

PGA308EVM

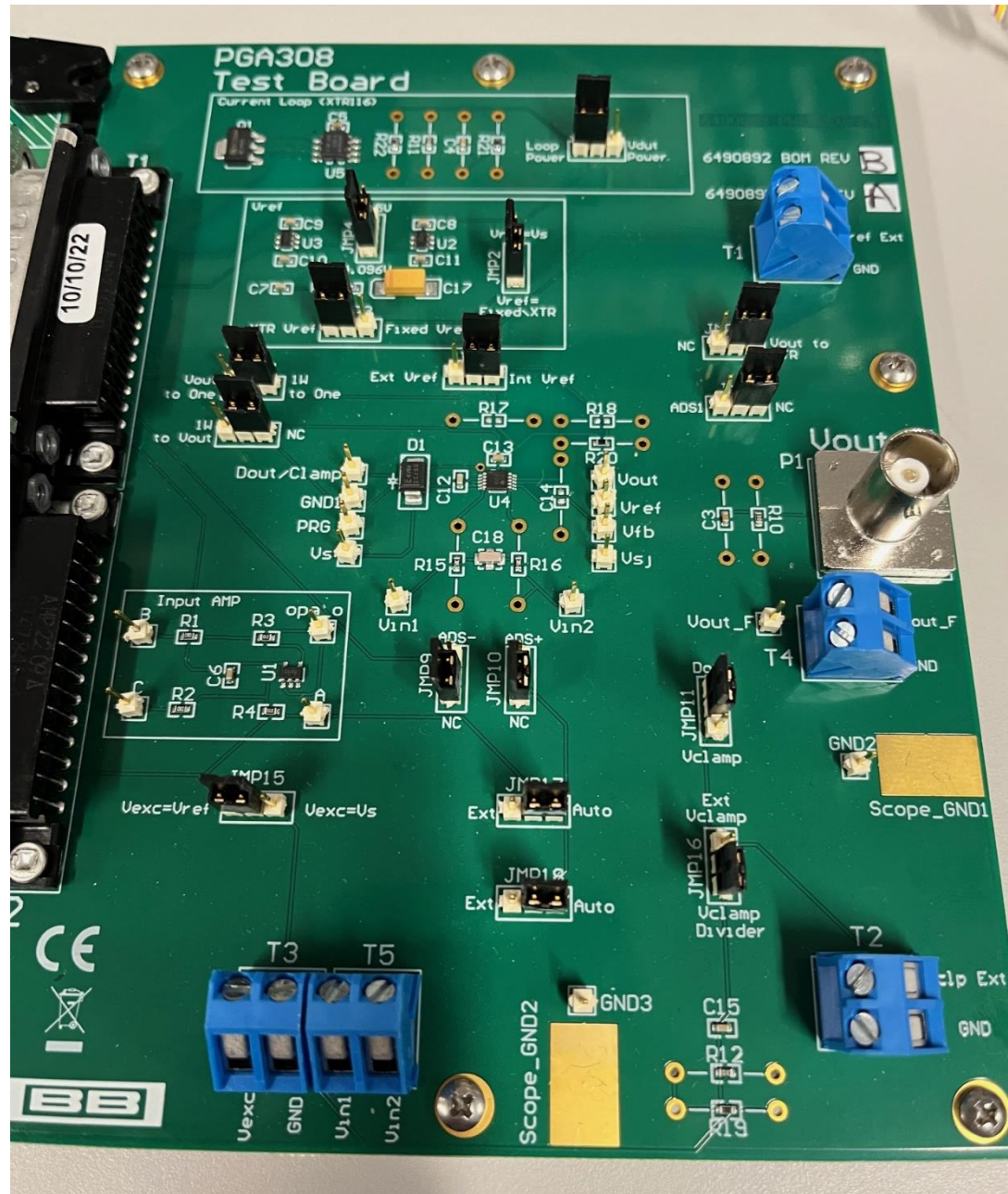
Current Loop Step-by-step example

Art Kay

10-18-2023

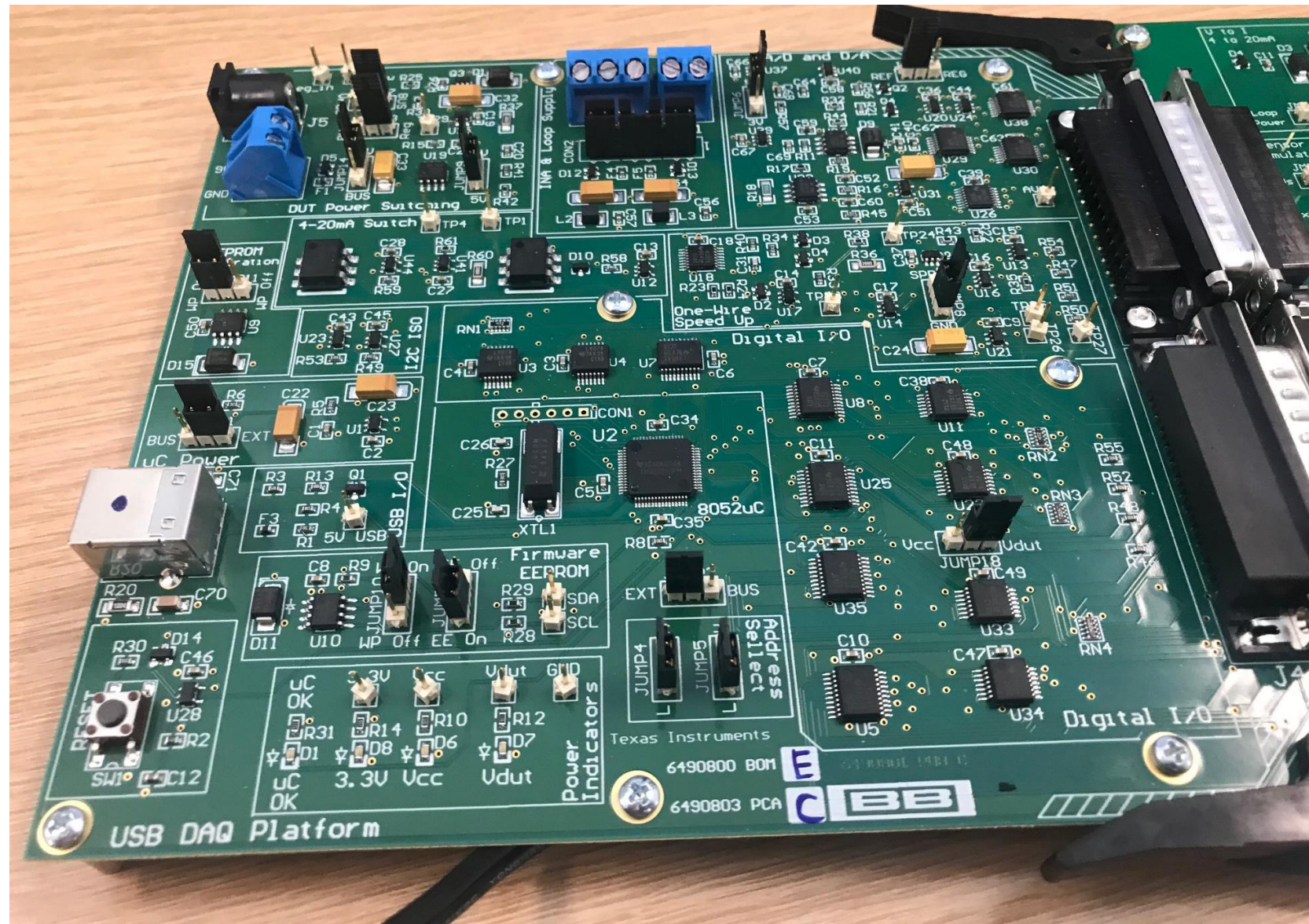


Jumper Settings on PGA308



