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UI Datalogger Application Notes

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1. Revision History

Revision Date	Revision	Description
08/24/2012	1.1	Document created
3/21/2013	1.2	Software version 1.2 is released
5/15/2013	1.3	Software version 1.3 is released

2. Reference

Please check the Register Map, EVB, and Production Specification of the relevant board.

http://www.invensense.com/mems/gyro/catalog.html

3. Purpose

The document purpose is to be as a guide for installing the data logger executable and also as a guide to show how to use the data logger tool.

4. Requirements

[1] PC with Windows OS. (Tested on Windows 7 32 bit OS and Windows 7 64 bit OS)
[2] ARM board with the firmware pre-loaded
[3] EVB board
[4] USB cable with mini on one side
[5] Application software
[6] Internet connection if the .net framework is not previously installed on the PC

5. Installation

[1] Please click/double click on the installation executable to start installation.

[2] Welcome screen shows up. Click next.

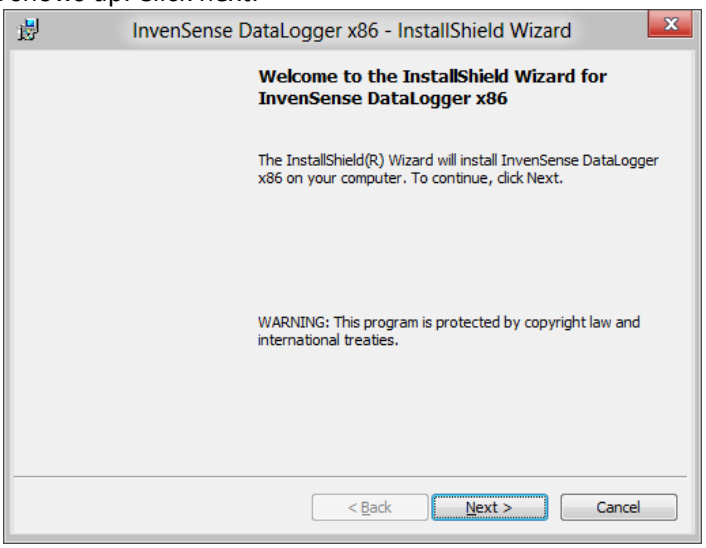


Figure 2: Installation Process Home screen

[3] Select the Installation destination folder and click next. Package will be installed.

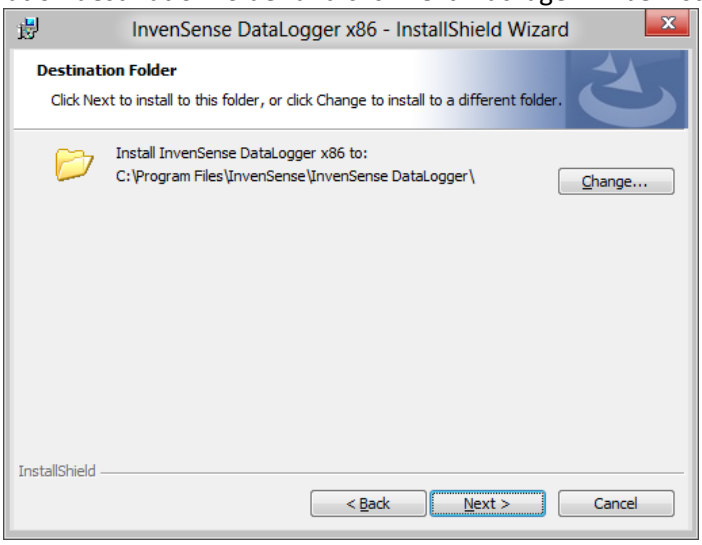


Figure 3: Select Installation Folder

[4] Note: If there is no previous installation of .net frameworks there will be a prompt asking to download the .net framework for your PC. Please make sure PC is connected to the Internet to install the .net framework.

[5] Next step will ask to install PL-2303 USB-to-Serial driver. Click next. It will take few moments to install the driver.

