



1328 Parkway Court • Beaver creek • OH • 45432
Phone: (937) 426-2703 • Fax: (937) 426-1125 • E-Mail: info@NexSens.com
Visit us on the web at <http://www.NexSens.com>

**LiCor 200 Pyranometer
Sensor Interface Manual
Revision 07.10.02**

Table of Contents

Keeping iChart Up to Date	2
Technical.....	3
Wiring.....	3
Adding to iChart	4
Troubleshooting.....	14

About NexSens Technology, Inc.

NexSens software and real-time data logging systems are designed to simplify the setup and operation of environmental monitoring networks. NexSens products automate much of the tedious programming, data collection, and manual data processing common with other systems.

iChart is an easy-to-learn, easy-to-use Windows-based software program designed to interface with the industry's most popular environmental monitoring sensors and systems. A large multi-vendor instrument library makes setup quick and easy. iChart automates much of the tedious programming, data collection and manual data processing common with other environmental data collection systems.

The NexSens iSIC (Intelligent Sensor Interface and Control) is a state-of-the-art line of data loggers that simplify the collection of real-time data from environmental sensors and monitoring instruments. The iSIC data logger supports multi-vendor sensor connections and is designed for environmental data monitoring with NexSens communication equipment and software.

How to Use This Manual

This manual is designed to provide you with detailed instructions for interfacing specific sensors to the NexSens iSIC data logger.

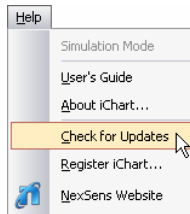
This manual provides you with all the information needed to interface your sensor with the iSIC data logger. For advanced system and sensor reference material:

- Review the material in the iSIC operations manual:
 - <http://www.nexsens.com/support/manuals.htm>
- Review the sensor manufacturer's operations manual. This information should have been provided with the purchase of the sensor. This material can also typically be found at the instrument manufacturer's website. If you are still having difficulty, email your technical support question to:

support@nexsens.com

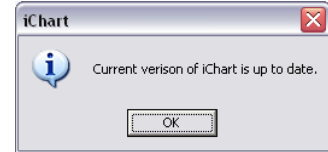
Keeping iChart Up to Date

NexSens periodically releases new versions of iChart software and iSIC firmware to be downloaded free of charge. The updated versions typically add new features, improve existing features, and/or add more reliability to the system. It is important that iChart is updated to the latest version before connecting a new sensor to your iSIC data logger. Your computer will require internet access to update automatically.



To obtain the latest version of iChart software, open the program on your computer. In the **Help** menu, select **Check for Updates**.

If your software is up to date, iChart will confirm that your computer is running the current software release.

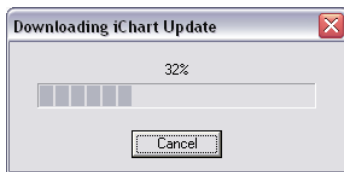


If a newer version of iChart is available, a dialog box will appear asking if you would like to upgrade to download the update.



Click **Yes**. iChart will begin downloading the update.

Note: Depending on your connection speed, this update may take a few minutes. You can continue running other applications on your computer while the download is progressing.



When the update has finished the downloading process, click **OK** and close iChart.

Reopen iChart. When the program opens, iChart will automatically begin the installation process. Follow the step-by-step installation windows to complete the iChart software update.

