PGA900 Software

Quick Start Guide

Literature Number: SLDU015A
May 2015–Revised January 2016

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PGA900 Software Quick Start Guide

Texas Instruments PGA900 is an interface device for piezoresistive and strain gauge pressure sense elements. The device incorporates analog front end that directly connects to the sense element and has voltage regulators and an oscillator. The device also includes sigma-delta analog-to-digital converter, ARM® Cortex®-M0 microprocessor and OTP memory.

This document describes a quick start procedure, PGA900 software architecture, source code directory structure, and software driver details.

1 Procedure to Build PGA900 Code

1. Download latest Code Composer Studio™ (CCS) from www.ti.com. TI recommends CCS version 6.1.1.00022.
   - If the user is using an older version, then migrate to CCS version 6.1.1.00022.
   - While migrating to CCS 6.1.1.00022, uninstall older CCS version and perform full fresh installation of CCS 6.1.1.00022.
2. While installing CCS on machine, use option 'Setup Type: Complete Feature Set'.
3. Check whether rtsv6M0_T_le_eabi.lib is present in following path: C:\ti\ccsv6\tools\compiler\ ti-cgt-arm_5.2.6\lib\ (use this path if CCS is installed on the C:\ drive, otherwise substitute the appropriate drive where it was installed).
4. In case rtsv6M0_T_le_eabi.lib is not present in the path from the previous step, then copy rtsv6M0_T_le_eabi.lib into path C:\ti\ccsv6\tools\compiler\ ti-cgt-arm_5.2.6\lib\ (use this path if CCS is installed on the C:\ drive, otherwise substitute the appropriate drive where it was installed).
5. Copy PGA900 folder (having PGA900 code) or ‘code’ folder into any path (for example, D:\temp)
6. Launch CCS IDE.
7. Workspace Launcher window pops up.

8. Provide workspace path (for example, D:\temp)

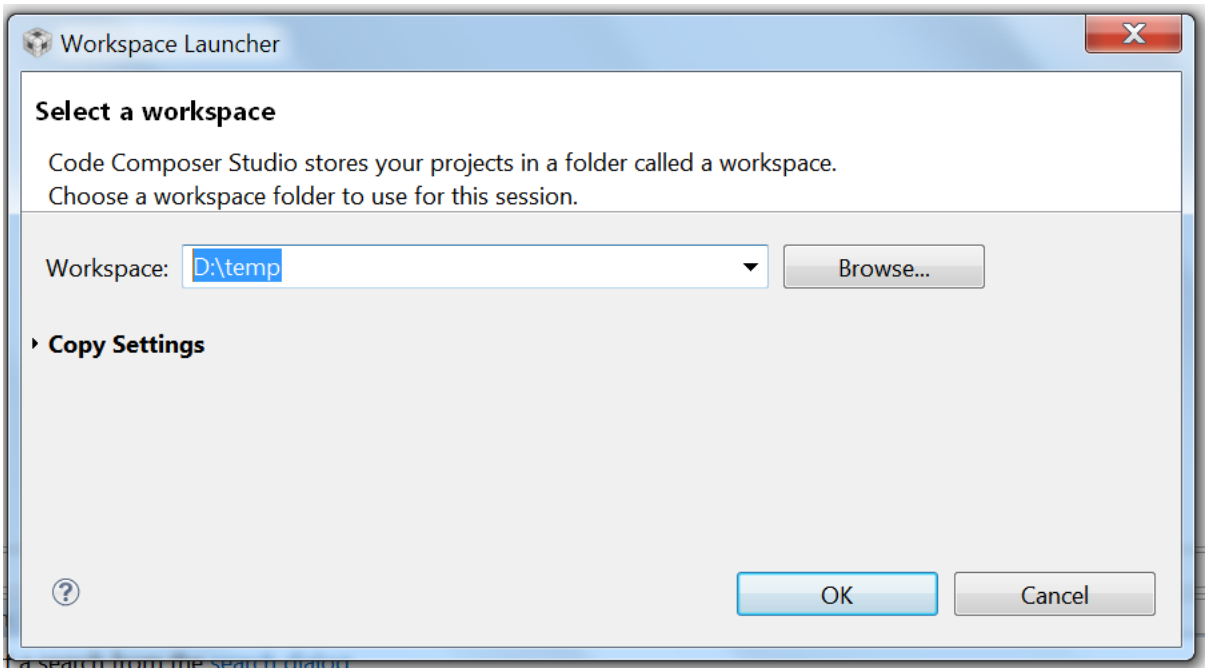

Figure 1. CCS Workspace Launcher

9. Import PGA900 code using Project → Import CCS Projects.

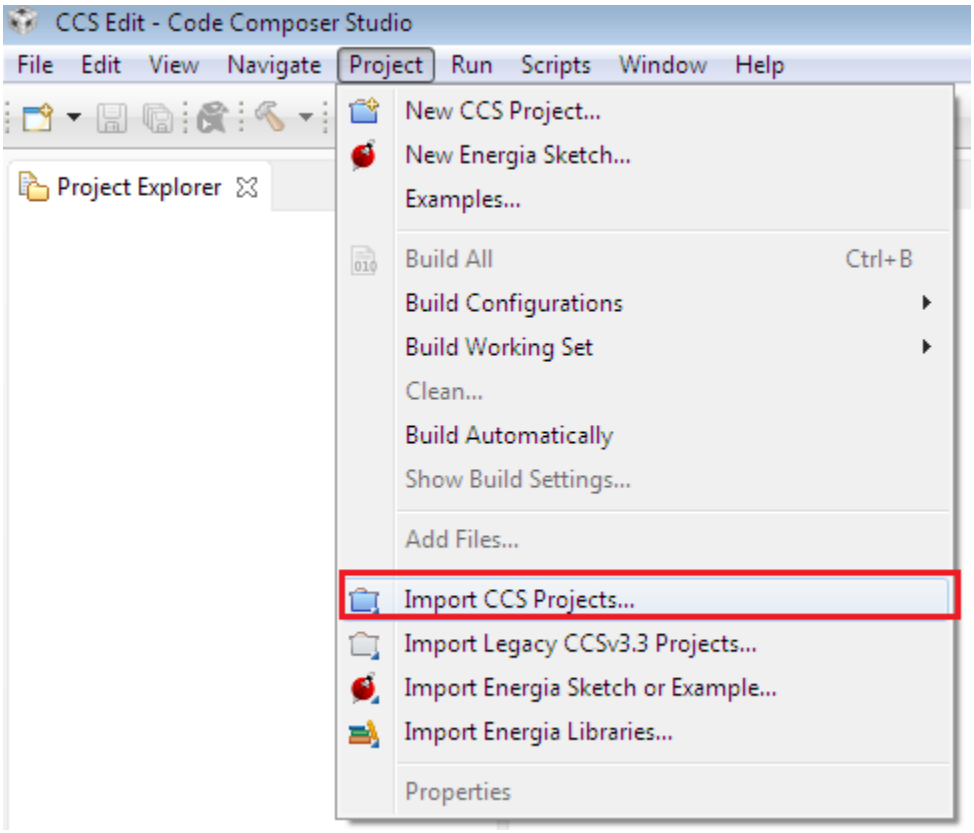

Figure 2. Import CCS Project

10. Import CCS Projects window will get pop-up as shown in Figure 3.
11. Provide the path in the Select search-directory option (for example, D:\temp).

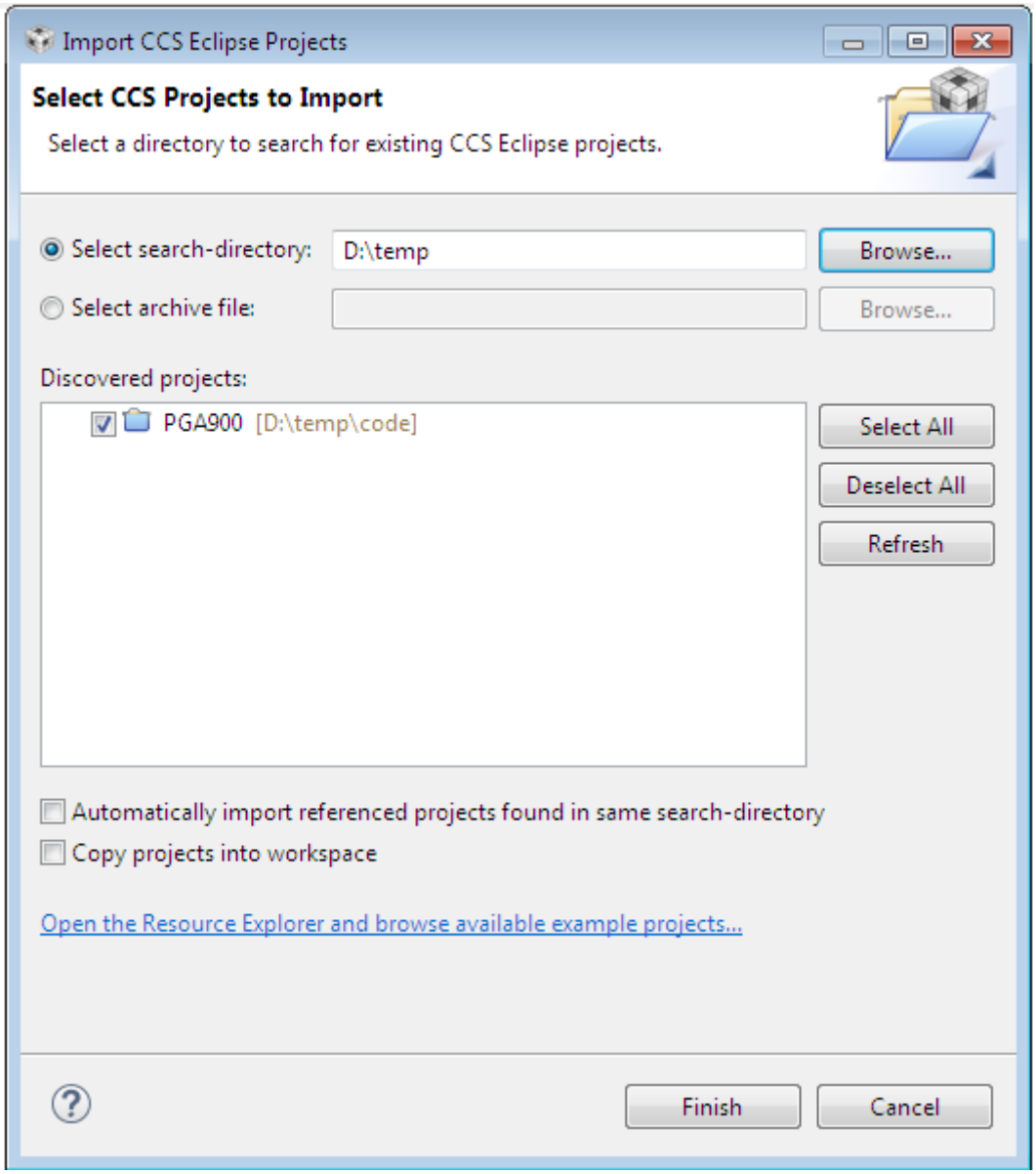

Figure 3. Select Search-Directory

12. Discovered projects: Option shows PGA900 as shown in Figure 3 or code.
13. Click finish button.
14. Project Explorer window displays the PGA900 folder as shown in Figure 4 or code folder.

