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LED Light Emitting Diode

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USB-6008

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Hardware

- DAQ Device (e.g., USB-6008)
- Breadboard
- LED
- Resistor, $R = 270\Omega$
- Wires (Jumper Wires)



USB-6008





Digital Channels

										\downarrow D	IGIT	AL			
32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
GND)+5V	+2.5V	PH0	P1.3	P1.2	P1.1	P1.0	P0.7	P0.6	P0.5	P0.4	P0.3	P0.2	P0.1	P0.0

Dev1/Port0/line0:7

P0.<0..7> Port 0 Digital I/O Channels 0 to 7 — You can individually configure each signal as an input or output.

Dev1/Port1/line0:3

P1.<0..3> Port 1 Digital I/O Channels 0 to 3 — You can individually configure each signal as an input or output

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Basic LED Example

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Basic LED Example

 We will turn on/off the LED by clicking on a Boolean button on the Front Panel

Breadboard

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Breadboard Wiring



Make sure not to short-circuit the components that you wire on the breadboard



fritzing The Breadboard is used to connect components and electrical circuits





fritzing



[Wikipedia]

Resistors

Resistance is measured in Ohm (Ω)

Resistors comes in many sizes, e.g., 220 Ω , 270 Ω , 330 Ω , 1k Ω m 10k Ω , ...

The resistance can be found using Ohms Law U = RI







Electrical symbol:

Resistor Color Codes





Resistor Calculator: http://www.allaboutcircuits.com/tools/resistor-color-code-calculator/

Wiring



Hardware Setup



 $R = 270\Omega$

LabVIEW Example



DAQ Settings



< Back

Finish

Cancel

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Visual Studio

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Measurement & Automation Explorer (MAX)

RI USB-6008 "Dev1" - Measurement & Automation Explorer File Edit View Tools Help	Save Refresh	🗢 Reset 🔀 Self-Test 🔲 Test Panels किं Create Task ≔≣ Devi	– ice Pinouts 🔹 Configure TEDS.	· □ ×
 ✓ My System > Data Neighborhood ✓ Devices and Interfaces ✓ Integrated Webcam "cam0" ✓ Microsoft® LifeCam Studio(TM) "cam1" ◆ NI USB-5008 "Dev1" ◆ NI USB-TC01 "TC01" ↓ Network Devices > ☺ Historical Data > ◀< Scales > ❑ Software > Remote Systems 	Save Refresh Settings Name Vendor Model Serial Number Status External Calibratio	Reset Self-Test Test Panels Dev1 National Instruments NI USB-6008 0147C52D Present	ce Pinouts Configure TEDS.	y? Hide Help
	Calibration Date Recommended Next Calibration	2009-11-11 00:00 t 2010-11-11 00:00		

Test Panel in MAX

Test Panels : NI USB-6008: "Dev1"	1)
Analog Input Analog Output Digital	I/O Counter I/O		
1. Select Port	2. Select Direction		
Port Name port0	Port/Line Direction port0/line0:7	port0/line0:7 Input (1) Output (0) 7 Output (1) All Input All Output	
	- 2. Salart State	port0 Direction 00000000 7 0	
	Dest line State		
	port0/line0:7	port0/line0:7 All High High (1) Image: All High Low (0) 7	
		port0 State 00000001 7 0	
		Start Stop	
		Close Help	

Create a new project

Recent project templates

 ASP.NET Core Web Application 	C#
■ ASP.NET Web Application (.NET Framework)	C#
■ ASP.NET Web Application (.NET Framework)	Visual Basic
Windows Forms App (.NET Core)	C#
Python Application	Python
œ Windows Forms App (.NET Framewor	rk) C#

Searc	h for templates (Alt+S) P - Clear all
C#	- Windows - Desktop -
۲.	NUnit Test Project (.NET Core) A project that contains NUnit tests that can run on .NET Core on Windows, Linux and MacOS. C# Linux macOS Windows Desktop Test Web
C#	Windows Forms App (.NET Framework) A project for creating an application with a Windows Forms (WinForms) user interface C# Windows Desktop
,	WPF App (.NET Framework) Windows Presentation Foundation client application C# Windows Desktop
	WPF App (.NET Core) Windows Presentation Foundation client application C# Windows Desktop
	WPF Custom Control Library (.NET Core) Windows Presentation Foundation custom control library C# Windows Desktop Library
Ĵ	WPF User Control Library (.NET Core) Windows Presentation Foundation user control library
∑ ĵ	Blank App (Universal Windows) A project for a single-page Universal Windows Platform (UWP) app that has no predefined controls or layout. C# Windows Xbox UWP Desktop

Configure your new project

Windows Forms App (.NET Framework) C# Windows

Project name

LEDApp

Location

C:\Users\hansha\OneDrive\Programming\Visual Studio Example -

Solution name 🕕

LEDApp

□ Place solution and project in the same directory

Framework

.NET Framework 4.7.2

ws Desktop

....

