DEVICE·MASTER® UP

Modbus® Server User Guide

COMTROL®
Network Enabling Devices

Document Number: 2000535 Rev C

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Modbus Server Application Overview

This section defines the software functionality for the Modbus Server application and provides an overview of other Comtrol Modbus solutions (Page 9).

The Modbus Server application was designed to provide enhanced connectivity for OPC servers and applications that require Modbus/RTU communications. While standard gateways provide connectivity for only one application per serial port, Modbus Server provides connectivity for up to six applications per serial port.

Modbus Server was designed to greatly enhance system maintenance capabilities. Included are comprehensive device and port specific diagnostic web pages that display status, message response timing, timeout, and other error counts, and overall message statistics. A serial log is also included to provide message level diagnosis.

Recommended Chassis

The following table lists the recommended DeviceMaster UP chassis based on Modbus/RTU message throughput.

Throughput	1-Port	2-Ports	4-Ports
Very High - Message rate of up to one message every 50 ms per port (20 messages per port per second)	X	X	
High - Message rate of up to one message every 100 ms per port (10 messages per port per second)	X	X	X
Medium - Message rate of up to one message every 200 ms per port (5 messages per port per second)	X	X	X
Low - Message rate of up to one message every 500 ms per port (2 messages per port per second)	X	X	X
Very Low - Message rate of up to one message every second per port (1 message per port per second)	X	X	X
Latency			
Transmit (From application to device)	2-10 ms (*)		
Receive (From device to application	2-10 ms (*)		
(*) = Based on one Ethernet TCP/IP connection per serial port running in a normal uncongested system. The maximum overall latency will increase as the number of Ethernet TCP/IP connections increase.			

Note: These estimates are based on a Modbus/RTU request and/or response message size of 20 bytes. Actual throughput will vary depending on message size and system requirements.

Terms and Definitions

This table provides *Modbus Server* definitions.

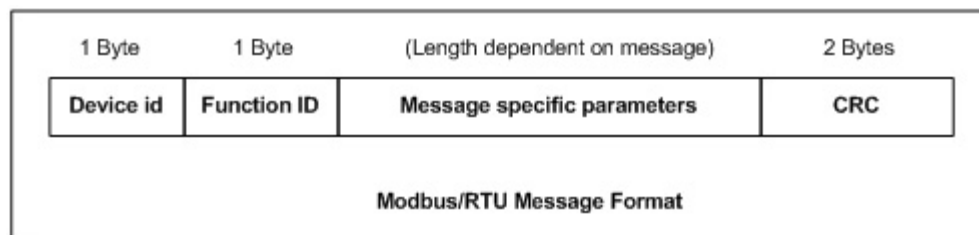| Term	Definition
Master (or Client) Mode	The method of operation when a DeviceMaster or an application is operating as a *Master* or the message originator.
Slave (or Server)	The method of operation when a DeviceMaster or an application is operating as a *Slave* or the message receiver.
Modbus/RTU	The standard Modbus messages, in hexadecimal format, that are typically transmitted over serial lines but can also be transmitted over other communication methods such as wireless or Ethernet TCP/IP socket connections. *Note: Modbus/RTU over Ethernet TCP/IP is not the same as Modbus/TCP.*
Polling	The process where an application requests data on a continual basis. In this operation the Master sends the request messages while the *Slave* responds to the messages.
Sockets	The method used to communicate between devices while communicating over Ethernet TCP/IP.
DeviceMaster	DeviceMaster RTS or DeviceMaster UP.

What is Modbus?

Modbus/RTU (Supported by Modbus Server)

Modbus/RTU is native Modbus in hexadecimal format. These are the base Modbus messages that contain simple read and write requests. The format is as follows:

1 Byte	1 Byte	(Length dependent on message)	2 Bytes
Device id	Function ID	Message specific parameters	CRC

Modbus/RTU Message Format

Where:

- The terms Master or Client are used to identify the sender of the message.
- The terms Slave or Server are used to identify the devices responding to the message.

Modbus/RTU is used for:

- Serial port connectivity. RS-485 is the most common, but RS-232 and RS-422 are also used.
- Ethernet TCP/IP socket connections. This is not the same as Modbus/TCP (please see next section), but does provide a very simple method of interfacing to remote devices. It is used by many applications and some OPC servers. Note: This communication method is not used by PLCs.

Modbus/TCP (Not supported by Modbus Server**)**

Modbus/TCP is an Ethernet network based protocol that contains a Modbus/RTU message, with the exception of the 2 byte CRC. The Modbus/TCP message contains a header with information designed to provide message identification and routing information. The format is as follows:

2 Bytes	2 Bytes	2 Bytes	1 Byte	1 Byte	(Length dependent on message)
Transfer ID	Protocol ID	Message Length	Device id	Function ID	Modbus Message specific parameters

◄———————— (Modbus TCP header) ————————►◄———— (Modbus/RTU message – no CRC) ————►
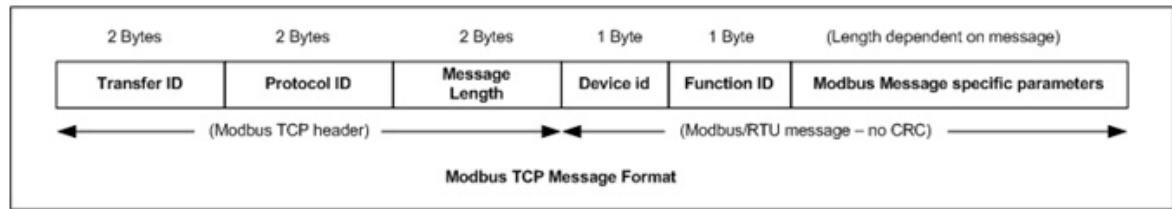
Modbus TCP Message Format

Where:

- The terms Master or Client are used to identify the sender of the message.
- The terms Slave or Server are used to identify the devices responding to the message.
- Modbus/TCP messages are typically sent to and received on a defined Ethernet TCP/IP socket of 502.
- Modbus/TCP implementations provide more capability, but also require more processing than simpler Modbus/RTU implementations.

Modbus/TCP is used for connecting advanced Ethernet based devices, such as PLCs, HMIs, SCADA Systems, and most OPC Servers to:

- Other Ethernet devices supporting Modbus/TCP.
- Remote serial Modbus/RTU devices through gateways (such as the DeviceMaster UP).
- Remote serial or Ethernet TCP/IP ASCII devices through a gateway (such as the DeviceMaster UP).

Note: Refer to the DeviceMaster UP for Modbus/TCP functionality.

# Modbus Server Functionality

The Modbus Server application provides the following functionality:

- Supports Modbus/RTU over Ethernet TCP/IP connections to the corresponding serial port through intelligent Modbus message handling and routing.
- Supports only Modbus/RTU over Ethernet TCP/IP connections to a serial port.

    Note: For Modbus/TCP functionality, refer the DeviceMaster UP.

- Supports up to six Ethernet TCP/IP connections to each serial port.
    - One TCP/IP connection can be created with the *Connect To* connection method.
    - The *Listen* connection method accepts up to five or six connections, depending if the *Connect To* connection is active.
- Supports up to 255 Modbus devices per port. Both valid, (1-247), and reserved, (248-255), device Ids are supported.
- Modbus/RTU specific message handling:
    - CRC verification of all messages received on the TCP/IP and serial interfaces.
    - Timing out of responses from slave Modbus/RTU devices.
    - Broadcast message handling on connected port only.

- System monitoring to ensure gateway operation:
  - Gateway busy.
  - Application message time-outs.
- Advanced diagnostics web pages:
  - Modbus/RTU device specific statistics and status. Up to 255 Modbus/RTU devices per port can be monitored simultaneously.
  - Serial port specific statistics, response timing, and status.
  - Serial port message logging.
- Combined with a serial port redirector, such as the Comtrol Secure Port Redirector, which can support up to six COM port connections to each serial port.
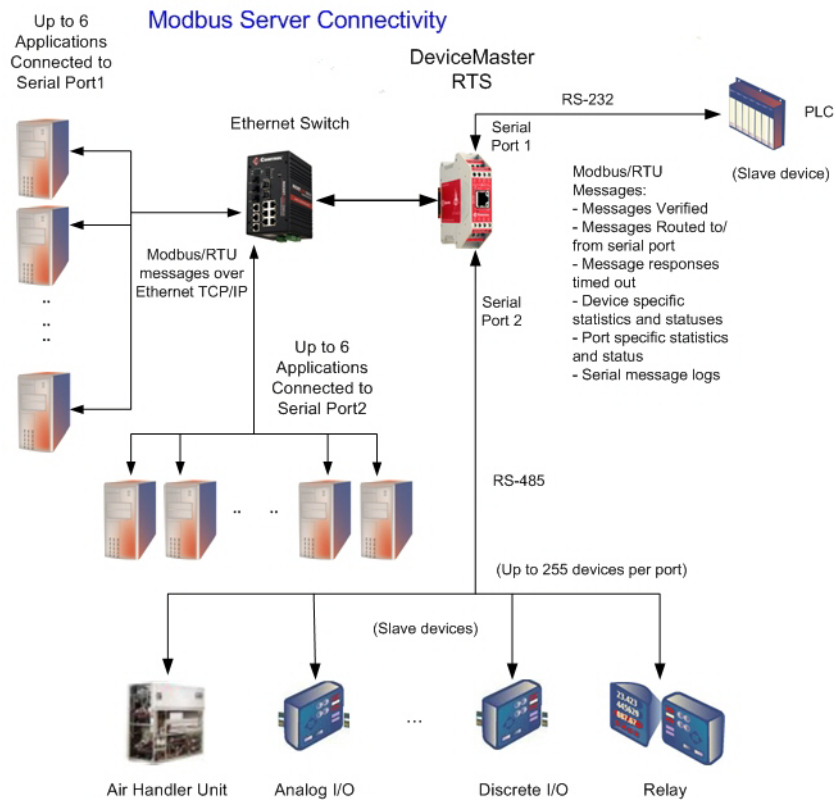
Other Comtrol Modbus Solutions

