



GRACE
DESIGN



**m900 Headphone Amp / DAC / Preamp
Owner's Manual Revision B
04/27/2018**

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1 Welcome

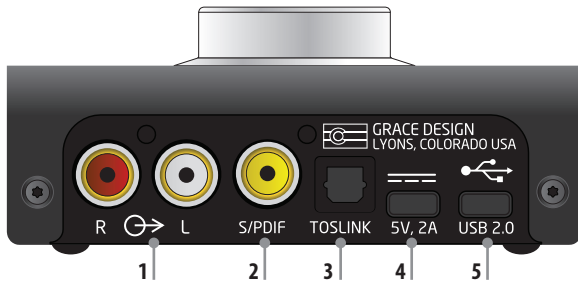
The m900 represents a new level of performance for compact, personal audio playback devices. With zero Ohm output impedance headphone outputs and a remarkable USB power supply design, the m900 delivers incredible playback performance with compact, stylish ergonomics.

Setup and operation is of the m900 simple. While mostly plug and play, there are a few operational concepts that are helpful to understand. We encourage you to read this manual thoroughly to familiarize yourself with the unit so you can use and enjoy it to its fullest extent.

If you have any questions, please visit our website for more information: www.gracedesign.com, or feel free to call us directly at 1.303.823.8100. We'd love to hear from you!

2 Connections and Controls

2.1 REAR PANEL



1 - Line Outputs

Unbalanced, level controlled line outputs via a pair of gold plated RCA phono jacks. These outputs are designed to connect to a power amp, powered speakers, preamps, or headphone amps. When headphones are connected to the right hand front panel jack, the line output signal is muted.

2 - S/PDIF Input

Accepts up to 192kHz, 24 bit PCM digital audio signal. Automatic de-emphasis equalization. The m900 setup menu contains an input select option that toggles between the USB, S/PDIF or TOSLINK input. See the Setup Menu section in this manual for more setup information.

3 - TOSLINK Optical Input

Accepts up to 96kHz, 24 bit PCM digital audio signal. Automatic de-emphasis equalization. The m900 setup menu contains an input select option that toggles between the USB, S/PDIF or TOSLINK input. See the Setup Menu section in this manual for more setup information.

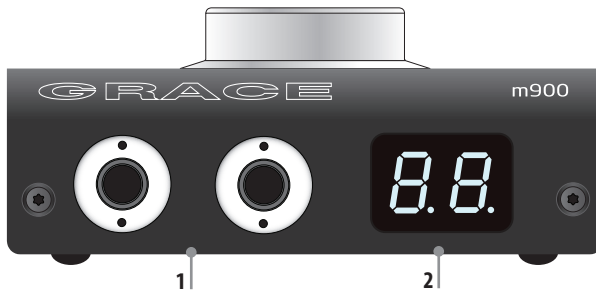
4 - USB Connector #2 - High Power Input

Use this power connection to operate the m900 in High Power mode. This connector carries only DC power and no USB data. Once the included low noise 2A USB power supply is plugged into this input, the m900 will enter High Power mode (indicated by "HP" on the 7-segment display).

5 - USB Connector #1 - Data / Signal / Bus Power Input

Asynchronous USB 2 interface for bit perfect, zero interface induced jitter DAC operation. Accommodates 44.1kHz to 384kHz PCM and 64X - 256X DSD. Driverless operation with MAC OS. USB Class 2 operation with Windows up to 384kHz with [free driver download](#) from Grace Design. When nothing is connected to the USB connector #2, the m900 is bus powered through this interface and operates in Low Power mode.

