ZOMBIE REC.

Pro Audio Equipment

MAMMUT

LOW END SHAPER

User Manual

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If you do not recycle, electrical equipment will end up in landfills where hazardous substances will leak out and cause soil and water contamination – harming wildlife and also human health.
To remind you that old electrical equipment can be recycled, it is now marked with a crossed-out wheeled bin symbol. Please do not throw any electrical equipment (including those marked with the crossed out wheeled bin symbol) in your bin.

You can recycle your Mammut with us.
Postage is at your own cost. Identical customs requirements like a return apply. Please refer to chapter Warranty at the end of this manual for return details.

WEEE-Reg.-Nr. DE 78028995

WARNING: High Voltage
Risk of electric shock.
Do not open chassis.
Refer service to qualified service staff only.
Before connecting the device to the main power supply, check if the right voltage is selected on the voltage selector.
This device must be earthed.
Replace the fuse with the same type and value only.
Do not use a damaged power cord.
Never place containers with liquid on the unit.
Do not expose this device to water, rain or moisture.

CAUTION: Temperature
Surfaces of the device may become hot during operation.
Do not install this device near any heat source such as radiators, stoves or other heat sources.
Always allow enough ventilation space around the unit for air circulation.
Do not cover circulation vents.

CAUTION: Connecting & Mounting
Never connect the output of a power amplifier to this device.
Screw the device to a professional 19” rack only.
Use the device according to this manual only.

CAUTION: Humidity
If this device is moved from a cold place to a warm room, condensation can occur inside the device. To avoid damaging the unit please allow it to reach room temperature before switching on.

CE Conformity
The conformity of this device to the EU directives is confirmed by the CE mark on the device.
This declaration becomes invalid by any unapproved modification of the device.

Manual
Please read the entire Manual carefully in order to operate this device correctly.

THANK YOU for your trust and curiosity you put forward in purchasing the Mammut Low End Shaper! This device was designed and hand built in Switzerland, with as many parts sourced locally as possible.

The Mammut was conceived out of the necessity to have a hardware unit to solve all low end needs once and for all. (Sub-)bass frequencies become more and more important as headphones and phone speakers improve with every new device, and music is mixed with an ever more powerful low end. It has never been easier to start making music in your own bedroom, and this music needs to be prepared for this new sonic world. And these are just to name a few of ever changing topics.

You might be tasked with fixing the low-end issues in tracks produced or mixed on small budget Speakers, or you simply want to improve the power and clarity of your low end during production. The Mammut does it all and it does it as fast as simply putting it in your chain and turning it on!

The big advantage of the Mammut is that you can solve low-end problems quickly and with great results, without spending hours trying a variety of software or hardware to fix that nasty kick! The entire device is full of new and proprietary circuits you won't find in any other hardware or software.

But why stop there? Hybrid studios are on the rise. You want to use your favorite plugins and hardware in tandem, and you want to be fast in doing so. Sessions need to be quick and turnover high, or you quickly want to jump between your current tracks-in-production, so what's better than controlling the hardware by software? Recallability and presets ready at your fingertips, without spending countless hours readjusting your outboard gear for those previous sessions that the customer asked to edit again or that other track you want to check out again.

The Mammut can be used like any other hardware unit by controlling the knobs on the front, or it can be remote-controlled via an Ethernet network connection. The later allows you to put the device offsite, maybe in your rack with the converters in the next room over, and simply remote control it with the plugin.

The signal path is fully analog and doesn't leave the main board. All controls are led from the front panel directly to where they are needed to switch features on or off. This ensures the highest signal integrity. Only high-grade components are used throughout, as the specifications testify.

The device is packed full of features for treating low end frequencies. From a custom-tailored Highpass filter, a novel Low Shelf EQ, the all-important Compressor/Expander core, to a curious transformer-based Saturation stage. All in just one rack height of space!

Please read this manual carefully to understand all the device's details and intricacies. The Mammut was designed to get good-sounding results fast, but you can spend as much time fiddling with different settings and options as you like. There is a huge number of combinations to discover!

Thank you and enjoy!

Raffaele Zompicchiatti

1. Connections

The following connections can be found on the back of the device (see next page).

- The inputs and outputs are arranged together as left and right channels. High-quality Neutrik jacks were used which ensure excellent fit and quality.

  These connections are standardized XLR Balanced-In / Balanced-Out with pin 2 Hot.

  When using unbalanced connections connect pin 3 Cold to pin 1.

- Standardized IEC connector for a power cable.

WARNING: High voltage
Make sure to disconnect the line cord before replacing eventually blown fuses or changing the operating voltage of the unit!

In order to change the operating voltage, use a flat screw driver to push and rotate the selector arrow to the desired voltage until you hear a click. Please refer to the line voltage level of your country to select the appropriate voltage setting and choose the fuse accordingly as marked on the device or as stated below.

WARNING: Fuses
Always make sure to use the correct fuses for the chosen voltage: **230 VAC 0.1 A Slow-Blow** or **115 VAC 0.2 A Slow-Blow**. Incorrect or missing fuses are dangerous safety hazards for both the device and you!

- An Ethernet RJ45 socket for communication to the plugin.
  Only use shielded CAT5 or higher network cables.

  Connect the cable to the same network hub or router to which your computer with the plugin is connected.

