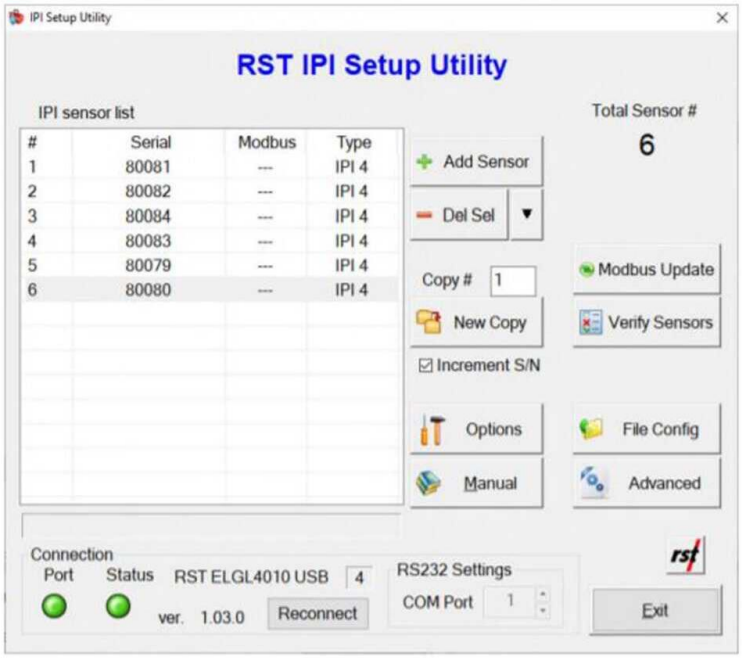

MEMS Digital In-Place Inclinometer System Utility Software

Installation and User Manual

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REVISION HISTORY

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A	Initial release	15-Feb-2021	PL	DH
B	Updated software version 1.02	08-Dec-2020	PL	
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E	Format update	10-Jun-2025	SM	PL, SP

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1 INTRODUCTION

RST Instruments' MEMS Digital In-Place Inclinometer (IPI) System is designed to reliably measure lateral movement in and around dams, embankments, landfills, landslides, piles, piers, retaining walls, and abutments, particularly when continuous remote monitoring is required. It provides an early warning for movement, essential for protecting life and equipment.

Each IPI sensor is identified by a factory-programmed unique serial number. When using the Modbus communication mode, each IPI sensor will be referenced by a unique Modbus address. Modbus addresses need to be programmed by the user each time a new IPI system is assembled and installed in the field, or when sensors are added to or replaced in an existing system.

The RST IPI Utility was created to facilitate programming the Modbus addresses in the field. It uses a familiar Microsoft Windows graphical interface. This manual outlines the procedure required to assign Modbus addresses to an IPI system.

The Modbus address is stored in the non-volatile memory of each IPI unit. As such, the procedures outlined in this manual will only need to be performed once per string, unless new units are added to a previously configured string.

NOTE: RST recommends that the system be configured, and MODBUS addresses assigned in the office or warehouse prior to installation in the field.

It is important to note that the instructions included in this manual are specific for RST's IPI27050 series IPIs with serial numbers greater than 80000. However, some earlier generations of RST's IPIs may also be configured to use Modbus communication. Please contact RST for further information.

FIGURE 1-1 RST IPI SENSOR WITH SERIAL NUMBER

2 SYSTEM REQUIREMENTS

2.1 HARDWARE

The following hardware is required to run and use the IPI Utility:

- IPI27050 Series System, with serial numbers 80000 and higher,
- RST ELGL4010 RS485 to USB Interface,
- RST IPI to ELGL4010 cable
- USB A to mini-B cable,
- Desktop or laptop PC with:
    - Intel or AMD processor, and
    - USB port.

2.2 WINDOWS HOST OPERATING SYSTEM

The following Microsoft™ Windows Operating Systems are currently supported:

- Windows 10 (x86 and x64).
- Windows 11.

3 QUICK START INSTRUCTIONS

The following section provides instructions to assist with the installation of the IPI Utility software.

3.1 SOFTWARE INSTALLATION

1. Run the software installation file **RST_IPIutility_Setup_X.XX.X.exe**, where X.XX.X indicates the version of the most recent software release. The most recent version can be downloaded from https://rstinstruments.com/product/ipi-utility-software/
2. Follow the on-screen prompts to install the software. The default directory is C:\Program Files (x86)\RST Instruments\IPI Utility.

NOTE: When using the RST ELGL4010 RS485 to USB interface, the IPI utility software requires a set of drivers be installed on the host computer to communicate of a USB communication port. If automatic driver updates are enabled and an internet connection is available, the RST USB drivers will be downloaded automatically from the Microsoft™ windows update server and installed.

For assistance, please see Section 4.

3.2 SYSTEM SETUP

Once the software has been installed on the PC, connect the IPI system to the PC using the RST IPI to ELGL4010 cable, the ELGL4010 RS485 to USB interface, and USB cables, as illustrated in Figure 3-1.

FIGURE 3-1 SYSTEM SETUP

3.3 UPDATING THE MODBUS ADDRESSES ON AN IPI SYSTEM

The following instructions detail how to use the IPI Utility to update the Modbus addresses on an IPI system.

