



# **X3-SUB Submersible Data Logger**

## **User Guide**

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# 1. Introduction

## X3-SUB Submersible Data Logger Overview

The X3-SUB is a rugged, self-powered remote data logger system specifically designed for offshore use without fear of accidental flooding. It automatically recognizes sensors and sends data to the [WQData LIVE web data center](#) via cellular or satellite telemetry. There, data is presented on a fully-featured and easy-to-use dashboard where remote, real-time communication with the logger is possible. The X3-SUB includes three MCIL/MCBH wet-mate sensor ports that are compatible with most environmental sensors using SDI-12, RS-232, or RS-485. All connections are made with a simple thread-on connector, and the built-in sensor library automatically facilitates setup and configuration. Data is stored on common or independent schedules.

The X3-SUB can be powered by an internal SLA battery, alkaline battery pack, or external 12VDC power. The internal SLA battery is intended for use with the [CB-75 Data Buoy](#) for continuous power via solar charging. Advanced power management combined with ultra-low sleep and run currents extend battery life and eliminate the need for multi-battery arrays or large solar charging systems. The X3-SUB monitors itself while collecting environmental data – internal temperature, humidity, voltages, and currents are constantly recorded, and failure alerts can be sent automatically to a predefined list of contacts.

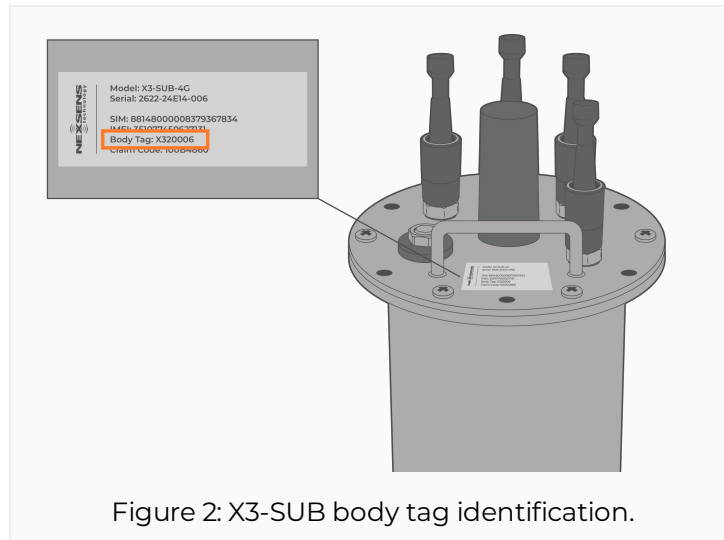
Using Bluetooth or a USB adapter with the NexSens CONNECT Software, users can configure the X3-SUB for deployment, view live data, change settings, or troubleshoot. Optional integrated 4G LTE cellular or Iridium satellite telemetry modules offer 2-way remote communications via the WQData LIVE.



Figure 1: X3-SUB Submersible Data Logger

## Body Tag Identification

Each X3-SUB logger has an identifier label placed on the top plate of the logger. The identifier label includes important information, such as the *Body Tag*. The tag is incorporated into the default name of the device on WQData LIVE and is used for logger identification. A NexSens technical support specialist will request this tag for remote troubleshooting or if NexSens-supplied data services require activation, suspension, or cancellation.



## Specifications

The X3 is fully sealed in a marine anodized aluminum housing. All sensor and power inputs utilize waterproof UW connectors, and antenna connections feature an O-ring seal. The unit is designed to work in extreme conditions, including underwater. A specially designed mounting bracket holds the X3 to a pole mast, and bolt holes on the top and bottom of the housing provide easy installation on NexSens CB-Series data buoys.

**Housing**

**Operation**

<ul style="list-style-type: none"> <li>• Material: Type 316 stainless steel</li> <li>• Weight: 12.0 lbs. (5.44kg)</li> <li>• Dimensions: 5.5" (13.97cm) diameter with 7.25" (18.42cm) flange x 13.63" (34.62cm) height</li> <li>• Rating: IP68</li> <li>• Operating Temperature: -40°C to 70°C</li> <li>• Antenna Port: Type N female</li> </ul> <p><b>Power</b></p>	<ul style="list-style-type: none"> <li>• User Interface: Wireless Bluetooth or wired RS-485 via USB adapter to CONNECT Software; WQData LIVE Web Datacenter with optional wireless telemetry; Status beeps</li> <li>• Log Interval: User configurable from 1-minute (10-minute default)<sup>1</sup>; Unique interval per sensor</li> <li>• Transmit Interval: User configurable from 5-minute (10-minute default)</li> <li>• Transmission Trigger: Time-based; Selective parameter upload option</li> <li>• Sensor Interfaces: RS-232 (3 Channels), SDI-12, RS-485, Pulse Count</li> <li>• Sensor Power: (2) independent switches from the input supply<sup>2,3</sup></li> <li>• Telemetry Options: 4G LTE global cellular; Iridium satellite</li> </ul> <p><b>Internal Features</b></p>
<ul style="list-style-type: none"> <li>• Internal Power: 6 A-Hr SLA battery, 12 VDC</li> <li>• External Power Requirements: 10.7 to 16.8 VDC +/-5%; includes reverse polarity protection, over voltage protection (OVP), and under voltage lock out (UVLO) protection</li> <li>• Current Draw (Typical @ 12VDC): Sleep: 450uA; Active: 55mA; Cellular transmitting: 300mA; Iridium satellite transmitting: 170mA</li> <li>• Peak Current: Power supply must be able to sustain a 500mA 1-second peak current (@ 12V)</li> </ul>	<ul style="list-style-type: none"> <li>• Real-Time Clock (RTC): &lt;30sec/month drift<sup>4</sup>; Auto-sync weekly<sup>5</sup>; Internal backup battery</li> <li>• Data Logging: 8 MB non-volatile flash memory; &gt; 1-year storage with 20 parameters at 15-minute intervals; Max 200 parameters per log interval</li> <li>• Built-in Sensors: <ul style="list-style-type: none"> <li>◦ Temperature (-40° to 100°C, 0.016°C resolution, ±0.3°C accuracy)</li> <li>◦ Humidity (0% to 100%, 0.03% resolution, ±4% accuracy from 5 to 95% RH)</li> <li>◦ System voltage</li> <li>◦ System current</li> <li>◦ System power</li> <li>◦ Real-time clock (RTC) battery voltage</li> </ul> </li> <li>• Sensor Ports: (3) MCBH-8-MP for sensor interface (RS-232, RS-485, SDI-12, Power, GND)</li> <li>• Power Port: (1) MCBH-6-FS for power and communication (12V Solar In, Power Switch, RS-485 Host, GND)</li> </ul>

<sup>1</sup>Minimum log interval dependent on sensor limitations and processing time

<sup>2</sup>Cumulative concurrent current limit of all three channels is 2A

<sup>3</sup>Logger power supply must be able to support current requirements of sensors

<sup>4</sup>Assumes 25°C operating temperature

<sup>5</sup>Requires the X3 to be connected to the internet

## What's Included & Accessories

All X3-SUB submersible data loggers have product identifier information prominently displayed on the quick start guide, package exterior, and data logger itself. These identifiers include the label on the X3-SUB top plate and the included Claim Code, which outlines ownership of the logger on WQData LIVE. Depending on the X3-SUB model, the appropriate antenna will be included.

### What's Included

When purchased with a CB-75 data buoy, the X3-SUB will come pre-mounted on the buoy platform. Dummy plugs will be included for the (3) MCBH sensor ports and the (1) MCIL-6 pin solar and communication port. An included quick-start guide provides a step-by-step process for integrating the logger with sensors, configuring the telemetry, and hosting a project on WQData LIVE.



### Accessories

Accessories for the X3-SUB data logger include specially designed software communication adapters, antennas, solar power packs, power cables, and sensor interface cables.

Communication	
MCIL6MP-USB-DC	Male 6-pin USB PC cable with external 12VDC power adapter

Buoy
------



CB-75	CB-75 data buoy with 1.5" instrument holes & (3) 4-watt solar panels, 75 lb. buoyancy
M550-F-Y	Solar marine light with flange mount & 1-3 nautical mile range, 15 flashes per minute, yellow

<b>Sensor Interface</b>	
MCIL-8-FS-X	Female 8-pin wet mateable connectorization of sensor cable assembly
MC-2W	Female 8-pin wet mateable 2-way sensor splitter, 1m

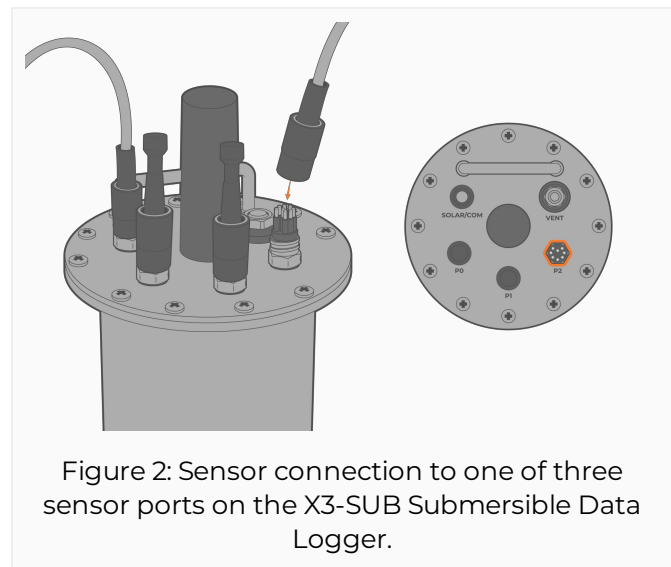
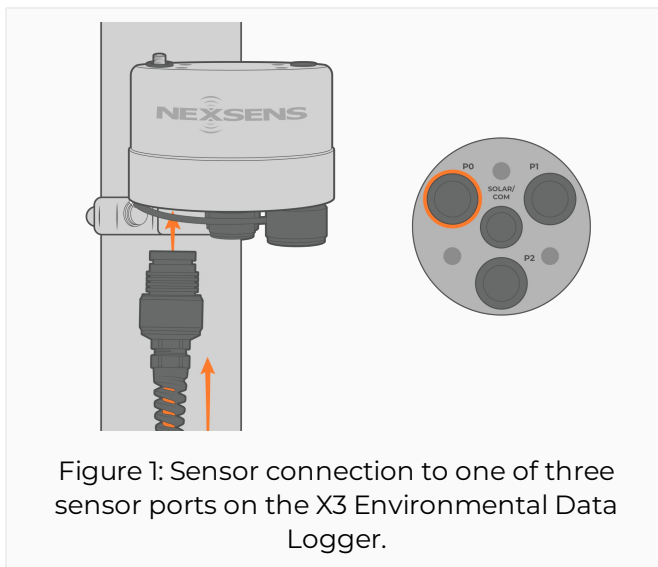
## 2. Data Logger Setup

### X3 Data Logging Features

Configuring an environmental data logger has traditionally been a complex task requiring intricate programming software. Users were tasked with indicating all connected sensors' communication protocols, sensor addresses, measurement commands, data format, and power requirements. However, with NexSens X3 data loggers, this process is simplified through *sensor detection*. Using a built-in sensor library, X3 data loggers can recognize connected sensors and store their information in internal memory, such as the make and model, parameters, and the port to which it is connected. Once a sensor is detected, the logger provides power to the sensor and gathers measurements at a user-specified interval.

The X3 data logger includes (3) sensor ports that communicate with environmental sensors via the SDI-12, RS-485, and RS-232 digital communication protocols. Using these protocols, the logger interfaces with sensors through SDI-12, Modbus-RTU, NMEA0183, and a General Serial Interface (GSI). Sensor scripts not included in the base library can be created using script generator tools in the NexSens CONNECT software. Any sensors communicating via the mentioned sensor interfaces are compatible with NexSens X-Series data loggers.

Users will use the CONNECT software to enable the necessary scripts for sensor detection. Once enabled, the logger provides power to all sensor ports and saves information regarding each connected sensor. The sensor information and subsequent data are stored in its internal memory and transmitted to the WQData LIVE web data center in real-time.



### Important Considerations

1. During sensor detection, only the *enabled* sensor scripts are processed.
  - a. Learn how to enable sensor scripts [here](#).
2. Only one RS-232 sensor can be connected to a single port.
3. Multiple SDI-12 and RS-485 sensors can be applied to a single port; however, each must

have a unique sensor address.

4. Most sensors require at least 12VDC power. During sensor detection, ensure the logger is connected to an adequate power source.
5. New sensor detections will erase any prior logger programming. Thus, any previously detected sensors that are physically disconnected or are experiencing communication disruptions at the time of a new detection will *not* be identified.
6. Port P0 will always use continuous power. Utilize this port for continuously powered sensors, such as rain gauges, weather stations, flow monitors, etc.

## When to Run a Sensor Detection

Sensor detections can be performed in three separate ways:

1. If a logger has not been programmed, it automatically begins a sensor detection when power is applied or cycled.
2. WQData LIVE provides a remote sensor detection option, which is outlined [here](#).
3. In most instances, the NexSens CONNECT software will provide the safest and most efficient way to perform sensor detection. The sensor detection process via the CONNECT software is outlined [here](#).

Sensor detections should be performed in a controlled environment before a scheduled deployment date. The new programming should be thoroughly examined to ensure all sensors and parameters are shown, they output in the correct units, and the values are within the expected ranges. Systems should be tested for multiple hours before deployment to confirm functionality. NexSens strongly discourages using the remote WQData LIVE sensor detection process while the unit is in the field; however, the remote command is helpful in a controlled environment.

## Buzzer Pattern Indicator

X3 Data Loggers include a built-in buzzer that outputs a distinctive pattern. The buzzer relays to the user the current processes being performed by the data logger. Upon power connection, the logger will beep once, indicating the system is powered. During a sensor detection, the logger will beep once every 3 seconds. Once the sensor detection is complete, the logger will continue this pattern as it gathers the first reading from the sensors. After collecting the measurements, the logger will automatically begin communicating with WQData LIVE. A “double-beep” pattern will be heard, which indicates the logger is setting up the cellular connection. When the connection has been established or if the connection failed, the logger will output two or three short beeps, respectively. If the connection is successful, the “double-beep” pattern will continue until all data is transmitted to the web.

Event	Beep Type	Status
Applying power	One short beep	System boot successful
Sensor detection/reading	One short beep every 3 seconds	Logger currently taking a reading or detecting sensors

Telemetry connection attempt	Double-beep every 3 seconds	Logger attempting to establish network connection
Telemetry connection successful	Two short beeps	Network connection established
Telemetry connection failed	Three short beeps	No signal/network connection failed

# X3 Data Logger Programming

In many instances, applications scientists and engineers at NexSens will pre-program data loggers based on user specifications. The system will be ready for “plug-and-play” and will not require the subsequent steps below to be performed. If a system is pre-programmed, a System Integration Guide will be included with the order, with an overview of the next steps to get the system up and running. Review the System Integration Guide guide and skip to the WQData LIVE Setup section of the user guide (linked at the end of the article).

**Note:** It is recommended to download the CONNECT software (step 1) for future use.

## 1. CONNECT Software Download

The NexSens CONNECT Software enables users to communicate directly with any NexSens X-Series data logger using a [UW6-USB-485P-DC cable](#). It supports a growing number of diagnostic and configuration tools to facilitate system setup and troubleshooting. New systems should be completely configured with sensors and a telemetry connection in a nearby work area. It is recommended to operate the system for several hours to ensure correct sensor readings. Use this test run to become familiar with the features and functions of the logger, the CONNECT software, and the WQData LIVE web data center.

