Description

The ZMID520x Evaluation Kit allows sensor module evaluation, laboratory setup, and module calibration development for the ZMID520x Family of Inductive Position Sensor ICs.

- ZMID5201: analog interface
- ZMID5202: PWM interface
- ZMID5203: SENT interface

The main purpose of the ZMID520x Evaluation Kit is communication between the user's computer and the ZMID520x. The computer sends commands and data via its USB port to the ZMID Communication Board.

The microcontroller on the Communication Board interprets these commands and relays them to the ZMID520x located on the ZMID520x Demo Board using the one-wire interface (OWI) communication interface.

The microcontroller also forwards data bytes from the ZMID520x back to the computer via the USB connection. These bytes can be sensor readings, raw analog-to-digital converter (ADC) data from analog outputs, or ZMID520x EEPROM contents.

The *ZMID520x EVK Application Software* is a graphical user interface (GUI) that is provided online for the kit. It supports all ZMID520x configurations and enables the user to understand the functionality of the ZMID520x as well as perform measurements.

Features

- USB "plug and play" – no driver installation needed
- Small ZMID Communication Board: 5 cm × 8 cm
- One-wire communication interface (OWI) enables quick and easy configuration and calibration of the ZMID520x using the user's computer
- PWM, analog, or SENT reading of the output depending on product
- The modular design allows easy swapping of ZMID520x Demo Boards
- Ability to connect and evaluate an external module board
  — No external power supply needed
  — External module is supplied from the ZMID520x Demo Board

Kit Contents

- ZMID520x Rotary 360° Demo Board with printed sensor coil
- ZMID Communication Board
- Micro-USB cable
- Kit software is available for download from the IDT web site:
  www.IDT.com/ZMID5201-EVK
  www.idt.com/ZMID5202-EVK
  www.IDT.com/ZMID5203-EVK

ZMID520x Evaluation Kit

Important Notes

<u>Disclaimer</u>

Integrated Device Technology, Inc. and its affiliated companies (herein referred to as "IDT") shall not be liable for any damages arising out of defects resulting from

    (i)   delivered hardware or software

    (ii)   non-observance of instructions contained in this manual and in any other documentation provided to user, or

    (iii)   misuse, abuse, use under abnormal conditions, or alteration by anyone other than IDT.

TO THE EXTENT PERMITTED BY LAW, IDT HEREBY EXPRESSLY DISCLAIMS AND USER EXPRESSLY WAIVES ANY AND ALL WARRANTIES, WHETHER EXPRESS, IMPLIED, OR STATUTORY, INCLUDING, WITHOUT LIMITATION, IMPLIED WARRANTIES OF MERCHANTABILITY AND OF FITNESS FOR A PARTICULAR PURPOSE, STATUTORY WARRANTY OF NON-INFRINGEMENT, AND ANY OTHER WARRANTY THAT MAY ARISE BY REASON OF USAGE OF TRADE, CUSTOM, OR COURSE OF DEALING.

<u>Restrictions in Use</u>

IDT's ZMID520x Evaluation Kit, consisting of the ZMID Communication Board, ZMID520x Demo Board, and micro-USB cable, and the *ZMID520x AID EVK Application Software* are designed for evaluation and configuration of the ZMID520x product family only. IDT's ZMID520x Evaluation Kit hardware and software must not be used for characterization measurements in terms of replacing calibrated laboratory environment and measurement devices.

!   **Important Equipment Warning:** Ensure the correct connection of all cables. Supplying the board using the wrong polarity could result in damage to the board and/or the equipment.

Contents

List of Figures

List of Tables

1. Setup

1.1 Required User Equipment

A Windows®-based computer is required for interfacing with the kit and configuring the ZMID520x.

1.2 User Computer Requirements and Setup

1.2.1 Computer Requirements

The user must have administrative rights on the computer to download and install the *ZMID520x EVK Application Software* for the kit.

The computer must meet the following requirements:

- Windows® XP SP3, Vista SP1 or later, 7 (including SP1), 8, 8.1, or 10. **Touch screens are not supported**.
- Supported architecture: x86 and x64
- Available USB port
- Internet access for downloading the *ZMID520x EVK Application Software*

1.2.2 Software Installation and Setup

The *ZMID520x EVK Application Software* is not included with the kit. To ensure use of the latest version of the software, it is available for download free of cost in zip file format from the IDT web site on the web pages given on page 1.

Follow these procedures to install the *ZMID520x EVK Application Software*:

1. After downloading the zip file to the user's computer, extract the contents of the zip file.

2. Double-click on the extracted *setup.exe* file to activate the installation.

3. Follow the standard installation instructions displayed on the screen and change the installation path if required. If the default path settings have been used, the software automatically completes the installation and creates an access link on the user's computer under *Start > All Programs > IDT > ZMID520x EVKIT*. The installation dialog offers the option to create a desktop short-cut icon for the software.

1.3 Hardware Setup

This section describes the basic hardware setup of the ZMID5202 Evaluation Kit and provides a brief overview on the components.

1.3.1 Overall of the Hardware

Figure 1 shows the assembled boards for the ZMID5202 Evaluation Kit.

Figure 1. ZMID520x Evaluation Kit
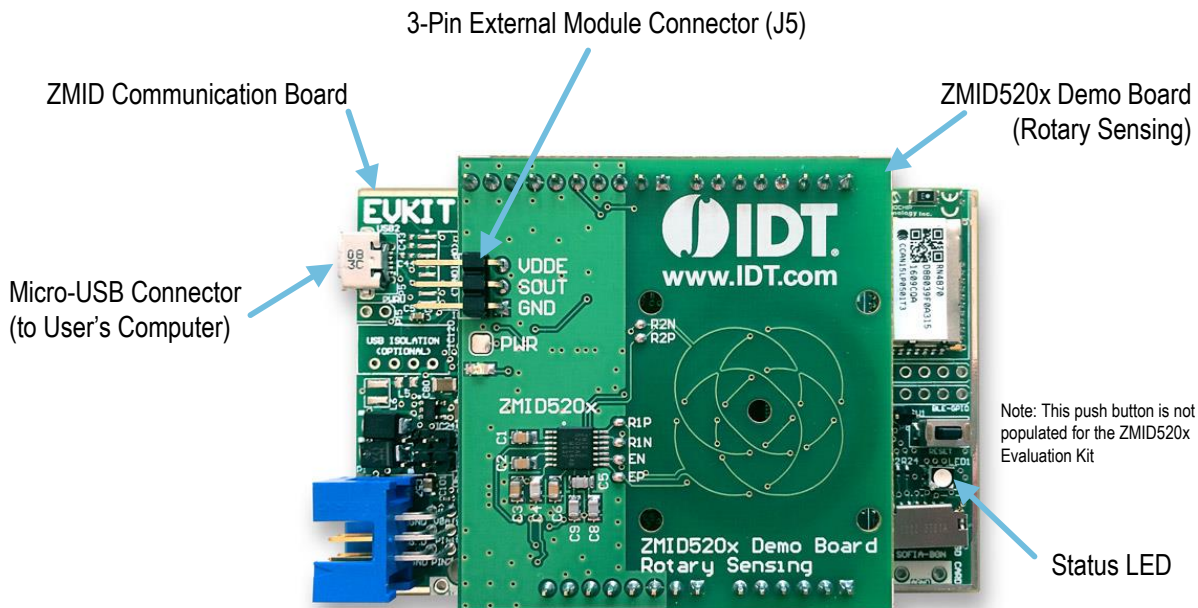
Figure 2. ZMID520x Rotary 360° Demo Board – Overview
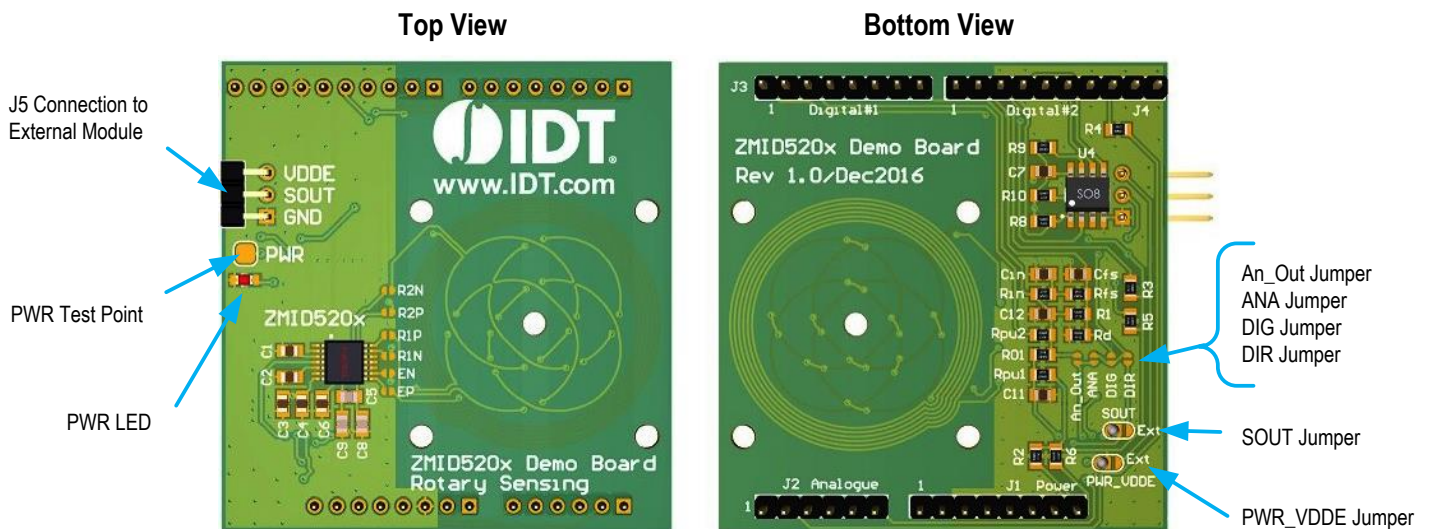
Table 1.   ZMID520x Rotary 360° Demo Board: Key Components and Connector Descriptions

Note: See Figure 2 and section 4 for the locations of the jumpers referenced in this table. The jumper settings vary depending on the ZMID520x product number and depending on whether a user-provided external module is connected (see section 1.4). Section 4 gives the jumper settings if the user's external module is not used. Section 1.4 gives the settings when the user's module is used.

Connector	Description
J1, J2, J3, J4	Header strips connected to the ZMID Communication Board
J5	3-pin male connector for connecting external modules
ZMID520x	The ZMID520x IC (ZMID5201, ZMID5202, or ZMID5203 depending on the kit order code).
PWR	Test pin for VDD
PWR LED	Status LED for the VDD
SOUT	Jumper JP1 for connecting an external module
PWR_VDDE	Jumper JP2 for connecting an external module
DIR	Jumper JP3 – interface network
ANA	Jumper JP4 – interface network
DIG	Jumper JP5 – interface network
An_Out	Jumper JP6 – interface network

1.3.2 Connecting the Kit

⚠ **!** **Important Equipment Warning:** Ensure the correct connection of all cables. Supplying the board using the wrong polarity could result in damage to the board and/or the equipment.

1. Ensure that the ZMID Communication Board is not connected to the computer.

2. Align the pin headers of the ZMID520x Demo Board with the headers of the ZMID Communication Board as shown in Figure 1 and slowly apply force on both sides to connect the two boards.

3. Connect the ZMID Communication Board to the computer using the micro-USB cable provided in the kit. Power is provided from the computer via the USB connection. No external power source is required.

