Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of "Quality Parts,Customers Priority,Honest Operation,and Considerate Service",our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

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Curiosity High Pin Count (HPC) Development Board User's Guide

Note the following details of the code protection feature on Microchip devices:

• Microchip products meet the specification contained in their particular Microchip Data Sheet.

• Microchip believes that its family of products is one of the most secure families of its kind on the market today, when used in the intended manner and under normal conditions.

• There are dishonest and possibly illegal methods used to breach the code protection feature. All of these methods, to our knowledge, require using the Microchip products in a manner outside the operating specifications contained in Microchip's Data Sheets. Most likely, the person doing so is engaged in theft of intellectual property.

• Microchip is willing to work with the customer who is concerned about the integrity of their code.

• Neither Microchip nor any other semiconductor manufacturer can guarantee the security of their code. Code protection does not mean that we are guaranteeing the product as "unbreakable."

Code protection is constantly evolving. We at Microchip are committed to continuously improving the code protection features of our products. Attempts to break Microchip's code protection feature may be a violation of the Digital Millennium Copyright Act. If such acts allow unauthorized access to your software or other copyrighted work, you may have a right to sue for relief under that Act.

QUALITY MANAGEMENT SYSTEM
CERTIFIED BY DNV
═ ISO/TS 16949 ═

Object of Declaration: Curiosity High Pin Count Development Board

EU Declaration of Conformity

Manufacturer: Microchip Technology Inc.
                  2355 W. Chandler Blvd.
                  Chandler, Arizona, 85224-6199
                  USA

This declaration of conformity is issued by the manufacturer.

The development/evaluation tool is designed to be used for research and development in a laboratory environment. This development/evaluation tool is not a Finished Appliance, nor is it intended for incorporation into Finished Appliances that are made commercially available as single functional units to end users under EU EMC Directive 2004/108/EC and as supported by the European Commission's Guide for the EMC Directive 2004/108/EC (8th February 2010).

This development/evaluation tool complies with EU RoHS2 Directive 2011/65/EU.

This development/evaluation tool, when incorporating wireless and radio-telecom functionality, is in compliance with the essential requirement and other relevant provisions of the R&TTE Directive 1999/5/EC and the FCC rules as stated in the declaration of conformity provided in the module datasheet and the module product page available at www.microchip.com.

For information regarding the exclusive, limited warranties applicable to Microchip products, please see Microchip's standard terms and conditions of sale, which are printed on our sales documentation and available at www.microchip.com.

Signed for and on behalf of Microchip Technology Inc. at Chandler, Arizona, USA

12-Sep-14

Derek Carlson   Date
VP Development Tools

NOTES:

CURIOSITY HIGH PIN COUNT DEVELOPMENT BOARD USER'S GUIDE

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CURIOSITY HIGH PIN COUNT DEVELOPMENT BOARD USER'S GUIDE

Preface

INTRODUCTION

This chapter contains general information that will be useful to know before using the Curiosity HPC Development Board. Items discussed in this chapter include:

- Document Layout
- Conventions Used in this Guide
- Recommended Reading
- The Microchip Website
- Development Systems Customer Change Notification Service
- Customer Support
- Revision History

DOCUMENT LAYOUT

This document describes how to use the Curiosity HPC Development Board as a development tool to emulate and debug firmware on a target board. The document is organized as follows:

- **Chapter 1. "Introduction to Curiosity High Pin Count (HPC)"** – This chapter contains general information regarding the Curiosity HPC Development Board kit contents, layout and power source.
- **Chapter 2. "Getting Started"** – This chapter offers information on how to program the Curiosity HPC Development Board.
- **Chapter 3. "Troubleshooting"** – Consult this chapter for troubleshooting information.
- **Appendix A. "Schematic"** – This appendix lists the Curiosity HPC Development Board schematic.
- **Appendix B. "General Notes"** – Refer to this appendix for general notes on using the Click module sockets and the solder blob jumpers.

Curiosity High Pin Count Development Board User's Guide

CONVENTIONS USED IN THIS GUIDE

This manual uses the following documentation conventions:

DOCUMENT CONVENTIONS

Description	Represents	Examples
Arial font:		
Italic characters	Referenced books	*MPLAB IDE User's Guide*
	Emphasized text	...is the *only* compiler...
Initial caps	A window	the Output window
	A dialog	the Settings dialog
	A menu selection	select Enable Programmer
Quotes	A field name in a window or dialog	"Save project before build"
Underlined, italic text with right angle bracket	A menu path	*File>Save*
Bold characters	A dialog button	Click **OK**
	A tab	Click the **Power** tab
N'Rnnnn	A number in verilog format, where N is the total number of digits, R is the radix and n is a digit.	4'b0010, 2'hF1
Text in angle brackets < >	A key on the keyboard	Press <Enter>, <F1>
Courier New font:		
Plain Courier New	Sample source code	`#define START`
	Filenames	`autoexec.bat`
	File paths	`c:\mcc18\h`
	Keywords	`_asm, _endasm, static`
	Command-line options	`-Opa+, -Opa-`
	Bit values	`0, 1`
	Constants	`0xFF, 'A'`
Italic Courier New	A variable argument	`file`.o, where `file` can be any valid filename
Square brackets [ ]	Optional arguments	`mcc18 [options] file [options]`
Curly brackets and pipe character: { | }	Choice of mutually exclusive arguments; an OR selection	`errorlevel {0|1}`
Ellipses...	Replaces repeated text	`var_name [, var_name...]`
	Represents code supplied by user	`void main (void) { ... }`

RECOMMENDED READING

This user's guide describes how to use the Curiosity HPC Development Board. For the latest information on using other tools, refer to the MPLAB® X IDE home page: www.microchip.com/mplabx/. This resource page contains updated documentation, downloads and links to other MPLAB X compatible tools, plug-ins and much more.

THE MICROCHIP WEBSITE

Microchip provides online support via our website at www.microchip.com. This website is used as a means to make files and information easily available to customers. Accessible by using your favorite Internet browser, the website contains the following information:

- **Product Support** – Data sheets and errata, application notes, sample programs and labs, design resources, user's guides and hardware support documents, latest software releases and archived software
  Curiosity Development Board-specific product support can be accessed via our website at www.microchip.com/curiosity.
- **General Technical Support** – Frequently Asked Questions (FAQs), technical support requests, online discussion groups, Microchip consultant program member listing
- **Business of Microchip** – Product selector and ordering guides, latest Microchip press releases, listing of seminars and events, listings of Microchip sales offices, distributors and factory representatives

DEVELOPMENT SYSTEMS CUSTOMER CHANGE NOTIFICATION SERVICE

Microchip's customer notification service helps keep customers current on Microchip products. Subscribers will receive e-mail notification whenever there are changes, updates, revisions or errata related to a specified product family or development tool of interest.

