

AURA8IP

VORSIS EMBEDDED PROCESSING BLADE

TECHNICAL MANUAL

 *Wheatstone Corporation*

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Wheatstone Corporation
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Aura8ip Technical Manual

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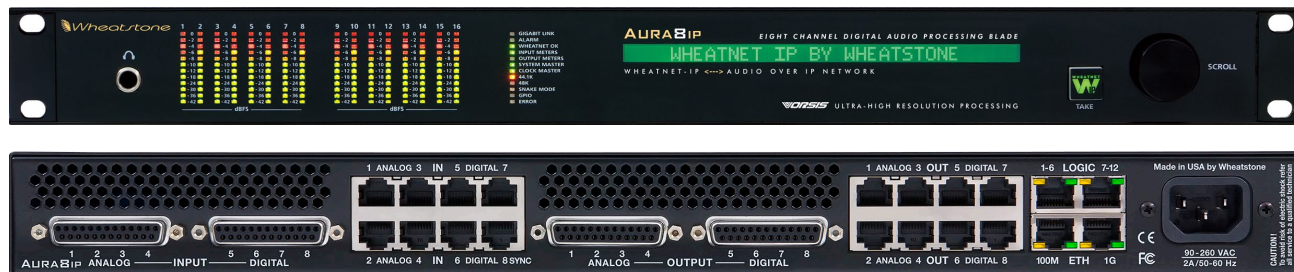
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General Information

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General Information

Introduction

The Aura8ip is the newest member of the Wheatstone WheatNet-IP Intelligent Network family of devices. It is really two devices in one package; a complete WheatNet-IP Blade with 8x8 stereo I/O and a Vorsis 8-channel multi-band audio processor.

WheatNet-IP Blades are the Swiss Army knife of audio routing, with local audio inputs and outputs, GPIO ports, built in router control, mixing, meters, monitoring, and a host of the other functions. Blades can operate as stand alone devices or be linked via gigabit Ethernet as part of an IP audio network.

As a member of the WheatNet-IP Blade family, the Blade functionality of the Aura8ip is described in detail in the *Wheatnet-IP Audio Over IP Network* manual supplied with the unit. In the *Wheatnet-IP Audio Over IP Network* manual you'll learn how to set up the device ID and IP address, and learn how to use all of the Blade features built into it.

The Vorsis processing features of the Aura8ip are unique to this unit and deserve their own documentation, which follows here. Use this document to learn all about the processing capabilities the Aura8ip has and how to control them with the included GUI application.

The Wheatstone Aura8ip “Vorsis Embedded” Processing Blade hosts eight discrete multiband audio processors. Because Aura8ip may be operated in stand alone or as part of a Wheatnet-IP system of any size, any available audio signal can be routed thru the Aura8ip to apply easy to use audio processing before the audio reaches its final destination.

The Aura8ip’s eight channels of multiband processing have the following features:

- Audio input and output audio via analog, digital, and Wheatnet-IP;*
- Selectable high pass filter which operates in the L/R or M/S domain;
- Phase rotator for smooth processing of live voice;
- Input channels may be phase reversed or channel swapped;
- Input channels may be operated in a mono mix down mode;
- Four band equalizer with shelving and parametric sections;
- Multiband AGC/Compressor with one, two, or three bands of processing per channel;**

- Parametric EQ with adjustable crossover networks;
- Stereo enhancement;
- Multiband limiter with one, two, or three bands of limiting per channel;**
- Selectable Vorsi bass enhancement;
- Final peak limiter with selectable lookahead function;
- Full complement of factory processing presets;
- Storage in the hardware for up to 80 presets.

* 50/50% mix of analog and digital I/O plus WheatNet-IP on all channels.

** The number of limiter bands always follows the selected number of AGC/Compressor bands.

Aura8ip's flexibility allows each processor to be operated in three bands, two bands, or as a broadband (one band) processor.

Each of the Aura8ip's processing blocks (AGC, Compressor, EQ, Limiters) may be enabled or disabled as desired. Each of the eight processing instances shares a library of up to 80 presets stored on the Aura8ip hardware. Several dozen "Factory" presets supplied with the unit provide good starting points that have been tuned for a variety of needs. Presets stored on any Aura8ip may be shared with any other Aura8ip on the network.

Preset Transitions

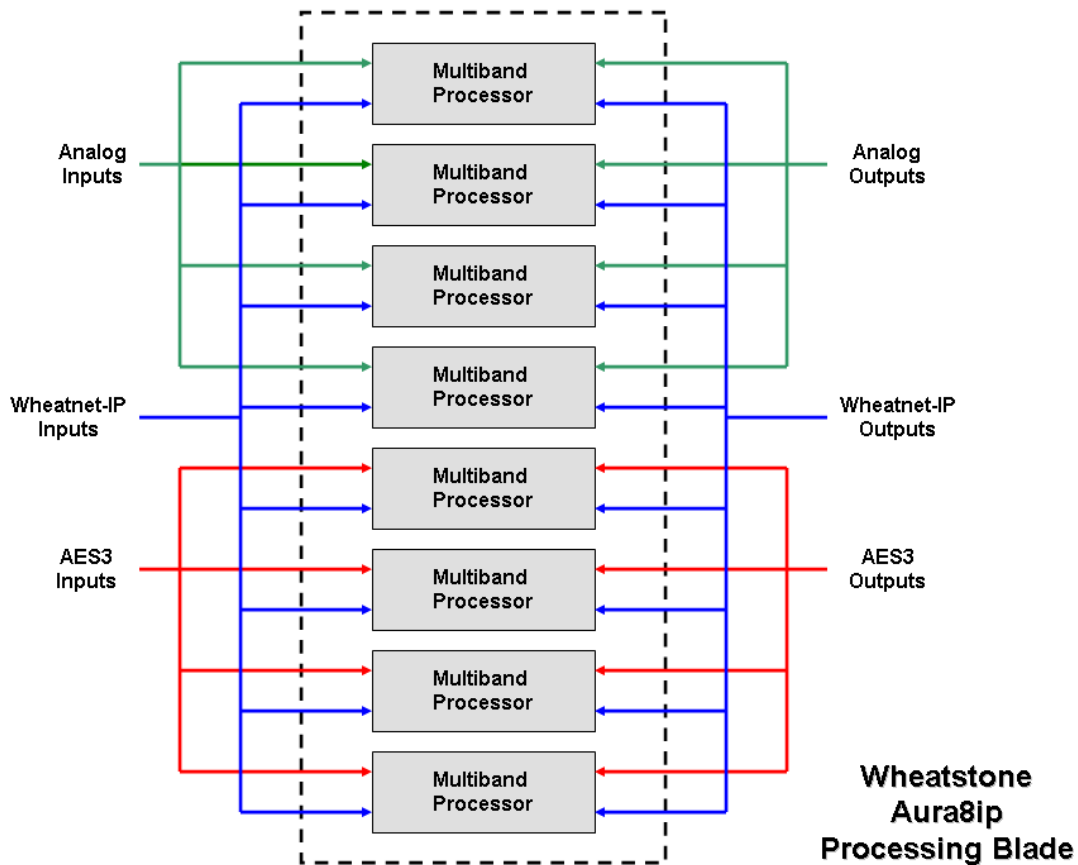
As with all Vorsi audio processors, changing from one preset to another doesn't abruptly change the audio, nor are clicks and pops generated during those changes. Instead, presets "segue" from one to another, causing a gradual change in sound as the parameters are slewed from their old to their new settings over the course of two seconds.

Some prefer hearing radical, easy to identify changes when a preset is recalled. However, this is usually the least desired behavior when presets change in actual on-air use. Since that mode is the most important mode – it's what an audience hears – we designed preset changing to be as unobtrusive as possible for listeners.

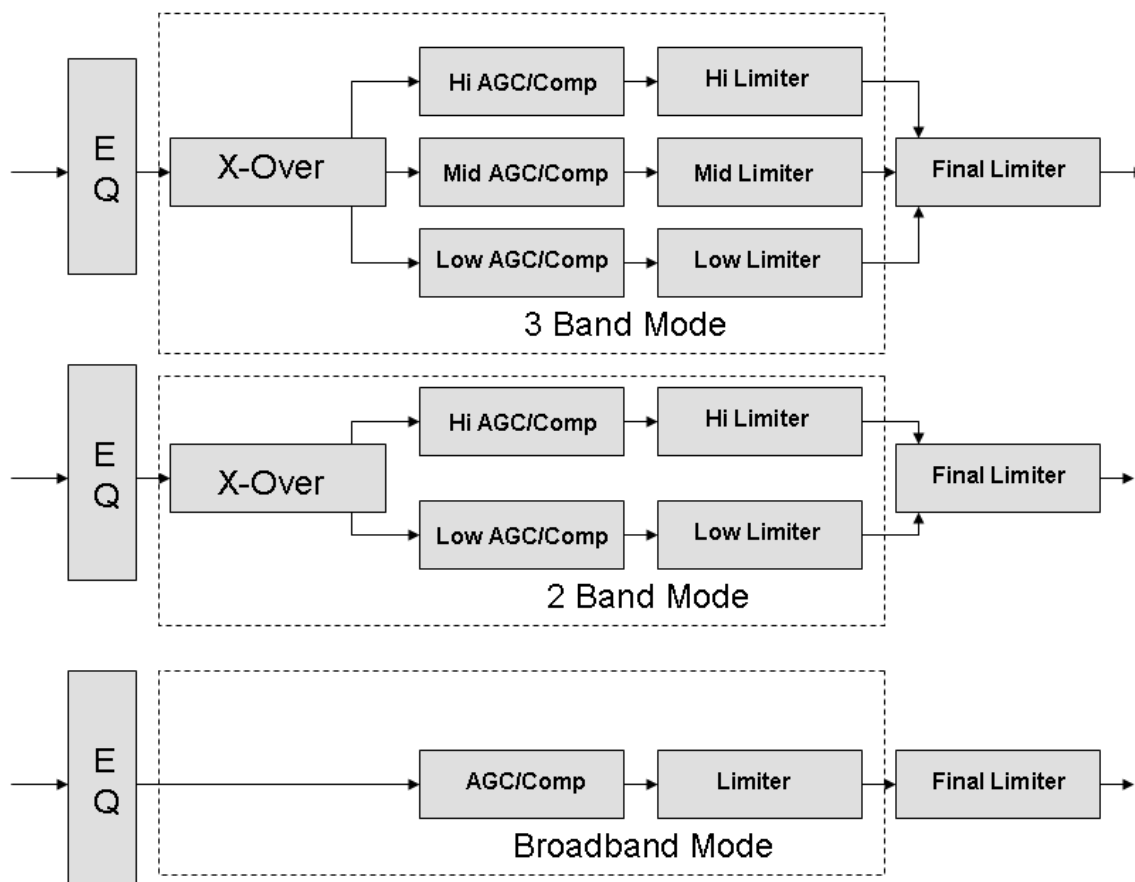
Aura8ip Audio Processing Overview

The following block diagrams show the internal structure of the Aura8ip Processing Blade.

The first graphic shows how four of the eight processors are equipped with analog I/O and four are equipped with digital I/O when run in stand alone mode, and all eight are equipped with Wheatnet-IP audio inputs and outputs when run in networked mode.



The second graphic shows the 3 Band, 2 Band, and Broadband processing signal paths.



Signal Flow in Broadband, Two-band, and Three-band modes

Note: EQ may be placed pre or post AGC/Compressor

Installing the Aura8ip Blade

Aura8ip is designed to be mounted in a standard 19" equipment rack. Ideally, four screws should be used to mount the unit. If only two screws are being used they must be used in the bottom holes in order to provide proper support.

Though Aura8ip does not add much heat load to the rack that it is installed in, good engineering practice suggests that it should never be mounted directly above a large source of heat such as a power supply or RF amplifier. Strong electromagnetic fields should also be avoided.

Energizing the Aura8ip Blade

Once it has been installed in the rack, the Aura8ip BLADE may be energized by connecting the factory supplied power cord to a source of AC power. For long term reliability, there is no power switch on the Aura8ip (rarely used switches are notoriously unreliable). When the Aura8ip first powers up, it will enter "Stand alone" mode. This is the mode that would be used if the BLADE were not part of a Wheatnet-IP system.

