VIOLECTRIC

HEADPHONE AMPLIFIER

Violectric HPA V202

USER´s MANUAL

Content

Theme	Page
About VIOLECTRIC	4
Safety Instructions	6
The Earth / Grounding Concept	8
General	10
Operation: Case, Power Supply, Power Switch	11
Block Circuitry	13
Operation: Inputs, Amplifiers, Volume,	14
About PRE-GAIN	15
Protective Measures	18
Headphone Outputs	19
Things to Know	20
Disposal	24
Technical Data	25
Dismantling, Jumper Settings	26
Warranty	27

CAUTION !!

THE HIGH OUTPUT LEVELS ACHIEVABLE WITH THIS UNIT MAY DAMAGE YOUR HEARING OR THE HEADPHONES

Cordial thanks for your decision in favour of a VIOLECTRIC product !

VIOLECTRIC is a trademark and product line of Lake People electronic GmbH. Lake People electronic GmbH develops, manufactures and distributes products in the professional range, for broadcast, television, airports, exhibition halls, festival venues, theatres, large-scale installations, private studios and more. In the private sector as well, Lake People products become increasingly popular due to their outstanding quality.
The trademark and product line VIOLECTRIC is specially intended to supply the Hi-Fi and High-End market with its specific requirements.

Who develops VIOLECTRIC equipment ?

The devices are exclusively developed in Germany by the engineers of Lake People electronic GmbH. In doing so, the team of developers can draw on over thirty years of experience and countless products for the pro-audio domain.
Among others, the first German-made 20-Bit A/D and D/A converters were developed by Lake People in the early nineties of the past century.

Who manufactures VIOLECTRIC equipment ?

The devices are exclusively manufactured in Germany by Lake People electronic GmbH or contractors in the company's vicinity. Lake People - and by association VIOLECTRIC - put high emphasis on domestic manufacturing. As well, all component suppliers are chosen in order to achieve the main part of added value inland.

How do VIOLECTRIC devices get to the customer ?

The devices can be obtained from respective specialist suppliers. If there is none such accessible regionally, the customer is supported by transregional distribution partners (google may help...) and, of course, by VIOLECTRIC on-line shop.

... and if it doesn't work like it should ?

VIOLECTRIC devices are covered by a 5-years warranty. In case of any malfunction during this period, they can be shipped to the manufacturer directly. Of course, the client will benefit from the full technical support even when warranty has expired. Any technical questions or need for advice is welcome.

VIOLECTRIC **is a subsidiary of**

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WARNING

For your protection, please read the following:

Water, Liquids, Moisture:
This appliance should not be used near water or other sources of liquids. Care should be taken so that objects do not fall and liquids are not spilled into the enclosure through openings.

Power Sources:
The appliance should be connected to a power supply only of the type described in the operating instructions or as marked on the appliance.

Grounding:
Care should be taken that this appliance is operated with proper grounding only.

Power Cord:
Power supply cords should be routed so that they are not likely to be walked on or pinched by items placed upon or against them, paying particular attention to cords at plugs, convenience receptacles, and the point where they exit from the appliance.
This unit is equipped with a 3-pole mains cable with German 3-pin mains plug.
In some countries this unit must be operated with a mains adaptor, supplied by the owner.
Please refer to the table below to connect a mains plug:

OVERVIEW: POWER CORD FUNCTION AND COLORS			
CONDUCTOR		COLOR	Alternativ
L	LIVE	BROWN	BLACK
N	NEUTRAL	BLUE	WHITE
E ⏚	PROTECTIVE EARTH	GREEN+YELLOW	GREEN

U.K. Mains Plug Warning:
A moulded mains plug that has been cut off from the cord is unsafe.
Discard the mains plug at a suitable disposal facility.

Mains Fuse:
The mains fuse of this appliance is soldered in place and accessible from the inside only!!
A blown fuse may indicate an internal problem and should be replaced during qualified servicing or repair work!

