Modbus® /TCP User Guide

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Eighth Edition, August 9, 2011

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Document Number: 2000447 Rev H

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Chapter 1. Introduction

The *Modbus/TCP User Guide* discusses the following topics:

- Chapter 2. Programming Interface on Page 17
- Chapter 3. Embedded Configuration Pages on Page 33
- Chapter 4. Embedded Diagnostic and Statistics Pages on Page 57
- Appendix A. Programming the PLC via Concept on Page 81
- Appendix B. LPBKCNCP Example Program on Page 99
- Appendix C. SCANCNCP Example Program on Page 105

For information about connecting the hardware, programming the DeviceMaster UP IP address, or uploading Modbus/TCP firmware, see the *DeviceMaster UP Hardware Installation and Configuration Guide*.

See the *Modbus/TCP Interface Configuration Quick Start* for embedded web page configuration procedures.

See 1.5. Locating Updated Software and Documents on Page 15 to locate the latest firmware, documentation, and tools.

1.1. Audience

The primary audience of this document is the person responsible for installing the DeviceMaster UP and programming the PLC. This guide assumes you are familiar with the following topics:

- Windows operating system
- Modbus/TCP, Modbus/RTU, and/or Modbus/ASCII
- A PLC, SCADA System, or OPC Server that communicates with Modbus/TCP, Modbus/RTU, or Modbus/ASCII
  - Raw/ASCII devices such as barcode scanners, weigh scales, and printers
  - Modbus/RTU and/or Modbus/ASCII slave devices.

1.2. Product Overview

The DeviceMaster UP operates as a highly versatile Modbus gateway when the Modbus/TCP firmware is uploaded to the DeviceMaster UP. The DeviceMaster UP provides Modbus/TCP, Modbus/RTU, Modbus/ASCII, and Ethernet TCP/IP controller interfaces to both serial and Ethernet TCP/IP raw/ASCII devices, and both Modbus/RTU and Modbus/ASCII slave devices.

Your particular DeviceMaster UP model may or may not have the Modbus/TCP firmware loaded (depending on the model you purchased).

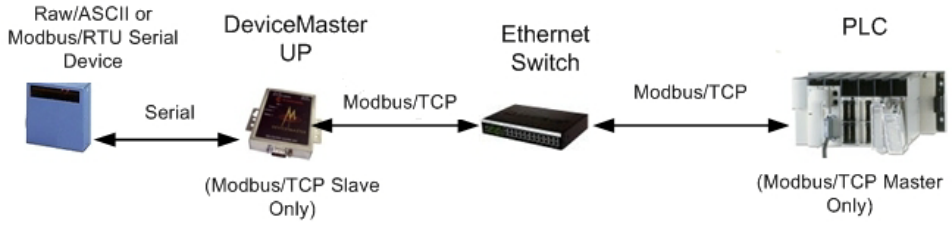
Note: *Models that have Modbus/TCP loaded on the DeviceMaster UP are identified in PortVision Plus and the DeviceMaster UP is labeled accordingly.*

1.3. Modbus/TCP Firmware

The following subsections provide information for existing users who may or may not want to update systems with the advanced Modbus/TCP firmware 5.0x. For new users, the following subsections provide Modbus system architecture information.

1.3.1. Traditional Modbus/TCP System Architecture (Firmware V2.x)

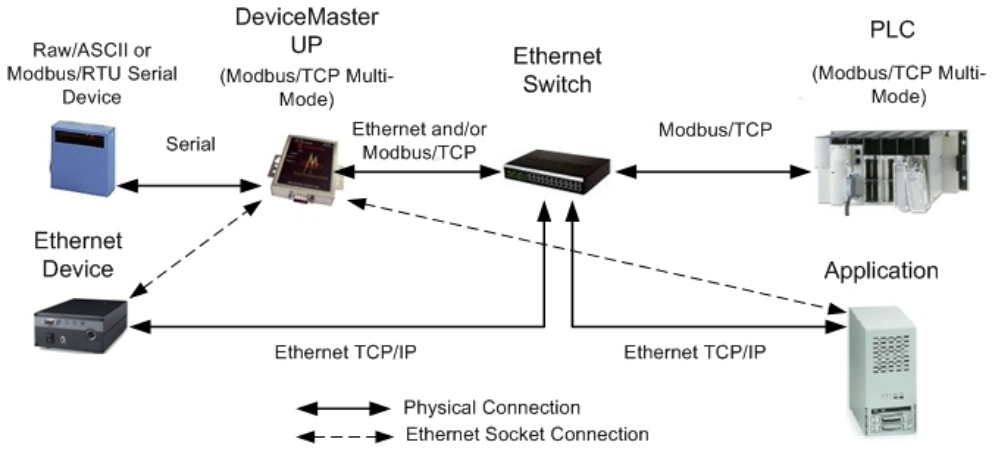
Modbus/TCP firmware V2.x provided a traditional Modbus/TCP slave interface to devices through a raw/ASCII or Modbus/RTU serial interface as illustrated.



