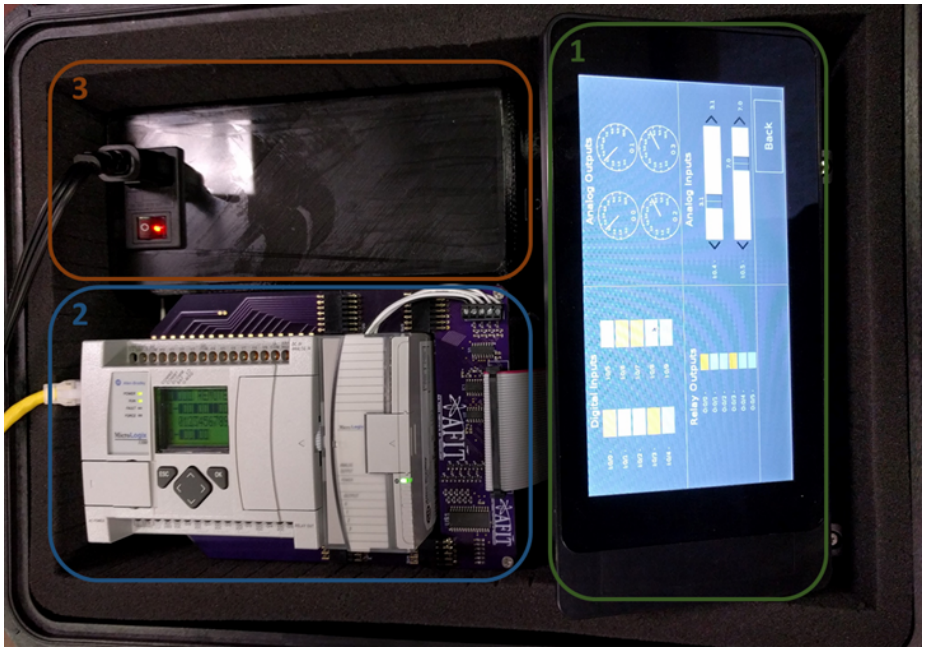
Programmable Logic Controllers (PLCs)
Lab #0 Setup

Intro

In this lab you will setup the PLC training kit you have received. This process includes understanding how to connect to the kit, program the PLC, and test the hardware using the IO_Test example project.

Kit Contents

WARNING!!! DO NOT REMOVE THE SYSTEM FROM THE PELICAN CASE.



1. Raspberry PI touchscreen - hardware-in-the-loop simulator.
2. MicroLogix 1100 - Programmable Logic Controller.
3. Power.

