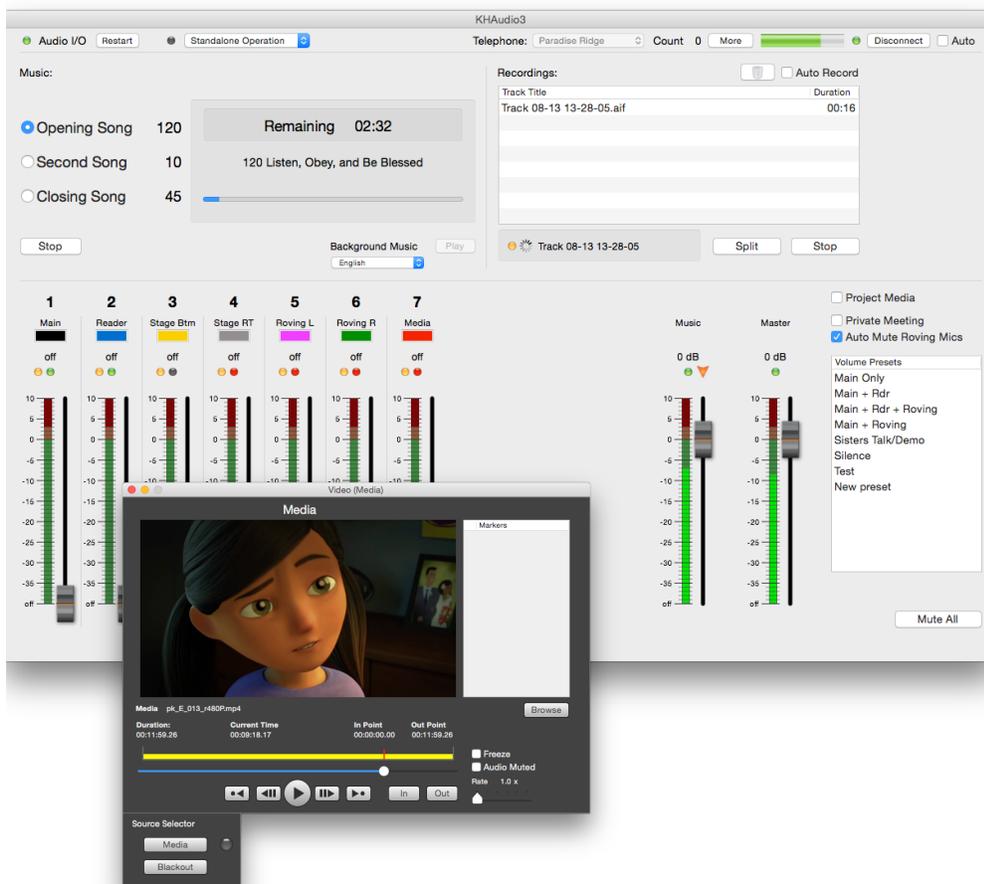


KH Audio 3 Installation Manual (4.x.x)

The OFFICIAL ONE...

Sound Setup and Configuration



This manual is very straightforward and as short as possible. It covers installation and configuration of KHAudio 3.

As this is a manual for installers, we assume that you have:

- Working knowledge of how to operate an Apple Mac
- Working knowledge of networking including how to configure routers, switches, etc
- Good knowledge of sound systems and how to set up professional audio
- Know how to install and fabricate cabling for sound, video and networking

If you don't have such knowledge yourself, then make sure you have people with that knowledge available to help you set up a system, you will need them.

First Time Configuration of the Computer

WARNING: FOLLOW THESE INSTRUCTIONS BEFORE YOU EVEN START THE COMPUTER THE FIRST TIME !

For instructions on how to prepare the computer for installation of the required software components, see the document “**Preparing the Computer**”.

Installing the KHAudio Software Components

1. Login to the System Manager account (short **sysman**, make sure all other accounts are completely logged out)
2. Start Safari and open this link:
<http://www.idotechnology.com/jw-developers/audio-systems/>
3. For the typical installation using the Presonus FireStudio Project do this:
Under Software Components click the link for the Presonus software which will bring you to the Presonus website. From there, download **Universal Control vX.X.X - Mac** (latest of course).