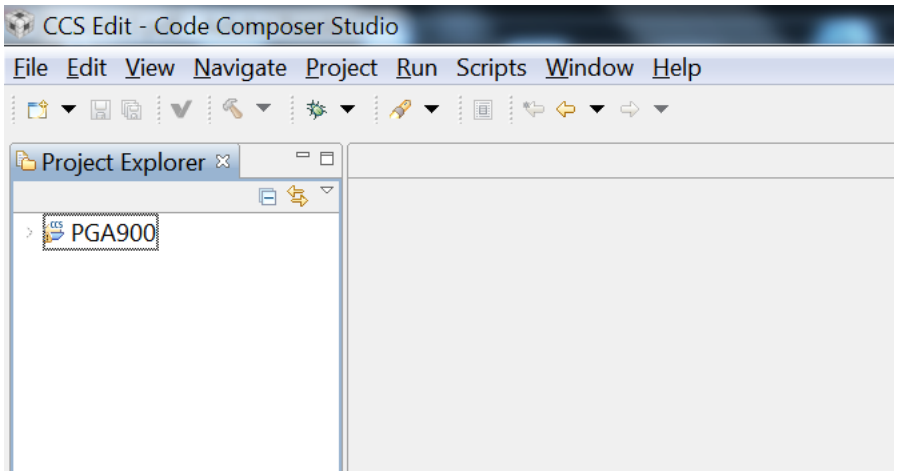

Figure 4. PGA900 Project

15. Compile PGA900 project using the Project → Build Project option.

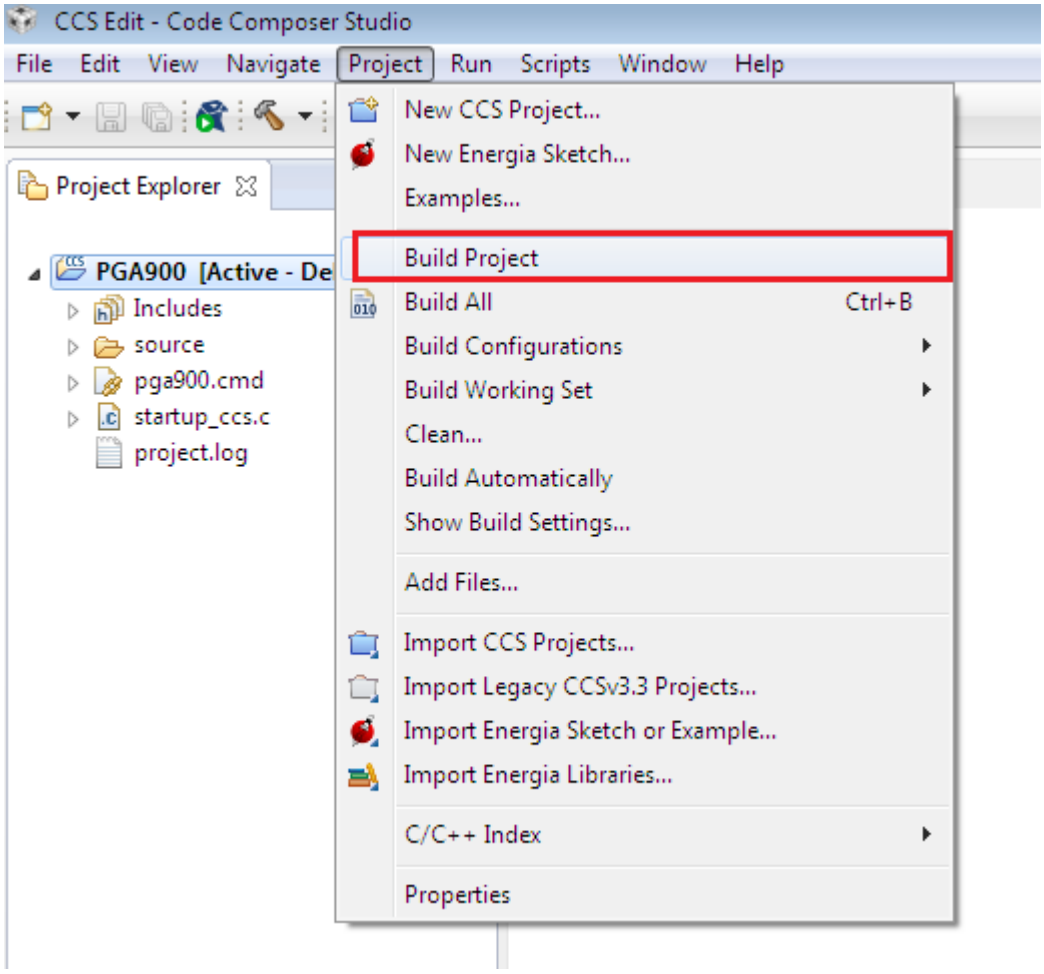

Figure 5. PGA900 Build Project

NOTE: In the PGA900 project, Cortex M0 setting is already present. If the user wants to confirm it, then use Project → Properties → Build → ARM Compiler → Processor Options → Target processor version.

