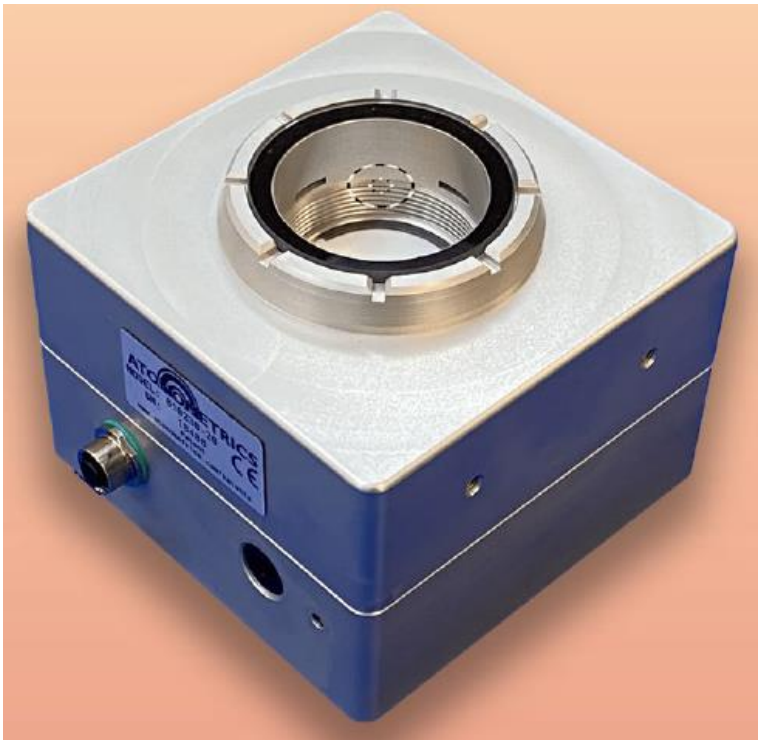
CONTENTS

INTRODUCTION

This document provides guidance on configuring an ***Atonometrics Mars™ Soiling Sensor*** (Model 810230-20, NRG item # 16562) for use with the NRG Systems LOGR data logger. The Mars™ Soiling Sensor offers a simplified approach to measuring soiling losses in PV installations. This technology utilizes an internal camera to detect accumulated soiling particles on a soil collection window. These units are waterless, compact, and easy to install. No site-specific dust calibration or technician cleaning visits are required, making them suitable for a wide range of PV installations.



INSTALLATION

Parts

NRG Part Number	Part Description	Part Specification	Qty
16562	Sensor	Sensor, Soiling, Mars, Atonometrics	1
Mounting Solutions:			
20462	Round TT Mount	Assy, Mars POA, Round TT	1
20441	Square/Octo TT Mount	Assy, Mars POA, Square TT	1
Cable Options:			
18856	25m Cable	Cable, 25m, Power and RS485	1
19568	50m Cable	Cable, 50m, Power and RS485	1

Mounting Hardware Parts

NRG Part Number	Part Description	Part Specification	Qty 20462	Qty 20441	Diagram Key
15821	Angle Bracket	1.5", Adjustable	4	4	**1**
12022	Screw	Button Head, 1/4"-20, 3/4" L, 18-8 SS	4	4	**2**
15869	Locknut	Serrated Flange, 1/4"-20, 18-8 SS	4	4	**3**
14979	Nyloc Nut	5/16"-18, 18-8 SS	4	4	**4**
20238	Screw	Button Head, 5/16"-18, 1.75" L, 18-8 SS	4	4	**5**
18251	Sleeve Washer	Insulating, 5/16" ID, Nylon	4	4	**6**
20240	Spacer	Unthreaded, for 3/8" Screw, 1" OD, 0.75" L	4	4	**7**
15848	U-Bolt	Clamping, 5" ID, Flange Nuts Included	2	0	**8**
16091	Plate	7.5"x1.5", Slotted, 316 SS	0	2	**8**
16101	Nut	Hex, 3/8"-16, 18-8 SS	0	4	**9**
17245	Bolt	Hex, 3/8"-16, Fully Threaded, 7" L, 18-8 SS	0	4	**10**
12095	Washer	Flat, for 3/8" Screw, 7/8" OD, 18-8 SS	0	8	**11**

