

ZCU102 System Controller – GUI Tutorial

May 2019



Revision History

Date	Version	Description
07/26/19	11.1	Minor update of details on VADJ and MIG.
05/29/19	11.0	Updated for 2019.1.
02/25/19	10.1	Updated document format.
12/10/18	10.0	Updated for 2018.3.
06/18/18	9.0	Updated for 2018.2
04/09/18	8.0	Updated for 2018.1.
12/20/17	7.0	Updated for 2017.4
10/09/17	6.0	Updated for 2017.3.
06/20/17	5.0	Updated for 2017.2.
04/19/17	4.0	Updated for 2017.1.
12/19/16	3.0	Updated for 2016.4.
10/13/16	2.0	Updated for SCUI version 1.1.

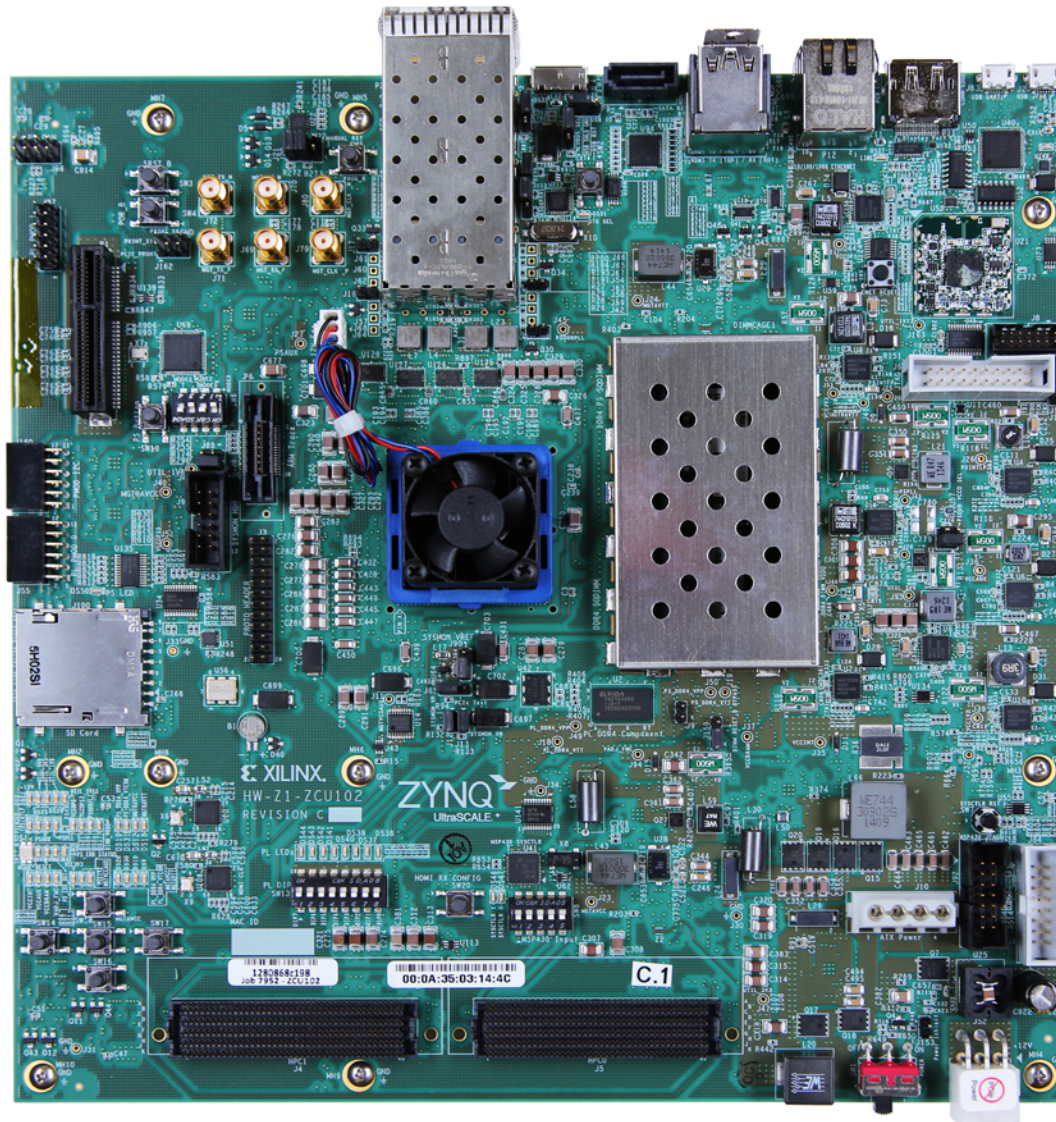
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Overview

- > **Xilinx ZCU102 Board**
- > **Updating the Firmware**
- > **ZCU102 SCUI**
 - >> Clocks
 - >> Voltages
 - >> Power
 - >> FMC
 - >> GTR MUX
 - >> EEPROM Data
 - >> GPIO Commands
 - >> System Monitor
 - >> About
- > **References**

Xilinx ZCU102 Board



Note: Presentation applies to the ZCU102

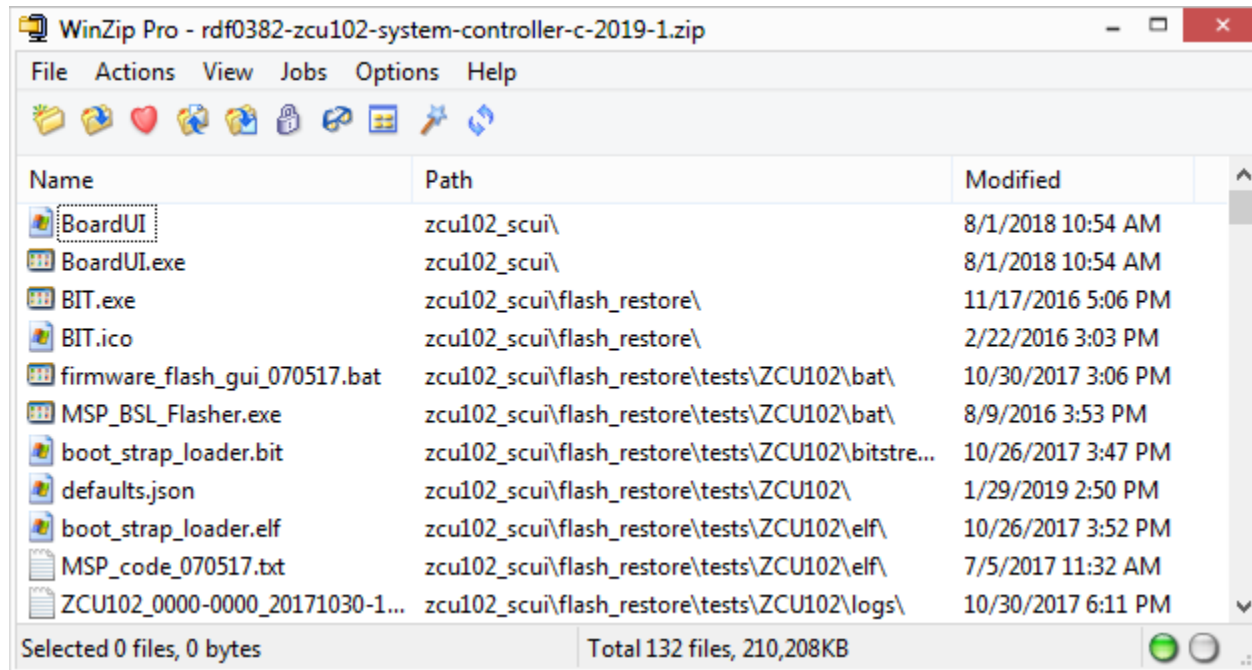
ZCU102 Software Install and Board Setup

- > Refer to XTP435 – ZCU102 Software Install and Board Setup for details on:
 - >> Software Requirements
 - >> ZCU102 Board Setup



ZCU102 System Controller Files

- > Open the RDF0382 – ZCU102 System Controller GUI (2019.1 C) ZIP file
 - >> Extract these files to your C:\ drive

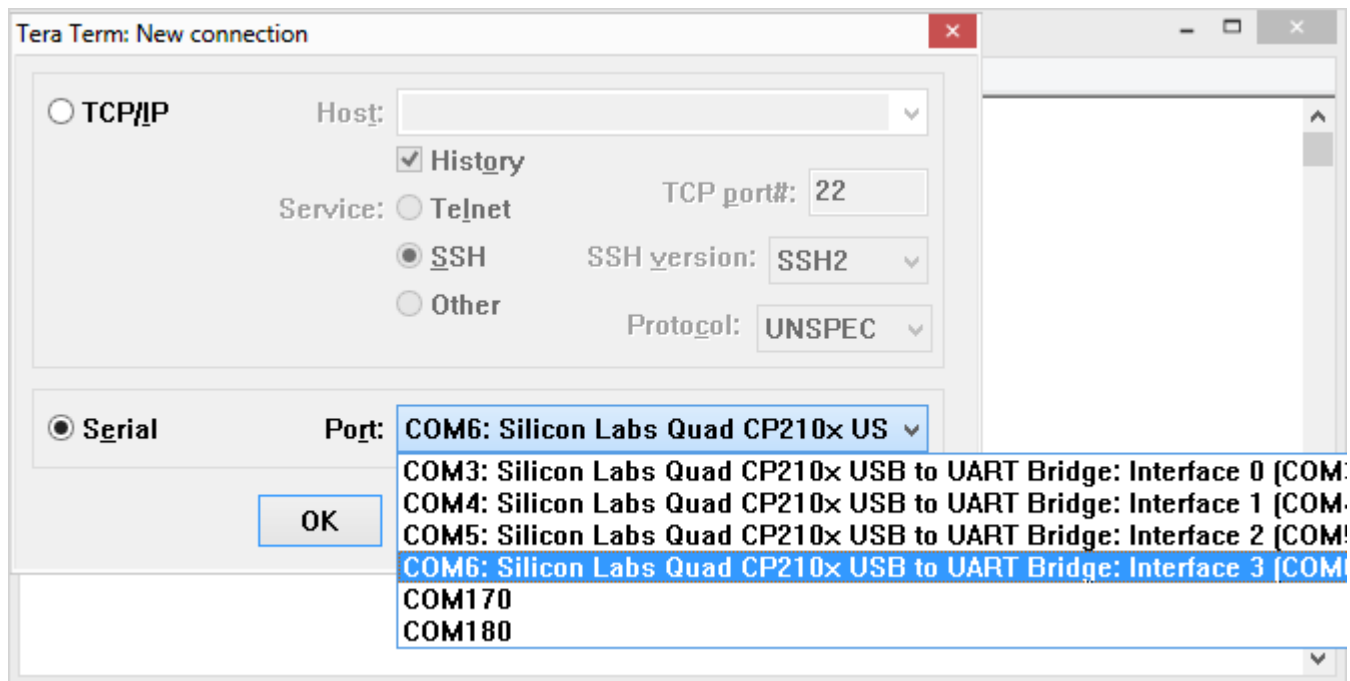


Updating the Firmware



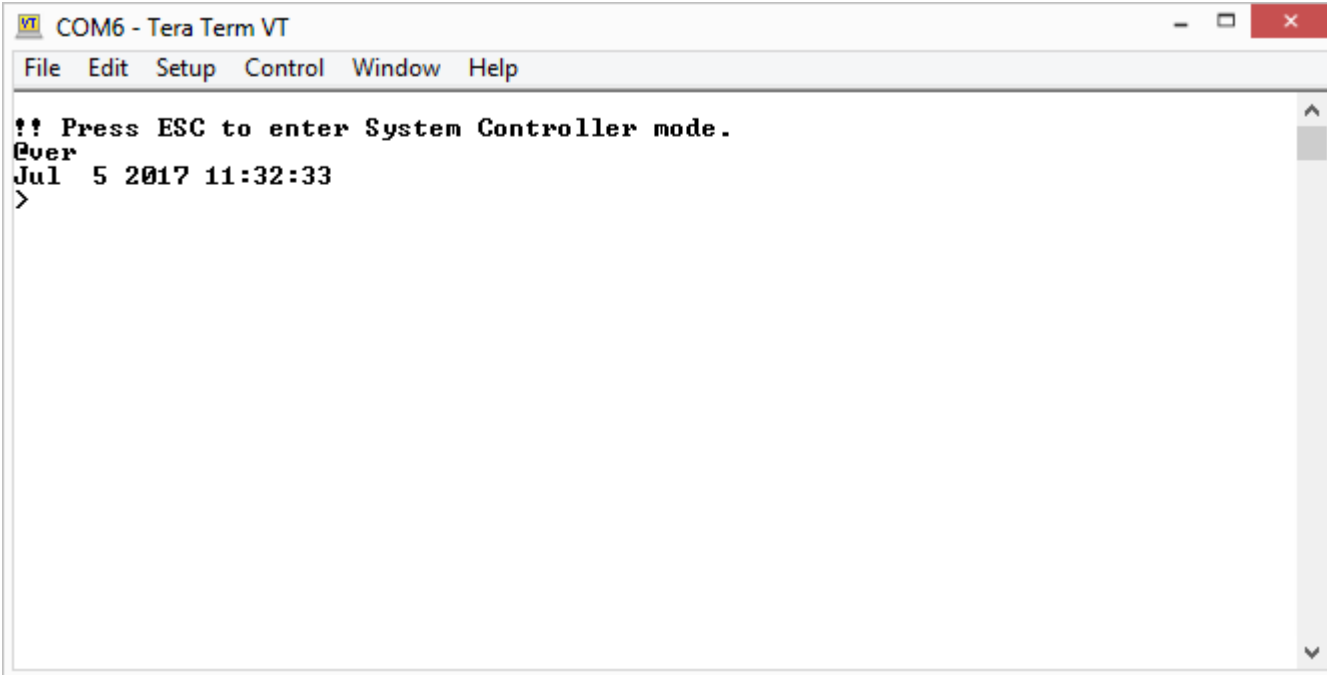
Updating the Firmware

- > This System Controller GUI requires the latest version of firmware
- > Xilinx recommends all ZCU102 users update their MSP430 firmware to the latest version
- > You can determine the firmware version by opening a Terminal, connected to Interface 3:



Updating the Firmware

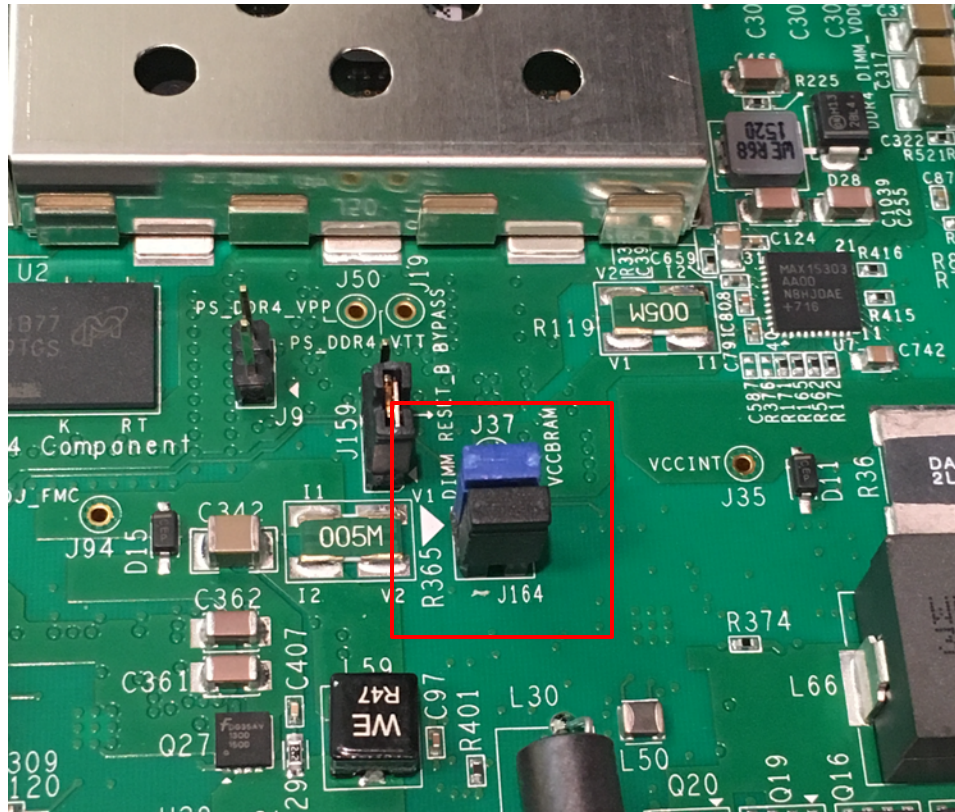
- > In this terminal, after power on, type:
 @ver
- > The timestamp of the firmware will appear
- > Any firmware with a timestamp before Jul 5 2017 should be updated



```
COM6 - Tera Term VT
File Edit Setup Control Window Help
!! Press ESC to enter System Controller mode.
@ver
Jul 5 2017 11:32:33
>
```

