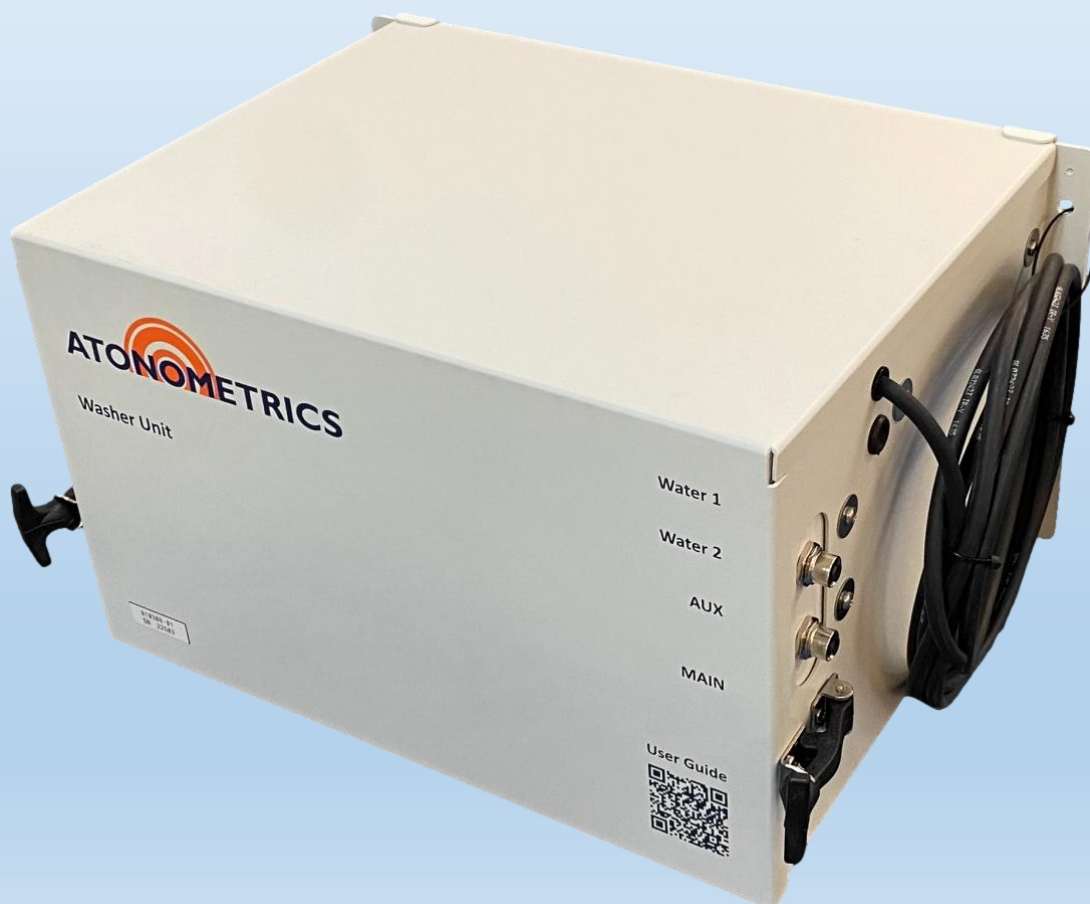


Cell Wash™ Automatic Reference Cell Washing System

User Guide



Document Number 880104 Rev. B, January 2026



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Figure 1-2: A washed and soiled reference cell pair for soiling measurement

2 Safety



WARNING: Follow directions: Operate this equipment only as directed in these instructions.



WARNING: Inspect before using: Inspect the equipment and note any damage or defects, including in wiring. Do not use the equipment if damaged or defective.



WARNING: Qualified personnel only: The product should only be installed and serviced by trained and qualified personnel.



WARNING: Follow standard safety precautions: When connecting this equipment to power sources, follow standard electrical safety precautions. Also, note that equipment in PV power plants may produce hazardous voltages. Follow all standard safety precautions applicable to the work environment.

3 Device Configurations

Cell Wash may be configured to support different system types and applications. Configurations are listed in **Table 3-1**.

System diagrams and wiring information for these systems, including those integrating with RDE300i, are provided in the [Soiling Products Ordering Guide](#) (880100) at support.atonometrics.com.

Set the Device Configuration using the Cell Wash Configuration Manager software as explained in Section 5.1.4 (Configure Cell Wash).

The part number for Cell Wash is 810308-01.

Table 3-1: Device configurations

Device Configuration	RC22s in System	How it Works	Applications
C1 Cell-Cell-Washer	2	Two front-side PV reference cells. One cell is automatically washed	- Soiling Ratio measurements - Reference cell irradiance measurements with automatic washing
R1 Module-Cell-Washer (Monofacial)	1	- Used together with RDE300i - One front-side PV reference cell, automatically washed by Cell Wash unit - RDE300i uses washed cell as reference for module performance measurements	- Soiling power loss measurements including effects of non-uniform soiling and module coatings and frames - Module performance and degradation
R2 Module-Cell-Washer (Bifacial)	3	As above, for a bifacial system, with two additional PV reference cells on the rear side	As above, for bifacial systems

4 Installation Overview

The following is an overview of the steps to install your Cell Wash unit. More details are given in the sections below.

- Configure the system equipment following instructions in Section 5 (Installation of System Configuration C1).
 - Set the communication settings of your RC22s.
 - Configure the Cell Wash unit.
 - If your system will be in a different configuration than C1, e.g., configuration R1, R2, refer to Section 6 (Other Device Configurations) for configuration settings.
 - Connect the RC22 to the Aux port of Cell Wash to verify the system configuration. Refer to the [Soiling Products Ordering Guide](#) (880100) for wiring information.
 - If your system includes an RDE300i, e.g., Configuration R1, R2, configure it following instructions in the [RDE300i User Guide](#) (880093) after completing the setup of Cell Wash. It can be mounted after confirming system configuration.
- Open the Cell Wash enclosure and connect the battery wires to the enclosed battery.

Note: The battery does not provide power to the Cell Wash control board. For Cell Wash to function properly, **both** main input power must be provided by the user **and** the battery must be connected.

Note: The battery will slowly discharge over long periods of storage, so it may need to recharge before washing will occur. Connect the battery and power the Cell Wash unit to charge the battery.



WARNING: Observe polarity markings for battery connection. Do not short the battery. The battery can produce high currents.

- Mount the Cell Wash unit per Section 5.2.1 (Mount Cell Wash Unit).
- Install the nozzle to the nozzle bracket, then install the hose to the inlet of the nozzle and secure it with the metal hose clamp per Section 5.2.2 (Install Nozzle to Hose).
- Add distilled water to the water tank
 - Note that water will not be detected until the tank is filled above the water sensor, which is located under the internal electronics enclosure.
 - Make sure the water tank lid is closed after filling it to prevent evaporation.

Note: Use only distilled water to avoid cloudy deposits on the reference cells.

- Test the pump using the “Test Pump” button on the Wash Settings tab of the Configuration Manager and verify that water exits the nozzle per Section 5.2.3 (Test Water Pumps).
 - After this point, the nozzles should remain above the tank to avoid siphoning water away from the tank.

Note: If the pump does not spray water after 3 attempts, then the pump may need to be manually primed by applying suction to the hose.

- Mount the RC22 units per Section 5.2.4 (Mount RC22 Units).
- Connect the nozzle bracket to the Washed RC22 per Section 5.2.5 (Mount Nozzle Bracket to Clean RC22).
- Connect the Y-cable from the Aux port of Cell Wash to the Washed RC22 per Section 5.2.6 (Connect Cable from Cell Wash to RC22).
- Align the nozzle outlet so that the water spray is directed to the PV cell of the Washed RC22. Make any adjustments to the nozzle as needed with a flat head screwdriver per Section 5.2.7 (Align Water Spray to RC22).
- Normalize the irradiance measurements of the system per Section 5.3 (Normalizing RC22 Irradiance Measurements).
- Disconnect the Configuration Kit and install power and communication cables per Section 5.3.1 (Connect System Cable) and Section 8 (Wiring).
- Provide power to the unit, then check that the indicator LED is flashing.
 - Inside the Cell Wash enclosure there is an electronics enclosure. The indicator LED is on the bottom surface of this internal enclosure, facing downwards.
- Close the Cell Wash enclosure. Installation is complete.

5 Installation of System Configuration C1

5.1 Configuring System Equipment

Figure 5-1 shows the system diagram of Configuration C1. This configuration is used for basic soiling measurement. Each of these pieces of equipment needs to be configured prior to installation.

