MANUAL

ICDM-RX/MOD

Modbus Server

PEPPERL+FUCHS

SENSING YOUR NEEDS

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1. Modbus Server Application Overview

This section defines the software functionality for the Modbus Server application and provides an overview of other Pepperl+Fuchs Modbus solutions (Page 10).

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

Note: *See the definition of application in Terms and Definitions on Page 6.*

1.1. Recommended Chassis

The following table lists the recommended ICDM-RX chassis based on Modbus/RTU message throughput.

The following products are supported by Modbus Server:

- ICDM-RX/MOD models
- ICDM-RX/TCP models

Note: *This Guide refers to the model simply as ICDM-RX unless there is model specific information.*

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

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1.2. Terms and Definitions

This table provides *Modbus Server* definitions.

Term	Definition
Application	Is a Modbus Master that uses Modbus/RTU over TCP/IP to connect to a serial port on the ICDM-RX or a Modbus Master connected to a virtual serial port.
ICDM-RX	ICDM-RX/TCP models or ICDM-RX/MOD models.
Master (or Client) Mode	The method of operation when a ICDM-RX or an application is operating as a *Master* or the message originator.
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.
Modbus/RTU over TCP/IP	Uses Ethernet TCP/IP as a transport for Modbus/RTU serial data (serial over Ethernet) ***Note:*** *Modbus/RTU over TCP/IP is not the same as Modbus/TCP.*
Modbus/TCP	Because Ethernet TCP/IP is already an error correcting protocol Modbus/TCP uses the Modbus/RTU data structure without the 2 CRC bytes. Modbus/TCP also adds a header to the message.
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.
Serial port redirector	Software that installs on a PC that adds a virtual serial port for programs on the PC to use. Uses Ethernet TCP/IP to connect to the physical remote serial port (ICDM-RX).
Slave (or Server)	The method of operation when a ICDM-RX or an application is operating as a *Slave* or the message receiver.
Sockets	The method used to communicate between devices while communicating over Ethernet TCP/IP.
Virtual Serial Port	A serial port that acts like a physical serial port on a PC. It is linked to a physical remote serial port (via TCP/IP) using a serial port redirector.

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1.3. What is Modbus?
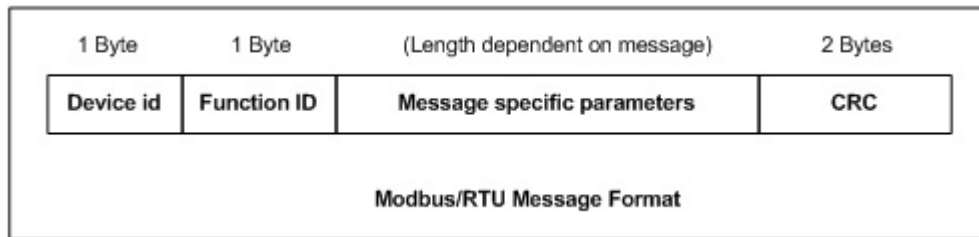
This subsection discusses the following topics:

- *Modbus/RTU over TCP/IP (Supported by Modbus Server)* on Page 7
- *Modbus/RTU (Supported by Modbus Server)* on Page 7
- *Modbus/TCP (Not supported by Modbus Server)* on Page 8

1.3.1. Modbus/RTU over TCP/IP (Supported by Modbus Server)

Modbus/RTU over TCP/IP uses the same Modbus/RTU message that is sent over serial but is instead sent over a TCP/IP connection. The IP Address of the device is used with a port specified by the device – not port 502 – which is reserved for Modbus/TCP.

1.3.2. 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.

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1.3.3. 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:
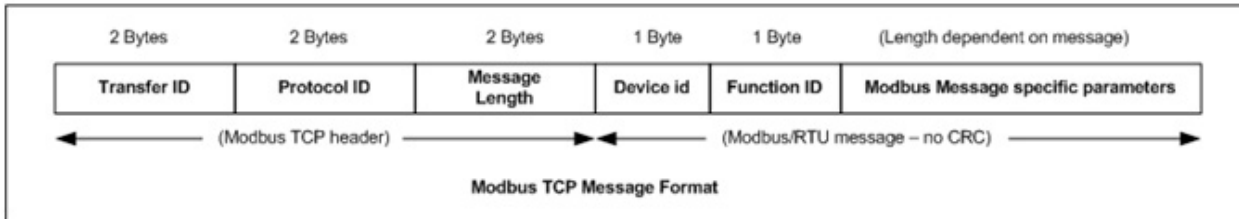
Modbus TCP Message Format

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.
- Remote serial or Ethernet TCP/IP ASCII devices through a gateway.

## 1.4. 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.
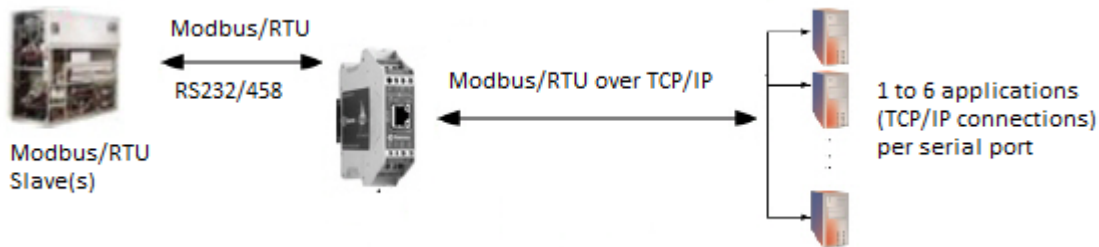
- Supports only Modbus/RTU over Ethernet TCP/IP connections to a serial port. Serial ports are independent of each other.
- Supports up to six Ethernet TCP/IP connections to each serial port.
  - One TCP/IP connection can be created with the *Connect To* connection method.
  - The *Listen* connection method accepts up to five or six connections, depending if the *Connect To* connection is active.

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- 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, which can support up to six COM port connections to each serial port.

