

bel canto

e.One™ series

DAC 1.5



USER'S GUIDE

DAC1.5™

Upsampling Audio DAC
with Master Reference Ultra-Clock™

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Important Safety Instructions

Explanation of symbols used in this manual or on the rear/underside of the apparatus:



The Lightning Flash with arrowhead symbol within an equilateral triangle, is intended to alert the user to the presence of uninsulated "dangerous voltage" within the product enclosure that may be of sufficient magnitude to constitute a risk of shock to persons.



The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the product.

- Read, keep and follow these instructions.
- Heed all warnings.
- Do not use the apparatus near water, ie near a bathtub, kitchen sink, laundry tub, in a wet basement, near a swimming pool etc.
- Clean only with dry cloth.
- Do not block any ventilation openings. Install in accordance with the Manufacturer's instructions. Site the apparatus so that its location or position does not interfere with its proper ventilation. For example, the apparatus should not be situated on a bed, sofa, rug, or similar surface that may block the ventilation openings, or placed in a built in installation such as a bookcase or cabinet that may impede the flow of air through the ventilation openings.
- Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus that produce heat.
- This apparatus uses Class I construction and must be connected to a mains socket with protective earthing connection.
- Protect the power cord from being walked on or pinched particularly at plugs, convenience receptacles, and at the point where they exit from the apparatus.
- Unplug this apparatus during lightning storms or when unused for long periods of time.
- Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as power-supply cord or plug has been damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.
- Mains plug: Use the mains plug to disconnect the apparatus from the mains supply. The mains plug must be accessible at all times. Use the mains switch (if applicable) when the apparatus is not in use.
- Objects and liquid entry: Do not let objects or liquids fall into the apparatus. Do not expose the apparatus to dripping or splashing. Do not place a vessel containing liquid on top of the apparatus.
- No naked flame sources, such as lighted candles, should be placed on the apparatus.
- The apparatus has been designed for use in moderate and tropical climates.

TO COMPLETELY DISCONNECT THIS APPARATUS FROM THE AC MAINS, DISCONNECT THE POWER SUPPLY CORD PLUG FROM THE AC RECEPTACLE.

THE MAINS PLUG OF THE POWER SUPPLY CORD SHALL REMAIN READILY ACCESSIBLE.

Disconnect supply cord before changing fuse. Refer servicing to qualified service personnel.

WARNING: TO REDUCE THE RISK OF FIRE OR ELECTRIC SHOCK, DO NOT EXPOSE THIS APPARATUS TO RAIN OR MOISTURE AND OBJECTS FILLED WITH LIQUIDS, SUCH AS VASES, SHOULD NOT BE PLACED ON THIS APPARATUS.

In The U.K.

Fuse replacement:

This appliance is fitted with a non-rewireable 10 amp mains plug. The plug contains a 10 amp fuse. If the fuse has blown it can be replaced as follows:

- a) Pull out the black fuse cover/carrier.
- b) Remove and dispose of the blown fuse.
- c) Fit a new 10 amp BS1362 approved fuse into the carrier and push the carrier back into the plug.

Always ensure the fuse cover is fitted. If the fuse cover is missing do not use the plug. Contact your Bel Canto retailer to obtain a replacement fuse cover. Fuses are for fire protection and do not protect against electric shock.



WARNING: THIS APPLIANCE MUST BE GROUNDED.

FCC NOTICE

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does

cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Green By Design

All Bel Canto products make use of compact and efficient design principles. Our products use less resources per unit to produce better performance than ever before. Everything from reduced packaging volume, to less weight in transport helps to reduce the overall environmental impact of bringing our products into the market.

Our products make very efficient use of electricity. Low energy usage and compact size ensure that the physical and environmental footprints of all Bel Canto products are minimized. Quality and performance play into this approach as all of our products are designed to remain vital and valid performers for many years. Should you want to upgrade to one of our new products, we even offer trade-in value for your old Bel Canto product to ensure that it is recycled in the most efficient and responsible manner.

RoHS and WEEE

All of our current products are designed and produced to RoHS standards, ensuring that dangerous materials do not enter the waste stream. Lead free electronics assemblies and environmentally safe finishing and production methods are utilized to ensure that our products and processes are environmentally safe.

