Application Note

How to Configure the DS320PR810 Using SigCon Architect

ABSTRACT

Welcome to the Falcon SigCon Architect User's Guide. This document explains how to configure your DS320PR810 redriver using the user-friendly GUI.

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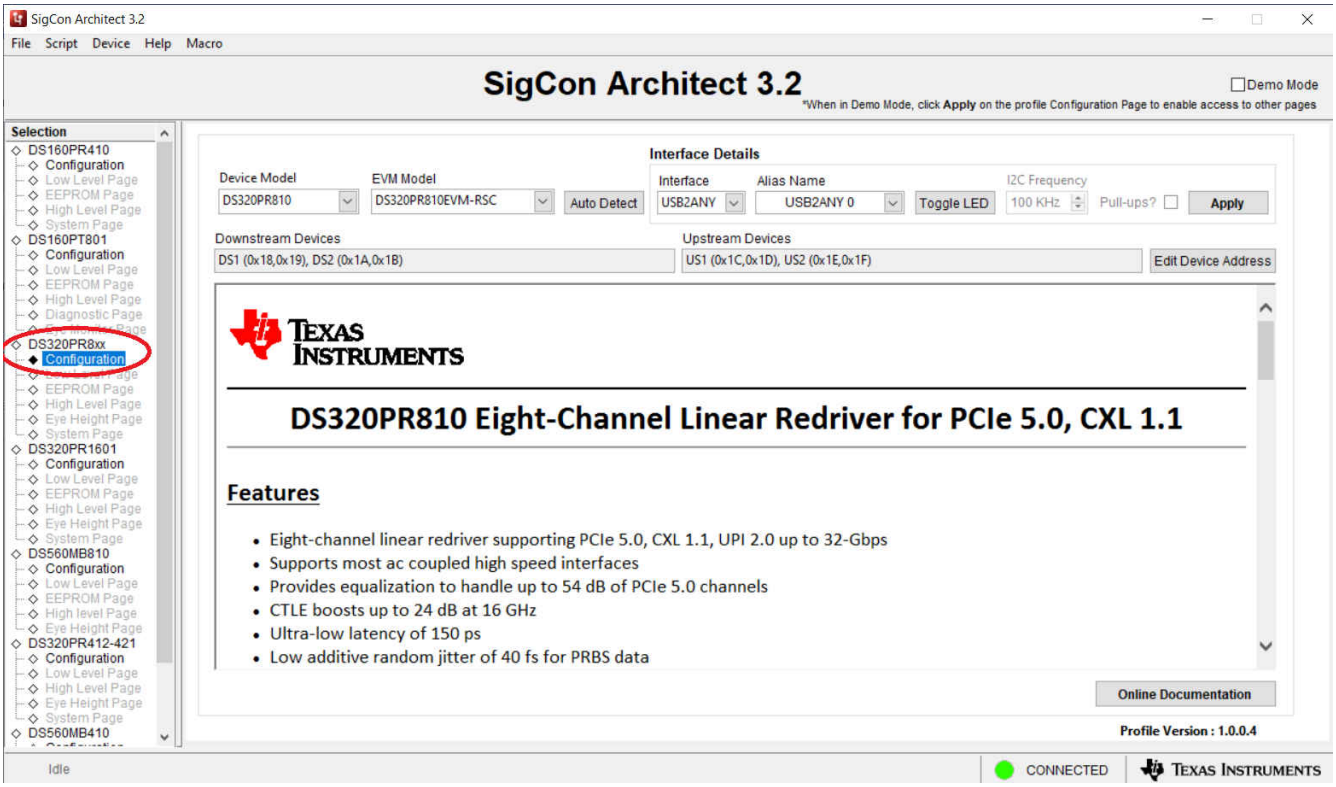
Trademarks

1 Getting Started

1. Download and install SigCon Architect. Follow the steps in the SigCon Architect: Installation and Starter's Guide for detailed instructions.
2. Download and install the DS320PR810 Profile Updater.
3. Connect a USB2ANY Interface Adapter or Aardvark I2C Host Adapter to the desired DS320PR810 and PC.
4. Open SigCon Architect and click the *Configuration* tab below the DS320PR8xx profile on the left, as shown below.



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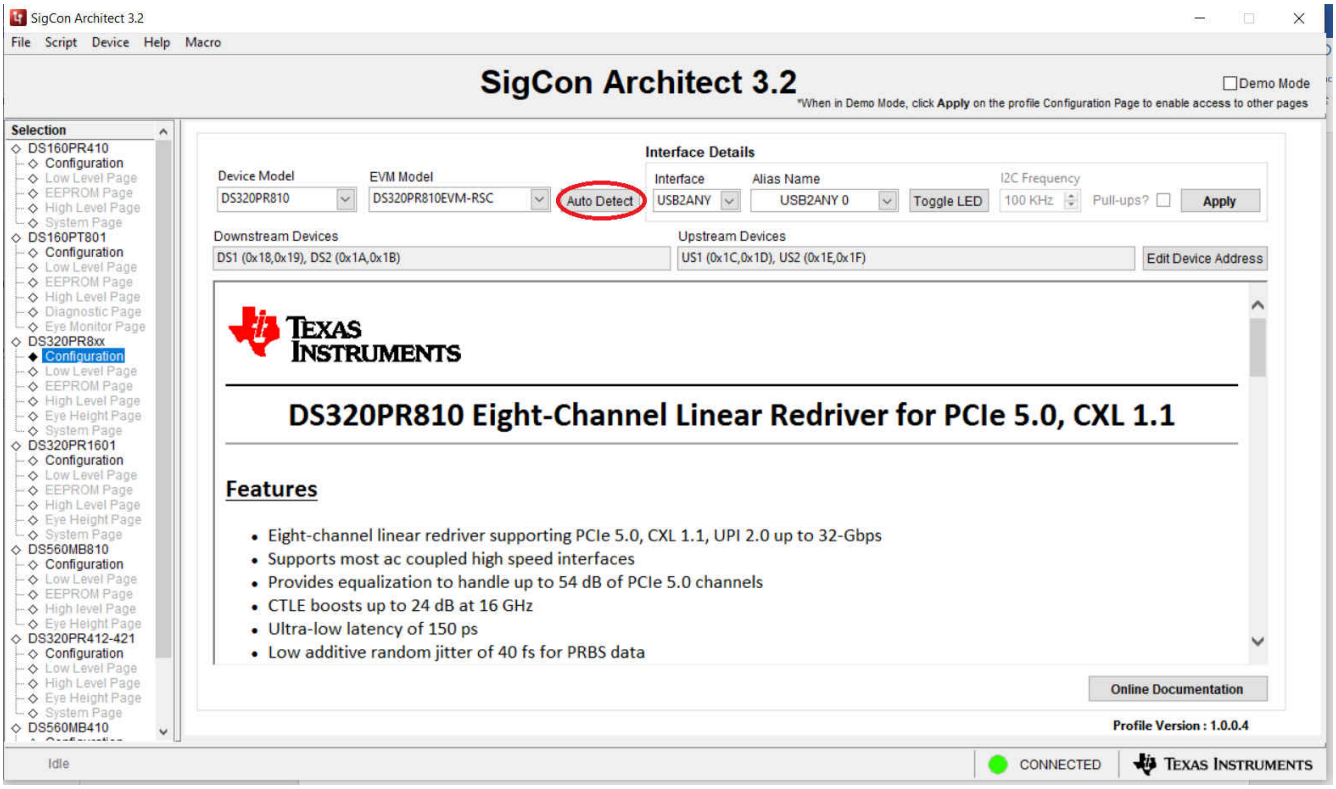
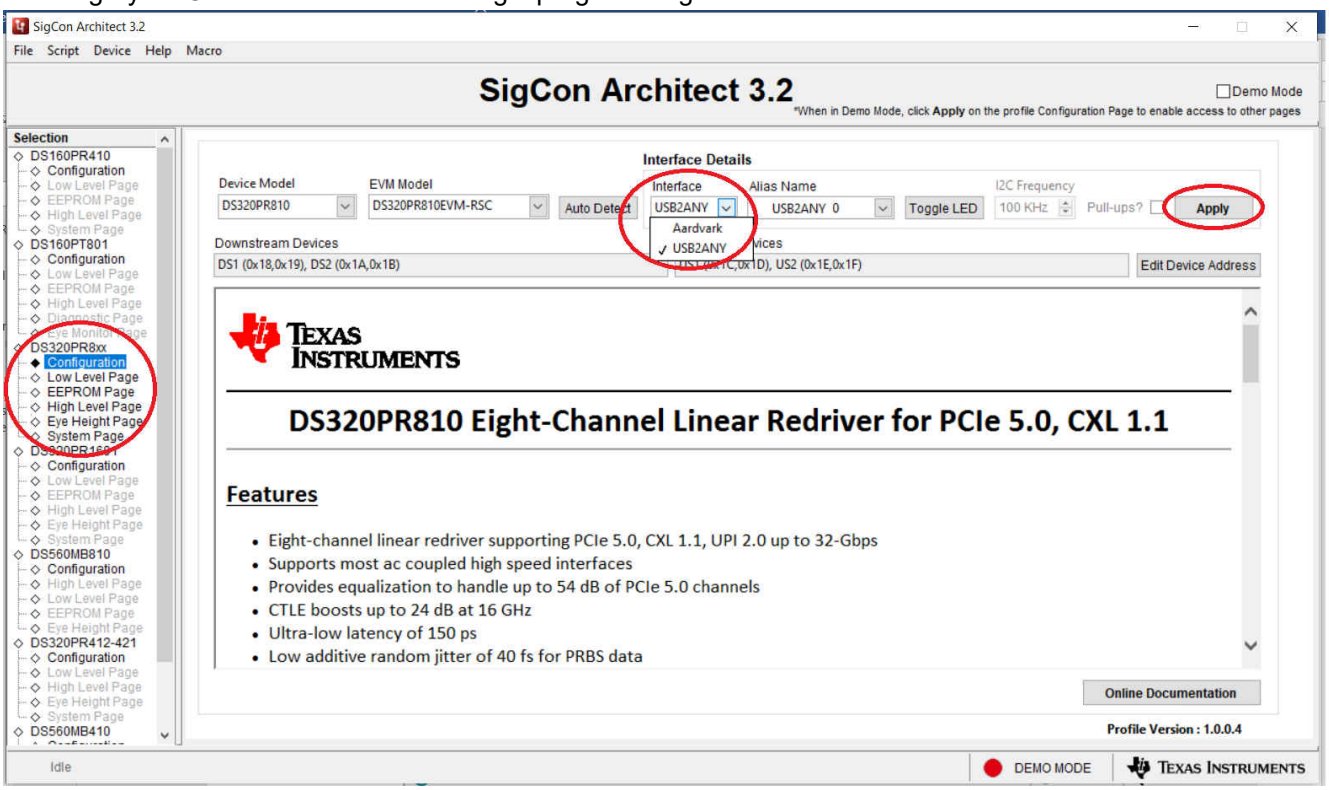
5. Click the *Auto Detect* button to detect the device and SMbus addresses.