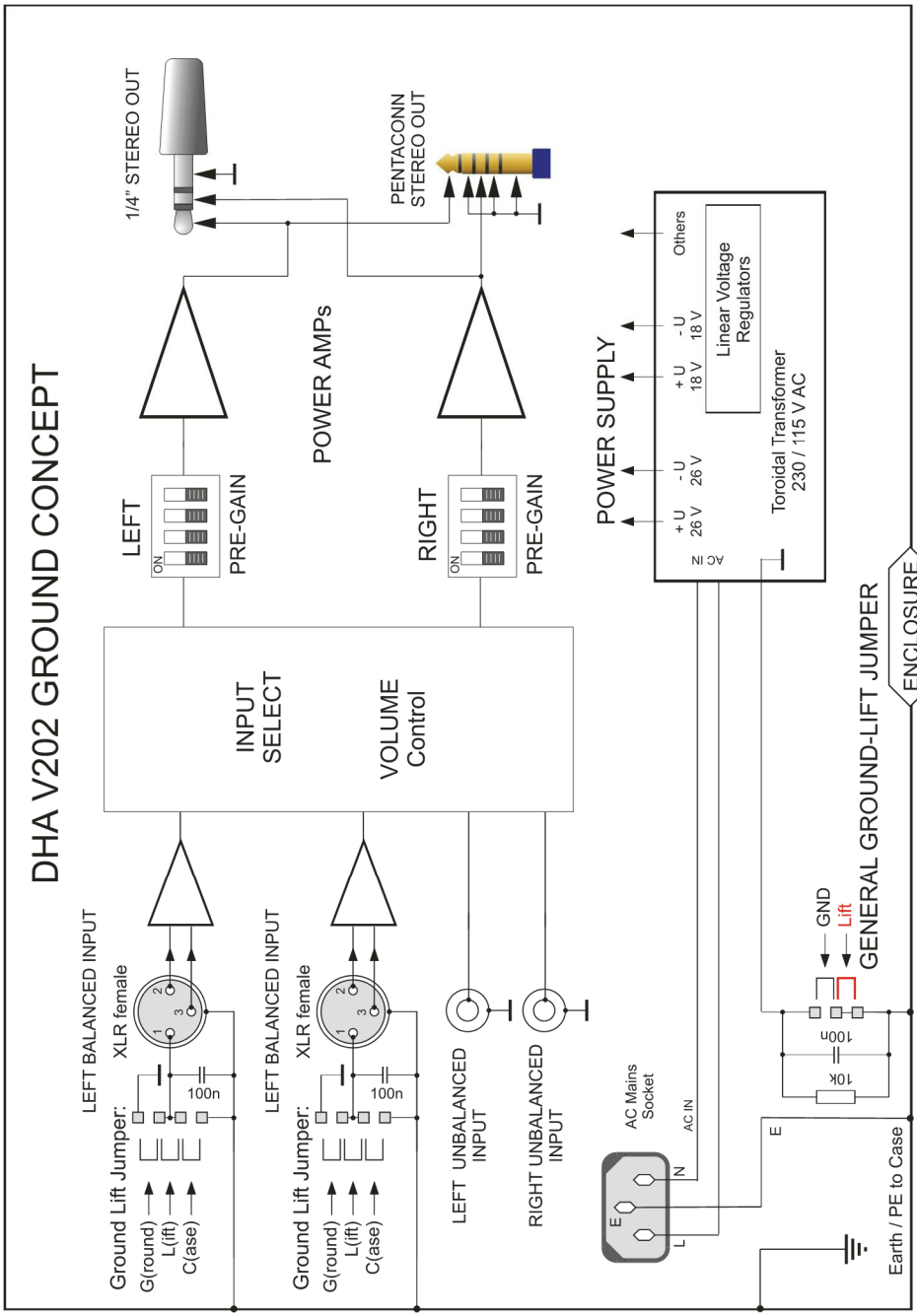
Switchable Power Supply:
Connect this unit to the power source indicated on the equipment rear panel only to ensure safe operation!
This unit is provided with an internally settable mains supply for 230 or 115 V AC.

Service / Repair:
To reduce the risk of fire or electric shock, the user should not attempt to service the appliance beyond the measures described in the operating manual. All other servicing or repair should be referred to qualified personnel!

Electromagnetic Compatibility
This unit conforms to the Product Specifications noted as **Declaration of Conformity** at the end of this manual. Operation is subject to the following conditions:

- this device may not cause harmful interferences
- this device must accept any interference received, including interference that may cause undesired operation
- this device must not be operated within significant electromagnetic field

The Earth / Grounding Concept



General GROUND-LIFT Jumper
(Accessible from the inside. Mind the SECURITY INSTRUCTIONS):

Ex-works this jumper is set to the **LIFT** position.
The internal ground potential is "lifted" by means of this jumper.
As a result, the interconnection for DC voltages and lower frequencies (< 150 Hz) will be cut.
Higher frequencies will be bled off to earth potential through the RC filter. The LIFT position is helpful in case of hum or jitter caused by different ground/earth potentials. Of course, full electrical protection is granted as the case is always connected to ground/earth potential!

Electrical safety is always ensured, since the earth conductor is permanently connected to the enclosure!

