

DAC-R

Digital to Analogue Converter

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Introduction

The Rega DAC-R is a 16/20/24-bit at 32kHz to 192kHz digital to analogue converter. Incorporating an enhanced version of the Rega designed circuit, the DAC-R offers the highest possible resolution over all inputs including fully asynchronous USB with the addition of remote functionality.

Developed to be simple to set up and use, the Rega DAC-R is designed to optimise performance from any two channel PCM digital audio source.

With the PC now widely accepted as a credible medium for storing and streaming music, the use of high quality lossless files such as WAV, FLAC and ALAC offer performance through the DAC-R equal to and in some cases better than Red Book CD. Great care has been taken to remove noise generated by the PC and other input sources. (During development this was identified as a major drawback with many DAC's on the market today).

The DAC-R is housed in a custom aluminium and steel case and boasts a pair of Wolfson DAC IC's, three user selectable digital filters and one isolated asynchronous USB, two isolated Co-axial inputs & two Toslink SPDIF inputs.

The DAC-R has been designed and engineered to integrate perfectly into any system and achieve the highest performance in its class. We hope you enjoy this Rega product for many years to come.

Technology

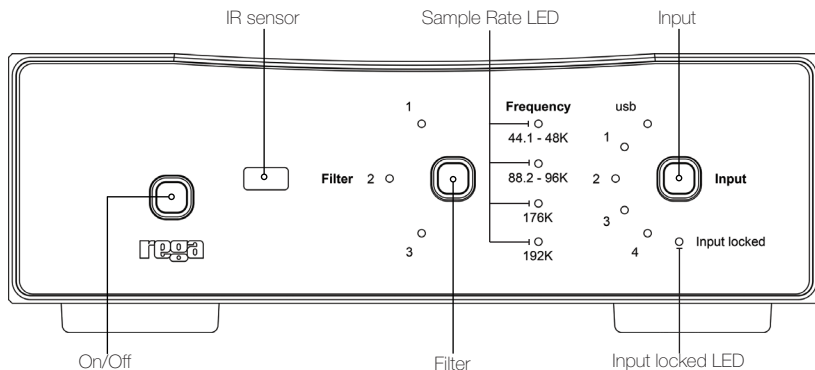
The optical and coaxial input stage comprises a Wolfson digital receiver with a high stability, low jitter clock driving the receiver PLL. The receiver and PLL have their own dedicated power supplies. The DAC stage comprises a pair of parallel-connected Wolfson WM8742 DAC's, that are driven via a buffer stage, which ensures the integrity of the data being fed to the DAC IC's similar to the arrangement used in the Isis reference CDP.

The USB input stage is comprised of a bit perfect XMOS USB Audio 2.0 with asynchronous clocking. The USB input stage feeds the Optical and Coaxial input stage via an isolating transformer giving total isolation from the host computer.

The output amplifier employs a discrete differential, multiple feedback filter and output amplifier, with a high cut-off frequency for use with higher sample rates. We decided not to use a sample rate converter and process the data at the incoming sample rate which keeps the signal processing to a minimum. Jitter was minimised by synchronously clocking the digital data with our receiver PLL (removing any jitter from the input signal).

All the capacitors associated with the analogue signal path are audio grade bypassed with MMK polyester capacitors, and low impedance conductive polymer capacitors are used for DAC decoupling. The power supply utilizes a toroidal transformer, fast rectifier diodes and again, audio grade capacitors. There is a power supply for the control micro controller, separate from the digital & analogue audio stages. Special attention being paid to the inter IC control signals ensures the control data noise is kept to a minimum.

Front panel indicators & operation



Power on/off When the power button is pressed the Rega logo illuminates.

Input Selects the 5 available digital inputs. Push to advance.

Filter Selects the three available filters. Push to advance

Input locked indicator Indicates the digital input signal is valid and the PLL in the receiver is locked. When the Input locked LED is off, the soft mute is activated.