NOTE: The MODBUS addresses for sensors in an IPI system must be assigned before using a MODBUS based logging instrument.

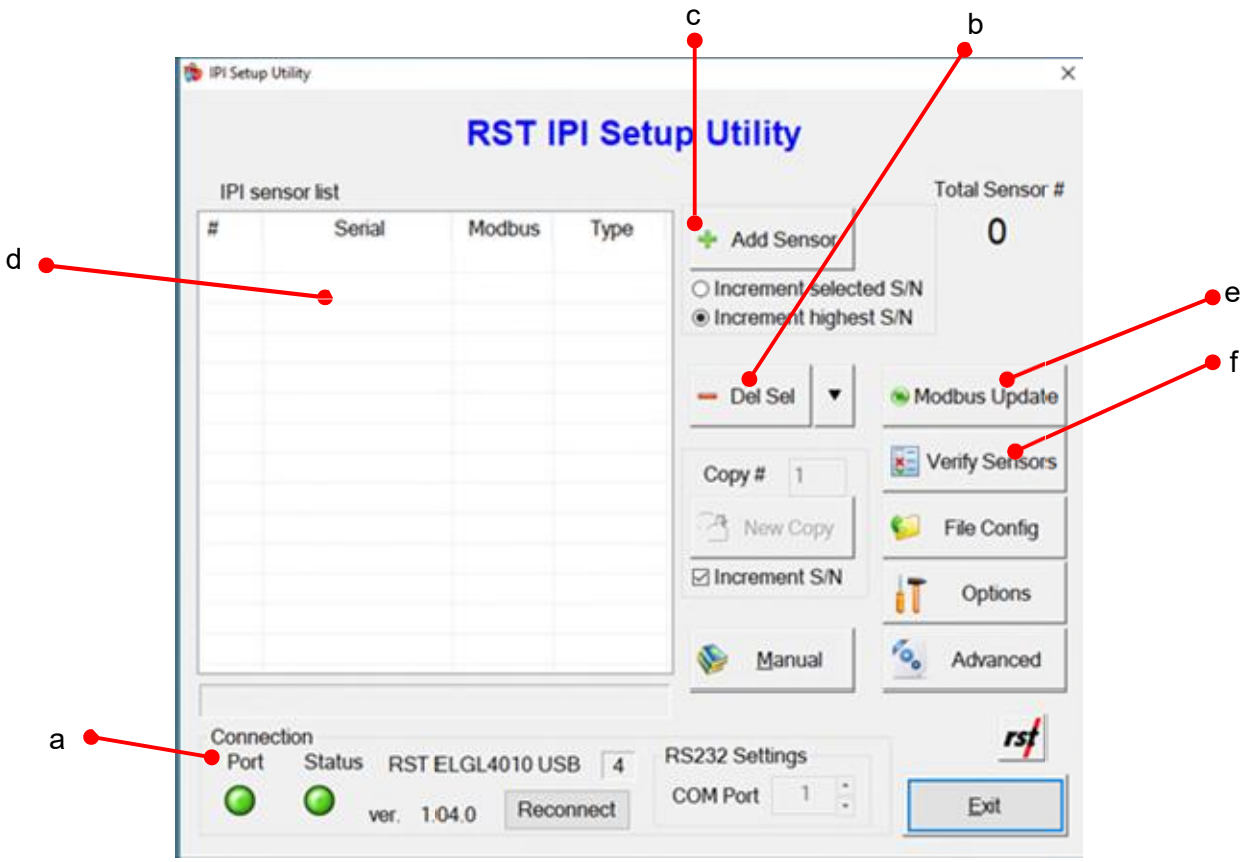

FIGURE 3-2 RST IPI UTILITY MAIN WINDOW

1. Ensure that the Port and Status indicators are green (Figure 3-2, a).
2. Ensure the IPI sensor list is blank by removing existing entries using *Del Sel* (Figure 3-2, b) or *Remove All* (*Remove All* can be found on the pull-down menu next to *Del Sel*).
3. Select *Add Sensor* (Figure 3-2, c) to enter the serial number of the first (i.e., topmost) IPI in the string.
4. Click on the *Serial* column (Figure 3-2, d) and enter the unit's serial number.
5. Repeat Steps 2 and 3 for each remaining sensor in the string.

CAUTION: Duplicate sensor serials are not permitted on DTBUS. Duplicate serial numbers will be indicated by red highlight and MODBUS address update will not start.

6. When all sensors are listed, click *Modbus Update* (Figure 3-2, e) to update the Modbus address of each sensor. Unless the DT Bus Options are changed (see Section 3.4 for details), the top-most sensor in the string will be assigned a Modbus address of 1 and subsequent sensors assigned sequential Modbus addresses according to how they were

entered into the IPI Sensor List. MODBUS addresses that have been successfully updated will be highlighted green (Figure 3-3). Failed updates will be highlighted red.

