a production generating the reproduction system loudspeaker feed signals.

Object-based audio typically contains a channel-based audio bed and many sound objects associated with metadata to place, adjust, and move and adjust these sound objects around the listener.

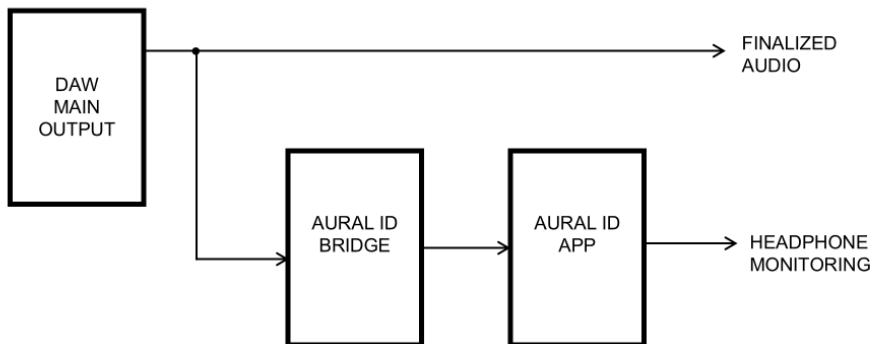
Object-oriented productions typically employ rendering software that takes the bed and audio objects with metadata and generates the monitoring loudspeaker feeds according to the selected loudspeaker layout. Aural ID Application can input these monitoring loudspeaker feed channels and output a two-channel binaural presentation for headphone monitoring, and this can create the experience of listening to the object-oriented mix using the selected monitoring loudspeaker layout.



Using Aural ID Application with an object-based audio production, generating the reproduction system loudspeaker feed signals in a renderer software from the sound objects in the DAW.

8.5 Aural ID Application in DAW Signal Flow

The Aural ID Application is a virtual sound card. It can be configured the sound output device in any software. The location where you assign the Aural ID Application in the case you are running a DAW, is in the point of the signal flow where you have the audio presentation intended for monitoring.



Aural ID Application location in the DAW signal processing relative to the finalized audio output.

When you install the App in the main output chain, you typically also have other functions in this chain, such as limiters and other processing functions. You want to hear all these effects correctly. Place the App at the last point, after all processing functions.

8.6 Configuring Aural ID Profile

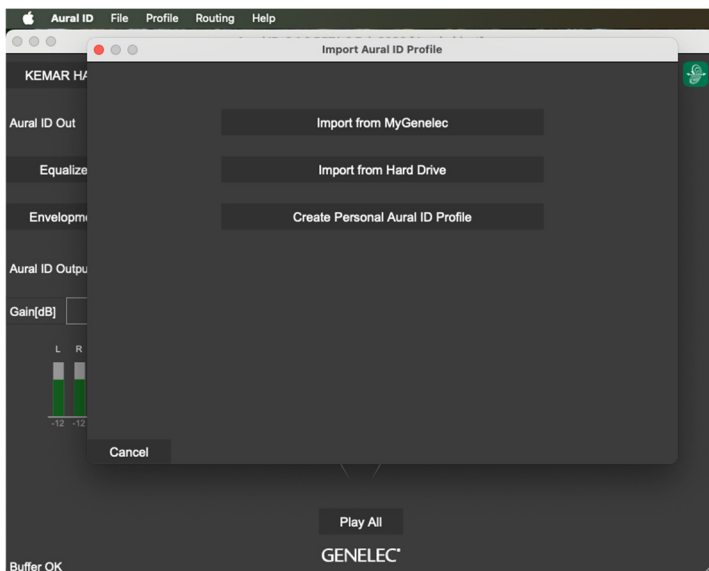
Aural ID Profile must be imported before the Aural ID Application can render on headphones.

An Aural ID can be imported in the main window 'Profile' menu item. You can also import and load an Aural ID HRTF profile by clicking the Profile in the upper-left corner of the main UI.

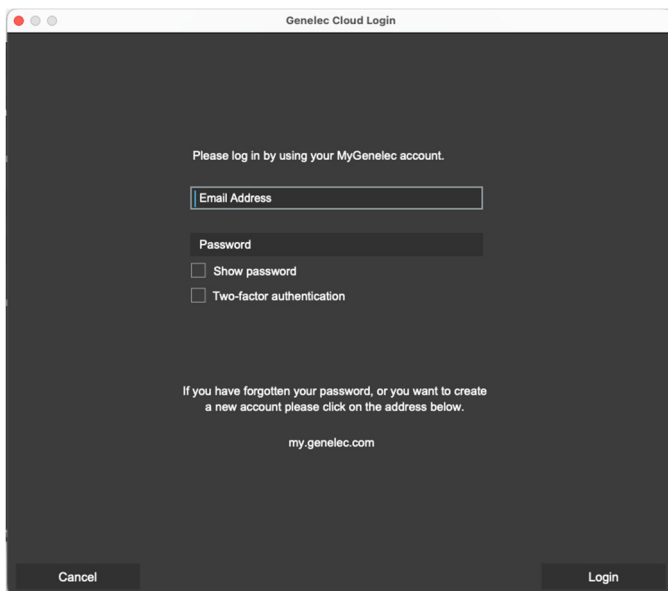
'Import from MyGenelec' – Aural ID HRTF data is imported on your MyGenelec account. This is needed at least once. After the MyGenelec import, the Aural ID HRTF is stored on your computer hard drive and can be loaded locally.

'Import from Hard Drive' – After having imported Aural ID in MyGenelec once, import from the local computer hard drive becomes active. This is faster method of importing the Aural ID in daily use.

'Import from MyGenelec' opens a screen with a login to MyGenelec. Enter your credentials and click Login.



Import Aural ID profile window.

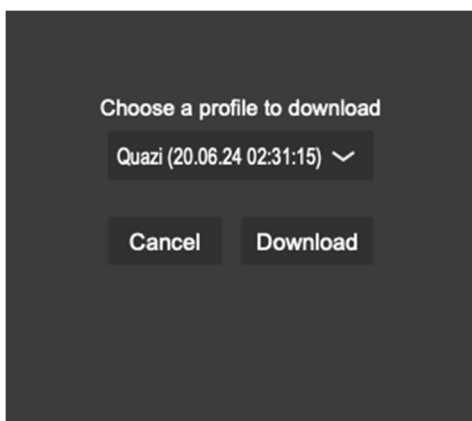


Aural ID import login window to MyGenelec.

All users have Kemar and KU100 head-and-torso simulator HRTF Aural ID profiles available. For higher precision in binaural rendering, use Aural ID profile containing your own HRTF.

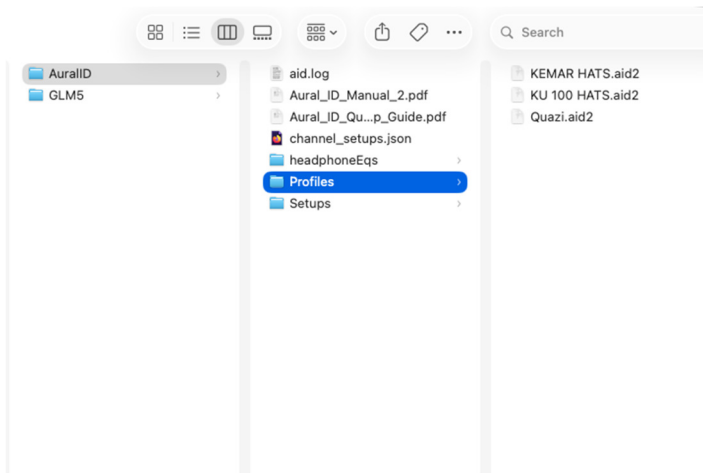
If you do not yet have the Aural ID profile containing your own HRTF, to get one click the 'Create Personal Aural ID Profile' menu item. This opens the Aural ID product page where you can find more information on ordering your own HRTF Aural ID.

You will use Aural ID Creator mobile app and a little help from your friend to complete collecting the data needed to order your own HRTF. The mobile app can be downloaded from the app store for iOS and Android phones. Look for "Genelec Aural ID Creator".