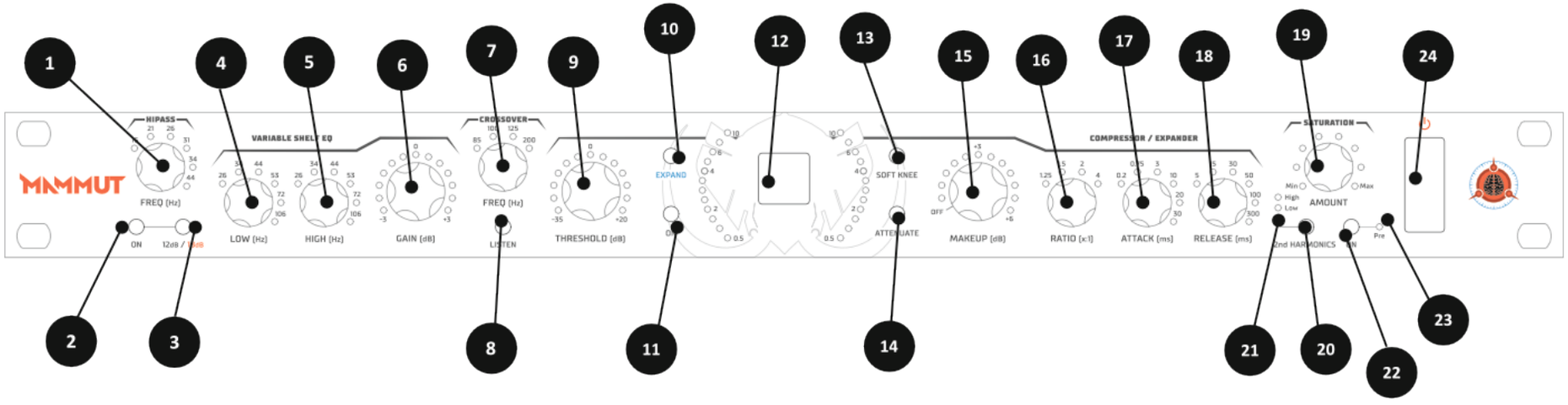
01: Voltage selector

02: Fuse holder

03: Input/Output XLR jacks

04: Ethernet RJ45 jack

3. Front Panel



01: High pass filter frequency

02: High pass filter bypass

03: High pass filter slope

04: Lower frequency point of the shelf EQ

05: Upper frequency point of the shelf EQ

06: Level adjustment of the shelf EQ

07: Crossover frequency

08: Listen mode

09: Threshold of the Compressor/Expander

10: Expander mode

11: Compressor/Expander Bypass

12: Mammut hard bypass

13: Soft Knee mode

14: Makeup attenuation mode

15: Makeup gain level

16: Compressor/Expander ratio

17: Attack time

18: Release time

19: Saturation odd harmonics strength

20: Even order harmonics bypass

21: Even order harmonics strength (long press)

22: Saturation and harmonics bypass

23: Saturation before compression LED (long press)

24: Power switch

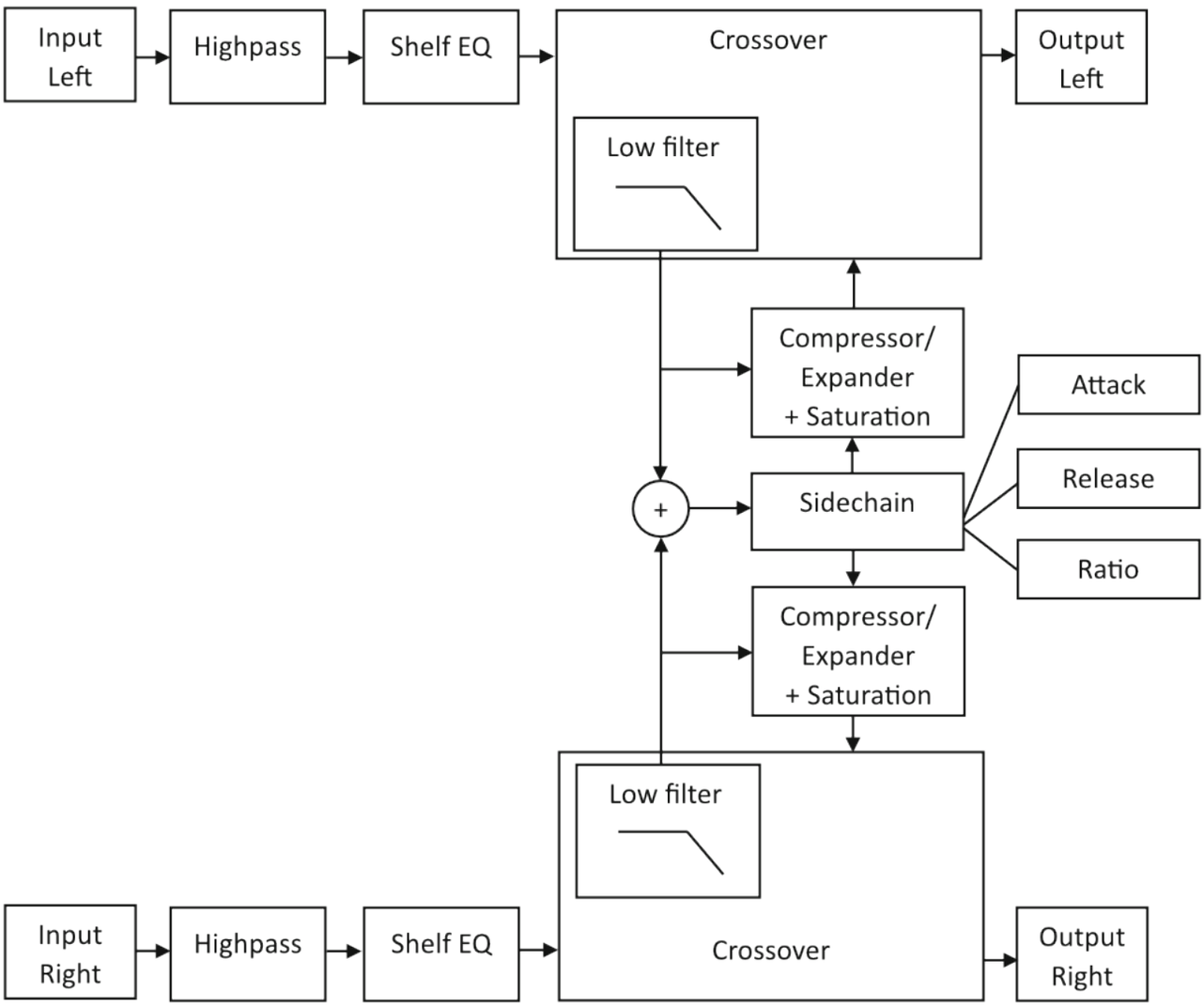
4. Signal Flow

When looking at the front panel, you can imagine the signal passing from left to right. The signal of each channel goes through both the Highpass and Shelf EQ (when activated respectively) before being split into two bands in the Crossover stage. The high band is left untouched while the low band is being sent to the Compressor/Expander (solely called Compressor from here on out) and Saturation stages. Afterwards both bands get merged again here and sent to the outputs.

The Compressor and Saturation stages can be swapped, which puts the Saturation before Compression stage instead of after. See section Saturation for more details.

