



Benchmark *HPA4* Instruction Manual

Reference Stereo Headphone Amplifier
and
Reference Line Amplifier
with
Relay Gain and Input Control



Safety Information

Fuses

CAUTION: FOR CONTINUED FIRE HAZARD PROTECTION ALWAYS REPLACE THE FUSES WITH THE CORRECT SIZE AND TYPE (T 0.5A 250V 5 X 20 MM – LITTELFUSE® SLO-BLO® HXP218.500 OR EQUIVALENT). THE FUSE DRAWER INCLUDES TWO FUSES. ALWAYS REPLACE BOTH FUSES AT THE SAME TIME.

AC Input Voltage Range

NOTE: THE *HPA4* IS EQUIPPED WITH A UNIVERSAL POWER SUPPLY. THERE IS NO VOLTAGE SELECTION SWITCH. AC VOLTAGE RANGE IS 88-264 VAC, 50-60 HZ. THE PRODUCT MAY ALSO BE OPERATED FROM DC POWER OVER A VOLTAGE RANGE OF 125-373 VDC.

Power Cord

CAUTION: ALWAYS USE A GROUNDED POWER CORD. THE PRODUCT IS EQUIPPED WITH A STANDARD IEC POWER ENTRY MODULE. USE AN IEC POWER CORD THAT IS EQUIPPED WITH THE APPROPRIATE CONNECTOR FOR YOUR LOCATION. CORDS ARE AVAILABLE FROM YOUR DEALER.

Modifications

CAUTION: DO NOT SUBSTITUTE PARTS OR MAKE ANY MODIFICATIONS WITHOUT THE WRITTEN APPROVAL OF BENCHMARK MEDIA SYSTEMS, INC. MODIFICATION MAY CREATE SAFETY HAZARDS AND VOID THE WARRANTY.

CAUTION: CHANGES OR MODIFICATIONS NOT EXPRESSLY APPROVED BY BENCHMARK MEDIA SYSTEMS COULD VOID THE USER'S AUTHORITY TO OPERATE THE EQUIPMENT UNDER FCC REGULATIONS.

Repairs

CAUTION: DO NOT SERVICE OR REPAIR THIS PRODUCT UNLESS PROPERLY QUALIFIED. ONLY A QUALIFIED TECHNICIAN SHOULD PERFORM REPAIRS.

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Front Panel



Rear Panel



Features

- THX-888 (AAA™) **Headphone Amplifier**
- Benchmark **Line Amplifier**
- 256-Step Fully-Balanced **Relay Gain Control**, 0.5 dB Steps
- Precision **Timed Relay Closures**
- Precision **Metal Film Resistors**
- **Gold-Contact Relays**
- Balanced and Unbalanced I/O
- **6 Watts** into 16 Ohm Headphones
- **11.5 Vrms** into 300 Ohm Headphones
- **0.01 Hz to 500 kHz** frequency response
- **SNR > 135 dB**
- **THD < 125 dB** (0.00006%) under full load
- **Short-Circuit Protection** on Headphone Amplifier
- **DC Protection** on Headphone Amplifier
- **Over-Voltage Protection** on Headphone Amplifier
- **Over-Current Protection** on Headphone Amplifier
- **Thermal Protection** on Headphone Amplifier
- Full-Color 3.5" **Capacitive Touch Screen**
- **IR Remote Control** (optional)
- **2 Balanced Stereo Line Inputs**
- **2 Unbalanced Stereo Line Inputs**
- **Balanced Stereo Line Output**
- **Unbalanced Stereo Line Output**
- **Balanced Mono Sum Output**
- **12V Trigger I/O** – two bi-directional 12V trigger ports
- **AUTO-ON Function** - can be programmed to turn on when AC is applied
- **Power Switch** – very low standby power , <0.5 W at 120 VAC
- **High-Efficiency Low-Noise Power Supplies** – 100-240 VAC, 50-60 Hz
- Meets **FCC Class B** and **CE** emissions requirements
- **Tested for immunity** to radiated and conducted RF interference

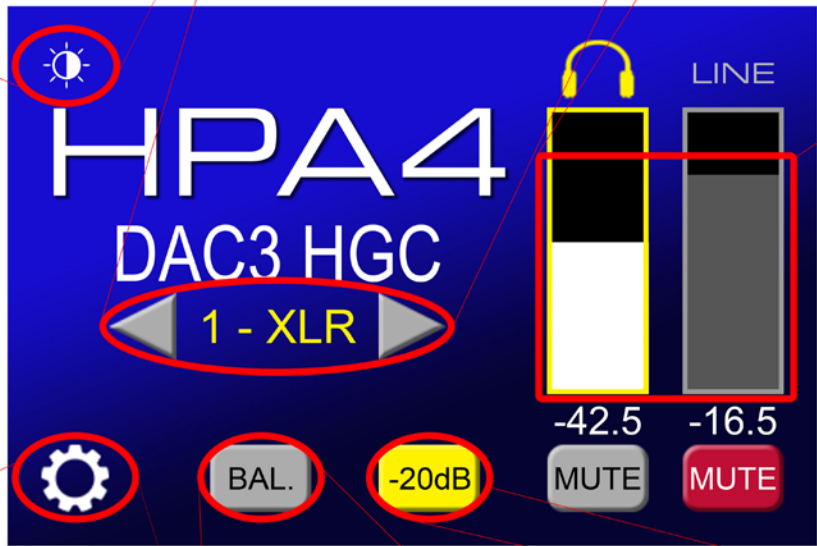
Quick Start Guide

Main Screen

BRIGHTNESS button. Use this button to dim the screen. When the screen is dimmed, touch anywhere to restore to full brightness. A DIM timer is available in the DISPLAY settings menu.

INPUT SELECTION. Use the left/right arrows to change inputs. Disabled inputs will be skipped. The input type is displayed between the arrows (XLR, RCA...).

VOLUME CONTROL ENABLE
Touch this area to change the selected output group (headphone, line, or both). Selected output groups are highlighted.



SETTINGS button. Use this button to access the SETTINGS menu.

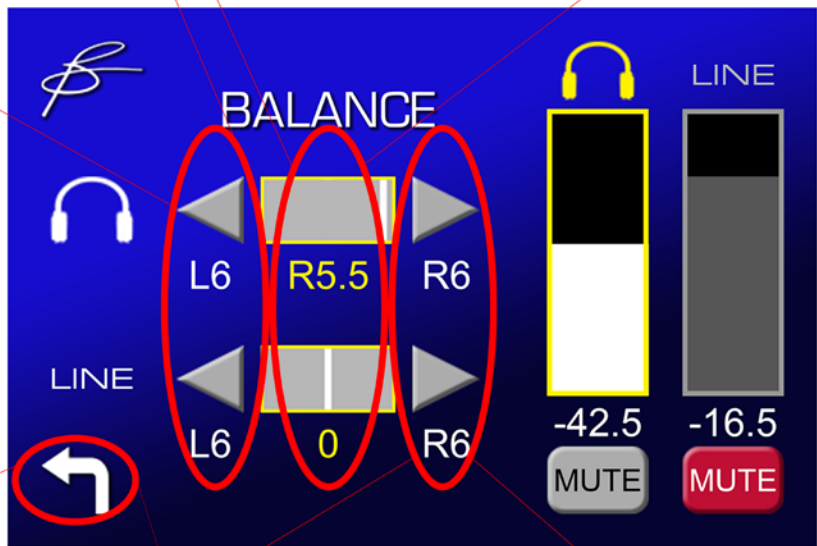
BALANCE button. Use this button to adjust the balance of the headphone and/or line output groups.

-20 dB Button. Use this button to reduce the volume of selected output group(s) by 20dB. Press again to return to previous volume setting.

Balance Controls

LEFT ARROWS
Use these buttons to adjust the balance to the left. The top button controls the headphone outputs and the bottom controls the line outputs.

CENTER
Press in the center to reset the balance back to center.



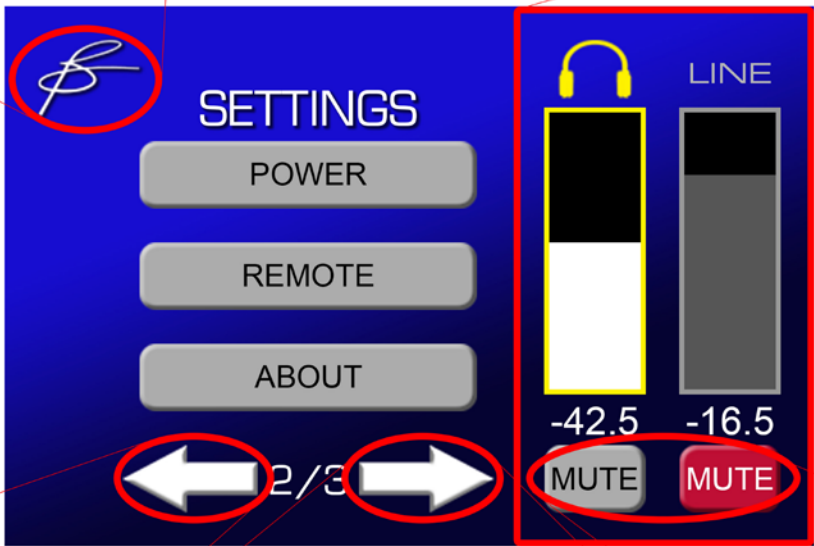
BACK BUTTON
Use this button to return to the previous page.