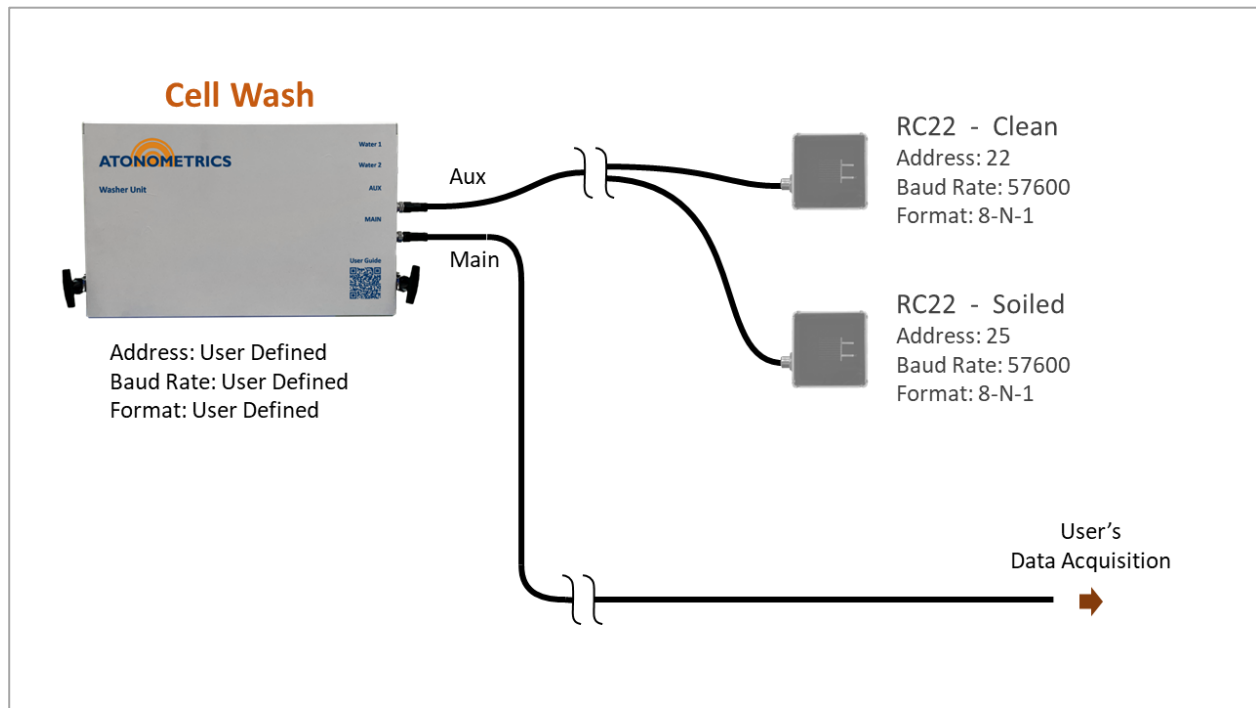


Figure 5-1: Configuration C1

5.1.1 Documentation

You will need the latest versions of the following software and documentation:

- This document, the [Cell Wash User Guide](#) (880104)
- [Cell Wash Configuration Manager](#) Software (500113)
- [RC22 User Guide](#) (880095)
- [RC22 Configuration Manager](#) Software (500099)
- [Soiling Products Ordering Guide](#) (880100), which contains wiring diagrams for each system configuration

All of these, along with installation instructions, can be found at support.atonometrics.com.

Atonometrics Configuration Manager software allows you to connect to your device, set communication and other configuration settings, and test system status. The software runs on a Windows PC.

5.1.2 Configuration Kit

The Configuration Kit (810276), sold separately, allows you to conveniently power your Atonometrics equipment, perform configuration, and test communication and system status. The main kit contents are shown in **Figure 5-2**.

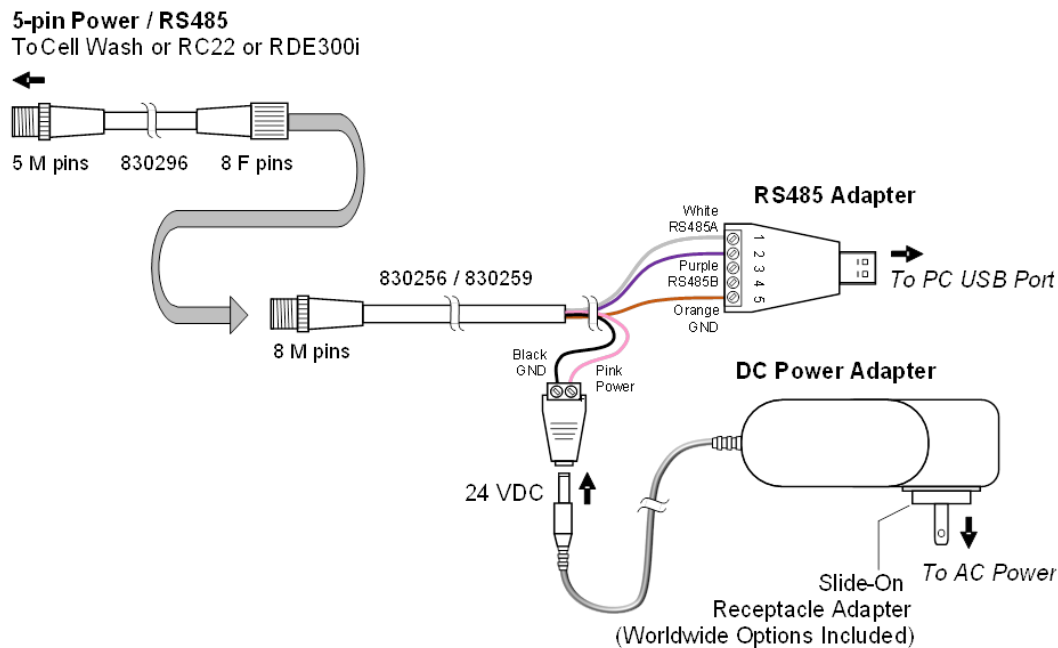


Figure 5-2: Configuration Kit (810276, sold separately)

To assemble and install the kit for use with your Windows PC:

- Assemble the power/RS485 cable and connect to the Main input on your Cell Wash unit
- Connect the RS485 adapter cable to your PC's USB port.
- Allow Windows to detect the USB adapter and automatically install its driver.
- Select the included AC power receptacle adapter appropriate for your region and install it on the AC-DC power adapter. Connect the power adapter to AC power.

Note: Older configuration kits shipped with a 12V DC power adapter. These power adapters will not work with Cell Wash. Check that your DC power adapter provides 24V.

Note: The 810276 Configuration Kit supports multiple products. It may include some accessories that are not required for your Cell Wash unit and are not shown here.

Note: The 810276 Configuration Kit is optional. You may duplicate their functions with your own supplied equipment and cables if desired.

Note: For more information on the 810276 Configuration Kit, or to find software drivers, visit the 810276 configuration kit page on support.atonometrics.com.

5.1.3 Configure RC22 Units

RC22 units must be set to specific addresses per Cell Wash system configuration. Cell Wash uses the configured addresses to identify each RC22 unit and its position (i.e. front/rear side, soiled/cleaned).

Use the RC22 Configuration Manager (500099) and the Configuration Kit (or equivalent equipment) to set the RC22 units to the communication parameters in **Table 5-1**.

Reference the RC22 User Guide (880095) for more detailed instructions on RC22 configuration.

Table 5-1: RC22 Communication Settings for C1 System Configuration

RC22 unit	Address	Baud Rate	Data Format
Clean Cell	22	57600	8-N-1
Soiled Cell	25	57600	8-N-1

5.1.4 Configure Cell Wash

5.1.4.1 Connect to Cell Wash

Connect the Cell Wash to the Configuration Kit (or equivalent equipment) as described above in Section 5.1.2 (Configuration Kit) and ensure the kit is powered. You can verify the Cell Wash is powered by the flashing LED on the bottom of the internal electronics enclosure.

Launch the Cell Wash Configuration Manager Software on your PC.

From Cell Wash Configuration Manager, use the Connect tab shown in **Figure 5-3** to connect to your Cell Wash unit.

Select your PC's COM port corresponding to the USB/RS485 adapter of the Configuration Kit.

If the Modbus communication settings of your Cell Wash are unknown, Scan for the Cell Wash using the Find button. The software will attempt to discover your Cell Wash address, baud rate, and data format.

If your Modbus communication settings are known, you may enter these in the Connect Manually box and press the Connect button.

Note: To determine the COM port of your RS485 adapter, check the COM ports drop down box with and without the adapter connected to your PC, using the Refresh button to update the list after connecting/disconnecting the adapter from the PC.

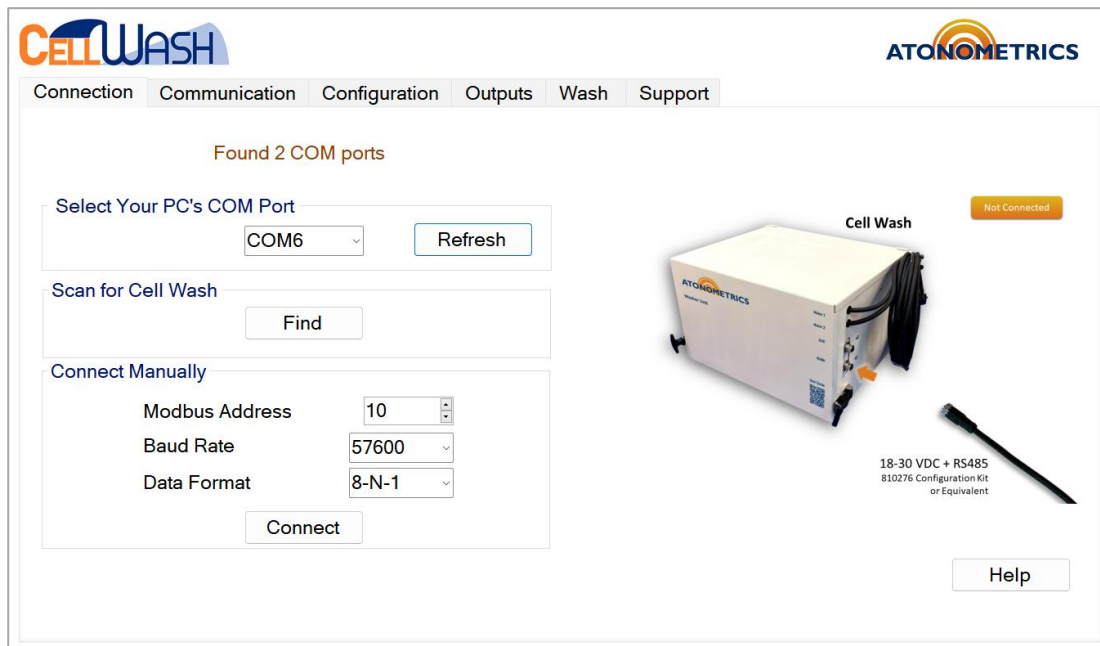


Figure 5-3: Connecting with Cell Wash Configuration Manager software

Once your Cell Wash unit is connected, the software will display the Connected status as shown in **Figure 5-4**.



