WHEATSTREAM & STREAMBLADE

Setup and Operation Manual

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All specifications are subject to change without notice.

Attention!

Federal Communications Commission (FCC) Compliance Notice:
Radio Frequency Notice

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

This is a Class A product. In a domestic environment, this product may cause radio interference, in which case, the user may be required to take appropriate measures.

This equipment must be installed and wired properly in order to assure compliance with FCC regulations.

Caution! ***Any modifications not expressly approved in writing by Wheatstone could void the user's authority to operate this equipment.***

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A NOTE FROM THE DESIGNER OF STREAMBLADE'S AUDIO PROCESSING

Back in the late sixties during my first "radio engineering job" I became fascinated by audio processing. It soon became a hobby (some claim a curse) and over the ensuing years I built many custom (and secret) audio processors for stations where I worked. Over those years I also became familiar with just about every other audio processor made, so when I state that StreamBlade's audio processing is like nothing that's existed before, I don't do it lightly.

When I was asked to design the audio processing portion of Wheatstone's new StreamBlade product my primary goal was to create something very powerful, but also something you won't notice while it's doing all the heavy lifting it needs to do to keep codecs happy. Not a trivial challenge…

Fortunately, I'd been experimenting at length with Neural Networks and discovered that it was indeed possible for the type of processing to be modified on the fly to be exactly what is needed at that instant – no more and no less. Therefore, gone are the usually fixed Attack, Release, Ratio and Threshold controls; each band's Neural Network handles those parameters on the fly by learning the characteristics of the current program type *at that instant*, and then adapts them so each band always does exactly what is needed, *at that instant*.

Also gone are the always troublesome to adjust inter-band coupling controls; the Neural Networks "know" what the desired spectral balance should be based on how the user has set the Band Mix controls and it maintains that balance as the program content changes.

One of each band's Neural Network tasks is to maintain historical data about the current program type, data it then uses to further hide the action of controlling levels. The end result is that the "sound" of StreamBlade's processing, dynamics-wise, sounds very close to that of the original unprocessed audio. Even though the dynamic range of the incoming program has been greatly reduced, there remains a sense of dynamics whose sole purpose is to enhance long-term stream listening by minimizing myriad factors that contribute to listener fatigue.

The audio can be loud but is never "squashed", though a special Density control *does* enable the user to increase the audibility of processing if that is the goal. Likewise a special Speed control governs the longish-term dynamics behavior by modifying how the Neural Networks use their historical data. The overall processing can be *quite* aggressive at controlling levels, but without ever sounding busy, smashed or lifeless.

Several dozen Factory Presets allow the end user to experiment with StreamBlade's various ways of creating dynamic and spectral signatures. The user is strongly encouraged to take some time to listen to *all* of the Factory presets to get a sense of what StreamBlade's processing is really capable of. Enjoy!

Jeff Keith, CPBE, NCE
Senior Product Development Engineer
Wheatstone Corporation

CHAPTER 1 – DEVICE SETUP

INTRODUCTION

Congratulations on your purchase of this Wheatstone streaming product! You're minutes away from delivering the best sounding streams to your audience's ears, wherever they chose to listen to you.

We recognize that you're anxious to get this online right away, and after reading through this section, you should be able to get your WheatStream/Streamblade online, connected to your stream host, and after choosing a preset having your audio processed in a way that best suits your content.

However, we hope you'll stick around for the whole manual to learn how to best choose your codec and bitrate and to learn the important differences between processing audio online versus on air. This chapter will cover the nuts and bolts of getting online, and the rest of the manual will teach you how to optimize your stream to keep your audience listening longer.

WHEATSTREAM VS STREAMBLADE

Wheatstone Corporation offers two streaming devices which are essentially similar.

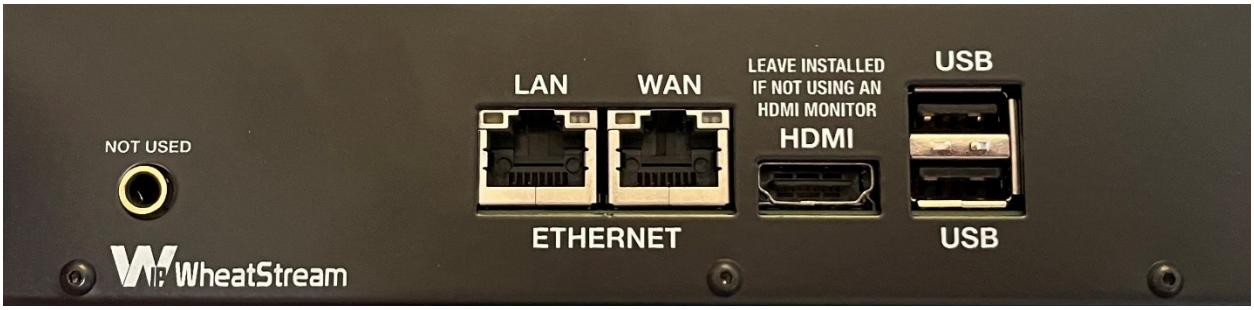
The WheatStream is an 8 channel streaming appliance powered entirely by Audio over IP.

The StreamBlade has the same 8 channel streaming appliance as the WheatStream, but adds an 8 input/8 output WheatNet-IP blade with analog and digital I/O for stations that do not have a full AoIP infrastructure or stations that need additional I/O for their WheatNet-IP system.

This manual applies to both products and covers the setup and operation of the streaming system. If you have a StreamBlade, you will configure the analog/digital I/O as with any other Blade in your WheatNet-IP system using WheatNet-IP Navigator.

INITIAL SETUP

The WheatStream/StreamBlade device is powered by an embedded computer. Make the following connections before applying power:



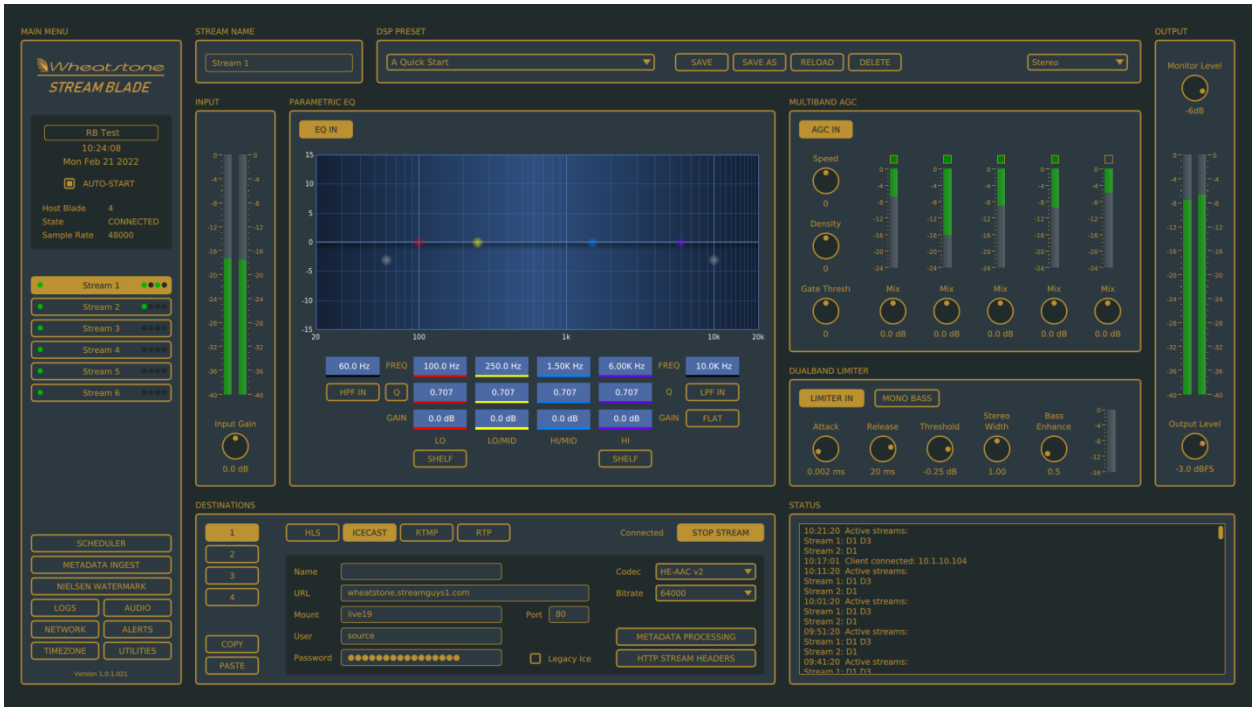
LAN: This is the connection to the WheatNet-IP network or AES-67 audio network.

WAN: This is the connection to the internet.

HDMI: Connect a HDMI monitor here for initial configuration. After setting up the network, you can optionally use the remote GUI on a separate computer to administer the WheatStream and disconnect this monitor. If you choose to do this, insert the dummy HDMI plug into the port, as the embedded PC will not boot if this jack is empty.

USB: Connect a keyboard and mouse here for configuration.

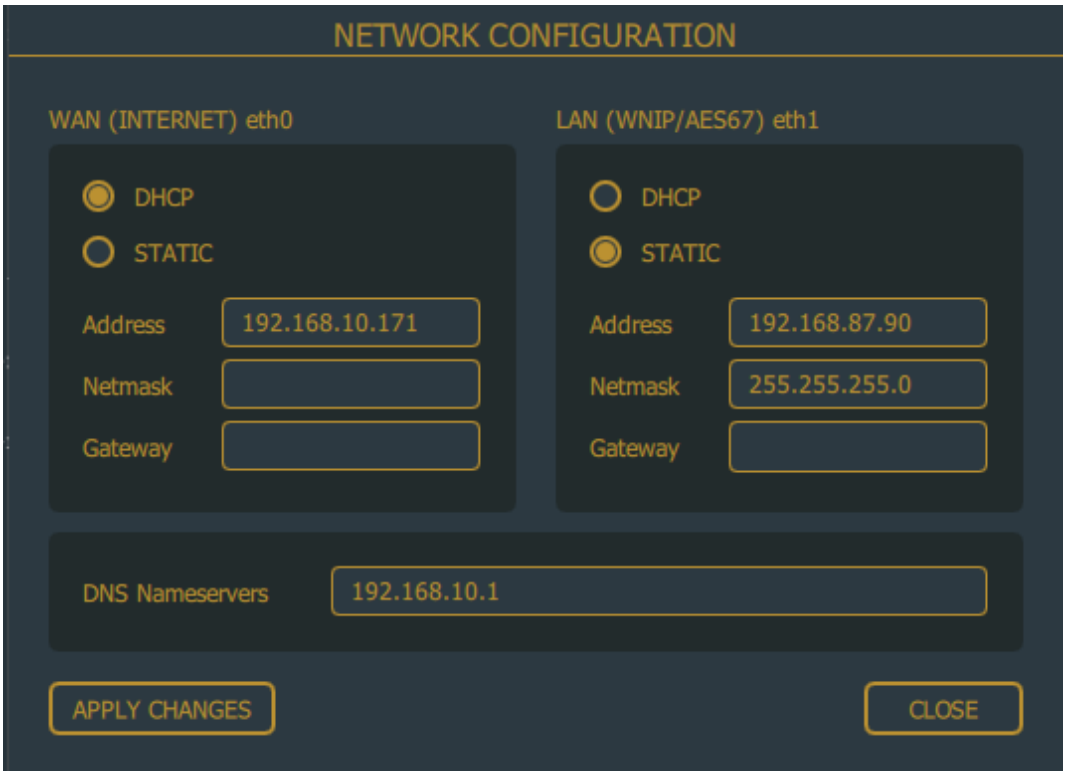
Now you can apply power to the device. The embedded PC will beep once upon booting. After the initial boot process you will be taken to the main screen.



CONFIGURE THE NETWORKS

We need to configure the IP address of both the AoIP network and connection to the internet.

In the lower left corner of the screen, click the Network button.



In the Internet column, choose DHCP or Static to match what your network requires. If you choose DHCP, the DNS Nameserver and the IP address assigned via DHCP will automatically fill in after you apply the changes. If you are using a static IP, you will need to fill in the address, netmask, gateway, and DNS server information.

In the WNIP column, choose DHCP or Static. Most WheatNet-IP networks use static IPs, so fill in the address and netmask, taking care to use an address not used by a Blade.

Click Apply Changes, then Close.

A Note About StreamBlade

StreamBlade has three network connections; two of these connections are on the WNIP network and one connection to the internet. One WNIP connection is for getting audio in and out of the blade hardware and one WNIP connection is joining the embedded PC to the WNIP network. The important thing to know is that you want to give two unique static IP addresses on your AoIP LAN to those WNIP connections (assigning the same IP to both will NOT work) and then you will set up the WAN connection to see the internet.