2.2 FRONT PANEL



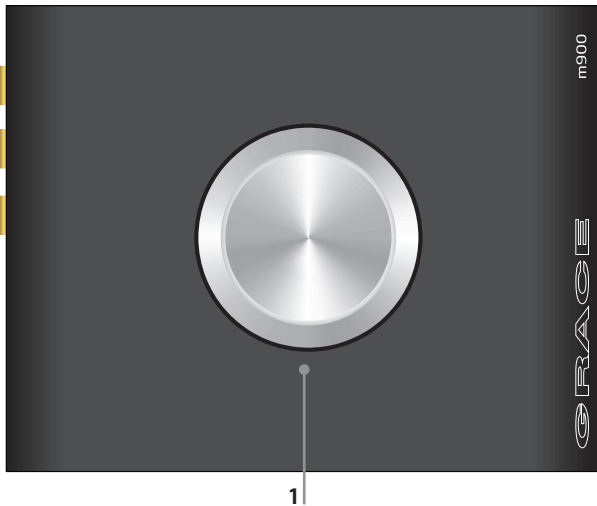
1 - Headphone Outputs

Parallel headphone outputs wired to high quality TRS jacks. When headphones are connected to the right hand jack, the line output signal is muted.

2 - 7 Segment LED

Displays level setting from 0 - 99. This display is also used for navigating the m900 setup menu. The volume control step size is 0.5dB. The right hand decimal point comes on to indicate the 0.5dB value. For instance, "65." indicates a volume setting of 65.5dB.

2.3 TOP PANEL



1 - Volume Control

The top mounted rotary encoder provides precise, stepped level control. Its push-button feature is used to mute all signals (single push and release) or access the setup menu (push and hold).

3 Operation

Unpacking Your m900

The m900 arrives in simple but protective Korrvu™ packaging. We recommend that you save this box in the event you wish to store or ship your unit in the future. The box will contain the m900, printed owner's manual, a 2A USB wall power supply and 2 USB type B mini cables – one 6' and one 10'. If you are missing any of these items, please contact us at 1.303.823.8100.

Setting Up Your m900

The m900 is designed to sit on your desktop or atop your audio center. Its small, low profile stature easily fits on any desk or media center furniture. Put your unit wherever you like, as long as it's within reach. The top mounted volume control will sit comfortably under your hand whenever you need to control your system volume, quickly mute or change settings.

Headphone jacks are on the front and inputs and line outs are on the back, so your cabling can remain clean and simple.

Powering Up Your m900

There is no power switch. Power is automatically applied when either of the USB jacks are connected. If you wish to power off the m900, simply disconnect the USB connection.

The m900 can be powered from the your computer's USB Bus in Low Power mode via the #1 USB connector. In this mode the internal supplies operate at lower voltage to conserve power. This is useful if you are traveling and do not have access to AC wall outlet.

If you connect the included 2A USB power supply to the #2 USB connector, the m900 switches into High Power mode. The #1 USB port will maintain an active connection to your computer, but no power will be drawn from the computer port. If running in High Power mode and the power supply is disconnected, the m900 will reboot.

The following is a summary of all of the powering and signal input configurations:

- 1. LOW POWER, USB INPUT** One USB cable from the computer to the m900 #1 USB input. m900 receives power and audio from the computer.
- 2. HIGH POWER, USB INPUT** One USB cable from the computer to the m900 #1 USB input and one USB cable from the external 2A DC power supply to the m900 #2 high power DC input connector. The m900 receives audio from the computer and receives power from the external DC supply.
- 3. LOW POWER, S/PDIF OR TOSLINK INPUT** One USB cable from a standard USB power source (computer or 0.5A USB power supply) connected to the m900 #1 USB input. TOSLINK or S/PDIF input source connected. (This would be an unusual setup where you don't have access to a high power DC power supply.)
- 4. HIGH POWER, S/PDIF OR TOSLINK INPUT** One USB cable from the 2A DC power supply to the m900 #2 high power DC input connector. TOSLINK or S/PDIF input source connected. m900 receives audio from TOSLINK or S/PDIF and power from the external DC supply.
- 5. SELF POWERED MODE** This mode is for connecting your mobile device (iOS, android) to the m900. Mobile devices generally cannot provide any power. In this mode the m900 will report that it is self powered. To enter self powered mode, first connect the USB cable from the external 2A DC power supply to the m900 #2 high power DC input connector, then connect your device to the m900 #1 USB input. For iOS, you will need the 'Apple Lightning to USB Camera Adapter', for supported Android devices you will need an 'On The Go' USB cable.