Tools Required

- **Small Flathead Screwdriver** (for logger terminations)
- **5/32" Hex Driver** (Allen Key) (for angle bracket assembly)
- **3/16" Hex Driver** and **1/2" Wrench** or Socket (for sensor mounting)
- **9/16" Wrench** or Socket **(x2** for 20441) (for torque tube mounting)

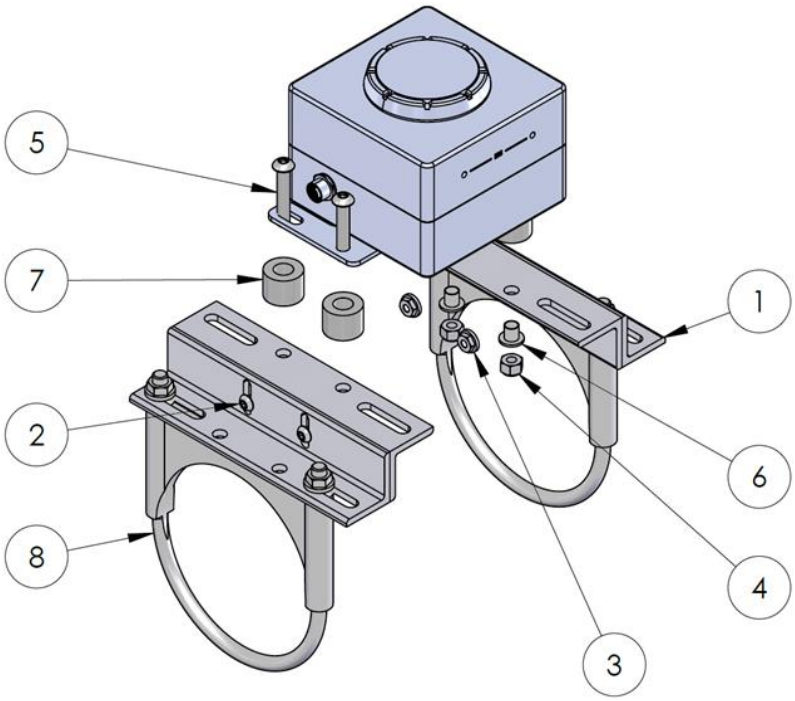


Figure 1: Round TT Mount (20462)

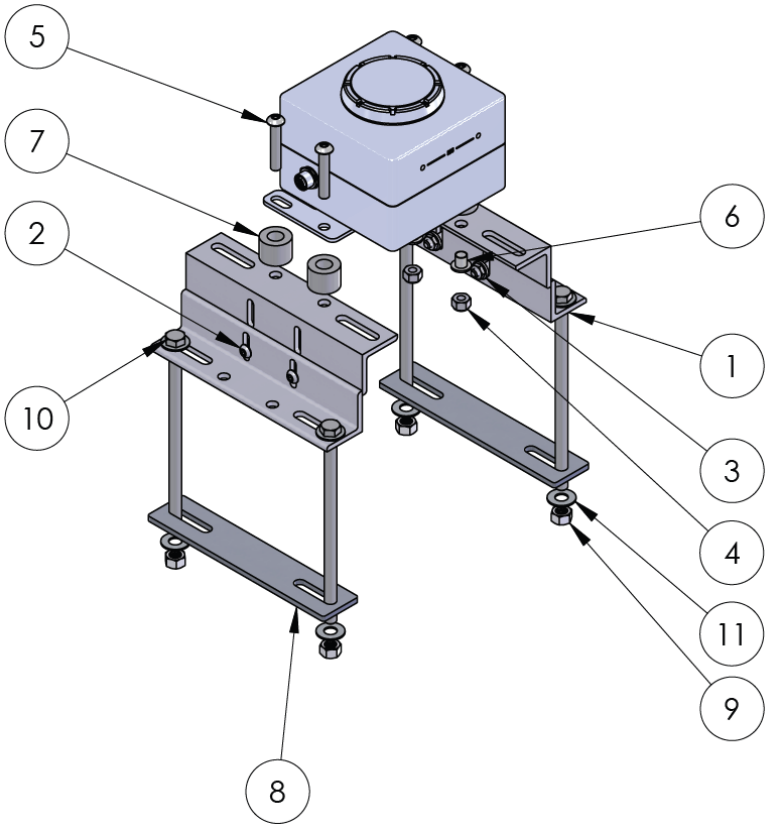


Figure 2: Square/Octo TT Mount (20441)

Installation Instructions

1. Assemble two sets of two #15821 angle brackets by inserting a #12022 screw through each of the bracket slots so that the top of one bracket is flush with the bottom of the other. Hand-tighten a #15869 locknut onto each screw. Final tightening to be completed after the full assembly is placed on the torque tube.

