

AZFP Certificate of Calibration Version : 12.0

12/3/2019

Operator: **Jay Milligan**

Unit Serial Number: **59020**

Sonar Channel #1:

Frequency:	38.0 KHz	Transducer Part#:	92A01N40	Transducer Serial#:	107	
OCV:	Voltage on reference:	8.8V	Reference TVR:	145.9dB	Transducer Voltage:	0.14V
TVR:	Voltage on transducer:	560V	Reference OCV:	-213.2dB	Reference Voltage:	0.81V

System Gain and Linearity:

Voltage on Reference	A/D Counts (N)	Calibration Values	Units	Sphere Check	Units
*	65000	TVR	156.4	Water Temp	2.5 °C
-10dB	58800	VTX	198.0	Range	330 cm
-20dB	52800	BP	0.13065	Measured	-50.8 dB
-30dB	46900	Echo Level	152.2	Expected	-51.0 dB
-40dB	40700	Slope	0.0231	Error	0.2 dB
-50dB	34600		V/dB		

*This voltage is adjusted to bring N between 64950 and 65050 counts
All measurements with 1.0 meter separation in 20°C fresh water unless otherwise noted.

Sonar Channel #2:

Frequency:	67.5KHz	Transducer Part#:		92A01N21	Transducer Serial#:	105
OCV:	Voltage on reference:	9.7V	Reference TVR:	143.2dB	Transducer Voltage:	0.14V
TVR:	Voltage on transducer:	440V	Reference OCV:	-213.1dB	Reference Voltage:	1.2V

System Gain and Linearity:

Voltage on Reference	A/D Counts (N)	Calibration Values	Units	Sphere Check	Units
*	65000	TVR	161.8	Water Temp	2.5 °C
-10dB	58900	VTX	155.6	Range	320 cm
-20dB	52900	BP	0.07719	Measured	-52.8 dB
-30dB	47000	Echo Level	149.0	Expected	-53.3 dB
-40dB	40750	Slope	0.0230	Error	0.5 dB
-50dB	34800		V/dB		

*This voltage is adjusted to bring N between 64950 and 65050 counts
All measurements with 1.0 meter separation in 20°C fresh water unless otherwise noted.

Sonar Channel #3:																																																						
Frequency:	125KHz	Transducer Part#:	92A01N21		Transducer Serial#:	105																																																
OCV:	Voltage on reference:	9.4V	Reference TVR:	139.7dB	Transducer Voltage:	0.09V																																																
TVR:	Voltage on transducer:	360V	Reference OCV:	-214dB	Reference Voltage:	2.5V																																																
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<table><tr><th>Voltage on Reference</th><th>A/D Counts (N)</th></tr><tr><td>*</td><td>65000</td></tr><tr><td>-10dB</td><td>58400</td></tr><tr><td>-20dB</td><td>52400</td></tr><tr><td>-30dB</td><td>46400</td></tr><tr><td>-40dB</td><td>40500</td></tr></table>		Voltage on Reference	A/D Counts (N)	*	65000	-10dB	58400	-20dB	52400	-30dB	46400	-40dB	40500	<table><tr><th colspan="2">Calibration Values</th><th>Units</th></tr><tr><td>TVR</td><td>170.8</td><td>dB</td></tr><tr><td>VTX</td><td>127.3</td><td>V_{RMS}</td></tr><tr><td>BP</td><td>0.01209</td><td>Sr</td></tr><tr><td>Echo Level</td><td>141.1</td><td>dB</td></tr><tr><td>Slope</td><td>0.0233</td><td>V/dB</td></tr></table>			Calibration Values		Units	TVR	170.8	dB	VTX	127.3	V _{RMS}	BP	0.01209	Sr	Echo Level	141.1	dB	Slope	0.0233	V/dB	<table><tr><th colspan="2">Sphere Check</th><th>Units</th></tr><tr><td>Water Temp</td><td>3.3</td><td>°C</td></tr><tr><td>Range</td><td>430</td><td>cm</td></tr><tr><td>Measured</td><td>-49.6</td><td>dB</td></tr><tr><td>Expected</td><td>-49.3</td><td>dB</td></tr><tr><td>Error</td><td>-0.3</td><td>dB</td></tr></table>		Sphere Check		Units	Water Temp	3.3	°C	Range	430	cm	Measured	-49.6	dB	Expected	-49.3	dB	Error	-0.3	dB
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Calibration Details

Sonar Calibration:

The sonar system is calibrated using a reference hydrophone and a reference source transducer in our fresh-water laboratory test tank. All measurements are at 20°C and 1.0 meters distance. The AZFP does not use a TVG system, so all system gain measurements are valid from 0 meters to full range.

Sonar Sphere Check:

The sonar sphere check is done in ASL's outdoor fresh water calibration tank. A precision tungsten-carbide sphere with known target strengths (at each frequency) is placed at 3.8m from the transducer. The values measured by the unit under test are compared to the known values of the sphere.

Tilt Sensor Check:

The unit under test is placed in ASL's tilt calibration jig and compared to the Reference Tilt Unit at three locations on each axis.

Battery Check:

The Main Voltage and Transmit Voltage are measured with a digital multimeter across a 1kΩ load.

Temperature Sensor Check:

The unit under test is compared to the Reference Temperature Unit at room temperature (in air) and then again in the outdoor fresh water calibration tank.



Pressure Sensor Check:

If a pressure sensor is installed in the unit under test, the pressure sensor is connected to the Reference Pressure Unit and a pressure reading is taken near 1BAR pressure and then another near the maximum pressure of the pressure sensor. The values from the Reference Pressure Unit are compared to the values reported on the unit under test.