OWNER'S MANUAL

24 VOLT

NOT FOR USE IN 12 V SYSTEMS!

MHD600/4-24V

4-Channel Class-D Full-Range Marine Amplifier



Thank you for purchasing a JL Audio amplifier for your marine sound system.

Your amplifier has been designed and manufactured to exacting standards in order to ensure years of musical enjoyment in your vessel. For maximum performance, we highly recommend that you have your new amplifier installed by an authorized JL Audio dealer. Your authorized dealer has the training, expertise and installation equipment to ensure optimum performance from this product. Should you decide to install the amplifier yourself, please take the time to read this manual thoroughly so as to familiarize yourself with its installation requirements and setup procedures.

If you have any questions regarding the instructions in this manual or any aspect of your amplifier's operation, please contact your authorized JL Audio dealer for assistance. If you need further assistance, please call the JL Audio Technical Support Department at (954) 443-1100 during business hours.

JL AUDIO®

PROTECT YOUR HEARING!

We value you as a long-term customer. For that reason, we urge you to practice restraint in the operation of this product so as not to damage your hearing and that of others in your vessel. Studies have shown that continuous exposure to high sound pressure levels can lead to permanent (irreparable) hearing loss. This and all other high-power amplifiers are capable of producing such high sound pressure levels when connected to a speaker system. Please limit your continuous exposure to high volume levels.

While driving, operate your audio system in a manner that still allows you to hear necessary noises to operate your vessel safely (horns, sirens, etc.).

SERIAL NUMBER

In the event that your amplifier requires service or is ever stolen, you will need to have a record of the product's serial number. Please take the time to enter that number in the space provided below. The serial number can be found on the bottom panel of the amplifier and on the amplifier packaging.

Serial Number:

_____

INSTALLATION APPLICATIONS

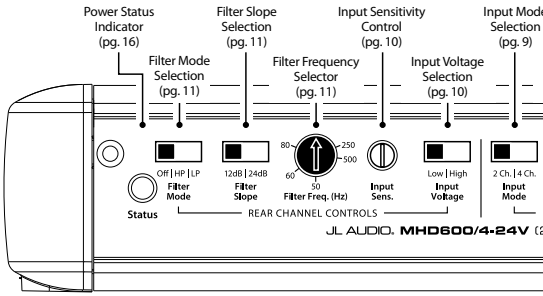
This amplifier is designed for operation in vessels with 24 volt, negative-ground electrical systems. Use of this product in vessels with positive ground and/or voltages other than 24V may result in damage to the product and will void the warranty.

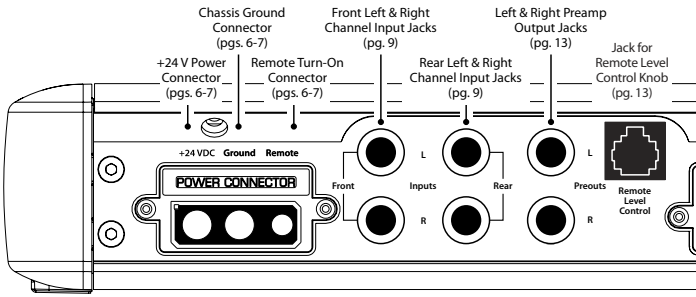
This product is not certified or approved for use in aircraft.

Do not attempt to "bridge" the outputs of this amplifier with the outputs of a second amplifier, including an identical one.

PLANNING YOUR INSTALLATION

It is important that you take the time to read this manual and that you plan out your installation carefully. The following are some considerations that you must take into account when planning your installation.





Cooling Efficiency Considerations:

The outer shell of your JL Audio amplifier is designed to remove heat from the amplifier circuitry. For optimum cooling performance, this outer shell should be exposed to as large a volume of air as possible. Enclosing the amplifier in a small, poorly ventilated chamber can lead to excessive heat build-up and degraded performance. If an installation calls for an enclosure around the amplifier, we recommend that this enclosure be ventilated with the aid of a fan. In normal applications, fan-cooling is not necessary.

! IMPORTANT

Mounting the amplifier upside down is strongly discouraged.

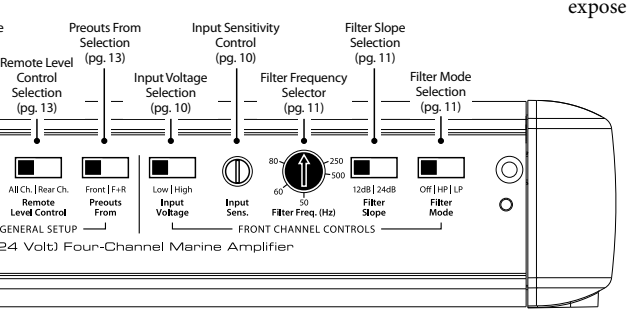
If mounting the amplifier under a seat, make sure there is at least 1 inch (2.5 cm) of space above the amplifier's outer shell to permit proper cooling.

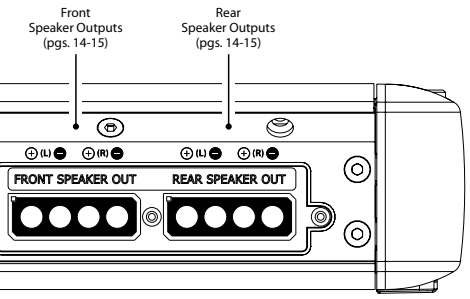
Safety Considerations:

Your amplifier needs to be installed in a dry, well-ventilated environment and in a manner which does not interfere with your vessel's factory installed electronic devices. You should also take the time to securely mount the amplifier so that it does not come loose in the event of a collision/ sudden jolt or as a result of the repeated vibrations the vessel is prone to during normal operation.

Stupid Mistakes to Avoid:

- Check before drilling any holes in your vessel to make sure that you will not be drilling through the hull, a fuel tank, fuel line, wiring harness or other vital vessel system.
- Do not run system wiring outside or underneath the vessel. This is an extremely dangerous practice which can result in severe damage to your vessel and person.
- Protect all system wires from sharp edges (metal, fiberglass, etc.) by carefully routing them, tying them down and using grommets and loom where appropriate.
- Do not mount the amplifier in the engine compartment or in any other area that will expose the amplifier circuitry to the elements.





! IMPORTANT

While this amplifier is specially designed for marine applications, it is not waterproof and it should not be mounted where it is likely to get wet.

PRODUCT DESCRIPTION

The JL Audio MHD600/4-24V is a very powerful and compact four-channel, full-range amplifier utilizing patented Single Cycle Control™ Class D technology for all channels. This groundbreaking technology delivers reference-grade sonic performance while requiring far less current from the vessel's electrical system than a conventional amplifier.

JL Audio's exclusive R.I.P.S. power supply design optimizes the output of each channel pair for any impedance between 1.5 and 4 ohms per channel (3-8 ohms bridged) allowing you to get full use of the MHD600/4-24V's performance capabilities with a wide range of speaker systems.

The tightly regulated power supply design also means that the MHD600/4-24V's clean power output capability remains stable over a wide range of voltages, resulting in enhanced fidelity.

The MHD600/4-24V flexible, studio-grade signal processing allows it to be deployed in a wide range of system applications:

1) As a four-channel (150W x 4) full-range amplifier, delivering full-range signals to two separate stereo speaker systems (front and rear, for example).

