SEA-BIRD COASTAL

UCI150511

Universal Coastal Interface

User manual

05/2015, Edition 1

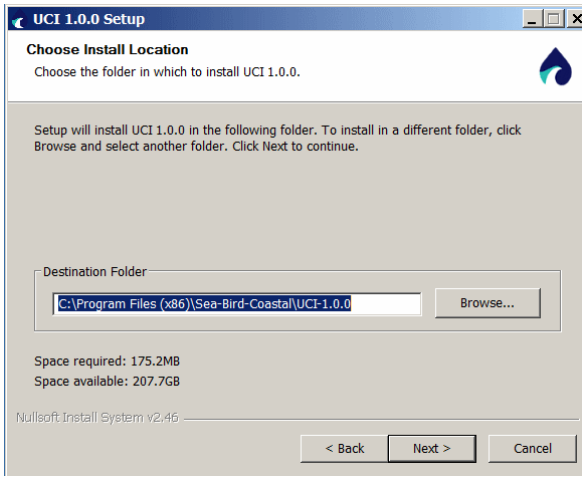
Table of Contents

Section 1 Install software

The Universal Coastal Interface (UCI) software communicates with a number of sensors. Refer to the sea-birdcoastal.com website for the current list of sensors that use this software.

1. Get the software from the sea-birdcoastal.com website or the manufacturer-supplied CD.
2. Double-click on the file with ".exe" appended to the name.
3. Push **Run** in the new window.
   The setup wizard starts.
4. Push **Next**.

5. Push **Agree** in the next window to agree with the terms of the software.
6. Install the software at the default location or push **Browse** to go to another location to install the software.
7. Push **Next**.



8. Put a check in the boxes next to the "Install USB-Serial Driver and "Show Readme."
9. Push **Finish**.

The software is ready to use.

Section 2 SUNA operation

2.1 Verify sensor operation

⚠WARNING

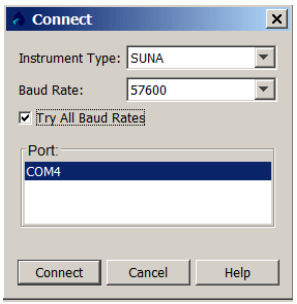
Nitrate sensors use an ultraviolet (UV) light. Do not look directly at a UV light when it is on. It can damage the eyes. Keep products that have UV light away from children, pets, and other living organisms. Wear polycarbonate UV-resistant safety glasses to protect the eyes when a UV light is on.

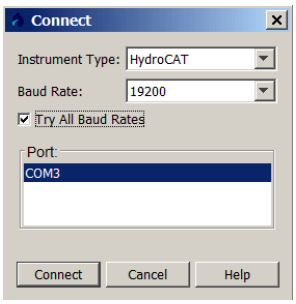
⚠CAUTION

Do not supply more than 15 VDC to the sensor. More than 15 VDC will damage the wiper.

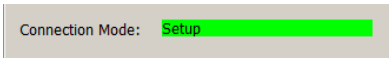
Do the steps below to make sure that the sensor operates before further setup and deployment.

1. Connect the connectors on the cable to the bulkhead connector on the sensor and to the PC.
2. Connect the USB or RS232 cable to the PC.
   For RS232: connect the power connectors on the cable to a 8–15 VDC power supply.
   For USB: a DC power supply is only necessary for data collection. If the sensor is equipped with internal memory, the file system will show as a USB mass storage device on the PC.
3. If necessary, start the software.
4. RS232: turn on the power supply.
5. Push **Connect** in the UCI Dashboard area.
6. If necessary, change the "Sensor Type" to the connected sensor.
7. Put a check in the "Try All Baud Rates" box.
   The software automatically finds the correct baud rate.
8. If necessary, select the communication port.

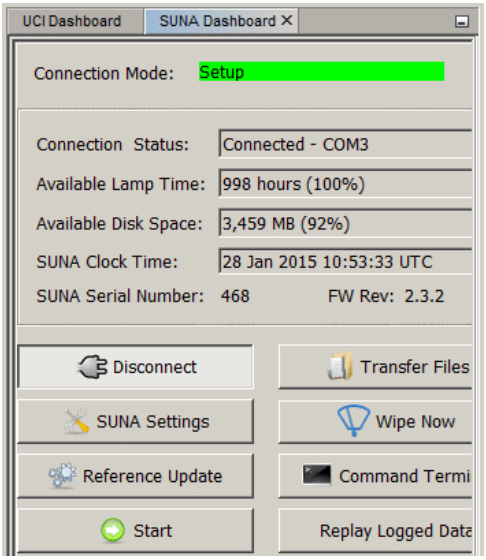




9. Push **Connect**.
   The "Connection Mode" shows "Transition" on a yellow background, and then shows "Setup" on a green background.



10. Push **SUNA Settings** in the SUNA Dashboard area.
    Make sure that the "Operational Mode" at the top of the new window is "Continuous."

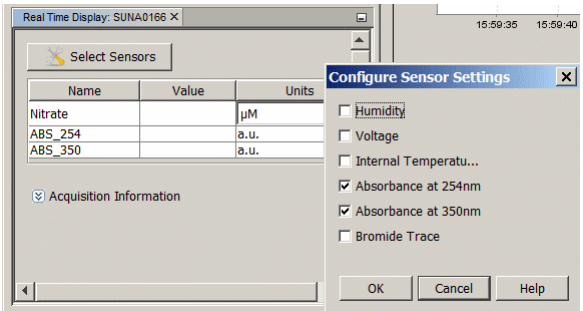


11. Push **Start** in the SUNA Dashboard area.
    The sensor collects data that shows in the *Spectra Graph* and *Time Series Graph* tabs.
12. For sensors that are not equipped with internal memory: Select the **View** menu, then *Data Logging*. Push **Start Log** to save data to the PC.
13. Let the sensor collect data for a minute or two.
14. Push **Stop**.
15. Make sure that the collected data is saved.
    - Sensors with internal memory: select **Transfer Files** in the SUNA Dashboard. Look at the files on the right for the file that was most recently saved.
    - Sensors without internal memory: Go to the directory on the PC to see the file that was most recently saved.

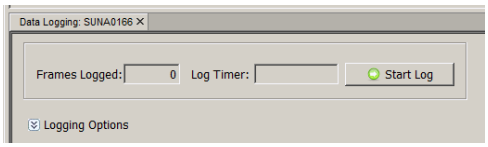
2.2 Monitor data collection

Use the software to monitor data as it is collected, or to look at it after a deployment, if the sensor is equipped with internal memory. If the sensor does not have internal memory, make sure to use the *Data Logging* tab to save collected data to a PC.

1. Push **Start** in the SUNA Dashboard area.
2. From the **View** menu, select the options to see the data:
   - *Real Time Data*—shows the most current data from the selected sensors.

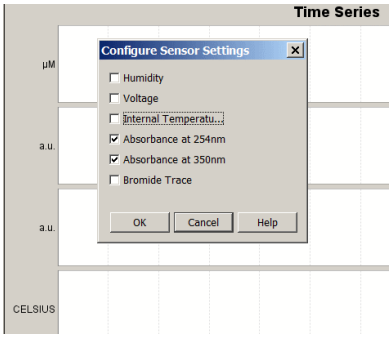


   - *Data Logging*—Push **Start Log** to save the collected data to the PC.



- *Time Series*, *Spectra*, and *Total Absorbance* graphs.

3. Push **Select Sensors** to see a list of parameters that can show in the *Time Series* tab.
4. Put a check in the box next to any additional parameters so that they will show in the *Time Series* graph.
   The left axis of the *Time Series* graph shows the parameters that are selected.



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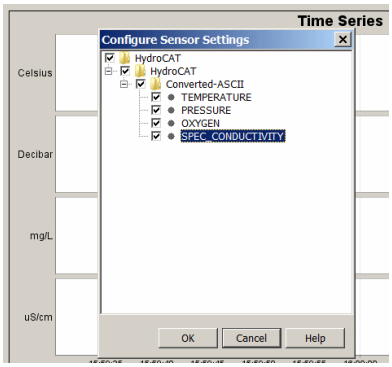
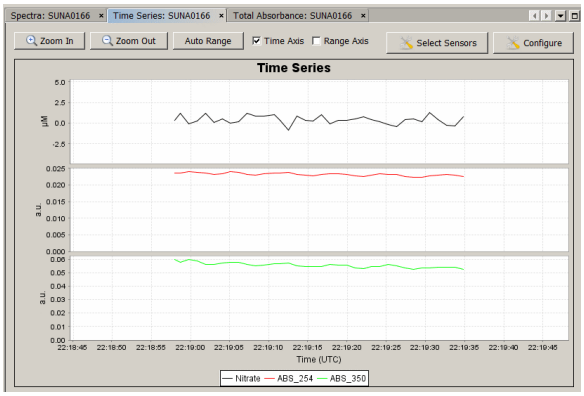
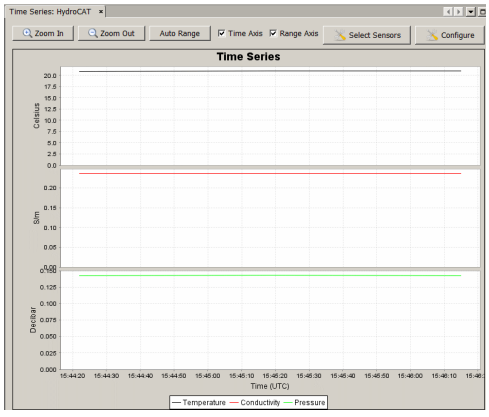
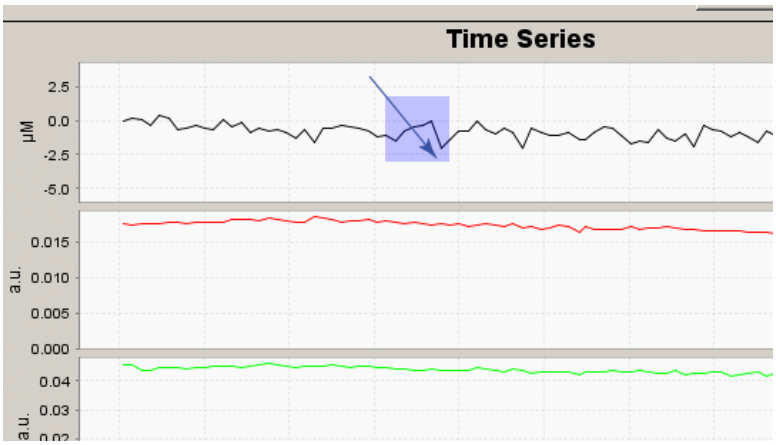


HydroCAT

5. Look at the data in the *Time Series* tab.
   - Put a check in the box next to "Time Axis" to push **Zoom In** and **Zoom Out** to change the scale of time.
   - Put a check in the box next to "Range Axis" to push **Zoom In** and **Zoom Out** to change the scale of the data.
   - To move the data in any direction, push the "Ctrl" key on the PC keyboard and the left button of the mouse pointer at the same time.
   - To select a specific part of the data to zoom in on, pull the mouse pointer diagonally (refer to the arrow in the graph below).