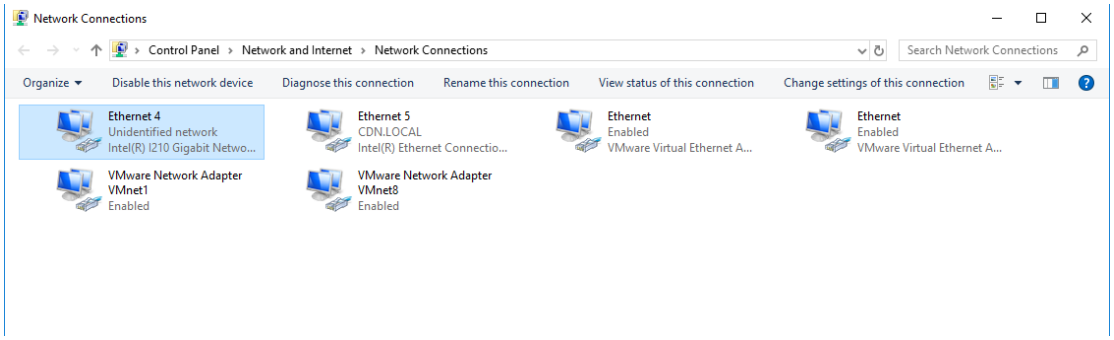
Lab Procedure

1. Open your PLC kit (**do not remove contents from Pelican case**).

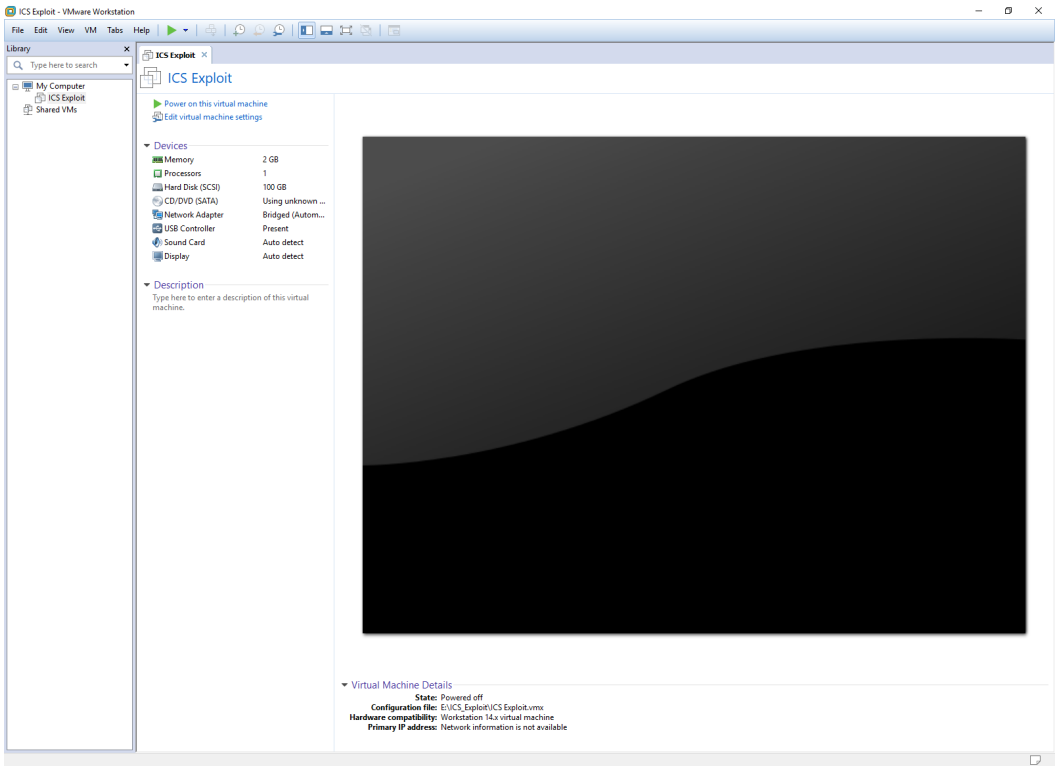
2. Use the power cord from an unused monitor to power the kit.

3. Connect the **PLC's Ethernet** to an **empty Ethernet port on your computer.**

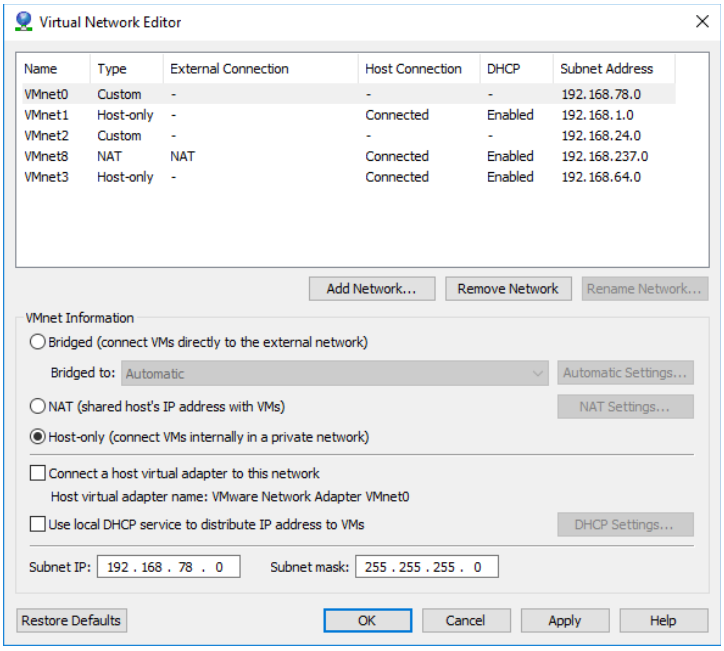
4. Check the name of the network interface that you used. In this picture it is the **I210 Gigabit Network**.