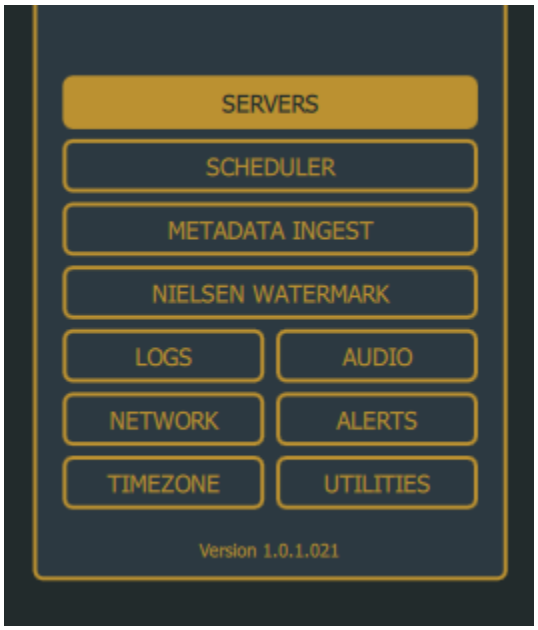
CONFIGURING THE REMOTE SOFTWARE

Let's face it, this device is most likely to end up in a rack room, and rack rooms are loud and cold and generally not a comfortable place to set up processing.

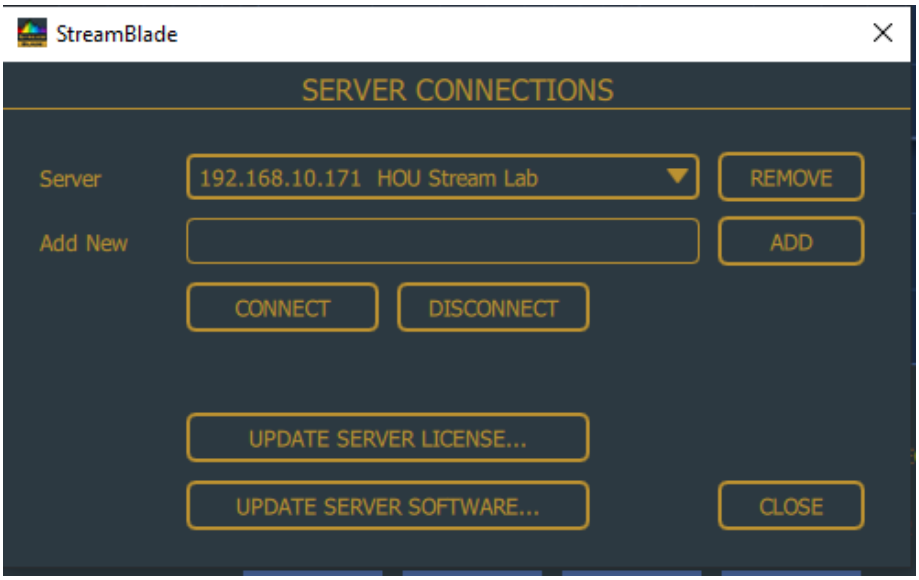
That's why after you've done the initial setup of the WheatStream device, you can remote into the box from anywhere on your network. Why stand in the rack room with a keyboard balancing on a spool of wire when you can manage WheatStream from your desk?

Install WheatStream Remote on a PC that is on the same network/subnet as one of the WheatStream/StreamBlade's network connections. It can be either the WAN (Internet) or LAN (AoIP) so long as your remote PC can connect to the device.

After installation, start the program, and click on the Servers button on the left side.



If your unit doesn't already appear in the Server box, in the Add New box, type the IP address for the WAN or LAN port of your WheatStream device and click Add. You will automatically connect.



If you manage multiple WheatStream appliances, as you add new devices they will be saved in the drop-down menu until you remove them. Using this feature you can then switch to other servers by clicking on the name in the list and clicking Connect.

SETTING THE TIME ZONE

Click the TIMEZONE button in the lower left corner to set up the proper time zone and connect to NTP.

Choose the proper city for your region and click Apply. (Tip: if you are located in a place that does not observe Daylight Saving Time, choose a city that reflects that. For example, someone in Arizona should pick Phoenix and not Denver, because while both cities are in the Mountain Time Zone, Denver observes DST and Phoenix does not.)

In the NTP Server Pool field, several publicly accessible NTP servers are already listed as default. If your network requires you to connect to a private NTP server, enter it here and click Apply.

Setting the correct time zone and setting up NTP will ensure that your logs will have accurate times and scheduled events will happen at the correct time.

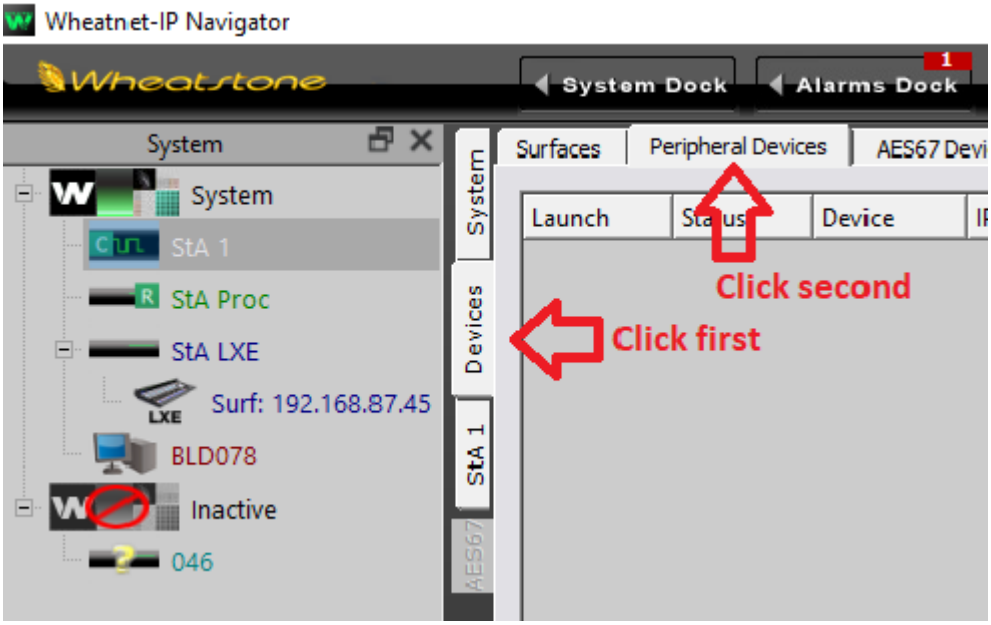
JOINING THE STREAMER TO THE WHEATNET-IP NETWORK

The streaming system that's embedded into both WheatStream and StreamBlade is considered a peripheral device to the WheatNet-IP network. Before we proceed any further, we need to connect the streaming system to a host blade using WheatNet-IP Navigator.

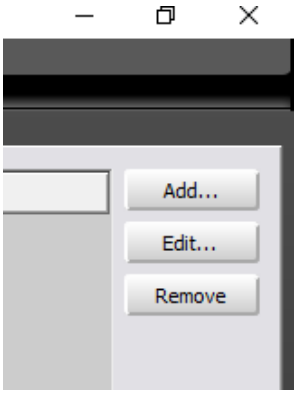
If you do not already have a copy of Navigator, contact Wheatstone support. Navigator is necessary to route audio in and out of the device and will connect to the same network as the LAN connection on the WheatStream. You will find it most convenient to have two network cards on your administration PC; one that's connected to the internet network and one that's connected to the audio network.

For WheatStream, you can assign any Blade in the system as the host. For StreamBlade, you usually will choose the Blade ID that you set for this device, but you could assign any Blade in the system as its host.

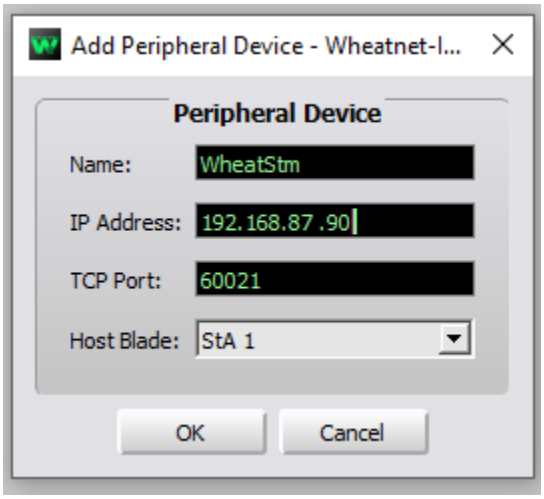
After you have added the streamer as a peripheral device, the sources and destinations for the streamer will appear with the host Blade, so choose a host Blade that's easy for you to find and logically makes sense to you. Got your blade in mind? Great, let's start by opening Navigator and click on the Devices tab on the left, then the Peripheral Devices tab up top.



Now, on the far right hand side of the screen, click Add.



In the center of the screen you'll get a box to fill in:



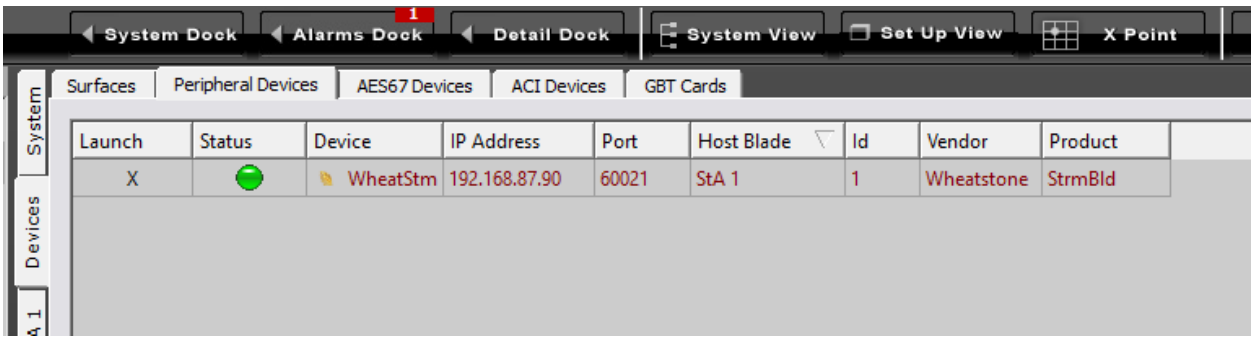
For the Name, give your streamer an 8 character name that will help you identify what it is in Navigator.

For the IP Address, enter the address from the WNIP side of the network settings you just set.

Leave TCP Port 60021 unchanged; this is the port Navigator uses to communicate with the box.

Use the Host Blade drop-down to assign the WheatStream/StreamBlade streaming device to the desired Blade.

Click OK. As long as the WheatStream/StreamBlade is powered up, connected to the correct network switches, and has the correct network settings, you will see a green light.



Now, you're good to go, and when you click on the System/Crosspoints tabs in Navigator, you will see Stream A – Stream H in the sources and destinations.

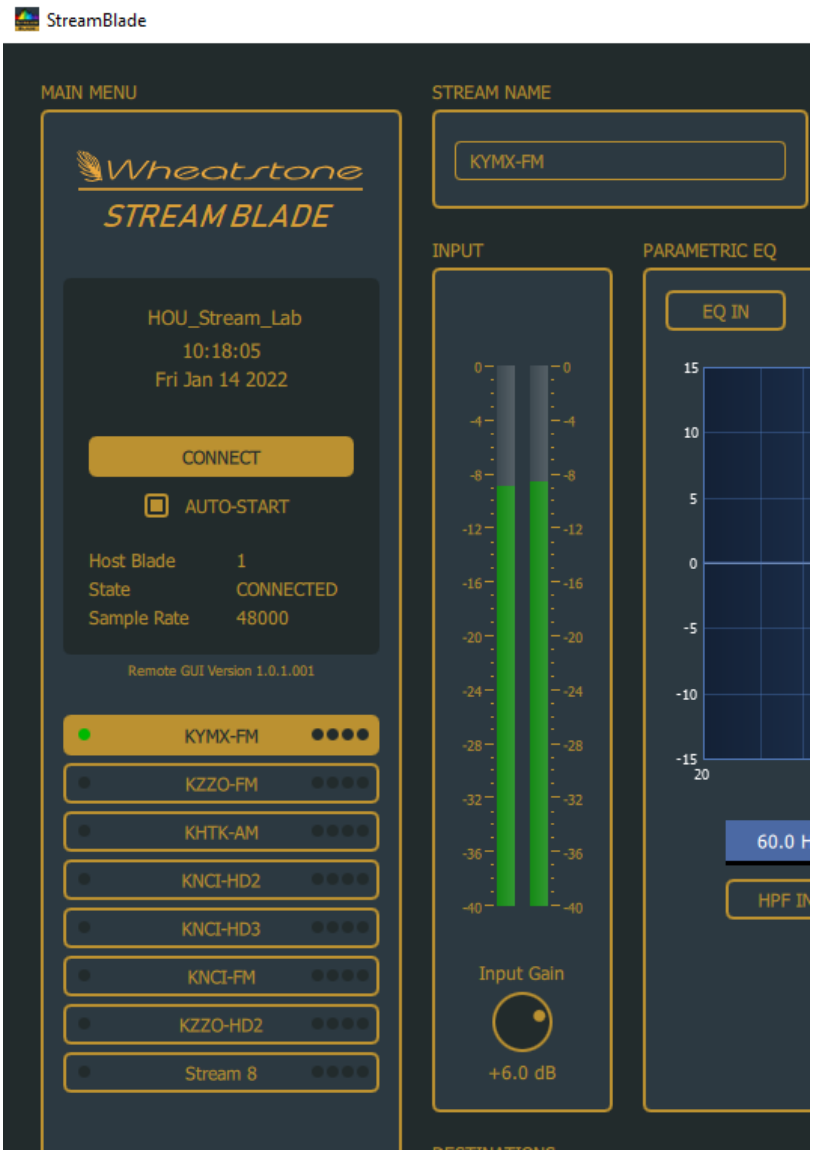
ROUTING AUDIO TO THE STREAMS

From the System/Crosspoints tab, click where the crosspoints intersect between the source along the top (a Program output from a studio or the output of an automation PC, whatever you are feeding to the stream) to the destination of Stream A – Stream H.