4. The status LED on the ZMID Communication Board will turn on. This indicates that the board is ready to communicate with the *ZMID520x EVK Application Software.* The PWR LED on the ZMID520x Demo Board (see Figure 2) also turns on when the board is powered up.

1.4   External Module Connection

⚠ **!** **Important Equipment Warning:** Ensure the correct connection of all cables. Supplying the board using the wrong polarity could result in damage to the board and/or the equipment.

There is an option to evaluate an external module by connecting it to the ZMID520x Demo Board. An external module is usually similar to the ZMID520x Demo Board but designed for a customized application. Since external modules can be equipped with ZMID5201, ZMID5202, or ZMID5203, all the interfaces (analog, PWM, SENT) can be supported when connecting to the 3-pin connector on the ZMID520x Demo Board; however jumper settings on the ZMID520x Demo Board must be modified depending on the interface type of the connected external module. See section 1.4.1 for a description of the hardware settings.

Before connecting an external module to the Demo Board ensure that the VDDE, SOUT, and GND pin connections on J5 match the module connector. Figure 2 shows an example of a rotary external module connected to the Demo Board.

Figure 3.   Example ZMID520x External Module Connected to the Demo Board
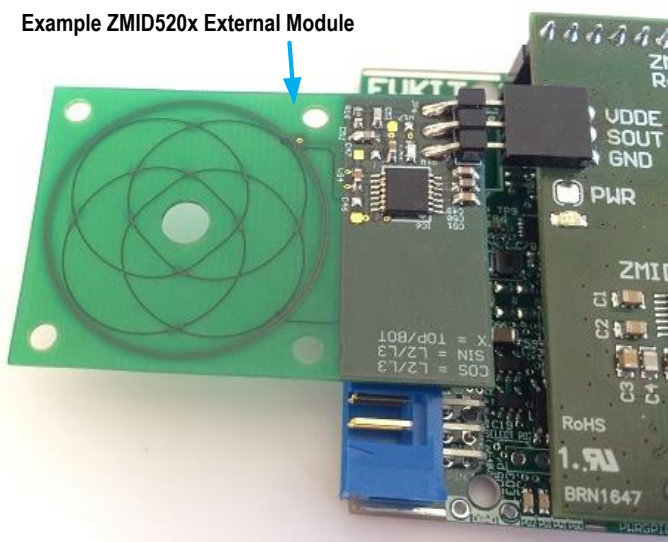
1.4.1 Jumper Settings for External Modules

To ensure that the correct interface network (located on the Demo Board) is used when reading the output signal of the ZMID520x, proper jumper settings are required on the bottom side of the Demo Board.

Whenever an external module is connected to the Demo Board, the jumpers SOUT and PWR_VDDE must be switched to the "Ext" setting as shown in Figure 4. Additional jumper settings depend on the interface type of the ZMID520x IC populated on the external module. Table 2 describes the jumper settings for the different type of products.

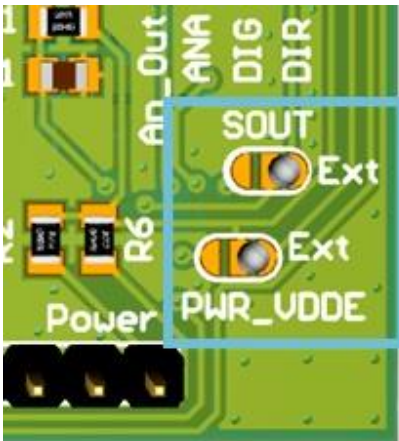**Figure 4. SOUT and PWR_VDDE Jumper Settings for External Module**

Table 2. Jumper Settings for Connecting External Modules Depending on the Interface Type

| Connector	ZMID5201 Analog Interface	ZMID5202 PWM Interface	ZMID5203 SENT Interface
DIR (JP3)	Open	Closed	Closed
ANA (JP4)	Closed	Open	Open
DIG (JP5)	Open	Open	Open
An_Out (JP6)	Closed	Open	Open

2. ZMID520x EVK Application Software User Guide

2.1 Sections of the Display

The *ZMID520x EVK Application Software* provides a graphic user interface (GUI) for communicating with the kit. The GUI is displayed when the application is started. Figure 5 identifies the various sections of the display.

Figure 5.   Sections of the GUI Display – Example ZMID5203
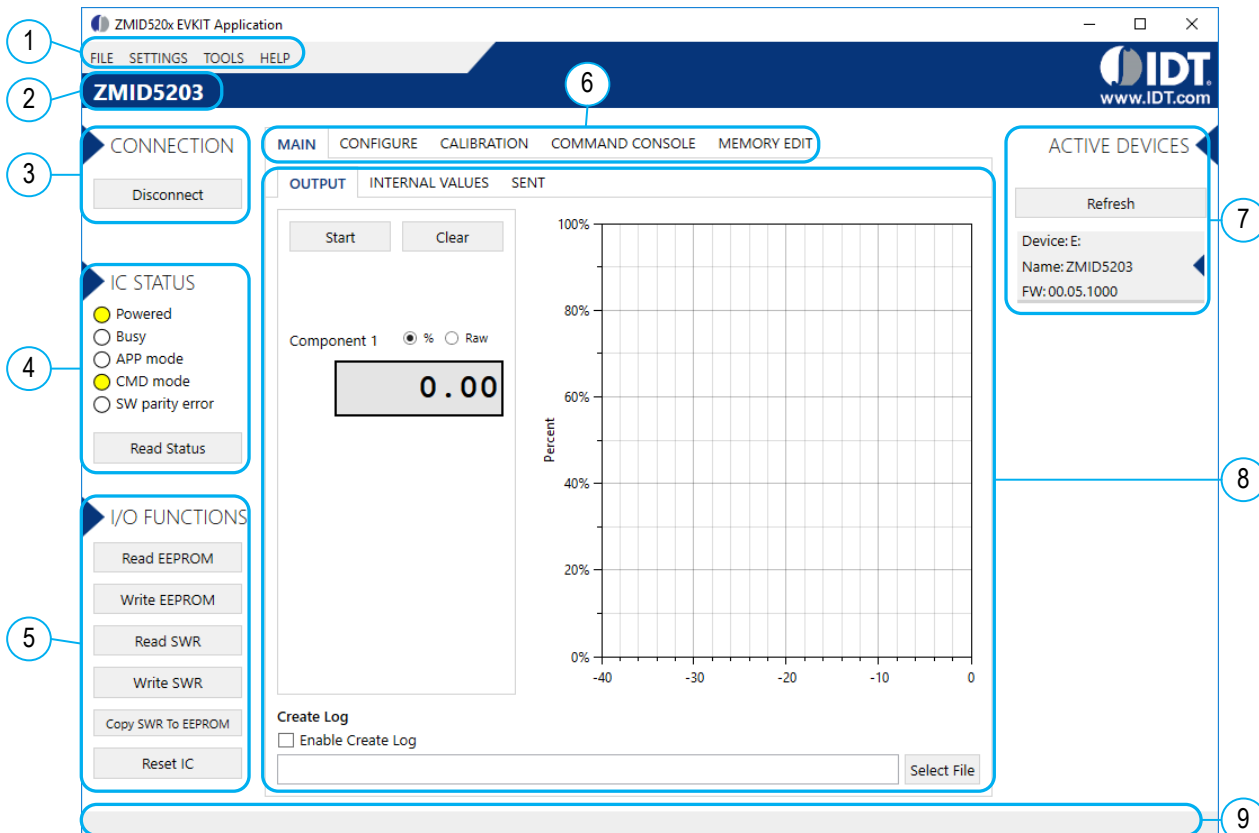
1. Menu bar: Contains settings and tools.

2. Information label: Displays the name of the connected device.

3. "CONNECTION" section: Displays connection-related options.

4. "IC STATUS" section: Displays status information from the connected device.

5. "I/O FUNCTIONS" section: Displays options to perform READ and WRITE actions to the connected device.

6. Navigation tabs: Used to switch between the different main window tabs.

7. "ACTIVE DEVICES" section: Displays a list of the currently connected communication boards.

8. Main window area: Displays options and information about the connected device.

9. Status bar: Displays status messages during operation.

2.2   Getting Started

The following steps describe how to establish a connection to the ZMID520x Demo Board and perform measurements. The combination of a ZMID Communication Board and its connected ZMID520x Demo Board is referred to as the "device" in the GUI.

2.2.1   Connecting to a Device

1.   Ensure that the ZMID520x Demo Board is properly connected to the ZMID Communication Board. See section 1.3.2.

2.   Connect the ZMID Communication Board to the user's computer using the micro-USB cable provided in the kit.

3.   Start the GUI application.

4.   The device will appear in the active devices section. If there are no other devices on the list, it will be automatically selected; otherwise select it by clicking on it.

5.   If the device shows as unknown, manually identify the device first. For a description of how to manually identify a device, refer to section 2.6.

6.   Click on the "Connect" button to initialize the connection.

7.   After a successful connection, the GUI will display the contents of the main window area.
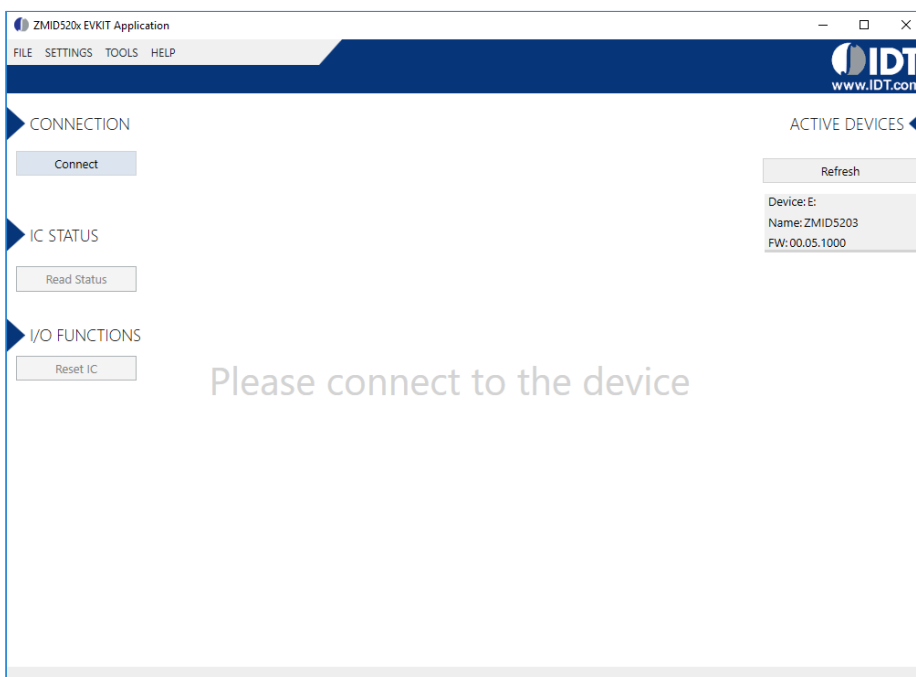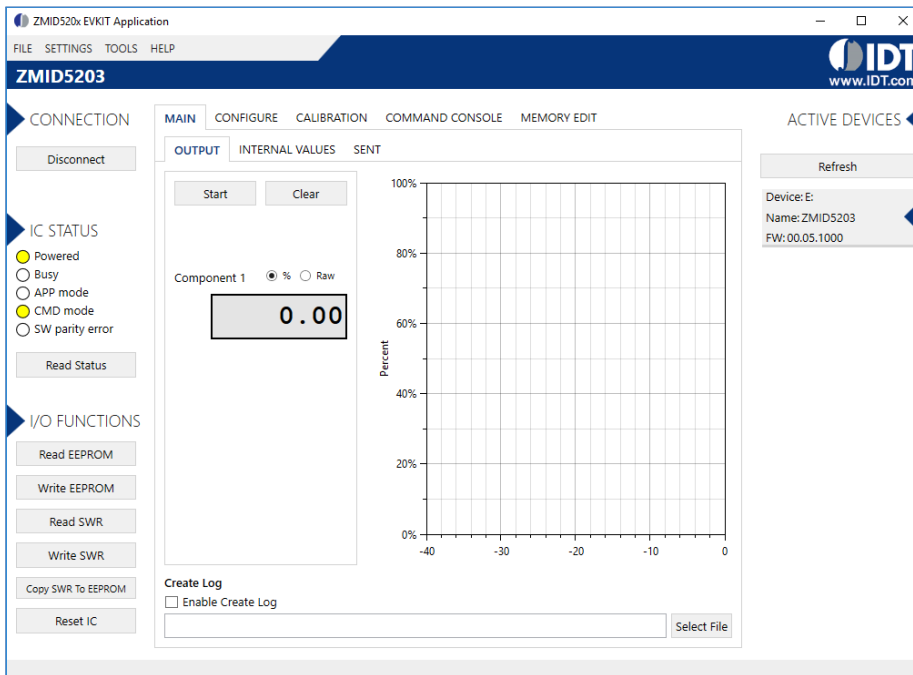
Figure 6.   Start-up Screen

