Microchip Minutes: helloWorld Application Lab

Contents

Overview

The purpose of this lab is to introduce basic concepts of how to set up a project in MPLAB® X IDE while using the MPLAB Code configurator to light an LED connected to one of the pins of a PIC16F1619 microcontroller. This is commonly known as the helloWorld application.

Equipment Needed

This lab was developed using the following tools:

Hardware:

- Curiosity Development Board: www.microchip.com/curiosity
  - Page includes user's guide along with schematics and other helpful information.
- PIC16F1619 8-bit PIC® microcontroller: http://www.microchip.com/wwwproducts/Devices.aspx?product=PIC16F1619

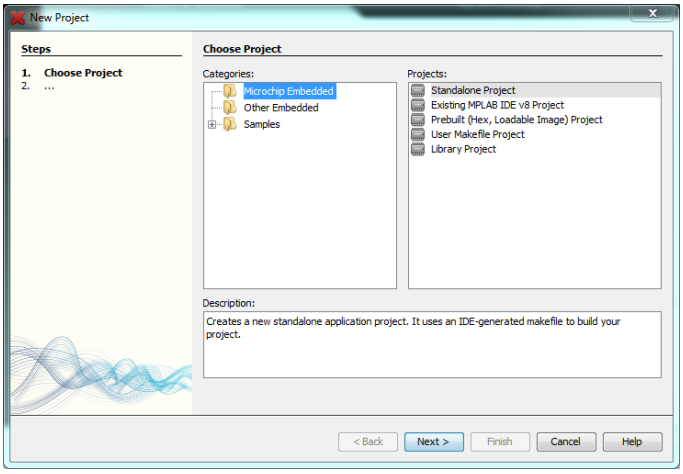
Software:

- MPLAB X IDE : www.microchip.com/mplabx
- MPLAB XC8 C Compiler: www.microchip.com/xc8
- MPLAB Code Configurator (MCC): Please see How to install MPLAB Code Configurator (MCC) at the end of this lab.

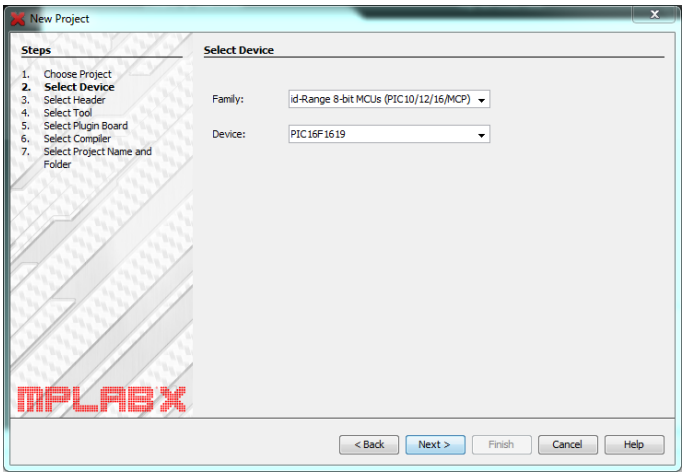
Procedure

Create a new project:

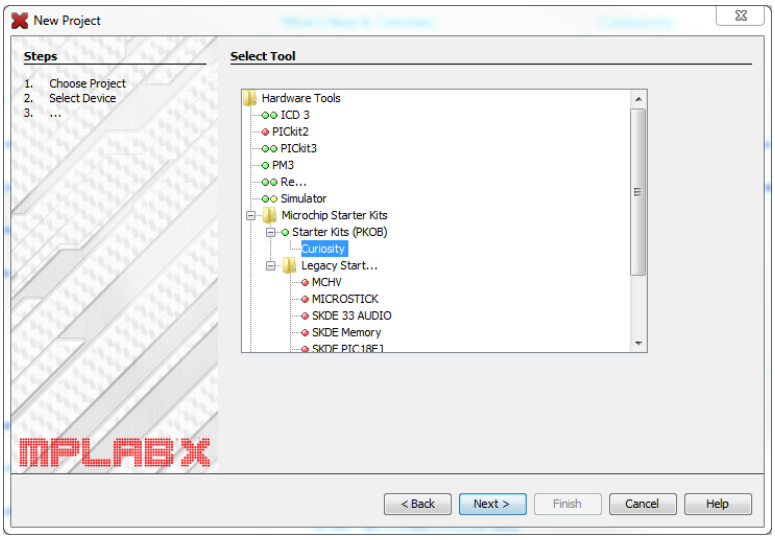
1. Open MPLAB X IDE
2. Create a new project by clicking the New Project icon  or by selecting *File>New Project…*
3. In the **New Project** window select **Microchip Embedded** in the **Categories:** frame and **Standalone Project** in the **Projects:** frame and click **Next**.



