Acromag®

BusWorks® 900EN Series
10/100 Mbps Industrial Ethernet I/O Modules

Connecting Acromag Series 900EN Ethernet Modules to Your PC

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OBJECTIVE

The purpose of this document is to provide a procedure for assigning a unique IP address to a second network interface card installed in a personal computer for the purpose of communicating with an Acromag Series 9xxEN Ethernet I/O Module. A procedure for accomplishing IP address assignment is provided using Window 98, Windows ME, and Windows XP.

BACKGROUND – IP ADDRESSES

Any TCP/IP packet contains two addresses: a unique fixed MAC address, and a unique IP address.

To communicate on the Internet, computers must have unique identifiers in order to differentiate one computer from another. This is accomplished through the assignment of an IP address. An IP address is a 32-bit identifier comprised of 4 octets (8-bits), with each octet a number from 0 to 255 and separated by a decimal point. For example, Acromag Series 9xxEN I/O Modules use a default IP address of 128.1.1.100.

Every host on a network must have at least one unique IP address. A personal computer with more than one network interface card (NIC) will have a unique IP address for every NIC card installed, as each NIC card may function as a node on a network. Additionally, all hosts on the same physical network must have the same network prefix.

IP addresses are divided into separate classes. Classes are pre-allocated to organizations that request them in address blocks. Three classes are used for host groups, Class A, Class B, and Class C. In Class A, the first octet identifies the network address, the remaining octets the host or node address. In Class B, the first two octets identify the network, the last two the host. In Class C, the first 3 octets identify the network, the last octet the host. As such, the total number of hosts that may be allowed on a network is determined by its Class designation.

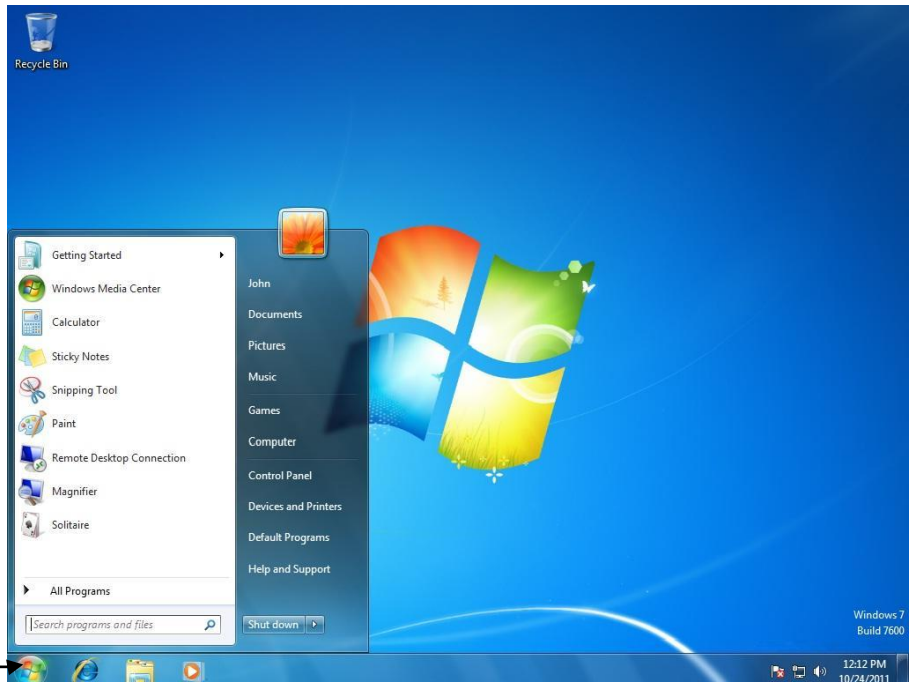
A network is further divided into subnets. For example, a subnet is a network on where you are currently located. That network can be made larger by adding more subnets. Subnet division is accomplished using subnet masks. The default subnet mask for a Class A network would be 255.0.0.0. For Class B it would be 255.255.0.0. For a Class C network, the default subnet mask is 255.255.255.0. The subnet mask flags the bits of the IP address that belong to the network address (first part), with the remaining bits corresponding to the host portion (last part). Thus, the unique subnet to which any IP address belongs to is recovered by performing a bit-wise AND operation between the IP address and the subnet mask. As such, a default IP address of 128.1.1.100 with a subnet mask of 255.255.255.0 tells us that this Class C sub-network address is 128.1.1.0 and the host address is at node 100 or 128.1.1.100. In assigning a node address, the first (.0) and last nodes (.255 for our example) are typically reserved and should not be used. The first node address is reserved for the network server (128.1.1.0 for our example). The last node address is usually reserved for a network bridge or switch (128.1.1.255 for our example). Other nodes may also be reserved for servers and other devices on the network. For example, the node 10 address is commonly used for a DNS server. The use of reserved node addresses may degrade performance.

Any network segment has at least two nodes, one at each end. Since your PC is already connected to the Internet, it already has a NIC card installed with its own unique IP address that represents your PC as an independent network node or host on your network. In addition, the unique IP address of your PC may be assigned dynamically and you will usually have no control over what it happens to be at any given time. Further, we have assigned a fixed default IP address to Acromag modules of 128.1.1.100. Thus, in order to connect this same PC to an Acromag Series 9xxEN Ethernet I/O Module, we need to install a second NIC card dedicated to creating another network that will communicate directly with the Acromag module (and share the module's default network address prefix of 128.1.1). Because each node on any network segment must have its own unique IP address, the second NIC card must be given a unique IP address different from the one used by the first NIC card that is already used to connect to the Internet. Further, it must share the same 128.1.1 address prefix as the Acromag I/O module. The resultant IP address will be different from the IP address already installed in the Acromag module by giving it a different node number, as it also represents another unique node/host on that network.

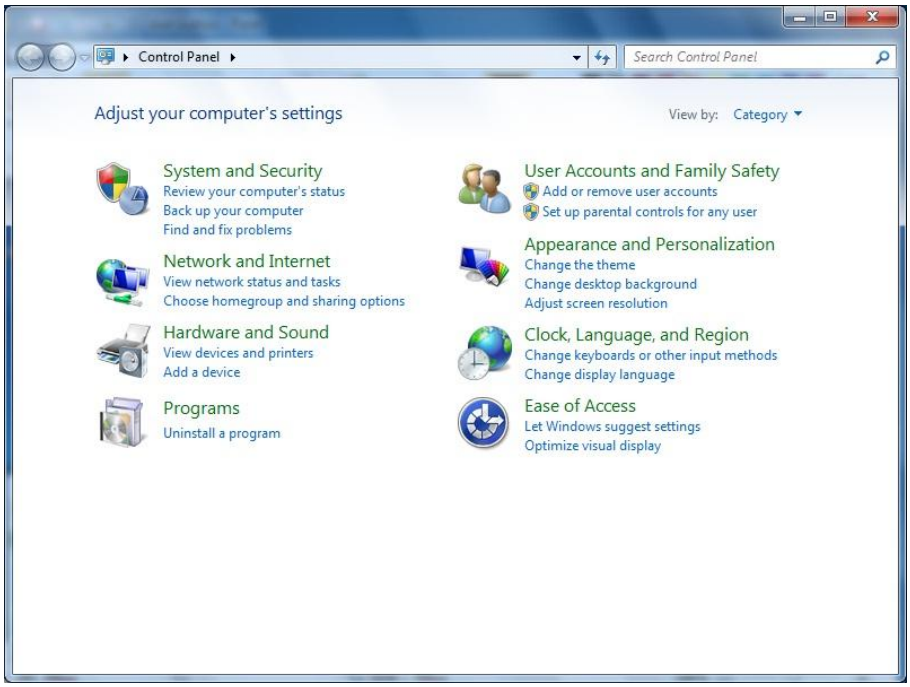
Note that if you don't care about preserving your existing network connection, you do not need to have a second NIC card installed in your PC. You can follow this procedure for changing the IP address of your primary NIC card, but you will not be able to use that card later to connect to your existing network unless you change its IP address back to its original settings.