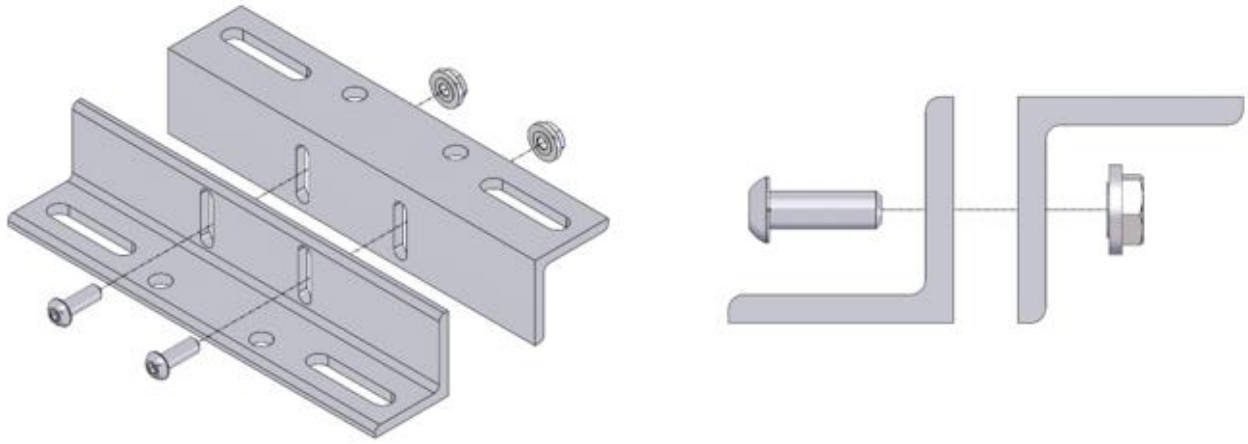


Figure 3: Angle Bracket Assembly

2. Mount the #20462 Mars™ Soiling Sensor to the angle bracket assemblies using #20238 screws, #20240 spacers, #18251 sleeve washers, and #14979 nyloc nuts, following the hardware stack-up shown in *Figure 4*. Tighten using a 3/16” hex driver and a 9/16” wrench or socket.

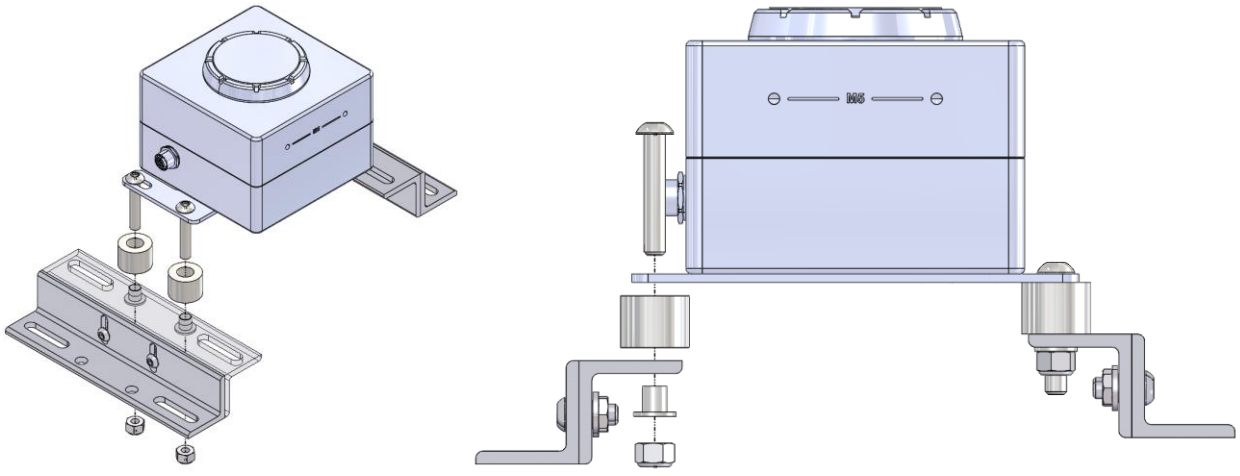


Figure 4: Mars™ to Angle Brackets Assembly

3. Mount the sensor to the array torque tube using the specified hardware for the application (Square/Octagonal, or Round torque tube hardware kits).
   - Square and Octagonal torque tubes use the #20441 mounting assembly, with #17245 bolts, #16091 plates, #12095 washers, and #16101 nuts, following the hardware stack-up shown in *Figure 5*. Tighten using two 9/16" wrenches or sockets.
   - Round torque tubes, use the #20462 mounting assembly, with #15848 U-bolts and provided flange nut, assembled as shown in *Figure 6*. Tighten using a 9/16" wrench or socket.

