



Modbus[®] Server User Guide



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Modbus Server Application Overview

This section defines the software functionality for the Modbus Server application.

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 RTS or DeviceMaster UP chassis based on Modbus/RTU message throughput.

Throughput	1 Port	2 Ports	4 Ports	8 Ports	16 Ports	32 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	X		
Low - Message rate of up to one message every 500 ms per port (2 messages per port per second)	X	X	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	X	X	X
Latency						
Transmit (From application to device)	2-10 ms (*)		5-20 ms (*)		0-30 ms (*)	
Receive (From device to application)	2-10 ms (*)		5-20 ms (*)		5-50 ms	10-100 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.

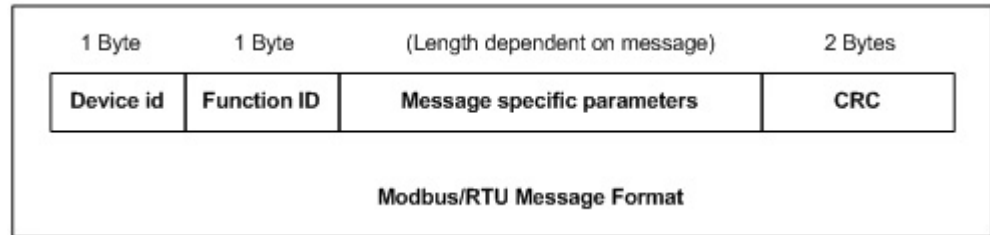
Terms and Definitions

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. <i>Note: Modbus/RTU over Ethernet TCP/IP is not the same as Modbus/TCP.</i>
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.

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:



Where:

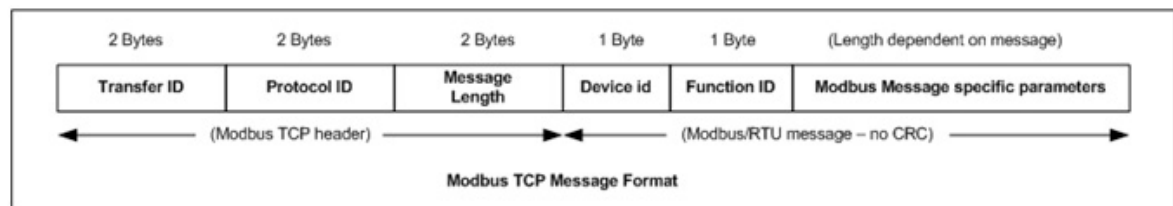
- The terms Master or Client are used to identify the sender of the message.
- The terms Slave or Server are used to identify the devices responding to the message.

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:



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).

