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

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**Object of Declaration: Curiosity High Pin Count Development Board**

EU Declaration of Conformity

Manufacturer:        Microchip Technology Inc.
                     2355 W. Chandler Blvd.
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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).

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

Derek Carlson
VP Development Tools

12-Sep-14
Date

**NOTES:**

# Table of Contents

**NOTES:**

# 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.

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- **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
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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.

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- Distributor or Representative
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- Technical Support

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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® 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.
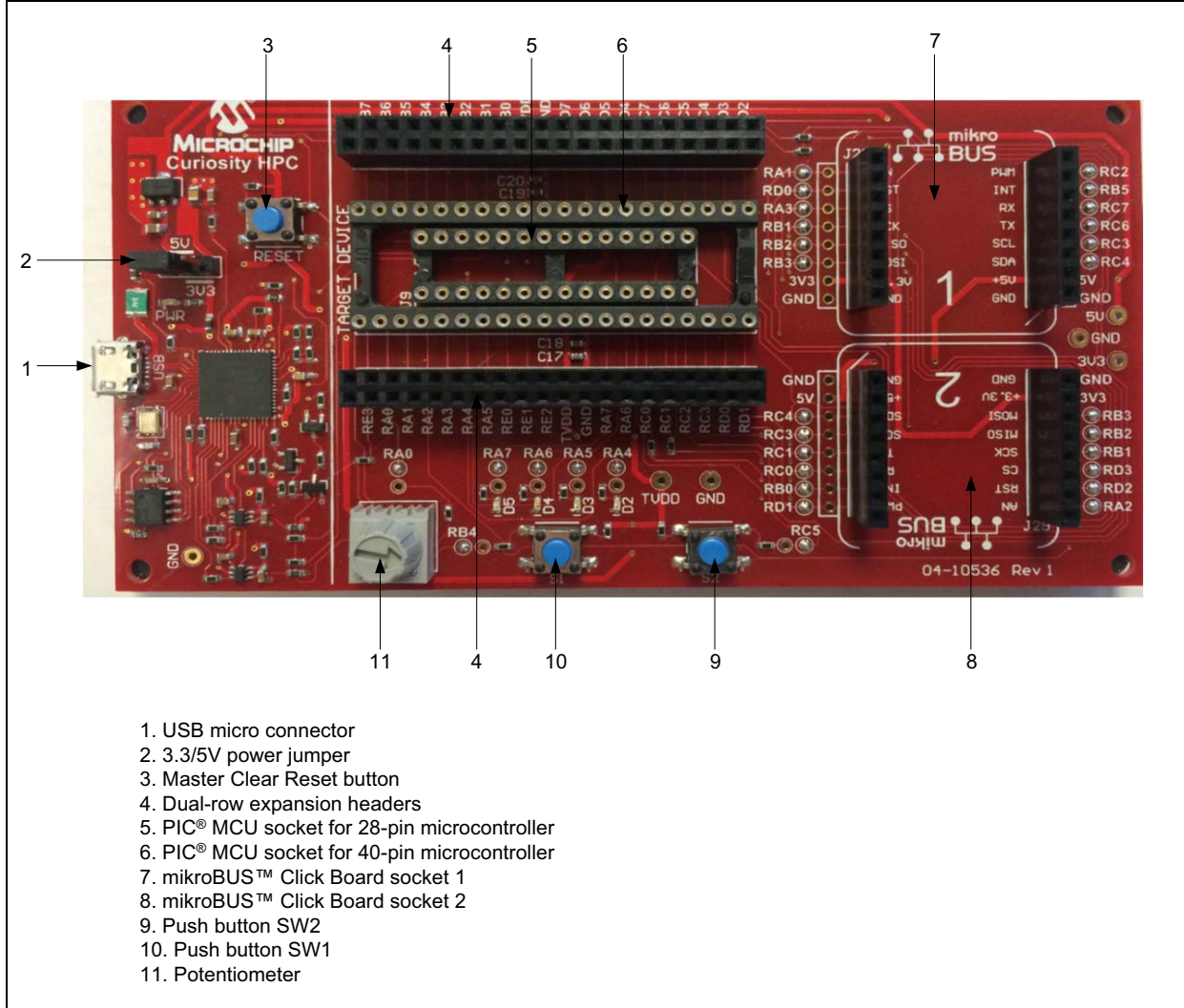
## 1.1 CURIOSITY HIGH PIN COUNT (HPC) DEVELOPMENT BOARD KIT CONTENTS

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**
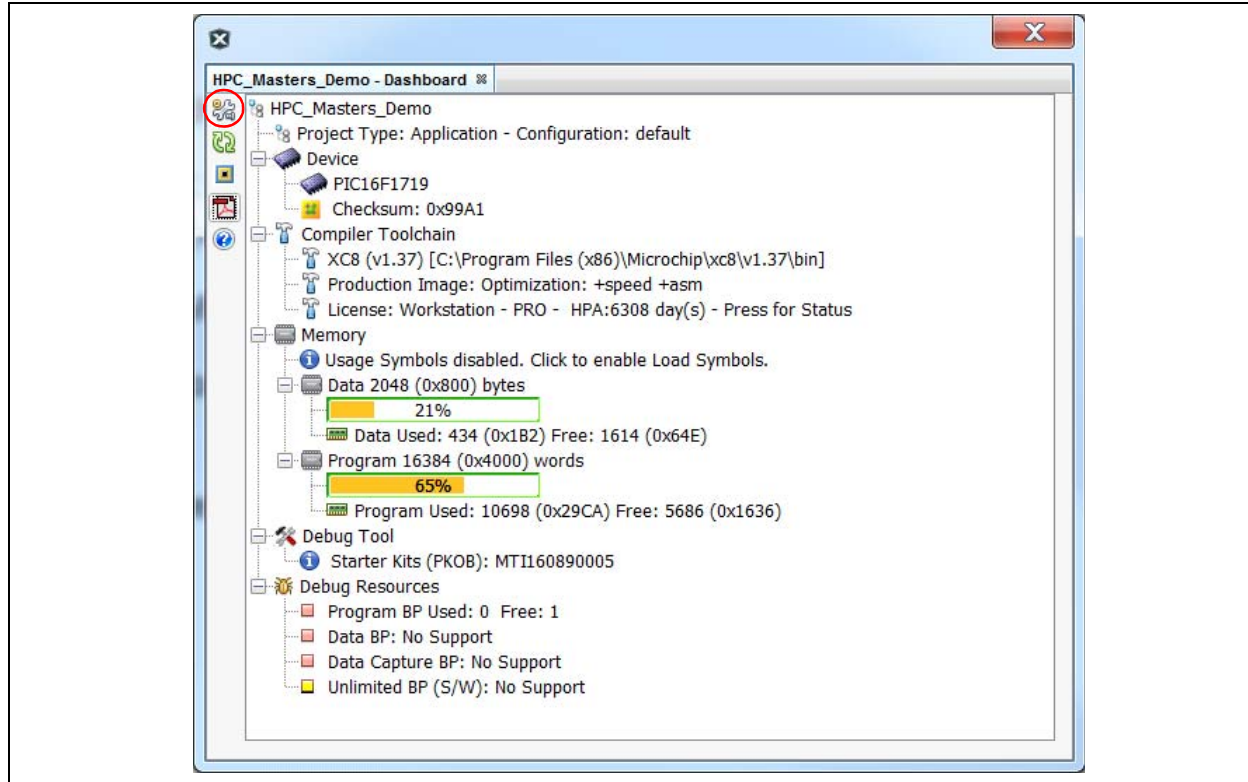