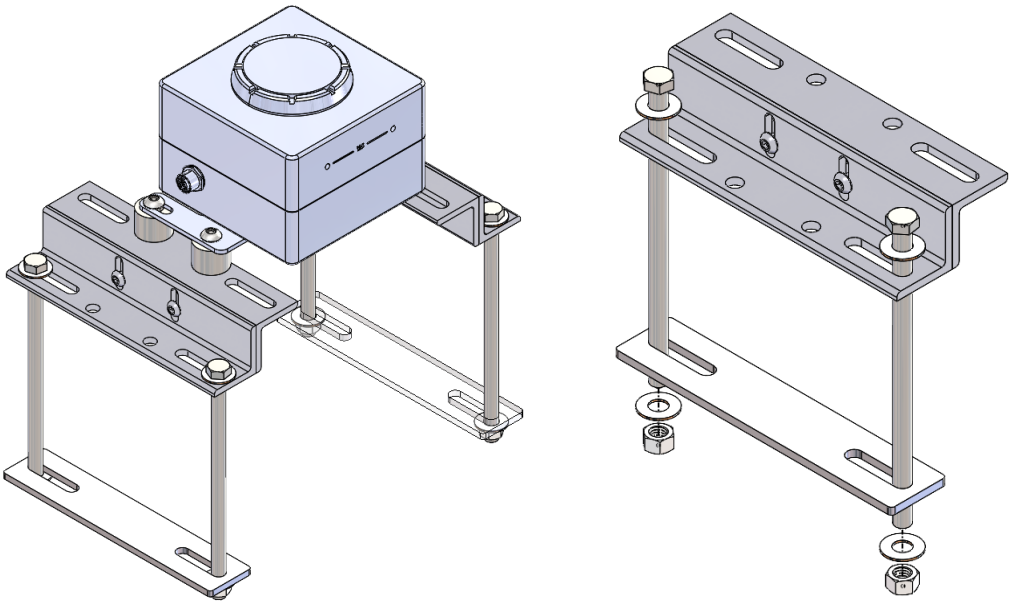


Figure 5: Complete Assembly (Square & Octagonal Torque Tube)

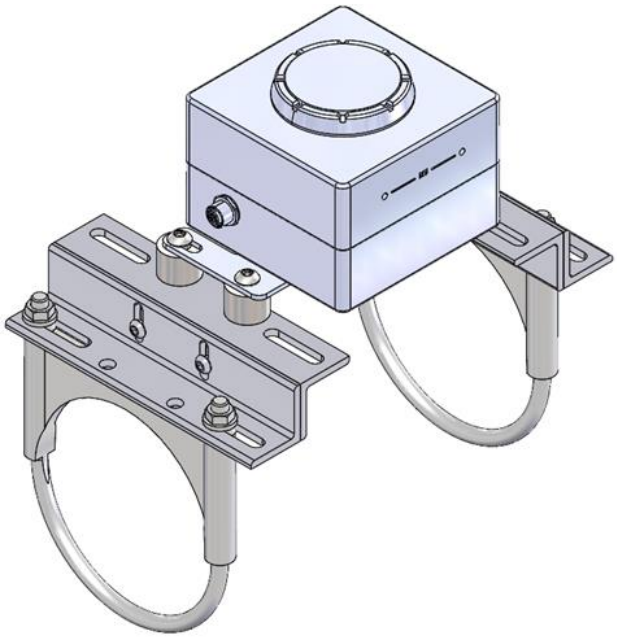


Figure 6: Complete Assembly (Round Torque Tube)

4. **It is critical that the window on the top of the soiling sensor box should be in-plane with the PV array panels. If possible, it is recommended to level the PV array table before leveling the sensor to the PV array panels.**

Adjust the sensor up or down by loosening the #12022 screws holding the angle brackets together and sliding the brackets to adjust the height of the sensor needed. When the sensor window is level with the array panels, use a 5/32” hex driver (Allen Key) to finish tightening.

