Tolomatic
EXCELLENCE IN MOTION

Technical Note

Monitoring Ethernet Traffic with Tolomatic ACS & Managed Switch

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1. Introduction

This procedure will show how to connect to a managed network switch using port mirroring to monitor the Ethernet/IP transactions between a PLC controller device and the Tolomatic's Ethernet/IP enabled ACS drive. This may be used to help troubleshoot undesirable behaviors, or check the health of the network.

NOTE: Your PC Network Protection Firewall must be DISABLED for proper operation.

2. Equipment

- Tolomatic ACS Drive with Ethernet/IP
- PLC with Ethernet/IP (Allen Bradley ControlLogix L3X)
- N-TRON 708TX Switch
- Windows PC (64-BIT Windows 7)
- Ethernet cable
- (Optional) 2nd PC (64-BIT Windows 7)

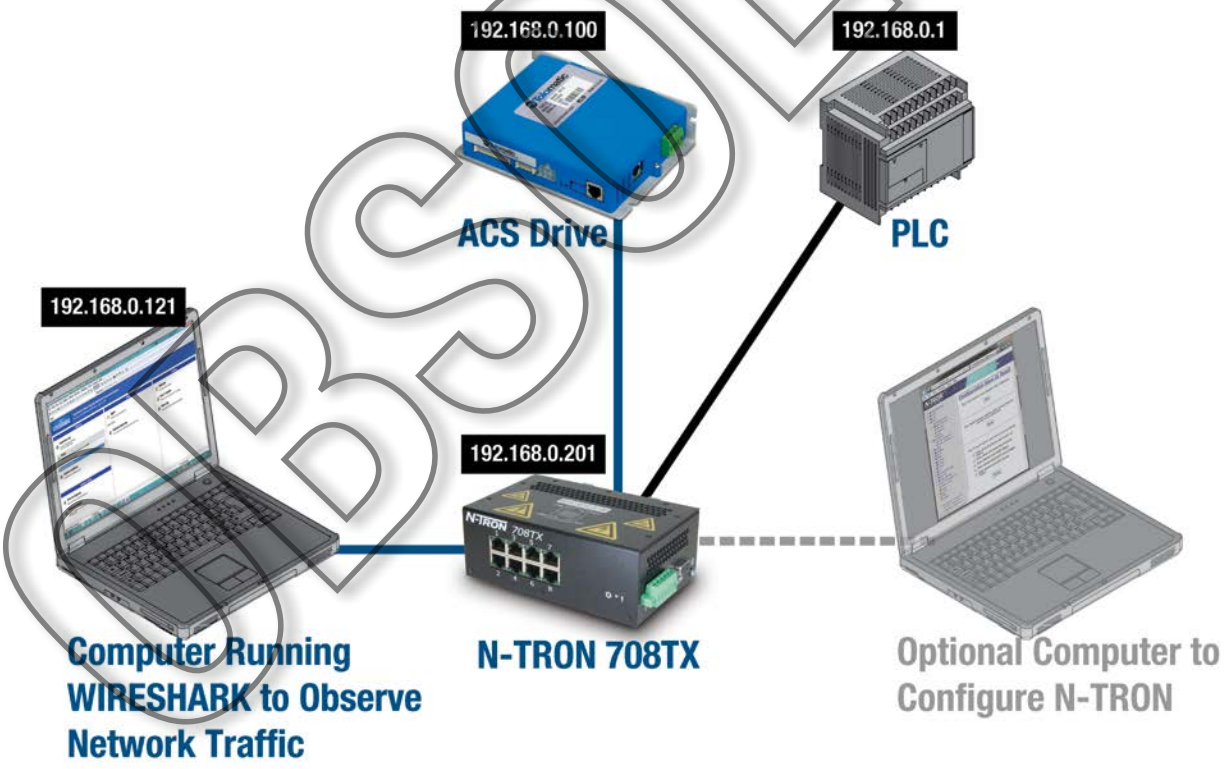

Figure 1: System Overview, make connections as shown in diagram above

3. Software

- WIRESHARK Network Protocol Analyzer (V1.10.0)
- Web Browser (Internet Explorer 9)
- PLC software (RSLogix 5000)

4. Definitions

PORT MIRRORING – A mirroring port is a specific port on a managed switch that is setup to receive copies of Ethernet frames from any other port or combination of ports.

5. Procedure

First, connect the PC to the switch with the Ethernet cable. It is recommended to disable any other network connections such as wireless connections.

6. Change IP Address

Next, change IP Address of the PC to be on the same network as the N-TRON switch. This is done under the Windows Start Menu -> Control Panel, select Network and Sharing Center, select Local Area Connection.

