

EVAL-ADIS: *i*Sensor Evaluation System

FEATURES

PC USB evaluation system for inertial measurement units

PC evaluation software

IMU evaluation: [ADIS16375](#), [ADIS16488](#)

Windows XP, Windows Vista, and Windows 7 compatible

32-bit and 64-bit USB driver support

Fast data acquisition

29,000 register reads per second (16-bit registers)

No external power supply required for most products

KIT CONTENTS

EVAL-ADIS circuit board

16-pin ribbon connector, 2 mm

USB mini cable, 6 ft

M2 × 0.4 mm machine screw kit



Figure 1. Photograph of Inertial Sensor Evaluation System

GENERAL DESCRIPTION

The *i*Sensor® family of inertial measurement units (IMU) provides a serial peripheral interface (SPI) for data communications. The SPI interface and a well-calibrated cluster of sensors enable quick integration into systems that employ embedded processor systems. The EVAL-ADIS system provides a simple tool for getting started with *i*Sensor IMUs for those who are not ready to integrate them into embedded processor systems.

The EVAL-ADIS circuit board provides tapped holes (M2 × 0.4 mm), and the kit includes an assortment of M2 × 0.4 mm machine screws for simple IMU attachment. The location of the mounting holes facilitates easy electrical connection with the mating connector (J4 on the EVAL-ADIS).

The power management system provides jumper selection for three device under test (DUT) power options: 5 V (USB), 3.3 V, and an external power option. The 5 V option provides access to the USB's 5 V supply voltage for the DUT, and the 3.3 V option uses a linear regulator, 400 μF of bulk capacitance, and a soft start circuit to manage transient currents on the USB port.

The EVAL-ADIS system and IMU evaluation software package support the [ADIS16375](#) and [ADIS16488](#) IMU products. This software package provides three different modes of operation:

demonstration (main window), register access, and data capture. When using the demonstration mode, users have access to a simple visual response to sensor motion in the form of a waveform recorder output, which is useful in concept demonstrations or functional verification of the IMU. Individual register read and write cycles are available in the **Register Access** window. PC data acquisition is available using the **Data Capture** window, which provides a number of control inputs, including data register selection, data file format, and data storage location. In data capture mode, the EVAL-ADIS reads and stores data from each selected register every time that the IMU's data-ready signal pulses. It offers a read rate of 29,000 register reads per second, which enables data acquisition of all 10 inertial outputs of the [ADIS16488](#) at its maximum sample rate.

The EVAL-ADIS kit includes a mini-USB cable for quick connection to a PC. The IMU evaluation software package supports operation on Windows® XP, Windows Vista, and Windows 7 (32-bit and 64-bit) PC systems.

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REVISION HISTORY

11/11—Revision 0: Initial Version

MECHANICAL SETUP/INSTALLATION

OVERVIEW

Figure 2 provides a top level view of the EVAL-ADIS printed circuit board (PCB), which provides two electrical connectors (J1, J4) and a series of mounting holes. Table 1 provides the mating connector and mounting hole identifiers for each compatible product. Table 2 provides the mounting hardware and power supply settings for each compatible product. The unused mounting holes and mating connectors support future product compatibility.

Table 1. Mating Connector and Mounting Hole Identifiers

Product	Mating Connector	Mounting Holes
ADIS16375AMLZ	J4	F
ADIS16488AMLZ	J4	F

Table 2. Mounting Hardware and Power Supply Settings

Product	JP1	Machine Screws
ADIS16375AMLZ	3.3 V	M2 × 0.4 × 20 mm ¹
ADIS16488AMLZ	3.3 V	M2 × 0.4 × 20 mm ¹

¹ May need to trim length or use M2 × 0.4 × 16 mm machine screws to maintain a flush bottom-side surface.

ADIS16375 AND ADIS16488 INSTALLATION

The [ADIS16375AMLZ](#) and [ADIS16488AMLZ](#) use the same package and pin assignments. Use the following steps to install either IMU onto the EVAL-ADIS:

1. Make sure that the EVAL-ADIS is not plugged into a PC USB port or any external source of power and signals.
2. Set the IMU in its correct location, using J4 and the F mounting holes.
3. Make sure that the IMU pins line up with the holes on J4, and then gently press the IMU down into the connector.
4. Inspect the connector to make sure that the pins are properly aligned and connected.
5. Secure the device with the M2 machine screws listed in Table 2.
6. Set the correct JP1 setting, according to Table 2.
7. Install the USB driver and IMU evaluation software package before plugging the EVAL-ADIS into a PC USB port.

