LadyBug LB989A SPI / I2C Demonstration Kit

GENERAL

LadyBug Technologies SPI Demonstration Kit is designed to demonstrate SPI and I2C communications with LB5900 Series sensors. The demonstration package includes firmware for an ST Micro STM32F429I-DISCO board and all adaptors and cables required to interface the sensor. The user will need to acquire a LadyBug LB5900 Series sensor and Atollic True Studio for ARM to develop the project. The free (lite) version of True Studio is suitable.

The examples are provided to assist the customer in getting started making measurements and developing their own system. Only limited testing has been done.

Users of this demonstration kit should be familiar with C programming and environments such as Atollic True Studio for ARM.

**Figure 1 - LB5918A-SPI Power Sensor
(Not included in Demonstration Kit)**

Kit Items:

ST Micro STM32F429I-DISCO	- Included in the Kit
USB A to Mini B for ST board with firmware	- Included in the Kit
LB985A SPI Adaptor	- Included in the Kit
LB981A I2C Adaptor	- Included in the Kit
LB989A 14 Pin Dip Adaptor	- Included in the Kit
Firmware for ST board with firmware**	- Included in the Kit

Non Kit Items:

LB5900 Sensor with Option SPI (Contact sales)	- Not provided in Kit
Atollic* True-Studio for ARM	- Not Provided in Kit

*Download True Studio for ARM Lite, free version from www.atollic.com
** Also available for download on LadyBug's site

Kit Contents

SPI Adaptor   I2C Adaptor   14 Pin DIP Adaptor

Users that need to use other controller boards are encouraged to contact LadyBug regarding the adaptors, sockets and other accessories suitable for developing applications with LB5900 direct connection.

Additional resources recommended (available in the kit and on LadyBug's website)
LadyBug's LB5900 Programming guide
LadyBug's Option SPI hardware guide
LadyBug PMA-12 USB Sensor software application
LadyBug Test Harness / Interactive IO software

ST Micro Demonstration board

The ST Micro board provided in the kit utilizes a series protection diode in the power supply circuit. This series diode can drop the 5 Volt USB supply voltage to levels below recommended operating voltage for the LB5900 Series Sensor. Therefore the diode has been bypassed on the kit provided board. Users who choose to acquire a board separately and install LadyBug demonstration firmware should bypass the diode as shown in Figure 2 of this document. Note that future revisions of the board may require review of the diode location and number.
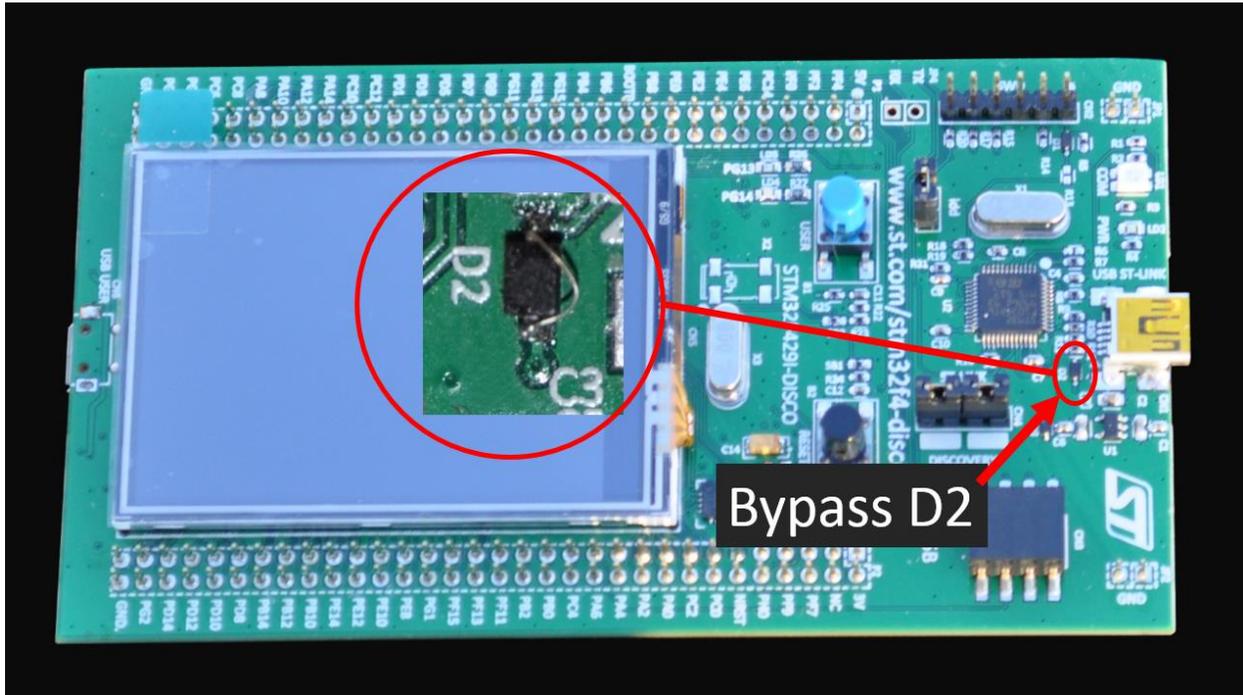
Figure 2 - ST Micro STM32F429I-DISCO Board with Bypassed Diode