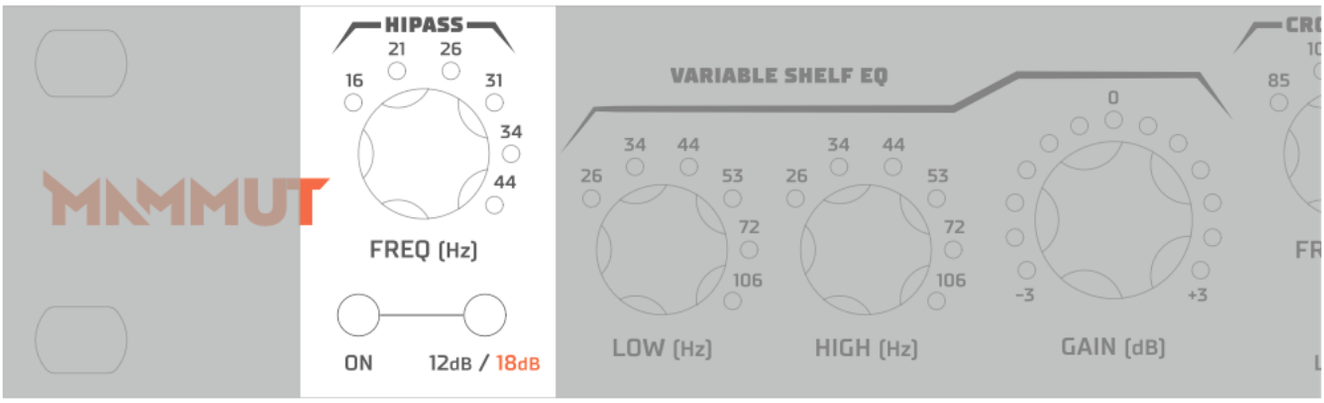
Due to the ultra linear frequency response of the Crossover stage, no level changes occur when the signal is otherwise left untouched.

This device is designed to operate with a nominal signal level of +4dBu with a maximum level of +24dBu.



5. Features

Highpass filter



The highpass filter isn't any old bog-standard filter. A special and more difficult-to-implement topology was chosen for it. Therefore, this is a filter you won't find anywhere else.

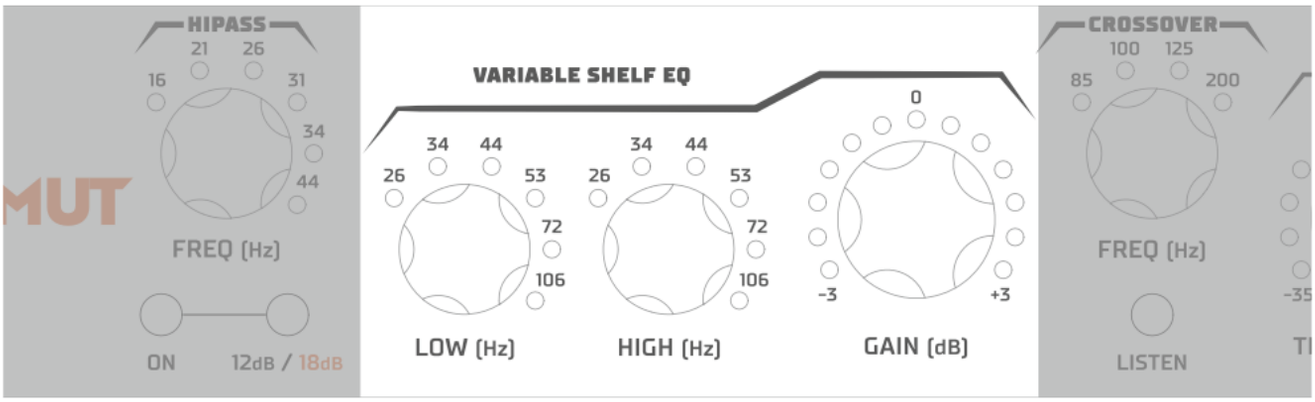
While the softer 12dB/Octave slope is more reminiscent of what might be traditionally used, the 18dB slope, in fact many users' favorite, allows the filter to show its full capabilities. It 'glues' the low end together and emphasizes the transients in a musical way, due to the specific impulse response and phase behavior of this design.

The slope allows the corner frequency to be brought closer to the material to cut out unwanted rumble, while barely touching the still desirable content.

The filter can be engaged by enabling it with the "On" button and switched to the 18dB/Octave slope when the 12dB / 18dB button is lit.

Tip: Start using the filter by activating the 18dB mode, set it to 26Hz and listen to how it tightens the low end without cutting information. Alter the frequency to taste.

Variable Shelf EQ



This shelf filter has been specifically created for the Mammut.

While the frequency response of a normal shelf filter remains linear towards DC, the bandwidth of this design is limited by the lower of the selectable frequency points.

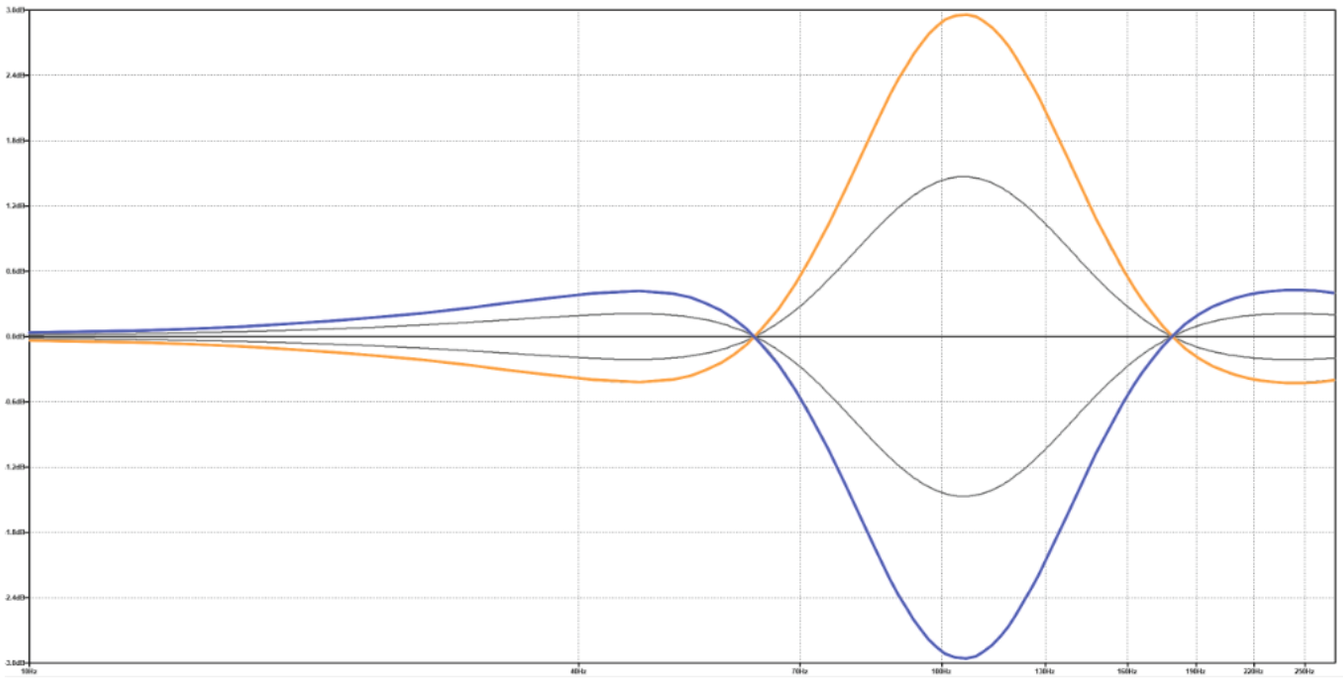
This allows for many different curves to be set and to be able to selectively process only areas of interest.