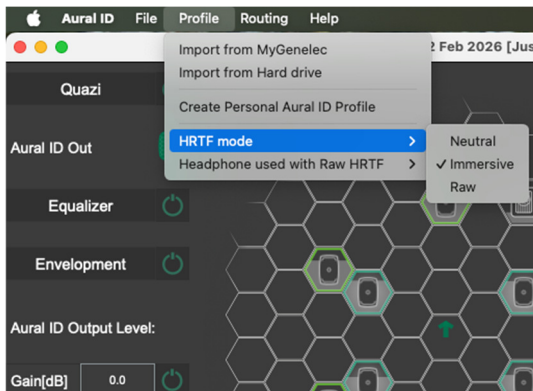
Aural ID profile selection and download window

Aural ID Profile is imported into your computer hard drive to the Document > Genelec > AurallID > Profiles folder. After one import in MyGenelec, use Profile > 'Import from Hard drive' to load the Aural ID Profile.



Aural ID Profile location in the local Hard drive.

After having imported an Aural ID, the rendering method is selected in HRTF mode menu item Profile > HRTF Mode. Typically, Neutral or Immersive modes are used. Additional options are available for the 'Raw' mode.



Aural ID application profile and HRTF mode menu.

There are additional controls on the main window to improve the precision of rendering. See the Reference section for more details on these.

'Equalizer' enables adjusting the rendering sound colour to match you and the headphones you wear.

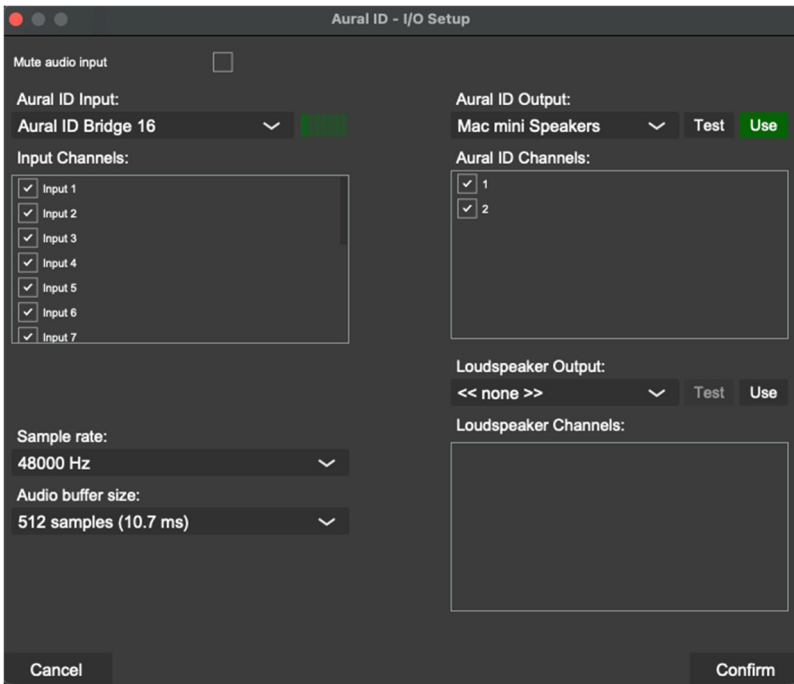
'Envelopment' enables matching binaural rendering at low frequencies to the low frequency directional capability of your reference stereo loudspeaker system.

8.7 I/O Setup

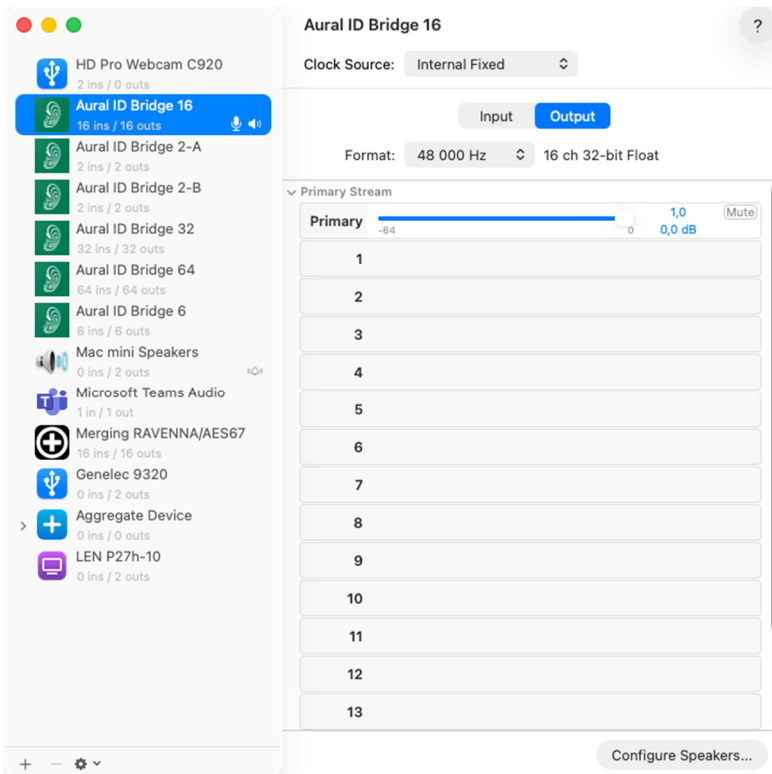
The audio input and output for the Aural ID Application are assigned using the menu Routing > I/O Setup.

The input of audio into the Aural ID Application is done enabled using Aural ID Bridge virtual sound card devices (selected inside I/O Setup). Aural ID Bridge virtual sound card devices with different numbers of channels are available in the 'Aural ID Input' drop-down.

To route audio into Aural ID, configure the same Aural ID Bridge virtual sound card device as the audio output in the computer audio settings. In the Mac computer, go to /Applications/Utilities/Audio Midi Setup. There, the full list of Aural ID Bridge virtual sound cards is available. Select the same sound card as you use in the Aural ID Application.

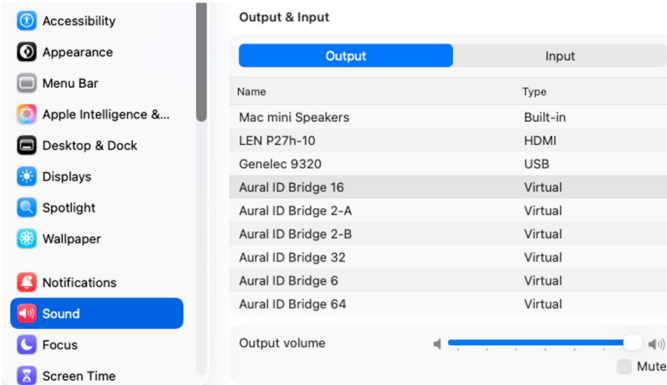


I/O Settings configure the input and two output devices. Only the binaural headphone-based monitoring output is configured in this example.

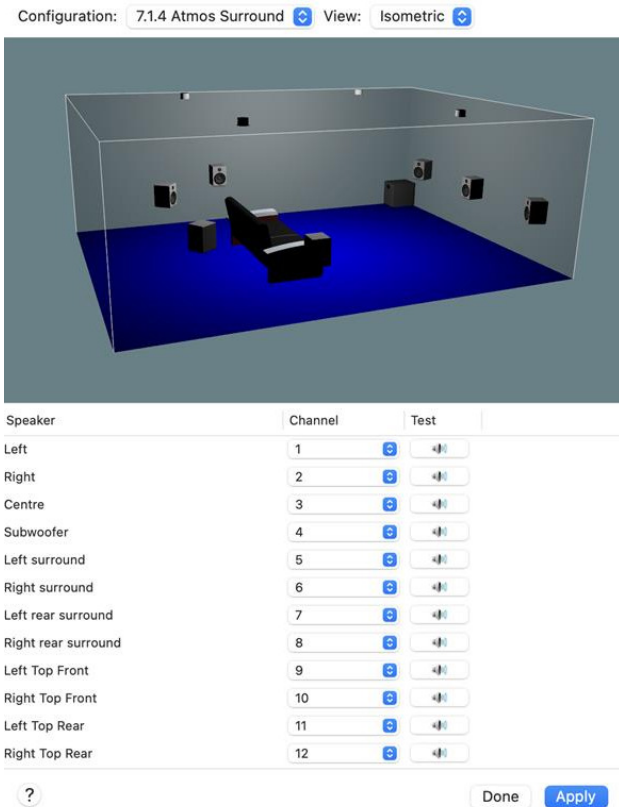


Example of Aural ID Application routing options available in Mac Audio Midi setup.