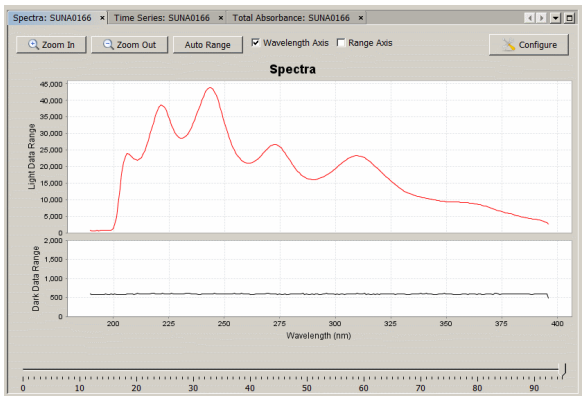




2.2.1 Monitor data in spectra graph

The *Spectra* graph shows both the dark and light data in raw counts.
The dark counts are from thermal noise. The light counts are the measured output minus the dark counts.

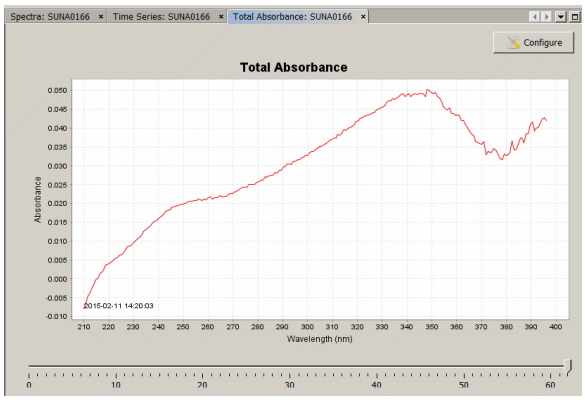
The measured spectrum is always flat below 200 nm, and then has four or five peaks. The peaks are approximately 25 nm apart in the lower wavelength range and up to 50 nm apart in the upper range.



1. Put a check in the box next to either or both the "Wavelength Axis" or the "Range Axis" to enable the **Zoom In** or **Zoom Out** options.
   The user can change the values for the axis with a check in the box.
2. Push **Select Sensors** either in the *Time Series* graph or in the *Real Time Display* tab to select the parameters to see on the graph.
3. Push **Configure** to put a limit on or to remove the limit to the "Time Axis Range."

2.2.2 Monitor data in absorbance graph

The *Total Absorbance* graph shows the calculated absorbance from 210 to 370 nm. This graph is an alternative to the *Spectra* graph. The absorbance graph should be flat when a sample of DI water is collected. The absorbance increases as absorbing species such as nitrate and bromide are added to samples.



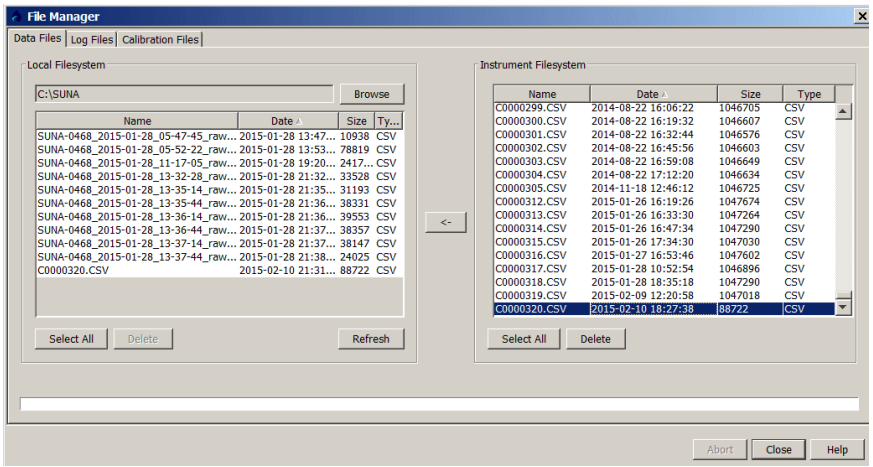
2.3 Get data from sensor

⚠CAUTION

Do data transfers away from harsh environments such as strong electric fields or electrostatic discharge sources. Electrostatic Discharge (ESD) sources may temporarily disrupt data transfer. If this occurs, move the sensor away from the ESD source. Turn the power off and then on and continue operation.

If the sensor is equipped with internal memory, the collected data is saved in the sensor.

1. Push **Transfer Files** in the SUNA Dashboard area.
   The files saved on the sensor show on the right side of the new **File Manager** window.



2. Select one or more files to copy to the PC.
   The manufacturer recommends that the user use a USB connection to move the files because it is much faster.
3. Push the **<-** arrow to start the move.
   The status shows at the bottom of the **File Manager** window.
4. Open the file on the PC to make sure it has all of the collected data.

2.4 Use software to set up sensor for deployment

The user can deploy the sensor in an autonomous or a logger-controlled mode.

Autonomous modes

- *Continuous operation*—when started, the sensor operates until the user removes power or pushes **Stop** in the SUNA Dashboard.

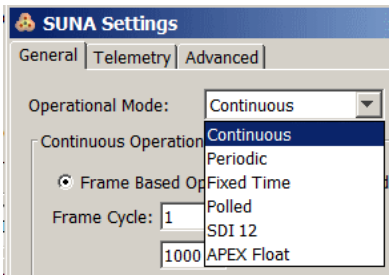
- *Fixed-time operation*—the sensor operates for a user-specified period of time or number of measurements.
- *Periodic operation*—the sensor operates at user-specified intervals. Data collection begins at a user-specified date and time and stops when the user removes power or pushes **Stop** in the SUNA Dashboard.
  Example: a sensor set up at 8:00 with a "Sample Interval" of 2 hours and an offset of 900 seconds (15 minutes) will operate at 10:15, 12:15, 2:15, etc.

Logger-controlled modes

- *Polled operation*—the sensor communicates through and is controlled by an RS232 terminal program.
- *SDI-12*—The sensor communicates through and is controlled by an SDI-12 controller.

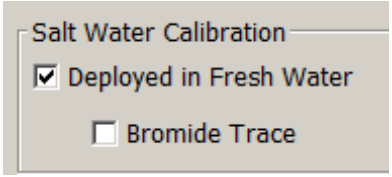
2.4.1 Set up for autonomous deployment

1. Make sure that the sensor is connected to a power supply and PC (RS232 or USB cable) and is on.
2. Make sure that the software is open and in communication with the sensor.
3. Push **SUNA Settings** in the SUNA Dashboard area.
4. Select the "Operational Mode" for the planned deployment.
5. Use the manufacturer-set values for that operation mode or change them as necessary.



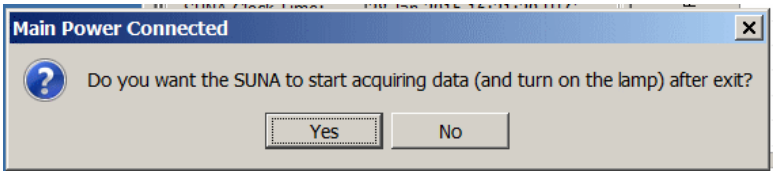
6. If the sensor has an integrated wiper, put a check in the "Integrated Wiper Enabled" box.

   The wiper operates one time data is collected, but no more than once per hour.
7. If the sensor is to be deployed in fresh water but has a calibration for seawater, select the *Advanced* tab and put a check in the "Deployed in Fresh Water" box.



8. Push **Upload** to save the settings in the sensor.
9. Push **OK** to save any changes, or push **Cancel** to close the window with no changes.
10. Go to the **UCI** menu at the top of the software window and select *Exit* (Ctrl-e).
11. Exit the software:
    - Push **No** to close the software.
      Turn off the sensor, remove from the power supply and attach the protective dummy connector and lock collar.

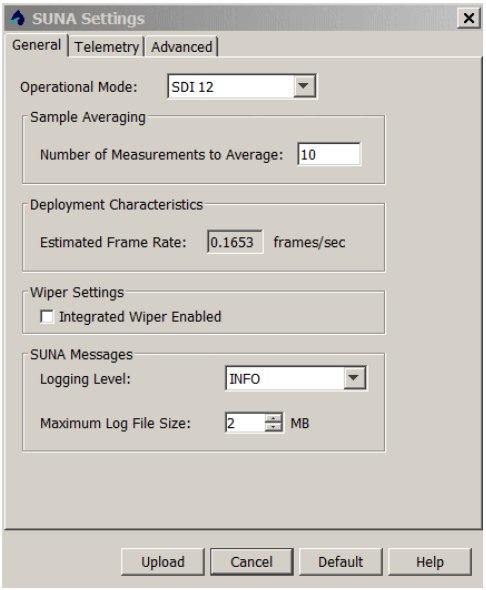
- Push **Yes** to close the software and start the sensor. The sensor will collect data immediately if the user selected "Continuous" or "Fixed-time" or at the user-specified time if "Periodic" was selected.



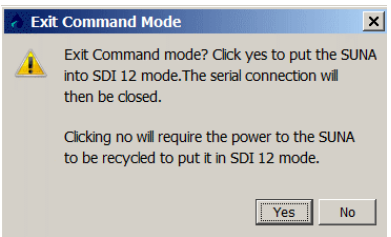
2.4.2 Set up for SDI-12 deployment

The user can deploy the sensor in a logger-controlled mode with an SDI-12 controller.

1. Set up the sensor in SDI-12 mode to operate with a controller.
2. Make sure that the sensor is connected to and in communication with the software.
3. Push **SUNA Settings** in the SUNA Dashboard.
4. At the *General* tab, select the "SDI 12 Operational Mode."



5. If necessary, change the "Number of Measurements per Frame."
   The sensor calculates the average of the value entered. For example, if "5" is entered, 5 measurements will be averaged and will show as one measurement in the data.
6. If the sensor is so equipped, put a check in the "Integrated Wiper Enabled" box.
   The wiper operates before each measurement.
7. The default "Logging Level" is INFO.
8. Push **Upload**.



   A new window shows.
9. Push **Yes** to put the SUNA into SDI-12 mode.
   The sensor is ready to connect to an SDI-12 data logger.

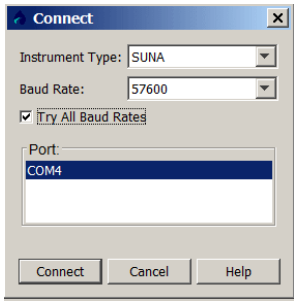
Section 3 HydroCAT operation

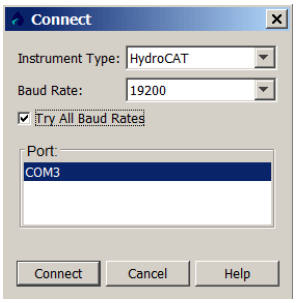
3.1 Verify sensor operation

Do the steps below to make sure that the sensor operates before further setup and deployment.

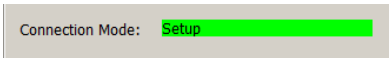
Make sure that the sensor is connected to a power supply (optional), SDI-12 controller, and PC and is on.
The sensor operates in RS232 and SDI-12 modes at the same time.

1. Connect the connectors on the cable to the bulkhead connector on the sensor and to the PC.
2. If necessary, start the software.
3. Push **Connect** in the UCI Dashboard area.
4. If necessary, change the "Sensor Type" to the connected sensor.
5. Put a check in the "Try All Baud Rates" box.
   The software automatically finds the correct baud rate.
6. If necessary, select the communication port.





7. Push **Connect**.
   The "Connection Mode" shows "Transition" on a yellow background, and then shows "Setup" on a green background.