Updating the Firmware

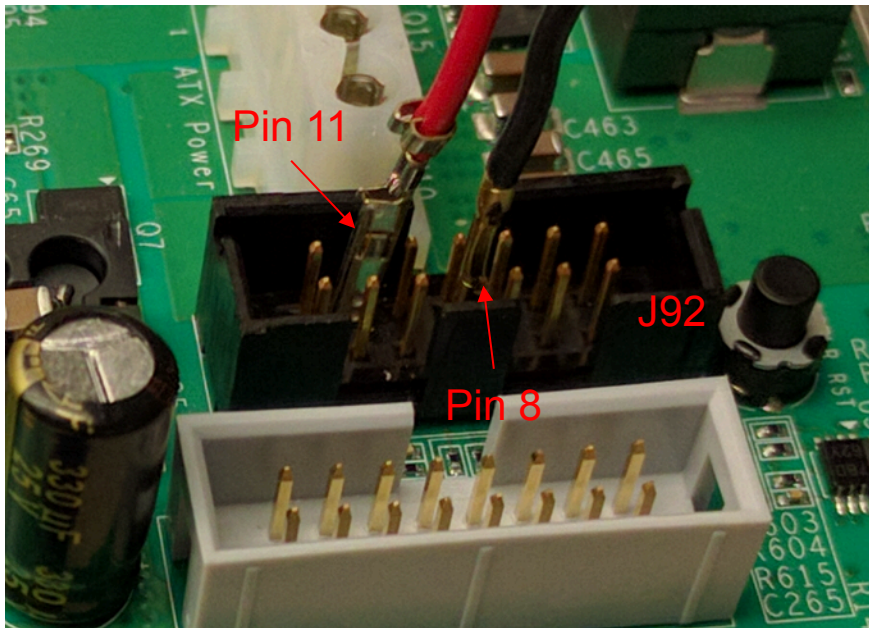
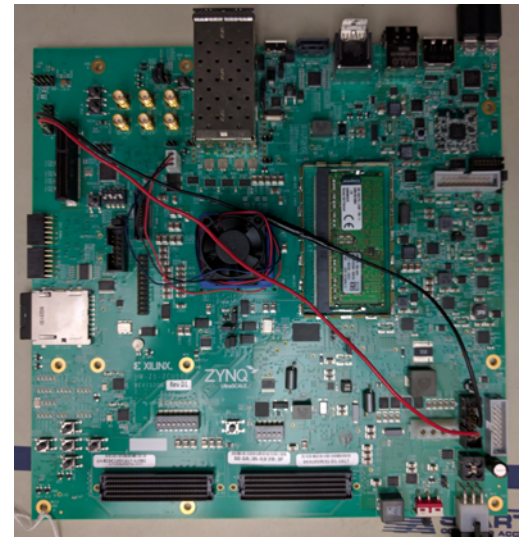
- > To update the firmware, attach two jumpers across J164 as shown



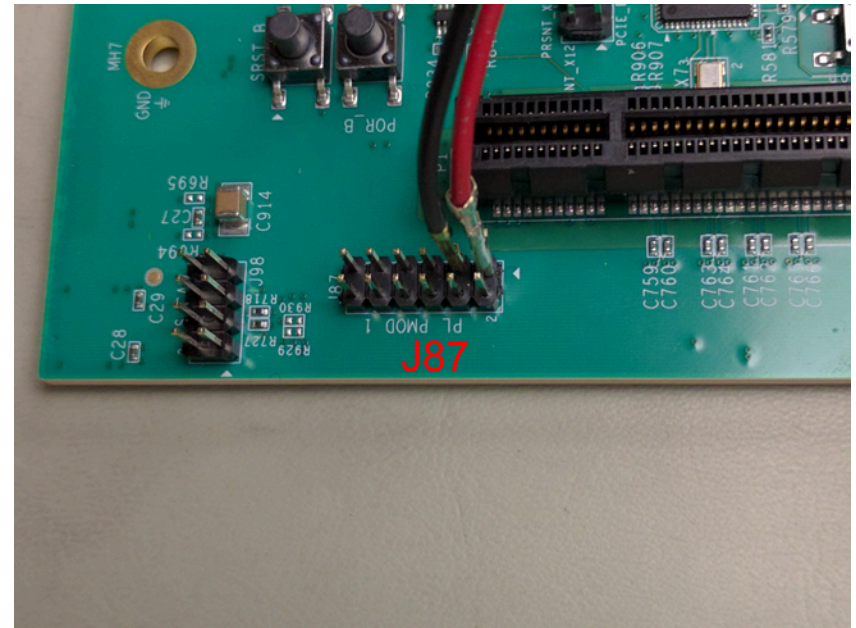
Updating the Firmware

> **Note: Some older ZCU102 boards, such as Rev D.2, do not have J164. For these boards, connect two long jumpers:**

- >> From J87 (PMOD1), Pin 1 to J92, Pin 11
- >> From J87 (PMOD1), Pin 3 to J92, Pin 8



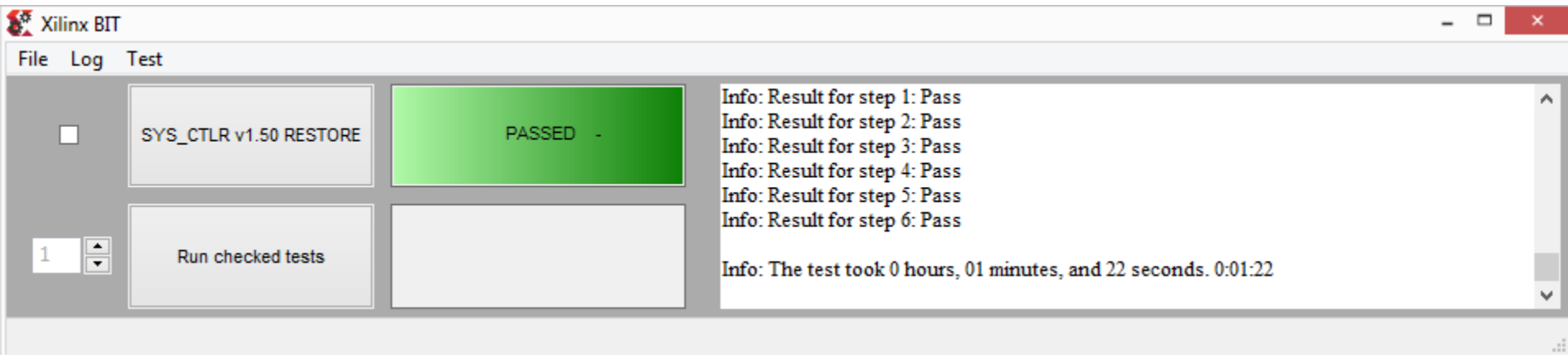
J92 connections



J87 connections

Updating the Firmware

> Run the BIT.exe from C:\zcu102_scul\flash_restore



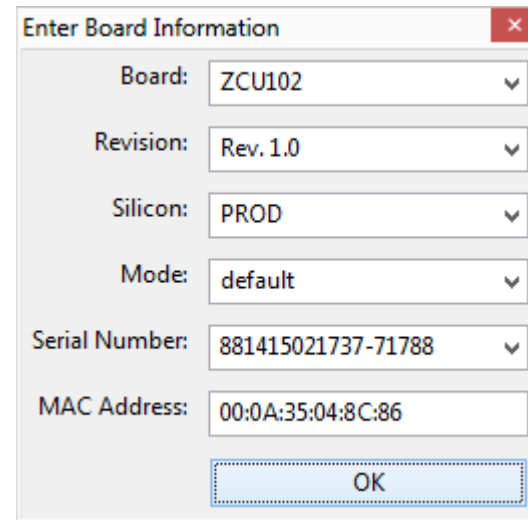
Note: Close the Terminal Window before restoring flash

Running the System Controller GUI



Running the System Controller GUI

- > From C:\zcu102_scul, double click on BoardUI.exe
- > Enter the board serial number and MAC ID
- > Click OK

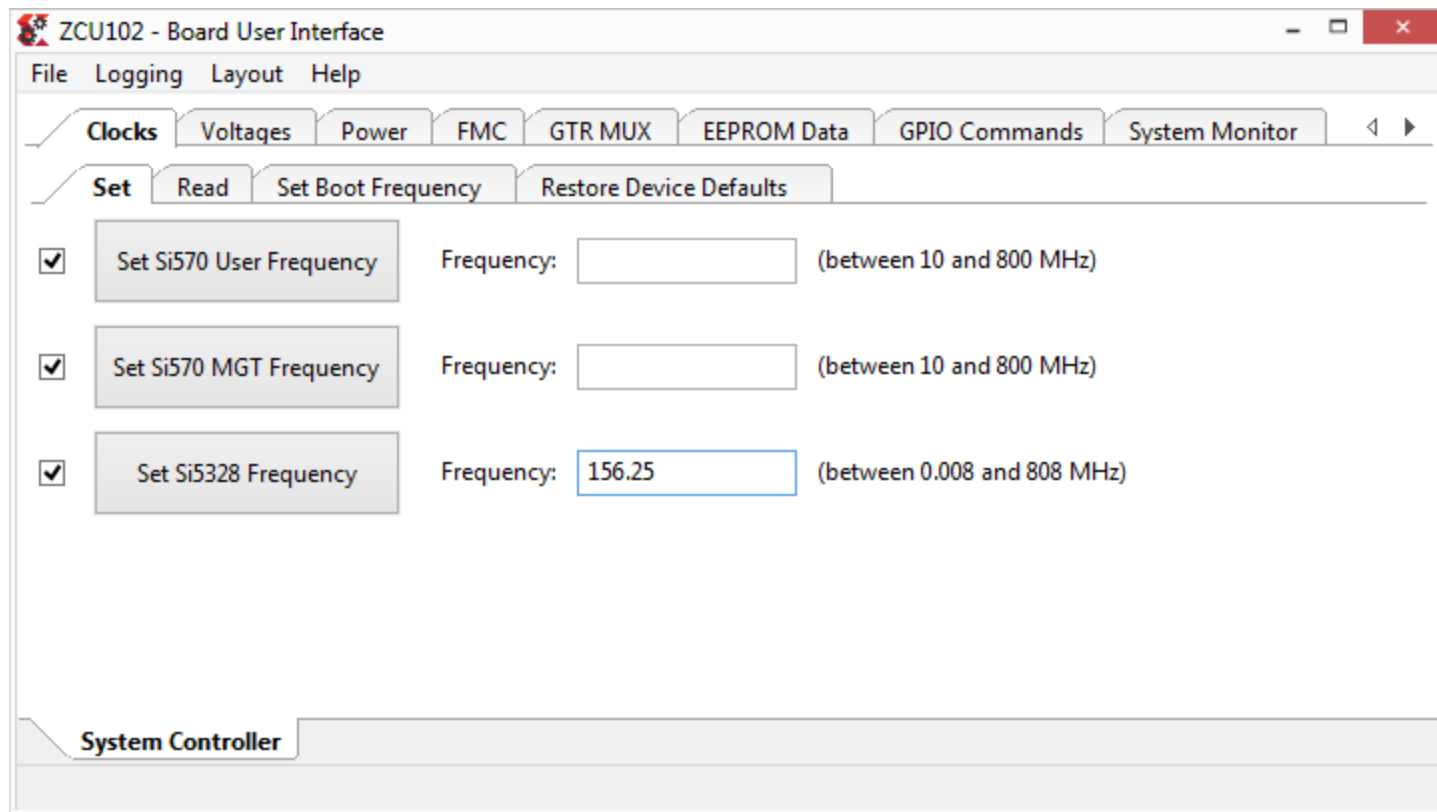
A screenshot of the "Enter Board Information" dialog box. The dialog has a title bar with a close button (X). It contains several input fields: "Board:" with a dropdown menu showing "ZCU102"; "Revision:" with a dropdown menu showing "Rev. 1.0"; "Silicon:" with a dropdown menu showing "PROD"; "Mode:" with a dropdown menu showing "default"; "Serial Number:" with a dropdown menu showing "881415021737-71788"; and "MAC Address:" with a text field containing "00:0A:35:04:8C:86". At the bottom, there is an "OK" button with a dotted border.

Clocks



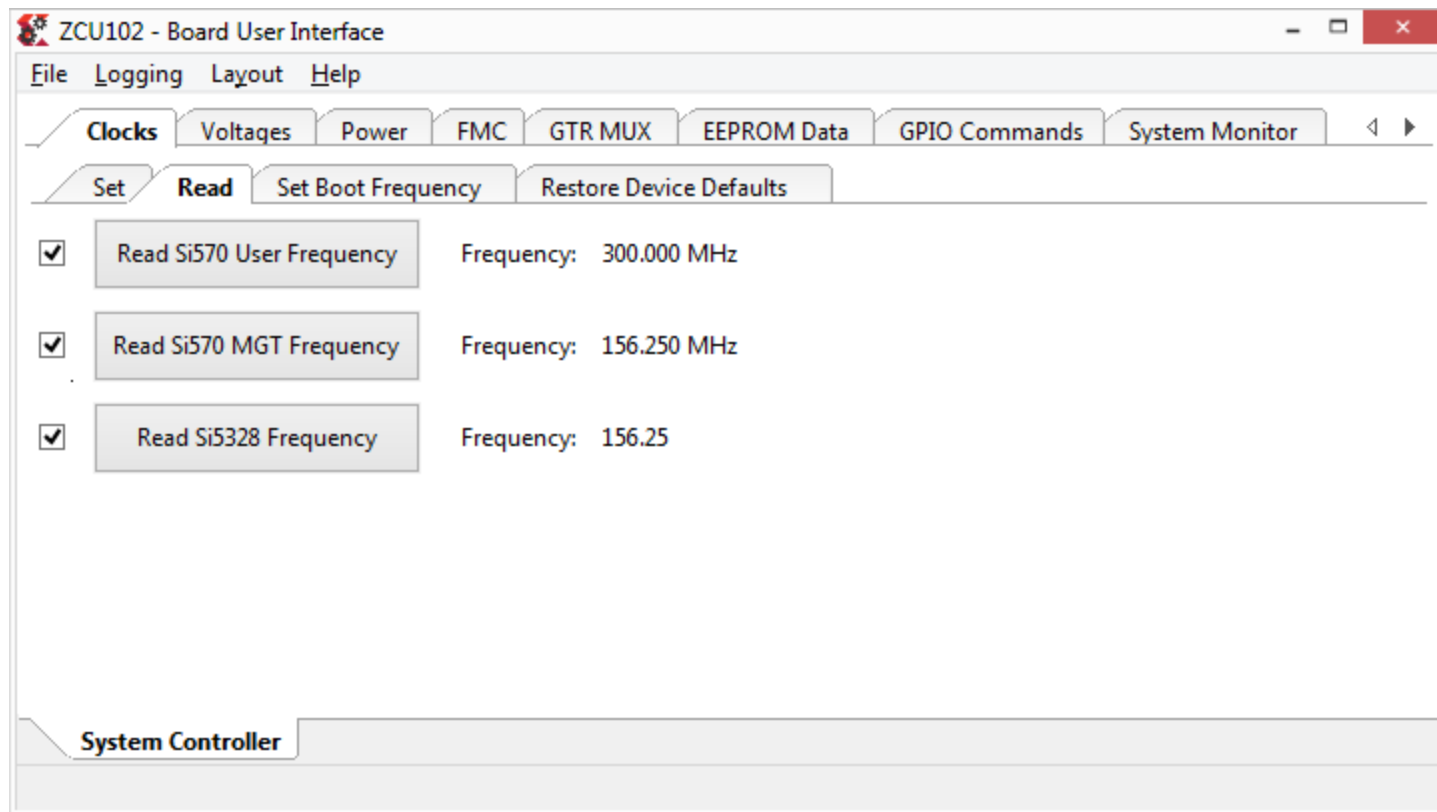
Setting the clocks

- > Select the Set tab underneath the Clocks tab
- > Enter 156.25 for the Si5328 and click the Set Si5328 Frequency button (takes a long moment to complete)



