

# PGA308

Input from AMC3301

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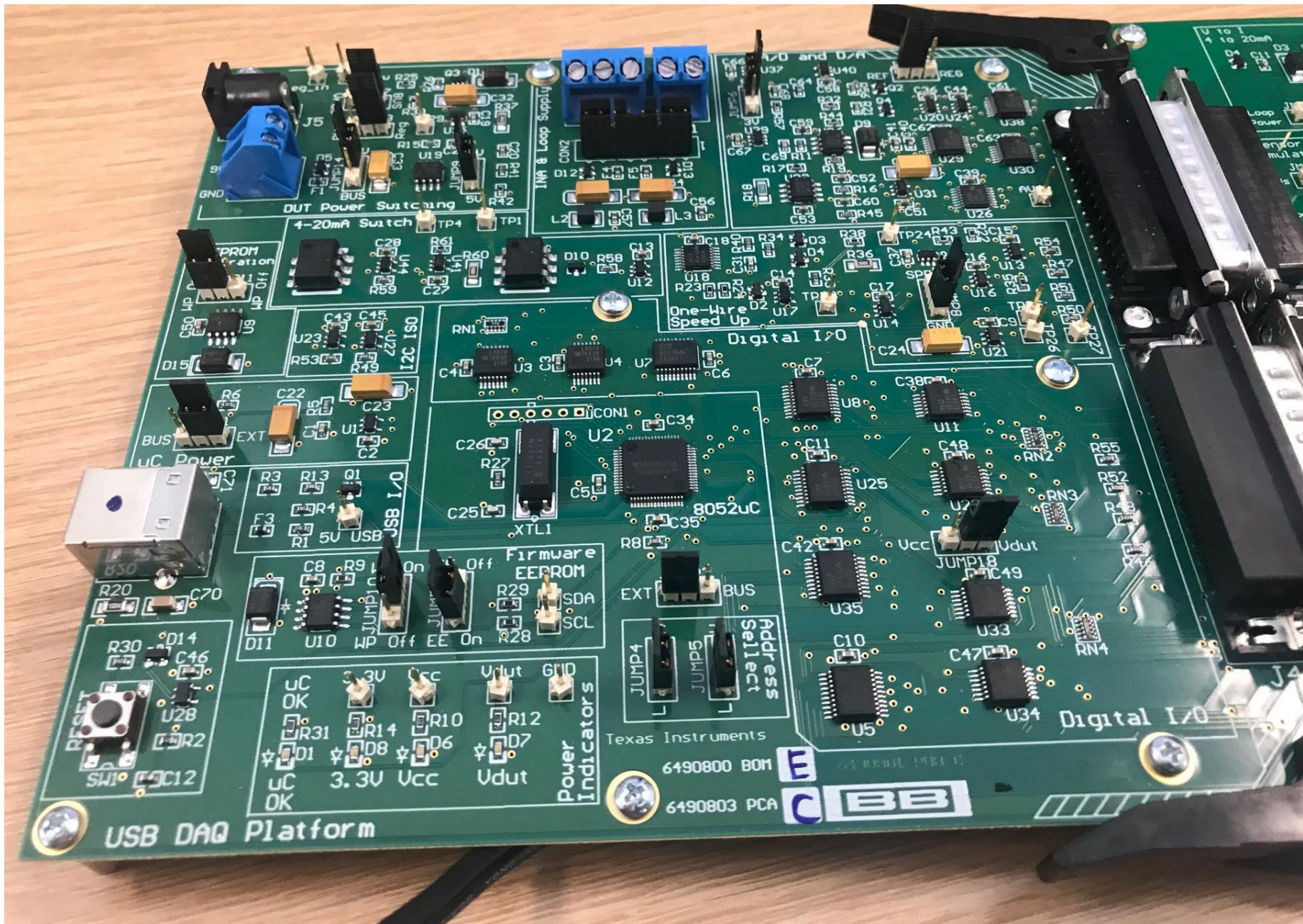


# overview

- Confirm software and hardware operation using the EVM built in sensor emulator
  - Set jumpers and connect power
  - Run software calibration
  - Confirm operation
- Connect external AMC3301 voltage
  - Change jumpers
  - External connections
  - Run calibration
  - Confirm operation



