

PGA309EVM

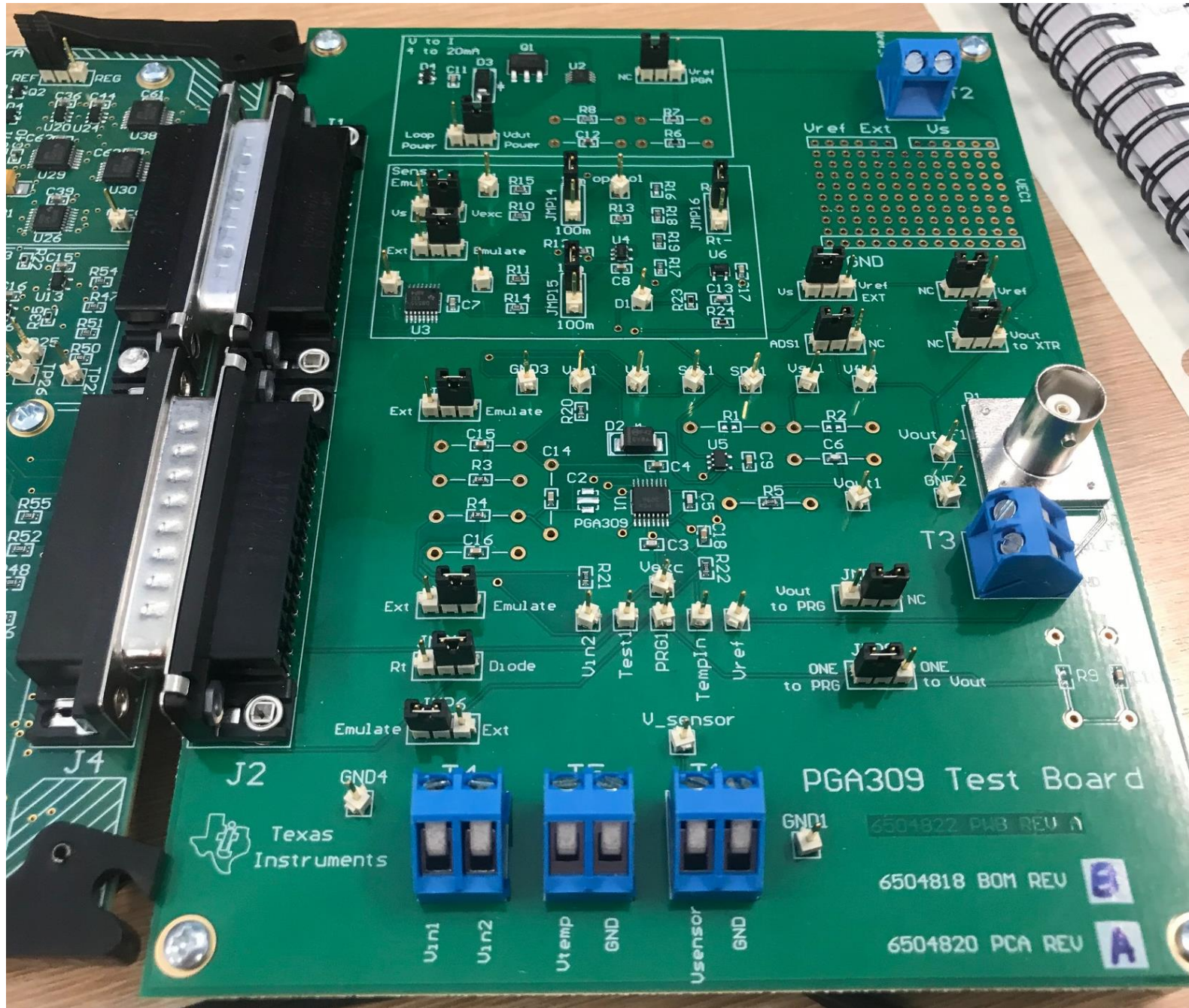
Step-by-step example

Art Kay

