

PW1 *Phono preamps are notoriously difficult to design.
Experience inspired an attitude of minimalist elegance.
PW1: a true **Phono Wizard**.*



PW1 - manual

Please read this manual before operating the unit.

Grimm | **AUDIO**

Table of Contents

1. Introduction	3
2. Important Safety Instructions	4
3. Installing	6
4. Operation and System Setup	8
5. Specifications	17
6. Grimm Audio Limited Warranty	18

1. Introduction

Thank you for purchasing the Grimm Audio PW1 phono preamplifier. Like all our products, the PW1 is designed and built with deep knowledge and passion.

For many generations, true lovers of sound and music are inspired by vinyl playback. Even in these days of high performance digital audio playback systems it is hard to imagine a future without LP's. There's just something magical to it.

Grimm Audio's co-founder Peter van Willenswaard spent a life time designing and improving phono preamps, both in solid state and with tubes. Of all stages of audio amplification, phono preamplifiers pose the biggest challenges to a designer. With moving coil cartridges, deep bass signals of a mere 50 nV require no less than 90 dB amplification!

For the PW1, Peter managed to develop a solid state phono preamplifier that matches his best tube based designs. Peter believes that designing a good phono

preamp is not about achieving the lowest possible harmonic distortion as an isolated parameter. He searches for an elegantly minimalistic circuit design in which he optimizes the 'electric environment' of all the active components, in conjunction with a meticulously tuned power supply. Needless to say that passive components like capacitors and resistors are carefully picked.

The result is a well balanced design with Peter's signature sound, which is very spacious, detailed and open, but at the same time rhythmically addictive and emotionally involving.

We wish you many hours of pure listening enjoyment with your PW1.

The Grimm Audio Team
info@grimmaudio.com

2. Important Safety Instructions

Grimm Audio gaat er van uit dat u deze Engelstalige tekst volledig begrijpt. Als u hier moeite mee heeft dient u contact op te nemen met Grimm Audio. Op verzoek sturen wij u een vertaling toe.

Grimm Audio nimmt an, dass Sie diesen Englischen Text völlig verstehen. Wenn notwendig, nehmen Sie bitte Kontakt auf mit Grimm Audio. Auf Wunsch wird Ihnen eine Übersetzung zugeschickt.

Grimm Audio suppose que le lecteur comprend parfaitement le texte en Anglais ci-dessous. En cas de doute s.v.p. contacter Grimm Audio. Si nécessaire, on pourra vous envoyer une traduction.

Grimm Audio da por supuesto que el texto en versión Inglesa no ofrece ninguna duda de interpretación y se entiende íntegramente. Si este no fuese su caso rogamos contacte con Grimm Audio quien, a petición, se encargaría de enviarle la correspondiente traducción.

Please follow these precautions when using this product:

1. Read these instructions.
2. Keep these instructions.
3. Heed all warnings.
4. Follow all instructions.
5. Dangerous voltage is inside this apparatus. Opening is only allowed by qualified service personnel.
6. Use the supplied power cable as intended. The PW1 does not use a third grounding prong in its power connection. For your safety the PW1 design is of the class 2 'double isolated' type.
7. Protect the power cord from being walked on or pinched, particularly at plugs, convenience receptacles, and the point where they exit from the apparatus.

8. Unplug this apparatus during lightning storms or when unused for long periods of time.
9. Do not use this apparatus near water.
10. Do not use this apparatus outside.
11. Do not expose the apparatus to dripping or splashing. Do not place objects filled with liquids (flower vases, drink cans, coffee cups, etc) on the apparatus.
12. Clean only with a dry, soft, non-fluffy cloth. Do not spray any liquid cleaner onto the cabinet, as this may lead to dangerous shocks.
13. Install in accordance with the manufacturer's instructions.
14. Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat. Avoid exposure to direct sunlight.
15. Use only attachments or accessories specified by the manufacturer.
16. This unit runs slightly warm when operating. Place in a normal ventilated area.
17. Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as when the power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.
18. **WARNING:** To reduce the risk of fire or electric shock, do not expose this apparatus to rain or moisture.

3. Installing

Unpacking and Installation

Your PW1 was carefully packed at the factory and the packaging it came in was designed to protect it from the trials and tribulations of shipping. Keep the box and all packing materials, so that in the unlikely event that you need to return the PW1 for servicing, you can do so safely.

