Mapúa University

School of Electrical, Electronics and Computer Engineering

Introduction to Embedded Systems

COE185P/ E01

Discrete LED

Experiment No.1

Submitted By:
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Submitted To:
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I. Introduction

MyRio provides educators with an embedded, WiFi-enabled solution to deliver an engaging approach to designing imaginative capstone projects (via National Instruments), It is used to develop applications that utilize its onboard FPGA and microprocessor. LabVIEW is a system-design platform and development environment for a visual programming language from NI.

LED is a semiconductor device that emits visible light and specialized type of diode as it has similar electrical characteristics to a PN junction diode. RGB LED combine the three colors RED, BLUE and GREEN to produce 16 million hues of light.

II. Objectives

1. Describe the essential concepts related to LEDs:
    - An LED is a diode that permits only one-way current,
    - The LED forward-bias voltage drop varies with color (wavelength),
    - The interface circuit design depends on knowledge of the DIO output resistance and source voltage,
    - LEDs may be direct-connected to the DIO under some circumstances, and
2. Select a suitable current-limiting resistor (or no resistor) based on the LED type.

III. Materials and Components

- Jumper Wires
- 1 LED
- NI myRio kit
- MXP(myRio expansion port)
- 1 Static Watches
- 1 Resistor 470 Ohms
- Breadboard

IV. PROCEDURE

Step 1. Connect the LED and Resistor based on this picture.

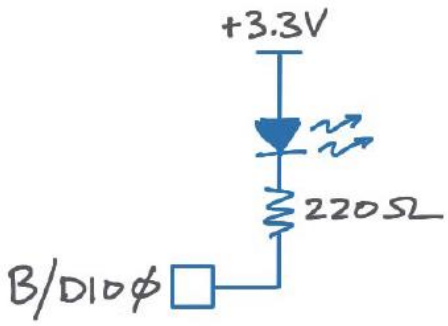

Figure 1. LED and RESISTOR connections

Step 2. Connect the breadboard to myRIO pins, connect the anode to 3.3v and connect the other end to B/DIO0 pin on the myRIO.

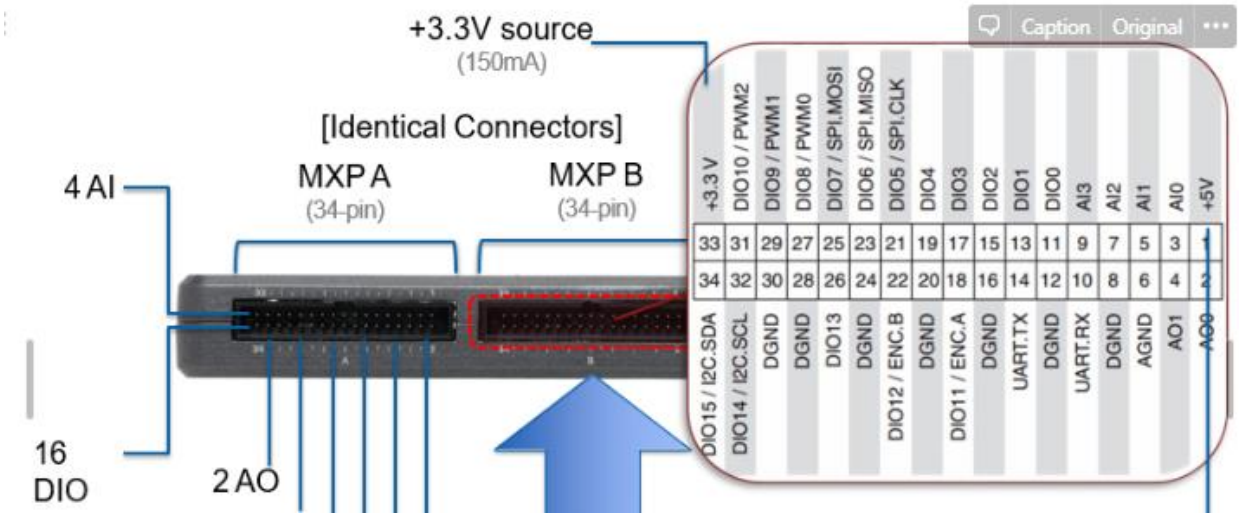

Figure 2. myRIO connection pins

Figure 3. Connected Pins during the experiment.