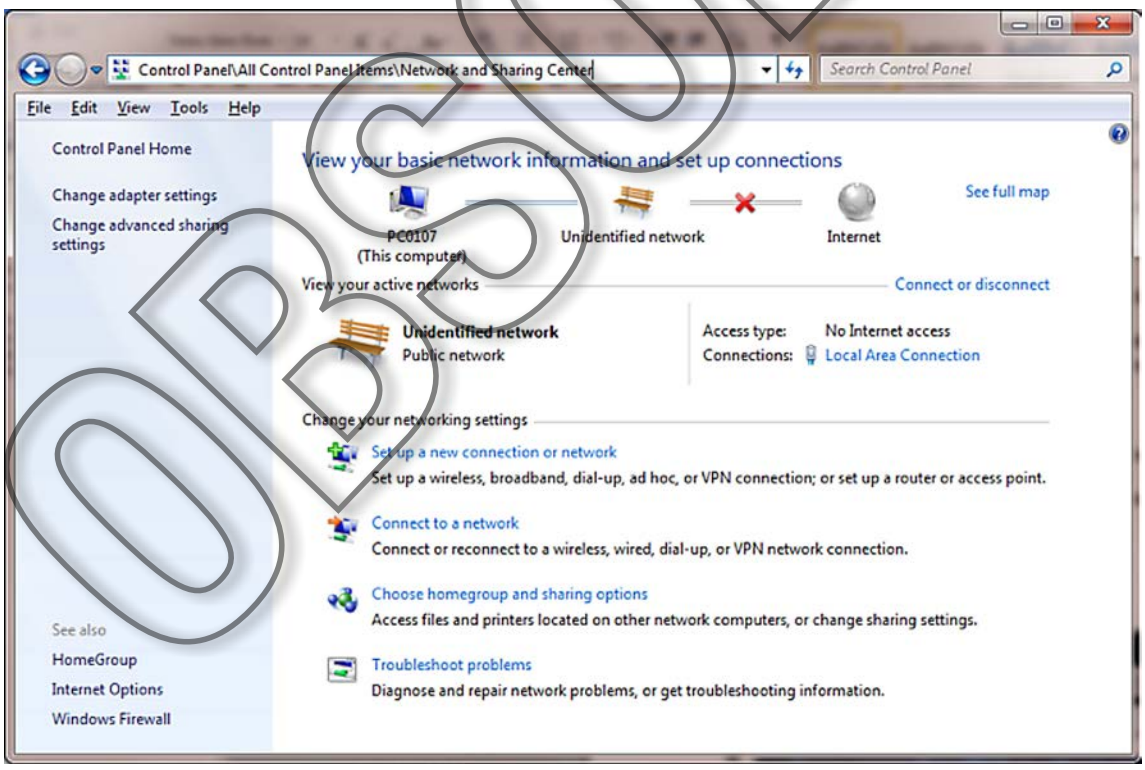

Figure 2: Network and Sharing Center Window

Click Properties to edit connection configuration.

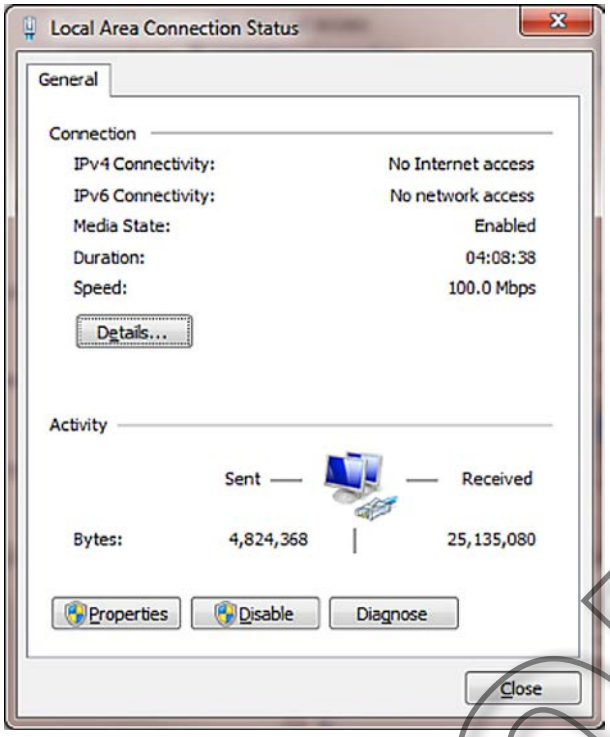

Figure 3: Local Area Connection Status Window

Click Internet Protocol Version 4 (TCP/IPv4) to highlight, then click Properties.