When connected to the ST Discovery board using the LadyBug adaptor, power is supplied for one sensor. The demonstration firmware is designed to manage one sensor. Sensor selection is discussed further below in the section for each adaptor (I2C or SPI) as well as LadyBug's Option SPI document.

The Demonstration board is pre-loaded with the SPI version of software and will begin making measurements as soon as it is connected to a sensor and powered.

ST Demonstration board with LB981A I2C Adaptor

The I2C adaptor is designed to slide over the 8 pin connector as shown in Figure 3. The Sensor's cable connects to the bottom side of the adaptor board. Use care when inserting the adaptor into the ST demo board so that all 8 pins align properly.
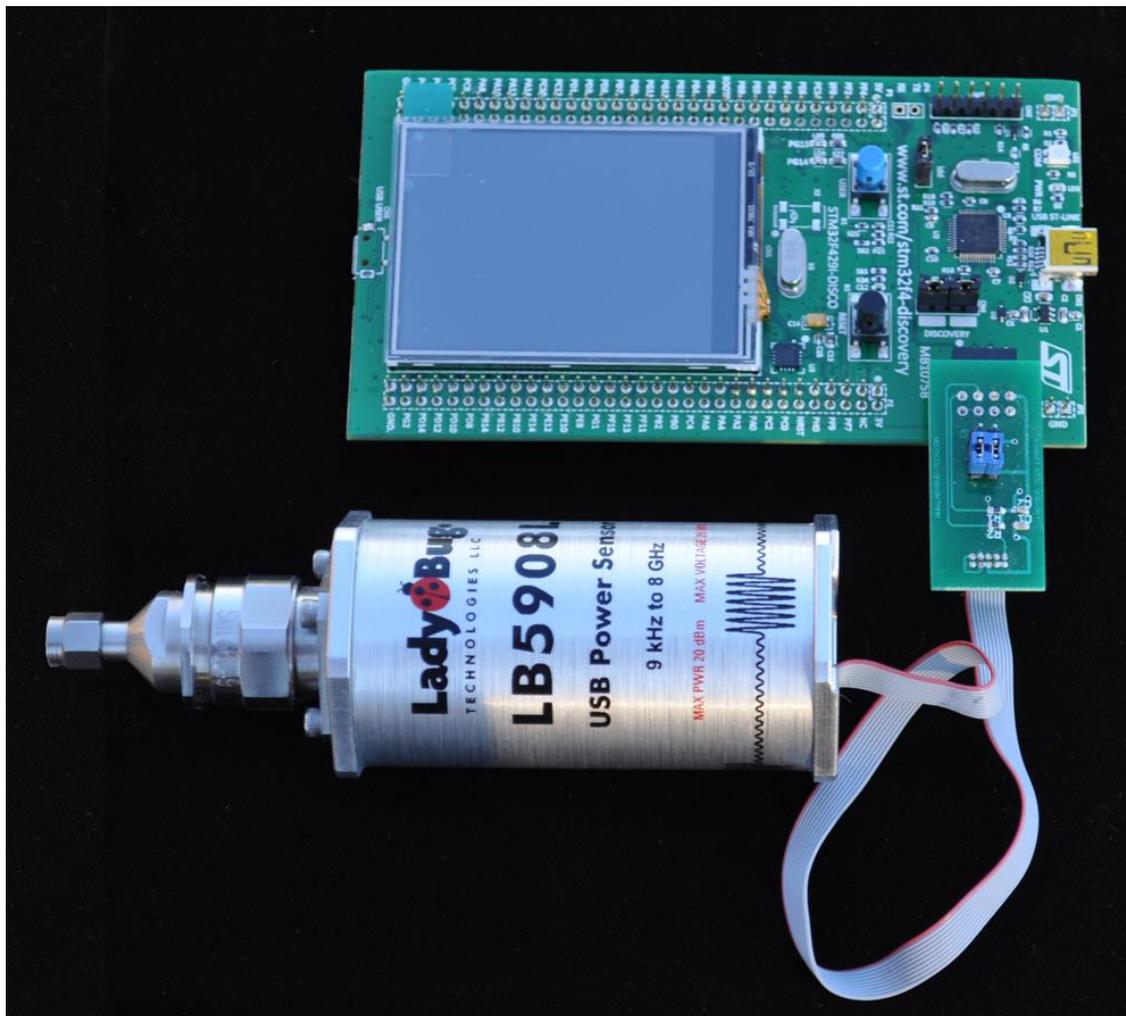
Figure 3 - ST Demonstration board with I2C Adaptor Connected

