



BRTSYS_AN_080

Modbus Configuration Utility User Guide [Release Ver.1.3.0]

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1 Introduction

Modbus Configuration Utility facilitates the configuration of Modbus devices through a COM port connection to a PC. The utility can scan all Modbus devices connected through the COM port and display comprehensive information for each detected device. The utility allows users to configure individual device settings, including address, baud rate, and parity, for each connected Modbus device.

In addition to configuration, the utility supports firmware updates, device control operations, and real-time data reading from connected Modbus devices. It also offers calibration functionality for devices equipped with calibration features. The utility is designed to support and manage all Modbus-compatible devices produced by BRT Systems.

In this version, the utility has been extended to include support for **Long Range Wide Area Network (LoRaWAN)** Node configuration, namely, LoRaWAN RAKWireless Modbus Bridge RAK7431. This configuration is necessary to prepare the bridge to work with the BRTSYS IoTPortal.

1.1 What's New in Version 1.3.0?

- ❖ Support for LoRaWAN RAKWireless Modbus Bridge RAK7431
- ❖ The following BRTSys Modbus Sensors and Controllers are supported over LoRaWAN:
 1. 4in1 Sensor (PIR, Ambient Light, Temperature & Humidity)
 2. CO2 Multi-Sensor (Ambient Light, Temperature & Humidity)
 3. Gas and TrueVOC Sensor
 4. Thermocouple Sensor Adapter
 5. 2CH Relay,
 6. 2CH Relay+iSENSE,
 7. 2CH NL Relay and
 8. 2CH NL Relay+iSENSE
 9. 4CH Solid State Relay

1.2 Known Issues & Limitations

None. Please report any issues or feedback to support@brtsys.com.

2 Hardware Setup Pre-requisites

The following components are required:

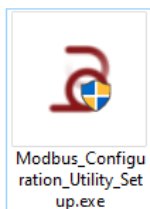
- Windows based PC
- USB Type A to RS485 cable or board
- Interface between RS485 and Modbus Devices (BRTSys Modbus devices come in 2 connector versions, namely RJ11 and JST)

For more information on hardware setup, refer to [Modbus Device Configuration application note](#).

3 Installing Modbus Configuration Utility

Following are the steps to install Modbus Configuration Utility for the **first time** –

1. Download the installation package from BRTSys Website –
<https://brtsys.com/resources/software/brtsys-utility-tools>
2. Extract the Zip file and run the **Setup** (.exe) file provided with the installation package.



3. A Welcome message appears along with Modbus Configuration Utility Installer Wizard. Click **[Next]**.

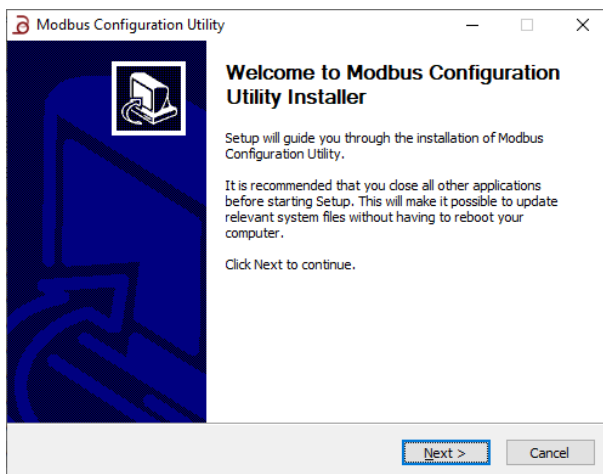


Figure 1 - Setup Wizard – Welcome Screen

4. Select or edit the Start Menu Folder Name. Click **[Next]**.

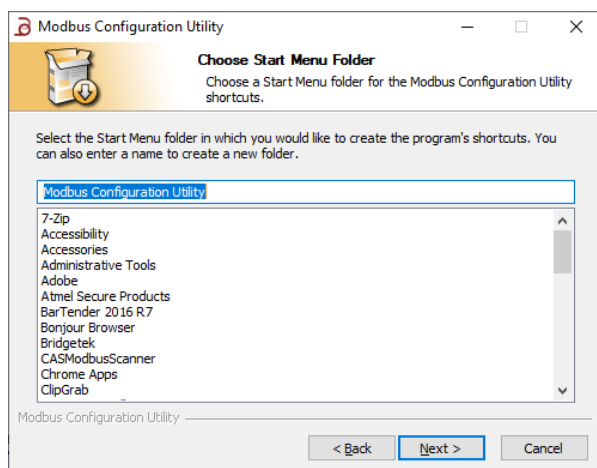


Figure 2 - Setup Wizard – Start Menu Folder Selection



NOTE:

At any point of time, during the installation, users may click [Back] to navigate to the previous window or click [Cancel] to abort the installation process.

5. Select a "Destination Folder" for installing the files. Accept the default folder or click [Browse] to specify a different location. Click [Install] to start the installation.

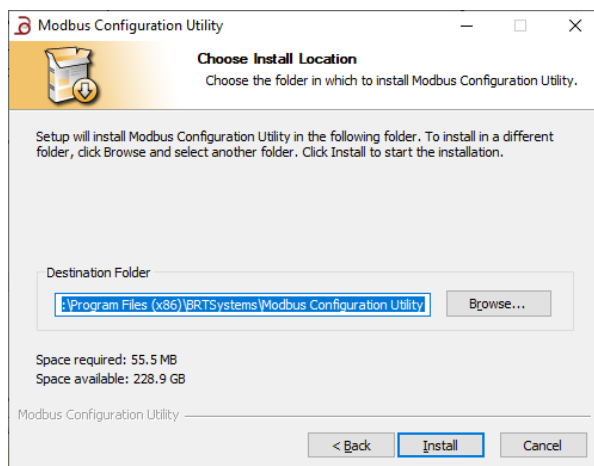


Figure 3 - Setup Wizard – Installation Location Selection

6. A progress bar indicates that the installation is in progress. It will request to install Microsoft.WindowsDesktop.App (runtime 9.0.2 is shown for illustration purpose), click [OK] to continue.

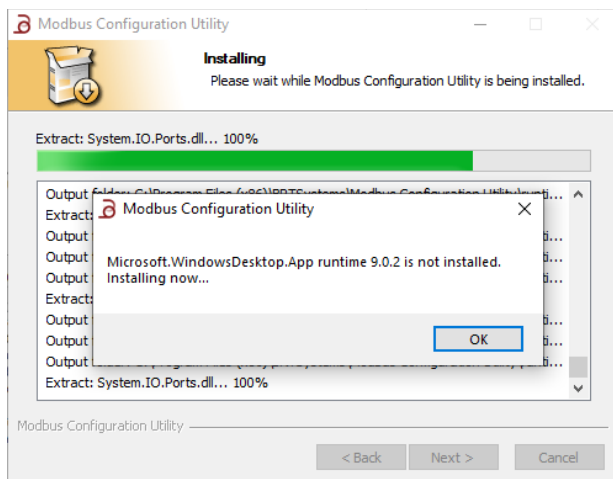


Figure 4 - Setup Wizard – Installation Progress

7. Upon successful installation, click [**Finish**] to close the setup. Select the check box to run the utility (optional).

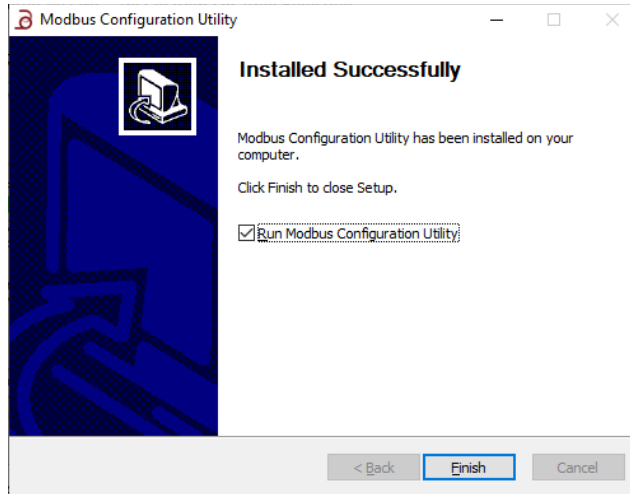


Figure 5 - Setup Wizard – Installation Complete



NOTE:

Ensure that Microsoft .NET 9.0 Desktop Runtime (v9.0.0) is installed.

8. By default, the Modbus Configuration Utility is installed in this path – “\Program Files (x86)\BRTSystems\Modbus Configuration Utility.”

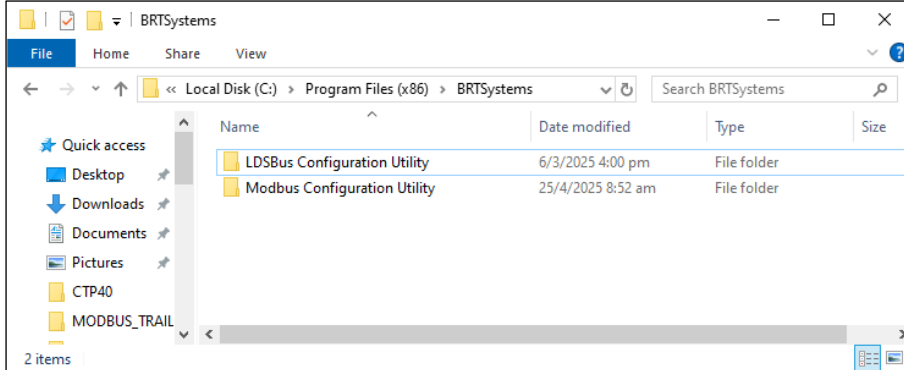


Figure 6 - Modbus Configuration Utility Installation Folder location

9. Logging Modbus device functionality records data in both **CSV** and **TXT** formats in default folder.

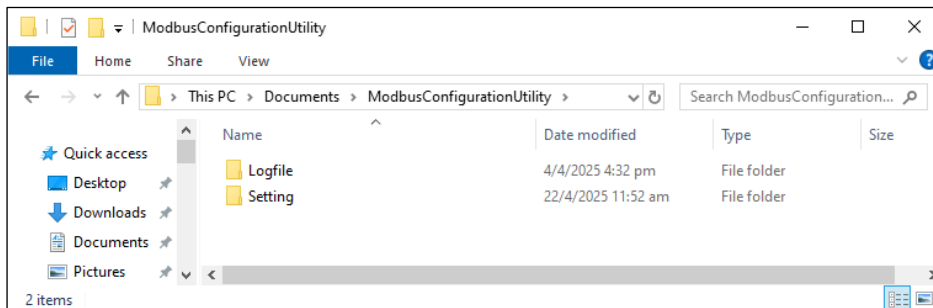


Figure 7 - Modbus Default Datalog Folder Location



NOTE:

To install an updated version of Modbus Configuration Utility, download the installation package from <https://brtsys.com/resources/software/brtsys-utility-tools> and run the setup.exe file. An uninstaller will run and remove the previous package and information from the system. *First-time installation will not show the uninstaller.* Refer to Section [3](#) for the installation steps.

4 Launch Modbus Configuration Utility

By default, the Modbus Configuration Utility is installed in this path - "*\Program Files (x86)\BRTSystems\Modbus Configuration Utility.*" Launch the Utility using the desktop shortcut or Windows search bar.

Upon launching the Modbus Configuration Utility, the landing page displays two main configuration options:

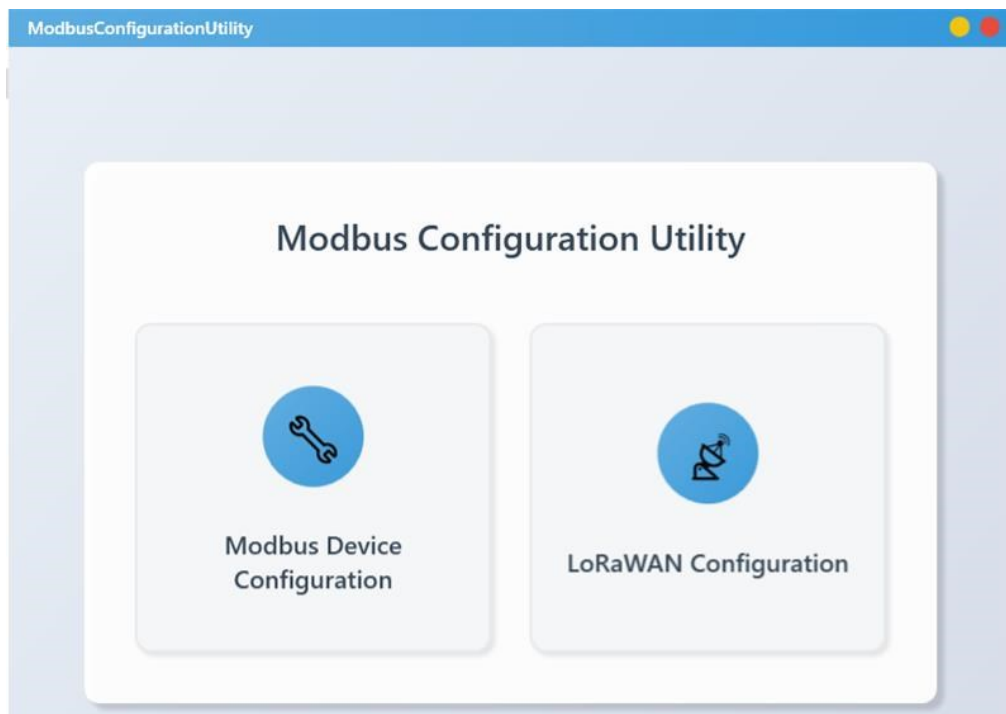


Figure 8 - Modbus Configuration Utility - Configuration Options

Modbus Device Configuration

- Allows users to configure Modbus devices.
- Supports setting up communication parameters, device addresses, and other Modbus-specific settings.

LoRaWAN Configuration

- Used to configure LoRaWAN nodes.
- Enables setup of network parameters, activation methods, security keys, and data transmission settings.
- Provides the ability to add and manage Modbus devices under LoRaWAN Node.

This landing page serves as the starting point for managing and configuring both Modbus and LoRaWAN-based devices efficiently.

Click on **Modbus Device Configuration** to configure Modbus devices. Refer to [Section 5](#) for more information.

Click on **LoRaWAN Configuration** to configure LoRaWAN devices. Refer to [Section 7](#) for more information.