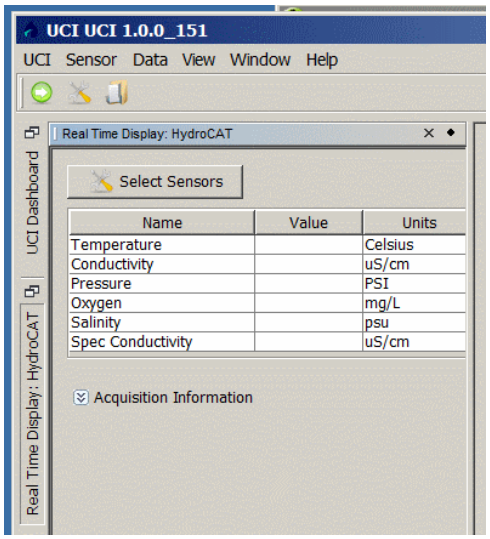


8. Select the **UCI** menu, then *Preferences*.
9. Go to the *General* tab and push **Browse** to find or make the *Default Data Directory* on the PC.
   Data from the sensor is saved here.
10. Push **OK**.

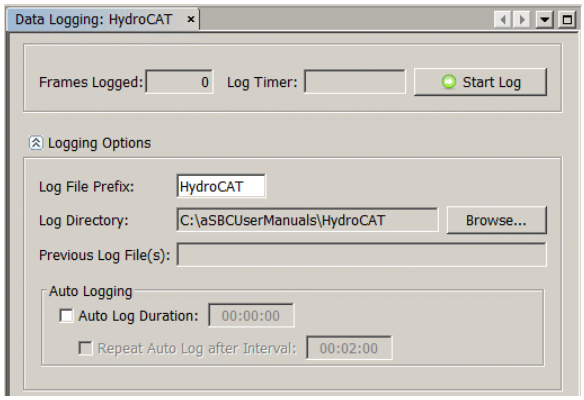
3.2 Monitor data collection

Use the software to monitor the data as it is collected, or after a deployment. Use the *Data Logging* tab to save collected data to a PC.

1. Push **Start** in the HydroCAT Dashboard area.
   The "Connection Mode" shows "Acquisition."
   Note: It may take up to two minutes for the sensor to show data.
2. From the **View** menu, select the options to see the data:
   - *Real Time Data*—shows the most current data from the selected sensors.

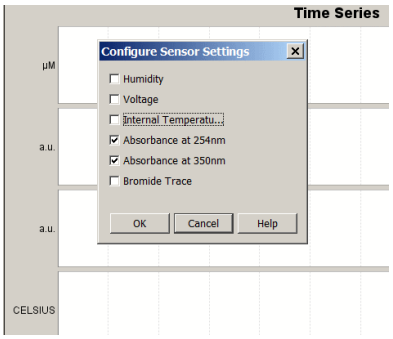


- *Data Logging*—Push **Start Log** to save the collected data to the PC.



- ***Time Series*** graphs.

3. Push **Select Sensors** to see a list of parameters that can show in the *Time Series* tab.
4. Put a check in the box next to any additional parameters so that they will show in the *Time Series* graph.
   The left axis of the *Time Series* graph shows the parameters that are selected.



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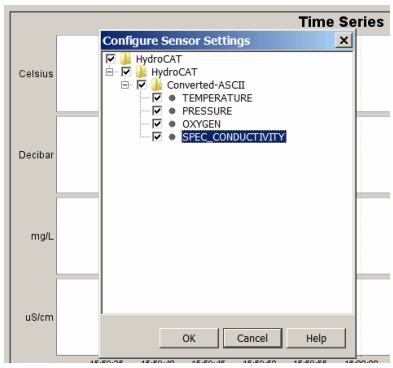

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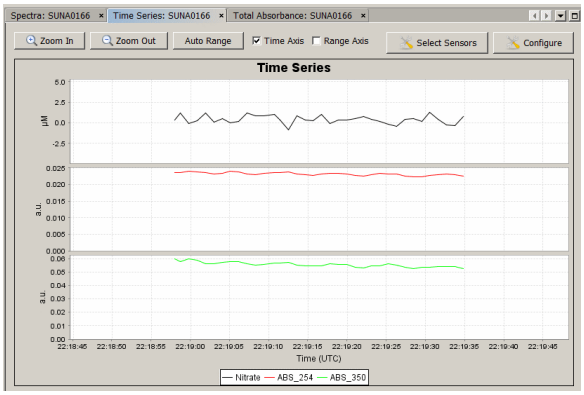
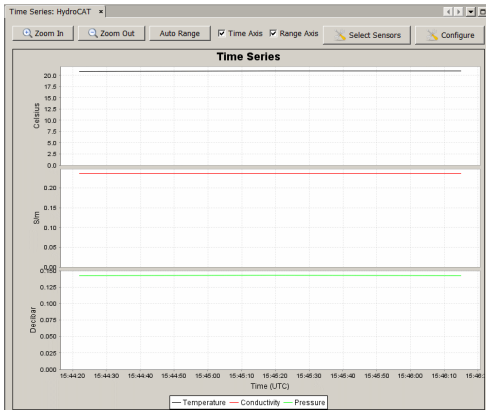
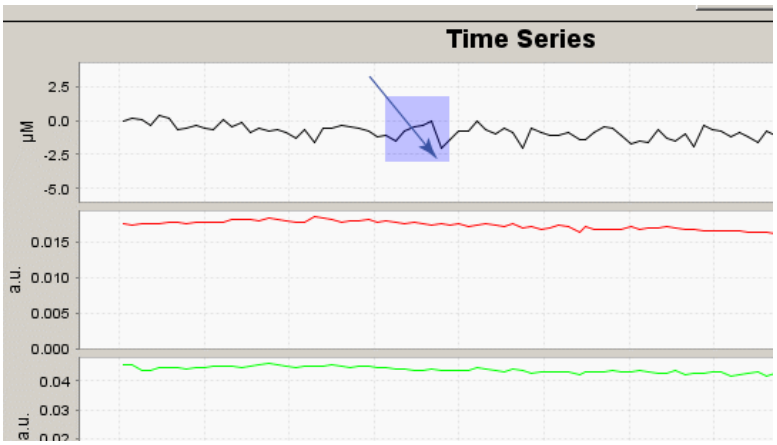
5. Look at the data in the *Time Series* tab.
   - Put a check in the box next to "Time Axis" to push **Zoom In** and **Zoom Out** to change the scale of time.
   - Put a check in the box next to "Range Axis" to push **Zoom In** and **Zoom Out** to change the scale of the data.

- To move the data in any direction, push the "Ctrl" key on the PC keyboard and the left button of the mouse pointer at the same time.
- To select a specific part of the data to zoom in on, pull the mouse pointer diagonally (refer to the arrow in the graph below).







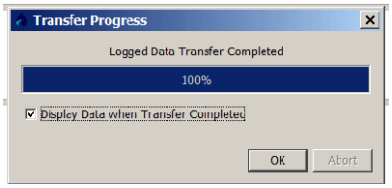
6. Let the sensor collect data for approximately 5 minutes.
7. Push **Stop** in the HydroCAT Dashboard.
   The "Connection Mode" mode shows "Setup."

3.3 Get data from sensor

⚠CAUTION

Do data transfers away from harsh environments such as strong electric fields or electrostatic discharge sources. Electrostatic Discharge (ESD) sources may temporarily disrupt data transfer. If this occurs, move the sensor away from the ESD source. Turn the power off and then on and continue operation.

1. Push **Transfer Data** in the HydroCAT Dashboard area.
   The new file shows near the bottom of the window in the "File Name" area.
2. If necessary, push **Browse** to change the directory on the PC in which the data is stored
3. Push **Transfer** to move the file to the PC.
4. Push **OK** when the **Transfer Progress** window shows 100%.

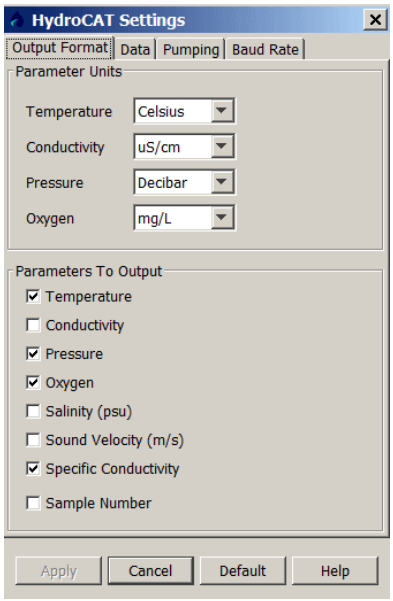


5. The manufacturer-set default is a check in the checkbox for "Display Data when Transfer Completed."
6. The sensor is ready to set up for a specific deployment.

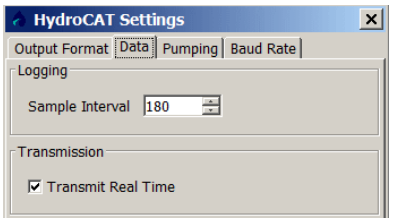
3.4 Set up for deployment

1. If necessary, start the software.
2. If necessary, connect the sensor to an SDI-12 controller if applicable, and PC.
3. Push **HydroCAT Settings** in the HydroCAT Dashboard area.
4. Select the *Output Format* tab if necessary. Select the settings for a specific deployment. Push **Default** to remove the "Conductivity" and "Salinity" parameters.
   Parameter Units
   - Temperature: select °C or °F.
   - Conductivity: select µS/cm, S/m, mS/cm.
   - Pressure: select PSI or Decibars.
   - Oxygen: select mg/L or ml/L.

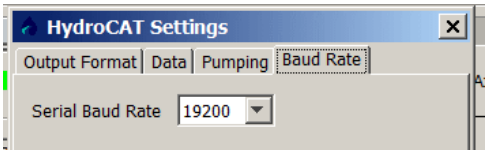
   Parameters to Output
   - Put a check in the box for each parameter to show "Temperature," "Conductivity," "Pressure," "Oxygen," "Salinity," "Sound Velocity."
   - Put a check in the box "Specific Conductivity" to show that parameter.
   - Put a check in the box "Sample Number" to add a number to each row of data that is collected.



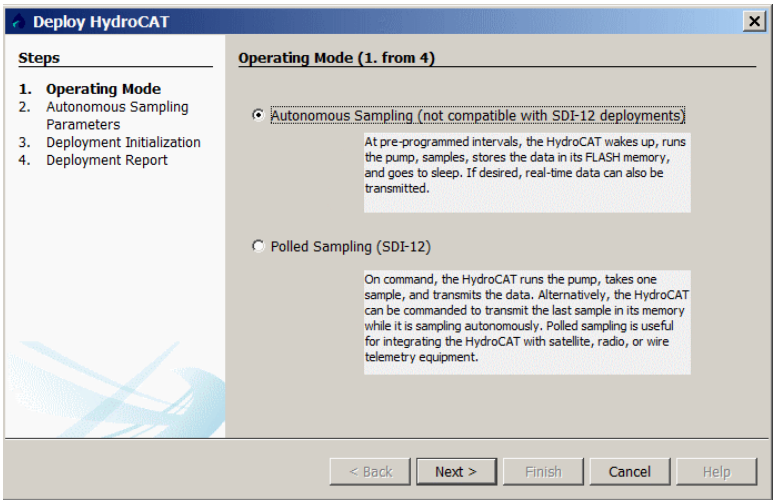
5. Select the *Data* tab to change the "Sample Interval" time (measured in seconds). Note: the sample interval time that is recorded by the sensor is directly related to pressure and temperature. This can result in a sample interval that is longer than the user-specified sample interval.