Placement

The PW1 was designed to be placed next to your turntable. It does not produce strong RF fields nor is susceptible to them. The PW1 can be placed near electric gear such as computers without worry, but it is recommended to keep some distance from equipment that produces strong magnetic fields to avoid hum.

AC Power Hookup

The PW1 has a built-in linear power supply that is preset to a 50 or 60 Hz AC mains voltage of either 100/115 V or 230 V. Please make sure that your unit is correctly set to your local mains voltage, as indicated on the back above the power switch. In case you need to change the indicated line voltage, please contact Grimm Audio Support for instructions.

The PW1 is shipped with a proper mains cable. Grimm Audio cannot be held responsible for problems caused by using the PW1 with improper AC wiring or voltage. The PW1 has a power switch on the rear panel. Please turn this switch off before plugging in or unplugging the AC power cable.

The PW1's IEC mains connector has no safety earth tab. This guarantees that there will never be a connection between safety earth and the PW1 housing or the signal reference, so unwanted ground loops are avoided.

Obviously, to guard your safety, the PW1 is designed in compliance with Class 2 'double isolation' levels.

Audio connections

On the rear of the PW1 all audio connections can be made. Top left you find the PW1 outputs on XLR and RCA (choose one pair). Bottom left are the Moving Coil (MC) RCA inputs, bottom right are the Moving Magnet (MM) RCA inputs. The brass ground post is in between them. Please note carefully the left (L) and right (R) indications of all connections.

Serial number

The serial number of your unit starts with "14-0" and is noted at the far bottom right position. You may need it in case of a service request.



4. Operation and System Setup

Power on

Before you plan serious listening, we recommend to switch your PW1 on and leave it on for at least 24 hours, to allow internal components to settle. The total break-in period to unlock the PW1's full potential will be several days. When in regular use, it is no problem to leave the unit powered on all the time for instant optimal performance. We do recommend to turn the PW1 off when you don't use it for several weeks, to extend the lifetime of its components.

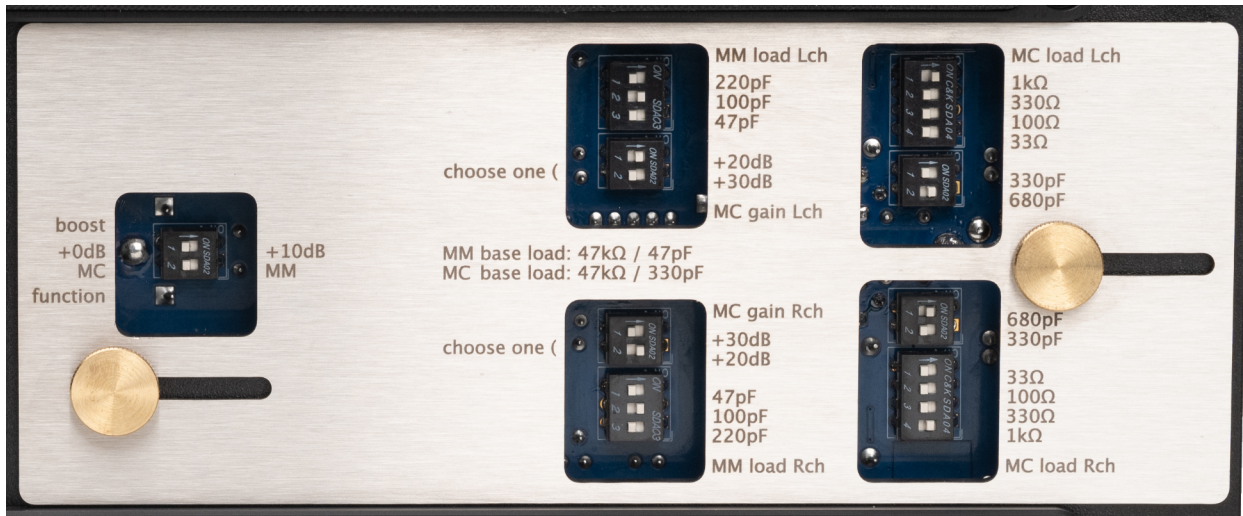
Setting up cartridge load and gain

The variety in output voltages and loading requirements of phono cartridges is enormous. In general two main cartridge types can be distinguished: Moving Magnet (MM) and Moving Coil (MC). MM cartridges are high-impedance items with a relatively high output voltage. MC's are of low-impedance and low output voltage. MC therefore needs extra gain, which explains why phono

preamps are usually fitted with separate MM and MC inputs, as is the PW1. Some MC cartridges are of the "Hi-Output" type. They usually can be treated similarly as MM cartridges. In this chapter we offer detailed setup instructions for all three types.