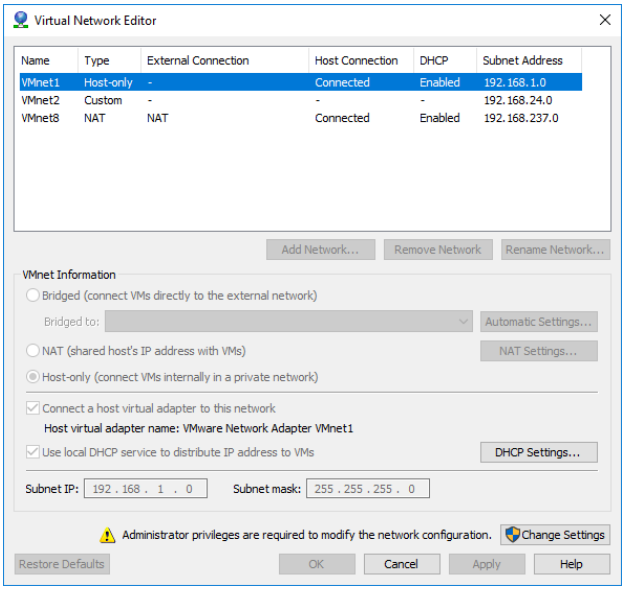
5. Open VMware Workstation

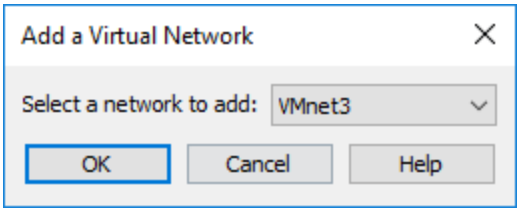


6. Enter the Virtual Network Editor. Select **VMnet0** and remove the **Bridged >> Automatic** setting. Either select a specific interface or switch it to **Host-only**.