6. Ensure the correct interface adapter is selected below the interface drop-down menu (USB2ANY or Aardvark). Then click *Apply*. The user will see the other tabs under the DS320PR8xx profile become un-greyed. Click the desired tab to begin programming the device.

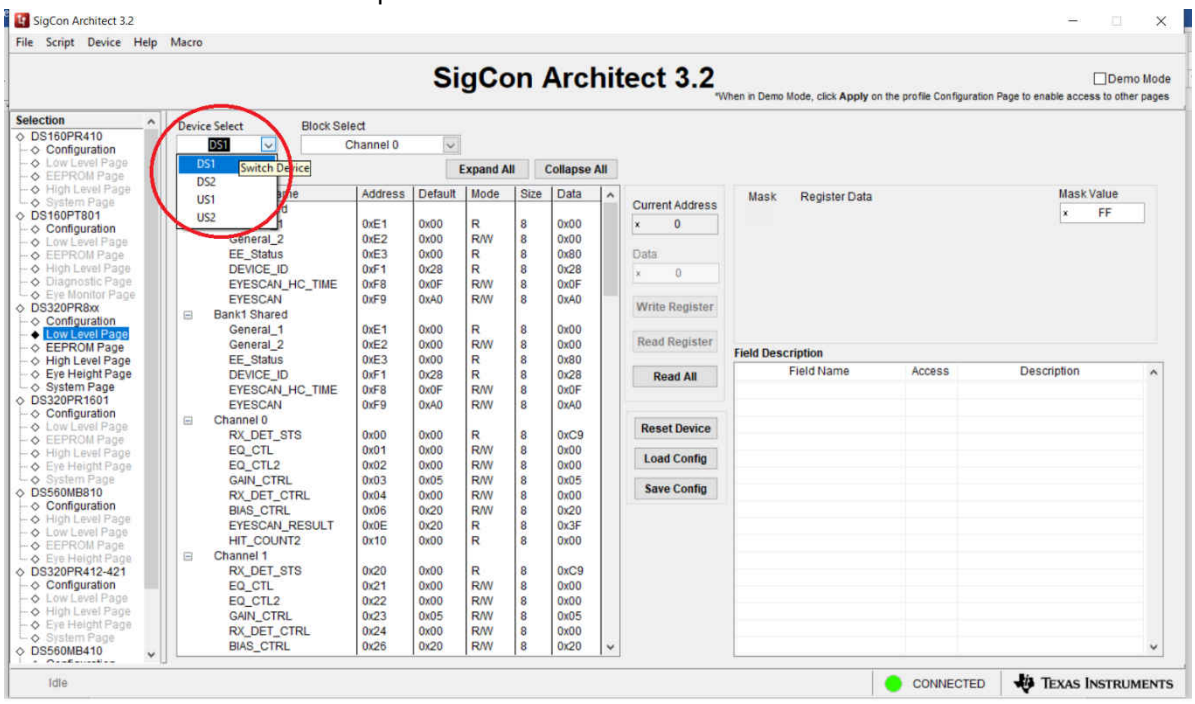


7. Descriptions of each tab is listed below:
   a. Low Level Page: Individual register access to the lowest level of the device. Can be used to change specific settings, or to verify changes from the high-level page have taken effect.

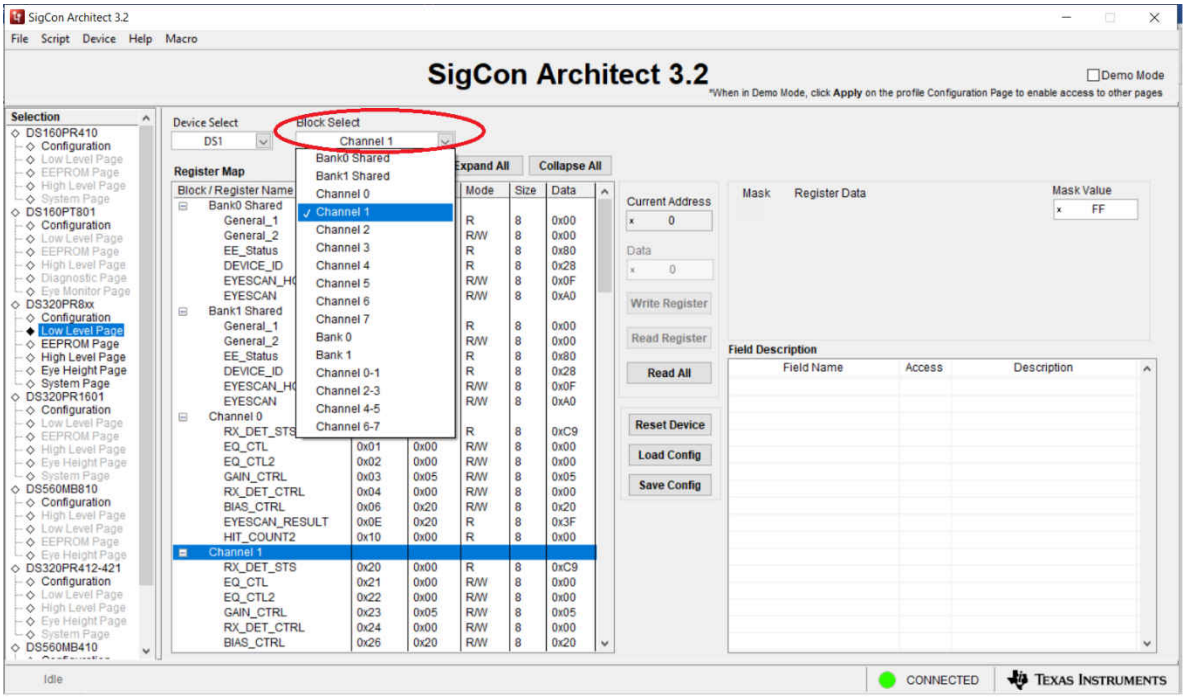
b. EEPROM Page: When in I2C primary mode, upon boot up the redriver will load the settings stored in its EEPROM. The user can configure those settings here.
c. High Level Page: Main page used to change EQ settings of the device and to see the active status of each channel
d. Eye Height Page: Performs a sweep of all CTLE settings for the desired channel and displays eye height for each settings. This can assist in choosing an optimal CTLE setting for your system.
e. System Page: Allows the user to input pre and post channel losses of their system, and provides a recommended CTLE index value for each PCIe transmitter preset.