Connecting Headphones

There are 2 ¼" headphone output jacks on the front, which are wired in parallel. The second jack on the right is a switched type. If you have the line outputs connected to a power amp or powered monitors, connecting headphones to this jack will automatically mute the line outputs, allowing you to effectively 'toggle' between the headphone and speaker outputs.

IMPORTANT NOTE: The m900 has very low output impedance, measuring around 0.08 Ohms. Ohm's law states that as the load impedance approaches 0 Ohms, even a small voltage will result in high current flow. When a headphone plug is inserted in to the headphone jack of any headphone amplifier, there is a brief moment when the output of the amplifier gets shorted to ground. If there is music playing when this happens, there will be high current flow which will likely cause the supply current to the m900 to rapidly rise above the maximum current which a computer or external USB power supply can deliver.

If an over-current condition occurs, the m900's processor will detect it, immediately mute the audio and turn off the internal audio power supplies. This will protect the m900 from damage and prevent it from drawing excess current from your computer or power supply. When this happens the LED display will indicate OC (Over Current) momentarily. Once the over-current condition is removed, the m900 audio power supplies will be turned back on and music will resume.

While this does not hurt the m900, it is good practice nonetheless to mute the audio (push down once on the volume knob) or pause your playback source while plugging or unplugging headphones.

Line Output Operation

The RCA phono line output jacks are provided to connect the m900 to an amplifier, powered speaker system, or preamplifier. Use RCA interconnects to connect from the m900 to the unbalanced line inputs of your external device. These outputs follow the volume / mute control. A volume level of 90 is "unity gain" and will allow the m900 to produce a 2V output signal for a 0dBFS digital input signal.

The signal feeding the rear panel line out jacks is "normalised" through the right hand headphone jack. This is so that if you have speakers connected to the line outputs, they will mute when you plug headphones into the right hand jack. If you want to hear speakers and headphones at the same time, simply use the left hand jack. *Note that the crossfeed circuit feeds these connectors, so when listening to loudspeakers you may want to turn crossfeed off.*

Volume and Mute Control

A high quality, light action stepped rotary encoder is used for volume and mute functions. Turn the knob clockwise to increase volume, counterclockwise to decrease the volume. A single push and release will mute all outputs. When the unit is muted, the 7 segment LED will dim and pulsate to indicate mute is active. Another single push and release deactivates mute. The m900 attenuator is a hybrid design. Most of the volume control duties are handled in the digital domain with 32 bit processing but there are two analog gain ranges as well. This allows a full 99dB of volume control range, preserves a very low noise floor for IEMs, and allows high peak output voltage for low efficiency planar magnetic phones.

Crossfeed Circuitry

A completely analog crossfeed circuit electronically simulates the signal crossfeed that occurs in a natural acoustic space. The crossfeed function can be switched on or off from the Setup Menu.

How does crossfeed work? When listening to loudspeakers in a room, your left ear hears sound primarily from the left speaker (and vice versa) but also receives a signal from the right speaker at a lower level and with some time delay compared to the right ear. As well, the right speaker sound that reaches the left ear does not have a flat frequency response as the sound waves have traveled around the shape of your head before reaching your left ear. The brain uses delay, level and frequency response characteristics to process the location of a sound and hence, create an aural image.

