

# PGA308EVM

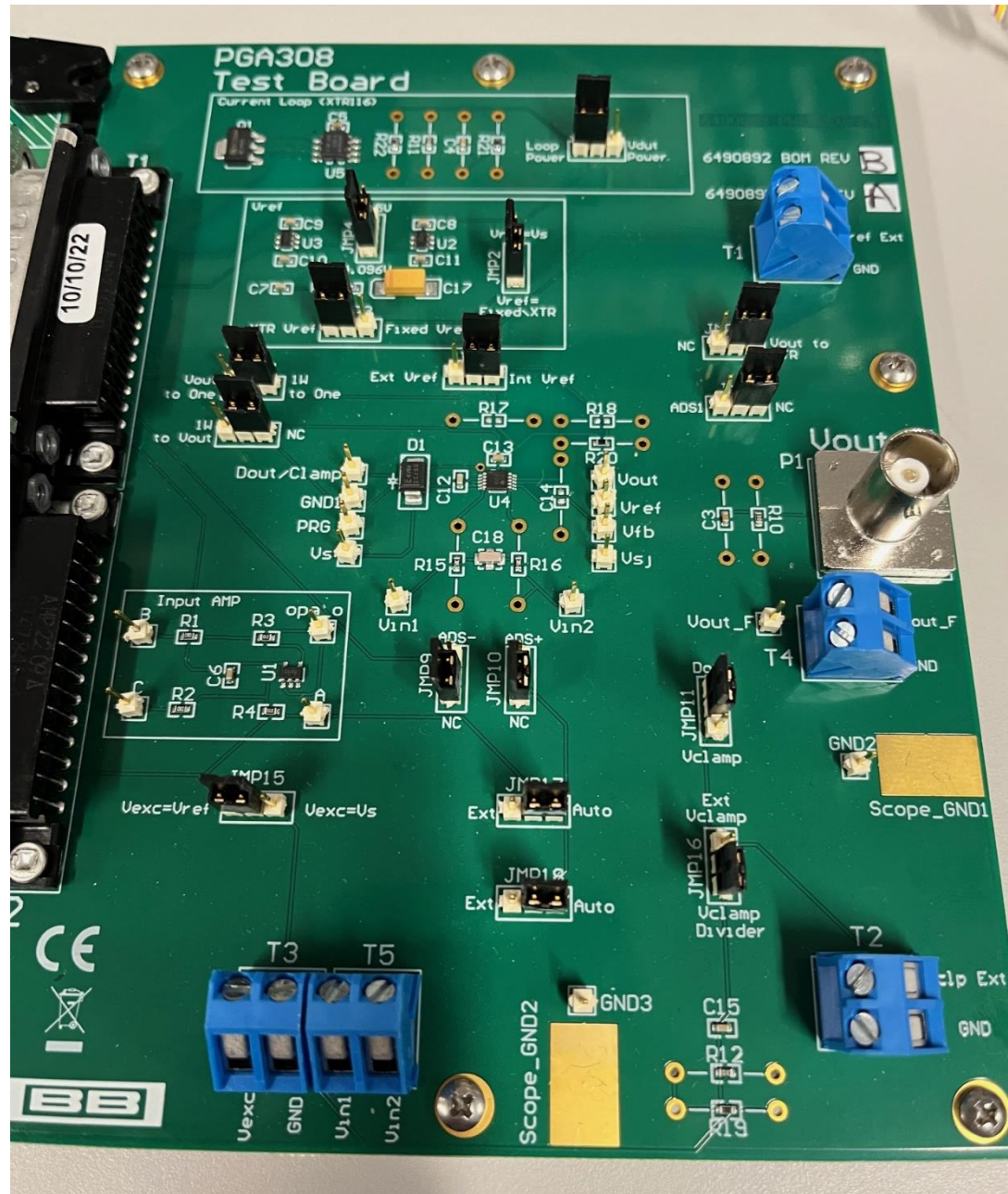
## Current Loop Step-by-step example

Art Kay

10-18-2023

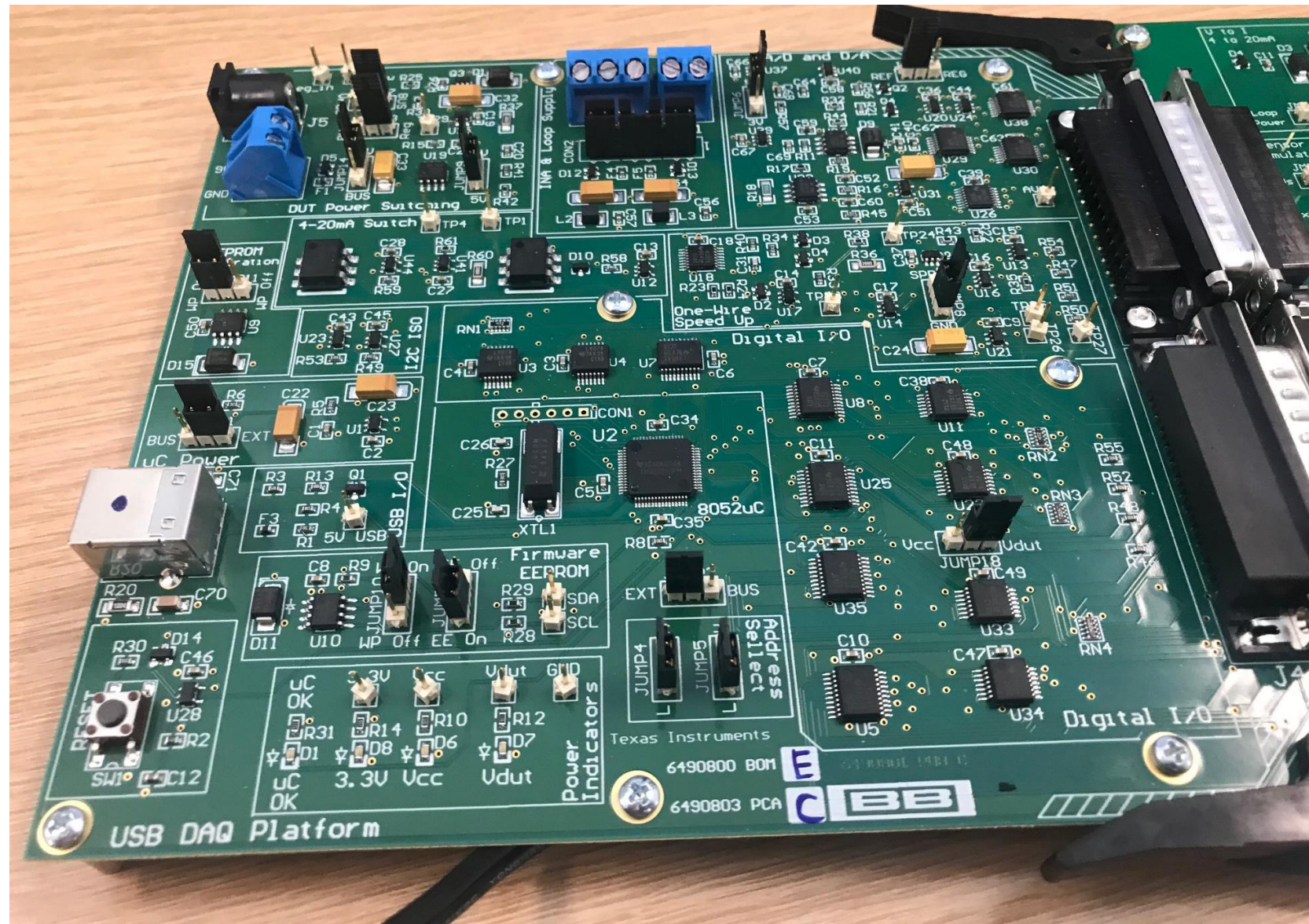


# Jumper Settings on PGA308



Jumper	Setting
14	Loop_Power
4	4.096V
2	Vref=Fixed/XTR
3	XTR Vref
7	1W to ONE
1	NC
5	Int Vref