Please note that with jumpers not in the ex-works position EMC emission might occur, for which the user is responsible only! So, only change these settings when you know what you are doing!

GENERAL INFORMATION

VIOLECTRIC HPA V202 contains a high-grade stereo **Headphone Amplifier** designed to drive low-, medium- and high-Z loads (16...600 ohms) as usually represented by high-quality headphones. Due to its specific, highly variable, low-noise and low distortion circuit design especially optimised for dynamic and orthodynamic headphones, HPA V202 fulfils even highest demands.

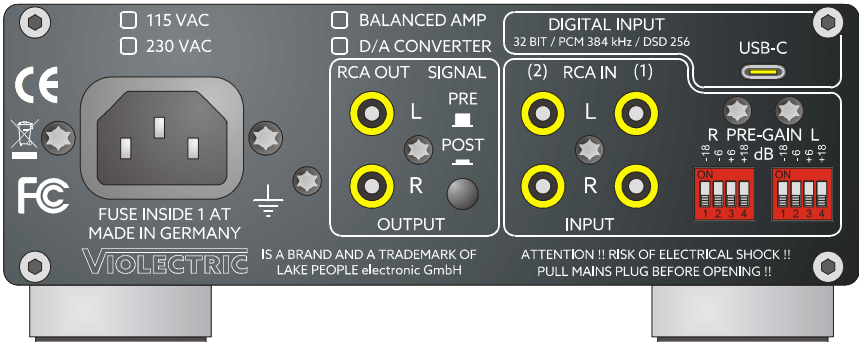
Features:

- **2 analogue Stereo Inputs**,
  unbalanced via RCA sockets, gold plated
  balanced via XLR connectors, gold plated
- inputs switchable from the front
- LED displays for the activated input
- **PRE-GAIN** = 7-fold switchable gain/attenuation
  -18 / -12 / -6 / 0 / +6 / +12 / +18 dBr
- Headphone amp with **discret-design power amps**
- 8 transistors per channel
- extremly low output impedance
- headphone connector 1 x 4,4 mm Pentaconn, gold plated
- headphone connector 1 x 6,3 mm (1/4") phone jack, Neutrik
- RK 27 volume attenuator
- High-grade MKP capacitors in the signal path
- 0,1 % und 1 % Metallfilm resistors
- Large filter capacity > 22.000 uF
- delayed relay-based headphone output during power on
- instant cut-off for power off
- **Protective circuits** for DC and frequency range
- toroidal transformer 15 W
- Rugged Aluminum case, black anodized
- 5 mm massive Aluminum front panel

With its compact dimensions, the VIOLECTRIC HPA V202 ensures optimum flexibility combined with high output power. During design, high emphasis was put on operational safety even when the unit is operated inappropriately.
HPA V202 is equipped with safety circuitry and internal filters to prevent damage to the connected headphones due to DC voltages at the outputs and high-frequency overload beyond the audible range

THE CASE

of VIOLECTRIC HPA V202 is made of 4 mm Aluminum and a thick 5 mm aluminum front panel. This choice of material ensures high mechanical stability and resistance whilst maintaining a high optical and haptic quality.



GROUND AND PROTECTIVE EARTH

The case of VIOLECTRIC HPA V202 is connected to protective earth.

POWER SUPPLY

Mains power is provided via a three-pin IEC/CEE socket and mating "cold-appliance" mains cord with Schuko-type plug for units purchased in middle Europe.

The device is set to 230V mains, whereas the actual voltage may vary between 190 and 240 volts for flawless operation.
The mains voltage may be altered to 115 V AC supply inside the unit with the aid of a mains voltage selector. In this case stable operation is granted in a range of 85 to 120 V (see page 26).
A toroidal transformer with 15 Watt is providing the internal operating voltages of +/-25 V. Out of these voltages some more operating voltages are generated.