[If you are using any other device than the Presonus FireStudio Project, like MOTU, Behringer, TASCAM or others then you will need to figure out how to install their respective drivers. As long as the audio interface will be visible for Apple Core Audio, it will work with KHAudio. Continue at step 6.]

4. Make sure the PreSonus is NOT connected and switched off. Then install the PreSonus Universal Control package.
5. Connect the Presonus and turn it on. Now start Applications > Universal Control. When it is open, make sure the global settings for the unit are:
Sample Rate: 48 kHz
Clock Source: FireStudio Project Master
Safe Mode: Normal

Make sure to do: Settings > Check Firmware (ensuring the interface has latest firmware installed).

Now select the FireStudio Project and it should show a window with mixer panels. For each pair of 2 outputs set its mode to Mixer first and then bring the first 10 sliders to Inf (all the way down for the first 10 sliders, all inputs closed).

Set all the output pairs back to DAW mode.

Quit Universal Control.

Switch to the Operator account (Fast User switching in top right menu bar) and DO THE SAME THERE (repeat this procedure, then log out of **operator** account and come back to **sysman** account). This needs to be done for any account where the sound system might be used.

6. Download the MP3 encoder from Thalictum (see web site > Software Components > 2. LAME MP3 Encoder). From your **Downloads** folder, start **lame-xxxx.pkg** (you might need to unzip) to install the LAME MP3 encoder.
7. Download the Spectrum Analyzer plug in (demo version is ok). Open the BlueCatFreqAnalystProAUDemo.dmg disk image. Drag the **Blue Cat FreqAnalyst Pro AU(Mono).component** on to the **Components** alias.
8. Download the needed sound tracks from JW.org as directed under item 4 on the web site.
9. Download the Pink Noise file.
10. Download the last version of KHAudio posted on the web site. Unzip and move it to the Applications folder. Drag it on the dock and start it up for the first time. Likely the system will ask approval to install a helper app (Apple is paranoid for good reasons). Approve installation of that (KHAudio will now create the necessary folders where we can put our audio tracks). Go to menu KHAudio > Check for Updates and install the latest update available. Quit the KHAudio app.
11. Navigate to the following folder: **/Library/Application Support/KHAudio Tracks/**
There you will see the sub folders **Songs** and **Background Tracks**. Copy the song tracks (including the new songs, of course all in **AAC format**) into the **Songs** sub folder. All English voice tracks or piano music or both can be copied into the **Background Tracks** folder for random background music. If you desire to have other languages as well, you can create other sub folders that start with Background Tracks + the language. For example: **Background Tracks Spanish** or **Background Tracks French**. You could even call one **Background Tracks Vocals** if you want to keep those separate. All of the extra choices will automatically show up in KHAudio's background tracks selection popup.
Also copy the unzipped **Pink Noise** file into the **KHAudio Tracks** folder (not in any sub folder).
12. Go to **System Preferences > Sound**. Select the **Sound Effects** tab and make sure the PreSonus is NOT the selected device. You might want **Internal Speakers** instead. Select the **Output** tab and do same. If you are using this system to **play video** as well, you **MUST select a line output** which is **wired back** to a **line input** on the PreSonus. Select the **Input** tab and make sure that the PreSonus is NOT the selected device. You might want the **Internal Microphone** here. You have to make the same settings in any other user account that might want to use the sound system.