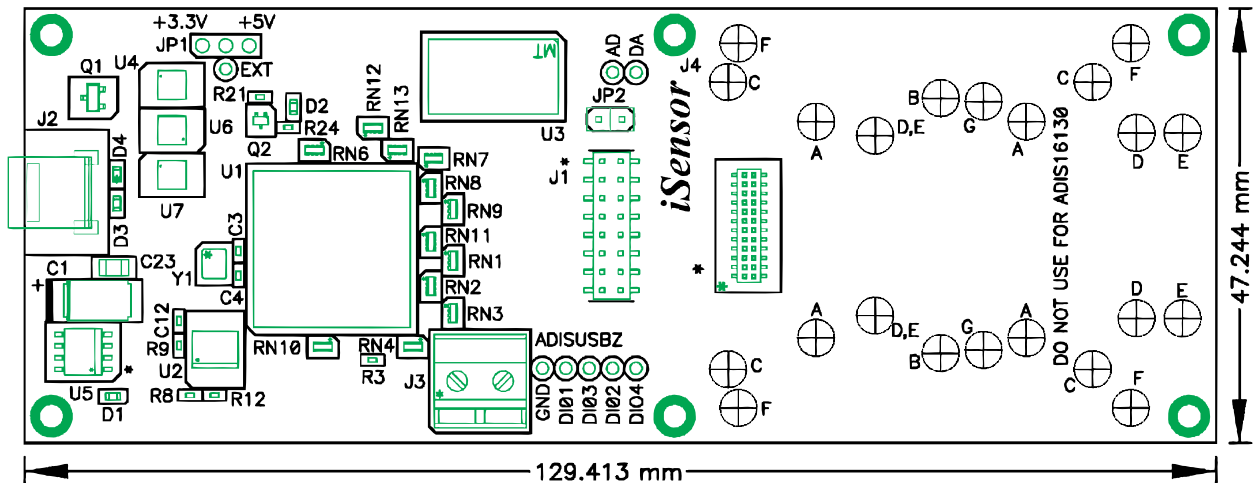


Figure 2. Top Level View of PCB

09902-002

SOFTWARE INSTALLATION

All software packages that are compatible with the EVAL-ADIS are available at: www.analog.com/EVAL-ADIS. Table 3 provides a list of compatible devices and their respective software packages.

Table 3. EVAL-ADIS-Compatible Devices and Software

Product	Software
ADIS16375AMLZ	IMU evaluation
ADIS16488AMLZ	IMU evaluation

Download the IMU evaluation installation package to a temporary location to evaluate the [ADIS16375](#) or the [ADIS16488](#). Then extract the file contents (from the *.zip file) to the same directory (see Figure 3).

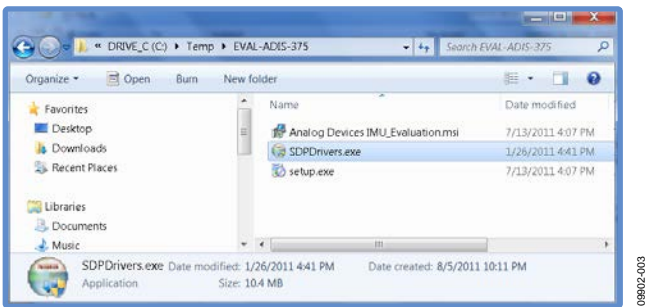


Figure 3. Typical Contents in Evaluation Download

USB DRIVER FILE INSTALLATION

The **SDPDrivers.exe** file contains USB drivers that are compatible with both 32-bit and 64-bit Windows systems. Double-click the **SDPDrivers.exe** file and follow the prompts to install the USB driver files onto the PC. Figure 4 and Figure 5 show the windows associated with this process.

