BRTSYS_AN_001

LDSBus Configuration Utility Guide

Version 1.4

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Table of Contents

1 Introduction

The Long-Distance Sensor Bus (LDSBus) Configuration Utility (V.1.2.2) enables configuration of an LDSBus to be connected to an LDSBus host system.

The tool has two main menu functions:

- LDSU (LDS Unit) Project
- LDSBus Project

1.1 LDSU (LDS Unit) Project

An LDSU Project can be created to configure LDSBus Devices (Sensors/Actuators) before they are connected to the LDSBus. Only one LDSBus Device can be configured at a time. The configuration page provides information about LDSBus Devices and their sensors as well.

1.2 LDSBus Project

The LDSBus Project is capable of simulating an LDSBus host system environment in which it identifies how many LDSBus devices are online. Additionally, the tool provides an estimate of the total power consumed over the LDSBus, which is useful when considering the power limitations of the LDSBus Host to which the LDSBus is attached. It is possible to view the detailed information about any LDSBus device on the bus.

LDSBus also has other features, such as the ability to read and write registers in LDSBus Devices, as well as the ability to update firmware.

2 Hardware Setup Pre-requisites

The following components are required to create a LDSU or LDSBus Project:

- Windows based PC
- USB Type A to Type C Cable
- LDSBus USB Adapter
- LDSBus Device(s) using RJ12/11 cable(s) to RJ12/11 cable(s) **or** RJ12/11 cable(s) to JST 4/6 cable(s)

For LDSBus Project Only:

- LDSBus HVT Junction (s)
- CAT 5e RJ45 to RJ45 Cable (s)
- 24VDC/18W Power Adapter

2.1 LDSU (LDSUnit) Project

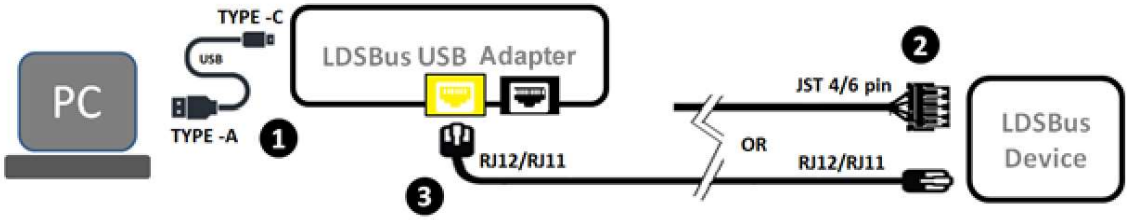


Figure 1 – LDSU Device (Sensors / Actuators) Connection Diagram

Step 1: Connect the LDSBus USB Adapter to the Windows PC using the USB-C to USB-A cable. (Or a USB-C to USB-C cable, if the PC has Type-C USB Ports)

Step 2: Connect the LDSBus Device to the cable at one end.

Step 3: Connect the other end of the cable to the LDSBus USB Adapter as shown in Figure 1.

Step 4: For instructions on configuring the LDSBus device, refer to the Software section.

2.2 LDSBus Project

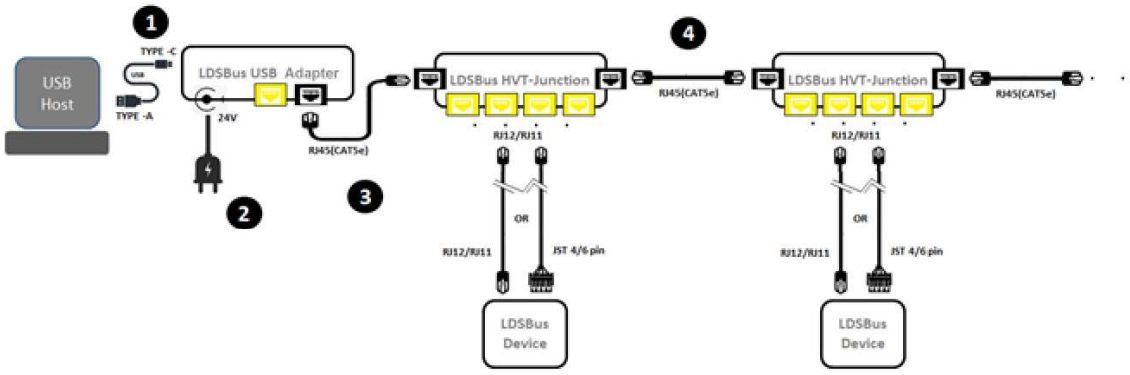


Figure 2 – LDS Bus – HVT Junction in LDSBus System – Connection Diagram

Step 1: Connect the LDSBus USB Adaptor to the Windows PC using the USB-C to USB-A cable (or a USB-C to USB-C cable if the PC has Type-C USB Ports).

Step 2: Connect a 24VDC/18W power adapter to the DC jack and turn it ON. The LDSBus and devices will be powered by software.

Step 3: Using an RJ45 (CAT5e) cable, connect the first HVT-Junction to the USB Adapter. LDSBus devices connected to the LDSBus HVT-Junction must be preconfigured through LDSU Project.

Step 4: In case of more than one LDSBus HVT-Junction, chain the connections together using RJ45 (CAT5e) cables. Ensure that termination is enabled for the last LDSBus device in the bus through the LDSU Project.

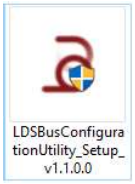
Step 5: For details on how to access the bus, see the Software section.

3 Installing LDSBus Configuration Utility

3.1 First Time Installation

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

1. Run the **Setup.exe** file provided with the installation package.



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

Figure 3 – Setup Wizard – Welcome Screen

3. A License Agreement is displayed. Click **[I Agree]** to proceed.

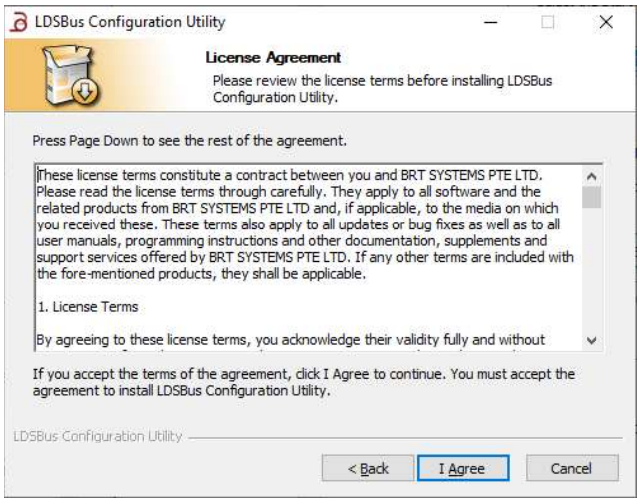


Figure 4 – Setup Wizard – License Agreement

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.

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

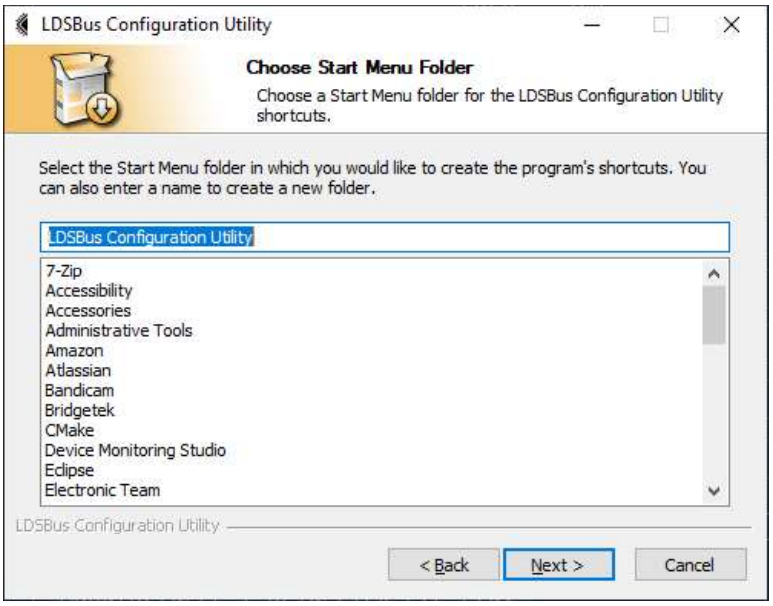


Figure 5 – Setup Wizard – Start Menu Folder Selection

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.

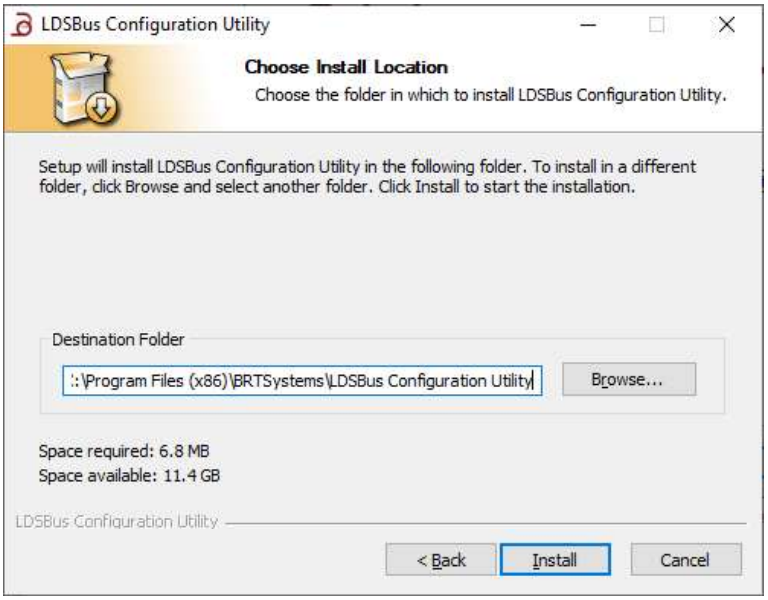


Figure 6 – Setup Wizard – Installation Location Selection

6. A progress bar indicates that the installation is in progress.

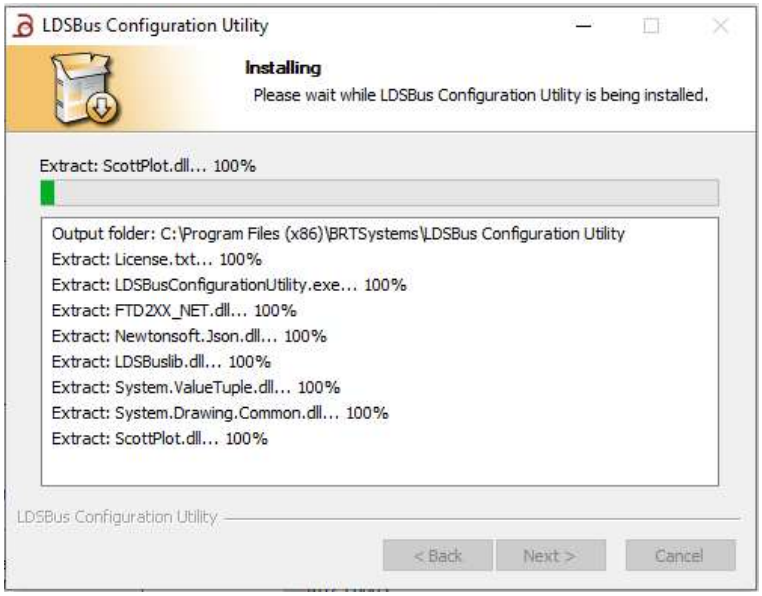


Figure 7 – Setup Wizard – Installation Progress

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

Figure 8 – Setup Wizard – Installation Complete

8. By default, the LDSBus Configuration Utility is installed in this path – "*\Program Files (x86)\BRTSystems\LDSBus Configuration Utility.*"

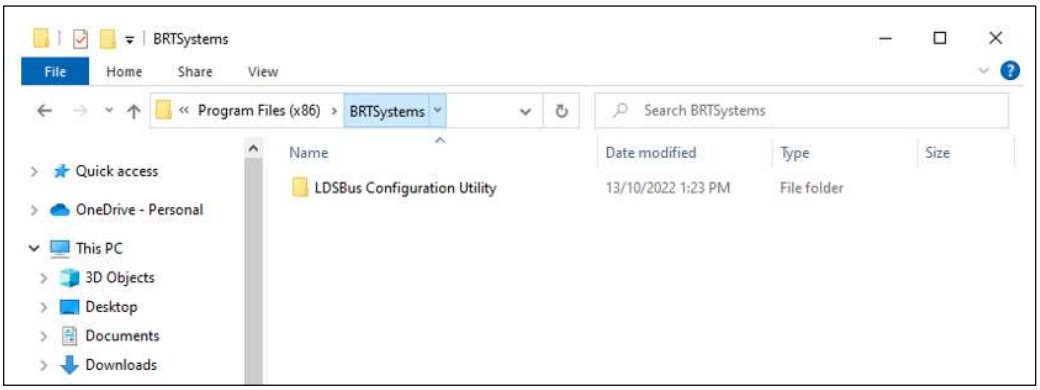


Figure 9 – LDSBus Configuration Utility Installation Folder location

9. The LDSBus Projects folder is the default folder that contains the projects saved by the utility.

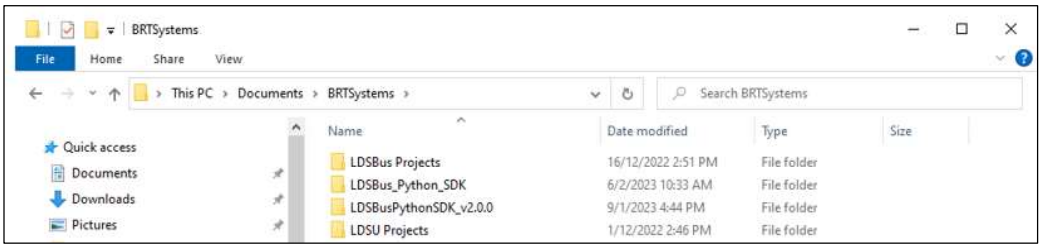


Figure 10 – LDSBus Projects Folder Location

3.2 Update to a new version

NOTE: While updating to a new version, an uninstaller will run and this will remove the previous package and information from the registry information. First time installation will not show the uninstaller.

Following are the steps to update to a latest version of LDSBus Configuration Utility –

1. Run the **Setup.exe** file.
2. The LDSBus Configuration Utility Uninstaller is displayed. Click **[Next]**.

Figure 11 – LDSBus Configuration Utility - Uninstaller

3. Click **[Uninstall]** to start uninstalling the old version. The uninstallation will be in progress.

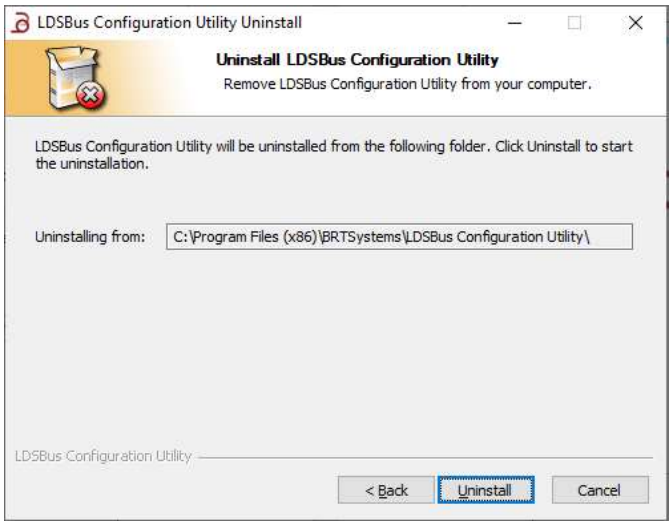


Figure 12 – LDSBus Configuration Utility – Uninstallation in Progress

4. Click **[Finish]** to complete the uninstallation.

Figure 13 – LDSBus Configuration Utility – Uninstallation Completed

4 LDSBus Configuration Utility – GUI Overview

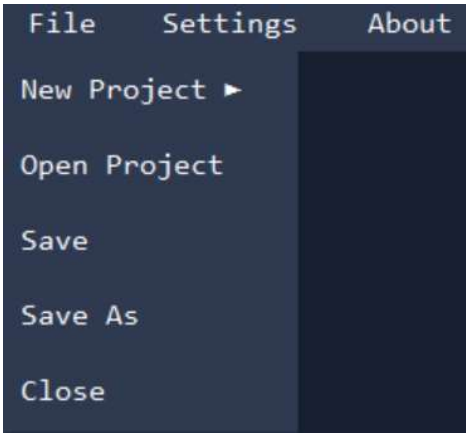
Figure 14 – LDSBus Configuration Utility User Interface

4.1 Default Menu bar

By default, the menu bar contains *File, Settings* and *About* menu options.

4.1.1 File Menu

In the menu bar, the first item is the *File* menu. It contains commands that are used to manage Projects, such as *New Project, Open Project, and Save Project* etc.



Menu Item	Description
New Project	To create a new LDSU / LDSBus projects
Open Project	To open or retrieve an existing LDSU / LDSBus project.
Save	To save the project. The file is saved with an ".ldsuproj" extension for LDSU projects and an ".ldsbusproj" extension for LDSBus projects.
Save As	To choose a different destination and file name to save the current project. The file is saved with the extension ".ese".
Close	To close the utility

4.1.2 Settings Menu / Interface

From the menu, click the **Settings** option to access the Settings interface. The settings screen lists the available *LDSBus USB Adapter's serial number*. Click Refresh icon  to get the new devices (if any).

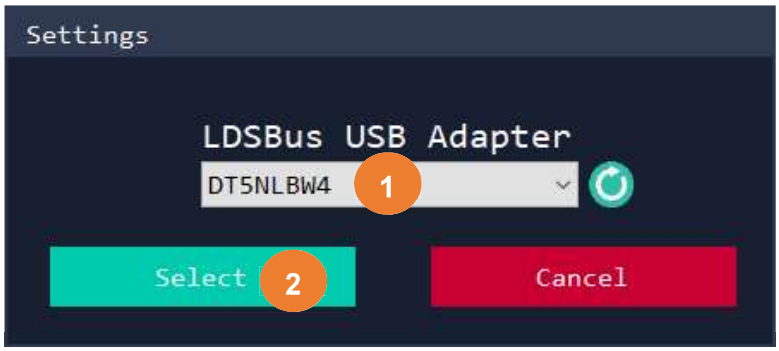


Figure 15 – Settings Interface

1. Select the required adapter from the dropdown list.
2. Upon selecting the adapter, click **[Select]** to use the adapter. Alternately, click **[Cancel]** to return to the previous screen.

4.1.3 Additional Menu (based on the selected Project)

LDSU Project

LDSBus Project

5 LDSU (LDSUnit) Project

5.1 Creating a New LDSU Project

To create an LDSU Project –

1. Choose the **LDSBus USB Adapter** from the **Settings** menu. Refer to Section 4.1.2.

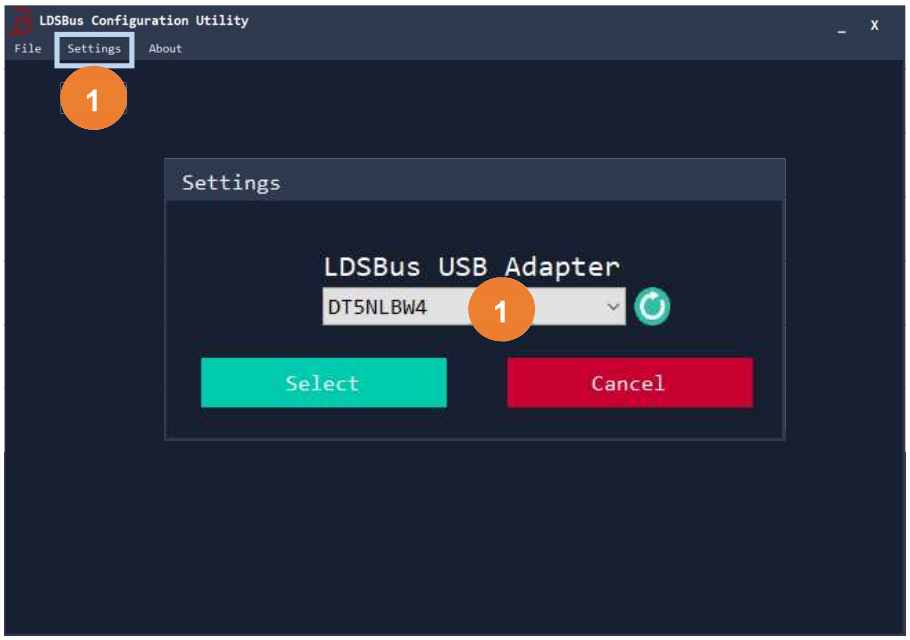


Figure 16 – LDSBus USB Adapter Selection

2. To create an LDSU project, click **File → New Project → LDSU Project**.

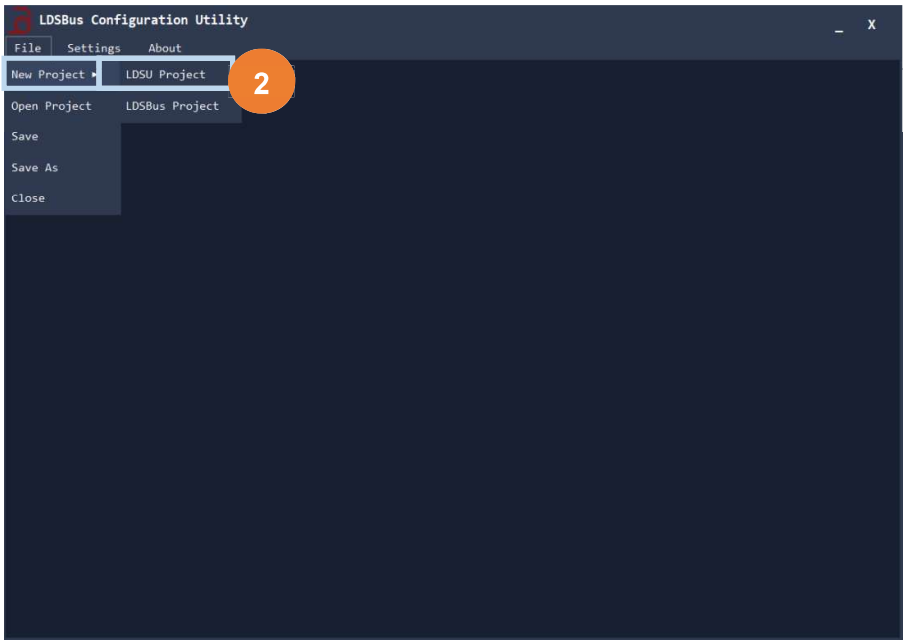


Figure 17 – Project Type Selection Menu

3. Based on the selected project, the application title will be displayed. For example, if the selected project type is "LDSU Project," then the title displayed will be *"LDSBus Configuration Utility – LDSU Project."* **Enable** the LDSU port power on the LDSBus Device connected to the LDSBus USB Adapter. Click **[Scan]**.

Figure 18 – LDSU Project Interface

4. Upon finding a device, the information related to the connected LDSBus Device will be displayed. The details of the sensor device are displayed at the bottom of the interface. Except for *LDSU ID; LDSU Termination Status* and *Nickname* all the other fields are *non-editable*.

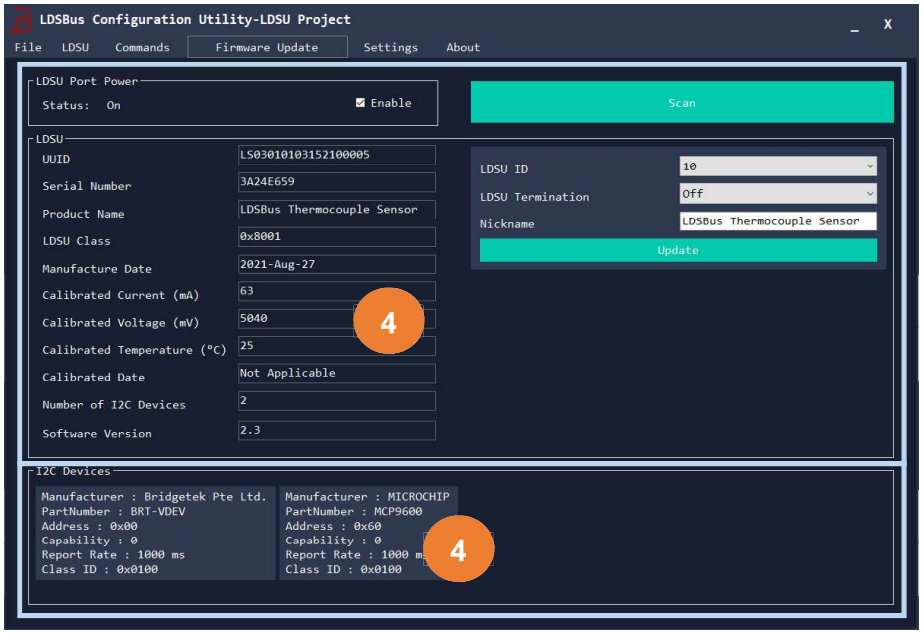


Figure 19 – LDSU Project Interface

5. Configure the following LDSU Device settings, if required:

Figure 20 – LDSU Device Settings

LDSU ID: Default is set as '126'. Change the ID accordingly based on the number of devices that will be connected to the LDSBus. For example, if you will be connecting more than one LDSBus Device on the bus, configure the first device with an ID of '1', second device with an ID of '2' and so on. Each LDSBus Device must have a unique ID.

LDSU Termination: Default is set as 'Off.' Ensure termination for the last LDSBus Device on the bus is set as 'On.'

Nick Name: Default is set as the product name. Change the device name accordingly. The device name set will be reflected in the LDSBus Host System.

Click **[Update]** to save any changes.

Click **[Calibrate]** to start the calibration. Refer to Section 7 for more information on the Calibration procedure.

5.2 Firmware Update

This function allows users to update the device firmware. To update firmware,

1. Select **Firmware Update** from the menu. A file browser dialogue box is displayed. Browse for the device update package (.unv) and click **[Open].**

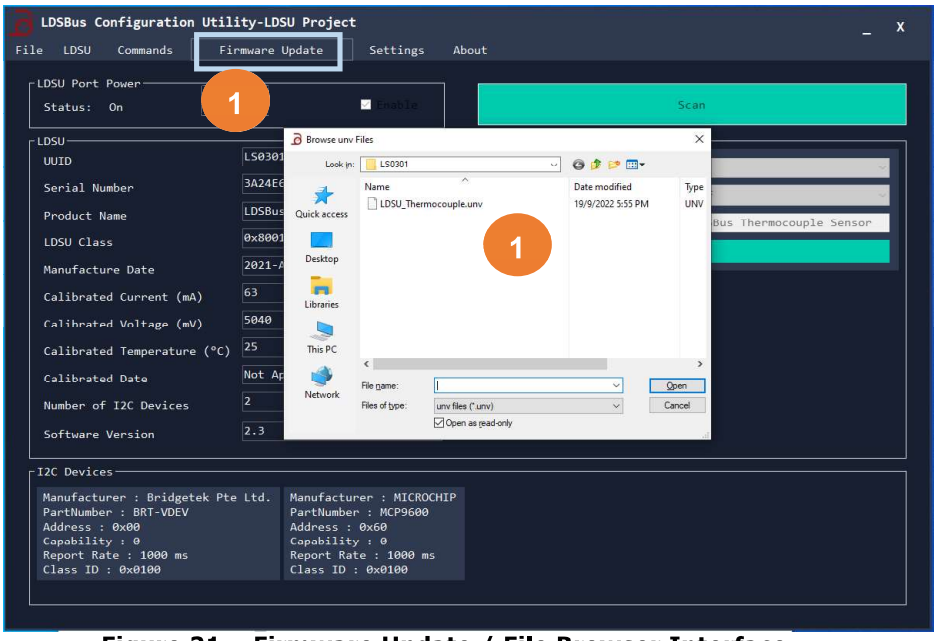


Figure 21 – Firmware Update / File Browser Interface

2. Upon selecting a valid firmware package, a confirmation window is displayed. Click **[OK]** to proceed with the firmware update. Alternately, click **[Abort]** to cancel.

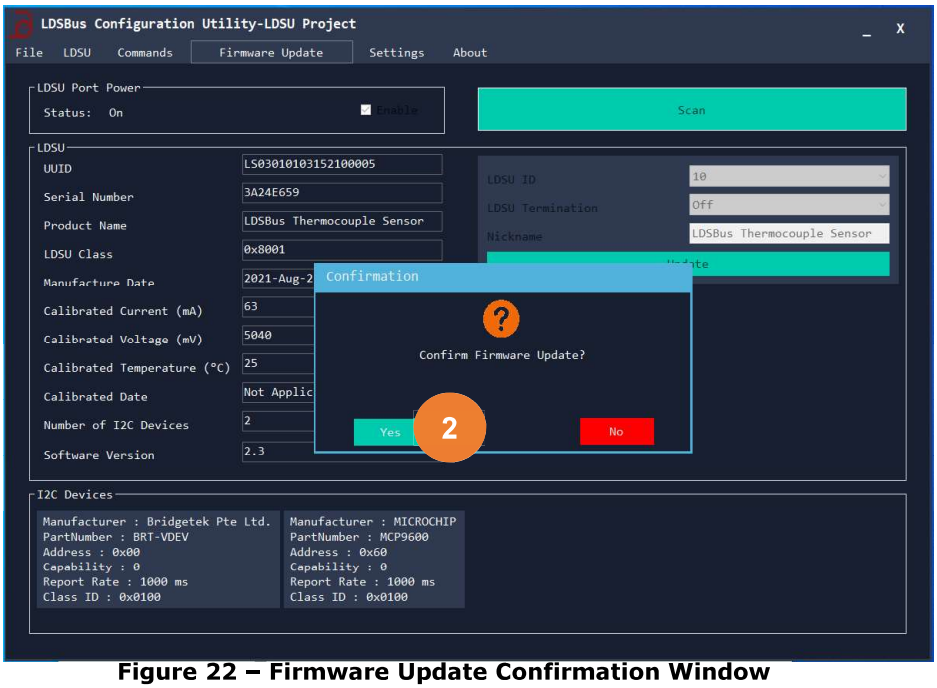


Figure 22 – Firmware Update Confirmation Window

OR

If the device is already updated with the latest firmware, an appropriate warning message is displayed. Click **[Yes]** to overwrite the existing version or **[No]** to cancel the firmware update.

