**Specifications:**

Default board setup: 26dB gain, differential output, P48 phantom-powered

| | | |
|---|---|---|
| Input Referred Noise: | < 1µV | 10nF input shunt<br>Unweighted 20Hz - 20KHz |
| -3dB Bandwidth: | 14Hz - 3MHz | 12dB gain |
| | 14Hz – 280KHz | 26dB gain 2KΩ output load |
| | 14Hz - 48KHz | 50dB gain |
| THD: | <0.005% | @1KHz |
| Max output: | >5V RMS | @1KHz, 2KΩ load, 10% THD |
| Max input: | >1.25V RMS | Note <1> |
| Current consumption: | 6.5 mA | Note <2> |
| Z out: | 50 Ω | Each phase to ground |
| Z in: | 2.2 MΩ (326KΩ)* | Note <3> |
| Physical | | |
| PA4-BO: | 23mm x 40.6mm, max height 16.3mm, 12g. | |
| PA4-P48 or PA4-DC: | Enclosure: 25mm x 25mm x 68mm (100mm inclusive of BNC connector and cable gland) output cable: 150mm long minimum. 90g ~ 200g, depending on configuration. | |

<1> Specified for minimum gain. Limited by Max output minus gain. Input is diode protected against overload and voltage transients. Approximately 210dB SPL re: 1 µPa, or 31.5KPa when used with Aquarian Scientific AS-1 hydrophone.

<2> Input shorted, 2KΩ output load. Rated for IEC P48 phantom power (default configuration). < 3.5mA with typical 24V phantom power or external DC power (J3 open).

<3> Can be modified by changing R4. When used with the Aquarian Audio H1 or H3 hydrophones, lowering Z in will filter infrasonic acceleration or pyroelectric noise that can saturate the amp. *326KΩ when factory-configured for Aquarian Audio.

This amplifier can be modified for additional bandwidth, gain, or power requirements. Alternate connectors may also be accommodated.

Contact Aquarian Scientific for custom configuration or additional technical support:

Aquarian Scientific
1004 Commercial Ave, #225
Anacortes, WA 98221, USA

www.aquarianscientific.com
sales@aquarianscientific.com
1-360-299-0372

**Warranty**

This part is warranted for one year, subject to the general warranty terms and conditions noted on our website. Please note special limitations for board only:

www.aquarianscientific.com/warranty.html

AQUARIAN Scientific

# PA4

## Hydrophone Buffer / Preamp
## Balanced Line Driver

User manual for PA4-BO, PA4-P48, PA4-DC and custom variants

Thank you for your purchase of the Aquarian Scientific PA4 Hydrophone Buffer / Preamp.

The PA4 is primarily designed to connect passive piezo sensors, used in most hydrophones, to professional-grade microphone preamplifiers. These include preamps that are built into digital recorders, high-quality computer sound interfaces, PA systems, and mixing consoles. The PA4 will also be useful for many other sensors, such as geophones, accelerometers, contact microphones, and any device requiring a low-noise, high-impedance buffer that works within the human auditory spectrum and above.

When used with microphone preamplifiers, the PA4 is typically phantom-powered. It can also be supplied with external 6 ~ 12 volt DC power. Gain is user-adjustable from 6 to 56dB by jumper configuration and output wiring. Output can be differential (balanced) or single-ended. Other factory modifications can be made to extend bandwidth, gain and power options. Contact Aquarian Scientific with your specific needs.

The PA4's low-noise, high gain, and wide dynamic range can overcome the limitations of many recorders and sound interfaces, making these low-cost tools useful for both research and entertainment. Its low-impedance balanced output is suitable for driving very long cables. Its small size allows placement in almost any housing or container.

**NOTE:** This amplifier is not waterproof. Care should be taken to keep all connectors and electrical components as dry as possible, especially when working in corrosive environments such as seawater or chlorinated water.

## USE:

The PA4 is available from stock in three standard configurations.

The **PA4-BO** is sold as board only with screw-terminal connections for use in your custom applications. See additional technical details for wiring and jumper settings. Proper grounding and EMI/RFI shielding is necessary in most applications for lowest noise.

The **PA4-P48** is fully assembled with a rugged aluminum housing, BNC input and XLR output. It is configured to simply connect between your hydrophone and mic preamp. Phantom power is required and will need to be switched on at your preamp. This may be a physical switch or you may find this within the menu settings of your recording device.

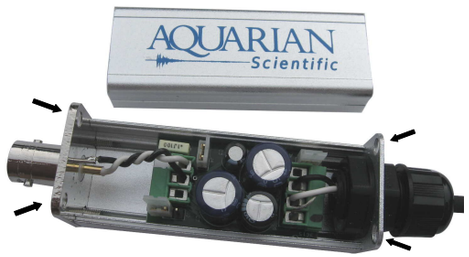
**Note:** Phantom power is an option in most professional-grade audio devices with microphone inputs. 48 volts (IEC P48) is the original standard by which most manufacturers comply, but the need for lower power consumption in battery-powered devices, along with simplification of design, led to other standards. Many low-cost amplifier manufacturers do not comply with any standard for phantom power. The PA4 is only guaranteed to work with IEC P48 power, though it does commonly work with phantom power voltages as low as 24 volts with reduced dynamic range.

