LabVIEW Assignment 2

Due February 16, 2016, 11:59 PM

Assignment guidelines:

- You may type or write your answers by hand. If you write by hand, make sure it is clearly presented. Please put your name and student ID clearly on each page of the submitted assignment.
- You may discuss problems in this assignment with your peers, but if you do so you must identify your collaborators. **Each student is expected to submit his or her own work**.
- **All homework must be submitted using MyCourses.**

Change Log

- Use a waveform chart, not a waveform graph in (3) below. 11-Feb

Feedback (1 pt extra credit)

a. How many hours did you spend working on this homework assignment?
b. With whom did you work on this homework assignment?

Your First myRIO Project (9 pts)

In this assignment, you will write a basic LabVIEW program and run it on the myRIO development hardware.

1. Open LabVIEW and click on the "Create Project" button in the left pane. As in the previous assignment, select "Blank Project." (There is a "myRIO Project" template, but don't use it.)

2. Right-click on "Project: <title of your project>", then "New", then "Targets and Devices". In the window that comes up, select "New target or device", then "myRIO 1900" to add the myRIO as a target for your project.

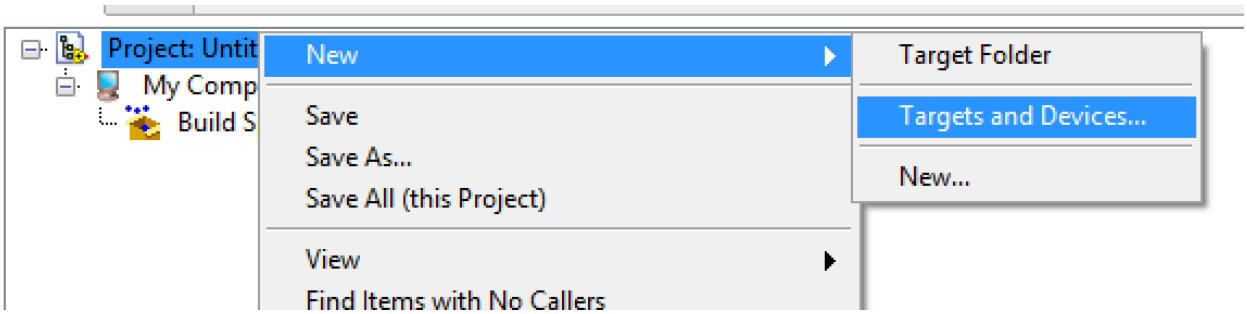

Figure 1: Adding targets

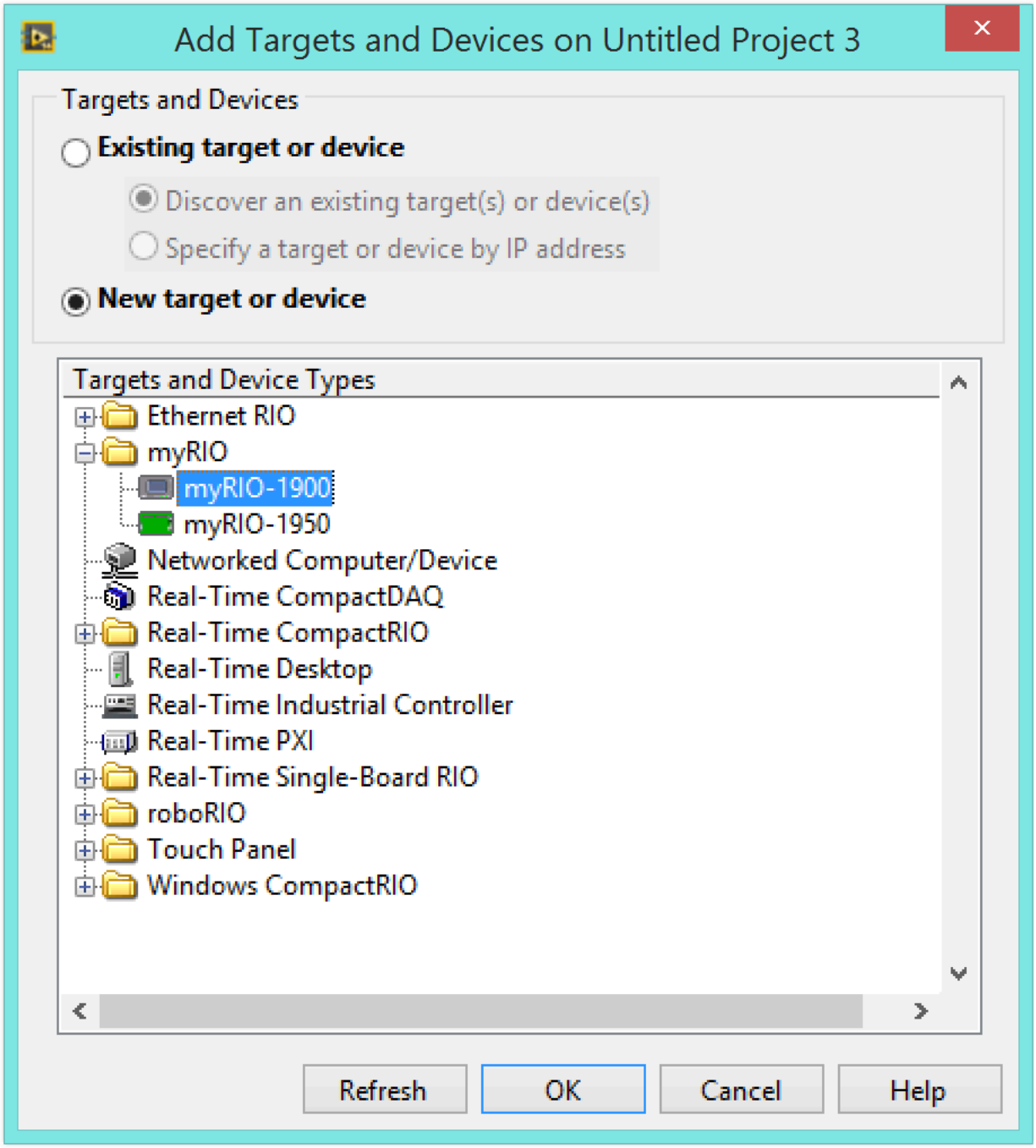

Figure 2: Adding myRIO

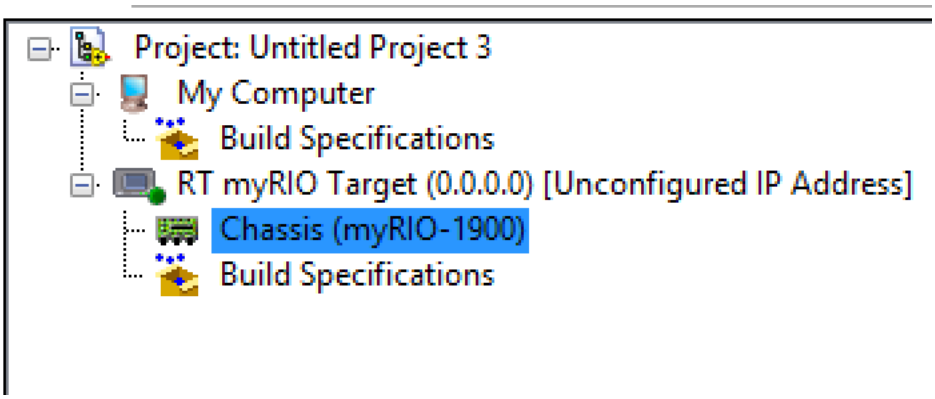

Figure 3: Resulting project structure

3. Right-click on the myRIO target and create a new VI there: this will cause the VI to run on your myRIO and not on the host desktop computer. In this VI, construct the LabVIEW code in Figure 1. On the structures pallet, select the flat frame sequence. In a flat frame sequence, all data to one of the frames must be ready before LabVIEW begins executing the subsequent frame. This structure is useful for programs that need initialization (actions that take place before the frame executes) and closing actions (actions that take place after the frame executes).

Next, create a while-loop and call it Main Loop. While-loop is available on the structures pallet. Put an instance of the Wait block in the while-loop and wire it with a constant 10 milliseconds.