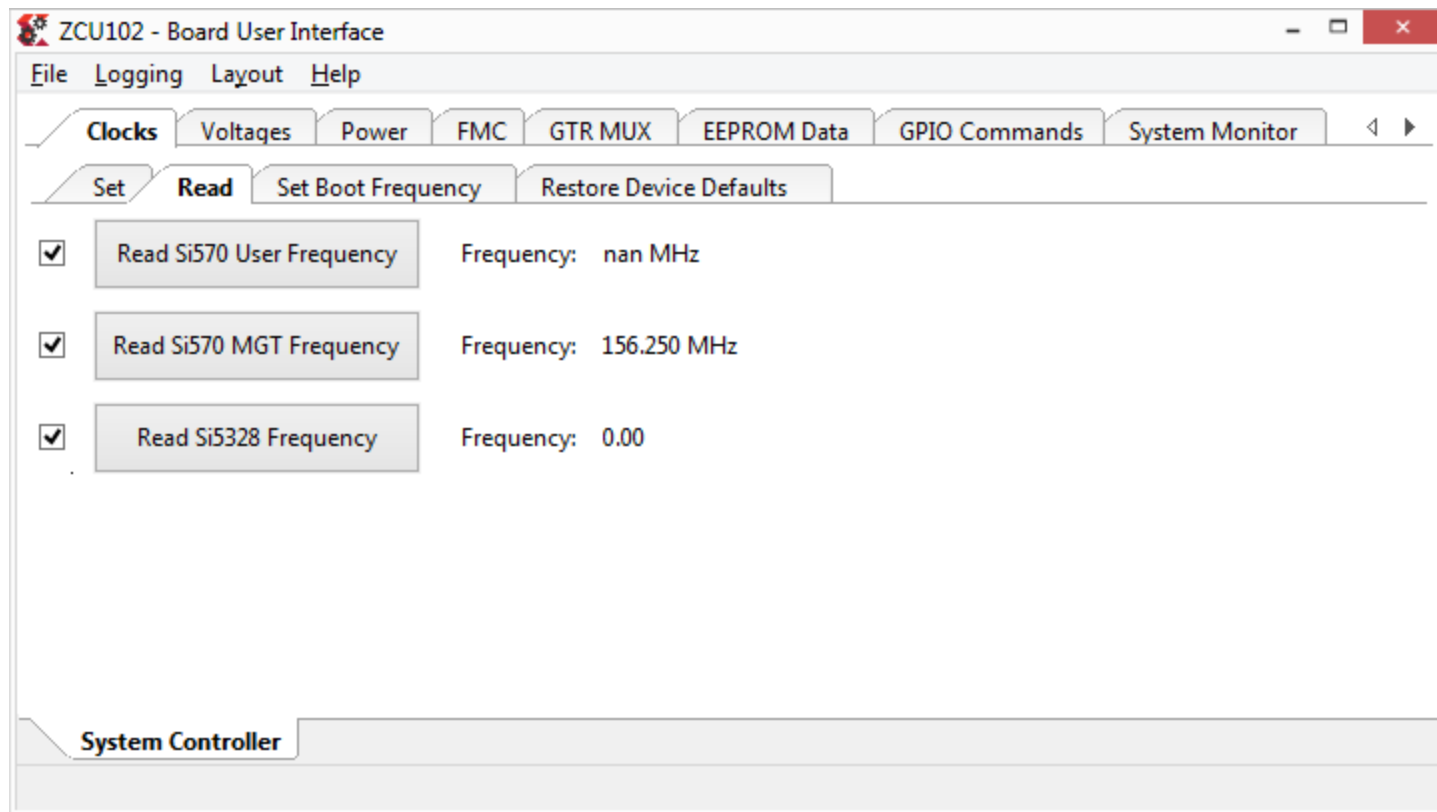
Reading the clocks

- > Select the Read tab
- > Click each of the Read buttons and verify the frequencies are set as shown



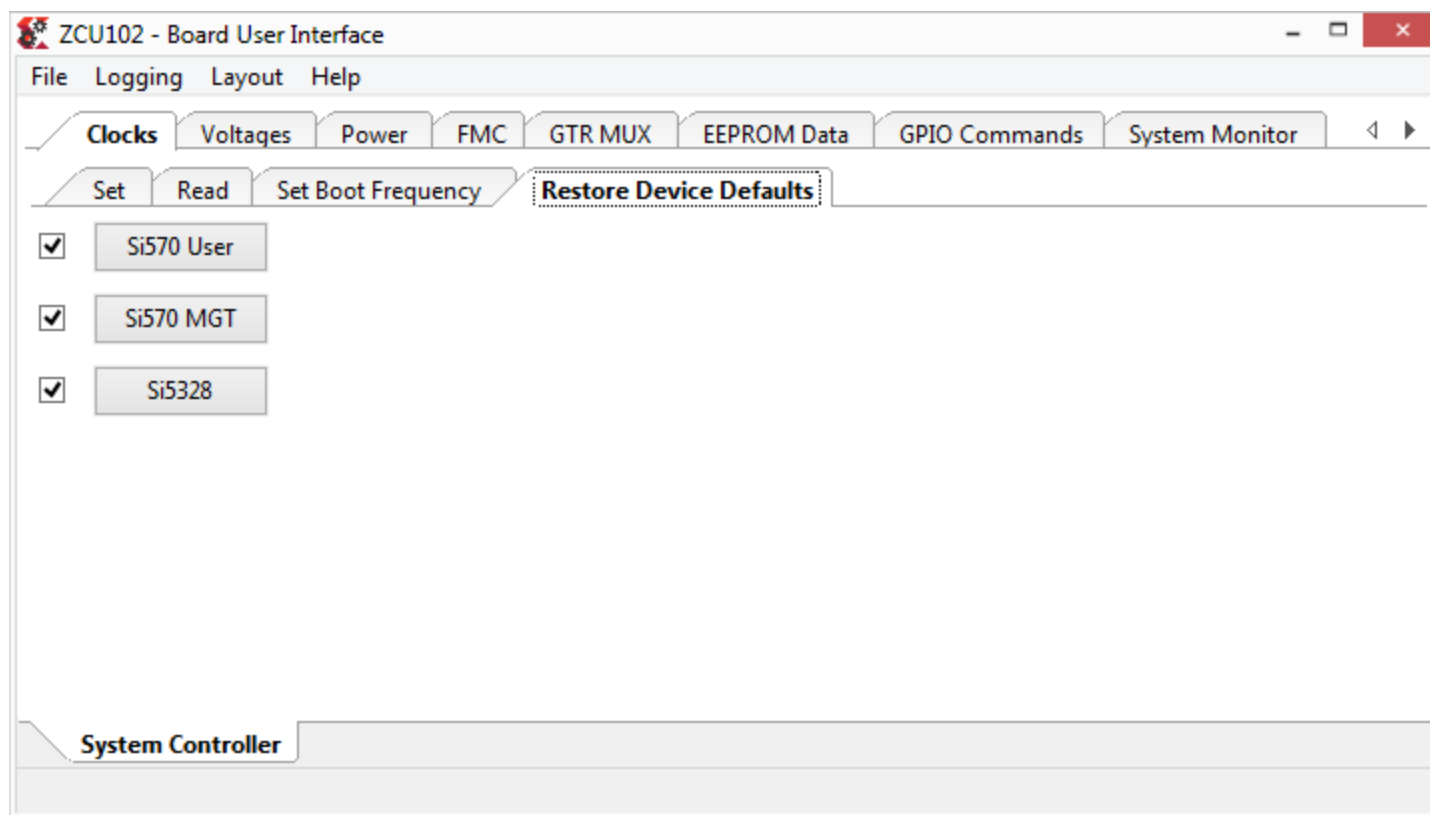
Reading the clocks

- > If some of the frequencies show up different, you will need to restore the defaults



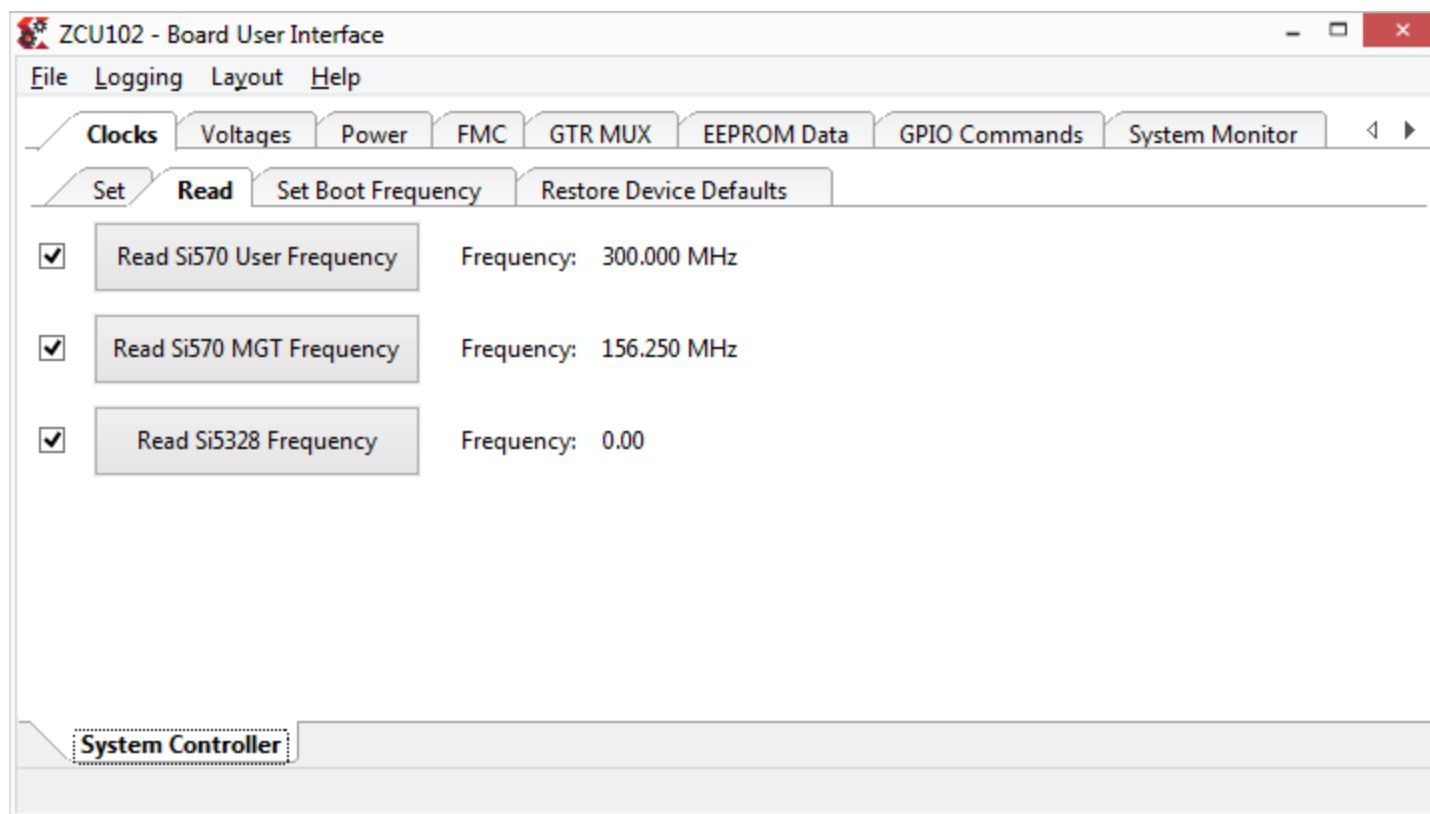
Restore Default Clock settings

- > Select the Restore Device Defaults tab
- > Restore the defaults by clicking the button associated with the clock you want to restore (300 MHz, 156.25 MHz, and 0 MHz)