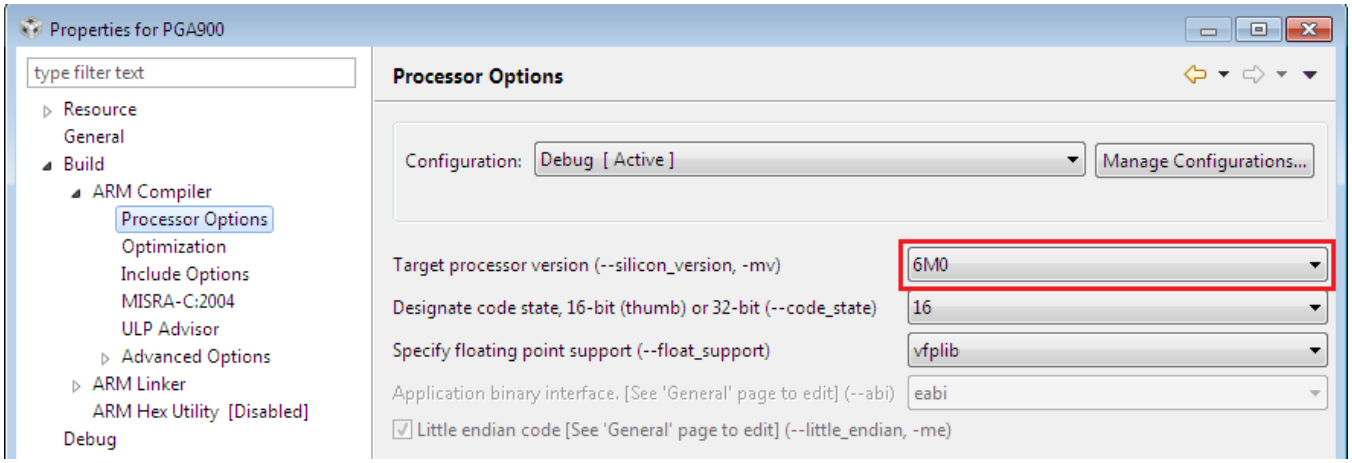

Figure 6. Target Processor Cortex M0 Selection

2 Procedure to Generate Intel Hex File

1. Go to menu Project → Properties.

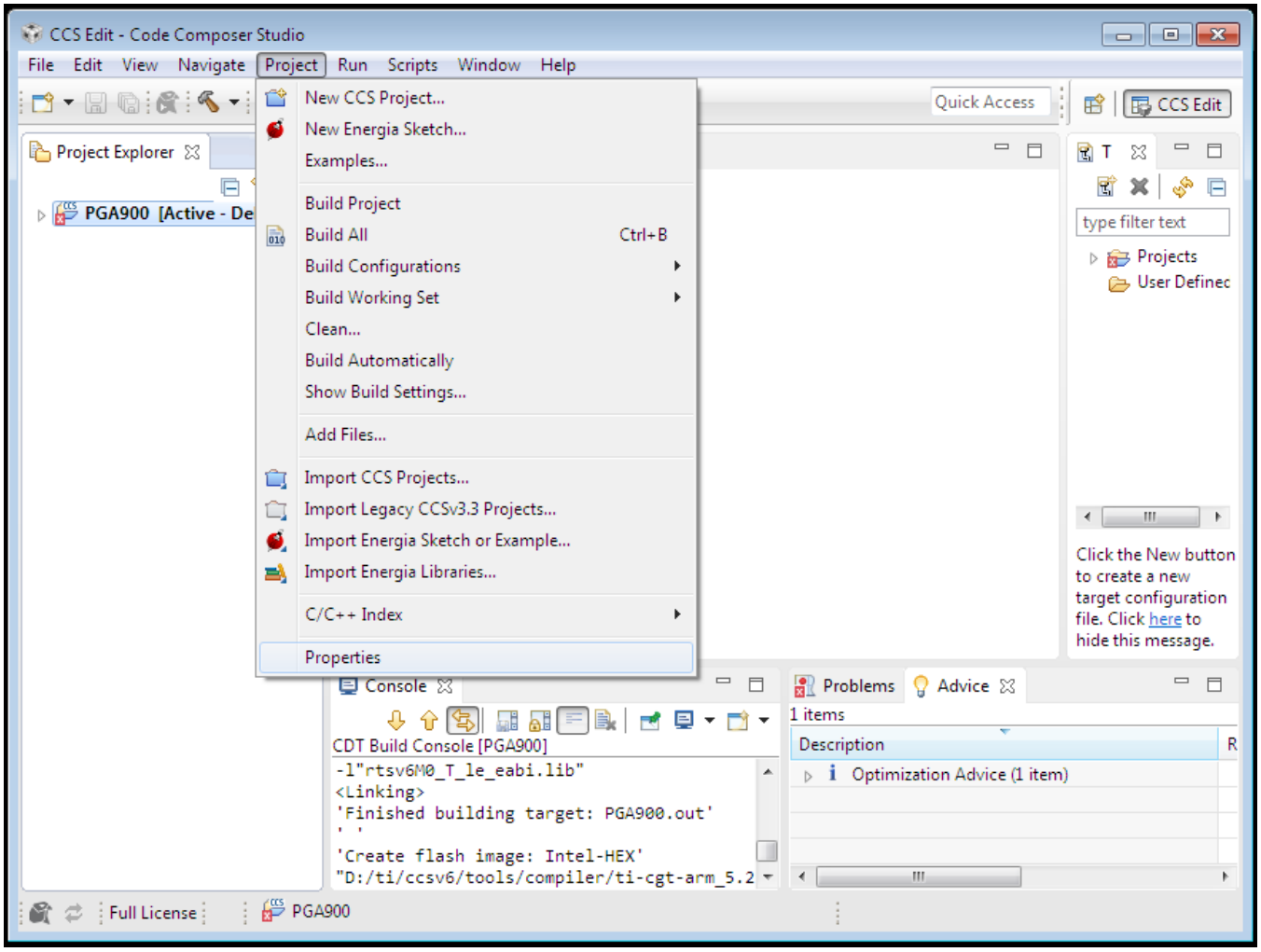

Figure 7. Project Options

2. Select 'Build' to see 'Steps' as shown in Figure 8.

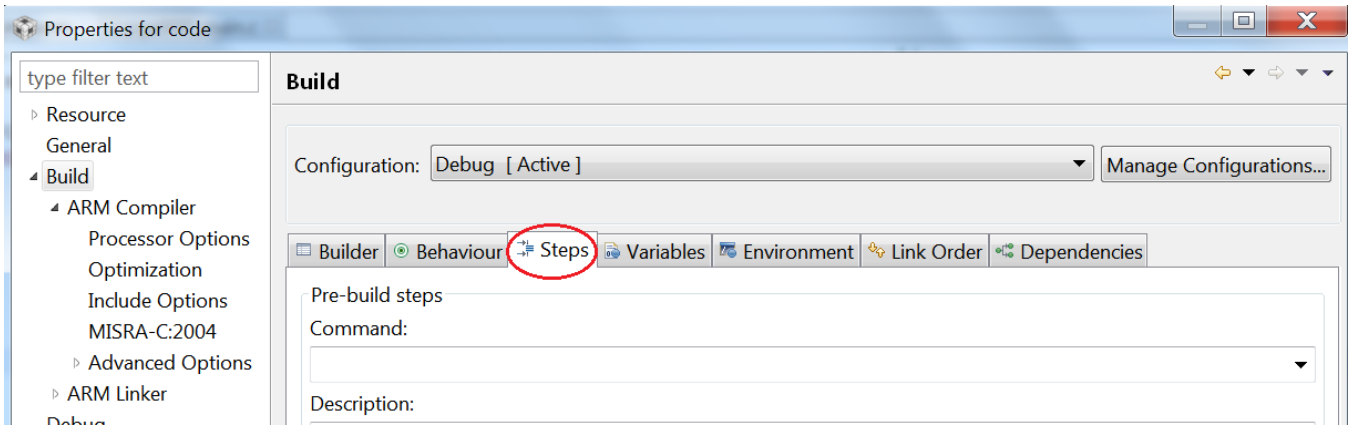

Figure 8. Build Options

3. In ‘Post-build steps’, type the Command "${CG_TOOL_HEX}" -i "${BuildArtifactFileName}" -o "${BuildArtifactFileBaseName}.hex" -order LS -romwidth 32 and in Description field enter ‘Create flash Image Intel-Hex’ as shown in Figure 9. -order LS indicates little-endian and -romwidth 32 indicates hex conversion formats width.

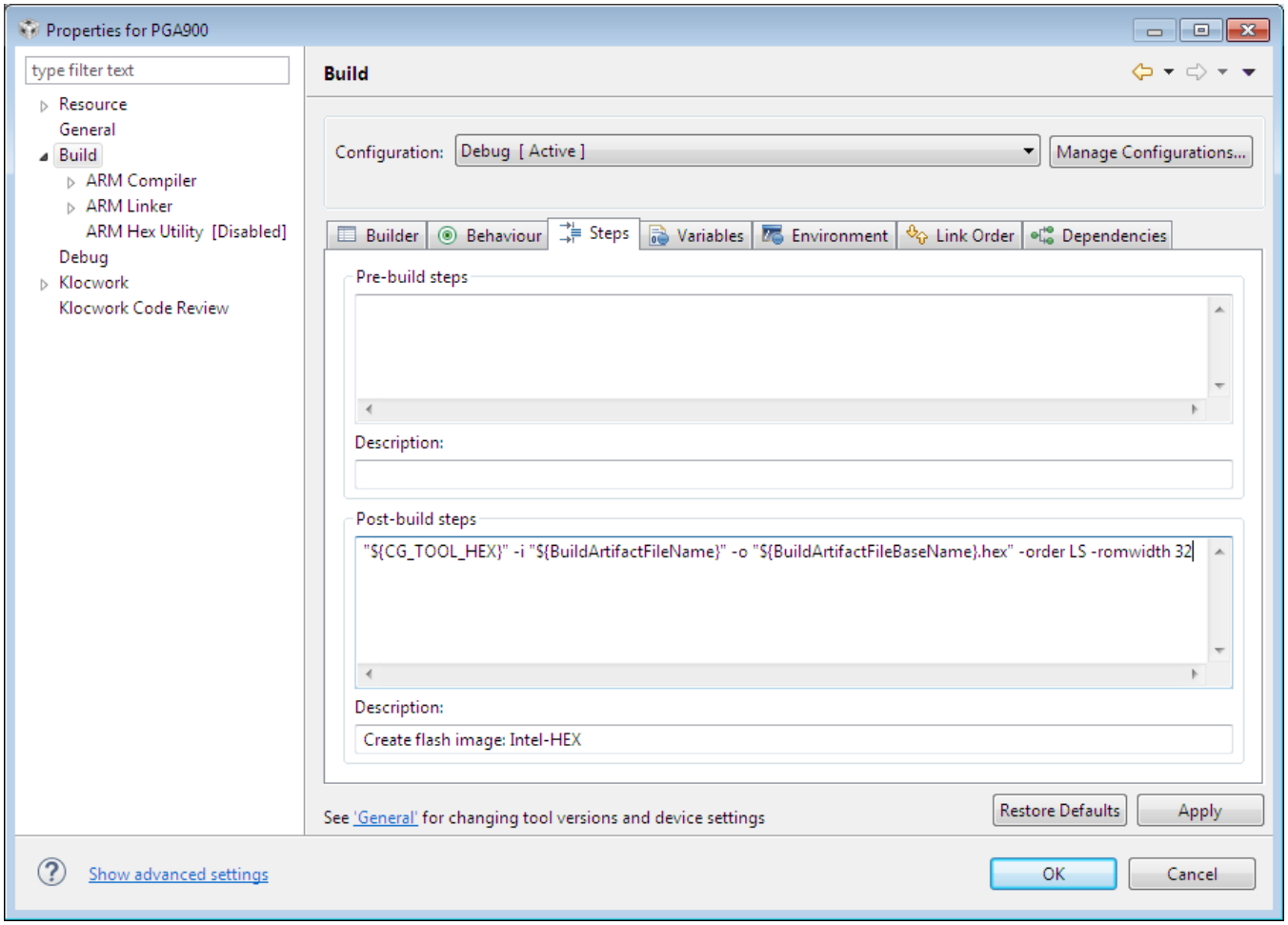

Figure 9. Flash Image Intel Hex Configuration

4. Click Apply button.
5. Click OK button.
6. Compile PGA900 code and Intel hex file (PGA900.hex) is generated in the Debug folder.

3 Procedure to Run PGA900 Firmware on PGA900EVM

The two development platforms are:

- USB2ANY interfacing board along with PGA900GUI and PGA900EVM
- XDS200 USB JTAG emulator and PGA900EVM

3.1 USB2ANY Interfacing Board Along With PGA900GUI and PGA900EVM

The USB2ANY provides the interface communication between the PGA900EVM and the PGA900GUI.

For more details, refer to the *PGA900 EVM User's Guide*, SLDU011.