# Jumper setup sensor emulator calibration



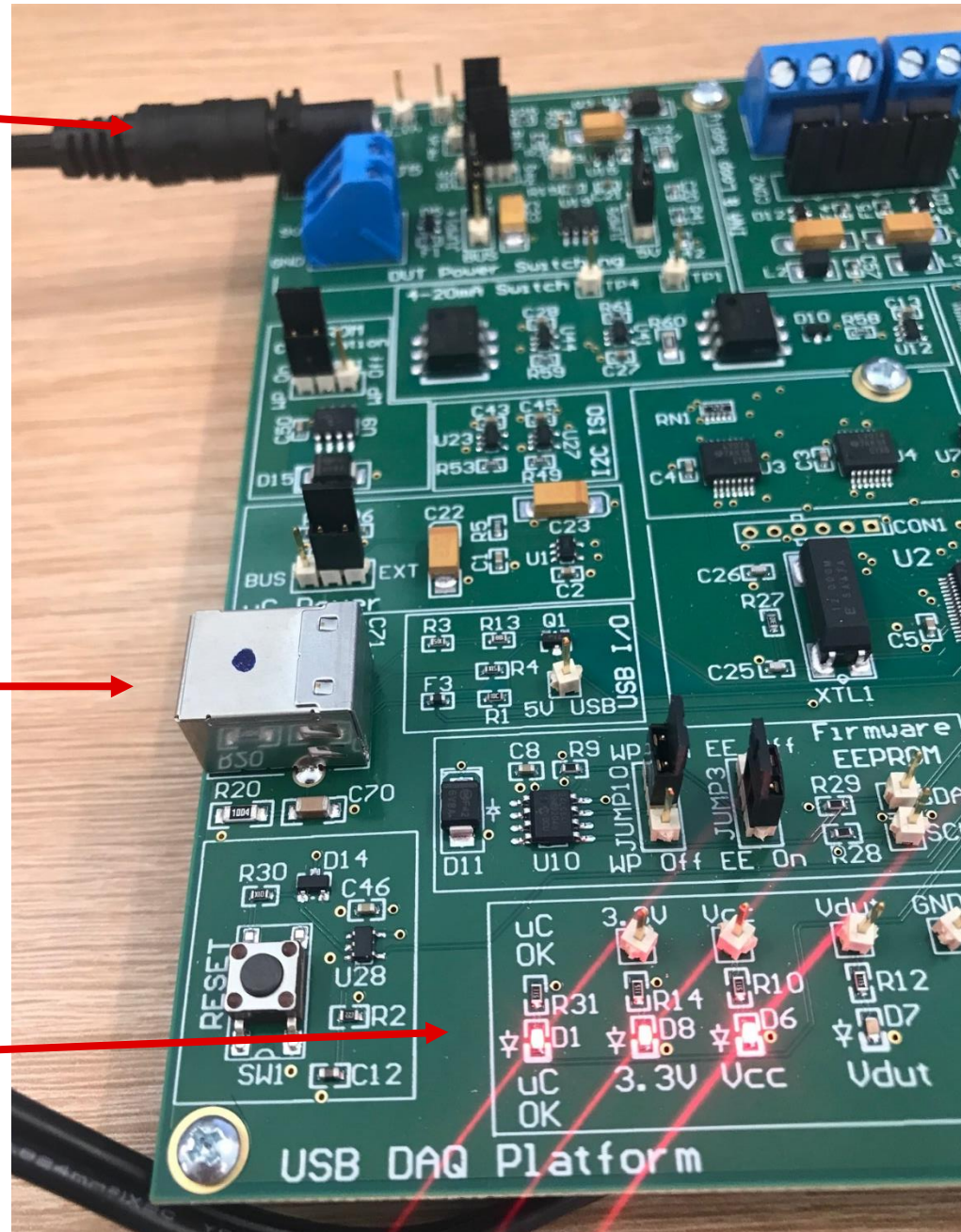
JMP	Position
17	BUS
13	Reg
14	9V
9	5V
11	WP On
6	5V
7	REF
1	EXT
8	GND
10	WP On
3	EE On
2	EXT
4	L
5	L
18	VDUT

# Connect Power (6V to 9V) then USB

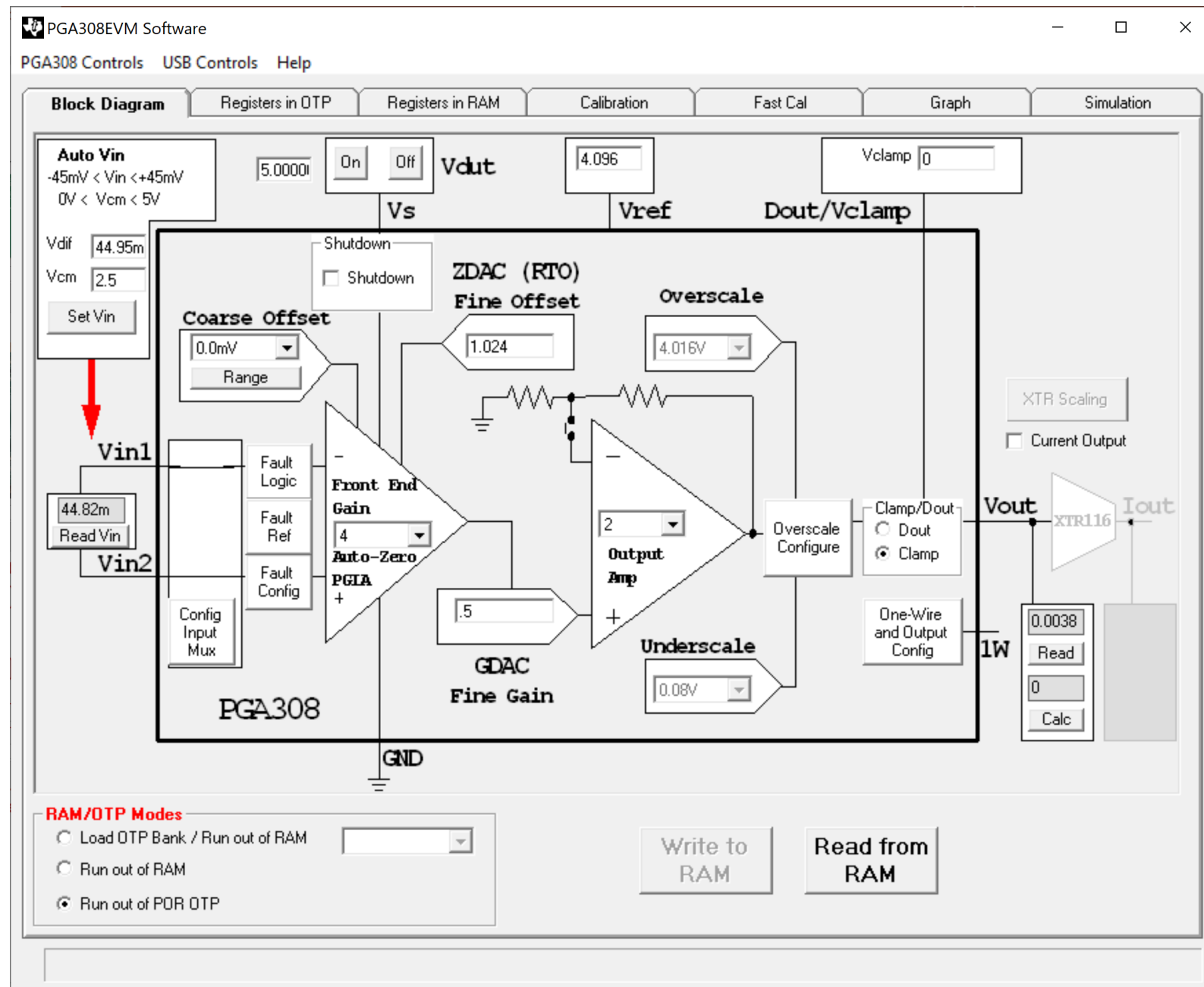
1. Connect 6V to 9V DC power here

3. Connect USB here

2. LED should eliminate as shown.



# Software startup



# Prepare for Auto cal

PGA308EVM Software  
PGA308 Controls USB Controls Help

Block Diagram Registers in OTP Registers in RAM **Calibration** Fast Cal Graph Simulation