RIGHT ARROWS
Use these buttons to adjust the balance to the right. The top button controls the headphone outputs and the bottom controls the line outputs.

Screen Navigation

HOME button.
Use this button to return to the HOME screen.

VOLUME INDICATORS.
This section shows the current volume, dim, mute, and selection status for each output group.



PREVIOUS arrow.
Use this button to access the previous page of settings.

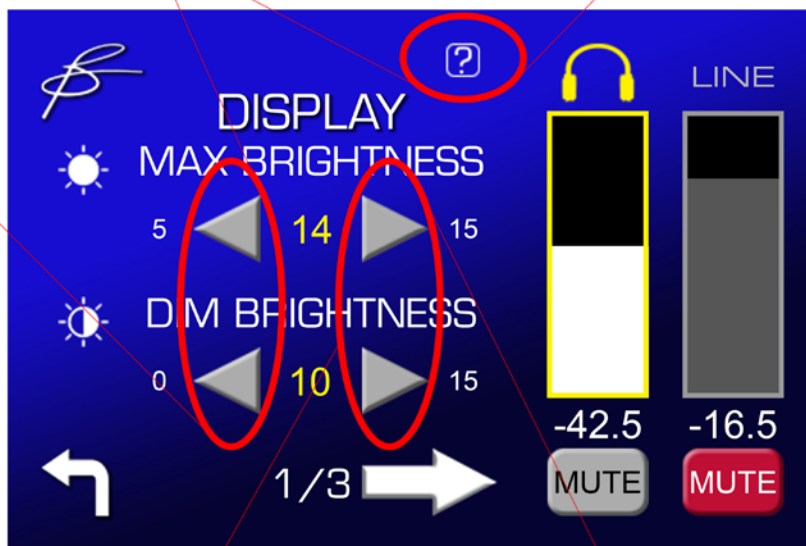
NEXT arrow.
Use this button to access the next page of settings.

MUTE buttons.
Use these buttons to mute the Headphones and/or Line output groups.

Display Settings

LEFT BUTTONS
Use these buttons to reduce the brightness of the screen.

HELP BUTTON
Use this button to get help about the screen you are currently on.



RIGHT BUTTONS
Use these buttons to increase the brightness of the screen.

Remote Control

The remote control is designed to control the **HPA4** and any Benchmark D/A converter that supports remote control.

The bottom six input selection buttons select the DAC inputs if the **DAC MODE** is enabled (on the **REMOTE** setup screen).

The **HPA4** inputs are controlled with the **INPUT ARROWS**.

The chart at the right summarizes the functions of the IR remote control.



ON	Turns the HPA4 on. Any devices slaved to the 12V TRIGGER will also turn on in a controlled sequence. If the HPA4 is ON, this button toggles the OUTPUT GROUP SELECTION (headphone, line, or both).
OFF	Turns the unit off. Any devices slaved to the 12V TRIGGER will turn off in a controlled sequence.
VOLUME ARROWS	Turns the volume up or down. Volume up cancels MUTE and DIM . Volume will only be adjusted on selected output group(s).
-20 dB DIM	Toggles the -20 dB DIM function. DIM will only be toggled on selected output group(s).
MUTE	Toggles the MUTE function. MUTE will only be toggled on selected output group(s).
INPUT ARROWS	Scrolls through the enabled inputs on the HPA4 .
D1	Selects input D1 on DAC if connected.
D2	Selects input D2 on DAC if connected.
D3	Selects input D3 on DAC if connected.
D4	Selects input D4 on DAC if connected.
USB	Selects USB input on DAC if connected.
Analog	Selects analog input(s) on DAC if connected.

Front Panel Controls



The front panel features a color touch screen, a power switch and a volume knob.

The volume knob includes a push switch that can be used to select which output group will be controlled by the knob rotation.

Tip: The IR remote sensor is located just to the right of the power switch. Keep this sensor unobstructed if you will be using the optional remote control.

Tip: When **AUTO-ON** is enabled, a switched AC outlet can be used to turn your system on and off. The **12V TRIGGER I/O** can be used as a trigger output to control the power state of additional components.

The chart at the right summarizes the functions of the power button and volume knob.

<p>POWER (button)</p>	<p>Turns the unit on or off.</p> <p>Any devices slaved to the 12V TRIGGER will also turn on or off in a controlled sequence.</p> <p>If AUTO-ON is enabled, the POWER button will toggle MUTE on and off (the unit will remain on at all times).</p>
<p>VOLUME (knob)</p>	<p>Adjusts the volume in 0.5 dB steps.</p> <p>The knob features an acceleration function. Rotate the knob quickly and the volume will change in larger steps.</p> <p>Volume up automatically cancels DIM and MUTE.</p> <p>Volume will only be adjusted on selected output group(s).</p> <p>Push the volume knob to select which output group(s) will be controlled (headphone, line, or both).</p>

Basic Features

Input Selection

Use the input selection arrows to scroll through the enabled inputs. These arrows are displayed on the **HOME** screen and are also available on the **REMOTE**.

Volume Control

The volume of the headphone and line output groups can be adjusted independently. The bar graphs show the current volume settings. The volume controls are enabled when the bar graph(s) are highlighted.

- **Select the OUTPUT GROUP(S)**

Press the volume knob or touch the bar graphs to select the **OUTPUT GROUP** that you would like to adjust (headphones, line or both). If you are using the remote, press the **ON** button to toggle between output groups.

- **Adjust the volume**

Rotate the volume knob or use the remote control to adjust the volume of the selected output group(s).

MUTE Function

The headphone output and line output groups have separate **MUTE** buttons on the touch screen. Each **MUTE** button is highlighted in red when the output group is muted.

The **MUTE** key on the remote will mute the selected output group(s).

Tip: Turn the **VOLUME** up to release **MUTE** and return to the prior volume setting.

-20 dB DIM Function

The **DIM** function reduces the level of the selected output group(s) by 20 dB. When **DIM** is toggled on, the volume is immediately reduced by exactly 20 dB. When **DIM** is toggled off, the volume ramps back up to the prior setting.

Tip: Turn the **VOLUME** up to release **DIM** and return to the prior volume setting.

Balance Adjust

Press the **BAL** button on the **HOME** screen to change the L/R balance of the headphone and/or line outputs. These are independently adjustable.

Advanced Features (Settings Screens)

Press the gear icon on the HOME screen to access the advanced features.

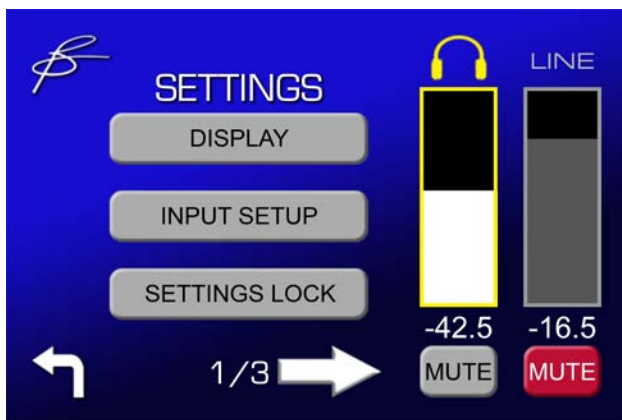


If the advanced features have been locked, a locked gear icon will be displayed on the HOME screen. Press and hold the gear icon for 3 seconds to access the advanced features.

