

ZeroUno PLUS

Digital & Analog Preamplifier

Technical Description

by CanEVER AUDIO®



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∞ Introduction

ZeroUno PLUS is an analog and digital preamplifier with tube output stage designed by CanEVER AUDIO® with the same design philosophy as that of the ZeroUno DAC.

At the time, when the ZeroUno DAC was introduced, the main design goals of CanEVER AUDIO® regarding that product have been explained in detail. Now the ZeroUno PLUS comes with all the building blocks making the ZeroUno DAC a great digital preamp, while adding a high end analog preamp section with two analog inputs inside the same cabinet.

Now the ZeroUno PLUS can act as the central preamp in a modern high end audio system to connect all kinds of digital AND analog sources!



∞ Quick Overview

The ZeroUno PLUS is a high end pre amp, which can handle all kinds of digital and analog sources.

All analog input signals are operated by a separate circuit implemented in one additional board stacked to the main board of the ZeroUno DAC.

The analog input board comes with a dedicated power supply and works totally independent from the digital circuit of the DAC section.

In addition to the digital inputs of the ZeroUno DAC there are two pairs of single ended RCA connectors for analog sources available on the backside of the ZeroUno PLUS.

The digital interface of the ZeroUno PLUS is exactly the same as that of the ZeroUno DAC. There are digital inputs for S/PDIF signals via RCA, XLR (AES/EBU), TOSLINK or USB in PCM and DSD formats. A true 75 Ohms input via a BNC connector is optional as a replacement for the AES/EBU input.

Both analog and digital signals, managed by the ZeroUno PLUS, are operated by the same tube output stage already introduced for the ZeroUno DAC.

All input signals are coupled to the volume control by interstage transformers custom made by Lundahl for CanEVER AUDIO®.

The volume control module works 100% in the analog domain for both digital and analog input signals. It is based on a ladder network of pure 0.1% high precision thin film resistors for the lowest possible noise, channel separation and perfect balance between the left and right channel and independently from the volume level. With each volume setting selected there are only TWO resistors operating the music signal. In total there are 127 different positions for volume setting in steps of 0.5dB possible, reaching a dynamic range of 127dB!

In addition to the volume control, there is a level control implemented. This feature let the user adjust the signals from all analog and digital sources to exactly the same level to avoid any increase or decrease in loudness while switching between input channels. The level can be adjusted in steps of 0.5dB in a range of -26 to +17dB.

Each input channel can be activated or muted. So the user can toggle between only those input channels, which are actually connected to a source. Or, if the user wants to compare the sound quality of two different inputs (e.g.: analog records vs digital sources), he can mute all input channels beside those two, which he would like to compare and switch only between them.

To switch between the active input channels the user can push the INPUT button on the front plate or use the MENU button on the RC.

Following the volume control stage is the heart of all ZeroUno products: the tube output stage!

The topology of this tube stage is different from standard circuits. Here the two triodes of one 6SN7GT are connected in a way to auto cancelling the residual ripples from the rectifier stage of the power supply. Using this topology the power supply does not need a huge capacitors to filter those ripples. The value of the filter capacitors can be small, because the main filtering is done by the two triodes inside the 6SN7GT.

Described in a more technical way: The design philosophy of the tube output stage works as a single ended stage for the audio signal, but as a “push-pull like stage” for the power supply as the auto cancelling capability of a push-pull circuit regarding the ripples from the power supply is well known.

In total the signal path inside the *ZeroUno PLUS* is very short and makes use of a minimum number of components for both analog and digital signals.

The final signal of the tube output stage is present via one pair of single ended RCA connectors and a pair of balanced XLR connectors. To balance the output signal a pair of high quality transformers produced by Lundahl due to CanEVER AUDIO® specifications are in use. Both pairs of output connectors can be used in parallel for bi-amping or to connect an active subwoofer.

Finally a few word about the power supplies implemented inside the *ZeroUno PLUS*.

Basically the power supplies inside the *ZeroUno PLUS* cover about 70% in number of components and board space.

The digital part of the circuit inside the *ZeroUno PLUS* is exactly the same as that of the *ZeroUno DAC*. It consists of 13 separate ultra-low noise power supplies fed by two toroidal transformers followed by a pre-filtering stage plus 13 discrete analog power supplies designed around four AD797 operational amplifiers.

The analog part of the circuit inside the *ZeroUno PLUS* is based upon three independent power supplies and is designed with the same philosophy in mind as the digital circuit: two dedicated toroidal transformers - one for the analog stage and one for the digital volume actuator – followed by three pre-filtering stages, the left analog channel, the right analog channel and the digital volume actuator, plus two ultra-low noise discrete analog power supplies designed around three AD797 to power the analog circuits.

All analog and digital paths are rigidly separated and powered totally independent to avoid any interference or cross talk.

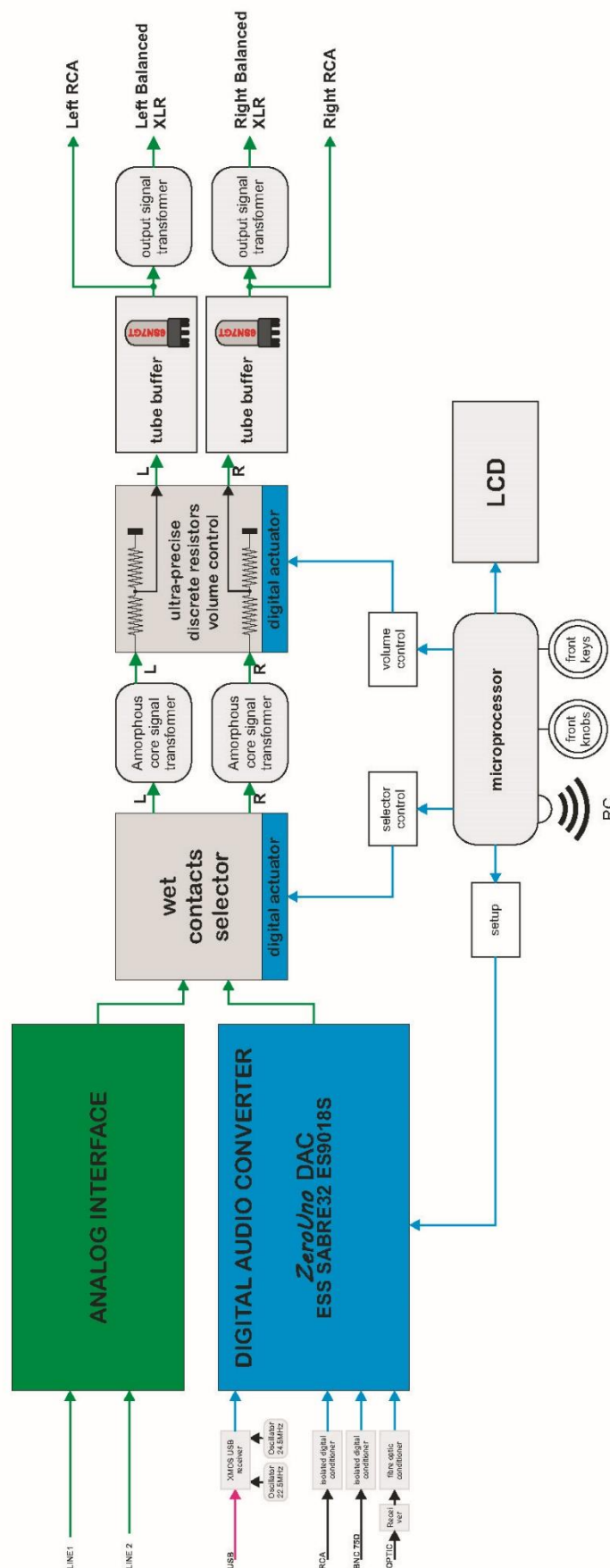
Finally: All the *ZeroUno DAC* produced after March 2017 can be upgraded to a *ZeroUno PLUS*!