5 Modbus Device Configuration

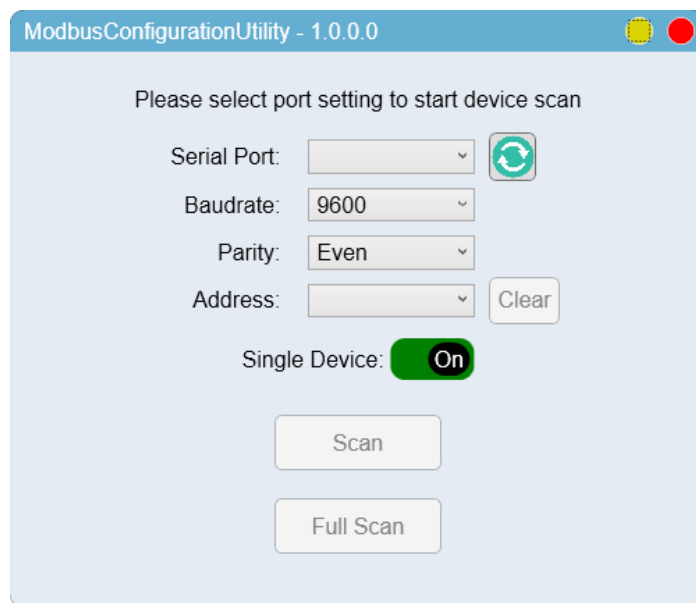



Figure 9 - Modbus Device Configuration Startup Window

5.1 Startup Window

Upon launching the application, the startup window (refer to **Figure 9 - Modbus**) requires users to configure basic communication settings before initiating a scan for devices on the communication bus.

- **Serial Port:** Allows the user to select the appropriate COM port.  button can be used to rescan and update the list of available COM ports.
- **Baud Rate:** Enables the user to configure the communication speed. For more information about the supported baud rates, refer to the Modbus Registers section in the respective device datasheets. The default baud rate for newly manufactured devices is set to 9600 bps.
- **Parity:** Allows the user to select the parity mode for communication. Supported values include *None*, *Odd*, and *Even*. By default, newly manufactured devices are configured with *Even* parity.
- **Address:** Enables the user to specify the device address when only one device is connected to the communication bus. The valid address range is from 1 to 126, with new devices defaulting to address 126. For multiple devices, leave the Address settings empty and toggle the **[Single Device]** option to **Off**.
- **Single Device Toggle Button:** Determines whether the scan should assume a single device or multiple devices are connected to the bus. When enabled and multiple devices are present, the scan process will terminate after the first device is detected. The default state is **On** upon application startup.
- **Scan Button:** Click the **[Scan]** button to initiate the scanning process and detect devices connected to the communication bus.
- **Full Scan Button:** Click the **[Full Scan]** button to search through all possible combinations of **baud rate**, **parity**, and **device address**. This feature is ideal for locating devices with unknown or misconfigured communication settings.

5.2 Device Setting Window

For illustration purpose, the procedure for scanning single device is given here.

Click the **[Scan]** button to initiate the device scanning process as outlined below:

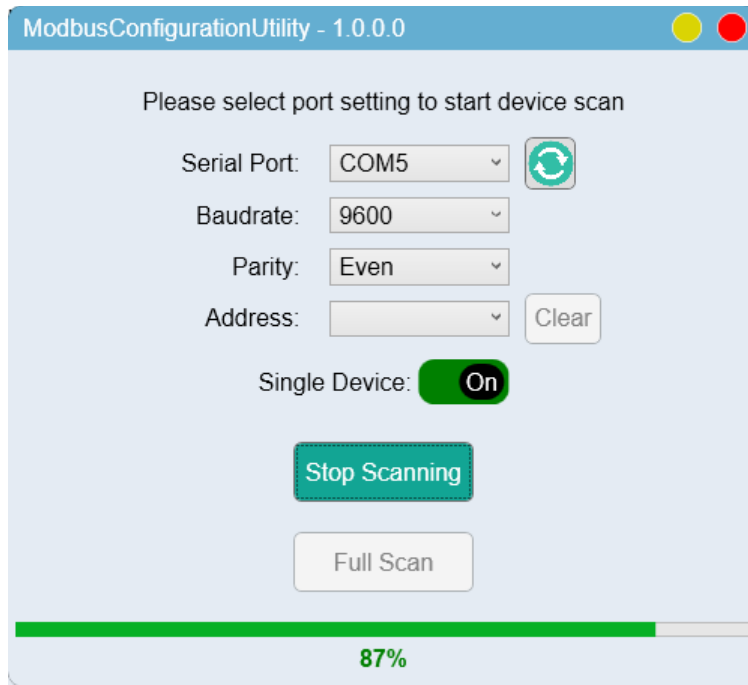


Figure 10 - Modbus Configuration Utility Scan Process

Upon completion of the scan, a message box appears indicating the number of devices detected. If a single device is found, its address will be displayed in the message as well.



Figure 11 - Modbus Configuration Utility After Scan Message

Note 1: Upon disabling the **Single Device** option (i.e. Setting Single Device – Off), all the devices in the bus are discovered. If the Single Device option is enabled (i.e. Setting Single Device – On), only the very first device in the bus will be discovered.

Note 2: **Full Scan** feature will search through all possible combinations of **baud rate, parity, and device address**. This feature is ideal for locating devices with unknown or misconfigured communication settings.

Once devices are detected and **[Ok]** is clicked, the Device Configuration window will be displayed, as shown in Figure 12. This interface allows users to view device information and modify communication and operational parameters.

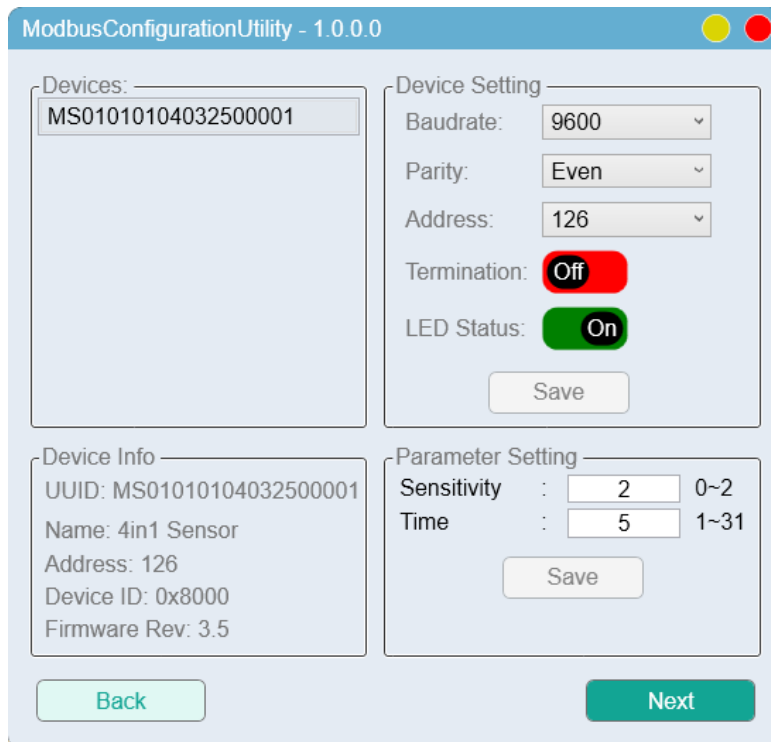


Figure 12 - Device Configuration Window

Devices List

- Displays the UUIDs of all detected devices.
- Selecting a device from the list populates the corresponding fields in the **Device Setting**, **Device Info**, and **Parameter Setting** sections.

Device Setting

- **Baudrate:** Dropdown menu to select the communication speed (e.g., 9600 bps).
- **Parity:** Dropdown to choose between *None*, *Odd*, or *Even*.
- **Address:** Allows setting a new Modbus address (1–126).
- **Termination:** Toggle button to enable or disable bus termination.
 - **Red (Off)** indicates termination is disabled.
 - **Green (On)** indicates termination is enabled.
- **LED Status:** Toggle to turn the device’s LED indicator On or Off.

- **Red (Off)** indicates LED is disabled.
- **Green (On)** indicates LED is enabled.
- **[Save]**: Saves the above settings to the selected device.

Device Info

- **UUID**: Unique identifier of the device.
- **Name**: Product name or type (e.g., *4in1 Sensor*).
- **Address**: Current Modbus address.
- **Device ID**: Internal device identifier (e.g., *0x8000*).
- **Firmware Rev.:** Firmware version (e.g., *3.5*).

Parameter Setting [Device Specific Feature]

- **Sensitivity**: Adjustable value in the range **0–2**.
- **Time**: Adjustable value in the range **1–31**.
- **[Save]**: Applies the parameter settings to the device.

Navigation Buttons

- **[Back]**: Returns to the previous screen.
- **[Next]**: Proceeds to the next step in the utility.

5.3 Sensor Reading Display Window

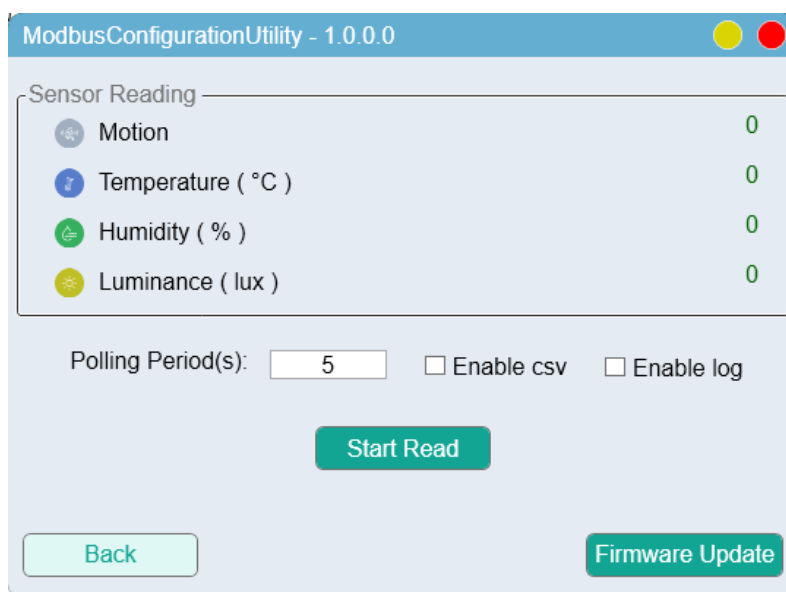


Figure 13 - Sensor Reading Display Window

After device configuration, users can navigate to the **Sensor Reading Display Window** to monitor live sensor data and configure data logging preferences. This feature is available **only for devices equipped with sensor functionalities**.

For devices that support control operations instead of sensor readings, the utility will automatically navigate to their **respective control interfaces** tailored for those device functions.

Sensor Reading Panel

Displays real-time values from the connected device (e.g., *4in1 Sensor*):

- **Motion**: Indicates motion detection status (0 = no motion, 1 = motion detected).
- **Temperature (°C)**: Current ambient temperature.
- **Humidity (%)**: Relative humidity reading.
- **Luminance (lux)**: Current light intensity in lux.

Polling Period

- **Polling Period (s)**: Specifies the interval (in seconds) at which the sensor values are refreshed.
(Default: 5 seconds)

Data Logging Options

- **Enable CSV**: When checked, sensor data will be saved in CSV format for further analysis.
- **Enable Log**: When checked, enables logging of sensor data into a text-based log file.

Control Buttons

- **Start Read**: Begins reading and displaying real-time sensor values based on the specified polling period.
- **Back**: Returns to the previous screen.
- **Firmware Update**: Opens the firmware upgrade interface for the connected device.

5.4 Firmware Update

To update the device firmware, click the **[Firmware Update]** button. A file browser window will appear, prompting the user to select the appropriate .unv firmware file. Select the correct .unv file to proceed with the firmware update process.

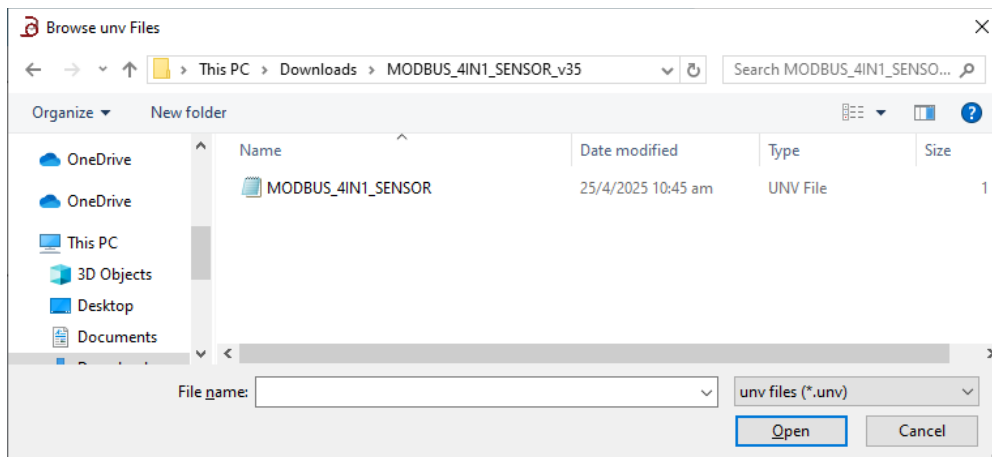


Figure 14 - Firmware Update File Browser Window

Firmware Update in Progress

Once a valid .unv firmware file is selected, the firmware update process begins. During the update:

- The **progress bar** at the bottom visually indicates the current status of the update.
- The **percentage** is displayed in real-time to inform the user of the update progress.
- All interaction buttons such as **Start Read**, **Firmware Update**, and **Back** are **disabled** to prevent accidental interruption.



Do not disconnect the device or close the utility during the firmware update process. After the update reaches 100%, a confirmation message will be displayed to indicate successful completion.

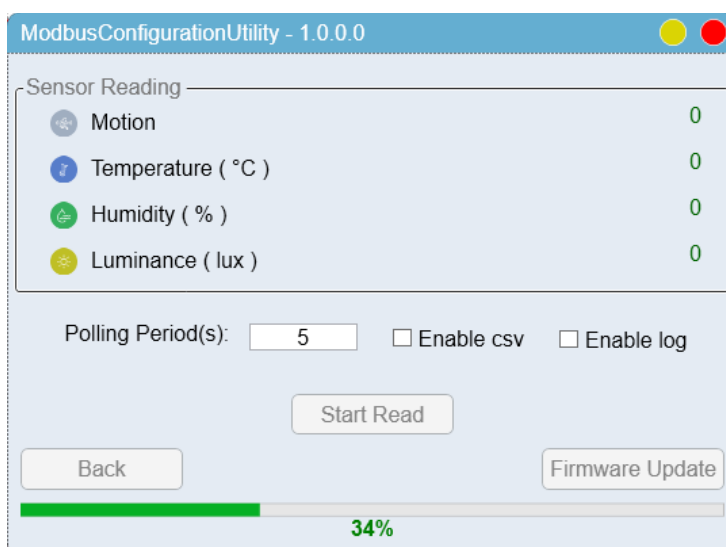


Figure 15 - Firmware Update Progress

Upon completion of the firmware update, a popup message will be displayed to indicate whether the update was successful or unsuccessful.