Settings Menu Screens

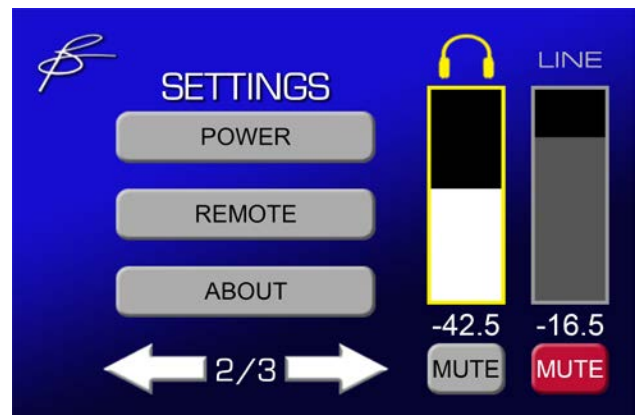
- **Settings 1**

- Display Settings
- Input Setup
- Lock/Unlock Advanced Settings



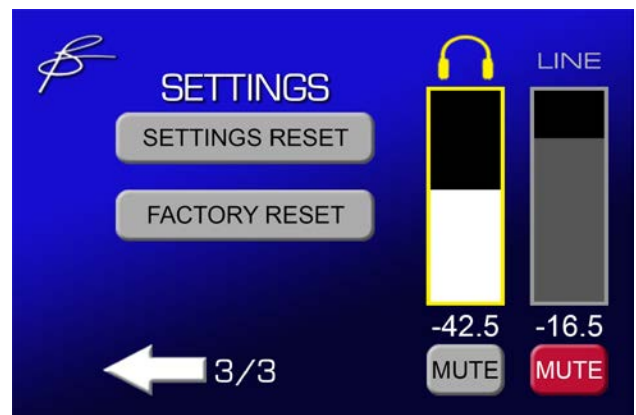
- **Settings 2**

- Power (Auto-On, Trigger)
- Remote (IR Enable, DAC Mode)
- About (System Information)



- **Settings 3**

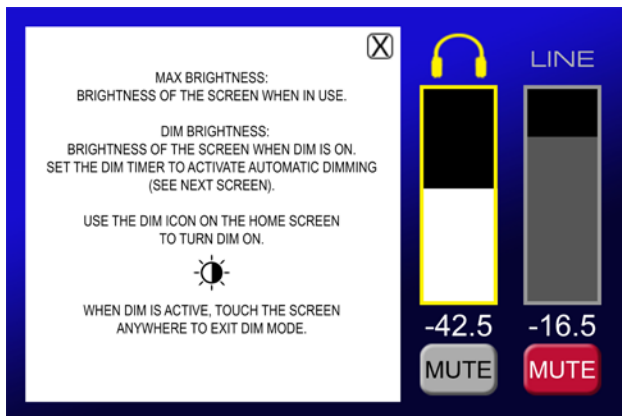
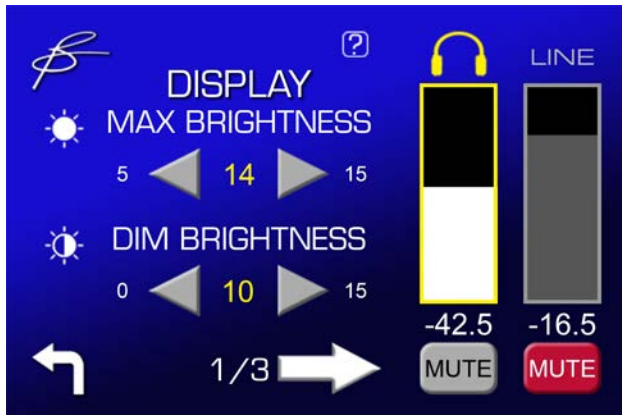
- Reset Advanced Settings
- Full Factory Reset



DISPLAY Settings

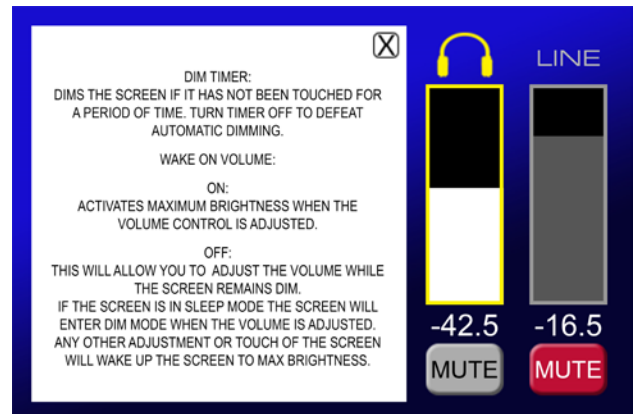
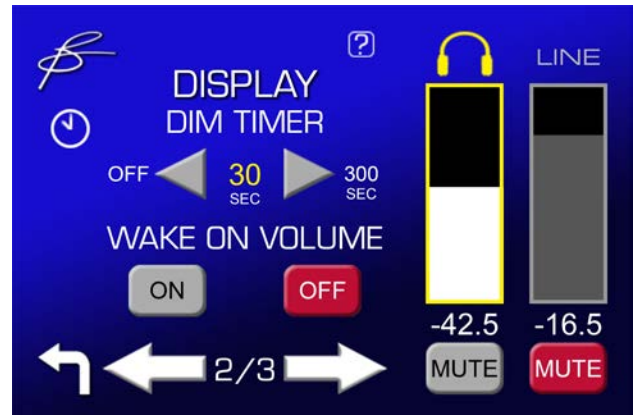
- **Display Settings 1**

- Maximum Screen Brightness
- Screen Brightness when Dimmed



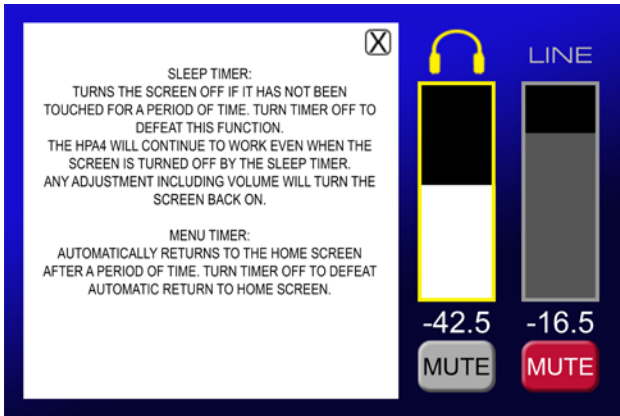
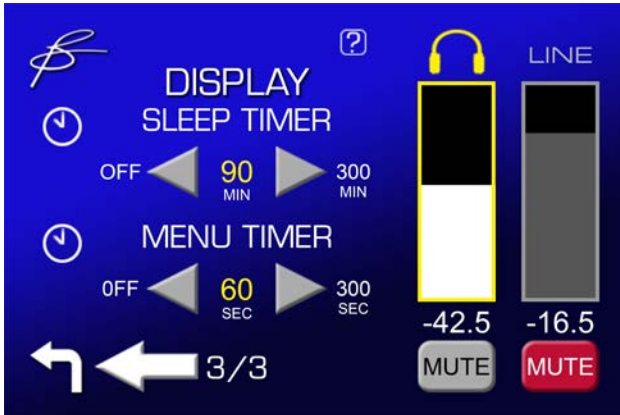
- **DISPLAY Settings 2**

- Screen Dim Timer
- 'WAKE ON VOLUME' Function



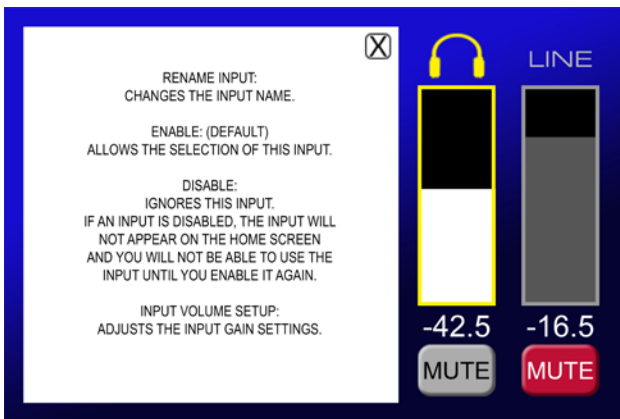
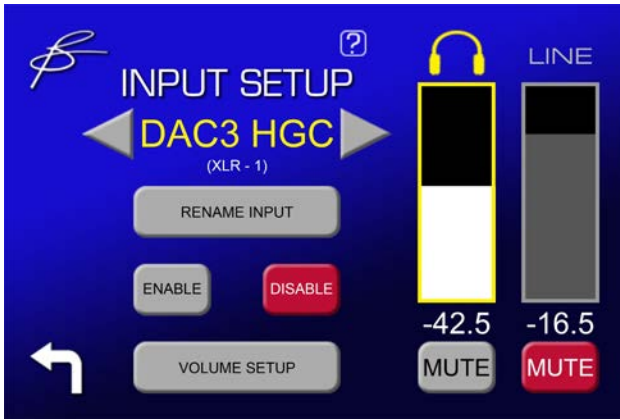
- **DISPLAY Settings 3**

- Display Sleep Timer (screen off)
- Menu Timer (return to home page)