Figure 5-4: Cell Wash connected

Cell Wash requires at least 24 VDC to operate correctly. If Cell Wash is not receiving enough power when connecting to it through the configuration manager, you will receive the warning shown in **Figure 5-5**. If you encounter this warning, check that your power supply is supplying enough voltage. For specific power requirements, refer to Section 8 (Wiring).

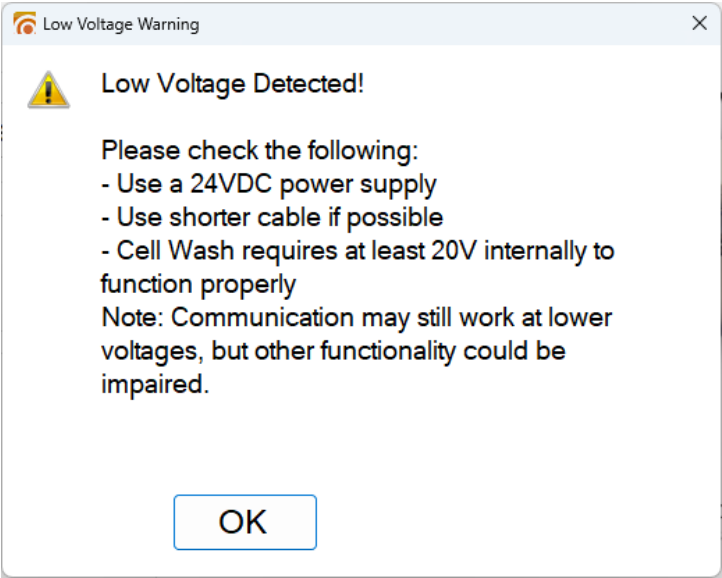


Figure 5-5: Cell Wash low voltage warning

5.1.4.2 Setting Communication Parameters

Cell Wash default Modbus serial communication parameters are Address = 10, Baud Rate = 57600, and Data Format = 8-N-1 (8 data bits, no parity, 1 stop bit).

To update the communication parameters, use the Communication tab of Cell Wash Configuration Manager, shown in **Figure 5-6**.

Enter your new parameters in the Update Modbus Settings box and press Apply to transmit these to the unit.

Addresses from 1 to 247 are allowed.

Supported baud rates are 9600, 19200, 38400, and 57600.

Supported data formats are 8-N-1, 8-N-2, 8-E-1, and 8-O-1.

Note: If Cell Wash is being used as an accessory to RDE300i, Modbus communication parameters must be left at the factory defaults and may not be changed by the user. See the [RDE300i User Guide](#) (880093) for more information.

The screenshot displays the 'Communication' tab of the Cell Wash Configuration Manager. At the top, the interface shows the 'CELLWASH' logo, 'Part Number: 810308-01', 'Serial Number: 12345', 'Firmware Version: R7461', and the 'ATONOMETRICS' logo. Below this is a navigation bar with tabs: 'Connection', 'Communication' (selected), 'Configuration', 'Outputs', 'Wash', and 'Support'. The main content area is divided into two sections: 'Current Modbus Settings' and 'Update Modbus Settings'. Both sections have three dropdown menus for 'Modbus Address' (set to 10), 'Baud Rate' (set to 57600), and 'Data Format' (set to 8-N-1). An 'Apply' button is located below the 'Update Modbus Settings' section. At the bottom right of the interface are 'Reset To Defaults' and 'Help' buttons.

Figure 5-6: Setting communication parameters

5.1.4.3 Set Cell Wash System Configuration to C1

The System tab of the Configuration Manager software contains a drop-down to set device configuration. The diagram displayed below the drop-down provides visual confirmation of the configuration operation and illustrates the RC22s on the Aux network.

Select “C1 (2 reference cells)” from the Choose Device Configuration drop-down in the Configure tab of Cell Wash Configuration Manager, as shown in **Figure 5-7**, and press Apply.

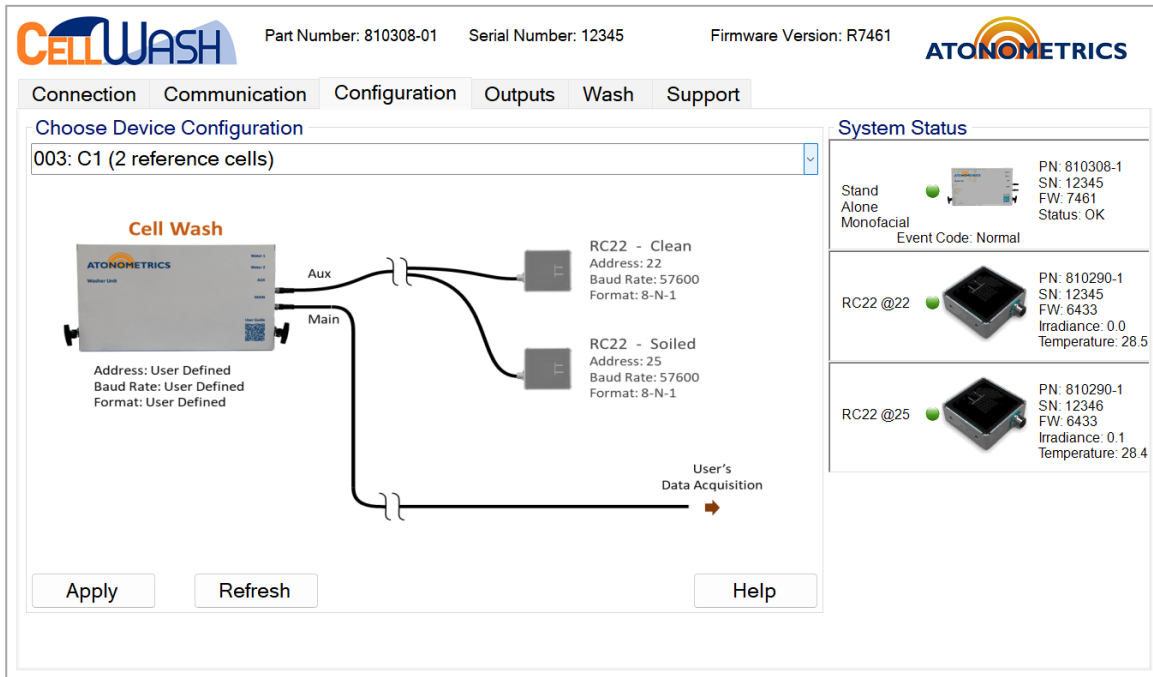


Figure 5-7: The Configuration Tab showing C1 applied

The System Status box displays the operation status of the connected Cell Wash as well as its part number, serial number, and installed firmware version. For warning and error conditions, an Event Code may be displayed.

The System Status box also displays the RC22 unit(s) on the Aux network. For each RC22, the operation status, part number, serial number, and installed firmware version are shown.

For Event Code explanations, see the Help screen or refer to help articles on support.atonometrics.com.

Note: If any Aux networked unit is not properly configured or connected, its status may be displayed with an error in the System Status box. To resolve this, connect to the RC22 according to its User Guide, configure the device to the required settings, and then reconnect it to the Aux port of Cell Wash.

5.1.4.4 Confirming Wash Settings

Cell Wash is shipped with recommended wash settings, which will wash cells daily. (Wash duration 5 seconds, time between washes 1 day.)

If changes are needed, the following settings are available in the Wash Tab of the Configuration Manager software:

- **Wash Duration:** The length of time, in seconds, that water will be pumped to wash the clean cell(s) during each wash event.
- **Time between washes:** The number of days between washes. Depending on the setting chosen, Cell Wash will wash either every day at sunset, or every other day at sunset.

A wash will not occur if any of these conditions are present:

- Temperature is too low (water may be frozen)
- There is no water detected in the water tank
- The battery in the Cell Wash unit is disconnected

The Wash Tab also shows the status of the wash cycle. If the last wash was unsuccessful, the errors will be shown in the top right.

For initial setup and test, there is a “Test Pump” button on this tab that can be used to send a wash command to the Cell Wash unit. There is a 60 second waiting period between test pump commands.

CELLWASH Part Number: 810308-01 Serial Number: 12345 Firmware Version: R7467 ATONOMETRICS

Connection Communication Configuration Outputs Wash Support

Current Wash Settings

Front Back

Wash Duration (seconds) 5 seconds

Time between washes 1 day

Washing State: Waiting ?

Update Wash Settings

Front Back

Wash Duration (seconds)

Time between washes

Apply

Reset To Defaults

Status: Ready to test the pump

Test Frontside Pump

Test Backside Pump

Help

Figure 5-8: The Wash Tab with wash duration and time between washes settings

5.1.5 Validate System Configuration

Following the system wiring diagram in reference to **Table 5-2** and the [Soiling Products Ordering Guide](#) (880100), connect the RC22 units to the Cell Wash unit's Aux port.

Table 5-2: System configuration descriptions

Configuration	Soiling Products Ordering Guide
C1	Cell-Cell-Washer
R1	Module-Cell-Washer (Monofacial)
R2	Module-Cell-Washer (Bifacial)

Open the Cell Wash enclosure and connect the battery wires to the battery, as shown in **Figure 5-9**.

Note: The battery does not provide power to the Cell Wash control board. For Cell Wash to function properly, **both** main input power must be provided by the user, **and** the battery must be connected.

Note: The battery will slowly discharge over long periods of storage, so it may need to recharge before washing will occur. Connect the battery and power the Cell Wash unit to charge the battery.



WARNING: Observe polarity markings for battery connection. Do not short the battery. The battery can produce high currents.