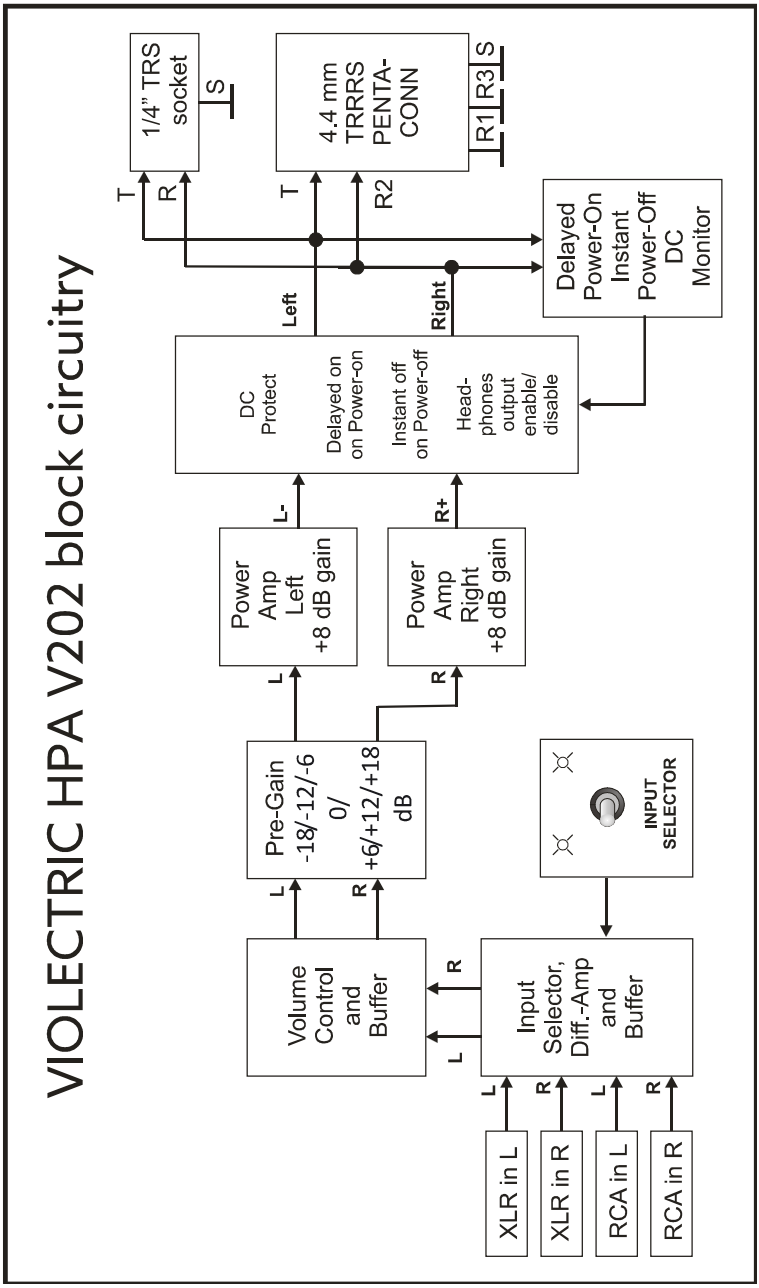
MAINS FUSE

The 0.5A time-lag fuse is soldered in place on the circuit board. In case, it must be replaced with a fuse of the same type only.

THE POWER-SWITCH

The unit is put into operation by means of the power switch.
The power-on procedure takes about 5 seconds.
Any breakdown will cause the headphone outputs to be switched off to protect the headphones.

Block circuitry VIOLECTRIC HPA V202



THE ANALOGUE SIGNAL INPUTS

are situated on the back of the unit. Gold plated sockets are provided. They are labelled as "UNBAL IN L/R" and "BAL IN LEFT/RIGHT".

The input impedance on all analogue inputs is 10 kohms. Maximum input level should not exceed +21 dBu. It is reduced to +3 dBu when **PRE-GAIN** +18 dB is engaged.

SELECTING / ACTIVATING AN INPUT

With the "INPUT" switch on the front of VIOLECTRIC HPA V202 one of two analogue inputs may be activated.
The corresponding LED is illuminated.

THE AMPLIFIER(S)

The input signals are fed to an amplifier stage especially designed for this application, with 8 transistors per channel. The channels are physically separated from each other to ensure optimum crosstalk rejection. The frequency range covers 5 Hz ... 250 kHz (-0.5 dB) in order to ensure fully linear performance within the entire audible

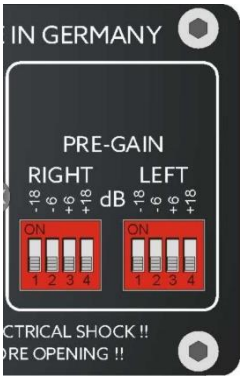
range. Overall gain is set to +8 dB to ensure lowest self-generated noise.

THE VOLUME ATTENUATOR

is to set the desired volume for the left and right channel simultaneously. The attenuator features mechanical a 41-steps detent which may be helpful for precise (re) adjusting the position.