Calibration

Effect of Load on Output Swing **Step 1**  
Riso   Omit Riso  
RL   Omit RL

Calibration Signal Source **Step 2**  
 Use DAC Signal  
 Apply Signal Externally

Measurement Tool **Step 3**  
 Use USB DAQ A/D  
 Use External Meter  
 HP34401A

Load Cal Preset **Step 4**  
  
Pre Cal File   
Auto Load

Output Mode

Desired PGA Output Swing  
PGA Zero Scale Output  V  
PGA Full Scale Output  V

Sensor Emulator Output **Step 5a**  
 Normalized Sensor Data  
Offset (V/V)   
Span (V/V)

**Step 5b**  
 Measured Sensor Data  
Offset (V)   
Full Scale (V)

**Step 6**

Input  
Measured Offset   
Measured Full Scale

Output  
Measured Zero Scale Output   
Measured Full Scale Output

Linear Output Range - After Step 6  
Min Linear Output  V  
Max Linear Output  V

Load Post Cal **Step 7**  
  
 Auto Load Post Cal  
Post Cal File   
Auto Load

Linear Output Range - After Step 7  
Min Linear Output  V  
Max Linear Output  V **Step 8**

**Step 9**

Post Calibration Results  
 V  %  
 V  %  
Test Limit  %

**Test Result =**

1. Make sure correct pre cal file is selected.

2. Make sure correct post cal file is selected.

# Editing pre/post cal

Load Preset to PGA308

Load Preset From File (Not Gain And Offset) Ok Save Preset to File

**Step 1**

Supply and Reference

Vs (V) 5.000000

Vref (V) 4.096

**Step 2**

Output Mode: Vout

XTR Info

R1 xtr\_Vref

0 0

R2 R\_ref

0 0

XTR Scaling

**Step 3**

Zero Scale Output Target 0.5 V

Full Scale Output Target 4.5 V

**Step 4**

Fault Logic

Fault Ref

Fault Config

Overscale Configure

Dout/Clamp

Dout

Clamp

Dout 0

One Wire and Output Config

PGA308EVM Software

PGA308 Controls USB Controls Help

Block Diagram Registers in OTP Registers in RAM **Calibration** Fast Cal Graph Simulation

Calibration

Effect of Load on Output Swing **Step 1**

Riso 100  Omit Riso

RL 10k  Omit RL

Sensor Emulator Output **Step 5a**

Normalized Sensor Data

Offset (V/V)

Span (V/V)

Measured Sensor Data **Step 5b**

Offset (V)

Full Scale (V)

**Step 6**

Calibrate

Measurement Tool **Step 3**

Use USB DAQ A/D

Use External Meter

HP34401A

Load Cal Preset **Step 4**

Select Cal Preset

Pre Cal File pre\_vout\_4p096.csv

Auto Load

Input

Measured Offset

Measured Full Scale

Output

Measured Zero Scale Output

Measured Full Scale Output

Linear Output Range - After Step 6

Min Linear Output

Max Linear Output

Load Post Cal **Step 7**

Select Post Cal Preset

Auto Load Post Cal

Post Cal File post\_vout\_4p096\_overscale.csv

Auto Load

Linear Output Range - After Step 7

Min Linear Output

Max Linear Output

**Step 8**

Program into OTP power on reset

**Step 9**

Measure Post Cal Results

Post Calibration Results

V %

V %

Test Limit 0.1 %

**Test Result =**

Pressing this button lets you edit/create/select the pre and post cal file. The Default values in the "pre\_vout\_4p096.csv" should be used for this example.



# Start calibration

The screenshot shows the 'PGA308EVM Software' interface with the 'Calibration' tab selected. The interface is divided into several sections:

- Calibration:** Includes 'Effect of Load on Output Swing' (Step 1) with 'Riso' (100) and 'RL' (10k) fields, and 'Calibration Signal Source' (Step 2) with 'Use DAC Signal' selected.
- Measurement Tool:** (Step 3) with 'Use USB DAQ A/D' selected.
- Load Cal Preset:** (Step 4) with 'Select Cal Preset' button and 'Pre Cal File' (pre\_vout\_4p096.csv).
- Desired PGA Output Swing:** 'PGA Zero Scale Output' (0.5 V) and 'PGA Full Scale Output' (4.5 V).
- Sensor Emulator Output:** (Step 5a) with 'Normalized Sensor Data' selected, 'Offset (V/V)' (1m), and 'Span (V/V)' (10m) fields.
- Measured Sensor Data:** (Step 5b) with 'Offset (V)' and 'Full Scale (V)' fields.
- Calibrate:** (Step 6) with a 'Calibrate' button.
- Input:** (Step 6) with 'Measured Offset' and 'Measured Full Scale' fields.
- Output:** (Step 6) with 'Measured Zero Scale Output' and 'Measured Full Scale Output' fields.
- Post Calibration Results:** (Step 9) with 'Measure Post Cal Results' button and 'Post Calibration Results' section showing 'Test Limit' (0.1 %).