- Download the CONNECT software and establish a connection with the logger via Bluetooth or the direct connect USB cable.
  - [CONNECT Setup](#)
  - The 6-pin port on the X3 or X3-SUB provides power and communication through the CONNECT software. Connect the [UW6-USB-485P-DC cable](#) to the middle 6-pin port of the pole-mount X3 and the [MCIL6MP-USB-DC](#) to the SOLAR/COM port on the X3-SUB.
  - For sensor programming, ensure 12VDC is supplied to the system.

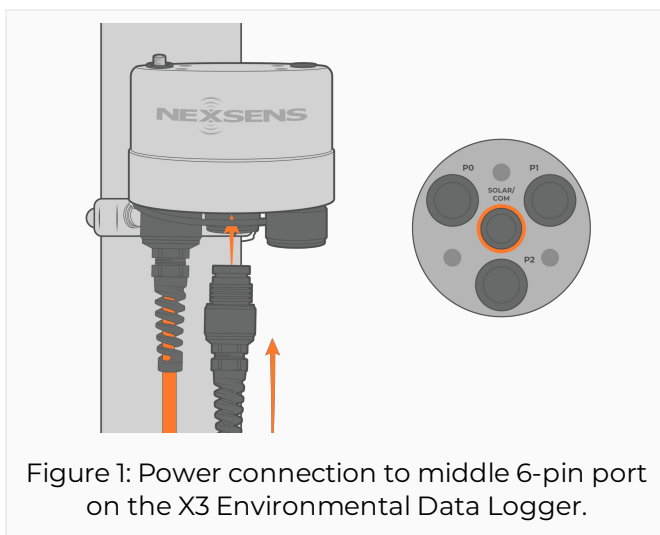


Figure 1: Power connection to middle 6-pin port on the X3 Environmental Data Logger.

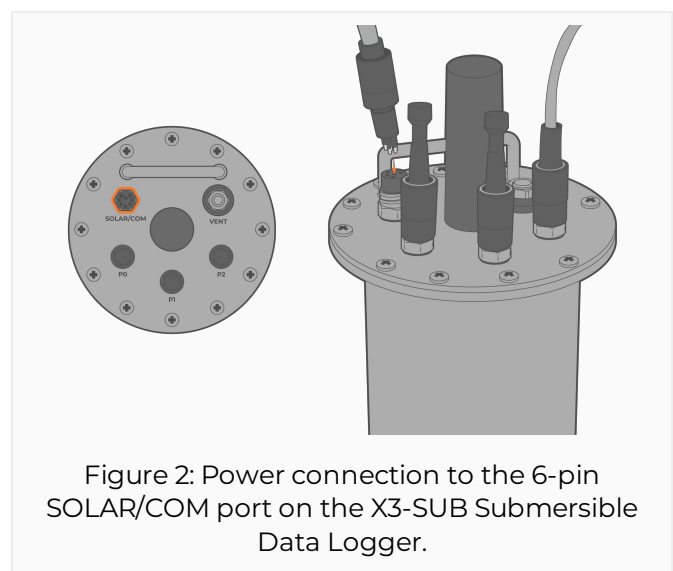


Figure 2: Power connection to the 6-pin SOLAR/COM port on the X3-SUB Submersible Data Logger.

## 2. Sensor Integration Guides

While the X3 data logger simplifies programming, most environmental sensors require their

own programming to communicate properly with the logger. NexSens application scientists and engineers created sensor integration guides to provide a step-by-step process for setting the appropriate communication settings on common environmental sensors for sensor detection.

- Review the sensor integration guides on the NexSens knowledge base to prepare the sensor(s) for the sensor detection.
  - [Sensor Integration Guides](#)
  - If a guide is unavailable, follow the links below to determine if a script for the sensor is available in the sensor library, or if a new script must be created.

### 3. Create and Enable Scripts

While the current sensor library on all X3 loggers is extensive and continuously growing, not all environmental sensors will be available. The sensor library can be reviewed in the CONNECT software following the link below to determine whether a sensor is available:

- [Configure Sensor Scripts](#)

For any scripts that are not available in the library, the CONNECT software provides an easy-to-use script generation tool for the X3's sensor interfaces. The user must review the sensor manufacturers' information regarding the appropriate protocol to choose. In many instances, a sensor will use multiple sensor interfaces, so it is imperative that the internal settings on the sensor are set to output in the proper interface.

Before creating a new script, below are a few important considerations to consider:

1. The sensor must be connected to the sensor port outlined in the script for proper communication. It is best to label the port with the sensor name after creating the script.
2. Only one RS-232 sensor can be connected to a single port.
3. Multiple SDI-12 and RS-485 sensors can be applied to a single port; however, they must each have a unique address.
4. Ensure the address selected in the script matches the address in the internal sensor settings.
5. Any scripts generated in the CONNECT software will automatically program onto the data logger, regardless of any confirmed communication with the sensor. Ensure to review the latest sensor readings to confirm the script is working. Below are articles to create specific scripts.
  - [Modbus Script](#)
  - [NMEA0183 Script](#)
  - [SDI-12 Script](#)
  - [GSI Script](#)

If there are any questions, contact NexSens technical support for assistance with new or existing scripts:

Phone: 937-426-2151  
Email: info@nexsens.com

#### **4. Automatic Sensor Detection**

Once the appropriate scripts are created and enabled, connect sensor(s) to the (3) available sensor ports on the logger. Before running any new sensor detection, it is always recommended to erase the log data and erase any previous sensor programming:

- [Erase Log Data](#)
- [Erase Sensor Programming](#)
  - After the logger is reset, the data logger will begin the automatic detection process using the internal script library.

Depending on the number of scripts enabled, the process can take from 5 to 15 minutes. While waiting for the detection to complete, proceed to the [WQData LIVE Setup](#).

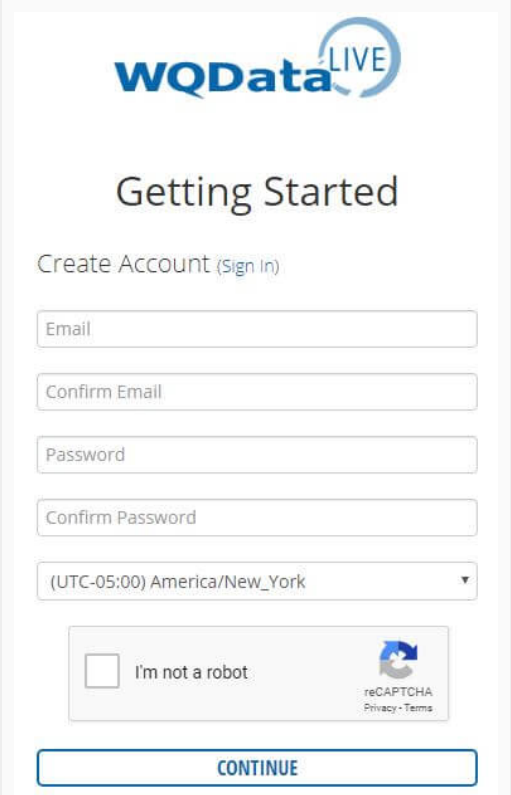
### 3. WQData LIVE Setup

#### Create a WQData LIVE Account

WQData LIVE is a web-based project management service that allows users to collect and manage data from NexSens data logging platforms. The *Basic* tier is free to use, while the *Advanced, Professional and Enterprise subscription tiers* offer an array of advanced project and data management features.

To get started with WQData LIVE, first, create an account:

1. Navigate to <https://www.wqdatalive.com/getting-started>
2. Fill out the form to create the account.
  - a. Select the proper time zone to ensure all dashboard data and reports display accurate timestamps.



The image shows a web form titled "Getting Started" for WQData LIVE. The form is for creating a new account and includes the following elements:

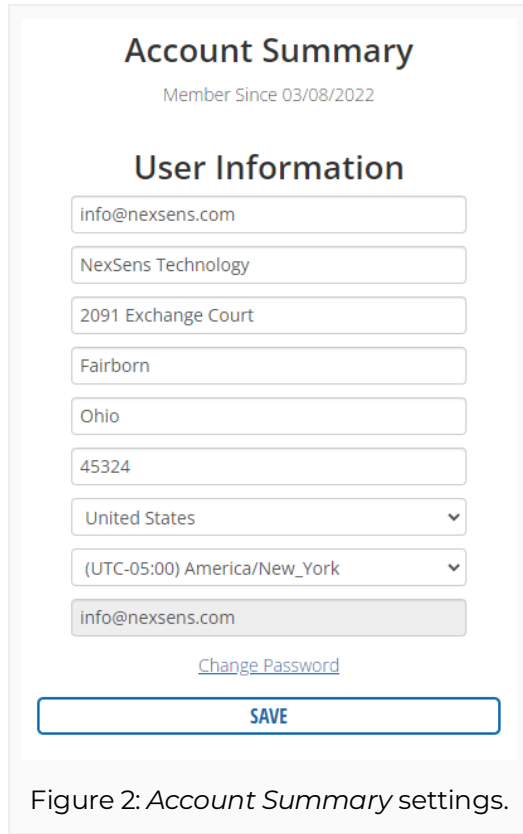
- WQData LIVE logo at the top.
- Section title: "Getting Started".
- Link: "Create Account (Sign In)".
- Input fields: "Email", "Confirm Email", "Password", and "Confirm Password".
- Time zone dropdown menu: "(UTC-05:00) America/New\_York".
- reCAPTCHA: "I'm not a robot" checkbox and "reCAPTCHA Privacy - Terms" link.
- Button: "CONTINUE".

Figure 1: WQData LIVE Create Account form.

3. Select **Continue** when finished, and a success notification, along with an email verification request, will be shown.
4. Click the confirmation link in your email to complete the activation of the new WQData LIVE account.
5. The link will redirect to the account login menu. Signing in for the first time will take the user to the *Account Summary* menu, where settings such as the local time zone can be



configured.



The screenshot shows a web interface for 'Account Summary'. At the top, it says 'Account Summary' and 'Member Since 03/08/2022'. Below this is a section titled 'User Information' with several input fields: 'info@nexsens.com', 'NexSens Technology', '2091 Exchange Court', 'Fairborn', 'Ohio', '45324', a dropdown menu for 'United States', and another dropdown menu for '(UTC-05:00) America/New\_York'. There is also a greyed-out field with 'info@nexsens.com' and a link for 'Change Password'. At the bottom of the form is a blue 'SAVE' button.

Figure 2: Account Summary settings.

6. Proceed to **create a WQData LIVE project** to continue the startup process.

## Create a WQData LIVE Project/Site

Data loggers and measurement data are organized into projects and sites on WQData LIVE. Projects may contain one or more sites for further organization, and each site may contain one or more data loggers.

To create a project and site(s):

1. Sign in to an existing [WQData LIVE account](#).
2. Hover over the email in the upper right-hand corner of the page and select **PROJECTS** from the drop-down menu.

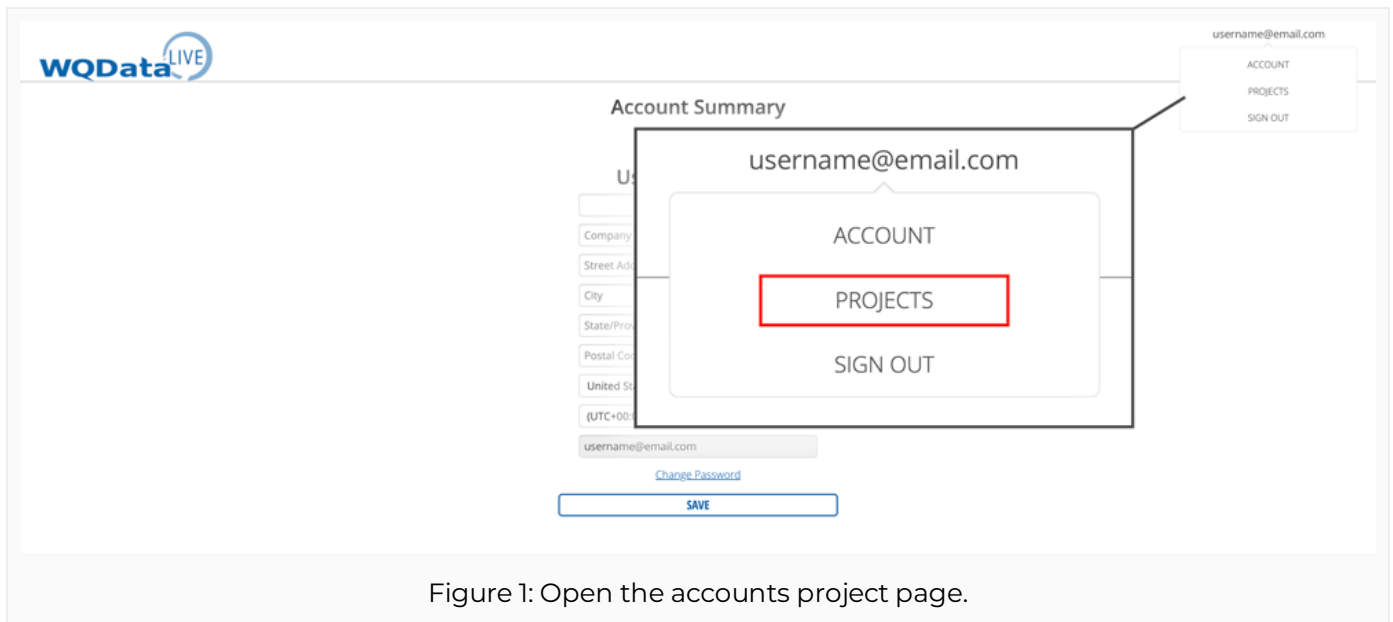


Figure 1: Open the accounts project page.

3. Select the tile labeled **Create New Project**.
4. Fill out the fields in the corresponding menu to title the project, and then click **CREATE PROJECT**.
5. The main *Project Dashboard* will appear. Access the administrator settings by going to **Admin | Settings** at the top.

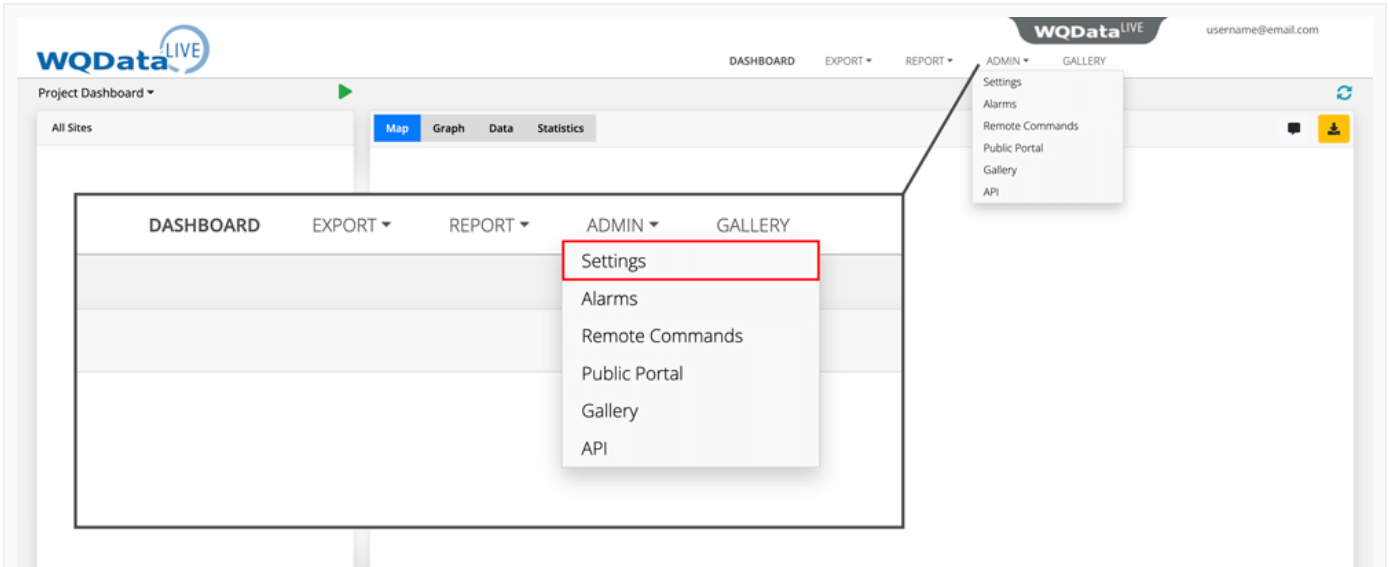


Figure 2: Access the administrator settings on the WQData LIVE project.