9-22-2023

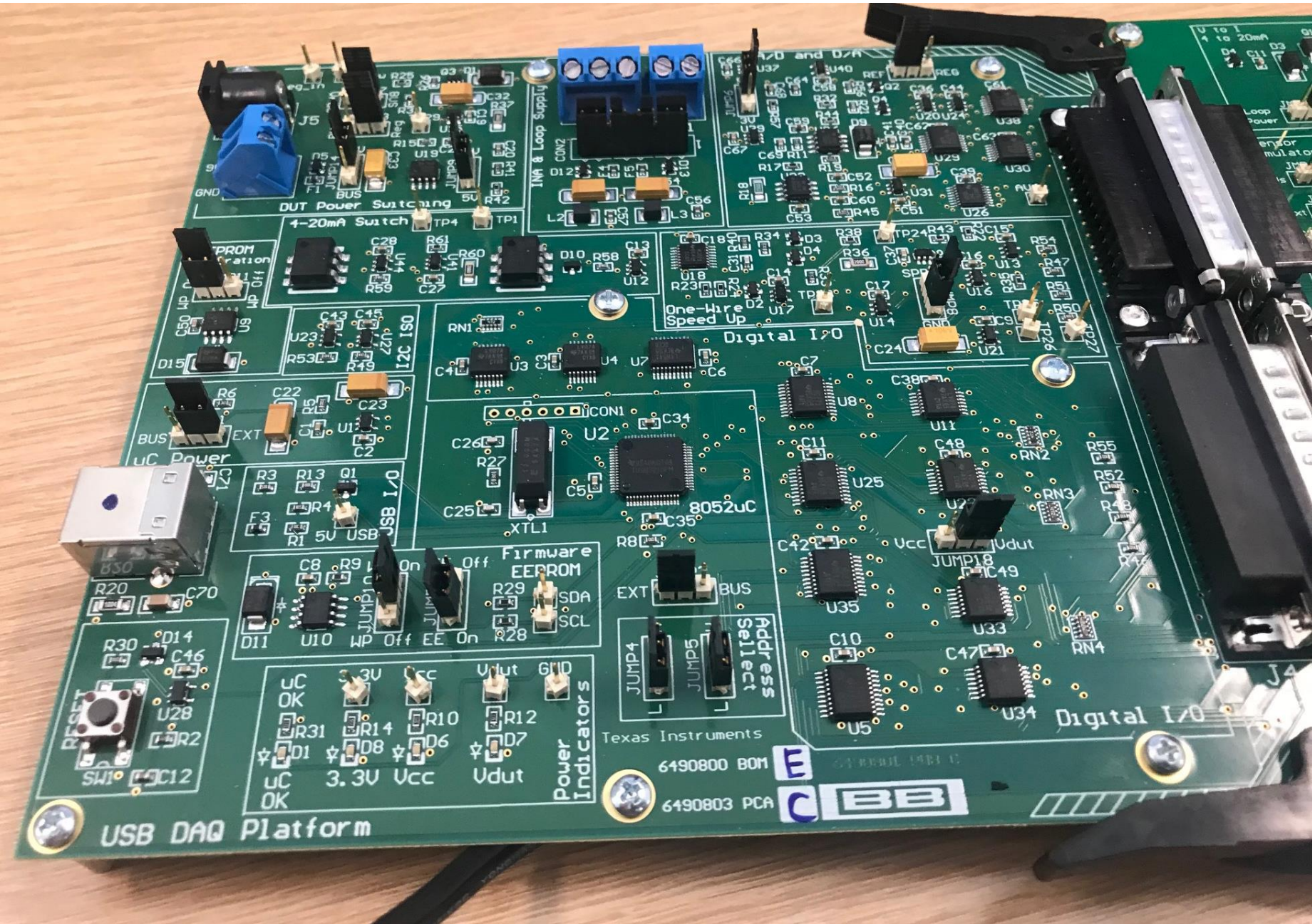


Set the jumpers on the test board.