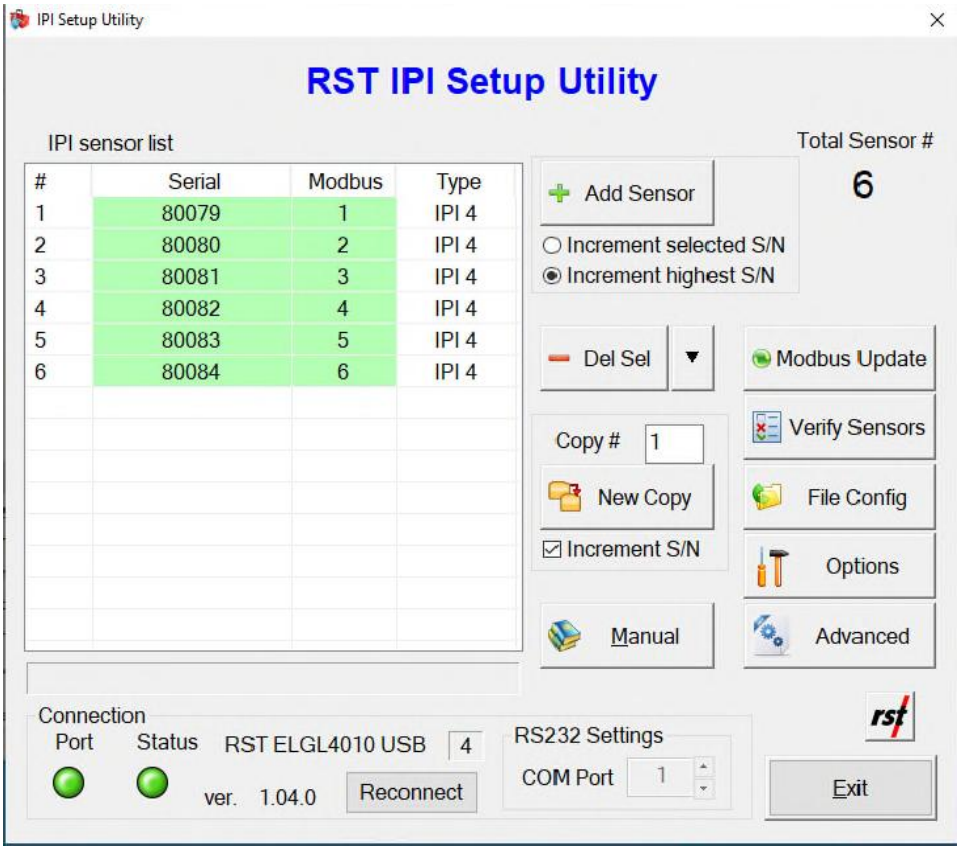

FIGURE 3-3 UPDATED AND VERIFIED SENSOR LIST

7. Click *Verify Sensors* (Figure 3-2, f) to ensure that the utility can communicate with and read the Modbus address from every sensor in the string. Verified sensors entries will be highlighted, as described in Step 6.

CAUTION: Duplicate sensor serials are not permitted on DTBUS. Duplicate serial numbers will be indicated by red highlight and MODBUS address update will not start.

.

NOTE: If entered correctly, the order that the sensors appear in the IPI utility will be a visual representation of the layout of the string in the borehole, with the bottom-most sensor on the IPI sensor list corresponding to the bottom-most sensor in the borehole, and the sensor in position 1 on the software corresponding to the top-most sensor in the string.

IPI Sensor List	Modbus	Borehole
Sensor 1	1	Sensor 1
Sensor 2	2	Sensor 2
Sensor 3	3	Sensor 3
Sensor 4	4	Sensor 4
Sensor 5	5	Sensor 5

Taking time to set up and configure the sensors correctly at the outset will result in a better data collection and interpretation experience.

CAUTION: To facilitate data collection, the system should be installed in the same order as in the initial set up and configuration to prevent reading errors and system failure.