LadyBug LB5900 Series Sensors using I2C are hardware address selectable. This allows the use of the use of up to 4 sensors over one I2C connection. Because no stored addressing is utilized inside the sensor, the sensor will function if Option MIL is installed. The two jumpers on the adaptor board feed into the sensor (not the ST Demo board) and indicate to the sensor which address it should respond to. This allows the user to develop the firmware with different address using only one sensor.

The jumpers are labeled 0 and 1, and reference the binary addresses 0-3. Refer to the Option SPI document for further information regarding sensor addressing.

ST Demonstration board with LB985A SPI Adaptor

The SPI adaptor is designed to slide over SWD pins, ground pins and part of the 2 row header as shown Figure 4. The Sensor's cable connects as shown on the adaptor board. Use care when inserting the adaptor into the ST demo board, both the two small ground pins (JP1) and PE2 on the two row header should be connected.
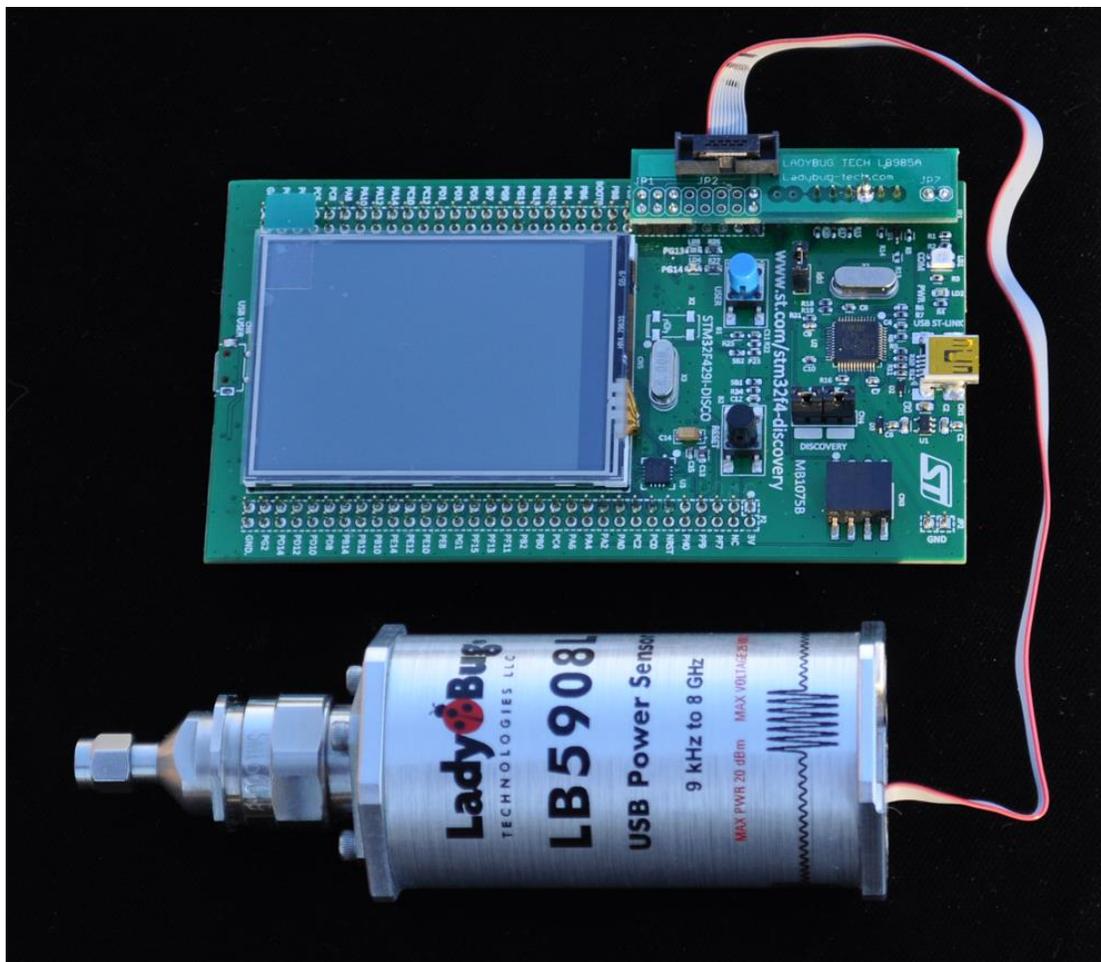
Figure 4 - ST Demonstration Board with SPI Adaptor