Bel Canto Recycles

Bel Canto has always been a forward thinking company. In the same way that we are focused on the development of high-end audio products, we are also conscious of what we leave behind. For many years we have implemented environmentally sound measures to make the most efficient use of resources and keep our impact at a minimum.

We reuse or recycle more than 99% of the packing materials for our incoming parts shipments. Each year we divert massive amounts of cardboard, paper, plastic film, and Styrofoam from landfills. Our plastic and Styrofoam is delivered directly to local facilities that process it on site for use in their manufacturing. Steel, aluminum, and other metal waste products are delivered to local metal scrap yards for recycling back into the production stream.

We also participate in Waste Management's e-Cycling program. All electronic waste is processed in the US, with hazardous material being separated from non-hazardous, at ISO 9001 and ISO 14001 certified regional processing centers.

Our commitment to responsible production processes ensures that the absolute minimum of material used in the making of our products enters the waste stream.

Warranty Information

Bel Canto products are automatically covered by a 90 day factory warranty that covers all internal parts and labor. Register online (http://www.belcantodesign.com/Belcanto_Warranty.html) within 30 days of purchase from an authorized dealer to automatically extend your warranty for 2 years starting from the date of purchase. If you do not have web access, please contact your dealer for assistance. Upon fully completing registration, within 5 business days you will receive an email that officially validates your warranty. Your information will be used for internal use only and will not be sold or released outside Bel Canto. Your comments and suggestions are appreciated and help us continually improve our products and services.

The warranty is only valid to the original owner and is non-transferable. Damage caused by unauthorized modification, abuse, or neglect of product will void your warranty. Any cost associated with return of product is the sole responsibility of the owner. All returns require a return authorization number issued after completing the RMA form in the support section of our website. If you have any questions, please feel free to contact us online at info@belcantodesign.com.

Unpacking Your DAC 1.5

DAC1.5 packaging contains the following:

- 1 (one) – DAC1.5
- 1 (one) – DAC1.5 User's Guide
- 1 (one) – Desktop 12VDC Power Supply and Power Cord
- 1 (one) – Remote Control

Carefully unpack each piece and check for shipping damage. If there is any damage, or if anything is missing, please contact your dealer, distributor or Bel Canto Design.

IMPORTANT: Save all packing materials as they are specially designed to protect the unit during transportation or shipping. If the packing becomes lost or damaged, please contact your dealer, distributor or Bel Canto before attempting to transport your unit.

Power Connection

The power supply on the DAC1.5 is preset for the proper power voltage. The power cable should have the correct plug for your local power system. If you believe this to not be true, please contact your dealer immediately.

This product, like any electrical component, can be dangerous and cause injury unless correct handling procedures are observed and used. Before powering this product, it is necessary to read and follow proper setup and procedures.



WARNING!

Do not connect power to this product yet!

Setup & Placement

Because the DAC1.5 runs cool, it can be placed in many system locations without compromise. We do not recommend placing weights or other objects directly on the DAC1.5. This may scratch or mar the chassis finish. Do not use harsh chemicals when cleaning the outside of your DAC1.5.

Single Ended RCA and Balanced XLR connectors are available. XLR jacks allow balanced hookup using the standard North American pin configuration:

Pin 1 Ground
Pin 2 Signal +
Pin 3 Signal -



IMPORTANT!

Make all connections before powering your unit!

Design Features

- Master Reference Ultra-Clock with high rate jitter filter ensures maximum dynamic range from any source.
- USB Link 24/96 Isolated computer audio input
- Dedicated Headphone DAC/Amplifier stage
- 4 Digit Green LED Display
- External 12VDC switching supply with internal LC filtration
- Critical analog supply filters using new Solid Polymer technology capacitors
- 4Vrms balanced output level to drive any amplifier

The DAC1.5 musical performance rests on the solid foundation of the Master Reference Ultra-Clock™, which provides jitter performance 50X better than other clocks. Specifications of 2 picoseconds RMS and frequency accuracy of 0.0001% ensure maximum dynamic range. The Ultra-Clock circuit is preceded by a new aggressive 2Hz jitter filter, ensuring that any incoming jitter on the data inputs can not compromise the final analog output signal quality.