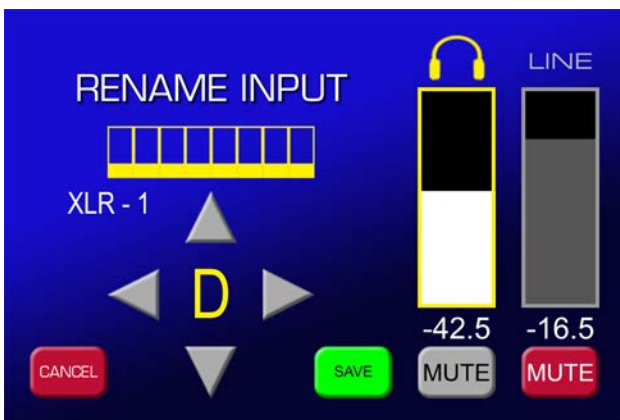
INPUT SETUP

- Rename Inputs
- Disable/Enable Inputs
- Volume Setup for Each Input



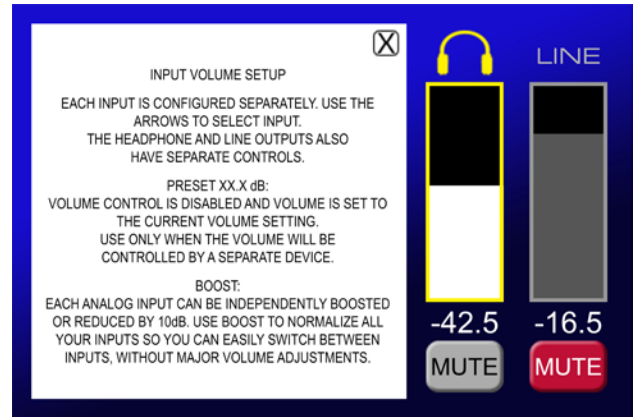
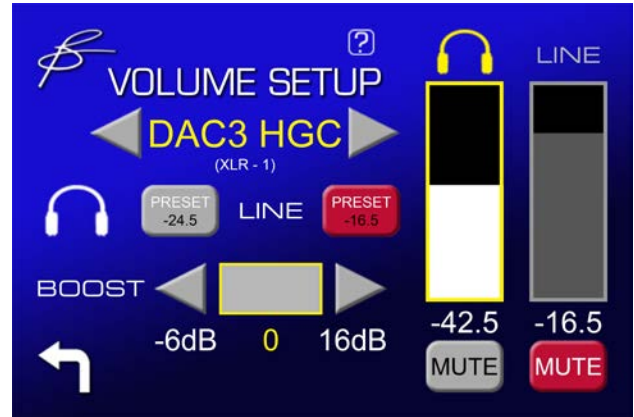
RENAME INPUT

- Input Name Edit



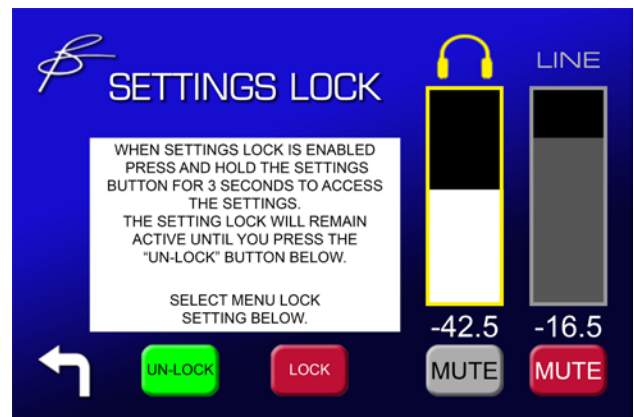
VOLUME SETUP

- Volume Preset - Enable/Disable
- Boost Adjust (input volume offset)



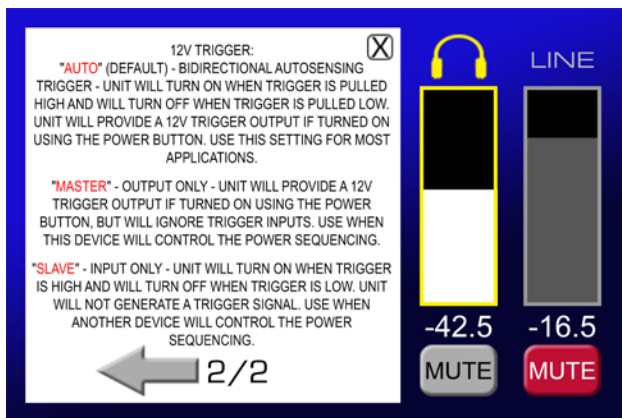
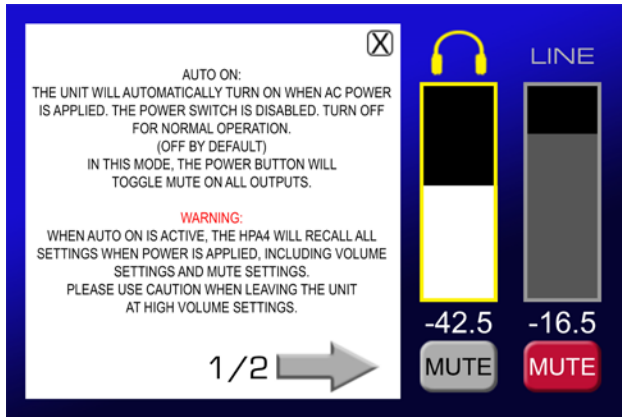
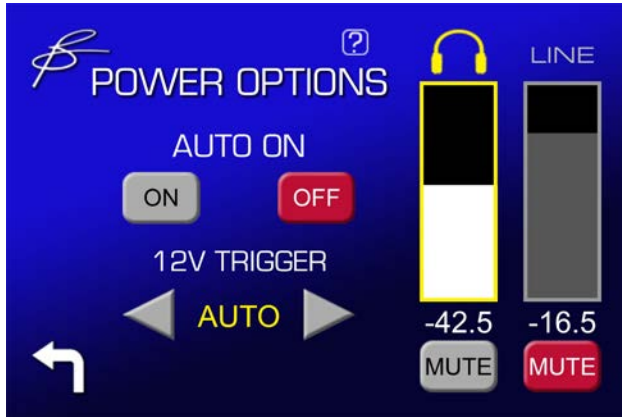
SETTINGS LOCK

- Lock/Unlock Advanced Settings



POWER

- Auto On - Enable/Disable
- 12V Trigger Mode



REMOTE

- Enable IR Remote Control
- Integrate with Benchmark DAC

REMOTE

ENABLE REMOTE?

YES NO

BENCHMARK DAC ON XLR1?

YES NO

Headphones icon: -42.5 MUTE

LINE icon: -16.5 MUTE

BENCHMARK DAC SETUP:

- 1: SET THE INTERNAL DAC XLR JUMPERS TO 0dB.
- 2: CONNECT DAC XLR OUT TO XLR1 ON THE HPA4.
- 3: SET THE DAC TO CALIBRATED OR HOME THEATER (HT) MODE ON ALL INPUTS.
(ON THE DAC2 AND DAC3, PUSH AND HOLD THE MUTE OR DIM/MUTE BUTTON UNTIL THE HT OR CALIBRATED LIGHT COMES ON)
- 4: CONNECT A TRIGGER CABLE BETWEEN THE DAC AND HPA4, IF THE DAC HAS A TRIGGER PORT (OPTIONAL).

NOTE: BOTH THE DAC AND HPA4 MUST BE IN RANGE OF THE REMOTE.

← 3/3

Headphones icon: -42.5 MUTE

LINE icon: -16.5 MUTE

ENABLE REMOTE?:

THIS OPTION ENABLES THE IR SENSOR. IF YOU SELECT "YES" THE IR SENSOR IS ACTIVATED AND YOU CAN USE ANY BENCHMARK REMOTE (OR UNIVERSAL REMOTE THAT IS PROGRAMED WITH THE SAME CODE AS A BENCHMARK REMOTE). IF YOU SELECT "NO", THE IR SENSOR WILL BE DEACTIVATED AND IT WILL NOT WORK WITH ANY REMOTE.

WHILE USING A BENCHMARK REMOTE USE THE "ON" BUTTON TO TOGGLE THE ACTIVE OUTPUT (HEADPHONES OR LINE) INDICATED WITH A YELLOW BORDER AND WHITE METER.

THE DIRECT INPUT BUTTONS ON THE REMOTE HAVE NO FUNCTION UNLESS A BENCHMARK DAC IS CONNECTED TO XLR1 (SEE NEXT PAGE FOR MORE DETAILS).

1/3 →

Headphones icon: -42.5 MUTE

LINE icon: -16.5 MUTE

BENCHMARK DAC ON XLR1?

WHEN USING THE HPA4 WITH A REMOTE ENABLED BENCHMARK DAC (CONNECTED TO XLR1 AND SET TO CALIBRATED / HT MODE) USE THE BENCHMARK DAC REMOTE TO CONTROL THE HPA4 AND THE DAC. THE LOWER 6 BUTTONS (ANALOG, USB, D1, D2,D3 AND D4) ARE USED TO SELECT A DAC INPUT AND WILL SWITCH THE HPA4 TO INPUT XLR1.

