



The Reference DAC

User Guide

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www.msbtechnology.com

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Hello@msbtechnology.com

04.12.2023

Reference DAC Support Page

All Reference DAC support topics, as well as a full PDF version of this user guide, can be found online by visiting the URL listed below or by scanning the following QR Code.



<https://msbtechnology.com/dacs/reference-support/>

Reference Series Youtube Playlist

Any Reference DAC support videos, as well as other related product videos, can be found online by visiting the URL listed below or by scanning the following QR Code.



[https://www.youtube.com/
playlist?list=PLA1wHoJozHNeXUpdBSSQeIGtsaQHHggjT](https://www.youtube.com/playlist?list=PLA1wHoJozHNeXUpdBSSQeIGtsaQHHggjT)

This user guide is modeled after the following firmware revisions:
The Reference DAC: 31.21
The Reference Digital Director: 11.11

Setup and Quick Start

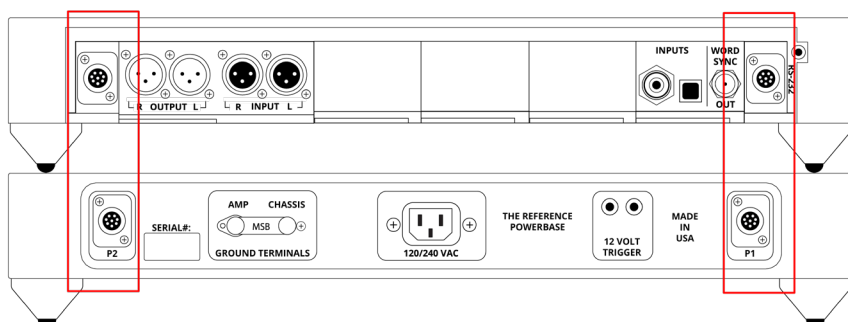
The interface is simple with few user controls. Input source defaults to auto switching. The display will let you know if you have an active input. Make the necessary connections, power on your system and turn the volume knob up until you hear music.

Step 1.

Unbox the units and place the units into their desired locations in your audio system.

Step 2.

When connecting to the Reference Powerbase, you'll have two Hybrid Power cables. Use both cables to connect each of the power connectors located on the Reference Powerbase to both of the power connectors located on the back of the Reference DAC.

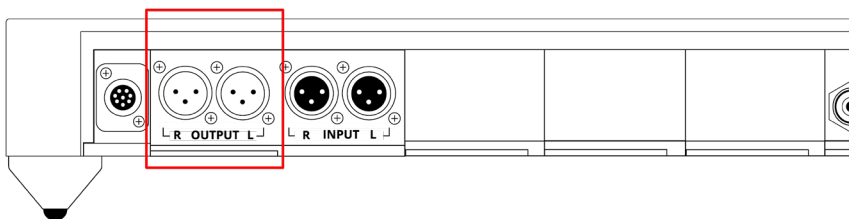


How to Disconnect Hybrid Power Cables

To disconnect a Hybrid Power cable, simply pinch the collar portion of the cable where the arrow symbol is located and pull the collar of the cable directly back from the jackpanel. No twisting or rotating is required to disconnect the cable.

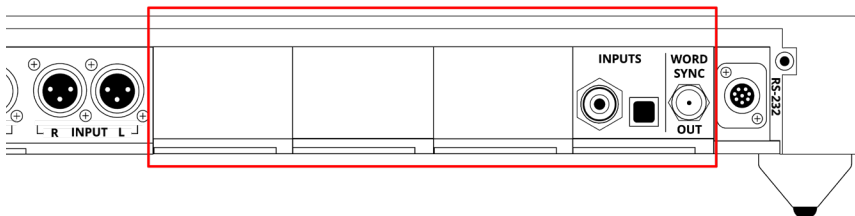
Step 3.

Connect the Analog outputs of your Reference DAC to the power amplifier(s) in your audio system.



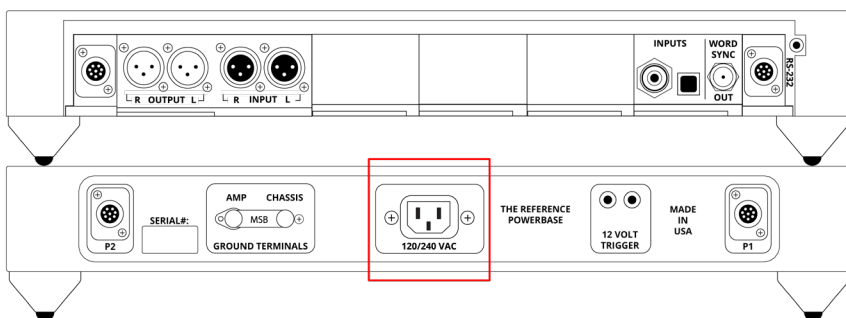
Step 4.