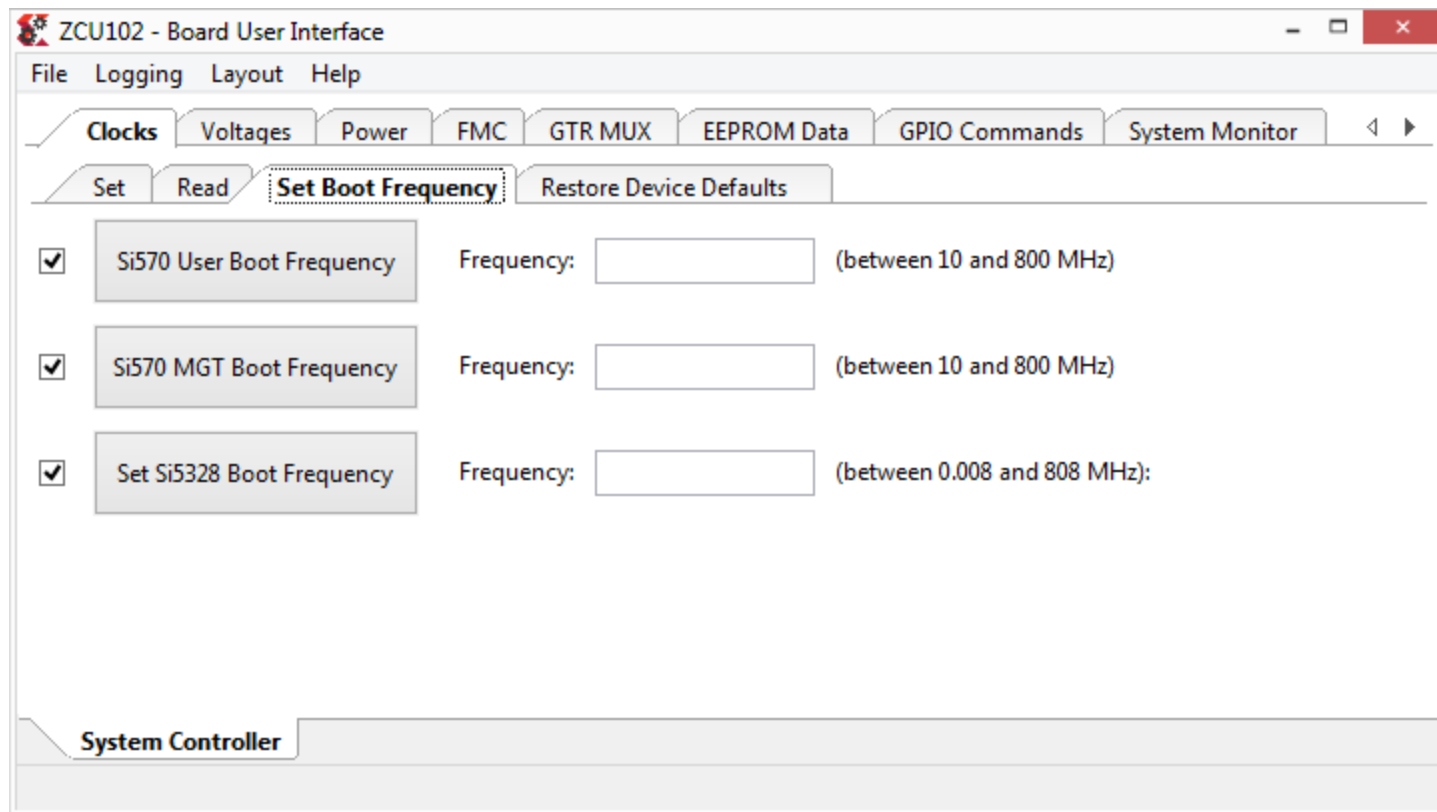
Restore Default Clock settings

- > Return to the Read tab and verify the settings are correct



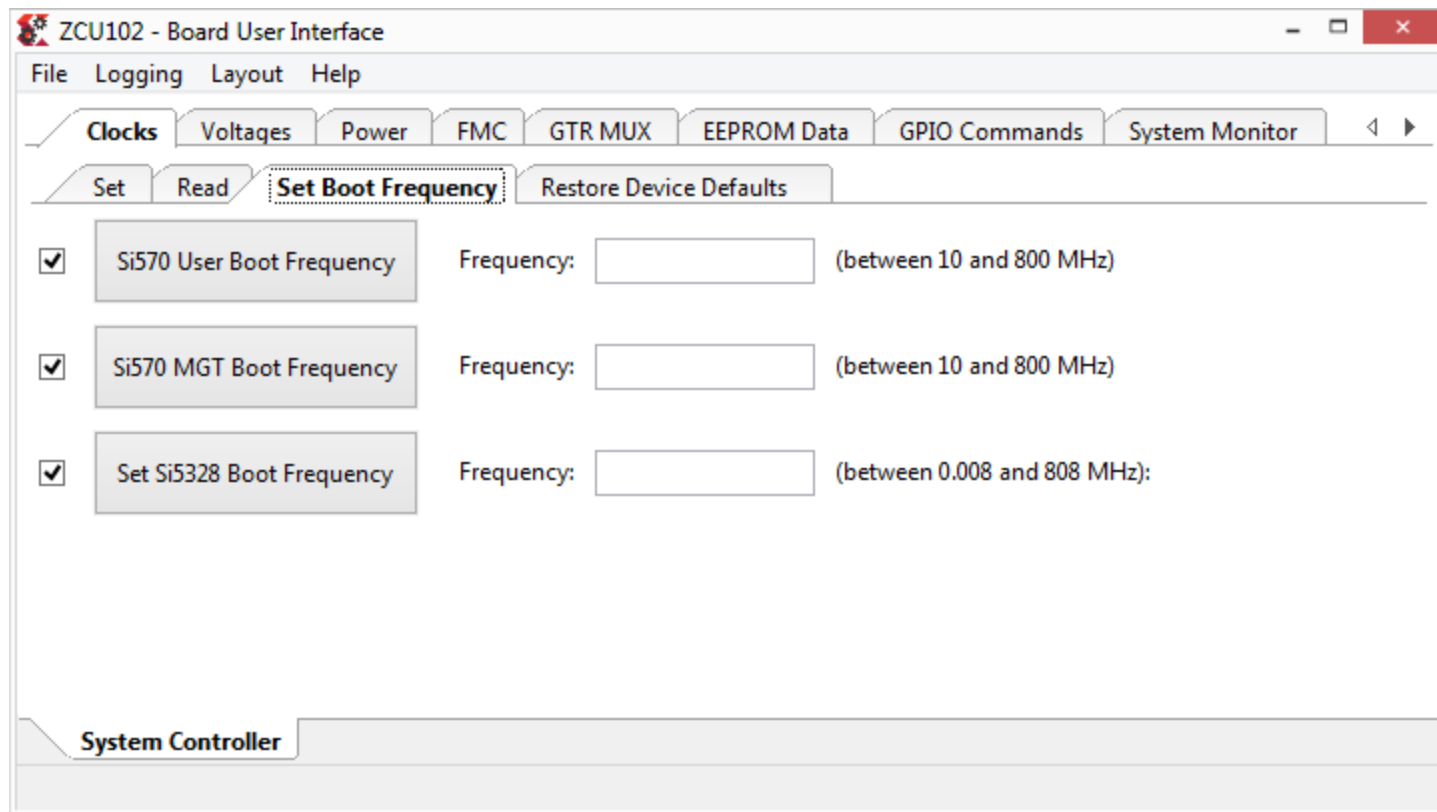
Setting Clock Boot Frequencies

- > Select the Set Boot Frequency tab
- > Type in your desired boot-up frequency and click the corresponding Set button



Setting Clock Boot Frequencies

- > **Note: The Set Boot Frequency settings will override the Restore Device Defaults at Bootup**
- > **The example designs, IBERT, IPI, MIG, etc., expect Si570 User set to 300 MHz, and Si570 MGT/Si5328 set to 156.25 MHz**

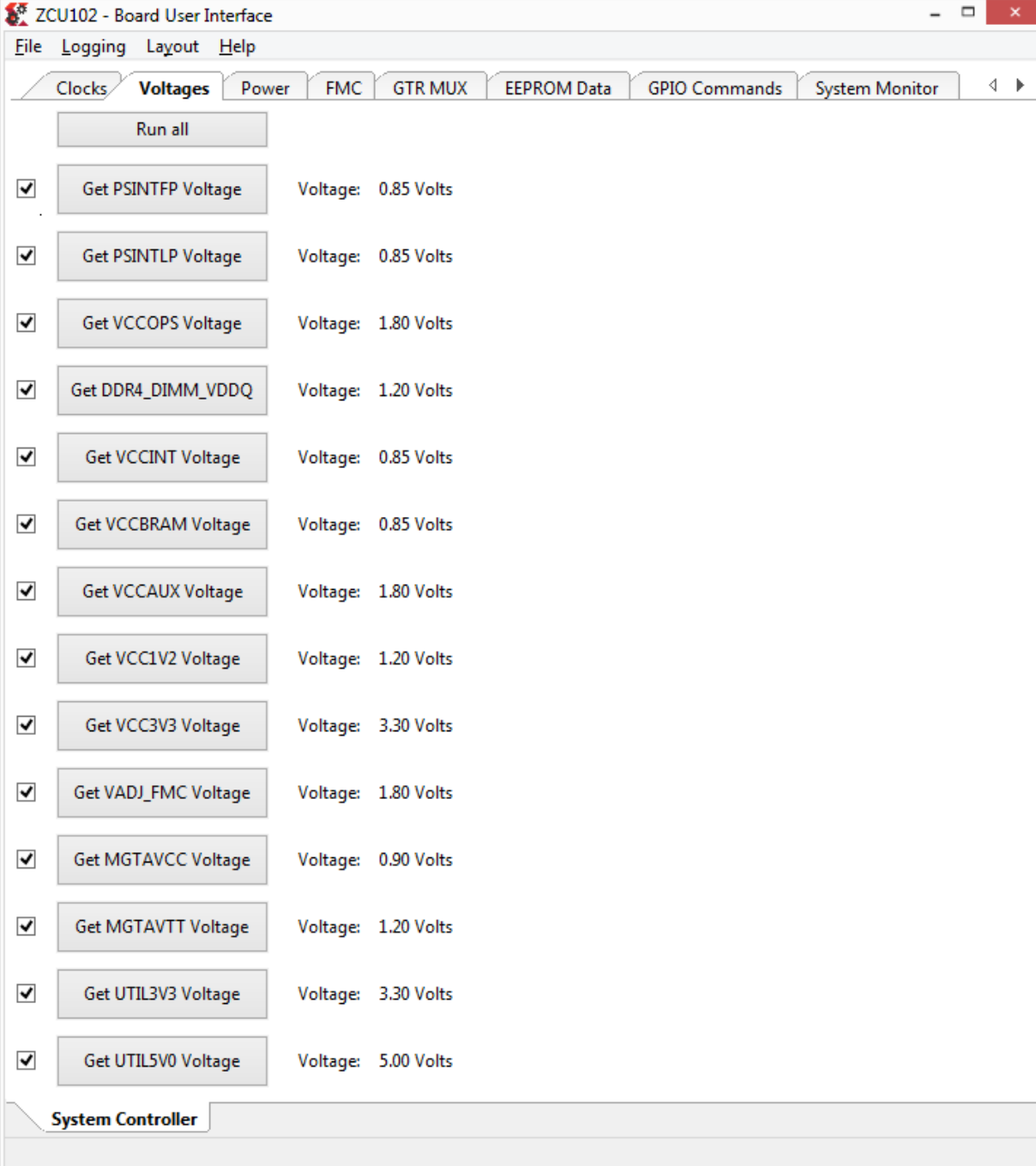


Voltages



Reading onboard ZCU102 voltages

- > Under the Voltages tab, click the Run all checked buttons button
- > Observe the ZCU102 voltages



The screenshot displays the 'ZCU102 - Board User Interface' window. The 'Voltages' tab is selected, showing a list of voltage readings for various components. A 'Run all' button is visible at the top of the list. The voltage readings are as follows:

Component	Voltage
Get PSINTFP Voltage	0.85 Volts
Get PSINTLP Voltage	0.85 Volts
Get VCCOPS Voltage	1.80 Volts
Get DDR4_DIMM_VDDQ	1.20 Volts
Get VCCINT Voltage	0.85 Volts
Get VCCBRAM Voltage	0.85 Volts
Get VCCAUX Voltage	1.80 Volts
Get VCC1V2 Voltage	1.20 Volts
Get VCC3V3 Voltage	3.30 Volts
Get VADJ_FMC Voltage	1.80 Volts
Get MGTAVCC Voltage	0.90 Volts
Get MGTAVTT Voltage	1.20 Volts
Get UTIL3V3 Voltage	3.30 Volts
Get UTIL5V0 Voltage	5.00 Volts

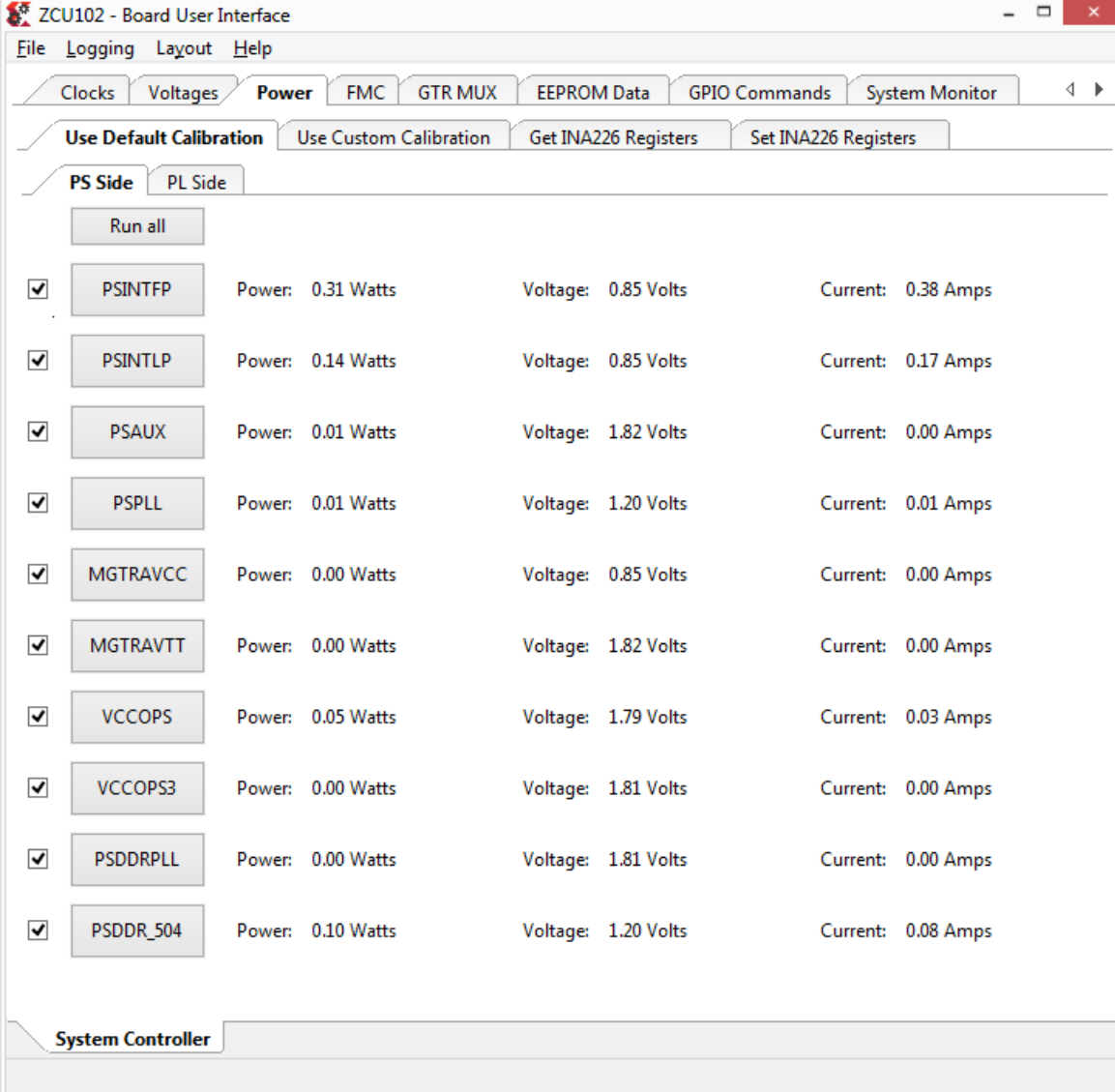
The 'System Controller' tab is visible at the bottom of the interface.