PRE-GAIN

These DIP-switches are situated on the back of the unit.
Settings are made for the left and right channel, they shall not be different from each other.
With these switches an additional gain or attenuation may be set.
It is dependent on the output level of the input source and the sensitivity of the headphones connected. By this measure it is maintained to achieve lowest possible noise and maximum travel of the volume attenuator.
The high gain/attenuation range of +/-18 dB (factor 64) ensures a perfect match to any source with any headphone in the market.



Too loud ? Too soft ? The PRE-GAIN method

The VIOLECTRIC HPA V202 is specially designed to drive headphones. To do so it is placed between up to two analogue sources and the headphones.

Headphones however can present load impedances from 8 to 2000 ohms and efficiency ratios from 85 to 115 dB per Milliwatt.
The sources may have output levels between 0.5 Volt up to 10 Volt.
Thus, it can be quite tricky to fulfil all demands, since...
... owners of high-efficiency headphones will rarely set the volume control higher than 9 o'clock in order to exclude hearing damage, while
... the maximum setting may still be too soft for low-efficiency headphones, but
... all users expect highest quality at lowest noise and distortion.
Thus, the *circuitry* must adapt itself - as the headphones won't do and the sources will seldom do!

WE CALL THE SOLUTION TO THIS PROBLEM **PRE-GAIN**

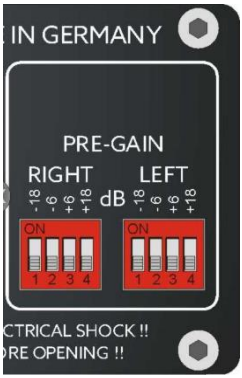
A single amp of HPA V202 has a gain of +8 dB (factor 2,5).
By this measure the amps will produce an extremely low self-generated noise which can hardly been heard even with highest sensitive in-ear-monitors (IEM).
On the other hand, the amps of HPA V202 with very powerful transformers and with their high operating voltage are able to drive low efficiency or high impedance headphone to the full with ease. You will hardly find a headphone driving HPA V202 to its limits. This effortless action will save your precious headphones as they will never see a distorted signal from the amp.
The alignment between amplifier and headphone is provided by the preamp stage, which can boost or attenuate the input signal in seven steps of -18 / -12 / -6 / 0 / +6 / +12 / +18 dBr. (Factor 64 !!) For this purpose, two switching devices are located on the rear panel for left and right channel individually.

HOW TO OPTIMIZE THE PRE-GAIN SETTING:

Connect your source to VIOLECTRIC HPA V202 and plug in your headphones.

Listen !!

Your amp is adjusted best by the individual PRE-GAIN setting when the volume control for “normal” listening is positioned around 12 o´clock. So it is provided, that there is enough attenuator travel to boost the signal through lower level passages or to listen with higher volume. On the other hand, the attenuator travel is optimized to reduce the self-generated noise from the amp.



THE HEADPHONE AMP PRE-GAIN SETTING

Ex works all switches are in the lower position: 0 dB gain.

PRE-GAIN -18 dB 1 = ON	**EX WORKS SETTING**	PRE-GAIN +18 dB 4 = ON
PRE-GAIN -12 dB 1 + 3 = ON	PRE-GAIN +/- 0 dB All OFF	PRE-GAIN +12 dB 2 + 4 = ON
PRE-GAIN -6 dB 2 = ON	**EINSTELLUNG AB WERK**	PRE-GAIN +6 dB 3 = ON

In case you cannot reach the 12 o´clock position because the input signal is too loud, feel free to reduce the signal with the PRE-GAIN steps -6 / -12 / -18 dBr (factor 0,5 / 0,25 / 0,125).

In case the signal is too soft even with volume settings above 12

o´clock please use the PRE-GAIN settings +6 / +12 / +18 dB to achieve more gain (factor 2 / 4 / 8).
Other than the above settings are not useful but harmless.

CAUTION

To avoid unwanted level leaps the settings should be altered under the following conditions only:

- The "VOLUME" control should be set to minimum or the headphone outputs shall be deactivated using the “OUTPUT“ switch.
- Left and right channel settings should be the same unless you want to settle the amp for different hearing abilities.

Ex-factory, all switches are set to their lowest position - i. e. 0 dB PRE-GAIN - which should be sufficient for most applications.

PROTECTIVE MEASURES:

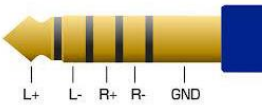
To ensure error-free operation and not to harm your valuable headphones in a comprehensive way your VIOLECTRIC HPA V202 is equipped with some protective circuits:

- During powering on there is a five second delay to protect your headphones from possibly unwholesome noises. After the time the headphone outputs are switched to the amp.
  Also, the instant cut-off after powering off is intended to protect your headphones.
- DC voltages are no good part of the output signal and must be avoided. If such are detected, the headphone sockets are cut from the electronics.
  When the DC voltage has vanished, the amp will automatically return to “normal” operation.