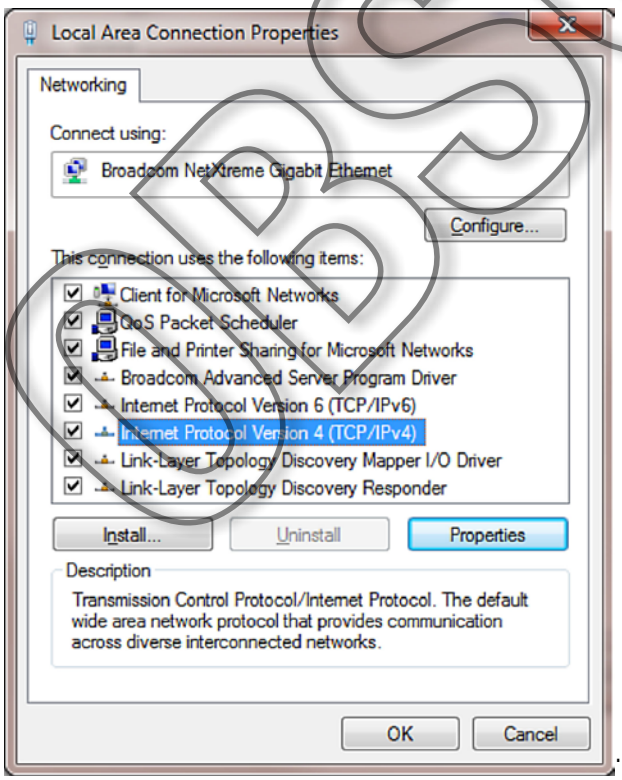

Figure 4: Entering Properties of TCP/IPv4

Select the radio button Use the Following IP Address and enter the IP Address, Subnet mask, and Default gateway so the PC will be on the same network as the switch. See the following example. The last numbers in the PC IP address must be unique numbers on the network.

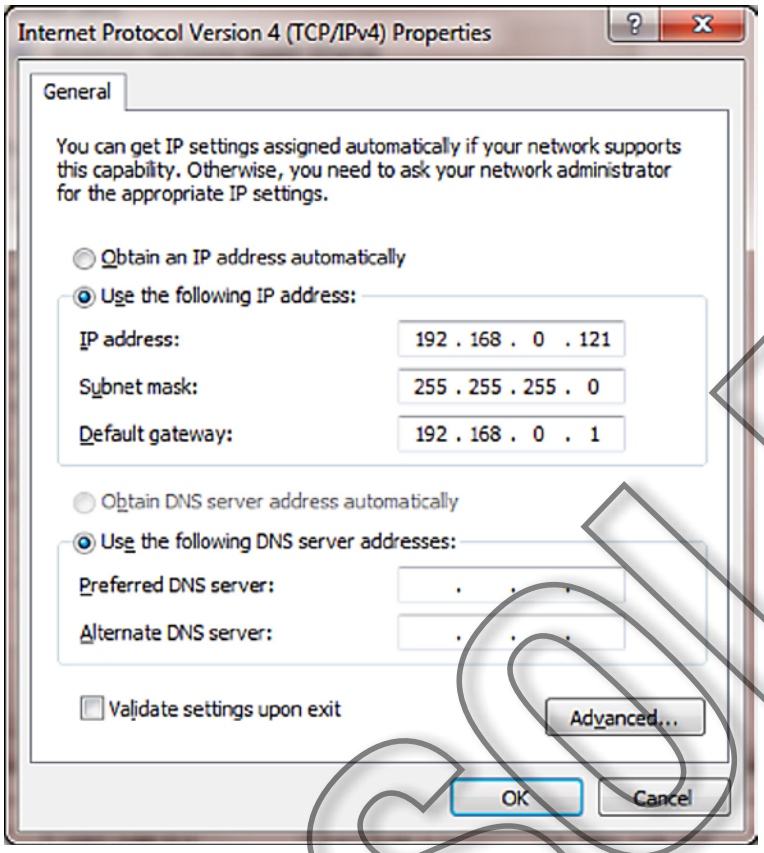

Figure 5: Setting the PC Network IP address

7. Network IP Addresses

Here are the configurations for the network devices used in this example:

	N-TRON switch	PLC	ACS drive	PC
IP address	192.168.0.201	192.168.0.1	192.168.0.100	192.168.0.121
Subnet mask	255.255.255.0	255.255.255.0	255.255.255.0	255.255.255.0
Default gateway	192.168.0.1	192.168.0.1	192.168.0.1	192.168.0.1
N-TRON Port	NA	PORT 8	PORT 1	PORT 7

Note: Some of the screenshots in this example were acquired during the initial configuration of the switch for the network. The switch default IP address was 192.168.1.201 and was later changed to 192.168.0.201 after being configured for this network. For this example it should be assumed that the later address is used.

8. Connecting to the Switch

Now that the PC has the correct IP address for this network, open a web browser to begin connecting to the switch. In the browser's address bar, type http:// plus the IP address of the switch, it should look like this: http://192.168.1.201.

The switch's login page should appear. Enter the correct Username and Password for the switch, the default login here was "admin".

Figure 6: Login screen for the switch

The next screen appears, giving access to all of the switch's configuration settings.

