Santa Fe (MAXREFDES5#) ZedBoard Quick Start Guide

Rev 1; 2/14

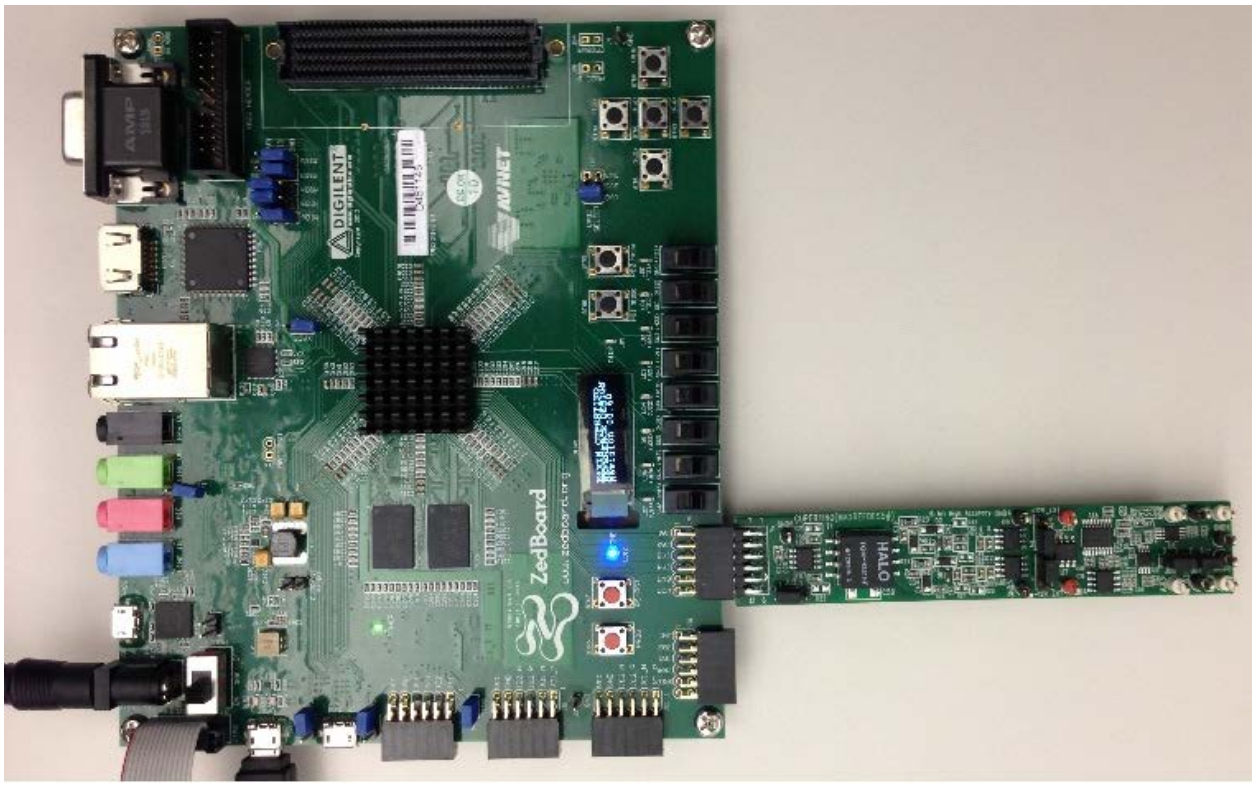

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Table of Contents

1. Required Equipment

- PC with Windows® OS with Xilinx® ISE®/SDK version 14.2 or later and two USB ports (Refer to Xilinx AR# 51895 if you installed ISE WebPACK™ design software on your PC.)
- License for Xilinx EDK/SDK version 14.2 or later (free WebPACK license is OK)
- Santa Fe (MAXREFDES5#) board
- ZedBoard™ development kit
- Industrial sensor or signal source

2. Overview

Below is a high-level overview of the steps required to quickly get the Santa Fe design running by downloading and running the FPGA project. Detailed instructions for each step are provided in the following pages. **The Santa Fe (MAXREFDES5#) subsystem reference design will be referred to as Santa Fe throughout this document.**

1) Connect the Santa Fe board to the JA1 port of a ZedBoard as shown in Figure 1. Ensure the connector is aligned as shown in Figure 2.
2) Download the latest “all design files” **RD5V02_00.ZIP** file located at the Santa Fe page.
3) Extract the **RD5V02_00.ZIP** file to a directory on your PC.
4) Open the Xilinx SDK.
5) Download the bitstream (.BIT) file to the board. This bitstream contains the FPGA hardware design and software bootloader.
6) Use Xilinx SDK to download and run the executable file (.ELF) on one of the two ARM® Cortex™ -A9 processors.

Figure 1. Santa Fe Board Connected to ZedBoard Development Kit

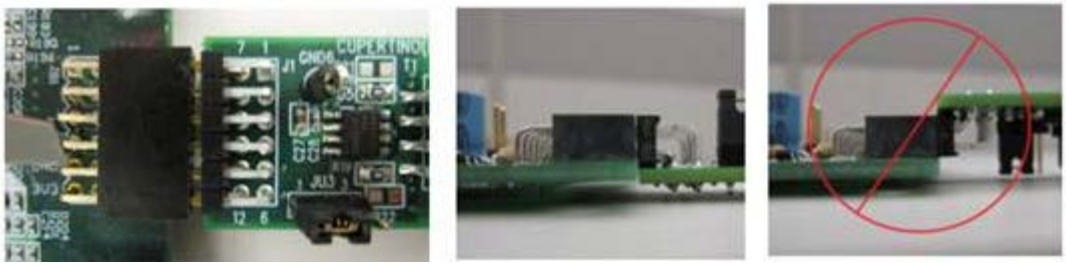


Figure 2. Pmod™ Connector Alignment

3. Included Files

The top level of the hardware design is a Xilinx PlanAhead Project (.prr) for Xilinx PlanAhead version 14.2. The Verilog-based arm_system_stub.v module provides FPGA/board net connectivity and instantiates both the Zynq® Processing System as well as the Zynq SPI peripheral that interfaces directly to the Pmod port. A Xilinx software development kit (SDK) project is supplied and includes an example c program to evaluate the Santa Fe subsystem reference design. The c-code driver routines are portable to the user's own software project.

