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Evaluating the ADIS16500, ADIS16505, and ADIS16507 Inertial Measurement Units Using the EVAL-ADIS2 Evaluation Platform

FEATURES OF EVAL-ADIS2

- **Simple power connection using the USB 5 V connection and on-board switching and LDO voltage regulators**
- **Regulators easily bypassed for power measurements**
- **On-board ADSP-BF527 DSP**
- **Easy access to digital I/O and diagnostic signals via I/O header**
- **Status LEDs for diagnostic signals**
- **Windows-based GUI with data logging, complete access to register map, and real-time updating of accelerometer and gyroscope outputs**

APPLICATIONS

- **Performance evaluation of IMU**
- **Small size permits mounting onto test fixtures or inside of autonomous vehicle**

GENERAL DESCRIPTION

This user guide applies to the ADIS1650x IMU (Inertial Measurement Units). The members of this family include the ADIS16500, ADIS16505, and ADIS16507. Although only the ADIS16505 is discussed within, this guide is applicable to all members of the ADIS1650x family, as these devices differ primarily performance levels and sensitivity ratings.

The ADIS16505 is a very small, high-performance. The ADIS16505 features factory internal calibration, high performance, and robust operation in dynamic and challenging environments.

The ADIS16505 evaluation board, together with the EVAL-ADIS2 are a compact, easy-to-use platform for evaluating all features of the ADIS16505.

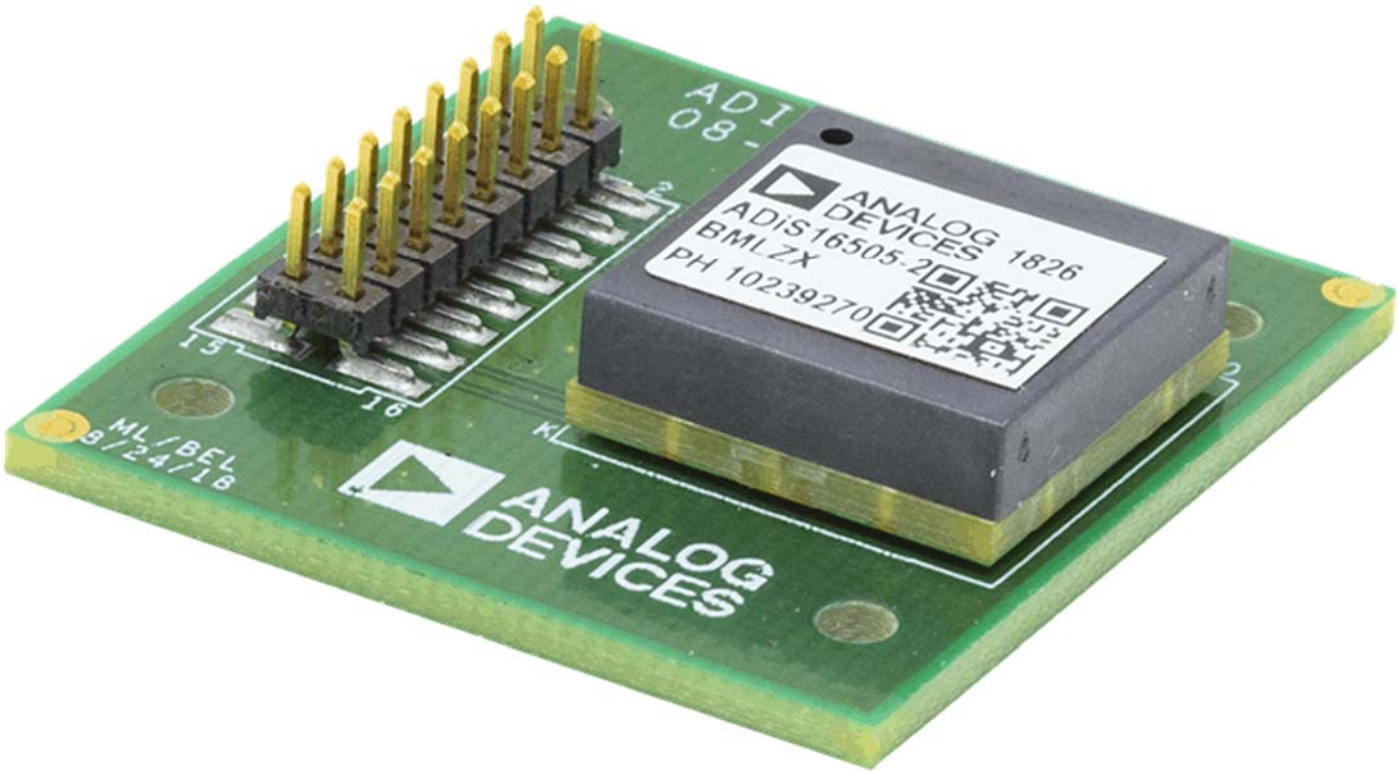

Figure 1. ADIS16505-2 Evaluation Board

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REVISION HISTORY

11/2019—Rev. PR.C to Rev. PR.B

Changes to Document Formatting 3
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5/2019—Rev. PR.B to Rev. PR.A

Changes to Document Title 3

4/2019—Revision PR.A: Initial Version

THE ADIS165505 BREAKOUT BOARD

Figure 2. ADIS16505-2/PCBZ

DESCRIPTION

Breakout boards provide a simple way to connect an existing embedded processor platform to an ADIS16500, ADIS16505 or ADIS16507 IMU. Each breakout board contains (1) IMU and a simple interface connector, which provides access to all necessary electrical connections with the IMU. Figure 2 provides a picture the ADIS16505-2/PCBZ breakout board, which contains and ADIS16505-2BMLZ IMU model.