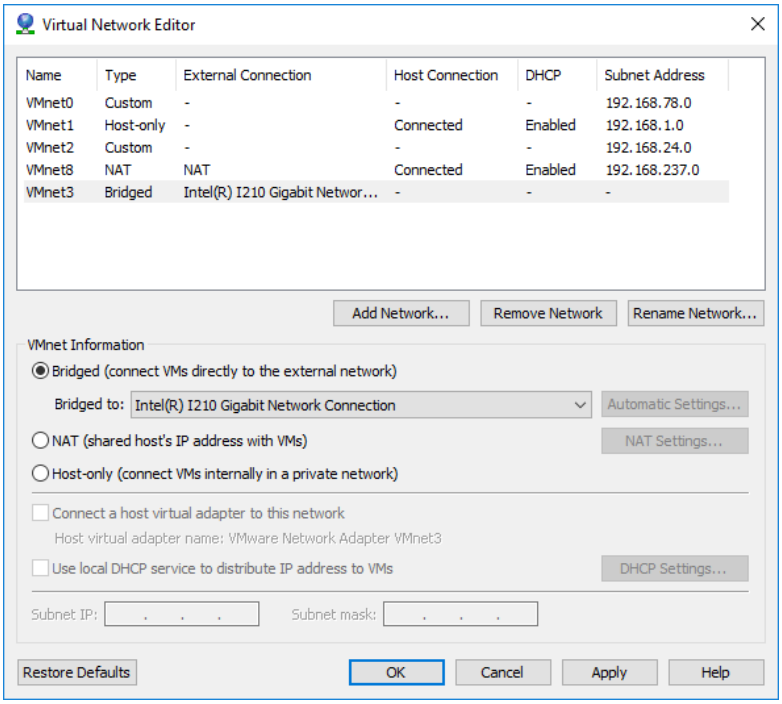


7. Click **Change Settings** and then **Add Network**. Note the name of the new network (**VMnet3** in this example).

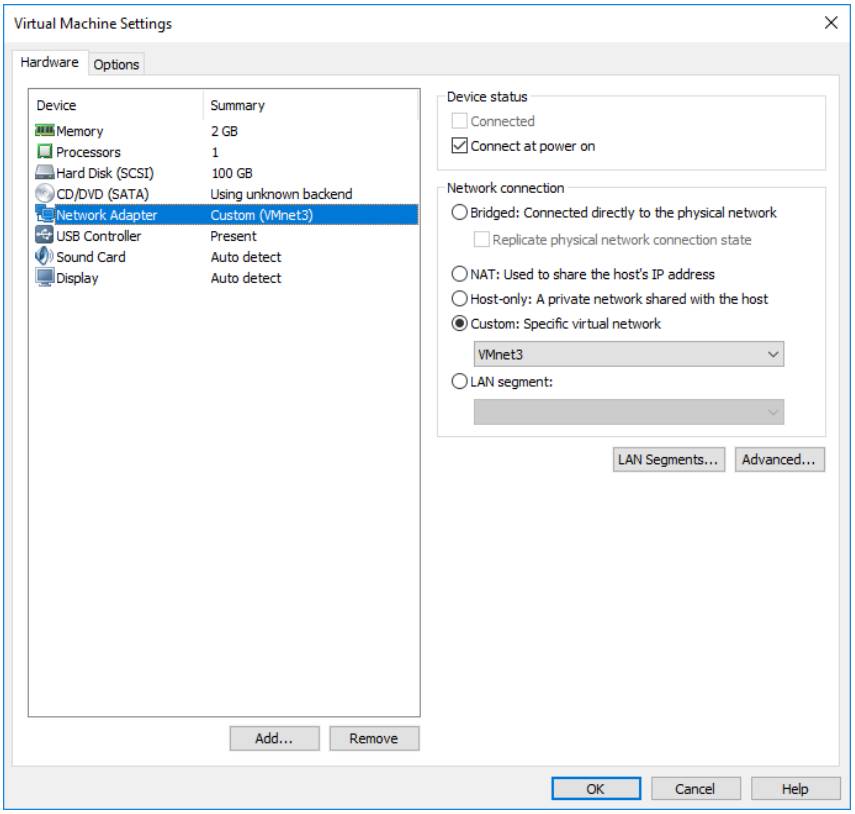




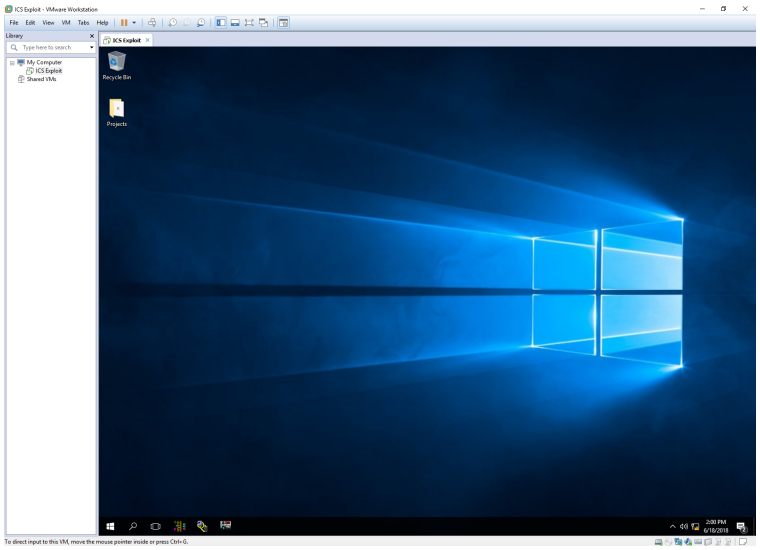
8. Select the network you added (**VMnet3** in this example)**,** set it to **Bridged** mode, and select the interface the PLC is connected to.