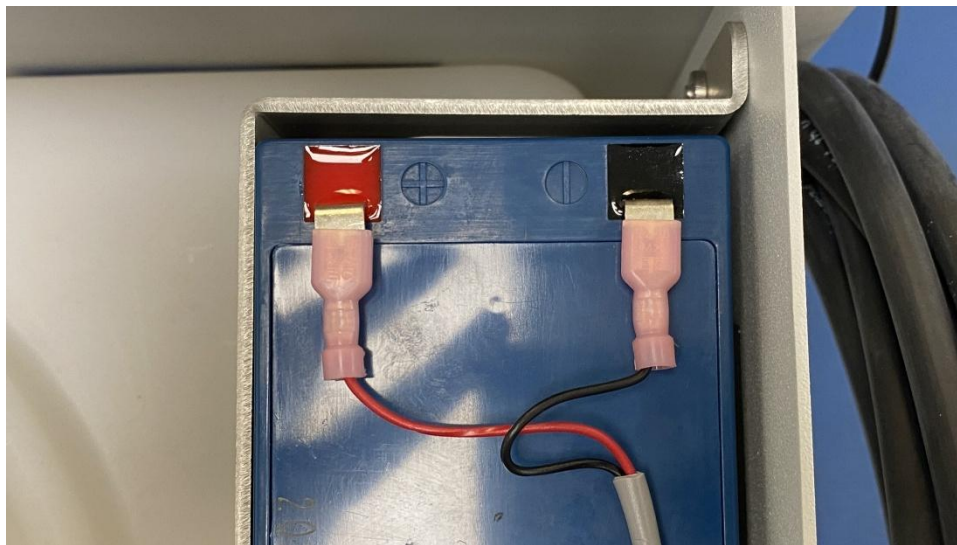


Figure 5-9: Connect battery wires

Connect the Cell Wash unit to the Configuration Kit and ensure the kit is powered on.

Using the Configuration Manager software, check the output data of Cell Wash. On the Wash Tab, check that temperature is reported and no water is detected. On the Outputs tab, check that the RC22 units are reporting irradiance and temperature data.

5.2 Installing System Equipment

5.2.1 Mount Cell Wash Unit

Mount the Cell Wash unit. See Section 7 (Mounting) for dimensions and mounting requirements.

To avoid siphoning water from the Cell Wash water tank, ensure that the water tank will always be lower than the washed RC22. Take special care for tracking systems, as the RC22 units may not be at their lowest point during installation.

Once it is mounted, add distilled water to the water tank. Note that water will not be detected until the tank is filled above the water level sensor, which is located under the internal electronics enclosure.

Make sure the water tank lid is closed after filling it to prevent evaporation.

Note: Use only distilled water to avoid cloudy deposits on the reference cells.

5.2.2 Install Nozzle to Hose

The Cell Wash ships with a Nozzle Bracket Kit (810330). The kit contains the nozzle bracket, nozzle, hose clamps, and screws. **Figure 5-10** shows the contents of the Nozzle Bracket Kit.



Figure 5-10: Nozzle Bracket Kit contents

Attach the nozzle to the metal bracket by screwing on the plastic knob. Thread the hose clamp onto the end of the Cell Wash water tube, past the length of the nozzle inlet. Feed the hose onto the nozzle, then use a pair of pliers to open the hose clamp and release it on nozzle inlet, as shown in **Figure 5-11**.



Figure 5-11: Connecting the nozzle and hose to the bracket

5.2.3 Test Water Pumps

After distilled water has been added to the water tank, the Cell Wash Configuration Manager software will show that water is detected.

Test the pumps using the “Test Pump” button on the Wash Settings tab of the Configuration Manager software, and verify that water exits from the nozzle.

If the pump does not spray water after 3 attempts, then the pump may need to be manually primed by applying suction to the hose.

A tool, such as a plastic syringe (e.g., McMaster-Carr PN 7510A201) may be inserted into the end of the hose to draw water through the pump and water tube, as shown in **Figure 5-12**. This part must be user-supplied.

Note: There is a 60 second waiting period between test pump commands.

Note: During normal daily operation, if the Cell Wash unit detects low current from the pump (dry state) after 2 seconds of attempting to spray, then it will stop the pump.

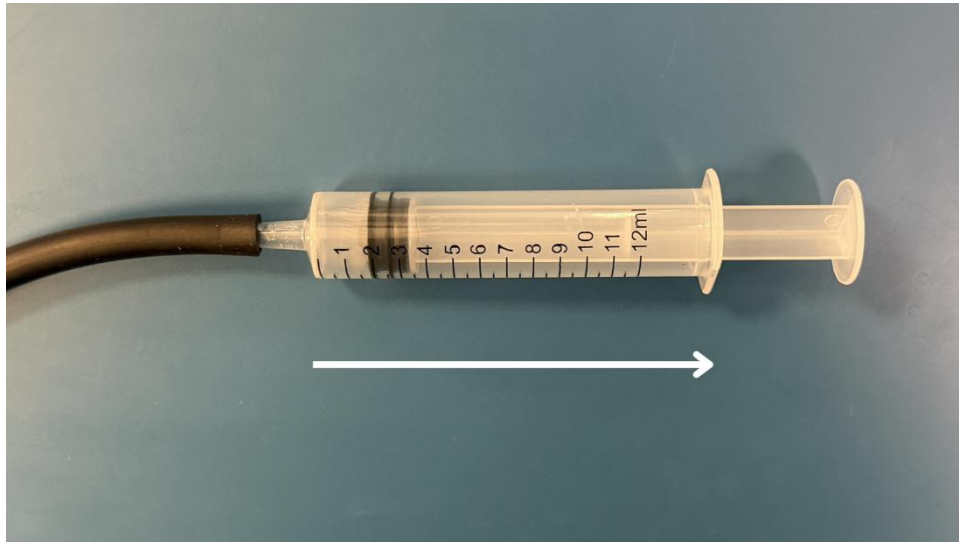


Figure 5-12: Example tool to prime pump (user-supplied)

5.2.4 Mount RC22 Units

Identify each RC22 unit as either the Clean Cell or the Dirty Cell. Refer to Section 5.1.3.

Remove the pre-attached standard mounting plates, then reuse the flathead screws to mount both RC22s to the Dual Cell Mounting Plate (610533). Ensure that both connectors point towards each other, and the Clean Cell is positioned near the notch on the long edge of the mounting plate, as shown in **Figure 5-13**.

If using the Torque Tube Mounting Clamp Kit (810313), refer to the [RC22 User Guide](#) (880095) or the support article “RC22 mounting solutions” at support.atonometrics.com for more information.

Mount the Dual Cell Mounting Plate and RC22 units less than 3 meters away from the Cell Wash unit, and in the same plane of array as your solar modules.

To avoid siphoning water from the Cell Wash water tank, ensure that the Clean Cell will always be higher than the Cell Wash unit. Take special care for tracking systems, as the RC22 units may not be at their lowest point during installation.

When mounting the Dual Cell Mounting Plate and RC22 units, avoid mounting them such that water may be sprayed towards nearby solar modules.



Figure 5-13: Mounting Clean Cell to the dual cell mounting plate

5.2.5 Mount Nozzle Bracket to Clean RC22

Mount the nozzle bracket with the connected water tube to the Clean Cell by installing two M5 screws from the Nozzle Bracket Kit with a P2 screwdriver, as shown in **Figure 5-14**.

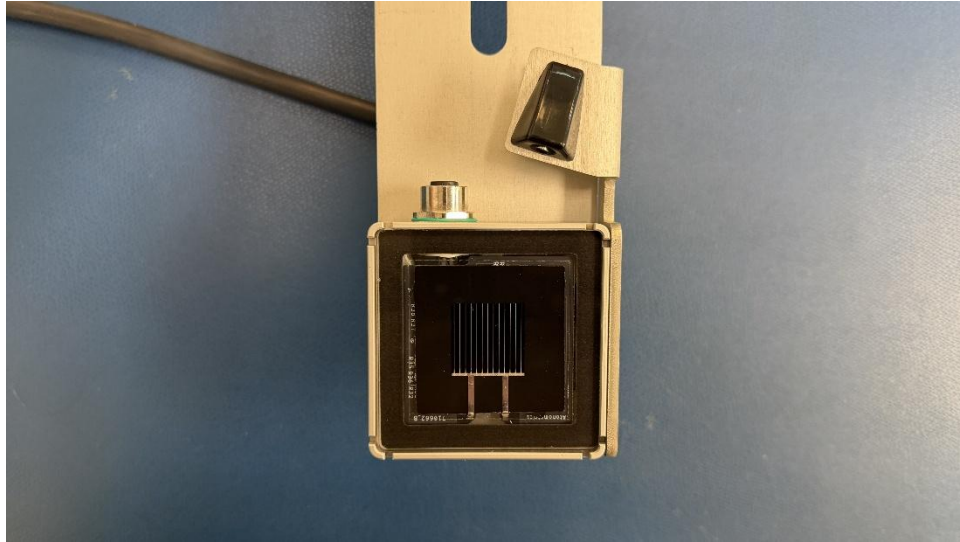


Figure 5-14: Mounting the nozzle bracket to the Clean Cell

5.2.6 Connect Cable from Cell Wash to RC22s

Prior to aligning the water spray to the Clean Cell, connect the 3-meter Y-Cable (PN 830341) from the Aux port of the Cell Wash unit to both RC22 units, as shown in **Figure 5-15**.

Secure cables and tubing, while ensuring that cables and tubing have adequate service length for module motion if using a PV tracker.

Note: Do not attempt to spray water until the cable is connected to the Clean Cell.

Note: You may connect either end of the Y-cable to either of the RC22 units.

Note: Do not compress the water hose with cable ties or other methods of cable management.