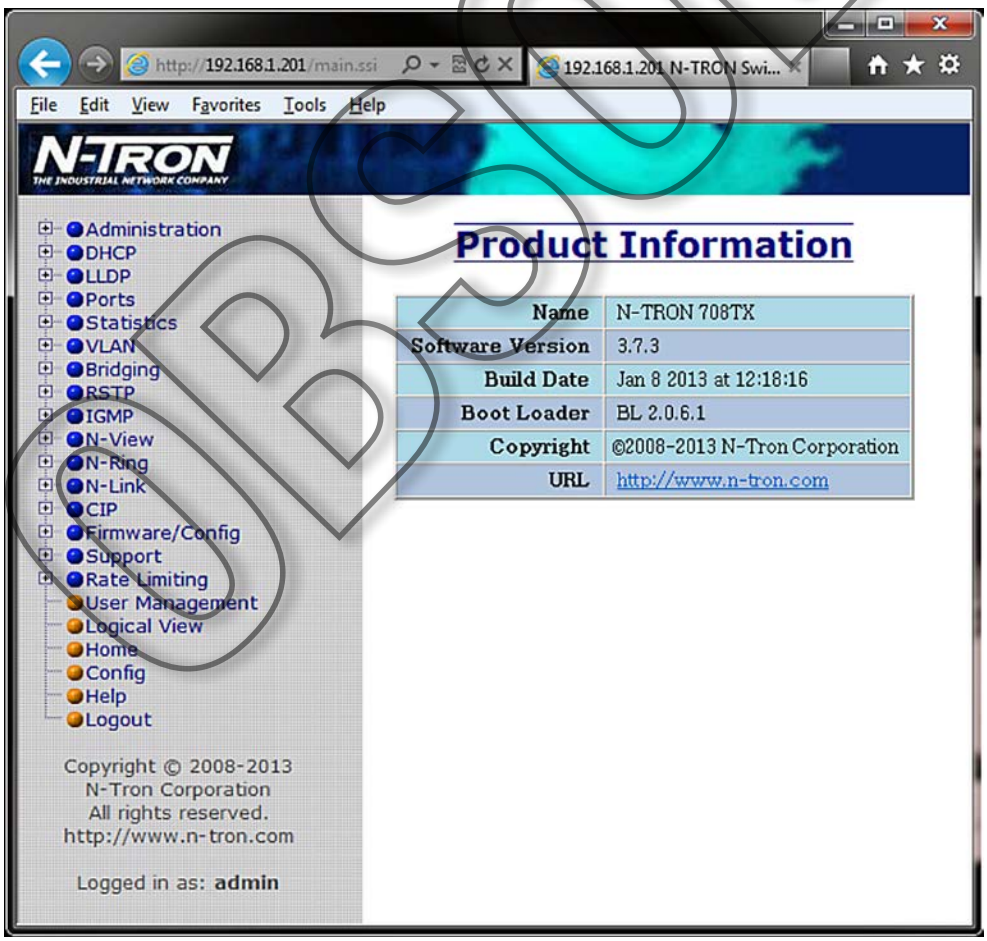

Figure 7: Switch General Configuration Screen

9. Logical View - Port Assignment

The N-TRON server provides a view of the ports that are connected and in use. Click on Logical View and a diagram of the switch appears with ports highlighted in green (Figure 7) to show they are in use. In this example port 1 is the ACS drive, port 5 is the PC connecting to the switch, port 8 is the PLC, and port 7 is a second PC used to read the port mirroring.

