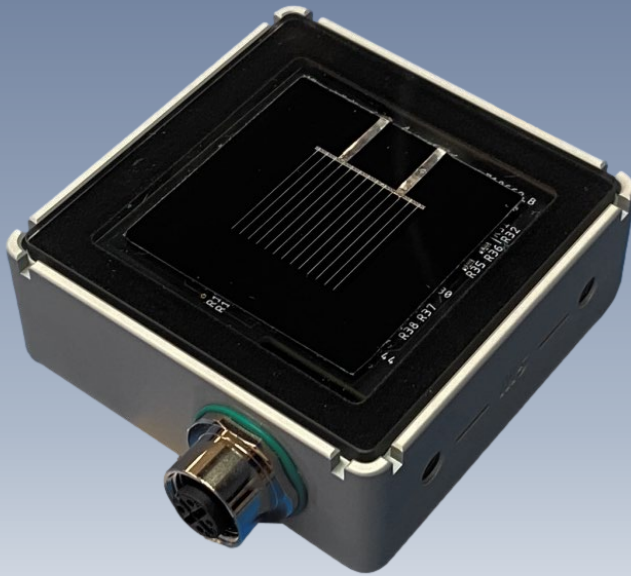


Application Note

Testing Modbus Communication on RC22

Modbus RTU (RS485)



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1 Overview

This application note provides a guide on testing your RC22™ to verify Modbus communication using simple PC-based Modbus software. The instructions are intended to help you confirm proper Modbus communication settings prior to setting up communication to your own datalogger or SCADA system. These steps are optional and are provided for those who wish to verify communication using third-party software in addition to using the Atonometrics-provided RC22 Configuration Manager.

To follow instructions in this guide, you will need:

- RC22 unit
- Configuration Kit for RC22 (PN 810235-01 or 810276)
- PC with USB port
- [RC22 Configuration Manager](#) software from Atonometrics (PN 500099)
- [Modbus Poll](#) software from Witte Software

2 Check Unit with Configuration Manager

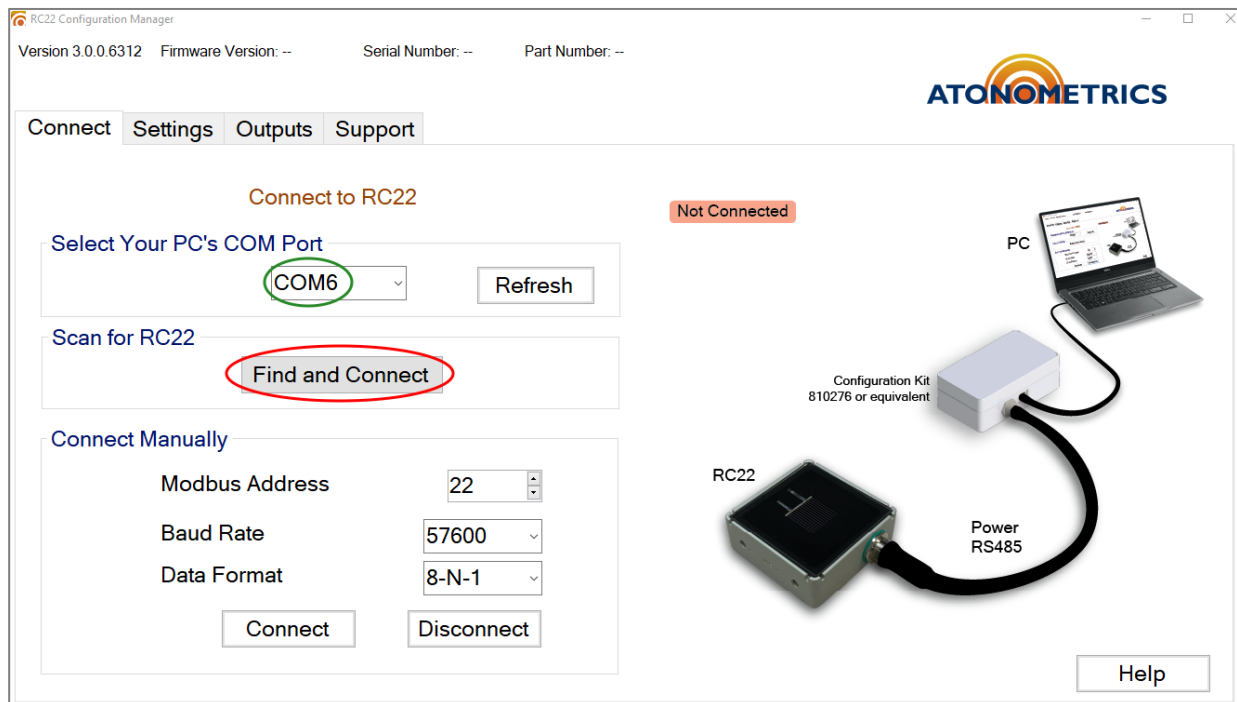
2.1 Hooking Up Your RC22

Before testing your RC22™ with the third-party Modbus Poll software, we will connect to it using the Atonometrics [RC22 Configuration Manager](#) to confirm the device is working and ensure all communication settings are known.

