



## DARU-2330 - Deep-water Acoustic Recording Unit

### Overview

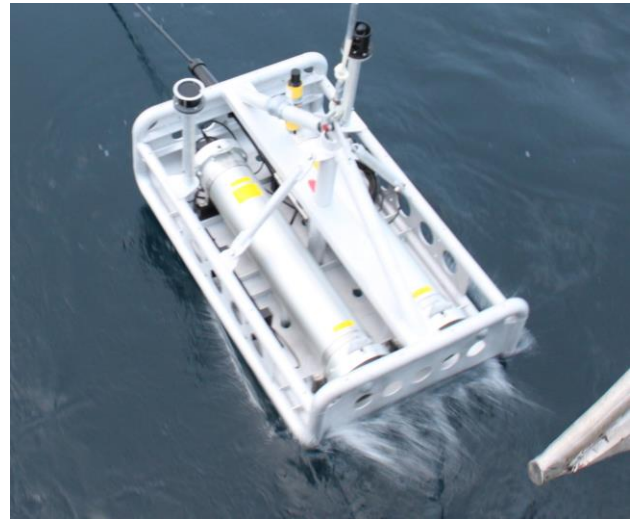
The DARU-2330 is an autonomous data recording unit for deepwater deployments (up to 2000 m) and wide-area surveillance. The system consists of a Digital Acoustic Surveillance Array (DASA) connected to a deployed platform containing batteries and controller electronics. The DARU is temporarily deployed to an area where it will record continuously, at scheduled intervals, or as instructed via an acoustic data link.

The acoustic array is 1000 m long and contains 64 low-frequency hydrophones installed at customer-specified positions along the cable. The system also has one (1) high-frequency hydrophone with a frequency response of 100 Hz - 19 kHz when sampling at 40 kSps.

The array connects to a Data Collection Unit (DCU) and Battery Case contained in a deployment frame that is lowered to the seabed. The system will operate and record continuously for more than 8 weeks or up to six months using an intermittent recording schedule. Software in the DCU allows the operator to configure different operating states during deployment and send system status information or health queries over an acoustic modem link. The DCU Pressure Case has dedicated internal space, power connections, and data network for a customer-installed auxiliary processing unit.

### Time Synchronization

The array controller synchronizes hydrophone samples across all sensors and locks timestamps the data to MCXO, TCXO source or a chip-scale atomic clock and RTC.



Data Collection Unit, 6 week deployment, Barents Sea

- *64 Digital Hydrophones, up to 5 kSp/s*
- *Input referenced noise well below Sea State 0*
- *8+ weeks of continuous operation, up to 6 months of intermittent recording*
- *1000 m long array section*
- *2000 m depth rating*
- *> 8 TBytes of SSD storage*
- *< 1 m spooling radius*



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## Hydrophones

The LF hydrophones for the DARU-2330 are a low-noise, low power design with an acoustic bandwidth from 6 Hz to 2.5 kHz. The hydrophones attach to molded breakouts on the array cable and are held in place by a protective plastic shroud. The hydrophone pressure vessel is constructed from Grade 2 Titanium and is designed for long-duration, deep water deployments. The hydrophone electronics are gain matched and simultaneously sampled.

## Side Channel Data

In addition to the acoustic samples, the sensors within hydrophones and DCU measure and record several diagnostic and auxiliary sensors including voltage, power-usage, battery level, hydrophone orientation, internal case temperature, pressure and humidity.



## Performance and Specifications

Parameter	Specifications	Comments
Number of Hydrophones	64	as standard configuration
Hydrophone Spacing	variable	as per customer specification at time of order (minimum spacing 0.6 m)
Maximum Operating Depth	2000 m	
<b>LF Hydrophones</b>		
Bandwidth	5 – 2500 Hz	-3 dB range, at 5 kSps
Sample Rate	5 kSps	selectable during operation
Sample Resolution	24 bits	~19 bits noise free resolution
Dynamic Range	115.5 dB (typ.)	ADC only, excludes gain steps
Noise floor		
@ 10 Hz	< 35 dB re 1 $\mu$ Pa/VHz	Measured at 40 dB gain, based on worst case hydrophone sensitivity and minimum hydrophone capacitance. (equiv. - referred to input in $\mu$ Pa/VHz)
@ 100 Hz	< 29 dB re 1 $\mu$ Pa/VHz	
@ 1000 Hz	< 28 dB re 1 $\mu$ Pa/VHz	
Maximum Unclipped Tonal Signal	205 dB	uPa(peak) @ 350 Hz, gain = 0 dB
Gain Matching @ 1k Hz	$\pm$ 0.2 dB (typ.)	electronics only, not including transducer sensitivity variations
Selectable Gain Range	0 dB – 50 dB	in 10 dB steps calibrated @ 1kHz
<b>HF Hydrophone</b>		
Bandwidth	100 - 19000 Hz	-3 dB range
Sample Rate	40 kSps	



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