

MEP-382: Design of Measurement Systems,
Faculty of Engineering, Ain Shams University,
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Lab-5: Interfacing Labview with Arduino using LINX

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LAB Goals:

Understanding:

- How Labview can be interfaced with Arduino
- Making Digital Write
- Understanding Pulse Width Modulation
- Making Analog read



Overview on measurement system

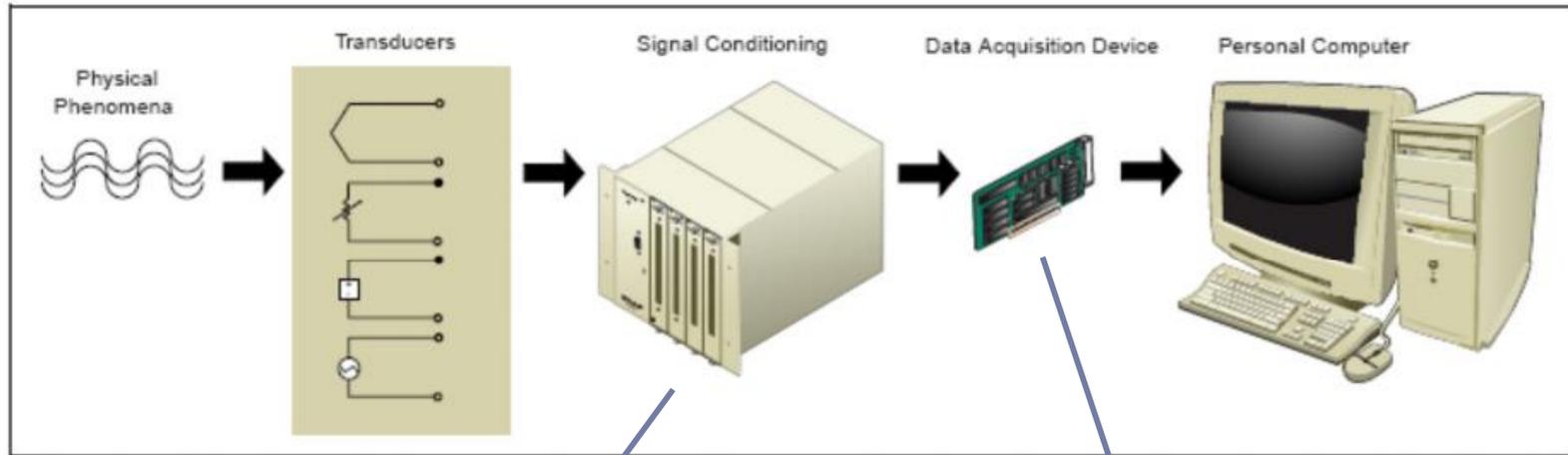


Figure 1. Signal conditioning is an important component of a PC-based DAQ system.

Conditioning using
OpAmps (Filtering,
Integration,
Differentiation)

www.ni.com

ADC for
multichannels

LINX Library

- ▶ LINX provides an interface between LabVIEW and an Arduino.
- ▶ LINX was developed and tested using an Arduino Uno but should work with most Arduino compatible hardware.
- ▶ LINX requires a data connection between LabVIEW and the Arduino at all times.
- ▶ LINX is an updated version of LIFA (LabVIEW Interface for Arduino).



How LINX Library works?

- ▶ LabVIEW sends a packet to the Arduino.
- ▶ The Arduino processes the packet and performs the specified operation (usually some I/O).
- ▶ The Arduino sends a response packet back to LabVIEW.
- ▶ The LabVIEW VI returns and your program continues.



LINX supported devices

- ▶ Arduino: UNO, Mega, Leonardo, Nano,..
- ▶ Raspberry Pi: some models

Plus other platforms



Getting started with LINX Library

NI LabVIEW



NI-VISA



The Virtual Instrument Software Architecture (VISA) is a standard for configuring, programming, and troubleshooting instrumentation systems comprising GPIB, VXI, PXI, Serial, Ethernet, and/or USB interfaces.

