

## Ethernet Driver in RSLinx

This lab is to be run in the PLC lab, using an SLC-5/05 processor. This would not be a lab to run on a student's virtual machine. Ethernet is becoming the primary means of communication for PLCs and other control devices.

Upon completion of this lab, the student should be able to:

1. Determine the MAC address of a computer
2. Determine the IP address of a computer
3. Explain the subnet mask settings.
4. Setup a static IP address on a laptop computer running Windows 7
5. Configure Channel 1 (Ethernet port) on an SLC-5/05 processor
6. Setup an Ethernet driver in RSLinx.
7. Ping a PLC processor to determine communication via Ethernet
8. Go Online to an SLC-5/05 via Ethernet

A **MAC address** is a hardware address for any device that connects to the internet. A cell phone has a MAC address. An iPad has a MAC address. A computer will have multiple ways to connect to the internet, so it will have multiple MAC addresses (wireless card and an Ethernet card). An example of a MAC address is as follows: **79:A4:29:FA:3C:91**.

A MAC address consists of six sets of double digits (Hexidecimal numbering system), separated by a colon. No two devices can have the same MAC address. This is set when the device is built.

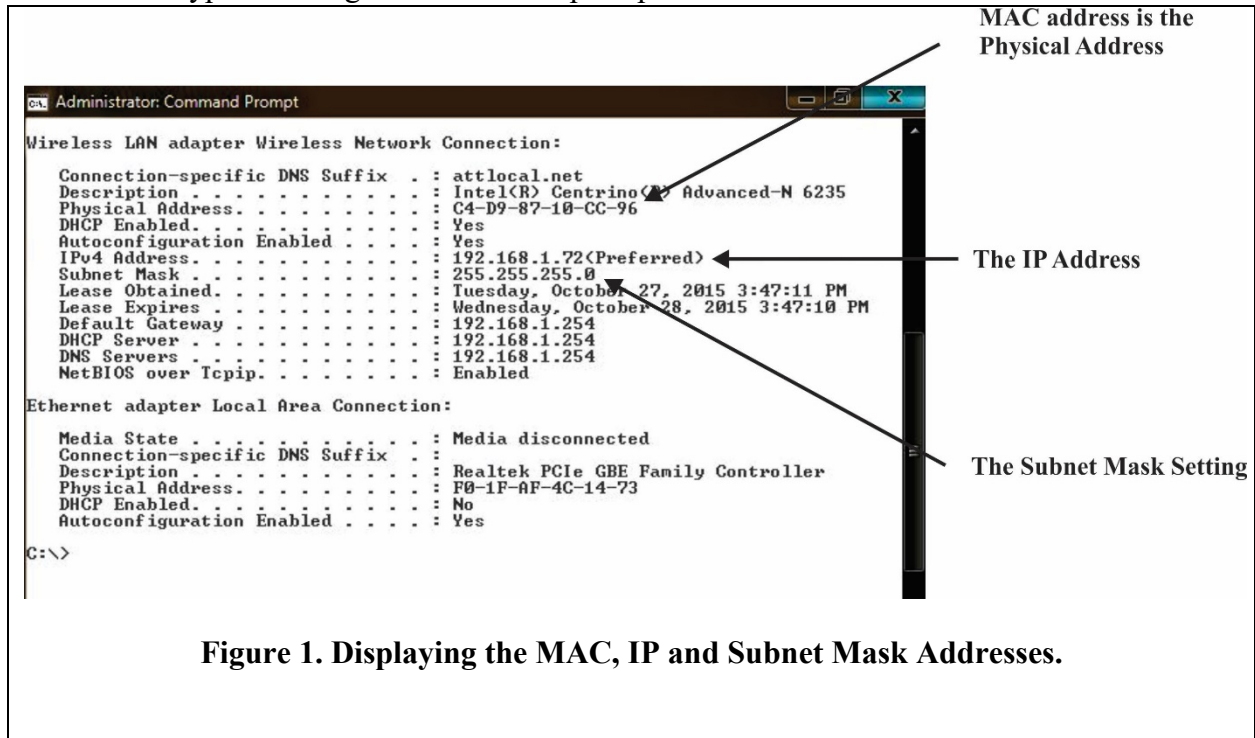
An **IP (Internet Protocol)** address is an address required to connect to the internet, or to another device via ethernet. A sample IP address is **192.148.101.24**. The IP address can be static, which is set to specific IP address (allocated to the user from the IT department), or it is dynamic, which means it is issued via a DHCP (Dynamic Host Communication Protocol) server located in the IP department. When a user plugs in an Ethernet cable to laptop, an IP address is issued to the wired Ethernet card. When a user connects to the wireless NSCC network with a smart phone, an IP address is issued from a DHCP server via a wireless access point in the building. Usually laptops that are used for PLC communications in a plant will have a static IP address for the hardwired Ethernet port, and a dynamic IP address for the wireless card so they can get on the internet.