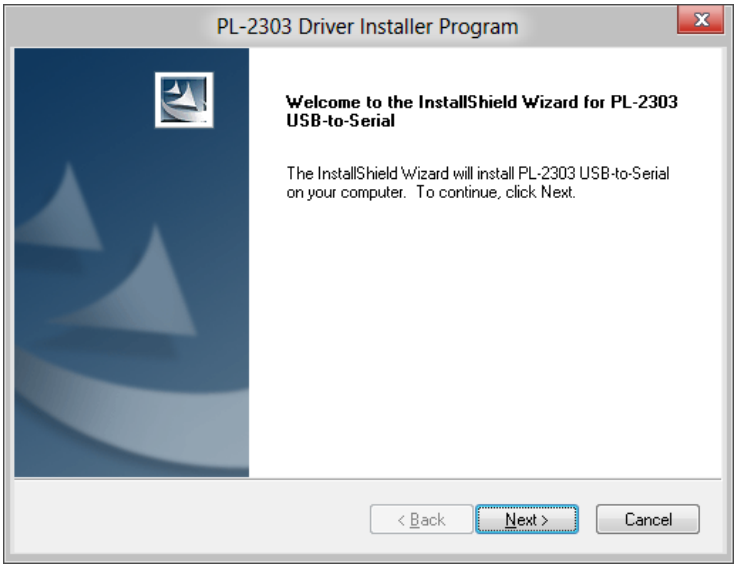


Figure 4: Start PL-2303 USB-to-Serial Installation

[6] Click finish button.

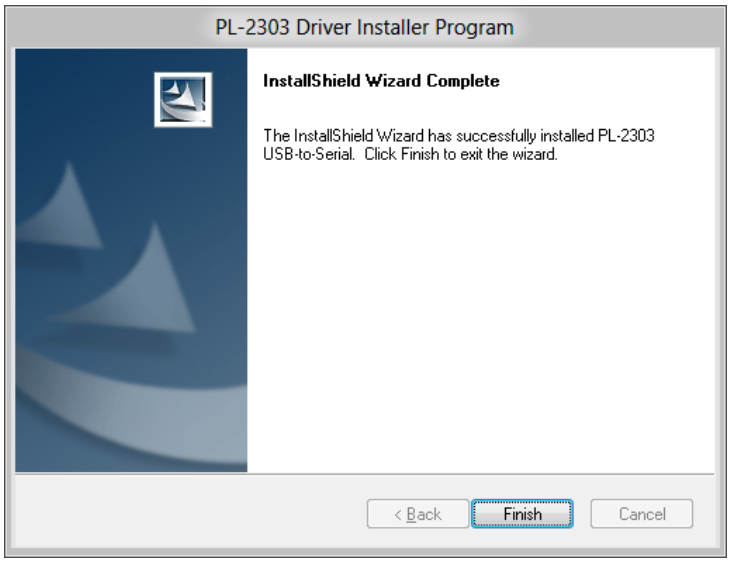


Figure 5: Finish PL-2303 USB-to-Serial Installation

[7] Click the finish button for Data Logger installation.

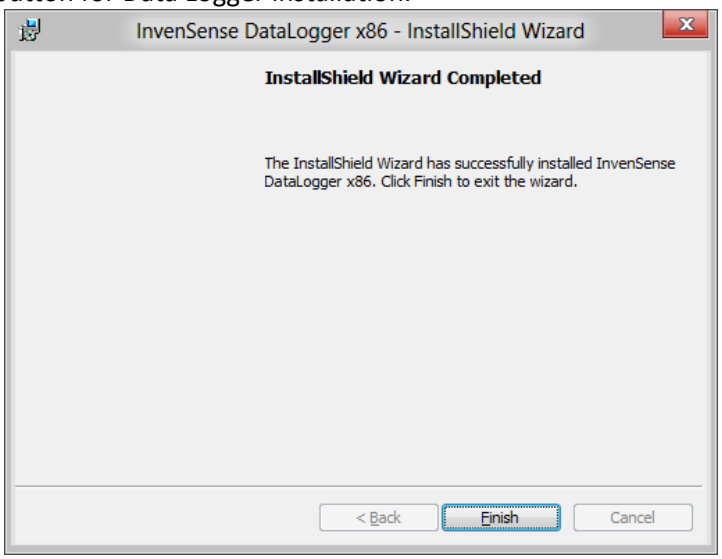


Figure 6: Finish Data Logger Installation

6. How to use the application (Screen Shots and any notes)

[1] Start application: Double click to launch the application, then select device (for this scenario) “MPU 6500” as shown below. Make sure the hardware is connected to the PC.

