



MPL3115A2 Sensor Toolbox User's Guide

1 Introduction

The Freescale DEMOSTBMPL3115A2 Sensor Toolbox provides the hardware and software for demonstrating the capability of the MPL3115A2 pressure sensor.

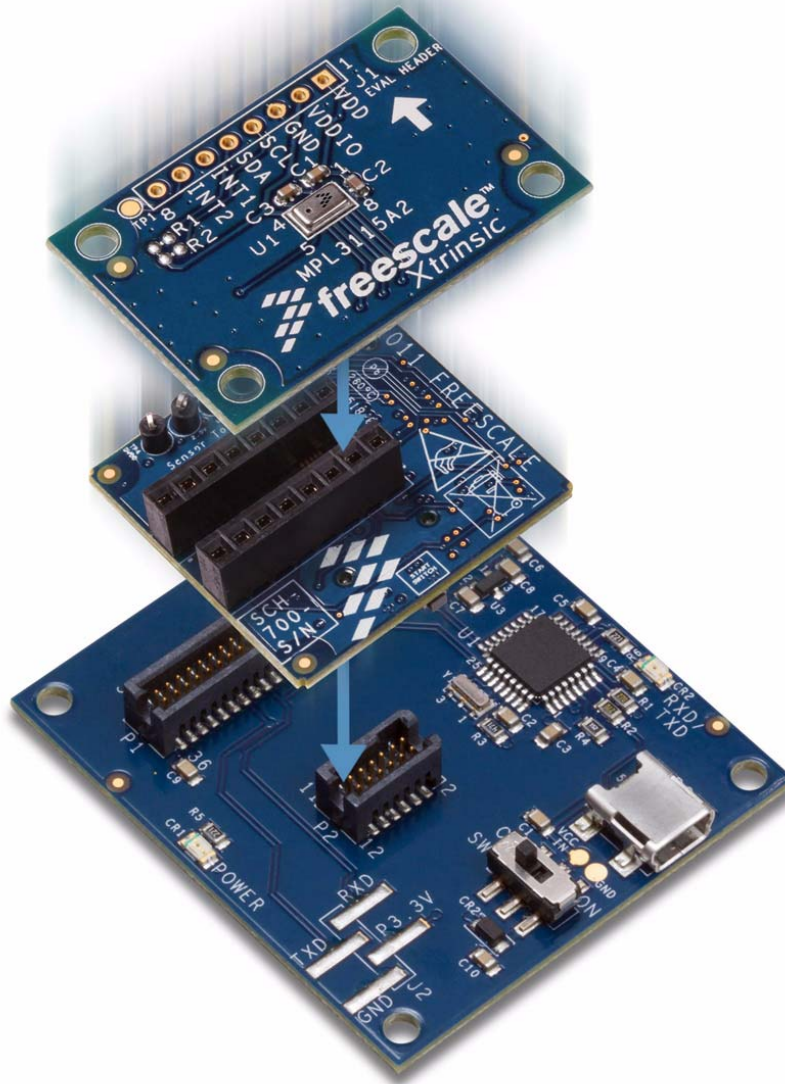
The kit includes the following:

- A daughter board KITSTBMPL3115A2 with the MPL3115A2 pressure sensor
- The LFSTBEBMPL3115A2 evaluation board to which the daughter board is attached
- The USB-interface board LFSTBUSB for connecting the evaluation board to a PC's USB port
- The DEMOSTBMPL3115A2 Quick Start Guide

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The kit, shown below, is available for order under part number DEMOSTBMPL3115A2.



2 Getting Started

To begin using the kit, assemble the kit's hardware and install the sensor toolbox software on the Windows PC to which the kit will be connected.

2.1 Assembling the Kit

As instructed in the quick start guide:

1. Attach the evaluation board to the USB-interface board.
2. Attach the daughter board to the evaluation board, aligning the small arrows on each board.

The hardware assembly will be completed as part of the software-installation process that follows.

2.2 Installing the Sensor Toolbox Software

The free sensor toolbox software provides a user interface that enables a Windows PC to evaluate and interact with the MPL3115A2 device.

The PC sends its requests over the USB-interface board and the evaluation board's bridge to the device, via the device's master I²C bus. The device processes the PC's requests and sends data back to the PC for display in the sensor toolbox software's user interface.

At the end of the installation process, you will be asked about installing a Future Technology Devices International (FTDI) serial-to-USB communications driver. This driver is required for communication between the PC and the evaluation board. If you have previously installed the sensor toolbox software, this driver already is installed.

To install the sensor toolbox software:

1. Download the sensor toolbox software by clicking the following link:

<http://www.freescale.com/sensortoolbox>

The webpage, shown below, appears.

Sensor Toolbox



Freescale offers the Sensor Toolbox that provides a customizable selection of sensor development tools, accessories and software from Freescale's portfolio of acceleration, pressure and proximity touch sensors which enrich designs with a broad range of capabilities in detecting real-world conditions, such as motion, touch or pressure.

[Download Software](#) *Required for all Sensor Toolbox boards*

2. Click the Download Software button.

The sensor Toolbox Installer license agreement page appears.

Getting Started

3. Scroll down to the bottom of the page, shown below, and click I Accept button.

SEVERABILITY. If any provision of this Agreement is held for any reason to be invalid or unenforceable, then the remaining provisions of this Agreement will be unimpaired and, unless a modification or replacement of the invalid or unenforceable provision is further held to deprive you or Freescale of a material benefit, in which case the Agreement will immediately terminate, the invalid or unenforceable provision will be replaced with a provision that is valid and enforceable and that comes closest to the intention underlying the invalid or unenforceable provision.

