

come. see. listen.

power

true digital audio

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Impressum

## Facts about **behold**

Creating **behold**, we believe that music is a cultural good which needs to be preserved and processed in the best possible way regardless of cost. Also we believe that based on existing offers the result of the reproduction in your home could be improved by new technologies and designs. We have a single-minded dedication to preserving the facts that make authentic music and their reproduction special. The basic idea is that behold components are built as "precision instruments" capable of extracting every nuance and shading embedded on data carrying medium, whether it's Vinyl, CD, SACD or DVD.

Creating **behold**, we combined the very latest available technology in parts and construction to a technological masterpiece. Our engineers work very closely together to achieve the goal to produce a "musical measurement instrument" in combination with creative designs. This is achieved through advanced electronic, industrial and mechanical engineering with the latest tools in CAD-design.

The complete engineering, design and manufacturing is done in Germany. Consequently the quality we deliver is far more than what you will ever expect.

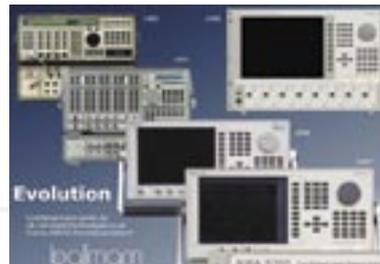


Ralf Ballmann  
President



## Who is **behold**

The Young Brand **behold** is the audiophile translation of the Know-How of the company Ballmann Electronica GmbH which produces the most complex high frequency network analyzers up to 6 GHz since 1985. The huge amount of accumulated knowledge how to handle the most critical and sensitive signals with accuracies not known in the audio industry up to now. The high frequency network analysis is the kings discipline in the measurement technique.



We have the latest measurement technology in our company, not only at audio frequencies but also in radio frequencies and DSP-technology, which enables us to have every single step of the developments fully under control. Ballmanns software engineers are able to program DSP's in Assembler, the one and only way with an absolute minimum in overhead. This is the reason why we can handle huge amounts of audio data very effectively to achieve a result far above commonly known products.

All the **behold** products have our unique user interfaces which enables customers to use an advanced system in a very easy way. All the **behold** products are upgradeable and easy to use. Software upgrades can be done via Internet free.

# APU768: Audio Processing Unit 768kHz

- Modular Digital Pre-Amplifier 768kHz/24bit
- Digital and Analogue In- and Outputs
- Stereo and Multi-Channel 5.1 to 7.1
- Multi-Room Capability
- Two totally independent Audio-Channels
- 14 Slots for Modules
- Display with Pull-Down-Menus
- Bluetooth Radio Link Remote Control
- Highest Quality Music Recording with a PC
- USB 1.1 for Recording and Settings
- Software-Updates via Internet free of charge
- Separate External Power Supply



## In Brief:

The behold APU 768 is a modular Digital Preamp. It has unlike many other high end audio systems of a higher price range a modular concept as its basis. The modularity enables you to build "your" device according to your ideas and wishes individually. Modifications are also possible. The basic APU768 offers space for up to 14 plug-in modules. The internal connection of the modules together is done via a high speed parallel bus system. The sequence of the modules is completely variable.

This bus system contains the digital control signals and four digital high speed audio channels which work completely independent from each other. This enables you to listen to different sources in separate rooms. All the necessary adjustments can be made in the large display where you select everything you need. The remote control we offer is based on a Handheld computer working with a bi-directional Bluetooth connection. So you clearly see what the remote control is doing.

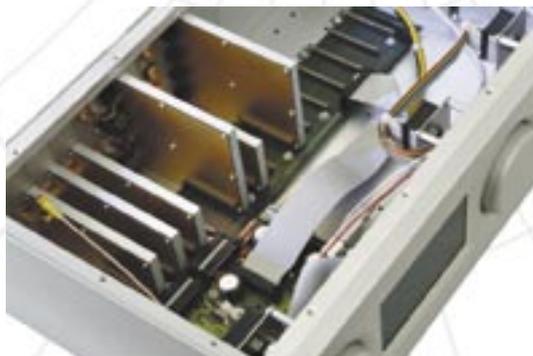
## In Detail:

### Modular Concept

Unlike many other high end audio systems of the higher price range **behold** has a modular concept as its basis.

### Individual Requests

The modularity enables the user to build "his" device according to his ideas and wishes individually. Modifications are also possible.



### Plugable APU-Modules

The basic device offers space for 14 plug-in modules. These can be the same or different depending on the wishes of the user.

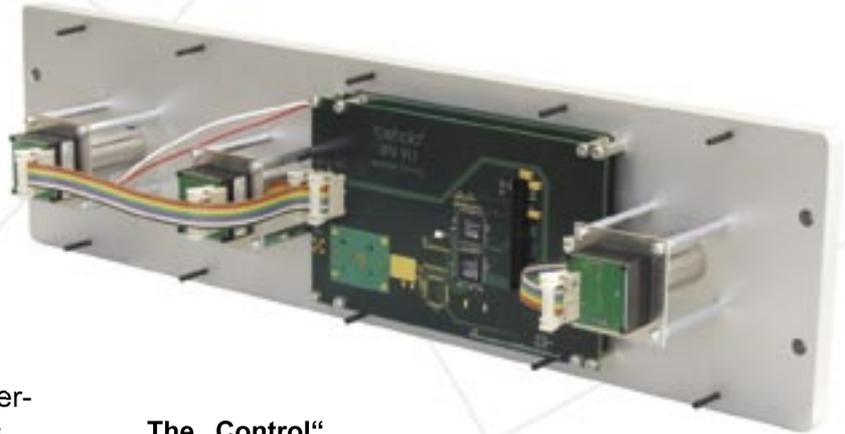


### SMA-Connections

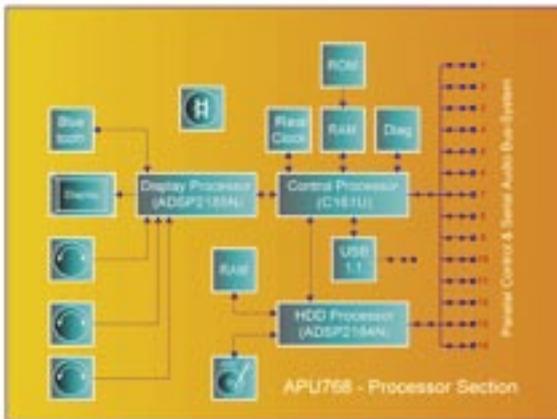
are perfect to perform a very high quality digital interconnection system with simple 50Ω coax cables at reasonable prices.



A **USB 1.1** interface is always installed as an integral part of the pre-amp.



The „Control“ is done by a control unit available in each device together with the LCD display and the three bit generators giving the commands.



**Parallel Bus-System**

The connection of the modules is realized via a parallel bus system. The sequence of the modules is completely variable.

**Two Digital Channels**

The bus system contains two digital control signals and two digital high speed audio channels which can be used independently from each other.



APU768 Main Circuit Board



## The APU768 Main Menu:

### Top Left

the actual active input is shown. The text is adjustable by the user and can be modified to own ideas.

### Two Level Peak Meters

are placed on the left respectively on the right side. They inform about the modulation of the signal source.

### -80dB

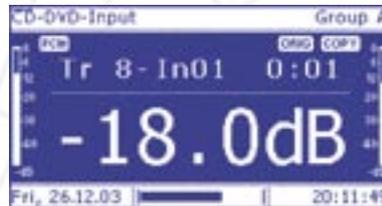
is the most quiet position. The minus stands for turned down and 80dB for 100 million times turned down than the loudest position.

### The Left Wheel

enables to call the other menus. By pushing this wheel the upper menu bar is activated.

### The Track Information

in the middle provides the information which number of a CD or DVD is just played. If the required information is not available in the digital stream the display will show "00".



### The Volume

is displayed in dB in the behold system as this logarithmic view fits as close as possible with the hearing sensitivity of human beings.

### The Bar in the Middle

shows the output volume as an analogue indication and informs therefore not numerically but analogue about the volume which is set.

### Top Right

is shown where the signal which is set will be transferred to. This is helpful if several outputs shall be operated differently.

### The Real Time Clock

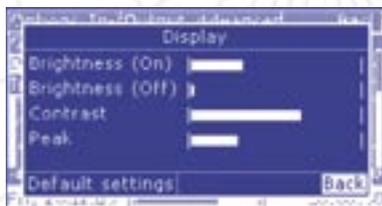
in the front shows on the left below the weekday and the date. The actual time in the format 24 hours, minutes and seconds is shown on the right below.

### 0dB

is the position for the loudest playback. It is the highest value for guaranteed undistorted signals. It is possible to adjust up to +10 dB, for very quiet recordings.

### The Right Wheel

is to set the volume, to mute and to switch off the complete system.



When the APU768 is fed in with power by the affiliated power supply the screen shows up first.

This screen shows which modules are available in the APU768 pre-amp and have reported proper function.

behold APU768-0101	
RAM	CL / HDD:0
SD1768#1-0101	
SD0768#1-0101	
DIO768#1-0101	

The Brightness for the APU768 display in the "on" or "off" condition of the system. The contrast of the APU768 display. The hold time of the peak meter. These show not only the just current rejection value but store also the peak for the time of the hold time.

When the behold system is turned off the display of the pre-amp APU768 shows the actual time with the date and weekday. The brightness can be fixed in the menu for display settings.



## Remote Control for the High-End System behold

### Today's IR Remote Controls

always have the disadvantage that the device to be controlled must be targeted at more or less exactly. A control from a neighbouring room without line-of-sight connection is completely impossible.



**Bluetooth**

The solution is radio link. Unlike the IR remote control this works bi-directionally which means that a change in the setting at the pre-amp is shown directly on the remote control display.

**Fully Update Access**

of the remote control software was the second fundamental aspect. It doesn't make sense to develop an audio system with a very high expansion capability and then be completely limited by the remote control.



**The solution is: Pocket PC.**

**For Everything**

one remote control and not for every device a different one and there may be an additional device at any time.

**Handy & Clear**

are all relevant parameters to be arranged on the colored LCD display, a touch-screen naturally.



**myAPU:**

The Software to Update the Complete **behold** Audio System: the APU, all it's modules, the BPA power-amp, the D/A-converter and the remote control. Just take a Laptop or a PC, use it's USB-connection and download the latest version of **myAPU**. It was never easier to get the Audio System **"Up To Date"**.

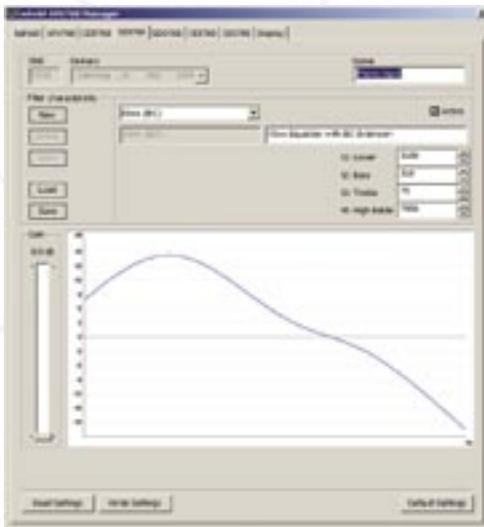


**RIAA Equalizer:**

Use any Equalizer Function which is applicable to your Vinyl Records. RIAA and RIAA (IEC) are preinstalled. All others are very simple to enter and store.

**Stereo and/or 5.1 to 7.1:**

All Details of the Individual Setup can be achieved by the myAPU tool. A full Matrix of Audio Switching give all the necessity needed.



All the Parameters of the behold Audio System for general Setup are accomplished very simple by the interactive control tool. Most useful flexibility is the result high performance development, just using it by ourselves and looking for good details

...





**The behold APU768 pre-amp contains no power supply**

We use an external power supply for a good reason. According to our ideas mains frequency and higher voltage should not be included in a pre-amp of highest quality. In addition, a power supply requires space which should be better available for use ful additions. The complete space may not be needed for all customers to install expansions. There should, however, be free space right from the beginning and no restrictions.

**Technical Data APU768:**

**Digital Features:**

Sampling rate of the audio bus systems:	768kHz
Number of audio bus systems:	2, 1x primary, 1x secondary
Number of bits per audio bus system:	2x 24Bit
Working frequency of the audio bus systems:	49.152MHz (1024x 48kHz)
Data rate per audio bus system:	24.576MBd
Working frequency of the Micro-Controller (161U):	36MHz (8MHzx 4.5)
Word length of the Micro-Controller (161U):	16Bit
Working frequency of the HDD-DSP (ADSP2184N):	49.152MHz (1024x 48kHz)
Word length / Accumulator of the HDD-DSP (ADSP2184N):	16Bit / 48Bit
Working frequency of the precision oscillator:	49.152MHz (1024x 48kHz)
Audio sampling frequency of the USB1.1-PC-interface:	48kHz, 96kHz, 192kHz, 2x 16 Bit stereo each

**Control Elements & Displays:**

Number of bit generators / division:	3, 2x 16 raster, 1x 32 raster
Graphical display / resolution / colour:	LC-Display, 240x120 pixel, blue / white monochrome
Brightness of the graphical display:	64 steps, linear
Control of the contrast of the graphical display:	64 steps, linear
Brightness of the LED's on the rear of the device:	256 steps, linear
Reading of the real time clock:	hh:mm:ss, DD:MM:YY, weekday

**Slots for the Modules:**

Number of slots :	14 totally
Number of 25mm slots :	14 maximum
Number of 50mm slots:	7 maximum

**Remote Control & Interfaces:**

Remote control, bi-directional:	Bluetooth
PC-interfaces (standard):	USB1.1

**Power Supply:**

Power supply voltage / current consumption incl. modules:	+5.20V +/-0.2V DC / 10.6A max.
Power consumption turned off, without a module, no HDD:	1.5W (290mA @ 5.2V), display with min. brightness
Power consumption turned on, without a module, no HDD:	3.9W (750mA @ 5.2V), display with max. brightness

**Connectors:**

Connector DC-power input:	Hirschmann CA3GS
Antenna plug for Bluetooth:	SMA 50Ω (standard RF-connector)
Connector for USB1.1:	type B

**Mechanical Figures:**

Available colours:	Al-nature, Al-black
Dimensions in mm (WxHxD):	484 x 132 x 320 (usable for 19" rack)
Weight without modules:	13kg

**Power Supply Unit:**

Power supply voltage / Maximum input power:	85V to 264V AC / 80W
Available colours:	Al-nature, Al-black
Dimensions in mm (WxHxD) without connector:	184 x 52 x 110
Dimensions in mm (WxHxD) with connector:	204 x 52 x 110
Weight:	1.3kg

# BPA768: Stereo and Bi-amping Power Amplifier @ 768kHz

## Two Choices:

### ► Sparkling Blue Fire:

Radial Sparkling Light from 22 Light Sources,  
the Absolute Eye Catch



### ► The Decent Harmonic Blue Ring:

The Silence and the Diversion from  
the Harmonic Blue Ring



## Key Features:

- 768kHz/24bit digital Signalprocessing
- Finalstage with 16x 24bit D/A-Converter
- Stereo- or Mono-Mode Usage
- Full Symmetrical Transimpedanz Amplifiers
- Two Fullbridge Outputstages
- 2x 600Watt CW @ 4Ω Load
- < -100dB THD+N DC-20kHz unweighted
- Dumpingfactor 700 @ 20kHz
- Analogue Frequency Slope +/-0.025dB
- Synchron Switching Powersupply
- Integrated Power Conditioner
- Digital Overloadprotection



## In Brief:

This Bi-Amping Power Amplifier is an analogue mono & stereo final stage with two fully balanced bridges and a digital audio input at 768kHz sampling rate.