13	Vout to XTR
6	NC
9	NC
10	NC
11	Dout
15	Vexc=Vref
17	Auto
18	Auto
16	Vclamp Divider

# Jumper Settings USB-DAQ-Platform



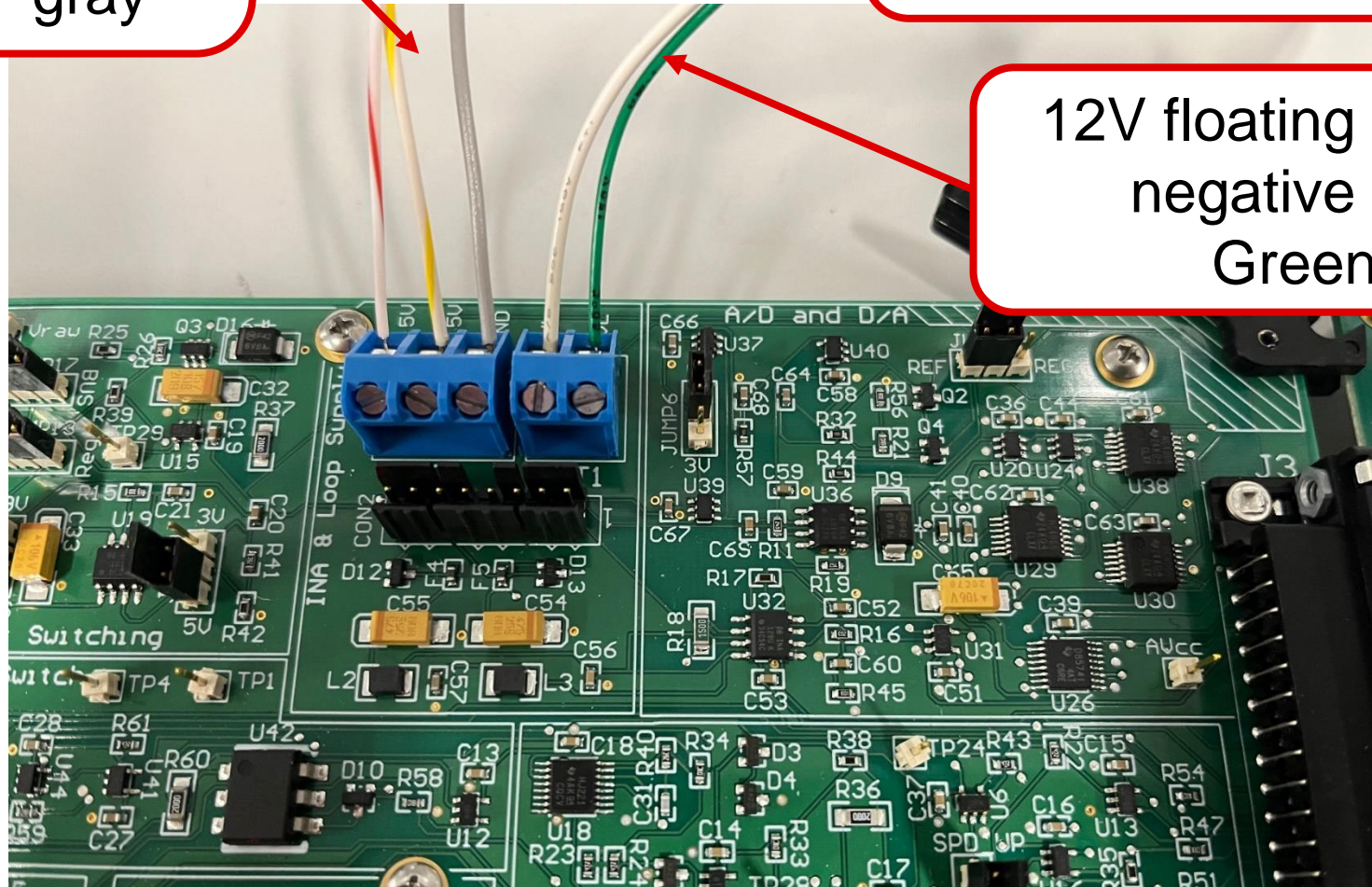
JMP	Position
17	BUS
13	Reg
14	9V
9	5V
11	WP On
6	5V
7	REF
1	EXT
8	GND
10	WP On
3	EE On
2	EXT
4	L
5	L
18	VDUT