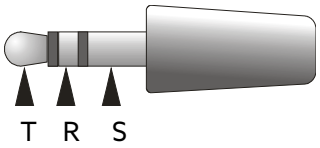
THE HEADPHONE OUTPUT CONNECTORS

HPA V202 offers two dedicated unbalanced headphone outputs. The outputs are situated on the front panel and come as a 4.4 mm Pentaconn and a ¼" (6,3 mm) standard phone jack

Pentaconn TRRRS connector:	
T (Tip)	Left channel
R1 (Ring 1)	Ground
R2 (Ring 2)	Right channel
R3 (Ring 3)	Ground
S (Sleeve)	Ground



¼" Headphone Jack:	
Tip	Left channel
Ring	Right channel
Sleeve	GND



Things to know ...

Why makes it sense to make such huge efforts?

A headphone amplifier is a device designed to condition audio signals with regards to the very specific requirements of headphones. This doesn't sound too spectacular at the first glance

and can be achieved relatively easy. As with many things however, the devil is in the details and much more effort is required to design **one** amplifier for **all** current headphone models.
Headphones per se are quite diverse, and there are two essential parameters: Impedance and Sensitivity.
In general, headphones with higher impedance can be regarded as less sensitive than headphones with low impedance (which is not generally true, but in the majority of cases). The sensitivity of headphones is usually stated in dB SPL (sound pressure level) per Milliwatt.
Extremes in this sense are the AKG K1000 with 74dB/mW on the one hand, and the Sennheiser HD25 with108 dB/mW on the other hand: The K1000 requires 2500 times the power to achieve the same sound pressure as the HD25.
There is also the fact that headphones with high impedance usually require much higher voltage to achieve high loudness. Thus, the amplifier *must* be designed with high internal supply voltages.

Why are op-amps ideal for low-level signal processing?
Discrete amplifiers (designed with transistors) are very popular in high-end audio design also for preamplifier stages. This is often marketed as an optimization measure, but the partially exorbitant extra expenses are of course to be paid by the customer.
But an op-amp consists of transistors as well ... moreover, its structure has the advantage of thermal coupling between its internal components. Also ageing issues play a much less important role.
Due to the large number of op-amp types offered, it is possible to pick an optimum type for any specific application.

Why does PRE-GAIN make sense?
Two extreme examples (with the HPA V202 with +8 dB gain = factor 2,5, volume control set to full):

1st example:
The (pre-) amplifier provides 8 V output voltage, whereas the headphone requires only 4 V for 100 dB sound pressure level.
With the volume control fully turned up, the amp would deliver 20 V output at +8 dB gain. Therefore, the volume control would have to be operated very carefully to avoid hearing damage. Moreover, any interference at the input should be avoided since it would be "unforgivingly" amplified as well.
With PRE-GAIN, the input level can be reduced by 12 dB (a fourth), with 2 V instead of 8 V input level as the result. This 2 V is again amplified by +8 dB, then equalling around 5 V. Now the volume control can be turned over almost the entire range.
2nd example:
The source provides 1 V, whereas the headphone requires 10 V to release 100 dB of sound pressure.
With the volume control fully clockwise, the amp would provide around 2,5 V at +8 dB gain only – too low for the headphone. By means of PRE-GAIN, input level can be boosted by 12 dB (four-fold), resulting in effective 4 V input voltage instead of 1 V. These are again multiplied by +8 dB or factor 2,5, now equalling 10 V. This is exactly what the headphones demand.

Why does frequency bandwidth limiting make sense?
In signal processing, sound is represented by AC voltages. Sound is audible - for young people - from about 20 to 20000 Hz. The elder the listener, the less he will hear high frequencies in particular.
In order to transmit these frequencies at optimum quality, the frequency response of an amplifier should be as wide and as "flat" as possible. At the low end of the scale, this limit is represented by DC, as there is no frequency lower than zero. In upward direction, the limit can be set to practically any frequency, but the higher, the more susceptible the device becomes concerning electro-magnetic

interference. This is not audible in the first place - but may interfere with the useful signal and then become evident. Therefore, unrestricted frequency response attests thoughtlessness rather than remarkable engineering skill.

Why a good volume attenuator is essential?

"Normal" devices do have a volume potentiometer which is a mechanical control element, it can be obtained on the market at any low price. Meanwhile it is often replaced by electronic circuitry, often exhibiting essential disadvantages concerning dynamic range, noise and distortion.