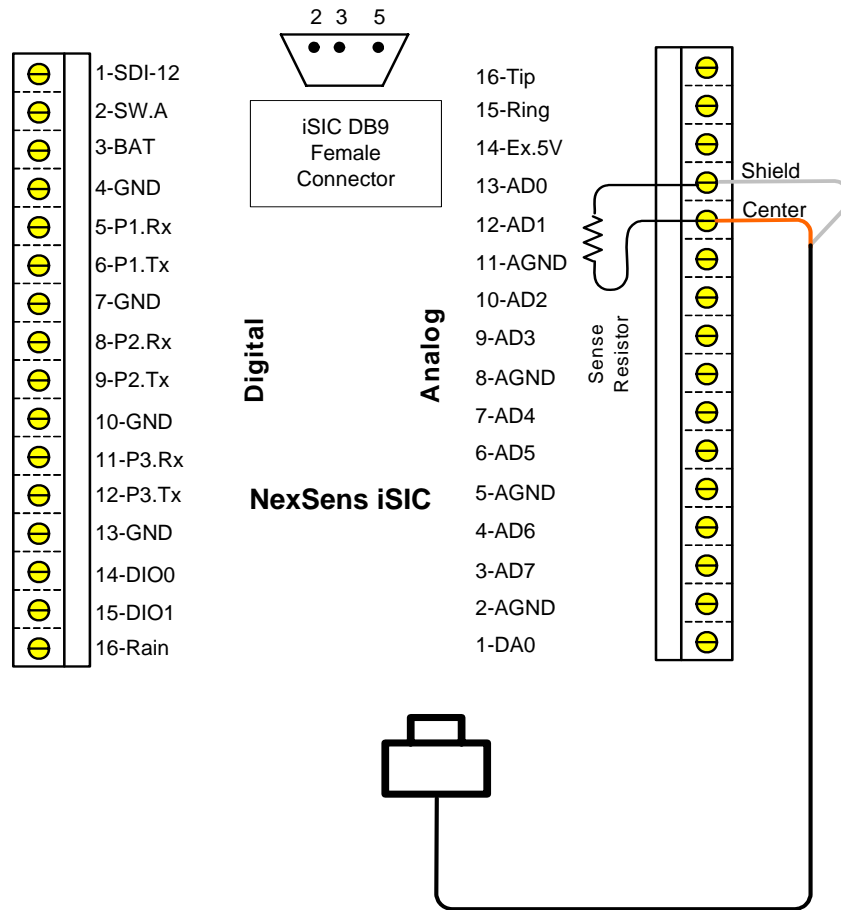
Note: If an internet connection is unavailable on the computer, iChart can be downloaded onto another computer and then moved to the computer where it needs installed. The latest version of iChart can be downloaded here:

<http://www.nexsens.com/support/downloads.htm>

Technical

The LiCor 200 Pyranometer is differential current source sensor. This signal can be converted into a signal usable by an iSIC data logger by using a 147-Ohm Resistor.

Wiring



To begin collecting data with this probe, connect it to the iSIC data logger's analog terminal strip. Connect the shield wire to even number analog pin (ie AD0, AD2, AD4, AD6) and the center wire to the next odd numbered analog pin (ie. AD1, AD3, AD5, AD7). A 147-Ohm resistor, provided with the LiCor sensor will also need to be placed across the two pins used.

If using the Li-Cor 200 mV adapter (Li-Cor Part # 2220) green goes into to even number analog pin (ie AD0, AD2, AD4, AD6) and blue goes into to the next odd numbered analog pin (ie. AD1, AD3, AD5, AD7).

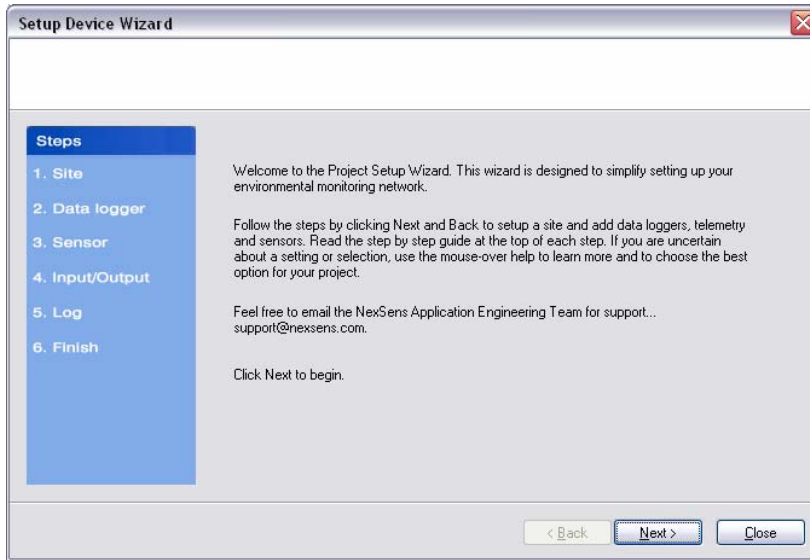
Note: Do not wire more than one analog wire to each analog pin.

Adding to iChart

Once all wiring is completed, the device is ready to be added to an iChart database. To add the device to an existing database, select **Instrument | Add Device**. To create a new database, select **File | New Project**.