3.2 XDS200 USB JTAG Emulator and PGA900EVM

Prerequisites:

- Installed CCS version CCS 6.1.1.00022.
- Spectrum Digital XDS200 USB JTAG Emulator kit
- PGA900 EVM

Connection between the Spectrum Digital XDS200 USB JTAG Emulator and PGA900EVM

1. For details regarding the Spectrum Digital XDS200 USB JTAG Emulator, refer to the *XDS200 Quick Start Guide* http://emulators.spectrumdigital.com/files/XDS200_QSG.pdf
2. The Spectrum Digital XDS200 USB JTAG Emulator kit contains three adapters. Connect the CTI20-ARM10 adapter to XDS200.
3. All XDS200 USB drivers and CCS v6 drivers are included with the CCS6.1.1.00022 software installation.
4. Connect the included USB cable to a USB port on the host computer and then connect the USB cable to the XDS200. Windows® recognizes the new hardware connection and completes the XDS200 installation automatically on Windows 7 or higher operating systems. On Windows XP, follow the hardware installer instructions and answer 'Yes' or 'default' if prompted
5. PGA900EVM should be unpowered at this time. Connect CTI20-ARM10 adapter to connector J6 of PGA900EVM. Figure 10 shows the orientation.

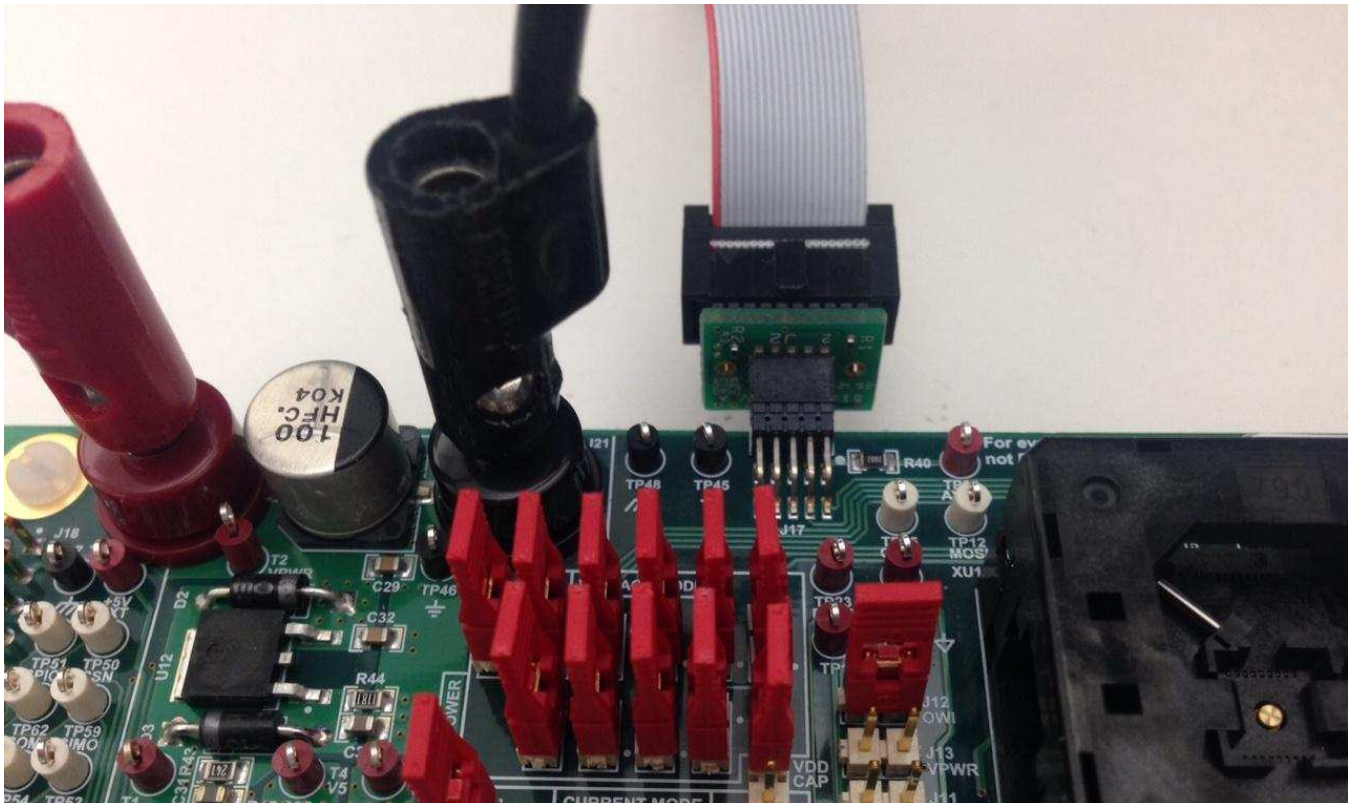

Figure 10. XDS200 Emulator Connection to the PGA900EVM

3.2.1 Setup the Target Configuration Options

A Target Configuration tells CCS how to connect to the device. It describes the device using gel files and device configuration files.

1. PGA900.xml file is available in the 'docs' folder of the software release package.
2. Copy the PGA900.xml file into folder C:\ti\ccsv6\ccs_base\common\targetdb\devices\ (if CCS is installed on C:\ drive otherwise select appropriate drive).
3. M0_systick.xml, M0_nvic.xml, and pga900_csr.xml files are available in the 'docs' folder of the software release package.
4. Create folder 'PGA900' in the CCS installation path C:\ti\ccsv6\ccs_base\common\targetdb\Modules\ (if CCS is installed on C:\ drive otherwise select appropriate drive).
5. Copy M0_systick.xml, M0_nvic.xml, and pga900_csr.xml files into the PGA900 folder path C:\ti\ccsv6\ccs_base\common\targetdb\Modules\PGA900\ (if CCS is installed on C:\ drive otherwise select appropriate drive).
6. pga900.gel file is available in the 'docs' folder of the software release package.
7. Copy pga900.gel file into folder C:\ti\ccsv6\ccs_base\emulation\gel\ (if CCS is installed on C:\ drive otherwise select appropriate drive).
8. Launch Code Composer Studio v6 from the shortcut on the desktop (that was created when CCS v6 was installed).
9. The Code Composer Studio v6 window appears. Click the 'File' menu, then select 'New- → Target Configuration File'
10. The 'New Target Configuration' window appears.

    (a) Type a name for the target configuration file. It will have a .ccxml suffix.

    (b) Leave the 'Use shared location' box checked.

11. Select 'Finish'.

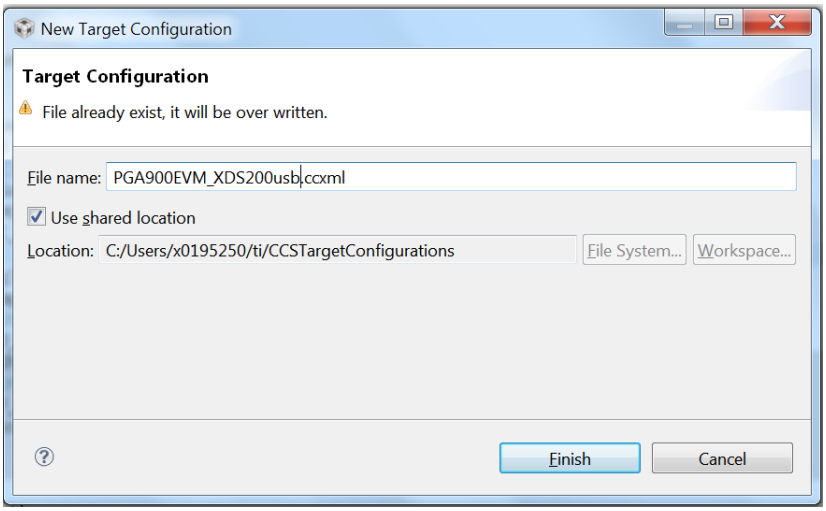

Figure 11. XDS200 Emulator Target Configuration

12. The 'Basic' configuration setup window will appear. Select 'Texas Instruments XDS2xx USB Debug Probe' from the 'Connection' menu.

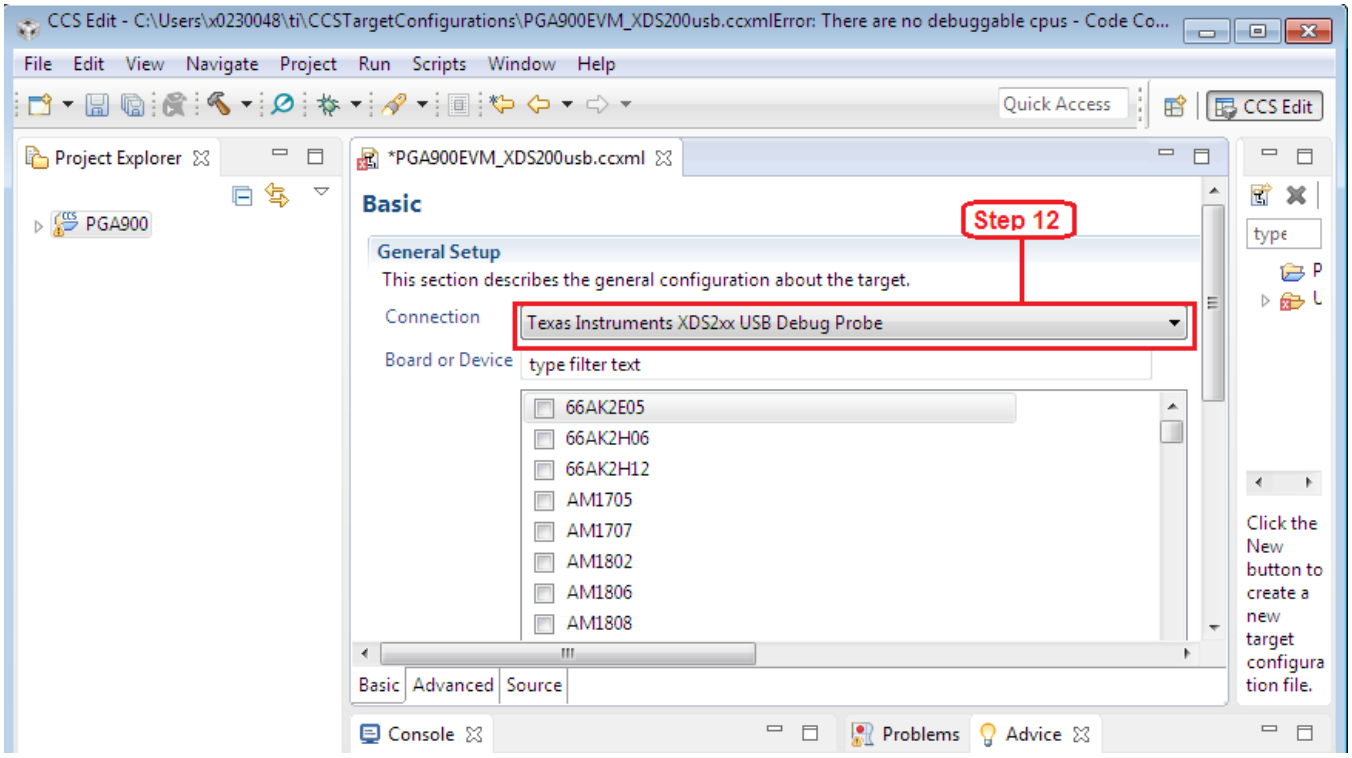

Figure 12. XDS200 Emulator Connection Configuration

13. Board or Device → type filter text as 'PGA900' and select PGA900 device.
14. Select 'Save'.
15. Click Target Configuration.