Conductive-plastic resistive tracks, high-quality multi-tap wipers and separated chambers for the individual sections are highly desirable for sophisticated applications, and high quality is inevitable to ensure trouble-free operation for years. Since the market for really good pots is a small one, manufacturers like Noble or Panasonic don't offer these anymore. A current sample of top-of-the-line pots is the RK27 by ALPS, which is used inside HPA V202.

Why a low output impedance is essential?

When actuated, electro-dynamic systems respond with a counterforce. When the voice coil of a headphone has been displaced by the signal, an (error-) current will be induced when it swings back to its initial position. This current must be suppressed as far as possible, which is affected best if the amplifier's output impedance is the lowest possible. The damping factor describes nothing but the ratio between the output impedance of an amplifier and a given load.

Since there is no known technical specification, we define the load (voice coil impedance) as 50 Ohms. With HPA V202 having an output impedance of < 0.25 Ohms this results in a damping factor of 200.

Due to general recommendations the output impedance of an amp shall not be higher than 5 % of the headphone impedance, that means a minimum damping factor of 20.

Why are high supply voltages essential?

A headphone doesn't really require high power, but from the equation $P = U^2 / R$ we can see that the square of the supply voltage determines the power into a given load resistance. The higher the headphone's impedance, the more voltage will be needed to achieve high listening levels. But this deals with the achievable loudness to a limited extent only: Technically spoken, music lives on fast transients which put high demands on signal processing. And thus, a fast transient can easily push an average amplifier with +/-15 volts supply to its limits (95 % of all headphone amps in the market are operated with these or even lower supply voltages). Due to the high supply voltage and the balanced operation mode of HPA V202 you will benefit from far over two times more output voltage swing capability compared to single ended amps with “standard” supply voltage.

Why we are making our amps in such a way.

They are made with transistors and operated with +/- 25 V supply voltage because it is senseful to do so. But a headphone amp must not be as powerful as a speaker amp.

Our “power” stage consists of eight transistors, four small ones, four bigger ones, all of them very fast. They are driven by an op-amp in non-inverting mode, the gain is set to +8 dB (factor 2,5).

For high impedance headphones a very high output voltage of >17 V RMS is achieved - while low impedance headphones will profit from a power over 3,1 Watt into 32 Ohms per channel.

Under all operating conditions noise, distortion and dynamic range is on the edges of physics.

Why does a output relay make sense when switching power?
Amplifiers generate unwanted output signals when applying or removing power, which can damage the connected headphones. The relay breaks the connection between amplifier and headphone for some seconds after power-on and thus protects the latter until electrical conditions have stabilized.

DISPOSAL

Disposal of Old **E**lectrical & **E**lectronic **E**quipment - WEEE Regulation (Applicable in the European Union and other European countries with separate collection systems)

This symbol on the product or on its packaging indicates that this product shall not be treated as household waste. Instead it shall be handed over to the applicable collection point for the recycling of electrical and electronic equipment.
By ensuring this product is disposed of correctly, you will help prevent potential negative consequences for the environment and human health, which could otherwise be caused by inappropriate waste handling of this product.
The recycling of materials will help to conserve natural resources.

For more detailed information about recycling of this product, please contact your local Civic Office, your household waste disposal service or the shop where you purchased the product.

TECHNICAL DATA HPA V202

Al measurements RMS unwtd., 20 Hz - 20 kHz, Pre-Gain set to 0 dB

Analogue Inputs (stereo):	1 x RCA, unbalanced; 1 x XLR, balanced
Max. Input Voltage:	+ 21 dBu
Input Impedance:	10 kohms
Amplifier Gain:	+8 dB
PRE-GAIN:	-18 / -12 / -6 / 0 / +6 / +12 / +18 dB
Frequency Range:	5 Hz ... 250 kHz (- 0,5 dB)
Damping Factor (@50 Ohm):	200
Output Impedance:	0,25 Ohm
Dynamic Range:	> 128 dB (A-wtd)
Noise:	< -100 dBu (A-wtd)
THD+N (1kHz/2x10V/100R = 1W)	< -100 dB / < 0,001 %
THD+N (1kHz/2x4V/32R = 0,5W)	< -103 dB / < 0.0007 %
Crosstalk:	-100 dB (1 kHz) / -95 dB (15 kHz)
Headphone Outputs:	1 x ¼" / 6.3 mm TRS Phone Jack 1 x 4,4 mm TRRRS Pentaconn

Max. Output Level:
balanced outputs
both channels driven
(1kHz / < 0.1% THD+N)

