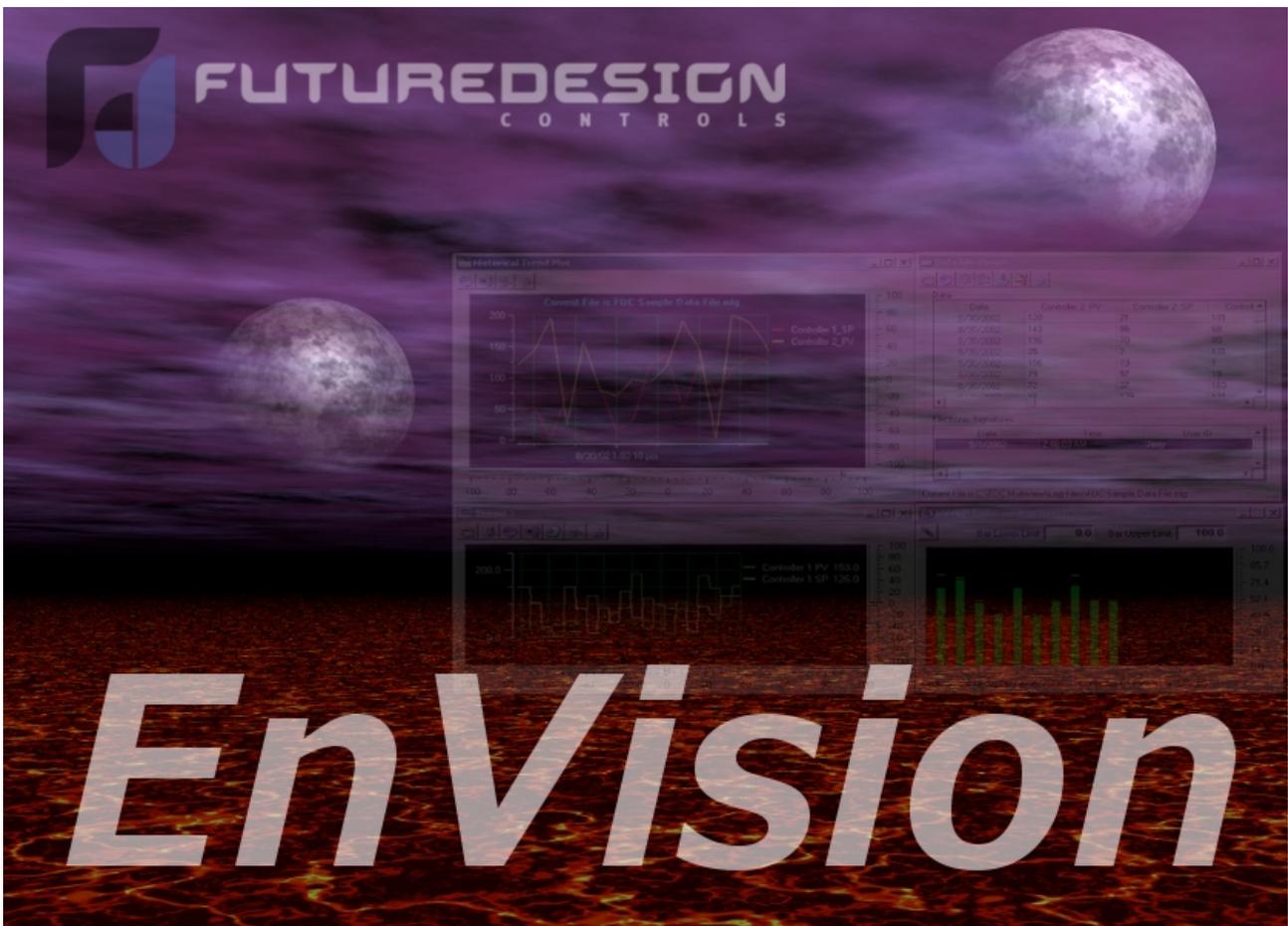




**FUTUREDESIGN**  
C O N T R O L S

## *EnVision* Network Communications Guide





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## 1 Getting Started

EnVision is a SCADA (Supervisory Control and Data Acquisition) package for the Orion-Mi and nCompass CM multi-loop control systems, the nCompass LC dual loop controller, and also provides support for use with Future Design Controls' 100, 300 and C-Series single-loop PID controllers, L91/L41 limit controllers, P-Series profile controls and FDC-IO modules. Data from each device can be monitored from the Windows® based EnVision package. Connection to the individual devices is accomplished via an RS485 serial connection or Ethernet-to-serial connection.

EnVision provides a rich set of tools for control interaction and data analysis. Control data can be viewed in device detail, faceplate, digital and trend formats. You can change set points, alarm set points and even create, save, download and start schedules for any Orion or P-Series controller in the system.

The EnVision software package can monitor up to 128 individual devices. Each of the 128 devices, whether an Orion-M controller, or 300-Series controller for example, can have their data saved to the hard disk at user-defined rates. Data file analysis tools (digital and trend) make looking at schedule run data a simple task.

EnVision offers 21CFR Part 11 security features for use in Pharmaceutical or any industry that requires controlled security access to software functions, encrypted data, electronic signatures and audit trail listings.

**NOTE:** *This guide covers the installation of an Ethernet-to-serial communications link for connecting devices to EnVision. See the EnVision Configuration and User Manuals for information regarding the setup and activation of each individual device in EnVision. For detailed operation and configuration of the Orion-M multi-loop controller or other FDC control product, please see the respective controller manual.*

### 1.1 Hardware Requirements

PC: minimum 2GHZ Pentium4 with 512MB of RAM.

OS: 98, NT 2000, XP Professional, Vista and Windows 7 operating systems supported.

EnVision will run on a lesser machine but performance may suffer if large trend buffers are used. It is recommended that a PC with an actual serial port be used. However, since many computers no longer provide a standard serial port, USB to serial port converters can be used. Note that port assignment for the converter can change depending upon which USB port it is connected to. Therefore, once the adapter has been connected to the computer and the proper port number is assigned in the EnVision Configurator, the adapter should always remain connected to the same USB port for use with EnVision.

Supported Controller Models: Orion-M iSeries and nCompass CM multi-loop, nCompass LC dual loop, 100, 300, and C-Series single-loop PID controllers, L91/L41 limit controllers and P-Series profile controls with RS485 communications as well as FDC IO-8TCS/6RTD/8AIIIS/8AIVS modules.

When using Ethernet communications, serial to Ethernet protocol converters are required. Future Design Controls offers the model PC-E converter for this purpose. One PC-E is typically required for each device in the system. In addition, a Moxa MB3170, MGate Modbus master is required at the PC to address individual controllers from the PC's serial port over the Ethernet network. Each of these devices converts the serial communications signals between the PC and individual controllers to an Ethernet protocol format so that a network connection can be used.

Windows® is a registered trademark of the Microsoft Corporation

## 1.2 Connecting Controllers to EnVision

Connecting the individual Orion-M, nCompass and single-loop PID controllers to EnVision, involves making the proper communication wiring connections and setting the Modbus slave address in each controller that is on the communications link. If the addresses are not set correctly, or multiple controls have the same communications address, the system will not work properly. Each controller must have its own unique address, from 1 to 128, corresponding to the address number (Add#) in the EnVision Configurator.

**NOTE:** *The location of the controller on the communications network does not matter when assigning the communications address. The controller is identified by its address only, not its position when wired into the communications link.*

### 1.2.1 Setting the Orion-M Controller Address

To assign the communications address from the Orion-M main view screen, select “System Setup” from the Setup menu. Next, select “Web Server/Modbus/VNC” from the Setup menu. This will display the Web Server/Modbus/VNC screen.

Touch the address entry field for the “Modbus Slave Address” and enter the desired address for the controller on the network. The address entered here, will correspond to the address (device) number in EnVision. In order to view the controller in EnVision, the corresponding device address in EnVision must be configured to match the Orion-M and be enabled under “Device Setup” in EnVision.

The Orion-M can only be assigned addresses in the range of 1-31. When assigning controllers to EnVision, be sure to leave the first 31 addresses open for Orion-M systems. If more than 31 Orion-M systems are going to be installed on the communications network, Orion-M controls with the same Modbus slave address must be placed on separate PC-E converters. The Moxa, MGate Modbus master can then be configured to assign a controller address of 42 in EnVision for example, to an Orion-M controller with a Modbus slave address of 3 at the IP address of the PC-E converter.

The address re-assignment is transparent to EnVision, which allows a total of 128 Orion-M systems to be attached to the network. For additional information regarding the configuration of the MGate Modbus master, see Section 3.0, Configuring the MGate Modbus Master of this Guide.

### 1.2.2 Setting the nCompass CM Controller Address

To assign the communications address from the main view screen, select “Settings” from the Device menu. Next, select “Comms” from the Comms settings menu. This will display the Communications screen.

The screenshot shows the 'Comms' settings screen. At the top, there are icons for a monitor, a question mark, and a home button, along with the date and time: 6/28/2013 2:39 PM. The settings are as follows:

- Modbus Address: 1
- VNC Address: 0
- VNC Device Name: nCompass
- VNC Password: (empty field)
- IP Address: 192.168.0.6
- Parity: None (dropdown menu)

At the bottom, there are three buttons: 'Www.' (with a small orange square), 'VNC' (with a small yellow square), and 'Save'.

Touch the Modbus Address entry field and enter the desired address for the controller on the network. The address entered here, will correspond to the address (device) number in EnVision. In order to view the controller in EnVision, the corresponding device address in EnVision must be configured to match the nCompass and be enabled under “Device Setup” in EnVision.