Step 3. Open LabVIEW and download the provided demo for LED. Then Simulate/Run the schematic for testing.

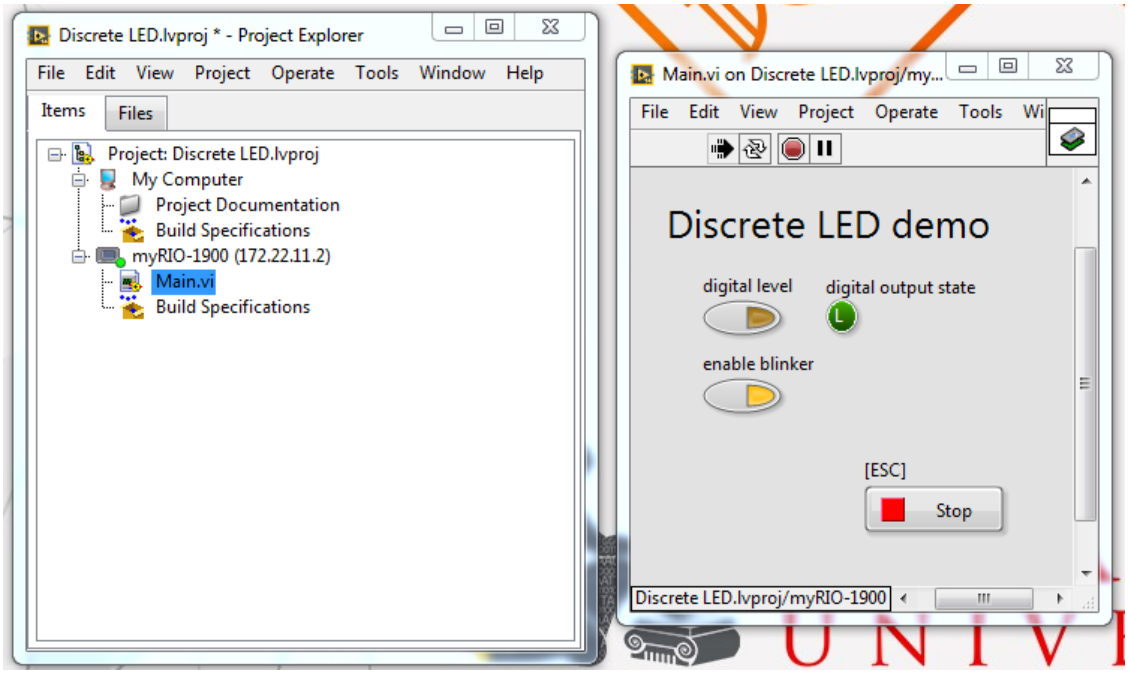

Figure 4. Discrete LED demo Schematic

Step 4. Test the LED Blinking and test the buttons in the schematic.