Due to the special design, the Variable Shelf EQ has a similar effect to the boost-cut trick of a well-known vintage tube EQ. This is more or less pronounced depending on the gain setting. The more gain or attenuation is applied, the more of the surrounding area is inversely cut or boosted. This helps to focus and cleanup the area of interest without needing much gain.

The upper and lower corner frequencies can also be swapped (low frequency point below high frequency point) to create even more curves with a different sound. Swapping the corner points like this will alter the gain level, move the frequency center point, and reduce the inverse cut/boost of the surrounding areas. These settings yield a softer bell type response.

Note: When setting both frequency points to the same frequency, they merge to a sort of bell curve, but which is not comparable to regular bell curves.

This EQ can accentuate or attenuate certain characteristics of the existing material and instruments and then, if desired, feed them that way into the Compressor and Saturation for further processing.

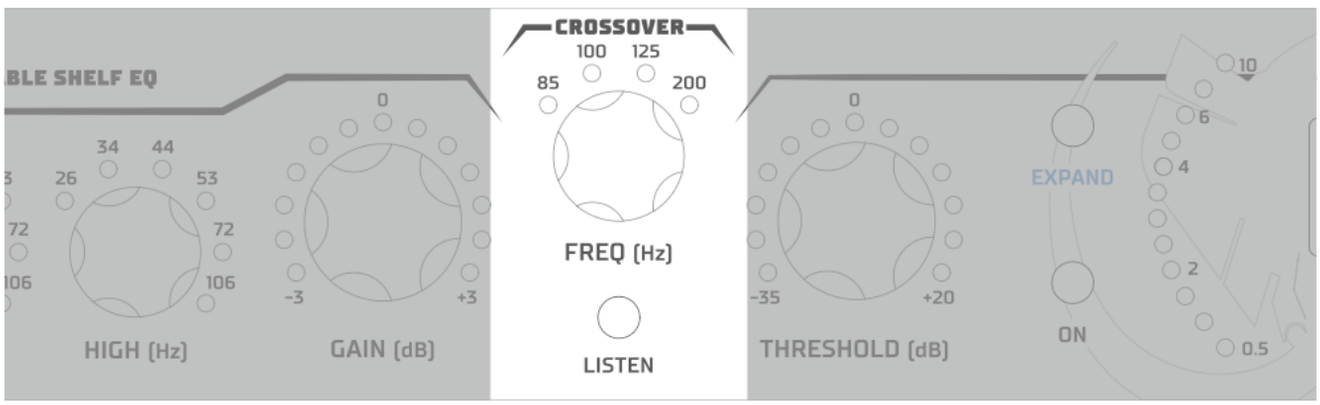


Lower and upper frequency point @106Hz

Lower frequency point @26Hz, upper frequency point @106Hz

Increasing or decreasing the gain will automatically enable the EQ. This stage is deactivated when the gain is set to “0”.

Crossover & Listen Mode



The Crossover filter separates the signal into two bands with a slope of 24dB per octave. From here on, the low band is fed into the Compressor/Expander and Saturation stages and then later reunited with the high band, which in turn is not being processed at all.

The selectable Crossover frequencies are 85Hz, 100Hz, 125Hz and 200Hz.

The lower frequency points are suitable when, for example, very bassy material must be tamed or missing power should be added.

The upper points incorporate more of the source material into the processing and reaches areas where several instruments are already interacting with each other. This range is ideal for giving more body to instruments or more cohesion to entire mixes.

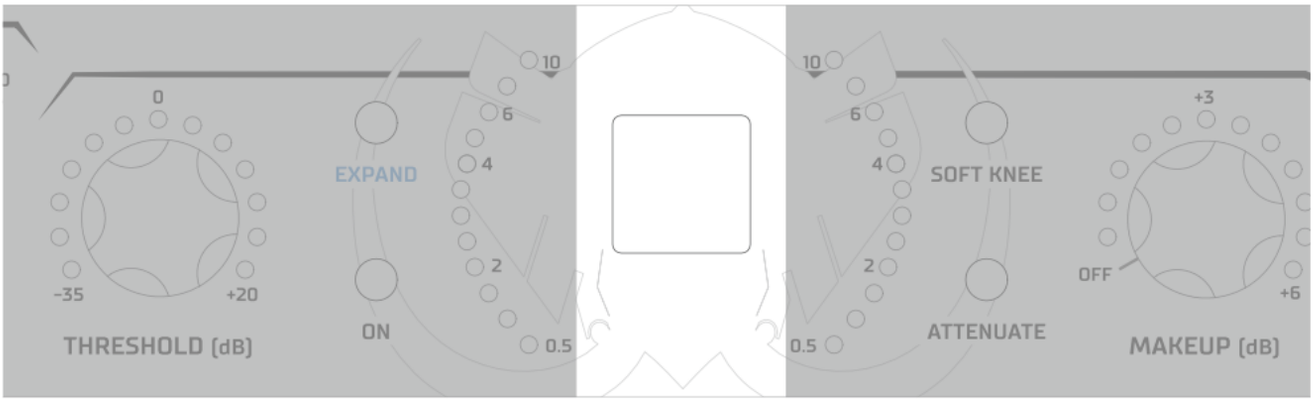
Listen mode disables the high band and only the processed low band is sent to the output. In this mode, the harmonics created in the Compressor and Saturation stages can be heard and fine-tuned if desired.