The DAC1.5 has been optimized to provide the highest level of performance for all of these critical functions. It can provide digital preamplifier as well as D/A conversion and bridge from traditional CD or DVD player sources and from the isolated USB input for computer music playback sources.

All digital input sources benefit from the new 2Hz digital PLL stage that rolls off incoming jitter by more than 10X at 10Hz frequencies and greater than 10,000X by 100 Hz. Any incoming jitter at frequencies above 10Hz is reduced to levels that have no effect on measured or sonic performance. *See page 8 for back panel.*

The dedicated headphone DAC/Amplifier stage is designed to drive any headphone with remarkable fidelity. This dedicated stage insures no compromise to either the main analog outputs or the headphone output. The main analog outputs are muted digitally when a headphone is plugged into the front panel jack. There is no additional switching of any analog signals or routing of analog lines. The headphone circuitry is all DC coupled, avoiding any sonic compromise due to coupling capacitors.

The PCM1796 dual-differential multi-bit delta-sigma DAC circuit achieves remarkable analog performance. The 4VRMS true balanced XLR outputs provide 122dB of dynamic range. The noise floor of this DAC/processor is so low and so clean that the DAC1.5 is optimally used as a complete DAC/Preamplifier with a digital level control. Because of dither applied to the 24bit word there is no loss of effective resolution. The application of optimized dither insures that the analog output noise floor maintains a clean sound, devoid of any tones or artifacts. The DAC1.5 provides a quality system solution with the addition of a Bel Canto e.One amplifier, eliminating the need for an analog preamplifier.

Single Knob Control Functions & Display

Upon Power Up:

When switched on, the DAC1.5 will display its software revision. The AES input will be selected and Soft Mute will be active. The volume will be set to 50.0 even if the fixed/variable button is in Fixed mode.

Front Panel Control Knob:

The control knob is a continuously rotating control with a push-switch function. Always push the button with your finger in the direct center of the knob. Pushing the knob will switch between selectable values on the display. Rotating the control left or right will adjust the selected value.

Variable Output Mode:

The DAC1.5 Variable Output operating mode, selected from the rear panel Fixed/Variable output switch, allows you to change volume level by rotating the knob. The volume down function (counter-clockwise rotation) is very rapid and allows quick changes in the volume level. Volume up (clockwise rotation) functions rapidly up to a displayed volume level of 65.0.

Input Selection Mode:

Pressing the control knob in briefly will toggle into the input selection mode. The selected input will be displayed for 5 seconds. During this time you can rotate the control knob to scroll to the desired input. Pressing the knob again will select the indicated input. The volume level will automatically ramp down and up during this selection process. If the control knob is not pressed for 5 seconds, the indicated input will automatically be selected and the DAC1.5 will return to the default volume control mode. Inputs are indicated as: AES, SP1 (SPDIF1), SP2 (SPDIF2), OPT (TOSLINK), and USB.

Fixed Output Operating Mode:

Pressing the rear panel Fixed/Variable Output switch to the in position will set the DAC1.5 in a fixed output operating mode. This mode is used when driving an analog preamp or integrated amplifier input. The volume control function is then provided by the associated preamplifier or integrated amplifier.

To use the Fixed Output mode set the output level to 100.0 for a 2 Vrms maximum level from the RCA outputs or 4 Vrms level for the Balanced XLR outputs. If you want the outputs set for a lower level then set the volume control to a lower level. For example, for about 2 Vrms out from the balanced outputs set the volume control to 94.0. This will represent about a 2 Vrms output level on the balanced outputs. When the level is set then press the rear panel Fixed/Variable Output button. The front panel display will now show the selected input. Rotating the knob will scroll to different inputs and the Volume and Mute functions on the remote will not function.

Front Panel Digital Lock Indicator:

When no digital input signal is present on an input the first decimal point on the display will blink on and off. For example the display will show: 65.0 and the first decimal point will be slowly blinking. If this occurs you need to check that the correct input is selected and then check that the digital source is connected, active and functioning correctly.

CONDITIONING

The sonic performance of the DAC1.5 will begin to stabilize after 100 hours of continuous power up.

Remote Control

The DAC1.5 Remote Control has a comprehensive set of control features that are not available on the front panel.

To access all DAC1.5 control features press the button marked DAC on the remote control. The Main CD controls will still operate in the DAC, PRE and Tuner modes.