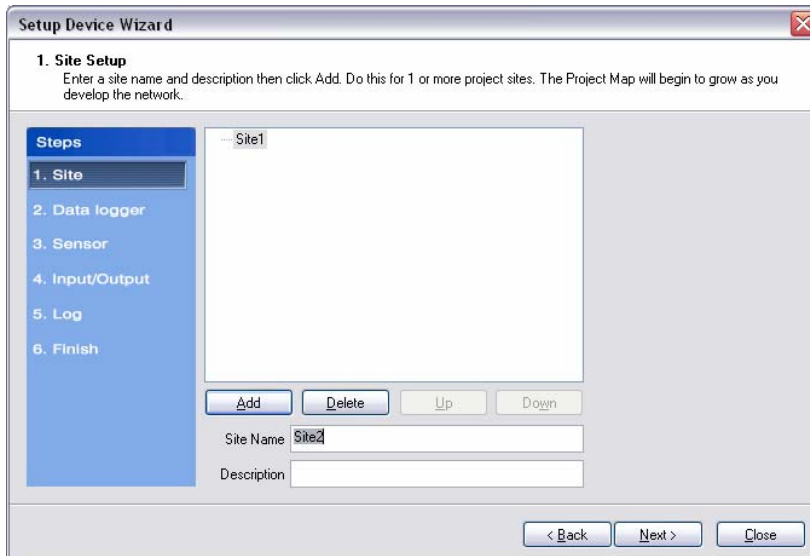
Setup Device Wizard

The Setup Device Wizard will begin. Click **Next** to continue.



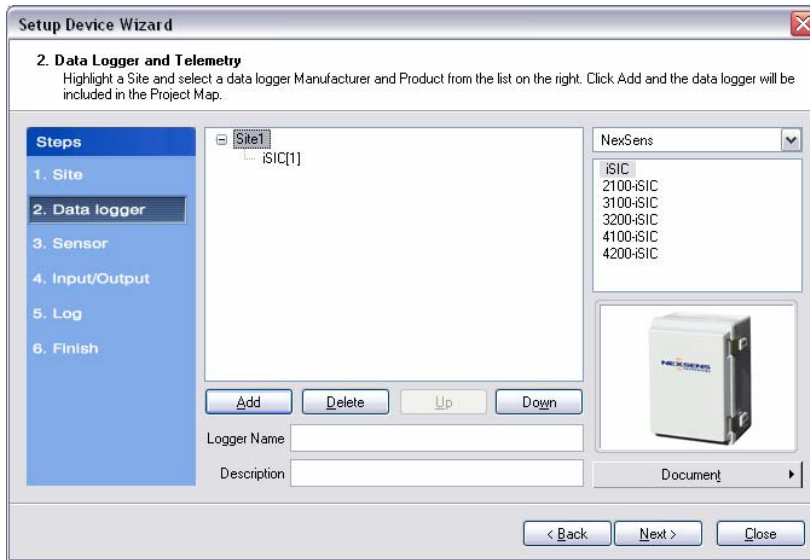
Step 1 – Site Setup

The first step is to create a site for data loggers and sensors to be located in. If this is an existing project, sites may already exist. Enter a **Site Name** and click **Add**.



Step 2 – Data Logger & Telemetry

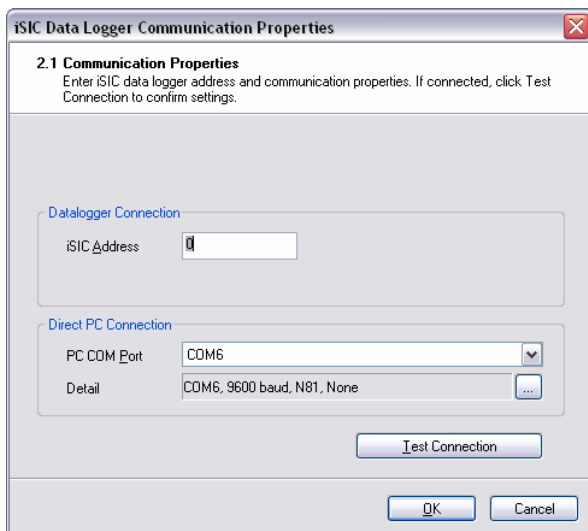
The next step is to add the data logger(s) to the sites created in the previous step. Select a site to add a data logger to. Then select the data logger model number from the list at right and click **Add**.