2) As a powerful (150W x 4) four-channel satellite amplifier in a bi-amplified system, delivering high-passed signals to front and rear speaker systems. Preamp outputs permit connection of a separate amplifier to drive the subwoofer system.

3) As a 600W full-system amplifier in bi-amplified mode with one channel pair driving subwoofers in low-pass mode (150W x 2 or 300W x 1) and the other channel pair driving main speakers in high-pass mode (150W x 2).

4) As a very powerful (300W x 2) full-range amplifier, delivering full-range signals to a stereo speaker system.

5) As a very powerful (300W x 2) two-channel satellite amplifier in a bi-amplified system, delivering high-passed signals to a stereo speaker system. Preamp outputs permit connection of a separate amplifier to drive the subwoofer system.

6) As a powerful (300W x 2) two-channel subwoofer amplifier in a bi-amplified system, delivering low-passed signals to a dual subwoofer system. Preamp outputs permit connection of a separate amplifier to drive the satellite speakers.

The MHD600/4-24V's flexible input and crossover sections permit operation with a wide variety of source units and system configurations. It can be operated with a single pair of stereo inputs or with separate inputs for its front and rear channels.

The MHD600/4-24V's preamp output can send pass-through signals from the Front Inputs only or it can sum all four input channels to feed a non-fading signal to a separate subwoofer amplifier.

As we said, it's very flexible.

TYPICAL INSTALLATION SEQUENCE

The following represents the sequence for a typical amplifier installation, using an aftermarket source unit. Additional steps and different procedures may be required in some applications. If you have any questions, please contact your authorized JL Audio dealer for assistance.

1) Disconnect the negative battery post connection and secure the disconnected cable to prevent accidental re-connection during installation. **This step is not optional!**

2) Run positive and negative power wire from the battery location to the amplifier mounting location, taking care to route it in such a way that it will not be damaged and will not interfere with vessel operation. 8 AWG is recommended for wire runs greater than 72 inches (180 cm) in length. Use a 2 AWG, 4AWG or 8 AWG main power wire with a power distribution block when additional amplifiers are being installed with the MHD600/4-24V and powered from the same main power wire.

3) Connect power wire to the positive battery post. Fuse the wire with an appropriate fuse block (and connectors) within 18 inches (45 cm) wire length of the positive battery post. This fuse is essential to protect the vessel. Do not install the fuse until the power wire has been connected to the amplifier.

4) Connect negative power wire to the negative battery post. Use the same size power wire as the wire connected to the "**+24V**" connection (minimum 8 AWG).

5) Run signal cables (RCA cables) and remote turn-on wire from the source unit or interface processor to the amplifier mounting location.

6) Run speaker wire from the speaker systems to the amplifier mounting location.

7) Securely mount the amplifier using appropriate hardware. (See page 8 for detailed mounting instructions).

8) Connect the remote turn-on wire and the positive and negative power wires to the amplifier's power connector plug. Then insert the power connector plug into the amplifier's power connector receptacle, pushing firmly.

9) Connect the RCA input cables to the amplifier.

10) Connect the speaker wires to the speaker connector plugs and insert the plugs firmly into the speaker connector receptacles.

11) Carefully review the amplifier's control settings to make sure that they are set according to the needs of the system.

12) Install power wire fuse (25A for a single MHD600/4-24V) and reconnect the negative battery post terminal.

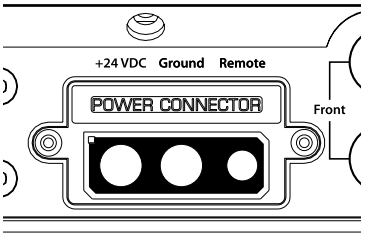
13) Turn on the source unit at a low level to double-check that the amplifier is configured correctly. Resist the temptation to crank it up until you have verified the control settings.

14) Make necessary adjustments to the input sensitivity controls to obtain the right overall output and the desired balance in the system. See Appendix C (pages 18, 19) for the recommended input sensitivity setting method.

15) Enjoy the fruits of your labor with your favorite music.

POWER AND TURN-ON CONNECTIONS

Before installing the amplifier, disconnect the negative (ground) wire from the vessel's battery. This will prevent accidental damage to the system, the vessel and your body during installation.



+24V Battery Connection

You will need to connect a power wire to the vessel's positive battery terminal, using an appropriate power ring or specialized battery terminal connector, such as the JL Audio XB-BTU. This connection must be tight and corrosion-free to ensure proper connectivity. This wire MUST be fused appropriately for safety. Any positive power wires run through metal, wood or fiberglass barriers, must be protected with a high quality insulating grommet to prevent damage to the insulation of the wire. Failure to do so may result in a dangerous short circuit.

Power Wire Requirements

The MHD600/4-24V's **"+24 VDC"** and **"Ground"** connections are designed to accept 8 to 4 AWG power wire. 8 AWG pure copper wire is the minimum recommended wire size for this amplifier. Use of smaller gauge wire (including cheap wire that is fraudulently sold as 8 AWG wire) can create a fire hazard.

If you are installing the MDH600/4-24V with other amplifiers and wish to use a single main power wire, use 4 AWG, 2 AWG or 1/0 AWG pure copper wire as a main power wire. This larger power wire should terminate into a distribution block mounted as close to the amplifiers as possible and should connect to the MDH600/4-24V with 8 AWG pure copper power wire, with each smaller wire fused appropriately for each amplifier or other electronics in the system.

Please note that lower AWG numbers mean bigger wire and vice-versa (1/0 AWG is the largest, 2 AWG is smaller, then 4 AWG, then 8 AWG, etc.).

! IMPORTANT

We do not recommend the use of "copper-clad aluminum wire" or "CCA" wire because this wire is significantly less conductive than pure copper wire. Only use pure copper power wire, such as JL Audio Premium Power Wire. Tinned copper wire (silver color) is desirable as the tin-plating is only a very minor component of the wire and provides corrosion resistance.

Fuse Requirements

The installation of a fuse on the main power wire, within 18 wire inches (45 cm) of the positive battery terminal is vital to protect the wire and the vehicle from fire in the event of a collision or short-circuit. The fuse value at each power wire should be just high enough for all of the equipment being run from that power wire. Do not use a fuse with a value that far exceeds the total fuse rating of the electronics connected to the wire.

If only the MHD600/4-24V is being run from that power wire, we recommend a 25A fuse be used. AGU (big glass fuse). AFS (small blade fuse) or MaxiFuse™ (big plastic-body fuse) types are recommended.

If other amplifiers are also being powered from a main power wire and exceed 80 amps in total fuse rating, we recommend the use of an ANL (large-blade) fuse and holder to protect the main wire and a fused distribution block to protect the individual power wires feeding the amplifiers.

Please consult with your JL Audio dealer to make sure that the wire, fuse holder and fuse ratings are appropriate for your system's needs. The safety of your installation depends on appropriate power connections and fuse protection.

Ground Connection

The ground connection should be made using the same gauge wire as the power connection.

It is common for the alternator to be grounded through its chassis. If the alternator is not grounded through its chassis and instead employs a small (10 AWG - 6 AWG) wire to connect to ground, this wire should also be upgraded to 4 AWG when installing amplifier systems with main fuse ratings above 60A.