3.4 ADDITIONAL FEATURES

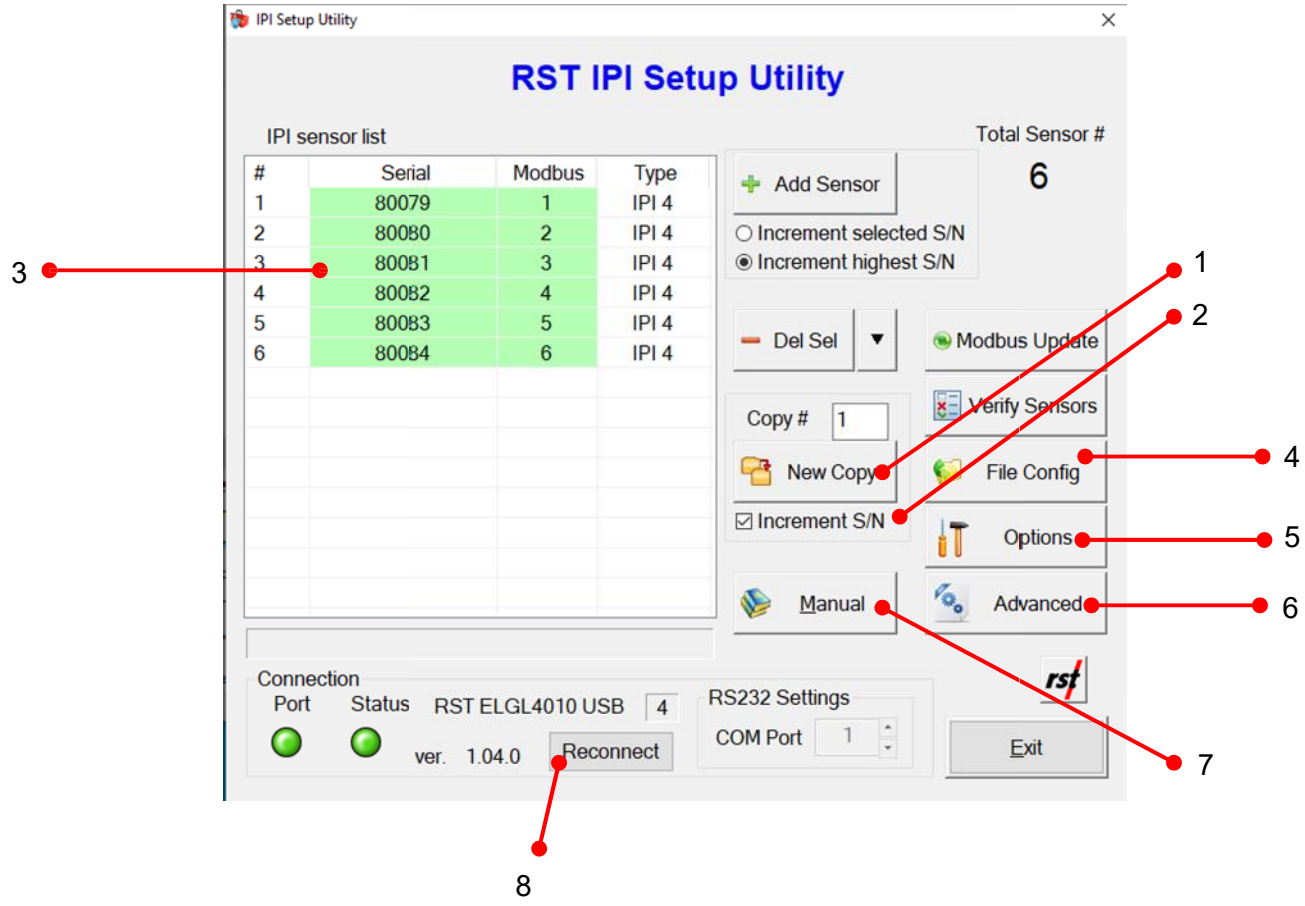

FIGURE 3-4 ADDITIONAL FEATURES

In addition to the functionality described in Section 3.3, the IPI Utility has the following features (Figure 3-4):

1. *New Copy*

   Selecting *New Copy* will copy the selected sensor and add it to the end of the list of IPIs.

2. *Increment S/N*

   If checked, *Increment S/N* will cause *Add Sensor* and *New Copy* to create new entries with incremented serial numbers for convenience when entering subsequent sensors.

→ **NOTE**: Serial numbers on IPI sensors may not be sequential. The serial numbers of individual units should be checked carefully.

3. Individual sensor dialog

   Right-click on an individual sensor in the IPI Sensor List to edit an individual sensor (Figure 3-5).

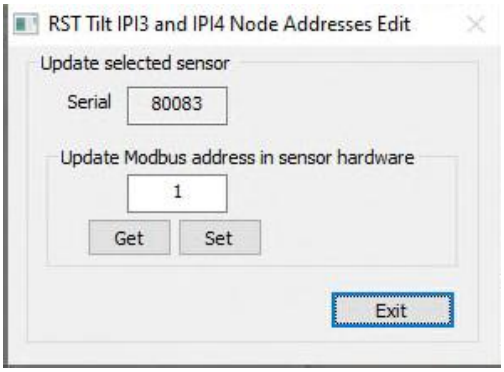

FIGURE 3-5 SENSOR EDIT DIALOG

Use the *Get* button to display the Modbus address currently programmed into the selected sensor. To update the Modbus address in the sensor's memory, enter the new Modbus address and click the *Set* button. The progress of the update will be displayed, and a successful update will be highlighted green.

4. *File Config*

   For future convenience, the entire sensor list can be saved into the configuration file using *Save to File*. When starting a new update session for the same sensor set, the previously saved configuration can be loaded by clicking on the *File Config* button.

5. *Options*

   DT Bus *Options* dialog allows the initial Modbus address to be adjusted, if necessary.

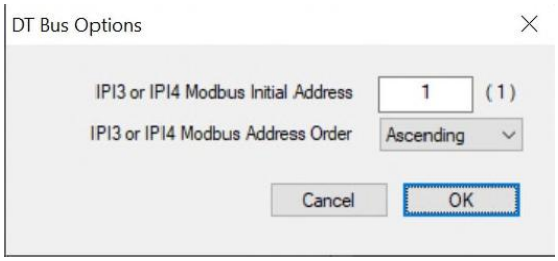

FIGURE 3-6 DT BUS OPTIONS

For reverse order installations, Modbus Address Order can be changed to Descending.

NOTE: MODBUS addresses for sensors on the same DT BUS must be unique. The MODBUS address range is between 1 and 247.