Figure 7. Display When Connected to a Device – ZMID5203 Example

2.2.2 Reading Measurements

1. After connecting to a device, select the "MAIN" tab from the navigation menu. Two sub-tabs "OUTPUT" and "INTERNAL VALUES" are displayed if the ZMID5201 or ZMID5202 is connected. For the ZMID5203, the "SENT" sub-tab is also displayed and provides a SENT interface decoder. The "OUTPUT" tab displays the reading at the ZMID520x output pin SOUT.

2. The "OUTPUT" tab readings represent

   a. Analog values for the ZMID5201

   b. PWM values for the ZMID5202

   c. SENT values for the ZMID5203

3. Use the "Component 1" radio buttons to select the desired method of presenting the values, which can be displayed as raw (decimal/hexadecimal) values or as scaled values in percent.

4. Clicking the "Start" button will activate the measurements and change this button to the "Stop" button. The GUI disables some of its buttons and options while the measurement is active. Clicking the "Stop" button will deactivate the measurement and reactivate all options and buttons again.

5. At the bottom of each measurement tab, the "Enable Create Log" box can be checked to log the measured values into a *.csv file. The filename and its location are specified with the "Select File" entry field.

The "OUTPUT" tab displays the physical values by using either the ADC or digital inputs of the ZMID Communication Board. Figure 8 shows an example of SENT interface readings. For the PWM or analog interface, the values are captured using a 12-bit ADC located on the ZMID Communication Board. Hence, the accuracy of the measured values is limited due to the setup. The ZMID Evaluation Kit is not intended to act as a measurement device rather than a configuration tool.

Figure 8.   "OUTPUT" Tab – ZMID5203 Example
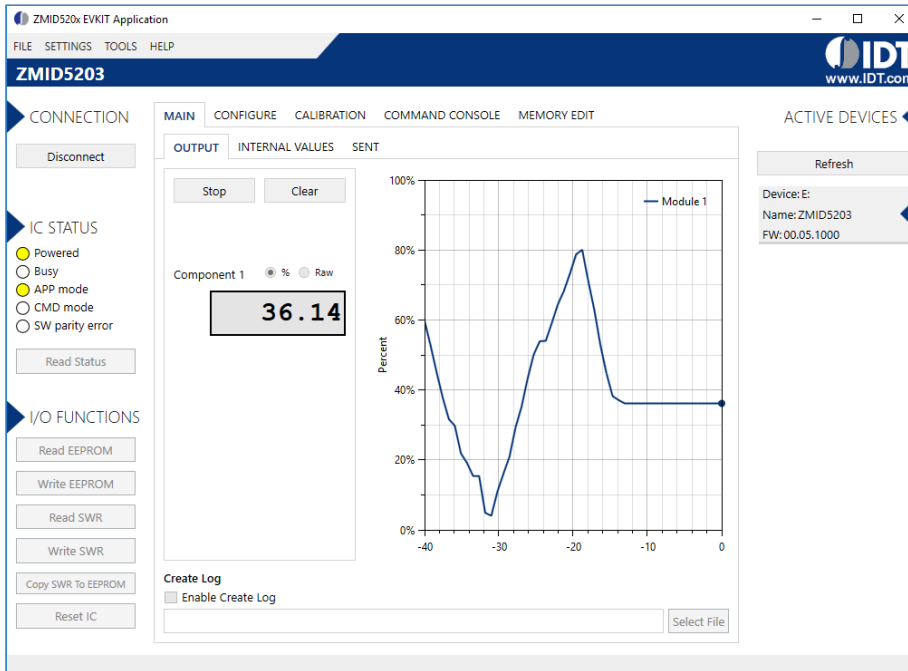
The "INTERNAL VALUES" tab displays measurements that are only accessible via OWI (see Figure 9). Therefore, all the readings are digital register contents and not limited in terms of hardware accuracy.

Figure 9.   "INTERNAL VALUES" Tab – ZMID5203 Example

There are three controls that can be used to view and change settings on the device.

- **AGC Mode:** Gain and integration time control – used to enable or disable the Automatic Gain Control (AGC) and the Integration Time Control of the device. The following standard options are available in the drop-down menu:
    - Gain adaptation and integration time adaptation off
    - Gain adaptation and integration time adaptation on

Two additional options are available for the AGC Mode that are for advanced testing only. Note: Before using either of these options, contact IDT support (see last page for contact information).

- Gain adaptation off and Integration time adaptation on
- Gain adaptation on and Integration time adaptation off

- **AGC Gain Stage.** Depending on the AGC Mode, this control has different behaviors:
    — When the AGC is active ("Gain and integration time adaptation" is on), the value in the "ACG Gain Stage" entry field specifies the maximum gain for gain regulation. During measurements, the box becomes read-only and displays the existing gain stage setting that the ZMID520x is using.
    — When the AGC is disabled ("Gain and integration time adaptation" is off), the value in the input field specifies the selected gain stage.

- **Over Sampling Rate.** The parameter OSR defines the number of averaging samples per receiving channel and reduces the noise level on the signal.

The "SENT" tab is only available when the ZMID5203 Demo Board is connected to the ZMID Communication Board. It displays the decoded SENT data information as shown in Figure 10.

Figure 10. "SENT" Tab (ZMID5203 only)
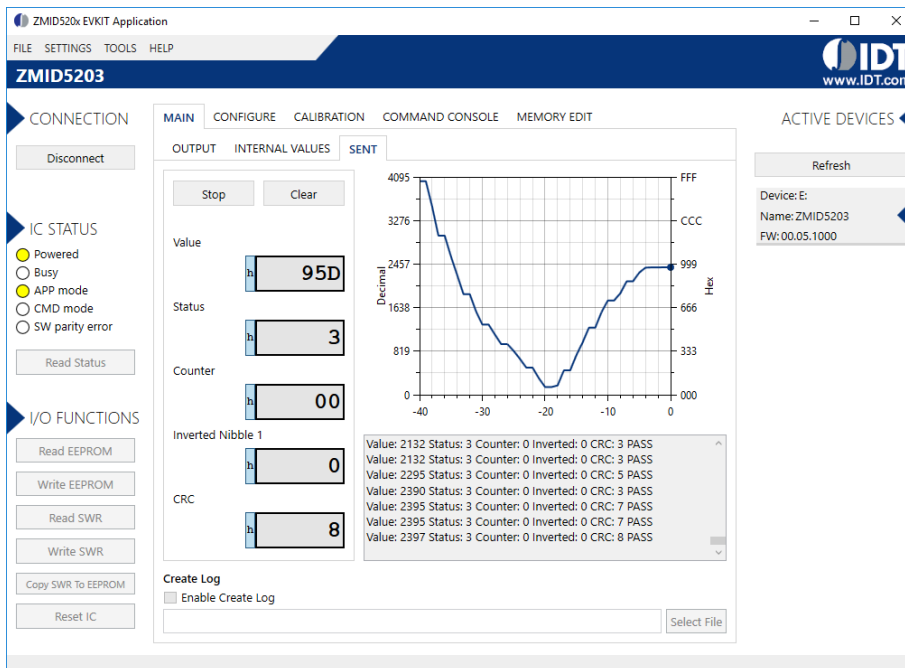
2.3   Changing the Configuration Settings

The "CONFIGURE" tab (see Figure 11) is designed to provide the user with an easy way of viewing and editing the IC configuration. Each value represents a register or a part of a register from the internal memory of the device. The displayed memory type can be either the ZMID520x EEPROM or the SWR memory. SWR refers to shadow registers used as the working memory for the ZMID520x, which can be temporarily written via the GUI to the ZMID520x for development purposes.

Figure 11. "CONFIGURE" Tab – Selection of Memory Type to be Displayed
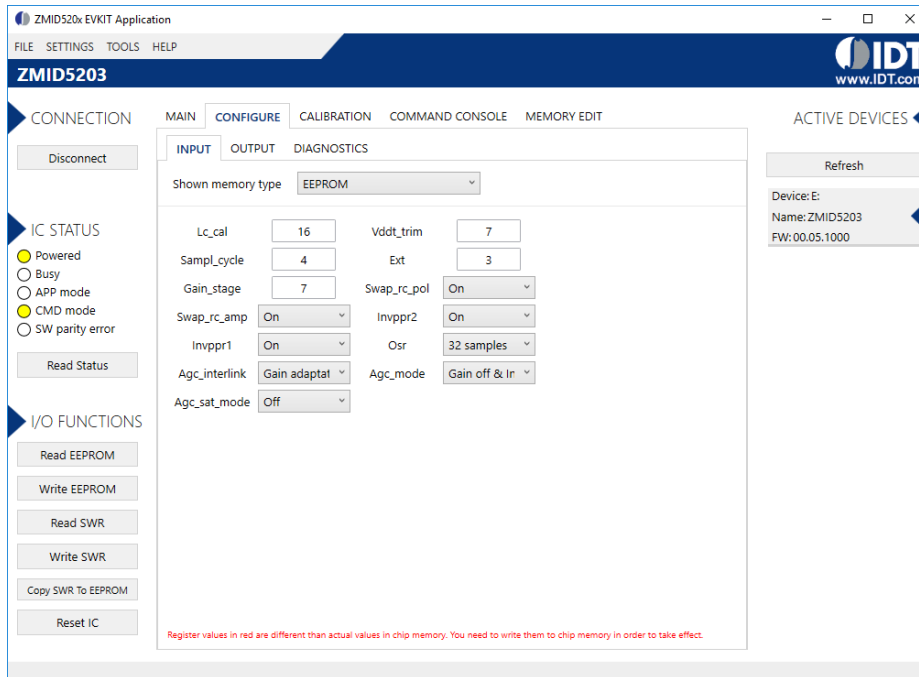
If parameters in the EEPROM memory selection have been changed, the ZMID520x must be reset after the writing process is finished for the changes to take effect. This is done automatically after pressing the "Write EEPROM" button from the "I/O FUNCTIONS" section (see Figure 12). This can be disabled via the "SETTINGS" menu > "Reset on Memory Write." In the case of the SWR selection, by default changes are immediately written to the SWR memory of the ZMID520x. The option can be disabled via the "SETTINGS" menu > "Enable Automatic SWR Write" (see Figure 13). Clicking the "Write SWR to EEPROM" button in the "I/O FUNCTIONS" section copies all of the current SWR settings to the EEPROM memory of the device. This section also provides the "Reset IC" button for manually resetting the ZMID520x. The reset power cycles the device and puts it in Command Mode. After reset, the contents of the EEPROM of the device are copied to its working memory SWR.