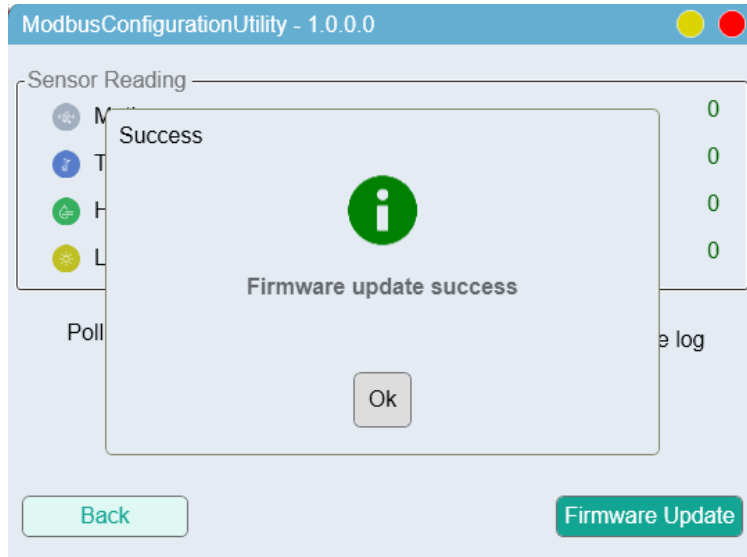


Figure 16 - Firmware update success popup message

5.5 Modbus 2CH Relay Configuration Window



Figure 17 - Modbus 2CH Relay Control Window

Modbus 2CH Relay Control Window allows users to configure the output behaviours for two relays: **Relay-1** and **Relay-2**. Each relay can be independently set for different output modes, timing parameters, polarity, and deactivation modes. The configuration supports applications such as timed control, pulse generation, or level-based switching.

Relay-1 Configuration Panel

- **Output Mode:**
Dropdown to choose how the relay behaves:
 - Level: Maintains output for a set duration.
 - Pulse: Output single in pulse mode
- **Polarity:**
Dropdown to set signal polarity:
 - Negative: Inverted output.
 - Positive: Normal output
- **Deactivation Mode (only available for Pulse Output Mode):**
Dropdown to select deactivation behaviour:
 - None: No special deactivation behaviour applied.
 - Immediate: Deactivation immediately
 - Deactivate immediately after T1 completion
 - Deactivate immediately after T2 completion
- **Timing and Cycle Parameters:**
 - **T1 (Secs):** Duration for first phase (default: 60).
 - **T2 (Secs):** Duration for second phase (default: 60).
 - **Cycles:** Number of repetitions (default: 1).
- **Relay State Display:**
 - Button to toggle relay control **ON/OFF**
- **Save Button:**
 - Saves the current configuration for Relay-1.

Relay-2 Configuration Panel

This panel is identical to the Relay-1 configuration panel, but it controls **Relay-2**. All settings and options mirror those of Relay-1.

Control Buttons

- **Back:** Returns the user to the previous screen.
- **Firmware Update:** Navigates to the firmware update section of the application. [Firmware Update](#)

User Actions

- Configure desired values for each relay:
 - Select appropriate Output Mode, Polarity, and Deactivation Mode.
 - Enter timing and cycle values.
- Click **Save** for each relay to apply and store the changes.
- Relay state will remain **Inactive** until activated based on configuration logic.
- Use **Back** to return or **Firmware Update** to update the firmware if needed.

Notes

- Ensure valid numeric input in timing and cycle fields.
- Configuration does not apply until **Save** is clicked.
- Relay activation will depend on device-specific triggers or external inputs.

5.6 Modbus 2CH Relay + iSENSE Control Window



Figure 18 - Modbus 2CH Relay + iSENSE Control Window

Modbus 2CH Relay + iSENSE Control Window allows users to configure the output behaviours for two relays: **Relay-1** and **Relay-2**. Each relay can be independently set for different output modes, timing parameters, polarity, and deactivation modes. The configuration supports applications such as timed control, pulse generation, or level-based switching.

Relay-1 Config Panel

- **Output Mode:**
Dropdown to choose how the relay behaves:
 - Level: Maintains output for a set duration.
 - Pulse: Output single in pulse mode
- **Polarity:**
Dropdown to set signal polarity:
 - Negative: Inverted output.
 - Positive: Normal output
- **Deactivation Mode(only available for Pulse Output Mode):**
Dropdown to select deactivation behaviour:
 - None: No special deactivation behaviour applied.
 - Immediate: Deactivation immediately
 - Deactivate immediately after T1 completion
 - Deactivate immediately after T2 completion
- **Timing and Cycle Parameters:**
 - **T1 (Secs)**: Duration for first phase (default: 60).
 - **T2 (Secs)**: Duration for second phase (default: 60).
 - **Cycles**: Number of repetitions (default: 1).
- **Relay State Display:**
 - Button to toggle relay control **ON/OFF**
- **Save Button:**

- Saves the current configuration for Relay-1.

Relay-2 Config Panel

This panel is identical to the Relay-1 configuration panel, but it controls **Relay-2**. All settings and options mirror those of Relay-1.

iSENSE Current Reading Panel

Displays real-time current readings from Relay 1 and Relay 2 connections.

- **Data Logging Options**
 - **Enable CSV:** When checked, sensor data will be saved in CSV format for further analysis.
 - **Enable Log:** When checked, enables logging of relay data into a text-based log file.

Control Buttons

- **Start Read:** Begins reading and displaying real-time relay's status based on the specified polling period.
- **Back:** Returns the user to the previous screen.
- **Firmware Update:** Navigates to the firmware update section of the application. [Firmware Update](#).

User Actions

- Configure desired values for each relay:
 - Select appropriate Output Mode, Polarity, and Deactivation Mode.
 - Enter timing and cycle values.
- Click **Save** for each relay to apply and store the changes.
- Relay state will remain **Inactive** until activated based on configuration logic.
- Use **Back** to return or **Firmware Update** to update the firmware if needed.

Notes

- Ensure valid numeric input in timing and cycle fields.
- Configuration does not apply until **Save** is clicked.
- Relay activation will depend on device-specific triggers or external inputs.

5.7 Modbus 4CH Solid State Relay Control Window



ModbusConfigurationUtility - 1.0.0.0

Temperature(°C): 23.75

Relay-1 Config

Output Mode: Level T1 (Secs): 60 T2 (Secs): 60

Deact Mode: None Cycles: 1

Relay State: Relay-1 Inactive Save

Relay-2 Config

Output Mode: Level T1 (Secs): 60 T2 (Secs): 60

Deact Mode: None Cycles: 1

Relay State: Relay-2 Inactive Save

Relay-3 Config

Output Mode: Level T1 (Secs): 60 T2 (Secs): 60

Deact Mode: None Cycles: 1

Relay State: Relay-3 Inactive Save

Relay-4 Config

Output Mode: Level T1 (Secs): 60 T2 (Secs): 60

Deact Mode: None Cycles: 1

Relay State: Relay-4 Inactive Save

Back Firmware Update

Figure 19 - Modbus 4CH Solid State Relay Control Window

Modbus 4CH Solid State Relay Control Window allows users to configure the output behaviours for four relays: **Relay-1, Relay-2, Relay-3 and Relay-4**. Each relay can be independently set for different output modes, timing parameters and deactivation modes. The configuration supports applications such as timed control, pulse generation, or level-based switching.

Temperature Reading Panel

- Read the board temperature and refresh every 10 seconds

Relay-1 Config Panel

- **Output Mode:**
Dropdown to choose how the relay behaves:
 - Level: Maintains output for a set duration.
 - Pulse: Output single in pulse mode

- **Deactivation Mode (only available for Pulse Output Mode):**
Dropdown to select deactivation behaviour:
 - None: No special deactivation behaviour applied.
 - Immediate: Deactivation immediately
 - Deactivate immediately after T1 completion
 - Deactivate immediately after T2 completion
- **Timing and Cycle Parameters:**
 - **T1 (Secs):** Duration for first phase (default: 60).
 - **T2 (Secs):** Duration for second phase (default: 60).
 - **Cycles:** Number of repetitions (default: 1).
- **Relay State Display:**
 - Button to toggle relay control **ON/OFF**
- **Save Button:**
 - Saves the current configuration for Relay-1.

Relay-2 Config Panel

This panel is identical to the Relay-1 configuration panel, but it controls **Relay-2**. All settings and options mirror those of Relay-1.

Relay-3 Config Panel

This panel is identical to the Relay-1 configuration panel, but it controls **Relay-3**. All settings and options mirror those of Relay-1.

Relay-4 Config Panel

This panel is identical to the Relay-1 configuration panel, but it controls **Relay-4**. All settings and options mirror those of Relay-1.

Control Buttons

- **Back:** Returns the user to the previous screen.
- **Firmware Update:** Navigates to the firmware update section of the application [Firmware Update](#)

User Actions

- Configure desired values for each relay:
 - Select appropriate Output Mode, Polarity, and Deactivation Mode.
 - Enter timing and cycle values.
- Click **Save** for each relay to apply and store the changes.
- Relay state will remain **Inactive** until activated based on configuration logic.
- Use **Back** to return or **Firmware Update** to update the firmware if needed.

Notes

- Ensure valid numeric input in timing and cycle fields.
- Configuration does not apply until **Save** is clicked.
- Relay activation will depend on device-specific triggers or external inputs.

5.8 Modbus Trailing Edge Dimmer Control Window

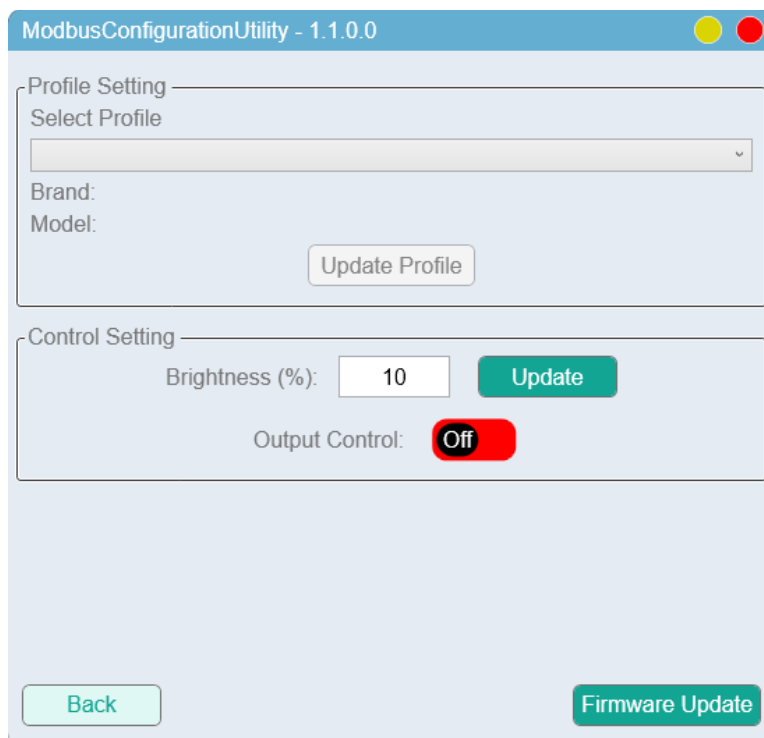


Figure 20 - Modbus Trailing Edge Dimmer Control Window

The Modbus Trailing Edge Dimmer Control Window allows users to configure the device profile, adjust brightness levels, control the output state and update the firmware.

Profile Setting Section

- **Select Profile Dropdown:** Allows you to choose a device profile.
- **Brand & Model Fields:** These are auto-filled based on the selected profile.
- **Update Profile Button:** Update selected profile to the connected device.

Control Setting Section

- **Brightness (%):** Allows you to enter a brightness level (in this case, it's set to 10) and update it.
- **Output Control:** Currently **Off** (displayed in a red button), toggles device output on or off.

Navigation Buttons

- **Back:** Returns the user to the previous screen.
- **Firmware Update:** Navigates to the firmware update section of the application. [Firmware Update](#)

6 Sensor Calibration Procedure

Sensor calibration is the process of aligning the sensor's output to known reference values to ensure accurate and consistent measurement performance. It is recommended to follow the calibration procedure before taking measurements to ensure accurate results. Before starting the calibration procedure, ensure that the required equipment and buffer solution are prepared.

6.1 Single Point Calibration Procedure

The flowchart below depicts single point sensor calibration procedure, which is applicable to the following sensors:

- CO2 Sensor
- DO Sensor
- ORP Sensor

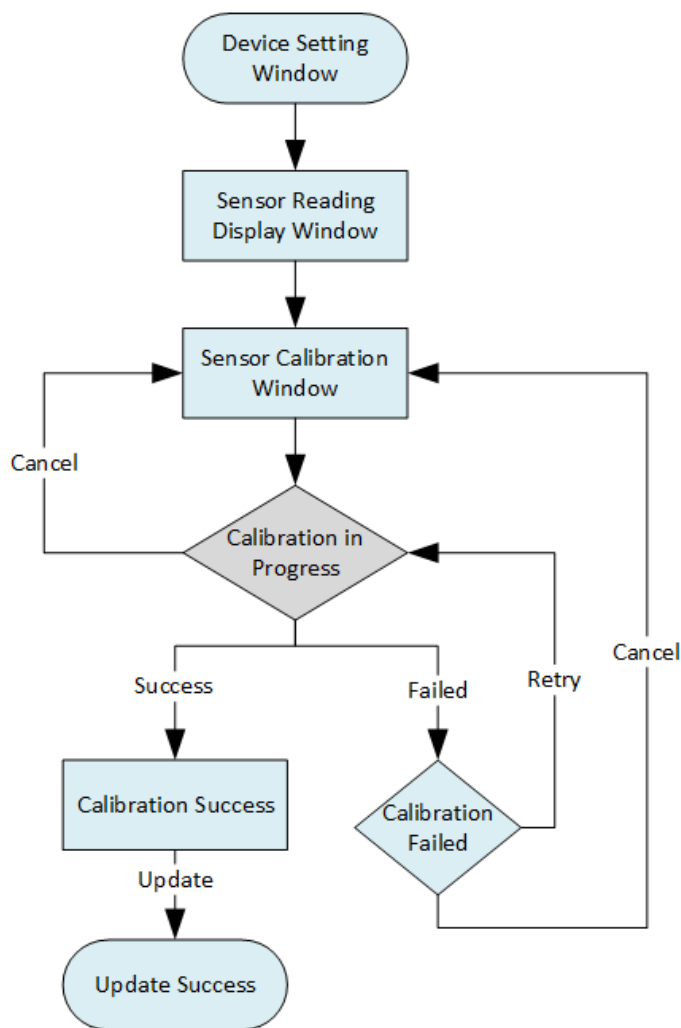


Figure 21 - Single Point Calibration Procedure

The following UI images illustrate the single point calibration of a DO sensor:

6.1.1 Device Setting Window

If a Modbus DO Sensor is connected to the bus, the sample device setting window will appear as shown below:

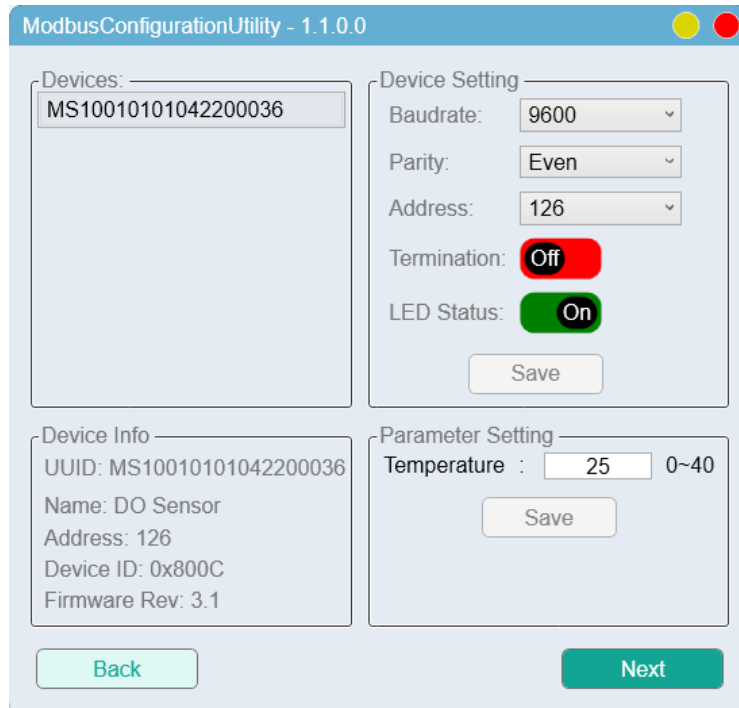


Figure 22 - Modbus DO Sensor Device Setting Window

6.1.2 Sensor Reading Display Window

Click the **[Next]** (refer to **Figure 22**) to proceed to the Sensor reading display window, as illustrated below:

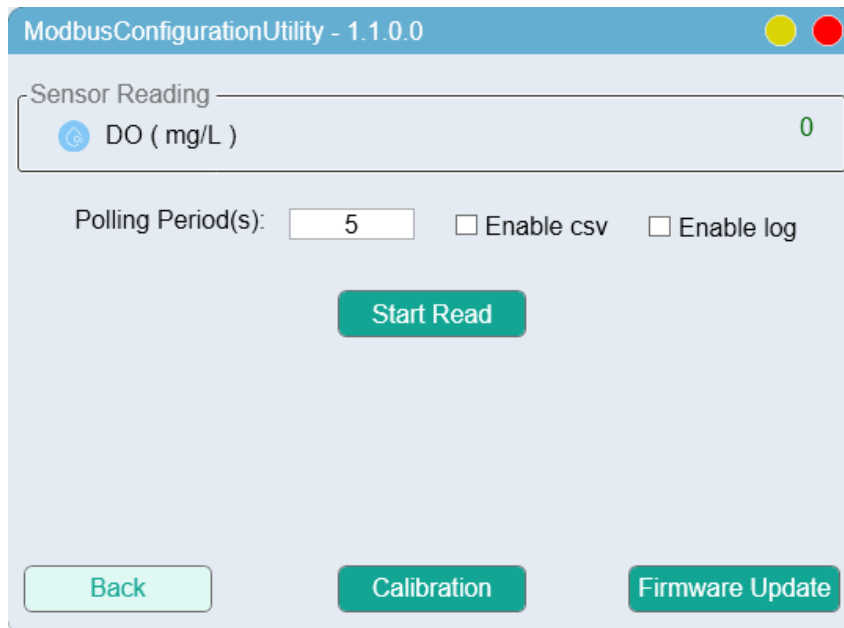


Figure 23 - Modbus DO Sensor Reading Display Window

6.1.3 Sensor Calibration Window

Click the **[Calibration]** button as shown in Figure 23, to proceed to the Modbus DO Sensor calibration window:

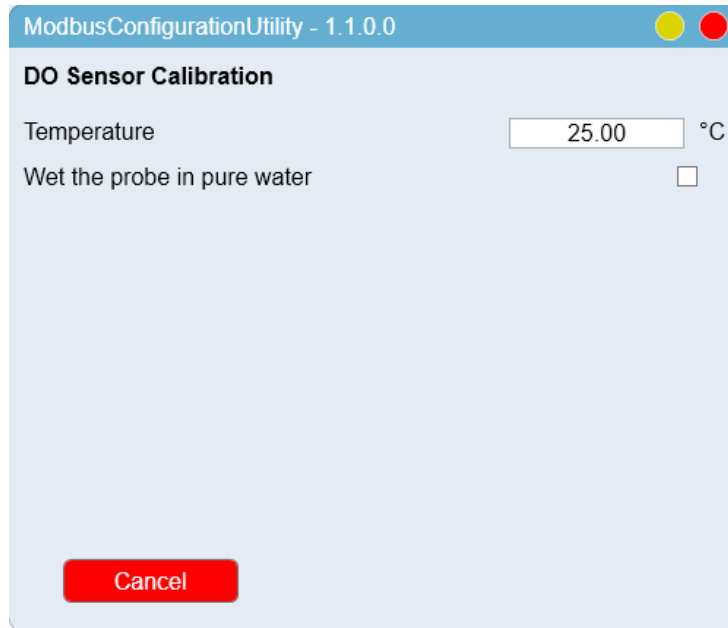


Figure 24 - Modbus DO Sensor Calibration Window

6.1.4 Calibration in Progress

Enter the correct calibration parameters, follow the given steps, and check each tick box upon completing the corresponding step. The entire calibration process will take approximately 3 minutes.

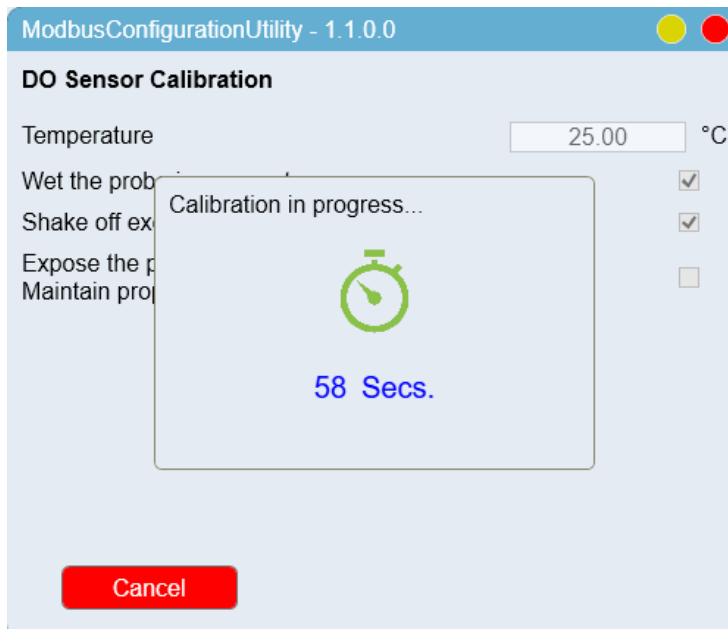


Figure 25 - Modbus DO Sensor Calibration in Progress

6.1.5 Calibration Success

If calibration was successful, user will be presented with a success message as shown below.

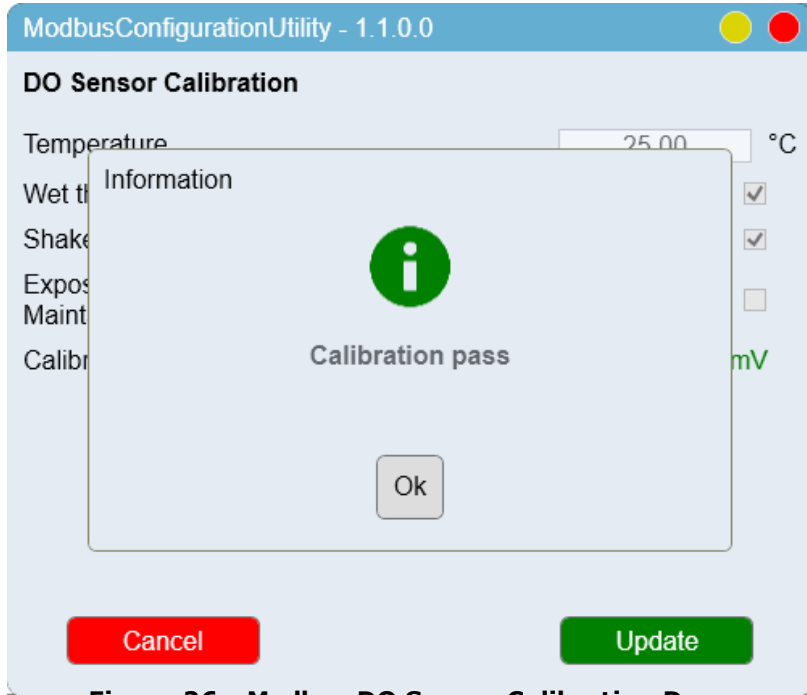


Figure 26 - Modbus DO Sensor Calibration Done

Click the [OK] button to view the detailed readings.

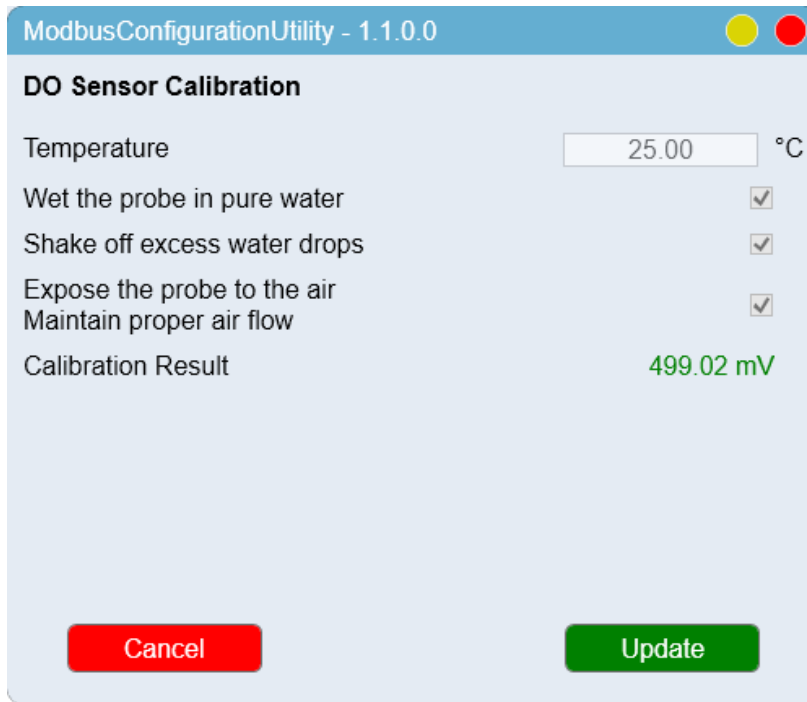


Figure 27 - Modbus DO Sensor Calibration Pass Reading

If user is satisfied with the calibration readings, click the [Update] button to apply the calibration to the device.

6.1.6 Update Success

The following message indicates that the calibration data has been successfully updated.

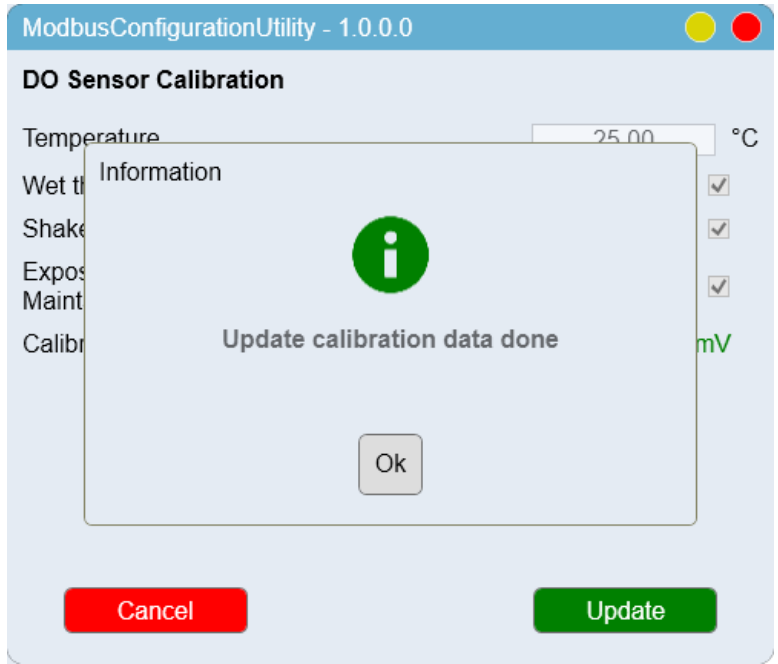


Figure 28 - Modbus DO Sensor Calibration Data Update Done

Click the [Ok] button to proceed to the Modbus DO Sensor reading display window to finish calibration.

6.1.7 Calibration Failed

If calibration failed, user will be presented with a message as shown below.

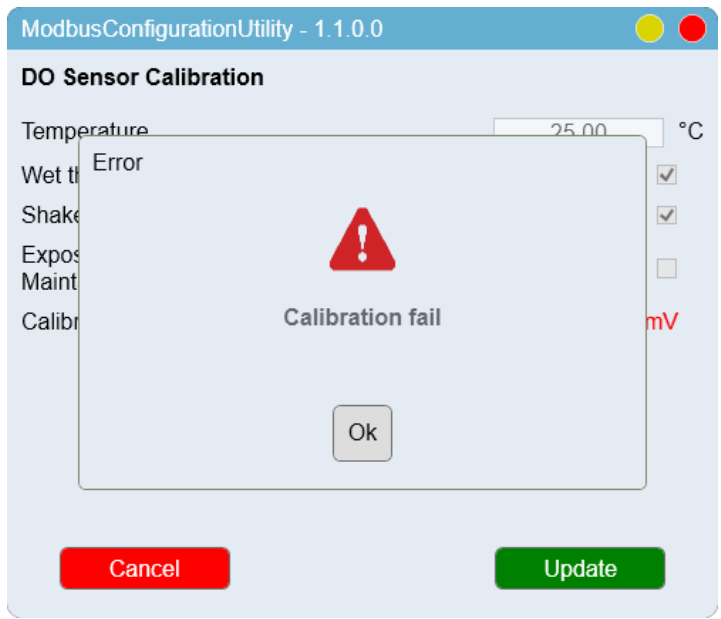


Figure 29 - Modbus DO Sensor Calibration Failure Message

Click **[Ok]** to view the detailed calibration readings.

