

Description and specifications, Bottom Pressure Recorders for NEPTUNE observatory array (updated from original sent to J. Cherniawski, 2004-12-30)

General instrument description

The Geological Survey of Canada, Pacific Geoscience Centre (PGC), will construct eight state-of-the-art bottom-water pressure, temperature, and conductivity recording systems (BPRs) for NEPTUNE monitoring to facilitate detection and characterization of tsunamis and other shallow and deep oceanographic transients over a broad frequency range. When connected to the NEPTUNE cable for power and data transmission, the recorders will provide pressure measurements at 1 Hz, and temperature and conductivity measurements at a lower rate. A non-rechargeable lithium thionyl chloride battery pack will supply the instrument during any cable power outages, and data will be recorded in flash memory. Detected absence of external power between 9 and 12 V will trigger the autonomous recording mode in which the sampling periods of pressure will be 10 s and of temperature and conductivity no greater than 30 min.

The unique aspect of these systems lies with the resolution with which pressure is measured at the sampling frequency of 1 Hz - better than 100 ppb or the equivalent of 0.4 mm of water. This resolution, and the use of an absolute pressure sensor, allow signals to be studied across a broad spectrum, ranging from seismic surface waves and tsunamis to seasonal and even decadal oceanographic variations. This capability is provided by no commercially available monitoring system.

As supplied, each BPR system will comprise pressure and temperature sensors, analog-to-digital conversion electronics, a real-time clock, an on-board logger for memory and communication control, a pressure housing, and a seafloor frame compatible with ROV operational constraints. The budget for the systems does not include conductivity sensors or underwater-mateable NEPTUNE connection connectors; these will be purchased by IOS or NEPTUNE, although PGC will complete full-assembly electrical tests including all sensors and connectors.

System specifications summary

Parameter	Specification
Channels	3: Pressure, Conductivity, Temperature
Bytes/sample	12
Sample period (cable connected)	1 s (P) 10 s (T, C)
Sample rate (autonomous power)	10 s (P) 30 min (T, C)
Memory capacity	256 Mb
External voltage	9 - 12 V
Battery capacity	630 A-hr @ 7.2 V 4473 W-hr
Power dissipation	
SCF+PPC sleep	0.38 mW
sampling @ 1.5 s	88 mW
average RTC+PPC	9.2 mW
total	32.2 mW
Lifetime	5 yrs (for autonomous fallback operation)

General:

Temperature sensor: GE Industries thermistor SP100BB254JA2/2C

Pressure sensor: Paroscientific 8B4000-1

Conductivity sensor: Sea-Bird 4M

Communications protocol: RS-422

Comm rates: 4800 Baud to 230.4 kBaud

Download protocols: Sector based (custom), 512 byte packets or
Xmodem - CRC, 128 byte packets or
Xmodem - checksum, 128 byte packets or
Streaming

Period measurement noise: < 10 ppb @ 800 ms integration time (1 Hz sampling)

Relative pressure resolution: < 100 ppb full scale @ 800 ms integration time (<0.4 mm H₂O) (relative conductivity resolution equivalent)

Absolute pressure accuracy: < 1 ppm full scale

Relative temperature resolution: < 0.1 mK

Absolute temperature resolution: IOS responsible for calibration

Absolute time uncertainty: < 1 s

Relative time uncertainty: < 100 ms

Price as described: \$22,320