The "music" is made on three different circuit boards. The structures are clear and considerable and in combination with a perfect pairing of excellent new digital technique and new ways in the area of analogue technique show a really well thought-out concept.

## In Detail:

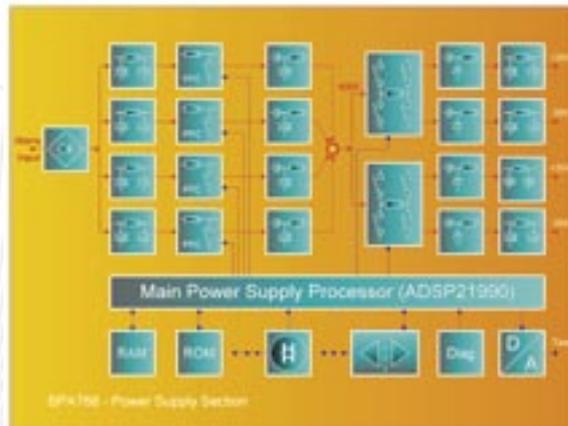


The **behold** BPA768-484 contains - unlike all other High End Power Amps - in one case three important equipment functions which have characteristics desirable today as well as in the future:

- Switched Mode Power Supply with Power Conditioner
- D/A-Converter
- Analogue Power Final Stage

### The Switched Mode Power Supply

made it possible to keep the weight in acceptable limits. The behold BPA768-484 weighs only 45kg and can be transported relatively comfortably by two persons by using the two handles, placed elegantly in the top and bottom cover.

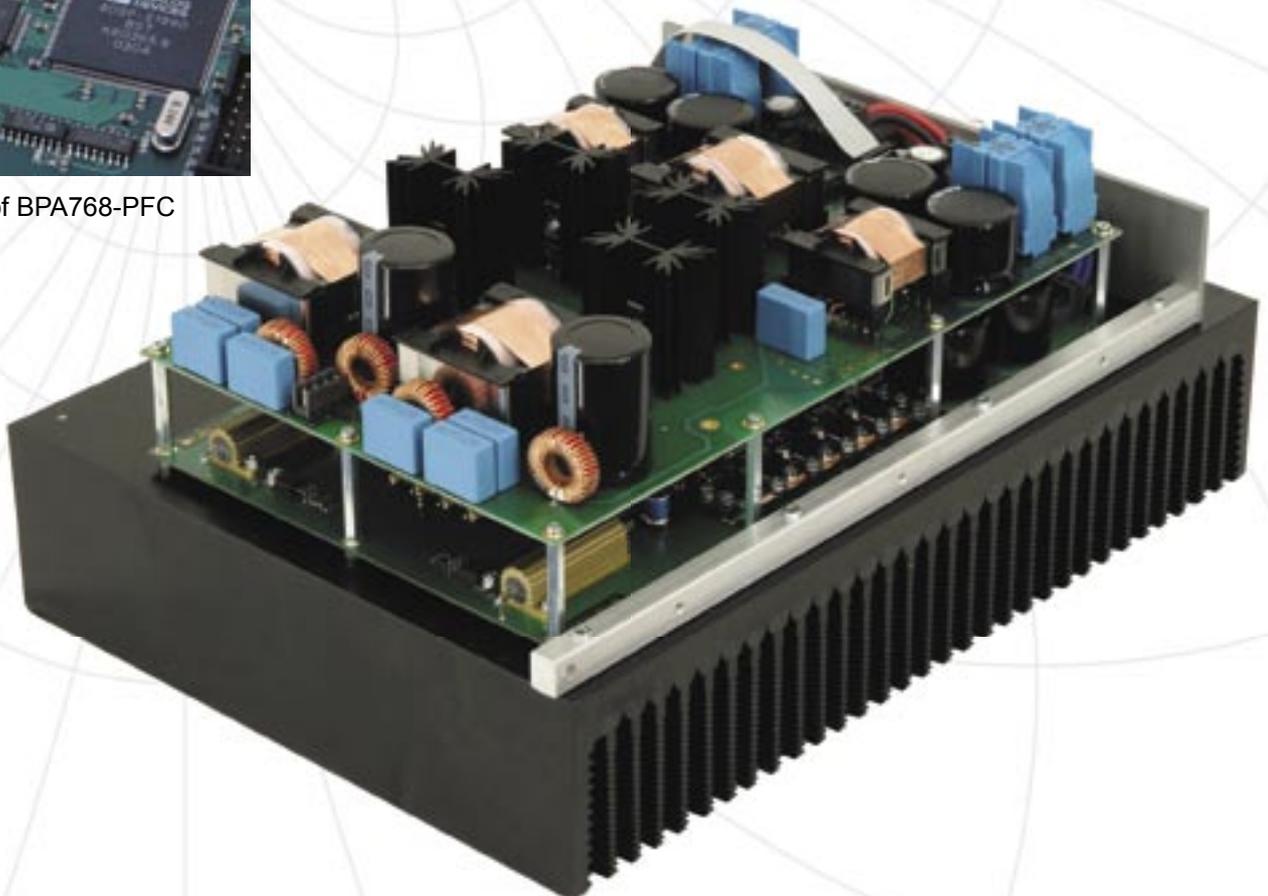


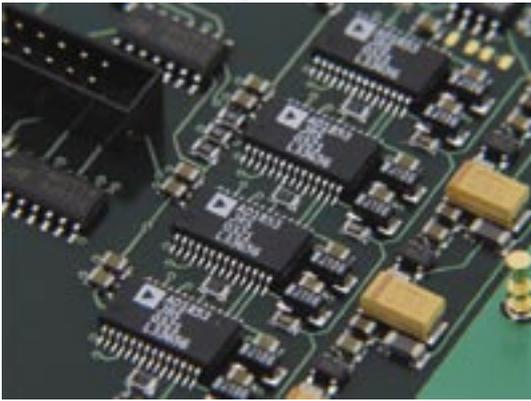
### Power Conditioner

in high end audio systems is generally arranged for the complete system first to the power supply. This is generally not required at **behold**. The pre-amp APU768 has a separate switching power supply for this task. At the final stages the power conditioner is functionally integrated in PFC-part of the the power supply. By that arrangement the converting part of the power supply of the final stages is supplied with "cleaned" current. Even when using two BPA768 blocks at stereo operation the function blocks do not influence each other.



CPU-Part of BPA768-PFC





D/A-Converter of BPA768-FPA Section

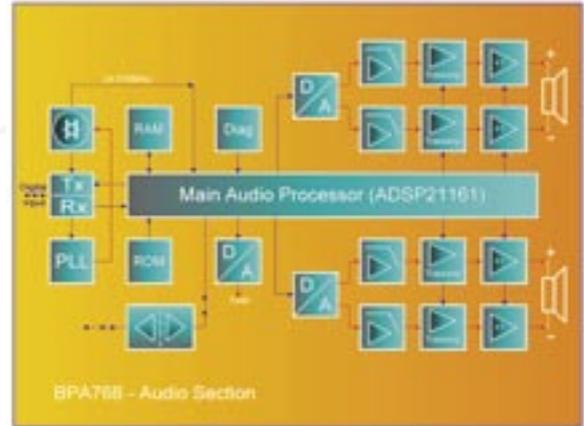
**The D/A-Converter**

is arranged together within the final stage. Because of that there are no connecting cables between the converter, voltage amplifier and the final stage buffer and consequently there are no distortions of the audio signal. A further advantage results from the fact that the signal processor is aware of the volume and is able to control the final stage in the best possible way in it's operating point.

**The Power Final Stage Amplifier**

in the behold system can be used as a Bi-Amping final stage. It works in this configuration as a mono block with two identical outputs, in case e.g. if one wants to control two loudspeaker systems parallel without connecting these in parallel, however, physically.

It also can run in Stereo-Mode.

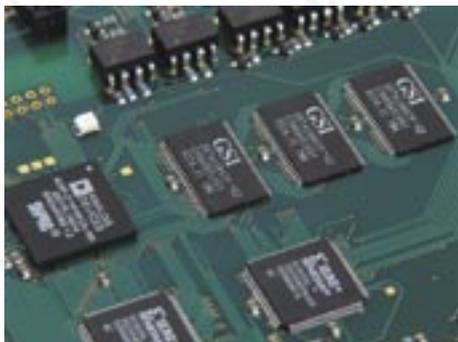


Power Stage of BPA768  
Analogue Section



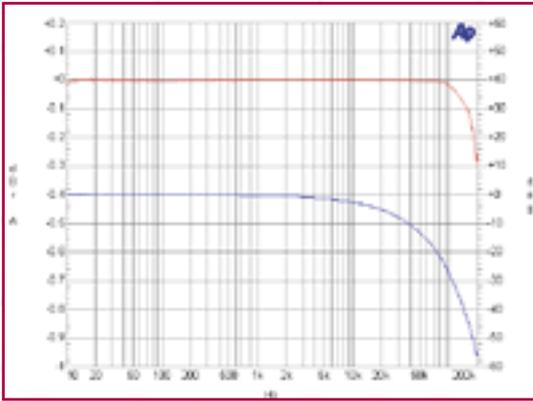
**Analogue Final Stage**

The analogue part of the final Stage is also not built up conventionally. It is equipped with full symmetrical transimpedance amplifiers instead of old-established difference amplifiers or tubes. The regulation of spacing current is not analogue but digital with the advantage that no disturbing analogue regulation or protection circuits impair the analogue path. This means it's a digital real time idle current tracking.



CPU-Part of BPA768-DSP





### Amplitude-Sweep 10Hz-200kHz with Filter

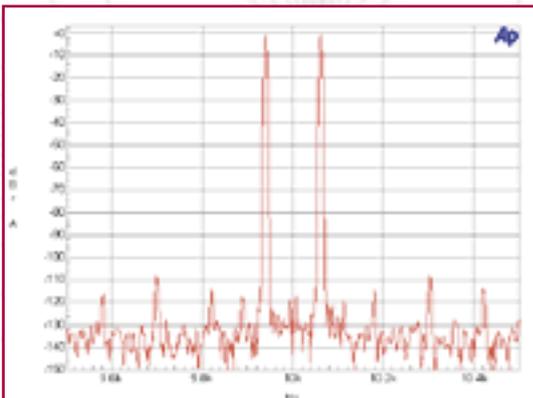
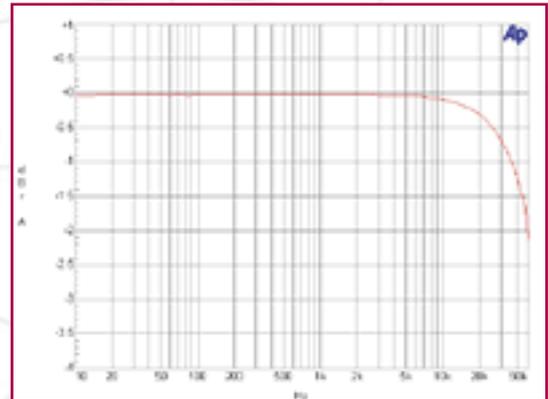
The amplitude frequency response of the transimpedance amplifier with final stage and antialias filter of the D/A-Converter is shown with the red trace measured analogue. Due to the optimal adjusted filter a deviation of less than 0,020dB to 100kHz results, a value not to be surpassed any more.

The blue trace shows the phase for this arrangement including the delay in time through the complete amplifier. More than remarkable is the fact that at 100kHz a phase shift of only  $-28^\circ$  is reached. (+32.4dBV/4Ω)

### Amplitude-Sweep 10Hz-55kHz with DAC

The diagram shows the amplitude frequency response via the complete final stage of with D/A-Converter. As can be easily recognized, the drop in the frequency response starts already relative early due to the low sampling frequency of 108kHz with  $-0.3\text{dB @ } 20\text{kHz}$ .

By that it gets once more clear how important a high sampling frequency is. When using 192kHz (SACD) this drop will appear at not just the double frequency. (+32.4dBV/4Ω)



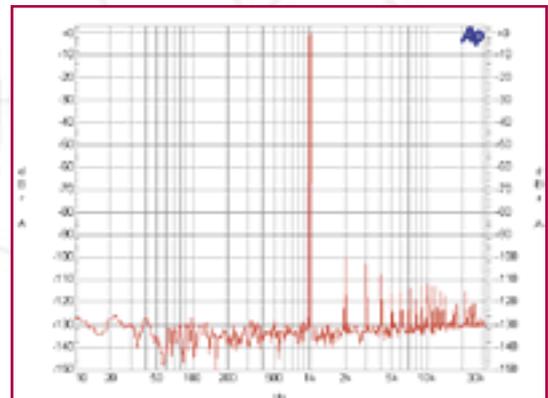
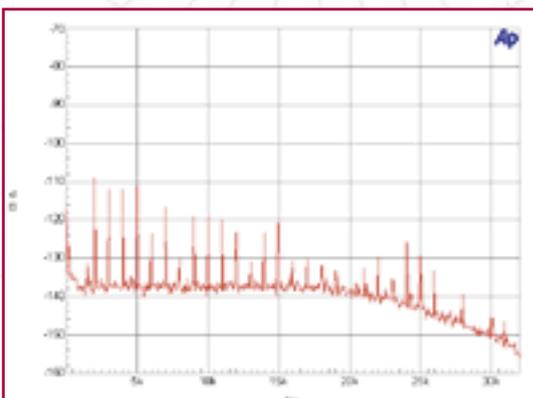
### Intermodulation at 10kHz

This is one of the most meaningful measurements at all. Almost everything can be seen here: the behaviour at a two-tone rejection. it is moreover very important, that the IMD products fade away as fast as possible, what by far is not the case at many other final stages. ( $2x +26.4 \text{ dBV}/4\Omega$ ) The two tones are chosen as (10 kHz $\pm$ 60 Hz) to make the IMD-products of the 50Hz from the power supply also visible. With  $-117 \text{ dBc}$  „wonderful“ results were reached here.

