

# Multi-Channel Counter

**SBE 31**  


The SBE 31 is most often used as a general-purpose laboratory counter, or (in conjunction with a computer) as a data logger during instrument calibration. It also contains encoding electronics found in the SBE 9 CTD Underwater Unit, allowing direct display of Sea-Bird CTD sensor outputs. The standard instrument is supplied with 3 frequency data channels.



Additional counter channels, or a multiplexed A/D for voltage-output sensors, can easily be added. The SBE 31 can power the temperature sensor (SBE 3), conductivity sensor (SBE 4), a Digiquartz® pressure sensor (SBE 12), and a submersible pump (SBE 5), making it possible to do CTD work in water less than a few hundred meters without the requirement for a regular CTD Underwater Unit.

The temperature, conductivity, and pressure sensors send their frequency outputs directly to the SBE 31 for encoding. A three-conductor (power, signal, common) cable for each sensor is required. A computer is required to take the data from the IEEE-488 or RS-232C output port, store it on disk, and convert it to engineering units for display and/or plotting. Indicator lights are provided to show when data is being properly encoded without error, and when the computer interface is in the Transmit or Receive mode. Output buffers accumulate data while the computer may be temporarily occupied with other tasks.

Hybrid period counting is used, so that the measurement period is always the same, regardless of sensor frequency, and yet the high-resolution advantages of period-counting are realized. Each channel is digitized 24 times per second. Any sensor frequency between 1687.5 Hz and 98,304 Hz will be unambiguously encoded (there are no "wrap-arounds" to keep track of). Other frequency ranges are available as option. The SBE 31 computes the sensor frequencies and presents the binary equivalents of these frequencies to the output port. While the scan rate is fixed at 24 per second, the SBE 31 can "average-together" the data from up to 24 scans. The effective scan rate is set by a command from the computer or dumb terminal, and can be any rate determined by the formula:

**Scan Rate = 24/N scans per second**, where N is any integer between 1 and 24 inclusive.

If the scan rate is reduced by increasing N, the system resolution improves. Operating at a lower scan rate results in fewer bytes of data at the output port, a feature which proves useful when less capable computers are used to process and log the data.

The SBE 31 has an 8-digit LED front panel array which can display raw frequency, voltage, or diagnostic information. A thumbwheel switch is used to select which frequency channel, A/D channel, or diagnostic function output is displayed. No computer is necessary to obtain this display.

Although almost any computer may be used with the SBE 31, the IBM-PC compatibles are convenient because they run Sea-Bird's SEASOFT data acquisition software. Supplied without charge to users of Sea-Bird equipment, SEASOFT provides CRT tabulation and graphing, multi-pen plotting, and floppy/hard disk archival of full-speed CTD data.

## SPECIFICATIONS:

### Number of Data Channels:

3 standard, 35 maximum (the internal scan rate must be reduced if more than 9 data channels are installed, e.g., with 35 data channels the scan rate is 6 per second); 8 multiplexed A/D (voltage input) channels may be added (limits to 31 frequency channels)

### Allowable Frequency Range and Waveform:

1687.5 to 98,304 Hz standard, 0.5 to 10 volt peak-to-peak sine or square wave. Other ranges available.

### Resolution at 24 Scans per Second:

0.006 Hz at 1687.5 Hz  
0.035 Hz at 10,000 Hz  
0.341 Hz at 98,304 Hz

### Resolution at 1 Scan per Second:

0.00024 Hz at 1687.5 Hz  
0.0014 Hz at 10,000 Hz  
0.0142 Hz at 98,304 Hz

### Accuracy:

The 27,648,000 Hz reference crystal ( $\pm 2$  ppm, 0 to 50 °C) is divided by 4 to obtain a 6,912,000 Hz reference frequency yielding count accuracies as follows:

$\pm 0.0034$  Hz at 1687.5 Hz;       $\pm 0.020$  Hz at 10,000 Hz;       $\pm 0.197$  Hz at 98,304 Hz

### Outputs:

IEEE-488 parallel port  
RS-232C serial port  
Auxiliary power +12 Volts DC at 0.2 Amperes (+15 volts optional)

### Power and Size:

The SBE 31 requires less than 100 watts at 115 or 230 VAC 50/60 Hz, and is supplied in a standard 19-inch rack-mount configuration (5.25 inches high, 17 inches deep).

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