! IMPORTANT

Many vessels employ small (10 AWG - 6 AWG) wire to ground the battery to the vessel ground point and to connect the alternator's positive connection to the battery. To prevent voltage drops, these wires should be upgraded to 4 AWG pure copper wire when installing amplifier systems with main fuse ratings above 60A.

Turn-On Wire

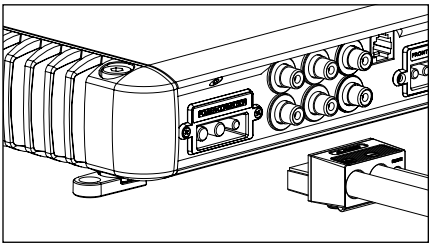
The MHD600/4-24V uses a conventional +12V or +24V remote turn-on wire, typically controlled by the source unit's remote turn-on output. The amplifier will turn on when +12V or +24V is present at its **"Remote"** input and turn off when +12V or +24V is switched off. If a source unit does not have a dedicated remote turn-on output, the amplifier's turn-on lead can be connected to +24V via a switch that derives power from an ignition-switched circuit.

The MHD600/4-24V's **"Remote"** turn-on connector is designed to accept 18 AWG – 12 AWG wire. 18 AWG is more than adequate for this purpose.

To connect the remote turn-on wire to the amplifier, first back out the set screw on the bottom of the Power Connector Plug, using the supplied hex wrench. Strip 1/2 inch (12mm) of wire and insert the bare wire into the receptacle, seating it firmly so that no bare wire is exposed. When using smaller wire, it may be necessary to strip 1 inch of insulation from the wire and fold the bare wire in half prior to insertion. While holding the wire in the terminal, tighten the set screw firmly using the supplied 2.5 mm hex wrench, taking care not to strip the head of the screw and making sure that the wire is firmly gripped by the set screw.

Amplifier Power Connector Plug

To connect the power wires and the remote turn-on wire to the amplifier, unplug the power connector plug from the amplifier chassis (pull back firmly) and back out the set screws on the connector plug, using the supplied 4 mm hex wrench for the **"+24 VDC"** and **"Ground"** connections and the supplied 2.5 mm hex wrench for the **"Remote"** connection. Strip 3/8 inch (10 mm) of insulation from the end of each wire and insert the bare wire into the receptacle on power connector plug, seating it firmly so that no bare wire is exposed. While holding each wire in place, tighten each set screw firmly, taking care not to strip the head of the screw.



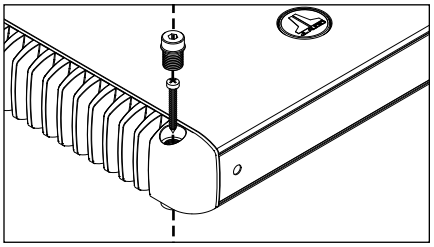
! IMPORTANT

Never make power connections with a "live" wire. Always disconnect the negative battery post before making any connections or adjustments to a 24V power connection!

AMPLIFIER MOUNTING OPTIONS

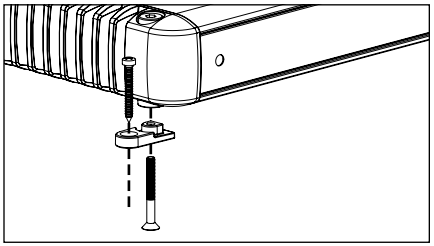
The MHD600/4-24V has two mounting options to ease in installation.

Standard Mounting



The standard method of mounting requires removal of the four corner caps with the 3/16-inch hex wrench included with your amplifier. Using appropriate mounting screws (not included), secure the amplifier in all four corners and replace the corner caps.

Lateral Mounting Feet



Lateral Mounting Feet are also included with your MHD600/4-24V to provide an alternative mounting option. Each mounting foot should be attached to the bottom of the amplifier by screwing the provided bolt into the bottom of the amplifier and up into the corner cap with the supplied 1/8-inch hex wrench. Next, using appropriate mounting screws (not included), secure the amplifier by its four Lateral Mounting Feet.

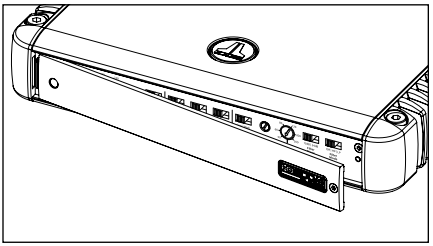
! IMPORTANT

Check before drilling any holes in your vessel to make sure that you will not be drilling through a gas tank, brake line, wiring harness or other vital vessel system.

CONTROL PANEL SECURITY COVER

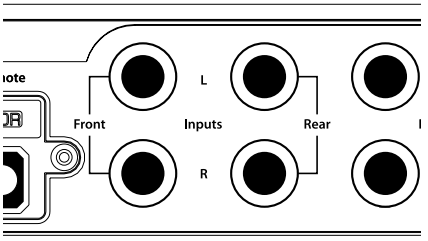
The MHD600/4-24V features a Control Panel Security Cover. When installed, the cover ensures that your amplifier settings are not accidentally changed while creating a clean aesthetic for the amplifier and your installation. The control panel security cover is pre-installed at the factory and must be temporarily removed for access to the controls described throughout this manual.

The security cover is secured by a single 2.5 mm hex-head screw at the far right of the panel. Loosen the hex-head screw to release the security cover (it is not necessary to completely remove the screw). To re-install the security cover once all adjustments have been made, insert the tongue on the cover's left edge into the groove where the left-side heatsink meets the control panel, hinge the panel closed and secure the screw using the supplied 2.5 mm hex wrench. Do not overtighten the screw.



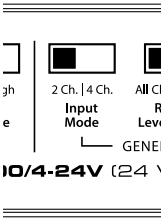
AMPLIFIER INPUTS

The MHD600/4-24V has two separate input sections, one for the **"Front"** left and right channels and another for the **"Rear"** left and right channels. Each section consists of a pair of RCA-type input jacks on the Connection Panel of the amplifier and a pair of input controls on the Control Panel of the amplifier: an **"Input Voltage"** switch and an **"Input Sens."** rotary control.



"INPUT MODE" SWITCH

The Control Panel houses an **"Input Mode"** switch located under the **"General Setup"** heading. This switch allows operation of all four amplifier channels with only one pair of input signals or with independent front and rear input signal pairs.



To use separate inputs for the **"Front"** and **"Rear"** amplifier sections, (in order to permit front-to-rear fading, for example), select **"4 Ch."** on the **"Input Mode"** switch. In this mode, you must connect separate pairs of input cables to the **"Front"** and **"Rear"** amplifier inputs.

To operate all four channels of the MHD600/4-24V with a single pair of stereo inputs, select the **"2 Ch."** position on the **"Input Mode"** switch and connect a single pair of input cables to the **"Front"** input jacks only. In this mode, the amplifier will route the signals connected to the **"Front"** inputs to the Front and Rear amplifier channels.

CHANNEL CONTROL SECTIONS

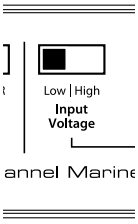
Flanking the **"General Setup"** section on the Control Panel of the amplifer are two sets of identical controls: one for the **"Rear Channel Controls"** (on the left side) and one for the **"Front Channel Controls"** of the amplifier (on the right side).