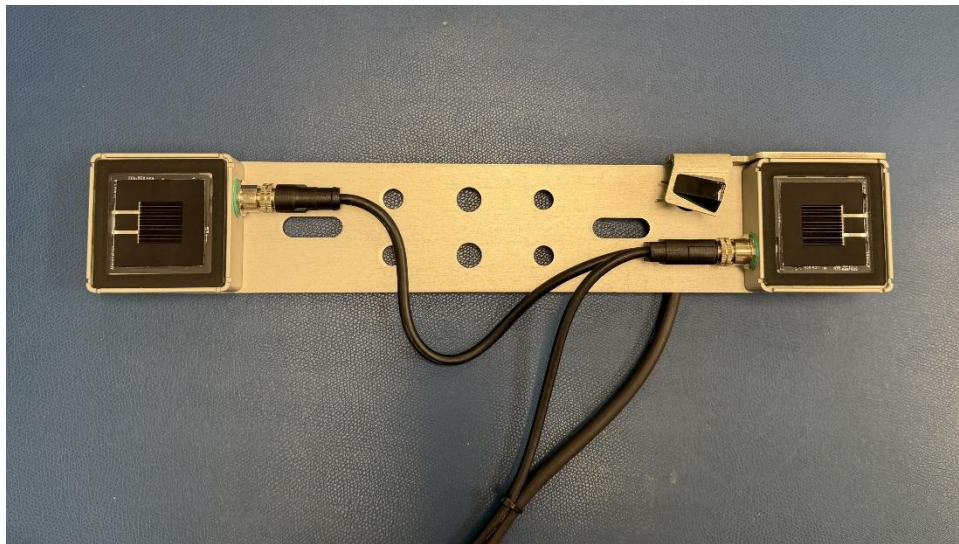


Figure 5-15: Connecting Y-Cable between Cell Wash and RC22 units.

5.2.7 Align Water Spray to RC22

Test the pump and align the small metal outlet of the nozzle so that the water sprays directly over the PV cell of the RC22 unit (the center square). Make any adjustments to the nozzle as needed with a flat head screwdriver, as shown in **Figure 5-16** and **Figure 5-17**. Use the “Test Pump” button in the configuration software to check alignment.

Ensure that no water is sprayed on nearby solar modules, and that no water is siphoned from the tank.

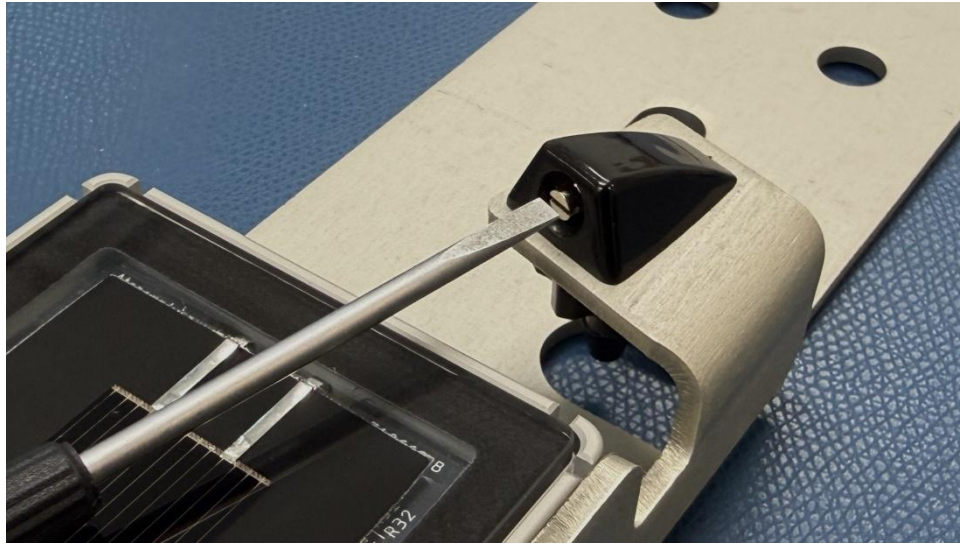


Figure 5-16: Adjusting nozzle outlet with flathead screwdriver

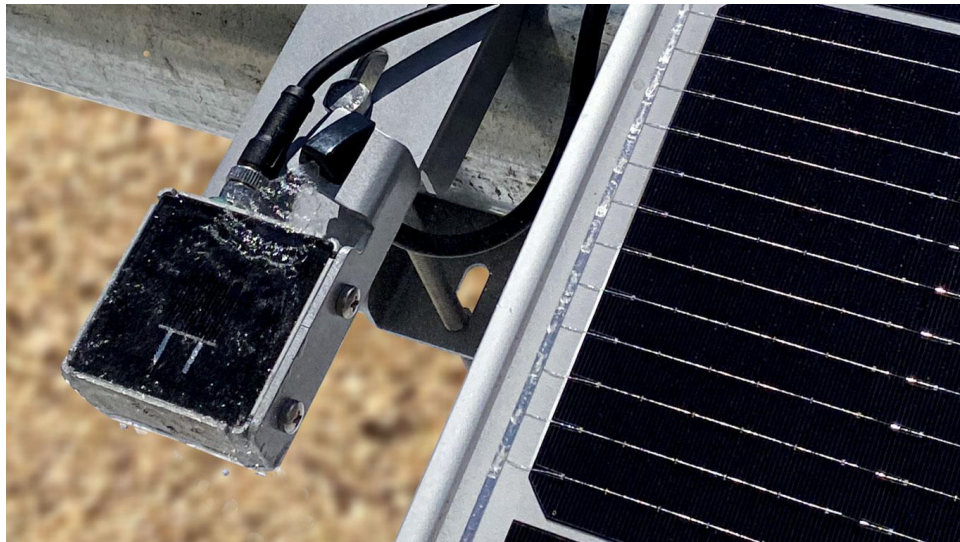


Figure 5-17: Water spray aligned to PV cell of Clean Cell

5.3 Normalizing RC22 Irradiance Measurements

In order for Cell Wash to calculate the Performance Index (Soiling Ratio) of the RC22s, their clean measurements must be normalized against each other. Normalization is completed through the Outputs tab of the Cell Wash Configuration Manager.

Before normalization, check these items:

- Ensure that it is a clear sunny day, preferably within 2-3 hours of local solar noon.
- Ensure angle of incidence to the sun is small, preferably less than 35 degrees
- Clean the RC22 units thoroughly.
- Ensure the RC22 units are at the same tilt angle, preferably within 0.5 degrees. Use a handheld inclinometer to confirm. Check the tilt in both directions across each device. If necessary, remount the devices.

If the above conditions are not met, normalization may fail or result in an incorrect normalization factor being stored and used by the Cell Wash unit.

The RC22 units must be properly configured and connected to the Cell Wash unit, as detailed in Section 5.1 (Configuring System Equipment).

Connect the Cell Wash to the Configuration Kit and ensure the kit is powered.

Connect to Cell Wash in the Configuration Manager, then go to the Outputs tab. Verify that the RC22 units are reporting irradiance and temperature data as expected.

After ensuring that the listed conditions above are met, use the button labeled “Normalize”, as shown in **Figure 5-18**. Cell Wash will automatically calculate the Normalization Factor.

If the resulting soiling ratio is not 1.00 (± 0.02), as shown in **Figure 5-19**, then procedure was not successful and must be repeated. Before trying again, check that both RC22s are clean and the sky conditions are bright and clear, according to the list of requirements above.

Note: An incorrectly normalized Cell Wash unit will provide incorrect soiling readings. Ensure the normalization procedure is followed correctly.

Connection	Communication	Configuration	Outputs	Wash	Support
Front Clean Cell Irradiance 807.26 Temperature 39.03					
Dirty Cell Irradiance 803.49 Temperature 38.88					
Soiling Ratio Real Time Soiling Ratio 0.88 Normalization Factor 1.00					
Normalize Help					

Figure 5-18: The Normalize button on the Outputs Tab

Connection	Communication	Configuration	Outputs	Wash	Support
Front Clean Cell Irradiance 826.34 Temperature 46.05					
Dirty Cell Irradiance 823.23 Temperature 45.79					
Soiling Ratio Real Time Soiling Ratio 1.00 Normalization Factor 1.01					
Normalize Help					

Figure 5-19: Soiling Ratio after successful normalization

5.3.1 Connect System Cable

Disconnect the Configuration Kit and install the power and communication cable per Section 8 (Wiring).

Provide power to the unit, then check that the indicator LED is flashing. The indicator LED is on the bottom surface of the internal electronics enclosure, facing downwards.

Install the Cell Wash enclosure lid. Installation is complete.

6 Other Device Configurations

System installation for other device configurations, including those systems integrating Cell Wash with RDE300i, follow the same steps as listed in Section 5 (Installation of System Configuration C1). Instead of using the configuration settings for C1, reference the sections below per your system configuration.

Mount the single Front-Side Clean Cell to the provided Dual Cell Mounting Plate or equivalent in the front-side plane of array. Attach the Nozzle Bracket Kit to the Front-Side Clean Cell.

Rear-Side Cells are clamped to the reference module frame equidistance from the module edge using the Rear-Side Module Clamps (PN 810302), and connected to the Aux port of the RDE300i. Refer to the [RC22 User Guide](#) (880095) or the support article “RC22 mounting solutions” at support.atonometrics.com for more information about the Rear-Side Module Clamps.

Manually clean the Rear-Side Cells at least every 6 months, or every time you refill the water tank.

For wiring the system, and cell positioning requirements, refer to the wiring diagrams in the [Soiling Products Ordering Guide](#) (880100).

For systems integrating Cell Wash with RDE300i, see the [RDE300i User Guide](#) for instructions on configuring the Leader RDE300i unit. For these systems, soiling ratio and normalization is also handled in the scope of the RDE300i.

Note: If any Aux networked device is not properly configured or connected, its status may be displayed with an error in the System Status box. To resolve this condition, connect directly to the Aux device according to its User Guide, configure the device to the required settings, and then reconnect to the Aux port.

6.1 R1 Configuration

To set Cell Wash to the R1 configuration, select “R1 (1 reference cell)” from the Choose Device Configuration drop-down in the Configure tab of Cell Wash Configuration Manager, as shown in **Figure 6-1**, and press Apply.

Configure the RC22 unit to the communication settings shown in **Table 6-1**.

Leave the Cell Wash unit at the default communication settings as shown in **Figure 5-3**.

Refer to the [RDE300i User Guide](#) (880093) for instructions on configuring the RDE300i unit.

