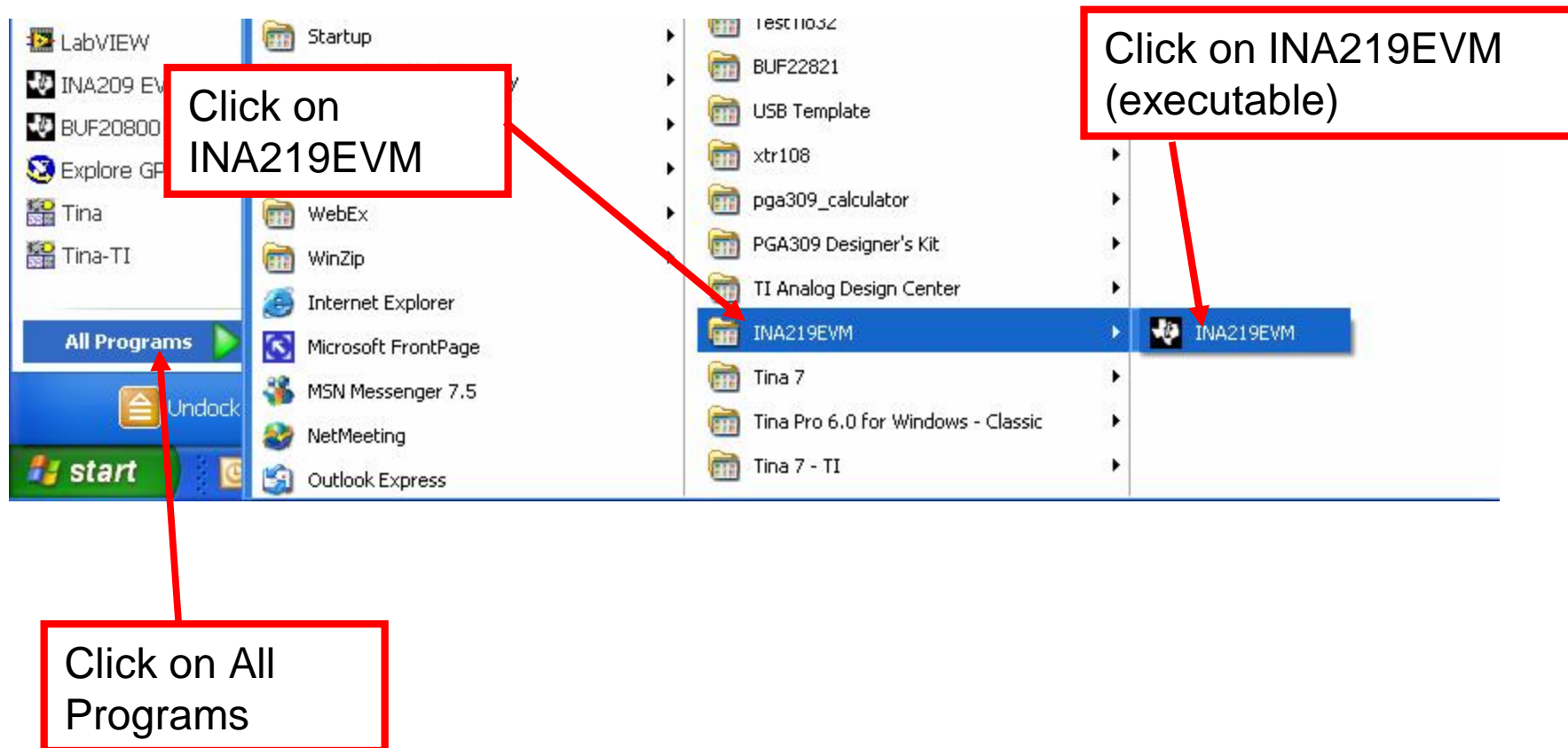
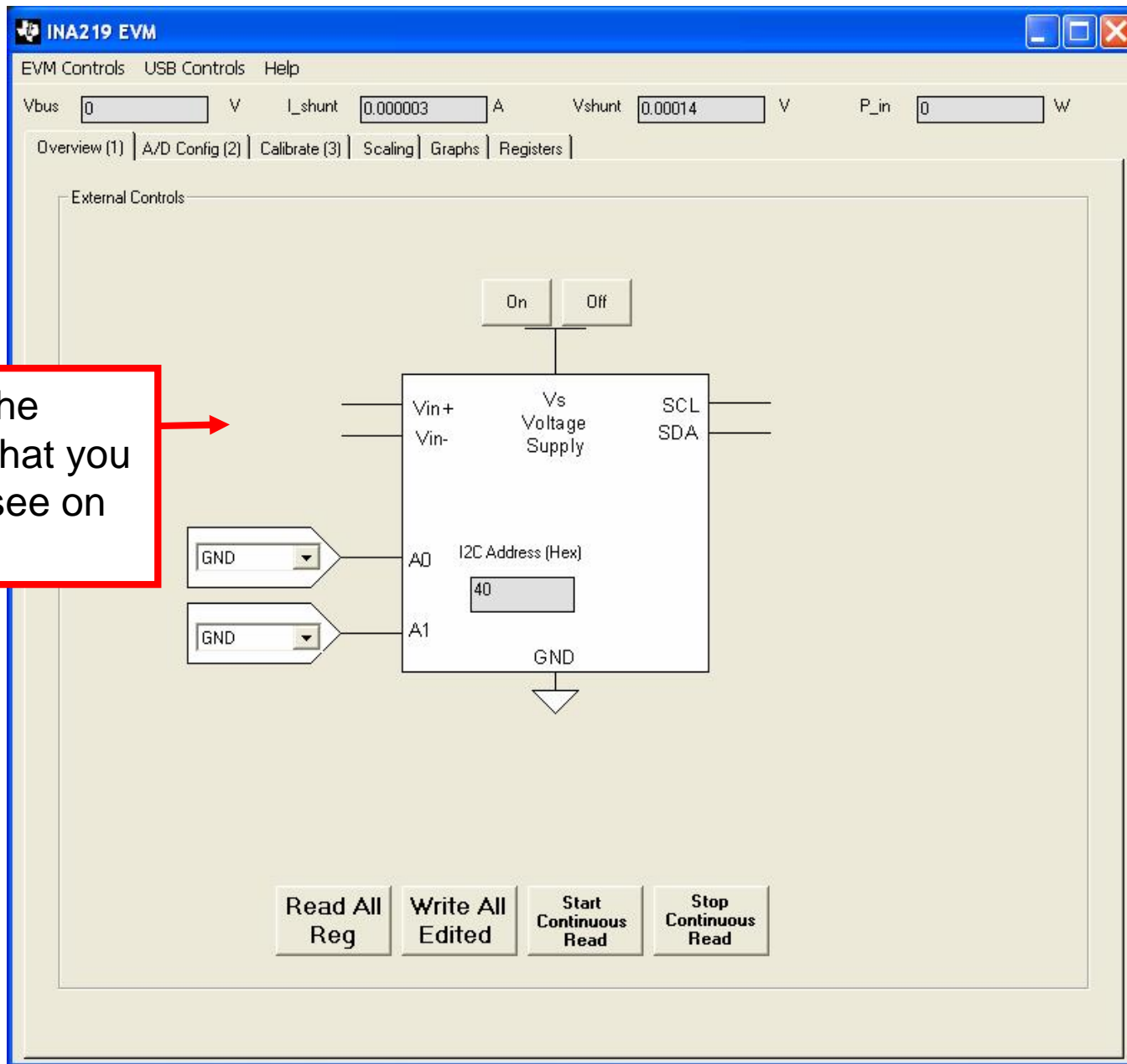


Software Overview of the INA219EVM





Fix for common problem.

If there is a communication problem this screen will pop-up.

The most likely issue is the wrong USB Address. Press “Set Address and Try Again”.

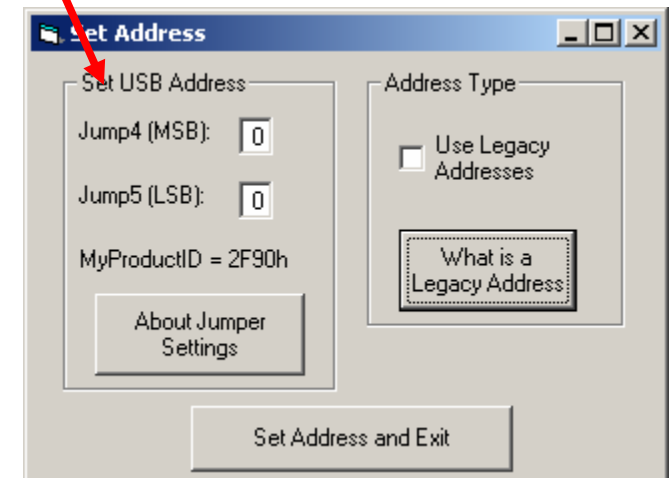


Fix for common problem.



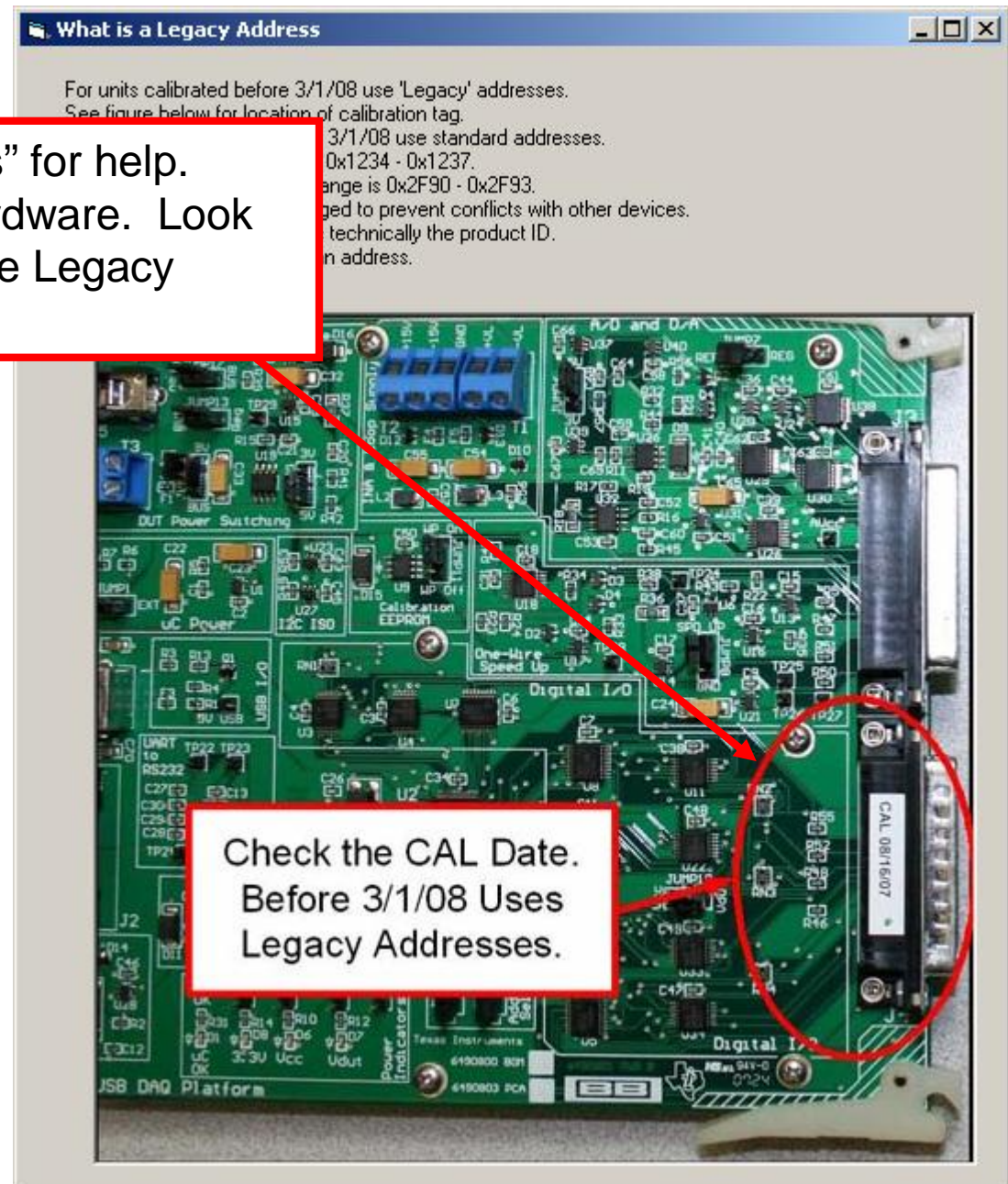
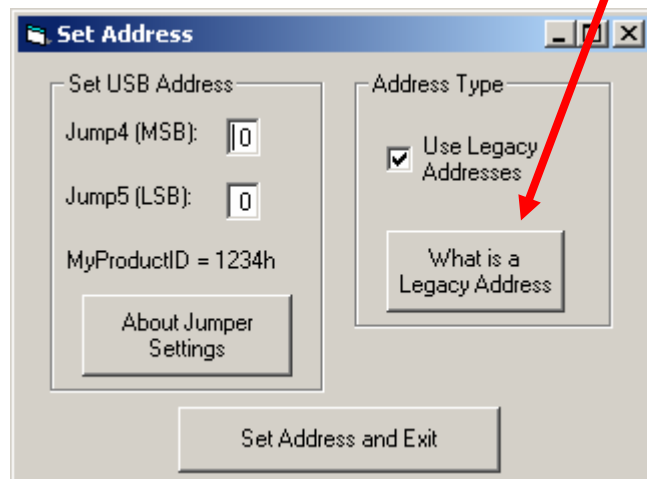
This window allows you to set the USB Address.

1. Look at the jumper settings on the USB DIG Platform. Default is Jump4 = L, Jump5 = L.
2. Set bits in window to match jumper settings. Default is Jump4=0, Jump5=0.
3. Select "Use Legacy Address" for boards calibrated before 3/1/08. (see next slide)
4. Press "Set Address and Exit"



Fix for common problem.

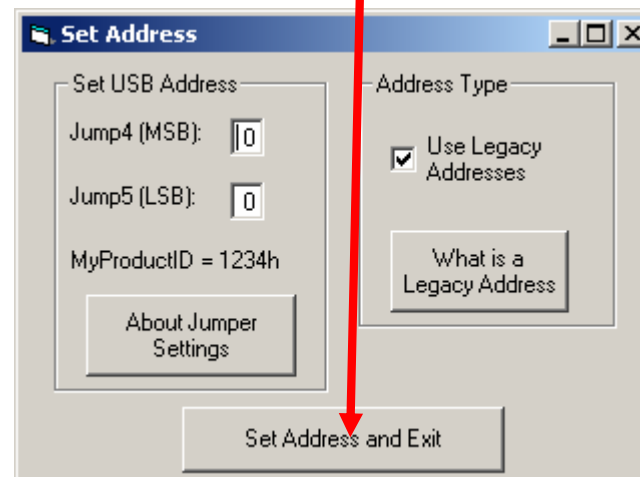
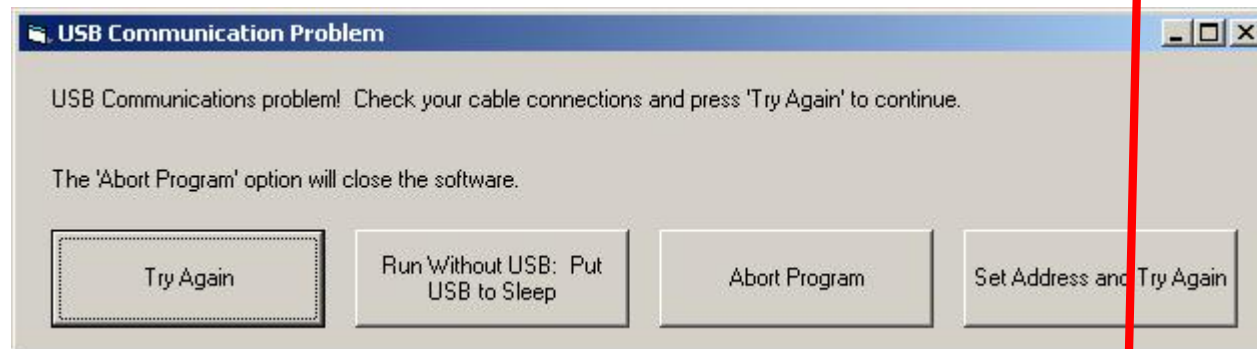
Press “What is a Legacy Address” for help.
Legacy Addresses are for old hardware. Look
at the calibration tag to see if “Use Legacy
Address” should be checked.

