

IntelliSAW Configuration Tool

USER MANUAL

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WARRANTY

These products are warranted to be free from functional defects in material and workmanship at time of manufacture and to conform at that time to the specifications set forth in the relevant instruction manuals or data sheets, for such products for a period of one year.

Reference IntelliSAW terms and conditions provided at time of purchase for complete warranty details.

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IT IS IMPORTANT TO READ THIS MANUAL BEFORE INSTALLING OR COMMISSIONING INTELLISAW CRITICAL ASSET MONITORING SYSTEMS.



DANGER

DANGER indicates an imminently hazardous situation, which, if not avoided, **will** result in death or serious injury.

Failure to follow the instructions given will result in death or serious injury.



WARNING

WARNING indicates a potentially hazardous situation, which, if not avoided, **could** result in death or serious injury.

Failure to follow the instructions given can result in death or serious injury



CAUTION

CAUTION indicates a potentially hazardous situation, which, if not avoided, **may** result in minor or moderate injury.

Failure to follow these instructions can result in personal injury.

NOTICE

NOTICE alerts unrelated to personal injury, such as those that can cause property damage.

Failure to follow these instructions can result in property damage.

IMPORTANT

IMPORTANT indicates additional information about making effective use of this product.

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1 OVERVIEW

This user manual describes how to use the IntelliSAW Configuration Tool to configure a monitoring **unit (CAM-4 or Reader)**, assign, view and calibrate sensors, upgrade firmware, and other common tasks involved in the commissioning of an IntelliSAW Critical Asset Monitoring (CAM) system.

This manual has been updated for **Configuration Tool 3.0 (Revision 1197 or greater)**; previous revisions may operate differently.

1.1 SYSTEM HARDWARE INSTALLATION

This manual provides details on software installation and unit configuration **ONLY**, please reference the individual system component installation manuals for specific hardware details.



WARNING

PROFESSIONAL INSTALLATION REQUIRED.

INSTALLATION AND CONFIGURATION SHOULD BE PERFORMED ONLY BY PERSONNEL WHO ARE TECHNICALLY COMPETENT AND AUTHORIZED TO DO SO. LOCAL REGULATIONS REGARDING ELECTRICAL INSTALLATION AND SAFETY MUST BE OBSERVED.

Failure to follow the instructions given can result in death or serious injury

2 CONFIGURATION TOOL INSTALLATION

2.1.1 Operating System

The IntelliSAW Configuration Tool operates **ONLY** on the Microsoft Windows operating system and is only tested on versions 7, or 8.x.

2.1.2 Configuration Tool Installer

To install IntelliSAW Configuration Tool, open the supplied distribution media (CD, memory stick, or zipped files sent via email) and double-click the IntelliSAW Configuration Tool installer.

The installer typically has the name **IntelliSAW_Configuration_Tool_xxxx_installer.exe**, where “xxxx” is the revision number.

The *IntelliSAW Configuration Tool – InstallShield Wizard* will appear once the installer is launched. Follow the installer wizard instructions to complete the installation.

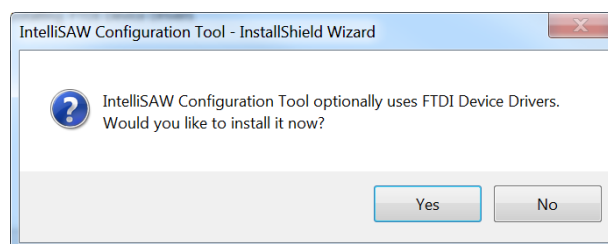
2.1.3 Other Required Installations

2.1.3.1 Microsoft .NET framework

The IntelliSAW Configuration Tool requires Microsoft .NET framework 4. If the machine does not have Microsoft .NET framework 4 installed, the installer can be found on the distribution media. The IntelliSAW Configuration Tool installer will prompt for the location of the Microsoft .NET framework installer if it is needed. Newer computers may only have newer framework versions and loading the older .NET framework will not harm more recent framework software.

2.1.3.2 FTDI drivers

FTDI drivers are required to communicate with a unit. The drivers may have already been installed if an older versions of IntelliSAW Configuration tool has been previously installed, and they do not need to be installed again. Once the Configuration Tool is launched, If Windows reports it cannot find the drivers or cannot communicate to a unit, the drivers will need to be installed. This occasionally occurs because of Administrative privileges preventing the installation, even though the installer reports success. Reinstallation of the drivers typically addresses this third party issue. Re-install the IntelliSAW Configuration Tool Installer. When prompted to install FTDI drivers, select yes and continue through the installation.



3 APPLICATION LAUNCH

The IntelliSAW Configuration Tool installer should have created a shortcut to on the desktop. Double-click this shortcut to launch the program. If this shortcut is missing, open the directory where Configuration Tool was installed and double-click "ISawConfigurationTool.exe". For Windows 8.x, locate newly installed applications in the Start screen and pin the program to the start menu or task bar, as desired.

The first time a unit is connected (via USB) to a computer, after a unit reboot, or after installing the FTDI drivers, the Windows operating system may take up to one minute to load the drivers. An attempt to run the Configuration Tool before the drivers have been loaded may result in an error message indicating no unit was found. If this occurs, close the Configuration Tool, wait one minute and reopen the Configuration Tool. Users that will work with many different readers should review [Appendix A: FTDI USB COM Port Fix](#) for instructions on preventing FTDI from creating a new COM port for each reader.

3.1 USB PORT IDENTIFICATION

Once Windows recognizes the USB connection, the Configuration Tool will attempt to locate a connected unit by identifying the first device that is using the FTDI drivers. Once connected, a Serial Port Settings dialog box will appear.

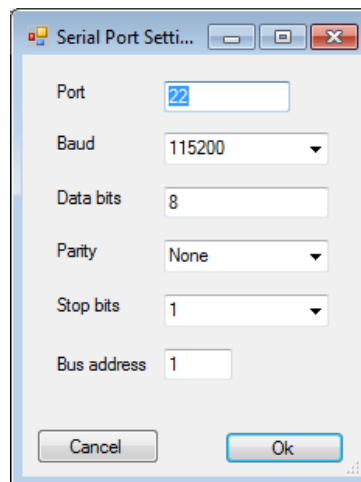


Figure 1: Serial Port Dialog Box

The Port text box will contain the number of the first found FTDI device. If multiple units are connected, or 3rd party devices using FTDI drivers are connected, the Configuration Tool may assume these ports are the unit to be configured and incorrectly populate the Port text box with the wrong port number.

Note that the first time IntelliSAW software is run on a computer, the baud rate may default to 19200.

The baud rate MUST be set at 115200 for proper execution.

Under normal use (USB connection) the bus address is always 1, regardless of the MODBUS address assigned to the RS485 port.

If no device was found, an error message, as shown below, will appear. If there is a serial port but the configuration is uncertain, e.g. multiple FTDI devices, the Port text box will show 0 or will show the last port used.

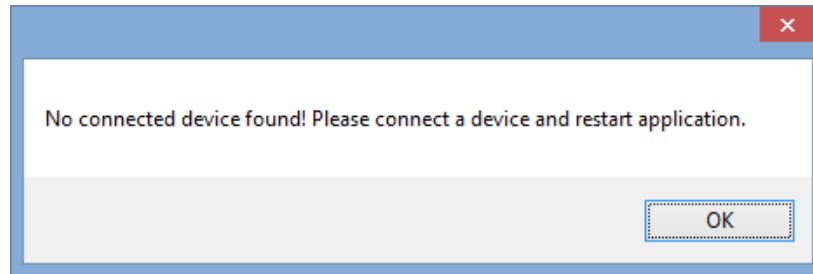


Figure 2: Dialog when no FTDI device is found and no serial port exists on the computer

3.1.1 Port Settings

The required settings of the USB port are:

Settings	Value
Baud Rate	115200
Data bits	8
Parity	None
Stop bits	1
Bus address	1

3.1.2 Connecting to a Unit

Once the port has been discovered and the proper settings have been applied, select OK.

For first time units (shipped after 01 July 2015) or units previously “locked”, the Compliance Mode notification will appear:

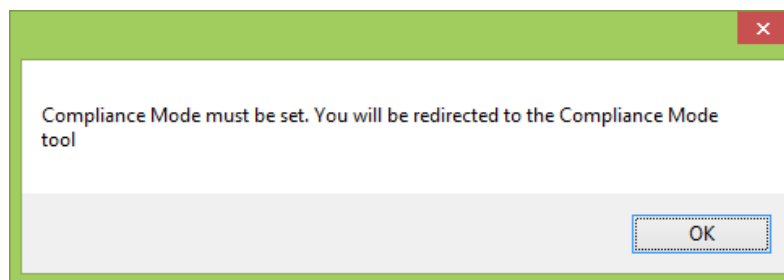


Figure 3: Compliance Mode Notification

If the unit has been configured before, the Configuration Tool main interface will appear:

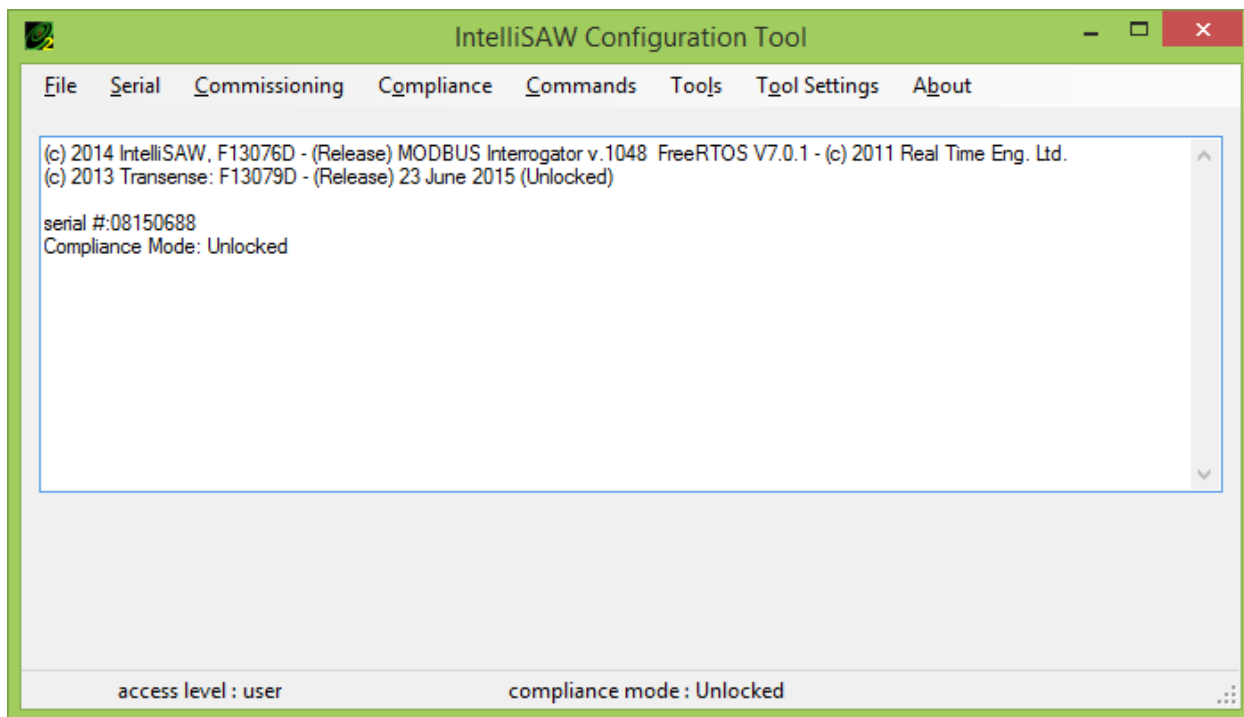


Figure 4: Configuration Tool Main Interface

3.1.2.1 Incorrect port settings

If the connection port or settings are incorrect, a Failed to Open dialog box will appear.

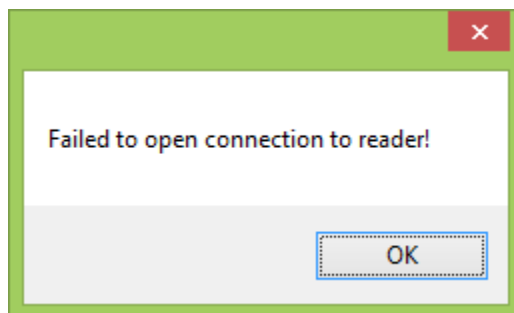


Figure 5: Failed to Open Connection

In the event of a failed connection, recheck the settings and ensure the correct USB port is being used. Discover the correct USB Port with the steps below to ensure the correct communications port is being used.

3.1.3 Discover Correct USB Port

If the port number is incorrect or set to 0, open Windows Device Manager (usually found in the Control Panel). In the Device Manager, select “Ports (COM & LPT)”. Connected units show up as “USB Serial Port (COMxx)”, where “xx” is the port number. Unplug and re-plug the USB cable from the unit; the connection that disappears and re-appears is the one associated with the unit which will be configured. The port number “xx” should be used in the serial port settings.

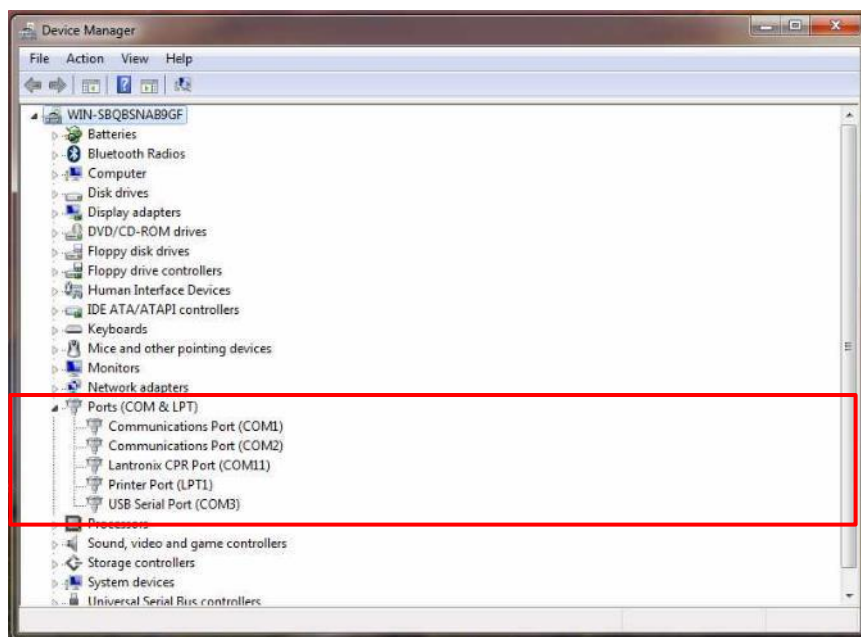


Figure 6: Device Manager, Ports (COM & LPT) Expanded

Note that FTDI drivers' default behavior is to assign a unique COM port to each reader. If you use a significant number of readers please consult either your IT expert or the factory for instructions on editing the Windows registry to prevent this behavior.

4 REGIONAL SETTINGS

Units (shipped after 01 July 2015) with Interrogator Firmware Revision D (DSP and dsPIC) or greater add support for regional settings, including FCC Part 15.231(e) compliance.

4.1 NEW UNITS

A unit that has not been configured before will be in “**Locked Mode**”, locking the wireless transmissions for temperature monitoring to ensure EMC regulations are being met, regardless of the shipping destination. If it is the first time the unit is being configured, the following screen will appear at application startup:

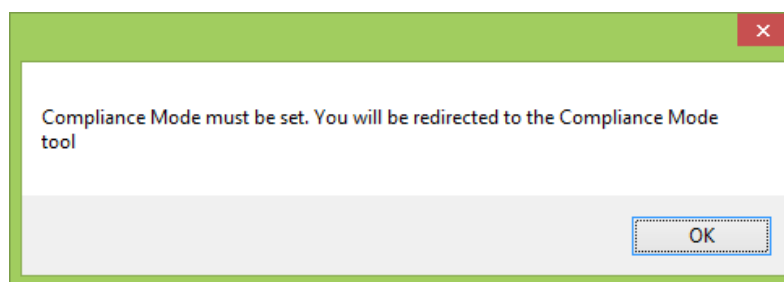


Figure 7: Initial Compliance Mode Dialog

IMPORTANT

A unit cannot be configured or operated without setting a Compliance Mode.

4.2 COMPLIANCE MODES

The installer must select their installation region (US/Canada or Rest of World) and select the available compliance mode based on region. The following details the modes:

4.2.1 FCC Open Air

IntelliSAW has been granted FCC approval to operate against Part 15 defined transmit levels in open air or in electrical compartments that are not ANSI C37 type enclosures. This setting will limit the transmission distance between air interfaces and sensors.

4.2.2 FCC/IC ANSI

IntelliSAW has been granted FCC approval at transmit power levels above the open air Part 15 levels based on professional installation into ANSI type metal enclosed or metal clad switchgear. *Whereas homologation for EMC compliance was previously the responsibility of the OEM or systems integrator, now OEMs and systems integrators in the US and Canada may rely on IntelliSAW's FCC authorization.* The most significant changes are in the timing constraints imposed by FCC Part 15. Periodic emissions from intentional radiators allow a maximum of 1 second of transmission time and a minimum time between bursts of transmission ranging from no less than 10 seconds and no less than 30 times the length of the transmission burst.

4.2.3 PD Only

The IntelliSAW units can be put into PD Only mode which will allow the unit to only read PD (if the option is available) and not transmit signal for temperature monitoring. This mode is compliant with regulations following FCC Part B or RTT&E rules for digital devices.

4.2.4 Locked

A unit can be locked to ensure it is not transmitting. No system configuration can occur in this mode. This mode is compliant in all regions, and is therefore the default shipping state.

4.2.5 Unlocked

A unit transmission can be unlocked to full power and no timing restrictions. **This is a Rest of World option only and is not valid for the United States or Canada.** In this mode, the professional installer is accepting responsibility for operating the reader as a component within a fixed system, such as a switchgear, offering sufficient shielding to prevent RF interference.

4.3 SETTING COMPLIANCE MODE

Once the correct region and setting has been selected and the installer understands they are responsible, enter “yes” and press ENTER to complete the mode setting. The data box will provide details on setting firmware compliance.