∞ **Product Specification**

- The circuit of the ZeroUno PLUS is based on four integrated hardware platforms: Cirrus CS3308 Analog Volume Control, ESS Technology SABRE32 ES9018S DAC, XMOS XU216-512-TQ128 and Atmega1284p
- For optimum performance the hardware platforms run on a proprietary implementation of special developed firmware, stored in a flash memory, easy to update
- 2 motherboards based on a four-layer PCB with extra thick copper traces to achieve ultra-short signal paths with minimal wiring, to avoid electromagnetic induction of noise and to insure perfect grounding
- Discrete built power supplies for the digital and the analogue section using 6 toroidal transformers, last generation of ultra-low noise rectifier diodes and high quality audio operational amplifiers AD797
- Discrete built ultra linear power supplies for the heating power and for the high voltage of the tube output stage using two toroidal transformers with last generation of ultra-low noise rectifier diodes, double π filter, audio grade resistors and capacitors
- Dedicated discrete filters for digital noise suppression
- Comprehensive noise regulation for all analog & digital circuits
- Analog volume control with digital actuator, with a precision higher than 1/100.000
- Voltage swing at the outputs, balanced and unbalanced, is 3.2Vrms / 9Vpp
- On board output level setup to match different sensitivity of the direct connected power amplifiers
- Input impedance of the power amplifier not below 20Kohm, recommended at least 47Kohm, to do not lose bandwidth
- True Class A discrete built analog tube output stage with zero negative global feedback for use with 6SN7GT tube family, including the CV181 tubes
- Jitter free operation by patented high performance algorithm
- PCM and DSD digital roll-off filters as well as asynchronous sample rate conversion of the Delta-Sigma DACs are Voltage-compensated, ultra-low phase noise and low jitter crystal oscillators (clock) acts as master clock. Two separated clocks for sampling families of 44.1, 88.2, 176.4, 352.8 kHz and 48, 96, 192, 384 kHz
- DAC output stage with shortest possible signal path based on custom made amorphous audio transformers produced by Lundahl with first order discrete analogue filter for best THD and digital noise suppression
- Separately powered USB chip by a “quasi battery power supply” using a 1,0 Farad super-cap to avoid any distortion induced by the connected computer (no connection to the +5V powerline of the USB cable)
- USB input based on XMOS xCore audio chip with bit perfect transfer for 16bit, 24bit or 32bit data in PCM format up to 384 kHz including support for native DSD and DoP
- 4 Digital-Inputs: 1x USB 2.0; 1x true S/PDIF 75 Ohm BNC or, optional, true AES/EBU 110Ohm XLR; 1x S/PDIF RCA; 1x S/PDIF OPTICAL
 - USB input compatible with following audio formats via PC and MAC:
 - ✓ PCM: 44.1; 48; 88.2; 96; 176.4; 192; 352.8 and 384 kHz up to 32 bits
 - ✓ DSD (DoP): 2.822 MHz / DSD64, 3.072 MHz, 5.644 MHz / DSD128
 - SPDIF inputs (AES/EBU, BNC, RCA) compatible with PCM signals from 44.1, 48, 88.2, 96, 176.4 and 192 kHz, up to 24 bits. The OPTICAL input accepts music files with a resolution up to 24/96 kHz
- LCD Display with variable brightness, changing letter size for better reading from listening position
- Infrared remote control with direct function keys for volume, balance, absolute polarity, mute and input switch
- No drivers required for LINUX or MAC OSX - USB Audio 2.0 driver available for Windows XP/Vista/7/8/10
- Dimensions (W x H x D): 400 x 198 x 360 mm
- Weight: 11.5 kg
- Power Supply: AC 220-240 V~ (or alternatively 100-120 V~), 50/60 Hz
- Power Consumption: MAX 30W at startup – MAX 7W after 1 minute (MAX is depending on the tube used)
- Infrared Remote Control: 38KHz - Standard CR2032 battery for the controller

∞ Block Diagram



ZeroUno PLUS split in blocks:

- Analog Interface
- DAC
- Wet contacts Selector
- Interstage transformers
- 2 resistors only volume control (ladder)
- Tube buffer with ripple cancelling
- Output transformers

∞ Motherboard



Fig. 1: The board with the Tube output stage, its power supplies and the DAC unit on the bottom and the board for the analog inputs mounted on top

In many audio products, one can see a number of individual printed circuit boards connected by numerous cables. The higher the frequencies of the operated signals in the circuit are the higher is the potential of negative influence on the signal quality by electromagnetic induction, e.g. into connecting cables. In a unit like the *ZeroUno_{PLUS}*, which operates with digital input signals up to 12.288 MHz and low level analog input signals with a useful bandwidth of at least 50 kHz, the electromagnetic induction can become a nightmare for the engineer. The same is valid for the correct grounding of all the separate modules of the circuit to reduce any kind of hum to a minimum.

To avoid such problems, the whole circuit of the *ZeroUno_{PLUS}* consists of only two four-layer PCBs with extra thick copper traces, where one PCB is dedicated to the analog inputs only and the other for the digital interface and the output stage. The separate PCB for handling the analog input signals avoids electromagnetic induction of noise and insures perfect grounding. The tube output stage and its power supply is located on the main PCB. Both PCBs use very short signal paths with minimal wiring. In both PCBs extra layers are reserved for the analog ground planes, digital ground separation and for the power lines of each stage for the best separation of the signals.