I/O Connections



All input, output, Ethernet, control and power connections are made on the rear of the Aura8ip Blade.

The audio I/O connections are via DB-25 or RJ-45 connectors on the rear of the unit, and the two types of connectors are electrically in parallel.

There are two RJ-45 connectors associated with networking, one Gigabit port and one 100BaseT port. Only the Gigabit port is currently supported.

Refer to the Chapter 1 of the *Wheatnet-IP Audio Over IP Network* manual for detailed wiring information.

Cable Considerations

The AES Digital input and output connections should be made with high quality digital audio cable. Typical AES/EBU cable has low capacitance per foot (pF/ft) and a nominal impedance of 110 ohms.

Avoid using run-of-the-mill analog audio cable for AES digital signals because this type of cable may have an impedance of 60 ohms or less and can cause problems in medium length cable runs and severe signal recovery issues on long runs. Like in the RF world, using the proper impedance cable is critical to obtaining the best and most reliable performance. Check with your favorite cable manufacturer to ensure that the cable you have chosen will work for you.

Connectors

All connections other than AC power are made thru rear panel DB-25 connectors and/or RJ-45 connectors. The DB-25 crimp style connector pins will accept wire sizes 22 through 28 AWG. For the RJ-45 audio connections Wheatstone recommends using XLR to RJ-45 adapters at the source (to the Blade) or at the destination (from the Blade) and to provide a proper strain relief for those adapters. Obviously using RJ-45 to XLR adapters can also be done on the back of the Blade, too, but doing it this way might make things a bit crowded.

When using a stereo XLR to RJ-45 adapter for AES digital signals only the XLR connector for channel one is used.

The Aura8ip will accommodate digital input signals with a wide range of sample rates. Those signals will be sample rate converted to the Aura8ip internal sample rate of 44.1 or 48kHz, which is set for the WheatNet-IP system, or for a stand alone Aura8ip, using the Navigator GUI.

Aura8ip Guru® GUI

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Vorsis Aura8ip Guru[®] GUI

Supplied with every Aura8ip processor is our Vorsis Audio Processing Guru[®] software (Guru GUI), which drastically simplifies processing adjustments and allows the processor to be controlled from anywhere in the world. The Guru GUI distills the Aura8ip's 93 user controls per processing channel down to just six intuitive and easy to use controls.

Guru GUI makes setting the sound of the processing quick and efficient and allows the managing of processing presets. Finding the perfect sound has never been easier!

Presets created on one Aura8ip can be migrated to other Aura8ip units via the built-in preset management utility.

Confidence metering along the bottom of the GUI provides visual feedback of all eight channels of the input and output signals and their relative levels.

Installing the Guru Software

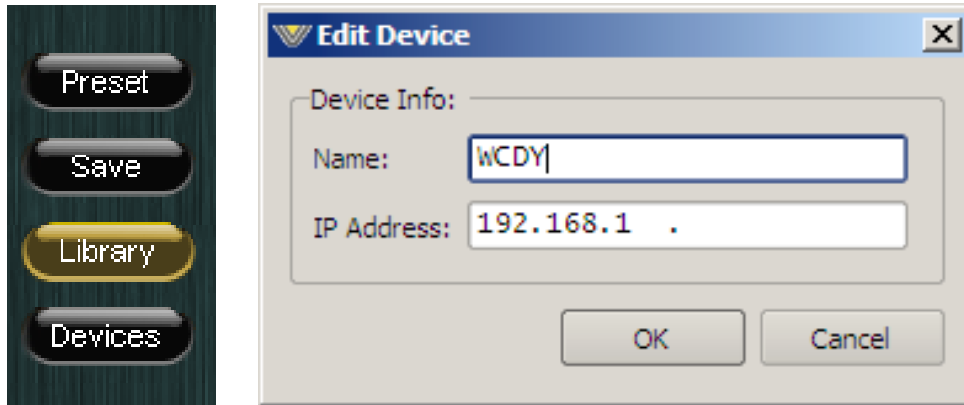
The Guru software is provided on a software CD shipped with the product and once installed, grants easy access to Aura8ip's vast sound processing capabilities. Installing the software is easily done using the following procedure:

- Insert the Aura8ip software CD into a Windows computer;
- Click the Start button;
- Click the Run option;
- Click the Browse option;
- Browse *My Computer* to locate the CDROM device and double click it;
- When the contents of the CDROM drive appears, locate the Aura8ip_exe file and double click it to start the GUI installation;
- Follow the on screen instructions to complete GUI installation.

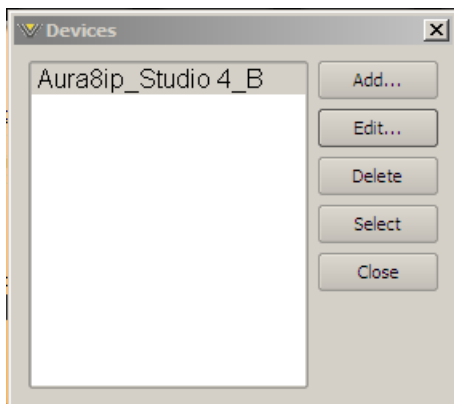
Configuring the Aura8ip TCP/IP Address*

Once the GUI has been installed on the host PC it must be configured before it can connect to and control the Aura8ip processor. Note also that as shipped, the factory default IP address of the Aura8ip is **192.168.87.101**. This address can be viewed and/or changed from the front panel if necessary, remembering that rebooting the Blade will be necessary if the IP address and/or the Blade number are changed.

Next, start the Aura8ip GUI software and use the following procedure to configure it to be able to connect and control the Aura8ip processor.



- On the right hand side of the GUI, click on the *Devices* button, then click the *Add...* button; the above dialog will open.
- Insert a name for the Aura8ip. This is the name that will be displayed at the top of the GUI to inform the user which processor he is currently connected to.
- Next enter the IP address of the Aura8ip, keeping in mind that if the address has not been changed from the Factory Default, that IP address is **192.168.87.101**.
- Click the *OK* button to close the dialog.
- Highlight the newly configured device and click the *Select* button.



If there is a network connection between the GUI's host PC and the Aura8ip processor, *and* the PC is configured to be on the *same* network subnet as the processor, the *Online* button at the top left of the GUI may be clicked to connect to the processor. When the GUI is online to the processor and controlling it, the green indicator inside the button will be illuminated and the Status window will display "Online."



IP Address Note: Unless special routing has been configured by the IT department the controlling PC *and* the Aura8ip must be on the same network subnet. As an example, if the Aura8ip has an IP address 192.168.87.1, then the PC's IP address must be configured to be *between* the addresses 192.168.87.1 and 192.168.87.254, noting that the Aura8ip and the host PC cannot share the *same* IP address.

* **NOTE:** TCP port 55901 must be open in any switch or router configuration in order to permit network traffic between Aura8ip and the controlling GUI.

Once the GUI is online with the processor the GUI's controls become active and may be used for adjusting levels, taking presets, and tweaking the sound of processing.

Selecting the Processing Channel

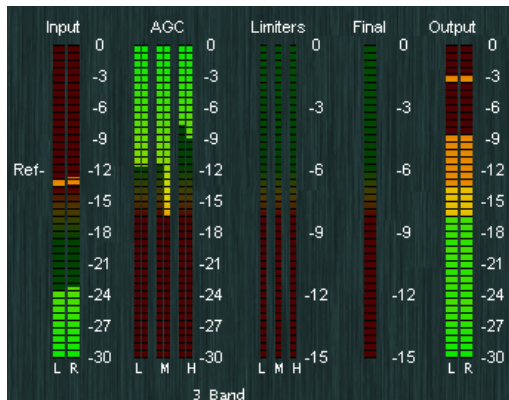


Across the top of the GUI are eight buttons representing the eight multiband processors of the Aura8ip. The channel currently being viewed is shown by an illuminated green indicator on the left side of the button.

Adjusting the Controls

Input Level

To achieve the best sound and performance from any audio processor the correct setting of the Input Levels is important. If levels are too low the processing settings may not operate as they were designed. For instance, if a factory preset is in use



and the input levels are too low the multiband AGC could stay in its gated mode when it shouldn't, reducing the effectiveness of the processing. Conversely, if input levels are too high, distortion can result on audio peaks.

Input levels are correct when the Input meters are just nudging the -12dBFS *Ref* mark on the Input meter scale (see left).

Setting up to operate with input levels higher than -12dBFS increases the risk of distortion. This is especially true if the levels coming into the processor happen to increase even further on other program material later on.



Operating with levels that are lower than normal can run into different issues, particularly with the behavior of the AGC and Compressor sections of processing.

Left/Right Channel Balance

This control is provided to trim the Left/Right channel balance by up to +/-12dB should it be necessary.

High Pass Filter

A High Pass Filter is used to reduce or remove infrasonic (very low frequency) signals from the audio that are not a part of the audio. Undesirable hum and rumble

that manages to get into the audio signal is an example of what the High Pass Filter can remove, and it is quite effective at reducing or removing such noises without impacting the musicality of the programming.

Output Level dBFS

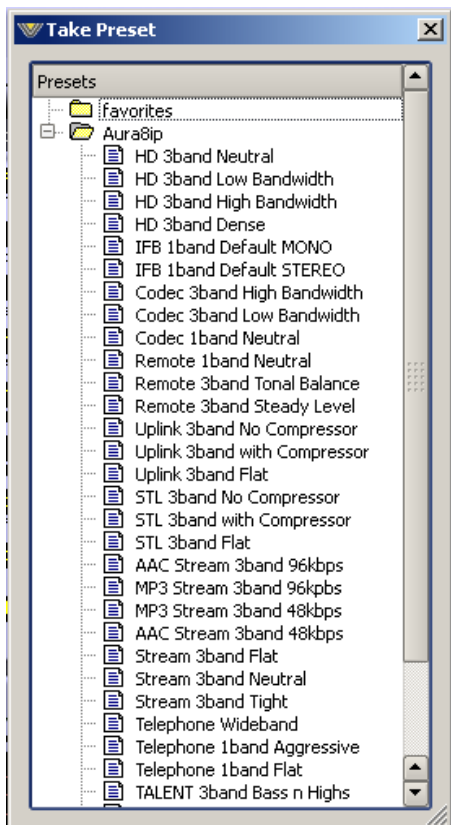
The Output Level meter scale is calibrated in dBFS (decibels Full Scale) a common scale for digital audio equipment. The top of the scale represents 0dBFS, the point where there are no more digital bits available to define further increases in level. Trying to exceed this level will not allow the audio to increase any further and it will become clipped and severely distorted.

The processing structure of the Aura8ip manages the peak levels applied to the *Output* level control. Therefore, unlike the input meter where we want to stay below -12dBFS, the Output meter can be pushed all the way up to 0dBFS without fear of distortion.

An exception to this statement – when the Final Peak Limiter is not used the Output Control *must* be operated in a way that leaves some headroom above the meter’s maximum peak indications ... “just in case.”

Taking Presets

Aura8ip is equipped with over two dozen Factory Presets and we recommend listening to each preset with typical programming to find the one that best meets your needs. Select the preset closest to the desired sound texture and use the six processing tweakers of the Guru GUI to ‘dial it in’ if necessary.



When the GUI’s Preset button is pressed a dialog will open (see left) with a list of the presets currently stored on the Aura8ip hardware. Presets are put into use by double-clicking them.

Note that the presets in the list are shared between the eight processors inside the Aura8ip – *every* preset is available to *every* processing channel. The same preset can also be used on multiple channels at the same time. Likewise, any *user* preset that has been created for one processing channel may be used on any other processing channel.

Note: unlike other Wheatstone products with Embedded Vorsis Processing™ the Aura8ip does not have just one Quick Start preset. Rather, it has three:

- Quick Start_1band
- Quick Start_2band
- Quick Start_3band

We believe these presets are good basic starting points for each of the three processing structures. They may be used as is, or modified using the Guru GUI’s six tweaker controls and then saved as new presets if desired.