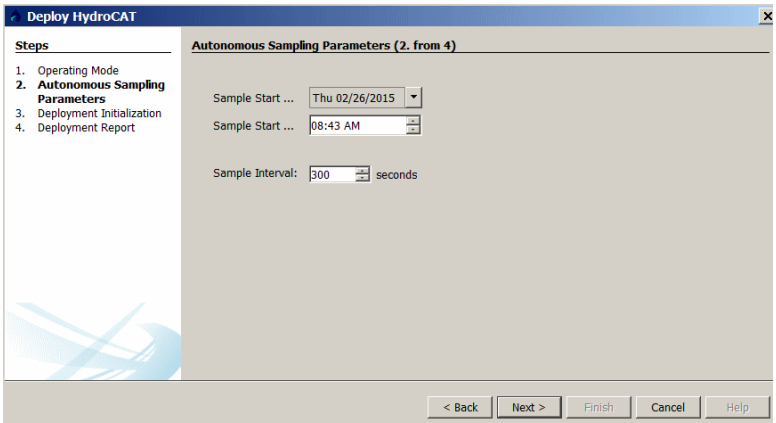
6. If necessary, select the RS232 data collection rate.



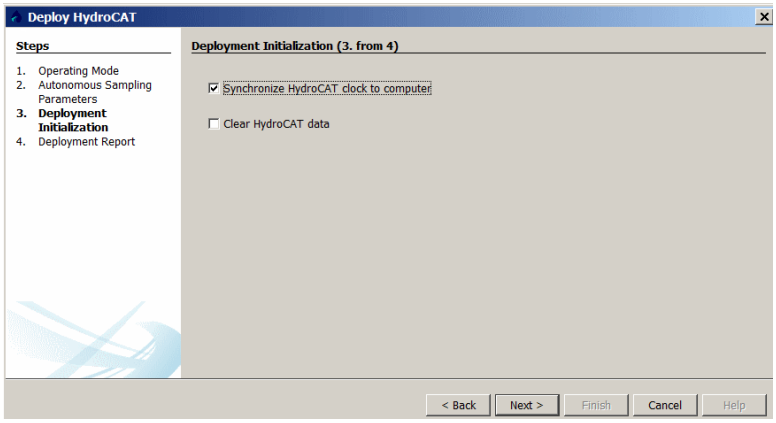
7. Push **Apply** to save the settings to the sensor.
8. Push **Deploy HydroCAT** in the HydroCAT Dashboard.
9. Select "Polled Sampling (SDI-12)" or "Autonomous Sampling."
10. Push **Next**.



11. Select the date and time to start data collection.
    Select the "Sample Interval."
12. Push **Next**.

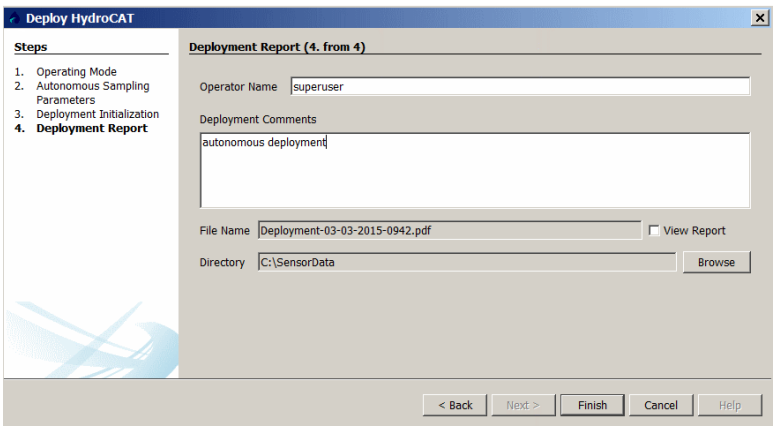


13. Put a check in the box to "Synchronize HydroCAT clock to computer."
    Put a check in the box next to "Clear HydroCAT data" to clear the memory in the sensor.
14. Push **Next**.



15. Enter any comments about the deployment.
Put a check in the box next to "View Report" to save a summary of the settings saved in the sensor.

If necessary, enter the directory in which the report will be saved, or push **Browse** to find a new directory.



16. Push **Finish**.
The software disconnects. The sensor is now ready for deployment.

4.1 Verify precision of sensor output

4.1.1 Update reference spectrum

The user needs to update the reference spectrum of the SUNA at regular intervals so that the data that the sensor collects is accurate. It may also be necessary to update the firmware, although that is not required very frequently.
A calibration file contains the data required to convert a spectral measurement into a nitrate concentration. The calibration data are the wavelengths of the spectrum, the extinction coefficients of chemical species and a reference spectrum relative to which the measurement is interpreted. The sensor can store many calibration files, but only the active file has a green background. Push **Transfer Files** > *File Manager*, then select the *Calibration Files* tab to see the list of calibration files stored in the sensor.

Make sure to clean the sensor and the sensor windows at regular intervals and before and after every deployment. Monitor the spectral intensity of the lamp. Although the intensity will decrease over time, make sure there are no sudden changes.

Necessary supplies:

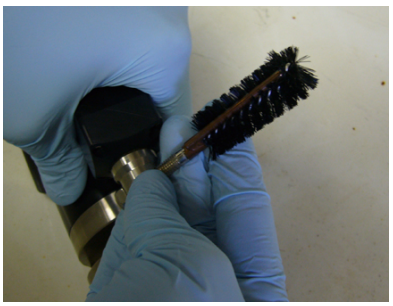
- Power supply
- PC with software
- Connector cable for sensor–PC–power supply
- Clean de-ionized (DI) water
- Lint-free tissues
- Cotton swabs
- Isopropyl alcohol (IPA)
- Parafilm® wrap

Notes

- Use only lint-free tissues, OPTO-WIPES™, or cotton swabs to clean the optical windows.
- Use the software to update the reference spectrum.
- Use only clean DI water that has been stored in clean glassware.
- Use Parafilm® wrap to capture DI water in the optical area of the sensor. Do not use cups, a bucket, or a tank to collect a reference sample.

1. Clean the sensor:
   a. Flush the sensor and the optical area with clean water to remove debris and saltwater.
   b. Clean the metal parts external to the optical area so that the Parafilm® will seal.
2. If the sensor has a wiper, carefully move it away from the optical area.

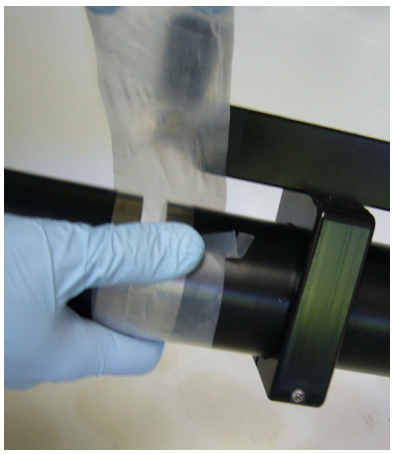
Figure 1 Wiper moved from optical area



3. Cut and stretch a length of approximately 40 cm (16 in.) of Parafilm®.

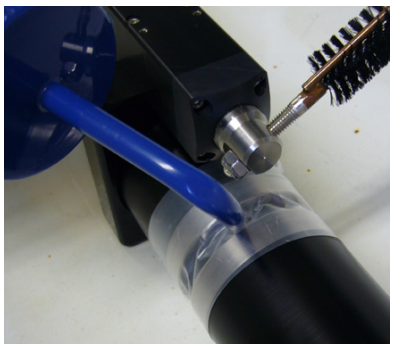
4. Wind the Parafilm® around the metal near the optical area.

Figure 2 Parafilm® on optical area



5. Break a small hole in the top of the Parafilm® and fill the optical area with DI water.

Figure 3 Optical area filled with DI water



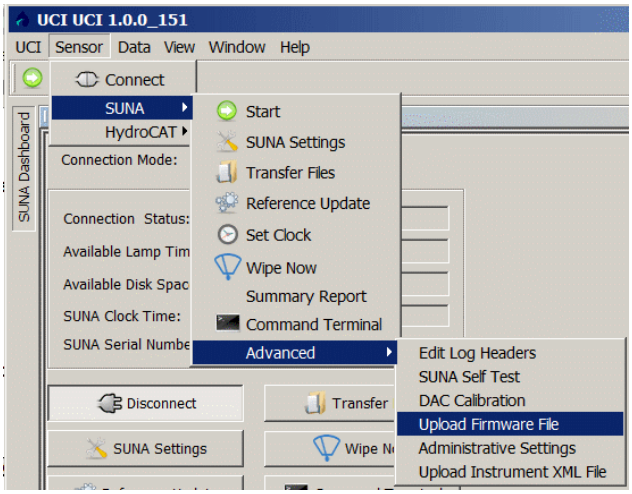
6. Supply power to the sensor and use the software to operate the sensor in "Continuous" mode.
7. Start the sensor and collect 1 minute of data.
8. Record the measurement value.
   This is a "dirty" measurement to record the value when there are biofouling and blockages in the optical area.
9. Stop the sensor.
10. Remove the Parafilm® and drain the water from the optical area.
11. Clean the optical area:
    a. Use DI water or IPA and cotton swabs and lint-free tissues to clean the windows.
    b. Use vinegar to clean debris such as barnacles. Be careful that the windows do not get scratches.
12. Flush the optical area with DI water to remove any remaining IPA or vinegar.
13. Wind Parafilm® around the metal near the optical area.
14. Break a small hole in the top of the Parafilm® and fill the optical area with fresh DI water.
15. Supply power to the sensor and use the software to operate the sensor in "Continuous" mode.
16. Start the sensor and collect 1 minute of data.
17. Record the measurement value.
    This measurement shows any sensor "drift" or change in the lamp output.

18. Stop the sensor.
19. Remove the Parafilm® and drain the water from the optical area.
20. Flush the optical area with DI water.
21. Wind Parafilm® around the metal near the optical area.
22. Break a small hole in the top of the Parafilm® and fill the optical area with fresh DI water.
23. Supply power to the sensor and use the software to operate the sensor in "Continuous" mode.
24. Start the sensor and collect 1 minute of data.
25. Record the measurement value.
26. Use the software to update the reference spectrum.
    a. Go to the **Sensor** menu, then select *Update Calibration*.
    b. Do the steps in the **Calibration Wizard** to update the reference spectrum.
27. If the measurement is ±2 µM (0.028 mgN/L) from the manufacturer-supplied reference (±5 µM [0.056 mgN/L] for a 5 mm pathlength sensor), the sensor is within the specification.
    If the measurement is not within these specifications, do this procedure from step 9 until the measurement is within specification.

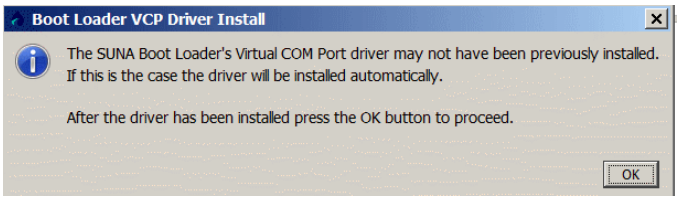
4.1.2 Update firmware

At regular intervals, make sure that the current firmware is installed in the SUNA. Go to the seabird-coastal.com web site to get the current firmware for the sensor.