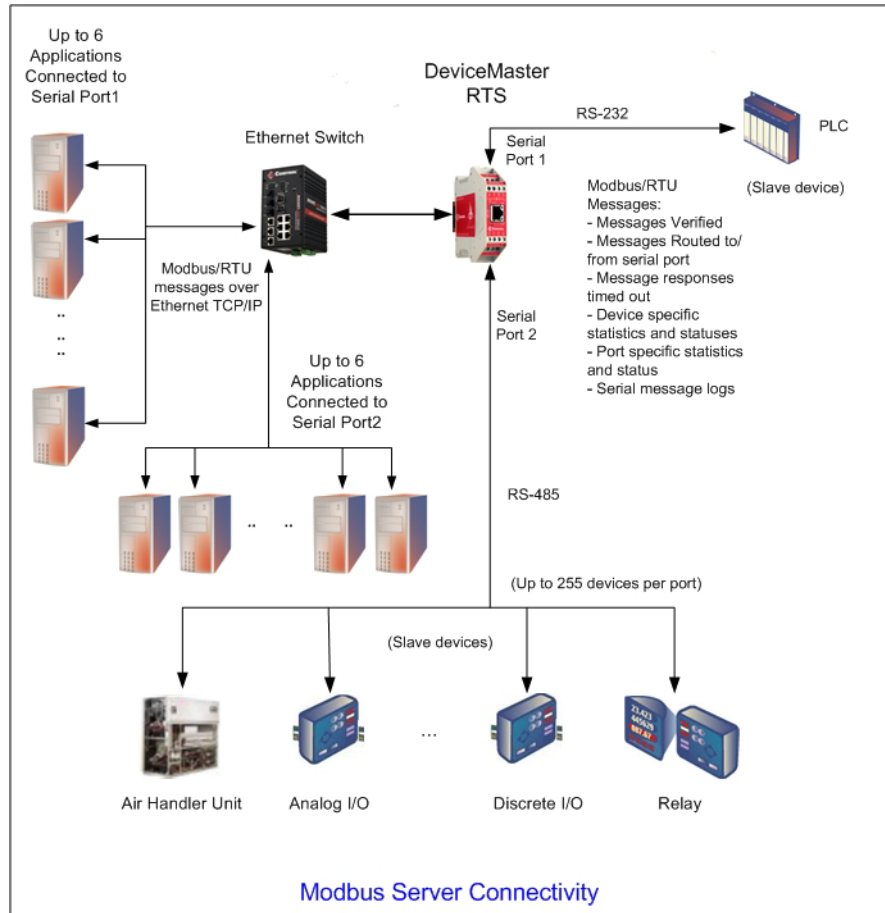
Note: Refer to the DeviceMaster UP for Modbus/TCP functionality.

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 Control Secure Port Redirector, can support up to six COM port connections to each serial port.





Installation Overview

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

An installation follows these basic steps.

1. Connect the DeviceMaster to the network.
If necessary, use the appropriate hardware installation document for your DeviceMaster.
2. Install PortVision Plus from the CD or download and install the latest version.

Hardware Installation Documents	Web
<i>DeviceMaster Installation and Configuration Guide</i>	
<i>DeviceMaster UP Hardware Installation and Configuration Guide</i>	

You can refer to the *Installing PortVision Plus* subsection to locate PortVision Plus and install it easily.

3. Configure the DeviceMaster network settings using PortVision Plus ([Configuring the Network Settings](#) on Page 12).
4. You **must** upload the Modbus Server firmware into the DeviceMaster using PortVision Plus ([Uploading Modbus Server](#) on Page 14).
5. Configure the port characteristics using the DeviceMaster embedded web page ([Embedded Web Pages](#) on Page 15).
6. Connect any serial device or devices using the appropriate hardware installation document for your DeviceMaster.

Installing PortVision Plus

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

- Windows XP
- Windows Server 2003
- Windows Vista
- Windows Server 2008
- Windows 7

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

Note: *If you have a previous version of PortVision Plus on your system, use the Control Panel to remove PortVision Plus before installing the latest version.*

Use the *Software and Documentation* CD that came with the DeviceMaster to check for the latest version of PortVision Plus or use the link below to download the latest version.

1. Execute the **pvplus_[version].msi** file and follow the installation wizard using one of the following methods:
 - **CD Installation:** Use the CD menu system to check the version on the CD against the latest released version.
 - **Download the latest version:** ftp://ftp.comtrol.com/dev_mstr/portvision_plus/.
2. Click **Launch** and **Finish** in the last installation screen.

- Click **Scan** so that PortVision Plus locates the DeviceMaster.

Note: *PortVision Plus locates all DeviceMaster models, including: the DeviceMaster 500, DeviceMaster AIR, DeviceMaster PRO, DeviceMaster RTS, DeviceMaster Serial Hub, and DeviceMaster UP.*

- Go to [Step 4](#) in the next section, *Configuring the Network Settings*, to program the DeviceMaster network settings.

If you need additional information about PortVision Plus, refer to the **Help** system.