In each of these sections you will find an **"Input Voltage"** range switch and a rotary control labeled **"Input Sens."** (Input Sensitivity). These controls are designed to match the input sensitivity of the MHD600/4-24V to the specific signal source that is feeding it and must be adjusted, with care, following the procedures outlined in this manual. Failure to make correct adjustments can result in weak output, excessive distortion and/or undesirable noise in the audio output of the amplifier!

Note: The Channel Control sections also house **"Filter Mode"**, **"Filter Slope"** and **"Filter Freq."** controls. These are crossover filter controls and will be discussed in the next section of this manual. This section will explain the Input Controls only.

"Input Voltage" Switch

A wide range of signal input voltages can be accommodated by each of the MHD600/4-24V's differential-balanced inputs (200mV – 8V RMS). This wide range is split up into two sub-ranges, accessible via the **"Input Voltage"** switches located in each input section of the amplifier. Be aware that each input section's **"Input Voltage"** switch will have to be configured, regardless of how many input cables are actually feeding the amplifier.



The **"Low"** position on each **"Input Voltage"** switch selects an input sensitivity range between 200mV and 2V. This means that the **"Input Sens."** rotary control will operate within that voltage window. If you are using an aftermarket source unit, with preamp-level outputs, this is most likely the position that you will use (regardless of what voltage output capability is claimed by the source unit).

The "**High**" position on the "**Input Voltage**" switch selects an input sensitivity range between 800mV and 8V. This is useful for certain high-output preamp level signals as well as speaker-level outputs from source units not equipped with preamp-level outputs.

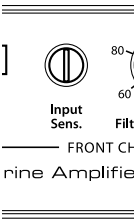
To use speaker-level sources, splice the speaker output wires of the source unit or small amplifier onto a pair of RCA plugs for each input pair or use the JL Audio ECS Speaker Wire to RCA adaptor (XB-CLRAIC2-SW).

! IMPORTANT

The output of the amplifier decreases for a given input voltage when the "Input Range" switch is placed in the "High" position. The output increases with the switch in the "Low" position. While this may sound counter-intuitive, it is correct as described.

"Input Sens." Control

Located next to the **"Input Voltage"** switch in each input section is a rotary control labeled **"Input Sens."**. Once the appropriate **"Input Voltage"** range has been selected, this control can be used to match the source unit's output voltage to the input stage of each pair of amplifier channels for maximum clean output. Rotating the control clockwise will result in higher sensitivity (louder for a given input voltage). Rotating the control counter-clockwise will result in lower sensitivity (quieter for a given input voltage). To properly set each pair of amplifier channels for maximum clean output, please refer to Appendix C (pages 18, 19) in this manual.



After using this procedure, you can then adjust the relative level of each channel pair by adjusting the input sensitivity downward on either or both channel pairs, if they require attenuation to achieve the desired system balance.

Do not increase the **"Input Sens."** setting for any amplifier in the system beyond the maximum level established during the procedure outlined in Appendix C (pages 18, 19). Doing so will result in audible distortion and possible speaker damage.

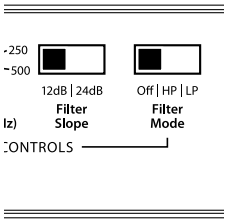
Be aware that both **"Input Sens."** adjustments will have to be made, regardless of how many input cables are feeding the amplifier. These controls will allow you to set the appropriate relative levels for the **"Front"** channels relative to the **"Rear"** channels and any other amplifier channels in the system.

CROSSOVER CONTROLS

Crossovers are groups of electronic filters designed to control the frequency ranges that each speaker in a system will be tasked with reproducing. Proper crossover setup is critical to sound quality and reliability.

The MHD600/4-24V has two individual filters, one for the **"Front"** channels and the other for the **"Rear"** channels. Each can be configured as a high-pass filter (attenuates low frequencies) or as a low-pass filter (attenuates high frequencies). Additionally, the user can select from a shallow (12dB/octave) filter slope or a more aggressive (24dB/octave) slope.

Each Channel Control section contains identical crossover filter controls.



1) "Filter Mode" Control: this switch allows you to configure the filter for that Channel Pair into one of two filter types.

"Off": Defeats the filter completely, allowing the full range of frequencies present at the inputs to feed that pair of channels. This is useful for systems utilizing outboard crossovers or requiring full-range reproduction from that pair of channels.

"HP" (**High-Pass**): Configures the CH 1&2 filter to attenuate frequencies below the selected filter frequency. Useful for connection of component speakers in a bi-amplified system.

"LP" (**Low-Pass**): Attenuates frequencies above the selected filter frequency. Useful for connection of subwoofer(s) in a bi-amplified system.

2) "Filter Slope" Control: This switch allows you to select from two filter slopes.

"12dB": Configures the filter to attenuate frequencies above or below the selected filter frequency at a rate of 12 dB per octave (Butterworth alignment).

"24dB": Configures the filter to attenuate frequencies above or below the selected filter frequency at a rate of 24 dB per octave (Linkwitz-Riley alignment).

Depending on the speaker system and the vessel, different filter slopes may be required to produce a smooth transition between the sound of different speakers in the system.

In high-pass mode, the sharper **"24dB"** setting will do a better job of protecting small speakers with limited power handling. In low-pass mode, the **"24dB"** setting can also help by more aggressively removing lower midrange output from a subwoofer system.

The shallower **"12dB"** octave setting allows for more output overlap between the speakers being crossed over. In many cases, this will result in a smoother "blend" or transition between speaker systems.

Experiment to find the slope or combination of slopes which best matches the acoustic requirements of your system.

3) "Filter Freq. (Hz)" Control:
This control selects the frequency at which the filter begins to attenuate the signal and refers specifically to the frequency at which output has been attenuated by -3dB.

The filter frequency markings surrounding this rotary control are for reference purposes and are generally accurate to within 1/3 octave or better. If you would like to select the filter cutoff frequency with a higher level of precision, consult the charts in Appendix B (page 18) of this manual.

BI-AMPLIFIED SYSTEMS

Bi-amplified systems are defined as systems in which separate amplifier channels drive low-frequency (LF) and high-frequency (HF) speakers and are separately filtered to send appropriate frequency ranges to each speaker system.

The most common application of bi-amplification in mobile audio is to drive a subwoofer system from one or more amplifiers or channels and component speakers from separate amplifiers or channels.

The MHD600/4-24V can be configured to drive a bi-amplified system by itself or with a separate subwoofer amplifier.

Bi-Amplified System with one MHD600/4-24V

In this configuration, the **"Rear"** channels of the MHD600/4-24V will drive subwoofers (stereo 150W x 2 or bridged 300W x 1) with low-pass filtering. The **"Front"** channels will drive component speakers in stereo (150W x 2) with high-pass filtering.

Crossover Setup for Bi-Amplified System with one MHD600/4-24V:

Once the input sections have been configured appropriately, go to the **"Rear Channel Controls"** Section. Select **"LP"** (low-pass) on the **"Filter Mode"** switch and **"12dB"** or **"24dB"** on the **"Filter Slope"** switch and an appropriate **"Filter Freq."** (80-90 Hz is a good starting point).