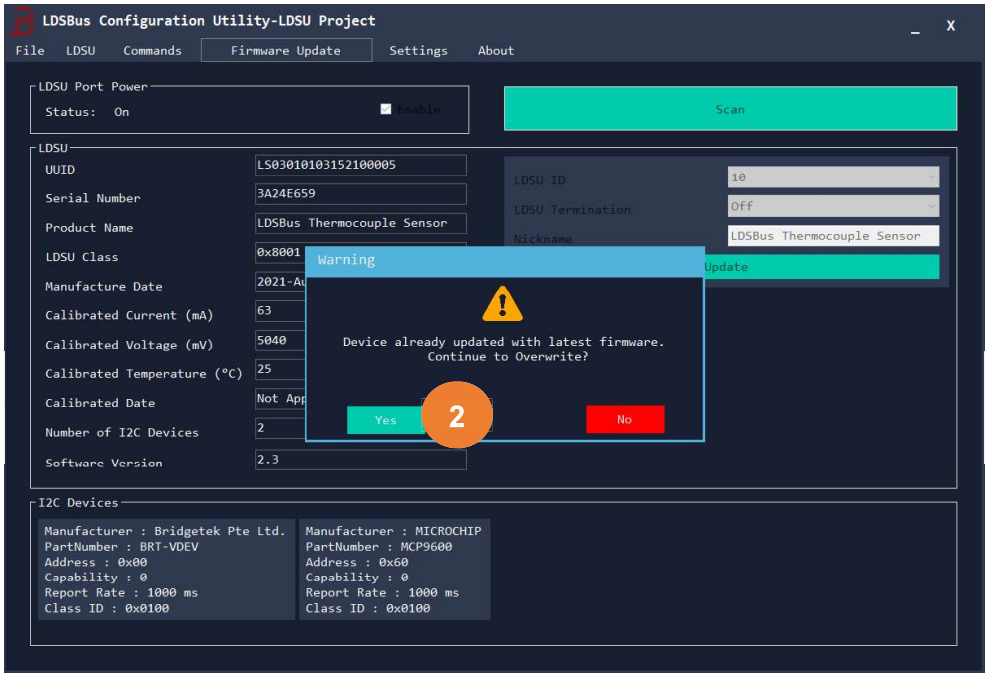


Figure 23 – Firmware Overwrite Alert Window

3. A dialog window with the information about the current firmware version and the new firmware version that will be installed, is displayed. Click **[OK]** to proceed.

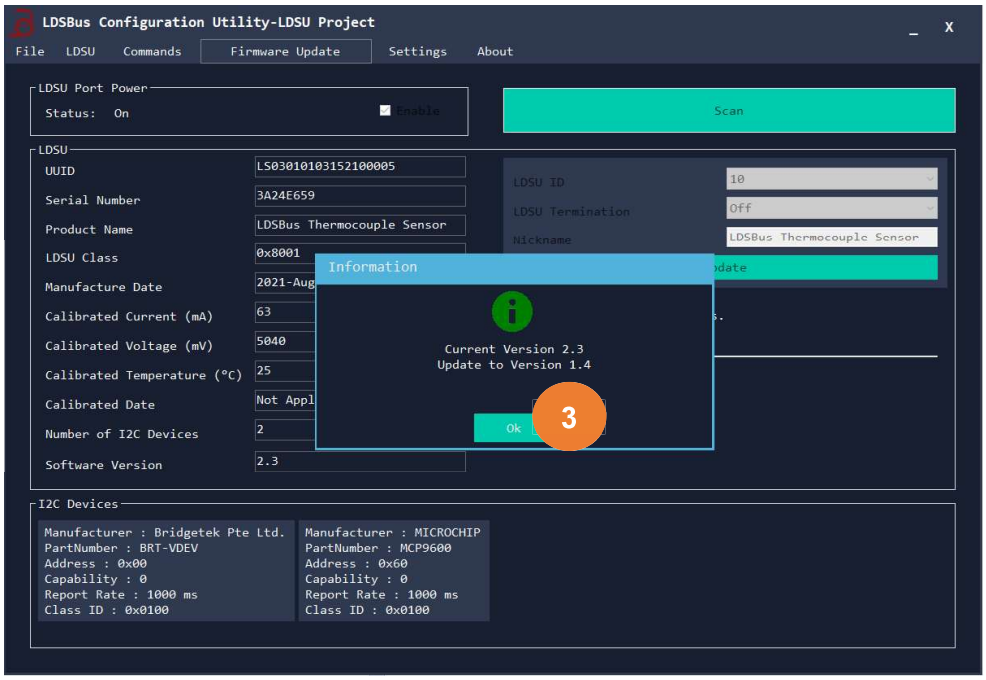


Figure 24 – Firmware Version Information

4. An appropriate message indicating that the firmware update is successful or not is displayed. Click **[OK]** to close the window.

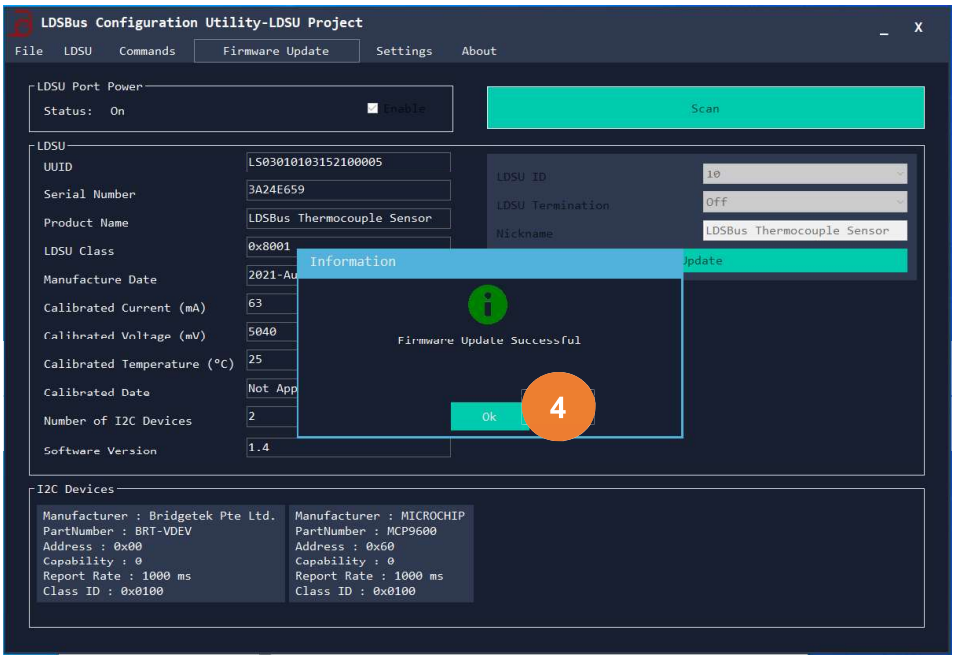


Figure 25 – Firmware Update Successful Message Window

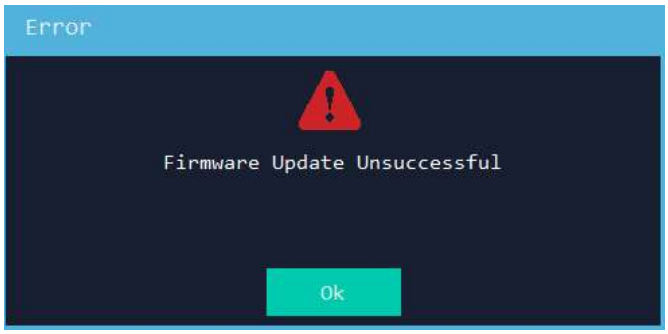


Figure 26 – Firmware Update Unsuccessful Message Window

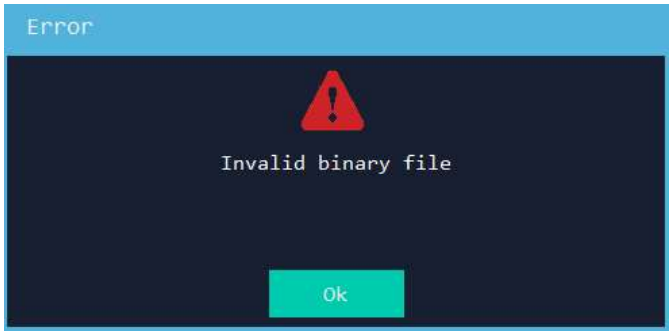


Figure 27 – Firmware Update Error Message Window

5.3 LDSU Command Interface

The LDSU command interface is used to communicate with the LDSU module by selecting the command from the list of support commands. The command settings are available only if the device is found on the bus. To access the Commands window,

1. Select **Commands** from the menu.

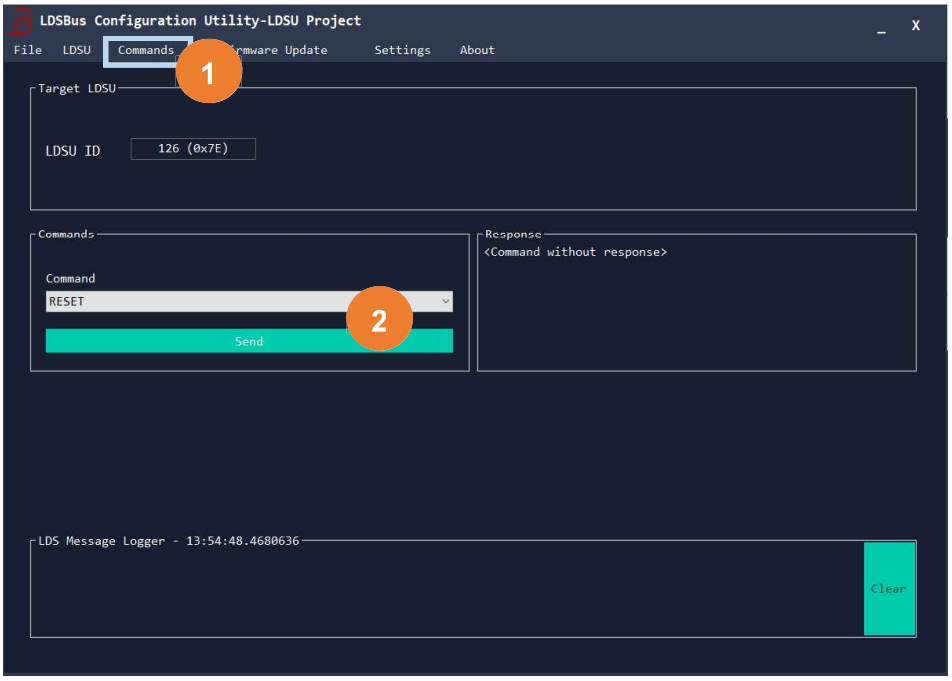


Figure 28 – LDSU Project – Commands Interface

2. The Commands interface is displayed.

   LDSU ID – Displays the selected Device ID
   Command – Displays a list of LDS Commands in a drop-down box
   Response – Upon selecting a command and clicking **[Send]**, the device response will extract the packets and display them in the response box. Refer to Table 1 for the list of commands with response and without response. Refer to Figure 30 for a sample command with response. Refer to Figure 31 for a sample command without response.
   LDS Message Logger – Displays the query and response logger.

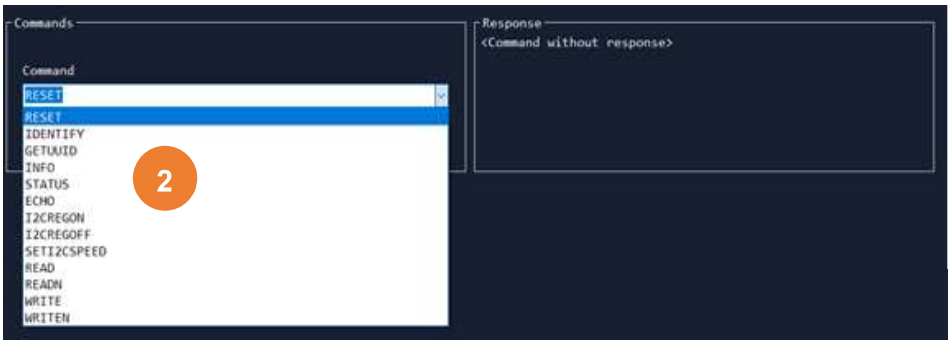


Figure 29 – LDSU Project – Commands List

Refer to Table 1 for the list of commands.

Commands with payload and response	READN; WRITEN; READ; ECHO
Commands without payload and no response (Same UI)	RESET; IDENTIFY;I2CREGOFF
Commands with payload and no response	I2CREGON; SETI2CSPEED; WRITE
Commands without payload and with response	INFO; STATUS; GETUUID

Table 1- List of Commands

Figure 30 – Sample Command with Response

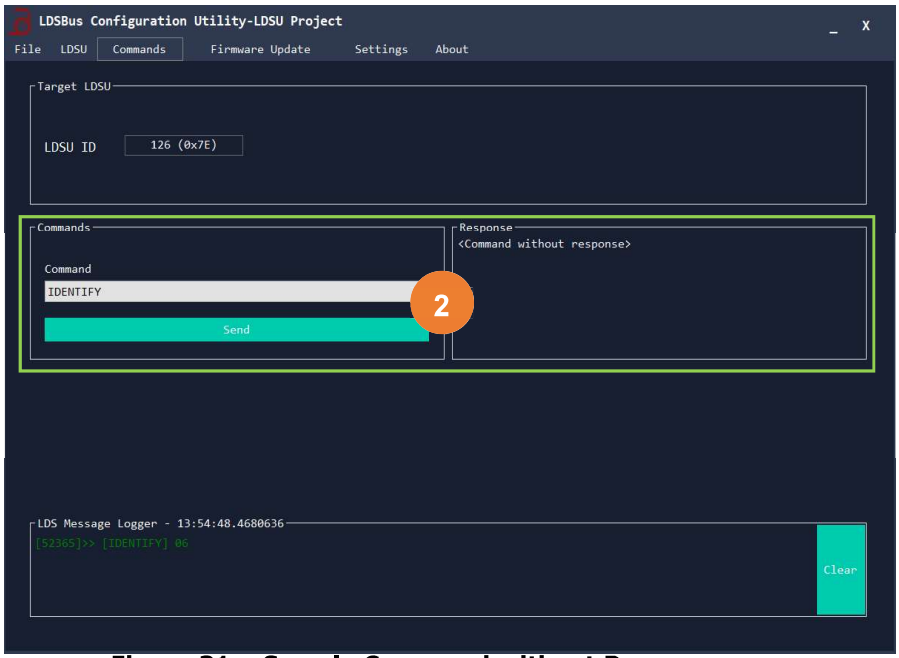


Figure 31 – Sample Command without Response

5.4 Saving LDSU (LDSUnit) Project

Upon creating an LDSU Project, users may save the project. To save a project –

1. Click **File → Save**.

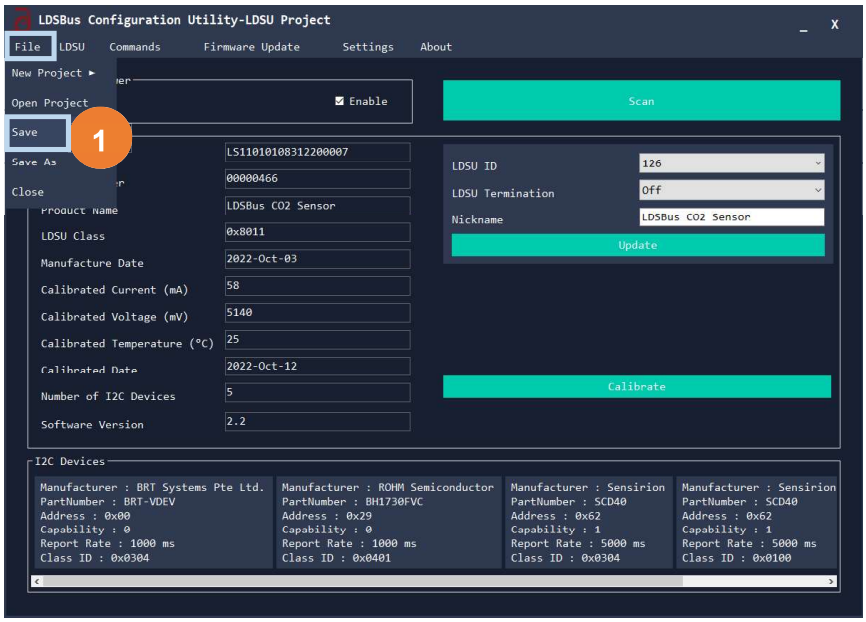


Figure 32 - Save LDSU Project

2. By default, the project will be saved under this location - */My Documents/BRTSystems/LDSBus Projects*. However, users may select a preferred to location to save the project. The LDSU project will be saved with a file extension - **.ldsuproj**.

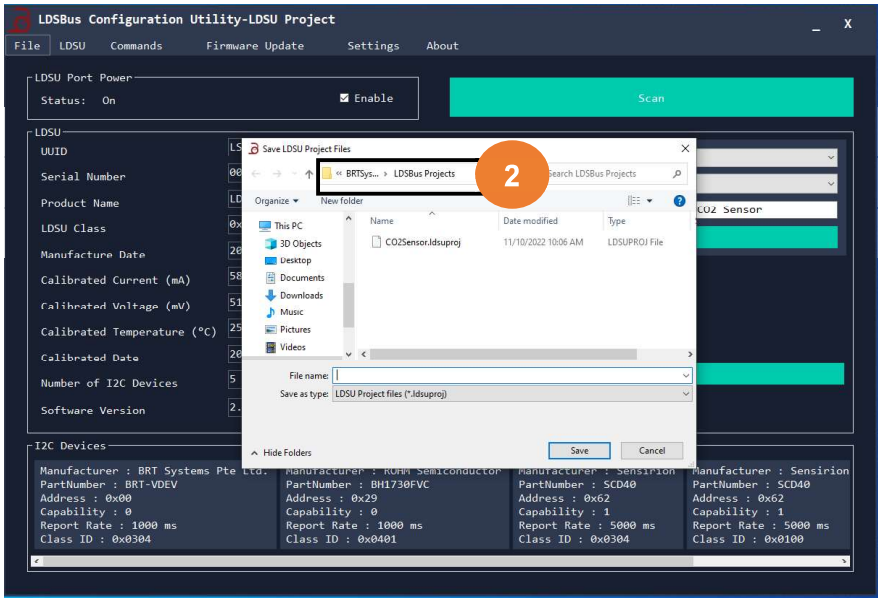


Figure 33 - Default Location to Save LDSU Project

3. Figure 34 shows a sample LDSU Project saved under the default location.

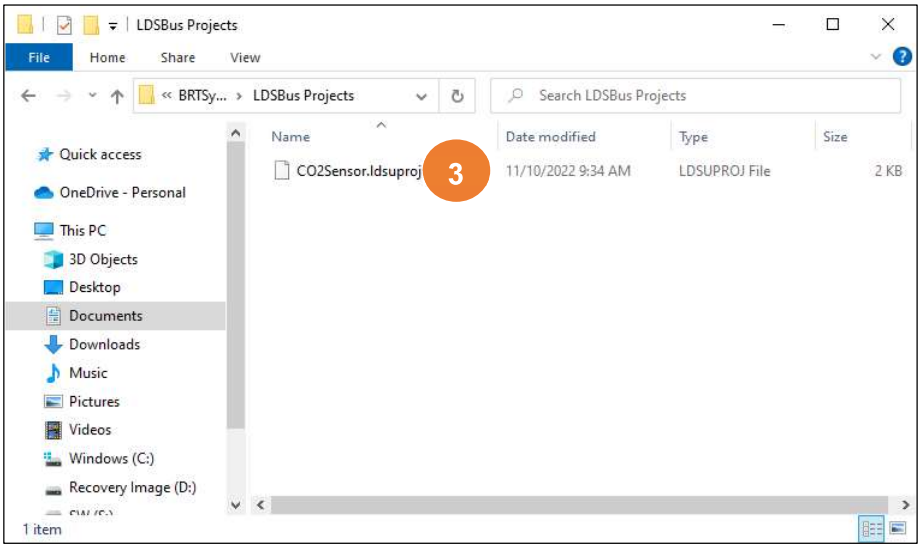


Figure 34 – Sample LDSU Project Saved under default location

NOTE: A copy of the file can be made in a different folder or with a different name by clicking the File → Save As.

5.5 Opening a LDSU Project

To open an existing LDSU Project,

1. Click **File → Open Project**.

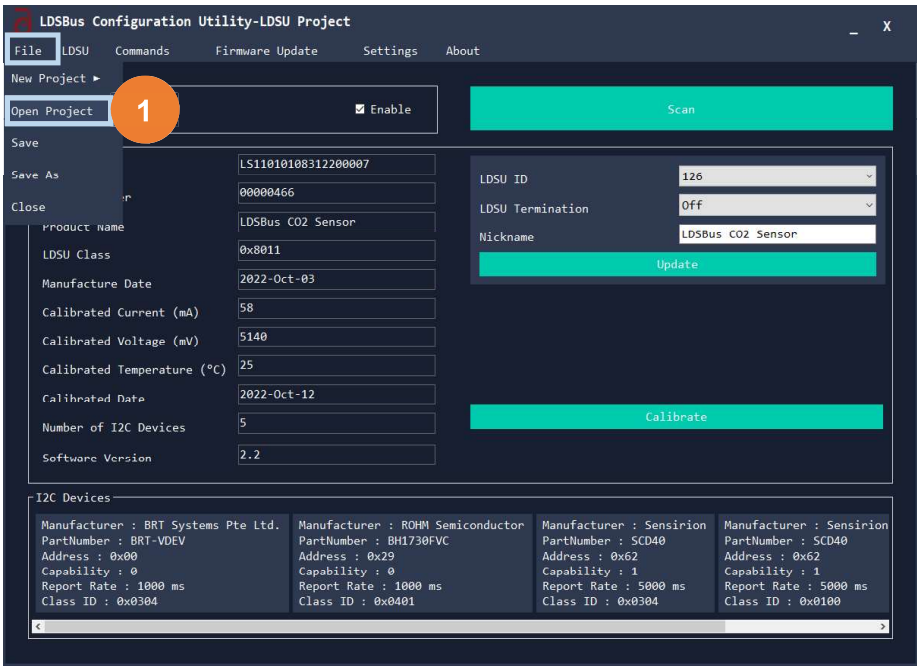


Figure 35 – File – Open Project Menu

2. Browse for the project in the File browser and select the LDSU Project. By default, the *Files of type* filter box display LDSBus Projects (*.ldsbusproj). Click the box and select a LDSU Project. Click and open the LDSU Project.

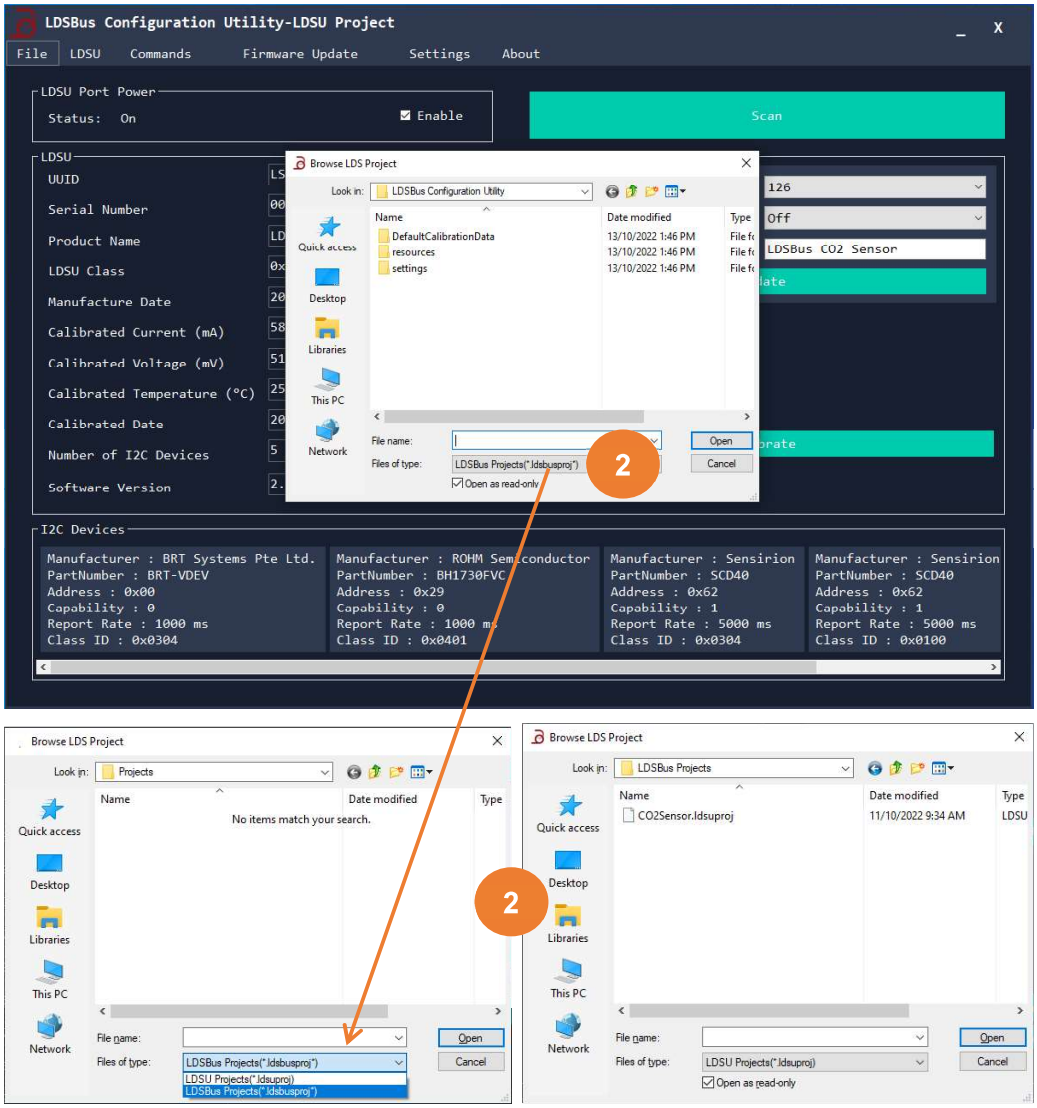


Figure 36 – File Browser – LDSU Project Selection

3. The LDSU project is opened in the project window.

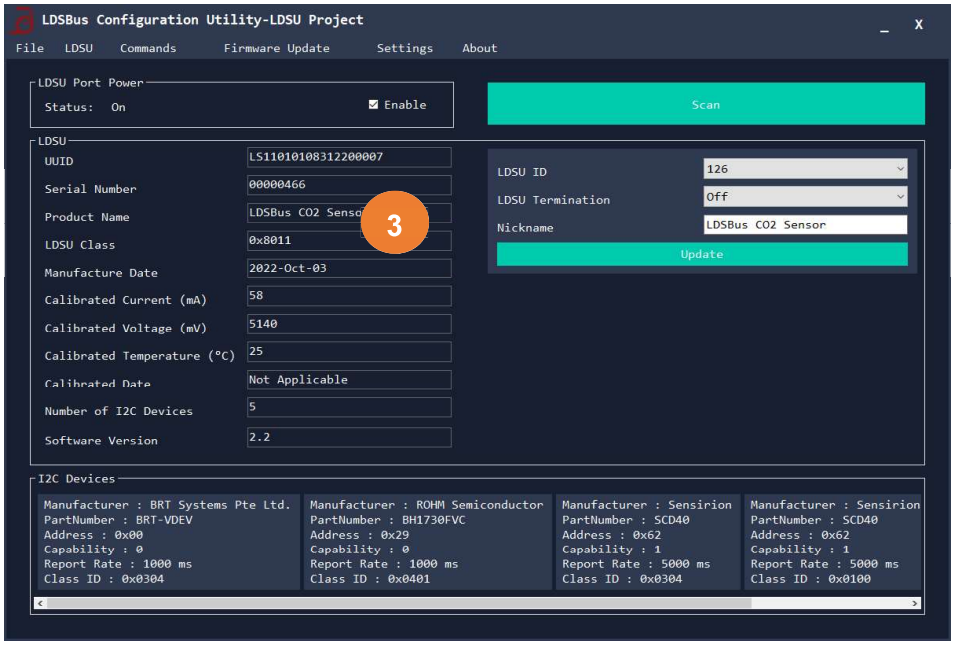


Figure 37 – LDSU Project Window

Refer to Section 5.1 for more information on creating the LDSU project.

6 Creating a New LDSBus Project

To create an LDSBus Project –

1. Click **File → New Project → LDSBus Project**.

Figure 38 – Project Type Selection Menu

2. Based on the selected project, the application title will be displayed. For example, if the selected project type is "LDSBus Project," then the title displayed will be *"LDSBus Configuration Utility – LDSBus Project."* **Enable** the LDSU port power on the LDSBus Device connected to the LDSBus USB Adapter. Click **[Scan]** to scan the devices in the bus.

Figure 39 – LDSBus Project Interface

3. Upon finding the device(s), information related to LDSBus Device will be displayed. There are two view options available, namely **LDSU IDs** View and **LDSU List** View. By default, LDUS IDs view is displayed.

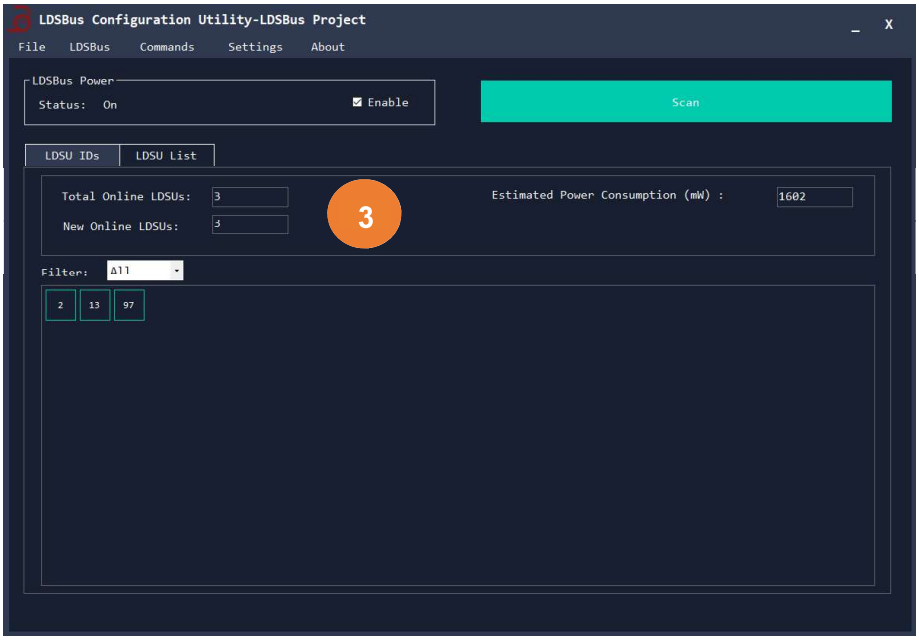


Figure 40 – LDSBus Project Interface (LDSU IDs View)

4. The following details are displayed as part of the LDSU IDs view –

   - *Total number online LDSU devices:* Displays the total number of LDSBus Devices which are physically connected and detected on the bus.
   - *New online LDSU devices:* Displays the total number of new LDSBus Devices which are physically connected and detected on the bus.
   - *Estimated Port Power Consumption:* Displays the estimated total power consumed by the bus
   - *Online/Offline Device Filter:* To filter all, online, offline, or new online LDSBus Devices. LDSBus Devices ID displayed based on filtering results.

5. Switch to LDSU List to view the basic device information. The list view displays all the LDSBus Devices connected in the bus with some device information. The LDSU List view displays the following information – *Device UUID; Device's Nickname; Date on which the device was last calibrated; Termination Status (ON / OFF).*

   Click **Details** to view the detailed information about the device.

