

NHR NETWORKED INSTRUMENT SETUP GUIDE



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1. Scope

Users may find it convenient to connect their computer to networked instruments in a variety of ways. This document explains the configuration procedures for NH Research Network instruments connected to a Windows computer either directly or using commercial network routers.

2. Reference Documents

Introduction to TCP/IP from Microsoft.com

<http://msdn2.microsoft.com/en-us/library/ms810606.aspx>

3. NH Research Networked Instrument Overview

NH Research instruments use a variety of network methodologies. Some require a DHCP server, others require a static IP address be assigned, and still others are configurable for DHCP or static IP.

3.1 Digital Measurement System (DMS)

- DHCP: Yes (default)
- Static IP: Not configurable
- Static IP Override: None

3.2 4700 LAN

- DHCP: Yes (default)
- Static IP: Yes
- Static IP Override: None

3.3 4700LXi

- DHCP: Yes (default)
- Static IP: Yes
- Static IP Override: Dip switch 7 open (1) forces IP to 192.168.0.2

3.4 4700LXi with PowerTouch

3.4.1 Load Control Board

- DHCP: No
- Static IP: Yes (default 192.168.0.230)
- Static IP Override: Dip switch 7 open (1) forces IP to 192.168.0.2

3.4.2 Internal Router

- DHCP: No
- Static IP: Yes (default 192.168.0.220)
- Static IP Override: No but factory default is 192.168.1.1

3.4.3 PowerTouch

- DHCP: No
- Static IP: Yes (default 192.168.0.240)
- Static IP Override: None

3.5 5427Lxi

- DHCP: Yes (default)
- Static IP: Yes
- Static IP Override: Dip switch 1 open (1) forces IP to 192.168.0.2

4. Software Installation

System Requirements:

Windows 2000 or XP, or XP Professional, SP2/SP3

Insert the NHR software install disk. Follow the on-screen instructions.

5. Windows Configuration

The setup required in Windows will depend on the physical connection made to the instrument. Screen shots may show Windows 2000 or XP, but functions are the same.

Please refer to the following diagrams to determine which setup you will need.

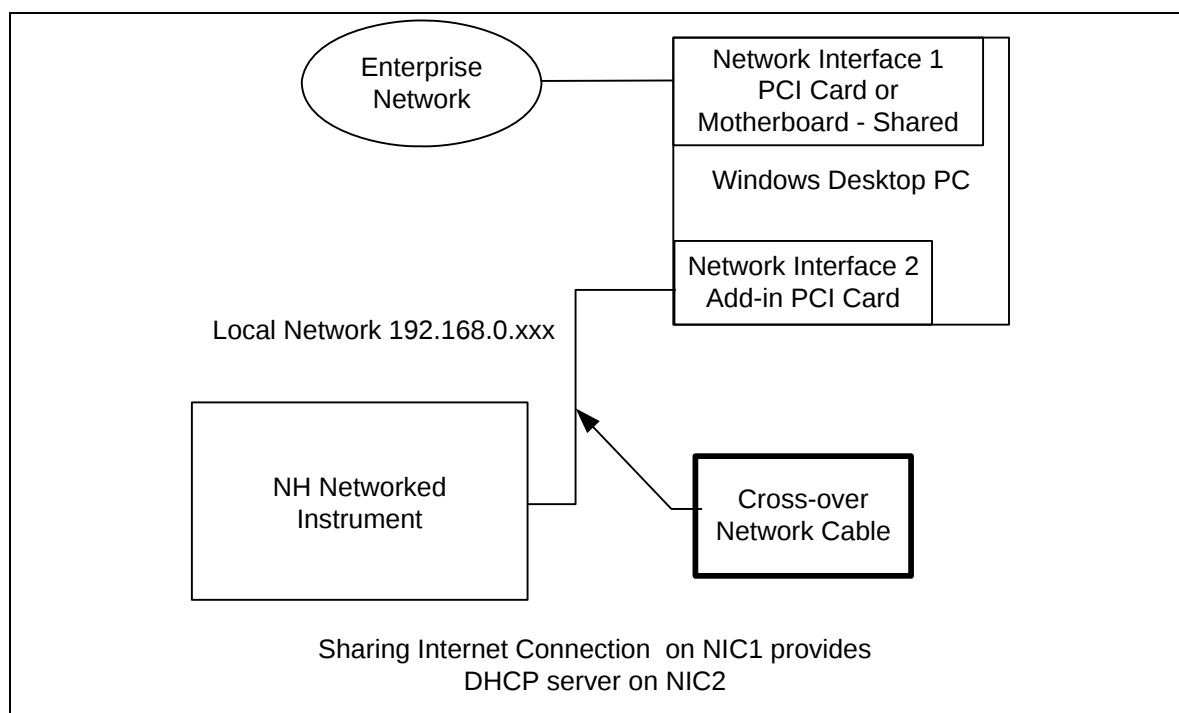


Figure 1 – Direct connection to a PC with Two Network Interfaces – No Switch
Go to Section 5.1