The nCompass CM can only be assigned addresses in the range of 1-31. When assigning controllers to EnVision, be sure to leave the first 31 addresses open for nCompass CM controls. If more than 31 controls are going to be installed on the communications network, nCompass CM controls with the same Modbus address must be placed on separate PC-E converters. The Moxa, MGate Modbus master can then be configured to assign a controller address of 62 in EnVision for example, to an nCompass CM controller with a Modbus address of 9 at the IP address of the PC-E converter.

The address re-assignment is transparent to EnVision, which allows a total of 128 nCompass controls to be attached to the network. For additional information regarding the configuration of the MGate Modbus master, see Section 3.0, Configuring the MGate Modbus Master of this Guide.

### 1.2.3 Setting the nCompass LC Controller Address

To assign the communications address from the main view screen, select “Settings” from the Device menu. Next, select “Comms” from the Comms settings menu. This will display the Communications screen.

The screenshot shows the 'Comms' settings screen. At the top, there are icons for a monitor, a question mark, and a home button, along with the date and time: 4/23/2013 5:04 PM. The settings are as follows:

- Modbus Address: 1
- VNC Address: 0
- VNC Device Name: nCompass
- VNC Password: \*\*\*\*\*
- IP Address: 192.168.0.6
- Parity: Even (dropdown menu)
- Pswrd: None (dropdown menu)

At the bottom, there are three buttons: 'Www.' (with a small yellow square), 'VNC' (with a small yellow square), and 'Save'.

Touch the Modbus Address entry field and enter the desired address for the controller on the network. The address entered here, will correspond to the address (device) number in EnVision. In order to view the controller in EnVision, the corresponding device address in EnVision must be configured to match the nCompass and be enabled under “Device Setup” in EnVision. The Parity settings must also be set for “Even” in order to be compatible with EnVision.

The nCompass LC can only be assigned addresses in the range of 1-31. When assigning controllers to EnVision, be sure to leave the first 31 addresses open for nCompass LC controls. If more than 31 controls are going to be installed on the communications network, nCompass LC controls with the same Modbus address must be placed on separate PC-E converters. The Moxa, MGate Modbus master can then be configured to assign a controller address of 36 in EnVision for example, to an nCompass LC controller with a Modbus address of 5 at the IP address of the PC-E converter.

The address re-assignment is transparent to EnVision, which allows a total of 128 nCompass controls to be attached to the network. For additional information regarding the configuration of the MGate Modbus master, see Section 3.0, Configuring the MGate Modbus Master of this Guide.

#### 1.2.4 Setting Single-Loop Controller Communication Parameters

The 100, 300, L91/L41, C and P-Series controllers provide additional communications settings for baud rate, data bits, stop bits and parity, in addition to the communications address. For instructions on how to access these settings, see the respective controller manual for the model of controller you are using. In order for the controllers to communicate with EnVision, set the communication settings to the factory default of 9600 baud, 8 data bits, even parity and 1 stop bit as applicable.

The communications address entered in the controller will correspond to the address (device) number in EnVision. In order to view the controller in EnVision, the corresponding device address in EnVision must be configured to match, and be enabled under “Device Setup” in EnVision.

#### 1.2.5 Setting IO Module Communication Parameters

The FDC IO-8TCS/6RTD/8AIIS/8AIVS modules must be configured prior to connecting them to the EnVision communications link. This includes setting the thermocouple or RTD type for temperature models, and programming the proper communication settings for compatibility with EnVision.

**NOTE:** *Analog and voltage input models must be programmed for the 0-4095 input range (input type =1). The EnVision Configurator provides linear scaling for each individual voltage and/or current input that allows the user to scale the 0(2)-10V or 0(4)-20mA signal to represent values in engineering units.*

For information regarding the steps involved in configuring the various IO modules, consult the FDC IO Manual on using IO Studio software, a free Windows based software package provided by Future Design that provides a simple, easy to use interface for configuring all FDC IO modules. The programmed communication settings must be set as follows:

Baud Rate: 9600  
Parity: Even  
Stop Bit: 1  
Reply Delay: 0

Once the module has been configured using IO Studio, DIP switch ten (0) must be turned on to activate the programmed communication settings so that the module can communicate properly with EnVision. DIP switches 1-7 must also be set to correspond with the desired address for the IO module on the EnVision communications link.

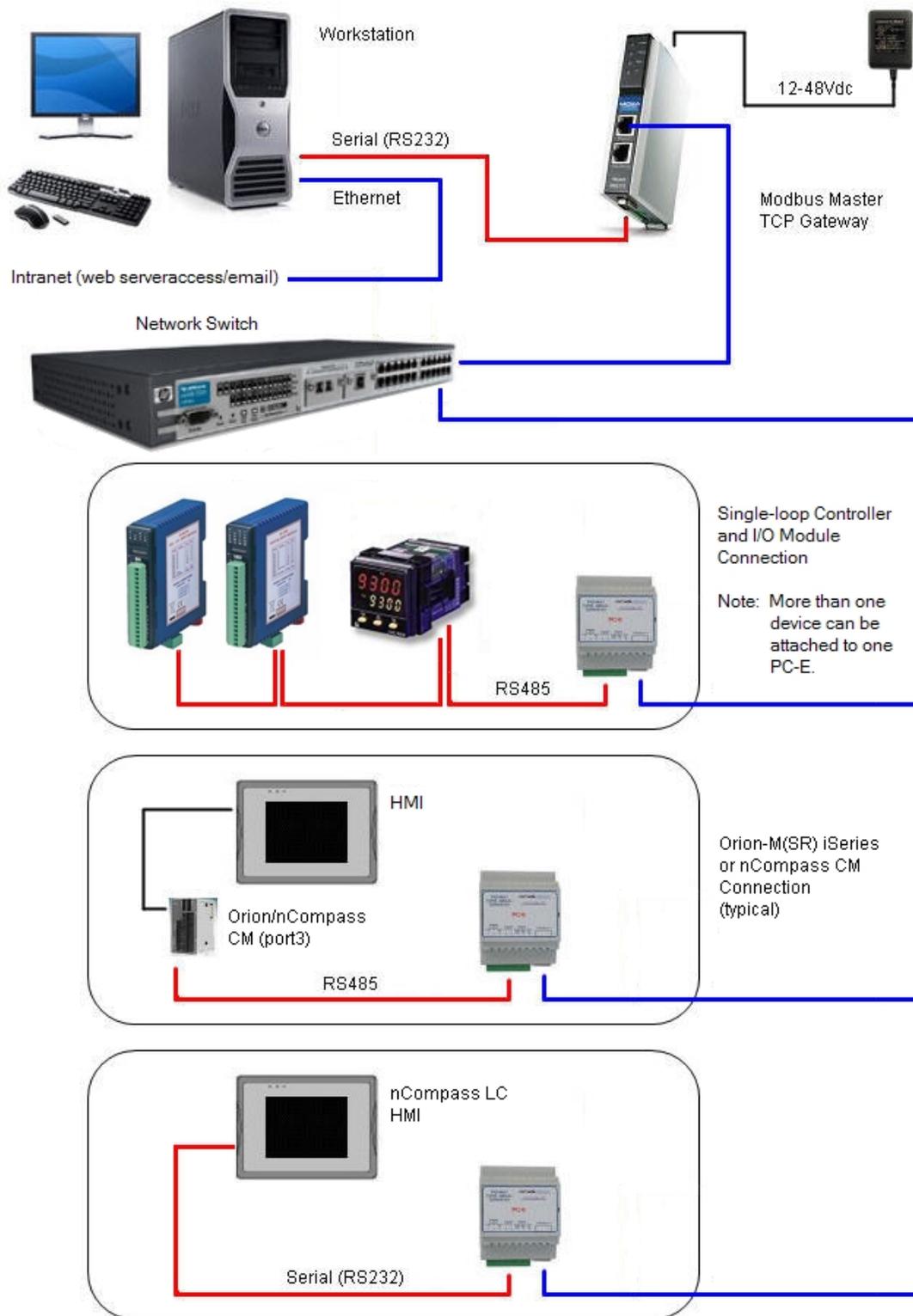
## 1.2.6 Ethernet to Serial Communications Wiring

Ethernet communication provides a very robust and reliable backbone for controller communications even in noisy environments, and offers a virtually unlimited distance between the controllers and the PC running EnVision. However, special consideration must be taken when connecting controllers to EnVision over an Ethernet network via the PC-E protocol converters.

To set up this type of communications link, each PC-E (typically one per controller) is configured with a unique IP address. The IP address must then reference the specific Modbus address of the controller, so that the Moxa MB3170, MGate Modbus master can send the proper Modbus command to the correct PC-E in order to communicate with the controller. In addition, the controller communications network should be separated from all other networks within the building.

While the convenience of Ethernet makes it appear that you can simply connect any device to your network and make it available, doing so can cause performance issues when using EnVision. In order for EnVision to perform operations such as data logging for example, it must be able to acquire data when needed to log it. If there is heavy network traffic from other devices like printers, a co-worker downloading a large file from the internet, etc., this can consume most of the network bandwidth at the time EnVision needs to acquire data. Since the network is consumed with other activity, EnVision would not be able to acquire the data it needs and a communications error would result.

To insure proper operation, EnVision should be run on an independent Ethernet network to prevent other business machines from interrupting communications. Setting up the PC to controller network, and the steps required to properly configure the PC-E and Moxa Ethernet to serial converters, is discussed in the following two sections of this guide.



**NOTES**

1. All network (Ethernet) cables are straight-thru (not crossover) patch cables.
2. Serial (RS232) cable between workstation serial port and Modbus Master TCP Gateway is a null-modem, DB9 female to DB9 female (crossover) cable.

### 1.3 Performance Considerations

For each device enabled in EnVision, the software must query data from the controller in order to display the information and data log the values. While communications to each individual device happens very quickly, as more devices are added to the communications link, the total amount of time that elapses between each read of a controller for data increases. This begins to slow the rate at which real-time data can be acquired and displayed in EnVision.