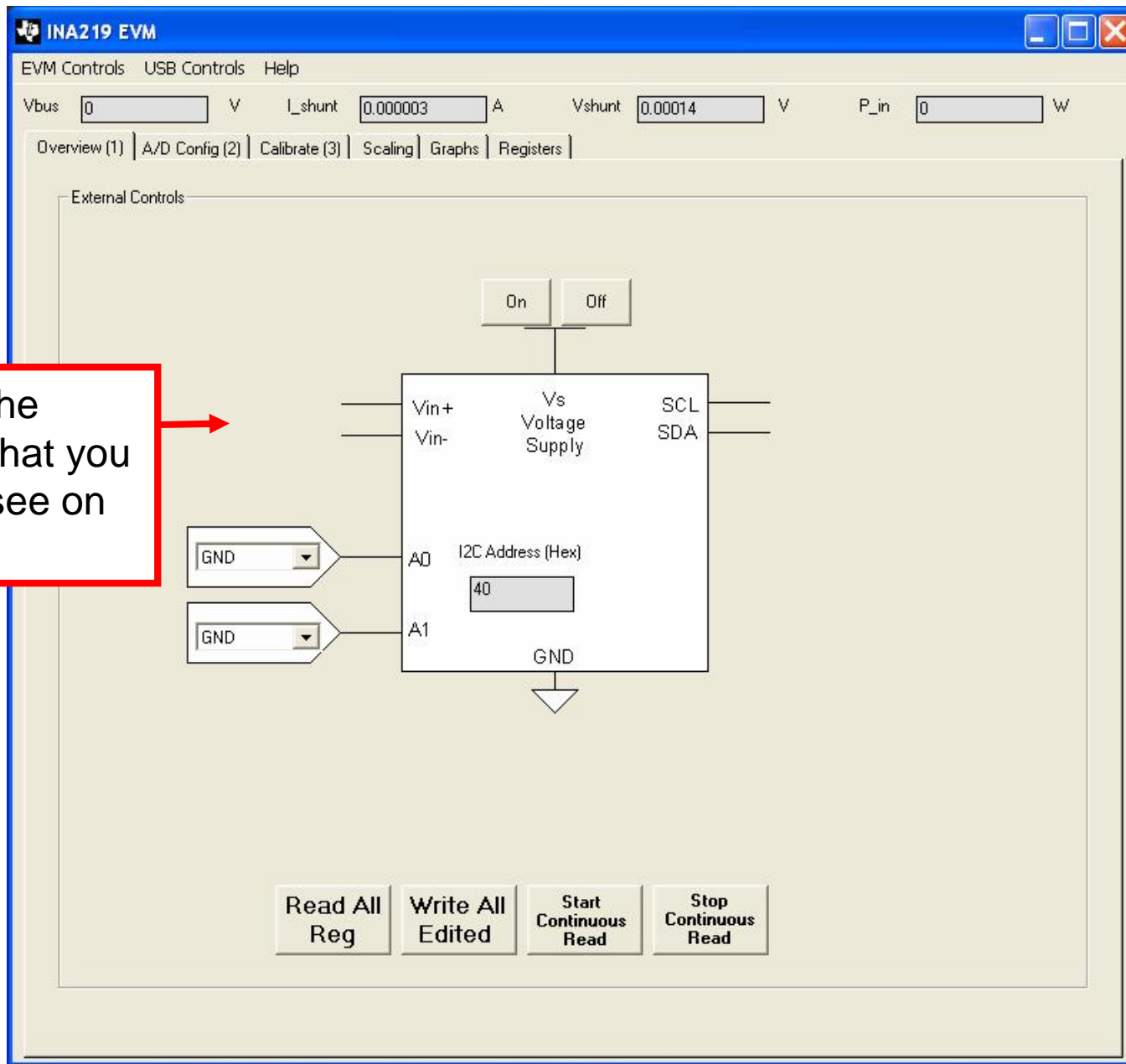


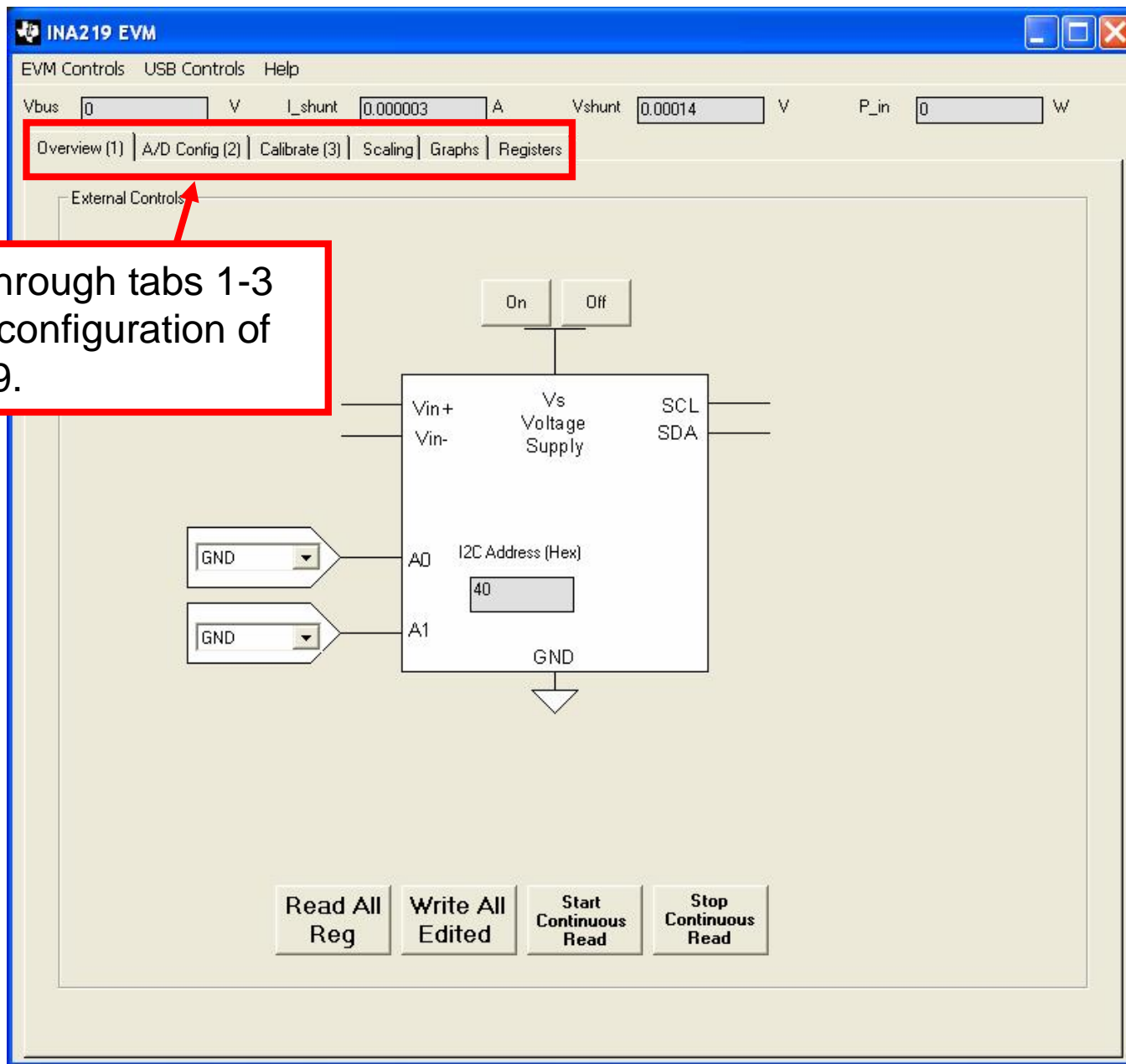
Check the CAL Date.
Before 3/1/08 Uses
Legacy Addresses.

Fix for common problem.

After the address has been changed, press “Set Address and Exit”.







Changing graphical controls on tabs 1-3 will change the corresponding bits in the registers. Changing bits in the registers will change the corresponding controls on tabs 1-3.

The left screenshot shows the 'A/D Configuration' tab. A red box highlights the 'Shunt A/D Configuration' section, which includes a '12-bit, 1 sig. 530u6' dropdown. A red arrow points from this dropdown to the 'Config' register in the 'INA219 Registers' table on the right.

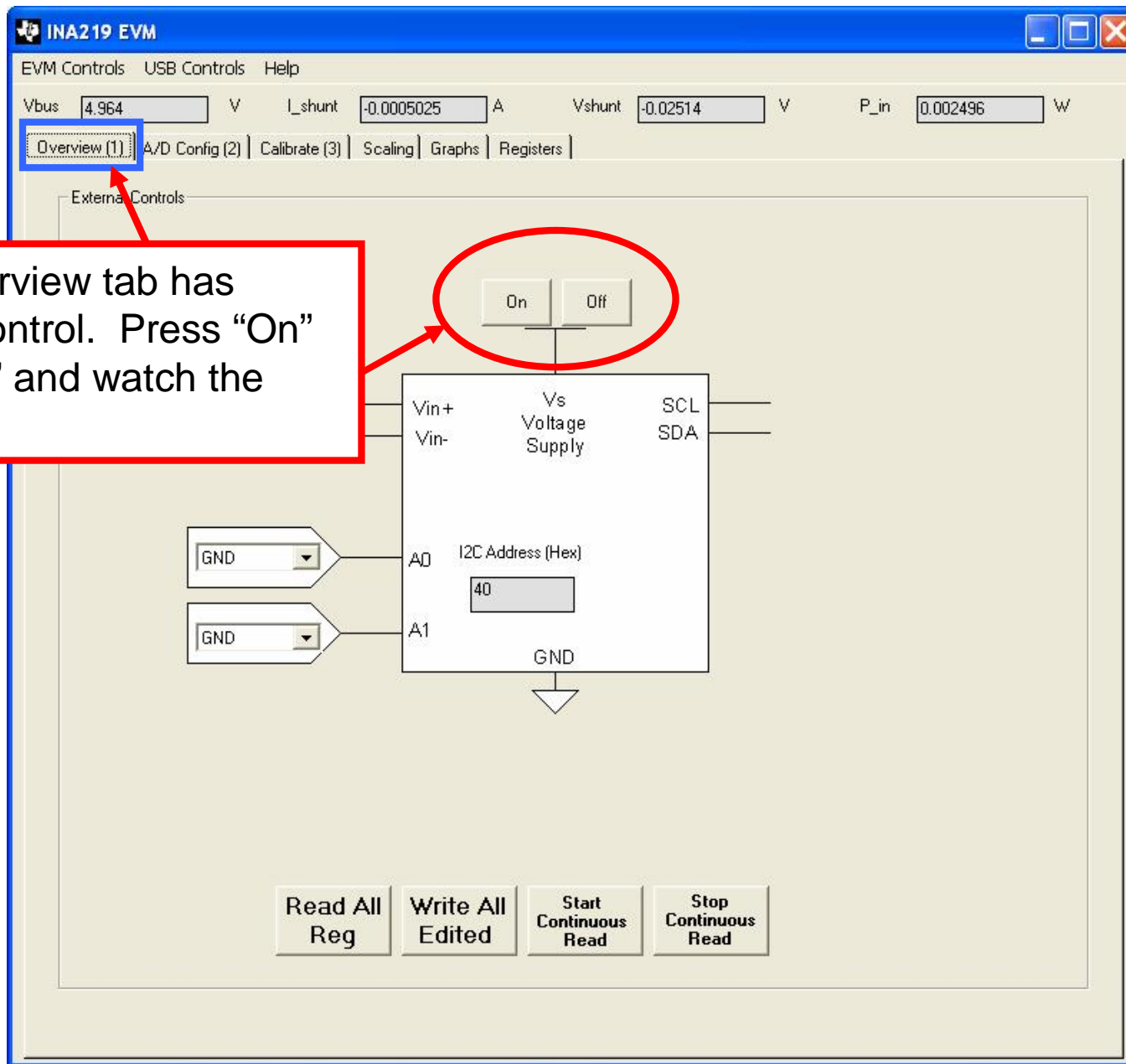
The right screenshot shows the 'Registers' tab. A red box highlights the 'INA219 Registers' table, which contains the following data:

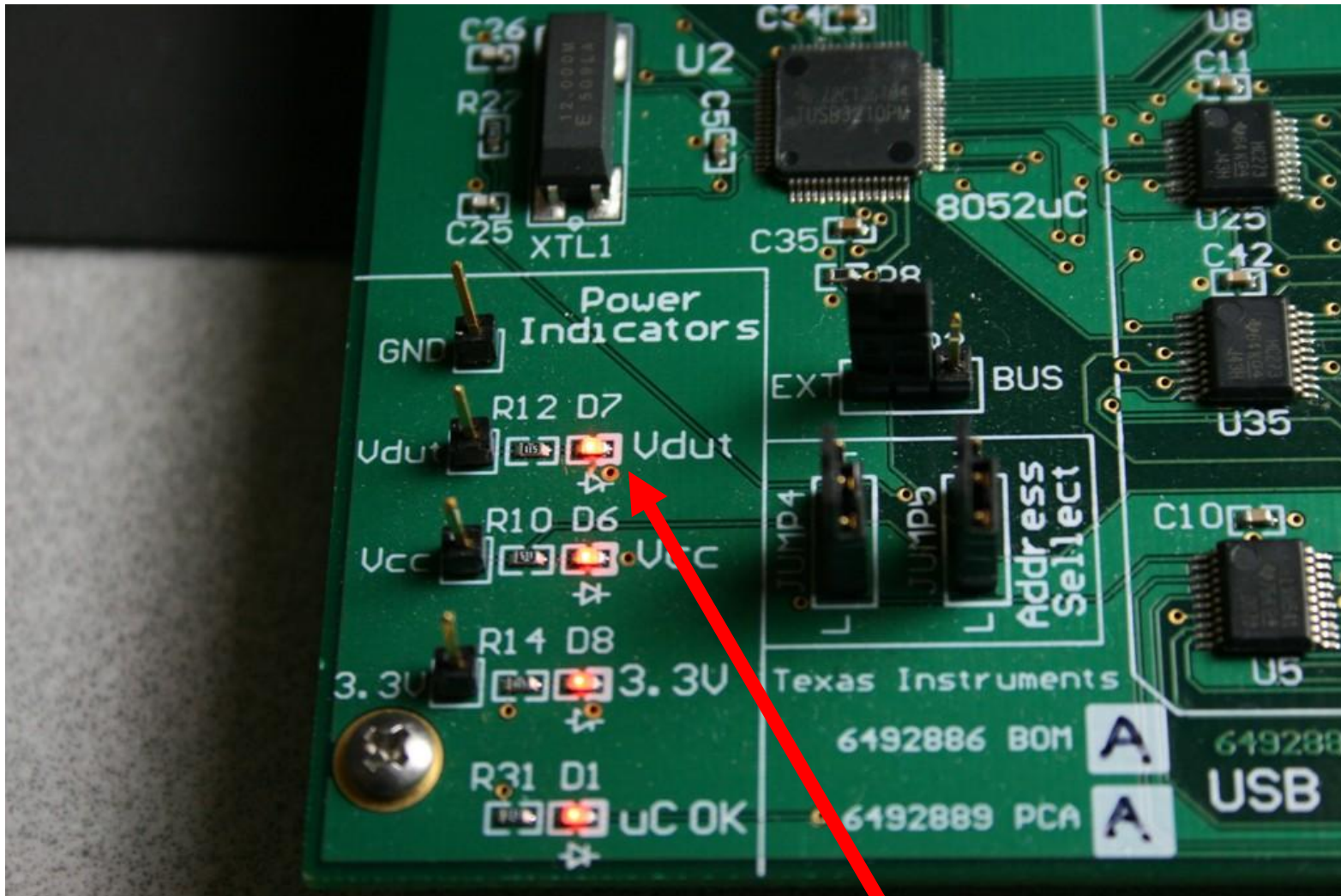
Addr	Name	Mask	Default	Current
00h	Config	0x010F	0x0000_0001_1001_1111	
01h	Shunt Voltage	0xF62E	0x1111_0110_0010_1110	-0.02514
02h	Bus Voltage	0x26CA	0x0010_0110_1100_1010	4.964
04h	Current / POA	0xECSF	0x1110_1100_0101_1111	-0.0009025
09h	Full Scale Cal	0x1FFE	0x0001_1111_1111_1110	

Another red box highlights the 'Registers Bit Map' section, which contains the following data:

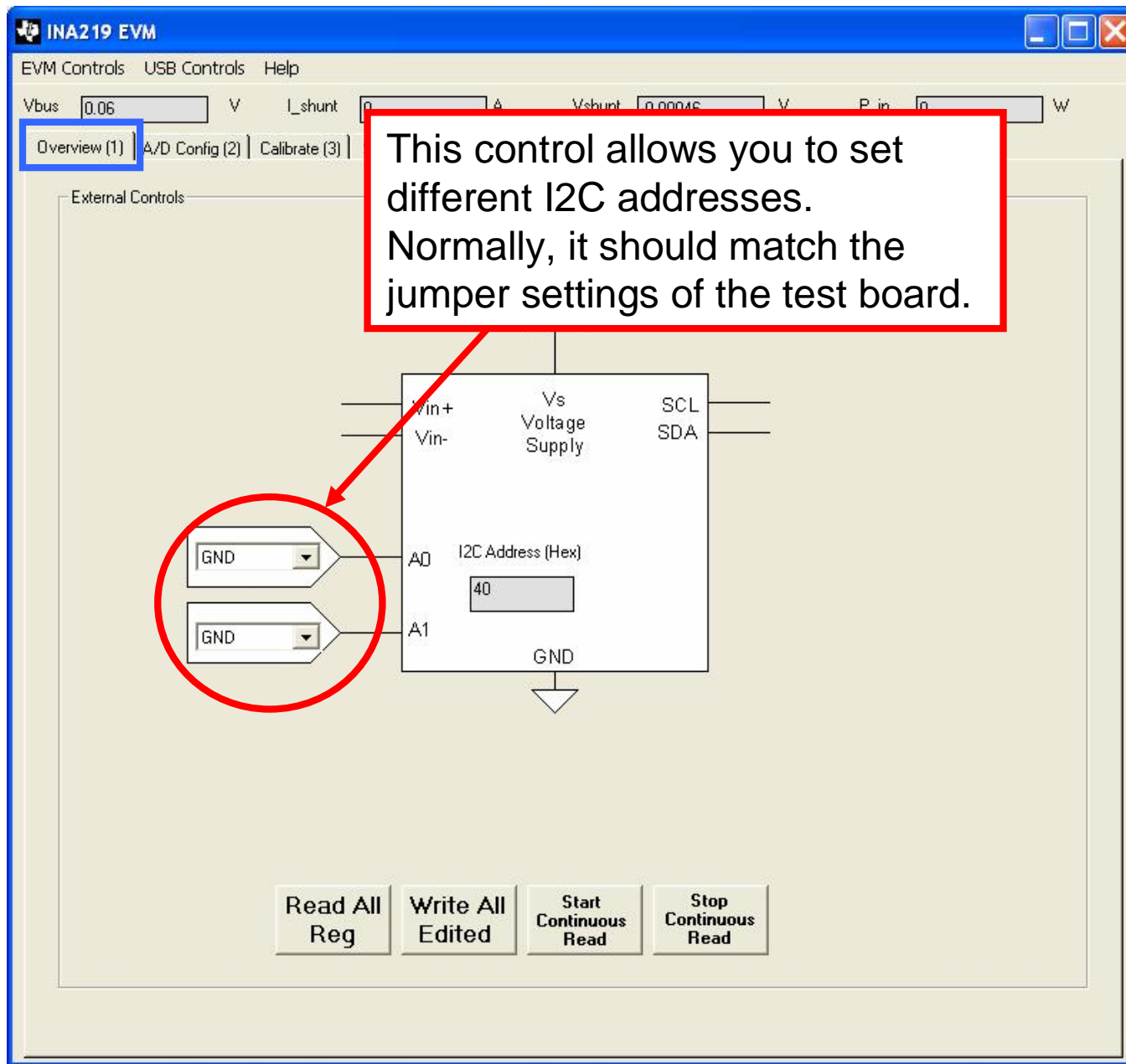
Register	Bit	Value
B_ADC1	RST	0
	B_ADC1	1
S_ADC4	S_ADC4	0
	S_ADC3	0
S_ADC2	S_ADC2	1
	S_ADC1	1
MODE3	MODE3	1
	MODE2	1
MODE1	MODE1	1
	MODE0	1