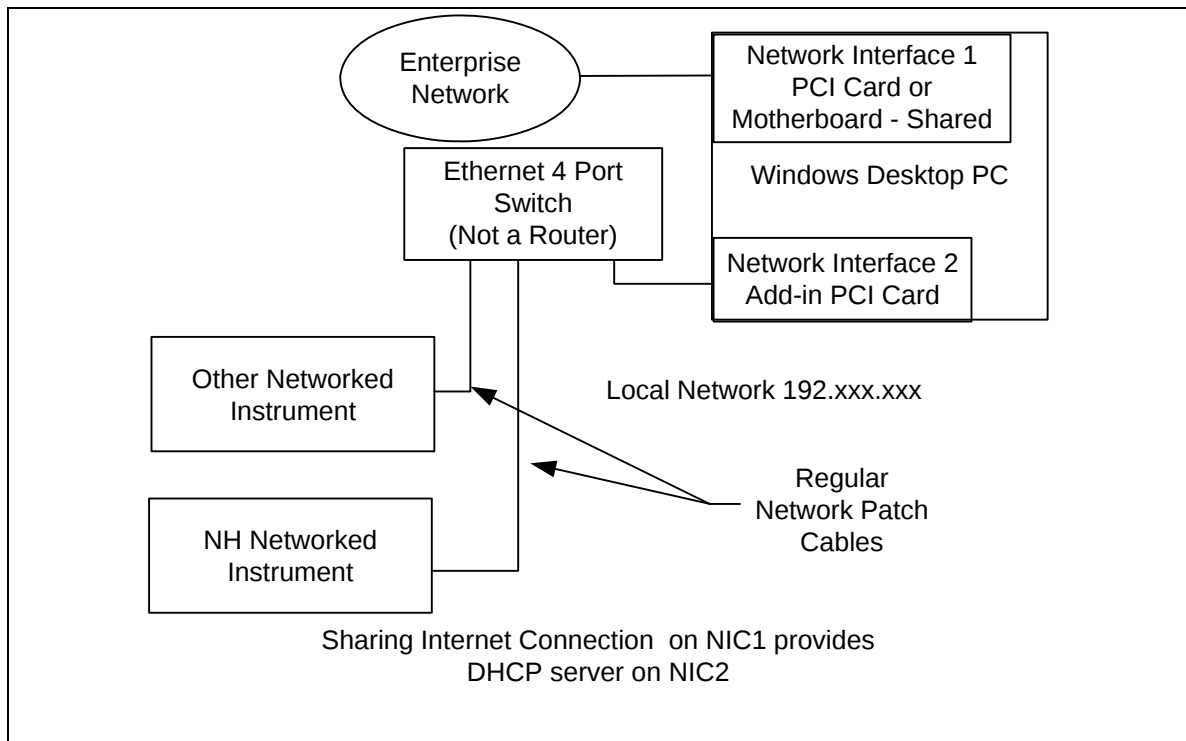


Figure 2 - Switch Connection to PC with Two Network Interfaces With Switch

Go to Section 5.1

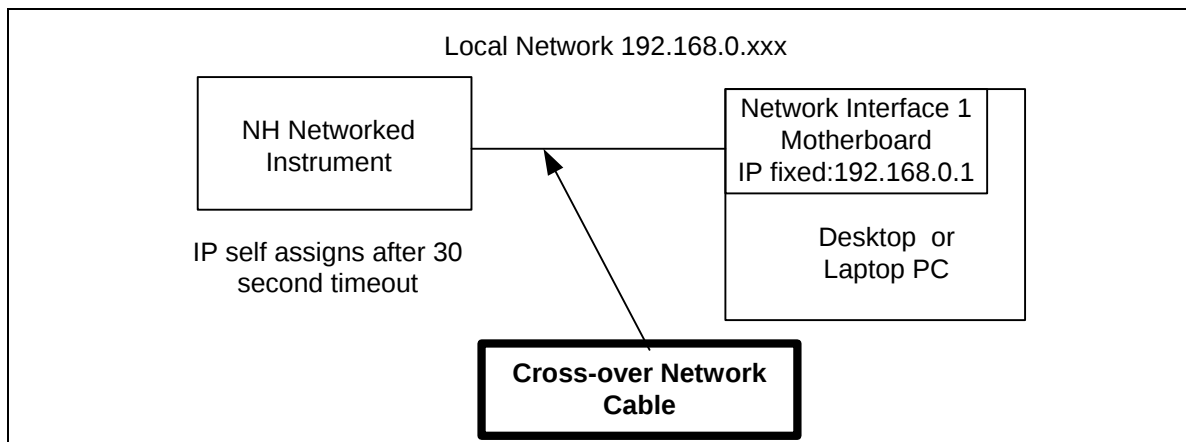


Figure 3 - Direct Connection to PC with One Network Interface

Go to Section 5.2

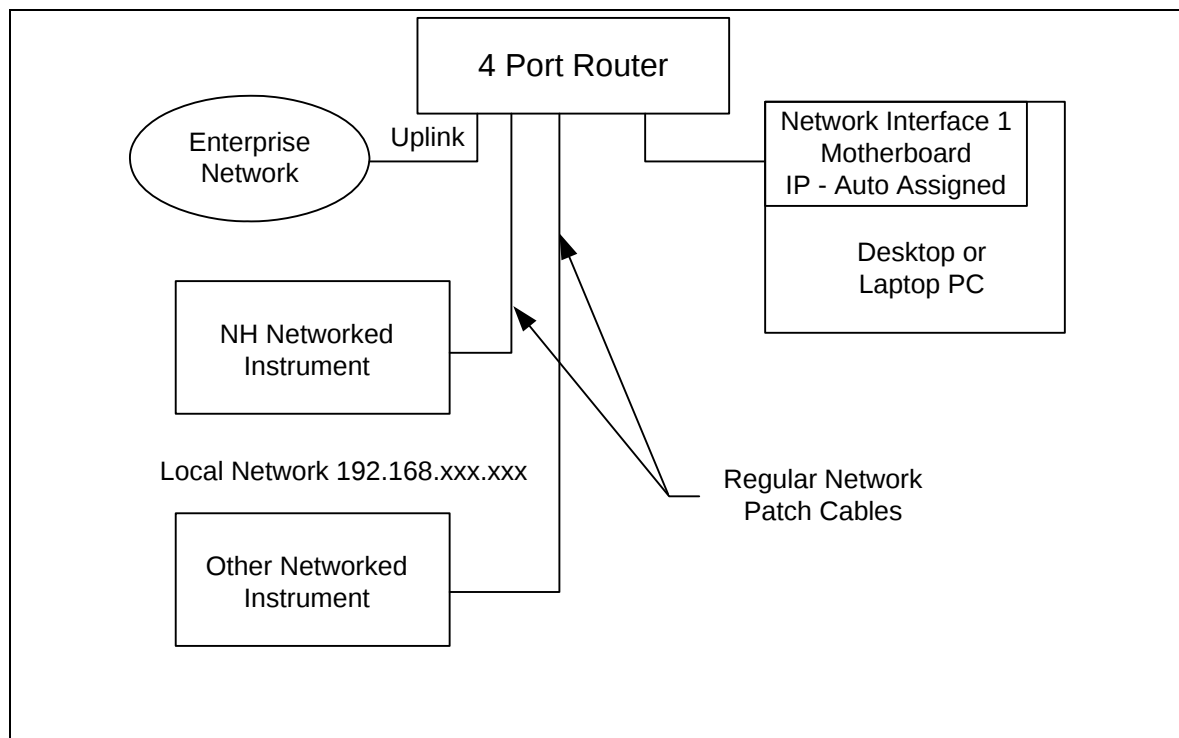


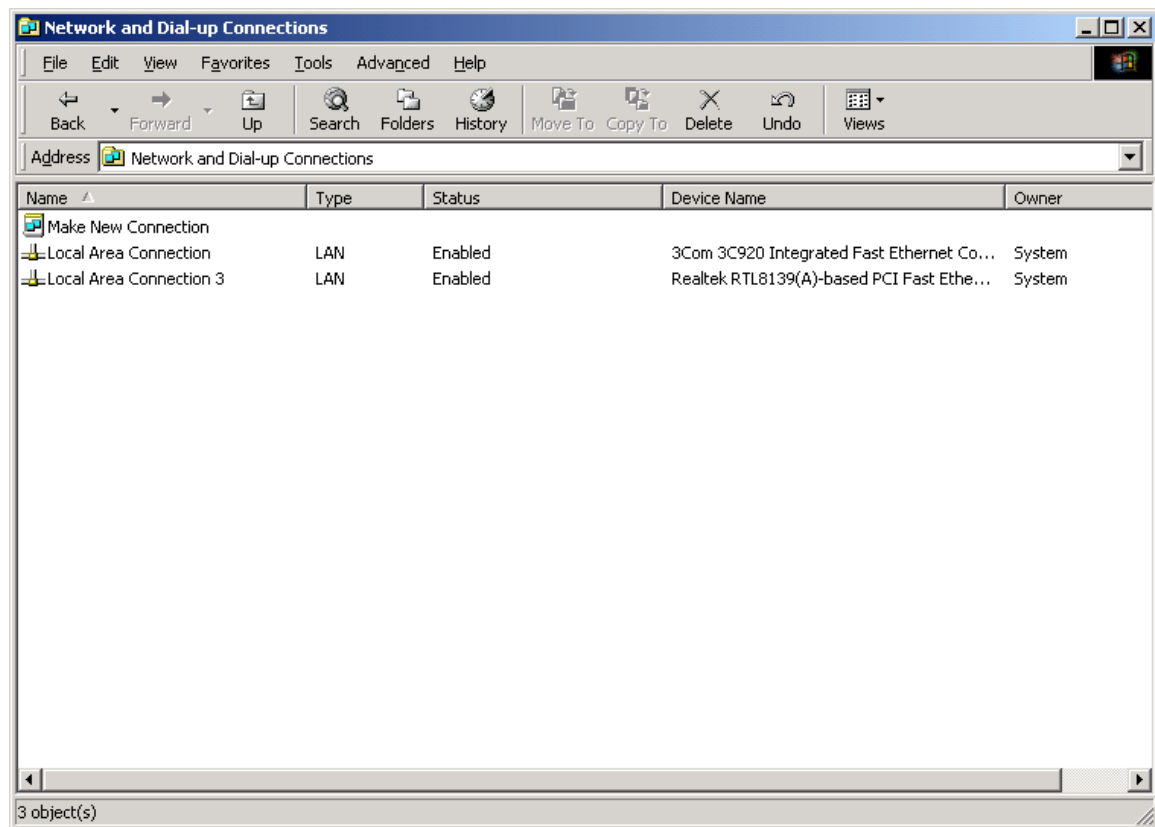
Figure 4 - Computer With One Network Interface and Router

Go to Section 5.3

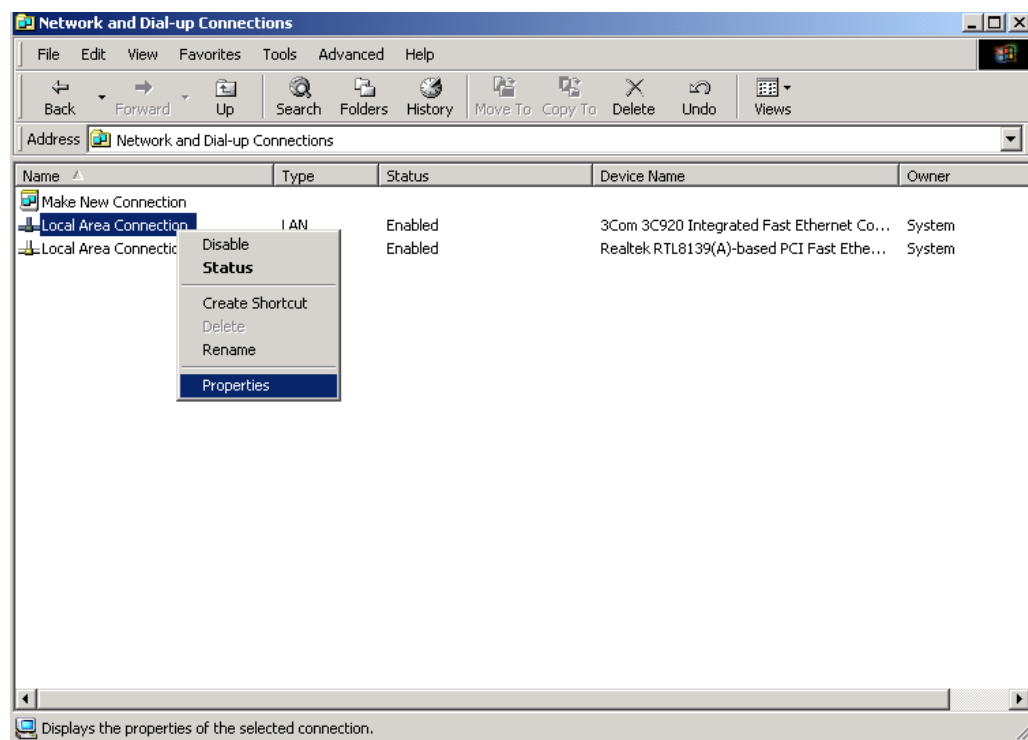
5.1 Configuration for PC with Two Network Interfaces (Direct or with Switch)

After installing add-in card, Window should install necessary drivers on power-up. An instrument or one port of the Network Switch must be plugged into the second PC Ethernet port before proceeding to configure the network sharing. This configuration only has to be performed once; it is then saved in Windows and will remain regardless of whether the computer is powered up with or without something connected.