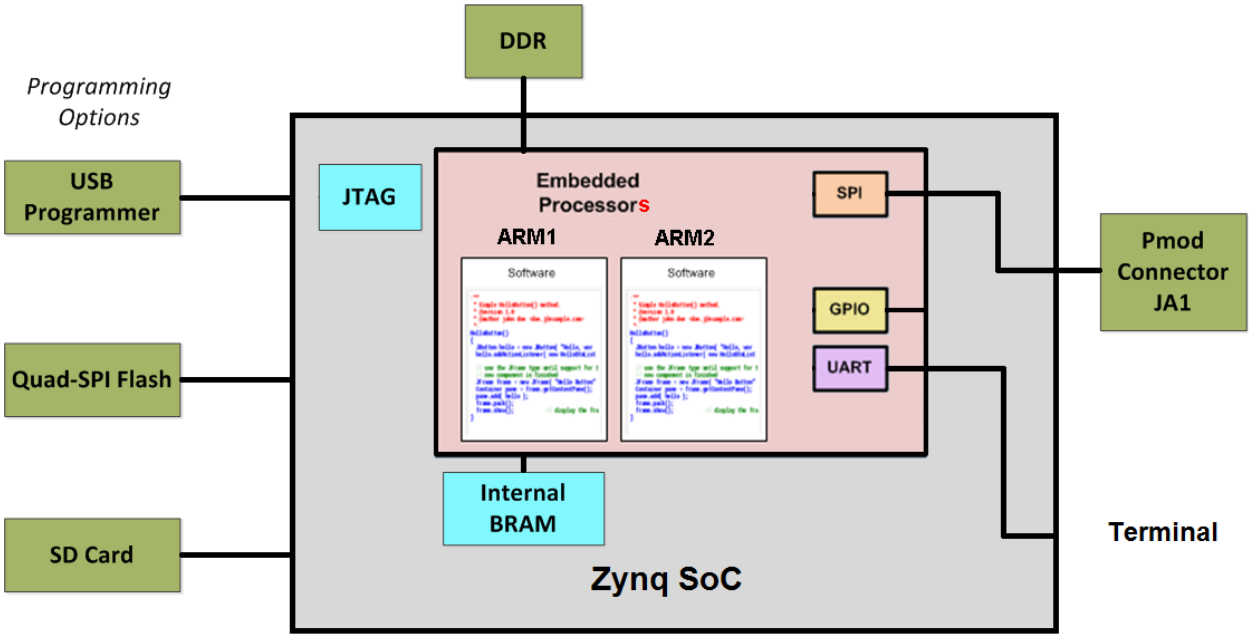


Figure 3. Block Diagram of FPGA Hardware Design

4. Procedure

1. Connect the Santa Fe board to the JA1 port of a ZedBoard as shown in Figure 1.

2. Power up the ZedBoard by connecting its corresponding AC-to-DC power adaptor and sliding the SW8 switch on the ZedBoard to the ON position.

3. Download the latest "all design files" **RD5V02_00.ZIP** file at **www.maximintegrated.com/AN5561**. All files available for download are available at the bottom of the page.

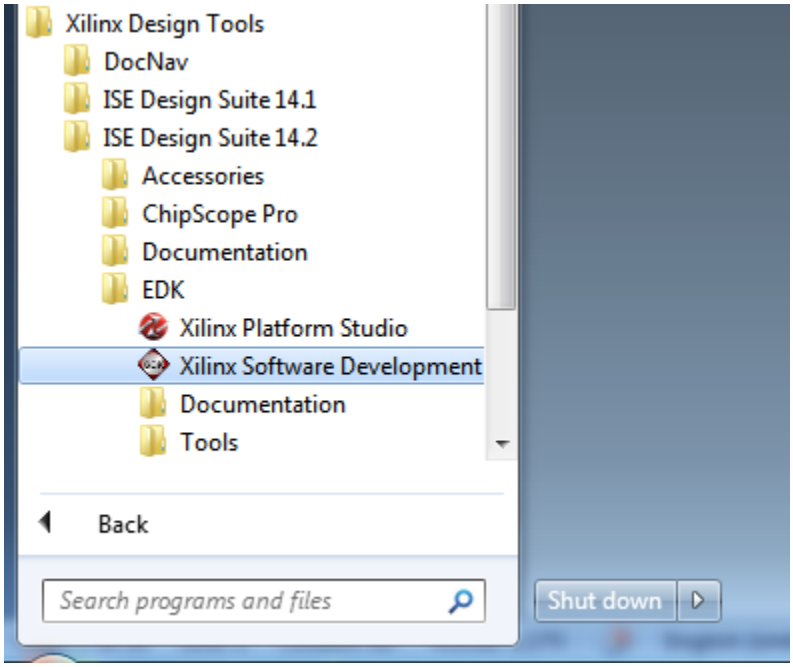
4. Extract the **RD5V02_00.ZIP** file to a directory on your PC. The location is arbitrary but the maximum path length limitation in Windows (260 characters) should not be exceeded.

   In addition, the Xilinx tools require the path to not contain any spaces.

   C:\Do Not Use Spaces In The Path\RD5V02_00.ZIP
   (This path has spaces.)

   For the purposes of this document, it will be **C:\designs\maxim\RD5V02_00**.
   See **Appendix A: Project Structure and Key Filenames** in this document for the project structure and key filenames.

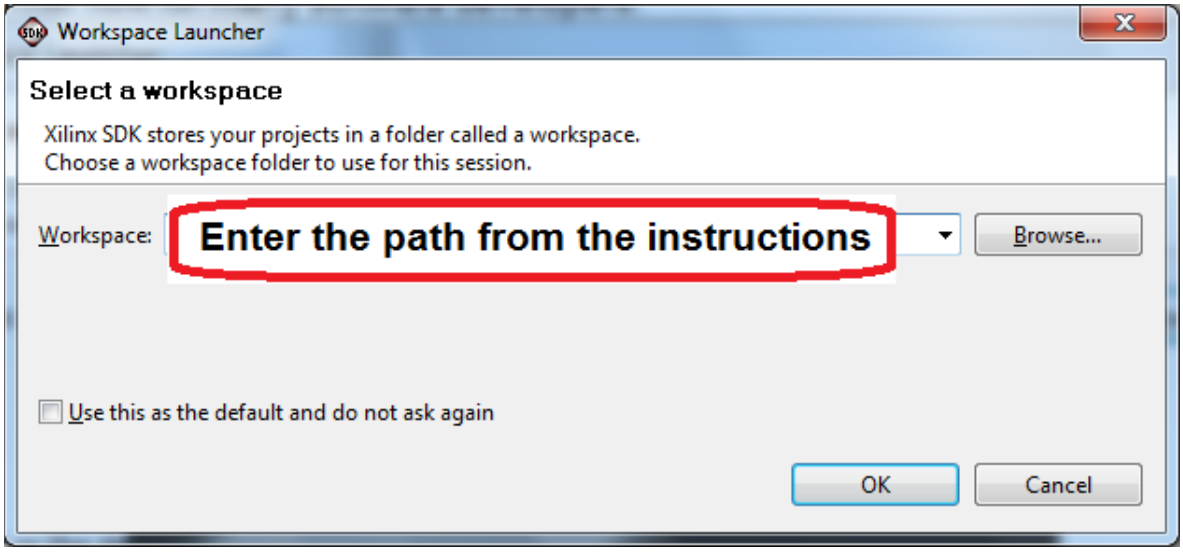
5. Open the **Xilinx Software Development Kit (SDK)** from the Windows **Start** menu.