Table 1 provides a list of the model numbers for each breakout board, along with the IMU model that is on each breakout board.

Table 1. Breakout Board Models

Breakout Board Model	IMU Model
ADIS16500/PCBZ	ADIS16500AMLZ
ADIS16505-1/PCBZ	ADIS16505-1BMLZ
ADIS16505-2/PCBZ	ADIS16505-2BMLZ
ADIS16505-3/PCBZ	ADIS16505-3BMLZ
ADIS16507-1/PCBZ	ADIS16507-1BMLZ
ADIS16507-2/PCBZ	ADIS16507-2BMLZ
ADIS16507-3/PCBZ	ADIS16507-3BMLZ

DRAWING

Figure 3 provides a top-level view of the breakout board layout, along with key physical attributes. The electrical interface (J1) on each breakout board is a dual row, 2 mm pitch, 16-pin interface. This supports standard ribbon cabling with 1 mm pitch.

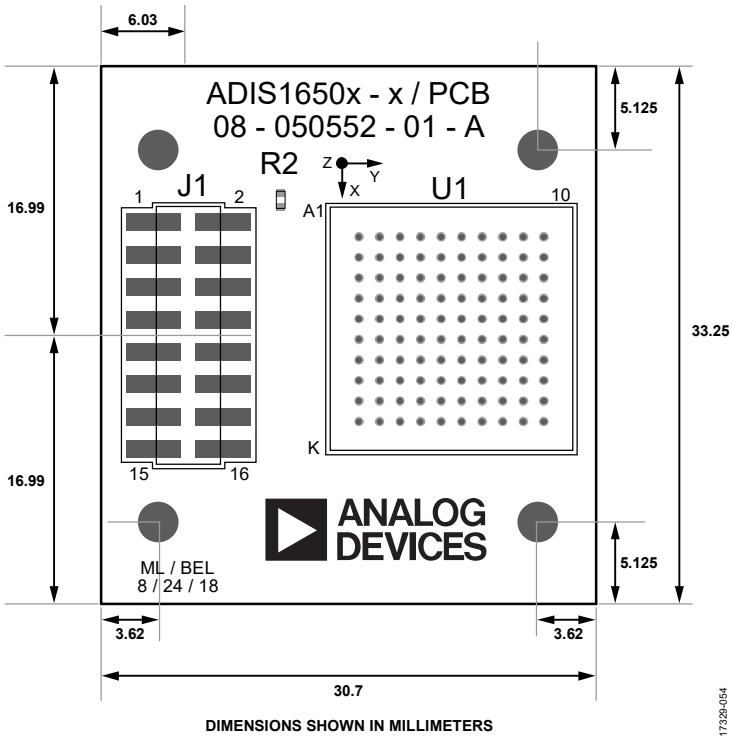


Figure 3. Top Level View of the Breakout Board

PIN ASSIGNMENTS

Table 2 provides the J1 pin assignments which support direct connection to an embedded processor board using standard ribbon cables. Although each environment has its own sensitivities (such as electromagnetic interference (EMI)), these boards typically support reliable communication over ribbon cables up to 20 cm in length.

Table 2. J1 Pin Assignments, Breakout Board

J1 Pin Number	Signal	Function
1	$\overline{\text{RST}}$	Reset
2	SCLK	SPI
3	$\overline{\text{CS}}$	SPI
4	DOUT	SPI
5	NC	No connect
6	DIN	SPI
7	GND	Ground
8	GND	Ground
9	GND	Ground
10	VDD	Power, 3.3 V
11	VDD	Power, 3.3 V
12	VDD	Power, 3.3 V
13	DR	Data ready
14	SYNC	Input clock
15	NC	No connect
16	NC	No connect