JMP	Position
10	NC
11	Vdut Power
12	Vexc
17	Emulate
14	10m
15	10m
16	Rt+
2	Vs
1	NC
3	ADS1
9	NC
4	Emulate
5	Emulate
13	Diode
6	Emulate
7	NC
8	ONE to PRG

Set the jumpers on the USB-DAQ



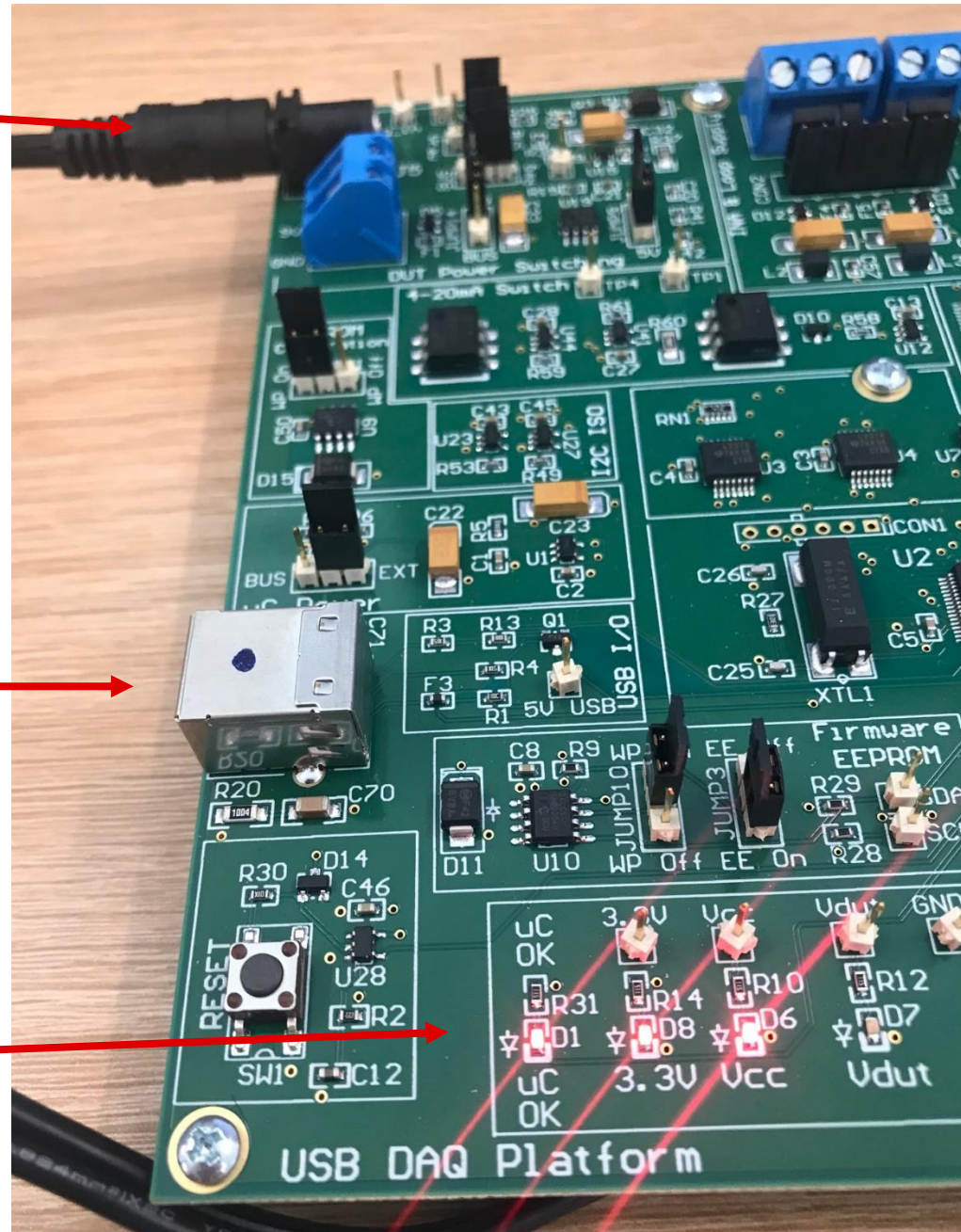
JMP	Position
17	BUS
13	Reg
14	9V
9	5V
11	WP On
6	5V
7	REF
1	EXT
8	GND
10	WP On
3	EE On
2	EXT
4	L
5	L
18	VDUT

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.