Configuring the KHAudio application

1. Start up KHAudio and go to menu **KHAudio > Preferences**. Now the real fun starts...
2. Select **Preferences > Global Settings**.
 Enter a **password** to **protect all settings** from unauthorized access. Make sure you keep that information safe and handy for future support.
Telephone Warning will pop up a warning to hang up the telephone (or close the call with KHConf) after the last song has played. Many forget to do this at great cost to the congregations
New/Old Songs Selector is probably obsolete. If you think you need to play songs from the old bundle for a language that doesn't have the new song book, contact us.
Video Presentations will enable video playback for media and streaming on KHAudio. If enabled, it will show warnings and possibly error messages if a secondary screen cannot be properly configured for video output.
SIP Connections will enable direct internet connections to conferencing services like KHConf and MetroConf. Configuration of the conferencing features will be explained below.
3. Select **Preferences > Devices**.
 Select the **PreSonus** as **input** and **output** device.
 Set the **amount of inputs** you think you are going to use. This will reserve that amount of input channels on the mixer system. Keep in mind that if you are using more than 1 PreSonus, your **first analog channel on the 2nd PreSonus is 11** as **channel 9 and 10 are S/PDIF** L/R inputs on the first PreSonus. And yes, you can indeed use those to feed the audio from an Apple TV to with the use of a fiber to coax S/PDIF converter so you get nice all digital signals.
 Set the **amount of outputs** needed including **main amp** out, **secondary amp** out, **telephone transmit** (if you are not using the built in conferencing features) and **FM transmit**. You can configure other outputs for extra needs like **stage monitors** (and yes, those are protected from causing feedback from the stage mics).
 Set the **buffer size to 64 frames** to start with (this is typically enough but in case you have a slow system, you could bring that up to 128 or even 256).
 After these parameters have been set, **click Change** to enforce these settings in the system. Then **click Save** to save them permanently in the configuration.
4. Select **Preferences > Inputs**.
 Under Input Settings set the desired type and label color for each input. You can choose from the following types:
Unused - will be hidden on the Main Panel
Regular - typical microphone input, no special features other than standard KHAudio processing
Main - input designated for main microphone input, this one will never be gated and will be brought up automatically at startup. Also, if voice is detected here, it will immediately bring up Roving Mics that were possibly Auto Muted by a voice speaking into a Reader mic.
Reader - input designated for paragraph readers. If so desired, upon detecting an active voice on this input the Roving Mics will automatically mute. They will re-open automatically 3 seconds after the reader stops talking into the mic.
Roving - input designated for roving mics. These inputs will automatically mute (if so desired) when a reader is actively talking into a mic typed Reader Mic. They will automatically re-open after 3 seconds when the reader stops or when a voice is detected in the main mic.

Tel Rx - input designated for telephone receive. If you want audience participation from shut-ins, you will need this. It is handled in such a way that it will prevent feedback as seen with typical implementations. Tel Rx is not sent back out in merged signal for the Tel Tx output.

Media - input for routing audio belonging to a video track into the mixer. The related slider will automatically be opened when video playback or a video stream is started and closed when the track or stream ends.

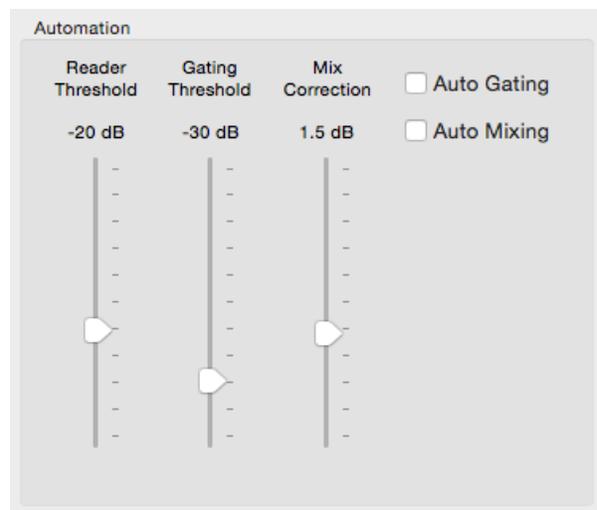
Under **Inputs** set the **Mic Gain to 0 dB** to start with.