LadyBug LB5900 Series Sensors using SPI are selected using the SS line as described in the Option SPI document. Provision for addressing other sensors is *not* provided on the LB985A adaptor.

Sensor using SPI or I2C will function when / if Option MIL is installed. Refer to Option MIL for any limitations.

Using the demonstration firmware

The ST board has been loaded with SPI & I2C firmware and will function with an LB5900 sensor when it is powered.

We have made every attempt to make the system usable from the start; however development tools, software and microcontroller products change at a very rapid pace. Some updating may be required. Developed using Atollic TrueSTUDIO® for ARM®. Version: 5.4.0

To install the software, unzip the desired LadyBug version (I2C / SPI) into a known location. Acquire Atollic True Studio for ARM.

Start Atollic and create a new empty workspace.

Select Import, then General and Existing Projects into Workspace then Next

Point the file selection at the upper directory in the UNZIPPED LadyBug project and select OK.

The project will import into the workspace.

Both the SPI and I2C projects should be imported into the same workspace and onto the board, however only one will be active on the board at any one time. The startup screen on the board allows selection of the communication type (SPI or I2C) when the board is powered up.

Make sure the project explorer window is open and highlight the desired project, then start the debugger and download the firmware to the board. At this point, if desired, the board can be connected to a power only adaptor or the Atollic environment can be closed.