To register, access the Microchip website at www.microchip.com, click on Customer Change Notification and follow the registration instructions.

The Development Systems product group categories are:

- **Compilers** – The latest information on Microchip C compilers, assemblers, linkers and other language tools. These include all MPLAB C compilers; all MPLAB assemblers (including MPASM™ assembler); all MPLAB linkers (including MPLINK™ object linker); and all MPLAB librarians (including MPLIB™ object librarian).
- **Emulators** – The latest information on Microchip in-circuit emulators.This includes the MPLAB REAL ICE™ and MPLAB ICE 2000 in-circuit emulators.
- **In-Circuit Debuggers** – The latest information on the Microchip in-circuit debuggers. This includes MPLAB ICD 3 in-circuit debuggers and PICkit™ 3 debug express.
- **MPLAB IDE** – The latest information on Microchip MPLAB IDE, the Windows® Integrated Development Environment for development systems tools. This list is focused on the MPLAB IDE, MPLAB IDE Project Manager, MPLAB Editor and MPLAB SIM simulator, as well as general editing and debugging features.
- **Programmers** – The latest information on Microchip programmers. These include production programmers such as MPLAB REAL ICE in-circuit emulator, MPLAB ICD 3 in-circuit debugger and MPLAB PM3 device programmers. Also included are nonproduction development programmers such as PICSTART® Plus and PICkit 2 and 3.

Curiosity High Pin Count Development Board User's Guide

CUSTOMER SUPPORT

Users of Microchip products can receive assistance through several channels:

- Distributor or Representative
- Local Sales Office
- Field Application Engineer (FAE)
- Technical Support

Customers should contact their distributor, representative or field application engineer (FAE) for support. Local sales offices are also available to help customers.

Technical support is available through the website at:

www.microchip.com/support.

REVISION HISTORY

Revision A (July 2016)

Initial release of this document.

Chapter 1. Introduction to Curiosity High Pin Count (HPC)

The Curiosity High Pin Count (HPC) Development Board supports Microchip's 28- and 40-pin 8-bit PIC$^{\circledR}$ MCUs. Two unique PDIP sockets are surrounded by dual-row expansion headers, which allow for connectivity to all pins on the PIC MCUs. Programming/debugging is accomplished through the PICkit™ On Board (PKOB), eliminating the need for an external programming/debugging tool. The development board includes a set of four indication LEDs, a potentiometer, and push-button switches. Additionally, the Curiosity HPC Board integrates two MikroElektronika microBUS™ sockets, which accommodate a variety of plug-in Click™ Board modules that can be used for application development.
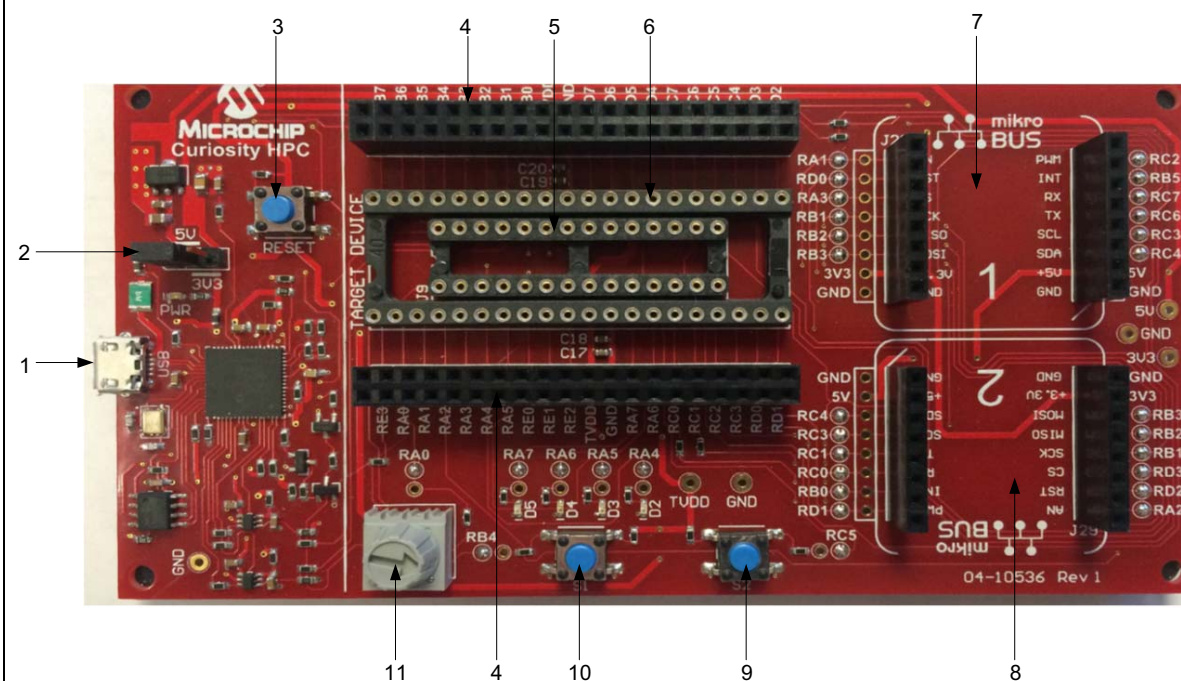
1.1 CURIOSITY HIGH PIN COUNT (HPC) DEVELOPMENT BOARD KIT CONTENTS

The Curiosity High Pin Count (HPC) Development Board kit contains the following:

- Curiosity High Pin Count (HPC) Development Board
- Quick Start Guide
- PIC16F18875 MCU

Curiosity High Pin Count Development Board User's Guide

FIGURE 1-1: **HPC DEVELOPMENT BOARD**

1. USB micro connector
2. 3.3/5V power jumper
3. Master Clear Reset button
4. Dual-row expansion headers
5. PIC® MCU socket for 28-pin microcontroller
6. PIC® MCU socket for 40-pin microcontroller
7. mikroBUS™ Click Board socket 1
8. mikroBUS™ Click Board socket 2
9. Push button SW2
10. Push button SW1
11. Potentiometer

Chapter 2. Getting Started

The Curiosity HPC Development Board can be used with either MPLAB® X Integrated Development Environment (IDE, version 3.0 or higher) or MPLAB® Xpress IDE; both IDEs are available for free at www.microchip.com.

The Curiosity HPC Development Board contains a PICkit On Board (PKOB) which allows for both low-voltage programming and low-voltage in-circuit debugging for all supported devices. When used with the MPLAB IDE, in-circuit debugging allows the user to run, modify, and troubleshoot their custom software and hardware quickly, without the need for additional debugging tools.