4. The Project Properties window will open. This window allows for the selection of the programming tool, compiler, and PIC MCU. MPLAB X refers to the Curiosity HPC Board as 'Starter Kits (PKOB)', with 'Curiosity' listed below in the Hardware Tool selection window. Click on **Curiosity** to select the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

**FIGURE 2-2:** **SELECTING THE CURIOSITY HPC DEVELOPMENT BOARD**
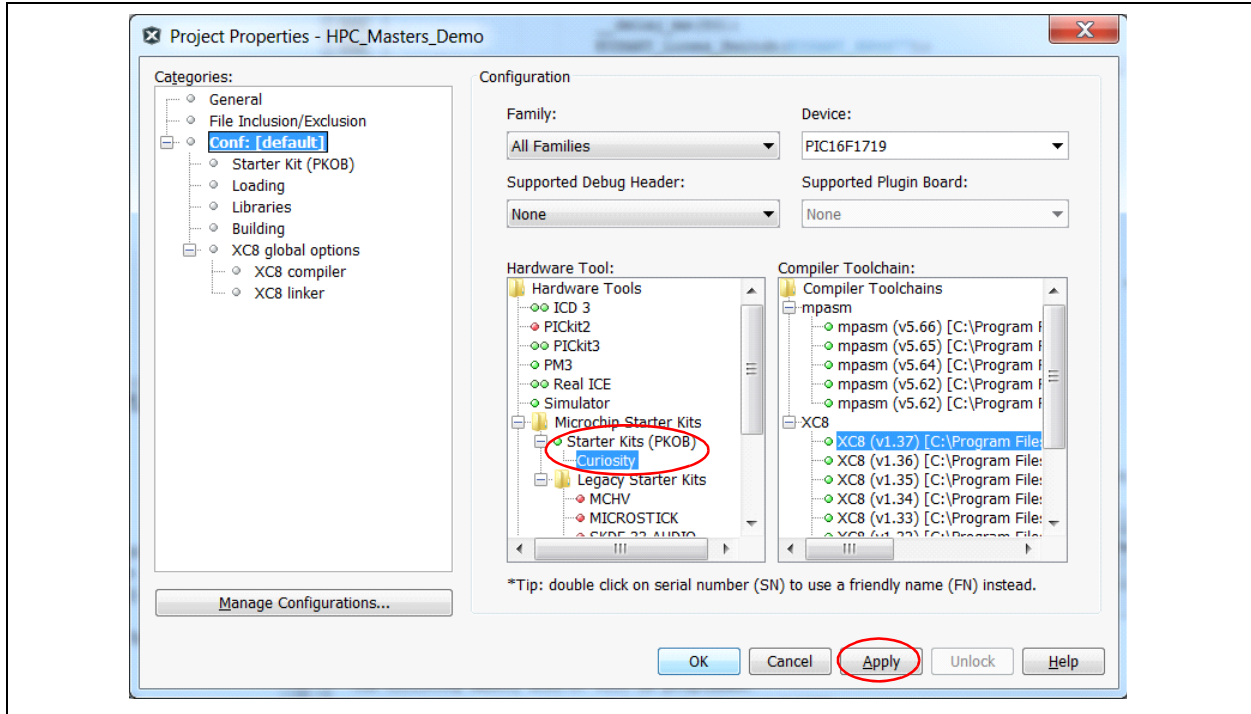


5.  In the upper left-hand corner of the Project Properties window, click on **Starter Kits (PKOB)**. The window will now show the configuration options for the PKOB programmer, as shown in Figure 2-3.