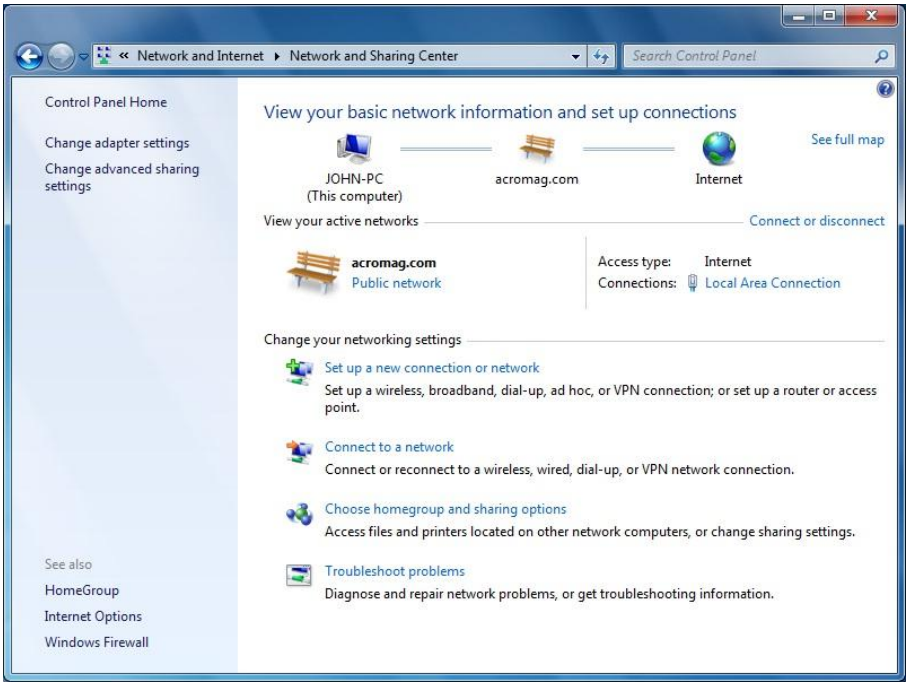
Setup for Windows 7 Operating System

1. From the Windows 7 desktop, click on the **windows** button in the lower left-hand corner, and then click on **Control Panel**.

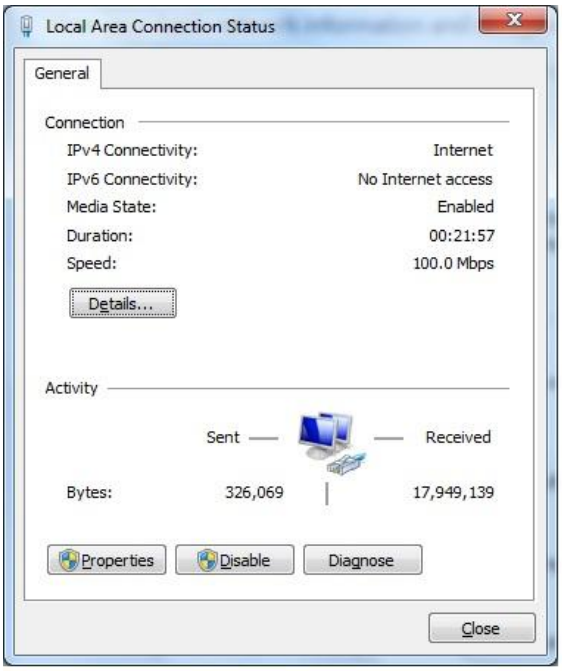


2. Click on **View network status and tasks.**



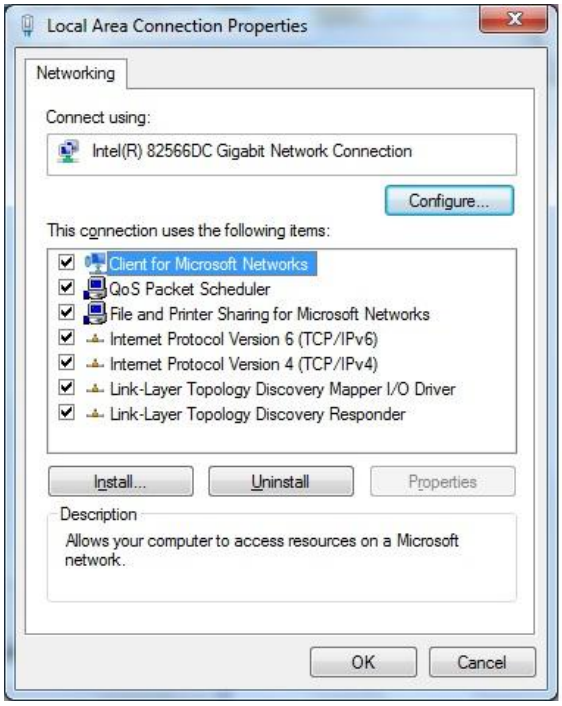


3. Click on the **Local Area Connections** icon.



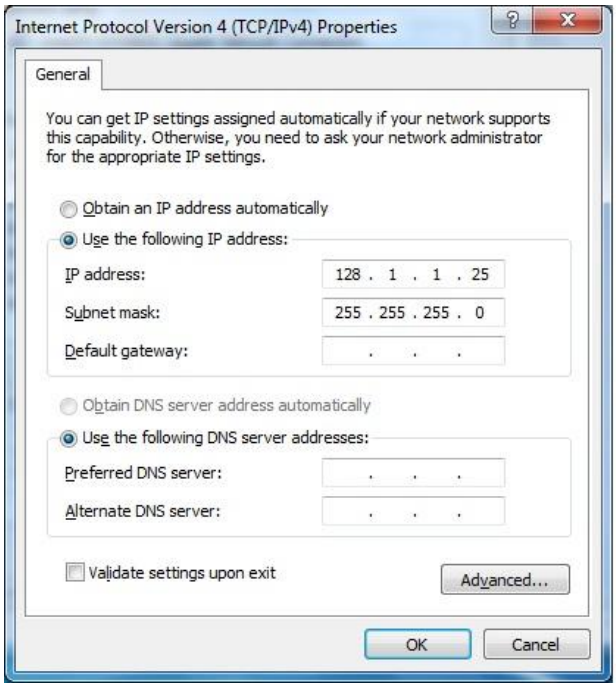
4. Click on the properties button.

5. Click on the **Internet Protocol Version 4 (TCP/IPv4)** item and click on the properties button.



6. Click on the Use the following IP address option.

7. Change the IP address to 128.1.1.XXX (128.1.1.25 for our example, see screenshot)



Note: The leading portion of the IP address (128.1.1) represents the sub-network that we are creating for the Acromag Module. The trailing portion (.XXX) represents the host/node number that you select. For this network, the host portion must be between 0 and 255. The first and last node addresses should not be used. In this example, we have arbitrarily chosen node 25. The following IP addresses are not allowed.