A **Subnet mask** is a 32-bit number that masks an IP address, and divides the IP address into network address and host address. Subnet Mask is made by setting network bits to all "1"s and setting host bits to all "0"s. For the purpose of this lab, the subnet mask value will be "255.255.255.0". Future labs will further explain the subnet mask.

The way to determine these settings is to go to the “Command Prompt” (which uses the DOS commands). On a Windows 7 machine, go to the Windows menu, choose Accessories, and then choose Command Prompt.

## At the C:> prompt, type IPCONFIG, then space, and /ALL and press Enter

An example of the settings on a Wireless LAN card on a laptop is shown in the following illustration. Type IPConfig /All at the C:/> prompt.



**Figure 1. Displaying the MAC, IP and Subnet Mask Addresses.**

The computers in the PLC lab on the Archbold campus has two hardwired network cards. The blue Ethernet cable is the network card that receives an IP address from a DHCP server. This is the network that allows the students to get on the internet.

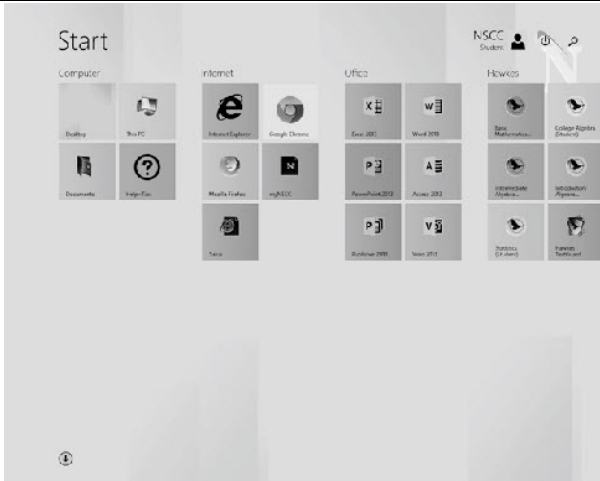
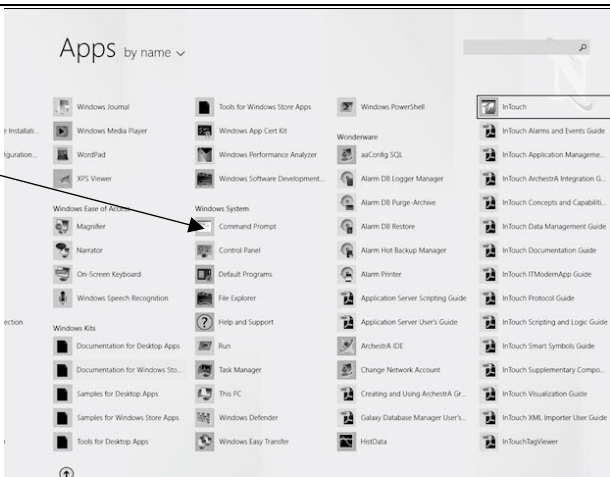

The other network adapter has a black cable connected to it. This is the PLC network. The IP address for this adapter is set by the IT department, and cannot be changed by the student.