Power



Reading power values using default calibration

- > Select the Use Default Calibration tab underneath Power
- > Under the PS Side tab, click the Run all button

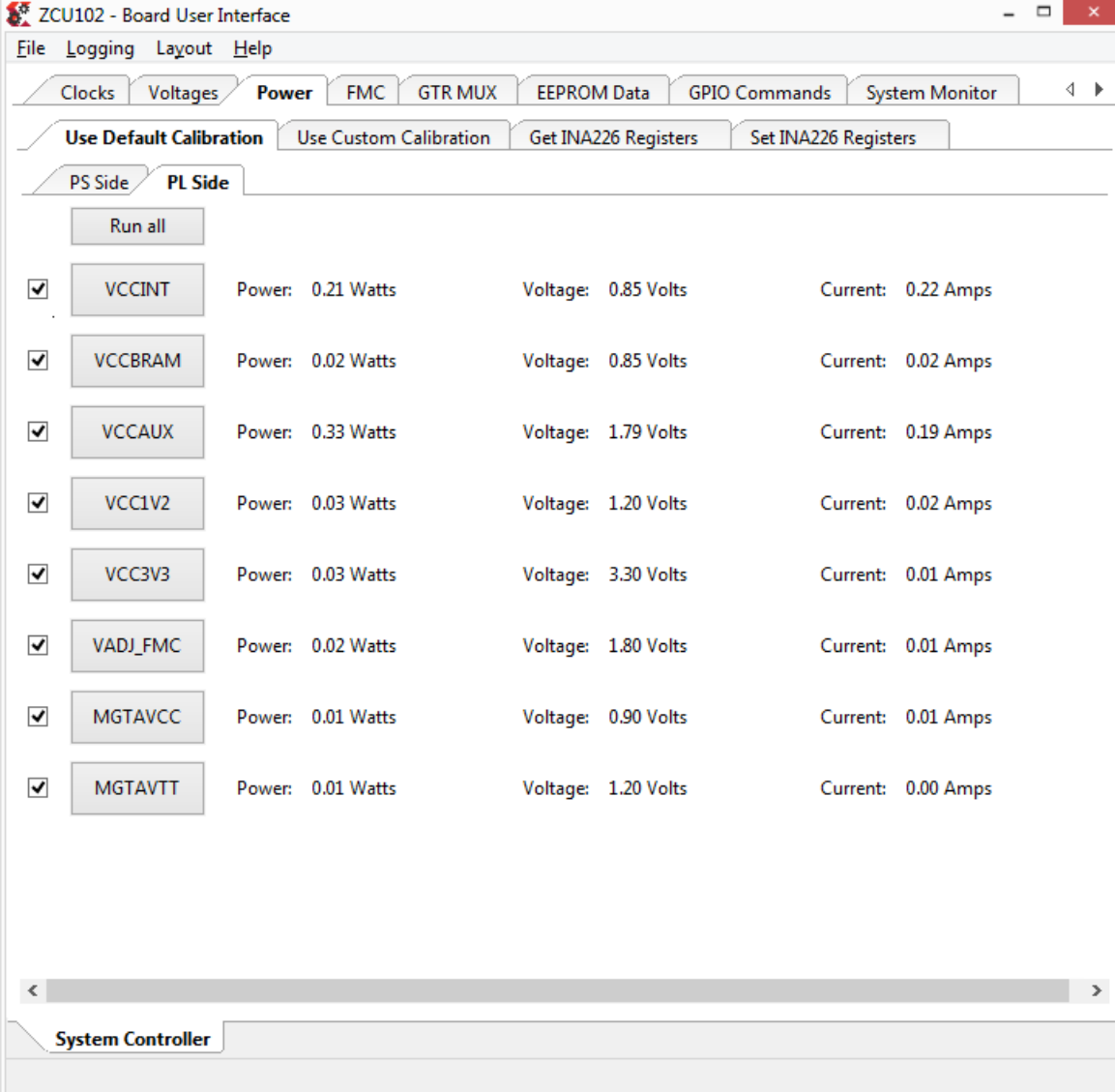


The screenshot displays the ZCU102 Board User Interface, specifically the Power tab under the PS Side. The interface shows a list of power components with their respective power, voltage, and current values. A 'Run all' button is visible at the top of the list.

Component	Power	Voltage	Current
PSINTFP	0.31 Watts	0.85 Volts	0.38 Amps
PSINTLP	0.14 Watts	0.85 Volts	0.17 Amps
PSAUX	0.01 Watts	1.82 Volts	0.00 Amps
PSPLL	0.01 Watts	1.20 Volts	0.01 Amps
MGTRAVCC	0.00 Watts	0.85 Volts	0.00 Amps
MGTRAVTT	0.00 Watts	1.82 Volts	0.00 Amps
VCCOPS	0.05 Watts	1.79 Volts	0.03 Amps
VCCOPS3	0.00 Watts	1.81 Volts	0.00 Amps
PSDDRPLL	0.00 Watts	1.81 Volts	0.00 Amps
PSDDR_504	0.10 Watts	1.20 Volts	0.08 Amps

Reading power values using default calibration

> Under the PL Side tab, click the Run all button



The screenshot displays the ZCU102 Board User Interface, specifically the Power monitoring section. The interface includes a menu bar (File, Logging, Layout, Help) and several tabs (Clocks, Voltages, Power, FMC, GTR MUX, EEPROM Data, GPIO Commands, System Monitor). The Power tab is active, and the 'Use Default Calibration' sub-tab is selected. The 'PL Side' tab is also active, showing a 'Run all' button and a list of power rails with their respective power, voltage, and current values.

Power Rail	Power	Voltage	Current
VCCINT	0.21 Watts	0.85 Volts	0.22 Amps
VCCBRAM	0.02 Watts	0.85 Volts	0.02 Amps
VCCAUX	0.33 Watts	1.79 Volts	0.19 Amps
VCC1V2	0.03 Watts	1.20 Volts	0.02 Amps
VCC3V3	0.03 Watts	3.30 Volts	0.01 Amps
VADJ_FMC	0.02 Watts	1.80 Volts	0.01 Amps
MGTAVCC	0.01 Watts	0.90 Volts	0.01 Amps
MGTAVTT	0.01 Watts	1.20 Volts	0.00 Amps

Read INA226 Registers

- > Select the Get INA226 Registers tab
- > Under the PS Side tab, click the Run all button and observe the INA226 Registers settings

The screenshot shows the ZCU102 Board User Interface with the 'Get INA226 Registers' tab selected. The interface displays a table of INA226 register settings for various power supplies (PSINITFP, PSINITLP, PSAUX, PSPLL, MGTRAVCC) under the PS Side tab. A 'Run all' button is visible at the top of the table.

Power Supply	Configuration	Shunt Voltage	Bus Voltage	Power	Current	Calibration	Mask/Enable	Alert Limit	Die ID
PSINITFP	4127	02EC	02A5	002B	04C9	0D1B	0008	0000	2260
PSINITLP	4127	014C	02A7	005C	0AA0	4189	0008	0000	2260
PSAUX	4127	0011	05AE	0014	0100	7FFF	0008	0000	2260
PSPLL	4127	001B	03C1	0015	01A0	7FFF	0008	0000	2260
MGTRAVCC	4127	0000	02A8	0000	0000	7FFF	0008	0000	2260

Read INA226 Registers

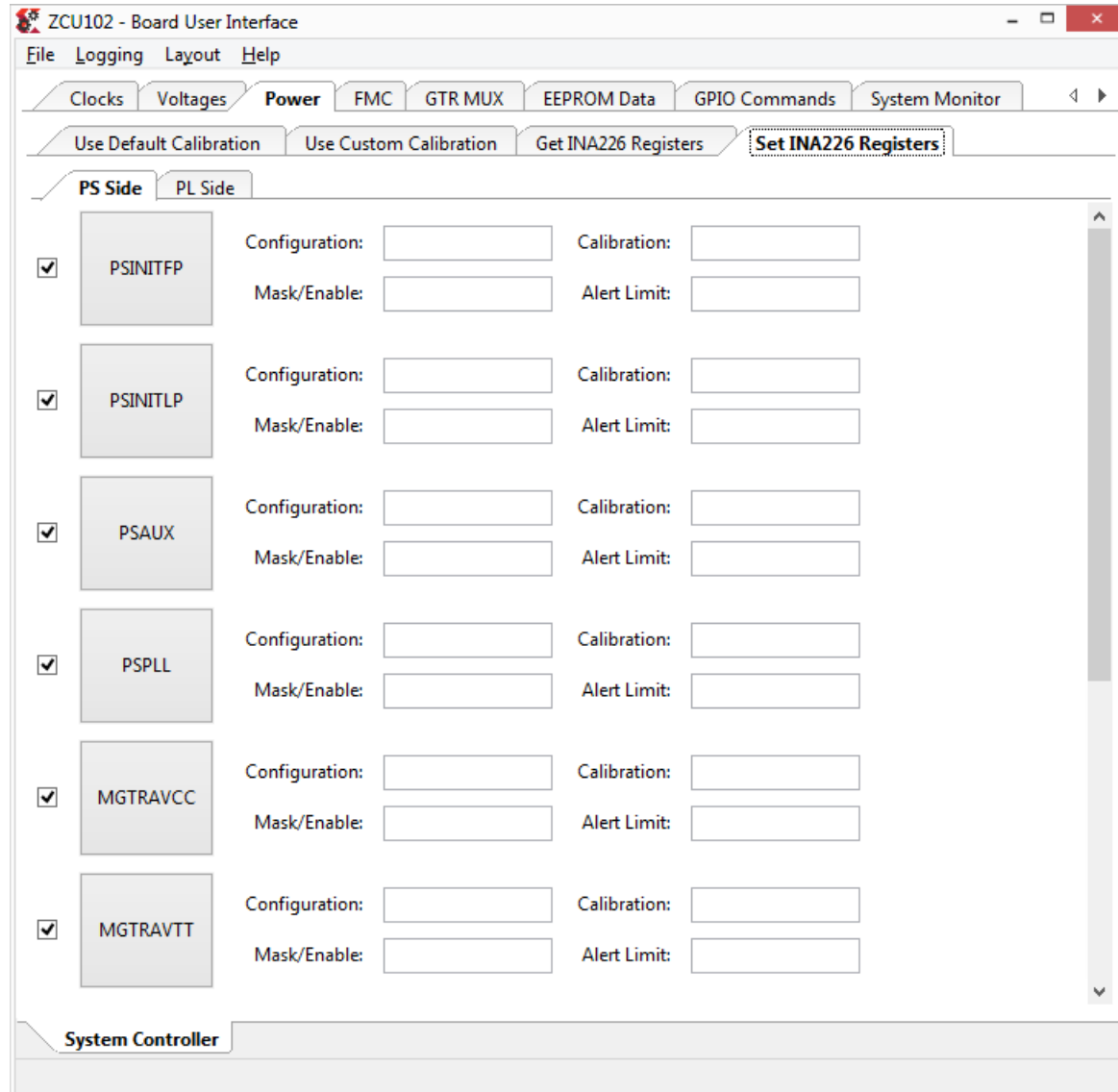
- > Select the Get INA226 Registers tab
- > Under the PL Side tab, click the Run all button and observe the INA226 Registers settings

The screenshot shows the ZCU102 Board User Interface. The 'Power' tab is selected, and the 'Get INA226 Registers' sub-tab is active. The 'PL Side' is selected, and the 'Run all' button is visible. A table displays the following data:

Power Supply	Configuration	Shunt Voltage	Bus Voltage	Power	Current	Calibration	Mask/Enable	Alert Limit	Die ID
VCCINT	4127	00B1	02A6	0007	00AF	0831	0008	0000	2260
VCCBRAM	4127	0030	02A6	0005	0086	15D8	0008	0000	2260
VCCAUX	4127	0175	059B	0092	07EF	28B0	0008	0000	2260
VCC1V2	4127	002E	03C1	0012	0168	4189	0008	0000	2260
VCC3V3	4127	000E	0A4F	0005	002B	1A36	0008	0000	2260

Set INA226 Registers

- > Select the Set INA226 Registers tab
- > Under the PS Side tab, set any desired calibrations
- > Review [TI INA226](#) documentation before making changes



The screenshot displays the ZCU102 Board User Interface. The window title is "ZCU102 - Board User Interface". The menu bar includes "File", "Logging", "Layout", and "Help". The main navigation tabs are "Clocks", "Voltages", "Power", "FMC", "GTR MUX", "EEPROM Data", "GPIO Commands", and "System Monitor". Below these, there are sub-tabs: "Use Default Calibration", "Use Custom Calibration", "Get INA226 Registers", and "Set INA226 Registers" (which is highlighted with a dashed border). The "PS Side" tab is selected, and the "PL Side" tab is also visible. The interface shows a list of registers with checkboxes and input fields for Configuration, Mask/Enable, Calibration, and Alert Limit.

Register	Configuration	Mask/Enable	Calibration	Alert Limit
<input checked="" type="checkbox"/> PSINITFP	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input checked="" type="checkbox"/> PSINITLP	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input checked="" type="checkbox"/> PSAUX	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input checked="" type="checkbox"/> PSPLL	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input checked="" type="checkbox"/> MGTRAVCC	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input checked="" type="checkbox"/> MGTRAVTT	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

System Controller

Set INA226 Registers

- > Select the Set INA226 Registers tab
- > Under the PL Side tab, set any desired calibrations
- > Review [TI INA226](#) documentation before making changes

The screenshot displays the ZCU102 Board User Interface. The window title is "ZCU102 - Board User Interface". The menu bar includes "File", "Logging", "Layout", and "Help". The main navigation tabs are "Clocks", "Voltages", "Power", "FMC", "GTR MUX", "EEPROM Data", "GPIO Commands", and "System Monitor". Below these, there are sub-tabs for "Use Default Calibration", "Use Custom Calibration", "Get INA226 Registers", and "Set INA226 Registers". The "PL Side" tab is selected. The interface shows a list of voltage regulators with checkboxes and input fields for Configuration, Mask/Enable, Calibration, and Alert Limit.

Regulator	Configuration	Mask/Enable	Calibration	Alert Limit
<input checked="" type="checkbox"/> VCCINT	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input checked="" type="checkbox"/> VCCBRAM	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input checked="" type="checkbox"/> VCCAUX	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input checked="" type="checkbox"/> VCC1V2	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input checked="" type="checkbox"/> VCC3V3	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input checked="" type="checkbox"/> VADJ_FMC	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

System Controller

Reading power values using custom calibration

- > Select the Use Custom Calibration tab
- > Under the PS Side tab, click the Run all checked buttons button (no calibrations were entered in this example)

The screenshot displays the ZCU102 Board User Interface, specifically the Power monitoring section. The 'Use Custom Calibration' tab is selected, and the 'PS Side' sub-tab is active. A 'Run all' button is visible, and a list of power components is shown with their respective power, voltage, and current values.

Component	Power	Voltage	Current
PSINTFP	0.20 Watts	0.85 Volts	0.22 Amps
PSINTLP	0.42 Watts	0.85 Volts	0.50 Amps
PSAUX	0.09 Watts	1.82 Volts	0.05 Amps
PSPLL	0.09 Watts	1.20 Volts	0.08 Amps
MGTRAVCC	0.00 Watts	0.85 Volts	0.00 Amps
MGTRAVTT	0.01 Watts	1.81 Volts	0.00 Amps
VCCOPS	0.08 Watts	1.79 Volts	0.05 Amps
VCCOPS3	0.01 Watts	1.81 Volts	0.00 Amps
PSDDRPLL	0.00 Watts	1.81 Volts	0.00 Amps
PSDDR_504	0.10 Watts	1.20 Volts	0.08 Amps

Reading power values using custom calibration

- > Select the Use Custom Calibration tab
- > Under the PL Side tab, click the Run all checked buttons button (no calibrations were entered in this example)

The screenshot displays the ZCU102 Board User Interface, specifically the Power monitoring section. The 'Use Custom Calibration' tab is selected, and the 'PL Side' is active. A 'Run all' button is visible, and a list of power domains is shown with their respective power, voltage, and current values.