USB /1 Optical /2 Optical /3 Co-axial /4 Co-axial

Sample rate LED's (only valid when Input locked is on).

32K- No sample rate LED is shown but Input locked is illuminated

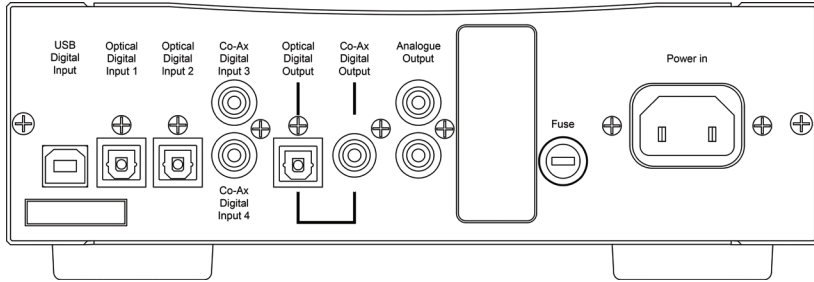
44.1-48K - Indicates the incoming sample rate is 44.1 or 48kHz

88.2-96K-Indicates the incoming sample rate is 88.2 or 96kHz

176K - Indicates the incoming sample rate is 176.4kHz

192K - Indicates the incoming sample rate is 192kHz

Back panel - inputs and Outputs



Inputs

- USB - Isolated Asynchronous/type B connector
- Optical Digital Input 1- Optical/Toslink
- Optical Digital Input 2- Optical /Toslink
- Co-Ax Digital Input 3- Isolated 75Ω Co-axial Phono
- Co-Ax Digital Input 4- Isolated 75Ω Co-axial Phono

Outputs

- Digital output (via receiver & PLL) -SPDIF
- Optical Toslink
- Co-axial/Phono Isolated 75Ω
- Analogue Output Left and Right Phono

- Power Mains/line input IEC C13 type
- Fuse Fuse holder

In use

Power-up the DAC-R using the power switch on the front panel. After a few seconds you will hear an audible click from the output mute relay and the analogue audio will be active. Please note: the front panel will display the previously selected setting's displayed before the unit was last powered down. If the currently selected input has an active source connected, the 'Input locked' LED, along with the appropriate incoming sample rate LED, will illuminate. Unless the Input locked LED is lit, the sample rate indication is irrelevant. By pressing the input selection switch you can select any one of the inputs. When the Input locked LED is off, or there is a transmission error, the internal soft mute is activated automatically. By pressing the Filter selection switch you can select any one of the 3 available digital filters. (The exact properties of these filters are outlined on page 6). Notably, each one has a different result at low and high sample rates. The differences, although subtle, are more noticeable at higher samples rates.

Digital Output & Optical inputs

The digital output mirrors the selected input. For example, when input 2 has been selected, the digital output will be the signal present on input 2 but cleaned up and re-clocked. This can be used to drive an auxiliary piece of equipment if so desired.

The optical system used for optical inputs 1&2 is nearing its maximum at 192K. If you experience difficulties try the following: Use a higher quality or shorter lead. When using 3.5mm jack outputs commonly found on computers and sound cards etc. Try and use a mini Toslink optical 3.5mm jack connector lead and avoid using a 3.5mm to full size adaptor with a standard full size Toslink lead.

Filter settings

The cut-off points of the filters are in the upper end of the frequency range. However, due to complex technical phenomena, this will have an effect lower in the frequency band. For further description, see the glossary of terms. These settings are a matter of personal taste and may only offer subtle changes. We suggest using Filter setting 1 and trying different settings with various music and equipment.

Filter setting switch & LED's - Push to advance to the next filter.