All settings of the PW1 are accessible via a sliding panel on the bottom. If you loosen the two knurled screws one turn and slide open the windowed panel you'll see 5 groups of mini-switches (as shown in the picture on the next page). These allow you to make the necessary adjustments that your cartridge of choice needs. While working on these settings, it is convenient to have the PW1 lying on its side or upside-down (on a soft cloth) until you are satisfied with the results. Then, close the lid and put the PW1 on its feet at the preferred location.

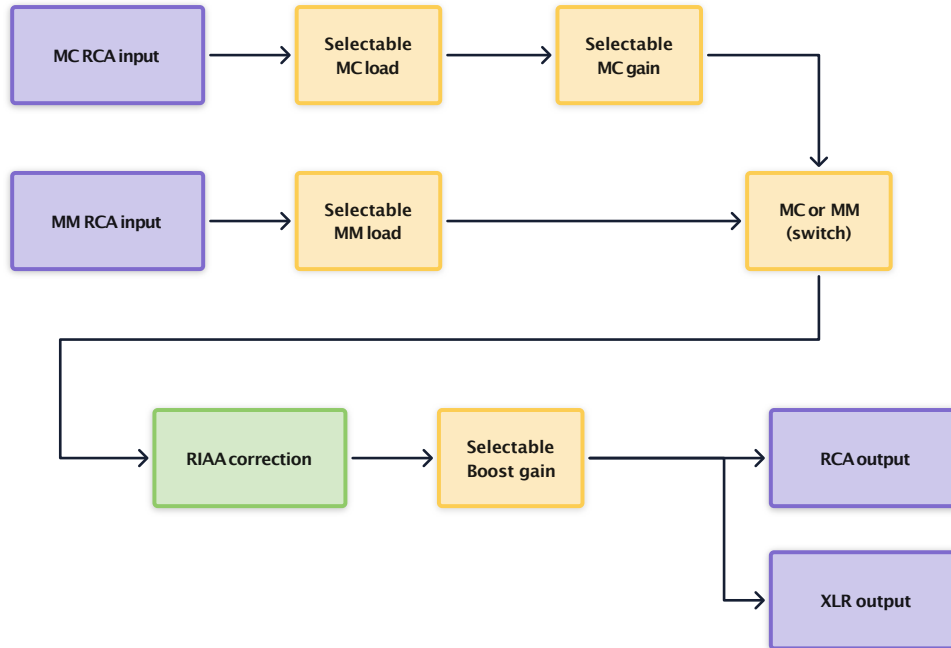
Warning: new cartridges will take 20 to 50 hours of play before they are totally run-in and arrive at the top of their musical performance. So some load settings may need a slight readjustment after the run-in period. Running-in can be done while listening to normal LPs, but there are a few special burn-in records that can speed up the process.



Phono cartridges are so-called velocity devices: the faster the needle moves, be it sideways or up/down when following an LP groove, the higher the output voltage. The international standard for measuring a cartridge's output is set at 5 cm/sec cutting speed. Much higher speeds should be anticipated while designing a phono preamp since peak groove excursions close to

100 cm/s have been measured. On the opposite side, very quiet musical sounds (near the LP's inherent noise level) may move the needle at as little as 20 $\mu\text{m}/\text{sec}$, which is 50000 times smaller! This requires tremendous agility from your phono preamp, and your PW1 is up to it.