Two callout boxes with red borders and arrows provide instructions:

1. Enter sensor emulator information as shown here. (Points to the 'Offset (V/V)' and 'Span (V/V)' fields in Step 5a.)
2. Press calibrate. The sensor emulator will automatically adjust throughout the procedure. (Points to the 'Calibrate' button in Step 6.)

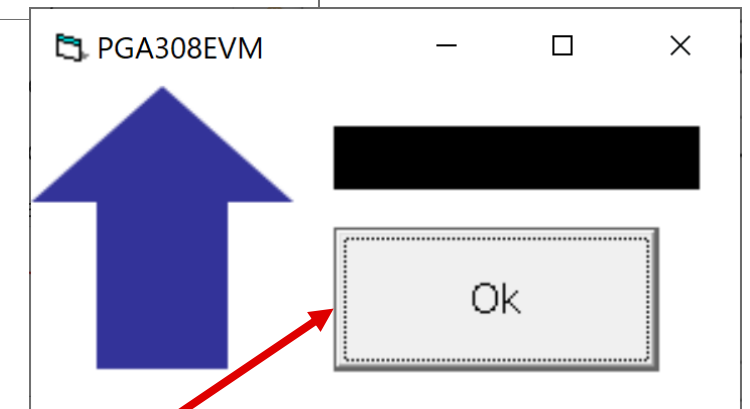
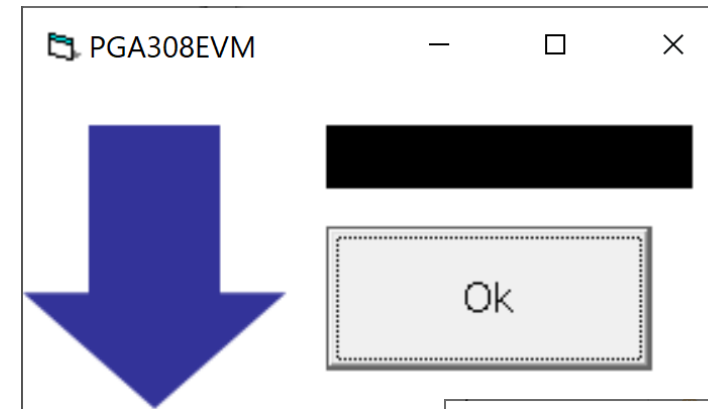
# Calibration process

PGA308EVM Software

PGA308 Controls USB Controls Help

The screenshot shows the 'Calibration' tab of the PGA308EVM software. The interface is divided into several sections:

- Step 1:** Effect of Load on Output Swing. Riso: 100, RL: 10k. Omit Riso and Omit RL are unchecked.
- Step 2:** Calibration Signal Source. Use DAC Signal is selected.
- Step 3:** Measurement Tool. Use USB DAQ A/D is selected.
- Step 4:** Load Cal Preset. Select Cal Preset button is visible.
- Step 5a:** Sensor Emulator Output. Normalized Sensor Data is selected. Offset (V/V): 1m, Span (V/V): 10m.
- Step 5b:** Measured Sensor Data. Offset (V) and Full Scale (V) fields are empty.
- Step 6:** Calibrate button.
- Step 7:** Load Post Cal. Auto Load Post Cal is checked. Post Cal File: post\_Vout\_4p096\_overscale.csv.
- Step 8:** Linear Output Range - After Step 7. Min Linear Output: .195 V, Max Linear Output: 4.805 V.
- Step 9:** Measure Post Cal Results. Measure Post Cal Results button.
- Post Calibration Results:** Fields for V and % are empty. Test Limit: 0.1 %.
- Input:** Measured Offset: 4.280m, Measured Full Scale: empty.
- Output:** Measured Zero Scale Output: empty, Measured Full Scale Output: empty.
- Desired PGA Output Swing:** PGA Zero Scale Output: 0.5 V, PGA Full Scale Output: 4.5 V.



1. Throughout the calibration these boxes will pop up indicating that “pressure” needs to be adjusted to min or max value

2. You will also notice the input and output fields update and the progress bar will update.

# Finish the calibration

PGA308EVM Software

PGA308 Controls USB Controls Help

Block Diagram Registers in OTP Registers in RAM **Calibration** Fast Cal Graph Simulation

Calibration

Effect of Load on Output Swing **Step 1**

Riso   Omit Riso

RL   Omit RL

Calibration Signal Source **Step 2**

Use DAC Signal

Apply Signal Externally

Measurement Tool **Step 3**

Use USB DAQ A/D

Use External Meter

HP34401A

Load Cal Preset **Step 4**

Pre Cal File

Auto Load

Output Mode

Desired PGA Output Swing

PGA Zero Scale Output  V

PGA Full Scale Output  V

Sensor Emulator Output **Step 5a**

Normalized Sensor Data

Offset (V/V)

Span (V/V)

**Step 5b**

Measured Sensor Data

Offset (V)

Full Scale (V)

**Step 6**

Input

Measured Offset

Measured Full Scale

Output

Measured Zero Scale Output

Measured Full Scale Output

Linear Output Range - After Step 6

Min Linear Output  V

Max Linear Output  V

Load Post Cal **Step 7**

Auto Load Post Cal

Post Cal File

Auto Load

Linear Output Range - After Step 7

Min Linear Output  V

Max Linear Output  V

**Step 8**

**Step 9**

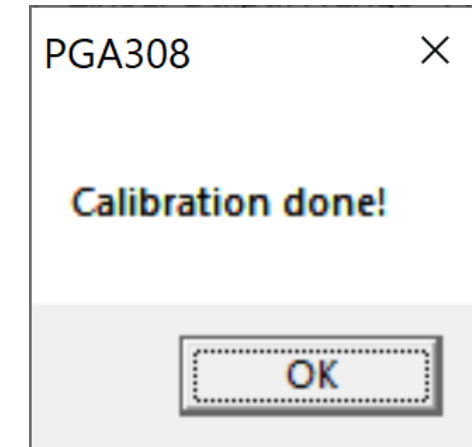
Post Calibration Results

V  %

V  %

Test Limit  %

**Test Result =**



1. This box will pop up when calibration is complete. Note that the values are near the targets

# Verify the calibration

PGA308EVM Software

PGA308 Controls USB Controls Help

Block Diagram Registers in OTP Registers in RAM **Calibration** Fast Cal Graph Simulation

