

## SBE 53 Bottom Pressure Recorder (BPR)

The SBE 53 BPR measures full ocean depth water level with extremely high resolution, accuracy, and stability. It combines a uniquely precise and stable time base with low-power frequency-acquisition circuitry, Paroscientific Digiquartz<sup>®</sup> pressure transducer, non-volatile 32 MB FLASH memory, and a precision thermometer, to provide unprecedented bottom-pressure recording capability.

The BPR integrates pressure measurements to obtain water levels (tides) unaffected by wave action. The interval between each water level measurement is programmable (1 minute to 1 hour), and the integration duration is also programmable (1 minute to entire tide interval). The BPR can continuously power the pressure transducer and reference frequency oscillator, eliminating turn-on transients and providing the highest quality data. Alternatively, it can enter a power-down state between measurements to conserve battery power, with a user-specified warm-up period before each pressure measurement. Temperature data is recorded with each pressure integration. Logging start and stop times are programmable, allowing lab setup before deployment.

The BPR stores data in memory, and also outputs real-time data. The large memory and low power requirements permit frequent water level recording. An input connector for an optional SBE 4M conductivity sensor is standard.



## Features

- Full ocean depth water level (6800 m), with extremely high resolution, accuracy, and stability.
- Precision thermometer, optional conductivity sensor.
- RS-232 interface, internal memory, and internal alkaline batteries (can be powered externally).
- Real-time data, and fast binary upload of data from memory.
- Large memory and low power requirements: 1.2-year deployment with alkaline batteries for a typical sampling scheme of water level measurements every 30 minutes (integrating pressure for the entire 30 minutes).
- Seasoft<sup>®</sup> for Waves Windows software package (setup, data upload, data conversion, plotting).
- Five-year limited warranty.

## Components

- Paroscientific Digiquartz<sup>®</sup> temperature-compensated pressure sensor, in four ranges from 1300 - 6800 m (2000 - 10,000 psia).
- Aged and pressure-protected thermistor with a long history of exceptional accuracy and stability.
- Frequency-input channel and bulkhead connector for optional SBE 4M conductivity sensor.
- Measurement times set by a continuously powered, real-time clock (accuracy  $\pm 5$  sec/month). Long-term drift of counter's reference frequency approximately ppm/year. To allow for drift correction, ovenized crystal oscillator is programmed to periodically make a reference frequency measurement.

## Options

- Accurate temperature sensor (aged thermistor embedded in end cap) or high-accuracy external temperature sensor.
- XSG/AG or wet-pluggable MCBH connectors.
- SBE 4M Conductivity sensor, interfaced via bulkhead connector and clamped to housing.
- Mounting fixture.
- Lithium batteries (not supplied by Sea-Bird).

## Measurement Range

Pressure	0 to 1300, 2000, 4000, or 6800 m (2000, 3000, 6000, or 10,000 psia)
Temperature	-5 to +35 °C (embedded or high-accuracy external)
Conductivity (optional)	0 to 7 S/m

## Initial Accuracy

Pressure	± 0.01% of full scale *
Temperature	± 0.01 °C (embedded); ± 0.002 °C (high-accuracy external)
Conductivity (optional)	± 0.001 S/m

\* Digiquartz residual temperature sensitivity is measured at Sea-Bird, and calibration coefficients are adjusted so that residual temperature sensitivity < 1 ppm over 0 – 20 °C (0.05 ppm/°C; 0.0005 psia for 10,000 psia sensor).

## Repeatability

Pressure	0.005% of full scale
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## Resolution

Pressure	0.045 ppm (0.3 mm for 10,000 psia, 1-min integration, continuously powered)
Temperature	0.001 °C (embedded); 0.0001 °C (high-accuracy external)
Conductivity (optional)	0.00002 S/m

## Hysteresis

Pressure	0.005% of full scale
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## Clocks

*Counter Time Base (pressure, pressure temperature):* Quartz TCXO ± 3 ppm/year aging (± 1 ppm/year typical), ± 0.1 ppm (0-20 °C).  
*Ovenized Crystal Oscillator (reference frequency drift correction):* Warm-up re-stabilization < ± 1 x 10<sup>-7</sup>;  
 Stability vs. temperature: ± 0.1 ppm (-20 to +70 °C); Aging: < 1 x 10<sup>-7</sup> per year, < 1 x 10<sup>-6</sup> /10 years.  
*Real-time clock (time stamp and sample timing):* Quartz TCXO watch-crystal type 32,768 Hz; accuracy ± 2 ppm (5 sec/month);  
 Battery-backed for minimum 2-year operation without main batteries installed.  
*Conductivity Time Base:* Quartz TCXO ± 1 ppm per year aging; ± 15 ppm (-20 to +70 °C).

## Memory & Data Storage

32 Mbyte non-volatile FLASH; No conductivity: 17 bytes/sample; With conductivity: 20 bytes/sample

## Power Supply

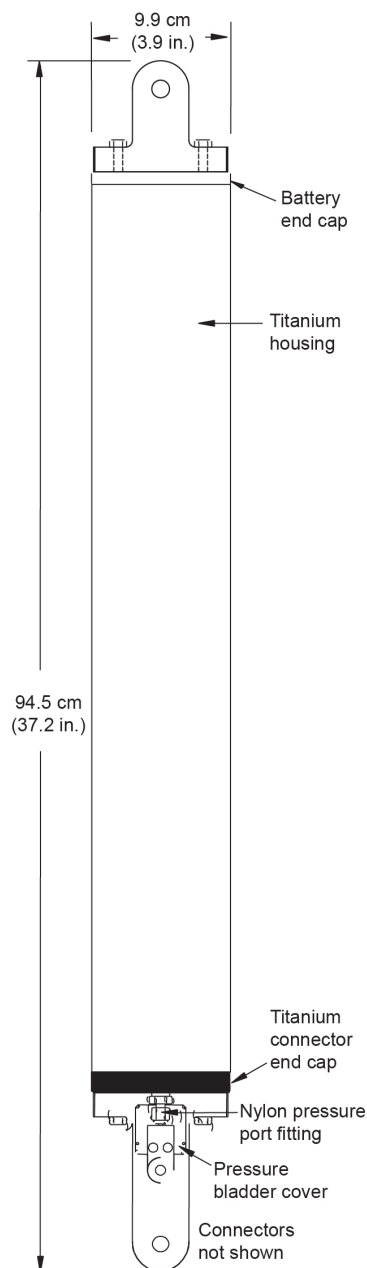
12 alkaline D-cells or 6 lithium DD cells (see manual for battery specifications and endurance)

## Optional External Power

12-24 VDC

## Housing, Depth, Weight

Titanium, 7000 m, in air 14.5 kg, in water 8.6 kg.  
 Mounting fixture weight in air 3.6 kg, in water 1.4 kg.



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