Reserved IP Addresses
128.1.1.0 (Network Server)
128.1.1.10 (DNS Server)
128.1.1.100 (Module Default)
128.1.1.255 (Bridge or Switch)

8. Change the **Subnet Mask** to **255.255.255.0** (see screenshot).

9. Click **OK** on the Internet Protocol Properties screen.

10. Click **OK** on the Local Area Connection Properties screen.

11. Click **Close** on the Local Area Connection Status screen.

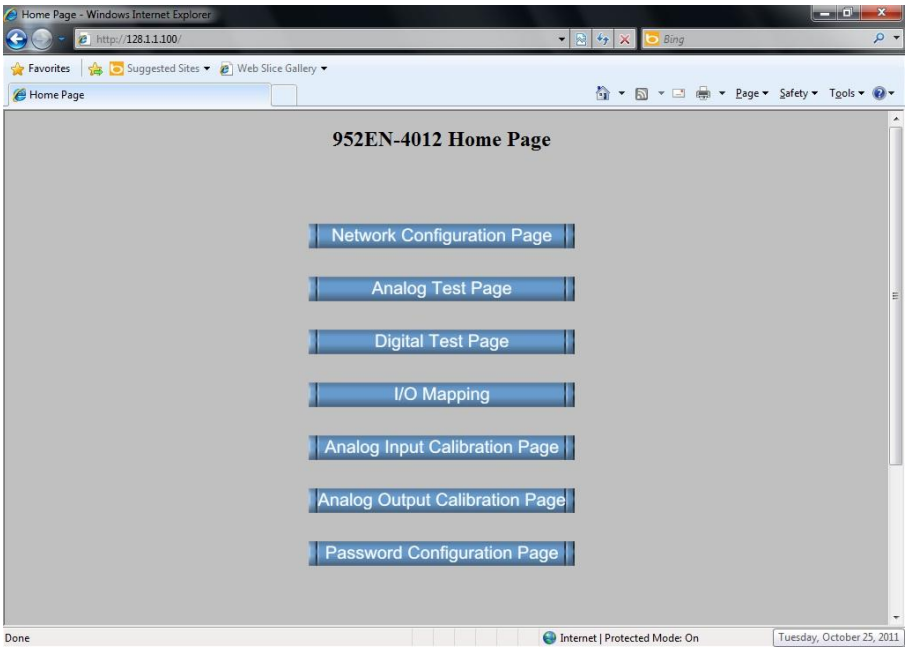
If we examine the IP address shown above, we note that we are building a Class C sub-network (see default Class C subnet mask) at address 128.1.1.0 (this first node address of a sub-network is reserved for the server of the sub-network). The NIC card is at node address at 128.1.1.25 (node 25). Note that all nodes of this sub-network will share the 128.1.1 address prefix. Typically, the address of node 10 is reserved for a DNS server (128.1.1.10). The last node address (128.1.1.255) is also reserved (typically for a network bridge or switch). The module will use the node 100 address at 128.1.1.100 (its Default Mode address). As a general rule, do not use the first and last node addresses for the module or the NIC card.

13. The Ethernet port of the Acromag Module is wired MDI and does not include automatic crossover. The Ethernet port of your PC is also wired MDI and may not include automatic crossover. As such, connect your Module to your PC using a crossover CAT-5 cable.

    Note: You may use a standard (direct) cable when connecting your PC or module to a hub or switch port, which are generally wired MDI-X and may even include automatic crossover.

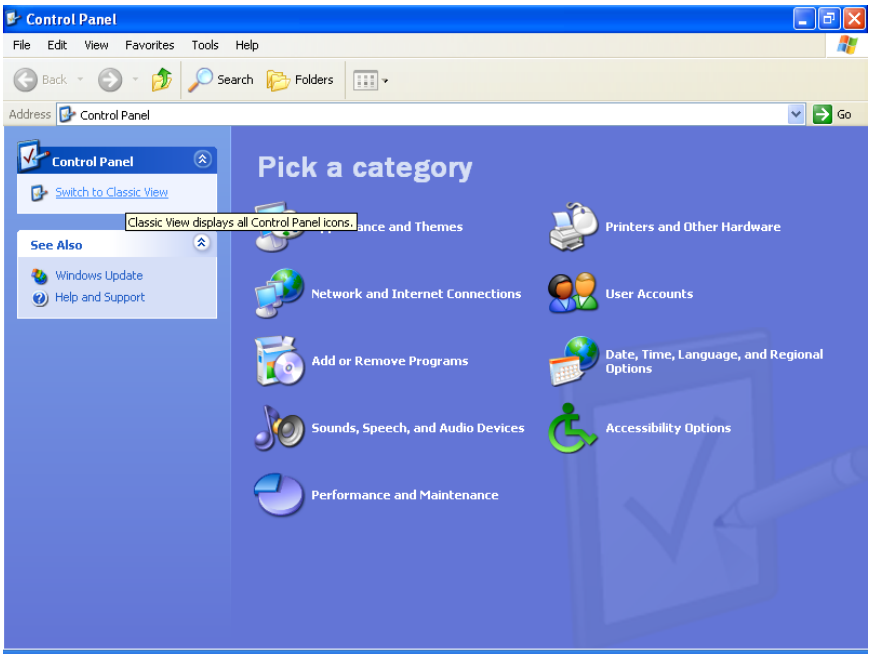
14. To gain access to the Ethernet Module web pages, open up your web browser and type the default address of the Ethernet Module (128.1.1.100) on the address line of the browser and then hit the enter button.

    Note: If the Ethernet Module is not powered, you cannot access its built-in web pages.



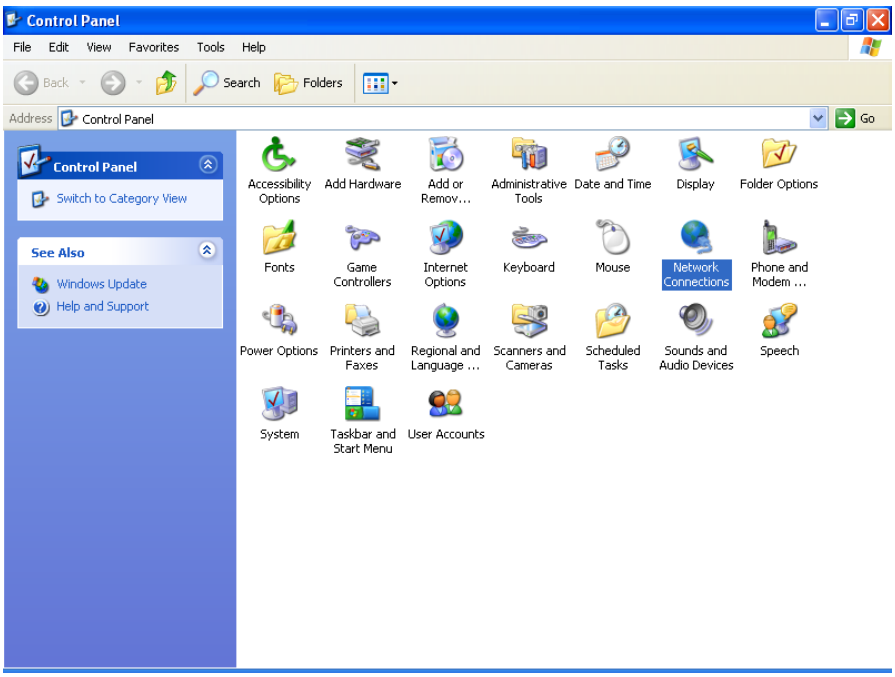
Setup for Windows XP Operating System

1. From the Windows XP desktop, click on the **Start** button in the lower left-hand corner, and then click on **Control Panel**.