This is not a limitation of the software, but the limitation of the communications link. For a system with a single Orion-M controller, EnVision can capture and display data as often as every 300ms. However, if ten Orion-M systems were attached at the given 300ms per control, that results in a 3 second scan rate. Thus, EnVision is only able to acquire data for each controller once every 3 seconds. Depending on the desired real-time data update rate, it may be necessary to divide the total number of devices between multiple PC's running EnVision to keep the total scan time as short as possible.

EnVision's scan rate can be adjusted by the user under Device Setup in the EnVision runtime program. This adjusts the polling interval, i.e., the minimum period between commands that EnVision sends to read data from each device on the communications link. The scan rate can be adjusted from 100ms to 5000ms (5 seconds). The shorter the time period the faster EnVision scans all enabled devices; however, depending upon the network configuration and controls on the link, the faster scan rate may cause communication errors. It also consumes more of the PC's processor capacity for handling communications rather than data logging or displaying information. By adjusting the scan rate, the user can balance the system for the best overall performance.

#### 1.3.1 Device Scan Rates

In order to acquire data from each device on the communications link, EnVision must send a "read" command to tell the device to send the requested information. There is a limit to the amount of data that can be sent in each response, therefore, certain devices may require more than one read command in order to get all available data from the device.

The total scan time for each device, i.e., the time it takes to acquire all of the data, is equal to the number of read commands multiplied by the scan rate set under Device Setup. For example, an FDC IO module requires one read command. At a 500ms scan rate, it would take 500ms to acquire the data. An Orion-M controller; however, requires 3 read commands. Using the 500ms scan rate, it would take 1.5 seconds to acquire the data for an Orion-M. The number of devices, the types of devices and the scan rate, all play a role in the total time it takes EnVision to acquire data from all devices enabled in the system.

*The number of read commands required per device is as follows:*

Orion-M iSeries Multi-loop Controls =	3 reads
nCompass CM Controls =	3 reads
nCompass LC Controls =	1 read
100, 300 and C-Series Controls =	1 read
P-Series Profiling Controls =	1 read
L41/91 Limit Controls =	1 read
FDC IO Modules =	1 read

Using the information above, it is possible to calculate the minimum amount of time that is required to obtain real time data updates for any combination of devices. This flexibility allows EnVision to be tailored for virtually any application from a simple data acquisition system using basic IO modules, to a combination central control and acquisition package by combining Orion-M, limit and single loop controls and IO modules, to make a plant wide monitoring system.

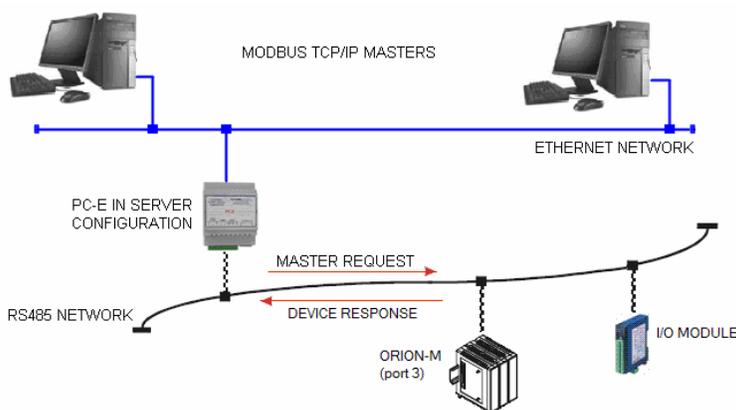


## 2 PC-E Ethernet TCP/IP-Serial Converter

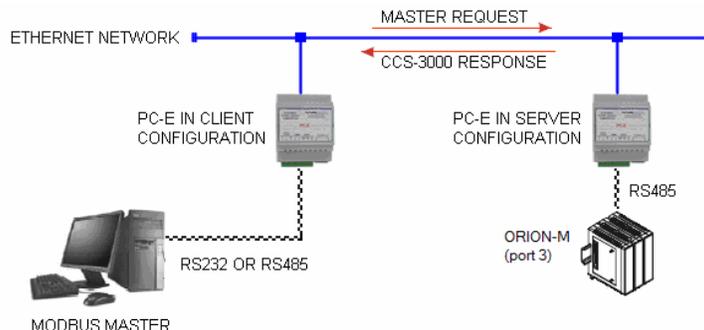
The PC-E, Ethernet TCP/IP-Serial Converter allows serial devices to be connected to an Ethernet network via their serial connection. The PC-E converter can be connected to multiple devices, allowing a single PC-E to connect multiple Orion-M, nCompass, 100, 300 or C and P-Series controllers or I/O modules to an Ethernet network. Using Modbus TCP/IP protocol, each device can then communicate with the PC running EnVision.

### 2.1 Modes of Operation

The PC-E converter provides two, primary modes of operation. The standard mode of operation is a server configuration. This is used to connect the controllers or I/O modules to the Ethernet network. In this configuration, the PC-E can accept up to four client connections, i.e., four Modbus TCP/IP masters. This allows four different computers, each running their own communications software like EnVision, to access the same device via the PC-E over the network.



The second mode of operation is a client configuration. It allows a computer running typical Modbus serial communications software like EnVision, to be connected to a network, and transmit the serial Modbus commands over the network to a PC-E running in server mode in a remote location that has a device (or multiple devices) connected to it. This allows an Orion-M, nCompass, I/O module, single-loop controller, etc., to be connected to the computer running EnVision using an existing network connection without having to run RS485 serial communications wiring from the computer to the controllers.



**NOTE:** The client configuration is only suitable for use with one PC-E in server mode. If there are multiple devices on the network, each with their own PC-E, the Moxa MB3170, MGate Modbus master must be used on the PC to address each PC-E separately. The PC-E client mode only allows for a single PC-E to PC-E connection. If there is only one device to communicate with, or multiple devices are connected remotely to a single PC-E in server mode, a PC-E in client mode can be used at the PC.

## 2.2 Configuring the PC-E

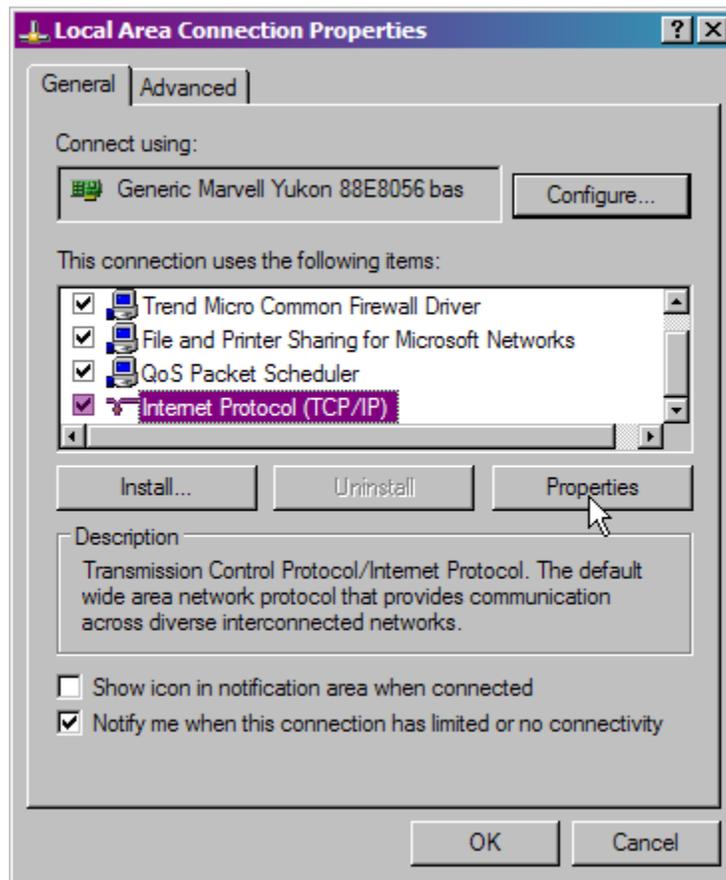
The PC-E converters are factory programmed with a default IP address of 192.168.0.112. This address must be changed before the converter is added to an existing Ethernet network. The IP address in the converter must be unique in the network, and is changed via its web server.

The web server allows the IP address, serial data format and operating modes of the PC-E to be set. Most web browsers like Internet Explorer, Netscape, etc., can access the web server. The web page address for viewing the setup parameters is <http://192.168.0.112/index.htm> and the web page address for configuring the converter is <http://192.168.0.112/ip.htm>.