6. Select **Project/Site | Sites | +New Site**. Enter the site information in the spaces provided.
  - a. Upload a project/site image
  - b. Enter project/site coordinates

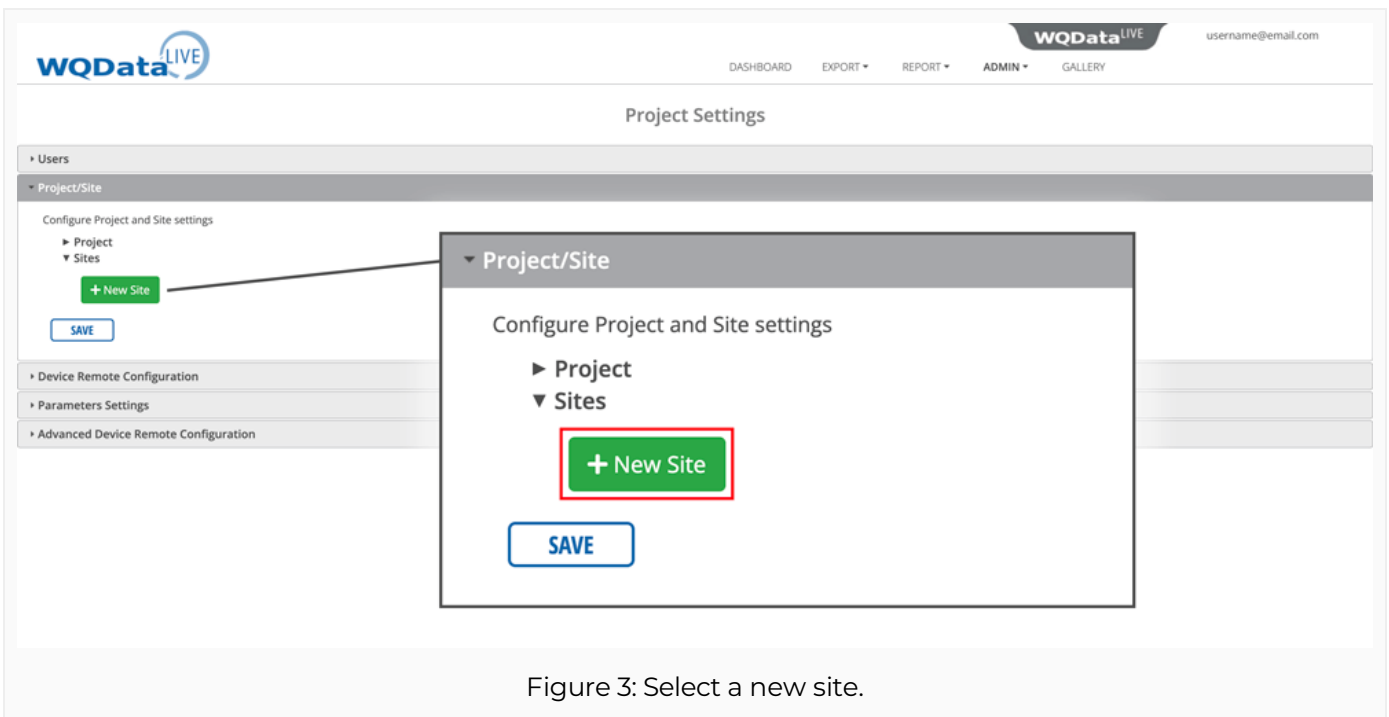


Figure 3: Select a new site.

7. Click **SAVE** when finished.
8. Proceed to [Add a data logger\(s\)](#) to each site to continue the startup process.

## Add a Data Logger to a WQData LIVE Project

During first-time configuration, data loggers are added to WQData LIVE projects using a *Claim Code* supplied with each data logger.

To assign a data logger using a *Claim Code*:

1. Log in to WQData LIVE and find the username in the top right-hand corner of the page. Mouse over the username to reveal a drop-down menu, and click **PROJECTS**.

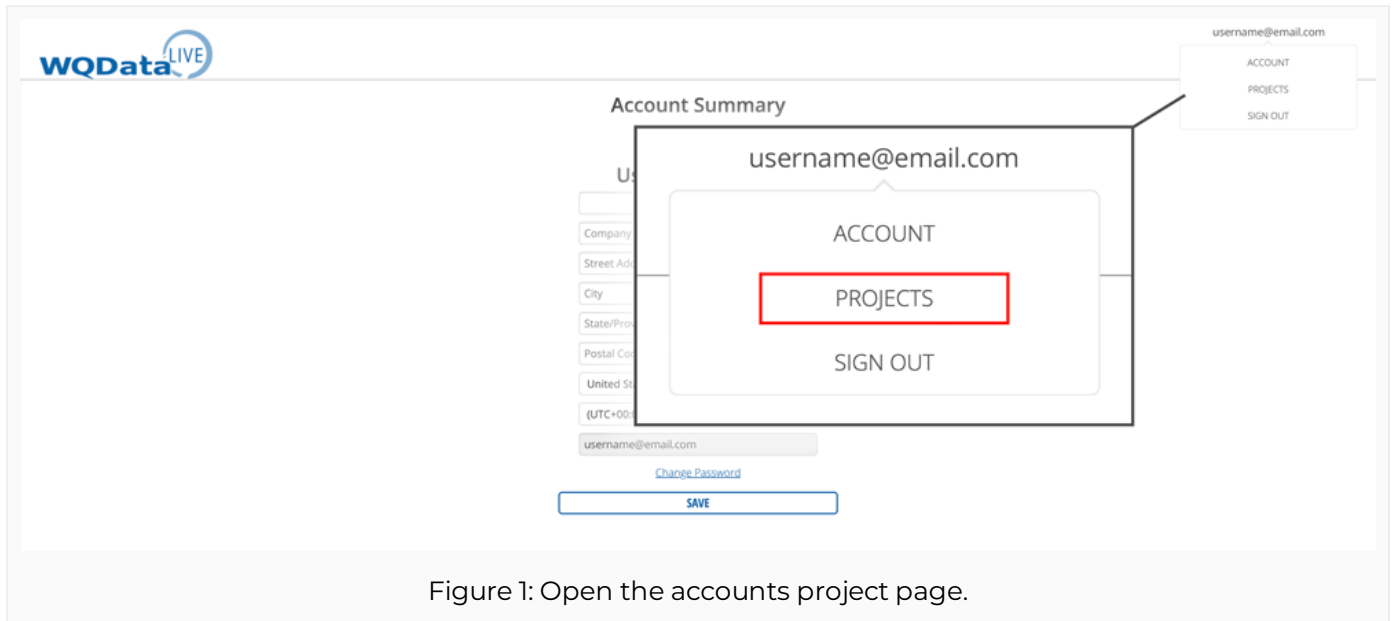


Figure 1: Open the accounts project page.

2. Choose an existing project or select **Create New Project**. Follow the link below for additional information on creating a new project.
  - a. [Creating a WQData LIVE Project](#)
3. After selecting or creating a project, click **ADMIN | Settings**, located at the top of the dashboard.

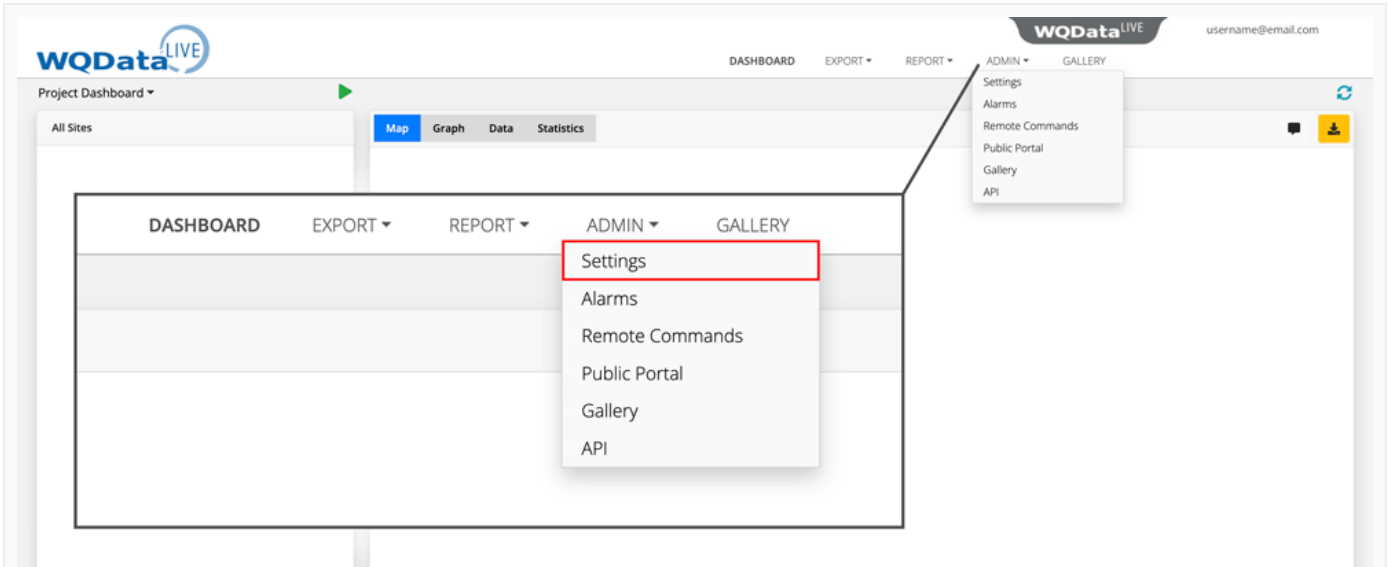


Figure 2: Access the administrator settings on the WQData LIVE project.

4. Click on the gray bar that says **Project/Site** to open a drop-down menu. Choose **Sites** to open a second drop-down menu.
5. The sites drop-down menu displays all of the current sites within the project. View the site settings by clicking on the name.
6. Locate the *Claim Code* on the serial label attached to the data logger's Quick Start Guide or System Integration Guide.

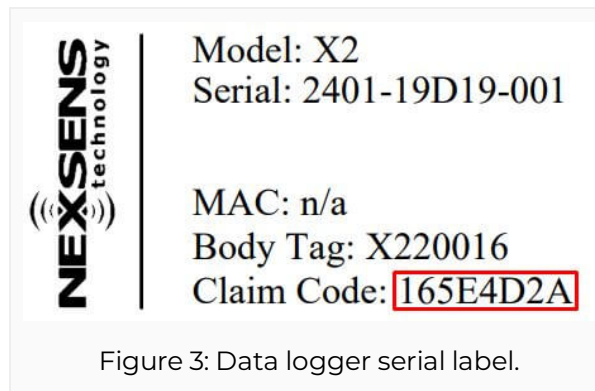


Figure 3: Data logger serial label.

7. Add a new logger by entering the *Claim Code* in the field near the bottom of the sites menu. Then click **Add Device**.

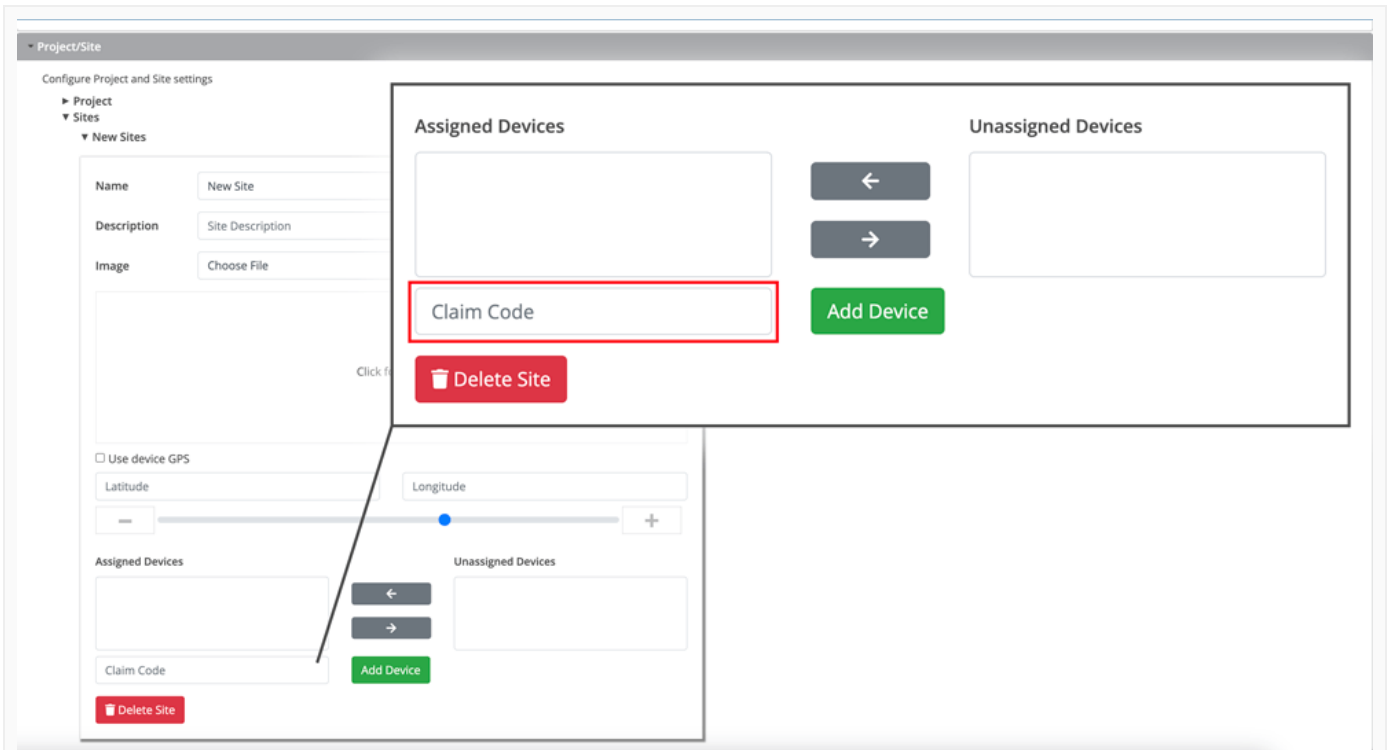


Figure 4: Enter the claim code in the space provided to add the data logger.

8. The device name will appear in the *Assigned Devices* box.
9. Click **SAVE** when finished.
  - a. All parameters and data for the logger will now be visible on the project and site dashboard.