Check that Audio device volume and mute settings are properly set, not muted. Check also that channels are properly configured by clicking ‘Configure Speakers...’ button. The channel assignment must be configured so that the channel assignment in the computer audio settings and in the virtual monitor routing in Aural ID Application match, and the Aural ID Application receives the audio channels in the correct order.



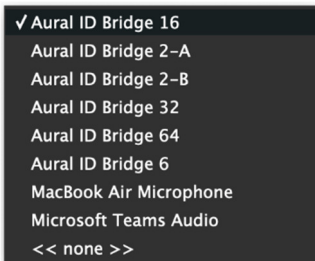
Example of Aural ID Application routing options available in Mac sound output settings.



Channel assignment in computer.

The Aural ID Input drop-down shows all the possible audio inputs in the computer. Normally, one of the Aural ID virtual sound card drivers is selected here. The number stated in the virtual sound card driver name

indicates the number of channels supported. Select a virtual sound card driver with the same or higher channel count as the number of DAW monitoring channel feeds you plan to use.



A sample Input Device drop-down showing the Aural ID virtual sound card devices.

The 'Mute audio input' control can prevent accidental audio looping if the same channel is by accident selected as the input and output. Activate 'Mute audio input' to prevent the loop. For normal operation, this control is not active.

Two output devices are configured in the I/O Setup. You may define monitoring output to headphone device and the physical loudspeaker output device.

For Genelec Personal Reference Monitoring (PRM) users, routing the headphone output through the 9320 Reference Controller is a very convenient option, allowing very easy and smooth switching between headphone monitoring and loudspeaker monitoring.

The output to the headphones is the binaural Aural ID audio.

The loudspeaker monitoring output is not binaurally rendered; it is a direct copy of the incoming audio channels.

The purpose of the first and second outputs is to enable quick switch-over from headphone-based binaural monitoring to loudspeaker-based conventional monitoring in situations where a loudspeaker monitoring system is available. This is useful, for example, when personally calibrating the binaural monitoring as this allows direct comparison between the headphone presentation and loudspeaker presentation.

The additional controls in the I/O Setup are the audio sample rate and buffering. Normally, the sampling rate is the same as in your project, to prevent the operating system from resampling audio.

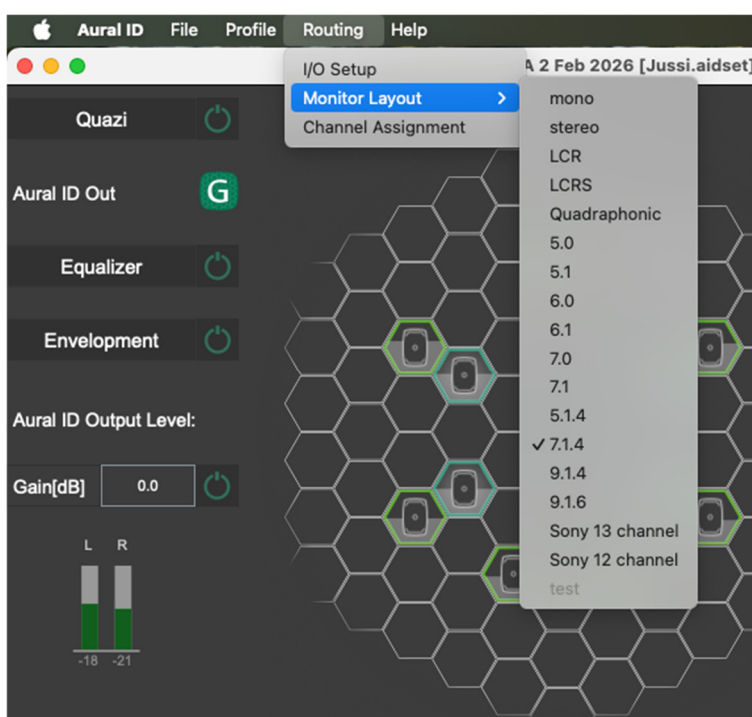
Audio buffering prevents audio dropouts when the computer is busy doing other tasks. A suitable value of buffering depends on the computer. A small value reduces the input-to-output latency, and a large value reduces the likelihood of audio dropouts. The default value is a good starting point.

8.8 Configuring Virtual Monitor Layout

The virtual monitor layout in Aural ID Application is configured using the Routing > Monitor Layout menu.

The Monitor Layout configures the virtual monitors on the binaural headphone output. Each layout creates virtual monitors on your headphones.

Select any monitor layout with less than or the same number of monitors as the number of input channels configured in the I/O Setup. For example, if the I/O Setup is configured for two channels, one or two virtual monitors can be configured (options 'mono' or 'stereo'). The 16-channel setting 'Aural ID Bridge 16' in the I/O Setup can support all monitor layouts up to 16 channels for virtual monitors. Your audio source software may set some limitation to I/O Setup settings as some software sense the number of channels in the soundcard and show different behaviour depending on the number of audio channels seen.



Aural ID Application Routing > Monitor Layout menu.

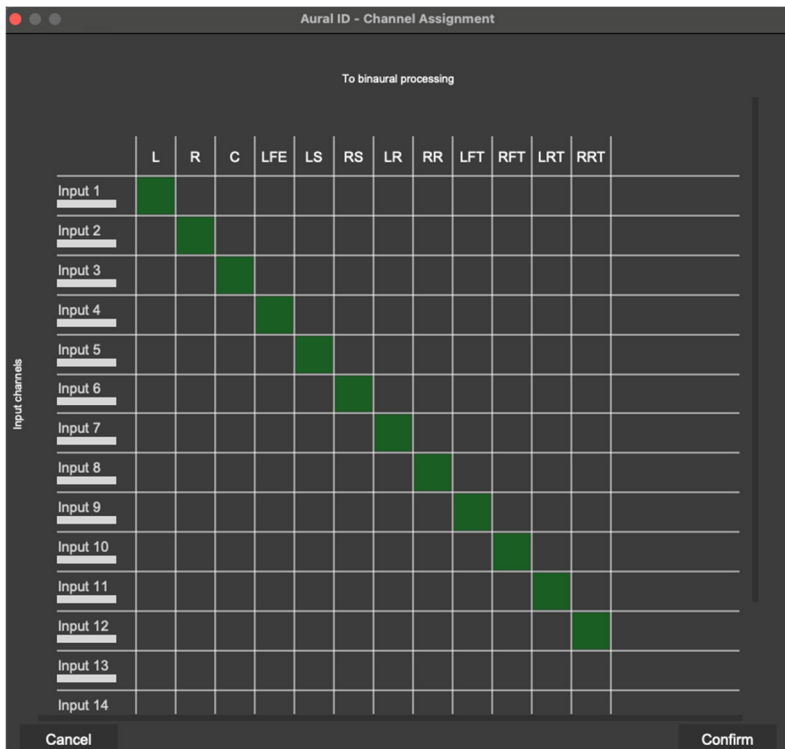
8.9 Virtual Monitor Routing

Virtual monitor routing assigns channels to virtual monitors on headphones. The menu item Routing > Channel assignment opens the audio routing window.

Routing table shows input channels from your computer or DAW on the left. Each input channel on the left also has a level meter. Green colour bar in the level indicates the signal level. These level meters can be useful for understanding that the audio source delivers signal into Aural ID Application.

The top row shows the roles of virtual monitors in the headphone. The names shown in the top row columns are configured by the virtual loudspeaker selection, menu item Routing > Monitor Layout.

Route inputs to virtual monitoring loudspeakers by highlighting an intersection (green marks). Use Solo and Mute functions in your audio source device to check that correct audio is routed to correctly virtual monitor.



Channel routing view with input audio level meters.

In case you are working object-based audio, select the loudspeaker monitoring layout option that matches the monitoring layout you have set in the renderer you use for monitoring object-based audio.

8.10 Virtual Monitor Calibrations

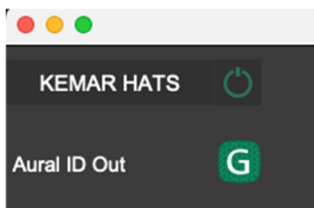
During calibration you can adjust the virtual monitors azimuth and elevation to be subjectively correct for your headphones. These controls are available by clicking each of the virtual monitor icons in the main view.



Spatial Azimuth and Elevation Coordinates of the Virtual Monitor in Binaural Rendering.

