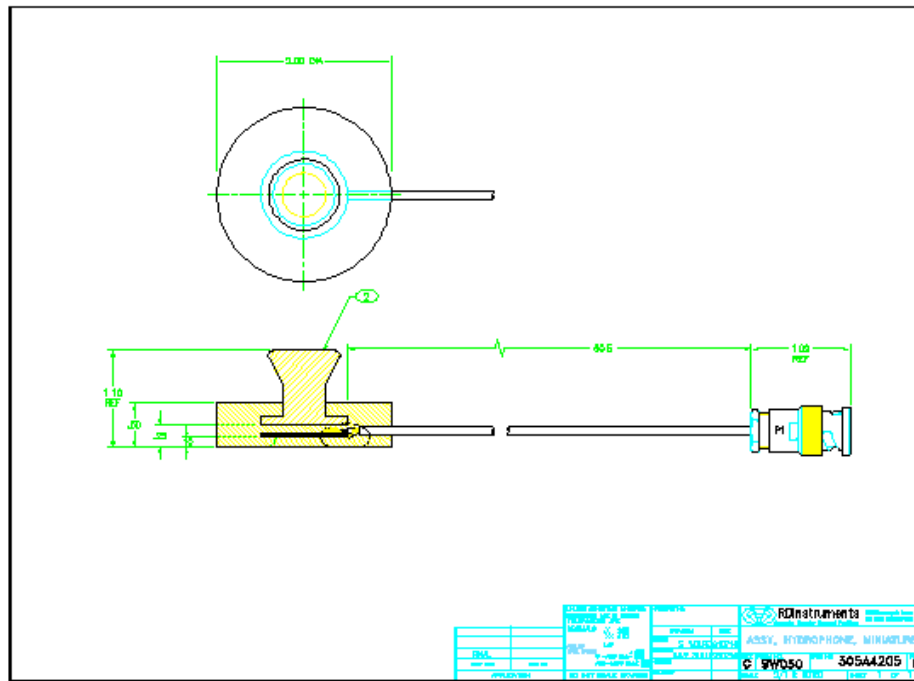




Using the 305A4205 Hydrophone to Identify the RSSI Scale Factors for Calibrating the Echo Strength Output of an ADCP

1 Introduction

The purpose of this procedure is to determine the scale factors for the individual receivers of a Broadband or Workhorse ADCP. A drawing of the hydrophone used in this procedure is shown in the following figure and is available as Part Number 305A4205 from RD Instruments. The hydrophone is used, not to listen, but to couple sound into the transducer beam under test.



The RD Instruments Hydrophone (PN 305A4205) is shaped like a Hockey Puck with a tail and a knob for a handle and will be referred to as the “puck”. The flat side of the puck is temporarily pasted against the face of the transducer using silicon grease, O-ring lube, petroleum jelly (Vaseline), honey, or burnt honey or other gooey substance. I like KY Jelly. It is water based and cleans up easily when you make a mess.

To do this test you will need the following test equipment, or their equivalent:

Description	Example
Hydrophone that operates at the frequency of the profiler under test.	RD Instruments, Part Number 305A4205
Frequency Synthesizer that operates at the frequency of the profiler under test with an output that is adjustable in precise 1 dB steps	Stanford Research Systems Model DS335, or Hewlett-Packard 3325A
Adjustable Attenuator in 10 dB steps over 120 dB Range	HP 355B
Co-axial cable with BNC connector for connecting synthesizer to attenuator	
A gooey substance to replace the air between the puck and the transducer and to hold them together.	KY Jelly, silicon grease, O-ring lube, petroleum jelly (Vaseline), honey, or burnt honey

2 Get Ready

Connect the function generator output to the attenuator and the attenuator to the puck. Never use the attenuator with less than 20dB set on it. To do so will create experimental errors.

Connect power and a computer to the ADCP.

Use BBTalk or DumbTerm to communicate between the ADCP and the computer. Wake up the computer, by sending a break (the “END” key on the keyboard). If the communications are garbled, the baud rate of the instrument and the computer don’t match. If the communications appear too long on the screen, the computer baudrate is too high. If it is too short the baudrate is too low. To change the baud rate, using DumbTerm, go to files, properties and change the “Bit per Second.” The response you should get is:

```
[BREAK Wakeup AB]
WorkHorse Broadband ADCP Version 8.22a
RD Instruments (c) 1996-1998
All rights reserved.
[Parameters set to USER defaults]
>
```

After communications are established, it will become convenient to increase the baudrate to 115200. To do that, send the command to the profiler to increase the baudrate “CB811” and change the computer baudrate to match.



If attention is not given to a Workhorse, it will “Power Down.” Send a break (the “End” key) to wake it up.

Using some goo, paste the puck on the face of the first transducer to be tested. While doing the experiment make sure that the puck does not slide on the face of the transducer. The coupling between them is location dependent. The precise location of the puck against the transducer is not important because the goal of the test is to get the slope and not the offset for the receiver transfer function.

Set the function generator to approximately the system frequency. To find out what that is, send the command, “PS0” (that is PS zero). The first line of the response is the answer.

Send a PT3. This is the receive test. About $\frac{3}{4}$ of the way through the test is the phrase “High Gain RSSI” with the RSSI data for the 4 beams. If you are coupling a large signal into one of the beam the RSSI value will be much higher than the others. (Approximately 165 for 0 dBm) Notice that when the signal is coupled into the transducer that the beam fails the test. This is perfectly normal.

Send PT103, this will cause the PT3 test to be repeated. When you want to stop it, you can with a break (“End” key).

To get a quick estimate of the slope, change the power level out of the synthesizer from minimum to maximum in 20dB steps. (The recommended synthesizers have the ability to adjust their output in dB.) In the region of interest, the RSSI value will change by about 40 to 50, giving a slope of about 0.4 to 0.5 dB/count. At the extremes of the signal level the RSSI should not change by this amount.

The function synthesizer output probably does not have a low enough power output to see the low end of the RSSI. To check, with the synthesizer level set to minimum, disconnect the puck from the synthesizer, the RSSI value should not change. The purpose of the attenuator is to extend the low end of the signal range available below that from the synthesizer.

Check the synthesizer – attenuator combination for discontinuities. The combined output is the attenuator setting subtracted from the synthesizer output in dBm. Thus there are a number of setting combinations for the synthesizer and attenuator that should give the same output and therefore the same RSSI values. Make sure that they do.

3 Procedure

Identify the region at the high and low signal level ends where the RSSI changes by less than 10 for a 10 dB step in the input level.

Step through the range between these two limits in small steps (1 to 5 dB each depending upon the required precision and the time available) while recording both the RSSI value and the input level (the attenuator setting subtracted from the synthesizer output level).

It is recommended that for the first few times this test is done that these values be plotted against one another, as the data is collected. There should be a region of input power, about 80 dB wide, where there is a near straight line forming.

Repeat for each beam.

Identify the straight line region and calculate the best fit straight line (SLOPE function in Microsoft Excel or polyfit in Matlab). The answer should be about 0.4 to 0.5 dB/count. The offset is not used.