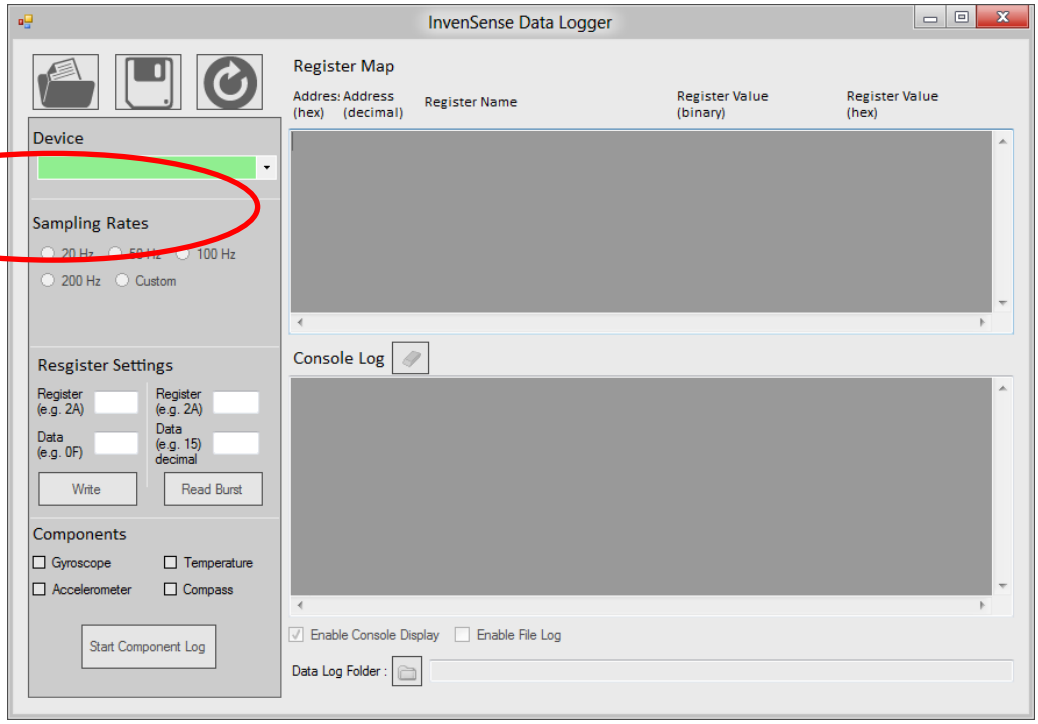


Figure 7.0 Show the first step of selecting the device

[2] If the device supports sensor board support both I2C and SPI interface, user will be requested to select the desired connection mode.