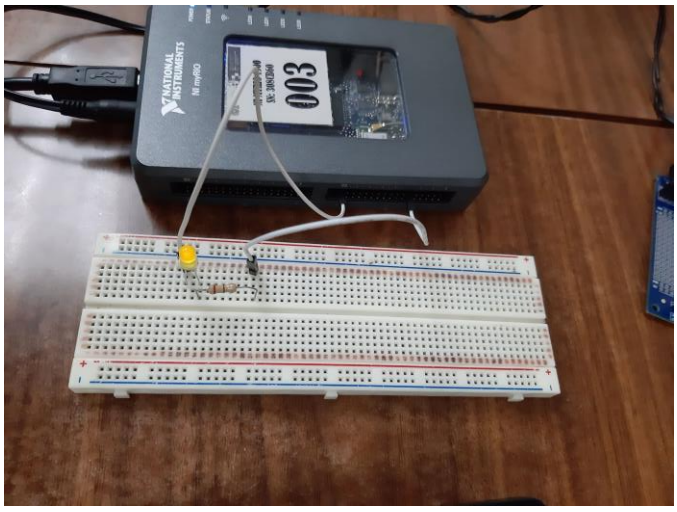

Figure 5. Blinking LED

Basic Modifications

Step 1. Adding a control to the front-panel

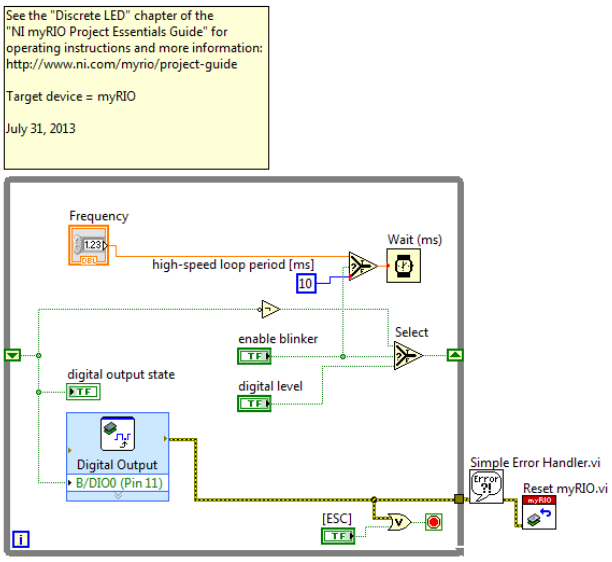

Figure 6. Adding Frequency Control

Step 2. Connect the control to the timer multiplexer

Step 3. Test the front-panel

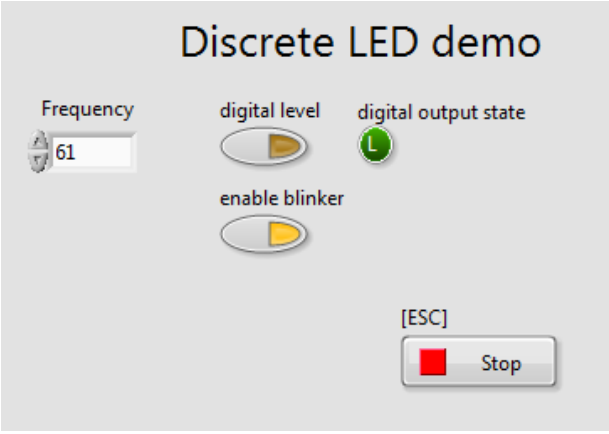

Figure 7. Front-Panel Frequency Control

V. Results and Discussion

The first part of the experiment is all about blinking the LED, the front-panel has 2 buttons these are DIGITAL LEVEL which you set if the LED is HIGH or LOW and ENABLE BLINKER which blinks the LED.

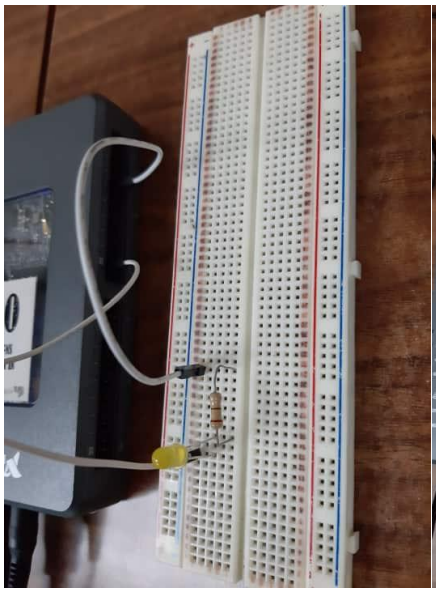

Figure 8. LED at LOW

Figure 9. LED at HIGH

Basic Modifications I choose add a front panel that control the frequency of the blinking LED, first I add control then connected it to the timer. When the frequency is at 0 the blinking becomes imperceptible when the frequency is at 10 it's very fast but as frequency increases the blinking becomes slower.