## 4. Telemetry Setup

### X-Series Logger Data Flow

NexSens X-Series data loggers have multiple options to access data collected by the logger. Communication options for the X3 data logger include cellular, satellite, Wi-Fi, Bluetooth, and a direct connection. The X2 data logger has an additional radio telemetry option. Telemetry models transmit data in real-time to the WQData LIVE web data center. All models include direct data download via Bluetooth (X3 only) or a direct cable. Direct data downloads are performed using the NexSens CONNECT software. The diagrams below outline how data is collected and transferred from the sensor to the user.

**Note:** X2 data loggers store data locally on a microSD card. X3 data loggers store data locally in internal memory.

#### Cellular

Modems and SIM cards in X-Series data loggers work with all major U.S. and international carriers. Cellular systems are best utilized near cities and areas with strong cellular coverage.

## NexSens X-Series Data Flow: Cellular Logger to WQData LIVE

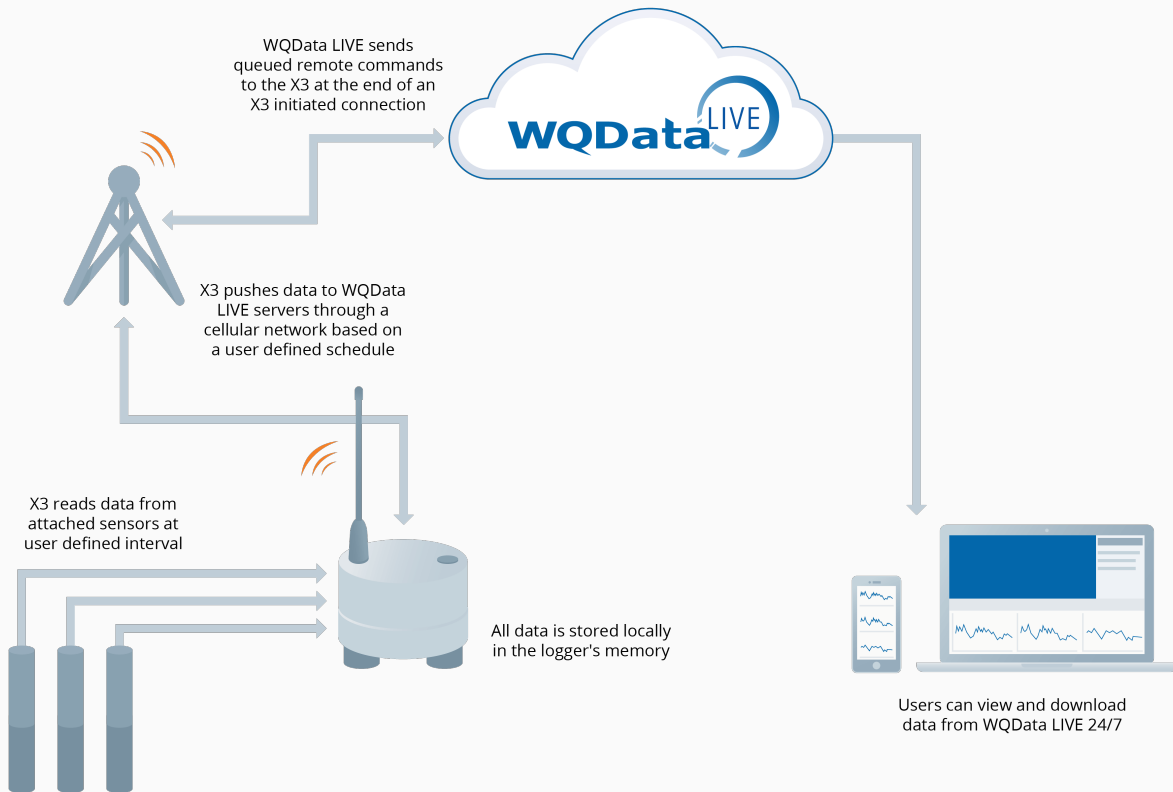


Figure 1: Cellular data flow to WQData LIVE.

### Iridium

Iridium systems are best utilized in extremely remote locations that lack adequate cellular reception. These systems work globally as satellite coverage extends to nearly every location. X-Series loggers send iridium messages with measurement data to specified email servers, which are then collected and parsed by WQData LIVE every 5 minutes.



## NexSens X-Series Data Flow: Iridium Logger to WQData LIVE

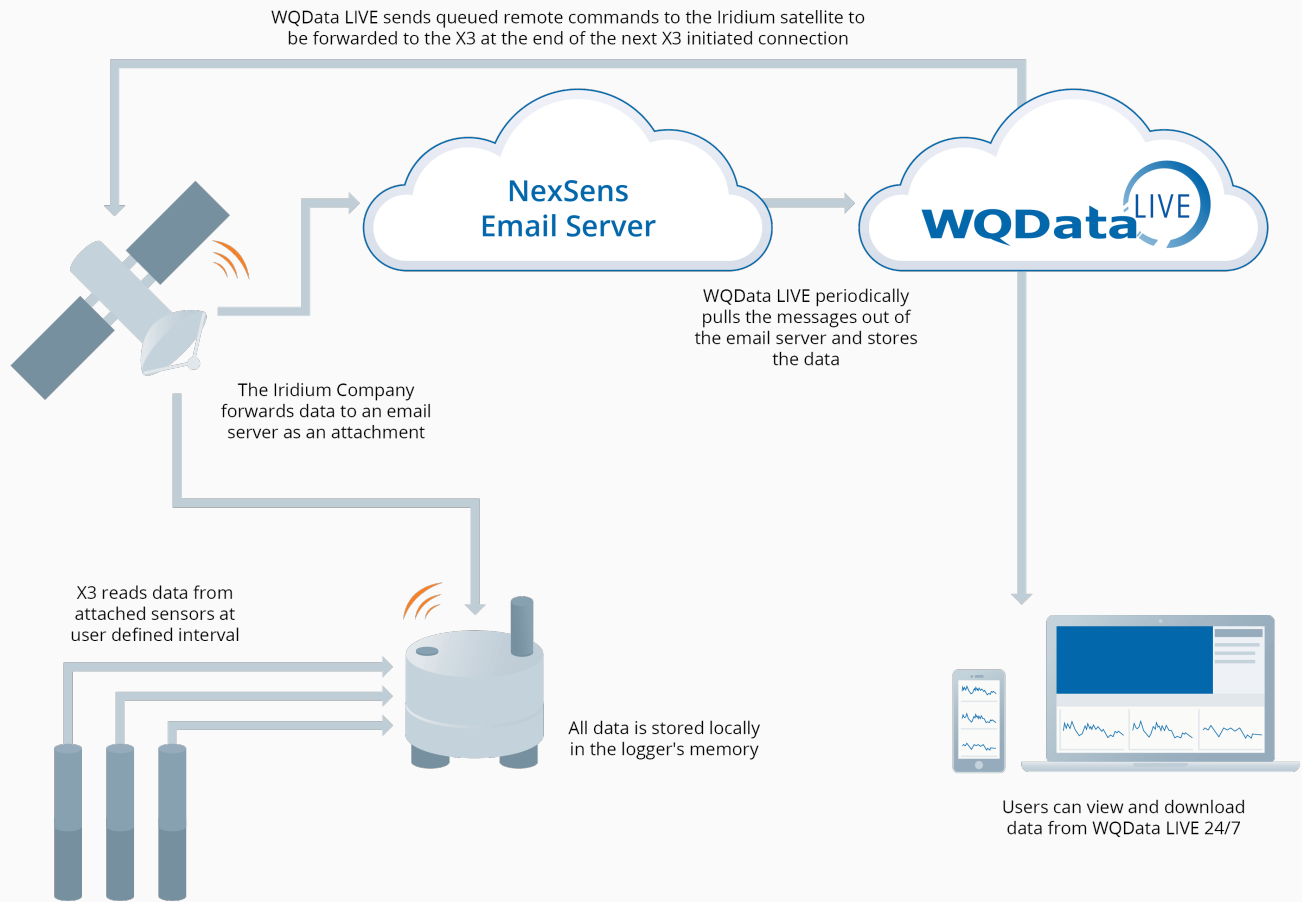


Figure 2: Iridium data flow to WQData LIVE.

### Wi-Fi

Wi-Fi systems are best utilized if a local area network is on-site or within range of the deployment location. These systems save money on the annual costs of cellular or satellite services.

## NexSens X-Series Data Flow: Wi-Fi Logger to WQData LIVE

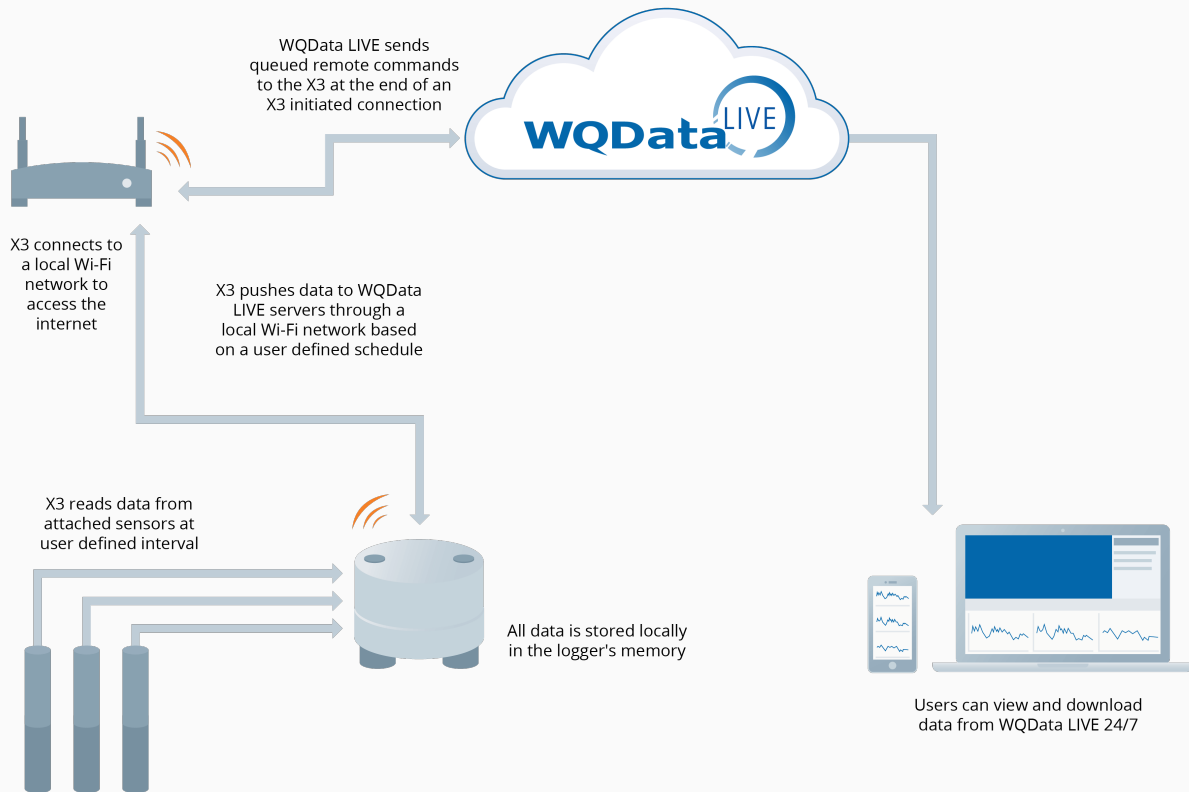


Figure 3: Wi-Fi data flow to WQData LIVE.

### Bluetooth

The X3 Environmental Data Logger includes connectivity to Bluetooth-compatible (BLE 5.0) devices. Bluetooth capability removes the need for a direct connect cable and provides more seamless uploads and downloads via the NexSens CONNECT software. NexSens recommends the *tp-link Bluetooth 5.0 Nano USB Adapter* as an affordable Bluetooth adapter option.

## NexSens X-Series Data Flow: Data Logger Bluetooth Connection to CONNECT Software



Figure 4: Bluetooth connectivity with the CONNECT software.

### Direct Connection

All X-series data loggers have a 6-pin port for power and communication. Users can download logged data directly via the CONNECT software and a [UW6-USB-485P-DC cable](#).

## NexSens X-Series Data Flow: Data Logger Direct Connect to CONNECT software

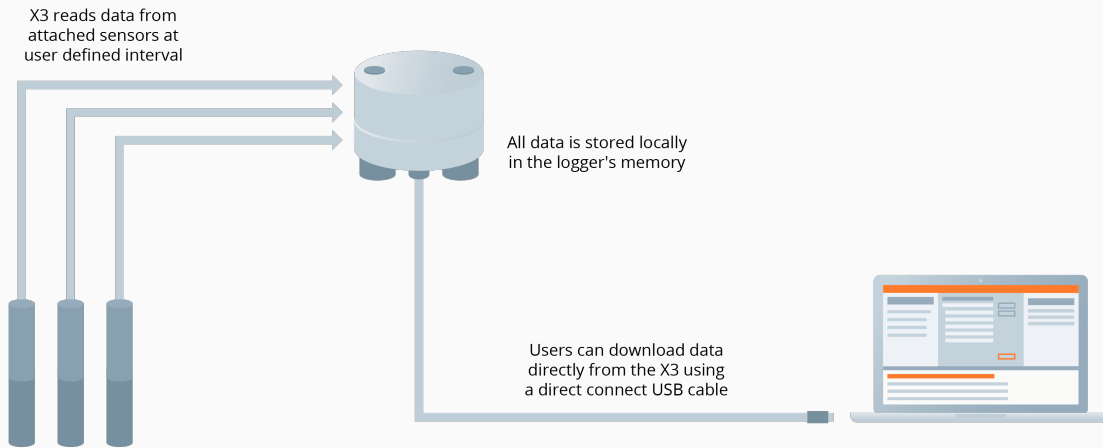


Figure 5: Direct connection via the CONNECT software.

## Cellular

### Set up a 4G Cellular Account for an X-Series Data Logger

While NexSens can provision and manage a cellular account for an X-Series Data Logger if desired, it may be preferred to set up and manage an account directly with a provider. The loggers' cellular telemetry requires a 4G-compatible SIM to operate. Please reference the following information for 4G cellular account setup:

#### Step 1) Verify cellular coverage

Prior to selecting a carrier, verify that the deployment location of the X-Series data logger has sufficient 4G data coverage. In addition to consulting a coverage map, confirm by visiting the deployment location with a 4G device operating on the carrier network, if possible. This is to ensure that the signal strength is not hindered by local obstructions.

#### Step 2) Receive the cellular module information from NexSens

In some cases, the cellular provider will request the device's International Mobile Equipment Identity (IMEI) number. NexSens will provide the IMEI number specific to each X-Series logger cellular module once assigned.

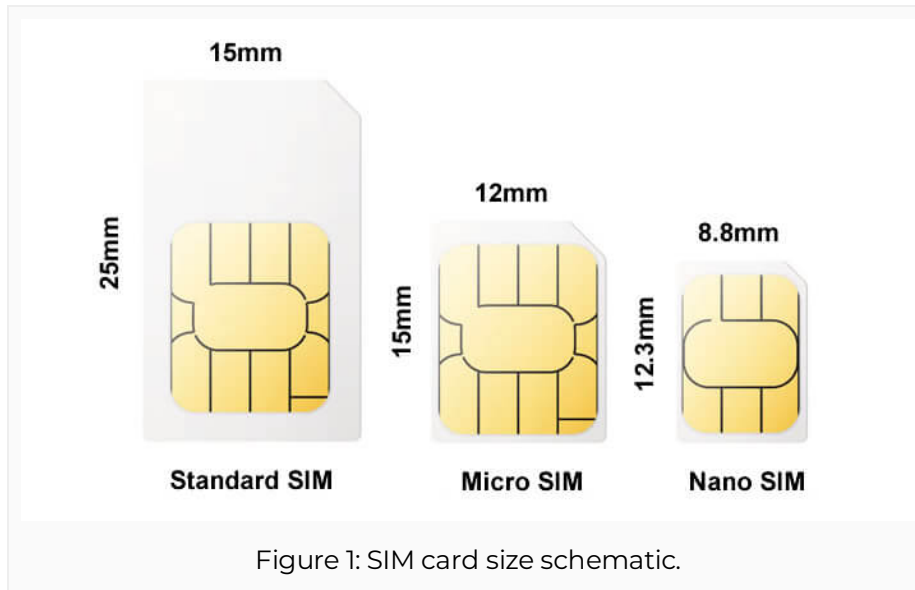
#### Step 3) Provide IMEI and data requirements to carrier and receive SIM card

Provide the 15-digit IMEI number to the carrier and request to assign this to a Micro SIM card (**3FF** size, 15mm x 12mm) for a *Machine-to-machine* data plan.