Tip! If nothing happens when you click in the intersection of the lines, then Navigator may be in safety mode where you must hold down the Ctrl key on the keyboard while clicking.

If audio is present, Navigator will show a green dot (mono) or green pair of dots (stereo), occasionally blinking red at peaks in the audio. If audio is not present (or very low), the dot(s) will be blue.

Back at the WheatStream GUI, you will see the audio on the meters.



Likewise, back in Navigator, you can find the output of the stream you are working on (Stream A – Stream H) and route it to an output that feeds some monitor speakers so you can evaluate your work.

NAMING WHEATSTREAM/STREAMBLADE DEVICES

You'll notice in the StreamBlade GUI there's a place by the clock where you can name your device.

Click in the box to edit the text. Press Enter when finished.

When you are managing more than one machine, it's nice to have a friendly name to identify which unit you're looking at.

Note that the naming field here is not the same as the Blade name as set in Navigator if this is a StreamBlade. You can give them the same name, or different ones depending upon your needs.

NAMING THE STREAMS

Likewise, it's nice to look at the call letters or program service instead of Stream 1.

In the left menu, click the button for the stream you wish to name. In the Stream Name box up top, type the new name. When you press Enter the change will take effect.

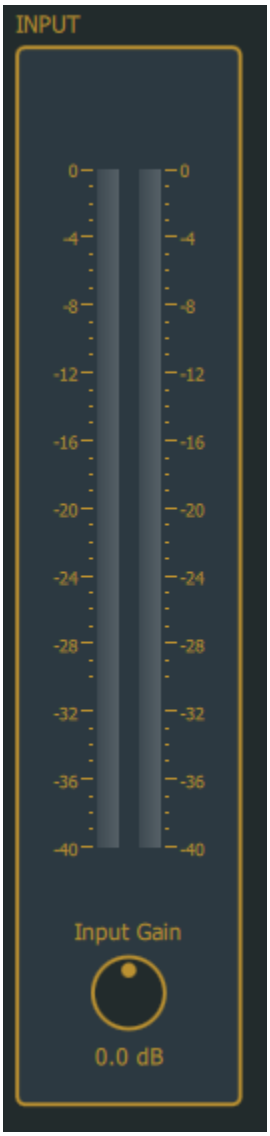

StreamBlade
MAIN MENU
Wheatstone
STREAM BLADE
HOU Stream Lab
08:35:45
Wed Jan 19 2022
CONNECT
AUTO-START
Host Blade 1
State CONNECTED
Sample Rate 48000
Remote GUI Version 1.0.1.001
KDKB-FM
KDKB-HD2
KUPD-FM
KUPD-HD2
KSLX-FM
KSLX-HD2
KDUS-AM
KAZG-AM
STREAM NAME
KDKB-FM
INPUT
0
-4
-8
-12
-16
-20
-24
-28
-32
-36
-40
Input Gain
0.0 dB
PARAMETRIC EQ
EQ IN
15
10
5
0
-5
-10
-15
20
60.0 Hz
HPF IN

GAIN ADJUSTMENTS

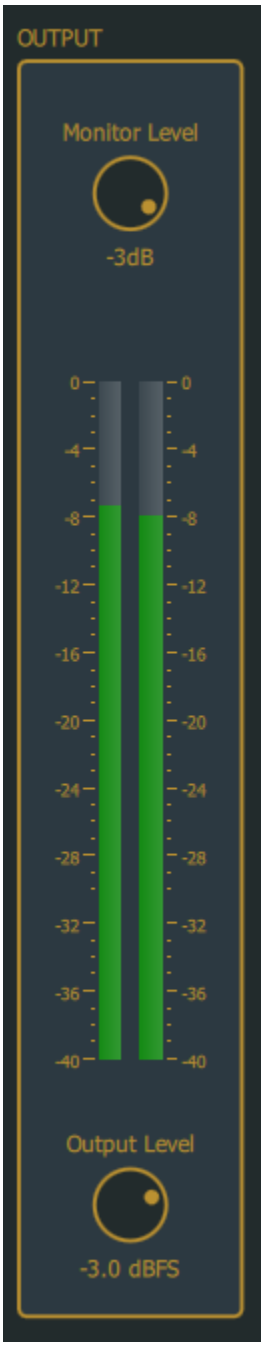
StreamBlade/WheatStream gives you the ability to adjust the input, output, and monitor gain of each stream.

INPUT GAIN

Adjust the input gain knob to set an appropriate level. The metering is peak, not average. Levels should hit between -12 and 0 without exceeding 0.



Output Gain



Adjust the Output Level to set the gain feeding the stream encoder. Changes made to this knob will be reflected in the metering. As with the input, this meter displays peak, not average and levels should hit between -12 and 0 without exceeding 0. The default level set to -3

Monitor Level

Located adjacent to the output meter, this control will adjust the monitor outputs (those listed as Stream A-Stream H in Navigator). Changes to this control will not be reflected in the WheatStream/StreamBlade meter, but you will hear them in your monitors. This control allows you to

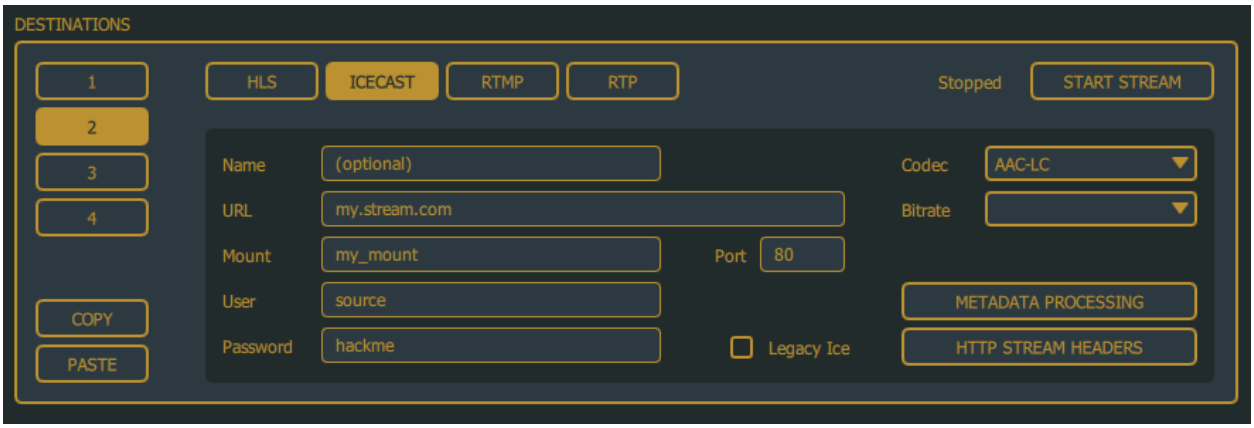
connect a powered speaker to a Blade output and have a level control on the screen to adjust the volume.

STREAM PROVIDER SETUP

The StreamBlade/WheatStream provides for 4 stream destinations for 8 different program services.

In StreamBlade, each ingest stream can be sent to as many as four different destinations, each with its own codec, bitrate, and transport format. The destination is typically a CDN (content distribution network), though RTP streams (either linear PCM or compressed AAC) may be sent to any receiver, such as a transmitter, which accepts that format. Your CDN will supply you with connection information such as the URL, user credentials, preferred transport format and bitrate, etc. Be aware that once a destination stream is started, none of its attributes (codec, bitrate, transport) may be changed without stopping the stream, setting the new parameters, then restarting the stream.

Click on the programming service on the left hand side of the screen, then in the Destinations section, click on the output number you wish to edit.



Choose the server type that your provider supports: HLS, Icecast, RTMP, or RTP, and enter your credentials.

LEGACY ICECAST

When Icecast was first introduced in 1999, it employed an HTTP method ("SOURCE") which has since been deprecated. However, many of these older servers are still in use, and they still expect the older method to be used in the establishment of the initial connection from the "origin server" (e.g. Streamblade).

METADATA PROCESSING

A very important part of StreamBlade's job is to forward metadata (typically from your automation system) to the CDN, where it is used to display artist, title and other information to the listener. Metadata also includes signals that are used to trigger ad replacements for streams which are being heard outside of the geographical location of the stream's origin. It is important to understand that there are no universally accepted standards for the transmission or formatting of metadata – neither for the sources which generate it, nor for the CDN servers which ingest it. In other words, metadata may arrive in virtually any format, and then it needs to be massaged into a different format acceptable to the CDN . For this reason, StreamBlade employs transformation filters written in the Lua scripting language.

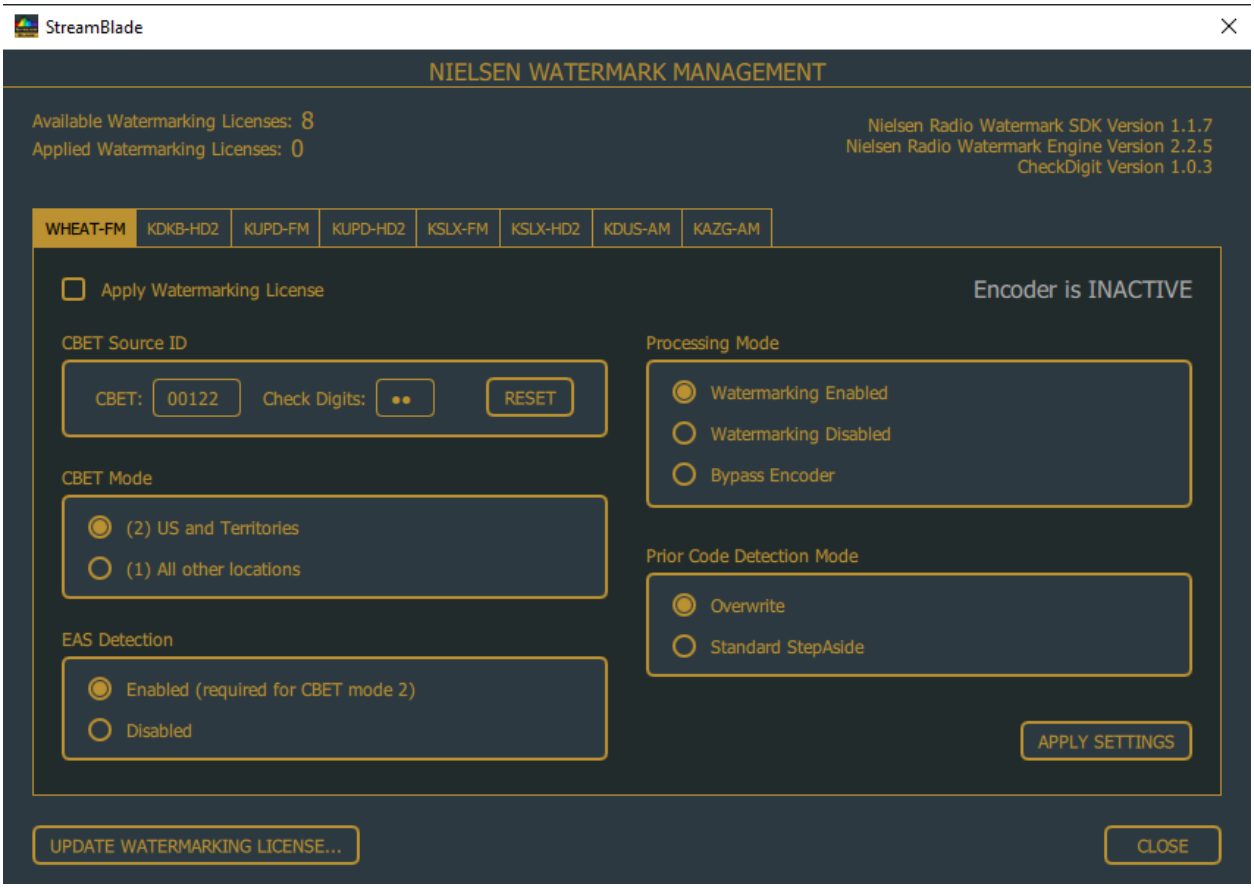
These filters are capable of ingesting metadata in any format, then spitting it back out in another format for the CDN.

StreamBlade can accept metadata coming in via UDP or TCP. Click the METADATA INGEST button to open a dialog where TCP/UDP reception can be enabled. In the DESTINATIONS pane, click the METADATA PROCESSING button to switch the DSP display to the Metadata Processing display. A small set of transformation filters are provided, any of which may be modified and customized to your (and the CDN's) needs. Typically there is a process of discovery and negotiation with the CDN over the precise format of the metadata update messages that will be sent to it. Adventurous users will be able to write or modify transform filters themselves, but we at Wheatstone are also ready and willing to help with this task. Metadata and ad-insertion signaling are areas where commercial standards are actively evolving, so you can expect to see many changes in this area in years to come.