Calibration

Effect of Load on Output Swing **Step 1**

Riso   Omit Riso

RL   Omit RL

Calibration Signal Source **Step 2**

Use DAC Signal

Apply Signal Externally

Measurement Tool **Step 3**

Use USB DAQ A/D

Use External Meter

HP34401A

Load Cal Preset **Step 4**

Select Cal Preset

Pre Cal File

Auto Load

Output Mode

Desired PGA Output Swing

PGA Zero Scale Output  V

PGA Full Scale Output  V

Sensor Emulator Output **Step 5a**

Normalized Sensor Data

Offset (V/V)

Span (V/V)

**Step 5b**

Measured Sensor Data

Offset (V)

Full Scale (V)

**Step 6**

Calibrate

Linear Output Range - After Step 6

Min Linear Output  V

Max Linear Output  V

Load Post Cal **Step 7**

Select Post Cal Preset

Auto Load Post Cal

Post Cal File

Auto Load

Linear Output Range - After Step 7

Min Linear Output  V

Max Linear Output  V

**Step 8**

Program into OTP power on reset

**Step 9**

Measure Post Cal Results

Post Calibration Results

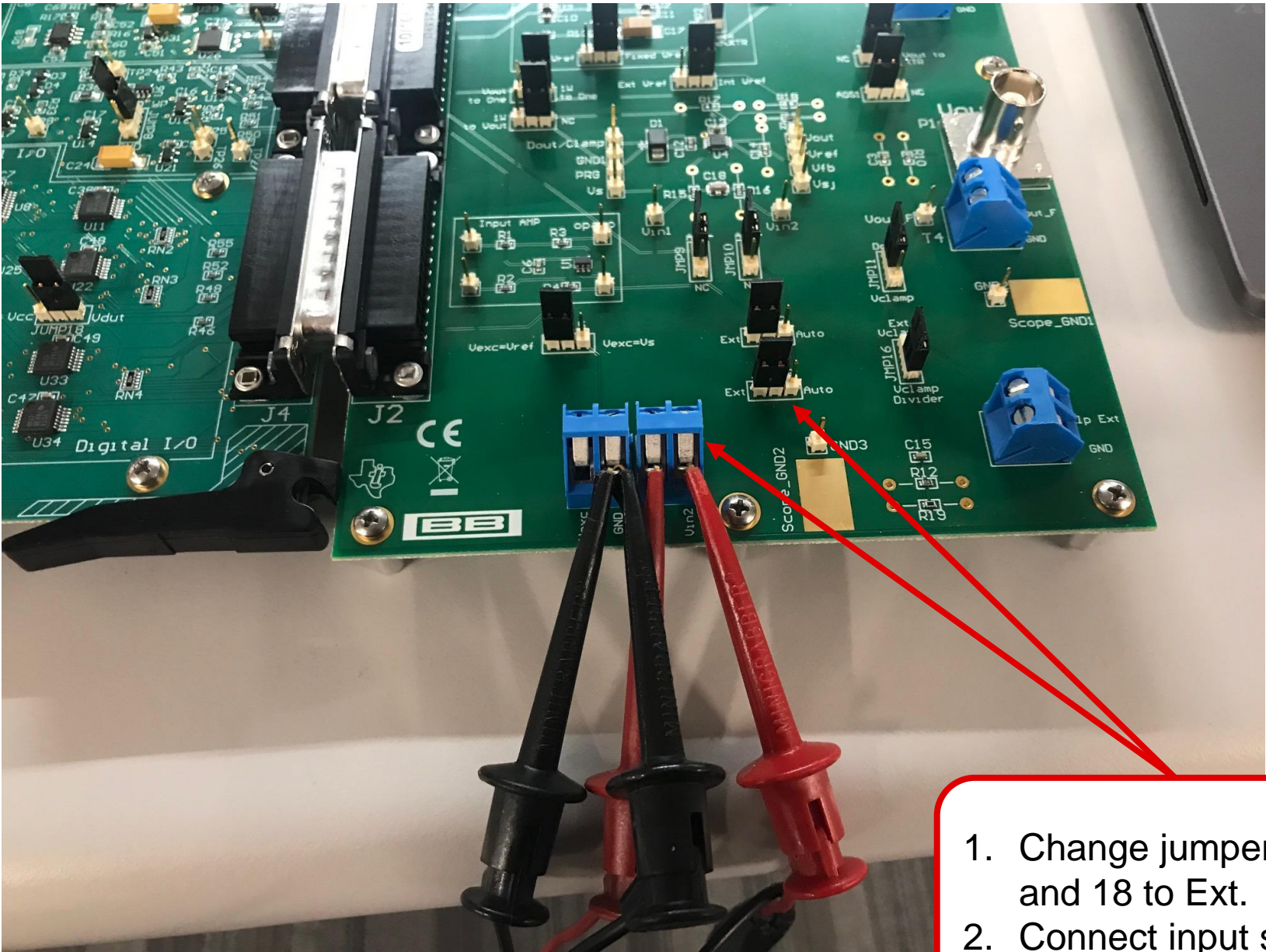
<input type="text" value="0.5"/> V	<input type="text" value="-0.007"/> %
<input type="text" value="4.5"/> V	<input type="text" value="-0.008"/> %
Test Limit	<input type="text" value="0.1"/> %

**Pass Test**

1. **caution**: You can program the calibration into OTP. This should only be done once you are absolutely sure you are want to save the calibration as the PGA308 has limited OTP memory. I recommend you skip this step for now.