Connect all of your desired digital audio sources to the matching digital inputs on your Reference DAC. The DAC will automatically switch to any active digital input source. The Frequency of the incoming digital source will be displayed on the unit when a source has been switched to.



Step 5.

Connect the Reference Powerbase using the supplied IEC cable. The unit will automatically switch to the required mains voltage.

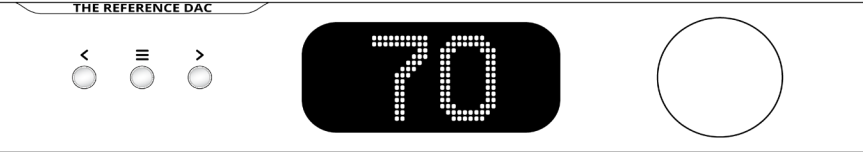


Step 6.

Turn on your DAC using the button on the front of your Reference Powerbase, play a digital audio file, and slowly turn up the volume on your Reference DAC until you can hear music.

DAC User Interface

<div>Menu Button</div> <div>≡</div>	The Menu button is single purpose. It will enter the setup menu at the top of the menu tree. If in the setup menu (it doesn't matter where) this button will exit the setup menu and return to the normal audio listening function.
<div>Arrow Buttons</div> <div>< ></div>	The right and left arrows switch inputs. The 'Auto' mode will be in the list of inputs. The right and left arrows switch inputs. If 'Auto' is selected, the unit will automatically switch inputs based on priority (Input slot B is higher than Input slot A). When a source with a higher priority becomes active, the unit will automatically switch to the new higher priority input. Toggling through the inputs manually will defeat any auto switching. When in the setup menu, the arrows move right and left through the menu structure.
<div>Volume Knob</div>	This knob adjusts the volume between 0 and 106.
<div>Display</div>	The display shows the Input, bit-depth, sample rate, or volume.



Reference Powerbase

The powerbase contains isolation technology. The powerbase detects the input voltage and switches to 120 volt or 240 volt operation. It is also available in a fixed 100 volt configuration. The Reference powerbase has over-voltage protection.

Two fuses are provided:

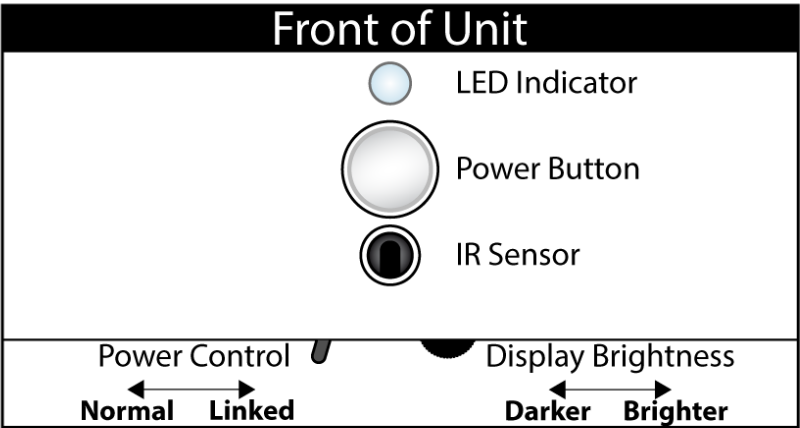
- 5A 250V SLO BLO - 5 mm x 20 mm miniature fuse (This is the main fuse).
- 100mA 250V SLO BLO - 5 mm x 20 mm miniature fuse

(This is for the standby supply only).