Under **Automation** make the following settings:

Reader Threshold to -20 dB. This level determines at what **signal strength** the system recognizes a **voice as speaking** into a microphone (not the same as trigger level for gating). In the Main Panel, this will typically **move the orange arrow** to the channel being spoken into. This allows the operator to raise/lower the level of the mic currently spoken into by pushing the +/- keys on the extended keyboard.

Gating Threshold to -30 dB. This level determines at what **level the system will open the gating** on inputs (assuming Auto Gating is enabled, otherwise this has no effect). The KHAudio system is special in that it always leaves the last 2 triggered inputs open. So if you have 2 sisters doing a talk using mics classified as Regular, you will not hear any gating at any time.

Mix Correction to 1.5 dB. This level determines how much the Master Volume should be reduced for every mic that opens after the first 2. So if 4 mics somehow get their gates opened by people talking at the same time (or some other phenomenon) the Master Volume would automatically go down by 3 dB (if Auto Mix Correction is enabled). This is a great way to prevent feedback runaways of the system even in unusual situations of added signals (thank your brothers in Texas).



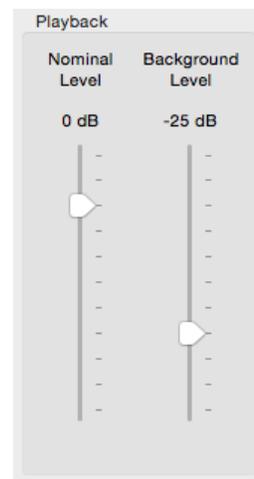
Make sure **Auto Gating** and **Auto Mixing** checkboxes are **off** for now. We will check them after eliminating feedback and level adjustments.

Volume Presets. Forget those for now, we will deal with them later.

Click **Save** at top right to lock in the changes you made.

5. Select **Preferences > Outputs**.

Under **Playback** set **Nominal Level to 0 dB** and **Background Level to -25 dB**. The **Nominal Level** is the typical level that you want to **play songs** at in your KH. The **Background Level** is the level the slider for Music moves to when **playing back background music**. Of course you can always change that level in the Main Panel. These are just the **typical** values.



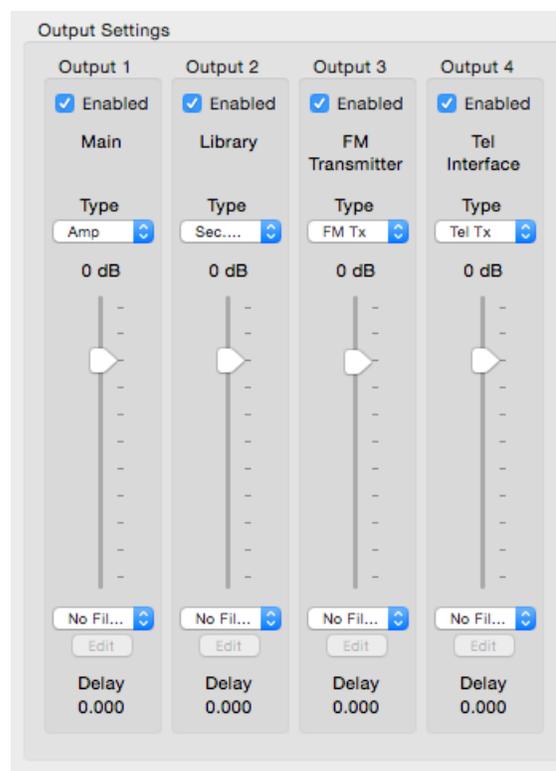
Under **Output Settings**, for each **output**:

Enable - activates that output so it will be sent audio. Disabling will completely block audio from leaving that channel.

Name - this will probably show **Unnamed** first but you can click on it and label that channel any way you see fit. After typing in the name of the channel, push the Tab key to go to the next name field.

