Acoustic Zooplankton Fish *Profiler*™

ASL Environmental Sciences

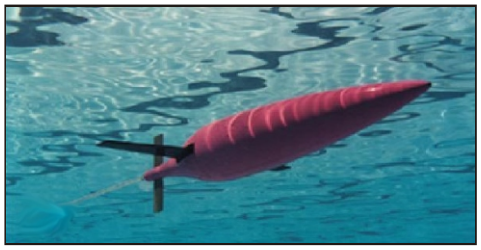
Glider and AUV mounted AZFP

ASL can design and supply single, dual, three and four frequency echosounder electronics package with transducer housings to mount on an underwater glider based on the Acoustic Zooplankton and Fish Profiler (AZFP), and assist the customer with the equipment integration into the glider or AUV.

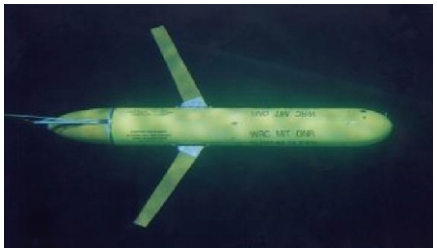
ASL is an industry leader in autonomous, low-power, calibrated sonar systems for scientific use. The AZFP instrument is a compact, single-beam, scientific echo sounder capable of extended deployments that can be readily adapted for use on gliders and AUVs. (see examples on page 3)

Several commercially available gliders for which the AZFP glider packages would be suitable:

Spray (Photo courtesy Bluefin)



Seaglider (Photo courtesy Applied Physics Laboratory, University of Washington)



Slocum Glider
(Photo courtesy Webb Research)

Power and power consumption estimates

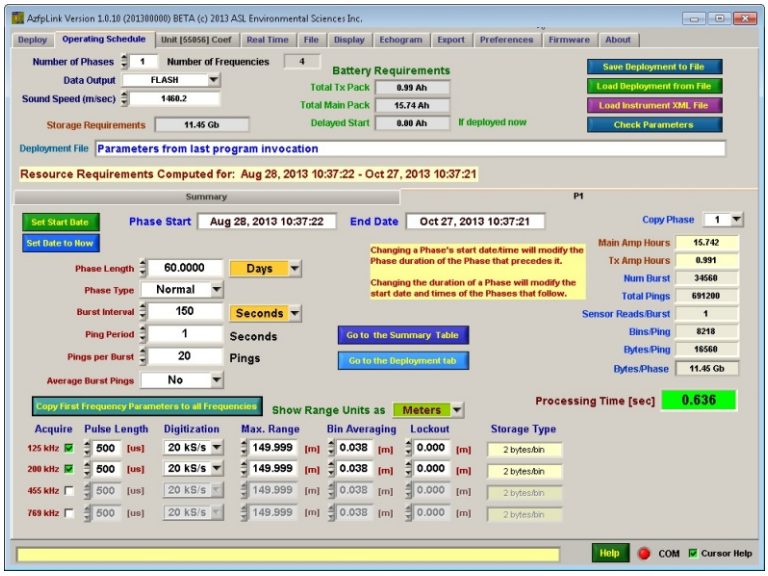
With an included DC-to-DC convertor, the glider's system can provide power to the AZFP instrument to turn it on and off for specific periods. During the time the instrument is on, it will run through a specific sequence (a phase) with detailed parameters entered into the AZFP instrument for each frequency and save data before the power is removed.
A detailed power consumption model is available (AZFPLink).
Single-frequency package recording data over 100m: Estimated Energy Consumption 1.0 MJ/ 1,000,000 pings.
Four-frequency package recording data over 100m: Estimated Energy Consumption 2.0 MJ/ 1,000,000 pings.

Size and weight

The electronics package measures approximately 131x208x60mm x 800 grams for the glider powered version and approximately 131x209x73mm x 1600 grams for the autonomously powered version with 1 MJ internal battery pack. Size and weight of the acoustic transducer(s) depend on the frequency and beam angle.

Data output:

The AZFPLink software outputs data in two formats: Binary and a comma delimited format. Sonar5 can read the first format. Echoview and Matlab can readily read the second format.



Print-screen from AZFPLink as an example of a 60-day deployment with 20 pings every 150 seconds

Acoustic properties:

Frequency: 38 kHz ±10%
Beam angle (-3 dB): 33° (±3°)
Nominal source Level: 206 dB

	Estimated Minimum Detectable Level (38 kHz x 33°)						
Range(m)	**5**	**10**	**20**	**50**	**100**	**200**	**300**
S_V(dB)	-115	-109	-103	-93	-88	-80	-72
TS (dB)	-115	-104	-92	-76	-63	-49	-35

Frequency: 70 kHz ±10%
Beam angle (-3 dB): 18° (±1°)
Nominal source Level: 205 dB

	Estimated Minimum Detectable Level (70 kHz x 18°)						
Range(m)	**5**	**10**	**20**	**50**	**100**	**200**	**300**
S_V(dB)	-116	-110	-104	-94	-86	-77	-69
TS (dB)	-120	-118	-95	-78	-64	-49	-38

Properties of other available standard AZFP frequencies:

			Estimated Minimum Detectable volume backscatter strength (dB)						
Frequency (kHz)	**Nominal -3dB Beam Angle**	**Nominal Source Level**(dB)	5m	10m	20m	50m	100m	200m	300m
125	8	201	-110	-104	-97	-87	-78	-65	-57
200	8	202	-113	-107	-100	-89	-78	-64	-48
455	7	214	-103	-96	-88	-73	-55	-	-
770	7	213	-98	-89	-78	-54	-	-	-