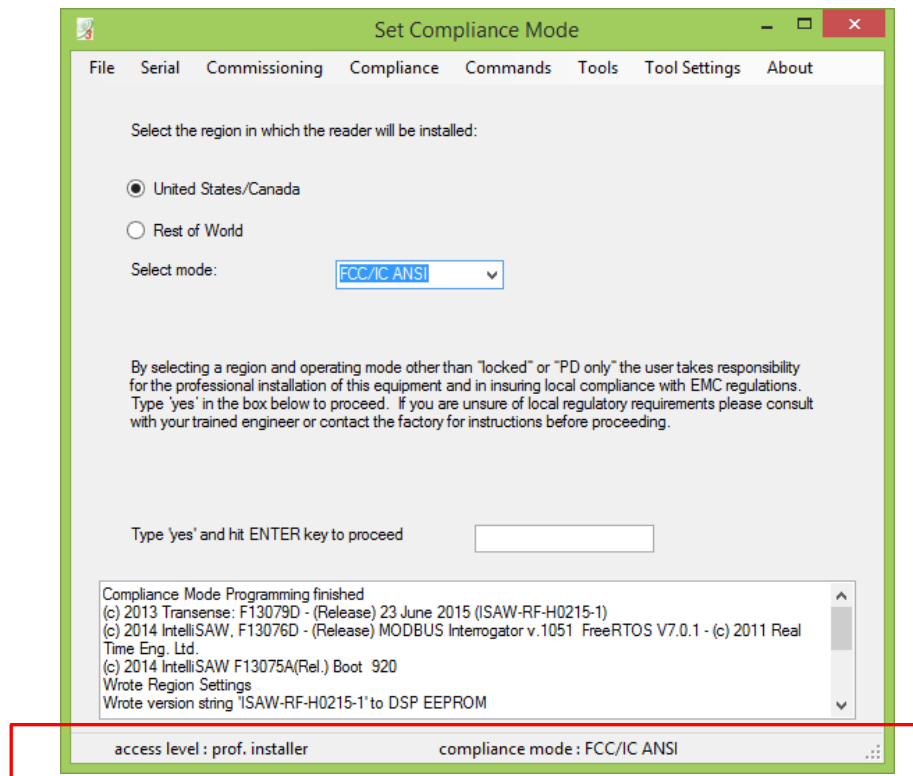


Figure 8: Configuration Tool after setting region

Note, the configuration tool footer shows the unit’s compliance mode at all times.

4.3.1 Professional Installation Access Level

Because of the required power and timing to comply with specific regional regulations, the user must acknowledge they are fully responsible for the region which they are configuring and that they are professionally installing the unit. **IntelliSAW is not liable for incorrect settings.**

4.4 UPDATING COMPLIANCE MODE

In the event that the compliance mode needs to be updated, the tool can be selected through the menu item: **Compliance → Set compliance Mode**

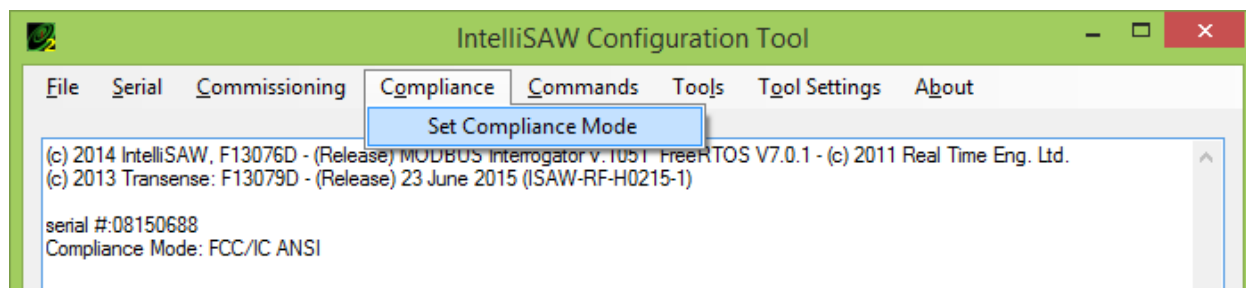


Figure 9: Menu Item for Setting Compliance Mode

4.5 COMPLIANCE MODE PATCH

If a unit shipped prior to 2015 July, or firmware was upgraded to DSP Rev D using configuration tool earlier than 1062, then this function will need to be performed, or the compliance mode must be set using configuration tool 1062 or higher. Operations details are detailed in section 11 below.

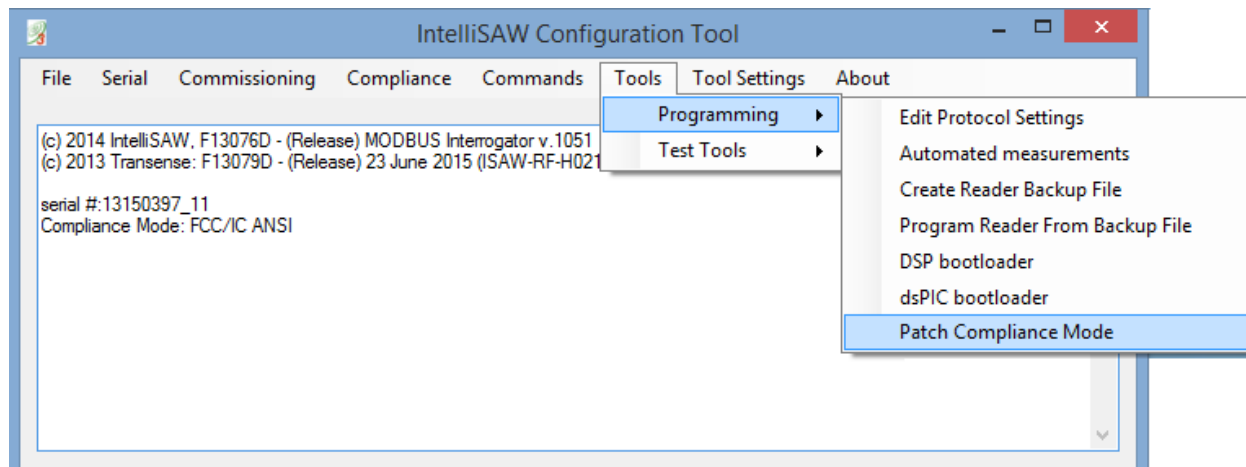


Figure 10: Compliance Mode Patch

5 COMMISSIONING: TEMPERATURE SENSORS

IMPORTANT

It is assumed sensors and air interfaces have been installed in the asset.

If operating in a test lab, ensure the sensors and air interfaces are on a metal surface for best results.

The SAW temperature sensors are configured through the menu items are found under **Commissioning → Temperature**. The tools allow the setting of defaults, editing settings, viewing data real-time for optimization, and verifying stable MODBUS register population from the configuration.

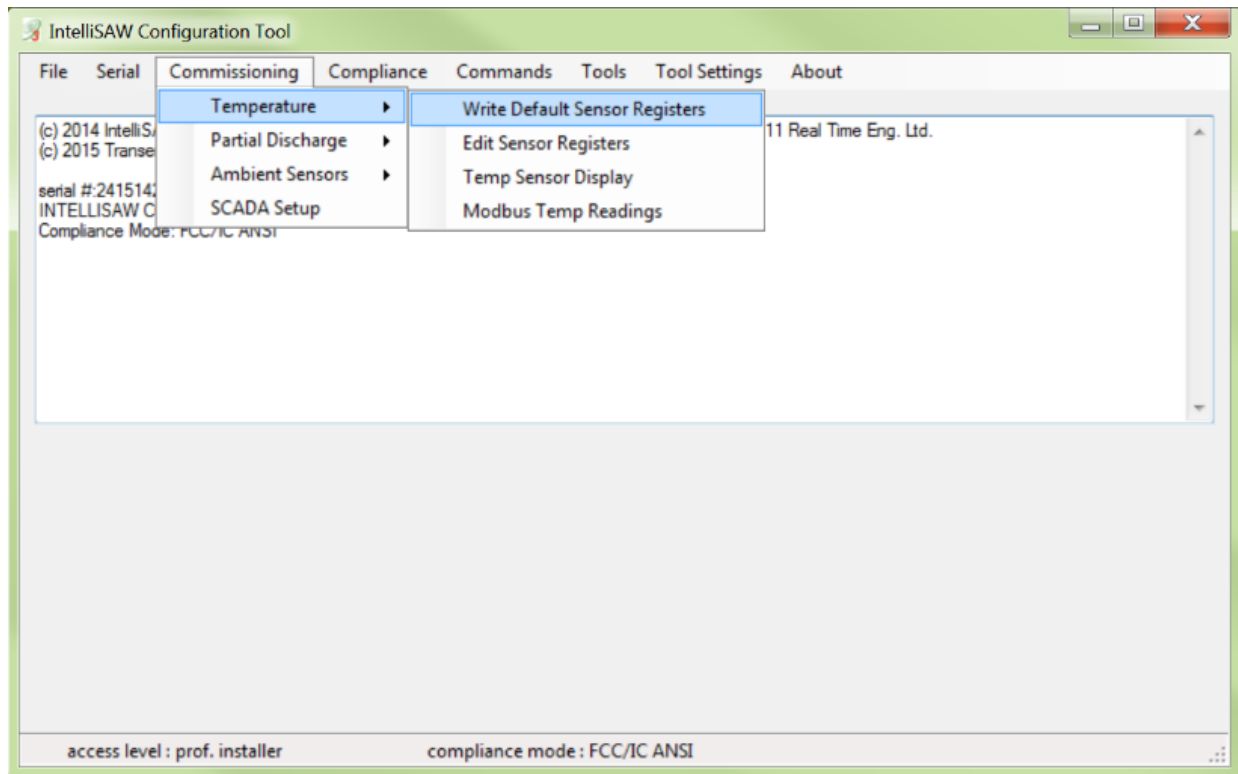


Figure 11: Configuration Tool Menu: Commissioning – Temperature

5.1 WRITE DEFAULT SENSOR REGISTERS

This Menu selection allows users to set factory defaults for temperature sensor registers. This is typically not needed at installation, but is provided as a means of resetting a reader to a known state.

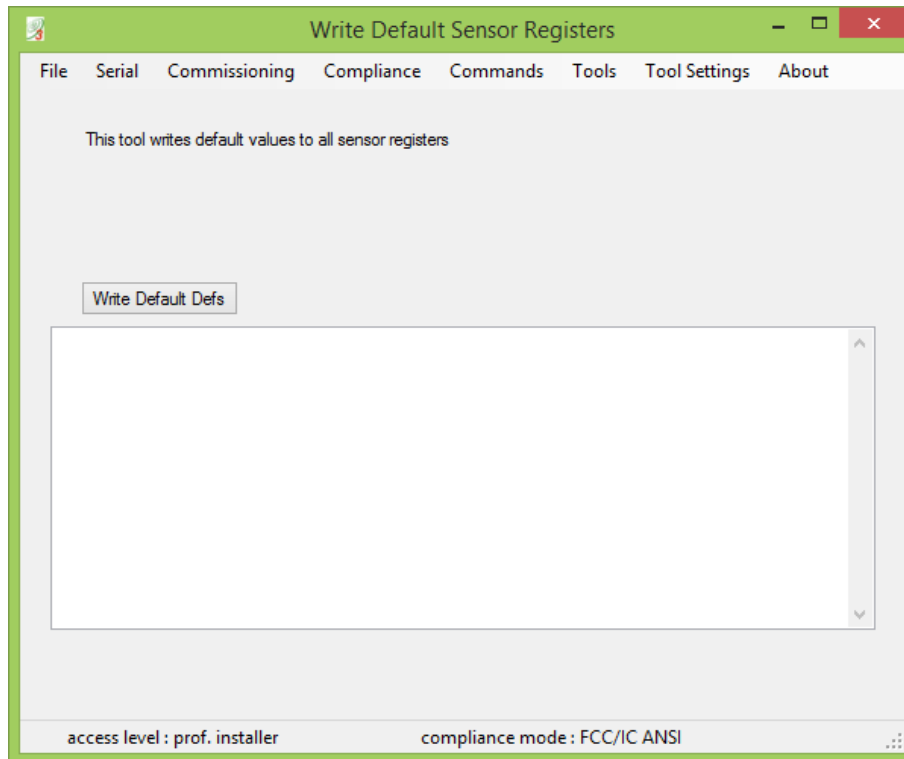


Figure 12: Write Default Sensor Register Interface

5.1.1 What is a Sensor Register?

A Sensor Register (also referred to as *sensor definition*) is how a unit keeps track of the wireless sensors. Each definition consists of a sensor frequency band (1-12), a calibration code, and the antenna which is used to interrogate the sensor. The temperature commissioning references 12 *locations*, each with the ability to use some or all of the 4 antennas, providing for redundant measurements. Each location has four sensor definitions, which are identical except for the antenna assigned and whether or not the measurement is enabled.

5.1.2 Setting Defaults

A new unit is shipped with default settings, if a unit is to be restored to factory default, the following steps can be taken:

- Select the **Write Default Defs** button
- The Erase Calibration dialog will appear to advise that writing defaults erases calibration.

- Select **Yes** to continue and set defaults, or **No** to cancel.

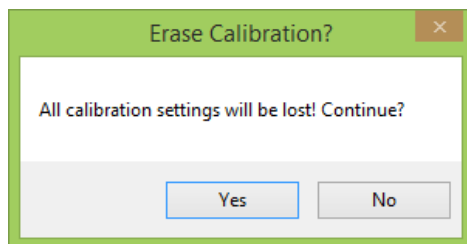


Figure 13: Erase calibration settings

- Unit will reboot and display the Firmware versions in the data field of the interface.

5.2 CONFIGURE TEMPERATURE SENSORS

The menu item **Commissioning → Temperature → Edit Sensor Registers** is used to configure the temperature sensor definitions. The unit's current sensor definitions and automated measurements (selected antenna) will display if they already exist. Since the application must retrieve the current configuration from the monitoring system, loading this page can take several seconds.

5.2.1 Register Assignment Scheme

Data from each sensor is stored in the unit's internal memory registers; the assignment of these memory registers is arbitrary, therefore a sensor assignment scheme should be determined. For example, when configuring multiple switchgear in a substation, the definition scheme will make it easy for the installation team to mount sensors and correlate to installation locations.

5.2.1.1 Temperature Sensor Labeling

The SAW temperature sensors have 12 unique band numbers and are grouped by color codes to ensure optimal performance along with easy installation and visualization in electrical power assets. They also contain a calibration letter which will be used during configuration. In this sensor example it would be **Band: 04**, **Cal Code: G**.



IMPORTANT

IF SENSOR INSTALLATION OCCURS BEFORE CONFIGURATION, ENSURE TO DOCUMENT SENSOR LOCATION, BAND NUMBER, AND CALIBRATION LETTER.

5.2.1.2 Antenna Port Arrangements

Multiple antenna ports can be used to measure each sensor, taking advantage of a feature in the Modbus registers that provides the best reading for each sensor from all of the ports used to measure that sensor. For each of the four readings that are enabled and that succeed, the MODBUS register is a weighted average of the readings, where the weighting factors are the signal strengths.

IMPORTANT

AN ANTENNA SHOULD ONLY BE ENABLED FOR SENSORS THAT ARE REASONABLY EXPECTED TO BE MEASURED. THAT IS, A SENSOR IN A CABLE COMPARTMENT CANNOT BE READ THROUGH A METAL BARRIER BY AN ANTENNA IN THE BUS BAR COMPARTMENT. THIS SHOULD NOT BE ENABLED.

5.2.2 Edit Sensor Interface

The Edit Sensor Interface is used to assign SAW temperature sensor definitions to the Modbus Registers. The interface is separated into four sections of 3 registers for quick setup as seen in Figure 14: Edit Sensor Registers

The screenshot shows the 'Edit Sensor Registers' window with a menu bar (File, Serial, Commissioning, Compliance, Commands, Tools, Tool Settings, About) and a status bar at the bottom indicating 'access level : prof. installer' and 'compliance mode : Unlocked'.

Below the menu bar is a text box: 'Set sensor configuration and enabled ports. Click the definition number to toggle enabled status for the definition. Disabled definitions will not be written.' and a 'Configure' button.

The main area contains four 'Port Select' sections, each with a table of sensor definitions. Each table has columns for Reg, Location, Band, Code, and four checkboxes (1, 2, 3, 4).

Reg	Location	Band	Code	1	2	3	4
418	IS01C	01	C	☐	☐	☐	☐
419	IS02C	02	C	☐	☐	☐	☐
420	IS03C	03	C	☐	☐	☐	☐

Reg	Location	Band	Code	1	2	3	4
424	IS07C	07	C	☐	☐	☐	☐
425	IS08C	08	C	☐	☐	☐	☐
426	IS09C	09	C	☐	☐	☐	☐

Reg	Location	Band	Code	1	2	3	4
421	IS04C	04	C	☐	☐	☐	☐
422	IS05C	05	C	☐	☐	☐	☐
423	IS06C	06	C	☐	☐	☐	☐

Reg	Location	Band	Code	1	2	3	4
427	IS10C	10	C	☐	☐	☐	☐
428	IS11C	11	C	☐	☐	☐	☐
429	IS12C	12	C	☐	☐	☐	☐

Figure 14: Edit Sensor Registers

5.2.2.1 Section Overview

Reg	Location	Band	Code	1	2	3	4
418		01	C	☒	☐	☐	☐
419		03	C	☒	☐	☐	☐
420		05	C	☒	☐	☐	☐

Port Select 	Enables a port. Automatically enables for the three registers.
Ports (1 – 4) ☒	Individual port selection for each register
Reg	Modbus Register where data is stored. If disabled, this register will not be modified.
Location	Human readable location used primarily for record keeping. Not accessible over Modbus by most PLC's.
Band / Code	Sensor band and calibration code

5.2.3 Temperature Sensor Configuration through Example

5.2.3.1 Example Installation Configuration

The table is used as an example to illustrate the process of configuring sensors and antennas with physical location and the memory registers. A graphical representation of location is also provided in Figure 15: Example sensor locations in a switchgear:

Modbus Register	Sensor Physical Location	Sensor Label	Antenna Ports
(40)418	Bus Bar Phase Red	01 A	1
(40)419	Bus Bar Phase Blue	03 E	1
(40)420	Bus Bar Phase Yellow	05 G	1
(40)421	Circuit Breaker In Phase Red	02 F	2 & 3
(40)422	Circuit Breaker In Phase Blue	04 C	2 & 3
(40)423	Circuit Breaker In Phase Yellow	06 F	2 & 3
(40)424	Circuit Breaker Out Phase Red	07 F	2 & 3
(40)425	Circuit Breaker Out Phase Blue	09 C	2 & 3
(40)426	Circuit Breaker Out Phase Yellow	11 E	2 & 3
(40)427	Cable Phase Red	08 G	4
(40)428	Cable Phase Blue	10 C	4
(40)429	Cable Phase Yellow	12 C	4

Table 1: Example Sensor Installation Configuration

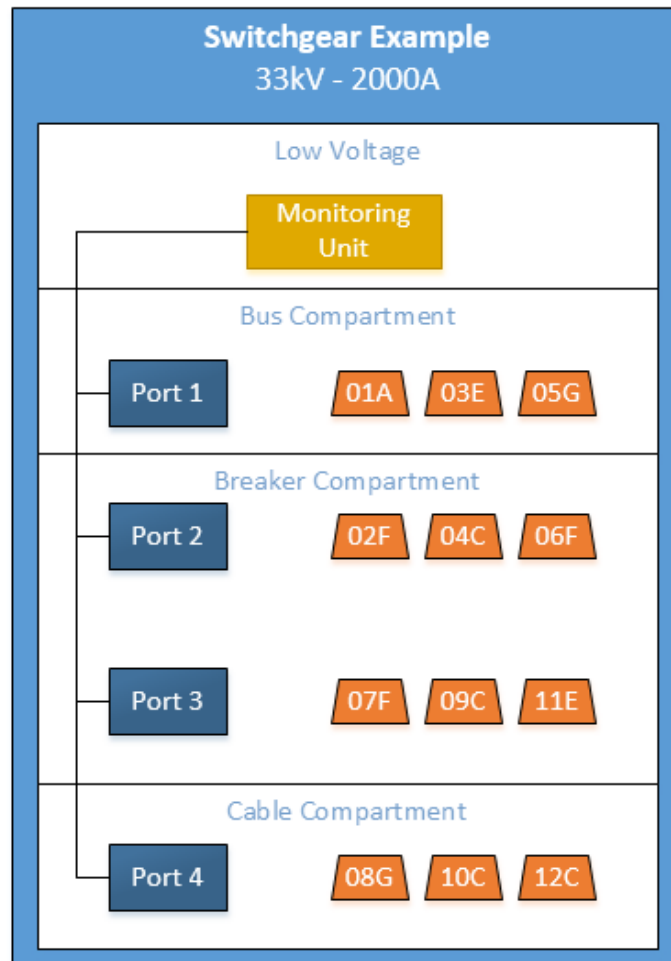


Figure 15: Example sensor locations in a switchgear

5.2.3.2 Editing Sensor Configuration (Register) Fields

To enable editing for a register, click the register number box or enable a port - the fields will go from grey to white and can now be edited. If there is already a configuration it will be loaded when the page loads.