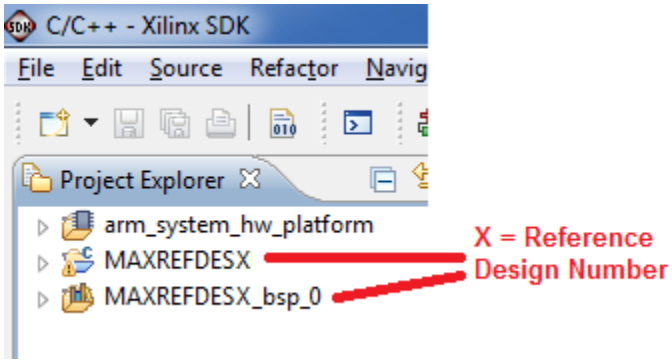
6. SDK will prompt for a workspace directory, which is the location where the software project is located. For this example, it is:

C:\designs\maxim\RD5V02_00\RD5_ZED_V01_00\Design_Files\top.sdk\SDK\SDK_Export

Click **OK** and SDK will open. The Xilinx SDK is based on an Eclipse™-based IDE, so it will be a familiar flow for many software developers.



7. Review the SDK IDE. The **Project Explorer** in the upper left tab should have three components as shown in the image below. If all three subfolders are present, you can skip the next step.

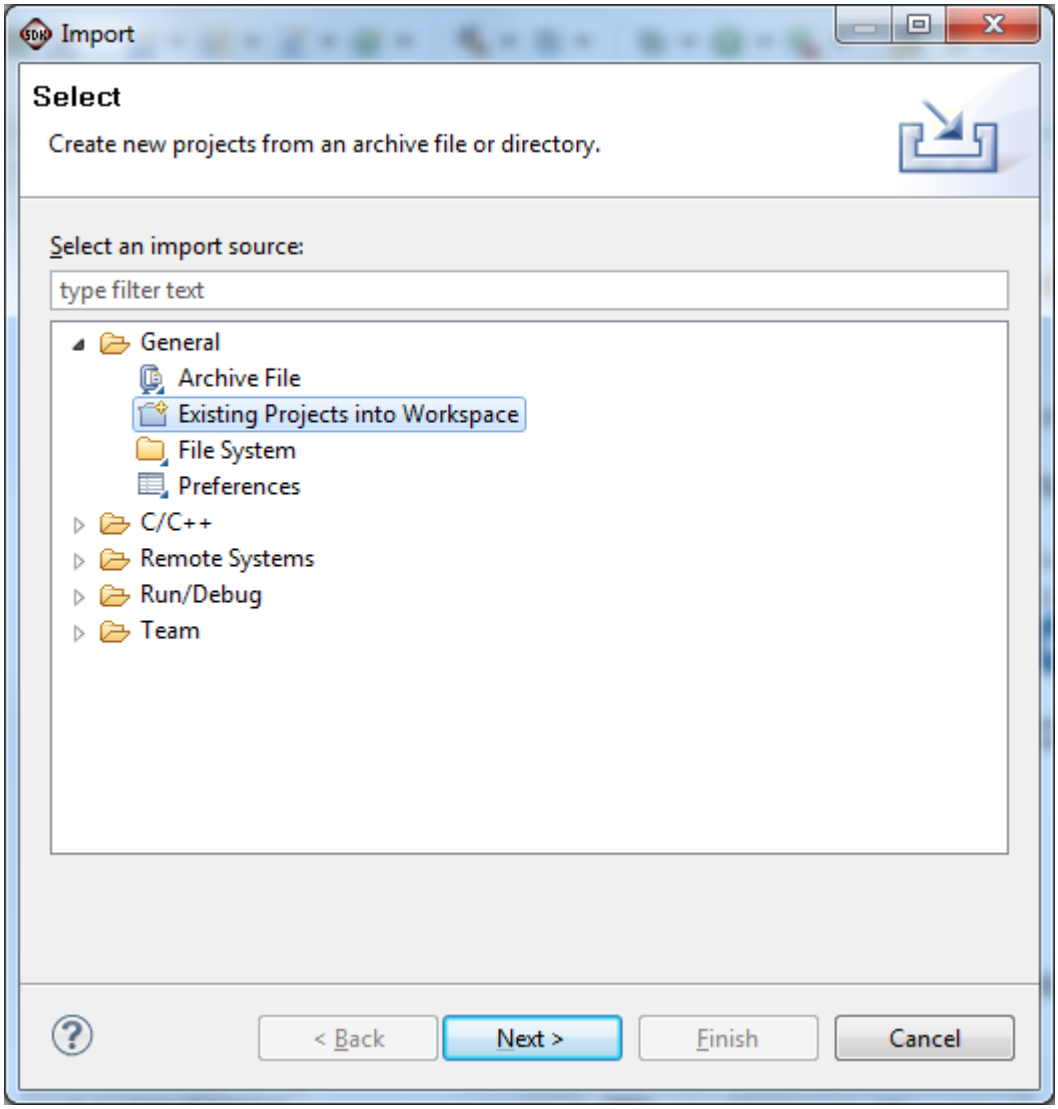


8. If the **Project Explorer** does not contain these three subfolders, launch the **File | Import** menu, expand the **General** folder, and select **Existing Projects into Workspace**. Click **Next**. Set the root directory to:

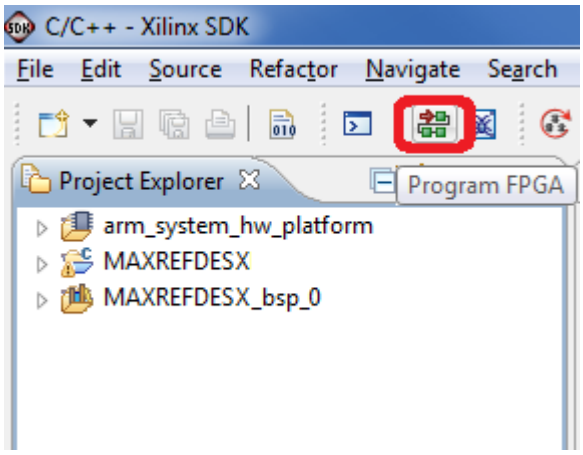
   C:\designs\maxim\RD5V02_00\RD5_ZED_V01_00\Design_Files\top.sdk\SDK\SDK_Export

   and the missing projects should appear in SDK **Project Explorer** with their checkboxes checked.

   Click **Finish** to import the projects.



