

Pocket Hydrophone

1. Overview

The Pocket Hydrophone was designed to provide a compact tool to quickly assess the acoustical activity of a particular location. The complete unit is housed in a 'fanny pack' (including hydrophone, amp, power, and headphones). There are 3 components to the unit; the hydrophone (w/50' cable, wound on a form), the amplifier and power (in a small plastic box slightly larger than a pack of cigarettes), and the headphones (modular ear-phones). The unit is designed such that headphone volume is an internal adjustment, and power is switched by connecting the hydrophone to the amplifier box. Additionally, there is a phono jack such that the hydrophone signal can be directly recorded while the user is listening. The cost of the unit is well under \$100, thus making it also an inexpensive tool for the researcher.

2. Fabrication

For the hydrophone fabrication, see the documents "Hydrophone Fabrication" and "Hydrophone Usage and Deployment". Ideally, 50' of cable is a good figure for size and weight. For casting the hydrophones, I cut a wooden shape roughly the size of an egg and then sawed it in half (along cable axis). I then had this made into a 2-part mold at the local sign shop, using their vacuum-forming thermal plastics machine.

Terminate the cast hydrophone's cable with the TA4F XLR connector, potting the backshell with silicon RTV. Crimp a fishing weight (1-1/2 oz egg-shaped with hole through long axis) to the cable ~2-4" above the hydrophone. To do this, you will need to cut out a large enough slot for the cable to fit through. Once it fits well, remove and fill with silicon RTV, fit over cable and crimp gently. Clean up excess silicon and put aside.

Fabricate the circuit board per the schematics. Drill and fit the enclosure for the jacks and the circuit board, then wire the jacks per the schematic. Connect a 9-volt battery, headphones, and the hydrophone, then adjust the internal pot to a comfortable level (typically the 90 degree position which also keeps battery drain minimized).

Fabricate the wooden cable spool for the hydrophone and wind the hydrophone cable on it, then pack everything into the fanny bag. Head into the field and have fun!

3. Usage

Usage of the pocket hydrophone is relatively simple. Simply plug in the headphones and the hydrophone, drop the hydrophone into the water, and enjoy. If you plan to record, you will need to connect the recorder to the RCA output of the electronics enclosure. Note that the internal volume control has no effect so the recorder's input level setting must be changed to suit the application.

For information of strumming minimization, etc. -- see the document "Hydrophone Usage and Deployment".

Appendix A. Specifications

Hydrophone & Amplifier unit

Sensitivity w/setting @90 degrees:
Response:

--159dB
20Hz--10KHz

Amplifier

Gain
Power consumption (gain @ 90 degrees, specified headphones)
[range=4.6 to 40mA]

X50 (34dB)
~8mA

Appendix B. Parts List

LM386N-1	Audio amplifier	Digikey
3316F-103	Bourns 10K trimmer	
0.001uF	capacitors	
0.047uF		
0.1uF		
1uF/50v KA		
22uF/16v		
220uF/10v		
470uF/16v		
10 Ohm, 1/8w 5%	resistors	
100 Ohm		
1K Ohm		
10K Ohm		
Mini-XLR connector, Switchcraft #TA4F		Newark Electronics
Mini-XLR receptacle, Switchcraft #TB4M		Newark Electronics
Duracell 9-volt Procell battery #PC1604		Newark Electronics
PacTec Electronic enclosure (#K-HML-9VB)		Newark Electronics
Hydrophone cable; 0.135"OD, Belden #9452		Newark Electronics
Hydrophone element (Sippican SMT design)		Hermes Electronics
Hydrophone casting urethane #EN-7		Conap
-- see Hydrophone Usage and Deployment document		
Headphones -- miniature, w/case		RadioShack #33-970
1-1/2 oz egg-shaped fishing weights		
Fanny pack carrying bag (3 pocket, large=hydrophone, small=headphone)		

Appendix C. Schematics

[attach electrical schematic here]

Appendix D. Mechanical

[attach mechanical drawing here]