Notes:

- The standard 38 kHz and 70 kHz AZFP transducers are too large to fit on the glider. The values listed above for these frequencies with larger beam angles to make them compatible with the use on the glider are based on estimates.
- Sidelobes are -15 dB or better
- Limits of detectable volume backscatter strength are estimates; individual units may vary by ± 3 dB
- Receiver dynamic range is 90 dB
- Volume backscatter and on-axis target strengths are calibrated to +/- 1dB, resolution is +/-0.1 dB
- The above specifications are subject to change without prior notice

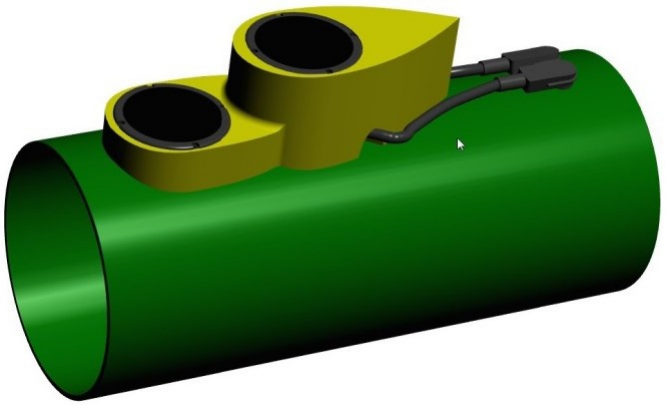
---

ASL can provide the following engineering services:

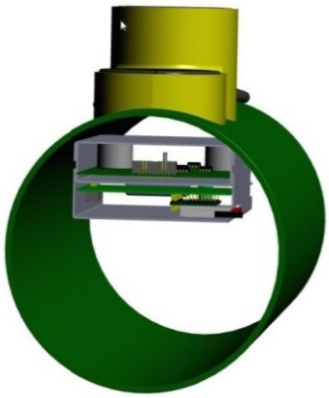
a. As necessary, enter into a Non-Disclosure Agreement with glider vendor and/or customer.
b. Design appropriate transducer housings and fairings.
c. Make drawings available to the customer for review and acceptance.
d. Software adaptation to allow AUV mode of operation.
e. Supply equipment according to drawings.
f. Provide integration assistance.

ASL Environmental Sciences Inc.
#1-6703 Rajpur Place, Victoria, BC, Canada V8M 1Z5
Phone: 1-250-656-0177 **Fax:** 1-250-656-2162 **Email:** asl@aslenv.com
www.aslenv.com and www.aslenv.com/AZFP.html

Sample Installation Configurations

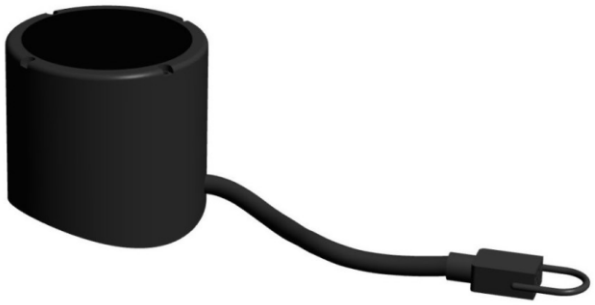


200 kHz and 38 kHz transducers with stream lined fairing shown on an 8" (203mm) diam. glider body



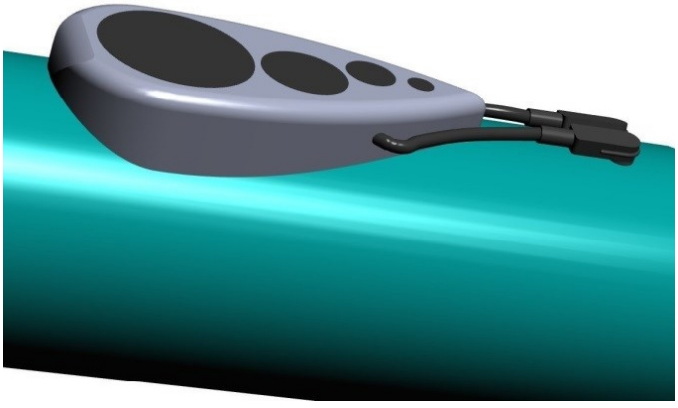
Front view of the transducer package and transducer fairing

Rear view of the electronics package and transducer fairing mounted on a glider body (shown with optional internal Lithium battery pack).

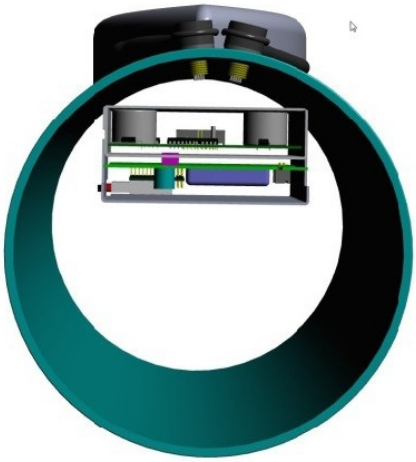


38 kHz transducer in surface mount housing with short cable and underwater connector

200kHz transducer in O-ring style housing



4-frequency (125, 200, 455 and 769 kHz) transducer stream lined CPVC housing shown on a glider body



Rear view of the 4-frequency (125, 200, 455 and 769 kHz) transducer housing