1.3.2. Enhanced Modbus/TCP System Architecture (Firmware 3.x)

Using the Modbus/TCP firmware V3.x doubles the capacity of the DeviceMaster UP by providing a raw/ASCII interface to both serial and Ethernet TCP/IP devices. At the same time, the DeviceMaster UP continues to provide a traditional Modbus/TCP to Modbus/RTU interface for Modbus/RTU slave devices.

- Improved PLC interfaces:
  - Transfer of large received serial device packets up to 1024 bytes in *Master Receive* mode.
  - Transfer of large received Ethernet device packets up to 2048 bytes in *Master Receive* mode.
  - Throttling of received data to the PLC in the *Master Receive* mode.
  - Ensures data received by the PLC is not overwritten before it can be processed.
  - Disabling of non-filtered receive queue, ensures the PLC will only receive the latest received serial/Ethernet device data.
- New embedded web pages
  - *PLC Interface Diagnostics* page provides statistics and error messages to monitor and help diagnose PLC interface problems.
  - *Serial/Ethernet Device Communication Statistics* page is a comprehensive statistics page for all serial and Ethernet device interfaces. Includes packet, byte, and error counts to the PLC(s) and application(s) as well as comprehensive filtering statistics.
  - *Ethernet Device Interface Configuration* page provides a user interface to the Ethernet device interface configuration.



For example:

- The DeviceMaster UP 1-port provides Modbus/TCP support for one raw/ASCII or Modbus/RTU serial device and one raw/ASCII Ethernet device for a total of two devices.
- The DeviceMaster UP 2-port provides Modbus/TCP support for two raw/ASCII or Modbus/RTU serial device and two raw/ASCII Ethernet device for a total of four devices.
- The DeviceMaster UP 4-port provides Modbus/TCP support for four raw/ASCII or Modbus/RTU serial devices and four raw/ASCII Ethernet devices for a total of eight devices.

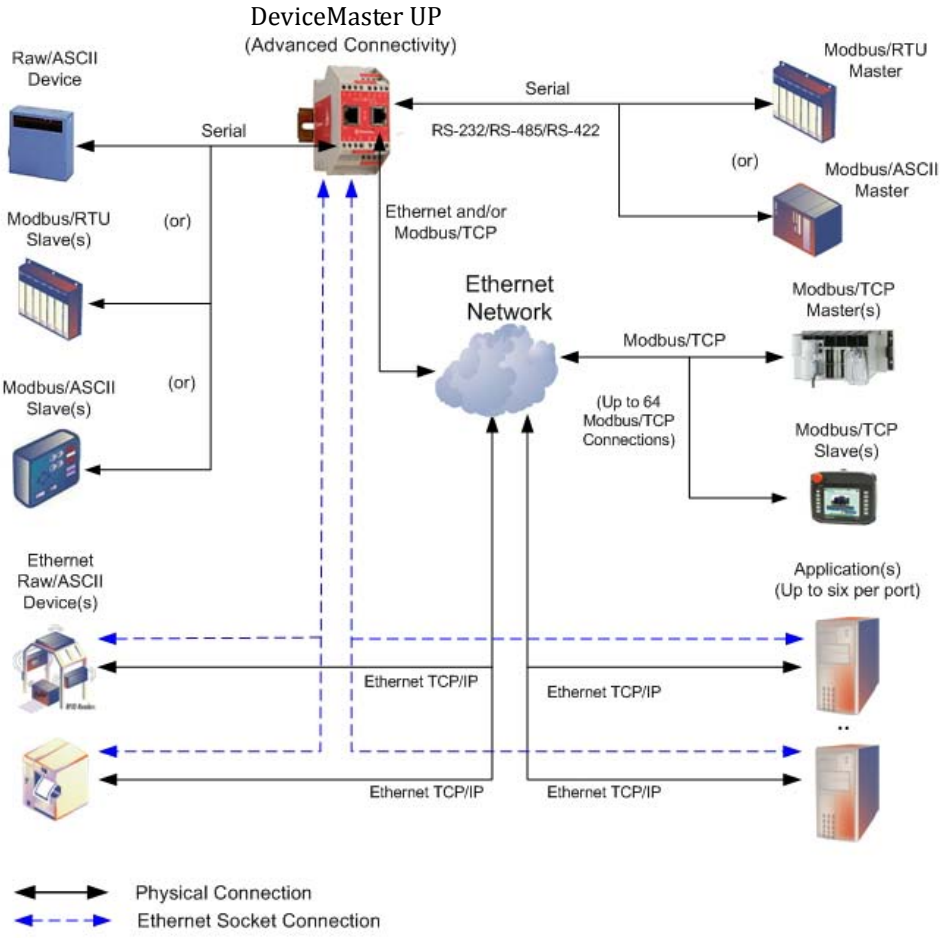
Modbus/TCP firmware 3.x provides an application interface for both serial and Ethernet raw/ASCII devices. You can connect any application, such as a configuration, database, or control application, via the application socket port to raw/ASCII serial and/or Ethernet devices while the device(s) are attached to the PLC via Modbus/TCP.