## 2.1 PROGRAMMING THE CURIOSITY HPC DEVELOPMENT BOARD

Programming the Curiosity HPC Development Board can be accomplished through one of the two following ways: either through MPLAB X (version 3.30 or higher), or through MPLAB Xpress.

> **Note:** The Curiosity HPC Board must be programmed using Low-Voltage Programming (LVP). The LVP bit of the Configuration Word(s) must be set (LVP = ON or '1').

2.1.1 Programming Using MPLAB® X

1. Connect the Curiosity HPC Board to the computer using the on-board micro-USB connector.
2. Open MPLAB X and either create a new project or open an existing one.
3. Click on the **Project Properties** icon located in the project's Dashboard window (as seen in Figure 2-1). Alternatively, the Project Properties window can be opened by clicking on *File > Project Properties*, or by right-clicking on the project name in the Projects window and clicking **Properties**.

FIGURE 2-1: **PROJECT PROPERTIES BUTTON**
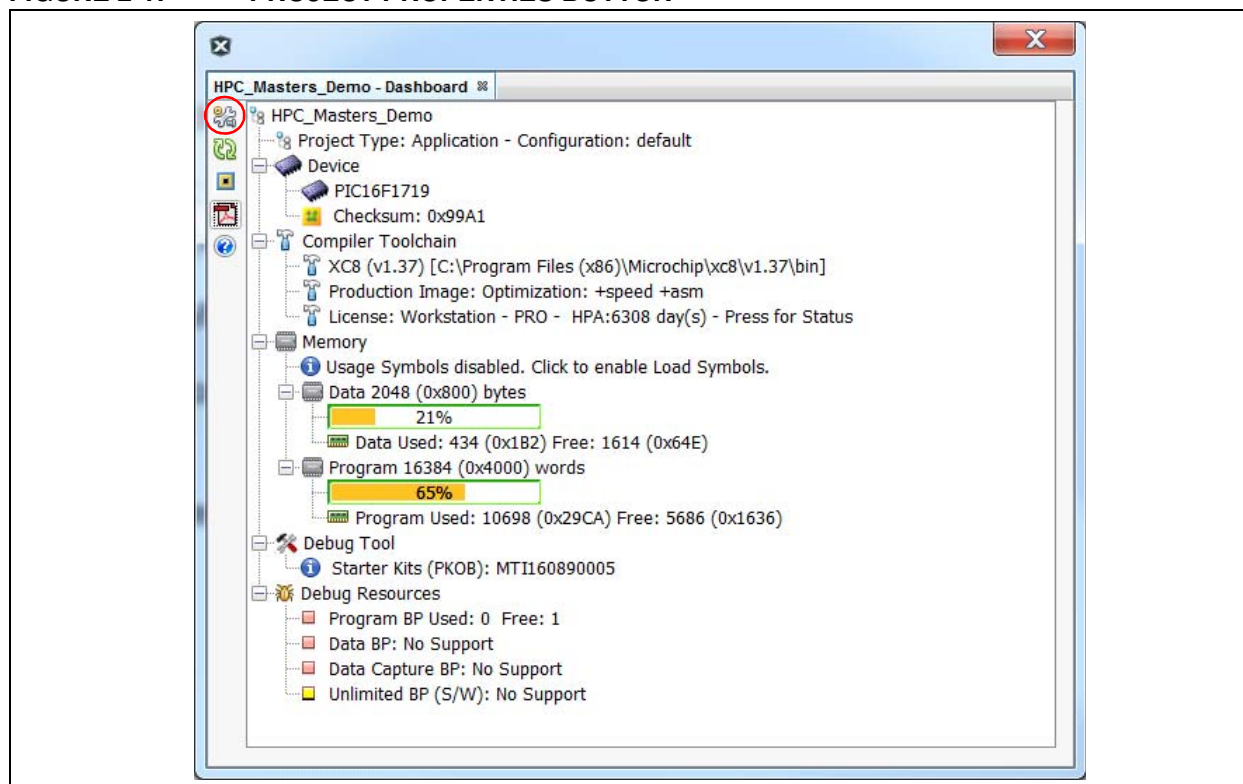
4. The Project Properties window will open. This window allows for the selection of the programming tool, compiler, and PIC MCU. MPLAB X refers to the Curiosity HPC Board as 'Starter Kits (PKOB)', with 'Curiosity' listed below in the Hardware Tool selection window. Click on **Curiosity** to select the Curiosity HPC Board, then click the **Apply** button (as seen in Figure 2-2).

FIGURE 2-2: **SELECTING THE CURIOSITY HPC DEVELOPMENT BOARD**
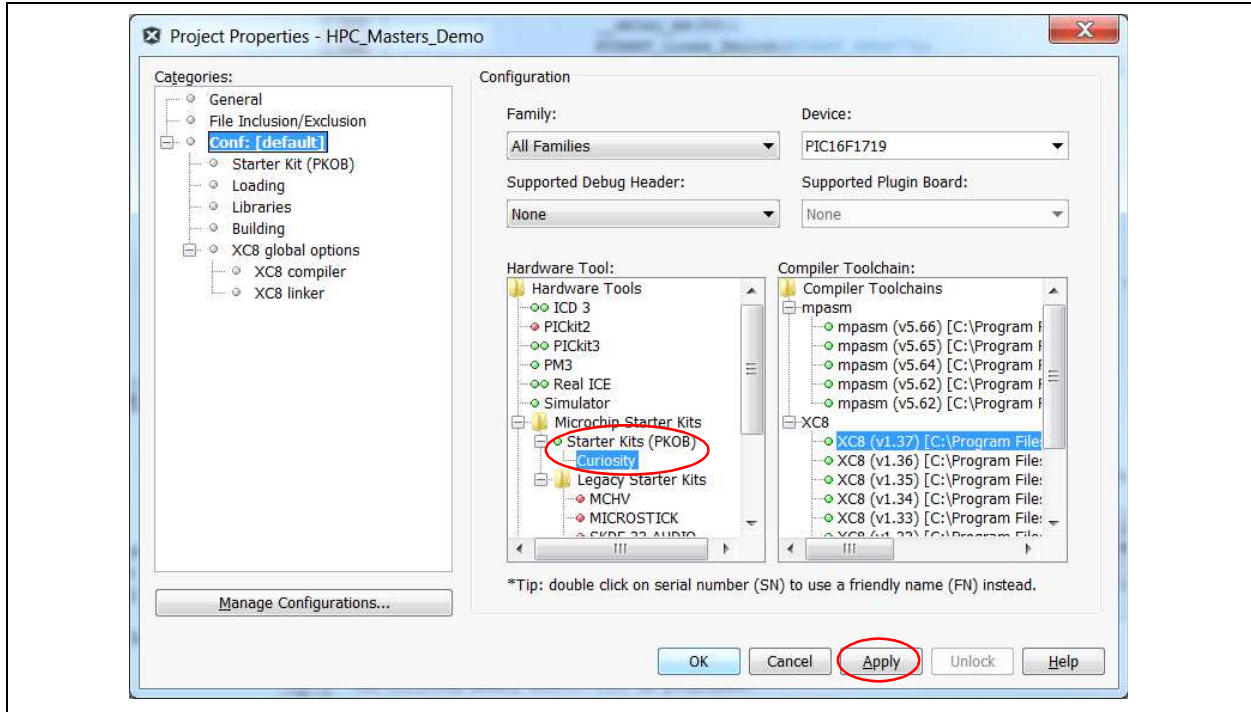
5. In the upper left-hand corner of the Project Properties window, click on **Starter Kits (PKOB)**. The window will now show the configuration options for the PKOB programmer, as shown in Figure 2-3.