Connect the RC22 to your PC through a USB port using the Configuration Kit described in the [RC22 User Guide](#). See the section titled “Configuration” and follow the instructions there.

2.2 Check RC22 Communication Parameters

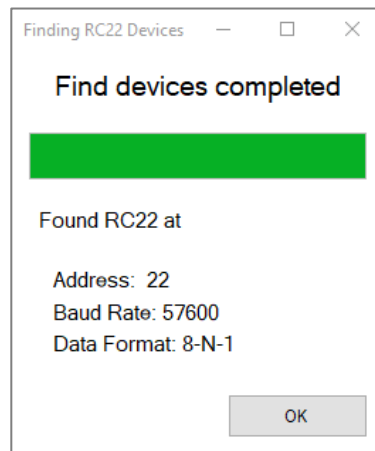
Following the instructions from the RC22 User Guide, open the RC22 Configuration Manager. Select the COM port that your RC22 is plugged into, and press “Find and Connect”:



Note: Your computer may have multiple COM ports. If you are unsure which one is connected to the RC22, try disconnecting the Configuration Kit, checking the COM ports list, then reconnecting the configuration kit and checking the COM ports list again.

Note: RC22 units are shipped from Atonometrics with a default Modbus Address and Data Format. The default address of 22 is shown when the Configuration Manager starts. When using the Find button, the software will detect the RC22 at its actual address and communication settings.

Once the RC22 is found, note its Address, Baud Rate, and Data format which appear on the Find dialogue:



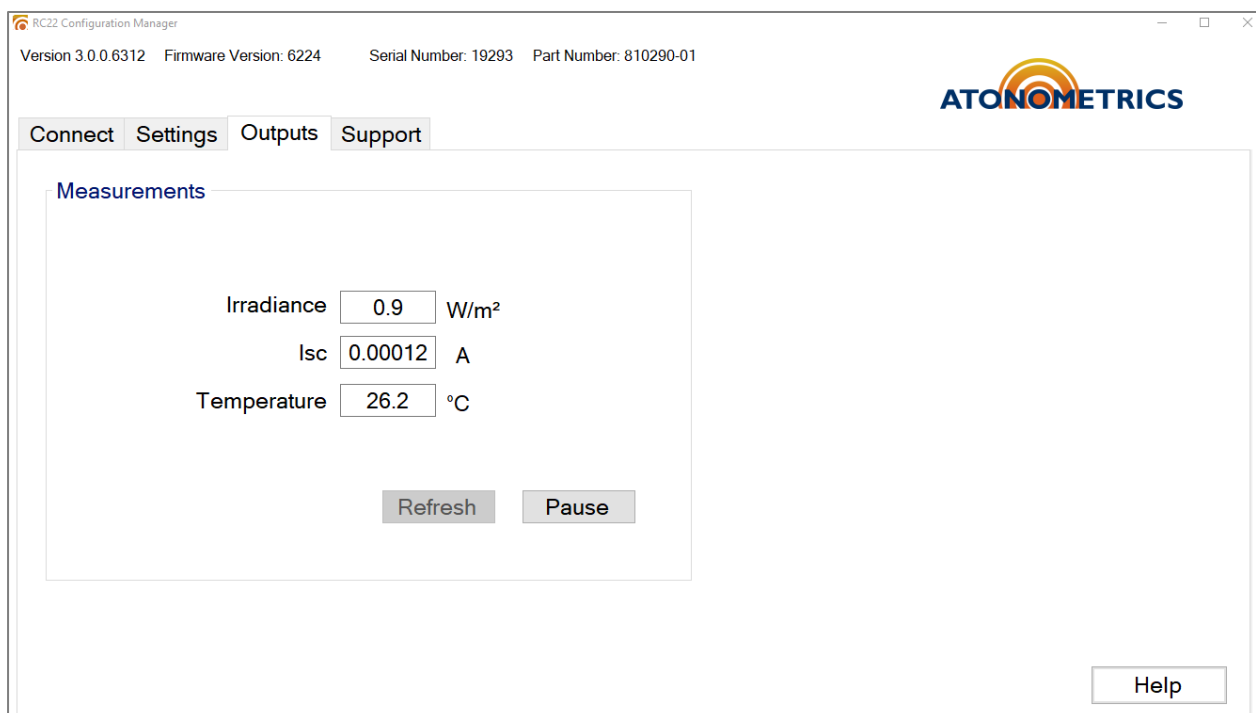
Click “OK.”