- Complete Location Names
- Define the appropriate Sensor bands and Codes
- Select the appropriate port
- Confirm all fields (Location, Band, Cal Code, and associated antenna) are correct based on the installation information
- Select the **Configure** button to store the data to the unit for the enabled rows. Rows with register numbers that are grayed out will not be modified. This allows one or more register to be modified without losing calibration on other, previously configured, registers.

Once all sensors definitions have been entered based on the example configuration, the Edit Screen should look like Figure 16: Sensor Configuration Screen (completed)

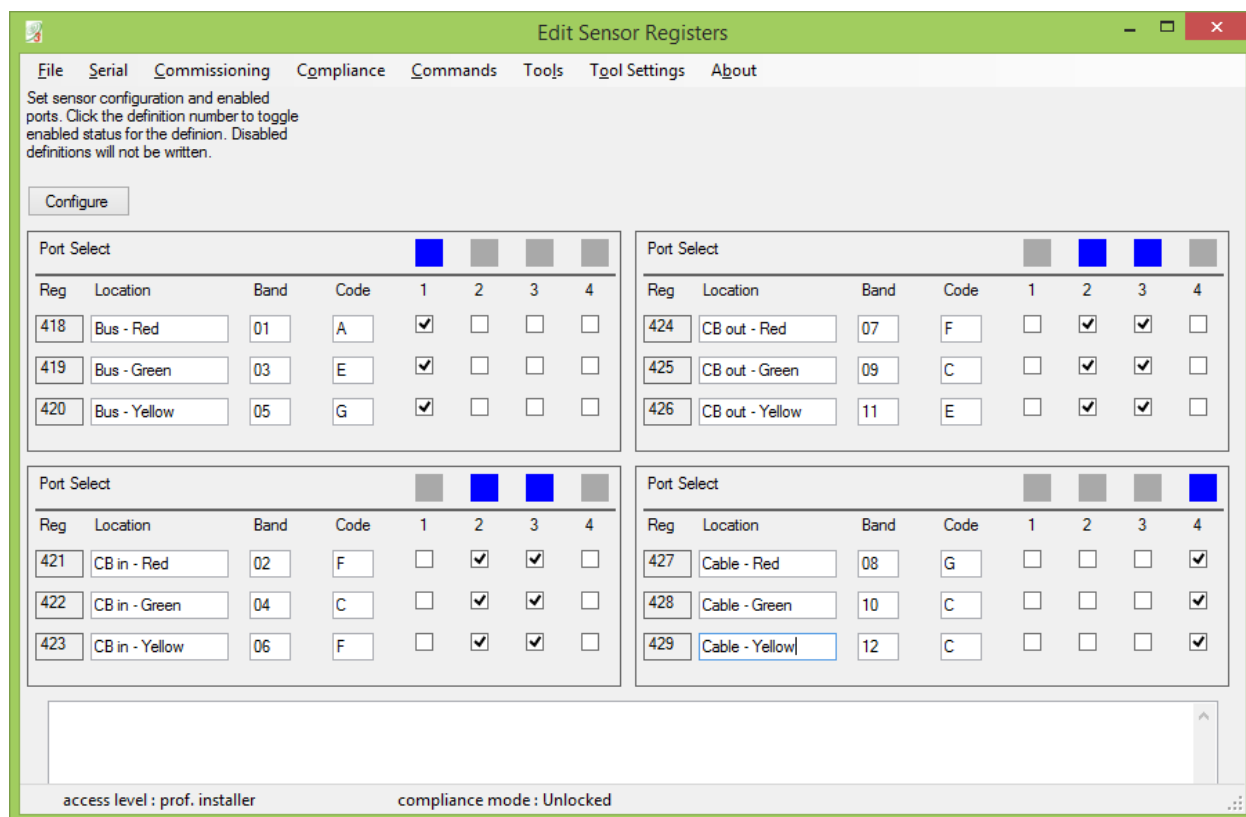


Figure 16: Sensor Configuration Screen (completed)

5.2.3.3 Confirm Erasing Calibration

Whenever Sensors are edited through this tool the sensor definitions are reinitialized and calibration will need to be performed again. The following dialog makes the user aware of this:

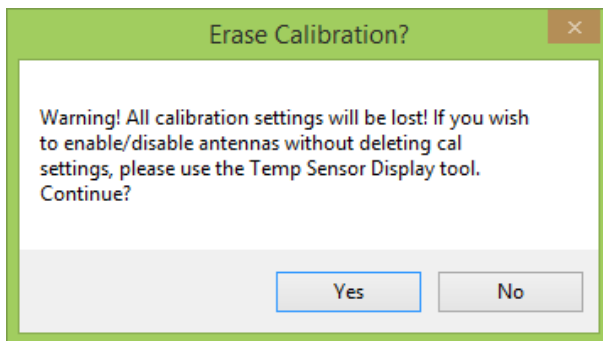


Figure 17: Erasing Calibration through Sensor Editing

5.3 TEMP SENSOR DISPLAY

This tool allows the software to interrogate sensors and monitor the temperatures during hardware installation and to fine-tune the sensor and air interface locations. Although the unit can only store 12 Modbus locations, the configuration view shows 48 blocks: 12 locations (columns) and 4 antennas (rows) per location to allow for all possible system configurations.

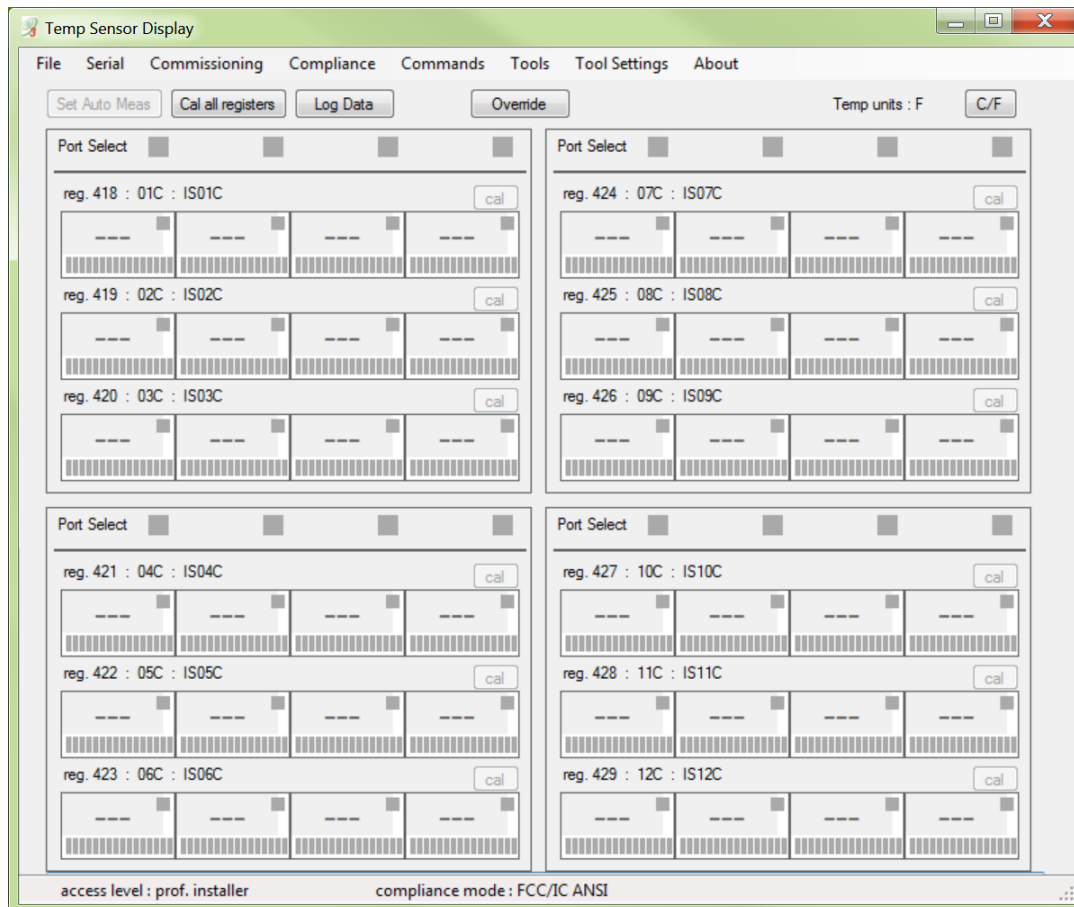


Figure 18: Real-time Temperature Sensor Display

5.3.1 Graphical Representation

The installation example setup the unit with the following sensor configuration:

Sensor Physical Location	Sensor Locations	Antenna Port
Bus Bar	1,2,3	1
Circuit Breaker In	4,5,6	2 & 3
Circuit Breaker Out	7,8,9	2 & 3
Cable	10,11,12	4

Table 2: Simple View of Example Installation

Notice that the Bus Bar sensor locations (Reg.418 to 420) on port 1 are displayed as active and are not greyed out, while the Circuit Breaker In and Out is showing up on both ports 2 and 3 because of how they were configured.

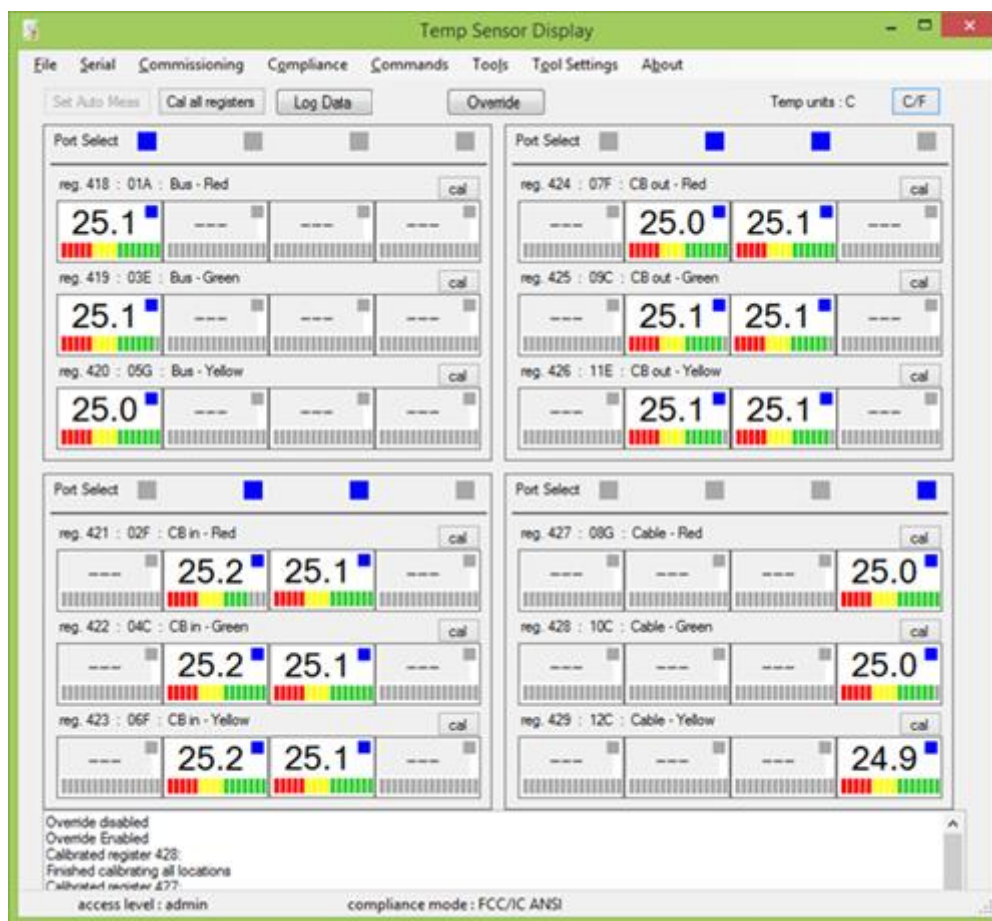
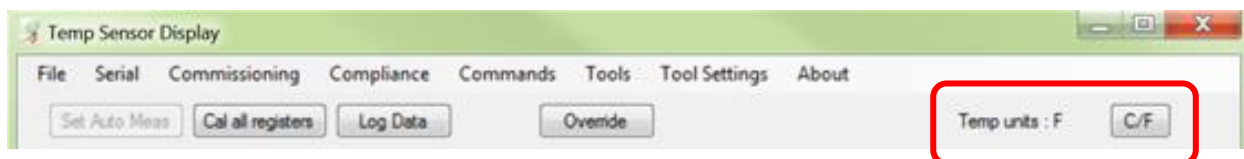


Figure 19: Sensor Display after Example Installation Configuration

5.3.1.1 Temperature Display Units

The display tool can be configured to show the temperature in Celsius or Fahrenheit with the unit select button. The display will toggle depending on the selection.



IMPORTANT

The unit's Modbus register data is always stored in degrees Celsius. This feature is only for configuration tool display convenience.

5.3.2 Display Elements

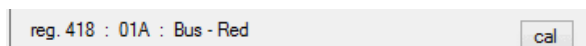
The display elements correlate to the edit sensor display for easy setup and recognition. A simplified signal strength display is implemented for easy installation.

5.3.2.1 Port Select



Shows which port(s) is currently enabled. The boxes can be toggled to enable/disable ports if desired.

5.3.2.2 Header



Details of the Modbus Register, sensor number, and location that was entered in the setup.

5.3.2.3 Temperature Reading



The temperature measurement for that sensor location/port, displayed in the units that were selected for the display. If a sensor cannot be read, is not configured or is of low signal strength, the display will show “ --- ”.

5.3.2.4 Channel Status Box



Active: If this box is blue (active), the display will show data for that sensor location/port combination.

Waiting: A red box indicates where the temperature interrogation will continue once the regulatory timing requirements have been met. This will only turn red in the FCC/IC modes.

Inactive: If the box is grey (inactive) data will not be displayed. Inactive sensors cannot be calibrated, will not be automatically measured, and will not contribute to the SCADA Modbus registers under normal operation.

5.3.2.5 Signal Strength & Optimizing Position

During system configuration and installation, this tool is used when initially trying to determine the optimal location for air interfaces and sensors. Details on the component placement process is not covered in this document and can be found in the reference document (910.00157.0001 IntelliSAW Air Interface Placement in Medium Voltage Switchgear.pdf).



The signal strength has three ranges:

Green: Indicating the sensor and air interface has a strong signal

Yellow: The sensor placement is acceptable and can be used, but a new location could be found to improve the signal strength. There is risk that changes over time could result in poor signal strength. If other redundant antenna measurements (see Port Redundancy, below) offer suitable performance it is possible to employ this as is or to disable it and only use alternate measurements of the sensor.

Red: The sensor and/or air interface must be moved to improve signal strength or the antenna/sensor position should be disabled if another redundant antenna measurement offers suitable performance.

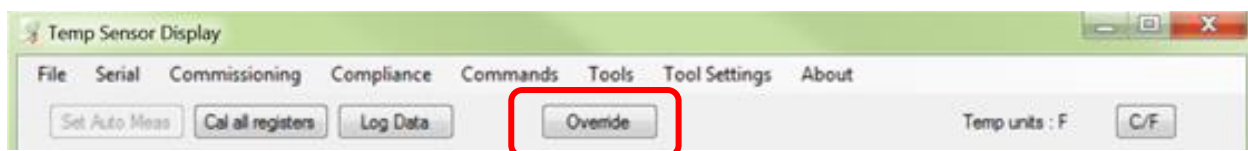
Hovering the cursor over the temperature block will display actual Tx and Rx strength.

IMPORTANT

THE GOAL OF A SATISFACTORY SYSTEM INSTALLATION IS TO HAVE THE MAJORITY OF SIGNAL STRENGTHS REPORTING GREEN. A FEW YELLOW SIGNAL STRENGTHS IS OK, BUT THERE SHOULD BE NONE THAT ARE RED.

5.3.3 Override Mode

If the unit was put into a compliance mode that restricts timing (such as FCC/IC ANSI), then the override button will be visible. This mode can be used by a professional installer to send a burst of measurements for sensor locations and populate the data that nominally complies with an alternate FCC timing condition. This will allow the installer to see all temperature data for all sensor/port combinations, providing an advantage for installation. The override function will time out automatically, as required by law, but may be manually pressed as needed after adjustments are made.



5.3.4 Port Redundancy

When using redundant antenna ports, such as the example with the Circuit Breaker Inputs and Outputs on ports 2 and 3, some ports may not be able to read some of the sensors, or may be unstable. Instability occurs primarily in open chambers where an adjacent switchgear has the same sensor band and the selected antenna has poor signal strength for the desired sensor. Alternately, some antennas will read the sensor better than others.

Using the channel status box (), the unwanted channel can be deactivated. As shown in Figure 20: Example Installation - Redundancy Ports, (Left) configuration with poor signal strength on reg. 424 port 3 and reg. 426 port 3. These two channels were inactivated.