**FIGURE 2-3:** **PROGRAM OPTIONS FOR THE PICkit™ ON BOARD (PKOB)**
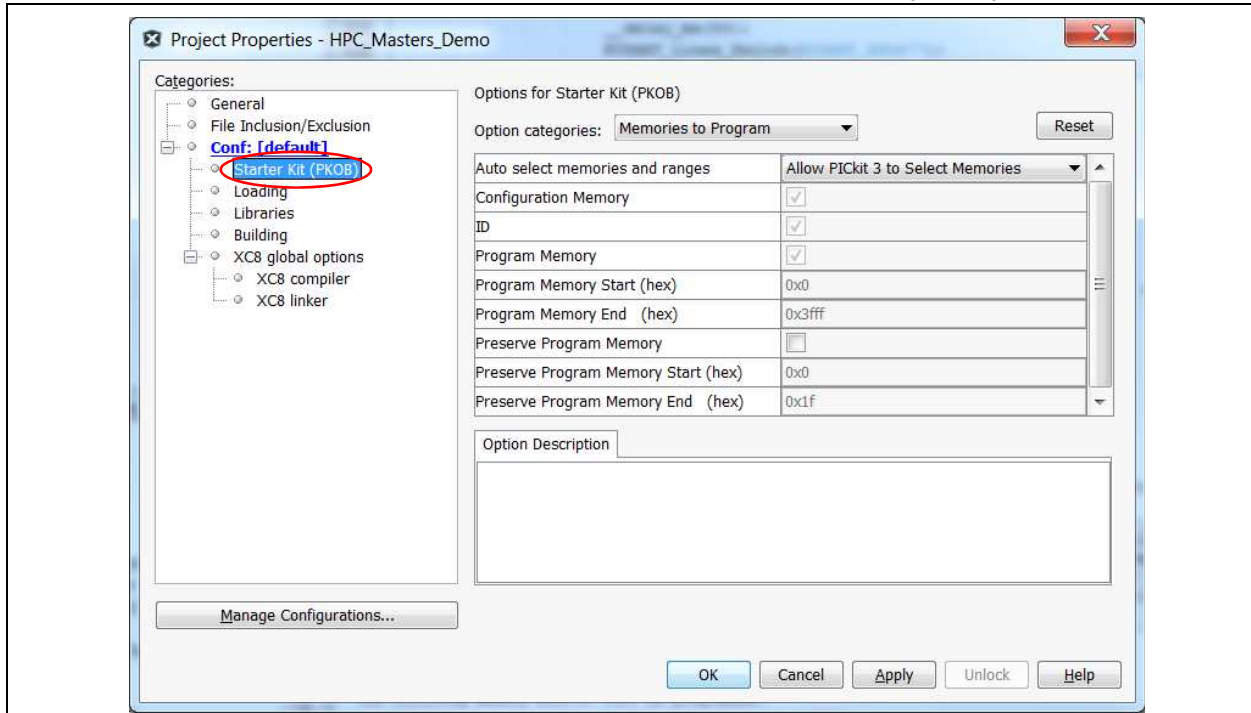
6. In the Option categories drop-down menu, select **Program Options**; ensure that the Enable Low Voltage Programming checkbox is checked (Figure 2-4). This option should go default to checked, which ensures low-voltage programming. Click the **OK** button. The Curiosity HPC Board is now ready to be programmed.