Type - here you specify one of the designated output types:

- **Unused** - disabled output.
- **Amp** - regular amp output, the main output which is fed with all mixer channels.
- **Sec. Amp** - secondary amp output for use of secondary rooms like libraries, restrooms, etc. This output will be disabled automatically when Private Meeting is selected in the Main Panel.
- **FM Tx** - output designated for an FM transmitter, this output has its own compressor in the output chain to be able to configure compression specifically for this output. This output will be disabled automatically when Private Meeting is selected in the Main Panel.
- **Tel Tx** - output designated for a telephone interface. It also has its own compressor in the output chain to be able to configure compression specifically for this output. This output will be disabled automatically when Private Meeting is selected in the Main Panel. It is not necessary to configure this type of output if you are using the newly built-in conferencing features. For that you don't need a physical output.
- **Stage Monitors** - output designated for stage monitor speakers. This output will have a mix of all sound channels minus the stage microphones (Main Mic, Reader Mic, Regular Mic) to prevent feedback. Roving Mics, Music, Media, Tel Rx are all forwarded to this output.



- **Output Volume Slider** - set to **0 dB**. This is typical output volume for this channel. You can correct this later if needed.

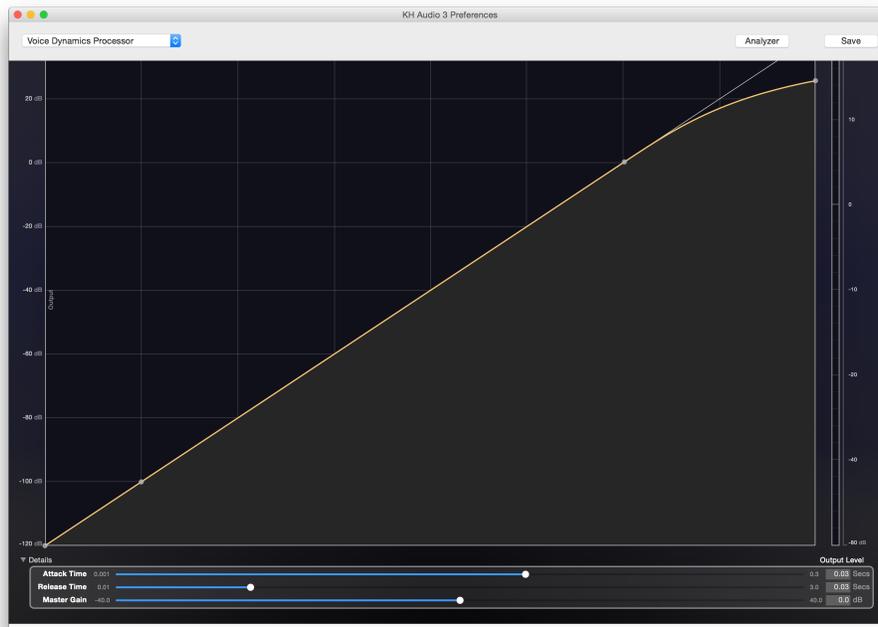
- **Output Filter** - Set to **No Filter**. There is rarely a need to configure filters here but you could.

- **Output Delay** - Set to 0.0. You would only need this if you have a point based system which is rarely the case in Kingdom Halls.

Click **Save** at top right to lock in the changes you made.

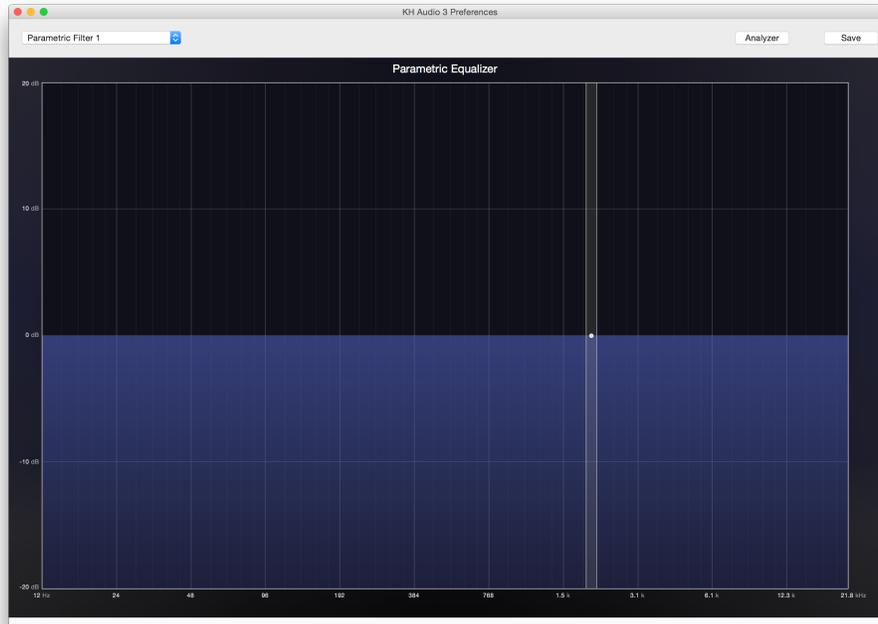
6. Select **Preferences > Voice Dynamics Processor**.