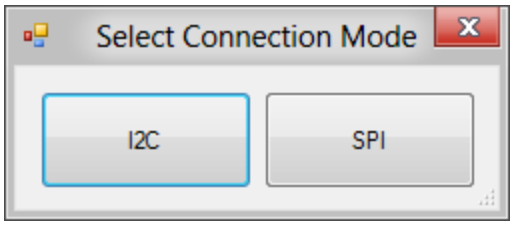


Figure 8.0 Select connection type

[3] Data logging options and controller

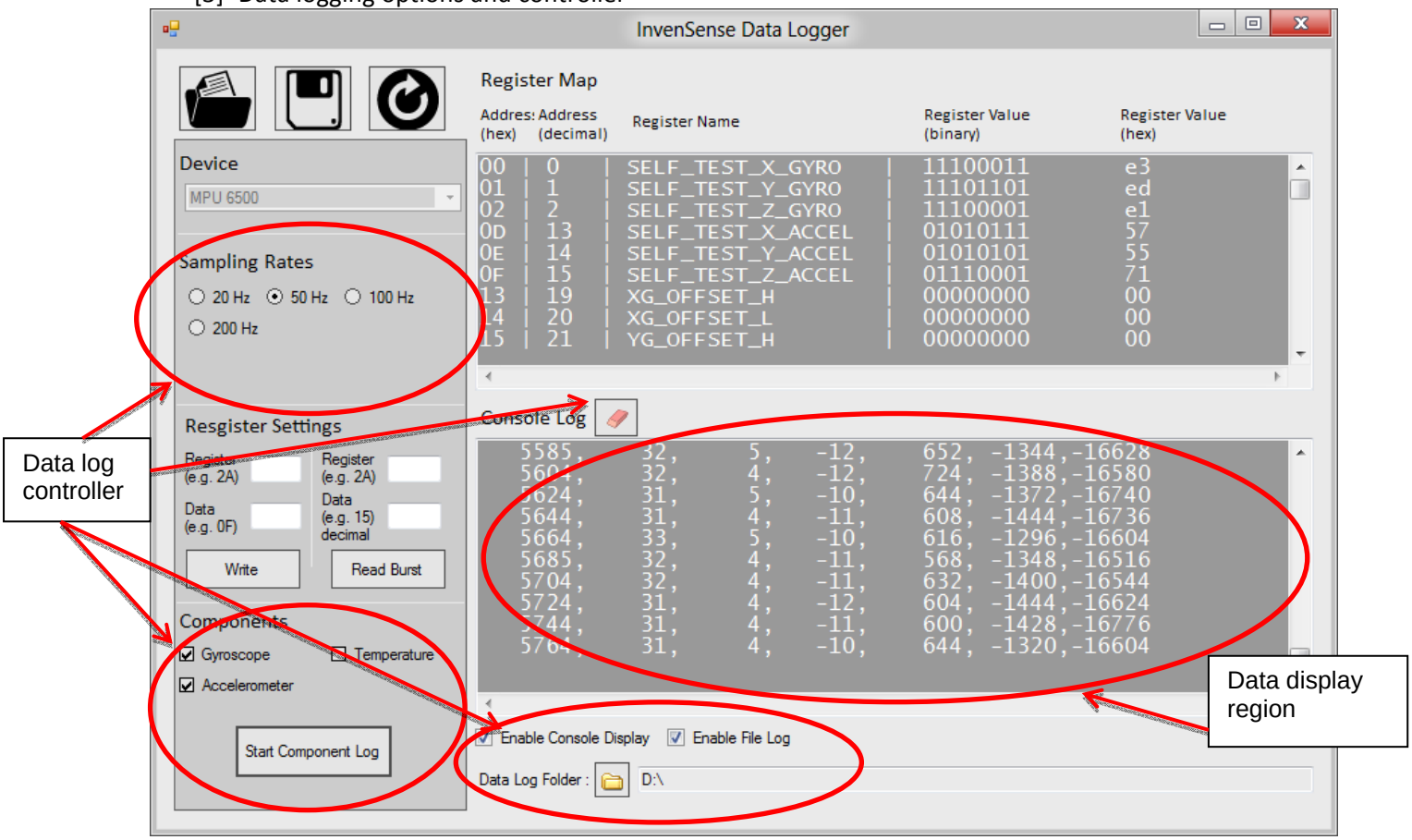


Figure 9.0 Show the different steps to start logging data

You can use data log controllers to setup

- Sensor components need to be logged; in this case, gyroscope data or accelerometer data. At least one of them needs to be selected.
- Data log folder where the logged csv file will be saved to.
  - *"Enable File Log"* option will allow you to dump data into a csv file.

- *Note, there will be an additional file generated with "reg" appended to the filename which records the register map setting for the file you just logged*
- "*Enable Console Display*" option will allow you to decide if real time logging data shall be displayed on the *data display region.*

- Set sampling rate by clicking default options. You can also choose different sampling rates by changing register map value. When you choose the radio button based sample rate the Low pass filter setting is selected for as well, please check the register map as a ~42Hz filter is selected.
- Start Component Log button: Click this button to start to logging. At least one of the "Enable File Log" option and "Enable Console Display" option should be chosen.

- Stop Component Log button: This button will show after user starts the data logging process. This button will stop the logging process.
- Erase button: clear out data display region.