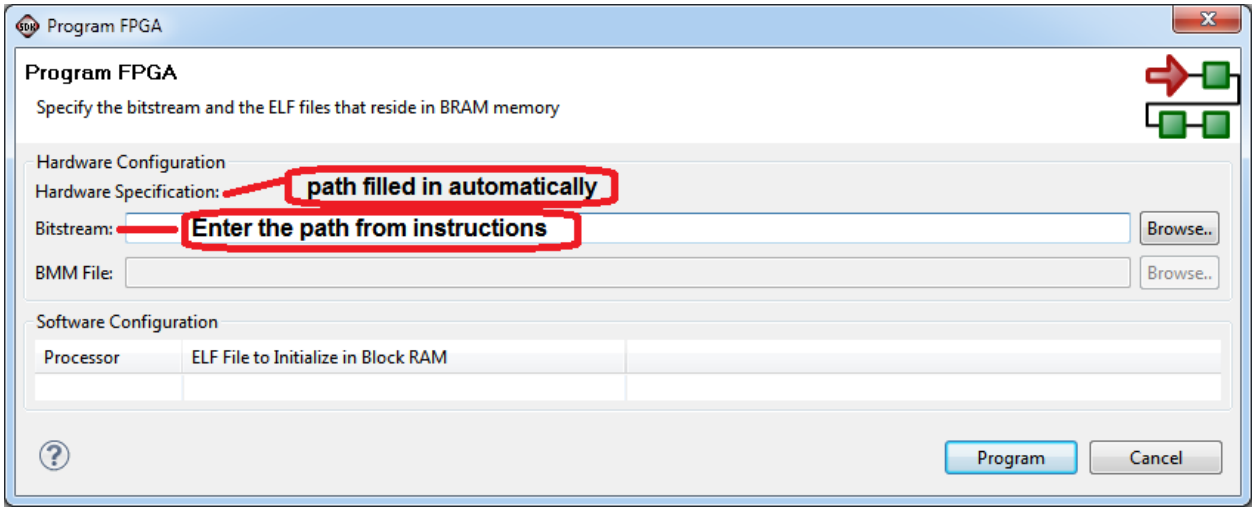
9. To download the bitstream (.BIT) file to the board, click on the **Program FPGA** icon (which looks like a green chain of devices).



The **Program FPGA** dialog box appears. From here, an FPGA bitstream (.BIT) file is selected. Be sure to select the .BIT file by using the path below.

Bitstream:
C:\designs\maxim\RD5V01_00\RD5_ZED_V01_00\Design_Files\top.sdk\SDK\SDK_Export\arm_system_hw_platform\system.bit

Press **Program**.



It takes approximately 10 seconds to download the FPGA, then a message box indicating **FPGA configuration complete** appears. If programming fails, try unplugging and reconnecting the USB programmer cable or restarting Xilinx SDK.

10. Set up the terminal program to run on the PC using the following steps. Before loading the executable firmware file on the FPGA, the terminal program on the PC should be running. The example firmware running on the FPGA communicates with the PC via a USB port set up to emulate a serial port (UART). To establish this communication link, the PC must be configured with the appropriate Windows drivers. A suitable terminal program such as Tera Term or HyperTerminal should be invoked.

    The ZedBoard utilizes the Cypress USB-UART bridge IC. If the Windows cannot automatically install the driver for the Cypress USB-UART bridge IC, the driver is available for download from www.cypress.com. If this link changes, search for the latest “CyUSBSerial USB UART” driver located at www.cypress.com. The driver is WHQL certified for the default Cypress VID / PID of 0x04B4 / 0x0008.

    Once installed, Windows will assign a previously unused COM port. Use the Windows **Control Panel | System | Device Manager** to determine the COM port number. (It will be named Cypress Serial). Make a note of which COM port this is. That information is needed in the next step.

    Next, a terminal emulation program needs to be installed and launched. For Windows XP® and earlier systems, the HyperTerminal program is the usual choice. However, since HyperTerminal was eliminated from Windows 7, it may be necessary to locate an alternative. Several are available; one good choice is called Tera Term (http://ttssh2.sourceforge.jp/). Whatever terminal program you choose, the communication should be set up by opening the COM port number previously described above and the port configured as :

    bits per second: **921,600**

    data bits: **8**;

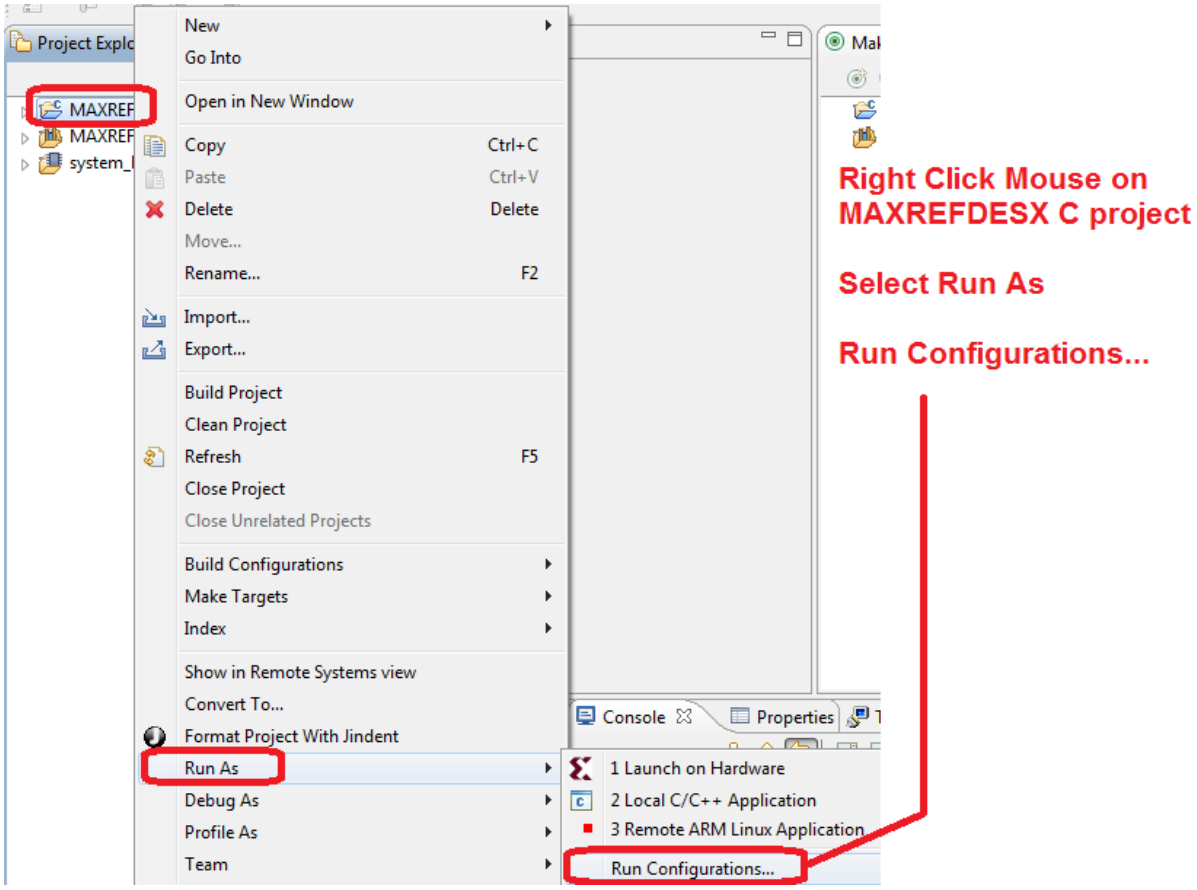
    parity: **none**;

    stop bits: **1**;