Don’t forget, harmonics are the goal of the Mammut. If it sounds distorted, you’re on the right path!

This circuit causes the stereo image to become more defined in a natural way by applying a soft mono focus that is gradually falling off along the low band slope of the Crossover filter, giving the image more width as it expands from the mono center to the stereo sides.

Tip: Split the signal into M/S mode before sending it into the Mammut and merge it back to L/R after it. Just let it pass through the unit without applying any other processing and listen to the stereo image. Play with the Crossover knob to alter it to taste.

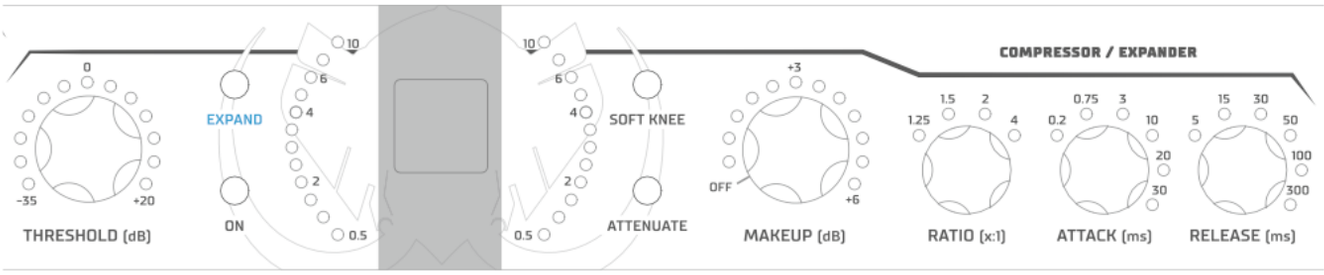
Hard Bypass



The hard bypass button is located in the center of the device, as the ‘eye’ of the Mammut. High-quality relays are used, which lead the signal untouched out of the device directly at the inputs and outputs. This allows for a true A/B comparison without altering the sound in any way when not engaged.

Note: Enabling and disabling the hard bypass, along with the bypass of other features, can create an audible click in the audio. This is normal behavior due to the nature of relays and other switches.

Compressor / Expander

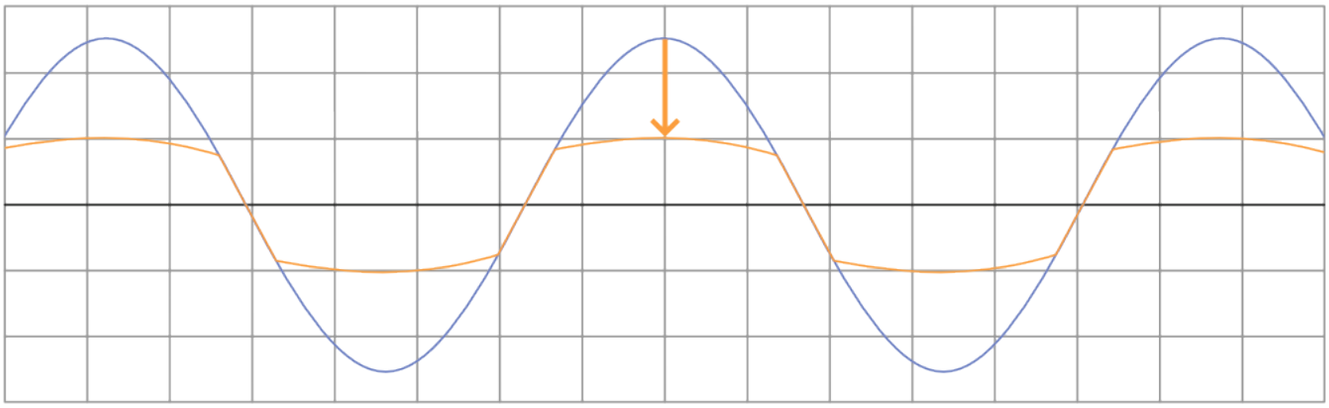


The Compressor / Expander is the heart of the Mammut. Only the low band below the selected Crossover frequency point is being processed here, with a gradual roll-off of 24dB/Octave. The high band is left untouched.

The Compressor can be engaged via the button "On" and switched to Expansion with “Expand”. The LEDs around the center still show the gain reduction in red or expansion in blue, even if it is not engaged. This lets you see the applied processing when A/B-ing the compression. The numbers next to the LEDs show the level change in dB.

When using this stage, you must forget everything you know about compression, as this circuit is far more involved than just being a regular compressor, even though the underlying functionality of a VCA gain cell still applies.

Think of it as a form of wave shaper with compression/expansion functionality!



As shown above, the wave can be compressed (shaped) more aggressively and precise than with a regular compressor.

Take note that the release time can be set as low as 5ms. Usually, this setting would create undesirable distortion. For the Mammut, however, it is the desired effect.
The Mammut is based around creating complex harmonics through distortion, that musically enhance your low end, without sounding intrusive (unless you want it to!).

A proprietary sidechain circuit was developed for this purpose, which makes the wave shaping possible. As a first step, you can imagine the attack and release settings as a frequency selection knife that lets you grab single waveforms with scalpel precision (see picture above).

Attack sets the limit of the lowest frequencies being shaped, from about 10Hz to the frequency denoted by the Attack time (with frequency = 1/ms). The slower the attack, the more of a single wave of such low frequency can pass unaltered which reduces the applied gain reduction and with that, the generated harmonics.

Release sets the bandwidth of influence on the higher frequencies and signals that are quieter than the current peak, starting from the Attack time up to the Release time. If no gain reduction seems to be applied when using a fast release, chances are there's more reduction starting to happen as the release is slowed down.

These bandwidth limits of both controls are gradual and their influence is much more complex than it might seem.

I suggested to start processing with both Attack and Release in the fastest setting. This allows to sculpt the waveforms with the most precision, grabbing each and every peak. In this setting, the most harmonics are being generated. Then play with the controls and listen to how the character of the source material changes as the bandwidth of influence changes.

The harmonics generated in the process emphasize the source material and make it cut through the mix and give it more weight, punch and warmth without muddying or booming and without having to resort to time consuming trial and error tricks and fixes.

