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1. Introduction

This document describes how to setup and use the Calibration Dynamic Link Library (DLL) in combination with a virtual instrument (VI) in National Instruments™ LabVIEW to perform calibration and linearization on the ZMID520x Inductive Position Sensor IC. After the VI has been run, it will produce the new coefficients to write into the memory of the ZMID520x.

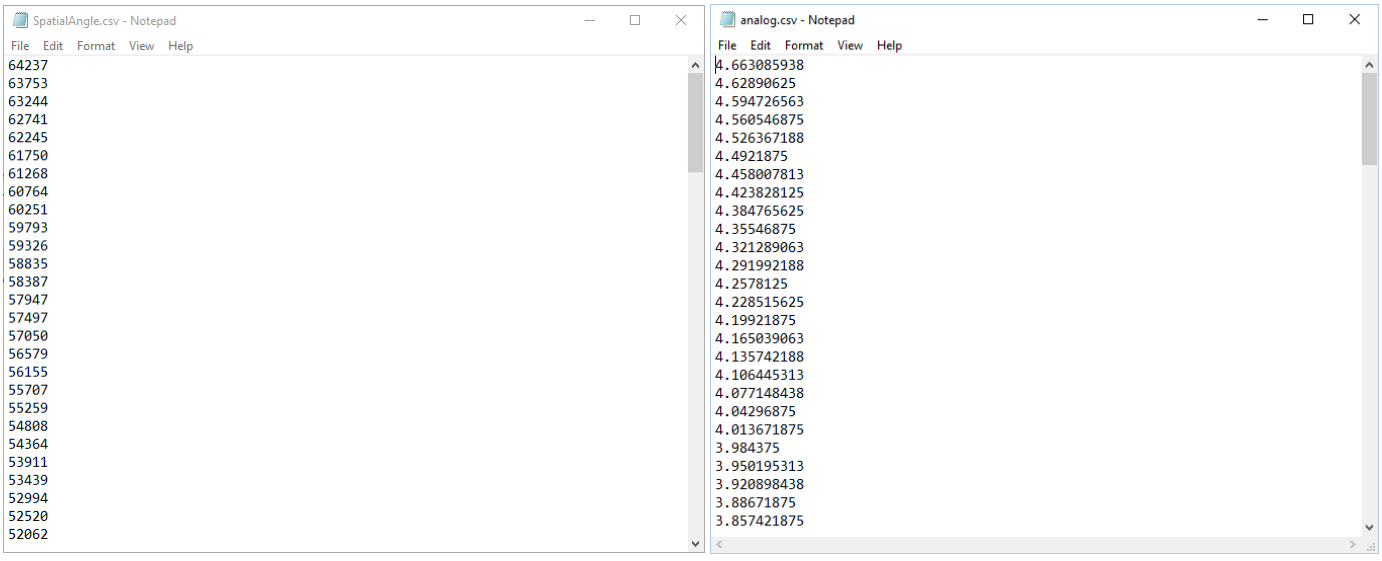
1.1 System Requirements

- Microsoft Windows® 7 SP1 ×64, Microsoft Windows® 8 ×64, Microsoft Windows® 10 ×64
- National Instruments™ LabVIEW 2016 ×64 or higher

2. Getting Started

1. Navigate to the web page for the applicable product:
   ZMID5201: www.IDT.com/zmid5201
   ZMID5202: www.IDT.com/zmid5202
   ZMID5203: www.IDT.com/zmid5203
2. Under "Software and Tools," download the zip files for the DLL and the VI graphical programming language file. Extract the contents of the folder after downloading has completed.
3. A CSV file containing spatial angle points, analog output points, Pulse Width Modulation (PWM) output points, or Single Edge Nibble Transmission (SENT) output points is required as an input to run the VI. Figure 1 shows a list of example values demonstrating the format that must be used. If the values have decimal points, a period must be used as the decimal separator (not a comma).

Figure 1. Example Content of Spatial Angle and Analog Output Values in CSV Files



3. Input Parameters

Open “ZMID520x_dll_64.vi” (Figure 2). Table 1 shows the eleven input parameters. After all input fields are filled in, run the VI. The calculated coefficients will be available, if the “Result Code” is equal to “0”, otherwise there is an error and the coefficients are not valid.