If asked about account monthly data plan size, note that most systems will require less than 25MB/month during deployment. Actual usage depends upon the number of recorded parameters, sampling frequency, and any over-the-air firmware updates. For a more precise estimate of system data usage, please contact NexSens.

A Static IP and Unrestricted Access are not required.

*Note: For X-Series models produced before 2023, the SIM card size is a Mini (Standard) SIM card (2FF size, 25mm x 15mm). Before procuring a SIM card, confirm with NexSens by providing the model identification (i.e., body tag or serial number).*



**Step 4) Mail SIM card to NexSens Technology for installation and testing**

Send the SIM card to NexSens for pre-shipment installation and testing (strongly recommended). Please ship the SIM card to:

**NexSens Technology**

**2091 Exchange Court**

**Fairborn, OH 45324**

## X3-SUB Logger SIM Card Installation

The cellular model of the X3-SUB Submersible Data Logger contains an internal modem for cellular telemetry. The SIM card slot on the modem is compatible with 4G-capable SIM cards that are a 3FF SIM size (12 x 15 mm; Micro-SIM). Before purchasing or installing a SIM card, ensure the SIM is set up according to the article below:

- [Set up a 4G Cellular Account for an X-Series Data Logger](#)

### Installation Instructions

Before installing a SIM card, ensure the logger is disconnected from all power sources. Statically ground yourself prior to and while contacting any of the electronics inside the logger. Failure to do so may result in a static discharge that can be harmful to the electronics.

1. Use a Phillips-head screwdriver to remove the (6) screws holding the top plate of the X3-SUB.

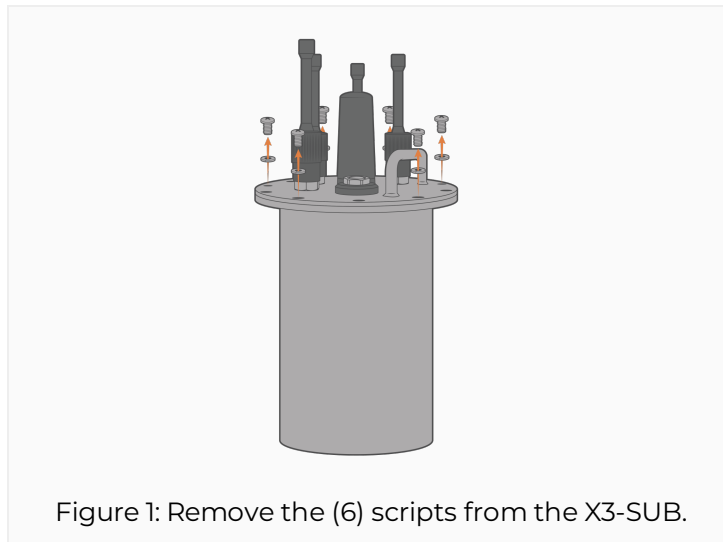
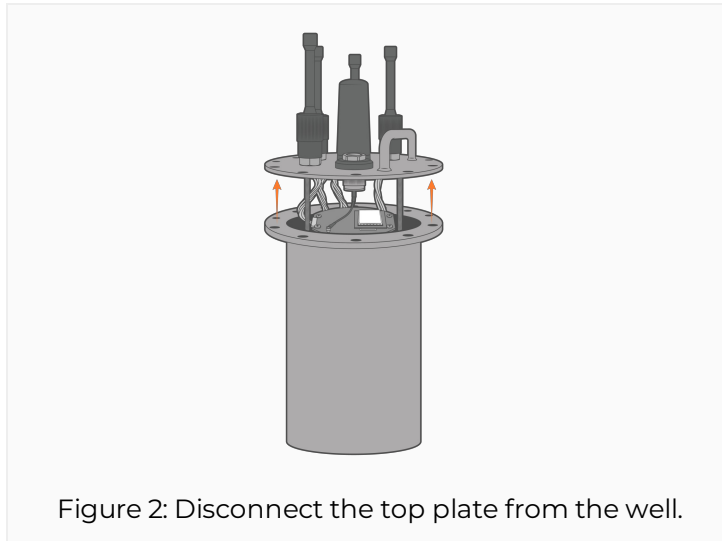
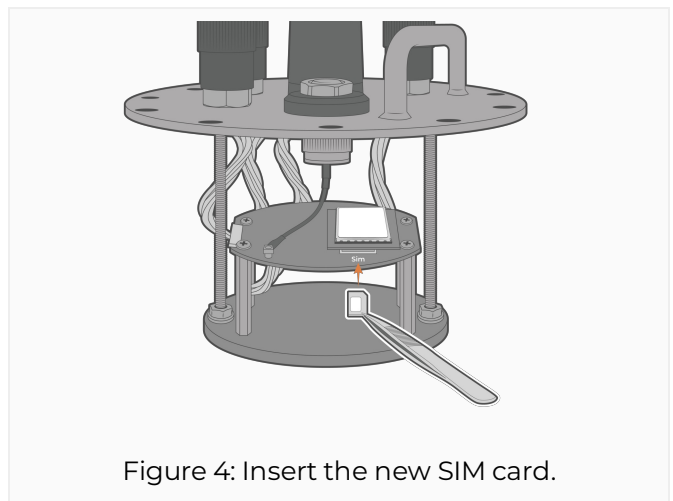
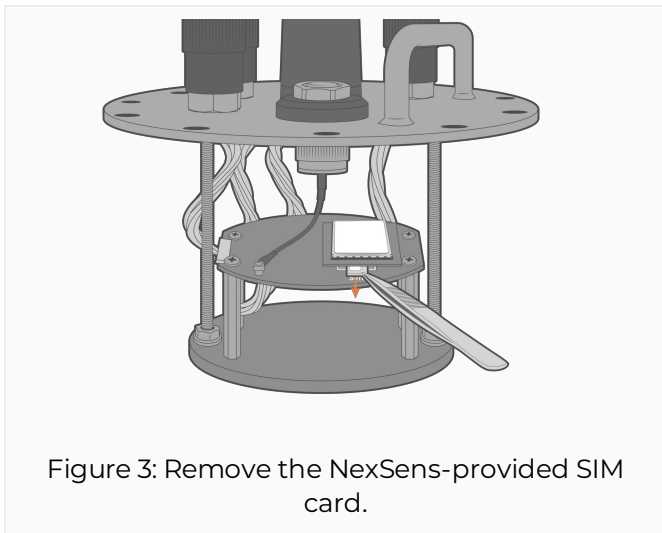


Figure 1: Remove the (6) screws from the X3-SUB.

2. Use the handle to lift up slowly on the top plate. Disconnect the Molex connection to the internal battery.

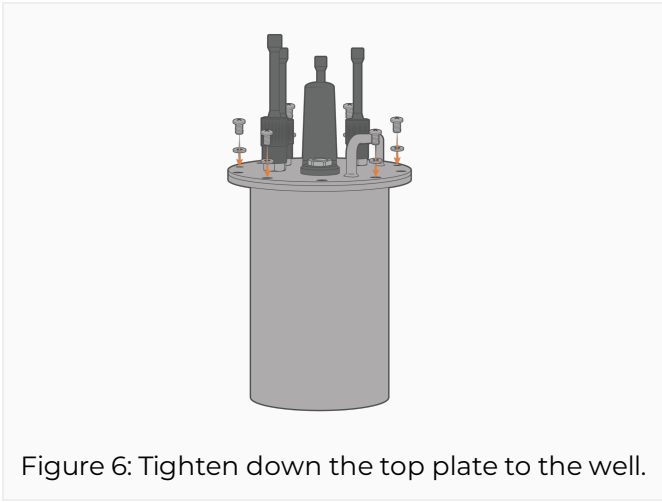
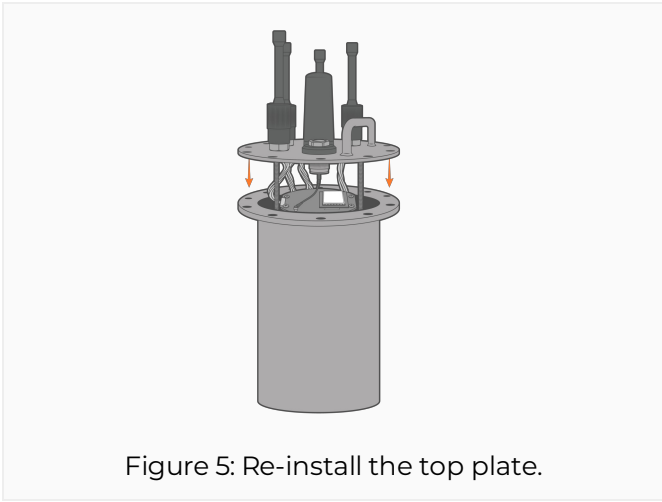


3. Locate the modem on top of the circuitry to the right of the gold RF antenna cable. Orient the SIM, as shown in the image, and insert it into the SIM card slot.
  - a. **Note:** All X3-SUBs ship with a pre-installed SIM card. Remove the current SIM card before installing the new one.



4. Re-connect the Molex connection with the internal battery and align the top plate with the threaded bolt holes on the well.
  - a. It is recommended to apply a light layer of O-ring grease to the O-ring before tightening down the top plate.





5. Follow the link below to set up the cellular telemetry on the X3-SUB:
  - a. [Enable Cellular Communication on an X-Series Data Logger](#)

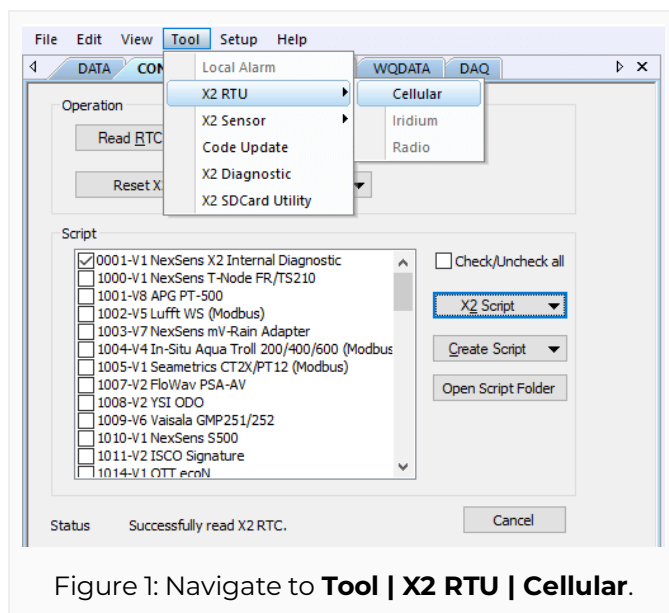
# Enable Cellular Communication on an X-Series Data Logger

To enable cellular communication on an X-Series data logger, the user must set the proper settings for the Packet Data Protocol (PDP) context in the CONNECT software. The PDP context involves the local context identification parameter (cid), the PDP type, and the Access Point Name (APN). Each of these settings specifies the local cellular carrier utilized by the modem and SIM card (e.g., Verizon, AT&T, T-Mobile, etc.) and provides a way to route data packets to the WQData LIVE Web Datacenter. For modems with multiple carrier options, multiple PDP contexts can be set; however, only one can be set to the “Active cid”. The process below outlines how to set the PDP context for cellular communication.

**Note:** All X3 data loggers will come with an active SIM card. If cellular service is purchased through NexSens, the card can be used for the duration of the active plan. No additional setup will be required. If cellular service is not purchased through NexSens, the SIM card will be active for a three-month trial period. The active SIM card can be used for initial testing and will not require the subsequent steps below. Only follow the steps below if a user-supplied SIM card is installed.

## 1) Power On the Modem

1. Connect the X-Series logger to a PC and launch the CONNECT software.
2. Navigate to **Tool | X2 RTU | Cellular** within CONNECT.
  - a. Wait for 30 seconds before powering on the RTU, as the X-Series data logger will conduct internal processes on powerup that will interfere with direct communication.



3. Select **Turn Power ON** to startup the loggers’s RTU board, which controls communication to the internal modem and SIM card.
  - a. Note that this process may take up to 30 seconds to complete.
  - b. A message will appear to confirm once RTU Power is successfully turned on.
    - o Note: The RTU will power down every 10 minutes or after completing a sensor reading. If this occurs, turn on the RTU again to continue direct communication.

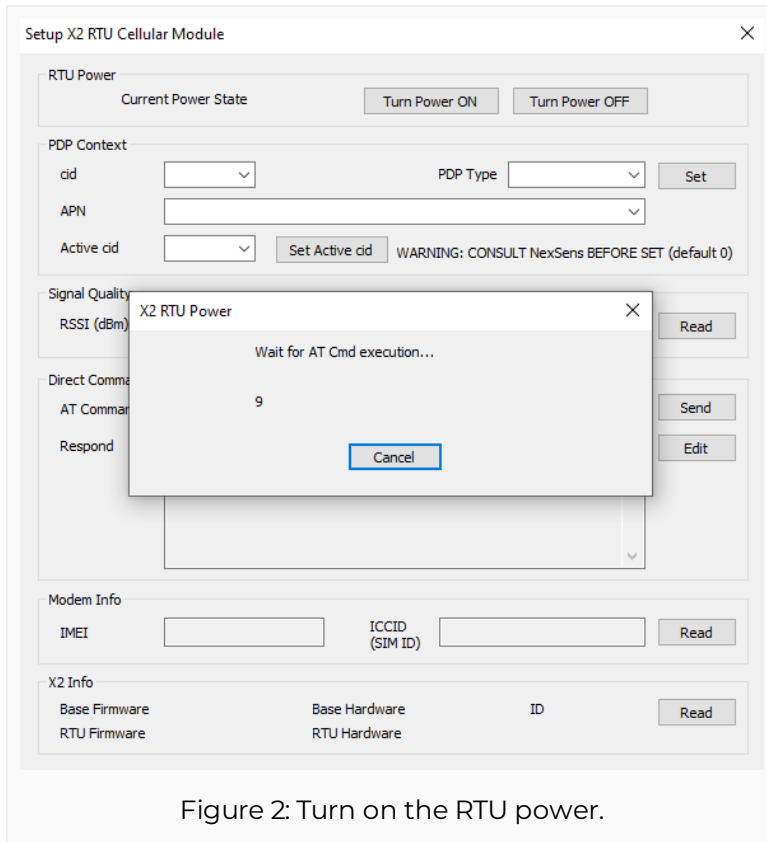


Figure 2: Turn on the RTU power.