Comtrol provides several other Modbus solutions other than Modbus Server that include:

- Modbus Router
- Modbus/TCP

Modbus Router

Modbus Router firmware was developed to provide innovative network-wide Modbus connectivity from a wide variety of Modbus masters to a wide variety of local and remote Modbus slaves. Advanced features include master-to-master communication, private serial bus connectivity, write protection, and device ID aliasing. With simplified configuration pages and advanced routing, Modbus Router provides unmatched Modbus connectivity.
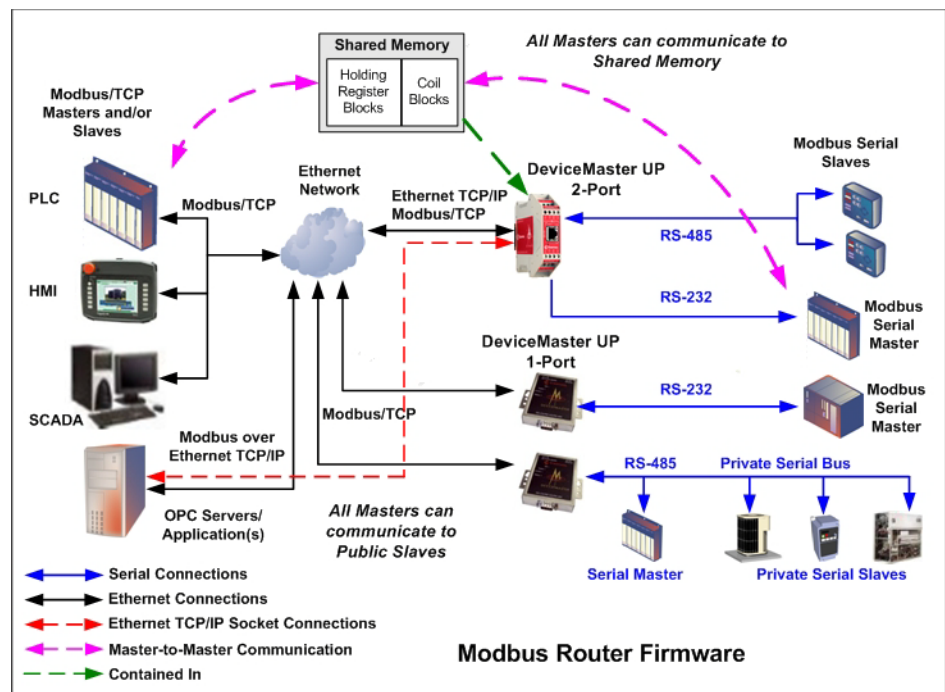
Modbus Router firmware supports the following controllers:

- Modbus/TCP masters
- Modbus/RTU and Modbus/ASCII serial masters
- Modbus/RTU and Modbus/ASCII over Ethernet TCP/IP masters
- Modbus Router firmware supports the following devices:
- Modbus/TCP slaves
- Modbus/RTU and Modbus/ASCII serial slaves

With additional gateways, both remote Modbus serial slaves and raw/ASCII devices Modbus Router firmware is recommended in installations that require:

- Local (directly attached) Modbus master and/or slave connectivity
- No local raw/ASCII device connectivity
- Automatic Modbus protocol translations (if needed)
- Connectivity to remote Modbus slave(s) and/or raw/ASCII device(s)
- Connecting single or multiple Modbus masters to the slave device(s)

- Master-to-Master connectivity (via Shared Memory subsystem)
- Isolation of serial Modbus slaves (via Private Serial Bus connectivity)
- Write protection of serial Modbus slaves
- Modbus Device ID conflict resolution

Modbus/TCP - Multiple Modbus Master and Slave Types, Serial and Ethernet Raw/ASCII Devices

The Modbus/TCP firmware has been designed to provide great flexibility for connecting both Modbus serial slaves and raw/ASCII devices to a variety of Modbus controllers and applications.

Such advanced raw/ASCII options as filtering, command/response mode, peer-to-peer Modbus communications and simultaneous connections to multiple Modbus controllers and/or Ethernet TCP/IP applications make the Modbus/TCP firmware the flagship of all Modbus to raw/ASCII gateways.
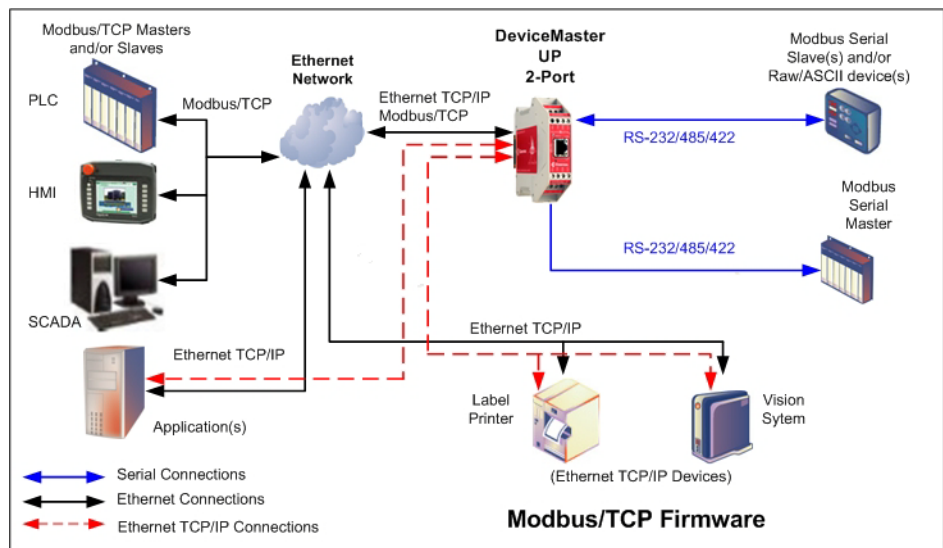
Modbus/TCP firmware supports the following controllers:

- Modbus/TCP masters and slaves
- Modbus/RTU and Modbus/ASCII serial masters and slaves
- Applications over Ethernet TCP/IP connections (raw/ASCII only)

Modbus/TCP firmware supports the following devices:

- Raw/ASCII devices, both serial and Ethernet TCP/IP, such as barcode scanners, vision systems, RFID readers, weigh scales, encoders and printers
- Modbus/RTU and Modbus/ASCII serial slaves
- Modbus/TCP firmware is recommended in installations that require:
- Connectivity to serial and/or Ethernet TCP/IP raw/ASCII devices
- Connectivity to Modbus/RTU and/or Modbus/ASCII serial devices
- Connectivity from single or multiple Modbus masters and/or applications to the devices
- Automatic Modbus protocol translations (if needed)

Installation Overview

Use this section to locate software and installation documentation for the DeviceMaster UP to quickly install and configure Modbus Server.

An installation follows these basic steps.

1. Connect the DeviceMaster UP to the network.

    If necessary, use the appropriate hardware installation document for your DeviceMaster UP.

2. Install PortVision DX. You can refer to the *PortVision DX Overview* subsection to locate PortVision DX and install it easily.

Hardware Installation Documents	Web
DeviceMaster UP Installation and Configuration Guide	
DeviceMaster UP Hardware Installation and Configuration Guide	

3. Configure the DeviceMaster UP network settings using PortVision DX (*Configuring the Network Settings* on Page 15).

4. You **must** upload the Modbus Server firmware into the DeviceMaster UP using PortVision DX (*Uploading Modbus Server* on Page 18).

5. Configure the port characteristics using the DeviceMaster UP embedded web page (*Embedded Web Pages* on Page 25).

6. Optionally, install the secure COM port redirector if you require COM port support (*Installing the Serial Port Redirector (Optional) on Page 19*).

7. Connect any serial device or devices using the appropriate hardware installation document for your DeviceMaster UP (table, above).

PortVision DX Overview

Use PortVision DX to identify, configure, update, and manage the DeviceMaster UP on the following operating systems:

*   Windows XP
*   Windows Server 2003
*   Windows Vista
*   Windows Server 2008
*   Windows 7
*   Windows Server 2012
*   Windows 8/8.1

PortVision DX requires that you connect the Comtrol Ethernet-attached product to the same network segment as the Windows host system if you want to be able to scan and locate it automatically during the configuration process.

Before installing PortVision DX, consider the following:

*   Use PortVision DX to upload firmware and apply changes to a DeviceMaster that is on the same local network segment as the system on which PortVision DX is installed. You cannot apply changes through PortVision DX to a DeviceMaster that is not on the same local network segment.

- Use PortVision DX to monitor any DeviceMaster on the network. The DeviceMaster does not have to be on the same local network segment as PortVision DX for monitoring purposes.

Installing PortVision DX

PortVision DX requires that you connect the DeviceMaster UP to the same network segment as the Windows system during the configuration process.