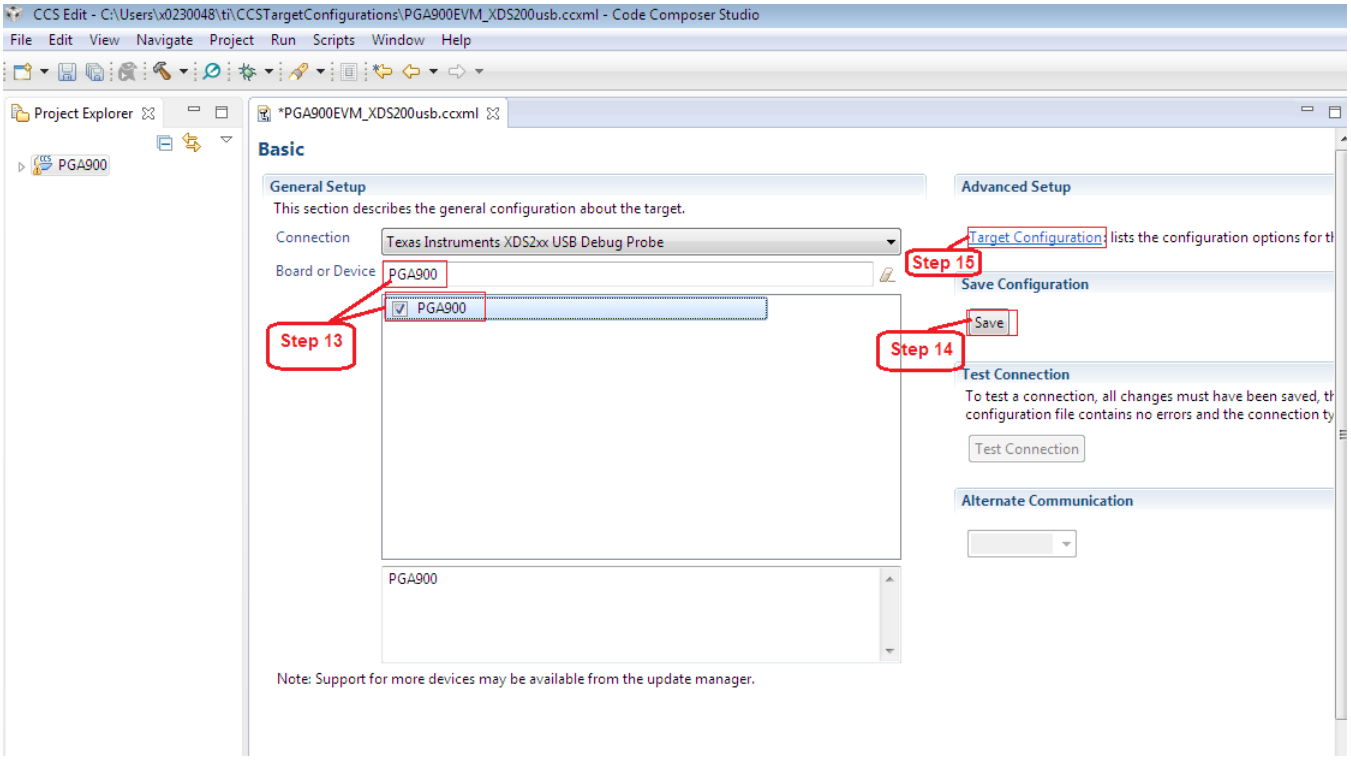

Figure 13. XDS200 Emulator Device Configuration

16. The 'Advanced' configuration setup window appears.
17. Select 'Texas Instruments XDS2xx USB Debug Probe_0'.

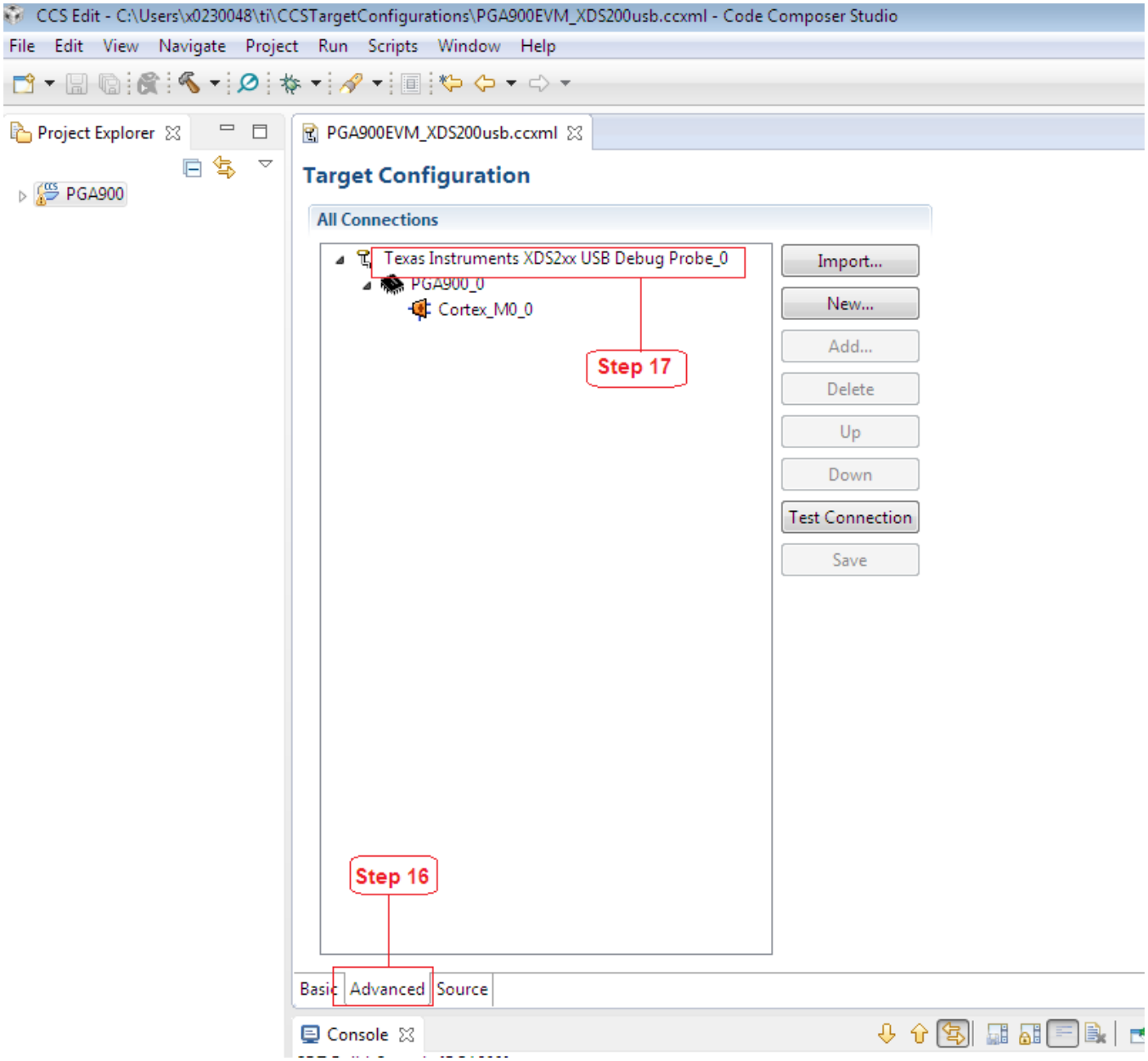

Figure 14. XDS200 USB Emulator Configuration

18. 'Connection Properties' setting should be as shown in Figure 15. Table 1 shows the 'Connection Properties' configured parameters.
19. Select 'Save'.