VI. Conclusion

This experiment was to learn to use the myRIO and LabVIEW program with the help of a LED. All of the activities in this experiment works without any errors, therefore, I conclude that this experiment was a success. LEDs only allow current through one direction. In this experiment, I achieved all the objectives needed in this experiment. While performing the experiment, I conclude that the LED's are forward biased and a one-way current. When the Frequency is at 0, when the frequency is at 10 the blinking of a LED is very fast but as frequency increase the blinking becomes slower, therefore, I conclude that at 0 frequency the blinking becomes imperceptible.

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Seven-Segment Display

Experiment No.2

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I. Introduction

This experiment is about seven-segment display it is a form of an electronic display device for display numbers it has 7 LED inside which are named a,b,c,d,e,f,g, and dp. This display are mainly used for devices that need numbers like clocks, meter, calculator and etc. There are two types of seven-segment display these are common anode and common cathode, common anode LED lights up only when it is LOW and common cathode lights up only the it is HIGH.

II. Objectives

After completing the activities in this chapter you will be able to:

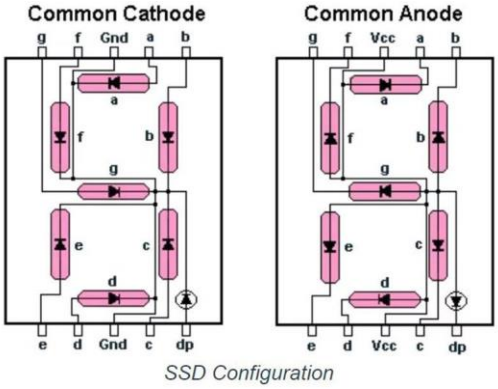
- Describe the array of LEDs wired with a common-anode connection,
- Design the interface circuit by applying knowledge of the DIO output resistance, source voltage, LED voltage-current characteristic, and
- Recognize that blue LEDs may be directly connected to the NI myRIO DIO without current-limiting resistors.

III. Materials and Components

- 10 jumper wires
- Seven Segment LED display
- NI myRio kit
- MXP(myRio expansion port)
- 1 static watches
- breadboard

IV. PROCEDURE

Step 1. Connect the wires to the seven-segment display use Figure 1 to 3 for connections.



Pin	MXP Terminal	
a	B/DIOØ	11
b	B/DIO1	13
c	B/DIO2	15
d	B/DIO3	17
e	B/DIO4	19
f	B/DIO5	21
g	B/DIO6	23
dp	B/DIO7	25
CA	B/+3.3V	33

Figure 1. Seven-Segment Display Pins ***Figure 2. Connections***

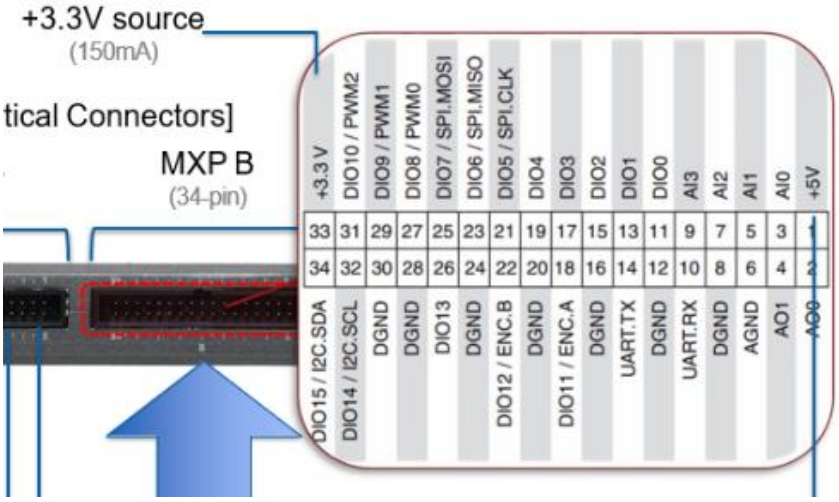


Figure 3. myRIO pins

Step 2. Open the LabVIEW then open the DEMO for the Seven-segment display.