However, when listening through headphones, each ear only hears the sound from one transducer and the mixing of signals between the ears does not exist. In this situation the brain is left without many of the psycho acoustic clues required to generate a properly distributed image and an accurate sound stage. The result is that instruments seem to cluster in the far left, far right or center of your head. Since the vital clues are absent, the brain has a difficult time deciding how to process the sounds coming from the headphone, which can result in listening fatigue when listening for extended periods of time. The m900 contains crossfeed circuitry which electronically simulates the signal crossfeed that occurs in a real acoustic space and helps the brain establish instrument locations across the entire sound stage. While it is difficult to perfectly model the very complex level, delay and frequency response characteristics of the head, the crossfeed circuitry in the m900 gives the brain some of the basic clues it needs and the result is a very pleasing simulation of an acoustic space while maintaining the tonality and balance of the original source.

Computer Configuration

The m900 computer audio connection is an asynchronous USB interface. With asynchronous mode USB operation, the m900 USB DAC becomes the clock master to which the computer's USB bus is synced. The computer is synced to a crystal-based audio clock signal and the system works with dramatically lower jitter. No phase-lock loop or sample rate conversion is necessary, which means bit-perfect playback from a computer with effectively zero interface induced jitter.

Regardless of the type of computer you will use to playback audio, it must have at least one available USB 2 (or 3) port. The m900 ships with 2 standard USB type A to USB type B micro cables, one 6' and one 10'. The type A connector plugs into the computer and the type B micro connector to the #1 USB m900 input.

The m900 can operate as a USB Audio Class 1 or Audio Class 2 device. In USB 1 mode the m900 supports driverless operation on Mac OS and Windows at sample rates up to 96kHz. In Audio Class 2 mode the m900 supports driverless operation on Mac OS at sample rates up to 384kHz. On Windows, Audio Class 2 operation requires downloading and installing a free driver, which can be found on our website – <http://www.gracedesign.com/support/support.htm>.

Driverless operation on Mac OS basically means 'plug and play'. The m900 will automatically show up in your computer's list of supported audio devices as 'm900'. In most cases, simply choose that as your audio playback device.

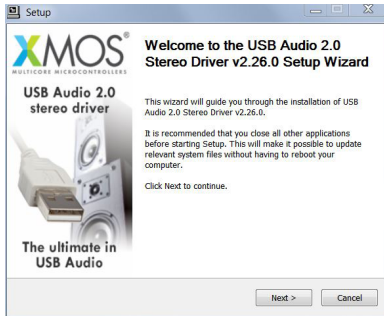
Different operating systems and audio players will pose their own set of configurations in setting up the m900 as the audio playback device. We will direct you to a very well written and comprehensive document by our friend and colleague Charles Hansen from Ayre Acoustics. <http://www.ayre.com/usb.htm>. This is an invaluable resource for computer/USB audio setup information for most current operating systems, and we strongly urge you to familiarize yourself with the information pertaining to your specific OS.

In the event that you have any setup issues which aren't addressed by these resources, feel from to contact us directly at 303.823.8100 M - Friday 9 – 5 MST, or you can email our service department - service@gracedesign.com.

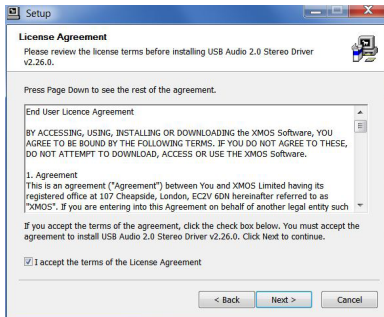
Installing the Windows USB driver

To download the Windows driver, visit our support page- <http://www.gracedesign.com/support/support.htm>. Under m900, locate and save the driver file titled 'XMOS Stereo USB Audio Class2 Driver'.