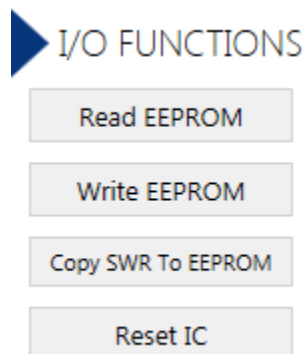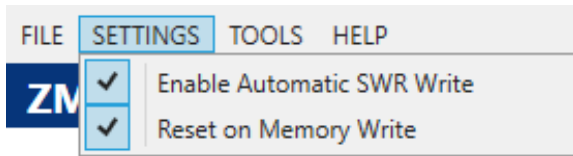**Figure 12. Buttons in the I/O FUNCTIONS Section**

Figure 13. Options on the SETTINGS Menu

There are three different data types shown on the "CONFIGURE" tab:

1. Numerical values are displayed in a white field (see Figure 14). If they are hexadecimal "0x" is automatically inserted at the beginning of the value (see Figure 15).

2. Values with predefined multiple choices are displayed in a drop-down menu (see Figure 15).

3. Read-only values are displayed with a light blue background. They can only be selected and copied (see Figure 16).

Figure 14. Example of Editable Numerical Values

Figure 15. Example of a Multiple Choice Value
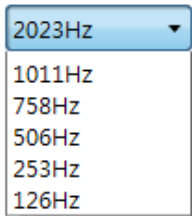
Figure 16. Example of Read-Only Values

Changing a value will change the font color to red (see Figure 17). This indicates that the change is not yet applied to the actual memory (EEPROM or SWR) of the IC. To apply the change, click the corresponding "Write…" button in the "I/O FUNCTIONS" section. If the "Reset IC" or one of the "Read" buttons is pressed, the values will be set to represent the current settings of the device.

Figure 17. Example of a Modified Value that is Not Yet Saved to Memory

Context-sensitive pop-ups (see Figure 18), referred to as "tooltips," provide additional information that appears briefly as the cursor hovers over an element on the screen. The tooltips for entry fields include a brief description of the setting and the address of the internal memory register.

**Figure 18. Example of Tooltip Information**
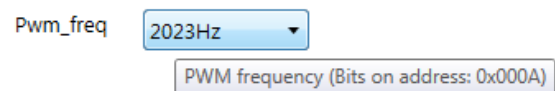
2.4 Calibration

There are three sub-tabs under the "CALIBRATION" tab: OUTPUT CONFIG, LINEAR INTERPOLATION, and AMPLITUDE OFFSET.
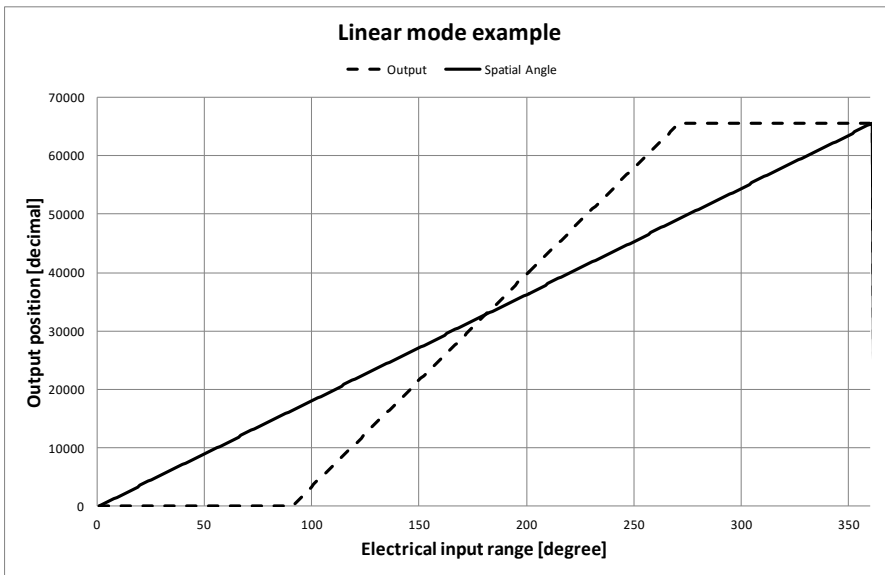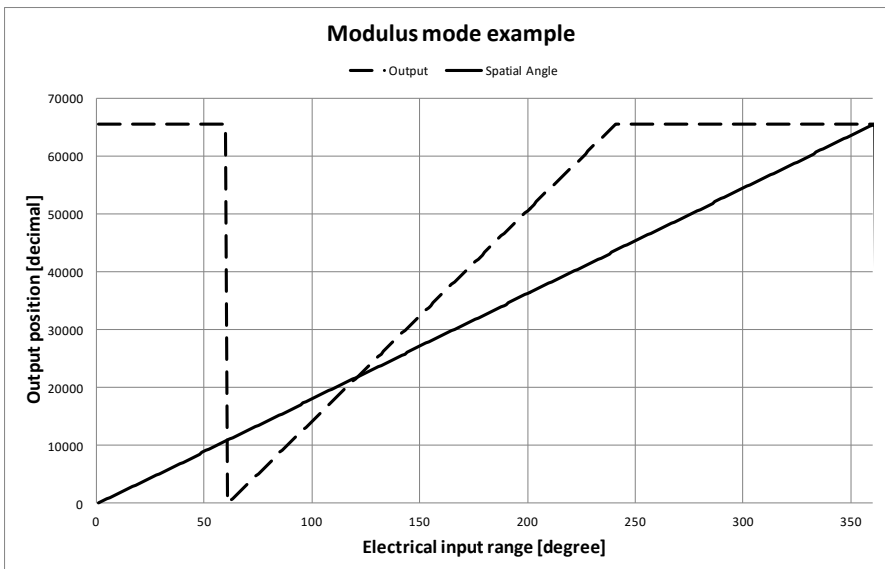
2.4.1 "OUTPUT CONFIG" Tab

The "OUTPUT CONFIG" sub-tab (see Figure 19) is used to configure the output behavior of the ZMID520x. For a detailed description of output settings, refer to the *ZMID520x Datasheet.*

Figure 19. "OUTPUT CONFIG" Tab – ZMID5201 Example
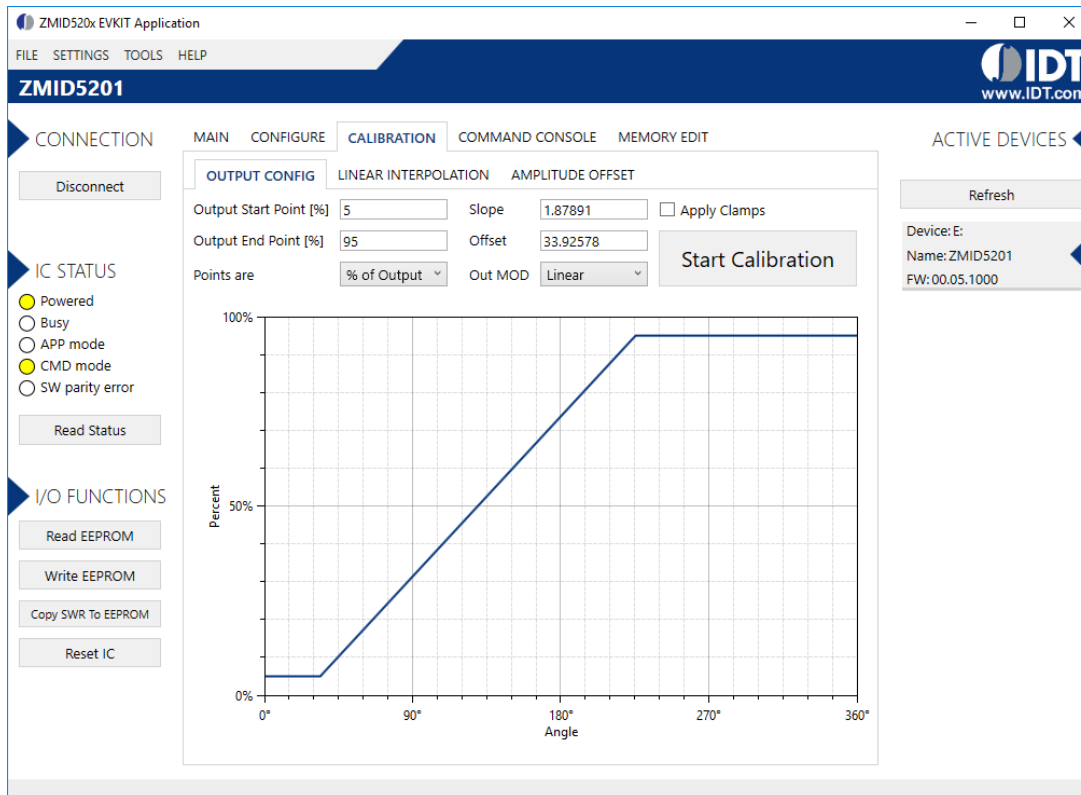
There are three values that can be edited for subsequent use during the calibration procedure:

- Output Start Point [%]: Defines the desired output value when the target is at the mechanical start point.
- Output End Point [%]: Defines the desired output value when the target is at the mechanical end point.
- Out MOD: Defines the output mode.
    — Linear: The Linear Output Mode is a non-repeating output mode in which the sensor output signal is clamped at the mechanical end points (see Figure 20).
    — Modulo 360: The Modulo Output (Sawtooth Output) Mode is a repeating output mode in which the sensor output signal is not clamped at the mechanical end points, but it is switched back to its origin (see Figure 21).

Figure 20. Linear Output Mode Example with Slope = 2, Offset = 90°

Figure 21. Modulus Output Example with Slope = 2, Offset = 60°

The results from the calibration procedure are displayed in two fields on the "OUTPUT CONFIG" tab. They are direct representations of the *Offset* and *Slope* registers in the ZMID520x. The values can also be manually entered by the user.

- Slope: The slope of the transfer function of the output signal.
- Offset: The zero-offset of the output signal referenced to the mechanical position in degrees.

There are two additional settings available only for the ZMID5201 (Analog interface) and the ZMID5202 (PWM Interface): "Apply Clamps" and "Points are."