### 2.2.1 Connecting the PC-E to a Computer

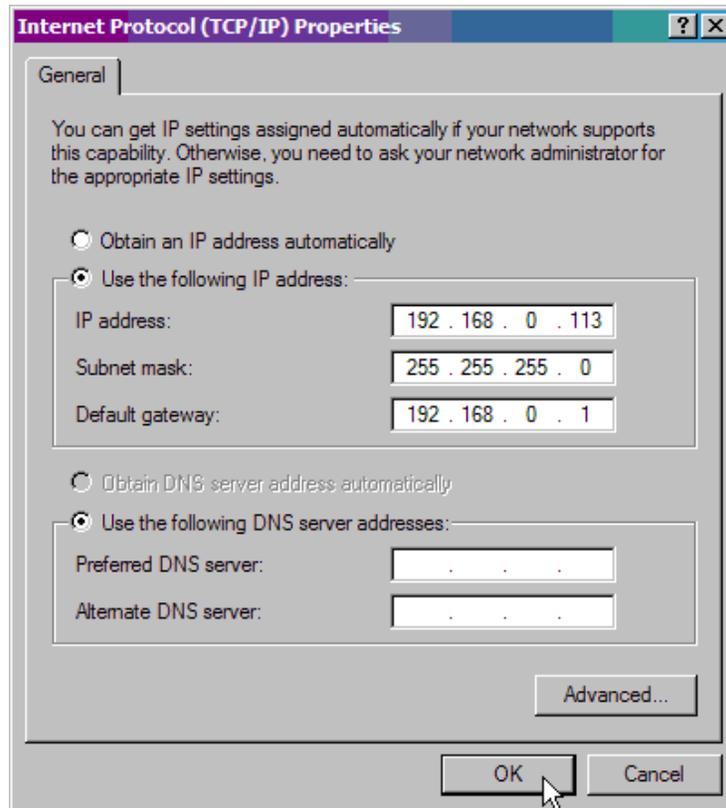
In order to configure the PC-E for the first time, a direct connection must be made between a PC and the PC-E. The PC-E converter is shipped with a default IP address of 192.168.0.112. For direct connection between the PC and the protocol converter, a crossover Ethernet cable is required. To set up your PC to connect directly to the PC-E, an IP address in the same range as the protocol converter must be assigned to the PC. In Windows environments, this can be done as follows:

1. Apply power to the PC-E and connect it to the PC using a crossover cable
2. Open the Windows Control Panel and select Network Connections
3. Select Local Area Connection and click on the Properties button
4. From the General Tab, select Internet Protocol (TCP/IP) and click the Properties button



From the Internet Protocol (TCP/IP) Properties page, do the following:

5. Choose to specify the IP address by clicking on “Use the following IP address”
6. Enter the IP address, subnet mask and default gateway as shown below
7. Accept the new settings by clicking on the “OK” button

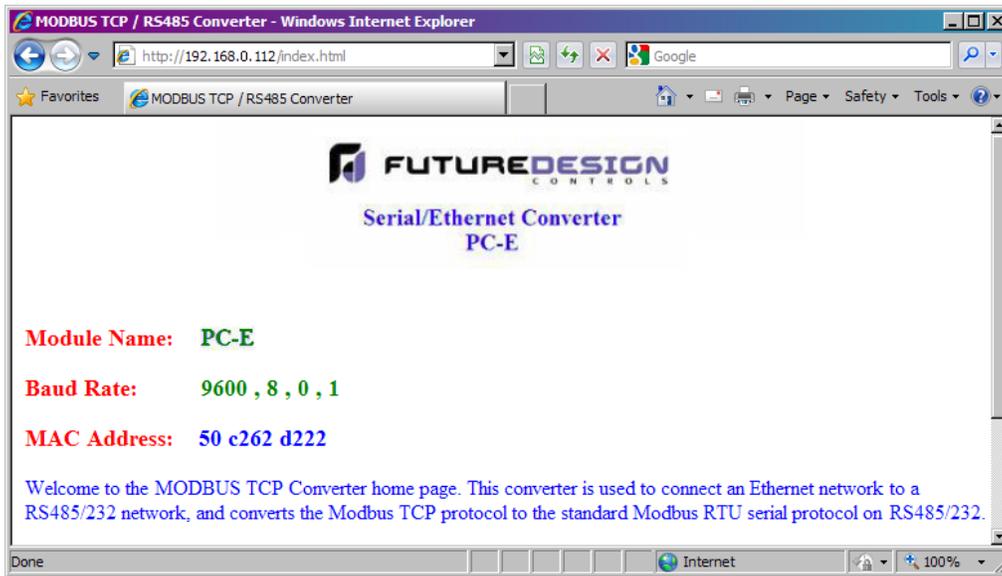


**NOTE:** If you have difficulty or are unsure of how to access the network connection properties of your PC, contact your network administrator for assistance.

### 2.2.2 Viewing the Web Page

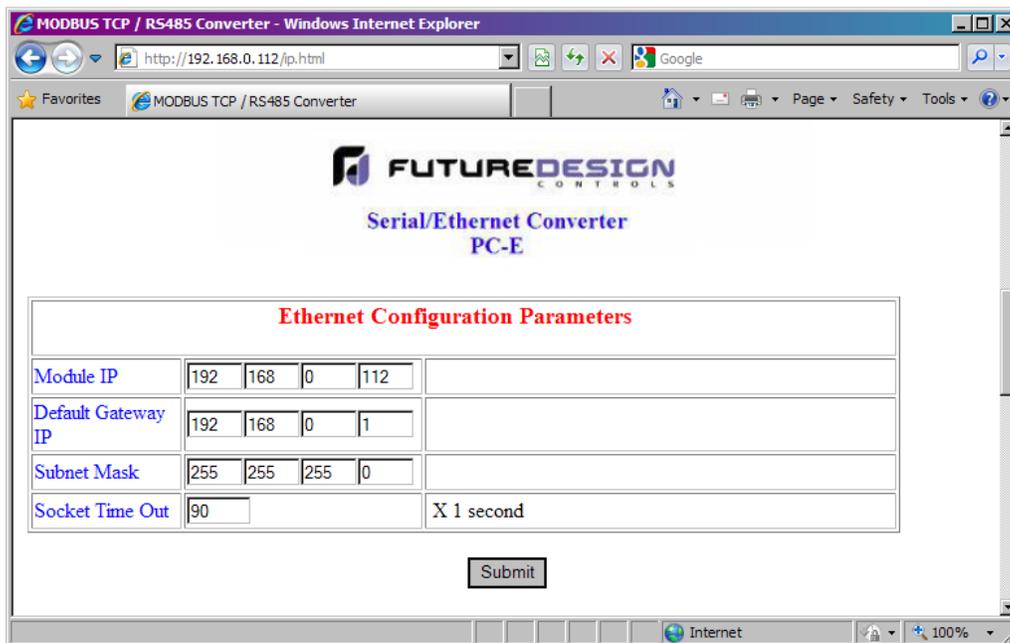
Once the PC's network adapter has been set up properly, test the connection to the PC-E by typing the following address into your web browser: <http://192.168.0.112/index.htm>. If the settings and connection have been made properly, the following web page will be displayed.

**NOTE:** If the web page is not displayed, test the network connection from the PC to the PC-E by using the ping command. This can be done by opening the Windows start menu, clicking on Run, and typing “ping 192.168.0.112” on the command line. If the PC-E replies to the ping messages, check the setup of the web browser. If the PC-E is connected to the PC through a firewall, a proxy server should be selected in the configuration menu. Contact your network administrator for assistance.



### 2.2.3 Setting the PC-E Communications Parameters

Once the connection to the PC-E has been verified, access the configuration web page by entering the following address, <http://192.168.0.112/ip.htm>, into your web browser. The web page will display 3 separate tables; Ethernet Configuration Parameters, Communication Modes and RS232/RS485 Communication Port Parameters. Each of these tables contain specific communications parameters that must be set properly for the PC-E to connect the Orion-M, 100, 300, C or P-Series control, L41/91 limit control or FDC I/O Modules to the Ethernet network.



The Ethernet Configuration Parameters table is at the top of the configuration web page. Note that the PC-E uses a fixed IP address. Regardless of the PC-E mode, server or client, the PC-E IP address must be unique and can not be a duplicate of any other address on the network it is going to be connected to.



**Contact your network administrator for an available IP address and the proper default gateway and subnet mask to be used for the PC-E network parameters. If a duplicate IP address is used or the subnet mask and default gateway are not properly assigned, the PC-E will not be able to communicate over your network.**

To adjust the settings, enter in the IP address, default gateway and subnet mask assigned for the PC-E by your network administrator. The socket time out can be left at the default 90 second setting. Once the new values have been entered, press the “Submit” button just below the table. This will refresh the web page and save the settings to the PC-E.

**IMPORTANT:** *DO NOT cycle power to the PC-E at this time. Proceed to section 2.2.4, PC-E Server Mode Settings (Device Connection) or section 2.2.5, PC-E Client Mode Settings (EnVision Modbus Master Connection) to finish the PC-E configuration.*

*The PC-E does not operate under the new Ethernet configuration settings until power is cycled to the PC-E. Once power is cycled, the new IP address assigned under the Ethernet Configuration Parameters must be used to reconnect to the PC-E. If power is cycled prior to completing the configuration process, remember to use the new IP address when trying to reconnect to the PC-E*

*Also note that the TCP/IP settings of your PC’s network adapter may also have to be changed to correspond with the new PC-E settings in order to establish the connection.*

## 2.2.4 PC-E Server Mode Settings (Device Connection)

The Ethernet Connection Parameters only define the PC-E’s connection to the network, not the connection to the controller or the mode of operation of the PC-E. To set these settings, the Communication Modes and RS232/RS485 Communications Port Parameters are used. These tables are accessed by scrolling down the configuration web page.