2 Low Level Page

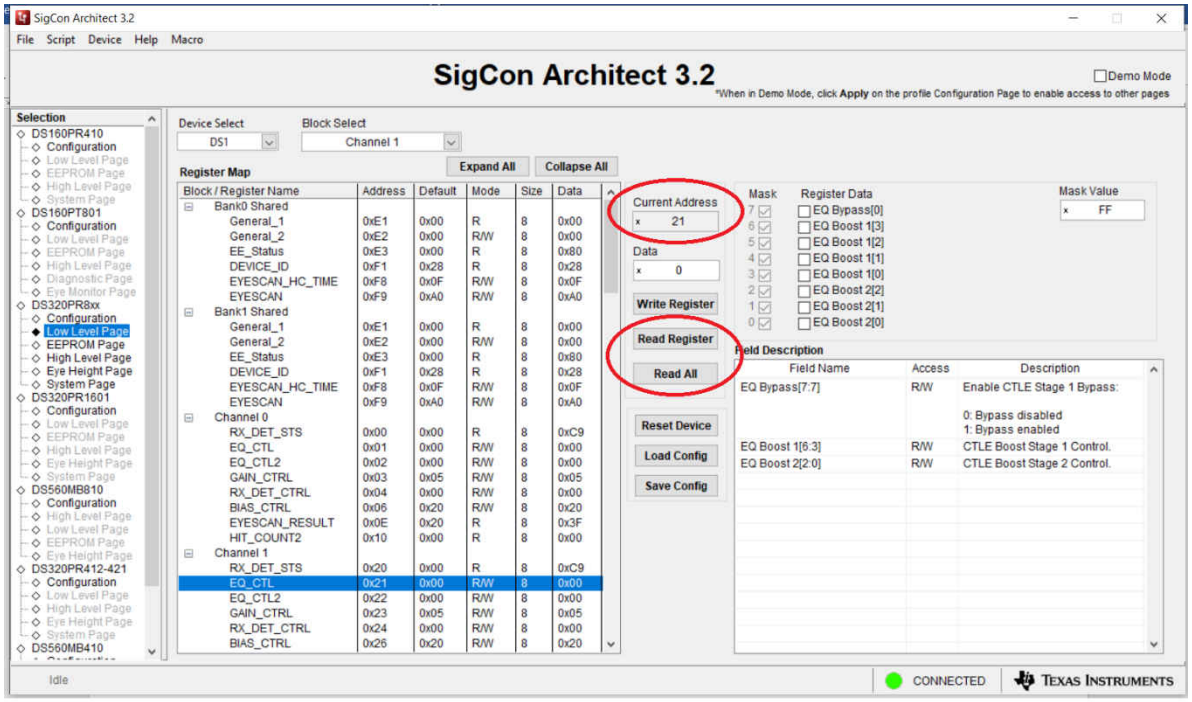
1. Use the *Device Select* drop-down menu to select which device you want to read or write to. The DS320PR810EVM includes two upstream and two downstream devices.



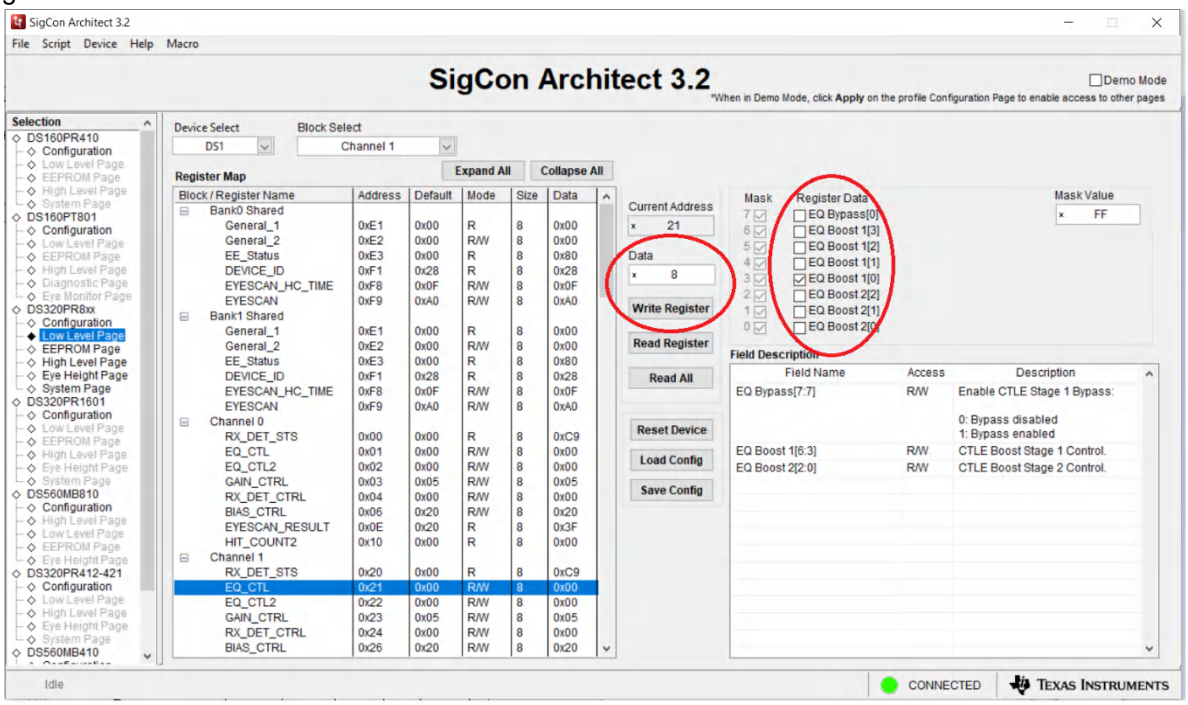
2. Once the device is selected, the complete register map appears in the table below. Use the *Block Select* drop-down menu to jump to the desired part of the table to view specific channels. Bank 0 includes channels 0-3 and Bank 1 includes channels 4-7.



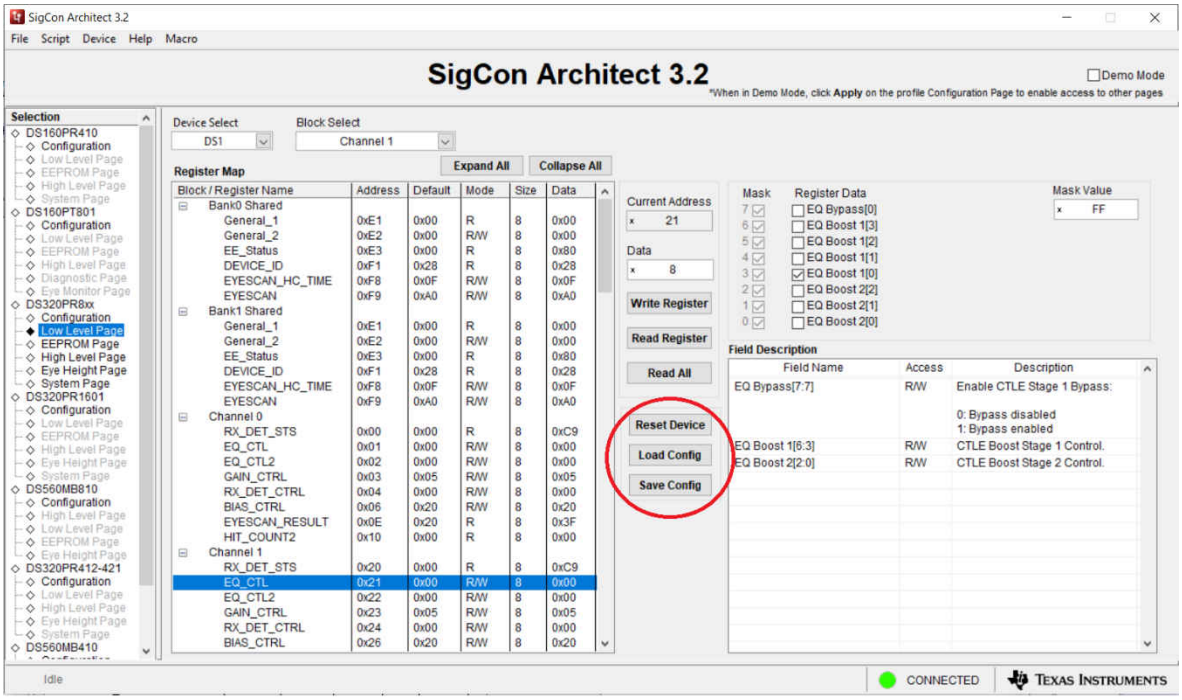
3. Click the *Read All* button to read the configuration of the entire device. Alternately, click on a specific register, and click the *Read Register* device to update the target register quicker. The current address field will automatically update with the highlighted register.



4. To write to the selected register, check or deselect the boxes in the *Register Data* field, or manually enter a hex value into the *Data* field. Then, click the *Write Register* button. To verify the change was made, click the *Read Register* button. Note the *Field Description* table describes the function of each bit in the highlighted register.



5. Use the *Save Config* and *Load Config* buttons to save the current configuration in a .cfg file, and load it back as needed. Click the *Reset Device* button to reset every setting to the default.