Configuring the Network Settings

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

Default Network Settings

IP address:
192.168.250.250
Subnet mask:
255.255.0.0
Gateway address:
192.168.250.1

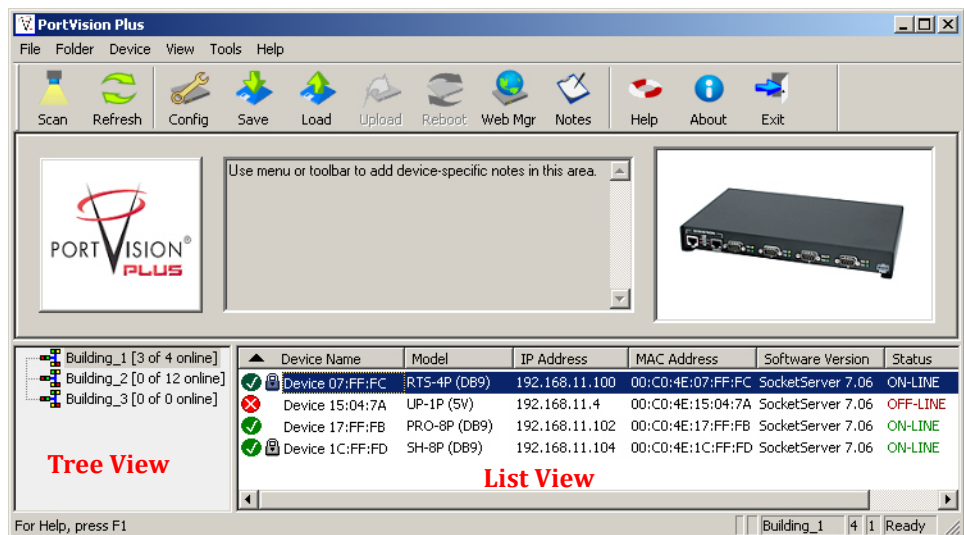
Note: *Technical Support advises configuring one new DeviceMaster at a time to avoid device driver configuration problems.*

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

- If you have not done so, install PortVision Plus ([Installing PortVision Plus on Page 11](#)).
- Start PortVision Plus using the **PortVision Plus** desktop shortcut or from the **Start** button, click **Programs, Control, PortVision Plus**.
- If this is the first time you have opened PortVision Plus, click **Scan** and then **Yes** to locate DeviceMasters on the network.

Note: *PortVision Plus will locate all Control DeviceMaster models, including: DeviceMaster 500, DeviceMaster AIR, DeviceMaster PRO, DeviceMaster RTS, DeviceMaster Serial Hub, and DeviceMaster UP.*

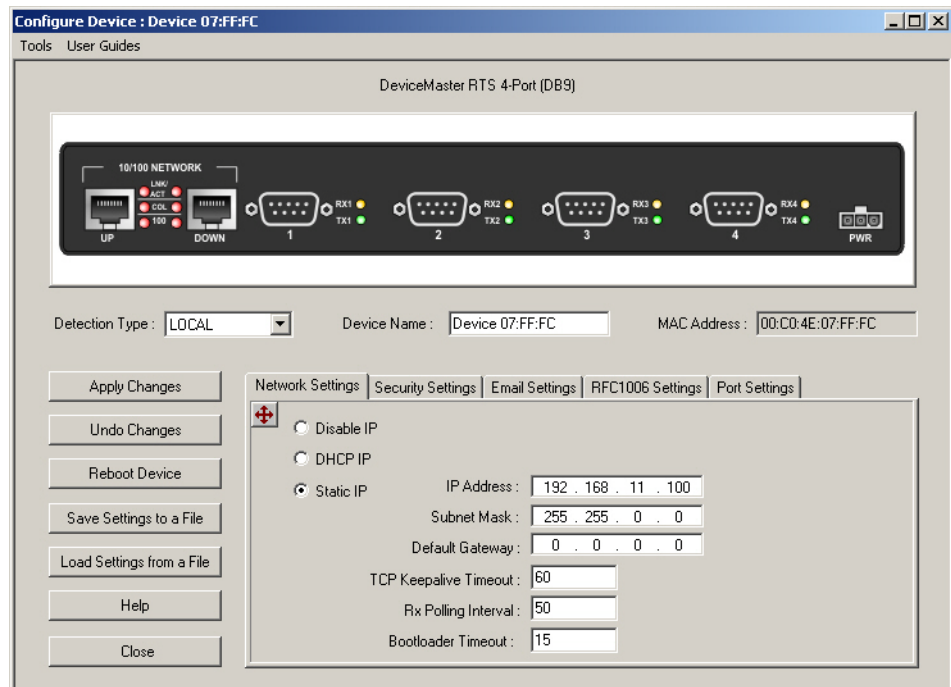
- Highlight the DeviceMaster for which you want to program network information and open the **Configure Device** screen using one of these methods.