Reference Powerbase User Interface

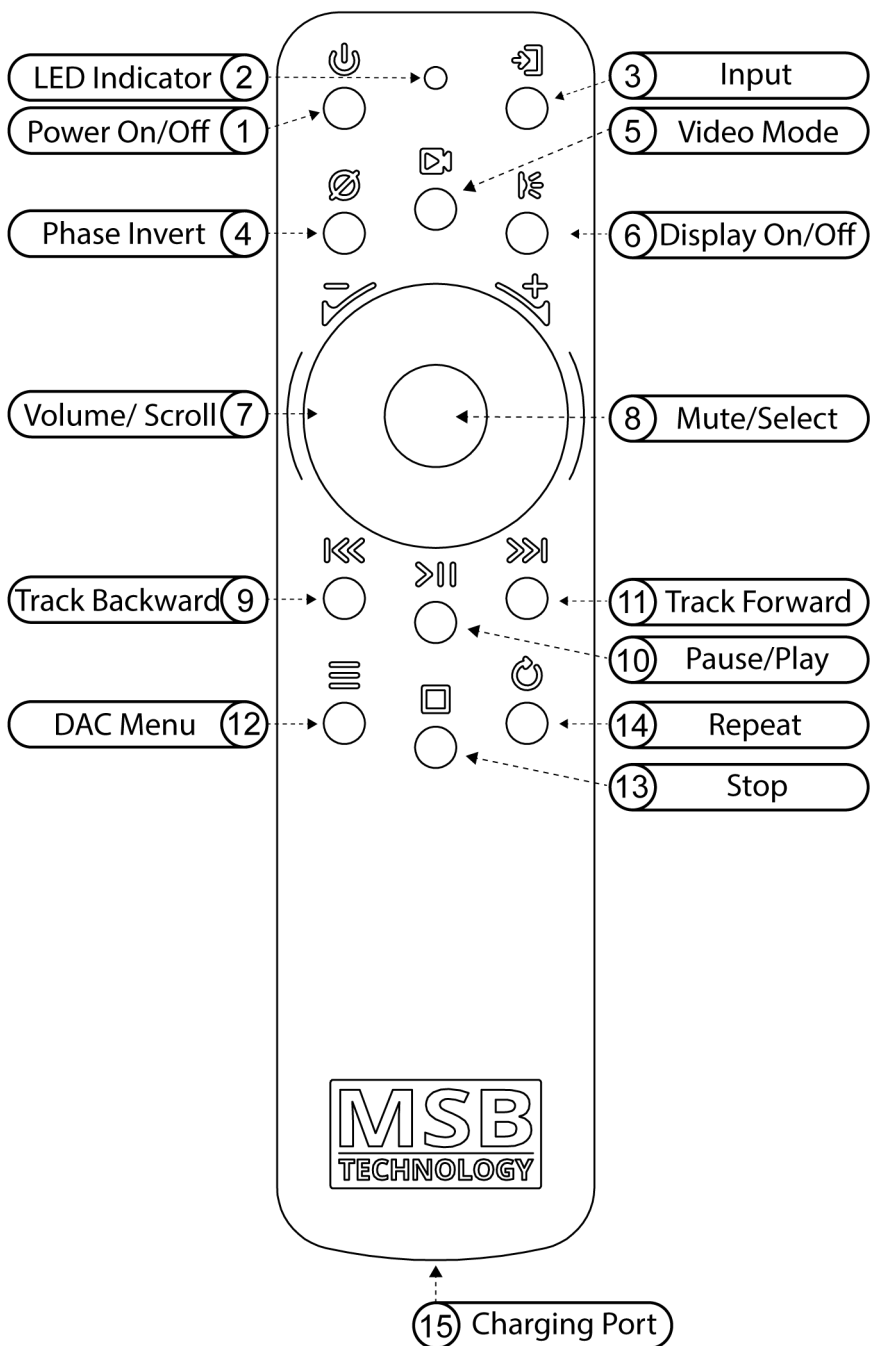
There is one button on the front of the powerbase— as well as two control features just under the front of the powerbase, on the bottom.

LED indications	White - Power On Red - Power off White/Red - Unit is in "Normal" mode but the 12v trigger has turned it off.
Display brightness	This is a rolling wheel to control the brightness for the power indicator light
Power control	Normal - This sets the powerbase as the 12 volt trigger master. Linked - This sets the powerbase as the 12 volt trigger slave. The 'master' powerbase will control this unit.



The MSB Remote

1	Power On/Off	Powerbase on and off. When the powerbase is linked to an amplifier or MSB product, this button will turn off the entire system
2	Indicator LED	While in use: White - Command Sent Red and White - Command Sent and Low Battery Red Flashing - Needs Charging While charging: Red - Charging White - Fully Charged
3	Input	Toggles directly through DAC inputs
4	Phase Invert	Toggles phase invert (I - on display)
5	Video Mode	Toggles video mode (V - on display)
6	Display On/Off	Toggles Display On/Off
7	Volume/Scroll	The center scroll wheel controls DAC volume and scrolls when in the menu.
8	Mute/Select	DAC mute and select when in the menu.
9	Track Backward	Skip backward (Renderer only)
10	Play/Pause	Play and pause (Renderer only)
11	Track Forward	Skip forward (Renderer only)
12	DAC Menu	Enter DAC menu While in menu: Up - Volume Up Down - Volume Down Enter - Mute Return - DAC Menu
13	Stop	Stop media (Renderer only)
14	Track Repeat	Track or playlist repeat (Renderer only)
15	Charging Port	Micro-USB to charge the remote battery



Saving Menu and Startup Settings

When changing settings in the menu, use the enter button in the center of your volume wheel on the remote, or the right arrow on the DAC faceplate to confirm settings in the DAC menu. After you have made your changes in the DAC menu, use the menu button to exit the DAC menu completely to save the changes you have made while in the DAC menu.