1. Save the firmware to the PC.
   The firmware is an ".sfw" file.
2. Make sure that the sensor is connected to the PC and a power supply.
3. Push **Connect**.
4. Go to the **Sensor** menu, then select *SUNA*, then *Advanced*, then *Upload Firmware File*.



5. Push **Browse** to find the firmware file that is saved on the PC.
6. Push **Open**.
7. Push **Upload**.
   It takes approximately 2 minutes for the software to complete the upload.



8. The firmware is updated.
   The software disconnects the sensor.

4.1.3 Temperature check

Make sure that the values of the temperature output of the HydroCAT sensor agree with a known temperature value. The manufacturer recommends to do this check in water because the temperature of water is more stable than air.

1. Make sure that the sensor is connected to a PC and the software and has power supplied.
2. Make a note of the temperature of the water in which the sensor is submerged.
3. Push **Temperature Check** in the HydroCAT dashboard.
4. Enter the water temperature in °C the "Temperature" area.
5. Push **Start**.
   The software takes a few minutes to collect data for the test. The results show in the "Status" area.
6. Push **Next**. Make a "Temperature Check Report."

4.1.4 Zero conductivity frequency test

Make sure that the conductivity values of the sensor agree to tenths of one Hz with the manufacturer-supplied calibration page values of the HydroCAT. This shows that the conductivity cell is clean and operates within specifications.

1. If necessary, make sure that the sensor is connected to a PC and the software and has power supplied.
2. If necessary, make sure that the conductivity cell is dry.
3. Push **Conductivity Check** in the HydroCAT dashboard.
4. Enter the "Calibration Zero Conductivity Frequency" value from the manufacturer-supplied calibration page.
5. Push **Start**.
   The software takes a few minutes to collect data for the test. The results show "Check Complete" in the "Status" area.
6. Push **Next** to do the Standards test for conductivity.

4.1.5 Conductivity standard check

Make sure that the output values of the sensor agree with a standard solution.

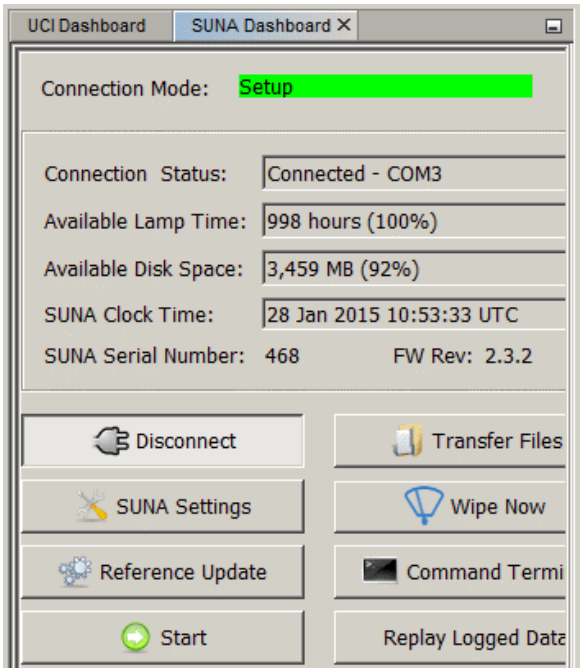
1. Enter the value for the "Standard Conductivity."
2. Push **Start**.
   The software takes a few minutes to collect data for the "Standard Check" test. The results show "Conductivity Check Passed" in the "Status" area.
3. Push **Next**.
4. Enter the value from a previous conductivity check to compare to the current output value.
5. Push **Next.**
6. Push **Next.**

The software makes a "Conductivity Check Report" that the user names and saves to the PC

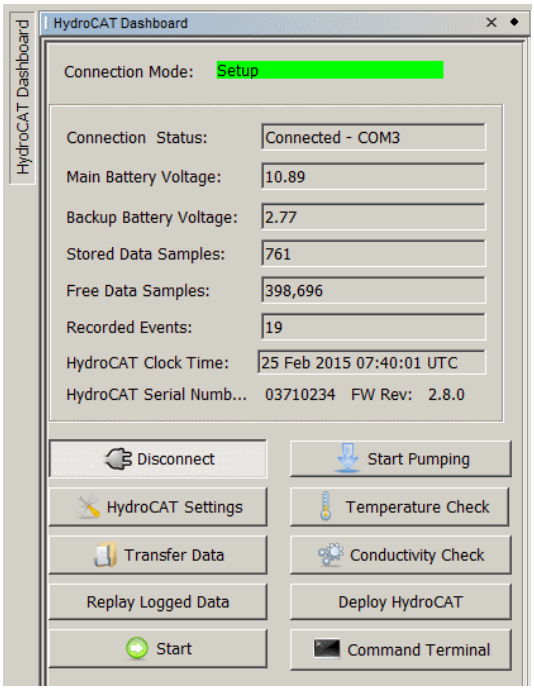
7. Push **Finish**.

4.2 Sensor dashboards

The dashboard is the main area from which to control and to communicate with the sensor.



SUNA dashboard



HydroCAT dashboard

Information about the status of the sensor is contained in the upper part of the window and is updated each time the sensor is connected to the software.

Common settings

- **Connect/Disconnect** lets the user start and stop communication between sensor and software.
- ***Sensor* Settings** lets the user select options for a specific deployment.
- **Transfer Files** lets the user move data saved on the sensor to a PC.
- **Replay Logged Data** lets the user see data that was saved on a PC in a graph.
- **Start/Stop** lets the user start and stop data collection.
- **Command Terminal** lets the user send terminal program-level commands to the sensor.

Sensor-specific settings

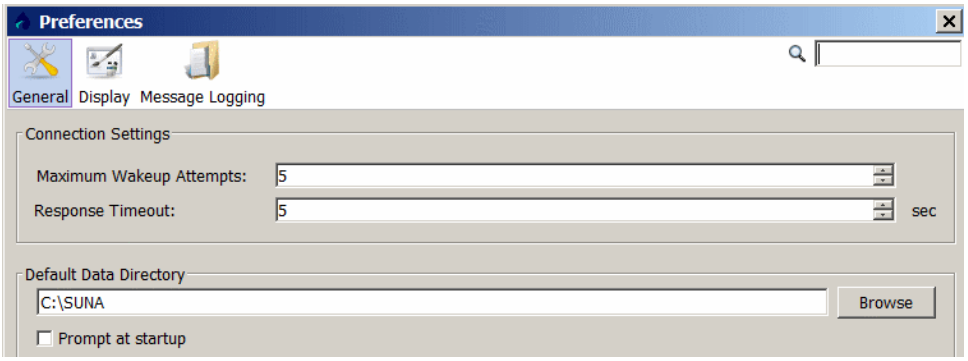
- SUNA:**Reference Update** lets the user update the reference spectrum stored in the sensor so that the sensor can accurately convert a spectral measurement into nitrate concentration.
- SUNA: **Wipe Now** lets the user operate the anti-fouling wiper for one revolution.
- HydroCAT: **Start Pumping** operates the pump for 5 minutes if the sensor is in water.
- HydroCAT: **Temperature Check** lets the user enter reference temperatures, collect data, and make new reference values..

- HydroCAT: **Conductivity Check** lets the user check that the conductivity reference value.
- HydroCAT: **Deploy HydroCAT** lets the user set a time and a date in the future for the sensor to start data collection.

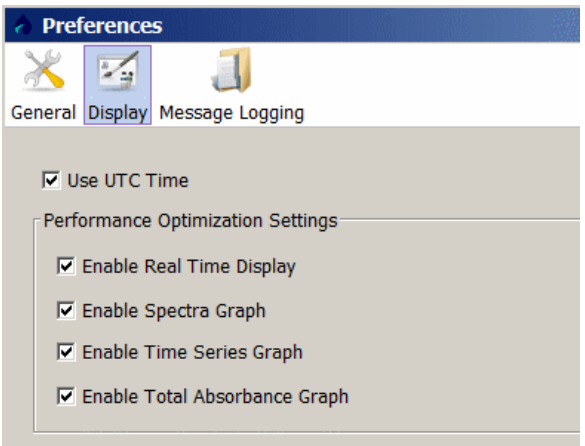
4.3 Preferences menu

The user can set up communication between the software and the sensor and change the way data appears.

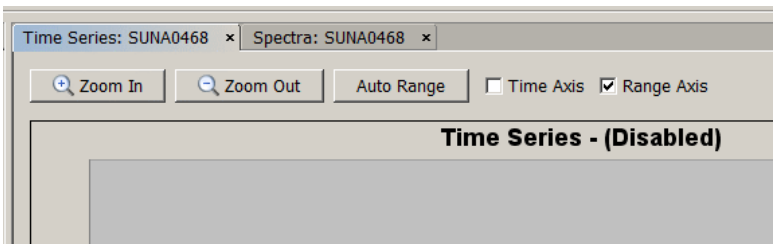
- "Maximum Wakeup Attempts" lets the user select the number of times the software will try to connect to a sensor. Range: 5–15.
- "Response Timeout" is the interval of time between communication between the sensor and the software. Range: 5–10.



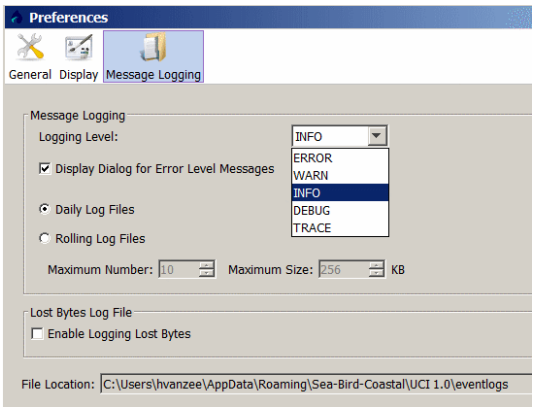
Data that is collected by the sensor shows in any of the user-selected graphs in the *Performance Optimization Settings* area.
Note: *The software operates faster if the user selects only one graph.*



If the user deselects the checkbox for "Enable Time Series Graph" for example, the graph will still show in the main window, but collected data will not.



The software automatically saves files that have information about sensor use, data collection, and software operation over time. This information helps the user and Customer Support find problems and do troubleshooting.



When the "Display Dialog for Error Level Messages" box has a check in it, the software saves one of five levels of error messages.

- **INFO**—The default level. All high-level operations are saved.
- **ERROR**—Minimum level. Only errors that need to be examined by the user or Customer Support are saved.
- **WARN**—Low level. The files that are saved do not have enough information for the user to make an analysis of how the sensor is used and configured.
- **TRACE**—The highest level. Used only for troubleshooting because very large files are created.
- **DEBUG**—High level. Used for troubleshooting.

"Daily Log Files"—all messages from a single day are saved in one file.

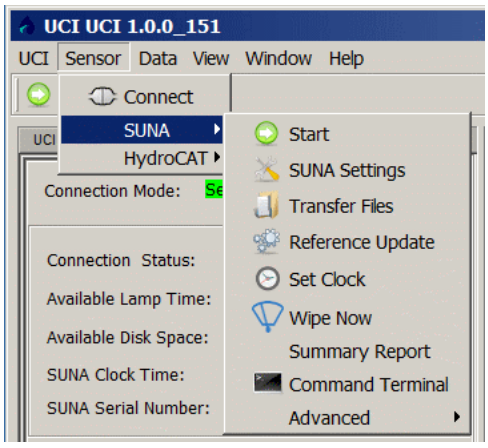
"Rolling Log Files"—all messages are saved in one file until it is the maximum size specified by the user. The messages are then saved to a new file. The user specifies the number of files to keep. The oldest files are erased first.