Start Software

The screenshot shows the PGA309EVM-USB software interface. The window title is "PGA309EVM-USB" and it has tabs for "USB Controls" and "PGA309 Controls". The "PGA309 Controls" tab is active, showing a "Start" button and an "Auto-continue" checkbox. Below these are "Calibration" buttons: "Continue", "Re-Run Current Measurement", and "Re-Cal Selected Temperature". A "Temperature" dropdown is set to "0.0".

The "Reg Cluster" section contains several sub-sections:

- Misc Value:** Temp No (0), Vin_Low (0), Vout_Low (0), Vo High Target (4.5), Io High Target (0), No of Temp (3), Output Mode (Vout (4-Wire)).
- Analog Reg:** Front Gain (0), Output Gain (0), Coarse Off (0), Gain Dac (0), Zero Dac (0), Vs (5), Vref (4.096), Klin (0), Kexc (0).
- Reg:** A column of registers with values: x0000, x0000, x0000, x0500, x0000, x0000, x1403, x0000, x0000, XTR_Vref (0), R_ref (0).
- Cal Control:** "Calibrate Nonlin (LinD)" and "Use Sensor Emulator" are checked. Range is "12mV/V".
- XTR Info:** R1 (0), R2 (0).

The "First Cal Status" and "Over Temp Status" sections show progress indicators for "Find", "Cal", and "Done" steps. The "Cal Results" section shows "Measurements Complete" and "EEPROM Written".

The "Calibration Info" table at the bottom displays the following data:

Done	Temperature	Temp DAC	Sensor Min	Sensor Max	Vout Max	Vout Min	Io Max	Io Min	Zero Dac	Gain Dac	Emul Min	Emul Max	Emul Temp
●	0	x0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0380	8.0980	0.75000
●	50	x0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0580	8.1555	0.65000
●	100	x0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.4620	9.2290	0.55000
●	0	x0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
●	0	x0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
●	0	x0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
●	0	x0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Should see a quick update on status bar and no error messages.

Select the “4wire_4p096_diode.txt” if needed

PGA309EVM-USB

USB Controls PGA309 Controls

Block Diagram Registers Set up Cal Auto-Cal EEPROM

Select Model File Emulator File Model File Name 4wire_4p096_diode.txt

Create Model File Emulator File

Run Sensor Emulator

Change DMM Interface Emulator

Comments

Config Files

Pre-Cal File Vout_4wire_4p096_diode.txt

Sensor Emulator File nonlin2.csv

EEPROM File Name

Model ID 4wire

Model No 1

Serial No 14

Date Code 3823

EEPROM File Name 4wire_MN_1_SN_14_DC_3823.txt

This file should be selected. If it is not, press the “Select Model File Emulator File” button and choose the file.

Choose or Enter Path of File

Save in: Model_Files

Name	Date modified	Type
3wire_4p096_diode.txt	12/21/2010 1:21 PM	Text [
4wire_2p5.txt	12/21/2010 1:30 PM	Text [
4wire_4p096_diode.txt	4/9/2011 11:09 AM	Text [
4wire_4p096_Rtm.txt	3/15/2011 10:51 PM	Text [
4wire_4p096_Rtp.txt	3/30/2011 9:49 AM	Text [
lout_4p096_diode.txt	12/23/2010 10:24 AM	Text [
larg-nonlin.txt	12/21/2010 2:38 PM	Text [

File name: 4wire_4p096_diode.txt

Save as type: All Files (*.*)

OK Cancel

Run Auto-Cal

2. Press start.

1. Check "auto-continue" to speed up calibration.

3. Continue should start to blink. Press this to initiate calibration.

PGA309EVM-USB
USB Controls PGA309 Controls

Block Diagram Registers Set up Cal Auto-Cal EEPROM

Adjust Pressure to Minimum
Adjust Temperature to 0.0C
and press continul

Start

Auto-continue

Calibration

Continue

Re-Run Current Measurement

Re-Cal Selected Temperature

Temperature 0.0

First Cal Status

Find Vin_Low	Calibrate Vin_High	Calibrate Vin_Low	Calibrate Vin_Mid
2nd Find Vin_Low	2nd Cal Vin_High	2nd Cal Vin_Low	Done Initial Cal

Over Temp Status

Find Vin_Low	Cal Vin_High	Cal Vin_Low	Done
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Mesurements Complete