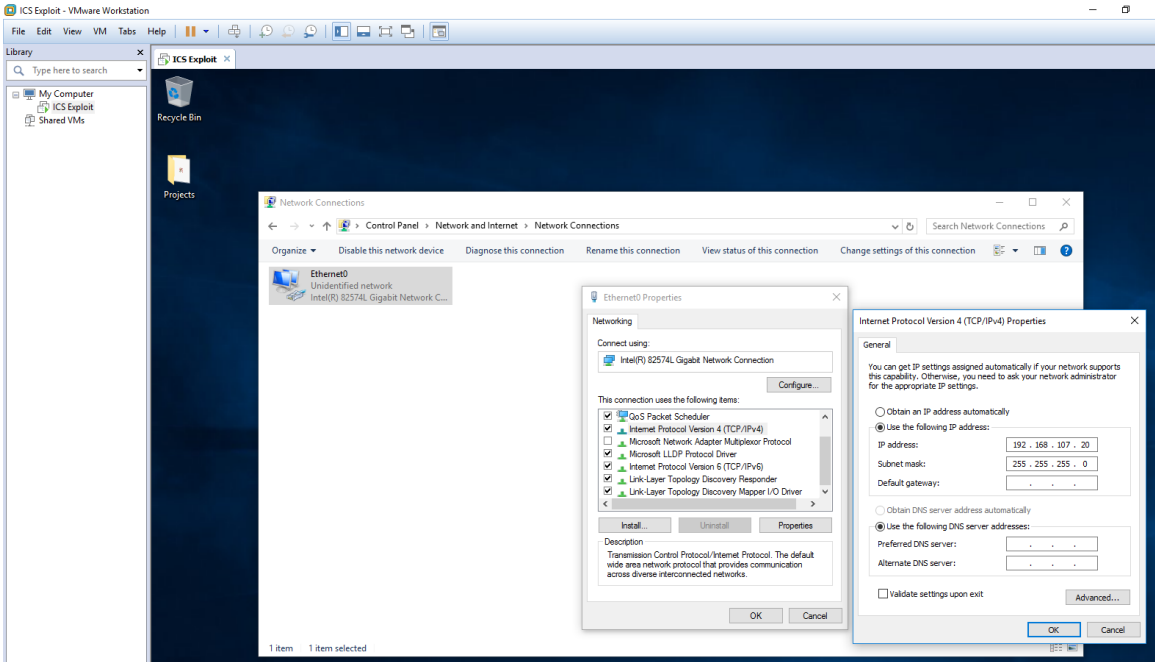
9. Select the ICS Exploit VM and click **Edit virtual machine settings**.
10. Under **Netork Adapter,** select **Custom** and select the network you created earlier (**VMnet3** in this example).



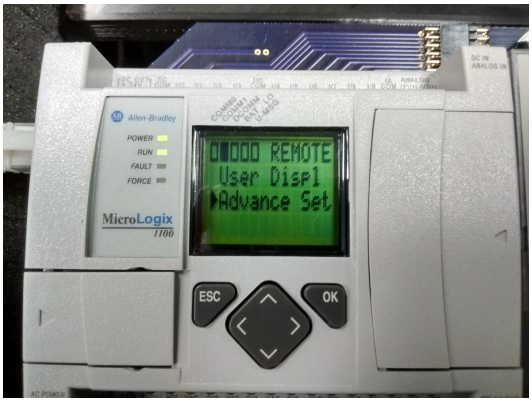
11. Start the VM



12. In the VM, check the IP address and, if necessary, set it to a non-conflicting IP in the **192.168.107.*** subnet. E.g., **192.168.107.42**.