SCHEMATIC

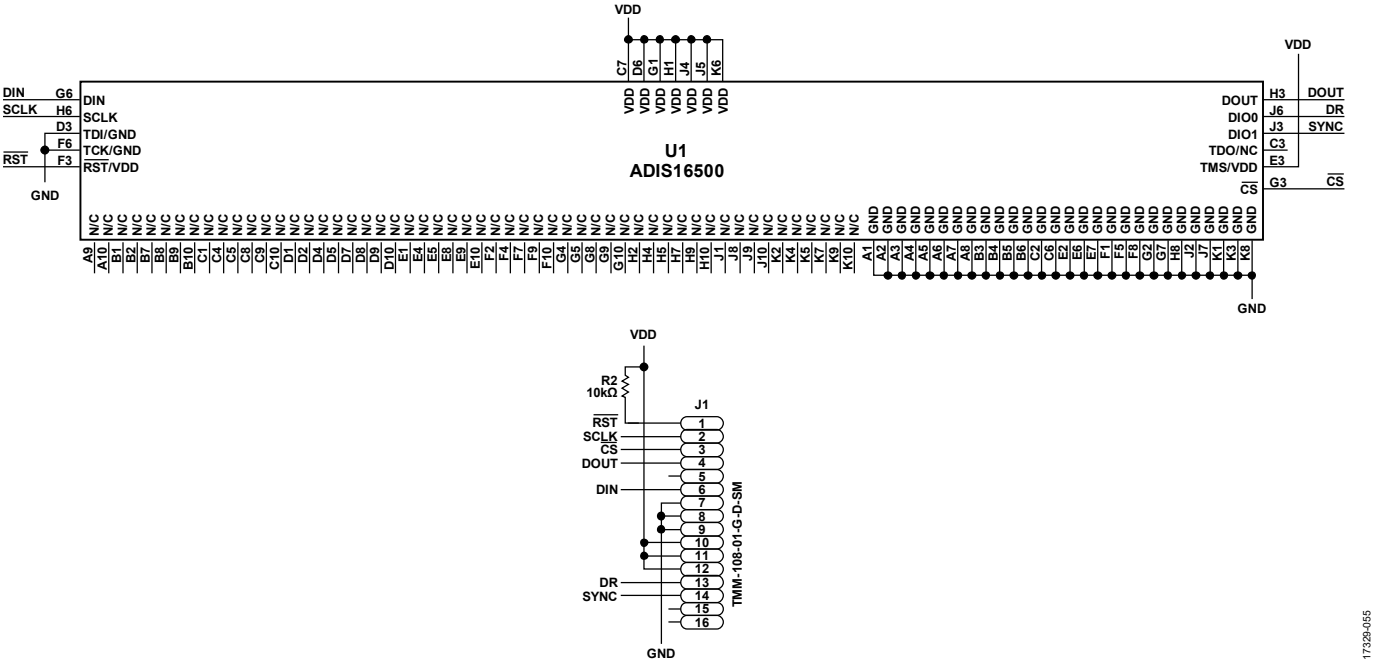


Figure 4. ADIS16500/PCB Schematic

EVALUATION USING THE EVAL-ADIS2 SYSTEM

Figure 5. EVAL-ADIS2 System Block Diagram

In addition to supporting quick prototype connections between the IMU and an embedded processing system, the breakout boards connect directly to J1 on the EVAL-ADIS2 evaluation system. When used in conjunction with the IMU Evaluation Software for the EVAL-ADISZ Platforms, the EVAL-ADIS2 provides a simple, functional test platform that allows users to configure and collect data from the IMU models. Figure 5 and Figure 8

Important: Download and install USB drivers before connecting the EVAL-ADIS2 to the test computer.

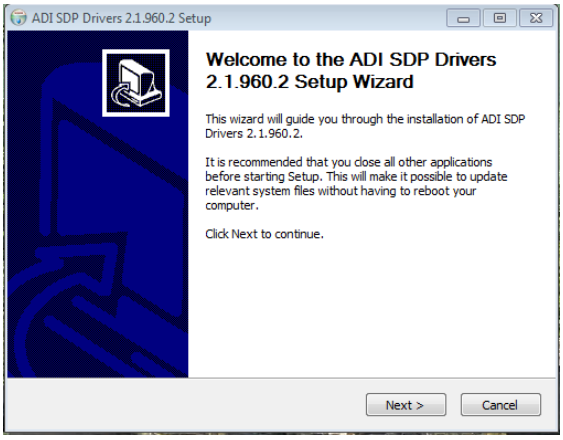
USB DRIVER INSTALLATION

The following instructions cover the USB driver installation for the EVAL-ADIS2, and is common to ADI IMU products.

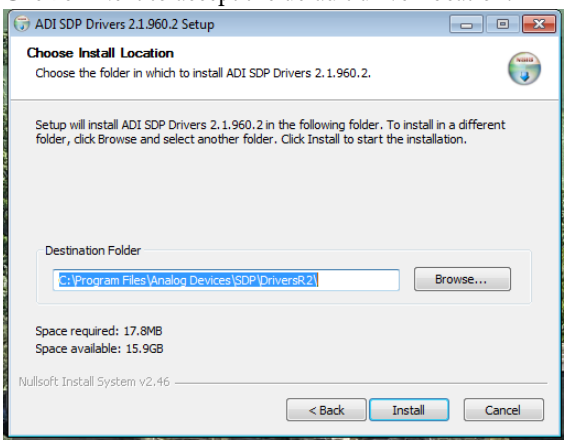
1. Navigate to ftp://ftp.analog.com/pub/IMU/IMU_FTP_Directory.htm.