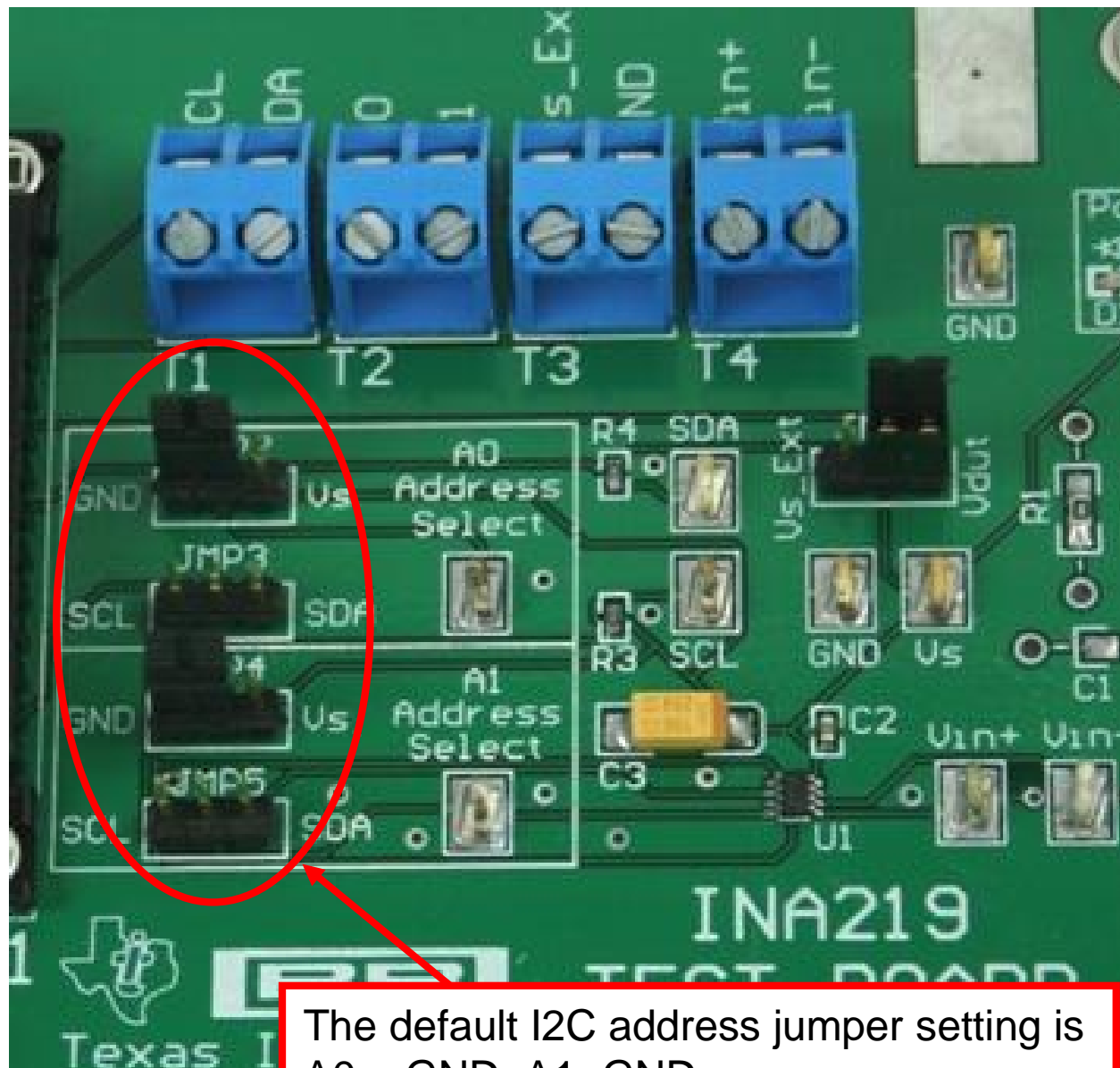
Red arrows point from the 'Shunt A/D Configuration' dropdown in the left screenshot to the 'Config' register in the right screenshot, and from the 'B_ADC1' bit in the right screenshot to the 'Shunt A/D Configuration' dropdown in the left screenshot.



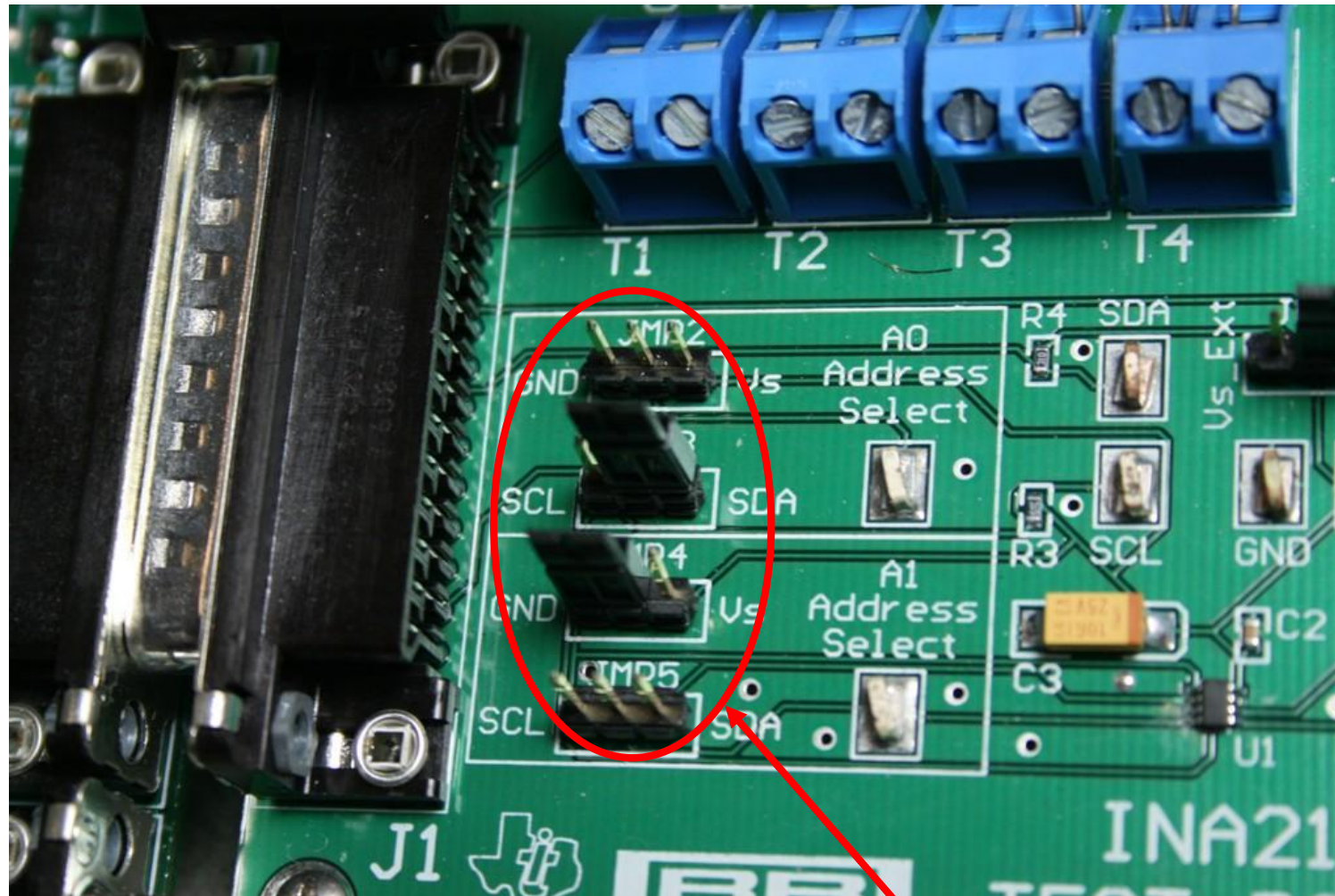


Vdut LED will light

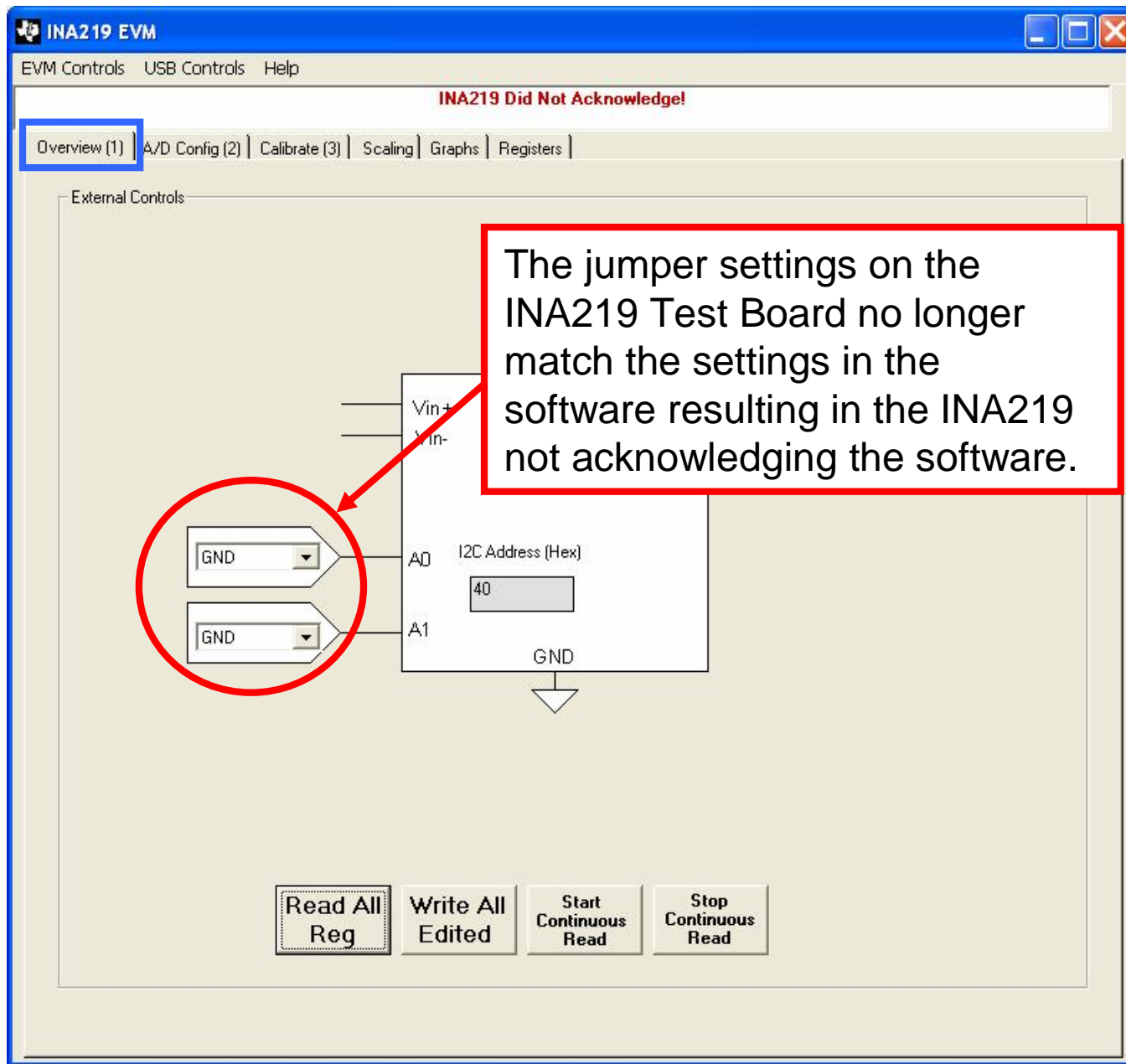


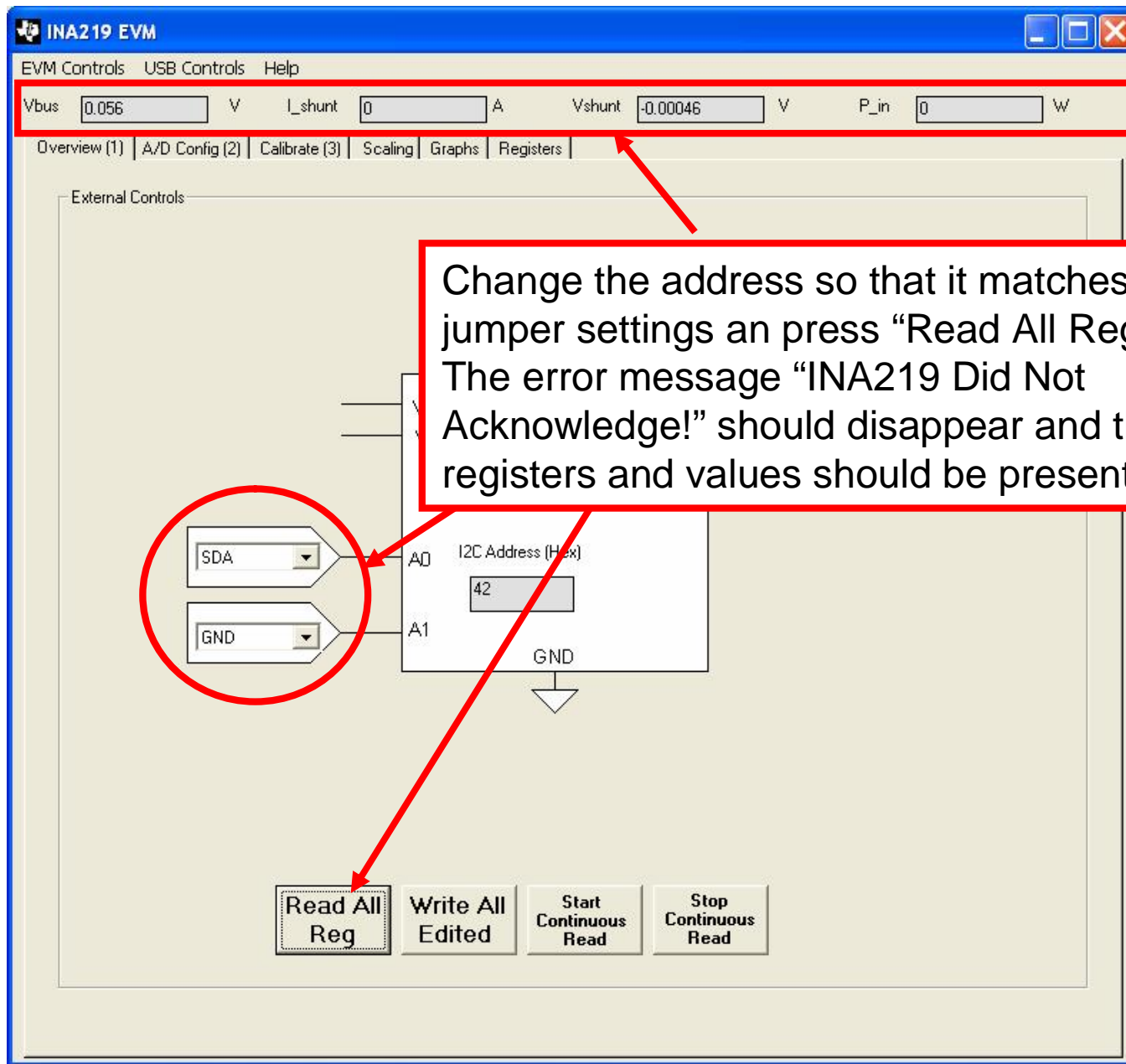


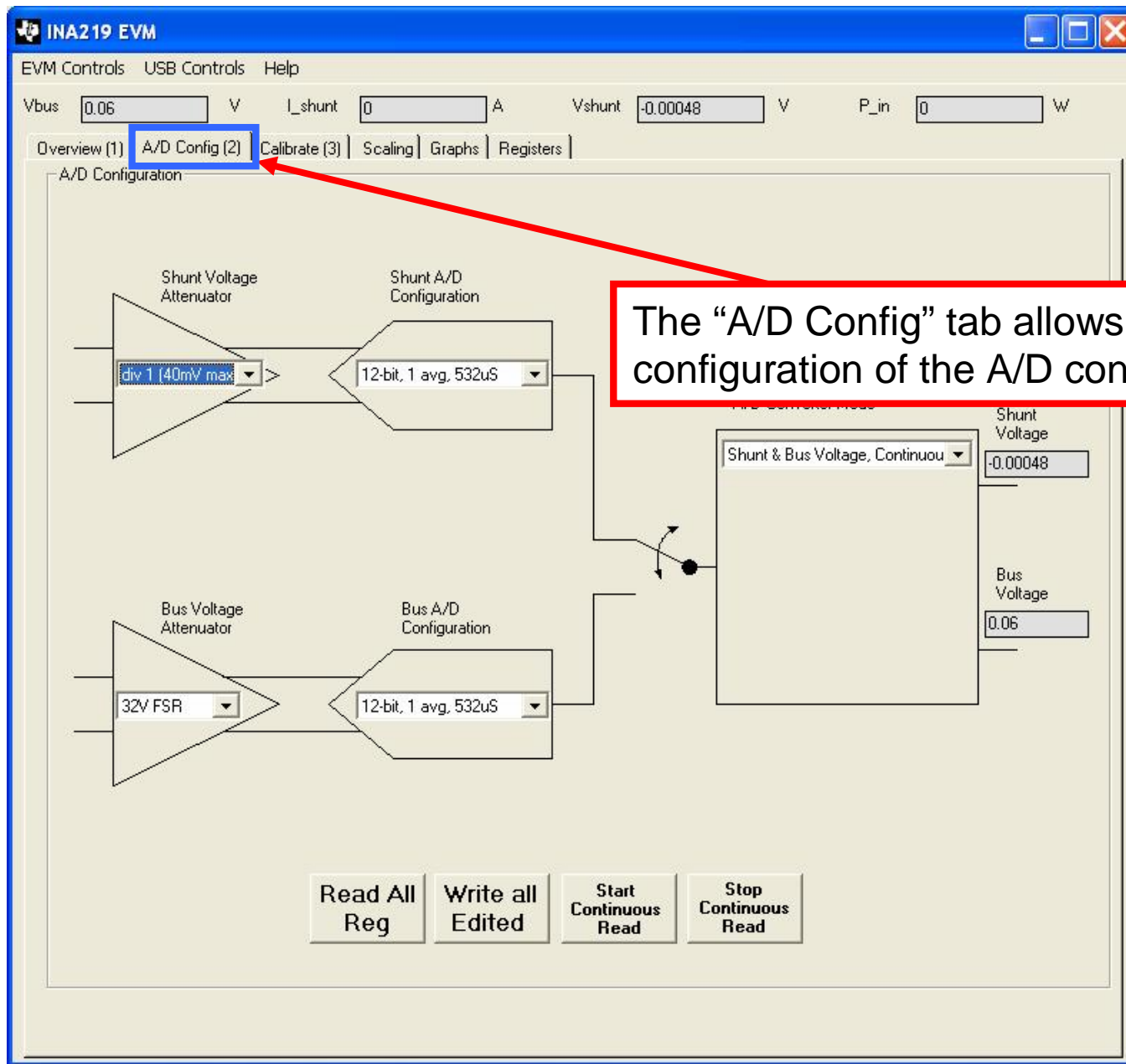
The default I2C address jumper setting is A0 = GND, A1=GND.