1.3.3. Advanced Modbus System Architecture (Firmware 5.x)

Using the Modbus/TCP V5.x firmware provides greatly enhances connectivity options. New options include:

- New Modbus support:
  - Modbus/ASCII serial slave device support.
  - Modbus/RTU and Modbus/ASCII serial master support. Modbus/RTU and Modbus/ASCII masters can now connect to Modbus/RTU serial slaves, Modbus/ASCII serial slaves, and both serial and Ethernet TCP/IP raw/ASCII devices.
- New raw/ASCII functionality:
  - Selectable Message Transfer mode
  - Data-Stream - Transmit all message to devices immediately. Return all receive data/responses to all PLC and Application Ethernet TCP/IP connections.
  - Command/Response - Transmit messages one command at a time and wait for response(s). Return all response(s) to command sender only.

This version of the firmware allows up to six Application Ethernet TCP/IP connections for each serial or socket port configuration. (Device Ethernet TCP/IP configurations still only allow one connection per device.)



1.3.4. Modbus/TCP Multi-Mode Connectivity

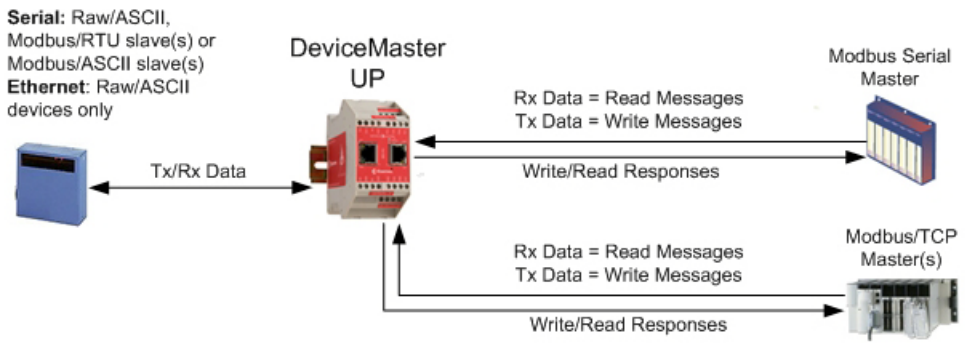
The Modbus/TCP firmware 5.x supports the following Modbus/TCP communication modes:

- PLC Master/DeviceMaster UP Slave Mode on Page 11
- PLC Slave/DeviceMaster UP Master Mode on Page 11
- Dual Master (Virtual Peer-to-Peer) - Write Mode on Page 12
- Dual Master (Virtual Peer-to-Peer) - Read Mode (Dual Polling) on Page 12
- Filtering and Data Extraction Functionality (Patent Pending) on Page 13

1.3.4.1. PLC Master/DeviceMaster UP Slave Mode

PLC Master/DeviceMaster UP Slave mode:

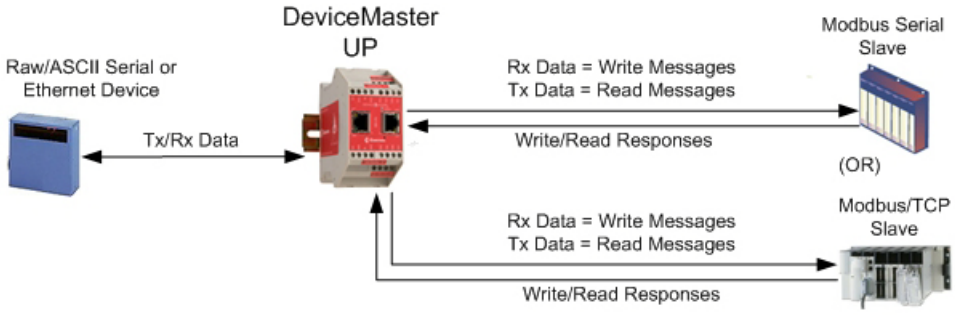
- Standard Modbus master to slave device method of communication. All read and write messages are initiated by the Modbus master.
- Raw/ASCII, Modbus/RTU slave, and Modbus/ASCII slave devices are supported in this mode.
- For raw/ASCII mode, the Receive Transfer mode and Transmit Transfer mode are both set to Slave (In Modbus/RTU-to-Slaves and Modbus/ASCII-to-Slaves mode, the DeviceMaster UP port only operates in To-Slave mode.



1.3.4.2. PLC Slave/DeviceMaster UP Master Mode

PLC slave/DeviceMaster UP master mode:

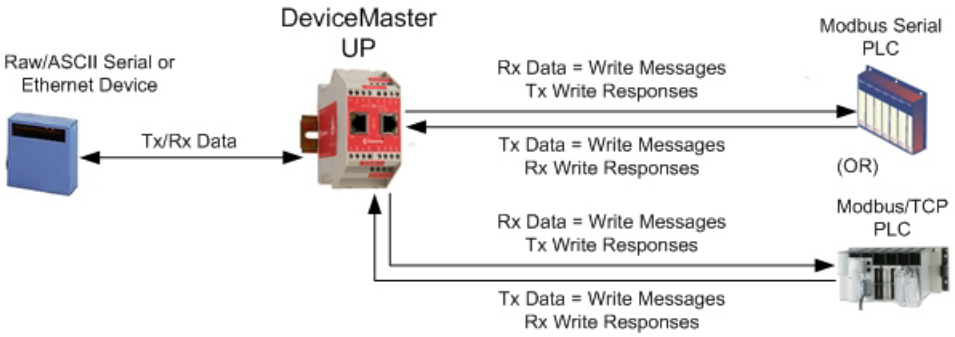
- The DeviceMaster UP initiates all read and write messages.
- The DeviceMaster UP writes received serial and/or Ethernet device data directly into PLC memory with minimal latency.
- The DeviceMaster UP polls the PLC for transmit data for serial and/or Ethernet devices.
- PLC programs can be simplified to eliminate both polling for received data and sending of write messages to transmit data.
- Only raw/ASCII devices are supported in this mode.
- The DeviceMaster UP *Receive Transfer* mode and *Transmit Transfer* mode are both set to *Master*.



1.3.4.3. Dual Master (Virtual Peer-to-Peer) - Write Mode

Dual master (virtual peer-to-peer) - write mode:

- The DeviceMaster UP and PLC initiate only write messages to each other.
- The DeviceMaster UP writes received serial and/or Ethernet device data directly into PLC memory with minimal latency.
- The PLC can write to serial and/or Ethernet devices through the DeviceMaster UP with minimal latency.

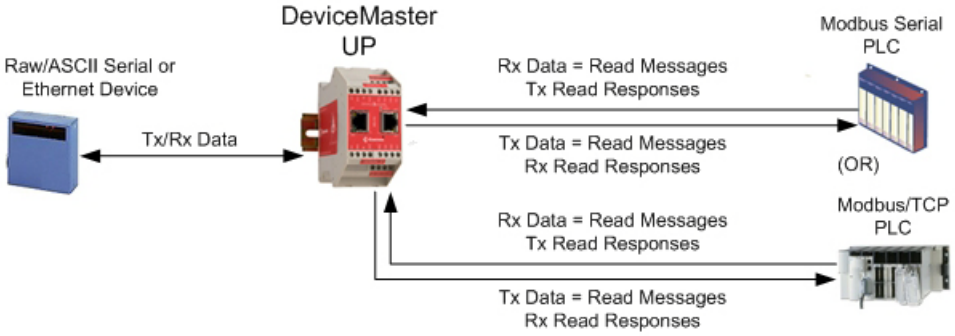


- This mode provides the lowest possible Ethernet bandwidth usage and most efficient usage of PLC and DeviceMaster UP processing power.
- Only raw/ASCII devices are supported in this mode.
- The *DeviceMaster UP Receive Transfer* mode is set to *Master* and *Transmit Transfer* mode is set to *Slave*.