Verify that RC22 is working properly by navigating to the Outputs tab.

The following parameters should contain numerical values (not “NaN”):

- Irradiance
- Isc
- Temperature

The values should be updating about every 2 seconds. In an office environment, irradiance will be very low, likely less than 1 W/m².



3 Check Unit with Third-Party Software

3.1 Get Modbus Poll

Several third-party tools are available for testing Modbus communication via a PC. This document describes using Modbus Poll software. You could also adapt these instructions to use other third-party software. Follow this [link](#) to download Modbus Poll, and install the software on your PC.

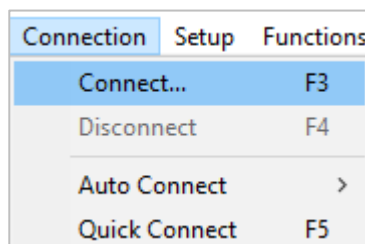
3.2 Testing with Modbus Poll

If it still open, close the RC22 Configuration Manager.

Note: You can only have one application connected to the RC22 at a time.

Open Modbus Poll.

From the Connection menu, press “Connect:”



There may be a registration dialog that you need to dismiss if you have a free trial license.

Choose “Serial Port” from the Connection menu, and the port labeled “USB Serial Port” from the Serial Settings menu. In the example shown below, the port is COM6. The port will likely be different on your PC.

Enter the Baud Rate, Data Bits, Stop Bits, and Parity Bits noted from earlier with the RC22 Configuration Manager.

Enter the Response Timeout and Delay Between Polls field. 250ms and 30ms are recommended for the Response Timeout and Delay Between Polls fields, respectively.

Press “OK.”

Connection Setup

Connection: Serial Port

Serial Settings: USB Serial Port (COM6)

57600 Baud, Custom Baud Rate: 9600

8 Data bits, None Parity, 1 Stop Bit

Mode: ☒ RTU, ☐ ASCII

Response Timeout: 250 [ms]

Delay Between Polls: 30 [ms]

Advanced...

Remote Modbus Server

IP Address or Node Name: 127.0.0.1

Server Port: 502, Connect Timeout: 3000 [ms]

☒ IPv4, ☐ IPv6

From the Setup menu, press “Read/Write Definition:”

Setup	Functions	Display	View	Window
Read/Write Definition...				F8
Read/Write Once				F6
Read/Write Disabled				Shift+F6
Excel Log...				Alt+X
Excel Logging Off				Alt+Q
Log...				Alt+L
Logging Off				Alt+O
Reset Counters				F12
Reset All Counters				Shift+F12
Use as Default				

In the Slave ID field, input the address noted after pressing “Find” in the RC22 Configuration Manager.

The “Modbus” section of the [RC22 User Guide](#) lists the available registers in table form. In this example, an array of all the registers will be read starting at the Irradiance register (1) and ending at the PV Temperature register (5).

The User Guide lists that these 3 registers are all floats (1 float = 4 bytes = 2 registers) so we will type in 6 to the “Quantity” field.

Type in the desired scan rate to the “Scan Rate” field. A 1000ms scan rate is recommended.

Note: Ensure that the “PLC Addresses (Base 1)” checkbox is not checked. If this box is checked, you must add 1 to all the register addresses in the RC22 User Guide.

Note: Watch for similar settings or unlisted defaults in other software packages.