NOTE: The ST Micro STM32F429I-DISCO board may require updating for all of the ST Micro & Atollic debug features to function properly. This can be done inside the Atollic environment and is normally self-explanatory. With some versions of the ST demo board, the firmware update feature may not start automatically. If this is the case, jumper the Boot0 pair on the ST demo board header and reconnect the USB line. This will force the board into DFU mode and the firmware will update within the Atollic environment. A jumper from the I2C board can be used if desired. Once the update is complete, remove the jumper.
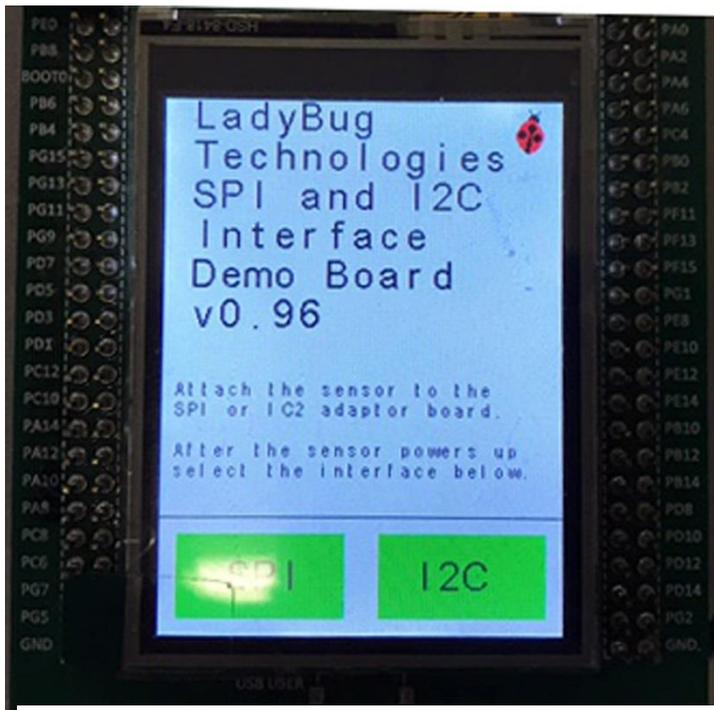
Figure 5 - Program Startup Screen

The demo board utilizes a touch screen in addition to the two pushbuttons. Referring to Figure 1, the Black Button will reset the board when depressed. This does not power down the sensor. Pressing the Blue Button (Figure 1) will cause the program to single step through the commands.

Figure 5 shows the startup screen that appears when the board is powered up ore released from reset. From here, you can select either the SPI or I2C firmware. Selection is done by lightly touching the SPI or I2C green highlighted Icons.
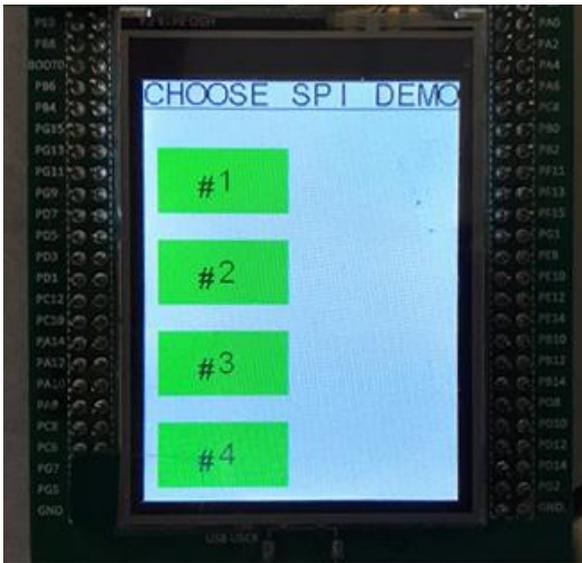
Figure 6 - SPI Choices

If the SPI connection is to be used, select the Green SPI icon and the board will display the image in Figure 6.