Figure 2. VI Front Panel

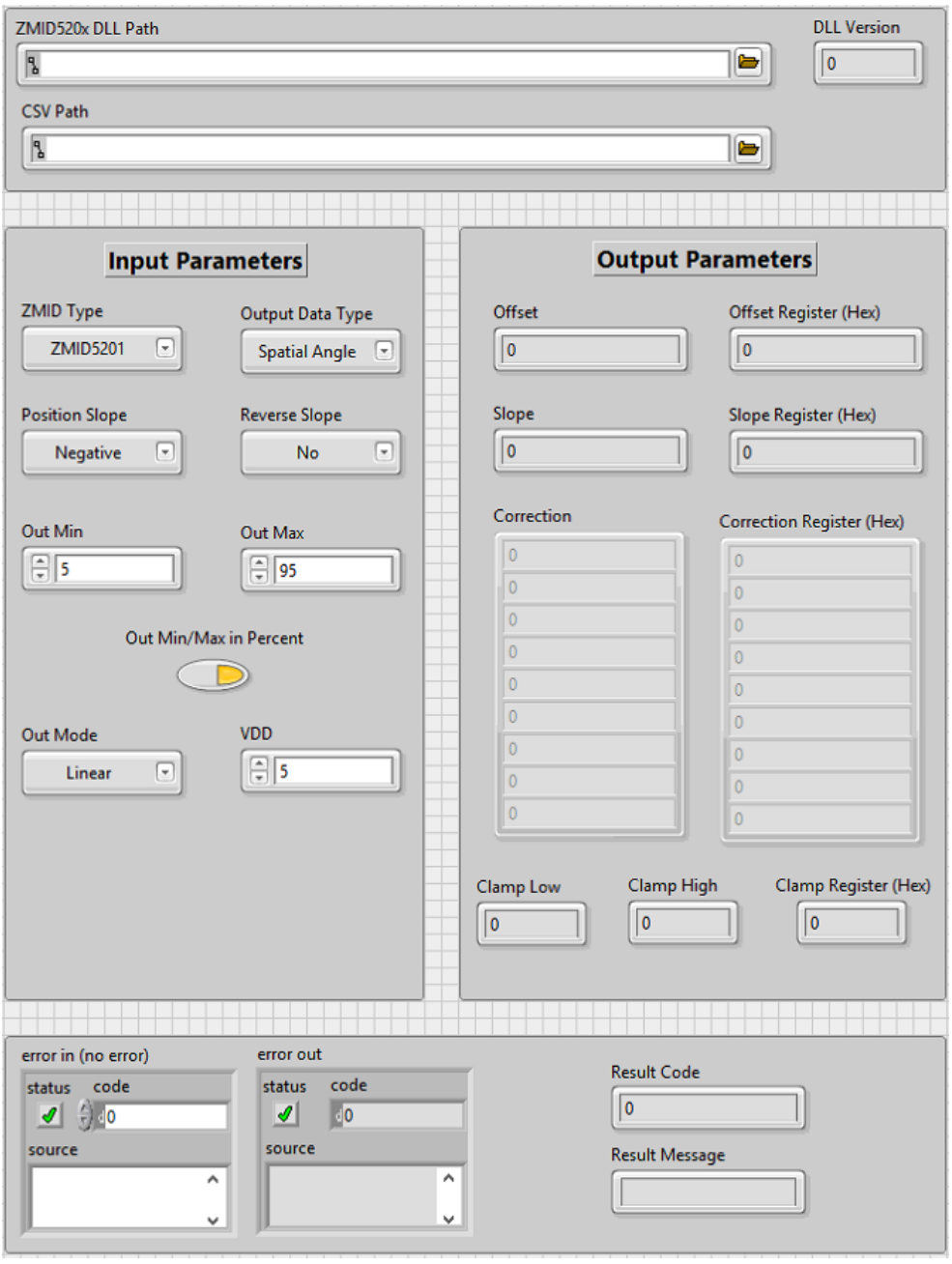


Table 1. User Entries

Input Parameter	Description
ZMID520x DLL Path	Full path of the location of the DLL
CSV Path	Full path of the location of the CSV
ZMID Type	1 = ZMID5201 (analog output), 2 = ZMID5202 (PWM), 3 = ZMID5203 (SENT)
Output Data Type	The type of the data contained in the CSV file: 0 = Spatial Angle, 1 = Analog, 2 = PWM, 3 = SENT
Position Slope	The slope of the list of points: 0 = positive, 1 = negative
Reverse Slope	This option can reverse the slope: 0 = keep the slope as is, 1 = invert the slope
Out Min	Lower clamping value: 5 = no clamping [a]
Out Max	Higher clamping value: 95 = no clamping [a]
Out Min/Max in Percent	Choose whether “Out Min” and “Out Max” are going to be filled in as percent of the output or as raw values by clicking this toggle button.
Out Mode	Output mode of the chip: 0 = Linear output mode, 1 = Modulo360 output mode
VDD	The power supply of the ZMID520x [b]

[a] ZMID5203 does not have clamping for the values.