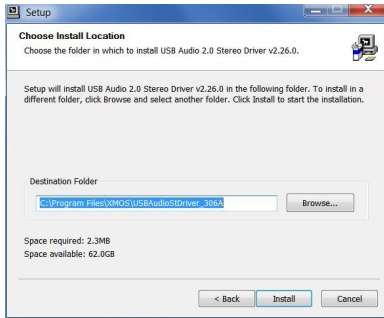
Begin with your m900 disconnected from your computer. Double click on the driver file to run and follow the instructions in the installation dialog:



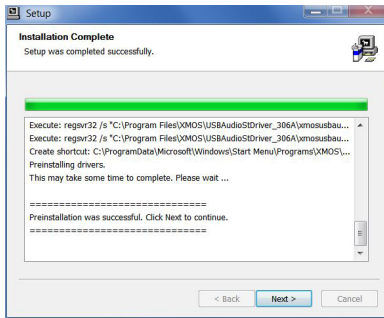
1. Open install dialog.



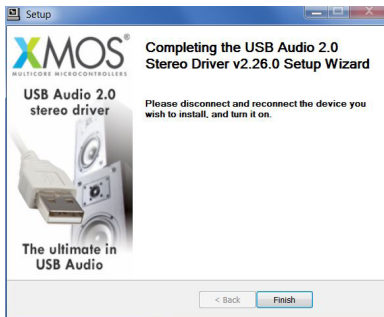
2. Accept terms and click next.



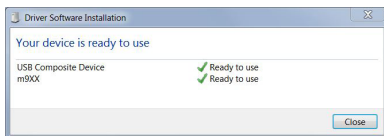
3. Choose default location and install.



4. Installation Complete.

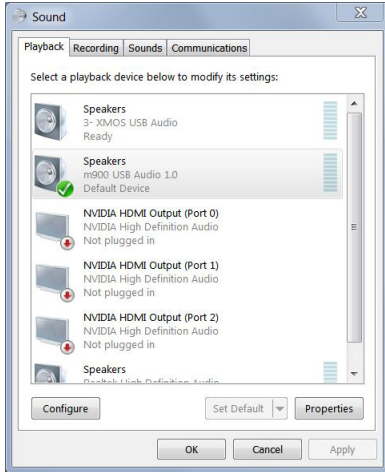


5. Connect your m900.

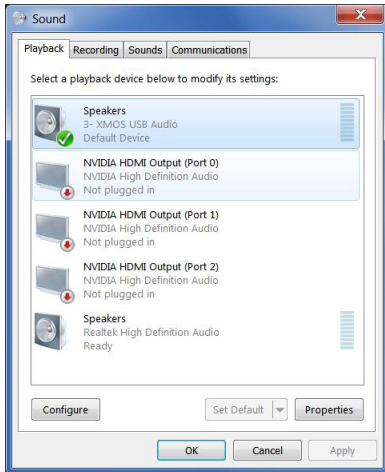


6. You're ready to go!

Once you have successfully installed your driver, you will have the option to operate your m900 in USB 1 mode or USB 2 mode, which are selected in the m900 setup menu (see 'using the setup' menu below). These modes will show up in the OS playback settings differently:



In USB 1 mode, the m900 will show up in the OS playback device dialog as 'm900'.



In USB 2 mode, the m900 will show up in the OS playback device dialog as 'XMOS USB Audio'.

4 Using the Setup Menu

Navigating the Setup Menu

The m900 provides several setup and calibration options, which are adjusted in the setup menu. The setup menu is accessed by the top panel volume encoder. To enter the setup menu, simply push and hold the volume encoder for 2 seconds. The 7 segment LED screen will change from the current level readout to the current setup menu item. From here you either turn the encoder to scroll through the setup menu, or push and release the encoder to adjust the current setup menu item. Rotate to select other menu items, or push and hold the encoder for 2 seconds to store your settings and exit the setup menu.

Setup Menu Items

CROSSFEED Activates crossfeed on the headphone outputs. In the Setup Menu, push and release the encoder to activate / deactivate crossfeed. The decimal points on indicate that crossfeed is active.

 = Crossfeed OFF


 = Crossfeed ON


MONO MODE Sums the left and right signals. Push and release the encoder to activate / deactivate MONO mode. The decimal points on indicate that MONO mode is active.