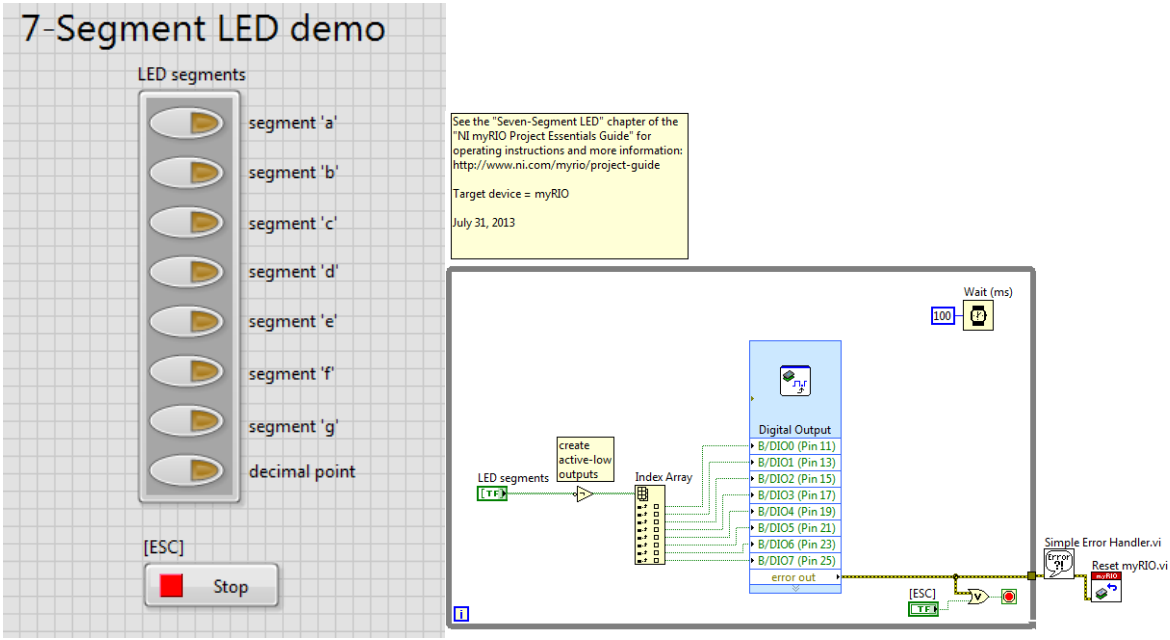


Figure 4-5. 7-Segment LED Demo Schematic

Step 3. Test the 7-Segment if working

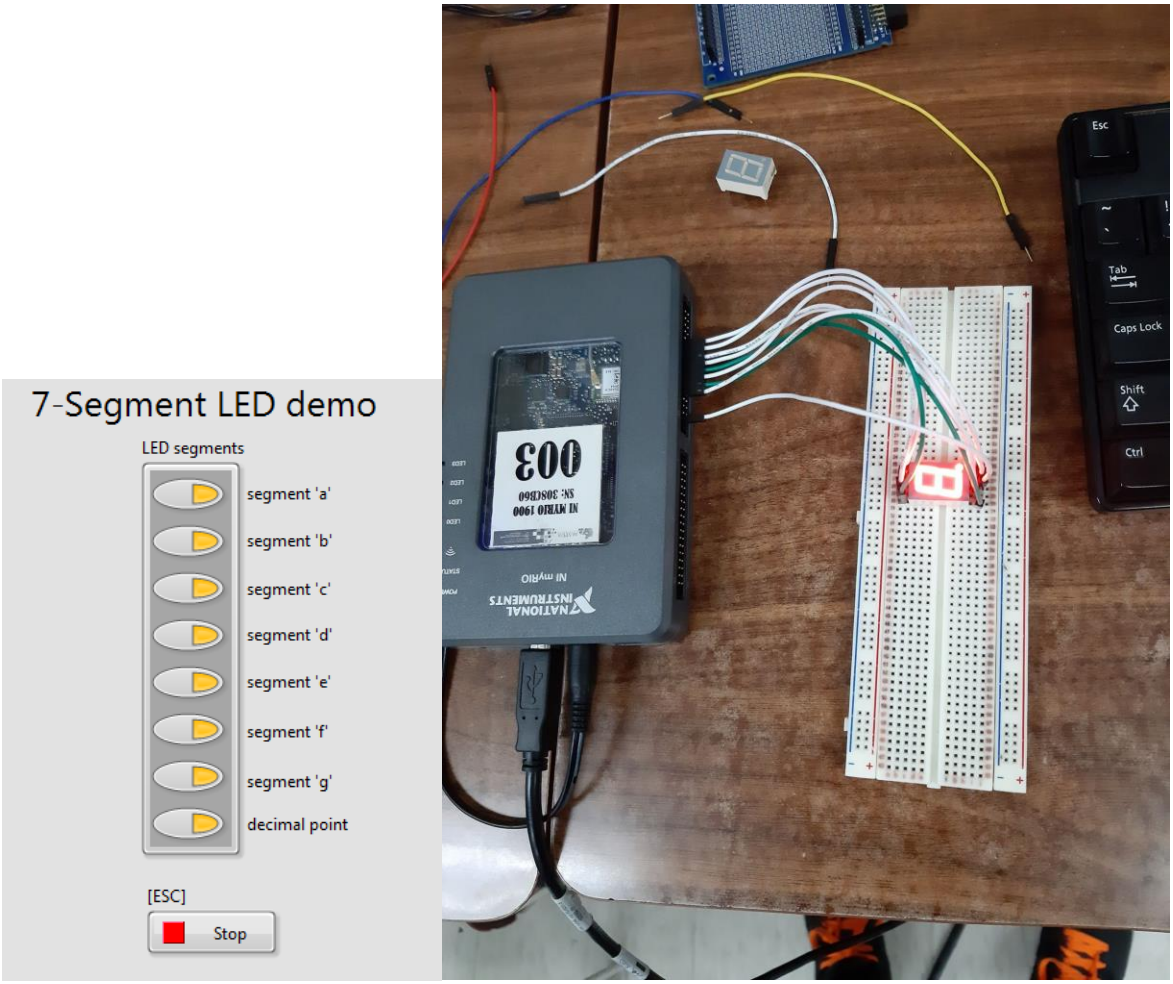


Figure 6-7. 7-segment testing

Basic Modifications

Step 1. Delete the index array then create an case structure.

Step 2. Create a Control then connect it to the sequence structure.

Step 3. Add a Boolean T and F, T for high and F for low.

Step 4. Connect the pins where you want the Led to light up.