### Harmonic and Mains Hum at 1 kHz

Well to be recognized are the low value harmonics of better than  $-105 \text{ dBc}$  at 1 dB under full modulation. (+32.4dBV/4Ω).

At the same time the 50 Hz Hum is at  $-130 \text{ dBc}$  or better.



### THD+N Residual

This measuring shows another THD+ N representation than the one above. The carrier is suppressed here and the intermodulation products can be judged one by one. (+32.4dBV/4Ω)

## Technical Data BPA768-484:

The BPA768-484 is a Power Amplifier containing two independent mono blocks for use in Stereo or Bi-Amping mode.

### Features of the Analogue Outputs:

Output voltage maximum (0dB):	134V <sub>ss</sub> = 33.5dBV @ 3.9Ω resistive
Output power sinus one block maximum (0dB):	575W CW @ 3.9Ω resistive each channel
Output power sinus one block maximum (-1dB):	840W CW @ 2.0Ω resistive each channel
Output power one block (0dB) pulse 1 period 30Hz sinus:	1100W @ 2.0Ω resistive
Output power sinus total stereo (0dB):	1150W CW @ 3.9Ω resistive each channel
Output power sinus total stereo (-1dB):	1680W CW @ 2.0Ω resistive each channel
Output impedance DC - 100Hz:	<0.71mΩ
Output impedance 1kHz - 10kHz:	<7.1mΩ
Output impedance 20kHz - 50kHz:	<18mΩ
Damping factor @ 20Hz and 100Hz: 11220 =	81dB (8Ω test load)
Damping factor @ 1kHz: 7080 =	77dB (8Ω test load)
Damping factor @ 20kHz: 562 =	56dB (8Ω test load)
Intermodulation products @ 10kHz (-1dB):	-100dBc
THD+N vs frequency DC-20kHz unweighted (-1dB):	<-90dB
Signal to noise unweighted (-1dB):	<-97dB
Suppression of mains hum @ (0dB) (+33.5dBV = 2x 575W):	-130dBc @ 50Hz; -128dBc @ 150Hz;
Offset voltage at the output:	+/- 200 mV max.

### Analogue Transfer Functions:

Coupling:	DC (no lower corner frequency, no coupling capacitors)
Frequency slope analogue final amplifier DC-20kHz:	+/- 0.025 dB
Frequency slope analogue final amplifier 20kHz-100kHz:	+0.10 / -0dB
Frequency slope D/A-Converter DC - 10kHz @ 108kHz sampling rate:	+0 / -0.15dB
Frequency slope D/A-Converter 10kHz - 20kHz @ 108kHz sampling rate:	+0 / -0.30dB
Frequency slope D/A-Converter 20kHz - 50kHz @ 108kHz sampling rate:	+0 / -2.20dB

### Digital Features:

Sampling frequency at mono playback:	768kHz @ 1x 24Bit
Sampling frequency at stereo playback:	384kHz @ 2x 24Bit
Working frequency of the PFC (ADSP21990):	98.304MHz (2048x 48kHz)
Word length / Accumulator of the PFC (ADSP21990):	16Bit / 48Bit
Working frequency of the DSP (ADSP21161):	98.304MHz (2024x 48kHz)
Word length / Accumulator of the DSP (ADSP21161):	32Bit / 64Bit
Working frequency of the D/A-Converter:	24.576MHz (512x 48kHz)
Number of D/A-Converter:	8 pairs, (8x AD1853)

### Data for Audio-Digital Connection Technique:

Input level at 50Ω:	+4.2dBm to +9.2dBm
Digital data rate at the input / coupling:	49.152MBd / AC
Max. distance with RG58 (24dB @ 100m/200MHz):	83m

### Power Supply:

Power supply voltage single phase, nominal:	100V to 240V
Power supply voltage range operating:	85V to 264V
Power consumption stand by:	<8.0W, typ. 7.7W
Power consumption idle (<-5dB), 400mA idle current:	130W bis 155W
Power consumption @ 1200W Output:	ca. 1900W

### Connectors:

Digital input connector:	SMA 50Ω (standard RF-connector) female
Number of power outputs: 2	
Quality of the power output clamp:	WBT 0645, full isolated
Power supply connector:	Standard Cold Device Plug

### Mechanical Figures:

Available colours:	Al-nature, Al-black
Dimensions in mm (WxHxD):	484 x 300 x 416 (usable for 19" rack)
Weight:	45kg

# DAC768: DA-Converter 768kHz

## Key Features:

- DA-Conversion directly before the Power-Amp.
- Datarate 768kHz/24Bit
- Eight monolithic 24bit DA-Converters
- Individual Volumecontrol
- Symmetrical Output (XLR)
- Unsymmetrical Output In-Phase(Cinch)
- Unsymmetrical Output Anti-Phase(Cinch)
- Phantom Powering



## In Brief:

The DAC768 is another masterpiece from behold which cannot be found elsewhere in this quality. This DA-Converter is always designed in mono. 8 pieces of the best available monolithic 24Bit DA-Converters are used in every channel of the DAC768. The real resolution of the signal is 24Bit @ 768KHz. To make sure this enormous amount of data is processed correct a DSP is receiving and distributing the data to the eight DA-Converters which work with a time shifted signal. The DAC768 provides best output signal possible to your Power-Amp. The DAC768 is a external box which should be placed direct behind your Power-Amp.



## In Detail:

### On the Playback Side

of the behold audio system the DA-Converter DAC768 is, besides the final stage BPA768, the essential part for the recovery of the analogue audio signal.

### This D/A-Converter

is always designed in mono. It should be arranged as close as possible to the power output stage so that the audio cables, always full of losses, are as short as possible.

### The Power Final Stage

then is arranged as near as possible to the loud-speaker. This is, however, the case anyway in professional High End setups.

### Mono Stages

whether DAC768 or BPA768, ensure a very, very high channel separation from themselves.

### Eight 24 Bit DA-Converters

are used for the recovery of the precious analogue signal as we did not want to economize on this essential part.

### The Number Eight

arises from four pairs which convert time moved to achieve best possible results.

### Sixteen Converters

involved at stereo while there are eight DA-Converter per channel.

### The Analogue Signal

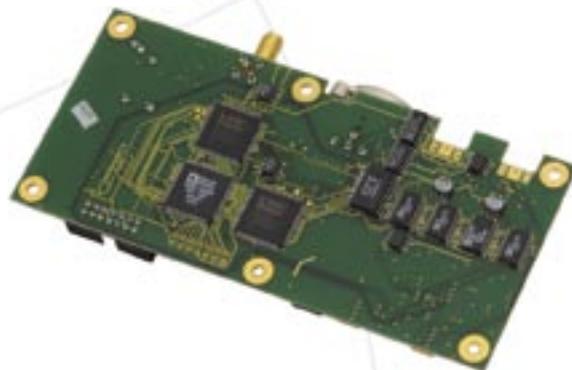
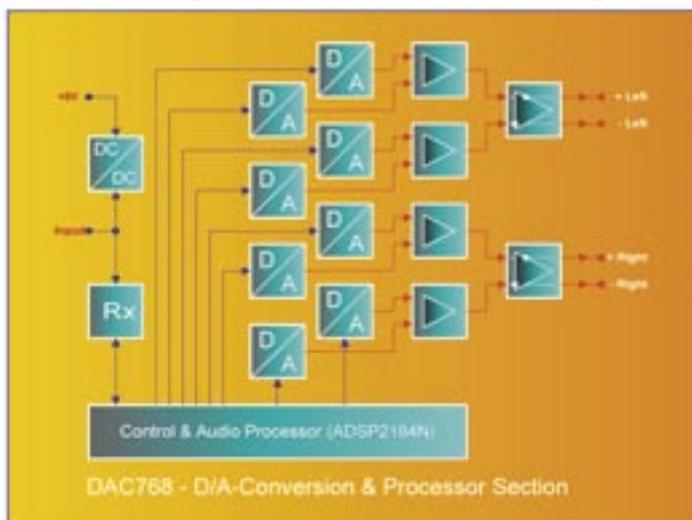
is of course output symmetrically, both via an XLR output and alternatively via two asymmetrical Cinch outputs in phase and anti phase.

### Plug-in Power Supply

As described already at the SDO768 the possibility exists to support the power supply of the DAC768 with a small plug-in power supply if the interconnection cable gets too long with more than 10m.

### The Pre-Amplifier

behold APU768 informs at the latest by a corresponding report, whether this becomes necessary.



#### Technical Data DAC768:

##### Features of the Analogue Outputs:

Output voltage maximal (0dB) balanced (XLR):	5.0V <sub>eff</sub> = +14dBV
Output voltage maximal (0dB) unbalanced (Cinch):	2x 2.5V <sub>eff</sub> = 2x +8dBV
Output impedance balanced (XLR):	44Ω
Output impedance unbalanced (Cinch):	22Ω each
Intermodulation products @ 10kHz (-1dB):	<-110dBc
THD+N residual 1kHz (0dB):	<-95dBc
THD+N vs frequency DC-20kHz unweighted (0dB):	<-95dBc
Output offset voltage:	+/- 10mV max.

##### Analogue Transfer Functions:

Coupling:	DC (no lower corner frequency, no coupling capacitors)
Frequency slope DC-10kHz:	+0/- 0.05dB
Frequency slope 10-20kHz:	+0/- 0.10dB
Frequency slope 20-40kHz:	+0/- 0.80dB

##### Digital Features:

Sampling frequency at playback:	768kHz
Number of bits:	1x 24Bit
Working frequency of the DSP (ADSP2184N):	49.152MHz (1024x 48kHz)
Word length / Accumulator of the DSP (ADSP2184N):	16Bit / 48Bit
Working frequency of the D/A-Converter:	24.576MHz (512x 48kHz)
Number of D/A-Converter:	1x stereo, (4x AD1853)

##### Power Supply:

Supply voltage extern:	DC +5.4V to +7.2V, +6.0V nominal
Power consumption:	2.5W

##### Connectors:

Connector of the digital audio input:	SMA socket 50Ω (standard RF-connector)
Connectors for balanced outputs:	XLR plug
Connectors for unbalanced outputs:	2x Cinch socket gold plated

##### Mechanical Figures:

Available colours:	Al-nature, Al-black
Dimensions in mm (WxHxD) without connectors:	160 x 52 x 101
Dimensions in mm (WxHxD) connectors:	160 x 52 x 117
Weight:	765g

# CD-Player

## Key Features:

- ▶ True Mass Disk Drive
- ▶ "Tap-Operating"
- ▶ Consequent Digital Audio Processing
- ▶ No Conventional Operating Devices
- ▶ No Additional Remote Control
- ▶ No Power Supply present
- ▶ One Connection Cable for all Functions

## In Brief:

This CD player is a true mass disk drive. The corpus is milled from a full block of aluminum. The disk drive is put in from the underside. The player has no operating devices and can be handled very simple through the "Tap-Operation" of the drawer or very comfortable with the remote control. The power supply of the CD player is done by the CDP module in the APU768.



## In Detail:

### The CD player

at behold has no operating devices and and is completely controlled from the APU768. This concept is the logical consequence if the complete audio system shall be controlled centrally.

### The Mass Disk Drive

among the CD players can be found at behold, because this player owns a case nobody has build ever before. The corpus consists of a solid aluminum block, one piece. Merely the faceplate and sides are mechanically separate.

### The Disk Drive Itself

is mounted on two short massive aluminum profiles as they are known from the other behold components. The result is one of the most rigid CD player housings ever build.

### The Operation

is comfortably done via the Bluetooth remote control and because it's bi-directional it shows the current operating state of the disk drive. Not only the number of existing titles is shown and which one is actually played without having to search for the mostly far away display of the CD player. But one can jump also arbitrarily and doesn't have „to work“ his way forward for the desired title only sequentially.

### The Simple Operation

without remote control happens by tapping the drawer to open, then inserting a CD or even leave it. The closing is achieved by pushing the drawer to close, as one is used to it at PC disk drives. After the CD player has „taken“ the CD it starts immediately to play or you can select the tracks on you own by remote.

### The LED Lights

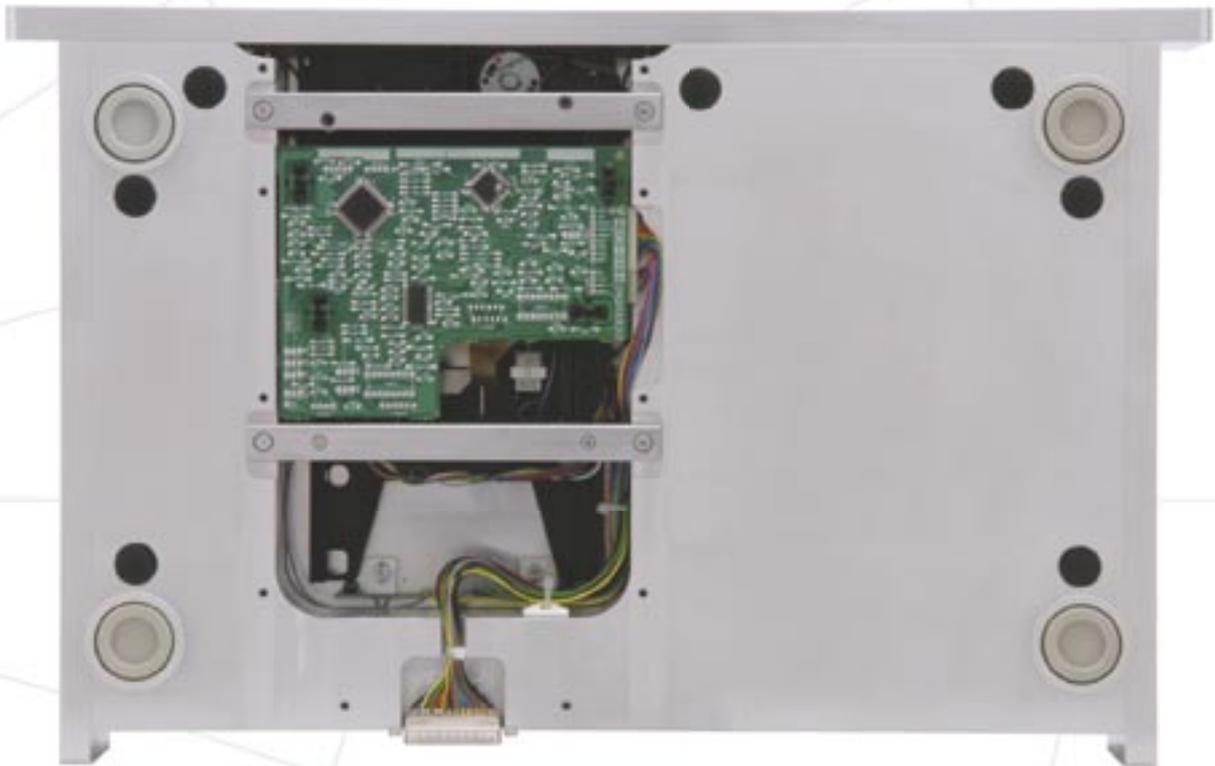
around the drawer can be dimmed by the APU768 pre-amplifier.