- Double-click the DeviceMaster in the *List View* pane.
- Click **Config**.
- Right-click the DeviceMaster in the *List View* pane and click **Configure Device**.

Note: *See the PortVision Plus Help system for information about using PortVision Plus.*

5. *Optionally*, rename the DeviceMaster in the **Device Name** field.



6. Change the DeviceMaster network properties as required for your site.
- If you want to run the DeviceMaster using the MAC addressing scheme, click **Disable IP**.
 - 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.

Note: For additional information, open the PortVision Plus Help system. Access the Help system using the Help button or go directly to the help for a specific property page by clicking the Context menu button ().

7. Click **Apply Changes** to update the network information on the DeviceMaster.
8. *Optionally*, click **Save Settings to a File** to create a configuration file that you can use to configure other DeviceMasters.

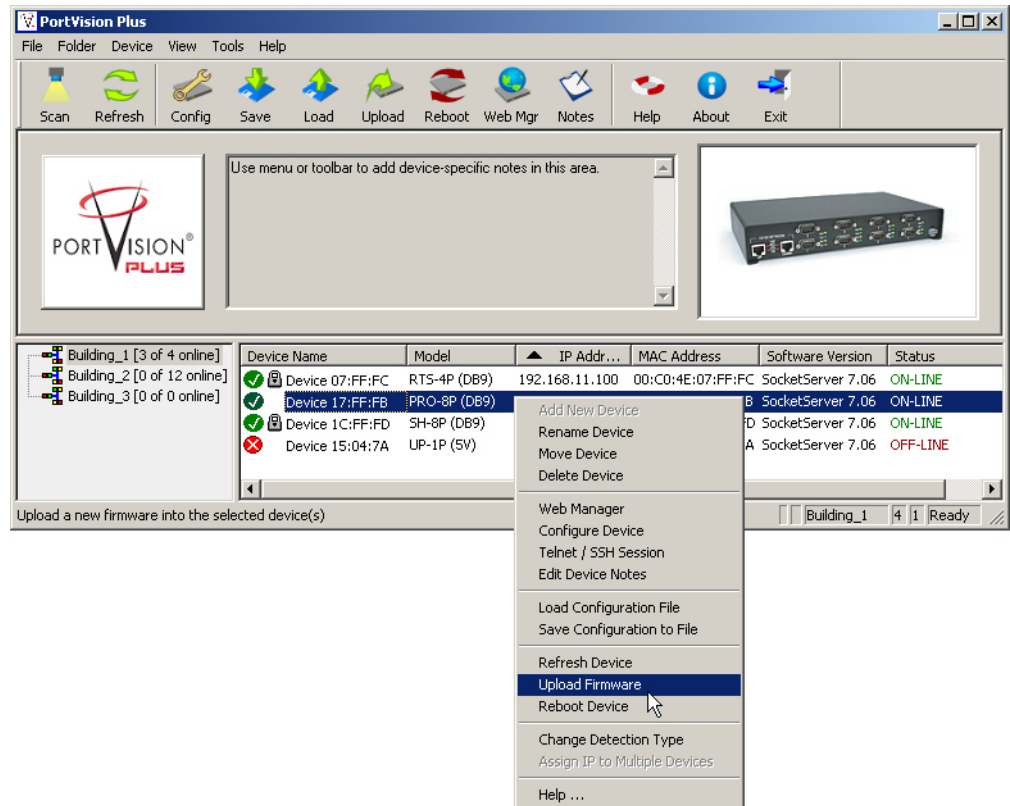
If you are deploying multiple DeviceMasters that share common values, you can save the configuration file and load that configuration onto other DeviceMasters.