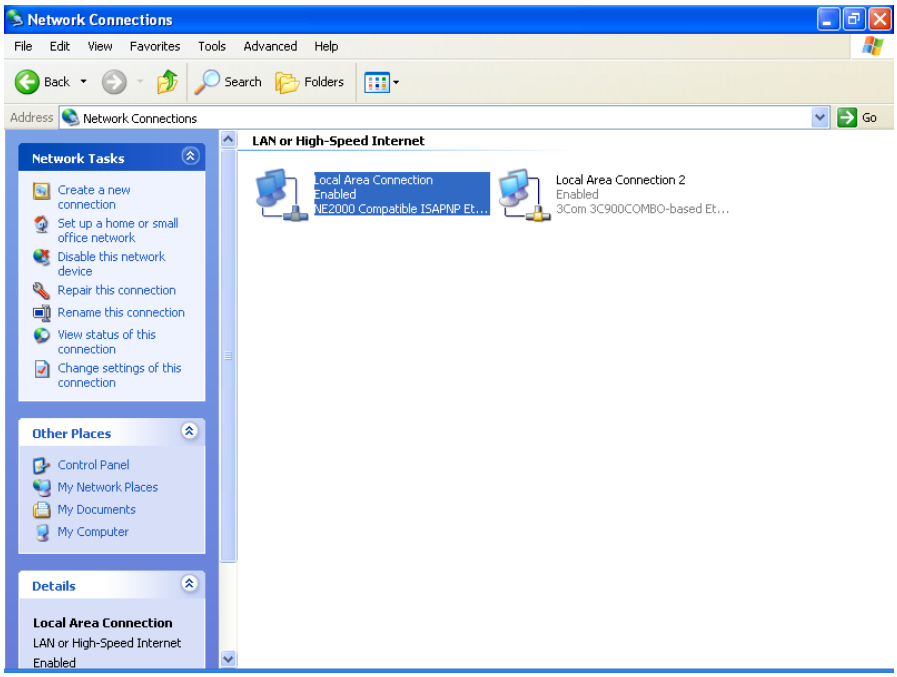


2. Click on **Switch to Classic View** to display all the Control Panel icons.

3. Double-click on the **Network Connections** icon.



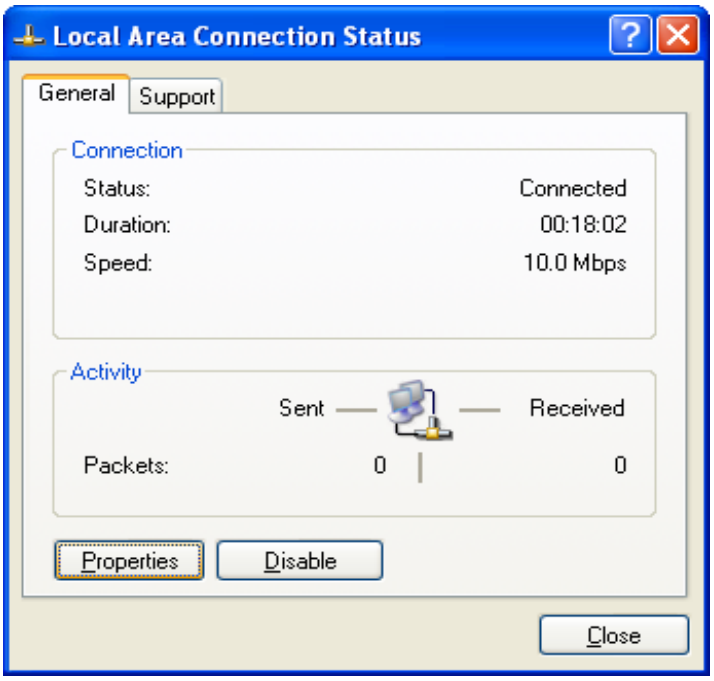
4. Double-click on the network adapter that will be connected to the Ethernet module.



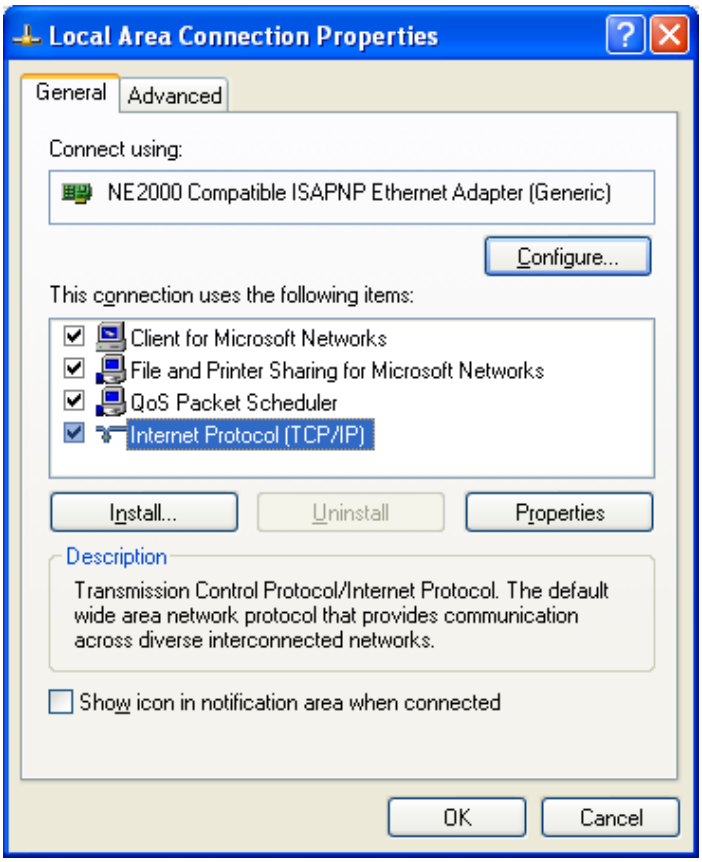
Note: It is assumed that your PC already has a primary network adapter that allows access to the Internet. This network adapter does not require any changes.

Note: In order to access your Ethernet Module via the Internet, your computer will need two network adapters. Use one adapter for your existing network connection and the other for connection to an Acromag Ethernet Module.

Note: The network adapters on your computer are most likely different than the ones used in this example. However, the setup for your network adapters should be similar.



5. Click on the **Properties** button.



6. Double-click on the **Internet Protocol (TCP/IP)** item.

7. Click on the **Use the following IP** address option.

8. Change the **IP address** to **128.1.1.XXX** (128.1.1.25 for our example, see screenshot).

Note: The leading portion of the IP address (128.1.1) represents the sub-network that we are creating for the Acromag Module. The trailing portion (.XXX) represents the host/node number that you select. For this network, the host portion must be between 0 and 255. The first and last node addresses should not be used. In this example, we have arbitrarily chosen node 25. The following IP addresses are not allowed.

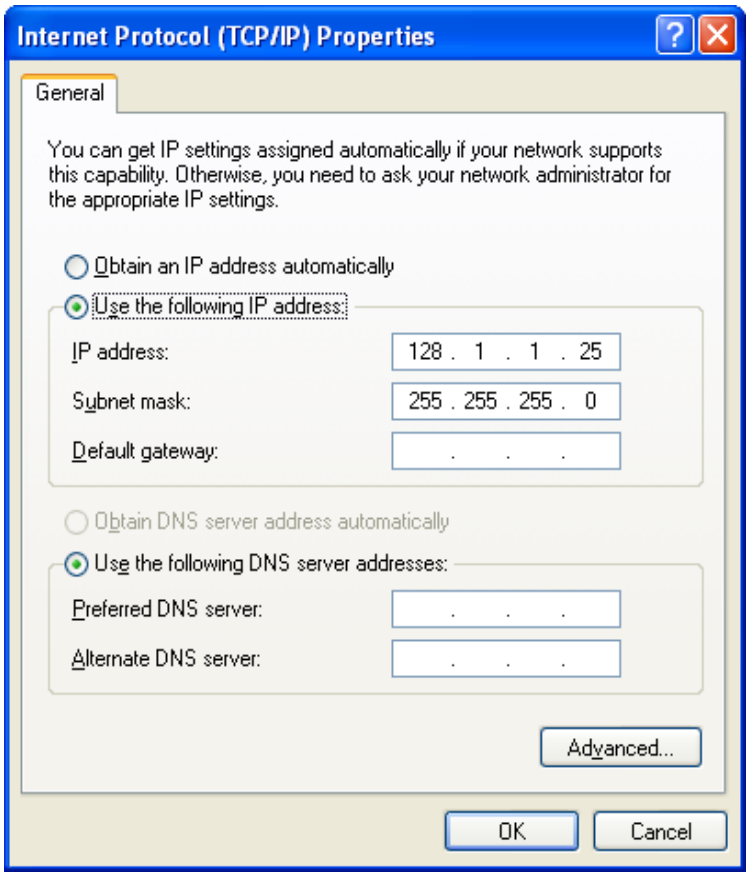
Reserved IP Addresses
128.1.1.0 (Network Server)
128.1.1.10 (DNS Server)
128.1.1.100 (Module Default)
128.1.1.255 (Bridge or Switch)