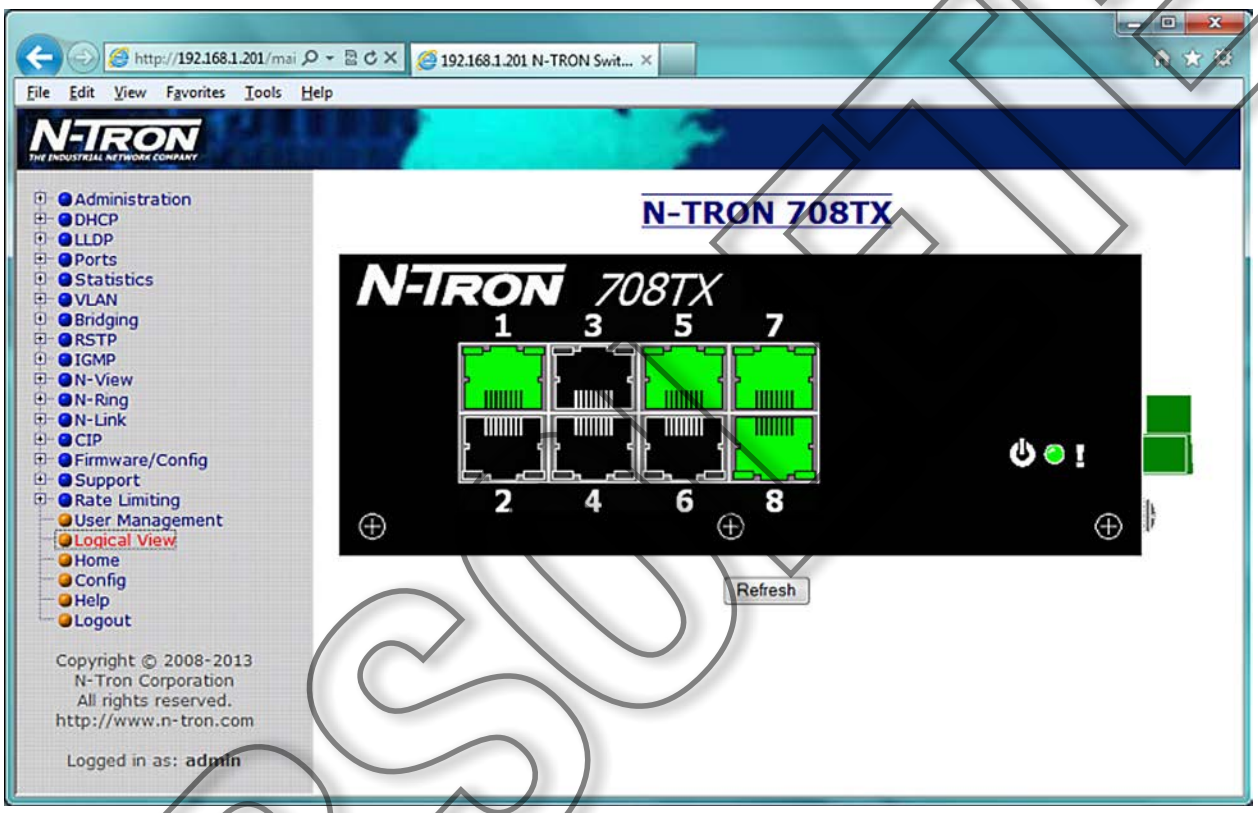

Figure 8: Switch Logical View

10. Enable Port Mirroring

To enable port mirroring, click on Ports -> Mirroring to bring up the port mirroring configuration view. Click Modify to enter a new configuration. Under Source Ports, select all of the ports to be copied to the destination port. In this example port 8 (PLC) RX and TX are selected. Select the desired destination port; this is the port the PC will be plugged into to for mirroring; here port 7 is used. Do not use the same port as the PC is plugged into for the mirroring port, select an open port. Select Enable next to Mirror Status. Click Update to update the settings.

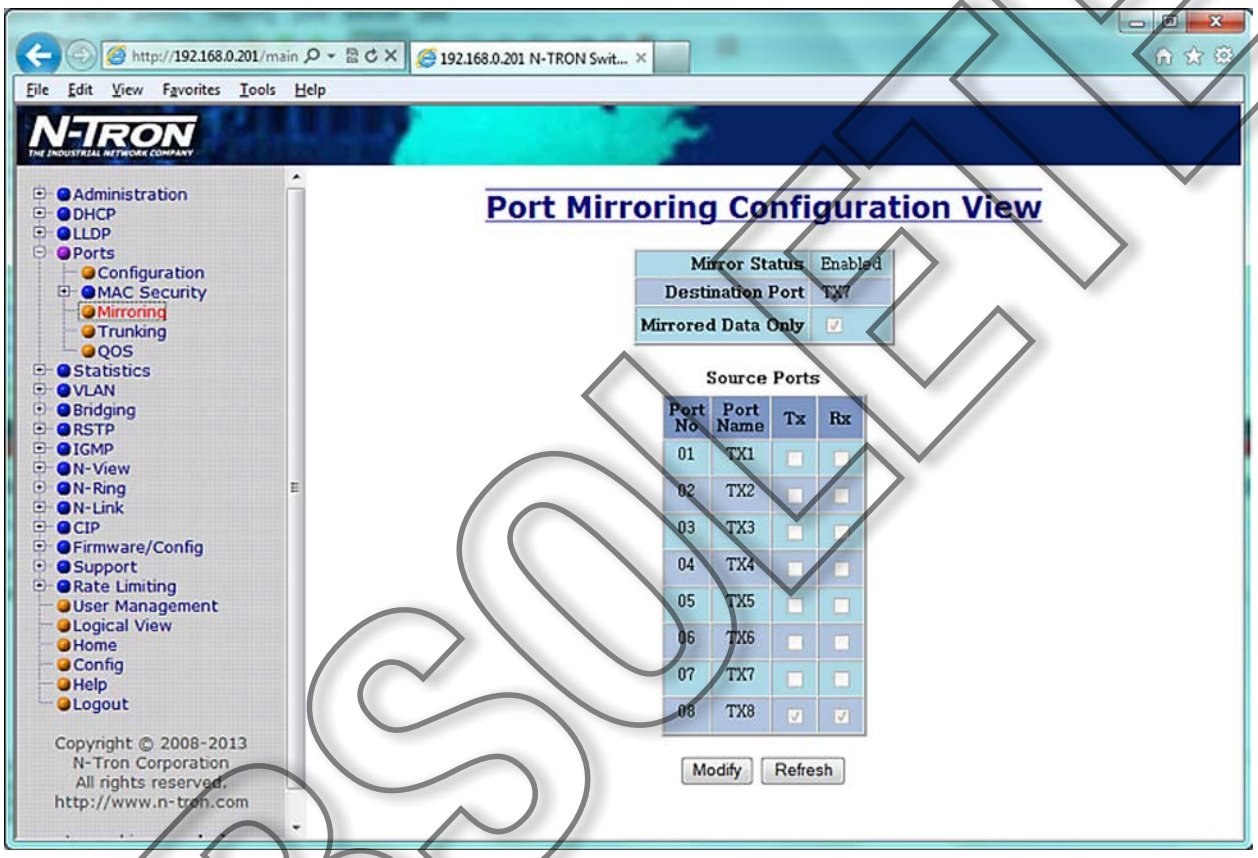

Figure 9: Port Mirroring Configuration View

Save the configuration, click Config on the left, then Save:

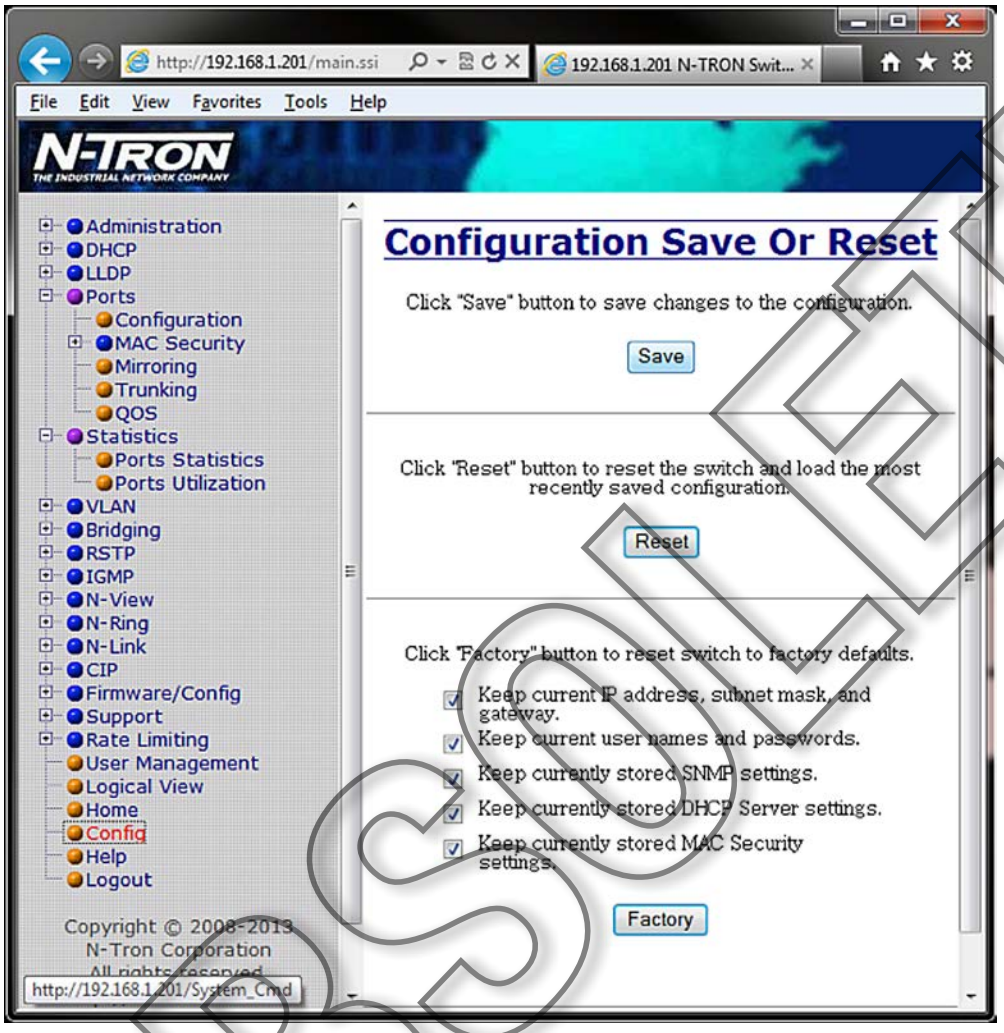

Figure 10: Configuration Save Screen

Next, unplug the PC from the current port location and plug it into the mirroring port.

11. Monitoring with WIRESHARK

NOTE: Your PC Network Protection Firewall must be DISABLED for the correct network to appear in Wireshark.

Open the WIRESHARK program. Select Local Area Connection and click Start.