For additional adjustability, the angle brackets mounted to the Mars™ can be flipped into a “T” formation. In this case, the #20238 screws and #14979 nyloc nuts are installed from the bottom of the angle bracket to minimize protruding hardware from interfering with mounting to the torque tube. See *Figure 7*.

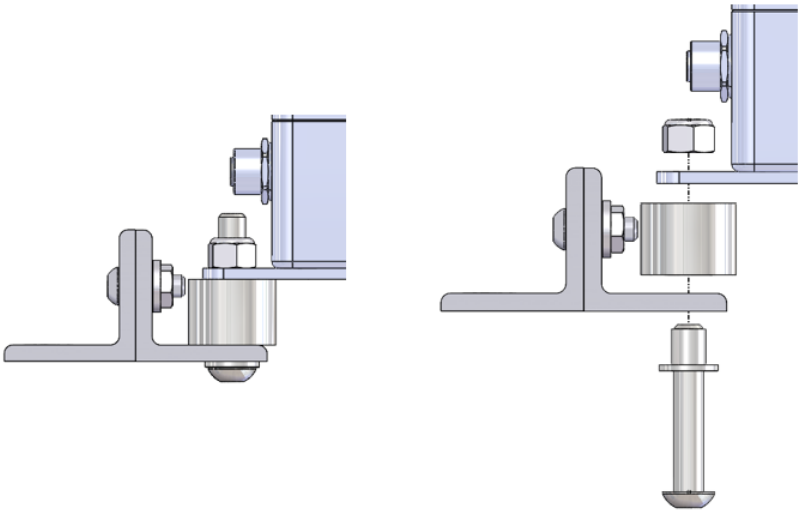


Figure 7: Flipped Angle Bracket Assembly

SENSOR CONFIGURATION WITH LOGR SERIES LOGGERS

The ***Mars™ Soiling Sensor*** can be configured on any Modbus COM ports.

Given the slow response time of this sensor, it is recommended to isolate the sensor on its own COM port, preferrably with any other serial sensors installed on COM ports that precede this sensor. For example, if the station also supports two pyranometers, both should be installed on COM-A, while the Mars™ Soiling Sensor is installed alone on COM-B.

Programming LOGR

Connecting to LOGR

From a PC connected to the same local network, connect the logger via ethernet cable directly to the computer. Open a web browser and enter the LOGR static IP address in the URL bar. If this is an unconfigured LOGR, the default IP address is **192.168.1.110** with subnet mask **255.255.255.0**. The default username is **admin**, and password is **logradmin**. When connected, the browser will direct to the logger home page (**Status** > **Sensor Outputs**).

Sensor Configuration

Ensure the LOGR is updated to firmware version 1.10.09 or newer; this is necessary to configure the Mars™ Soiling Sensor.

Navigate to the **Sensors** tab on the top of the page and select **Serial Sensor Setup** from the drop-down menu.

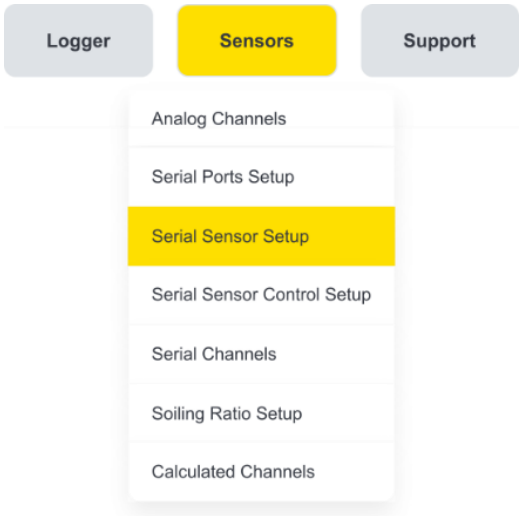


Figure 8: LOGR – Sensors > Serial Sensor Setup

Configure the ***Atonometrics Mars™ Soiling Sensor*** with the following settings:

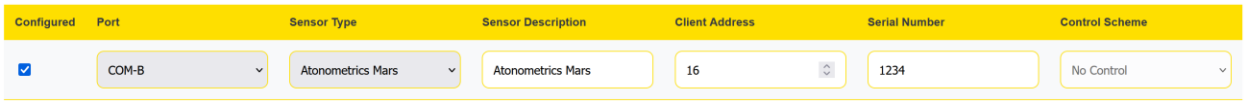


Figure 9: LOGR - Serial Sensor Setup

Port	Sensor Type	Description	Client Address	Serial Number	Control Scheme
COM-A / B	Atonometrics Mars	Edit as needed	16 or Last 2 of S/N	Per Sensor	No Control

After the sensor is added, scroll down and click the yellow **Save** button. The page will automatically redirect to the **Serial Channels** page where the *Serial Measurands* are configured.