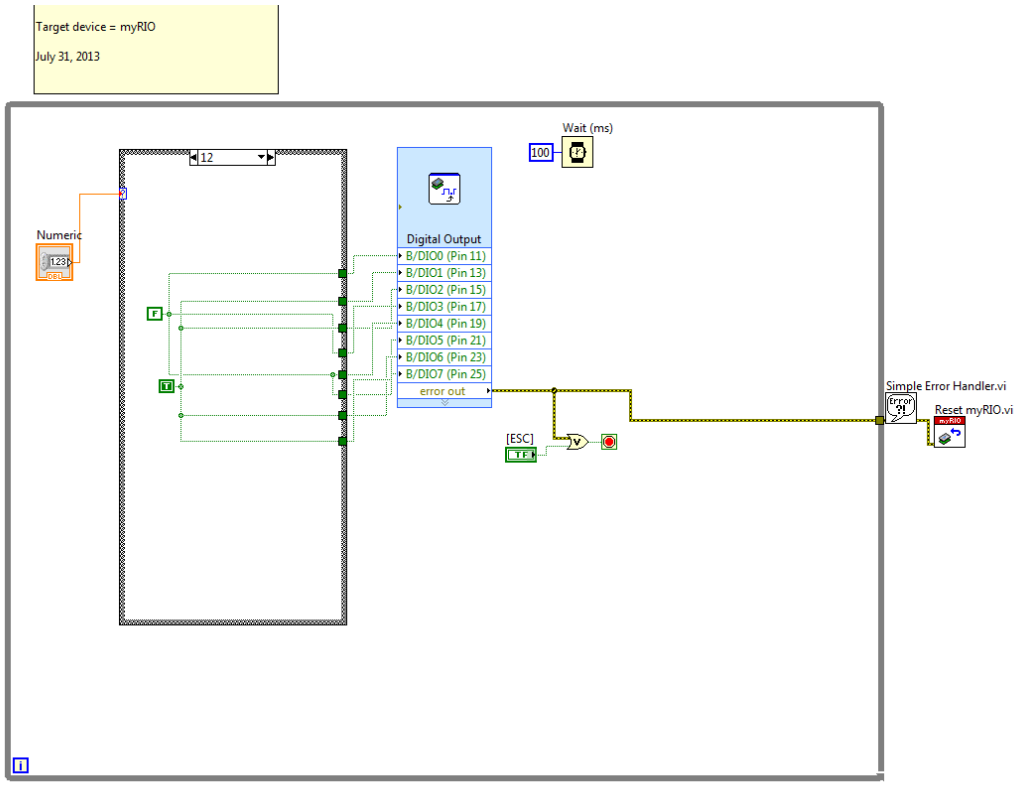


Figure 8. Case Structure Created

Step 5. Test the Front-Panel

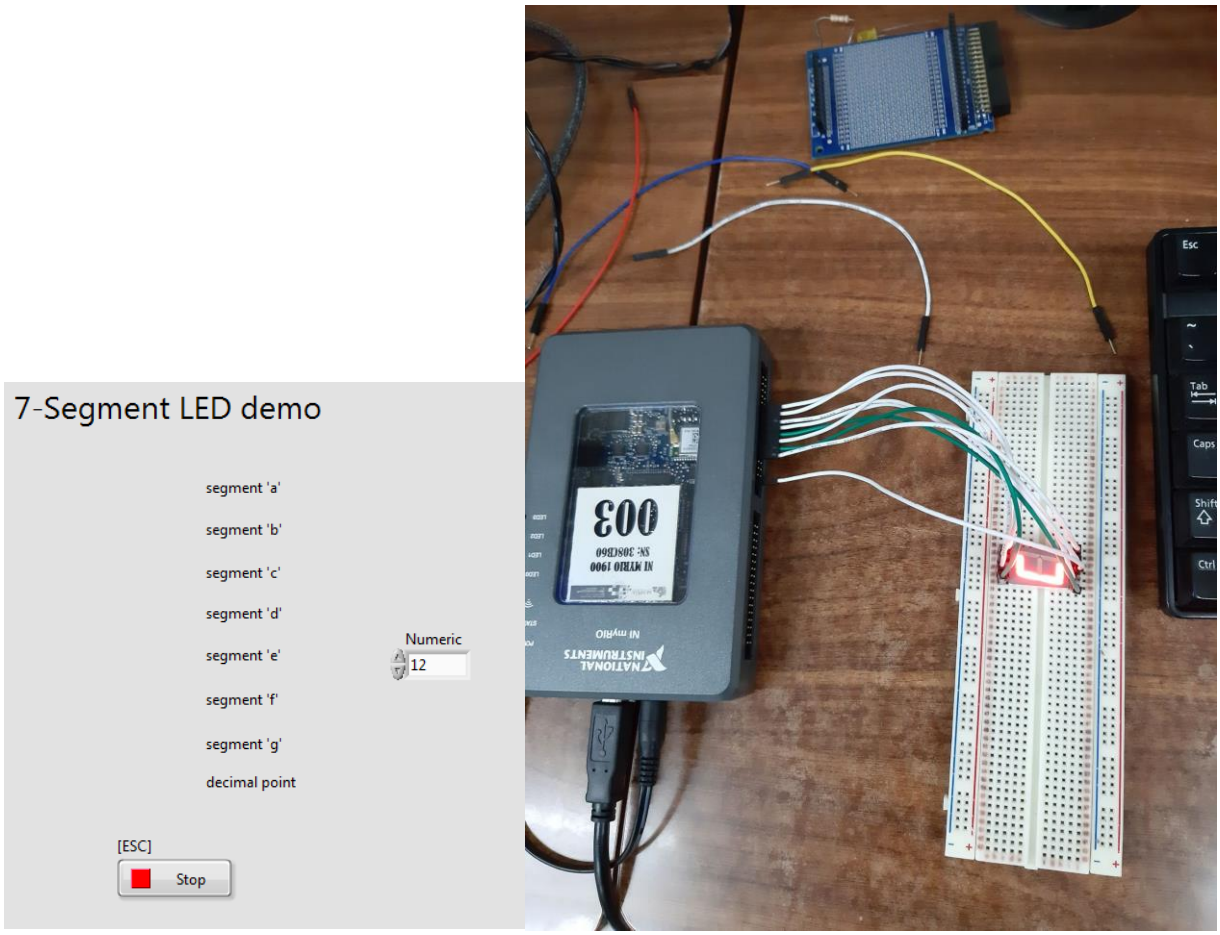


Figure 9-10. Front-Panel Testing

V. Results and Discussion

The Seven-Segment LED were able to illuminate by manually using the buttons in the front-panel. There were modifications since the 7-segment LED given in the lab has different pins from the book.

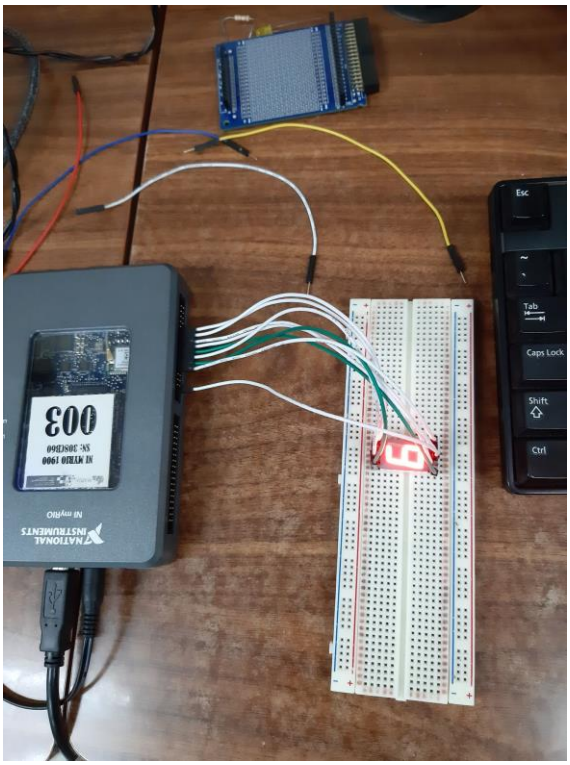


Figure 11. Displaying number 6 manually

In the second part of the experiment we modified the schematic by adding case structure then adding a Boolean T and F. The hexadecimal values from 0-9 and A-F were able to appear on the seven-segment display which were input manually by the user see figure 9-10.

VI. Conclusion

This experiment was about 7-segment display LED and how to manipulate it using myRIO, When applying low signal to a segment it lights up when the display is a common anode and high signal when common cathode. We also modified the given demo schematic by using rotating signal and case structure and using it to move around the display or display the numbers 0-F hexadecimal, Therefore I conclude that this experiment is successfully learned.