We attempt to name presets according to the application that we feel they may be appropriate for; however the name doesn't always mean that the preset is *only* good for an application by that name. That said, we *do* use a preset naming convention that has four defined variables which are intended to make it easier for users to select which preset to use or start with. That naming convention is as follows:

<Potential Use>_<Number of Bands>_<Tonal Quality>_<Dynamics Feel>

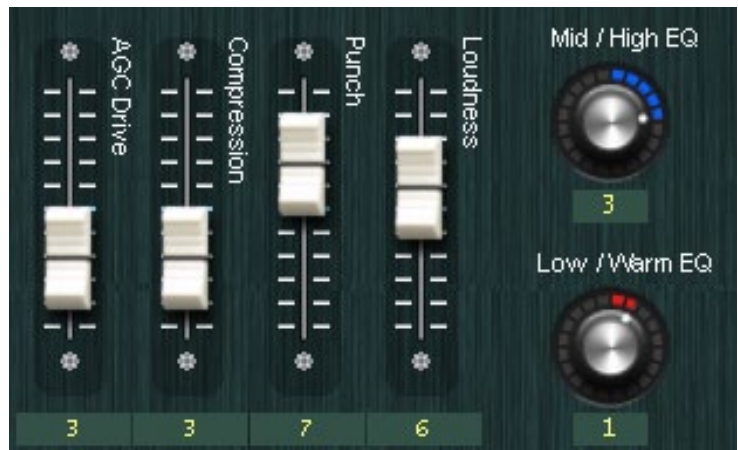
Following this, a preset called **TalentHeadphones_3Band_Warm_Compressed** could be used for processing console audio for feeding it to talent headphones in order to provide air staff a simulated off-air signal in the situation where the use of diversity delay in an HD-equipped system makes listening to the actual off air signal impractical.

Please feel free to experiment with each preset to see how it sounds in your application. New presets are frequently added to the Wheatstone website for customers to download, and presets can easily be installed into any Aura8ip via the GUI's built-in Preset Management feature.

Guru's Six Adjust Sound Controls

The six controls in the Guru GUI make adjusting the sound of processing far easier than using the more than 90 controls assigned to Aura8ip's processing.

The Guru GUI has six "tweakers;" four slider controls for adjusting processing texture and two knobs for adjusting the low and high frequency equalization. When a Factory preset is recalled all six tweakers reset to their midpoint positions, which is "5" for the four texture tweakers and "0" for the two EQ tweakers. Each tweaker



then allows adjustments up and down from the Factory preset's starting point. The six Guru GUI tweakers are:

AGC Drive

This control adjusts how much *long-term* AGC processing is applied to the audio. Higher settings cause deeper AGC action which will tend to hold up fading musical passages longer while lower settings do the opposite.

Compression

This control adjusts the amount of *medium-term* compression. Higher settings bring out subtle *details* in the program content as well as add a bit of energy and some loudness to the signal. Lower settings do just the opposite.

Punch

This control primarily changes the amount of *short-term* processing, making the audio denser when the control is pushed up, and less dense when it is pulled down. Increased density also tends to increase the perception of loudness, so this control has some effect on that parameter too.

Loudness

In addition to the output level control which adjusts the actual processing chain's output *level* (which of course does affect loudness) the Loudness control is the primary control associated with the actual processing itself. Pushing this control up will make the audio louder by making it more dense, while pulling the control down will have the effect of lessening density which then reduces the perception of loudness.

Mid/High EQ

This control modifies the equalization being applied by a particular preset. Turning the control clockwise increases the amount of mid and high frequency energy, while turning it counterclockwise has the opposite effect and reduces this energy.

Low/Warm EQ

This control behaves the same way the Mid/High EQ control does, but it affects only the lower frequencies.

Why Six Controls and Not One?

Over the years there were processors equipped with a one-knob, less-more, adjustment intended to be a simplified user interface. After selecting a Factory preset, the user would turn the less-more control up or down to change density and loudness.

Customers told us that one knob didn't allow them the kind of control they really wanted. They told us didn't want to need to know processing's technical terms, but they did want more than one knob – maybe a couple of knobs that could turn after taking a preset that could change *several* aspects of that preset's basic sound instead of just density and loudness. So we listened. We took their suggestions and their advice. We designed what we believe is a better way...

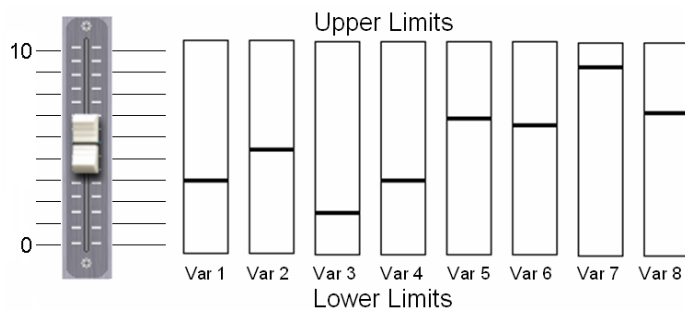
Instead of one knob, there are six, and each one provides plenty of adjustment range around a Factory preset's base values. With six tweakers instead of one, each factory preset has millions of sound textures available instead of just ten. Lost? Get right back where you started by simply recalling the preset again.

How Do the Tweakers Work?

Each Guru tweaker moves a group of controls that would normally be associated with the big Professional GUI. Note that the Guru controls are not *new* controls, nor are they ones that would normally be hidden behind some secret back door. Rather, they are extensions of the *same* controls already existing in the Professional version of the graphical user interface. The biggest difference between the two GUIs is that a Guru tweaker can modify more than one processing parameter at a time while Professional GUI can't.

What Causes a Guru Tweaker to Stop Before Reaching 0 or 10?

Because Guru is adjusting parameters that would normally be associated with the Professional GUI, it's possible for one of the parameters being adjusted to encounter its normal end stop while being adjusted by a Guru tweaker. Since we're not allowed to go past a control's natural end stop Guru must do something to let the user know that an end stop he can't see has been reached, and we do this by preventing the Guru tweaker from going any further in whatever direction is causing a parameter to reach one of its own natural limits (the same limit that Pro GUI would bump into if it were being used). The following graphic shows one Guru tweaker manipulating eight processing parameters and it will help to illustrate this point.



At left, eight Pro GUI parameters are being simultaneously adjusted by one Guru tweaker. These parameters are represented by the eight vertical bars labeled Var 1 through Var 8, and the horizontal lines inside each one show where that parameter currently is within its available adjustment range.

Notice now the vertical bars for “Var 3” and “Var 7,” and how close they already are to their minimum and maximum values. Remember that these controls are *not* seen by a Guru GUI user but they *do* exist in Professional GUI. Remember also that each “Var” has *its own* pre-determined minimum and maximum limits.

Imagine now that the Guru tweaker is being moved up towards 10 and all eight “Var” sliders are following along. It should be obvious that “Var 7” is going to reach its upper limit long before the other “Vars,” and it might also reach its limit before the Guru tweaker does. What happens?

As soon as one of the eight ‘Vars’ reaches its limit, the Guru tweaker is stopped from moving any further in the direction that it was being moved. This same scenario applies when a Guru tweaker is being moved downward to reduce a setting.

This is an important concept to remember: if a Guru tweaker won't go any further in one direction or the other it is because one of the values that it is modifying has reached a normal predefined limit. Each Guru tweaker can do the work of many controls. Each Guru tweaker has enough range to provide a lot of variability from Factory presets, even when the adjustment range seems to be inexplicably restricted by control limits that are not seen by a Guru user.

Guru GUI Caveats

If you're a processing expert, Professional GUI is your gateway to extremely deep customization of Factory presets. Guru GUI, on the other hand, is *designed* for those without a lot of audio processing experience, helping them quickly achieve a desired sound *without* needing to learn the interactions of literally *hundreds* of controls.

What follows is an overview of things to keep in mind about how the Guru GUI interacts with both the Aura8ip and the Professional version of the GUI.

- **The Guru GUI can only modify virgin *Factory* presets.**

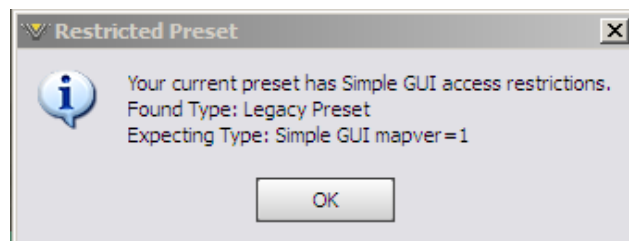
Guru GUI relies on known starting points within the Factory presets before it can make modifications. Therefore the only presets that can be modified by the Guru GUI are Factory presets.

- **Once a Factory preset has been modified by GUI Professional it cannot be modified using Guru GUI.**

If a Factory preset has been modified by the Professional GUI it is no longer a “Factory” preset and therefore it is not allowed to be modified using Guru GUI.

Understanding the Differences Between Factory, Legacy, and Guru Presets

- *Factory* presets are those created by the Factory using specialized tools.
- *Legacy* presets are presets that are created by a customer using the full control Professional GUI, or those created and saved by the Guru GUI.
- The biggest difference between the two types of presets is that the Guru GUI is permitted to modify *only* Factory presets.
- If while using the Guru GUI you receive the “Restricted Preset” dialog, shown below, *and* you know for sure that the preset being adjusted is a virgin Factory preset, simply recall the preset again using the Guru GUI and the error should disappear.



Additional Notes on Aura8ip and Network to GUI Connectivity

Aura8ip utilizes both TCP/IP and UDP to communicate with the remote GUI. TCP/IP utilizes Port 55901 and the first available UDP port in the range of 60001 to 60010 during communications sessions.

TCP/IP - The TCP protocol is used for controlling the Aura8ip and reporting its control settings back to the GUI because TCP repairs *any* transmission errors that might have occurred on the network. Using TCP for this function guarantees that the Aura8ip controls *always* do exactly what the GUI tells them to do, and that the control settings seen on the GUI are in perfect agreement with what the Aura8ip hardware *thinks* they are.

UDP - Metering between the Aura8ip and the GUI works differently. For this task we chose the UDP protocol, a simple data transmission model without any hand-shaking to drive the meters. We used UDP for metering because of its very low overhead at both ends of the link, and because we don't mind if an occasional meter data packet (or a bunch of meter packets) gets lost on the network. Metering data is updated frequently so a missed metering packet here or there has an inconsequential effect on the visual appearance and no impact whatsoever on the sound.

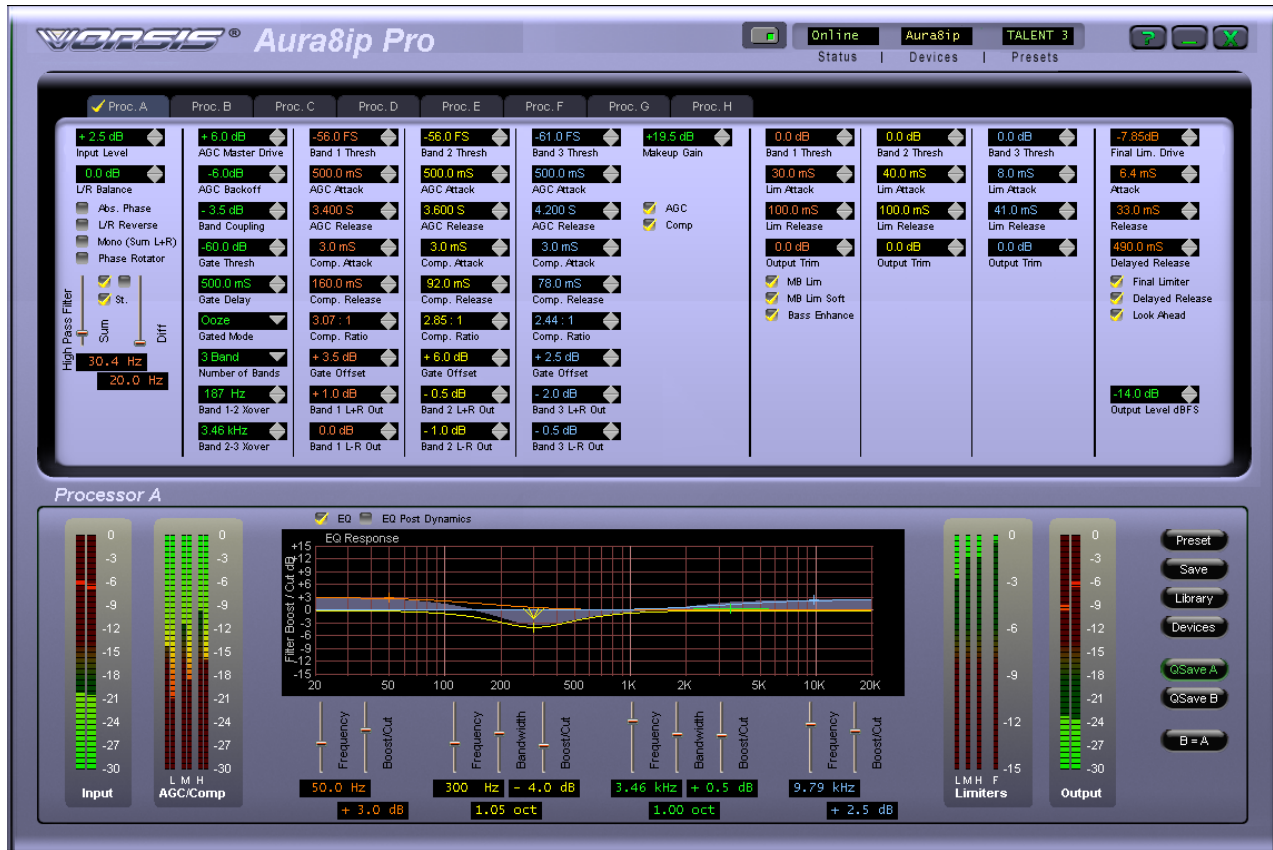
Aura8ip Pro GUI

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The Aura8ip Professional (Pro) GUI