## 2) Set the Network Configuration for the Local Cellular Carrier

Newer modem models (LE910C1-xx) available in X-Series data loggers can switch between multiple cellular carriers (e.g., AT&T, Verizon, T-Mobile, etc.). For proper communication, the carrier used at any given time must be specified and saved within the modem's internal settings. Begin by confirming the modem model and then setting the proper cellular carrier accordingly.

**Note:** All X3 Environmental Data Loggers will contain the LE910C1-WW4G modem, and the mode will be set to AT#FWSWTICH=40,1 (Global). If an X3 logger is purchased, users can skip to the next section.

1. Send the **AT#CGMM** to return the model name of the installed modem.
  - a. If the logger contains the LE910C1-xx model, continue to step 2.
  - b. If the logger contains a different modem model, continue to **Verify the Current APN Settings**.

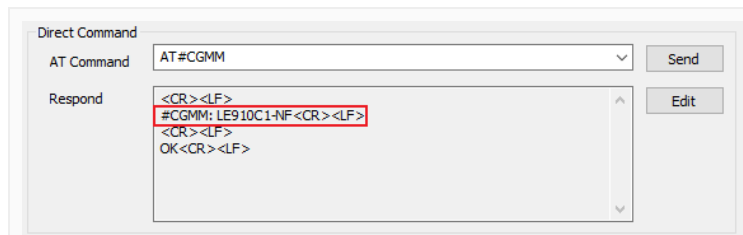


Figure 3: CONNECT view modem model command.

2. Check which mode the modem is currently in by entering: **AT#FWSWITCH?**

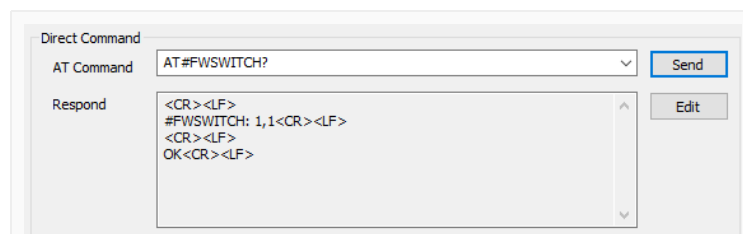


Figure 4: Check the current mode command. The current mode is Verizon.

3. Change the mode to the proper cellular carrier by entering any of the following commands:
  - a. **AT#FWSWITCH=0,1** (AT&T/International)
  - b. **AT#FWSWITCH=1,1** (Verizon)
  - c. **AT#FWSWITCH=3,1** (Bell)
  - d. **AT#FWSWITCH=4,1** (Telus)
  - e. **AT#FWSWITCH=40,1** (Global)
  - f. **AT#FWSWITCH=101,1** (T-Mobile Deutsche)
    - o After sending the command, wait ~30 seconds for the firmware change to complete.

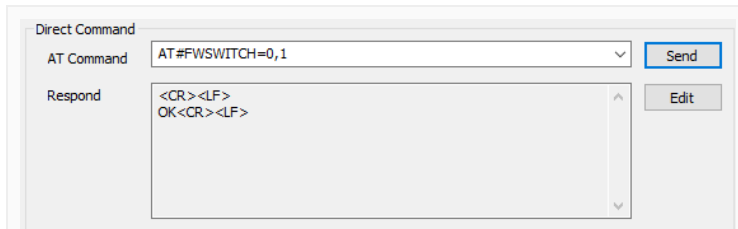


Figure 5: Change from cellular carrier mode.

4. Resend the **AT#FWSWITCH?** to ensure a successful change.

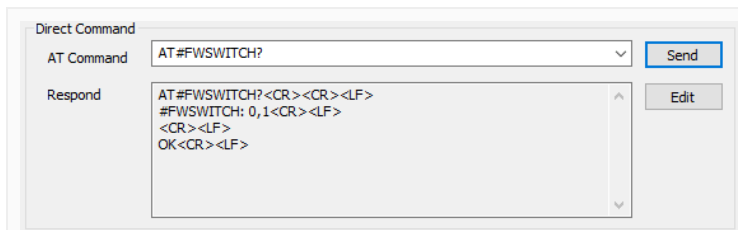


Figure 6: Confirm successful mode change.

5. Enter and send the following command (**AT+WS46=28**) to force the modem to only look for 4G networks.
  - a. By default, modems will look for available 2G and 3G networks, which are becoming obsolete. Limiting the connection to 4G networks substantially lowers the amount of time required for the modem to connect to a network.

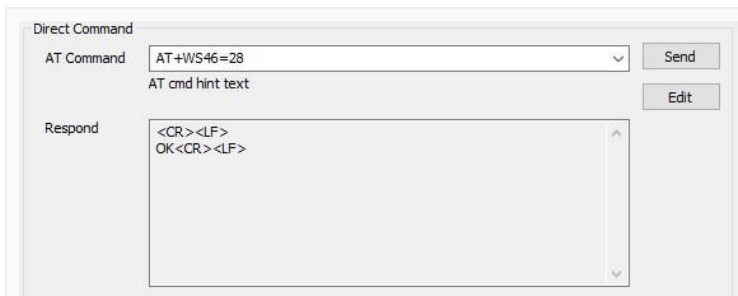
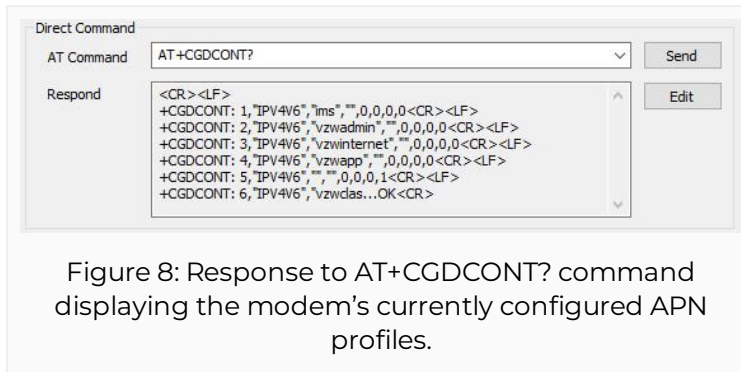


Figure 7: 4G-only cellular connectivity.

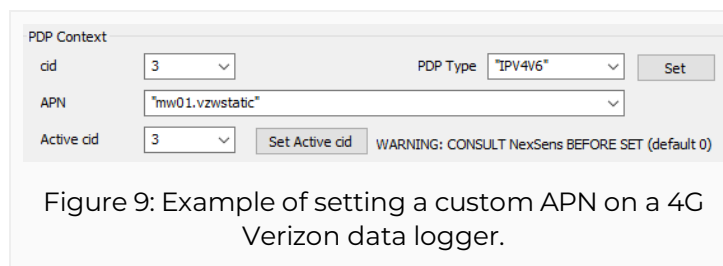
### 3) Verify and Configure the Current PDP Context Settings

New modem and SIM card combinations usually come with standard PDP context settings available in the list. The current PDP context settings can be verified before making any adjustments, if necessary.

1. To confirm the PDP Context settings, select and send the **AT+CGDCONT?** command from the *Direct Command* list.



2. In the *PDP Context* field of the menu, enter the following information:
  - a. *cid*
    - o Each cellular carrier has multiple cid's available for different purposes (e.g., IMS services, administrative, emergency, general internet connection, etc.). The cid necessary for communication with WQData LIVE is for general internet connections only.
      - 1 = AT&T, T-Mobile, or most International carriers
      - 3 = Verizon
  - b. *PDP Type* – (Type of IP address assigned to the PDP)
    - o **IPV4V6** typically works universally.
    - o KORE SIM cards provided by NexSens use the **IP** PDP type. If you are uncertain about the SIM card type, confirm it with NexSens.
  - c. *APN*
    - o Each cellular carrier has multiple APNs used for different purposes and corresponding to a specific cid. The most common APNs are available within the drop-down list.
    - o If the required APN is not on the list, which will often be the case, enter the proper APN enclosed in quotations.



3. After entering the values, click **Set**. Then, a prompt will appear indicating whether the command was successful.
4. Multiple PDP contexts with different cids can be set; however, the Active cid must be set for the carrier that is currently being utilized. Enter the appropriate cid and select **Set Active cid**.
5. It is recommended to read back the APN settings via the **AT+CGDCONT?** direct command following the change to verify they are properly listed on the modem.

#### 4) Test Network Connection

After configuring the modem APN settings, test the modem's network connection.

1. Send the **AT+CMEE=2** command to turn on extended error codes.

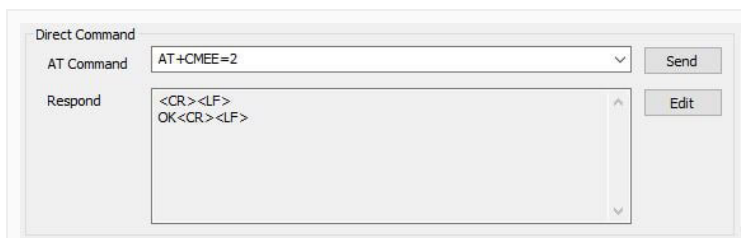


Figure 10: Turn on extended error code responses in the modem.

2. Read the *Signal Quality* of the system to verify it is within the -51 dBm to -90 dBm range.



Figure 11: Verify the signal strength is adequate.

3. Send the **Custom 1**, followed by the **Custom 2** command.
  - a. The Custom 1 command activates the modem and sets an HTTP connection to wqdatalive.com.
    - o Before sending the Custom 1 command, select *Edit* to ensure the **AT#SGACT** command is sending the correct information. For AT&T/International SIMs, the command should be **AT#SGACT=1,1**. For Verizon SIMs, the command should be **AT#SGACT=3,1**. The AT#SGACT command queries the modem, connects to the network, and resolves an IP address.
    - o Successful connections will display the IP address assigned to the modem during its connection request.
    - o Connections that fail will display one of many messages (facilitated by the extended error code activation in step 1). Some common ones are:
      - *SIM not inserted* – indicates a loose or improperly installed SIM card in the modem.
      - *Activation Failed* – generally a cellular account setup issue.
      - *Requested Service Option not subscribed* – generally a cellular account setup issue.
      - *Unspecified GPRS error* – typically a cellular account setup issue or an incompatibility between the network in use and the supported cell modem/antenna bands.
  - b. The Custom 2 command tests the communication with WQData LIVE by transmitting null data to wqdatalive.com and seeing if a timestamp is returned.
    - o If the Custom 1 command returns an error, the Custom 2 command should not be sent until the issue is resolved.

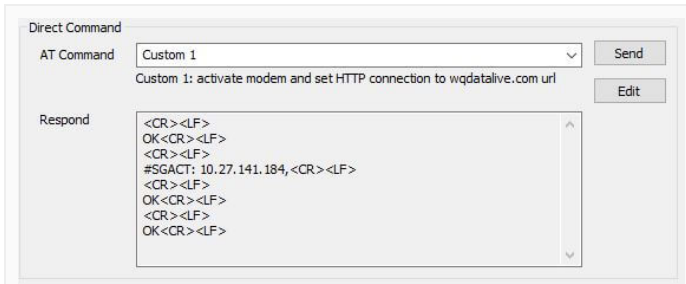


Figure 12: Successful Custom 1 command response.

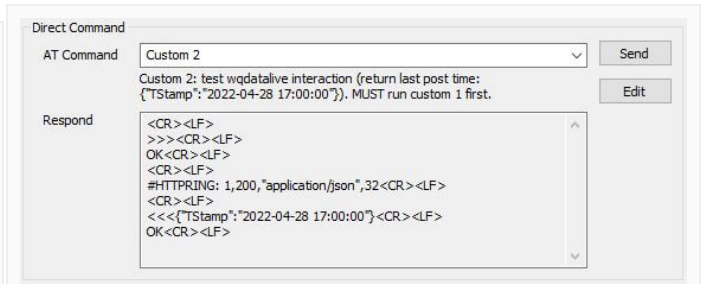


Figure 13: Successful Custom 2 command response.

After successfully configuring the network connection, use the WQDATA tab in CONNECT to transfer data to WQData LIVE.

- Communicate with WQData LIVE through CONNECT



# Iridium

## Enable Iridium Communication on an X-Series Data Logger

Satellite/Iridium transmission is more expensive than other traditional forms of communication (e.g., cellular, radio, Wi-Fi). Therefore, it is imperative that the end-user only transmit the most useful diagnostic and sensor parameters. The CONNECT software can set these parameters and their log/transmission interval *before* the data logger transfers data to the web. Thus, outlining the proper sensor configuration through the CONNECT software will reduce overall data transfer.

If a sensor detection has not been performed, follow the included quick start guide to complete the detection process. It is recommended to disconnect the iridium antenna before performing the detection to ensure no communication is established with WQData LIVE. It is imperative that all internal logger settings are finalized before allowing the logger to send data to WQData LIVE.

### 1) Setup an Iridium Short-Burst Data (SBD) Account

All Iridium-enabled X-Series data loggers must have an active SBD account in order to send measurement data to WQData LIVE. *If iridium service is not purchased through NexSens*, follow the link below to find a 3rd party iridium service provider and set up an SBD account:

- [Setup an Iridium SBD Account](#)

### 2) Setup a Gmail Account for Iridium Messages

X-Series loggers with Iridium telemetry transmit data messages to a dedicated email server. The messages are then downloaded from the email server to the WQData LIVE web datacenter. NexSens hosts a secure Gmail account as a medium to store and upload data to WQData LIVE. Although this option is freely available to all customers who purchase an Iridium system, private Gmail accounts can be set up to achieve the same purpose. Follow the link below to set up a user-owned Gmail account to send Iridium data messages to WQData LIVE.

- [Setup Gmail Account for Iridium Messages](#)

### 3) Set Transmit Flags

Transmit flags control which parameter data is transmitted to WQData LIVE. Setting the transmit flags allows the user to control the amount of data that is transmitted to the web at each interval. It is important to review the iridium plan purchased through NexSens or a 3rd party provider to ensure the data size does not exceed the allowable limit.

- Follow the link below to set the appropriate transmit flags for the logger.
  - [Set Transmit Flags and Start Time/Interval](#)
    - It is advised to enable transmit flags for the following internal X2 parameters:
      1. Primary Power

2. Internal Humidity
3. Cell Signal Strength
4. Cell Status

#### 4) Set Log/Selective Upload Interval(s)

The log interval controls the frequency at which parameter data is recorded, and the selective upload interval controls the frequency at which parameter data is transmitted. Users may set parameter data to log internally at a higher frequency while only transmitting a portion of the logged data. The selective upload feature allows Iridium users to limit their overall transmission size while still collecting data at a higher resolution. The logged data can then be downloaded directly at a later date.

- Follow the link below to set the appropriate log and selective upload intervals based on the Iridium data plan and the data collection requirements.
  - [Set Log and Selective Upload Intervals](#)
    - It is advised to set the selective upload interval for the internal X2 parameters to at least 6 hours; however, this will depend on the Iridium plan purchased for the logger.

#### 5) Review & Begin WQData LIVE Setup

Review the final sensor configuration and gather multiple readings before continuing with the WQData LIVE setup. The Gmail account associated with the Iridium service must be entered into the advanced WQData LIVE settings for the data logger. These settings create the connection required for WQData LIVE to extract the Iridium messages. Follow the link below to set the appropriate settings on WQData LIVE:

- [Configure an Iridium Logger on WQData LIVE](#)
  - At the next transmit interval, the logger will push its sensor configuration to the email assigned to it during the Iridium account setup.
  - WQData LIVE will request messages from that email every 5 minutes. Once the emails are extracted, it will take ~2 additional minutes for processing before the configuration is visible on the web.