Modbus Server Connectivity

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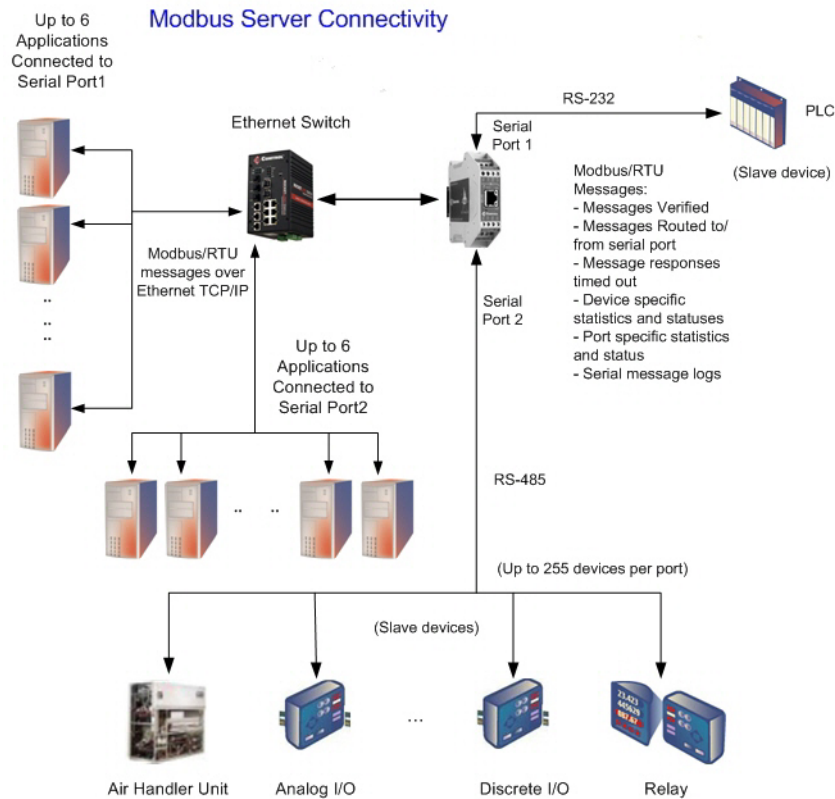
# 1.5. Other Pepperl+Fuchs Modbus Solutions

Pepperl+Fuchs provides several other Modbus solutions other than Modbus Server that include:

- Modbus Router firmware - Advanced Modbus Protocol connectivity - including Modbus/TCP, Modbus/RTU and Modbus/ASCII - multiple masters and slaves.

- Modbus/TCP firmware - allows multiple Modbus/TCP or Modbus/RTU/ASCII masters to access Modbus/RTU slaves and raw/ASCII data.

Note: *You must purchase a ICDM-RX/MOD model for the Modbus Router or Modbus/TCP to load on the device server. This means that you cannot load them on an ICDM-RX/TCP models. Only Modbus Server runs on all ICDM-RX/TCP models.*

1.5.1. Modbus Router Firmware

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
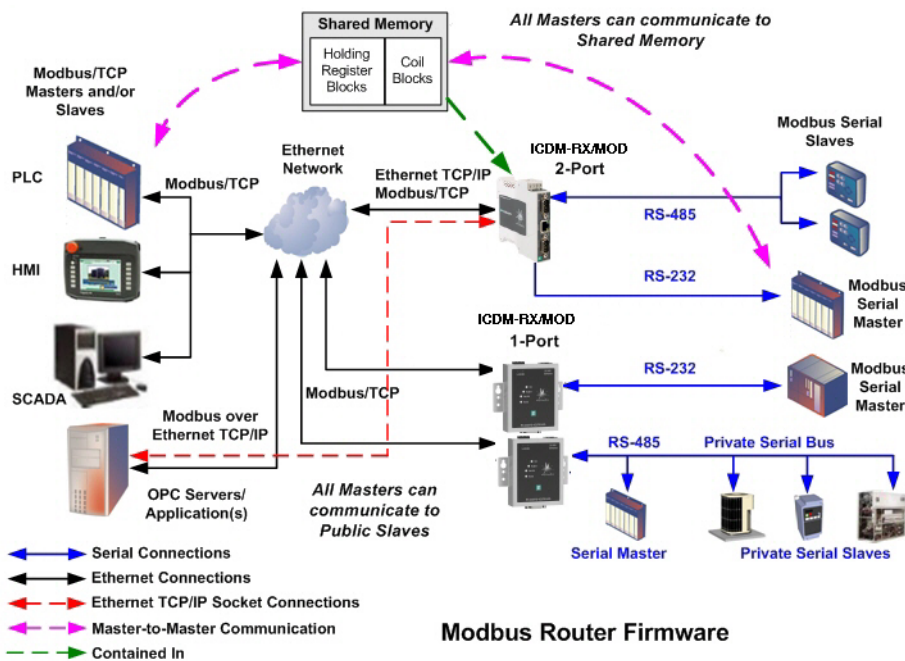
Modbus Router firmware supports the following controllers:

- 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

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- 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

1.5.2. Modbus/TCP Firmware (Raw/ASCII and Modbus/RTU Slaves)

Modbus/TCP firmware was designed to provide great flexibility for connecting both Modbus serial slaves and raw/ASCII devices to a variety of Modbus controllers and applications. Modbus/TCP firmware - Serial and Ethernet Modbus Masters can simultaneously communicate to raw/ASCII devices and Modbus/RTU slaves.

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.
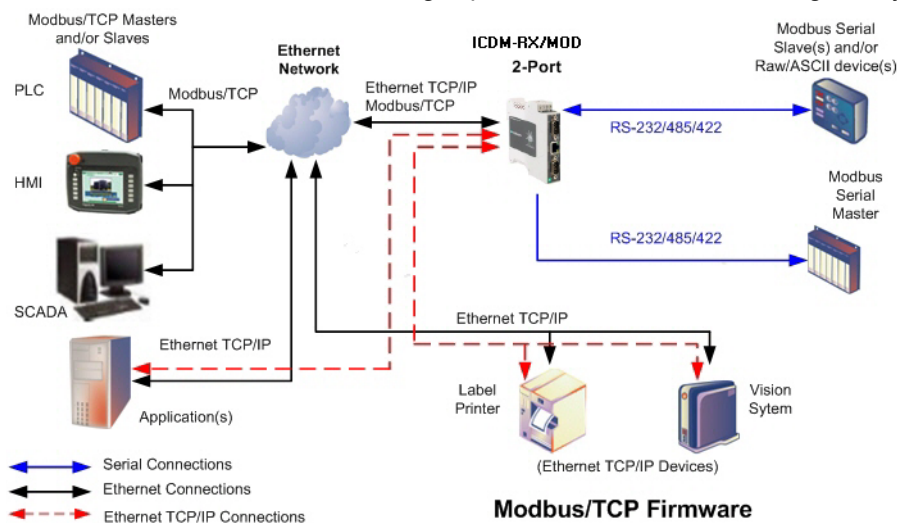
Modbus/TCP firmware supports the following controllers:
- Modbus/TCP masters and slaves
- Modbus/RTU and Modbus/ASCII serial masters and slaves
- Applications over Ethernet TCP/IP connections (raw/ASCII only)

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)

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2. Installation Overview

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

An installation follows these basic steps.

1. Connect the ICDM-RX to the network.

   If necessary, use the appropriate hardware installation document for your ICDM-RX.

   Note: You can download the latest documentation from https://pepperl-fuchs.com.