# USB-DAQ-Platform power connections

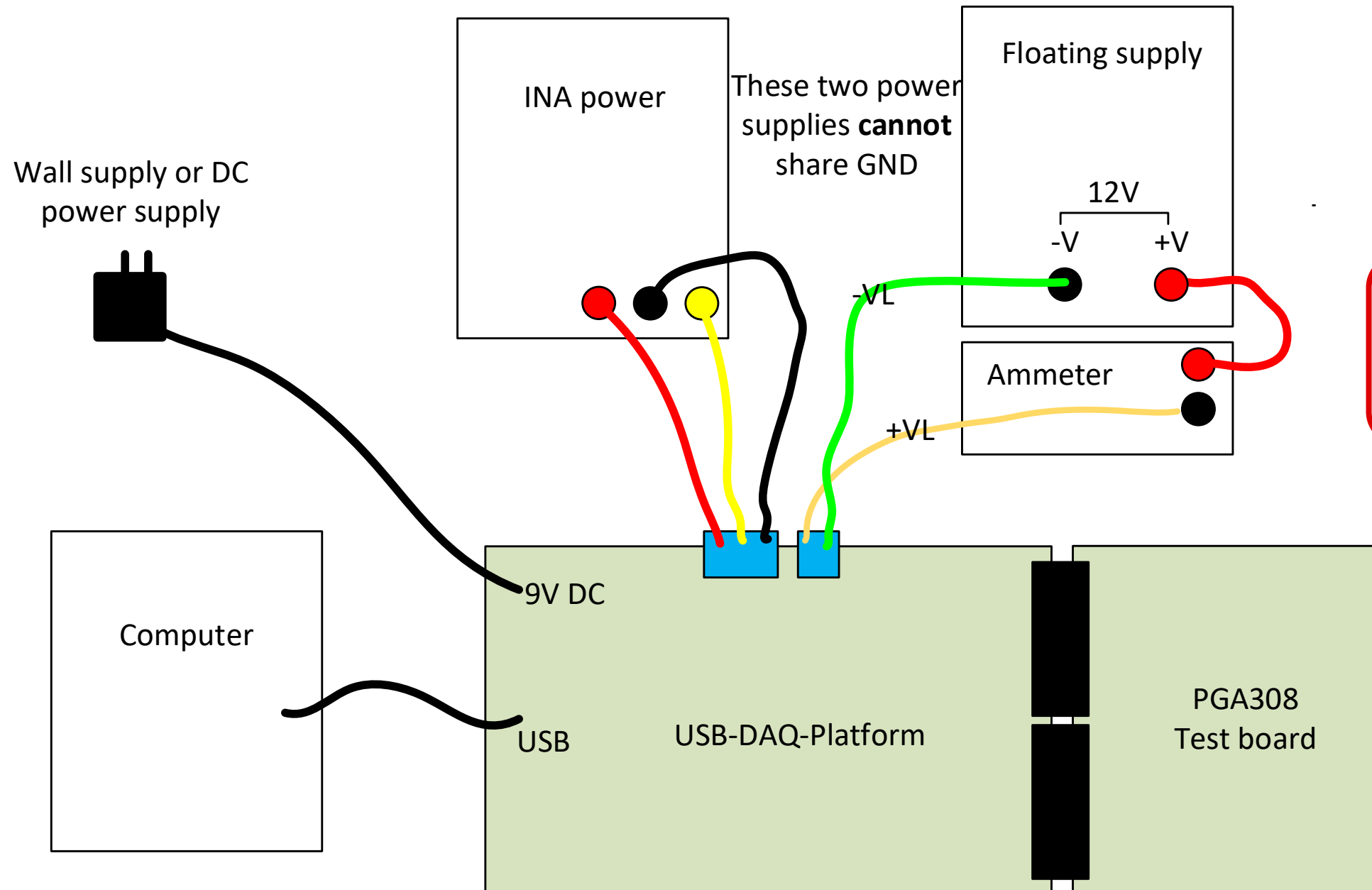
+12V – red/white  
-12V –  
yellow/white  
GND – gray