#### 6) Update Logger's Binary Format

1. Once the configuration is visible, the user must send the "Update Binary Format" command from WQData LIVE.
  - The binary format command will provide the settings outlined in the CONNECT software.
  - **Note:** No data will transfer until the data logger provides an updated binary format to the web.

2. Navigate to the **ADMIN | Settings** tab at the top of the WQData LIVE *Project Dashboard*.

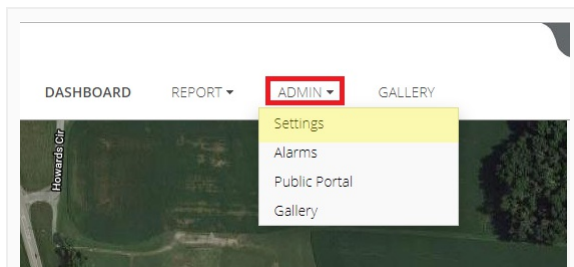


Figure 1: **ADMIN | Settings** tab.

3. Click on the **Advanced Device Remote Configuration** drop-down menu and choose the logger.
  - Enter code 'nexsens' when prompted.

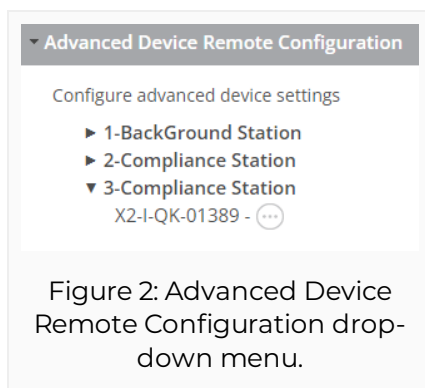


Figure 2: Advanced Device Remote Configuration drop-down menu.

4. Click the **UPDATE** button underneath *Update Binary Format*.
  - A prompt should display showing the command was sent successfully.
5. After the command is sent, three full transmission intervals will occur before data is pushed to the web.
  - The logger will pull this remote command from the email at the first transmit interval.
  - The logger will provide the updated format at the second transmit interval.
  - WQData LIVE will process this format and be able to parse the data that is pushed on the third transmit interval.

## Iridium Transmission Delay

Compared to data loggers utilizing cellular, radio, or Wi-Fi telemetry, Iridium transmission systems have an additional step in the data upload process which may cause a delay in the time it takes from the logger recording a measurement to data being posted on WQData LIVE.

Data messages transmitted from the logger's satellite modem are first packaged as email attachments (SBD file). WQData LIVE must pull and process these data files from the associated Iridium email server before the data can be posted to the web.

Server-side restrictions limit the maximum frequency that polling of the Iridium mailbox can occur. Each device mailbox is checked once every 5 minutes. As a result, there will be at least a 5 minute delay between the scheduled Iridium transmission interval and posting of data to WQData LIVE. Systems which include sensors with long measurement acquisition times will experience even longer delays.

An example scenario:

- An Iridium X-Series logger is set to log and transmit its next reading at 08:00
- The reading is initiated and the last sensor completes its measurement at 08:06
- The logger records the new reading internally and signals the system to transmit the data
- The Iridium data message is delivered to the email server at 08:07
- WQData LIVE polls the mailbox and finds the new data message at 08:10
- The 08:00 reading is available to view on the WQData LIVE project shortly after 08:10

This process is illustrated in the diagram below.

# NexSens X-Series Data Flow: Iridium Logger to WQData LIVE

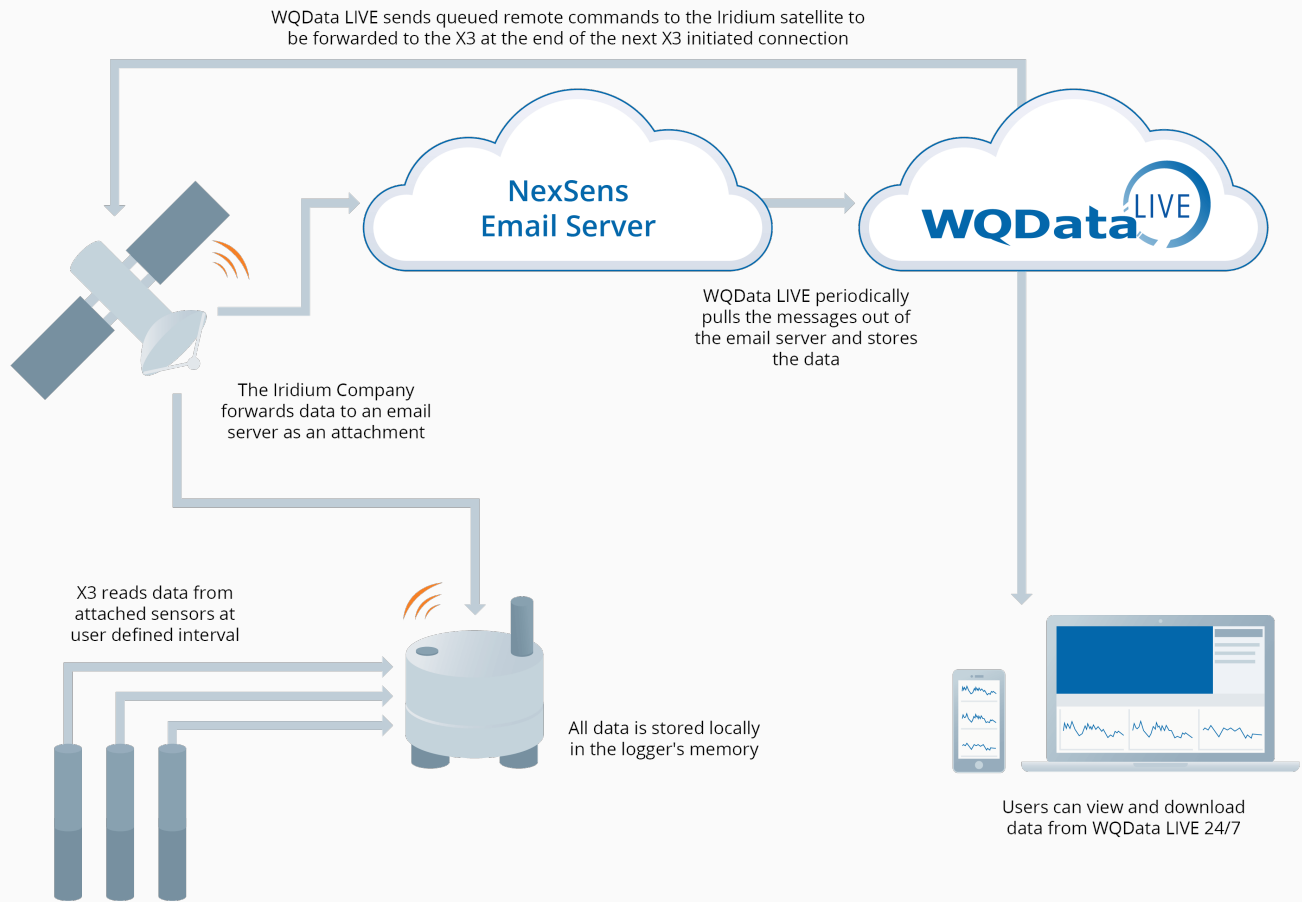


Figure 1: Iridium X-Series logger data flow.

## 5. Troubleshooting

### Sensor(s) Not Found During X-Series Logger Auto-Detection

If an X-Series data logger fails to detect a connected sensor following the completion of the auto-detection process, verify the following:

1. Check for proper wiring of sensor signals and seating of all cable connections.
2. Verify that the **script for the sensor** has been developed, loaded onto the logger, and enabled to run.
3. Confirm the required configuration settings for each sensor.
  - a. Assign each SDI-12 or Modbus sensor a unique address to avoid conflicting with one another.
  - b. Connect each RS-232 sensor to a unique port to avoid conflicting with another RS-232 sensor (1 sensor to P0, 1 sensor to P1, 1 sensor to P2).
  - c. For multi-parameter sensors, confirm parameter outputs and/or the data formats using manufacturer software.
  - d. Many highly customizable sensors, such as a current profiler or wave sensor, require setting the instrument into a 'deployment mode' before external communications will work.
4. Verify sufficient 12VDC power supply to the logger.
  - a. The USB cable power, for example, may not provide enough current to properly power up certain sensors. This will, therefore, prevent them from responding during the detection process.
  - b. Old, damaged, or insufficiently charged SLA-type batteries may be unable to output the system current required for detection.

Once all of the above have been verified, **re-run sensor detection**. If the auto-detection still fails to identify any connected sensors, contact NexSens Technology for further assistance.

Phone: 937-426-2151

Email: [info@nexsens.com](mailto:info@nexsens.com)

## Running a Sensor Re-Detection

After running a sensor auto-detection during initial setup, WQData LIVE receives and parses the specific **XML data format** that outlines the logger's sensor configuration (i.e., sensor id, parameter ids, parameter units, etc.). Once the sensor configuration is received, it is saved on the backend of WQData LIVE and used to parse data for future transmissions from the logger.

When running a sensor **re-detection** to add or remove sensors/parameters, the XML data format of the sensor configuration changes, and WQData LIVE must be updated. If the new format is not saved via a *WQData setup* or *sync settings* command, data transmissions will be rejected as WQData LIVE cannot correctly parse the data. Additionally, the data logger relies on the latest timestamp from WQData LIVE to push up any backlogged data. Thus, the same parsing issues may arise if old data remains (gathered using the old sensor configuration) on the logger after running a new sensor detection.

### Re-Detection Considerations

NexSens recommends running sensor re-detections while directly communicating with the data logger using the **NexSens CONNECT software**. CONNECT allows you to erase the log data and sensor programming, enable the proper scripts, run the sensor detection, and push the new configuration immediately to WQData LIVE. CONNECT will display the final sensor configuration that the user should confirm before transmitting the new sensor configuration.

- Ensure to consider the following for the sensors in the new detection:
  - All sensors are set up properly for communication with the data logger following their **X-Series integration guide**.
  - Only one RS-232 sensor is connected to a single port.
  - All SDI-12 and RS-485 sensors have unique addresses.
  - 12VDC power is connected during the detection process.

### Re-Detection Process

1. Connect the sensors to the data logger.
  - a. If possible, connect the sensors used in the previous detection to the same port.
2. **Download and open the CONNECT software**. Establish a direct connection to the data logger using a **UW6-USB-485P communication cable**.
  - a. For buoy models, the internal battery will be used for power.
  - b. For pole-mount models, a DC adapter must be connected to the UW6-USB-485P cable.
  - c. For SDL models, (16) D-Cell batteries should be installed to provide adequate power.
3. Enable or create the proper sensor scripts for the connected sensors. NexSens recommends only enabling the necessary scripts.
  - a. **Configure Sensor Scripts**.
4. **Erase the log data**.

5. Erase the sensor programming.
6. Reset the logger.
  - a. The data logger will begin the automatic sensor detection process since its previous sensor configuration was erased.

### **Confirming the New Sensor Configuration**

Depending on the number of scripts enabled, the sensor detection duration can be 2 to 15 minutes. The user must periodically check the sensor configuration in the CONNECT software to ensure the detection process is successful. Always gather a few sensor readings to confirm accuracy before moving further.

- Read Sensor Configuration.
  - If the new sensor configuration is incorrect, double-check the steps above.

### **Updating the Sensor Configuration on WQData LIVE**

After a successful re-detection, the new sensor configuration must be sent to WQData LIVE. Depending on the extent of the changes, the user may need to contact a support specialist at NexSens Technology to re-create the device on the web.

- NexSens Technical Support Line: (+1) 937-426-2703
- Email: [info@nexsens.com](mailto:info@nexsens.com)

Re-creating the device will make the original device obsolete on the web. All historical data, however, will still be available with the obsolete device. The new sensor configuration and all subsequent data transmissions will be uploaded to a separate location within the users' project/site. A new location is necessary to avoid overwriting the original device configuration, which may cause incorrect sensor/parameter labeling and create parsing issues on the web. A NexSens support specialist will walk you through this process, rename the old device, and ensure the new device is reading correctly.



## 6. Maintenance

### MCBH & MCIL Connector Operation & Maintenance

Multiple NexSens data logger models and CB-MCL wet-mate lids include male and female Micro-Circular Bulkhead (MCBH) connectors compatible with Micro-Circular In-line (MCIL) sensor connectors. These connectors are designed for use in wet conditions (not while submerged) as they force out water as connectors are mated. Like other connector types, MCBH and MCIL connectors still require proper lubrication and maintenance to avoid debris buildup that may allow moisture intrusion when deployed. Dielectric, silicon-based grease is typically applied as lubrication to repel water and protect metal components from corrosion.

**Note:** While these connectors are designed to force out water during mating, NexSens still recommends ensuring the connectors are completely dry before greasing and applying the connection.



#### Required Tools

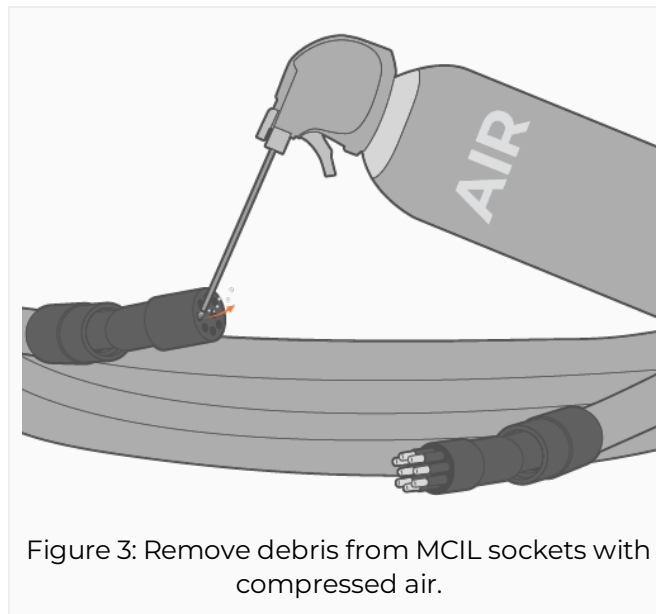
While cleaning and lubricating the connectors, it is essential to leave no residue or debris behind that will prevent the water-tight seal. The tools below will assist in cleaning and removing all contaminants from the connector pins and sockets.

1. Compressed air ([Uline "Air in a Can"](#))
2. Lubricant grease for MCIL connectors ([Krytox grease](#))
3. Silicone-based lubricant grease for MCBH connectors ([Molykote44 grease](#))
4. Dummy plugs (with Locking Sleeves)
  - a. [NexSens MCDC Male Dummy Plugs with a Locking Sleeve](#)
  - b. [NexSens MCDC Female Dummy Plugs with a Locking Sleeve](#)
5. Lint-free wipes ([Kimwipes](#))
6. Flashlight

- a. For viewing within female sockets.
- 7. Steel-lined cable ties
  - a. For securely mounting sensor cables.
- 8. Isopropyl alcohol
  - a. For removing corrosion.

## Before Deployment

- 1. Carefully clean the male MCIL and MCBH connector pins with a Kimwipe. Remove all grease, hair, dirt, and other contamination.
- 2. Inject compressed air into the female MCIL and MCBH socket connectors to remove all debris.
  - a. Use a flashlight to view the inside of the sockets properly.
  - b. Do not insert any foreign objects into the socket connectors.



- 3. Ensure both connectors are completely dry. If not, let them air dry.
- 4. Apply a thin film of Krytox Grease.
  - a. **Caution:** Do not use WD-40 or other petroleum-based lubricants, as they will damage the connectors.
  - b. Only apply a small, even coating of grease. A pea-sized amount of grease should be sufficient. Extensive amounts of grease can allow for contamination. Connectors should appear shiny when grease is applied correctly.