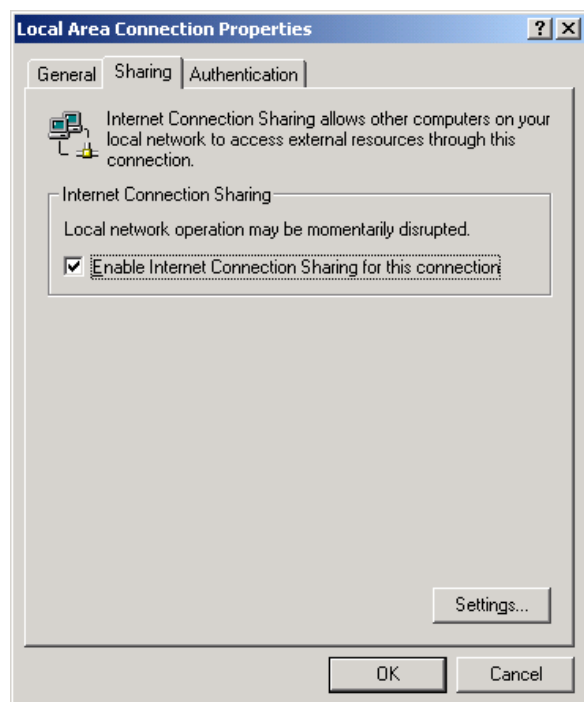
Using the Windows Control Panel, open the Network and Dial Up Connections (Win2000) or Network Connections (WinXP) window. Set the Windows Views option to Detailed. Verify that two local area connections are present and both are enabled. Instruments must be powered up for the enabled status to appear. The next sharing step won't work if both connections are not enabled.



Right-click on the Local Area Connection NOT connected to the networked instrument. This is the one typically connected to the company network. Select Properties.

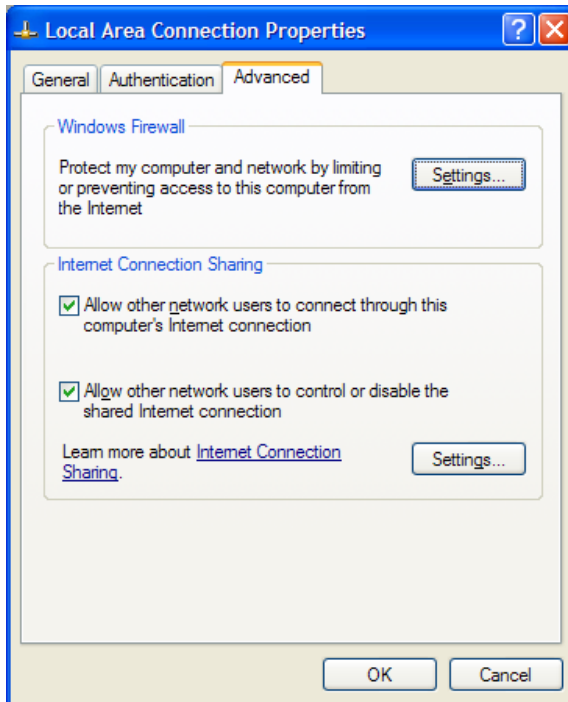


In Win2000, select the Sharing tab in the Properties window and check “Enable Internet Connection Sharing for this connection.”



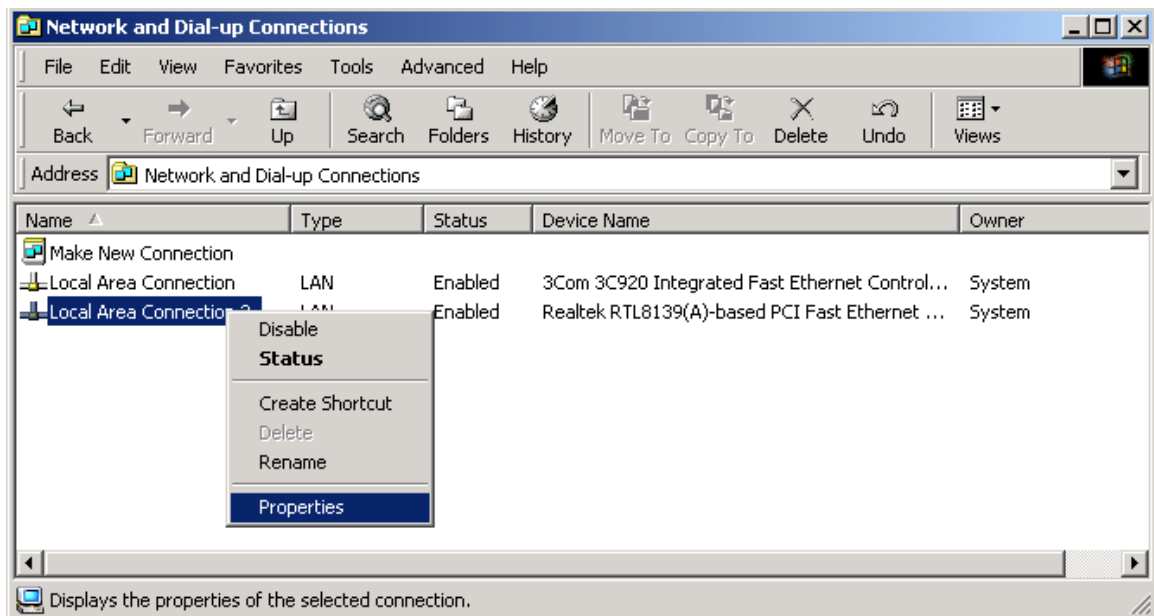
If a warning appears about changing the IP address, select “Yes” to share the connection.

In WinXP, select the Advanced tab contains this option. Check “Allow other network users to connect through this computer’s Internet connection.”

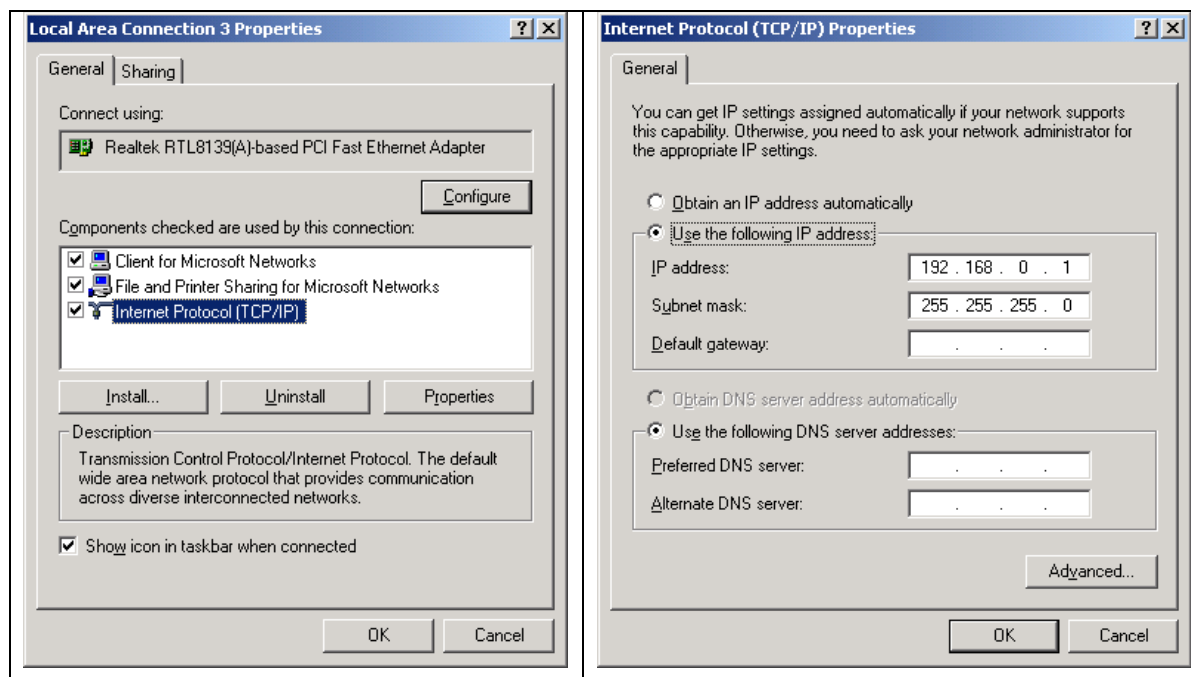


If a warning appears about changing the IP address, select “Yes” to share the connection.

Using the Windows Control Panel; open the Network and Dial Up Connections window (or Network Connections) again, right-click on the OTHER Local Area Connection - the one to be connected to the Networked Instrument, then select Properties.