For Icecast streams, please note that static metadata such as the name of the station, description and genre can be set by clicking the HTTP STREAM HEADERS button. Again, these static headers must be set before the destination stream is started.

NIELSEN WATERMARKING

The WheatStream/Streamblade contains a Nielsen PPM encoder to ensure that your station gets ratings credit for panelists carrying meters that hear your streams. Click the Nielsen Watermark button.



A software license is required to use the Nielsen Watermarking feature. Contact Wheatstone Sales if you have not ordered a license and are interested in using this feature. You will also need your station's CBET information from Nielsen to set this up.

See Chapter 4 – Maintenance to learn how to apply the software license to enable Nielsen Watermarking.

CHAPTER 2 - STREAMBLADE AUDIO PROCESSING

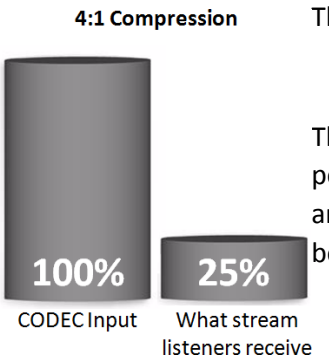
During design discussions for Wheatstone's StreamBlade product we recognized that great sounding Internet streams didn't happen by accident. It takes very carefully designed and specialized audio processing to allow codecs to deliver their best perceived audio quality. That being said, air chain processing is the most *inappropriate* processor for Internet streams, as are repurposed utility compressors and limiters. They simply don't have the intelligence for the job.

WHAT DOES A STREAMING CODEC DO?

The job of a streaming codec is to remove details from the audio and then hide the fact that those details have been taken away. Unfortunately, how well a codec can perform that task isn't just up to the codec; audio that is inappropriately processed can make an Internet stream sound a lot worse than it should if the codec is "making mistakes" because it can't tell processing artifacts from audio. Purpose built stream processing cleverly avoids such pitfalls and will *always* make a huge improvement in the quality of a web stream's sound.

AUDIO IN, A LOT LESS AUDIO OUT

It's not unusual for Internet stream codecs to operate at 4:1 or higher compression. What may not be appreciated is what the seemingly low compression of 4:1 actually means. One way to think of it is "4 parts in and only 1 part out" as shown in the following example.



The left column represents the audio at the codec input.

The right column represents what's *left* of the audio after the codec has performed 4:1 compression. In other words, it's only the remaining 25% that arrives at your stream's listeners; they will never hear all of the original audio because of the missing 75%.

Fortunately, and because of how our hearing works (Google "auditory masking") humans never hear everything that's in the audio anyway and perceptual codecs capitalize on that by removing details we probably wouldn't hear, hopefully without upsetting what we *do* hear. Regardless of the amount of compression, the amount of audio data that needs to be transmitted is greatly reduced. Even a very gentle 2:1 compression removes half of the audio data.

It bears repeating that the *only* job of a perceptual codec is to remove things from the audio that most people won't notice is missing in order to make the data "fit" within the constraints of the stream's bitrate. The lower the codec's bitrate is, the more aggressively it must remove data to make the data fit.

Audio processing artifacts and other unwanted signals can "tease" a codec into making mistakes. Noise, hum, large phase errors between left and right channels, clipping distortion byproducts and non-audio signals are all undesired. Competent Internet stream processing is designed to minimize those undesirables. Again, repurposed on-air processing or utility compressors and limiters are simply not smart enough for the job.

WHAT MAKES STREAMBLADE PROCESSING DIFFERENT?

Taking into consideration everything in the Introduction, we then add the goals that competent Internet stream processing *must* meet to be "competent":

- Not produce, or at least minimize, all of the codec "teasers".
- Provide consistent loudness across widely varied program levels and content.
- Provide consistent spectral balance under all program conditions.
- Provide absolute peak control to keep the codec input level away from 0dBFS (there's nothing above 0dBFS but distortion, i.e. you're "out of bits!"

Wheatstone's StreamBlade accomplishes these goals using a clever combination of processing tools. All eight processing instances are completely independent:

Allpass filters: (phase rotators) make program content waveforms more symmetrical. Symmetrical audio waveforms allow audio processing algorithms to work more effectively, especially when the control of audio peaks is accomplished.

The Internet transmission medium has symmetrical positive and negative limits (like FM), therefore StreamBlade's allpass filters are always active.

A six band equalizer which includes:

- Adjustable high-pass filters to remove non-program related subsonic energy for cleaner sounding processing.
- Four parametric equalizers, two of which may be operated in shelving or parametric modes to allow tailoring of a stream's spectral balance.
- Adjustable low-pass filters to remove out of band and/or very high frequency non-program related energy. Doing so can make codecs sound better, especially when operating at very low bitrates.

A multiband main processor:

- Each band's Predictive Dynamics Controller utilizes Neural Network techniques to manage each band's gain for extremely natural management of program dynamics. Sophisticated algorithms utilize current and historical data to steer the processing to *exactly* what is required at that instant.

A highly specialized multiband final peak limiting section:

- On-air processor style Bass Management permits customizing the sound of the web stream to better match a station's on-air bass style and texture.
- Sophisticated Stereo Width Management maintains a natural stereo sound field, always preventing over enhancement of already wide stereo separation.
- Specialized multiband final peak limiters managed by Peak Energy Estimators for excellent peak control and vanishingly low inter-modulation distortion and dynamics- related artifacts.

StreamBlade's audio processing offers a wide adjustment range to allow the texture of streamed content to be customized. Anything from virtually indistinguishable from the incoming programming to wall of sound is possible. Even codecs running at very low bitrates will be presented with codec-friendly audio.

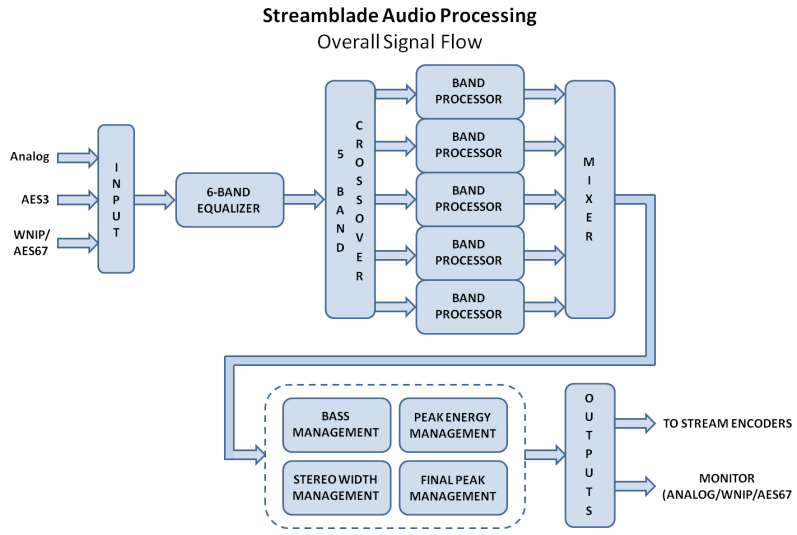
WHY PROCESS THE STREAM DIFFERENTLY THAN ON AIR?

As mentioned previously is the possibility for StreamBlade's processed audio to sound almost identical to the incoming programming even though the dynamic range has been drastically reduced. Such flexibility was designed in for several reasons:

First, not every stream type needs to be processed by heavy handed algorithms – sometimes the goal is to hear the stream's audio sound more like the original programming. Second, the "gentler" the processing seems, the more opportunities a codec will have to remove things we won't notice. Third, being able to run "gentle" doesn't mean that StreamBlade can't also set the world on fire with radical changes in dynamic range and spectral rebalancing – if that is the stream's sound target.

Across its entire adjustable operating range StreamBlade provides consistent loud- ness and spectral balance; its output is *always* processed and a quick output to input comparison bears that out. Because StreamBlade's output might not "sound" processed under certain conditions, that doesn't infer that it isn't. Radical differences will always be measurable and audible in direct A/B tests.

STREAMBLADE PROCESSING BLOCK DIAGRAM



The above diagram shows the audio signal flow for one of StreamBlade's eight audio processing instances, noting that the input can receive audio from analog, WheatNet/AES67 or AES3 sources.

StreamBlade's audio processing and Streaming Engines are hosted within its own WheatNet-IP Blade whose rear-panel analog and digital I/O adds lots of options for signal routing. Audio routing to StreamBlade's processing inputs may be modified via Wheatstone's Navigator utility.

Each processing instance has its own Input Gain control with a +/-12dB available adjustment range to best match the incoming program levels. The default Input Gain setting is 0dB in all Factory Presets which presents a unity gain (0dBFS) signal path to the outside world.

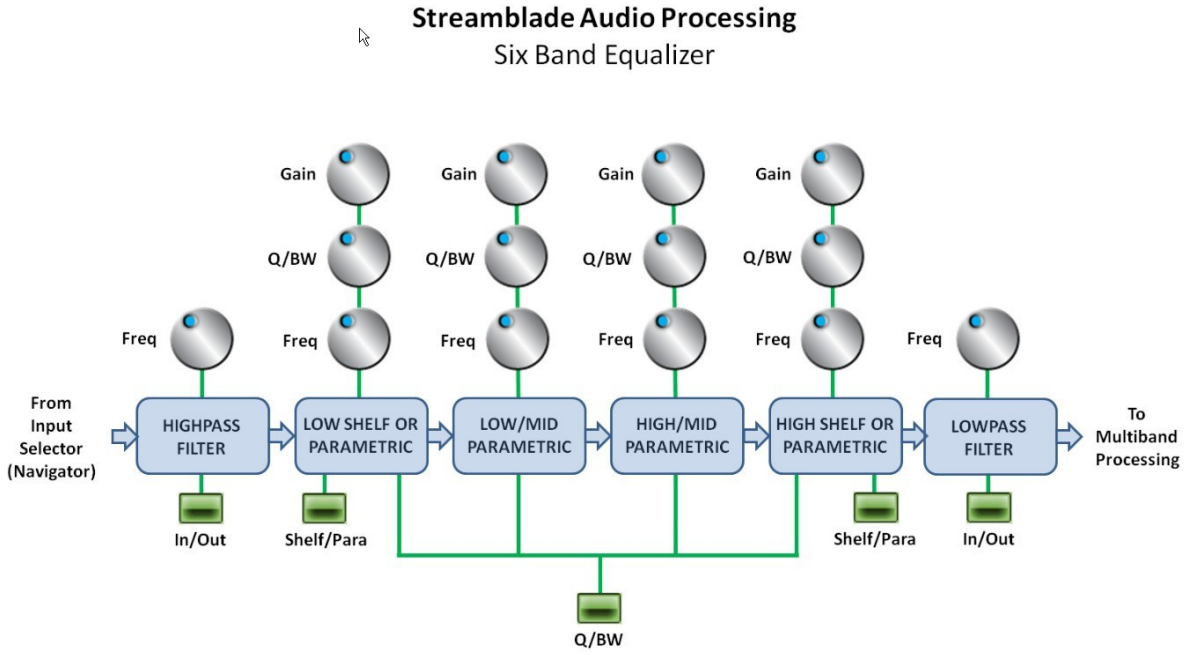
Each of StreamBlade's processing instances can feed *five* different destinations:

- Four Streaming Engines dedicated to HLS, ICECAST, RTMP and RTP destinations.
- Audio outputs for pre-codec monitoring to allow StreamBlade's processing to be monitored in real time rather than waiting for the audio stream to be decoded.
- The processed audio being fed to the Streaming Engines and the monitor outputs share a *common* Output Level control with an adjustment range of -24dB to +0dB. Setting the Output Level control to 0dB permits the maximum permissible audio levels into the codec; by design about -0.25dBFS when all processing is enabled and StreamBlade is running a Factory preset.

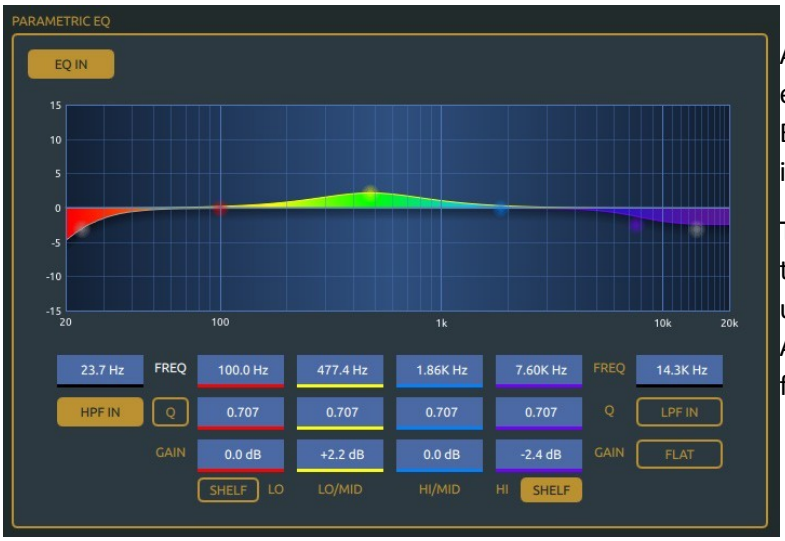
As noted above, the gain structure of StreamBlade's final audio limiters is configured to achieve a maximum peak level of -0.25dBFS into the Streaming Engines when the Output control is set full scale to 0dB. Constraining the maximum peak output level to below digital full scale prevents unintentional downstream headroom issues which might otherwise occur if gain were allowed to be added *after* StreamBlade's limiters.