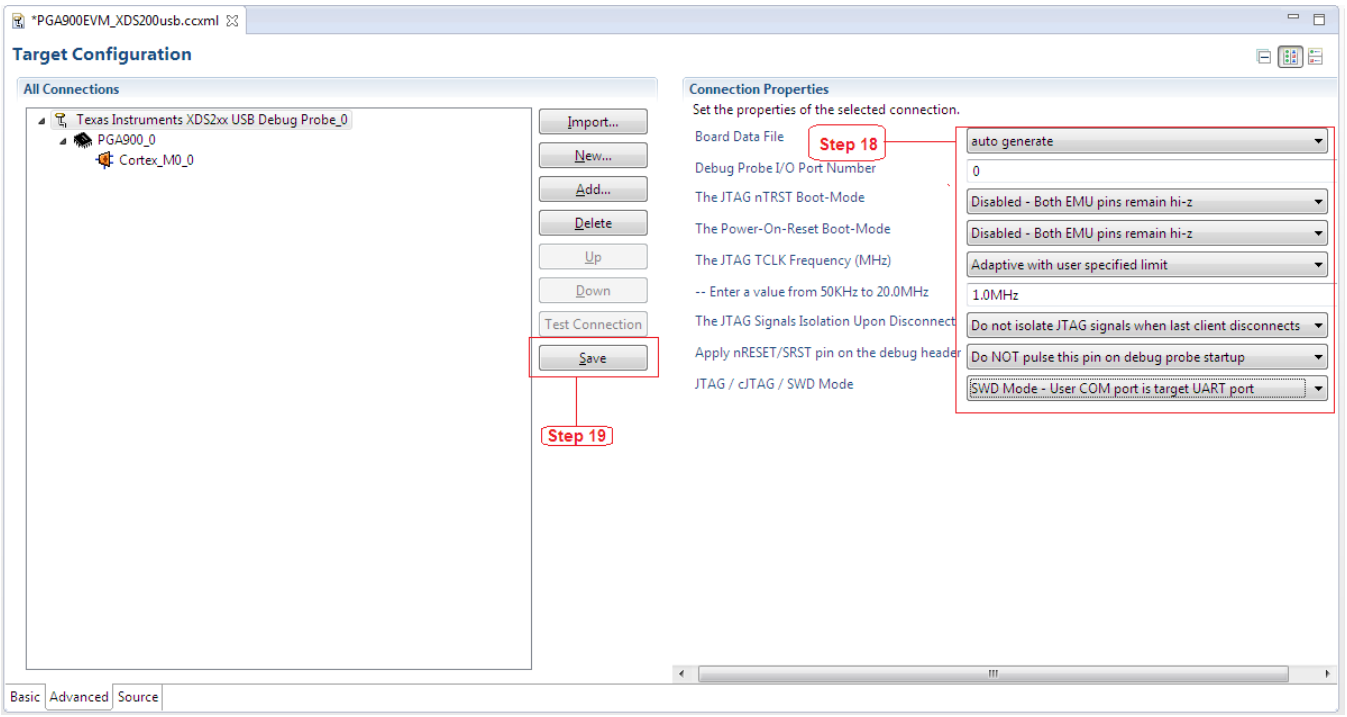

Figure 15. XDS200 USB Emulator Connection Properties

Table 1. Connection Properties Parameter Configuration

Connection Type	Connection Properties
Board data file	Auto generate
Emulator I/O Port Number	0
The JTAG nTRST Boot-Mode	Disabled – Both EMU pins remain hi-z
The Power-On-Reset Boot-Mode	Disabled – Both EMU pins remain hi-z
The JTAG TCLK Frequency (MHz)	Adaptive with user specified limit
---Enter a value from 50KHz to 20.0 MHz	1.0MHz
The JTAG Signals Isolation Upon Disconnect	Do not isolate JTAG signals when last client disconnects
Apply nReset/SRST pin on the debug header	Do NOT pulse this pin on debug probe startup
JTAG/ cJTAG/SWD Mode	SWD Mode - User COM port is target UART port

20. Apply power to the PGA900EVM.
21. Select 'Test Connection'.

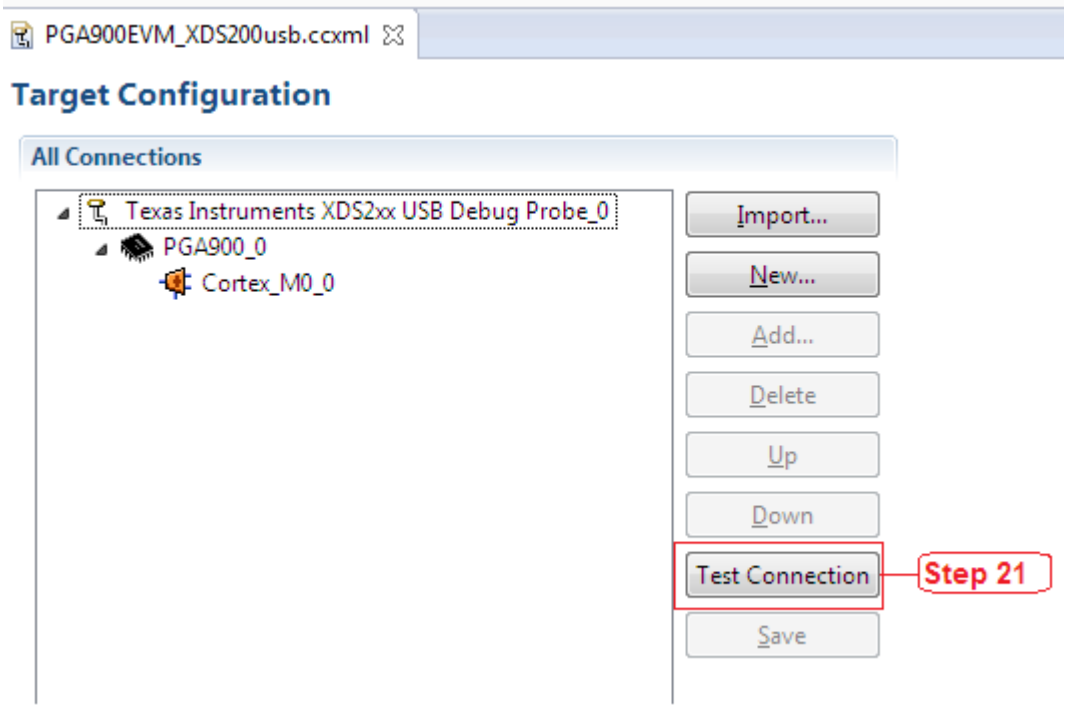

Figure 16. XDS200 USB Emulator Test Connection

22. 'Test Connection' report is displayed.

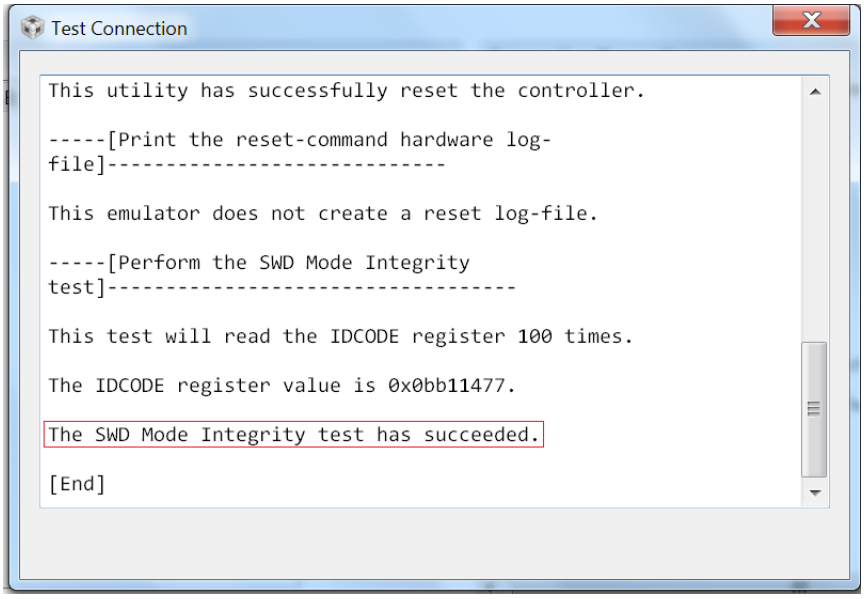

Figure 17. XDS200 USB Emulator Test Connection Report

3.2.2 Launch the Debugger

1. Open the project and compile the code.
2. Launch the debugger by right-clicking the target configuration and selecting 'Launch Selected Configuration'.