Under the General tab, highlight the Internet Protocol TCP/IP component, and select the Properties. Verify that the Use IP Address selection has been set to address 192.168.0.1. Don't modify the DNS server selections.

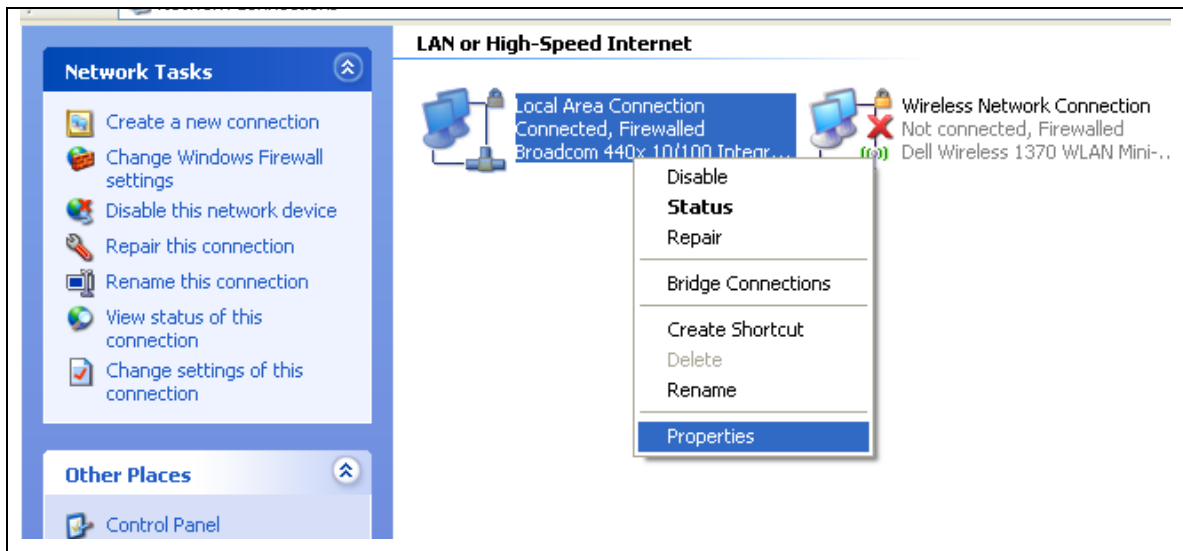


You may find it convenient to rename this connection to something descriptive like “NHR Instrumentation” to help differentiate it from the corporate network connection. You can rename a connection by right-clicking its name and selecting “Rename.”

You can now proceed to section 5.4, Windows Firewall Configuration.

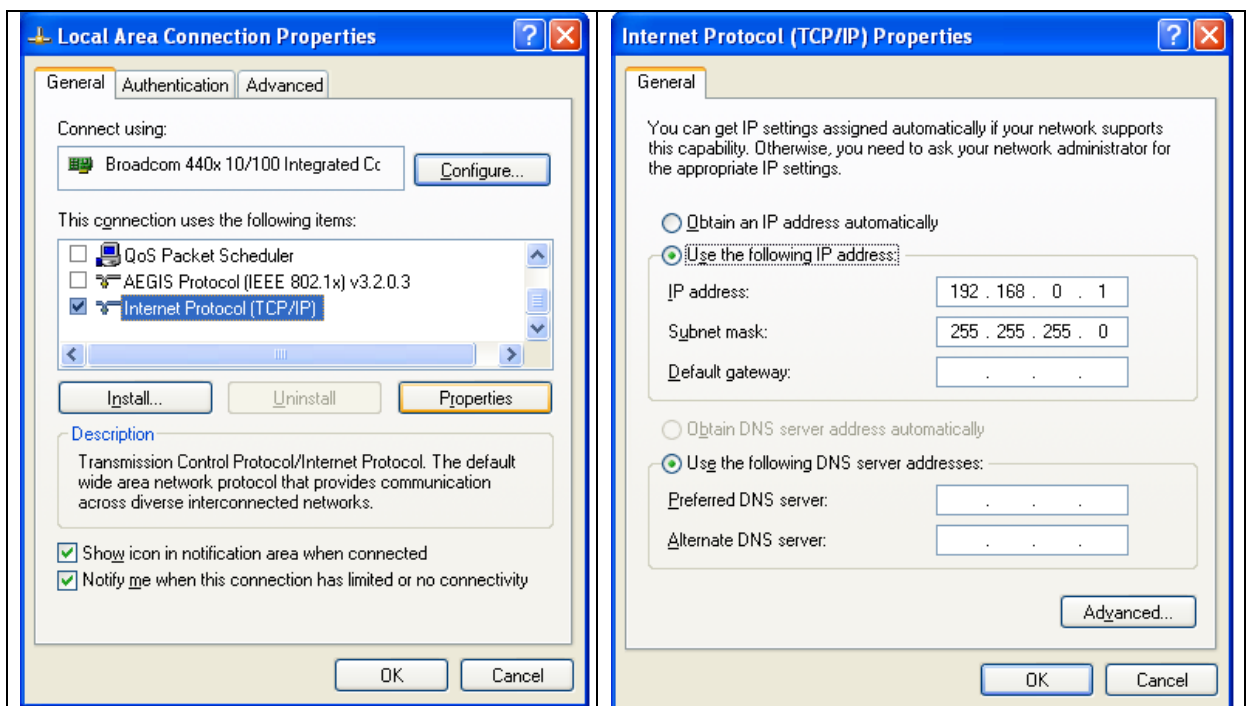
5.2 Configuration for Direct Connection for PC with One Network Interface

Using the Windows Control Panel, open the Network and Dial Up Connections (Win2000) or Network Connections (WinXP) window, right-click on the Local Area Connection (the one wired to the instrument, not the Wireless Network), and then select Properties.



Under the General tab, highlight the Internet Protocol TCP/IP component, and select the Properties. Select “Use the following IP address”, enter 192.168.000.001, and then hit the Tab on the keyboard to fill in the subnet mask automatically (255.255.255.0). Don’t modify the DNS server selections.

NOTE: Using this mode of operation, the NH Instrument will need to be turned on for at least 30 seconds before it self-assigns an IP address in the 192-168.0.xxx range. Don’t start any software that attempts to communicate with it until this timeout expires.

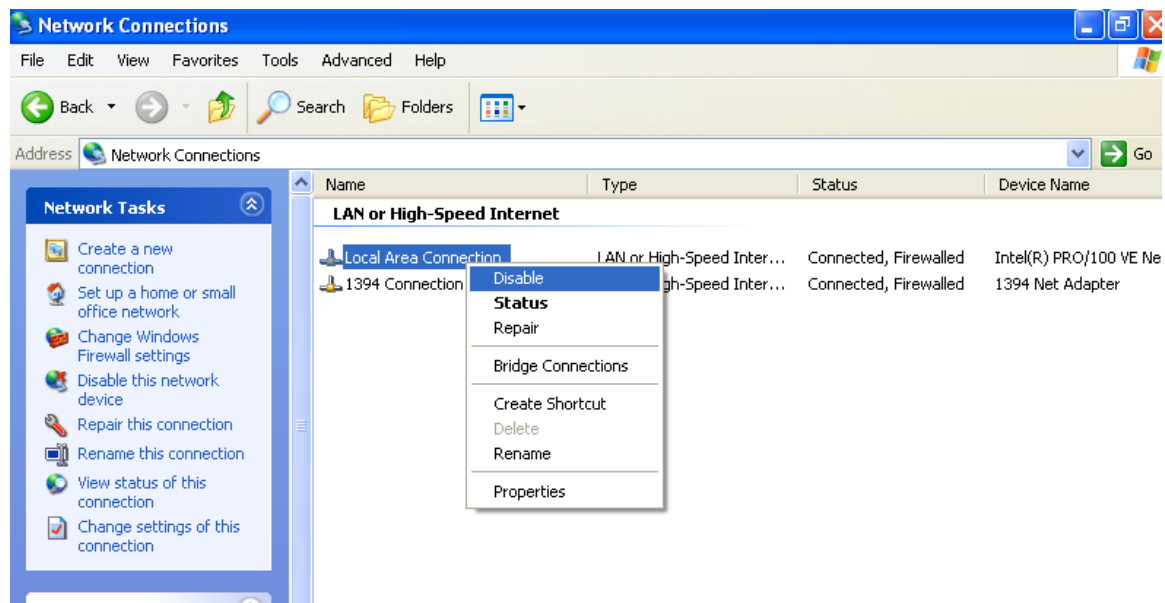


You can now proceed to section 5.4, Windows Firewall Configuration.