9. Click **Close** to exit the *Configure Device* window.

Uploading Modbus Server

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

1. Make sure that you have located or downloaded the [latest Modbus Server version](#).
2. Right-click the DeviceMaster for which you want to update, click **Upload Firmware**, browse to the Modbus Server **.bin** file, and then click **Open**.



3. 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.
4. Click **Ok** to the advisory message about waiting to use the device until the status reads **ON-LINE**. In the next polling cycle, PortVision Plus updates the *List View* pane and displays the new SocketServer version.

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 Plus help system.

This section discusses the following:

- Configuration overview (below)
- [Server Configuration \(Main\) Page](#) on Page 16
- [Serial Interface Configuration Page](#) on Page 17
- [Edit Port Configuration Page](#) on Page 18
- [Edit Network Configuration Page](#) on Page 21

See the *Embedded Diagnostic and Statistics Pages* (Page 23) 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 Plus, highlight the DeviceMaster that you want to configure and select **Web Manager**.
2. Optionally, enter the IP address of the device in the **Address** box of your web browser.
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.



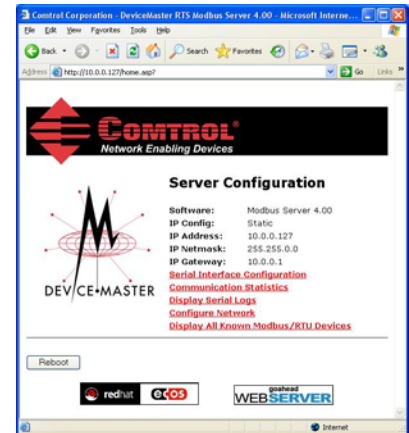
Server Configuration (Main) Page

Access the main DeviceMaster web page (*Server Configuration*) from PortVision Plus 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 <i>Serial Interface Configuration Page</i> (Page 17), which provides an overview of the serial interface settings and provides access to the <i>Edit Port Configuration</i> page for serial port configuration on the selected port.
Communication Statistics	Opens the <i>Serial Interface Communications Statistics Page</i> (Page 17), which contains serial interface and application connection statistics.
Display Serial Logs	Opens the <i>Serial Interface Logs Page</i> (Page 26), which contains the statistics and error reporting information for each port.
Configure Network	Opens the <i>Edit Network Configuration Page</i> (Page 21), which can be used to modify DeviceMaster network configuration after initial configuration using PortVision Plus.
Display All Known Modbus/RTU Devices	Opens the <i>Known Modbus/RTU Device List Web Page</i> (Page 23), 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 16)
 - *Serial Interface Communications Statistics Page* (Page 24)
 - *Serial Interface Logs Page* (Page 26)
 - *Known Modbus/RTU Device List Web Page* (Page 23) 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.



Serial Interface Configuration

[Server Configuration Home](#)
[Communication Statistics](#)
[Display Serial Logs](#)