In the row corresponding with the desired channel, configure the *Soiling Ratio* measurand. The default *Slope* and *Offset* are pre-populated based on the selected measurand.

Figure 10: LOGR - Serial Channels

	Soiling Ratio
Slope	1
Offset	0
Units	N/A

When the desired serial channel has been configured, ensure additions and changes are saved by scrolling to the bottom of the **Serial Channels** page and clicking the yellow **Save** button. The page will redirect to the **Sensor Outputs home** page, where all active configured channels are viewable.

Wiring Sensor to LOGR

Match the logger COM port terminal block to the previously programmed COM port from the web UI. For example, if the sensor is configured on port COM-A within the web UI, the sensor can be wired to any COM-A terminal blocks (COM A-1, COM A-2, or COM A-3; they share the COM-A serial bus). If the sensor is configured on COM-B within the web UI, the sensor can only be wired to COM B-1 as there is only one COM-B terminal block.

Wire Color	Function	Termination
Blue	N/A	N/A
Black	Power Ground	GND
Grey	RS485+	D+
White	RS485-	D-
Brown	Power Excitation	EXC
Shield	Cable Shield	SHD

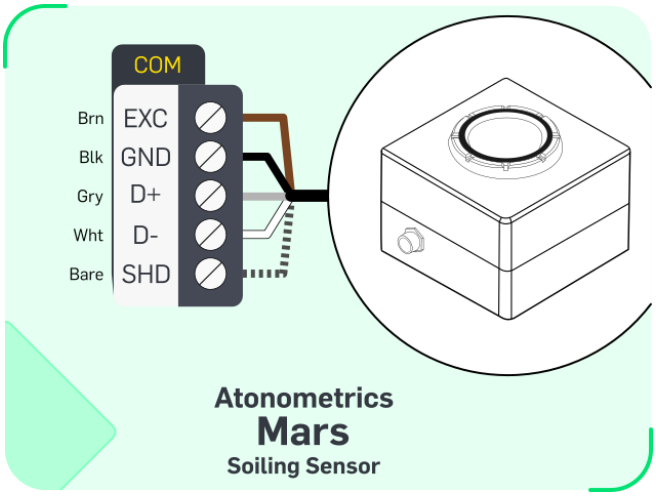


Figure 11: Mars™ Wiring Diagrams

Final LOGR Checks

Pull-test all wires to ensure proper connection; if any disconnect, reseat and hand-tighten to secure.

On the **Sensor Outputs** home page, verify that the sensor output is producing reasonable values for live data. See note below if live data is not valid.

If this is not a preprogrammed sensor, the Modbus RTU settings of the sensor need to be changed from the manufacturer defaults for LOGR communication. See Sensor Access and RTU Settings instructions below.

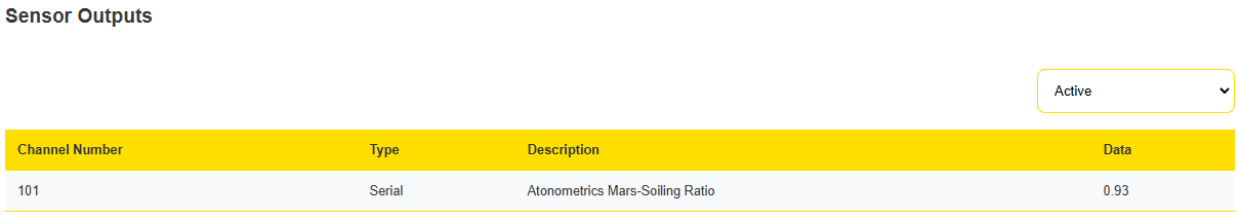


Figure 12: Sensor Live Data

OTHER INFO

Atonometrics provides a web-based user interface which allows further configuration capabilities of the sensor. Most commonly, this can be used to change the sensor's Modbus RTU settings or to update the sensor firmware.

Accessing the Atonometrics Web-Based User Interface

1. The sensor should be powered on. On start-up, the sensor soil collection window will light up for a short time and then go dark.
2. Wait 1-2 minutes for the device to start its local Wi-Fi network for configuration.
3. From a smartphone or laptop PC, use the network selection interface to select the Wi-Fi network associated with the Mars™ unit. It is identified by the unit SSID (network name), which will be "Mars" followed by the last three digits of the sensor serial number.