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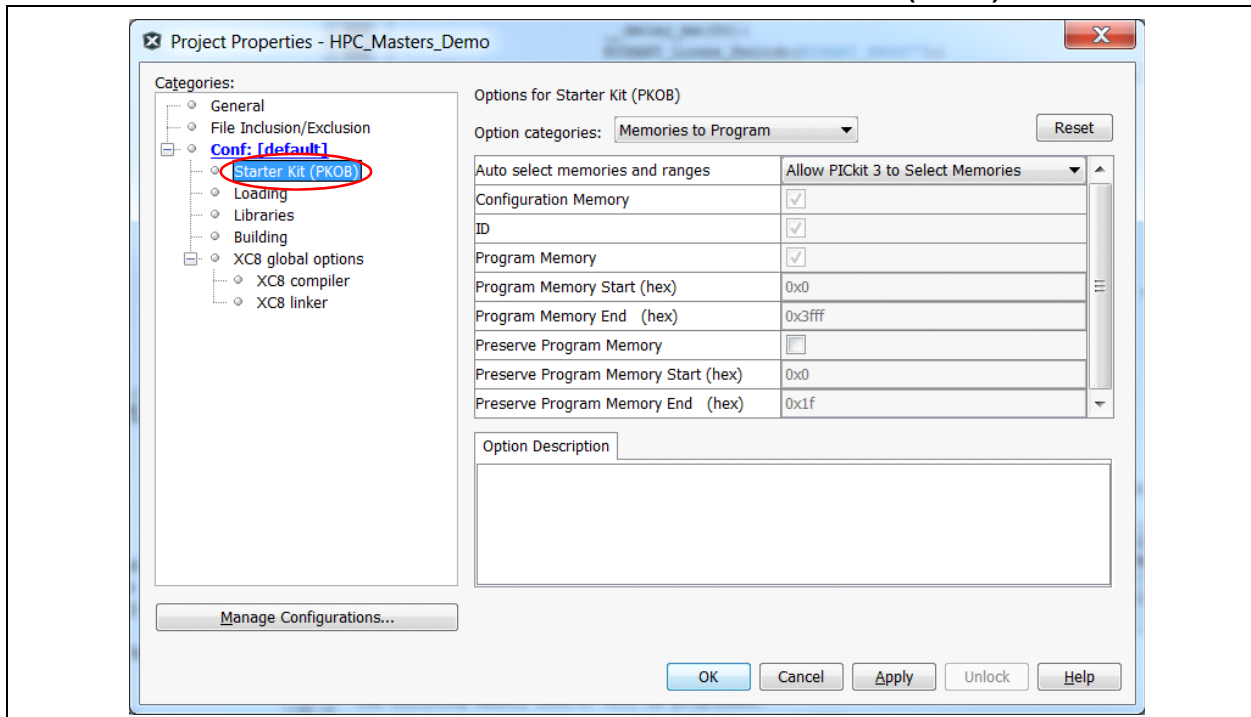
6. In the Option categories drop-down menu, select **Program Options**; ensure that the Enable Low Voltage Programming checkbox is checked (Figure 2-4). This option should go default to checked, which ensures low-voltage programming. Click the **OK** button. The Curiosity HPC Board is now ready to be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

**FIGURE 2-4:**     **ENSURE LOW-VOLTAGE PROGRAMMING IS ENABLED**
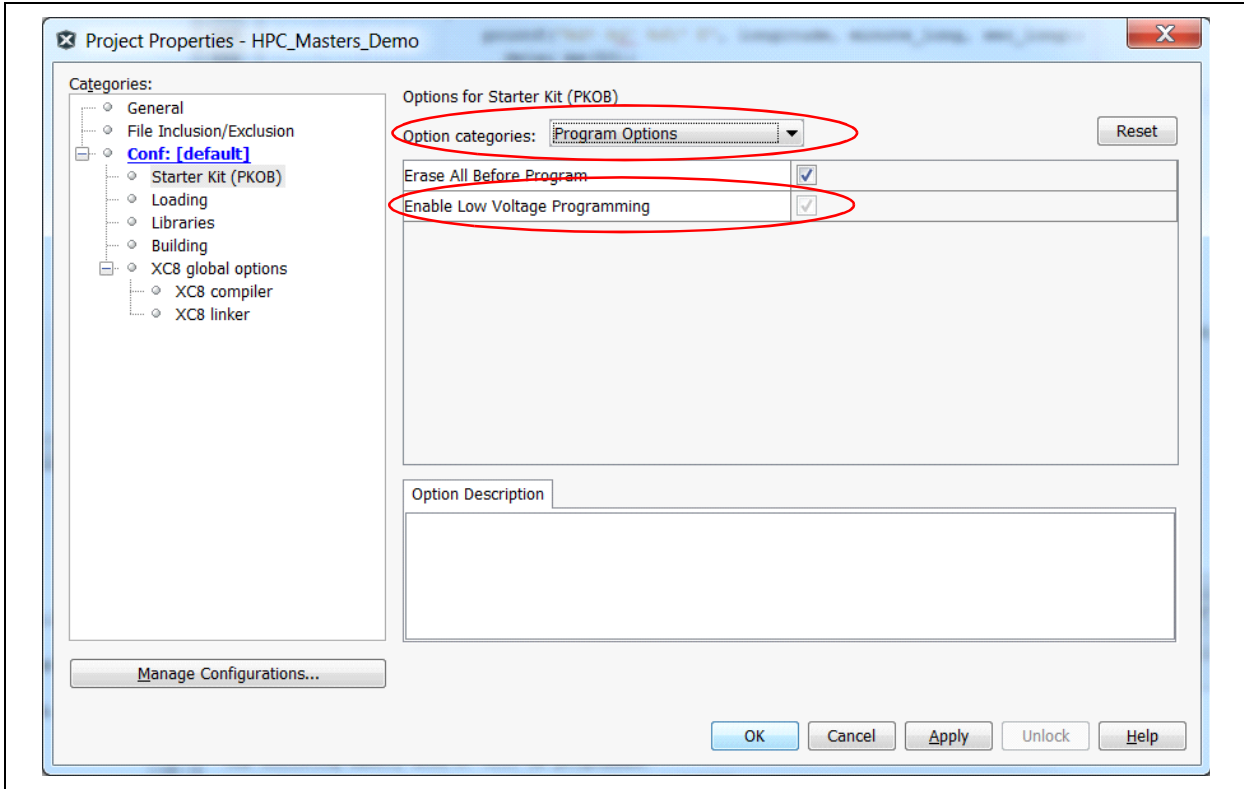


7. Once the project is ready to be programmed, simply click on the **Make and Program Device** button, and MPLAB will build and compile the code and program the PIC device, as displayed in Figure 2-5.