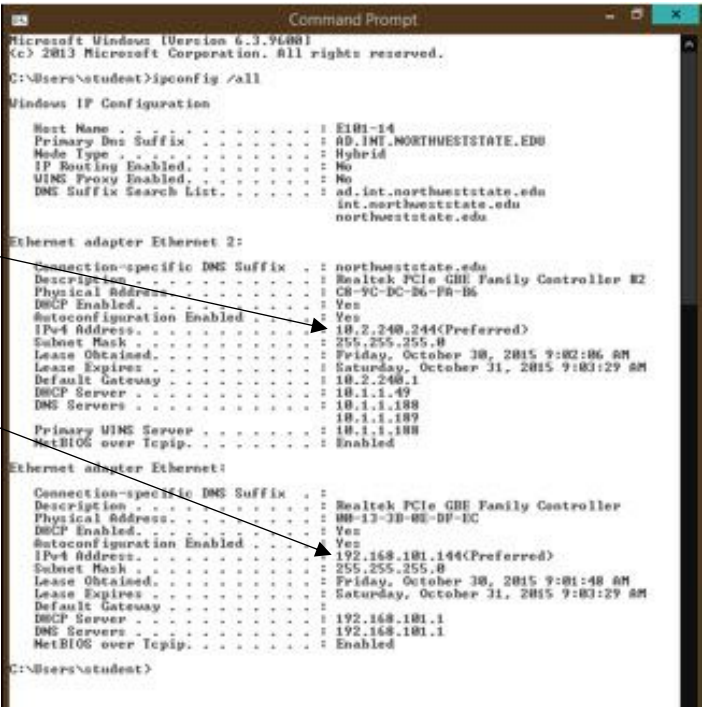
The next step is to set a static IP address for the laptop computer you will be using. Realize that if you are working in the PLC Lab, the IP addresses for the PLC network is set by the Information Technology department, and cannot be changed by the student.

Here are the steps to setup a static IP address on a laptop:

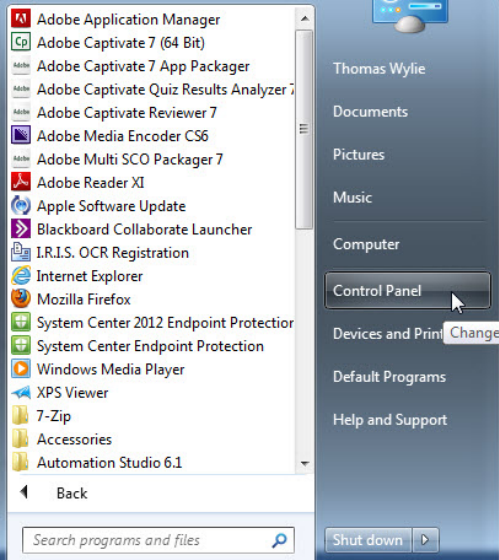
The computers in the PLC Lab on main campus also has Windows 8 installed. Use the following steps to get to the Command Prompt on a Windows 8 machine.

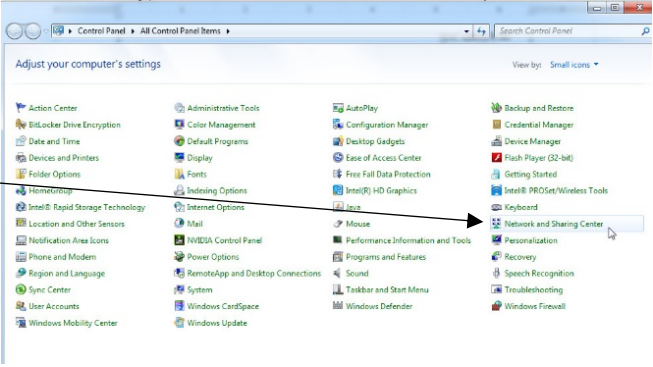
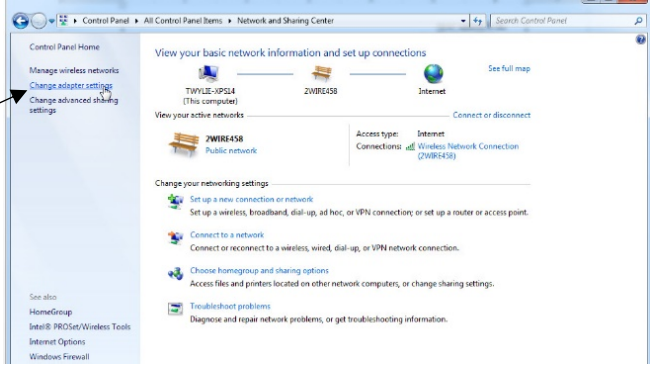

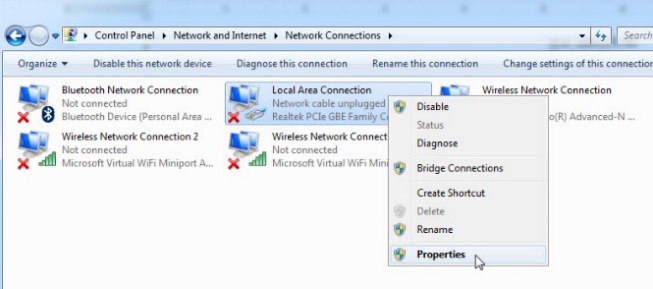
### Getting to the Command Prompt in Windows 8