[4] Register map and how to modify

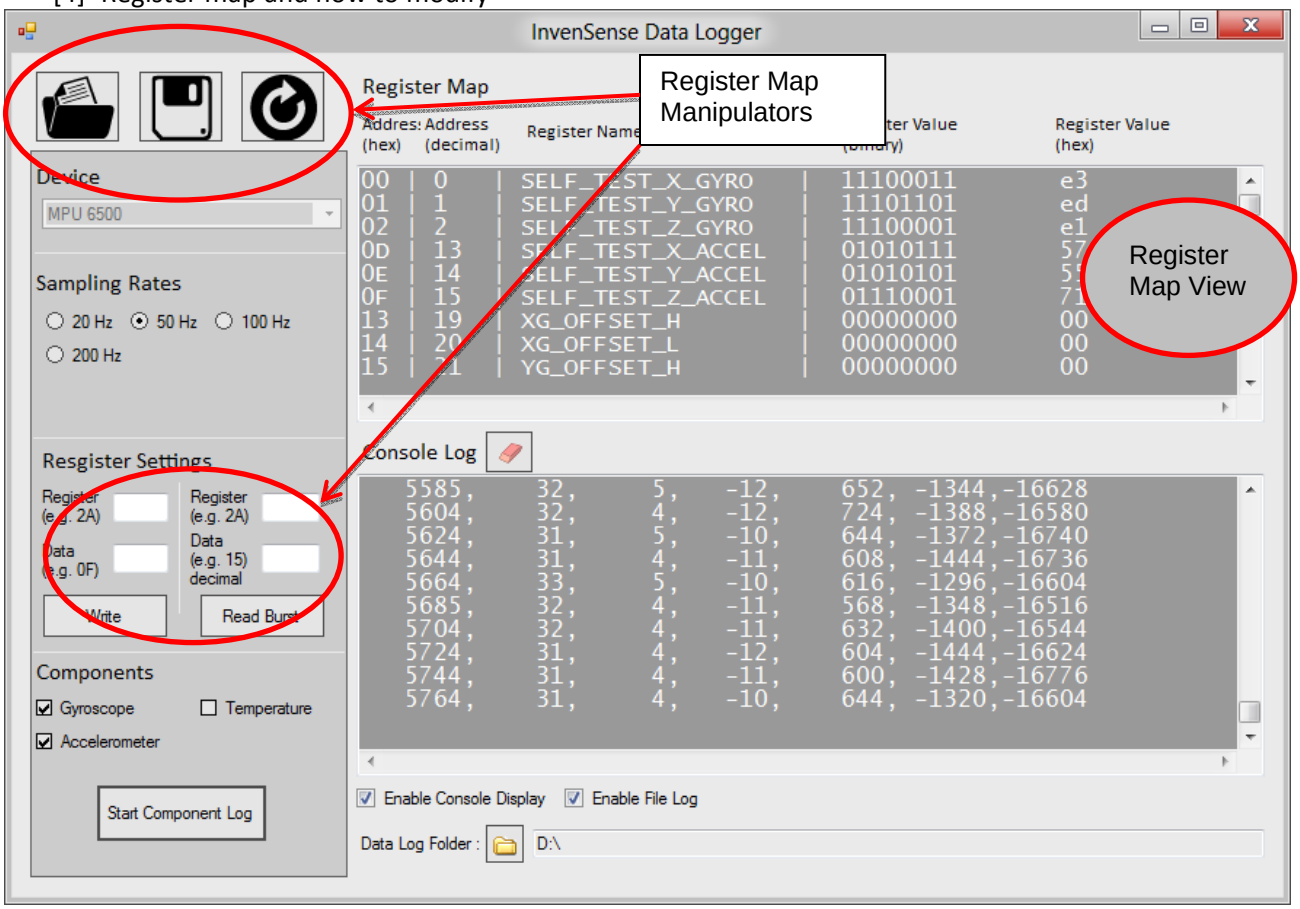


Figure 10.0 Show the register map definitions and how to change

- Existing register map will be automatically loaded once a valid device is selected.

- Save register button: save register map to a file.
- Load register button: load register map from an existing file.
- Refresh button: Loads the current register map data from board to Register Map View.
- Writer register map: write a value into a register address. Both are hex values. For example one can write value “05” to register 0x19. By doing this, sampling rate divider will be set to be 5 and sampling rate will set to be 166 Hz. (1000/(sampling_rate_divider +1))

7. How to interpret the logged data

Going through the data sheet and the register map setting one should be able to interpret the data from the counts to its respective units. Here is an example which will show how to interpret data for Gyroscope, Accelerometer, Magnetometer and Temperature data.