1. If necessary, download the latest version of PortVision DX from ftp://ftp.comtrol.com/dev_mstr/portvision_dx/.

2. Execute the **PortVision_DX_[version].msi** file.

3. Click **Next** on the *Welcome* screen.
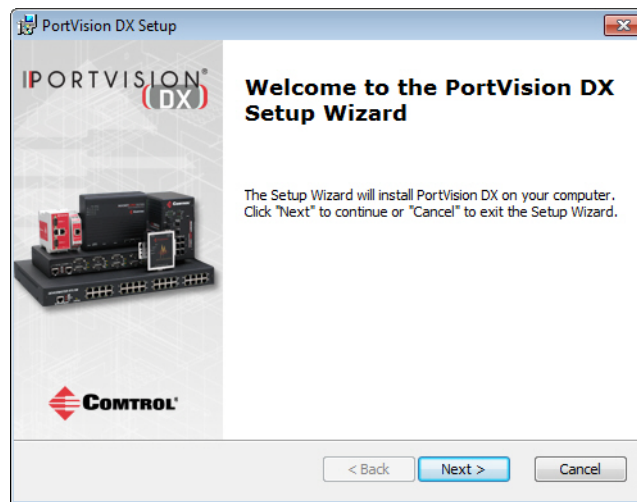
4. Click **I accept the terms in the License Agreement** and **Next**.
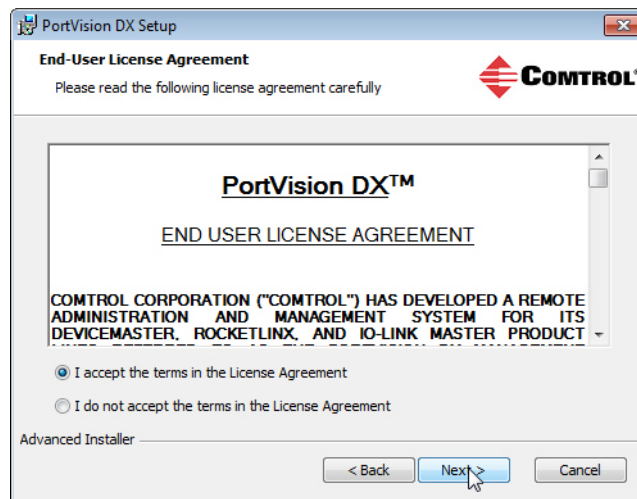
5. Click **Next** or optionally, browse to a different location and then click **Next**.
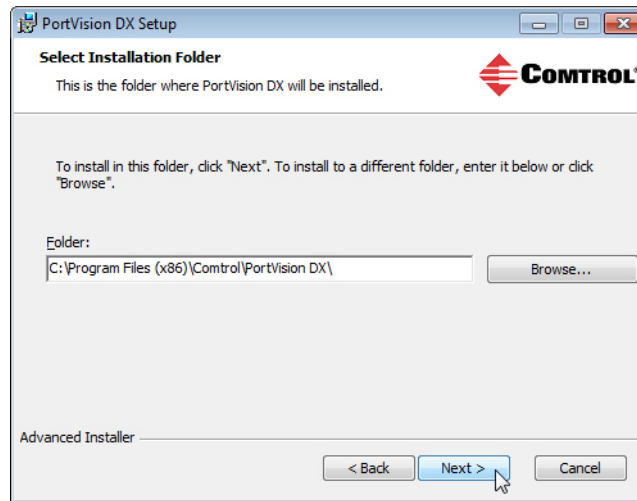
6. Click **Next** to configure the shortcuts.

7. Click **Install**.
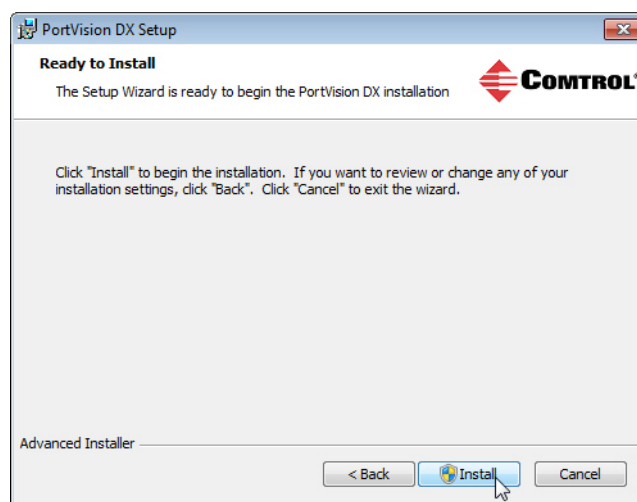
8. Depending on the operating system, you may need to click **Yes** to the *Do you want to allow the following program to install software on this computer?* query.
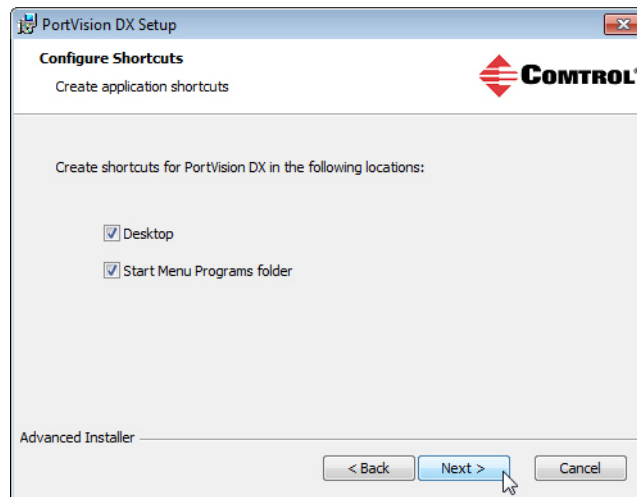
9. Click **Launch** and **Finish** in the last installation screen.
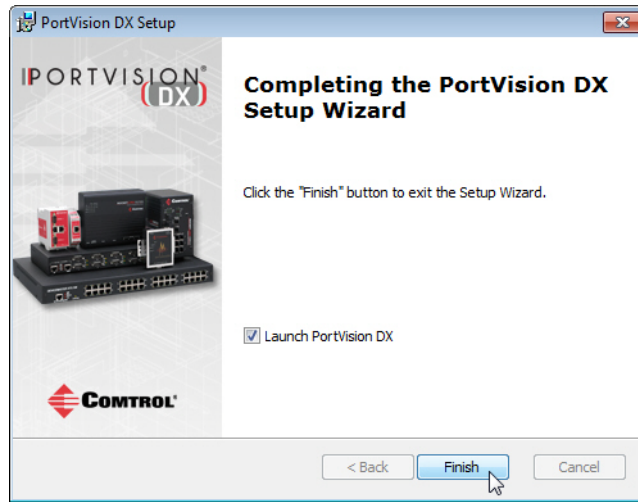
10. Click the **Scan** button in the Toolbar so that PortVision DX locates the DeviceMaster UP.
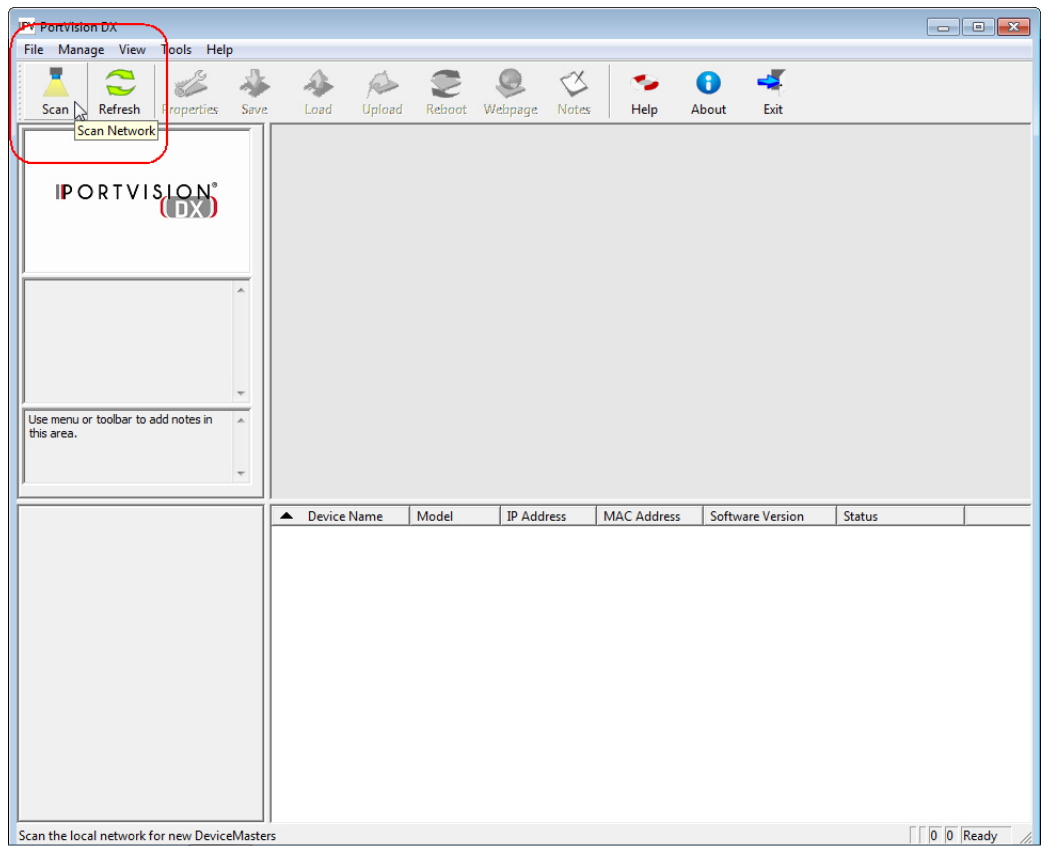
> ***Note:*** *PortVision DX locates all DeviceMaster models, including: the DeviceMaster 500, DeviceMaster LT, DeviceMaster PRO, DeviceMaster RTS, DeviceMaster Serial Hub, and DeviceMaster UP.*

11. Select the products for which you want to scan. If you do not have any RocketLinx managed switches or IO-Link Masters it saves scanning time if you do not scan for them..

Note: *If the Comtrol Ethernet-attached product is not on the local segment and it has been programmed with an IP address, it will be necessary to manually add the Comtrol Ethernet-attached product to PortVision DX.*

12. Go to *Step 5* in the next section, *Configuring the Network Settings*, to program the DeviceMaster UP network settings.

If you need additional information about PortVision DX, refer to the **Help** system.
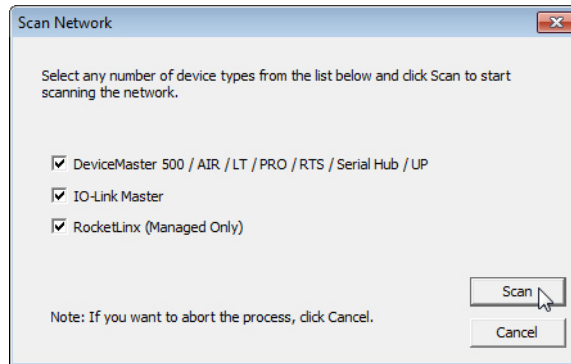
Configuring the Network Settings

Use the following procedure to change the default network settings on the DeviceMaster UP for your network.