When the PC-E is used to attach a controller to the network, it must be set for the server mode of operation. By default, the factory communication mode settings are correct and do not need to be changed. The settings are as follows:

Converter Mode = 0  
 Char Timeout = 0  
 Port Number = 502  
 Server IP = 0.0.0.0 (not applicable for server mode)

In order for the PC-E to be able to communicate with the controller over its serial connection, the RS232/RS485 Communications Port Parameters must be according to the controller settings set as follows:

Baud Rate = 9600  
 Data Bits = 8  
 Parity = 1 (even parity)  
 Stop Bits = 1  
 RS232/RS485 = 1 (RS485) - can be set to 0 (RS232) for single nCompass LC use  
 Serial Reply Timeout = 100 (sets 1 second timeout – recommended)  
 RS485 On Delay = 0  
 RS485 Off Delay = 0

**NOTE:** *Remember to press the “Submit” button below the respective settings table to save any changes made to the parameters. Changes to these settings take affect immediately.*

The screenshot shows a web browser window titled "MODBUS TCP / RS485 Converter - Windows Internet Explorer". The address bar shows "http://192.168.0.112/ip.html". The page content is divided into two main sections:

**Communication Modes**

Converter Mode	<input type="text" value="0"/>	0 = Server - Standard Mode / Multi Socket 1 = Server - Socket Listen Mode / Single socket 2 = Client - Remote Socket Open Mode / Single socket
Char Timeout	<input type="text" value="0"/>	Time to wait before sending Rx Chars when using Port 30004 in Mode 0, or using Mode 1/2 X 10 milliseconds
Port Number	<input type="text" value="502"/>	Modbus TCP = 502 Mode 1&2 only
Server IP	<input type="text" value="0"/> <input type="text" value="0"/> <input type="text" value="0"/> <input type="text" value="0"/>	Mode 2 only

**RS232/RS485 Communications Port Parameters**

Baud Rate	<input type="text" value="9600"/>	
Data Bits	<input type="text" value="8"/>	
Parity	<input type="text" value="1"/>	0=None, 1=Even, 2=Odd
Stop Bits	<input type="text" value="1"/>	
RS232/RS485	<input type="text" value="1"/>	0=RS232, 1=RS485
Serial Reply Timeout	<input type="text" value="100"/>	X 10 milliseconds
RS485 On Delay	<input type="text" value="0"/>	X 1 milliseconds
RS485 Off Delay	<input type="text" value="0"/>	X 1 milliseconds

### 2.2.5 PC-E Client Mode Settings (EnVision Modbus Master Connection)

The Ethernet Connection Parameters only define the PC-E's connection to the network, not the connection to the Modbus Master or the mode of operation of the PC-E. To set these settings, the Communication Modes and RS232/RS485 Communications Port Parameters are used. These tables are accessed by scrolling down the configuration web page.

When the PC-E is used to attach a computer (Modbus master) to the network, it must be set for the client mode of operation. For this mode of operation, the settings are as follows:

Converter Mode = 2  
 Char Timeout = 0  
 Port Number = 502  
 Server IP = IP address of PC-E attached to the Orion-M, single-loop controller and/or I/O modules

Note that the server IP for the client mode of operation must be set to the IP address of the PC-E connecting the controller(s) to the network that you wish to communicate with. This allows the client PC-E on the computer to obtain the network connection to the server PC-E for the controller(s), so that all of the serial communication commands from the computer can be transmitted back and forth between EnVision and the controller(s) over the network.

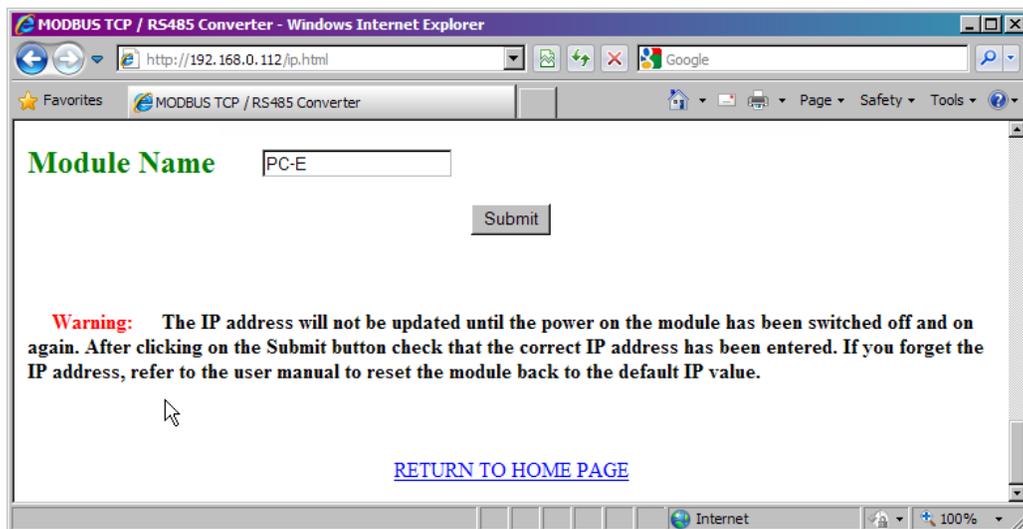
In order for the PC-E to be able to communicate with the computer over its serial connection, the RS232/RS485 Communications Port Parameters must be set as follows:

Baud Rate = 9600  
Data Bits = 8  
Parity = 1 (even parity)  
Stop Bits = 1  
RS232/RS485 = 0 (RS232) or 1 (RS485) – based on connection from PC  
Serial Reply Timeout = 100 (sets 1 second timeout – recommended)  
RS485 On Delay = 0  
RS485 Off Delay = 0

Note that the RS232/RS485 selection is based upon the serial connection between the PC and the PC-E. If a standard RS232 port on the PC is being used, then use the RS232 setting. If the PC is equipped with an RS485 communications card, or a converter is installed on the computer's RS232 port to change the signal to RS485, then use the RS485 selection on the PC-E.

### 2.2.6 Assigning a Name to the PC-E

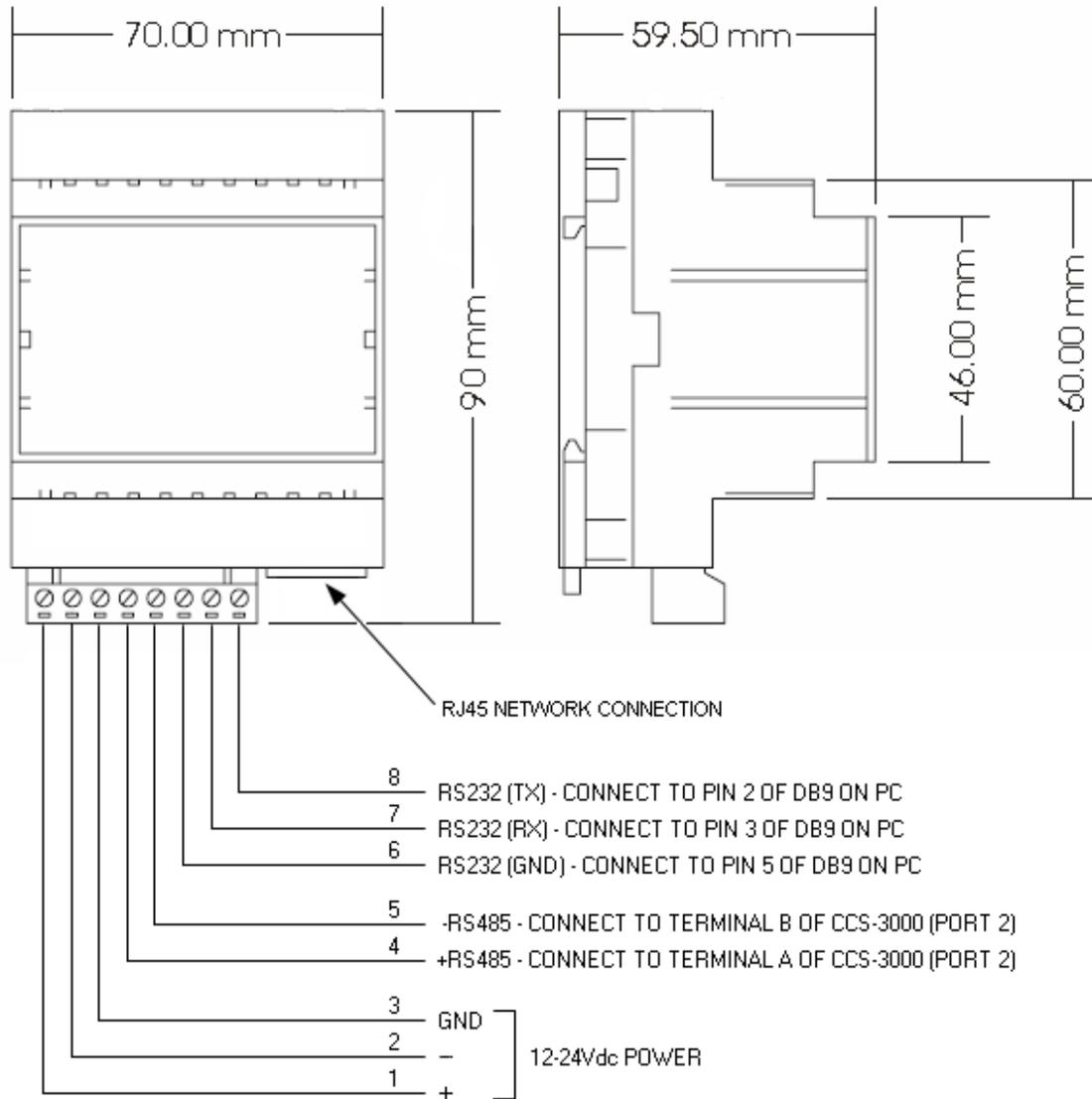
The PC-E configuration page also allows you to assign a module name to the converter that is displayed on the parameters web page. This can be used to identify the PC-E in the future and/or be used to describe the connection or devices it is connected to. This setting is located at the bottom of the configuration web page.



Enter the desired Module Name for the converter and press the “Submit” button to save it. Once all settings have been made to the PC-E, it is ready to be connected to the controller(s) or a computer (Modbus master) and connected to your network.