Tip: Using a low ratio is best suited for giving overall warmth and a balanced enhancement. The ratio 2:1 or even 4:1 is best suited for taming or emphasizing percussive or very peaky material, to give that extra punch. Of course, there is no hard rule to this. Sometimes it's enough to just do 0.5dB of gain reduction with a 1.25:1 ratio.

By default, a hard knee transition is used, but can optionally be switched to soft knee. This reduces distortion to a lower level and smooths the low end processing. Using the soft knee together with both the slowest Attack and Release settings yields the lowest distortion and most transparency.

By design and in contrast to the hard knee mode, the soft knee circuit already starts to generate harmonics, even when the threshold is set to the upper limit of +20dBu and no gain reduction is taking place. Lowering the threshold gently increases these harmonics until compression/expansion kicks in. The amount depends on the selected ratio.

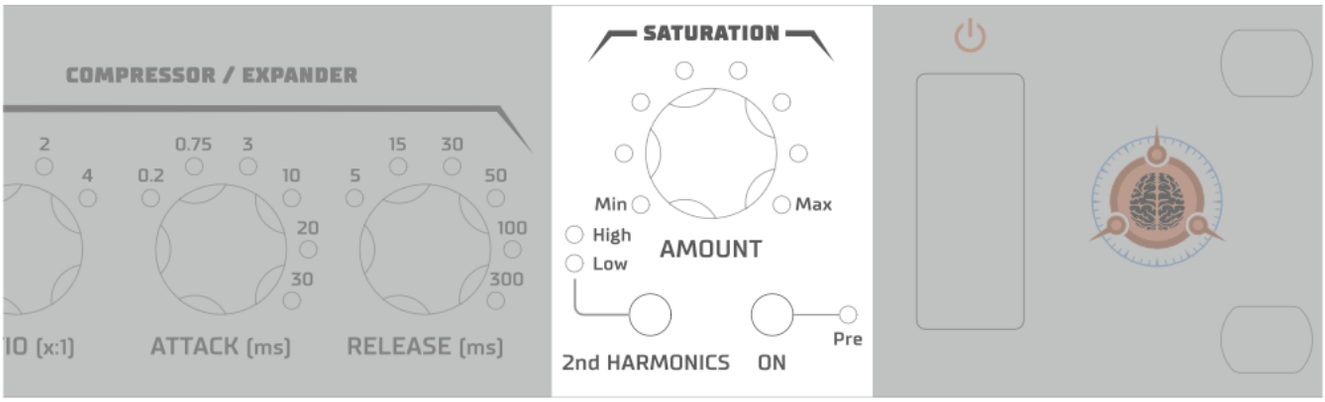
The Makeup Gain behaves like a true low shelf filter. It is affecting the entire low band, as selected by the Crossover stage. This creates a shelf with a focused 24dB/Octave slope with no additional dips or boosts, you won't find this anywhere else!
Countless curves can be created in combination with the Variable Shelf EQ. The Makeup Gain can be switched between boost and attenuation (e.g. for expansion mode) by pressing the "Attenuate" button.

The active expansion mode can be recognized by the blue LED color of the "Expand" button as well as the gain reduction LEDs.

Tip: You can use the Expander for creative wave shaping of oscillators. Try sending a sine wave into one channel of the Mammut and a saw wave with a bit of frequency offset relative to the sine wave into the other channel and use the expander to boost the sine wave while only listening to that channel and hear how it's getting modulated by the signal in the other channel! You can use any modulator in one channel to affect the other via the Expander, as long as the modulator is within the Crossover selected low band range.

Ratio: 1.25:1, 1.5:1, 2:1, 4:1 (Compression) 1:1.25, 1:1.5, 1:2, 1:4 (Expansion) respectively
Attack: 0.2ms, 0.75ms, 3ms, 10ms, 20ms, 30ms
Release: 5ms, 15ms, 30ms, 50ms, 100ms, 300ms
Makeup Gain: -6dB to +6dB

Saturation



As with the Compressor, the Saturation is only applied to the low band, selected via the Crossover filter. The high band is left untouched.

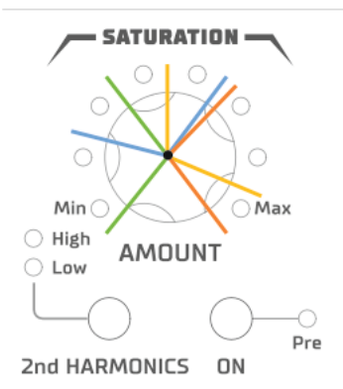
This stage is based around a steel/nickel transformer, which is brought into saturation as soon as the stage is engaged with the button set to "On".

By switching the level gradually from "Min" to "Max", the saturation is continuously increased. This allows quieter sources to be processed, or louder ones to be brought up to overdrive and even hard clipping. Unless clipped, the overall level of the signal does not change.

As usual for transformers, the saturation mainly produces odd order harmonics that bring out the source material, adds sheen and acts like a kind of presence control.

The saturation dial was sectioned into four different signal levels. The first ranging from level 1 through 3 (green) is intended for the hottest levels of around +14dBu. Level 3 through 5 (blue) for +8dBu. Level 5 through 7 (yellow) for +4dBu and finally level 6 through 8 (orange) for 0dBu. Of course, you are not limited to these ranges. These are only used as guidance to achieve an approximately identical amount of saturation.

Tip: If pushed beyond the limit, this stage will start to hard clip, which can be an interesting creative tool!



Optionally, even order harmonics can be added via the "2nd Harmonics" button. The strength is indicated by the "High" and "Low" LEDs and can be switched by applying a long (>0.5s) press on the "2nd Harmonics" button. These even harmonics are largely level-independent and will add warmth and weight to the source, no matter the signal level.

The normal signal path leads through the Compressor first and then into the Saturation stage. With a long (>0.5s) press on the "On" button, the "Pre" LED lights up and the Saturation is switched before the Compressor. This allows for a different sonic character, as the harmonics are then fed into the Compressor for further processing.

6. Additional Tips

#1 Don't be afraid to first attenuate the signal with the Shelf EQ and/or the Compressor and then lift it with the Makeup Gain. The created harmonics will make up for the compressed peaks.

#2 Do the same in reverse: Boost with the Shelf EQ and/or Expander, then lower the level with the Makeup Attenuation.

#3 Or you don’t even have to compensate at all! Just boost the peaks with the expander to taste!