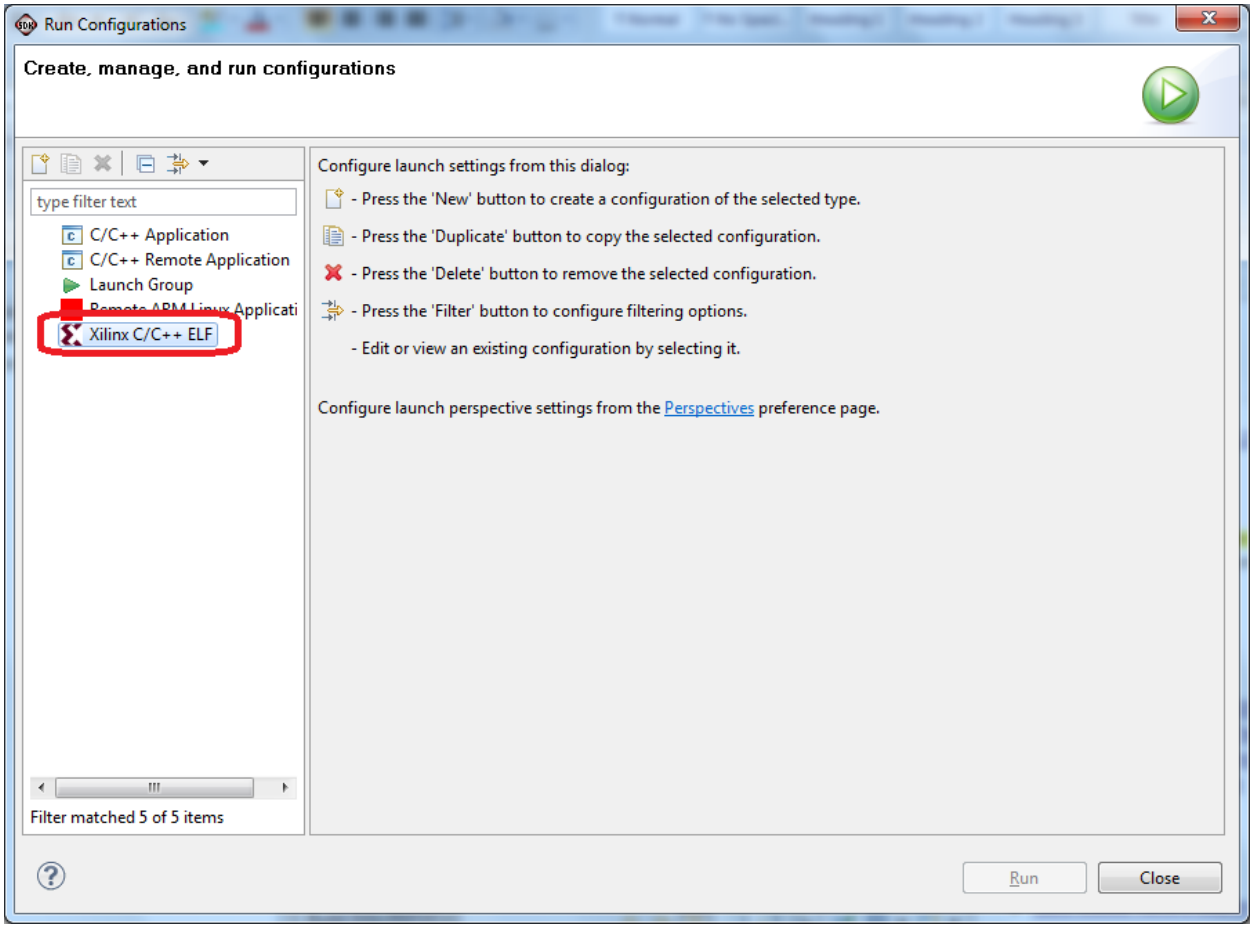
    flow control: **none**.

11. Use the Xilinx SDK to download and run the executable ELF (.ELF) file on the ARM Cortex-A9 processor using the following steps.

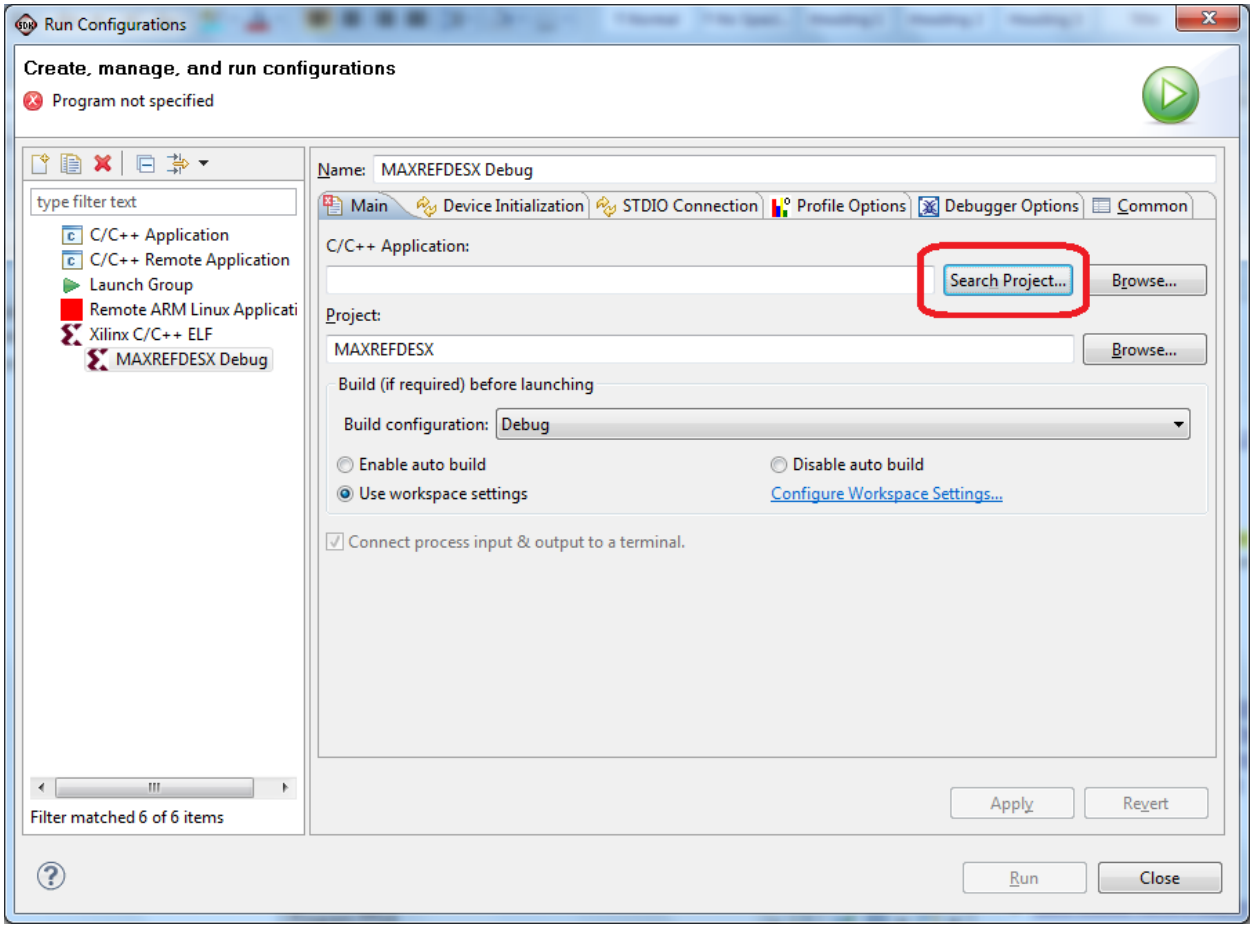
    Right-click the mouse while the **MAXREFDES5 C** project is selected, choose the **Run As** menu, and then **Run Configurations…** menu as shown below.