▪ **"Apply Clamps" checkbox:** If activated, the output is clamped between the specified start and end points if the target goes beyond these mechanical positions. Due to the low resolution of the clamps register, the available clamping values might not match the selected output start and end points exactly. See Figure 22 and Figure 23 for examples of the output without clamping and the output with clamping, respectively.
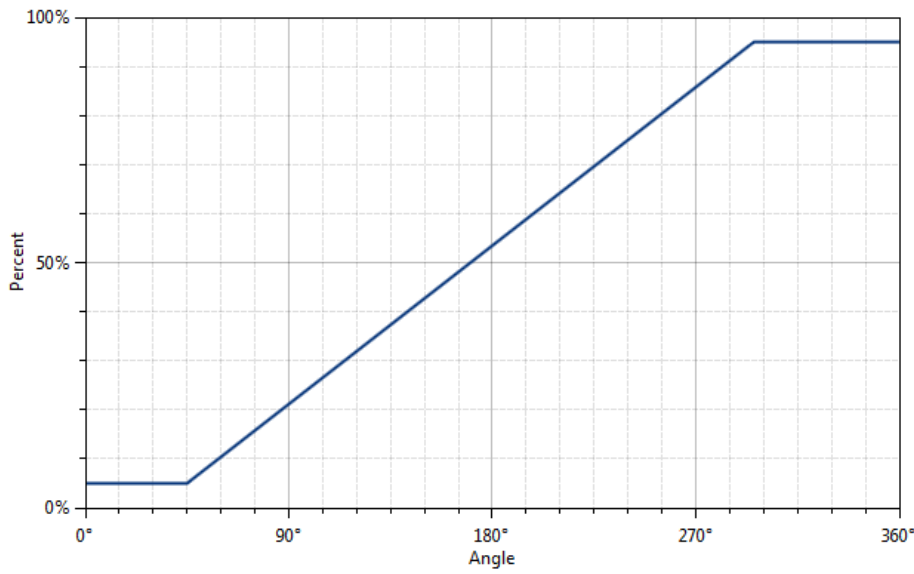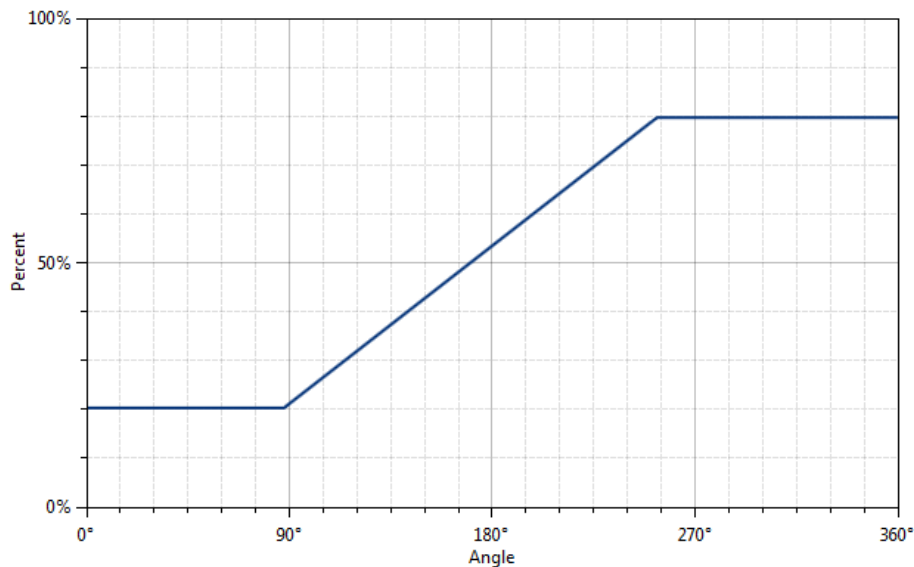
Figure 22. Output without Clamping

Figure 23. Output Clamped from 20% to 80%

- **"Points are" drop-down menu:** Defines how the start and end points should be interpreted. Two options are available:
  - % of Output: The start and end points are percent values of the ZMID5201/ZMID5202 output. The position result is mapped between 5% and 95% of the output of the IC. For example, setting the start point to 20% is equivalent to 20%VDD (analog) or 20% duty cycle (PWM).
  - % of Pos0: The start and end points are percent values of the Pos0 register (0 to 65535 in codes). For example, setting the start point to 20% is equivalent to 13107 in codes.

2.4.2   Automatic Output Calibration Procedure

To start the automatic calibration, click the "Start Calibration" button. The GUI will guide the user through a sequence of instructions for performing the calibration procedure.

1. Move the sensing target to the start position, and click "OK" in the dialog box. The graph will start displaying the internal reading of the position.

2. Move the sensing target to the end position, and click OK. The GUI will automatically attempt to determine if the slope polarity of the values is positive (values ascending) or negative (values descending). If this cannot be determined, the GUI will ask the user to specify the polarity of the slope. For the example provided in Figure 24, the slope is negative.

3. Based on the acquired data, the GUI will attempt to calculate the best values for the *Slope*, *Offset*, and *Clamps* registers. If the calibration is not possible with the currently selected "Out MOD" setting, the GUI will ask the user to change to the other setting (see Figure 25). The calculated values will be prepared to be written to the memory, and the user will be directed to use the "Write EEPROM" button in the "I/O FUNCTIONS" section to write the new coefficients to the memory of the device. See Figure 26.

4. If the calculated values are out of range or the calibration is not possible, a message will inform the user which value is affected. The most common cause of unsuccessful calibration is setting the start and end target positions too close to each other since this could require a slope value larger than the valid range of slope values. See Figure 27.

5. A detailed log from the calibration function is available from the "TOOLS" menu -> "Open Log File" -> "Calibration."

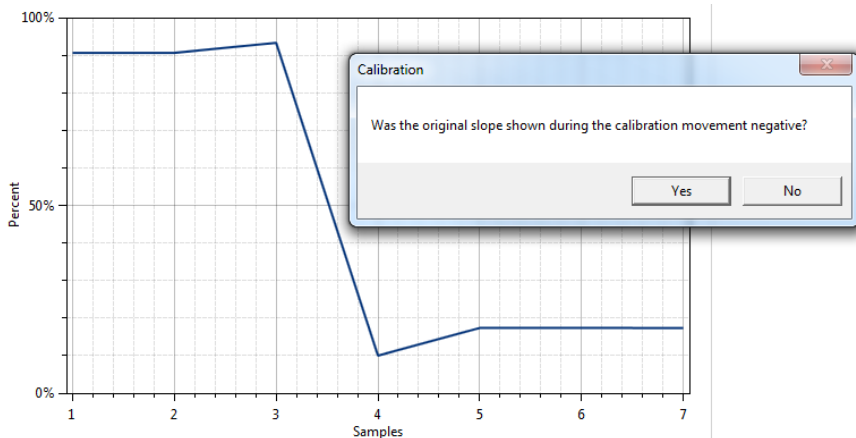## Figure 24. Specify the Original Slope

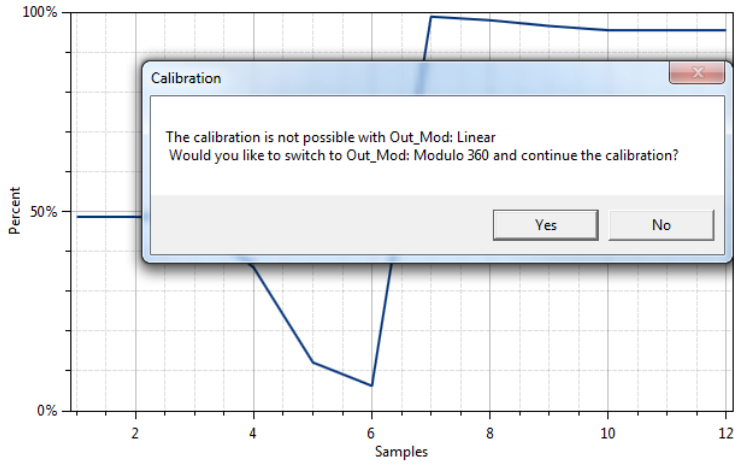**Figure 25. Request for Changing the Out_Mod Setting**
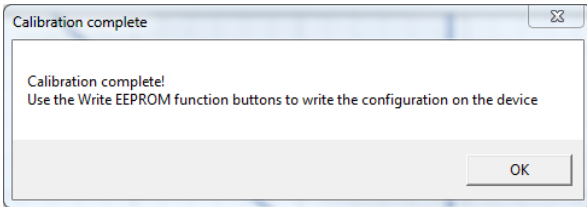

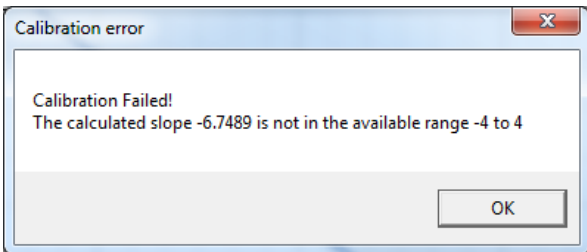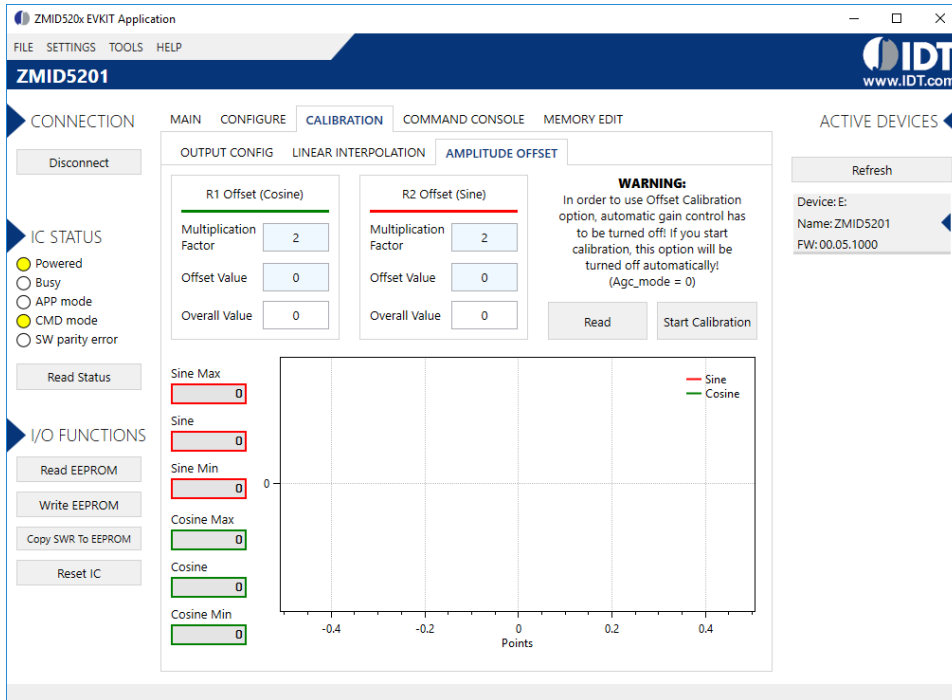**Figure 26. Successful Calibration Message**

Figure 27. Unsuccessful Calibration Message
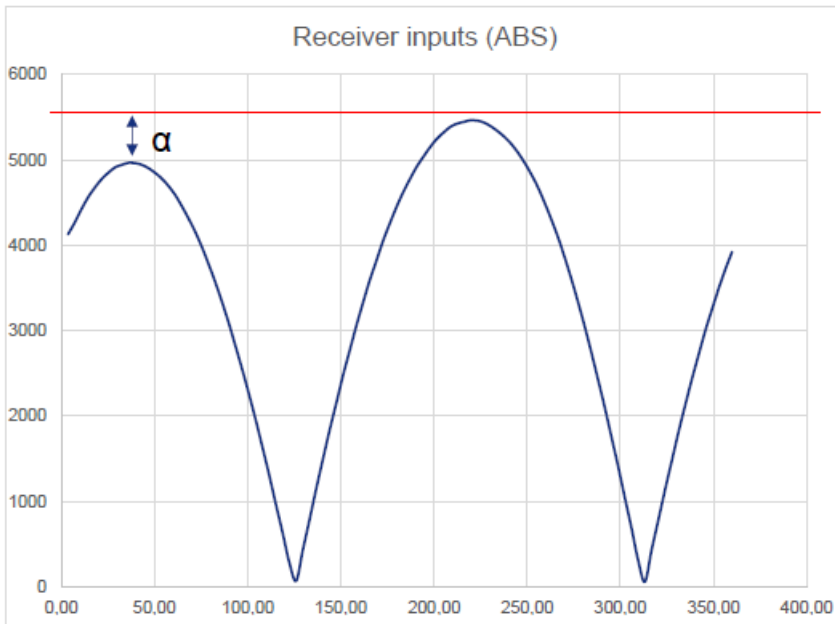
2.4.3 "AMPLITUDE OFFSET" Tab

The "AMPLITUDE OFFSET"" sub-tab is located under the "CALIBRATION" tab (see Figure 28). It is used to compensate the offset of the signal acquired from coils R1 and R2 connected to the ZMID520x.

