The Trillium Compact Ocean Bottom Seismometer (OBS) is an ultra-low power broadband seismometer for ocean bottom deployments to 6000m depth. The OBS vessel and gimbal design preserves the full performance of the land-based Trillium Compact seismometer, including its exceptional dynamic range and low noise floor.

Incorporating a robust and reliable leveling gimbal that operates over a full 360° range, the Compact OBS will auto-level from all orientations. A full titanium cylindrical pressure vessel for 6000m deployments, or stainless steel vessel for 1200m deployments, and proven glass epoxy connectors ensure exceptional ruggedness and resistance to corrosion in marine and fresh water environments.

The system employs two separate connections: the primary analogue connection as well as a digital connection. The digital connector is provided for final configuration and sensor verification prior to deploying the OBS overboard.

**Performance and Dependability**

**Benefits**

- The precise, kinematic 360° gimbal auto-levels from any orientation ensuring successful deployment and implementation.
- SoH outputs include case orientation, providing a powerful data set for optimizing deployment techniques.
- Ocean current induced noise effects are minimized due to a low-profile OBS design.
- Ultra-low power consumption of 180mw reduces battery costs.
- 120-second broadband seismometer that integrates with existing short period or mid-band infrastructure (platforms, power systems, and digitizers).

**Nanometrics**
SEISOMETER TECHNOLOGY

**Topology**
Symmetric triaxial

**Feedback**
Force balance with capacitive transducer

**Mass Centering**
Not required

**PERFORMANCE**

**Self-noise**
See graph

**Sensitivity**
750 V/s/m
(Reference User Guide for precise value)

**Precision**
± 0.5% relative to User Guide specification

**Off-axis Sensitivity**
± 0.5%

**Bandwidth**
-3 dB points at 120 s and 100 Hz

**Transfer Function**
Lower corner poles within ± 0.5% of nominal
High-frequency response within 1 dB of nominal
No peak in response at high frequency

**Clip Level**
26 mV/s from 0.1 Hz to 10 Hz

**Parasitic Resonances**
None below 100 Hz

**Operational Tilt Range**
± 2.5° without re-leveling

**DIGITAL COMMAND AND CONTROL INTERFACE**

**WEB interface**
Onboard web server, using industry standard web browsers

**COMMAND LINE**
Basic interface for non-SLIP connections

**CONFIGURATION AND CONTROL**

**Sensor**
XYZ/UVW mode
Calibration channel selection (off, all, U, V or W)
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
Upload custom information

**DATA OUTPUTS**

**On-request**
Seismometer mass position values
Temperature
Internal relative humidity
Magnetometer readings
Seismometer response (poles, zeroes, sensitivity)
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
Upload/Download custom information

**Leveling Log**
Every leveling event logged in non-volatile memory
Full before and after State of Health log
downloaded

**State of Health Log**
Scheduled interval recordings of SoH, includes:
> time from power on
> seismometer mass positions
> vessel and seismometer orientations
> magnetometer readings
> temperature
Capacity for >2 years daily recordings

LEVELING AND ORIENTATION

**Technology**
Dual degree-of-freedom motorized gimbals
Jam-free mechanism
Kinematic design preserves full seismometer performance

**Range**
≥ ± 180° relative to upright case

**Accuracy**
Levels to within ± 0.5° of true vertical

**Leveling initiation**
Leveling checks done at some or all of:
> configurable delay after power on
> configurable periodic (three stage schedule)
> on external command
Delay intervals configurable from seconds to months
Levels only when needed based on configurable mass position threshold

**Magnetometer**
3-component, mounted on and leveled with seismometer

COMMUNICATIONS

**Interfaces**
RS-232 serial on main and auxiliary connectors

**Protocols**
Serial Line IP (SLIP)
HTTP (POST and GET)
Command line protocol

CONNECTORS/PLUGS

**Main**
12-pin female, VSK-12-BCL rubber-molded glass epoxy
40 V peak-to-peak differential seismic signal plus ground (3 channels)
Serial RS-232 port (Rx, Tx)
Calibration voltage input
Power input and return

**Auxiliary/diagnostic**
4-pin female, VSG-4-BCL rubber-molded glass epoxy
Serial RS-232 port (Rx, Tx, Grd)
Auxiliary control input

**Vacuum/pressure port**
1/4” male quick disconnect with shutoff
Vent for evacuation and servicing

POWER

**Supply voltage**
9 to 29 VDC isolated
Power consumption ≤ 195 mW typical (leveled, quiescent)
Protection Reverse-voltage and over-voltage protected
Self-resetting over-current protection
Unit can be powered on for descent and ascent

ENVIRONMENTAL

**Marine**
Depth to 6000 m, fresh and salt water (titanium)
Depth to 1200 m, fresh and salt water (stainless steel)

**Operating temp.**
-20 °C to +60 °C

**Storage temp.**
-40 °C to +70 °C

**Shock**
100 g half sine, 5 ms without damage, 6 axes
No seismometer mass lock required prior to deployment and through full experiment cycle

PHYSICAL

**Enclosure**
Titanium cylinder, stainless steel
All connectors on end cap
End cap removable for O-ring servicing
Dual O-ring seals on end cap

**Diameter**
158 mm

**Height**
257 mm, not including connectors

**Weight**
11.96 kg on land, 6.66 kg in water

Figure 10-1: Top view
Figure 10-2: Side view

Trillium OBS TECHNICAL SPECIFICATIONS

Preliminary specifications subject to change without notice.