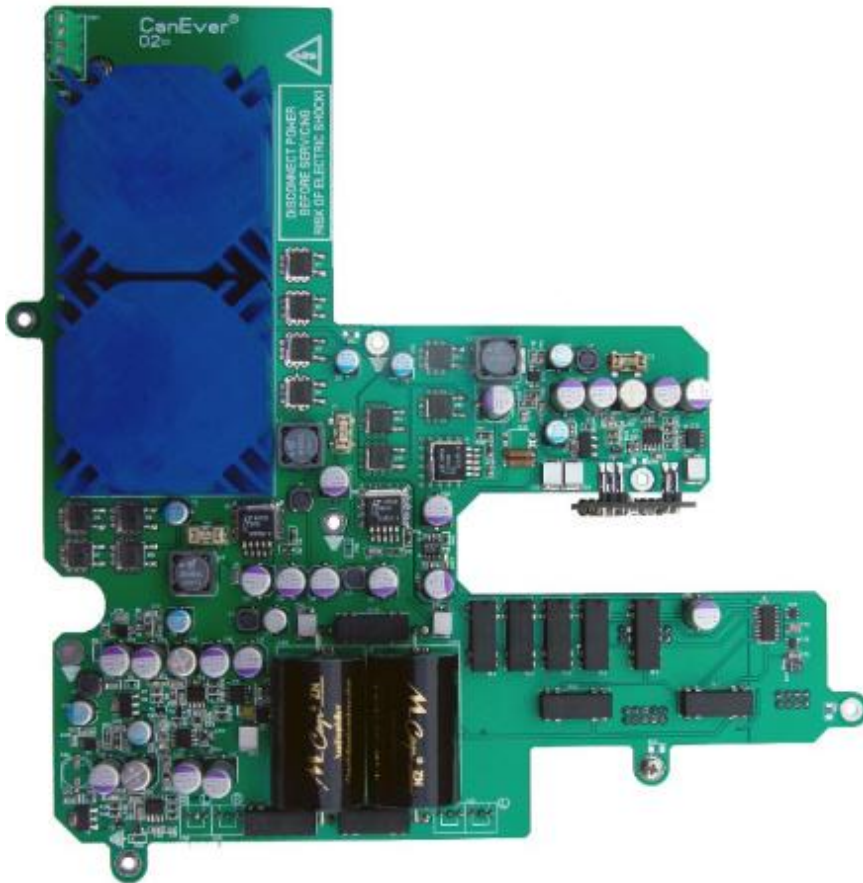


Fig. 2: The analog board in detail



Fig. 3: The board with the Tube output stage, its power supplies, the DAC unit and the mains filters

∞ *Interstage Transformers*

Switching between the different analog and digital input channels is done by a set of wet contact relays. These relays are totally sealed and the contacts are free of any spike and oxidation to guaranty perfect signal transfer for a long period in time.

The relays connect the signals of the selected input directly to a pair of high performance amorphous core step up interstage transformers. This results in a minimum number of components in the signal path, which so is as clean and short as possible: no capacitors, no resistors and no active components ... only a single transformer for each channel!

The interstage transformers are produced by Lundahl due to CanEVER AUDIO® specifications.

The coils are wound around an amorphous core resulting in high sensitivity. There is no loss of any detail of the signals even at very low levels. The very special winding of the transformers guaranty a perfect transmission even of very low frequencies. Furthermore, the transformers perform very linear across the audio band and even more important, within the human audio bandwidth.

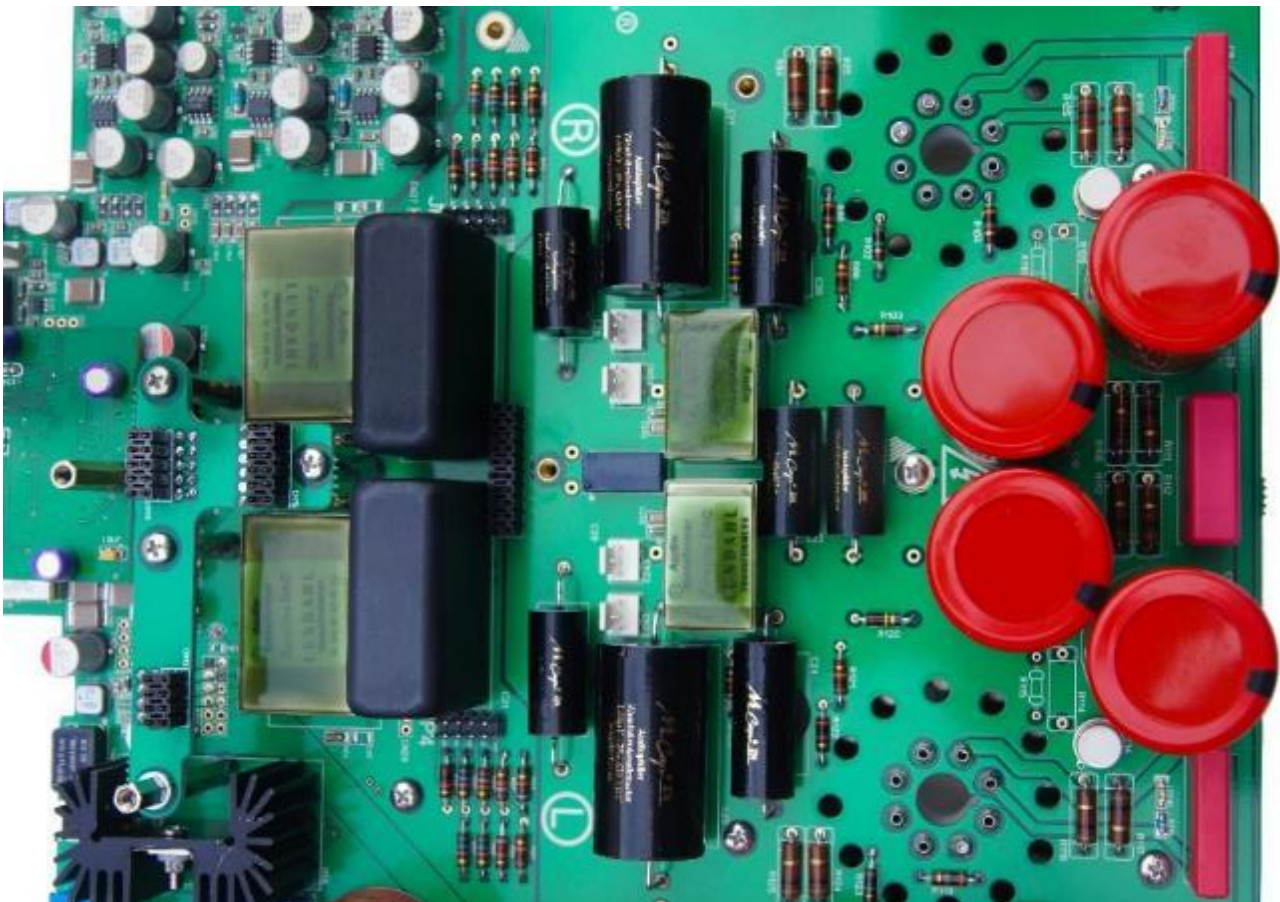


Fig. 4: *The interstage transformers on the left side and the transformers for the balanced outputs in the center of the board*

∞ Volume Control

The importance of the volume control cannot be underestimated in the design of high-end and professional audio applications. Unfortunately this fact is not focused enough upon by many manufacturers. Basically there is no sense to talk about “focus” or “3D image” or “soundstage” as long as there is a lack of precise control of the volume in the two stereo channels.

The volume control module inside the ZeroUno PLUS works 100% in the analog domain for both digital and analog input signals.

The solution used, is the CS3308 chip with a special physical and electrical structure inside to cancel the nonlinearity of its polysilicon resistors resulting in minimised distortions.