Then insert an express VI accelerometer from the myRIO pallet. (If you don't see this pallet, close the front panel, move the VI to the myRIO target, reopen the VI, and the pallet should be there.) Wire each of the axes to a bundle array block and feed the data to a waveform ~~graph~~ ***chart***. Right-click on the input error terminal and click on create->constant. Drag the constant into the initialize frame and out of the while-loop. Connect the output error terminal to an OR-gate and the output of the OR-gate to the while-loop stop condition. The OR-gate will also take a binary input from a button on the front panel. This will allow the program to stop if an error occurs or if the stop button is pressed. Also carry the error output outside of the while-loop to the close frame. Wire it into a "Reset myRIO.vi" and then create an error out indicator. The front-panel and block diagram should look similar to the following figures.

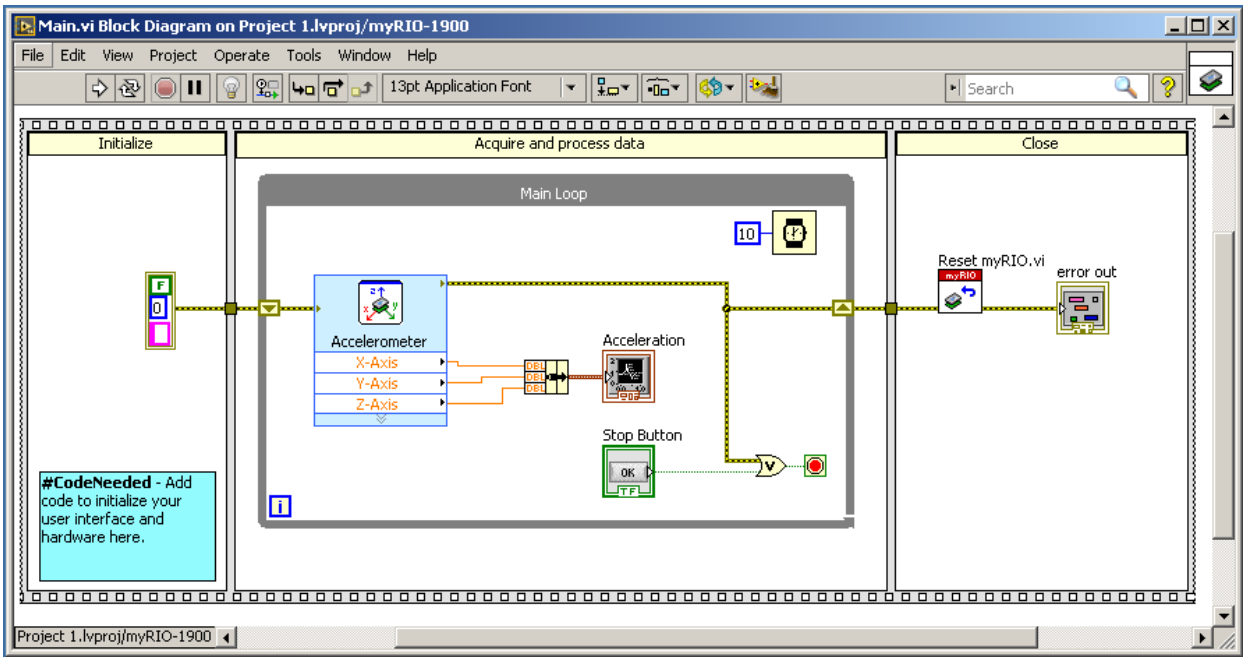

Figure 4: Block diagram

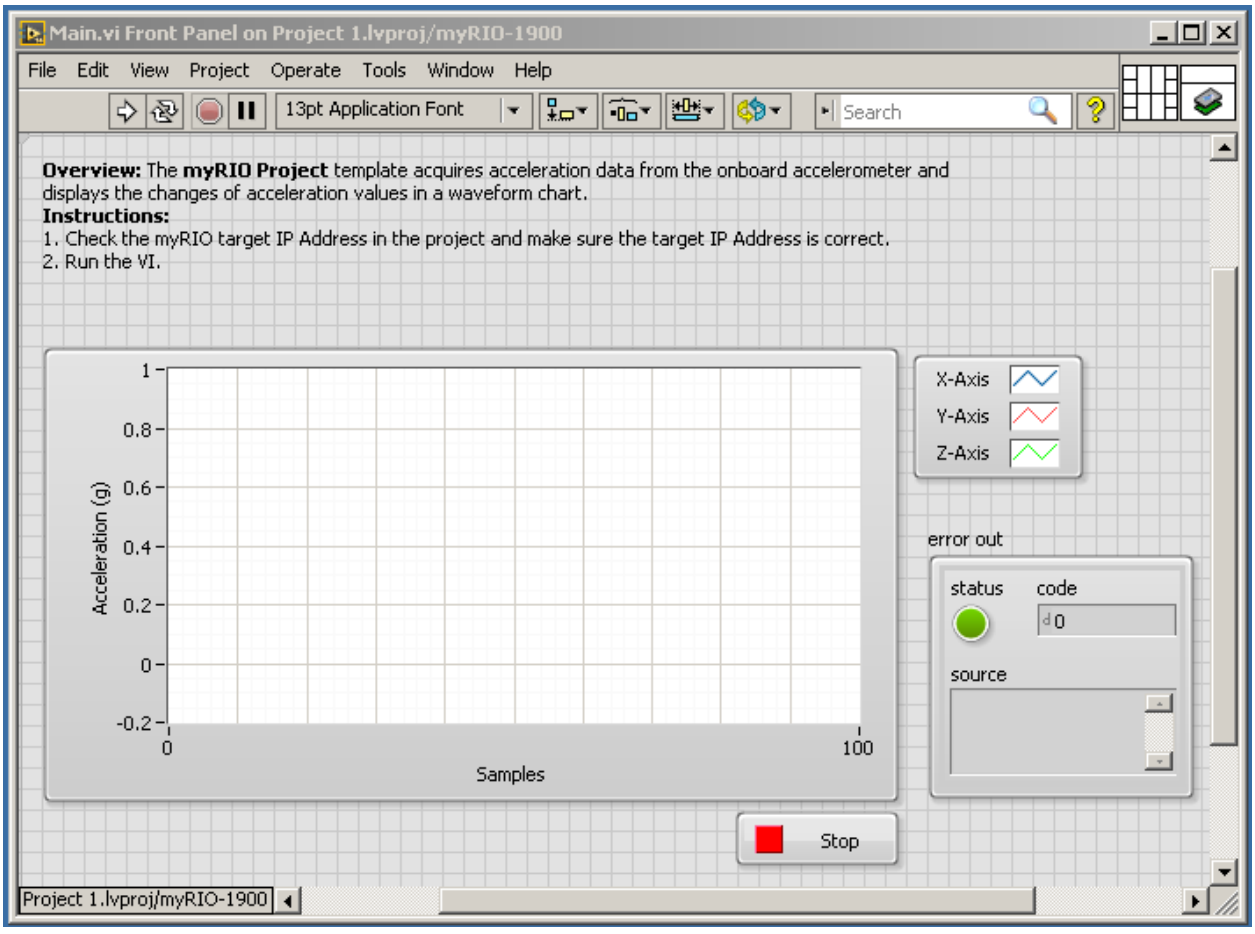

Figure 5: Front panel

4. Before you can run your code on the myRIO, you need to configure the myRIO for this project. Plug the myRIO into the host computer, then right-click on the myRIO target, then "Properties", and change the IP address to 172.22.11.2. Now you can click the white arrow in the VI to run your code. Move the myRIO around and observe the accelerometer readings. Take a screen capture of your front panel in action as well as your code.

5. If the board is not accelerating, it will experience 1 g (in free fall, it would experience 0 g- but don't try to test this!). The 1 g vector always points upward with respect to the earth, no matter which way the board is rotated. We can take advantage of this fact to calculate the "pitch" and "roll" angles of the board using trigonometry. The equation for the pitch angle is:

$$\boldsymbol{pitch = arcsin(g_x)}$$

and the equation for the roll angle is:

$$\boldsymbol{roll = arcsin(g_y)}$$

where g_x and g_y are the accelerometer readings in the x- and y-directions, respectively. Modify the LabVIEW program to calculate and display these angles.

Hand In Procedure

Hand in, via MyCourses, in a single ZIP file:

1.) A PDF with
   a. screen shots of your modified block diagram and front panel and (3 pts)
   b. explanation of the changes and their rationale. (3 pts)
2.) Another zip file with the LabVIEW code. (3 pts)