If the final limiter is switched Off or is operating with long attack times peak output levels may be indeterminate and may try to exceed 0dBFS. This will result in distorted stream audio.

SIX BAND EQUALIZER



The signal path through StreamBlade's equalizer section is shown above, including the high pass and low pass filters and the four parametric equalizers which may operate in parametric or shelving mode.



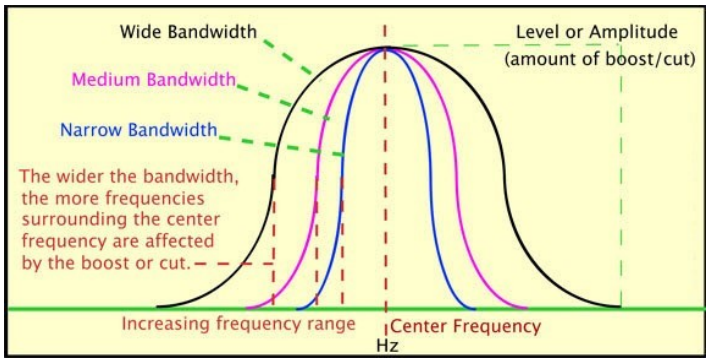
At left is a screenshot of StreamBlade's equalizer controls. At upper left is the EQ IN/EQ OUT button which will illuminate when the equalizer is active.

The HPF IN button at lower left enables the high pass filter which removes unwanted low frequency energy. Above the HPF IN button is the filter's frequency selector.

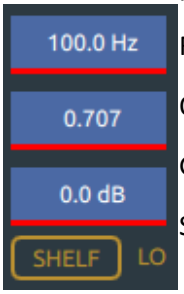
The equalizer's Q/BW button selects whether the parametric equalizer will use Q or Bandwidth parameters for setting how equalization affects adjacent frequencies. Higher Q settings create a narrower filter as do lower bandwidth settings so functionally, Q and Bandwidth could be considered reciprocal.

The following compares Bandwidth, Q, and the amount of audio spectrum affected by the equalizer *around* a selected center frequency.

BW (Octaves)	Q
2.0	0.667
1.0	1.414
2/3 (0.66666)	2.145
1/2 (0.50000)	2.871
1/3 (0.33333)	4.318
1/6 (0.16666)	8.651
1/10 (0.10000)	14.242
1/30 (0.03000)	43.280



There are four parametric equalizer sections. Sections one and four may be operated in either shelf <u>or</u> parametric mode.



FREQ: Adjust the frequency where boost or cut will take effect.

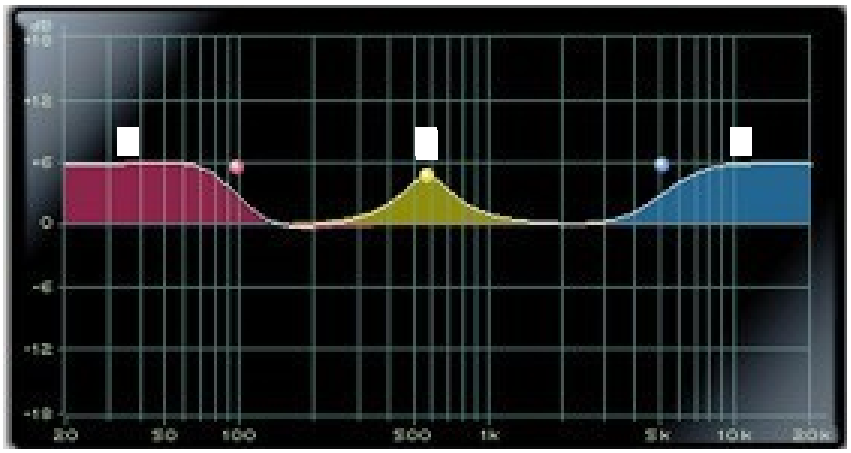
Q/BW: Sets how much audio spectrum around FREQ is affected by boost or cut.

GAIN: Sets the boost or cut applied to the selected FREQ.

SHELF: Selects equalizer band one's Shelf mode (rather than parametric).

The Shelf and Parametric modes shape the audio spectrum in different ways. Shelf mode affects all frequencies above or below a particular frequency while parametric mode affects frequencies either side of a center frequency. The graphic below compares the equalizer behavior when in shelf or parametric modes.

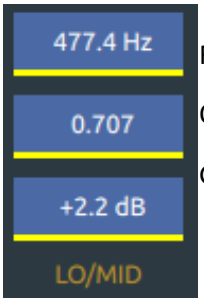
Shelf Parametric Shelf



A Shelf response is useful for boosting overall bass heft or brightness.

A Parametric response is useful for enhancing or reducing a narrow band of energy around a chosen center frequency.

The LO/MID and HIGH/MID equalizers have only parametric behavior and are useful for boosting or cutting just a *specific* band of frequencies around a desired *center* frequency. There are three controls associated with the LO/MID and HIGH/MID equalizers:



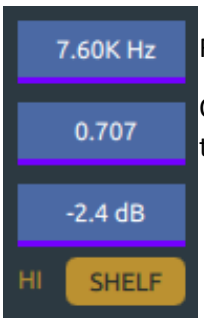
FREQ: Adjusts the frequency where boost or cut will take effect.

Q/ BW: Sets how much audio spectrum around FREQ is affected by boost or cut.

GAIN: Sets the boost or cut applied to the selected FREQ.

Note that the parametric equalizers may be *overlapped* to create highly specialized filters.

The fourth equalizer may be operated in either its shelf or parametric mode.

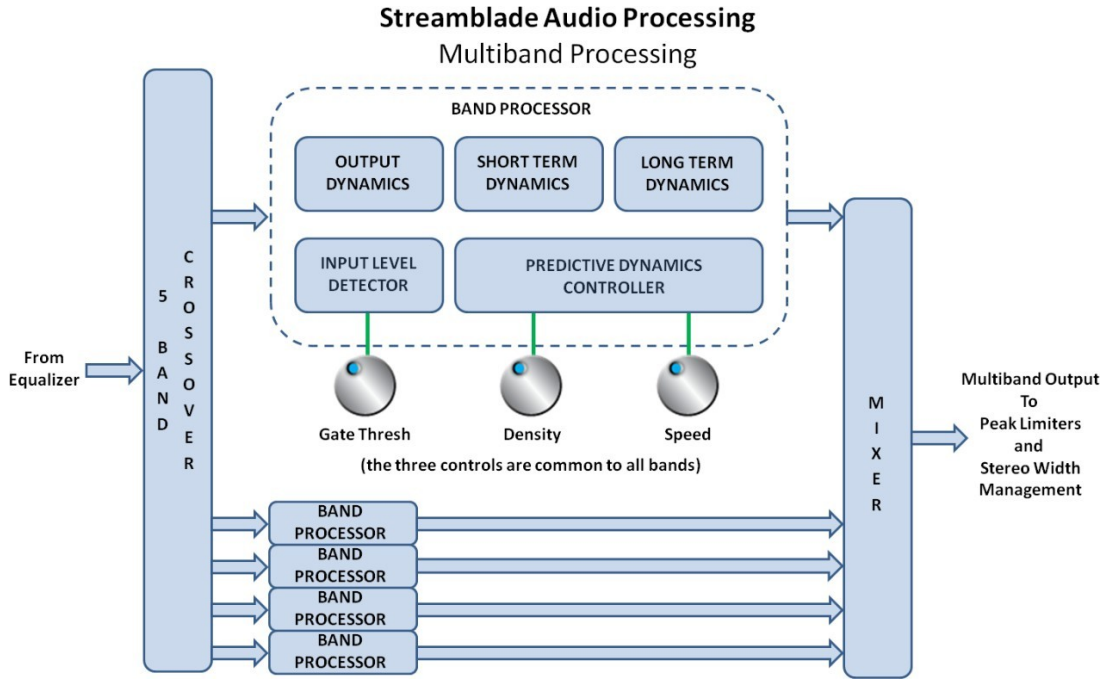


FREQ: Adjusts the frequency where boost or cut will take effect.

Q/ BW: Sets how much spectrum around FREQ affected by boost or cut. GAIN: Sets the boost or cut applied to the selected FREQ.

SHELF: Selects equalizer band four's Shelf mode (rather than parametric).

MULTIBAND PROCESSING SECTION



The above diagram shows the signal flow through the five-band processor with extra detail shown for Band One.

AGC USER CONTROLS

Each of the five processing bands has a gain reduction meter with a zero to -24dB scale which shows the depth of processing at that moment.

Located directly above each gain reduction meter is the GATE indica- tor for the band. The GATE indicator will be ON (lit) when the input level to a band is *above* the setting of the Gate Thresh control. In other words, a lighted Gate indicator shows that a band is actively engaged.

Under certain processing conditions one or more gain reduction meters may appear to be at full scale – maximum gain reduction –

however this is no cause for concern. There is *plenty* of processing headroom beyond a meter's -24dB indication, but unlike conventional processing StreamBlade's audio does not get more dense or "tighter" as the gain reduction gets deeper, even if pushed well beyond -24dB full scale.

The user controls Gate Thresh, Density, and Speed are common to all five bands. Though they *are* common controls how they affect the processing in each band on a moment to moment basis depends on past and present characteristics of the unprocessed *and* processed audio within that band.

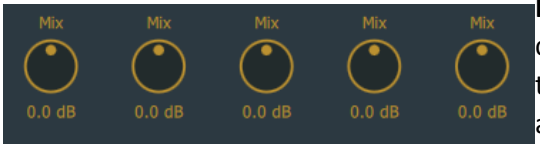
SPEED**:** Like the other two "processing" controls the Speed control has 21 positions from -10 to +10. 0 is the default setting in all Factory presets. Higher settings cause processing to more tightly regulate a band's output level while lower settings have the opposite effect. Unlike conventional processing, StreamBlade's Speed control does *not* affect release times but only increases *opportunities* for a band to change its gain.

DENSITY**:** While StreamBlade processing can invisibly manage the audio levels of all program types, sometimes invisible is not what is wanted. The Density control allows the user to dial in some "excitement" or "radio show" for how StreamBlade sounds as it processes the audio.

GATE THRESH**:** The Gate Thresh control determines a band's threshold upon which gain changes are frozen if the input audio level falls. When a band is gated its gain is held steady so as to not increase noise. Lower Gate Thresh settings permit the input level to fall farther before freezing the gain. Higher settings increase the threshold for when a band's gain will unfreeze.

Referring to the block diagram, each band's Input Level Detector, Output Dynamics, Short and Long Term Dynamics and Predictive Dynamics blocks measure certain characteristics of the incoming and processed output audio. Such data allows each band's Neural Network to "steer" its attack times, release times, compression ratios and control slopes to ensure that the band's output is exactly what the user desires given his settings of the Speed and Density controls.

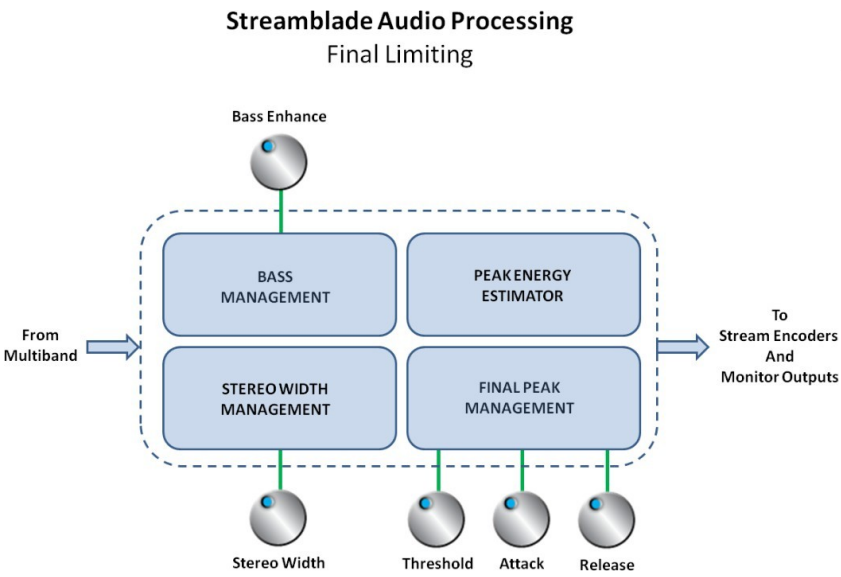
Of note is the complete absence of the typical multiband coupling controls. Stream- Blade's intelligence ensures that the bands never wander too far from each other, even though the multiband Linkwitz-Riley crossover slopes are rather steep.



Mix: MIX: Each band of processing has its own output Mix control to allow the spectral balance of the processed audio to be customized. The Mix controls have a +/-6dB adjustment range with 0.1dB steps. In Factory presets the Mix controls will be in their 0dB positions.