8.11 HRTF Rendering Bypass

Next to the Aural ID file name, you will find the on/off switch icon to toggle the HRTF rendering on and off (bypassed). Aural ID rendering is on when the switch icon colour is green, and rendering is bypassed (off) when the switch icon colour is red.



Aural ID profile and the bypass switch for the binaural HRTF processing.

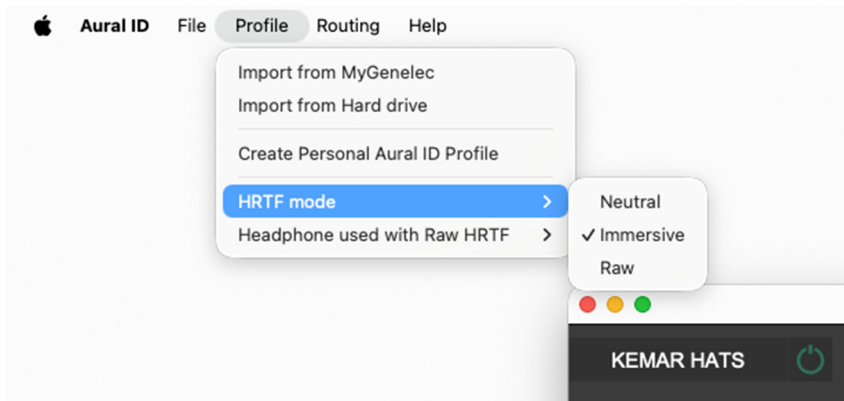
When the Aural ID processing is on (colour of icon is green), binaural processing is applied, and you hear the binauralized presentation of all in the input signals.

When you turn off the Aural ID, and the binaural rendering is bypassed. Then, the first two input channels in the Routing > Channel Assignment view are routed as the left and right headphone output signals. This enables you to listen to a stereo audio signal without binaural processing, just like with any headphones. In that situation, the audio localizes mostly inside your head.

Running Genelec Loudspeaker Manager (GLM) software, enables HRTF rendering to bypass automatically under the control of GLM software. This enables seamless integration of headphone monitoring, with easy switching between Aural ID headphone monitoring and loudspeaker-based monitoring.

8.12 HRTF Mode

HRTF mode selection offers three pre-processing options for the HRTF data.



Selecting the headphone rendering mode.

Immersive HRTF

This is the Aural ID default setting.

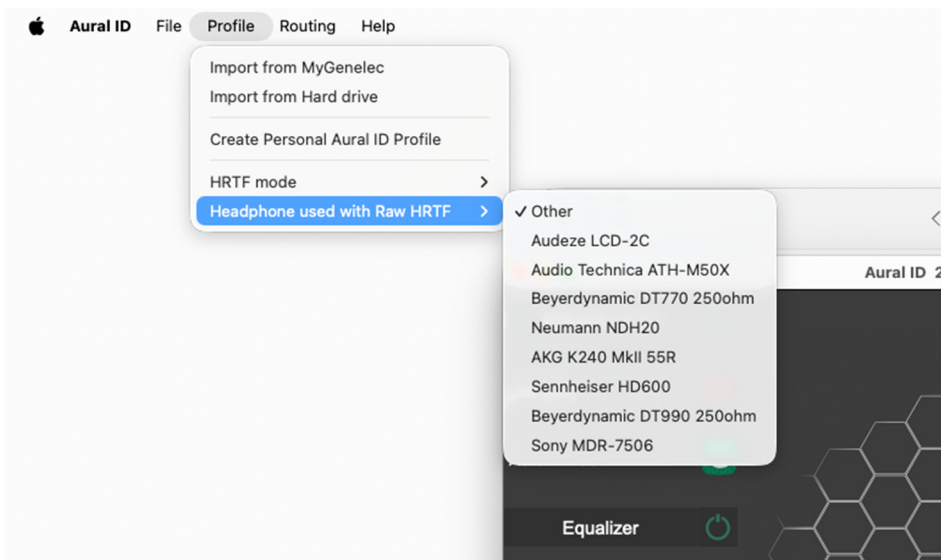
‘Immersive HRTF’ mode applies the directional factor of the HRTF data. This mode can be used with any headphones. This mode may require adjusting the sound colour depending on the headphones used and your Genelec recommends high quality professional headphones and discourages the use of wireless headphones because they can use strong audio coding that can alter details in HRTF, preventing the Aural ID from working reliably.

Neutral HRTF

‘Neutral HRTF’ is optimized for stereo audio monitoring. This mode can be used with any headphones, and it retains the natural headphone sound character. Genelec recommends using high quality professional headphones and discourages the use of wireless headphones because they typically use strong audio coding that can alter the details in HRTF, preventing the Aural ID from working reliably.

RAW HRTF

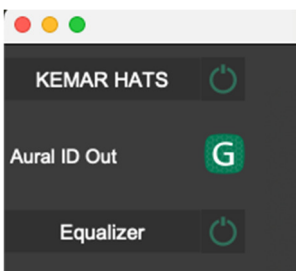
The ‘Raw HRTF’ mode uses the complete personal HRTF data in your Aural ID including the common and directional factors. The raw HRTF can be used when the headphone frequency response is equalized to be linear at the ear drum. Headphone-specific equalizers in the ‘Headphone Mode’ selection take steps to providing this, but additional personal equalization may be needed. Headphone model specific equalizers are available when option ‘Raw HRTF’ is selected as the HRTF mode.



Raw mode headphone type selection.

8.13 Equalizer and On/Off Control

The equalizer applies the same sound colour to all the virtual monitors. To adjust equalizer settings, click the Equalizer button. Next to the Equalizer button there is an on/off bypassing switch for the equalizer. This equalizer can be used for several purposes:



Access to equalizer settings and bypass control for the equalizer.

- Personal calibration of the headphone/user interaction, rendering the audio presentation subjectively linear and neutral for specific headphone and for a certain person.
- Matching the virtual monitoring sound character with a reference loudspeaker-based monitoring system, for a certain headphone and a certain person.
- Achieving the personal sound character with certain headphones that is familiar to the user to aid the accuracy of monitoring.



Equalizer view showing parametric controls for headphone monitoring.

The equalizer offers six parametric filters. These can be controlled using the parameter values or by adjusting the filter graph itself. Three different filter types are available: *Peaking filter*, *High shelf filter* or *Low shelf filter*.

Following controls are available in the filter graph:

- *To adjust the frequency:* Drag the filter marker left or right
- *To adjust the gain:* Drag the filter marker up or down
- *To adjust the Q value:* Hold CTRL key and drag the filter marker up or down (or right-click the marker, hold the right mouse button down and move the mouse up or down).
- *To turn a filter on or off:* Double-click on the filter marker.

You can also adjust each filter using the parameter field under the graphic. You can use the plus and minus buttons, or you can write a specific value into the numeric field. The fields are:

- Drop-down selection of the filter type.
- Numeric fields: centre frequency, gain and Q-value.



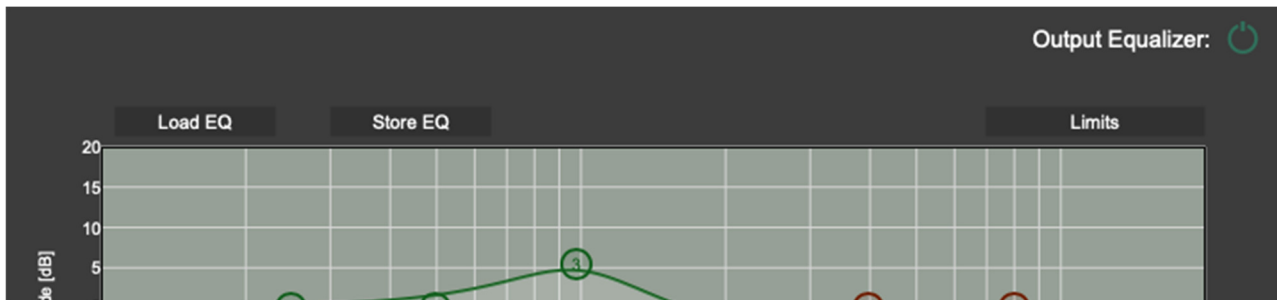
Parametric filter controls.

Close the EQ window by clicking 'OK' to save your edits. Click on the 'Cancel' button to discard your edits.

8.14 Store EQ and Load EQ

The equalizer settings can be stored to and loaded from a file. This also enables moving equalizer settings from one computer to another and documenting equalizer settings.