Figure 28. "AMPLITUDE OFFSET" Tab – ZMID5201 Example


For each of the coils, the following are displayed:

1. Multiplication factor; this value will be displayed at the end of calibration (2 or 4).

2. Offset value; this value will be displayed at the end of calibration (0 to ±63).

3. The overall value to be added to (subtracted from) the R1 and R2 values. This field can be directly defined by the user.

4. After calibration is performed, write to the EEPROM to save the offset values.

Figure 29. Receiver Coil (ABS Value) Offset Example with Offset Compensation = $\alpha/2$

To start the automatic calibration for amplitude offset, click the "Start Calibration" button. The GUI will guide the user through a sequence of instructions for performing the calibration procedure.

1. Move the target to one end position of the movement range, and press "Ok."

2. Move the target at the opposite end position of the movement range, and press "Ok."

3. Values for the Multiplication Factor, Offset Value, and Overall Value will be updated (see Figure 30).

Figure 30. Amplitude Offset Calibration Completed – ZMID5201 Example
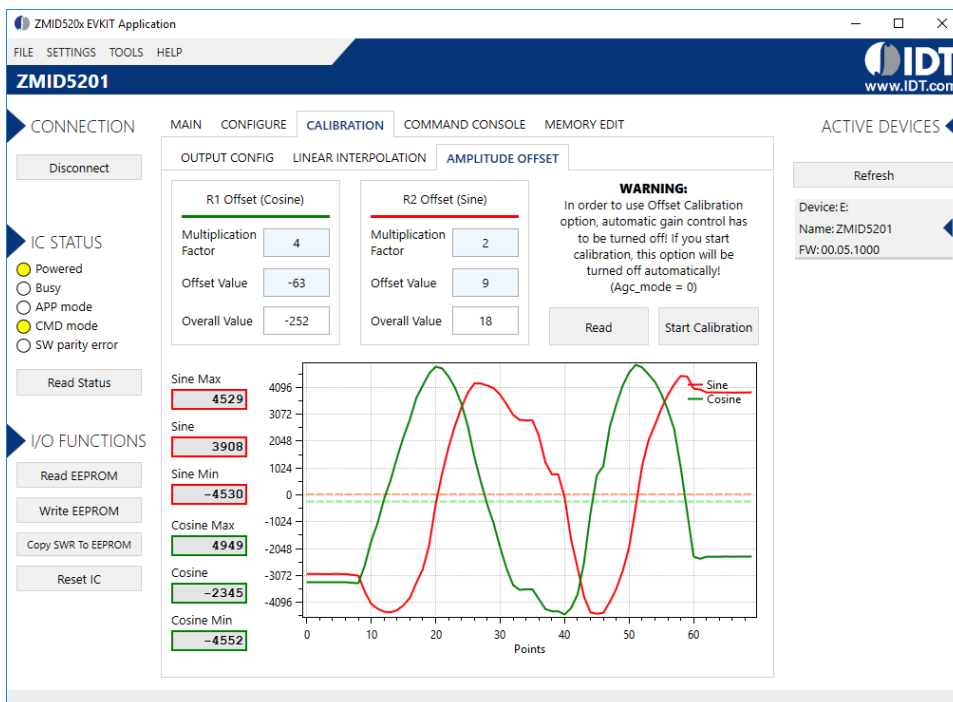
2.4.4 "LINEAR INTERPOLATION" Tab

The table on the "LINEAR INTERPOLATION" tab shows the nine points for which a value can be specified for application to a correction curve over the position range (see Figure 31).

The table has the following rows:

- Correction Point: Constraint points for linearization 1 to 9; below each correction point, the electrical position is shown in the next row (0 to 360 degrees in pre-calibration or 0 to 100% after calibration).

- Ideal Value: The ideal value (read-only) according to the motion range provided.

- Measured Value [mm] or [deg]: Entry field for values measured at the correction points ("mm" is not applicable to the ZMID520x Rotary 360° Demo Board). These values are entered by the user.

- Correction: These read-only values (integers in the range of -127 to 127) will be added (after a multiplication x 32) to the "Spatial Angle" data if linearization is performed before calibration; in the case of linearization post-calibration, these values will be applied (after a multiplication x 32) to the Position 0 data, resulting in the Position 1 data. See the description of the "Start Reading" button below for an explanation of the "Position 0" and "Position 1" data fields.

Three additional controls are available on this tab.

- Motion Range [mm] or [deg]: Entry field for the linear motion range in mm (not applicable to the ZMID520x Rotary 360° Demo Board) or the arc/rotation motion range in degrees. This user-selected value is used to calculate the ideal values.

- Correction Mode: This drop-down menu allows selecting whether the linearization is applied before or after calibration.

- Angle Offset: This drop-down menu offers the option to shift the linearization points if required. Whether the offset is applied or not is determined by the non-linearity error distribution. (Refer to the *ZMID520x Datasheet* for details).

Figure 31. "LINEAR INTERPOLATION" Tab – ZMID5201 Example

The "Start Reading" button triggers a continuous reading of the three internal position registers of the ZMID520x (see Figure 31 for the corresponding measurement points in the calibration process). This is implemented to help the user measure the linearization error at the specific points. The "Spatial Angle" reading represents the CORDIC output angle before applying the slope and offset calibration. The "Position 0" reading is the position value after applying the slope and offset calibration but before applying the linear interpolation. The "Position 1" reading is the final value after the linear interpolation is applied (see Figure 32)

To save changes to the device, use the corresponding "Write…" button in the "I/O FUNCTIONS" section.

Figure 32. Calibration Diagram
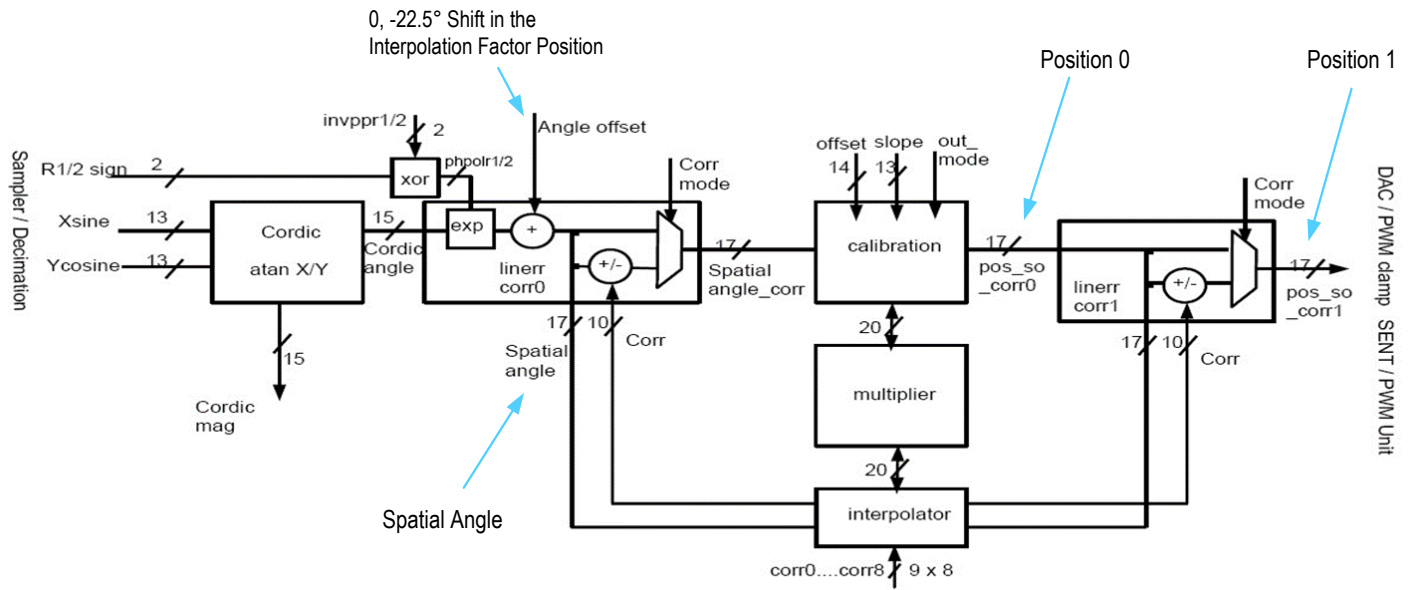
2.5   Working with the Memory

2.5.1   "MEMORY EDIT" Tab

Information for all the memory types of the device and their values can be found on the "MEMORY EDIT" tab (see Figure 33). The data is organized in tables, and the register values are in hexadecimal format.

Figure 33. "MEMORY EDIT" Tab Contents – ZMID5201 Example

The read-only registers are marked with a light blue background. Modified register values will appear in red color until they are written to the device memory or re-read from it (see Figure 34).

Figure 34. Example of a Modified Value on the "MEMORY EDIT" Tab

Placing the cursor over a table cell displays a tooltip with additional information about the register (see Figure 35).

Figure 35. Example of "MEMORY EDIT" Tab Tooltip Information

EEPROM	0	1	2	3	
0h	01EA	1683	0000	0000	0(
8h		0000	4803		
10h	0000				

Calibration slope (Address: 0x0001)

2.5.2 Saving and Loading Memory Dump Files

The current memory configuration can be saved to a file via the "FILE" menu > "Save Memory Dump." This is useful for providing a backup of the verified memory configuration or for copying a configuration to another device (see Figure 36).

The "Load Memory Dump" option loads a selected memory dump file into the "MEMORY EDIT" tab. The "Write EEPROM" button in the "I/O FUNCTIONS" section must be used to write the configuration into the memory of the ZMID520x.

The GUI provides a set of default memory dump files that can be used to easily return a device to its original settings.

The default memory dump files can be found in the "*MemoryDumps*" folder located in the main installation directory of the GUI.

Figure 36. Menu Options for Saving and Loading Memory Dump Files

ZMID520x EVKIT Application

FILE SETTINGS TOOLS HELP

Load Memory Dump
Save Memory Dump

Exit
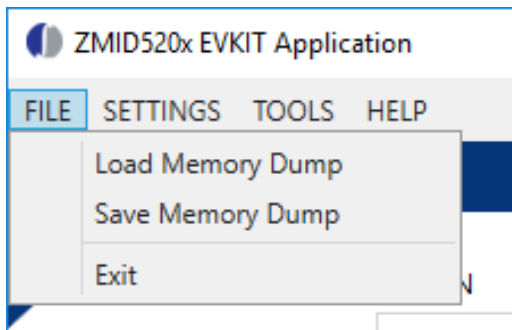
2.5.3   Viewing Memory Dump Files without Connecting to a Device – "Offline"

It is possible to load a memory dump file when no device is connected. This allows the user to view and edit the contents of a memory dump file. The "Save Memory Dump" menu option is used to save the changes to the same or a new file. Since there is no device connected, only the "CONFIGURE" and "MEMORY EDIT" tabs are available (see Figure 37). The values that are different from the default values for the ZMID are displayed in red. Connecting to a device while viewing a memory dump file "offline" will cause the GUI to discard any unsaved changes to the memory dump file and switch to displaying the current settings from the connected device's memory.