The **iSIC Data Logger Communication Properties** dialog box will appear. Enter the required iSIC data logger connection information (see below for model-specific instructions) to finish adding the data logger to the selected site. When complete, click **OK**.

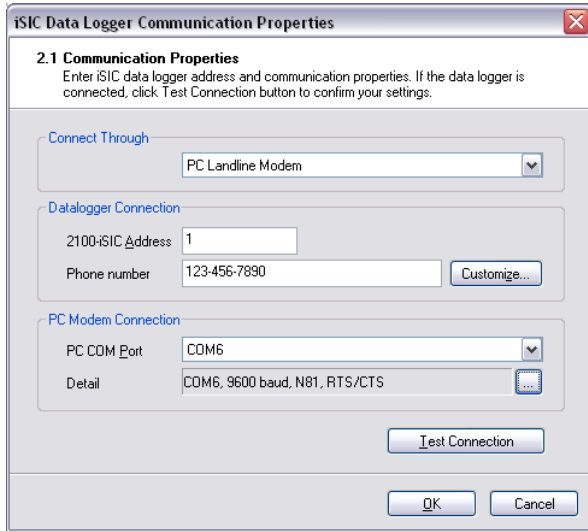
For an **iSIC** data logger, enter the iSIC address and select the PC COM Port that the data logger is connected to.

- The iSIC address is typically '1'. If unknown, enter '0' and click **Test Connection** to determine the address.
- The PC COM Port drop-down menu is the list of available COM ports iChart detected on the computer.



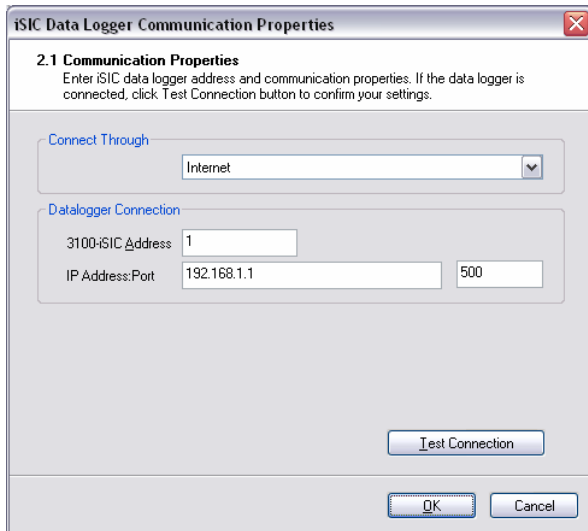
For a **2100-iSIC**, enter the 2100-iSIC address, phone number, and PC COM Port that the computer phone modem is connected to.

- The 2100-iSIC address is typically '1'. If unknown, enter '0' and click **Test Connection** to determine the address.
- The PC COM Port drop-down menu is the list of available COM ports iChart detected on the computer. Internal PC phone modems are typically set to COM3.



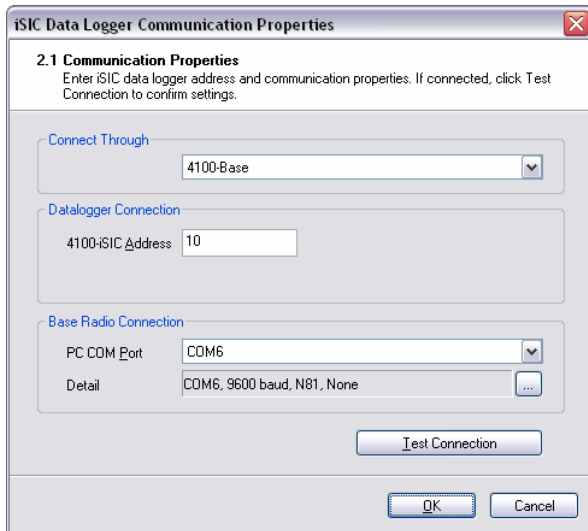
For a **3100-iSIC**, enter the 3100-iSIC address and the IP address of the data logger.

- The 3100-iSIC address is typically '1'. If unknown, enter '0' and click **Test Connection** to determine the address.
- The IP address is provided by the cellular service provider in which your cellular data account is setup. The port is set to 500 by default.