### 2.3 Installing the PC-E

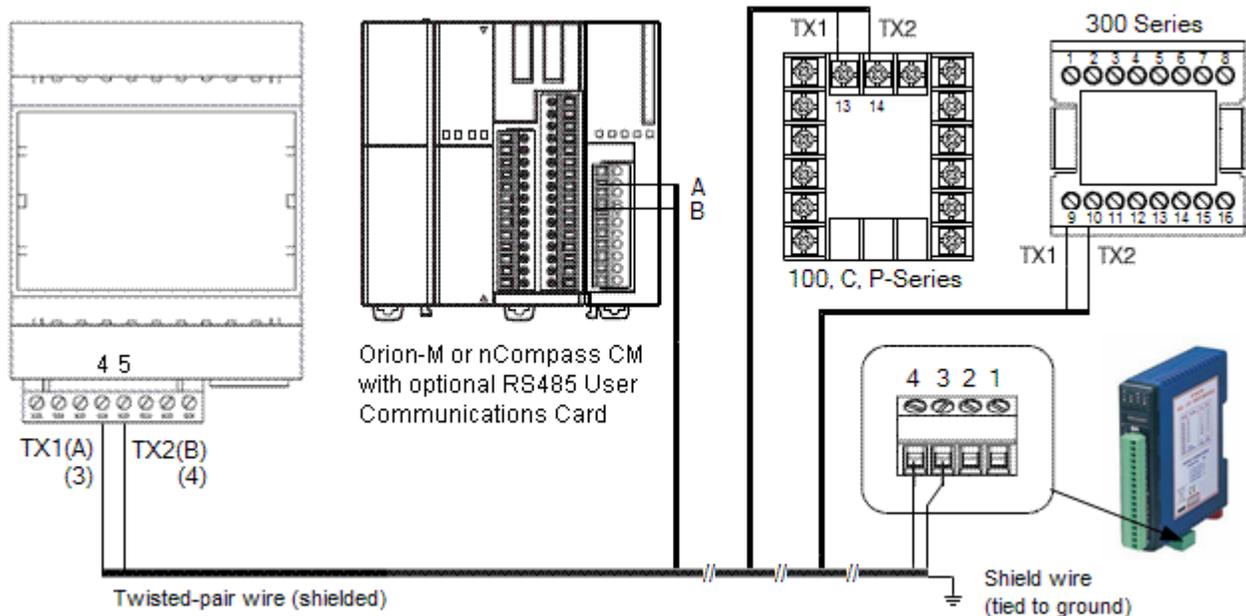
The PC-E is designed with a quick snap-in assembly for mounting onto a standard 35mm DIN rail. When installing the PC-E, do not locate the unit next to other devices that produce high levels of electromagnetic radiation, i.e., power lines, transformers, motor drives, etc.



<b>Power Supply</b>	PC-E	90mA @ 10VDC / 40mA @ 26VDC
<b>Ethernet</b>	10/100 Mbits/s	10/100Base-TX
<b>Serial</b>	RS232	3 Wire , TX,RX,GND
	RS485	2 Wire Multi drop twisted pair
<b>Temperature</b>	Operating Temperature.	-10°C to + 50°C
	Storage Temperature	-40°C to + 85°C
<b>Humidity</b>		Up to 95% non-condensing.

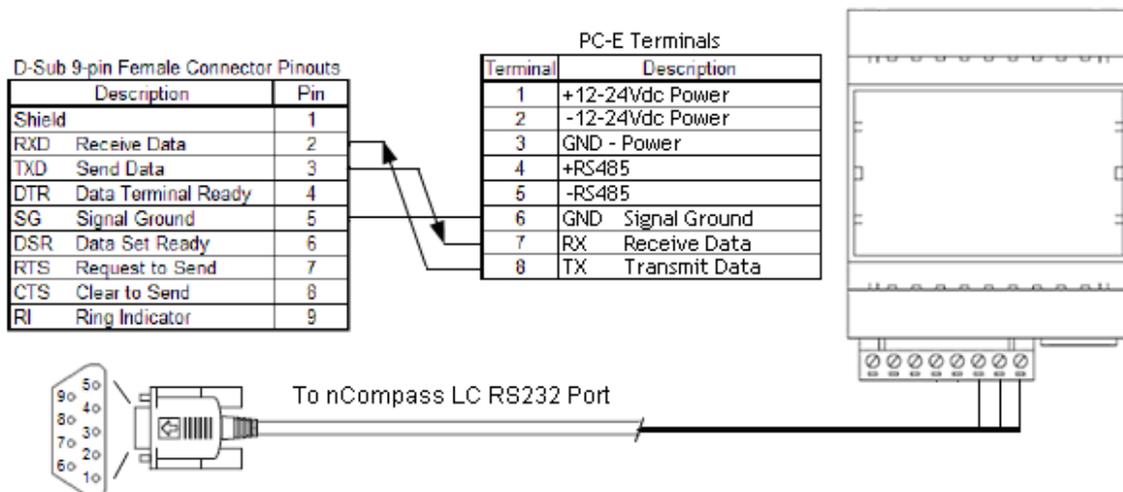
**2.3.1 Connecting the PC-E to a Controller or I/O Module**

When installing the PC-E in an enclosure with an Orion-M or nCompass CM, it can be powered directly from the controllers 24Vdc power supply. However, if one PC-E is going to be used to connect multiple controllers to the network, then it is recommended to power the PC-E from an independent power supply. This insures that the PC-E will remain operational regardless of the power on state of the individual controller or I/O modules it is connected to.



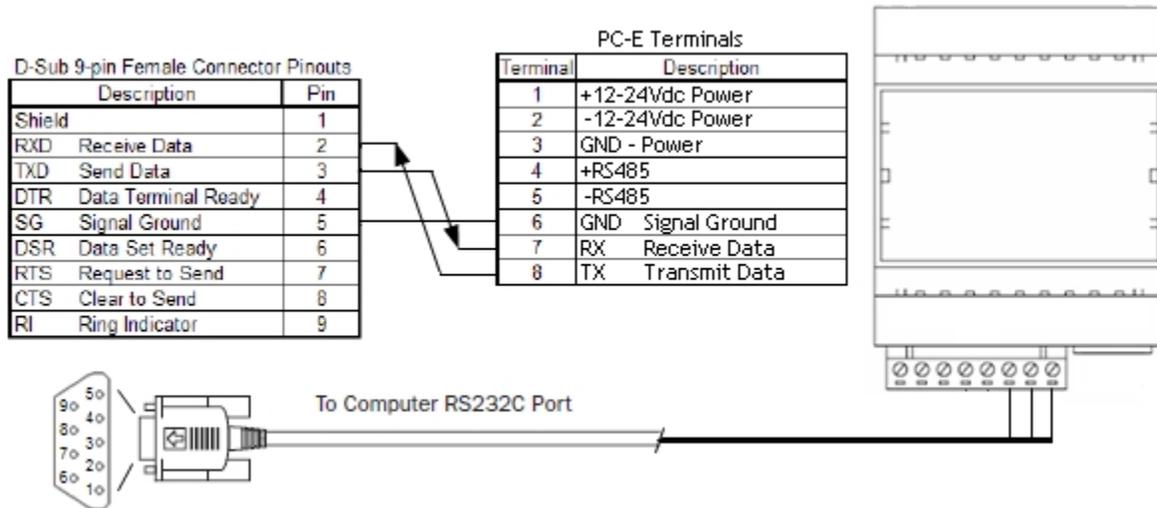
When connecting the RS485 serial communications wiring between the PC-E and the devices, it is recommended that shielded, twisted pair wire be used to make the connection. Be sure to ground the shield at only one end.

The nCompass LC only provides an RS232 user connection. In order to connect multiple nCompass LC controllers to a single PC-E or to connect one on the same link with other controllers, an RS232/485 adapter is required on the nCompass LC. A one-to-one connection is also available in which a single nCompass LC can be connected via RS232 to a single PC-E. To connect an nCompass LC directly to a PC-E using the RS232 interface, a cable must be fashioned to make the connection as follows:



### 2.3.2 Connecting the PC-E to a Computer

When connecting the PC-E to a computer, a separate power supply is required. To connect the PC-E to the computer's serial port, a cable must be fashioned to make the connection as follows:



## 2.4 Troubleshooting

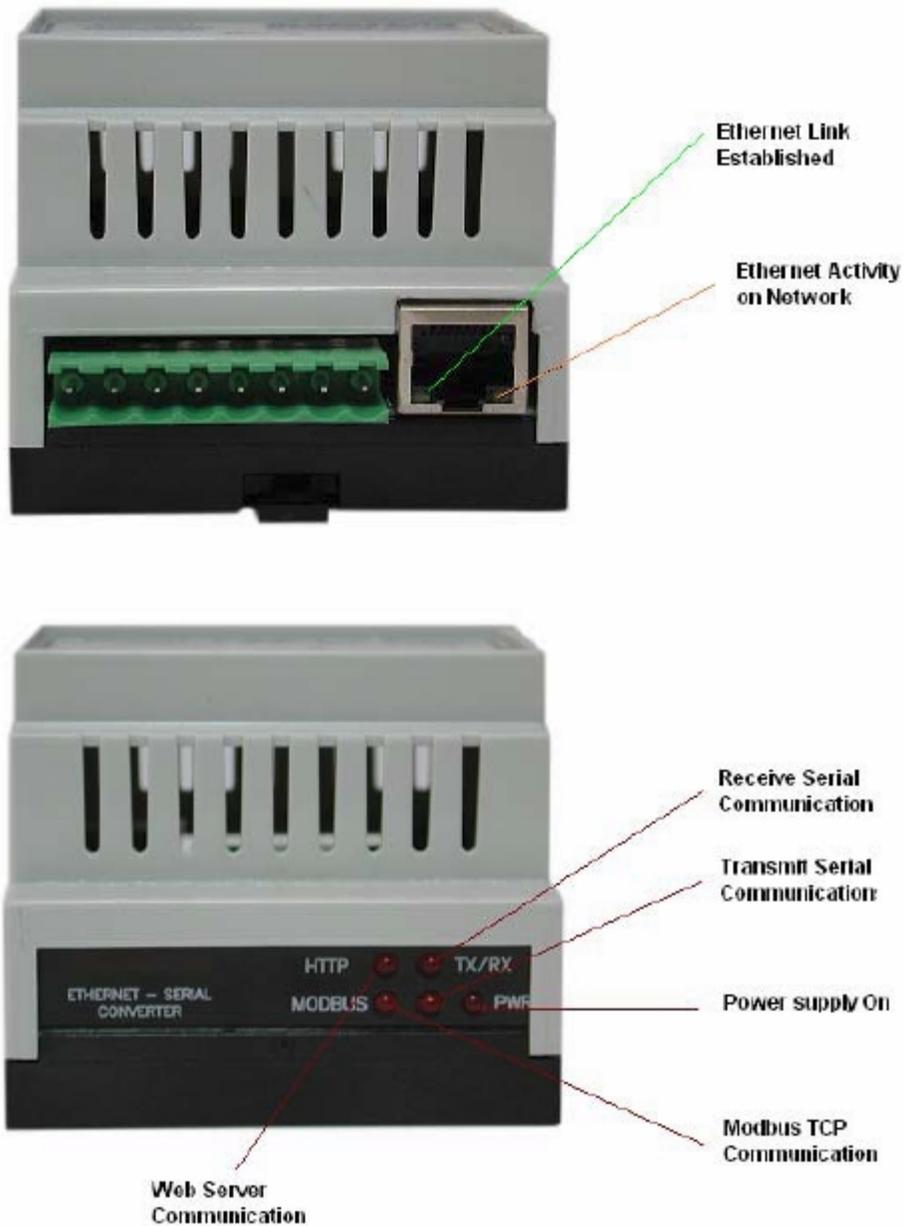
No	Checkpoint		Solution
1	Is the LINK LED on and is the ACTIVITY LED flashing with short pulses?	No	No network connection is detected. The Ethernet cable is either not plugged in or wrong type of cable is used. For connection to a network with a hub or switch, a straight through network cable can be used. For direct connection between PC and Protocol converter, a cross over Ethernet cable must be used.
		Yes	A network connection is detected; the Protocol converter is connected to the network.
2	Does the Protocol converter respond to PING requests?	No	Either the PC or the Protocol converter is setup with wrong IP address. Set PC-E with default IP address. To change the IP address of a PC, use the Windows "control panel -> network -> TCP/IP properties" and setup an IP address close to the Protocol converter address. The Protocol converter is shipped with a default IP address of 192.168.0.112, the PC can be setup with an IP address of 192.168.0.113
		Yes	The PC and Protocol converter are setup with a correct IP address and they are able to communicate with each other.
3	Can the default Web page be accessed in a Web browser?	No	This is normally caused by the setup of the Web browser. In the "options" or "preferences" menu, check that the Web browser is configured for direct network connection or local area network and <b>NOT</b> using a proxy server.
		Yes	No problems.
4	Are the LINK LED and ACTIVITY LED flashing together?	Yes	Switch off the power to PC-E. Wait for some time before switching on the power for next time.
		No	No Problems

### 2.4.1 Resetting the PC-E to Default IP Address

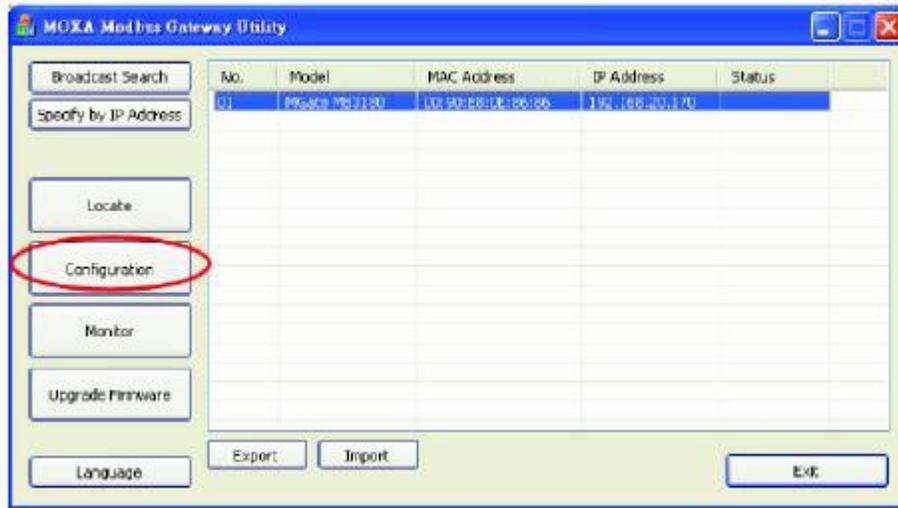
If the IP address of the PC-E is lost or unknown, the PC-E can be defaulted back to the factory default IP address of 192.168.0.112. This will provide access to the configuration of the PC-E so it can be reconfigured for your application. To perform the factory reset, perform the following steps:

1. Remove power from the PC-E
2. Remove the top cover by gently prying open the locking tabs on each side of the PC-E
3. Remove the "Default IP" jumper
4. Connect an Ethernet cable to the PC-E and plug it into a router or switch
5. Apply power to the PC-E
6. After about 2 seconds the link LED should come on and must not flash
7. Replace "Default IP" jumper
8. Reattach top cover of PC-E
9. Factory reset is complete and the PC-E can be accessed using IP address of 192.168.0.112

2.4.2 PC-E Status LED's

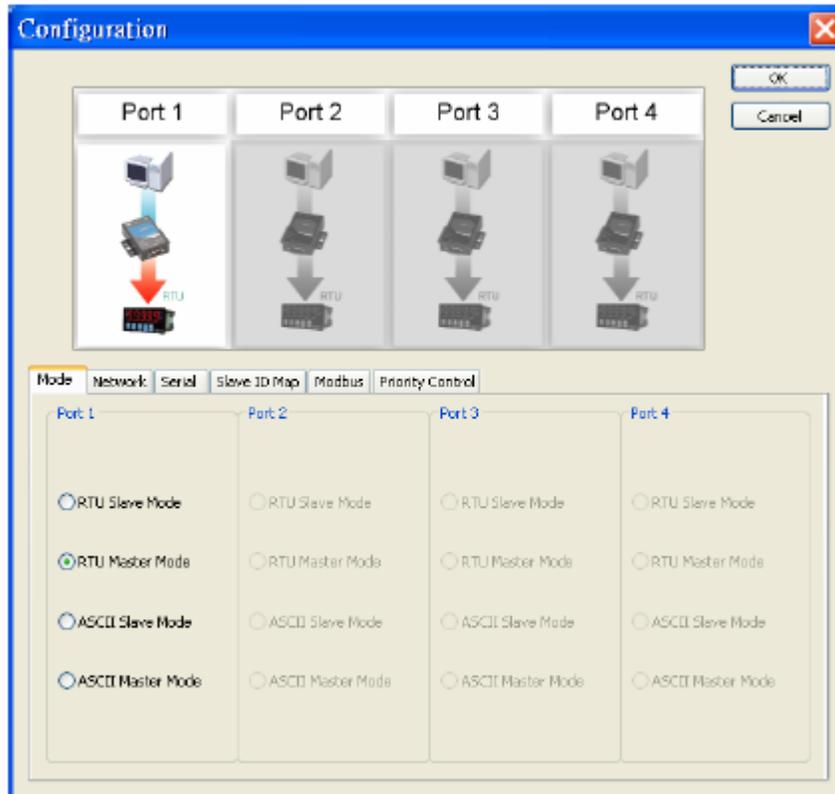




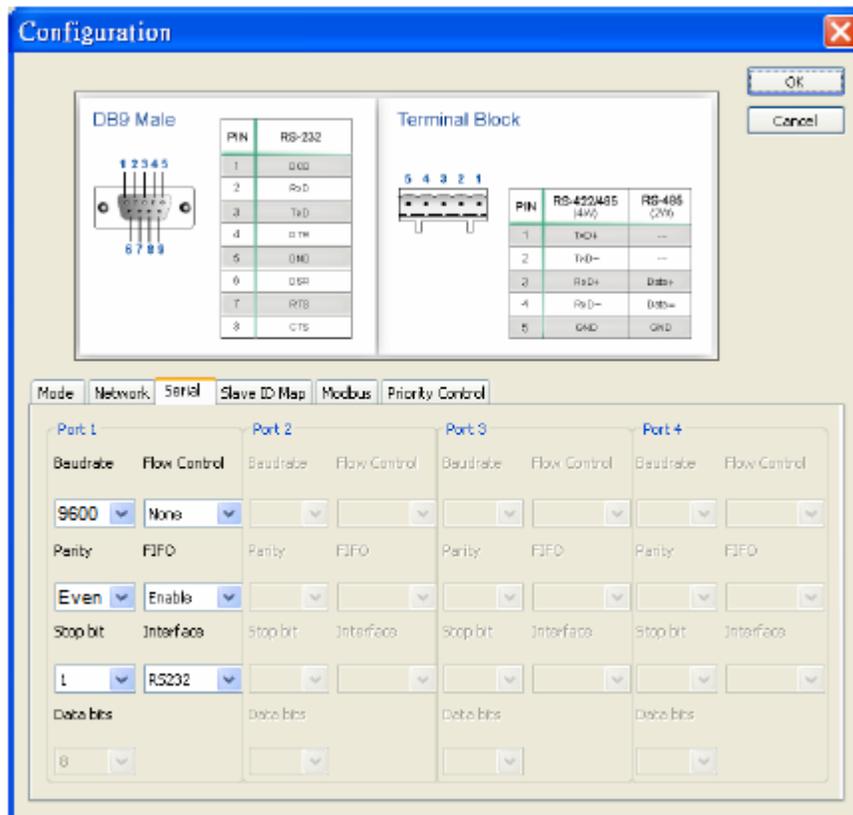


### 3.1.1 Configuring the Serial Port

The “Mode” tab is used to set the operational mode of the MGate’s serial port. For use with EnVision, the serial port must be set to the “RTU Master” mode.