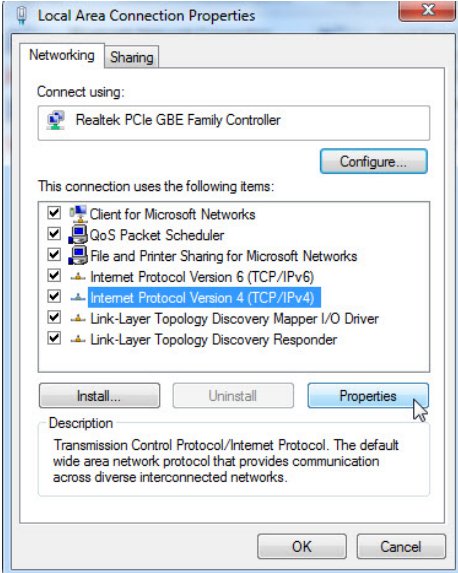
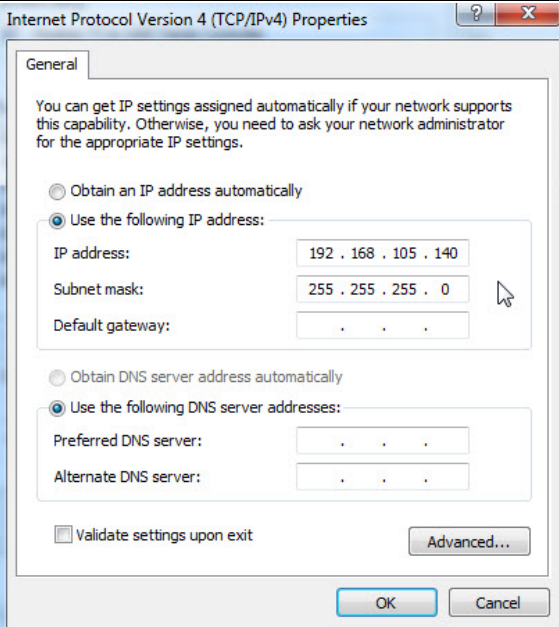
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| <p>1 When Windows 8 desktop comes up, click on the circle with the Down Arrow, which will take the user to the Apps page.</p>  |    |
| <p>2 The Apps are listed. The user can right arrow until they get to the Windows System, and choose the Command Prompt icon.</p>   |   |
| <p>3 The user could also type Command Prompt in the search window located in the upper right hand side of the page.</p> <p>The Apps will appear by name as the user types in the name.</p> |  |

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| <p>4</p> | <p>At the C:\&gt; prompt type:</p> <p>IPCONFIG /All</p> <p>And press the Enter key.</p> <p>The 10.2.240.244 IP address was obtained from a DHCP server.</p> <p>The 192.168.101.144 IP address is a static IP addressed configured by the IT department.</p> |  <pre> Microsoft Windows [Version 6.3.9600] (c) 2013 Microsoft Corporation. All rights reserved.  C:\Users\student&gt;ipconfig /all  Windows IP Configuration  Host Name . . . . . : E101-14 Primary Dns Suffix . . . . . : AD.INT.NORTHWESTSTATE.EDU Mode Type . . . . . : Hybrid IP Routing Enabled. . . . . : No WINS Proxy Enabled. . . . . : No DNS Suffix Search List. . . . . : ad.int.northweststate.edu int.northweststate.edu northweststate.edu  Ethernet adapter Ethernet 2:  Connection-specific DNS Suffix . : northweststate.edu Description . . . . . : Realtek PCIe GBE Family Controller #2 Physical Address. . . . . : C8-9C-DC-36-FA-B6 DHCP Enabled. . . . . : Yes Autoconfiguration Enabled . . . . : Yes IPv4 Address. . . . . : 10.2.240.244(Preferred) Subnet Mask . . . . . : 255.255.255.0 Lease Obtained. . . . . : Friday, October 30, 2015 9:02:06 AM Lease Expires . . . . . : Saturday, October 31, 2015 9:03:29 AM Default Gateway . . . . . : 10.2.240.1 DHCP Server . . . . . : 10.1.1.188 DNS Servers . . . . . : 10.1.1.189 Primary WINS Server . . . . . : 10.1.1.188 NetBIOS over Tcpip. . . . . : Enabled  Ethernet adapter Ethernet:  Connection-specific DNS Suffix . : Description . . . . . : Realtek PCIe GBE Family Controller Physical Address. . . . . : 88-13-3B-0E-0F-1C DHCP Enabled. . . . . : Yes Autoconfiguration Enabled . . . . : Yes IPv4 Address. . . . . : 192.168.101.144(Preferred) Subnet Mask . . . . . : 255.255.255.0 Lease Obtained. . . . . : Friday, October 30, 2015 9:01:48 AM Lease Expires . . . . . : Saturday, October 31, 2015 9:03:29 AM Default Gateway . . . . . : DHCP Server . . . . . : 192.168.101.1 DNS Servers . . . . . : 192.168.101.1 NetBIOS over Tcpip. . . . . : Enabled  C:\Users\student&gt; </pre> |
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### Setting the static computer IP address in Windows 7