FIGURE 2-4: **ENSURE LOW-VOLTAGE PROGRAMMING IS ENABLED**
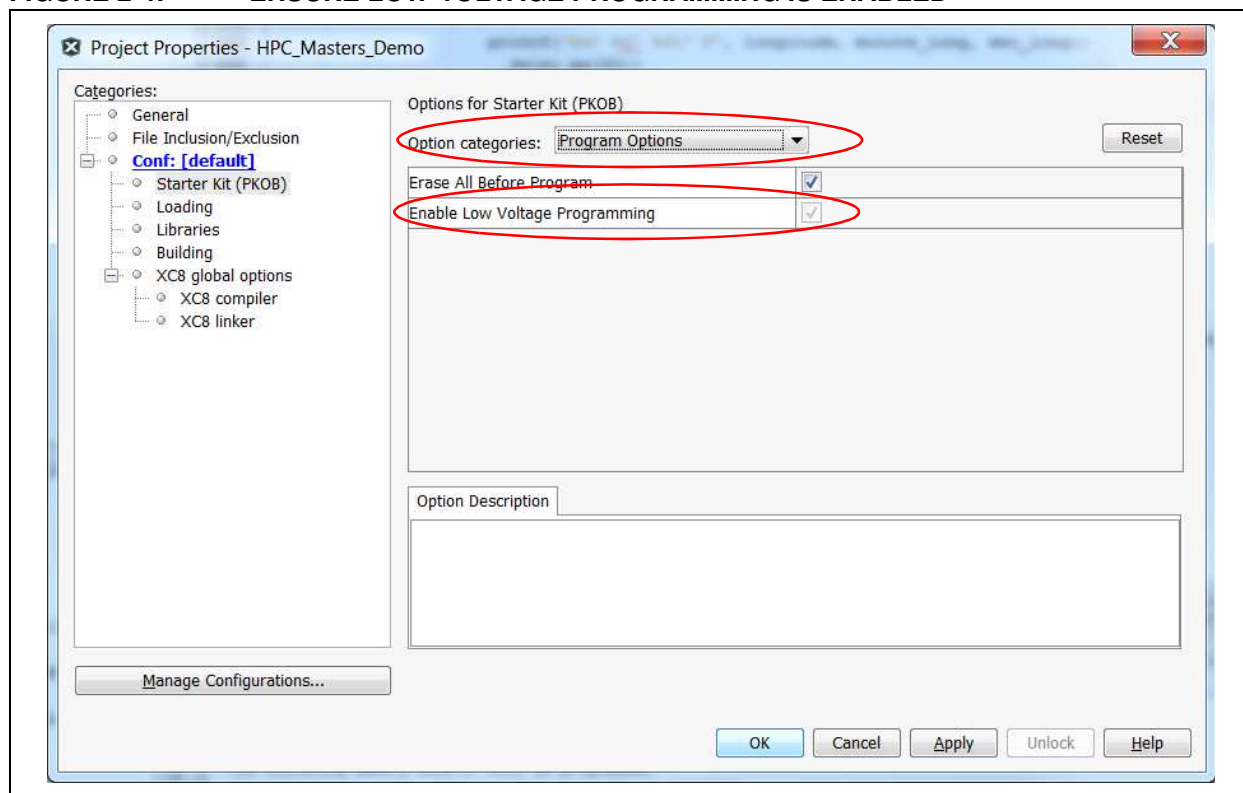
7. Once the project is ready to be programmed, simply click on the **Make and Program Device** button, and MPLAB will build and compile the code and program the PIC device, as displayed in Figure 2-5.
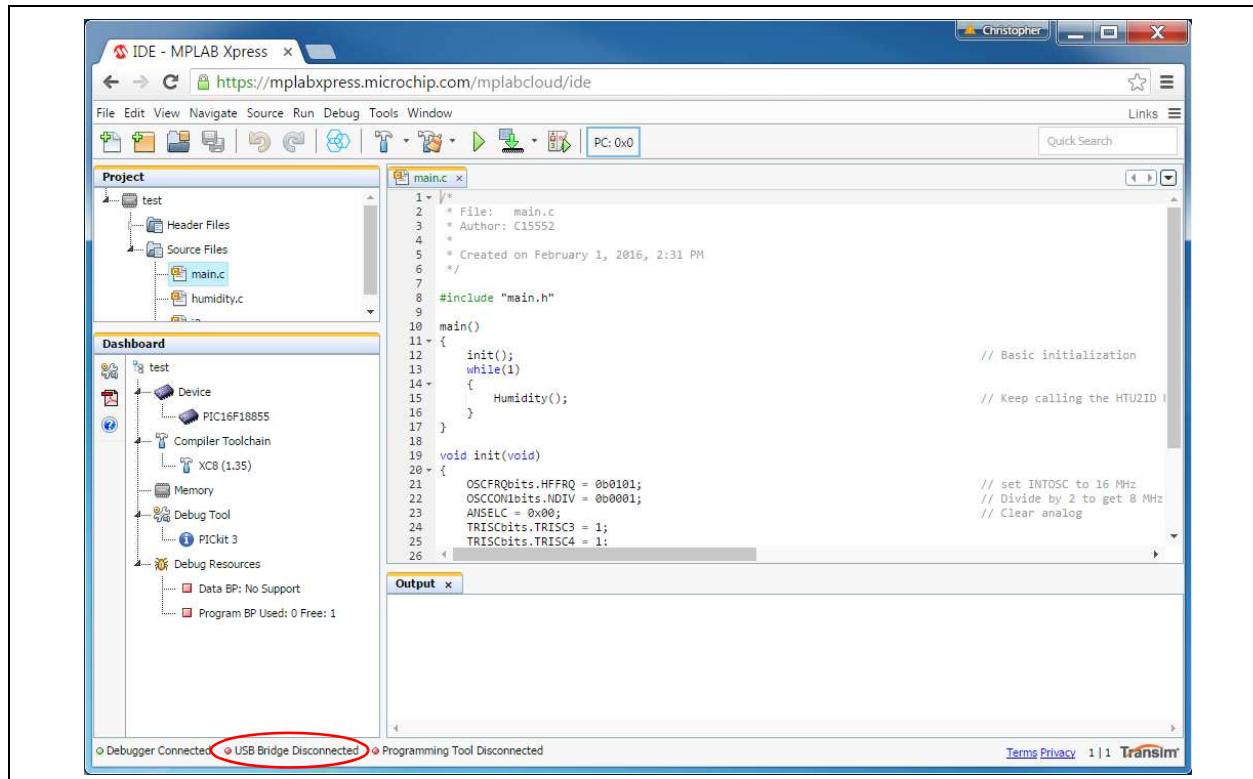
FIGURE 2-5: **DEVICE PROGRAMMING**
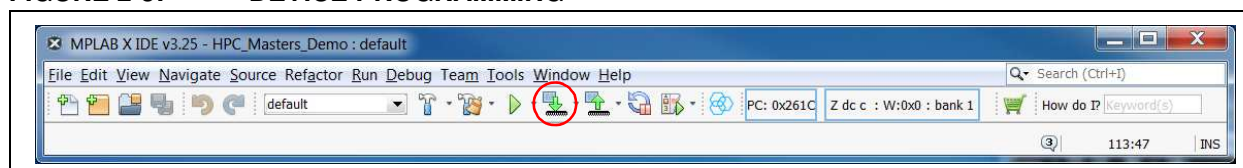
2.1.2 Programming using MPLAB® Xpress

1. Connect the Curiosity HPC Board to the computer using the on-board micro-USB connector.
2. Type the link to the MPLAB Xpress IDE (www.mplabxpress.microchip.com) into a browser window.
3. Create a new project or open an existing project.
4. At the very bottom of the MPLAB Xpress window, click on the label **USB Bridge Disconnected** (Figure 2-6); a new Manage USB Bridge window will open.

FIGURE 2-6: **CONNECTING THE USB BRIDGE**

5. The new window configures the USB connection between the computer and the Curiosity HPC Board (Figure 2-7). Step 1 indicates that the latest Java Runtime Environment must be installed, allowing the user to download and install the latest version. Step 2 opens the bridge tool; click on the **Download USB Bridge Tool** button to download the bridge tool. A new window, MPLAB Xpress USB Bridge will appear, and may ask for the unique token found in Step 3 in the Manage USB Bridge window. Copy and paste the token into the USB Bridge tool. Once connected, the Bridge tool will show the connection and the words "Everything is looking good." will appear (Figure 2-8). It is important to note that the Bridge Tool window must remain open while working on the project. Click the **OK** button in the Manage USB Bridge window.