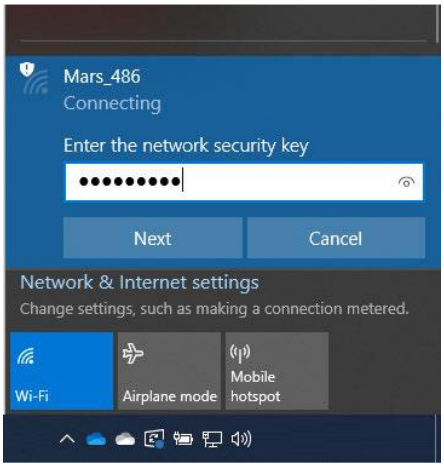


Figure 13: Example of Wi-Fi Network Selection on Windows PC

5. By default, the network Wi-Fi password will be "marsXXXXX" where XXXXX is the 5-digit sensor serial number. Ignore any security warnings. If asked, select the PC to be non-discoverable.
6. Launch a web browser window. In the browser URL bar, enter the default sensor IP address of **10.244.69.66**.

7. The Atonometrics Mars Soiling Sensor interface will load in the browser. From this page, live data can be viewed, the Modbus RTU Node Address (Client Address) can be edited, and firmware can be updated among other things. See detailed instructions below.

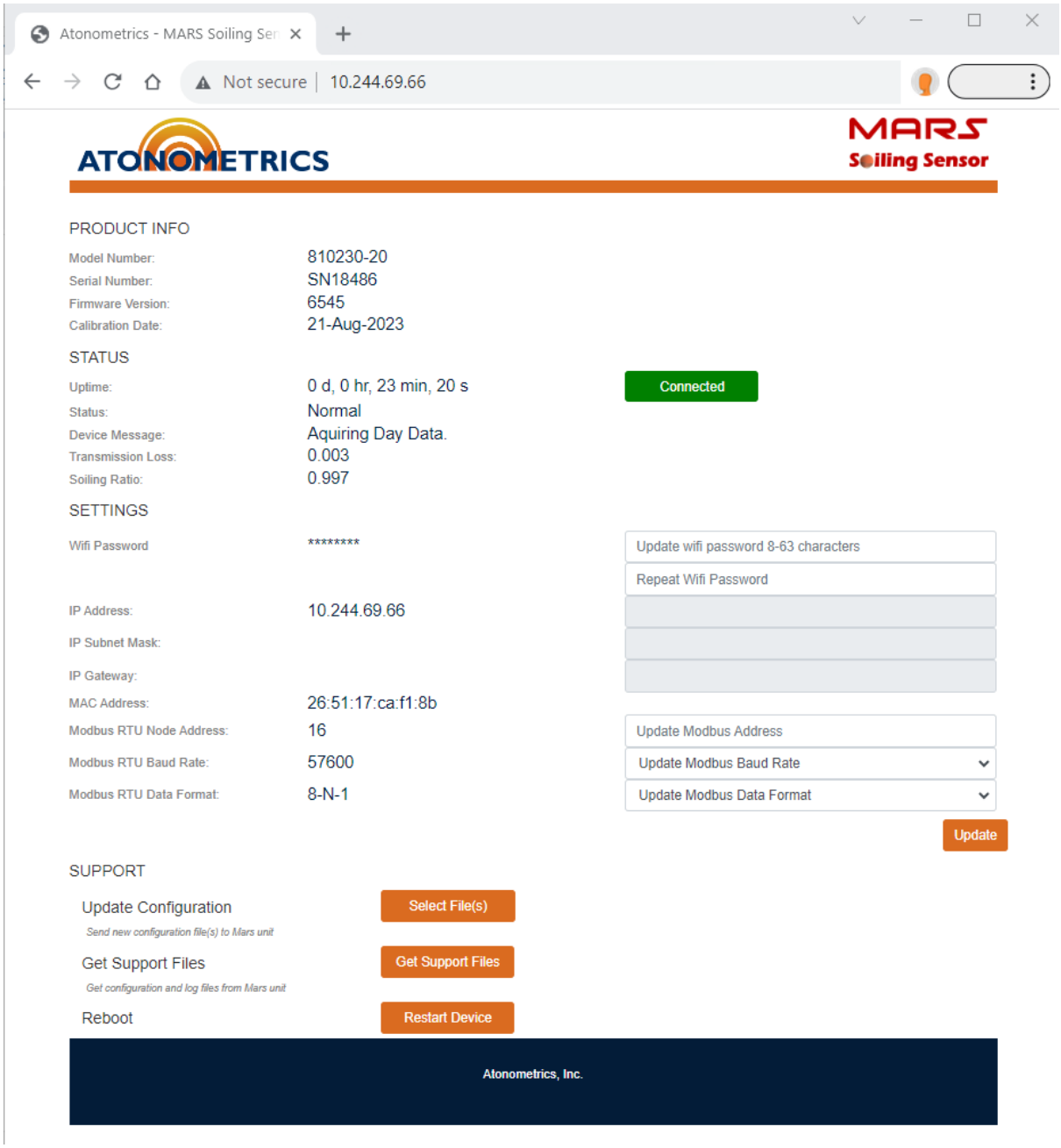


Figure 14: Atonometrics Mars™ Wi-Fi User Interface

Updating Firmware

1. Use a web browser to navigate to the Mars Firmware Release Notes page and view the latest firmware release.
2. Cross-reference the latest firmware release with the current sensor firmware version shown near the top of the Wi-Fi user interface, under **Product Info**.
3. If the latest firmware is not installed, navigate to the Mars Firmware Update page and download the latest firmware version from the link provided at the bottom of the page.
4. To initiate the firmware update in the sensor's Wi-Fi user interface, click "*Select File(s)*" next to "*Update Configuration*" near the bottom of the browser page. Following the prompts that appear, select the latest downloaded firmware update file, and upload it to the Mars™ unit.
5. Wait approximately 5 minutes while the software is applied. **Do not remove power from the unit during the update.**