"Enable Logging Lost Bytes"—if this box has a check in it, the software saves all of the unexpected output from the sensor to a file.

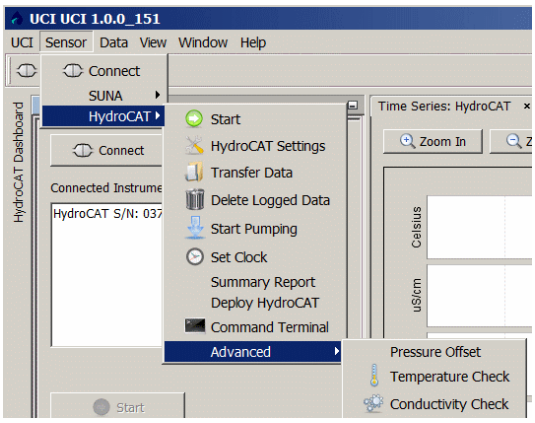
"File Location"—the operating system of the PC determines where these files are saved.

4.4 Sensor menu

The **Sensor** menus have options for each sensor that the software communicates with.



SUNA **Sensor** menu



HydroCAT **Sensor** menu

Refer to the section on Sensor dashboards on page 23 for more information about these items and the *Advanced* menu items for the HydroCAT.

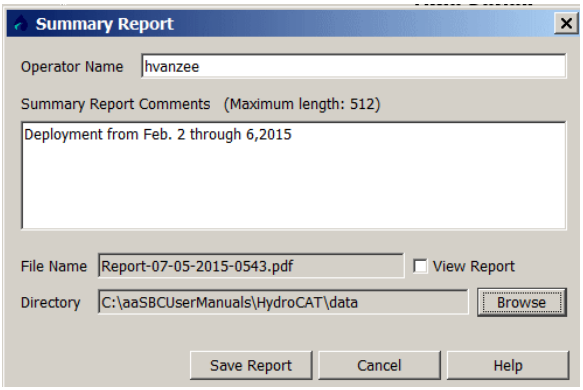
Advanced sensor menu items

- SUNA: *Edit Log Headers*—lets the user put labels on log files.
- SUNA: *SUNA Self Test*—the software does a test of the sensor function. The output shows in the *Instrument Console* tab.
- SUNA: *DAC Calibration*—does not apply to coastal deployments.
- SUNA: *Upload Firmware File*—lets the user update the firmware in the sensor. Refer to Update firmware on page 21 for details.
- SUNA: *Administrative Settings*—for use by manufacturer
- SUNA: *Upload Instrument XML File*—an .xml file necessary for the sensor to process data. It is installed at C:\users\%username%\AppData\Roaming\Sea-Bird-Coastal \UCI 1.0\SUNA_%SN%.xml.
- HydroCAT: *Pressure Offset*—lets the user change the pressure offset value.
- HydroCAT: *Temperature Check*—lets the user do a check of temperature values for a reference.
- HydroCAT: *Conductivity Check*—lets the user do a check of conductivity values for a reference.

4.4.1 Create summary report

Get a summary of the settings saved in the sensor.

1. Select *Summary Report*.



2. Enter any comments about the report (optional).
3. Put a check in the "View Report" checkbox to see the report after it is created.
4. Push **Browse** to go to the directory in which to save the report.
5. Push **Save Report**.
   A .pdf of the Summary Report is created.

SEA-BIRD COASTAL

HydroCAT Summary Report

SEA-BIRD COASTAL

HydroCAT 03715859

Operator: hvanzee

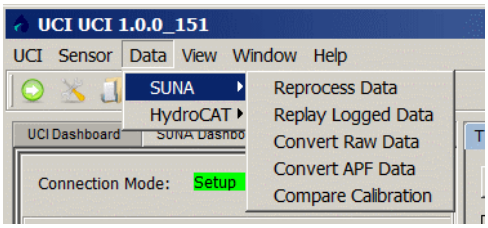
Comment: Deployment from Feb. 2 through 6, 2015

Ancillary	Value
Firmware Revision	2.8.0
Recorded Events	111
Stored Samples	385
Free Samples	399,072
Main Battery Voltage	16.53
Backup Battery Voltage	3.07
Clock Time	2015/05/07 12:40:29 UTC

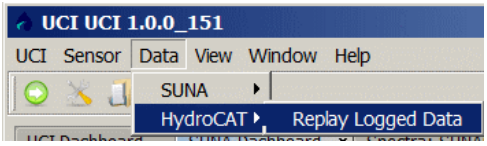
Setting	Value
Baud Rate	19200
Temperature Units	Celsius
Conductivity Units	uS/cm
Pressure Units	Decibar
Oxygen Units	mg/L
Output Temperature	true
Output Conductivity	false
Output Pressure	true
Output Oxygen	true
Output Salinity	false
Output Sound Velocity	false
Output Specific Conductivity	true
Spec Conductivity Temp Coef	0.02
Output Sample Number	false
Transmit Data Realtime	true
Sample Interval (seconds)	180
Min Conductivity Frequency (Hz)	0.0
SDI-12 Address	0
SDI-12 Bad Data Flag	9999999

4.5 Data menu

The data menu has sensor-specific options for data management.



SUNA **Data** menu



HydroCAT **Data** menu

4.5.1 Files necessary to process data

Go to the **Data** menu to select how data is processed. The HydroCAT can only replay data.

- Use *Convert Raw Data* to change binary files into ASCII files.
- Use *Replay Logged Data* to show a graph of saved data.
- Use *Reprocess Data* to apply a different reference value or change the settings to process the data.

The SUNA uses the three files below to process data:

1. The .xml package file that is stored in C:\users\%username%\AppData\Roaming\Sea-Bird-Coastal\UCI 1.0\SUNA_%SN%.xml.
2. The raw data file to process.
3. The reference spectrum file (optional for *Replay Logged Data*).

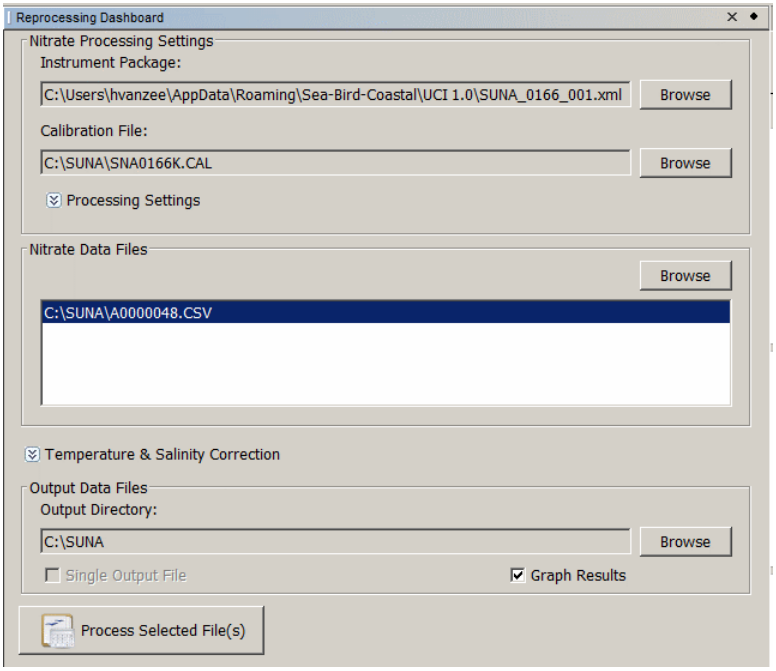
4.5.1.1 Reprocess SUNA data

The user may find that it helps to use the *Reprocess Data* option under some conditions.

- The settings for the sensor were incorrect. Use the Reprocess option to correct for this, such as when a sensor was deployed in seawater, but set up for fresh water.
- The data that is collected has changed over an extended deployment. Data is processed with an updated reference spectrum file, and compared to the original reference.
- Water temperature and salinity data are collected. These can be put together with the spectral data from the sensor to get more accurate nitrate data (Sakamoto et al. 2009).

Note that the data files collected with SDI-12 do not contain spectral data and cannot be reprocessed.

1. Start the software.
2. Go to the **Data** menu, then select *SUNA*, then *Reprocess Data*.



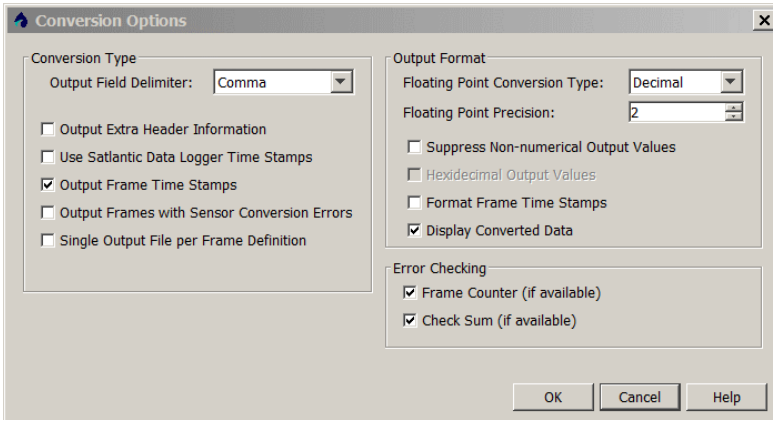
The Reprocessing Dashboard shows.

3. Push **Browse** to find the package file, the reference file, and the data file required to reprocess the data.
4. "Processing Settings" are set by the manufacturer and usually do not need to be changed.
5. Push **Process Selected File(s)**.
   The software starts to reprocess the data.

4.5.1.2 Convert SUNA raw data

The user can collect data in either an ASCII or binary format. Although binary files require less storage space and are faster to transmit than ASCII, binary files are not human-readable and must be converted. Use the software to convert binary to ASCII, and also to "convert" ASCII files so that they contain sensor headers, tab delimiters, and other information to help the user more easily do an analysis on the data.

1. Go to the **Data** menu, then *SUNA*, then *Convert Raw Data*.
2. If necessary, push **Browse** to find the .xml "Instrument Package File" that is saved on the PC at "Users/*username*/AppData/Roaming/Sea-Bird-Coastal/UCI 1.0." A typical file is "SUNA_*xxx*_001.xml, where *xxx* is the serial number of the sensor.
3. Put a check in the boxes next to the parameters to convert.
4. Push **Browse** to find the file of data to convert.
5. Push **Browse** to select the directory in which to save the converted data.
6. Push **Options**. More settings are available in a new window.
7. Select any options under Conversion Type.



- "Output Field Delimiter"—select either comma or tab delimiter.
- "Output Extra Header Information"—put a check to get an additional row of data at the start of the output file.
- "Use Satlantic Data Logger Time Stamps"—put a check to add data and time values from an attached data logger. This is not usually necessary because the sensor includes this information in its output.
- "Output Frame Time Stamps"—put a check to add the time stamps from the data frame to the output.
- "Output Frames with Sensor Conversion Errors"—put a check to remove any frames that have a field that cannot be converted.
- "Single Output File per Frame Definition"—put a check to get all of the output in one file. Usually there is one output file for each input file.