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Example 1

LED1 ON

Form1

using System; using System.Windows.Forms; using NationalInstruments.DAQmx;

namespace LEDApp

public partial class Form1 : Form

public Form1()

×

InitializeComponent();

private void chkLED_CheckedChanged(object sender, EventArgs e)

Task digitalOutTask = new Task();

digitalOutTask.DOChannels.**CreateChannel**("**dev1/Port0/line0**", "myDAChannel", ChannelLineGrouping.**OneChannelForEachLine**);

DigitalSingleChannelWriter writer = new DigitalSingleChannelWriter(digitalOutTask.Stream);

bool digitalDataOut = chkLed1.Checked;

writer.WriteSingleSampleSingleLine(true, digitalDataOut);

Example 2

🖶 Form2	_		×
LED 1			
LED 2			
LED 3			
LED 4			
LED 5			
LED 6			
LED 7			
LED 8		Write to	

using System; using System.Windows.Forms; using NationalInstruments.DAQmx;

namespace LEDApp

public partial class Form2 : Form

public Form2()

InitializeComponent();

private void btnWriteDaq_Click(object sender, EventArgs e)

Task digitalOutTask = new Task();

digitalOutTask.DOChannels.**CreateChannel**("**dev1/Port0/line0:7**", "myDAChannel", ChannelLineGrouping.**OneChannelForAllLines**);

DigitalSingleChannelWriter writer = new DigitalSingleChannelWriter(digitalOutTask.Stream);

bool[] dataArray = new bool[8]; dataArray[0] = chkLed1.Checked; dataArray[1] = chkLed2.Checked; dataArray[2] = chkLed3.Checked; dataArray[3] = chkLed4.Checked; dataArray[4] = chkLed5.Checked; dataArray[5] = chkLed6.Checked; dataArray[6] = chkLed7.Checked; dataArray[7] = chkLed8.Checked;

writer.WriteSingleSampleMultiLine(true, dataArray);

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Alarm LED Example

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Alarm LED Example

• We will turn on the LED when the temperature reach a specific Alarm Level

LabVIEW Example



> ...:

LabVIEW Example



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Temperature Sensor Example

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TMP36 Temperature Sensor



Analog voltage out

A Temperature sensor like TM36 use a solid-state technique to determine the temperature.

They use the fact as temperature increases, the voltage across a diode increases at a known rate.

https://learn.adafruit.com/tmp36-temperature-sensor

Necessary Equipment

- PC
- DAQ Module, e.g., USB-6008
- Breadboard
- TMP36
- Wires (Jumper Wires)













Wiring Example

Here you see a wiring examples using Arduino. You make the same wiring using a DAQ device like USB-6008 or similar.



AI0

Linear Scaling



This gives:

$$y - 25 = \frac{50 - 25}{1 - 0.75}(x - 0.75)$$

Then we get the following formula: y = 100x - 50 Convert form Voltage (V) to degrees Celsius From the Datasheet we have:

 $\begin{array}{l} (x_1,y_1) \ = \ (0.75V,25^\circ C) \\ (x_2,y_2) \ = \ (1V,50^\circ C) \end{array}$

There is a linear relationship between Voltage and degrees Celsius:

y = ax + b

We can find a and b using the following known formula:

$$y - y_1 = \frac{y_2 - y_1}{x_2 - x_1} (x - x_1)$$





TMP

We connect the TMP36 to LabVIEW using a USB DAQ Device from National Instruments, e.g., USB-6001, USB-6008 or similar. I have used a breadboard for the wiring.

LabVIEW Example



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Temperature Sensor with Alarm Example

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Necessary Equipment

- PC
- DAQ Module, e.g., USB-6008
- Breadboard
- TMP36
- LED
- Resistor, $R = 270\Omega$
- Wires (Jumper Wires)





Wiring



LabVIEW Example





LabVIEW Example

Temperature with Alarm Example.vi Block Diagram	- 🗆 🗙
File Edit View Project Operate Tools Window Help	
While Loop	
milliseconds to wait Wait (ms) Image: Stop Butt Image: Stop Butt Image: Stop Butt	<u>יח</u>

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