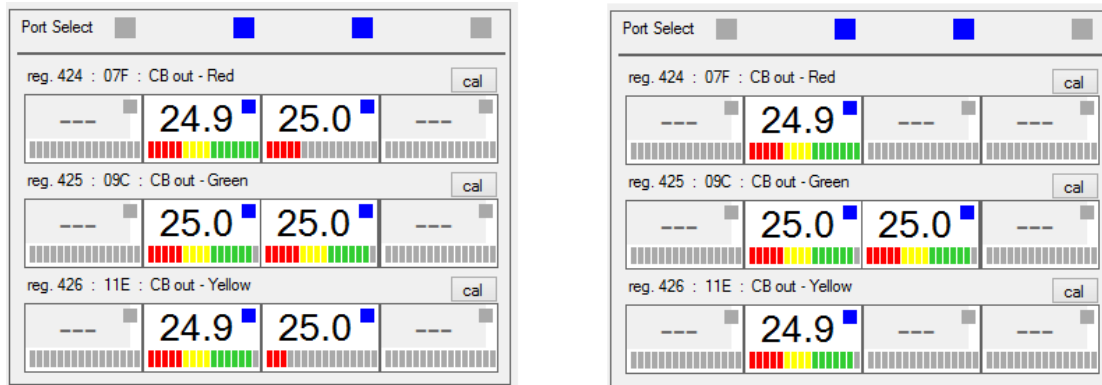


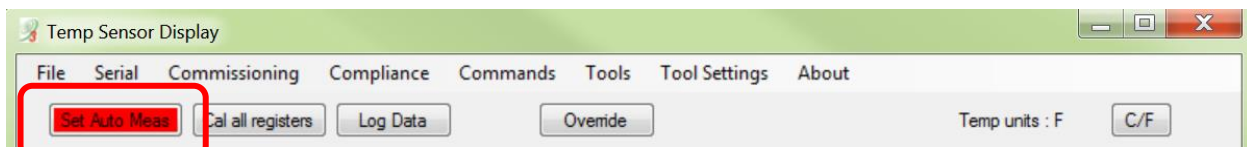
Figure 20: Example Installation - Redundancy Ports

5.3.4.1 Average Value

When a sensor location is interrogated by two or more ports, the unit will automatically create a weighted averaged of the readings based on signal strength. This average value will be stored in the Modbus register location. Note that the MODBUS register will not necessarily equal the value displayed because of averaging in the register over multiple redundant measurements and averaging over time.

5.3.4.2 Set Auto Measure

If sensor / port configurations have been altered, the **Set Auto Meas** button will be enabled and blink red to gain operator attention.



If trying to leave the Temp Sensor Display page before saving, a window will appear advising the configuration is about to be changed.

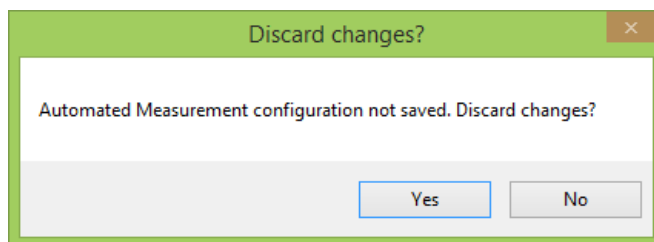


Figure 21: Set New Configuration Reminder

IMPORTANT

SETTING AUTO MEASUREMENTS FROM THE SENSOR DISPLAY SCREEN WILL OVERWRITE THE SENSOR CONFIGURATION PERFORMED IN WIZARD PART 2.

5.3.5 Sensor Calibration

Once the final positions of the sensors and air interfaces have been established, the unit should be calibrated. An independent temperature measurement (i.e. IR gun) of the sensor locations should be taken if the equipment has recently been energized. If the system has been idle and is in thermal equilibrium, a room temperature measurement can be taken.

5.3.5.1 Calibrate System

If the sensors are installed and the locations are known to be at the same ambient temperature, a full system calibration can be performed by selecting the Cal all registers button.



Once selected the calibration window will appear. Enter the temperature that the unit will be calibrated to, recognizing that it is in the units you are displaying.

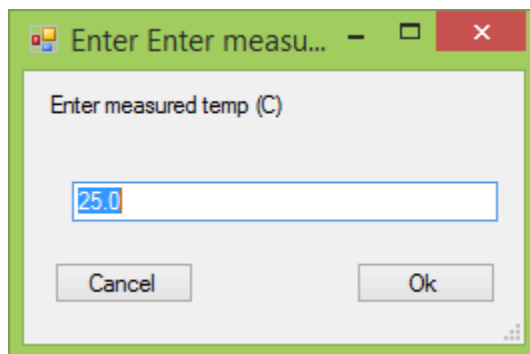


Figure 22: Calibration Window

5.3.5.2 Calibrate a single measurement

Calibration of a single measurement should be used if all locations are known to not be at the same temperature and can be done by selecting the location's **calibrate** button:

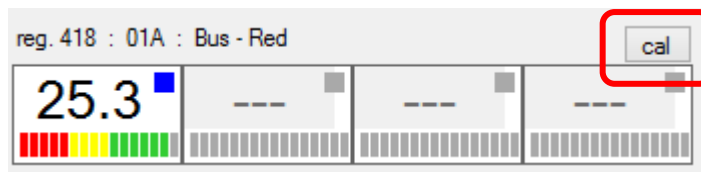


Figure 23: Calibration Button for Single Location

5.3.5.3 Calibration Errors

The status area below the sensor data display will show whether or not the calibration for each measurement succeeded. If, for any reason, a measurement cannot calibrate, an error message will be displayed indicating the problem. **Calibration may be attempted again on this measurement.** If the problem persists, either the measurement reading is unstable, the signal strength is too weak, or the sensor definition for this measurement was corrupted.

5.3.5.4 Confirm Calibration

Monitor the system for a few minutes, using the override mode, if needed, to accelerate the readings. Any sensors that have erratic signal or temperature are experiencing interference and should be disabled. If any sensors were disabled in this step, again execute **Set Auto Meas** and repeat the calibration for this set to eliminate any influence of the disabled sensor measurement.

IMPORTANT

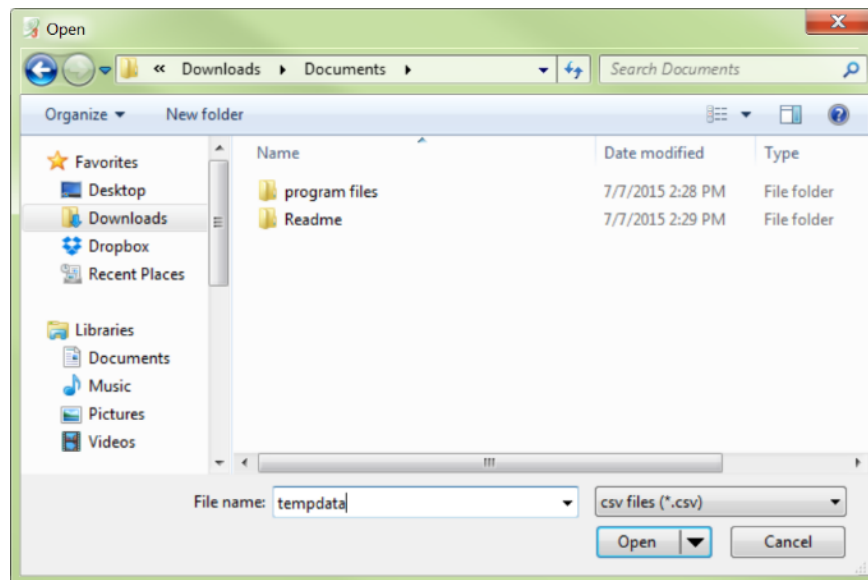
IF THIS RESULTS IN A SENSOR LOCATION BEING COMPLETELY DISABLED, THE ANTENNA(S) POSITION FOR THAT SENSOR MUST BE RECONSIDERED.

5.3.6 Log Data

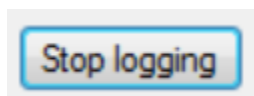
The Log Data function is used for logging debugging information and is not meant to be a long term logging function.

5.3.6.1 Log Data Button

In order to Log Data, select Log Data. A new screen will prompt you for a file name and location. Once you have selected a name and location to store the file, select open to begin Data Logging.



Once Data logging begins the Log Data button will change to “Stop Logging”



To end logging, select Stop Logging or exit the screen. Logging capabilities will end and all data points will be saved to your log file.

5.3.6.2 Data Log File

The data log file is only to be used for debug purposes and sent to IntelliSAW for evaluation. The file format will not be discussed.

5.3.7 Exit without saving

If the Temp Sensor Display has been modified and Set Auto Measurements has not been selected, the following dialog will appear:

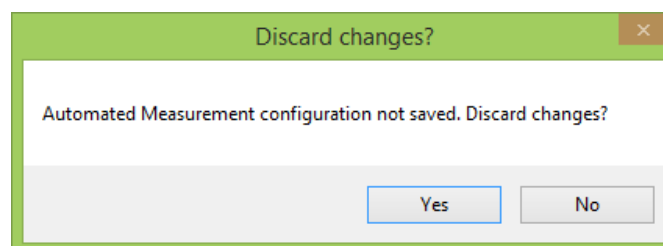


Figure 24: Discard Automated Measurement Changes

- If changes are required to be saved, Select NO and then **Set Auto Meas.**

5.4 MODBUS TEMP READINGS

The menu item **Commissioning → Temperature → Modbus Temp Readings** is used to view the temperature data being transmitted through Modbus RTU. The screen shows all 12 temp registers and their respective temperature data. This screen also gives you the option of Logging the data onto an Excel Spread sheet for testing or monitoring purposes. It will also display the temp data in a graph by register.

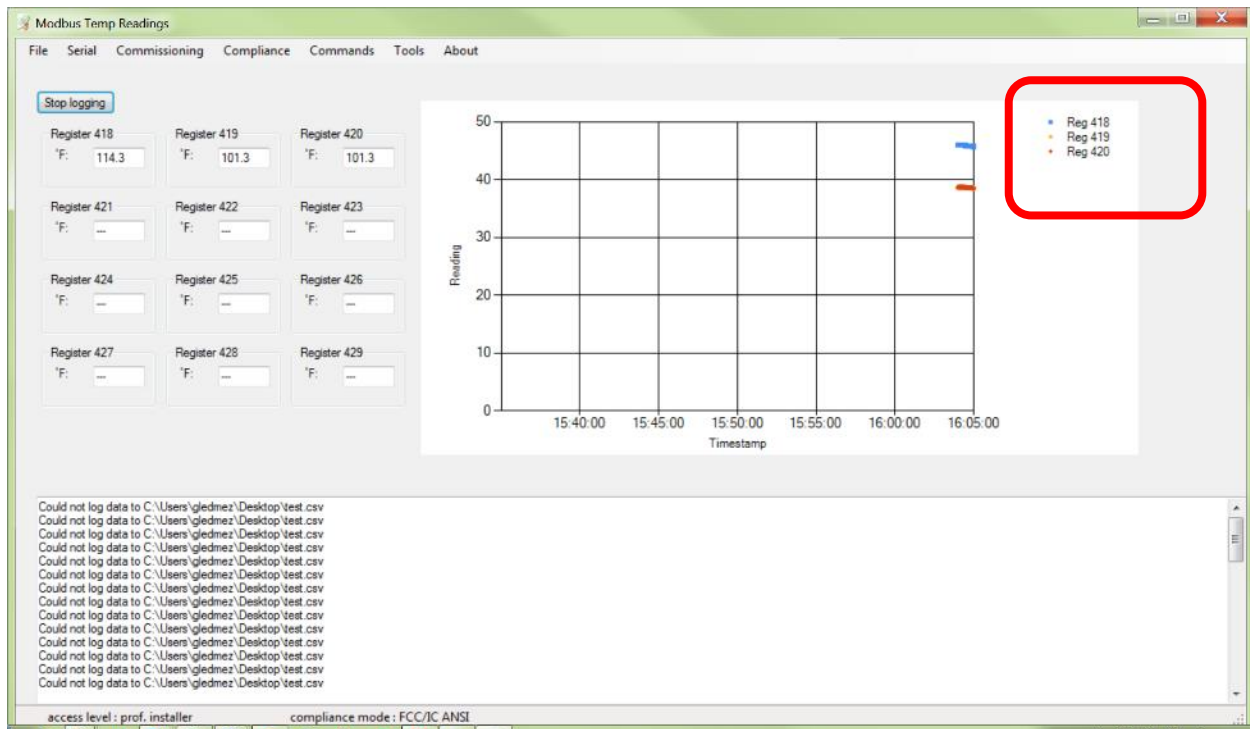
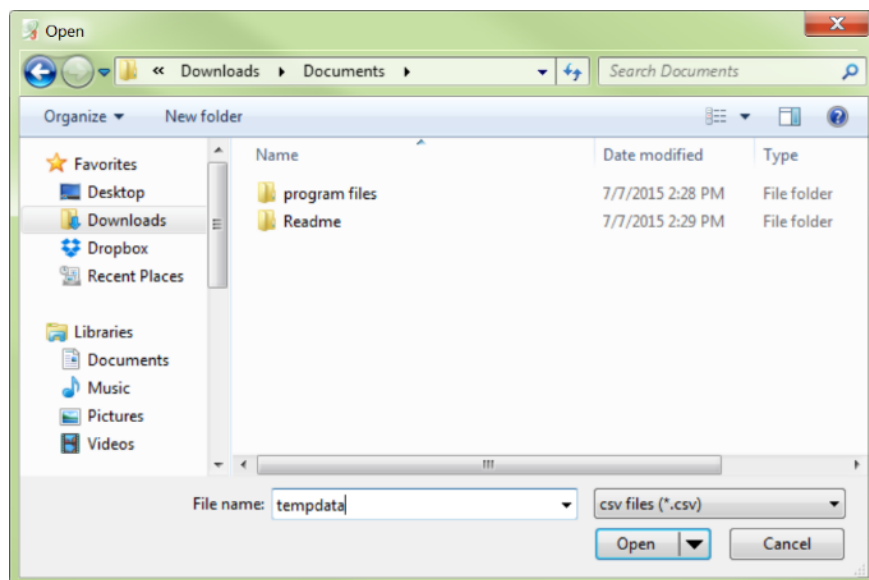


Figure 25: Modbus Temp Reading Screen

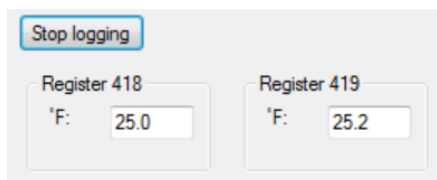
Data plots can be hidden/displayed by selecting the series name in the legend.

5.4.1 Log Data

In order to Log Data, select Log Data. A new screen will prompt you for a file name and location. Once you have selected a name and location to store the file, select open to begin Data Logging.



Once Data logging begins the Log Data button will change to “Stop Logging”



To end logging, select Stop Logging or exit the screen. Logging capabilities will end and all data points will be saved to your log file.

5.4.2 Data Log File

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	timestamp	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12
2	6/8/2016 16:36	-3.9	-3.8	-3.8	0.1	0.5	-2.3	2.6	-1.6	-8	-3.9	-4.1	-4
3	6/8/2016 16:36	-3.9	-3.8	-3.8	0.1	0.5	-2.3	2.6	-1.6	-8	-3.9	-4.1	-4
4	6/8/2016 16:36	-3.9	-3.8	-3.8	0.1	0.5	-2.3	2.6	-1.6	-8	-3.9	-4.1	-4

The Data Log file will time stamp all data points and will save all data from each register in a separate Column. Data from register 418 will be saved under the T1 column, from register 419 under T2 column, all the way to register 429 under the T12 column. All temperature data is saved in Celsius.

6 COMMISSIONING: PARTIAL DISCHARGE

IMPORTANT

THIS SECTION SHOULD ONLY BE USED IF A UNIT INCLUDES PARTIAL DISCHARGE MEASUREMENT CAPABILITY. SYSTEMS NOT SOLD WITH THE SUPPORTING CIRCUITRY MAY READ ALL VALUES AS ZERO OR MAY PROVIDE UNPREDICTABLE RESPONSES.

IMPORTANT

PARTIAL DISCHARGE UNITS REQUIRE dsPIC FIRMWARE REV.E OR GREATER. CONTACT INTELLISAW FOR UPGRADE DETAILS.

6.1 INTELLISAW PARTIAL DISCHARGE DETECTION OVERVIEW

The IntelliSAW Partial Discharge (PD) detection system consists of a monitoring unit (CAM-4 or reader) and IA-MM-TPD antenna. The monitoring units include specific hardware and an algorithm for analyzing ultra-high frequency (UHF) radio emissions to detect and quantify the signatures of symmetric and asymmetric discharges that are synchronous with the power line frequency, while distinguishing them from other modulated UHF emissions that come from non-discharge related noise sources. Unmodulated, continuous UHF signals will raise the detection noise floor but will not be detected by the algorithm.

6.1.1 Monitoring Bands

The partial discharge detection uses UHF radio detection methods over three distinct bands (centered at 300MHz, 600MHz, and 1200MHz). The use of three bands affords multiple opportunities to “see” partial discharge events and to distinguish these events from noise sources. The bands were chosen to reflect lower UHF frequencies that can propagate along cables and busses (300 MHz), frequencies resonant on short sections of bus bar and in small switchgear cabinets (600 MHz), and frequencies that can propagate through bus ducts (1200 MHz).

6.1.2 Monitoring Signals

6.1.2.1 Noise

Noise denotes UHF energy in the selected frequency band(s) that does not correlate well with the power line frequency. External radio interference is reliably classified as noise; however weak and erratic partial discharge – which occurs early in the evolution of a defect – can sometimes also be classified as noise.

6.1.2.2 Partial Discharge

Partial discharges that occur in insulation surrounding conductors have a more symmetric pattern with respect to the power line frequency. The portion of incoming energy matching this pattern is classified as PD. The value represents the magnitude of the symmetric signal in excess of the combination of detected noise and the asymmetric value.

6.1.2.3 Summary PD

Summary PD is the maximum PD for one antenna port accumulated in one register over the enabled bands. The enabling / disabling of frequency bands will affect the summary value if the enabled or disabled band is the highest. This data point in the Modbus registers should be used for trending.

6.1.2.4 Surface Discharge (Corona)

Surface discharges are events that depend on the polarity of an object because of a metal/air boundary. These events occur on the negative polarity wave cycle when emitted electrons ionize the air, causing corona discharges. The value represents the magnitude of the asymmetric signal in excess of detected noise.

6.1.2.5 Summary SD

Summary SD is the maximum SD for one antenna port accumulated in one register over the enabled bands. The enabling / disabling of frequency bands will affect the summary if the enabled or disabled band is the highest. This data point in the Modbus registers should be used for trending.