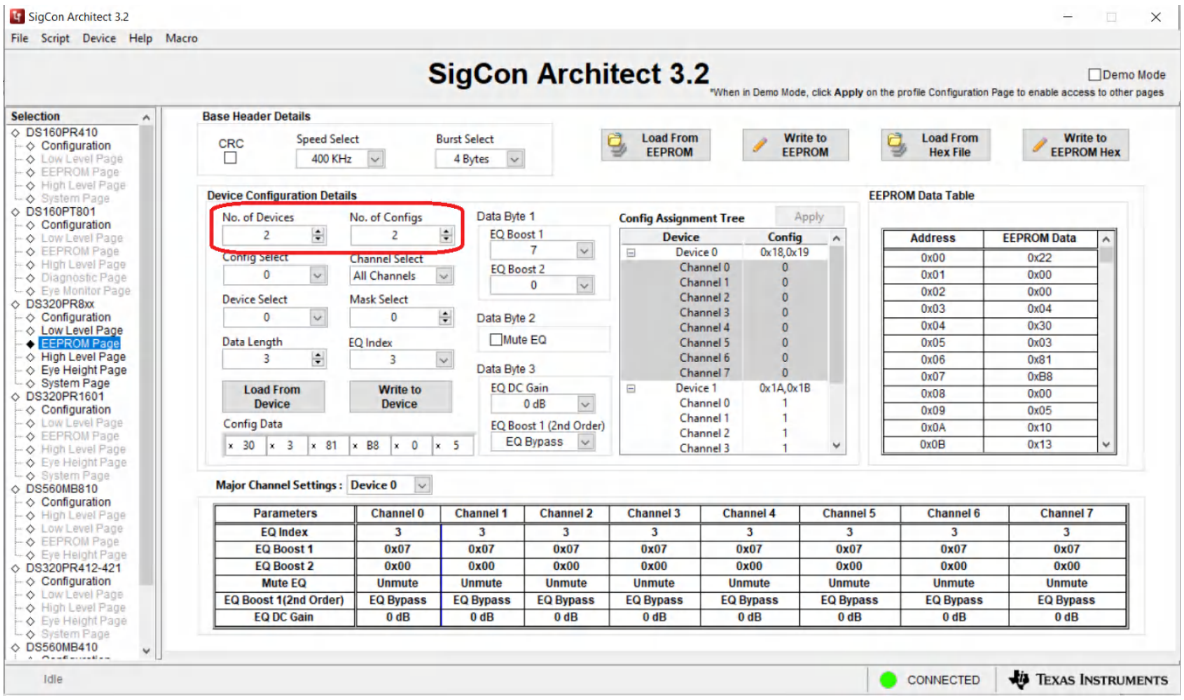


3 EEPROM Programming Page

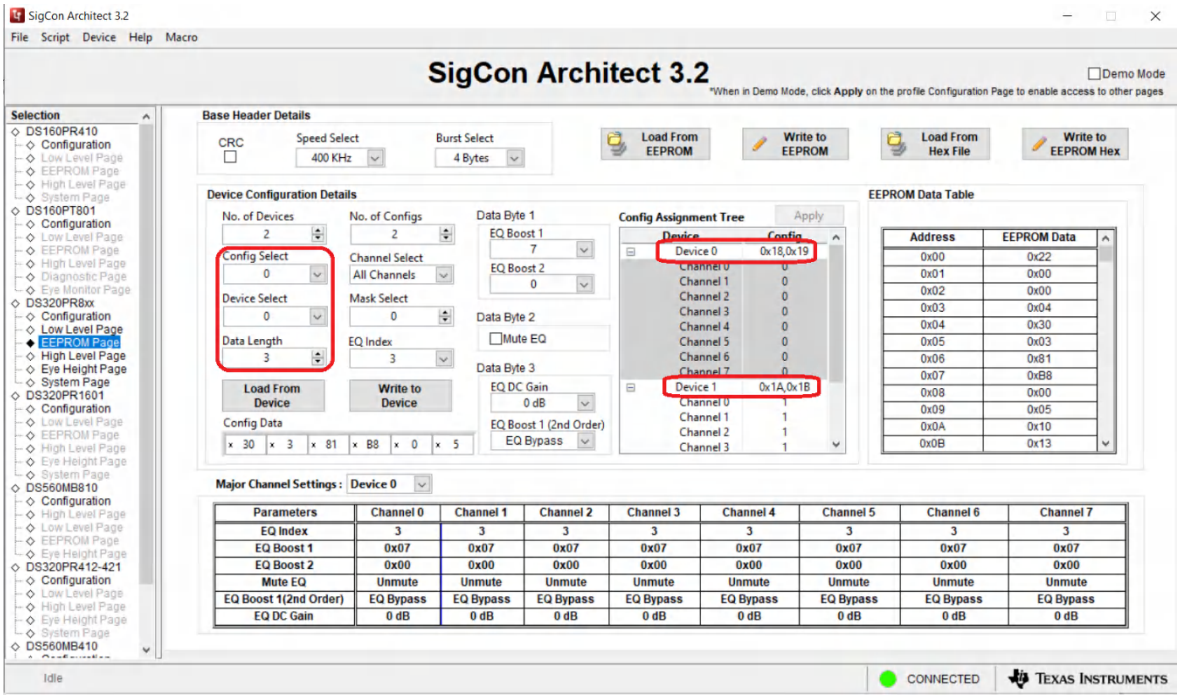
SigCon Architect can be used to generate an EEPROM file for a single redriver or multiple DS320PR810 redrivers. The below images provide an example.

In this example, two redrivers are present with different EQ index values (CTLE index 3 for device at address 0x18, 0x19 and CTLE index 7 for device at address 0x1A, 0x1B), for each device, the same value is used for every channel. For programming additional devices, increase the number of devices and configs as needed.

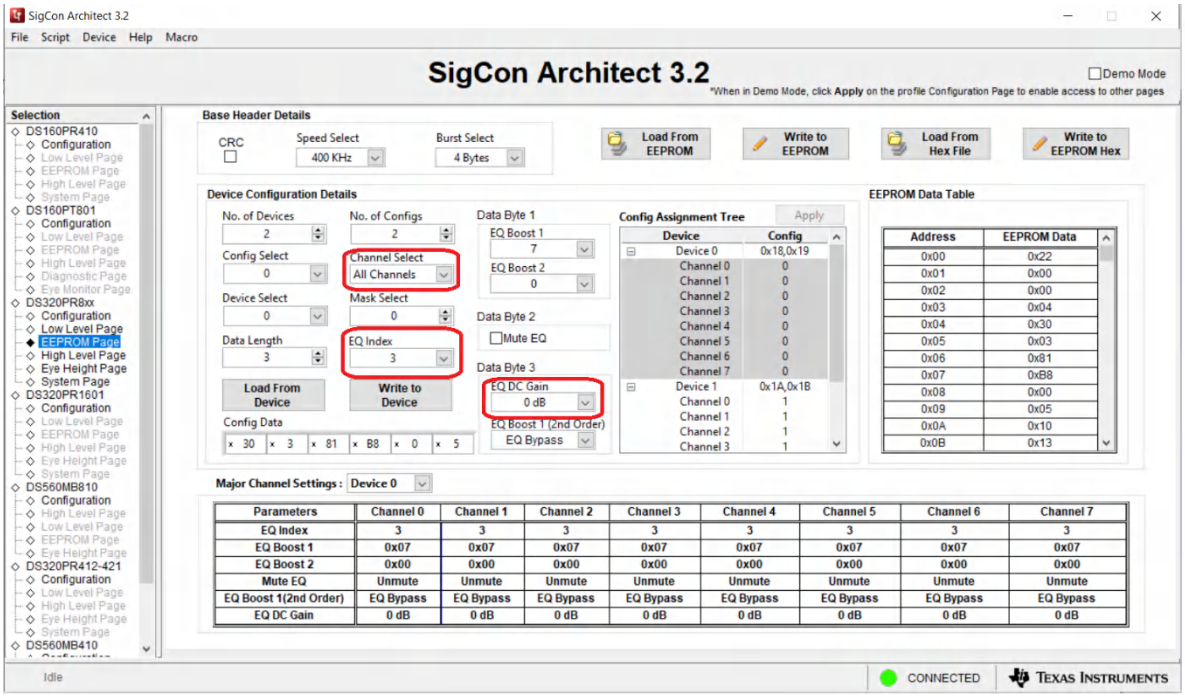
1. Multiple devices can be programmed at once. Select the number of devices and the number of configurations. Up to 16 different configurations can be created and assigned to each device and channel as needed.