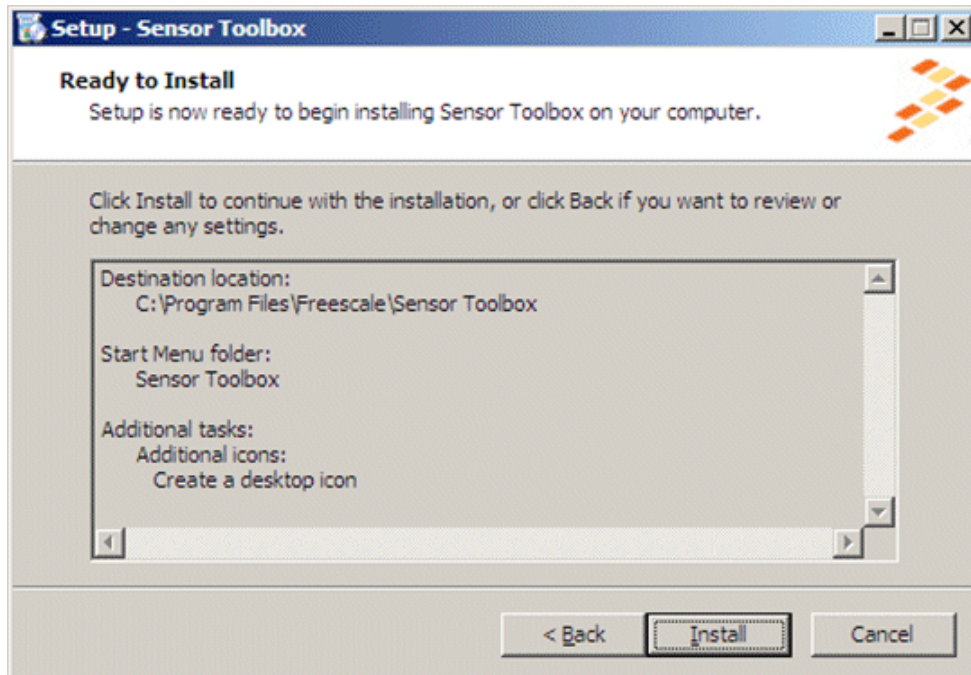
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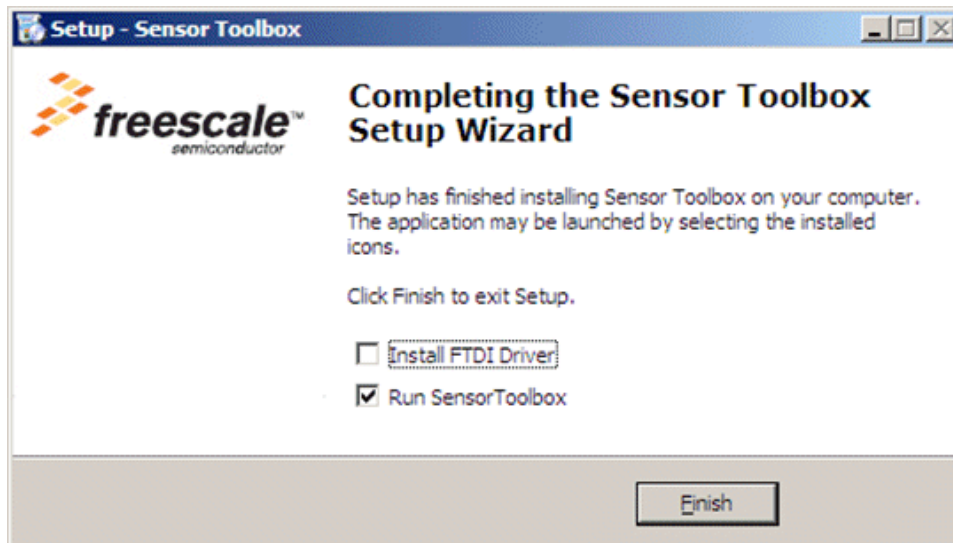
4. Save the software's installation executable file (SensorToolboxInstaller.exe) to your PC.
5. Complete the kit's hardware assembly by using the supplied USB cable to connect the LFSTBUSB USB-interface board to a USB port on your PC. If the evaluation board's red power LED does not illuminate, check the power switch located next to the board's USB connector.
6. Locate the software toolkit's installation file on your PC and double-click on it. Proceed through the setup wizard's series of dialog boxes.

During the process, you will be asked if you want a Sensor Toolbox icon added to your Start menu and desktop.

- When the Ready to Install dialog box, shown below, appears, review the installation configuration and click the Install button.



A progress bar displays the status of the software installation and the final dialog box, shown below, appears.



Getting Started

8. Do any of the following and click the Finish button:
 - To install the Future Technology Devices International (FTDI) serial-to-USB communications driver, enable the Install FTDI Driver checkbox
 - To launch the toolbox software upon completion of the setup, leave the Run Sensor Toolbox checkbox enabled

If you chose to install the FTDI driver, a command-line window briefly appears.

9. If you do not have the Adobe Shockwave software installed on your PC, use the following link to download and install that application:

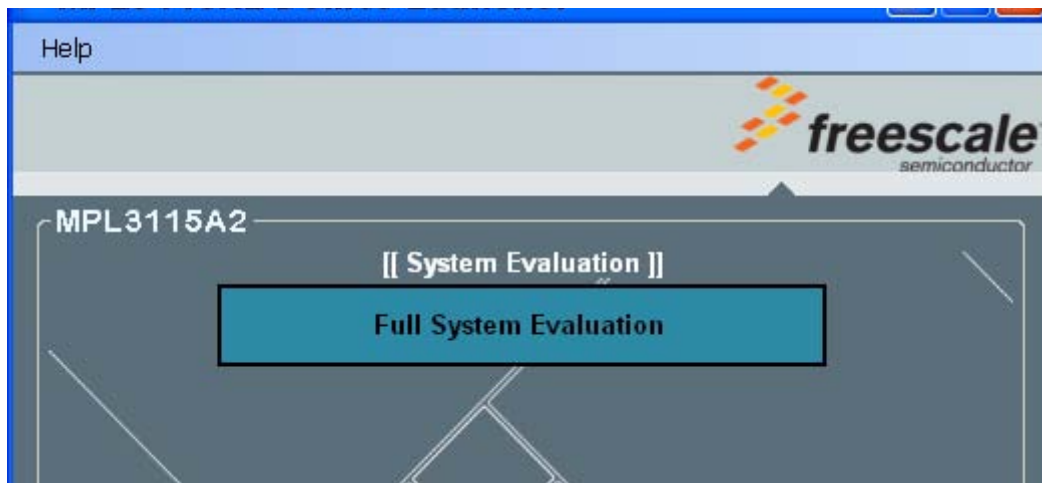
<http://get.adobe.com/shockwave>

The application is now ready for use. If you left the Run Sensor Toolbox checkbox enabled, the application launches and detects the devices connected to the evaluation board. To manually launch the application, see the next section.

2.3 Launching the Sensor Toolbox Software

1. Launch the toolbox software by doing either of the following:
 - Double-click on the application's desktop icon
 - Select Start > Programs > Sensor Toolbox > Sensor Toolbox

If the PCB is plugged in properly, the software will detect the presence of the MPL3115A2 daughter board and automatically run the Sensor Toolbox software. The evaluation board's red power LED illuminates. (If the LED does not illuminate, check the power switch located next to the board's USB connector.)