9. Change the **Subnet Mask** to **255.255.255.0** (see screenshot).

10. Click **OK** on the Internet Protocol Properties screen.

11. Click **OK** on the Local Area Connection Properties screen.

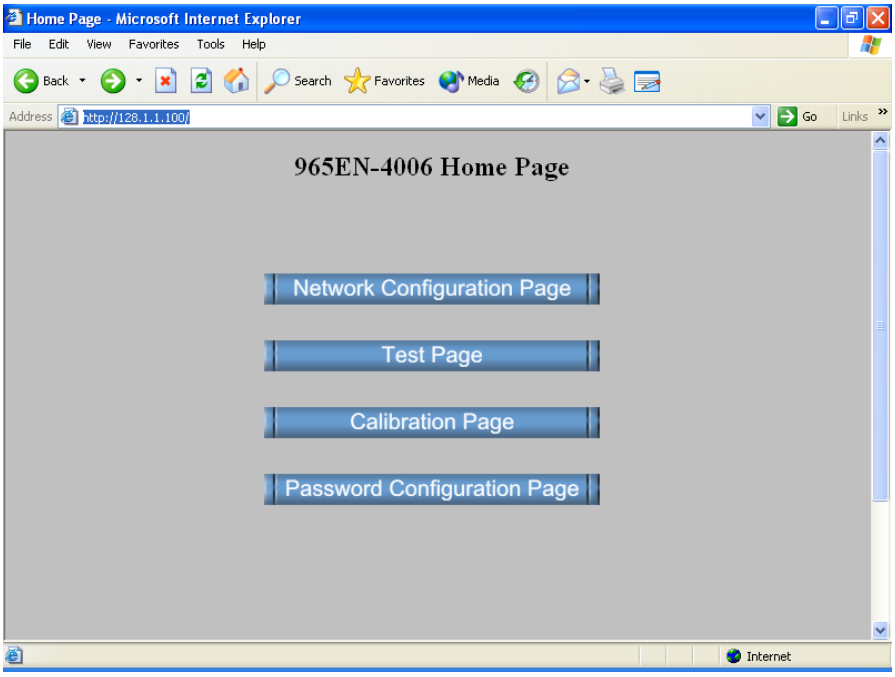
12. Click **Close** on the Local Area Connection Status screen.



If we examine the IP address shown above, we note that we are building a Class C sub-network (see default Class C subnet mask) at address 128.1.1.0 (this first node address of a sub-network is reserved for the server of the sub-network). The NIC card is at node address at 128.1.1.25 (node 25). Note that all nodes of this sub-network will share the 128.1.1 address prefix. Typically, the address of node 10 is reserved for a DNS server (128.1.1.10). The last node address (128.1.1.255) is also reserved (typically for a network bridge or switch). The module will use the node 100 address at 128.1.1.100 (its Default Mode address). As a general rule, do not use the first and last node addresses for the module or the NIC card.

13. The Ethernet port of the Acromag Module is wired MDI and does not include automatic crossover. The Ethernet port of your PC is also wired MDI and may not include automatic crossover. As such, connect your Module to your PC using a crossover CAT-5 cable.

Note: You may use a standard (direct) cable when connecting your PC or module to a hub or switch port, which are generally wired MDI-X and may even include automatic crossover.

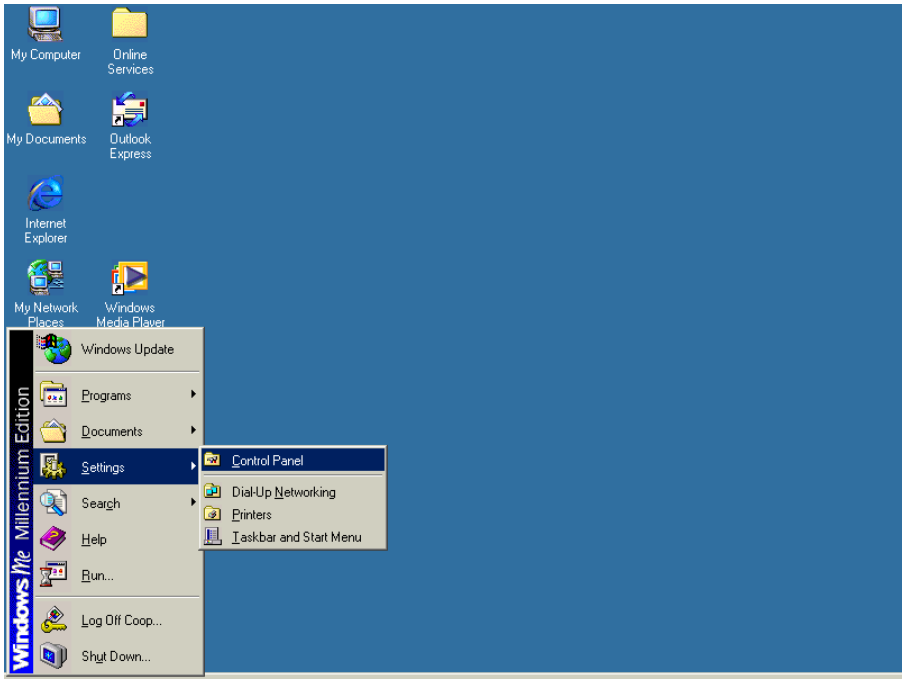


14. To gain access to the Ethernet Module web pages, open up your web browser and type the default address of the Ethernet Module (128.1.1.100) on the address line of the browser and then click **Go**.

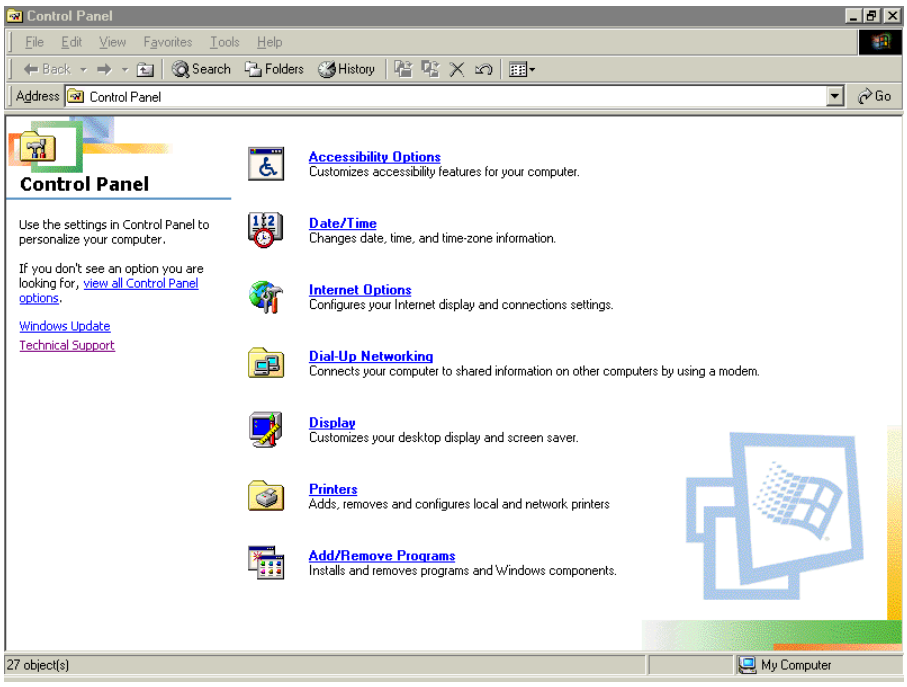
    Note: If the Ethernet Module is not powered, you cannot access its built-in web pages.