Filter settings 1–3

(low sample rates 32/44.1/48K)

1. Linear phase half-band filter
2. Minimum phase half-band filter
3. Minimum phase apodising filter

Filter settings 1–3

(medium & high sample rates 88.2/96 & 176.4/192K)

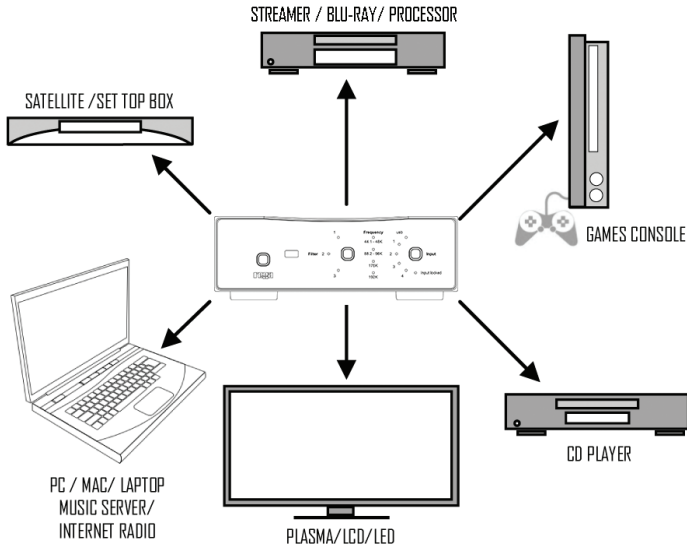
1. Linear phase soft-knee filter
2. Minimum phase brickwall filter
3. Linear phase apodising filter

The filters have a greater effect on higher sample rates because of the higher Nyquist frequency which is $\frac{1}{2}$ of the sample rate. This means the filter has a wider frequency range in which to be active.

Connectivity (examples)

1 USB A-B/ 2 OPTICAL/3 CO-AXIAL

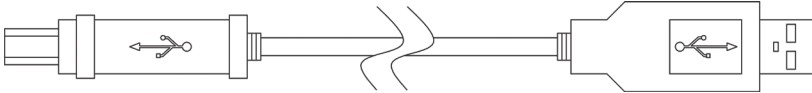
This page offers 'suggested connectivity'. With so many products offering a number of options, it is important to check the manual of the product you are connecting for the appropriate or optimum output connection and settings required to operate properly.



Please note : This unit only accepts two-channel PCM digital audio. You cannot connect a Dolby Digital 5.1/7.1 or a DTS signal as they will not be recognised. If you wish to connect a DVD or similar device, please ensure that the sound output of your player is set to two-channel PCM.

USB Setup and connectivity

Connect a USB A-B type lead (as illustrated) from the DAC USB to a USB output on your PC. IMPORTANT: Before you can use the USB function of the DAC-R you must first download the Rega USB Windows driver and install it on your PC. This driver is available for download from the Rega website, www.rega.co.uk. Go to 'product range' and select CD players / DAC', then DAC-R. Under product downloads on the product page you will see the USB driver. Follow the instruction for installation. Once installed, USB will be ready to use. The driver is not required for MAC OS.



USB A-B Lead (not supplied)

It is recommended to switch off any other system sounds emitted by the PC via the control panel. In some systems, the DAC-R will automatically become the default for your PC whilst connected. Once disconnected, the previous default should be restored. If this does not happen, you can manually reset as follows:

Windows Vista - Control Panel / Hardware & Sound/Manage Audio Devices/select 'USB Audio' from list.

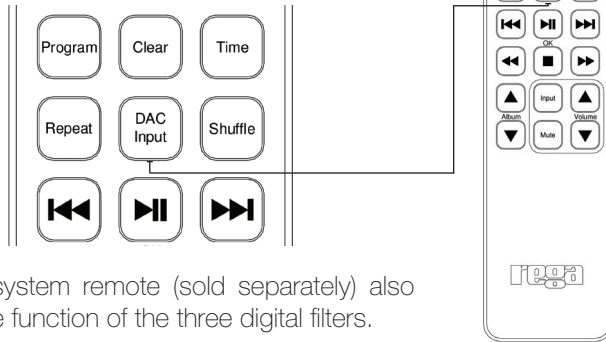
Windows7 - Control Panel / Sound / Manage Audio Devices / select USB Audio

Windows 8 - Control Panel / Hardware and Sound / Sound / Advanced / select USB Audio

Mac OS - System Preferences / Sound Output / Select 'USB DAC'.