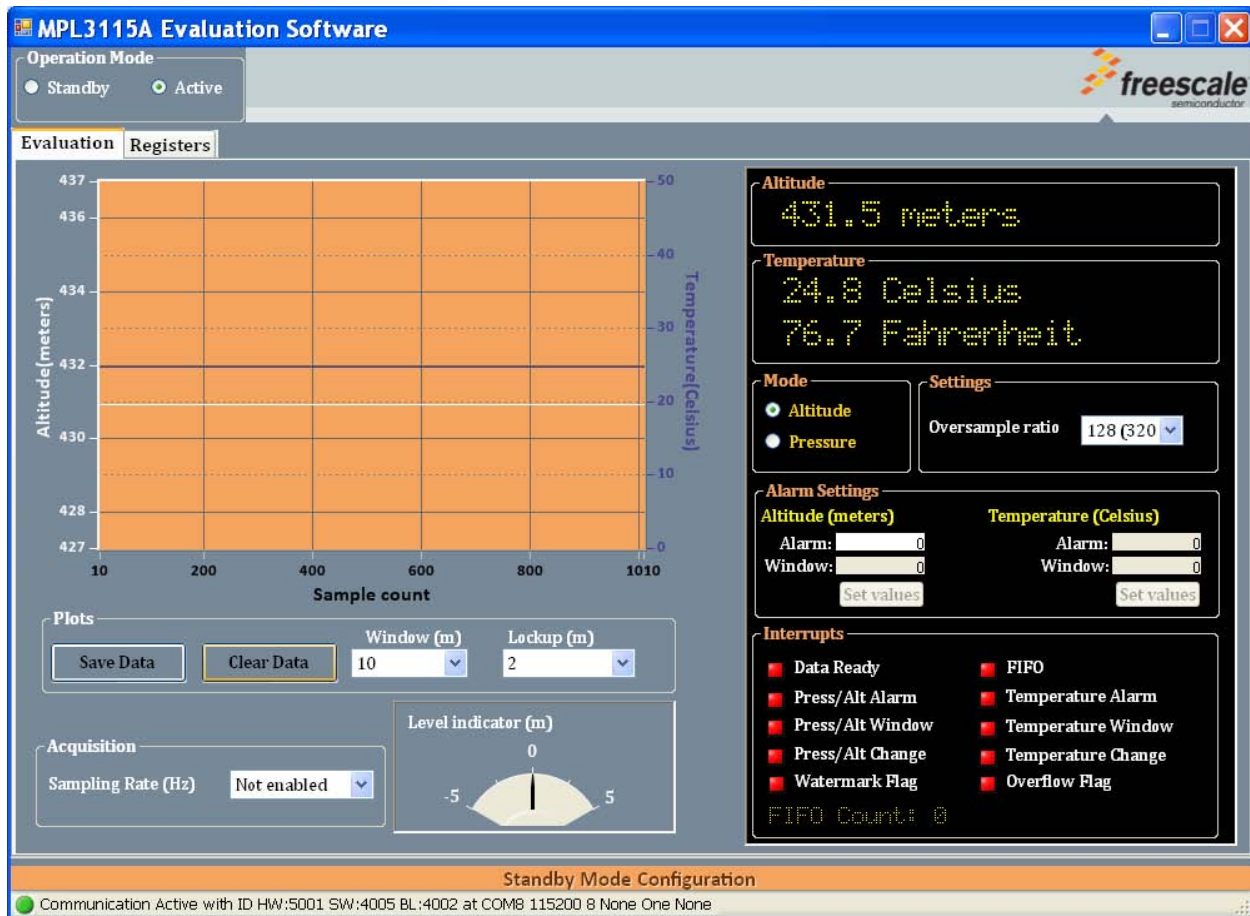


The Full System Evaluation button is enabled when USB communication is established with the MPL3115A2 evaluation board. If this button is not enabled, please check that the FTDI USB to Serial driver is properly installed.

2. To launch the MPL3115A2 application, click on the Full System Evaluation button.

2.4 MPL3115A2 Main Screen

The main screen showcases the results of the altitude and temperature readings. The Y axis is set at 10 meters and on the X axis, altitude filtering set at 2 meters.



The screen contains the following areas:

- Operation Mode
- Altitude and Temperature Graph
- Plots
- Acquisition
- Level Indicator
- Altitude
- Temperature
- Mode
- Settings
- Alarm Settings
- Interrupts

Getting Started

Each area and options are described in the following table.

Table 1. MPL3115A2 Main Screen

Area	Description
Operation Mode	Contains Standby and Active radio buttons, tells the system to be in Standby or Active mode
Altitude and Temperature Graph	Shows the altitude (meters) and temperature (Celsius) data on the Y axis and displays the current sample count on the X axis. Choose output pressure or altitude by selecting the Altitude/Pressure radio button in the Operation Mode Box.
Plots	<p>Contains the Save Data and Clear Data buttons along with the Window (m) and Lockup (m) pulldown menus.</p> <p>Save Data button</p> <ul style="list-style-type: none"> • Saves the data in the Altitude and Temperature graph <p>Clear Data button</p> <ul style="list-style-type: none"> • Clears the data in the Altitude and Temperature graph <p>Window (m) pulldown menu</p> <ul style="list-style-type: none"> • Determines the Y-axis range of the Altitude and Temperature graph <p>Lockup (m) pulldown menu</p> <ul style="list-style-type: none"> • Determines the upper and lower control limit range
Acquisition	Shows the Sampling Rate in Hertz (Hz), select the sampling rate from the pulldown menu
Level Indicator	From the starting altitude of the device, displays the change in altitude (+ or -) in meters (m).
Altitude	Shows altitude (meters) or pressure (Pascals) based on the radio button selection in the Mode area.
Temperature	Displays the current temperature reading. Temperature is displayed in both Celsius and Fahrenheit.
Mode	Contains the Altitude and Pressure radio buttons. The radio buttons tell the system to display either the altitude reading or pressure reading in the Altitude area.
Settings	<p>Select an oversampling ratio from 1x to 128x from the pulldown menu. Using a larger oversampling ratio will minimize both pressure and altitude readout noise.</p> <p>Note: The default value is 128x, the maximum oversampling.</p>
Alarm Settings	Displays alarm settings for Altitude (meters) and Temperature (Celsius)
Interrupts	Alarm indicators show interrupt status for Data Ready, Press/Alt Alarm, Pres/Alt Window, Press/Alt Change, Watermark Flag, FIFO, Temperature Alarm, Temperature Window, Temperature Change, and Overflow Flag

2.4.1 Alarm Settings

To enter values in the Alarm Settings area, the device must first be in Standby mode.