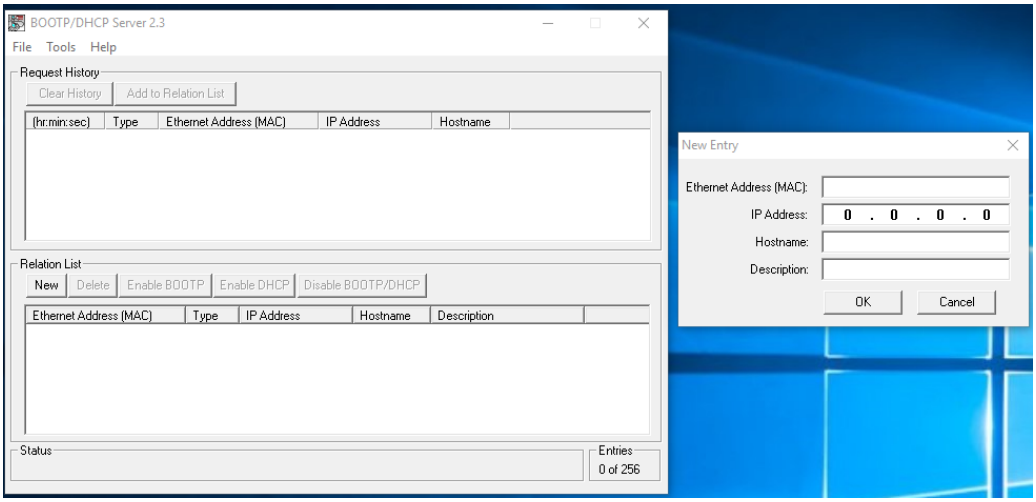


13. Find your PLC's current IP address.

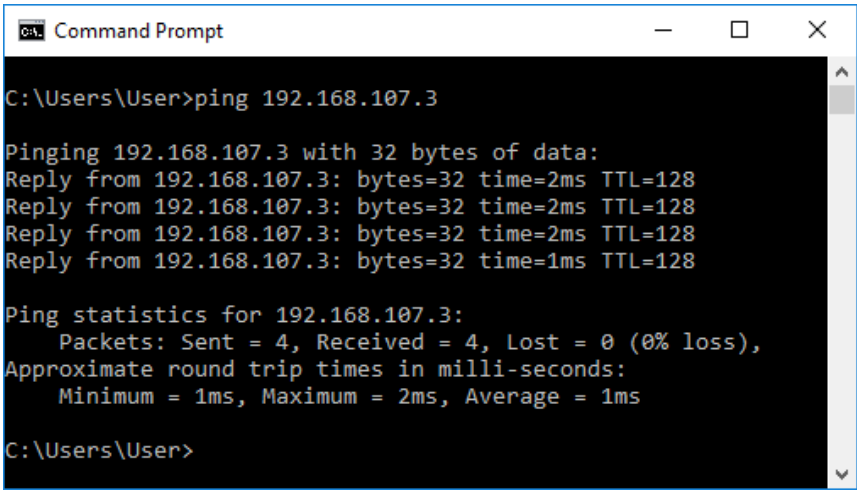


14. If your PLC does not have an IP address assigned, create a new relation in the BOOTP/DHCP Server. You can follow this tutorial for additional details: https://www.youtube.com/watch?v=ErdkGziBkmA

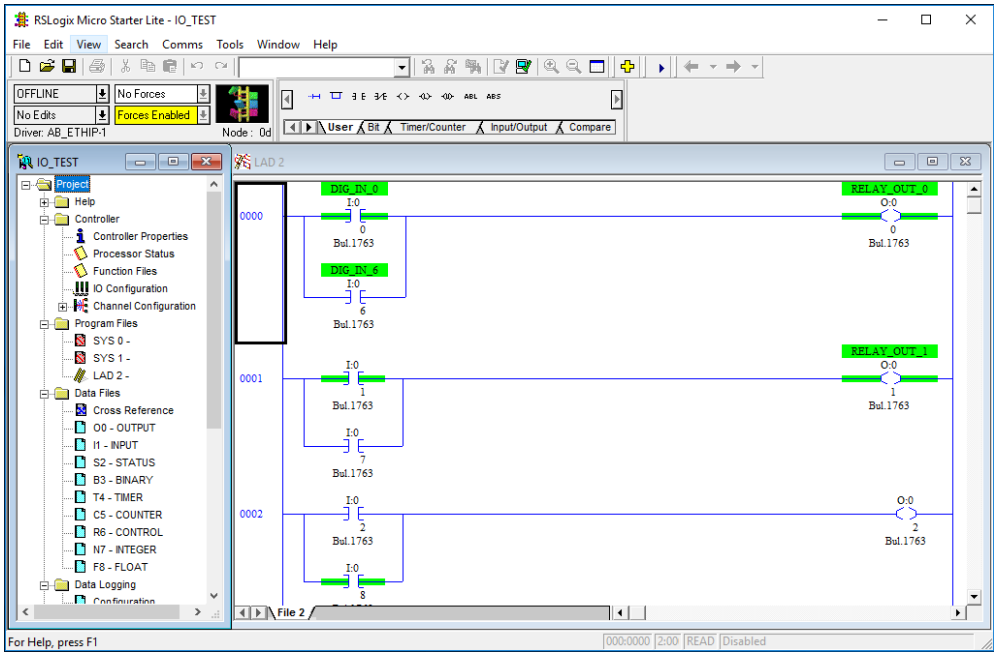
    We recommend using **192.168.107.3** for the IP address. This IP was used for development and will allow you to skip a few steps during the lab.