**FIGURE 2-5:**     **DEVICE PROGRAMMING**
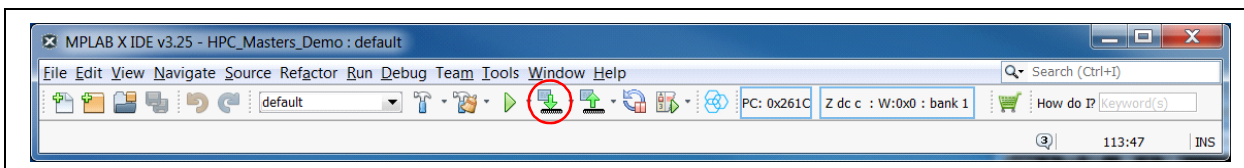
### 2.1.2 Programming using MPLAB® Xpress

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
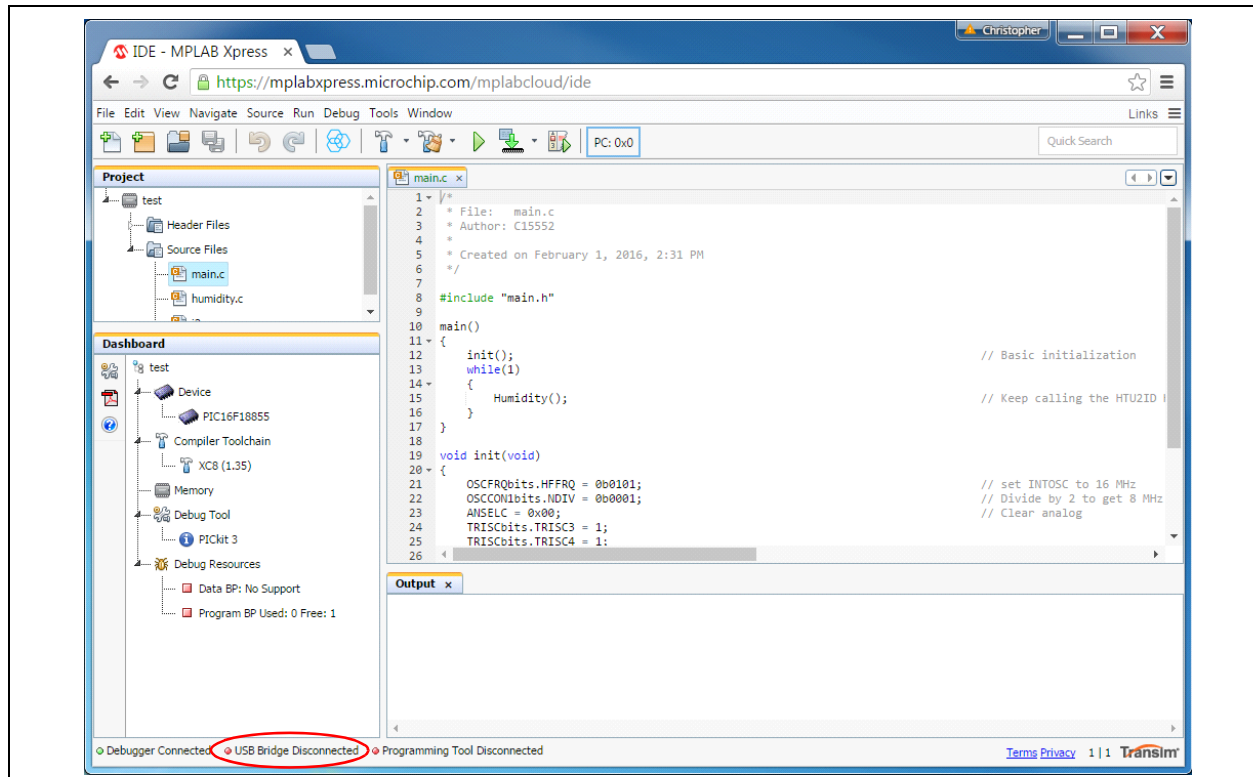
5.  The new window configures the USB connection between the computer and the Curiosity HPC Board (Figure 2-7). Step 1 indicates that the latest Java Runtime Environment must be installed, allowing the user to download and install the latest version. Step 2 opens the bridge tool; click on the **Download 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.