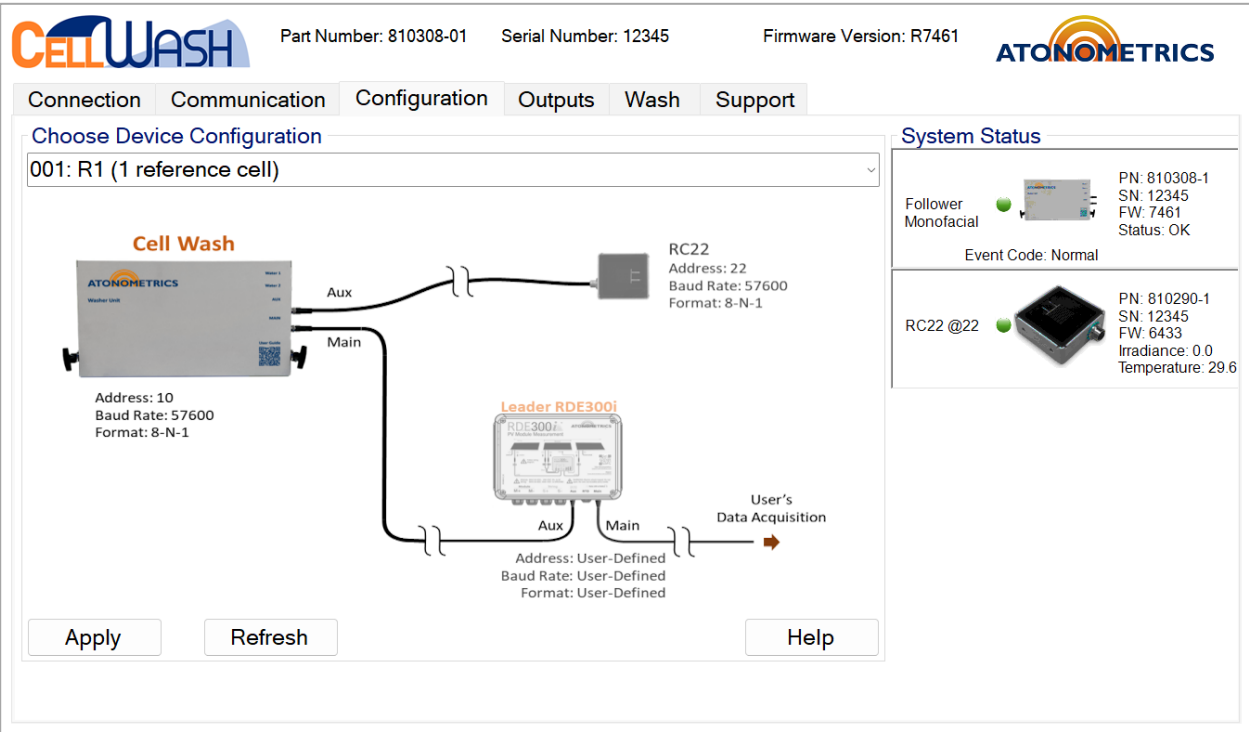


Figure 6-1: R1 Configuration

Table 6-1: RC22 Communication Settings for R1 System Configuration

RC22 unit	Address	Baud Rate	Data Format
Front-Side Clean Cell	22	57600	8-N-1

6.2 R2 Configuration

To set Cell Wash to the R2 configuration, select “R2 (3 reference cells)” from the Choose Device Configuration drop-down in the Configure tab of Cell Wash Configuration Manager, as shown in **Figure 6-2**, and press Apply.

Configure the 3 RC22 units to the communication settings shown in **Table 6-2**.

Leave the Cell Wash unit at default communication settings as shown in **Figure 6-2**.

Refer to the [RDE300i User Guide](#) (880093) for instructions on configuring the RDE300i unit.

Note: The Rear-Side Cells are connected to the Aux port of the RDE300i unit. Only the Clean Cell is connected to the Aux port of the Cell Wash unit.

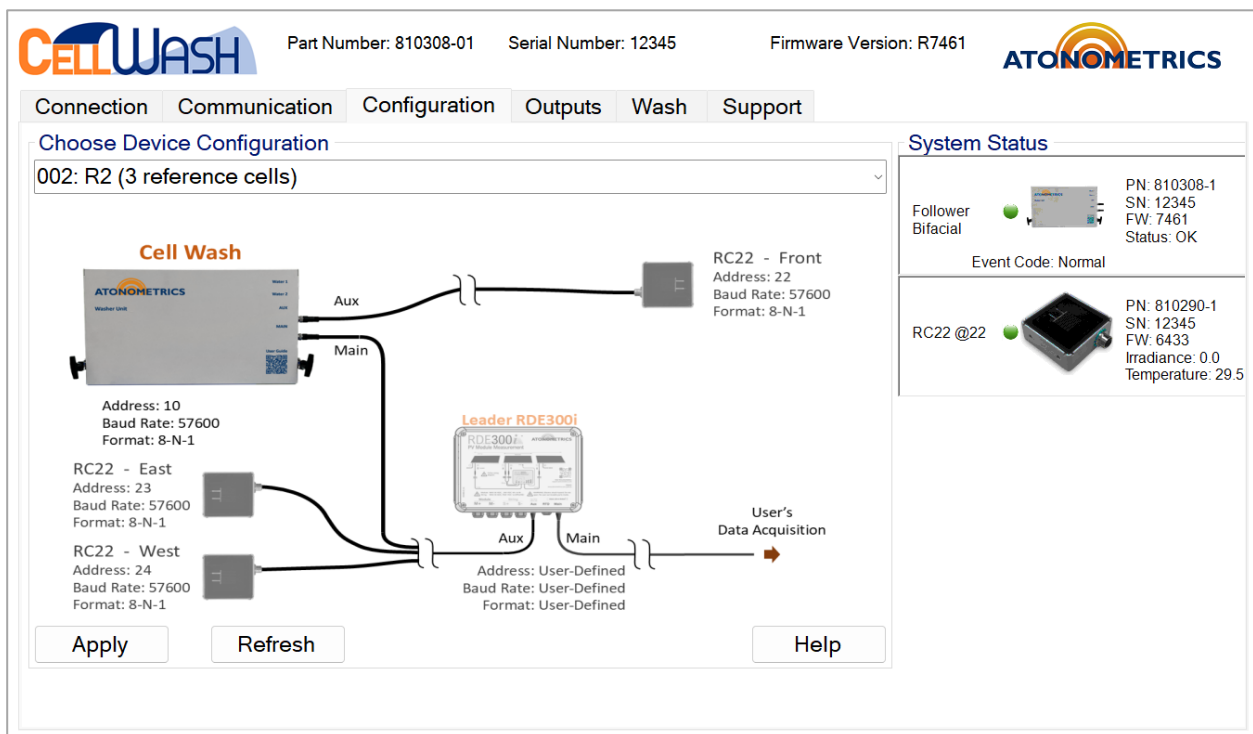


Figure 6-2: R2 Configuration

Table 6-2: RC22 Communication Settings for R2 System Configuration

RC22 unit	Address	Baud Rate	Data Format
Front-Side Clean Cell	22	57600	8-N-1
Rear-Side East Cell	23	57600	8-N-1
Rear-Side West Cell	24	57600	8-N-1

7 Mounting

7.1 Location

Mount your Cell Wash unit as close as possible to the mounting position of the Washed RC22 reference cell. If possible, choose a shaded location underneath the modules.

To avoid siphoning water from the Cell Wash water tank, mount the unit below the Clean Cell. Take special care with tracking systems, as the Clean Cell may not be at the lowest point during installation.

Mount the Cell Wash unit with the text upright. The lid must be removable for regular water tank refills.

Limit distances between components as follows:

	Maximum Distance
Power supply to Cell Wash	50 meters
RDE300i to Cell Wash	50 meters
Cell Wash to Clean Cell	3 meters

Note: The Cell Wash water tube is 3 meters long and cannot be extended. Ensure that cables and tubing have adequate service length for module motion if using a tracker.

Note: Do not compress the water tubes with cable ties or other methods of cable management.

7.2 Water

- When filling the water tank, use distilled water only.
- For Cell Wash to sense there is water in the tank, the water must be filled above the water sensor (a small, white, circular sensor pressed to the front of the water tank). This sensor is below the electronics enclosure inside the unit.

Note: Use only distilled water. Using tap water may result in cloudy deposits on the reference cells caused by minerals present in the water.

7.3 Dimensions

Figure 7-1 shows the Cell Wash enclosure dimensions and mounting hole positions. To mount the Cell Wash unit, use the mounting holes on the rear flanges of the enclosure.

Refer to the [RC22 User Guide](#) (880095) and [RDE300i User Guide](#) (880093) for dimensions relative to those specific products and their mounting options.

Note: Dimensions are approximate and may vary slightly due to material variations.