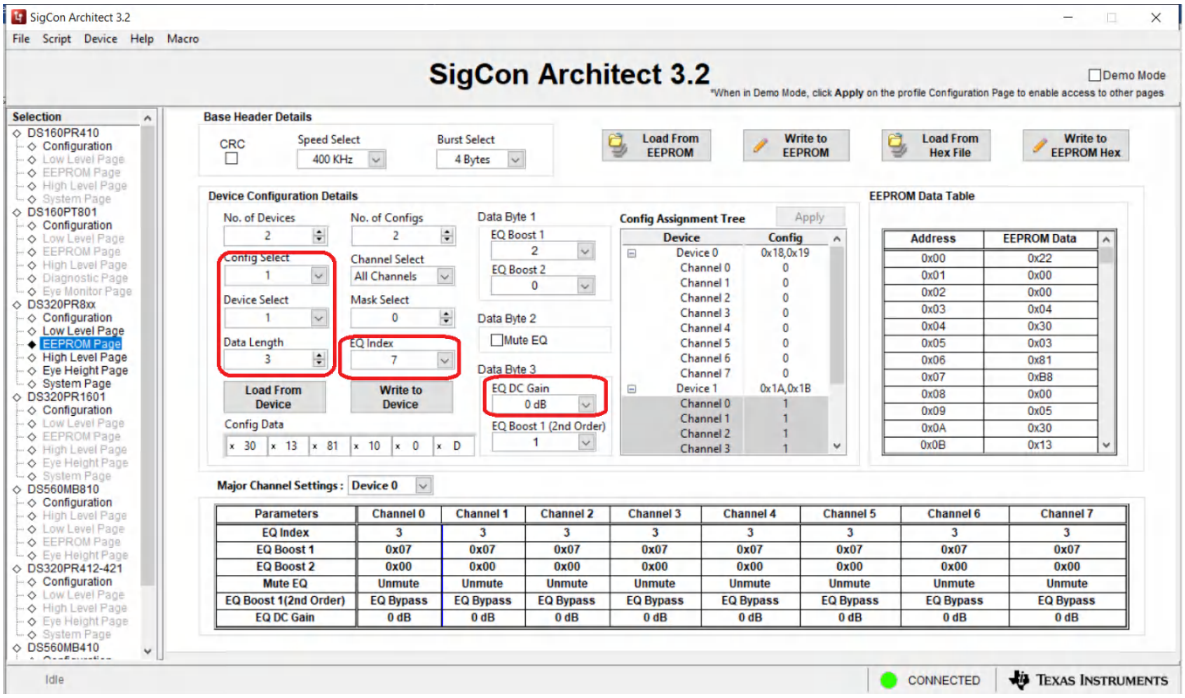
2. To program the first device, select configuration 0 and device 0 from the drop-down menu. Note the Config Assignment Tree shows the hex address of each device (0x18, 0x19 for device 0). Set the data length to 3 since 3 bytes are needed to program the DS320PR810.



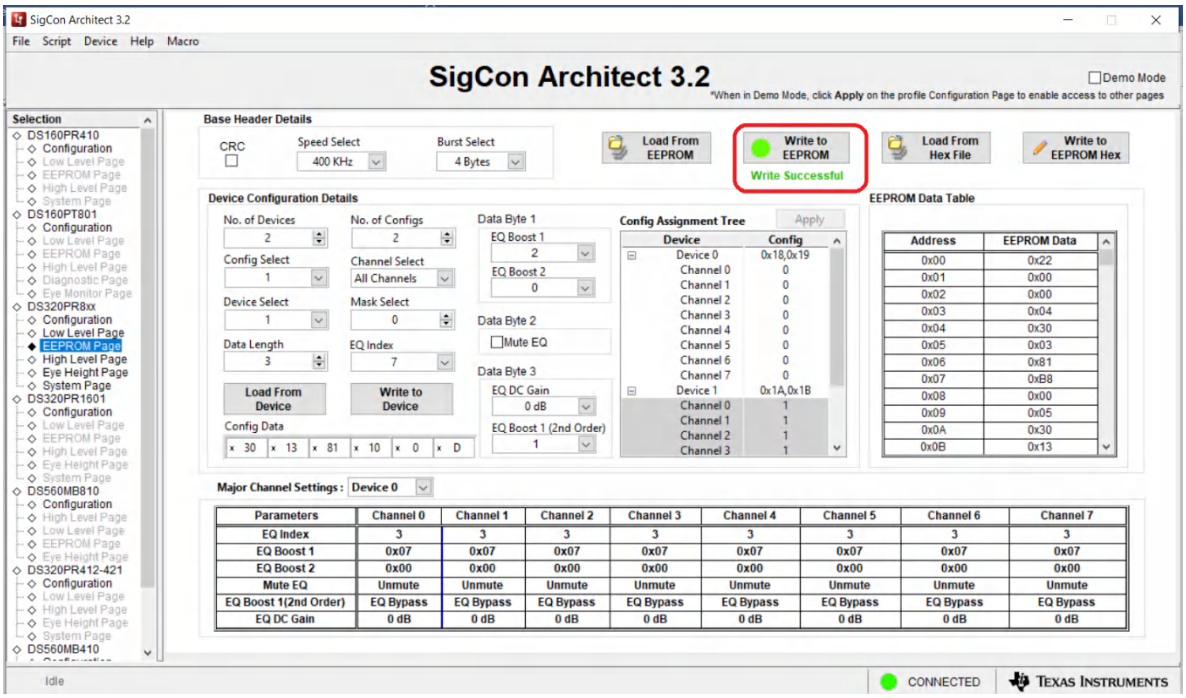
3. Select the desired channel, then choose an *EQ Index* from the drop-down menu. This will automatically adjust the EQ boost 1, EQ boost 2, and EQ Boost 1 (2nd Order) fields. Select the desired EQ DC gain. Note in the Config Assignment Tree that the desired channel of device 0 will be applied with configuration 0.



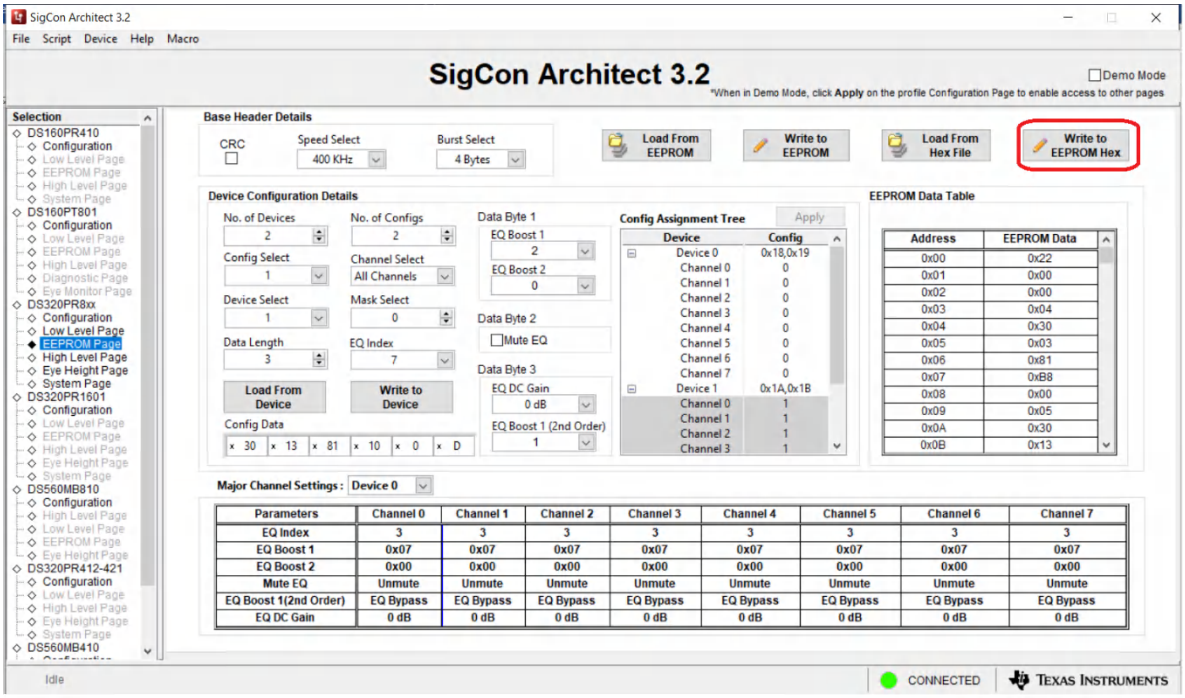
4. Switch to configuration 1 and device 1 in the drop-down menu, set the data length back to 3, and select the new EQ index, and DC gain. Notice the config assignment tree will update the device 1 channels as config 1.