2. Locate and click on the link called SDPDrivers.zip under the heading of EVAL-ADIS2 USB drivers.

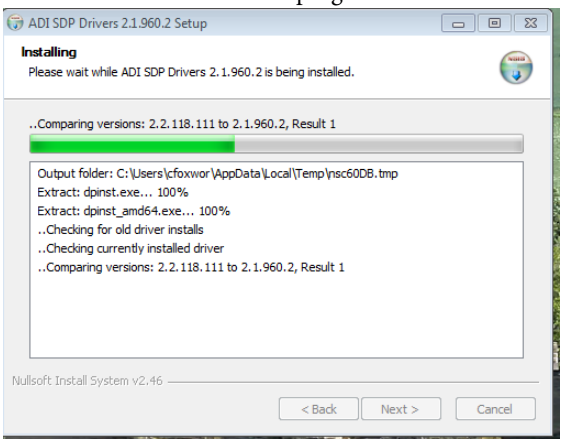
3. After downloading the EVAL-ADIS USB Driver file, extract the SDPDrivers.exe file from the zip file and double click on the EXE to start the process. When the setup wizard opens, click on Next to start the installation process:



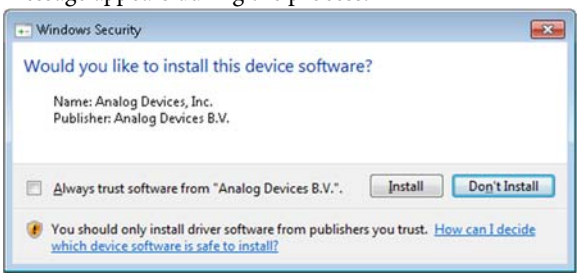
4. Click on Next to accept the default driver location.



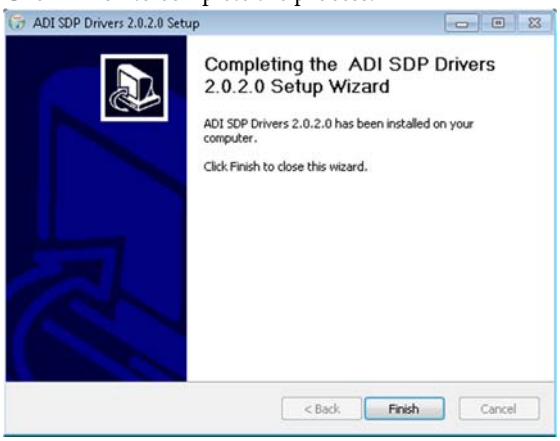
5. The user will see at least two progress bars like this:



6. Click on Install to continue with the installation if this message appears during the process:



7. Click Finish to complete the process.



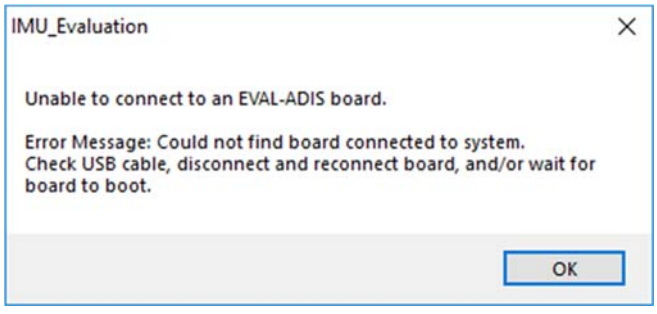
DOWNLOADING THE EVALUATION SOFTWARE

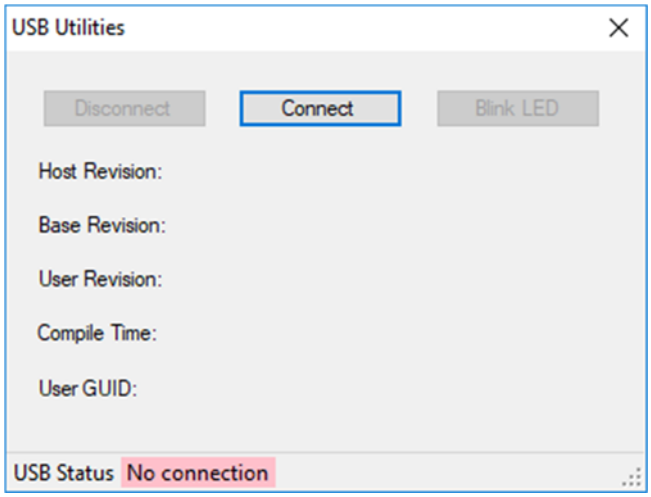
The evaluation software for the ADIS16505 can be downloaded from the ADI IMU ftp site

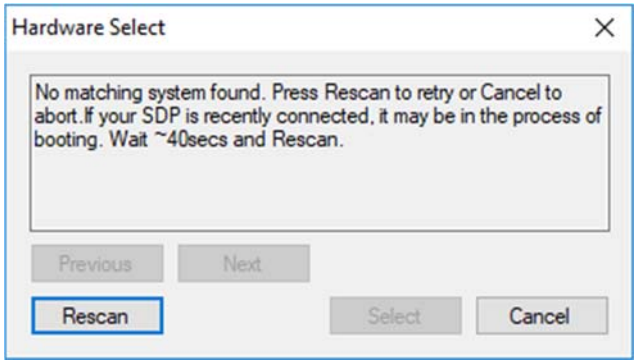
1. Navigate to the ftp site by clicking here: ftp://ftp.analog.com/pub/IMU/IMU_FTP_Directory.htm
2. Click on "IMU Evaluation 1.18.xx" where "xx" is the latest version posted on the FTP site.