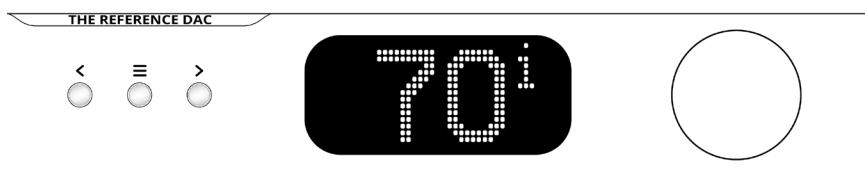
The DAC will not save any of your settings until you exit the menu.

The “Action Buttons” on your remote change certain settings on your DAC without navigating the DAC menu (Phase Invert and Video Mode). However, these settings reset every time the DAC is reset or powered off. If you would like these settings to persist through resets or power offs, you simply have to choose the action button setting that you wish to be default and then enter and exit the DAC menu by double clicking the Menu button on your remote or DAC faceplate.

If at any point the DAC seems to be improperly setup or you want to start fresh with your settings and functions, there is a “Reset” option near the end of the DAC menu. Simply select this and confirm “YES” before closing the DAC menu and restarting the unit.

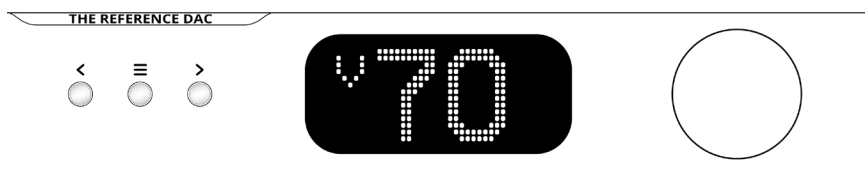
Phase Invert

Phase invert is a button located on the remote to allow the user an easy way to invert the audio phase. This is a situational based feature that is not always needed, but can be used to fix certain recording or system setup requirements.



Video Mode

Video mode is a button located on the remote to reduce signal latency and compensate for lip-sync delays when using your DAC for audio and video simultaneously. It is best to only use this feature when needed because the reduced latency causes reduced jitter rejection.



The Reference DAC Menu

Bright

Display Brightness

1 - 10 (Default 8)

Brightness of display

Disp

Display on/off

On (Default)

Display always on

Off

Display is off, turns on momentarily when information changes

Note: Setting your display to “off” helps reduce the chances of burn-in on your display. This can also be done with a button on the remote.

Screen

Display Format

Big (Default)

Displays large volume characters

Small

Displays small volume characters, bit depth, and sample rate

Switch

Input switching

Manua

Manual switching between active and previously active inputs

Smart (Default)

Manual and auto switching between active inputs

All

Manual and auto switching between all installed inputs

Note: Auto switching only works if you have not manually selected a prior input. To go back to auto again simply switch inputs until the arrow in front of the selection dissappears from the display.

Continued...

Direct
Digital Director
audio filter

Note: Option only shown
when a director is
installed in audio system

Pass
Audio filtering is off.

Filtr (Default)
Audio filtering is on. “+” will appear
on the display.

Note: The Digital Director audio filter must be set to “Passthrough”
when updating DAC firmware.