Unlike the Aura8ip GURU GUI, which was specifically designed to help simplify processor tuning for those without a lot of processing expertise or not needing a deep level of tailoring, the Aura8ip Professional (Pro) GUI is intended for the audio processing expert. This GUI holds nothing back, every parameter is revealed – the number of bands, parametric eq., thresholds, attacks and releases, interband-coupling, individual band mix levels, stereo enhancement, etc. Nothing is hidden, and to eliminate paging back and forth between processing sections everything is logically presented on one page per Aura8ip processing instance.

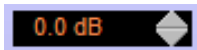
This section of the manual will address all of the available adjustments and help familiarize you with what the adjustments do.

Selecting the Processor Instances

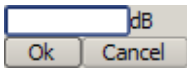


There are eight 3-band Vorsis audio processors inside the Aura8ip. Each processor can be accessed by selecting the tab of the processor you want to adjust at the top of the Pro GUI. A check mark appears next to the selected processor. In this case, processor (Proc) “A” has been selected.

A Word About Our Controls



The control at left is typical of those found in the Pro GUI. To increase its value, left click on the UP arrow. To decrease its value, left click on the DOWN arrow. If you wish to quickly move to a value, you may click and hold the UP or DOWN arrows and the control will scan to the end of its range.

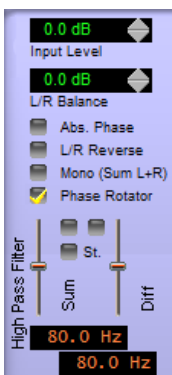


Another option is to double-click in the numeric field of the control which will open up a dialogue where you can input the value you want. If the value is not within the range of the controller, the controller will return to the last known good value that was selected.



Controls that have a DOWN arrow but no UP arrow are drop down menus. Usually, only 2 or 3 fixed options are available within this type of control. Click the arrow, select the parameter and the drop down menu will automatically close, having selected and displayed the new value.

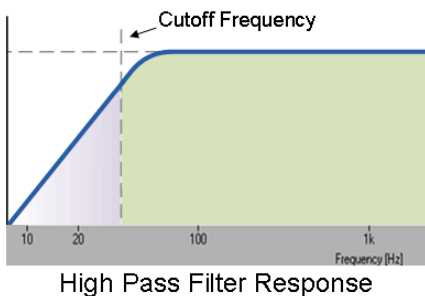
Input Controls



The upper left corner of the Pro GUI hosts the Input settings for the selected processor instance. Here, the input levels and left/right balance can be adjusted, and there are also options for reversing the phase of both left and right channels (Abs. Phase), swapping channels (L/R Reverse) summing the left and right input to mono (Mono (Sum L+R)) and turning on and off the phase rotator.

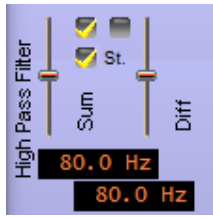
The input level range is adjustable between -36dB to +12dB with a setting of 0dB referencing a peak input level of -12dBFS. Left/right channel balance may be corrected by +/-12dB from 0dB (default).

High Pass Filter (HPF)

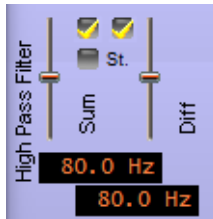


The purpose of a high pass filter is to remove or reduce low frequency signals that are in the audio, but may not be a desired part of the audio. Whatever frequency is chosen as the Cutoff Frequency is the frequency at which the response to undesired signals will be reduced by 3dB (half power). The high pass response is that of a critically damped fourth order filter.

The high pass filter (HPF) in the Aura8ip is designed a bit differently than those found in other processors in that it has the ability to reduce undesired low frequency noise in the sum (mono) signal, or the difference (stereo) signal, or both. It does this by using its two different high pass filter operating modes as explained next.



Stereo – In the STEREO (St.) mode, the left hand control sets the frequency where the filter begins to work on both sum and difference signals simultaneously. Because the effect is applied to both signals equally, it is mathematically equivalent to the filter being operated in the left/right domain. As the image at upper left shows, audio signals below the selected frequency are reduced or filtered out.



Sum & Difference – In this mode, two controls separately affect the L+R and L-R aspects of the input audio. Since lower frequencies (generally below 300Hz) are non-directional, eliminating lower frequencies in the L-R domain can yield enhancements to the audio signal above the filter’s frequency. Adjust this control while listening to the bass to find the best setting when using the HPF in this mode.

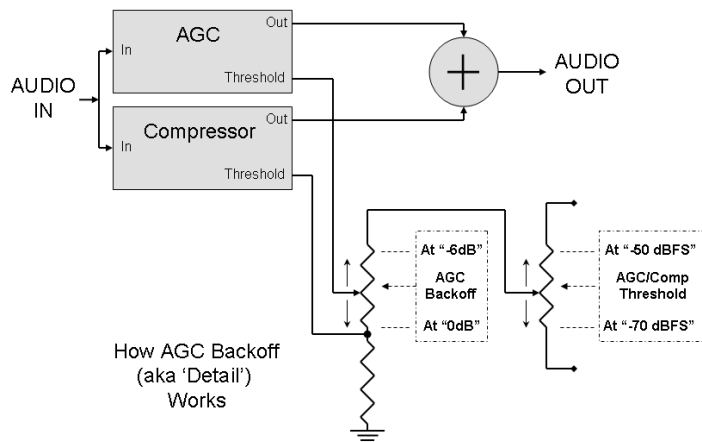
As with all adjustments in the Aura8ip, the high pass filter settings are preset dependent. That is, presets can be saved with the HPF in STEREO or SUM & DIFFERENCE modes, and the preset will remember this. Speaking of presets...

AGC and Compressor Controls - Part 1

To the right of the Input control column is the column of Master adjustments for the multiband AGC. These adjustments include AGC Master Drive (with a range of -12 to +6 dB), the AGC Backoff control (explained next), Band Coupling, Gate Threshold, Gate Delay, Gate Mode, and lastly, controls for the Number of Bands of processing desired and the Crossover frequency adjustments.

AGC Backoff

This is a very unique control found only in Vorsis signal processors. The AGC Backoff algorithm decouples the AGC and Compressor processing blocks from each other. When the Backoff control is set to 0dB the AGC and Compressor act as one processor. However, as the Backoff control is adjusted towards -6dB, the AGC and Compressor become more decoupled and begin acting as two separate processors. A better explanation of our AGC Backoff control, a control sometimes called the “Detail” control by our customers, is in order.



The diagram at left shows the essentials of what the AGC Backoff control does. When the Backoff control is at 0dB the AGC and Compressor are operating with identical thresholds. While their time constants may be different (and typically are) their thresholds, or the audio level where they begin to reduce the level, are the same.

As the Backoff control is adjusted away from 0dB the threshold of the AGC is raised above that of the Compressor. This causes the AGC to do less work, but since the AGC and Compressor operate as two separate entities they do not see each other, and the Compressor has no idea that the AGC is now doing less work.

The audible effect is that as the Backoff control is adjusted away from 0dB the action of the Compressor becomes more obvious even though it is doing the same amount of work. In essence, lifting the AGC threshold has exposed the action of the Compressor, which then exposes the audibility of the work that it is doing. Because the AGC/Compressor stage always operate in sum and difference mode, as the Backoff control is adjusted away from 0dB the audibility of processing on L+R and L-R is increased, with the net effect being that the audio becomes more detailed, more alive, has more depth, and is more up front.

It is important to recognize that while the Compressor and AGC operate independently, from a maximum gain standpoint they are linked. That is, at any moment in time the Compressor can never have more gain than the AGC. In fact, when the AGC and Compressor attack a signal at their own time constants and then release, the Compressor can only increase its gain up to whatever gain value the AGC is current at. This behavior is obvious in operation by watching the two meters associated with AGC and Compressor gain reduction as audio is being processed – because the attack time of the Compressor is shorter, it will be reducing gain more than (or faster than) the AGC.

Moving the AGC Backoff setting away from 0dB is one of the places in the processing structure where additional density and loudness may be gained. Basically, you have the ability to not only add or take away compression via the bypass option, but you have the ability to dial in the audibility of that compression in any way desired.

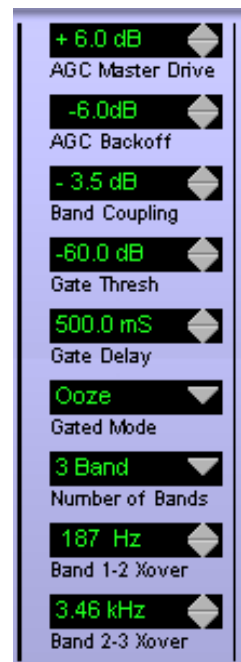
Note that if the AGC Backoff is operated at its maximum value (-6dB), changes to the compressor release times will probably be needed in order to ensure that the audio doesn't become too busy-sounding or overly dense.

Band Coupling

This adjustment controls how much gain could be ADDED by the AGC in Bands 1 and 3 (referenced to Band 2) when energy in those two bands isn't sufficient to cause the same amount of gain reduction as is occurring in Band 2. When Band Coupling is set at 0dB the AGC will prohibit the gains in Bands 1 and 3 from increasing above whatever the current gain in Band 2 happens to be. This prevents Bands 1 and 3 from adding gain when they release, which causes the spectral balance to remain flat. A setting like this is useful in situations where the benefits of multiband gain control are needed but "spectral rebalancing" is not required or desired.

As the Band Coupling control is moved away from 0dB Bands 1 and 3 are allowed to have more gain than Band 2 by whatever the Coupling setting is. For example, setting the control at -6dB will allow Band 1 and 3 to add up to an additional 6dB of gain from Band 2.

It should be noted that the Band Coupling control works only on the AGC. If the AGC is bypassed and the compressor is enabled the compressor does not utilize the Band Coupling controls and therefore it will be allowed to take on as much gain as needed. Also to be noted is that in this mode the



compressor will always release to 0dB gain reduction because the compressor itself is not gated, only the AGC. We do not recommend using the compressor by itself unless a specific sound is desired or it is used with light (<6dB) of average gain reduction.

Gate Thresh, Gate Delay, and Gated Mode

Each band of the AGC is managed by a gating algorithm that serves to freeze the AGC’s action when audio levels fall below a set value. In effect, that gate manages how the AGC recovers in the absence of audio. Without a gate, the gain would continue to increase as the AGC released, potentially causing noise suck-up or other undesired effects.

The operation of the Gate Thresh control is straightforward. When audio in a processing band falls below the value set by the Gate Thresh control, the AGC will freeze its gain. The compressor may be allowed to decrease gain if needed, but no additional gain increase will occur by the AGC once audio has fallen below this value.