1. To change the operation mode to Standby, use the radio buttons located in the Operation Mode area.
2. Click on the Standby Mode Configuration label located along the bottom of the main screen.
3. In the Alarm Settings area, set the Alarm and Window values for Altitude (meters) and Temperature (Celsius).

Table 2. Alarm Settings Frame

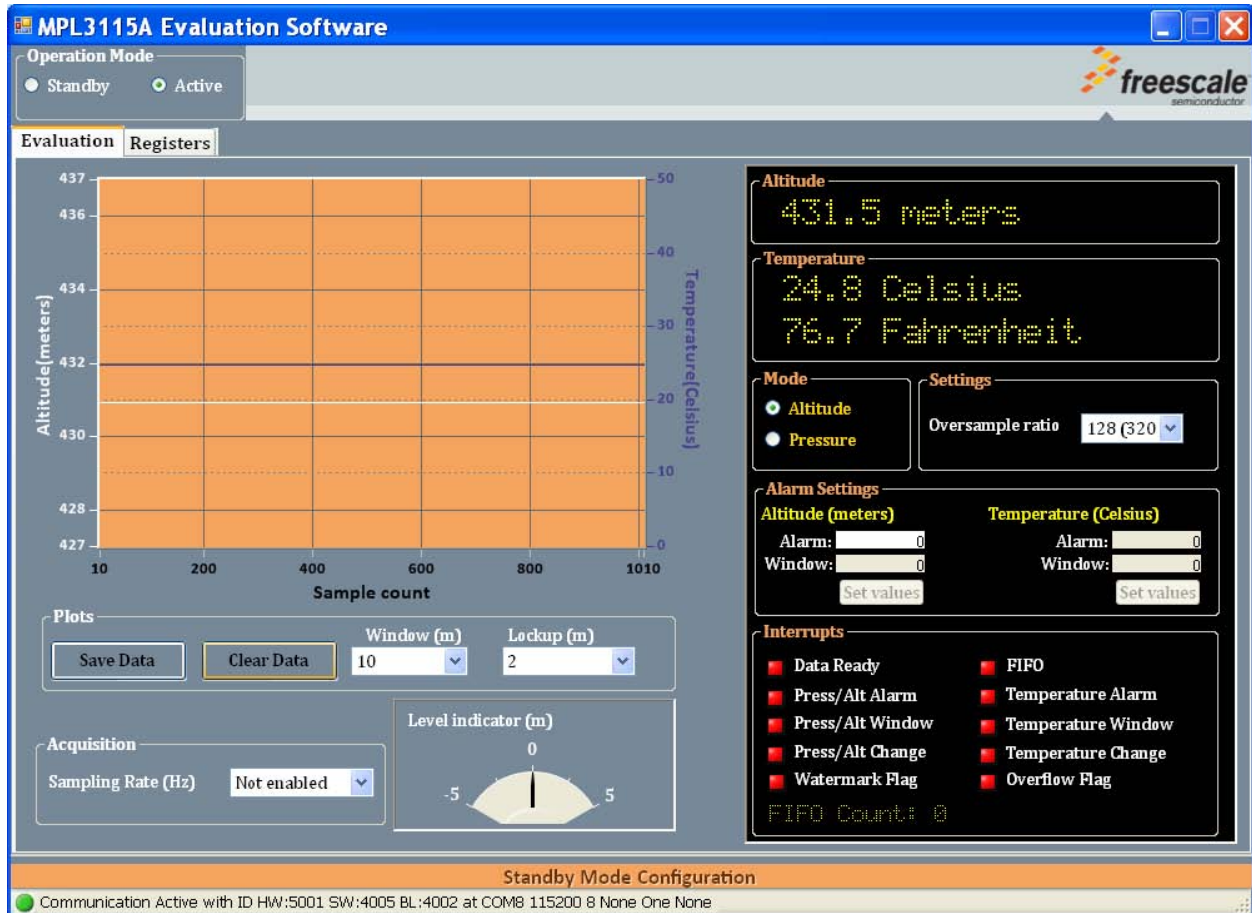
Setting	Action
Alarm (below)	If an alarm setting is below the current value, then the Alarm indicators in the Interrupts area will turn on (Green) when the current value falls below the alarm value
Alarm (above)	If an alarm setting is above the current value, then the Alarm indicators in the Interrupts area will turn on (Green) when the current value rises above the alarm value.
Alarm indicators in Interrupts area	Alarm indicators in the Interrupts area will turn on (Green), when the output readings from the sensor reach plus or minus the alarm value

Note: The Alarms can be configured for both Pressure and Temperature. Pressure is measured in either Altitude (meters) or Barometric Pressure (Pascals), Temperature is measured in degrees (Celsius).