It is based on a ladder network of pure 0.1% high precision thin film resistors for the lowest possible noise, perfect channel separation and perfect balance between the left and right channel independent from any volume level selected.

For any volume setting selected, there are only TWO resistors operating the music signal. In total there are 127 different positions for volume setting in steps of 0.5 dB possible within a range of +22 dB to -96 dB, reaching a dynamic range of 127dB!

The tracking control or better the difference between the volume level of the left and right channel in any position is better than 0.05 dB/step. This level of precision is impossible to reach with any classic potentiometer, even when made of 0.1% precision discrete resistors.

An extremely low total harmonic distortion (THD) plus noise is achieved. THD is virtually below 0.001%. But more important: it is mainly consisting of very low level noise instead of distortion!

In a nutshell: the volume control is very transparent with a very high quality track control.

The volume control itself is digitally actuated either by the RC or the ELMA rotary switch on the right side of the front plane to have the perfect control about all the 127 possible volume level positions.

The rotary encoder mounted behind the volume knob is a high quality ELMA rotary encoder.

To ensure maximum mechanical stability, the axis of the encoder is supported by an additional bearing. While turning the knob the user has a “smooth” but precise tactile feedback.



Fig. 5: The ELMA rotary encoder with the mechanical structure

∞ Level Control

In addition to the volume control, there is a level control implemented too.

This feature let the user adjust the signals from all analog and digital sources to exactly the same level to avoid any increase or decrease in loudness while switching between input channels. The level can be adjusted in steps of 0.5dB in a range of -26 dB to +17 dB.

∞ Tube Output Stage

The audio performance of a preamplifier – as well as that of any other electronic audio component, whether it is digital or analog, is very much related to the topology and quality of the analog output stage!

The analog output stage of the *ZeroUno PLUS* is built around a full Class A cascade buffer with zero feedback.

The topology of this tube stage is uncommon to normal use. Inside the *ZeroUno PLUS* the two triodes of one 6SN7GT are connected in a way to auto cancelling the residual ripples from the rectifier stage of the power supply. Using this topology the power supply does not need a huge capacitors to filter those ripples. The value of the filter capacitors can be small, because the main filtering is done by the two triodes inside the 6SN7GT.

As the auto cancelling capability of a push-pull circuit regarding the ripples from the power supply is well known, the topology of the tube output stage can be described in a more technical way like this: The tube output stage works as a single ended stage for the audio signal, but as a “push-pull like stage” in regards to the power supply.

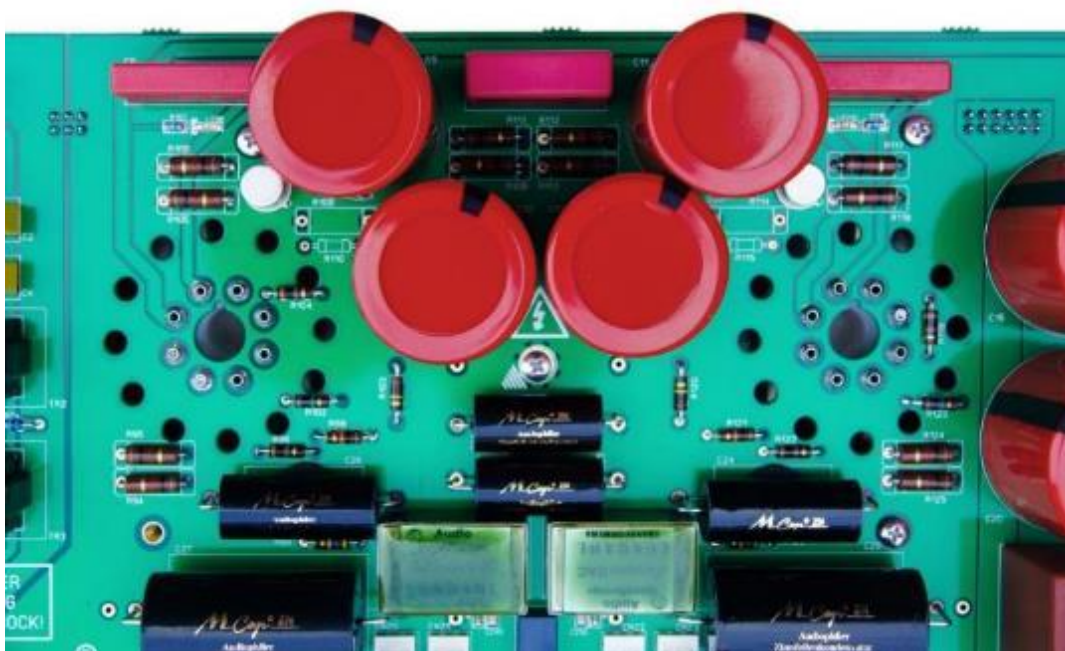


Fig. 6: The board for the tube Output Stage with the tubes sockets on the opposite side



Fig. 7: The Tubes power supply – filament on the lower part of the PCB and for the anodic on the upper part

The tube buffer in the output stage is able to drive the 6SN7GT family of tubes as well as the CV181 without any changes to the circuit. The customer only has to change the tubes in the sockets. The CV181 is a special version of the 6SN7GT, with the same output curves, but with higher current needed to heat the filaments of the tubes. Compared to the “standard” 6SN7GT it has a more solid construction with a graphite screen deposited inside the globe resulting in less microphonic sensitivity, more solid sound in the bass region and a fast sound attack.

All the resistors in the tube stage are of the carbon composition type. The best for the sound, but maybe not for the pure “engineering” approach. If you “listen” by an oscilloscope and a noise analyser, you might decide for metal film or bulk foil resistors, but if you hear by your ears, you will decide to use carbon composition types.

All the high voltage capacitors are for audio use with lead sheet inside to increase the performance and to smooth the influences of vibrations.

The best tube output stage cannot perform on its peak performance level without a state-of-the-art power supply. The tube power supply of the output stage of the ZeroUno PLUS utilises two dedicated toroidal transformers, which can deliver the needed current to drive both, the standard 6SN7GT and the more demanding CV181. The rectifier module uses the last generation of spike noise free components followed by a double π filter. As a choke in the rectifier stage is needed for better sound ZeroUno PLUS uses two of them! The capacity of the filter (choke) used is so big, that it represents quasi a regulated power supply without an active component in the power line!

∞ **Power Supply**

The performance in any electronic unit is depending on a professional power supply!

In the *ZeroUno PLUS*, the digital and analogue power supplies (16 in total) are powered individually by four toroidal transformers - two for the analog circuits and two for the digital circuits.

Exclusive ground planes are used for the analog and the digital circuits.

For the tube output stage there are additional power supplies using two toroidal transformers: one for the anodic system of the output tubes and one for heating the filaments.

All transformers sit in antimagnetic metal canisters using resin mix as damping material to avoid any kind of mechanical hum and vibrations.

Both the power supplies for the analogue and digital sections are split into two sections.