This setting controls compression on all mic channels coming in (behind mic mixer). Initially, set this to its default settings as below:



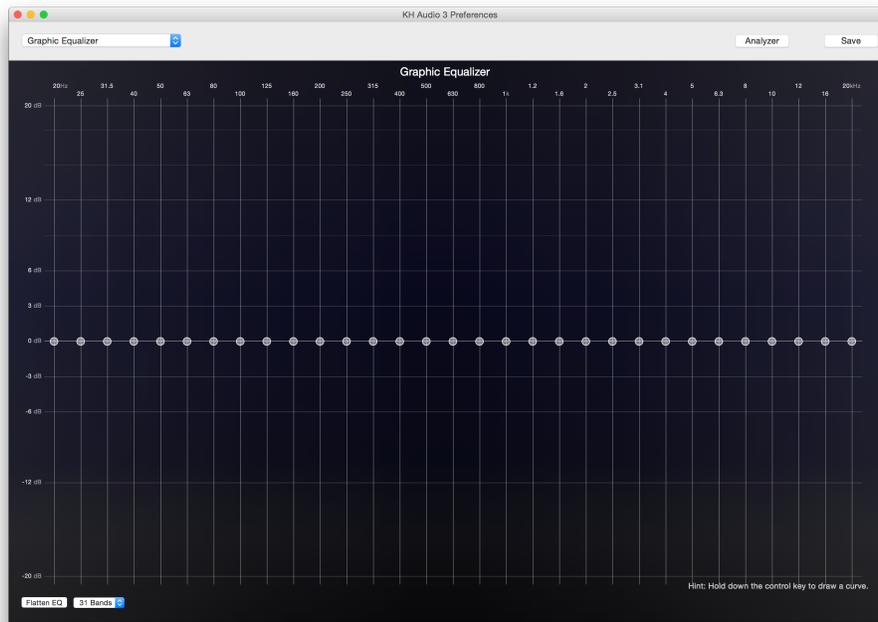
7. Select **Preferences > Parametric Filter 1..3**

These filters are provided to take out the feedback frequencies of your auditorium. Make sure they are flat at start like below:



8. Select **Preferences > Graphic Equalizer**

This equalizer is right before the main amp output and provides the ability to adapt for room conditions. However, keep in mind that most people will quickly adapt to how a room sounds and excessive filtering always affects the overall quality of the sound because of inherent phase shifts being introduced. Start with the equalizer flat as below:



9. Select **Preferences > FM Dynamics Processor**

Providing a compressor specific to the FM Transmit (FM Tx) output. Use it to limit the dynamic range of that output compared to the main amp signal. Set it the same as the Voice Dynamics Processor for now (see above).

10. Select **Preferences > Tel Dynamics Processor**

Providing a compressor specific to the Telephone Transmit (Tel Tx) output. You can (and should later) use it to limit the dynamic range of that output compared to the main amp signal. Set it the same as the Voice Dynamics Processor for now (see above).