6.1.3 Monitoring Units

The IntelliSAW system measures the integrated (cumulative) discharge over a power cycle with a relative scale approximately related to pico-coulombs (pC) cumulative/ power cycle. The MODBUS registers are scaled by 10 with counts of 1 – 65534 representing approximately 10 – 655,340 pC cumulative (but un-calibrated by default). The measured values depend on the distance of the air interface from the discharge and may other factors. While the result can be calibrated to a reference location using a discharge synthesizer, variability in the source of real discharges and the exact nature of the discharge will have significant influences on the measurement, as does non-linearity in the detector. *Therefore, the result from the unit should only be used for trending and differential analysis over time as an early warning system for detecting corona and partial discharge and not as an absolute measurement.*

6.2 ACCESSING PD CONFIGURATION TOOLS

To access the Partial Discharge tools, select menu item: **Commissioning → Partial Discharge**

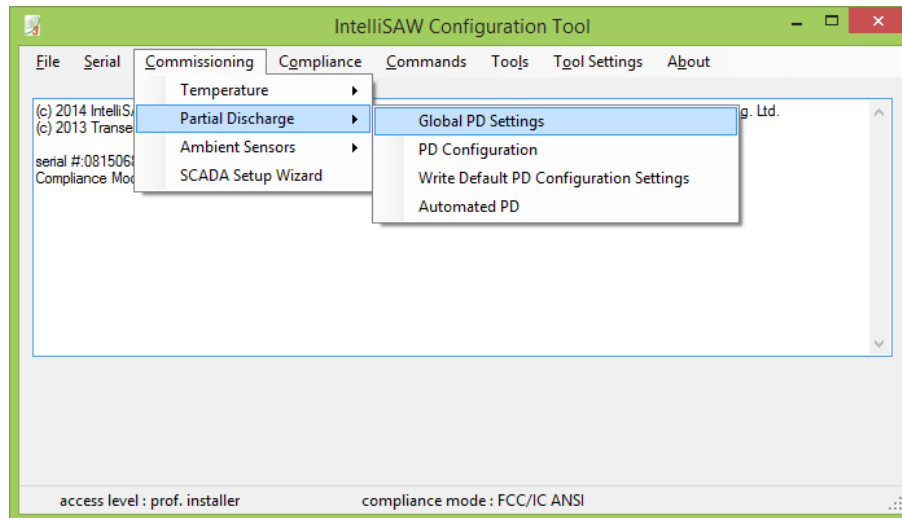


Figure 26: Partial Discharge Menu Items

6.2.1 Global PD Settings

There are two sets of PD global variables:

- **Power (Frequency and Cycles)** – these set the line frequency of the equipment which will be monitored (50 or 60 Hz) and the number of power cycles to monitor before classifying a signal as Noise, Corona, or PD. Selecting the wrong power line frequency will result in misclassification of signals between noise, SD, and PD. Note the classification cannot be applied to DC power systems.
The Enable global override must be selected for these to take effect in individual channel configuration. When enabled, the values will overwrite the associated fields in the individual registers on the next restart. This is convenient for changing the frequency when using the equipment with a different line frequency.
- **Averaging (up and down)** – The default averaging values (damping rates) provide a quasi-peak hold to ensure a PD event is captured and can be reported through MODBUS communications. “Up” gives the attack rate of the quasi-peak detector with an effective averaging factor of 2 for a value of 0.5. “Down” gives the decay rate, with an effective averaging factor of 2 for a value of 0.5 and 100-point average for a value of 0.99, on decreasing values. The default is 0.5 on current FW releases.

It is recommended to configure the unit with the values:

Avg. up = 0.5 and Avg. down = 0.5 for fast response

Avg. up = 0.5 and Avg. down = 0.99 for quasi-peak response

- Once Global PD Settings are set, select **Save Edits**.

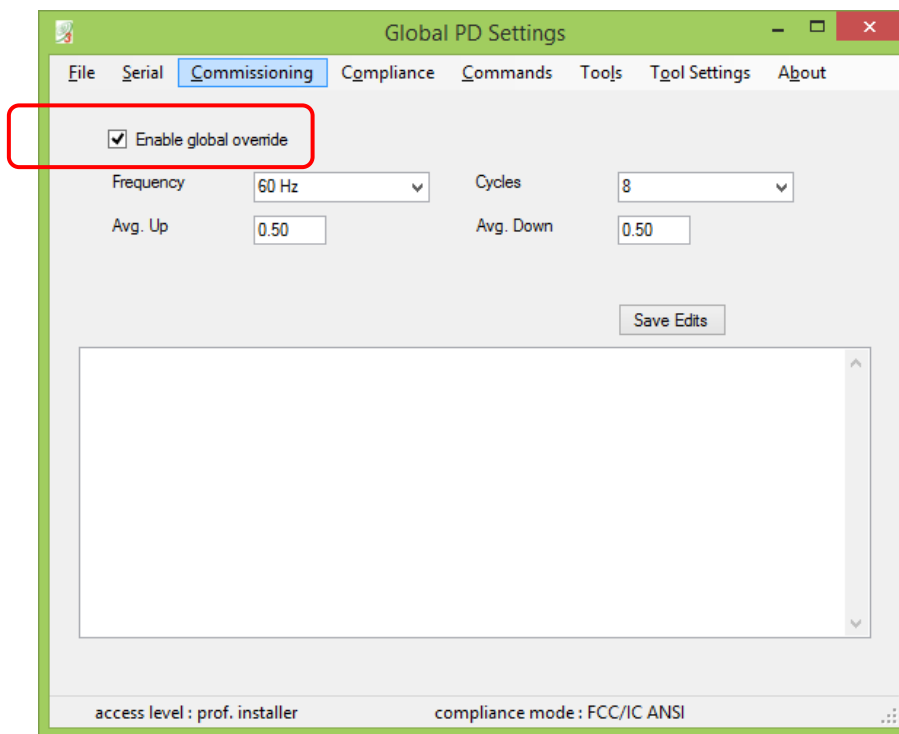


Figure 27: Global PD Settings

6.2.2 Set PD Configuration Defaults

To quickly set the PD configuration back to factory defaults, select **Commissioning** → **Partial Discharge** → **Write Default PD Configuration Settings**.

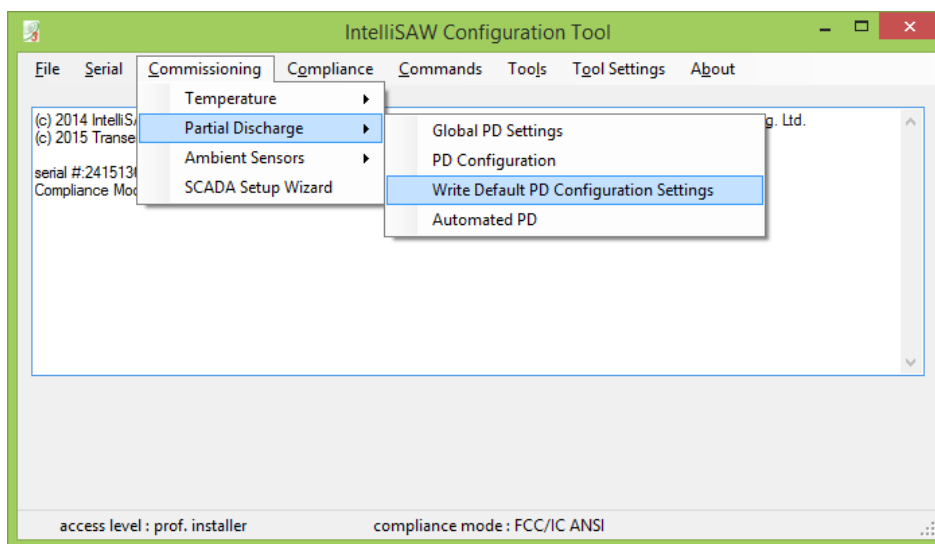


Figure 28: Menu for Writing Default PD Configuration

6.2.2.1 PD defaults values

The default positions are configured as:

- (1 to 3): Port 1 – 300 MHz, 600 MHz, 1200 MHz
- (4 to 6): Port 2 – 300 MHz, 600 MHz, 1200 MHz
- (7 to 9): Port 3 – 300 MHz, 600 MHz, 1200 MHz
- (10 to 11): Port 4 – 300 MHz, 600 MHz, 1200 MHz

The default settings per position:

- Frequency: 60Hz
- Num Cycles: 8 cycles
- Cal type: Linear
- Offset: 0
- Weight: 1.00

To set the defaults:

- Select the antenna ports that have PD air interfaces connected.
- Select the frequencies of interest
- Select **Write Default PD Config**

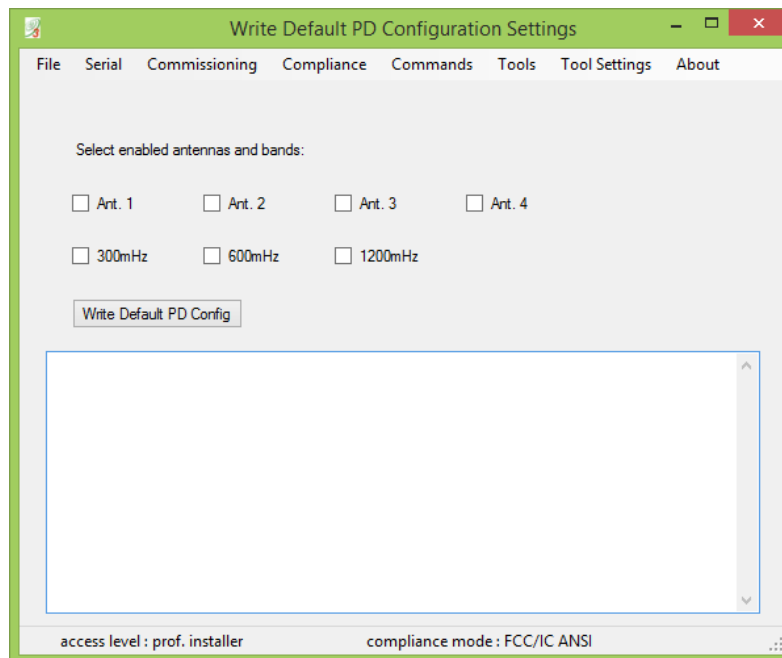


Figure 29: Write Default PD Configuration Settings

The system will write the defaults and enable the appropriate channels. This can be confirmed by going to **PD Configuration** page.

6.2.3 PD Configuration

If settings are custom or if specific channels need to be disabled, this would be configured through the Partial Discharge Configuration, select menu item: **Commissioning → Partial Discharge → PD Configuration**. Other than selectively disabling measurements, customization is only possible in Rev. D firmware and will not be consistent with Automated PD in this tool or with other IntelliSAW solutions intended for Rev E or higher firmware.

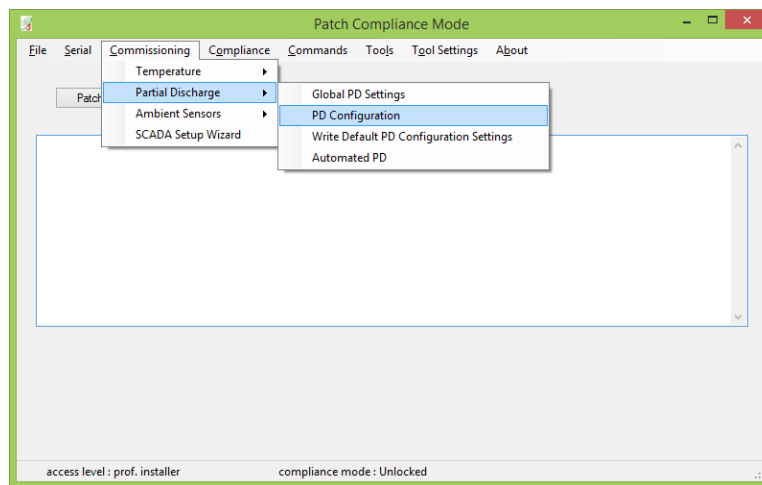


Figure 30: PD Configuration Menu

The IntelliSAW PD monitoring units have 12 memory positions (broken up into sets of 3) to configure the antenna ports for PD Monitoring. Some or all of these may be enabled for automation. The tool disables modification of antennas and bands in the image below.

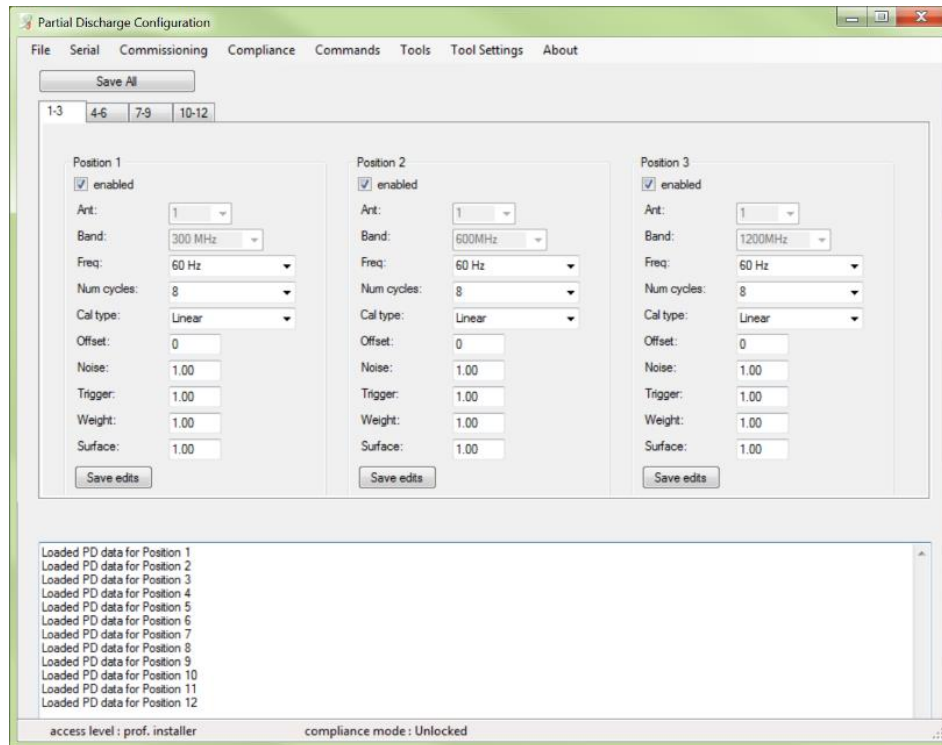


Figure 31: PD Configuration Interface

6.2.3.1 PD Memory Positions

A PD Memory position is a block of memory that can be read through the Modbus Registers. The Positions have the following configuration details:

Field	Default Value	Description
Enabled	☐	Enables/Disables monitoring and writing data to the Modbus register
Ant	v	Antenna port (1, 2, 3, or 4) that the PD Air Interface is connected to. For rev E and higher firmware this value is not editable. Note, only IA-MM-TPD or IA-BM-TPD air interfaces properly monitor PD. Third party PD sensors may or may not function as expected.
Band	v	Frequency band (300MHz, 600MHz, or 1200MHz) to monitor for PD activity. For rev E and higher firmware this value is not editable.
Freq	60 Hz	Selection of the line frequency of the equipment which will be monitored (50 or 60 Hz).

Field	Default Value	Description
Num cycles	8	Sets the number of power cycles to monitor before classifying a signal as Noise, Corona, or PD. Num cycles should remain at 8 unless previously configured to a different value. This seeks correlation of discharges to the power frequency over 8 power cycles. Lower values may not properly discriminate noise.
Weight	1.0	Calibration factor (default value)
Advanced Settings The following fields are engineering units and should remain at their default values, or as factory set.		
Cal Type	Linear	Engineering constant
Offset	0	Engineering constant
Noise	1.0	Engineering constant
Trigger	1.0	Engineering constant
Surface	1.0	Engineering constant

Table 3: PD Position Description

6.2.3.2 Setting PD Configuration

- Select **Enabled** ☒ enabled on the position which will be edited
This operation will make the position available for editing
- Select power **Frequency**
- Confirm **Num Cycles** and all **Calibration Details** are set to defaults above.

To complete the editing of the memory position:

- Select **Save edits**

Repeat the process for all positions. Once completed, the unit must be reset if it is running Rev D firmware or earlier.

- Select **Save All** (Save All will reboot the Reader Automatically)

6.2.4 Automated PD

The Automated PD Screen (**Commissioning → Partial Discharge → Automated PD**) provides a method of monitoring and logging data to file.

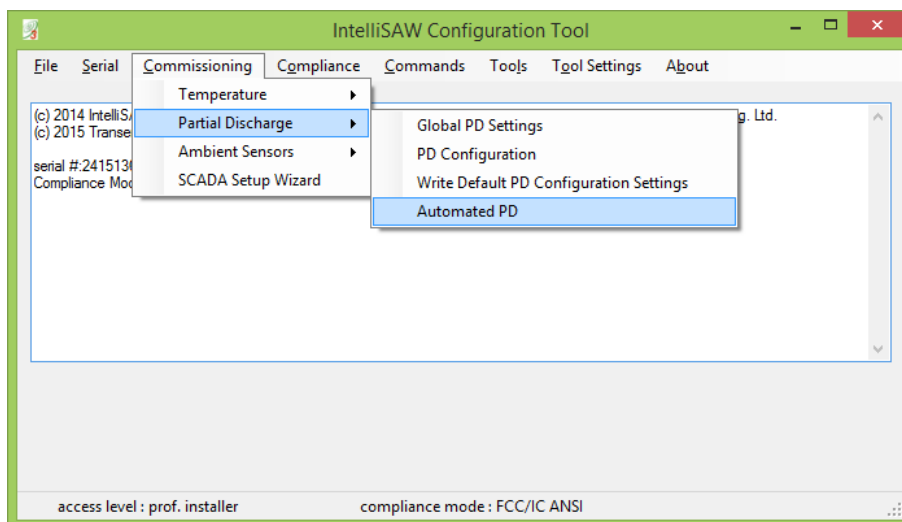


Figure 32: Automated PD Tool Select

The units provide raw data for each frequency in use and a Total value for Surface and Partial discharge used for trending. The raw antenna values and summary pages will show depending on how the system was configured.

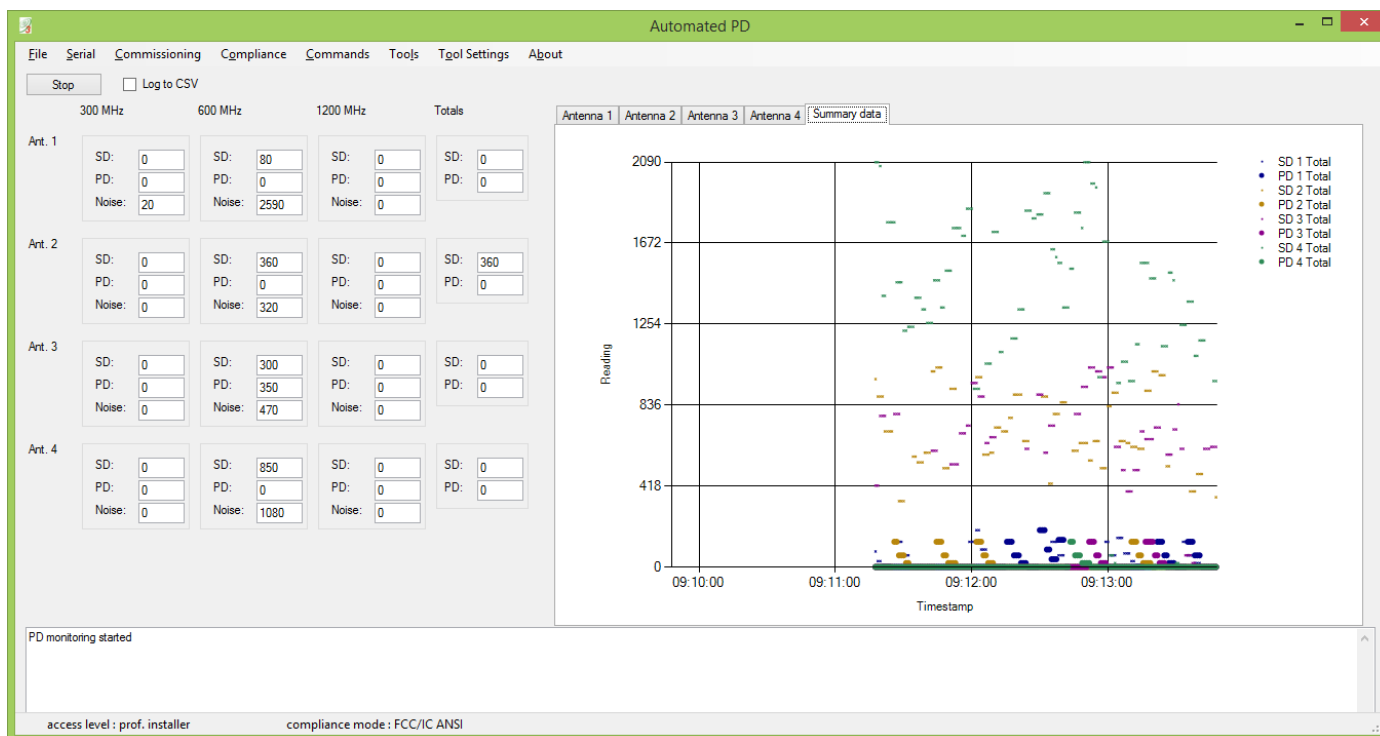


Figure 33: Automated PD View

Data plots can be hidden/displayed by selecting the series name in the legend.