For a **4100-iSIC**, select the method in which the 4100-iSIC is connected to your PC and enter the 4100-iSIC address.

- A 4100-iSIC can connect to a PC through a 4100-BASE or a 4200-iSIC.
 - A 4100-BASE system connects to a PC via RS-232 cable.
 - A 4200-iSIC connects to a PC via landline telephone.
- The 4100-iSIC address is '1' by default.
 - If there is more than one 4100-iSIC in use, each 4100-iSIC should be programmed with different addresses (See the *4100-iSIC | iSIC Addressing* section in the iSIC manual).

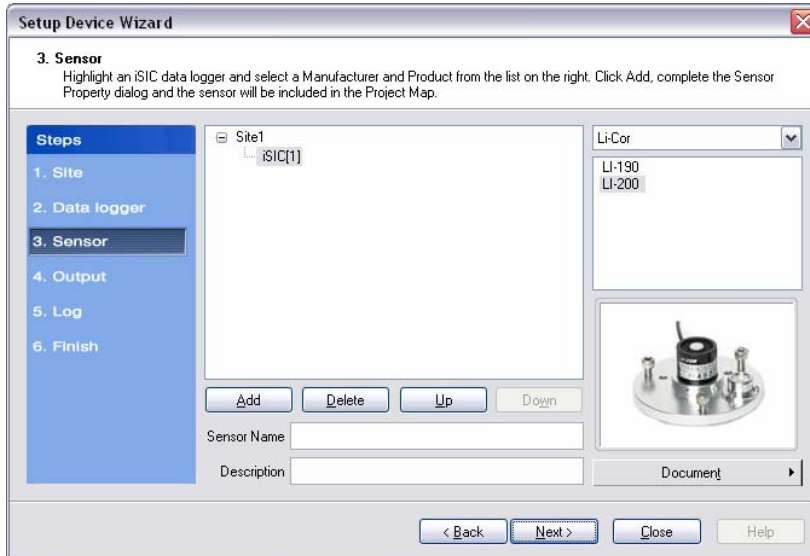


For a **4200-iSIC**, enter the iSIC address and PC COM port the data logger is connected to.

- The 4200-iSIC address is typically 250. When communicating with a 4200-iSIC, any communication using the 4200-iSIC address will be sent to the 4200-iSIC data logger.
 - Communications using any other address will be broadcast to any 4100-iSIC(s) in your radio network.
- **Note:** Do not use address '0' when communicating to a 4200-iSIC.
- The drop down menu of PC COM Port's is the list of available COM ports iChart detected on the computer. Internal phone modems are typically set to COM3.

Step 3 – Sensor

After selecting a data logger, click **Next** and select **LiCor** from the drop-down list of manufacturers. Then select the **LI-200** model number and click **Add**.



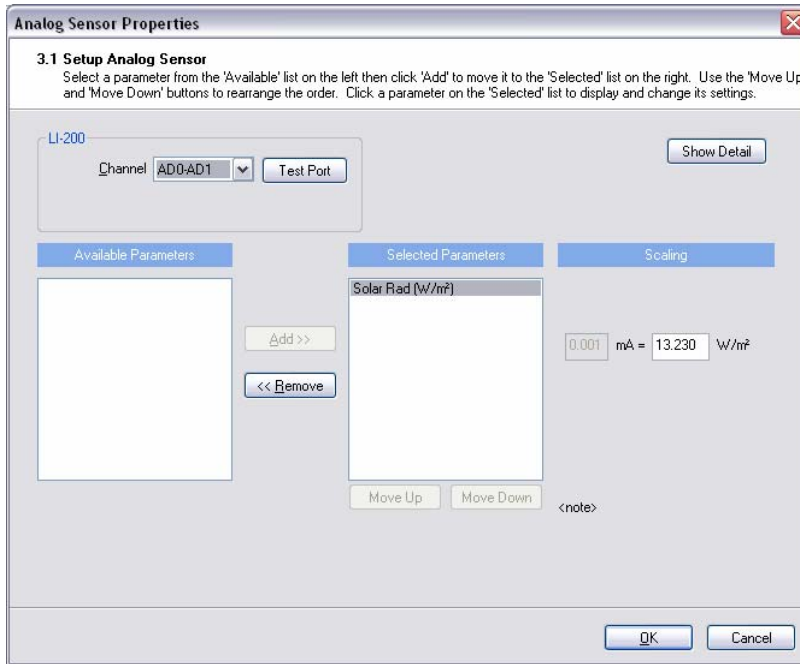
The **Sensor Properties** dialog box will come on the screen. From the **Analog Channel** drop-down menu, choose the channel the LI-200 sensor is connected to. ADO-AD1 was used in the wiring diagram at the beginning of this manual. In the scaling field enter the Calibration Multiplier:

The Calibration Multiplier value is located on a tag connected to each LiCor 200 Pyranometer sensor. It is located on the top of this tag.

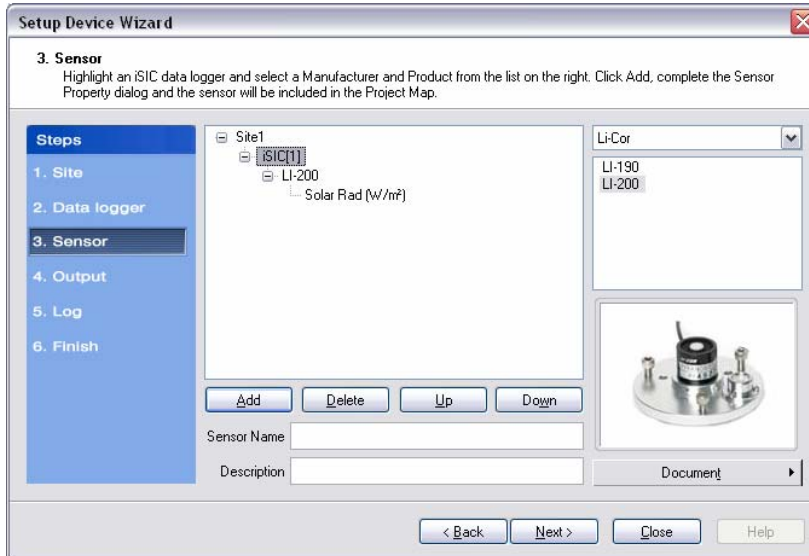


It is a value measure in "Wm² per uA" and is also located on the Certificate of Calibration:

CERTIFICATE OF CALIBRATION			
Model : LI-200 PYRANOMETER SENSOR			
Serial Number:	PY56641	Date of Calibration:	03 Apr 2007
Calibration Constant:	99.90	μA per 1000 watts m ⁻²	
Calibration Multiplier:	-10.01	W m ⁻² per μA	
Please consult the instruction manual for further information on the calibration constant and calibration multiplier. Recalibration is recommended every two years.			
By: _____			
LI-COR			
LI-COR, inc. Environmental Division 4421 Superior Street Lincoln, Nebraska 68504 USA			

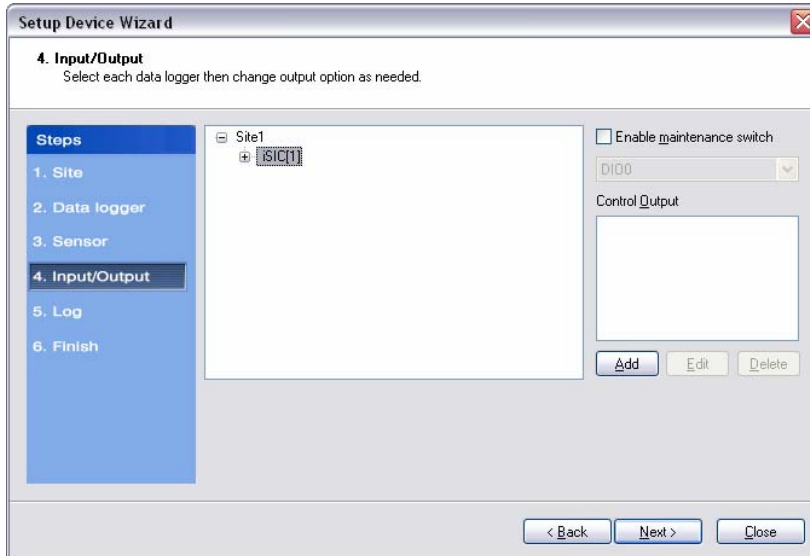


Click **OK** and the sensor will be added to the selected data logger. More sensors can be added at this time by selecting the sensor manufacturer and then sensor model number from the drop down menu on the right. Click **Next** when finished adding sensors.