6. *Advanced Options*

The *Advanced Options* dialog (Figure 3-7) provides a sensor discovery feature. This feature should only be used for recovery.

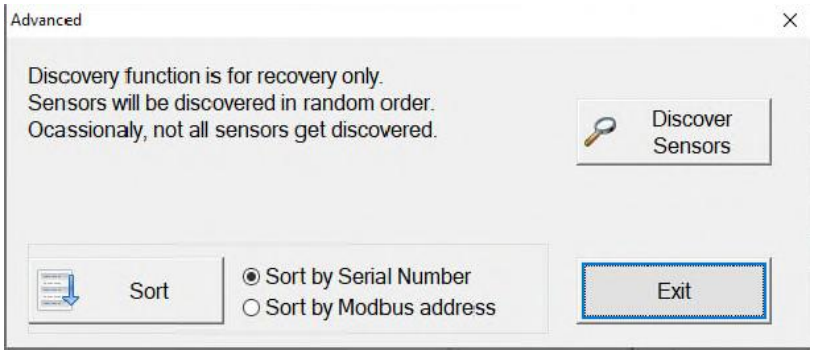

FIGURE 3-7 ADVANCED OPTIONS

NOTE: This feature should be used with caution. Discovery function is for recovery only. Sensors will be discovered in random order. Occasionally, not all sensors will be discovered.

a. To use the automatic sensor detection feature, click on the *Discover Sensors* button. The discovery process may take a few moments.

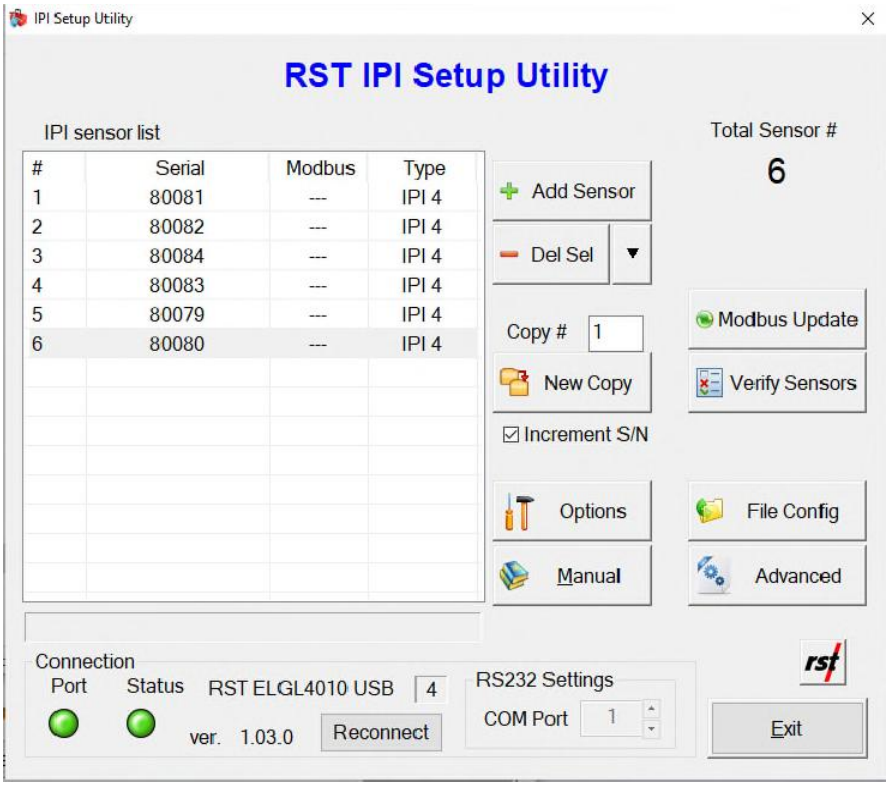

FIGURE 3-8 DISCOVERED SENSOR LIST

NOTE: For long sensor chains, it may be necessary to repeat the sensor discovery until all sensors have been detected.

b. The *Sort* button in the *Advanced Options* dialog (Figure 3-7) can be used to sort sensors by ascending serial number or Modbus address.