Block diagram



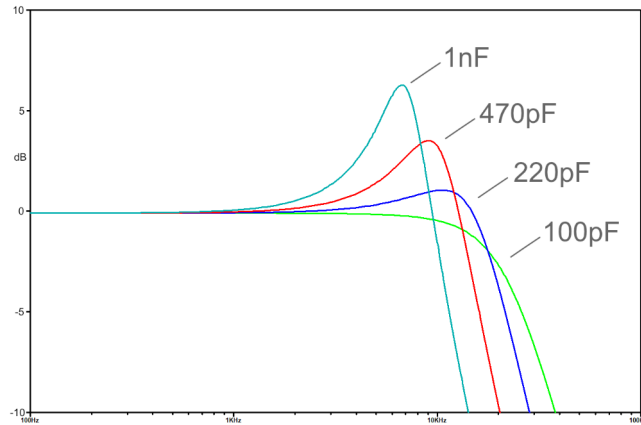
MM cartridge setup

We start with explaining how to set up for a MM (Moving Magnet) cartridge, since that is a relatively simple case. You will find a 'dip-switch' to choose between MM and MC mode in the small window at the bottom left of the PW1. Set it to MM. Connect the cable from your record player to the MM input on the back. Don't forget to connect the ground wire that comes with this cable to the brass ground post (if you forget, you'll have hum).

MM output voltages vary from 1 to 8 mV (@ 3.54 cm/s) but most MMs are 5 mV or close to that. The MM gain of the PW1 is nominally 37 dB (@ 1 kHz) which is enough to accommodate most preamp inputs. Should you find the output signal strength to be insufficient, be it due to a less sensitive downstream preamp input or because a 2 mV cartridge is used, you can add a +10 dB boost with the mini-switch next to the MM/MC-choice (this 10 dB switch adds extra gain to the 'output stage' of the PW1, so is effective to MM as well as MC).

The prescribed resistive load for MM cartridges is 47 k Ω (very few MMs break this law). This is the base load in the PW1. It is paralleled at the MM input with an rf-interference suppressing capacitor of 47 pF. Be aware that the cable from the record deck to the phono preamp also adds its own 100 pF (some thicker cables may add only around 50 pF, check the record deck's specifications!). This means that in general the standard capacitive load already adds up to ca 150 pF.

The optimal capacitive load of an MM cartridge varies with manufacturer and type, so please check the specifications of your MM cartridge to see what is the recommended value in pF. Now take a look at the middle windows at the bottom of the PW1. Here you'll find switches to add extra loads of 47, 100 or 220 pF (or any combination of these: activated values will add up). Note that the L channel and the R channel have their own switches, but need to be set to the same position. As stated above, if the cartridge manufacturer recommends 150 pF, no extra capacitor will be necessary since the cable plus fixed internal capacitance already add up to that value. If the cartridge needs 300



Typical MM cartridge capacitive loading influence on frequency response (with 47 kΩ resistive load in parallel).

pF (for most cartridges an excessive value), you need to activate 47 pF and 100 pF which together with the 150 pF of the phono cable and the internal fixed cap add up to that 300 pF.

Note that these values are not terribly critical, and please feel free to experiment if you find your cartridge sounding a little dull or a bit too bright. In the picture above you can see the influence of capacitive loading.

MM cartridges sport a relatively high self-inductance, which causes loss of high frequencies. Adding a small value capacitor to the load will invoke a limited amount of resonance which lifts the frequency response in the 20 kHz region, correcting the high frequency loss. However, too much capacitance will cause unwanted peaking.

Hi-Output MC cartridge setup

The sensitivity of Hi-Output MC cartridges generally varies from 0.8 to 2 mV (@ 3.54 cm/s). As the name says (“Moving Coil”), the coil is now the moving element. It must be light and therefore small, so it will be of relatively low impedance. These cartridges rarely need an extra capacitive load to correct for hf loss, and most are designed to be loaded with just 47 kΩ. Hi-Output MCs are usually connected to the MM input. So set the MC/MM input mini-switch to MM, turn all capacitive loads off and, because of the lowish output compared to an MM, engage the extra +10 dB 'boost' using the mini-switch next to it.

In the rare case that your Hi-Output MC offers a too low signal strength, you may try to use the MC inputs instead of the MM's. Set the MC/MM choice to MC, disengage the extra +10 dB boost there, set the MC gain to 20 dB in both L and R mid windows (leave the 30 dB gain setting in the off position). The overall gain is now 20 dB from the MC stage plus 37 dB from the RIAA section, which is 10 dB more than can be obtained when

using the MM input plus the extra 10 dB boost. Of course this will confront the phono preamp with much higher peak voltages than from *low-output* MCs, but in most cases the PW1's overload margins will be wide enough to cope with such extremes.