Reset
Factory Reset

DSD Mode
Display on/off

Optim (Default)
DSD with MSB Optimized algorithm

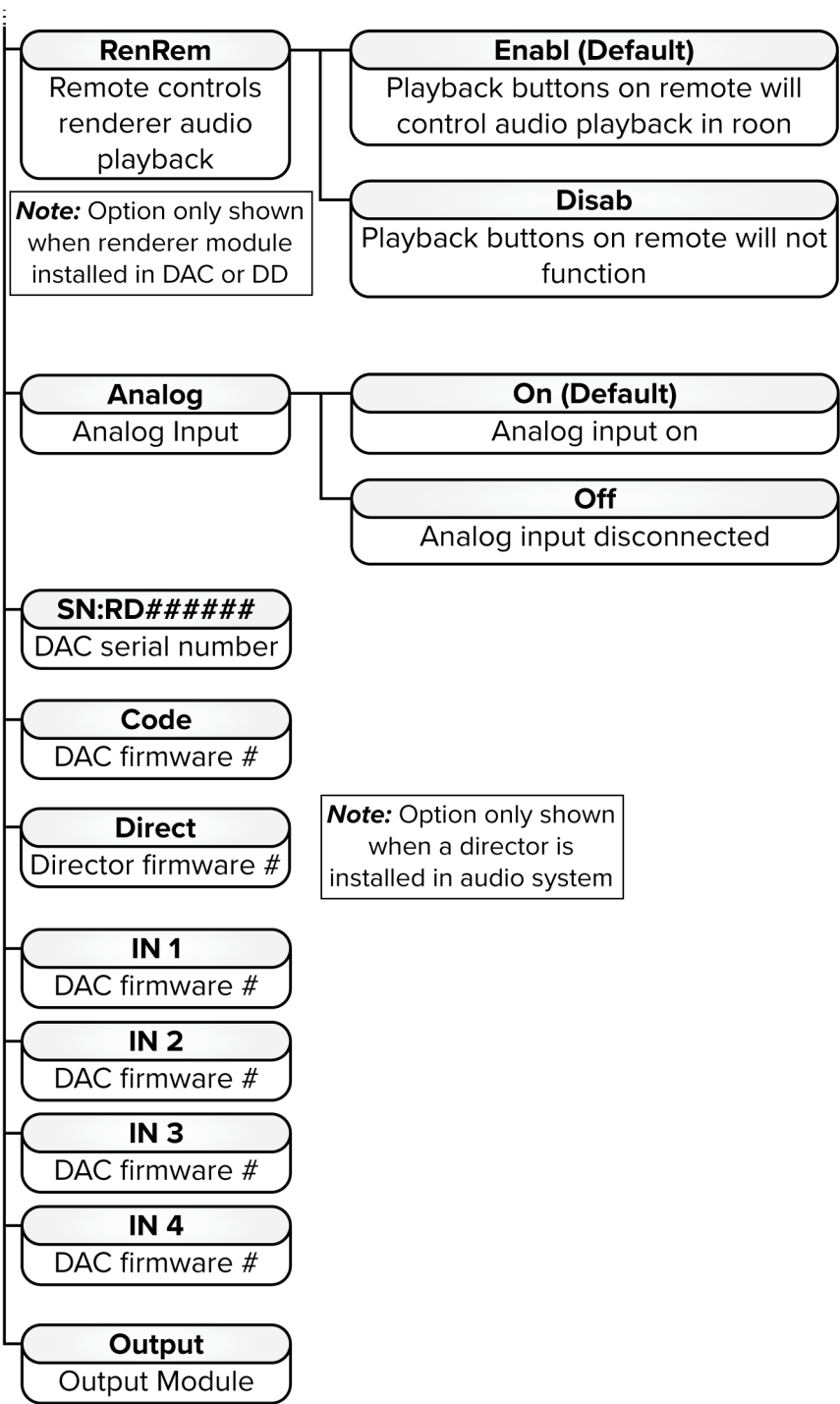
Nativ
Native DSD

Volume
Startup volume

0 - 100 (Default 70)
Set startup volume from 0 - 100 or
disabled

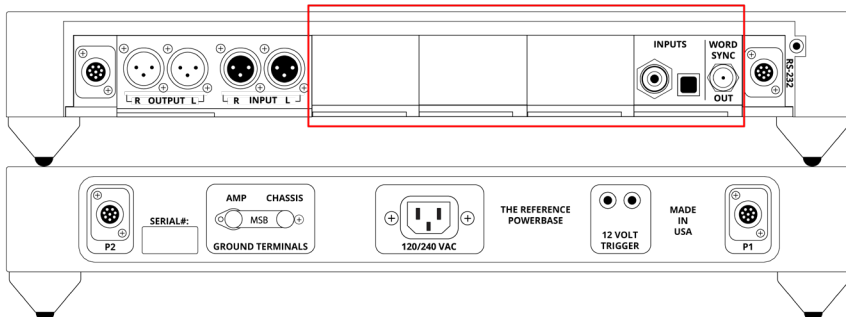
Off
Volume control disabled

Note: If you choose to use the DAC with an external preamp, we
recommend turning the volume control off. To do this, turn the knob
past 100 to “off”. If the volume is set to “off” the display setting above
will also default to off since volume is no longer being used.



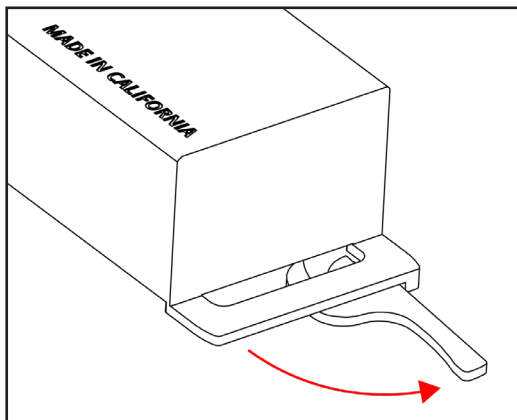
About the Four Input Module Slots

The DAC has four input module slots. They are labeled A through D. Input modules can be placed in any position. Each module is completely self contained. It is recognized by the DAC and identified on the display. When the module is not in use it is disabled.