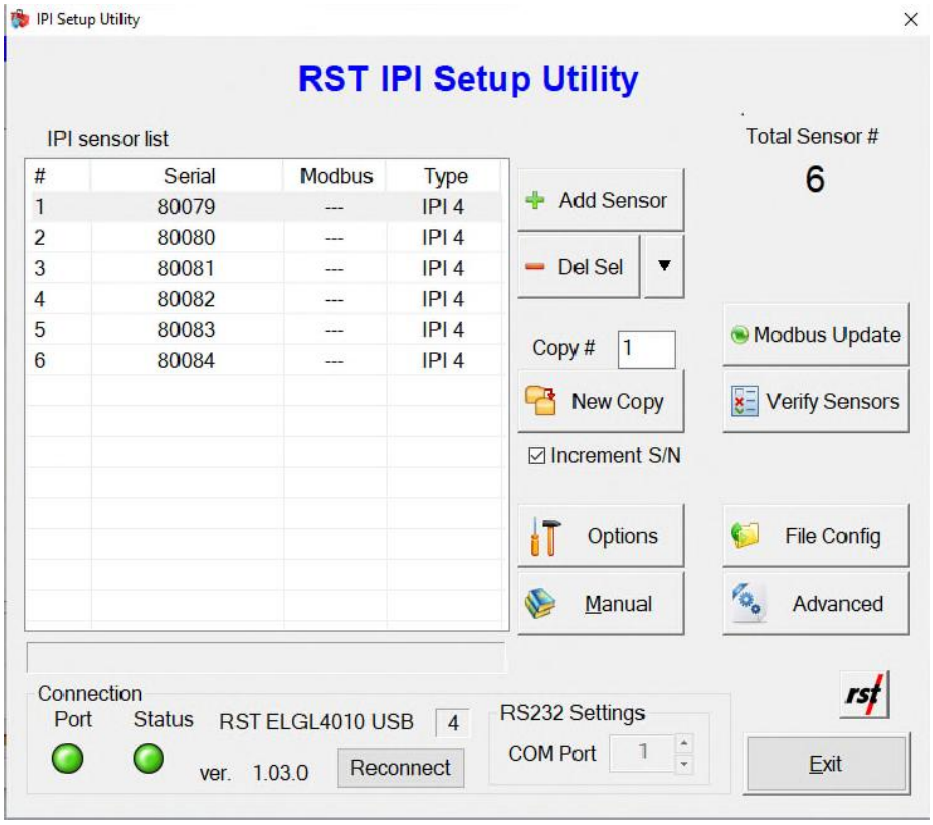

FIGURE 3-9 SORTED SENSOR LIST

NOTE: The sensor discovery function can be used in combination with manual sensor updating. Only sensors absent from the list will be discovered.

7. *Manual*

Click on the *Manual* button to open the software manual in PDF format.

8. *Reconnect*

After changing the connected RS485 interface or adjusting the port number, click on the *Reconnect* button to open the selected port.

4 RST USB DRIVER SET REINSTALLATION

NOTE: The user needs to have Windows admin access to install the system level drivers.

The RST ELGL4010 RS485 to USB interface requires that a set of drivers be installed on the host computer to communicate over a USB communication port. All required USB drivers are installed during the IPI Utility setup. If the drivers need to be reinstalled, follow the steps below to manually install the USB drivers.

The following steps outline procedures for installing the RST Controller Driver Set on Microsoft™ Windows 10 and 11 platforms.

1. After the IPI Utility software has been installed, click on *Install USB Drivers* under the *Tools* section of the IPI Utility program group. The IPI Utility group should reside under *RST Instruments* in the Windows Start menu by default.