### Visually pleasant

is the CD player can be put directly under the APU768.

### The Connection

is managed by one single cable to the APU768 pre-amp. This carries bidirectionally the control data, audio data and the power supply of the CD player.



### Technical Data CD-Player:

#### Digital Features:

Sampling rate of the audio system:	44.1kHz
Audio channel coding:	PCM
Number of bits of the audio channel:	2x 16Bit, stereo
Data format of the CD-Player communication:	DSA

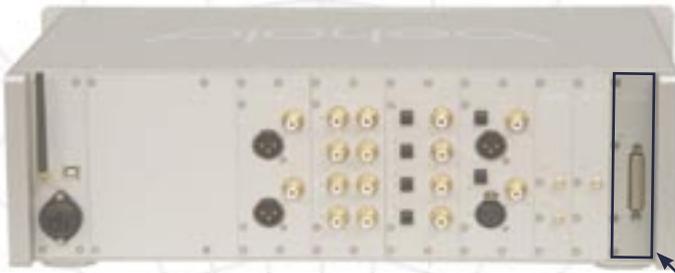
#### Connector:

Connector for CD-Player connection:	SubD-25-Pol plug gold plated contacts
-------------------------------------	---------------------------------------

#### Mechanical Figures:

Available colours:	Al-nature, Al-black
Dimensions in mm (WxHxD):	484 x 76 x 320 (usable for 19" rack)
Weight:	20.5kg

# CDP768: CD-Player Module 768kHz

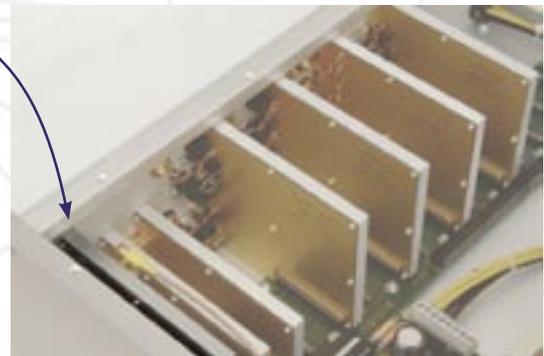
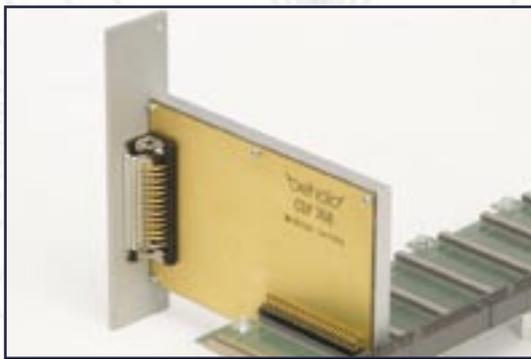
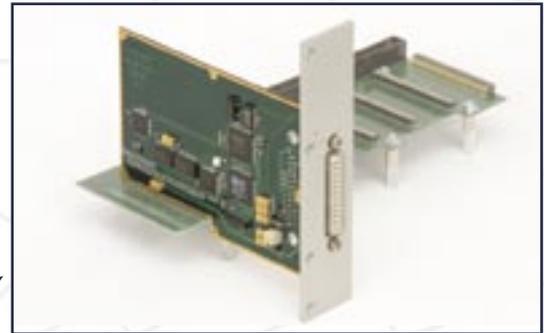


## Key Features:

- Generating DSA-Commands to control the CD player
- Converting the CD audio data format to behold level
- Power supply of the CD player via DC/DC converter
- PWM modulator for LED supply

## In Brief:

CDP768 is the module for the complete control of the CD player. The PCM audio data coming from the CD disk drive are converted to APU768 level within this unit. The module also delivers moreover all power supply of the CD disk drive so that no power supply unit is needed in the CD player to avoid absolute all negative influences from the mains power supply.



## In Detail:

### The Module

to run the CD player takes the complete control of the CD player drive. The "DSA - Commands" which the disk drive understands are generated here.

### This Interface

does not only take the control of the CD player it also does the processing of the audio data coming from disk drive. They are delivered with merely 2x 16Bits @ 44.1kHz PCM data and must be converted to the behold APU768 standard of 2x 24Bits @ 768kHz.

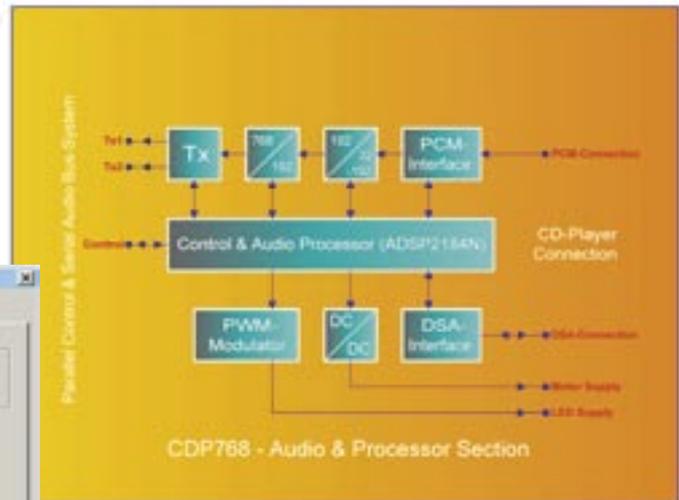
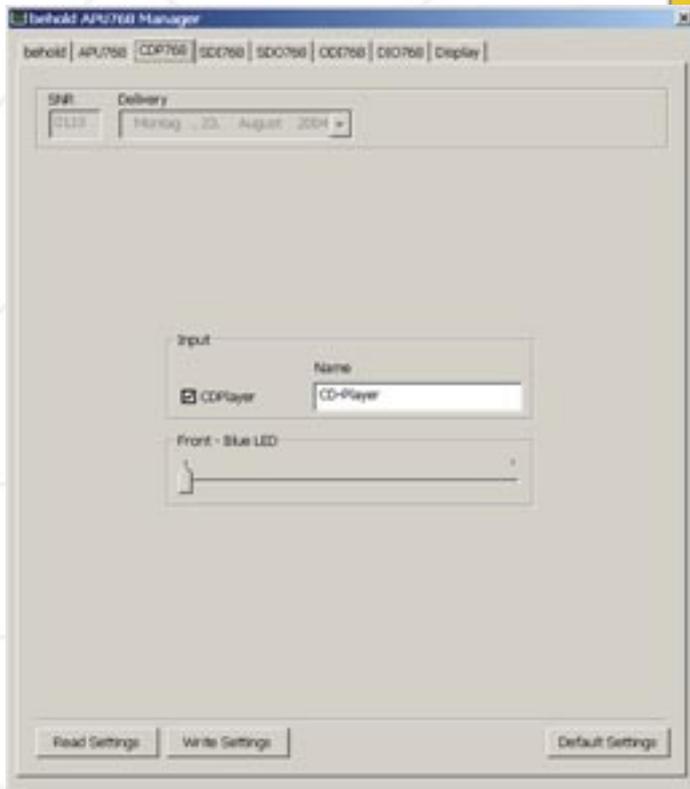
### Since the CD player

has no power supply of it's own, the power must come from the CDP module. This is carried out to avoid negative influences from the mains power supply and to simplify the attaching of the CD player.

### The Slot Size

of the module with it's 30mm takes a special position. The available place in the APU768 is used optimally while the SubD 25 pole connection gets the necessary space.

The APU768 is provided for the use of one CD player.



### Technical Data CDP768:

#### Digital Features:

Sampling frequency on the audio bus system:	768kHz
Number of bits on the audio bus system:	2x 24Bit
Number of outputs to the audio bus system:	2, 1x primary, 1x secondary, stereo each
Number of digital audio inputs:	1, PCM
Data format of the CD-Player communication:	DSA
Sampling frequency of the digital audio inputs:	32kHz to 192kHz step less, automatic
Working frequency of the DSP (ADSP2184N):	49.152MHz (1024x 48kHz)
Word length / Accumulator of the DSP (ADSP2184N):	16Bit / 48Bit
Number of bits on the audio input:	2x 24Bit, stereo

#### Connectors:

Connector of the digital audio bus system:	50 pole 2mm high precision contacts gold plated
Connector for CD-Player connection:	SubD-25-Pol socket gold plated contacts

#### Mechanical Figures:

Width of module slot:	30mm
Available colours:	Al-nature, Al-black

# MCA768: Moving Coil Adapter 768kHz

**768kHz: 16-time higher** is the sampling frequency compared to a standard CD or DAT of 44.1/48 kHz. This means it is far beyond anything else before.



**Directly on the Headshell** the very sensitive Phono signals are pre-amplified and AD-converted immediately. This is the way to lower analogue losses to an absolute minimum.



**This Procedure** enables to shorten all analogue wiring to an absolute minimum. Lower losses are not possible.

## Key Features:

- PCB mounted directly on the Headshell
- Shortest Analogue Cables Possible: 30mm
- Very Low Noise Fully Balanced Pre-Amplifiers
- Very High Speed and Resolution AD-Conversion
- Two Separate AD-Converters for both Channels on Top and Bottom
- Loss Free Digital Data Transport
- Separate DC/DC-Converters for both Channels and Logic
- Very Small in Size and Weight
- Very Small and Light Cables Conduct the Data in the Tonearm

**The Pre-Amplifying** is necessary because the electrical signals of the moving coil are much too small to send them directly to an AD-converter.

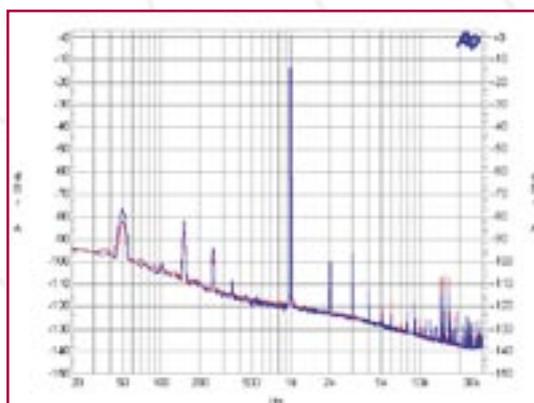
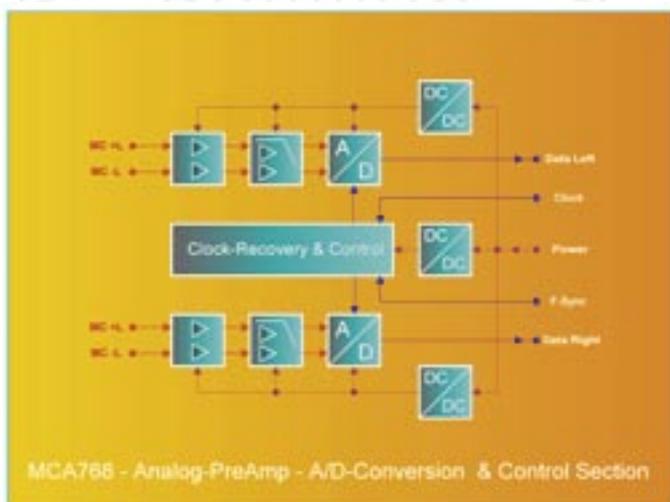
**Two Separate AD-Converters** operate at 768 kHz, i.e. with the four-times sampling frequency compared to the SACD signal.



Original Size

**Smallest Dimensions** of 20mm x 39mm and only 7mm thick. 4.2 grams in weight will never overload a regular headshell.

**The Digital Data Stream** produced is sent serially via an extremely thin special cable to the MCK768.



Harmonics @ 1kHz & RIAA

## Technical Data MCA768:

### Features of the Analogue Inputs:

Distortion @ 1kHz & RIAA 2nd harmonic:	-100dBc
Distortion @ 1kHz & RIAA 3rd harmonic:	-95dBc
Distortion @ 1kHz & RIAA all harm. up to 20kHz:	< -110dBc
Mains hum without tone generator connected:	not detectable (< -100dBc)

### Analogue Transfer Functions:

Coupling:	DC (no lower corner frequency, no coupling capacitors)
Equalizer Transfer Functions:	RIAA; RIAA (IEC); user defined
Frequency slope DC-100kHz without Equalizer:	+0/- 0.15 dB

### Digital Features:

Sampling frequency of audio data output stream:	768kHz
Data format of audio data output stream:	2x 16Bit, Stereo, PCM

### Power Consumption:

Power dissipation:	2.1W
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### Connectors:

Plug for digital data output:	9 pole, 1.27mm raster, contacts gold plated
Socket for analogue input:	4x precision gold plated sockets with 30mm wire each rd, gn, wt, bl

### Mechanical Figures:

Dimensions in mm (WxHxD) without connectors:	20 x 7 x 39
Dimensions in mm (WxHxD) connectors:	20 x 10 x 39
Length of the interconnection cable to the MCK768:	30 cm to 1m
Weight without wires and connectors:	4.2g

# MCK768: Master Clock 768kHz

### Key Features:

- Master Clock Generator for Phono
- Extreme Low Jitter Clock Generator
- Data Conversion Stereo to Serial
- 50Ω Coaxial Cable Transmitter
- Separate DC/CD-Conversion for Clock Generator and Logic
- Power Supply for MCA768



### The Digital Audio Signal

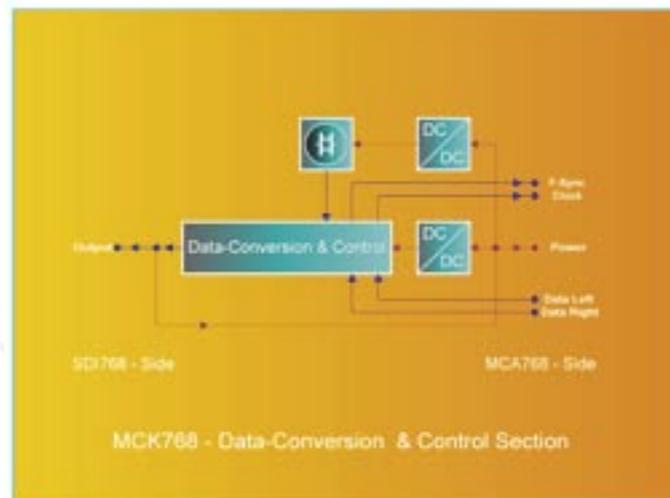
produced by the behold Moving Coil adapter MCA768 is sent to the master Clock. It is „packed“ digitally here together with the system clock and processed to a standard 50Ω line to be sent on it.

### Absolutely Loss-Free

is this signal then conducted to the pre-amp over a distance of up to 10m using a simple 50Ω coaxial cable.

### Remote Power Feeding

makes an additional power supply unnecessary. This technique is known at satellite receiving systems for decades.