EEPROM Written

Cal Results 4wire_MN_1_SN_14_DC_3823.txt

Reg Cluster

Misc Value	Temp	Analog Reg	Reg
Temp No	Temp	Front Gain	Vs
0	0	0	5
Vin_Low	Vin_High	Output Gain	Vref
0	0	0	4.096
Vout_Low	Vout_High	Coarse Off	Klin
0	0	0	0
Vo High Target	Vo Low Target	Gain Dac	Kexc
4.5	0.5	0	0
Io High Target	Io Low Target	Zero Dac	
0	0	0	
No of Temp	Poly Order	Cal Control	XTR Info
3	2	<input checked="" type="checkbox"/> Calibrate Nonlin (LinD)	R1 XTR_Vref
Output Mode	Temp Sensor	<input checked="" type="checkbox"/> Use Sensor Emulator	0 0
Vout (4-Wire)	Diode / Raw	Range 12mV/V	R2 R_ref
			0 0

Calibration Info

Done	Temperature	Temp DAC	Sensor Min	Sensor Max	Vout Max	Vout Min	Io Max	Io Min	Zero Dac	Gain Dac	Emul Min	Emul Max	Emul Temp
<input checked="" type="checkbox"/>	0	x0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0380	8.0980	0.75000
<input checked="" type="checkbox"/>	50	x0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0580	8.1555	0.65000
<input checked="" type="checkbox"/>	100	x0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.4620	9.2290	0.55000
<input checked="" type="checkbox"/>	0	x0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
<input checked="" type="checkbox"/>	0	x0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
<input checked="" type="checkbox"/>	0	x0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
<input checked="" type="checkbox"/>	0	x0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Calibration progress

1. Text describing the current step is shown here

2. Measured results will update here. The sensor emulator will automatically adjust the "sensor" output according to the current emulated temperature and pressure.

PGA309EVM-USB

USB Controls PGA309 Controls

Block Diagram Registers Set up Cal Auto-Cal EEPROM

testing at High Pressure...

Start

Auto-continue

Calibration

Continue

Re-Run Current Measurement

Re-Cal Selected Temperature

Temperature 0.0

First Cal Status

Find Vin_Low Calibrate Vin_High Calibrate Vin_Low Calibrate Vin_Mid

2nd Find Vin_Low 2nd Cal Vin_High 2nd Cal Vin_Low Done Initial Cal

Over Temp Status

Find Vin_Low Cal Vin_High Cal Vin_Low Done

Measurements Complete

EEPROM Written

Cal Results 4wire_MN_1_SN_14_DC_3823.txt

Reg Cluster

Misc Value

Temp No 0 Temp 0

Vin_Low 1.033m Vin_High 7.943m

Vout_Low 2.9495 Vout_High 2.9321

Vo High Target 4.5 Vo Low Target 0.5

Io High Target 0 Io Low Target 0

No of Temp 3 Poly Order 2

Output Mode Vout (4-Wire) Temp Sensor Diode / Raw

Analog Reg

Front Gain 8 Vs 5

Output Gain 2 Vref 4.096

Coarse Off 0 Klin 0

Gain Dac 0.99999 Kexc 0.83

Zero Dac 1.25002

Cal Control

Calibrate Nonlin (LinD)

Use Sensor Emulator

Range 12mV/V

XTR Info

R1 0 XTR_Vref 0

R2 0 R_ref 0

0 0

Calibration Info

Done	Temperature	Temp DAC	Sensor Min	Sensor Max	Vout Max	Vout Min	Io Max	Io Min	Zero Dac	Gain Dac	Emul Min	Emul Max	Emul Temp
<input checked="" type="checkbox"/>	0	0	1.033m	7.943m	2.9321	2.9495	0.0000	0.0000	0.0000	0.0000	1.0380	8.0980	0.75000
<input checked="" type="checkbox"/>	50	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0580	8.1555	0.65000
<input checked="" type="checkbox"/>	100	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.4620	9.2290	0.55000
<input checked="" type="checkbox"/>	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
<input checked="" type="checkbox"/>	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
<input checked="" type="checkbox"/>	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
<input checked="" type="checkbox"/>	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Calibration complete

PGA309EVM-USB
USB Controls PGA309 Controls

Block Diagram Registers Set up Cal Auto-Cal EEPROM

Start Calibration Complete!