2. The USB driver setup starts by displaying the following dialog box:

FIGURE 4-1 NEW HARDWARE WIZARD FOR DEVICE

3. Click *Next* to proceed with the USB driver installation.

4. Select your acceptance of the RST Instruments End User License Agreement and click *Next* (Figure 4-2).

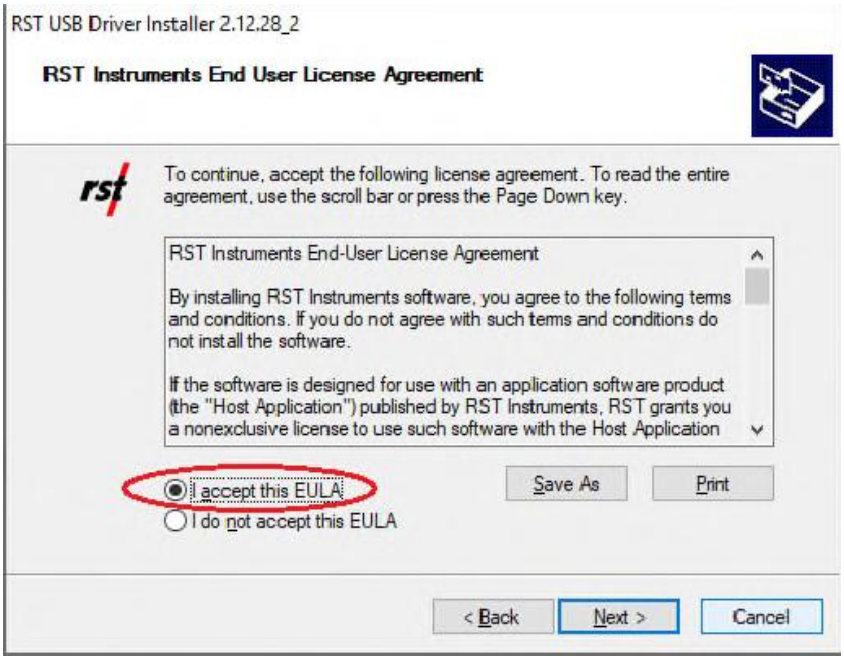

FIGURE 4-2 ACCEPTING THE END USER LICENSE AGREEMENT

5. Wait for driver installation to finish.

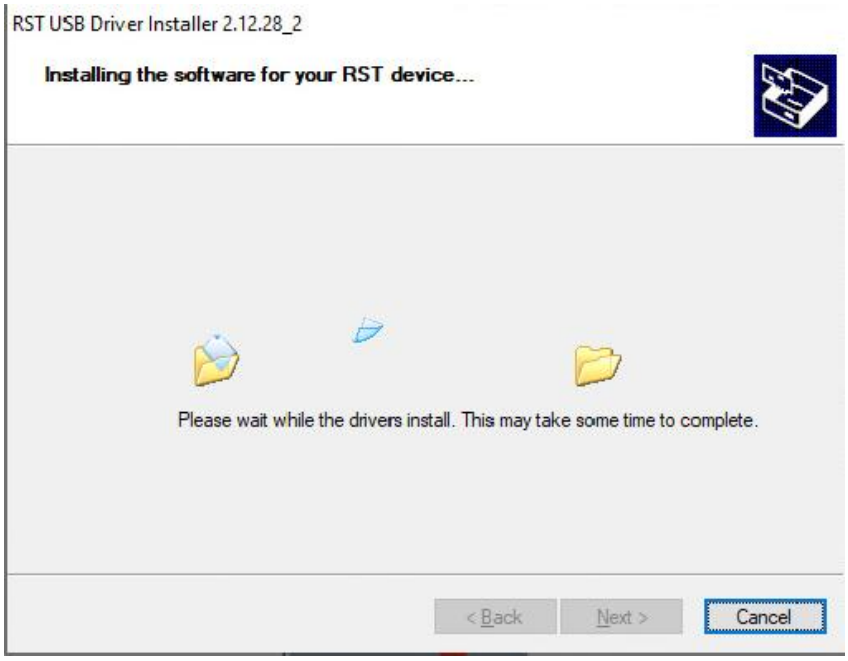

FIGURE 4-3 DRIVER INSTALLATION PROGRESS

6. Click *Finish* to complete the installation (Figure 4-4).

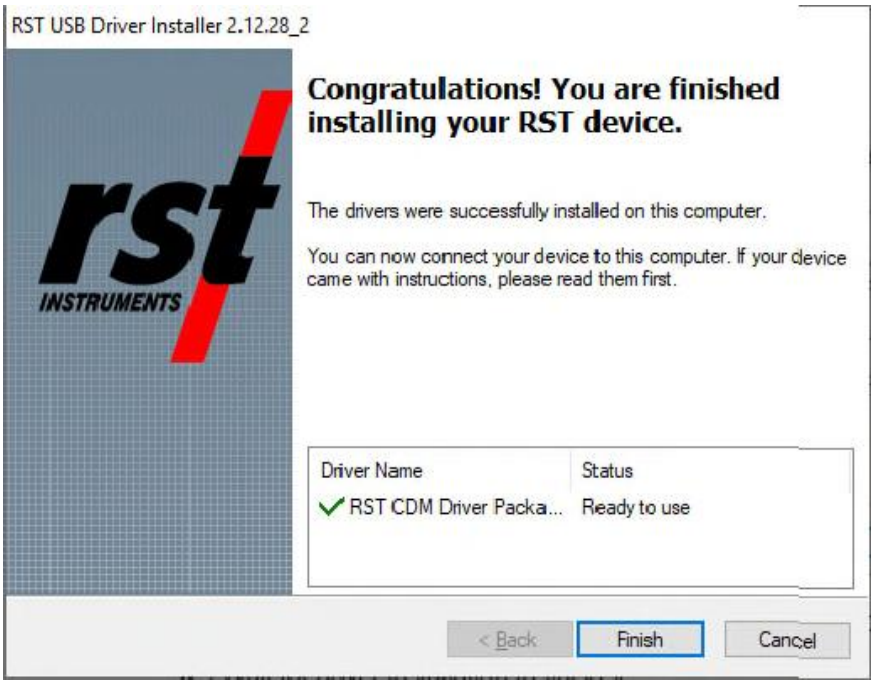

FIGURE 4-4 NEW HARDWARE WIZARD FOR DEVICE – INSTALLATION COMPLETE

7. After the successful installation of the device drivers, connect the RST ELGL4010 RS485 to USB interface to the host computer. Windows should detect the new device and display the yellow message balloon in the lower right-hand corner stating that all device drivers are installed and ready to use.

8. Open the Device Manager (under the Control Panel\System, click *Device Manager*) and expand the *Ports* branch. The device appears as “RST RS485 to USB Interface” (Figure 4-5).