8. Select options under Output Format:

   - "Floating Point Conversion Type"—specify the floating point values in decimal or scientific notation.
   - "Floating Point Precision"—specify the number of significant digits in the floating point value. Range: 0–10.
   - "Suppress Non-numerical Output Values"—put a check so that text content does not show in the output.
   - "Format Frame Time Stamps"—put a check so that the time stamps print in human-readable format.
   - "Display Converted Data"—put a check so that the data shows in the graph area of the software.

9. Select options under Error Checking:

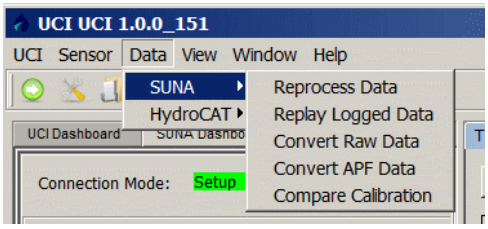
   - "Frame Counter (if available)"—put a check so that the value increases by one from frame to frame. Any increments larger than one will show in the Application Console.
   - "Check Sum (if available)"—put a check so that each frame is examined. Correct frames have a zero entry in the checksum field. Incorrect frames are not converted.

10. Push **OK**. The **Conversion Options** window closes.
11. Push **OK**. The **Convert Raw Data Files to ASCII** window closes.

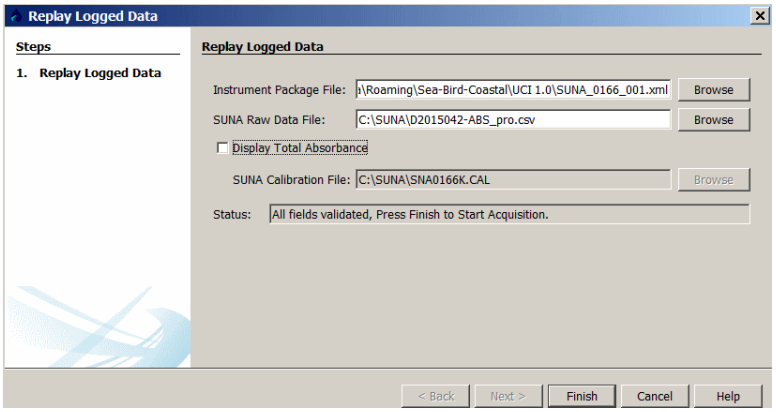
4.5.1.3 Replay saved SUNA data

Use *Replay Logged Data* to see the data that has been saved on the PC.

1. Push **Data**, then *SUNA*, then *Replay Logged Data*.



2. If necessary, push **Browse** to find the .xml "Instrument Package File" that is saved on the PC at "Users/*username*/AppData/Roaming/Sea-Bird-Coastal/UCI 1.0." A typical file is "SUNA_*xxx*_001.xml, where *xxx* is the serial number of the sensor.
3. Push **Browse** to find the "SUNA Raw Data File" to replay the data that is saved on the PC.
4. Push **Browse** to find the current "SUNA Calibration File" on the PC. A typical file is SUNA_*xxxn*.CAL, where *xxx* is the serial number of the sensor, and *n* is the calibration version.
5. Push **Finish**.

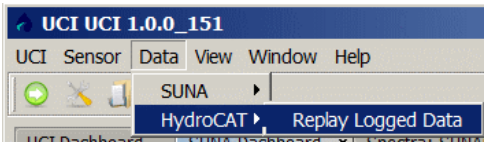


6. The saved data shows in the *Time Series* tab.

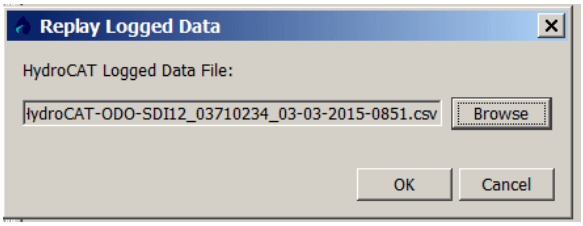
4.5.2 Replay saved HydroCAT data

Use *Replay Logged Data* to see the data that has been saved on the PC.

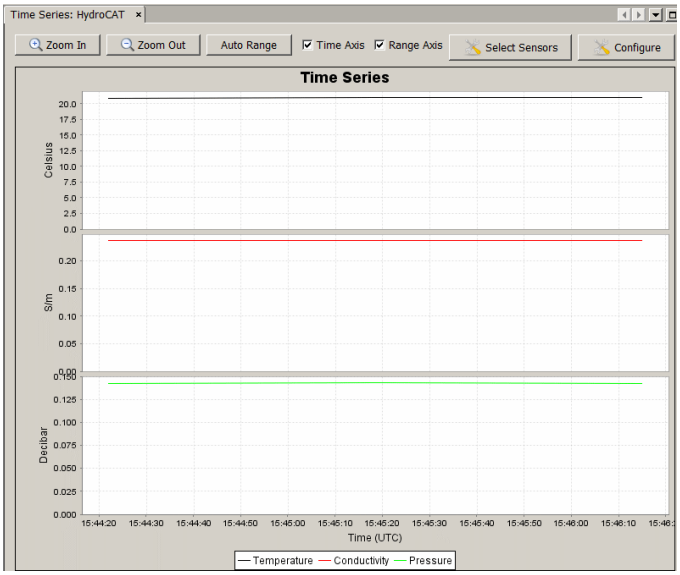
1. Push **Data**, then *HydroCAT*, then *Replay Logged Data*.



2. Push **Browse** to find the file to replay that is saved on the PC.
3. Push **OK**.



4. The saved data shows in the *Time Series* tab.

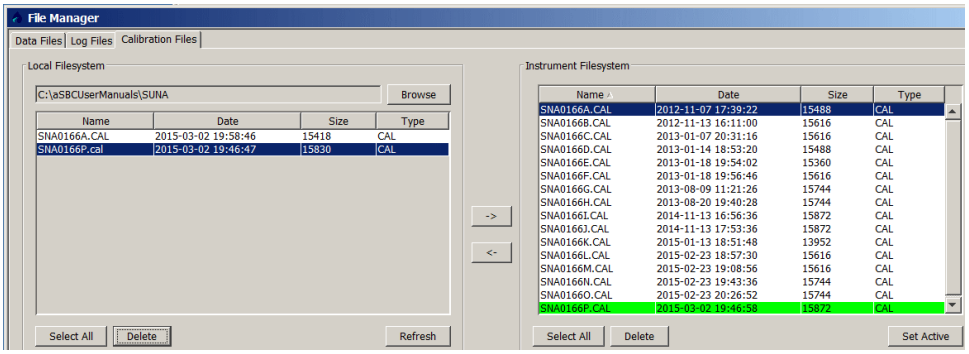


4.5.3 Compare reference spectrum files

Compare the change between two reference spectrum files. The amount of change is related to the time interval between the updates and the amount of lamp use during that time.

Note that this procedure is done automatically by the software when the user updates the reference spectrum for the sensor. Refer to Update reference spectrum on page 19 for more information.

1. Find the two files to compare:

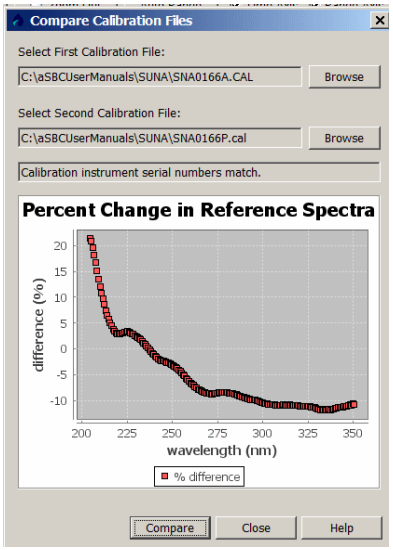


   a. Push **Transfer Files** in the SUNA Dashboard area.
   b. Select the *Calibration Files* tab.

c. Select the first file under Instrument filesystem.
d. Select the directory in the Local filesystem to save the file in.
e. Push the <-- to move the first file.
f. Do steps d and e to move the second file.
g. Push **Close**.

Note that the date of the files changes to the current date.

2. Select the **Data** > **SUNA** > **Compare Calibration** menu
3. Push **Browse** to find to the first reference, or calibration, file on the PC to compare.
4. Push **Browse** to find to the second reference, or calibration, file on the PC to compare.
5. Push **Compare**.



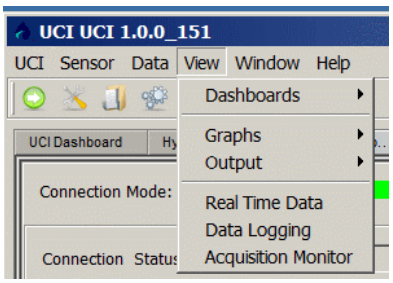
A typical update interval of 3–6 months with no more than 100 hours of lamp use should cause a change of no more than 10% in the 215–240 nm interval.

Below 215 nm, larger relative changes are normal.

Above 240 nm, the change is smaller than at the 215–240 nm range.

If there is a large change, do several reference updates 12–24 hours apart to monitor the stability of the reference spectrum.

4.6 View menu

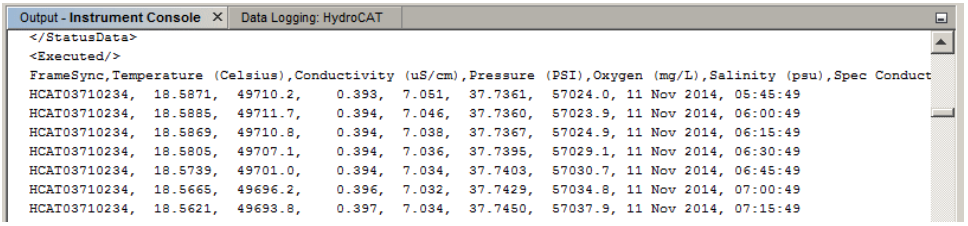


***Dashboards*—**Go to the **View** menu and *Dashboards*, to select the dashboard for a specified senor.

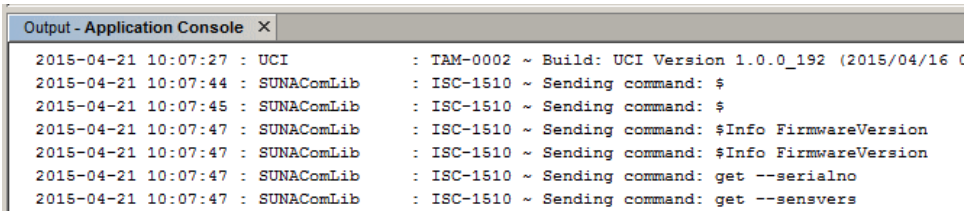
***Graphs*—**Go to the **View** menu and select from *Spectra*, *Absorbance*, *Reprocessed Nitrate*, or *Time Series*graphs. The *Time Series* graph is used by both the SUNA and the HydroCAT.

Output—Go to the **View** menu and select *Instrument Console* to see the data collected by the sensor. Select *Application Console* to see terminal-level communications. HydroCAT: select *Post-processed Console*.

