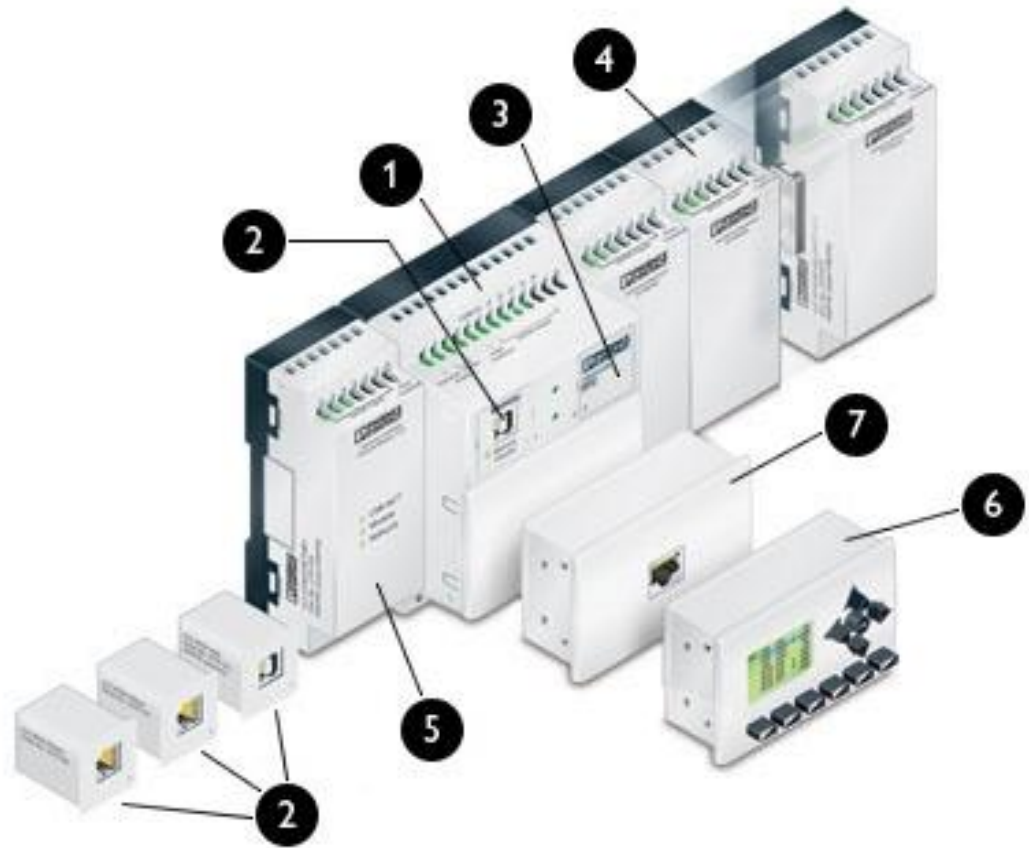# Info on Phoenix Contact **NanoLC** ("**Nanoline Series**") Programmable Logic Controllers (PLC's) including "**Nanonavigator**" software
JT Wunderlich PhD and Chris Peters

1. Base Unit

2. Communications Option modules

3. Real time Clock

4. Expansion I/O Modules

5. Communications Expansion Modules (Ethernet and SMS Modem)

6. Operator Panel

7. Remote mounting for Operator Panel

Read "**Nano quickstart**.pdf" in my public folder

Update "Nanonavigator" firmware if necessary – read "UpdatingnanoLC_and_nanoNavigator2630_en_A.pdf" in my public folder

Read Datasheets for "Nanoline Seies" **base unit and modules** on Dig-key:
http://www.digikey.com/catalog/en/partgroup/nanoline-series/50362?mpart=2700453&vendor=277

Read Datasheets for **relays** ("Phoenix Contact Sockets") on Dig-key:
http://www.digikey.com/catalog/en/partgroup/phoenix-contact-sockets/19176

Watch Phoenix Contact video on how to program it with **flow charts**:
https://www.youtube.com/watch?v=qXA2O47rqqw

Then, watch this Phoenix Contact video on how to program it with **Relay Ladder** Logic:
https://www.youtube.com/watch?v=i4wJFXCS9OU

NOTE: Supplemental Text on Ladder Logic (copy in Lab), and excerpts and related lecture notes distributed:
Frank D. Petruzella, *"Programmable Logical Controllers,"* 4th edition, **September 3, 2010**, McGraw-Hill Science/Engineering/Math, (ISBN: 0073510882).
Also, here's a good YouTube video (although not for Phoenix Contact NanoLC):
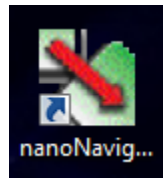https://www.youtube.com/watch?v=Ei4_HqzUFBs

More info at: http://www.phoenixcontact.com/nanoline

Getting Started

To begin the setup you will need a NanoLC main unit, a USB chord, and the NanoLC software.
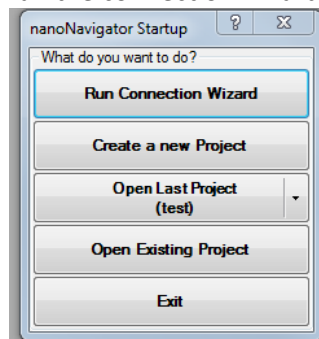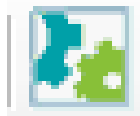
(NanoLC)

Start by first plugging the NanoLC into the USB port on the front of the computer. Start the nanoline software by clicking on the icon depicted below.