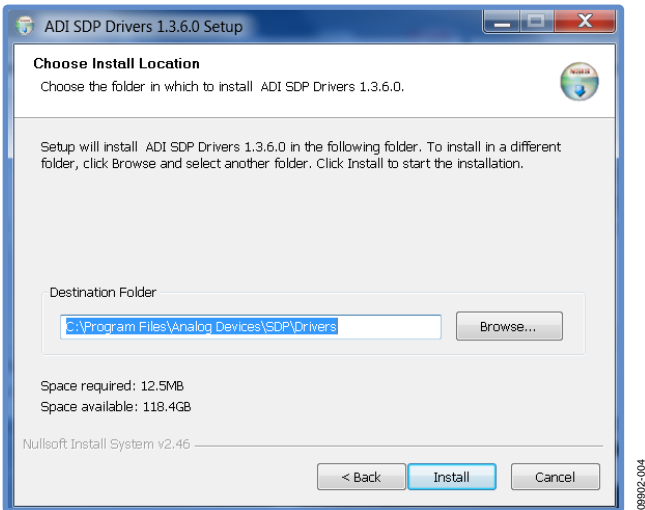


Figure 4. USB (SDP) Driver Setup Window

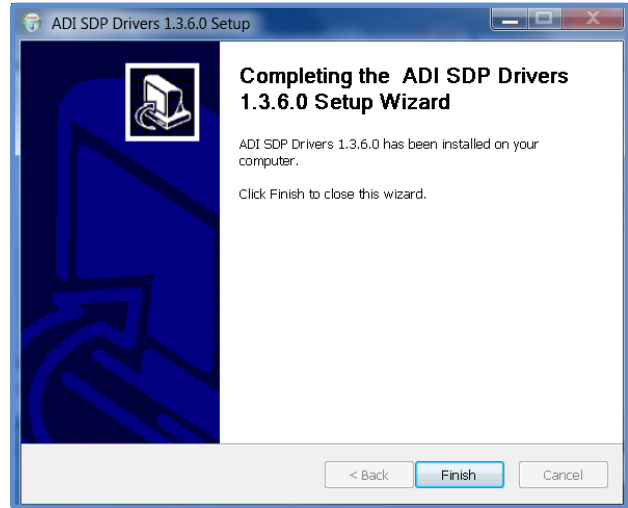


Figure 5. USB Driver Installation Confirmation Window

Microsoft .NET Framework 3.5

The IMU evaluation software requires the Microsoft .NET Framework 3.5, which is now installed on every Windows PC. For legacy computers that do not have this, download it from www.analog.com/EVAL-ADIS, under **Software**. It is included in the file, **SDPDriversNET.zip**.

IMU EVALUATION SOFTWARE INSTALLATION

Double-click the **setup.exe** file to start the software installation process and then follow the prompts. Click **Next** in the welcome window (see Figure 6), enter the installation location folder by clicking **Browse** (see Figure 7), select **Everyone**, and then click **Next** to configure the installation. Confirm the configuration by clicking **Next** (see Figure 8) and wait for all of the files to load. Click **Close** after this process is completed (see Figure 9).