The first section is a low-noise power supply that:

- pre-regulates the voltages generating a very clean DC voltage
- isolates the second section from the domestic AC line
reducing electric noise induced from there

As a result, the second level power supply is sourced by a very clean DC power and works in “quasi” battery mode.

The second section to power the *analog* stage, is made of four separate ultra-low noise power supplies and it sources directly the analog stage of the *ZeroUno PLUS*. These ultra-low noise power supplies are built of discrete components only, designed around the AD797 operational amplifier to reduce the noise to an extreme low level.

The second section, to power the *digital* stage, is made of 13 separate ultra-low noise power supplies. Four of these ultra-low noise power supplies are built of discrete components only, designed around the AD797 chip to reduce the noise to an extreme low level.

As the power supply is such an important part of the circuit, almost 60% of the time to develop the *ZeroUno PLUS* was dedicated to the design of the power supplies, the correct signal path as well as to the paths of the power supplies and grounds.

Selected components used in the power supplies of the *ZeroUno PLUS* make sure to avoid noise created in the rectifier stage. The diodes in use here are almost free of any “converting spikes”, which usually have a negative impact on the sound quality of the audio signal.



Fig.8: The discrete ultra-low noise power supplies in details

To improve the performance of the power supply furthermore almost all capacitors used in the circuit are *aluminium organic solid polymer capacitors* instead of electrolytic type. In addition, for top noise filtering, there are 25 individual coupling inductors implemented in the power supply.

This architecture is fundamental to keep the noise as low as possible. In many audio components these kind of noise is present, while affecting the sound in a negative way, creating harsh and cold sound textures.

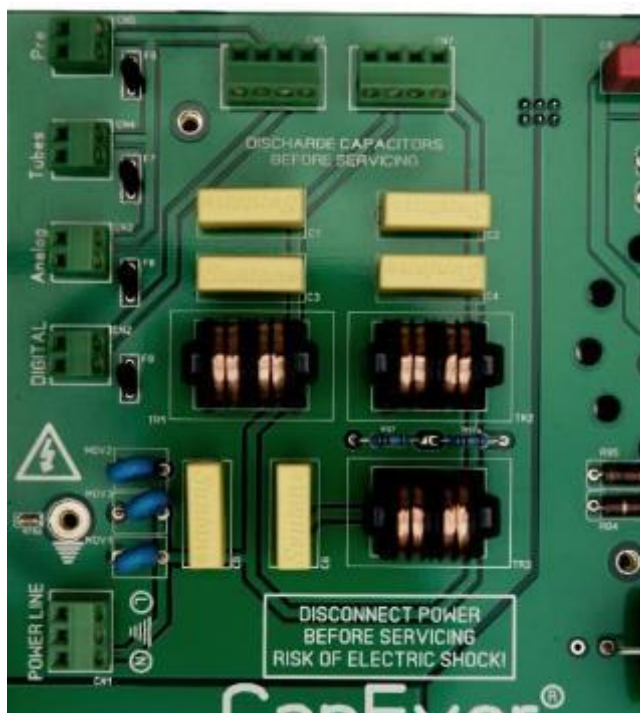
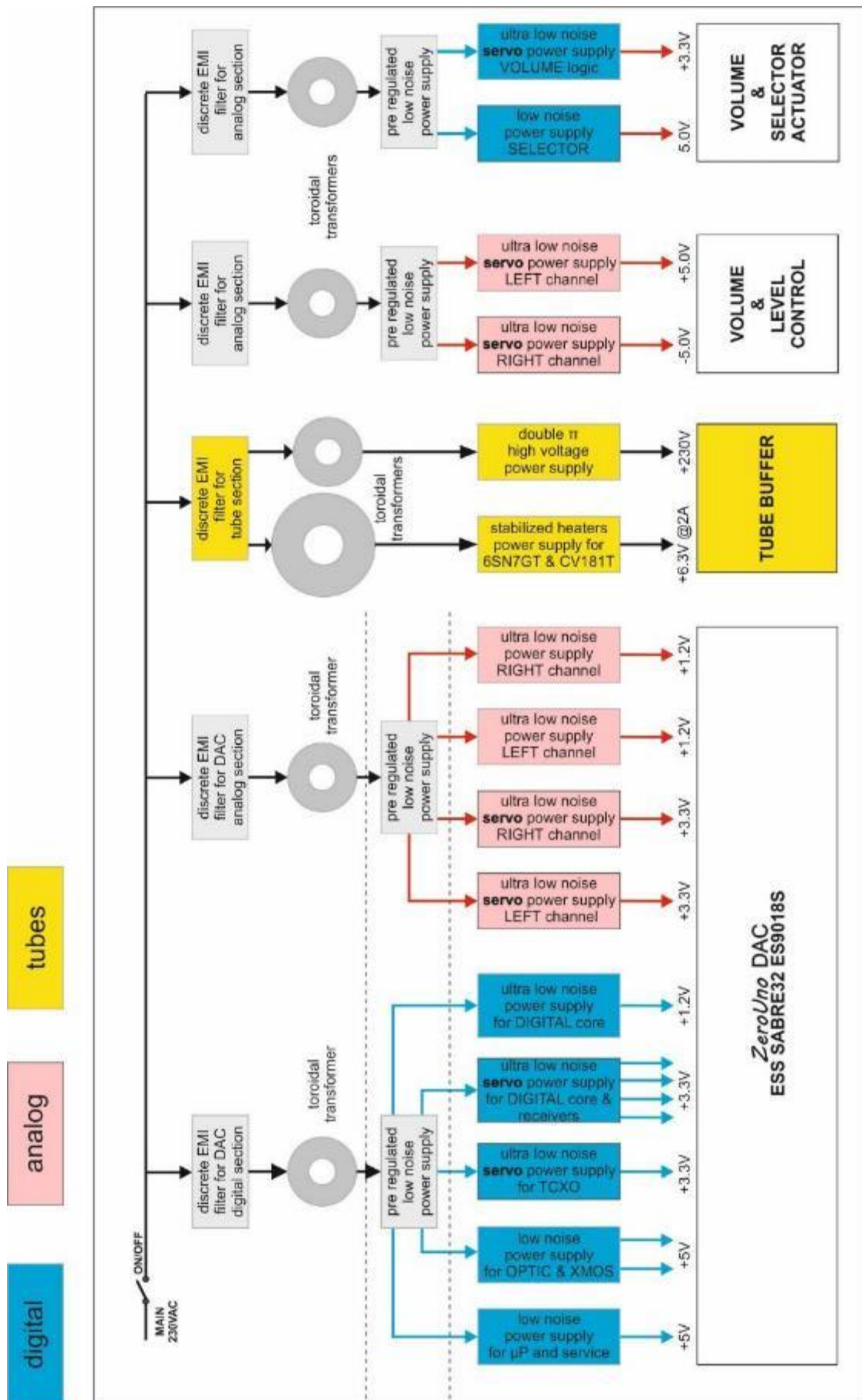


Fig. 9: The mains filter power supply to isolate the ZeroUno PLUS from the mains power network

Last but not least a dedicated discrete EMI filter is part of the main power supply. This filter isolates the ZeroUno PLUS from the mains power supply.