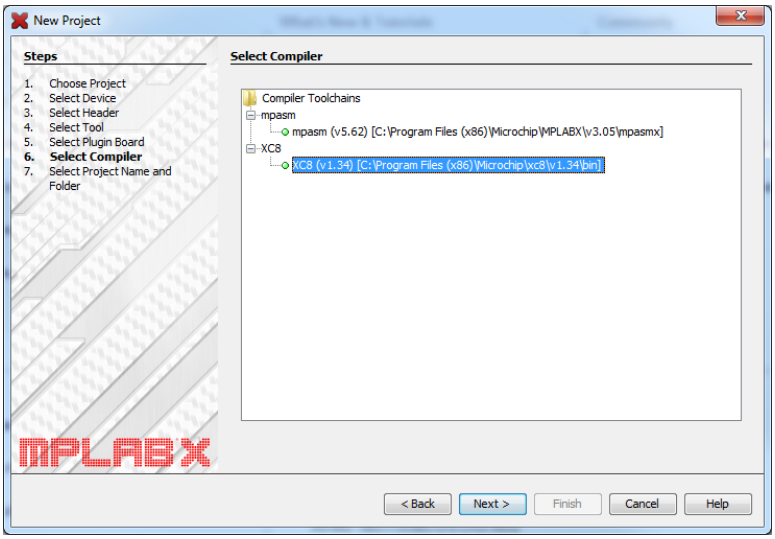
4. Select the **Mid-Range 8-bit MCUs (PIC10/12/16/MCP)** in the **Family** dropdown in the **Select Device** window and then select PIC16F1619 in the **Device** dropdown. Click **Next>**.



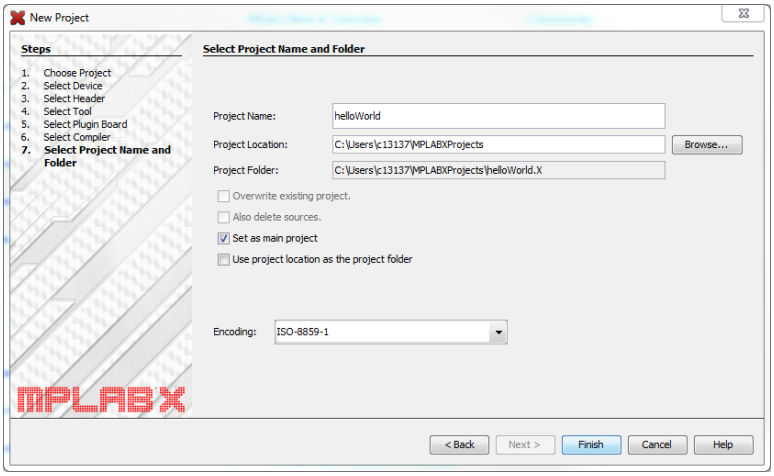
5. Select the **Curiosity** Board in the **Select Tool** window and click **Next>.**



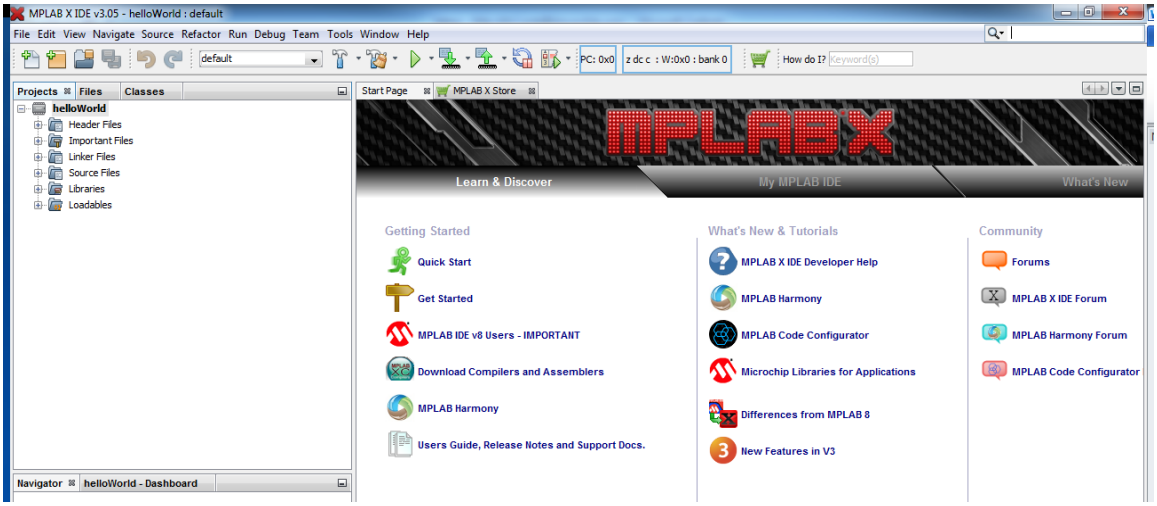
6. Next, select the **XC8** compiler in the **Select Compiler** window and click **Next>.**