Figure 6. IMU Evaluation Setup Wizard

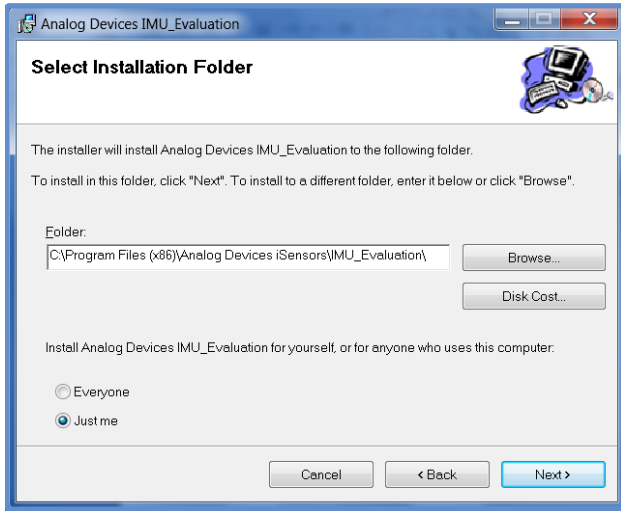


Figure 7. Select Installation Folder Window

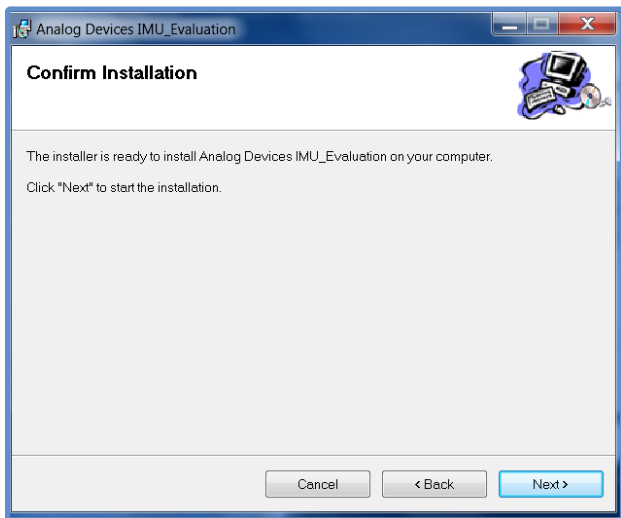


Figure 8. Confirmation Window

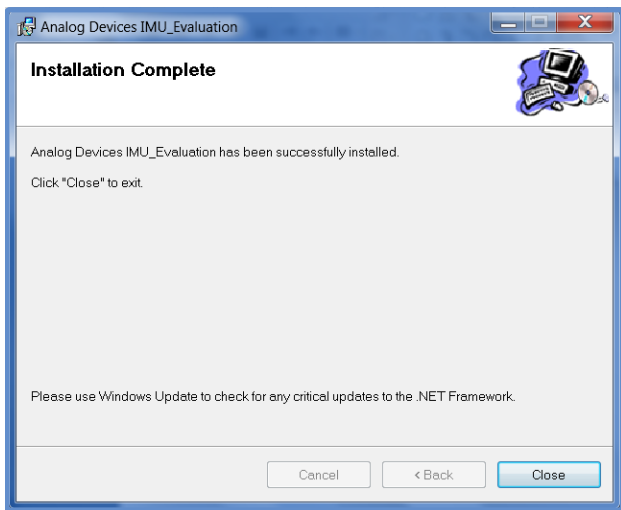


Figure 9. Installation Complete Window

INITIAL SETUP

After installing the application software, plug the EVAL-ADIS into a PC USB port. The EVAL-ADIS takes approximately 10 seconds to boot up and be ready for communication with a PC. After LED1 illuminates to indicate full operation, start the IMU evaluation application, which is in the Windows **Start** menu.

1. Click **All Programs**.
2. Click **Analog Devices iSensors**.
3. Select **IMU Evaluation**.

If EVAL-ADIS communication with the PC does not initialize properly, the **Hardware Select** window opens (see Figure 10).

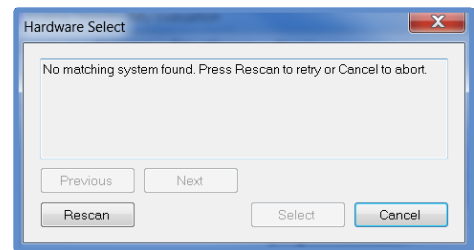


Figure 10. Hardware Select Window, No Device Found

If the **Hardware Select** window opens, use the following steps to establish communication with the EVAL-ADIS:

1. Unplug the EVAL-ADIS from the PC USB port.
2. Wait 2 sec to 3 sec and plug the EVAL-ADIS back into the PC USB port using the USB cable. LED2 illuminates immediately, and LED1 lights up when the EVAL-ADIS has completed its self-initialization.
3. Click **Rescan** in the **Hardware Select** window.
4. LED1 begins blinking and the **Hardware Select** window updates with an option to select the device (see Figure 11). Click **Select**. The program completes the connection and opens the main window (see Figure 12).

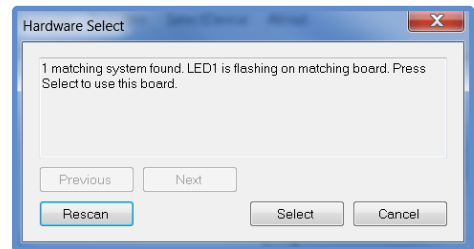


Figure 11. Hardware Select Window, **Select** Option Enabled

IMU EVALUATION SOFTWARE OPERATION

The main window (see Figure 12) provides waveform recorders for basic demonstration, along with the following menu bar options: **Devices** (device selection), **Register Access**, **Data Capture**, **USB Tools**, and **About** (basic information).