2. Press Measure Post Cal Results. The calibration settings are in the PGA308 RAM. Pressing this button will apply the sensor emulator output again to confirm the accuracy. Note for this example the accuracy is -0.007% and -0.008%.

# Setup for external input

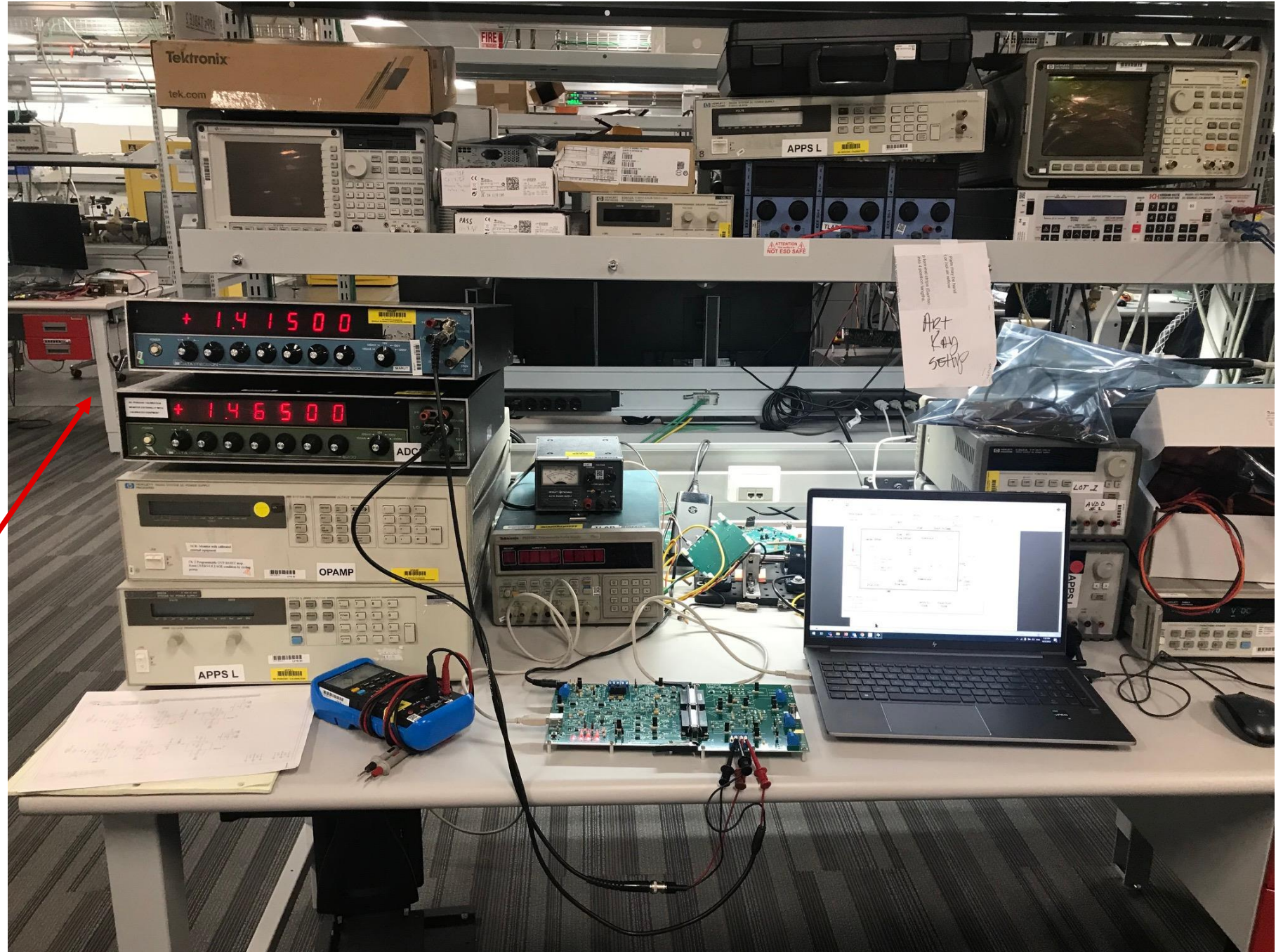


1. Change jumper 17 and 18 to Ext.
2. Connect input signal

JMP	Position
14	Vdout power
4	4.096V
2	Vref=fixed\XTR
3	Fixed Vref
7	1W to One
1	NC
5	Int Vref
13	NC
6	ADS1
9	ADS-
10	ADS+
11	Dout
15	Vexc=Vref
<b>17</b>	<b>Ext</b>
16	Vclamp Divider
<b>18</b>	<b>Ext</b>

# My setup

1. I used two DP8200 precision sources. To create the input signal of 1.415V and 1.465V.
2. I switched the leads to simulate minimum and maximum input.