7. Select a project location and name the project to something meaningful such as **helloWorld.** Be sure that the check box next to **Set as main project** is selected and click **Finish.**



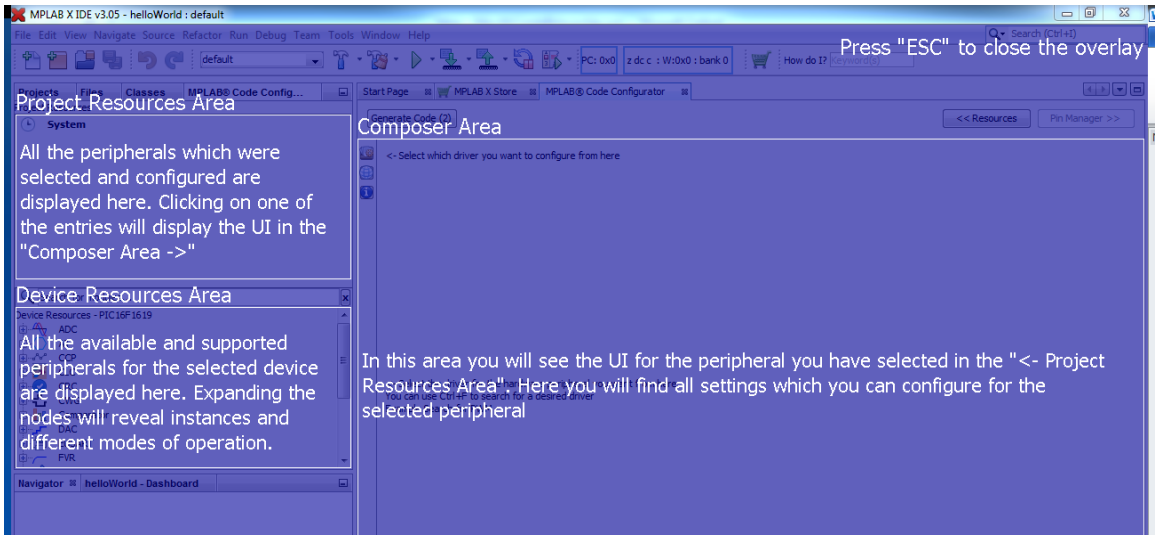
8. The MPLAB X IDE workspace should look similar to below. If not, common windows such as **Projects** can be opened through ***Windows>Projects*** etc…



Setup MPLAB Code Configurator (MCC) to Generate Code

1. Open MPLAB Code Configurator (MCC) from *Tools>Embedded>MPLAB Code Configurator*. If the MCC is not listed or if the *Tools>Embedded* menu isn't listed, then MCC will need to be installed (see How to install MPLAB Code Configurator at end of manual)

2. Opening the MCC for the first time will display an overlay describing key sections of the workspace including Project Resources, Device Resources and Composer area. The reader is encouraged to take a moment to familiarize themselves with these sections. The overlay can be closed by hitting the ESC key and reopened anytime by selecting the button.

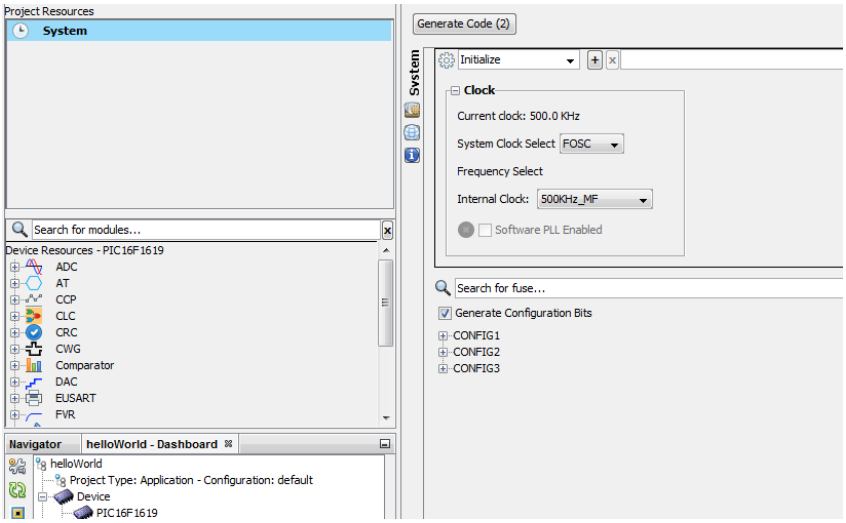


Other buttons in the MCC include:

Accesses the MCC Homepage and Forums

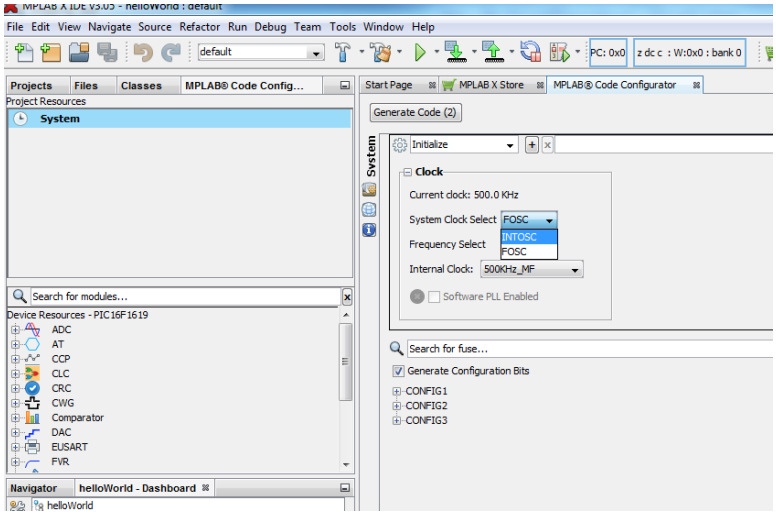
Accesses Options to customize how the MCC behaves. These labs will use the default configuration

3. In the **Project Resources** area, select the **System** resource to open the user interface in the composer area.



The system user interface is where core device operational parameters are setup such as oscillator selection and enabling or disabling features such as brown-out reset, windowed-watchdog use and so on.

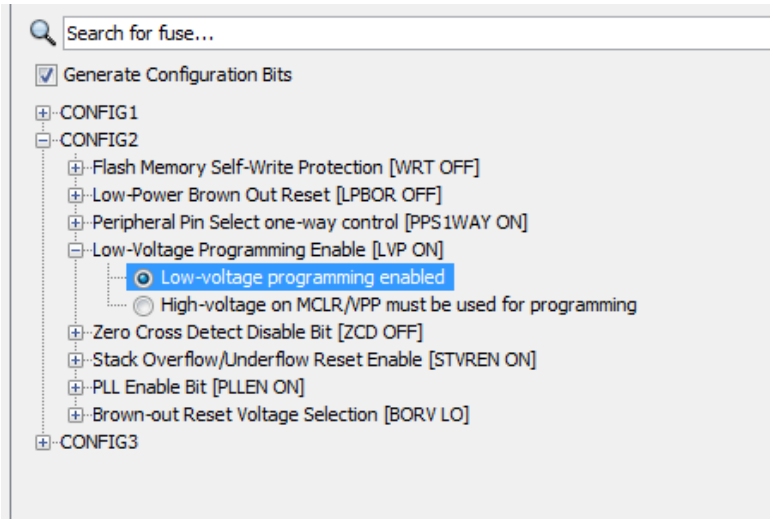
4. Configure the system to use the INTOSC (Internal Oscillator) from the **System Clock Select** drop-down menu. The **Internal Clock** set to **500KHz_HF** default can be left as is.



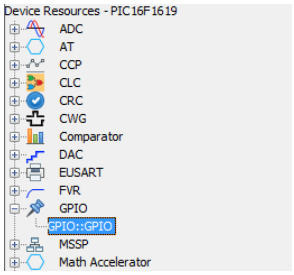
5. In the bottom section of the **Composer Area** is where fuses or configuration bits are set. Here the Microcontroller will need to be configured to use **Low Voltage Programming**. This is the programming mode used by the integrated programmer/debugger on the Curiosity Board.