**Technical Data MCK768:**

**Digital Features:**

Data rate of output stream:  
Data format of audio data output stream:  
Training sequence:

49.152MBd  
2x 16Bit, Stereo, PCM  
32Bit

**Remote Feeding from SDI768:**

Feeding voltage at the SMA connector:  
Currant consumption incl. MCA768:  
Power dissipation (without MCA768):

+5.40V to +7.20V  
385mA maximum  
610mW

**Connectors:**

Socket for digital data input (from MCA768):  
Socket for digital data output:

9 pole, 1.27mm raster, contacts gold plated  
SMA 50Ω gold plated (standardized RF-connector) female

**Mechanical Figures:**

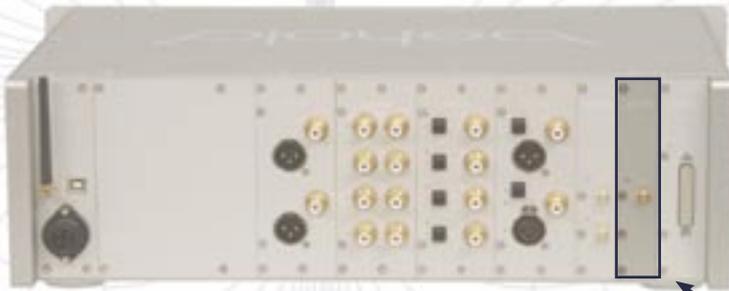
Available colors:  
Dimensions in mm (WxHxD) without connectors:  
Dimensions in mm (WxHxD) connectors:  
Weight without wires and connectors:

Al-nature, Al-black  
34 x 7 x 38  
34 x 17 x 44  
22g



**Original Size**

## SDI768: Serial Data Input 768kHz

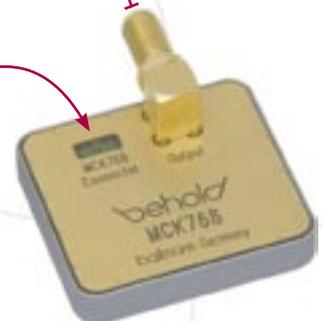
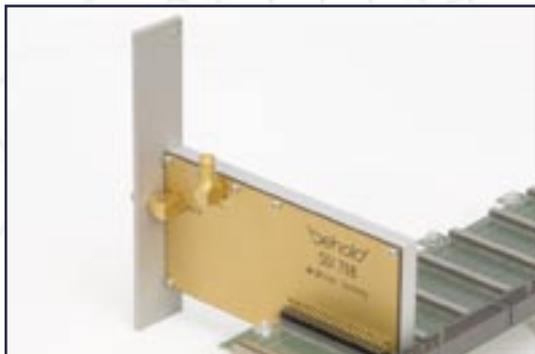
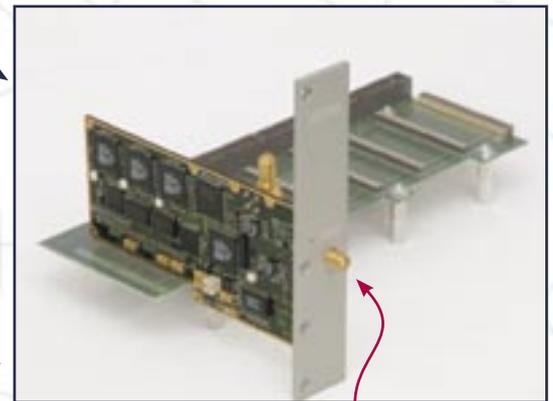


**Key Features:**

- Complete Digital Phonostage 768kHz/24bit
- Variable Equalizer Characteristics
- Storage of the Characteristics
- Four DSPs calculate the Equalization
- Absolute Reproducibility
- Additional Digital Signal Gain

**In Brief:**

This module receives the data from the headshell units, does the signal processing and RIAA-Equalisation or other characteristics complete digital with a result of 24Bit resolution at 768kHz sampling rate. This is achieved by four Digital-Signal-Processors in real time with a very high precision. Different equalisation characteristics can be entered and processed to meet your individual needs.



## In Detail:

### The Phono Input Port

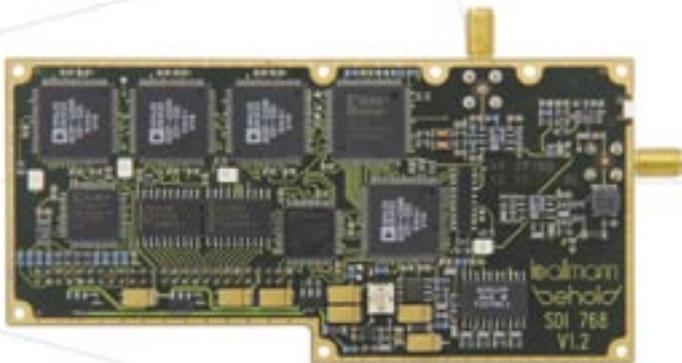
The Serial Data Input module is the input point for digital audio signals coming from MCA768/MCK768. It is the third component in this troika which makes it possible to digitise phono signals at the highest standard. The component serves as a receiver of the digital phono signal.

### Worldwide Unique

in this module in addition the required RIAA equalization and also other characteristics necessary when playing Vinyl-Records are calculated in four digital signal processors in real time. This is performed the very high sampling frequency of 768kHz.

### Digital Arithmetic-Logic Unit

You may wonder why this effort is done. The answer is very simple. The faults caused in a 48 bits wide digital arithmetic-logic unit are much smaller than ever possible in any analogue equalizer. The results are arbitrarily often reproducible at any time.



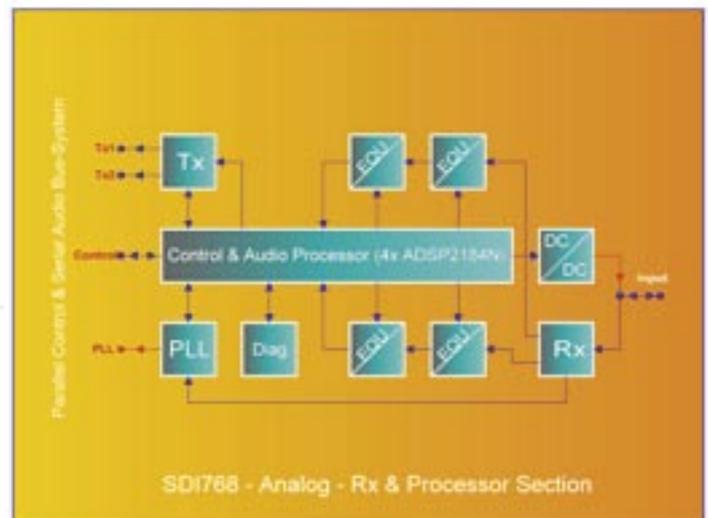
### No Analog Components

there are no analog components which would be subject to natural fluctuations. There are no analog coupling capacitors or capacitors for time constants which would cause mistakes.

### Several Equalizer Characteristics

And "last not least": the coefficients for different equalizer characteristics can be entered numerical, stored and called without the slightest wear or fluctuation in the reproducibility as this is the case at analogue, adjustable equalizers.

The behold APU768 pre-amp is designed for up to three SDI768 that means three phono inputs are possible.



### Technical Data SDI768:

#### Digital Features:

Sampling frequency on the audio bus system:	768kHz
Number of bits on the audio bus system:	2x 24Bit
Number of inputs from the audio bus system:	2, 1x primary, 1x secondary, stereo each
Number of digital audio inputs:	1, stereo
Sampling frequency of the digital audio outputs:	768kHz
Working frequency of the DSP (ADSP2184N):	49.152MHz (1024x 48kHz)
Word length / Accumulator of the DSP (ADSP2184N):	16Bit / 64Bit
Number of bits on the audio input:	2x 16Bit, stereo

#### Power Supply Feeding for DAC768:

Feeding voltage of the outputs:	2x +7.0V +/-0.2V
Maximum feeding current:	400mA
Short circuit protection:	infinite

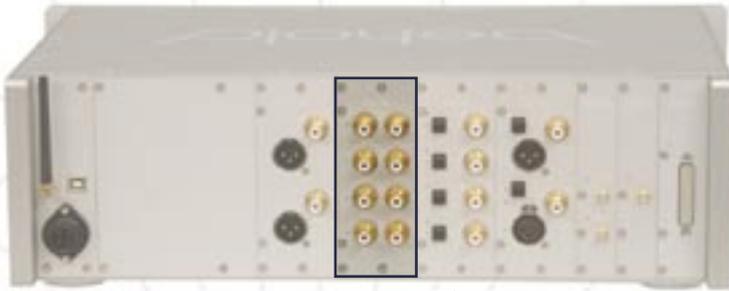
#### Connectors:

Connector of the digital audio bus system:	50 pole 2mm high precision contacts gold plated
Connector for the digital audio input:	SMA socket 50Ω (standard RF-connector)

#### Mechanical Figures:

Width of module slot:	25mm
Available colours:	Al-nature, Al-black

# ADC192: A/D-Converter 192kHz

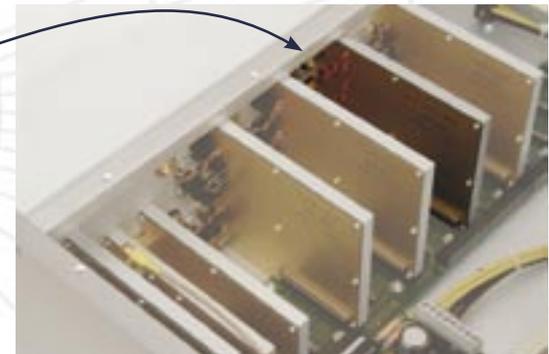
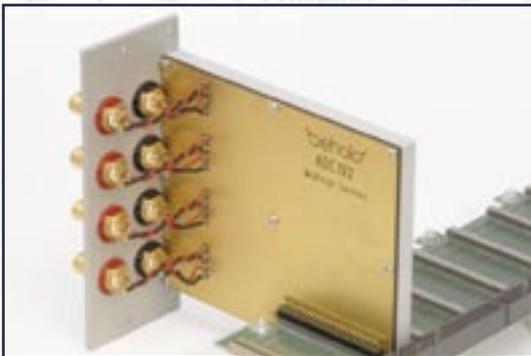
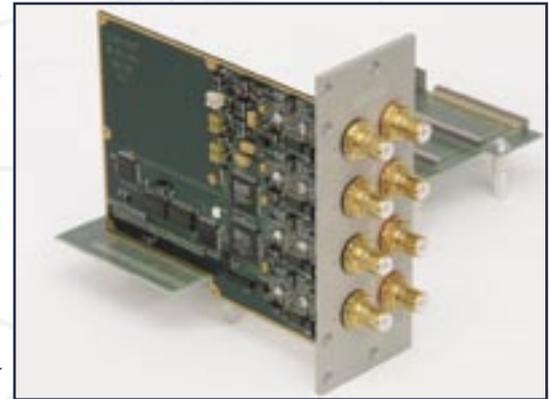


## Key Features:

- ▶ Eight Analog-Inputs with 192kHz/24bit
- ▶ 4x Stereo or
- ▶ Multichannel 5.1 and 1x Stereo or
- ▶ Multichannel 6.1 and/or 7.1
- ▶ Additional Digital Signal Gain
- ▶ DSP based Conversion to 768kHz

## In Brief:

The ADC192 is a 8 channel Analog Input card which can be used as 4 stereo Analog Inputs or Multichannel up to 7.1 or SACD. This card is needed to connect Analog devices like a SACD Player - Tuner or Tape deck to the Preamp. It can also be used to connect a Multichannel System to your behold APU. Internally every input channel is converted with 192kHz to ensure best possible quality.



## In Detail:

### The Analogous Inputs

for high level signals are combined by behold in one module with 4 stereo inputs. Consequently four different stereo signals can be processed at the same time, i.e. A/D converted.

### 4 Stereo-AD-Converters

convert synchronously, not switched in succession. The sampling rate of the AD-Converters is 192 kHz in the same way as SACD. The conversion to 768 kHz when processing a stereo signal is done out also digitally in this module.

### An SACD Signal

from an external SACD player is put in into the ADC192. Also the use of two or more players to compare them is possible.

### The analogous 5.1 input

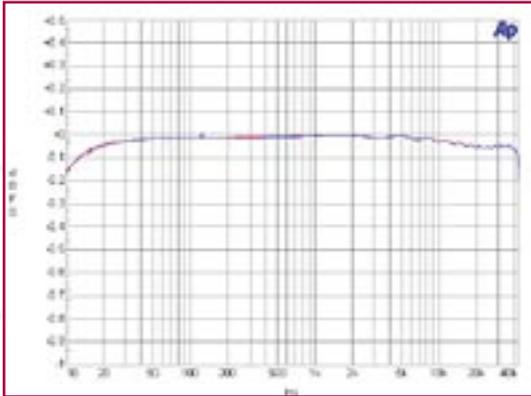
is also realized here by connecting 6 of the 8 analogous inputs. 6.1 and 7.1 can of course also be realized here. The sampling rate of 192 kHz is passed on in turn with 4 x 192 kHz resulting consequently to 768 kHz here.

### SACD & 5.1

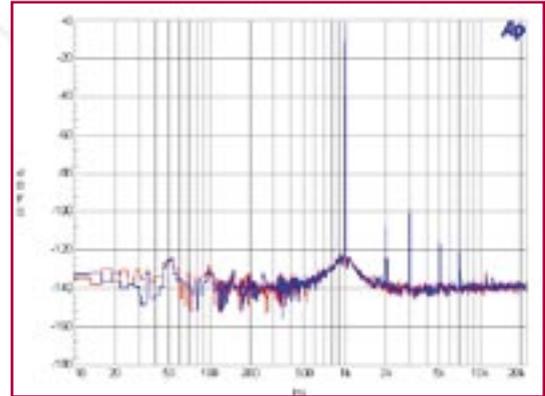
to be used in common is intended by using the inputs 1 to 6 for 5.1 and the SACD signal is connected to 7 & 8. For SACD a sampling rate of 768 kHz is provided for the further processing, For 5.1 in turn it is 4 x 192 kHz.

### The Configuration

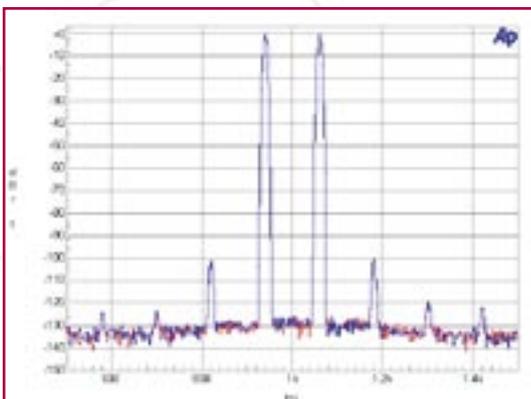
is set up in the control unit APU768 using the software of the menu control.