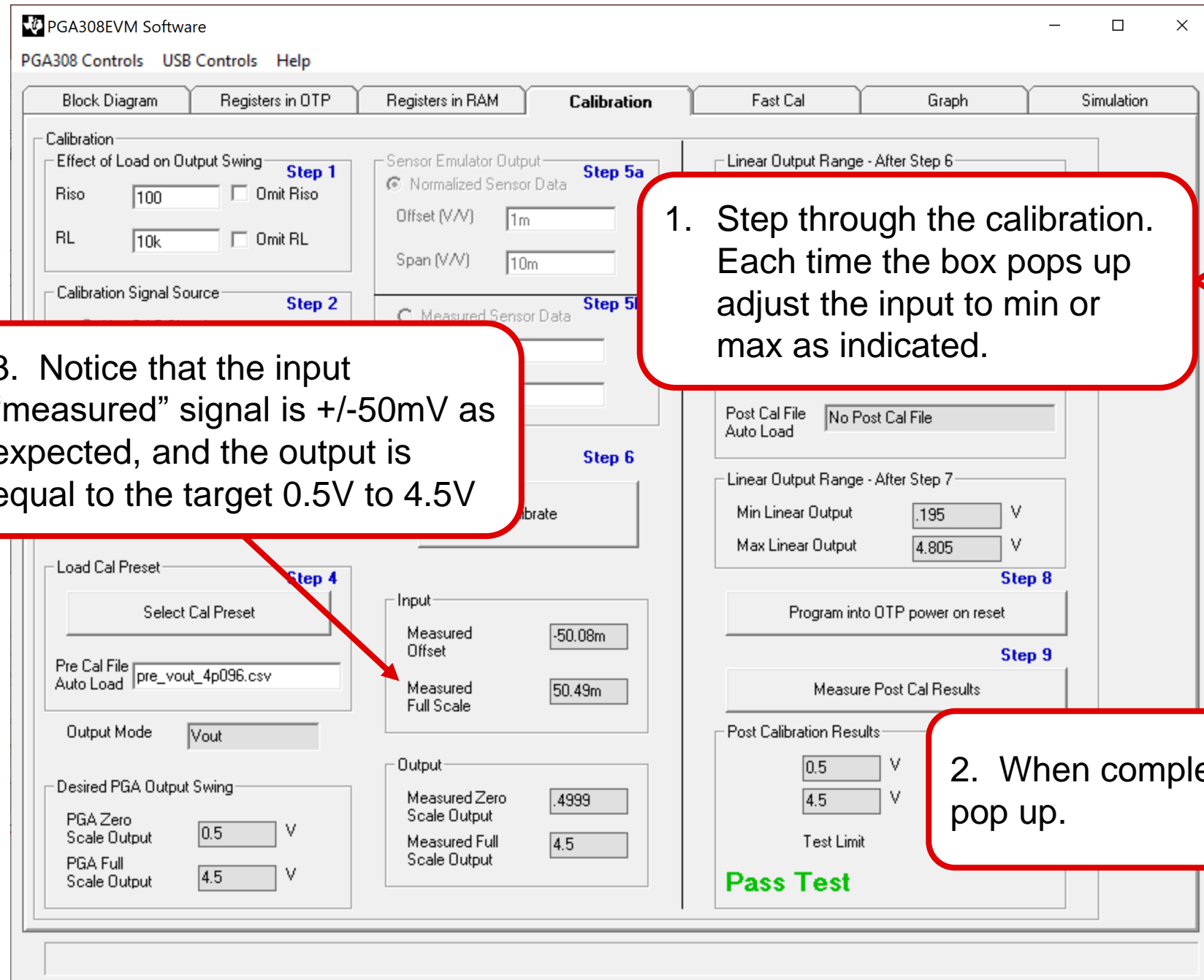


# Software setup

1. Select "apply signal externally"

1. Disable "auto load pre cal"

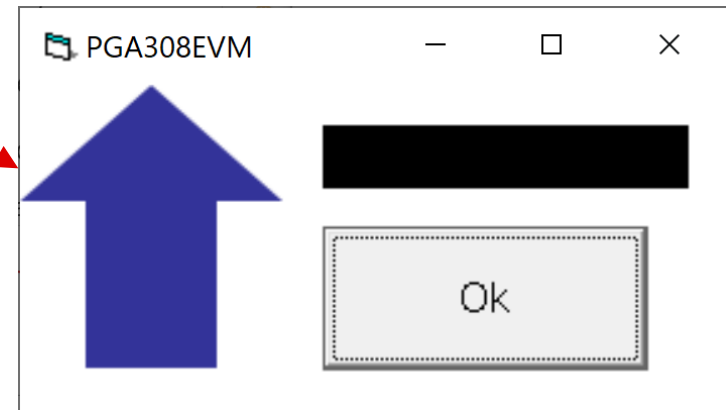
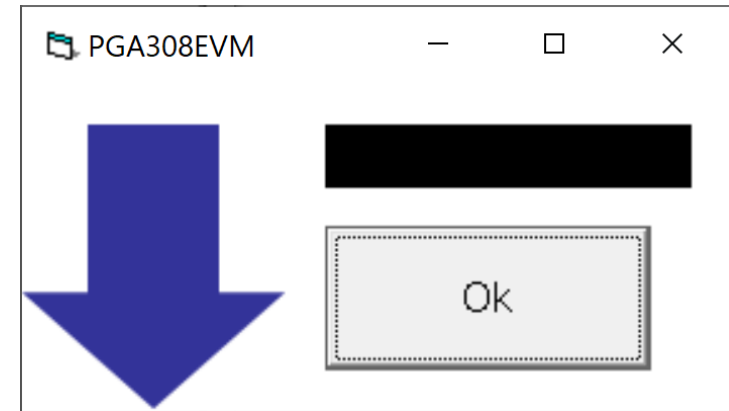
# Step through the calibration



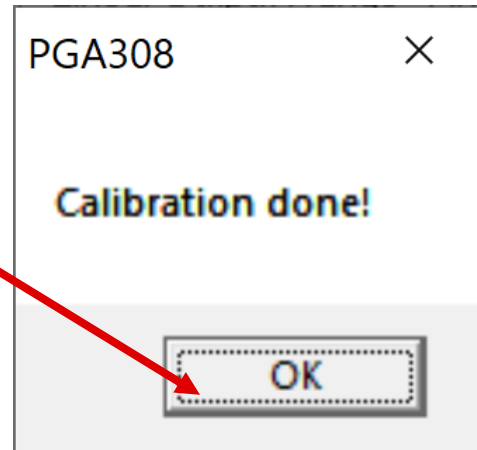
The main software window shows the 'Calibration' tab. It includes sections for 'Effect of Load on Output Swing' (Step 1), 'Sensor Emulator Output' (Step 5a), 'Calibration Signal Source' (Step 2), 'Load Cal Preset' (Step 4), and 'Post Calibration Results' (Step 9). The 'Post Calibration Results' section shows 'Pass Test' and values for 0.5V and 4.5V outputs.