This filter blocks digital noise created inside the ZeroUno PLUS, which could otherwise affect the AC lines in the house.

POWER SUPPLY BLOCK DIAGRAM



∞ **SABRE³² DAC Chip and firmware**

The ZeroUno PLUS and the ZeroUno DAC use exactly the same main board.



Fig. 10: The DAC circuit and the USB bridge board; SABRE³² chip behind the USB bridge board.

The chip used in the DAC section is the ESS Technology SABRE³² ES9018s. This chip incorporates in total eight individual DACs in dual differential coupling. But the ES9018s is not only a DAC! It is one of the most advanced industrial digital chips available today, working with 32 bits math, including 8 pairs of DACs with selectable resolution, IIR filter, FIR filter, de-emphasis filter, notch filter, 8 channels 32 bit volume control, patented jitter reduction algorithm and an 8 channel SPDIF multiplexer.



Although the ES9018s is a very powerful component, it comes from the factory documented for a standard configuration only. This leads to a situation, in which many DACs, using this chip, make use only of the “default” standard configuration. The result often is a sound reproduction, which does not show the real performance level of the ES9018s.

To make full use of the complete *ES9018s* feature set, it needs sophisticated engineering skills. For the *ZeroUno PLUS* exactly the same firmware as of the *ZeroUno DAC* is implemented. So the special and complex firmware developed to let the *ES9018s* run at its full potential is included in the *ZeroUno PLUS* too. The core implementation is a two channel DAC based on four paralleled pairs of differential DACs. Based on the patented internal jitter reduction module of the *ES9018s* the *ZeroUno PLUS* reaches a very low level of jitter.

The key feature of the *ZeroUno PLUS* is the smooth and natural sound without any loss of the rhythm e.g. using the human voice and unamplified natural instruments as the test benchmark. The special internal configuration of the *ES9018s* chip used for the *ZeroUno PLUS* eliminates artefacts in the digital domain, which usually affect the quality of sound. Those kind of distortions are more or less part of digital audio gear since the introduction of the CD in the early '80's and the *ZeroUno PLUS* is developed mainly to avoid them.

The firmware of the *ZeroUno PLUS* is stored inside a separate memory chip fitted in a socket on the board mounted behind the front plane. This offers the opportunity to upgrade the firmware easily.

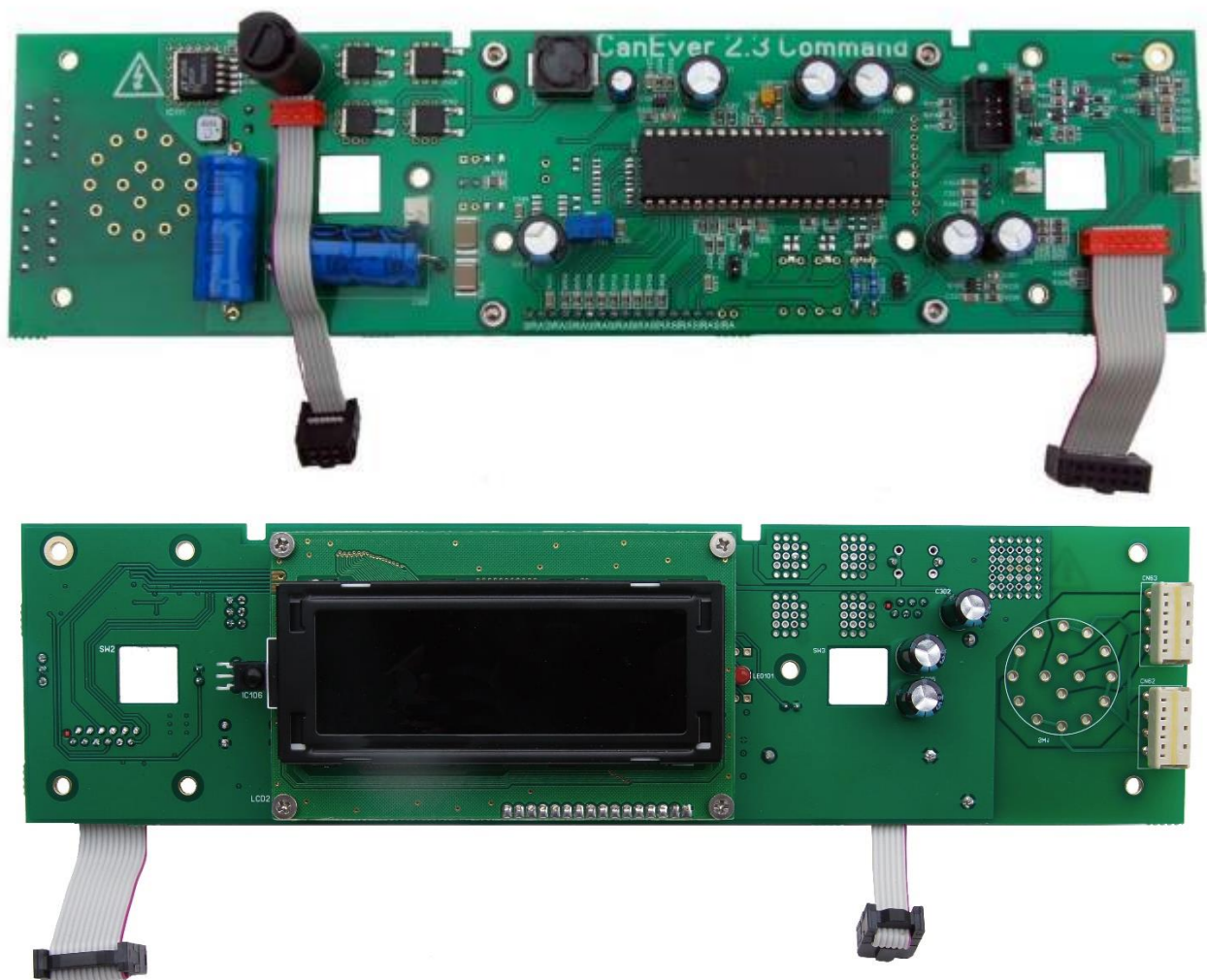
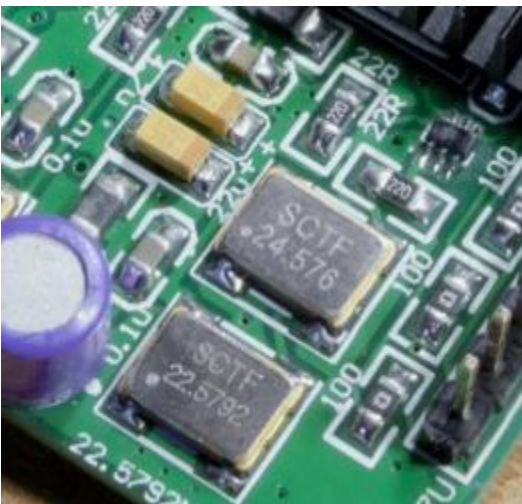


Fig. 11. The front panel with the microprocessor chip where the firmware is stored.