Settings for data collection:

- EVB selected 9250
- Sample rate selected 50Hz (Use radio button)
- Put the board flat on the table and collect data for a minute
- Selected all the component for logging and enabling file logging

What is needed?

- 9250 register map data sheet and product specification data sheet
- <filename>.csv file one just logged or console data
- <filename_reg>.csv register map for the logged file or reading from the UI

Following calculation is for reference only; please check spec and data sheet for each specific board.

Gyroscope Data:

1. Get gyroscope data configuration.
   Based on register map, register address 0x1B is for gyroscope configuration. Gyroscope full scale range is defined by [4:3] bits. In the example, we have 01, i.e. ¼ full scales. Full scale is 2000 DPS
2. If the gyroscope LSB data(X, Y, Z) is (-484, 1930, 3722). To convert LSB to DPS:
   <dps_value> = <LSB>/(2^15) * Full_scale_range*1/4 .
   (-484, 1930, 3722)LSB = (-7.38, 29.45, 56.79) DPS

Accelerometer Data:

1. Get accelerometer data configuration.
   Based on register map, register address 0x1C is for accelerometer configuration. Accelerometer full scale range is defined by [4:3] bits. In the example, we have +/-4g(01).
2. If the accelerometer LSB data(X, Y, Z) is (168, 858, 8127). To convert LSB to g:
   <g_value> = <LSB>/(2^15) * Full_scale_range.
   (168, 858, 8127)LSB = (0.02, 0.1, 0.992)g

Magnetometer Data:

Based on AKM8963 spec, the sensitivity is defined as 0.6µT/LSB

< µT _value> = <LSB>*0.6
(-14, -49, 12)LSB = (-8.4, 29.4, 7.2) µT

Temperature Data:

Based on the register map data sheet, the temperature should be calculated as follow:

< °C_Value> = (35 + (<LSB>+ 532)/340)°C = <LSB>/340 + 36.5647

(-3870)LSB = (25.18)°C

8. Trouble shooting tips

In case there is problem in connecting to device or one is facing trouble in automatic driver installation, please follow the following process to manually install the driver/trouble shoot the USB connection.

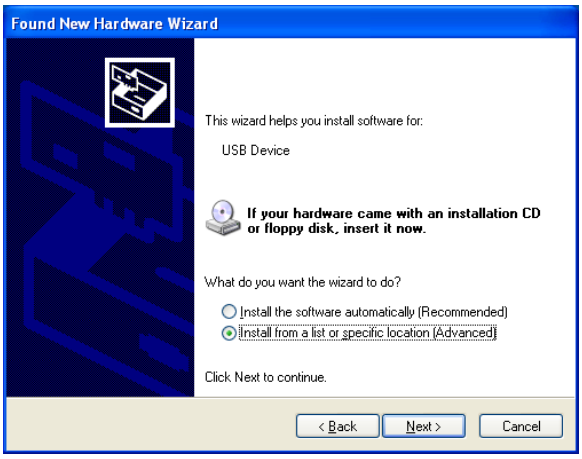
8.1 USB driver installation

The installation should take care of providing the system with all the necessary files and driver to operate the USB platform. Nevertheless, if the process goes wrong the installation package contains a copy of the drivers.

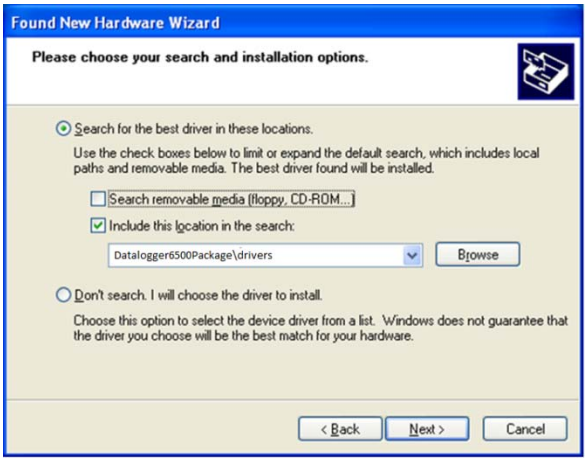
Plug the supplied USB cable into the MPU USB board, and then into host PC. Automatic USB device discovery should now start in Windows, as shown below.