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

3. Configure the ICDM-RX network settings using PortVision DX (*Configuring the Network Settings on Page 14*).

4. You **must** upload the Modbus Server firmware into the ICDM-RX. You can use PortVision DX (*Uploading Modbus Server Firmware on Page 15*) or the web interface (*Update Firmware Page* on Page 35).

5. Configure the port characteristics using the ICDM-RX embedded web page (*Serial Configuration on Page 19*).

6. Optionally, install a serial port redirector if you require COM port support.

7. Connect any serial device or devices using the appropriate hardware installation document for your ICDM-RX.

2.1. PortVision DX Overview

Use PortVision DX to identify, configure, update, and manage the ICDM-RX using Windows XP through Windows 10.

PortVision DX requires that you connect the Pepperl+Fuchs 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 ICDM-RX 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 ICDM-RX that is not on the same local network segment.

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

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2.2. Installing PortVision DX

PortVision DX requires that you connect the ICDM-RX to the same network segment as the Windows system during the configuration process.

1. If necessary, download the latest version of PortVision DX from https://pepperl-fuchs.com.

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 so that PortVision DX locates the ICDM-RX.

    Note: PortVision DX locates all ICDM-RX models.

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 Pepperl+Fuchs 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 Pepperl+Fuchs Ethernet-attached product to PortVision DX.

12. Go to Step 5 in the next section, *Configuring the Network Settings*, to program the ICDM-RX network settings.

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

2.3. Configuring the Network Settings

Use the following procedure to change the default network settings on the ICDM-RX for your network using PortVision DX.

The default network settings are:

*   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 ICDM-RX *at a time to avoid device driver configuration problems.*

The following procedure shows how to configure a single ICDM-RX 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 14).

2. Start PortVision DX using the **PortVision DX** desktop shortcut or from the **Start** button.

3. 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 Pepperl+Fuchs 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 Pepperl+Fuchs Ethernet-

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attached product to PortVision DX.

5. Right-click the ICDM-RX for which you want to program network information and click the **Properties** option.

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

6. *Optionally*, rename the ICDM-RX in the **Device Name** field.

   Note: The MAC address and Device Status fields are automatically populated and you cannot change those values.

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

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

   • **LOCAL** means that the ICDM-RX is on this local network segment and uses MAC communications.

8. Change the ICDM-RX network properties as required for your site.

   • To use the ICDM-RX 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 ICDM-RX in the DHCP server.

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

9. Click **Apply Changes** to update the network information on the ICDM-RX.

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

2.4. Uploading Modbus Server Firmware

Use this section to upload Modbus Server on the ICDM-RX using PortVision DX.

1. You will need to request the Modbus Server firmware from Technical Support. See *Technical Support* on Page 43 for contact information or go to https://pepperl-fuchs.com to submit a request.

2. If necessary, open PortVision DX.

3. Right-click the ICDM-RX or ICDM-RXs for which you want to load, click **Advanced | Upload Firmware**, browse to the Modbus Server **.cmtl** file and then click **Open**.

4. Click **Yes** to the *Upload Firmware* message that warns you that this is a sensitive process.

Note: It may take a few moments for the firmware to upload onto the device. The ICDM-RX will reboot itself during the upload process. Do **NOT** disconnect the ICDM-RX from the network or power while uploading firmware.

5. 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 and displays the new Modbus Server version.

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2.5. Modbus Server Home Page

Access the ICDM-RX Modbus Server *Home* page from PortVision DX or enter the IP address of the ICDM-RX in the **Address** box of your web browser.
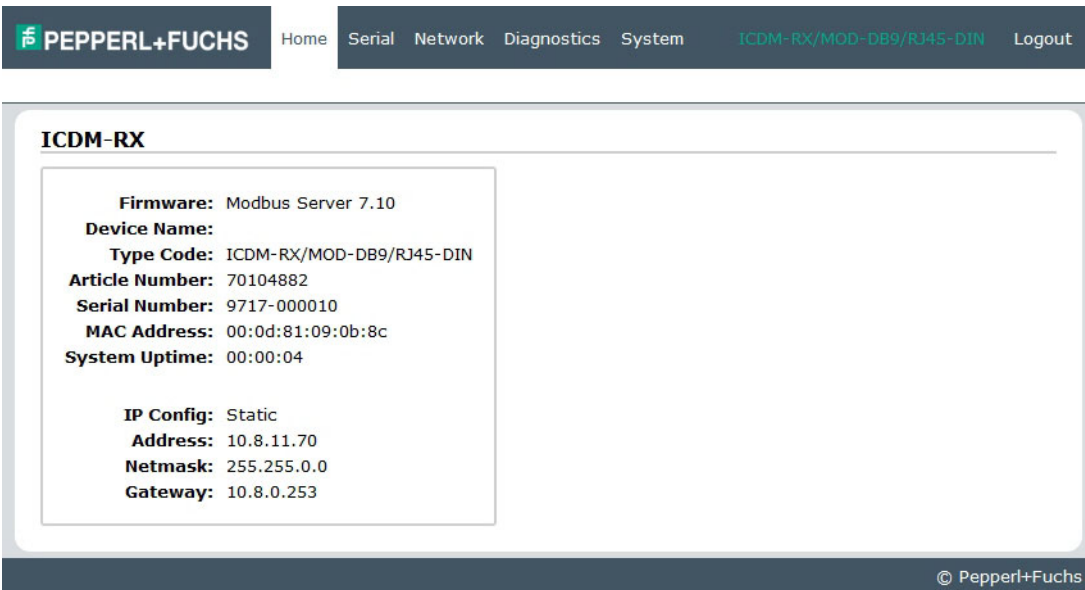
The *Home* page displays the software version and current network configuration for the ICDM-RX.

Modbus Server Home Page	
Firmware	Modbus Server firmware version currently running on the ICDM-RX.
Device Name	You can enter a Device Name in the *Network	Configuration* page, which will display in this field.
Type Code	Model name.
Article Number	Device part number.
Serial Number	The ICDM-RX serial number.
MAC Address	This is the MAC address of this ICDM-RX, which is located on the compliance label on the ICDM-RX.
System Uptime	Displays how long this ICDM-RX has been on-line since powered on or rebooted.
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 ICDM-RX.

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2.6. Modbus Master Connections

Each Modbus Server serial port supports up to six Modbus RTU over TCP/IP connections including one Connect To connection.

The connections can be from different physical hardware or multiple connection from the same physical hardware or a combination of the two. Each Modbus Server serial port is also capable of connecting to a Modbus RTU master (i.e. initiating a TCP/IP connection).