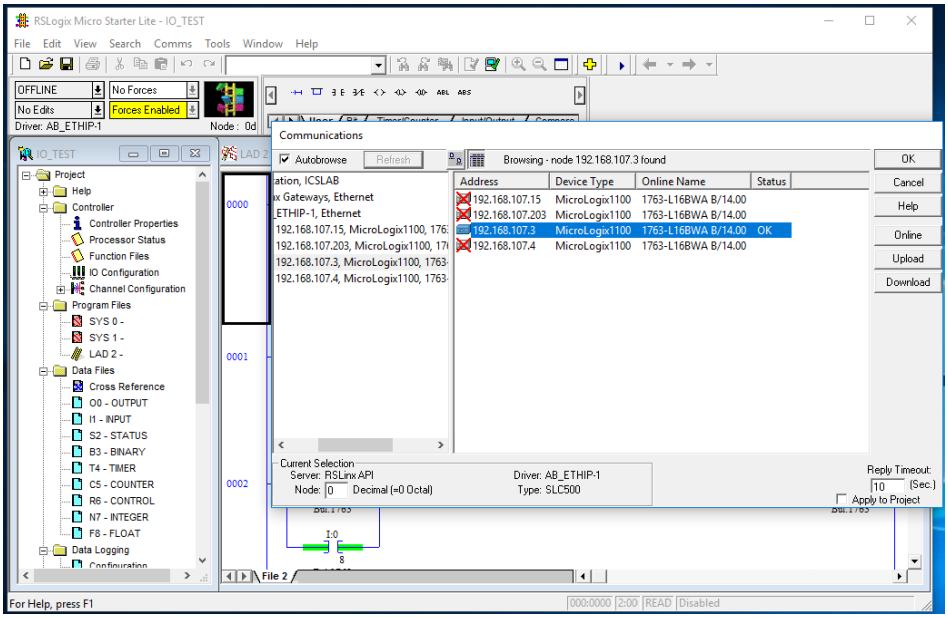
15. Use **ping** to verify connectivity with the PLC.



16. Start RSLogix Micro and open **Desktop\Projects\IO_Test**.



17. Open the **Comms >> System Comms** menu**.**
18. Select the IP of your PLC.
19. **Download** the program, clicking through the numerous, pointless and annoying pop ups.
    Note: In this program, “download” means write the program to the PLC. This naming scheme is backwards and annoying.



20. Run the **IO_Test** application on the **Raspberry Pi**. This application is used to test the inputs and outputs of the PLC. The IO_Test ladder logic program copies the state of the Digital Inputs to the Relay Outputs. It also copies the voltage from the Analog Inputs to the Analog Outputs. Use this to verify that all IO is working.

    Note: the labels in this application match the addressing scheme used by RSLogix Micro. Pay close attention to the difference between '/' and '.' for inputs. I:0.4 is analog input 1 (IV1). I:0/4 is digital input 4.

21. While in **Online** mode with the PLC, compare the ladder logic interface to the Touchscreen to gain an understanding of the logic and hardware. Additionally you can check the status of the digital inputs and outputs on the PLC under the IO_STATUS option.