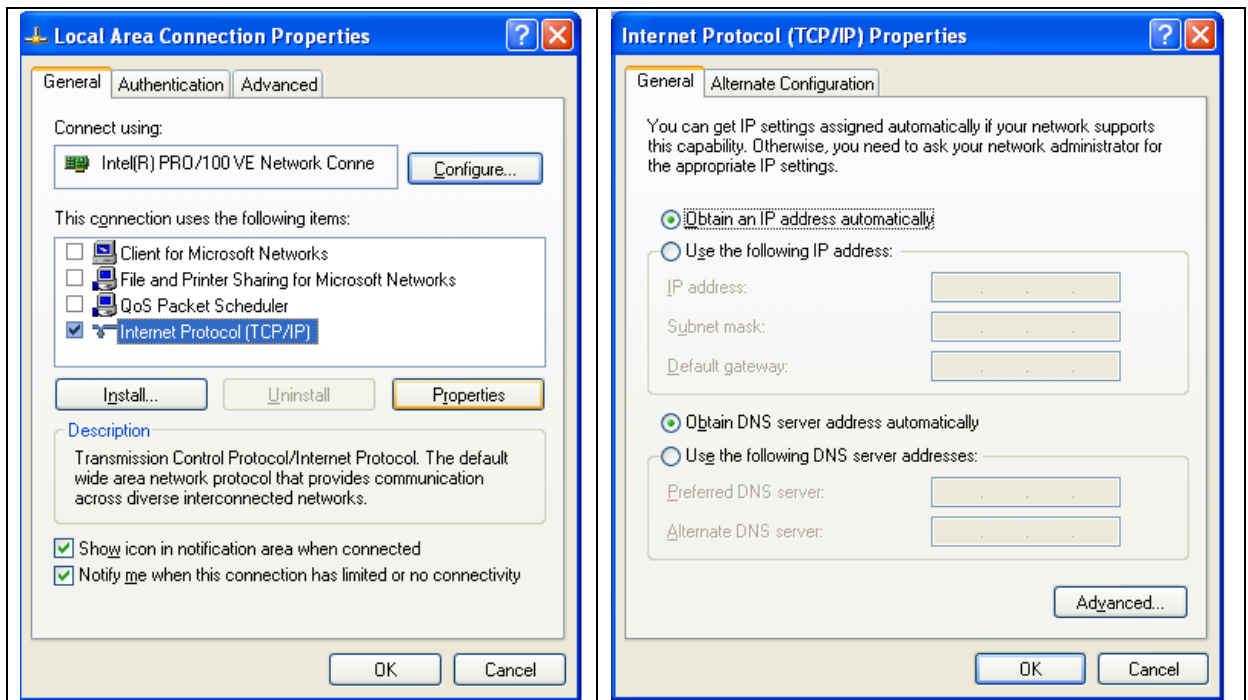
NOTE: When instrument operations are complete, be sure and return your computer's network interface settings under TCP/IP Properties to the previous setting (usually "Obtain an IP address automatically"). Leaving the computer interface at a Fixed IP Address may keep it from working with the enterprise network and email servers.

5.3 Configuration for Router Connection to PC with One Network Interface

Using the Windows Control Panel, open the Network and Dial Up Connections (Win2000) or Network Connections (WinXP) window, right-click on the Local Area Connection (the one wired to the instrument, not the Wireless Network), and then select Properties.



Under the General tab, highlight the Internet Protocol TCP/IP component, and select the Properties. Verify that "Obtain an IP address automatically" is active. Don't modify the DNS server selections.



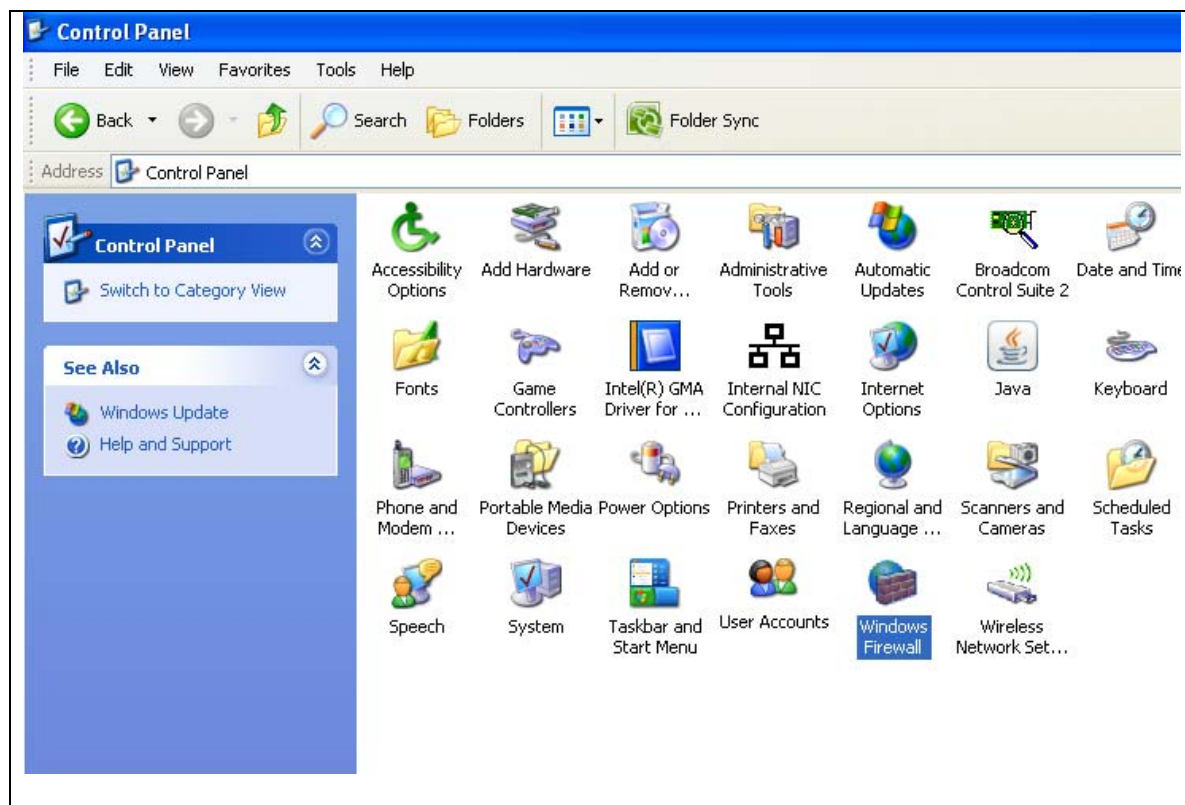
Depending on security settings and other options, some routers may not assign instrument addresses within the 30-second timeout period. If that timeout elapses, the instrument will self assign an IP address in the local network IP range 192.168.0.2 – 192.168.0.254. If the IP address is self assigned, the NHR Instrument will need to be turned on for at least 30 seconds before any software attempts to communicate.

Most routers have a browser based control panel for enabling options like DHCP server functions and address assignment ranges. Usually opening the Windows Internet Explorer browser and entering 192.168.0.1 will bring up the control panel for the router. Unless defaults have been changed, they often require a default user name of “admin”, and a password of “password”.

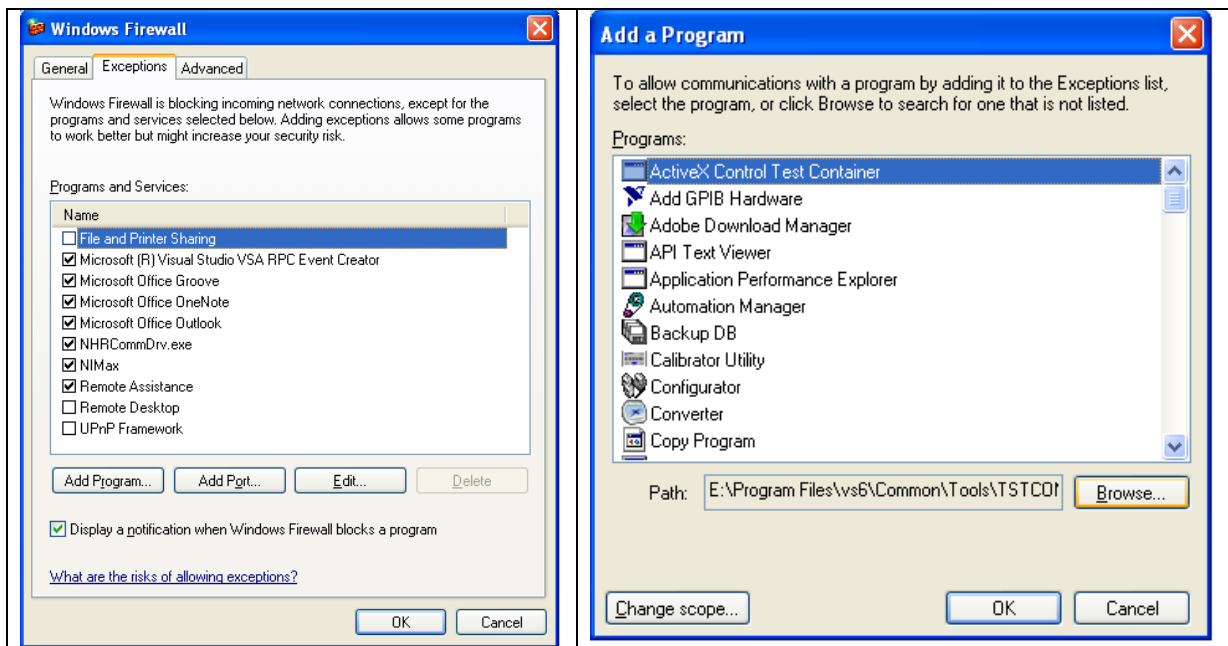
5.4 Windows Firewall Configuration

The Windows XP built in firewall, as well as third party firewall software, may keep the computer from communicating with networked instruments. To make sure the firewall software allows communication, the following setup is required in Windows.