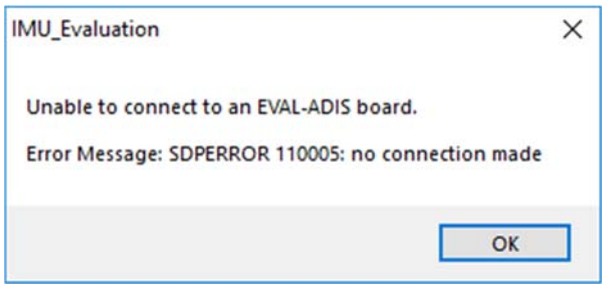
After the EXE file downloads, place it in a convenient location on the host PC, but don't run it until the evaluation board is connected to the PC.

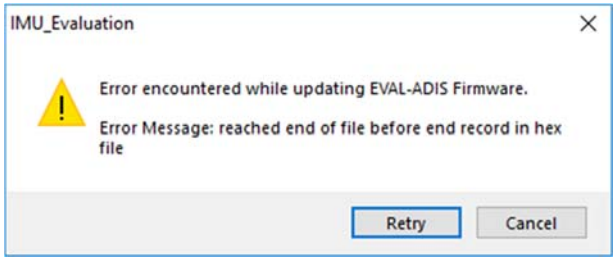
Note: If the user runs the software before connecting the evaluation board, the user will see the following pop-up windows and errors:











If this occurs, the user should exit out of the software, and proceed to the "EVAL-ADIS2 Physical Connections" section of this user guide and ensure that the evaluation board is properly connected and powered prior to running the evaluation software.

EVAL-ADIS2 PHYSICAL CONNECTIONS

Figure 8 illustrates the physical connection between the ADIS16505-2/PCBZ and an EVAL-ADIS2Z evaluation system.

Connecting the Evaluation Boards

1. Ensure that Jumper JP1 (See "DUT Supply Selection" in Figure 6) is straddling the left "+3.3V REG" pin and the center pin, assuming the EVAL-ADIS2 board is oriented as shown in Figure 6.

   Note: If the user wishes to use an external power supply, move the JP1 jumper so that it straddles the center and lower pin and connect the external supply to Connector J3. GND is the left pin and VDD (+3.3 V) is the right pin. See Figure 7 for an illustration.

2. Connect the ribbon cable between the EVAL-ADIS2 and ADIS16505 evaluation board.

3. Connect the EVAL-ADIS2 USB cable to the PC and verify that LED1 and LED2 are illuminated on the EVAL-ADIS2 board.

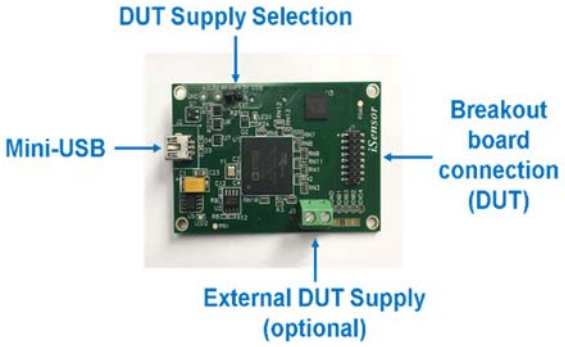


Figure 6. EVAL-ADIS2 Connector Locations

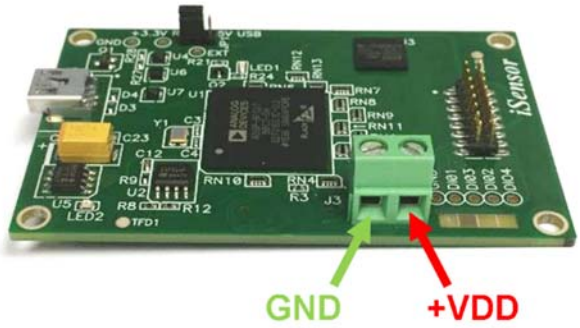


Figure 7. EVAL-ADIS2 External Power Connector

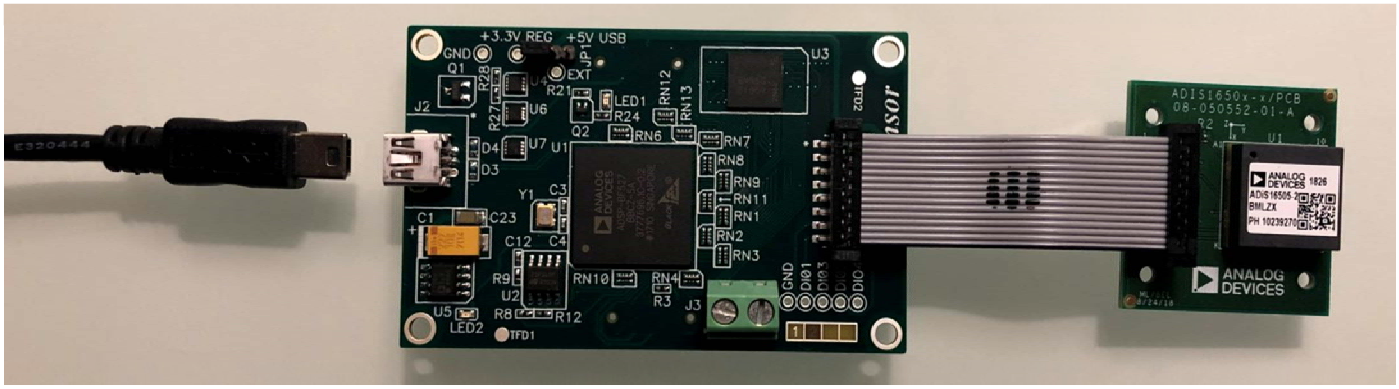
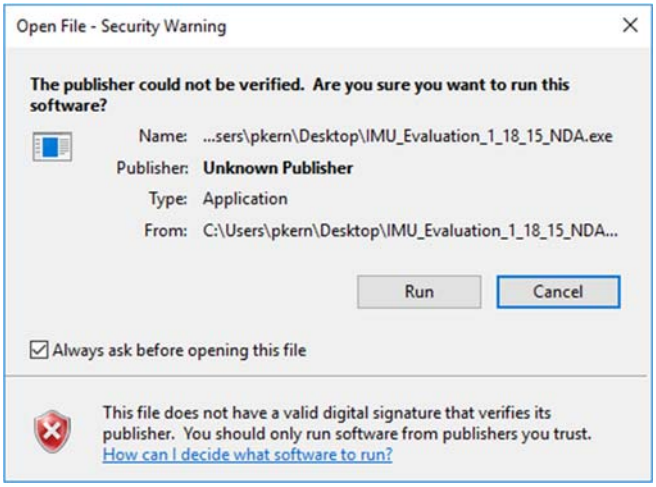