6.2.4.1 *Log to CSV*

This check box will open a File Selection window will open where an existing data file can be selected, or a new file can be named. Once completed select **Open**.

The data file is a CSV (comma separated variable) file which can easily be opened with Excel.

6.2.4.2 *Run / Stop Button*

The Run / Stop button will initiate the unit for reading PD on the configured channels or stop the unit from monitoring.

6.2.4.3 *Setting Chart Parameters*

Double Clicking on the chart will bring up a settings page allowing the axis parameters to be modified.

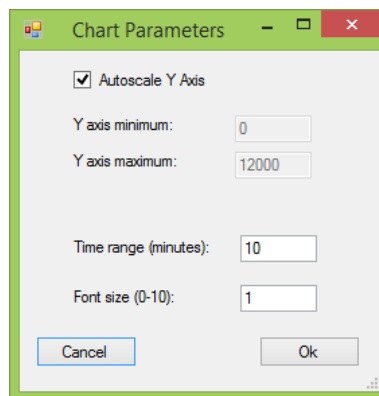


Figure 34: PD Chart Parameter Settings

7 COMMISSIONING: AMBIENT HUMIDITY & TEMPERATURE SENSOR

IMPORTANT

THIS SECTION SHOULD ONLY BE USED IF A UNIT INCLUDES AMBIENT HUMIDITY MEASUREMENT CAPABILITY.

The IntelliSAW monitoring units have an option for integrated ambient environment monitoring capability. The sensor provides real-time humidity, temperature, and dew point calculations. The humidity port supports up to 8 series connected sensors, although most systems will use a single unit except for bus duct monitoring. Please reference the data sheet for details on installation. The menu item **Commissioning → Ambient Sensors → Ambient Sensor Display** will allow for configuration and monitoring of the sensors.

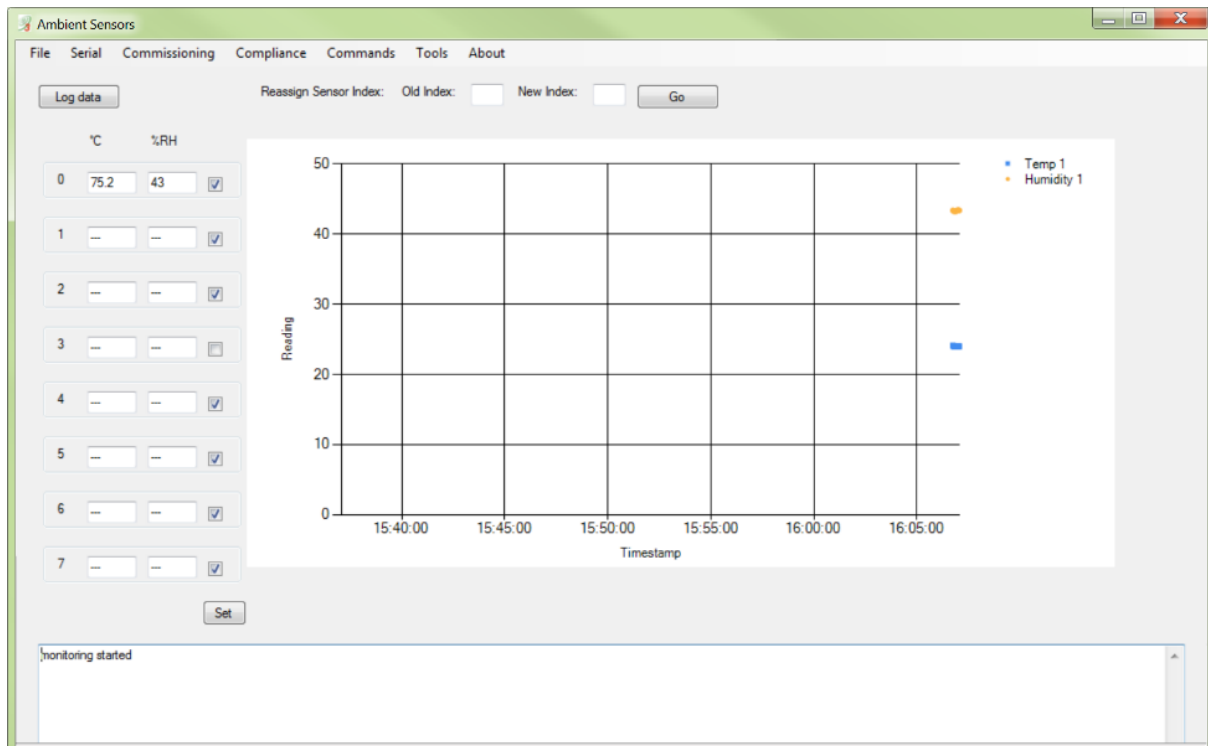


Figure 35: Ambient Humidity & Temperature Display

The Screen will show both real time data of the humidity sensor, as loaded from the MODBUS registers, as well as graphed data of all the active humidity sensors. A humidity sensor has to be properly indexed and connected to be monitored and its checkbox must be enabled.

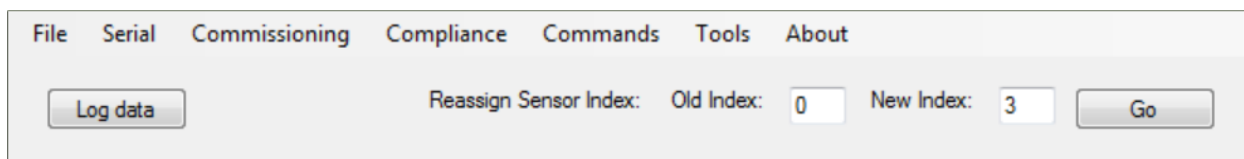
Note: To view graphed data, the check box next to the Humidity Sensor Index Number has to be checked.

Data plots can be hidden/displayed by selecting the series name in the legend.

7.1 REASSIGNING HUMIDITY SENSOR INDEXES

Sensors are shipped from the factory as 'sensor 0'. If sensors are being installed in series, they should be reassigned appropriately between 0 and 7. To do this, connect a sensor to the unit and its reading will appear.

- Insert unique (unused) values for the **Old** and **New** indices. Typically, Old is 0 and New is the target address.



File Serial Commissioning Compliance Commands Tools About

Log data Reassign Sensor Index: Old Index: 0 New Index: 3 Go

- Select **GO**



	°C	%RH	
0	---	---	☒
1	---	---	☒
2	---	---	☒
3	75.2	43	☒
4	---	---	☒
5	---	---	☒
6	---	---	☒
7	---	---	☒

Figure 36: Re-assigned Humidity Sensor Index

This process can only be performed for one sensor at a time. Relocate sensor 0 to a new address for the first sensor and then repeat with each new sensor. The last sensor connected may be left at address 0. The address is retained in EEPROM of the sensor itself and is a permanent assignment.

It is good practice to label any sensor that has been readdressed.

Note: When a Humidity Sensor is reassigned, the graphed humidity data changes color to the newly reassigned index colors.

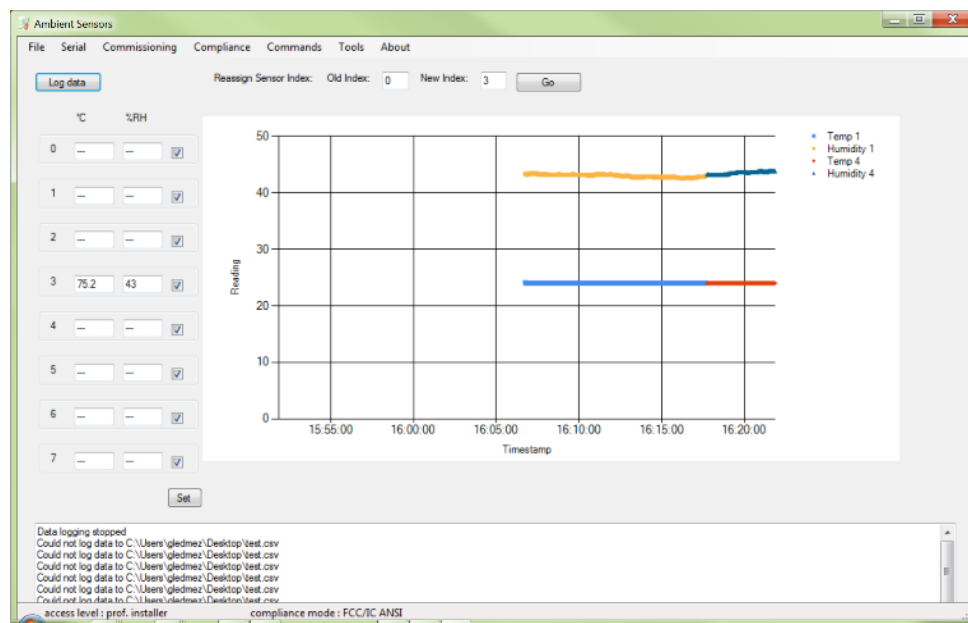


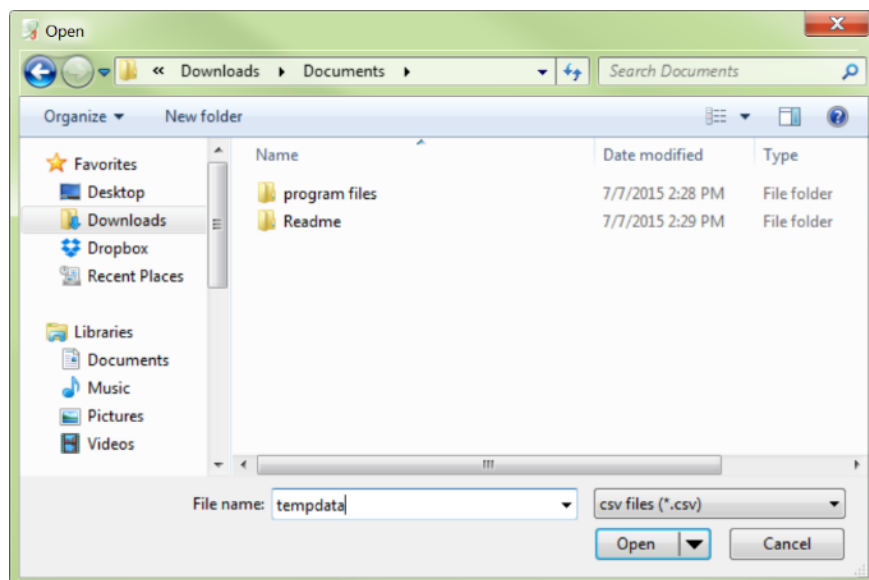
Figure 37: Re-assigned Humidity Sensor Graph Data

7.1.1 Selectively Enabling Sensors

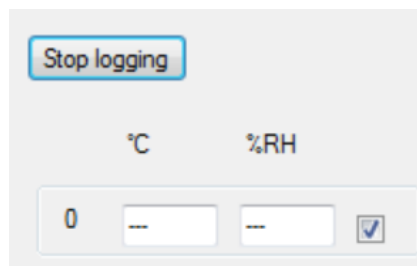
For Rev E3 and later, it is possible to disable uninstalled sensors by deselecting the checkboxes and pressing Set. These sensors will not be read, improving the responsiveness of the installed sensors.

7.1.2 Log Data

In order to Log Data, select Log Data. A new screen will prompt you for a file name and location. Once you have selected a name and location to store the file, select open to begin Data Logging.



Once Data logging begins the Log Data button will change to “Stop Logging”



To end logging, select Stop Logging or exit the screen. Logging capabilities will end and all data points will be saved to your log file.

7.1.3 Data Log File

	timestamp	T1	H1	T2	H2	T3	H3	T4	H4	T5	H5	T6	H6	T7	H7	T8	H8
1	7/14/2016 16:26							24	43								
2	7/14/2016 16:26							24.1	43								
3	7/14/2016 16:26							24.1	43								
4	7/14/2016 16:26							24.1	43								
5	7/14/2016 16:26							24.1	43								
6	7/14/2016 16:26							24.1	43								

The Data Log file will time stamp all data points and will save all data from each register in a separate Column. Data from register Humidity Sensor 1 will be saved under the T1 and H1 (Ambient Temperature and Humidity), data from Humidity Sensor 2 will be saved as T2 and H2, all the way to Humidity Sensor 8 as T8 and H8. All temperature data is saved in Celsius.

8 SCADA SETUP (RS485 INTERFACE)

The Commissioning tool used to configure the unit's SCADA (RS485) Port Settings can be found by select the **Commissioning → SCADA Setup Wizard** menu item. The following screen will be displayed:

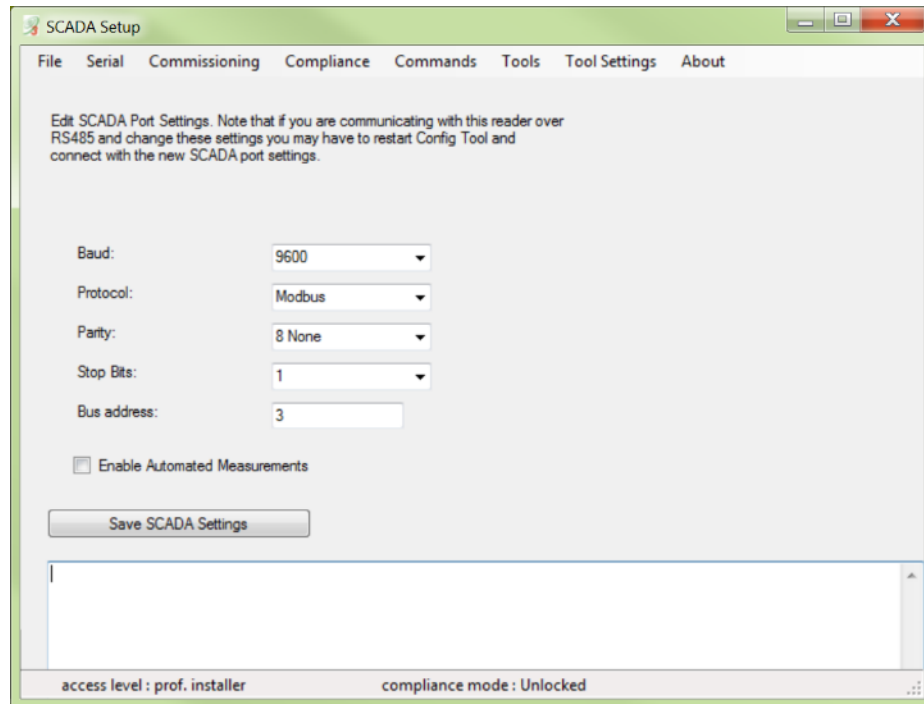


Figure 38: SCADA Setup Wizard - SCADA Communication Settings

8.1.1 SCADA Port Fields

8.1.1.1 Baud Rate

The RS485 port permits communication at baud rates of 4800, 9600, 19200, 38700, 57600 or 115200 baud. Select a baud rate that matches the baud rate of the master device that will be retrieving data from the unit. Because of the protection hardware, higher baud rates will only support limited RS485 bus lengths.

Most installations are best configured to use **9600 baud**, as it is a good compromise between long bus lengths and noise immunity.

IMPORTANT

THE RS485 BAUD RATE IS INDEPENDENT OF THE USB BAUD RATE (115200). CHANGING THE RS485 BAUD RATE DOES NOT AFFECT THE USB BAUD RATE. THE USB BAUD RATE CANNOT BE CHANGED, NOR CAN THE USB DEVICE ADDRESS.

8.1.1.2 *Communication Protocol*

The IntelliSAW units support two protocols, the IntelliSAW Native protocol and industry-standard Modbus protocol. The IntelliSAW Native protocol should be used when using IntelliSAW software to communicate with the unit over the RS485 bus. Note that leaving a system in Native mode is the most common source of failed communications over SCADA. The change does not take place until a reboot.

IMPORTANT

PROTOCOL SHOULD BE SET TO **MODBUS** IF CONNECTING TO A SCADA SYSTEM. LEAVING A SYSTEM IN NATIVE MODE IS THE MOST COMMON SOURCE OF FAILED COMMUNICATIONS.

For more information about Modbus mode on IntelliSAW units, please contact a technical service representative.

8.1.1.3 *Data, Parity and Stop Bits*

The data, parity, and stop bits are serial port parameter settings and should be configured based on the RS485 bus settings to communicate with the master device. The most common configuration is **Data/Parity: 8 None** and **Stop bits: 1**

8.1.1.4 *Bus Address*

The bus address (Modbus address) is how a master device identifies the units on the communications bus to retrieve the appropriate data. The bus address can range from 1 to 247.

IMPORTANT

ALL UNITS ON THE SAME RS485 BUS MUST HAVE A **UNIQUE BUS ADDRESS**

Note: many RS485 implementations restrict the total number of devices on a single RS485 bus to 32 units. This is an electrical limit imposed by protection circuitry. The IntelliSAW implementation allows 16 devices at 19200 baud and 32 devices at or below 9600 baud. Operation at higher addresses has been tested only for single devices. If more than 32 devices must be connected to one SCADA system, more than one RS485 bus segment will be required. Either multiple ports will be required on the SCADA master or RS485 repeaters will be required.

8.1.1.5 *Enable Automated Measurements*

This box must be checked in order for the reader to automatically make measurements and fill MODBUS registers other than ambient temperature and humidity. If the automated measurements are not enabled, the reader cannot be used for unattended measurements of temperature or partial discharge.