Next, turn your attention to the **"Front Channel Controls"** Section. and select **"HP"** (high-pass) on the **"Filter Mode"** switch and **"12dB"** or **"24dB"** on the **"Filter Slope"** switch and an appropriate **"Filter Freq."** (again, 80-90 Hz is a good starting point).

After proper adjustment of the Front and Rear channel **"Input Range"** and **"Input Sens."** controls using the method shown in Appendix C (pages 18, 19), you can fine tune filter frequencies and slopes and attenuate either pair of channels to achieve proper balance. For precise filter frequency information refer to Appendix B (page 18).

Bi-Amplified System with one MHD600/4-24V in four-channel mode and a separate subwoofer amplifier

This configuration requires that the separate subwoofer amplifier has a built-in low-pass filter. In this configuration, the **"Front"** channels of the MHD600/4-24V will drive front component speakers (stereo 150W x 2) with high-pass filtering. The **"Rear"** channels will drive rear component speakers in stereo (150W x 2) with high-pass filtering.

The separate subwoofer amplifier will drive the subwoofer system with low-pass filtering (select a filter frequency of 80-90 Hz to start). The inputs of the subwoofer amplifier can be fed from the MHD600/4-24V's preamp output or from a dedicated subwoofer output on the source unit.

Crossover Setup for Bi-Amplified System with one MHD600/4-24V and a separate subwoofer amplifier:

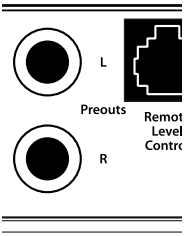
Once the input and preamp output sections have been configured appropriately, go to the **"Front Channel Controls"** Section. Select **"HP"** (high-pass) on the **"Filter Mode"** switch and **"12dB"** or **"24dB"** on the **"Filter Slope"** switch and an appropriate **"Filter Freq."** (80-90 Hz is a good starting point).

Next, turn your attention to the **"Rear Channel Controls"** Section and select **"HP"** (high-pass) on the **"Filter Mode"** switch and **"12dB"** or **"24dB"** on the **"Filter Slope"** switch and an appropriate **"Filter Freq."** (again, 80-90 Hz is a good starting point).

After proper adjustment of the MHD600/4-24V's and the subwoofer amplifier's **"Input Range"** and **"Input Sens."**, you can fine tune filter frequencies and slopes and attenuate either pair of channels to achieve proper balance. For proper adjustment of the **"Input Sens."** controls of the MHD600/4-24V use the method shown in Appendix C (pages 18, 19). For precise filter frequency information for the MHD600/4-24V refer to Appendix B (pages 18). Refer to the subwoofer amplifier owner's manual for its proper adjustment levels.

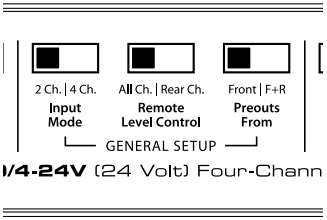
PREAMP OUTPUTS

The MHD600/4-24V incorporates a pass-through preamp output section, so that additional amplifiers can easily be connected to the same signal(s) feeding the MHD600/4-24V. These preamp output signals are accessible via a stereo pair of RCA-type jacks, labeled **"Preouts",** on the Connection Panel.



The term "pass-through" refers to the fact that the Preamp Output signals are not affected by any crossover filter or input sensitivity setting selected on the MHD600/4-24V (if the input signal is full-range, the Preamp Output will be full-range). These preamp output signals are buffered to prevent noise and are always preamp level, regardless of the level of signals feeding the MHD600/4-24V's inputs.

The pass-through Preamp Outputs can be configured two different ways using the switch labeled **"Preouts From"** in the **"General Setup"** section of the Control Panel.



1) "Front": The preamp output delivers the same signal that is connected to the MHD600/4-24V's **"Front Inputs"**. This mode is useful for feeding a subwoofer amplifier when the MHD600/4-24V is being used to drive front and rear speaker systems. In this mode, the preamp output level will track with the signal level of the front input signals, allowing the user to fade the rear channels in and out, without affecting the subwoofer level.

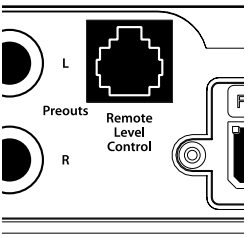
3) "F+R" (Front + Rear): This mode delivers a sum of the signals being fed to the **"Front Inputs"** and the **"Rear Inputs"** of the amplifier. When the MHD600/4-24V is being used to drive front and rear speaker systems, this preamp output mode will deliver a summed front/rear signal to the subwoofer amplifier, while permitting fading of the front and rear speaker systems from the source unit.

REMOTE LEVEL CONTROL (OPTIONAL)

With the addition of the optional Remote Level Control (HD-RLC), you can control the volume of one or both channel pairs of the MHD600/4-24V from the cockpit. This is useful for subwoofer level control or even as a master volume control for the system.

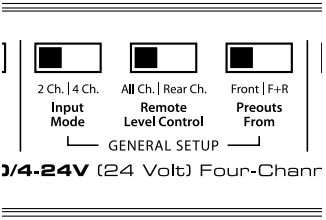
The HD-RLC connects to the jack labeled **"Remote Level Control"** on the Connection Panel of the amplifier using a standard telephone cable (supplied with the HD-RLC).

If desired, multiple MHD amplifiers can be controlled from a single HD-RLC controller using a simple phone line "splitter" and multiple phone cables (not supplied).



When connected to the amplifier, the HD-RLC operates as follows. At full counter-clockwise rotation, the audio will mute completely. At full clockwise rotation the level will be the same as if the HD-RLC was not connected at all. In other words, it operates strictly as a level attenuator.

Depending on the application, you may want the HD-RLC to only affect one channel pair or both channel pairs. A switch labeled **"Remote Level Control"** in the **"General Setup"** Section of the Control Panel allows you to determine whether the HD-RLC affects the level of all channels **"All Ch."** or only the rear channels **"Rear Ch."**



For example, if you are using the MHD600/4-24V in a stand-alone bi-amplified mode, you may want the HD-RLC to only affect the level of the subwoofer channels. Setting the **"Remote Level Control"** switch to the **"Rear Ch."** position accomplishes this (provided the subwoofer system is connected to the rear channels).

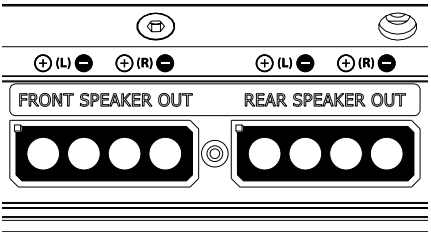
In other cases, you may want control of all four channels at the same time, so you would set the **"Remote Level Control"** switch to the **"All Ch."** position.

! IMPORTANT

The RBC-1 Remote Bass Control used with JL Audio Slash, Slash v2, e-Series, A-Series and G-Series amplifiers is NOT compatible with the MHD Series amplifiers. If you attempt to connect an RBC-1 to an MHD amplifer, the control will not work. You must use the HD-RLC controller.

SPEAKER OUTPUTS

The MHD600/4-24V employs JL Audio's exclusive Regulated, Intelligent Power Supply (R.I.P.S.) design. The operation of the R.I.P.S. system is independent for each pair of channels. This sophisticated power supply allows the amplifier to produce its optimum power (150 watts x 4) over a wide range of speaker impedances.