Another role of the Mix controls is setting how hard the Final Limiter section is driven. As a Band Mix control is turned clockwise its output level increases which then drives the Final Limiters harder and causes them to do more limiting. It follows that a generic increase in overall limiter drive can be accomplished by advancing all five Mix controls clockwise by an equal amount. Likewise, a decrease in final limiter drive may be accomplished by turning the Mix controls in the opposite direction. Keep this behavior in mind if the drive to the final limiter needs to be adjusted.

FINAL LIMITING



The final Limiter has its own IN button which is illuminated when that section is active. The gain structures of the multiband section and back end limiters are arranged so that the *average* output level doesn't radically change when sections are switched in and out. The peak output level *will* increase however when the limiters are bypassed due to the lack of peak limiting.

StreamBlade's Dual Band Limiting is where the majority of "codec-friendly" processing occurs.In very general terms the final limiting separately occurs in two bands, above and below 250Hz.

LIMITER USER CONTROLS

The Dual Band Limiter, its controls and its gain reduction meter are shown in the graphic at left.

LIMITER IN/OUT: When Limiter In is illuminated the Dual Band limiter sections are enabled; all related processing is active. If the Limiter In button is not illuminated peak control is disabled and the peak audio output level is uncontrolled and therefore could be high enough to cause audio clipping in the stream encoder.

MONO BASS: To assist low bitrate codecs in their endeavor to reduce the data to be streamed it can be beneficial to remove low frequency energy in the stereo difference channel (L-R). For StreamBlade that includes frequencies below 250Hz.

The "Mono Bass" option is effective because our ears are less sensitive to stereo separation at low frequencies, a fact that makes stereo separation redundant for a good perception of stereo. When the Mono Bass button is illuminated StreamBlade removes energy below 250Hz in the L-R stereo difference channel (only!). With such energy removed the codec doesn't see or try to encode it, leaving more bits available for encoding things which are more perceptible.

ATTACK**:** Sets the attack time of the final limiters in StreamBlade's limiting section. To accommodate the widest possible use cases the adjustment range has been made quite large: 10 microseconds to 1 millisecond (0.001 to 1.0mS). Short attack times below about 50 microseconds (0.005) will provide extremely tight limiting with virtually zero overshoots, and without resorting to clipping.

In all Factory Presets the Final Limiter Attack time is set quite fast, the Limiter Threshold is set to -0.25 dBFS, and the Output Gain control is set to -3.0dB. With these settings the processor's final peak level output should be no higher than -3.25dBFS, approximately the industry recommended maximum peak audio input level for streaming codecs.

RELEASE**:** Sets the release time of the final limiters in StreamBlade's limiting section. Like the attack time, the release time adjustment range has been made quite broad: 1.0 millisecond to 100 milliseconds. Although wide, this adjustment range was provided both for "artistic" reasons and to accommodate all possible use cases.

Note that setting the limiter release times below about 10 milliseconds may create some artifacts with sustained limiting depth beyond a few dB. The most effective peak control occurs when the limiter is doing no more than about 3dB on peaks. Deeper and/or more sustained limiting provides no real benefit and can create listener fatigue.

THRESHOLD**:** Sets the threshold of limiting in dBFS (decibels below digital full scale) for the final limiters which then determines the maximum peak level fed to the Output Level control.

STEREO WIDTH**:** In streaming, the stereo image width needs to be managed in order to optimize how codecs sound, especially those operating at low bitrates. Preventing excessive stereo image width helps mitigate the "codec swishies" and other artifacts not part of the original program audio.

With the Stereo Width control set to 1.0, as it is in Factory presets, the encoded stereo image width will be very similar to the original source material and will remain so over a very large range of program content.

Stereo Width settings lower than 1.0 can be advantageous for codecs operating at or below 64kbit/s. Likewise, codecs operating at or above 128kbit/s can *usually* encode additional L-R stereo information without generating undesirable artifacts. The range of the Stereo Width control has been constrained to prevent codec-teasing and excessive stereo im- age width. When the control is set to zero, energy above 250Hz will be reduced to mono *(see below). When the control is set to its 2.0 position the stereo image width above 250Hz is enhanced by 6dB.

***Special Note**: If the Stereo Width control is advanced to zero and the Mono Bass function is not enabled, stereo separation will only exist below 250Hz unless/until the Mono Bass function is activated.

BASS ENHANCE**:** The Final Limiter is equipped with an on-air style Bass Processor to allow better matching of a station's Internet stream to its on-air sound. The Bass Enhance algorithm operates only on L+R (mono) frequencies below 250Hz, and unlike the Mono Bass function has minimal effect on the sound of low bit rate codecs, even with generous bass enhancement dialed in.

OUTPUT**:** Sets the peak audio output level in dBFS (deciBels Full Scale), of each processing instance and therefore the input to its Streaming Engine. It also sets the output level of the monitor outputs and the processed audio available within the WheatNet-IP domain.

The Output Gain control has an adjustment range of -12dBFS to 0dBFS in 1dB steps and is set to -3dBFS in Factory presets.

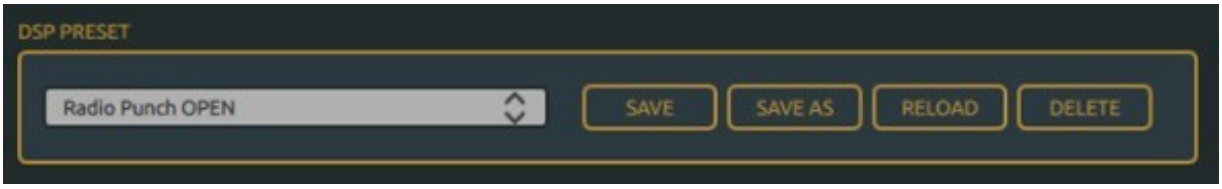
A FEW WORDS ABOUT STREAMBLADE FACTORY PRESETS

StreamBlade comes equipped with a generous selection of Factory Presets with around 50 presets being the norm. The intent of this large a selection is to permit an end user to deeply explore the wide variety of dynamics and tonal textures that StreamBlade can create.

The multiband processing section's "Speed" and "Density" controls allow each preset to be highly modified from its original Factory settings. As a data point, modifying 50 Factory presets using just those two controls can create over 22,000 combinations of sound and texture.

When the five Band Mix controls and their adjustment ranges are considered, there are even more choices; in fact over 13 million different combinations of sound, texture and spectral balance are available with those 50 Factory presets!

As is standard fare on most modern audio processors, StreamBlade's Factory presets are configured so they cannot intentionally be overwritten, creating a safe place to return to if one happens to get "lost".



The Preset dialog's SAVE, SAVE AS, RELOAD and DELETE buttons do exactly as their labels suggest, though the RELOAD button might need a brief explanation.

If a Factory Preset has been recalled and then modified by the user controls, clicking the RELOAD button simply reloads the last taken preset without having to go back to the list of presets to locate and select it again. Consider the RELOAD button a shortcut to resetting the preset parameters back to the Factory settings before they were modified by the user controls.

WE APPRECIATE AND DESIRE USER FEEDBACK FROM THE FIELD!

If you find that the factory presets don't result in the sound you are seeking, please reach out! We can be reached via our Website's Tech Support Portal, as well as by email or phone:

On the web: www.wheatstone.com/support
Via email: techsupport@wheatstone.com
Via telephone: (252) 638-7000

CHAPTER 3 - USING THE SCHEDULER

Streaming your programming is easy, right? Sure, until it's not.

While most stations will stream whatever is on their terrestrial on-air signal all of the time, performance rights rules sometimes makes things complicated. For example, if your station carries sporting events, some leagues won't allow you to stream that programming. Or perhaps your station streams local sporting events that aren't carried on your on air signal several times a week, or your station carries a mix of music and talk and you want to optimize the stream's processing to match the source material.

With the scheduling software that's built into WheatStream/StreamBlade, you don't need to count on a board operator going in to click the right button at the right time.

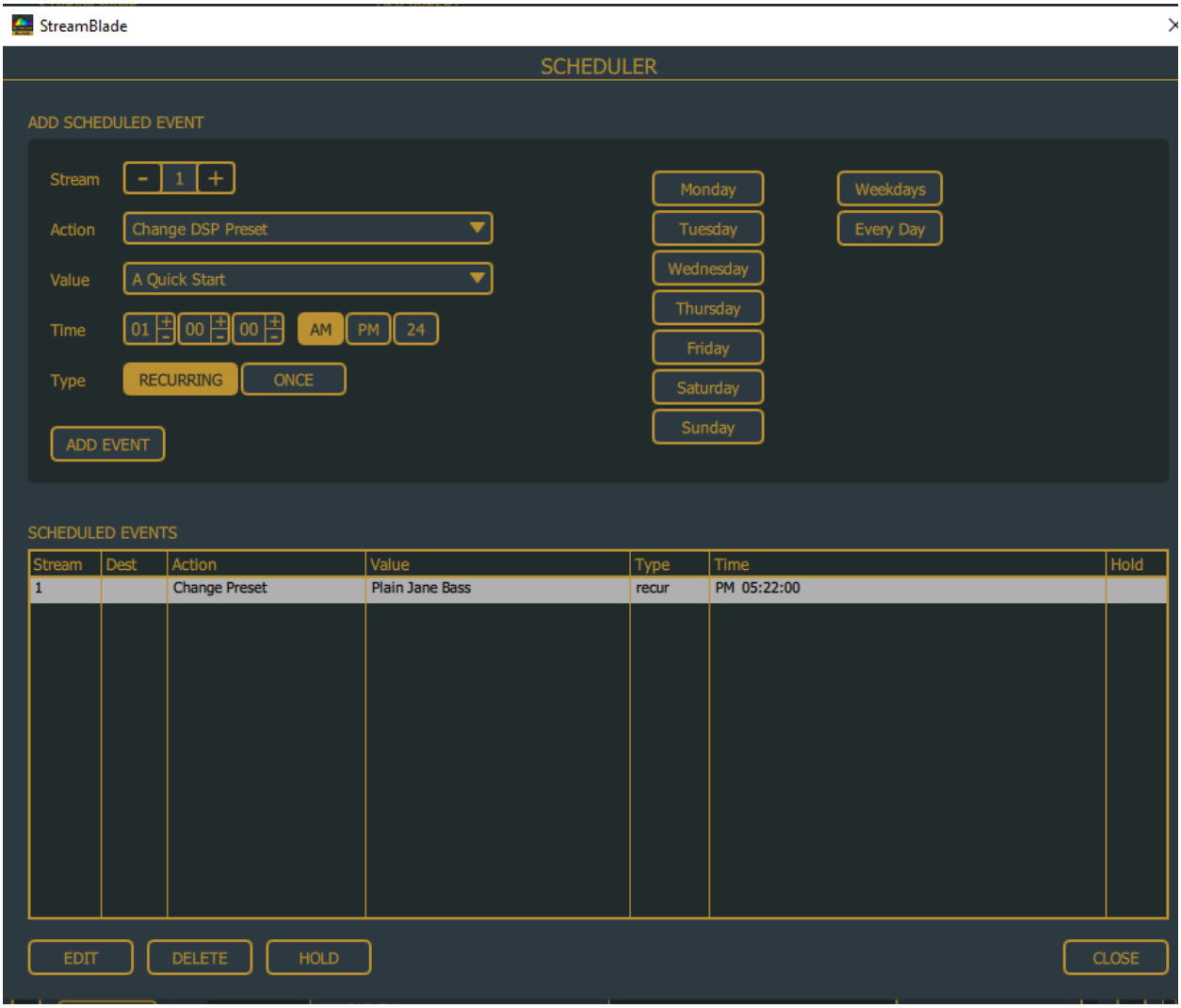
EVENTS THAT YOU CAN SCHEDULE

- Change DSP Preset
- Start Destination Stream
- Stop Destination Stream
- Set Metadata Filter (4 User Variables available)

Events may be scheduled to happen once at a specific day and time, or to happen on a recurring basis. Recurring events can happen at a time on a specific day of the week, or at a specific time on weekdays only, or at the same time every day.

CREATE A RECURRING EVENT

Click the Scheduler button in the lower left corner.



Choose which stream number you are using.