Select #4 for a demonstration on READ?. Read is a perhaps the most straightforward and useful measurement command. When READ? is sent to the sensor, it begins a measurement and returns after the specific number of averages has been collected. After Selecting #4, several setup commands will be made and shown, and then the measurement will be repeated as shown in the red highlighted area of Figure #7.
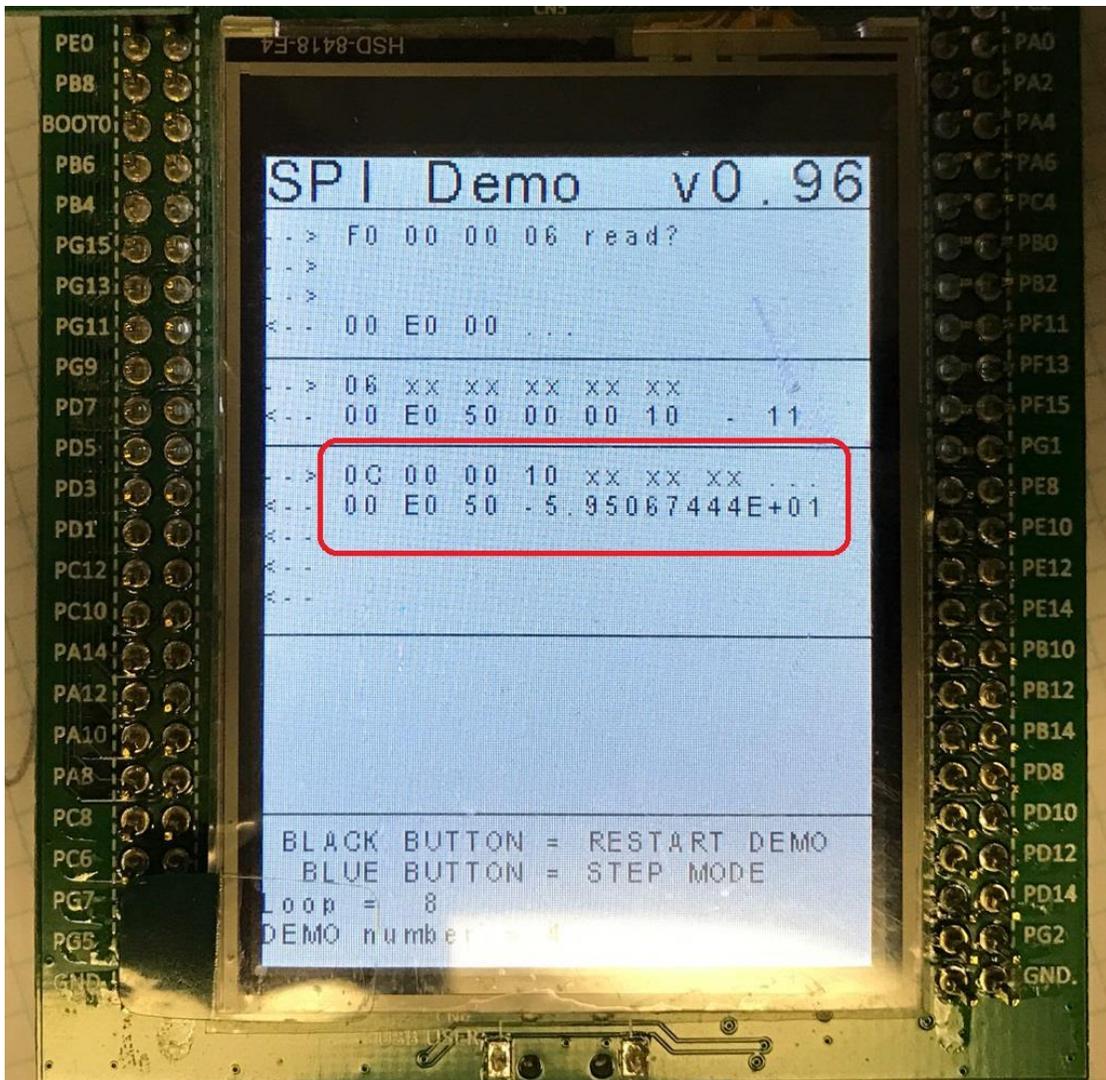
Figure 7 - SPI-Measurement
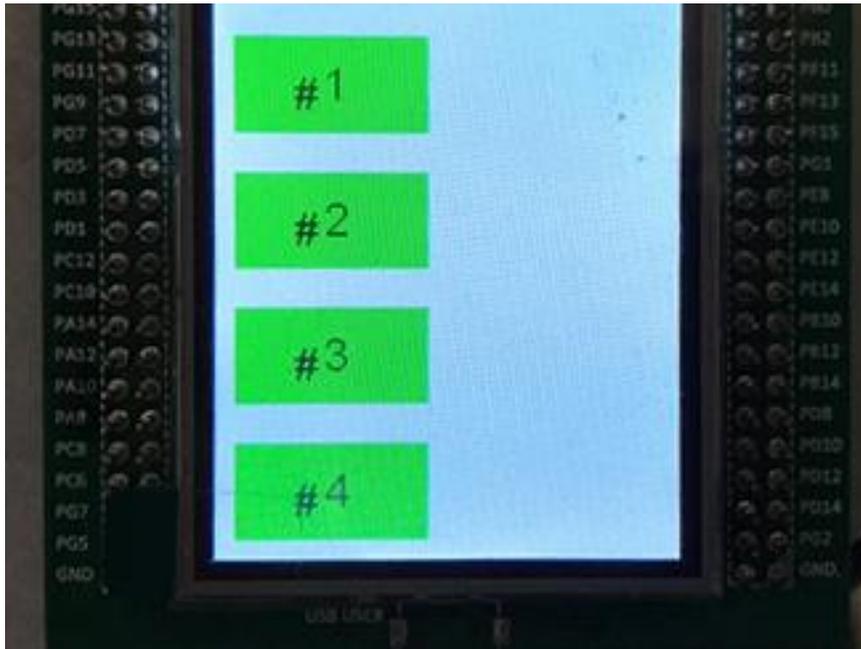
Figure 8 - I2C Selection Screen