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



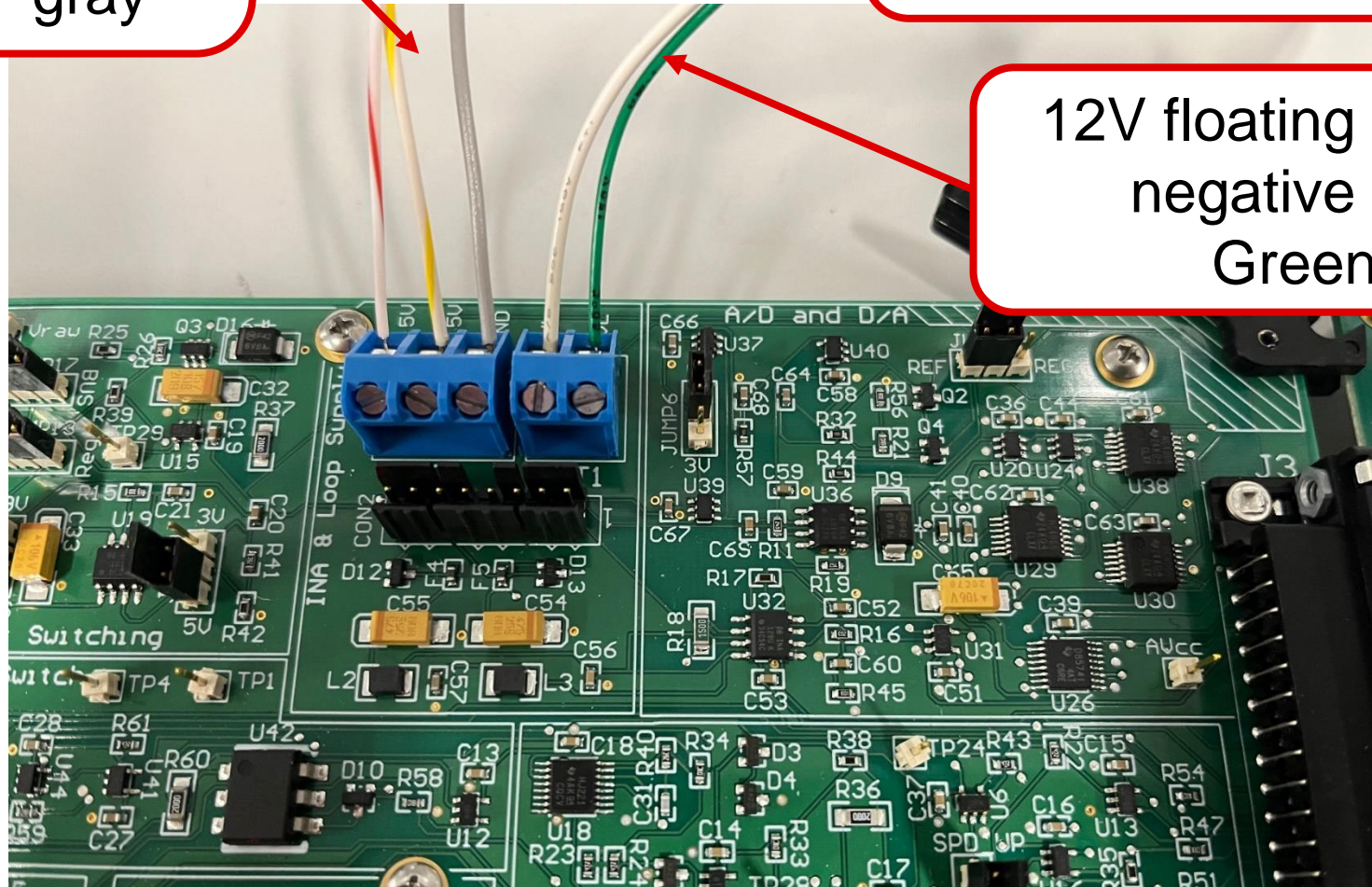
JMP	Position
17	BUS
13	Reg
14	9V
9	5V
11	WP On
6	5V
7	REF
1	EXT
8	GND
10	WP On
3	EE On
2	EXT
4	L
5	L
18	VDUT