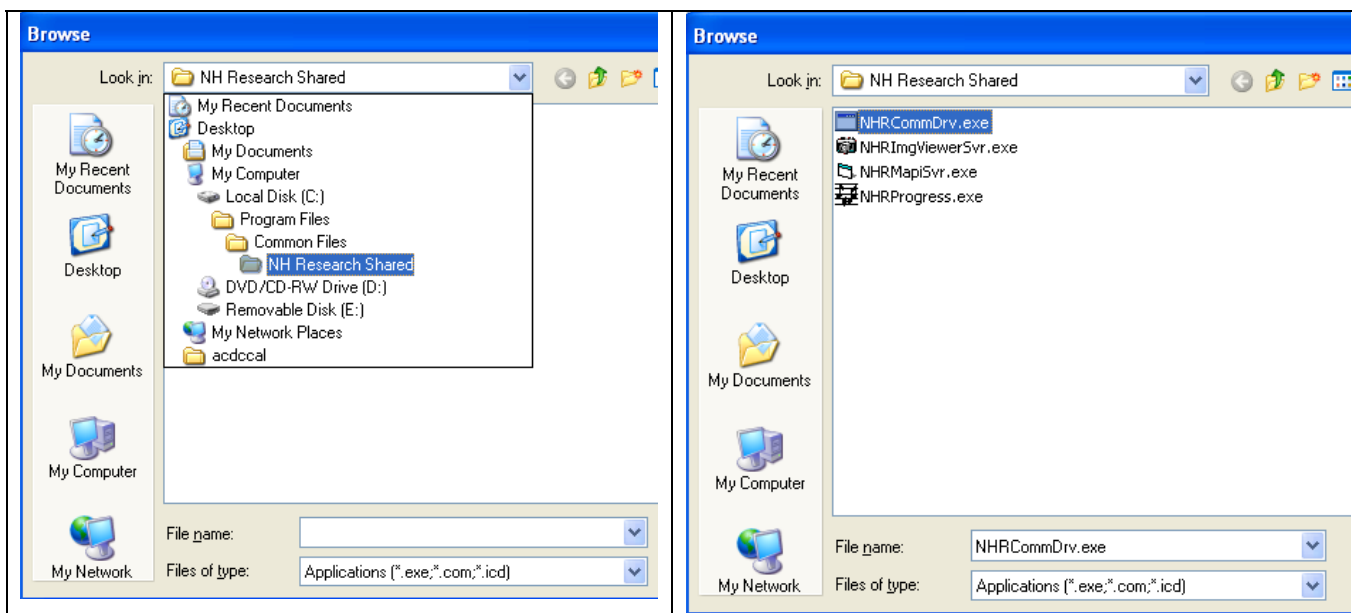
Open the Control Panel, select Windows Firewall, and Open



Select the Exceptions tab in the Firewall control, and then the Add Program button. In the Add a Program window, select the Browse option at the bottom and find the NH Research Shared folder. The usual path is C:\Program Files\Common Files\.



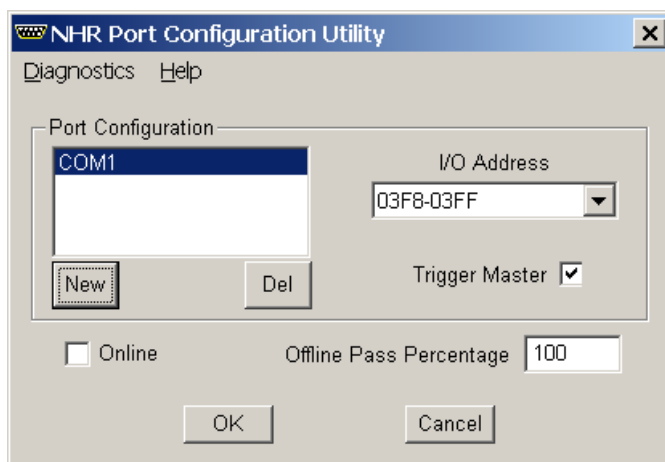
In that folder, select NHRCommDrv.exe file, and click Open. This should allow NHR instrument drivers to communicate through the firewall.



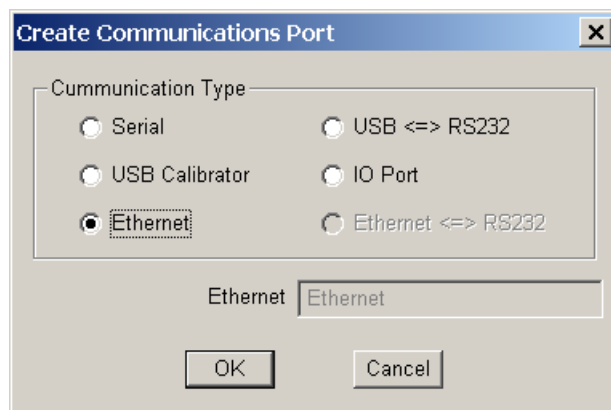
5.5 Port Configuration

NH Research software requires instruments to be correctly configured in a driver database to select the correct instrument driver and communication method. The following steps show how to install an NH Research Networked 4700 DC Load.

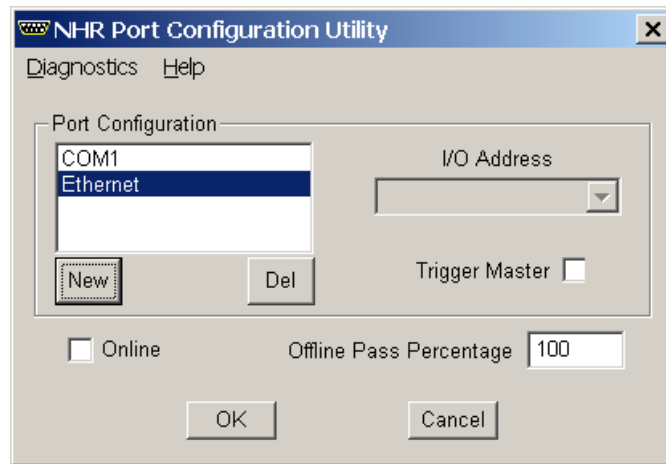
The install program should have created an NH Research folder in the Windows Start menu. Run the PortConfig application in that folder to configure the communication drivers. Starting the program will open the Configuration Utility window.



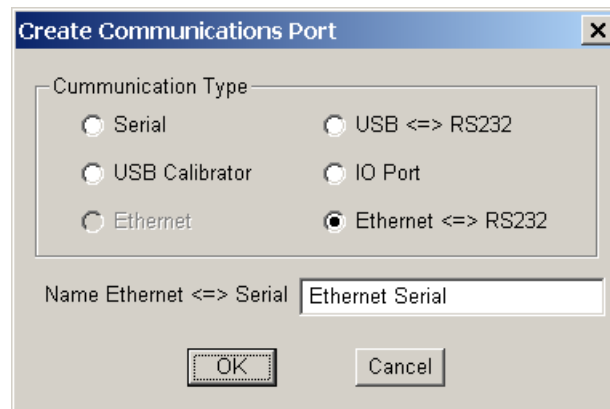
Select New and add the Ethernet Communications port.



Click OK to return to the Port Configuration window.



Click on New again, and add another port called Ethernet ⇔ RS232

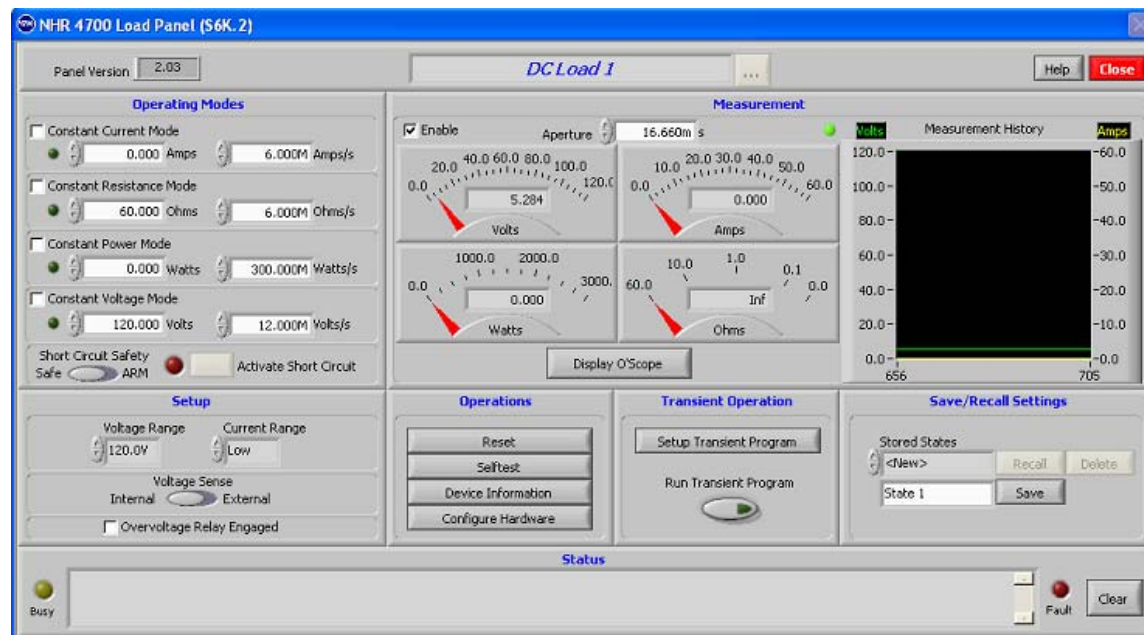


Return to the Port Configuration Utility window, verify that the Online and Trigger Master boxes are checked, click OK to leave window and PortConfig.