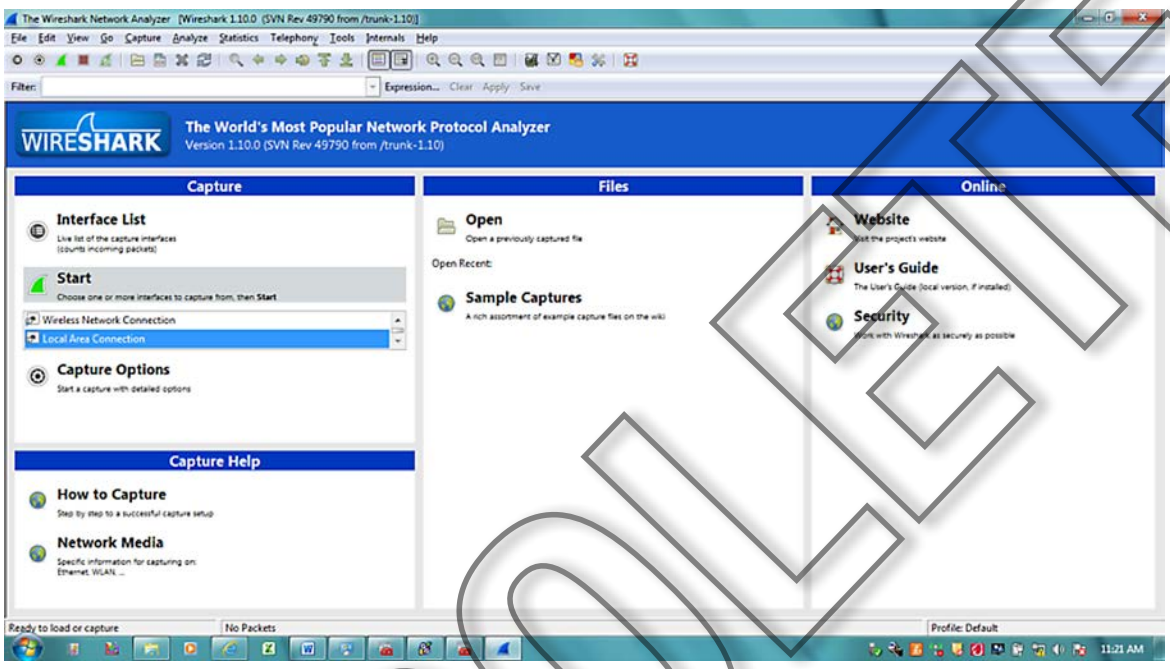

Figure 11: WIRESHARK Startup Screen

Figure 11 shows what the network traffic looks like with these devices running. Both the ACS drive and PLC IP addresses are logged with the transactions. Each line can be expanded to show more details and data to help in troubleshooting the network.

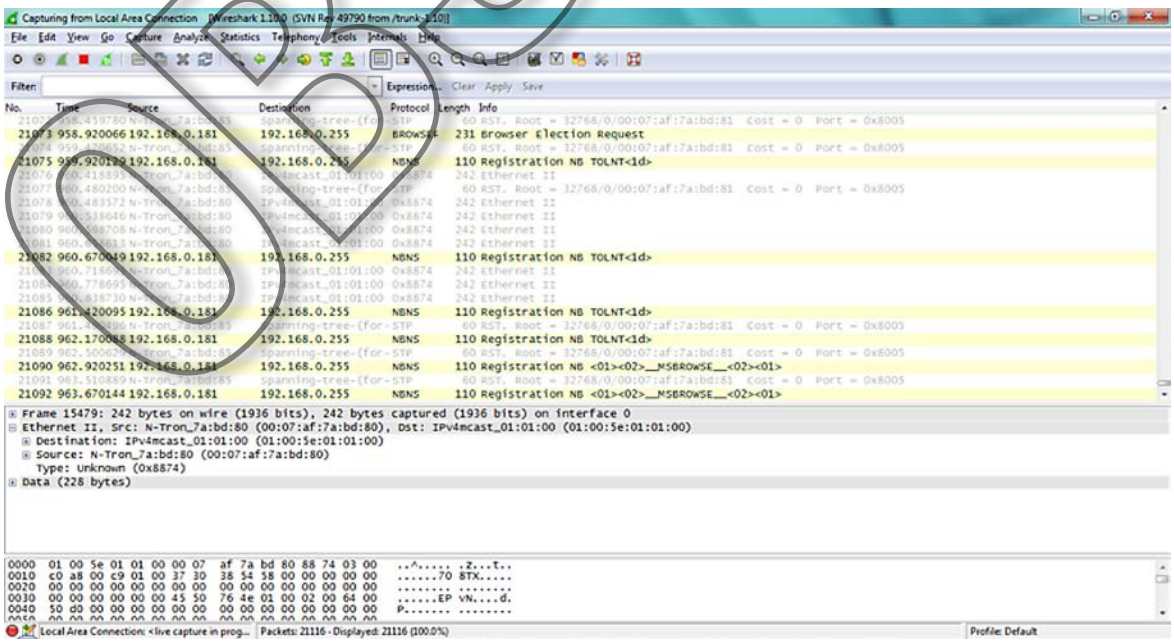

Figure 12: WIRESHARK Network Traffic

For more information about what the logged data means, please refer to WIRESHARK help documentation and Ethernet IP standards.

When finished, plug the PC back into an open port and disable the port mirroring function on the switch.