2.4.2 Interrupts

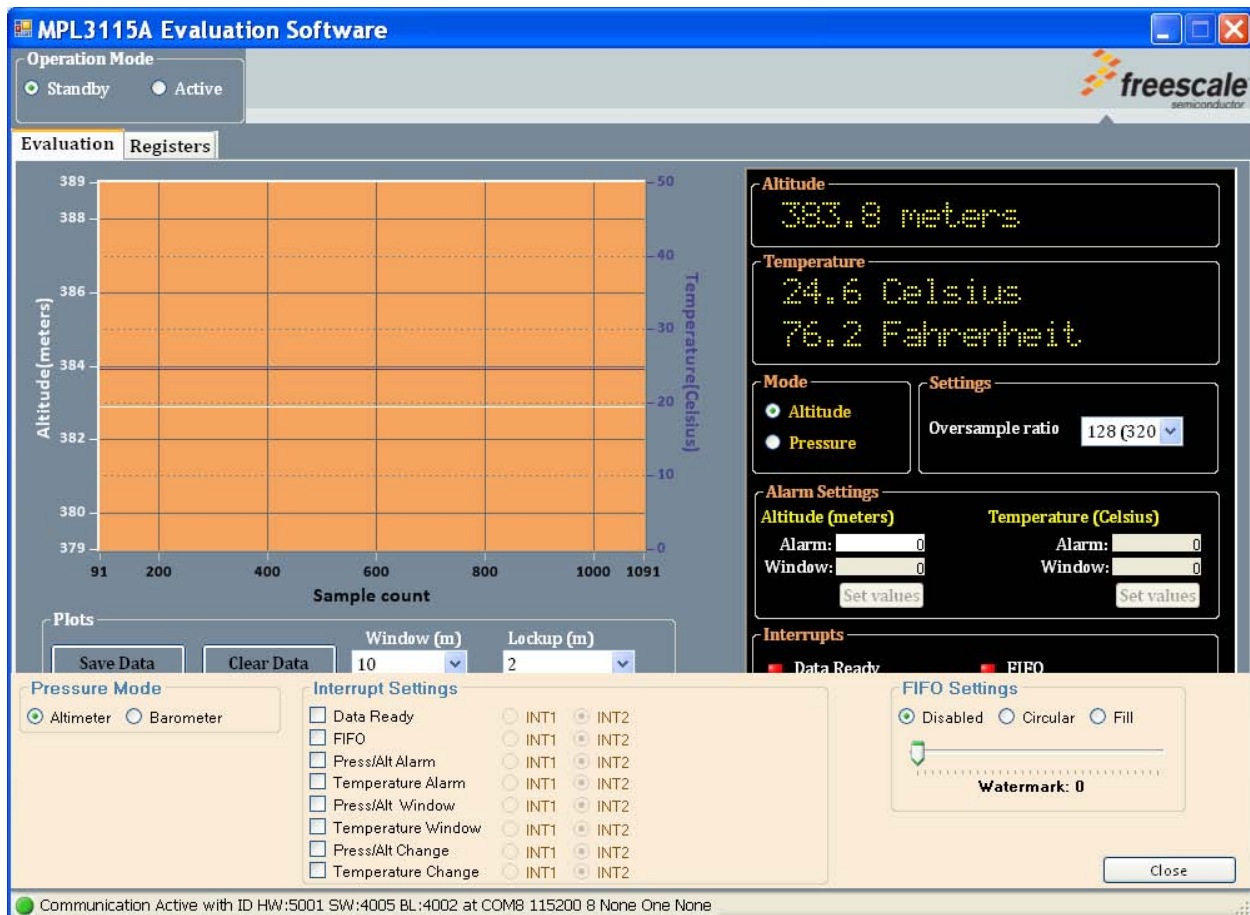
To enter values in the Interrupts area, the device must first be in Standby mode.

1. Select Standby in the Operation Mode area.
2. Select either the Altitude or Pressure radio button from the Mode area.



3. Click on the orange Standby Mode Configuration label at the bottom of the main screen.

The Configuration screen appears at the bottom of the window as shown below:



The Configuration screen allows you to change the Pressure Mode, Interrupt Settings and FIFO Settings.

Pressure Mode

- Altimeter and Barometer radio buttons allow you to display the altitude (meters) or pressure (Pascals). These radio buttons have the same effect as the radio buttons located in Mode area.

Interrupt Settings

- Alarm activation can be configured to alert for changes in pressure, altitude and/or temperature.

FIFO Settings

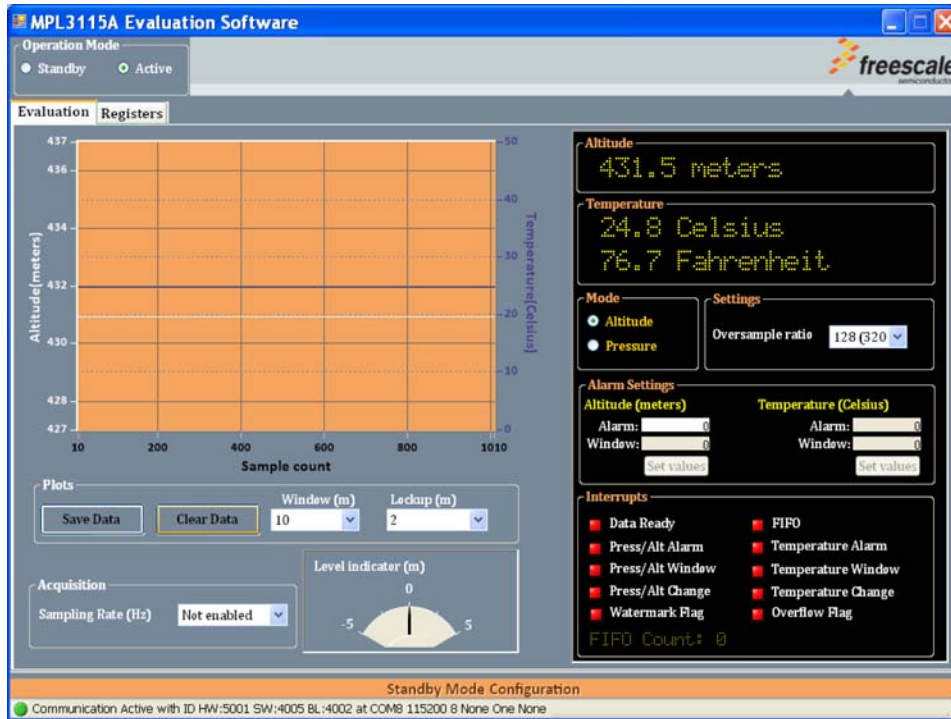
- The FIFO can be disabled by selecting the Disabled radio button or enabled by selecting the Circular or Fill radio buttons.