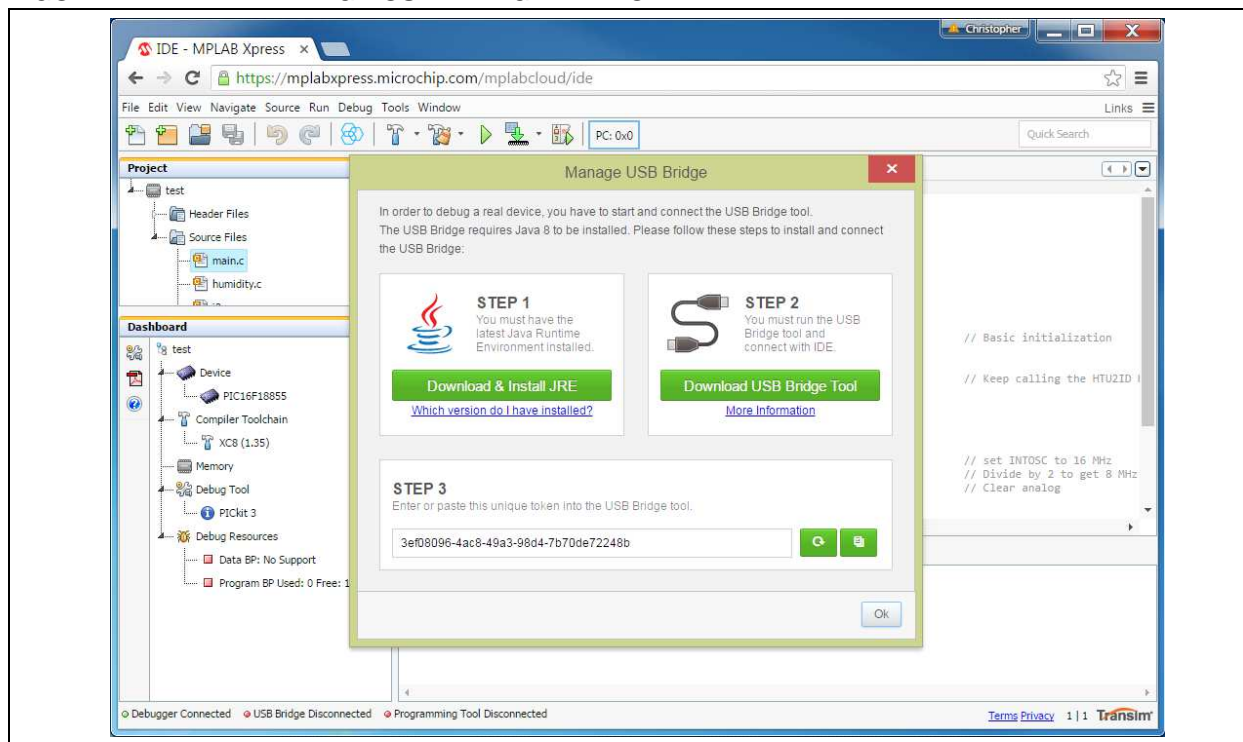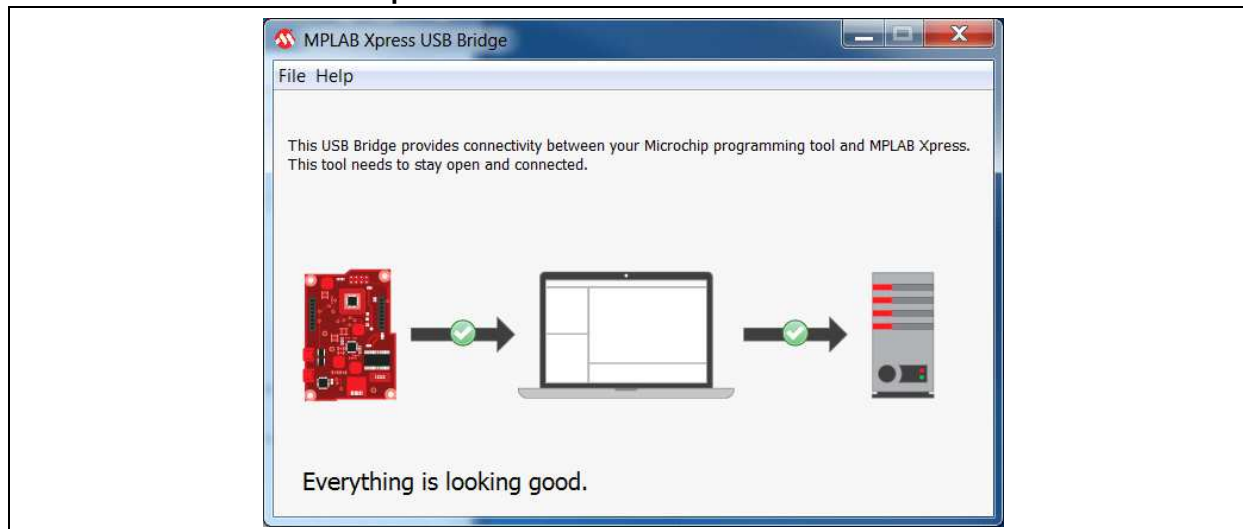**FIGURE 2-7:** **MANAGE USB BRIDGE WINDOW**

FIGURE 2-8: **MPLAB® Xpress USB BRIDGE WINDOW**

6. Click on the **Project Properties** icon located in the project's Dashboard window ([Figure 2-9](#)). Alternatively, the Project Properties window can be opened by clicking on *File > Project Properties*, or by right-clicking on the project name in the Projects window and clicking **Project Properties**.