Figure 8. ADIS16505-2PCBZ connection to the EVAL-ADIS2

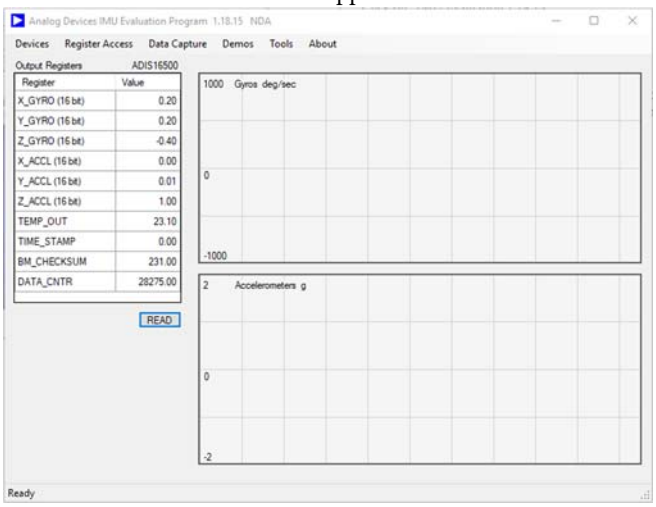
EVALUATION SOFTWARE

RUNNING THE EVALUATION SOFTWARE

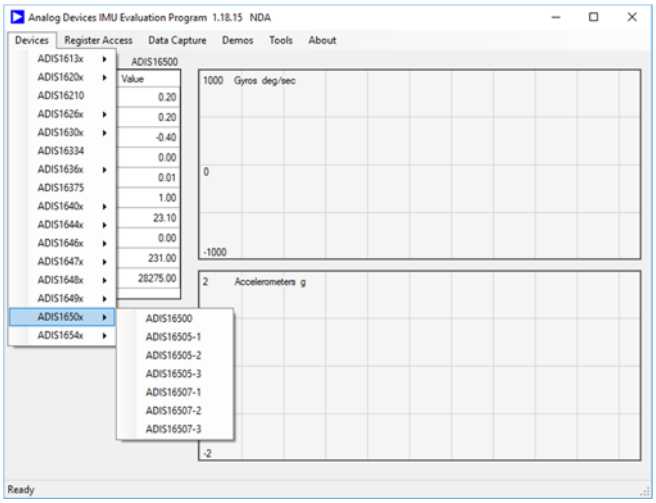
1. Ensure the that USB Driver is properly installed as described in the "USB Driver Installation" section of this user's guide.
2. Ensure that the evaluation board is properly connected as described in the "EVAL-ADIS2 Physical Connections" section of this user's guide.
3. Double-click on the ADIS16505 evaluation software EXE file. The user should click the "Run" button if this pop-up window appears:



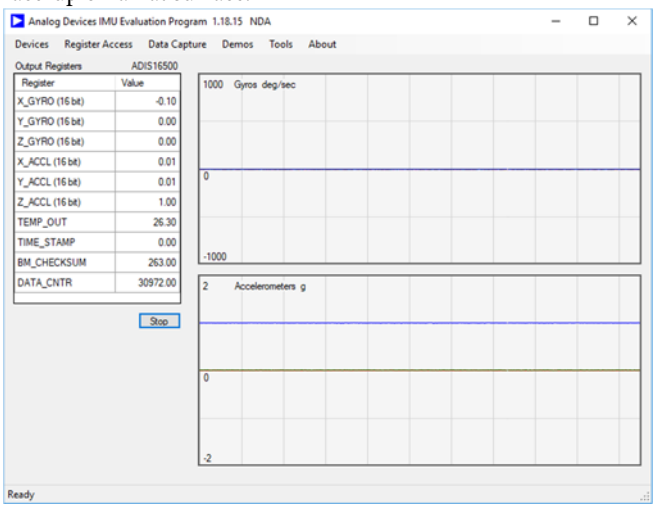
4. The EVAL-ADIS main window appears



5. On the Devices Menu, select the correct IMU model.

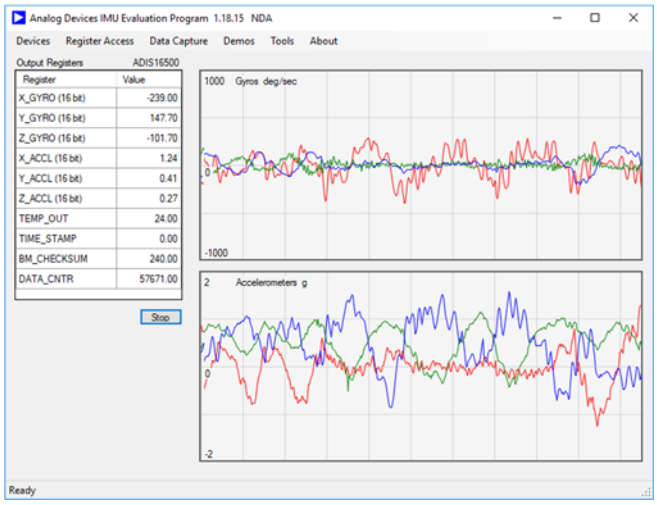


6. Click on the "READ" button to read the IMU registers in real-time. If the EVAL-ADIS2 is correctly connected, and all the drivers and software are correctly installed, the user should see the following, if the IMU is at rest and lying face-up on a flat surface:

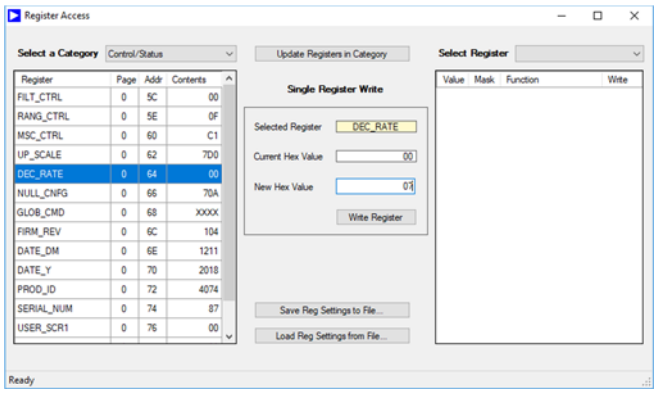


Note that the gyroscopes read zero rotation, the x- and y-axis accelerometers read 0 *g*, and the z-axis reads 1 *g*.

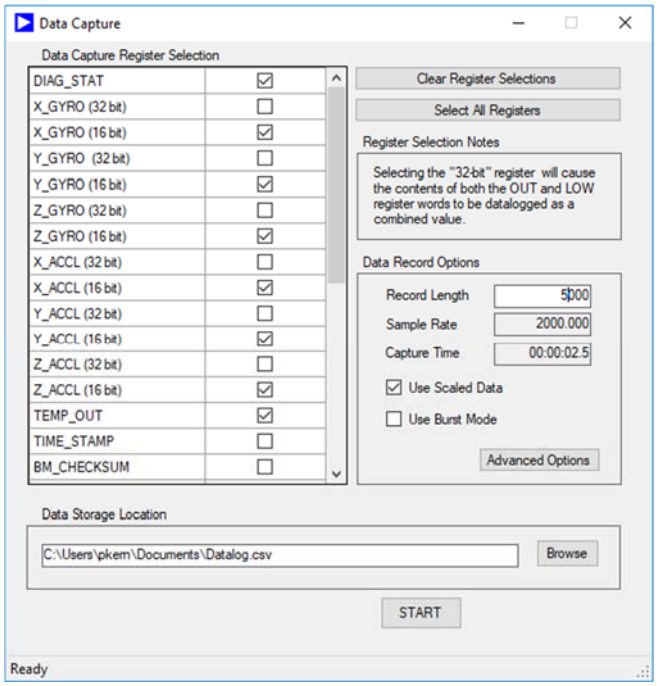
7. Movement of the IMU is recorded and displayed in real time:



8. The user can change register settings by clicking on the "Register Access" menu. In this example, the decimation rate is being changed from 0x00 to 0x07.



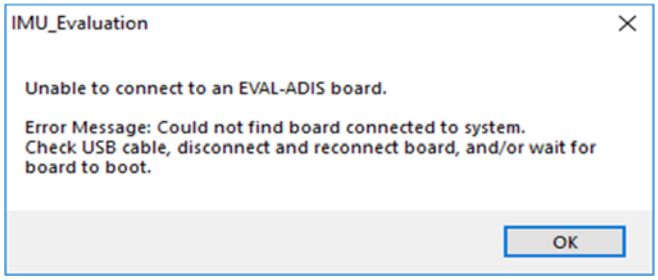
9. Logging the IMU readings is a common task using the EVAL-ADIS2 and clicking on the Data Capture menu brings up the data capture window. This window allows the user to choose which settings to log. Note that if a decimation rate of 0 (no averaging) is used, the user will need to select 16-bit gyro and accelerometer values (not 32-bit) to have enough time to transfer all data in one data capture interval. However, this does not limit the accuracy of the IMU data, as the lower 16-bits are only significant when averaging or filtering is enabled.