8.1.2 Setting SCADA Port Data

Using the dropdown menus, select the Modbus bus configuration settings:

- Baud Rate (9600)
- Protocol (Modbus)
- Parity (8 None)
- Stop Bit (1)

Then,

- Enter a **Unique** Bus address

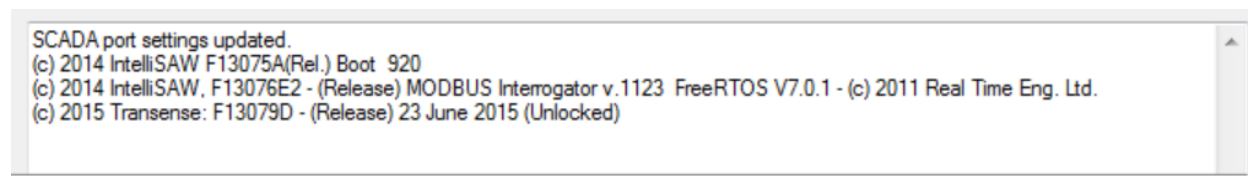
To complete the SCADA Port settings:

- Select **Save SCADA Settings**



Selecting Save SCADA Settings will automatically Enable Automated Measurements and Reboot the Reader. Enabling Automated Measurements will set the reader up to automatically measure sensor data and update Modbus Registers. Rebooting the reader will implement the changes made to the RS485 parameters.

The SCADA setup wizard will show the following message once the Reader has rebooted.



9 CONFIGURATION BACKUP

Once the unit and sensors have been properly installed and the installation has been verified to be working properly and safely, it is **imperative that the unit's internal settings be backed up to a file on the PC**. This will preserve all of the settings and calibration data for the sensors.

If the monitoring unit ever needs to be replaced, the restore function can be used to “clone” the original settings, allowing the old unit to be replaced without shutting down the asset. Note: Although the “Backup” procedure is a standard level tool, the “Restore” tool is an administrative-level tool. This prevents inexperienced users from inadvertently erasing a unit's internal settings and calibration data. Restore writes all data except the serial number.

To begin, select the menu item: **Tools → Programming → Create Reader Backup File**

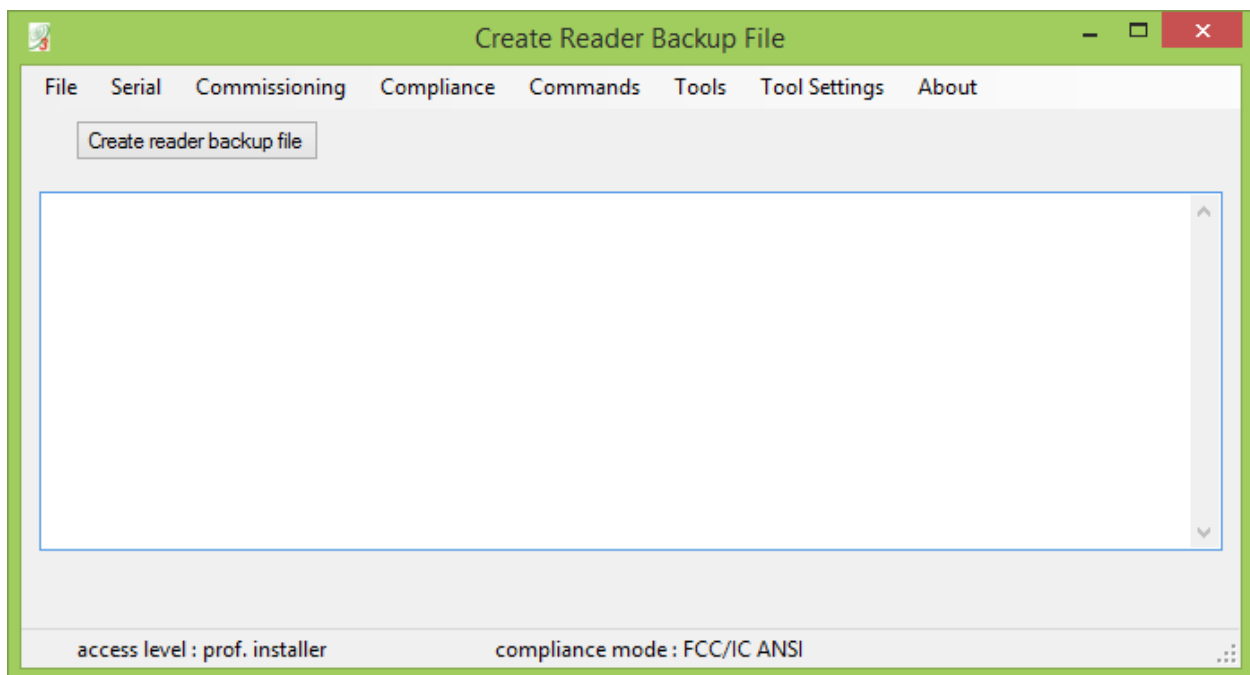


Figure 39: Create Backup File

To begin a backup,

- Select **Create reader backup file**

A progress window will appear detailing the current backup details. When all the backup information has been gathered, a window will open that allows you to choose a file location and name for the backup data.

- Provide a file path and name for the backup file
- Select **Save**

Save this file and location into your project's folder

10 UPGRADING FIRMWARE

IMPORTANT

MICROCONTROLLER FIRMWARE MUST BE LOADED BEFORE THE DSP CODE. DOING SO IN REVERSE MAY RENDER THE UNIT NON-FUNCTIONAL. LEGACY HARDWARE WITH BOOTLOADER VERSIONS BEFORE 851 MAY NOT BE PROPERLY RECOGNIZED BY THE CURRENT CONFIGURATION TOOLS. CONSULT THE FACTORY BEFORE BOOTLOADING OLDER SYSTEMS.

10.1 BOOTLOAD THE MICROCONTROLLER

The first step is to upgrade the firmware for the microcontroller. Select the menu item **Tools → Programming → dsPIC bootloader**.

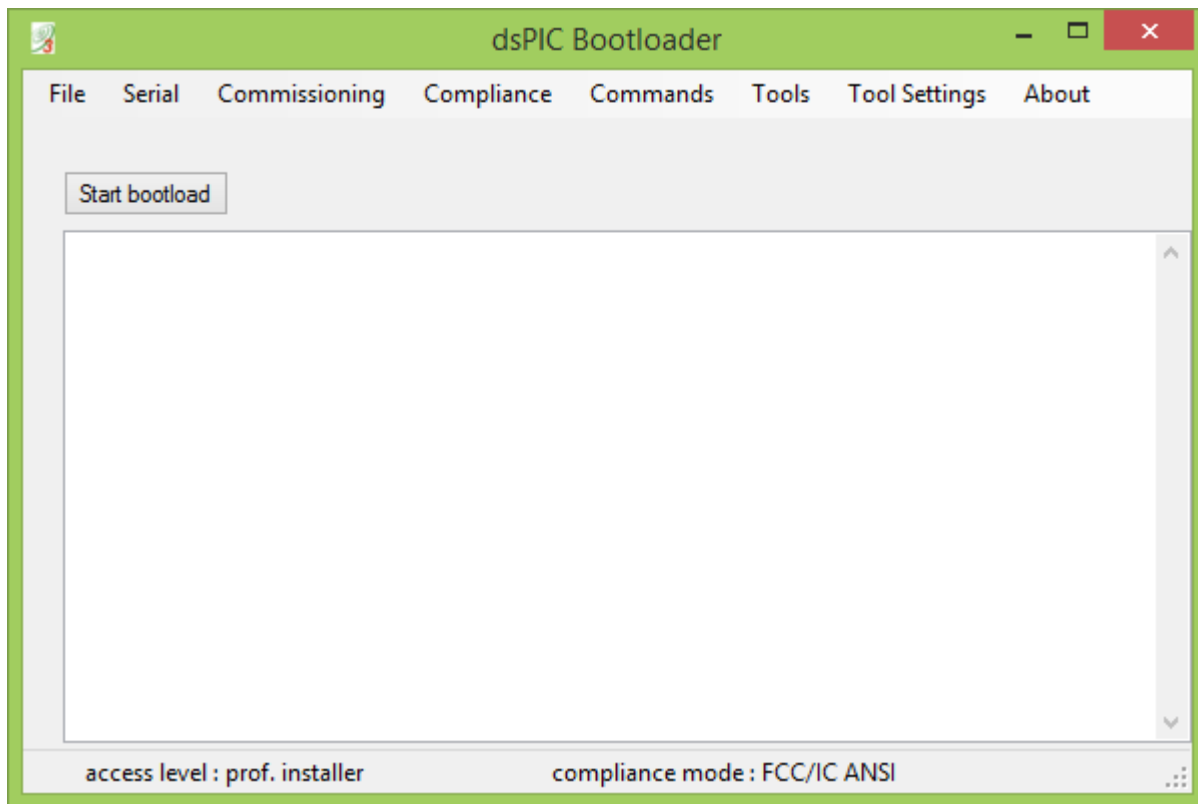


Figure 40: Microcontroller Bootloader Interface

- Select **Start bootloader**

A navigation window will appear for you to select the proper bootloader file.

dsPIC Bootload files end in .hex

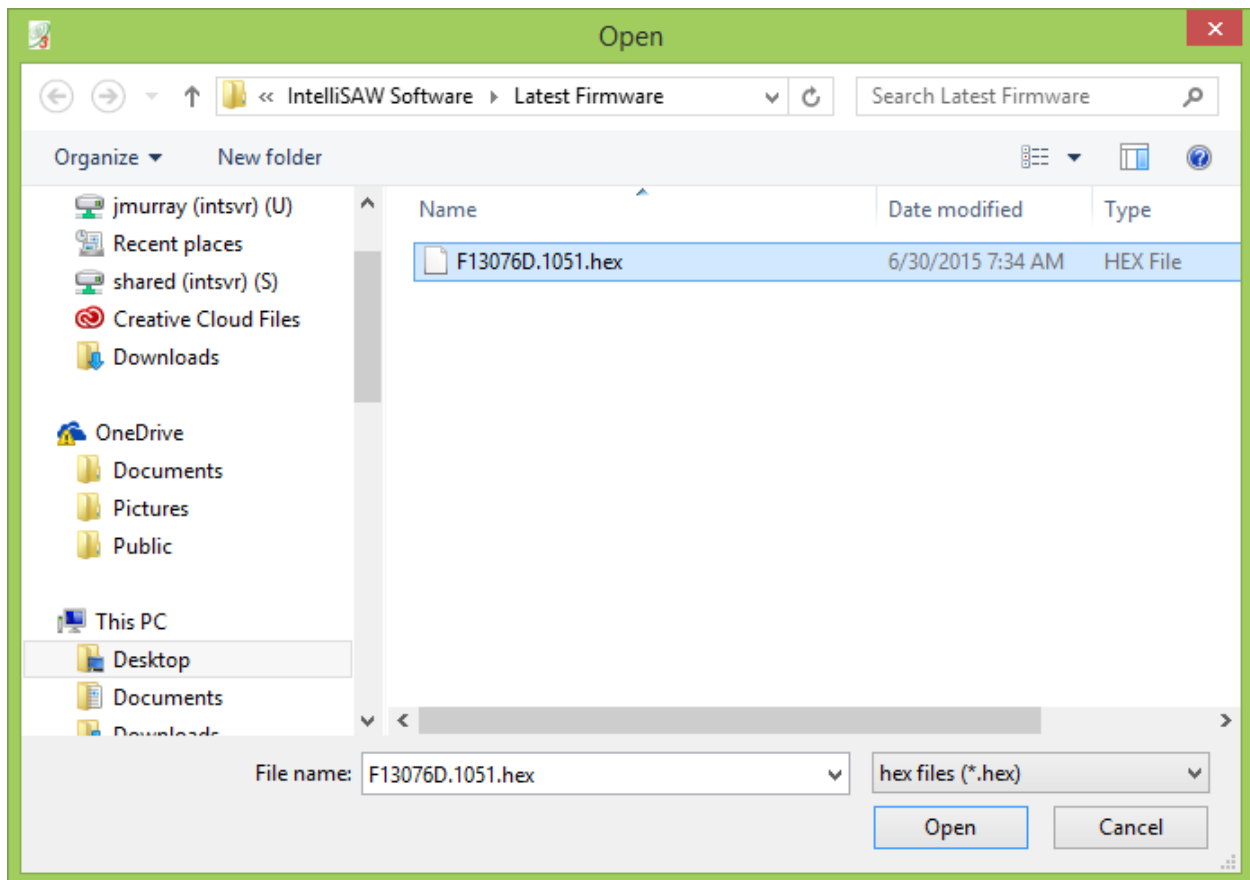


Figure 41: Select Bootloader Window

- Navigate to the correct folder and select the bootloader file to be loaded
- Select **Open**

The dsPIC Bootloader will initiate the microcontroller load procedure. If the unit is not in the correct state to load the code, the tool will bring up a window indicating this.

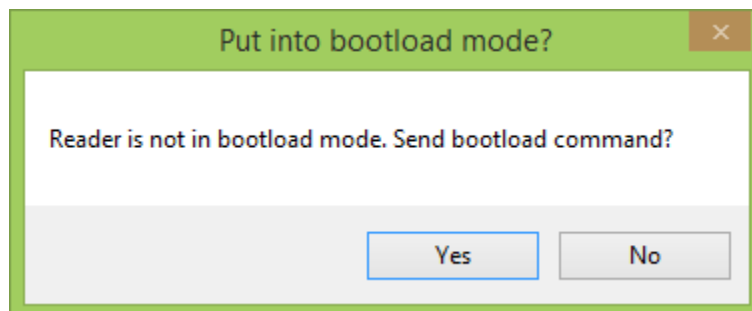


Figure 42: Put into Bootload mode

- If required, Select **YES** to proceed with the bootloader.

Once the bootloader installation process begins, the window will show the install progress. Upon completion, a window will appear notifying the process was completed.

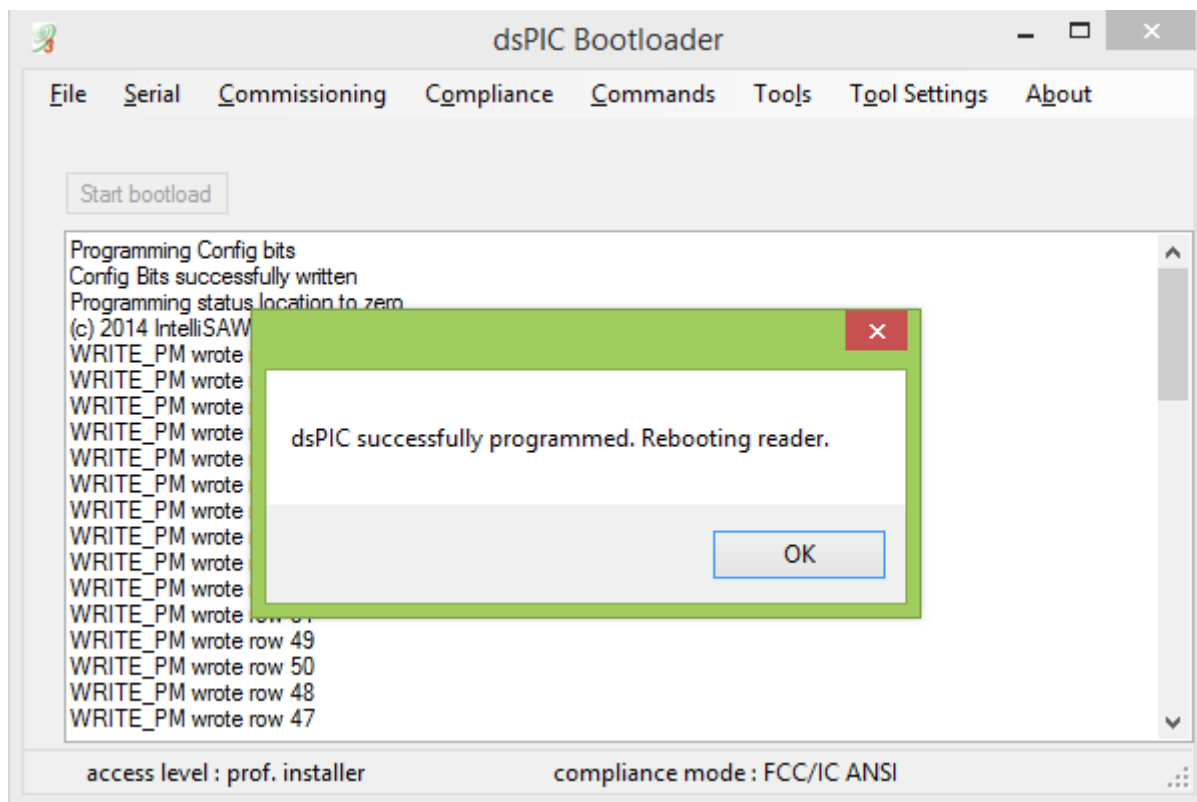


Figure 43: Bootloader Completed

- Select **OK** to complete the process.
- The unit will reboot and Firmware should be indicated in the data screen.

10.2 BOOTLOAD THE DSP

Once the microcontroller bootload has completed, the DSP can be bootloaded. Select the menu item **Tools → Programming → DSP bootloader**.

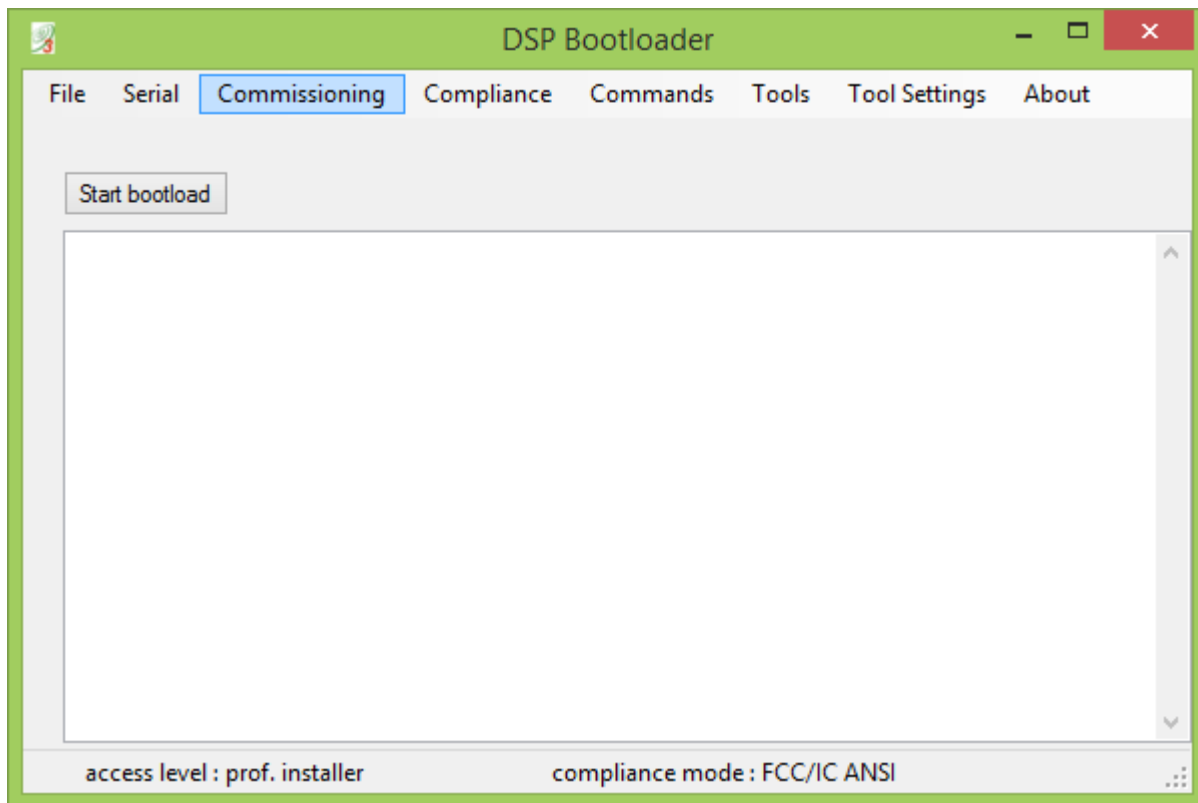


Figure 44: DSP Bootloader Window

The process is very similar to that of the microcontroller:

- Select Start bootloader

A navigation window will appear for you to select the proper bootloader file.