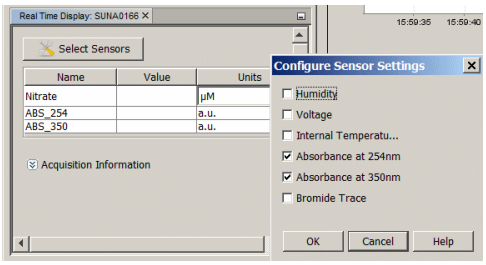
Instrument Console

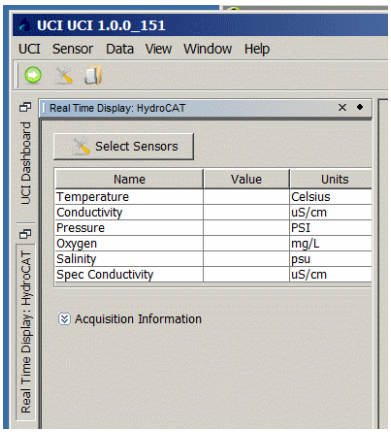


Application Console

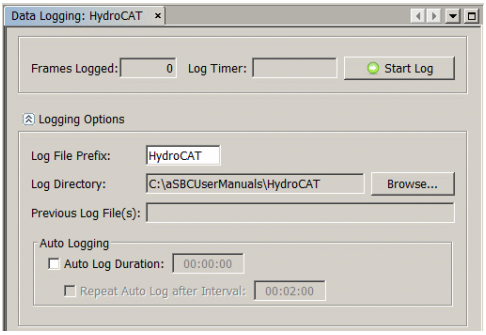


Real Time Data—From the **View** menu, select *Real Time Data* to select the parameters that the specific sensor will use for data collection.





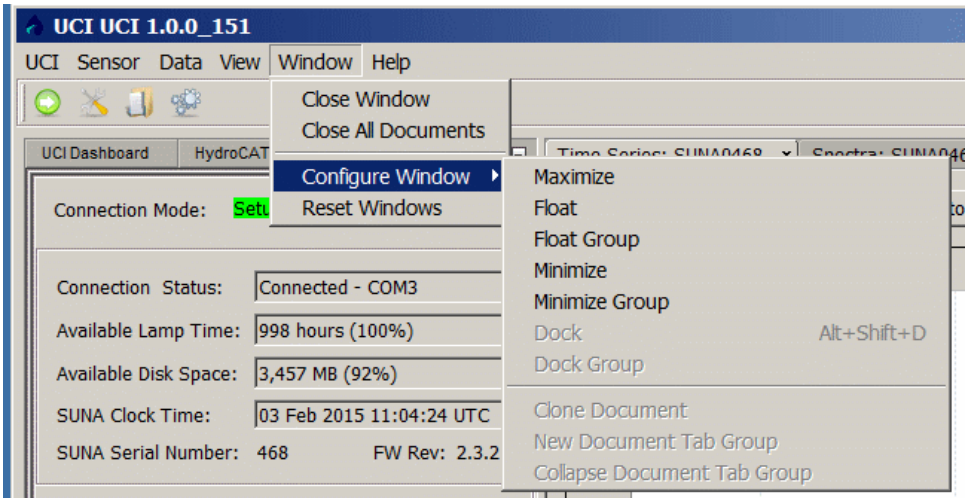
Data Logging—Go to the **View** menu and select *Data Logging* to select the location on the PC that the collected data is saved.



Data Acquisition Monitor—Use for troubleshooting.

4.7 Window menu

The user can change how the software shows different tabs.



- *Close Window*—closes the selected tab (highlighted in blue).
- *Close all Documents*—closes all tabs except the UCI Dashboard.
- *Configure Window*—
  Maximize: increases the size of the selected tab to fill the software screen size.

  Float: unlocks the selected tab from the software screen so that the user can move it to other locations on the PC screen.

  Float Groups: the same as *Float* above, but all tabs that are open are unlocked so that the user can move them to other locations on the PC screen.

  Minimize: Minimizes the selected tab and moves it to the side of the software screen.

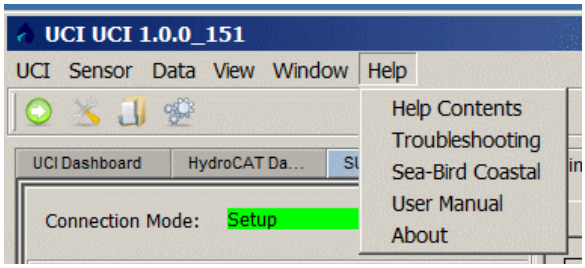
  Minimize Group: minimizes the open tabs in the "Console," "Dashboard," or "Graph" areas of the software.

  Dock: locks the tab that the user selected to "float" back in its previous position in the software window.

  Dock Group: the same as Dock above, but all tabs that are open are locked back into their previous position in the software window.
- *Reset Windows*: all tabs go to their initial location in the software when the software started.

4.8 Help menu

Go to the Help menu for help with sensor operation, settings in the software, and troubleshooting. Select *Sea-Bird Coastal* to go to the manufacturer's web site.



Section 5 Troubleshooting

5.1 SUNA general troubleshooting

⚠WARNING

Nitrate sensors use an ultraviolet (UV) light. Do not look directly at a UV light when it is on. It can damage the eyes. Keep products that have UV light away from children, pets, and other living organisms. Wear polycarbonate UV-resistant safety glasses to protect the eyes when a UV light is on.

Possible problem	Possible solution
Sensor does not appear to be on	Check that the cable is connected and the power source is on.
	Turn the sensor off for at least 60 seconds. Turn the power on again. If the sensor still does not appear to be on, use a different cable.
	Check that the voltage supplied to the sensor is between 8–15 VDC with at least 1 amp of current. Check the cable voltage: put the leads of a DMM in DC voltage mode at contacts 1 (+) and 2 (-) of the cable to see if there is voltage. If not, use a different cable.
	Check the mode of operation. The sensor may be in an unknown mode. Start a terminal program, supply power to the sensor, and type "$" then "Enter" three or more times. A prompt from the sensor shows.
	Check the cable for continuity. Refer to the sensor specifications for connector functions.
	Check the power consumption. Use a power supply with an accurate digital current indicator. • current > 500 mA at 12V: sensor is in data collection mode. Put a piece of white paper into the optical area and make sure that there is a blue spot. If there is not, the sensor may be in an unknown mode or there is a system failure. • current > 5 mA: sensor is in "standby" mode and gives a result over the RS232 input. • current >100 µA: sensor is not in operation. Contact Customer Support.

5.2 SUNA operation troubleshooting

Possible problem	Possible solution
Self-test fails for internal humidity	Monitor the sensor and do a sensor self-test at regular intervals. Make sure that the sensor is not attached to any frame so tightly that the pressure housing is out-of-round.
Self-test fails for low spectrum average or high dark counts	Clean the optical windows with a low-lint swab or tissue and isopropyl alcohol. The average value in DI water is within specifications shown below. • Dark spectrum: 500–1000 counts, with a standard deviation of no more than 12 counts. • Maximum light spectrum: no more than 55000, with no more than 60-count standard deviation. • Average light spectrum: approximately 10000–15000 counts, with ranges to at least 20000 counts. An average value of <10000 may mean that the optical windows are dirty or stained, or that the lamp is degraded.
Baseline "drift"	Check if the lamp is degraded. Apply drift corrections if the rate is approximately 0.004 mgN/L per hour of lamp "on" time.
Wiper does not operate correctly	• Make sure that there is a check in the box for "Integrated Wiper Enabled" in the *General* tab of the *Settings* tab of the software. • Check the alignment of the wiper brushes and make sure that the wiper is not bent • If the wiper is from another manufacturer, check that the battery contacts are functional. • Contact Customer Support for further help.

5.3 SUNA communication troubleshooting

Possible problem	Possible solution
Collected data is different from transmitted data	• Check the clock settings in the sensor. • Make sure that there is no extra averaging or data collection in the setup. • Check the data output settings.
Problems with sensor-to-software communication	• Make sure that the sensor-PC cable is connected correctly. • Make sure the current software and firmware are installed.
Self-test fails to complete	Make sure that the sensor has an external power source; external power is necessary to turn on the lamp.

5.4 SUNA warnings and error messages

Possible problem	Possible solution
Data warnings and error messages	Contact Customer Support. If possible, have the information listed below: • screenshot of the "Application Console" of the software. • "messages.log" file—go to the **Transfer Files** window and select the *Log Files* tab. Copy the file to the PC for Customer Support.
Negative nitrate concentration	Clean the optical area and check the reference spectrum. Apply a new one if necessary. • Make sure that the sensor is in water. • Check that the "Deploy in Fresh Water" box has the appropriate check in it. • Check for salinity compensation.
Analysis of nitrate standard shows sensor is possibly out of specification	Check that the nitrate standard concentrations are accurate. Make sure the dilutions were done correctly and that the standards are used within 1 week (in the lab) or before expiration (unopened standards). Verify that the standards were made in comparable units (mg/L as nitrogen or µMoles).
	Check the sensor settings. Make sure that the "Deployed in Fresh Water" setting has a check in the box if the sensor operates in fresh water.
Poor correlation with field samples (grab samples)	Check the sensor for fouling or lamp change ("drift"). Clean the optical windows and do a blank check. • Set the sensor to do a self-test. Check light:dark counts, such as high CDOM or other absorbers and other data about the sensor. • Check for matrix interferences that can cause measurement errors. Do measurements for a wider range of constituents an do possible lab matrix spikes to isolate the cause.
	Check the representativeness of the data collection site. If the data from the sensor does not agree with grab samples but shows good performance, the site may not be representative of conditions, or the water is not well mixed.
Data collection rate is very slow	Check if the internal memory is on. Data collection starts after approximately 5 seconds.
	Check if the "adaptive integration" is on. Data collection starts after approximately 500 milliseconds (20 × "integration period").
Nitrate values are not stable	• Check that the optical area is not blocked with debris. • Check that the wiper functions correctly. • Clean and dry the optical area.

Possible problem	Possible solution
Nitrate value are frequently "-1" or "NAN"	Check that the lamp intensity is sufficient. Measure the spectrum in DI or tap water. Maximum output is > 10000. For best case, > 30000.
	Check the data: if the maximum is < 1000 and the lamp intensity is sufficient, the water sample is optically dense.
SELFTEST alert for lamp intensity or high humidity	Check the sensor for high internal humidity. Do a "selftest": if humidity is > 50%, the sensor may have a leak. Contact Customer Support. if humdity is > 30%, the sensor is probably ok. Contact Customer Support.

Section 6 General information

Revised editions of this user manual are on the manufacturer's website.

6.1 Service and Support

The manufacturer recommends that sensors be sent back to the factory annually to be cleaned, calibrated, and for standard maintenance.
Refer to the website for FAQs and technical notes, or contact the manufacturer for support at:

support@sea-birdcoastal.com

Do the steps below to send a sensor back to the manufacturer.

1. Contact the manufacturer for a Return Merchandise Authorization (RMA).
   Note: *The manufacturer is not responsible for damage to the sensor during return shipment.*
2. Remove all anti-fouling treatment from the sensor before sending it back to the manufacturer.
   Note: *The manufacturer will not accept sensors that have been treated with anti-fouling compounds for service or repair. This includes tri-butyl tin, marine anti-fouling paint, ablative coatings, etc.*
3. Use the sensor's original ruggedized shipping case to send the sensor back to the manufacturer.
4. Write the RMA number on the outside of the shipping case and on the packing list.
5. Use 3rd-day air to ship the sensor back to the manufacturer. Do not use ground shipping.
6. The manufacturer will supply all replacement parts and labor and pay to send the sensor back to the user via 3rd-day air shipping.

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