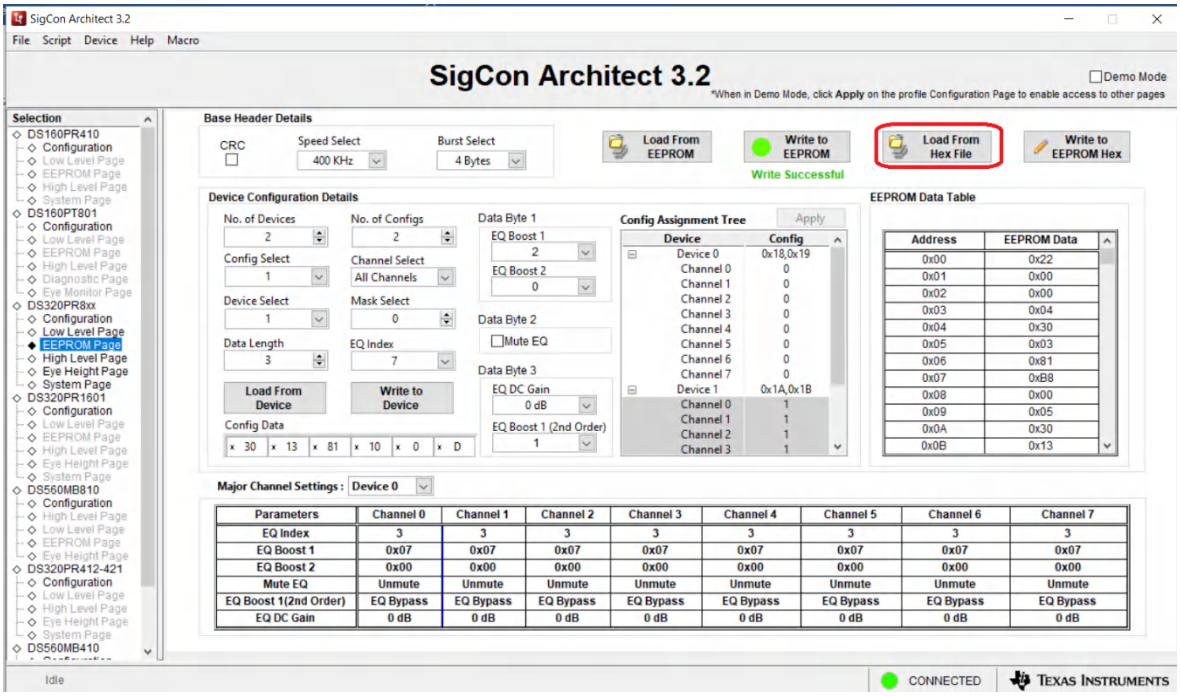
5. Once all devices have been configured, click the *Write to EEPROM* button to load the EEPROM with the new settings. The button will turn green when the write is completed.



6. To save these current EEPROM settings for later, click the *Write to EEPROM Hex* button to create a hex file with these settings. Save the hex file to the desired location.



7. To load the EEPROM settings back from the hex file, click the *Load from Hex File* button, select the hex file you saved, then click the *Write to EEPROM* button and wait for the green dot.



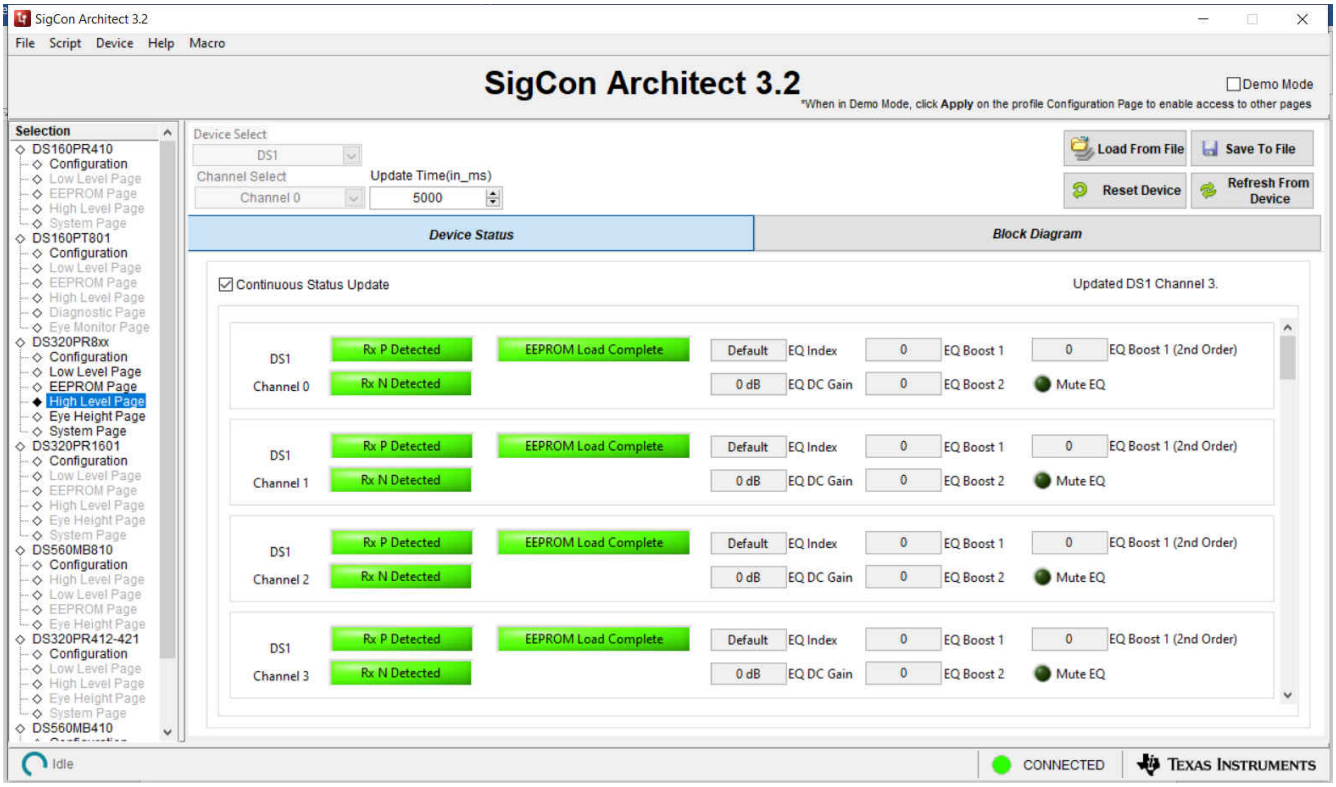
4 High Level Page

The DS320PR810 redriver features a continuous-time linear equalizer (CTLE) that applies high-frequency boost and low-frequency attenuation to help equalize the frequency-dependent insertion loss effects of a passive channel.

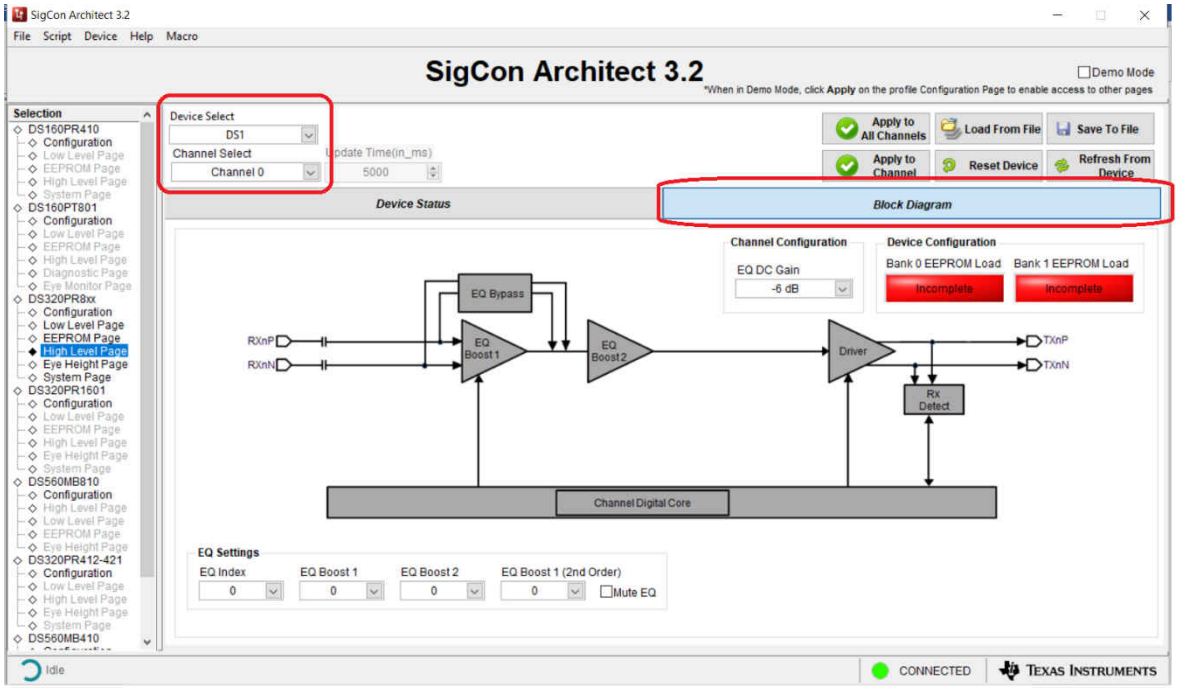
This page is used to quickly and easily adjust the CTLE settings as needed for your specific application. A further description of this feature is described in Section 7.3 of the DS320PR810 data sheet.