USB-DAQ-Platform power connections

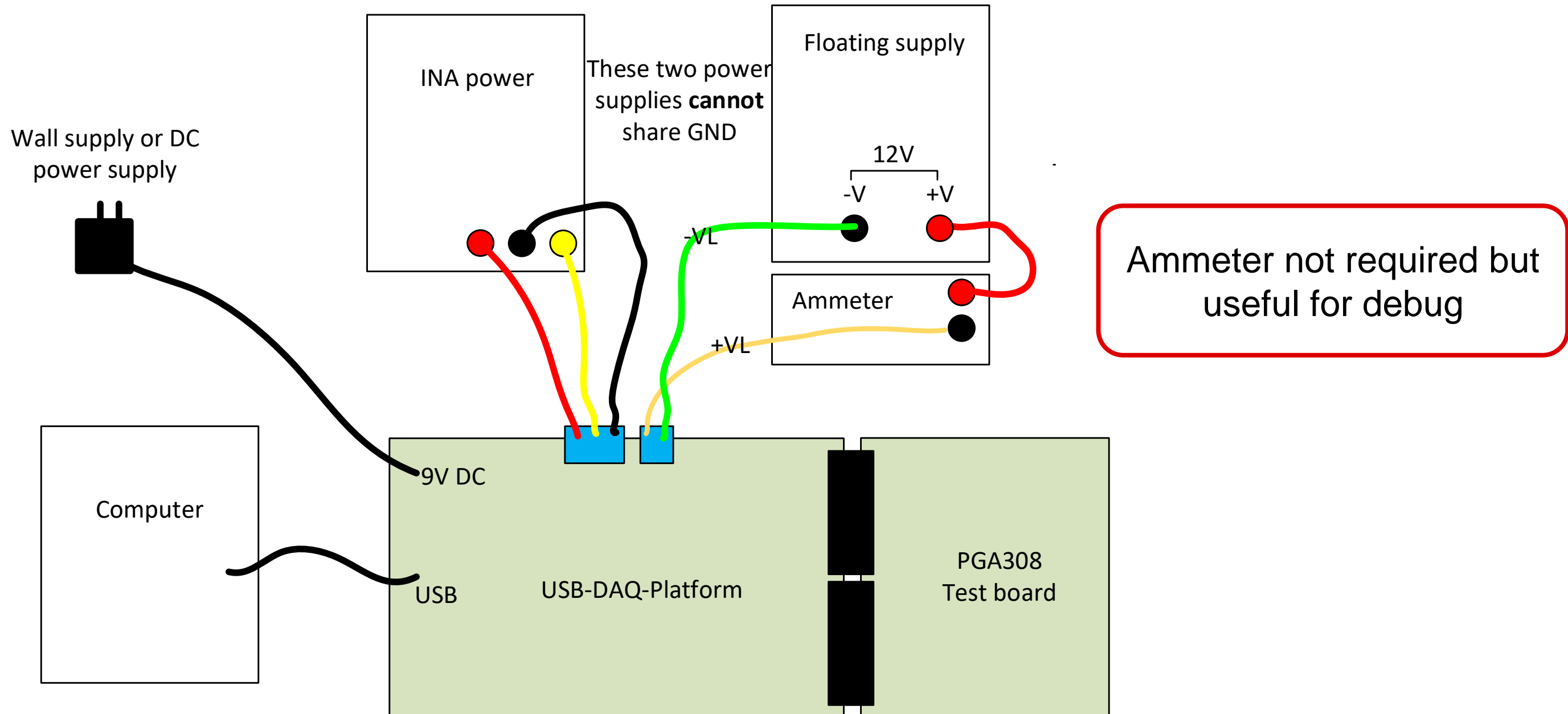
+12V – red/white
-12V –
yellow/white
GND – gray