DEVICES MENU

Products with the ADIS163xx/4xx part numbers have a specific register that contains the part number. The software reads this register automatically when it starts up and uses the register to configure the software with the correct register and function information. Click the **Devices** menu option after changing the DUT on the EVAL-ADIS. Use the following steps to change a unit while keeping the IMU evaluation software open:

1. Unplug the EVAL-ADIS from the PC USB and any other power source.
2. Remove the existing DUT from the EVAL-ADIS.

3. Install the new DUT onto the EVAL-ADIS (see the ADIS16375 and ADIS16488 Installation section).
4. Plug the EVAL-ADIS back into the PC USB.
5. Wait for LED1 to illuminate, indicating that the EVAL-ADIS is ready for communication with the PC.
6. If the software does not recognize the EVAL-ADIS automatically, click **USB Tools**, then **Connect**, to establish communication (see Figure 18).
7. Select **Devices** and then select the part number for the new DUT that is installed on the EVAL-ADIS.

WAVEFORM RECORDER

Click the **Read** button to start the waveform recorder function, and then move the IMU to observe the response on the screen (see Figure 13 for an example). The **Read** button changes to a **Stop** button when the waveform recorder is in operation. Click **Stop** to turn the waveform recording off.

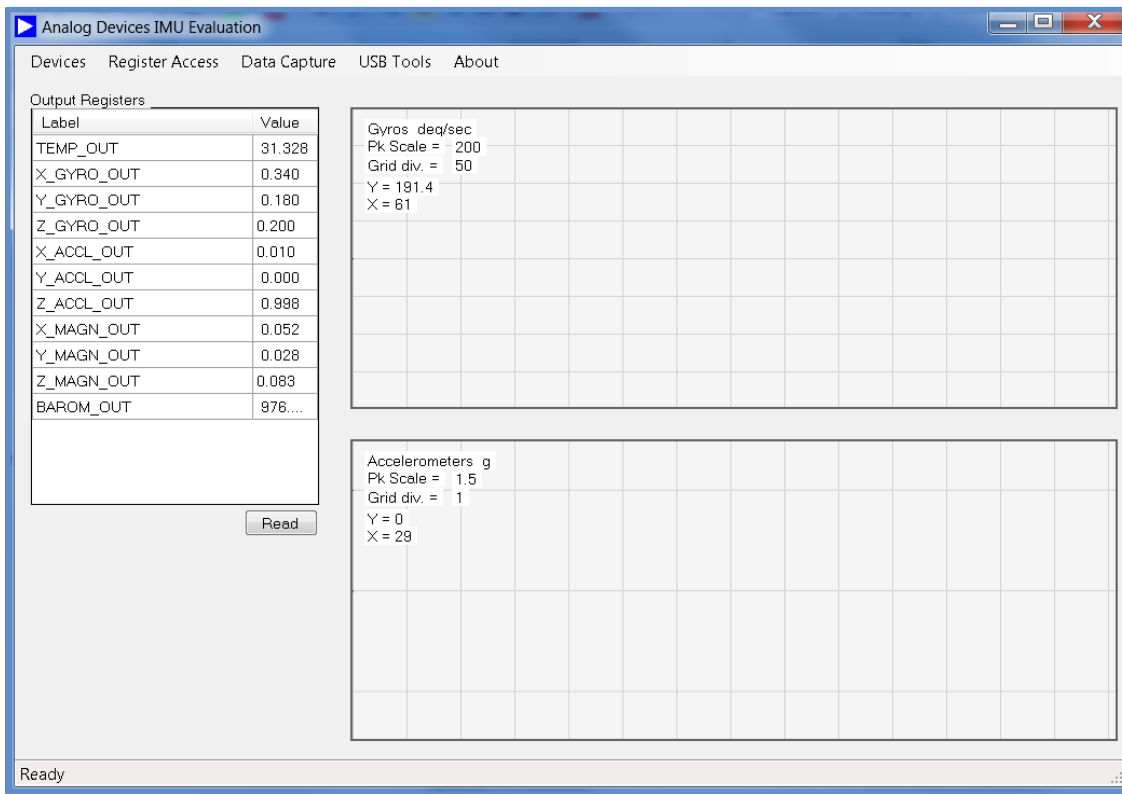


Figure 12. IMU Evaluation Main Window

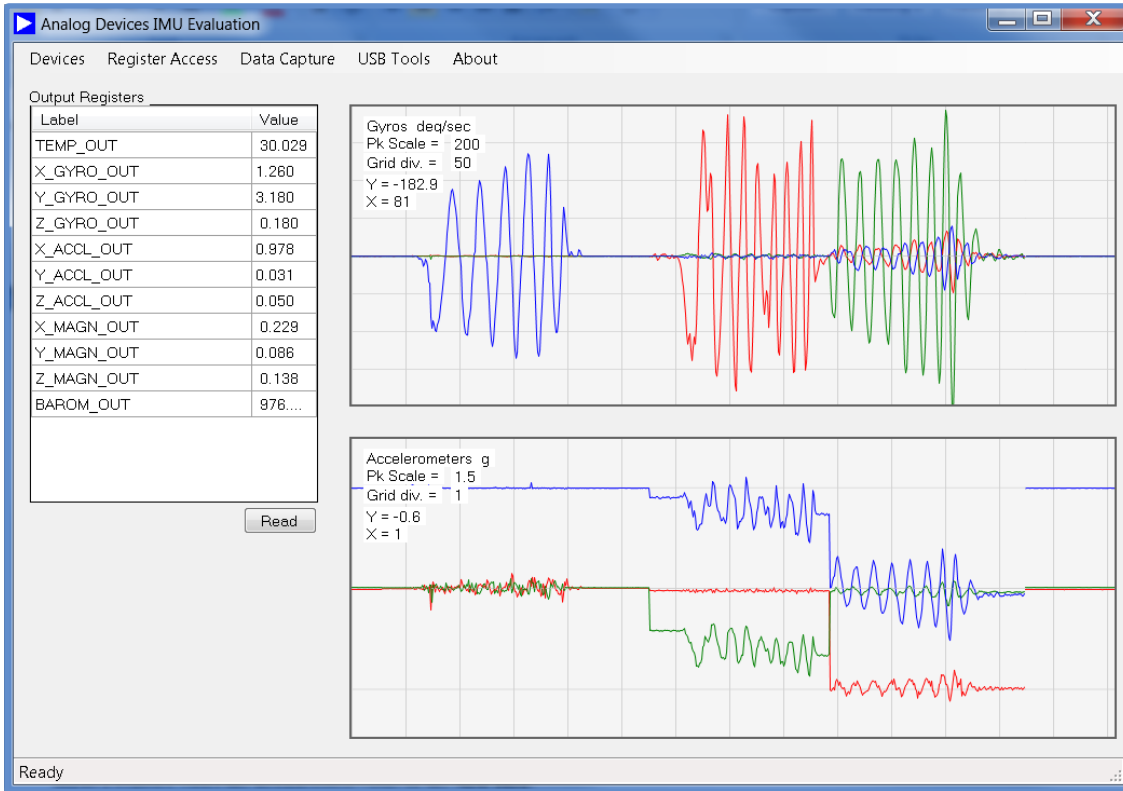


Figure 13. Demonstration/Function Testing Example

REGISTER ACCESS MENU

Click **Register Access** in the menu bar of the main window to access the window that provides read/write access to each register inside the DUT.

The **Register Access** window provides a list of all user-accessible registers inside the DUT (see Figure 14). The categories organize the registers according to their function. Use the **Select a Category** option to select the **Output**, **Control**, or **Calibration** category. Each register includes its label, page, address, and contents. The **Read** button updates the contents of the register listing and the **Current Hex Value** output box. When writing to a register, enter the hexadecimal value in the **New Hex Value** box, and then click **WRITE**. Use the **Update Flash** button to back up all of the control registers into nonvolatile flash memory.

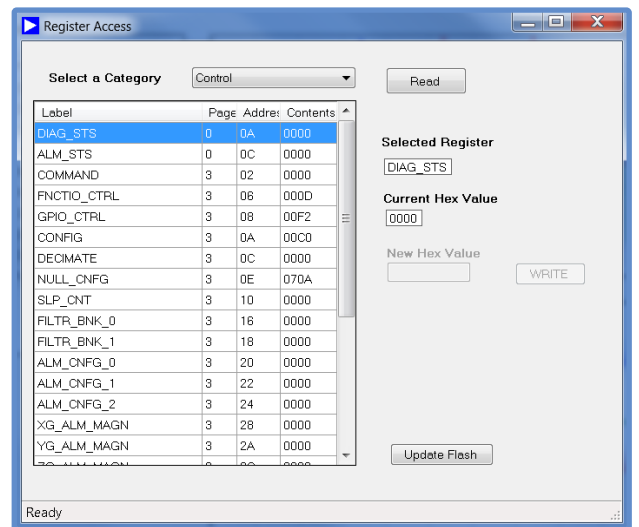


Figure 14. Register Access Window

Figure 15 provide an example of writing to the DEC_RATE register, which increases the decimation filter rate inside the DUT. Click DEC_RATE, type F in the **New Hex Value** box, and then click **WRITE**. This value lowers the output data rate in the **ADIS16375** and **ADIS16488** to 153.73 SPS (2.46 kHz ÷ 16).