The high level page also contains a device status page which shows which channels are detecting a signal.

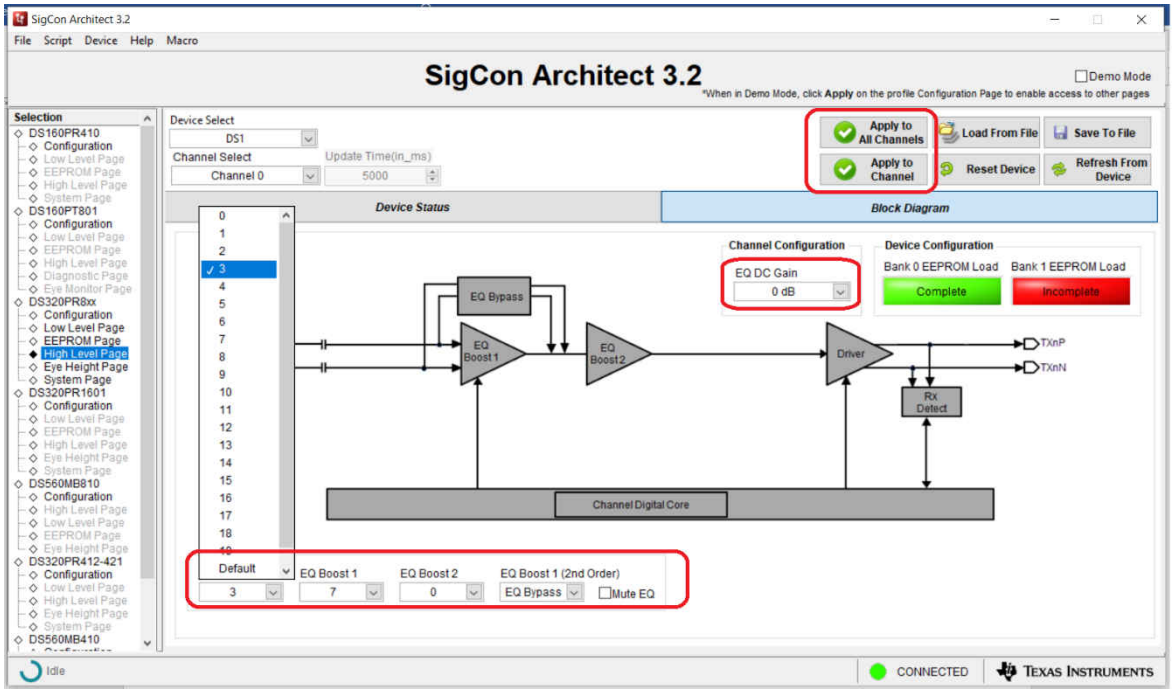
1. After clicking on the high level tab, the device status page will be shown. Each channel status will be updated sequentially, and appear green if a signal is detected and red if a signal is not detected. The current EQ settings will also be shown next to each channel.



2. Click on the *Block Diagram* tab to show the following screen. Here, we can adjust the EQ values for each channel. Select a device and channel from the drop-down menu.



3. Select the desired EQ settings and DC gain. The *EQ Index* drop-down menu is the easiest way to quickly adjust the amount of equalization applied. After selecting an Index value, the Boost 1, Boost2, and Boost 1 (second order) fields will automatically populate. The user can adjust each boost value for finer tuning as needed. Refer to table 7-1 of the DS320PR810 data sheet for more information. Click the *Apply to Channel* or *Apply to All Channels* button to apply the changes.



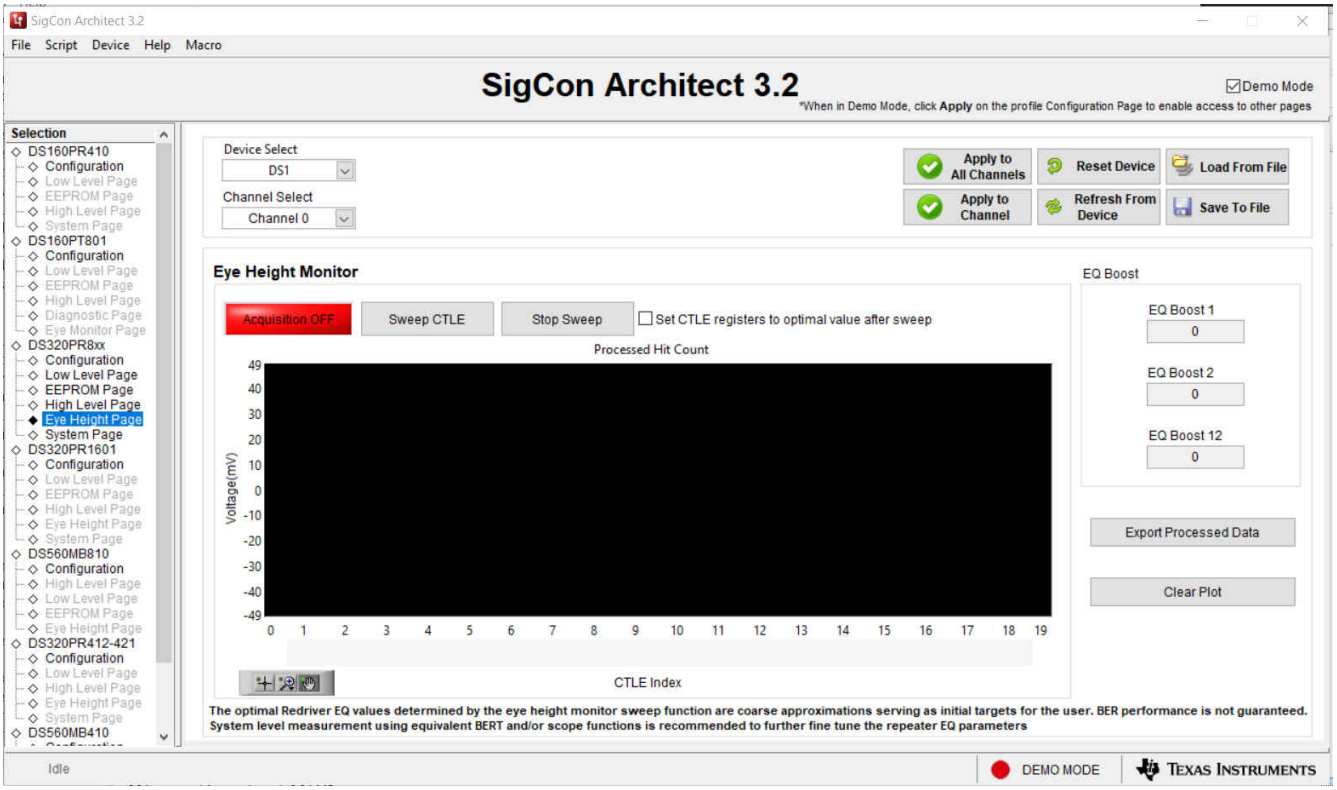
5 Eye Height Page

Note

This page is currently under development and the provided results might not be accurate

This page can assist the user in tuning the CTLE settings to best match their system. Use it to display the eye height of the signal passing through the redriver, for all 20 CTLE index settings. Select the channel you would like to test, and click the *Sweep CTLE* button. The redriver will automatically detect the eye height with each index setting and display it in the plot below.