Table 3. Interrupt Settings Checkbox

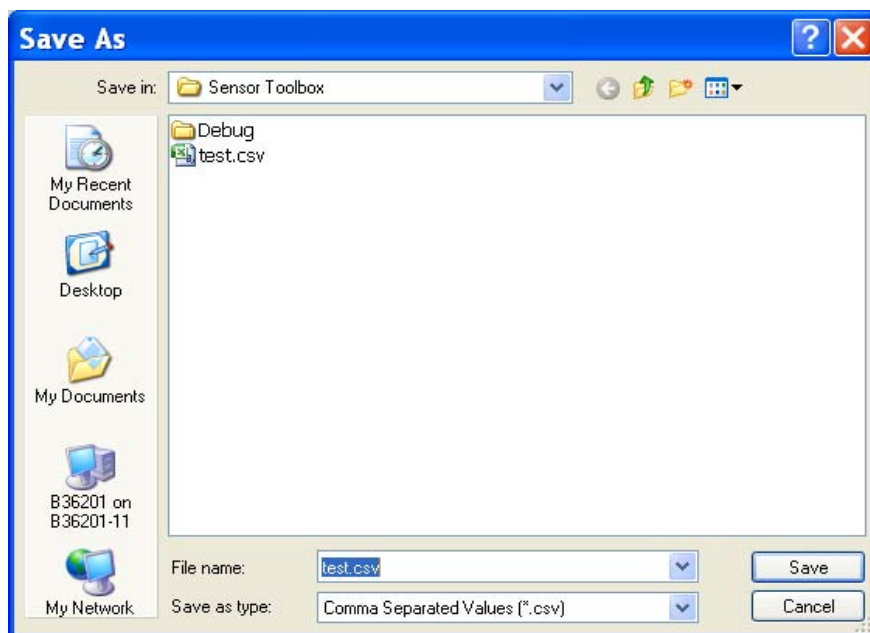
Setting	Description
INT1 and INT2 radio buttons	These radio buttons allow the user to decide which interrupts pin that user would like to trigger in the event that has been configured by the user.
Data Ready	Data Ready is an interrupt status bit. When new pressure/altitude/temperature data is available, the LED light from the Interrupts area will turn on.
FIFO	This is a read-only register which represents the status of FIFO. When the FIFO condition is met by the setting of the user, the LED light will turn on during Active mode.
Press/Alt Alarm	When the Press/Alt Alarm checkbox is selected, the Press/Alt Alarm LED will be activated when the pressure/altitude value reaches the value stored in the Alarm text box located in the Alarm Settings area.
Temperature Alarm	This interrupt bit indicates status of temperature change. It will assert if sequential temperature acquisitions exceed value store in the Window text box from Alarm Settings area.
Press/Alt Window	Use these Window Alarm interrupts to provide a signal when the reading of pressure/altitude is approaching to the value entered in Alarm text box. This pressure/altitude readout value can be a value that is either above or below the alarm value. For example: When the Altitude alarm is set at 3000m and the window value is set to 100m, the Press/Alt Window LED will turn on when the altitude readout from the device is passing 2900m, 3000m and 3100m.
Temperature Window	Uses these windows interrupt to provide signal when the reading of temperature is approaching to the value enter in Alarm text box. This temperature readout value from the device can either comes from above or below based upon the value in Window text box from Interrupt frame.
Press/Alt Change	This interrupt bit indicates status of pressure/altitude Change. It will assert if sequential pressure/altitude acquisitions exceed value store in the window text box from Alarm Settings frame.
Temperature Change	This interrupt bit indicates status of temperature Change. It will assert if sequential temperature acquisitions exceed value store in the window text box from Alarm Settings frame.
FIFO Settings Frame	This frame contains three radio buttons: Disabled, Circular and Fill
Disabled	When this button is selected, FIFO is not used. This button must be selected if the user would like to use the display window from main screen (Evaluation Screen).
Circular	When this button is selected the FIFO will acquire data until it is full and then begin replacing its oldest entry with each new data point. The FIFO will store the most recent data when it is overflowed.
Fill	When this button is selected the FIFO will acquire data until it is full, and then stop acquiring data until the FIFO is read. The FIFO will stop accepting new data when it is overflowed.
Watermark Slider	This slider sets the value of FIFO Count from interrupt frame. The Watermark Flag LED will turn on when sampling data is equal or greater than the value store at FIFO contains.
Watermark Flag	This LED will turn on when the FIFO Count is greater than or equal to the count specified by the Watermark slider in the Standby Configuration Screen
Overflow Flag	This LED will turn on when the new readout data from the device had arrived while FIFO is full and one or more data have been discarded. This LED will turn off again, when the overflow condition has resolved or data have been read out from FIFO.

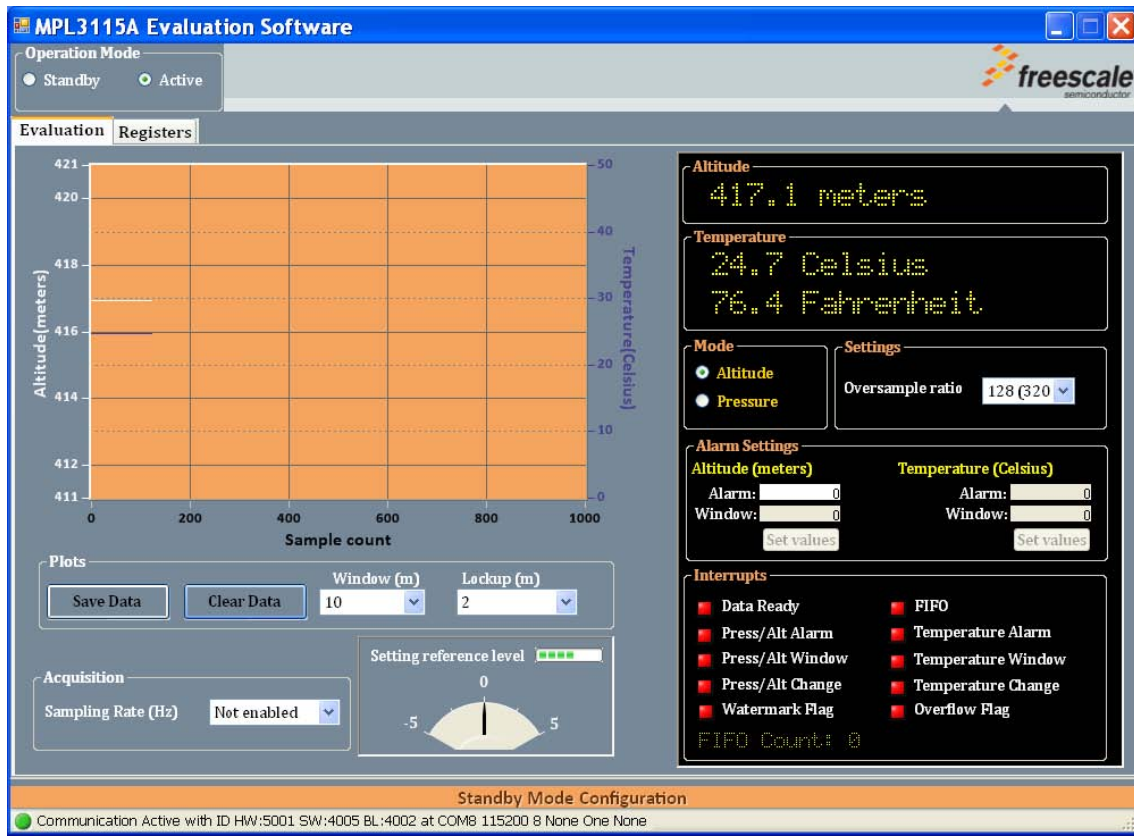
2.4.3 Plots

There is a way to save the data file within the Plots area.