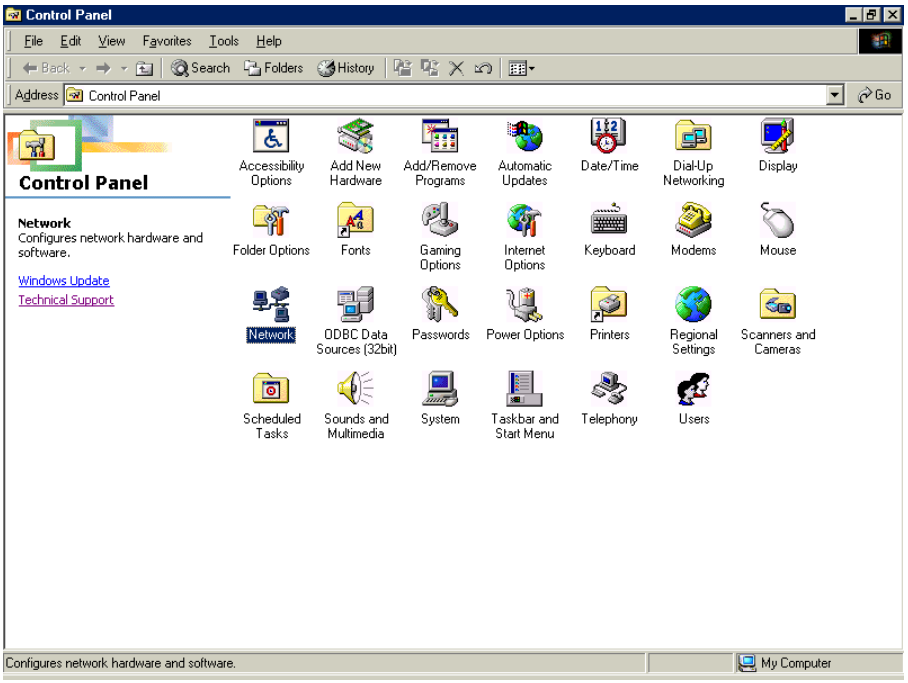
Setup For Windows ME Operating System

1. From the Windows ME desktop, click on the **Start** button in the lower left-hand corner. Highlight **Settings** from the pop-up menu and then click on **Control Panel**.

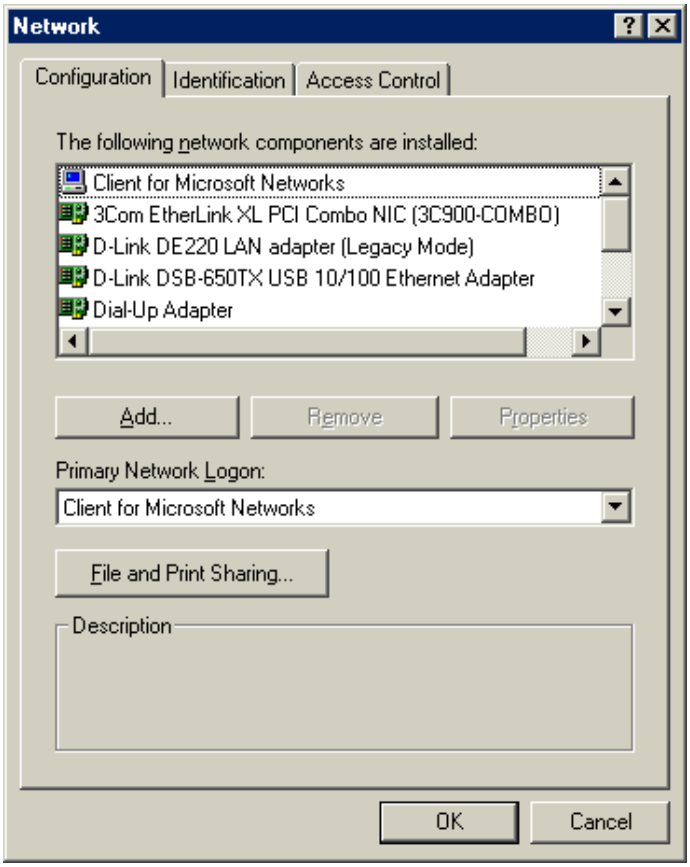


2. Click on the **view all control Panel options** located on the left side of the screen.





3. Double-click on the **Network** icon.



Note: It is assumed that your PC already has a primary network adapter that allows access to the Internet. This network adapter does not require any changes.

Note: In order to access Acromag Ethernet Modules via the Internet, your computer will need two network adapters. Use one adapter for your existing network connection and the other for a connection to an Acromag Ethernet Module.

Note: The network adapters on your computer are most likely different than the ones in this example. However, the setup for your network adapters should be similar.

4. Scroll down the list of installed network components. Towards the bottom of the list, you will see that all of the network adapters are listed again but they have “TCP/IP” prefixes.

5. Click on the network adapter that will have the Ethernet module connected to it, and then click on the **Properties** button.

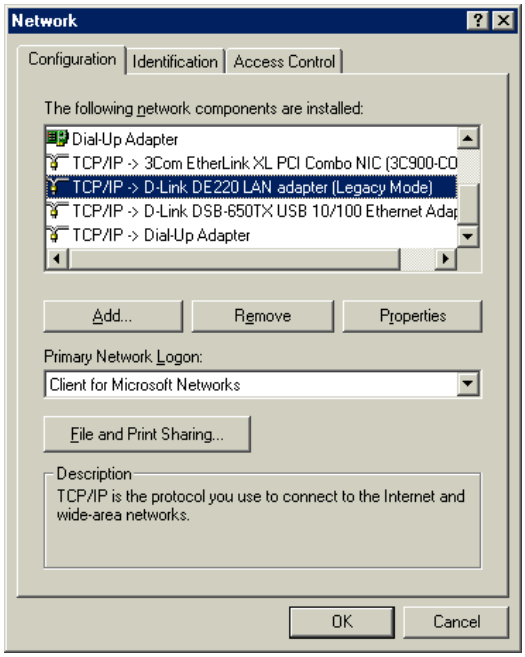
6. The TCP/IP Properties screen will appear for the network adapter you selected. Click on the **Specify an IP address** option located on the IP address screen.

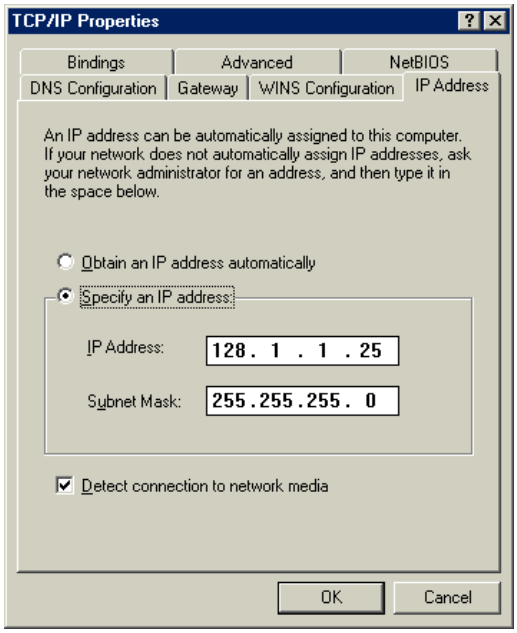
7. Change the **IP Address** to **128.1.1.XXX** (128.1.1.25 for our example, see screenshot).

Note: The leading portion of the IP address (128.1.1) represents the sub-network that we are creating for the Acromag Module. The trailing portion (.XXX) represents the host/node number that you select. For this network, the host portion must be between 0 and 255. The first and last node addresses should not be used. In this example, we have arbitrarily chosen node 25. The following IP addresses are not allowed.