Removing and Installing Modules

Removal and installation of modules is a tool-free process that is easily performed at the back of the unit. Under the lower lip of each module is a lever arm. Simply pull the lever out and away until it is perpendicular with the back of the unit. Then gently but firmly pull the module lip and lever until the module releases. Slide it out of the unit. Refer to the “Module Handling” portion of your manual.



Module Handling

It is important that you refrain from touching the circuit board or rear connector of any input or output module when removing or installing any input or output module from your DAC. When handling these modules it is important that you only contact the metal case of the module or the front edge of the module where the cam arm is located. **Improper handling of your modules can result in static shock and damage to the module or DAC.**

Available Digital Input Modules

If the standard digital inputs available on the Reference DAC do not fulfill your full digital input requirements, a list of the currently available modules and their intended uses are listed below. A full digital list of these inputs, as well as a comprehensive list of pros and cons for each input format, can be found on our website by scanning the QR code or visiting the URL listed below.



<https://www.msbtechnology.com/dacs/digital-inputs/>

Pro ISL	MSB proprietary interface for use with MSB sources. This module provides one input.
Renderer	A renderer interface for use on a home network or server. (See Renderer manual for operation and setup details)
MQA USB	A single USB interface for playback via a computer based device. This module provides support for MQA decoding. (See USB manual for operation and setup details)
Optical/Coaxial S/PDIF	A Toslink and Coaxial digital input with a word sync output.
XLR S/PDIF	A single XLR digital input with a word sync output.
ProI ² S	MSB proprietary interface for use with MSB transports. This module provides two inputs.

Burn-In

The feedback we receive leads us to recommend at least 100 hours of burn-in on this DAC. Customers generally report improvement up to one month.

Updating Firmware

The following firmware instructions are for updating DAC and Digital Director firmware. If you do not have a Digital Director installed in your system, then ignore any Digital Director instructions. The firmware files are .WAV audio files.

Updating DAC Firmware - Before Digital Director Install

To start, if you have not installed your digital director in your system, first begin by updating the DAC firmware. This is important; your DAC will not recognize the Digital Director and the firmware updates will not work. Your Discrete DAC firmware must be updated to 31.21 or later. Please check your DAC firmware before installing your Digital Director. This can be done by scrolling through your DAC's menu until you see the "Code" or "DAC Software" screen where the currently installed revision number will be displayed.

Begin by downloading both the Digital Director Firmware and the DAC firmware. Add these files to your bit perfect playback software. Please note, these must be played by a bit perfect source. If the update fails, it is not being played bit perfect. These updates include two upgrades within the same file. The file is several minutes long. Please do not interrupt the process and let the file finish to the end. When you play the file, you will hear instructions and two upgrade tones. Following each tone, you will either hear silence for about 30 seconds (this varies) or you will hear the message 'upgrade failed'. If all the upgrades fail, it is because you did not play the file bit-perfect. You may have computer upsampling on or digital volume control somewhere in your playback system. The screen on the DAC will confirm when the upgrade is happening. Contact MSB if you need help.

After the DAC firmware is updated, you can now install your Digital Director. Please see our other video on Digital Director Setup for more specific instructions.

Updating Firmware with a Digital Director

For any updates after the initial setup, you will need to follow this order for updating.

Power on the DAC and the director. Always begin by updating the DAC firmware first. The Firmware file will not be able to update the DAC while Digital Director processing is on. Enter the menu, scroll to the "Director" screen, then select "passthrough mode" for the Digital Director. This will allow the firmware update to reach the DAC bit perfect.

Updating Firmware with a Digital Director (cont.)

Now, play the DAC firmware update. After the DAC firmware is installed and complete, you can now play the Digital Director firmware. Finally, go back into the menu and enable the Digital Director filtering again.

After the firmware updates are complete, you can check for a successful connection between the Digital Director and DAC indicated by a small “+” sign on the display. If you do not see this “+” sign, the Digital Director is not performing the improved digital filtering. Please check the menu to see if the filtering is enabled. If it is, please check and confirm the currently installed firmware numbers reflect the new update files.

If you see an error message with “Err” it means there is an issue with the quality of the ProISL connection or toslink control cable. Check your cables and replace them if need be.

If you need further clarification or are encountering issues with your update, please reach out to our technical support team.



<https://msbtechnology.com/dacs/reference-support/>

Bit-Perfect Source Testing

Files can be downloaded from the MSB website to verify bit-perfect playback on any transport. They are .WAV music test files that when played, will be identified by the DAC and checked, and will be reported on the display if they are bit-perfect. If there is a problem with the test, it will play but the display will not indicate any change. Be sure upsampling is turned off in any transport, as this prevents a file from remaining bit-perfect. This system will allow you to easily test your source, especially computer sources, to see if all your settings are correct. There are files at all sample rates for both 16 bit and 24 bit operation.