[b] The power supply of the ZMID520x is needed only if using analog points as the “Output Data Type.”

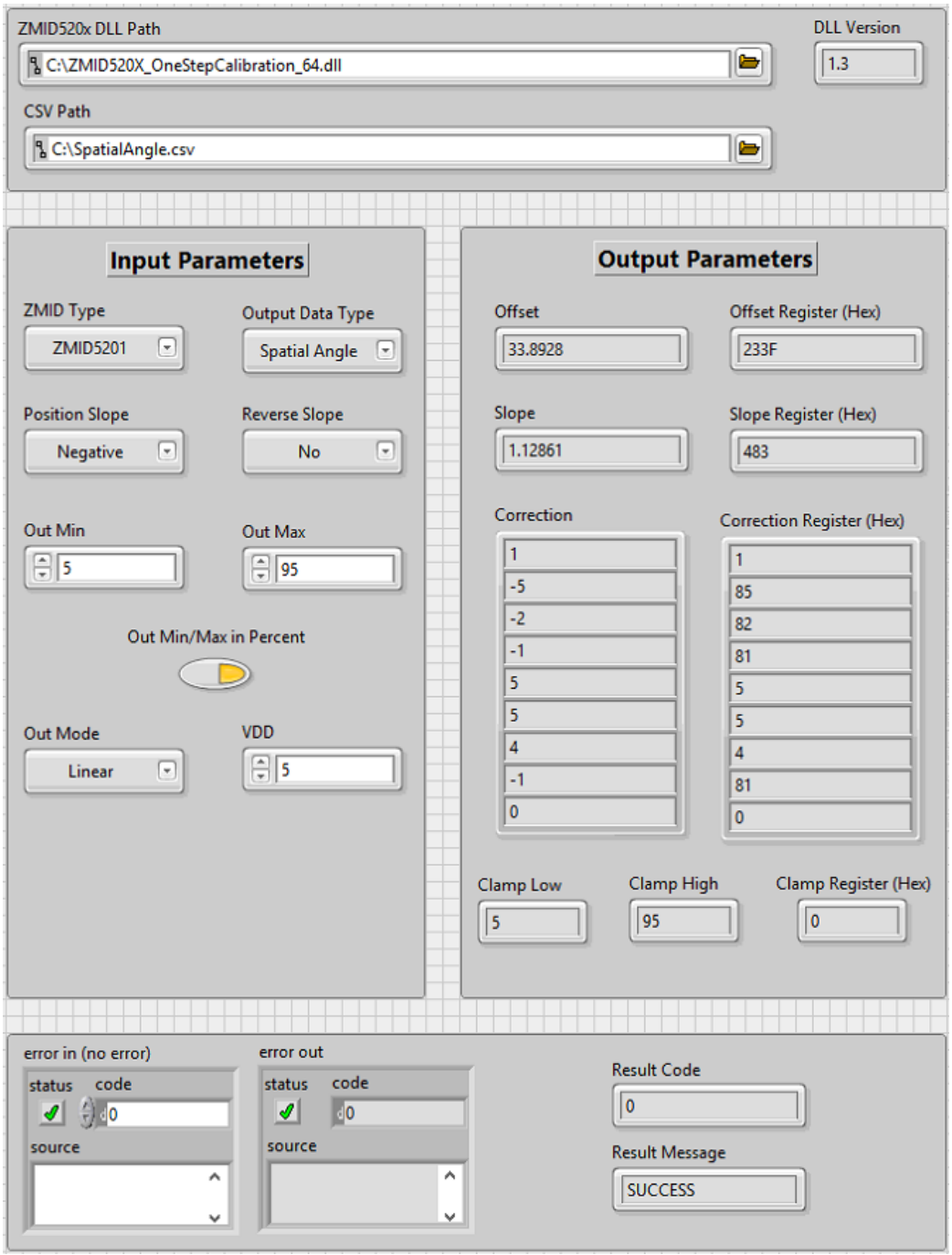
Write the generated coefficients into the respective registers in the chip. One way to do this is with the ZMID520x EVK Application Software which is a graphical user interface (GUI) found on the ZMID520x product web page (see section 2).