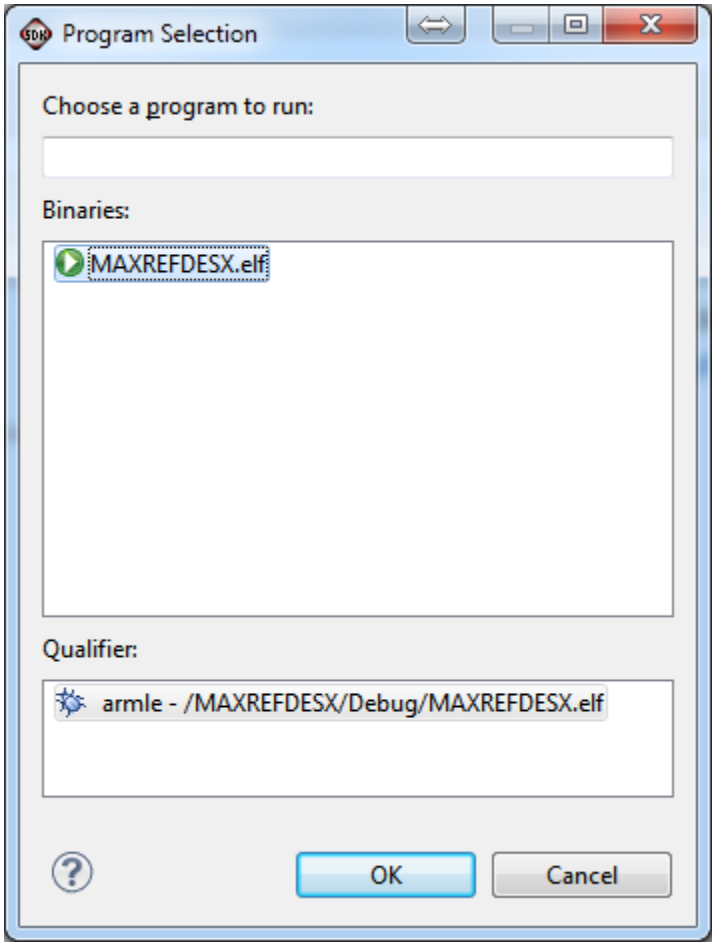
Next, double-click the mouse on the **Xilinx C/C++ ELF** menu.



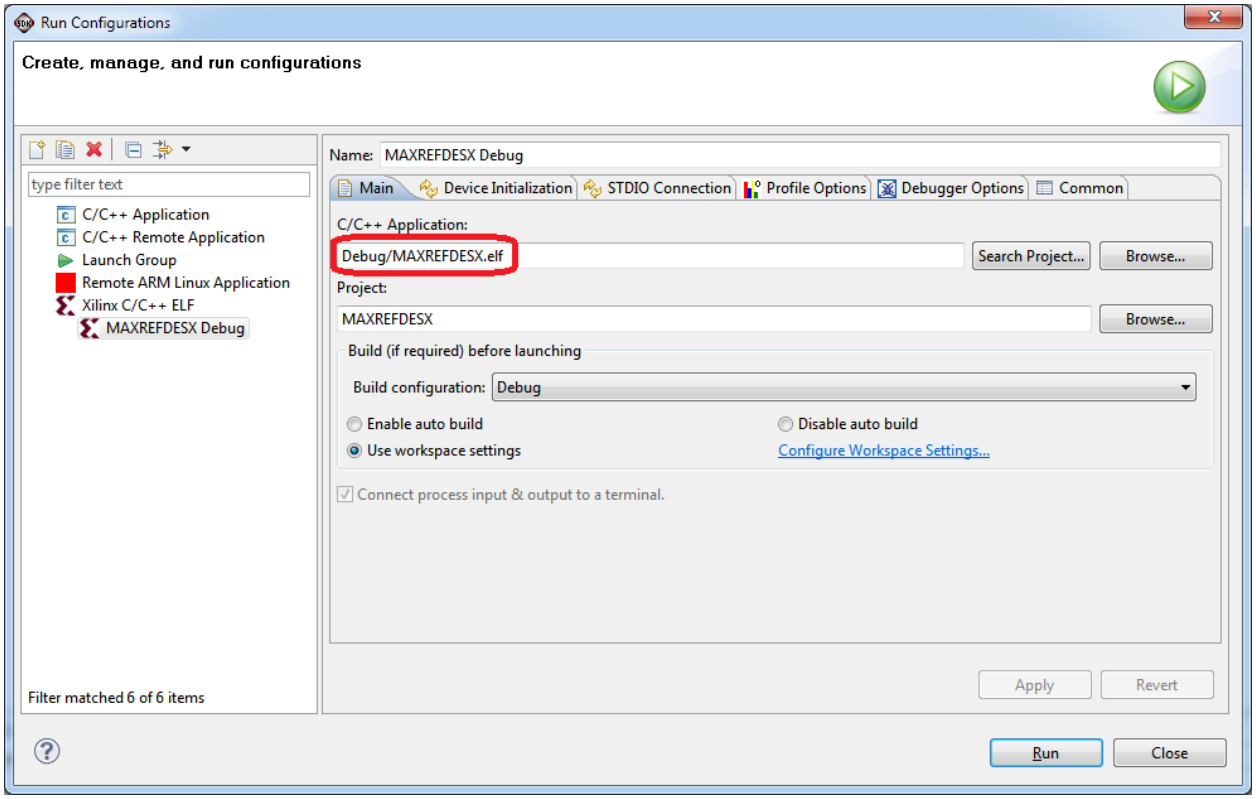
Next, press the **Search Project** button.