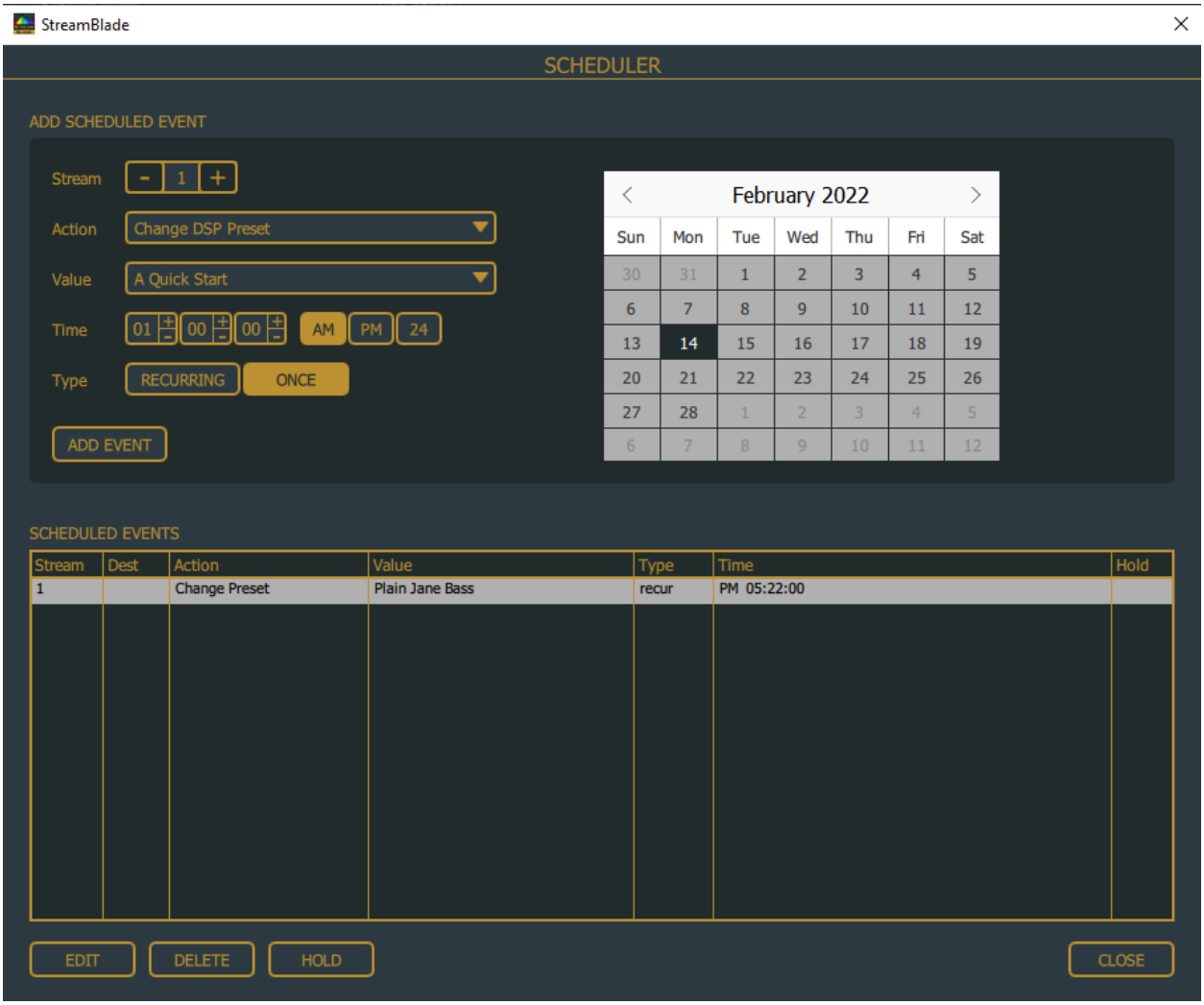
Pick the **Action** from the drop-down menu. The **value** field will change to match the action.

Set the time, using the buttons to select AM/PM or 24 hour time entry.

Click the buttons for the days of the week it will repeat. You can choose more than one day of the week. The Weekdays and Every Day buttons may be used as a shortcut. Click **Add Event** to add this to the schedule.

CREATE A ONE-TIME EVENT

Click the Scheduler button in the lower left corner.



Choose which stream number you are using.

Pick the **Action** from the drop-down menu. The **value** field will change to match the action.

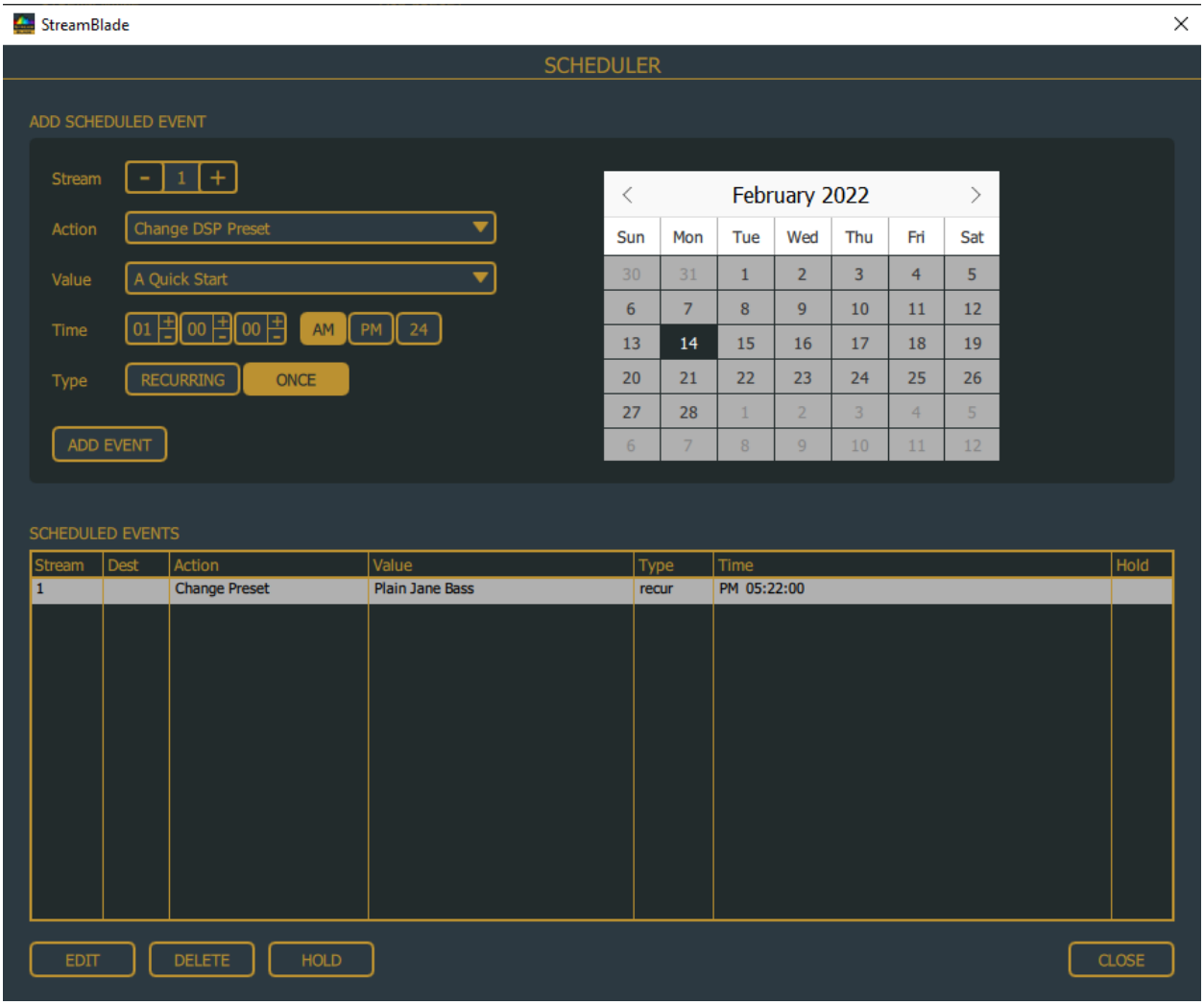
Set the time, using the buttons to select AM/PM or 24 hour time entry.

Click the **ONCE** button. A calendar will appear. Highlight the desired date.

Click **ADD EVENT** to add this to the schedule.

PUT A SCHEDULED EVENT ON HOLD

Click the Scheduler button in the lower left corner



Click to highlight the desired event.

Click the **HOLD** button.

The word “true” will appear in the Hold column.

Events on hold will be skipped. To resume the schedule for this event, click to highlight the event, click the **HOLD** button, and the “true” will be removed making the event active again.

USING THE METADATA FILTER TO DELAY METADATA

When your station uses profanity delay, you can get into a situation where the title and artist metadata will be sent to the stream encoder before the audio actually hits.

If your automation system has a LUA metadata transform filter for delay, setting the user value of that filter to match the profanity delay buffer time will delay the metadata by that many seconds.

For example, a Wide Orbit customer whose User Defined Filter of *WideOrbitXML_WideOrbitICEbarsV3Delay* using a 12 second profanity delay set the value of that filter to 12, the metadata change would be delayed by 12 seconds.

If you're only in delay for one daypart like a morning show, putting this filter on a schedule would delay the title/artist information while you're in delay and then shift back to normal when the profanity delay is removed.

See Chapter 4 to learn how to upload LUA metadata transform filters.

CHAPTER 4 – MAINTENANCE AND OPERATIONAL TIPS

MONITOR VIEW KEYBOARD SHORTCUTS

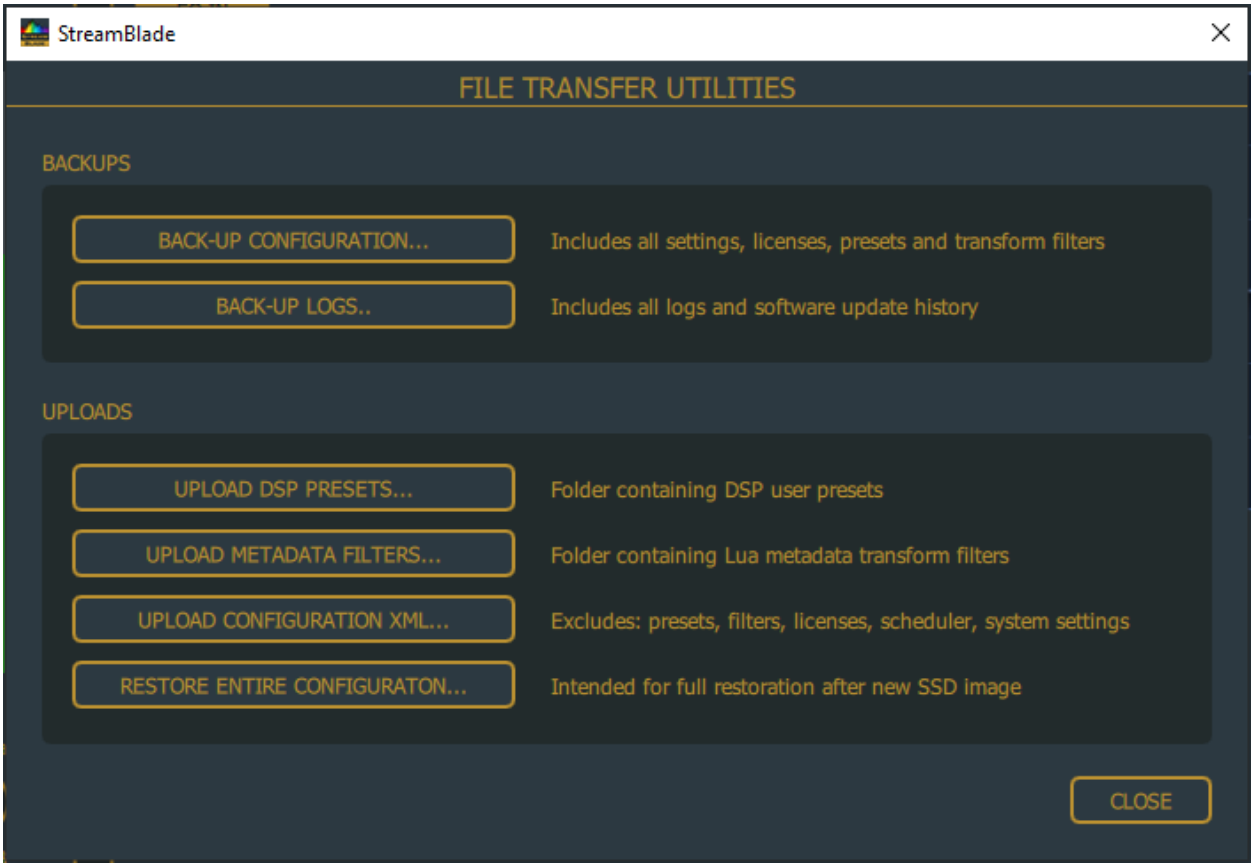
If you are using a less-than full size monitor for either server or remote client, the following keyboard shortcuts will be helpful:

<Alt> + F2 toggles in and out of fullscreen mode

<Alt> + F3 reduces the window to 80% of monitor size

REMOTE UTILITIES

Clicking the UTILITIES button in the lower left corner while in the remote client will give you the following options:



BACK-UP CONFIGURATION: this will save all settings, licenses, presets, and transform filters to C:\Users\Public\Wheatstone\Backups on your remote PC. This is saved as a .tar file; if you do not have an archive program that can read a .tar, we recommend 7-Zip.