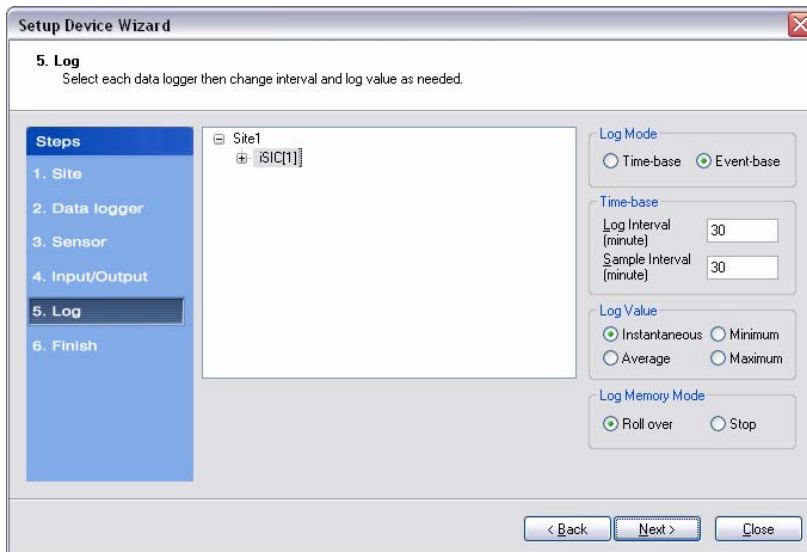
Step 4 – Input/Output

Enable any output and control features of the data logger. See the iSIC manual, section **4.4.2 iSIC Controls** for more information on this functionality.



Step 5 – Log

Select each data logger from the site list and enter the desired **Log Interval** and **Sample Interval** for the data logger in the **Interval** section. In the **Log Value** section, select how the data logger should log data points.



Log Mode

The Log Mode controls when data is logged by an iSIC. In **Time-base** (the default and most common), data is logged at a specified interval, controlled in the **Time-base** section. In **Event-base** log mode, data is only logged when a ground pulse is sent to the Rain input pin on the iSIC digital terminal strip (such as from the contact closure of a tipping bucket rain gauge).

Log Value

By default, the **Sample Interval** and **Log Interval** are equal. When a sampling interval is different than the log interval, all the sampled measurements for the iSIC are used to calculate the average, minimum, or maximum of that logging interval (based on the log type selected, only one can be selected at a time). The individual data points that comprise the samples are not saved; only the final, average, minimum or maximum data point is saved at the specified log interval.

Log Memory Mode

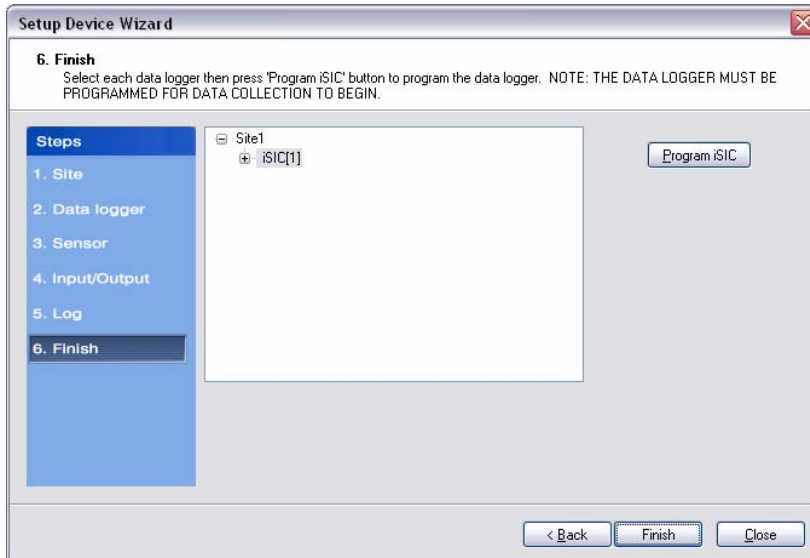
The default memory mode is **Roll over**, and is the recommended operating mode. In this mode, the last ~150K readings (when using 512K flash) will be stored in iSIC memory. When the iSIC memory has filled with readings it will “roll over” the original readings and keep logging. This is ideal for real time applications, where data is being uploaded to a PC as

In **Stop** memory mode, the first ~150K readings (when using 512K flash) will be stored in the iSIC memory. When the iSIC memory has filled with readings, it will stop logging until memory is cleared. When operating in this mode, it is recommended that memory is cleared every time data is uploaded.