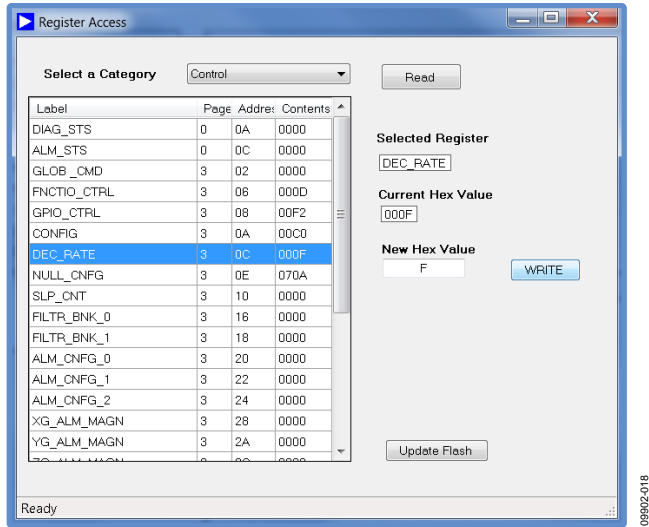


Figure 15. Register Access Window

DATA CAPTURE MENU

Click **Data Capture** in the menu bar of the main window to read and store a sequence of output data from the DUT. The **Data Capture** window (see Figure 16) provides controls for the data storage location, data file name, register selection, data format, and data file header. Each data collection cycle starts when the DUT’s data-ready signal pulses.

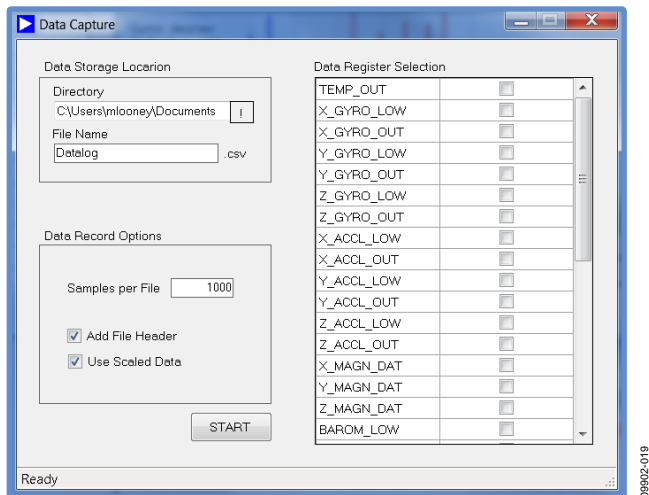


Figure 16. Data Capture Window

Data Register Selection

The **Data Capture** window contains a list of the output registers, along with a corresponding selection check box. Use the check box to include an output register in each data collection cycle of the data record. The gyroscope, accelerometer, delta-angle and delta-velocity have 32 bits available. Each output uses two registers, x_XXXX_OUT (upper 16 bits) and x_XXXX_LOW (lower 16 bits). When capturing data at the maximum sample rate (DEC_RATE = 0x0000, update rate = 2.46 kHz), the upper word registers (x_XXXX_OUT) contain enough information to preserve core sensor behaviors. Do not select the X_XXXX_LOW registers when collecting data at the maximum sample rate. This overloads the internal processor (EVAL-ADIS) and causes it to miss data.