JKI VIPM



JKI Software's VI Package Manager (VIPM) makes using and distributing an NI [LabVIEW](#) add-on simple. With VIPM, it is easy to manage and share reusable VIs across multiple projects, computers, and teams of developers.

LVH LINX



https://labviewhacker.com/doku.php?id=learn:libraries:linx:getting_started

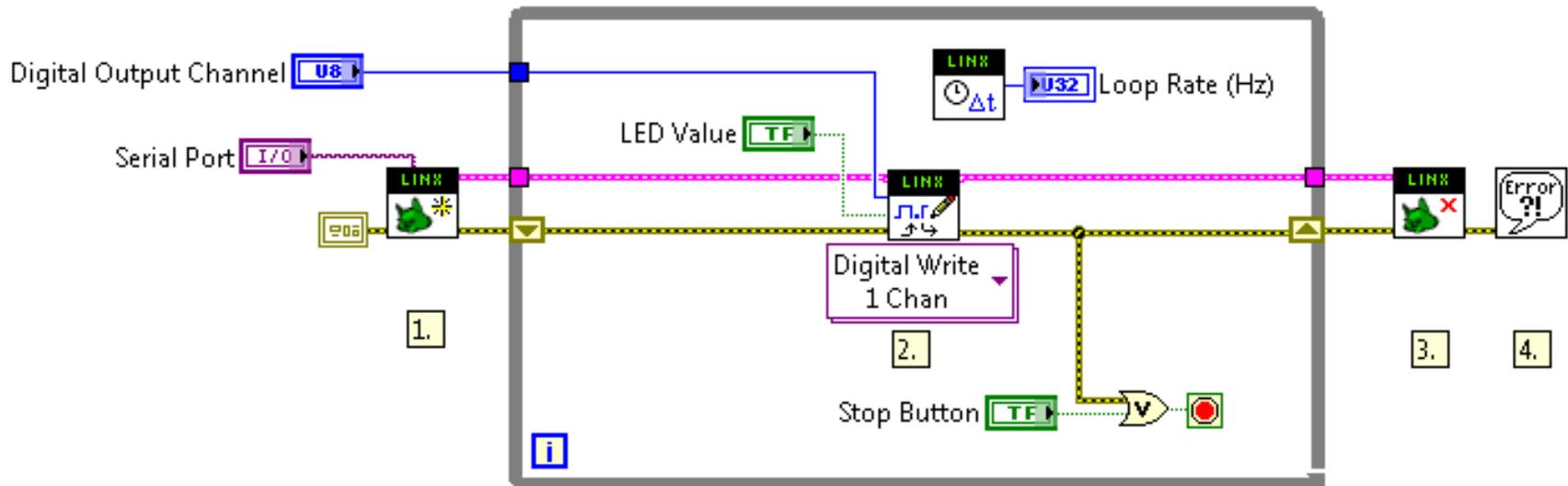


Getting started with LINX Library

- ▶ In LabVIEW click **Tools » LabVIEW Hacker » LINX » Firmware Wizard**
- ▶ Choose the **Device Family**
- ▶ Choose the **Device Type**
- ▶ Choose the Firmware Program Interface
 - ▶ *Most LINX devices use a serial interface.*
- ▶ Click **Next**
- ▶ Configure the **Firmware Program Interface**
 - ▶ *For serial devices simply choose the **COM Port** associated with the device.*
- ▶ Click **Next**
- ▶ Choose the **Firmware Version**
- ▶ Click **Next**
- ▶ Wait while the firmware is uploaded to the device.
- ▶ Click **Launch Example**