1. Step through the calibration. Each time the box pops up adjust the input to min or max as indicated.

3. Notice that the input "measured" signal is +/-50mV as expected, and the output is equal to the target 0.5V to 4.5V



2. When complete this box will pop up.





# Check the post cal accuracy

PGA308EVM Software

PGA308 Controls USB Controls Help

Block Diagram Registers in OTP Registers in RAM **Calibration** Fast Cal Graph Simulation

Calibration

Effect of Load on Output Swing **Step 1**

Riso   Omit Riso

RL   Omit RL

Calibration Signal Source **Step 2**

Use DAC Signal

Apply Signal Externally

Measurement Tool **Step 3**

Use USB DAQ A/D

Use External Meter

HP34401A

Load Cal Preset **Step 4**

Pre Cal File

Auto Load

Output Mode

Desired PGA Output Swing

PGA Zero Scale Output  V

PGA Full Scale Output  V

Sensor Emulator Output **Step 5a**

Normalized Sensor Data

Offset (V/V)

Span (V/V)

**Step 5b**

Measured Sensor Data

Offset (V)

Full Scale (V)

**Step 6**

Input

Measured Offset

Measured Full Scale

Output

Measured Zero Scale Output

Measured Full Scale Output

Linear Output Range - After Step 6

Min Linear Output  V

Max Linear Output  V

Load Post Cal **Step 7**

Auto Load Post Cal

Post Cal File

Auto Load

Linear Output Range - After Step 7

Min Linear Output  V

Max Linear Output  V

**Step 8**

**Step 9**

Post Calibration Results

V  %

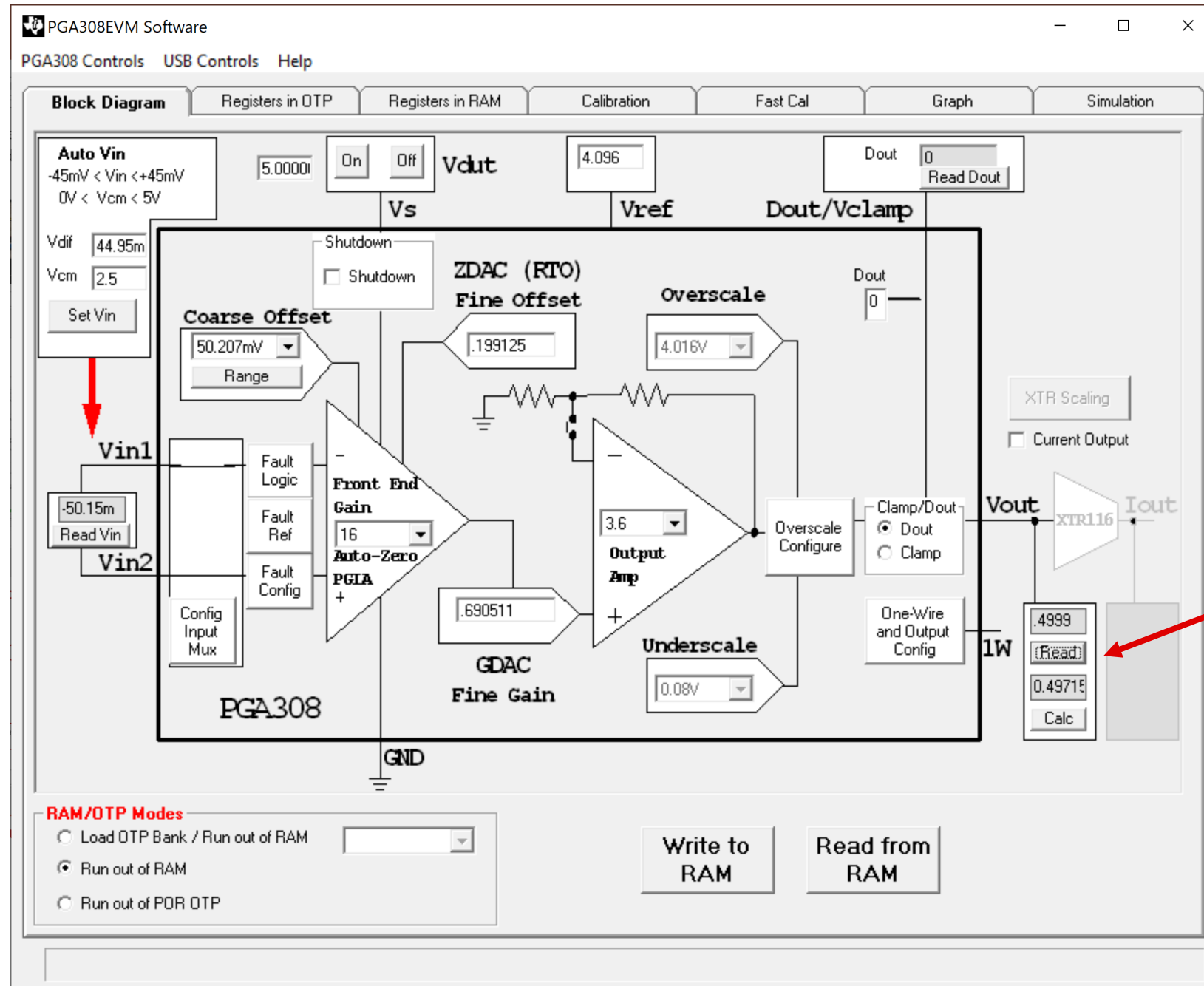
V  %

Test Limit  %

**Pass Test**

1. You can use the post cal results button to test the accuracy of the calibration. Just adjust the input as directed by the software and the error will be calculated.

# Check the post cal accuracy



1. Alternatively, you can press “read” to measure the output with the EVM at any time. Note that measuring with a precision DMM will show some difference as the ADC on the USB DAC has limited accuracy and is included for simplicity of proof of concept. The PGA308 software does allow for a precision DMM to be used in place of the on board ADC.