Appendix - 1
12. Additional screen captures:

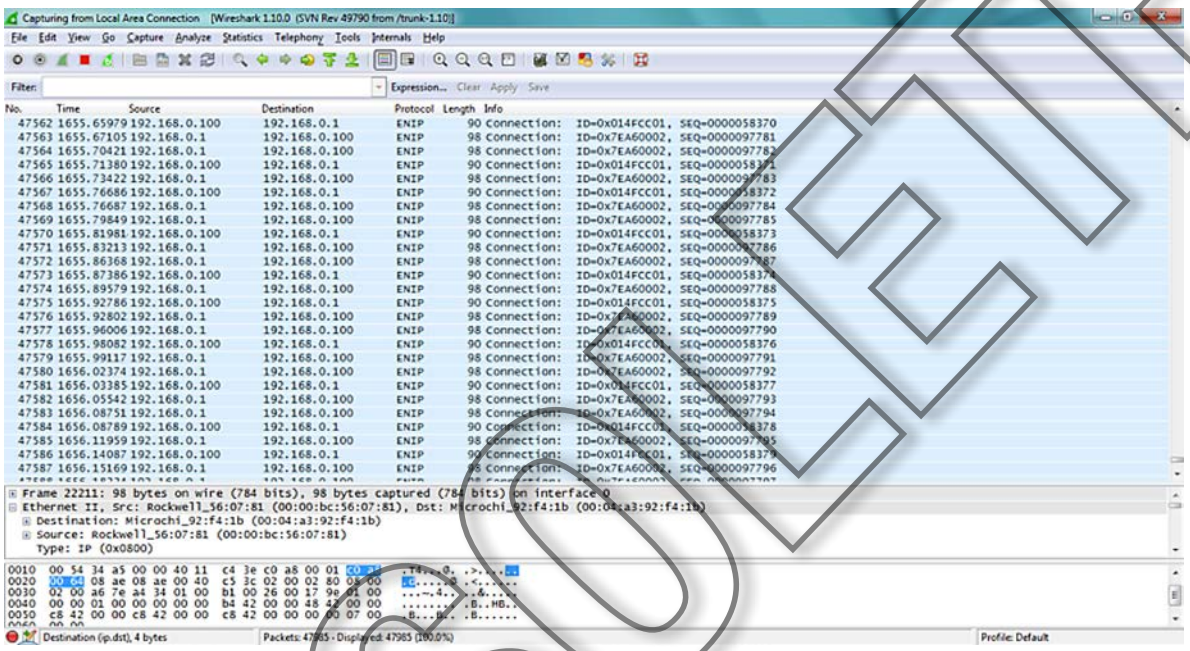

Figure 13: Port traffic without port mirroring

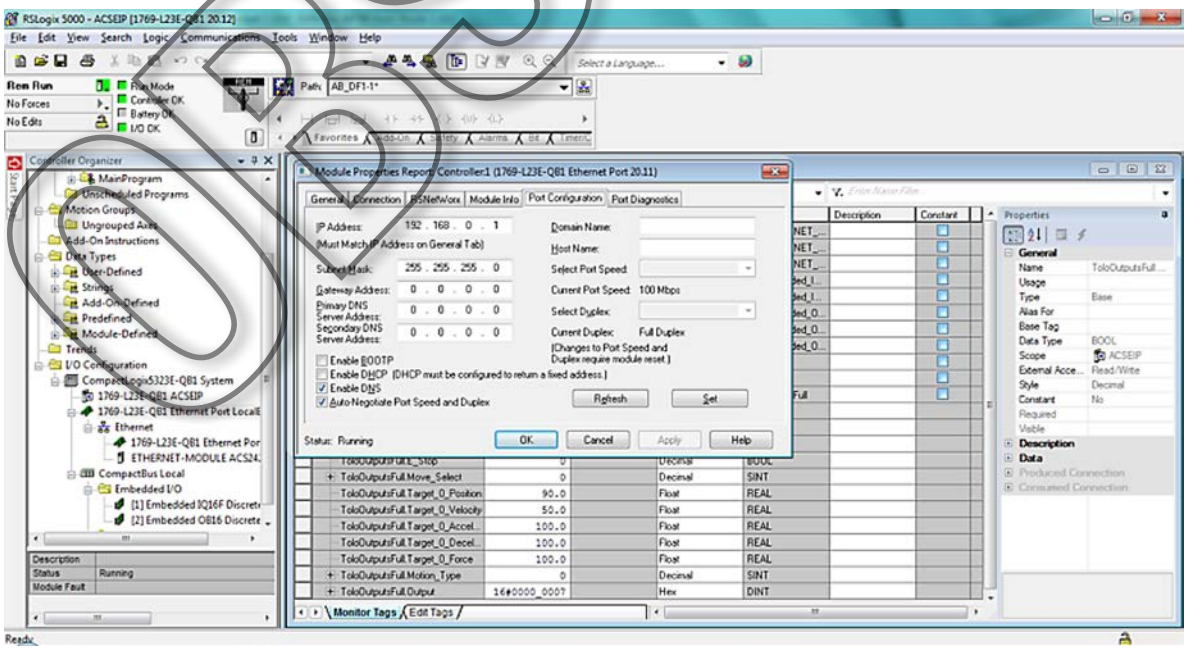

Figure 14: IP address configuration in RSLogix5000

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