1. Modbus Master using Modbus RTU over TCP/IP.
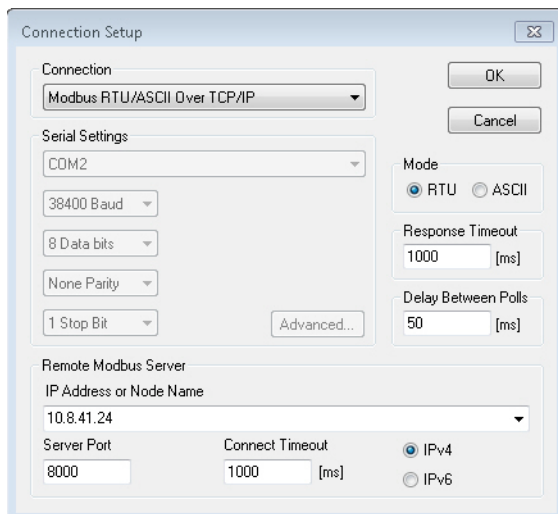
2. Modbus Master connecting to a virtual serial port.
    a. Serial port redirector.

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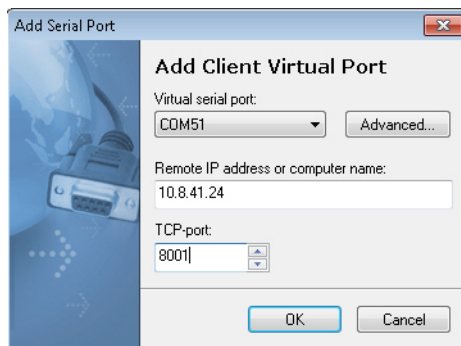
b. Set Protocol to Raw (does not support RFC2217 or SSL).
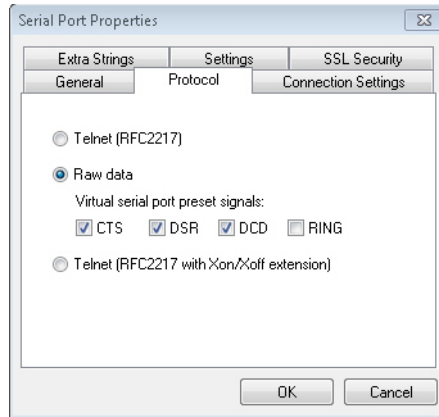
c. Modbus RTU master to virtual serial port.
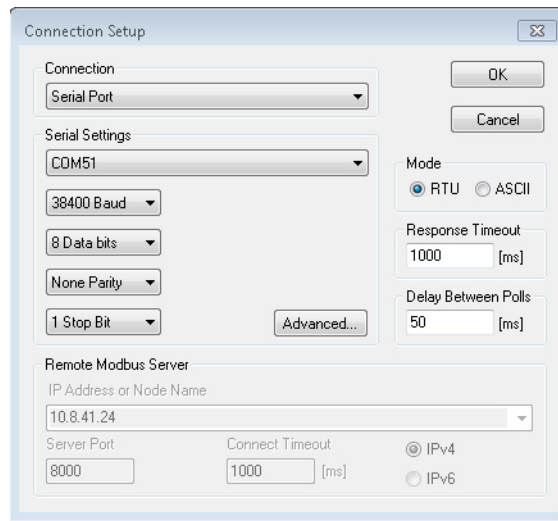
   Note: *Settings must match serial port configuration on ICDM-RX.*

3. Connecting from ICDM-RX to Modbus RTU master over TCP/IP.

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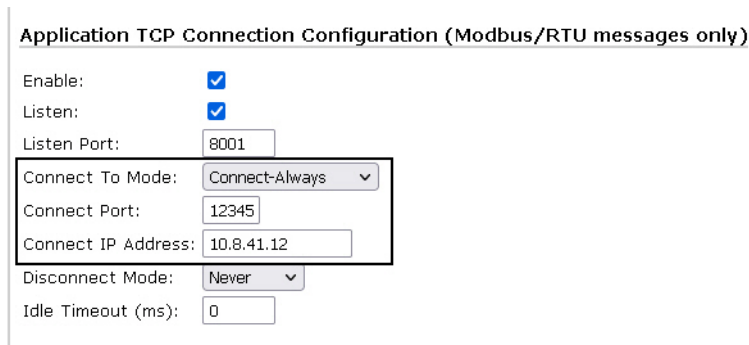
3. Serial Configuration

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

See the *Diagnostics Pages* on Page 29 section for information about locating diagnostic and statistics for Modbus Server.

3.1. Serial Port Overview Page

The *Serial Port Overview* page provides a view of the serial settings for all ports.

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3.2. Port Configuration Page

Access the *Port Configuration* page by clicking **Serial** and the appropriate port number.

The following provides information about the *Port Configuration* page.

Port Configuration Page	
Serial Configuration	
Port Name	You can enter a friendly port name.
Port Mode (Default = RS-232)	Selectable serial mode of communications. Panel and rack mount models: • RS-232 • RS-422 • RS-485 DIN rail models: • RS-232 • RS-422 • RS-485_2-wire • RS-485 4-wire Master • RS-485 4-wire Slave
Baud Rate (Default = 38400)	Selectable serial port baud rates: 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, and 230400.

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Port Configuration Page (Continued)	
Parity (Default = None)	Selectable parity values. • None • Even • Odd
Data Bits (Default = 8	Selectable data bit values.: 5, 6, 7, and 8.
Stop Bits (Default = 1)	Selectable stop bit values: 1 or 2.
Flow Control (Default = None)	Selectable flow control values: • None • RTS/CTS • XON/XOFF • Half-Duplex

RS-485 Terminating Resistor
(Supported on the DIN rail models, only)
	To ensure the best signal integrity on a long distance high-speed RS-422 or RS-485 network sometimes it is required to place a 120? termination resistor between each of the transmit differential pair or receive differential pair. Signal reflection is reduced and a reliable communication is ensured by placing the 120? termination resistor. Using this option, you can place 120? termination resistors between the signals shown below:
	• RS-422 Mode
	  - Between TxD+ and TxD- (Pin 5 and 7)
	  - Between RxD+ and RxD- (Pin 4 and 2)
	• RS-485 - Between TxD/RxD+ and TxD/RxD- (Pin 5 and 7)

DTR Mode	Available choices are: ON all the time or OFF all the time.
Rx Timeout Between Packets (Default = 50)	Receive time-outs between packets in milliseconds with a range of 0 to 65535. 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.*
Discard Rx Packets With Errors (Default = On)	If selected, the ICDM-RX drops all packets received with parity, framing, or overrun errors. *Note: Modbus/RTU messages with invalid CRCs will always be discarded independent of this setting.*
Clone settings to all serial ports	If selected, this option applies this serial port configuration to all serial ports.
Modbus/RTU Protocol Settings	
Response Timeout (Default=1000 ms)	The maximum allowable time for a slave Modbus/RTU to respond to a message before the message is considered timed out. The range is from 0 to 65535.
Application TCP Connection Configuration	
Enable (Default = On)	If selected, this TCP/IP socket interface will be enabled.