The Gate Thresh is calibrated in dBFS (decibels Full Scale) a common calibration in digital audio equipment. Because the internal audio reference level is -20dBFS (to allow headroom) a normal Gate Threshold setting will be as much as 24dB to 30dB below this value. Therefore it is quite normal to see Gate Threshold settings that are in the range of -44dB to -60dB. The gate function may be defeated by adjusting the Gate Thresh control towards -80dB which will then disable it and cause the Gate Thresh display to indicate OFF.

The Gate Delay setting tells the AGC how long to wait after the audio falls below the Gate Thresh before it freezes the gain. The control range is 50ms to 500ms. Setting the Gate Delay control to times greater than about 100ms loosens up its action which helps gating action when the level of audio passages is just riding the Gate Thresh level.

The Gated Mode control decides if the AGC should freeze the gain when audio falls below the Gate Thresh (Gate), or if it should allow the gain to very slowly recover towards 0dB gain reduction (Ooze). As explained in the introduction, allowing the gain to freeze prevents noise suck-up in the absence of audio. The Ooze function, on the other hand, can be very helpful on formats such as Classical or Jazz, where it might be inappropriate for the AGC gain to get stuck when audio was present, but below the Gate Threshold setting. Using the Ooze mode to allow the gain to slowly recover sounds very natural, and therefore this is the setting that is recommended for the more gentle formats.



Number of Bands

The Aura8ip’s AGC, Compressor and Limiter sections may be operated in wide-band, 2 band or 3 band modes. Whichever operating mode is selected, the appropriate number of columns of processing controls will appear in the Pro GUI. When switching from 3 Band, to 2 Band, to Broadband mode, columns of controls will be defeated and hidden, revealing only the controls available for the number of bands chosen.



The Aura8ip’s eight processing sections are completely independent, so each processor may be operated in any band count desired.



Comparison of AGC controls visible in 3 band mode (left), 2 band mode (center), and broadband mode (right)

Crossovers

The purpose of a crossover (Xover) is to separate the audio spectrum into different frequency bands prior to processing. The reason this is done is to eliminate or reduce the effects of gain control happening in one part of the spectrum from affecting another. For example, processing bass-heavy material with a broadband (1 band) processor almost inevitably results in an effect called “spectral gain intermodulation,” which simply means that the gain is being arbitrarily changed in one part of the audio spectrum because of signals in another part of the spectrum that need the gain to be changed. Unless this is done to create an effect, spectral gain intermodulation can be annoying as well as fatiguing to listen to.



Aura8ip has very flexible phase-linear crossovers which operate at 24dB/octave (4th order). Each crossover may be adjusted within a wide frequency range:

- The BAND 1-2 crossover is adjustable between 20Hz and 687Hz in 3 band mode, or 20Hz and 20kHz in 2 band mode. This band has a wide adjustment range in order to accommodate the requirements of running in two band mode
- The BAND 2-3 crossover has a range of 728 to 20 kHz.

Making the crossover settings by ear is the best way to discover how to set the crossovers for the best sound on the type of material being processed.

In “3 Band” mode, the BAND 1-2 crossover will usually end up between 80 and 300 Hz while the BAND 2-3 crossover will fall somewhere between 800Hz and 3kHz.

In “2 Band” mode the Band 1-2 crossover will be found somewhere in the range between 120Hz and 400Hz. There is no Band 2-3 crossover setting when the processing is in two band mode because in that mode there is no Band 3.

In Broadband mode there are no crossover settings because there is no crossover to adjust.

AGC and Compressor Controls - Part 2

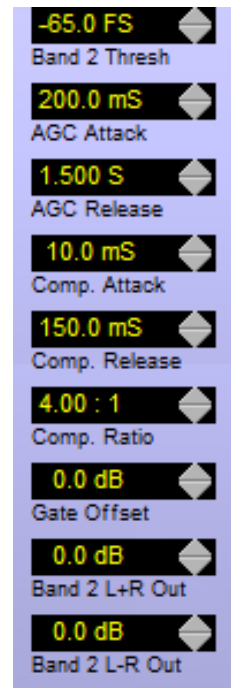
To the right of the AGC Master controls in column #1 are additional adjustments for each of the three AGC/Compressor bands. As pointed out earlier, the number of AGC/Compressor control columns depends on the number of processing bands chosen. We have chosen to color code the controls in each column to make navigation easier. Please note that column #2 and #3 are the only two AGC/Compressor columns serving two roles:

Column #2: Processing adjustments for the lowest frequency band when in 2 or 3 Band mode, or all of the controls when in Broadband mode. The control values in this column are always orange.

Column #3: Processing adjustments for the “Mid” band when in 3 Band mode, or the “High” band when in 2 Band mode. The control values in this column are always yellow.

Column #4 is only visible when the AGC/Compressors are operating in 3 Band mode and it hosts the processing adjustments for the “High” band when in 3 Band mode. The control values in this column are always blue.

What follows is an explanation of what each processing control is called, what it does, and if applicable, what its audible effect is.



Threshold

The first adjustment in each column is the Threshold (Thresh) control. This control sets the level at which the AGC will start working (or processing) the audio. If the AGC is defeated, then this control will govern the behavior of the compressor.

Like many other controls, the Threshold control is calibrated in dFBS. And, like the Gate Threshold discussed previously, the Threshold control operates with a peak program reference level of -20dBFS. What this means is that if the onset of AGC gain control action should begin 20dB below average program level (to achieve 20dB of average compression), this control should be set 20dB below the internal reference level, or at -40dBFS.

AGC Attack/Release

The next two adjustments in the column control the speed of the AGC. The AGC Attack setting controls how fast the AGC adapts to increases in audio levels. The range of the AGC Attack control is 50-500ms.

Conversely, the AGC Release control setting controls how fast the AGC responds to decreases in audio level. The range of the Release control is 1000-7000ms (1 second to 7 seconds).

Recommending “perfect” settings for the AGC Attack and Release controls is difficult because of how highly subjective the resulting processing will be. What this means is that the settings are highly dependent on many factors including the desired density of processing and its audibility. In general, slower settings in both controls create less noticeable AGC action while faster settings cause the audibility of processing to increase.

If we were to recommend starting points for the AGC Attack and Release we would specify around 300 ms for Attack and 4000ms (4 seconds) for Release. While the range

of the AGC Attack controls could achieve a 50ms Attack and 1000ms Release, we do not suggest using AGC Attack times faster than about 150ms and Release times faster than about 2000ms IF all parts of the processor are enabled (AGC, Compressor, Limiter, etc.).

Compressor Attack/Release

These next two adjustments control the timing of the Compressor. Unlike the AGC however, the Compressor is designed to work primarily on short term dynamics and therefore helps to not only build density, but it allows the limiters upstream to not work so hard on the audio coming out of the AGC/Compressor stage.

The Compressor Attack (Comp. Attack) control range is adjustable between 3ms and 100ms. Compressor Release (Comp. Release) is adjustable between 50 and 1000ms (1 second). The ranges of the Compressor controls have been limited to what we feel are the most useful settings and they cannot be set to sound bad. That said, we recommend Compressor Attack settings of between 3ms and 20ms and Compressor Release settings around 300ms. These settings may need to be modified to work better in concert with other controls later downstream.

Compressor Ratio

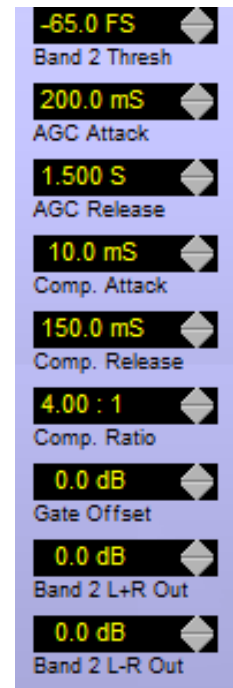
The Compression Ratio (Comp. Ratio) control adjusts how much the audio output level is allowed to increase as the input level increases. A Compression Ratio of 1:1 would make output level changes be a mirror image of the input, i.e., there would be no processing. Likewise a Compression Ratio of 20:1 would allow the output level to only increase by 1dB even though the input level increased by 20dB (a 10:1 change).

The ‘correct’ setting of the Compression Ratio control is highly subjective, just like many other controls in any audio processor. However, our experience is that a Compression Ratio setting of between 2:1 and 6:1 is the most useful, with a setting halfway between (at 4:1) a good all around tradeoff.

Higher Compression Ratios will sound tighter and more squashed while lower Compression Ratios will sound more free and dynamic. The user is completely free to use whatever Compression Ratio he feels sounds best in his application.

It would not be uncommon to see different Compression Ratio settings for each processing band, although that is never a requirement. Our recommendation is to pick a number, say 4:1, and set all bands to that Compression Ratio. Then after adjusting the other controls for the desired density and impact, make small adjustments to the ratios as needed to tame a particular issue. Let us provide an example of when the Compression Ratio is the right knob to grab:

Suppose the Aura8ip is running in its 3 Band mode and everything is sounding really good but you notice that sometimes the high end isn’t quite controlled enough on some material. The best way to even things out would be to slightly increase the Compression Ratio for Band 3, and only band 3. Suppose you look at the Compression Ratio setting for that band and see that it is set to 4:1. Try setting it a bit higher, to perhaps 4.4:1 and then listen for a while. If there is too much control, reduce the ratio a little and listen again. If it’s not controlled enough, nudge it up a little and listen again.



Again, the ears are always the best judge of the correct settings to use. The best advice that we, as processing experts, can offer an end user about audio processing is this:

**Regardless of what the controls and the meters might say,
if it sounds right, then it IS right!
Stop adjusting!**

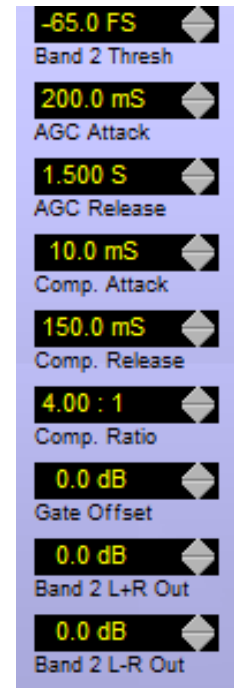
Gate Offset

The Gate Offset applies a Gate Threshold offset to each band – an offset of whatever the master Gate Thresh is as applied in the first column.

The purpose of the Gate Offset controls is to allow the precise gating thresholds for each band to be different from the master setting by a specified amount. The amount of available offset is +/-6dB. The best way to explain how the Gate Offset controls work is by example:

Suppose the master Gate Threshold is set to -48dB and everything seems fine except that sometimes Band 3 seems to be gating too late. This can be remedied by adjusting the Band 3 Gate Offset to a setting that is “higher” than 0dB, such as +3dB, which would then set the Band 3 Gate Threshold to -45dB (-48dB plus 3dB = -45dB). This adjustment will have raised the effective Gate Threshold for Band 3, making its gate operate sooner.

At first glance the Gate Offset controls may not seem to have much range, but remember that -6dB is half and +6dB is twice whatever the 0dB gating level is.



Processing Band L+R and L-R Outputs (L+R Out, L-R Out)

Each processing band has a pair of output level controls (L+R Out, L-R Out) that serve as mix controls allowing the processing’s output spectral mix to be adjusted to taste. Both pairs of Output controls have a +/-6dB range. The L-R Output controls, because they are a special case, are also equipped with a MONO position (to be covered shortly).



The L+R and L-R Output controls feed the input to the following multiband limiter (if enabled) so some care must be taken in adjusting the mix controls in order to feed the multiband limiter an appropriate signal. We recommend staying within a +/-3dB range when setting the L+R Output mix controls.

As mentioned previously the L-R Output controls are a special case. The Aura8ip AGC/Compressors operate in the sum and difference domain (L+R/L-R). What this means is that the mono part of the signal (L+R) and the stereo parts of the signal (L-R) are processed independently. Doing it this way permits useful audio enhancements that cannot be accomplished in processors that operate strictly in the Left/Right domain, as most do.

In the Aura8ip the L-R Output control adjusts the stereo part of the audio signal (its depth, width, and spectral balance) without affecting the mono, or “dead center” part (such as live voice). This permits very unique sonic signatures to be created that cannot be achieved any other way.

