TECH 3821
Lab #2
# Relay Driver with Computer Control

Name:_____

Background: One of the most basic controls in industry is the ability to turn things on and off. As we saw in Lab #1, a relay is often used to turn on / off devices. In today's lab we will use a Darlington pair transistor to turn on a relay. We will then use a National Instruments Data Acquisition Card to control the relay via a LabVIEW VI.

Equipment: Relay (KRPA-11DG-12), Diode, 1K Resistor, TIP120 Darlington Pair Transistor, SC-2075 NI Breadboard, SH68-68-EP Cable, NI PCI-6014 Data Acquisition Card (in PC)

Diagrams:
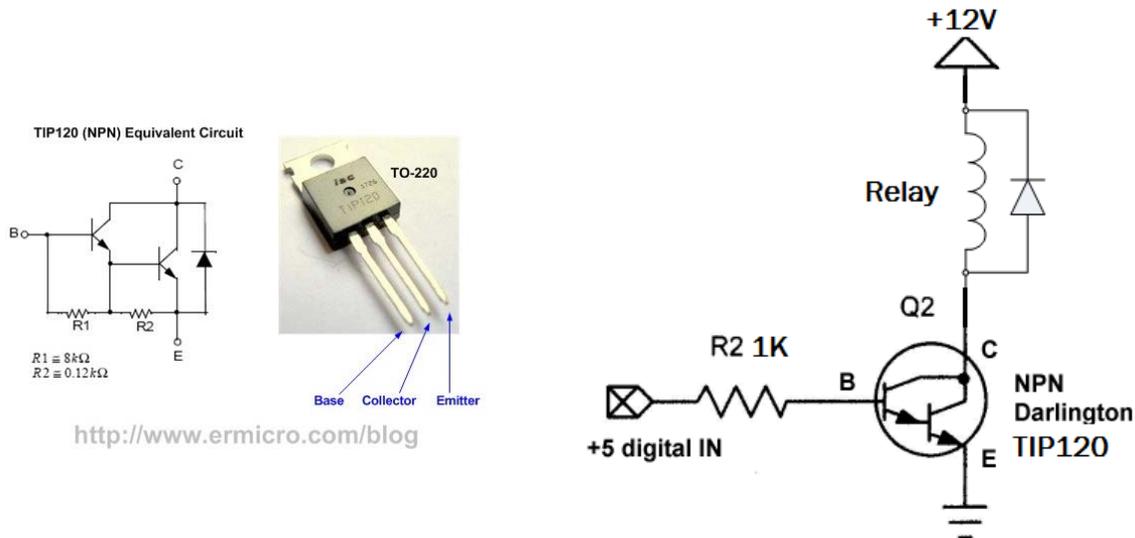
Procedure: Build the circuit as show on the NI SC-2075 Breadboard, connect the Heathkit power supply (using A for the +12V and the 5V for the digital in). Make sure you have a common ground (ie both the +5V and +12V ground are connected together and connected to the emitter). Touch the 5V supply to the base resistor and verify the relay is energized.

Now connect the Breadboard, via the SH68-68-EP Cable, to the PCI-6014 Data Acq card in the computer.

Replace the +5V digital in, with a wire from the DI00 Spring Terminal. Replace the Ground with a connection from the GND Spring Terminal (the ground and +12V from the Heathkit power supply remain connected)

Now we will use LabVIEW to create a program to control our relay driver. LabVIEW is a GRAPHICAL Programming Language. A Program in LabVIEW is called a VI (or **V**irtual **I**nstrument).

Open LabVIEW and do a FILE | NEW VI.

TWO windows should open, a "Front Panel" and a "Block Diagram". The block diagram is the program and the front panel is the user interface.

We will start in the Block Diagram Window.