THE INPUT SELECT ARROWS ON THE REMOTE ARE USED TO SELECT INPUTS 2-4 ON THE HPA4.

THE ONLY WAY TO RETURN TO A DAC INPUT IS TO USE ONE OF THE LOWER 6 BUTTONS ON THE REMOTE, OR THE INPUT ARROWS ON THE SCREEN.

DAC SETUP INSTRUCTIONS ON PAGE 3

← 2/3 →

Headphones icon: -42.5 MUTE

LINE icon: -16.5 MUTE

ABOUT

- Firmware Version (hardware drivers)
- Software Version (touch screen)



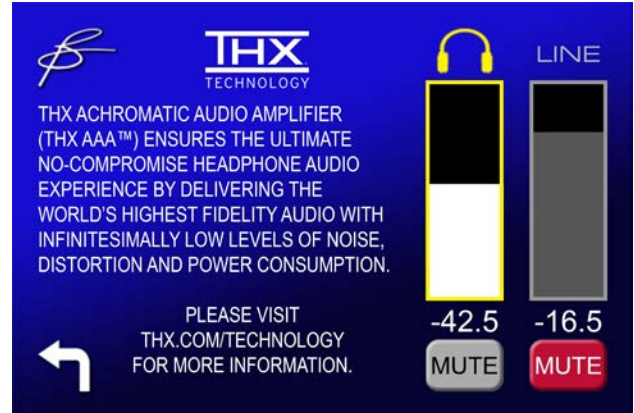
ABOUT BENCHMARK

- Benchmark Contact Information



ABOUT THX

- THX AAA(TM) Technology Information



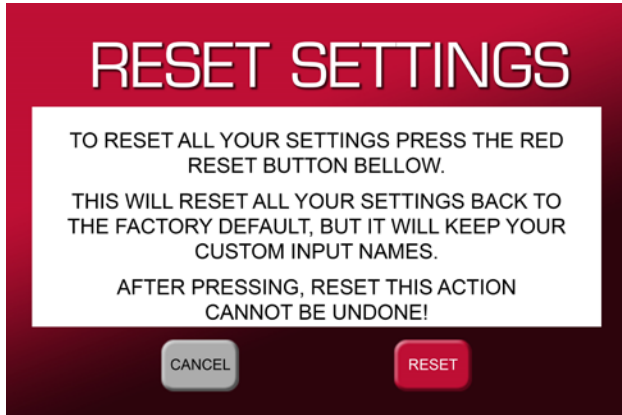
SPLASH SCREEN

- Unit is Turning On or Off, Audio is Muted



Settings Reset

- Reset all Advanced Settings Except Input Names



Factory Reset

- Reset all Advanced Settings Including Input Names



HPA4 System Overview

The Ultimate Headphone Amplifier

Benchmark Media Systems, Inc. and THX, Ltd. have partnered to introduce the Benchmark **HPA4** headphone/line amplifier featuring THX Achromatic Audio Amplifier (AAA™) technology.

THX AAA™ reduces harmonic, intermodulation, and crossover distortion by 20 to 40 dB to guarantee a realistic and fatigue-free listening experience. It accomplishes this using a patented feed-forward topology to null conventional distortion and noise mechanisms, resulting in the world's most linear amplifier. THX AAA allows the amplifier to reach its maximum output power and sound pressure level (SPL) without producing the distortion that normally accompanies increased output levels in traditional amplifiers.

Featuring the flagship THX-888 amplifier design, the revolutionary **HPA4** headphone amplifier incorporates the same THX AAA technology that Benchmark uses in the **AHB2** power amplifier. The **HPA4** delivers sonic perfection. Hear the music without any contamination from electronic noise or distortion. The **HPA4** delivers power, audio fidelity, speed and accuracy over an utterly silent background.

The Ultimate Line Amplifier

The THX-888 amplifier is driven by a Benchmark line amplifier that features relay gain control, relay input selection, and relay muting. It is designed to deliver the lowest possible distortion and noise over a wide range of volume settings. We believe that the **HPA4** line amplifier is the finest available at any price.

Relay-Controlled Gain Stages

The relay-controlled gain stages provide 256 volume steps in precise 0.5 dB increments. These gain stages feature the finest gold-contact relays available.

Relay closures are precisely timed to deliver silky-smooth volume changes. No other relay-controlled gain stage offers this level of precision or performance.

The **HPA4** includes 4 independent fully-balanced 256-step volume controls: two for the L&R headphone outputs, and two for the L&R line outputs. To make this all happen, the **HPA4** includes a total of 64 precision relays.

Balance Controls

The line and headphone outputs feature independent balance controls that are adjustable in 0.5 dB steps.

100% Analog Signal Path

The **HPA4** is 100% analog. It is designed to be driven from an external D/A converter or an external analog source. The **HPA4** is designed to provide the ultimate analog signal path between inputs and outputs. The **HPA4** eclipses the performance of typical high-end preamplifiers by achieving much lower noise and distortion.

Fully-Balanced Signal Paths

The internal signal paths are fully balanced. The inputs are routed to a balanced pair of precision differential amplifiers. These drive two sets of fully-balanced 256-step volume controls. The balanced outputs from the volume controls drive the headphone amplifier and line output drivers.

Differential Amplifiers

The **HPA4** features precision differential amplifiers on all inputs. These reject common-mode noise, common-mode distortion and common-mode interference. This feature is especially important when using D/A converters that lack their own differential amplifiers.

Benchmark D/A converters include differential amplifiers, but many competing converters

lack these stages which remove the common-mode distortion produced by D/A chips.

Powerful Headphone Output

The THX-888 amplifier in the **HPA4** can cleanly deliver high power and current into low-impedance headphones. It can also deliver the high voltage required by very low-sensitivity headphones.

- **High Power**

The **HPA4** delivers 6 watts into 16 Ohms. Best of all, there is no increase in THD when driving low-impedance headphones. The THX AAA-technology keeps the output distortion free while driving very difficult low-impedance loads.

- **High Current**

Low-impedance headphones may also require high current due to difficult phase angles presented by non-resistive driver loading. The HPA4 can provide peak currents exceeding 1.5 amps. This is more than enough current to drive difficult headphones with ease.

- **High Voltage**

High-impedance headphones may not draw much power or much current, but they may demand high drive voltages. The **HPA4** delivers 11.9 Vrms into 300-Ohm headphones. This is plenty of voltage to drive headphones with very low sensitivities.

Dual Headphone Outputs

The HPA4 features a traditional 1/4" TRS headphone jack and a 4-pin XLR jack.

The 4-pin jack provides separate returns for the left and right channels. Each output channel is driven differentially relative to its return pin on the 4-pin jack.

We recommend using the 4-pin jack because the XLR connector provides lower contact resistance than the TRS connector.

Ultra-Wide Bandwidth

The frequency response of the **HPA4** extends from 0.01 Hz to 500 kHz. This extended range keeps the phase response extremely accurate over the entire audio band. The entire audio spectrum is delivered with the proper timing.

Bass is delivered with the correct timing relative to other frequencies. Most audio products deliver the bass slightly late. Bass that arrives late tends to mask high-frequency details. In contrast, bass that arrives with the correct timing will sound deep, full and well damped. For this reason, all Benchmark products feature low-frequency extension to 0.01 Hz.

The extreme 500 kHz high-frequency extension delivered virtually perfect timing at the high end of the audio spectrum. High frequencies are delivered with precise timing relative to low and mid frequencies. In addition, the left-right differential phase is virtually perfect at 20 kHz. These timing characteristics preserve the precise placement of voices within a well-defined 3D stereo image.

Rotary Encoder

The volume control knob features a high-quality optical encoder that is rated for heavy use. An acceleration feature makes it easy to move through the 256 volume steps while maintaining 0.5 dB/step resolution. A press of the control knob toggles between headphone volume, line volume, or both.

Convenience Features

The **HPA4** includes independent on-screen mute buttons for the headphone and line outputs. Both can also be muted with the volume knob or with the optional remote control.

The **HPA4** includes an on-screen -20 dB dim button that instantly reduces the level by 20dB. This function provides a temporary

volume reduction and an easy return to the previous listening level. This control makes it easy to transition between a normal listening level and a background level. The dim function is also accessible from the optional remote control.

Inputs may be renamed and unused inputs may be disabled. Input levels can be trimmed to provide input-to-input level matching.

Screen brightness is adjustable and timers can be set to dim or shut off the display. The setup screen can be locked to prevent access to advanced features.

12V Trigger

The **HPA4** has two trigger ports. These can be connected to other audio components so that the entire audio system can turn on and off in a sequenced fashion. The **HPA4** will pull the trigger I/O to 12 volts DC while the **HPA4** is on. If the **HPA4** is off and an external device pulls the trigger I/O to 12 volts, the **HPA4** will turn on.