Auto-continue

Calibration

Continue

Re-Run Current Measurement

Re-Cal Selected Temperature

Temperature 100.0

First Cal Status

Find Vin_Low	Calibrate Vin_High	Calibrate Vin_Low	Calibrate Vin_Mid
2nd Find Vin_Low	2nd Cal Vin_High	2nd Cal Vin_Low	Done Initial Cal

Over Temp Status

Find Vin_Low	Cal Vin_High	Cal Vin_Low	Done
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Mesurements Complete

EEPROM Written

Cal Results 4wire_MN_1_SN_14_DC_3823.txt

Calibration Info

Done	Temperature	Temp DAC	Sensor Min	Sensor Max	Vout Max	Vout Min	Io Max	Io Min	Zero Dac	Gain Dac	Emul Min	Emul Max	Emul Temp
<input checked="" type="checkbox"/>	0	17A2	1.065m	8.095m	4.4998	0.49951	0.0000	0.0000	2.1639	0.62250	1.0380	8.0980	0.75000
<input checked="" type="checkbox"/>	50	1480	1.086m	8.153m	4.5001	0.49941	0.0000	0.0000	2.1573	0.61911	1.0580	8.1555	0.65000
<input checked="" type="checkbox"/>	100	115E	1.492m	9.225m	4.5001	0.49951	0.0000	0.0000	2.0184	0.56497	1.4620	9.2290	0.55000
<input type="checkbox"/>	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
<input type="checkbox"/>	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
<input type="checkbox"/>	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
<input type="checkbox"/>	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Reg Cluster

Misc Value

Temp No	Temp
2	100
Vin_Low	Vin_High
1.455m	9.225m
Vout_Low	Vout_High
499.51m	4.5001
Vo High Target	Vo Low Target
4.5	0.5
Io High Target	Io Low Target
0	0
No of Temp	Poly Order
3	2
Output Mode	Temp Sensor
Vout (4-Wire)	Mode / Raw

Analog Reg

Front Gain	Vs
128	5
Output Gain	Vref
2	4.096
Coarse Off	Klin
-17.41m	0.03346:
Gain Dac	Kexc
0.57124:	0.83
Zero Dac	
1.97497	

Cal Control

Calibrate Nonlin (LinD)