12V floating loop supply  
positive terminal  
White wire

12V floating loop supply  
negative terminal  
Green wire

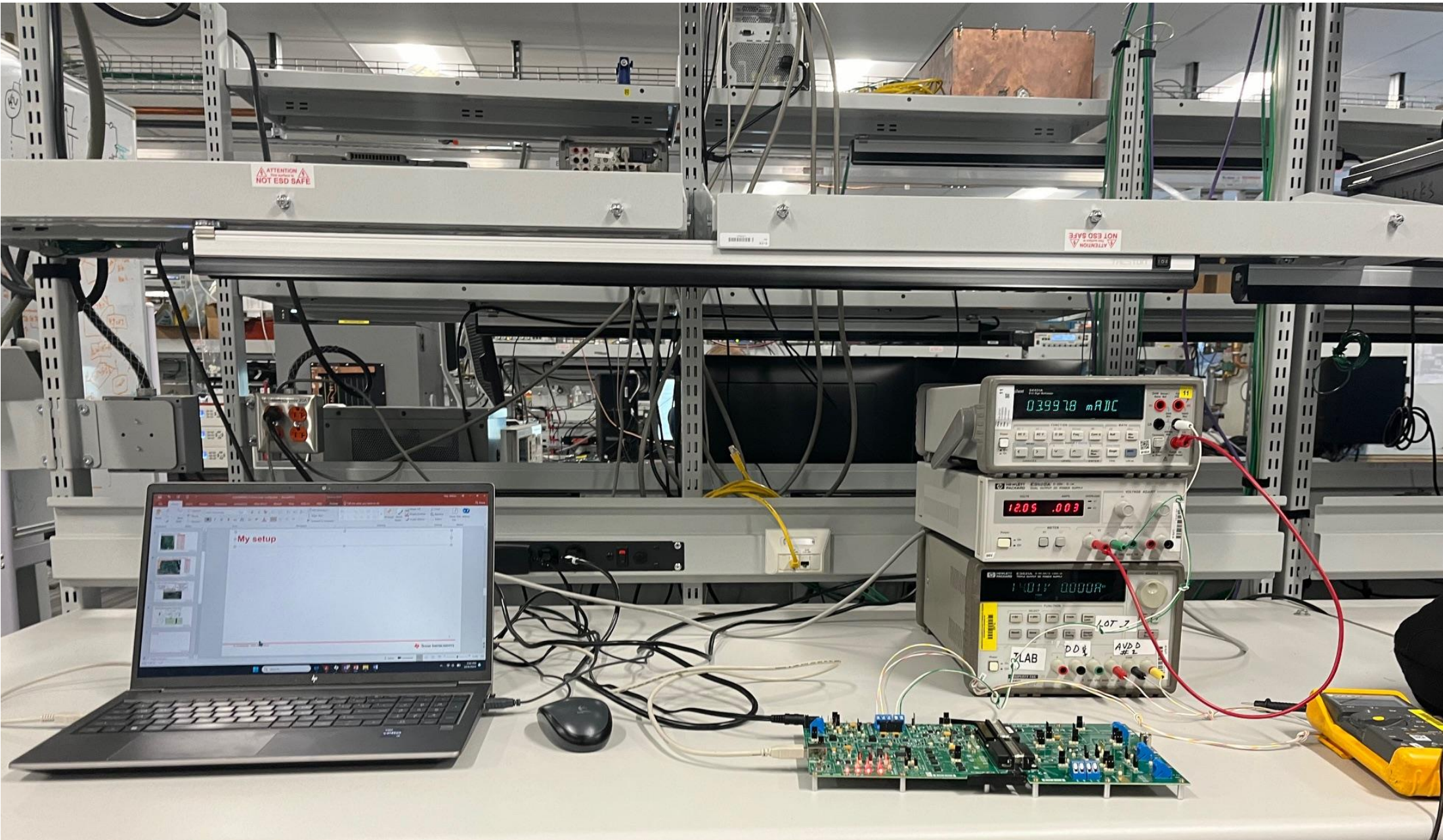


# USB-DAQ-Platform power connections



Ammeter not required but useful for debug

# My setup



# Start software

The screenshot displays the PGA308EVM Software interface. At the top, there are tabs for 'Block Diagram', 'Registers in OTP', 'Registers in RAM', 'Calibration', 'Fast Cal', 'Graph', and 'Simulation'. The 'Calibration' tab is selected and highlighted with a red arrow. The main area shows a detailed block diagram of the PGA308 chip, including sections for 'Auto Vin', 'Coarse Offset', 'ZDAC (RTO) Fine Offset', 'Overscale', 'Front End Gain', 'GDAC Fine Gain', 'Output Amp', 'Underscale', and 'XTR116'. Various parameters are set, such as 'Vs' (5.0000), 'Vref' (4.09600), 'Vclamp' (0), 'Vdif' (10m), 'Vcm' (2.5), 'Coarse Offset' (0.0mV), 'ZDAC Fine Offset' (1.024), 'Overscale' (21.0mA), 'Front End Gain' (4), 'GDAC Fine Gain' (.5), 'Output Amp' (2), and 'Underscale' (2.52mA). The output 'Vout' is 0.6028 and 'Iout' is 0. A red arrow points from the 'Calibration' tab to a callout box on the right.