Expand the **CONFIG2** drop down and select the radio button next to the **Low-voltage**

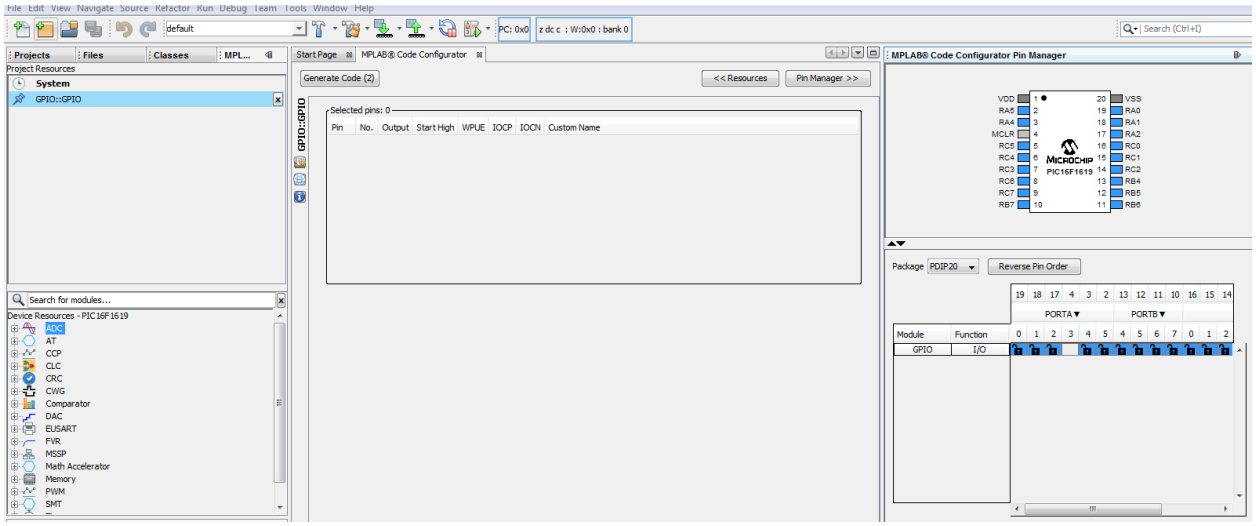
programming enabled selection under the **Low-Voltage Programming Enable [LVP ON]** sub category.



6. A General Purpose I/O pin will be driven HIGH to light an LED connected to it. In the **Device Resource Area**, locate and expand the **GPIO** drop-down and double-click on the **GPIO::GPIO** selection to add to the **Project Resources Area**.

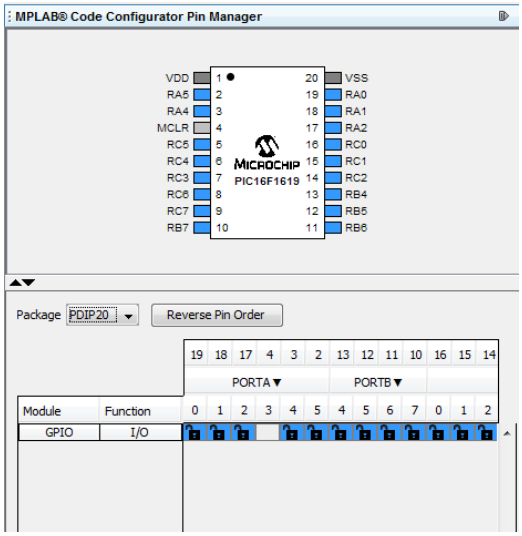


Select **GPIO::GPIO** in the **Project Resources Area** to open the GPIO peripheral user interface in the **Composer Area**.

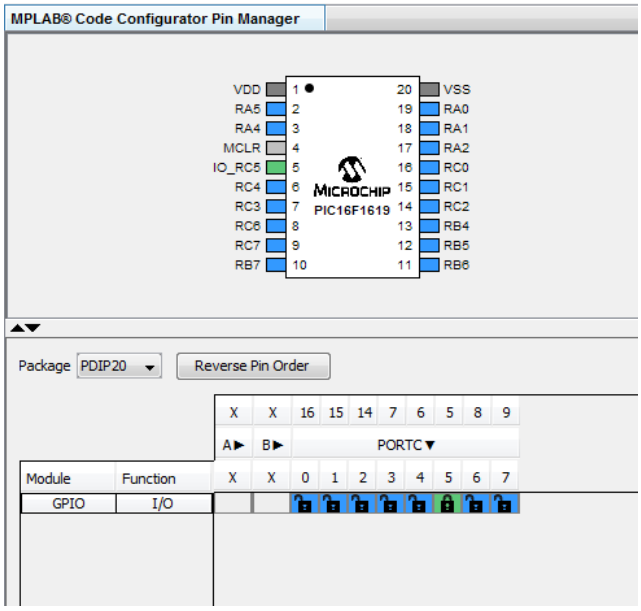


Note that an additional area appears called the **MPLAB Code Configurator Pin Manager.** This area provides a graphical representation of the selected device along with available pins for the selected peripheral in blue. Pins are assigned by selecting the desired pin in the lower section of the area.