To demonstrate alternate I2C addresses, change the jumper setting for the A0 Address Selector to the SDA position.







INA219 EVM

EVM Controls USB Controls Help

Vbus 0.06 V I_shunt 0 A Vshunt -0.00048 V P_in 0 W

Overview (1) A/D Config (2) Calibrate (3) Scaling Graphs Registers

A/D Configuration

Shunt Voltage Attenuator

- div 1 (40mV max)
- div 1 (40mV max)
- div 2 (80mV max)
- div 4 (160mV max)
- div 8 (320mV max)

Shunt A/D Configuration

12-bit, 1 avg, 332uS

Bus Voltage Attenuator

32V FSR

Bus A/D Configuration

12-bit, 1 avg, 532uS

A/D Converter Mode

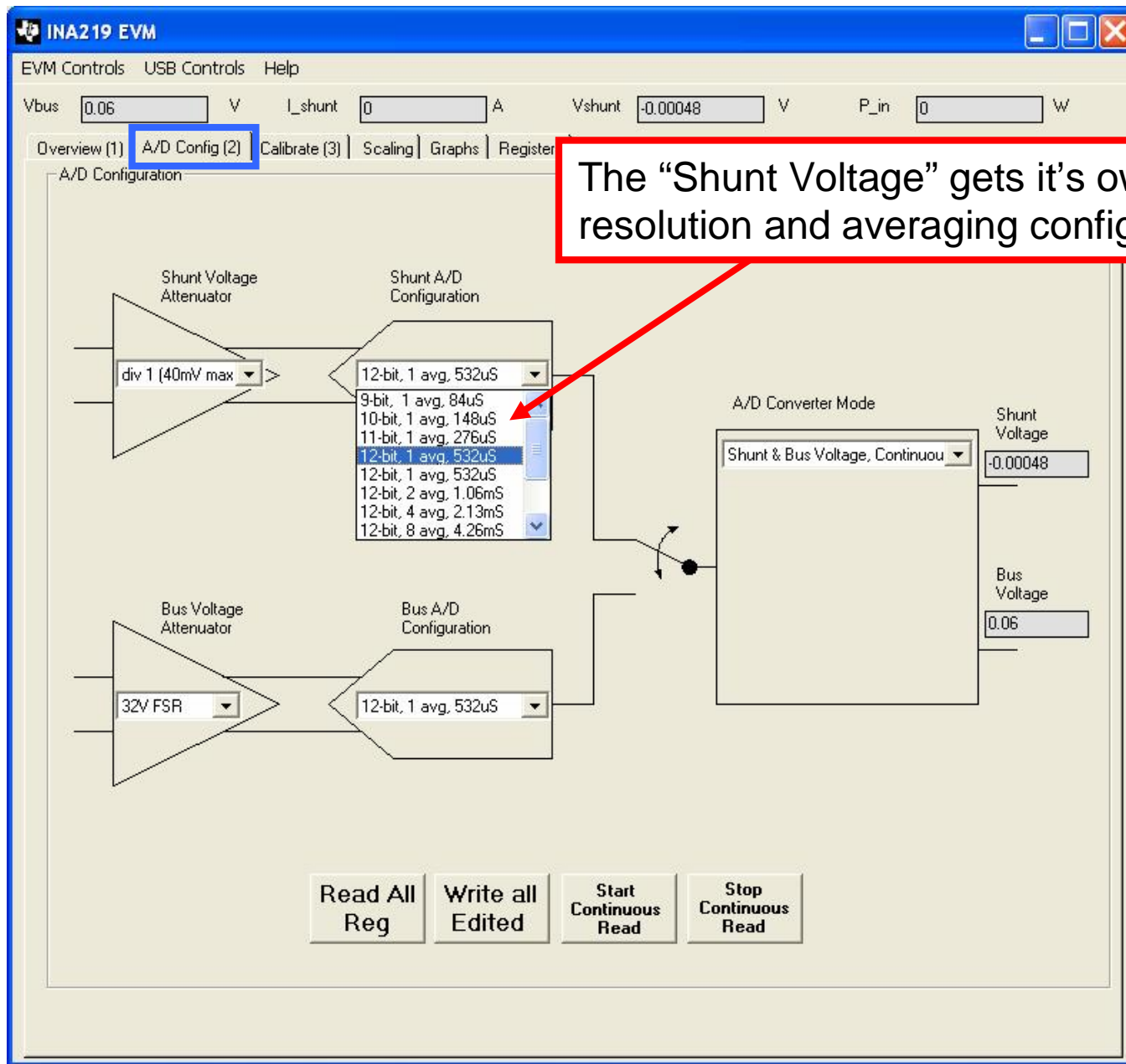
Shunt & Bus Voltage, Continuou

Shunt Voltage -0.00048

Bus Voltage 0.06

Read All Reg Write all Edited Start Continuous Read Stop Continuous Read

The "Shunt Voltage" input has four different ranges.



INA219 EVM

EVM Controls USB Controls Help

Vbus 0.06 V I_shunt 0 A Vshunt -0.00048 V P_in 0 W

Overview (1) A/D Config (2) Calibrate (3) Scaling Graphs Registers

A/D Configuration

Shunt Voltage Attenuator

div 1 (40mV max)