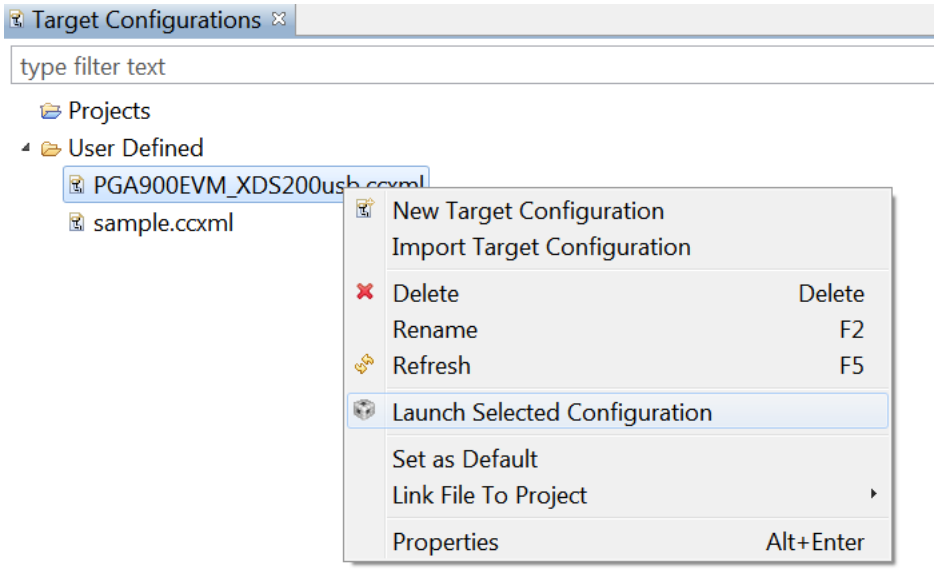

Figure 18. Launch Debugger

3. The debugger window appears.

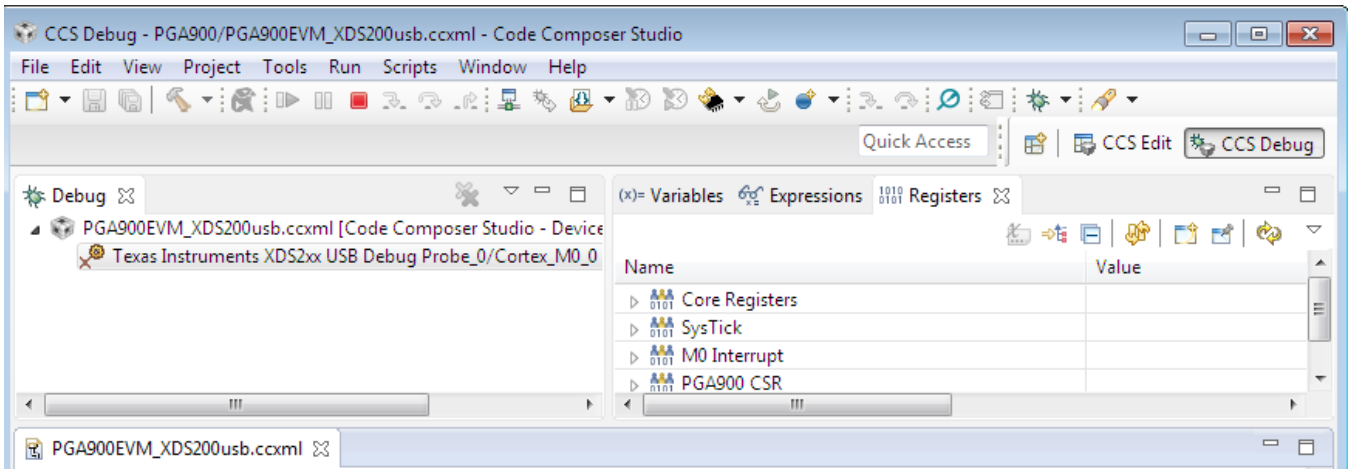

Figure 19. Debugger Window

3.2.3 Connect to the Target

1. In the debug window, select which CPU to connect to.
   - In this example, the Cortex_M0_0 is selected.
2. Right-click the core and select 'Connect Target'.
   - Alternative: Select 'Run → Connect Target'
   - Alternative: Use the keyboard shortcut CTRL + ALT + C

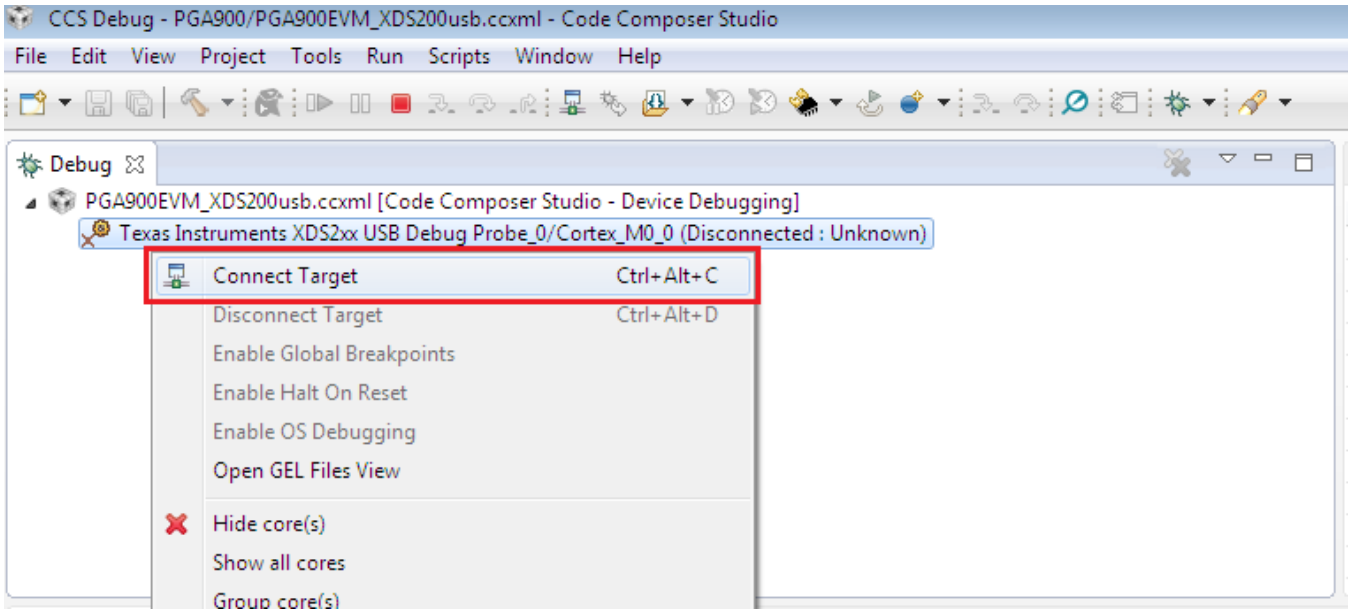

Figure 20. Connect to the PGA900EVM

NOTE: The user can configure the debug button to also automatically connect to the target after launch. In the CCS Debug perspective: 'Tools → Debugger Options → Auto Run and Launch Options' and select 'Connect to Target on Debugger Setup'.

Select Auto Run and Launch Options as in Figure 21.

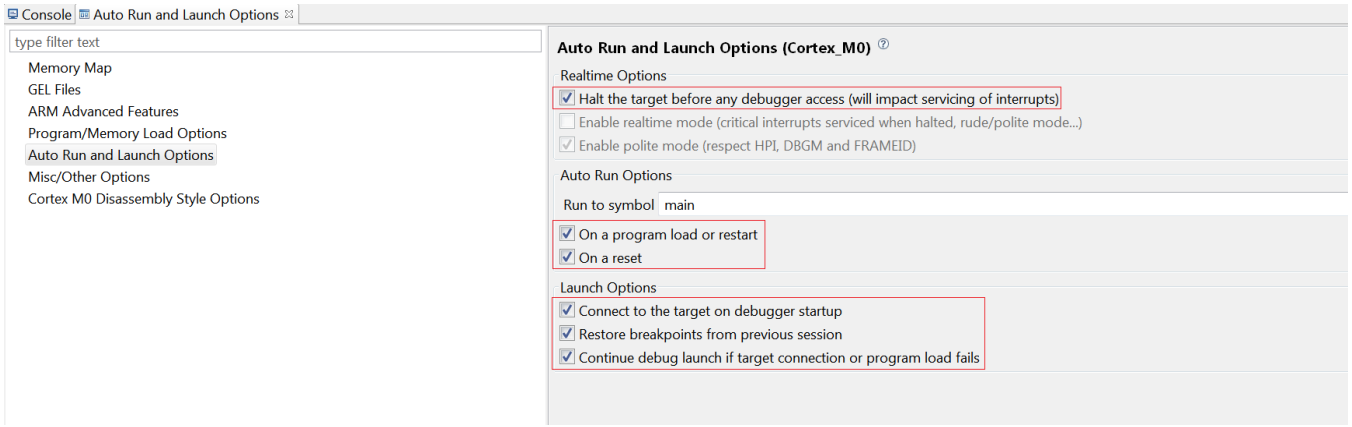

Figure 21. Auto Run and Launch Options

Select Program/Memory Load Options as in Figure 22.