FIGURE 2-9: **SELECTING THE CURIOSITY HPC IN MPLAB® Xpress**
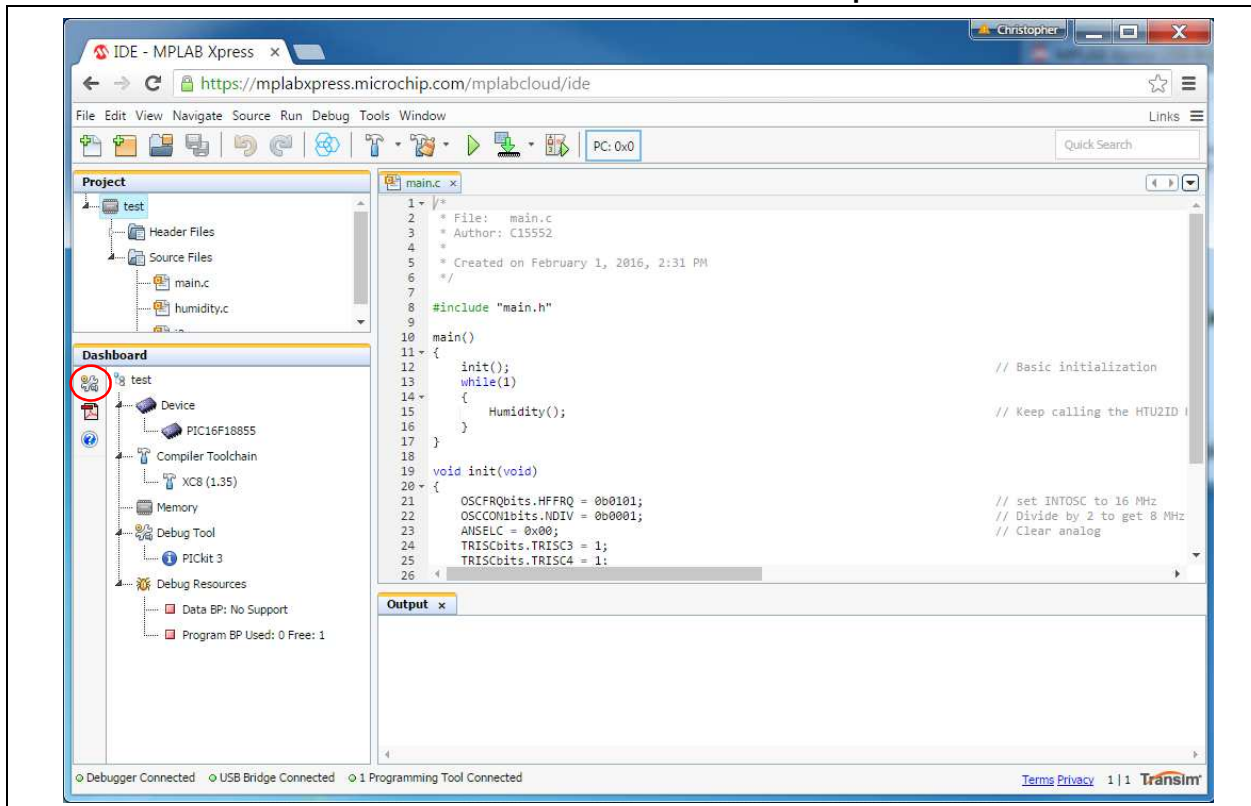
7. The Project Properties window will open; this window allows for the selection of the programming tool, compiler, and PIC MCU. MPLAB Xpress refers to the Curiosity HPC Board as 'Curiosity', with the Curiosity HPC serial number listed below in the Hardware Tool selection window. Click on the **serial number** to select the Curiosity HPC Board then click the **Apply** button ([Figure 2-10](#)).

FIGURE 2-10: **SELECTING THE CURIOSITY HPC IN MPLAB® Xpress**
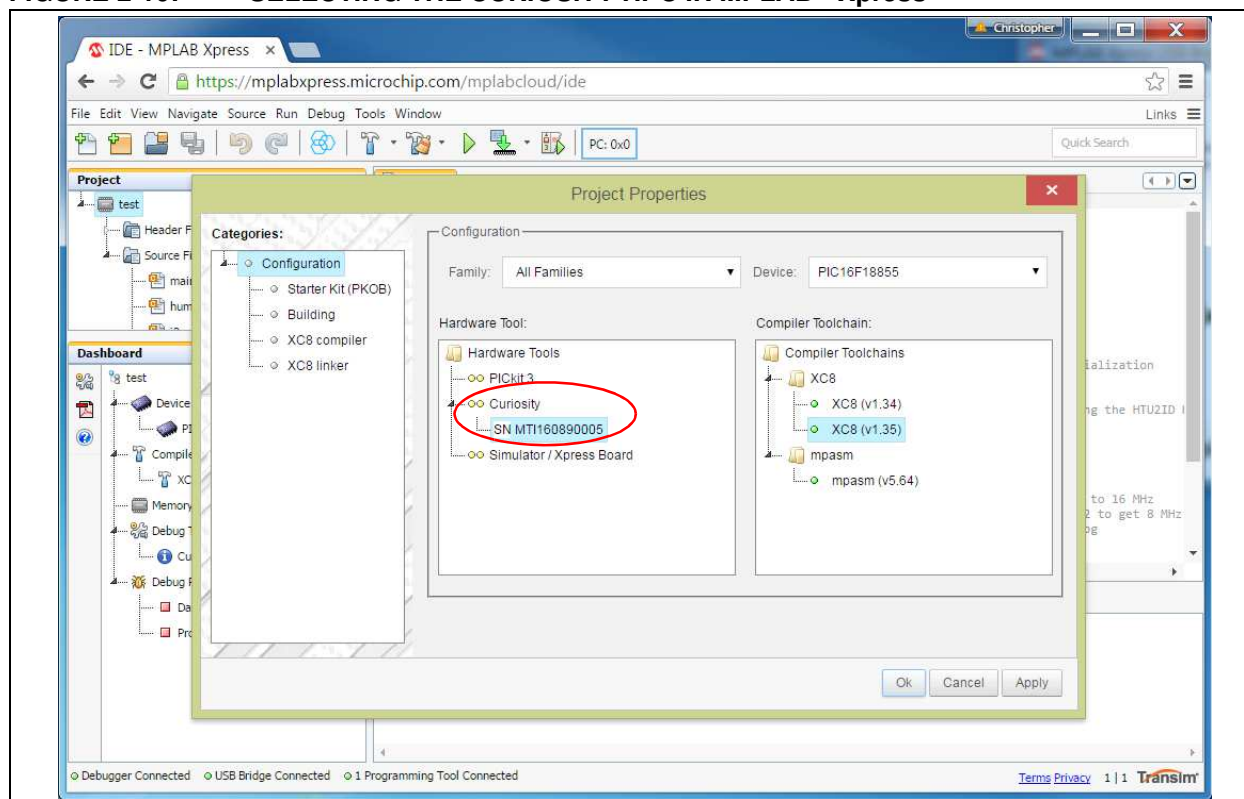
8. In the upper left-hand corner of the Project Properties window, click on **Starter Kit (PKOB)**. The window will now show the program options for the PKOB. Ensure that the Enable Low-Voltage Programming checkbox is checked (Figure 2-11) and press the **OK** button. The Curiosity HPC Board is now ready to be programmed.