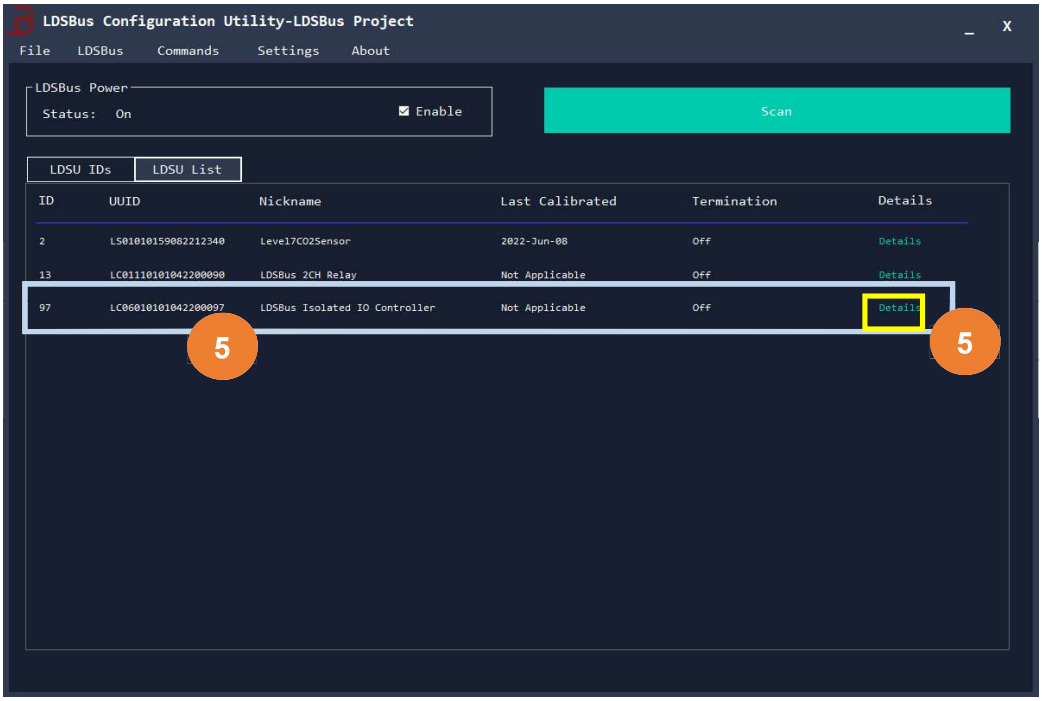


Figure 41 – LDSU List Interface

6. Upon clicking the **Details** link, the detailed LDSU information is displayed.

Figure 42 – LDSU Information

Click **[Commands]** to access the command interface.

Click **[Delete]** to remove any of the device from the list.

Click **[Calibration]** to start the calibration process.

Click **[Application]** to configure the application types.

6.1 LDSBus Command Interface

The LDSBus command interface is used to communicate with the LDSBus module by selecting the command from the list of supported commands. The command settings are available only if the device is found on the bus. Refer to Section 5.3 for more information.

6.2 Saving LDSBus Project

Upon creating an LDSBus Project, users may save the project. The steps for saving a LDSU Project and LDSBus Project is the same. Refer to Section 5.4 for more information.

6.3 Opening a LDSBus Project

The steps for opening a LDSU Project and LDSU Project is the same. Refer to Section 5.5 for more information.

6.4 LDSBus Right Click Functions

To access the dropdown menu of the device under LDSBus project.

1. Right click the device green square box.

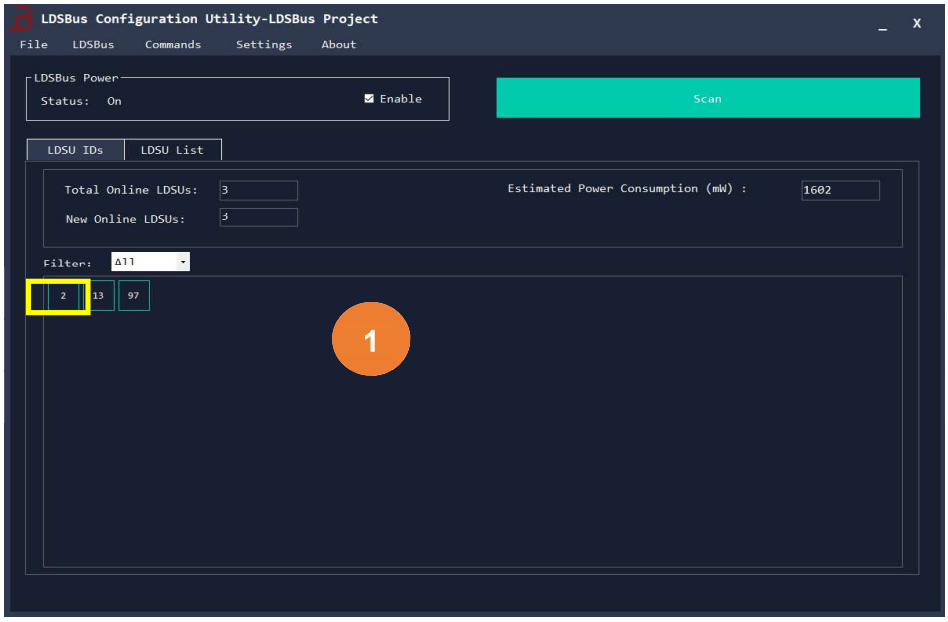


Figure 43 – LDSBus Project - LDSU IDs

2. The dropdown menu will be displayed.

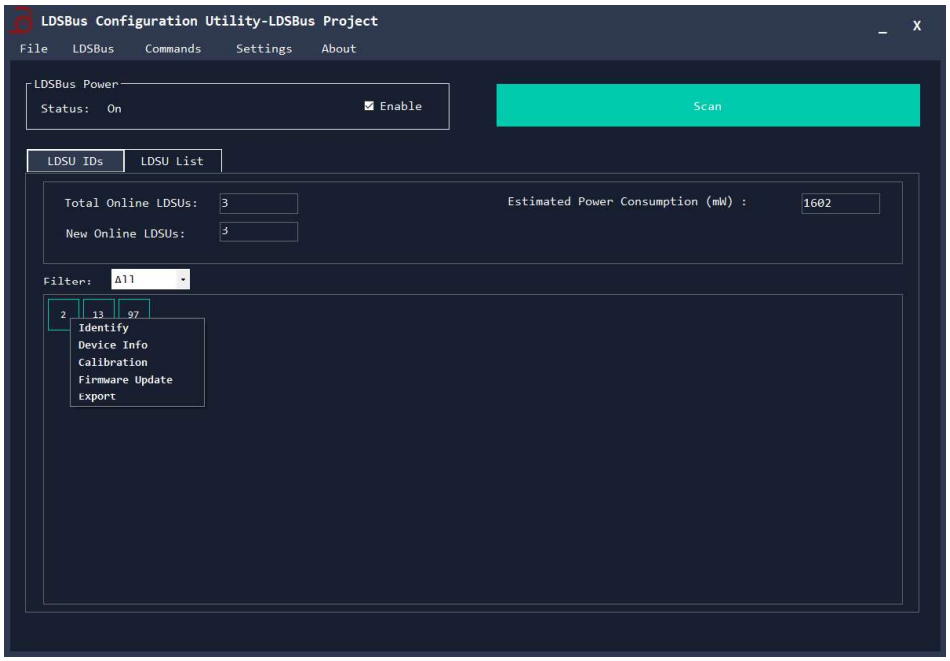


Figure 44 – LDSBus Right Click Drop Down Menu

Common items shown in the dropdown menu are "Identify," "Device Info," "Firmware Update," "Export," "Calibration," "Application Setting," "Profile Setting," "RFID Setting" and "Sensor Configuration" are device related.

Identify – To send identify command.

Device Info – To view the LDSU device as shown in **Figure 42.**

Firmware Update – To update device firmware. Refer to Section 6.5 for more details. On firmware update.

Export – To save the selected unit's data to LDSU project file.

Calibration – To perform calibration. Refer to Section 7 for more details on calibration procedure.

Application Setting – To configure application Type. Refer to Section 8 for more information related to application type configuration.

Profile Setting – To configure profile setting. Refer to Section 8.3 for more information on Profile Setting.

RFID Setting – To configure RFID Setting. Refer to Section 8.4 for more information on Configuring RFID Setting.

Sensor Configuration – To configure Senor Setting. Refer to Section 8.5 for more information on Sensor Configuration Setting.

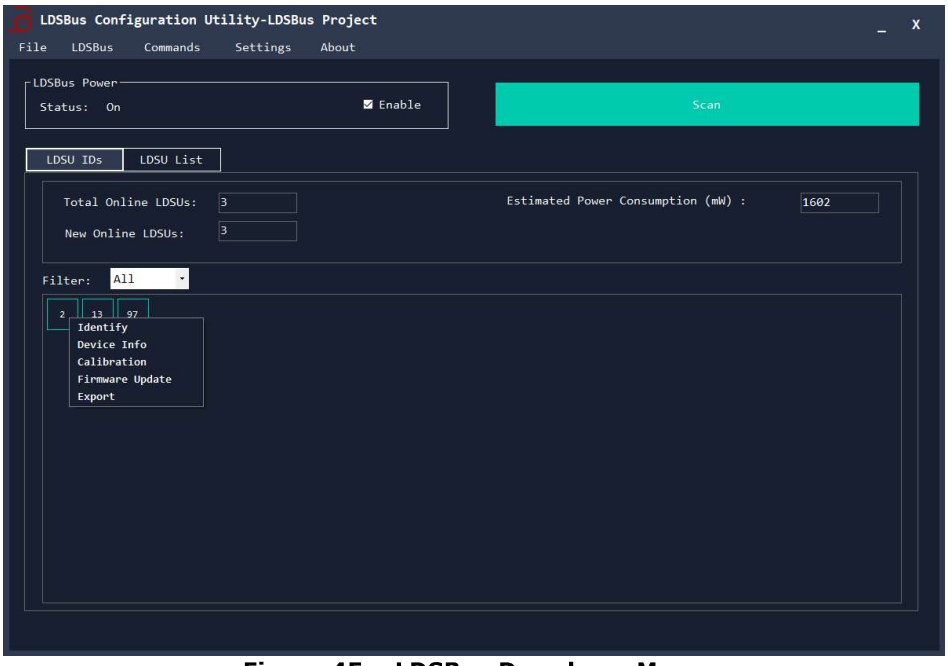


Figure 45 – LDSBus Dropdown Menu

6.5 LDSBus Firmware Update

To update device's firmware under LDSBus project –

1. Right click and select the device for which the firmware needs to be updated; From the resulting drop-down menu, click on **[Firmware Update]** to start the firmware update process.

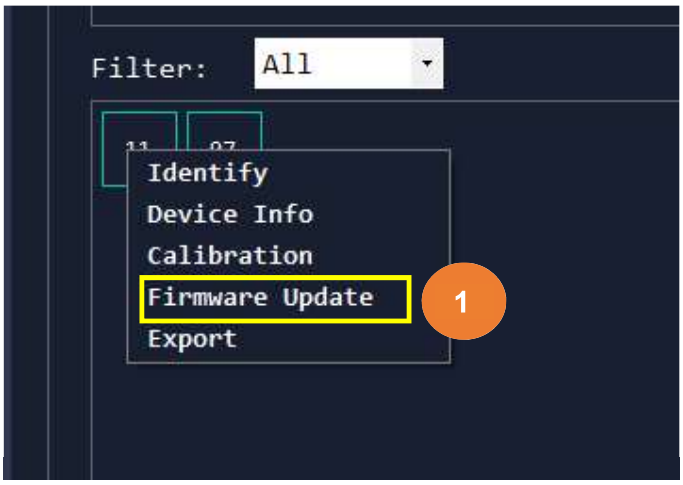
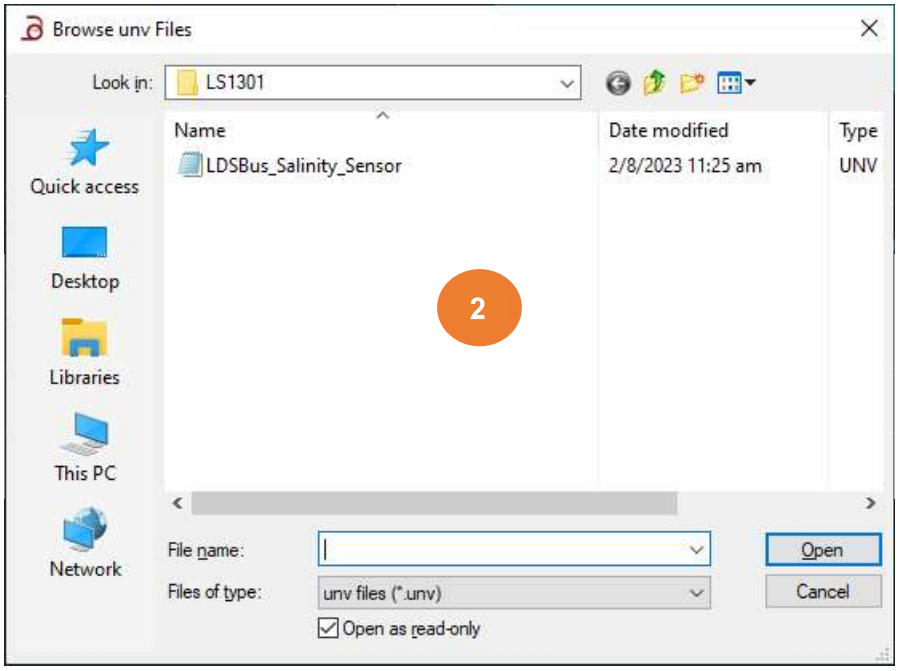


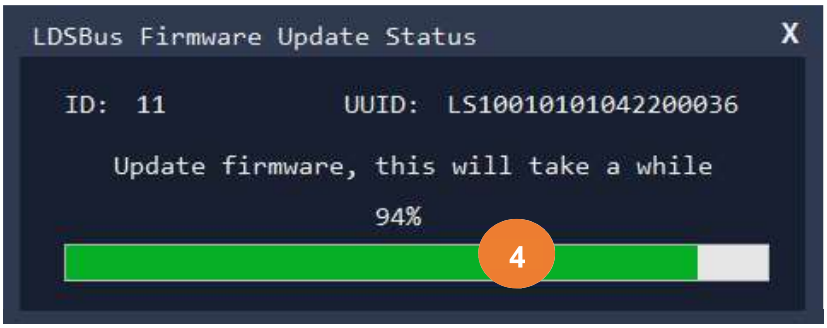
Figure 46 – Drop Down Menu – Firmware Update

2. Open File Dialog window will pop up for users to select the unv file; choose the correct unv file and click **[Open]** to continue. Alternately, click **[Cancel]** to cancel firmware update.

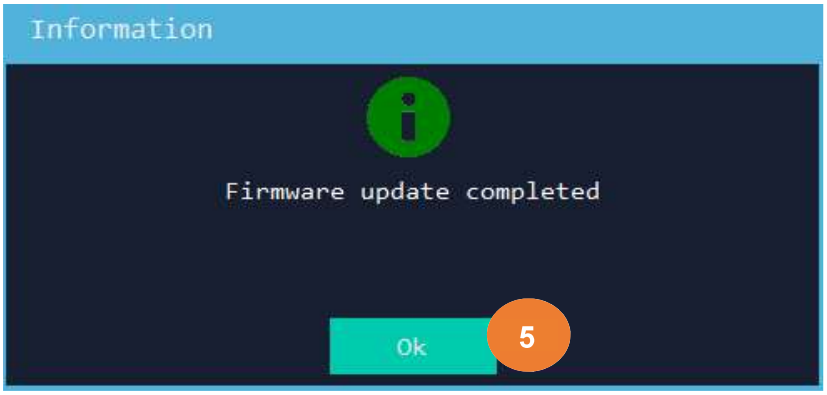


3. A confirmation window will pop up. Click **[Yes]** to confirm the firmware update operation or click **[No]** to cancel the update.

4. LDSBus Firmware update status window will pop up to show the progress of the firmware update.



5. Upon successful completion of update, an appropriate message indicating the same will be displayed. Click **[OK]** to return back LDSBus Project window.



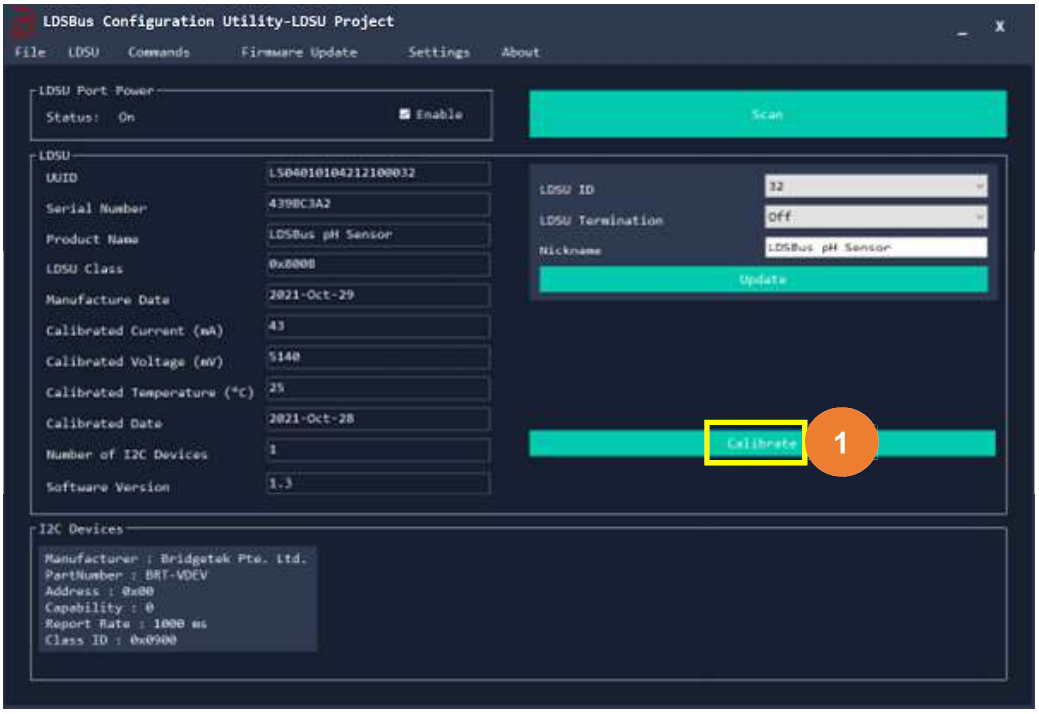
7 Calibration Procedure

From V1.2.2 of the configuration utility, sensor calibration may be performed in-situ on the LDSBus, i.e. the sensor adapter and probe need not be removed from the bus and prevents any disruption to the existing setup in the field. For in-situ calibration, detach the RJ-45 cable from the gateway LDSBus Port and attach it to the RJ-45 interface of the LDSBus USB Adapter and open an LDSBus Project in the utility, instead.

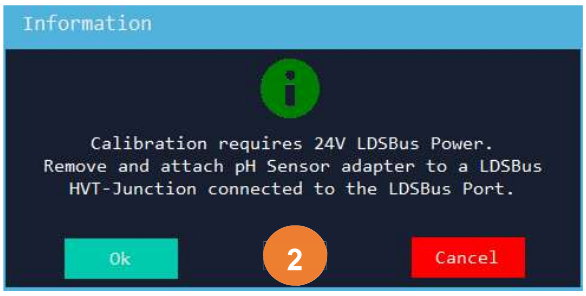
7.1 LDSBus pH Sensor Adapter Calibration

To calibrate pH Sensor Adapter, follow these steps –

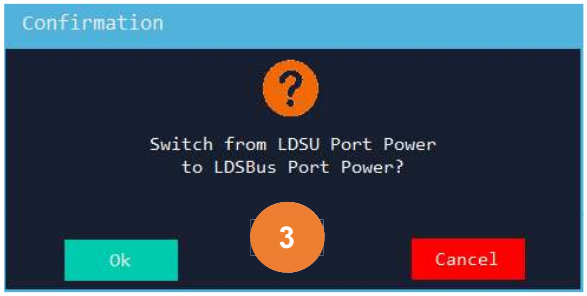
1. Click **[Calibrate]** from the LDSU / LDSBus Project interface.



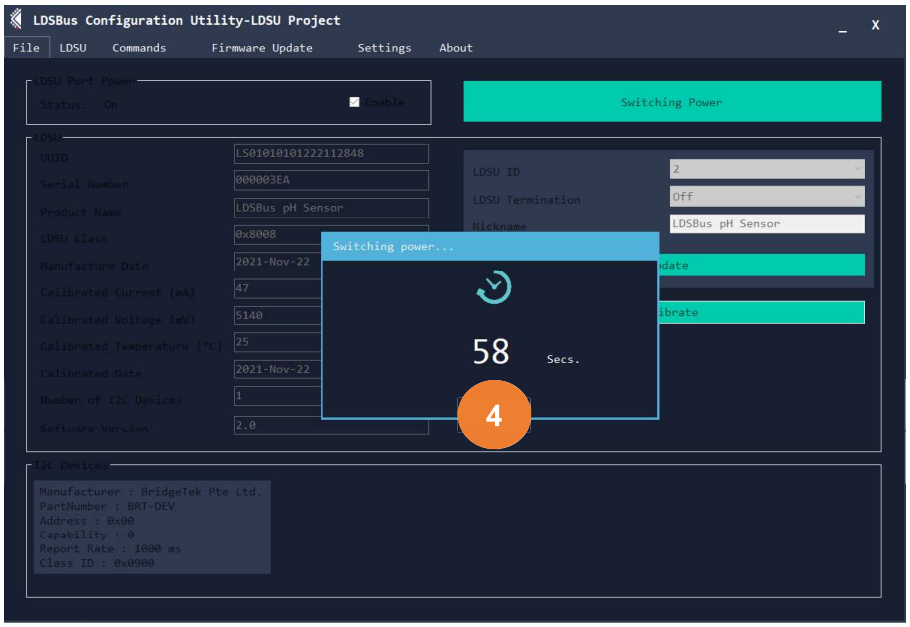
2. An information window prompting the users for Power Selection is displayed. LDSU Calibration requires 24V Power supply. Remove the sensor module and attach to the HVT-Junction connected to the LDSBus Port. Click **[Ok]** to continue or **[Cancel]** to quit the calibration process.



3. Upon clicking **[Ok]**, a confirmation window prompting the user to switch from LDSU Port Power to LDSBus Port Power is displayed. Click **[Ok]** to switch. Alternately, click **[Cancel]** to exit the calibration process.

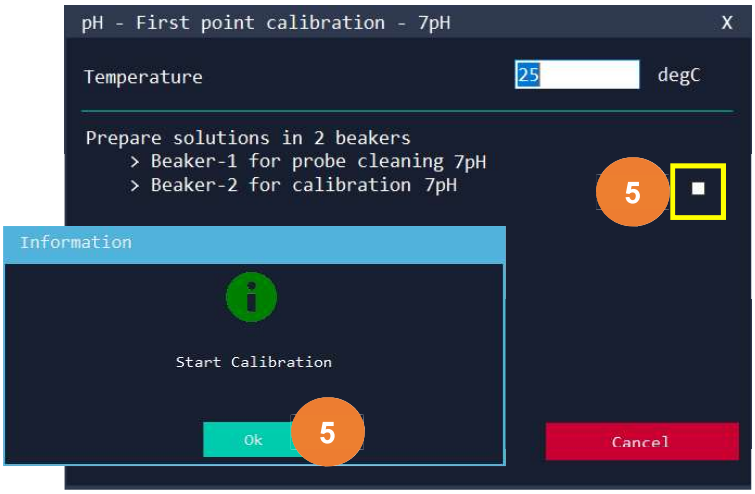


4. Upon clicking **[Ok]**, the project window will be in disabled mode and the countdown timer starts as shown in the picture indicating that the power switching is in progress.

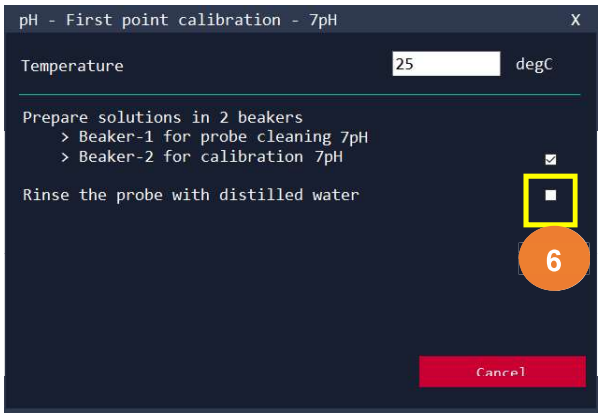


First Point Calibration

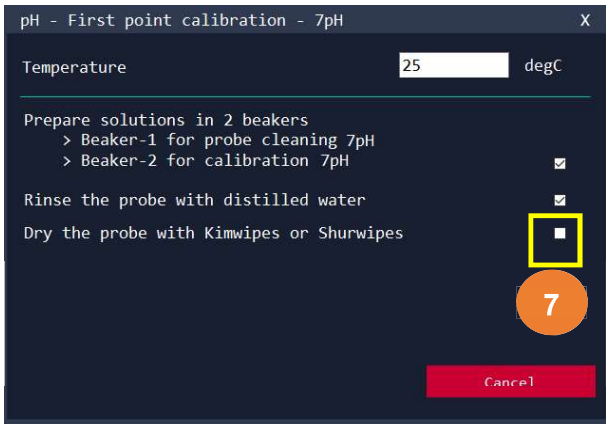
5. Upon successful power switch, system will prompt the users to start the calibration. Click **[OK].** The interface for the First point calibration for 7pH is displayed. Prepare Buffer solution (7pH and one more optional). There should be two sets of beakers for each solution. Beaker 1 is used to clean the probe before a calibration and Beaker 2 is used for the actual calibration measurement. *Temperature* can be edited if required. Upon preparing the solutions, click on the *Beaker-2 for Calibration 7pH* checkbox.



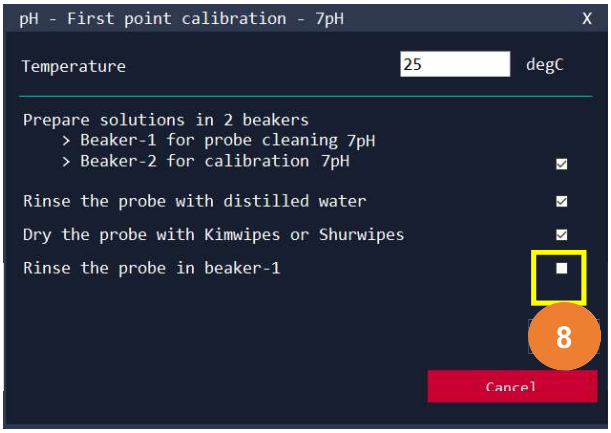
6. Remove the electrode from its storage solution and rinse it with distilled water in an empty waste beaker. Upon rinsing the probe with distilled water, click on the *Rinse the probe with distilled water* check box.



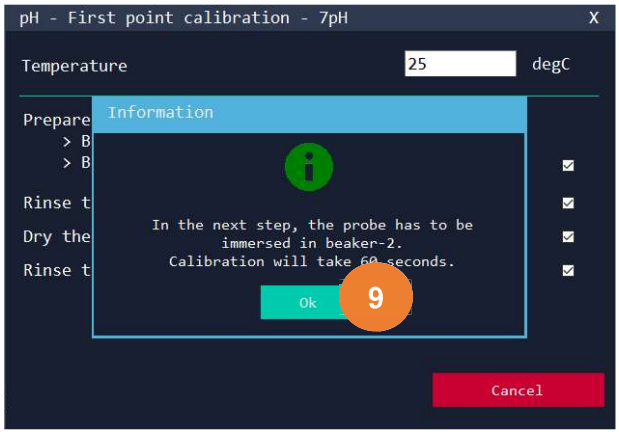
7. After rinsing, wipe dry with Kimwipes or Shurwipes and click on the *Dry the probe with Kimwipes or Shurwipes* checkbox. (Avoid rubbing the electrode because it has a sensitive membrane).



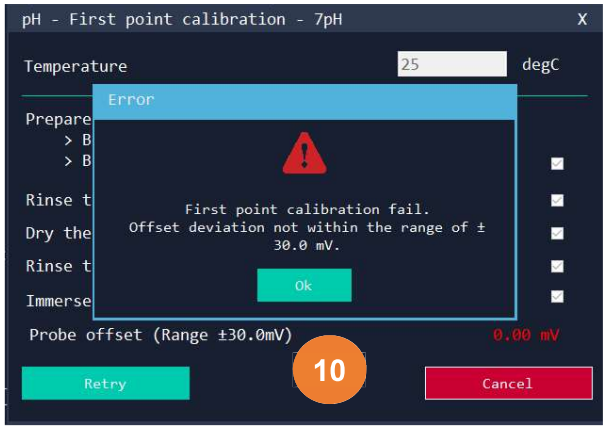
8. Use Beaker 1 (7pH) to rinse the electrode. Use Beaker 2 (7pH) to place the electrode to start the calibration. Rinse the probe in beaker 1 (7pH), then click the *Rinse the probe in beaker-1* checkbox.



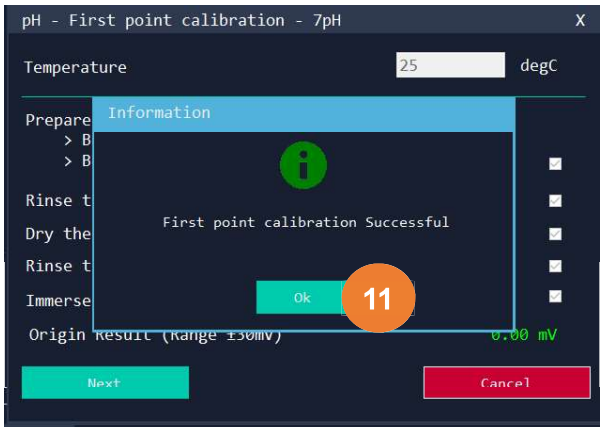
9. An information window will appear. Click **[Ok]** to proceed. The calibration window will be in disabled mode and the countdown timer starts as shown in the picture. Wait for 60 seconds to stabilize the readings.



10. Check the result. If the first point calibration is unsuccessful, an error message is displayed. Click **[Retry]** to start the first point calibration again (Repeat Steps 5 – 10 until the first point calibration is successful).

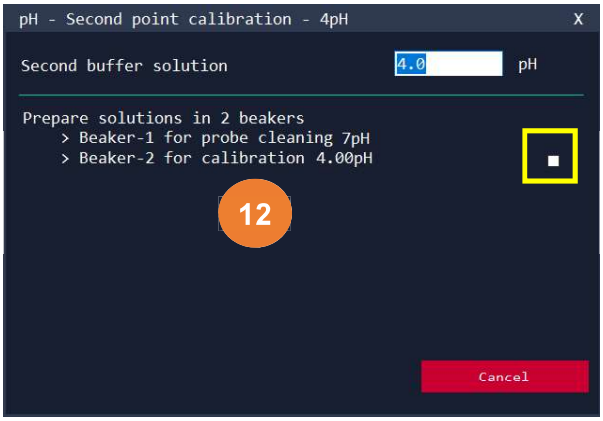


11. Upon successful calibration, an appropriate message indicating the same is displayed. Click **[Ok]** to continue. The Calibration result will be displayed. Click **[Next]** to proceed with the Second point calibration.