Shunt A/D Configuration

12-bit, 1 avg, 532uS

Bus Voltage Attenuator

32V FSR
16V FSR
32V FSR

Bus A/D Configuration

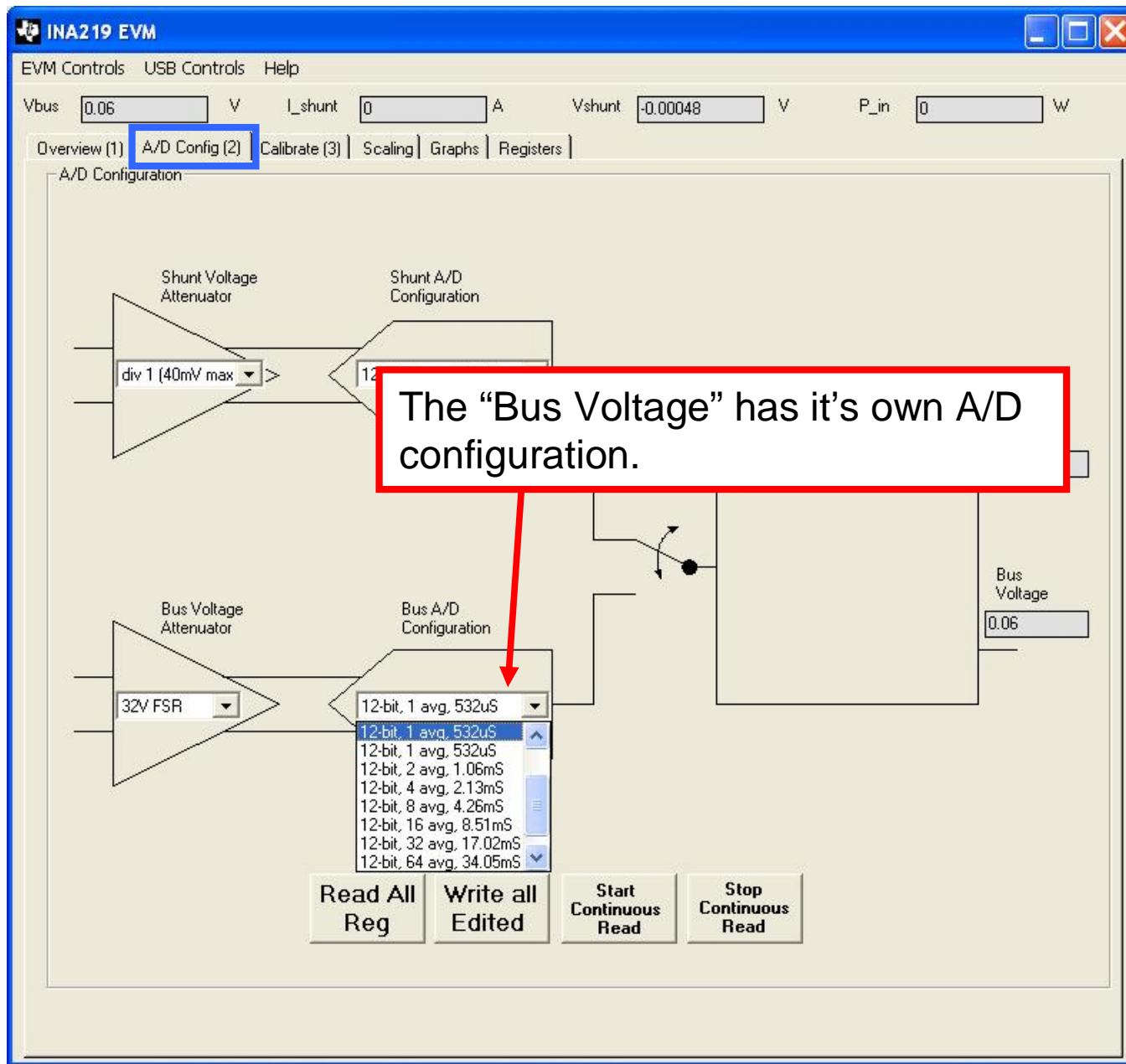
12-bit, 1 avg, 532uS

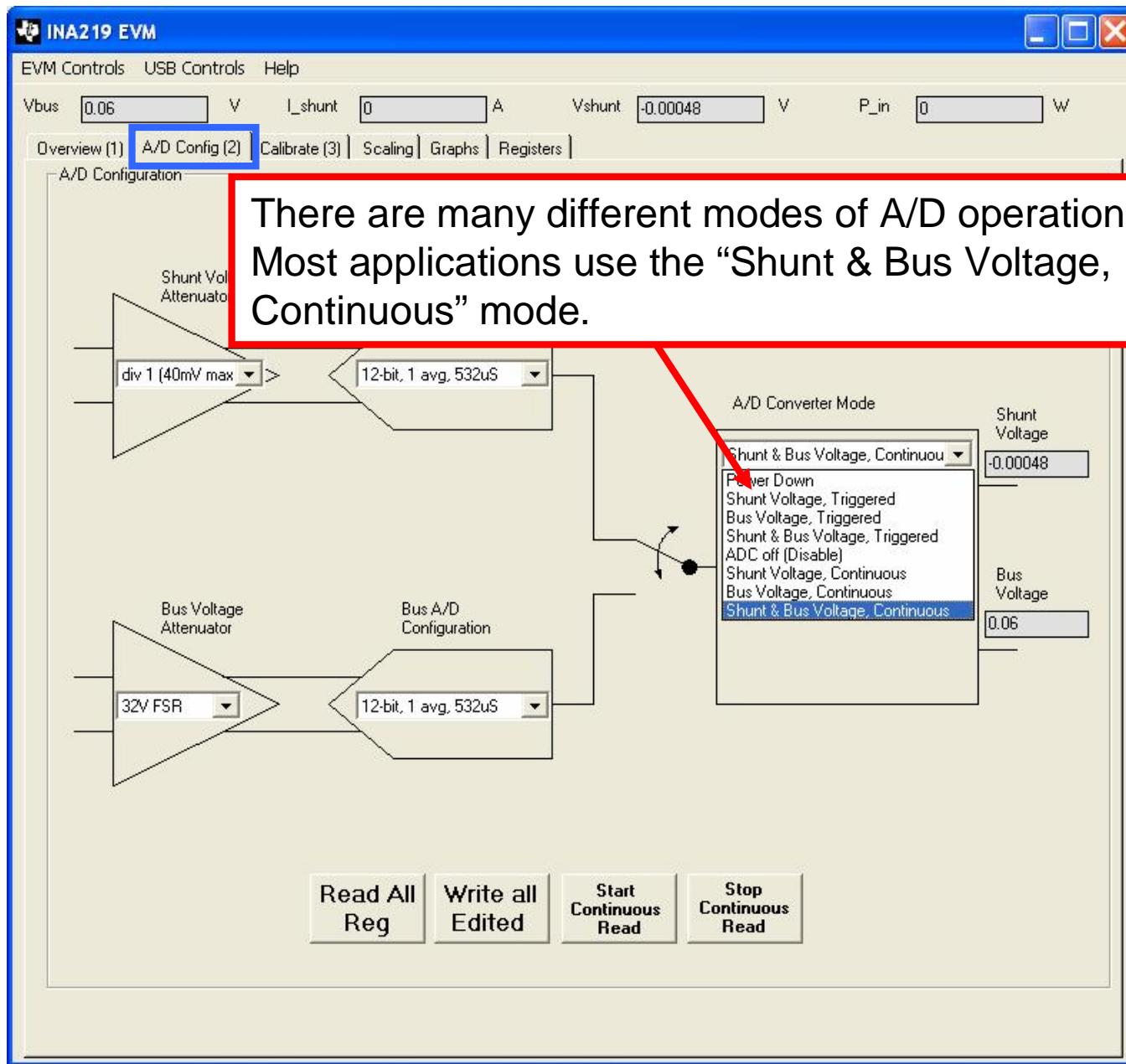
Bus Voltage

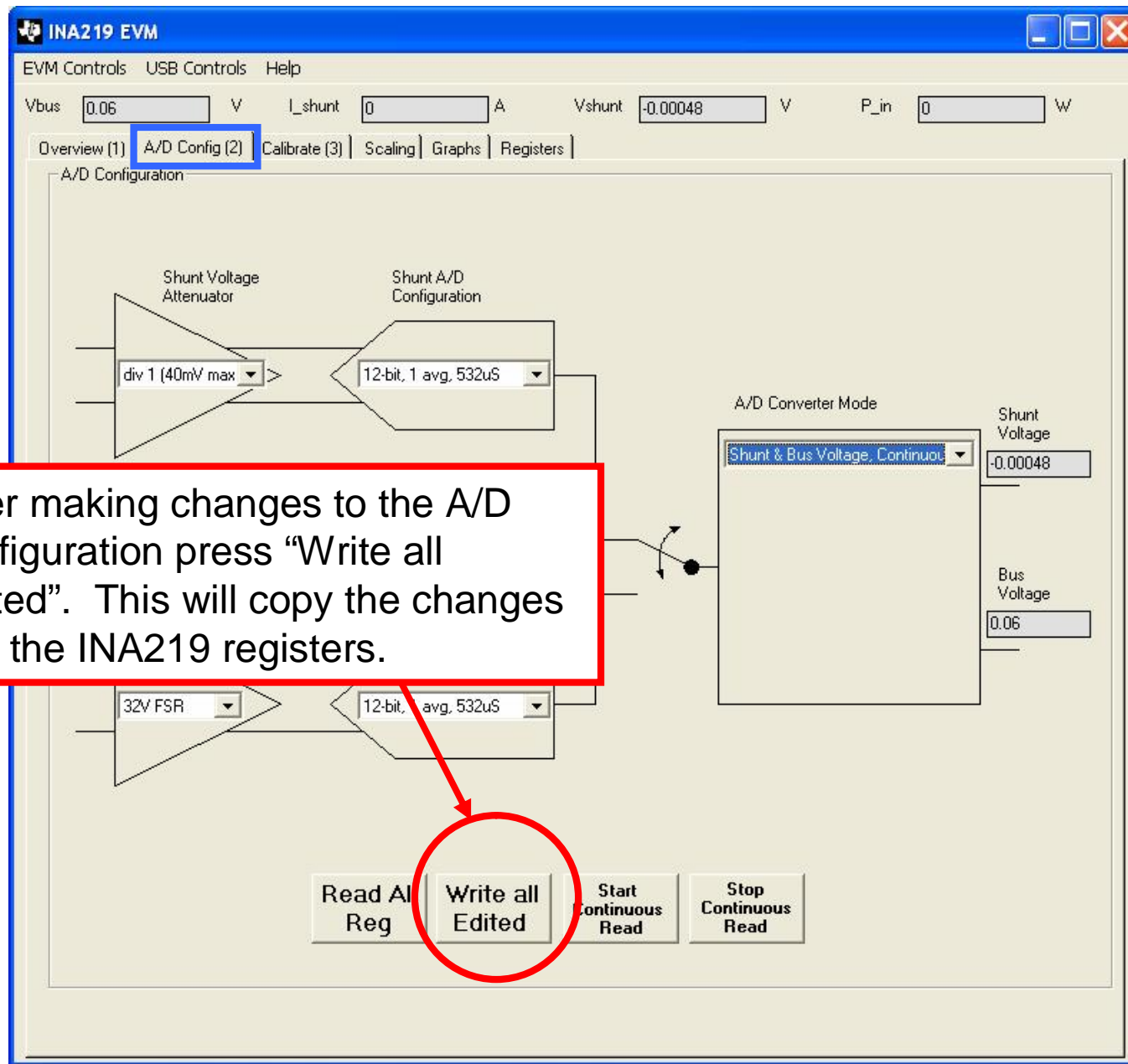
0.06

Read All Reg Write all Edited Start Continuous Read Stop Continuous Read

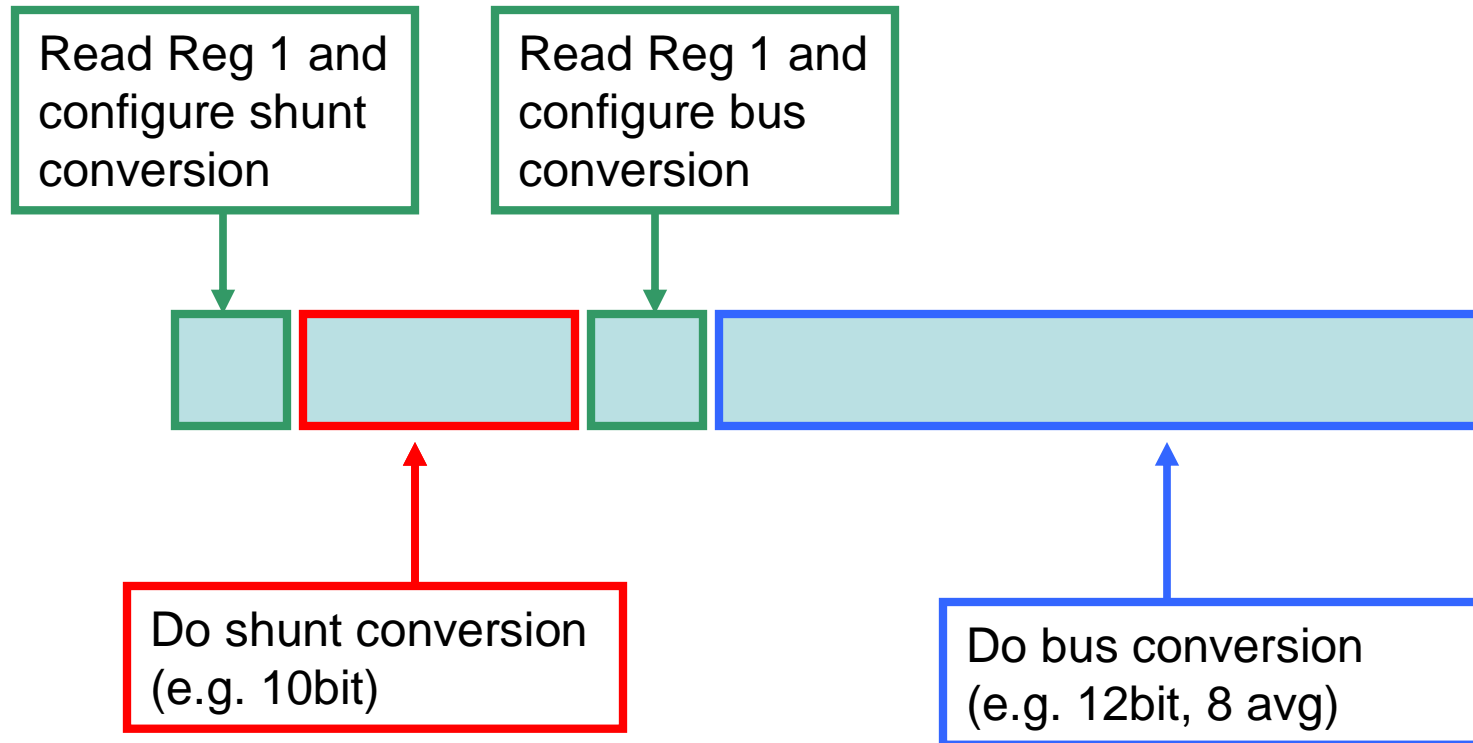
The "Bus Voltage" input has two different ranges.

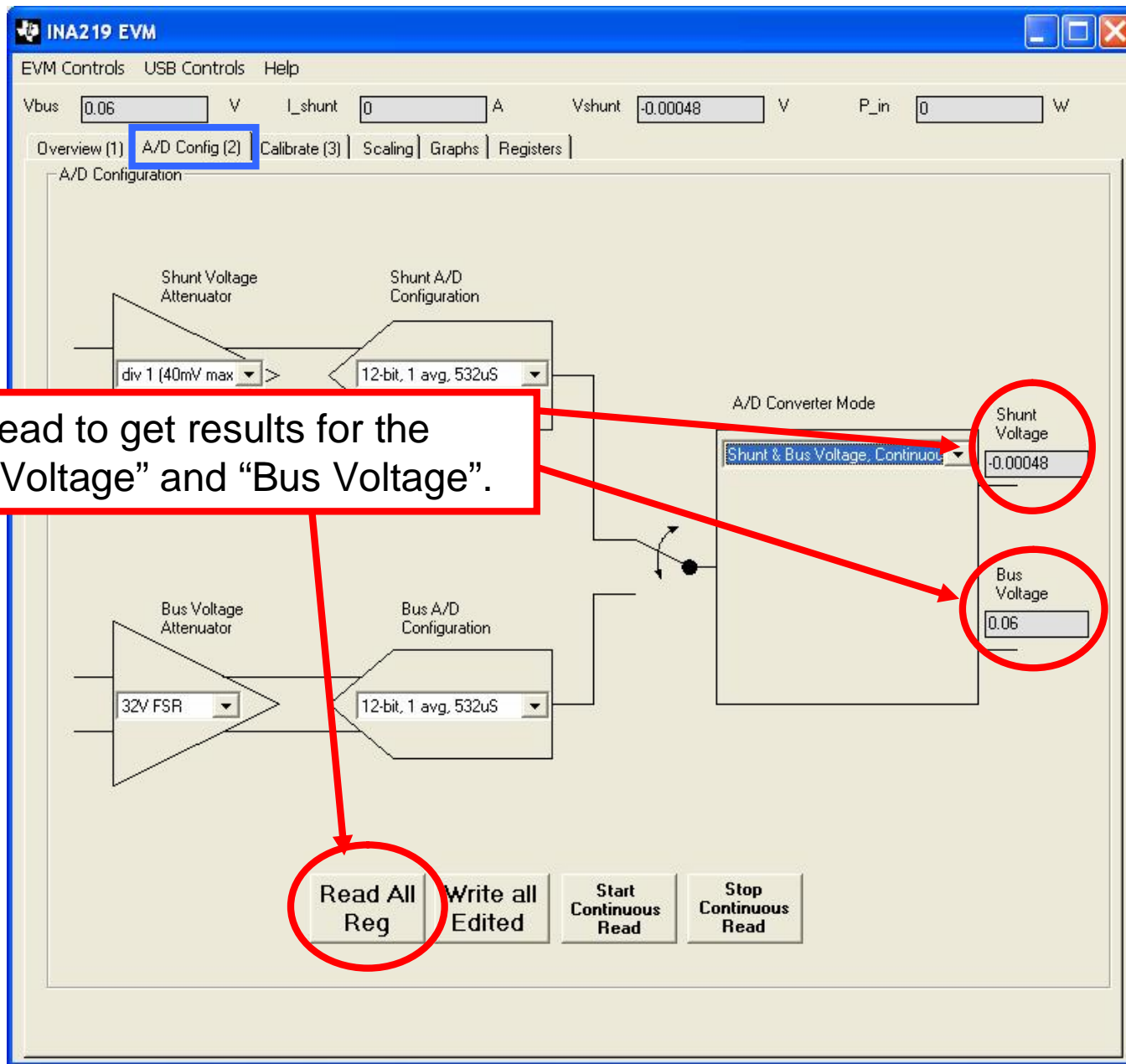






How the A/D Works





INA219 EVM

EVM Controls USB Controls Help

Vbus 4.948 V I_shunt 0 A Vshunt 0.02571 V P_in 0 W

Overview (1) A/D Config (2) Calibrate (3) Scaling Graphs Registers

Initial Calibration (Compute Full Scale Cal Reg)

Max Bus Voltage 32 V

Max Shunt Voltage 0.32 V

Rshunt 50 Ohms

Enter Shunt Resistance

Max Possible Current +/- 0.0064 A

Max Expected Current +/- A

Max Current Before Overflow A

Max Current Before Overflow A

Max Current Before Overflow A

Enter LSB 0 A/bit

Enter Current LSB

Calibration Reg Int Hex

Max Shunt Voltage Before Current Overflow V (Note)

Max Current Before Overflow A

Power LSB W/bit

Max Power W

Second Calibration

Read Initial Cal Current

INA219 Pre Second Cal Current

Measured Shunt Current

Compute New Full Scale Cal Reg

Read Post Second Cal Current

INA219 Post Second Cal Current

Int Hex

New Full Scale Cal

Write all Edited

Read All Reg

Enter a value
for Rshunt

Prior to calibration
the power value
reads zero.

INA219 EVM

EVM Controls USB Controls Help

Vbus 4.948 V I_shunt 0 A Vshunt 0.02571 V P_in 0 W

Overview (1) A/D Config (2) **Calibrate (3)** Scaling Graphs Registers

Initial Calibration (Compute Full Scale Cal Reg)

Max Bus Voltage 32 V

Max Shunt Voltage 0.32 V

Rshunt 50 Ohms

Enter Shunt Resistance

Max Possible Current +/- .0064 A

Max Expected Current +/-

Enter Max Expected Current

Enter Current LSB

Calibration Reg Int Hex

Max Shunt Voltage Before Current Overflow V (Note)

Max Current Before Overflow A

Power LSB W/bit

Max Power W

Second Calibration

Read Initial Cal Current

INA219 Pre Second Cal Current

Measured Shunt Current

Compute New Full Scale Cal and Read Post Second Cal Current

INA219 Post Second Cal Current

New Full Scale Cal Int Hex

Write all Edited Read All Reg

Press the "Enter Shunt Resistance" button.

INA219 EVM

EVM Controls USB Controls Help

Vbus 4.948 V I_shunt 0 A Vshunt 0.02571 V P_in 0 W

Overview (1) A/D Config (2) **Calibrate (3)** Scaling Graphs Registers

Initial Calibration (Compute Full Scale Cal Reg)

Max Bus Voltage 32 V

Max Shunt Voltage 0.32 V

Rshunt 50 Ohms

Enter Shunt Resistance

Max Possible Current +/- .0064 A

Max Expected Current +/- 600u A

Enter Max Expected Current

Min Current LSB (15 bit Resolution) A/bit

Max Current LSB (12 bit Resolution) A/Bit

Enter LSB A/bit

Second Calibration

Read Initial Cal Current

INA219 Pre Second Cal Current

Measured Shunt Current

Compute New Full Scale Cal and Read Post Second Cal Current

INA219 Post Second Cal Current

New Full Scale Cal Int Hex

Write all Edited Read All Reg

Power LSB W/bit

Max Power W

Enter the maximum expected current for your system.

This must be less then "Max Possible Current".

INA219 EVM

EVM Controls | USB Controls | Help

Vbus: 4.948 V | I_shunt: 0 A | Vshunt: 0.02571 V | P_in: 0 W

Overview (1) | A/D Config (2) | **Calibrate (3)** | Scaling | Graphs | Registers

Initial Calibration (Compute Full Scale Cal Reg)

Max Bus Voltage: 32 V
Max Shunt Voltage: 0.32 V
Rshunt: 50 Ohms
Enter Shunt Resistance

Max Possible Current +/-: .0064 A
Max Expected Current +/-: 600u A
Enter Max Expected Current

Min Current LSB (15 bit Resolution): A/bit
Max Current LSB (12 bit Resolution): A/Bit
Enter LSB: 0 A/bit
Enter Current LSB

Calibration Reg: Int Hex
Max Shunt Voltage Before Current Overflow: V (Note)
Max Current Before Overflow: A
Power LSB: W/bit
Max Power: W

Second Calibration

Read Initial Cal Current

INA219 Pre Second Cal Current

Measured Shunt Current

Compute New Full Scale Cal and Read Post Second Cal Current

INA219 Post Second Cal Current

New Full Scale Cal: Int Hex

Write Edit

Press "Enter Max Expected Current" to compute the resolution range below.

INA219 EVM

EVM Controls USB Controls Help

Vbus 4.948 V I_shunt 0 A Vshunt 0.02571 V P_in 0 W

Overview (1) A/D Config (2) **Calibrate (3)** Scaling Graphs

Initial Calibration (Compute Full Scale Cal Reg)

Max Bus Voltage 32 V

Max Shunt Voltage 0.32 V

Rshunt 50 Ohms

Enter Shunt Resistance

Max Possible Current +/- 0.0064 A

Max Expected Current +/- 600u A

Enter Max Expected Current

Min Current LSB (15 bit Resolution) 18.311n A/bit

Max Current LSB (12 bit Resolution) 146.520n A/Bit

Enter LSB 100n A/bit

Enter Current LSB

Calibration Reg Int Hex

Max Shunt Voltage Before Current Overflow V (Note)

Max Current Before Overflow A

Power LSB W/bit

Max Power W

INA219 Post Second Cal Current

Int Hex

New Full Scale Cal

Write all Edited Read All Reg

Enter Current LSB. This value must be between the Min calculated Current LSB and the Max calculated Current LSB.

Choose a value close to "Min Current LSB" for best resolution.

INA219 EVM

EVM Controls USB Controls Help

Vbus 4.948 V I_shunt 0.0005143 A Vshunt 0.02571 V P_in 0.002546 W

Overview (1) A/D Config (2) **Calibrate (3)** Scaling Graphs Registers

Initial Calibration (Compute Full Scale Cal Reg)

Max Bus Voltage 32 V

Max Shunt Voltage 0.32 V

Rshunt 50 Ohms

Enter Shunt Resistance

Max Possible Current +/- 0.0064 A

Max Expected Current +/- 600u A

Enter Max Expected Current

Min Current LSB (15 bit Resolution) 18.311n A/bit

Max Current LSB (12 bit Resolution) 146.520n A/Bit

Enter LSB 100n A/bit

Enter Current LSB

Second Calibration

Read Initial Cal Current

INA219 Pre Second Cal Current

Write all Edited Read All Reg

Calibration Reg 8191 1FFF

Max Shunt Voltage Before Current Overflow 0.163835 V (Overflow Possible)

Max Current Before Overflow 0.0032767 A 7FFE

Power LSB 2.000u W/bit

Max Power 104.854m W

Press Enter Current LSB.

This will compute the values below.

At this point the INA209 is calibrated.
The second calibration is optional.

INA219 EVM

EVM Controls USB Controls Help

Vbus V I_shunt A Vshunt V P_in W

Overview (1) | A/D Config (2) | **Calibrate (3)** | Scaling | Graphs | Registers

Initial Calibration (Compute Full Scale Cal Reg)

Max Bus Voltage V

Max Shunt Voltage V

Rshunt Ohms

Max Possible Current +/- A

Max Expected Current +/- A

Min Current LSB (15 bit Resolution) A/bit

Max Current LSB (12 bit Resolution) A/Bit

A/bit

V (Overflow Possible)
 A

Power LSB W/bit

Max Power W

Second Calibration

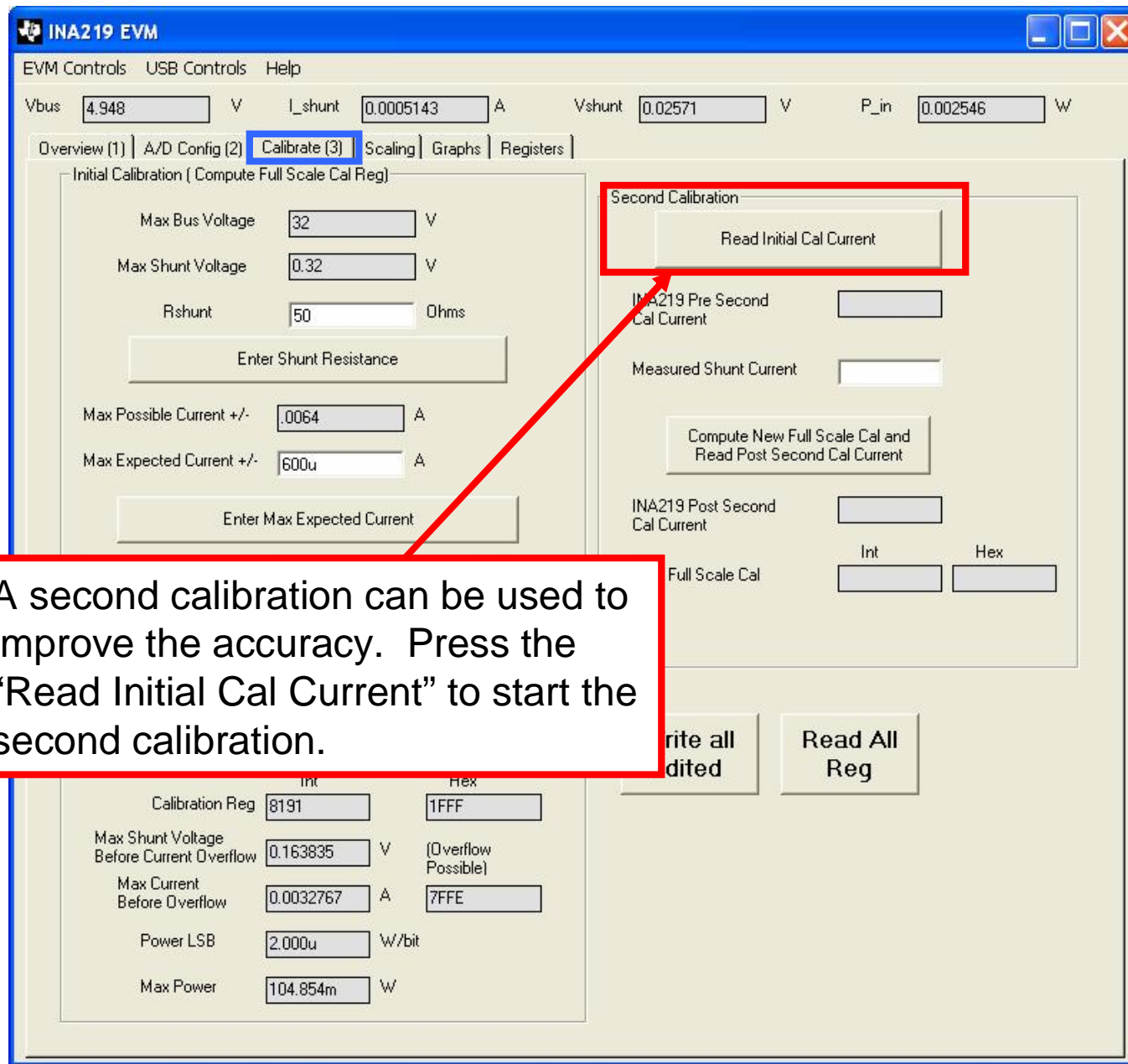
INA219 Pre Second Cal Current

Measured Shunt Current

INA219 Post Second Cal Current

New Full Scale Cal

The goal of the calibration was to compute the "Current LSB" and the "Calibration Reg".