The righthand windows are dedicated to the loads of the MC input. Although the Hi-Outputs carry the letters “MC” in their name, our advice is to not use any of these load settings: leave all of them in the off position (unless of course the spec sheet of your Hi-Output cartridge says otherwise). With all settings turned off, the input resistance is the standard 47 kΩ, in parallel with an rf-interference suppressing 330 pF capacitance (plus of course the extra 100 pF or so from the phono cable). Due to the nature of MC cartridges the capacitive load is not very critical, so this 430 pF is still close enough to the MM input load of 150 pF that we had when we connected the cartridge to the MM inputs in the first paragraph of this chapter.

Low-Output MC cartridge setup

For these cartridges, use the MC input pair, set the MC/MM switch to MC and leave the +10 dB 'output gain' switch in the off position. Low-Output MC cartridges are low resistance, low-inductance designs and therefore relatively insensitive to loading. Phono preamps nevertheless offer various options for loading MC cartridges. The reason is that these are usually the top models (in musical quality, and price) of a manufacturer's cartridge range, so they deserve extra care. Most manufacturers specify the resistive and capacitive loads which they feel lead to optimal musical and technical performance. So please check the specifications that came with your Low-Output MC.

As explained above, if you keep all load switches turned off, the input impedance is 47 k Ω in parallel with 330 pF. This 330 pF needs to be added to any selected value. Often 1 nF (= 1000 pF) is the specified load capacity, so in that case you need to enable the 680 pF mini-switches in the righthand windows (both of the L and R channels). The standard 330 pF plus the 680 pF will add

up to around 1000 pF. Similarly, you can set capacitive loading to 660 pF by activating only the 330 pF mini-switches, or to 1330 pF if you activate both the 330 and 680 pF mini-switches.

If a 1 k Ω load is specified for your MC cartridge, activate the corresponding mini-switches (L and R). If you need 100 Ω , activate only those switches. Should you need a very low value, activate both the 100 Ω and 33 Ω switches. Because they are in parallel this results in a resistance of 25 Ω . Intermediate values are possible with other combinations. Setting 1 k Ω and 330 Ω gives 250 Ω , setting 100 Ω and 330 Ω gives 75 Ω .

But again: the load values are not very critical, so normally the basic steps from 1 k Ω to 330 Ω to 100 Ω to 33 Ω (choose one) will offer sufficient precision. Note that many hi-fi aficionados ignore what the specs prescribe them and play their MC cartridges bluntly into 47 k Ω , not using any of the low impedance values discussed above, because they feel the sound is then more free, less restrained. Listen for yourselves is all we can say.....

Low-Output MCs usually offer between 0.1 and 0.6 mV (@ 3.54 cm/s), most being of the 0.3-0.4 mV variety. First, try the 20 dB MC gain setting (the corresponding mini- switches can be found in the mid windows). If that should not give you enough output, activate the +10 dB 'boost' (output gain) switch in the leftmost window. The total gain from MC-input to output will then be 20 dB (MC-stage) + 37 dB (RIAA-stage) + 10 dB boost = 67 dB. Changes can be made while listening, but keep your volume lowish when switching, just in case.

MC cartridges outputting only 0.05 mV (@ 3.54 cm/s) are rare but do exist. The Audio Note IO-II comes to mind. In such cases you may need even more gain to get an acceptable signal strength at the outputs. Turn the 20 dB MC-gain switches back to off and engage the 30 dB ones instead (note: never set both switches in the 'on' position). The final gain then amounts to a whopping 77 dB. And yes, the PW1's signal-to-noise ratio on the MC inputs is good enough even for these extremely low-output MCs!

During your experiments, please follow the order of gain setting as described above, as this guarantees the highest available signal-to-noise ratio and lowest distortion. So first try the +20 dB setting. If it's too soft, add the +10 dB 'boost'. If that's still too soft, set MC gain to 30 dB. Note that using the 30 dB MC gain setting with normally sensitive MC cartridges may occasionally overload the phono amplifier.

The variety in sensitivity of pickup cartridges is enormous, it may rank from 50 μ V to nearly 10 mV (@ 3.54 cm/s): a factor of 200! So it is impossible to cover all possibilities. What we have written above are guidelines.

A wrong choice of gain setting for a given cartridge may lead to overload of your preamp input or even of the PW1's output stage in spite of its +22 dBu (= 10 Vrms!) max output capability. So if you should hear distortion on some loud records, try a lower gain setting (and compensate the lower loudness with your volume control).