12V floating loop supply
positive terminal
White wire

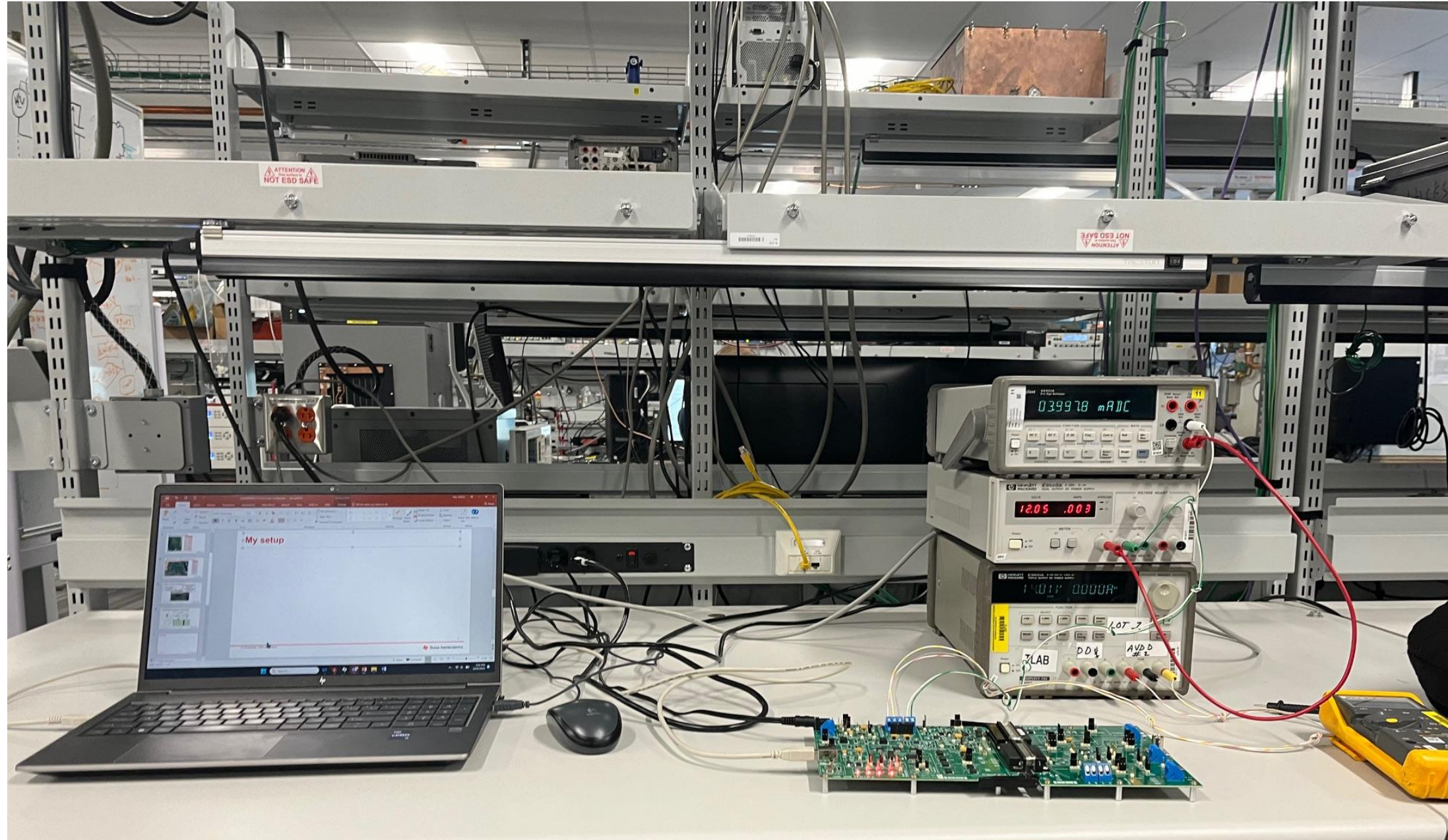
12V floating loop supply
negative terminal
Green wire