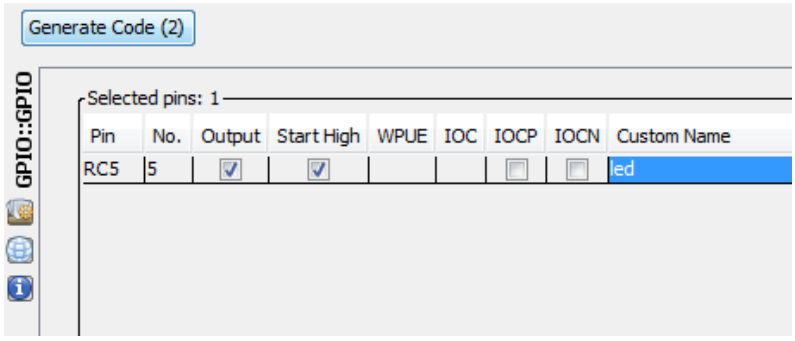
7. Ensure that the appropriate package is selected in the Pin Manager using the Package drop-down menu. This lab utilizes the Curiosity board populated with a PIC16F1619 in 20-pin PDIP package.



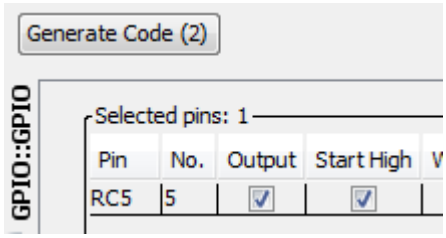
8. Referring to the Curiosity Board schematic, LEDs are connected to RC5 (PORTC bit 5), RA2 (PORTA bit 2), RA1 (PORTA bit 1) and RA5 (PORTA bit 5) I/O pins. Select one of these by clicking on the appropriate pin in the lower **Pin Manager** window. Here RC5 connected to LED D7 is selected. Note the changes in the **Pin Manager** with the pin selected now appearing green with a lock icon.



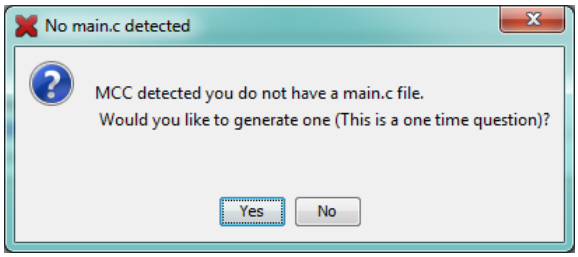
9. Pin names can be changed by the user so that they are easier to identify. In the **Composer Area**, configure the I/O pin as an output by checking the appropriate box and change the name to something meaningful such as **led**.



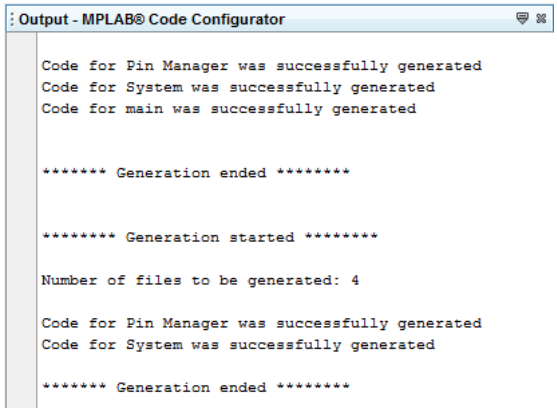
Next, click on the **Generate Code** button in the **Composer Area** to generate the necessary C code that corresponds to the configuration setup in the MCC.



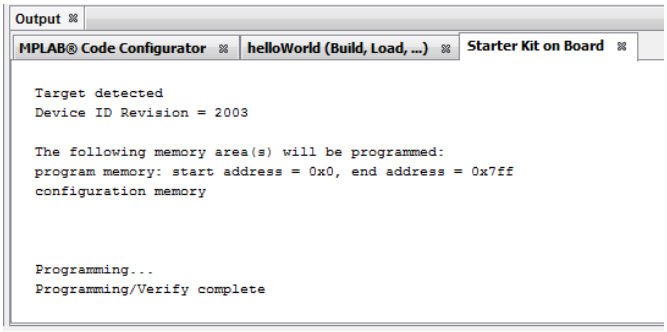
Note that the MCC will ask if the user would like to generate a **main.c** file if one doesn't already exist. In this instance, click **Yes**.



10. The **Output – MPLAB Code Configurator** window at the bottom of MPLAB X IDE should indicate that code has been generated successfully. If the **Output** window is not visible it can be opened by selecting *Window>Output>Output*.