If I2C is selected on the Startup Screen shown in Figure 5, The I2C selector screen shown in Figure 8 will appear. After selecting #4, the board will test to see which I2C address the sensor is set to, then setup and make the READ? measurement.

The measurement is shown in Figure #9.
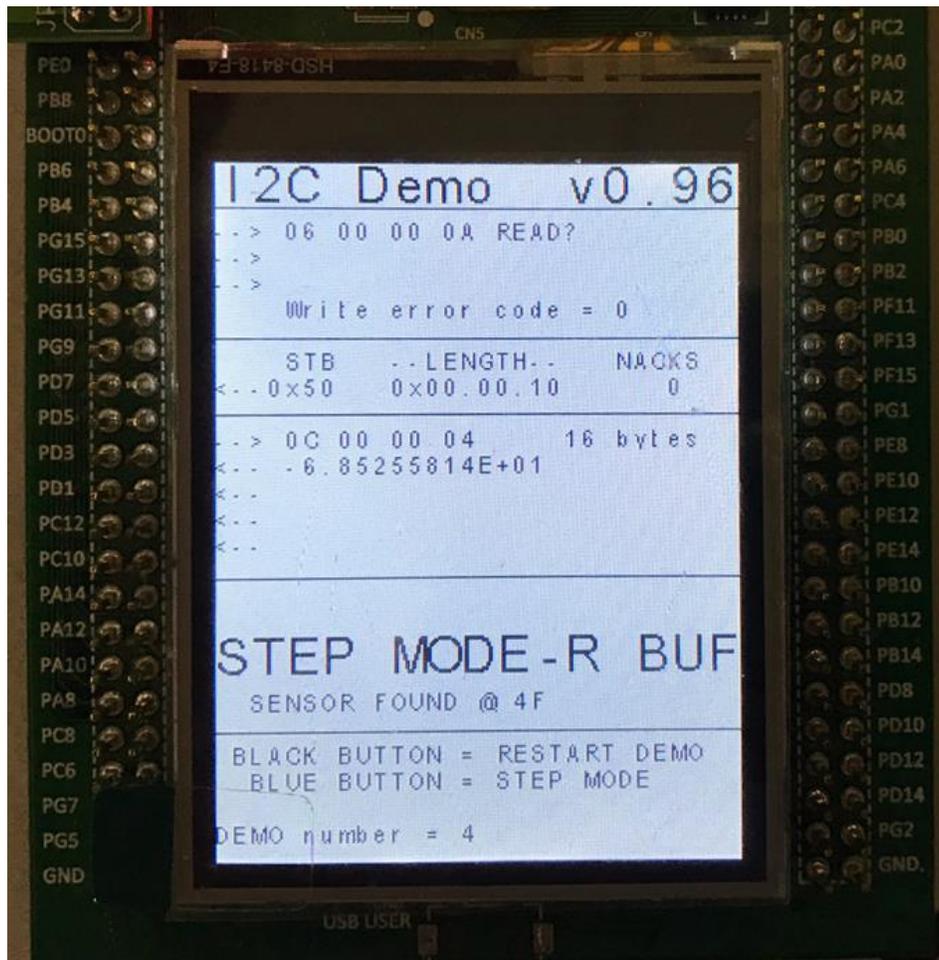
Figure 9 - I2C Measurement

Please contact sales@ladybug-tech.com for assistance.