R_L (x 2)	U_a (dBu)	U_a (V)	P_a (mW)
600	27,0	17,3	500
300	26,7	16,7	930
100	25,5	14,5	2100
50	24,0	12,2	3000
32	22,2	10,0	3100
16	16,5	5,2	1700

Supply Voltage:	230 V AC / 115 VAC max. 15 VA
Case, Front, Back:	Aluminium
Case Dimensions:	170 x 54 x 228 mm (W x H x D)
Overall Dimensions:	170 x 65 x 252 mm (W x H x D)

Dismantling / Jumper Settings

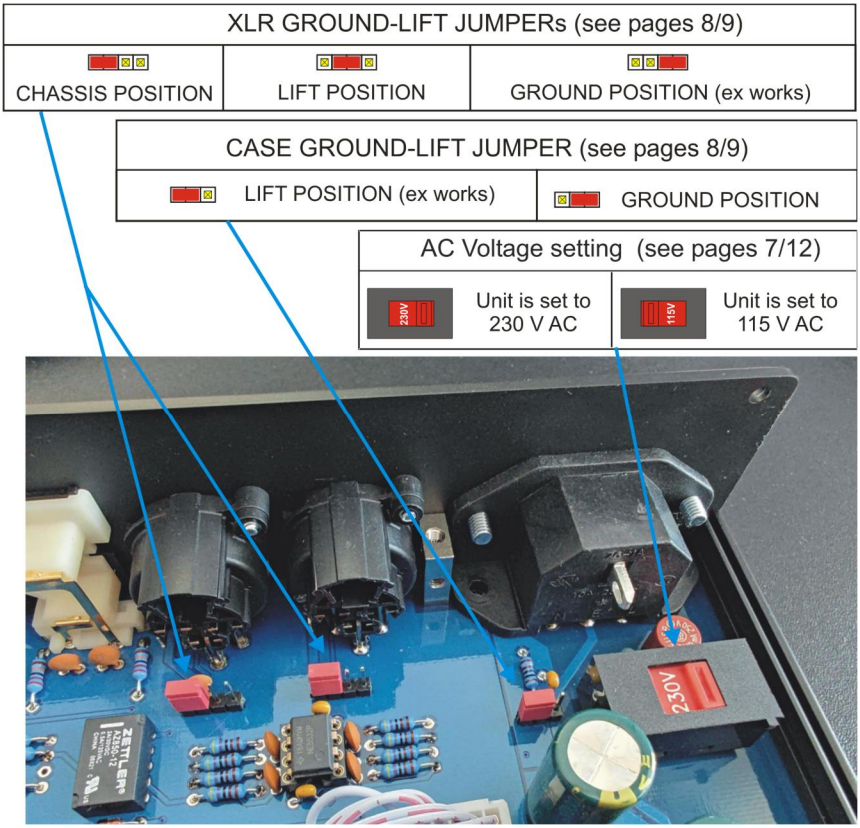
Please note:
To open the case, a TORX T10 screwdriver is necessary - and you should by all means

PULL THE MAINS PLUG !!!

Only thereafter the settings can be altered without any hazard.

Dismantling

1. Screw off two upper screws from the front panel
2. Screw off two upper from the back panel
3. Lift the upper case and make your settings
4. Assemble the unit in opposite order



WARRENTY

Since 1986 we are constructing and manufacturing sophisticated electronics for ambitious customers.
Since the early beginnings we are trying hard by accompanying measures, the use of 1st choice components and multiple quality checks during production to avoid faults at large.
We are quite effective in that and this is – amongst others - why we enjoy such a good reputation.
Despite all accurateness faults may appear which may derogate the proper operation of your product.

In this case your unit is protected by a **5-year Warranty!**

Needless to say that we will care for your product even after the expiration of the warranty.
If it is necessary, please dispatch your item to:

Lake People electronic GmbH	Fon	+49 (0) 7531 73678
Turmstrasse 7a	Fax	+49 (0) 7531 74998
78467 Konstanz	E-Mail	info@lake-people.de
Germany	Web	www.lake-people.de

Your warranty claim begins with the date of purchase,
which should be denoted on your proof of purchase.
Do not forget to include the receipt of sales or a copy of the receipt.
Please also include a short description of the fault(s).
For the reshipment we need you correct address!
Care for a safe packaging.
Best is to use the original packaging.
Please keep in mind that we cannot accept collect freight.
We will grant a quick repair and quick return of the unit.
In case of a warranty repair we will reship free of charge.

Please denote here the serial number and the date of purchase:

Serial Number	Date of Purchase