

# Integration of High Accuracy Conductivity and Temperature Measurements with the LISST-100

*The LISST-100 instrument has been designed with flexibility in mind. An example of this is the integration of a SeaBird MicroCAT Conductivity and Temperature sensor. The SeaBird CT Sensor is controlled and powered by the LISST-100. The data is stored, at full accuracy, by the LISST-100 in it's standard data format.*

SEQUOIA SCIENTIFIC, INC.

■ APPLICATION NOTE L004



At the core of the LISST-100 Particle Size Analyzer is a TattleTale Model 4A data logger manufactured by Onset Computer of Pocasset, Massachusetts. This data logger was chosen because of its ease of use. It has allowed us to

offer a wide range of additional features at a low cost. Some of these features are the user accessible auxiliary analog and digital channels. These channels can be used for a wide array of applications. The analog channel can be used to log 12-bit data from any 0 to 5V sensor. The two digital channels can be used to control other instruments or be controlled by other instruments, for example the fire off a water-sample bottle or to be event triggered by a current meter. Another use of the digital channels is in communicating via RS232 with another instrument such as the SeaBird MicroCAT CT sensor.

In response to a request from a current LISST user we interfaced a SeaBird MicroCAT Conductivity and Temperature Sensor (Model number SBE 37-SI) to a standard LISST-100. The users requirements were that the package be self contained, the data be logged by the LISST-100, the data be fully synchronized with the particle size and concentration data, and the sample rate be at least 1 Hz.

The requirements were easily met with the addition of a few hardware components and some customization of the standard LISST data acquisition software. By modifying the software to com-

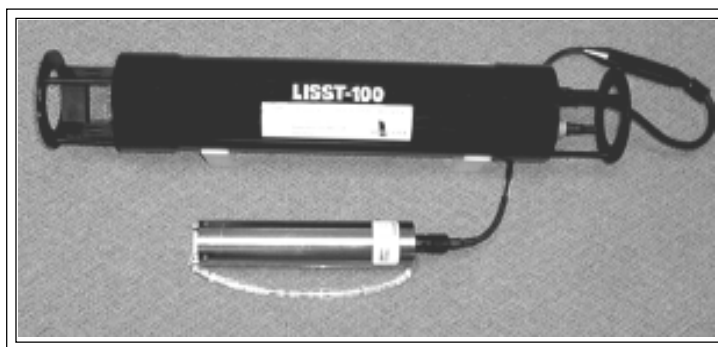


Figure 1: LISST-100 and SeaBird Conductivity and Temperature Sensor.

municate with the CT sensor during the standard data acquisition subroutine we were able to obtain the data at the 1 Hz rate required. The high accuracy conductivity and temperature data are stored in the standard LISST data file format. The processing of the LISST size distributions by the Windows software was unaffected by the changes. Since the data is transferred digitally there is no loss in performance of the CT sensor.

This example shows how the additional analog and digital channels available on the provided underwater connector can be used to communicate with other RS232 instruments. The only limitation is that there is no buffering of RS232 instruments. The only limitation is that there is no buffering of RS232 signals in the LISST-100. Therefore signals will only be received if the LISST is "listening" for them. In most applications this can be easily dealt with. In the case of the SeaBird MicroCAT a command is sent to the MicroCAT

telling it to acquire a sample and hold it. After acquiring the size data, the LISST then sends a second command to the MicroCAT asking it to transmit the acquired data in calibrated units. The LISST receives the data and stores it in its standard datafile.

Figure 2 shows the display of auxiliary parameters from the LISST processing program. The values are shown for one sample. These values are also stored into the processed data file with each size distribution sample.

| Parameter           | Value  | Units  |
|---------------------|--------|--------|
| Laser Power         | 2.07   | mwatts |
| Battery             | 15.657 | volts  |
| External Instrument | 0.015  | volts  |
| Laser Reference     | 2.796  | mwatts |
| Pressure            | 0.152  | meters |
| Temperature (SBE)   | 7.318  | deg C  |
| Conductivity (SBE)  | 4.246  | S/m    |
| Aux2                | 21     |        |
| Transmission        | 0.877  |        |

Frame: 200

Show raw data

Cancel

Figure 2: Display from LISST processing software showing the high resolution temperature and conductivity being stored.

Figure 3 shows that the only modification required to the LISST processing program was to the Calibration Constants for the Auxiliary Parameters. The SeaCat temperature and conductivity are now being stored in place of the old temperature measurement and an auxiliary channel that used earlier to store the minute that the sample was taken. By simply changing the labels and calibration values, we can process, display, and store the data in the proper units.

| Parameter   | Display Label       | Multiplier | Offset | Units  |
|-------------|---------------------|------------|--------|--------|
| Parameter 1 | Laser Power         | 0.00093    | 0      | mwatts |
| Parameter 2 | Battery             | 0.00491    | 0      | volts  |
| Parameter 3 | External Instrument | 0.0012307  | 0      | volts  |
| Parameter 4 | Laser Reference     | 0.00094    | 0      | mwatts |
| Parameter 5 | Pressure            | 0.0169     | 0.152  | meters |
| Parameter 6 | Temperature (SBE)   | 0.001      | 0      | deg C  |
| Parameter 7 | Conductivity (SBE)  | 0.001      | 0      | S/m    |
| Parameter 8 | Aux2                | 1          | 0      |        |

Volume Conversion Constant: 39000

Cancel OK

Figure 3: Calibration and constant window of the LISST processing program.

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