Unlike conventional amplifiers that require a specific impedance to produce optimum power, the R.I.P.S.-equipped MHD600/4-24V gives you the freedom to use a variety of speaker configurations that achieve final nominal impedances between 1.5 – 4Ω per channel in stereo (without sacrificing power output or sound quality). When bridged, each channel pair will optimize output at 300 watts between 3 – 8Ω.

The operation of the R.I.P.S. circuitry is entirely automatic and adjusts itself every time the amplifier is turned on. There are no user controls to configure. The system operates through multiple stages of impedance optimization, choosing the stage most appropriate to the actual impedance of the speakers you connect to it.

! IMPORTANT

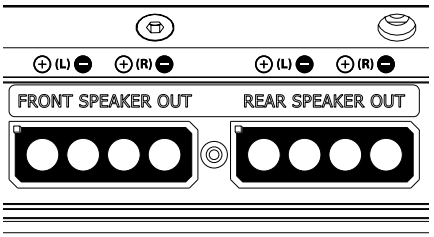
If you connect a load higher than 4Ω nominal per channel in stereo mode (or 8Ω in bridged mode), power will drop by half with every doubling of impedance above 4Ω stereo / 8Ω mono. If you connect a load lower than 1.5Ω nominal per channel in stereo mode (or 3Ω in bridged mode, the amplifier protection circuitry activates a "safe" mode which reduces amplifier power to protect the circuitry from failure (the LED status indicator on the control panel will light up amber to indicate that this has happened). See page 16 for details.

! IMPORTANT

Speaker loads below 1.5Ω nominal per channel in stereo or 3Ω nominal in bridged mode are not recommended and may cause the amplifier output to distort excessively.

BRIDGING CONSIDERATIONS

Bridging is the practice of combining the output of two amplifier channels to drive a single load. When bridged, each channel produces signals of equal magnitude, but opposite polarity. The combined output of the two channels provides twice the output voltage available from a single channel. The MHD600/4-24V has been designed for bridging of its channel pairs without the need for input inversion adaptors.

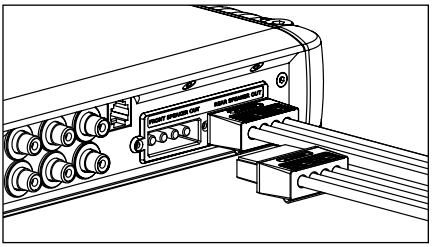


To bridge a pair of channels, use the **"Left +"** and **"Right –"** speaker connectors only (the **"Left –"** and **"Right +"** remain unused). Then connect a mono signal to both left and right RCA inputs for that channel pair. This requires an RCA "Y-Adaptor" (sold separately), because a bridged pair of channels requires that both amplifier channels of the bridged pair receive input. Connection of only one RCA input will result in reduced power output, increased distortion and can cause the amplifier to overheat.

When bridged, each channel pair will deliver optimum power into a 3-8Ω load. Operating bridged channel pairs into a load lower than 3Ω is not recommended.

Speaker Connector Plugs

To connect the speaker wires to the amplifier, unplug the speaker connector plugs from the amplifier chassis (pull back firmly) and back out the set screws on each connector plug, using the supplied 2.5 mm hex wrench. Strip 3/8 inch (10 mm) of insulation from the end of each wire and insert the bare wire into the receptacle on the speaker connector plug, seating it firmly so that no bare wire is exposed. While holding each wire in place, tighten each set screw firmly, taking care not to strip the head of the screw.



"STATUS" LED / PROTECTION CIRCUITRY

There is a single multi-color LED on the control panel of the amplifier to indicate the amplifier's operating status. This LED's behavior is as follows:

1) **Flashing Green**: amplifier is powering up, audio output is muted.

2) **Constant Green**: amplifier is on and functioning normally, audio output is active.

3) **Constant Red**: lights to indicate that the amplifier has exceeded its safe operating temperature, putting the amplifier into a self-protection mode, which reduces the peak power output of the amplifier. The red light will turn green and the amplifier will return to full-power operating mode when its temperature returns to a safe level.

3) **Constant Amber (yellow)**: lights to indicate that the impedance of the speaker load connected to the amplifier is lower than the optimum load impedance range for the amplifier. When this light is on, a protection circuit engages and reduces the power output of the **"Front"** or the **"Rear"** channels, depending on which channel is experiencing the problem. The amber indicator will also light when a short-circuit is detected in the speaker wiring (this can be a short between the positive and negative speaker wires or between either speaker wire and the vessel chassis). This can be used to diagnose a short-circuit by only connecting one of the amplifier sections at a time (**"Front"** or **"Rear"** channels). The amber LED will light when you connect the section that is experiencing the problem and turn the volume up.

4) **Alternating Red and Green**: lights to indicate that the amplifier is experiencing a fault that may require service of the amplifier, its wiring or the vessel's charging system. Audio is muted when this fault occurs. The most likely cause of this fault is a low supply voltage condition. If battery voltage drops below 17 volts at any point, the amplifier (except for the "Status" LED) will shut itself off to protect itself and the vessel's charging system. If the Remote Turn-On voltage drops below 12 volts, the "Status" LED will also turn off.

   The amplifier will turn back on automatically when voltage climbs back above 18 volts. This shut-down and turn-on behavior may happen in a rapid cycle when bass-heavy program material causes a weak charging system to momentarily dip too low. If this is happening in your system, have your charging system inspected to make sure it is working properly.

   If no problem is found with the supply voltage to the amplifier and you are still seeing alternating Red and Green on the "Status" LED, check that there are no short-circuits to chassis ground in any of the speaker wiring in the vessel. Disconnect speaker connectors from the amplifier one-by-one to check.

   If no problem is found with the supply or remote voltage, disconnect everything except power/ground/remote. If the amplifier is then turned on and displays an alternating red-green, the amplifier needs service.

   For more information on troubleshooting this amplifier, refer to Appendix D (pages 20, 21)

SERVICING YOUR JL AUDIO AMPLIFIER

If your amplifier fails or malfunctions, please return it to your authorized JL Audio dealer so that it may be sent in to JL Audio for service. There are no user serviceable parts or fuses inside the amplifier. The unique nature of the circuitry in the JL Audio amplifiers requires specifically trained service personnel. Do not attempt to service the amplifier yourself or through unauthorized repair facilities. This will not only void the warranty, but may result in the creation of more problems within the amplifier.

If you have any questions about the installation or setup of the amplifier not covered in this manual, please contact your dealer or technical support.