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| <p>1</p> | <p>Click on the Windows menu in the lower left of the Windows 7 screen, then choose Control Panel.</p> |  |
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| <p>2 Control panel objects will be listed.</p> <p>Double click on the Network and Sharing Center option.</p>               |    |
| <p>3 The network adapters will be listed.</p> <p>Click on the “Change adapter settings” option.</p>                        |    |
| <p>4 The network adapters will be listed.</p>  |  |
| <p>5 Right click on the Local Area Connection and choose Properties.</p> <p>This is the Ethernet Port on the computer.</p> |  |

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| <p>6</p> | <p>The user should choose the Internet Protocol Version 4 (TCP/IPv4).</p> <p>Then click on the Properties button.</p>   |   |
| <p>7</p> | <p>As you can see, the “Use the following IP address” radio button option is shown.</p> <p>This means that the IP address was entered by a user and is 192.168.105.140.</p> <p>The subnet mask is 255.255.255.0</p> <p><i>If the “Obtain an IP address automatically” radio button was chosen, the IP address would have to be obtained from a DHCP server.</i></p> |  |

So for this lab, the user will be setting up the laptop computer to have the following settings:

IP address: 192.168.101.140

Subnet mask: 255.255.255.0

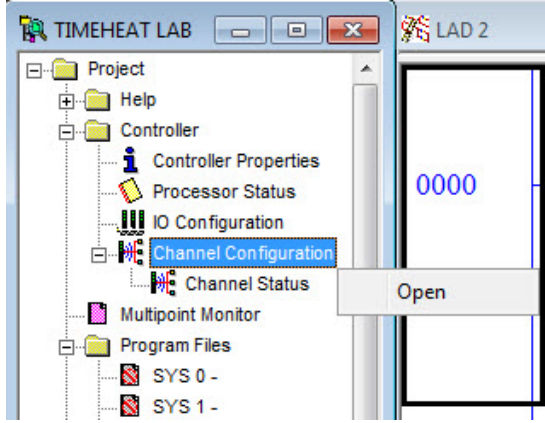
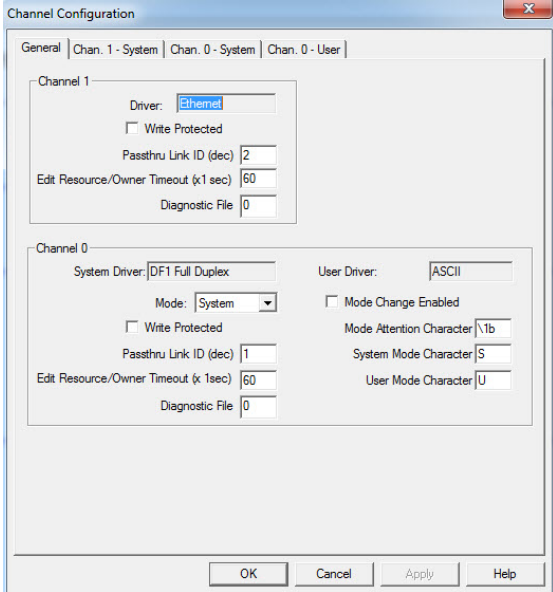
The user will setup the Ethernet port on the SLC-5/05 processor to the following settings:

IP address: 192.168.101.150

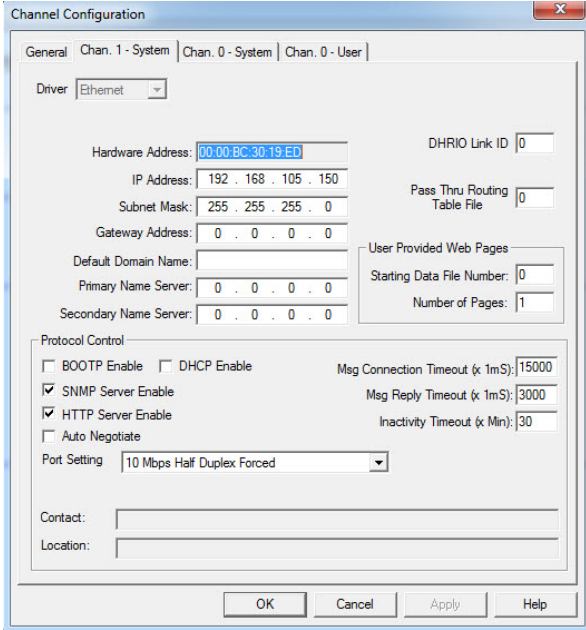
Subnet mask: 255.255.255.0

These settings will have to be done Offline, saved, and downloaded through the serial port.

**Configuring Channel 1 (Ethernet port) on an SLC-5/05 processor while Offline**

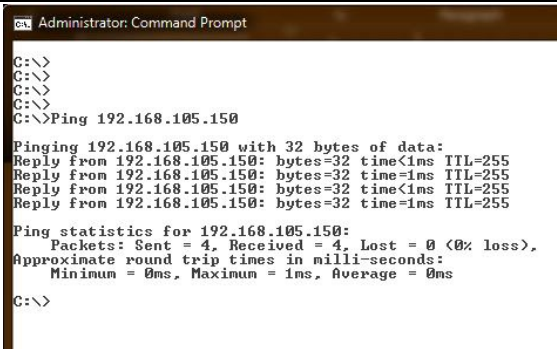
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| <p>1 Right click on Channel Configuration, then choose Open to open up the channel menu.</p>   |  <p>The screenshot shows a software window titled 'TIMEHEAT LAB' with a tree view on the left. The tree view includes folders for 'Project', 'Help', 'Controller', 'Multipoint Monitor', and 'Program Files'. Under 'Controller', there are items for 'Controller Properties', 'Processor Status', 'IO Configuration', 'Channel Configuration' (highlighted in blue), and 'Channel Status'. A right-click context menu is open over 'Channel Configuration', showing an 'Open' option.</p>   |
| <p>2 The General tab will be displayed for the overall configuration.</p> <p>Channel 1 – System is the Ethernet port.</p> <p>Chan. 0 – System is the RS-232 port for communication with a program panel.</p> <p>Chan. 0 – User is the RS-232 port configuration if a peripheral device is connected such as a bar code printer, HMI, or set of scales with a serial interface.</p> |  <p>The screenshot shows the 'Channel Configuration' dialog box with the 'General' tab selected. It has three sub-tabs: 'Chan. 1 - System', 'Chan. 0 - System', and 'Chan. 0 - User'.<br/>         Under 'Channel 1':<br/>         - Driver: Ethernet<br/>         - Write Protected: unchecked<br/>         - Passthru Link ID (dec): 2<br/>         - Edit Resource/Owner Timeout (k 1sec): 60<br/>         - Diagnostic File: 0<br/>         Under 'Channel 0':<br/>         - System Driver: DF1 Full Duplex<br/>         - Mode: System (dropdown)<br/>         - Write Protected: unchecked<br/>         - Passthru Link ID (dec): 1<br/>         - Edit Resource/Owner Timeout (k 1sec): 60<br/>         - Diagnostic File: 0<br/>         - User Driver: ASCII<br/>         - Mode Change Enabled: unchecked<br/>         - Mode Attention Character: \b<br/>         - System Mode Character: S<br/>         - User Mode Character: U<br/>         Buttons at the bottom: OK, Cancel, Apply, Help.</p> |