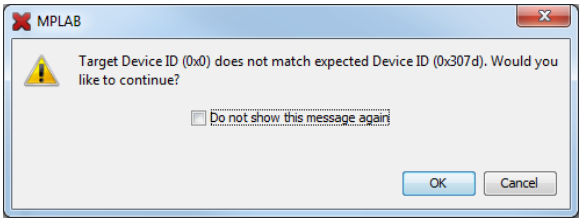
11. Compile the project and download to the PIC16F1619 by clicking the **Make and Program Device Main Project** button  in the MPLAB X IDE Workspace.



Result

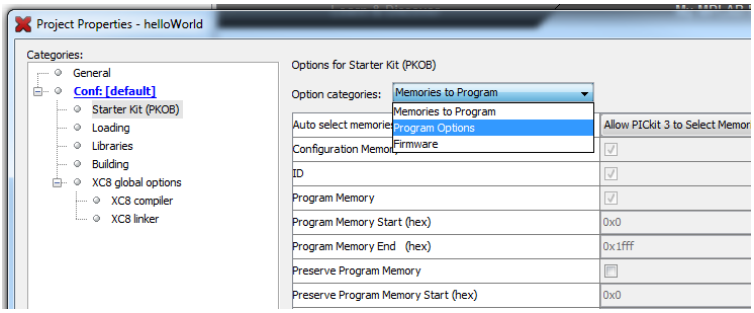
If configured correctly, the LED D7 on the Curiosity Board should light.

Note: If MPLAB X IDE displays a window indicating the target device is not recognized, low-voltage programming may need to be enabled in the project properties.



Enable Low-Voltage Programming Mode in Project Properties

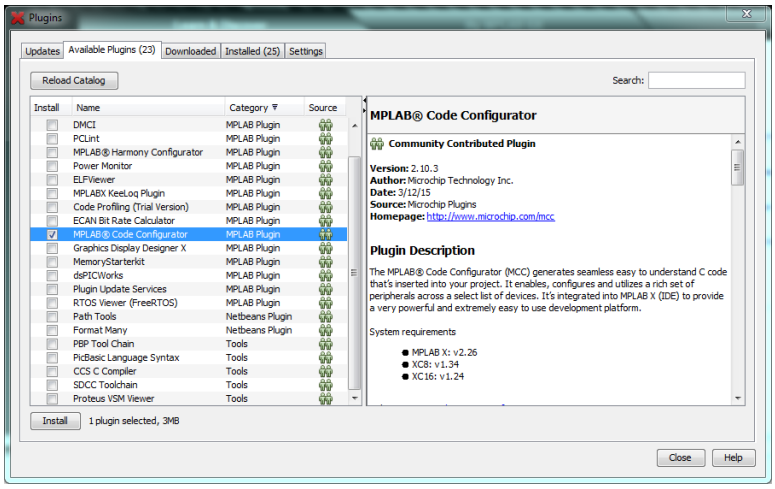
1. Open ***File>Project Properties (helloWorld)***
2. In the **Project Properties** window, highlight **Starter Kit (PKOB)** in the **Categories** pane.
3. On the right side of the **Project Properties** window, select **Program Options** from the **Option categories:** drop-down menu



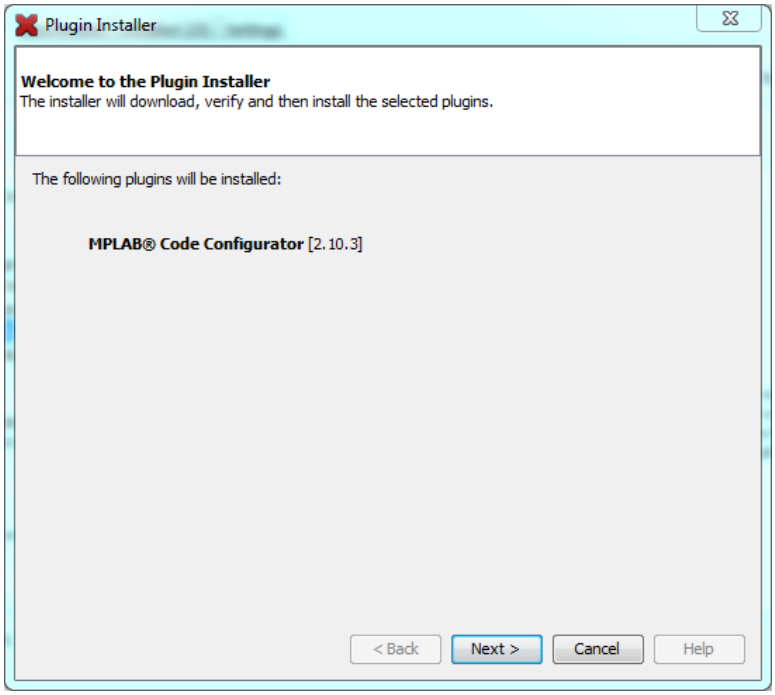
4. Make sure that the checkbox next to **Enable Low Voltage Programming** is selected. Even if the checkbox is selected click **Apply** and then **OK** to close the window.