Display: Toggles through several display options:

1. Normal mode with Level Displayed
2. Input Sample Rate Displayed for several seconds, example 44.1 or 96 or LOS indicating Loss of Signal or no digital input detected.
3. Display Off: Display comes on for several seconds whenever a status change is detected

Mute: When in variable output mode this will switch the analog outputs from Soft to Hard Mute and Un-muted modes. Soft mute is indicated by two decimal points in the far right of the display. Hard mute is indicated by 3 decimals on the display. The Mute function will Punch Through to any Bel Canto unit set in Variable Output mode.

VOL+: Increases the volume setting in Variable Output mode. This will Punch Through to any Bel Canto unit in Variable Output mode. The display will show the volume level while changing.

VOL-: Decreases the volume setting in Variable Output mode. This will Punch Through to any Bel Canto unit in Variable Output mode. The display will show the volume level while changing.

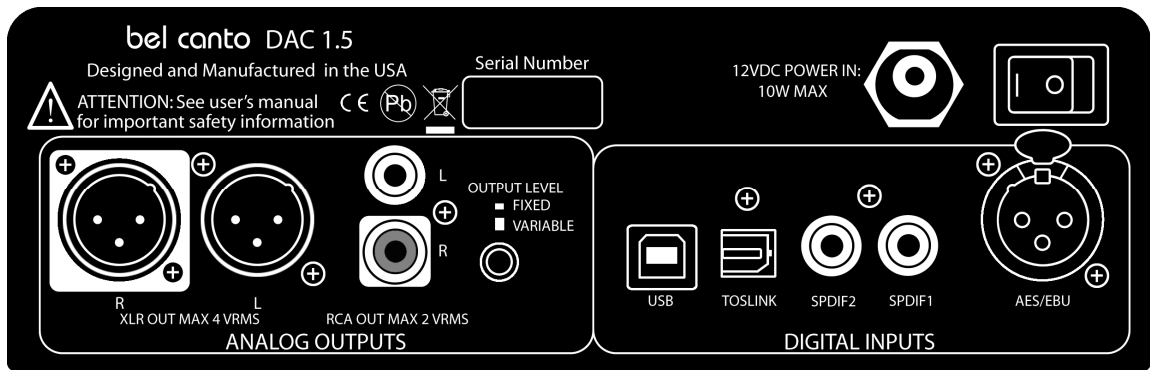
CH/SCAN+: This will toggle the input selection up in number and wrap around. Note that the first press of this control will show the active input selection.

CH/SCAN-: This will toggle the input selection down in number and wrap around. Note that the first press of this control will show the active input selection.

Number Buttons: Use for direct input selection.
1: AES 2: SPDIF1 3: SPDIF2 4: TOSLINK 5: USB



Rear Panel Connections



IMPORTANT: If using the DAC1.5 directly into a power amplifier, ensure that the Fixed/Variable Output button is in the OUT (variable) position. Operation in Fixed Mode directly into the amplifier could cause extreme output levels, clipping and damage to the loudspeakers, amplifiers or your ears!

Beginning in the upper right:

- 2.1mm power input jack for the supplied 12VDC supply, can be used with LNS1 or VBS1 supply with correct cable.
- On OFF switch applies power when the switch is in the 1 position.
- XLR 4 Vrms or RCA 2 Vrms outputs are used for directly driving a power amplifier in Variable Output Mode or a preamplifier input when in Fixed Output Mode
- Output Level Button selects Fixed or Variable Output Mode
- USB Input can be connected to a computer for playback of any audio format up to a 24/96 data rate. The system will automatically recognize the DAC1.5 as an audio converter enumerated as *Bel Canto USB 2496* when using Windows 98 or later and any version of Macintosh OSX
- TOSLINK Input accepts any standard plastic or glass fiber optical TOSLINK cable and operates to 24/192 data rate
- SPDIF1 and SPDIF2 accept RCA connections from any 75 ohm SPDIF source and operates up to and including a 24/192 data rate
- AES/EBU Input accepts any AES/EBU standard 110 ohm digital source and operates up to at least a 24/192 data rate

When all connections to and from the unit have been made then double check everything before plugging the DAC1.5 into the power source. After turning on, the DAC1.5 will go through its display check and show the software revision number. The unit will be in Soft Mute with the AES input selected. The volume will be set to 65 even if the fixed/variable button is in Fixed mode.