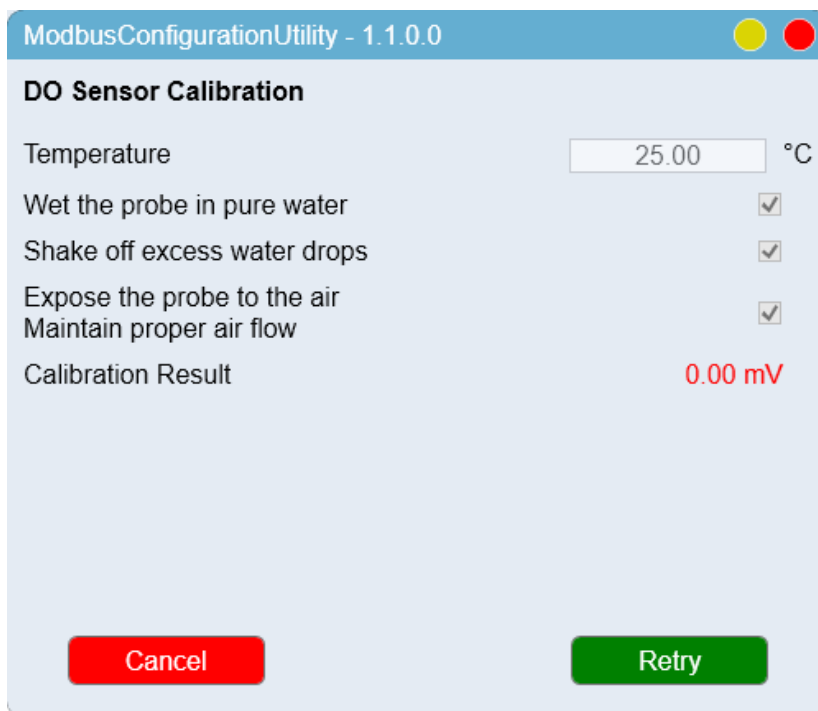


Figure 30 - Modbus DO Sensor Calibration Failure Reading

User can either click **[Cancel]** to stop the calibration or select **[Retry]** to try again.

6.2 Two Point Calibration Procedure

The flowchart below depicts two point sensor calibration procedure, which is applicable to the following sensors:

- pH Sensor
- EC Sensor
- Salinity Sensor

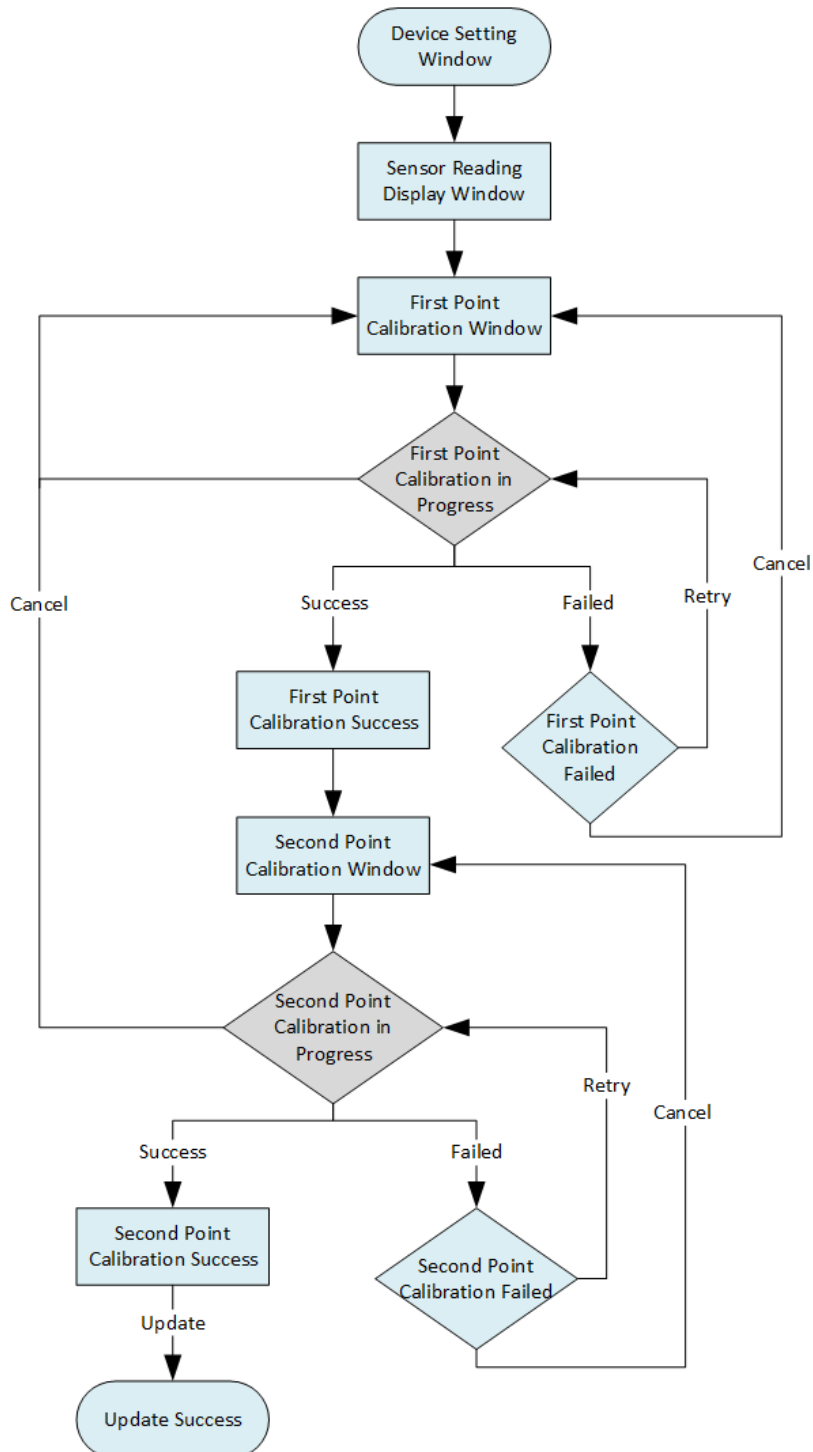


Figure 31 - Two Point Calibration Procedure

The following UI images illustrates double point calibration of a pH sensor:

6.2.1 Device Setting Window

If a Modbus pH Sensor is connected to the bus, the sample device setting window will appear as shown below:

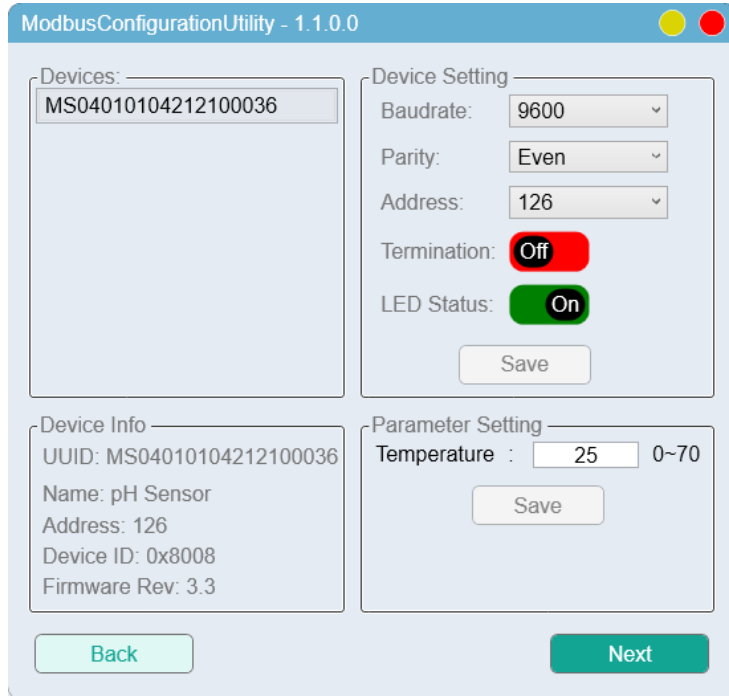


Figure 32 - Modbus pH Sensor Device Setting Window

6.2.2 Sensor Reading Display Window

Click the [**Next**] button to proceed to the Modbus pH Sensor reading display window, as illustrated below:

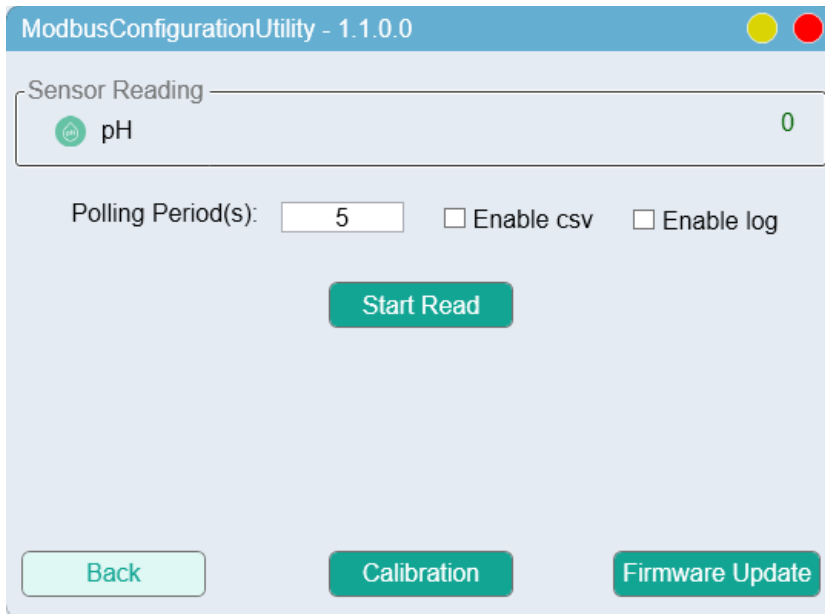


Figure 33 - Modbus pH Sensor Reading Display Window

6.2.3 First Calibration Window

Click the **[Calibration]** button to proceed to the pH Sensor first point calibration window, as illustrated in Figure 34.

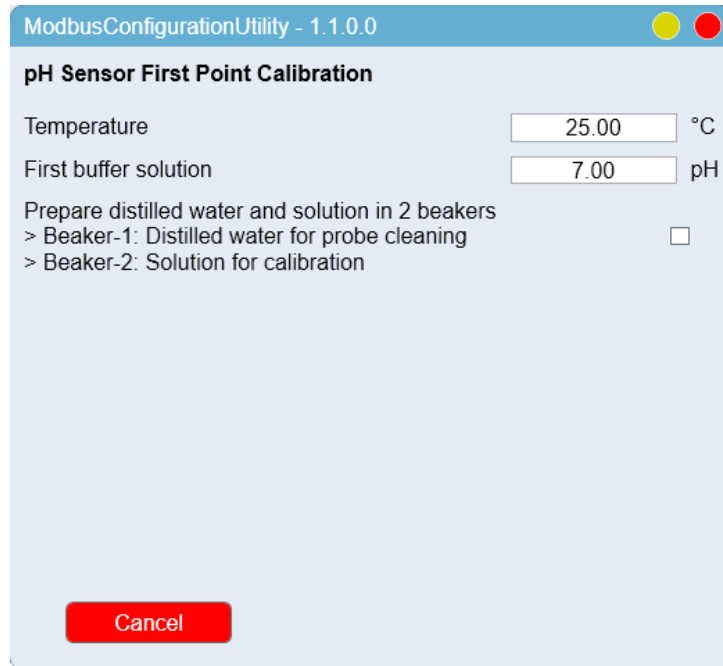


Figure 34 - Modbus pH Sensor First Point Calibration Window

6.2.4 First Point Calibration in Progress

Enter the correct calibration parameters, follow the given steps, and check each tick box upon completing the corresponding step. After the final step is checked, a 60-second countdown timer will automatically appear to initiate the calibration process. Do not remove the probe from the buffer solution during the calibration process to ensure accurate results.

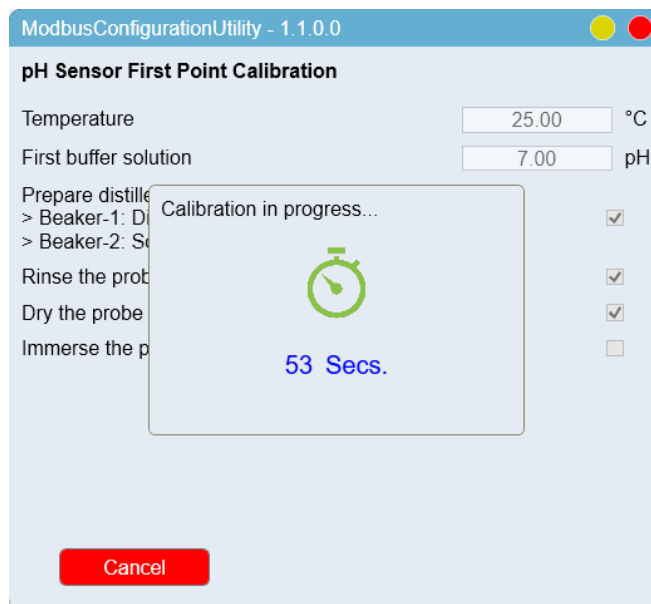


Figure 35 - Modbus pH Sensor First Point Calibration Timer

6.2.5 First Point Calibration Success

The following is an example of a calibration pass message.

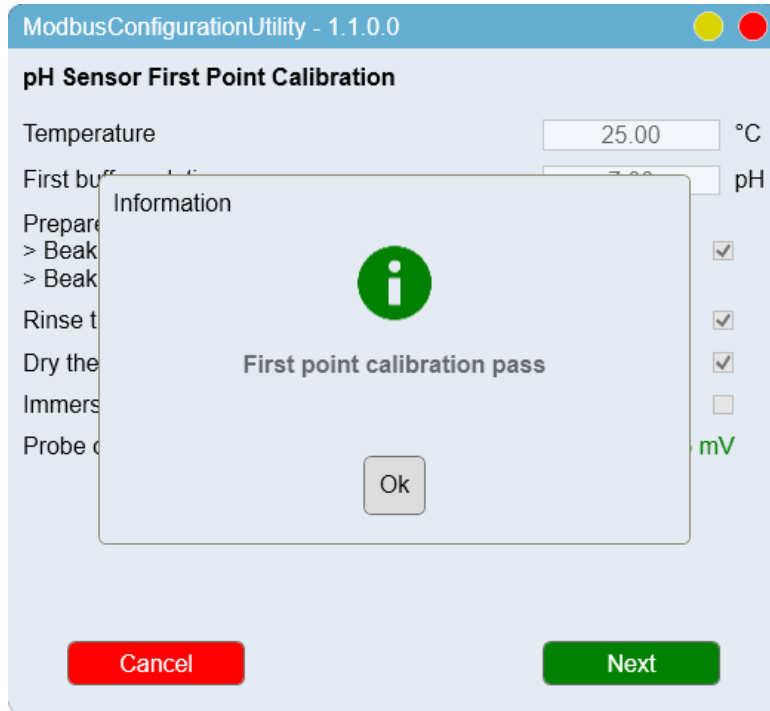


Figure 36 - Modbus pH Sensor First Point Calibration Pass Message

Click the [OK] button to view the detailed readings. An example is shown in Figure 37.