How to install MPLAB Code Configurator (MCC)

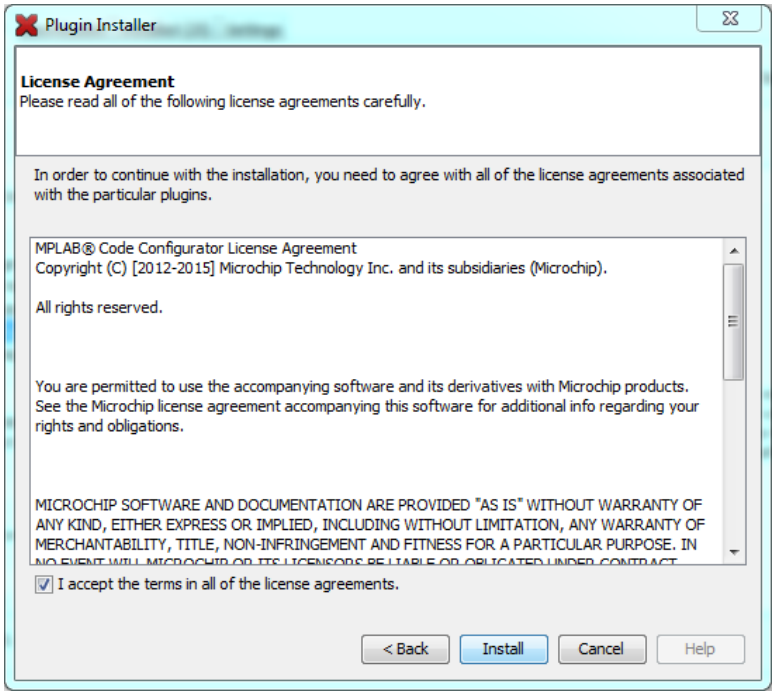
1. Select *Tools>Plugins*
2. In the **Plugins** window select the **Available Plugins** tab, locate the **MPLAB Code Configurator** and ensure the checkbox under **Install** is selected. Click **Install** to install the plugin.



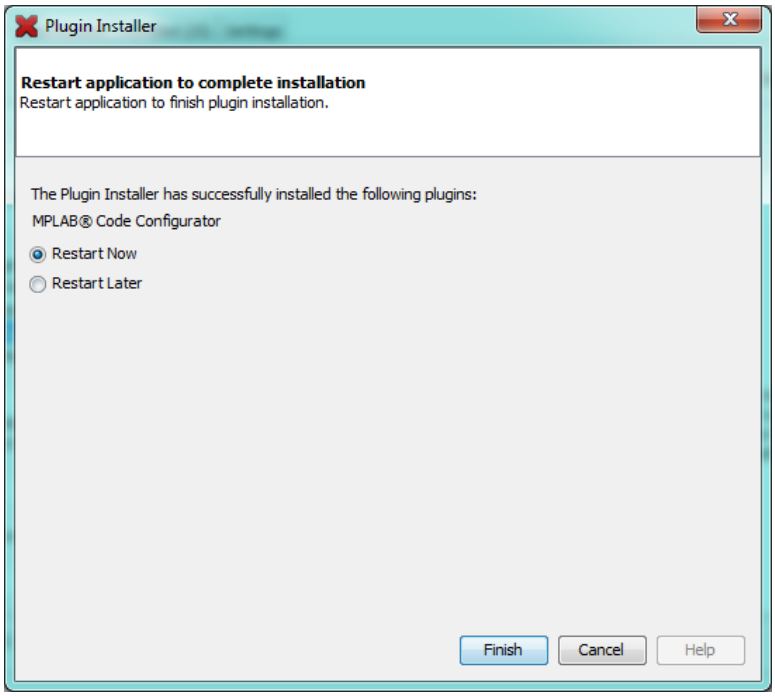
3. Click **Next>**in the **Plugin Installer** window



4. Check next to **I accept the terms in all of the license agreements** and then click the **Install** button to install MCC.



5. MPLAB X IDE will need to be restarted in order to complete plugin installation. Click **Finish** to restart the IDE



Restarting the IDE may take a minute or two.

6. Once restarted, MCC should now appear in the *Tools>Embedded* menu.