The load and store buttons are located at top left of the 'Output EQ' window. Limits button allows you to adjust equalizer curve window.



Load EQ , Store EQ and output Equalizer bypass buttons.

The equalizer settings are stored in a .json file which can be inspected and edited with a standard text file editor.

The .json file contains the equalizer settings as key, value pairs. The values are arrays of parameters corresponding to individual equalizers.

The keys are as follows:

- on/off icon: true or false, selecting the equalizer section to be active or non-active
- gains: gain values in decibels
- freqs: center or corner frequency values
- Qs: filter Q values
- types: equalizer filter type selection; the filter types are as follows: Peak EQ, Low shelf, High shelf

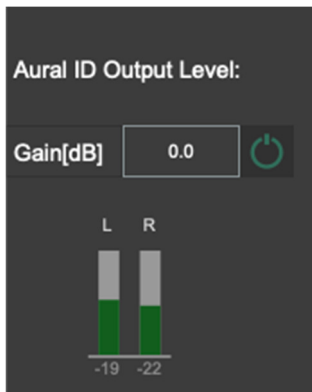
The total equalizer frequency response is the filter resulting from applying each of the filters to the outgoing signal.

Although it is possible to increase level (use positive gain) using the equalizer, this should be used with care as this may result in the signal clipping in later parts of your signal chain.

8.15 Output Gain Control

The output gain enables the Aural ID Application output level to be calibrated.

The range of this control is from -100 dB to +10 dB. This control can match subjective level between headphone-based and loudspeaker-based monitoring, avoiding the need to adjust the DAW monitoring level.



Output level gain control button.

Binaural processing uses floating point signal processing and does not clip, but a clip can occur when the binaural audio is output. The output level meters on the main view show the level in left and right output channels. If a clip occurs, the colour of the level bar changes from green (normal) to red (clip).

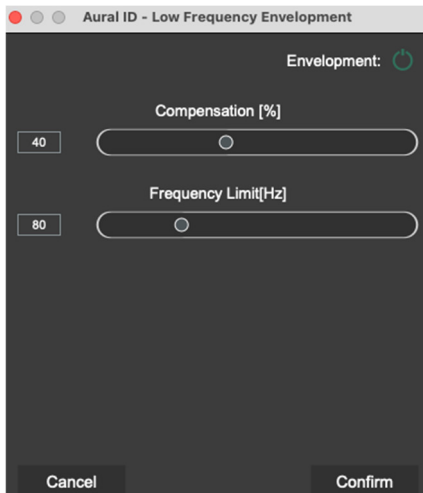
As several incoming channels are combined to the binaural output, the composite output can have a higher level than single input channels. If the binaural output clips, the two output level bar meters will momentarily change from green to red colour. Then, reduce the level either at the audio source or reduce the Aural ID output gain setting.

8.16 Low Frequency Envelopment

The low frequency envelopment control can improve understanding the cooperation of a stereo loudspeaker system in creating low frequency level and direction in a room. The settings should be set so that the headphone listening creates the same low frequency envelopments and sense of directions as a reference stereo loudspeaker system.

The low frequency envelopment setting can significantly improve low frequency mixing work using Aural ID Application when the low frequency content in the mix is not monophonic but has significant out-of-phase component. The exact settings depend on the reference system, and are affected by the loudspeaker placement, listening location and room acoustics. Evaluate the correct setting for this such that the low frequency presentation is similar to that in your reference loudspeaker-based monitoring system.

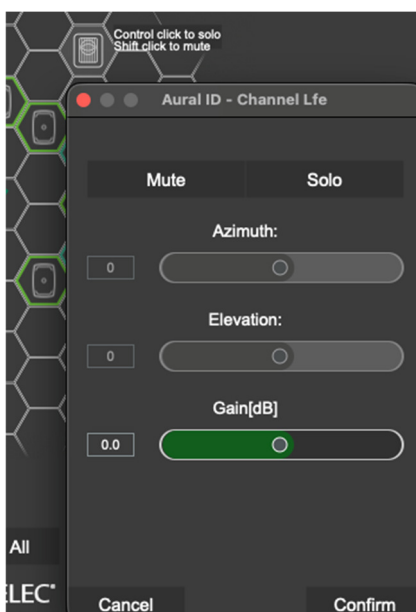
There are two controls, 'Compensation' and 'Frequency Limit'. The low frequency envelopment processing can be turned on/off with the toggle switch to control if the processing is applied. When the effect toggle switch is set to 'on' the enhancement is applied in frequencies lower than the 'Frequency' setting. The amount set in 'Compensation' adjusts how much the direction of low frequency audio is audible on the headphones.



The Envelopment controls.

8.17 LFE Channel Controls

LFE Channel Controls provide settings for handling the LFE channel (when one is included) within the currently selected monitor layout. You can mute and solo the LFE output for debugging purposes and adjust the LFE gain in the virtual monitor presentation.



LFE channel calibration settings.

The LFE channel content is not processed through the Aural ID filters as the LFE content usually does not have a specific direction while it is usually assumed to be reproduced in the front. The LFE channel content is distributed evenly to the left and right earphone channels, placing subjectively the LFE content in centre, resembling the typical subwoofer handling the LFE in a monitoring room.

8.18 Keyboard Shortcuts for Virtual Monitors

There are keyboard shortcuts to mute and solo virtual monitors:

- 'shift-click' mutes a virtual monitor
- 'control-click' solos a virtual monitor

Keyboard shortcuts enable quick selectively listening to a certain set of monitors alone or working together.

8.19 Calibrating the Virtual Monitors

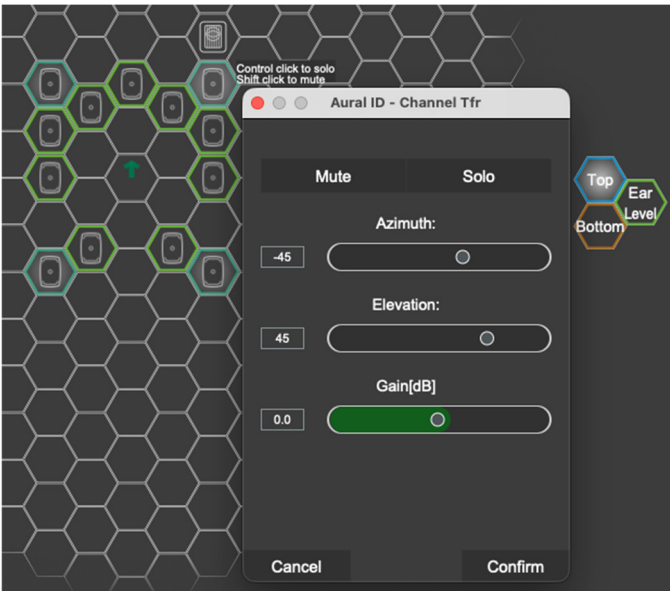
Headphones interact with your personal hearing, and this modifies how you hear the direction and colour of sound in the Aural ID rendering. The virtual monitor locations may require calibration to the headphones you use. This calibration can be performed individually for every virtual monitor.

Each virtual monitor has the following calibration controls:

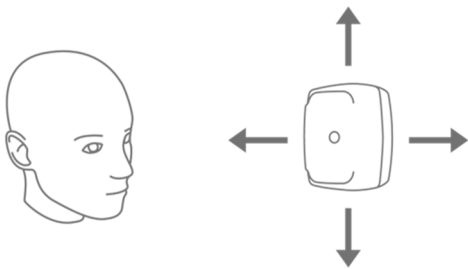
- Azimuth control adjusts the position of the virtual monitor on the horizontal plane, left to right. Setting 0 places the virtual monitor at the front. Positive values move the monitor to the left. The -90 setting is directly to the right and +90 setting directly to the left, and both +180 and -180 settings place the monitor at the back. The values of the monitor location are given in degrees.
- Elevation control adjusts the position of the virtual monitor in the vertical direction. Positive values increase the height. The adjustment range is +90 directly above to -90 directly below. The values of the monitor location are given in degrees.
- Gain control adjusts the level of the virtual monitor.
- Mute button mutes the virtual monitor.
- Solo button plays only this virtual monitor. However, applying 'solo' to several virtual monitors is possible and then only the soloed monitors will play.

Note that when you are adjusting the virtual monitor with the control window open, the controls on your main window are disabled. After you accept confirm or cancel the setting for the virtual monitor and the window closes, the controls on the main window become active again.