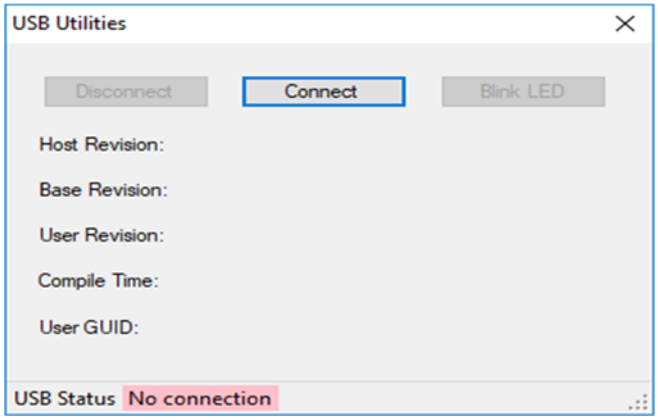


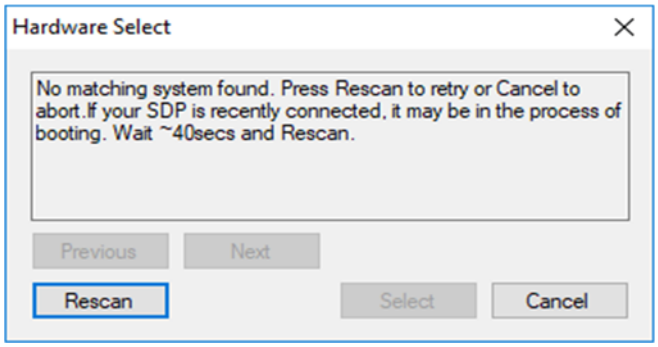
TROUBLESHOOTING

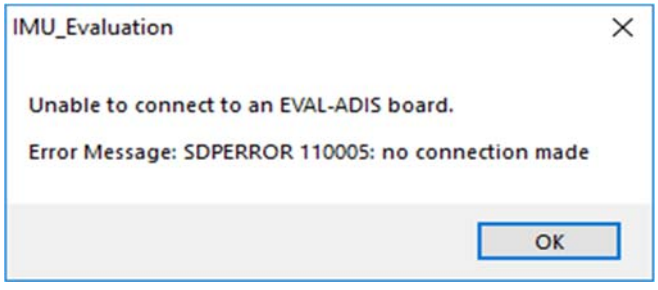
RUNNING THE SOFTWARE WITHOUT AN EVAL-ADIS2 EVALUATION BOARD ATTACHED

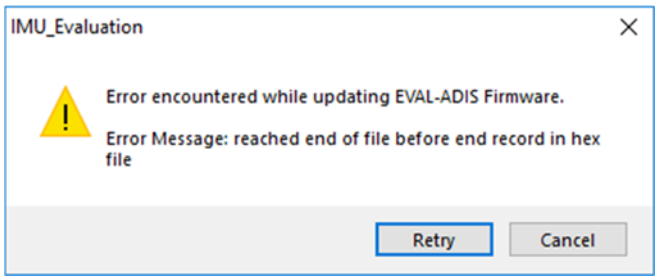
The user will see the following screens if the evaluation software is run without the EVAL-ADIS2 connected:





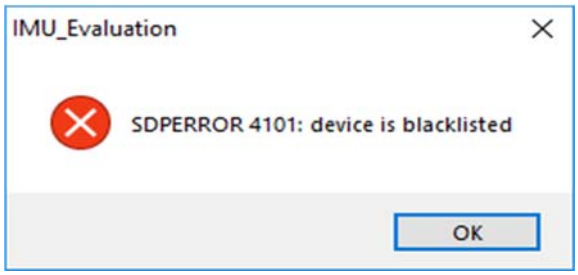






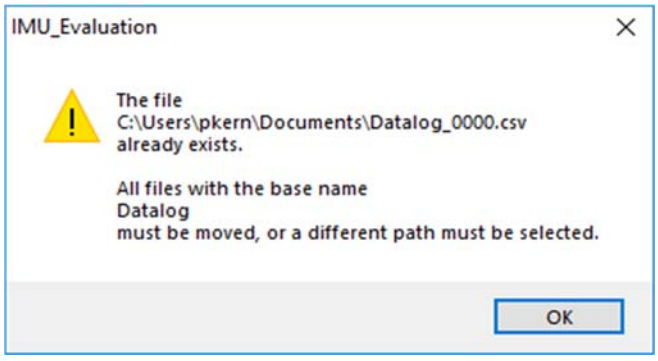
In this case, the user should exit out of the software, and proceed to the "EVAL-ADIS2 Physical Connections" section of this user guide and ensure that the evaluation board is properly connected and powered prior to running the evaluation software.

DEVICE BLACKLISTED



The most common cause of this error is attempting to read the registers of the IMU while the EVAL-ADIS2 evaluation board is disconnected from the PC after having previously been successfully connected. Communication can be restored by reconnecting the EVAL-ADIS2 to the PC.

LOG FILE ERROR



This error occurs if the filename specified for the data log file already exists. The user should either rename the existing file or choose a different filename for the new log file.

NOTES

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.

ANALOG DEVICES

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