If the PC drivers are not installed correctly, a Found New Hardware window may appear and ask you if you wish to connect to Windows Update to search for software. Select **Yes, this time only** and click the **Next >** button. Keep in mind that this box may not appear based on the individual settings of the computer.

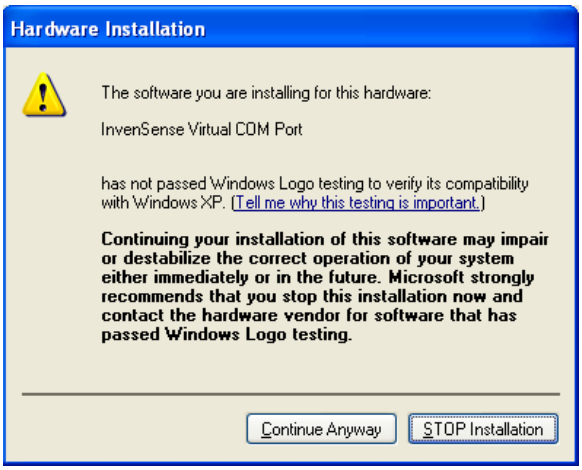
Windows will attempt to search for an appropriate driver. It will then ask for an install location. Select **Install from a list or specific location (Advanced).**



The user will then need to specify the location of the driver files. They should be located in the installation directory in the 'drivers' folder. The filename is 'Invensense *.inf'.

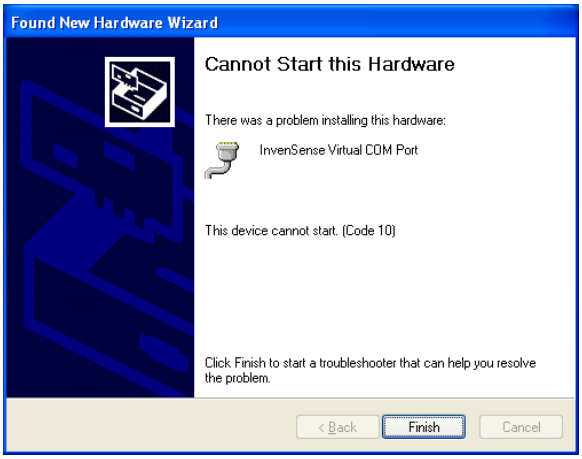


If a dialogue box appears stating that the drivers have not been certified, click **Continue Anyway**. The software has been tested with Windows XP and Windows 2000, and operates correctly.



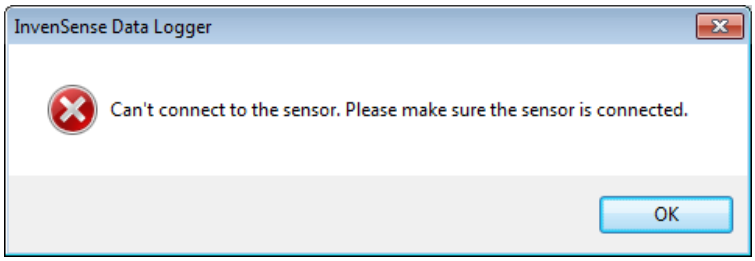
Windows will then install the necessary driver files. A dialogue box stating that the installation has completed will appear. Press “continue anyway” and the installation will be completed.

Note: Occasionally a Dialog box will appear stating that the hardware did not start correctly. If this is the case, click on **Finish** to clear the box. Then disconnect the USB cable from the computer, wait 5 seconds, and reconnect the USB cable to the computer. This will re-establish communications and the demonstration kit hardware will now operate correctly.



8.2 Can’t connect to the sensor.

For docking system, it has been noticed that when USB cable is connected to the PC directly, it can’t connect to the sensor. Please switch to USB port on the docking system and try again. Switch to different ports if needed.


InvenSense Data Logger
Can't connect to the sensor. Please make sure the sensor is connected.
OK