Use Sensor Emulator

Range 12mV/V

XTR Info

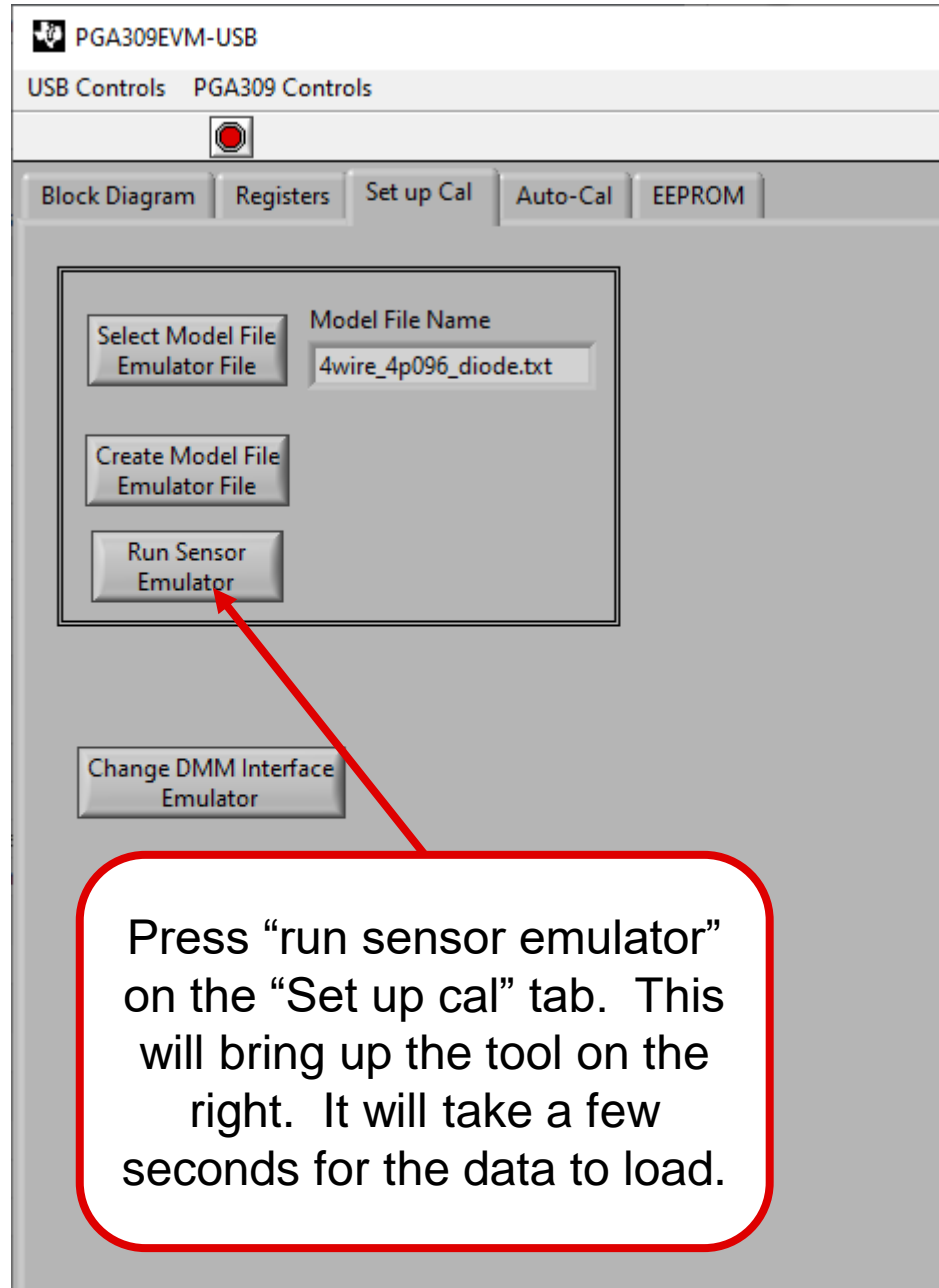
R1	XTR_Vref
0	0
R2	R_ref
0	0

Reg

x115E
x7B6F
x5B5C
x051A
x0715
x0000
x1403
x0000
x0000
x0000
x0000
x0000
x0000

1. Notice that the calibrated min and max output are approximately at the target of 0.5V to 4.5V. This indicates that the calibration worked and the hardware is functioning correctly