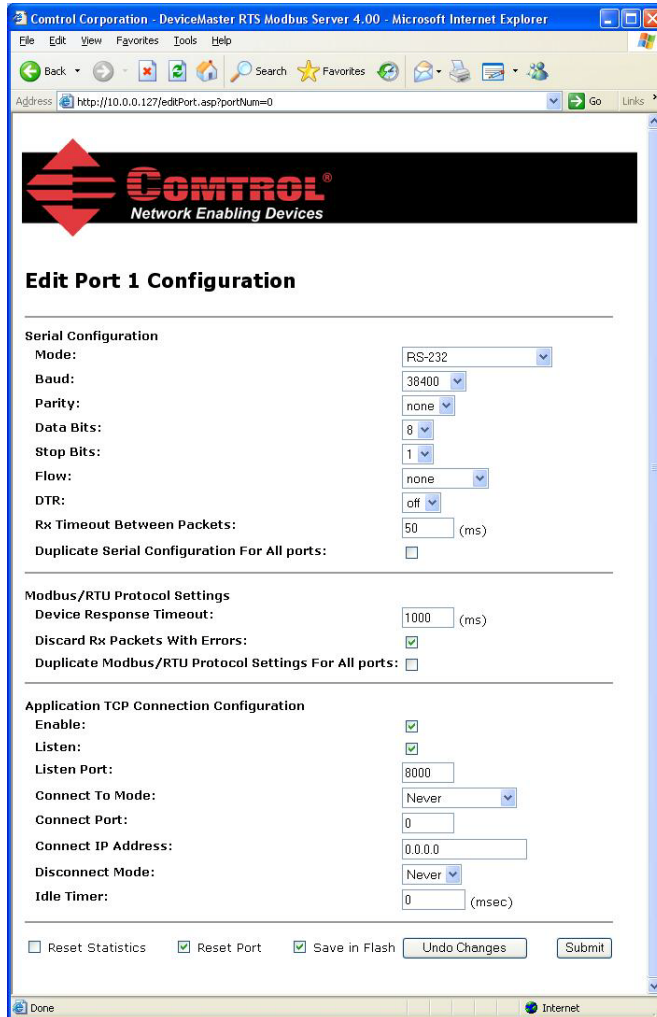
[Port 1](#) [Port 2](#)

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
<i>Serial Configuration</i>		
Mode	All models, except 2-port models: <ul style="list-style-type: none"> • RS-232 (default) • RS-422 • RS-485 2-port models: <ul style="list-style-type: none"> • 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: <i>If this value is set too low, incomplete and/or invalid Modbus/RTU messages may be incorrectly detected.</i>
Duplicate Serial Configuration For All Ports.	N/A	If selected, will apply the serial port configuration to all serial ports.

Name	Value(s)	Description
<i>Modbus/RTU Protocol Settings</i>		
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.
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: <i>Modbus/RTU messages with invalid CRCs will always be discarded independent of this setting.</i>
Duplicate Modbus/RTU Protocol for All Ports.	N/A	If selected, will apply the Modbus/RTU protocol settings to all serial ports.
<i>Application TCP Connection Configuration</i>		
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.

Name	Value(s)	Description
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 Plus for initial network configuration.

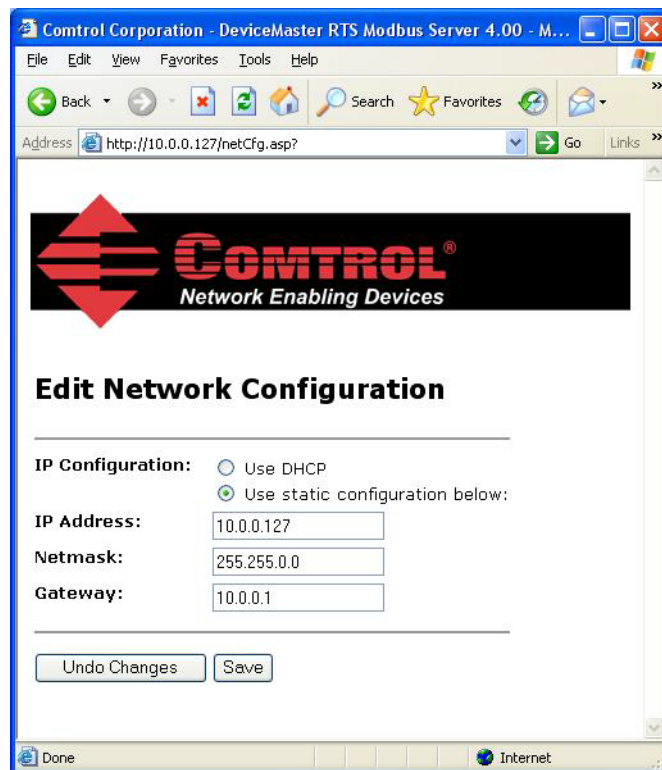
Use the following procedure to change the network configuration.