Reserved IP Addresses
128.1.1.0 (Network Server)
128.1.1.10 (DNS Server)
128.1.1.100 (Module Default)
128.1.1.255 (Bridge or Switch)

8. Change the **Subnet Mask** to **255.255.255.0** (see screenshot).





If we examine the IP address shown above, we note that we are building a Class C sub-network (see default Class C subnet mask) at address 128.1.1.0 (this first node address of a sub-network is reserved for the server of the sub-network). The NIC card is at node address at 128.1.1.25 (node 25). Note that all nodes of this sub-network will share the 128.1.1 address prefix. Typically, the address of node 10 is reserved for a DNS server (128.1.1.10). The last node address (128.1.1.255) is also reserved (typically for a network bridge or switch). The module will use the node 100 address at 128.1.1.100 (its Default Mode address). As a general rule, do not use the first and last node addresses for the module or the NIC card.

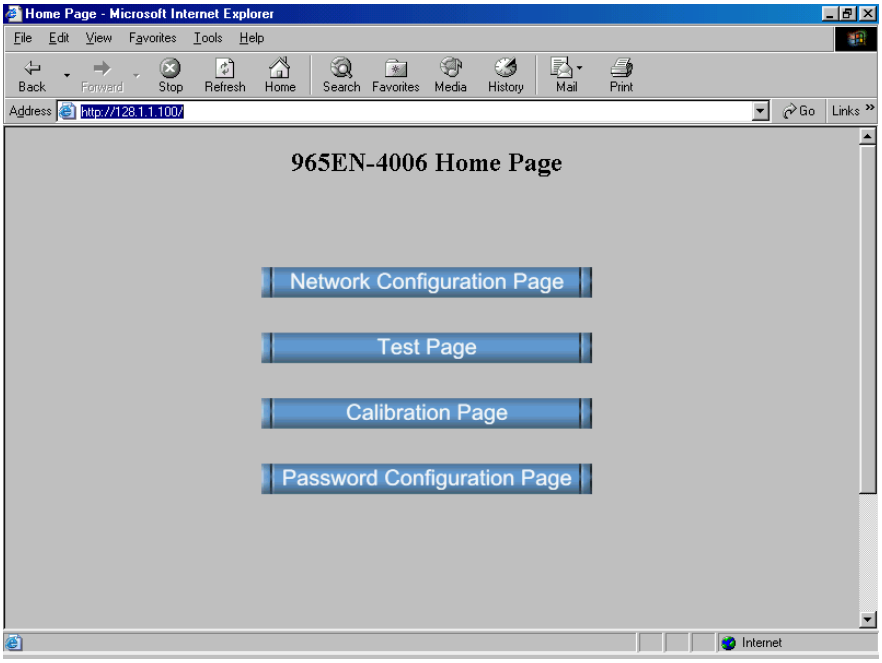
9. Click **OK** on the TCP/IP Properties screen.

10. Click **OK** on the Network screen.

11. You must restart your computer in order to continue the setup.

12. The Ethernet port of the Acromag Module is wired MDI and does not include automatic crossover. The Ethernet port of your PC is also wired MDI and may not include automatic crossover. As such, connect your Module to your PC using a crossover CAT-5 cable.

Note: You may use a standard (direct) cable when connecting your PC or Module to a hub or switch port, which are generally wired MDI-X and may include automatic crossover

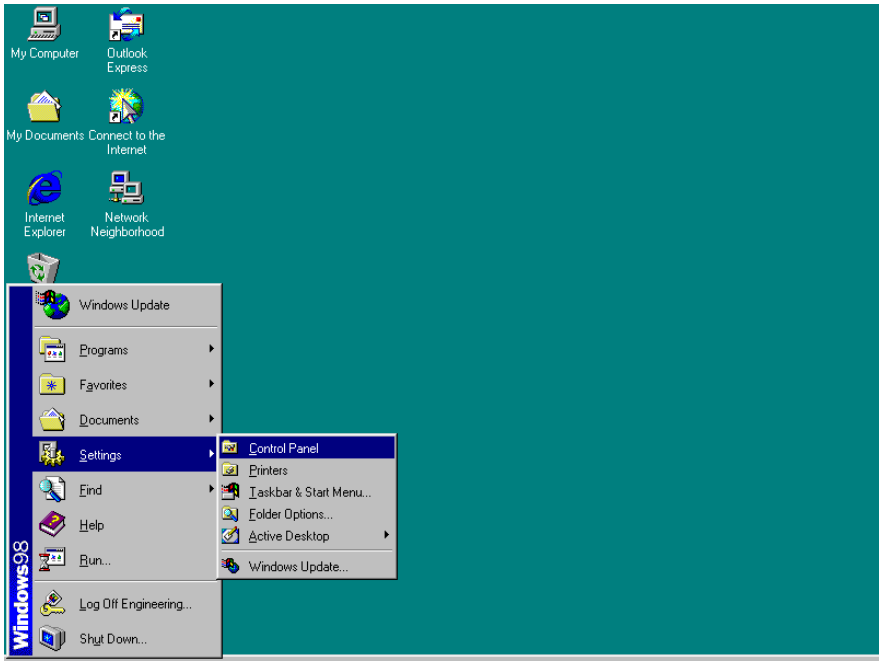


13. To gain access to the Ethernet Module web pages, open up your web browser and type the default address of the Ethernet Module **(128.1.1.100)** on the address line of the browser and then click **Go**.

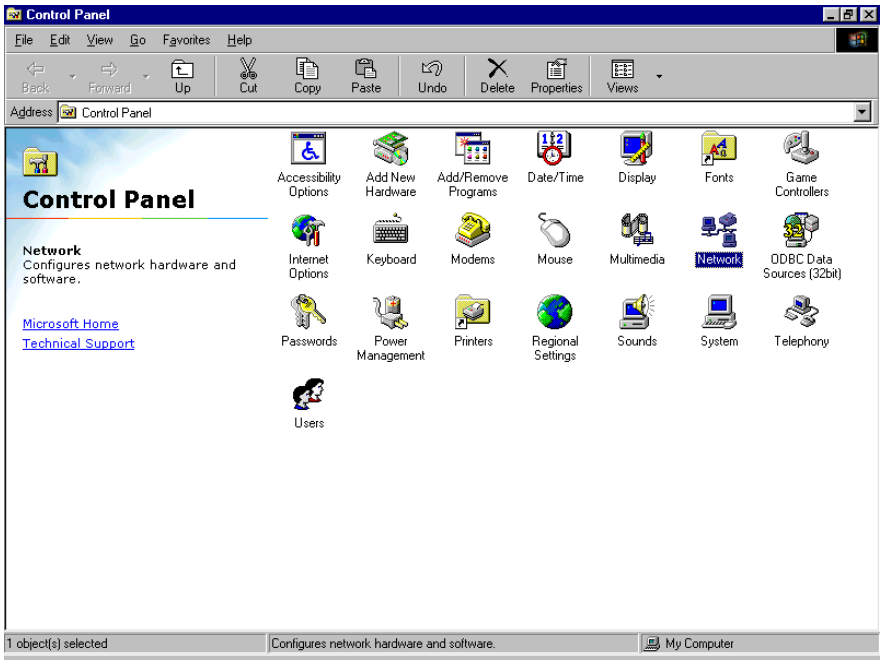
    Note: If the Ethernet Module is not powered, you cannot access its built-in web pages.