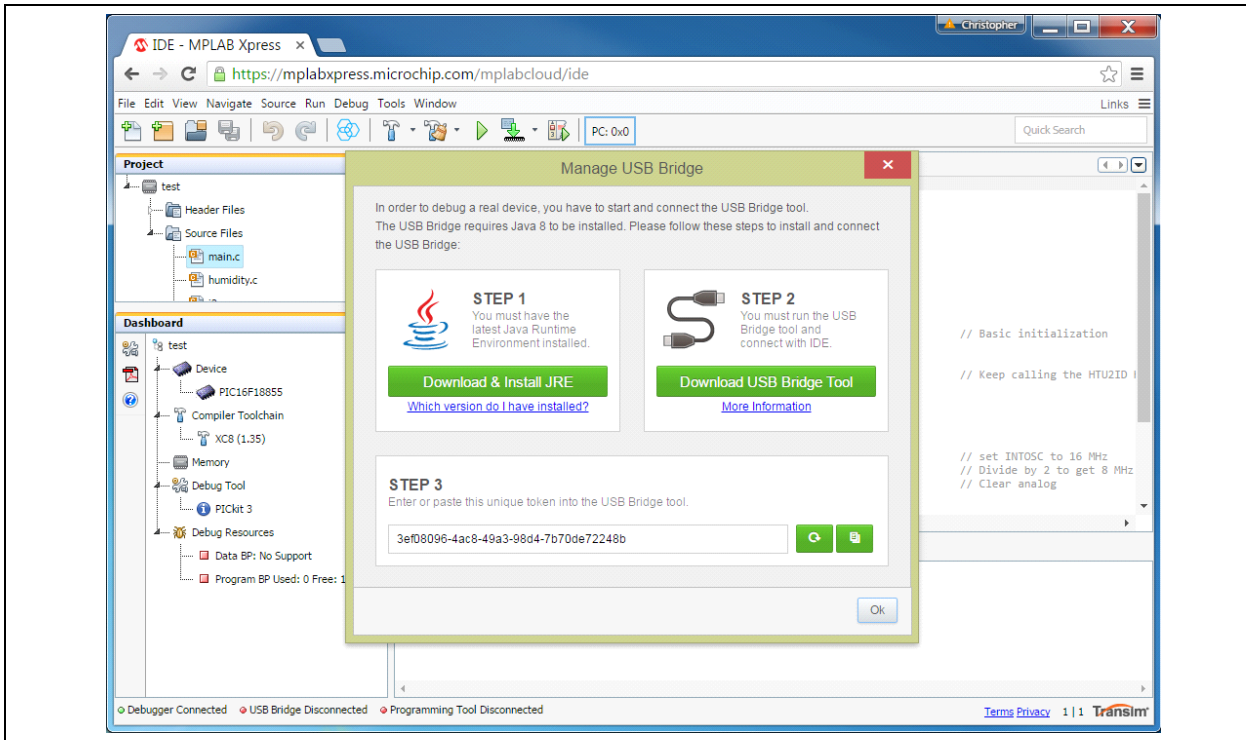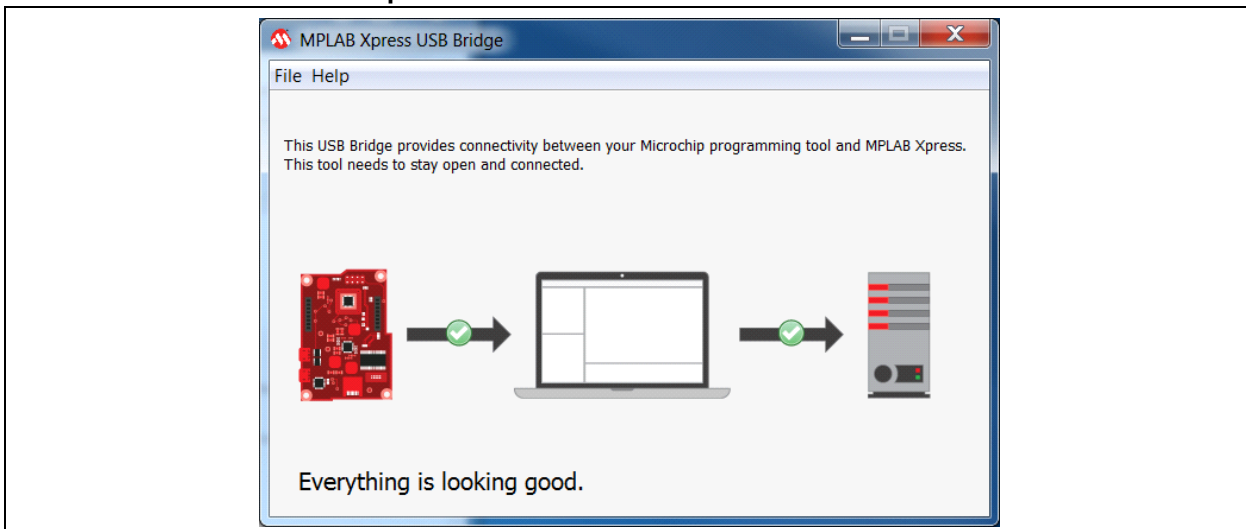**FIGURE 2-7:**     **MANAGE USB BRIDGE WINDOW**