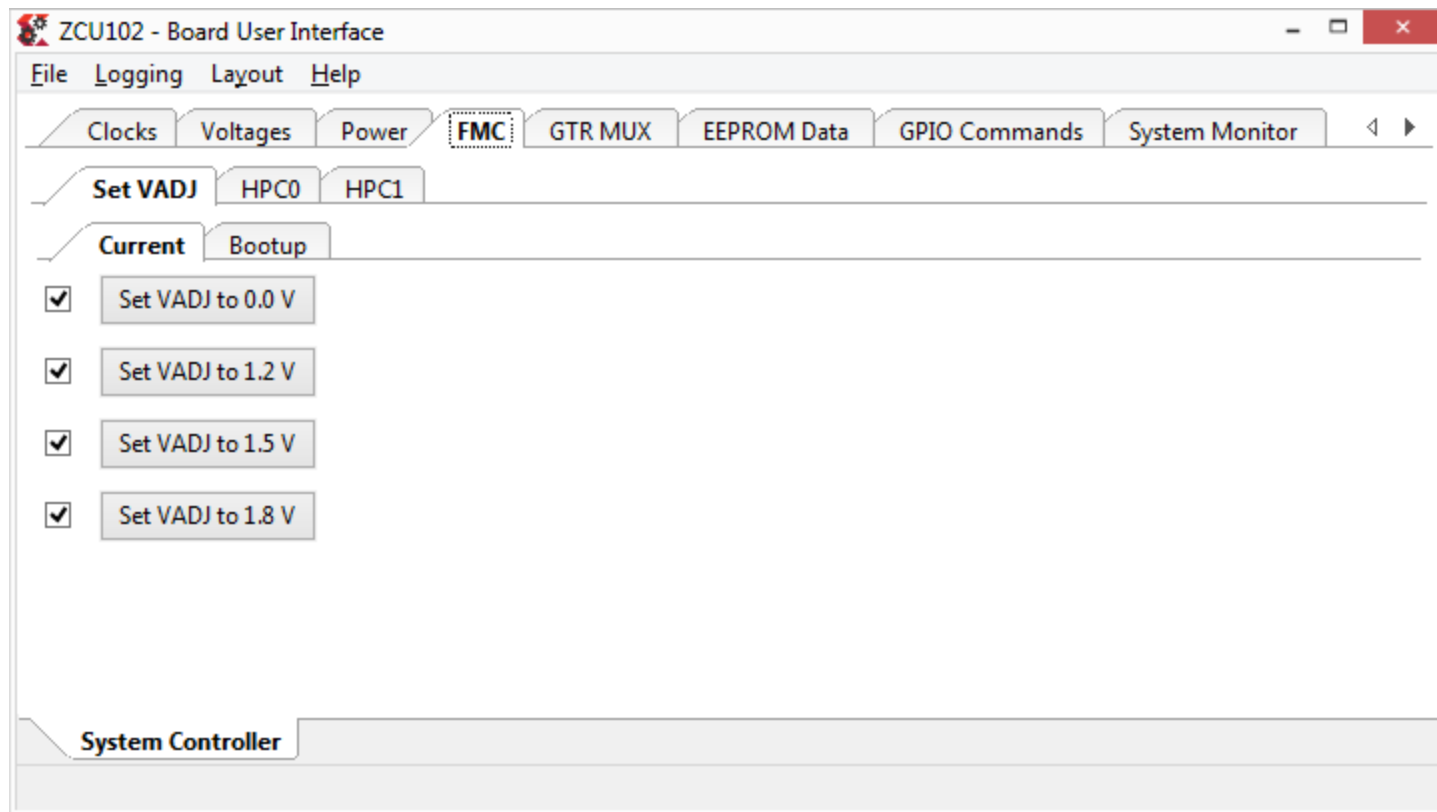
Power Domain	Power	Voltage	Current
VCCINT	0.03 Watts	0.85 Volts	0.03 Amps
VCCBRAM	0.02 Watts	0.85 Volts	0.02 Amps
VCCAUX	0.67 Watts	1.79 Volts	0.37 Amps
VCC1V2	0.08 Watts	1.20 Volts	0.06 Amps
VCC3V3	0.03 Watts	3.30 Volts	0.01 Amps
VADJ_FMC	0.01 Watts	1.80 Volts	0.01 Amps
MGTAVCC	0.01 Watts	0.90 Volts	0.01 Amps
MGTAVTT	0.01 Watts	1.20 Volts	0.00 Amps

FMC



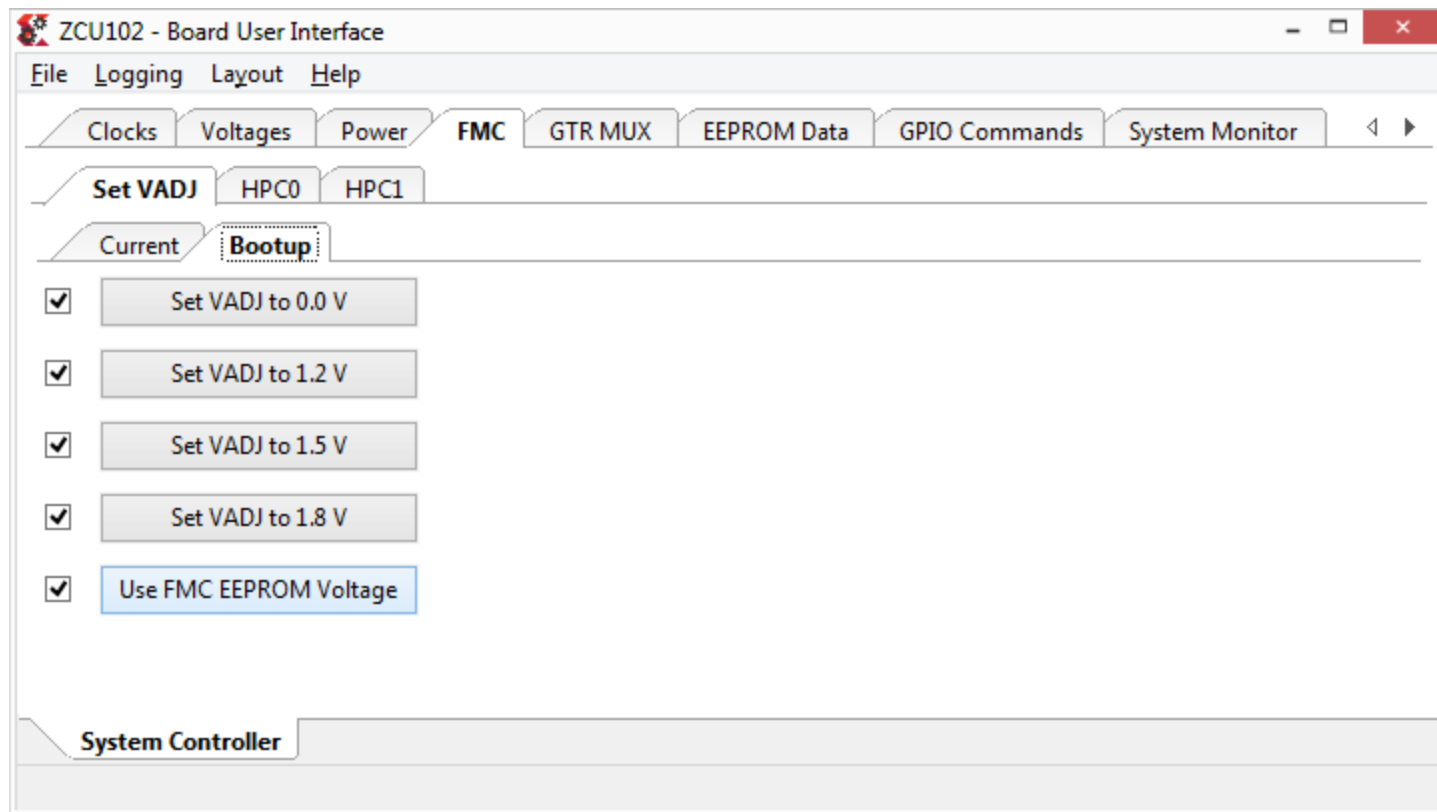
Set VADJ

- > Select the Set VADJ tab underneath the FMC tab
- > Under the Current tab, select the desired VADJ voltage
- > PL MIG requires a voltage (1.2 to 1.8V) to operate
- > BIT (XTP428) will force VADJ to 1.8 V for any test that needs VADJ



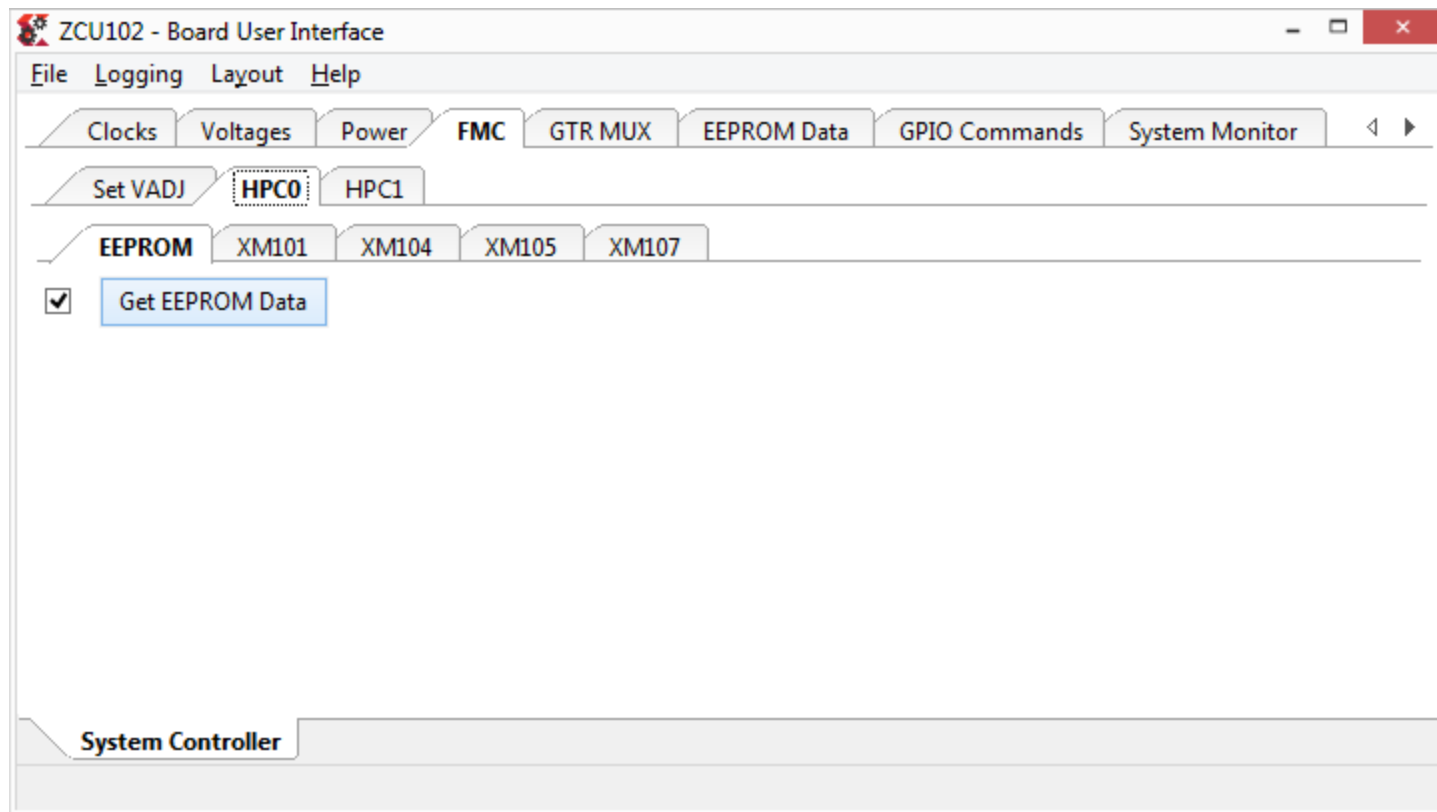
Set Boot-Up VADJ

- > Select the Boot-up tab and choose the desired power-on voltage
- > The default, Use FMC EEPROM Voltage, will set 1.8 V unless you attach an FMC card with a different setting



Reading FMC EEPROM

- > Select the HPC0 or HPC1 tab depending on which FMC slot your FMC card is attached to
- > Click the Get EEPROM Data button