JL Audio Technical Support:
(954) 443-1100
9:00 AM – 5:30 PM (Eastern Time Zone)
Monday - Friday

APPENDIX A:
MHD600/4-24V Specifications

Amplifier Topology: Class D, switching type with patented Single-Cycle Control™ technology.
Power Supply: Pulse width modulation-regulated switching power supply
Recommended Fuse Value / Type: 25A (AFS, AGU or MaxiFuse™)
Rated Power (Stereo):
150W RMS x 4 @ 1.5-4Ω (22V - 29V)
Rated Power (Bridged):
300W RMS x 2 @ 3-8Ω (22V - 29V)
THD at Rated Power: <0.03% @ 4Ω per channel (Average at 1 kHz)
Signal to Noise Ratio (20 kHz Bandwidth):
Referred to Rated Power: 110 dBA
Referred to 1 Watt: 88.2 dBA
Frequency Response: 6 Hz - 30 kHz (+0, -1dB)
Damping Factor:
300 @ 4Ω per ch. / 50 Hz
150 @ 2Ω per ch. / 50 Hz

Crossover Filters:

Filter Sets: Two (Front Channel and Rear Channel)
Filter Type: State-variable, 12 dB/octave Butterworth or 24 dB/octave Linkwitz-Riley
Filter Modes: Low-Pass or High-Pass, Defeatable.
Cutoff Freq. Range: Continuously variable, 50 - 500 Hz

Input Sections:

No. of Inputs: Two Stereo Pairs (Front and Rear)
Input Type: Differential-balanced with RCA jack inputs
Input Range: Switchable from 200mV - 2V RMS (Low) to 800mV - 8V RMS (High)

Preamp Output:

2-Channel, buffered pass-through type, switch-selectable to pass signal from "Front" inputs only, or from all four inputs (summed).

Chassis Dimensions (LxWxH):

10.74 in. x 7.85 in. x 1.93 in. (273 mm x 199.5 mm x 49 mm)
Dimensions do not include connectors.

Due to ongoing product development, all specifications are subject to change without notice.

APPENDIX B:
Precise Frequency Selection Chart

Detent Number	"FILTER FREQ" Panel Marking	Actual Freq.
Full counter-clockwise: 53		
01	"50"	53
02		53
03		53
04		53
05		54
06		56
07		58
08	"60"	60
09		62
10		64
11		66
12		68
13		71
14		74
15		76
16	"80"	80
17		83
18		87
19		91
20		94
21		99
22		104
23		109
24	"12 o'clock"	115
25		121
26		128
27		137
28		147
29		160
30		174
31		191
32		211
33	"250"	236
34		269
35		309
36		369
37		443
38	"500"	484
39		525
Full-clockwise: 528		

APPENDIX C:
Input Sensitivity Level Setting

JL Audio amplifiers utilizing the Regulated Intelligent Power Supply (R.I.P.S.) allow delivery of their rated power when connected to any load impedance from 1.5 - 4Ω per channel and when connected to a charging system with any voltage from 22 - 29V. This design is beneficial for many reasons. One of these reasons is ease of setup.

Because each JL Audio amplifier will always deliver the same amount of power within its operational range of impedances and supply voltages, the maximum, unclipped output is very predictable.

This makes setting the gain structure via the input sensitivity controls very simple. Following the directions below will allow the user to adjust the input sensitivity of the amplifier(s) simply and easily in just a few minutes using equipment which is commonly available in installation bays.

Necessary Equipment

- Digital AC Voltmeter
- CD with a sine-wave test tone recorded at 0 dB reference level in the frequency range to be amplified for that set of channels (50 Hz for subwoofer channels, 1 kHz for a midrange application). The CleanSweep® Calibration Disc contains the appropriate test tones and is available for sale at http://store.jlaudio.com Do not use attenuated test tones (-10 dB, -20 dB, etc.).

! IMPORTANT

Do not increase any "Input Sens." setting in the system beyond the maximum level established during this procedure. Doing so will result in audible distortion and possible speaker damage.

It will be necessary to re-adjust the **"Input Sens."** for the affected channels if any equalizer boost is activated after setting the **"Input Sens."** with this procedure. This applies to any EQ boost circuit, source unit tone controls or EQ circuits. EQ cuts will not require re-adjustment.

The Nine-Step Procedure

(follow this procedure for each pair of channels)

1) Disconnect the Speaker Connector Plugs.

2) Turn off all processing on the source unit (bass/treble, loudness, EQ, etc.). Set fader control to center position and subwoofer level control to 3/4 of maximum (if used to drive the MHD600/4-24V). Disconnect the HD-RLC Remote Level Control temporarily (if one is being used).

3) Switch the **"Input Voltage"** to **"Low"** and turn the **"Input Sens."** control on both sets of channels all the way down.

4) Set the source unit volume to 3/4 of full volume. If either set of channels is being driven by a source unit's dedicated subwoofer output, also adjust the source unit's subwoofer level control to 3/4 of maximum output. This will allow for reasonable gain overlap with moderate clipping at full volume.

5) Using the chart below, determine the target voltage for input sensitivity adjustment according to the nominal impedance of the speaker system connected to each set of outputs.

6) Verify that you have disconnected the Speaker Connector Plugs before proceeding. Play a track with an appropriate sine wave (within the frequency range to be amplified by each set of channels) at 3/4 source unit volume.

7) Connect the AC voltmeter to the **"Front Speaker Outputs"** or **"Rear Speaker Outputs"** connectors of the amplifier. If the channel pair is operating in stereo, it is only necessary to measure one channel in the pair. If bridged, make sure you test the voltage at the correct connectors (L+ and R–).

8) Increase the "**Input Sens**." control until the target voltage is delivered for that set of channels. If excessive voltage is read on either set of channels with the control at minimum (full counterclockwise), switch the appropriate **"Input Voltage"** switch to **"High"** and re-adjust.

9) Once you have adjusted each set of channels to its maximum unclipped output level, reconnect the speaker(s). The **"Input Sens."** controls can now be adjusted downward if either or both sets of channels requires attenuation to achieve the desired system balance.

Nom. Impedance	FRONT CHANNELS		REAR CHANNELS	
	Stereo	Bridged	Stereo	Bridged
8Ω	24.5 V	49.0 V	24.5 V	49.0 V
6Ω	24.5 V	42.4 V	24.5 V	42.4 V
4Ω	24.5 V	34.6 V	24.5 V	34.6 V
3Ω	21.2 V	30.0 V	21.2 V	30.0 V
2Ω	17.3 V	**not recommended**	17.3 V	**not recommended**
1.5Ω	15.0 V	**not recommended**	15.0 V	**not recommended**

APPENDIX D: TROUBLESHOOTING

"How do I properly set the input sensitivity on my amplifier"

Please refer to Appendix C (pages 18, 19) to set the input sensitivity for maximum, low-distortion output.

"My amplifier doesn't turn on"

Check the fuse(s), not just visually, but with a continuity meter. It is possible for a fuse to have poor internal connections that cannot be found by visual inspection. It is best to take the fuse out of the holder for testing. If no problem is found with the fuse, inspect the fuse-holder.

Check the integrity of the connections made to each of the "**+24VDC**", "**Ground**", and "**Remote**" terminals. Ensure that no wire insulation is pinched by the terminal set screw and that each connection is tight.

Check to make sure there is +12V/+24V at the **"Remote"** connection of the amplifier. In some cases, the turn-on lead from the source unit is insufficient to turn on multiple devices and the use of a relay is required.

"I get a distorted / attenuated sound coming out of the speaker(s)"

Check the speaker wires for a possible short, either between the positive and negative leads or between either speaker lead and the vessel's chassis ground. If a short is present, you will experience distorted and/or attenuated output. The **"Status"** LED will turn amber (yellow) in this situation. It may be helpful to disconnect the speaker wires from the amplifier and use a different set of wires connected to a test speaker.

Check the nominal load impedance to verify that each channel of the amplifier is driving a load equal to or greater than 1.5 ohms in stereo mode (3 ohms bridged).