Read/Write Definition

Slave ID: 22 OK

Function: 03 Read Holding Registers (4x) Cancel

Address mode
☒ Dec ☐ Hex

Address: 1 PLC address = 40002

Quantity: 6

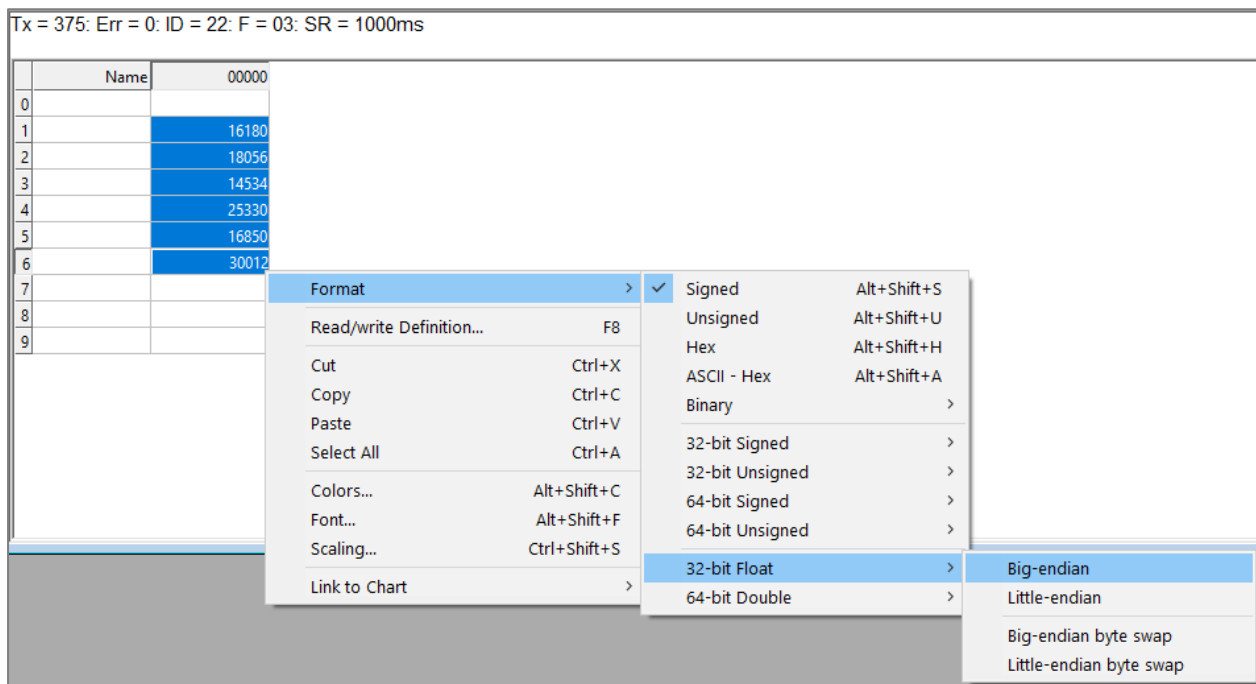
Scan Rate: 1000 [ms] Apply

Disable
☐ Read/Write Disabled
☐ Disable on error Read/Write Once

View
Rows
☒ 10 ☐ 20 ☐ 50 ☐ 100 ☐ Fit to Quantity
☐ Hide Name Columns ☐ PLC Addresses (Base 1)
☐ Address in Cell ☐ Enron/Daniel Mode

Request
RTU
16 03 00 01 00 06 97 2F
ASCII
3A 31 36 30 33 30 30 31 30 30 30 36 45 30 0D 0A

Now we need to change the data format. According to the “Register Tables” section of the [RC22 User Guide](#), these registers are 32-bit floats with most significant bytes first. Therefore, in Modbus Poll select the cells with the data, and from the Display menu, select 32 Bit Float and Big-endian:



Register names must be typed in manually.

Here, we can see the value of irradiance, short circuit current, and PV temperature, respectively. In an office setting, the irradiance will be very low, likely less than 1.

Tx = 616: Err = 0: ID = 22: F = 03: SR = 1000ms

	Name	Value
0		00000
1	Irradiance (W/m2)	0.8609219
2		--
3	Isc (A)	0.0001156445
4		--
5	PV Temp (C)	26.19637
6		--
7		
8		
9		

4 Troubleshooting

- If the RC22 Configuration Manager is not working as expected, make sure to review the [RC22 User Guide](#) for setup info.
- If the device cannot be found by the RC22 Configuration Manager, check your COM port and check all wiring of the configuration kit.
- If an error is thrown when attempting to poll the task in Modbus Poll, make sure to review the RC22 Configuration Manager for the correct communication parameters (COM serial port, Baud Rate, Data Format, and Address).
- If either the RC22 Configuration Manager or Modbus Poll are not able to connect to the RC22, make sure that the other software package is closed. Only one application may query the sensor at a time.
- If the data value is incorrect or does not match your expectations, check the byte order for data conversion. Also, check the register address for the quantity you are querying against the addresses in the RC22 User Guide.
- Remember that for some Modbus client software it is necessary to add 1 to the register addresses listed in the RC22 User Guide, due to differences in Modbus standards. For Modbus Poll, this can be controlled by the PLC Addresses checkbox mentioned above.