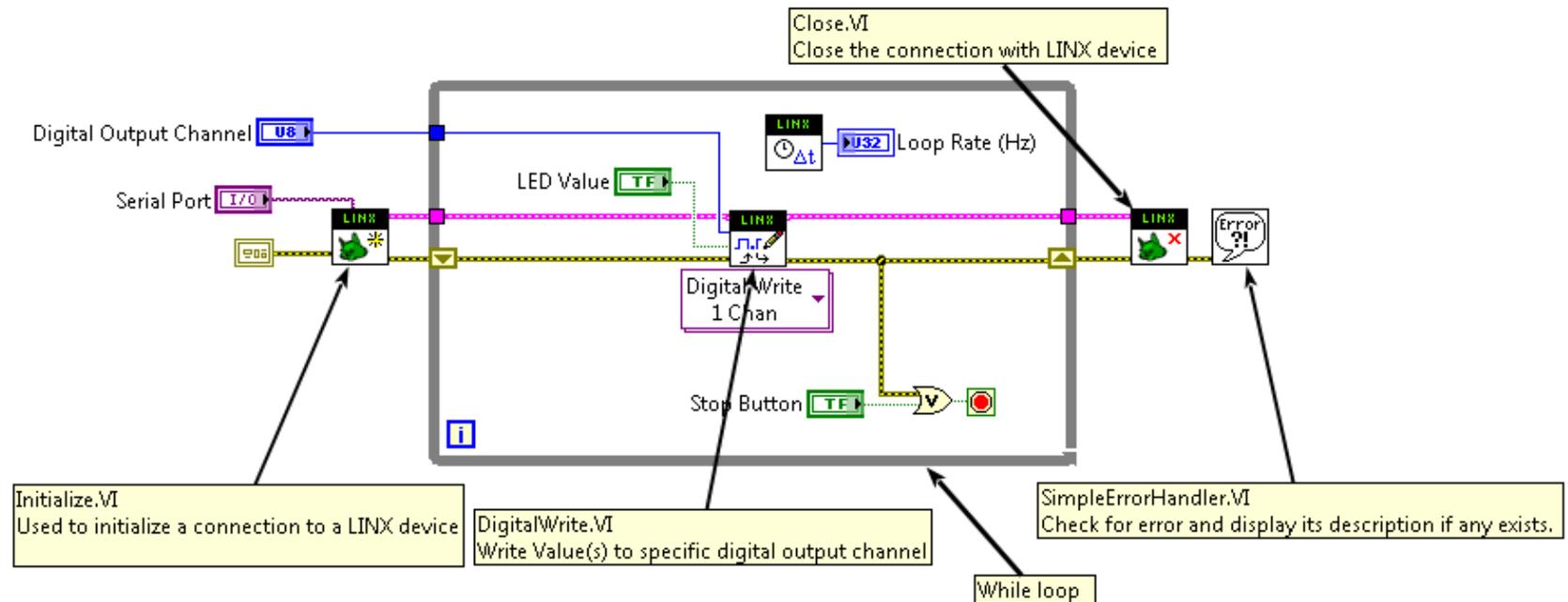


LED Toggle Example



1. Open a connection to the LINX device.
3. Write the value to the specified DO channel.
4. Close the connection to the LINX device.
5. Handle Errors

LED Toggle Example



Blink

- ▶ Modify the previous program to make the LED automatically blinks and repeats.