Default Network Settings

IP address:
    192.168.250.250

Subnet mask:
    255.255.0.0

Gateway address:
    192.168.250.1

Note: *Technical Support advises configuring one new DeviceMaster UP at a time to avoid device driver configuration problems.*

The following procedure shows how to configure a single DeviceMaster UP connected to the same network segment as the Windows system.

1. If you have not done so, install PortVision DX (*Installing PortVision DX on Page 12*).

2. Start PortVision DX using the **PortVision DX** desktop shortcut or from the **Start** button, click **Programs > Comtrol**, > **PortVision DX**.

3. If this is the first time you have opened PortVision DX, click the **Scan** button in the Toolbar.

4. Select the products for which you want to scan. If you do not have any RocketLinx managed switches or IO-Link Masters it saves scanning time if you do not scan for them..

Note: *If the Comtrol Ethernet-attached product is not on the local segment and it has been programmed with an IP address, it will be necessary to manually add the Comtrol Ethernet-attached product to PortVision DX.*
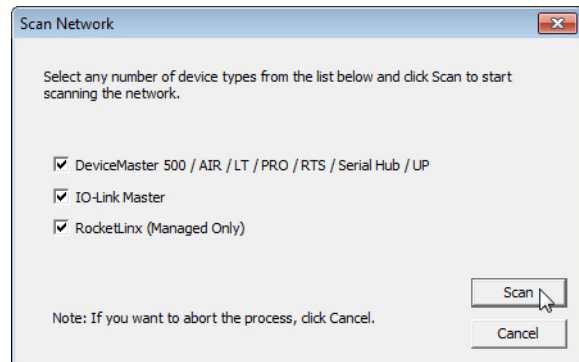
5. Highlight the DeviceMaster for which you want to program network information and open the **Properties** screen using one of these methods.

   - Double-click the DeviceMaster in the *Device Tree* or *Device List* pane.
   - Highlight the DeviceMaster in the *Device Tree* or *Device List* pane and click the **Properties** button.
   - Right-click the DeviceMaster in the *Device Tree* or *Device List* pane and click **Properties** in the popup menu
   - Highlight the DeviceMaster, click the **Manage** menu and then **Properties**.
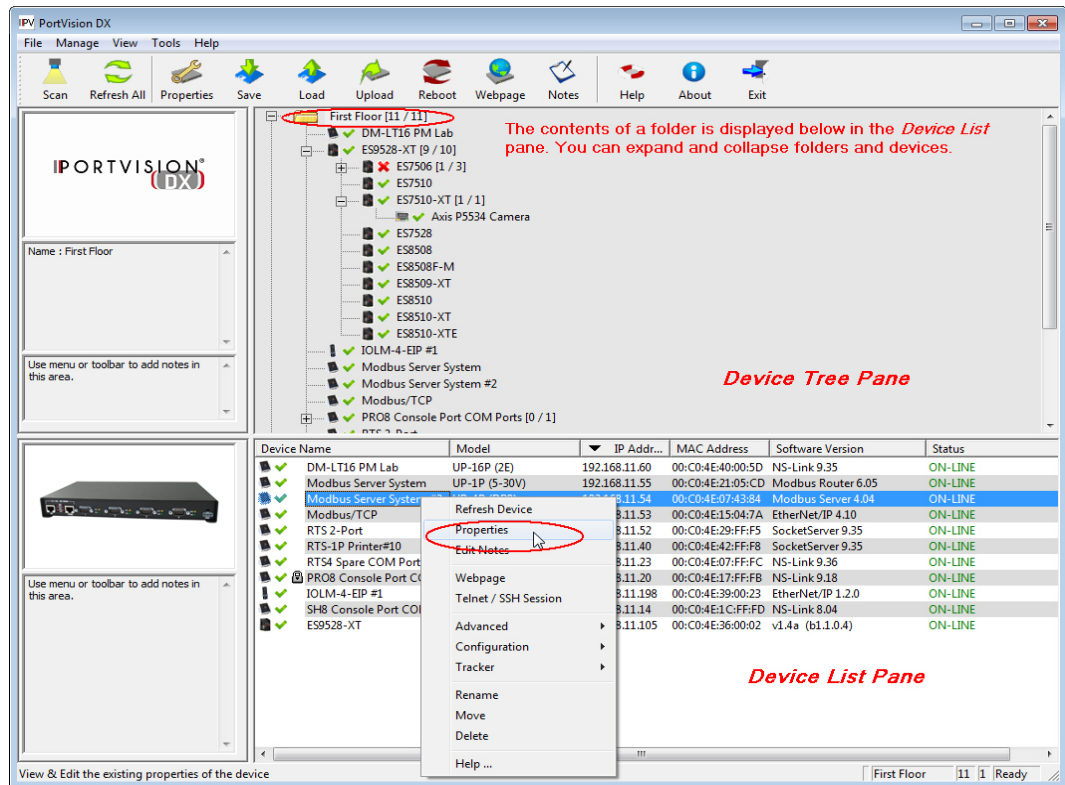
Note: See the PortVision DX Help system for information about using PortVision DX.

6. *Optionally*, rename the DeviceMaster UP in the **Device Name** field.
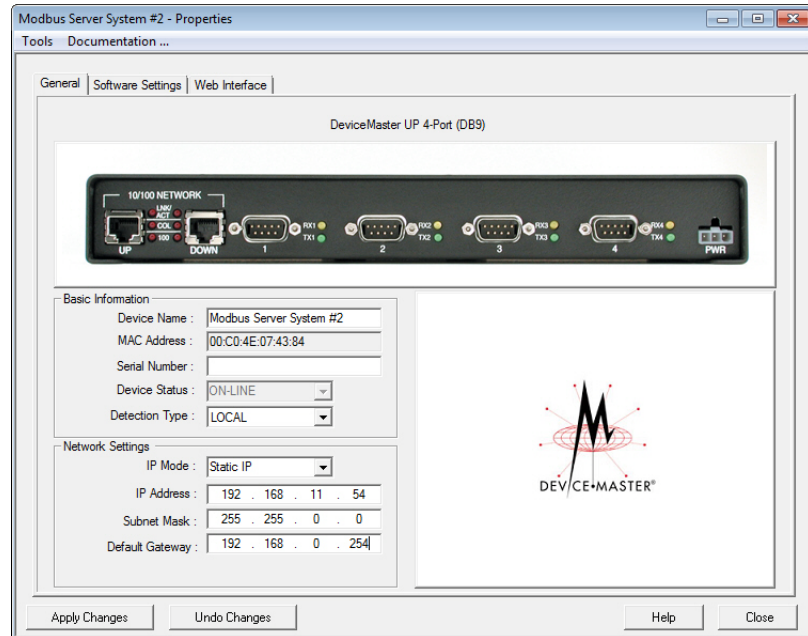
Note: *The MAC address and Device Status fields are automatically populated and you cannot change those values.*

7. Optionally, enter the serial number, which is on a label on the DeviceMaster.

8. If necessary, you can change the **Detection Type**.

- **REMOTE** means that the DeviceMaster is not connected to this segment of the network and it uses IP communications, not MAC communications.

- **LOCAL** means that the DeviceMaster is on this local network segment and uses MAC communications. An IP address is not required but Technical Support recommends using an IP address.

9. Change the DeviceMaster network properties as required for your site.

- Do not select this option to run the DeviceMaster in MAC mode. The DeviceMaster does not support MAC mode.

- To use the DeviceMaster with DHCP, click **DHCP IP**, and make sure that you provide the MAC address of the device to the network administrator. Make sure that the administrator reserves the IP address, subnet mask and gateway address of the DeviceMaster in the DHCP server.

- To program a static IP address, click **Static IP** and enter the appropriate values for your site.

10. Click **Apply Changes** to update the network information on the DeviceMaster.

11. Click **Close** to exit the *Properties* window.

Uploading Modbus Server

Use this section to upload Modbus Server on the DeviceMaster UP using PortVision DX.

1. Make sure that you download the latest Modbus Server version.

2. Execute the .msi to unpackage the Modbus Server firmware file.

3. If necessary, open **PortVision DX > Start/Programs > Comtrol > PortVision DX > PortVision DX** or use the desktop shortcut.