1. To save the file, press the Save Data button in the Plots area.
The system displays the Save As dialog box
2. To save the file, click the Save button.
The system saves the file as.csv extension (Microsoft Office Excel Comma Separated Values File).





Here are the features located in the Plots area:

Clear Data Button

Pressing the Clear Data button is one way to clear the data.
 Clears the display data and resets the sampling count to 0 (zero).
 Can also be used for setting the floor level reference point.

Window (m) pulldown menu

The Window (m) pulldown menu allows you to select the y axis window width.

Lockup (m) pulldown menu

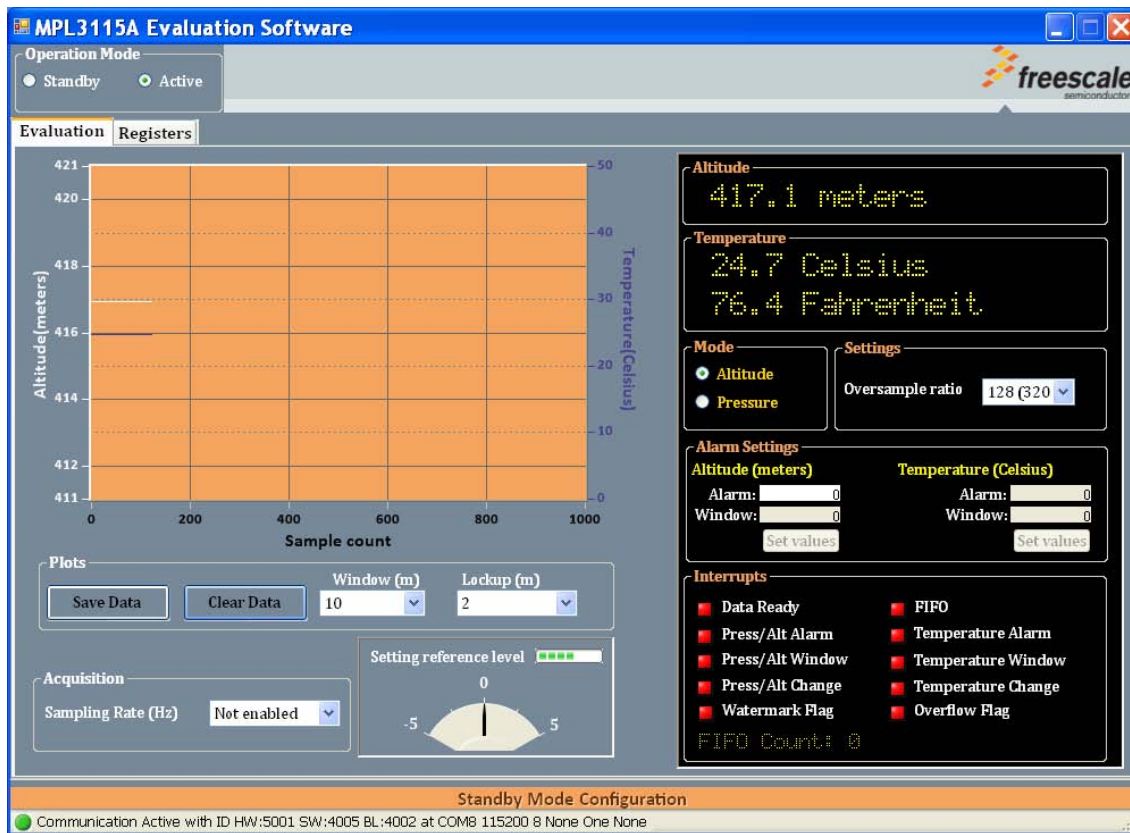
The Lockup (m) pulldown menu allows you to select the appropriate software filtering program given the data range of the altitude readings.
 For example: Selecting 1m (meter), the display will not change its value until the altitude has changed more than $\pm 1m$ from its starting point.

2.4.4 Acquisition

The sampling rate is selectable from 5 Hz to 140 Hz. To activate an ODR higher than 1 Hz, select the device to output data up to 140 Hz for OST (one-shot mode). To activate the OST, the device must first be in Standby mode. Once the device is in Standby mode, you can select an output frequency from the pulldown menu in the Acquisition frame.