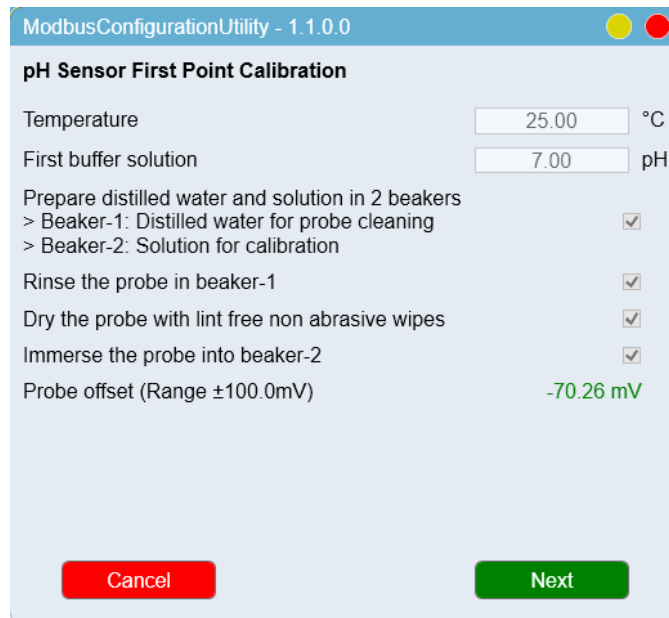


Figure 37 - Modbus pH Sensor First Point Calibration Pass Reading

6.2.6 First Point Calibration Failed

The following is an example of a calibration failure message.

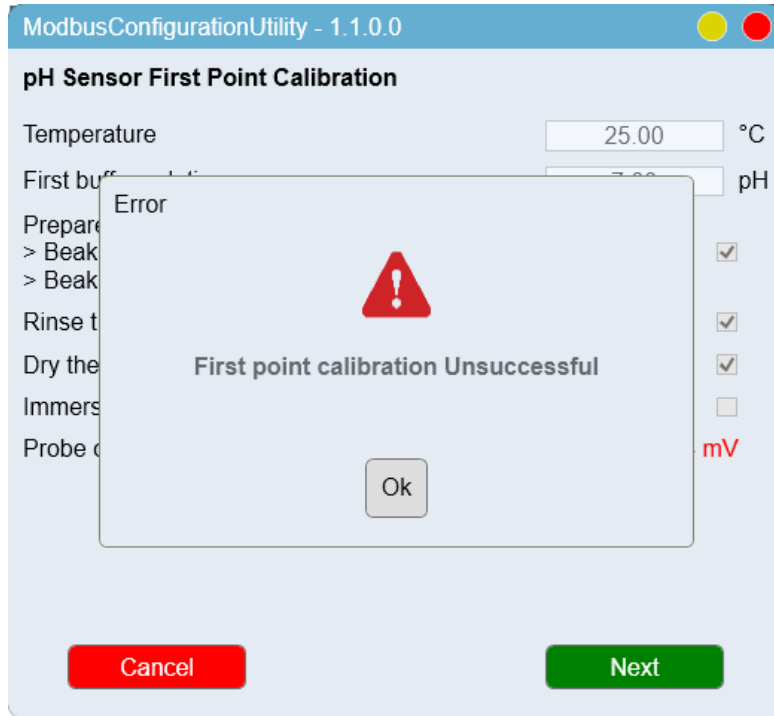


Figure 38 - Modbus pH Sensor First Point Calibration Failure Message

Click the **[OK]** button to view the detailed calibration readings (see Figure 39).
Click the **[Retry]** button to repeat the first point calibration. An example of the result display is shown below:

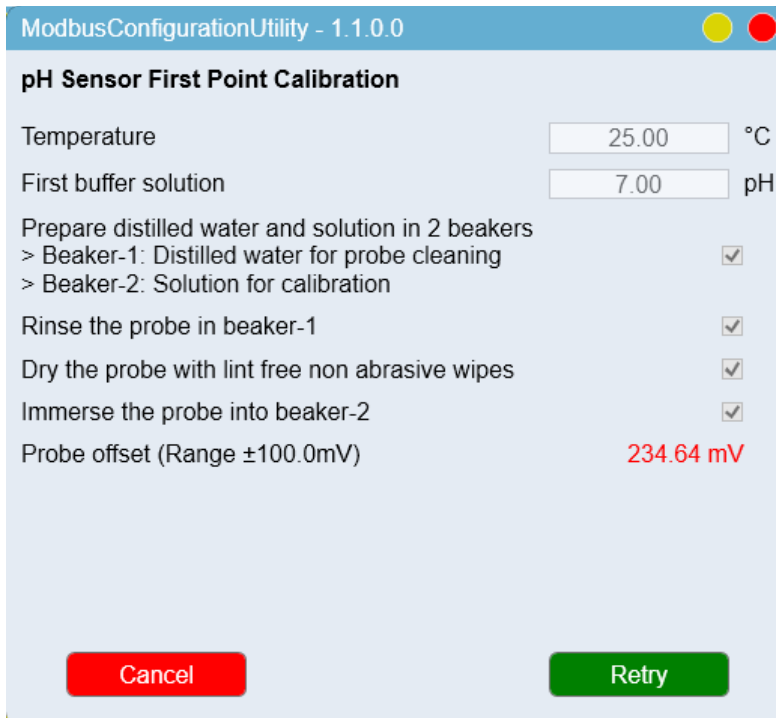


Figure 39 - Modbus pH Sensor First Point Calibration Failure Reading

6.2.7 Second Point Calibration Window

Click the **[Next]** button in Figure 37 to proceed to the second point calibration window for the pH sensor.

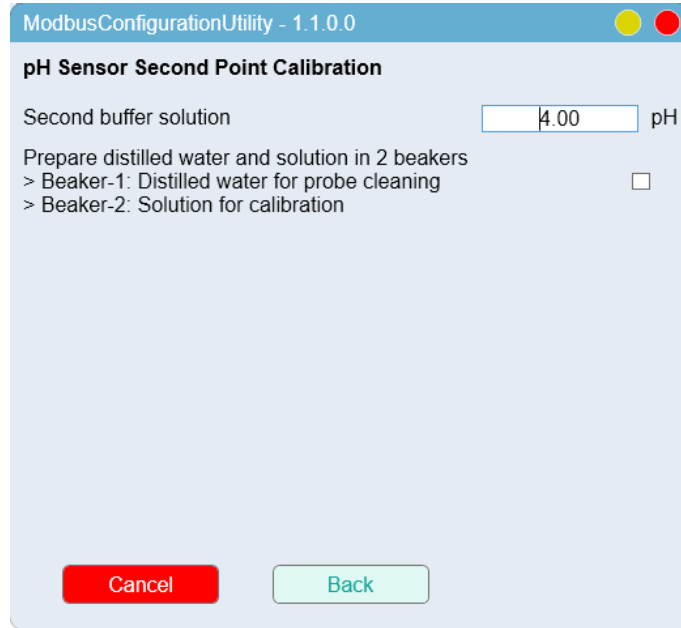


Figure 40 - Modbus pH Sensor Second Point Calibration Window

6.2.8 Second Point Calibration in Progress

Enter the correct calibration parameters, follow the given steps, and check each tick box upon completing the corresponding step. After the final step is checked, a 60-second countdown timer will automatically appear to initiate the calibration process. Do not remove the probe from the buffer solution during the calibration process to ensure accurate results.

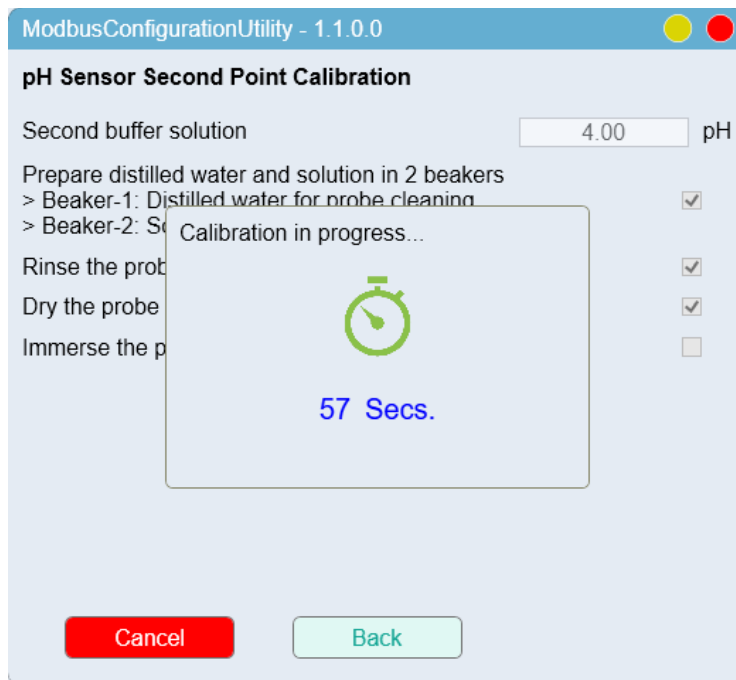


Figure 41 - Modbus pH Sensor Second Point Calibration Timer

6.2.9 Second Point Calibration Success

The following is an example of a calibration pass message.

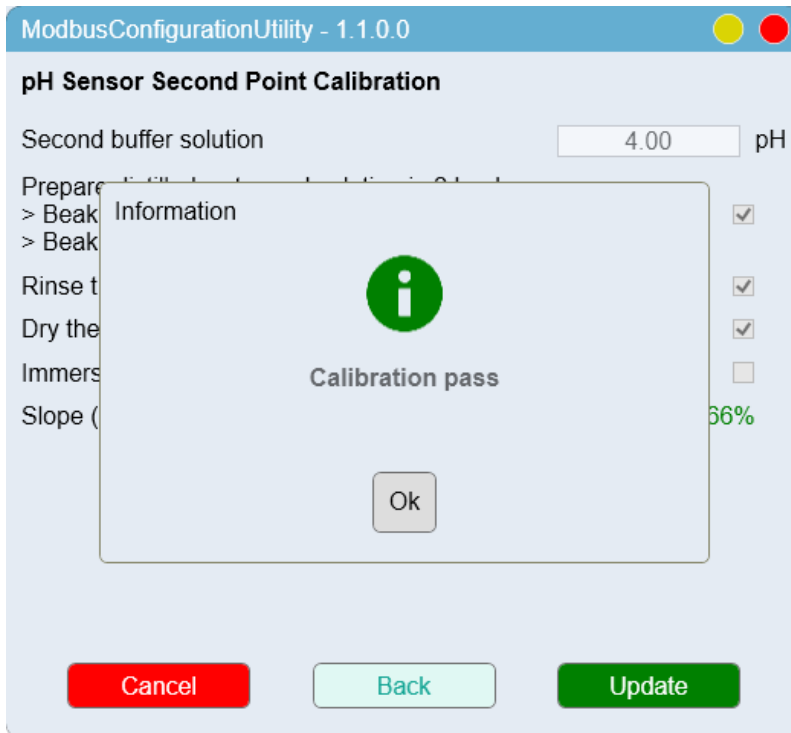


Figure 42 - Modbus pH Sensor Second Point Calibration Pass Message

Click the [OK] button to view the detailed readings. An example is shown in Figure 43.

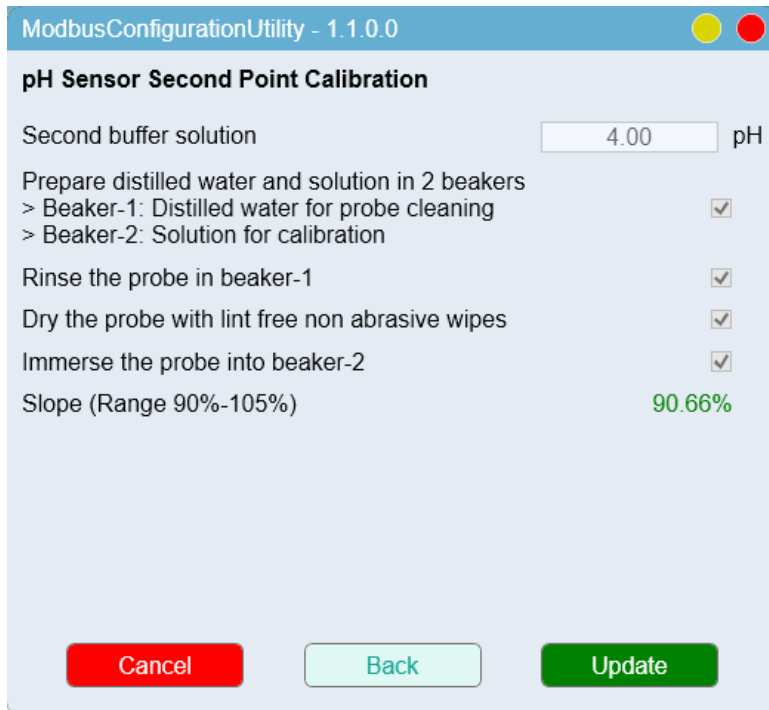


Figure 43 - Modbus pH Sensor Second Point Calibration Pass Reading

6.2.10 Update Success

If you are satisfied with the calibration readings, click the **[Update]** button to apply the calibration to the device. The following message indicates that the calibration data has been successfully updated.

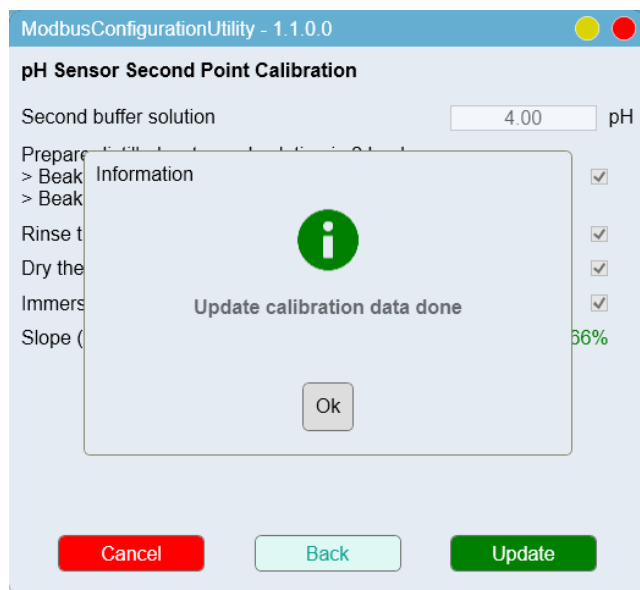


Figure 44 - Modbus pH Sensor Calibration Data Update Done

Click the **[Ok]** button to proceed to the Modbus pH Sensor reading display window to finish calibration.