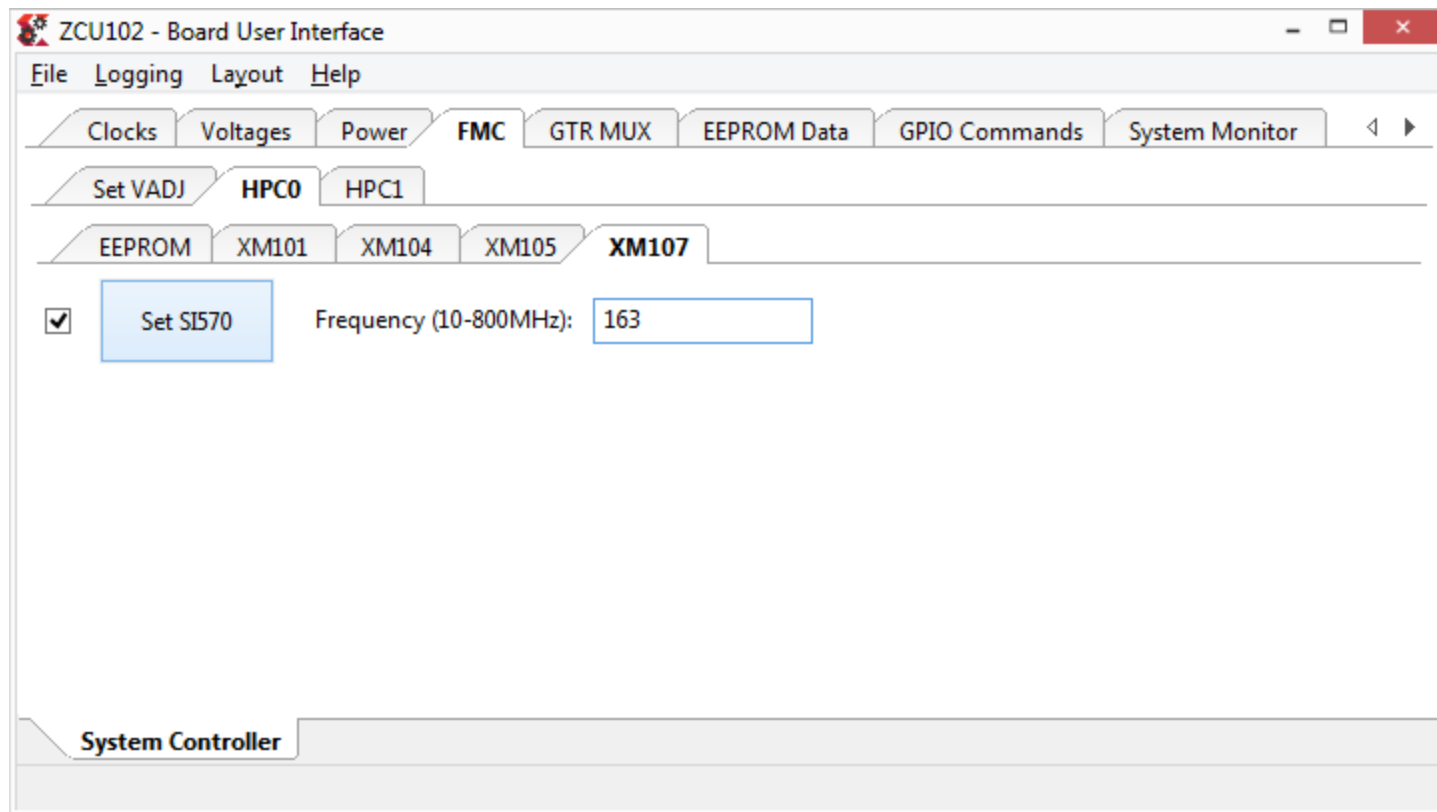
Reading FMC EEPROM

- > The EEPROM data will be displayed in a separate window (XM107 data shown)

```
data.dump - Simple Hexadecimal Viewer
01 00 00 01 00 08 00 f6 01 07 19 80 e1 7f ca 58 ████████████████████████████X
69 6c 69 6e 78 20 49 6e 63 c5 58 4d 31 30 37 c8 ilinx Inc████XM107██
30 30 30 30 2d 30 30 34 ce 48 57 2d 46 4d 43 2d 0000-004████HW-FMC-
58 4d 31 30 37 2d 47 00 c5 52 65 76 20 30 c1 e3 XM107-G████Rev 0███
fa 02 0b 70 89 a2 12 00 00 1c 74 2c 00 00 a0 80 █████p██████████t,██████
02 02 0d 30 bf 00 fa 00 6e 00 5e 01 32 00 00 00 █████0██████n^█2████
d0 07 02 02 0d 10 df 01 4a 01 3b 01 5e 01 32 00 ████████████████J█;█^█2█
00 00 d0 07 02 02 0d d9 16 02 b0 04 74 04 ec 04 ████████████████████████t████
32 00 00 00 d0 07 01 02 0d 82 6e 03 fa 00 6e 00 2██████████████████n████n█
5e 01 32 00 00 00 7e 04 01 02 0d fc f4 04 00 00 ^█2████~██████████████
00 00 00 00 00 00 00 00 00 00 01 82 0d fb 75 05 ████████████████████████u█
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Setting FMC HPC clocks

- > With an optional XM107 FMC card attached, select the XM107 tab
- > For the IBERT FMC testing, set 163, and click the Set SI570 button

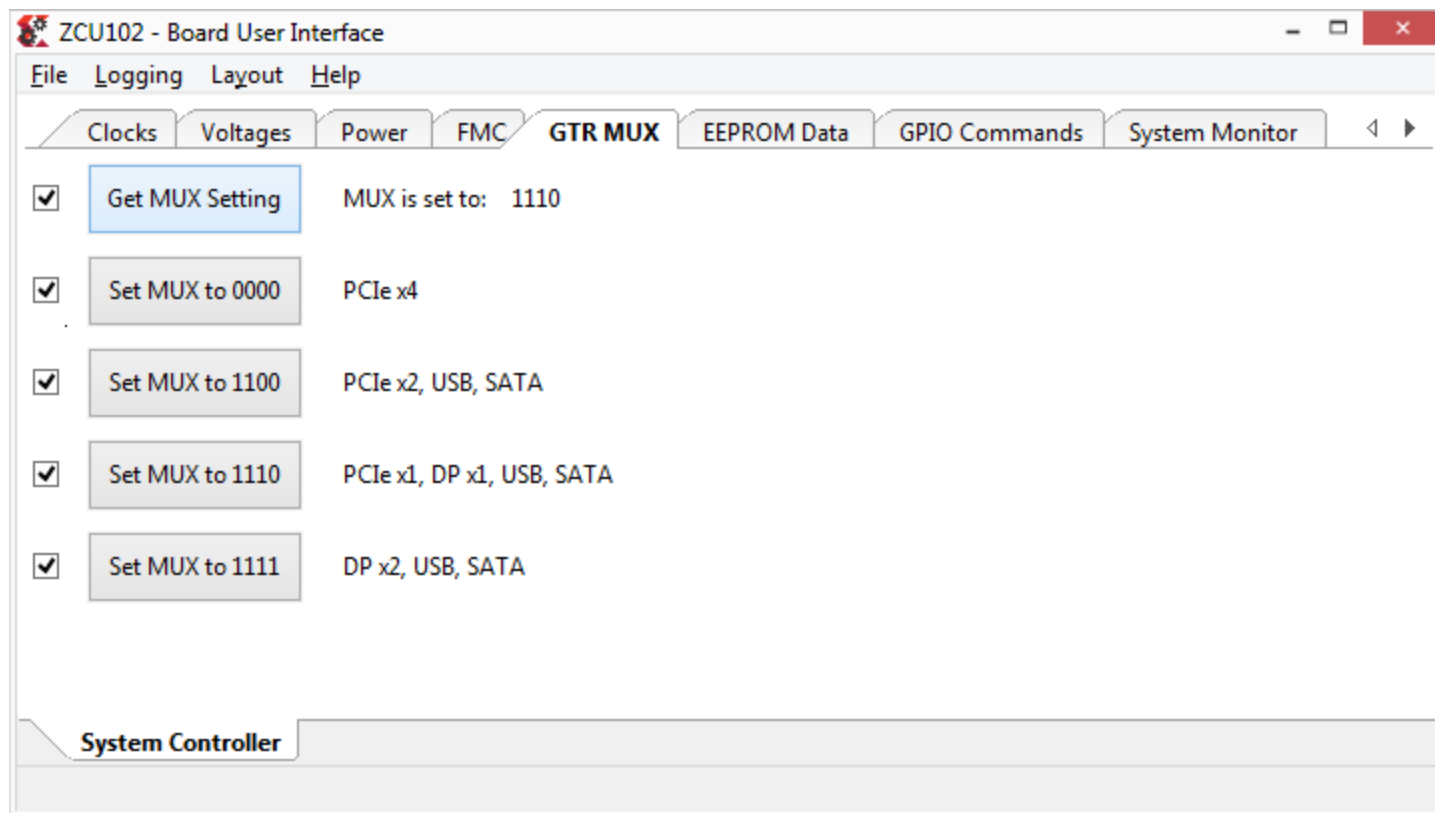


GTR MUX



Set GTR MUX

- > Select the GTR MUX tab
- > Click the corresponding button for the desired setting

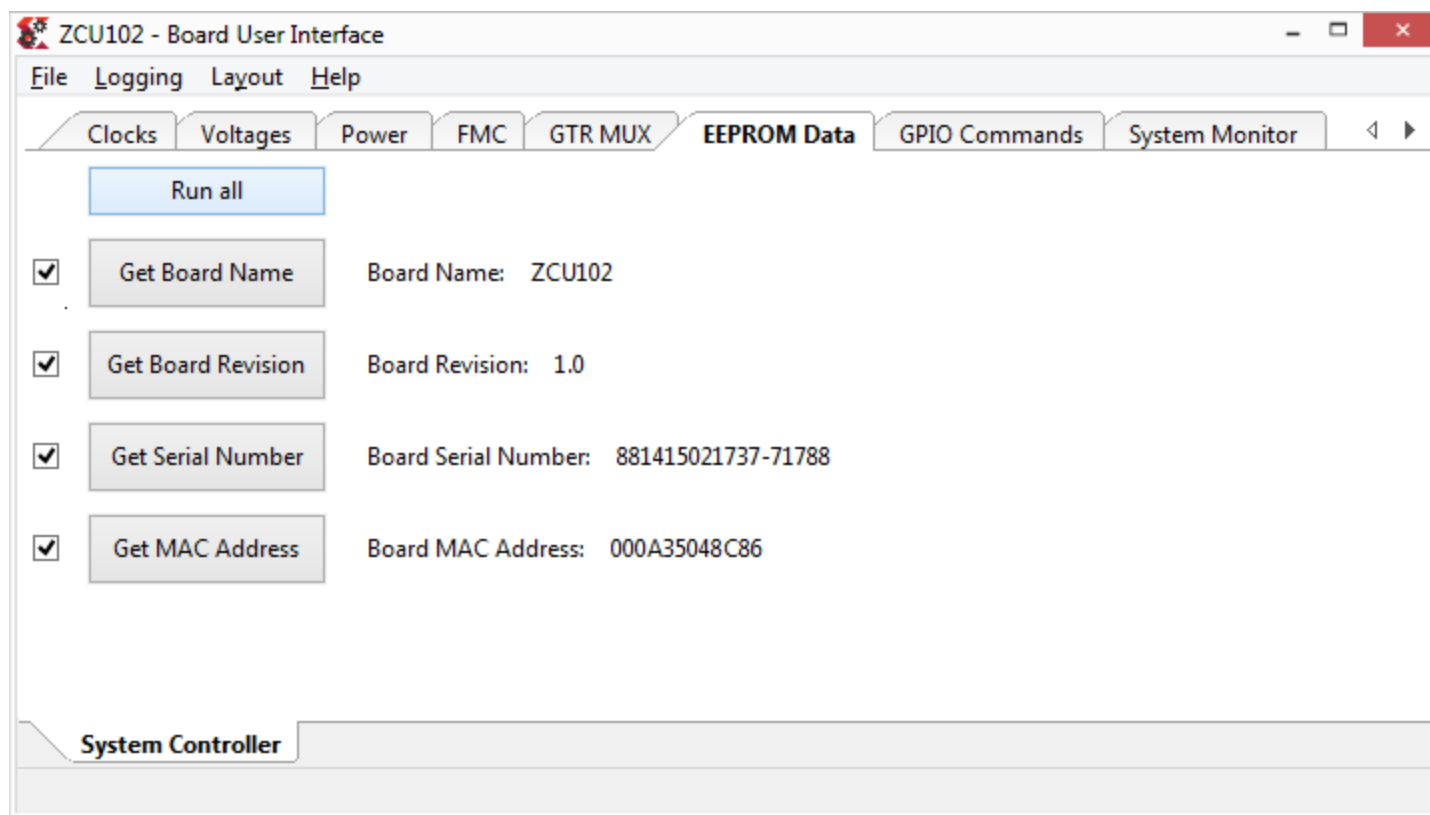


EEPROM Data



Reading the Board EEPROM Data

- > Select the EEPROM Data tab
- > Click the Get All EEPROM Data button

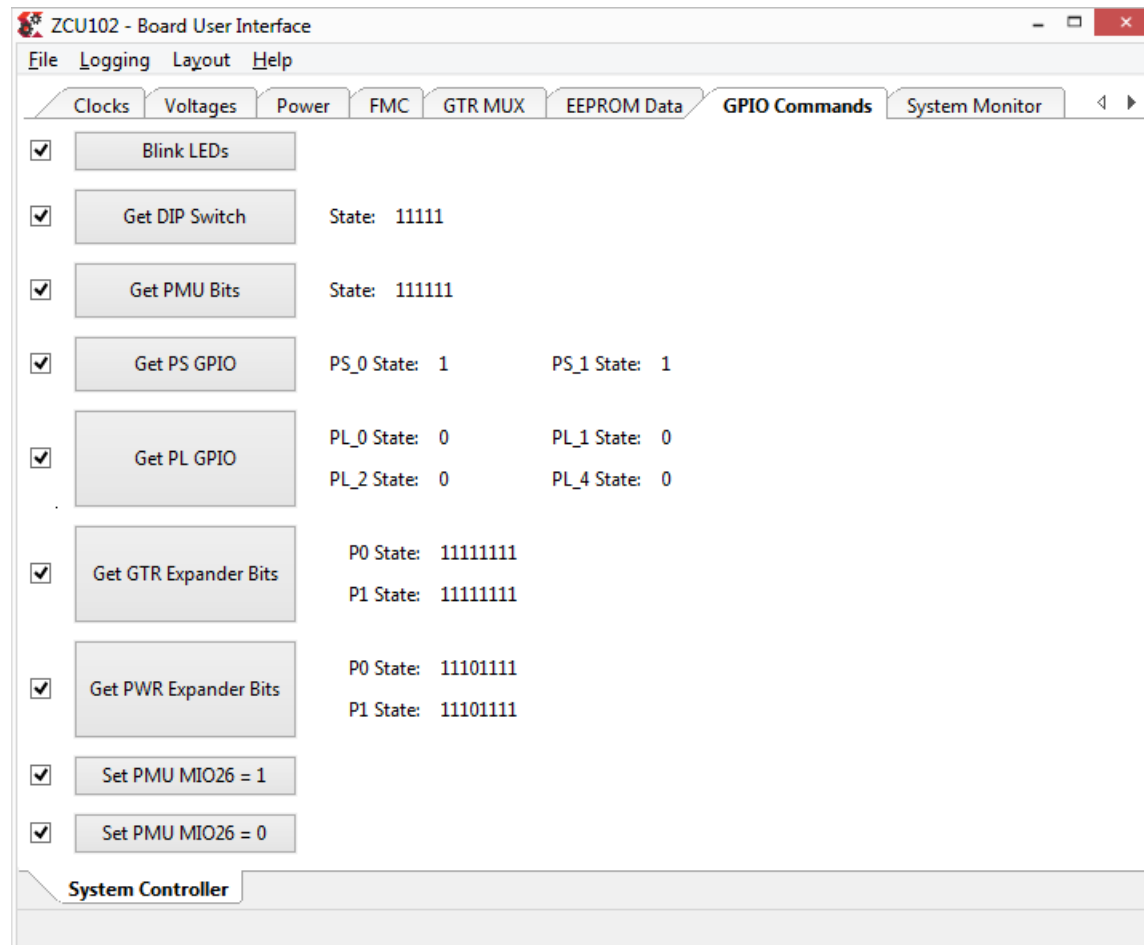


GPIO Commands



Set GPIOs

- > Select the GPIO Commands tab
- > Click the button for the operation you would like to perform.



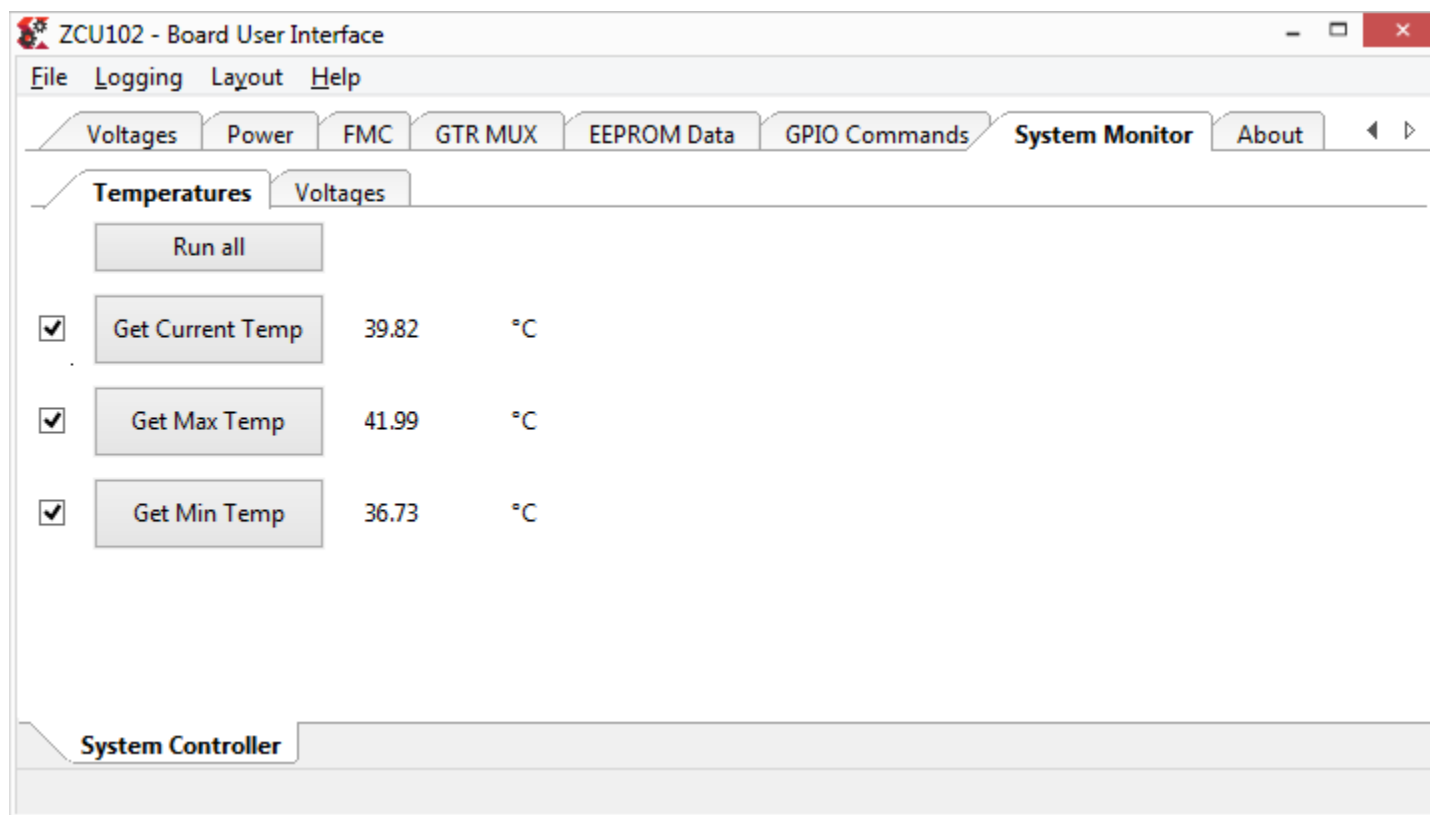
Note: Presentation applies to the ZCU102

System Monitor



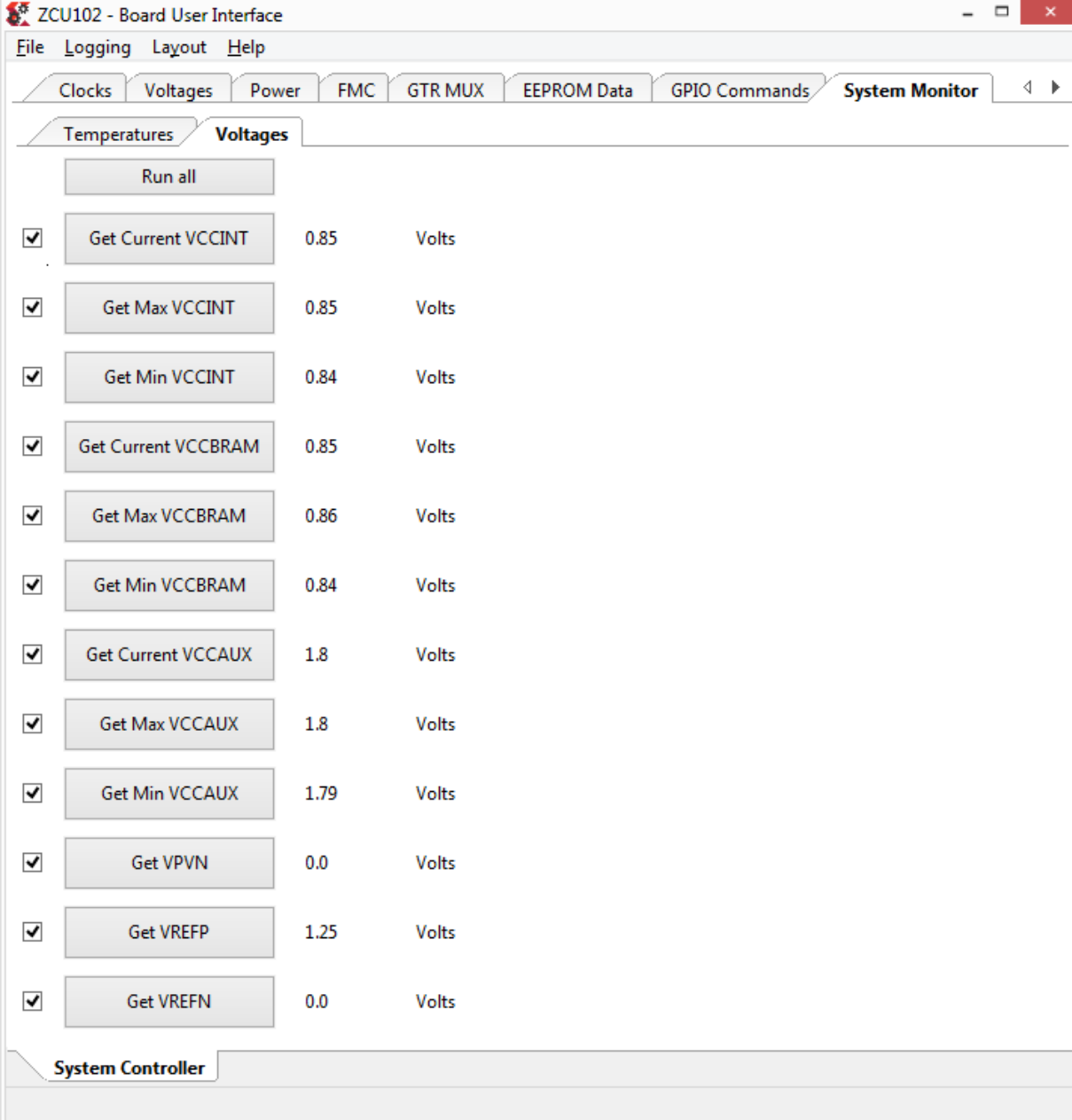
Reading the FPGA System Monitor Temperatures

- > This test requires a bitstream with System Monitor; you can use the BIST bitstream from the QSPI – see XTP434 for details
- > Select Temperatures tab under the System Monitor tab and click Run all



Reading the FPGA System Monitor Voltages

- > This test requires a bitstream with System Monitor; you can use the BIST bitstream from the QSPI – see XTP434 for details
- > Select the System Monitor tab
- > Click Run All and observe the readings



The screenshot shows the ZCU102 Board User Interface with the System Monitor tab selected. The interface displays a list of voltage readings for various power rails, including VCCINT, VCCBRAM, VCCAUX, VPVN, VREFP, and VREFN. Each reading is accompanied by a checkbox and a 'Run all' button. The 'Run all' button is located at the top of the list. The 'System Controller' tab is visible at the bottom of the interface.