PGA308EVM Software  
PGA308 Controls USB Controls Help

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

Auto Vin  
-45mV < Vin <+45mV  
0V < Vcm < 5V

Vdif 10m  
Vcm 2.5  
Set Vin

Vin1  
-55.23m  
Read Vin

Vin2

Shutdown  
 Shutdown

Coarse Offset  
0.0mV  
Range

ZDAC (RTO)  
Fine Offset  
1.024

Overscale  
21.0mA

Front End Gain  
4  
Auto-Zero  
PGA

GDAC  
Fine Gain  
.5

Output Amp  
2

Underscale  
2.52mA

Vs 5.0000  
Vref 4.09600  
Vclamp 0

Dout/Vclamp

XTR Scaling  
 Current Output

Clamp/Dout  
 Dout  
 Clamp

One-Wire and Output Config

Vout 0.6028  
Read  
0  
Calc

Iout  
Read  
Calc

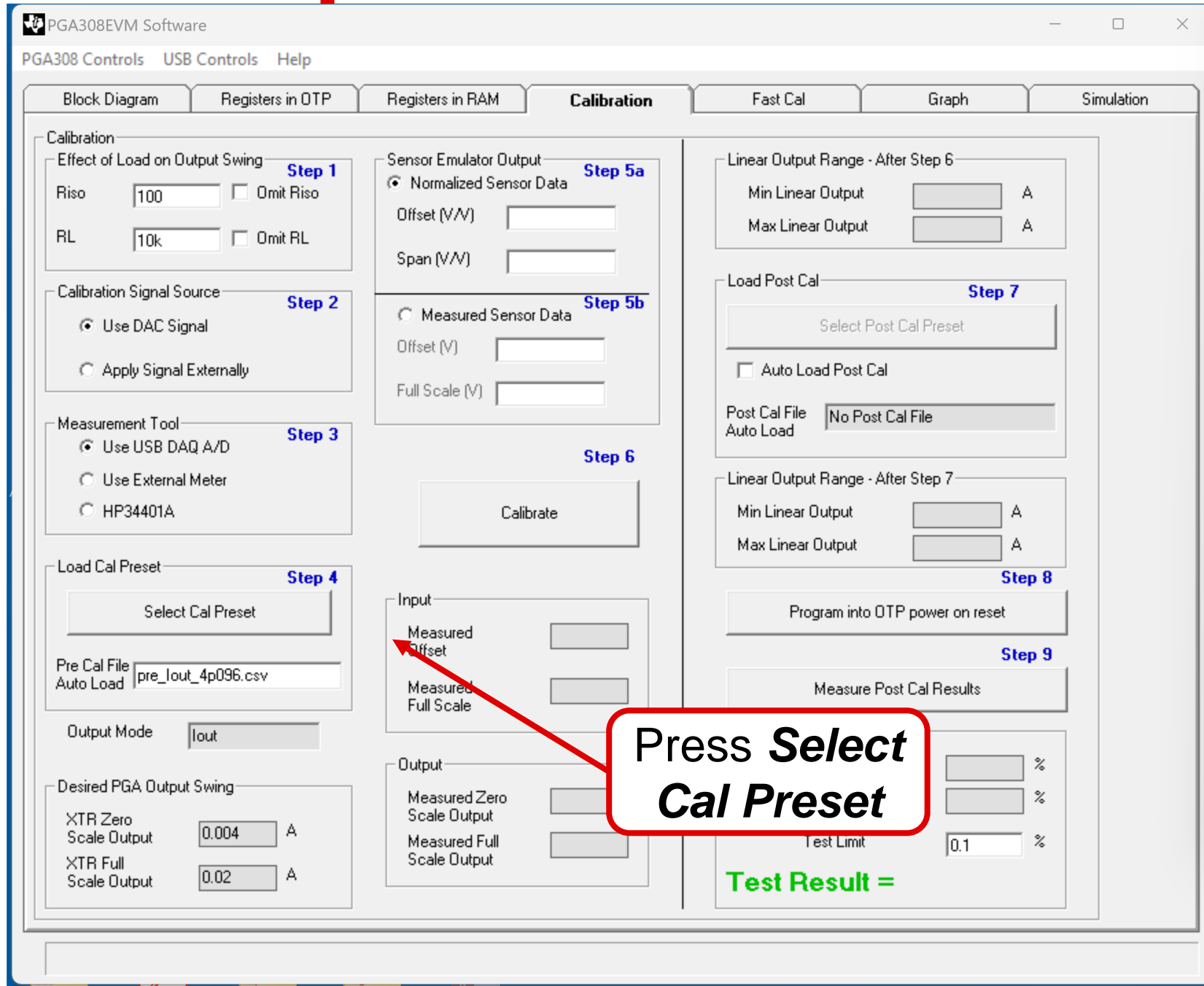
1W

RAM/OTP Modes  
 Load OTP Bank / Run out of RAM  
 Run out of RAM  
 Run out of POR OTP

Write to RAM  
Read from RAM

Click on calibration tab

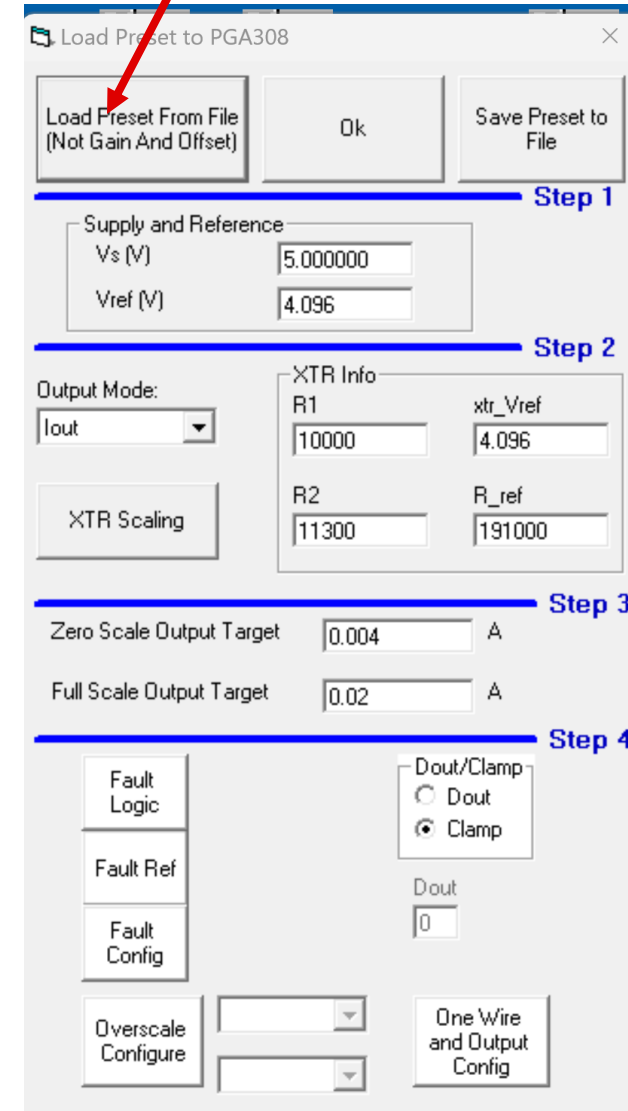
# Select precal file



The main software window shows the 'Calibration' tab. In the 'Load Cal Preset' section (Step 4), the 'Pre Cal File' field contains 'pre\_lout\_4p096.csv'. A red arrow points from a callout box to the 'Select Cal Preset' button.