The trigger ports are bi-directional by default, but they can be configured as inputs or outputs.

Auto-On Function

The **HPA4** can be programmed to automatically turn on when AC power is applied.

Casework

The **HPA4** is available with a black or silver faceplate and is designed to match the Benchmark **AHB2** power amplifier. It occupies the same footprint as the Benchmark **DAC1**, **DAC2** and **DAC3** converters. The case features a milled faceplate and milled sides. Top, bottom, and rear panels are made from thick aluminum and feature a brushed texture. The **HPA4** is built to last and will be a fine addition to your listening space.

Equipment Placement

Locate the **HPA4** where the side panels are exposed to air. These panels help dissipate heat and should not be obstructed.

The IR sensor for the remote control is located to the right of the power switch on the front panel. Make sure this is visible from your listening position.

The **HPA4** does not emit strong magnetic fields and for this reason, it will not create interference with audio devices that are placed above or below the **HPA4**.

Please note that most power amplifiers emit strong magnetic fields. In most cases, the **HPA4** should not be stacked directly above or below a power amplifier. Allow at least a few inches of space above or below a power amplifier. The magnetic fields produced by the power amplifier may interfere with the **HPA4**. One exception is the Benchmark **AHB2** power amplifier. The **HPA4** can be stacked directly above or below an **AHB2** without any risk of magnetic interference from the power amplifier.

The **HPA4** can also be stacked directly above or below Benchmark **DAC2** or **DAC3** converters. The older **DAC1** series converters emit stronger magnetic fields and should not be stacked directly above or below the **HPA4**.

Auto-Ranging Power Supply

The internal power supply automatically senses the AC line voltage. There are no settings or fuses to change for international operation. Select a grounded IEC power cord that matches the AC outlets in your country.

Audio Line Inputs

The **HPA4** features two stereo balanced XLR analog inputs and two stereo unbalanced RCA analog inputs.

Balanced XLR Interfaces

Balanced interfaces use higher signal levels and for this reason, they provide better signal to noise ratios. Balanced interfaces also provide immunity from ground loop induced hum and buzz. In general, balanced interfaces are vastly superior to unbalanced. Select products with balanced interfaces and avoid the use of unbalanced interfaces whenever possible.

Unbalanced RCA Interfaces

Given the widespread consumer use of unbalanced RCA interconnects, we have made every effort to extract the highest possible performance from these antiquated consumer audio interconnects.

The unbalanced RCA inputs on the **HPA4** are connected to balanced receivers. These balanced receivers provide significant immunity to ground loop induced hum and buzz. This topology provides the RCA inputs with some of the advantages of fully-balanced interfaces. Nevertheless, unbalanced interfaces can never match the full performance of professional-grade balanced interfaces.

If your D/A converter and/or power amplifier lack balanced interfaces, it is a good indication that these devices are not true high-resolution audio products. Look for professional-grade balanced interfaces that support 24 dBu signal levels.

Input Level Matching

By default, the unbalanced inputs on the **HPA4** are automatically boosted by 15.8 dB so that they will match the level of the professional-grade balanced inputs. If the

15.8 dB default boost doesn't work in your system, individual inputs can be trimmed by +/- 10 dB in 0.5 dB steps using the **BOOST** function. The boost value does not impact the audio performance. It is equivalent to automatically rotating the volume control when the input is changed. The boost value changes the way the volume is numerically displayed.

Tip: We recommend using professional-grade balanced XLR interconnects that provide +24 dBu at 0 dBFS. Consumer-grade balanced XLR interconnects operate at levels that are about 10 dB lower (4 Vrms or +14.2 dBu at 0 dBFS). Consumer RCA interconnects operate at levels that are about 16 dB lower (2 Vrms or 8.2 dBu at 0 dBFS). High signal levels and differential signaling are essential in high-resolution audio systems. RCA interconnects will limit system performance.

Audio Line Outputs

The **HPA4** features a stereo pair of balanced XLR outputs and a stereo pair of unbalanced RCA outputs. It also includes a balanced mono sum output. The mono sum can be used to drive a powered subwoofer.

The balanced outputs are designed to operate at professional levels (+24 dBu at 0 dBFS).

The unbalanced outputs are designed to operate at consumer levels (2 Vrms at 0 dBFS).

Unity Gain at 0 dB

If the volume control is set to 0 dB, the XLR output levels will be identical to the XLR input levels feeding the system. Likewise, the RCA output levels will be identical to the RCA input levels feeding the system.

15.8 dB Offset Balanced vs. Unbalanced

Balanced outputs are 15.8 dB hotter than the unbalanced outputs. Balanced inputs are assumed to be 15.8 dB hotter than unbalanced.

Headphone Outputs



The left-hand jack is a traditional 1/4" TRS headphone jack. The L & R channels share a common return.	The right-hand jack is a 4-pin XLR headphone jack that features dedicated returns for each channel.
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Driving Two Sets of Headphones

The **HPA4** has more than enough power and output current to drive two sets of headphones simultaneously. The two headphone jacks can be used simultaneously, but the two sets of headphones need to have similar sensitivities. If the sensitivities are different, one set of headphones will play louder than the other.

The main purpose of the second connector is to provide a high-performance alternative to the traditional TRS phone jack.

Performance Limitations of TRS Connectors

In our tests we have found that the tip-ring-sleeve (TRS) contacts can produce more distortion than the entire **HPA4** headphone amplifier. We have selected one of the highest quality TRS jacks available, but the performance of the TRS jack is highly dependent upon the quality and condition of the headphone plug. Gold plated plugs are highly recommended.

The traditional 1/4" TRS connector uses the sleeve as a common ground for the left and right channels. This connection carries twice the current carried by the other contacts. High contact resistance at the sleeve connection can cause distortion on both channels.

With many TRS plugs we have found that the tip connection is somewhat less reliable than the ring connection. This means that there is a higher chance of distortion being added to the left channel.

If the TRS plug is gold plated, clean and in good condition, the TRS jack can match the performance of the XLR4. When conditions are less than ideal, the TRS contact resistance can be the largest source of distortion in the entire **HPA4** headphone system.

High Performance XLR4 Connector

The 4-pin XLR connector provides dedicated pins for the left and right returns. There are no shared connections. In the **HPA4**, the left and right outputs are differentially driven relative to their respective returns.

The separate returns eliminate any interaction between the channels. More importantly, the XLR4 connector provides much lower contact resistance than the traditional 1/4" TRS connector.

Our tests have shown that XLR jack and plug combinations provide very reliable electrical connections. No measurable distortion was produced by the XLR4 connector in any of our tests.

Tip: The **Volume Control** simultaneously adjusts the level for both jacks. If two listeners will be simultaneously using the headphone outputs, we recommend using headphones with identical or very similar voltage sensitivities.

THX-888 Amplifier

The headphone outputs are driven by the flagship THX-888 amplifier. This headphone amplifier incorporates the same patented THX AAA technology that Benchmark uses in the **AHB2** power amplifier. The **HPA4** is designed to deliver power, audio fidelity, speed and accuracy over an utterly silent background.

THX AAA™ reduces harmonic, intermodulation, and crossover distortion by 20 to 40 dB to guarantee a realistic and fatigue-free listening experience. It accomplishes this using a patented feed-forward topology to null conventional distortion and noise mechanisms. THX AAA™ allows the amplifier to reach its maximum output power and sound pressure level (SPL) without producing the distortion that normally accompanies increased output levels in traditional amplifiers.

Headphone and Hearing Warnings

CAUTION: The THX-888 headphone amplifier in the **HPA4** is capable of delivering peak-to-peak voltages of about 25 Volts. It is also capable of delivering 1.5 Amps. These levels are high enough to damage most headphones (and your ears). Use caution when adjusting playback levels.

CAUTION: Do not drive a set of headphones while they are sitting on a desk or stand. It is easy to accidentally overdrive them. This is especially true when you have set the headphones aside while listening to speakers. Mute or unplug your headphones when they are not in use!

Soft-Start Circuit

The THX-888 uses relays to mute the headphone output until the power supplies have reached normal voltages.

Protection Circuits

The THX-888 headphone amplifier has several circuits that are intended to protect the amplifier from overloads and short circuits. Fault conditions will disable a pair of output relays which will disconnect the amplifier from the output jacks. The output relays are only energized when all conditions are normal.

- **Over Current Protection**

If the output current exceeds 1.5 Amps on either output channel, the protection relays will disconnect the amplifier from the output jacks. The connection will be restored after a few seconds. The protection cycle will repeat if necessary. This protection mode may engage if headphones are plugged into the 1/4" TRS jack while audio is playing. TRS plugs can cause a temporary short-circuit condition while the plug is being inserted.