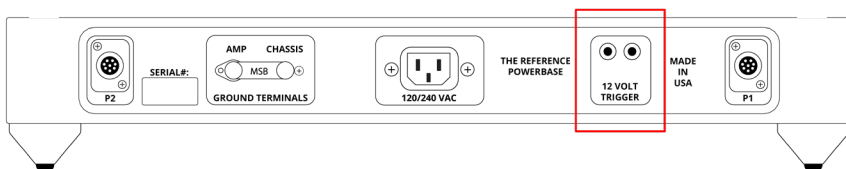
<https://www.msbtechnology.com/support/bit-perfect-testing/>

Reference Powerbase - Advanced Setup

The Reference Powerbase comes with a few features that are not required for basic operation. These features are mainly used for altering your system setup and slight ease-of-use improvements. The 12-volt trigger is a network of 3.5mm mini-jack connections that can make your Reference Powerbase power button turn on/off your MSB amplifier(s) using the power button located on the faceplate or the power button on your remote to create a single power control for your entire MSB system. The second feature on the Reference Powerbase is a ground shield network that can offer a slight increase in sonic performance by connecting all of your MSB products in a chain and lifting the chassis ground connections.

Powerbase - 12 Volt Remote Trigger

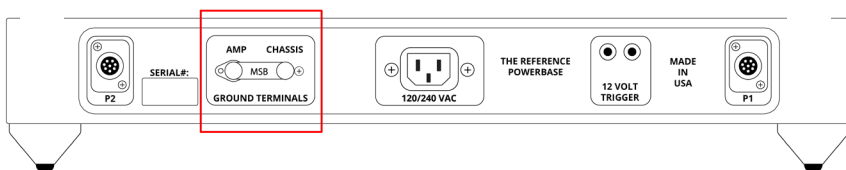
The Reference powerbase is equipped with a remote trigger for use with other MSB products. The trigger uses a 3 pin mini jack. When any MSB product is turned off, the other products connected will also turn off and vice-versa. This trigger can also be used with other products. Products may use this trigger differently, so you may need an MSB 12Volt trigger adapter.



Shielding Ground - Basic Operation

The Basic Operation provides isolation only for the DAC. This gets you half the shielding available. For full shielding, be sure the jumper is in place between the Chassis Ground and Amplifier Ground. This is the shipping configuration.

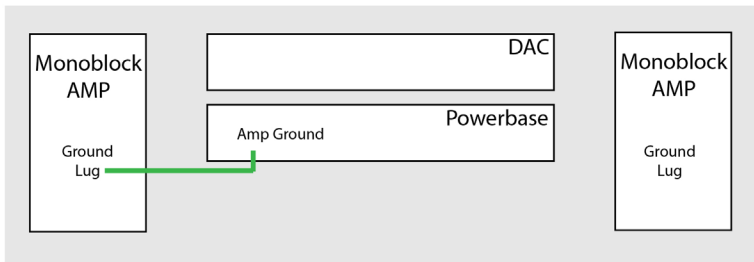
NEVER OPERATE WITHOUT THE JUMPER OR A GROUND WIRE ATTACHED.



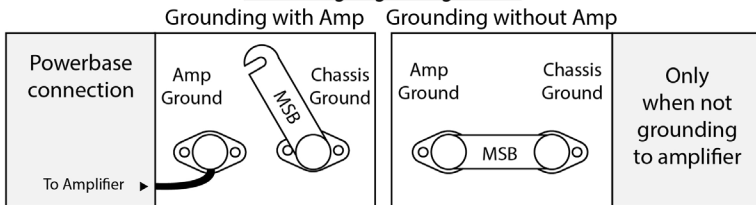
Shielding Ground - Enhanced Operation

The Enhanced Operation provides isolation for both the DAC and the amplifier. This gets you the full isolation available. With the jumper disconnected, connect the supplied ground wire from the AMPLIFIER GROUND lug to the chassis of the amplifier. Note this connection is dependent on the amplifier, so you will have to look for the best place to attach the wire. Generally, the easiest place would be to loosen a screw on the Amplifier Chassis and slip the open Spade lug under the screw head and tighten the screw. The only other place a true ground may be found is on the ground pin of the power connector to the AMP, but this will not be easy to connect to.

Enhanced Shielding Ground Operation - Diagram



Grounding Lug Configuration



Powerbase Connection

Attach the ground wire to the "Amp ground" lug of the powerbase. Lift the jumper between "Amp Ground" and "Chassis Ground" as shown above.

Amp Connection

Attach the ground wire to the Ground Lug on the jack panel of the MSB amp. If there is no ground lug, attach wire to a chassis screw.