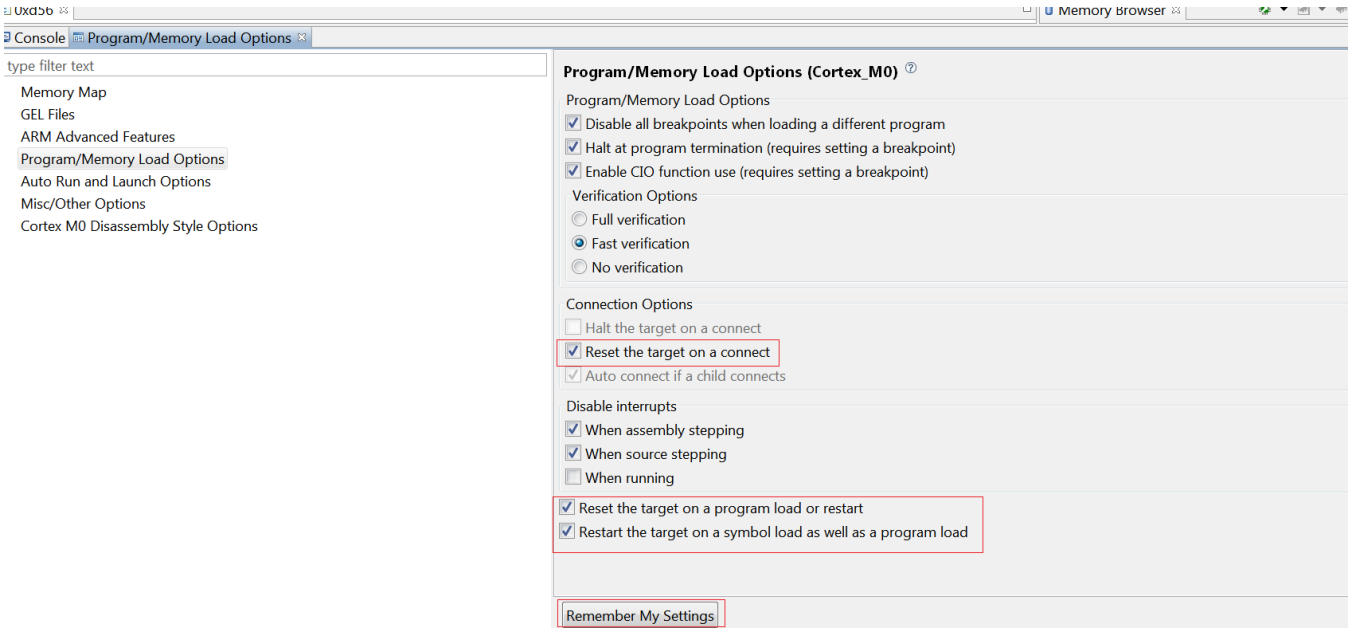

Figure 22. Program/Memory Load Options

3.2.4 Load the Application

1. Select 'Run → Load → Load Program'.

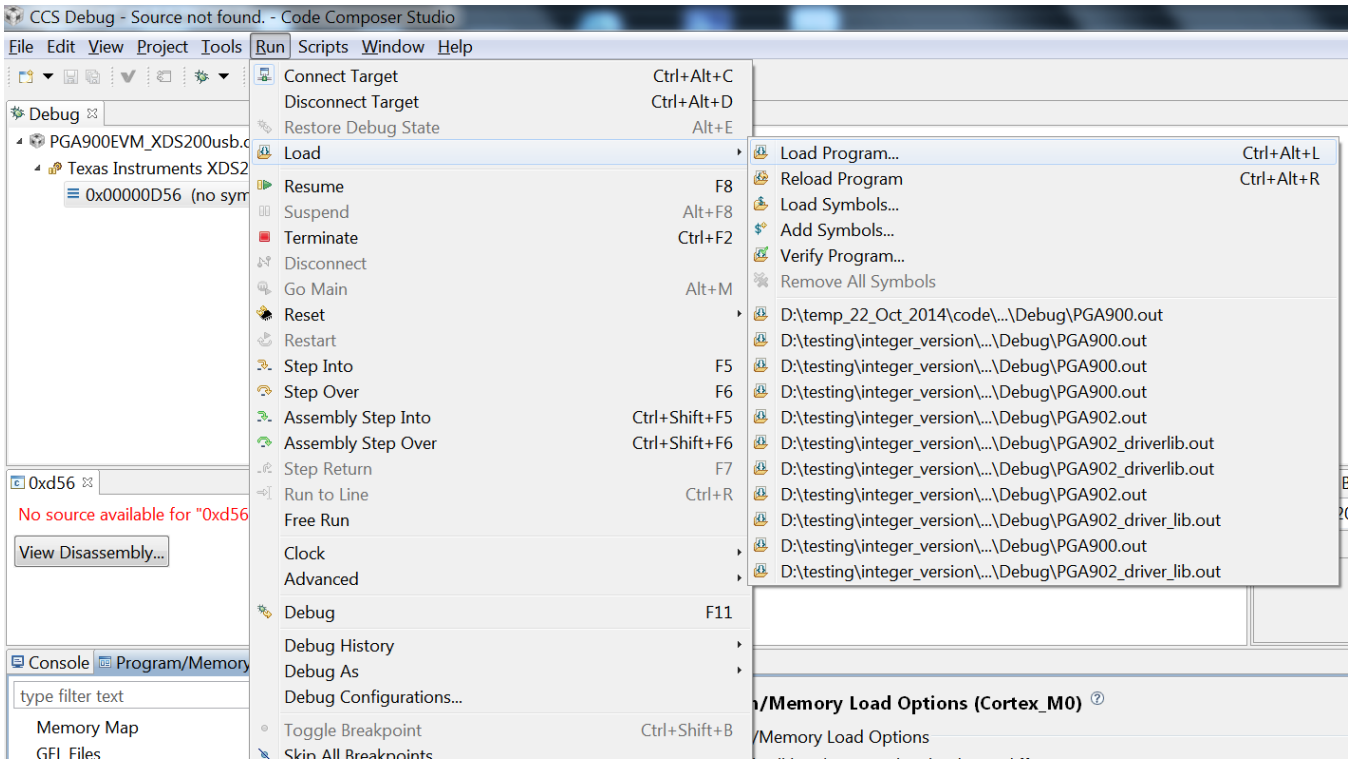

Figure 23. Load Program

2. Select 'Browse Projects'. All projects imported into CCS are shown along with their .out file if they exist.
3. Select the .out file to load into the MCU.
4. Select 'Ok'.

3.2.5 Run the Program

Select the green arrow icon on the toolbar or go to 'Run → Resume' (see Figure 24).

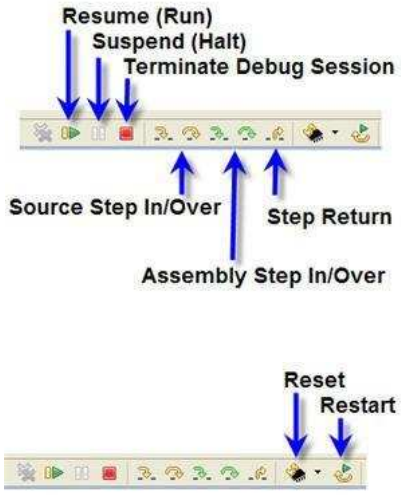

Figure 24. Run Program

3.2.6 Add Variables to the Expression View

To quickly add variables to the expressions view:

Go to 'View → Expressions' and enter name of the global variable, for example, ADC_Count1.

Figure 25. Expressions View

3.2.7 View PGA900 Registers

Go to 'View → Registers' (see Figure 26).

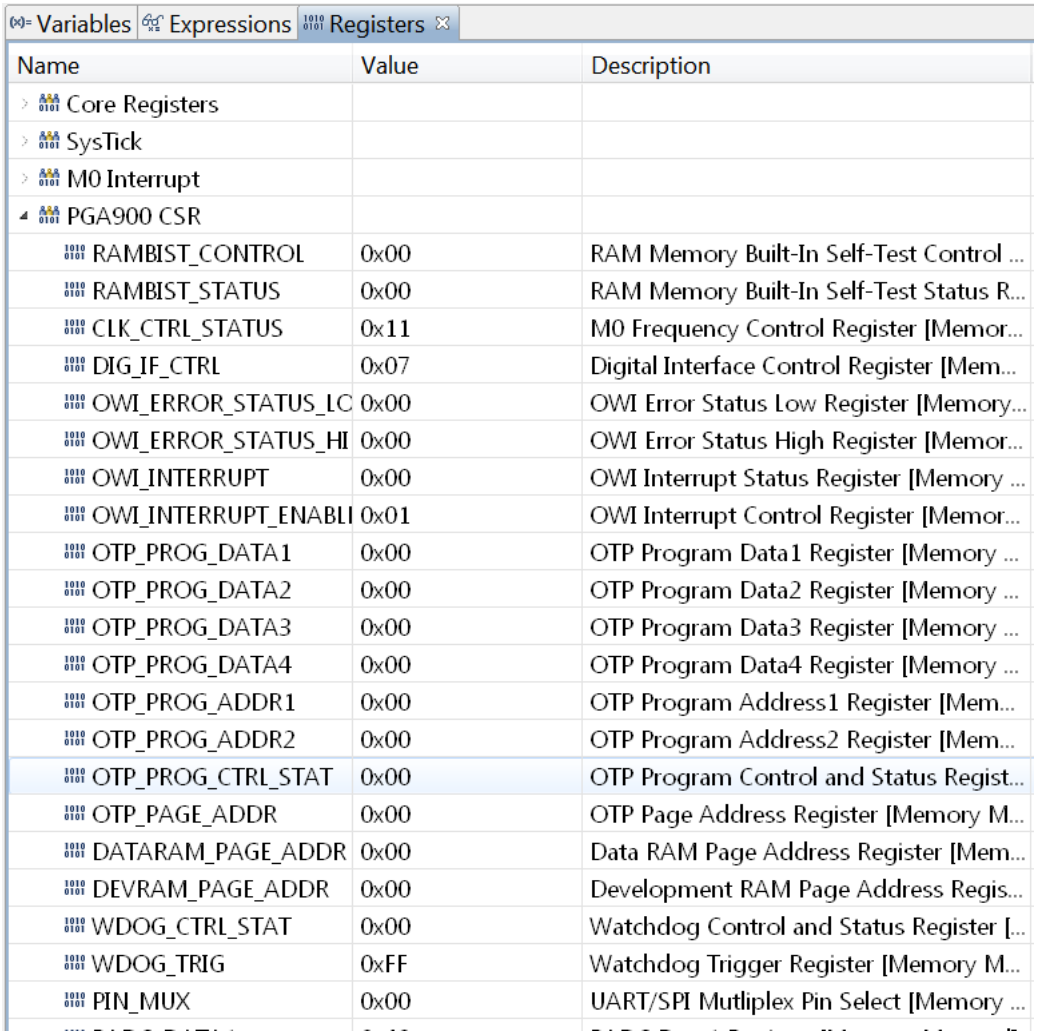

Figure 26. PGA900 Registers

3.3 PGA900EVM, XDS200 USB JTAG Emulator, and USB2ANY Usage

The following steps show the test scenario for simultaneous use of the XDS200 USB JTAG emulator and USB2ANY interfacing board along with PGA900GUI with PGA900EVM.

1. XDS200 USB JTAG emulator is used to load the application into PGA900EVM. Run it and debug the downloaded application.
2. PGA900GUI with USB2ANY interfacing board is used to communicate with PGA900EVM using COMBUF registers when the PGA900 microcontroller is running. PGA900GUI writes data into the COM_DIF_TO_MCU register and reads data from the COM_MCU_TO_DIF register while PGA900 microcontroller is running.

4 Troubleshooting XDS200 USB JTAG Emulator

Strategy for troubleshooting XDS200USB JTAG emulator connectivity problems

1. Check that you are using high-quality cables for connections.
2. Determine whether the USB cable is connected to a USB port of the host computer and to the XDS200.
3. Determine whether the emulator is correctly setup in Windows (that is, are the USB driver, and so forth, working?) by checking in the Windows system devices control panel. If this is not right, then the user needs to check the CCS installed version. Recommended CCS version is CCS 6.1.1.00022.
4. Determine whether the CTI20-ARM10 adapter is connected to XDS200 and connector J1 of PGA900EVM, and check its orientation. Refer to *Section 3.2*.
5. Determine whether USB2ANY interfacing board is connected to the PGA900EVM. In case it is connected to PGA900EVM, then disconnect it from PGA900EVM or make sure that the USB2ANY interfacing board is connected to a USB port of the host computer.

Revision History

Changes from Original (May 2015) to A Revision **Page**

- Updated to version 6.1 across the entire document 4
- Updated path due to CCS version update across the entire document 4
- Removed "Procedure to Run PGA900 Code on Simulator" section 8
- Removed "Flash Image Configuration" step due to CCS version update 10
- Updated connection type and properties due to CCS version update 16

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