Virtual monitors are presented as loudspeaker icons in hexagons. The colour on the edges of the hexagon indicates the elevation setting of the loudspeaker. When you click on a virtual monitor, the setting window opens as shown below.



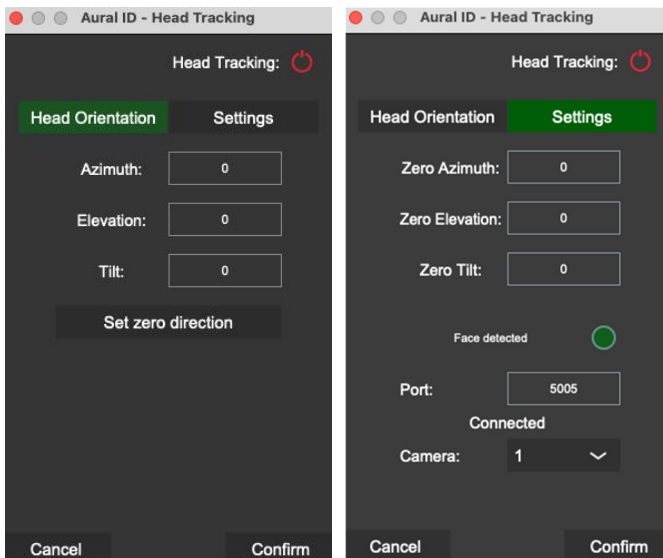
Virtual monitor settings.



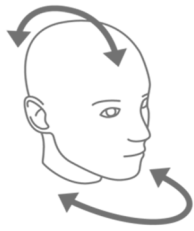
Each virtual monitor can be adjusted up and down (elevation) and left to right (azimuth).

8.20 Calibrating Listener Look Direction

The listener is represented by an orientation arrow in the middle of the virtual monitor set.



The listener orientation control can adjust the head direction manually or with data from a head tracker (left pane). The look direction setting can be zeroed into a certain direction, for example when the head tracker camera is not directly in front of the listener (right pane).



Listener orientation controls adjust listener direction in azimuth (head turn) and elevation (head tilt).

By clicking the listener arrow icon in the middle of the grid you open the settings for the look direction. The default look direction is straight ahead (zero azimuth and zero elevation).

You can adjust the azimuth and elevation to rotate and tilt the complete monitoring layout, thereby calibrating the correct virtual monitor layout orientation. This setting depends on your personal listening preference and how your headphones interact with your hearing.

When you adjust the azimuth, you will see the look direction arrow rotate. When you adjust the elevation, you will see the colour of the arrow change. Positive elevation values (i.e. when looking upwards) are indicated with a shift towards a blue colour. Negative elevation values (i.e. when looking downwards) are indicated with a shift towards a brown colour.

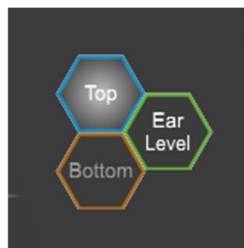
Head tilt is not represented in the arrow but can be seen in the adjustment panel head orientation settings.

Note that when you are adjusting the virtual monitor with the control window open, the controls on your main window are disabled. After you confirm or cancel the setting for the virtual monitor and the window closes, the controls on the main window become active again.

When the head tracker is running, the head tracker automatically adjusts the head orientation, and these changes can be seen in the UI. Manual adjustment of the head direction is useful when the head tracker is not connected. See the section 'Head Tracker' for the full details on configuring the head tracking system.

8.21 Legend

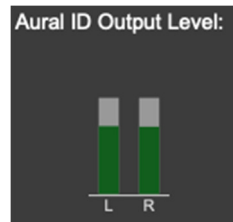
The legend identifies the colour coding of the ear height layer and the top layer virtual monitors.



8.22 Output Level Meters

The digital output level of the binaural signal to the headphones is shown with a bar display.

When the output signal is at or exceeds 0 dB, the level bar display changes from green to red colour momentarily. Even brief peaks at or above 0 dB are shown. If this happens, adjust the 'Gain' such that the binaural headphone signal does not show clip. Adjusting the 'Aural ID Output Gain' may be particularly useful for a multichannel immersive audio monitoring, as the large number of monitoring audio channels can contribute to make the binaural output high.



9 Aural ID Head Tracker Reference

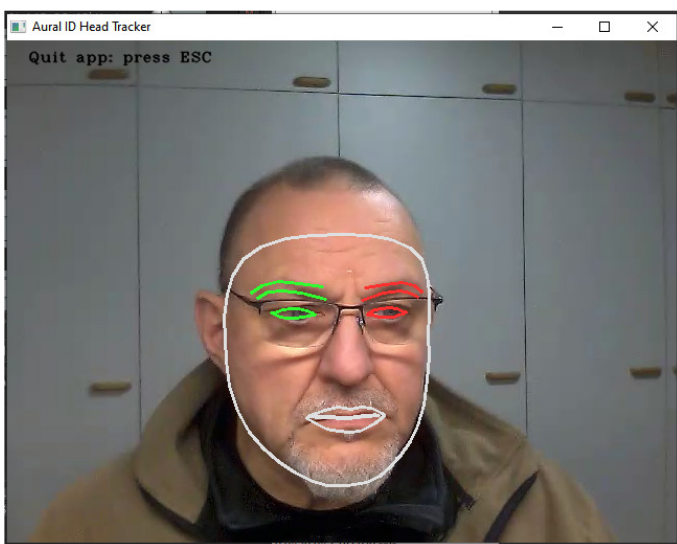
Unless you are using a hardware head tracker device, a webcam is needed for the head tracker to work. A built-in camera of a laptop or a separate webcam can both be used. The camera should be positioned in front of the listener if possible.

Webcam head tracking is a very easy method for enabling head tracking in Aural ID. It supports all the webcams in your computer.

The Aural ID Head Tracker application must be started before starting the Aural ID Application or Stand-Alone applications.

Upon starting the webcam head tracker, you will see the webcam image and, if a face is detectable, the detected face outline with eyes and mouth marked for guidance. After this, the tracking information is available to Aural ID, and the Aural ID application can be started.

As the head tracker application needs to see your face, it is recommended that you choose a camera in the forward direction as this gives the highest tracking accuracy.



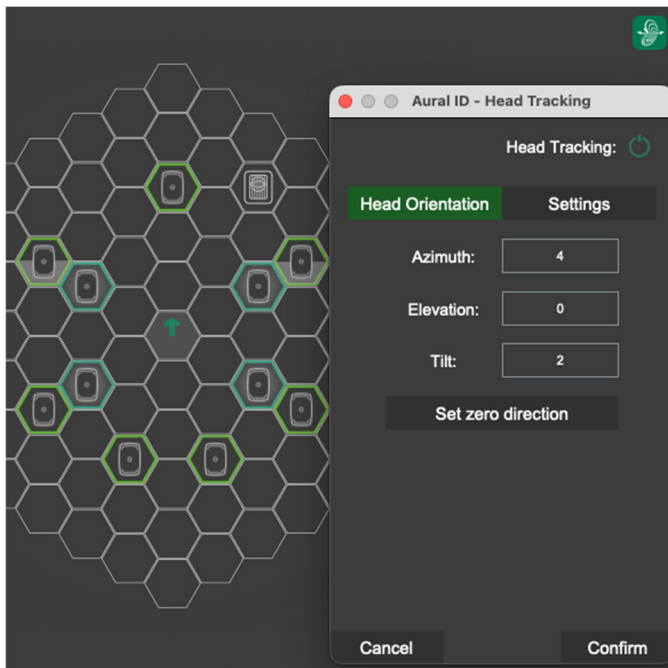
Aural ID head tracker window.

The head tracker only processes the video inside to detect the face orientation your computer and does not send images outside your computer or store video data.

The head tracker app does not automatically stop when you quit your audio processing application. The head tracker can be stopped in the tracker window by pressing the ESC key.

9.1 Look Direction Controls

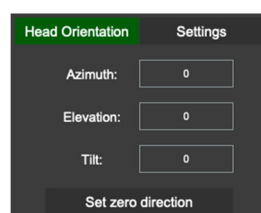
The head direction and head tracking controls are accessible by clicking on the direction arrow in the centre of the virtual loudspeaker layout. This opens the head direction controls panel.



Look direction, head orientation controls.