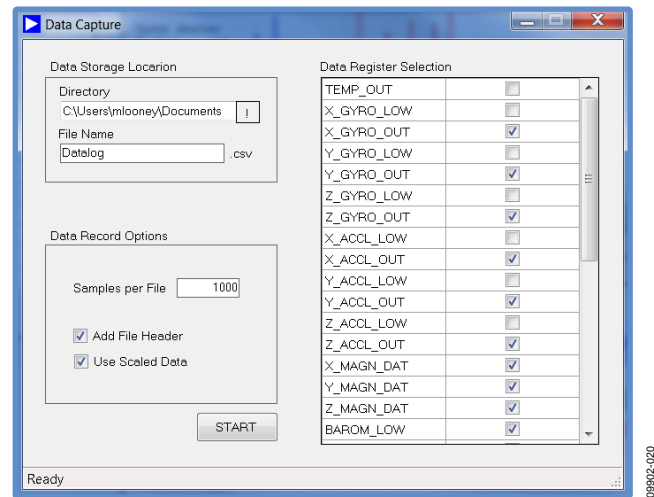


Figure 17. Data Capture Window

Data Capture Timing

Although each data cycle triggers the data-ready pulse, managing the PC USB communications causes the capture function to miss approximately one out of every 16 samples from the DUT. Future versions of the EVAL-ADIS firmware will support synchronous sample collection.

Data Record Time

The internal sample rate in the **ADIS16375** and **ADIS16488** is 2.46 kHz. The update rate for the output registers (f_{UR}) is equal to 2.46 kHz divided by the decimation factor, which is equal to DEC_RATE + 1. Use the following formula to estimate the number of samples associated with a given record time (t_R):

$$N_R = t_R \times f_{UR} \times \frac{15}{16}$$

The ratio of 15/16 approximates the difference associated with the lost samples, which are associated with managing the PC USB interface. For example, when using an update rate of 153.75 (DEC_RATE = 15), type **29000** ($N_R = 28,829$) in the **Samples per File** box to produce a data record that lasts at least 200 seconds, and then click the **START** button to begin data collection.

Data Record Options

The **Add File Header** option controls the first line of the data record file. Turning this option off removes the header line from the data record. The **Use Scaled Data** option causes the software to convert the digital output codes into a decimal equivalent prior to storing them in the data record file.

USB TOOLS MENU

The **USB Tools** menu option provides a diagnostic tool for managing the connection to the EVAL-ADIS. Click this option to request a connection attempt. This window also provides several revision numbers. These numbers represent internal source control codes and are for Analog Devices, Inc., internal use only (see Figure 18 and Figure 19).

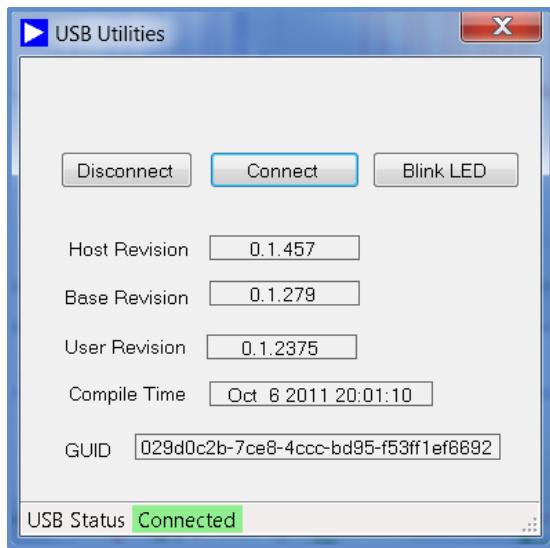


Figure 18. USB Tools, Connected

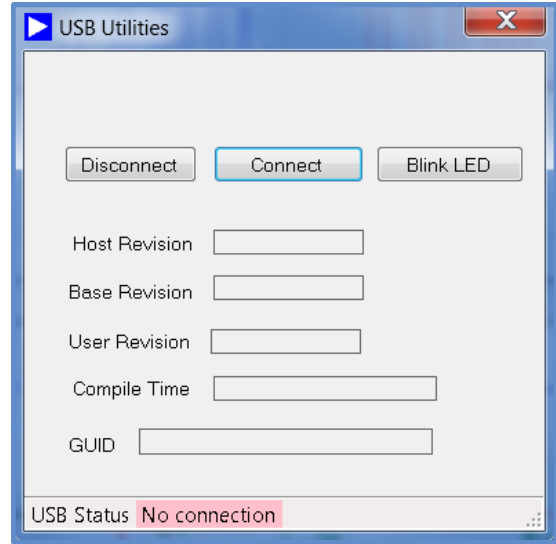


Figure 19. USB Tools, Not Connected

ABOUT

Click **About** in the menu bar of the main window to review the software revision information.



Figure 20. About Window

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**ESD Caution**

ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

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