4. Right-click the DeviceMaster or DeviceMasters for which you want to load, click **Advanced > Upload Firmware**, browse to the Modbus Server **.cmtl** file and then click **Open**.
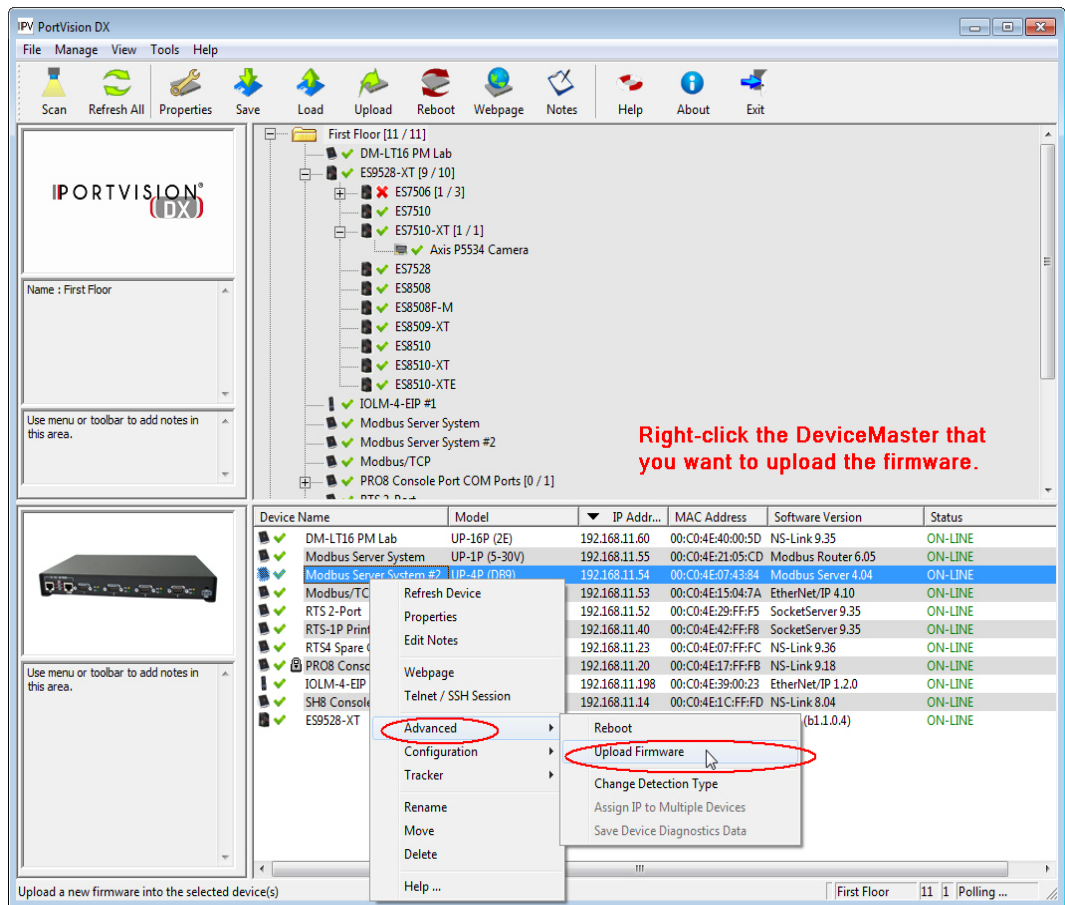
5. Click **Yes** to the *Upload Firmware* message that warns you that this is a sensitive process.
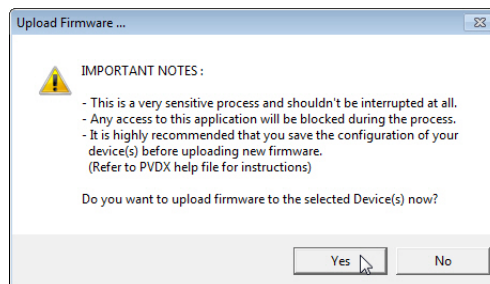
It may take a few moments for the firmware to upload onto the device. The device will reboot itself during the upload process.

6. Click **Ok** to the advisory message about waiting to use the device until the status reads **ON-LINE**. In the next polling cycle, PortVision DX updates the *List View* pane and displays the new Modbus Server version.

Installing the Serial Port Redirector (Optional)

If your environment requires COM port support, you can install the Comtrol serial port redirector using the following procedure.

1. If you have not done so, download the serial port redirector.

2. Execute the .msi file and click **Next**.
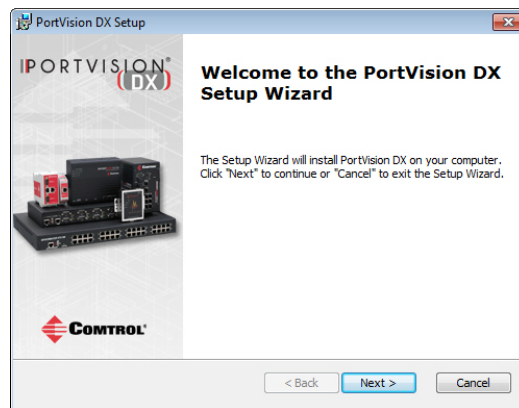
3. Click **I accept the terms in the License Agreement** and then click **Next**.
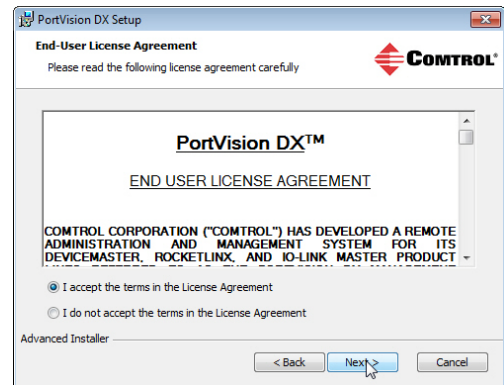
4. If desired, **Browse** to another installation location or click **Next**.
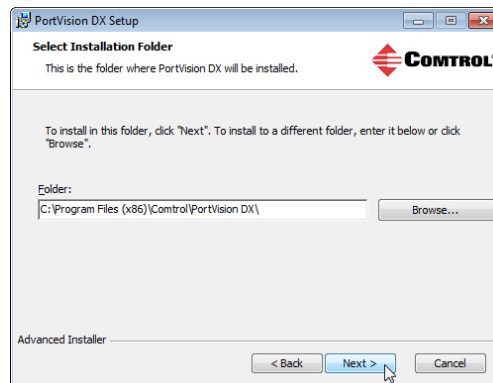
5. Click **Next** to the *Configure Shortcuts* screen.
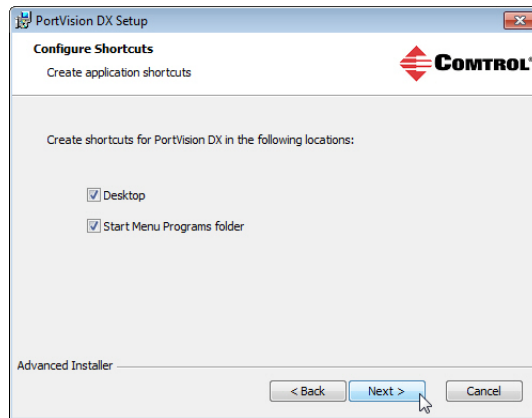
6. Click **Install**.
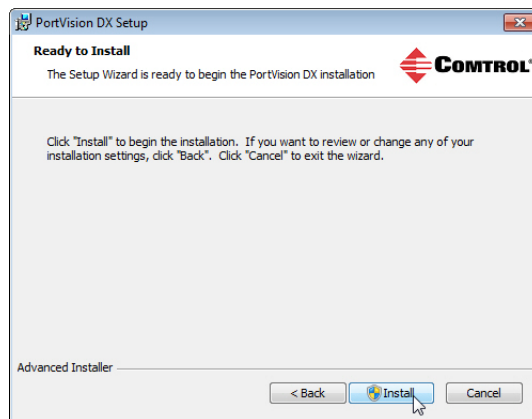
7. Click **Finish**.
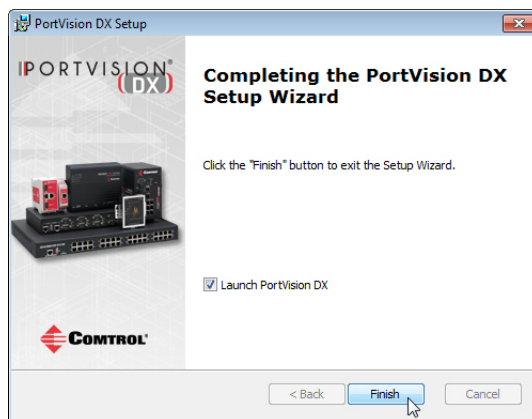
Configuring Port Redirector COM Ports

Use the following procedures to:

- Add a DeviceMaster UP port
- Configure the port for the secure port redirector

If necessary, refer to the secure port redirector help system for more information.

Adding a Secure Port

Use the following procedure to add a secure port or ports.

Note: You must have enabled the security feature in SocketServer and have the IP address and TCP port numbers and enabled the TCP Connection for each port before performing the following procedure.

1. If necessary, open the *Secure Port Redirector*, click **Start**, **Programs**, **Secure Port Redirector**, and **Secure Port Redirector**.

2. Click **Port** and **Add**.
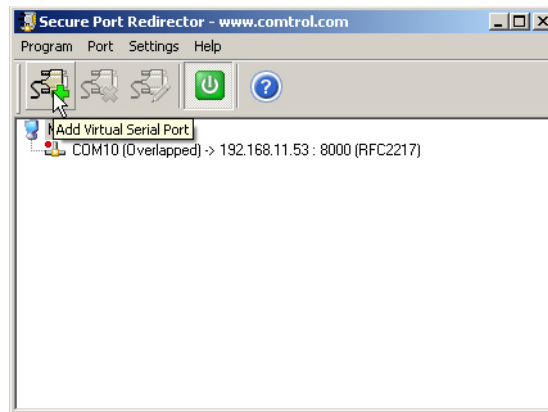
3. Select an available COM port in the *Virtual serial port* drop list.

4. Click **Client** or **Server** depending on the COM port requirements.

5. Enter the Remote IP address of the DeviceMaster UP.

6. Enter the TCP port number for which you want to communicate on the DeviceMaster UP.

7. Click **Ok**.

8. Repeat *Step 2* for each port that you want to use as a secure COM port.
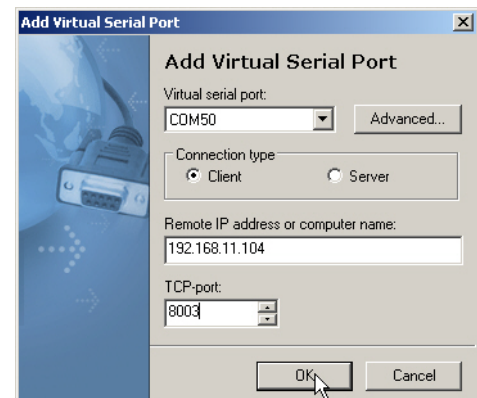
**Configuring the
Secure COM Port**

Use the following procedure to configure the port.