The software will now prompt to reboot computer.

After reboot, the Instrument Control Panel can be started from the NH Folder in the Start, Program menu.

As an example, the 4700 Load S6K Test Panel program can be started to control the load interactively. The program should appear on the screen when started.



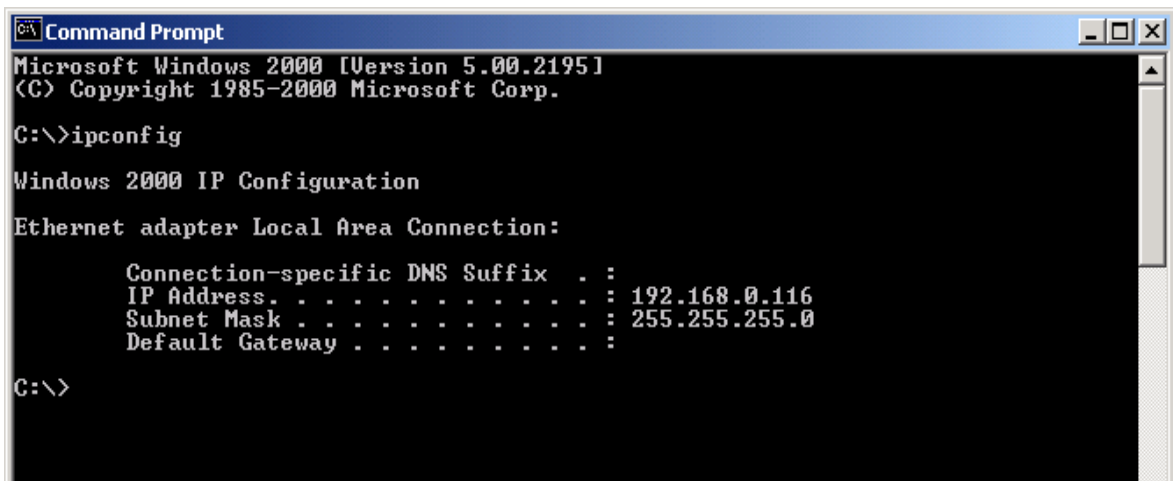
6. Network Addressing and Fixed IP Addresses

6.1 General IP Address Information

Instruments on a network have individual IP (Internet Protocol) addresses so they can be controlled individually, even though they share an interface. These IP addresses must be assigned somehow; either automatically assigned by software, entered through a front panel interface, or stored in non-volatile memory on the instrument.

The software function that automatically assigns each instrument an IP address when requested is referred to as a DHCP server. This software is typically found on a network router, but a scaled down version of the software is also available in Windows. The Windows version is only activated when a network connection sharing option is selected.

You can verify the IP address assigned to the network interfaces in the PC by using a DOS command utility called ipconfig. Run this utility by entering DOS using the Windows Start, Run window and entering cmd, and clicking Open (you may need to type Exit to escape DOS when finished). Enter ipconfig at the DOS prompt to display the IP address assigned to each network interface. The result will look something like the figure below:



```
Command Prompt
Microsoft Windows 2000 [Version 5.00.2195]
(C) Copyright 1985-2000 Microsoft Corp.

C:\>ipconfig

Windows 2000 IP Configuration

Ethernet adapter Local Area Connection:

    Connection-specific DNS Suffix  . : 
    IP Address. . . . .               : 192.168.0.116
    Subnet Mask . . . . .             : 255.255.255.0
    Default Gateway . . . . .         : 

C:\>
```

The computer's IP address is shown in the line right after "Connection-specific DNS Suffix". In this case, the IP address is 192.168.0.116.

NH Research Instruments use a 255 address domain, meaning that the IP address of the computer network interface, and the IP address of the NH Research instrument, must have identical numbers for the top three fields of the IP address.

In this example, the NH Instrument can be assigned any address from 192.168.0.2 – 192.168.0.115, or 192.168.0.117-192.168.0.254. Addresses 192.168.0.0, 192.168.0.1, and 192.168.0.255 should not be used..

If there is no DHCP server anywhere in the network, instruments may wait for a time-out period, then assign themselves a default IP address. NH instruments auto-assign IP addresses reserved for private networks ranging from 192.168.0.2 to 192.168.0.254.

6.2 User Assigned Fixed IP Addresses

User can assign the instrument a fixed IP address that will be stored in non-volatile memory in the 4700 Family Load. That value will always be used by the load from the time it is programmed until a new value, or a value of 0.0.0.0, is programmed. If the zero value IP address is programmed, it will re-enable the DHCP automatic address allocation capability, and the load will require a DHCP server on the next power-up cycle to provide an IP address. If no DHCP server is present at that time, it will self-assign an IP value after 30 seconds. NH instruments auto-assign IP addresses reserved for private networks ranging from 192.168.0.2 to 192.168.0.254.

NOTE: Programming changes to the IP address will not take effect until the next load power-up cycle.

To program an IP, you must first have established communication with the instrument using the method described above for your particular connection setup.

The most basic method is shown in Figures 3 and Section 4.2 above, and it can be used to program the IP address as follows;

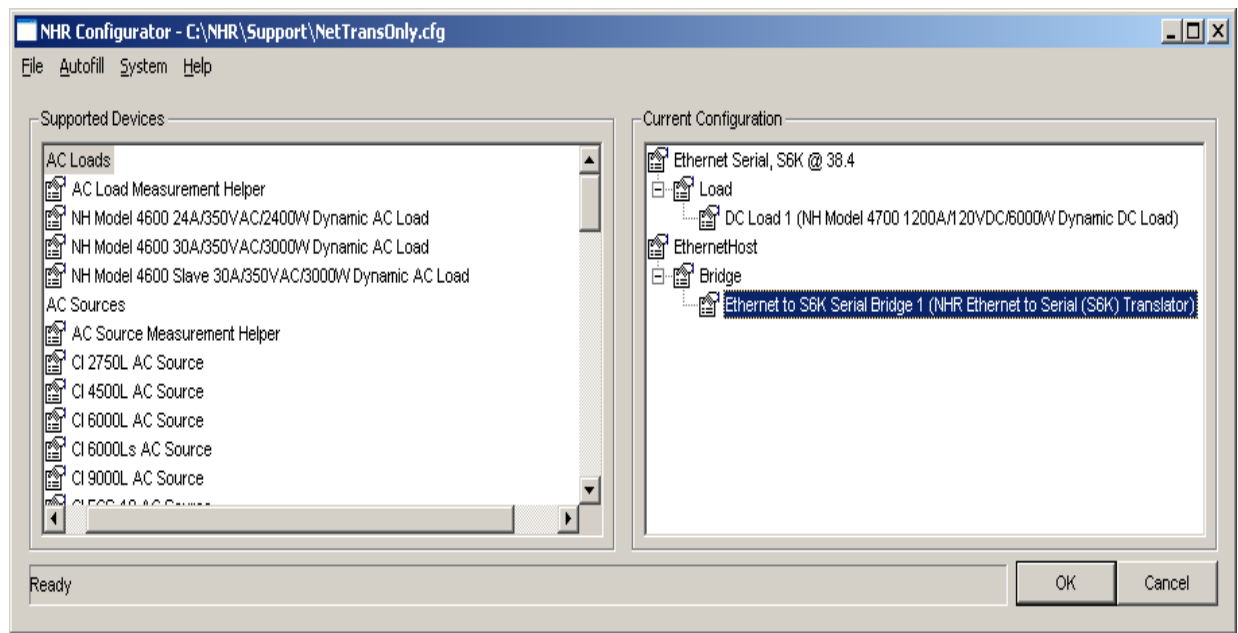
Using the cross-over cable supplied with the instrument, connect to the PC network interface.

Change the PC network interface to a fixed IP address 192.168.0.1 as described in Section 4.2.

Turn on the instrument and wait for at least 35 seconds for it to self-assign an IP address in the 192.168.0.xxx domain.

Using the Windows start menu, go to Programs, NH Research, NHR Configurator. This should have been installed by the instrument software installation.