Default settings

Cartridge	MM	Hi-Output MC	Low-Output MC
Use inputs	MM	MM	MC
Resistive load setting	47 k Ω (fixed)	47 k Ω (fixed)	Set 1 k Ω switch
Capacitive load setting	All off	All off	Set 680 pF switch
Boost	0 dB	+10 dB	0 dB
MC gain	(Not applicable)	(Not applicable)	Set +20 dB switch

Recommended default settings for the three major types of cartridges, as a starting point.

5. Specifications

General:

- Max. ambient temperature for operation: 45 °C.
- Internally set line voltage 100/115 V or 230 V.
- IEC C18 type line voltage connector (without safety earth pin). Class 2 isolation.
- Fuse 115 V: 315 mA TT, Littelfuse 0215.315MXP.
- Fuse 230 V: 200 mA TT, Littelfuse 0215.200MXP.
- Weight: 3.3 kg.
- Dimensions: w x d x h: 100 x 250 x 100 mm.
- Package dimensions: 265 x 350 x 220 mm.

Connections:

- MM/RIAA gain: 37 dB \pm 1 dB. Sensitivity: typical 5 mV.
- MC gain: MM/RIAA gain plus 20 or 30 dB. Sensitivity: typical 500 μ V (20 dB gain) or 160 μ V (30 dB gain).
- Optional output boost: +10 dB.
- Output impedance: 100 Ω (RCA and XLR).
- Recommended output load impedance: > 10 k Ω .

Input impedance:

- MM resistive: 47 k Ω
- MM capacitive: 47 pF, plus optional 47 pF, 100 pF, and/or 220 pF in parallel.
- MC resistive: 47 k Ω , plus optional 33 Ω , 100 Ω , 330 Ω and/or 1 k Ω in parallel.
- MC capacitive: 330 pF, plus optional 330 pF and/or 680 pF in parallel.

Performance:

- THD+N: MM \leq -45 dB (1 kHz, 5 mV); MC \leq -45 dB (1 kHz, 500 μ V).
- SNR CCIR-2k: MM \geq 80 dB (+0 dB position, ref. 5 mV); MC \geq 76 dB (+20 dB position, ref. 500 μ V); \geq 80 dB (+30 dB position, ref. 500 μ V).
- Overload margin: MM 24 dB (1 kHz, 5 mV); MC 24 dB (1 kHz, 500 μ V).
- RIAA precision: \pm 0.5 dB 20 Hz – 20 kHz.
- Channel imbalance: \leq 0.5 dB.
- Crosstalk: MM \geq 90 dB (1 kHz, 5 mV); MC \geq 86 dB (1 kHz, 500 μ V).

6. Grimm Audio Limited Warranty

Grimm Audio B.V. ("Grimm Audio") warrants this product to be free of defects in material and workmanship for a period of two (2) years for parts and for a period of two (2) years for labor from the date of original purchase. This warranty is linked to the serial number of the device and can be transferred to second hand owners if they can show the original purchase bill. The original owner can extend his limited warranty to a period of five (5) years for labor and parts if he sends the original warranty card that came with the unit to the Grimm Audio factory. The extended warranty is enforceable only by the original retail purchaser and cannot be transferred or assigned.

During the warranty period Grimm Audio shall, at its sole and absolute option, either repair or replace free of charge any product that proves to be defective on inspection by Grimm Audio or its authorized service representative. In all cases disputes concerning this warranty shall be resolved as prescribed by law. To obtain warranty service, the purchaser must first call or

write Grimm Audio at the address and telephone number printed below to obtain instructions where to send the unit for service. All enquiries must be accompanied by a description of the problem. All authorized returns must be sent to Grimm Audio or an authorized Grimm Audio repair facility postage prepaid, insured and properly packaged. Proof of purchase must be presented in the form of a bill of sale or some other positive proof that the product is within the warranty period. Grimm Audio reserves the right to update any unit returned for repair. Grimm Audio reserves the right to change or improve design of the product at any time without prior notice.

This warranty does not cover claims for damage due to abuse, neglect, alteration or attempted repair by unauthorized personnel, and is limited to failures arising during normal use that are due to defects in material or workmanship in the product.

In no event will Grimm Audio be liable for incidental, consequential, indirect or other damages resulting from the breach of any express or implied warranty, including, among other things, damage to property, damage based on inconvenience or on loss of use of the product, and, to the extent permitted by law, damages for personal injury.

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