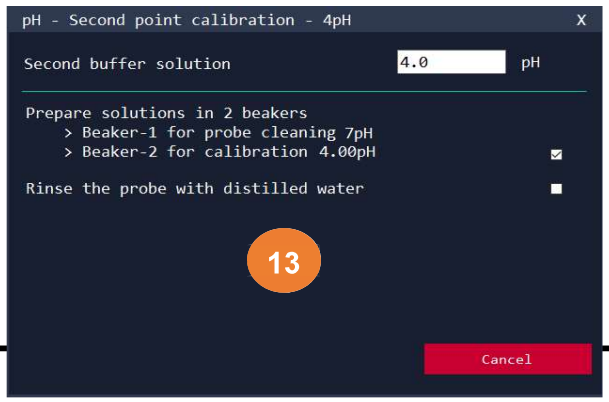


Second Point Calibration

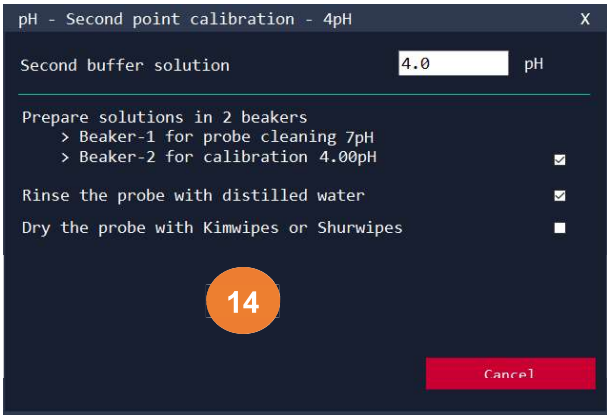
12. Upon successfully completing the First Point Calibration, the Second Point Calibration interface is displayed. Prepare Second buffer solution. There should be two sets of beakers for each solution. Beaker 1 is used to clean the probe before a calibration and Beaker 2 is used for the actual calibration measurement. Upon preparing the solutions, click on the *Beaker-2 for Calibration 4.00pH* checkbox.



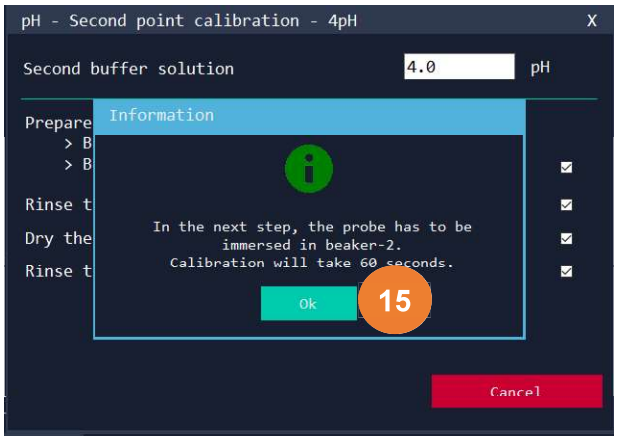
13. Remove the electrode from its storage solution and rinse it with distilled water in an empty waste beaker. Upon rinsing the probe with distilled water, click on the *Rinse the probe with distilled water* check box.



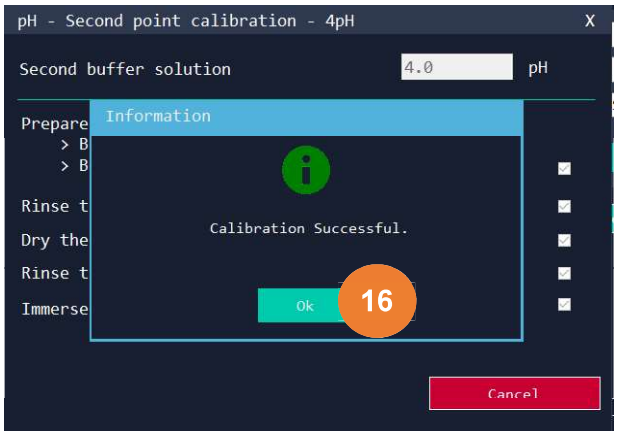
14. After rinsing, wipe dry with Kimwipes or Shurwipes and click on the *Dry the probe with Kimwipes or Shurwipes* checkbox.



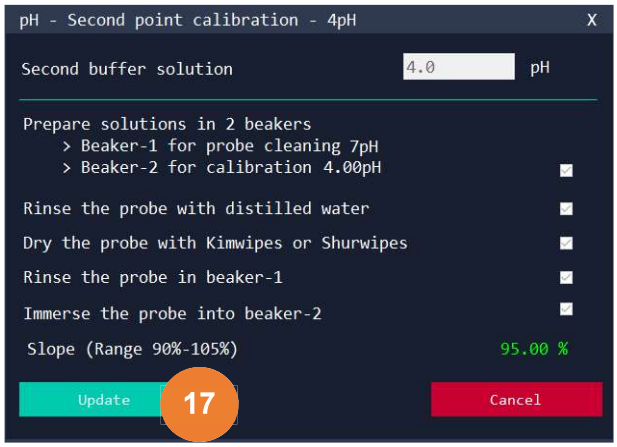
15. An information window will appear. Click **[Ok]** to proceed. The calibration window will be in disabled mode and the countdown timer starts as shown in the picture. Waiting for 60 seconds to stabilize the readings.



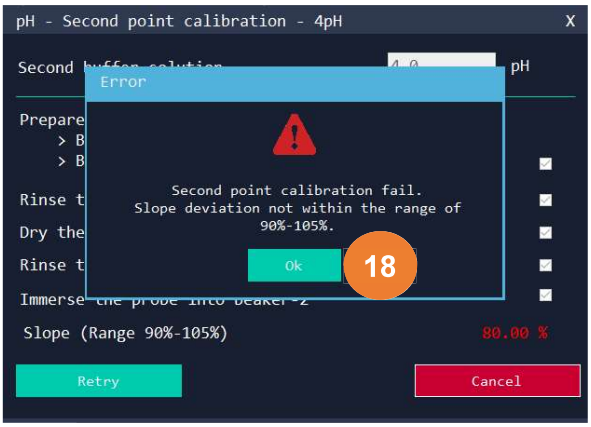
16. Check the result. Upon successful calibration, an appropriate message indicating the same is displayed. Click **[Ok]** to continue.



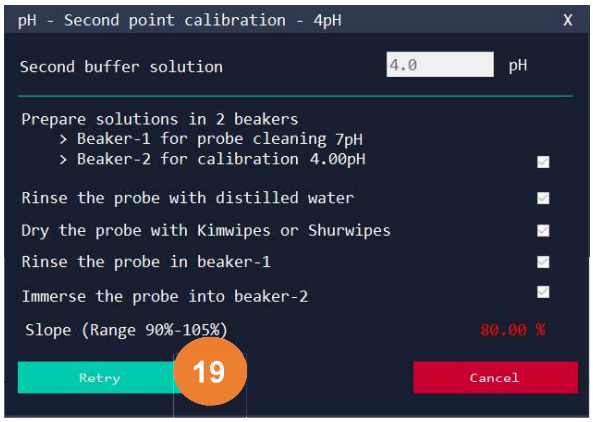
17. The Calibration result will be displayed. Click **[Update]** to flash the calibration data into the device. System will switch power from LDSBus Port to LDSU Port.



18. If the calibration fails, then appropriate error message is displayed. Click **[Ok]**.

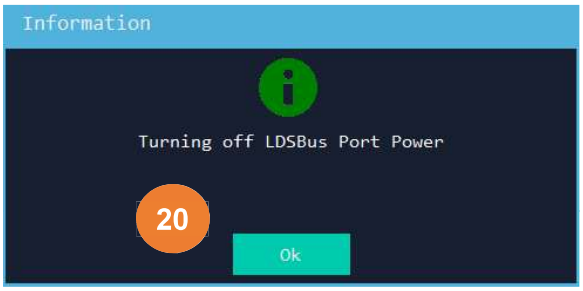


19. Click **[Retry]** to do the second point calibration again. (Repeat Steps 13 – 19 until the calibration is successful) or click **[Cancel]** to exit the calibration process. Upon cancelling the calibration process, system will switch power from LDSBus Port to LDSU Port.

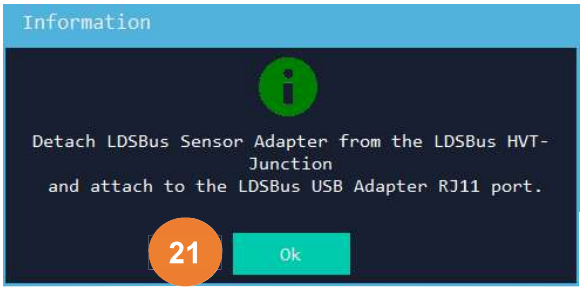


Post Completion or Cancellation of Calibration Process

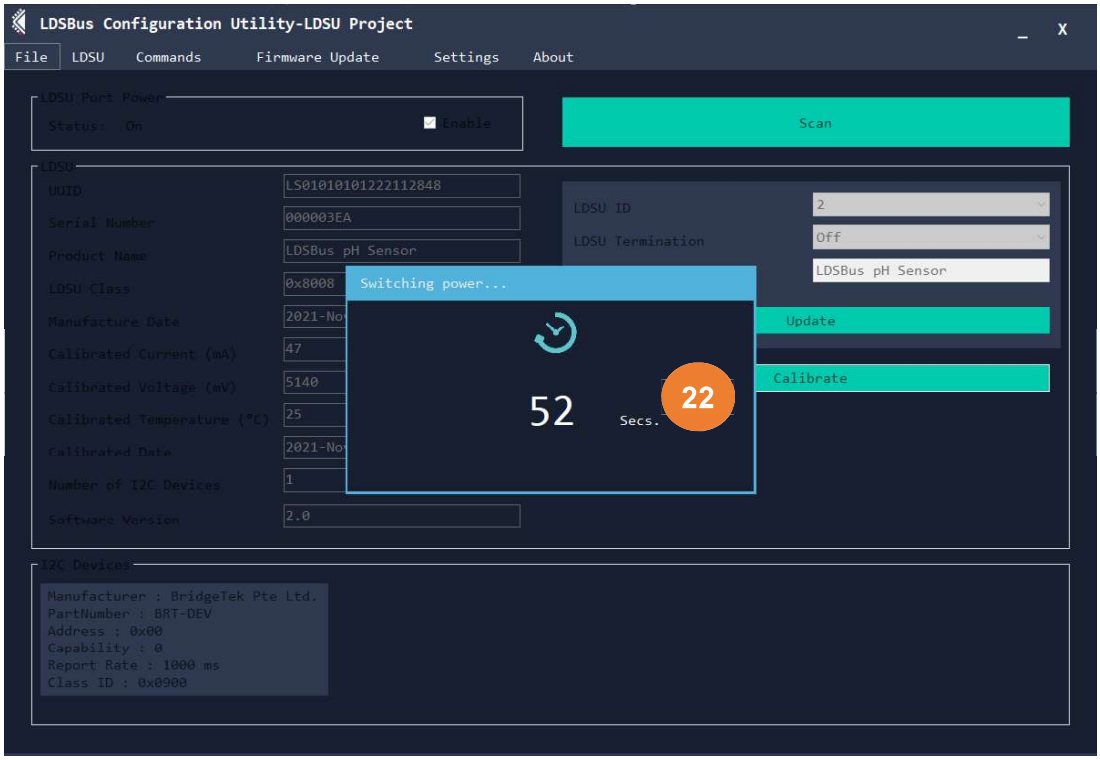
20. Upon successful completion or cancellation of calibration process, system will switch power from LDSBus Port to LDSU Port.



21. An information window prompting the users to detach the LDSBus pH Sensor Adapter from the LDSBus HVT-Junction and attach to the LDSBus USB Adapter RJ11 Port is displayed. Click **[Ok]**.



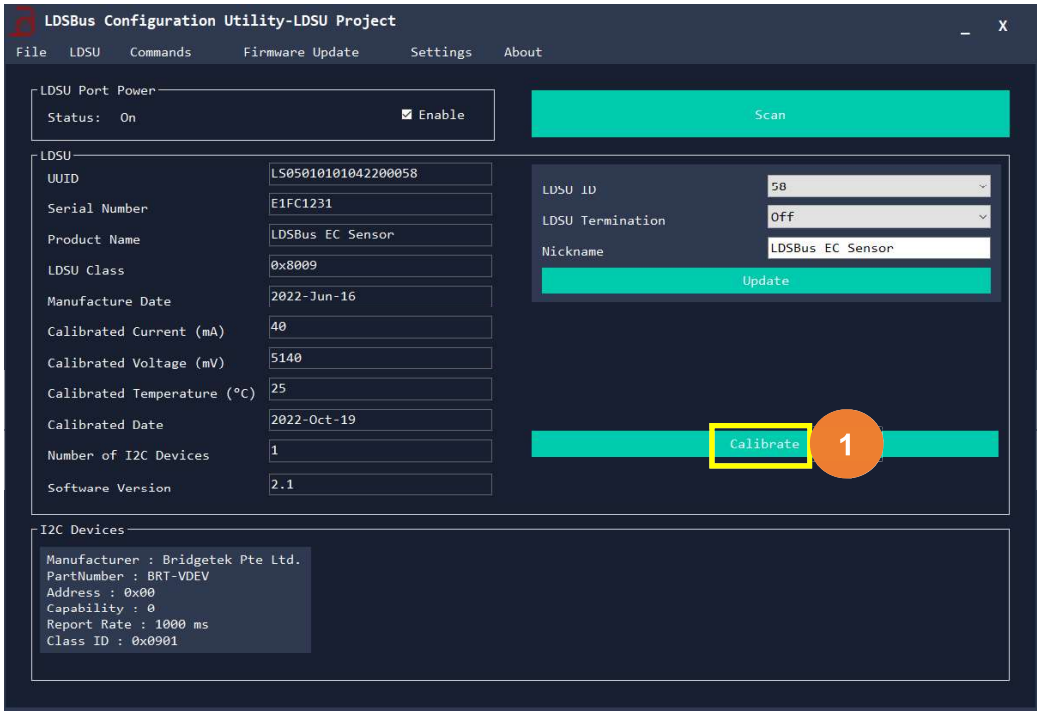
22. Upon clicking **[OK]**, the project window will be in disabled mode and the countdown timer starts as shown in the picture indicating that the power switching is in progress.



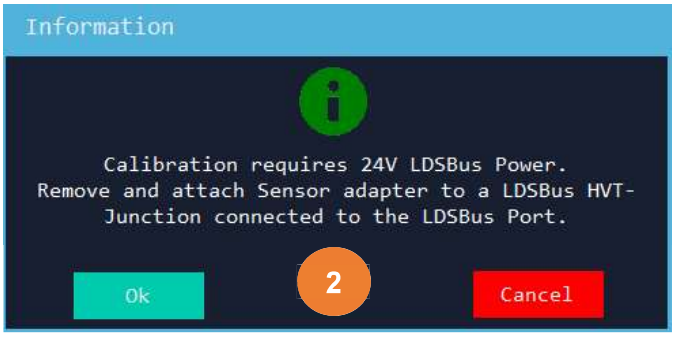
7.2 LDSBus EC/Salinity Sensor Adapter Calibration

To calibrate EC / Salinity Sensor Adapter, follow these steps –

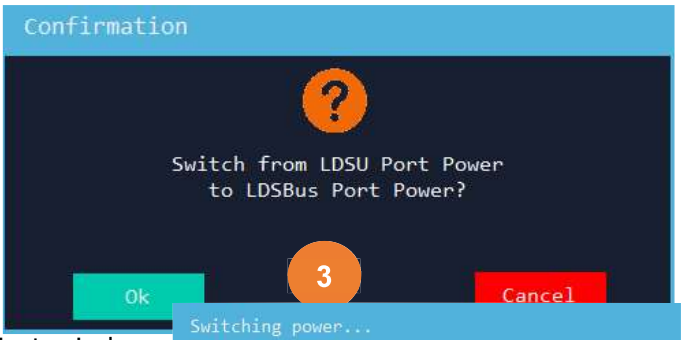
1. Click **[Calibrate]** from the LDSU / LDSBus Project interface to start the calibration.



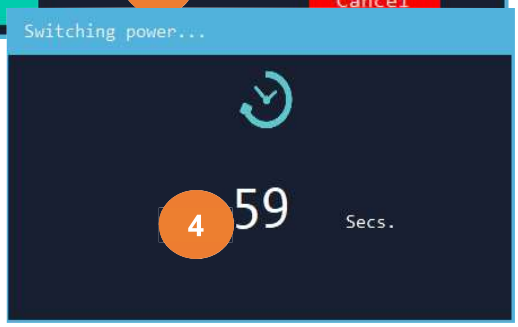
2. An information window prompting the users for Power Selection is displayed. LDSU Calibration requires 24V Power supply. Remove the sensor module and attach to the HVT-Junction connected to the LDSBus Port. Click **[Ok]** to continue or **[Cancel]** to quit the calibration process.



3. Upon clicking **[Ok]**, a confirmation window prompting the user to switch from LDSU Port Power to LDSBus Port Power is displayed. Click **[Ok]** to switch. Alternately, click **[Cancel]** to exit the calibration process.



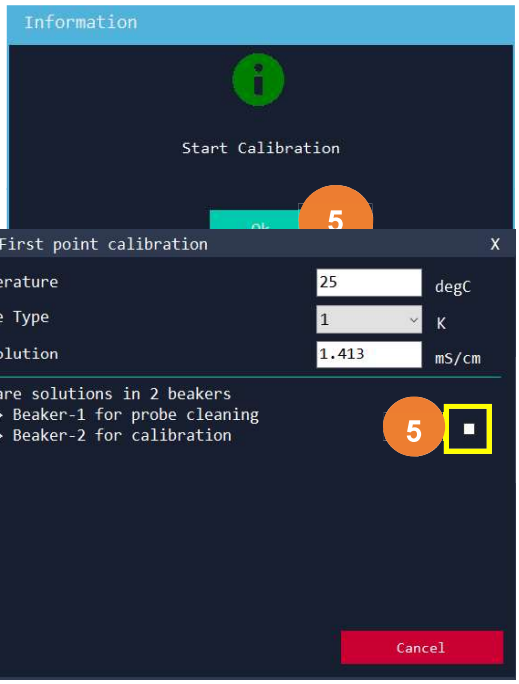
4. Upon clicking **[OK]**, the project window will be in disabled mode and the countdown timer starts as shown in the picture indicating that the power switching is in progress.



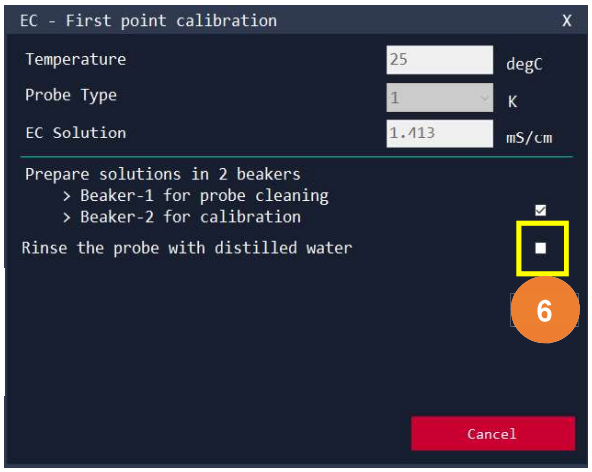
First Point Calibration

5. Upon successful power switch, system will prompt the users to start the calibration. Click **[Ok].** The interface for the First point calibration for EC Sensor is displayed. Prepare Buffer solution (EC Sensor and one more optional). There should be two sets of beakers for each solution. Beaker 1 is used to clean the probe before a calibration and Beaker 2 is used for the actual calibration measurement.

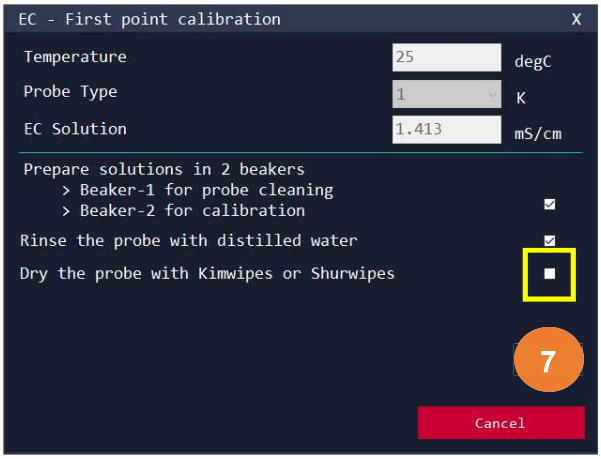
   Temperature/Probe Type/EC Solution can be edited if required. Upon preparing the solutions, click on the *Beaker-2 for Calibration* checkbox.



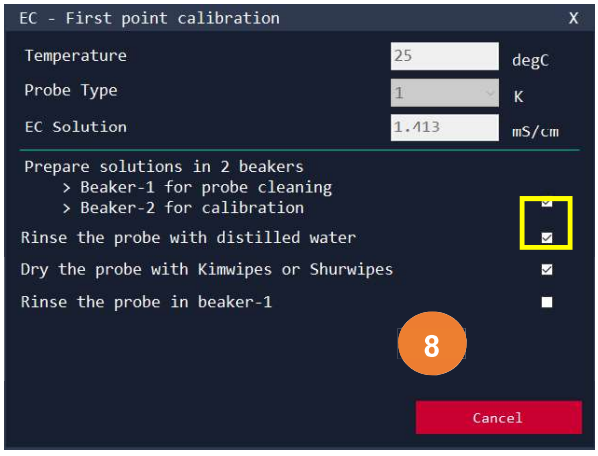
6. Remove the electrode from its storage solution and rinse it with distilled water in an empty waste beaker. Upon rinsing the probe with distilled water, click on the *Rinse the probe with distilled water* check box.



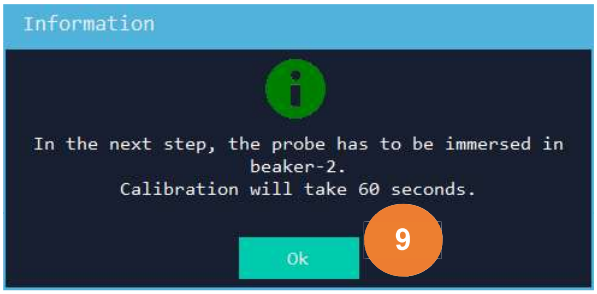
7. After rinsing, wipe dry with Kimwipes or Shurwipes and click on the *Dry the probe with Kimwipes or Shurwipes* checkbox. (Avoid rubbing the electrode because it has a sensitive membrane).



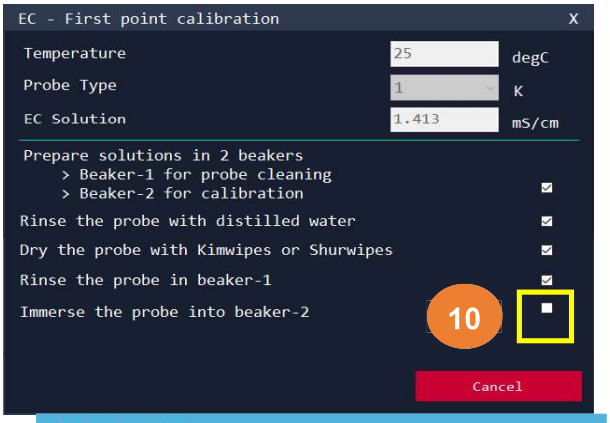
8. Use Beaker 1 to rinse the electrode. Use Beaker 2 to place the electrode to start the calibration. Rinse the probe in beaker 1, then click the *Rinse the probe in beaker-1* checkbox.



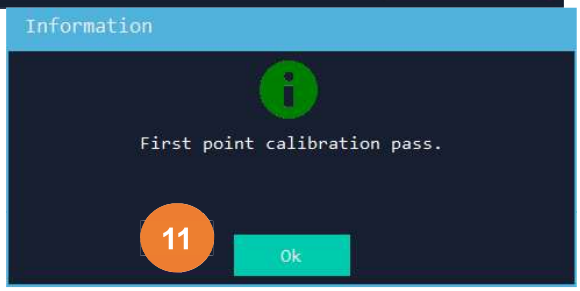
9. An information window will appear prompting for immersing the probe in beaker 2. Click **[Ok]** to proceed.



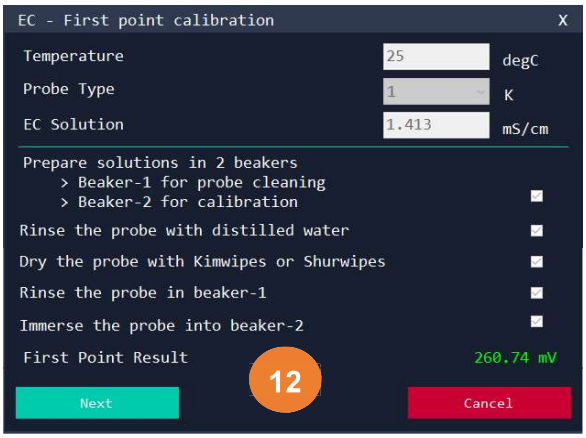
10. Upon immersing the probe, click on the corresponding checkbox. Wait for 60 seconds to stabilize the readings.



11. Upon successful calibration, an appropriate message indicating the same is displayed. Click **[Ok]** to continue. The Calibration result will be displayed.

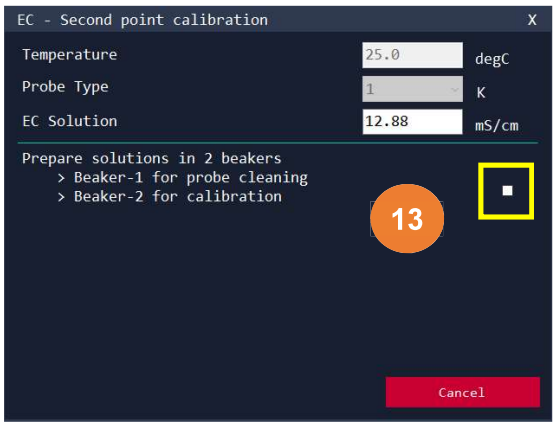


12. Click **[Next]** to proceed with the Second point calibration.

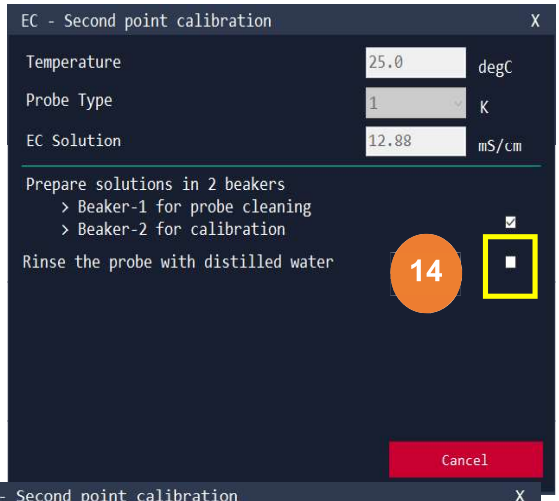


Second Point Calibration

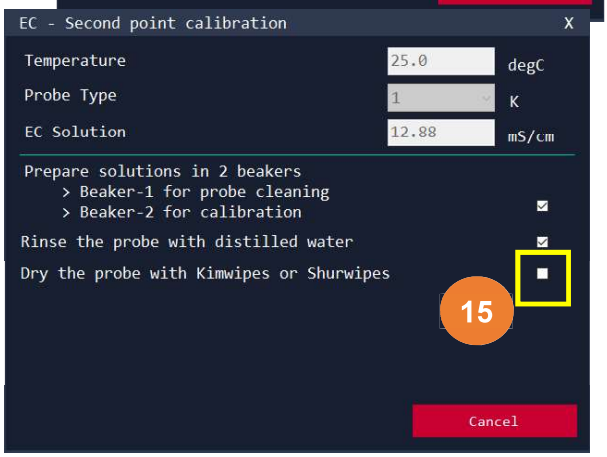
13. Upon successfully completing the First Point Calibration, the Second Point Calibration interface is displayed. Prepare Second buffer solution. There should be two sets of beakers for each solution. Beaker 1 is used to clean the probe before a calibration and Beaker 2 is used for the actual calibration measurement. Upon preparing the solutions, click on the *Beaker-2 for Calibration* checkbox.



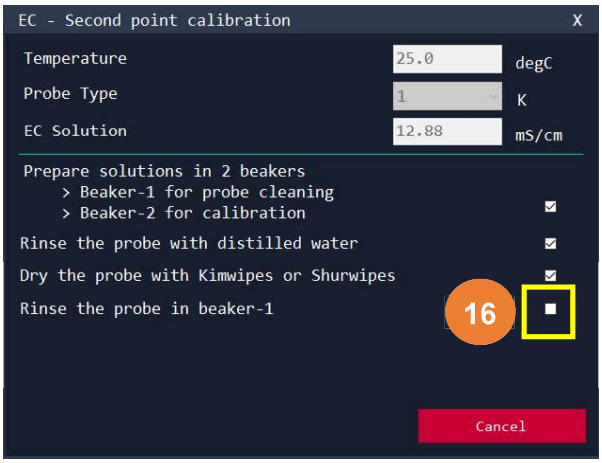
14. Remove the electrode from its storage solution and rinse it with distilled water in an empty waste beaker. Upon rinsing the probe with distilled water, click on the *Rinse the probe with distilled water* check box.



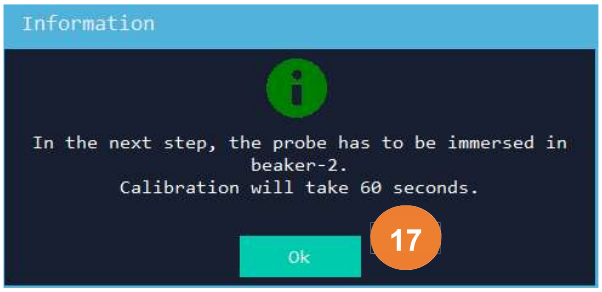
15. After rinsing, wipe dry with Kimwipes or Shurwipes and click on the *Dry the probe with Kimwipes or Shurwipes* checkbox.



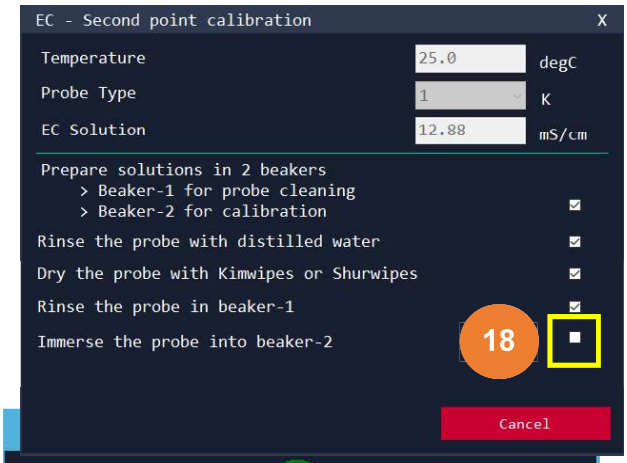
16. Rinse the probe in beaker solution. Once done, click on the *Rinse the probe in beaker-1* checkbox.



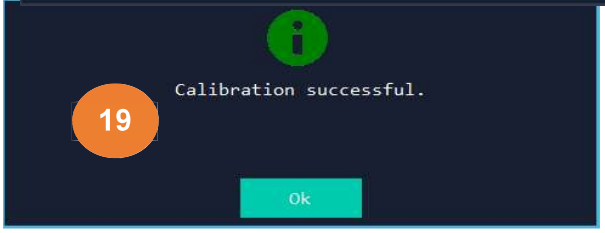
17. An information window will appear prompting for immersing the probe in beaker 2. Click **[Ok]** to proceed.