INA219 EVM

EVM Controls USB Controls Help

Vbus 4.952 V I_shunt 0.0005141 A Vshunt 0.02571 V P_in 0.002546 W

Overview (1) A/D Config (2) Calibrate (3) Scaling Graphs Registers

Initial Calibration (Compute Full Scale Cal Reg)

Max Bus Voltage 32 V

Max Shunt Voltage 0.32 V

Rshunt 50 Ohms

Enter Shunt Resistance

Max Possible Current +/- 0.0064 A

Max Expected Current +/- 600u A

Enter Max Expected Current

Min Current LSB 19.211u A/bit

Second Calibration

Read Initial Cal Current

INA219 Pre Second Cal Current 0.0005141

Measured Shunt Current

Compute New Full Scale Cal and Read Post Second Cal Current

INA219 Post Second Cal Current

Int Hex

New Full Scale Cal

Write all Edited

Read All Reg

Calibration Reg Int Hex

8191 1FFF

Max Shunt Voltage Before Current Overflow 0.163835 V (Overflow Possible)

Max Current Before Overflow 0.0032767 A 7FFE

Power LSB 2.000u W/bit

Max Power 104.854m W

This value (e.g. 514.1uA) was measured using the initial calibration.

INA219 EVM

EVM Controls USB Controls Help

Vbus 4.952 V I_shunt 0.0005141 A Vshunt 0.02571 V P_in 0.002546 W

Overview (1) A/D Config (2) Calibrate (3) Scaling Graphs Registers

Initial Calibration (Compute Full Scale Cal Reg)

Max Bus Voltage 32 V

Max Shunt Voltage 0.32 V

Rshunt 50 Ohms

Enter Shunt Resistance

Max Possible Current +/- 0.0064 A

Max Expected Current +/- 600u A

Enter Max Expected Current

Min Current LSB (5-bit Resolution) 18.311n A/bit

Second Calibration

Read Initial Cal Current

INA219 Pre Second Cal Current 0.0005141

Measured Shunt Current 524.9u

Compute New Full Scale Cal and Read Post Second Cal Current

INA219 Post Second Cal Current

Int Hex

New Full Scale Cal

Write all Edited

Read All Reg

Enter Current LSB

Calibration Reg Int 8191 Hex 1FFF

Max Shunt Voltage Before Current Overflow 0.163835 V (Overflow Possible)

Max Current Before Overflow 0.0032767 A 7FFE

Power LSB 2.000u W/bit

Max Power 104.854m W

Use an external precision ammeter to measure the shunt current.

INA219 EVM

EVM Controls USB Controls Help

Vbus 4.952 V I_shunt 0.0005141 A Vshunt 0.02571 V P_in 0.002546 W

Overview (1) A/D Config (2) **Calibrate (3)** Scaling Graphs Registers

Initial Calibration (Compute Full Scale Cal Reg)

Max Bus Voltage 32 V

Max Shunt Voltage 0.32 V

Rshunt 50 Ohms

Enter Shunt Resistance

Max Possible Current +/- .0064 A

Max Expected Current +/- 600u A

Enter Max Expected Current

Min Current LSB (15 bit Resolution) 18.311n A/bit

Max Current LSB (12 bit Resolution) 146.520n A/Bit

Second Calibration

Read Initial Cal Current

INA219 Pre Second Cal Current 0.0005141

Measured Shunt Current 524.9u

Compute New Full Scale Cal and Read Post Second Cal Current

INA219 Post Second Cal Current

Int Hex

New Full Scale Cal

Write all Edited Read All Reg

Power LSB 2.000u W/bit

Max Power 104.854m W

Pressing this button will adjust the Calibration register to correct for the difference between the INA219 measurement and the precision measurement.

INA219 EVM

EVM Controls USB Controls Help

Vbus 4.952 V I_shunt 0.0005245 A Vshunt 0.0257 V P_in 0.002602 W

Overview (1) A/D Config (2) Calibrate (3) Scaling Graphs Registers

Initial Calibration (Compute Full Scale Cal Reg)

Max Bus Voltage 32 V

Max Shunt Voltage 0.32 V

Reboot

Max Expected Current +/- 600u A

Enter Max Expected Current

Min Current LSB (15 bit Resolution) 18.311n A/bit

Max Current LSB (12 bit Resolution) 146.520n A/bit

Enter LSB 100n A/bit

Enter Current LSB

Calibration Reg Int 8191 Hex 1FFF

Max Shunt Voltage Before Current Overflow 0.163835 V (Overflow Possible)

Max Current Before Overflow 0.0032767 A 7FFE

Power LSB 2.000u W/bit

Max Power 104.854m W

Second Calibration

Read Initial Cal Current

INA219 Pre Second Cal Current 0.0005141

Measured Shunt Current 524.9u

Compute New Full Scale Cal and Read Post-Second Cal Current

INA219 Post Second Cal Current 0.0005245

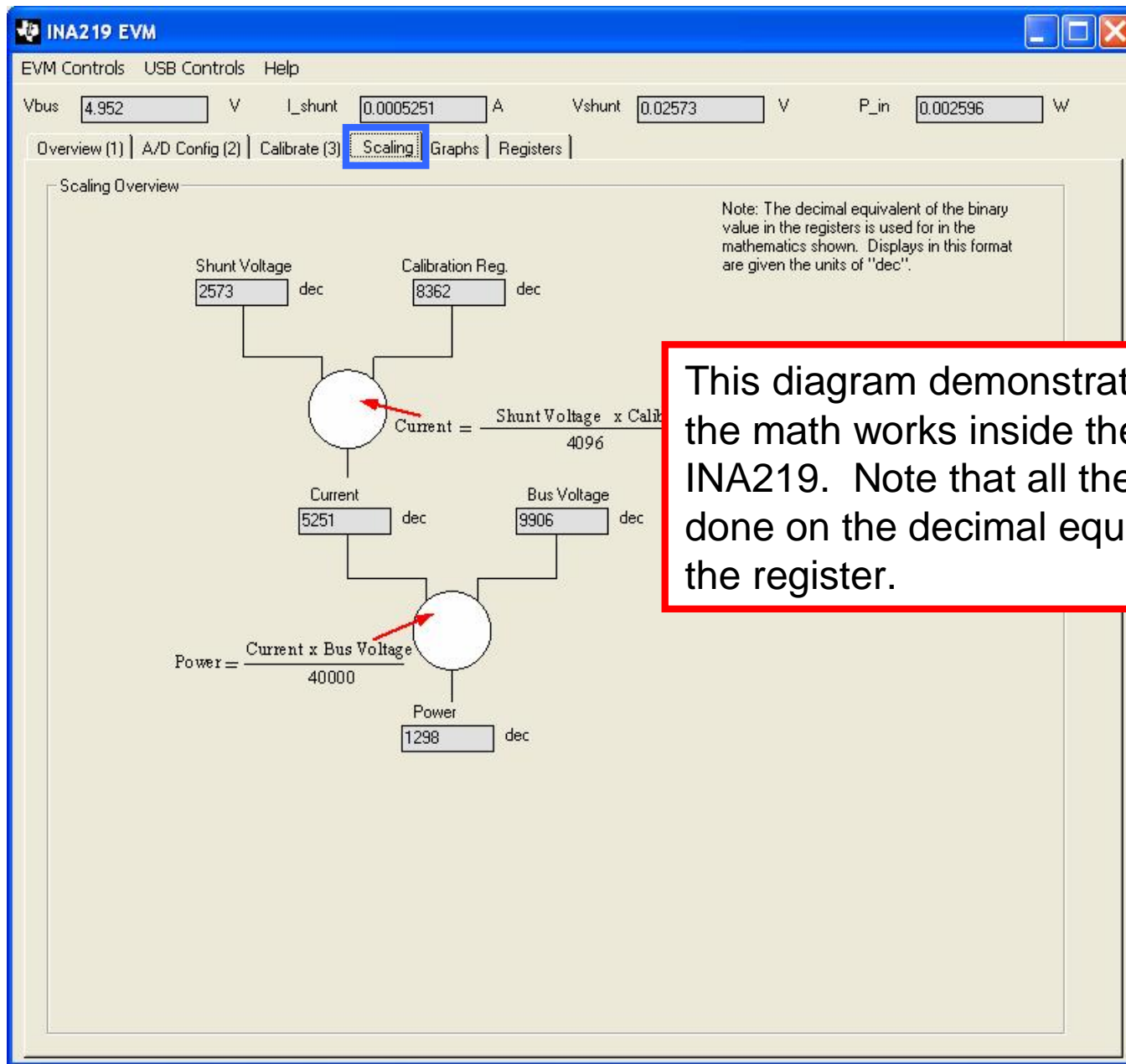
New Full Scale Cal Int 8362 Hex 20AA

Write all Edited

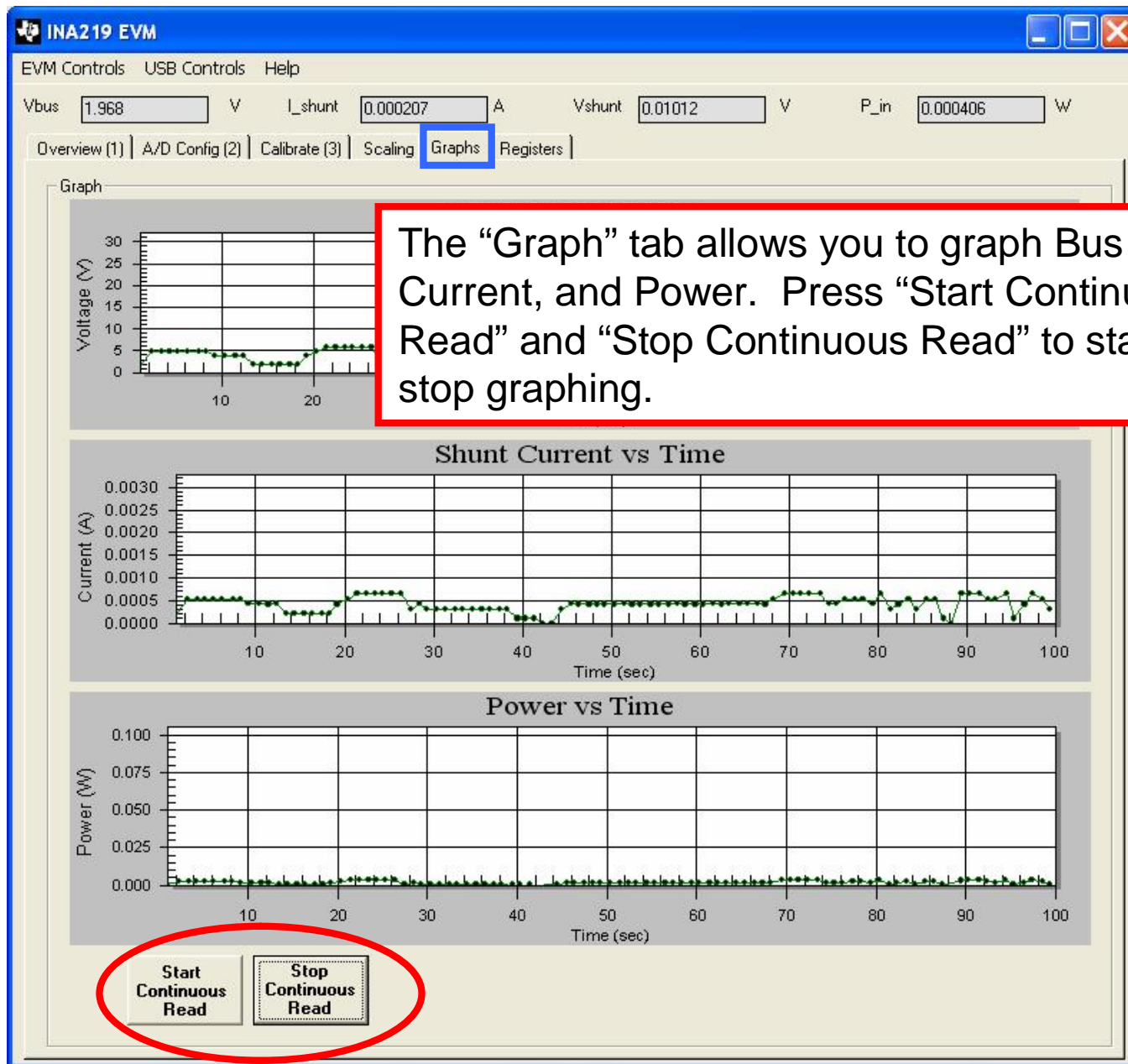
Read All Reg

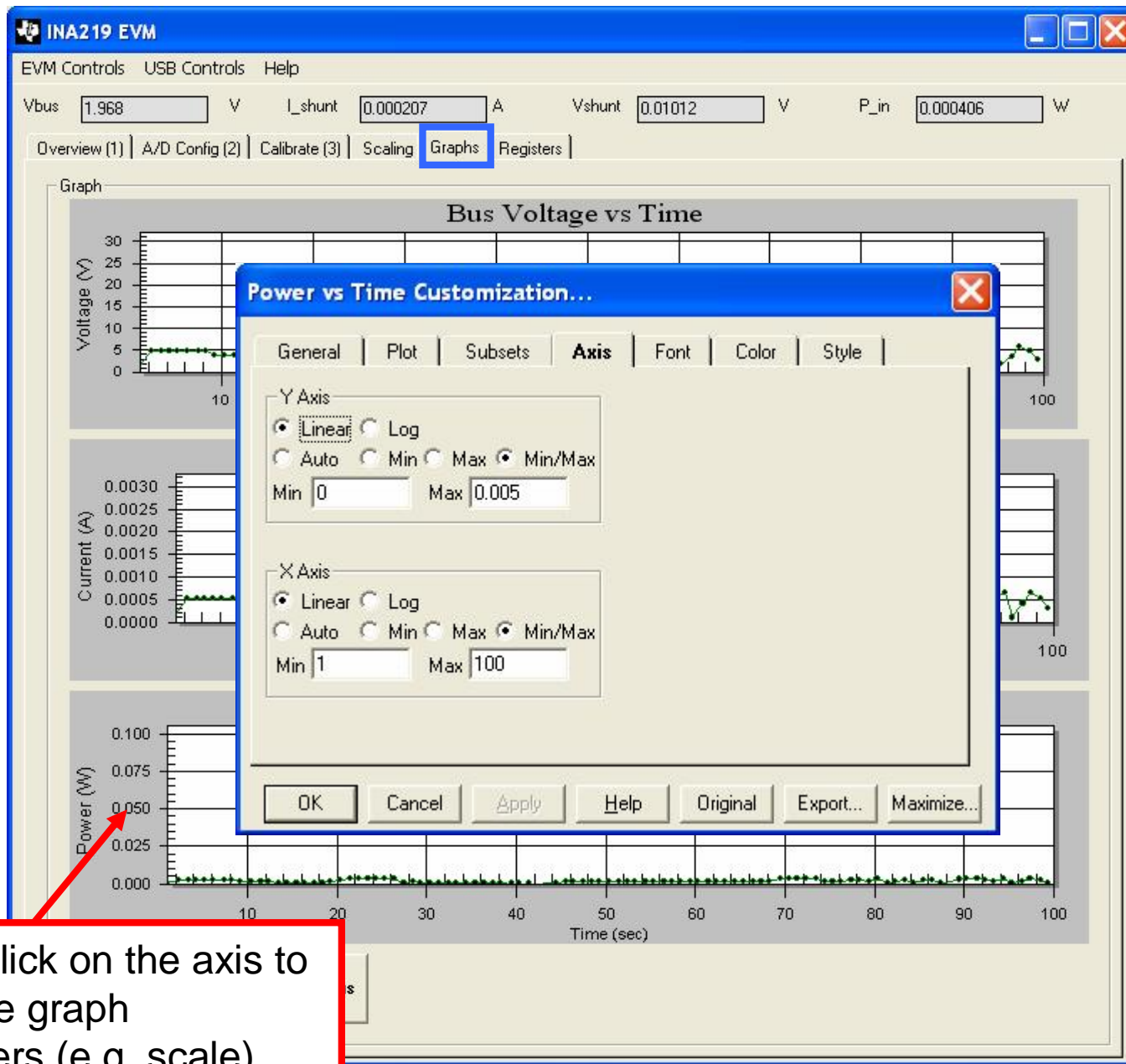
Note that the INA219 now reads close to the precision ammeter.