Because there is an L-R Output mix control for each band, certain parts of the audio spectrum may have their stereo width and depth enhanced (or reduced) independently of the other bands.



The L-R Output controls also have a MONO position. When a band’s L-R Output control is set to MONO, there is no L-R stereo width or depth signal added by that band. A popular use of this feature is to remove subsonic “mud” from the stereo difference signal. Bass energy in most contemporary music has equal amplitude, in-phase components in the left and right channels, so any L-R signal that

might creep into the low frequencies is probably not bass at all, but noise or other undesired signals. By setting the Band 1 L-R Output (L-R Out) control to MONO, extraneous signals that might otherwise have contaminated the bass frequencies are eliminated.

The setting of the L-R Output controls also adjusts the amount of stereo enhancement present in the output mix. Adjusting the L-R Output controls to positive numbers increases the amount of stereo separation for frequencies contained in the bands whose controls are set above 0dB. A useful setting of the L-R Output controls for tasteful stereo enhancement would be Band 1 = 0dB, Band 2 = +3dB, Band 3 = +1.5dB. Of course reducing these controls has the opposite effect, reducing stereo separation.

Makeup Gain

All of Aura8ip’s processing is accomplished by feed-forward control algorithms.



Feed-forward control has the advantage that it doesn’t rely on errors in the compressor’s output signals (as do feed-back algorithms) in order to dynamically control the gain. Rather than measuring mistakes in the output level and then trying to correct them by a (now very late) control signal, feed-forward control prevents errors in the output signal by carefully measuring changes in the input signal’s levels and then calculating the precise amount of gain control needed to achieve the perfect output.

Because the compressor’s output levels are controlled by changes in the input levels, when the input levels go up, the compressor will push the output level down by whatever amount of gain reduction is called for. This causes the output levels of feed-forward compressors to need to be “made up” after processing, and this is accomplished with a control called Makeup Gain.

The amount of Makeup Gain needed is a function of how much gain reduction was called for due to an increase in input level. In our design we leave around 6dB of additional headroom to accommodate the compressor attack times and such, so if 20dB of gain reduction is being done by a band’s AGC/Compressor, then the correct amount of Makeup Gain will be 20dB plus that 6dB, or around +26dB.

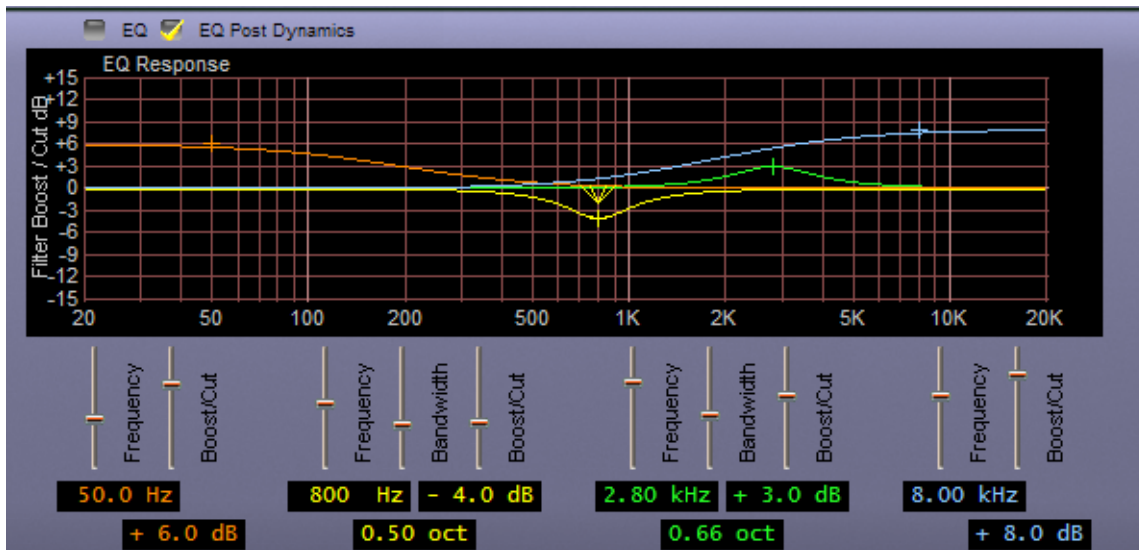
The less gain reduction being called for, the less Makeup Gain that is required to bring the signal back up to normal levels afterwards.



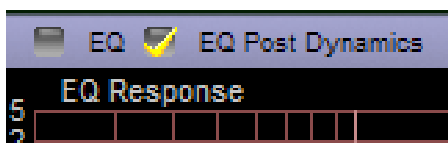
Those who may be concerned about “... adding gain after AGC/Compression because it will increase noise...” need to know that the signal processing chain inside Aura8ip has 144dB of dynamic range. This is approximately 50dB more dynamic range than a digital CD. Therefore “noise” is of no concern whatsoever – the processing chain will remain absolutely dead quiet regardless of the amount of Makeup Gain that may be required.

Note also that the amount of Makeup Gain is somewhat dependent on the Compression Ratios being applied to the signals in each processing band. The higher the Compression Ratio, the tighter the output level is regulated, and therefore the more Makeup Gain that will be required. However, the difference in the Makeup Gain required with 20dB of compression at a 4:1 ratio and that required at 20dB compression with a 10:1 ratio is only around 3dB.

Parametric EQ



The Aura8ip is equipped with a flexible equalizer section which may be used to sweeten the spectral balance. The equalizer provides a graphical representation of the equalizer’s contribution to the audio by creating shaded areas in the graph representing the mathematical result of an overlapping equalizer sections.



The equalizer may be placed before or after the AGC/Compressor stage, and though the audible effects of each placement are different (and sometimes subtle) they are important to understand. We will discuss this shortly.

The equalizer has two parametric sections (adjustable frequency, boost/cut, and Q) and two shelving filters (adjustable frequency and boost/cut). The shelving filters behave somewhat like tone controls on consumer audio equipment, and provide a broad, low-Q boost or cut at the extremes of the audio spectrum.

The two parametric sections provide a broad or narrow boost or cut to any frequency within the 20Hz to 20kHz audio spectrum, and may even overlap to create special EQ curves.

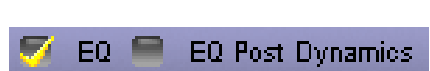
Equalizer Band 1 provides a shelving response of +/-14dB and may be tuned between 20Hz and 198Hz.

Equalizer Bands 2 and 3 have a parametric response and may be tuned anywhere within the 20Hz to 20kHz audio band, providing up to 14dB of boost or cut and at bandwidths (Q) of between 0.20 and 3.0 octaves.

Equalizer Band 4 provides a shelving response of +/-14dB and may be tuned between 2.0 kHz and 20 kHz.

As mentioned earlier, the equalizer section may be placed before or after the AGC/Compressor. Placing it before “preloads” the AGC and allows any tonal adjustments to be managed by the AGC/Compressor. This, for instance, allows the adding in of more bass or high end without fear of overloading the following multiband limiter on some program material because the AGC/Compressor will see this extra energy and try to manage it.

On the other hand, placing the equalizer after the AGC/Compressor can sound more dramatic because any equalization is no longer managed by the AGC /Compressor (which helps to tame it somewhat) but is instead managed by the multiband limiter which typically is doing very little gain management.

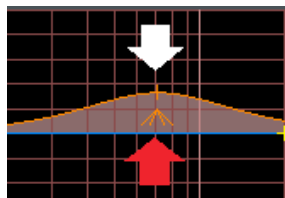


The correct placement for the equalizer is both highly subjective and highly dependent upon the particular application. For most applications we recommend operating with the “EQ Post Dynamics” box unchecked. There are three ways to adjust the EQ:

1. The sliders below the graphical area may be used to adjust the frequency, boost or cut and the bandwidth (Q, if available) in the band of interest;

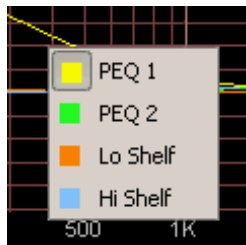
2. The value displays under the controls can be double-clicked which opens an entry dialog where the desired values can be manually entered from the keyboard;

3. The equalization curves themselves may be dragged with a mouse to the desired settings.



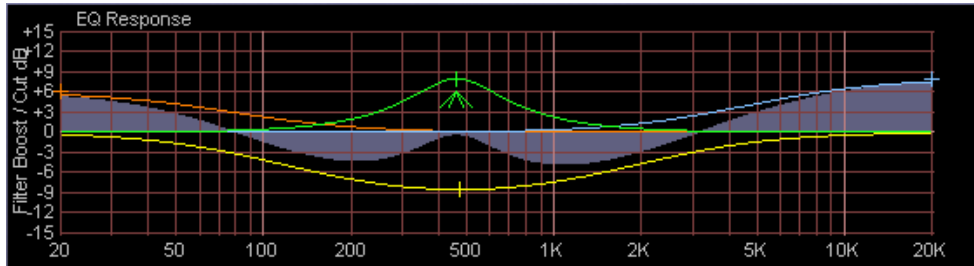
When manually dragging the curves there are three control behaviors to be aware of. The first two pertain to the “+” at the center of the curve which can be dragged left to right to set the desired equalizer frequency and up and down to set the desired boost or cut.

The third control is available only in the two parametric sections and it is represented by the tent symbol underneath the curve. Placing the mouse cursor on this symbol and then dragging left or right adjusts the Q (bandwidth) of the equalizer section.



If it seems that a curve isn’t responding to mouse input, right click on the graphical area to bring up the dialog shown at left and select the curve that you wish to adjust.

When the equalizer section is enabled the audio spectrum being influenced by the equalization is represented by shaded areas of the audio spectrum. To show what we mean, please refer to the next graphic.



Here we've created a bizarre (for example only!) curve to show how the shaded areas represent the mathematical effects of the applied equalization. We've added low and high frequency shelving to boost the signals at the extremes of the audio spectrum. We've also used the two parametric equalizers in an overlapping fashion to create two scooped out areas of the midrange. Note how the yellow curve (bottom) is very broad – this is applying a very broad dip in the frequency response between about 100Hz and 3kHz. However, notice that the green curve (top) is set to be rather narrow – much narrower than the yellow curve on the bottom. The combined effect is a broad reduction in frequencies between 100Hz and 350Hz and between 600Hz and 2.5kHz.

A Word About Our Limiters

Vorsis has returned the limiter to its rightful place as a device that only reacts to control a peak in the audio level and only to the degree necessary to control that peak. These limiters are not intended to be used to add their own signature to the audio; they are there merely to prevent audio from exceeding a predetermined peak level.

In more conventional designs the limiters are sometimes found to be equipped with gates, return to zero functions, temporary holds and even interband coupling. These limiters typically need these functions to make up for deficiencies in the preceding AGC or compressor – the limiters then act as a second, faster compressor to build density while, at the same time, are also tasked with controlling peaks. Conversely, Vorsis designs utilize much better AGC and Compressor algorithms that allow the following limiter to be just that, a limiter.

Unless the limiters have been tuned to create a very specific effect, there should normally be no more than 3dB of average gain reduction seen. At times, there may not be any activity at all in a limiter band, however rest assured that the limiters ARE working properly, they just don't need gating and 12dB of gain reduction to do it!

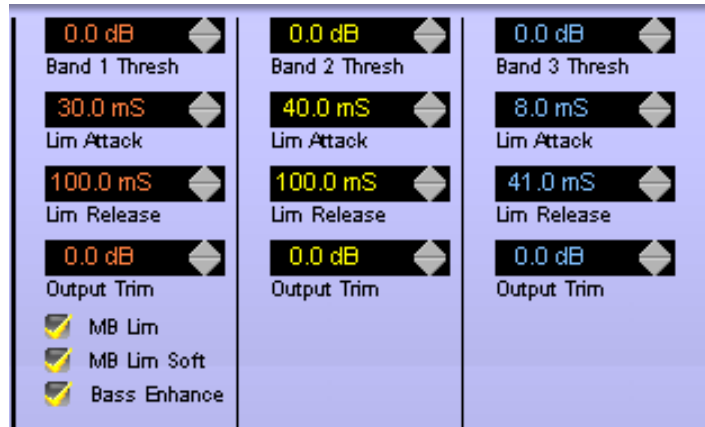
Multiband Limiter

Before we begin discussing the multiband limiter it is important to recognize that the number of limiter bands is controlled by the number of AGC/Compressor bands as selected by the *Number of Bands* control discussed in the AGC/Compressor section of this manual. Further, if the number of bands control has been set to Broadband, we recommend not enabling the remaining band of the multiband limiter – this



work is better done by the final limiter. In fact it will be obvious from our presets that all Broadband factory presets defeat this limiter.