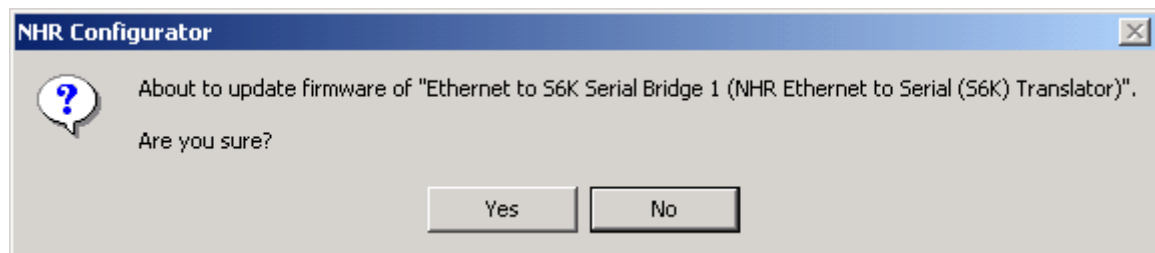
The Configurator screen should appear as below;



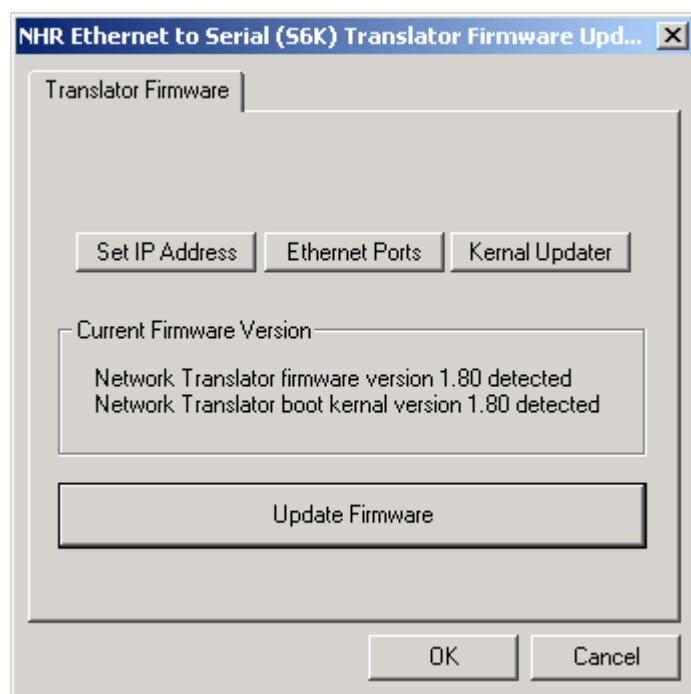
Be sure to select the Ethernet to Serial bridge, not the DC Load instrument.

Right click on the selected Ethernet to Serial bridge and select Update Firmware.

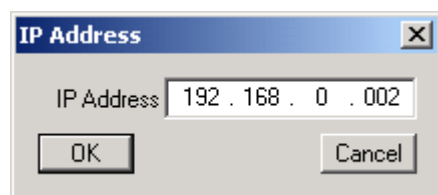
Click Yes to the resulting warning window;



The Firmware Update Control Panel will appear. Be sure to select ONLY the SetIPAddress function. The other functions should only be used when directed to do so NH Research customer support.



This will bring up the IP Address Setting Dialog window. Enter the IP Address desired and click OK. The change will take affect the next time the load is powered on, and will remain the fixed IP address until programmed to another value. The IP address programmed can be any legal value, as long as the computer that will be communicating with it after the next power-up is in the same 254 address domain. That is, the upper three IP address values are the same for Instrument and Computer (in this case 192.168.0)



NOTE: When IP programming operations are complete, be sure and return your computer's network interface settings under TCP/IP Properties to the previous "normal" setting (usually Obtain An IP Address Automatically) if no further instrument communication is required. Leaving the computer interface at a Fixed IP Address may keep it from working with the enterprise network and email servers.

Here is how the IP address is assigned in the various network configuration shown;

Configuration	DHCP Server	Address Assigned
PC with two network interfaces, either direct or with network switch	Windows internet sharing function	192.168.0.2 – 192.168.0.254
PC direct with single network interface	None – Instrument times out after 30 seconds and self-assigns. PC network interface must be fixed at 192.168.0.1	192.168.0.nnn nnn = modulo 256 sum of lower 3 bytes of instrument MAC address
Local network router	Router – enabled for DHCP server function with default local network address range (Router takes 192.168.0.1)	192.168.0.2 – 192.168.0.254 Note: If router address not accepted by instrument, self assigns after 30 seconds.
PC direct with single network interface	None – Instrument times out after 30 seconds and self-assigns. PC network interface must be fixed at 192.168.0.1	Fixed IP assigned using by user with NHR Configurator. May be in any domain

7. Troubleshooting

Connection Problems;

Check the following to verify a good connection:

As soon as a network cable that is connected to computer or router is plugged into a powered-on Network Instrument, the green Link Active LED in the Ethernet connector should light. If it doesn't, one end of the cable may be disconnected, the cable may be bad, or it may be a straight-through cable when a cross-over cable is required.

A cross-over cable is required only when connecting the instrument directly to a network connector on a PC. Cross-over cables are usually clearly marked as such on both ends.

If the connection is Good, and communication is not working:

Make sure the Networked Instrument is powered up for at least 30 seconds before attempting to communicate. This is the timeout period before the instrument assigns itself an IP address in the 192.168.0.xxx range. This self-assignment is necessary when the instrument is connected directly to a PC network connector, or if connected to a router that for some reason can't correctly assign an IP address to the instrument.

If the instrument still doesn't communicate:

Verify that the computer network interface that is attempting to communicate with the instrument is in the same IP address "domain". This can be checked by using the ipconfig DOS utility as described in the Network Addressing section above. The IP address of the computer network interface should be in the range 192.168.0.1 – 192.168.0.254.

Windows Firewall;

Some Windows XP installations and third party software packages have settings to block unknown programs from accessing the network. See the Windows Firewall Configuration section of this document for instructions on adding program exceptions.

Verify Instrument Activity

If the instrument is communicating, each command processed will cause the Yellow Activity LED in the Ethernet connector to flash.

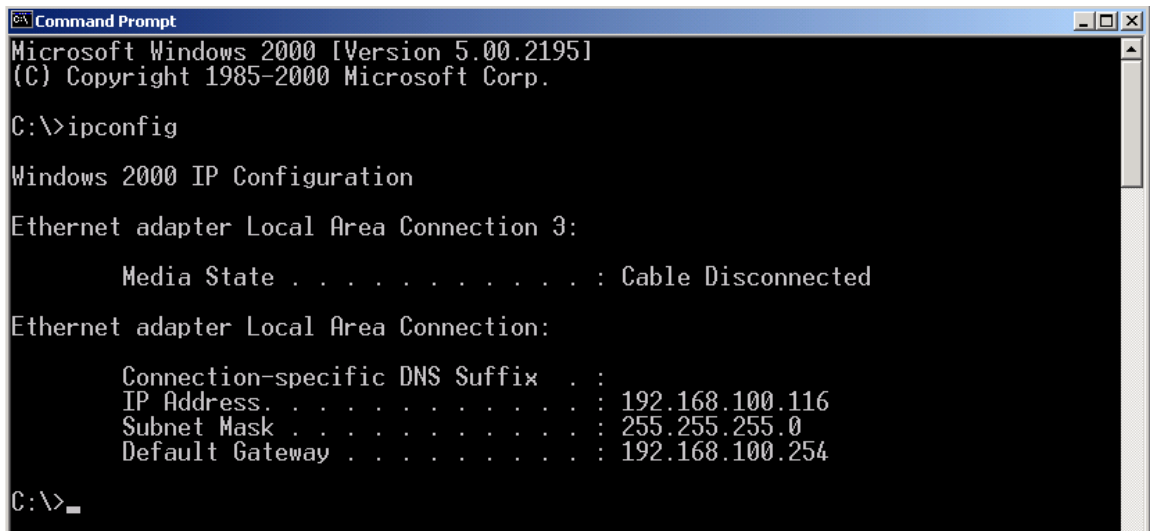
Operational Problems

Some Networked Instruments have an address dipswitch on the rear panel to select unique addresses. These are usually shipped at address value 01 (hex) for stand alone

instruments. Each position on the switch represents a single bit in a hexadecimal value, and a switch in the up position represents a “one” bit.

If the switch position has changed since the original software configuration of the instrument, it will stop communicating.

If the instrument is communicating, each command processed will cause the Yellow Activity LED in the Ethernet connector to flash.



```
Command Prompt
Microsoft Windows 2000 [Version 5.00.2195]
(C) Copyright 1985-2000 Microsoft Corp.

C:\>ipconfig

Windows 2000 IP Configuration

Ethernet adapter Local Area Connection 3:

    Media State . . . . . : Cable Disconnected

Ethernet adapter Local Area Connection:

    Connection-specific DNS Suffix . : 
    IP Address. . . . . : 192.168.100.116
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . : 192.168.100.254

C:\>
```