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Port Configuration Page (Continued)	
Listen (Default = On)	If selected, the TCP/IP socket interface will listen for a connection at the specified **Listen Port.**
Listen Port (Defaults: 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. The range is from 1 to 65535.
Connect to Mode (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 (Default=0)	Socket port to connect to. Used in conjunction with **Connect to Mode** and **Connect IP Address.** The range is from 1 to 65535.
Connect IP Address	IP Address of application to create a connection. Used in conjunction with **Connect to Mode** and **Connect Port.**
Disconnect Mode (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 (Default=0)	If the **Disconnect Mode** is set to **Idle**, the idle or inactivity time when the connection(s) will be closed. The range is from 1 to 65535.

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4. Network Menu

This section discusses the pages under the *Network* menu, which includes:

4.1. Network Configuration Page

You can use the *Network Configuration* page to change the ICDM-RX network configuration after using PortVision DX for initial network configuration.

Click the **Network tab** to access this page.

The following table provides information about the **Network Configuration** fields.

Network Configuration Page

General	
Host Name	You can enter a 16-character **Host Name** to identify this ICDM-RX on the *Home* page.
TCP Keepalive Default = 60	The TCP protocol has a keepalive feature where the two network stacks periodically ping each other to make sure the connection is still up. Upon loss of a TCP/IP connection, the network stack starts a timer. If the TCP/IP connection is still lost after the number of seconds set by the TCP Keepalive value, then the ICDM-RX closes the connection and frees all the ports associated with the connection. If the ICDM-RX was the originator of the first connection, it will then try to re-connect the TCP/IP connection. This allows the ICDM-RX to be connected and ready to send/receive data even after a network disturbance. For most networks the default value should not need to be changed.
Boot Timeout Default = 15	Allows you to change the bootloader time-out value before the default application, Modbus Server loads. You may need to increase this time-out value to 45 for compatibility with spanning tree devices (normally switches). If you change the time-out value to 0, this prevents Modbus Server from loading.
IP Configuration (IPv4)	
Use DHCP	Configures the ICDM-RX to use DHCPv4 mode. If you select **Use DHCP**, the IPv4 Address field below is disabled and set to 0.0.0.0. See your System Administrator to acquire a unique reserved IPv4 address if you are using DHCP. They will need the MAC address of the unit to provide you with an IPv4 address.
Use static configuration below	Configures the ICDM-RX with the static IPv4 address information that you provide in the IPv4 Address, IPv4 Netmask, and IPv4 Gateway fields below. The ICDM-RX is shipped from the factory with the following default IPv4 network settings: • IPv4 address = 192.168.250.250 • IPv4 Netmask = 255.255.0.0 • IPv4 Gateway address = 192.168.250.1

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4.2. Password Page

You can easily set up a password to secure the ICDM-RX.

There is no password set from the factory.

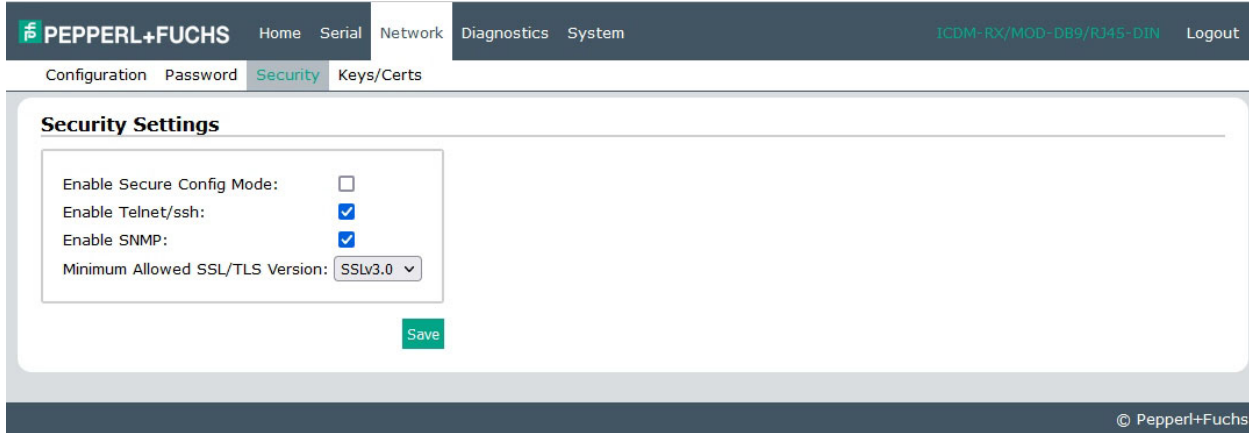Use the following information to configure a password for this ICDM-RX.

1. If necessary, click **Network | Password**.
2. If changing an existing password, enter that password in the **Old Password** field.
3. Enter a new password.
4. Enter the password in the **Confirm New Password** field.
5. Click the **Save** button.

To log into the ICDM-RX, you must enter the following:

- **admin** for the username
- The configured password for the password

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4.3. Security Page

This table discusses **Security Settings** options.

Security Settings Page	
Enable Secure Config Mode	If **Secure Config** mode is enabled, unencrypted access to administrative and diagnostic functions is disabled. **Secure Config** mode changes ICDM-RX behavior as follows: • Telnet access to administrative and diagnostic functions is disabled. SSH access is still allowed. • Unencrypted access to the web server via port 80 (http:// URLs) is disabled. Encrypted access to the web server via port 443 (https:// URLs) is still allowed. • Administrative commands that change configuration or operating state which are received using the Pepperl+Fuchs proprietary TCP driver protocol on TCP port 4606 are ignored. • Administrative commands that change configuration or operating state that are received using the Pepperl+Fuchs MAC mode proprietary Ethernet protocol number 0x11FE are ignored.
Enable Telnet/ssh	This option enables or disables the telnet security feature after you click Save and the ICDM-RX has been rebooted. This option is enabled by default.
Enable SNMP	This option enables or disables the SNMP security feature after you click **Save** and the ICDM-RX has been rebooted. This option is enabled by default.
Minimum Allowed SSL/TLS Version	You can select the appropriate version for your environment. • SSLv3.0 (default) • TLSv1.0 • TLSv1.1 • TLSv1.2

Use the following steps to change security settings in the ICDM-RX.

1. Click the **Network | Security**.

2. Click the appropriate check boxes in the *Security Settings* page to enable or disable security accordingly.

3. After making changes, you must click **Save**.

4. You may need to configure security keys or certificates depending on your choices using the next subsection.

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4.4. Keys/Certs Page

For secure operation, the ICDM-RX uses a set of three keys and certificates. These keys and certificates are user configurable.