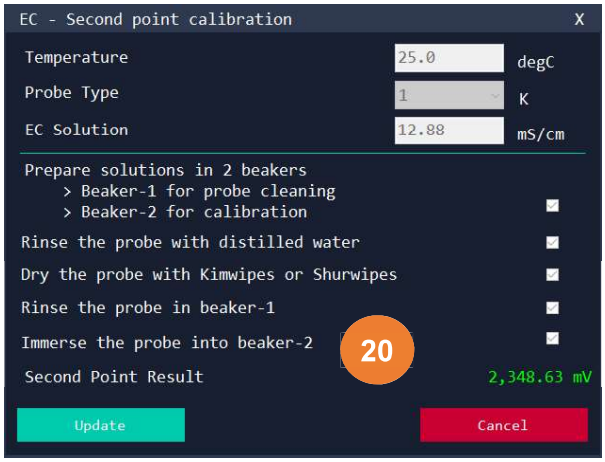
18. Upon immersing the probe, click on the corresponding checkbox. Wait for 60 seconds to stabilize the readings.



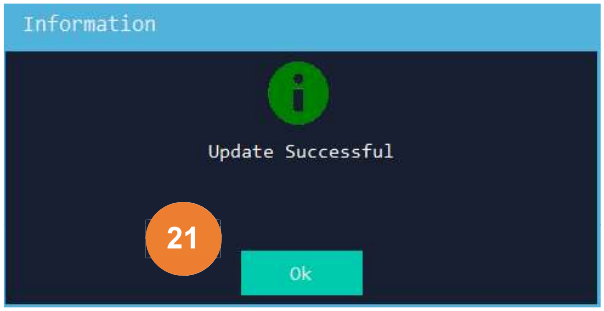
19. Upon successful calibration, an appropriate message indicating the same is displayed. Click **[Ok]** to continue. The Calibration result will be displayed.



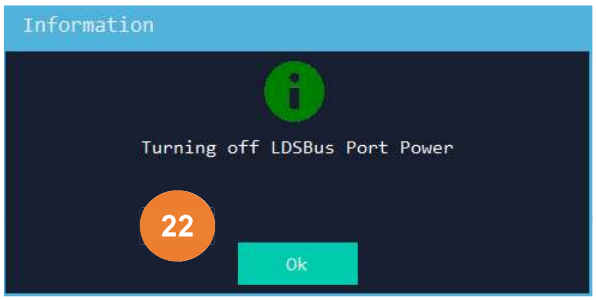
20. The second point calibration result will be displayed. Click **[Update]** to flash calibration data into EEPROM or click **[Cancel]** to avoid saving data.



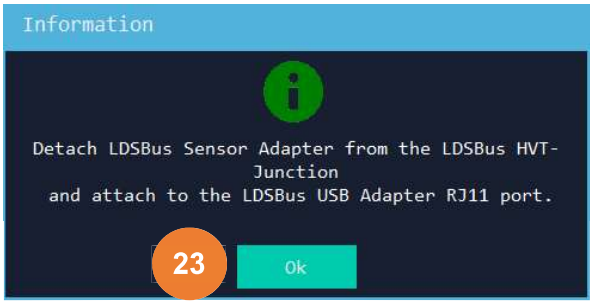
21. Upon successful update, an appropriate message indicating the same is displayed.



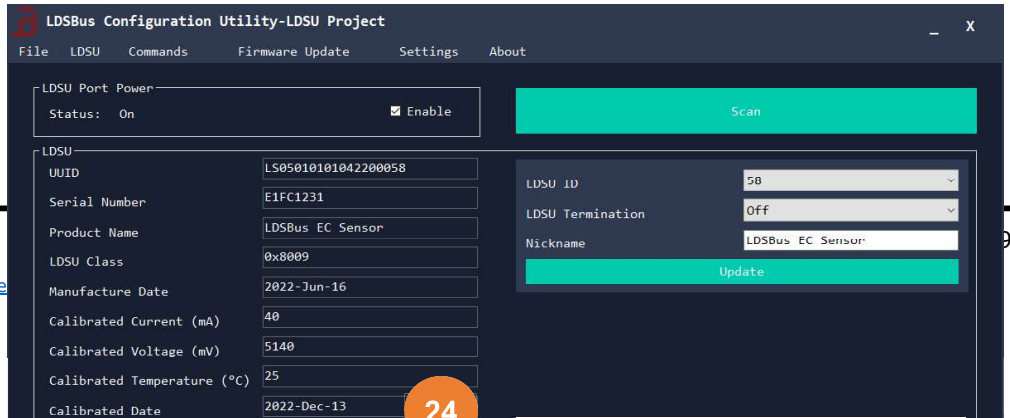
22. LDSBus Power will be switched off.



23. Connect the sensor back to the USB adapter after removing it from the HVT junction, and then click **[Ok]**. For power switching, wait 60 seconds.



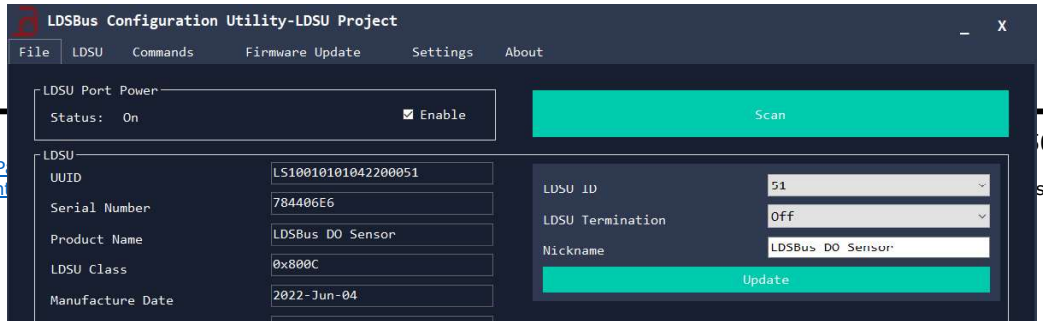
24. In the main window, the calibration date will be updated after the utility scans the device again.



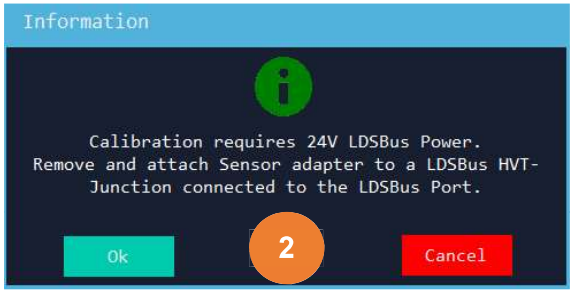
7.3 LDSBus DO Sensor Adapter Calibration

To calibrate DO Sensor Adapter, follow these steps –

1. Click **[Calibrate]** from the LDSU / LDSBus Project interface to start the calibration.

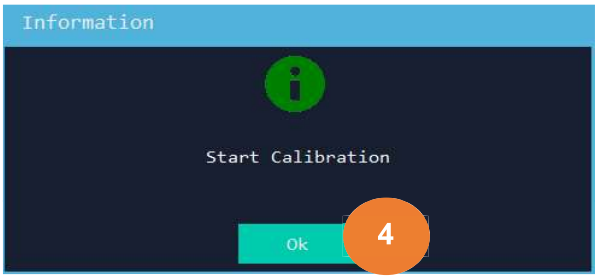


2. An information window prompting the users for Power Selection is displayed. LDSU Calibration requires 24V Power supply. Remove the sensor module and attach to the HVT-Junction connected to the LDSBus Port. Click **[Ok]** to continue or **[Cancel]** to quit the calibration process.

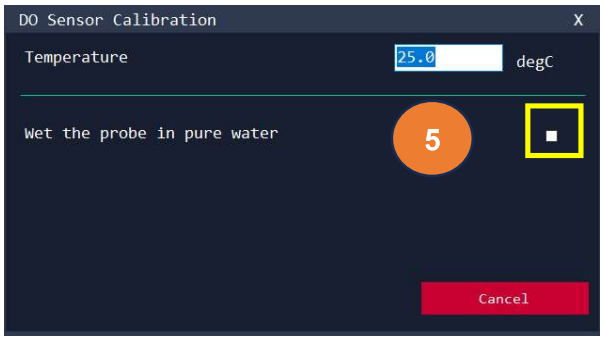


3. Upon clicking **[Ok]**, a confirmation window prompting the user to switch from LDSU Port Power to LDSBus Port Power is displayed. Click **[Ok]** to switch. Alternately, click **[Cancel]** to exit the calibration process. Upon clicking **[OK]**, the project window will be in disabled mode and the countdown timer starts.

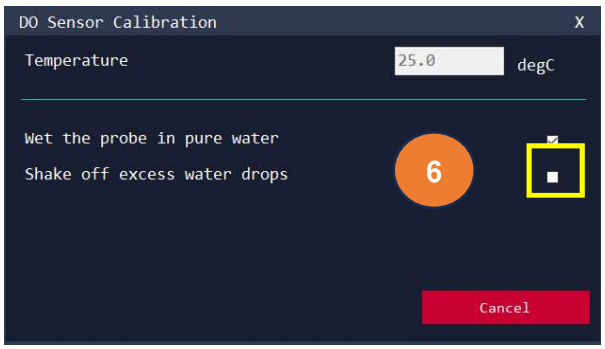
4. Upon successful power switch, system will prompt the users to start the calibration. Click **[Ok].**



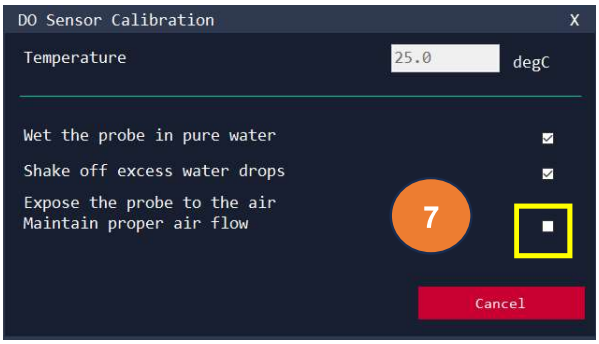
5. Calibration interface for DO Sensor is displayed. Using pure water, wet the probe and click on the checkbox accordingly.



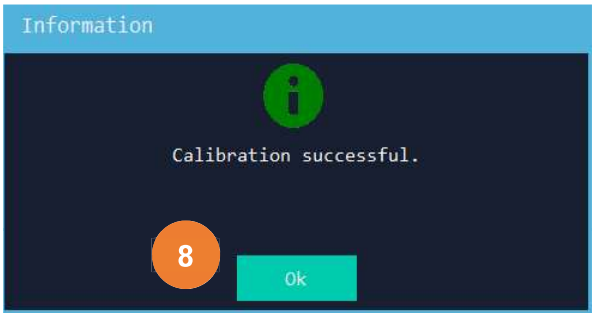
6. After shaking off excess water, click the check box.



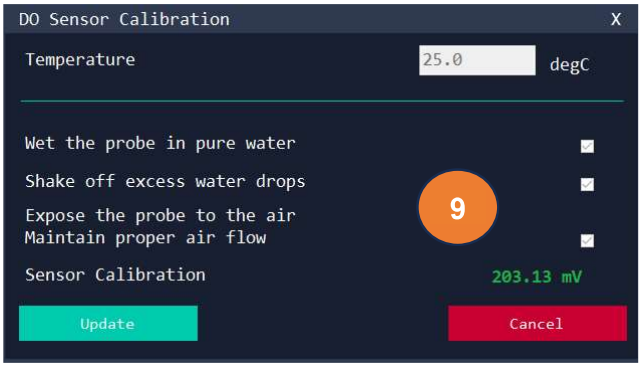
7. Make sure the probe is exposed to the air, then click the check box.



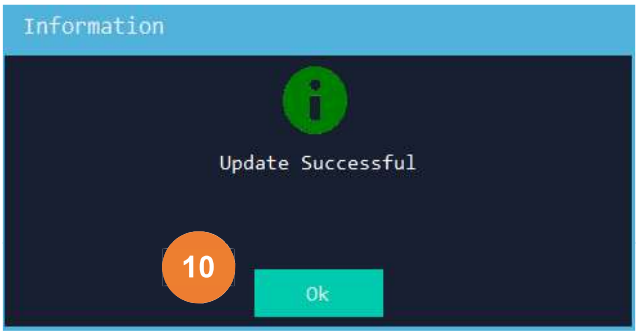
8. Upon successful calibration, an appropriate message indicating the same is displayed. Click **[Ok]** to continue.



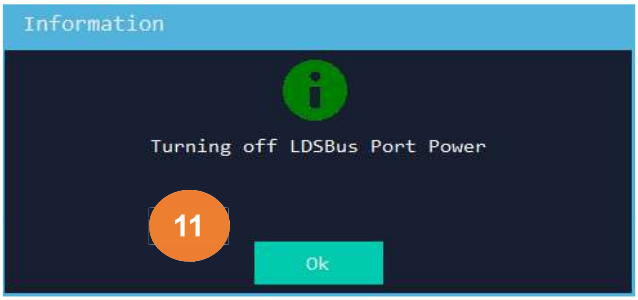
9. The calibration result will be displayed. Click **[Update]** to flash calibration data into EEPROM or click **[Cancel]** to avoid saving data.



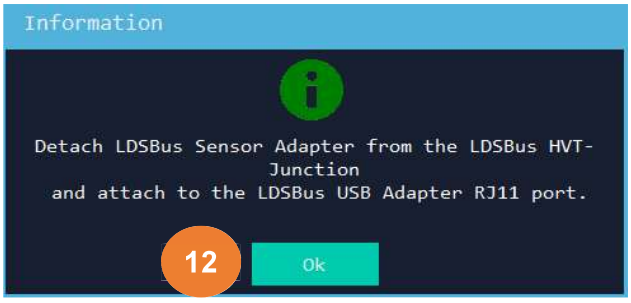
10. Upon successful update, an appropriate message indicating the same is displayed.



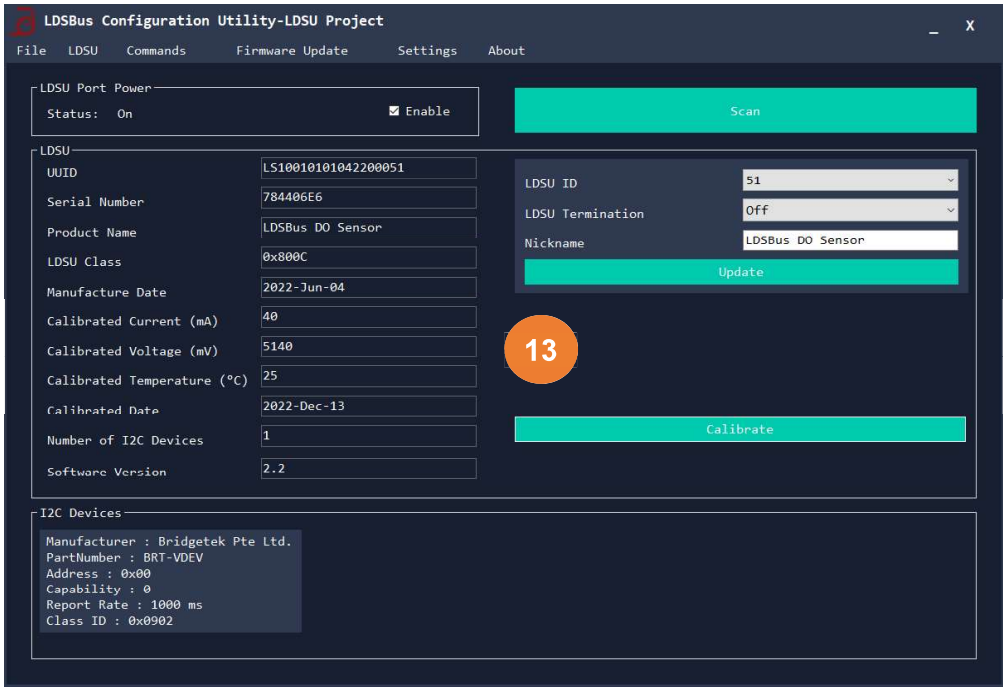
11. LDSBus Power will be switched off.



12. Connect the sensor back to the USB adapter after removing it from the HVT junction, and then click **[Ok]**. For power switching, wait 60 seconds.



13. In the main window, the calibration date will be updated after the utility scans the device again.

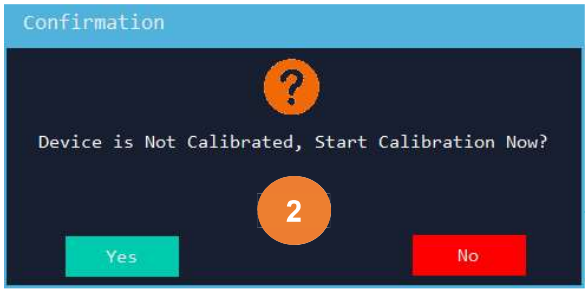


7.4 LDSBus ORP Sensor Adapter Calibration

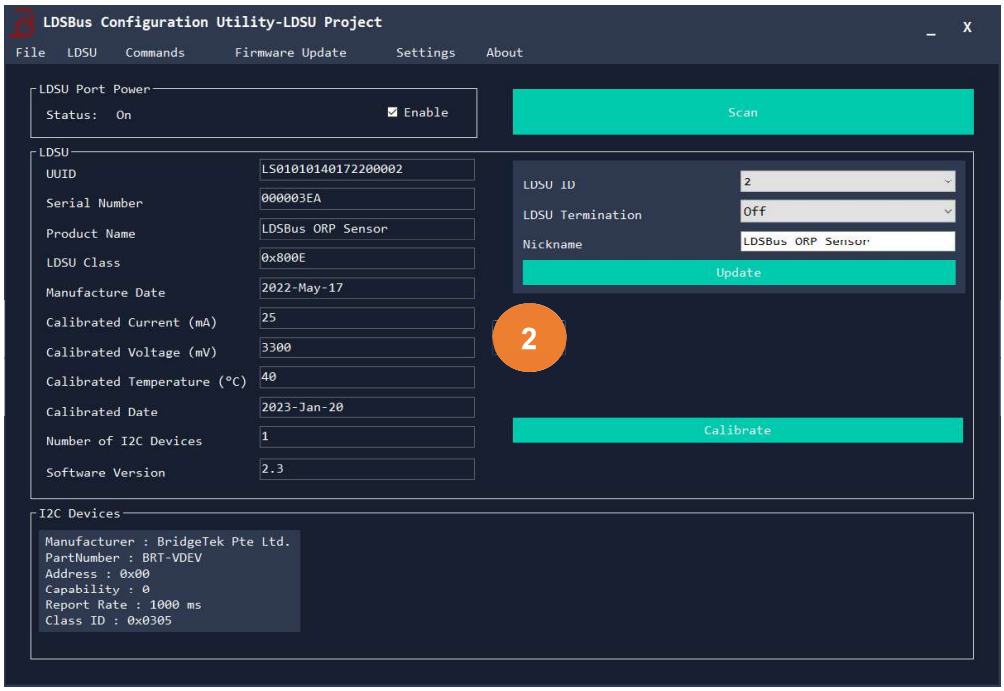
To calibrate ORP Sensor Adapter, follow these steps –

1. Make one beaker of pure water and connect an ORP sensor to a USB adapter.

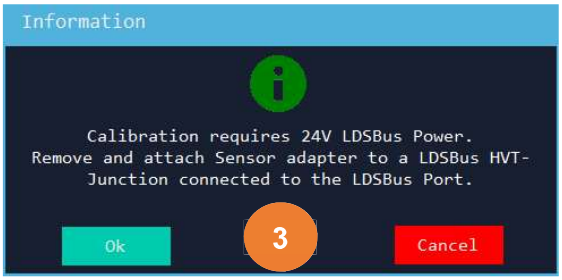
2. To scan the ORP sensor, click **[Scan]**, if the sensor has not been calibrated, an alert will appear asking whether to calibrate. Click **[Yes]** to start the calibration process.



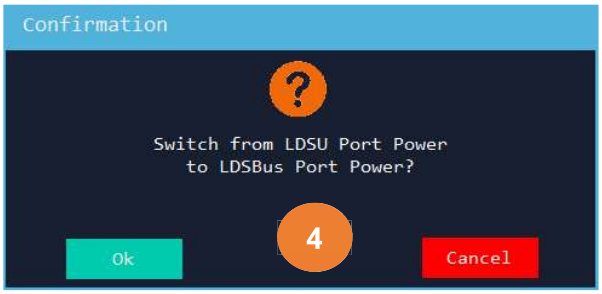
Clicking **[No]** will display the same calibration data screen as the sensor. Click **[Calibrate]** to start the calibration.



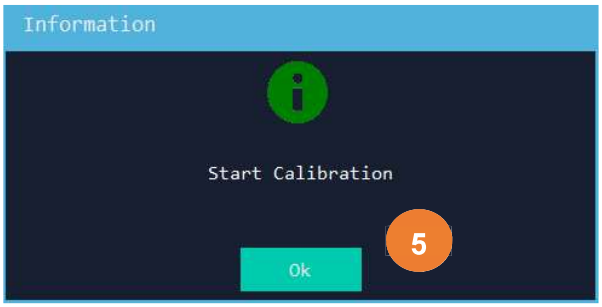
3. An information window prompting the users for Power Selection is displayed. LDSU Calibration requires 24V Power supply. Remove the sensor module and attach to the HVT-Junction connected to the LDSBus Port. Click **[Ok]** to continue or **[Cancel]** to quit the calibration process.



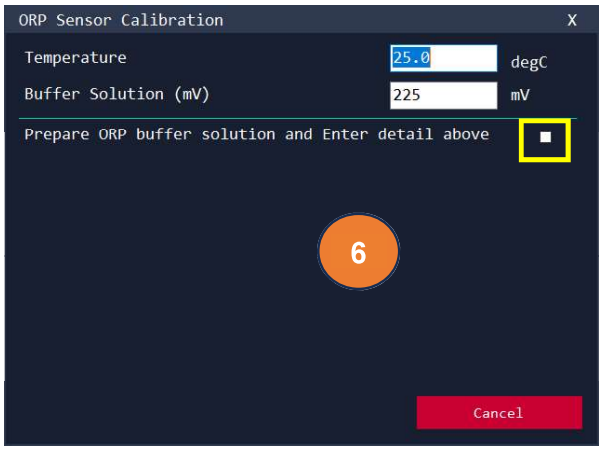
4. Upon clicking **[Ok]**, a confirmation window prompting the user to switch from LDSU Port Power to LDSBus Port Power is displayed. Click **[Ok]** to switch. Alternately, click **[Cancel]** to exit the calibration process. Upon clicking **[Ok]**, the project window will be in disabled mode and the countdown timer starts.



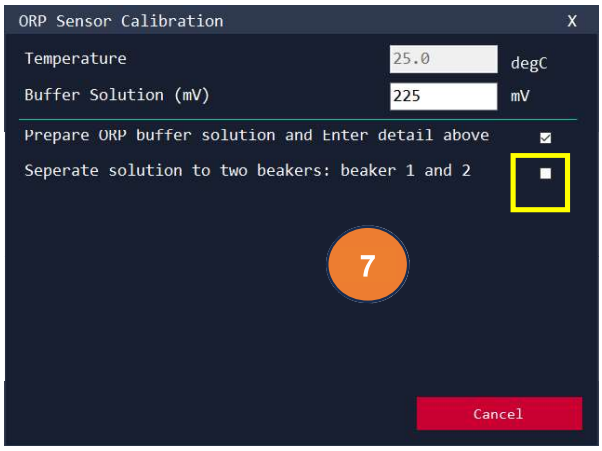
5. Upon successful power switch, system will prompt the users to start the calibration. Click **[Ok].**



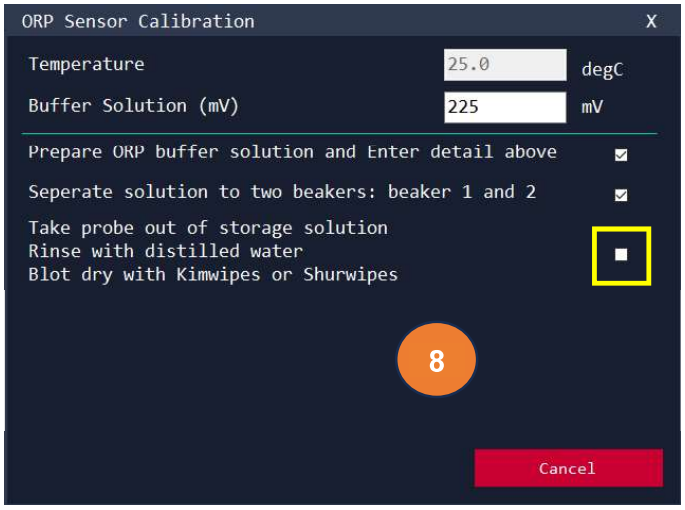
6. Calibration interface for ORP Sensor is displayed. Enter the correct calibration *temperature* and *buffer solution*. Prepare the ORP buffer solution and click on the checkbox accordingly.



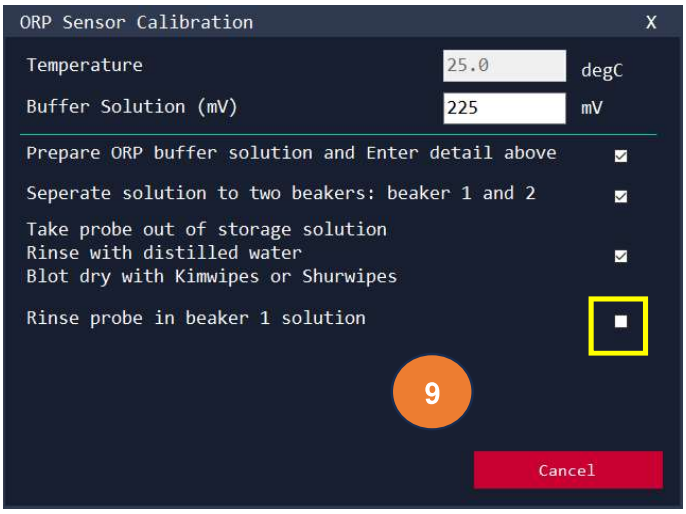
7. Separate buffer solutions into two beakers, beaker 1 and beaker 2 and click on the checkbox accordingly.



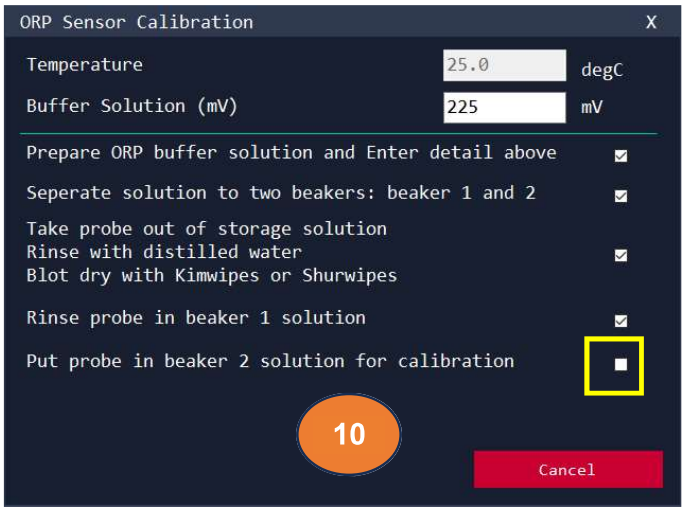
8. Remove the probe from its storage solution, rinse with distilled water, and blot dry with Kimwipes or Shurwipes. Upon doing so, click the check box.



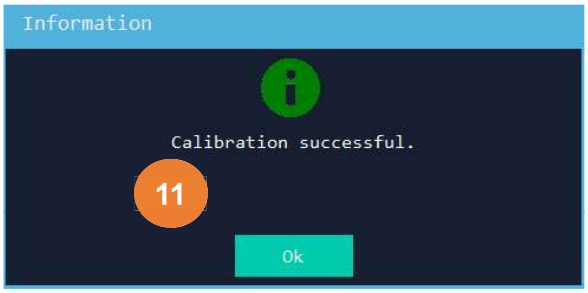
9. Rinse the probe with solution from beaker 1 and click on the check box.



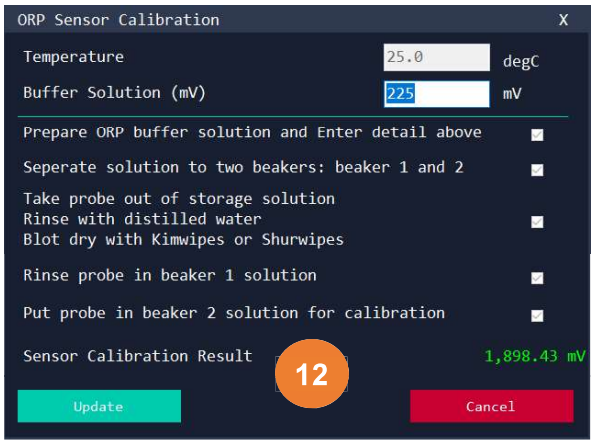
10. Calibrate the probe by putting it in beaker 2 solution and click on the check box.



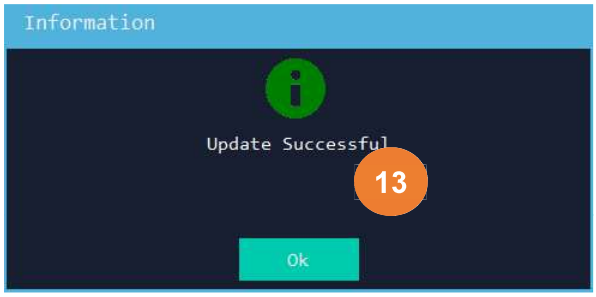
11. Upon successful calibration, an appropriate message indicating the same is displayed. Click **[Ok]** to continue.



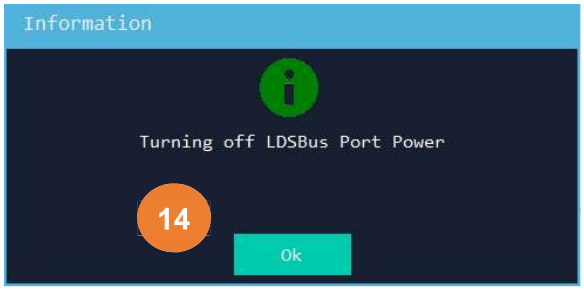
12. The calibration result will be displayed. Click **[Update]** to flash calibration data into EEPROM or click **[Cancel]** to avoid saving data.



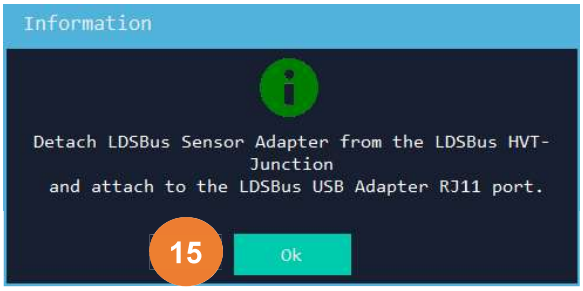
13. Upon successful update, an appropriate message indicating the same is displayed.