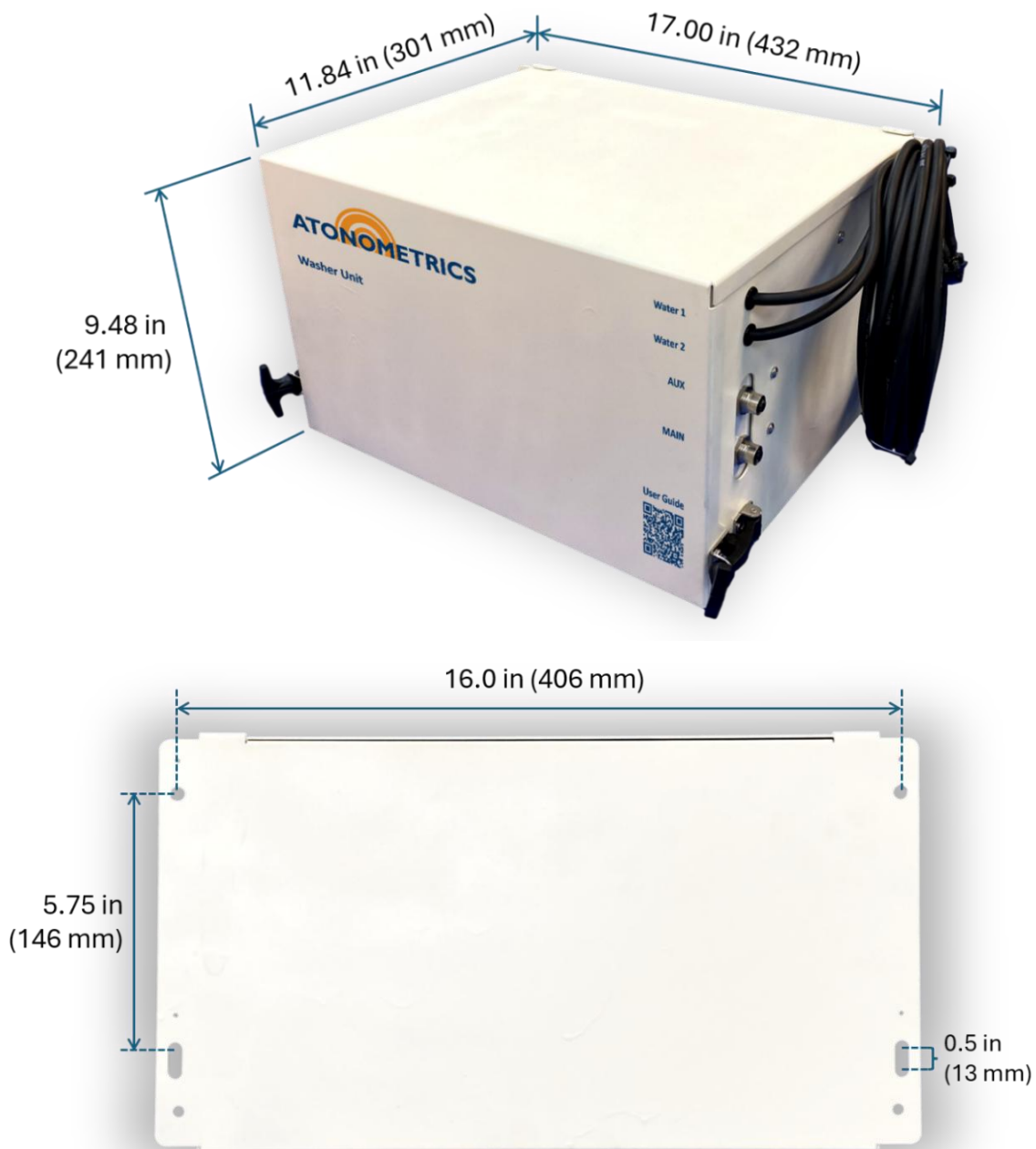


Figure 7-1: Dimensions and mounting hole spacing on rear flange

8 Wiring

Cell Wash requires 24-30 VDC and 2-6 W of power at its power input.

Typical power draw is <2 W but increases to 6 W for a few minutes after a wash.

Note that total power draw will be larger with longer cables because of cable resistance. Power supply voltage must be at least 24 VDC to account for cable voltage drops.

Power supplies should be sized for >2 times the required power to provide for startup currents.

Communication is via Modbus RTU protocol over RS485.

Both power and communication are applied to the Cell Wash unit at the M12 connectorized port labeled Main. A second M12 connectorized port labeled Aux provides power and communication to the RC22 network.

Cell Wash must be connected to the user's power and communication equipment. Use cable series 830303, which connects to the Main port and provides bare wires for connection to the user's equipment. This series uses 24 AWG conductors. See M12 power and communication cables listed in **Table 8-1**.

For cables ≥ 50 meters, place the 830331 RS485 termination accessory cable between the cable and the Cell Wash Main input as indicated in the table. **Figure 8-1** lists the wire colors for cable series 830303. Cable length to the Main input must not exceed 50 meters.

Connect the Clean Cell to the Aux port of the Cell Wash. If the system configuration uses one RC22, use cable 830284-004. If the system configuration uses multiple RC22s, the Y-cables 830314 and 830341 are used. For more information on device configurations, see Section 3 (Device Configurations).

For additional wiring and power information, including system diagrams and which cables are used per system configuration, see the [Soiling Products Ordering Guide](#) (880100).

Table 8-1: M12 Power and Communication Cables

Length	Main to User's Power & RS485 (M12 5-pin / Bare Wire)	Minimum Power Supply Voltage	830331 RS485 Termination Required?
4 m	830303-004	24 VDC	No
10 m	830303-010	24 VDC	No
25 m	830303-025	24 VDC	No
50 m	830303-050	24 VDC	Yes

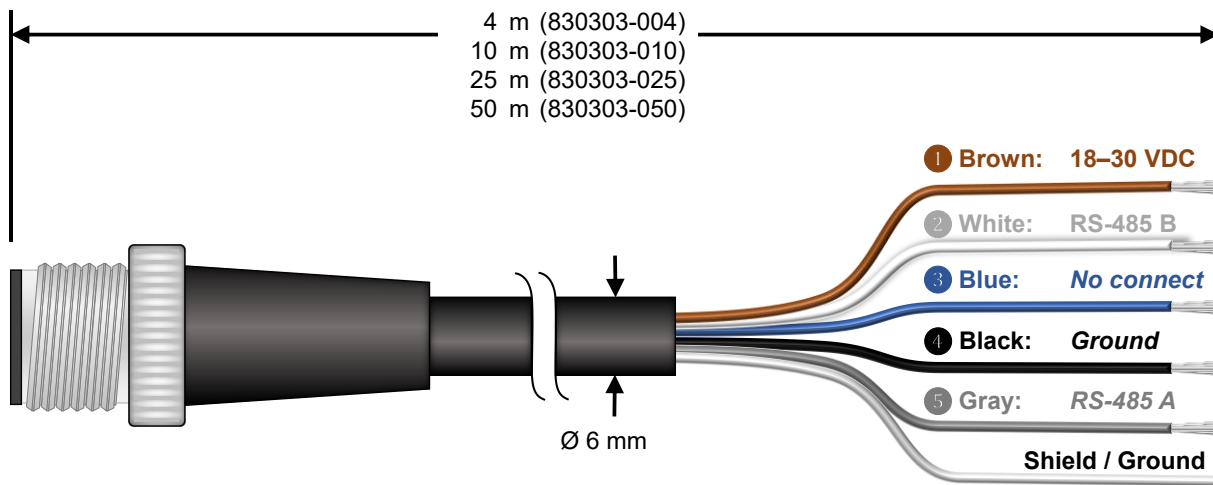


Figure 8-1: Wire colors for 830303 cables

Note: Use only Atonometrics-supplied cable assemblies. Although other components may appear to fit, use of non-approved components may result in water penetration.

Note: Connect the shield / ground wire of the 830303 cable to ground in your equipment cabinet.

Note: Cut the blue wire, which is not used in this product.

Note: For additional wiring and power information regarding systems configured to have RDE300i integrated with one or more additional Atonometrics sensors, see the Ordering Guide (880100).

WARNING: Check all wiring before turning on power. Incorrect wiring may damage the unit and/or other equipment.

9 Support

To check for Cell Wash Configuration Manager or Cell Wash Firmware software updates, use the software updates Check button on the Support tab, shown in **Figure 9-1**, or visit support.atonometrics.com. Keep your software up to date.

The Event Code Queue shown on the Support tab is useful for diagnosing any issues with your Cell Wash unit. Press the View button to observe the real-time event code. Press the Pause button on the Event Code Queue screen to freeze the currently displayed event codes. Event codes are displayed with respect to time from newest (position 1) to oldest (position 60). See **Figure 9-2** for an example screenshot.

If support is needed, send screenshots of the Configuration tab, the Event Code Queue window, and the Diagnostic Info window with your ticket. Sending these will help us resolve your issues more quickly.

Note: If internet is available, the software updates Check button will determine if there is newer Cell Wash software available. Otherwise, it will display a QR code that may be scanned with a cell phone to obtain Cell Wash software versioning information.

Note: As shown below, the Support tab also provides convenient links to the Atonometrics support website for obtaining product documentation and accessing our support portal.