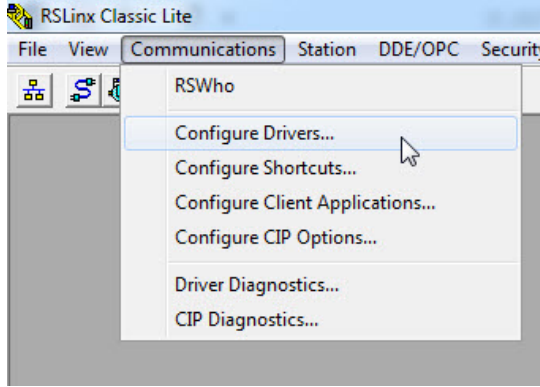
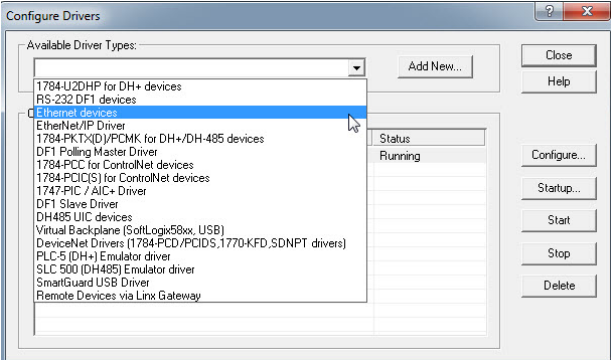
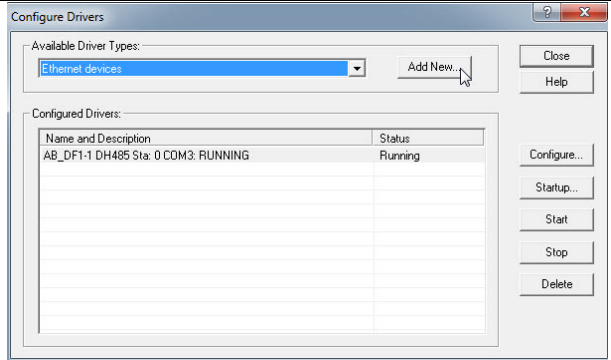
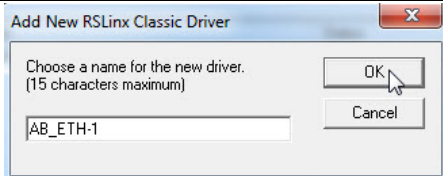
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| <p>3</p> | <p>The hardware address is set.<br/>The user will type in the IP address and subnet mask settings as shown in this graphic.</p> <p>Make sure BOOTP Enable and the DHCP Enable options are not checked.</p> <p>Click the OK button.</p> |  |
| <p>4</p> | <p>Save the program and download it through the serial port (Channel 0).</p>   |  |

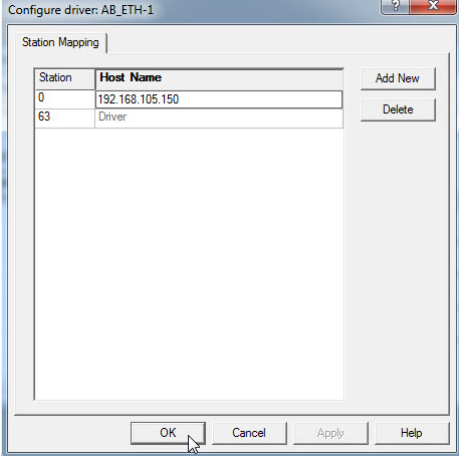
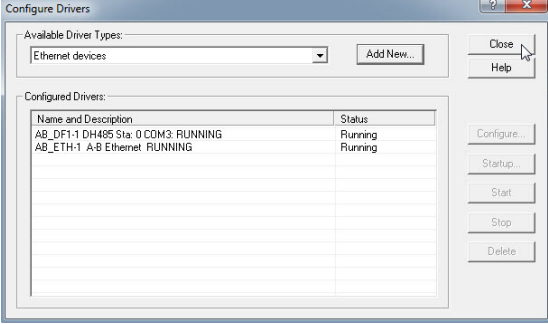
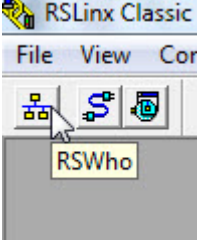
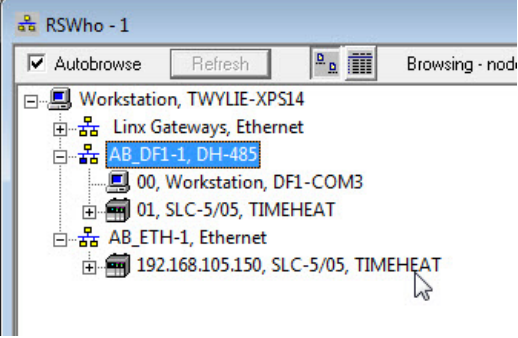
To make sure that a laptop or desktop can communicate with an SLC-5/05 processor, the user should ping the processor. To do this the user must go to a command prompt, and use the network command of ping. If there is no reply (timeout), there can be no communication. The computer will send out 4 communication poll requests. Either there is a reply, or a failure.