- **Clip Detection**

If the headphone amplifier is driven into clipping, the protection relays will disconnect the amplifier from the output jacks. If clipping ceases, the connection will be restored after a few seconds.

- **DC Detection**

If DC is detected on the output of the headphone amplifier, the protection relays will disconnect the amplifier from the output jacks. This protection circuit is intended to protect the headphones in the unlikely event of a catastrophic component failure.

- **Temperature Limiting**

If the THX-888 is severely overloaded for a period of time, component temperatures may start to climb. If safe operating temperatures are exceeded, the protection relays will disconnect the amplifier from the output jacks. After the drivers have cooled, the connection will be restored. This cooling cycle may take several minutes.

Advanced Feature Details

PRESET Mode

The **PRESET** mode sets the output level to a fixed level. There are separate presets for the headphone and line outputs. Each input has two preset buttons. One for the headphone outputs and one for the line outputs. These can be set on the **VOLUME SETUP** screen which is accessed from the **INPUT SETUP** screen.

Auto-On Function

The **HPA4** can be programmed to automatically turn on whenever AC power is applied. This function allows automation using switched AC outlets. When **AUTO-ON** is enabled, the **HPA4** cannot be turned off without removing AC power.

The **AUTO-ON** function is programmed on the **POWER** screen.

If **AUTO-ON** is enabled, the power switch will mute all of the outputs, but will not turn the unit off. Likewise, the **OFF** button on the remote will mute all of the outputs.

Tip: Turn the **VOLUME** up to release **MUTE** and return to the prior volume setting.

Bi-directional 12V Trigger

Benchmark has reinvented the 12 volt trigger by adding bi-directional signaling. The trigger connection on the **HPA4** can be used as an input, an output, or both. It is compatible with any common 12 volt trigger input or output.

The **12V TRIGGER** I/O can be used to turn other audio components on when the **HPA4** turns on. The **HPA4** can also turn on and off in response to other connected components. The Benchmark bi-directional **12V Trigger** is compatible with virtually all trigger systems.

The **12V TRIGGER** I/O can be connected to the trigger input or output ports on a D/A converter, power amplifier, or both.

The **HPA4** can send a 12 Volt DC trigger signal to start other components in the system, or it can wake up in response to an externally generated trigger signal.

The trigger modes can be set using the **POWER** screen.

- **Auto Trigger Mode**

By default, the trigger ports are set to **AUTO TRIGGER** mode. In this mode, the **HPA4** automatically configures its trigger I/O ports as inputs (slave) or outputs (master) as needed. This mode is recommended for most applications. In **AUTO TRIGGER** mode, the **HPA4** will always turn other devices on and off. It will also respond when other devices force the trigger line high or low.

- **Master Trigger Mode - (Output Only)**

In **MASTER TRIGGER** mode, the **HPA4** will ignore external inputs to the trigger ports. The **HPA4** will force the trigger ports to 12 volts DC when the unit is **ON**, and will force the ports to 0 volts while the unit is turning **OFF**.

- **Slave Trigger Mode - (Input Only)**

In **SLAVE TRIGGER** mode, the **HPA4** will not drive the trigger ports. The ports will be configured for input only. The **HPA4** will turn on and off in response to the trigger signal supplied by other system devices.

- **Typical Trigger Applications**

Typical trigger applications:

- **HPA4** → Amplifier
- **HPA4** → Amplifier → Amplifier
- **HPA4** → DAC → Amplifier

- **Bi-Directional Trigger Applications**

Benchmark products support bi-directional communications over the trigger bus. Any Benchmark product connected to the bus can turn the entire system on or off. Because of the bi-directional design, any power button on a Benchmark **HPA4**, **AHB2**, or **DAC** can be used to start or stop the system.

The Benchmark device that starts the system will become the trigger master. If the trigger master is turned off, all slave devices will follow. If a slave device is turned off, all other devices will stay on.

If the **HPA4** is used to turn the system on, any connected **AHB2** amplifiers will become slave devices and they can be turned off without shutting down the **HPA4**. This feature makes it easy to turn the **AHB2** amplifier(s) off when listening to headphones.

Slave devices can force the entire trigger bus to shut down if the **POWER** button or **OFF** button is pressed and held for 3 seconds.

Tip: Press and hold the **POWER** button on any Benchmark device for 3 seconds to force a shutdown of the entire trigger-connected system.

- **Trigger Specifications**

The Benchmark **12V TRIGGER** I/O has a wide operating range to allow interfacing with most other DC trigger systems. It should only be used with trigger inputs that are designed to tolerate 12 VDC.

- 12 VDC 200 mA current-limited output
- Input responds to 3.3 V logic and higher
- Maximum input voltage = 30 VDC
- Maximum reverse input voltage = -0.3 VDC
- Input Impedance = 20 k Ohms
- 1/8" (3.5 mm) TRS jack
- Tip = 12 Volt Trigger I/O
- Ring = no connection
- Sleeve = chassis ground

Caution: The **12V TRIGGER** I/O is not an audio connection! This is a 12V DC connection for synchronizing the on and off sequencing of an entire audio system.

Software Version Identification

The software and firmware versions are displayed on the **ABOUT** screen. The software drives the touch screen and the firmware programs the Xilinx FPGA hardware control system. The FPGA controls the power supplies, trigger ports, rotary volume knob, remote control and relays. The FPGA has the speed and precision required to execute precise timing of the make-before-break relay closures in the stepped volume control.

AC Power-Entry and Fuse Module



- **Input Voltage Range**

Note: The **HPA4** is equipped with a universal power supply. There is no voltage selection switch. AC voltage range is 100 to 240 VAC, 50 to 60 Hz.

- **Power Cord**

Note: The AC power input uses a standard IEC type connector. One USA-compatible power cord is included with the **HPA4**. IEC style power cords in country-specific configurations are available in your locality.

Caution: Always use a grounded power cord. The **HPA4** is equipped with a standard IEC power entry module. Use an IEC power cord that is equipped with the appropriate connector for your location. Cords are available from your dealer.

- **Fuses**

Caution: For continued fire hazard protection always replace the fuses with the correct size and type (T 0.5A 250V, 5 x 20 mm – Littelfuse® Slo-Blo® HXP218.500 or equivalent). The fuse drawer includes two fuses. Always replace both fuses at the same time.

Specifications

THX-888 Headphone Outputs	
<i>Test conditions: 1 kHz test tone, Output Level = +21 dBu, Unity Gain (unless noted)</i>	
Number of Headphone Outputs	2
Output Connector - Differential Drive	Gold-Pin Neutrik™ XLR4 - female
Output Connector - Common Ground Return	1/4" Neutrik™ TRS Jack
SNR	135 dB, A-Weighted 131 dB, 20 Hz to 20 kHz
Output Noise	< 2.45 uV, 20 Hz to 20 kHz
Frequency Response	-0.003 dB at 10 Hz -0.001 dB at 20 kHz -3 dB at 0.1 Hz and 500 kHz
Output Impedance	Near 0 Ohms
Maximum Output Power and Voltage	6 Watts into 16 Ohms, 9.8 Vrms 2.6 Watts into 45 Ohms, 10.8 Vrms 640 mW into 200 Ohms, 11.3 Vrms 440 mW into 300 Ohms, 11.5 Vrms
Maximum Output Current (protection threshold)	1.5 Amps
Crosstalk, XLR4 Output	-133 dB@1kHz, -115 dB@10kHz
THD, 16-Ohm Load	-125 dB, 0.00006%, 16-Ohm Load
THD+N, 20 kHz BW, 16-Ohm load	-115 dB, 0.00018%
Volume Control Range	Mute, -112 dB to +15 dB in 0.5 dB steps
Balance Control Range	+/- 6 dB in 0.5 dB steps

Balanced Analog Outputs	
<i>Test conditions: 1 kHz test tone, Output Level = +24 dBu, Unity Gain (unless noted)</i>	
Number of Balanced Analog Outputs	3 (left, right, mono sum)
Output Connectors	Gold-Pin Neutrik™ XLR - male
SNR	137 dB, A-Weighted 135 dB, 20 Hz to 20 kHz
Output Noise	< 1.9 uV, 20 Hz to 20 kHz
Frequency Response	-0.003 dB at 10 Hz -0.001 dB at 20 kHz -3 dB at 0.1 Hz and 500 kHz
Output Impedance	60 Ohms
Maximum Output Level	+28 dBu, 19.5 Vrms
THD	-126 dB, 0.00005%
THD+N, 20 kHz BW	-115 dB, 0.00018%
Volume Control Range (with 0 dBFS digital input)	Mute, -112 dB to +15 dB in 0.5 dB steps
Balance Control Range	+/- 6 dB in 0.5 dB steps