Note: *All ICDM-RX units are shipped from the factory with identical configurations. They all have the identical self-signed, Pepperl+Fuchs Server RSA Certificates, Server RSA Keys, and Server DH Keys.*

For maximum data and access security, you should configure all ICDM-RX units with custom certificates and keys.

Key and Certificate Management Page	
RSA Key pair used by SSL and SSH servers	This is a private/public key pair that is used for two purposes: • It is used by some cipher suites to encrypt the SSL/TLS handshaking messages. Possession of the private portion of this key pair allows an eavesdropper to both decrypt traffic on SSL/TLS connections that use RSA encryption during handshaking. • It is used to sign the Server RSA Certificate in order to verify that the ICDM-RX is authorized to use the server RSA identity certificate. **Note:** *Possession of the private portion of this key pair allows somebody to pose as the ICDM-RX.* If the Server RSA Key is to be replaced, a corresponding RSA identity certificate must also be generated and uploaded or clients are not able to verify the identity certificate.

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Key and Certificate Management Page	
RSA Server Certificate used by SSL servers	This is the RSA identity certificate that the ICDM-RX uses during SSL/TLS handshaking to identify itself. It is used most frequently by SSL server code in the ICDM-RX when clients open connections to the ICDM-RX's secure web server or other secure TCP ports.
	If a ICDM-RX serial port configuration is set up to open (as a client) a TCP connection to another server device, the ICDM-RX also uses this certificate to identify itself as an SSL client if requested by the server.
	In order to function properly, this certificate must be signed using the Server RSA Key. This means that the server RSA certificate and server RSA key must be replaced as a pair.
DH Key pair used by SSL servers	This is a private/public key pair that is used by some cipher suites to encrypt the SSL/TLS handshaking messages.
	Note: *Possession of the private portion of the key pair allows an eavesdropper to decrypt traffic on SSL/TLS connections that use DH encryption during handshaking.*

Use the following steps to update security keys and certificates in the ICDM-RX.

1. Click the **Network | Keys/Cert**.

2. Click **Browse** to locate the key or certificate file, highlight the file, and click **Open**.

3. Click **Upload** when you return to the Key and Certificate Management page.

   The key or certificate notation changes from **factory** or **none** to **User** when the ICDM-RX is secure.

   Note: *You do not need to click **Save**, but changes will not take effect until the ICDM-RX is rebooted.*

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5. Diagnostics Pages

This section discusses the following topics:

- *Serial Communication Statistics*
- *Known Modbus/RTU Device List* on Page 31
- *Serial Interface Logs Page* on Page 32
- *System Log* on Page 33

5.1. Serial Communication Statistics

Access the *Serial Communication Statistics* page by clicking the **Diagnostics** tab.

The following table provides detailed information about the *Serial Communication Statistics* page.

Serial Communication Statistics Page	
Serial Interface	
TX Byte Count (To Device)	Displays the number of bytes transmitted out the serial port.
TX Message Count	Displays the number of messages transmitted out of the serial port.
RX Byte Count (From Device)	Displays the number of bytes received on the serial port.
RX Response Count	Displays the number of responses received on the serial port.
TX Broadcast Msg Count	Displays the number of broadcast messages transmitted out the serial port.
Parity Error Count	Displays the number of parity errors received on the serial port. Typically occurs due to an incorrect parity setting.
Framing Error Count	Displays the number of framing errors received on the serial port. Typically occurs due to an incorrect baud rate or stop bit setting.
Overrun Error Count	Displays the number of overrun errors received on the serial port. This typically occurs to one of the following events: incorrect flow control, incorrect baud rate, incorrect data size, or incorrect stop bit setting.
Invalid RTU Device Responses	Displays the number of invalid RTU device responses received to any of the following events: • Message received after the timeout period. This may require increasing the **Modbus/RTU Protocol Response Timeout**. • Incorrect device ID in response message. • Incorrect function code in response message.
RTU Device Timeouts	Displays the number of RTU device timeouts that occurred when there was no response for a Modbus message.
Last Device Active?	The last device that a Modbus message was sent to replied with a response.
Device Transitions Inactive to Active	Count of transitions of Modbus devices from inactive to active. A Modbus device is inactive when it does not respond to a command.
Device Transitions Active to Inactive	Count of transitions of Modbus devices from active to inactive. A Modbus device is inactive when it does not respond to a command.
Application Connection Statistics	
TX Byte Count (To Application)	Displays the number of bytes sent out the application socket port.
TX Response Count	Displays the number of responses received from the application.
Dropped TX Responses	Displays the number of received serial or Ethernet device packets intended for the application dropped: • No STX byte(s) found • No ETX byte(s) found • Time-outs • Packet to large • Receive buffer queue overflows • Application connection is offline
RX Byte Count (From Application)	Displays the number of bytes received over the application socket port.
RX Message Count	Displays the number of RX messages received from the application.

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Serial Communication Statistics Page (Continued)	
Dropped RX Messages Due to Congestion	Number of Modbus messages dropped when the queue for the serial port overflows.
Dropped Invalid or Incomplete RX Messages	Number of Modbus responses (received on the serial port) that are invalid or incomplete.
Dropped RX Messages Due to Invalid CRCs	Number of Modbus responses (received on the serial port) that have an invalid CRC (checksum).
Remote Connection Status	A list of TCP/IP connections.

5.2. Known Modbus/RTU Device List

Access the *Known Modbus/RTU Device List* page by clicking **Diagnostics | Modbus Devices**.

The following table provides information about the *Known Modbus/RTU Device List* page.

Known Modbus/RTU Device List Page	
Device ID	Displays the device ID associated with this device.
Active?	Displays the 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 or the device has not yet received a message.
Tx Requests	Displays the number of Modbus messages transmitted to this device.
Rx Responses	Displays the number of Modbus responses received from this device.
Timeouts	Displays the number of response timeouts associated with this device.

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Known Modbus/RTU Device List Page (Continued)	
Invalid Responses	Displays the number of invalid messages or responses received to any of the following: • Message received after the timeout period. This may require increasing the **Device Response Timeout**. • Incorrect device ID in response message. • Incorrect function code in response message.
Last Rsp Time	Displays the last response time from the Modbus device.
Avg Rsp Time	Displays the average response time from the Modbus device.
Min Rsp Time	Displays the minimum response time from the Modbus device.
Max Rsp Time	Displays the maximum response time from the Modbus device.

5.3. Serial Interface Logs Page

This page displays the serial messages transmitted and received during normal operation. Click **Diagnostics** | **Communication** | **Serial Logs** to access this page.

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

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ss – seconds since last system restart

mss – milliseconds since last system restart

(**data**) – Modbus/RTU or Modbus/ASCII message data.