**Press Select Cal Preset**

**Press Load Preset File**

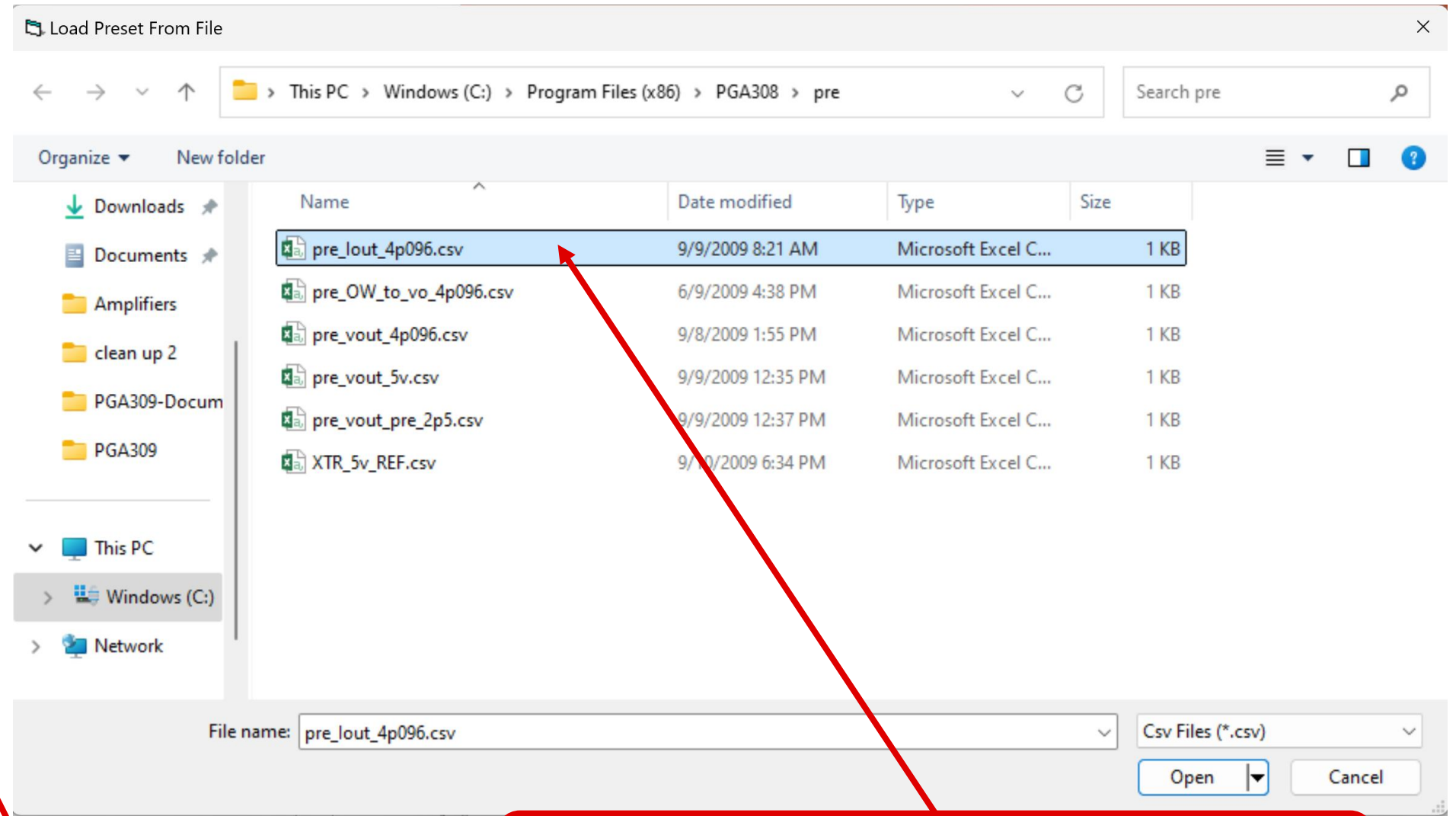
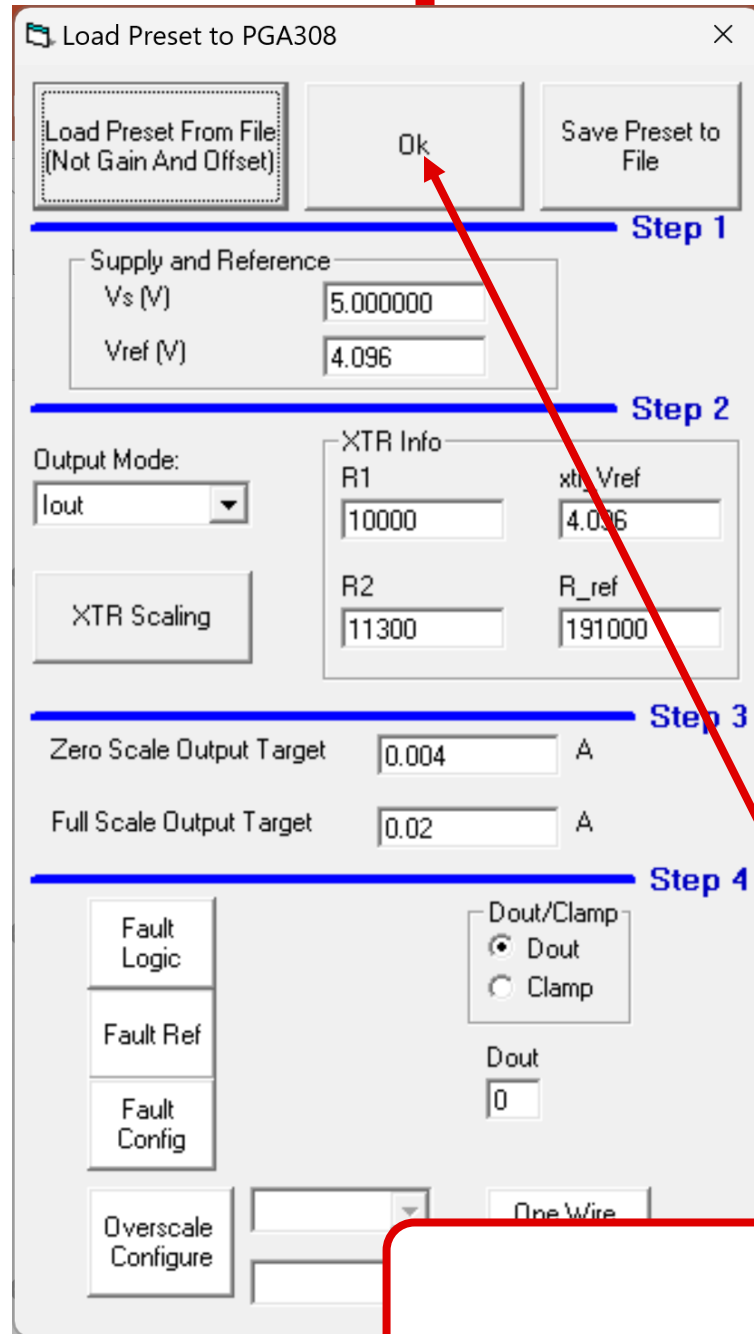


The dialog box 'Load Preset to PGA308' has a 'Load Preset From File (Not Gain And Offset)' button highlighted with a red arrow from the callout above. The dialog is divided into four steps:

- Step 1:** 'Load Preset From File (Not Gain And Offset)', 'Ok', and 'Save Preset to File' buttons.
- Step 2:** 'Supply and Reference' section with 'Vs (V)' set to 5.000000 and 'Vref (V)' set to 4.096.
- Step 3:** 'Output Mode' set to 'Iout', 'XTR Info' section with 'R1' (10000), 'xtr\_Vref' (4.096), 'R2' (11300), and 'R\_ref' (191000). Includes an 'XTR Scaling' button.
- Step 4:** 'Zero Scale Output Target' (0.004 A) and 'Full Scale Output Target' (0.02 A). Includes 'Fault Logic', 'Fault Ref', 'Fault Config', 'Dout/Clamp' (Clamp selected), 'Dout' (0), 'Overscale Configure', and 'One Wire and Output Config' buttons.