1.3.4.4. Dual Master (Virtual Peer-to-Peer) - Read Mode (Dual Polling)

Dual master (virtual peer-to-peer) - read mode (dual polling):

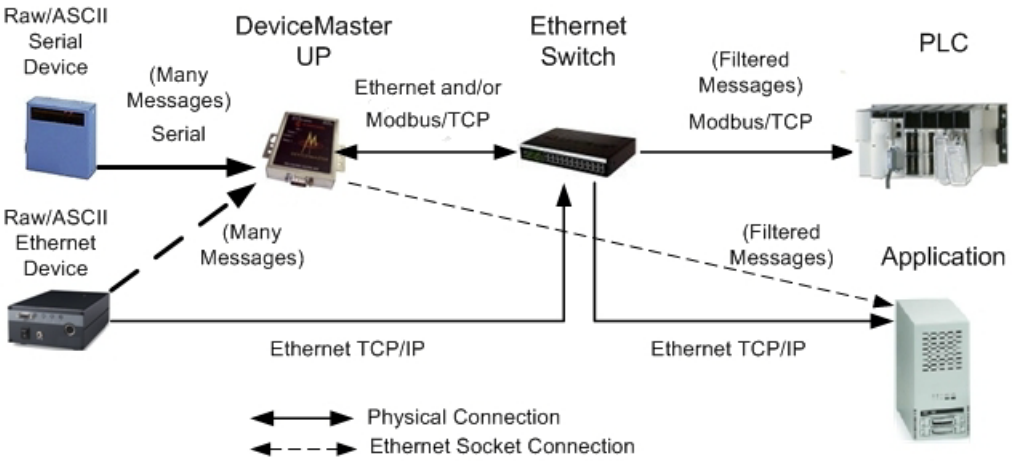
- This is provided for programmers who strongly prefer polling.
- The DeviceMaster UP and PLC initiate only read messages to each other.
- The PLC will poll for received serial and/or Ethernet device data.
- The DeviceMaster UP polls for transmit data to serial and/or Ethernet devices.



- This mode requires the highest possible Ethernet bandwidth usage and provides the least efficient usage of PLC and DeviceMaster UP processing power.
- Only raw/ASCII devices are supported in this mode.
- The DeviceMaster UP *Receive Transfer* mode is set to *Slave* and *Transmit Transfer* mode is set to *Master*.

1.3.4.5. Filtering and Data Extraction Functionality (Patent Pending)

The DeviceMaster UP provides the following filtering and data extraction functionality.



- Filtering:
  - String Filtering of up to 128 bytes of raw/ASCII data to both the PLC and/or application.
  - RFID filtering of EPCglobal formatted RFID tag data to both the PLC and/or application.
  - Barcode filtering of all UPC/EAN formatted barcodes data to both the PLC and/or application.
  - Simplifies PLC and application programming tasks.
- Data Extraction:
  - RFID data extraction extracts all parameters, such as company code, product code, and serial numbers, from any or all of the 43 EPCglobal tag formats. It then transfers the data to the PLC and/or application in a consistent and simple format.
  - Barcode data extraction extracts the company, product, and numbering codes from UPC/EAN formatted barcodes. It then transfers the data to the PLC and/or application in a consistent and simple format.
  - Simplifies PLC and application programming tasks.
- Environment specific support:
  - Support for multiple RFID reader tag formats.
  - RFID antenna grouping.
  - Aging of filtered string/RFID/barcode entries.
  - Discarding of unrecognized RFID and barcode messages.

For detailed information about filtering and data extraction, see the *DeviceMaster UP Filtering and Data Extraction Reference Guide*.

1.4. Definitions and Terms

This section describes the Modbus/TCP definitions and terms included in the Modbus/TCP interface and supported by the DeviceMaster UP.

1.4.1. Data Type Definitions

The following list defines the available data types.

Data Type	Definition
BYTE	Bit String (8-bits)
DINT	Signed Double Integer (32-bits)
DWORD	Bit String (32-bits)
INT	Signed Integer (16-bits)
STRING	Character String (1-byte per character)
UDINT	Unsigned Double Integer (32-bits)
USINT	Unsigned Short Integer (8-bits)
WORD	Unsigned Integer (16-bits)

1.4.2. Glossary

The following list defines terms associated with Modbus/TCP.