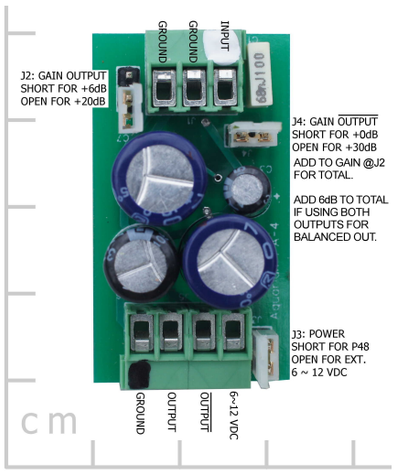
The **PA4-DC** is fully assembled with a rugged aluminum housing and BNC input and is configured for external power. Output connections include your choice of XLR, 1/4" TRS, 3.5mm (TRS or TRRS), RCA and BNC--configured as shown at right. Power input is through a standard 5.5mm x 2.1mm center-positive DC connector and is compatible with many low-cost battery packs and adapters made for closed-circuit video. Power input is reverse-polarity protected. Supplied with 9V battery connector.

**Note:** Noise can be introduced to the signal path when using unregulated and poor-quality AC power adapters. Unregulated adapters may also output substantially higher peak voltage than rated. The PA4-DC will be damaged if supplied with voltage higher than 15V.

## User Adjustments:

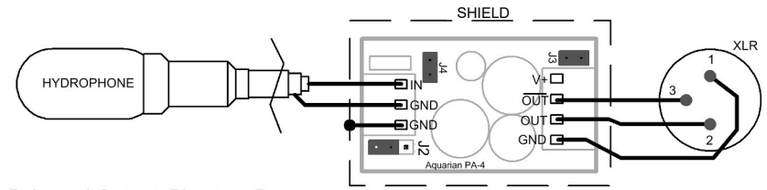
For PA4-P48 and PA4-DC, remove four screws securing top cover (as shown below) to access gain and power jumpers.



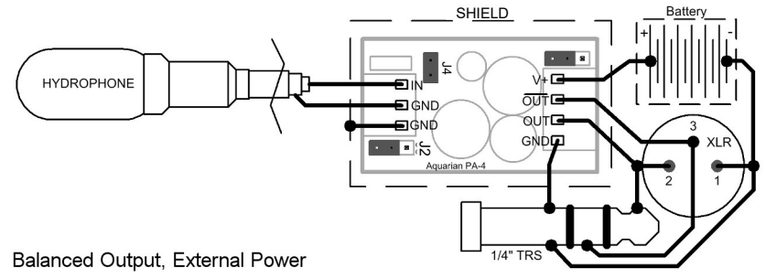




## Typical Applications:

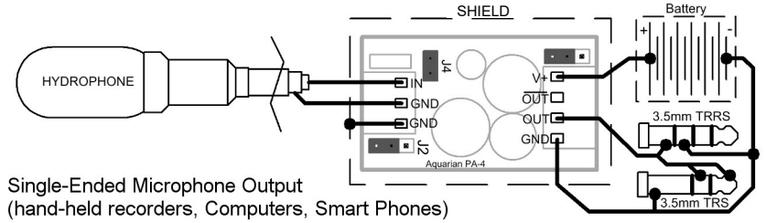
The following wiring and jumper configurations are typical for connection to standard audio interfaces. Where multiple output connectors are drawn, consider those as standard options. Both are not typically used.



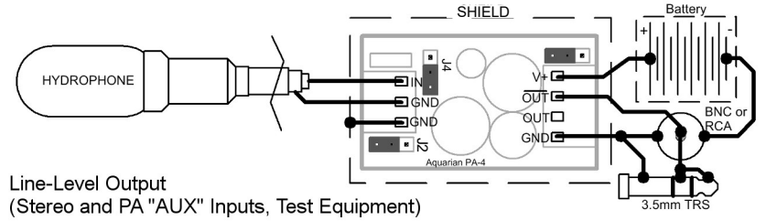

Balanced Output, Phantom Power




Balanced Output, External Power




Single-Ended Microphone Output
(hand-held recorders, Computers, Smart Phones)




Line-Level Output
(Stereo and PA "AUX" Inputs, Test Equipment)

**Note:** Ground connections are interchangeable. Total gain equals stage one gain (J2) for non-inverted single-ended output, stage one and stage 2 (J2 + J4) for inverted single-ended output, or stage one and stage 2 (J2 + J4) + 6dB for balanced output. See photo at left for additional detail.