Check the input signal and input signal cables to make sure signal is present at the **"Amplifier Inputs"** and the cables are not pinched or loose. It may be helpful to try a different set of cables and/or a different signal source to be sure.

"My amplifier's output fluctuates when I tap on it or hit a bump"

Check the connections to the amplifier. Make sure that the insulation for all wires has been stripped back far enough to allow a good contact area inside the connector plugs.

Check the input connectors to ensure that they all are making good contact with the input jacks on the amplifier.

"My amplifier shuts off once in a while, usually at higher volumes"

Check your voltage source and grounding point. The power supply of the MDH600/4-24V will operate with charging system voltages down to 18V. Shutdown problems at higher volume levels can occur when the charging system voltage drops below 18V. These dips can be of very short duration making them extremely difficult to detect with a common DC voltmeter. To ensure proper voltage, inspect all wiring and termination points. It may also be necessary to upgrade the ground wire connecting the battery to the vessel's chassis and the power wire connecting the alternator to the battery. Many vessels employ small (10 AWG - 6 AWG) wire to ground the battery to the vessel's chassis and to connect the alternator to the battery. To prevent voltage drops, these wires should be upgraded to 4 AWG when installing amplifier systems with main fuse ratings above 60A. **Grounding problems are the leading cause of misdiagnosed amplifier "failures."**

"My amplifier turns on, but there is no output"

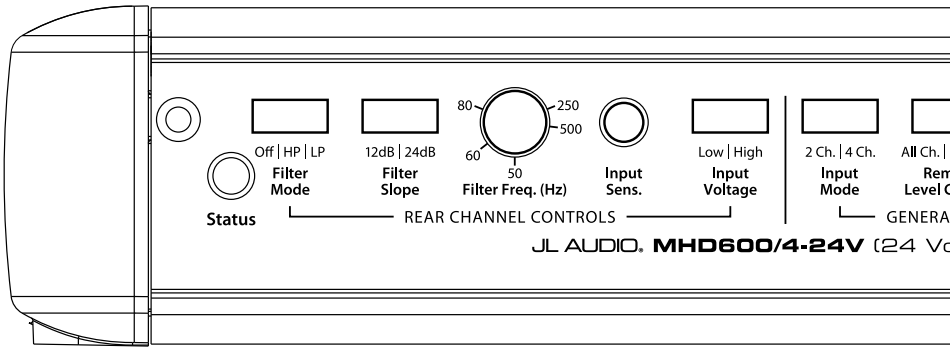
Check the input signal using an AC voltmeter to measure the voltage from the source unit while an appropriate test tone is played through the source unit (disconnect the input cables from the amplifier prior to this test). The frequency used should be in the range that is to be amplified by the amplifier (example: 50 Hz for a sub bass application or 1 kHz for a full range / high-pass application). A steady, sufficient voltage (between 200mV and 8.0-volts) should be present at the output of the signal cables.

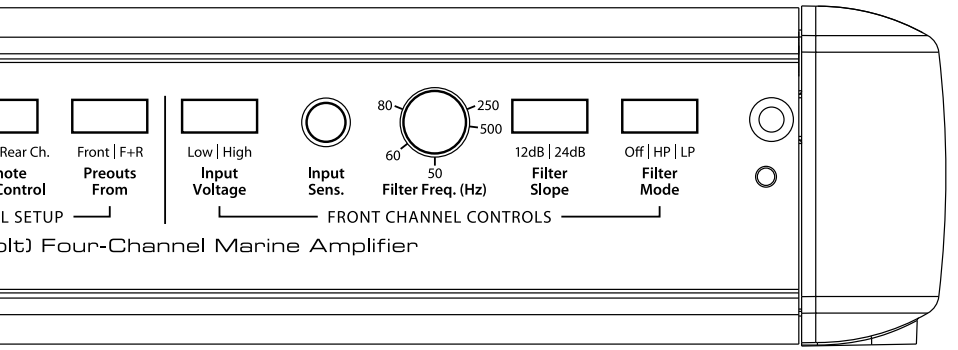
Check the output of the amplifier. Using the procedure explained in the previous check item (after plugging the input cables back into the amplifier) test for output at the speaker outputs of the amplifier. Unless you enjoy test tones at high levels, it is a good idea to remove the Speaker Connector Plugs from the amplifier while doing this. Turn the volume up approximately half way. 5V or more should be measured at the speaker outputs. This output level can vary greatly between amplifiers but it should not be in the millivolt range with the source unit at half volume. If you are reading sufficient voltage, check your speaker connections as explained below.

Check to ensure that the speaker wires are making a good connection with the metal inside the Speaker Connector Plugs. The speaker wire connectors are designed to accept up to 12 AWG wire. Make sure to strip the wire to allow for a sufficient connection with the metal inside each terminal.

INSTALLATION NOTES:

Use this diagram to document your amplifier's switch and control positions.




Rear Ch.
Front | F+R
Preouts From
Low | High
Input Voltage
Input Sens.
80
250
500
60
50
Filter Freq. (Hz)
12dB | 24dB
Filter Slope
Off | HP | LP
Filter Mode
L SETUP
FRONT CHANNEL CONTROLS
olt) Four-Channel Marine Amplifier

LIMITED WARRANTY - MARINE PRODUCTS (USA)

JL AUDIO warrants this product to be free of defects in materials and workmanship for a period of two (2) years from the original date of purchase.

This warranty is not transferable and applies only to the original purchaser from an authorized JL AUDIO dealer. Should service be necessary under this warranty for any reason due to manufacturing defect or malfunction, JL AUDIO will (at its discretion), repair or replace the defective product with new or remanufactured product at no charge. Damage caused by the following is not covered under warranty: accident, misuse, abuse, product modification or neglect, failure to follow installation instructions, unauthorized repair attempts, misrepresentations by the seller. This warranty does not cover incidental or consequential damages and does not cover the cost of removing or reinstalling the unit(s). Cosmetic damage due to accident or normal wear and tear is not covered under warranty.

Warranty is void if the product's serial number has been removed or defaced.

Any applicable implied warranties are limited in duration to the period of the express warranty as provided herein beginning with the date of the original purchase at retail, and no warranties, whether express or implied, shall apply to this product thereafter. Some states do not allow limitations on implied warranties, therefore these exclusions may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

If you need service on your JL AUDIO product:

All warranty returns should be sent to JL AUDIO 's Amplifier Service Facility freight-prepaid through an authorized JL AUDIO dealer and must be accompanied by proof of purchase (a copy of the original sales receipt). Direct returns from consumers or non-authorized dealers will be refused unless specifically authorized by JL AUDIO with a valid return authorization number.

Warranty expiration on products returned without proof of purchase will be determined from the manufacturing date code. Coverage may be invalidated as this date is previous to purchase date. Non-defective items received will be returned freight-collect. Customer is responsible for shipping charges and insurance in sending the product to JL AUDIO. Freight damage on returns is not covered under warranty.

For Service Information in the U.S.A. please call
JL Audio Customer Service: (954) 443-1100
9:00 AM – 5:30 PM (Eastern Time Zone)
JL Audio, Inc
10369 North Commerce Pkwy.
Miramar, FL 33025
(do not send product for repair to this address)

International Warranties:
Products purchased outside the United States of America are covered only by that country's distributor and not by JL Audio, Inc.

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