The 'Head Tracking' on/off toggle and 'Set zero direction' controls are available on the 'Head Orientation' tab. The on/off toggle can select the head tracking on or off, depending on the application.

In the App interface the 'Set zero direction' button can be used to calibrate the exact front look direction of the listener. The set zero direction control is usually used as the first step, to establish the zero direction for the head tracker data input. To set the zero direction first orient your face to look towards direct in the centre direction and make sure your head is vertical (not tilted sideways or in the forward/backward direction). Then click on the 'Set zero direction' button. This resets the azimuth, elevation and tilt readings in this direction.

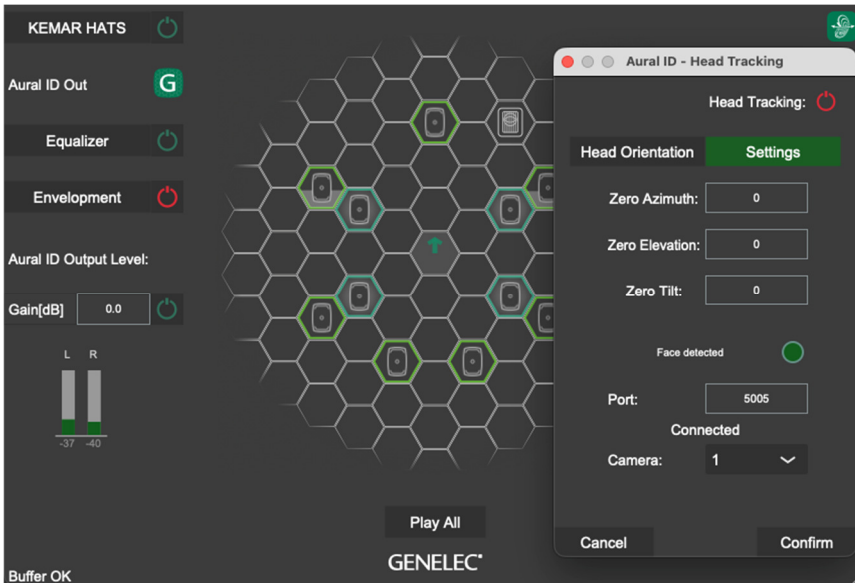


On the Settings tab you find manual fields to define your zero direction in relation to the webcam data.

The 'No face detected' lights up with red colour when the webcam does not see a face and cannot determine the head direction.

In this tab, in the 'Port' field you can also define the port for hardware Open Interface head tracker device.

The 'Camera' field allows selecting the webcam to use in case the computer has several webcams. This drop-down selector will show a number identifier for every webcam accessible.

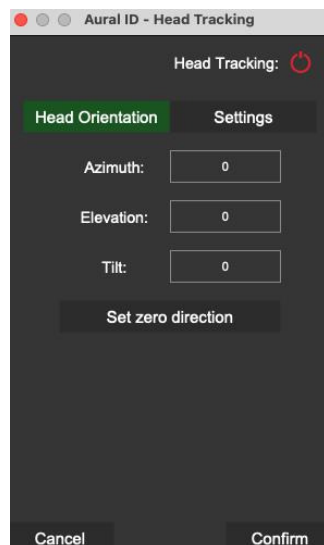


Look direction, head tracking and camera settings.

9.2 Tracker Settings

By clicking the listener icon in the middle of the virtual loudspeaker grid you open the settings for the look direction. The default look direction is straight ahead (zero azimuth and zero elevation). This opens the 'Look Direction' control panel.

In the 'Head Orientation' tab, the current head orientation is shown. The zero direction can be set here, clicking the 'Set zero direction' button.



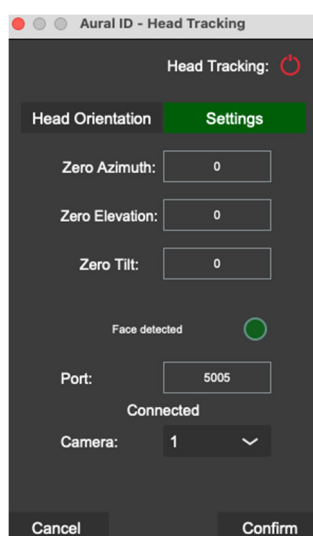
In the 'Head Tracker Settings' tab, the current zero direction is shown.

The 'Zero azimuth', 'Zero elevation' and 'Zero tilt': The zero direction can be manually configured in this view.

'Face detected': The 'Face Detected' indicator light shows a green colour when the head tracker detects the face and can determine its direction in the webcam video. If the face cannot be detected, the light is red. Use this light to verify that the head track can see a face in the video feed.

'Port': Port used for communication. There's no need to change this when using the Genelec head tracker. The port setting is needed when using OSC devices for head tracking.

'Camera': The webcam to be used for head tracking can be selected using the 'camera' drop-down when there are more than one available webcams or by pushing the keyboard key 'c'.



9.3 Selecting and Switching the Webcam

In case there are multiple webcams available, the camera can be switched from a drop-down menu in the App or by pushing keyboard key 'c' when the head tracker face detection window is active.

Keyboard key 'c': Changes the current camera.

Keyboard key 'ESC': closes and exits the head tracker software. The head tracker window must be selected.

On a Mac computer the head tracker is located in '/Applications' folder.

10 Learn More

10.1 Monitoring of Audio

When audio is recorded, edited and mixed, the result is typically monitored using loudspeakers, but increasingly with headphones, too. Monitoring using loudspeakers is usually preferred because loudspeakers enable location of sound images and presentation of the sound stage, enabling presentations to be designed reliably for loudspeaker reproduction.

As a part of the recording creation process, virtual sound images are created on the sound stage, the space between two or more loudspeakers. Level panning is the typical method for placing a virtual source at a certain location inside the sound stage. Microphone techniques can also create placements of sound images in the audible acoustic space, audible using loudspeakers.

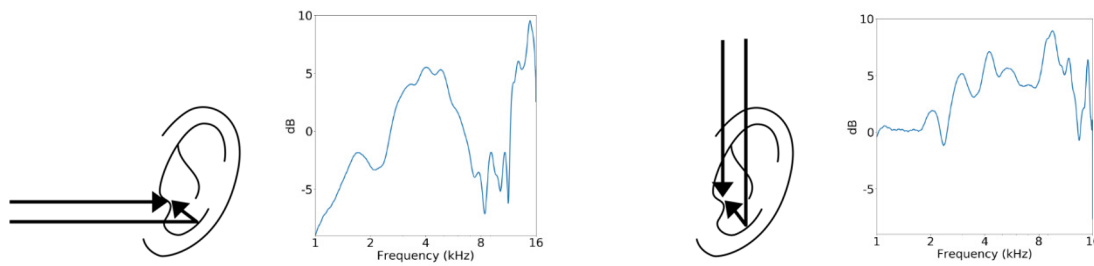
Experiences of sound stage, virtual sound images, and acoustic space are created because of the mechanisms of human directional hearing. Although we can determine the direction of sound with one ear alone, two ears hear sound slightly differently and when the brain combines these inputs, this can contribute to sensing the direction of sound. For real sound sources, we may also spontaneously turn our head while we try and localize sound.

10.2 Mechanisms for Localization of Sound

We localize sound using:

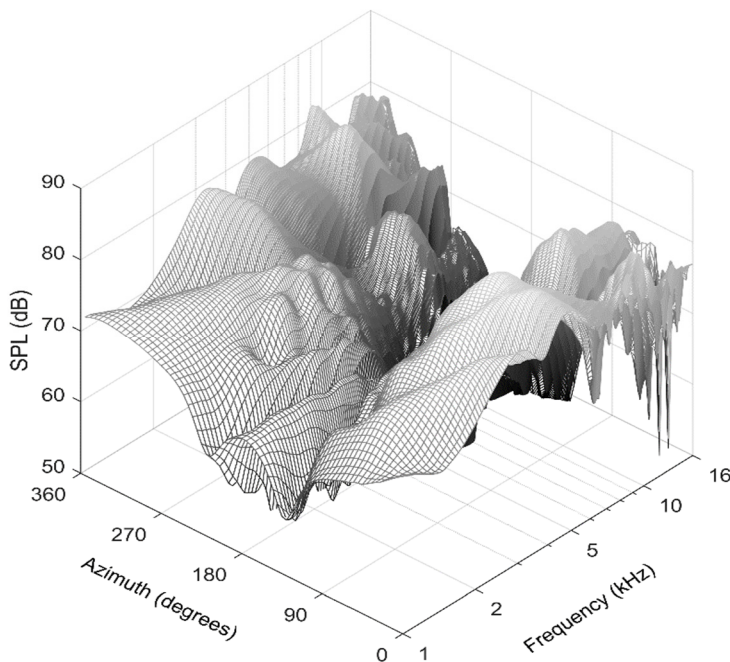
- Head-Related Transfer Function (HRTF) – sound colour changes and time delay changes that depend on the direction of sound arrival and frequency, and this describes your personal effect on the sound colour.
- Interaural Time Difference (ITD) – the frequency-specific time difference for the sound arriving at the left and right ears. This is part of the HRTF.
- Interaural Level Difference (ILD) – the frequency specific level difference that depends on the direction of sound arrival. This is a part of the HRTF.
- Head movements.