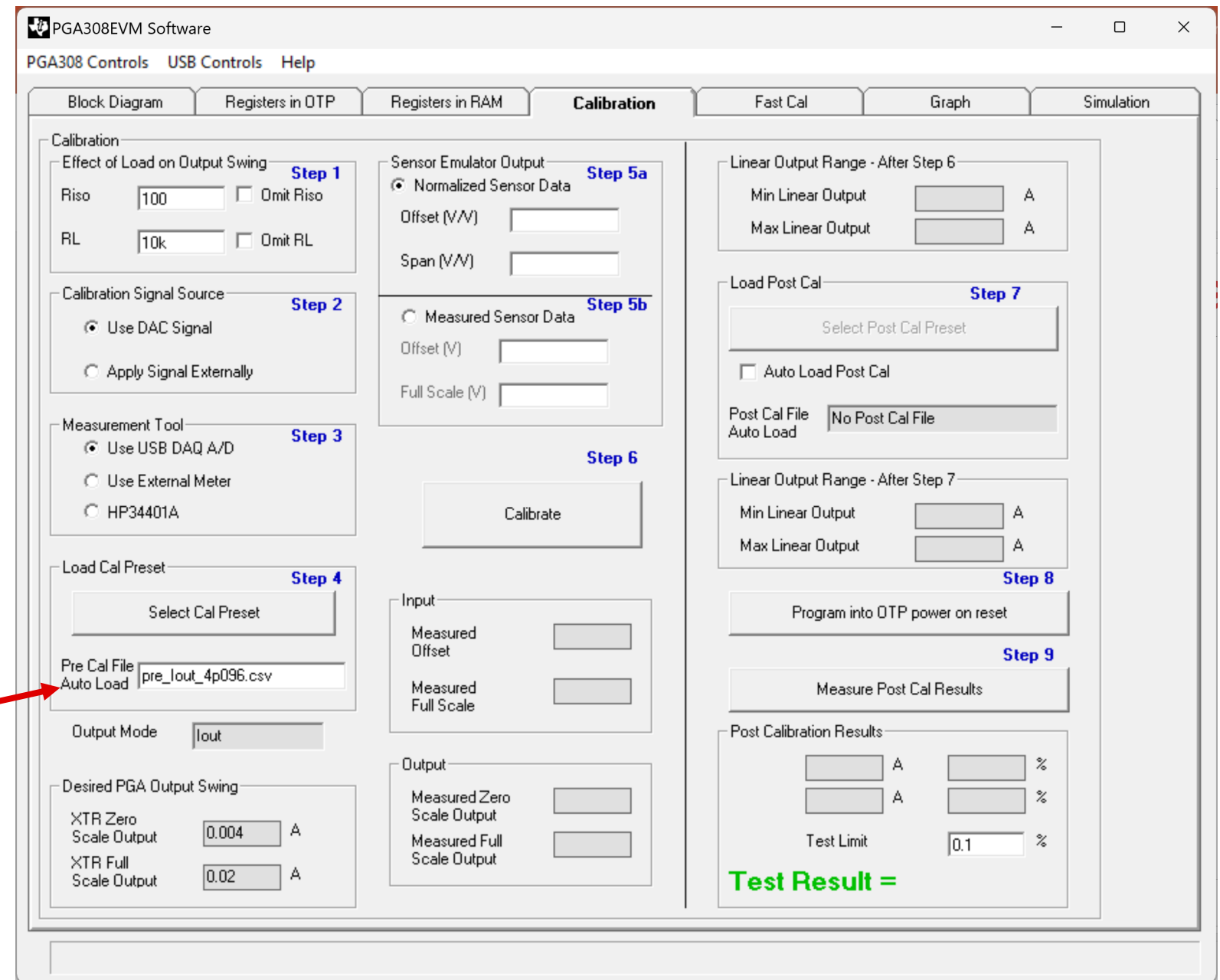
# Select precal file continued



2. Press **Ok**

1. Choose ***pre\_lout\_4p096.csv***

# Make sure pre\_lout\_4p096.csv is selected



Confirm *pre\_lout\_4p096.csv* is selected.