Once the serial port mode is set, select the “Serial” tab in order to configure the port to properly communicate with EnVision via the serial connection to the PC’s serial port.



The port parameters must be configured as follows:

- Baudrate: 9600
- Parity: Even
- Stop bit: 1
- Data bits: 8 (fixed)
- Flow Control: None
- FIFO: Enable (default)
- Interface: RS232 (default – set to RS485 if connection to PC is via an RS485 connection)

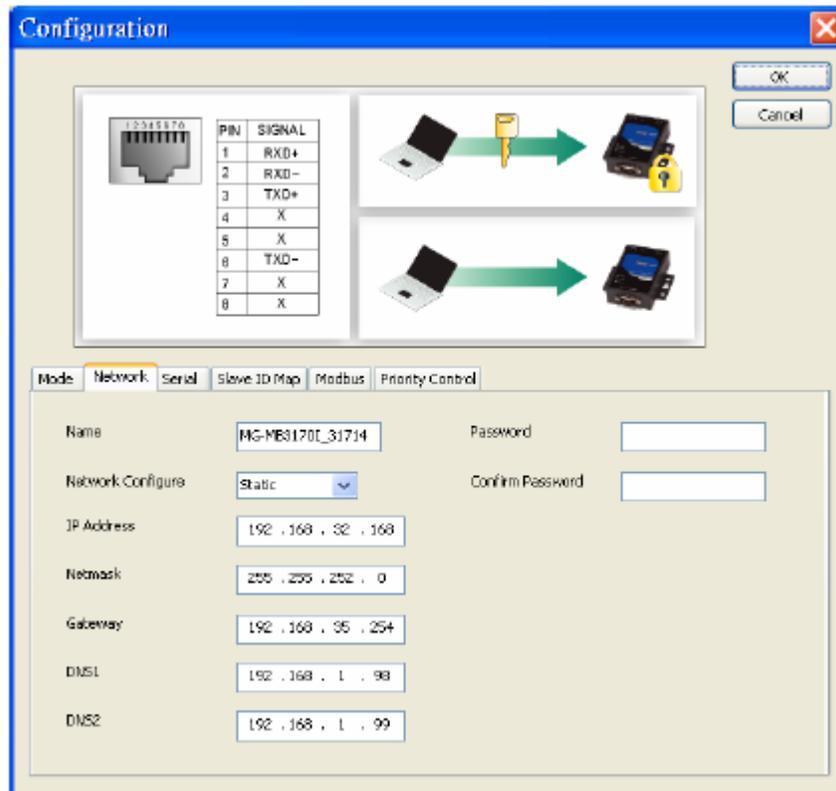
### 3.1.2 Configuring the Network Connection

The “Network” tab is where the unit’s network settings are configured. The Name, Network Configuration, IP Address, Netmask, Default Gateway, and DNS can all be adjusted. A password can also be set from this tab which protects the unit from unauthorized access.



**Contact your network administrator for an available IP address and the proper default gateway and subnet mask to be used for the MGate network parameters. If a duplicate IP address is used or the subnet mask and default gateway are not properly assigned, the MGate will not be able to communicate over your network to the PC-E converters.**

**The MGate master can be set with a static IP or use DHCP to have an IP address assigned automatically by the network. It is recommended that a static IP address be used. This allows a simple controller communications network to be installed using simple switches and/or routers.**



The **Name** field allows the user to enter a name to help identify the unit, such as the location, function, etc.

The **Network Configure** field is used to select the connection mode of the MGate. Available selections are Static IP, DHCP, BootP and DHCP/BootP. FDC recommends that the unit be set for Static IP. When the Static IP mode is selected, the IP Address, Netmask and Gateway must be specified. If DHCP is selected, these fields are set by the network when the MGate is connected. However, this requires that a DHCP server be installed on the network as well.

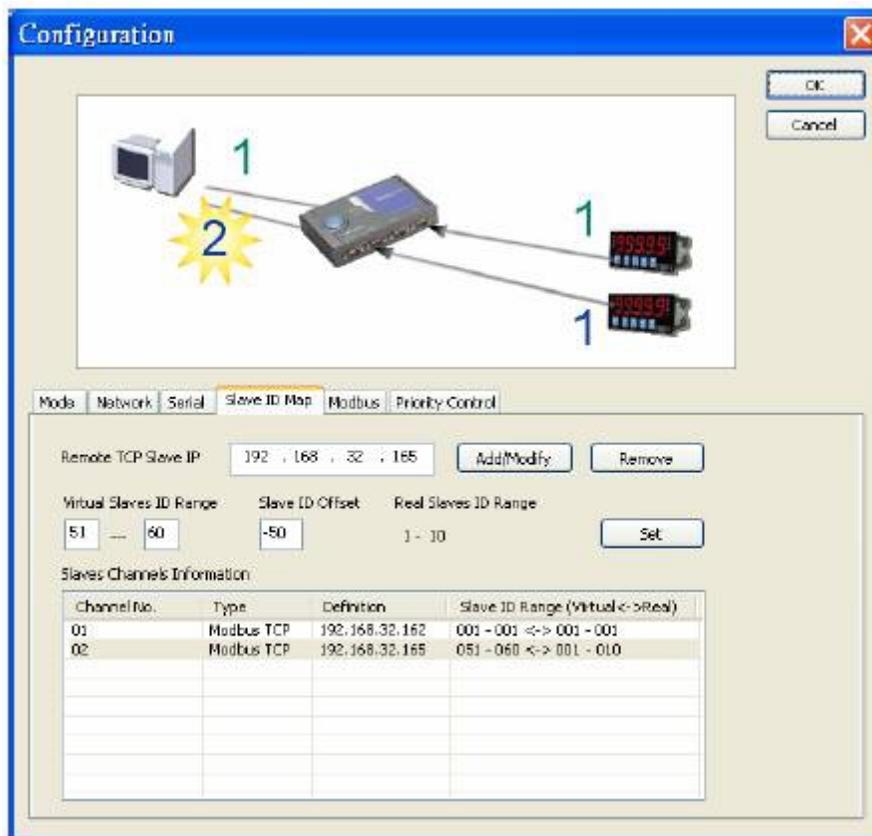
Set the **IP Address**, **Netmask** and **Gateway** as required in order to connect to the controller network. If you are unsure about these values, contact your network administrator for assistance.

The domain name server fields, **DNS1** and **DNS2**, are not required for proper operation. Contact your network administrator regarding these fields and what IP address if any, should be used.

If desired, access to the MGate can be restricted to prevent unauthorized changes to the configuration of the unit. To activate security, enter a password in the **Password** and **Confirm Password** fields. This will require the user to enter the password prior to gaining access to the unit configuration. To remove the password protection, simply clear both fields and security will be disabled.

### 3.1.3 Configuring Slave ID (Controller) Mapping

The "Slave ID Map" tab is where the device addresses in EnVision are mapped to the corresponding PC-E's that they are connected to. When EnVision requests information from a controller, the request is directed to the PC-E per the configured slave ID's in the unit.



To enter a slave ID, begin by entering the PC-E IP address in the “Remote TCP Slave IP” field and click the “Add/Modify” button to enter the IP address into the map list. If only one controller is attached to the PC-E, enter the Modbus slave (device) address of the controller in the “Virtual Slave ID Range” field. The address must be entered for both range values. This will instruct the MGate to send messages for only the single device listed to the PC-E at the remote TCP slave IP address.

If more than one controller is attached to the PC-E, enter the range of addresses present on the PC-E. For example, if 10 controllers are attached to the PC-E with addresses in the range of 51-60, enter 51 and 60 for the virtual slave ID range. This will instruct the MGate to send messages for devices 51-60 in EnVision to the PC-E at the remote TCP slave IP address.

**NOTE:** *When multiple controllers are attached to a single PC-E, it is important that the Modbus slave addresses are sequential so that a single slave ID map entry can be made for the PC-E. The MGate will only support 32 map entries. If addresses are not entered sequentially, it may not be possible to map all controllers attached to all PC-E’s on the network.*

*Conflicts and communication errors can also occur if a range is entered for one PC-E, and a controller on another PC-E has a Modbus address that falls within that virtual range. The virtual slave ID ranges for each map entry must be unique and not overlap with the range of any other map entry.*

The “Slave ID Offset” field is used to enter an offset from the virtual slave addresses to match the real Modbus slave addresses of the controllers attached to the PC-E. For example, if FDC I/O modules with addresses 51-60 were attached to the PC-E, the required offset would be 0. As EnVision requests data from the I/O modules (devices 51-60), the MGate will direct the requests to the PC-E using the same Modbus slave addresses.

However, if the attached devices were Orion-M controllers, their Modbus slave addresses can only be set within the range of 1-31. Therefore, to communicate with these controllers, their Modbus slave addresses would be set within the range of 1-10. The virtual ID offset would then be set to -50. This would instruct the MGate to readdress the commands for devices 51-60 in EnVision, to Modbus slave addresses of 1-10 for the corresponding Orion-M controllers. This allows any combination of FDC products to be configured at any device number in EnVision, and be properly mapped and communicated with.

Once the virtual slave ID range and offset are entered for the IP address, click the “Set” button to enter the range for the selected IP address. This procedure must be followed for each PC-E attached to the communications network. After all the PC-E’s have been configured, the MGate is ready for use. No further configuration is required.

### **3.1.4 Customizing Modbus Settings**

The “Modbus” tab is only used with Modbus RTU/ASCII slaves and is not utilized for TCP slaves. Since the MGate is configured for serial master and TCP slave, no configuration is required as these settings are not used.

### **3.1.5 Priority Control**

The “Priority Control” tab is only used with Modbus RTU/ASCII slaves and is not utilized for TCP slaves. Since the MGate is configured for serial master and TCP slave, no configuration is required as these settings are not used.