6. Once the update is complete, refresh the Wi-Fi user interface web page and verify that the firmware version is updated to the latest version.

Configuring Modus RTU Settings

1. The default Modbus Address of this sensor is 16. To edit the Modbus Node Address (also known as the Client Address) enter the new address in the user interface in the "*Update Modbus Address*" box and click **Update**.

   Note: Valid Modbus Addresses range from 1 to 247.

2. To edit Baud Rate and Data Format, select the appropriate serial communication parameters from the dropdown menus, then click **Update**.

   The settings for LOGR are as follows:

   a. Baud Rate: 19200
   b. Data Format: 8-E-1

   Note: *The currently configured Modbus address will remain unchanged during this update.*

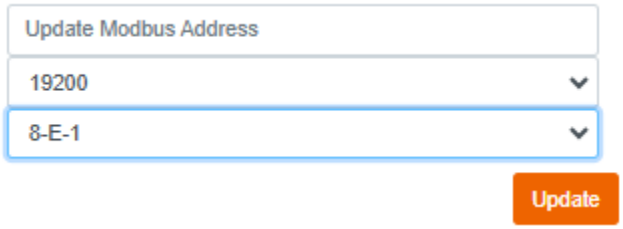


Figure 15: Sensor Modbus RTU Settings Updates for LOGR

3. Refresh the Wi-Fi user interface web page and verify that the intended settings are saved to the Mars™ unit.

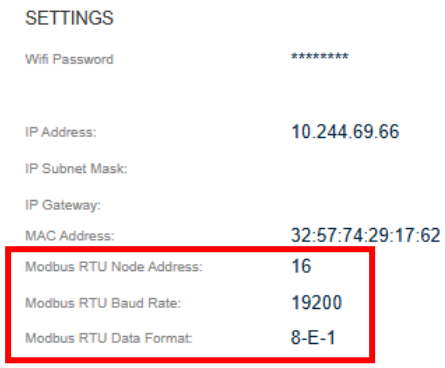


Figure 16: Modbus RTU Settings Update Confirmation

APPENDIX

Manufacturers Default Sensor Configuration

- Baud Rate: **57600**
- Address: **16**
- Data Format: **8-N-1**

Manufacturers Documentation Links

Datasheet

https://support.atonometrics.com/support/solutions/articles/71000000454-mars-soiling-sensor-810230-20-datasheet

User Guide

https://support.atonometrics.com/support/solutions/articles/71000000453-mars-810230-20-user-guide

Firmware Update

https://support.atonometrics.com/support/solutions/articles/71000000159-mars-firmware-update

Other Documentation

https://support.atonometrics.com/support/solutions/folders/71000000097