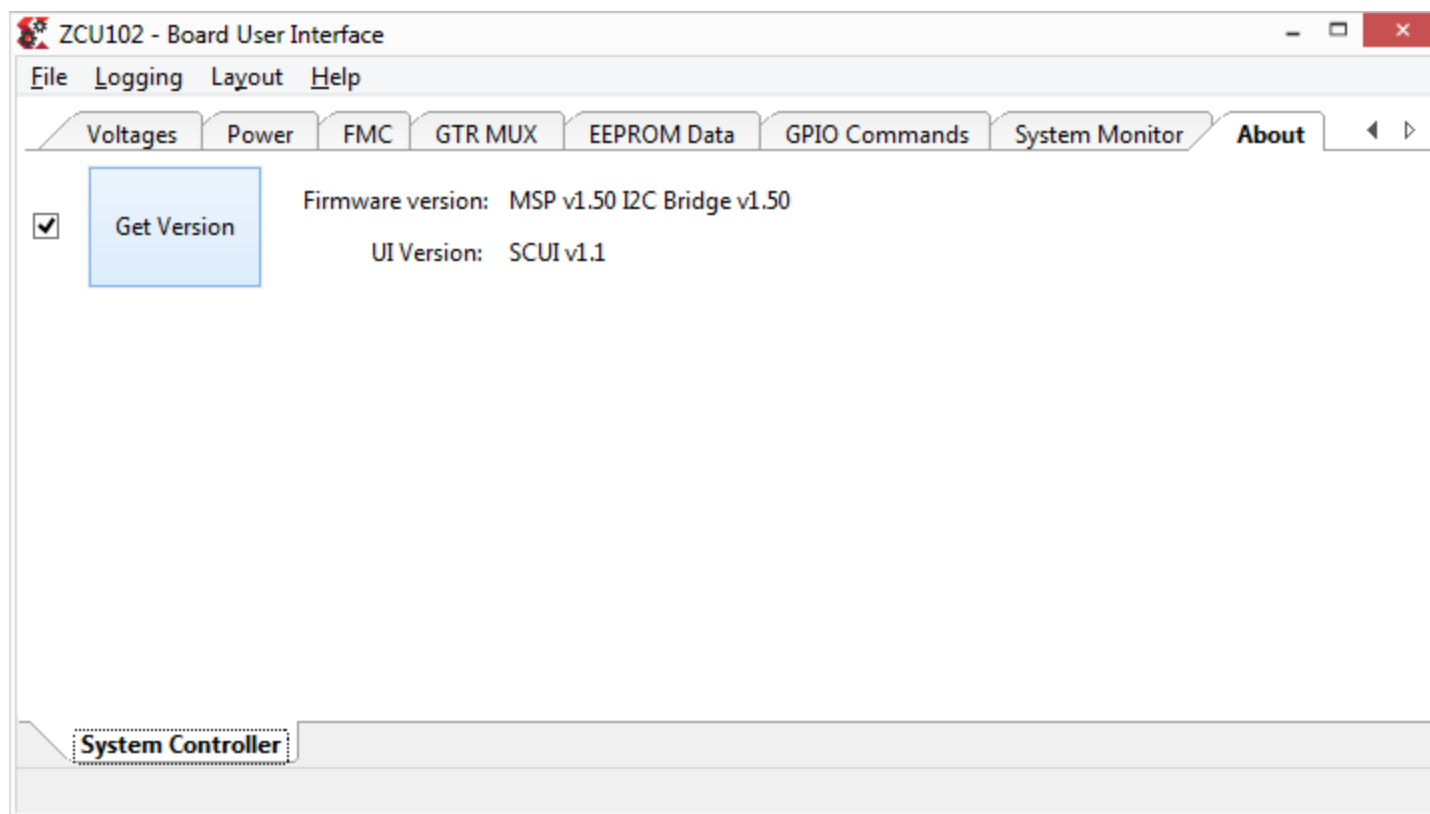
Checkbox	Button Label	Value	Unit
<input type="checkbox"/>	Run all		
<input checked="" type="checkbox"/>	Get Current VCCINT	0.85	Volts
<input checked="" type="checkbox"/>	Get Max VCCINT	0.85	Volts
<input checked="" type="checkbox"/>	Get Min VCCINT	0.84	Volts
<input checked="" type="checkbox"/>	Get Current VCCBRAM	0.85	Volts
<input checked="" type="checkbox"/>	Get Max VCCBRAM	0.86	Volts
<input checked="" type="checkbox"/>	Get Min VCCBRAM	0.84	Volts
<input checked="" type="checkbox"/>	Get Current VCCAUX	1.8	Volts
<input checked="" type="checkbox"/>	Get Max VCCAUX	1.8	Volts
<input checked="" type="checkbox"/>	Get Min VCCAUX	1.79	Volts
<input checked="" type="checkbox"/>	Get VPVN	0.0	Volts
<input checked="" type="checkbox"/>	Get VREFP	1.25	Volts
<input checked="" type="checkbox"/>	Get VREFN	0.0	Volts

About



Reading version information

- > Select the About tab
- > Click the Get Version button to get MSP430 Firmware version

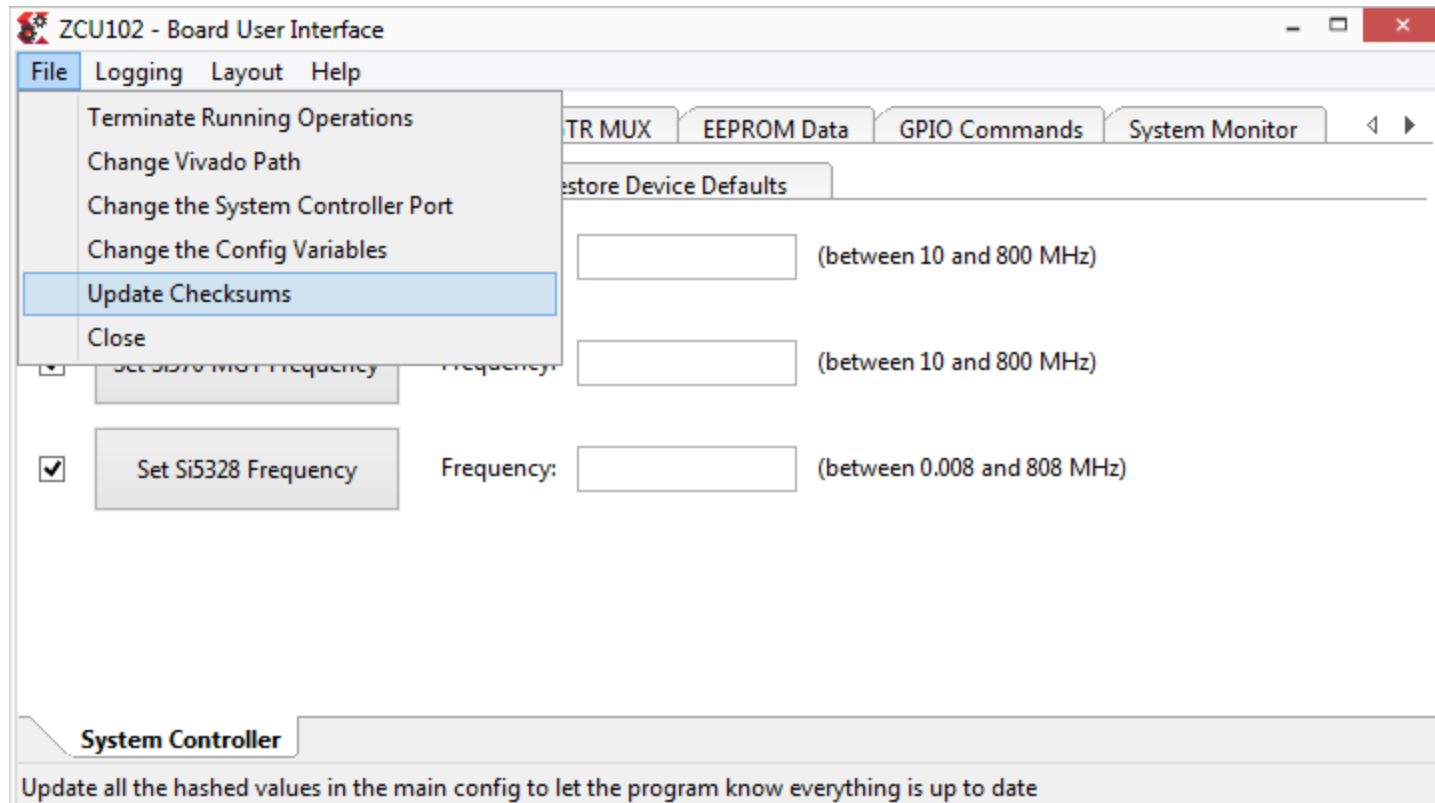
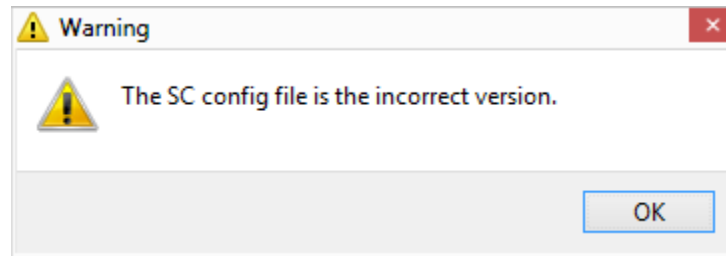


File Changes



File changes

- > If you make changes some of the *.yaml files, you may get this warning. Select Update Checksums and restart GUI to resolve.



References



References

> Vivado Release Notes

- >> Vivado Design Suite User Guide - Release Notes – UG973
 - https://www.xilinx.com/support/documentation/sw_manuals/xilinx2019_1/ug973-vivado-release-notes-install-license.pdf
- >> Vivado Design Suite 2019 - Vivado Known Issues
 - <https://www.xilinx.com/support/answers/72162.html>

> Vivado Programming and Debugging

- >> Vivado Design Suite Programming and Debugging User Guide – UG908
 - https://www.xilinx.com/support/documentation/sw_manuals/xilinx2019_1/ug908-vivado-programming-debugging.pdf

Documentation



Documentation

> Zynq UltraScale+

>> Zynq UltraScale+ MPSoC

- <http://www.xilinx.com/products/silicon-devices/soc/zynq-ultrascale-mpsoc.html>

> ZCU102 Documentation

>> Xilinx Zynq UltraScale+ MPSoC ZCU102 Evaluation Kit

- <https://www.xilinx.com/products/boards-and-kits/ek-u1-zcu102-g.html>

>> ZCU102 Board User Guide – UG1182

- https://www.xilinx.com/support/documentation/boards_and_kits/zcu102/ug1182-zcu102-eval-bd.pdf

>> ZCU102 Evaluation Kit Quick Start Guide User Guide – XTP426

- https://www.xilinx.com/support/documentation/boards_and_kits/zcu102/xtp426-zcu102-quickstart.pdf

>> ZCU102 - Known Issues Master Answer Record

- <https://www.xilinx.com/support/answers/66752.html>