Sensor emulator for verification



PGA309EVM-USB
USB Controls PGA309 Controls

Block Diagram Registers Set up Cal Auto-Cal EEPROM

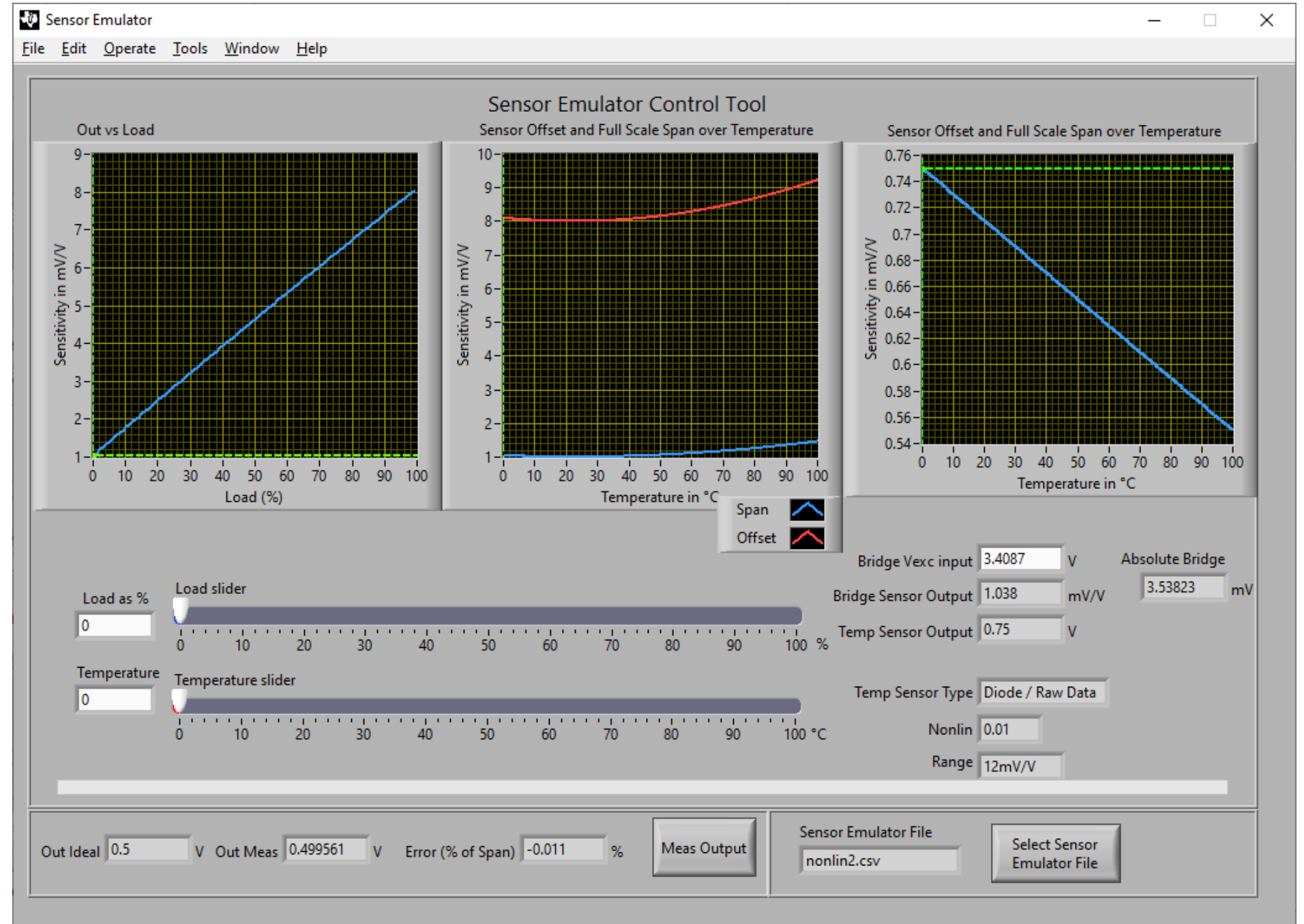
Select Model File Emulator File Model File Name
4wire_4p096_diode.txt

Create Model File Emulator File

Run Sensor Emulator

Change DMM Interface Emulator

Press "run sensor emulator" on the "Set up cal" tab. This will bring up the tool on the right. It will take a few seconds for the data to load.



Sensor Emulator
File Edit Operate Tools Window Help

Sensor Emulator Control Tool

Out vs Load
Sensitivity in mV/V vs Load (%)

Sensor Offset and Full Scale Span over Temperature
Sensitivity in mV/V vs Temperature in °C

Sensor Offset and Full Scale Span over Temperature
Sensitivity in mV/V vs Temperature in °C

Span
Offset

Load as % Load slider
0 0 10 20 30 40 50 60 70 80 90 100 %

Temperature Temperature slider
0 0 10 20 30 40 50 60 70 80 90 100 °C

Bridge Vexc input 3.4087 V Absolute Bridge
Bridge Sensor Output 1.038 mV/V 3.53823 mV
Temp Sensor Output 0.75 V
Temp Sensor Type Diode / Raw Data
Nonlin 0.01
Range 12mV/V

Out Ideal 0.5 V Out Meas 0.499561 V Error (% of Span) -0.011 % Meas Output
Sensor Emulator File nonlin2.csv Select Sensor Emulator File

Sensor emulator for verification

2. The cursor position will adjust to show the current temperature and pressure conditions on the sensor curves.

1. Adjust the sliders to any temperature or pressure.

3. The “ideal output” and “Out Meas” should be approximately equal. The Error should be less than 0.1%. In this case the error is 0.017% so it is working well.