#4 Try to set the Shelf EQ upper and lower points to the same frequency and sweep through the available settings and listen to how it can emphasize the overall feel of the low end. Don’t be afraid to cut too!

#5 Just utilizing the Highpass filter combined with the magic of the Crossover filter can be enough to give the source material that extra something.

#6 Don’t forget to regularly try to switch the Saturation stage in front of the Compressor to alter the behavior of the later, even without using much Saturation.

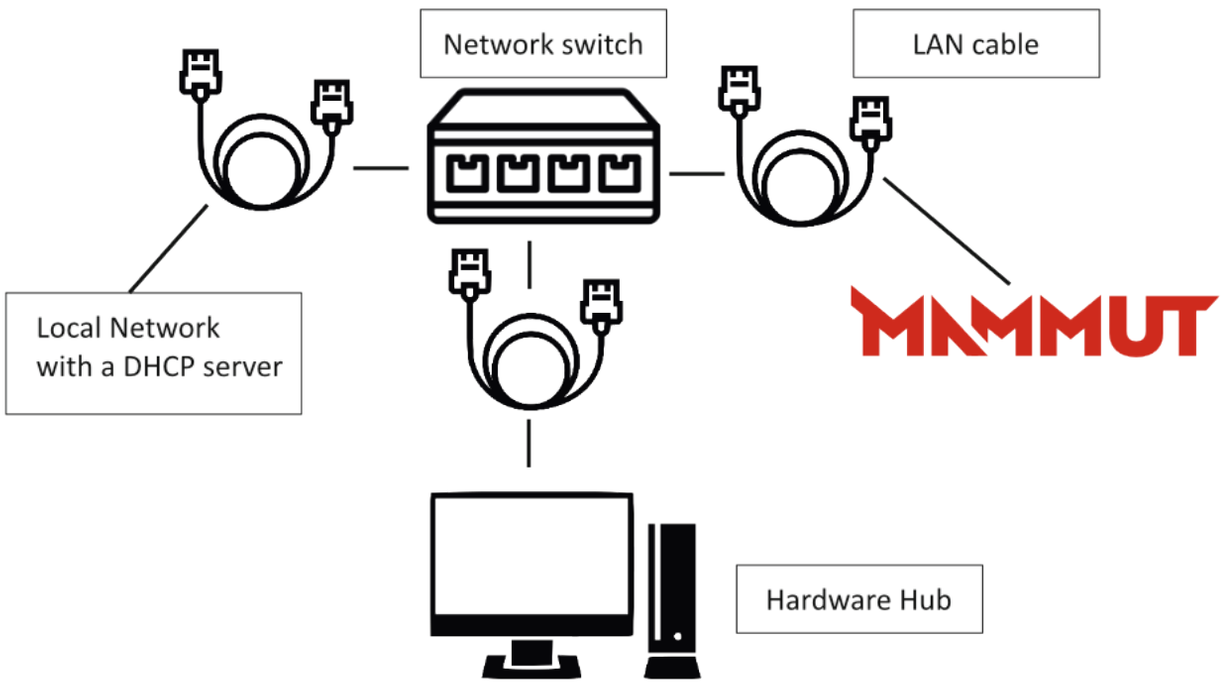
7. Software

The software is not necessary for the operation of the hardware and is purely optional. It offers the possibility of remote control and the saving and loading of presets and sessions for easy recalling.

Network Connection

The Ethernet port is located on the back of the Mammut. This must be connected to the network where the computer with the Hardware Hub software is located. If you don’t yet have a LAN network installed, in most cases, it is sufficient to unplug the computer's Ethernet cable and connect it to a network switch, then connect one cable from the switch to the computer and another to the Mammut.

Note: Please do not connect the device directly to your computer or mac, as this connection will not work. A DHCP server in the network is required in order to assign an IP address to the device and establish the connection.
Neither the device nor the hardware hub communicates with the Internet.



Hardware Hub

The Hardware Hub is the "brain" for the communication between hardware and plugin. After startup, it is located in the task bar and runs in the background. Look for the blue “Play” icon:

With a right click on the blue icon, the context menu can be opened.

Open: Opens the overview window (see below).

Start: Starts the server.

Stop: Stops the server. All active connections are closed in the process.

Restart: Restarts the server. All active connections will be disconnected, but the clients involved will reconnect immediately after the server restarted.

Exit: Closes the Hardware Hub server application, all active connections will be closed.

Note: The Hardware Hub does not start automatically and must be started manually.

The overview window shows all connected devices, their ID, type, and whether a plugin is currently connected to them. When a plugin connects, the status changes from orange to green.

The window can be closed at any time without shutting down the server.

Tip: The Hardware Hub software can be installed on any computer in the network and does not have to run on the same computer as the plugin. It is only important that the hardware is on the same network. Make sure to edit the plugin settings to point to the correct IP address of the computer running the Hardware Hub (see below).

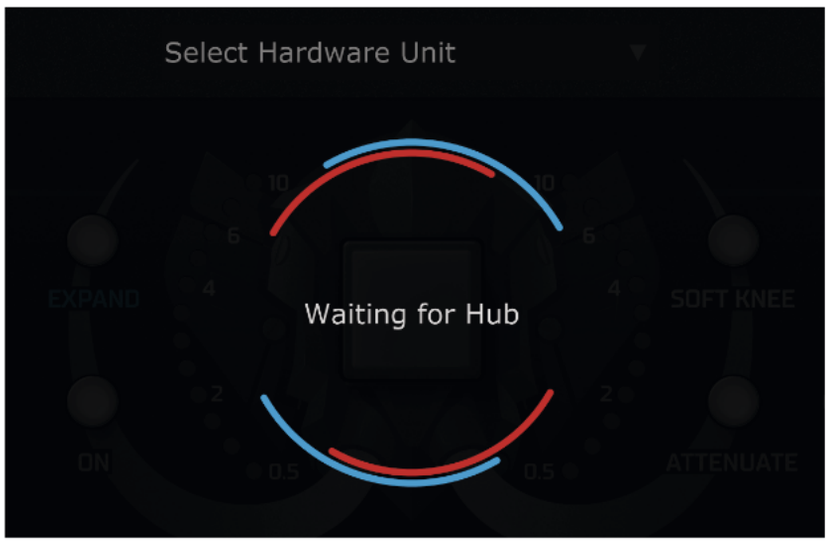
Plugin

Supported are 64Bit VST3/AU/AAX on Windows and macOs.