**Setting up an Ethernet Driver:**

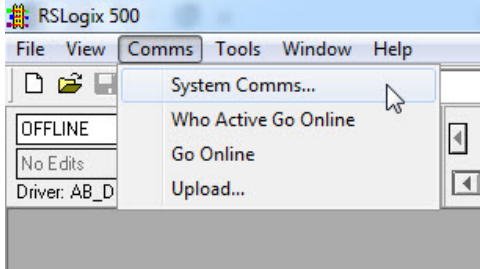
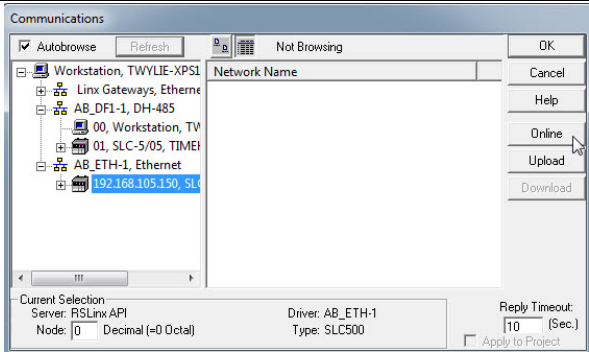
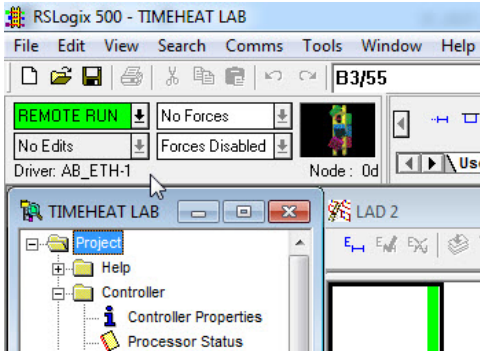
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| <p>1</p> | <p>To make sure the laptop can communicate via Ethernet to the processor, the user should bring up a command prompt, then type:<br/>Ping 192.168.105.150 and Enter</p> <p>Notice the reply back from the processor is less than 1 milli-second.</p> |  |
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| <p>2 Execute RSLinx</p> <p>Choose the Communications pull down menu.</p> <p>Choose Configure Drivers.</p> |    |
| <p>2 Choose the Ethernet devices driver.</p>  |    |
| <p>3 Click the Add New... button.</p>   |  |
| <p>4 The default name for the driver is given.<br/>This name can be changed as well.</p>                  |  |

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| <p>5 Type in the IP address that Channel 1 on the SLC-5/05 is set for.<br/>192.168.101.150</p> <p>Click the OK button.</p>                   |     |
| <p>6 Click the Close button to close out of Configure Drivers.</p>   |    |
| <p>7 Click on the RSWho icon on the toolbar to show the drivers.</p>   |  |
| <p>8 Now the user will see two drivers:<br/>AB_DF1-1 which is the RS-232 driver</p> <p>And</p> <p>AB_ETH-1 which is the Ethernet driver.</p> |   |

**Going Online to the Processor through the Ethernet Driver:**

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| <p>1</p> | <p>Open RSLogix500</p> <p>Choose Comms pull down menu</p> <p>Choose System Comms...</p>   |   |
| <p>2</p> | <p>RSLink is activated showing the drivers.</p> <p>Open the AB_ETH-1 and put the focus on the processor and IP address.</p> <p>Click Online</p> |   |
| <p>3</p> | <p>The user will go online to the processor.</p> <p>Notice the Driver name.</p> <p>Notice how fast the ladder is spinning.</p>                  |  |

**Questions:**

1. What is a MAC address on a computer, ipad or smartphone?
2. What is an IP address on a computer, ipad or smartphone?
3. What does the term Ethernet mean?
4. Which of the following is a MAC address:
  - a. 168.192.101.15
  - b. 77:A5:20:FC:26:92
5. Which of the following is IP address:
  - a. 168.192.101.15
  - b. 77:A5:20:FC:26:92
6. What is the range of numbers for the Hexi-decimal numbering system?
7. How does the user find the IP address issued to a computer?
8. What does it mean to have a static IP address?
9. What is the purpose of the “Ping” command at the DOS prompt?
10. T F For a standard RSLinx Ethernet driver, a user must type in the IP address in the driver of the processor they wish to communicate with.

### DOL DISCLAIMER:

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