USB-DAQ-Platform power connections



My setup

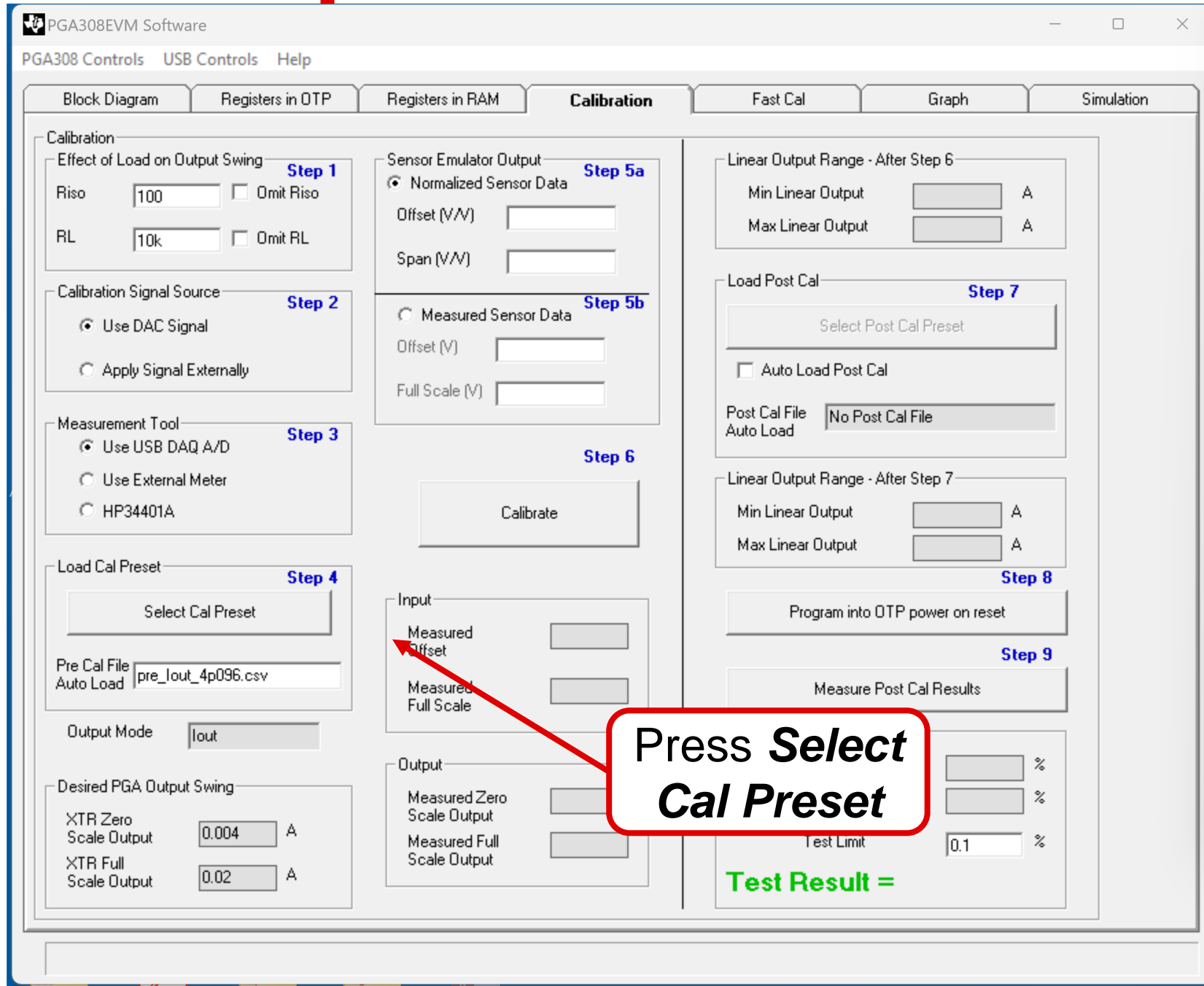


Start software

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 block diagram of the PGA308 chip with various configuration parameters. On the left, there are input fields for 'Auto Vin' (range: -45mV < Vin < +45mV, 0V < Vcm < 5V), 'Vdif' (10m), and 'Vcm' (2.5). A red arrow points to the 'Set Vin' button. The 'Vin1' input is set to -55.23mV. The 'Vs' parameter is 5.0000, 'Vref' is 4.09600, and 'Vclamp' is 0. The 'ZDAC (RTO)' section has 'Fine Offset' set to 1.024 and 'Overscale' set to 21.0mA. The 'Front End Gain' is set to 4, and 'Auto-Zero' is checked. The 'GDAC Fine Gain' is set to .5. The 'Output Amp' is set to 2, and 'Underscale' is set to 2.52mA. The 'Clamp/Dout' section has 'Clamp' selected. The 'XTR116' section has 'XTR Scaling' checked and 'Current Output' checked. The 'Vout' is 0.6028 and 'Iout' is 0. At the bottom, there are 'RAM/OTP Modes' (Load OTP Bank / Run out of RAM, Run out of RAM, Run out of POR OTP) and 'Write to RAM' and 'Read from RAM' buttons.

Click on calibration tab

Select precal file

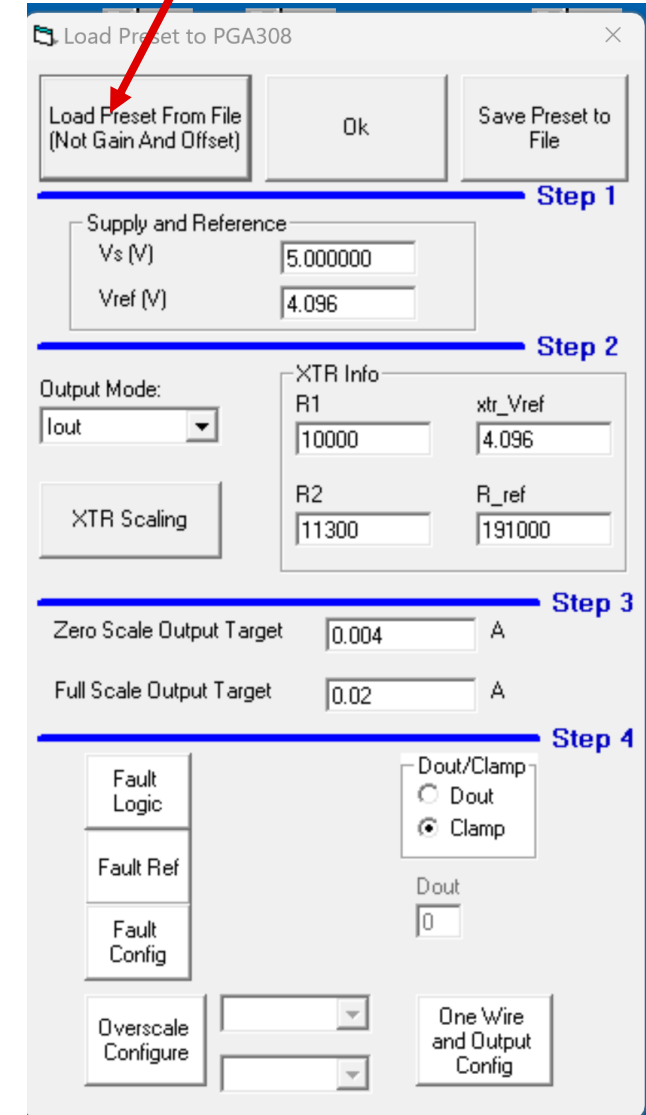


The main software window shows the 'Calibration' tab. It is divided into several sections:

- Effect of Load on Output Swing (Step 1):** Riso (100), RL (10k), and Omit options.
- Calibration Signal Source (Step 2):** Use DAC Signal (selected) or Apply Signal Externally.
- Measurement Tool (Step 3):** Use USB DAQ A/D (selected) or HP34401A.
- Load Cal Preset (Step 4):** Select Cal Preset button and Pre Cal File (pre_lout_4p096.csv).
- Sensor Emulator Output (Step 5a):** Normalized Sensor Data (selected) with Offset and Span fields.
- Measured Sensor Data (Step 5b):** Measured Sensor Data (selected) with Offset and Full Scale fields.
- Linear Output Range - After Step 6:** Min and Max Linear Output fields.
- Load Post Cal (Step 7):** Select Post Cal Preset button and Auto Load checkbox.
- Linear Output Range - After Step 7:** Min and Max Linear Output fields.
- Input (Step 8):** Measured Offset, Measured Full Scale, and Measured Zero Scale Output fields.
- Output (Step 9):** Measured Full Scale Output and Test Limit (0.1%) fields.

A red callout box with the text "Press Select Cal Preset" points to the "Select Cal Preset" button in the Load Cal Preset section.

Press **Load Preset File**



The 'Load Preset to PGA308' dialog box contains the following sections:

- Step 1:** Load Preset From File (Not Gain And Offset) button, Ok button, and Save Preset to File button.
- Step 2:** Supply and Reference section with Vs (V) (5.000000) and Vref (V) (4.096) fields.
- Step 3:** Output Mode (Iout) dropdown, XTR Scaling button, and XTR Info table:

XTR Info	
R1	xtr_Vref
10000	4.096
R2	R_ref
11300	191000
- Step 4:** Zero Scale Output Target (0.004 A) and Full Scale Output Target (0.02 A) fields.
- Bottom Section:** Fault Logic, Fault Ref, Fault Config, Overscale Configure, Dout/Clamp (Dout selected), Dout (0), and One Wire and Output Config buttons.