Step 6 – Finish

All data loggers and sensors must be programmed before data collection can begin.

- Select an iSIC data logger and click the '**Program iSIC**' button. Before programming an iSIC:
 - The iSIC must be powered and connected to the computer.
 - The 2100-iSIC must be powered and connected to a phone line.
 - The 3100-iSIC must be powered and have a cellular data account.
 - The 4100-iSIC must be powered and be able to communicate to the computer through a 4100-base or 4200-iSIC
 - The 5100-iSIC must be powered and be able to communicate to the computer over Ethernet.
- Click **Finish** when programming is complete.



This wizard can always be revisited by selecting **Project | Setup Device Wizard** if you would like to program an iSIC at a later time or need to setup other sites, data loggers, and sensors.

Step 7 – Retrieve an Initial Data Set and Use the Instrument Within iChart

After your sensor has been added to the database, the main instrument control screen will appear.

Important: All parameters are initially displayed with blank values until after the first log interval has passed and data has been interrogated. Once data has been retrieved from the iSIC, these fields will show the most recent data set recorded by the instrument. By default, iChart will automatically interrogate devices five minutes after every hour.

Troubleshooting

Connection Problems:

1. First make sure you can communicate to the iSIC data logger by right clicking on the data logger in the iChart navigation menu, selecting **Property** and then clicking **Test Connection**.

Sensor reading errors:

If solar radiation values are not correct it could be from a variety of causes.

Li-Cor has great literature on our website about Radiation Measurements that you might find useful. Starting on page 3 through page 6, there is a pretty good discussion on the possibilities and sources of errors in solar radiation measurements. It also discusses the potential percentages of errors that can be caused by these sources.

http://www.licor.com/env/PDF_Files/Rad_Meas.pdf

If the document does not seem to describe the source of error, check the following items in iChart and on the iSIC data logger:

1. The first thing to check is the sensor itself.
 - a. Make sure the sensor is clean and free of any debris
 - b. Make sure the sensor is facing upright and is level.
 - c. Confirm the shield (metallic color wire) is connected to ADx, and the center (copper color wire) is connected to ADy where x and y are the AD pin number pair the wires are connected to and x is the first AD pin in the pair (ie x is AD0 and y is AD1) the voltage should be positive when in sunlight.
 - d. Make sure there is a 147 Ohm resistor across the AD pins. If possible verify the resistance with a multimeter.
 - e. Check the wiring for any cuts or areas that look damaged. Double check the wiring according to the wiring earlier in this document.
2. Next, check is the iChart setup:
 - a. Check to make sure that the LiCor is still setup using the correct differential AD channel (AD0-AD1 was used in the wiring diagram at the beginning of this manual). You can check this by right clicking on the LiCor sensor and selecting property in the Navigation Panel. It should say "ADx-ADy" in the channel selection box, where x and y are the AD pin number pair the wires are connected to.
 - b. When you have the property window open click "Test Port" to see what the reading is currently.
 - c. Additionally, check to make sure the scaling factor matches the calibration value of the LiCor unit. This scaling factor is under the same property window.
3. If the setup is correct, and nothing is blocking the sensor, check the voltage readings.
 - a. When you have the iSIC open double check that the wires go to the correct pins. Then with a multi-meter, check the voltage of the signal wires.
 - b. The voltage should go to zero when the sensor is completely covered.

- c. When measuring the positive of the multimeter (usually red) on ADx and the negative of the multimeter (usually black) on ADy where x and y are the AD pin number pair the wires are connected to and x is the first AD pin in the pair (ie x is AD0 and y is AD1) the voltage should be positive when in sunlight.

Full sun should be around 15mV (using the 147 Ohm resistor). The sensor is not recommended to go over 20mV, thus the reason for the 147 Ohm resistor.