There are four adjustments for each limiter band:



Threshold (Band x Thresh)

This control has a range of -6dB to +6dB and sets the level at which LIMITING will commence. At 0dB the limiter acts more as a protective device to prevent peaks from getting above 0dB. Set to negative numbers the limiters begins to work sooner and therefore limits the audio to below 0dB. Set this way the limiter is not only preventing peaks, it is also imparting its own signature on the sound. When set to positive numbers, and if the gain structure of the processing prior to the limiters is correct, the limiter will still be awake but will rarely, if ever, introduce gain reduction.

Limiter Attack (Lim Attack)

This controls how rapidly the limiter will act to control audio peaks. We made the range of this control 0.3ms to 100ms however we recommend operating with settings between 0.3 and 10ms. With settings slower than this, peak control will be sloppier and though the multiband limiter attack setting isn't critical, slowish attack times will make the final peak limiter work harder.

Limiter Release (Lim Release)

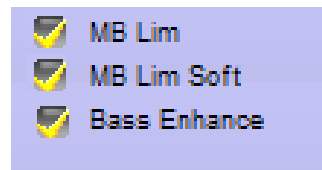
This control sets how quickly the limiter recovers once a peak has passed and the audio level falls below the limit threshold. The adjustment range of this control is 3ms to 100ms.

Very fast release times (under 30ms and especially in the low band) coupled by very fast attack times (under 5ms) will yield a tightly controlled audio signal that has a "radio" sound. Very slow release times (greater than 50ms) will yield a more open sound that is still well controlled (relative to the attack time settings). As we have said with the AGC/Compressors, unless you are very familiar with these types of controls, it's probably best to not wander too far from the settings in the factory presets.

Output Trim

Each limiter band is followed by its own Output Level mix control which can be used to make fine adjustments to the final tonal balance. Because the setting of these controls can be fairly touchy, we recommend leaving them at 0dB unless a specific sonic effect is desired.

Multiband Limiter Options



The multiband limiter is equipped with two other operating modes besides simply on and off. On and Off is controlled by the checkbox labeled **MB Lim**. The other two options require some explanation.

MB Lim Soft – Checking this box enables a small amount of anticipation in the limiter behavior, causing it to start to limit approximately 2dB below the absolute limit threshold as set by the Band x Thresh control. This anticipation serves to soften the limiter action by making it “spongy.” That is, it will ooze in and out of limiting in a softer fashion which makes it quite effective (and good sounding) in voice applications.

Bass Enhance – This checkbox enables a Vorsis-proprietary algorithm which enhances low bass without creating intermodulation distortion or muddiness. It enhances the sound of bass when heard on small, bass shy speakers and adds richness to the sound without adding noticeable distortion.

Look Ahead Final Peak Limiter

The final section of processing is the Lookahead Limiter with its defeatable lookahead function. In studio applications, the final limiter can probably be defeated. However, if the audio destination is a method of transmission (STL, audio stream, uplink) with a defined maximum peak input level, or if you want to recreate a “radio” sensation for talent headphones, using this limiter is a good idea.

Final Lim. Drive

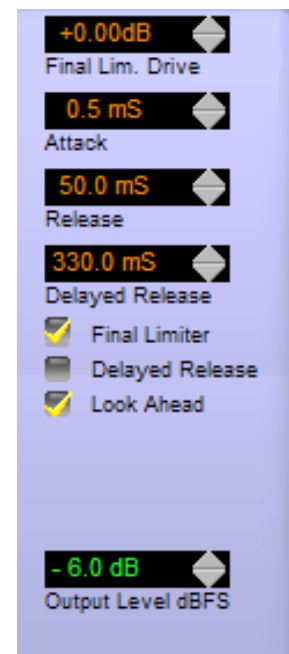
This control sets the drive level for the final peak limiter. The preferred way to set this control is to adjust the Final Lim. Drive until there is 1dB to 3dB of indicated limiting on the final limiter meter.

Attack

This control sets how quickly the limiter will react to audio peaks. While the range for this control is 0.2 to 30ms, Vorsis recommends a setting between 0.2 and 10ms. Anything slower than 10ms will not yield effective peak control.

Release

This control sets how quickly the limiter will recover after reacting to an audio peak and after the level drops. The range of this control is 33ms to 330ms, with a recommended setting of around 180ms.



Delayed Release Control

This control sets the amount of delayed or secondary release for the limiter. When Delayed Release is engaged (see below) the first 3dB of gain reduction is released at the Release Time setting and the remainder occurs at the speed set by the Delayed Release control. The purpose of delayed release is to reduce or prevent intermodulation distortion when very fast limiter release times are being used. Delayed Release also helps to reduce pumping artifacts by preventing the limiter from making a full gain recovery during syllabic changes in audio level.

Look Ahead Limiter Special Option Checkboxes

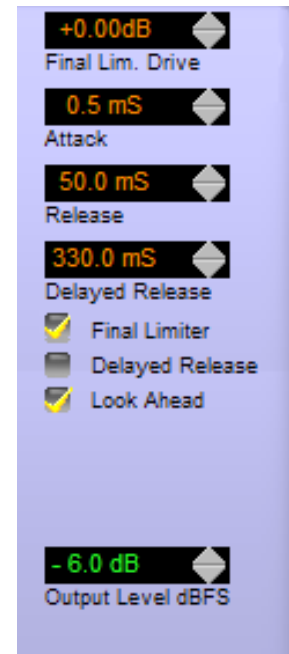
Final Limiter – When this box is checked the final limiter is engaged and its operation is governed by the final limiter operating adjustments. When this box is not checked the final limiter is disabled and no final peak control is in effect.

Delayed Release – When this box is checked the final limiter is utilizing the Delayed Release algorithm as governed by the Delayed Release control setting as explained earlier. When this box is not checked, only the primary Release time algorithm is in effect.

Look Ahead – When this box is checked a small amount of lookahead is applied to the final limiter, allowing it to react to an upcoming audio peak just as it arrives at the limiter input. Lookahead allows the limiter to anticipate peaks and adapt to them early enough that output level overshoots due to non-zero attack time are prevented. We recommend using the Lookahead option whenever signal path latency is NOT an issue. If latency is an issue, this option should not be checked (lookahead is then bypassed).

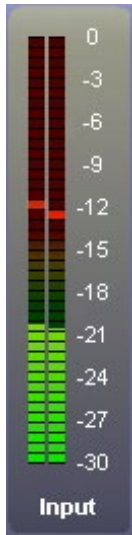
Output Control (Output Level dBFS)

The output level control sets the absolute peak output level within the range of -39.5dBFS to 0dBFS. If the control is set below -39.5dBFS the audio is muted (OFF). Remember that there is no more processing available after this stage so some care is required in setting the Output Level if peak headroom is a concern in your application.



Metering Discussion

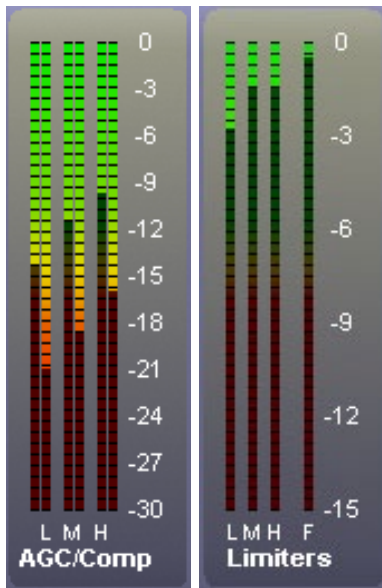
Input Metering



All metering in the Aura8ip is sample-accurate, true peak reading, including the gain reduction meters. The Input and Output meters are calibrated in dBFS so that an accurate determination of these levels may be made. The recommended input level operating range is between -18dBFS and -12dBFS. Care should be taken to ensure that the input peak level never exceeds -9dBFS, especially if the Phase Rotator is enabled. This is because clipped waveforms exit any phase rotator at much higher peak levels because the phase rotator upsets the signal’s harmonics. It is not uncommon to see clipped waveforms exit a phase rotator with an increase of 12dB in peak levels!

In conventional, VU and average responding meters, **0dB** (or 0 VU) usually indicates the desired average operating level. On the other hand, the metering within the Aura8ip follows standard operating practice for digital signals and provides an accurate indication for when **0dBFS** is reached. If and when signal peaks reach 0dBFS, there are no more digital bits available to define the audio signal which results in hard clipping and severe distortion. The Input meter shown at left is indicating good input levels – peaks are at, but not above, -12dBFS – good operating practice.

Gain Reduction Meters



Multiband AGC/Compressor and Limiter – The AGC/Compressor gain reduction meters display the amount of processing in each band, and for both the slower AGC, and faster Compressor.

The gain reduction meters for the multiband limiters look similar to the meters for the AGC/Compressor, but have reduced scales more appropriate for limiters.

Metering for each band follows the L, M, H (Low, Medium and High) convention, and the left meter is for AGC and right for Compressor.

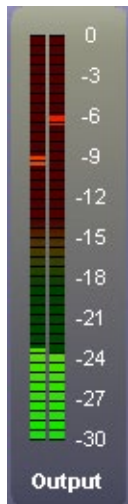
Final Look Ahead Limiter Metering – The right-most meter scale within the group of multiband limiter meters is for the final lookahead limiter. This meter should rarely show more than 2dB to 3dB of activity.

Normal Gain Reduction

The following is a general guideline for what normal indications might be:

Meter	Minimum Reading	Maximum Reading
Multiband AGC	3dB	24dB
Multiband Limiter	0dB	6dB
Final Limiter	0dB	3dB

Output Metering



Like the Input metering, the Output metering is sample-accurate, peak reading, and is calibrated in dBFS. By observing the difference between the consistency of the Input and Output levels the effects of processing are readily apparent.

Note also that because the Output Meters are reading the peak levels of audio which has been processed and probably also peak limited, there is no maximum level constraint like there is on the Input side of the processor. In other words, the effects of processing have made the maximum peak levels ‘known’ and therefore the Output meters may safely indicate all the way up to 0dBFS.

While a 0dBFS output level is certainly possible, it may not be practical from the standpoint that we do not know what the behavior of the device following the Aura8ip is going to be, and whether it has enough headroom. Our experience is that it is safe to set the digital output levels up to around -3dBFS without incurring any unexpected distortion or other issue in the equipment coming afterwards.

One additional thought about Output levels, if we may ... when feeding audio codecs it is best to keep their maximum Input level at -3dBFS or even slightly lower. The reason for this is that when the codec removes energy from the audio (which it must do in order to encode the audio) the peak audio levels inside the codec algorithm increase because information has been removed, information that was required in order to maintain the original peak levels. Now, the designers of the codec may have accounted for this effect, or they may not. We do not know for sure. Therefore the best thing to do is run the codec’s input levels a little on the light side, perhaps between -6dBFS and -3dBFS, just to be safe.

Sidebar Region

To the right of the OUTPUT METERING column is a vertical row of seven special buttons. Each button has been designed as an entry point into a dialog designed to help the end user get the most functionality out of the product.

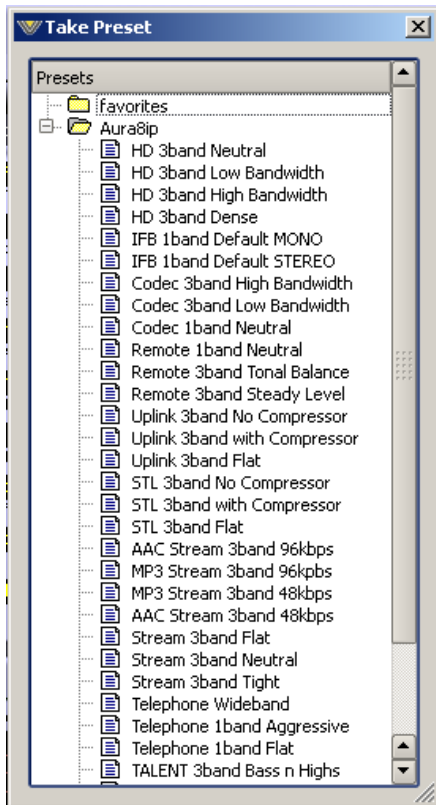
Preset

When this button is left-clicked, a Windows style dialog opens. The Pro GUI must be online to the processor for the window to display the list of presets installed on the Aura8ip hardware.