- Navigate to the correct folder and select the DSP bootloader file to be loaded
DSP firmware files have a ".BOB file extension.
- Select **Open**

The DSP Bootloader will initiate the load procedure. When the DSP bootloader process has completed, a message will be displayed in the Output Window indicating that the process has completed successfully and the unit will reboot and show its firmware revisions.

10.3 FIRMWARE LOAD CONFIRMATION

Confirm that the displayed revision numbers match the revisions of firmware that were installed on the output screen from loading the firmware.

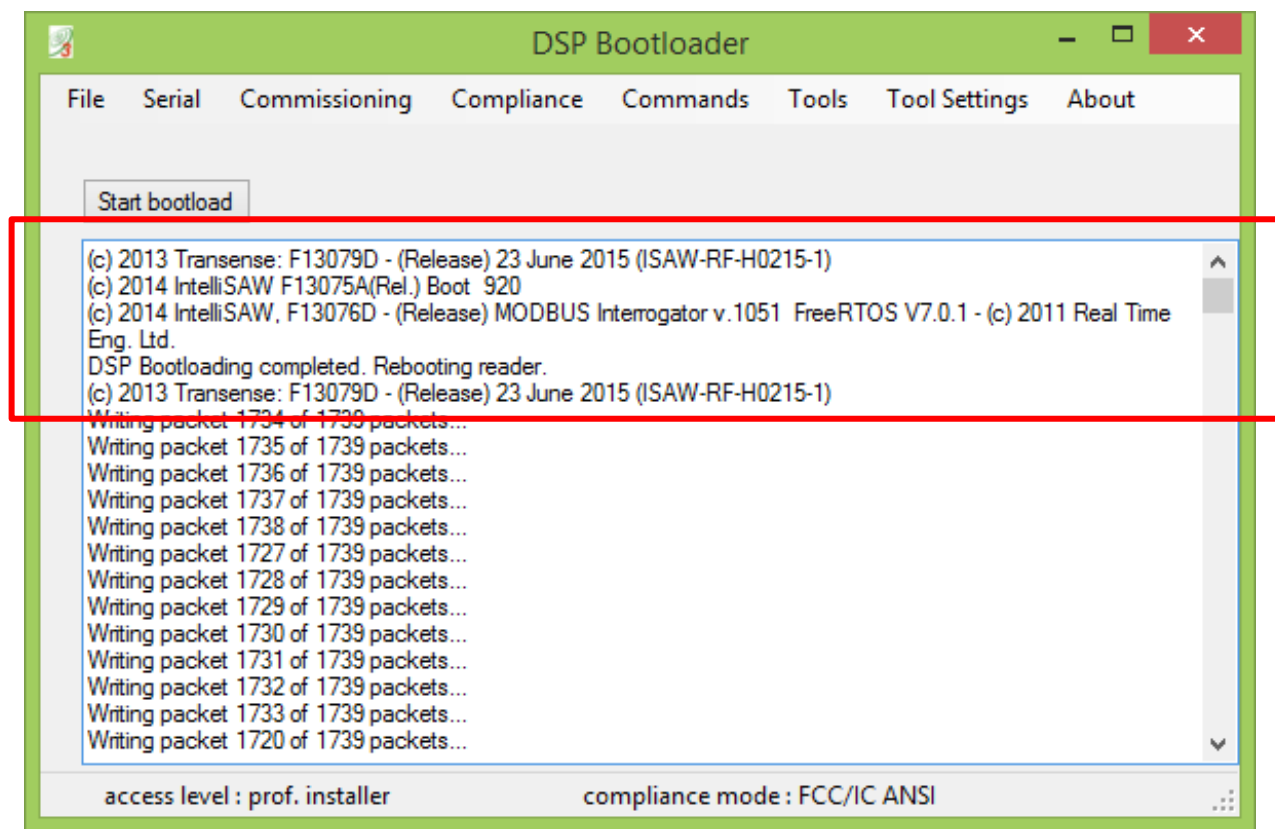


Figure 45: Firmware Load confirmation

10.3.1 Unit Remains in Bootloader Mode Notification

If the reader firmware update process was interrupted, the following notice will be displayed the next time configuration tool is launched. The DSP or dsPIC firmware must be reloaded.

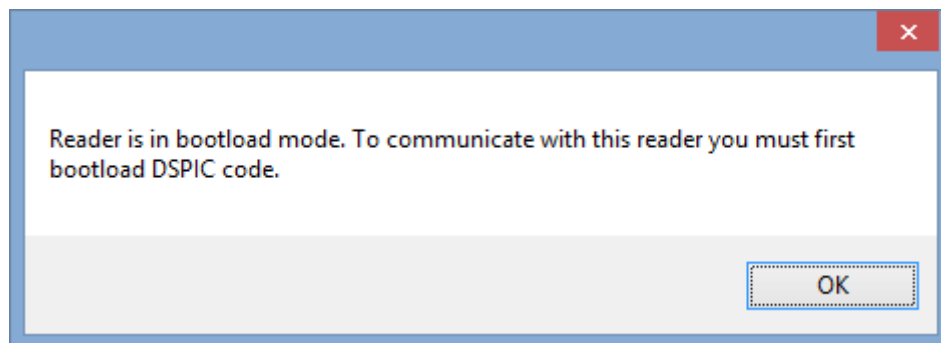


Figure 46: Unit in Bootloader Mode

11 REMAINING APPLICATION MENU ITEMS

11.1 FILE MENU

11.1.1 Exit

Exit closes the Configuration Tool. Select this menu item to exit the program.

11.1.2 Unlock admin functions

This menu item grants authorized access to administrative-level functions.

The first time this program is run, you are asked to create a password that will be used to grant access to administrative-level functions. These are functions that can potentially cause significant damage to a unit. After the first time the program is run, this function becomes a toggle, enabling you to either unlock administrative functions or to lock administrative functions.

11.1.3 Enable Command Logger

Logs all serial bus traffic recognized by configuration tool for deep debugging. This is to be used under guidance from support staff.

11.1.4 Copy Debug Log

Makes a copy of the debug log file from the system directory to a user accessible location.

11.1.5 Clear Debug Log

Clears the debug log file.

11.2 SERIAL MENU

11.2.1 Connection Settings

This menu item opens the Serial Connection Settings window for the unit's USB configuration port. See section: [Application Launch](#) for more details.

11.2.2 Edit SCADA Settings

This menu item opens the SCADA Port Settings window, which is also seen in the SCADA Commissioning Wizard. See section: [Setting SCADA Port Data](#) for more details.

11.3 COMMISSIONING MENU

This menu is covered in detail in the [Commissioning Sections](#)

11.4 COMMANDS MENU

11.4.1 Reboot

This menu item reboots the unit and indicates the reboot success, along with the firmware revisions in the Output Window.

11.5 TOOLS MENU

This menu provides a variety of tools that can be useful for the setup, commissioning and maintenance of a reader. These tools are broken down into two categories; Programming and Test Tools. The Test Tools require IntelliSAW administration password to access features and are not discussed in this manual.

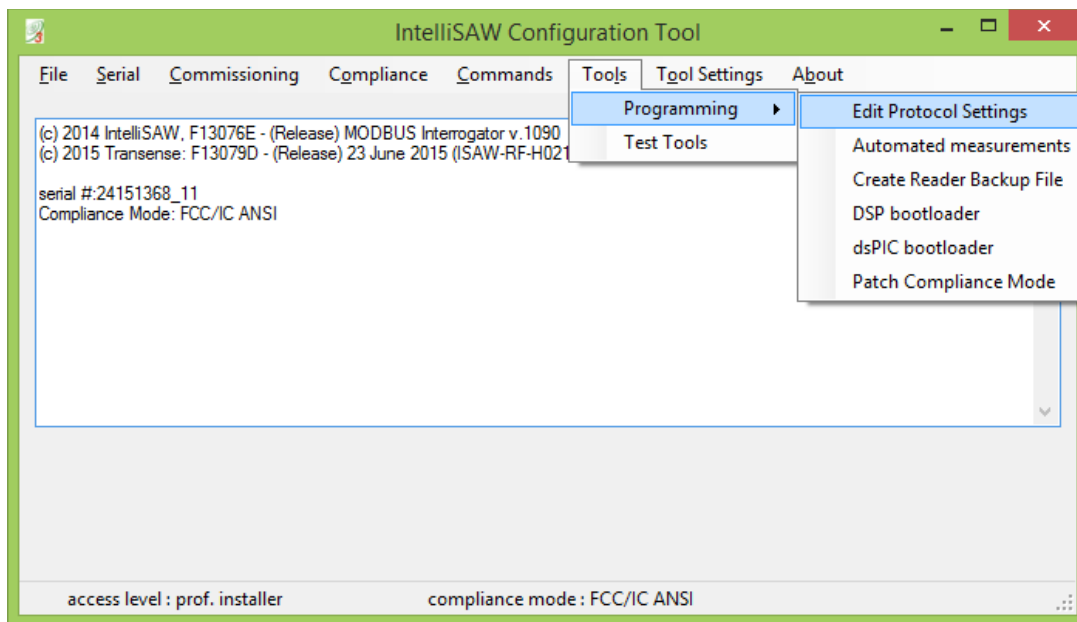


Figure 47: Tools Menu

11.5.1 Programming

11.5.1.1 Edit Protocol Settings

Editing of the Advanced Modbus Protocol Settings for

- **TestZeroCRC:** acceptable values: 1 or 0. (1)Always test CRC even if value is zero, or (0) Ignoring the CRC when it's zero
- **MinDelay:** Setting the minimum millisecond delay value of line idle requirement.

11.5.1.2 Automated Measurements

Automated Measurements are set through the SCADA configuration interface. The following location allows for automated measurements to be stopped, paused, or started.

- Select the type of action for automated measurements from the drop down box
- Select **GO** to implement

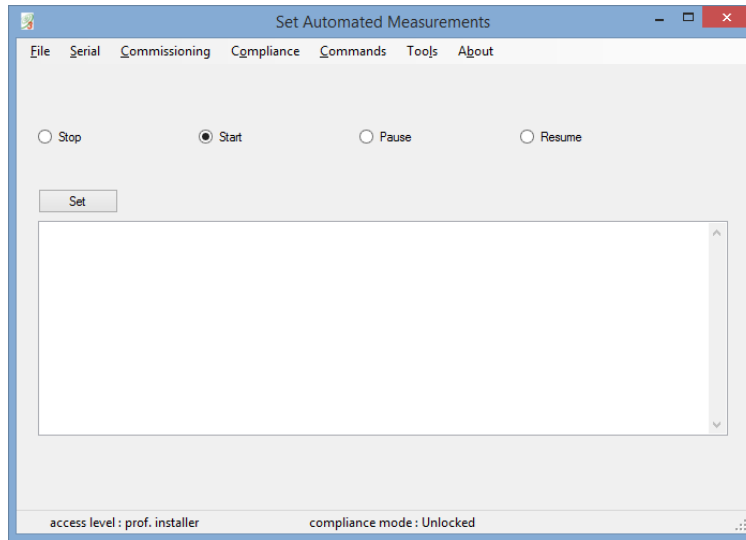


Figure 48: Set Automated Measurements

11.5.1.3 Create Reader Backup File

This menu is covered in detail in section [Configuration Backup](#)

11.5.1.4 DSP Bootloader

This menu is covered in detail in section [Bootload the DSP](#)

11.5.1.5 dsPIC Bootloader

This menu is covered in detail in section [Bootload the Microcontroller](#)

11.5.1.6 Patch Compliance Mode

If a unit shipped prior to 2015-07 or firmware was upgraded to DSP Rev D using configuration tool earlier than 1062, then this function will need to be performed, or the compliance mode must be set using configuration tool 1062.

- Once the menu path was selected, click **Patch** and the update will be performed.

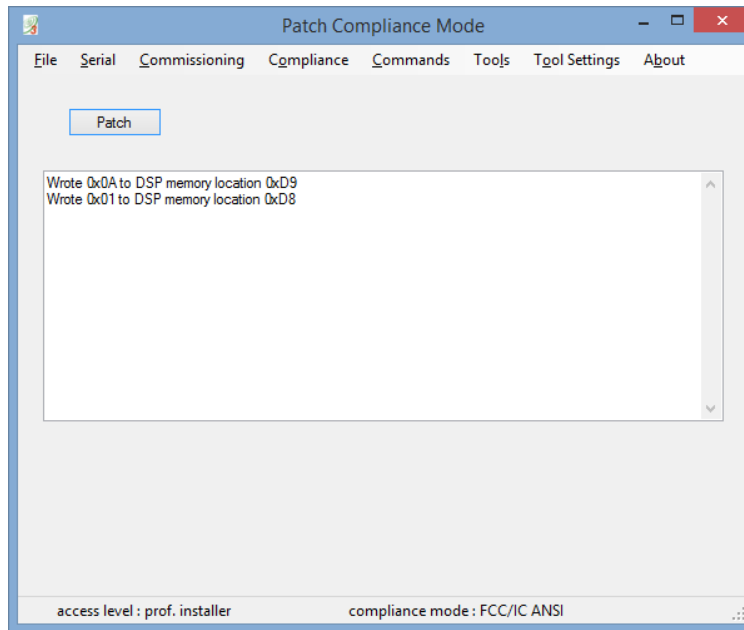
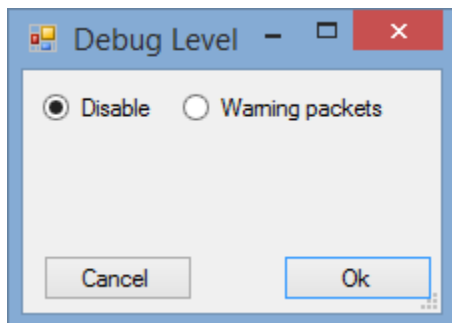


Figure 49: Patch Compliance Mode

11.5.2 Test Tools

11.5.2.1 Set Debug Level

Enable or disable reporting of warnings from the reader to the USB port. These warnings are logged to a file that may be sent to IntelliSAW for extended troubleshooting.



11.6 TOOL SETTINGS MENU

This menu is used to display options specific to the tool being used. If a particular item under the Tools menu has additional settings, they will appear here. If there are no additional options this menu item will be empty.

11.7 ABOUT MENU

This menu displays a popup window used to identify the configuration tool software revisions.

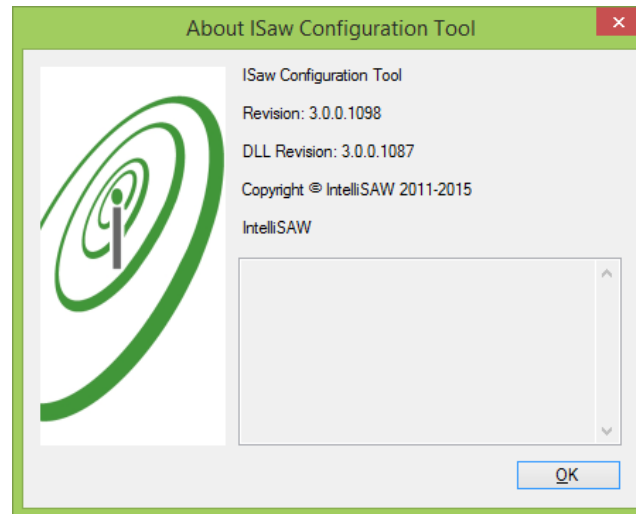


Figure 50: About iSAW Configuration Tool

APPENDIX A: FTDI USB COM PORT FIX

Preventing Virtual COM Port Proliferation with FTDI USB-to-Serial Devices

PROBLEM

Devices that use the FTDI VCP drivers create unique registry entries for each connected device. The unique id is a combination of the PID(product ID), VID(vendor ID), and the device serial number. Windows will assign a new virtual COM port for each device. If many devices are connected to the computer, the number of virtual COM ports will proliferate. This is an annoyance when using a single computer to configure many readers, since there is no need to persist registry info about the reader once it has been configured and installed in the field. It also forces the user to constantly enter new COM port info into our software.

SOLUTION

The registry can be modified to force Windows to ignore the device serial number when installing drivers. Setting this registry entry causes all FTDI devices with the same VID and PID to look identical to Windows when connected to a common USB port. Windows will create a single registry entry for the PID, VID, and USB port.

INSTRUCTIONS

If you have previously connected a reader to your computer, you will need to clear all installed information for these readers prior to setting the registry entry. If you have never attached a reader to your computer, you can skip to step #5.

- 1) Open Control Panel. Click **Advanced System Settings**. Click the button titled **Environment Variables**. Under **System Variables**, click the **New** button. For variable name enter **devmgr_show_nonpresent_devices**. Set the variable value to 1. Restart your computer.
- 2) Open Device Manager (**Control Panel->Device Manager**). In the file menu, select **View->Show hidden devices**.
- 3) There are two sections that need entries removed, **Ports (COM & LPT)** and **Universal Serial Bus Controllers**. Expand the Ports category. Right-click any entries that are titled **USB Serial Port** and select Uninstall. When the confirm dialog window opens, check the box that says **Delete the driver software for this device** and click **OK**. Repeat this process for each USB Serial port.
- 4) Expand the section titled **Universal Serial Bus controllers**. Look for entries named **USB Serial Converter**. Right-click each entry and select **Properties** to confirm the manufacturer is FTDI. Right-click each entry and select **Uninstall**. Check the box that

says **Delete the driver software for this device** and click **OK**. Repeat this process for each USB Serial converter entry. You may now close the Device Manager.

- 5) Create a new text document and enter the following information:

Windows Registry Editor Version 5.00

```
[HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\usbflags]
"IgnoreHWSerNum04036001"=hex:01
```

Save the document as **IgnoreHWSerNum04036001.reg**. Double-click the newly created file to write the registry information into the registry. Delete the file when finished.

NOTE: This action may fail due to insufficient privileges. It may be necessary to give yourself permission to create this registry entry. Open Regedit . Right-click the **HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\usbflags** key and select **Permissions**. Give your account full control. Close the **Permissions** window and try running the **IgnoreHWSerNum04036001.reg** file again.

Now, when a reader is connected to a USB port, a registry entry will be created specific to the FTDI VID, PID, and the USB port. Subsequent devices with the same VID and PID connected to the same USB port will not create new virtual COM ports. The maximum number of virtual COM ports created for FTDI USB-Serial devices will be the same as the number of USB ports that exist on the computer.

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