The plugin is a pure control surface and lets all audio signals simply pass through unchanged. This causes no plugin latency.

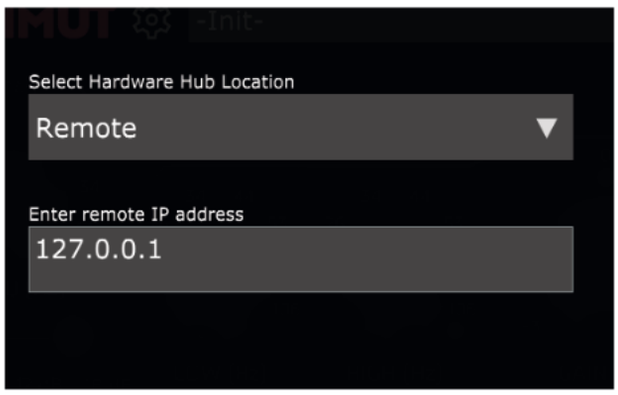
It can be inserted on any channel. The signal must be sent out via the respective DAW integrated outboard inserts, such as "Hardware Insert" in ProTools, "External Audio Effect" in Ableton Live, "Pipeline Stereo" in Studio One, etc. If necessary, consult the manual of your respective DAW.

When the plugin is started, the first thing it tries to do is to establish a connection to the Hardware Hub. The text "Waiting for Hub" is displayed in the center:



Note: The default setting tries to establish a connection on the local computer the plugin is running on. If the Hardware Hub is located on another computer, its IP must be changed in the settings (white gear in the upper left corner).

To do this, the setting must be changed from "Local" to "Remote":



After saving, the connection to the new IP is automatically established.

As soon as a connection has been successfully established, the text "Waiting for Hardware" is displayed:

By clicking on "Select Hardware Unit" the ID of all turned on devices on the network can be selected from the list and connected by clicking on its respective ID entry:

Once the ID is selected, the internal connection process is started. When the hardware is connected to the plugin, the actual plugin interface is displayed, and the current state of the plugin controls is sent to the hardware and immediately mirrored by it.

The preset system works in the same way. When a preset is selected, this state is immediately sent to the hardware.

Other instances of the plugin indicate the correct state of the device's connection by displaying the suffix "(Claimed)" after the device ID.

However, the same hardware can be selected again, and the selecting plugin then takes control and sends its current state to the hardware. Thus, different states on different tracks can be transferred to the hardware with two clicks.

The previous connected plugin is informed about this re-claim:

All parameters can be automated and are transmitted to the hardware in real-time. This communication also works in the opposite direction: A control change on the hardware causes a change in the plugin. This also works during playback when automation is active. Depending on your DAW, this will automatically stop the programmed automation.

Communication from Plugin to Hardware Hub is independent of the DAW used. This means that a re-claim from e.g. Pro Tools is also communicated to the plugins in Ableton Live. This also applies to different operating systems or computers on the network (if they are connected to the same Hardware Hub).

The state of the plugin is saved in the session curing closing and will be reloaded on the next session load and the state is transferred directly to the previously selected device, if it is currently turned on.

8. Specifications

Frequency Response	< ±0.1dB 10Hz - 20kHz, -1dB @75kHz
Noise Floor (Unweighted)	< -96dBu, BW: 22Hz - 22kHz
THD+N	< 0.001% @+4dBu 1kHz, BW: 20-20kHz < 0.003% @+4dBu 30Hz, BW: 20-20kHz
IMD (SMPTE)	< 0.002% 60Hz/7kHz 4:1 +4dBu
CMRR (Worst Case)	> 74dB, BW 10-20kHz
CMRR (Typical)	> 80dB, BW 10-70kHz
Max Input Level	+24dBu balanced, <1% THD
Max Output Level	+24dBu balanced, BW: 20-20kHz, <1% THD
Output Impedance	78Ω
Input Impedance	30kΩ
Signal to noise ratio	>100dB @+4dBu, BW: 20Hz-20kHz
Dynamic Range	120dB @+24dBu, BW: 22-22kHz
Crosstalk	-109dB @1kHz +4dBu channel-to-channel

9. Warranty

Conditions and limitations

The Mammut is covered by a limited warranty for a period of 1 year against defects in parts and labor from the date of purchase. Natural wear is not covered by this warranty. Zombie REC. Pro Audio will remedy problems caused by material or workmanship either by repair or replacement to restore the product to full performance without charge for parts and labor. Repairs or replacements will not extend the warranty period.

The warranty is given to the original purchaser only and is not transferable. Zombie REC. Pro Audio will only give warranty on products purchased through authorized Zombie REC. Pro Audio dealers. The warranty will only be valid in the country of the original purchase unless otherwise pre-authorized by Zombie REC. Pro Audio.
All warranties become void when the product has been damaged by misuse, accident, neglect, modification, tampering or unauthorized alteration by anyone other than Zombie REC. Pro Audio authorized service personnel.

The warrantor assumes no liability for property damage or any other incidental or consequential damage whatsoever which may result from failure of this product. Any and all warrantees of merchantability and fitness implied by law are limited to the duration of the expressed warranty.

This warranty gives you specific legal rights and you may also have other rights which vary from state to state. Some of the above limitations may not apply to you.

Warranty confirmation and return

Your receipt with a date of purchase is your confirmation of warranty.
In case you notice any defect, please contact Zombie REC. Pro Audio for technical support directly. You can find the corresponding contact details at the end of this warranty statement. You will receive a return authorization which enables you to send your product to the Zombie REC. Pro Audio workshop where it will be repaired and then sent back to you.

Packaging and shipping

All returns must be in the original packaging, accompanied by the return authorization, and must be shipped via insured freight at the customer's own expense. A new original packaging can be ordered from Zombie REC. Pro Audio. The customer will be charged for new factory original packaging if he fails to ship the product in the original factory packaging.
In case that a product must be returned to us from a country outside Switzerland, the customer must adhere to specific shipping, customs, and commercial invoicing instructions, given with the return authorization as Zombie REC. Pro Audio will not be responsible for transportation costs or customs fees related to any import or re-export charges whatsoever.
After repair, the product will then be returned to the customer via prepaid insured shipping, method and carrier to be determined by Zombie REC. Pro Audio. Zombie REC. Pro Audio will not pay for express or overnight shipping. All damages caused by transport are not covered by this warranty.

Contact

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info@zombierec.com

Download Software and Firmware from

www.zombierecaudio.com