Never connect the ground wire to the negative speaker terminal

Reference DAC Specifications

Supported Formats (Input dependent)	44.1kHz to 3,072kHz PCM up to 32 bits 1xDSD, 2xDSD, 4xDSD, 8xDSD Supports DSD via DoP on all inputs
Digital Inputs	4x Advanced isolated input module slots
XLR Analog Inputs	100K Ohm Balanced 12Vrms Maximum Isolated when not selected
XLR Analog Outputs	3.57Vrms Maximum (Digital Input) 12Vrms Maximum (Analog Input) 150 Ohm Balanced Galvanically isolated
Volume Control	Purely passive constant impedance analog attenuation 1dB steps
Display	Custom discrete LED audio clocksynchronous Adjustable brightness and auto-off feature
Controls	Isolated RS-232 IR Remote Knob + 3 Buttons
Chassis Dimensions	Width: 17.5 in (444 mm) Depth: 17.5 in (444 mm) Height without feet: 2.2 in (56 mm) Stack height: 2.85 in (72 mm) Weight: 25 lbs (12 kg) Product Feet: M6x1 Thread
Shipping Dimensions	Width: 23 in (585 mm) Depth: 23 in (585 mm) Height: 7 in (178 mm) Weight: 36 lbs (17 kg)
Included Accessories	User Manual MSB Remote Micro USB Charging Cable
Warranty	3 Years

Reference Powerbase Specifications

AC Voltage	120/240V (Auto switching) Optional 100V fixed configuration
Power Consumption	90 Watts with fully configured Reference DAC Less than 2W standby
Chassis Dimensions	Width: 17.5 in (444 mm) Depth: 17.5 in (444 mm) Height without feet: 2.2 in (56 mm) Stack height: 2.85 in (72 mm) Weight: 45 lbs (20 kg)
Shipping Dimensions	Width: 23 in (585 mm) Depth: 23 in (585 mm) Height: 7 in (178 mm) Weight: 47 lbs (22 kg)
Included Accessories	2X Power Cables Ground Cable IEC Power Cord
Warranty	3 Years

Technical Support

If you are experiencing any issues with your MSB product, please contact your nearest dealer or try our support page at www.msbtechnology.com/support. Please be sure you have the most current edition of your products' firmware installed. If your issue persists, please feel free to contact MSB directly. Emails are usually responded to in 1-2 business days. **Email:** hello@msbtechnology.com

MSB Return Procedure (RMA)

If a customer, dealer, or distributor has a problem with an MSB product, they should email tech support before sending anything back to the factory. MSB will do their best to respond within 1-2 business days. Should it be clear that a product must be returned, tech support should be informed and all the following relevant information should be provided:

1	Product in question
2	Serial number
3	Exact configuration when symptom is observed along with a list with the input used, source material, system connections, and amplifier
4	Customer name
5	Customer shipping address
6	Customer phone number and email
7	Special return shipping instructions

MSB will issue an RMA number and create an invoice with all details outlined, except the final price as the product has not yet been seen. This invoice will be emailed so all the above information can be checked and verified by the customer.

The product should be returned with the RMA number present on the box. Work can then begin immediately and the product can be sent back quickly.

Any repair that is difficult and cannot be completed in two weeks will be identified and the customer will be informed when it is to be expected. Otherwise the majority of repairs should be shipped back within two weeks if all the required information is present on the invoice.

Link to page:

<https://msbtechnology.com/support/repairs/>

The Reference DAC Limited Warranty

Warranty includes:

- MSB warranty covers the unit against defects in materials and workmanship for a period of **3 years** from the date the unit was originally shipped from MSB.
- This warranty covers parts and labor only; it does not cover shipping charges or tax/duty. During the Warranty period, there will normally be no charge for parts or labor.
- During the warranty period, MSB will repair or, at our discretion, replace a faulty product.
- Warranty repairs must be carried out by MSB or our authorized dealer. Please contact your dealer if your unit requires service.

Warranty excludes:

- The Warranty does not cover standard wear and tear.
- The product is misused in any way.
- Any unauthorized modifications or repairs were performed.
- The product is not used in accordance with the Operating Conditions stated below.
- The product is serviced or repaired by someone other than MSB or an authorized dealer.
- The product is operated without a mains earth (or ground) connection.
- The unit is returned inadequately packed.
- MSB reserves the right to apply a service charge if the product returned for warranty repair is found to be operating correctly, or if the product is returned without a returns number (RMA) being issued.

Operating Conditions:

- Ambient temperature range: 32F to 90F, non-condensing.
- The supply voltage must remain within the AC voltage specified on the power base.
- Do not install the unit near heat sources such as radiators, air ducts, power amplifiers or in direct strong sunlight. This may cause the product to overheat.