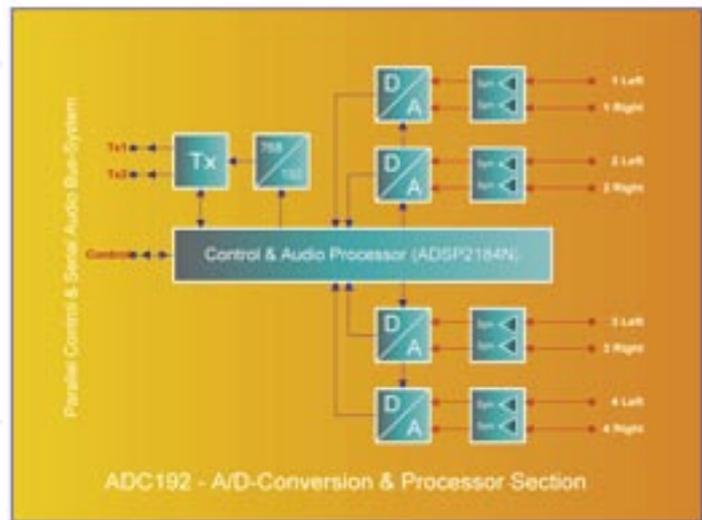
Amplitude-Sweep 10Hz-44kHz with Filter



Harmonics @ 1kHz / +5dBV



Intermodulation @ 1kHz / +5dBV



**Technical Data ADC192:**

**Features of the Analogue Outputs:**

Input voltage maximal (0dB) unbalanced:  
 Input impedance (0dB) unbalanced:  
 Intermodulation products @ 1kHz (-1dB):  
 THD+N vs frequency DC-20kHz unweighted (-1dB):  
 Input offset voltage:

2.0V<sub>eff</sub> = 6dBV  
 47kΩ // 100pF  
 <-100dBc  
 <-85dBc  
 +/- 200 mV max.

**Analogue Transfer Functions:**

Coupling:  
 Frequency slope DC-40kHz (lower cutoff inactive):

DC (no lower corner frequency, no coupling capacitors)  
 +0/- 0.05 dB

**Digital Features:**

Sampling frequency at recording:  
 Number of bits:  
 Working frequency of the DSP (ADSP2184N):  
 Word length / Accumulator of the DSP (ADSP2184N):  
 Working frequency of the AD-converter:  
 Number of AD-converter:

192kHz  
 8x 24Bit  
 49.152MHz (1024x 48kHz)  
 16Bit / 48Bit  
 24.576MHz (512x 48kHz)  
 4x stereo, (4x CS5361)

**Connectors:**

Connector of the digital audio bus system:  
 Connectors for unbalanced inputs:

50 pole 2mm high precision contacts gold plated  
 8x Cinch socket gold plated

**Mechanical Figures:**

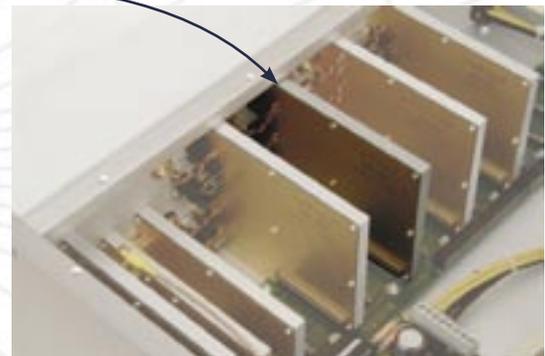
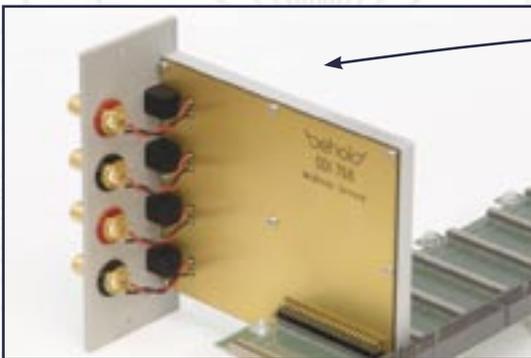
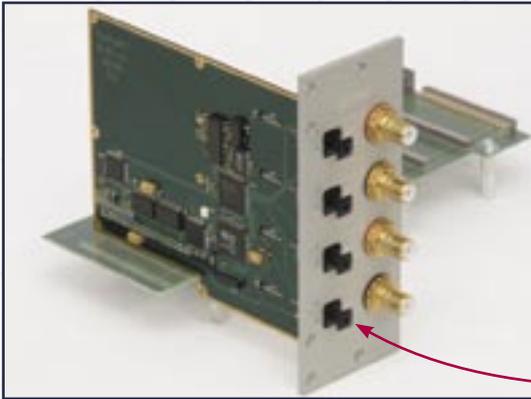
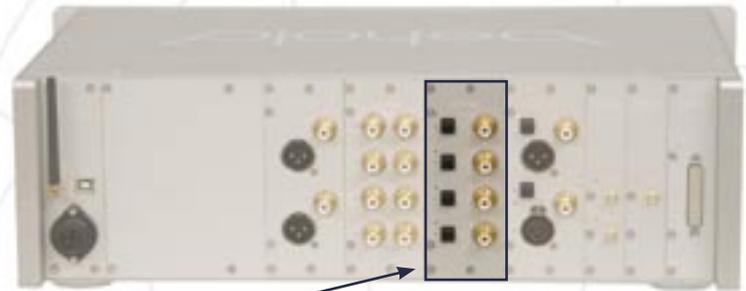
Width of module slot:  
 Available colours:

50mm  
 Al-nature, Al-black

# ODI768: Octal Digital Input 768kHz

## Key Features:

- Four S/PDIF Inputs (Cinch)
- Four Toslink Inputs (optical)
- Input Datarates from 32 to 192kHz
- DSP based Conversion to 768kHz



## In Brief:

The ODI768 is a Digital input card which accepts up to 8 digital input sources. All Signals between 32kHz and 192kHz are processed in the best possible way. The known sampling rates of 44,1kHz (CD-player), 48kHz (DVD-Video, DAT & TV),

96kHz (studio technology) and 192kHz (SACD & DVD-Audio) are accepted. All incoming signals are converted in two steps. First they are converted step-less from the input initial data rate to 192kHz sampling rate and then up sampled to 768kHz.

## In Detail:

### Digital Audio Sources

Many stereo audio sources today are digital such as CD, DVD, digital TV etc. All players of that category have analogue outputs, using them would distort the sensitive audio signal.

### S/PDIF Audio Signals

In the meantime, however, most players have an optical or electrical digital output too. The electrical outputs deliver in general a standardized digital audio signal named S/PDIF.

### Toslink

The optical output via Toslink also delivers a signal specified to S/PDIF. Both can be recorded by the **behold** ODI768. Within certain limits it doesn't matter at which data rate the signal arrives.

### All Signals

between 32 kHz and 108 kHz are processed in the best possible way. Consequently also the known sampling rates of 44,1 kHz (CD-player), 48 kHz (DVD-Video, DAT & TV), 96 kHz (studio technology) and 192kHz (SACD & DVD-Audio) are recorded.

### No Forwarding

Octal Digital Input means of course no output so no forwarding of digital audio signals from behold to other digital devices. If this feature is wanted you have to use the DIO768 module.

### In Two Steps

It should be mentioned here that all signals in the behold DIO768 are converted in two steps. At first they are converted step-less from the input initial data rate to 192 kHz sampling rate and from there fourfold to the 768 kHz already known.

### Highest Possible Level

The signals then are available for further processing in the system on highest possible level. We of course can not process information not available in the digital audio signal. We can, however, reduce considerably the negative effects which unavoidable appear at low sampling rates.

It applies also here that the number of ODI768 is arbitrary to the pre-amp APU768 as long as there is space.

### Technical Data ODI768:

#### Digital Features:

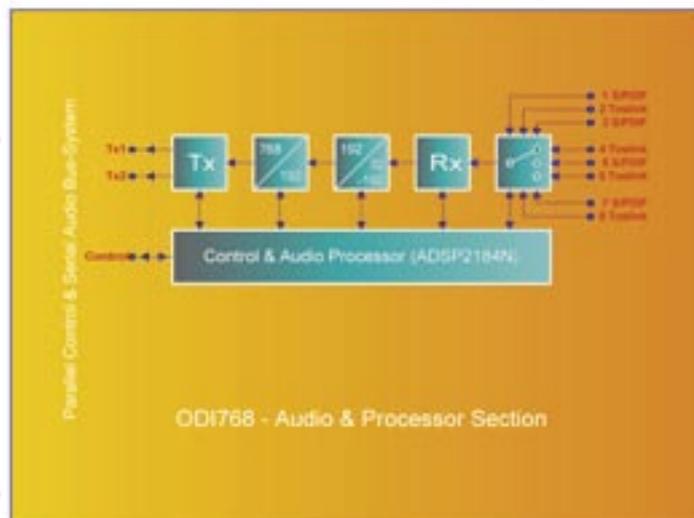
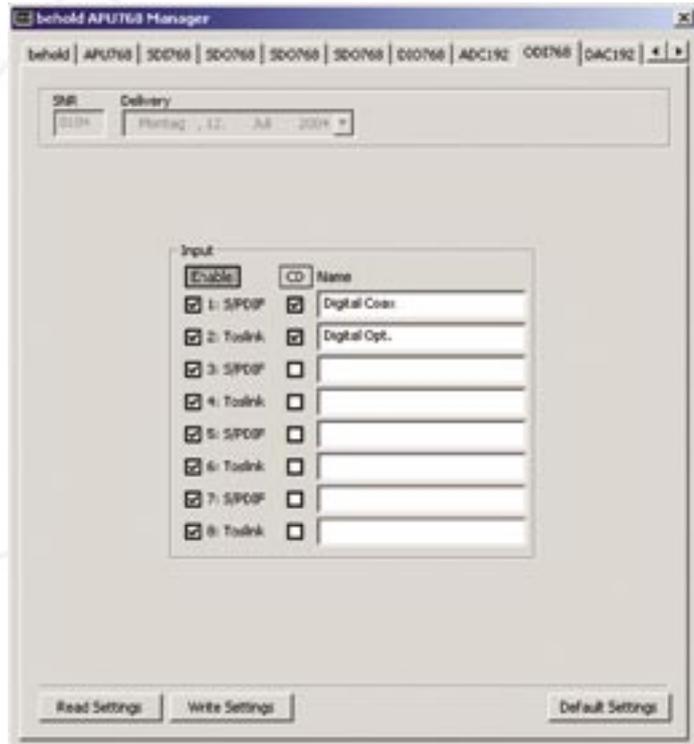
Sampling frequency on the audio bus system:  
Number of bits on the audio bus system:  
Number of outputs to the audio bus system:  
Number of digital audio inputs:  
Sampling frequency of the digital audio inputs:  
Working frequency of the DSP (ADSP2184N):  
Word length / Accumulator of the DSP (ADSP2184N):  
Number of bits on the audio input and output:  
Data transfer of digital audio data on input:

#### Connectors:

Connector of the digital audio bus system:  
Connector for S/PDIF unbalanced input:  
Connector for optical input:

#### Mechanical Figures:

Width of module slot:  
Available colours:



768kHz  
2x 24Bit  
2, 1x primary, 1x secondary, stereo each  
8, 4x S/PDIF, 4xToslink  
32kHz to192kHz step less, automatic  
49.152MHz (1024x 48kHz)  
16Bit / 48Bit  
2x 24Bit, stereo  
1 of 8

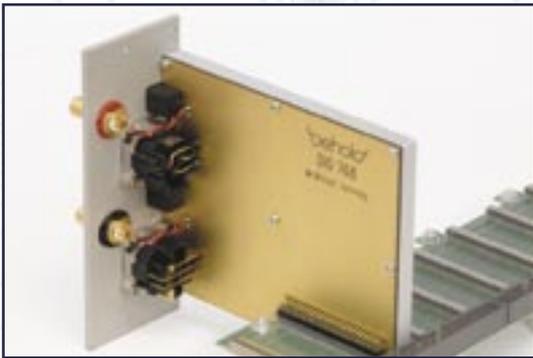
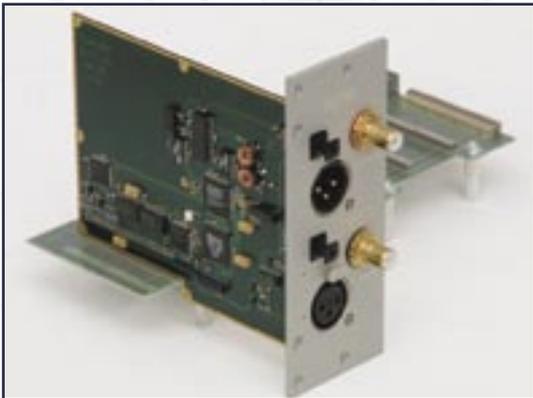
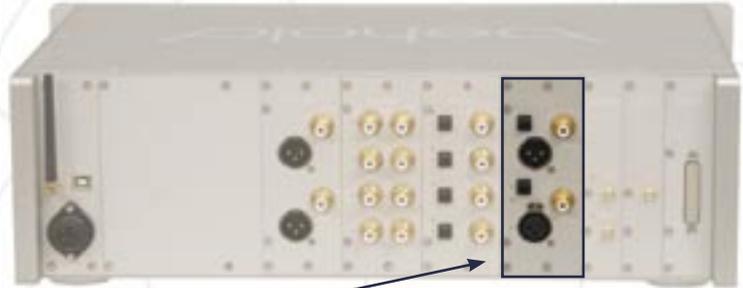
50 pole 2mm high precision contacts gold plated  
Cinch socket gold plated (75Ω)  
Toslink: TORX141P

50mm  
Al-nature, Al-black

# DIO768: Digital In- & Output 768kHz

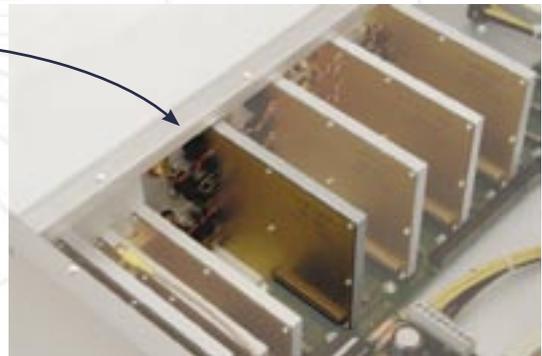
## Key Features:

- ▶ Three digital Inputs (AES, S/PDIF, Toslink)
- ▶ Three digital Outputs (AES, S/PDIF, Toslink)
- ▶ Input Datarate from 32 to 108kHz
- ▶ Output Datarate 44.1, 48 or 96kHz
- ▶ DSP based Conversion to 768kHz



## In Brief:

The DIO768 is a Digital input & output card which accepts up to 3 digital input sources. Also there are 3 digital outputs on the DIO768 which enables you to get Digital data out of your Preamp. The DIO768 provides all popular norms like XLR - SPDIF/RCA and Toslink for in and output Signals. All Signals between 32kHz and 108kHz are processed in the best possible way. Consequently also the known sampling rates of 44,1kHz (CD-player), 48kHz (DVD, DAT & TV), 96kHz (studio technology) are accepted. All incoming signals to the OD1768 are converted in two steps. First they are converted step-less from the input initial data rate to 192kHz sampling rate and then up sampled to 768kHz.