Once the software starts up the next step is to run the connection wizard to set up the NanoLC.

Adjust the USB port settings if the plc is not detected. If the NanoLC is properly connected you will be able to write code. Once you're in the software the NanoLC as well as any I/O expansions need to be configured. Refer to Appendix A for a list of expansion devices and their use. Click on the icon depicted below to enter the configuration menu.

The voltage needs to be adjusted on the input and output of the expansion devices as well as the NanoLC. Voltage is measured in millivolts. For example if you need the NanoLC to take in 5 volts you would need the high value to be at least 5000.
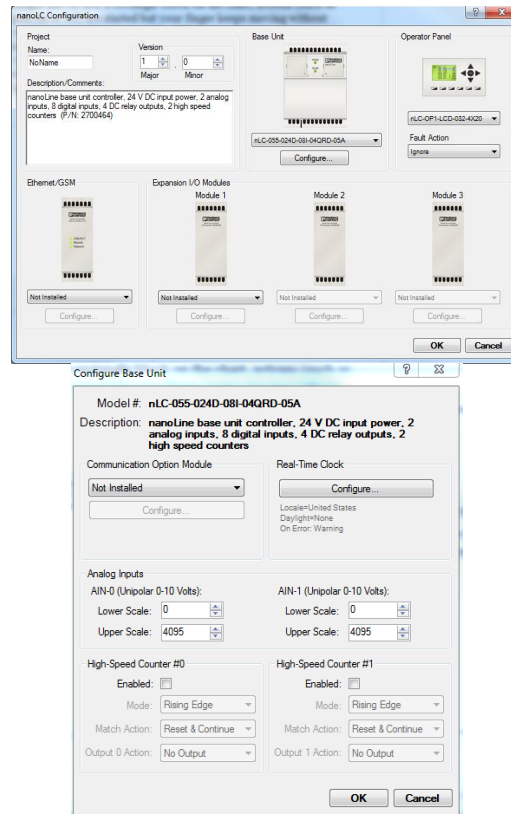
At this point you can begin to code the NanoLC. Code for the NanoLC is written in flowcharts. There are 7 main types of functional blocks that can be used to control the NanoLC. Refer to Appendix B for a list of the functional blocks and what they're used for.
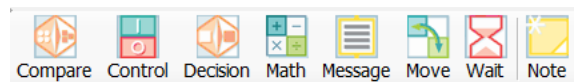
Once your code is ready you can either simulate the code in the NanoLC software or you can upload the code to the NanoLC if you're more confident. To run the simulation press the button pictured below.
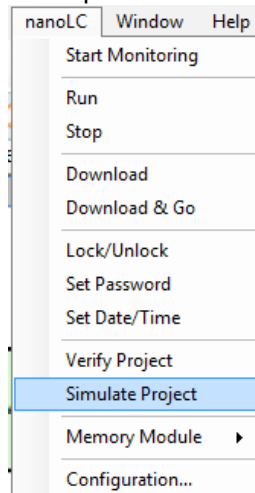
If you want to directly upload the code to the NanoLC press the following button:

If you wish to stop the simulation or code on the NanoLC press the following button.

At this point you are now aware of the basics of the NanoLC. Now before you get started we'll first look at some safety precautions.

Safety

The NanoLC is an industrial microcontroller that is completely capable of manipulating high voltages. There a multiple safety precautions that needs to be followed when using the NanoLC.

1.   Leave the NanoLC unplugged as long as possible
While using the NanoLC it's wise to turn the power off whenever possible. Leaving the NanoLC off when plugging things in, writing code, or any other development reduces the risk of damaging the NanoLC and the risk of getting shocked.

2.   Check your wiring
Before testing your code on the NanoLC it's always best to look over your wiring. It's easy to wire things up wrong, so checking your wires will reduce your risk of damaging the equipment.

3.   Color code your wires
We have both red and black wires available in the lab. Use red for positive connections and black for negative connections. Color coding your wires makes it easier to visualize what your NanoLC is doing.

4.   Test with lower voltage first
If you are planning on developing a circuit that uses high voltage it may be a smart idea to first test with a much lower voltage. In case something goes wrong using a lower voltage will decrease the chance of damaging the NanoLC and decrease the chance of someone getting shocked.

5.   Simulate your code first
Even though you have the ability to upload and run your code at the same time it isn't always wise to do so. To make sure everything works it's wise to simulate your code first.

6.   Make sure there are no live wires
Live wires can result in a painful shock. Make sure you don't leave any wires only connected at one end. Also be sure there are no wire fibers exposed. The wire we use for the NanoLCs is frayed and can easily have exposed strands. If you notice any exposed strands be sure to run the wire through a terminal block first. This will reduce the risk of touching a frayed strand.

Following these safety guide lines will keep you safe while working with the NanoLCs. We do have these in the lab !