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.

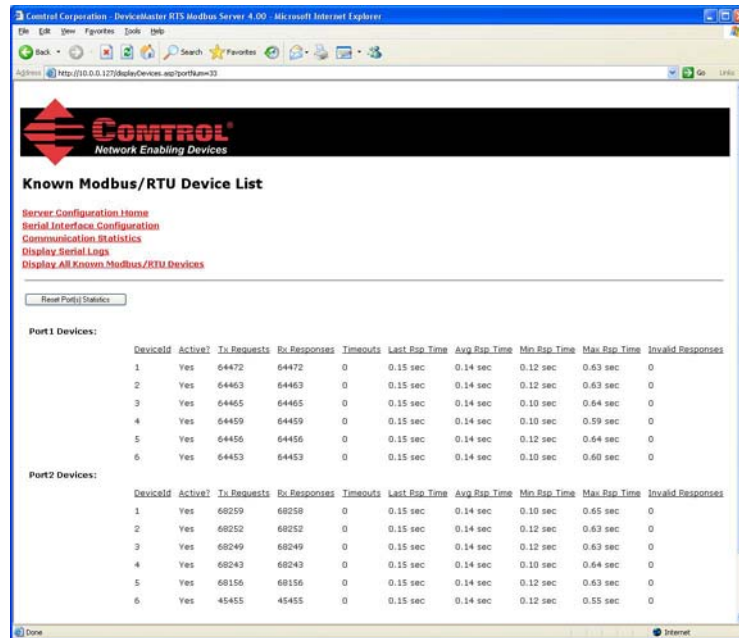


Embedded Diagnostic and Statistics Pages

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

Known Modbus/RTU Device List Web Page

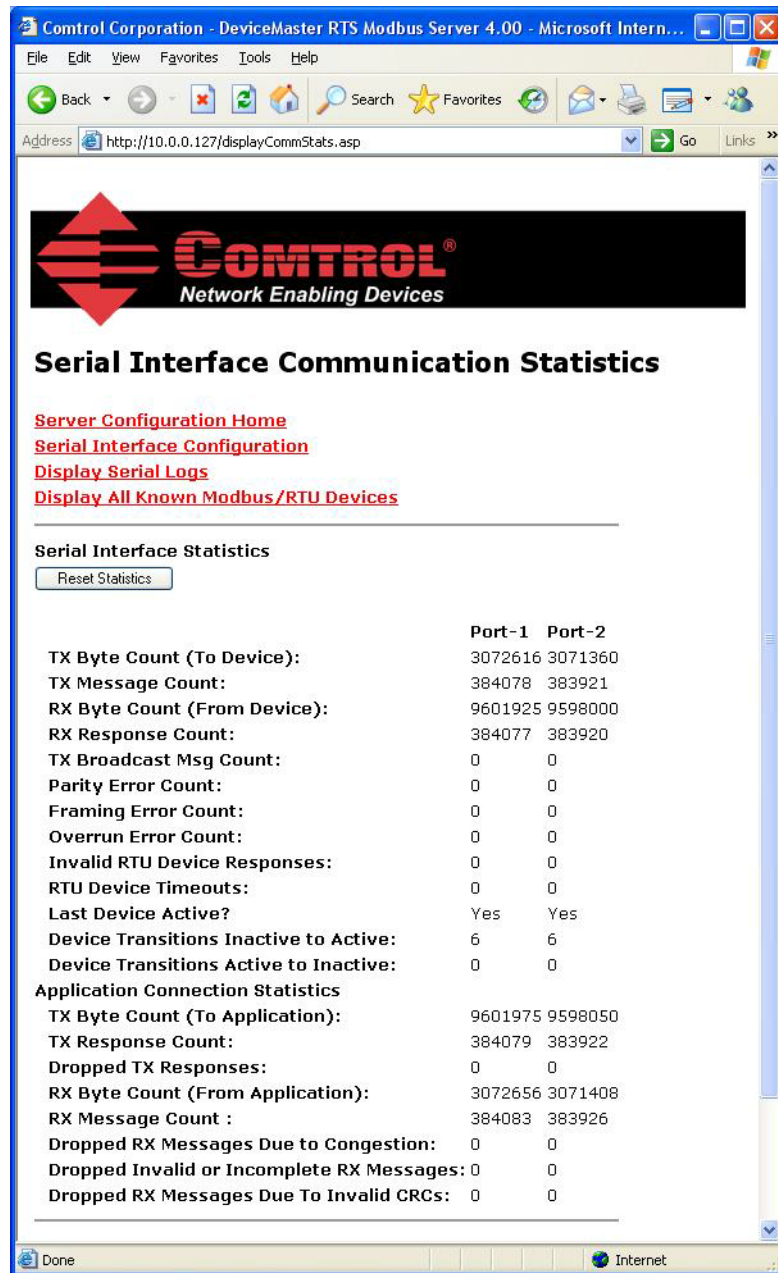
The *Known Modbus/RTU Device List* page provides device specific status and statistics for each device on one or all ports.