 = Mono mode OFF

 = Mono mode ON

LEFT MINUS RIGHT Subtracts the right from the left channel and plays the difference in both channels.


 = Left minus right OFF

 = Left minus right ON

MONITORING MODE Allows you select between 6 different monitoring modes.

 = Normal stereo

 = Swapped left and right channels

 = Left to both channels

rr = Right to both channels

L- = Left channel only

-r = Right channel only

INPUT SOURCE SELECT Toggles between the 3 available audio inputs - USB, TOSLINK or S/PDIF. In the Setup Menu, push and release the encoder to select input source.

U = USB input

to = TOSLINK input

SP = S/PDIF input

DISPLAY DIMMER MODE Turns off the 7 segment display after 5 seconds of inactivity. Turning or pushing encoder re-illuminates the display. Push and release the encoder to toggle the setting.

dd = Decimal points ON indicate that display dimmer mode is active.

dd = Decimal points OFF indicate that display dimmer mode is not active.

POWER UP LEVEL Enters current level setting as the default power up level. Set to 0 as factory default. Push and release the encoder to activate.

PL = Decimal points ON indicate that current level is stored as the power up level.

PL = Decimal points OFF indicate that current level does not match the power up level.

BALANCE AJDUST Adjusts the balance between the left and right channels.

rr = No balance adjustment

6r = balance fully left (6dB)

r6 = balance fully right (6dB)

DAC FILTER Changes the response of the digital filter. Push and release the encoder to scroll through the filter response modes:

F1 = sharp roll off, linear phase

For linear phase response and time coherency. Fast roll off protects against aliasing distortion from high amplitude high frequency content. Best for recordings that are loud, com-

pressed, and with lots of treble. Will contain substantial ringing before and after transients (pre-echo and post-echo). Note that the ringing occurs at the Nyquist frequency ($\frac{1}{2}$ of the sample rate), so it is not directly audible. However, it can cause intermodulation distortion in downstream components.

F2 = slow roll off, linear phase

For linear phase response and time coherency. Best for acoustic music without compression and artificially high levels of treble. Will have very low levels of ringing before and after transients but is susceptible to distortion artifacts caused by high amplitude high frequency information in the program material.

F3 = sharp roll off, minimum phase

Not linear phase in the pass band. Fast roll off protects against aliasing distortion from high amplitude high frequency content. Best for recordings that are loud, compressed, and with lots of treble. Will contain substantial ringing caused by transients, but all of the ringing is shifted to after the transient. This can reduce the perceived effects of downstream intermodulation distortion due to the Hass Effect.

F4 = slow roll off, minimum phase

Not linear phase in the pass band. Best for acoustic music without compression and artificially high levels of treble. Will have very low level of ringing caused by transients and ringing will be shifted to after the transient.

USB MODE Changes the USB operation mode from Audio Class 1 to Audio Class 2. Unit will power cycle when setting is changed.

U1 = USB Audio Class 1 mode

U2 = USB Audio Class 2 mode

SAMPLE RATE DISPLAY Displays the incoming audio stream sample rate. 'FS' will be displayed for briefly and change to indicate the incoming sample rate.

44 = 44.1 kHz

48 = 48 kHz

88 = 88.2 kHz

96 = 96 kHz

Because the m900's display is only 2 characters, the higher sample rates are abbreviated as the following:

17 = (176kHz)

19 = (192kHz)

35 = (354kHz)

38 = (384kHz)

DSD rates are shown as:

d1 = (DSD64)

d2 = (DSD128)

d4 = (DSD256)