• Private messages between the master and slaves on the Master/Slaves ports are indicated with "(**Private**)".

• All other messages are those routed through the Modbus gateway to the Modbus network or Shared Memory.

5.4. System Log

If you call Technical Support, they may have you send a log file.

Access the *System Log* page by clicking **Diagnostics** I **System Log**.

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6. System Menu

This section discusses the web pages under the **System** menu:

- *Update Firmware Page* on Page 35
- *Configuration File Page* on Page 36
- *Device Snapshot Page* on Page 38
- *Restore Defaults Page* on Page 39
- *Reboot Page* on Page 40

6.1. Update Firmware Page

You can upload firmware (Modbus Server or Bootloader) using the **System | Update Firmware** page. You must first unpackage the firmware from the **.zip** file.

*Note: Optionally, you can use PortVision DX to upload firmware after unpackaging the **.zip** file.*

Use the following procedure to upload the latest firmware onto the ICDM-RX.

1. If necessary, contact Technical support to acquire the Modbus Server firmware. Refer to *Technical Support on Page 43* for more information or go to https://pepperl-fuchs.com.
2. Open your web browser and enter the IP address of the ICDM-RX.
3. Click the **System** menu.
4. Click the **Browse** button, navigate to the file, select it and click the **Open** button.
5. Click the **Update** button.
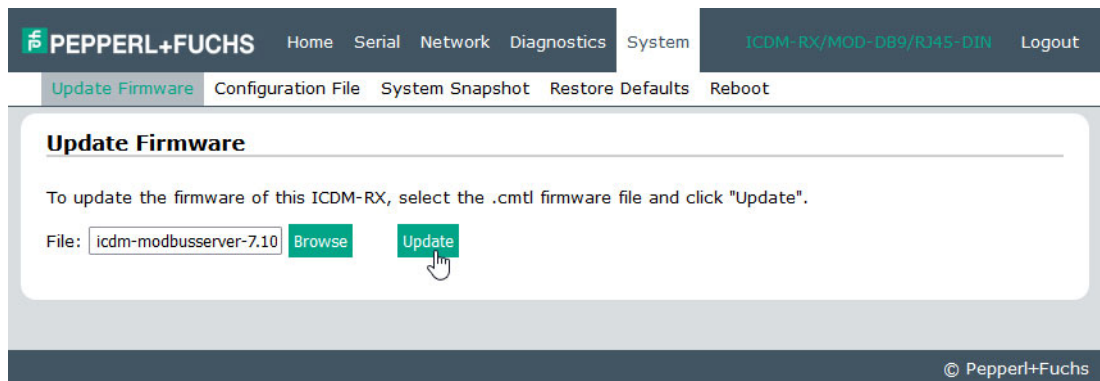
An *Update In Progress* pop up notifies you with the upload duration, not to reset or disconnect the device or to close the page.

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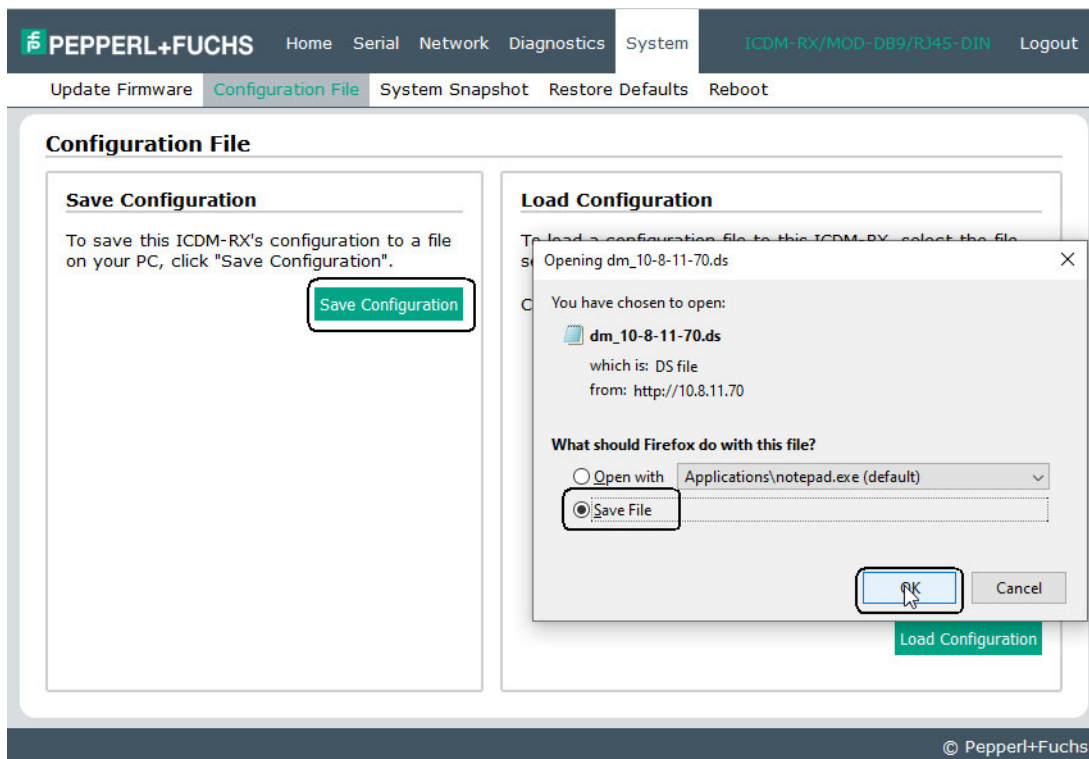
6.2. Configuration File Page

You can use the **Save Configuration** option to save a ICDM-RX configuration file for recovery purposes or to quickly configure other ICDM-RXs that require the same configuration using the **Load Configuration** option.

Note: *Optionally, you can use PortVision DX to save and load configuration files.*

6.2.1. Saving a Configuration File

You can use this procedure to save a ICDM-RX configuration file.

1.   Click **System** | **Configuration File**.
2.   Click the **Save Configuration** button.
3.   Save the configuration file following your browser prompts.

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6.2.2. Loading a Configuration File

You can use this procedure to load a previously saved ICDM-RX configuration file.

1. Click **System** | **Configuration File**.
2. Click the **Browse** button, highlight the configuration file you want to load, and click the **Open** button.
3. Click the **Load Configuration** button.

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6.3. Device Snapshot Page

You can use the Device Snapshot page to download a snapshot of the device status, log, and configuration. You may find the information can help you diagnose a problem with the ICDM-RX. In addition, this information may be requested by technical support if you have called for assistance.