Know Modbus/RTU Device List Page	
Device ID	Unit identifier associated with this device.
Active?	Status of device: <ul style="list-style-type: none"> • 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

Counter Name	Description
RX Response Count	Number of responses received on the serial port.
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: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • 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.
<i>Application Connection Statistics</i>	
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).

Counter Name	Description
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: <ul style="list-style-type: none"> Containing an invalid Modbus/RTU message format. Containing an incomplete Modbus/RU message.
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

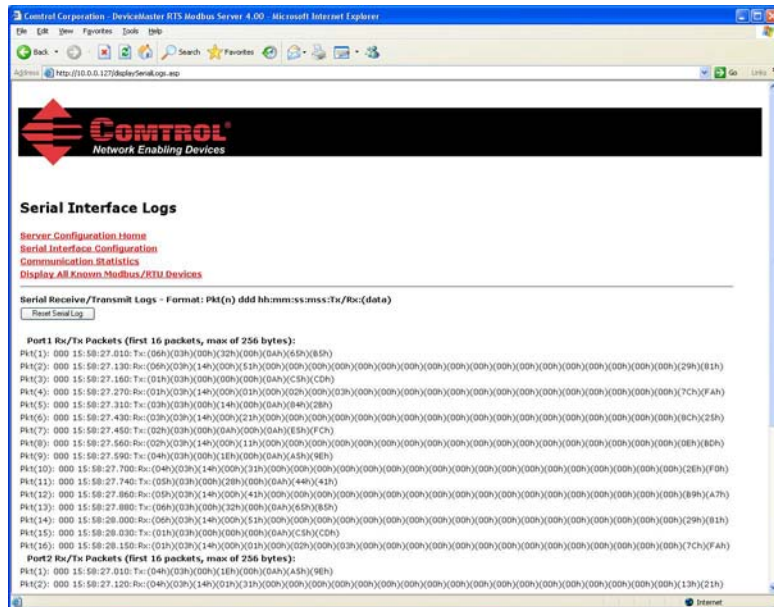
The following page displays the serial message transmitted and received during normal operation.

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.

- [Troubleshooting Checklist on Page 27](#)
- [General Troubleshooting on Page 28](#)
- [Daisy-Chaining DeviceMaster 2E/4-Port Units on Page 29](#)

If you cannot diagnose the problem, you can contact [Technical Support on Page 30](#).

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 Control 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)	NIC or Ethernet hub	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 [Troubleshooting Checklist on Page 27](#).

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: http://www.comtrol.com/support/download.asp . <i>Note: If the PWR or Status LED is still flashing, contact Technical Support.</i>
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 27).
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

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.

Control 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.

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.

Control Contact Information	
Downloads	ftp://ftp.control.com/html/up_modbus_server_main.htm
Web site	http://www.control.com
Phone	763.494.4100