First we need to turn on the Functions Pallet by doing a VIEW | Functions Pallet. Now find the Measurement I/O menu and select it, then select NI-DAQmx.
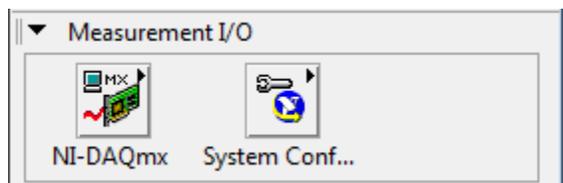
This will open up all the functions associated with the Data Acq Card. It should look like this:
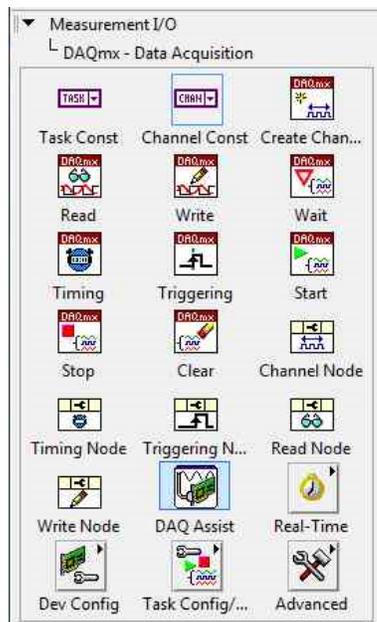
Find the Write Icon. Click the left mouse button AND hold it down and drag over to your Block Diagram Window and Release. This places that FUNCTION into your program. Under the icon is a pull down menu. Click on the ˅and do the following selections:
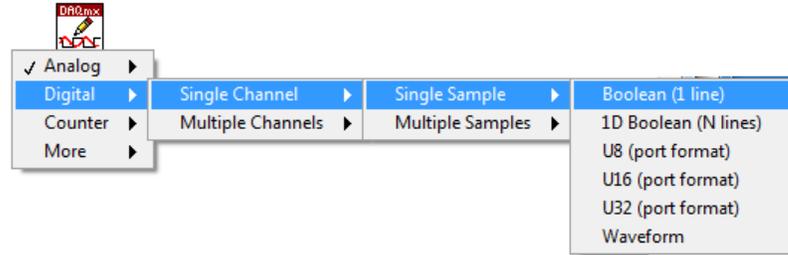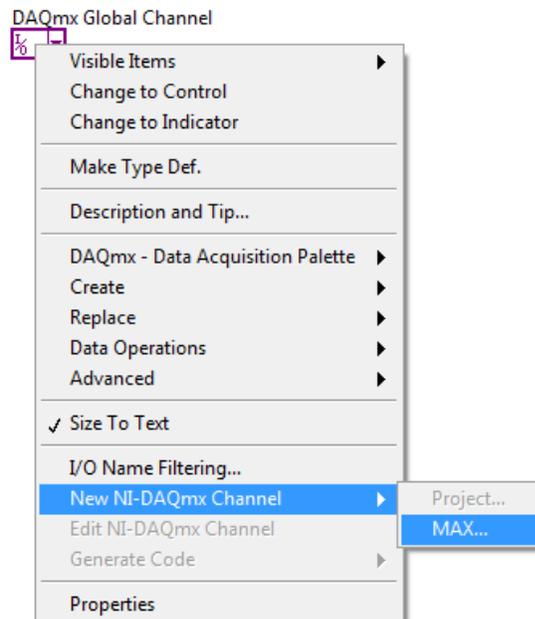

[Digital | Single Channel | Single Sample | Boolean (1 line)]

This sets up one Digital Output Pin. Now we need to define which of the 8 pins we will use. To do that go back to the NI-DAQmx functions and select "Channel Const"


And drag and drop this onto your block diagram to the left of the write block.

Right click on this new block and select the following

This will take you through a series screens. Since we want one digital output pin we will select: GENERATE SIGNALS | DIGITAL OUTPUT | LINE OUTPUT

Then we will select the port/line we will connect the circuit to. On our board we only have one port (called PORT 0) and Lines 0 – 7. We will select line 0.
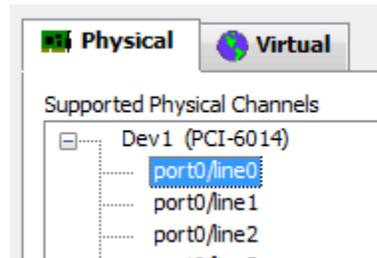
It will ask you to "Enter a Name" you can just leave the default and hit finish.

It will then bring up a test screen where you can check your I/O. To do this click on the RUN ICON:

Then click on the radio button on the screen to turn the I/O point on and off. If it is working correctly the LED on the breadboard corresponding to DIO0 should turn on and off with the radio button
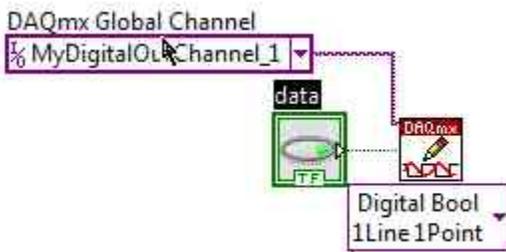
Once you are done testing, click on OK at the bottom of the window.