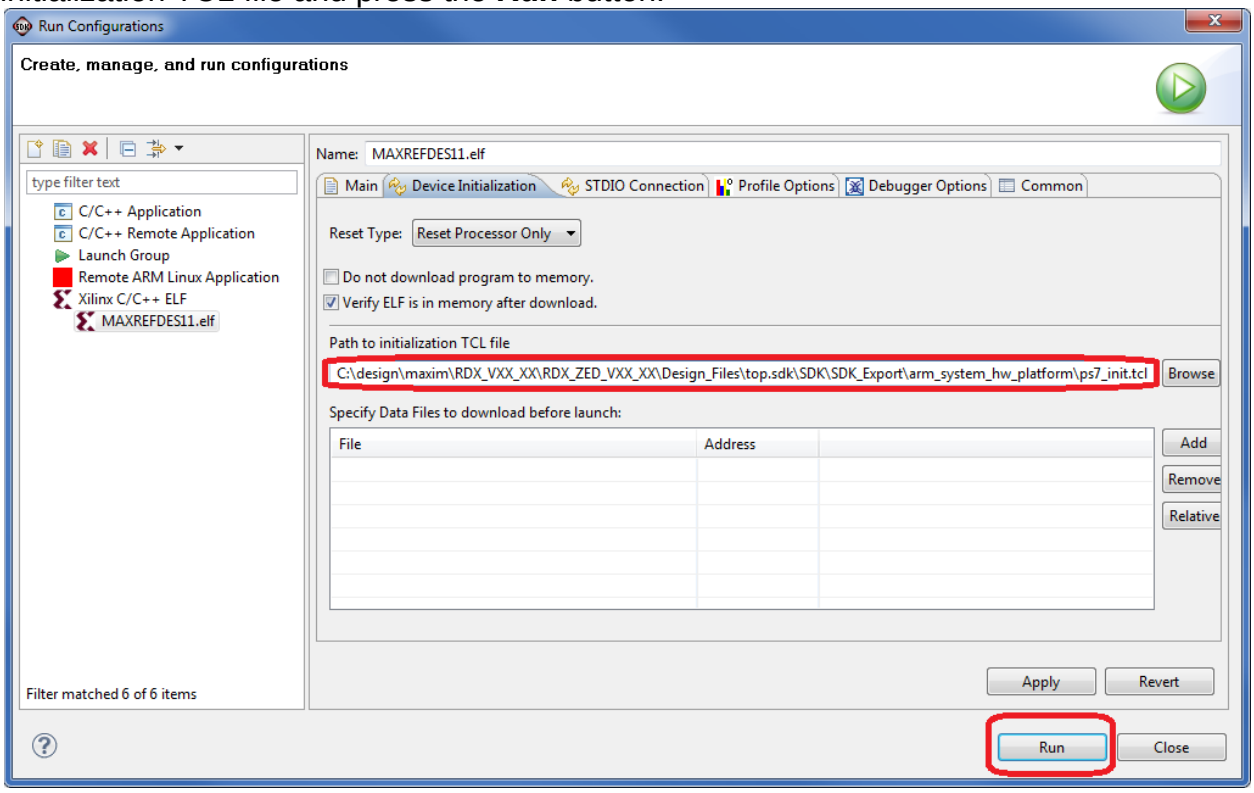
Double-click on the **MAXREFDES5.elf** binary.



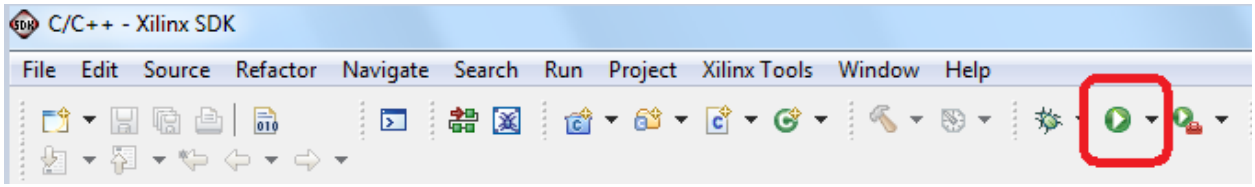
Verify the application is selected on the **Main** tab.



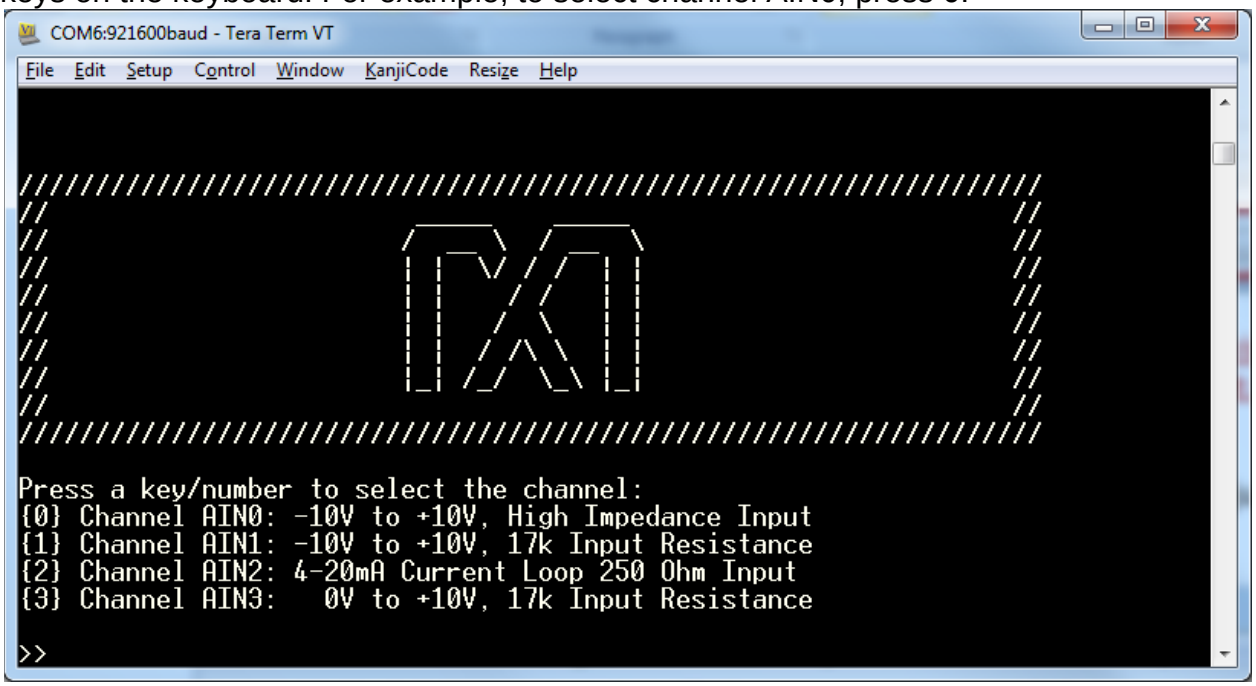
On the **Device Initialization** tab, click **Browse…** button to select the "**ps7_init.tcl**" initialization TCL file and press the **Run** button.