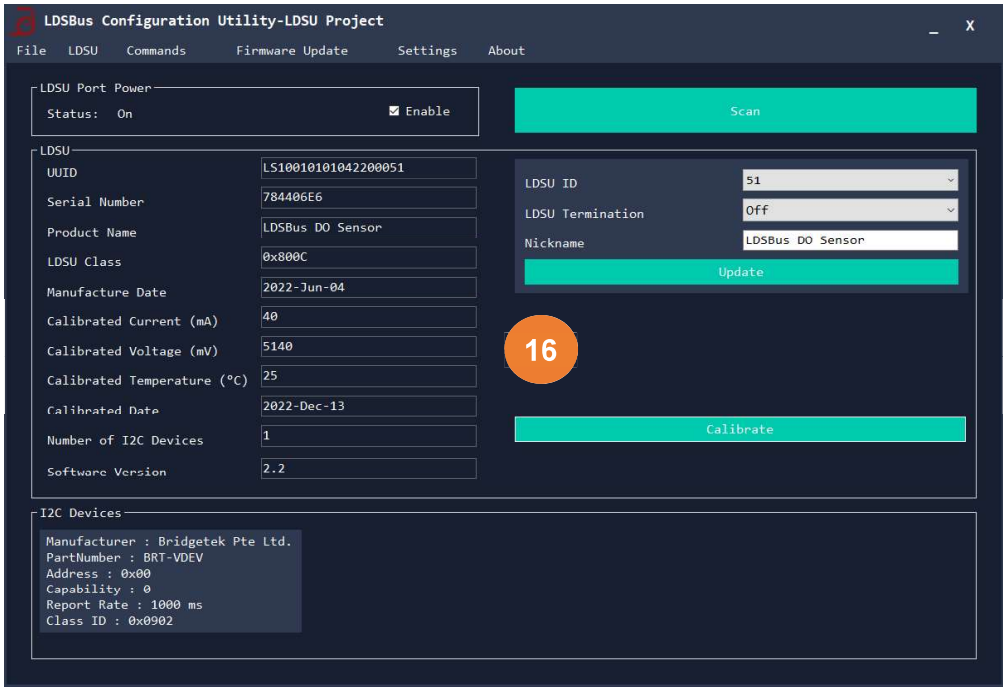
14. LDSBus Power will be switched off.



15. Connect the sensor back to the USB adapter after removing it from the HVT junction, and then click **[Ok]**. For power switching, wait 60 seconds.



16. In the main window, the calibration date will be updated after the utility scans the device again.

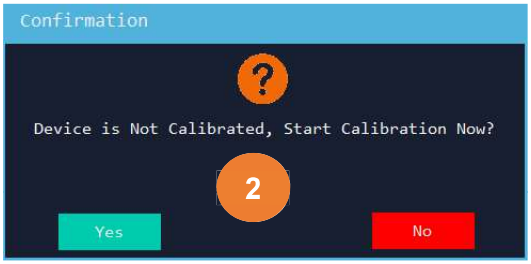


7.5 LDSBus CO2 Sensor Adapter Calibration

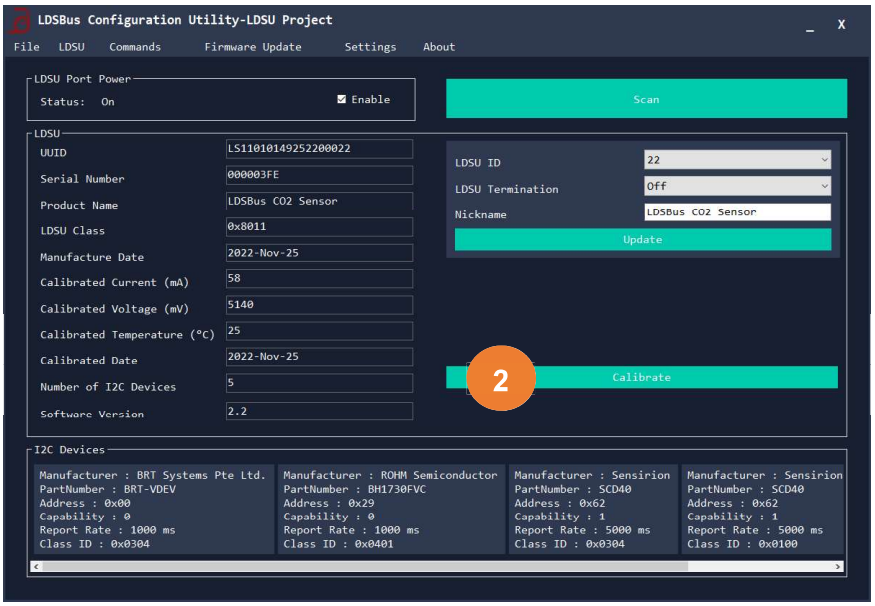
To calibrate CO2 Sensor Adapter, follow these steps –

1. Prepare the reference CO2 meter and connect it to the USB adapter to achieve better accuracy. Make sure that the reading of the environment CO2 is greater than 400ppm.

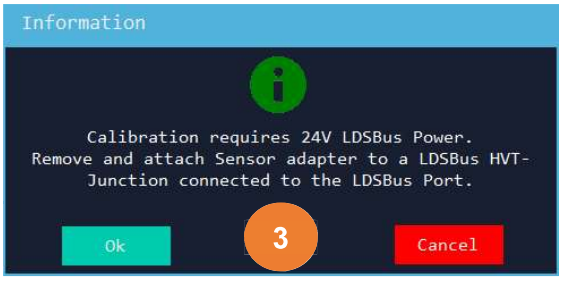
2. To scan the CO2 sensor, click **[Scan]**, if the sensor has not been calibrated, an alert will appear asking whether to calibrate. Click **[Yes]** to start the calibration process.



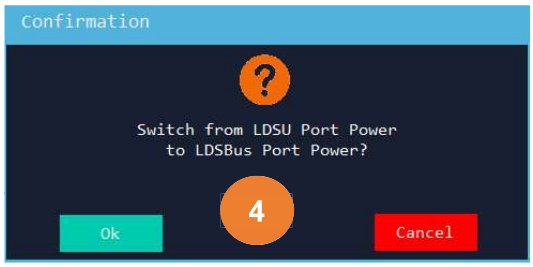
Clicking **[No]** will display the same calibration data screen as the sensor. Click **[Calibrate]** to start the calibration.



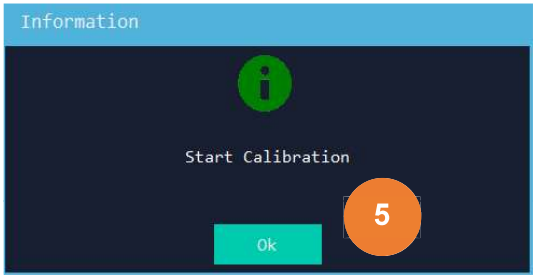
3. An information window prompting the users for Power Selection is displayed. LDSU Calibration requires 24V Power supply. Remove the sensor module and attach to the HVT-Junction connected to the LDSBus Port. Click **[Ok]** to continue or **[Cancel]** to quit the calibration process.



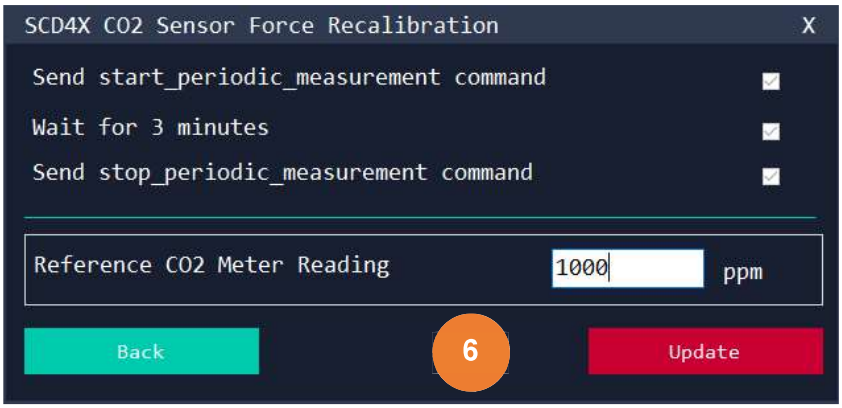
4. Upon clicking **[Ok]**, a confirmation window prompting the user to switch from LDSU Port Power to LDSBus Port Power is displayed. Click **[Ok]** to switch. Alternately, click **[Cancel]** to exit the calibration process. Upon clicking **[OK]**, the project window will be in disabled mode and the countdown timer starts.



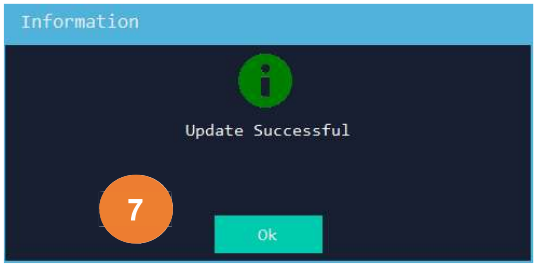
5. Upon successful power switch, system will prompt the users to start the calibration. Click **[Ok].** Wait for 180 seconds for CO2 reading to stabilize.



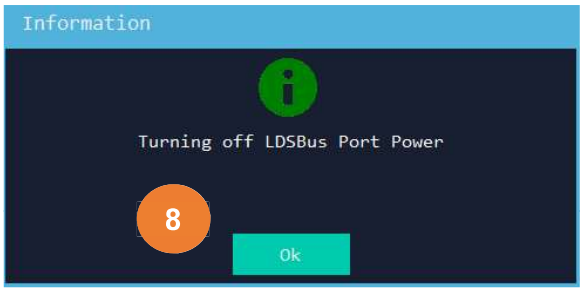
6. The calibration result will be displayed. Enter the CO2 reading from CO2 reference meter. Click **[Update]** to save calibration data into EEPROM.



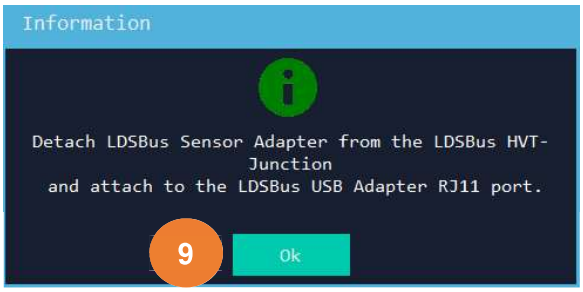
7. Upon successful update, an appropriate message indicating the same is displayed.



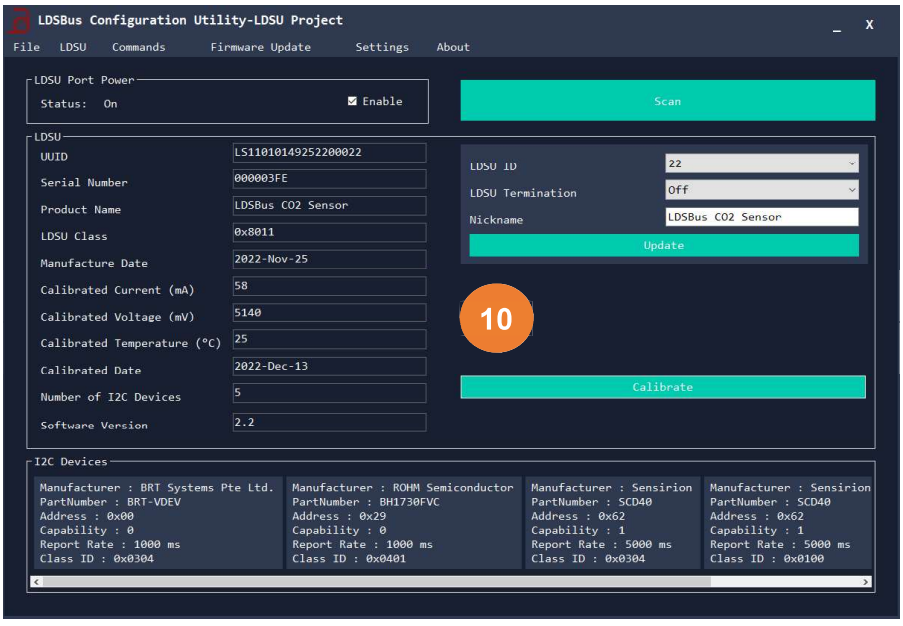
8. LDSBus Power will be switched off.



9. Connect the sensor back to the USB adapter after removing it from the HVT junction, and then click **[Ok]**. For power switching, wait 60 seconds.



10. In the main window, the calibration date will be updated after the utility scans the device again.

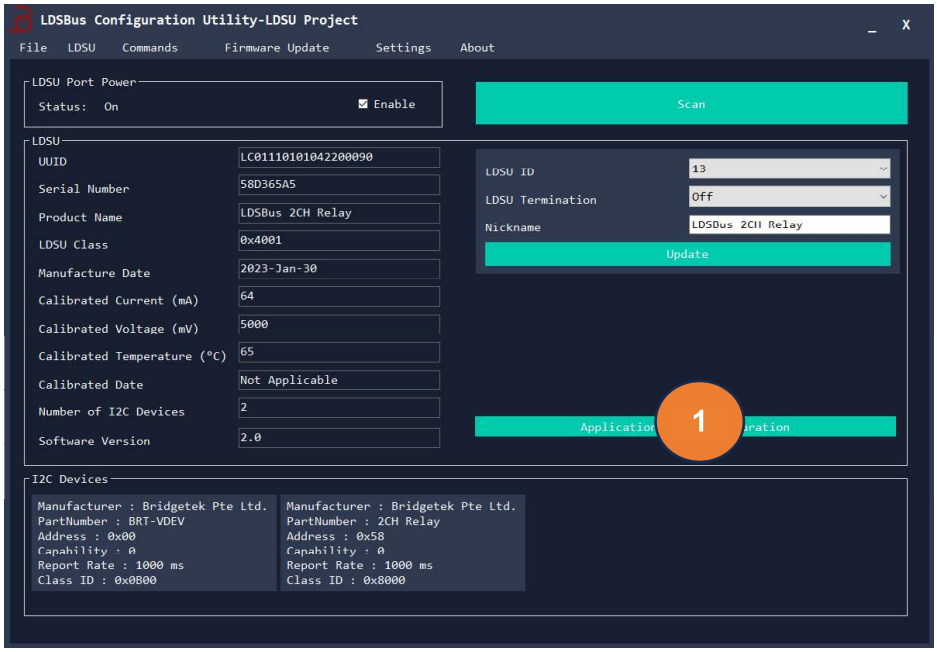


8 Application Type Configuration

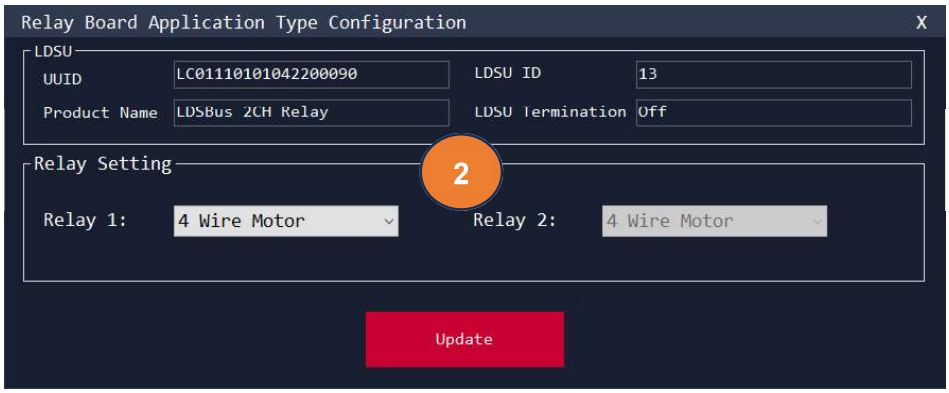
8.1 Relay Controller Application Type Configuration

To configure application type for Relay Controller –

1. Click **[Application Type Configuration]**.



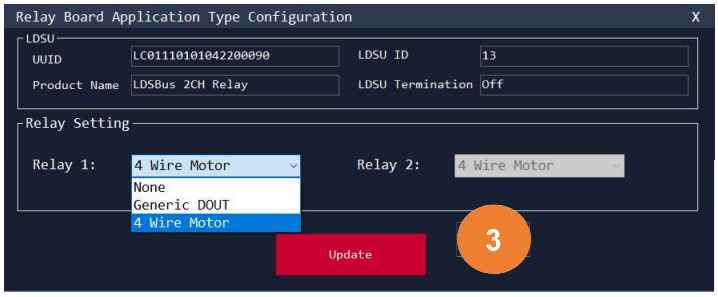
2. The Relay Controller Application Type configuration window is displayed.

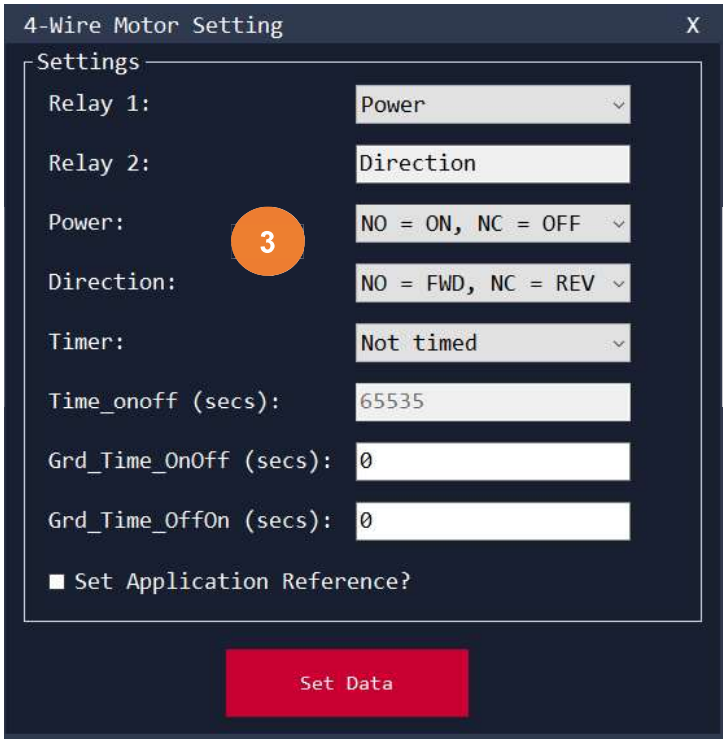


3. Select the setting for each relay from the drop-down box. There are different input windows for the different relay settings. For example, for 4 wire motor, the setting input will look like the one shown in the picture.

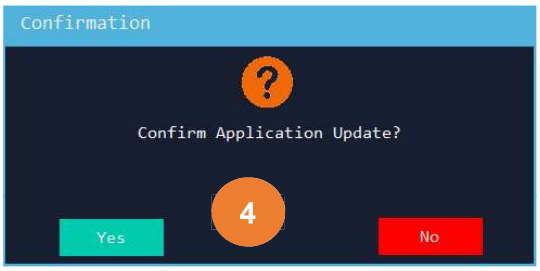
    a. The settings shown in the 4-wire Motor Setting, indicate that the motor is powered via the COM-NO contacts of Relay 1, i.e., when Relay 1's contacts are in COM-NC, the power is OFF.

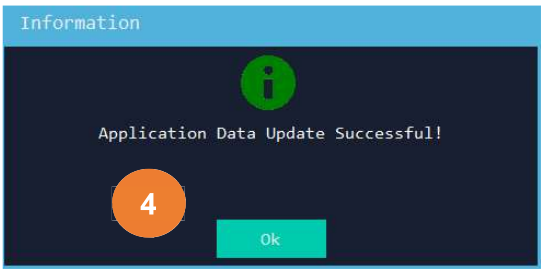
b. Similarly, when Relay 2's COM-NO contacts are closed, the motor is driven in the forward (FWD) direction and when COM-NC contacts are closed, the motor is driven in the reverse (REV) direction. The user shall determine the forward and reverse directions of the motor.





4. Once all relays are configured, click **[Update]** to save the settings to the device's EEPROM. A confirmation window will be displayed whether to update the application. Click **[Yes]** to update; **[No]** to cancel the update. Upon successful update, an appropriate message indicating the same will be displayed.

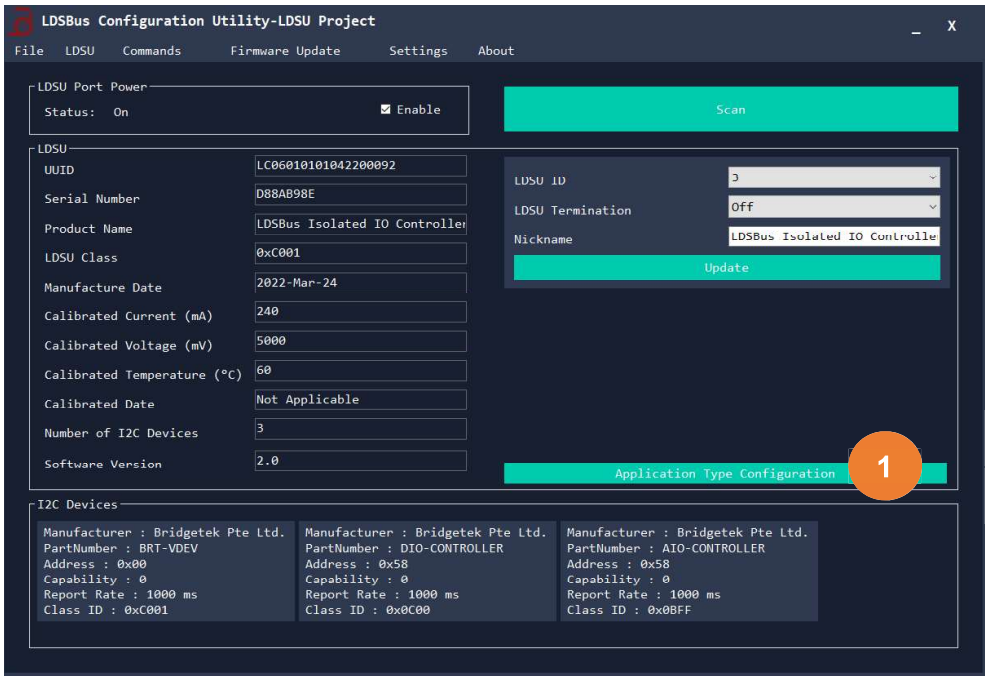




8.2 IO Controller Application Type Configuration

To configure application type for IO Controller Module –

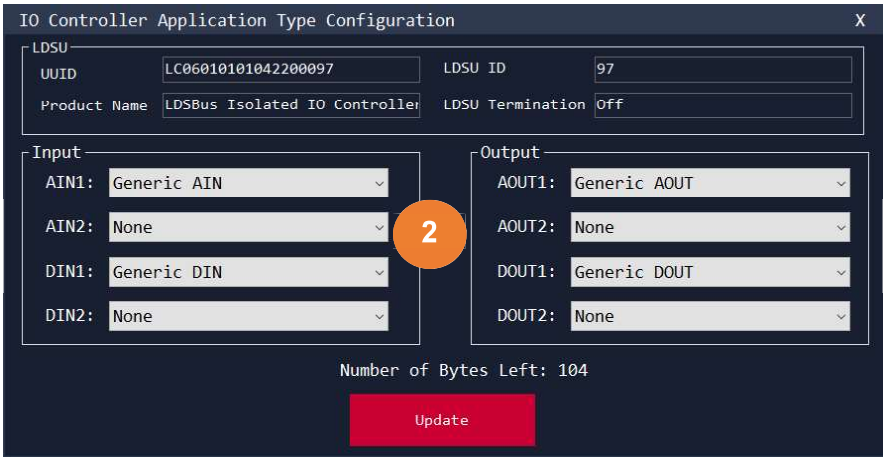
1. Click **[Application Type Configuration]**.



2. A window will appear asking for a new configuration if the IO controller board was configured previously. Click **[Yes]** to change the setting; **[No]** to not change the setting.

Alternatively, if the IO controller has not been configured previously, this window will not appear.

Click **[Yes]** to configure the IO controller application type. If no configuration is done on the board, the following window will appear.

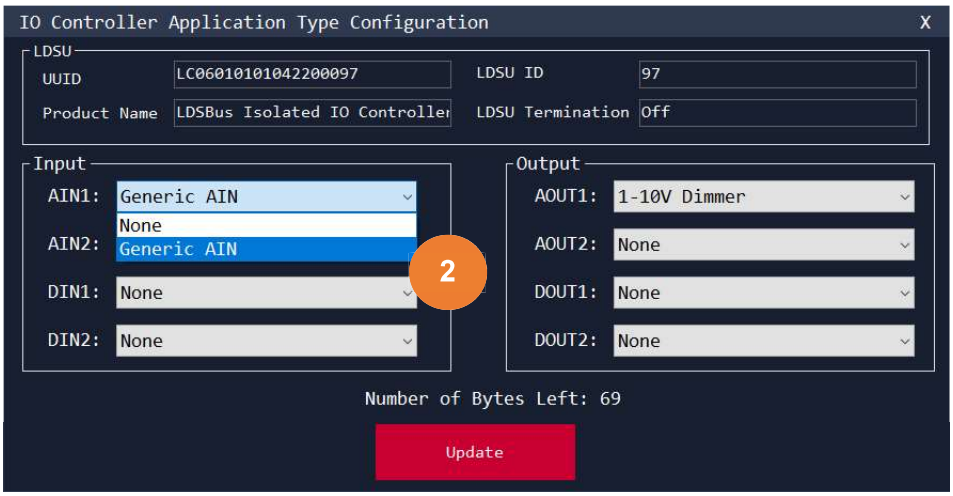


In total, there are 8 channels that can be configured. Below is a list of the input definitions of all channels.

- AIN1 – Analog input channel 1
- AIN2 – Analog input channel 2
- DIN1 – Digital input channel 1
- DIN2 – Digital input channel 2
- AOUT1 – Analog output channel 1
- AOUT2 – Analog output channel 2
- DOUT1 – Digital output channel 1
- DOUT2 – Digital output channel 2

AIN 1 & AIN 2 Channels

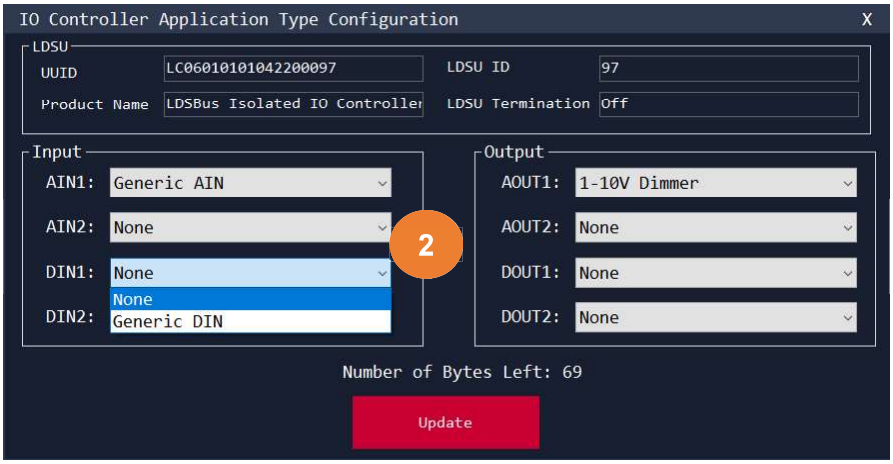
Both AIN1 and AIN2 have the same drop-down options –



- *None - Not Configured*
- *Generic AIN - General Analog input configuration*

DIN 1 & DIN 2 Channels

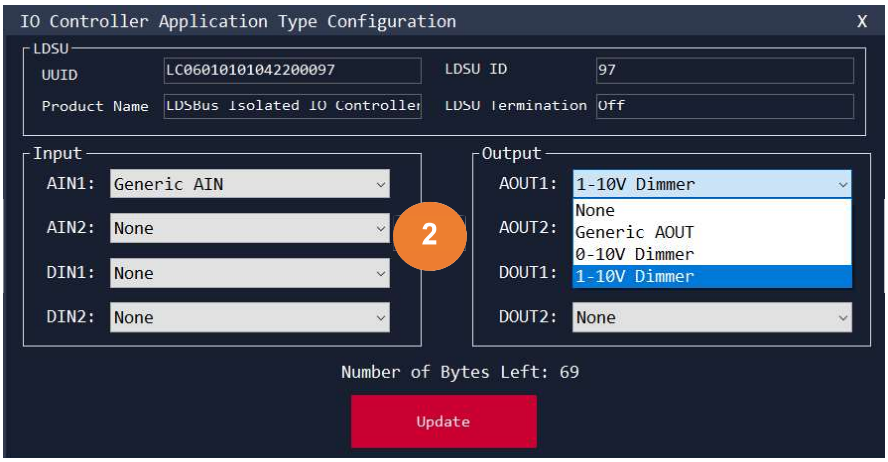
Both DIN1 and DIN2 have the same drop-down options –



- *None - Not Configured*
- *Generic DIN - General Digital input configuration*

AOUT 1 & AOUT 2 Channels

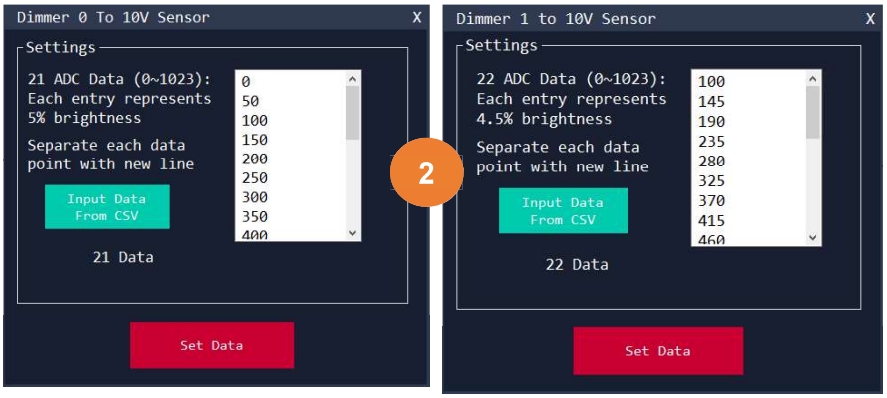
Both AOUT1 and AOUT2 have the same drop-down options –



- *None - Not Configured*
- *Generic AOUT - General Analog Output configuration*
- *0-10V Dimmer – To configure 0-10V Dimmer*
- *1-10V Dimmer – To configure 1-10V Dimmer*

0-10V Dimmer / 1-10V Dimmer

- The LDSBus Isolated IO Controller supports 0-10V and 1-10V application types. Upon selecting *0-10V / 1-10V Dimmer*, the respective configuration interface is displayed.