11. Select **Preferences > Network Sender**

If you are not in a network with another auditorium, then don't bother with this setting. Continue at step 25. If you want to be able to send the signal from this sound system to another KHAudio sound system over a network (or even over the internet) then you need to configure:

- **Data Format:** AAC 32 kbps or up to 128 kbps per channel
- **Port:** 52800
- **Bonjour name:** a lookup name for your sound system on the network, for example: Mountain View North
- **Password:** Leave empty for now

12. Select **Preferences > Network Receiver**

If you are not in a network with another auditorium, then don't bother with this setting. Continue at step 25.

13. Select **Preferences > Video Settings**

Before you can make changes here, you need to make sure your complete video projection chain is turned on and working (see KHAudio - Video Setup and Configuration). If you still need to turn on your video equipment, then quite KHAudio and start it back up after turning the video equipment on. Under **Media Display Resolution** you should now select the desired resolution that you want KHAudio to use on the projectors or monitors. We strongly recommend using 1280 x 720 60 Hz. Anything higher uses more bandwidth but is essentially useless for your audience (they won't be able to tell the difference from where they are seated). Click **Save** under the resolution popup which will then cause the desired resolution to be shown under **Stored mode description**.

If **Don't show video warnings at start up** is checked, KHAudio will not warn you that the secondary display can't be configured appropriately to run video presentations or streams. It will try to re-configure when you switch on **Project Media** in the main panel. We suggest not checking this option so you can be sure before the meeting starts that things will work fine when needed.

For those KHs that have a sign language system or a more elaborate video system (using a Camera Controller), the option **Use SL Studio Camera Controller** can be checked. **Change** lets you select a Camera Controller on the network. This option will make KHAudio connect to the Camera Controller and use it to automatically turn on all the monitors / projectors in the KH, bring down projection screens and change lighting conditions when needed (during video presentations). This all assumes that the controller is properly configured of course.

Click **Save** at top right to lock in the changes you made.

Adjusting the Sound Configuration

1. We assume all equipment is wired properly. Prepare the stage by plugging in all mics. Make sure roving mics are ready to operate as well. Turn on the amp(s).
2. Go to **KHAudio > Preferences > Graphic Equalizer** and roll off frequencies above 12 kHz by dragging down the 16 kHz slider halfway and the 20 kHz slider down all the way. Also, roll off the frequencies lower than 100 Hz with a slightly smoother curve. Click **Save** in top right.
3. Get a professional **SPL meter** and set it to **A weighted, fast, 80dB range**.

4. **Adjusting the Main Amplifier.**

Play regular music by entering a song number and clicking **Play**.

Adjust the amp output level such that you get about **73-75 dB peak levels** at ear height throughout the auditorium.

This will be the reference level that everything else will be adjusted to. After this exercise, do NOT change amplifier levels again, nor the **Playback Nominal Level** in **KHAudio > Preferences > Outputs**.

Stop the music when done.

5. **Adjusting the Main Mic Input.**

Setup the **Main Mic** for normal use at center stage. In **KHAudio > Main Panel**, set the Main Mic slider to 0 dB (open). Also make sure the **Master** is set to 0 dB.

Place someone with a good speaking voice behind the lectern with the main mic pointing up at a 30° angle about 4 inches from his mouth and let him read material while projecting to the audience.

Set the related input level on the Presonus (blue knob) such that the VU meter level on the KHAudio Main Panel regularly touches 0 dB. Typically this would be at about 4 clicks from max.

Verify that throughout the auditorium you get SPL readings of 65-68 dB peak during test.

6. **Adjusting other mics.**

The following exercise will make sure **all mics** deliver input to the system at **similar levels**.

Calibrate every other mic one by one by holding it parallel to the main mic and speaking into both at the same time. Your VU levels should be showing similar levels. Make necessary adjustments on the mic input under test by setting the blue knobs on the Presonus. Don't re-adjust the Main Mic, we were done with that one and it is our reference.

7. **Eliminating Feedback.**

Go to **Preferences > Parametric Filter 1**. Click the **Analyzer** button at top right to show a spectrum analyzer in a separate floating window (the free demo plugin will freeze once in a while, this is normal).