∞ Clocks



For precise clocking, the digital part of the *ZeroUno PLUS* uses an ultralow phase noise and low jitter voltage controlled crystal oscillator. This 100MHz oscillator works as main clock to make sure, that the DAC works at maximum throughput and synchronizes the whole system.



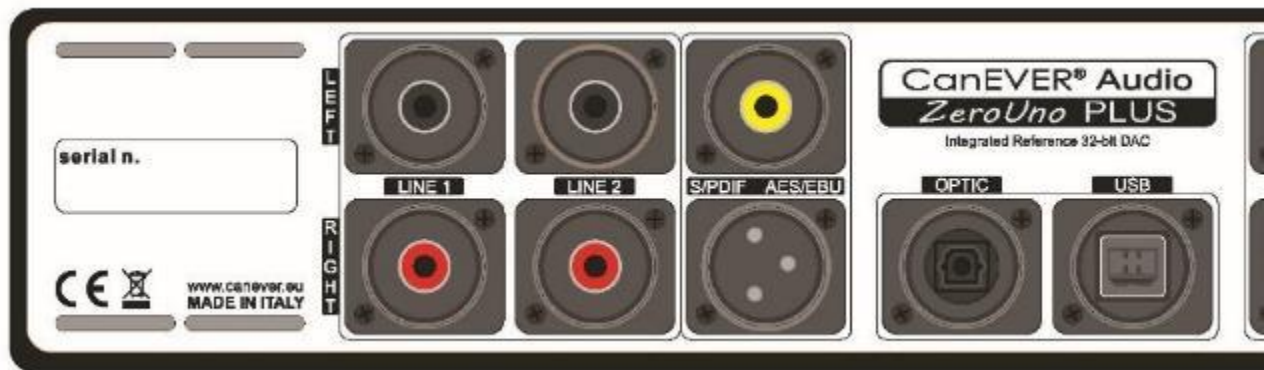
Another two low noise oscillators control independently the sampling rate of the two PCM “families” of input signals:

- 44,1; 88,2; 176,4 and 352,8 kHz
- 48; 96; 192 and 384 kHz

The DSD the sampling rate “families”, which the DAC locks, are:

- 2,822; 3,072 MHz - DSD64
- 5,644; 6.144 MHz - DSD128

∞ Analog & Digital Inputs



The *ZeroUno PLUS* offers two analog inputs.

The user can assign an individual name for these inputs corresponding on the type of equipment, which is connected to the individual input. Every time an analog input is selected, the assigned name will be presented in the display on the front.

The names of choice for the analog inputs are:

- Tape
- Phono
- Tuner
- Line 1
- Line 2
- AUX 1
- AUX 2

The individual input names can be selected from the SETUP menu!

The digital inputs are:

- 1x RCA, 1x XLR (AES/EBU) and 1x TOSLINK for S/PDIF signals (optional: 1x BNC instead of the XLR input)
- 1x USB Audio 2.0 port for a direct connection to a computer or a network bridge / streamer

All the S/PDIF digital inputs have a galvanic ground insulation from the connected components.

Each input channel can be activated or muted. So the user can toggle between only those input channels, which are actually connected to a source. Or, if the user wants to compare the sound quality of two different inputs (e.g.: analog records vs digital sources), he can mute all input channels despite those two, which he would like to compare.

∞ USB Chip

The USB interface is located in a separated module mounted above the ES9018S to reduce the length of the signal path to a minimum. The firmware is stored in a dedicated flash memory, to allow easy future upgrading, if necessary.

The USB module is NOT powered through the connected computer by the standard and usually dirty 5V power lines of an USB cable! Instead, a dedicated ultra-low-noise power supply inside the ZeroUno PLUS powers the USB receiver separately. Furthermore, a dedicated 1 Farad Super Cap buffers this power and acts almost like a pure battery power to the USB receiver chip.



USB signals demand high processing speed and efficiency, robust bit perfect audio streaming and flexible multi-format audio connectivity. To insure this, the ZeroUno PLUS uses in the USB input board a chip of the xCORE-200 multicore family, the XMOS XU216-512.

Unlike conventional microprocessors with only one CPU that handles the audio signal, the XU216-512 microprocessor has got inside 16 CPUs to execute multiple tasks parallel in real time.

By the dedicated ZeroUno PLUS firmware this 16 CPUs are optimised for handling audio signals, offering:

- the XMOS Hi-Res 2 AUDIO platform
- very low response latency
- high-performance real-time processing,

All these features ensures a bit perfect transfer of all audio data.

The USB interface together with the standard stereo 2-channels XMOS driver is 100% USB Audio 2.2 compliant and support signals up to 384 kHz in PCM mode as well as DSD64 and DSD128 in DoP mode. The driver for the Windows operating system works in ASIO or WASAPI mode. No additional driver is needed for Mac users, because the ZeroUno PLUS is 100% compatible with the Mac OS and it's built in Core Audio.

The USB interface of the ZeroUno PLUS is ready to support the native playback of DSD64, DSD128 and DSD256 files.

As soon as XMOS will release the standard ASIO driver for the native DSD formats, this driver can be used with the ZeroUno PLUS as well.

∞ Digital File Formats

The ZeroUno PLUS can play almost all the music formats being commercially available today, whether they are in PCM or DSD/DoP format.

PCM: 44.1kHz, 48kHz, 88.2kHz, 96kHz, 176.4kHz, 192kHz, 352.8kHz, 384kHz.

DSD/DoP: DSD64; DSD128

∞ Outputs

The ZeroUno PLUS is equipped with:

- 2x RCA unbalanced outputs
- 2 x XLR true balanced outputs

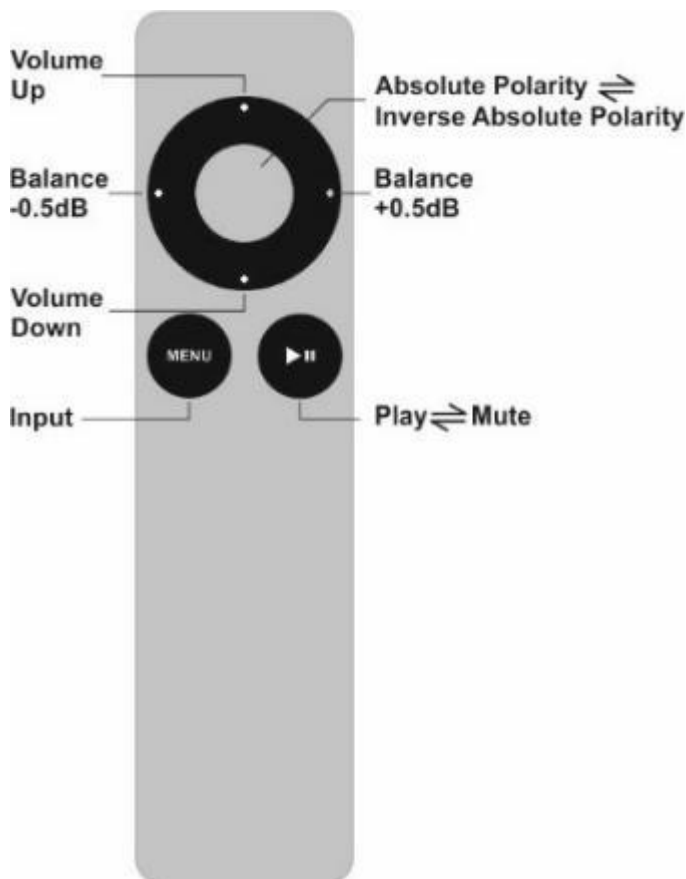
Both couple of outputs can be used at the same time. This is useful for bi-amping and to connect a subwoofer if any.