The folder called **Aura8ip** represents the hardware itself and the presets stored there. Other folders, **favorites**, **Factory Presets**, etc. can only be seen within the Library dialog, covered later.

The appearance of the window that opens when the Preset button is pressed is shown on the next page.



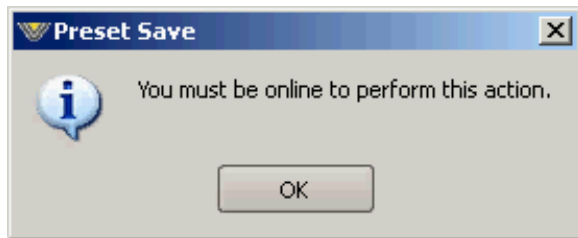
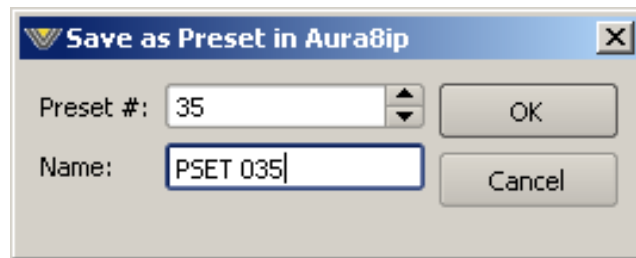


Here, the presets stored on the hardware itself are visible, and any preset may be selected and placed into use by simply double-clicking on it.

Note that each of the eight processors on board the Aura8ip are completely independent – one processing instance has no idea what presets may be running on another processing instance.

An important concept to grasp is that the preset list is common to **all eight** processing instances, so any preset that might need to be taken by any processing instance must either be stored here, or on the user's PC.

In order to save a preset, simply press the **SAVE** button to open a Windows-style file save dialog.



Note that the Pro GUI must be online to the processor in order for presets to be saved. If the Pro GUI is not online and the Save button is pressed, a warning dialog will appear.

It is important to remember to save any preset deemed important before taking another because any unsaved settings will be lost once the new preset is loaded. There is no warning dialog!

When saving a preset, and unless selected otherwise, the preset will be saved into the next available empty slot on the hardware.

Alternatively, by nudging the preset number (“PRESET #”) up or down, a preset may be saved in any preset location except one that has been locked. If a preset is saved into an unlocked location where a preset already exists, that preset will be overwritten with the new preset!

Locking Presets – Presets that have been stored within the processor hardware may be locked by the user to prevent inadvertent overwriting, renaming, or deletion. This is accomplished by opening the Preset Library by clicking on the Library button in the Pro GUI. Once the list of presets is open, the presets stored on the processor hardware are visible in the left pane.

There are two ways to manage the lock status of user presets:

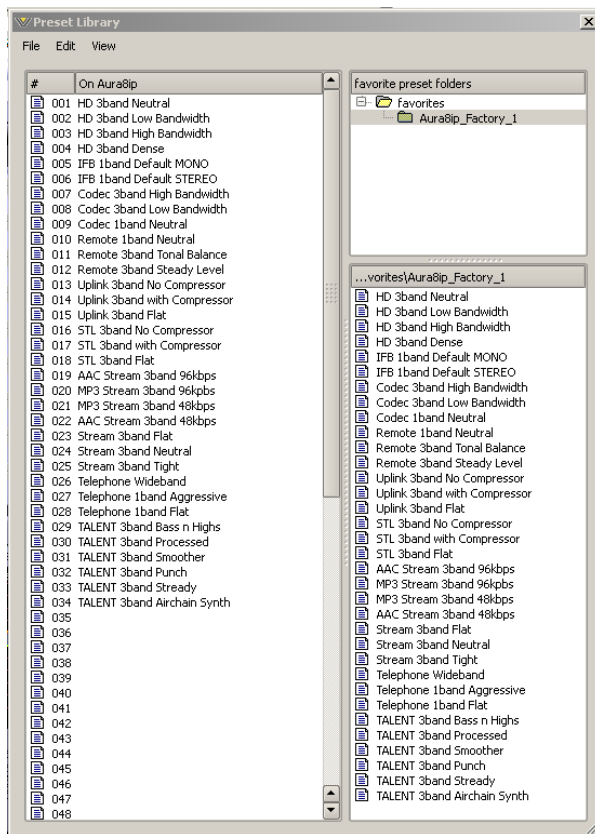
- The first method is by highlighting a preset (single left click) and then right clicking it to open a dialog box. Among the options are Lock Preset and Unlock Preset.
- The second method is by highlighting a preset as above, and then clicking the Edit option at the top of the Preset Library dialog box to reveal the Lock Preset/Unlock Preset options.

Save	Ctrl+S
Take	Ctrl+T
Copy	Ctrl+C
Paste	Ctrl+V
Delete	Del
Rename...	
Lock Preset	
Un-Lock Preset	
View	▶

Note that these are user-level preset lock options and do not override the lock status of a preset that has been factory-locked!

Library

When the Library button is clicked a three panel Windows-like dialog will appear.



This dialog is divided down the center, and each side has a special purpose. The left hand side will display all of the presets currently stored on the hardware, and the right hand side shows the folders and presets currently stored on the user's PC where the Pro GUI has been installed.

Simple Windows-style drag and drop mouse actions are utilized when moving presets back and forth between the PC and the hardware

Note that if the Pro GUI is not online to the hardware, no presets will appear in the left hand pane simply because when the Pro GUI is not online it has no way to retrieve the list.

The Library dialog is also the place where presets can be added and deleted from the PC or the hardware, or if desired, presets can even be locked on the hardware to prevent inadvertent changes or deletions.

Devices

Clicking on the Devices button opens up a list of Aura8ip devices known to the Pro GUI. To connect to any Aura8ip processor, it must first be selected in the device dialog before the Pro GUI will attempt to go online to it. By highlighting the desired Aura8ip's name and hitting *Select*, the Pro GUI will then know that that is the unit you wish to connect to the next time you press the Pro GUI's Online button.

If the Pro GUI was already online to another device at the time a new device is selected within the Devices dialog, the Pro GUI will immediately try to connect to the new device as soon as the Select button has been pressed.

The first time the Device dialog is opened, no devices will be shown. Before the Pro GUI can connect to **any** Aura8ip the unit must first be made known to the Pro GUI by using the Add Device dialog.

When the Add Device dialog is opened there is an opportunity to provide a custom name for the Aura8ip, and this name will be shown in the Device window at the top of the Pro GUI. Once the IP Address of the Aura8ip has been entered the Select button should be pressed if that is the processor you wish to connect to, or if you are just adding a device for later, click the OK button to close the dialog.

Quick Save (QSave)

The Aura8ip has a unique feature called QSave which allows the instant comparison of two different sets of processing tuning settings. It can also be used to compare the sound of a Factory preset to the modifications being made by a user without having to first save the user preset.

The QSave A and QSave B buttons are assigned to two temporary buffers inside the Aura8ip that hold all current processing settings as long as power is applied to the unit. While QSave A is highlighted green any adjustments that you make to the controls are being saved to that temporary buffer. QSave B is another temporary buffer that operates just like QSave A. When a QSave button is active its green indicator is illuminated.

Though there are several ways to use the QSAVE feature, one popular way is to compare the sound of a factory preset to changes made to that preset by a user without having to first save it as a user preset. To do this, follow these steps:

1. Recall the factory or user preset that you wish to adjust.
2. Ensure that QSave A is highlighted. If it is not, press its button to highlight it.
3. Press the B=A button. This will copy the contents of QSave buffer A to QSave buffer B. Now the contents of both buffers are identical.
4. Change some settings on the Aura8ip. These settings will automatically be stored in the QSave A buffer.
5. Compare your changed settings to the recalled factory preset by pressing the QSave B button.
6. Compare those settings back to the factory preset by pressing QSave A.
7. When you are happy with your changes you can commit them to a user preset by using the Save preset dialog that was covered previously.

The QSave A and QSave B buttons may also be used to compare the sound of two different sets of user settings. To do this:

1. Load the preset that you want to change, then make changes to it and press QSave A to save those settings to buffer QSave A.
2. Make additional changes as desired and then press QSave B to save those additional changes to buffer QSave B.
3. Now you can compare the two sets of settings by toggling back and forth between the QSave A and QSave B buttons.
4. When you are pleased with one set of settings and need more buffers for further tweaking, you can use the A=B/B=A button to make the two buffers the same and have one of them to use to start comparing from again.

Title Bar Region



As was hinted at in the section of the manual pertaining to configuring and selecting devices, the Aura8ip Pro GUI is capable of controlling hundreds of Aura8ip units on the same connected network.

Along the top edge of the Aura8ip Pro GUI screen and between the “Vorsis Aura8ip Pro” product label on the left and the Windows About/Minimize/Exit icons on the right are four status indicators and controls for the management of devices and presets.



The first is a small button with embedded green indicator. This button is used to put the Pro GUI online to an Aura8ip device. When the indicator is green the Pro GUI is connected to, and is controlling, the selected Aura8ip device.

Status

When a connection is attempted, made, or disconnected the Status window will display the status of this action. When the display indicates Offline no connection to an Aura8ip device is being attempted.

When the Status window indicates Trying the Pro GUI is in the process of establishing a connection to a remote Aura8ip device. As long as the status is Trying the device has been found but full communications has not been established.

When the Status window indicates Online, the Pro GUI is in command of the connected device

Devices

This window indicates what device has been selected for control from within the Devices dialog covered earlier. If no device is displayed, or if it indicates “Unknown” then no device has been configured or selected in the Devices dialog.

Presets

This window shows the currently running processing preset. If the text is displayed in green, all parameters that were originally saved with the preset are still active and no changes have been made to any of the settings. If the text is displayed in orange, then one or more parameters in the current preset has been modified and the new settings have NOT yet been saved as a new preset. If the text is displayed in orange and a new preset is taken, any changes preset in the previous preset are lost forever. This may or may not be the desired action – be careful!

Accessing Menu Option

Right clicking anywhere on the Vorsis Aura8ip Control Panel will open a pop up menu tree with access to the File, Hardware, and Presets choices. These choices then lead to sub-menus and dialog boxes that may also be accessed by clicking on other dedicated buttons on the main Vorsis Aura8ip control panel.

As with many Windows programs, there are multiple ways to access the menu trees – please feel free to go ahead and explore.

File Menu Items

About – brings up the About box to indicate the Pro GUI software version.

Choose Skin – brings up the Choose Skin dialog box. Skins in Vorsis processors are Pro GUI overlays which alter the look of the Pro GUI. It could be color, shape, or other aspects of the Pro GUI which change when skins are changed.

Exit – Closes the entire Pro GUI (not just the dialog window).

Hardware Menu Items

The Hardware menu tree may be accessed by right clicking anywhere on the main Aura8ip Control Panel. Please note that most of the hardware-related items cannot be reported unless the Pro GUI is online to the hardware (this is where the data must come from!).

Sub menu choices include:

Devices... – opens the Devices dialog box which allows the creation, editing, selection, and deletion of Vorsis processor devices that are known to the Pro GUI.

On-Line Mode... – toggles between ONLINE and OFFLINE modes. In offline mode the Pro GUI is not connected to the processor but can still take presets and have their settings viewed.

Login Password... – opens the Passwords dialog box for creating and editing login passwords.

Version... – displays the current software and firmware versions that are installed and running on the Aura8ip hardware, noting that the only time you can view the hardware versions from the Pro GUI is if it is actually connected and online to the hardware.

Presets Menu Items

The Presets menu tree may be accessed by right clicking anywhere on the main Aura8ip Control Panel.

Take... – performs the same action as clicking the Preset button.

Save... – performs the same action as clicking the Save button.

Library... – performs the same action as clicking the Library button.