1. Open your browser and enter the IP address of the ICDM-RX.
2. Click **System | System Snapshot**.
3. Click the **Device Snapshot** button.
4. Save the file using the method for your browser.
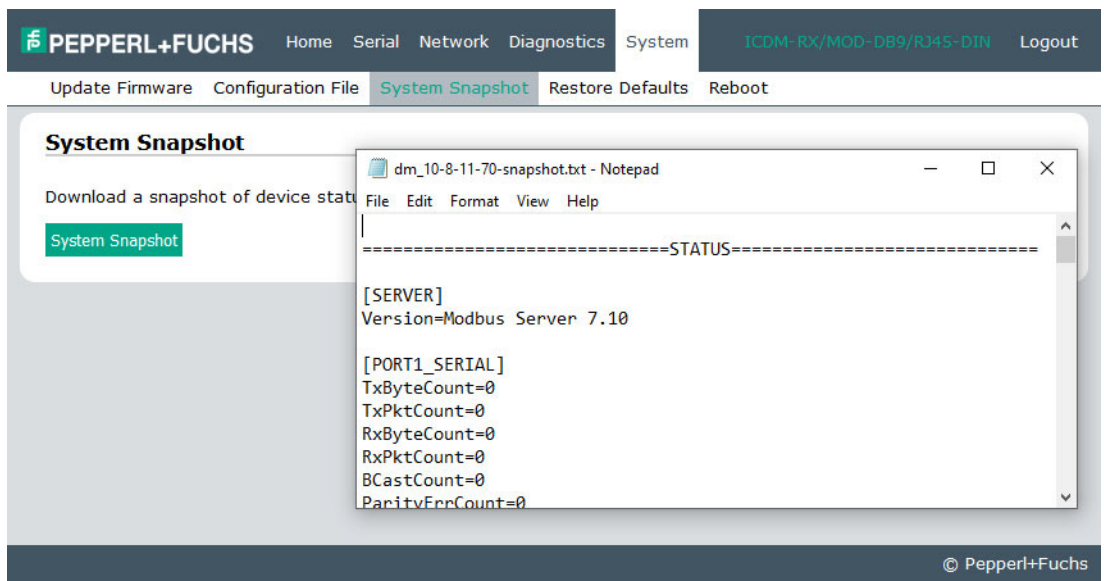
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6.4. Restore Defaults Page

You can easily some or all of your settings to factory defaults by using the procedure below.

1. Open your browser and enter the IP address of the ICDM-RX.
2. Click **System** | **Restore Defaults**.

3. Select **Everything** or the specific setting or settings that you want to restore.
4. Click the **Restore** button.
5. The ICDM-RX reboots and re-opens the web interface.

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6.5. Reboot Page

You can reboot the ICDM-RX remotely using the Reboot web page.

1. Click **System | Reboot**.
2. Click the **Reboot Now** button or wait the 10 seconds for it automatically reboot.

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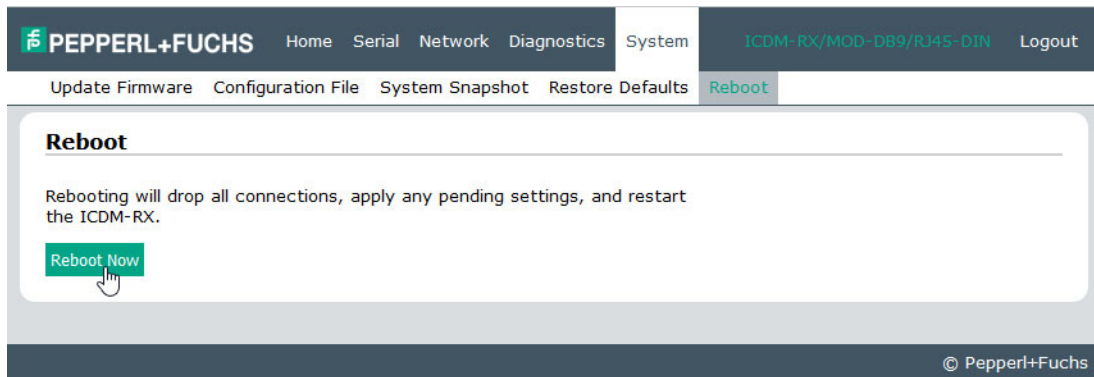
7. Troubleshooting and Technical Support

This section contains troubleshooting information for your ICDM-RX. 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 41
- *General Troubleshooting* on Page 42
- *Daisy-Chaining ICDM-RX Units With Dual Ethernet Ports* on Page 42

If you cannot diagnose the problem, you can contact *Technical Support* on Page 43.

7.1. 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 Pepperl+Fuchs Technical Support are eventually traced to cabling or network problems.*

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

Model	Connected to	Ethernet Cable	Connector Name
1-Port Panel	Ethernet hub or NIC	Standard	10/100 ETHERNET
1-Port DIN Rail	Ethernet hub or NIC	Standard	10/100
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 Panel	NIC	Standard	DOWN
	Ethernet hub	Standard	UP
4-Port DIN Rail	Ethernet hub or NIC	Standard	10/100 - E1/E2
16-Port	Ethernet hub or NIC	Standard	10/100

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

PWR or Status LED	Description
5 sec. off, 3 flashes, 5 sec. off, 3 flashes ...	Redboot^{TM} 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.

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- If the device has a power switch, turn the device's power switch off and on, while watching the LED diagnostics.

- If the ICDM-RX 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 ICDM-RX.

- Verify that the IP address programmed into the ICDM-RX 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 ICDM-RX.

- If you have a spare ICDM-RX, try replacing the device.

7.2. General Troubleshooting

This table illustrates some general troubleshooting tips.

Note: Make sure that you have reviewed the Troubleshooting Checklist on Page 41.

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 installed the most current firmware for your protocol. Contact Technical Support at https://pepperl-fuchs.com. *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 ICDM-RX from the network. Connect the device directly to the NIC in the host system (see Page 41).
Cannot ping or connect to the ICDM-RX	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.
ICDM-RX 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.

7.3. Daisy-Chaining ICDM-RX Units With Dual Ethernet Ports

When using the **UP** (E1)and **DOWN** (E2) ports, the ICDM-RX with dual Ethernet ports is classified as a switch. When using the **UP** port only, it is a simple end node device.

The maximum number of daisy-chained ICDM-RX 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.

Pepperl+Fuchs has tested with seven ICDM-RX 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.

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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.

7.4. 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.

Worldwide Headquarters Pepperl+Fuchs 68307 Mannheim, Germany	+49 621 766-0	info@de.pepperl-fuchs.com
USA Headquarters Pepperl+Fuchs, Inc. Twinsburg, Ohio 44087 - USA	+1 330 425 3555	sales@us.pepperl-fuchs.com
Asia Pacific Headquarters Pepperl+Fuchs Pte Ltd. Company Registration No.199003130E Singapore 139942	+65 6779 9091	sales@sg.pepperl-fuchs.com

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