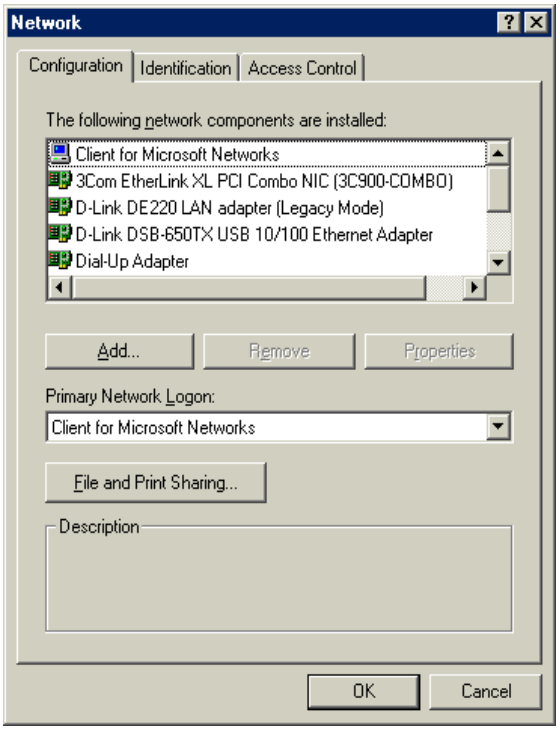
Setup for Windows 98 Operating System

1. From the Windows 98 desktop, click on the **Start** button in the lower left-hand corner. Highlight **Settings** from the pop-up menu and click on Control **Panel.**



2. Double-click on the **Network** icon.





Note: It is assumed that your PC already has a primary network adapter that allows access to the Internet. This network adapter does not require any changes.

Note: In order to access Acromag Ethernet Modules via the Internet, your computer will need two network adapters. Use one adapter for your existing network connection and the other for a connection to an Acromag Ethernet Module.

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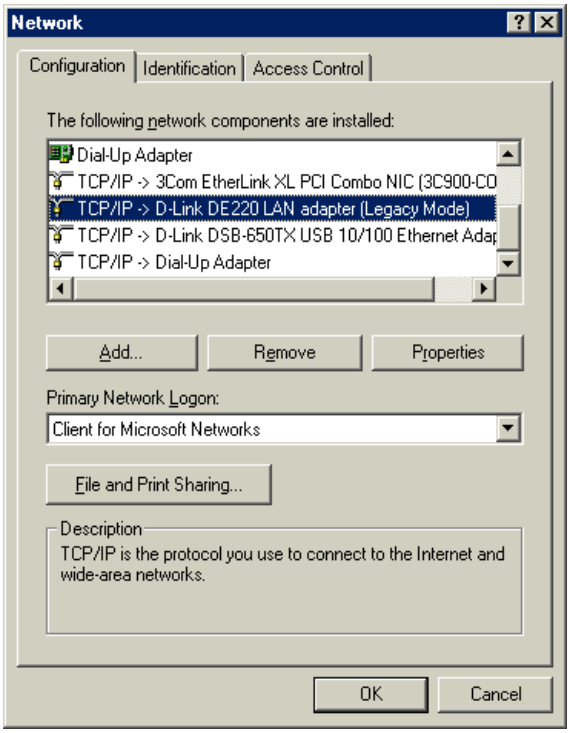

3. Scroll down the list of installed network components. Towards the bottom of the list you will see that all of the network adapters are listed again but they have “TCP/IP” prefixes.

4. Click on the network adapter that will have the Ethernet Module connected to it, and then click on the **Properties** button.

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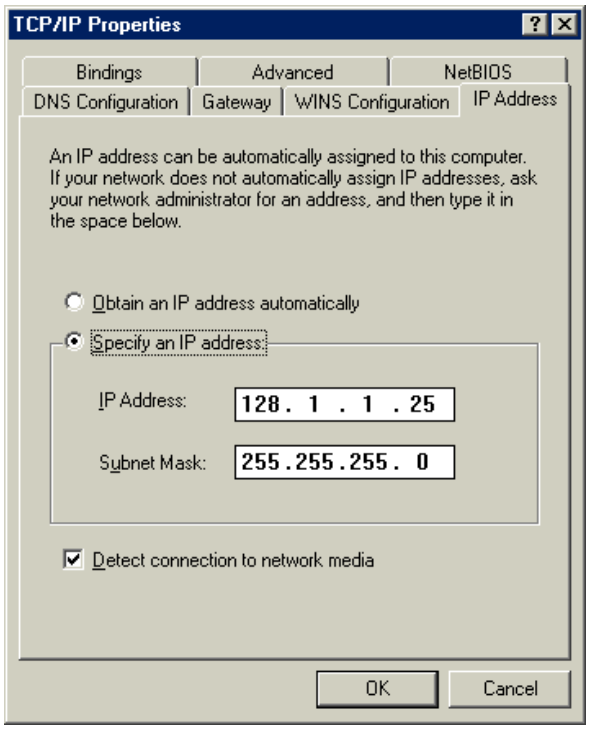
128.1.1.10 (DNS Server)
128.1.1.100 (Module Default)
128.1.1.255 (Bridge or Switch)

7. Change the **Subnet Mask** to **255.255.255.0** (see screenshot).

8. Click **OK** on the TCP/IP Properties screen.

9. Click **OK** on the Network screen.

10. You must restart your computer in order to continue the setup.



If we examine the IP address shown above, we note that we are building a Class C sub-network (see default Class C subnet mask) at address 128.1.1.0 (this first node address of a sub-network is reserved for the server of the sub-network). The NIC card is at node address at 128.1.1.25 (node 25). Note that all nodes of this sub-network will share the 128.1.1 address prefix. Typically, the address of node 10 is reserved for a DNS server (128.1.1.10). The last node address (128.1.1.255) is also reserved (typically for a network bridge or switch). The module will use the node 100 address at 128.1.1.100 (its Default Mode address). As a general rule, do not use the first and last node addresses for the module or the NIC card.

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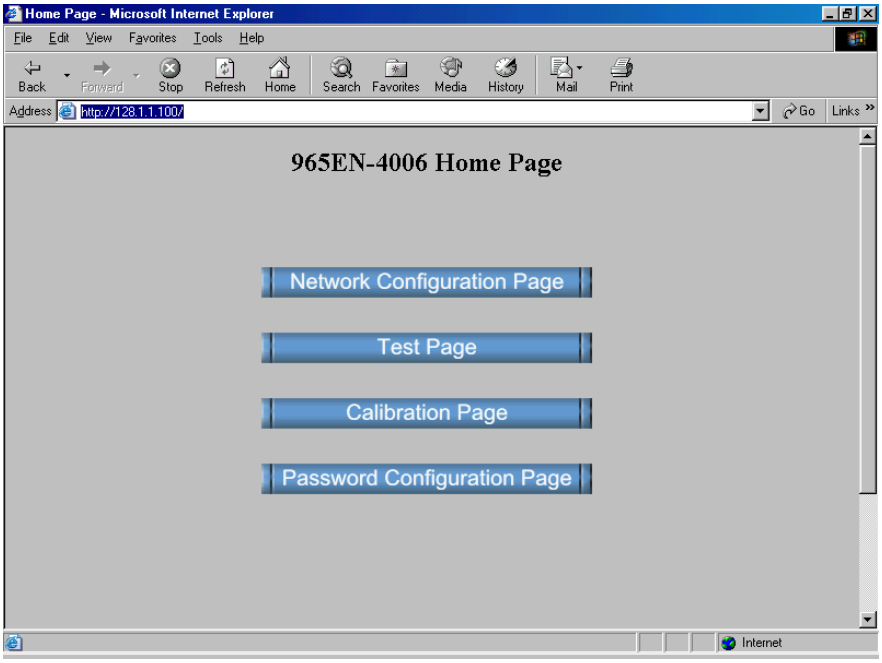

12. To gain access to the Ethernet Module web pages, open up your web browser and type the default address of the Ethernet Module **(128.1.1.100)** on the address line of the browser and then click **Go**.

    Note: If the Ethernet Module is not powered, you cannot access its built-in web pages.