

Aquarian Audio Products

H1a Hydrophone User's Guide

Thank you for purchasing your *Aquarian Audio Products* H1a hydrophone. This hydrophone is designed to provide high-quality audio performance in a low-cost device. It is very durable and will interface directly with high-impedance microphone or instrument preamps. It offers very good sensitivity and low noise in the human auditory range. The H1a's streamlined shape and high specific gravity will help to maintain a low working depth in a moving water column. Its compact size and the easy hand of its cable make it very portable and simple to use.

Using the H1a

The H1a utilizes a passive piezo sound pickup. There is no preamp or impedance buffer circuit within the hydrophone. The advantages are that the hydrophone remains as simple and low cost as possible, it does not require any power, and it offers a very wide dynamic range. System gain and input impedance must be considered while choosing a preamp.

System gain is the amount of signal amplification required and will depend on the amplitude of the sounds that you are attempting to monitor, as well as what you are doing with the output. Generally speaking, if you are driving headphones or a line audio circuit, or working with a computer sound device, you may require 20 dB of gain for industrial monitoring, 40 ~ 50 dB for listening to cetaceans and large aquatic wildlife, and 60 dB or more for very distant or faint sounds.

Input Impedance is the amount of load that your preamp puts on the hydrophone. The low-frequency response of a piezo transducer, such as that used in the H1a, will be limited by the input impedance of the preamp. Higher input impedance will give you an extended low-frequency response. This relationship can be calculated for the H1a with the following formula:

$$F_c = 1 / 0.000000157 * R$$

F_c is the frequency at which electrical output is 3dB down from nominal and R is the input impedance of your preamp. Therefore, using a preamp with an input impedance of 300 Kohms will give you a low-frequency cutoff of 20 hertz—the low end of what humans can hear. A preamp with an input impedance of 100 Kohms might work well for the PA system on a whale-watching vessel, giving a F_c of 64 Hz, which is compatible with the capabilities of most speaker systems. The higher F_c might also help filter the extreme low frequency noise of the hydrophone rising and falling in the water as the boat moves on a swell.

If all of this seems like too much to pay attention to, there is good news. Though there are exceptions, if you are plugging the H1a into a standard piece of audio equipment, and the plug fits, you are likely to be working with the right type of preamp. And even if it doesn't work well, it is very unlikely that you will damage either the hydrophone or preamp by trying it.

Hydrophone care

No special care is required for the H1a. 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 increase corrosion problems with the output plug. Making an extra effort to coil the cable nicely when retrieving the hydrophone will help avoid problems with tangles as the cable ages. Most importantly, protect the

cable from cuts and abrasions! The cable chosen for this application was designed to be compact and easy to use. This unfortunately comes at the expense of ultimate durability. 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 shroud, such as plastic tubing, can help protect the hydrophone with long-term installations.

Specifications

The H1a is intended to be a lower-cost alternative to military and lab-grade hydrophones. Deriving high sensitivity and low noise from lower-cost components were made a priority over maintaining strict tolerances. These specifications are typical of a limited sample group and are not guaranteed. They are for basic comparison information only.

Sensitivity:	-190dB re: 1V/ μ Pa	(+/- 4dB 20Hz-4KHz)
Useful range:	<1 Hz to >100KHz	(not measured above 100KHz, approximate sensitivity @100KHz = -220dB re: 1V/ μ Pa)
Capacitance:	25nF	
Polar Response:	Omnidirectional	(horizontal)
Operating depth:	<80 meters	
<u>Physical:</u>		(cable and output plug excluded)
Dimensions:	25mm x 46mm	
Mass:	105 grams	
Specific Gravity:	5.3	