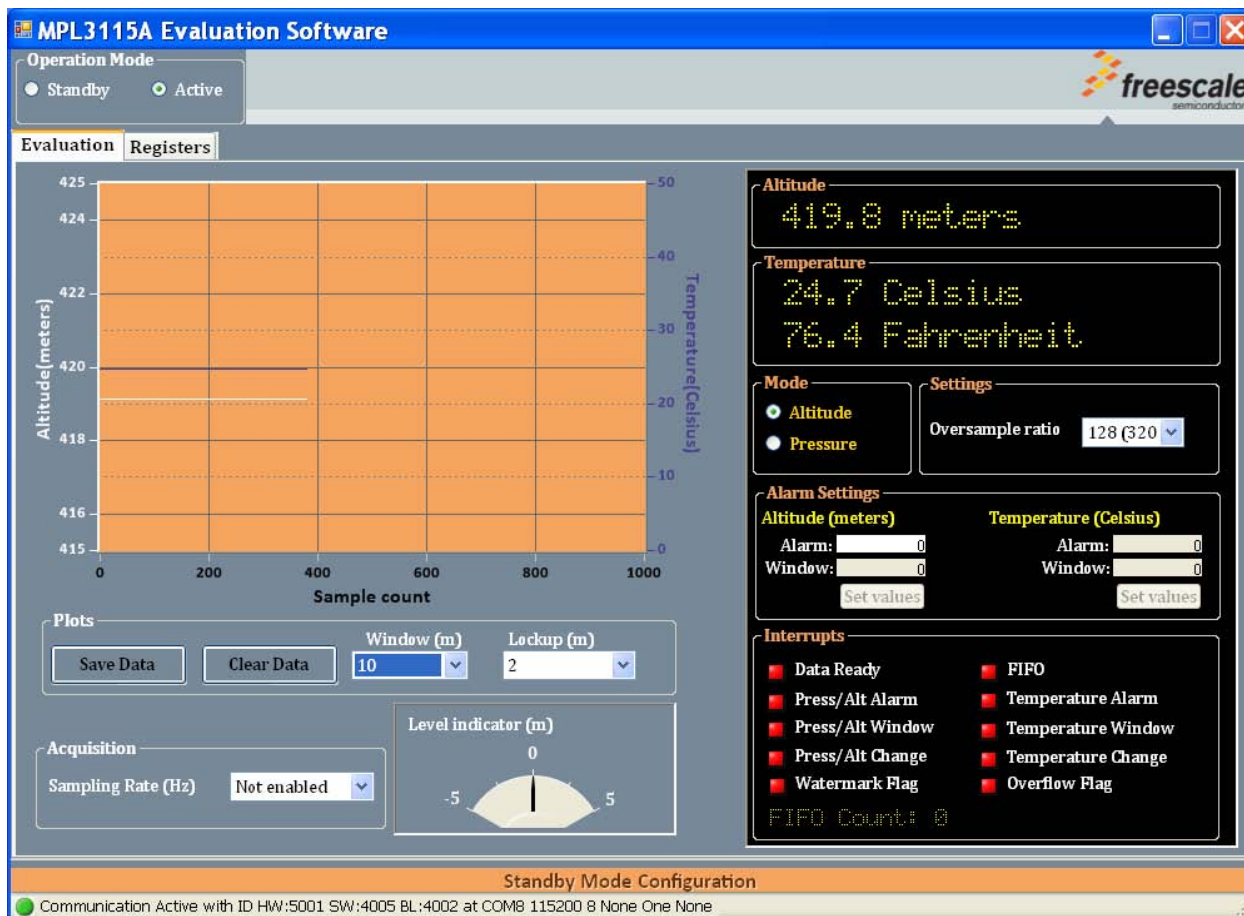
2.4.5 Setting Reference Level

The reference floor level setting is established using the Setting Reference level indicator. The user will set the reference level by pressing the Clear Data button located in the Plots area. Once the Clear Data button has been pressed, the level indicator will change to Setting Reference Level, as shown below.

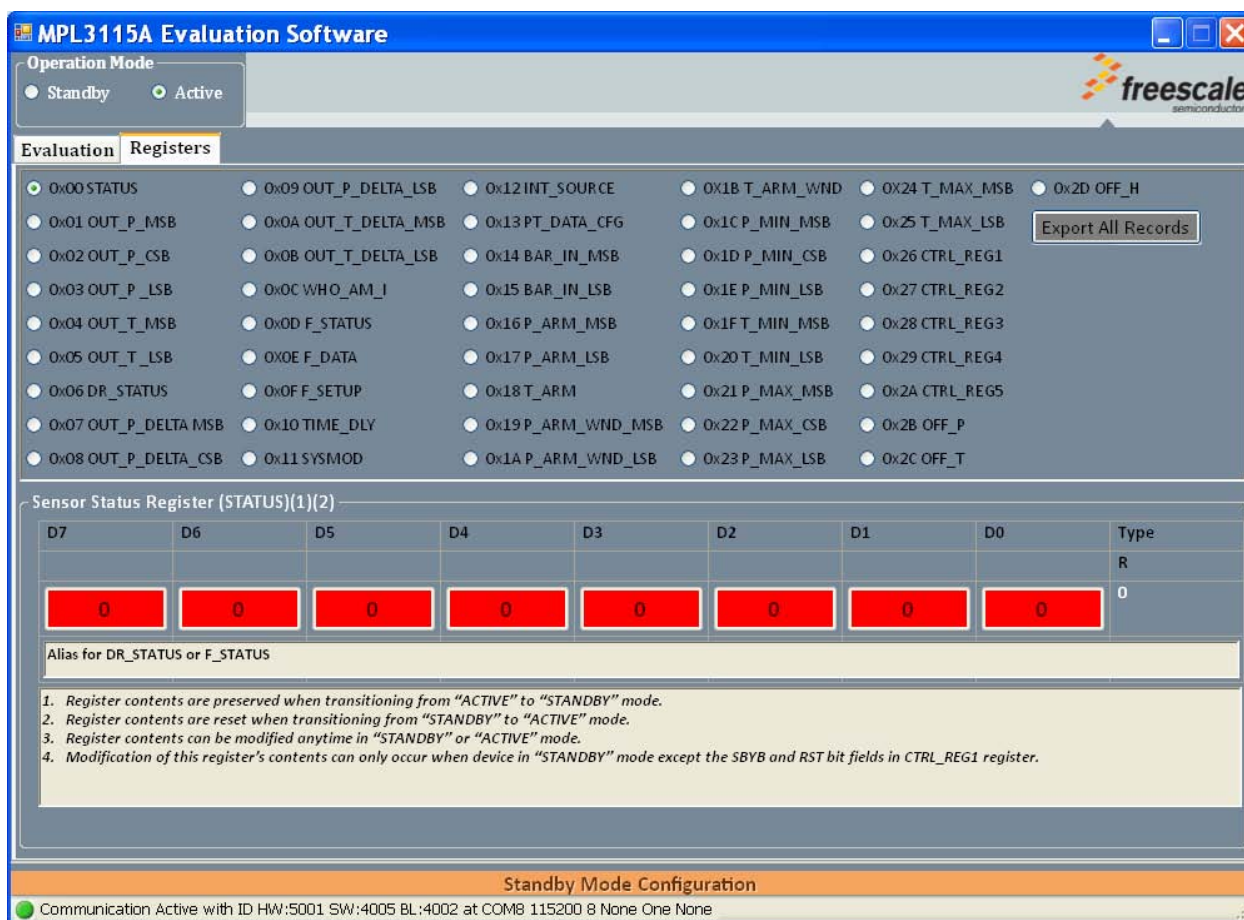


Getting Started

After the device has collected enough data as a reference point (about 300 sample counts), the Setting Reference Level will change back to Level Indicator (m), as shown as below. At this point, users are able to use the indicator as an up/down level indicator as an altimeter application.



2.5 Registers Screen (For Advanced Users Only)



This Register screen allows advanced users to read from or write to, any of the device's registers. This allows the user to modify and understand the multiple variations and functionality of any given application prior to designing it. See the MPL3115A2 data sheet for the functions/values of each register.

2.6 Related Documentation

The MAG3110 device features and operations are described in a variety of reference manuals, user guides, and application notes. To find the most-current versions of these documents:

- Go to the Freescale homepage at:
<http://www.freescale.com/>
- In the Keyword search box at the top of the page, enter the device number MAG3110.
- In the Refine Your Result pane on the left, click on the Documentation link.

How to Reach Us:

Home Page:
www.freescale.com

Web Support:
<http://www.freescale.com/support>

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