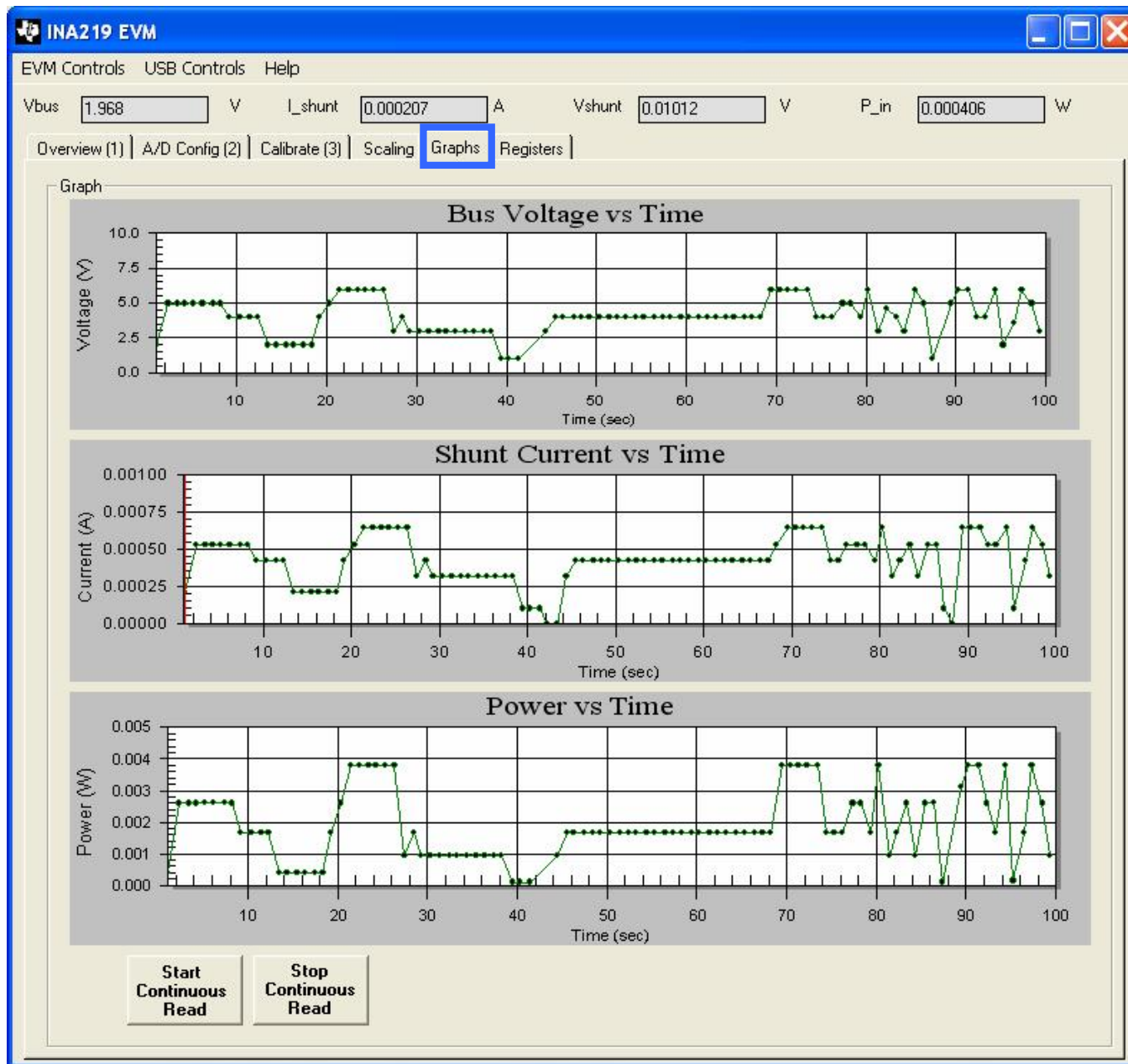
Note that the INA219 calibration register was adjusted.



This diagram demonstrates how the math works inside the INA219. Note that all the math is done on the decimal equivalent of the register.







INA219 EVM

EVM Controls USB Controls Help

Vbus V I_shunt A Vshunt V P_in W

Overview (1) | A/D Config (2) | Calibrate (3) | Scaling | Graphs | **Registers**

INA219 Registers

Addr	Name	Hex	Binary	Decimal
00h	Config	0x399F	0x0011_1001_1001_1111	
01h	Shunt Voltage	0x0A0A	0x0000_1010_0000_1010	0.0257
02h	Bus Voltage	0x26B2	0x0010_0110_1011_0010	4.952
03h	Power	0x0515	0x0000_0101_0001_0101	0.002602
04h	Current / PGA	0x147D	0x0001_0100_0111_1101	0.0005245
05h	Full Scale Cal	0x20AA	0x0010_0000_1010_1010	

This tab shows all the registers in hex, binary, and analog for the INA219.

Read All Reg Write all Edited Write Current Reg Start Continuous Read Stop Continuous Read Help With Current Reg

Register Bit Map

RST	D14	BRNG	PG1	PG0	B_ADC4	B_ADC3	B_ADC2	<input type="text" value="399F"/>
<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="1"/>	<input type="text" value="1"/>	<input type="text" value="1"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="1"/>	
B_ADC1	S_ADC4	S_ADC3	S_ADC2	S_ADC1	MODE3	MODE2	MODE1	<input type="text" value="0"/>
<input type="text" value="1"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="1"/>	<input type="text" value="1"/>	<input type="text" value="1"/>	<input type="text" value="1"/>	<input type="text" value="1"/>	

INA219 EVM

EVM Controls USB Controls Help

Vbus 4.952 V I_shunt 0.0005245 A Vshunt 0.0257 V P_in 0.002602 W

Overview (1) A/D Config (2) Calibrate (3) Scaling Graphs **Registers**

INA219 Registers

Addr	Name	Hex	Binary	Decimal
00h	Config	0x399F	0x0011_1001_1001_1111	
01h	Shunt Voltage	0x0A0A	0x0000_1010_0000_1010	0.0257
02h	Bus Voltage	0x26B2	0x0010_0110_1011_0010	4.952
03h	Power	0x0515	0x0000_0101_0001_0101	0.002602
04h	Current / PGA	0x147D	0x0001_0100_0111_1101	0.0005245
05h	Full Scale Cal	0x20AA	0x0010_0000_1010_1010	

Click on a row in the register table to select the register. The individual bits with their functional labels will show up in the "Register Bit Map" below.

Read All Reg Write all Edited Write Current Reg Start Continuous Read Stop Continuous Read Help With Current Reg

Register Bit Map

RST	D14	BRNG	PG1	PG0	B_ADC4	B_ADC3	B_ADC2	399F
0	0	1	1	1	0	0	1	
B_ADC1	S_ADC4	S_ADC3	S_ADC2	S_ADC1	MODE3	MODE2	MODE1	0
1	0	0	1	1	1	1	1	

- Click on individual bits to edit the “Register Bit Map”. A click on a bit will change ‘0’ to ‘1’ or ‘1’ to ‘0’.

Vbus 1.968 V I_shunt 0.000207 A Vshunt 0.01012 V P_in 0.000406 W

Overview (1) | A/D Config (2) | Calibrate (3) | Scaling | Graphs | **Registers**

INA219 Registers

Addr	Name	Hex	Binary	Decimal
00h	*** Config ***	0x399F	0x0011_1001_1001_1111	
01h	*** Shunt Voltage ***	0x03F4	0x0000_0011_1111_0100	0.01012
02h	*** Bus Voltage ***	0x0F62	0x0000_1111_0110_0010	1.968
03h	*** Power ***	0x00CB	0x0000_0000_1100_1011	0.000406
04h	*** Current / PGA ***	0x0816	0x0000_1000_0001_0110	0.000207
05h	*** Full Scale Cal ***	0x20AA	0x0010_0000_1010_1010	

Read All Reg Write all Edited Write Current Reg Start Continuous Read Stop Continuous Read Help With Current Reg

Register Bit Map

RST	D14	BRNG	PG1	PG0	B_ADC4	B_ADC3	B_ADC2
0	0	1	1	1	0	0	1
B_ADC1	S_ADC4	S_ADC3	S_ADC2	S_ADC1	MODE3	MODE2	MODE1
1	0	0	1	1	1	1	1

399F

0

INA219 EVM

EVM Controls USB Controls Help

Vbus 1.968 V I_shunt 0.000207 A Vshunt 0.01012 V P_in 0.000406 W

Overview (1) A/D Config (2) Calibrate (3) Scaling Graphs Registers

INA219 Registers

Addr	Name	Hex	Binary	Decimal
00h	*** Config ***	0x199F	0x0001_1001_1001_1111	
01h	*** Shunt Voltage ***	0x03F7	0x0000_0011_1111_0100	0.01012
02h	*** Bus Voltage ***	0x0F62	0x0000_1111_0110_0010	1.968
03h	*** Power ***	0x00CB	0x0000_0000_1100_1011	0.000406
04h	*** Current / PGA ***	0x0816	0x0000_1000_0001_0110	0.000207
05h	*** Full Scale Cal ***	0x20AA	0x0010_0000_1010_1010	

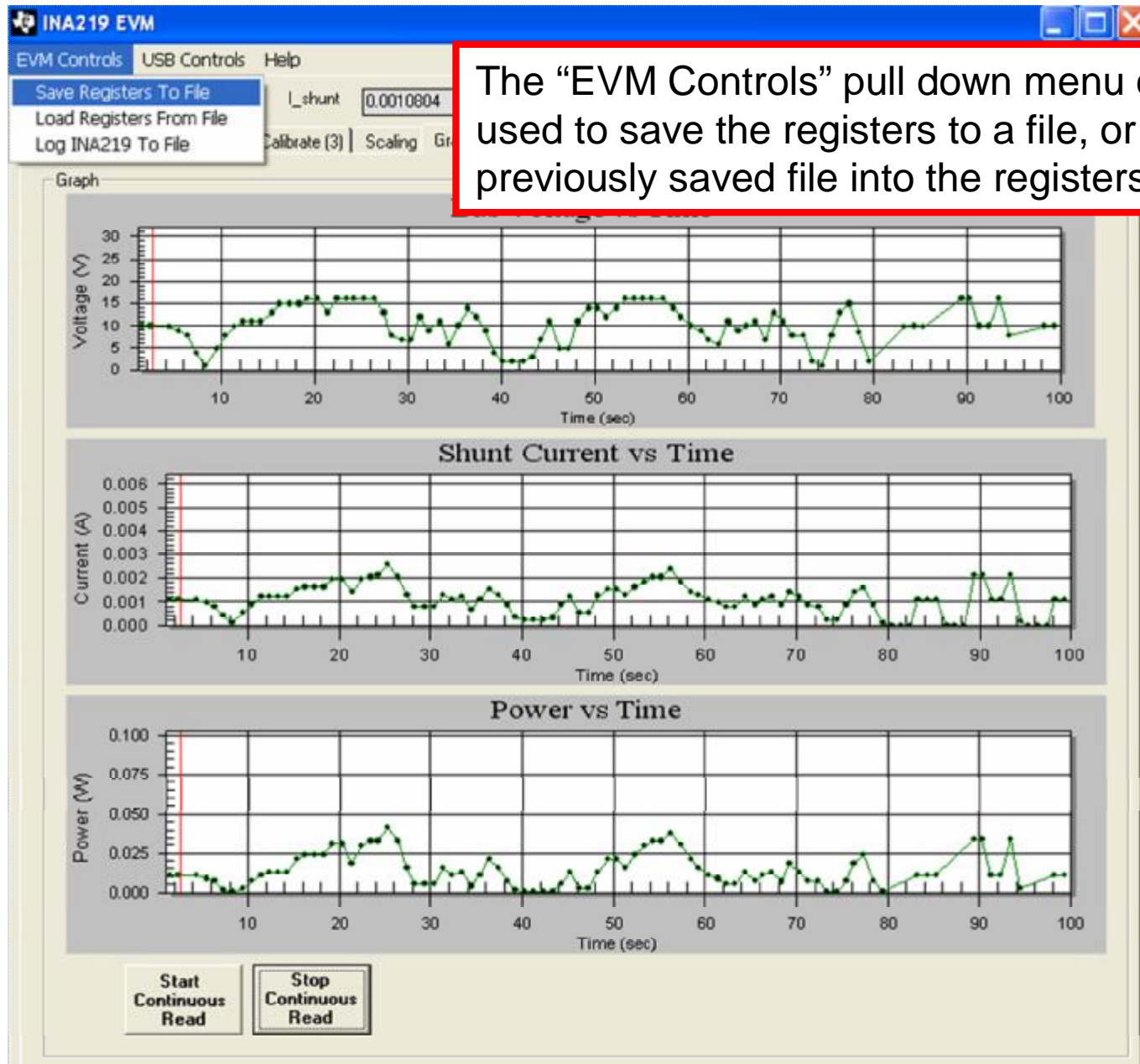
Changing the bus voltage range bit from a 1 to a zero the config register has been updated to include this adjustment.

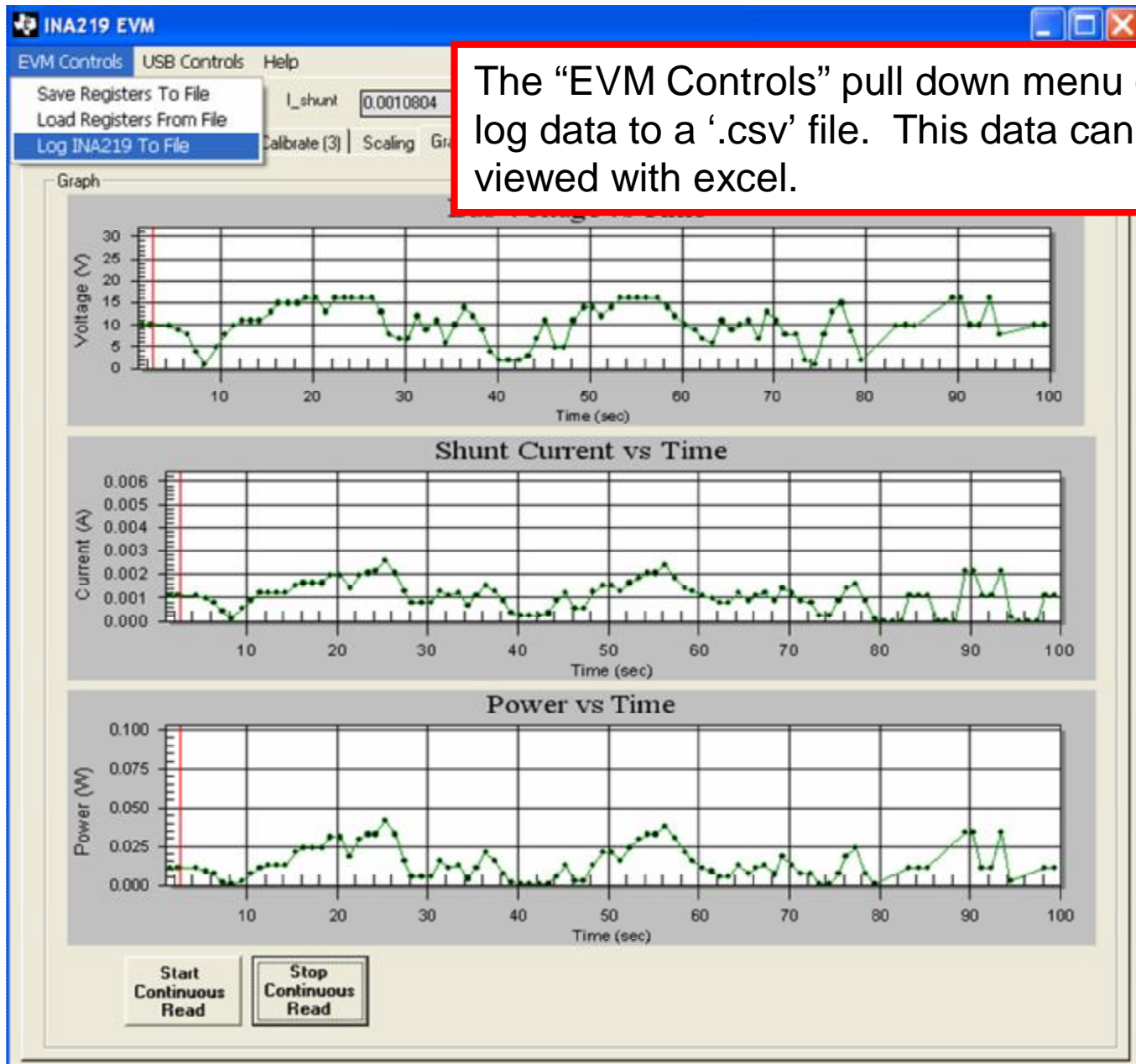
Read All Reg Write all Edited Write Current Reg Start Continuous Read Stop Continuous Read Help With Current Reg