FIGURE 2-11: **ENSURING LOW-VOLTAGE PROGRAMMING IS ENABLED**
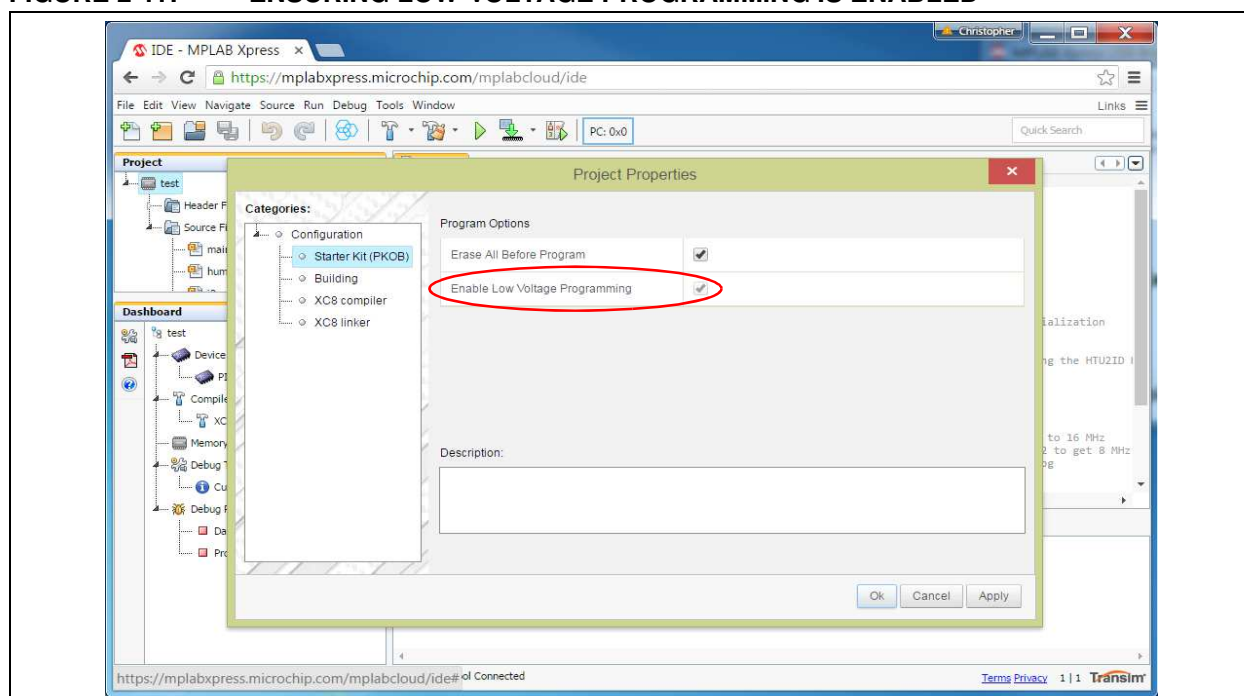
9. Once the project is ready to be programmed, simply click on the **Make and Program Device** button and MPLAB Xpress will build and compile the code, and program the PIC device (Figure 2-12).

FIGURE 2-12: PIC® DEVICE PROGRAMMING
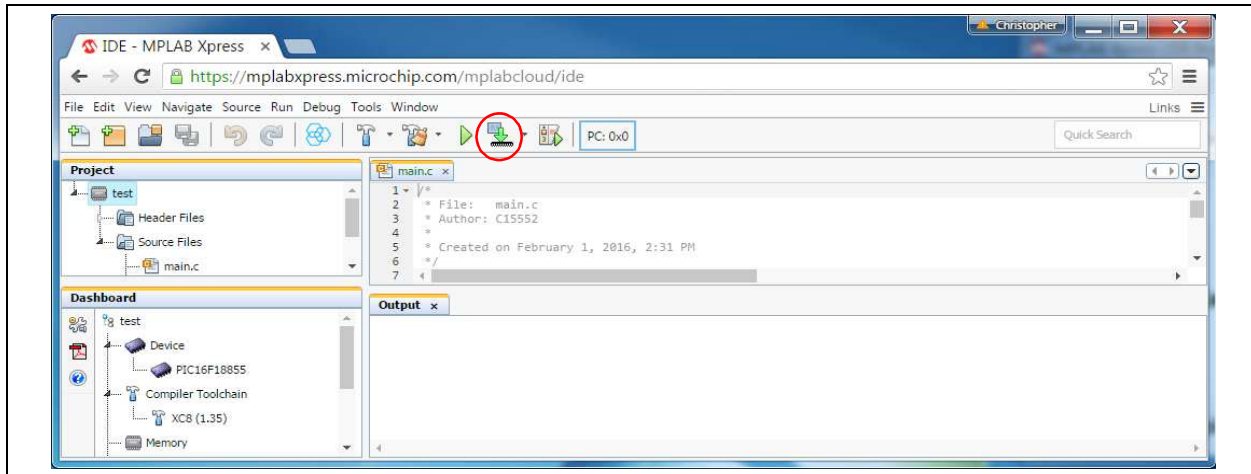
NOTES:

Chapter 3. Troubleshooting

This chapter discusses common operational issues and methods to resolve them.

3.1 THE MCU WILL NOT PROGRAM USING THE PKOB

The Curiosity HPC Development Board's PICkit On Board (PKOB) uses low-voltage programming. Both MPLAB X and MPLAB Xpress set the Low-Voltage Programming (LVP) bit to a '1', allowing low-voltage programming.

1. When using custom firmware, the LVP bit must be set to '1' in the Configuration Word. MPLAB X will not allow programming using the PKOB unless the bit is properly configured.

2. When using a PIC microcontroller (one not included with the Curiosity Development Board) that has already been programmed using high-voltage programming and the LVP bit is cleared (LVP = OFF or '0'), the device will not be recognized and cannot be programmed using the PKOB. Reprogramming the device can be achieved by one of the following two methods:

   a) Connect a PICkit™ 3 Programmer to the PIC device dual-row expansion headers, ensuring the appropriate ICSP™, GND, and V$_{DD}$ connections are made. Configure MPLAB to use the PICkit 3 as the programmer, and ensure the LVP bit is set to '1' in the Configuration Word. Reprogram the device.

   b) Use an unprogrammed (blank) device and ensure the LVP bit is set to '1' in the Configuration Word.

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Appendix A. Schematic

A.1 CURIOSITY HPC DEVELOPMENT BOARD SCHEMATIC

FIGURE A-1: CURIOSITY HPC DEVELOPMENT BOARD SCHEMATIC (1 OF 2)

REV	ECO#	DESCRIPTION	DATE

Drawn By: M. Loper
Engineer: M. Pearce
PartNumber: DM164136
Project Title: *Curiosity HPC*
Sheet Title: mikroBUS and Target PIC Interface
Size B   Sch #03-10536   Date: 3/31/2016 10:48:21 AM
Revision:1   Sheet 1 of 2
File: 03-10536xl.SchDoc
Designed with Altium   Altium.com