**Figure 37. Viewing a Memory Dump File "Offline"**
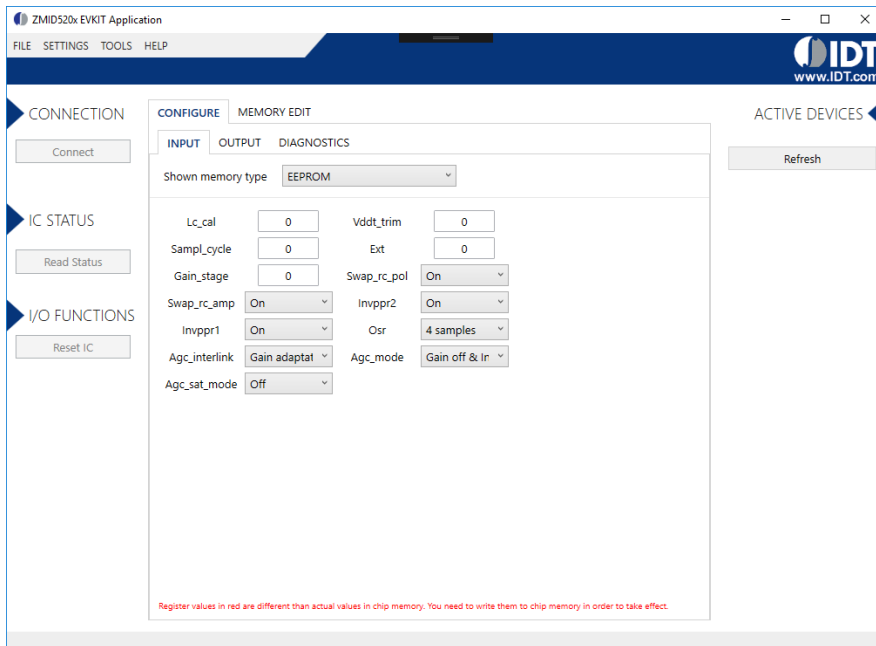
2.6   Manually Identifying a Device

When a new device is connected to the computer, the GUI automatically recognizes it. If it is unable to identify the device, the user must manually identify it. There is also a menu option to re-identify a device (see Figure 38).

2.6.1   Identifying an Unknown Device

If the GUI is unable to automatically identify the device, it will be displayed as an unknown device in the "ACTIVE DEVICES" section, and the "Connect" button will be replaced by an "Identify Device" button.

Figure 38. GUI View when an Unknown Device is Selected
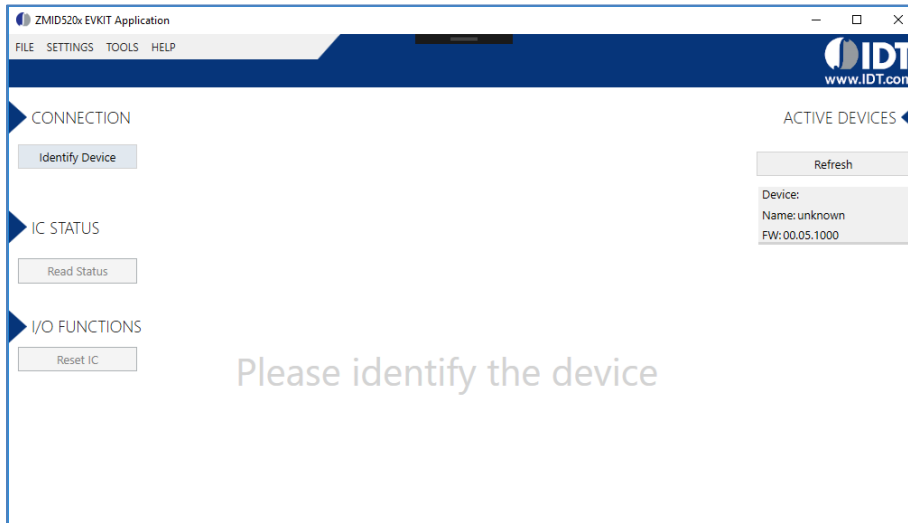
Follow these steps to identify an unknown device:

1.   Select the device by clicking on it in the "ACTIVE DEVICES" section.

2.   Click on the "Identify Device" button in the "CONNECTION" section.

3.   In the resulting common file dialog, select the proper identification file based on the type of ZMID520x Demo Board, and click "Open." The identification files can be found in the root directory in the *Profiles* folder (see Figure 39). Filenames with suffix "_d" are used with Dual-ZMID devices.

4.   The GUI will identify the device and automatically connect to it.

Figure 39. File Dialog to Select an Identification File
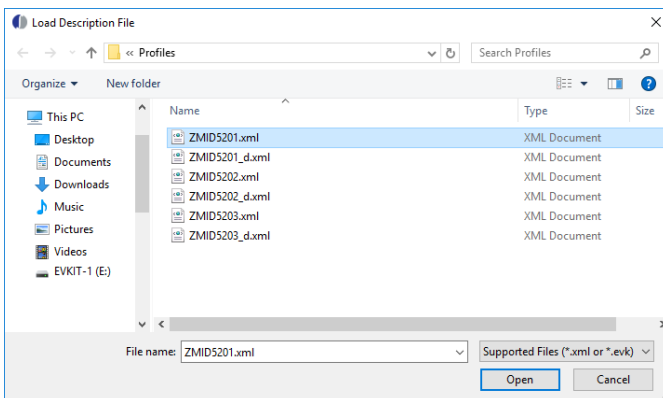
2.6.2 Re-identifying a Device

1. Ensure the GUI is not connected to any device.

2. Select the device to identify from the "ACTIVE DEVICES" list by clicking on it.

3. Open the "TOOLS" menu, and select the "Identify Selected Device" menu option.

4. In the resulting common file dialog, select the proper identification file based on the type of ZMID520x Demo Board, and click "Open." The filenames ending with "_d" are for advanced testing.

5. The GUI will re-identify the device with the selected identification file and update the device information in the "ACTIVE DEVICES" section.

Figure 40. "Identify Selected Device" Menu Option
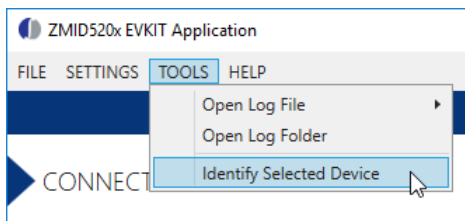
3. Firmware Update

This section provides optional instructions for upgrading the firmware for the Communication Board if needed for special uses of the kit that might require additional features in the latest version of the firmware. Normally this is not needed since all versions of the firmware function properly with the GUI and hardware. To determine the existing version of the firmware on the board, see the "FW" version shown in the "ACTIVE DEVICES" section at the right of the display (see Figure 5).

> ⚠ **Important Equipment Warning:** Ensure the correct connection of all cables. Supplying the board using the wrong polarity could result in damage to the board and/or the equipment.

To perform a firmware update of the Communication Board, complete these steps:

1. Download the latest firmware file from the IDT website.

2. Disconnect the Communication Board from the USB port of the computer.

3. Install a jumper to short the two "**BOOT**" pins on the Communication Board as shown in Figure 41.

Figure 41. Position of the BOOT Pins

4. Connect the Communication Board to the USB port of the computer.

5. The Communication Board will show up as a removable drive named "**CRP DISABLD.**" Open the drive to browse the files.

Figure 42. Locating the Removable Device

6. Delete the "**firmware.bin"** file from the device. Recommendation: Store a copy of the file on the user's computer as a backup.

7. Copy the new firmware file to the device.

8. Disconnect the board from the USB port of the computer.

9. Remove the jumper from the "**BOOT**" pins.

To verify the firmware update, install a ZMID520x Demo Board and connect to the computer. The GUI will now display the new version of the firmware on the board information in the "ACTIVE DEVICES" section.

4. Schematics

Figure 43. ZMID5201 Demo Board Schematic

Jumper	Name	State (No External Module)
JP1	SOUT	Closed (1, 2)
JP2	PWR_VDDE	Closed (1, 2)
JP3	DIR	Open
JP4	ANA	Closed
JP5	DIG	Open
JP6	AN_OUT	Closed
JP6	R1P	Closed
JP8	R1N	Closed
JP9	R2P	Closed
JP10	R2N	Closed
JP11	EP	Closed
JP12	EN	Closed
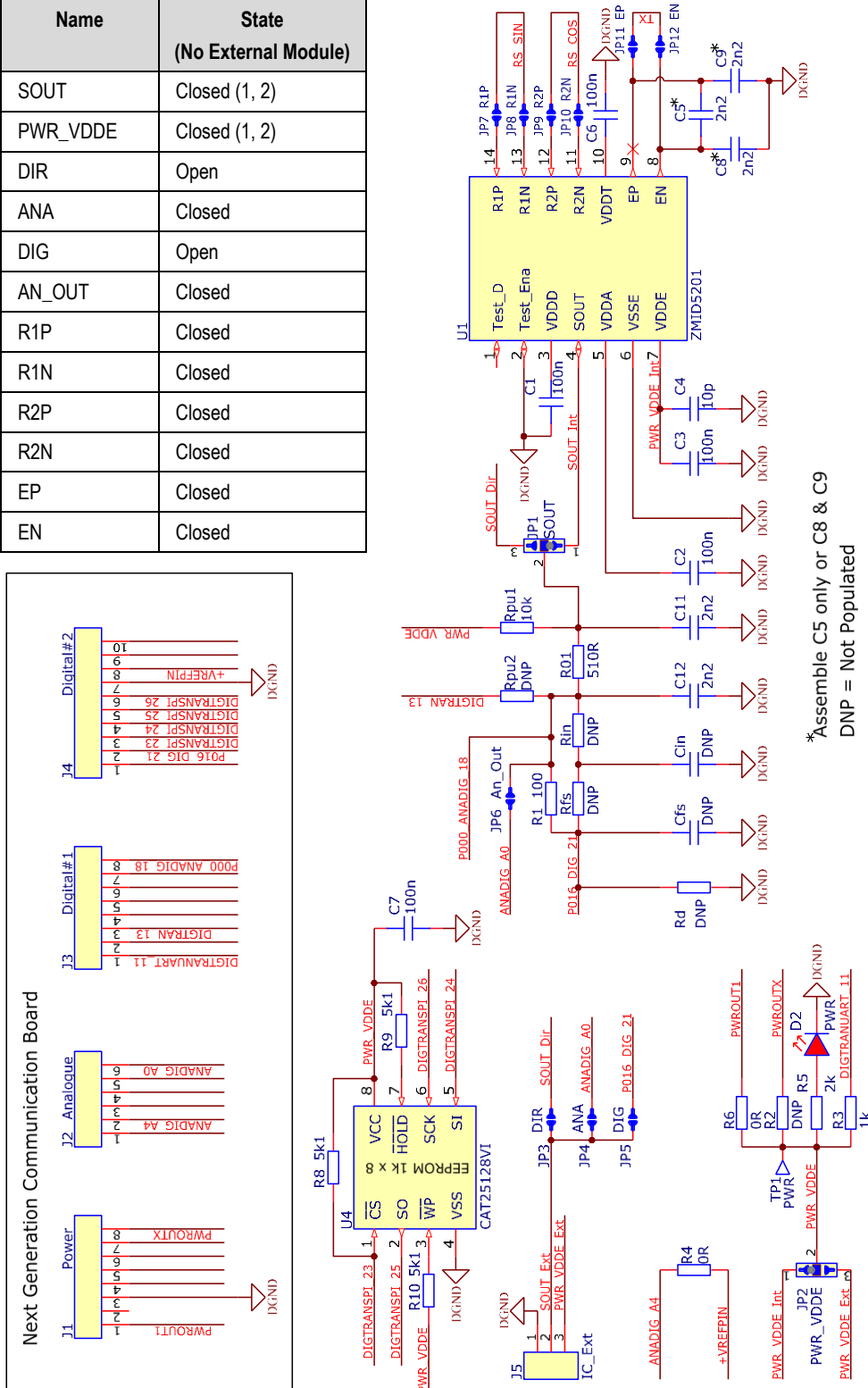
Figure 44. ZMID5202 Demo Board Schematic