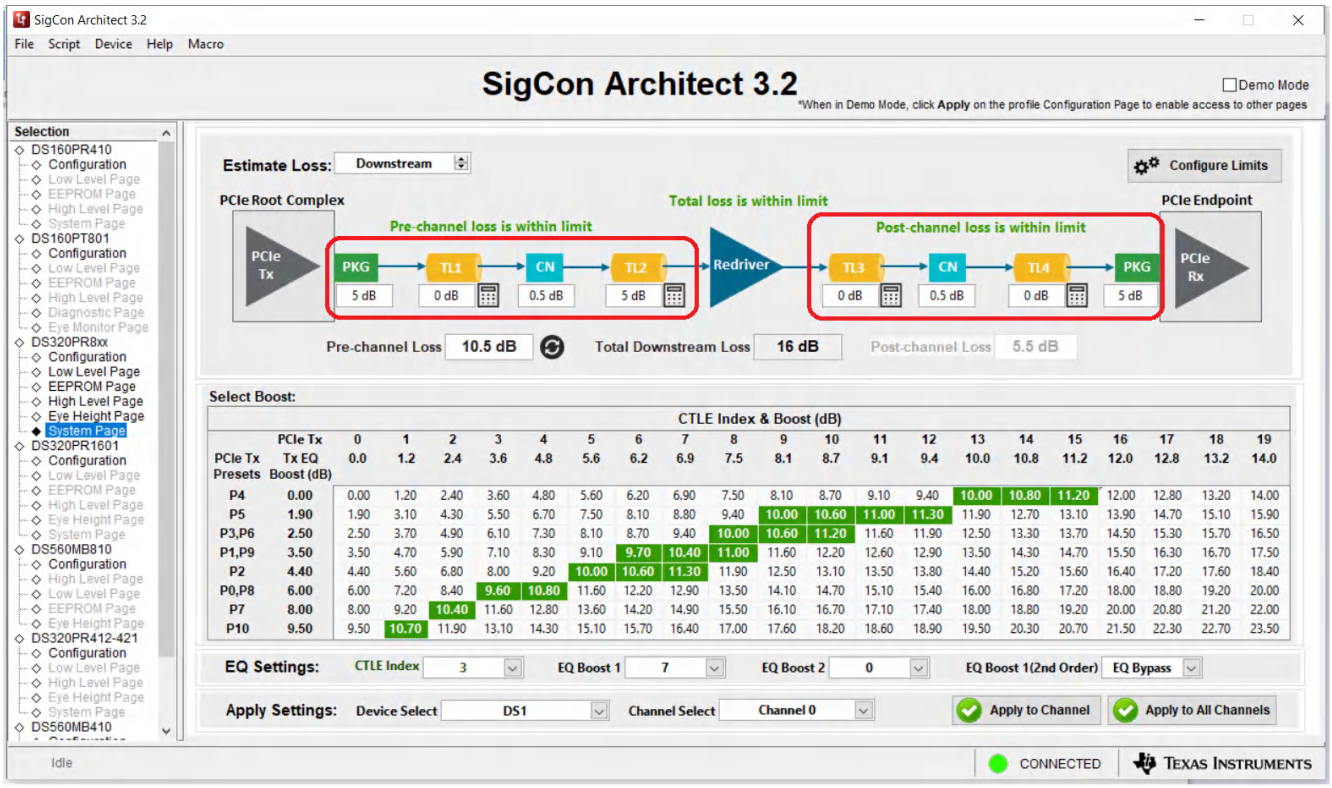
Note that this plot displays the eye heights directly at the output pins of the redriver. It is recommended to also use other lane margining tools to monitor signal quality at each end of the link. This tool should only be used as a reference and cannot guarantee optimal system performance based on this plot alone.



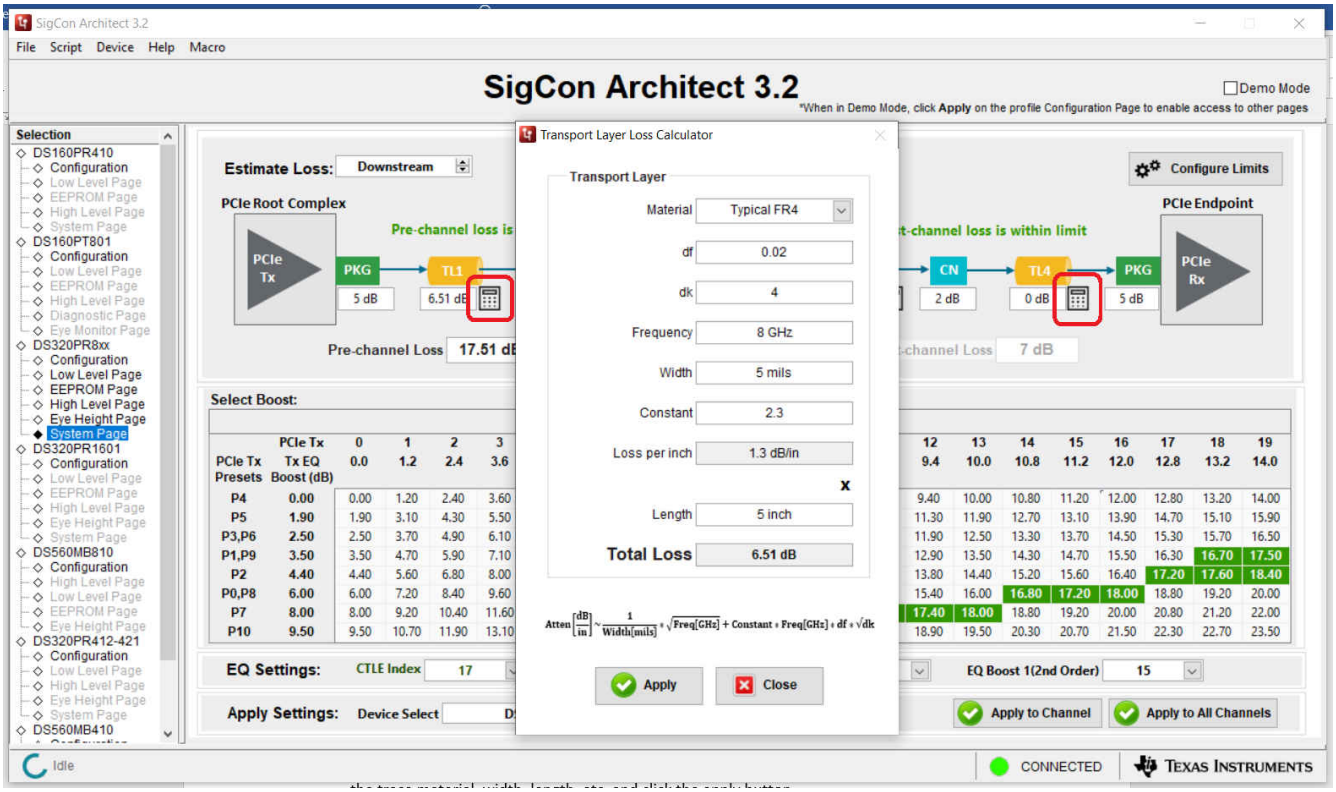
6 System Page

This page allows users to estimate optimal CTLE settings for their application, based on known pre and post channel losses. This feature is also available in Demo Mode.

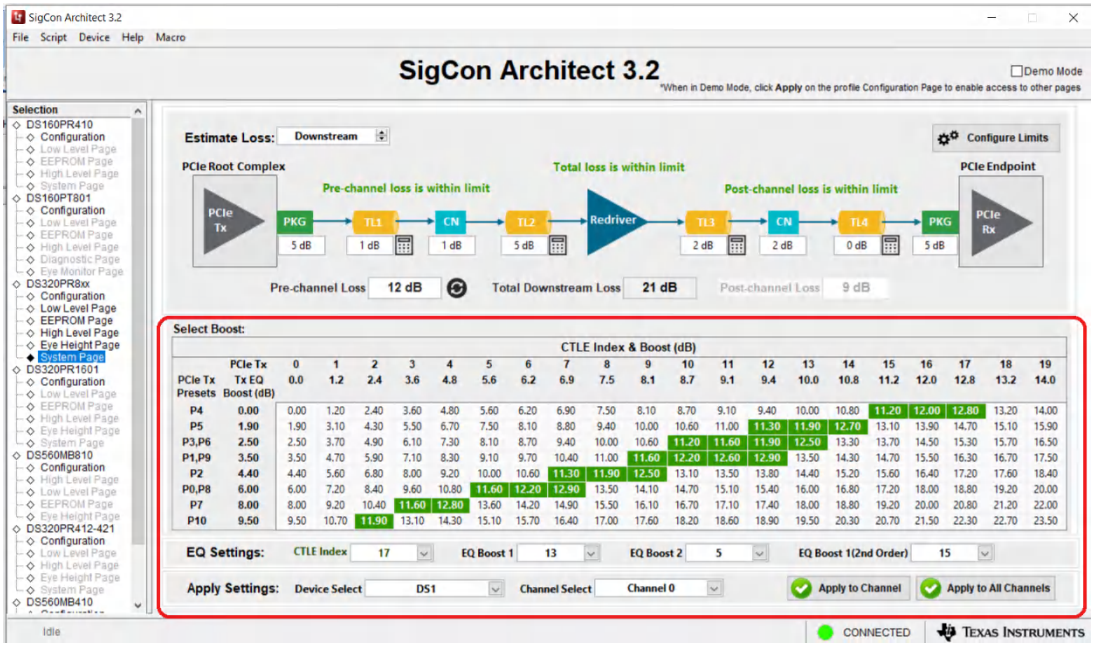
1. Enter the known Pre and Post-channel losses into each of the boxes. The GUI will show whether the losses are within the limit of the redriver or not.



2. Click the calculator button next to the transmission lines to calculate loss for PCB traces. Enter the trace material, width, length, and so on, and then click the *Apply* button.



3. The table will highlight suggested CTLE values for each PCIe Tx Preset, based on the losses you entered. You can use the lowest part of the screen to apply these CTLE settings, or do it from the high-level page. Note that these are only estimated values and are not guaranteed to be the best settings. Further IBIS model simulation, or bit error rate testing can be used to further determine the optimal redriver settings.



7 References

- Texas Instruments, *DS320PR810 Eight-Channel Linear Redriver for PCIe 5.0, CXL 1.1* data sheet.

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