The localization of sound for humans is traditionally explained using the concepts of the time differences and level differences for the sound arriving at the left and right ears. Level difference (ILD) is considered to be the main localization mechanism above the frequency at which the human head becomes a significant shadow for sound (above 1500 Hz), while the time difference (ITD) significantly explains localization at lower frequencies. However, both of these are actually part of a more complete description of the directional hearing mechanism, that of the HRTF.



Examples of HRTF magnitude responses for audio arriving from the front (left) and from above (right).

The example above shows the direction-dependent filtering in the HRTF caused by the external ear, with sound arriving from the left and sound arriving from above. Our brain automatically decodes the sound colouration created by the external ear as the direction of arrival of the audio.



Example of the HRTF magnitude response as a function of azimuth angle at one ear.

To give you some examples of how HRTF affects sound, let's look at the direction-dependent level variations.

The example above shows the direction-dependent level variations for the left ear located at about 80 degrees azimuth, seen on the horizontal plane for a sound source going around the head. The 'straight ahead' direction is at zero degrees azimuth (and 360 degrees), straight back is at 180 degrees azimuth, and with increasing angle value, rotation happens to the left. In the figure you see the frequency-dependent level at the ear when the audio is arriving from different directions on the horizontal plane. Although you can see the heavy filtering that happens because of your external ears, head, and torso, in real life, you will not hear these changes as sound colour but instead you understand sound arriving in a certain direction.

10.3 Directional and Common Transfer Functions

The HRTF for a person has two components. One of these will change depending on the direction of audio, and one remains the same irrespective of the direction of audio.

The direction-dependent part of the full HRTF is called the Directional Transfer Function (DTF). This direction-dependent part of the HRTF is created by your head and body diffracting and reflecting audio differently depending on the audio direction. DTF represents the differences between the left and right ears, including the ITD and ILD.

The nondirectional part of the full HRTF is called the Common Transfer Function (CTF). This part exists because your head and body affect the sound field, and this causes a change in the sound colour that you hear.

Both DTF and CTF are personal and specific to you. The reason for this is that these are determined by your exact size and shape, including length of your neck and how you naturally hold your head, on top of the shapes in your external ear and the shape and size of your head. All these things make HRTF personal and unique.

10.4 HRTF in a SOFA file

With certain subscriptions the personal HRTF data can also be downloaded as a SOFA (Spatially Oriented Format for Acoustics) formatted file.

The SOFA is a file format for storing spatially oriented acoustic data such as head-related transfer functions (HRTFs) and binaural or spatial room impulse responses (BRIRs, SRIRs). SOFA format is defined in the standard AES69-2015 by the Audio Engineering Society (AES).

The SOFA file format is a standard frequently supported by binaural audio processing software but note that SOFA file is not used by Aural ID Application.

Consider SOFA file download only if you plan to use your HRTF with other binaural processors.

10.5 Advanced Layout Configurations

If the monitor layout you need is not included in the set of available virtual monitor layouts, you can edit the layout definition file to create your own layout and add it as a new selection.

The virtual monitor layout options are defined in file 'channel setups.json' which is located in the user documents folder under the path 'Genelec/AuralID'. Modifications to this file become available after you restart the App.

When you edit the JSON file, please make a backup copy first to avoid any possibility of losing the original file.

Note also that it is perfectly fine to use a virtual monitor layout that contains more monitors than the number of actual input channels.

10.6 Locations of Applications Executables

Aural ID Application install folders on your hard drive are typically located here:

- Application executable: /Applications
- Head tracker executable: /Applications
- Aural ID Bridge files: /Library/Audio/Plug-ins/HAL

10.7 Location of Your Data

Your data is placed in Aural ID profile files and settings files.

The Aural ID profile/licence files have the extension **.aid2**. Your Aural ID data is downloaded into this computer location:

- Mac: ~Documents/Genelec/AuralID/Profiles

The Aural ID application settings file has the extension **.aidset**. Default Aural ID settings folder is:

- Mac: ~Documents/Genelec/AuralID/Setups

10.8 Operating System Support

The Aural ID Application is available for Mac computers, Apple silicon is recommended. The Application supports Mac OS X 13.1 (Ventura) or later and is not supported on earlier Mac OS X versions.

10.9 Modifying Aural ID Channel Setup

This chapter explains the concept of aural ID channel layout mapping, describing the spatial orientation of audio channels around the listener.

Direction 0 degrees azimuth is located directly forward from the listener with azimuth angle increasing anticlockwise to +180 and clockwise to -180 degrees. In height, the ear level corresponds to 0 degrees elevation, with angles below and above ear level being less than or greater than zero degrees respectively.

To modify a layout or to add your own layout, you must edit the file ~/Documents/Genelec/AuralID/channel_setups.json.

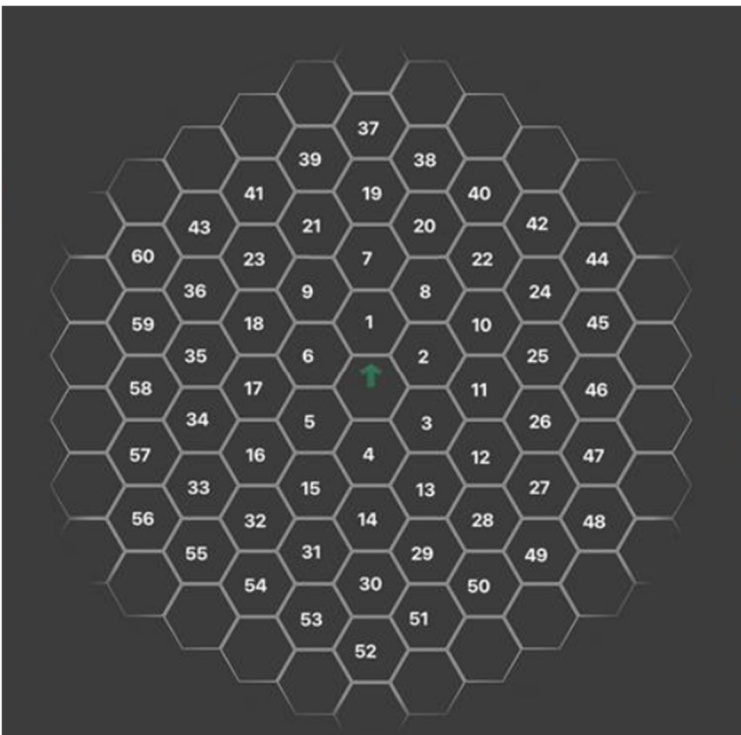
Aural ID will read this JSON file every time it is launched and update the list of monitor layouts in the menu. When editing, please ensure that the proper JSON structure is maintained. Taking a backup of the original JSON file is recommended. Deleting or renaming the file ~/Documents/Genelec/AuralID/channel_setups.json will force the default settings to be used.

The standard stereo loudspeaker positions are at +30 degrees azimuth for the left channel and -30 degrees for the right channel, both at 0 degrees elevation. The variable "channelLocation" is an index indicating where a monitor should be placed.

JSON example here shows the channel names, azimuths, elevations, and location indices for the left and right channels in a stereo setup.

```
{
  "name": "My Stereo",
  "info": [
    {
      "channelName": "L",
      "channelAzi": "30",
      "channelEle": "0",
      "channelLocation": "41"
    },
    {
      "channelName": "R",
      "channelAzi": "-30",
      "channelEle": "0",
      "channelLocation": "40"
    }
  ]
}
```

Please refer to the image below to find indexes for each cell.



Indices to the Aural ID honeycomb GUI cells.