1. Double-click the port that you want to configure.
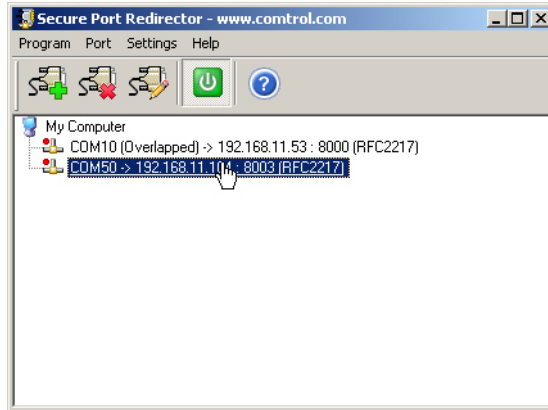
2. Optionally click the *Connection Settings* tab, click **Auto-reconnect when connection is broken**, set the **Reconnect interval**, set **Cache data when the connection is broken**, and then **Ok**.
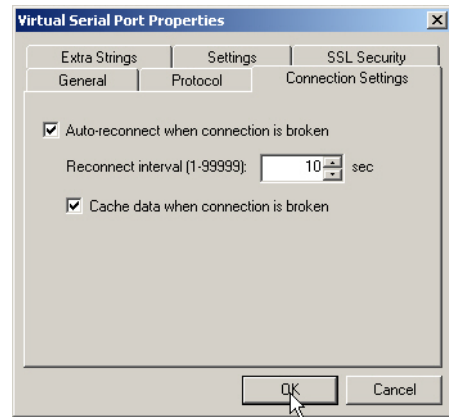
3. Click the *SSL Security* tab and then click **Use SSL for connection to remote side**.
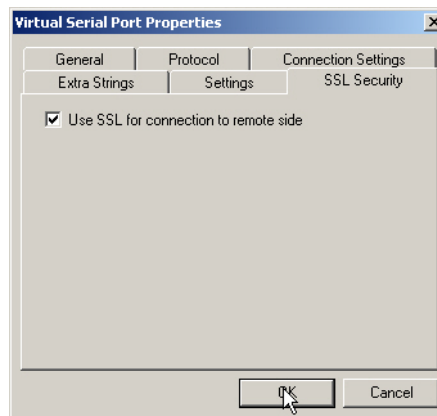
4. Click the *Settings* tab and select the appropriate serial port settings.
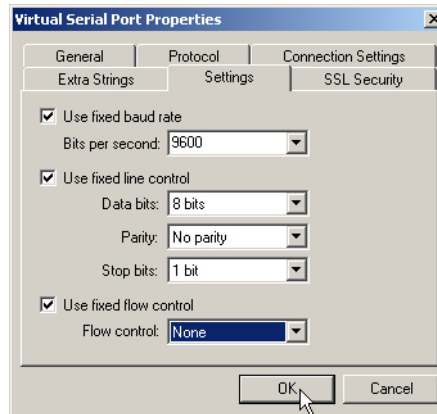
5. Optionally, click the *Extra Strings* tab and enter the appropriate values.
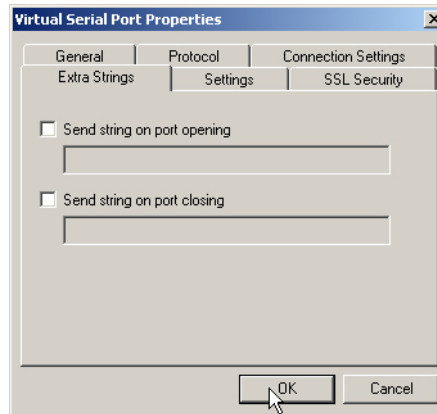
6. Click **OK** to save the settings for the DeviceMaster UP.

7. Repeat the above procedure for each port that you want to use as a secure COM port.

8. Close the Secure Port Redirector window when you are done.

You are now ready to connect the serial devices to the DeviceMaster UP ports.

Embedded Web Pages

All configuration and status information is provided through embedded web pages for Modbus Server.

Note: *The latest Modbus Server firmware must be installed before you can configure network or serial/socket port characteristics.*

For firmware installation and setup information, see *Installation Overview on Page 11* or the PortVision DX help system.

This section discusses the following:

- Configuration overview (below)
- *Server Configuration (Main) Page* on Page 26
- *Serial Interface Configuration Page* on Page 27
- *Edit Port Configuration Page* on Page 28
- *Edit Network Configuration Page* on Page 31

See the *Embedded Diagnostic and Statistics Pages* (Page 33) section for information about locating diagnostic and statistics for Modbus Server.

Configuration Overview

The following overview shows how to access the DeviceMaster *Server Configuration* embedded web page and configure serial device interfaces.

Note: *If you have not configured the network information into the DeviceMaster during initial setup, you must configure the network information before configuring port characteristics.*

1. From PortVision DX, highlight the DeviceMaster that you want to configure and select **Webpage**.

2. Optionally, enter the IP address of the device in the **Address** box of your web browse.

3. Select **Serial Interface Configuration**.

4. Select the appropriate port to access the *Edit Port Configuration* page for that port.

5. Change the serial port configuration properties as required for your site.

Server Configuration (Main) Page

Access the main DeviceMaster web page (*Server Configuration*) from PortVision DX or enter the IP address of the DeviceMaster in the **Address** box of your web browser.

The *Server Configuration* page displays the software version and current network configuration for the DeviceMaster.

In addition, the *Server Configuration* page links to the configuration, statistics, and diagnostics pages, which are discussed in the table below.

Server Configuration Page	
Software	Modbus Server firmware version currently running on the DeviceMaster.
IP Config	Type of IP configuration currently in use (static or DHCP).
IP Address IP Netmask IP Gateway	IP address, netmask, and gateway configured in the DeviceMaster.
Serial Interface Configuration	Opens the *Serial Interface Configuration Page* (Page 27), which provides an overview of the serial interface settings and provides access to the *Edit Port Configuration* page for serial port configuration on the selected port.
Communication Statistics	Opens the *Serial Interface Communications Statistics Page* (Page 27), which contains serial interface and application connection statistics.
Display Serial Logs	Opens the *Serial Interface Logs Page* (Page 36), which contains the statistics and error reporting information for each port.
Configure Network	Opens the *Edit Network Configuration Page* (Page 31), which can be used to modify DeviceMaster network configuration after initial configuration using PortVision DX.
Display All Known Modbus/RTU Devices	Opens the *Known Modbus/ RTU Device List Web Page* (Page 33), which displays all known Modbus/RTU device attached to all serial ports.
Reboot	Reboots the DeviceMaster.
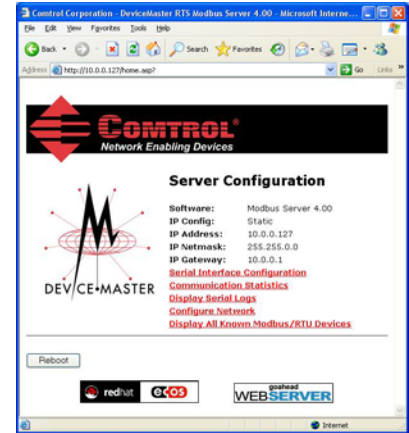
Serial Interface Configuration Page

The *Serial Interface Configuration* page provides:

- Links to the following pages:
    - *Server Configuration (Main) Page* (Page 26)
    - *Serial Interface Communications Statistics Page* (Page 34)
    - *Serial Interface Logs Page* (Page 36)
    - *Known Modbus/RTU Device List Web Page* (Page 33) for all ports or a specific port. Clicking the *Display Devices (all)* link or the Display *Devices* for a specific port.
- Access to the *Edit Port Configuration* page for each port (Port #)
- An overview of serial device configuration settings for each port, which displays the current settings

Note: *The Application TCP Connection Status displays the Remote Connections.*

Up to six active TCP/IP connections for each serial port may be displayed at one time.

To change any settings for a port, select the corresponding **Port #** link, which opens

the *Edit Port Configuration* page.

Select the appropriate serial port number to configure the serial port characteristics.

Edit Port Configuration Page

Use the *Edit Port Configuration* page to change a serial port's configuration parameters.

To access the *Edit Port Configuration* page, select the appropriate port number link (for example, Port 1) on the *Serial Interface Configuration* page.

Use the *Serial Configuration* area of the *Edit Port Configuration* page to configure serial port characteristics for the device that you plan on connecting to the port.

Name	Value(s)	Description
Serial Configuration		
Mode	All models, except 2-port models: • **RS-232** (default) • RS-422 • RS-485 2-port models: • **RS-232** (default) • RS-422 • RS-485_2-wire • RS-485 4-wire Master • RS-485 4-wire Slave	Selectable serial mode of communications.
Baud Rate	300, 600, 1200, 2400, 4800, 9600, 19200, **38400** (default), 57600, 115200, 230400	Selectable serial port baud rates.
Parity	**None** (default) Even Odd	Selectable parity values.
Data Bits	5, 6, 7, **8** (default)	Selectable data bit values.
Stop Bits	**1**(default) or 2	Selectable stop bit values.
Flow	**None** (default) RTS/CTS XON/XOFF Half-Duplex	Selectable flow control values.
Rx Timeout Between Packets	0-65535 (default = **50**)	Receive time-outs between packets in milliseconds. This is the maximum spacing between received bytes allowed before Modbus/RTU messages/responses received over both the serial and Ethernet TCP/IP interface are expected to be complete. *Note: If this value is set too low, incomplete and/or invalid Modbus/RTU messages may be incorrectly detected.*
Duplicate Serial Configuration For All Ports	N/A	If selected, will apply the serial port configuration to all serial ports.
Modbus/RTU Protocol Settings		
Device Response Timeout	0 to 65535 ms. (Default=1000 ms)	The maximum allowable time for a slave Modbus/RTU to respond to a message before the message is considered timed out.

Name	Value(s)	Description
Discard Rx Packets With Errors	On/Off (Default = On)	If selected, the DeviceMaster will drop all packets received with parity, framing, or overrun errors. *Note: Modbus/RTU messages with invalid CRCs will always be discarded independent of this setting.*
Duplicate Modbus/ RTU Protocol for All Ports.	N/A	If selected, will apply the Modbus/RTU protocol settings to all serial ports.
Application TCP Connection Configuration		
Enable	On/Off (Default = On)	If selected, this TCP/IP socket interface will be enabled.
Listen	On/Off (Default = On)	If selected, the TCP/IP socket interface will listen for a connection at the specified **Listen Port.**
Listen Port	1-65535 Default: Port 1=8000 Port 2=8001 Port 3=8002 .. .. Port N =800N -1	If **Enable** and **Listen** are both selected, allows acceptance of: Up to six connections from external applications if there is no active **Connect-to** connection. Up to five connections if there is an active **Connect-to** connection.
Connect to Mode	Never Connect-Always (Default = Never)	If **Enable** is selected, this setting determines how to connect to an application. If **Never**, do not attempt to make a connection. If **Connect-Always:** Always attempt to maintain a connection to the application at **Connect IP Address** and **Connect Port.**
Connect Port	1 to 65535 (Default=0)	Socket port to connect to. Used in conjunction with **Connect to Mode** and **Connect IP Address.**
Connect IP Address	Standard IP address format: xxx.xxx.xxx.xxx	IP Address of application to create a connection. Used in conjunction with **Connect to Mode** and **Connect Port.**
Disconnect Mode	Never Idle (Default = Never)	Mode on which to disconnect from the application. **Never** – Will not disconnect when connection(s) are idle. (Typically used in **Listen** and **Connect-Always** modes.) **Idle** – Utilizes the **Idle Timer** to determine when to close the connection.
Idle Timer	1 to 65535 (Default=0)	If the **Disconnect Mode** is set to **Idle**, the idle or inactivity time when the connection(s) will be closed.