4. Examples of Usage

4.1 Usage as a Standalone VI

The following lines are an example of how to fill in the parameters using a ZMID5201 (analog output) and spatial angle points. In this example, the output mode is set to linear, the slope is negative and not inverted, and clamping is set to 5% to 95%. For the ZMID5201, refer to the *ZMID5201 Manual for Calibration and Linearization Using the Analog Output* for more details regarding the parameter definitions.

Figure 3. Example of Usage as a Standalone VI



After the coefficients are calculated, they appear on “Output Parameters” section. The fields must be written to the ZMID5201 memory at the following addresses for these example values.

Address 0x00: 233F (“Offset Register” field)

Address 0x01: 0483 (“Slope Register” field)

Address 0x02: 0000 (“Clamp Register” field)

Address 0x03: 8501 (first two “Correction Register” fields)

Address 0x04: 8182 (next two “Correction Register” fields)

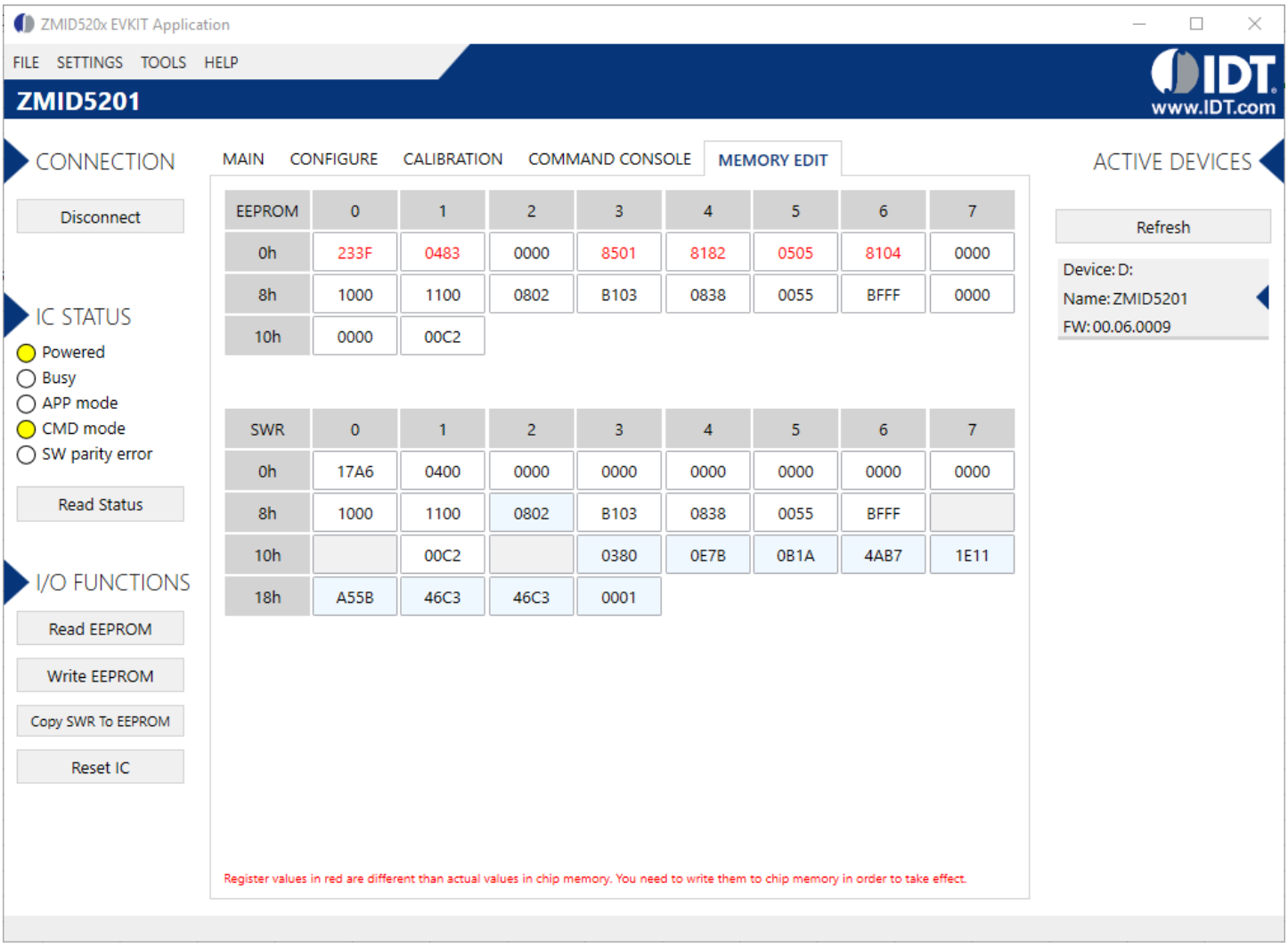
Address 0x05: 0505 (next two “Correction Register” fields)