**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**
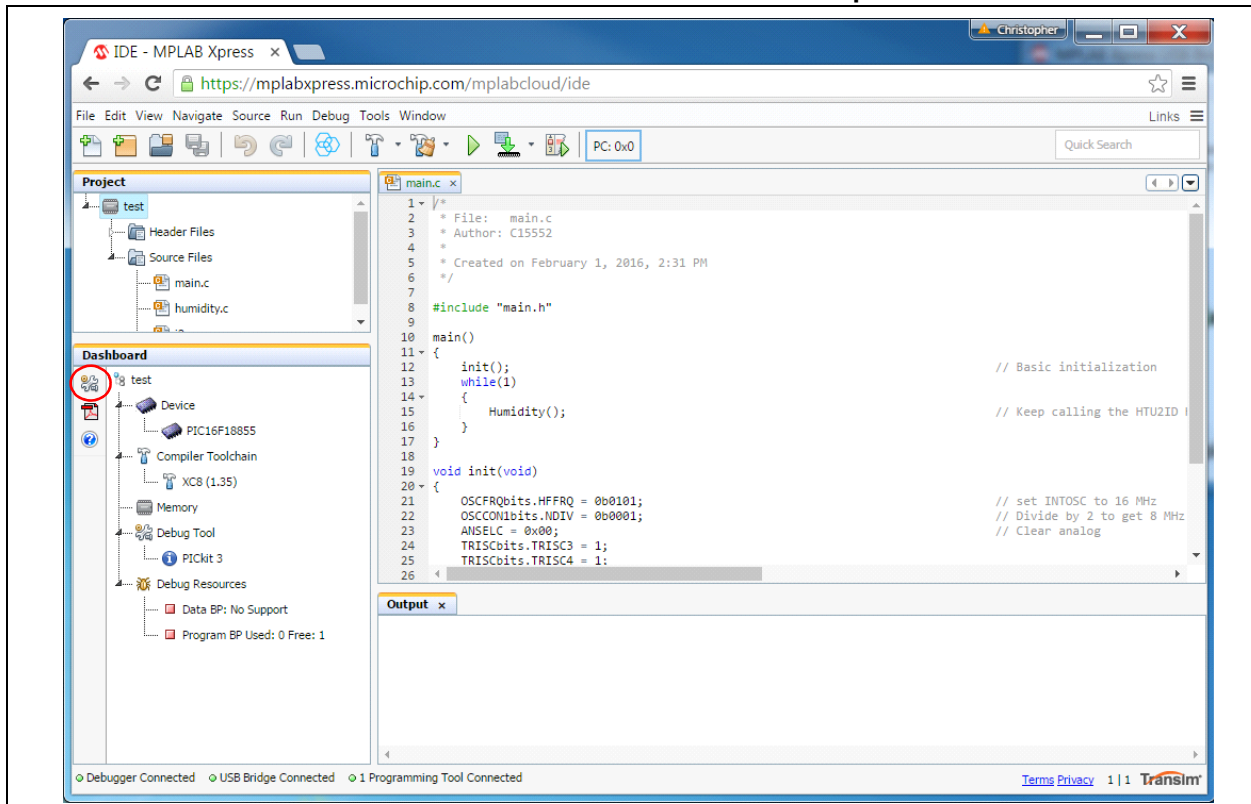


7. The Project Properties window will open; this window allows for the selection of the programming tool, compiler, and PIC MCU. MPLAB Xpress refers to the Curiosity HPC Board as 'Curiosity', with the Curiosity HPC serial number listed below in the Hardware Tool selection window. Click on the **serial 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**
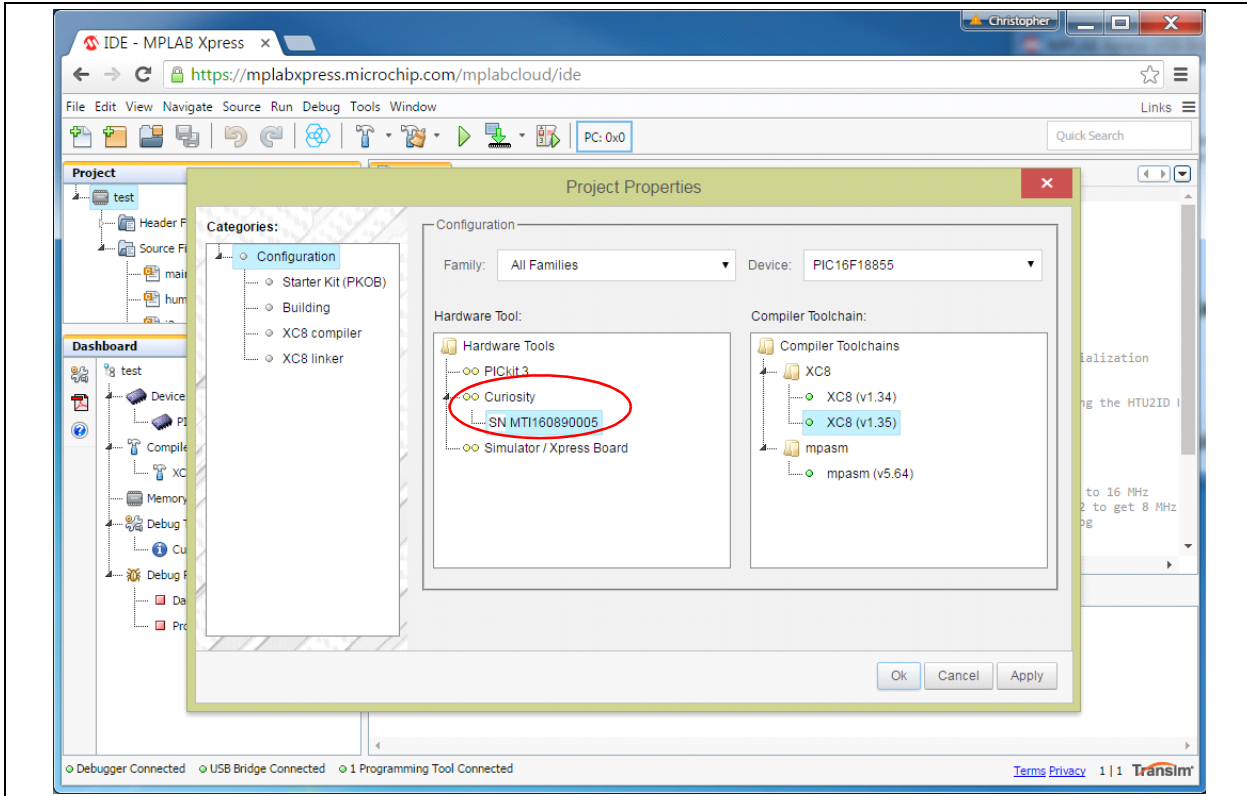


8. In the upper left-hand corner of the Project Properties window, click on **Starter Kit (PKOB)**. The window will now show the program options for the PKOB. Ensure that the Enable Low-Voltage Programming checkbox is checked (Figure 2-11) and press the **OK** button. The Curiosity HPC Board is now ready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

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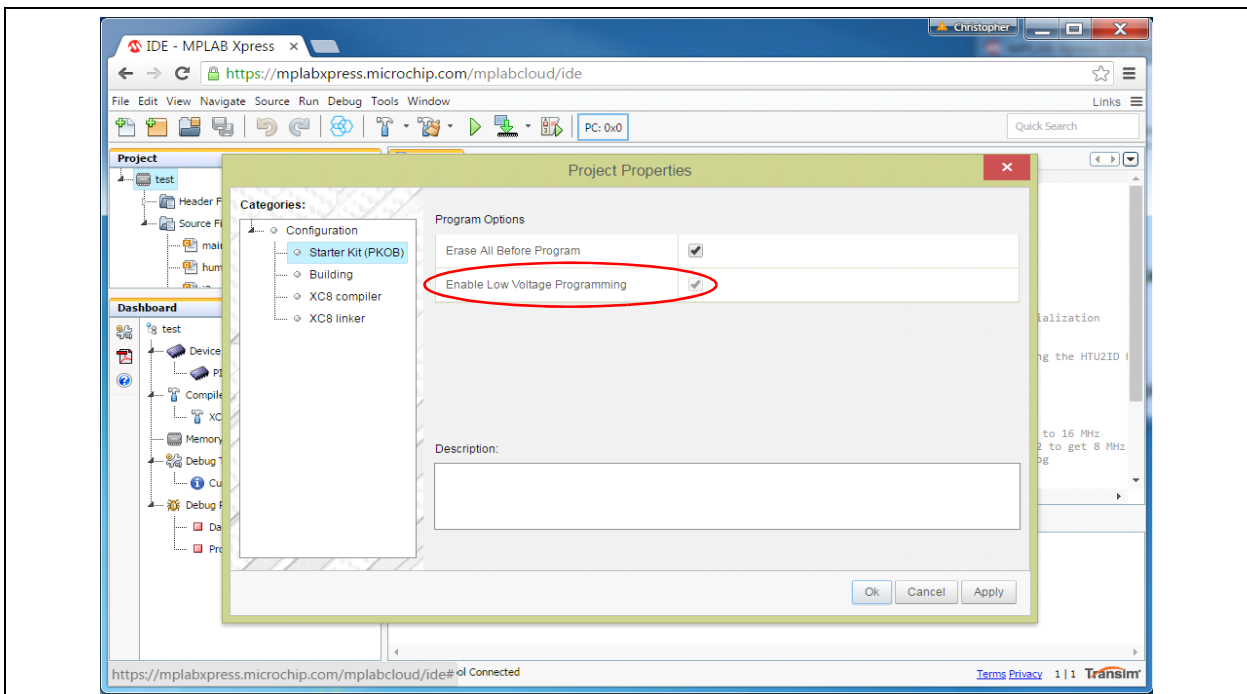
9. Once the project is ready to be programmed, simply click on the **Make and Program Device** button and MPLAB Xpress will build and compile the code, and program the PIC device (Figure 2-12).