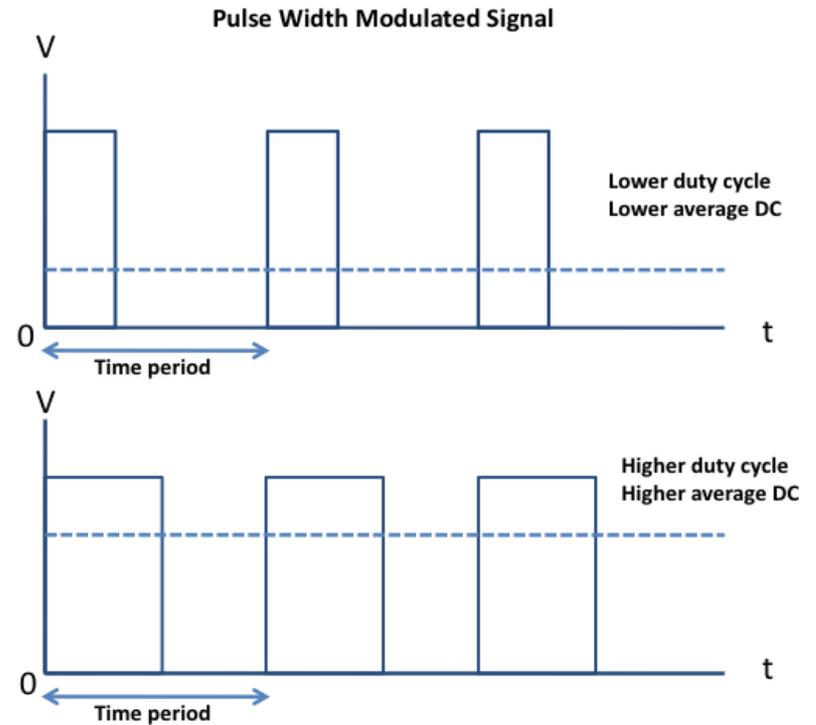
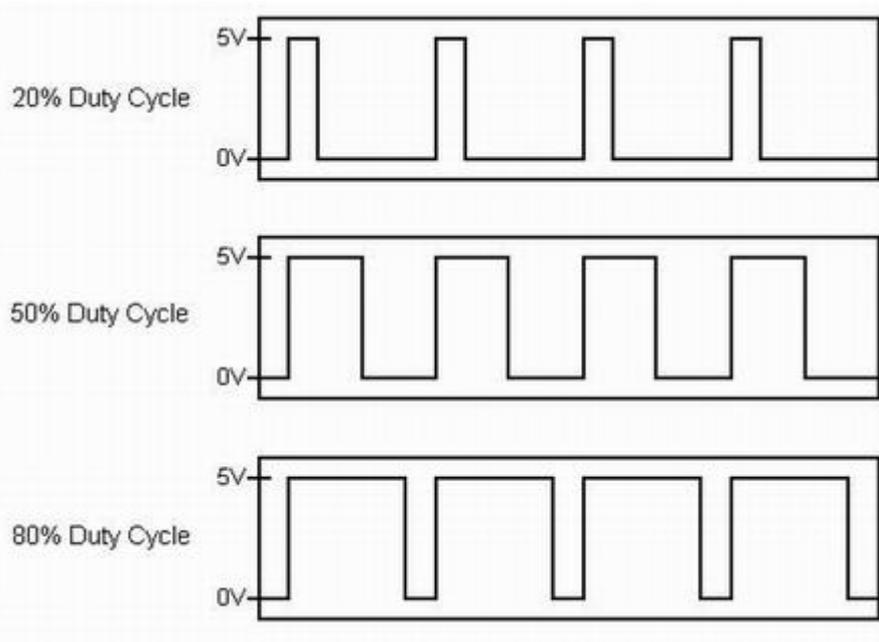
Pulse Width Modulation

- ▶ Pulse Width Modulation, or PWM, is a technique for getting analog results with digital means.
- ▶ Digital control is used to create a square wave, a signal switched between on and off.
- ▶ This on-off pattern can simulate voltages in between full on (5 Volts) and off (0 Volts) by changing the portion of the time the signal spends on versus the time that the signal spends off.
- ▶ The duration of "on time" is called the pulse width.
- ▶ If you repeat this on-off pattern fast enough with an LED for example, the result is as if the signal is a steady voltage between 0 and 5v controlling the brightness of the LED.



Pulse Width Modulation

- ▶ Arduino's PWM frequency at about 500Hz (Period: 2 ms)



Pulse Width Modulation

- ▶ Ex: To create a 3V signal given a digital source that can be either high (on) at 5V or low (off) at 0V, you can use PWM with a duty cycle of 60% which outputs 5V 60% of the time.
- ▶ Selecting a duty cycle of 80% would yield 4V, 20% would yield 1V, and so on.



Exercise:

- ▶ It is required to interface a potentiometer, read its analog value (0-5v), use this value after the proper conversion as the duty cycle to control the fading (level of illumination) of a LED.



LED and Pot interface