Remote functionality

The DAC-R is supplied with a mini system remote which gives the user the ability to switch inputs via a single button marked 'DAC Input'.



The Solaris system remote (sold separately) also allows remote function of the three digital filters.

Notes on high resolution playback

The DAC-R can operate up to 192kHz when used with a capable soundcard connected via the Co-axial, optical or USB input. Due to the limitations of some operating systems and playback software, the exact configuration and set-up can vary from one PC/laptop to another and may not have a bit perfect high sample rate 'signal' path through the PC/laptop. It may be necessary to install further drivers in order to bypass the Windows Audio drivers (for example ASIO4ALL). Select the new driver in your chosen media player preferences. In some circumstances it is possible using the sound properties panel to make the DAC run at a higher sample rate than that of the file being played, thus 'up sampling' the data rate in the DAC. (sometimes called 'bitty' software sample rate conversion).

Technical Specifications

DAC 2x Wolfson WM8742

Frequency Response (100K Ω load) Filter 1 selected

Low data rate

44.1/48KHz = 10Hz -0.05dB to (44.1K) 20.02KHz (48K) 21.7KHz -0.03dB

Medium data rate

88.2/96KHz = 10Hz -0.05dB to (88.1K) 28.7KHz (96K) 31.2KHz -3dB

High data rate

176.4/192KHz = 10Hz -0.05dB to (176.4K) 44.1KHz (192K) 47.7KHz -3dB

Maximum output level = 2.175V into 100K Ω load

Bit resolution (all inputs) 16 to 24bit

Supported data rates = 32, 44.1, 48, 88.2, 96, 176.4, 192KHz

Total Harmonic Distortion all inputs (24bit 96KHz) = 0.006% @ 1KHz

Signal to Noise Ratio -105dB

(relative to maximum output level with a 100Hz to 22KHz bandwidth)

Digital inputs

USB Asynchronous Isolated (24bit 44.1/48/88.2/96/176.4/192KHz)

Input 1 Optical/Toslink (24bit 32/44.1/48/88.2/96/176.4/192KHz)

Input 2 Optical/Toslink (24bit 32/44.1/48/88.2/96/176.4/192KHz)

Input 3 Isolated 75 Ω Co-axial (24bit 32/44.1/48/88.2/96/176.4/192KHz)

Input 4 Isolated 75 Ω Co-axial (24bit 32/44.1/48/88.2/96/176.4/192KHz)

Digital SPDIF outputs (via receiver & PLL)

Optical/Toslink

Isolated 75 Ω Co-axial

Power 230v/115v/7.6W

Dimensions in cm W 21.5 x D 32 x H 8

Remote NEC system (6E91)

Weight 4.0 Kg

Glossary of terms

ASYNCHRONOUS

An asynchronous USB DAC uses its own clock to regulate the data rate from the computer, which allows for jitter-free data transfer

PLL

Phase lock loop

PCM

Pulse code modulation

SPDIF

Sony Philips digital interface protocol

SOFT MUTE

Software mute (not output mute)

SOFT KNEE FILTER

Filter with a large transition band which reduces dispersion and delay

HALF BAND

Filter where the transition region is centred at one quarter of the sampling rate

APODISING FILTER

Filter exhibiting a smooth roll off

BRICKWALL FILTER

Filter exhibiting a steep roll off

FLAC/ALAC

Examples of lossless audio formats

DIGITAL FILTER

Device or process that removes unwanted features from a signal.

Owners Log

(1)
Owner.....
Date.....
Where purchased.....

(2)
Owner.....
Date.....
Where purchased.....

(3)
Owner.....
Date.....
Where purchased.....

(4)
Owner.....
Date.....
Where purchased.....

(5)
Owner.....
Date.....
Where purchased.....

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