Address 0x06: 8104 (next two “Correction Register” fields)

Address 0x07: 0000 (last “Correction Register” field as lower byte with upper byte filled with 00_{HEX})

In the GUI, the new coefficients can be written into the ZMID5201 EEPROM by entering them in the “MEMORY EDIT” tab and then clicking “Write EEPROM” button.

Figure 4. Example of Writing Coefficients into the “MEMORY EDIT” Tab



EEPROM	0	1	2	3	4	5	6	7
0h	233F	0483	0000	8501	8182	0505	8104	0000
8h	1000	1100	0802	B103	0838	0055	BFFF	0000
10h	0000	00C2						

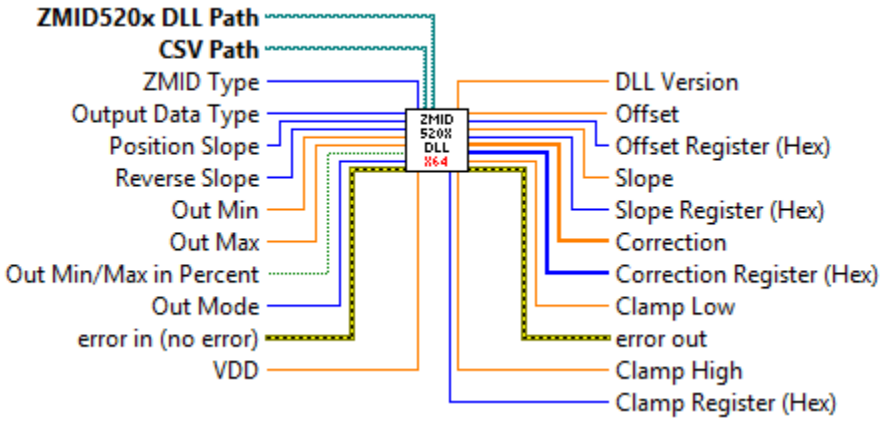
SWR	0	1	2	3	4	5	6	7
0h	17A6	0400	0000	0000	0000	0000	0000	0000
8h	1000	1100	0802	B103	0838	0055	BFFF	
10h		00C2		0380	0E7B	0B1A	4AB7	1E11
18h	A55B	46C3	46C3	0001				

4.2 Usage as a SubVI

The VI can be used as sub-block in other VIs. The connector pane is shown in Figure 5. If an error occurs, as displayed in the “error in” input section, the code of the VI is not executed and the error is transported to the “error out” output.

Note: The clamping parameters do not apply to the ZMID5203.

Figure 5. ZMID520x_dll_64.vi Connector Pane



5. Error Codes

If the run is successful, “0” will be displayed in the “Result Code” field and “SUCCESS” will appear in the “Result Message” field. If instead there has been an error, a negative error code will be displayed in “Result Code” and the corresponding error name will be displayed in “Result Message” field. Table 2 defines the DLL error codes and names.

Table 2. Possible Error Codes in the “Result Code” Display Field

Error Code	Error Name	Description
Error code -1	ERR_INVALID_INPUT	One or more of the inputs are invalid.
Error code -2	ERR_SLOPE	The calculated slope is out of range.
Error code -3	ERR_OFFSET	The calculated offset is out of range.
Error code -4	ERR_CORR	One or more of the calculated correction values are out of range.
Error code -5	ERR_POS0	One or more of the calculated Pos0 values are out of range.
Error code -6	ERR_POS1	One or more of the calculated Pos1 values are out of range.

6. Revision History

Revision Date	Description of Change
July 23, 2018	Initial release

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