6.2.11 Second Point Calibration Failed

The following is an example of a calibration failure message.

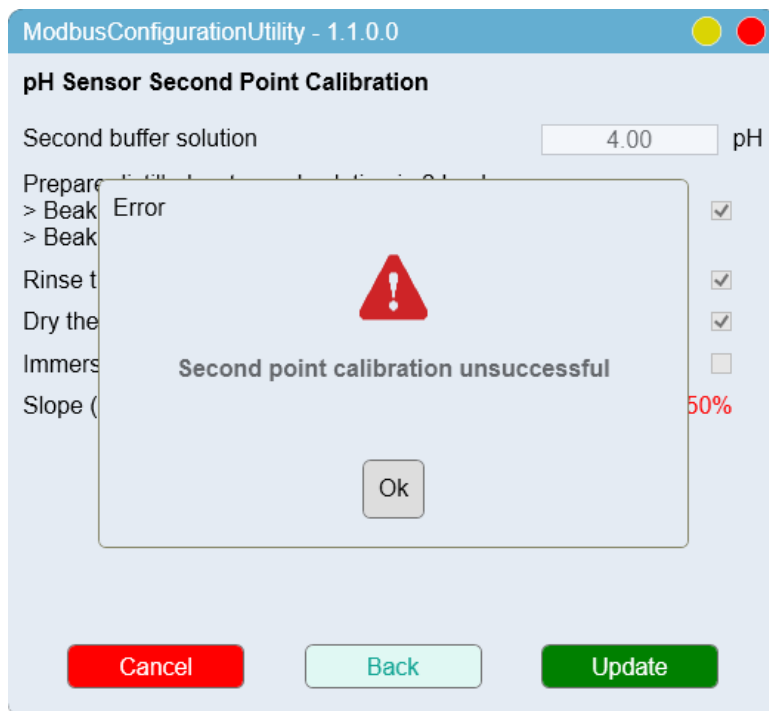


Figure 45 - Modbus pH Sensor Second Point Calibration Failure Message

Click the **[Ok]** button to view the detailed calibration readings. See [Figure 46](#).

Click the **[Retry]** button to repeat the second point calibration. Click **[Back]** to return back to first point calibration. An example of the result display is shown below:



Figure 46 - Modbus pH Sensor Second Point Calibration Failed Reading

7 LoRaWAN Devices Configuration

Upon clicking on LoRaWAN Configuration from the landing page, the LoRaWAN Device Selection screen is displayed.

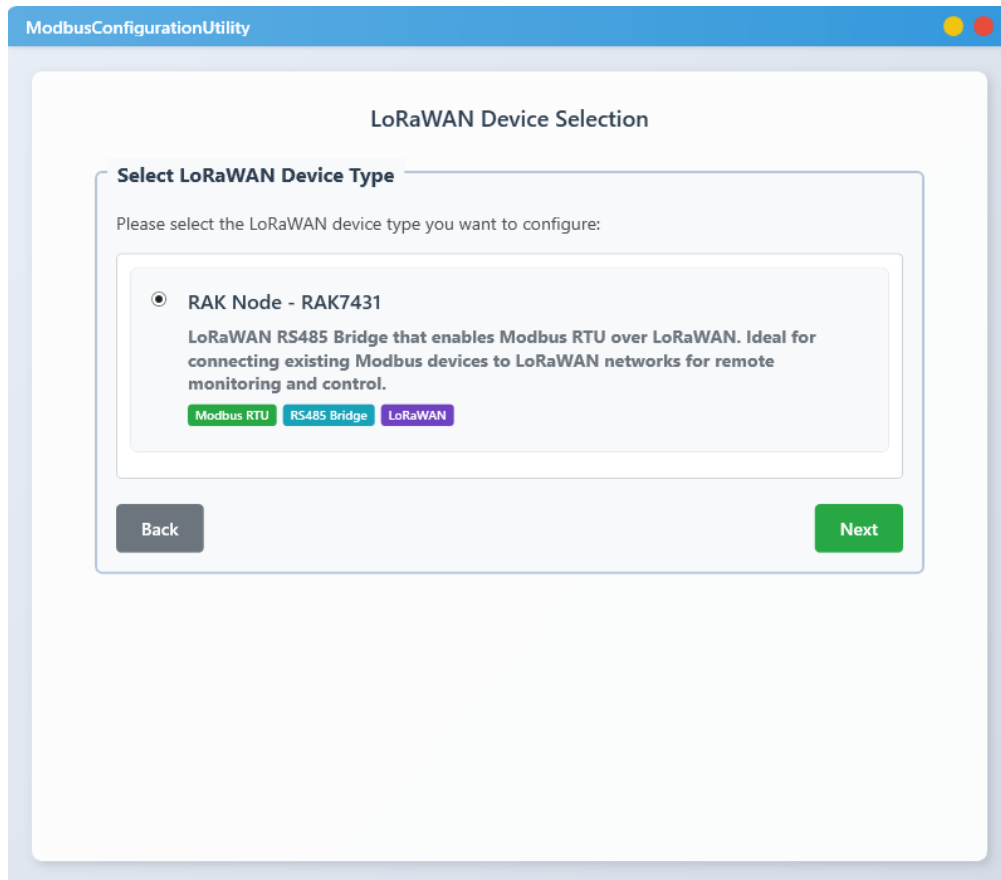


Figure 47 - LoRaWAN Device Selection

1. From the list of supported devices, Select the LoRaWAN Device Type to configure. Presently, one LoRaWAN node, the RAK7431 Modbus Bridge, is supported.

Device Tags:

- Modbus RTU → Indicates support for the Modbus RTU communication protocol.
- RS485 Bridge → Shows that the device bridges RS485-based Modbus devices to a LoRaWAN network.
- LoRaWAN → Confirms the device's capability to communicate over LoRaWAN.

Upon selecting the device, click **[Next]** to continue.

Note: At any point of time, to return back to the previous screen, click **[Back]**.

2. Select the **Communication Port** from the available list of COM Ports. The COM port from the USB port of the bridge is to be selected.

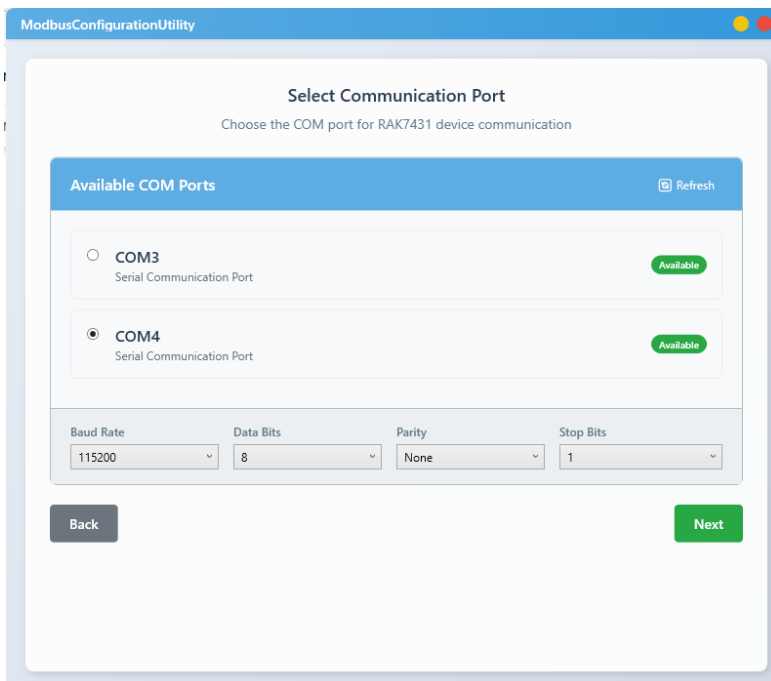


Figure 48 - LoRaWAN Device Configuration – Communication Port Selection

The default *Baud Rate*, *Data Bits*, *Parity* and *Stop Bits* values for the selected device is displayed. Click **[Next]**.

3. The Device Management Interface (i.e., RAK7431 Configuration Interface) is displayed. This interface provides comprehensive management of BRTSYS Modbus devices. The RAK7431 Node provides support for up to 16 Modbus devices and multiple device instances may be added and configured. The left pane, in the figure below, displays the list of devices on the bus and the right pane allows selection of devices to be added.

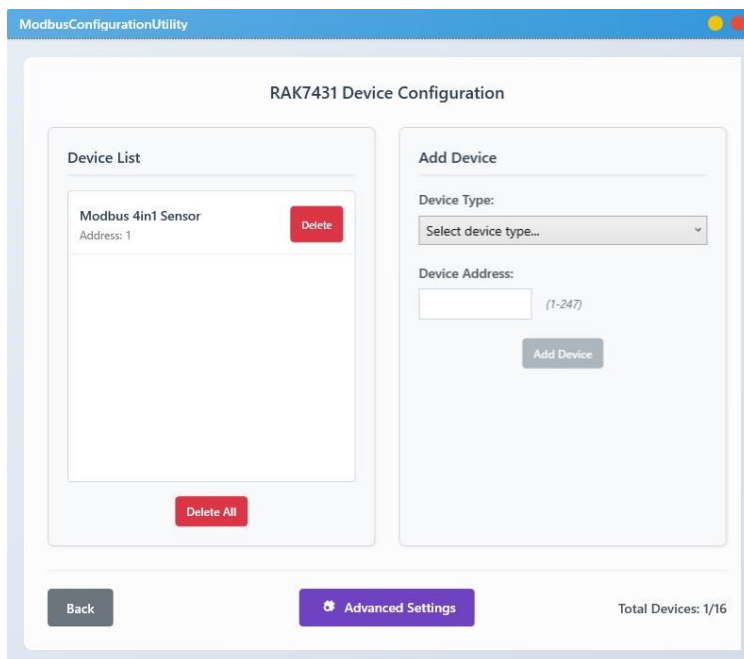


Figure 49 - LoRaWAN Device Configuration - Device Management List

Adding Devices

4. To add a new device to RAK7431:

Select Device Type: Choose from the dropdown menu to specify the type of Modbus device being connected (Modbus 4in1 Sensor, Modbus CO2 Sensor etc.). For illustration purpose, Modbus CO2 Sensor is selected.

Set Device Address: Enter a unique address (1-247) for the device in the Device Address field. Make sure that the device address matches the one in the Modbus Device Configuration Window (Figure 12). For illustration purpose, device address is set to "2".

Click **[Add Device]** to register the device. Once a device is successfully added, the RAK7431 node automatically updates its configuration to include the new device, making it immediately available for communication.

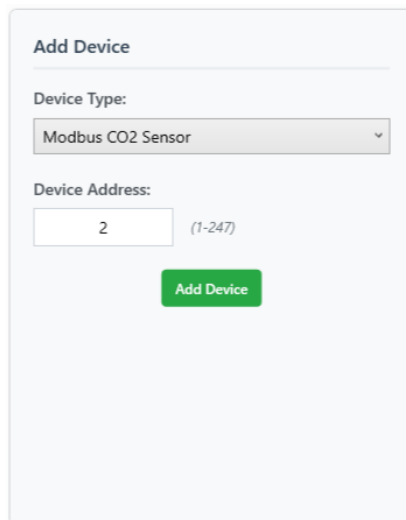
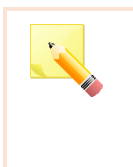


Figure 50 - Add Device Interface



NOTE:

Device address and communication parameters are configured using the Modbus Device Configuration option.

The Device List displays all currently configured devices with the following information:

- **Device Type:** Shows the specific type of Modbus device
- **Address:** Displays the assigned Modbus address

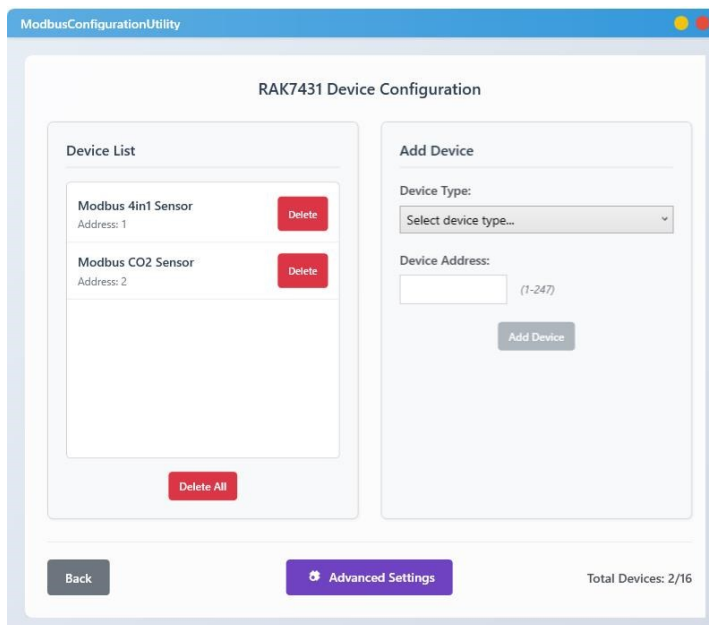
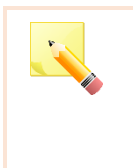


Figure 51 - LoRaWAN Device Configuration - Device Configuration Interface



NOTE:

Previously added devices in the display list will not show the device name; instead, they will be displayed as *Device-n*, where *n* represents the device address.

Deleting Devices

Each device has a **[Delete]** button to remove it from the configuration. Click **[Delete]** to remove only a specific device from the RAK7431 configuration.

The **[Delete All]** button provides a comprehensive reset option. Click **[Delete All]** to remove ALL devices from the RAK7431 configuration, including:

- All devices that have been added to the node.

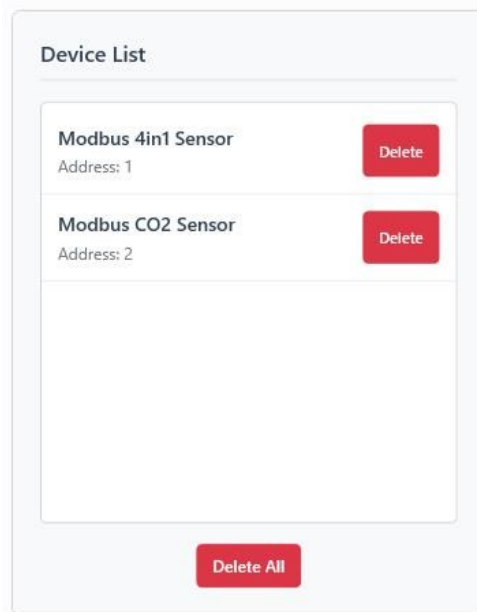


Figure 52 - Device List



NOTE:

The [Delete All] function performs a complete wipe of all device configuration and cannot be undone. Use this option when there is a need to start fresh or completely re-configure your Modbus network.