Select precal file continued

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: Iout

XTR Info

R1 10000 xtr_Vref 4.096

R2 11300 R_ref 191000

XTR Scaling

Step 3

Zero Scale Output Target 0.004 A

Full Scale Output Target 0.02 A

Step 4

Fault Logic

Fault Ref

Fault Config

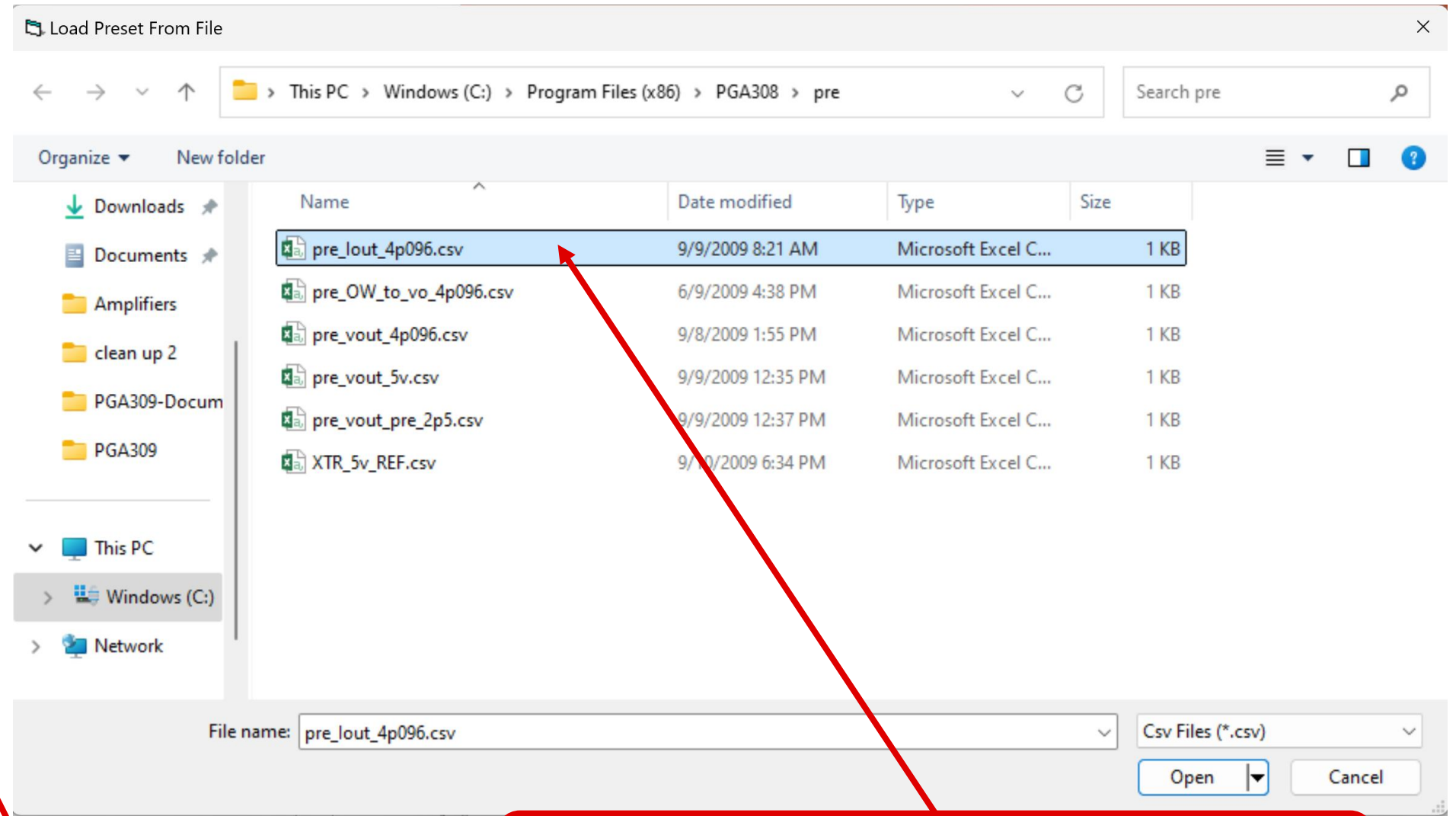
Overscale Configure

Dout/Clamp

Dout Clamp

Dout 0

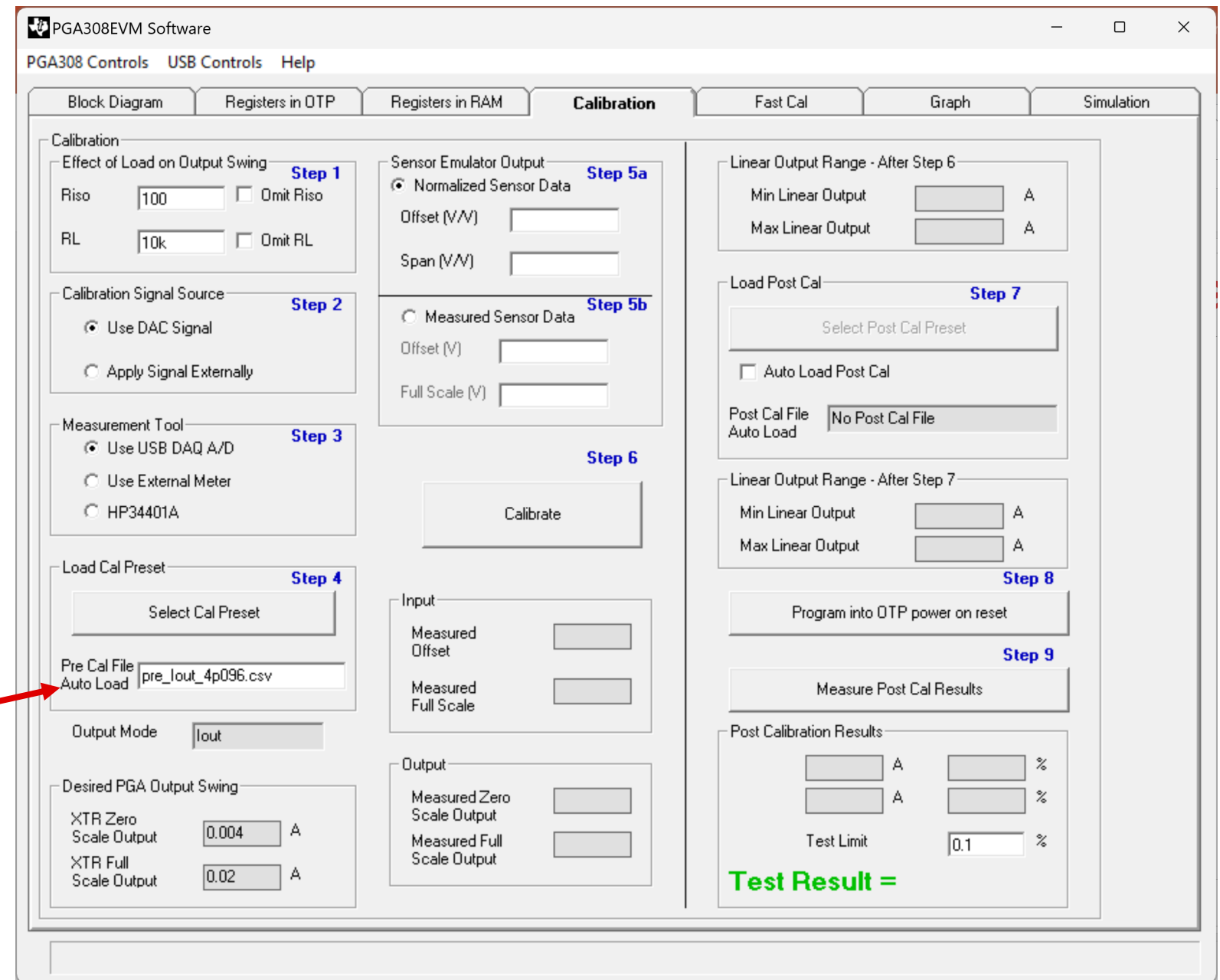
One Wire



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**

Select Cal Preset

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

Calibrate

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**

Select Post Cal Preset

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

Program into OTP power on reset

Step 9

Measure Post Cal Results

Post Calibration Results

A %

A %

Test Limit %

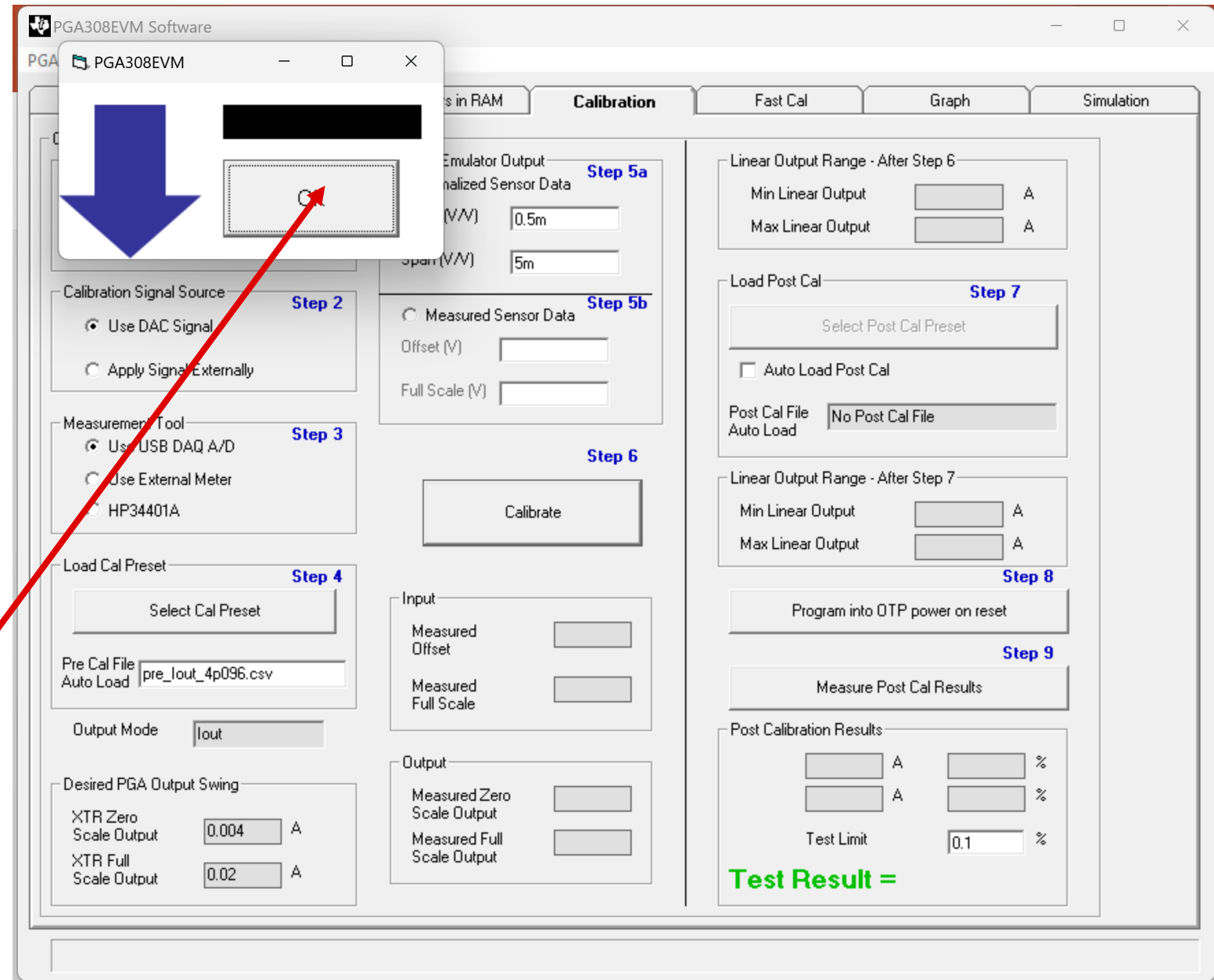
Test Result =

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.

PGA308EVM Software

PGA308EVM

Calibration

Fast Cal

Graph

Simulation

Emulator Output Analyzed Sensor Data **Step 5a**

Measured Sensor Data **Step 5b**

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 pre_lout_4p096.csv

Output Mode Iout

Desired PGA Output Swing

XTR Zero Scale Output 0.004 A

XTR Full Scale Output 0.02 A

Calibrate

Input

Measured Offset 1.976m

Measured Full Scale 22.57m

Output

Measured Zero Scale Output

Measured Full Scale Output 20.00m

Linear Output Range - After Step 6

Min Linear Output 2.533m A

Max Linear Output 24.92m A

Load Post Cal **Step 7**

Select Post Cal Preset

Auto Load Post Cal

Post Cal File Auto Load No Post Cal File

Linear Output Range - After Step 7

Min Linear Output A

Max Linear Output A

Program into OTP power on reset **Step 8**

Measure Post Cal Results **Step 9**

Post Calibration Results

Test Result =

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.

On the right side, there are sections for 'Linear Output Range - After Step 6' and 'Linear Output Range - After Step 7', both showing 'Min Linear Output' and 'Max Linear Output' values. Below these is a 'Program into OTP, power on' button and a 'Measure Post Cal Results' button.

A 'Calibration done!' dialog box is overlaid on the interface, with an 'OK' button. A red arrow points from the dialog box to the 'Post Calibration Results' section, which 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

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**

Select Cal Preset

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

Calibrate

Linear Output Range - After Step 6

Min Linear Output A

Max Linear Output A

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 A

Max Linear Output A

Step 8

Program into OTP power on reset

Step 9

Measure Post Cal Results

Post Calibration Results

<input type="text" value="4.000m"/> A	<input type="text" value="0.0"/> %
<input type="text" value="20.00m"/> A	<input type="text" value="0.003"/> %
Test Limit	<input type="text" value="0.1"/> %

Pass Test

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