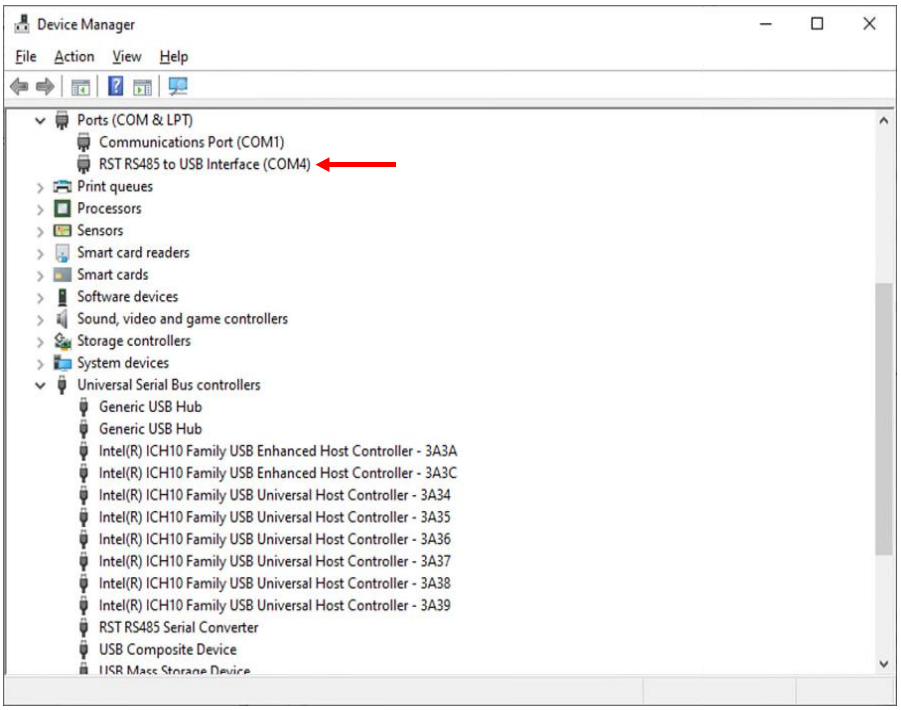

FIGURE 4-5 WINDOWS 10 AND 11 DEVICE MANAGER

9. If the driver was installed correctly, the RST RS485 to USB Interface port will appear, as shown in Figure 4-5. If it was not installed correctly, a yellow exclamation mark will appear next to the device on the Device Manager.

10. Once the installation has been verified, note the COM number which has been assigned to the USB serial port. This will vary from computer to computer. In the example shown in Figure 4-5, the COM number assigned is COM4.

11. Close the Device Manager and launch the IPI Utility software. The IPI Utility software should now connect to the ELGL4010 RS485 to USB interface. Confirmation of the connection can be seen in the Connection Status indicator on the bottom left-hand corner of the IPI Utility's Main Window.

5 TROUBLESHOOTING

5.1 CONNECTION PROBLEMS

Upon launching the IPI Utility software, the program will attempt to connect to the RS485 interface using the current communication settings. Once connected, the port indicator on the Main Window will turn green.

The connection status is displayed on the status indicator. If the connection fails (i.e., the status indicators are red or yellow, or the dialog screen shows no status data), check the USB cable connection.
Check the port number setting and compare it with the number displayed in the Device Manager (Figure 5-1).

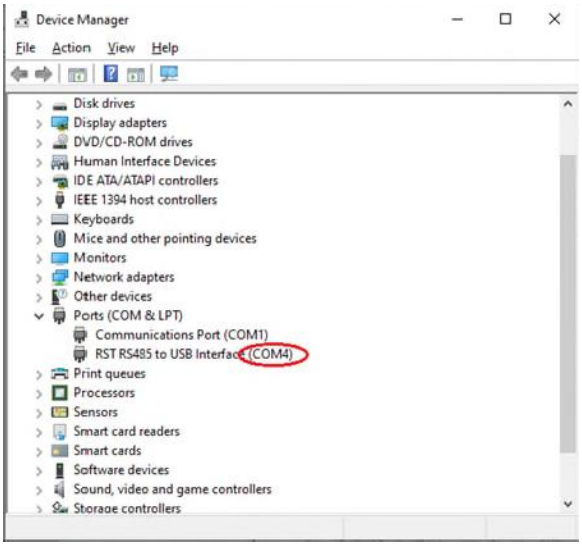

FIGURE 5-1 RS485 INTERFACE PORT NUMBER

In the event that connection problems persist, disable Bluetooth in the Device Manager (Figure 5-2).

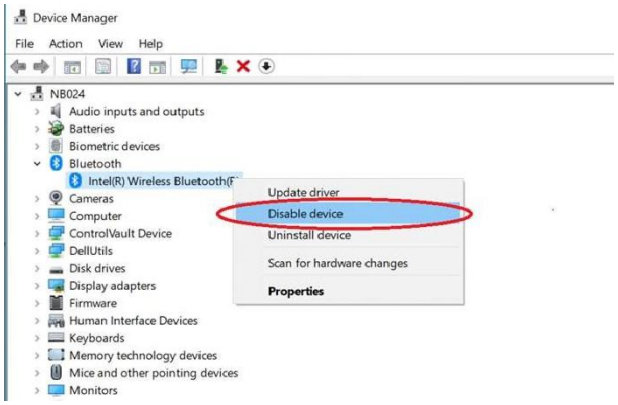

FIGURE 5-2 DISABLE BLUETOOTH

5.2 SOFTWARE STABILITY

The IPI Utility relies on continuous data transmission over a serial communication port. The transmission may occasionally be interrupted by other computer activity, resulting in the program freezing or displaying erroneous data. If this occurs, the IPI Utility program must be shut down and restarted. Always exit by clicking the “Exit” button in the bottom-right corner of the Main Window. The program should always be restarted when changing RS485 interfaces or reconnecting a USB communication cable.

6 SERVICE, REPAIR, AND CONTACT INFORMATION

This product does not contain any user-serviceable parts.
Contact RST for product services or repairs.

- For sales information: sales@rstinstruments.com
- For technical support: support@rstinstruments.com
- Support portal: https://support.rstinstruments.com/support/tickets/new
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