# Enter sensor information & start 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

XTR Zero Scale Output  A

XTR Full Scale Output  A

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**

Input

Measured Offset

Measured Full Scale

Output

Measured Zero Scale Output

Measured Full Scale Output

Linear Output Range - After Step 6

Min Linear Output  A

Max Linear Output  A

Load Post Cal **Step 7**

Auto Load Post Cal

Post Cal File  Auto Load

Linear Output Range - After Step 7

Min Linear Output  A

Max Linear Output  A

**Step 8**

**Step 9**

Post Calibration Results

A  %

A  %

Test Limit  %

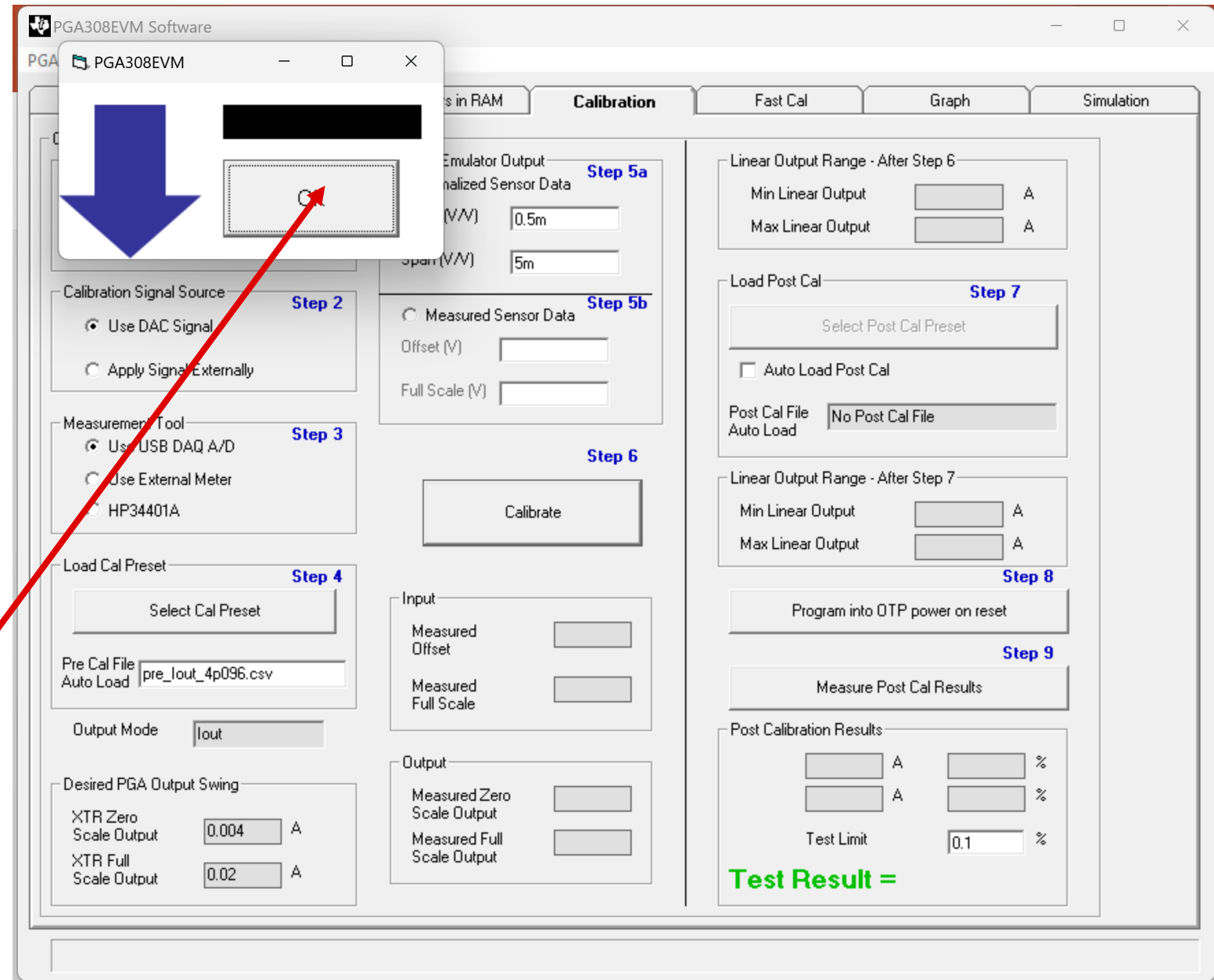
**Test Result =**

1. Enter Offset = 0.5m  
Span = 5m

2. Press **Calibrate**

# Calibration process

This box will pop up and pause the calibration. Press **Ok** to continue. The idea behind the pause is that you could adjust the pressure source throughout the calibration. However, in this example the sensor is automatically emulated. Thus, you only need to press **Ok** to continue at each pause.



# Calibration process

Throughout the calibration the input and output values will be updated.

The progress bar will move to indicate measurements are being made.

# Calibration complete

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

- Step 1:** Effect of Load on Output Swing. Includes fields for Riso (100) and RL (10k), with checkboxes for 'Omit Riso' and 'Omit RL'.
- Step 2:** Calibration Signal Source. Options for 'Use DAC Signal' (selected) and 'Apply Signal Externally'.
- Step 3:** Measurement Tool. Options for 'Use USB DAQ A/D' (selected), 'Use External Meter', and 'HP34401A'.
- Step 4:** Load Cal Preset. Includes a 'Select Cal Preset' button and a 'Pre Cal File' field with 'Auto Load' checked.
- Step 5a:** Sensor Emulator Output. Options for 'Normalized Sensor Data' (selected) and 'Measured Sensor Data'. Includes fields for Offset (V/V) and Span (V/V).
- Step 5b:** Measured Sensor Data. Includes fields for Offset (V) and Full Scale (V).
- Step 6:** A 'Calibrate' button.
- Step 7:** Load Post Cal. Includes a 'Select Post Cal Preset' button, an 'Auto Load Post Cal' checkbox, and a 'Post Cal File' field.

Below the steps, there are sections for 'Input' and 'Output' measurements:

- Input:** Measured Offset (1.949m), Measured Full Scale (22.57m).
- Output:** Measured Zero Scale Output (4.000m), Measured Full Scale Output (20.00m).

A 'Calibration done!' dialog box is overlaid on the interface, with an 'OK' button. A red arrow points from the dialog box to the 'Calibration done!' text in the main interface. The 'Post Calibration Results' section shows a 'Test Result =' in green text.

The calibration done box will pop up. At this time the output should have been calibrated to 4mA to 20mA

# Optional – Program OTP

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

- Calibration:** Includes sections for "Effect of Load on Output Swing" (Step 1), "Calibration Signal Source" (Step 2), "Measurement Tool" (Step 3), and "Load Cal Preset" (Step 4).
- Sensor Emulator Output:** Includes "Sensor Emulator Output" (Step 5a) and "Measured Sensor Data" (Step 5b).
- Linear Output Range:** Includes "Linear Output Range - After Step 6" and "Linear Output Range - After Step 7".
- Load Post Cal:** Includes "Load Post Cal" (Step 7) and "Post Cal File Auto Load".
- Post Calibration Results:** Includes "Post Calibration Results" (Step 8) and "Measure Post Cal Results" (Step 9).

A dialog box titled "PGA308" is overlaid on the interface, displaying the message: "OTP Programming Complete! Bank Number 1 has been programmed with POR Bank Sel1. You have 3 banks available for programming." An arrow points from the dialog box to the "Program into OTP power on reset" button in the software interface.

As an optional step you can program One-Time-Programmable memory. This will save the current settings into the PGA308. However, you can do this a maximum of 3 times. After programming the 3<sup>rd</sup> time, you will need to replace the PGA308 device if you want to re-program. If you do not program the device will loose memory when power is cycled.

# Post 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  
XTR Zero Scale Output  A  
XTR Full Scale Output  A

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**

Input  
Measured Offset   
Measured Full Scale

Output  
Measured Zero Scale Output   
Measured Full Scale Output

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

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

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

**Step 9**

Post Calibration Results  
 A  %  
 A  %  
Test Limit  %

**Pass Test**

Press **Measure Post Cal Results** to confirm calibration error. This example shows very low error of 0.003%



# Using a programmed PGA308

Once the device OTP has been programmed, you can test the device using the Block Diagram tab. First set the input signal to the desired input signal. Second, press Set Vin. Finally, press the Read button for Iout. Make sure that the Vdut LED is on (default startup state of software).

