



TRILLIUM 360 OBS OCEAN BOTTOM SEISMOMETER



The **Trillium 360 Ocean Bottom Seismometer (OBS)** combines exceptionally high-performance with low-power to optimize the data collection and duration of ocean bottom experiments. Providing new opportunities for OBS deployments, the Trillium 360 OBS delivers very broadband performance with the ease-of-use and durability of our industry-leading land-based Trillium seismometers.

Purpose-Built for Ocean Bottom Seismology

Incorporating a robust leveling gimbal, the 360 OBS can self-level up to a $\pm 50^\circ$ tilt range to ensure a successful deployment on the ocean bottom. The titanium ellipsoidal pressure vessel is rated for 6000 m deployments, and features proven glass epoxy connectors to provide exceptional ruggedness and resistance to corrosion in both marine and fresh water environments.

Ultra Low-Noise Floor in a Versatile Form Factor

The Trillium 360 OBS exceeds the exceptionally low-noise performance of our previous Trillium 240 OBS while also providing a 60-70% reduction in size, weight, and power to facilitate integration into new or existing OBS deployment systems.

Low-Power Solutions for OBS Systems

The Trillium 360 OBS is optimized for use with our purpose-built, Pegasus OBS digital recorder, providing a low-power system for integration into any OBS system or as part of our turnkey Abalones Ocean Bottom System.

The Abalones combines a Trillium OBS seismometer with the streamlined workflows of the modern Pegasus OBS digital recorder and a robust deployment frame design, licensed from Scripps Institution of Oceanography.



Key Benefits

- Ultra-low 250 mW power consumption reduces battery costs and extends experiment durations
- Maintenance-free titanium pressure vessel rated to 6000 m depths
- Robust design doesn't require a mass or gimbal lock providing reliable, trouble-free operation
- Precise, kinematic auto-leveling gimbal ensures successful deployments
- Plug and play interface for Pegasus OBS providing automatic generation of StationXML metadata
- Comprehensive State-of-Health logging includes case orientation, providing a powerful data set for optimizing deployments
- Digital connectivity provides visibility into the configuration and State-of-Health prior to deployment
- Also available:
Trillium Compact OBS,
Trillium 120 OBS

TECHNICAL SPECIFICATIONS TRILLIUM 360 OBS

*Specifications subject to change without notice

SEISMOMETER

SEISMOMETER TECHNOLOGY

Topology: Symmetric triaxial

Feedback: Force balance with capacitive displacement transducer

Mass Centering: Motorized recentering automatically initiated during leveling sequence

SEISMOMETER PERFORMANCE

Self-Noise: See self-noise graph

Sensitivity: (Nominal) 2000 V·s/m; (Actual) 2001.2 V·s/m $\pm 0.5\%$

Accuracy: $\pm 0.5\%$ relative to user guide specification

Bandwidth: -3 dB points at 360 s and 136 Hz

Clip level: 10 mm/s up to 15 Hz and 0.1 g above 15 Hz

Dynamic Range: 169 dB @ 1 Hz

Oper Tilt Range: $\pm 50^\circ$ tilt range

Temperature: $\pm 10^\circ\text{C}$ without recentering

Magnetic sensitivity: $< 0.03 \text{ (m/s}^2\text{)}/\text{T}$

AVAILABLE MODELS

T360-OBST2: 6000 m, Titanium Model

LEVELING AND ORIENTATION

Technology: Dual degree-of-freedom motorized gimbals

- Jam-free mechanism, no mass lock/unlock
- Kinematic design preserves full seismometer performance

Accuracy: Levels to within $\pm 0.5^\circ$ of true vertical

Leveling initiation: Leveling checks done at some or all of:

- Configurable delay after power on
- Configurable periodic (three stage user-configurable schedule)
- On external command via serial interface from a SLIP-enabled device or Centaur digital recorder
- Initiated by the digitizer via control line

CONNECTORS/PLUGS

Main:

- 16-pin submersible connector, male, MCBH16MTI (Titanium)
- Mounted on top of case

Vacuum/pressure port:

- 1/4-inch male quick disconnect with shutoff
- Vent for evacuation and servicing

POWER

Supply voltage: 9 to 36 VDC isolated

Power Consumption: 250 mW typical quiescent

Protection: Reverse-voltage and over-voltage protected

- Self-resetting over-current protection
- Unit can be powered on for descent and ascent

PHYSICAL

Enclosure: Titanium ellipsoidal pressure vessel, split dual half-shell assembly, with tripod feet

- All connectors on top side
- Dual O-ring sealing between half-shells
- Internal magnetic shield

Diameter: 327 mm

Height: 265 mm (not including tripod, feet, or connectors)

- 340 mm with Abalones tripod kit

Weight:

- Weight of complete assembly in air: 26.1 kg
- Weight of complete assembly in sea water: 10.5 kg

ENVIRONMENTAL

Operating Temperature: -5°C to $+40^\circ\text{C}$

Storage Temperature: -40°C to $+70^\circ\text{C}$

Shock: 20 g half sine, 5 ms without damage, 6 axes

Ingress Protection: Marine 6000 m submersion depth in fresh or salt water

Humidity: 0% to 100% (submersible)

DIGITAL COMMAND AND CONTROL INTERFACE

USER INTERFACE

Web Browser: Onboard web server, accessed with industry standard web browsers using Serial Line IP (SLIP) HTTP

Plug-and-Play: Nanometrics interface for communication via Pegasus OBS digital recorder

CONFIGURATION AND CONTROL

Sensor: XYZ/UVW mode

- Calibration enable
- Short/long period mode

Leveling: Initiate immediate leveling check

- Automatic cycle mode selection: (post power-on, three stage periodic)
- Automatic cycle parameter selection: (delay and interval times, max attempts)

Unit: Firmware updates

- State-of-health request

DATA OUTPUTS

On-Request: Seismometer mass position values

- Temperature
- Internal relative humidity
- Instrument serial number, subassembly revisions
- Firmware revision
- Case orientation (with respect to vertical)
- Seismometer orientation (with respect to vertical)
- Download logged state-of-health
- Erase state-of-health log

Leveling Log: Every leveling event logged in non-volatile memory

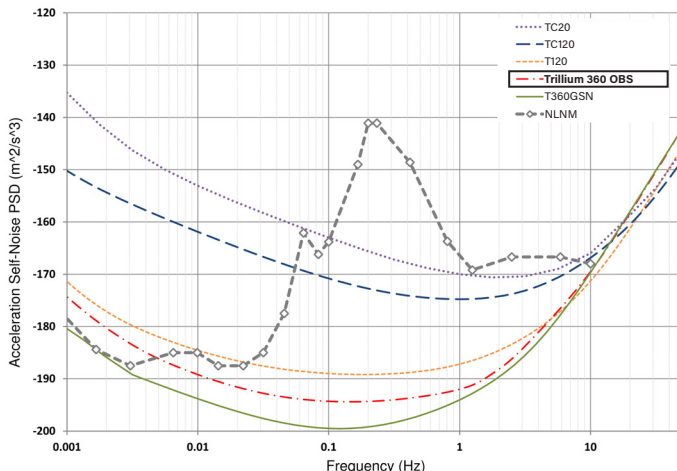
- Full before-and-after State of Health logged

State of Health Log:

Recording capacity of >2 years of daily scheduled interval SoH values

- Time from power on
- Seismometer mass positions
- Vessel and seismometer orientations
- Temperature

SELF-NOISE GRAPH



Seismometer self-noise plotted against NLNM (after Peterson, 1993) and MLNM (after McNamara and Buland, 2004)

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Listening to the Earth

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