Once the Debug/MAXREFDES5 configuration is set up once, you just need to press the **Run** button if you ever want to run the program again.

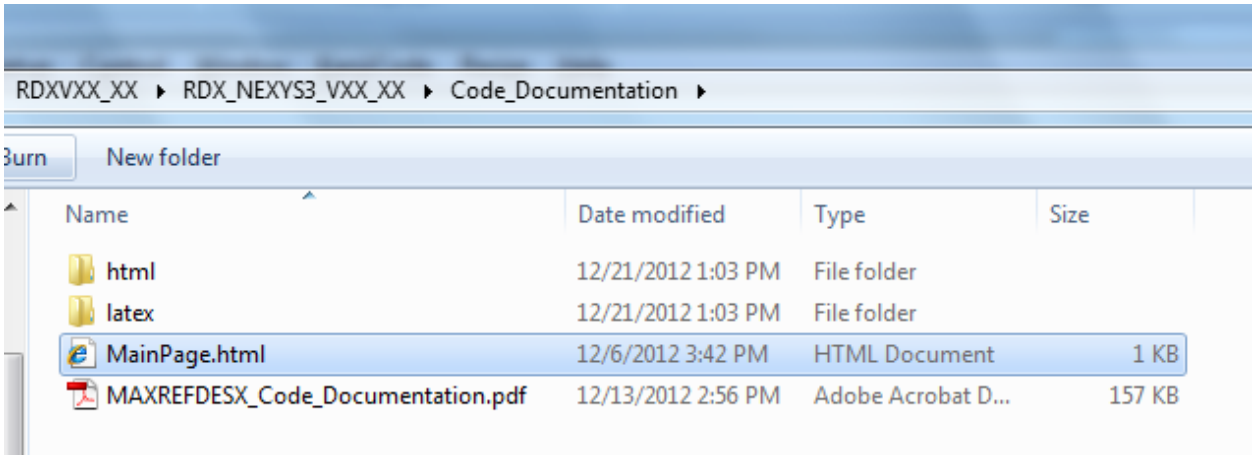


At this point, the application will be running on the Cortex-A9 and the terminal program will show the menu below. Make the desired selections by pressing the appropriate keys on the keyboard. For example, to select channel AIN0, press **0**.



5. Code Documentation

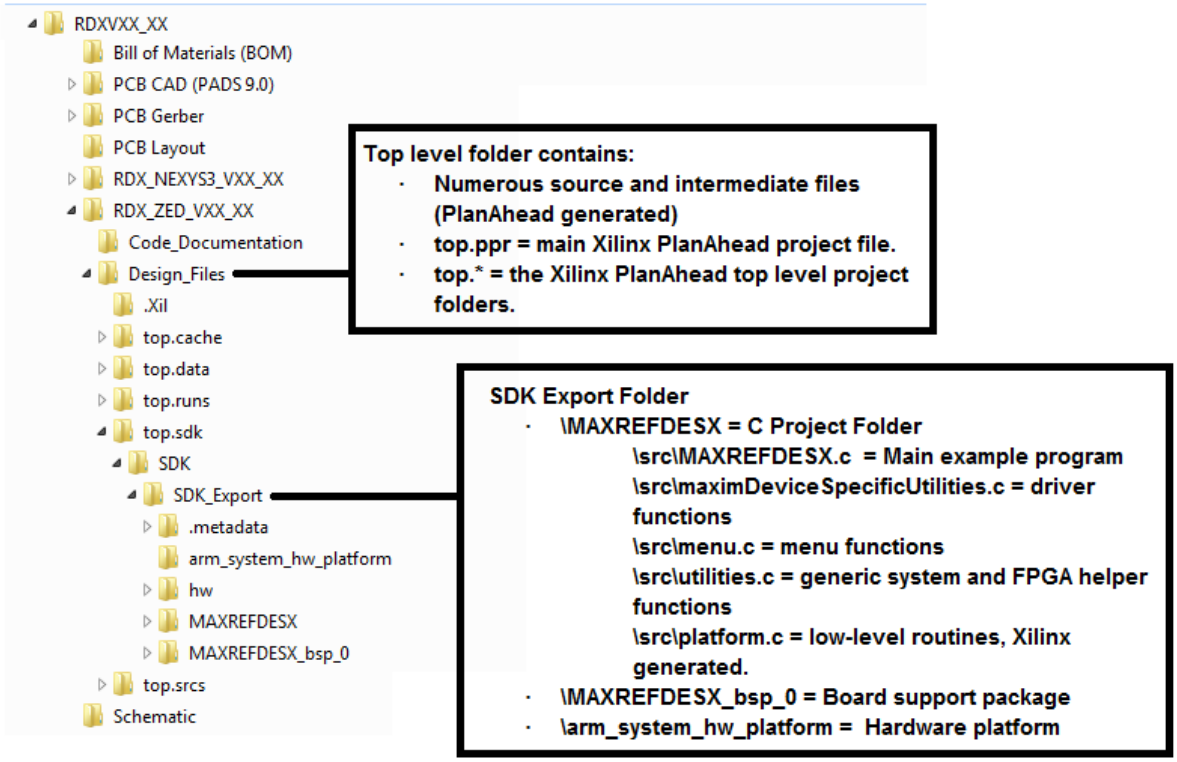
Code documentation can be found at:
C:\...\RD5V01_00\RD5_ZED_V01_00\Code_Documentation



To view the code documentation in HTML format with a browser, open the **MainPage.html** file.

To view the code documentation in .PDF format with a PDF reader, open the **MAXREFDES5_Code_Documentation.pdf** file.

6. Appendix A: Project Structure and Key Filenames



7. Trademarks

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Windows is a registered trademark and registered service mark and Windows XP is a registered trademark of Microsoft Corporation.
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ZedBoard is a trademark of ZedBoard.org.
Zynq is a registered trademark of Xilinx, Inc.

8. Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	4/13	Initial release	—
1	2/14	Replaced the board name “Cupertino” with “Santa Fe”	All