Edit Network Configuration Page

You can use the *Edit Network Configuration* page to change the DeviceMaster network configuration after using PortVision DX for initial network configuration.

Use the following procedure to change the network configuration.

1. Select the IP configuration type (**Use DHCP** or **Use Static configuration below:**).

2. If you select **Use Static configuration below**, enter a valid IP address, subnet mask, and IP gateway for your network. The network information is programmed into the DeviceMaster after applying the changes and rebooting the device. If necessary, see your network administrator for a valid IP address.

    Note: *The DeviceMaster family default IP address is 192.168.250.250, default subnet mask is 255.255.0.0, and the default IP gateway is 192.168.250.1.*

3. Select **Save** or **Undo Changes** to close the page.

4. If you selected **Save**, select **Reboot** to program the network information into the DeviceMaster or **Continue** if you want to reboot later.

Note: *Changed network settings will not take affect until the DeviceMaster is rebooted.*
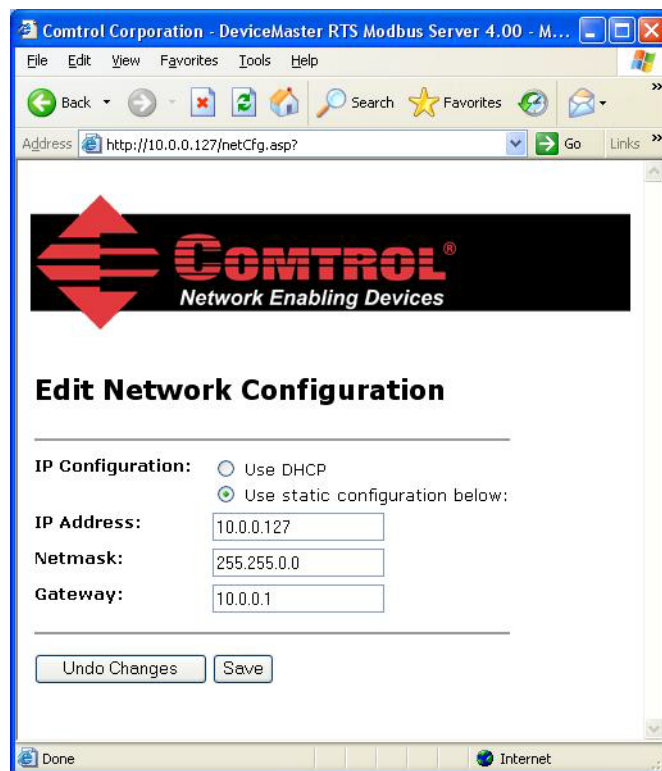
Embedded Diagnostic and Statistics Pages

This section discusses embedded diagnostic and statistics web pages for Modbus Server.

Known Modbus/RTU Device List Web Page

The *Known Modbus/RTU Device List* page provides device specific status and statistics for each device on one or all ports.
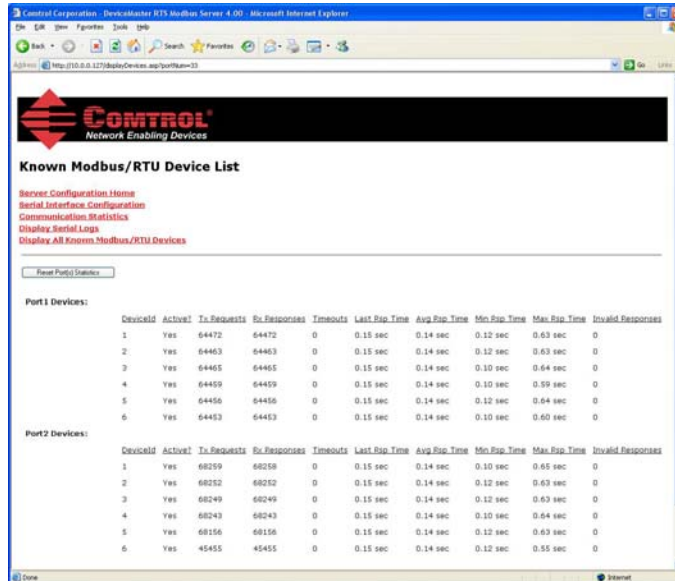
Know Modbus/RTU Device List Page	
Device ID	Unit identifier associated with this device.
Active?	Status of device: • **Yes** means that the last request received a valid response and did not time out. • **No** means that the last request timed out.
Tx Requests	Number of Modbus messages transmitted to this device.
Rx Responses	Number of Modbus responses received from this device.
Timeouts	Number of response time-outs associated with this device.
Last Rsp Time	The last response time from Modbus/RTU device.
Avg Rsp Time	The average response time from Modbus/RTU device.
Min Rsp Time	The minimum response time from Modbus/RTU device.
Max Rsp Time	The maximum response time from Modbus/RTU device.
Invalid Responses	Number of invalid responses received from this device.

Serial Interface Communications Statistics Page

Where the following definitions apply:.
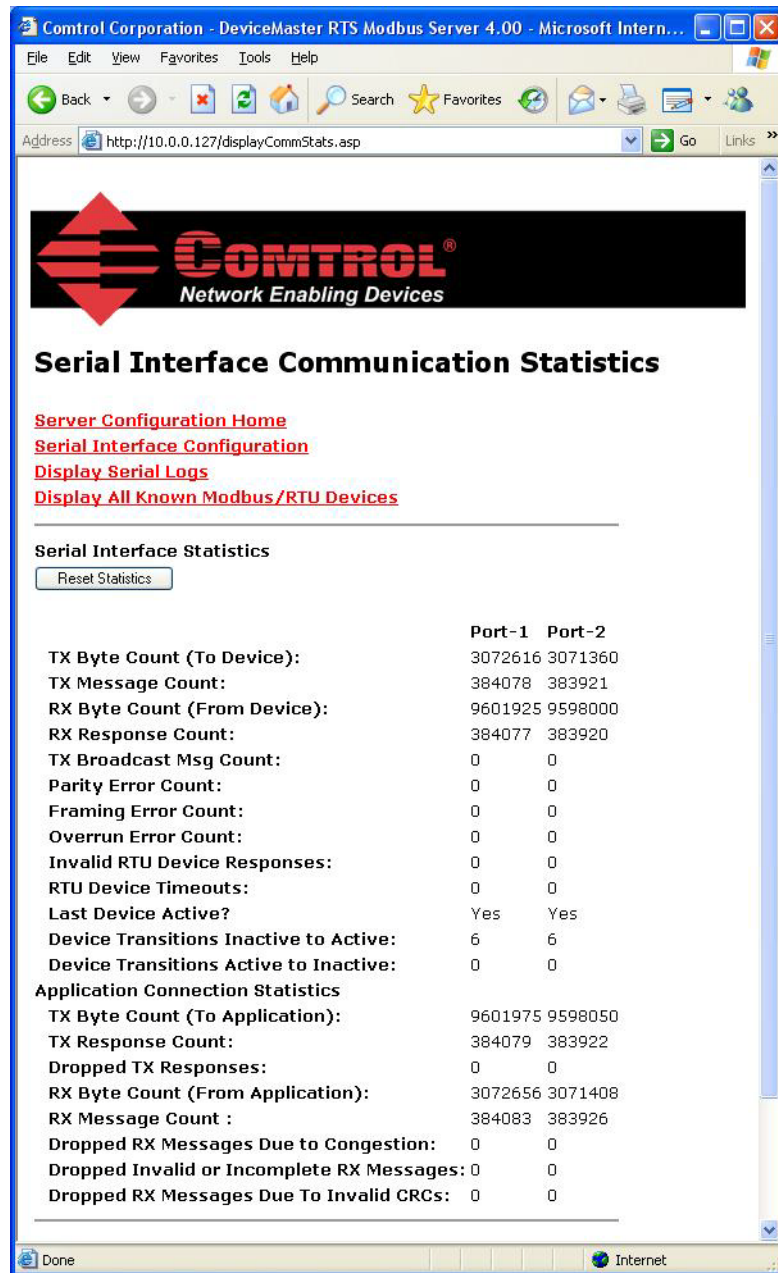
Counter Name	Description
TX Byte Count (To Device)	Number of bytes transmitted out the serial port.
TX Message Count	Number of messages transmitted out the serial port.
RX Byte Count (From Device)	Number of bytes received on the serial port.
RX Response Count	Number of responses received on the serial port.