Jumper	Name	State (No External Module)
JP1	SOUT	Closed (1, 2)
JP2	PWR_VDDE	Closed (1, 2)
JP3	DIR	Open
JP4	ANA	Open
JP5	DIG	Open
JP6	AN_OUT	Open
JP6	R1P	Closed
JP8	R1N	Closed
JP9	R2P	Closed
JP10	R2N	Closed
JP11	EP	Closed
JP12	EN	Closed

Figure 45. ZMID5203 Demo Board Schematic

Jumper	Name	State (No External Module)
JP1	SOUT	Closed (1, 2)
JP2	PWR_VDDE	Closed (1, 2)
JP3	DIR	Open
JP4	ANA	Open
JP5	DIG	Open
JP6	AN_OUT	Open
JP6	R1P	Closed
JP8	R1N	Closed
JP9	R2P	Closed
JP10	R2N	Closed
JP11	EP	Closed
JP12	EN	Closed

5. Bill of Materials (BOM)

Table 3.   ZMID520x Rotary 360˚ Demo Board BOM

Note: Refer to Figure 43, Figure 44, or Figure 45 to determine if the following components are placed for the kit variation for the ZMID5201, ZMID5202, or ZMID5203, respectively.

Designator	Value	Package	Manufacturer P/N	Manufacturer	Quantity
C1, C2, C3, C6, C7	Cap 100nF 100V X7R	0805	CL21B104KCFSFNG	Samsung	5
C4	Cap 10pF 50V COG	0805	CL21C100DBNC	Samsung	1
C5, C8, C9, C11, C12, Cin	Cap 2.2nF 100V COG	0805	CGA4F2COG2A222J 085AA	TDK	6
D2	LED 0805 Red	0805	KPT-2012SURCK	Kingbright	1
J1, J2, J3, J4	Header Male 1x8, Header Male 1x6, Header Male 1x8, Header Male 1x10	Row 2.54mm	CH31402V200	CVILUX	4
J5	Header Male 1x3 RA	TH P2.54mm	CH31402H200	CVILUX	1
R1	Res 100R 1%	0805	0805S8F0101T50	UNI OHM	1
R01	Res 120R 1%	0805	0805S8F0121T50	UNI OHM	1
R2, R4, R6	Res 0R 5%	0805	0805S8J000T50	UNI OHM	3
R3	Res 1.0k 1%	0805	0805S8F0102T50	UNI OHM	1
R5	Res 2.0k 1%	0805	0805S8F0202T50	UNI OHM	1
R8, R9, R10	Res 5.1k 1%	0805	0805S8F0512T50	UNI OHM	3
Rin	Res 560R 1%	0805	0805S8F0561T50	UNI OHM	1
Rpu1, Rpu2	Res 51k 1%	0805	0805S8F0513T50	UNI OHM	2
U1	Position Sensor	TSSOP-14	ZMID5201/-02/-03	IDT	1
U4	SPI EE Memory	SOIC-8	CAT25080VI-GT3	Digi-Key	1

6. Demo Board Layout

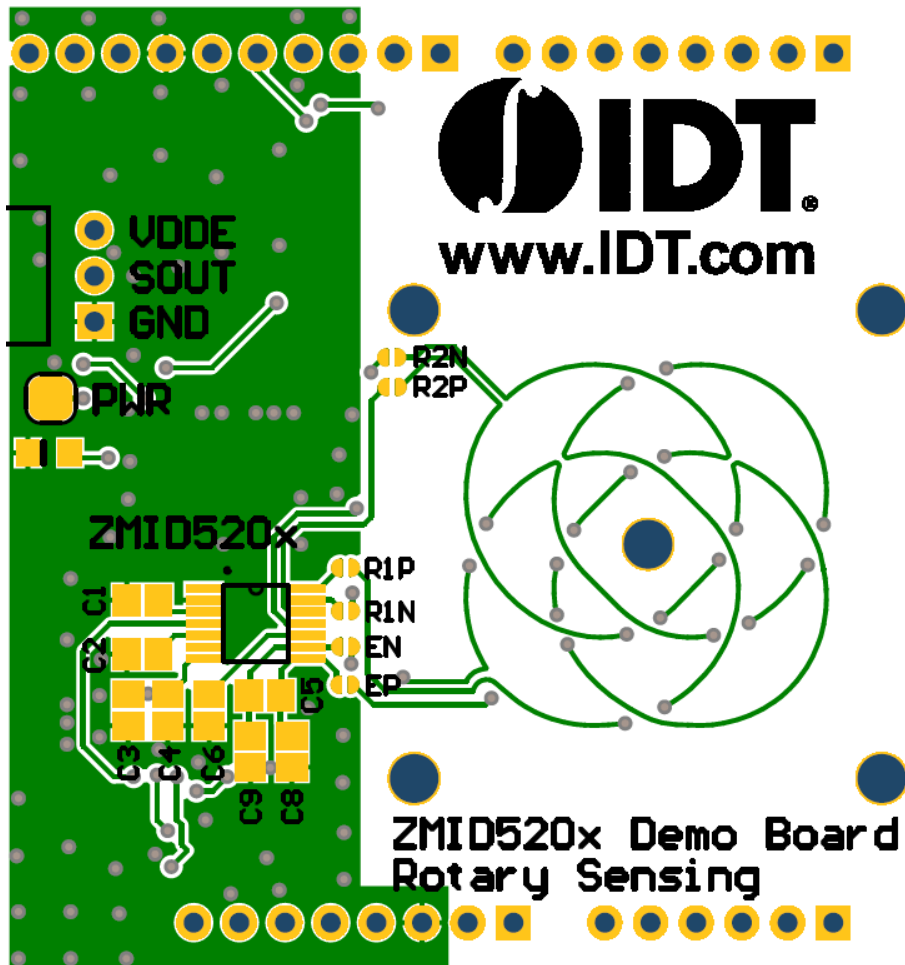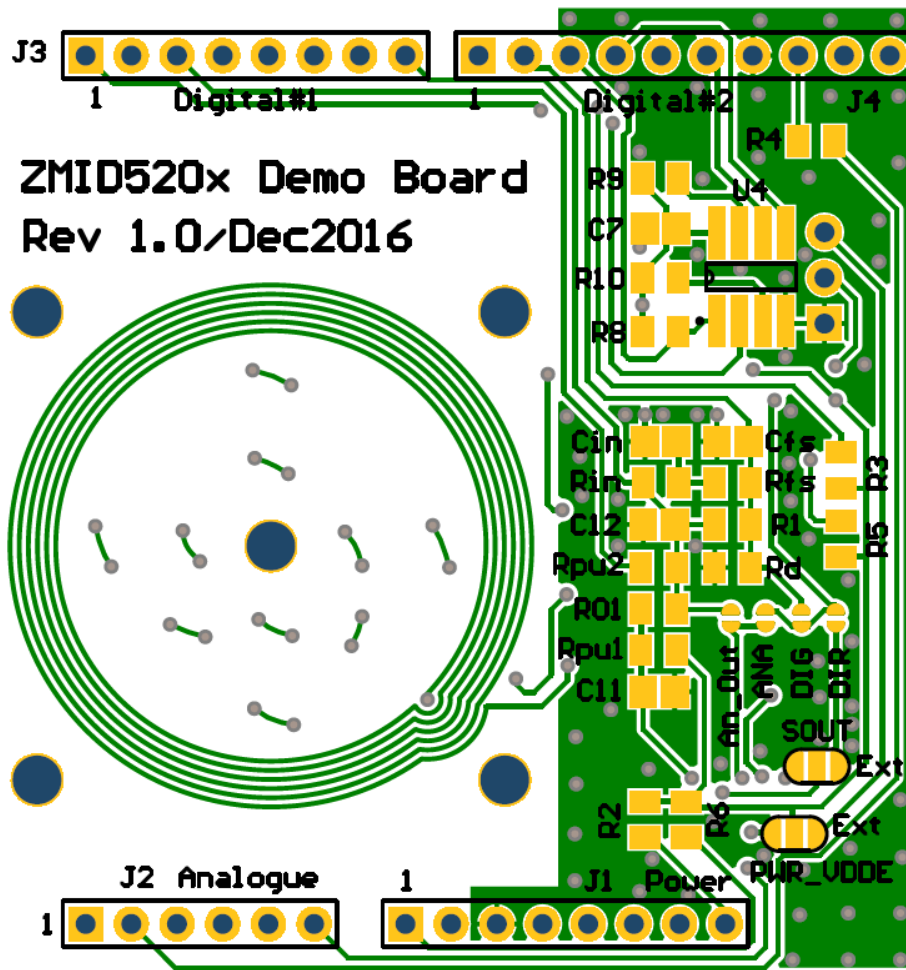**Figure 46. ZMID520x Rotary 360° Demo Board Layout – Top Layer**

Figure 47. ZMID520x Rotary 360° Demo Board Layout – Bottom Layer

7. Glossary

Term	Definition
ADC	Analog-to-Digital Converter
AGC	Automatic Gain Control
CSV	Comma Separated Values – A file format that can be imported in spreadsheets.
EEPROM	Electrically Erasable Programmable Read-Only Memory – the storage memory of the ZMID520x IC
EVK	Evaluation Kit
GUI	Graphical User Interface – Refers to the application used for communication with the kit
OWI	One-Wire Interface
PWM	Pulse Width Modulation
SENT	Single Edge Nibble Transmission
SWR	Shadow Register – Used as working memory for the ZMID520x IC.
USB	Universal Serial Bus

8. Ordering Information

Orderable Part Number	Description
ZMID5201-EVK	ZMID5201 Evaluation Kit: ZMID Communication Board, ZMID5201 Demo Board with printed sensor coil, micro-USB cable
ZMID5202-EVK	ZMID5202 Evaluation Kit: ZMID Communication Board, ZMID5202 Demo Board with printed sensor coil, micro-USB cable
ZMID5203-EVK	ZMID5203 Evaluation Kit: ZMID Communication Board, ZMID5203 Demo Board with printed sensor coil, micro-USB cable

9. Revision History

Revision Date	Description of Change
November 9, 2017	▪ General update including addition of new sections. ▪ New images of software with new GUI title. ▪ Minor edits.
March 27, 2017	Initial release.