**FIGURE 2-12:     PIC® DEVICE PROGRAMMING**
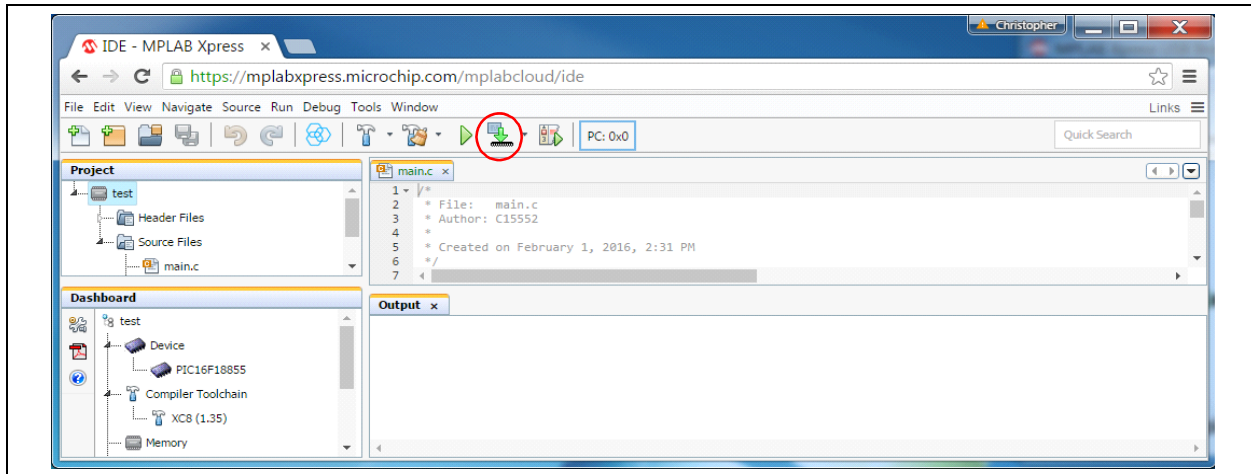
**NOTES:**

# 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.

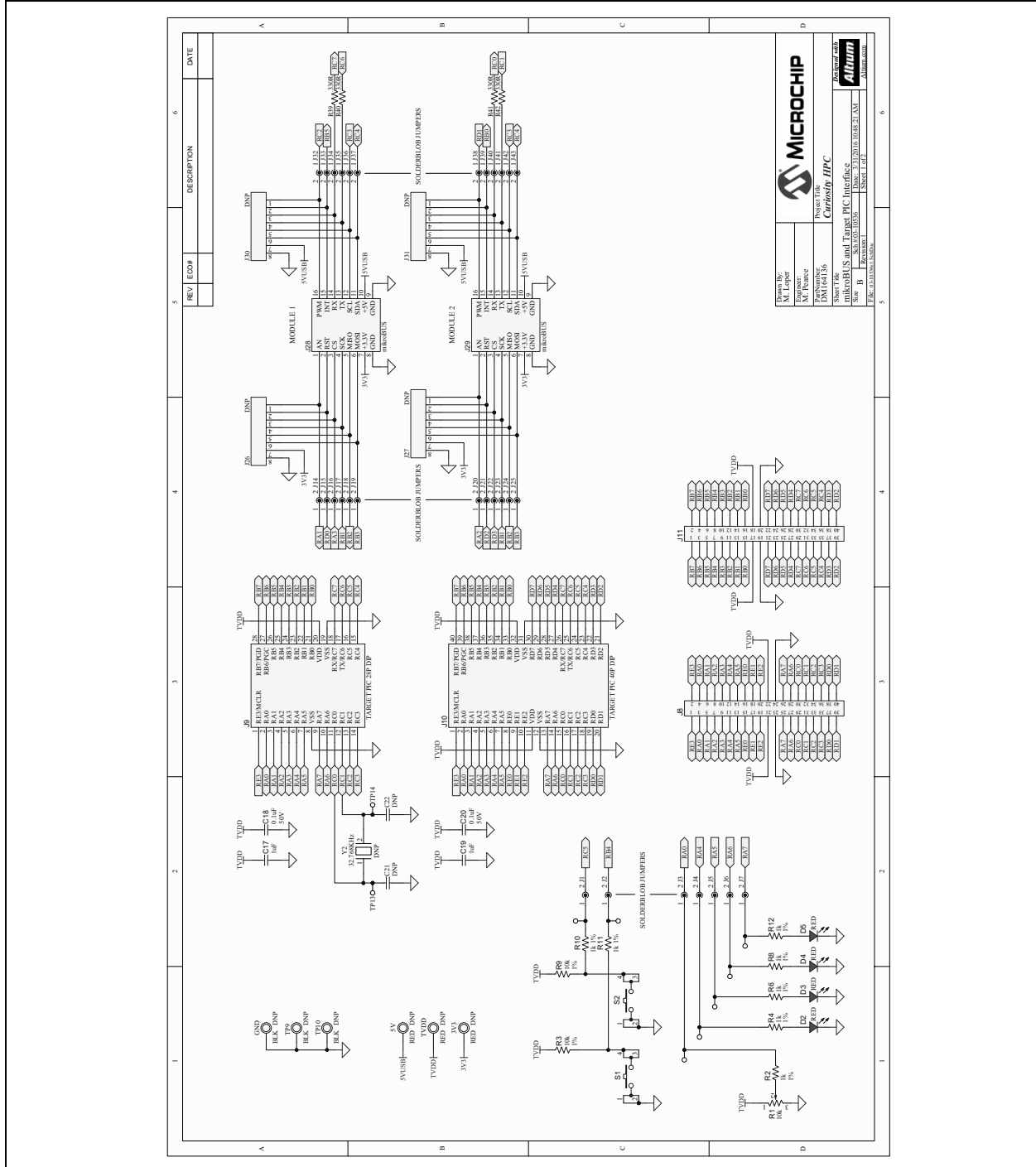   b) Use an unprogrammed (blank) device and ensure the LVP bit is set to '1' in the Configuration Word.
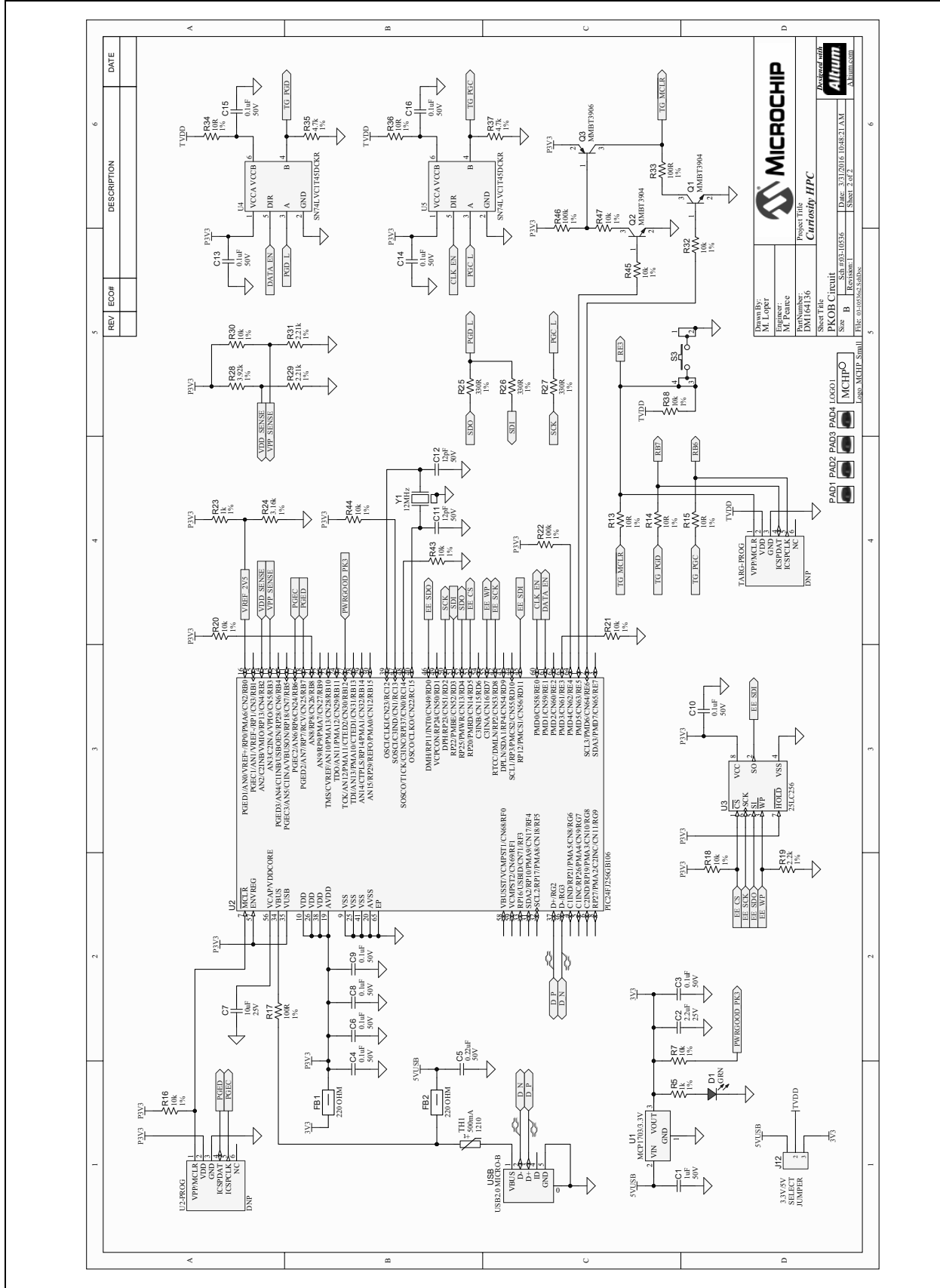
**NOTES:**

# Appendix A. Schematic

## A.1 CURIOSITY HPC DEVELOPMENT BOARD SCHEMATIC

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

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

# Appendix B. General Notes

## B.1    microBUS™ CLICKS

Module 1 is the main click socket, which is compatible with both 28-pin and 40-pin PIC devices. Module 2 is the secondary socket, and is fully compatible with a 40-pin PIC device. When using a 28-pin PIC device, Module 2 may be used with some Click modules, as long as the application does not use the SPI Chip Select ($\overline{\text{CS}}$) line, the Reset (RST) line, or the PWM line dedicated to Module 2.

## B.2    SOLDER BLOB JUMPER

Solder blob jumpers can be found on each Click module, push-button switch, LED, or potentiometer connection. This allows the user to utilize those pin connections for other applications.

**NOTES:**

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