Tips For Operation

Using Headphones

When headphones are inserted into the headphone jack, the volume can be adjusted via the control knob or remote regardless of whether the DAC1.5 is in Fixed or Variable mode. The input can be selected as normal from the front panel or remote. The main outputs of the DAC1.5 are disabled when headphones are in use.

Output Connections

We strongly recommend that you use the Balanced XLR output to drive your e.One amplifier. Because of the DC coupled nature of the DAC1.5 there is a small residual DC offset on the outputs. This is typically less than 10mV (0.01 Volts) and will not be a problem for any Bel Canto amplifier or any vacuum tube or solid state amplifier with AC coupling or DC servo control. There is no problem connecting to a preamp. If using a Bel Canto preamp there will be no small click or pop when selecting the input. Other preamplifiers that do not ramp the volume up or down may produce a small click when selecting the DAC1.5 input.

Power Up

We recommend leaving the DAC1.5 powered at all times as the sonic quality is best after several hundred hours of play and 48-72 hours of power on after the initial break-in time.

Connection to a Computer

The USB port can be used for up to 24/96 data, enough for any CD source. For connection at 24/192 or higher data rates, we recommend using a quality sound card with SPDIF, AES/EBU or glass TOSLINK connection. For more details on optimizing computer audio sources please refer to our on-line guide at: www.belcantodesign.com

What to do if there is hum or ground noise

The design of the DAC1.5 greatly reduces the chance for ground loop induced hum and noise. We recommend using the balanced outputs for best performance-the balanced outputs can drive long lines to 10 meter length.

Connect all power cables of the audio system to a common outlet box or power conditioner unit. Having the audio system components share a common ground will greatly reduce the possibility for ground current noise being introduced into the audio signal path

Volume Control Punch Through

The Volume Up, Down and Mute functions on the remote control will affect any Bel Canto unit in Variable Output mode regardless of whether PRE, DAC, CD or TUNER is selected. It is recommended that only the device with volume control closest to the power amps be in Variable Output mode. Any other devices that are capable of volume control should be in Fixed Volume mode.

Specifications

Digital Section:

Maximum Input Data Rate:	
24bit Data at 192Ks/s:	TOSLINK, AES 110ohm XLR, SPDIF 75ohm
24bit Data at 96Ks/s:	USB
Master Clock jitter:	2picosecond RMS

Analog 24/192 DAC Section:

Maximum Output:	4Vrms balanced XLR, 2Vrms RCA
Output Impedance:	200 ohms balanced XLR, 100 ohms RCA
Frequency Response:	20 Hz-20KHz, +/- 0.5dB
THD+N:	<0.0015%, 4Vrms balanced out, 1KHz
Output Noise:	3.3uVrms, A-weighted 20Hz-20KHz
Dynamic Range:	122dB, A-weighted 20Hz-20KHz

Headphone Section:

Maximum Output:	138mW
THD+N:	0.0055% 35mW, 1KHz
Output Noise:	17uVrms, A-weighted 20Hz-20KHz

General:

Power Usage On:	8W
Power Usage Off:	0.0W
Power Requirement:	12VDC, 0.75A
Dimensions:	8.5" W x 12.5" D x 3.5" H (216 mm x 318 mm x 88 mm)
Weight:	13lbs. (6.2 kg)

External Power Supply:

IEC 3-prong grounded plug	
Class II power supply:	100-240VAC 50/60 Hz 0.5A

Features and specifications are subject to improvements and changes without prior notice.

Declaration Of Conformity

Application of Council Directive(s):

2004/108/EC and 2006/95/EC, as amended

Standard(s) to Which Conformity Is Declared:

EN 55013:2001 + A1:2003 + A2:2006

EN 55020:2007

EN 61000-3-2:2006

EN 61000-3-3:1995 + A1:2001 + A2:2005

EN 60065:2002/A12:2011

Manufacturer:

Bel Canto Design, Ltd.

221 1st Street North

Minneapolis, MN 55401 USA

The equipment identified here conforms to the Directive(s) and Standard(s) specified above.

Type of Equipment: Digital to Analog Converter

Models: DAC1.5

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