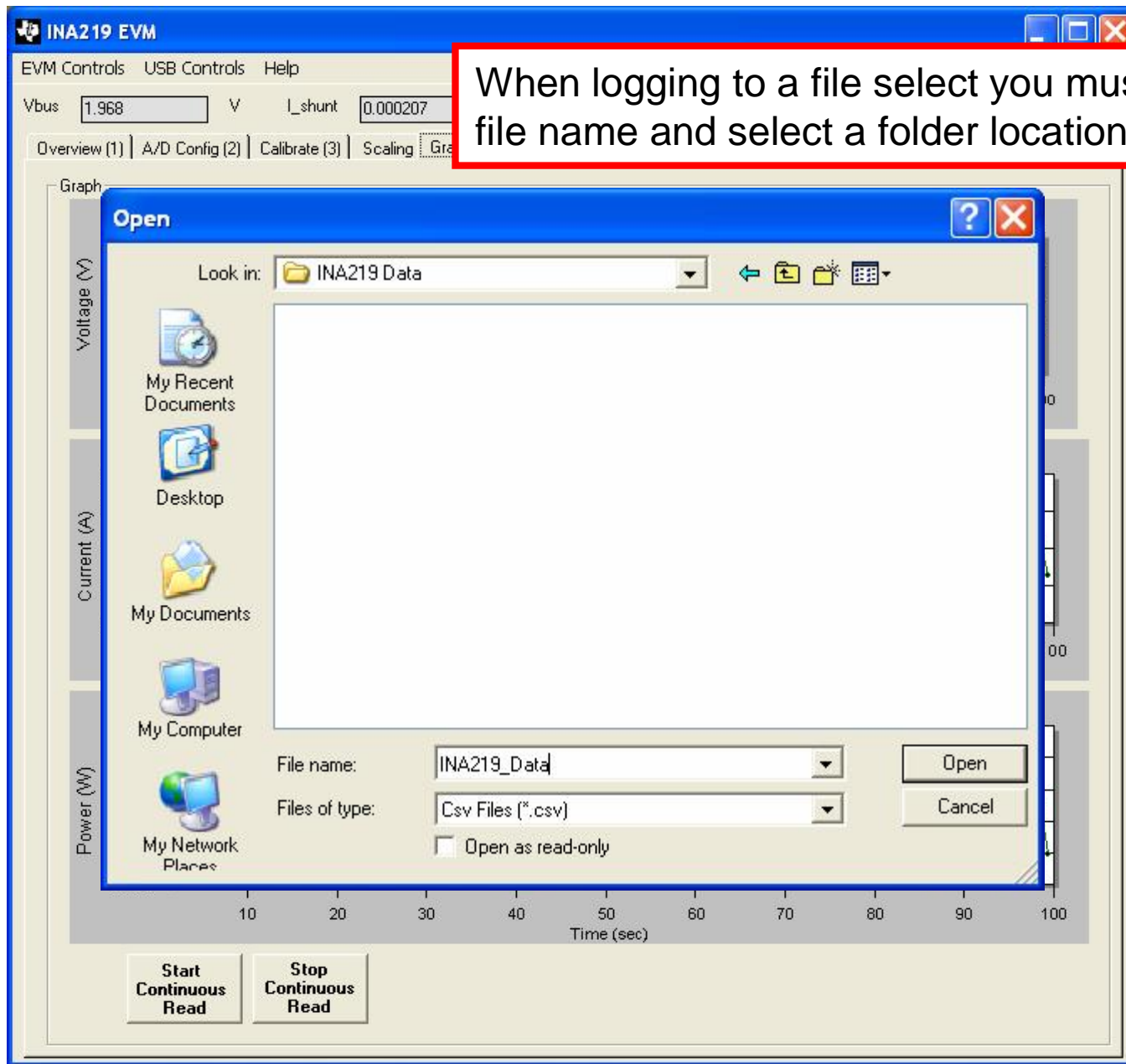
Register Bit Map

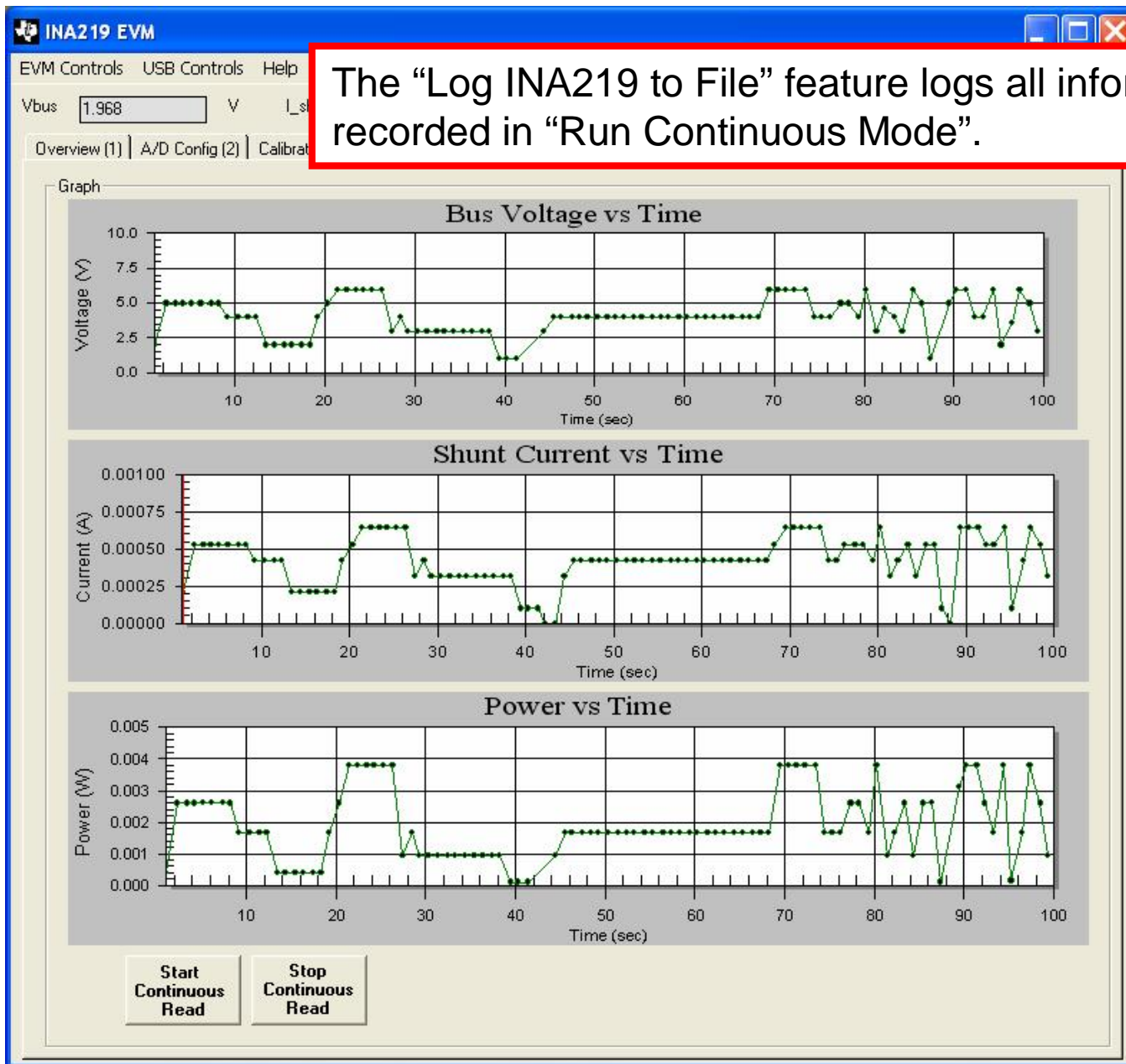
RST	D14	BRNG	PG1	PG0	B_ADC4	B_ADC3	B_ADC2
0	0	0	1	1	0	0	1
B_ADC1	S_ADC4	S_ADC3	S_ADC2	S_ADC1	MODE3	MODE2	MODE1
1	0	0	1	1	1	1	1

199F
0

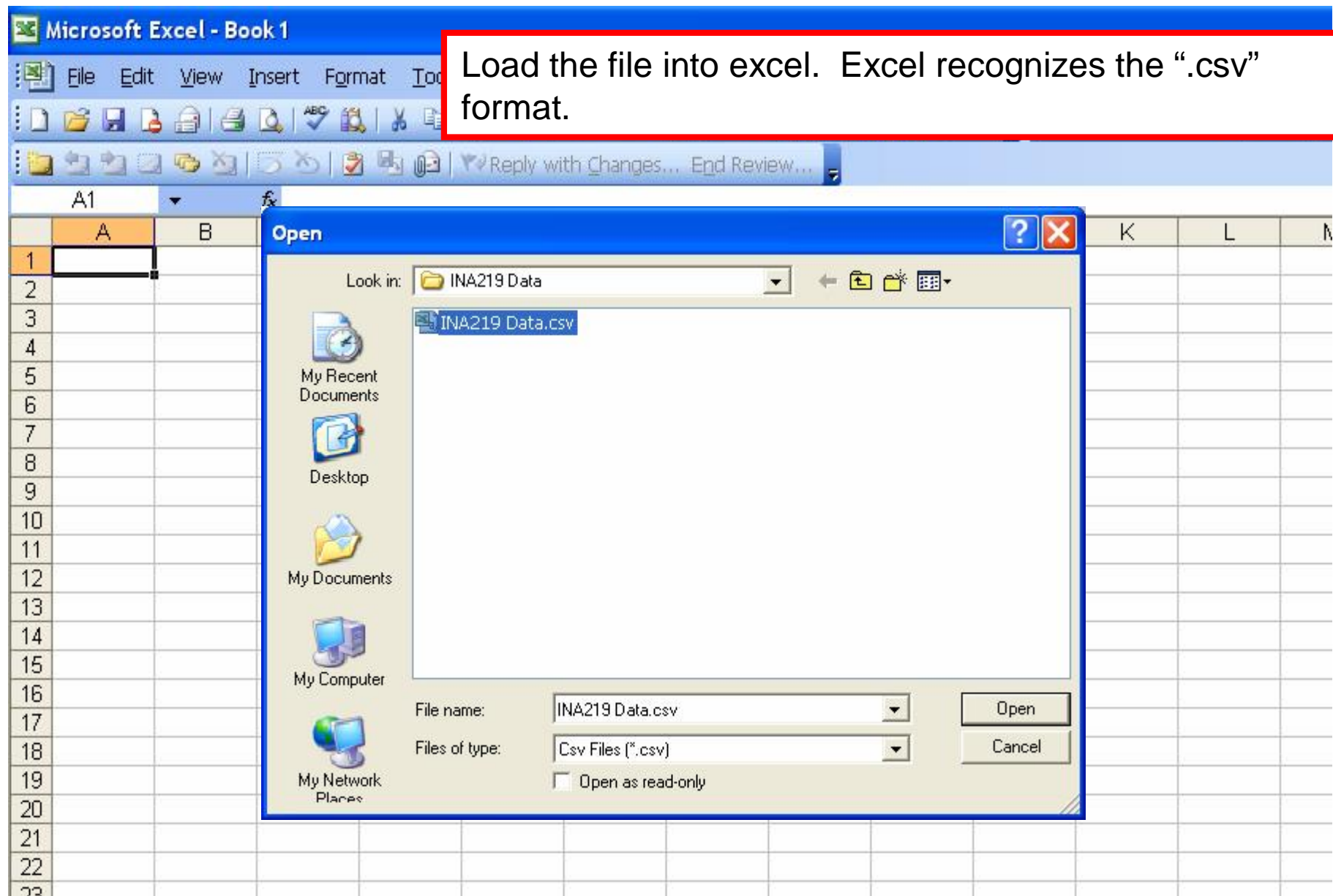








When you are done logging, select the “Log INA219 to File” menu item again to turn off logging. Note that the check mark will disappear when logging is turned off.



Microsoft Excel - INA219 Data.csv

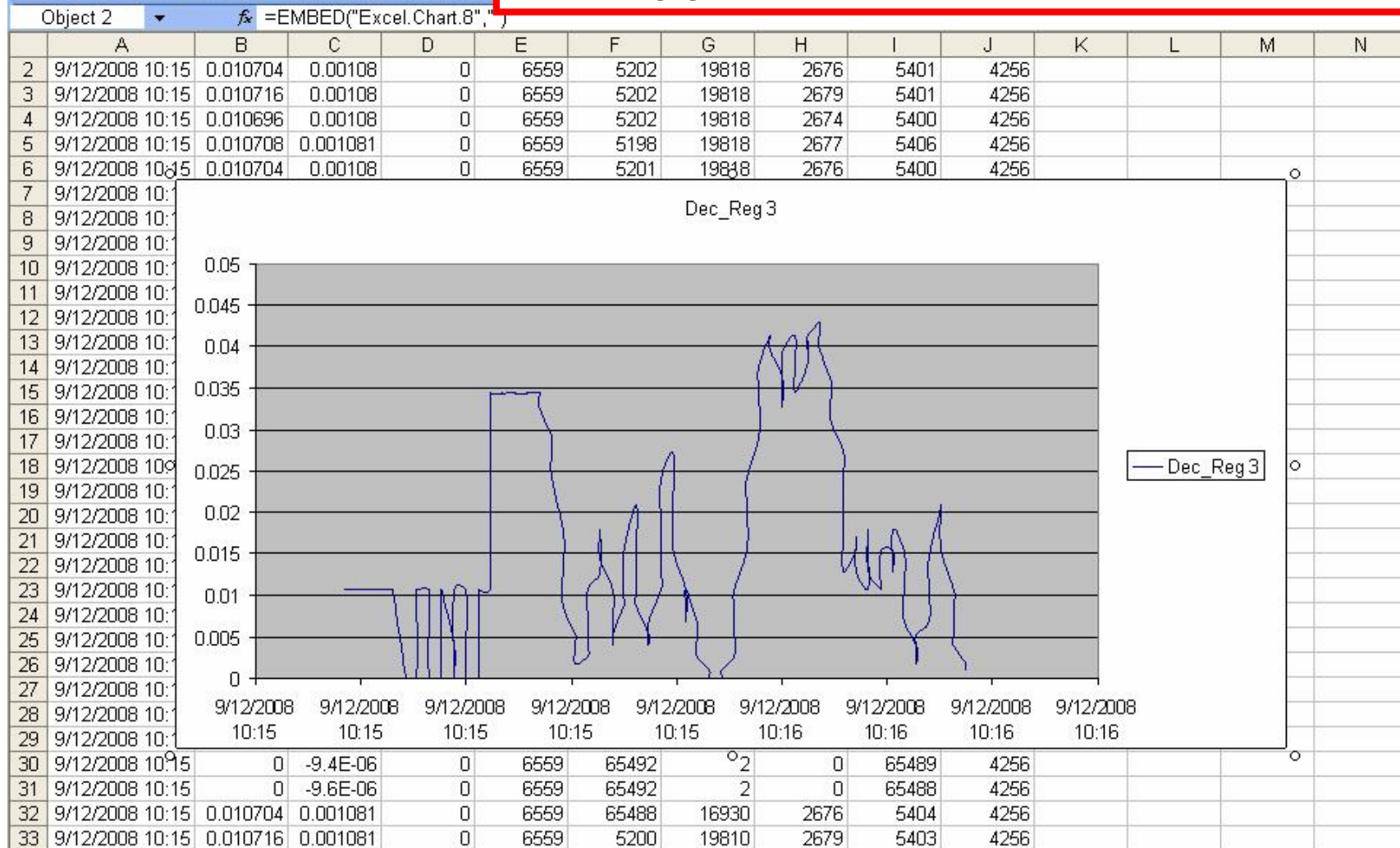
File Edit View Insert Format Tools

The log file contains all the registers.

Reply with Changes... End Review...

	A1	Date_Stamp												
	Previous Comment	B	C	D	E	F	G	H	I	J	K	L	M	
1	Date_Stamp	Dec_Reg 3	Dec_Reg 4	Dec_Reg 5	Dec_Reg 6	Dec_Reg 7	Dec_Reg 8	Dec_Reg 9	Dec_Reg 10	Dec_Reg 11	Dec_Reg 12	Dec_Reg 13	Dec_Reg 14	
2	9/12/2008 10:15	0.010704	0.00108	0	6559	5202	19818	2676	5401	4256				
3	9/12/2008 10:15	0.010716	0.00108	0	6559	5202	19818	2679	5401	4256				
4	9/12/2008 10:15	0.010696	0.00108	0	6559	5202	19818	2674	5400	4256				
5	9/12/2008 10:15	0.010708	0.001081	0	6559	5198	19818	2677	5406	4256				
6	9/12/2008 10:15	0.010704	0.00108	0	6559	5201	19818	2676	5400	4256				
7	9/12/2008 10:15	0.010704	0.00108	0	6559	5203	19818	2676	5402	4256				
8	9/12/2008 10:15	0.010708	0.001081	0	6559	5202	19818	2677	5405	4256				
9	9/12/2008 10:15	0.010704	0.00108	0	6559	5202	19818	2676	5402	4256				
10	9/12/2008 10:15	0.010716	0.001081	0	6559	5199	19818	2679	5403	4256				
11	9/12/2008 10:15	0.010704	0.00108	0	6559	5201	19818	2676	5402	4256				
12	9/12/2008 10:15	0.010704	0.00108	0	6559	5199	19818	2676	5402	4256				
13	9/12/2008 10:15	0.010704	0.001081	0	6559	5200	19818	2676	5403	4256				
14	9/12/2008 10:15	0.010704	0.001081	0	6559	5199	19818	2676	5403	4256				
15	9/12/2008 10:15	0.010708	0.00108	0	6559	5199	19818	2677	5401	4256				
16	9/12/2008 10:15	0.010708	0.001081	0	6559	5198	19818	2677	5404	4256				
17	9/12/2008 10:15	0.010704	0.00108	0	6559	5198	19818	2676	5402	4256				
18	9/12/2008 10:15	0.010708	0.00108	0	6559	5201	19818	2677	5402	4256				
19	9/12/2008 10:15	0.010704	0.00104	0	6559	5200	19818	2676	5202	4256				
20	9/12/2008 10:15	0	-1.1E-05	0	6559	65487	2	0	65481	4256				
21	9/12/2008 10:15	0	-9.6E-06	0	6559	65487	2	0	65488	4256				
22	9/12/2008 10:15	0	-0.00001	0	6559	65485	2	0	65486	4256				
23	9/12/2008 10:15	0	-0.00001	0	6559	65488	2	0	65486	4256				
24	9/12/2008 10:15	0.010696	0.001081	0	6559	65489	19690	2674	5405	4256				
25	9/12/2008 10:15	0.010708	0.001081	0	6559	5198	19818	2677	5403	4256				

Excel gives many possible ways of analyzing the data, including graphs, and statistics.



**End of
Software Overview
Thank you for your time!**