Unbalanced Analog Outputs	
<i>Test conditions: 1 kHz test tone, Input Level = 2 Vrms, Unity Gain (unless noted)</i>	
Number of Unbalanced Analog Outputs	2 (left, right)
Output Connectors	Gold RCA - female
SNR	137 dB, A-Weighted 135 dB, 20 Hz to 20 kHz
Output Noise	< 1.9 uV, 20 Hz to 20 kHz
Frequency Response	-0.03 dB at 10 Hz -0.002 dB at 20 kHz -3 dB at 0.1 Hz and 500 kHz
Output Impedance	30 Ohms
Maximum Output Level	+12.2 dBu, 3.2 Vrms
Volume Control Range (with 0 dBFS digital input)	Mute, -112 dB to +15 dB in 0.5 dB steps
Balance Control Range	+/- 6 dB in 0.5 dB steps

Balanced Analog Inputs	
Number of Unbalanced Analog Inputs	4 (2 stereo pairs)
Input Connectors	Gold-Pin Neutrik™ XLR - female
Output Impedance	>50 k Ohms
Maximum Input Level	+28 dBu, , 19.5 Vrms
Input Selection and Muting	Gold-Contact Relays
Input State when Power is Off	Inputs are Disconnected using Relays

Unbalanced Analog Inputs	
Number of Unbalanced Analog Inputs	4 (2 stereo pairs)
Input Connectors	Gold RCA - female
Output Impedance	>50 k Ohms
Maximum Input Level	+12.2 dBu, 3.2 Vrms
Input Selection and Muting	Gold-Contact Relays
Input State when Power is Off	Inputs are Disconnected using Relays

Status Display	
Type	3.5" Color TFT with Capacitive Touch
Volume Indication - Headphone Output	Bar Graph and dB Gain
Volume Indication - Line Output	Bar Graph and dB Gain
MUTE Indicator	One for Headphone, One for Line
-20 dB DIM Indicator	Common for Both Output Groups
Input Name	8-Character, User Programmable
Input Connector Display	Input Number, Connector Type

AC Power Requirements	
Nominal Operating Range	100 – 240 VAC, 50 - 60 Hz
Min/Max Operating range	90 – 260 VAC, 47 - 63 Hz
Power	< 0.5 Watts Standby 15 Watts Typical Program 28 Watts Maximum
Fuses (2 required)	5x20 mm, 0.5 A 250 V Slo-Blo® Type

Dimensions	
Form Factor	½ Rack Wide, 2 RU High
Depth - excluding knob and connectors	8.33" (220 mm)
Overall Depth - including knob and connectors	9.33" (237 mm)
Width	8.65" (220 mm)
Height - excluding feet	3.47" (88 mm)
Height - including feet	3.88" (99 mm)

Weight	
HPA4 only	8 lb.
HPA4 with remote, power cord and manual	9 lb.
Shipping weight	12 lb.

Regulatory Compliance

FCC and RoHS Compliance Statements

FCC Notice (U.S. Only)

NOTICE: 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 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.

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received including interference that may cause undesired operation.

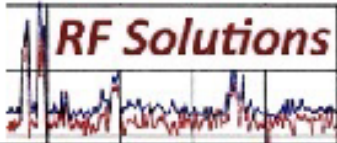
NOTICE: Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

RoHS Compliant Information

This statement clarifies Benchmark Media Systems, Inc. product compliance with the *EU's* (European Union) directive 2002/95/EC, or, *RoHS* (Restrictions of Hazardous Substances).

As of July 01, 2006, All Benchmark Media Systems, Inc. products placed on the European Union market are *compliant* (containing quantity limit weight less than or equal to 0.1% (1000 ppm) of any homogeneous Lead (Pb), Mercury (Hg), Hexavalent Chromium (Cr VI), and flame retardant Polybrominated Biphenyls (PBB) or Polybrominated Diphenyl Ethers (PBDE)).

CE Certificate of Compliance



801 Hiawatha Blvd East
Syracuse NY 13208
Phone 315-457-0245 | Fax 315-457-0428

Certificate of Compliance

RF Solutions, LLC has tested the product to the current appropriate standards and finds that the product is in compliance with those requirements.

EMC Directive:	2014/30/EU	
Generic Emissions Standard:	EN 61000-6-3:2007+A1:2010	
Product Specific Emissions:	55032:2015 Class B	
Generic Immunity Standard:	EN 55103-2:2010	
Immunity:	EN 61000-4-2:2009	Electrostatic Discharge
	EN 61000-4-3:2016	Radiated Susceptibility
	EN 61000-4-4:2012	Electrical Fast Transient/Burst
	EN 61000-4-5:2014	Surge
	EN 61000-4-6:2014	Conducted Susceptibility
	EN 61000-4-8:2010	Magnetics
	EN 61000-4-11:2004	Voltage Dips & Interruptions
	EN 61000-3-2:2014	Harmonic Current
	EN 61000-3-3:2013	Voltage Fluctuations & Flicker

Manufacturer's Name: Benchmark Media Systems
Manufacturer's Address: 203 E Hampton Pl, Ste 2
 Syracuse, NY 13206
Product: HPA4 Headphone / Line Amplifier
Model Number: 450-17200-200

This Certificate of Compliance issued July 11, 2018 is valid for the test sample of the product specified above and that it complies with the Directive(s) and Standard(s).

Signature: 
 Annelle Frierson, Managing Partner
 RF Solutions, LLC
 801 Hiawatha Blvd. East
 Syracuse, NY 13208
 Phone: 315-457-0245 / Fax: 315-457-0428

Warranty Information

Benchmark 1-Year Warranty

The Benchmark 1-Year Warranty

Benchmark Media Systems, Inc. warrants its products to be free from defects in material and workmanship under normal use and service for a period **of one year from the date of delivery.**

This warranty extends only to the original purchaser. This warranty does not apply to fuses, lamps, batteries, or any products or parts that have been subjected to misuse, neglect, accident, modification, or abnormal operating conditions.

In the event of failure of a product under this warranty, Benchmark Media Systems, Inc. will repair, at no charge, the product returned to its factory. Benchmark Media Systems, Inc. may, at its option, replace the product in lieu of repair. If the failure has been caused by misuse, neglect, accident, or, abnormal operating conditions, repairs will be billed at the normal shop rate. In such cases, an estimate will be submitted before work is started, if requested by the customer.

Attempts to deliberately deface, mutilate, or remove the product's label will render this warranty void. Benchmark will not honor warranties for any products disingenuously purchased on the US or Canadian markets for export.

The foregoing warranty is in lieu of all other warranties, expressed or implied, including but not limited to any implied warranty of merchantability, fitness or adequacy for any particular purpose or use. Benchmark Media Systems, Inc. shall not be liable for any special, incidental, or consequential damages, and reserves the right to change this information without notice. This limited warranty gives the consumer-owner specific legal rights, and there may also be other rights that vary from state to state.

Benchmark Extended Warranty Options

The Benchmark Extended 5-Year Warranty *

Benchmark Media Systems, Inc. optionally extends the standard 1-year warranty to a period of **five years from the date of delivery**.

*For the extended warranty to become effective, the original purchaser must register the product at the time of purchase either by way of the enclosed registration card or through the product registration section of the Benchmark Media Systems, Inc. website. This optional warranty applies only to products purchased within the US and Canada and is extended only to the original purchaser.

Attempts to deliberately deface, mutilate, or remove the product's label will render this warranty void. Benchmark will not honor warranties for any products disingenuously purchased on the US or Canadian markets for export. The terms of the extended warranty are subject to change without notice. For products purchased outside the US and Canada, please refer to the Extended Two 2-Year International Warranty.

The Benchmark Extended 2-Year International Warranty **

Benchmark Media Systems, Inc. optionally extends the standard 1-year warranty to a period of **two years from the date of delivery**.

**For the extended warranty to become effective, the original purchaser must register the product at the time of purchase either by way of the enclosed registration card or through the product registration section of the Benchmark Media Systems, Inc. website. This optional warranty applies only to products purchased outside the US and Canada and is extended only to the original purchaser.

Attempts to deliberately deface, mutilate, or remove the product's label will render this warranty void. Benchmark will not honor warranties for any products disingenuously purchased on the US or Canadian markets for export. The terms of the extended warranty are subject to change without notice. For products purchased in within the US and Canada, please refer to the Extended Five 5-Year Warranty.

Notes on Warranty Repairs

An RMA (return merchandise authorization) number, issued by our Customer Service Department, is required when sending products for repair.

They must be shipped to Benchmark Media Systems prepaid and preferably in their original shipping carton with the RMA number clearly visible on the exterior of the packaging. A letter should be included giving full details of the difficulty.

Revision A - 7/11/2018

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Benchmark Media Systems, Inc.
Benchmark Media Systems, Inc.
203 East Hampton Place, STE 2
Syracuse, NY 13206
USA

PHONE: +1-315-437-6300
FAX: +1-315-437-8119
benchmarkmedia.com