In **KHAudio > Main Panel**, close the **Master slider** (down).

Setup all stage mics on stands in their typical positions for main, demos, readers, etc. Open all mic sliders in the main panel up to 0 dB.

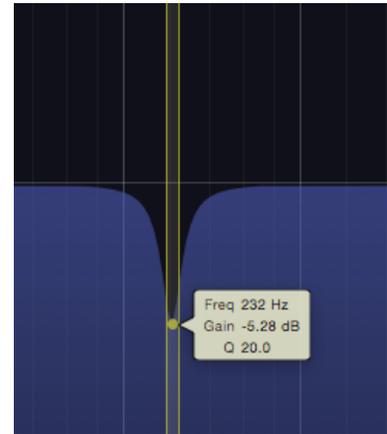
Slowly bring up the **Master** until you get definite feedback (if possible). Typically you will get at least some ringing in the 200 - 300 Hz range and possibly harmonics of that at higher frequencies.

Using the spectrum analyzer **determine which 3 frequencies are most pronounced** and carefully

set the **Parametric Filters (1-3)** to eliminate those. Don't go overboard, typical values should be a Q of 15-20 and filter depth of -3 to -6 dB. If you need more your overall volume might be too high.

The end result should be that with the mics at 0 dB and the master at 0 dB there is no ringing whatsoever. In special circumstances you might do some more filtering using the Graphic Equalizer but it is strongly recommended to avoid this if at all possible (excessive filtering does not lead to good sound quality).

Click **Save** in top right.



8. FM and Telephone.

If needed you can reduce or increase the volume for FM output or telephone output (not needed if using built-in SIP conferencing features) by changing the slider levels under **Preferences > Outputs**. Of course you should only do this after verifying their current levels.

9. Last Refinements.

Auto Gating and Auto Mixing. Go back to **Preferences > Inputs** and check the boxes for **Auto Gating** and **Auto Mixing**. Test the functionality by alternately speaking at normal levels into all the mics. If the **Gating Threshold** is properly set, you should have no delay in the channels opening up (providing their sliders are at 0 dB of course). The system will always leave the last 2 used channels open (to accommodate interviews and 2 person talks). The main mic will always stay open as well. You can see which mics have been opened by the system by watching the left LED above each VU meter. If it is orange, the channel is open. When closed the LED is off.

Auto Mute Roving Mics. In the **Main Panel** turn on **Auto Mute Roving Mics**. Based on the assigned mic for reading (see **Input Type**) and the configured **Reader Threshold**, KHAudio will automatically mute the roving mics when the sound level on the reader mic goes above the **Reader Threshold**. Whenever the reader stops reading for more than 3 seconds, the roving mics will automatically un-mute. This prevents all kinds of noises from coming through when the roving mics are not in use while paragraphs are being read.

10. Finally **Volume Presets**.

Select **Preferences > Inputs**. Under **Volume Presets** click the + button to add a new preset. Double click the name to be able to edit it. Make sure it remains selected while you switch to the **Main Panel** and put all your input sliders to the desired levels. Then click **Set** in the **Preferences** panel to store those settings in the selected Volume Preset. After adding the desired Volume Presets, click **Save** in the top right to save the configuration.

We suggest to have at least the following presets:

Preset	Channels
Main Only	Main mic up
Main + Roving	Main and roving mics up
Main + Reader + Roving	Main and reader and roving mics up
Main + Reader	Main and reader mics up
Demo	Table / auxiliary standing mics up (no main)

After this configuration the **BLUE KNOBS ON THE PRESONUS SHOULD NEVER BE TOUCHED AGAIN**. So record what the settings are for proper operation to be used as future reference because some “specialist” will indeed change it and by doing so mess up the whole balance of the system.

You should now have a proper sounding audio setup for your KH. Enjoy !

For instructions on how to prepare the computer for installation of the required software components, see the document “**Setting up SIP Connections (Telephone)**”.