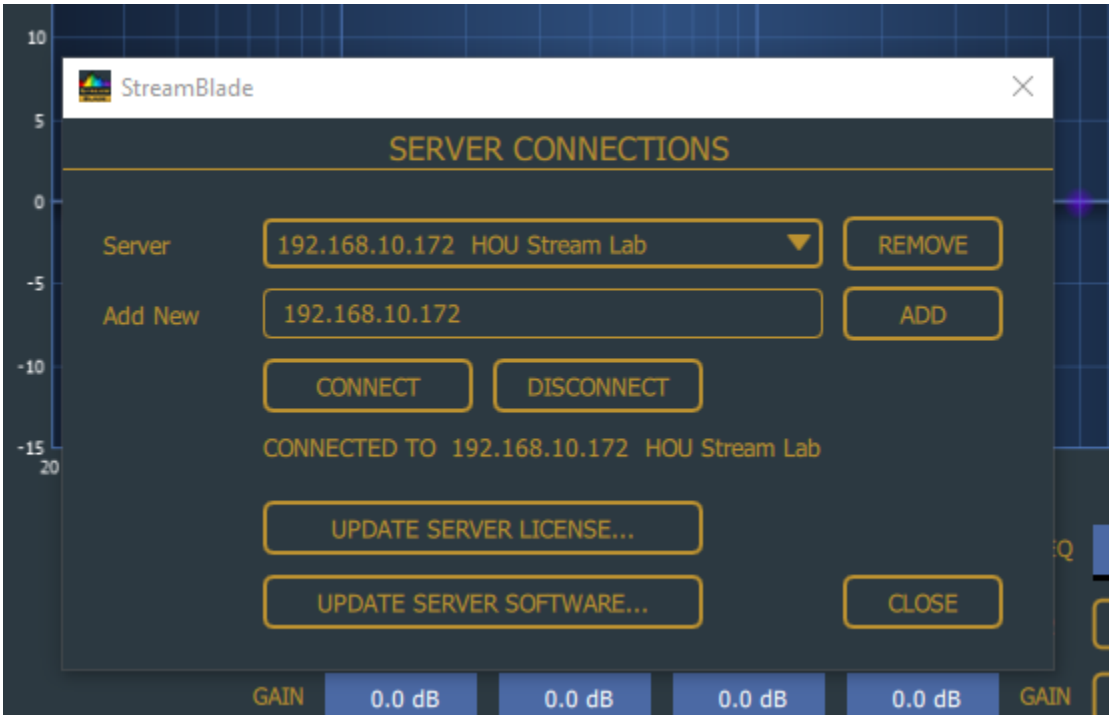
BACK-UP LOGS: this will back up all logs and software update history to C:\Users\Public\Wheatstone\Backups on your remote PC. Again, this will be saved as a .tar file.

This page will also give you the ability to upload DSP presets, LUA metadata transform filters, a configuration XML file, or an entire configuration from the factory from the remote PC.

APPLY SOFTWARE LICENSE

Certain features of WheatStream/StreamBlade, such as Nielsen Watermarking, requires an additional software license.

After obtaining a license file from Wheatstone, open the remote client, and click on the **SERVERS** button in the lower-left hand corner and connect to your WheatStream/StreamBlade server.



Click the **UPDATE SERVER LICENSE BUTTON**

Paste the license text into the box or browse for the text file that has been provided. Apply.

UPDATE SERVER SOFTWARE

From time to time, Wheatstone will provide software updates for your WheatStream/StreamBlade device.

There are two types of update files: the Operating System and the Software.

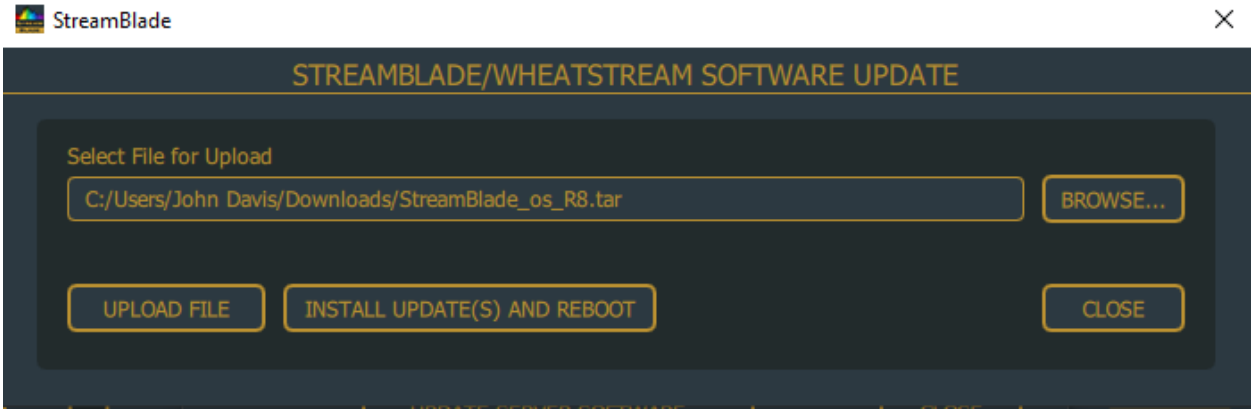
The Operating System file is a compressed update for the Linux operating system on the Jetway PC.

The Software file is an update for the Wheatstone applications running on the operating system.

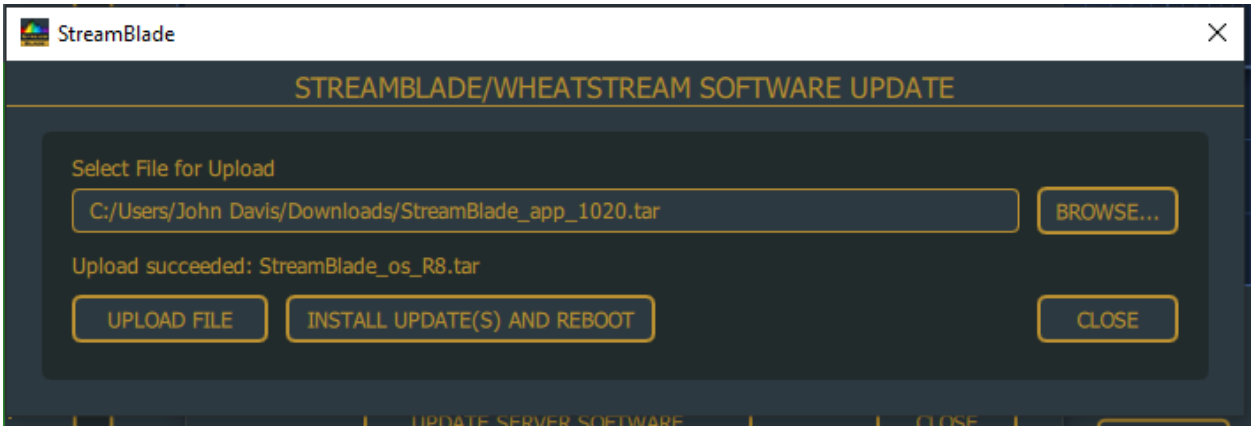
It is critical that the steps for these updates are performed in the proper order to prevent locking up the PC.

UPDATING BOTH THE OS AND THE SOFTWARE.

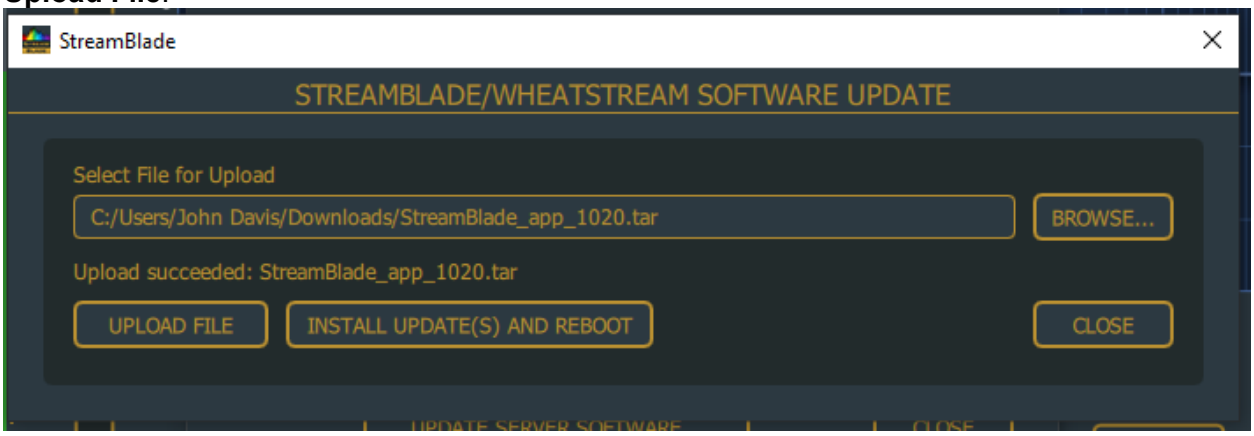
1. **Browse** for the OS file.



2. Click **Upload File**. Depending upon the speed of your PC/network this may take a moment.



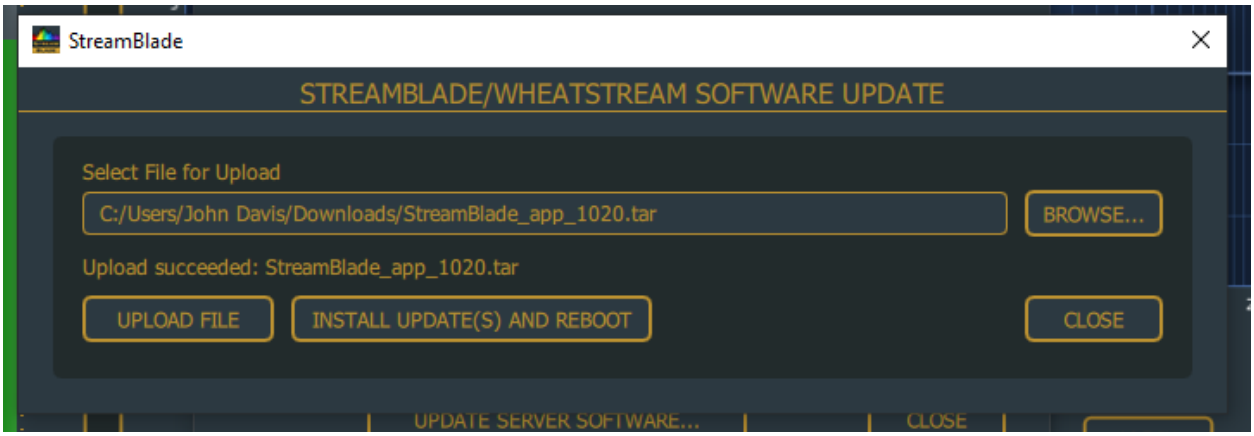
3. Once you see the Upload Succeed message, browse for the software file. Then click **Upload File**.



4. This file is smaller, so it will upload very quickly. When you see the Upload Succeeded message, it is safe to click **Install Updates and Reboot**. After the unit reboots, you're done.

Updating Just The Software

1. Browse for the software file.



2. Click **UPLOAD FILE**.
3. Wait for the Upload Succeeded Message.
4. Click **INSTALL UPDATE(S) AND REBOOT**. After the reboot is complete, you're done.

WARRANTY STATEMENT

LIMITED WARRANTY BY WHEATSTONE CORPORATION

1. All equipment sold and shipped to final destinations within the USA and its possessions warranted for one (1) full year from the date of purchase against defects in material and workmanship. All equipment sold and shipped to final destinations outside the U.S.A. and its possessions warranted for one (1) full year from the date of purchase against defects in material and workmanship.

All repairs to maintain the unit at original specification will be made at no charge to the original purchaser, except for shipping and insurance costs to be prepaid by the owner to the factory in the event the unit cannot be serviced by an authorized Wheatstone Corporation dealer.

2. This Warranty is subject to the following restrictions and conditions:

a) The owner must have filled out the enclosed Warranty Card and returned it to Wheatstone Corporation; or at the time of servicing the owner must provide proof of purchase from an authorized Wheatstone Corporation distributor or dealer.

b) This Warranty is valid for the original purchaser on the unit. Parts used for replacement are warranted for the remainder of the original warranty period. Repair or replacement is in the discretion of Wheatstone Corporation and is the exclusive remedy hereunder.

c) This Warranty DOES NOT apply to damage or defects resulting from abuse, careless use, misuse, improper installation, electrical spikes or surges, or alteration, repair, or service of the unit or equipment by anyone other than Wheatstone Corporation or its authorized dealer.

d) This Warranty is void if the serial number has been removed, altered or defaced.

e) This Warranty DOES NOT cover loss or damage, direct or indirect, arising out of the use or inability to use this unit or for shipping or transportation to any dealer.

f) Wheatstone Corporation reserves the right to modify or change any unit in whole or in part at any time prior to return delivery in order to incorporate electronic or mechanical improvements deemed appropriate by the Wheatstone Corporation but without incurring any responsibility for modifications or changes of any unit previously delivered or to supply any new equipment in accordance with any earlier specifications.

g) THERE ARE NO OTHER WARRANTIES, EXPRESSED, IMPLIED, OR STATUTORY, INCLUDING ANY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. IF FOR ANY REASON, ANY IMPLIED OR STATUTORY WARRANTY CANNOT BE DISCLAIMED, THEY ARE LIMITED TO THIRTY (30) DAYS FROM THE DATE OF PURCHASE. WHEATSTONE CORPORATION IS NOT RESPONSIBLE FOR ELECTRICAL DAMAGE, LOSS OF USE, INCONVENIENCE, DAMAGE TO OTHER PROPERTY, OR ANY OTHER INCIDENTAL OR CONSEQUENTIAL, WHETHER DIRECT OR INDIRECT, AND WHETHER ARISING IN CONTRACT, TORT, OR OTHERWISE. NO REPRESENTATIVES, DEALERS, OR WHEATSTONE PERSONNEL ARE AUTHORIZED TO MAKE ANY WARRANTIES, REPRESENTATIONS, OR GUARANTIESS OTHER THAN THOSE EXPRESSLY STATED HEREIN.