Now you should be back on the Block Diagram. Draw a line between the DAQmx name and the DAQmx Write block as follows:
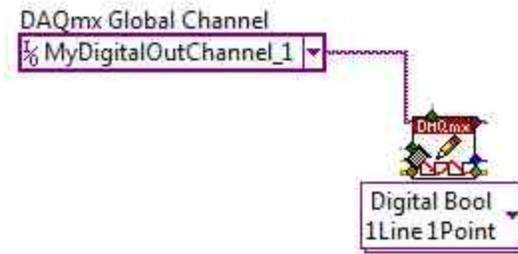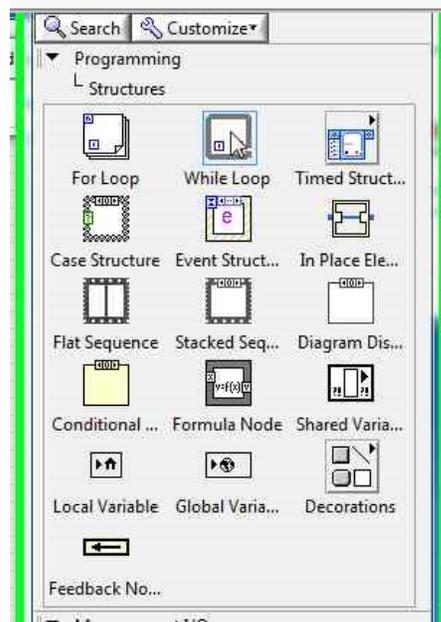
Now you need to add a control. To do this put the wiring spool over the dot on the DAQmx Write block that says "DATA" and then do a right click | Create | Control
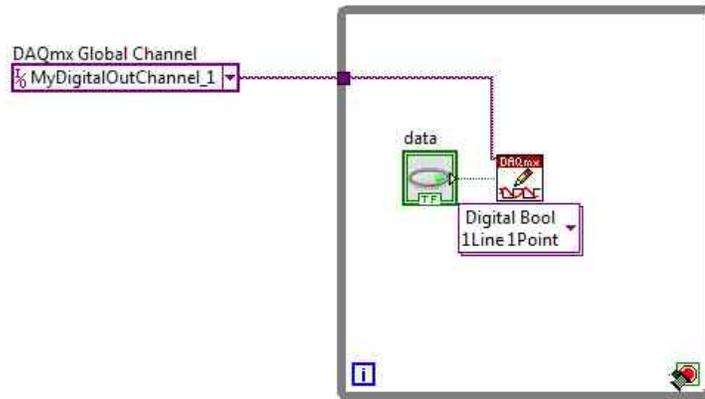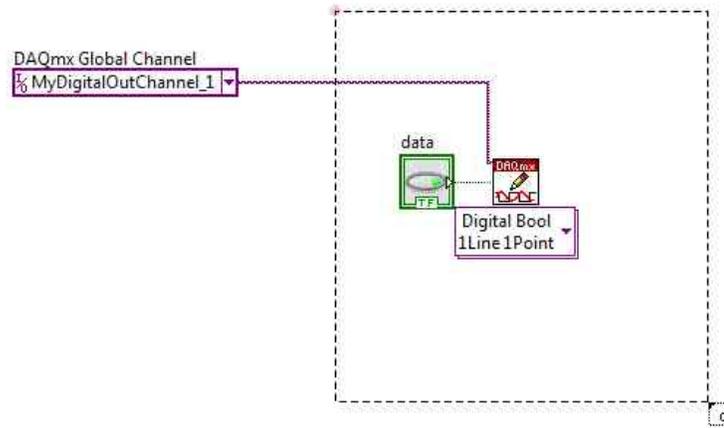
You should now have

Lastly we want to do this over and over, so we will create a loop. From the Functions Pallet, select Programming | Structures | While Loop
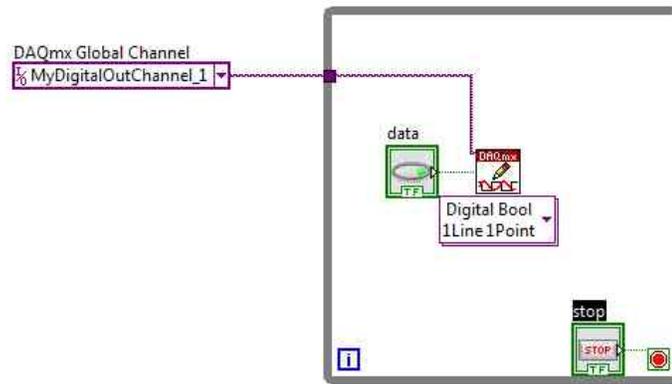
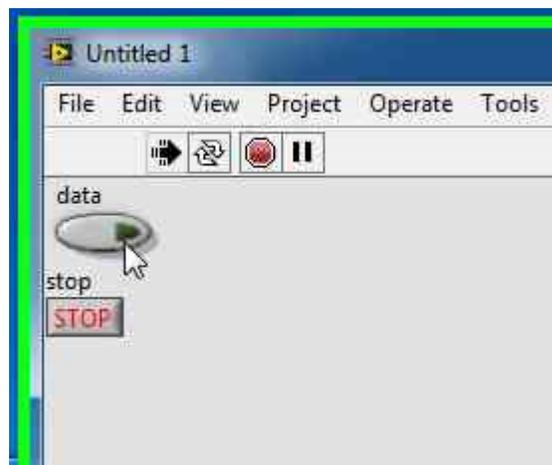Then draw the while loop box around everything by the Global Channel:

Lastly do a right click on the dot next to the red stop sign in the corner and do Create | Control

You should end up with

Go to the front panel, and you should have

Except where the black arrow is, your arrow will be white, indicating the program is not running. Click on the Arrow to run the program. Click on the Data button to turn the LED and Relay on and off. Hit stop to end the program.

Demo the code / circuit to the instructor. Submit the finish .vi file via the on line submission system.