Counter Name	Description
Parity Error Count	Number of parity errors received on the serial port. Typically occurs due to an incorrect parity setting.
Framing Error Count	Number of framing errors received on the serial port. Typically occurs due to an incorrect baud rate or stop bit setting.
Overrun Error Count	Number of overrun errors received on the serial port.. Typically occurs to one of the following: incorrect flow control, incorrect baud rate, incorrect data size, or incorrect stop bit setting.
Invalid RTU Device Responses	Number of invalid RTU device responses. These responses can be caused by the following: • Message received after the timeout period. This may require increasing the **Modbus/RTU Device Response Timeout.** • Incorrect device ID in response message. • Incorrect function code in response message.
RTU Device Timeouts	The number of RTU device time-outs that occurred when there was no response for a Modbus message.
Last Device Active?	The status of the last device response: • **Yes** – The last message received a valid response from a device connected to the serial port. • **No** – The last message did not receive a valid response from a device connected to the serial port
Device Transitions Inactive to Active	The number of times a device went from the inactive state, (not responding or no responses yet), to the active state (responding correctly). In a system with all devices responding correctly, this number will typically equal the number of active devices.
Device Transitions Active to Inactive	The number of times a device went from the active state (responding correctly) to the inactive state (not responding correctly). This number is intended to help identify the number times devices respond intermittently.
Application Connection Statistics	
TX Byte Count	Number of bytes transmitted out of the TCP/IP connection(s).
TX Response Count (TO application)	Number of responses transmitted out of the TCP/IP connection(s).
Dropped TX Responses	The number of responses that were intended to be transmitted out the TCP/IP connection(s) but could not be and were dropped. This typically occurs when one or more connections close unexpectedly.
RX Byte Count	Number of bytes received on the TCP/IP connection(s).
RX Message Count (From Application)	Number of messages received on the TCP/IP connection(s).
Dropped RX Messages Due to Congestion	The number of messages that were dropped to the gateway being overly congested. This typically occurs when the application(s) send messages faster than the device(s) can respond.
Dropped Invalid or Incomplete RX Messages	The number of messages from the application(s) that were dropped to: • Containing an invalid Modbus/RTU message format. • Containing an incomplete Modbus/RU message.

Counter Name	Description
Dropped RX Messages Due to Invalid CRCs	Number of messages from the application(s) that were dropped due to an invalid Modbus/RTU CRC.
TX Byte Count (To Device)	Number of bytes transmitted out the serial port.

Serial Interface Logs Page

The following page displays the serial message transmitted and received during normal operation.

The format is as follows:

    Pkt(N): ddd:hh:mm:ss.mss Rx/Tx:(data packet)

Where:

ddd   Days since last system restart

hh   Hours since last system restart

mm   Minutes since last system restart

ss   Seconds since last system restart

mss   Milliseconds since last system restart

(data)   Modbus/RTU message data.
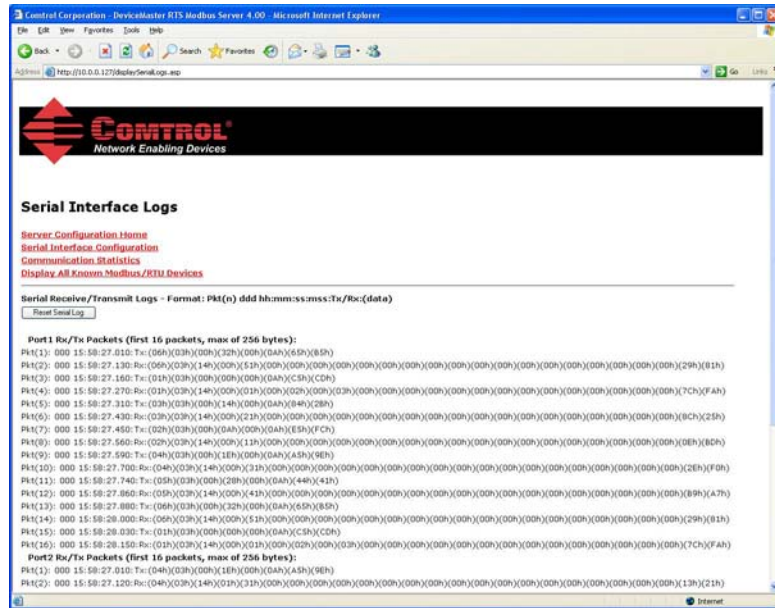
Troubleshooting and Technical Support

This section contains troubleshooting information for your DeviceMaster. You should review the following subsections before calling Technical Support because they will request that you perform many of the procedures or verifications before they will be able to help you diagnose a problem.

- <hyperlink-CrossReference>Troubleshooting Checklist on Page 37
- <hyperlink-CrossReference>General Troubleshooting on Page 38
- <hyperlink-CrossReference>Daisy-Chaining DeviceMaster 2E/4-Port Units on Page 39

If you cannot diagnose the problem, you can contact <hyperlink-CrossReference>Technical Support on Page 40.

Troubleshooting Checklist

The following checklist may help you diagnose your problem:

- Verify that you are using the correct types of cables on the correct connectors and that all cables are connected securely.

  Note: *Most customer problems reported to Comtrol Technical Support are eventually traced to cabling or network problems.*

- Isolate the DeviceMaster from the network by connecting the device directly to a NIC in a host system.

Model	Connected to	Ethernet Cable	Connector Name
1-Port	Ethernet hub or NIC	Standard	10/100 ETHERNET
1-Port Embedded	Ethernet hub or NIC	Standard	RJ45 port (not labeled)
2-Port - 1E (All models)	Ethernet hub or NIC	Standard	10/100
2-Port - 2E (All dual Ethernet ports)	Ethernet hub or NIC	Standard	10/100 - E1/E2
4-Port	NIC	Standard	DOWN
	Ethernet hub	Standard	UP

- Verify that the Ethernet hub and any other network devices between the system and the DeviceMaster are powered up and operating.
- Reset the power on the DeviceMaster and watch the **PWR** or **Status** light activity.

PWR or Status LED	Description
5 sec. off, 3 flashes, 5 sec. off, 3 flashes ...	Redboot™ checksum failure.
5 sec. off, 4 flashes, 5 sec. off, 4 flashes ...	SREC load failure.
5 quick flashes	The default application is starting up.
10 sec. on, .1 sec. off, 10 sec. on .1 sec. off ...	The default application is running.

- If the device has a power switch, turn the device's power switch off and on, while watching the LED diagnostics.
- If the DeviceMaster does not have a power switch, disconnect and reconnect the power cord.
- Verify that the network IP address, subnet mask, and gateway is correct and appropriate for the network. If IP addressing is being used, the system should be able to ping the DeviceMaster.
- Verify that the IP address programmed into the DeviceMaster matches the unique reserved IP configured address assigned by the system administrator.
- If using DHCP, the host system needs to provide the subnet mask and gateway.
- Reboot the system and the DeviceMaster.
- If you have a spare DeviceMaster, try replacing the device.

General Troubleshooting

This table illustrates some general troubleshooting tips.

Note: *Make sure that you have reviewed the <hyperlink-CrossReference>Troubleshooting Checklist on Page 37.*

General Condition	Explanation/Action
PWR or **Status** LED flashing	Indicates that boot program has not downloaded to the unit. 1. Reboot the system. 2. Make sure that you have downloaded the most current firmware for your protocol: ftp://ftp.comtrol.com/html/up_main.htm. *Note:* *If the PWR or Status LED is still flashing, contact Technical Support.*
PWR or **Status** LED not lit	Indicates that power has not been applied or there is a hardware failure. Contact Technical Support.
Cannot ping the device through Ethernet hub	Isolate the DeviceMaster from the network. Connect the device directly to the NIC in the host system (see Page 37).
Cannot ping or connect to the DeviceMaster	The default IP address is often not accessible due to the subnet masking from another network unless **192.168** is used in the network. In most cases, it will be necessary to program in an address that conforms to your network.
DeviceMaster continuously reboots when connected to some Ethernet switches or routers	Invalid IP information may also cause the switch or router to check for a gateway address. Lack of a gateway address is a common cause.

Daisy-Chaining DeviceMaster 2E/4-Port Units

Daisy-Chaining DeviceMaster 2E/4-Port Units

The DeviceMaster 2E/4-port models with external power supplies follow the IEEE specifications for standard Ethernet topologies.

When using the **UP** and **DOWN** ports, the DeviceMaster 2E/4 is classified as a switch. When using the **UP** port only, it is a simple end node device.

The maximum number of daisy-chained DeviceMaster 2E/4 units, and the maximum distance between units is based on the Ethernet standards and will be determined by your own environment and the conformity of your network to these standards.

Comtrol has tested with seven DeviceMaster 2E/4 units daisy-chained together using 10 foot CAT5 cables, but this is not the theoretical limit. You may experience a performance hit on the devices at the end of the chain, so it is recommended that you overload and test for performance in your environment. The OS and the application may also limit the total number of ports that may be installed.

Following are some quick guidelines and URLs of additional information. Please note that standards and URLs do change.

- Ethernet 10BASE-T Rules

  - The maximum number of repeater hops is four.

  - You can use Category 3 or 5 twisted-pair 10BASE-T cables.

  - The maximum length of each cable is 100m (328ft).

    Note: Category 3 or 5 twisted pair cables look the same as telephone cables but they are not the same. The network will not work if telephone cables are used to connect the equipment.

- Fast Ethernet 100BASE-TX rules

  - The maximum number of repeater hops is two (for a Class II hub). A Class II hub can be connected directly to one other Class II Fast Ethernet hub. A Class I hub cannot be connected directly to another Fast Ethernet hub.

  - You must use Category 5 twisted-pair 100BASE-TX cables.

  - The maximum length of each twisted-pair cable is 100m (328ft).

  - The total length of twisted-pair cabling (across directly connected hubs) must not exceed 205m (672ft).

    Note: Category 5 twisted pair cables look the same as telephone cables but they are not the same. The network will not work if telephone cables are used to connect the equipment.

- IEEE 802.3 specification: A network using repeaters between communicating stations (PCs) is subject to the "5-4-3" rule of repeater placement on the network:

  - Five segments connected on the network.

  - Four repeaters.

  - Three segments of the 5 segments can have stations connected. The other two segments must be inter-repeater link segments with no stations connected.

    See http://www.optronics.gr/Tutorials/ethernet.htm for more specific information.

    Additional information may be found at http://compnetworking.about.com/cs/ethernet1/ or by searching the web.

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Technical Support

It contains troubleshooting procedures that you should perform before contacting Technical Support since they will request that you perform, some or all of the procedures before they will be able to help you diagnose your problem. If you need technical support, use one of the following methods.

Comtrol Contact Information	
Downloads	ftp://ftp.comtrol.com/html/up_modbus_server_main.htm
Web site	http://www.comtrol.com
Phone	763.957.6000