



Aquarian Audio

H3dX Hydrophone User's Guide

H3 product family overview

The H3 uses a unique high-sensitivity, dual-sensor, mechanically-balanced transducer assembly that offers exceptional signal-to-noise performance in the human auditory bandwidth. The fully-shielded design inherently rejects EMI and RFI noise, making it useful in the studio, lab or shop. Its low mass and full polyurethane rubber encapsulant make it highly resistant to damage caused by impact. Its small size allows users to fish it inside of pipes and other tight spaces, making it excellent for leak finding. Though designed primarily for underwater listening and leak finding, it is also useful as a waterproof microphone for tool room applications, such as monitoring cutting in waterjet and other CNC tooling¹.

The **H3nP** and **H3nB** are sold as passive hydrophones, terminated with 1/4" TS and BNC output plugs respectively. These can be useful with DAQ and test equipment or high-impedance audio preamps. **H3dM and H3dX** configurations include signal conditioning that is built into the hydrophone, which make them compatible with standard consumer and professional microphone circuits. They are identical, other than the output connector. The "d" in the part number designates use of our latest CS6 signal-conditioning board and offers approximately 10dB better sensitivity as compared to legacy parts made with our CS4 board (without the "d" in the part number). Please reference correct manual for each version.

The H3 hydrophone can be optionally assembled with our WT150g sliding stainless steel weight assembly for maintaining negative buoyancy. There are several advantages to placing the weight on the cable, rather than building it into the hydrophone. When the hydrophone is dropped, the cable flexes and absorbs any stress from impact, making the hydrophone more durable. The weight can be moved if needed to allow insertion into a pipe. Both of these attributes are especially useful to the leak finding specialist. Moving the weight away from the hydrophone dampens acceleration noise that is transmitted down the cable from handling and it also minimizes response irregularities caused by material resonances and sound reflections. It can also be used for mounting a shroud tube to minimize flow noise over the hydrophone. To move the WT150g weight, turn the black plastic thumbscrew counter-clockwise to loosen the internal rubber compression sleeve and slide the weight where needed. Wet the cable if this is difficult. Secure again by turning the thumbscrew clockwise. **Be Advised:** Fingertighten thumbscrew only and always leave a minimum spacing of 5cm (2 in.) between hydrophone and weight!

Using the H3dX

The H3dX is terminated with a 3-pin male XLR plug. Wiring is standard: pin 1 is ground, pin 2 is hot and pin 3 unused². This configuration should be compatible with any standard female XLR microphone jack found in recorders, mixing boards, professional video cameras and PA systems. **Phantom power is required and will need to be switched on in your device.** Any standard phantom power supply voltage will work. Do not exceed +48V when powering the H3dX. If your recorder or mic preamp offers options for phantom voltage, we recommend using the lowest voltage available for lowest noise and power consumption. With the connection firmly made and phantom power switched on, there's nothing more to do but adjust levels and take in the sounds of the deep.

1 Aquarian does not guarantee compatibility of rubber and plastic materials used in its hydrophones for anything other than natural aquatic environments. Prospective users should test compatibility with machine coolants and lubricants in production environments.

2 Most XLR-terminated microphones are balanced and use Pin 3 for a *cold* (or *low*) side of the signal, which has the same output impedance and is typically complimentary to the signal on Pin 2. This configuration can be beneficial for common-mode noise reduction when used with a balanced input device. The H2dX runs single-ended. It is a simple output plug variation of our standard H2dM. Single-ended operation lowers cost (mostly because it allows the use of a coaxial cable) and power use. Common-mode noise is seldom a problem in most hydrophone applications and the hydrophone is well shielded from electrical noise. Nearly all microphone preamps now are electronically balanced and tolerate this well, so this single-ended configuration is generally advantageous overall.

Hydrophone care

No special care is required for the H3dX. It is designed to withstand corrosion and the impact of accidental drops, but making an attempt to keep the output plug clean and dry and avoiding unnecessarily rough handling will help to ensure the long-term stability of the product. It is best NOT to store the hydrophone in a waterproof enclosure. Doing so will trap moisture, salts and minerals that are left on the hydrophone and cable after deployment and corrode the output plug. Making an extra effort to coil the cable neatly when retrieving the hydrophone will help avoid problems with tangles as the cable ages. Most importantly, protect the cable from cuts and abrasions! The H3d uses a custom-made cable with a very durable urethane jacket. However, it is also designed to be compact and flexible. Kinking the cable, walking on it, or dragging it over a sharp or abrasive surface may damage the cable sheath and eventually cause the hydrophone to fail. Both aquatic and terrestrial animals may attack the cable in an unattended application. Using some kind of cable conduit, such as plastic tubing, can help protect the hydrophone in long-term installations.

Specifications

Specifications are dependent upon the audio device to which the H3dX is connected. The output impedance of the H3dX is set by the phantom power supply from the audio device with which the hydrophone is used. Gain of the signal conditioning amplifier in the H3dX is related to the bias current and input impedance of the mic preamp. High-frequency performance is also limited by the output impedance of the hydrophone and the cable impedance—which is a function of length. For all of these reasons, we do not publish detailed response plots for this design. Please also note that further limitations in your overall system may result from the sampling rate of digital recorders and by the input stage of your audio device's microphone preamp.

The following specifications are based on typical response when using the H3dX with a standard 48V phantom power supply (48V with 6.8K pull-up resistors):

Sensitivity:	-176dB re: 1V/ μ Pa	(+/- 5dB 20Hz-10KHz)
Useful range:	<10 Hz to >100KHz	(not measured above 100KHz, approximate sensitivity @100KHz = -220dB re: 1V/ μ Pa)
Polar Response:	Omnidirectional	(horizontal)
Operating depth:	<80 meters	
Output impedance:	6.8 K Ω	(typical)
Power:	1.2 mA	(typical)
<u>Physical:</u>		(cable and output plug excluded)
Dimensions:	17mm x 32mm	
Mass:	10 grams	
Specific Gravity:	1.3	