Advanced Settings

The Advance Settings feature comes with a comprehensive configuration interface for RAK7431 node, that provides access to critical network and operational parameters.

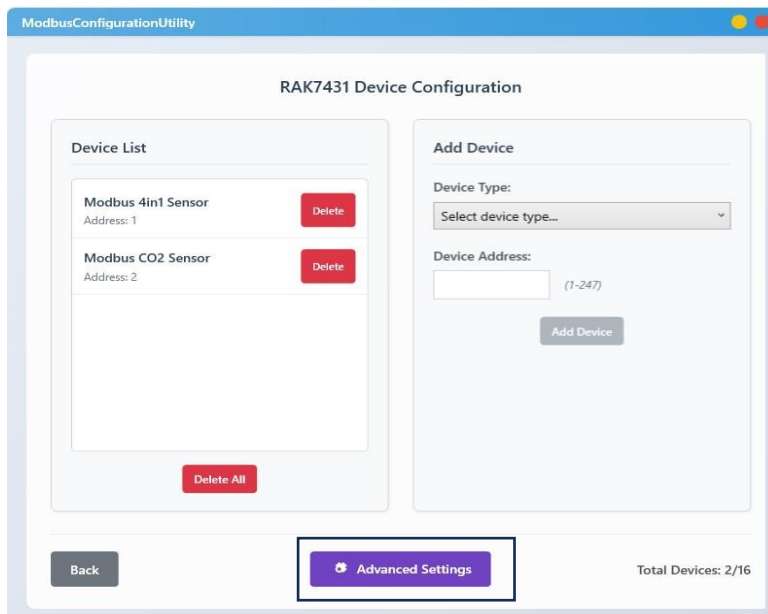


Figure 53 – Advanced Settings Button

Click **[Advanced Settings]** to access the interface.

LoRaWAN Configuration

The Advanced Settings menu allows users to configure the following essential LoRaWAN connectivity parameters:

- Device Identity
- Session Keys
- Communication
- Modbus Settings
- Radio Settings

Device Identity

To set Device Identity parameters, click **Device Identity**.

IMPORTANT The “Dev EUI” (Device Extended Unique Identifier¹) and “App Key” (Application Key) fields are populated automatically from the connected device. This device extended unique identifier will be used for LoRaWAN Node registration. Save the Dev EUI as it is required when registering the LoRaWAN node in the IoTPortal. For more information refer to “BRTSYS_AN_091_IoTPortal - LoRaWAN Getting Started Guide” under <https://brtsys.com/components/ → LoRaWAN → Resources → Application Note>.

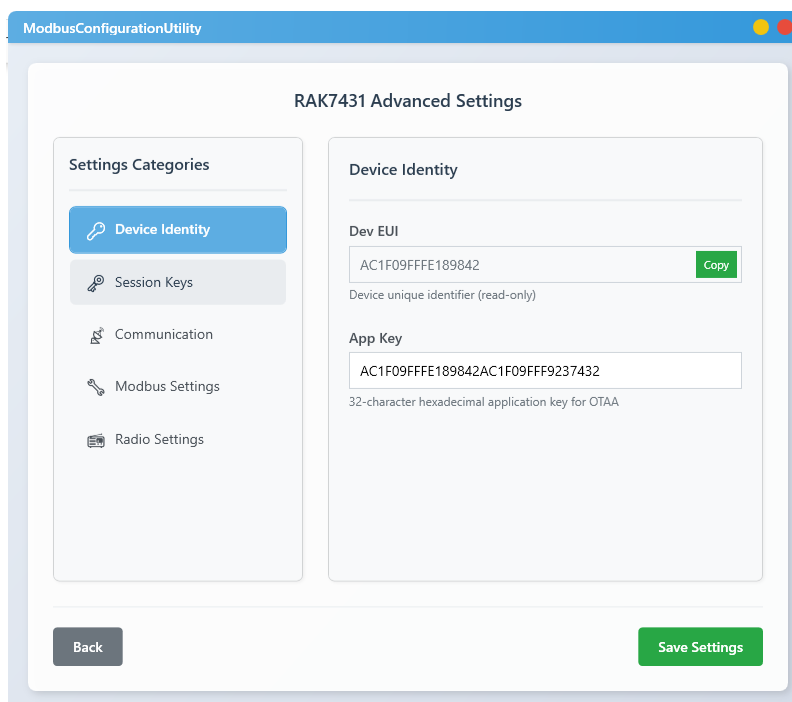


Figure 54 - LoRaWAN Device Configuration - Advanced Settings – Device Identity

The **App Key** field should be left as default and not be modified. Ensure that the key given is 32-character hexadecimal application key.

¹ A DevEUI is a unique 64-bit global identifier for a specific LoRaWAN end-device, assigned by the manufacturer and registered under the IEEE EUI-64 address space.

Session Keys

To set Session Keys parameters, click **Session Keys**.

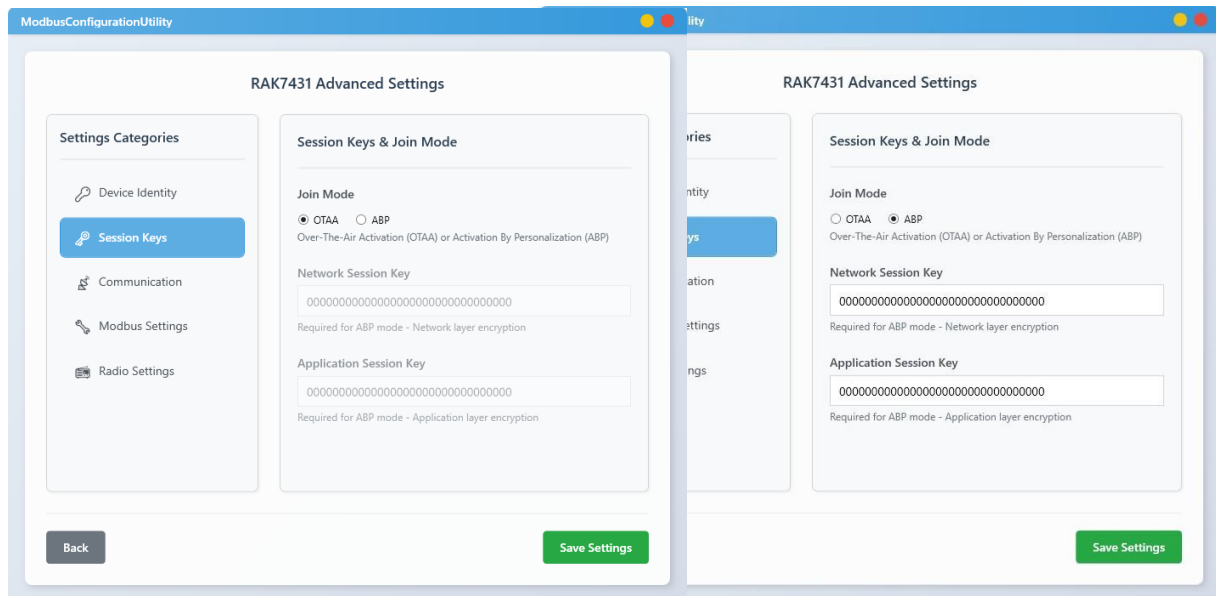


Figure 55 - Advance Settings – Session Keys

Set up **OTAA (Over-The-Air Activation)** or **ABP (Activation By Personalization)** connection Methods and session keys based on activation mode. If the **Join Mode – ABP** is selected, then the “Network Session Key” and “Application Session Key” fields should be left as default and not be modified.

Communication

To set communication parameters, click **Communication**.

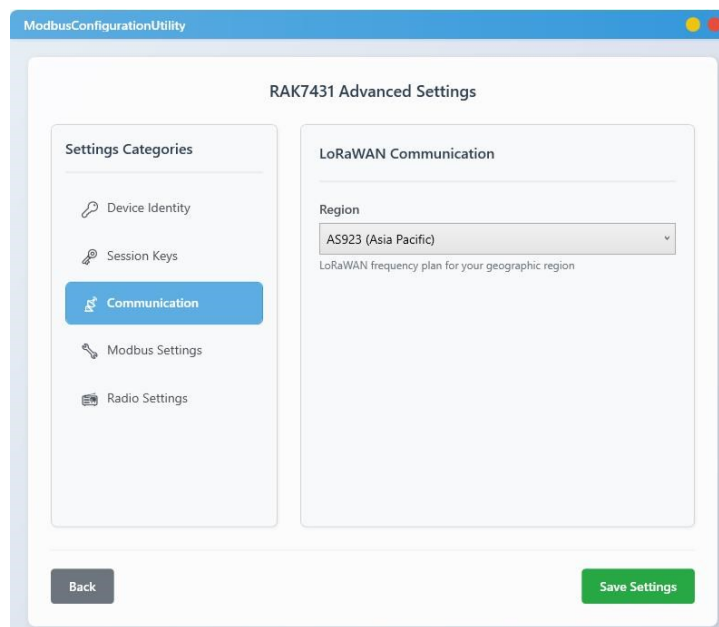


Figure 56 - LoRaWAN Device Configuration - Advanced Settings - Communication

Select the “Region” from the drop down control. Click **[Save Settings]** upon making any changes.

Modbus Settings

To set Modbus parameters, click **Modbus Settings**.

The screenshot shows the 'Modbus Configuration Utility' window. On the left is a sidebar with icons and labels for 'Device Identity', 'Session Keys', 'Communication', 'Modbus Settings' (which is highlighted with a blue bar), and 'Radio Settings'. The main content area is divided into sections: 'Poll Period' with a dropdown menu set to '10 minutes' and a descriptive text; 'UART Communication' with sub-sections for 'Baud Rate' (9600), 'Parity' (Even), 'Data Bits' (8), 'Stop Bits' (1), and 'Timeout (ms)' (1200). Each parameter has a dropdown menu or text input field and a brief description. At the bottom of the window are two buttons: 'Back' and 'Save Settings'.

Figure 57 - LoRaWAN Device Configuration - Advance Settings – Modbus Settings

The polling system controls how frequently the RAK7431 queries connected Modbus devices. Set the base interval at which the RAK7431 polls all configured Modbus devices for data by clicking on the “Poll Period” frequency from the drop-down control.

Update the UART communication parameters (Baud Rate, Parity etc.) as required. Click [**Save Settings**] upon making any changes.



NOTE:

Modbus devices should all be configured with UART communication, otherwise communication will fail.

Slave Address must be different for each device; UART communication must be same for all devices. Refer to Figure 12 (Device Configuration Window)

Radio Settings

To set the transmission power parameters, click **Radio Settings**. Click **[Save Settings]** upon making any changes.

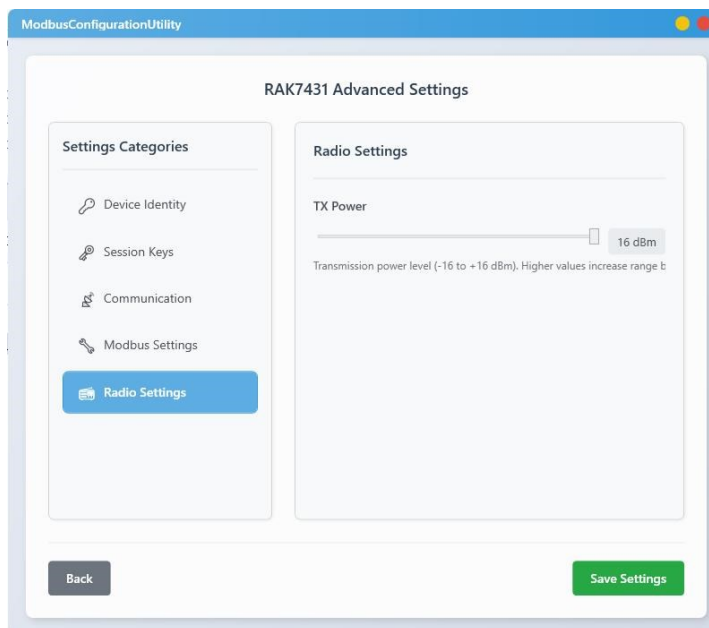


Figure 58 - LoRaWAN Device Configuration - Advanced Settings – Radio Settings

8 Contact Information

Refer to <https://brtsys.com/contact-us/> for contact information.

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Appendix A – References

Document References

Modbus Utility

[Modbus Device Configuration Application Note](#)

Actuators

[2CH Relay Datasheet](#)
[2CH Relay + iSENSE Datasheet](#)
[4CH Solid State Relay Datasheet](#)
[Isolated IO Controller Datasheet](#)
[Trailing Edge Light Dimmer Datasheet](#)
[2CH NL Relay Datasheet](#)
[2CH NL Relay + iSENSE Datasheet](#)

Adapters

[DO Sensor Adapter Datasheet](#)
[EC Sensor Adapter Datasheet](#)
[ORP Sensor Adapter Datasheet](#)
[pH Sensor Adapter Datasheet](#)
[Salinity Sensor Adapter Datasheet](#)
[Thermocouple Sensor Adapter Datasheet](#)

Sensors

[4in1 Sensor Datasheet](#)
[CO2 Sensor Datasheet](#)
[Gas and TrueVOC Sensor Datasheet](#)

Acronyms and Abbreviations

Terms	Description
ABP	Activation By Personalization
COM	Communication Port
CO2	Carbon dioxide
DO	Dissolved Oxygen
EC	Electrical Conductivity
EUI	Extended Unique Identifier
ORP	Oxidation Reduction Potential
OTAA	Over-The-Air-Activation
PC	Personal Computer
UART	Universal Asynchronous Receiver/Transmitter

Terms	Description
UUID	Universally Unique Identifier
USB	Universal Serial Bus

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NA

Appendix B – Revision History

Document Title: BRTSYS_AN_080 Modbus Configuration Utility User Guide

Document Reference No.: BRTSYS_000169

Clearance No.: BRTSYS#124

Product Page: [Software \(Utility Tools\) - BRT Systems Pte Ltd](#)

Document Feedback: [Send Feedback](#)

Revision	Changes	Date
1.0	Initial release for the Modbus Configuration Utility Ver.1.1.0	01-08-2025
2.0	Updated release for the Modbus Configuration Utility Ver.1.3.0	23-10-2025