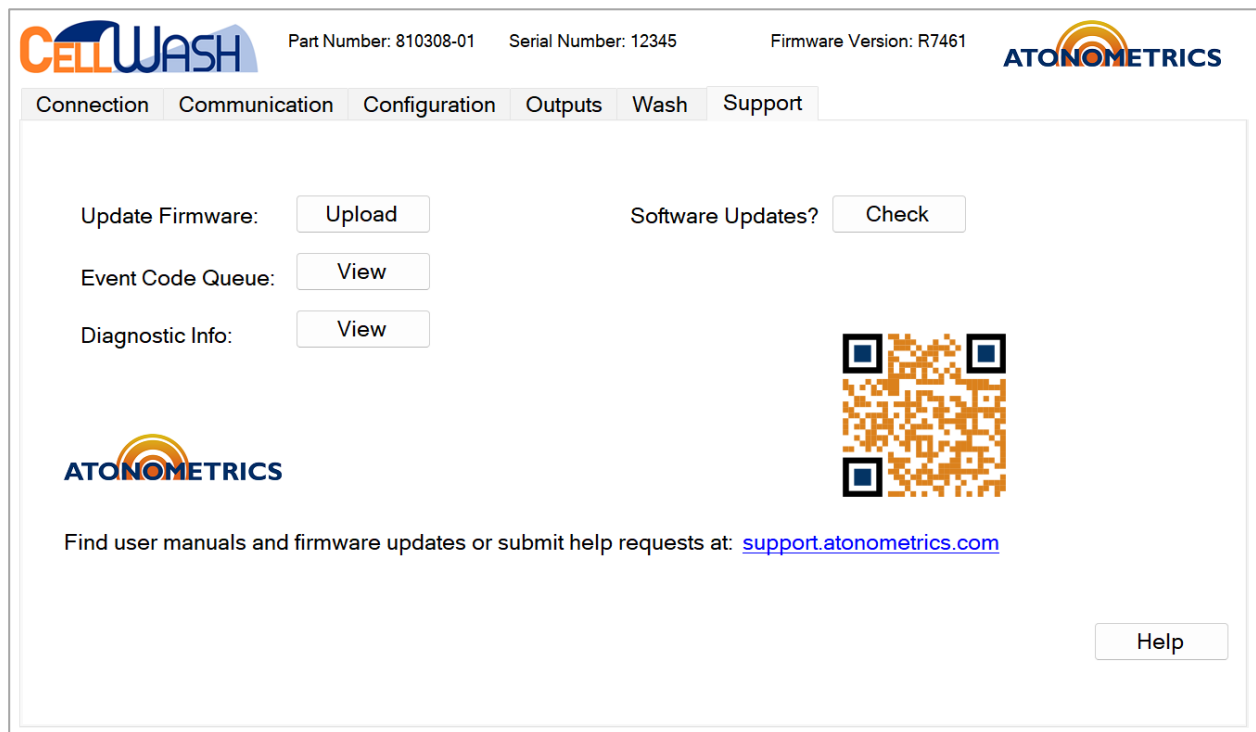


Figure 9-1: Support Tab

Table 9-1: Event Codes and Troubleshooting Actions

Event Code	Event Description	Troubleshooting Actions
0	No Event	No action needed.
1	Hardware Fault	Restart the unit.
2	AUX Network Fault	- Check cables to AUX network devices. - Check communication settings of AUX devices match requirements of System Configuration.
3	Battery Issue	- Check the battery and pump wiring are connected. - Restart the unit. - Check the battery voltage. - If the battery voltage is very low, check the age of the battery and replace if needed.
101	Pump Failed to Wash	- Check the Water Level to ensure there is water in the tank. - Check the temperature. Cell Wash does not wash while temperatures are freezing or slightly above freezing. - Check that the battery wiring and pump wiring are connected. - Provide suction at the end of the water tube to prime the pump
102	Water Level Low	- Add more distilled water to the water tank. - If there is water in the tank and it is higher than the water level sensor (found under the electronics enclosure), ensure it is pressed against the tank. Contact Atonometrics for support.
103	Temperature Too Low	No action needed. This is an alert that Cell Wash will not wash until the temperature is above freezing (as measured by the unit).
104	Equipment Testing Mode	Restart the unit.
Any Other	Software Event	- Ensure both Cell Wash Firmware and the Cell Wash Configuration Manager are up to date. - Newly added event codes will be defined in the Configuration Manager.

If support is needed, send screenshots of the Configuration tab, the Event Code Queue window, and the Diagnostic Info window with your ticket. This will help us resolve your issues more quickly. The Event Code Queue and Diagnostic Info window buttons can be found on the Support Tab of the Configuration Manager. Examples of these windows can be found in **Figure 9-2** and **Figure 9-3**.

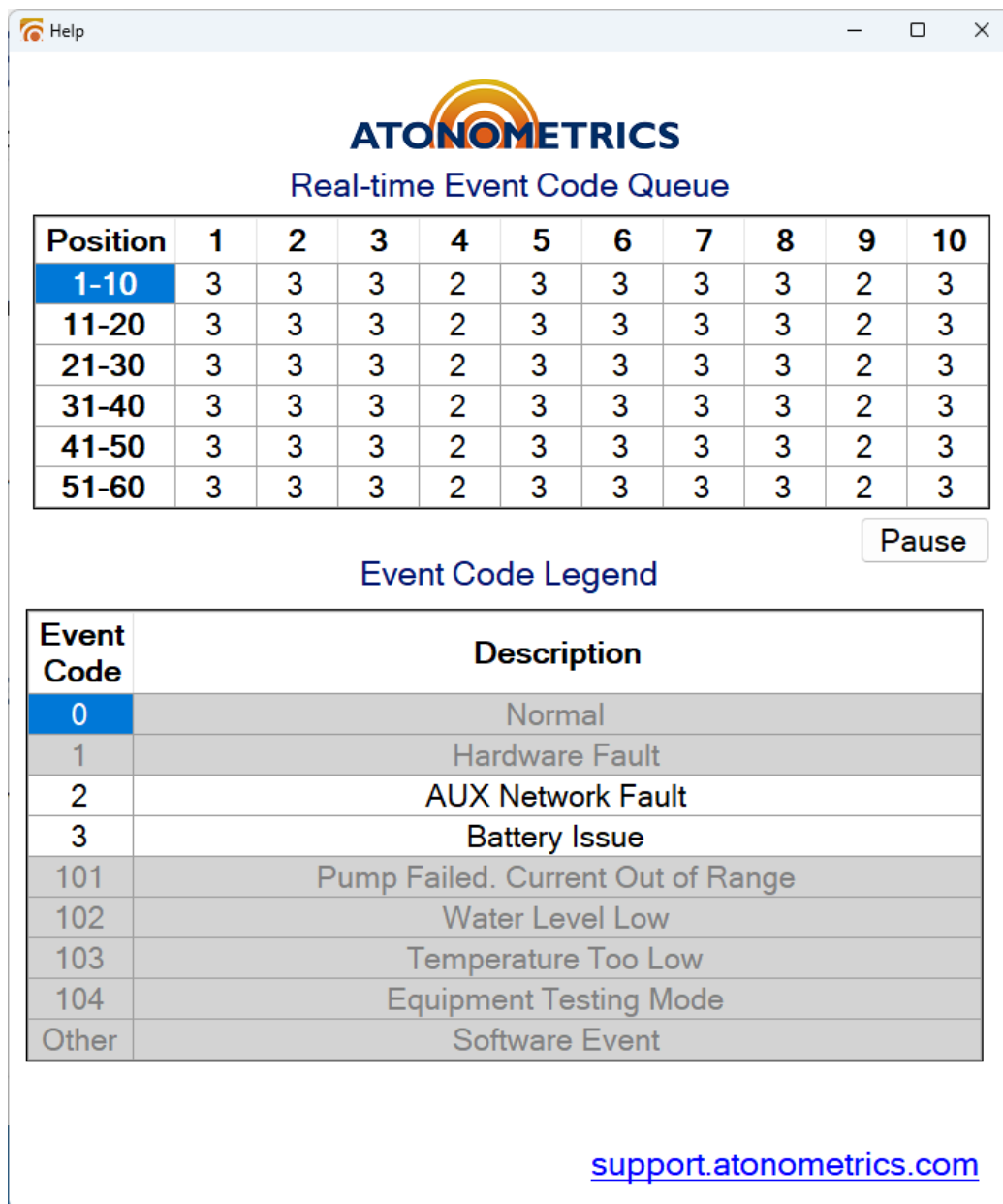


Figure 9-2: Event code queue showing Aux network fault and battery issue codes



Figure 9-3: Diagnostic Info window showing symptoms of a disconnected battery and disconnected Aux cable

10 Modbus Registers

Cell Wash supplies data outputs using Modbus RTU protocol. For detailed information on Modbus protocols, please refer to the specifications published by Modbus.org.

All parameters are returned as single-precision 32-bit floating point per IEEE 754, requiring four bytes. Modbus defines a register as a two-byte value. Therefore, each parameter occupies two successive registers. Bytes are returned big-endian: bytes *ABCD* are ordered from most to least significant, and the first register in a pair returns bytes *AB* while the second returns *CD*.

Note: On some user data acquisition devices, it is necessary to add 1 to all the register values.

Note: Recommended rates: scan period ≥ 1 s, timeout ≥ 500 ms, delay between polls ≥ 30 ms.

Table 10-1 lists the registers available for your client software to read data from Cell Wash.

Note that for configurations R1, R2, soiling ratio and normalization is handled in the scope of the RDE300i. No Modbus registers will be read directly from the Cell Wash unit.

For systems including an RDE300i unit, all data will be aggregated in the RDE300i. See the [RDE300i User Guide](#) (880093) for Modbus register information.

See Section 3 (Device Configurations) for more details about system configurations.

Table 10-1: Cell Wash Modbus Registers

Parameter	Reg. Start	Count	Data Type	Units	Notes
Status	1001	2	Float		0 = Normal; 1 = Warning; 2 = Error. If status is not 0, check the Event Code for more information.
Event Code	1003	2	Float		The latest Event Code in the Event Code queue. The configuration manager shows the entire queue of recent codes. See Table 9-1 for more Event Code definitions.
<i>Reserved</i>	...	...	...		<i>Not in use. Returns NaN</i>
Water Level Low	1013	2	Float		1 indicates water is low and needs refill with distilled water.
PCB Temperature	1015	2	Float	°C	Temperature is measured by Cell Wash to avoid washing while water is frozen.
Number of RC22s	1017	2	Float		This number is determined by the system configuration.
Clean RC22 (Address 22) Irradiance	1019	2	Float	W/m ²	Instantaneous measurements from RC22 at address 22. The unit at address 22 is assumed to be the clean unit, per system definition.
Clean RC22 (Address 22) Temperature	1021	2	Float	°C	
Soiled RC22 (Address 25) Irradiance	1023	2	Float	W/m ²	Only used for system configurations with more than 1 RC22. Instantaneous measurements from RC22 at address 25. The unit at address 25 is assumed to be the soiled unit, per system definition.
Soiled RC22 (Address 25) Temperature	1025	2	Float	°C	
<i>Reserved</i>	...	...	...		<i>Not in use. Returns 0.</i>
Time Since Last Washed	1035	2	Float	seconds	The time in seconds since the last successful wash of the clean cell.
<i>Reserved</i>	...	...	...		<i>Not in use. Returns 0.</i>
Real-Time Soiling Ratio	1039	2	Float		10 second average Soiling Ratio (Performance Index) output of Cell Wash for the RC22s.
10min Avg Soiling Ratio	1041	2	Float		The average Soiling Ratio over the last 10 minutes of data.
24-hr Avg Soiling Ratio	1043	2	Float		The Soiling Ratio average of the last 24 hours of Cell Wash data. This is the effective daily Soiling Ratio for monofacial systems.