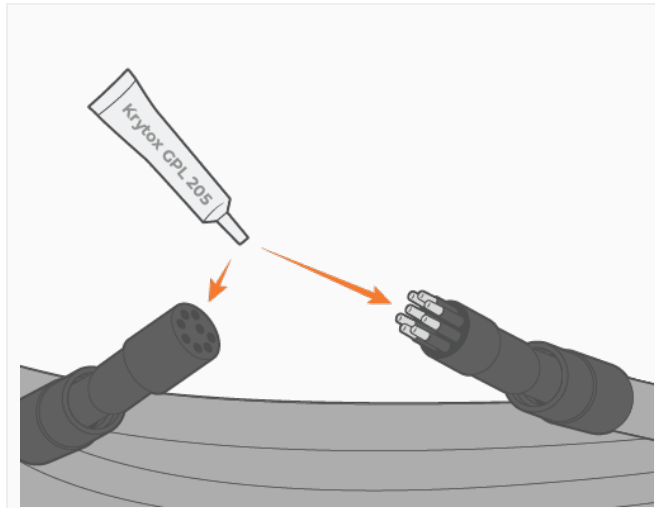


Figure 4: Apply grease to MCIL connectors before mating with MCBH bulkheads.

5. Apply the connection, ensuring complete contact between the male and female connectors.
  - a. Do not twist the cable boot or dummy plug, as this will lead to broken or bent pins.
  - b. After greasing, connections should be smooth without the need for excessive force. If excessive force is required, remove the connection and apply more grease to the connectors.
6. An audible pop may be heard when making the connection, a good sign that air is escaping, allowing for a vacuum-like seal.
  - a. Squeeze the sides of the mating connector to eject any additional trapped air.
7. Ensure no sharp bends are at the connector point or throughout the cable length.
  - a. Avoid angular loads on the connector.

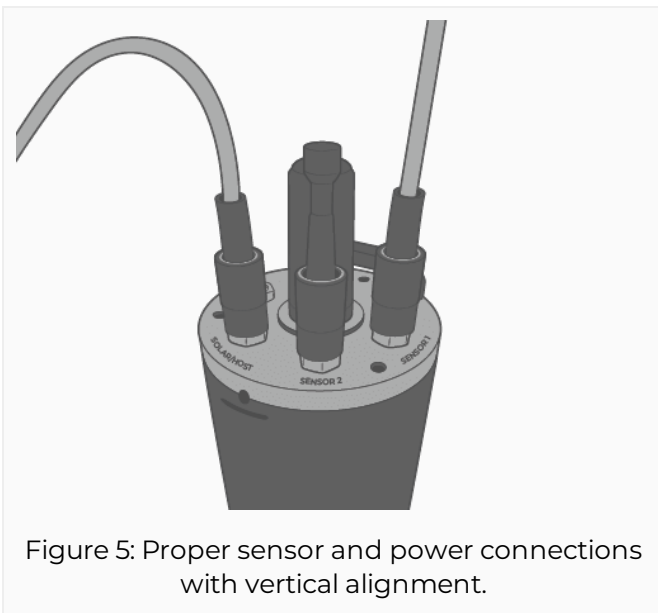


Figure 5: Proper sensor and power connections with vertical alignment.

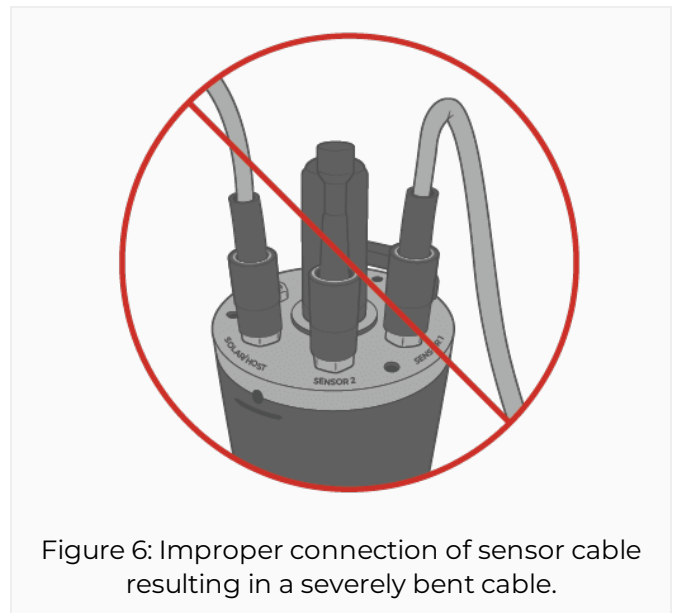


Figure 6: Improper connection of sensor cable resulting in a severely bent cable.

8. Avoid nicks and cuts around contact points and throughout the entire cable length.
  - a. Cable armor should be installed around areas where the cable may contact abrasive

surfaces.

9. Secure the cable to the mounting fixture to avoid mechanical stress on the connector and constant friction with other surfaces.
  - a. Steel-lined cable ties may be used for a secure connection.

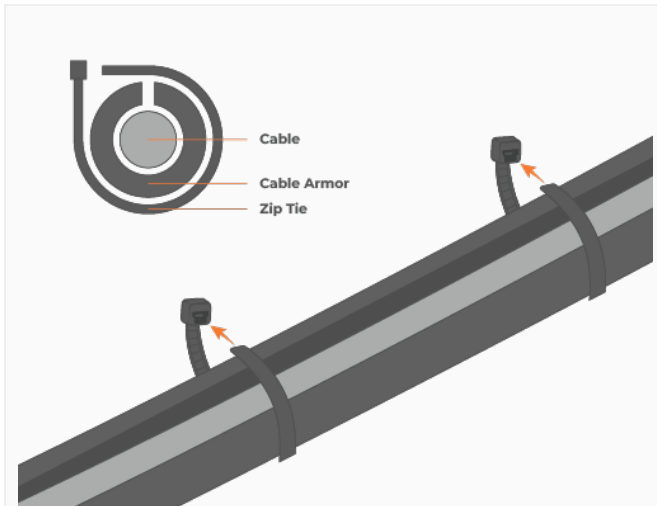


Figure 7: Application of cable armor around an exposed sensor cable.

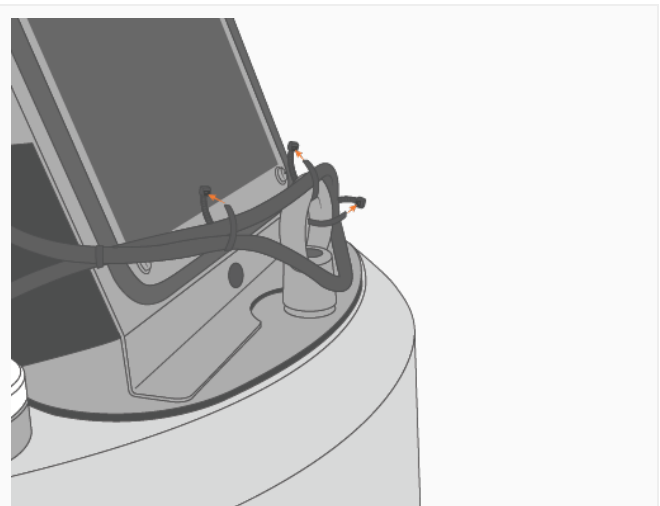


Figure 8: Secure mounting of a loose sensor cable.

## During Deployment

1. Always install a freshly lubricated dummy plug when removing a sensor or solar panel connection for maintenance during deployment.
2. While disconnecting, do not pull on the cable itself. Pull at the base of the connector after the locking sleeve has been entirely removed.
  - a. Disconnect by pulling vertically, not at an angle.



Figure 9: Proper disconnection of sensor cable with vertical removal.

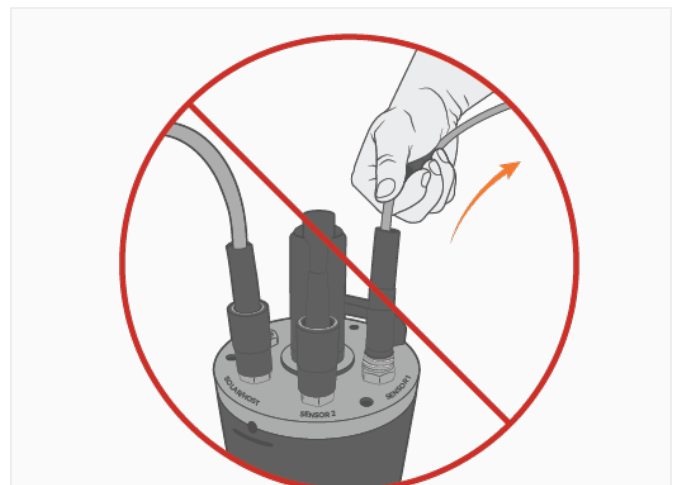


Figure 10: Improper disconnection of a sensor cable.

3. Inspect for damaged or bent pins, corrosion, or cuts along the cable or connection point.

- a. Pins should be shiny without discoloration. If pins are discolored or corroded, then clean them with isopropyl alcohol and a Q-tip.
- b. Replace all severely corroded or damaged pins immediately.
- c. Follow the steps outlined in the **Before Deployment** section before re-applying the connection.

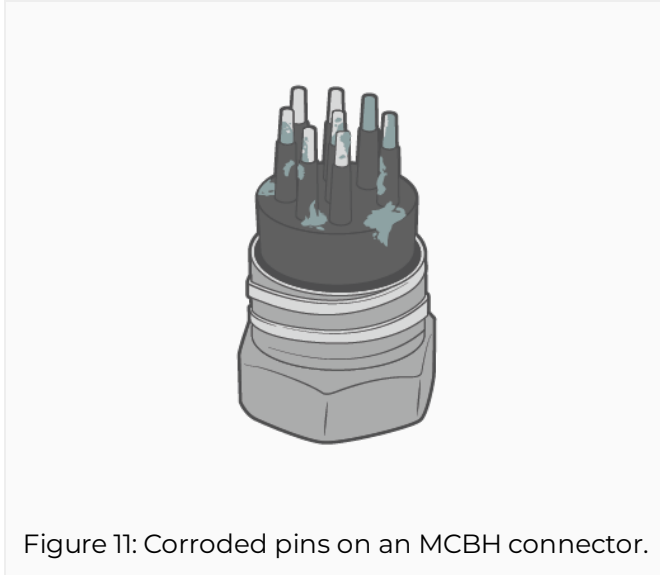


Figure 11: Corroded pins on an MCBH connector.

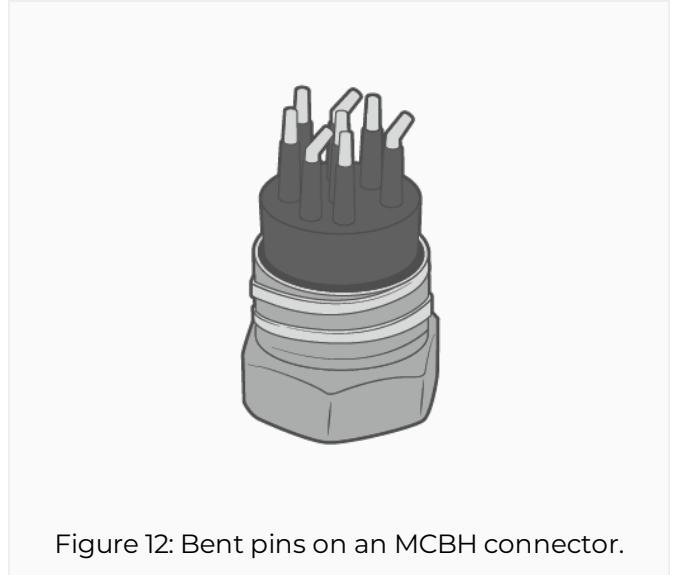


Figure 12: Bent pins on an MCBH connector.

4. If possible, reduce the amount of direct sunlight exposure on the connectors to avoid UV degradation.
5. Before removing a frozen connector, wrap the connection with a cloth and apply hot water. After a minute or two, the connection will thaw and be flexible enough to remove thereafter.

### After Deployment/Storage

1. Before storage, ensure to conduct the same maintenance steps required before deployment.
2. Leave the connections in place during storage to protect the connectors.
  - a. **Caution:** Always remove the solar panel connection and install a dummy plug when storing an X2 data logger.
3. Store the equipment safely, free from direct sunlight and high humidity.
4. Avoid sharp bends at the connector or through the cable during storage.
5. If connections must be disconnected for sensor maintenance or calibration, ensure to install a dummy plug onto the connectors while exposed.

## X-Series Logger Storage Requirements

The following practices should be carried out when storing an X-Series data logger for an extended period of time:

- Disconnect the solar tower cable, **SP-series solar power pack**, or **UW6-PW AC power adapter** cable from the center 6-pin port on the data logger.
  - Cap the 6-pin port with the blank plug included during shipment.
- Disconnect any telemetry antenna(s) to prevent any accidental damage resulting from field removal, transport, or storage.
- Protect all cable and port connections.
  - Inspect all sensor ports and cable connections ensuring there are no signs of moisture or damage.
  - Cover all logger or cable connectors with a dust cap or **UW-plug**.
  - Keep all system cable O-rings and connectors clean by covering them with the included red (8-pin) or yellow (6-pin) polymer caps. If these caps are no longer accessible, any means of shielding the connectors from debris is acceptable.
  - Use the O-ring grease included in the maintenance kit as needed to re-grease the cable/plug connector O-rings.
- Store the data logger, SP solar pack or AC adapter, and other logger accessories in a dry, climate-controlled environment.
- **Check the battery voltage** on any SP-series solar power packs monthly.
  - Ensure the voltage holds at or above 12V.
  - Place in the sun as needed (normally every 2-3 months) to keep the SLA battery inside topped off.

## 7. Warranty

NexSens Technology, Inc. warrants products against defects in materials or workmanship for a period of 12 months from the date of delivery to the original customer. This warranty is limited to the replacement or repair of such defects, without charge, when the product is returned to NexSens Technology, Inc. Damage due to accidents, misuse, tampering, lack of reasonable care, loss of parts, failure to perform prescribed maintenance, or accidents of nature are not covered. This warranty excludes all other warranties, express or implied, and is limited to a value not exceeding the purchase price of the instrument.

### Limitation of Warranty

This warranty is not applicable to any NexSens Technology, Inc. product damage or failure caused by failure to install, operate or use the product in accordance with NexSens Technology, Inc. written instructions; abuse or misuse of the product; failure to maintain the product in accordance with NexSens Technology, Inc. written instructions; any improper customer repairs to the product; use by the customer of defective or improper components or parts in servicing or repairing the product; or customer modification of the product in any way not expressly authorized by NexSens Technology, Inc.

*NexSens Technology, Inc. products are not authorized for use as critical components in any life support system where failure of the product may affect its safety or effectiveness.*

### Corporate Headquarters & Authorized Service Center

NexSens Technology, Inc.  
2091 Exchange Court  
Fairborn, OH 45324  
Phone: 937.426.2703 | Fax: 937.426.1125  
Email: [support@nexsens.com](mailto:support@nexsens.com)

## 8. Service Request

### Service Request

To return equipment for evaluation and repair, request Return Authorization (RA) at the following link:

[NexSens Return Authorization](#)

An email authorization receipt with a reference number will be sent to print and include with your shipment.

**Products within the warranty period will be fixed at no charge. Initial evaluations are performed at no cost, and a quote will be provided if charges apply.**

For additional support or inquiries, email [support@nexsens.com](mailto:support@nexsens.com).