## In Detail:

### Digital Audio Sources

Many stereo audio sources today are digital such as CD, DVD, digital TV etc. All players of that category have analogue outputs, using them would distort the sensitive audio signal.

### S/PDIF Audio Signals

Currently, most players also have an optical or electrical digital output too. Those outputs deliver in general a standardized digital audio signal named S/PDIF (asymmetrical) or AES/EBU symmetrical).

### Toslink

The optical output via Toslink also delivers a signal specified to S/PDIF. All three can be recorded by the behold DIO768. Within certain limits it doesn't matter at which data rate the signal arrives.

### All Signals

between 32 kHz and 108 kHz are processed in the best possible way. Consequently also the known sampling rates of 44,1 kHz (CD-player), 48 kHz (DVD, DAT & TV) and 96 kHz (studio technology) are recorded.

### Also Forwarding

Input "and" Output means of course also the forwarding of digital audio signals from behold to other digital devices which understand those standards.

### In Two Steps

It may be particularly mentioned here that all signals in the behold DIO768 are converted in two steps. At first they are converted step-less from the input initial

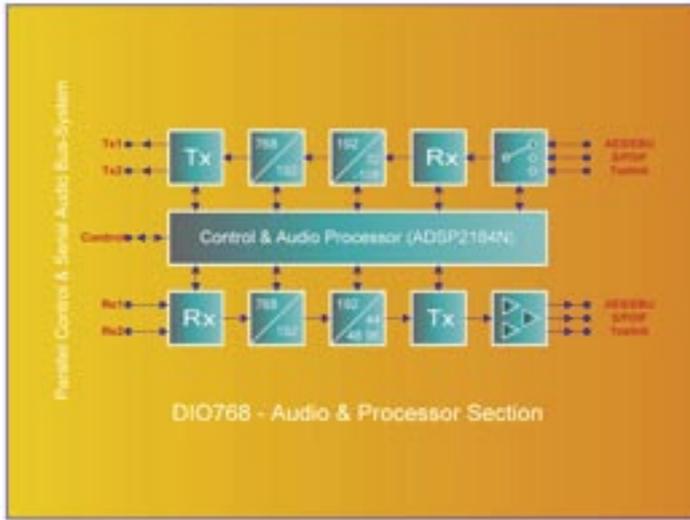
data rate to 192 kHz sampling rate and from there fourfold to the 768 kHz already known.

**Highest Possible Level**

The signals then are available for the further processing in the system on highest possible level. We of course can not process information

not available in the digital audio signal. We can, however, reduce considerably the negative effects which unavoidable appear at low sampling rates.

It applies also here that the number of DIO768 is arbitrary to the pre-amp APU768 as long as there is space.



**Technical Data DIO768:**

**Digital Features:**

Sampling frequency on the audio bus system:  
 Number of bits on the audio bus system:  
 Number of inputs from the audio bus system:  
 Number of outputs to the audio bus system:  
 Number of digital audio inputs:  
 Number of digital audio outputs:  
 Sampling frequency of the digital audio inputs:  
 Sampling frequency of the digital audio outputs:  
 Working frequency of the DSP (ADSP2184N):  
 Word length / Accumulator of the DSP (ADSP2184N):  
 Number of bits on the audio input and output:  
 Data transfer of digital audio data on input:  
 Data transfer of digital audio data on output:

768kHz  
 2x 24Bit  
 2, 1x primary, 1x secondary, stereo each  
 2, 1x primary, 1x secondary, stereo each  
 3, AES/EBU, S/PDIF, Toslink  
 3, AES/EBU, S/PDIF, Toslink  
 32kHz to 108kHz step less, automatic  
 44.1kHz, 48kHz or 96kHz adjustable  
 49.152MHz (1024x 48kHz)  
 16Bit / 48Bit  
 2x 24Bit, stereo  
 1 of 3, AES/EBU or S/PDIF or Toslink  
 3, AES/EBU and S/PDIF and Toslink

**Connectors:**

Connector of the digital audio bus system:  
 Connector for AES/EBU balanced input:  
 Connector for AES/EBU balanced output:  
 Connector for S/PDIF unbalanced input / output:  
 Connector for optical input / output:

50 pole 2mm high precision contacts gold plated  
 XLR socket (110Ω)  
 XLR plug (110Ω)  
 Cinch socket gold plated (75Ω)  
 Toslink: TORX141P / TOTX141P

**Mechanical Figures:**

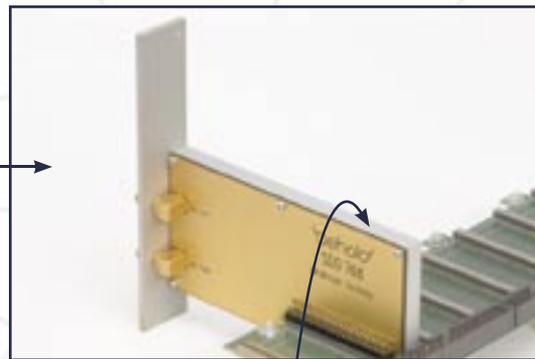
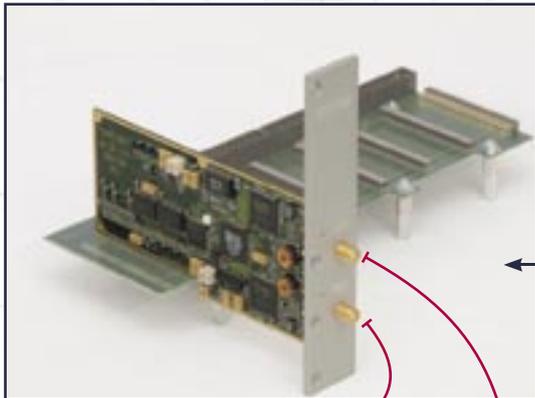
Width of module slot:  
 Available colours:

50mm  
 Al-nature, Al-black

# SDO768: Serial Data Output 768kHz

## Key Features:

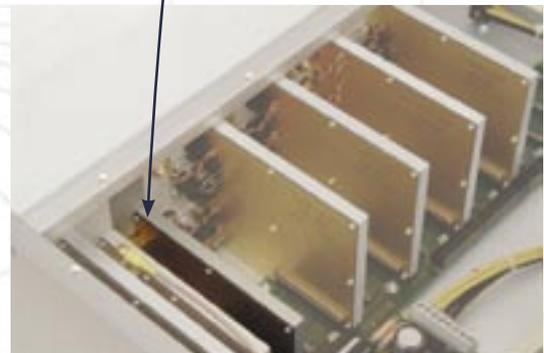
- Audiodata Output to BPA768/DAC768
- Datarate 768kHz/24Bit
- Output in Stereo & Multichannel
- Individual Volumecontrol
- Full bidirectional digital Datatransmission
- Simple 50Ω Cable
- Multitroom-capability



Feeding the BPA768 Power-Amplifier



Or Feeding two of the DAC768 D/A-Converter



## In Brief:

This module is transmitting the digital output data from the Pre-Amplifier APU768 to the behold Power-Amplifier BPA768 or the DA-Converter DAC768. The audio signal travels with 24Bit/768kHz each

channel which is an enormous amount of data to make sure the music is transported in the best possible way. All other information, loudness, operating commands and the update data, are also send this way.

## In Detail:

### Sending Data

What is the need of a perfect digital audio signal, if it doesn't leave the behold pre-amp APU768? For this purpose there is a module named Serial Data Output.

### Always Two Channels

This unit always transmits two channels at the same time, at stereo left and right. The digital data transfer is send at a rate of 768kHz two amplifiers in mono mode attached or 384kHz one amplifier working in stereo mode.

### Receives Diagnostic Data

Furthermore here are data received from the attached device of the family behold BPA768 or also by behold DAC768. These are data about the condition, e.g. diagnostic data.

### Simple 50Ω Cable

The data transfer will be done on simple 50Ω standard cables. In normal use as well as in multiroom the distance sets no limits while using at home.

### Distances up to 10m

In case of distances up to 10m a connected DAC768 can be supplied by the behold pre-amp APU768 via the power feeding which is running with the digital data transfer.

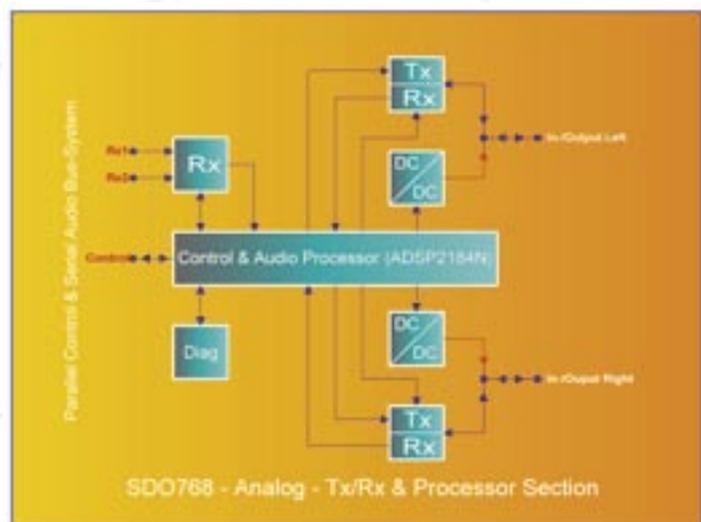
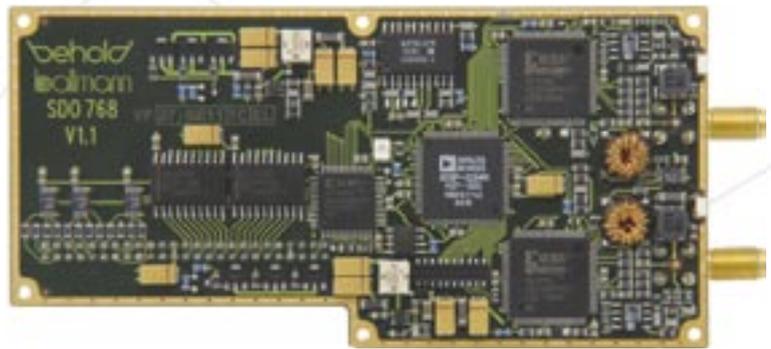
### Distances more than 10m

In case of a longer cable it is recommended to supply the DAC768 additional with a small plug-in power supply.

### Without plug-in Power Supply

When using a final stage of the family behold BPA 768 long cables may be operated without additional plug-in power supply. The required feeding is carried out in the final stage itself.

The number of SDO768 in the pre-amp behold APU768 is limited to at most eight.



### Technical Data SDO768:

#### Digital Features:

Sampling frequency on the audio bus system:	768kHz
Number of bits on the audio bus system:	2x 24Bit
Number of inputs from the audio bus system:	2, 1x primary, 1x secondary, stereo each
Number of digital audio outputs:	2, left / right or 2x stereo
Sampling frequency of the digital audio outputs:	768kHz mono, 384 stereo
Working frequency of the DSP (ADSP2184N):	49.152MHz (1024x 48kHz)
Word length / Accumulator of the DSP (ADSP2184N):	16Bit / 48Bit
Number of bits on the audio output:	2x 32Bit, mono and stereo

#### Power Supply Feeding for DAC768:

Feeding voltage of the outputs:	2x +7.0V +/-0.2V
Maximum feeding current:	400mA, each output
Short circuit protection:	infinite

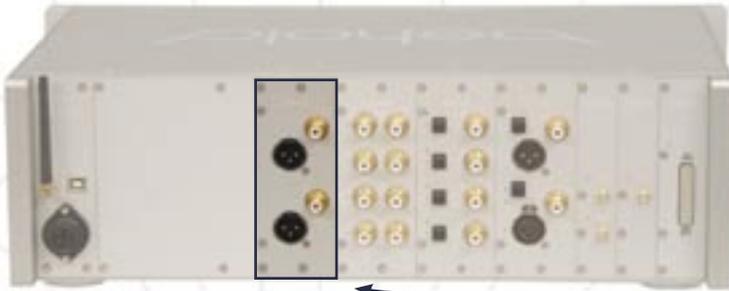
#### Connectors:

Connector of the digital audio bus system:	50 pole 2mm high precision contacts gold plated
Connectors for the digital audio outputs:	2x SMA socket 50Ω (standard RF-connector)

#### Mechanical Figures:

Width of module slot:	25mm
Available colours:	Al-nature, Al-black

# DAC192: D/A-Converter 192kHz

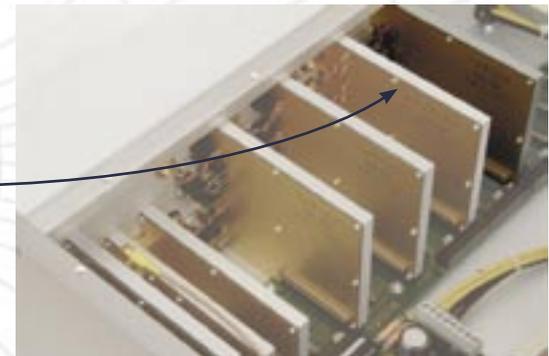
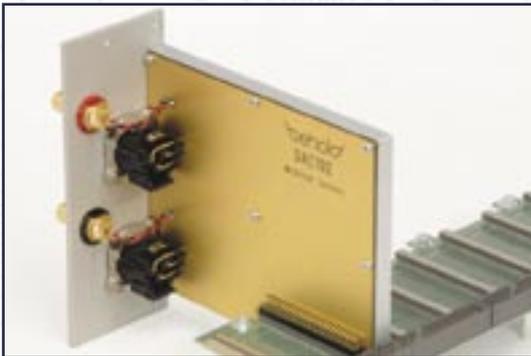
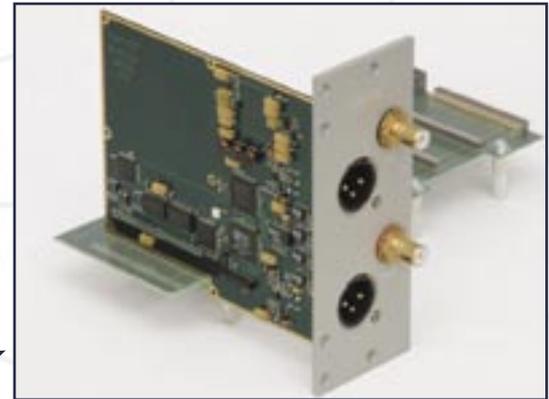


## Key Features:

- ▶ DA-Conversion in the Pre-Amplifier
- ▶ Datarate 192kHz/24bit
- ▶ Output for Stereo & Multichannel
- ▶ Individual Volumecontrol
- ▶ Symmetrical Outputs (XLR)
- ▶ Unsymmetrical Outputs (Cinch)

## In Brief:

The DAC192 is the choice if you want to connect a non behold Poweramp to your APU768. It provides a Analog Output Signal which is also Volume controlled to drive any existing Power amp. Output is available as a balanced XLR Signal or unbalanced RCA. The internal D/A conversion is done with 192kHz and therefore at the same level as SACD. This card is placed directly into the APU768.



