Digital Reversing Thermometer

SBE 35RT

The SBE 35RT is an accurate, ocean-range temperature sensor that is capable of measuring temperature in the ocean to depths of 6800 meters (22,300 ft). The SBE 35RT communicates via a standard RS-232 interface at 300 baud, 8 data bits, no parity.

Real-Time Operation:

11*plus* — 9*plus* CTD — Carousel
35RT

33–Carousel–19, 19*plus*, 19*plus* V2, or 25 CTD
35RT

Autonomous Operation:

9*plus* CTD — 17*plus* — Carousel
35RT

19,19*plus*,19*plus* V2, or 25 CTD–AFM — Carousel
35RT

The SBE 35RT is used with the SBE 32 Carousel Water Sampler and one of the following CTD systems:

- **Real-time** (bottles closed by command from ship)
  SBE 9*plus* CTD with SBE 11*plus* Deck Unit, ***or***
  SBE 19, 19*plus*, 19*plus* V2, or 25 CTD with SBE 33 Deck Unit
- **Autonomous** (bottles closed based on programmed pressures or times)
  SBE 9*plus* CTD with SBE 17*plus* V2 SEARAM, ***or***
  SBE 19, 19*plus*, 19*plus* V2 or 25 CTD with Auto Fire Module (AFM)

The SBE 35RT makes a temperature measurement each time a bottle fire confirmation is received, and stores the value in EEPROM. Each stored value contains the time and bottle position in addition to the temperature data, allowing comparison of the SBE 35RT record with CTD and water bottle data. Using one SBE 35RT eliminates the need for reversing thermometers, and provides higher accuracy temperature readings at lower cost.

Calibration coefficients stored in EEPROM allow the SBE 35RT to transmit data in engineering units. SEATERM, the terminal program in our SEASOFT©-Win32 software suite, provides easy SBE 35RT setup and data uploading. When configured in a real-time system, the SBE 35RT can use the system modem channel for two-way communications; it is not necessary to change cable connections to communicate with and retrieve data from the SBE 35RT.

The SBE 35RT can be supplied with an optional, small, desktop Interface Box that is connected to the SBE 35RT and a computer for setup and lab use. The Interface Box is 110/220 VAC powered, provides 15 VDC to the SBE 35RT, and buffers the communication lines to minimize interference from external noise. When used with the Interface Box, user-selectable operating modes are:

- Sample continuously and output real-time data (data is not stored in EEPROM), or
- Take a single sample, store the data in EEPROM, and output real-time data.

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MEASUREMENT METHOD

Temperature is determined by applying an AC excitation to reference resistances and an ultrastable aged thermistor with a drift rate of less than 0.001°C per year. Each of the resulting outputs is digitized by a 20-bit A/D converter. The reference resistor is a hermetically sealed, temperature-controlled VISHAY. The switches are mercury wetted reed relays with a stable contact resistance. AC excitation and ratiometric comparison using a common processing channel removes measurement errors due to parasitic thermocouples, offset voltages, leakage currents, and gain errors. Maximum power dissipated in the thermistor is 0.5 microwatts, and contributes less than 200 μK of overheat error. The output from the sensor is a raw count related to resistance measurements:

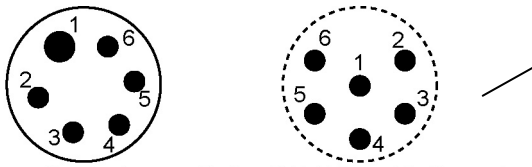
Sensor Output (raw counts) = 1048576 * (NT - NZ) / (NR - NZ)

where NR is reference resistor output, NZ is zero ohms output, and NT is thermistor output.

Each measurement acquisition cycle takes 1.1 seconds. The number of cycles per measurement is programmable. Increasing the cycles increases acquisition time while reducing RMS temperature noise from the sensor. In a thermally quiet environment, the temperature noise standard deviation is: 82 * sqrt (1/n cycles) [μK].

SPECIFICATIONS

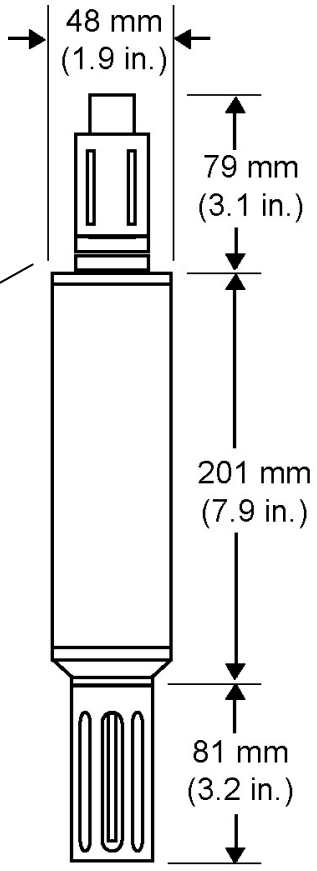
Measurement range	-5 to +35 °C
Initial accuracy	0.001 °C
Typical stability (per year)	0.001 °C
Resolution	0.000025 °C
Sensor calibration	-1.5 to + 32.5 °C
Data storage	Up to 179 samples
Real-time clock	Watch-crystal type
External power	9 - 16 VDC
Current	
On power application (≈ 1 minute)	140 – 160 mA
Operating	60 – 70 mA
Housing materials	Aluminum, rated at 6,800 meters (22,300 feet)
Weight	
In water	0.3 kg (0.7 lbs)
In air	0.7 kg (1.5 lbs)



Standard Connector AG-306-HP-SS

Optional Wet-Pluggable Connector MCBH-6MP (WB), AL (3/8" length base, 1/2-20 thread)

Pin	Signal
1	Ground
2	Receive from SBE 9*plus*, SBE 33, or Interface Box
3	Transmit
4	N/C
5	Bottle fire confirmation from Carousel
6	Power +9 to +16V



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