Suggested input impedance of the power amplifier should not be below 47Kohms.

The maximum voltage swing at the outputs is 9.0Vpp, equivalent to 3.2 Vrms.



∞ Remote Control



A remote control, which comes standard with each unit, gives access to most of the functions of the *ZeroUno PLUS* from a distance. Different from most other DACs on the market, the RC offers in addition to the function "volume up/down" buttons for "balance left/right" level adjustments! A "phase" button for changing the absolute polarity of the music signal and a "mute" button for reducing the volume complete the functions on the RC. All those options assist the customer to adjust the sound in a very comfortable way right from the listening position.

To switch between the different input channels, the user has to push the "MENU" button. The name of the selected input then is shown for 5 seconds in big letters at the display.

The Remote Controller coming with each *ZeroUno PLUS* has been paired already with the receiver inside the DAC in the factory by selecting one of 256 possible pairing codes.

In case of interference with the RC's of other electronics in the household, the preselected RC code can be changed at any time.

To change the code, first move the RC close to the *ZeroUno PLUS* (about 1 m).

Then press the SETUP and POLARITY buttons at the RC *simultaneously* for at least 5 seconds. In a second step, the RC must be paired with the DAC again.

To pair the RC, press the SETUP button at the front of the *ZeroUno PLUS* for at least 2 seconds to enter the SETUP MODE, release the button and finally press the SETUP and the INPUT buttons *simultaneously*.

If there is still interference with other RC's in the household, please restart the process described above to generate another code.

∞ Display

For optimal user control the ZeroUno PLUS has a large display located in the centre of the front plate. In *PLAY* mode this display shows the selected input, volume, level, balance and absolute polarity.



Once a digital input signal is detected, the lock is displayed followed by the sampling rate.

As an option, the sample rate of the incoming digital data stream can be shown at the display in large letters. This feature is activated by setting the related parameter in the *SETUP* menu.

In *SETUP* mode the display shows all possible parameters selectable by the user and their related values.

When pressing the volume or balance buttons (+/-) at the remote control, the display presents the level in large digits for easier reading the display information from a distance. The same happens, if the user presses the *MUTE/PLAY* or the *PHASE* buttons. After 5 seconds, the display switches back to the default mode. Then again, the display shows all selected values in standard size together with all other data about the selected input and the active signal.

The brightness of the display can be set to various levels (50% 60% 70% 90% 100%).

After a defined time (e.g. 10s / 20s / 30s / 40s / 50s) of no user interaction via the Remote Controller or the buttons at the front of the DAC the display turns off. Based on individual settings in the *SETUP* menu, the display could stay *ALWAYS ON* as well, if preferred by the customer.

If the *MUTE* function is activated, the display will show *MUTE* in big characters continuously without any timeout until the *MUTE* function is turned off again.

∞ **Absolute Polarity Listening**

As during the recording, the mastering and the production process the absolute polarity of the music data is changing many times, the final digital master file can be stored in inverted polarity. As some listeners are very sensitive to this fact, the ZeroUno PLUS gives the customer the option to change the absolute polarity of the music file by pushing the round toggle switch at the remote control.



After pressing the toggle switch, the display shows
 “PHASE+” (absolute polarity) or
 “PHASE-” (inverted absolute polarity)
 in large letters for 5 seconds.

∞ **SETUP Menu**

The ZeroUno PLUS comes completely configured by the factory for top performance!

To give the customer maximum flexibility to configure the unit to according to his personal taste, the SETUP mode is implemented. To enter the SETUP mode the customer has to press the SETUP button at the front for a minimum of 2 seconds.

Then the following list of parameters is ready for change:

PARAMETER	VALUE
Balance	range from 5.0dB left to 5.0dB right in steps of 0.5dB
Level	range from -22.0dB left to +17.0dB in steps of 0.5dB
Active Inputs	to active or exclude the INPUTs
Name	assign name of analog source connected (e.g. Tape, Tuner, Phono)
Phase	absolute polarity vs. inverted absolute polarity
LCD Brightness	display brightness: 50% / 60% / 70% / 90% / 100%
LCD Time Out	display timer: 10s / 20s / 30s / 40s / 50s / always on
Sampling Rate	show / hide (in large digits for 5 seconds)

For each parameter its value is visible at the display.

Rotating the right knob changes the parameter values.

To select the next parameter the SETUP button needs to be pressed shortly.

If no button is pressed or the right knob is not turned within a period of 10 seconds, the ZeroUno PLUS automatically stores the values shown at the display and switches back to the PLAY/MUTE mode.

A countdown running on the second row of the display assists the user during this process.

All selected parameters are stored in a no volatile memory, so that the setup information is not lost after powering off the unit.

To RESTORE the factory values the SETUP button at the front panel of the ZeroUno PLUS must be pressed for at least 10 seconds.

∞ Cabinet

The engine of a car can exhibit the maximum performance only, if it has a frame, which can manage the vibrations. This is a mechanical law to follow not to lose power of the engine. The engine in our case is the DAC chip with its 16 power supplies plus the tube buffer and its power supply. The frame in our case is the cabinet, which has to be deaf and rigid without compromises.

It is important to understand, that the cabinet is an “active” part of the *ZeroUno PLUS*.

The cabinet of the *ZeroUno PLUS* is made of a combination of aeronautic aluminium and sheets of stainless steel joined together to create a rigid, light and vibration free structure. Moreover, the cabinet has a coating of acrylic resin, which further dampens the structure and avoids vibrations. While the cabinet is acoustically “dead”, it shields the electronics inside from electromagnetic interference (EMI) from outside as well.

∞ Conclusion

Although the *ZeroUno PLUS* is offering high performance technical data, it is impossible to judge it's value based on these only. The result of the management of the input signals in the *ZeroUno PLUS* is a natural, warm, not harsh and a very dynamic sound, which is not polished to exhibit the last possible details, but to *let the music play*.....

Looking at directly heated triode based tube amps (e.g. 300B, 2A3 or 211 and 845) or tube amps in general one can make similar observations. From a pure engineering point of view, there is no reason to prefer a tube amplifier over a transistor based amplifier. Most of the technical measurements are even voting against a tube amp. However, if we do not leave it up to the instruments alone to qualify such an amp and instead we use our ears to listen and feel our emotions, the picture in many cases can change a lot!

Have fun with the *ZeroUno PLUS*!

The Specifications in this document are subject to change without notice.

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