## In Detail:

### For Users

who like to have an analogous audio signal from the control device, the possibility is given here to receive such a signal in stereo or two canals from 5.1...7.1.

### This D/A-Converter

operates at 192 kHz sampling rate, the rate which is used at SACD. This rate is the maximum with many other analogous audio signal processing.

### Highest Demands

beyond this quality are fulfilled with the D/A-Converter behold DAC768.

### The Analogus Signal

is made available via XLR for symmetrical outputs. The Cinch outputs likewise available deliver an asymmetrical analogous signal.

### 22Ω Series Resistance

are installed in the output circuit stage to the analogous line quite specifically. The experience of RF

technology shows clearly that the coupling may not be directly carried out to a very low-impedance output circuit stage because otherwise the reflections which always appear would not be sufficiently terminated.

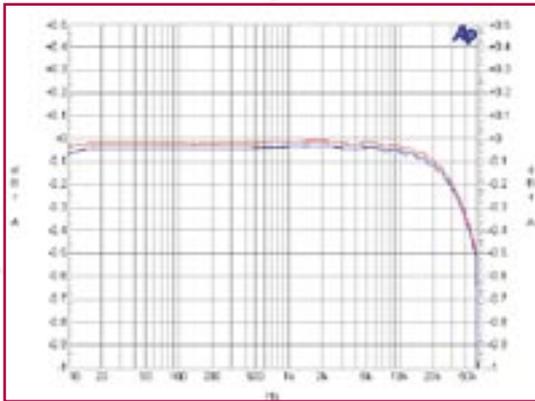
### On the other hand

the 22Ω by far do not result to a considerable drop of the frequency response, even not at a 10m long cable. Checked briefly: At a Cable capacity of approx. 100pF/m a length of 10m will result to approx. 1nF. The -3 dB corner frequency of a RC low-pass of 22Ω/1nF is at 7.2 MHz and therefore far away from every audio frequency.

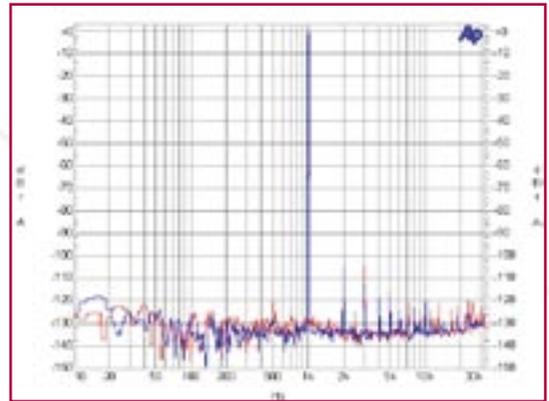
### 5.1 Users

can use for sure three DAC192 to get the six necessary outputs.

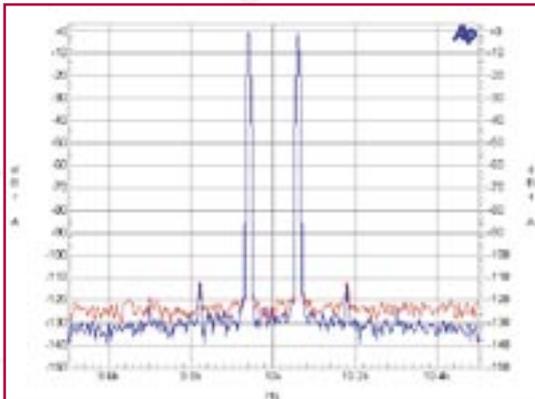
For this also applies, the number of the DAC192 in the pre-amp APU768 is limited to at most four.



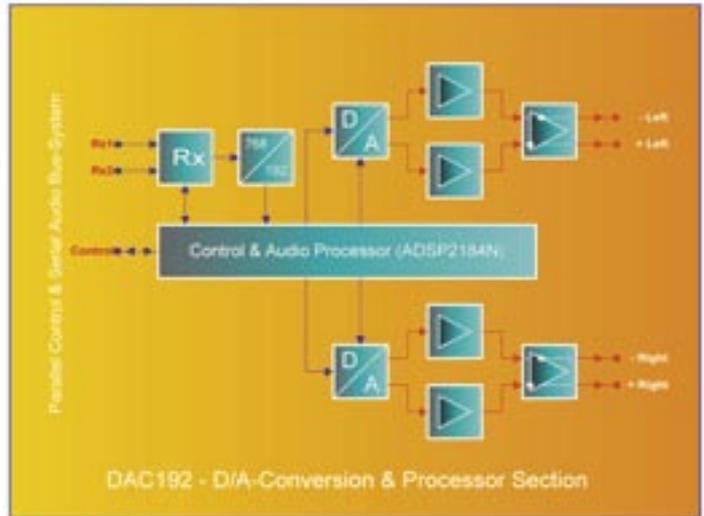
Amplitude-Sweep 10Hz-52kHz with Filter



Harmonics @ 1kHz / 0dB



Intermodulation @ 10kHz / -1dB



**Technical Data DAC192:**

**Features of the Analogue Outputs:**

- Output voltage maximal (0dB) balanced (XLR):
- Output voltage maximal (0dB) unbalanced Cinch):
- Output impedance balanced (XLR):
- Output impedance unbalanced (Cinch):
- Intermodulation products @ 10kHz (-1dB):
- THD+N residual 1kHz (0dB):
- THD+N vs frequency DC-20kHz unweighted (0dB):
- Output offset voltage:

- 5.0Veff = +14dBV
- 2x 2.5Veff = 2x +8dBV
- 44Ω
- 22Ω each
- <-111dBc
- <-105dBc
- <-100dBc
- +/- 30mV max.

**Analogue Transfer Functions:**

- Coupling:
- Frequency slope DC-20kHz:
- Frequency slope 20-50kHz:

- DC (no lower corner frequency, no coupling capacitors)
- +0/- 0.1 dB
- +0/- 0.5 dB

**Digital Features:**

- Sampling frequency at playback:
- Number of bits:
- Working frequency of the DSP (ADSP2184N):
- Word length / Accumulator of the DSP (ADSP2184N):
- Working frequency of the D/A-Converter:
- Number of D/A-Converter:

- 192kHz
- 2x 24Bit
- 49.152MHz (1024x 48kHz)
- 16Bit / 48Bit
- 24.576MHz (512x 48kHz)
- 1x stereo, (4x AD1853)

**Connectors:**

- Connector of the digital audio bus system:
- Connectors for balanced outputs:
- Connectors for unbalanced outputs:

- 50 pole 2mm high precision contacts gold plated
- 2x XLR plug
- 2x Cinch socket gold plated

**Mechanical Figures:**

- Width of module slot:
- Available colours:

- 50mm
- Al-nature, Al-black

# Common Data for all behold Components

## Data for behold Audio-Digital-Connection-Technique:

Coupling:	DC; On: +5V to +7V; Off 0V
Input level at 50Ω:	+4.2dBm to +9.2dBm
Digital data rate / coupling:	49.152MBd / AC
Max. attenuation of the connection cable:	10dB @ 50MHz; 20dB @ 200MHz
Max. distance with RG223 (20dB @ 100m/200MHz):	100m
Max. distance with RG58 (24dB @ 100m/200MHz):	83m
Max. distance with RG316 (35dB @ 100m/200MHz):	57m
Max. distance with RG174 (45dB @ 100m/200MHz):	44m
Max. distance with RG178 (62dB @ 100m/200MHz):	32m

## Mains Power Supply:

Power supply voltage single phase, nominal:	100V to 240V
Power supply voltage range operating:	85V to 264V

## Connectors:

Digital coaxial connector:	SMA 50Ω standardised RF-connector
Connector of the digital audio bus system:	50 pole 2mm high precision contacts gold plated
Connectors for balanced in- & outputs:	2x XLR plug & socket
Connectors for unbalanced in- & outputs:	2x Cinch socket gold plated
Quality of the power output clamp:	WBT 0645, full isolated
Power supply connector:	Standard IEK mains socket

## Temperatures:

Temperature range operating (room temperature):	+10°C to +40°C
Temperature range operating of the cooler (BPA768):	+10°C to +70°C
Temperature range storage (transportation also):	0°C to +70°C

## Safety:

Electrical Safety:	according EN 60065: 2002
Safety against squirting water:	according IPX4

## CE-Approval:

Emission:	EN 55013: 2000, EN 61000-3-2: 2000 and EN 61000-3-3:
1996	
Disturbing influence:	EN 55020: 2000
Electrical discharge:	EN 61000-6-1: 2001

## Examples for Configurations

behold **Basic** Setup:

<b>APU768</b>	Digital Pre-Amplifier 768kHz with PDA Bluetooth Remote Control and Power Supply
<b>ODI768</b>	Octal Digital Input Module four Cinch/Toslink
<b>DAC192</b>	Analogue Stereo Output Module 192kHz



behold **Advanced** Setup:

<b>APU768</b>	Digital Pre-Amplifier 768kHz with PDA Bluetooth Remote Control and Power Supply
<b>ODI768</b>	Octal Digital Input Module four Cinch/Toslink
<b>SDO768</b>	Digital Output Module 768kHz
<b>2x DAC768</b>	Precision Mono D/A-Converter 768kHz



behold **Advanced CD** Setup:

**APU768** Digital Pre-Amplifier 768kHz with  
PDA Bluetooth Remote Control and Power Supply  
**CD-Player** True Mass CD-Player  
**CDP768** CD-Player Module  
**ODI768** Octal Digital Input Module four Cinch/Toslink  
**SDO768** Digital Output Module 768kHz  
**2x DAC768** Precision Mono DA-Converter 768kHz



behold **Advanced Analogue** Setup:

**APU768** Digital Pre-Amplifier 768kHz with  
PDA Bluetooth Remote Control and Power Supply  
**ODI768** Octal Digital Input Module four Cinch/Toslink  
**ADC192** Octal Analogue Input Module 192kHz  
**SDO768** Digital Output Module 768kHz  
**2x DAC768** Precision Mono DA-Converter 768kHz



behold **Progressed** Setup:

**APU768** Digital Pre-Amplifier 768kHz with  
PDA Bluetooth Remote Control and Power Supply  
**ODI768** Octal Digital Input Module four Cinch/Toslink  
**SDO768** Digital Output Module 768kHz  
**BPA768-484** Bi-Amping Power Amplifier 768kHz



behold **Progressed CD** Setup:

**APU768** Digital Pre-Amplifier 768kHz with  
PDA Bluetooth Remote Control and Power Supply  
**CD-Player** True Mass CD-Player  
**CDP768** CD-Player Module  
**ODI768** Octal Digital Input Module four Cinch/Toslink  
**SDO768** Digital Output Module 768kHz  
**BPA768-484** Bi-Amping Power Amplifier 768kHz



behold **Progressed Analogue** Setup:

- APU768** Digital Pre-Amplifier 768kHz with PDA Bluetooth Remote Control and Power Supply
- ODI768** Octal Digital Input Module four Cinch/Toslink
- ADC192** Octal Analogue Input Module 192kHz
- SDO768** Digital Output Module 768kHz
- BPA768-484** Bi-Amping Power Amplifier 768kHz



behold **Progressed Phono** Setup:

- APU768** Digital Pre-Amplifier 768kHz with PDA Bluetooth Remote Control and Power Supply
- ODI768** Octal Digital Input Module four Cinch/Toslink
- ADC192** Octal Analogue Input Module 192kHz
- MCA768** Phono AD-Converter Headshell 768kHz
- MCK768** Phono Data-Converter 768kHz
- SDI768** Phono Digital Input Module 768kHz
- SDO768** Digital Output Module 768kHz
- BPA768-484** Bi-Amping Power Amplifier 768kHz



behold **Progressed CD Phono** Setup:

- APU768** Digital Pre-Amplifier 768kHz with PDA Bluetooth Remote Control and Power Supply
- CD-Player** True Mass CD-Player
- CDP768** CD-Player Module
- ODI768** Octal Digital Input Module four Cinch/Toslink
- ADC192** Octal Analogue Input Module 192kHz
- MCA768** Phono AD-Converter Headshell 768kHz
- MCK768** Phono Data-Converter 768kHz
- SDI768** Phono Digital Input Module 768kHz
- SDO768** Digital Output Module 768kHz
- BPA768-484** Bi-Amping Power Amplifier 768kHz



behold **Reference** Setup:

- APU768** Digital Pre-Amplifier 768kHz with PDA Bluetooth Remote Control & Power Supply
- CD-Player** True Mass CD-Player
- CDP768** CD-Player Module
- ODI768** Octal Digital Input Module four Cinch/Toslink
- ADC192** Octal Analogue Input Module 192kHz
- MCA768** Phono AD-Converter Headshell 768kHz
- MCK768** Phono Data-Converter 768kHz
- SDI768** Phono Digital Input Module 768kHz
- SDO768** Digital Output Module 768kHz
- 2x BPA768-484** Bi-Amping Power Amplifier 768kHz



# Impressum



Build in 1756



Manufacturing

## Manufacturer & Sales:

### Ballmann Electronica GmbH

Subsidiary and postal address for behold:

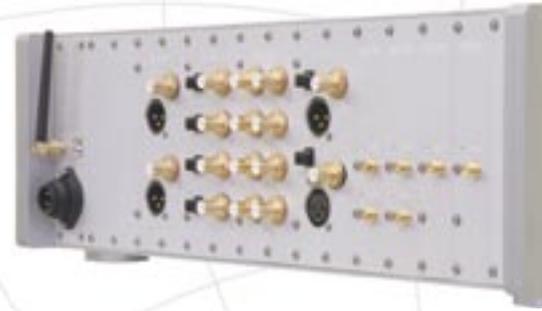
Theaterplatz 14, D-91054 Erlangen  
Phone +49 9131 9236540  
Fax +49 9131 9236544  
e-mail: [info@behold-highend.de](mailto:info@behold-highend.de)

Company main office: D-91080 Marloffstein  
Commercial register: Fuerth HRB 5822  
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Vice-President: Gisela Ballmann

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