The user has to input a brightness curve. A brightness curve attempts to compensate for the non-linearities of the lighting element (e.g., incandescent bulb, CCFL, LED). There are 2 steps to perform. In the first step, the user has to obtain the brightness curve from the manufacturer. This brightness curve shall provide information for Luminance (Brightness) in units of Lux versus the 0-10V or 1-10V input. In the second step, the user shall then divide the Brightness range (0 Lux to Maximum Lux) into 21 or 22 equal points. For each point the corresponding voltage may be picked from the brightness curve. Then this voltage (Analog_Voltage) shall be converted into an ADC value through the following formulae:

a. 0-10V:
   ADC value = Analog_Voltage/10 * 1023

b. 1-10V:
   ADC value = Analog_Voltage/9 * 1023

For example, if the brightness curve of a 0-10V light has example value pairs as follows:

a. 0 Lux, 0V
b. 10 Lux, 1V
c. 50 Lux, 2V
d. 100 Lux, 3V
e. 200 Lux, 4V
f. 400 Lux, 5V
g. 400 Lux, 6V
h. 400 Lux, 7V
i. 400 Lux, 8V
j. 400 Lux, 9V
k. 400 Lux, 10V

Then the brightness range is between 0-400Lux and the 21 Lux points will each have a step of 20 Lux (400Lux/20). For each Lux point, the analog input voltage can be interpolated from the above table. For e.g. At 50% brightness, the Lux value is 200 and this corresponds to 4V. The corresponding ADC value is:

ADC = 4/10 * 1023 = 409 (rounded to the nearest integer)

For example, if the brightness curve of a 1-10V light has example value pairs as follows:

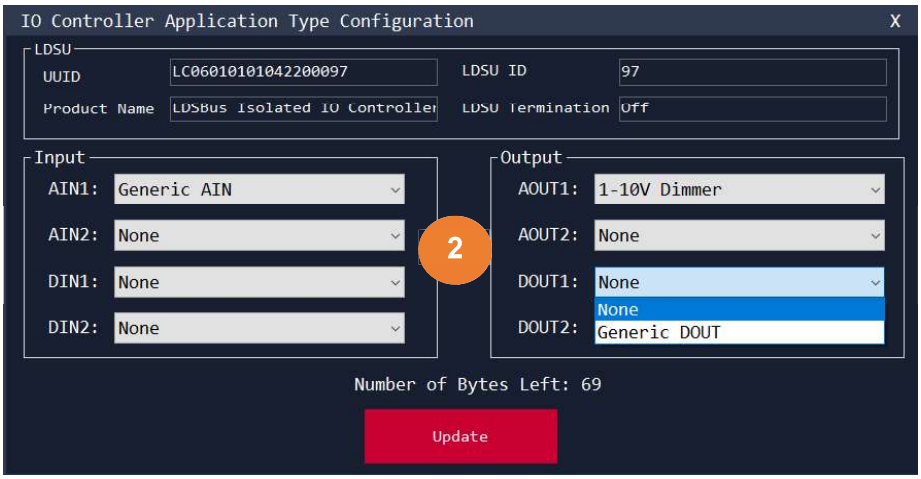
a. 0 Lux, 1V
b. 10 Lux, 2V
c. 50 Lux, 3V
d. 100 Lux, 4V
e. 200 Lux, 5V
f. 400 Lux, 6V
g. 400 Lux, 7V
h. 400 Lux, 8V
i. 400 Lux, 9V
j. 400 Lux, 10V

Then the brightness range is between 0-400Lux and the 22 Lux points will each have a step of 19 Lux (400Lux/21). For each Lux point, the analog input voltage can be interpolated from the above table. For e.g. At 75% brightness, the Lux value is 300 (linear interpolation) and this corresponds to 5.5V. The corresponding ADC value is:

ADC = 5.5/9 * 1023 = 625 (rounded to the nearest integer)

DOUT 1 & DOUT 2 Channels

Both DOUT1 and DOUT2 have the same drop-down options –



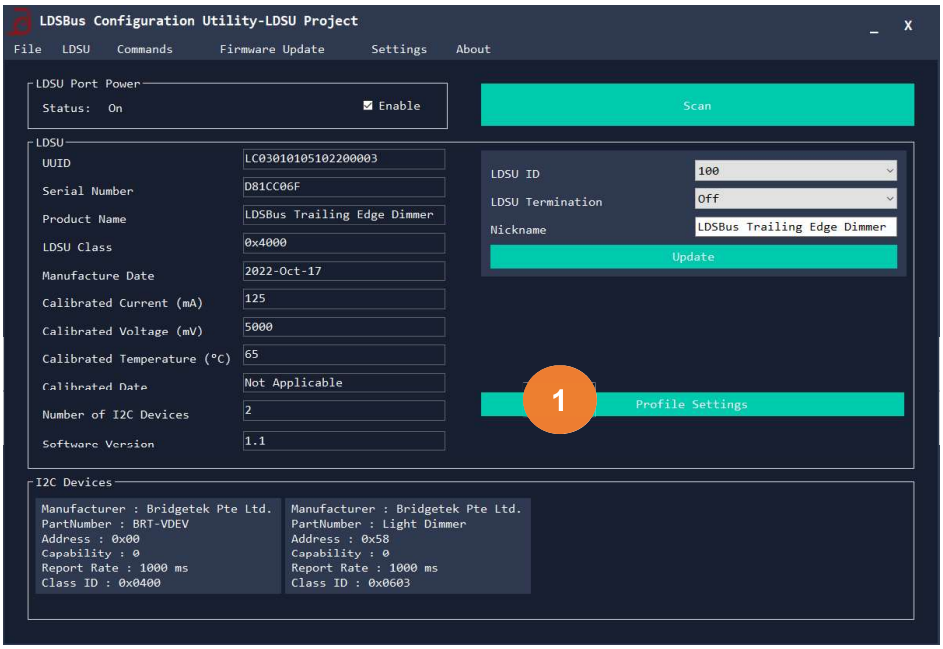
- *None - Not Configured*
- *Generic DOUT - General Digital Output configuration*

In the event that the configuration space is limited, an appropriate message will be displayed to indicate that there is not enough EEPROM space to configure the application type.

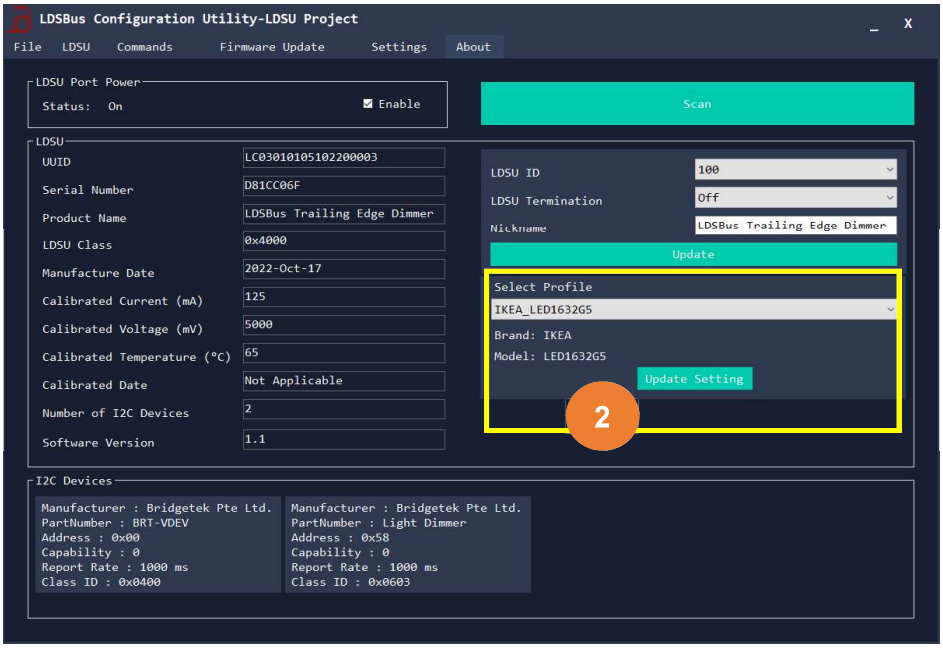
8.3 Trailing Edge Dimmer Profile Setting

To configure profile setting for LDSBus Trailing Edge Dimmer –

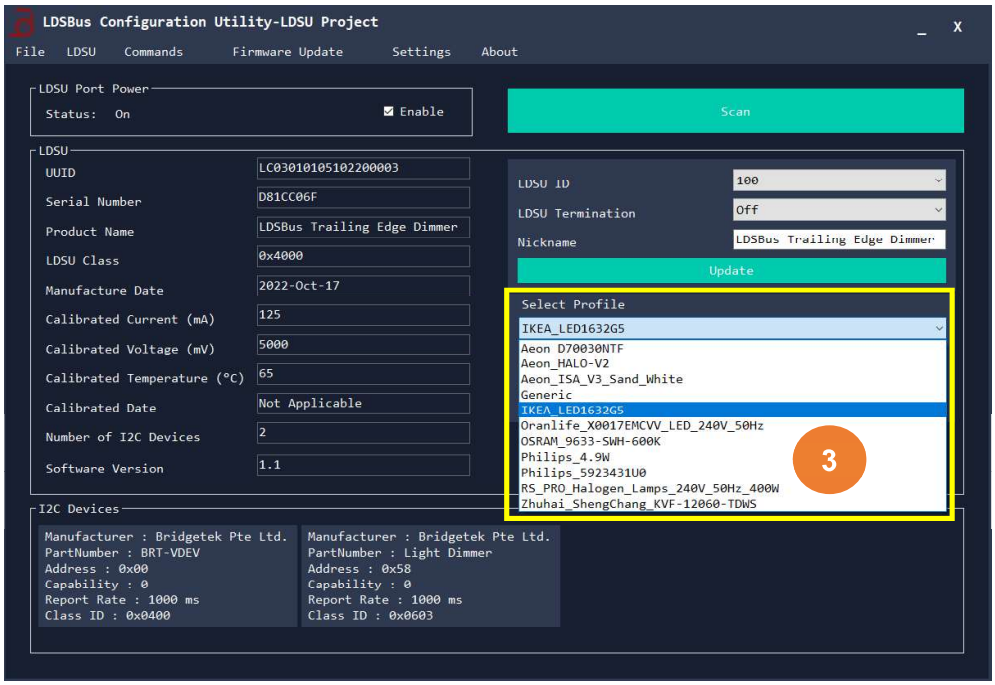
1. Click **[Profile Settings]**.

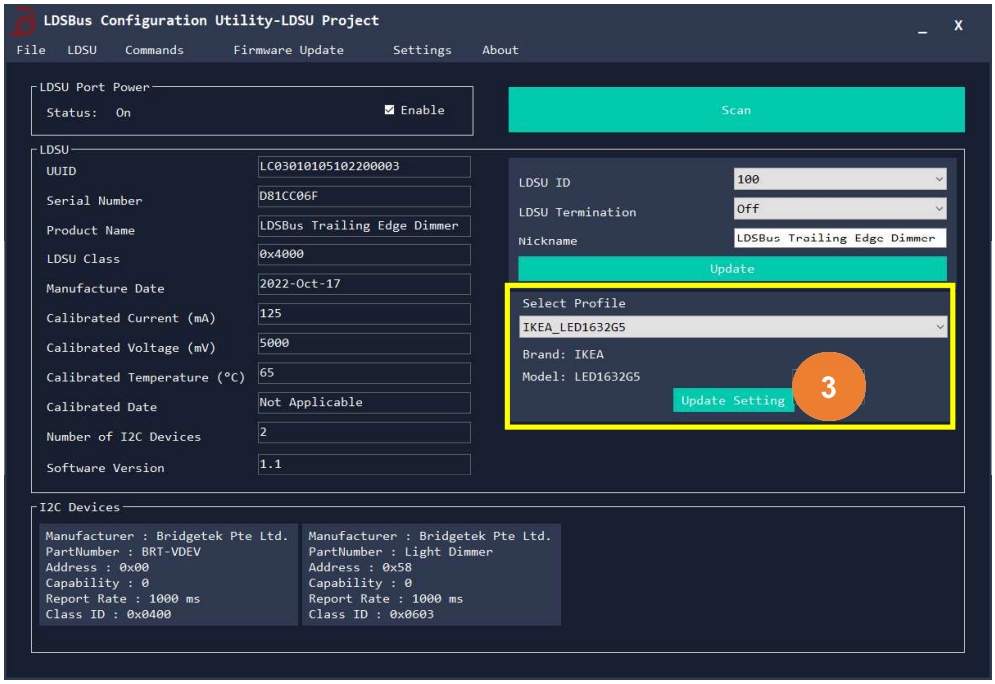


2. The profile selection panel will appear and the current setting will be displayed.



3. Click on the *Select Profile* drop down box and select a different default profile. Depending upon the selected profile, the details are displayed. For example, if the selected profile is *IKEA_LED1632G5*, then the *brand name* and *model* is displayed.



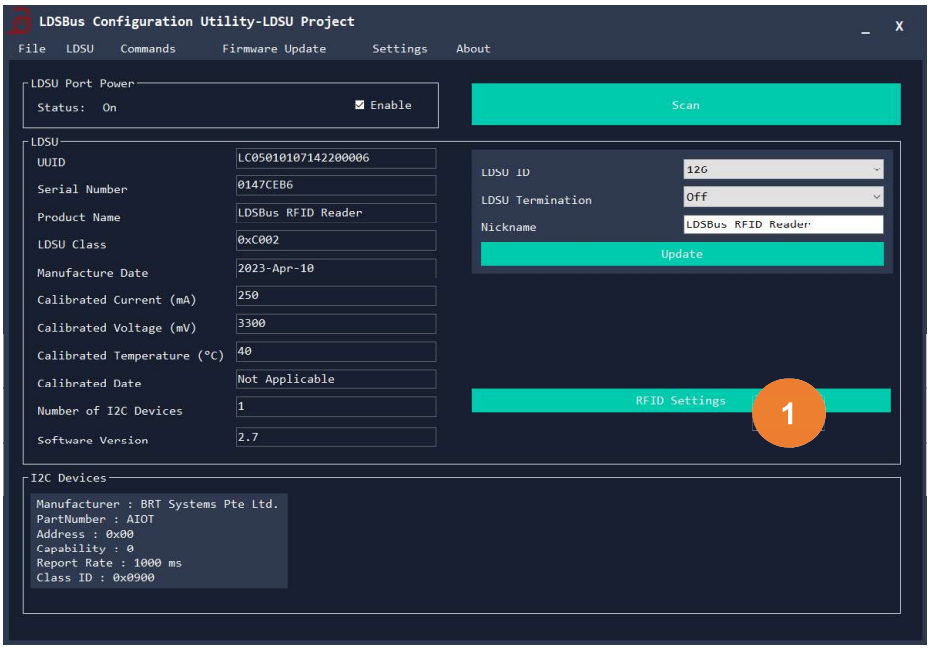


Upon selecting the profile, click **[Update Setting]** to update the profile to the EEPROM. Once the profile has been successfully updated, the utility will return to the main window.

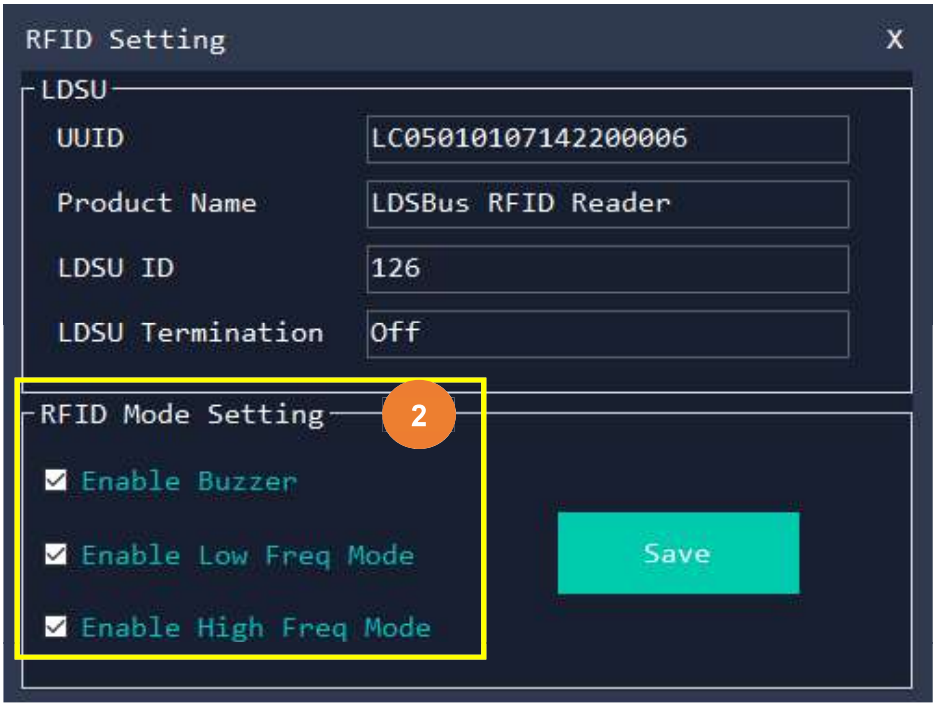
8.4 RFID Configuration Settings

To configure RFID setting for LDSBus RFID Reader –

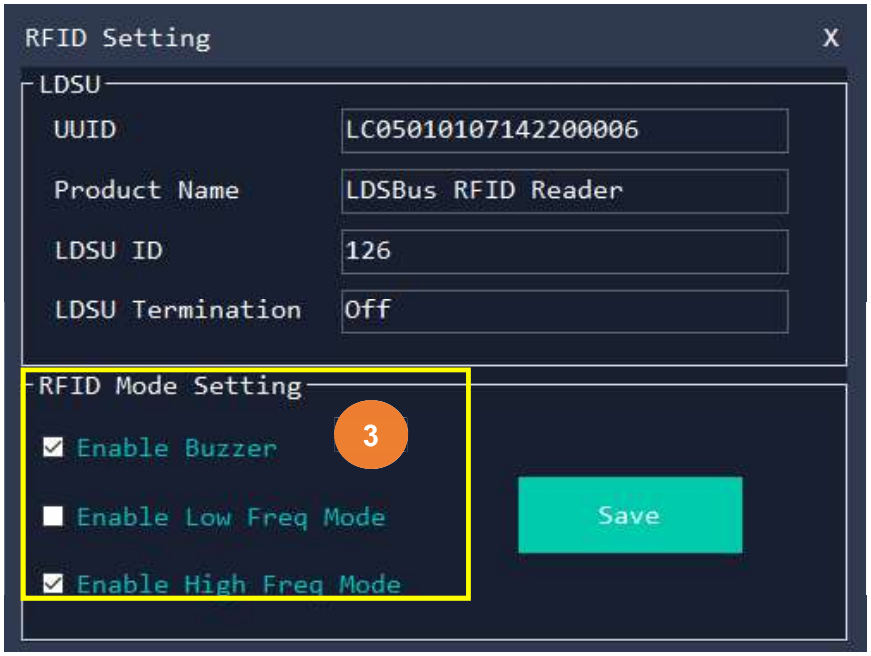
1. Click **[RFID Settings]**.



2. The RFID setting window will pop up with the current settings as shown in the picture below.



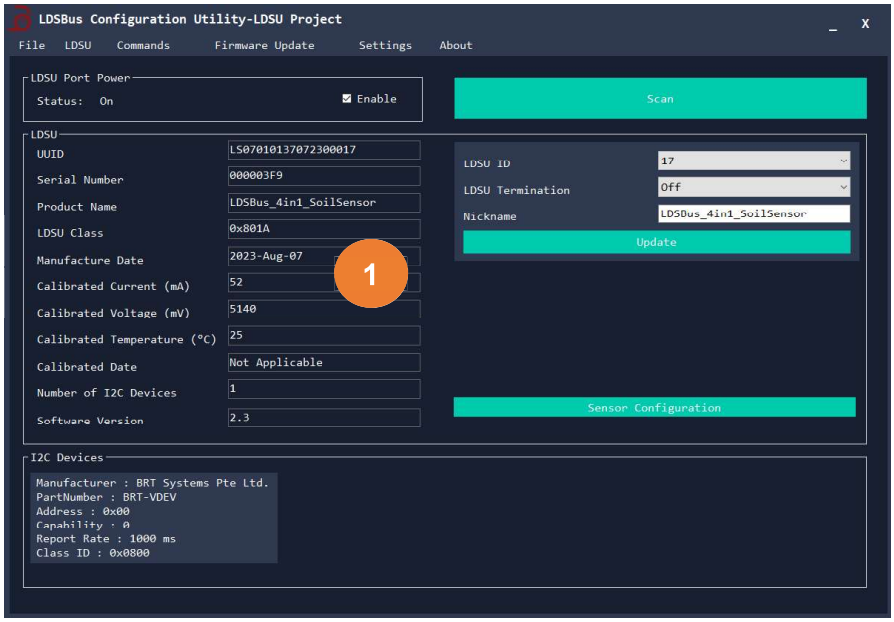
3. Change the settings by clicking on the checkbox to enable or disable buzzer, low freq. mode and high freq. mode; Click **[Save]** to save the new settings to the device (if any).



8.5 Soil Sensor Configuration Settings

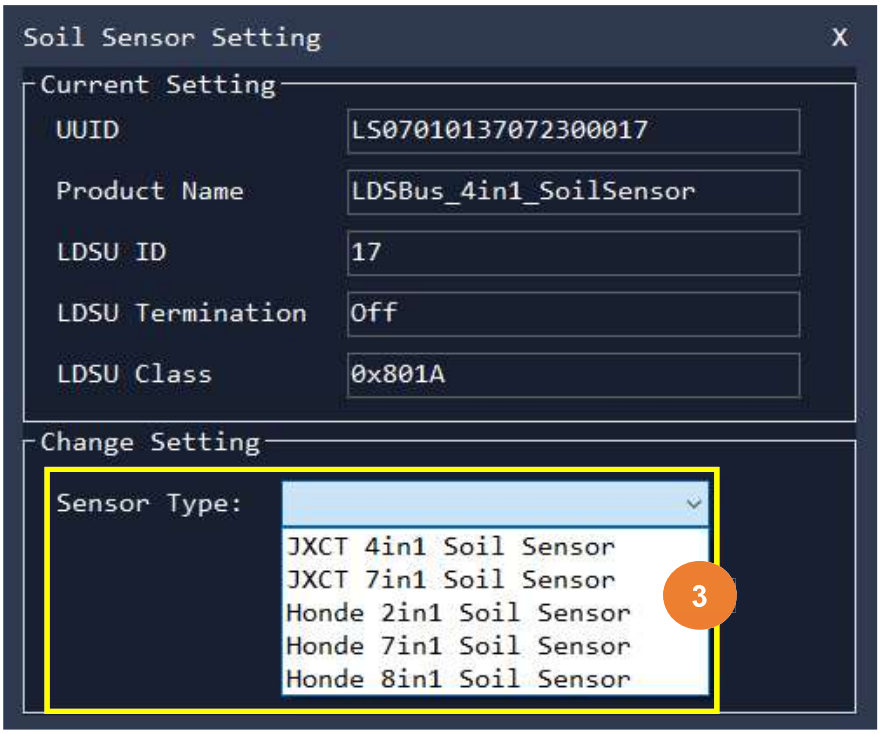
To configure Soil sensor setting for LDSBus soil sensors –

1. Click **[Sensor Configuration]**.

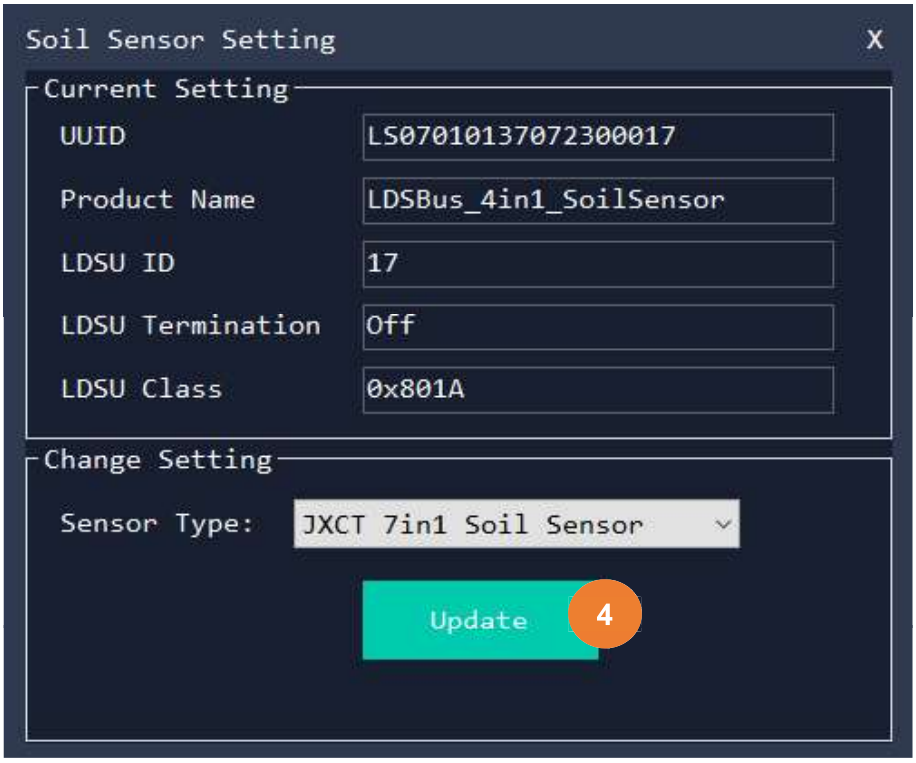


2. The soil sensor setting window will pop up.

3. Click on the *Sensor Type* drop down box and select a different type of soil sensor configuration.

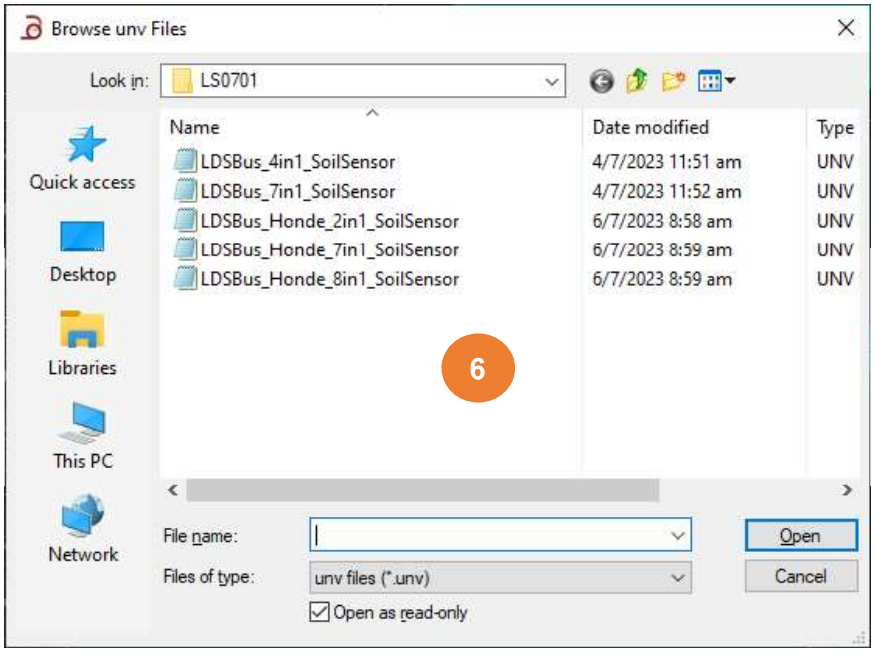


4. Upon selecting the Soil Sensor configuration, click **[Save]** to update the new setting to the sensor.

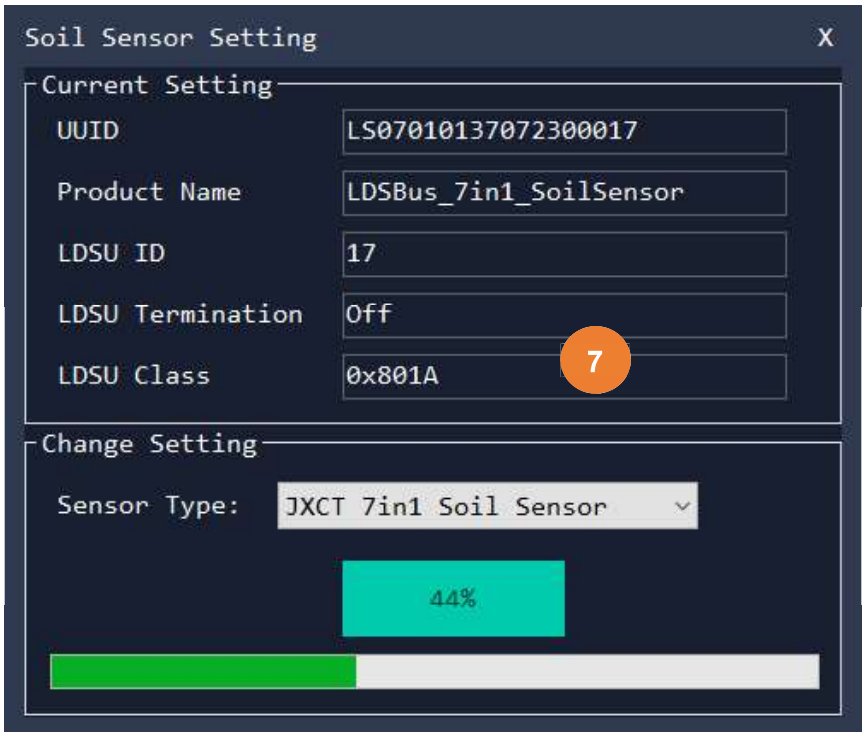


5. Confirmation window will pop up for user input, click **[Yes]** update the configuration. Alternatively, click **[No]** to cancel the update.

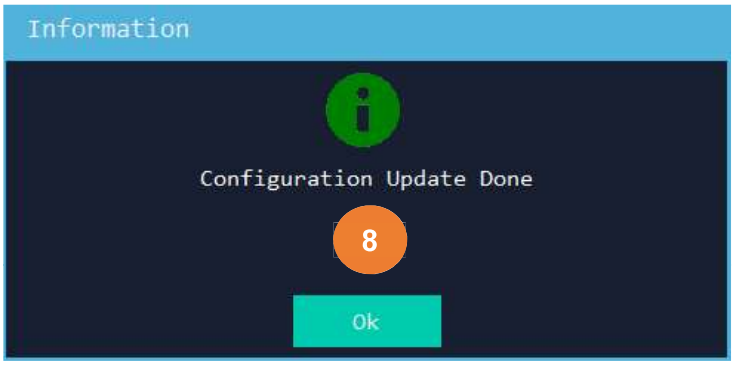
6. Open file dialog window will pop up for users to select the unv file; choose the correct unv file and click **[Open]** to start update; click **[Cancel]** to return back to Soil Sensor setting window.



7. A progress indicating that the update has started is displayed.



8. Upon successful completion of the update, an appropriate message indicating the same will be displayed. Click **[Ok]** to return back to soil sensor setting window.



9 Contact Information

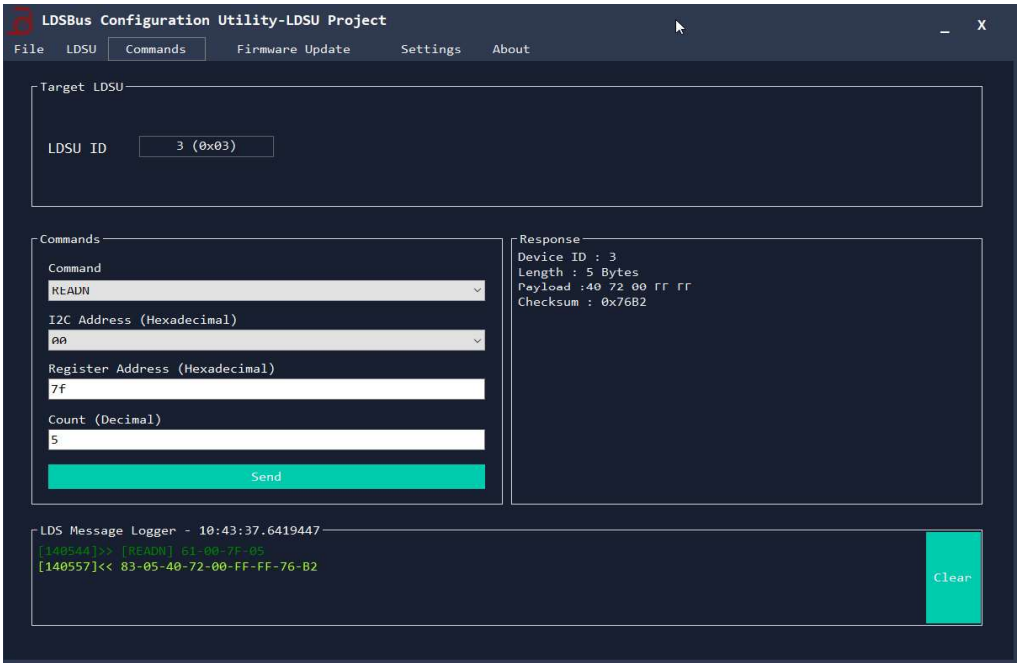
Refer to https://brtsys.com/contact-us/ for contact information.