5 Specifications

THD+N 1kHz, 22Hz-22kHz BW		
@1.0V out, no load		<0.002%
@1.0V out, 32 Ohm load		<0.010%
Intermodulation Distortion SMTPE/DIN 4:1 50Hz, 7kHz		
@1.0V out, no load		<0.008%
@1.0V out, 32 Ohm load		<0.009%
Frequency Response +/-3dB		
Fs=96kHz		0.5-45.9kHz
Dynamic Range		
20-22kHz bandwidth		112dB
20-22kHz bandwidth and A weighting filter		115dB
Output Noise		
20-22kHz, volume=0-90		-106dBV
A weighting filter, volume = 0-90		-109dBV
20-22kHz, volume=90.5-99.5		-96dBV
A weighting filter, volume = 90.5-99.5		-98dBV
Crosstalk		
100Hz		<107dB
1kHz		<98dB
20kHz		<72dB
Attenuation Range		
0 to -99dB, 0.5dB steps		
Channel Tracking Accuracy		
+/-0.05dB		
Maximum Output Level, No load		
Low Power Mode		+14.1dBV (5.1V)
High Power Mode		+15.5dBV (6.0V)
Impedances		
Headphone Output		0.08 Ohms
Line Output		47.5 Ohms
Input Lock Range		
S/PDIF	Sample Rate	Lock Range
	44.1kHz	43870-45420Hz
	48kHz	46590-49220Hz
	88.2kHz	87760-90830Hz
	96kHz	93520-98430Hz
	176.4kHz	175700-181640Hz
	192kHz	187050-196380Hz
TOSLINK	44.1kHz	43900-45410Hz
	48kHz	46590-49190Hz
	88.2kHz	87840-90830Hz
	96kHz	93520-97530Hz
USB supported sample rates	44.1, 48, 88.2, 96, 176.4, 192, 352.8, 384kHz	
Power Consumption		
Max, High Power mode		8.0W
Max, Low Power mode		2.5W
Dimensions		
4" x 5.25" x 1.8"		
Headphone Output Power / Low Power Mode		Output Power mW
Load Resistance Ohms	1 Channel Driven	2 Channels driven
4	80	22
8	140	45
16	310	90
20	350	100
32	600	175
50	560	280
300	83	83
600	40	40
Headphone Output Power / High Power Mode		Output Power mW
Load Resistance Ohms	1 Channel Driven	2 Channels driven
4	925	240
8	1800	490
16	1900	940
20	1575	1030
32	1020	950
50	680	650
300	115	115
600	57	57

6 Cleaning and Maintenance

Your m900 chassis is constructed out of high quality anodized aluminum and steel. Under normal circumstances, very little maintenance is required to keep it looking good. However, if you find it getting more dirty or dusty than you like, here are some

cleaning tips: We recommend using a little shot of Windex™, applied to a clean, dry, lint free cloth. Gently wipe all surfaces, taking care not to allow the cleaning product to build up around or under the knob or chassis seams.

7 Warranty Information

- Grace Design warrants this product to be free of defective parts and workmanship for a period of five years. This warranty period begins at the original date of purchase and is transferable to any person who may subsequently purchase the product during this time.
- This warranty excludes the following conditions: normal wear and tear, misuse, customer negligence, accidental damage, unauthorized repair or modification, cosmetic damage and damage incurred during shipment.
- During the time of this warranty, Grace Design will repair or replace, at its option, any defective parts or repair defective workmanship without charge, provided the customer has appropriate proof of purchase and that the product has its original factory serial number.
- In order for Grace Design to provide efficient and timely warranty service, it is important that you mail the completed warranty registration card enclosed with all of our products within 10 days of the original date of purchase. You may also register your product directly with Grace Design by telephone (303-823-8100 Monday-Friday 9:00am to 5:00pm MST), or you can register your product online at www.gracedesign.com.
- This warranty is in lieu of all other warranties whether written, expressed, or implied, INCLUDING ANY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.
- In no event will Grace Design be liable for lost profits or any other incidental, consequential or Exemplary damages, even if Grace Design is aware of the possibility of such damages. In no event will Grace Design's liability exceed the purchase price of the product.
- This warranty gives the customer specific legal rights. The customer may also have other rights, which vary from state to state. Some states do not allow limitations on implied warranties or consequential damages, so some of the limitations of the above may not apply to a particular customer.