Appendix A – Command List

Commands with payload / response

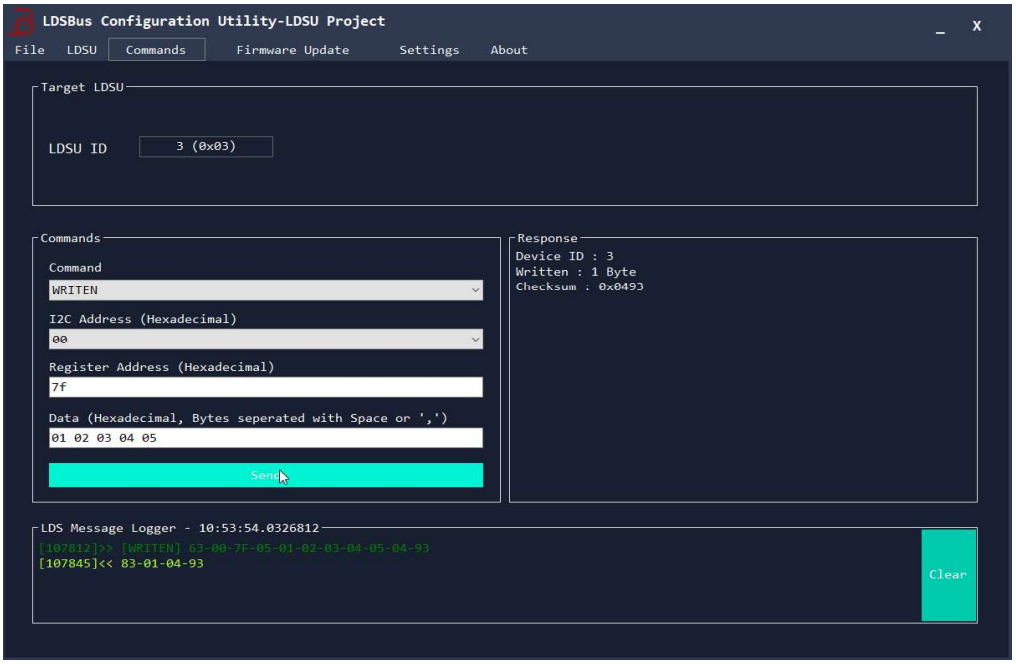
READN

This command is used to read multiple consecutive bytes from an I2C device.



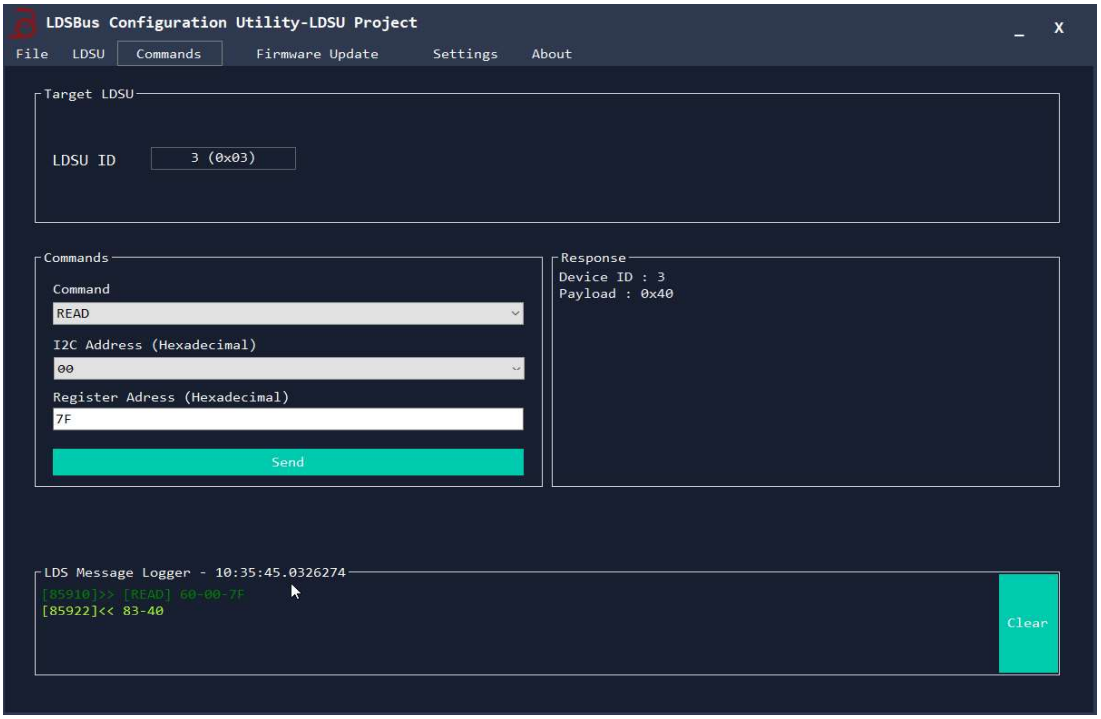
WRITEN

This command is used to write multiple consecutive register locations in an I2C device.



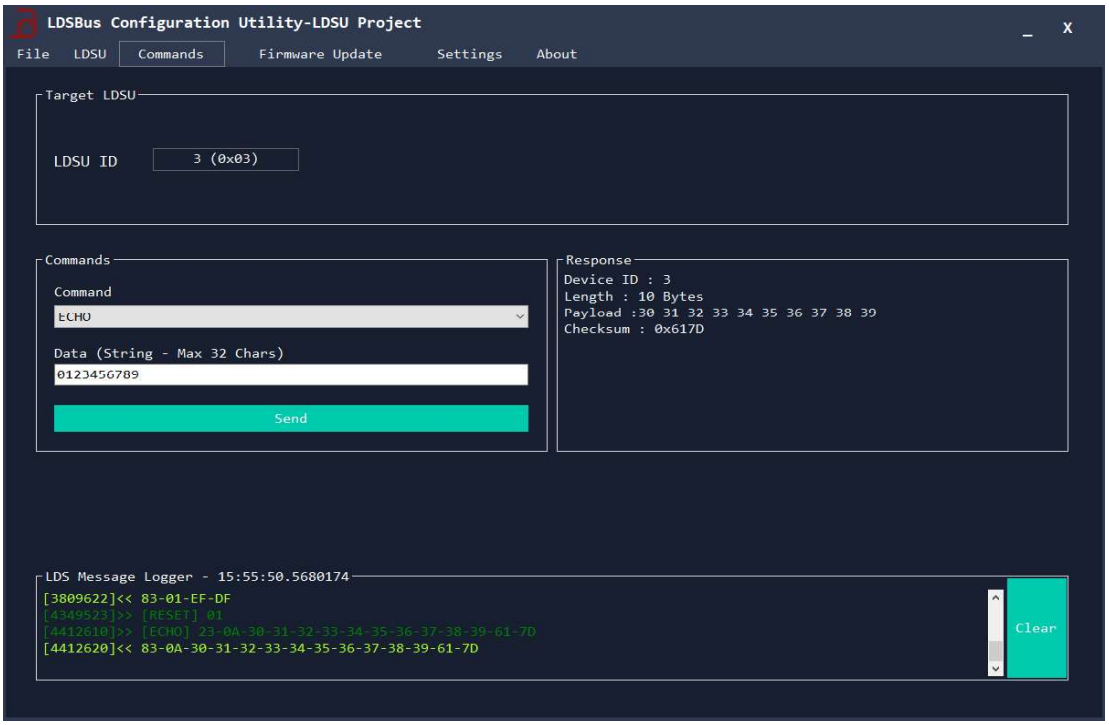
READ

This command is used to read an I2C device register.



ECHO

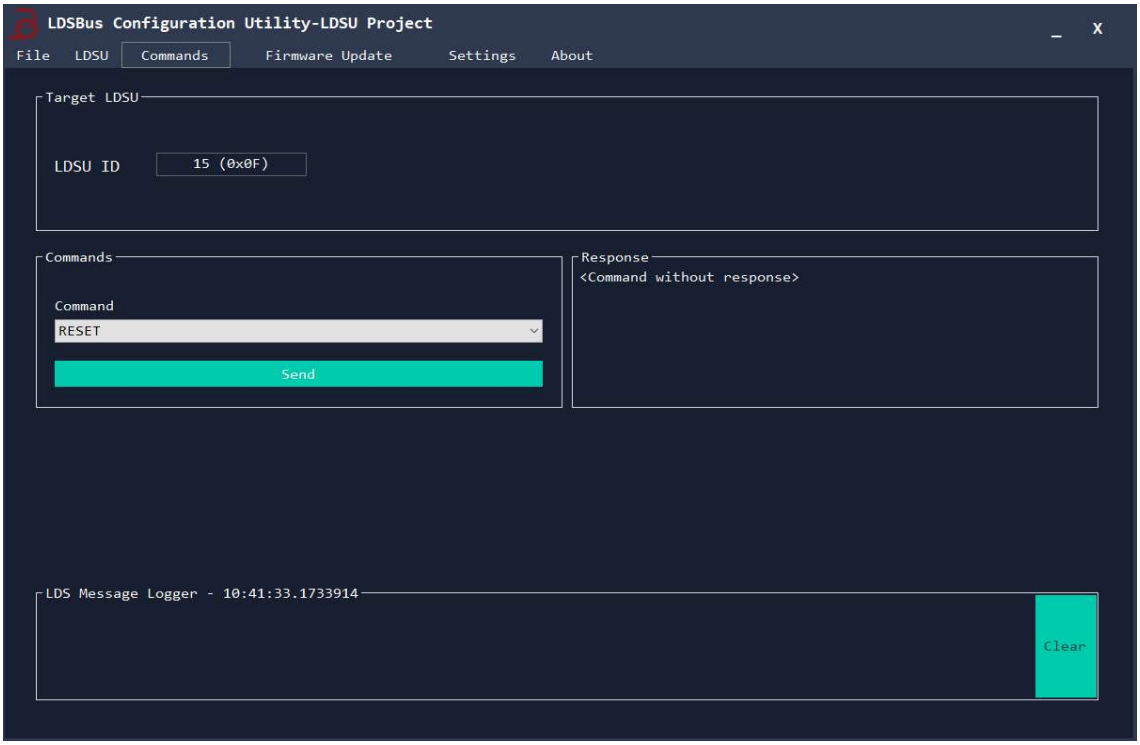
The addressed device, if present, shall echo the bytes from the host controller. This command is a special command to check the communication.



Commands without payload /response

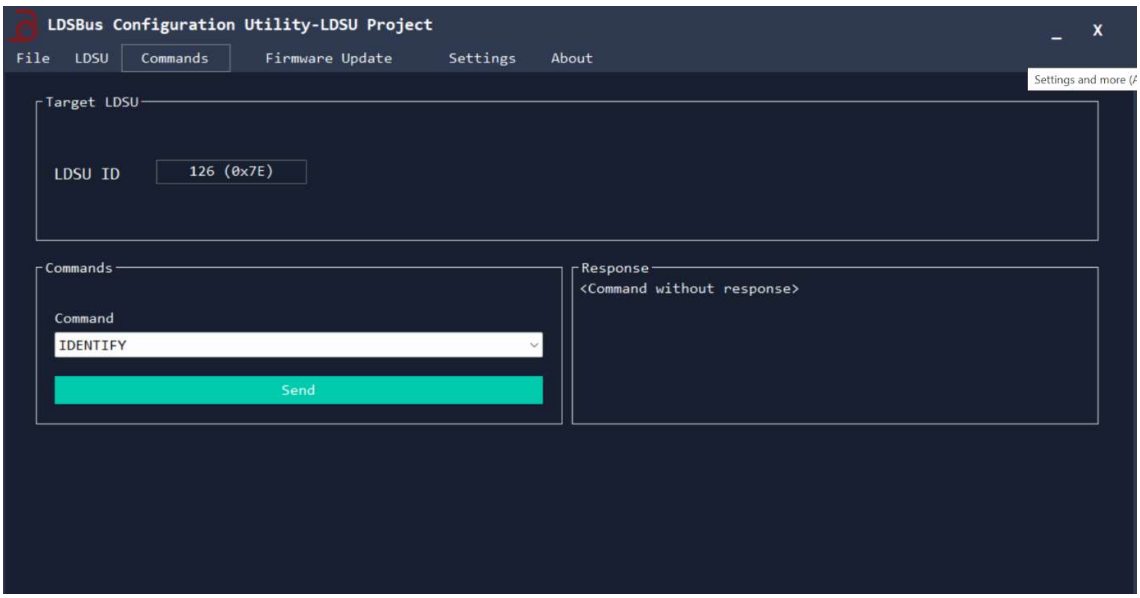
RESET

This command will reset the LDSU module.



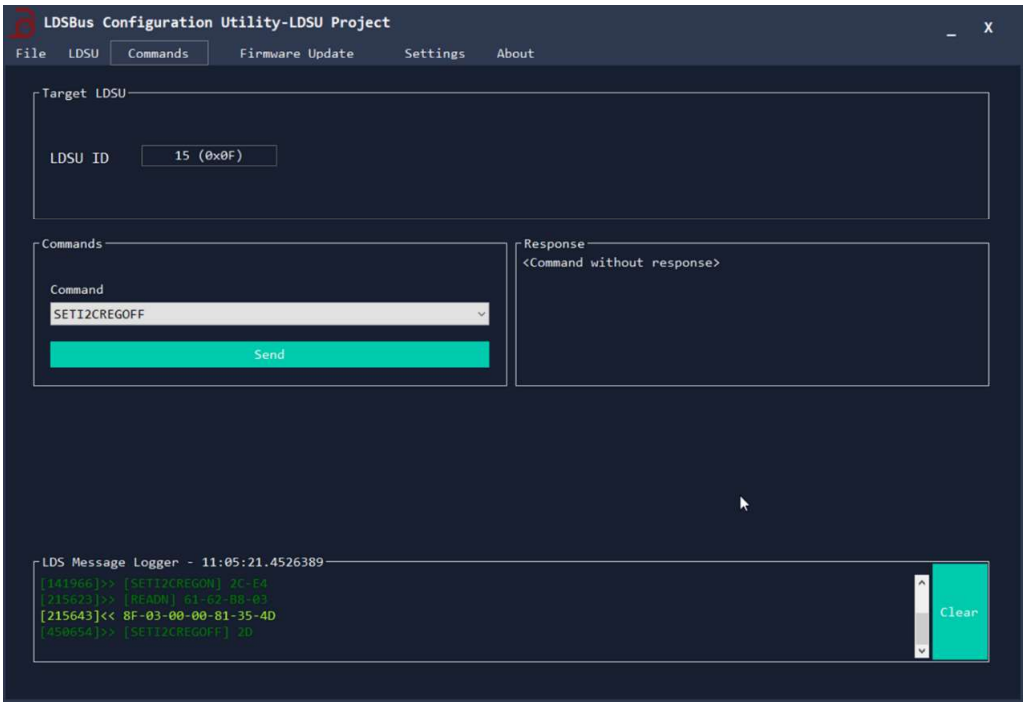
IDENTIFY

This command will trigger the LED in the LDSU Device.



I2CREGOFF

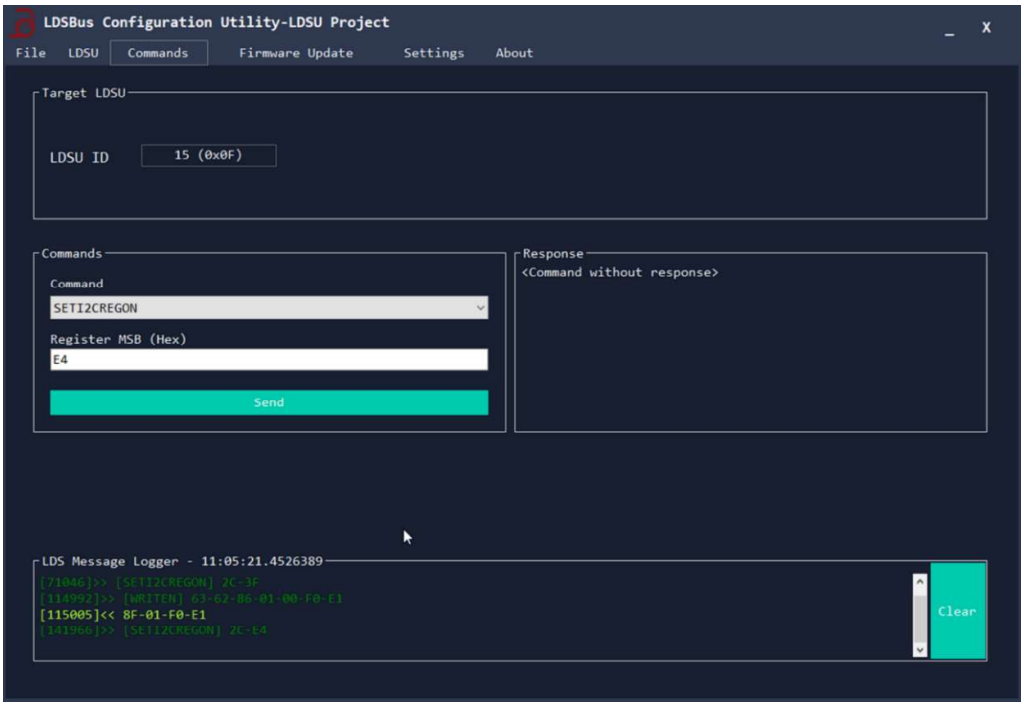
This command will turn off the 16bit register access



Commands with payload / without response

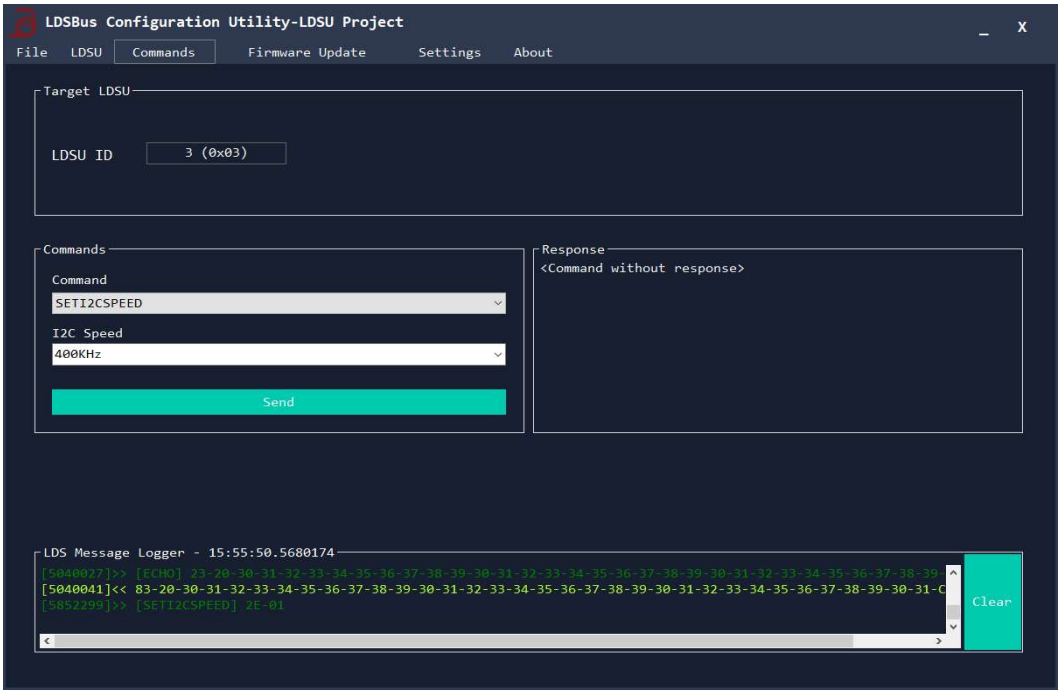
I2CREGON

This command sets the I2C register addressing to 16-bit mode.



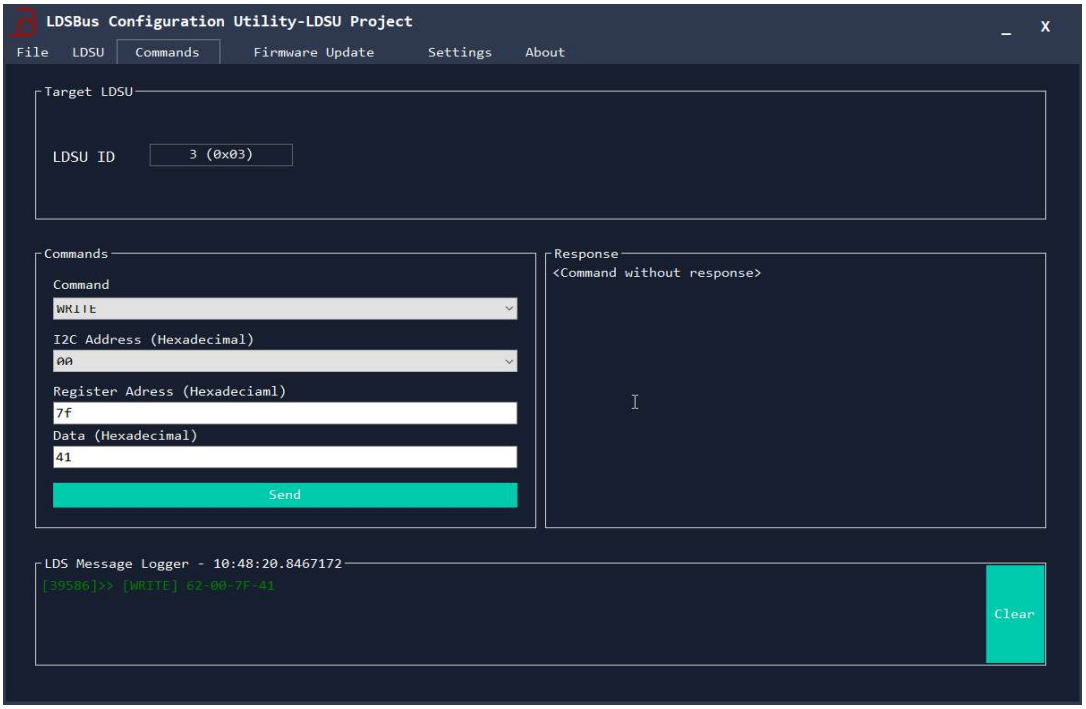
SETI2CSPEED

This command is used to set the I2C Speed (100 KHz or 400 KHz).



WRITE

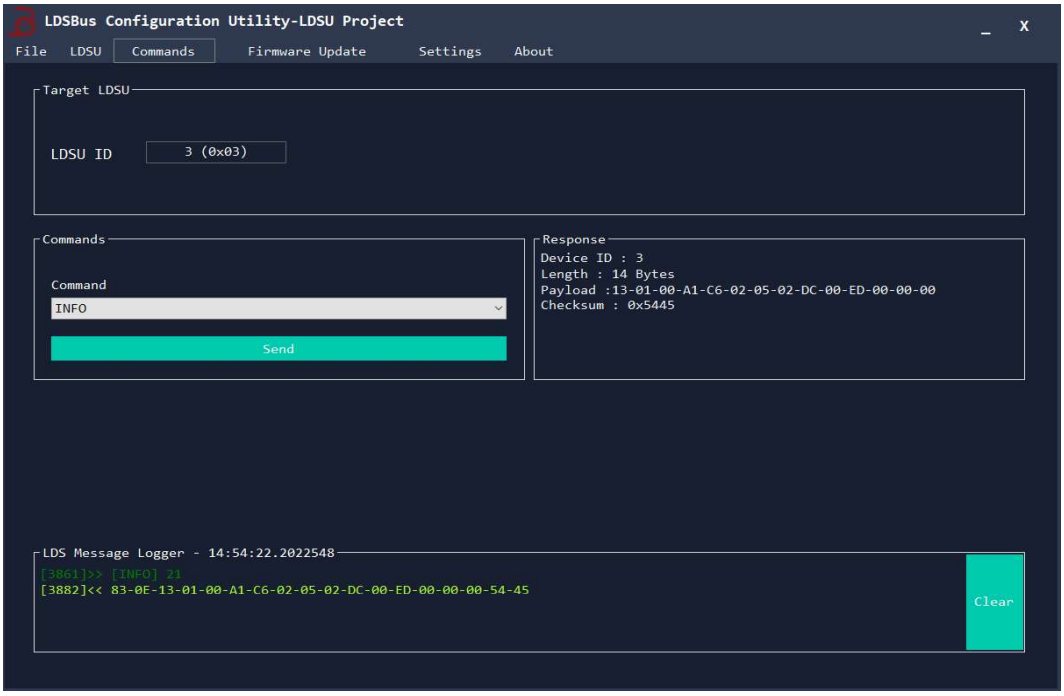
This command is used to write a single register location in an I2C device.



Commands without payload / with response

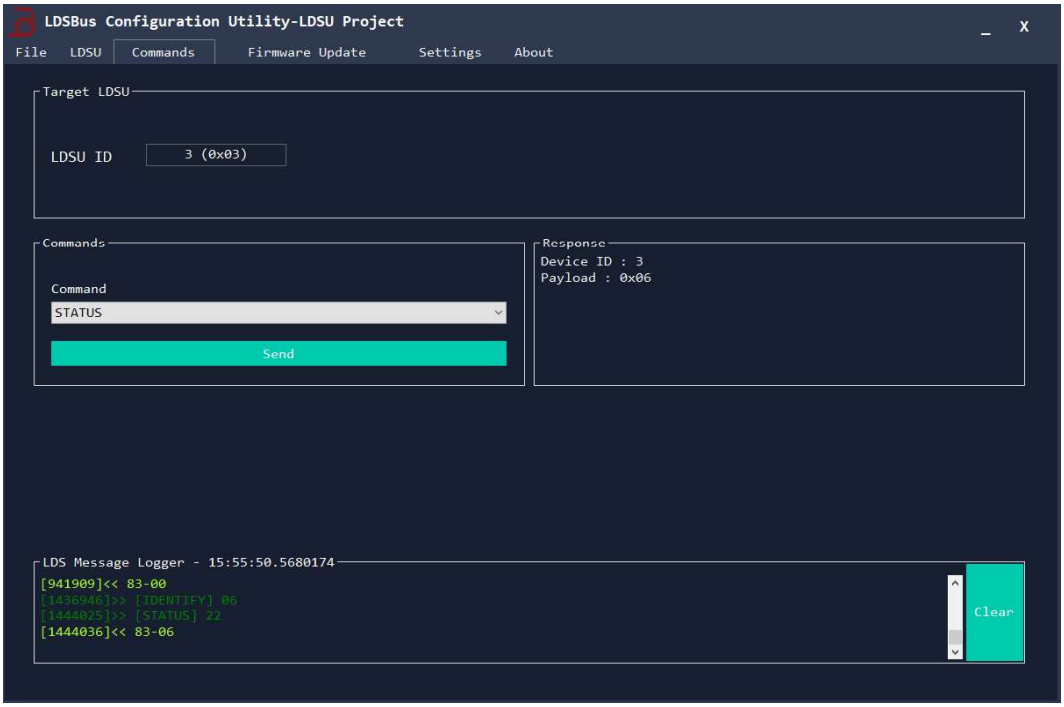
INFO

This command will get the information about the LDSU Module.



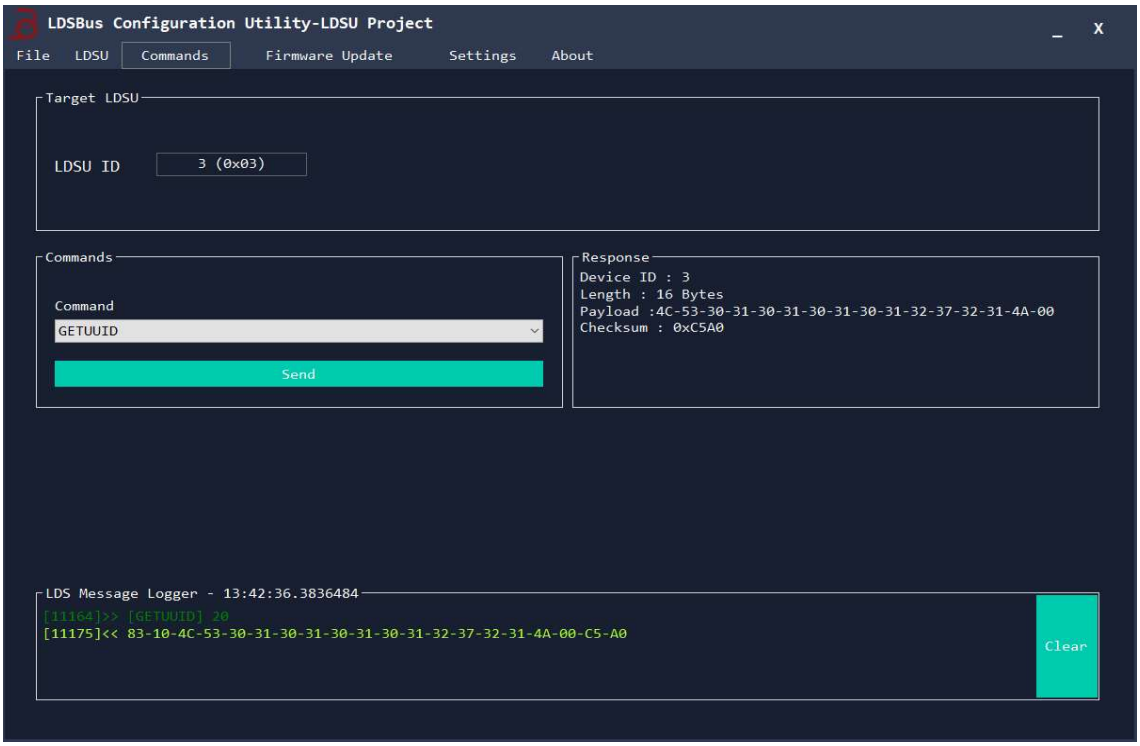
STATUS

This command will get the last sent command status.



GETUUID

This command will get the device's unique UID.



Appendix B - References

Document References

BRTSYS_API_001_LDSBus_Python_SDK_Guide

BRTSYS_AN_003_LDSBus Python SDK on IDM2040 User Guide

Acronyms and Abbreviations

Terms	Description
LDSU	LDSBus Units
LDSBus	Long Distance Sensor Bus
USB	Universal Serial Bus

Appendix C – List of Figures & Tables

List of Figures

List of Tables

Appendix D – Revision History

Document Title: BRTSYS_AN_001 LDSBus Configuration Utility Guide

Document Reference No.: BRTSYS_000014

Clearance No.: BRTSYS#038

Product Page: https://brtsys.com/ldsbus/

Document Feedback: Send Feedback

Revision	Changes	Date
1.0	Initial release	29-11-2021
1.1	Updated release under BRTSys	27-04-2023
1.2	Updated the document as per version LDSBus Configuration Utility 1.2.0 (Section 6.4 - Added LDSBus right click dropdown menu; Section 6.5 - LDSBus Firmware Upgrade; Section 8.4 - RFID Configuration Setting; Section 8.5 - Soil Sensor Configuration Setting)	29-09-2023
1.3	Updated the document as per version LDSBus Configuration Utility Ver.1.2.1 (Section 8.2 – IO Controller Application Type Configuration – Removed references related to Water Level, Windvane options from AIN; Anemometer and Rain Guage options from DIN; Updated screenshots)	30-11-2023
1.4	Updated release for LDSBus Configuration Utility Ver.1.2.2	08-07-2024