Term	Definition
Alias Device ID	The device ID that the original received ID is changed to when an Alias Device ID is configured.
Device ID	The address of the slave device and the term is identical to *Unit Identifier* and *Slave Address*.
Ethernet Device	A device that communicates through an Ethernet TCP/IP connection.
Master Device	A device that transmits Modbus/TCP messages to slave devices and receives the corresponding responses.
Modbus	An application layer messaging protocol that provides client/server communications between devices connected on different types of buses.
Modbus Serial	The Modbus protocol over a serial connection.
Modbus/ASCII	Modbus Serial in ASCII format. This form of Modbus communication requires two characters for each byte.
Modbus/RTU	Modbus Serial in binary format.
Modbus/TCP	The Modbus protocol over an Ethernet TCP/IP connection. Also known as Modbus over Ethernet.
Raw Serial Device	A common serial device that communicates over serial ports through plain byte or ASCII data messages.
Slave Address	The address of the slave device. This term is identical to Unit Identifier and Device ID.
Slave Device	A device that only responds to Modbus messages.
Socket Port	The Ethernet socket port that is used to communicate to an Ethernet device.
Unit Identifier	The address of the slave device and the term is identical to *Device ID* and *Slave Address*.

1.5. Locating Updated Software and Documents

You can access the firmware software assembly, PortVision Plus, and the DeviceMaster UP documentation from the CD shipped with the DeviceMaster UP or you can download the latest files from:

ftp://ftp.comtrol.com/html/up_modbus_tcp_main.htm

1.6. Modbus/TCP Application Setup

Before you can configure the Modbus/TCP firmware on the DeviceMaster UP, you must have previously performed the following steps:

- Install the hardware
- Install PortVision Plus
- If necessary, upload the Modbus/TCP firmware using PortVision Plus

  Note: *Models that have Modbus/TCP loaded on the DeviceMaster UP are identified in PortVision Plus and the DeviceMaster UP is labeled accordingly.*
- Configure the DeviceMaster UP IP address using PortVision Plus

  Note: *If necessary, refer to the DeviceMaster UP Hardware Installation and Configuration Guide for the above procedures.*

Use the following steps to complete the DeviceMaster UP configuration for Modbus/TCP.

1. Program the Modbus/TCP PLC (refer to the information in Chapter 2. Programming Interface on Page 17).
2. Configure the DeviceMaster UP serial and Ethernet device interface settings using the *Modbus/TCP Interface Configuration Quick Start.* You can use Chapter 3. Embedded Configuration Pages on Page 33) as a reference if you need additional information about fields on the web pages.
3. Connect your serial device or devices and make sure all Ethernet devices are attached to the same Ethernet subnet. If necessary, refer to the *DeviceMaster UP Hardware Installation and Configuration Guide*.

Chapter 2. Programming Interface

2.1. Overview

The DeviceMaster UP provides highly flexible Modbus connectivity.

- Modbus masters supported include Modbus/TCP and Modbus/RTU and Modbus/ASCII serial masters.
- Both serial Modbus/RTU and Modbus/ASCII slave devices are supported.
- All Modbus masters can communicate with all Modbus slave devices.
- The Modbus/RTU and Modbus/ASCII Protocol Interface is defined in (*2.4. Modbus/RTU and Modbus/ASCII To-Slaves Protocol Interface* on Page 29).

The DeviceMaster UP provides highly advanced raw/ASCII device functionality:

- Both serial and Ethernet TCP/IP devices are supported.
- Modbus interfaces include Modbus/TCP masters, Modbus/TCP slaves, and both Modbus/RTU and Modbus/ASCII serial masters.
- Up to six Ethernet TCP/IP Application connections per serial or Ethernet TCP/IP device.
- The raw/ASCII interface is defined in (*2.2. Raw Data Interface* on Page 19).

You must configure the DeviceMaster UP through its embedded web pages defined in *Chapter 3. Embedded Configuration Pages* on Page 33.

The DeviceMaster UP uses normal Modbus addressing conventions and provides receive, transmit, and statistical data.

Appendix A. Programming the PLC via Concept on Page 81 describes the Concept™ PLC programming examples provided with the DeviceMaster UP. It describes how to configure the DeviceMaster UP for raw serial data and start running the example programs using the embedded web pages and the example PLC program code.

Note: *While the Concept PLC example programs directly apply only to the Schneider Electric Momentum, Quantum, and Compact PLCs, they can be used as a guide for programming other PLCs.*

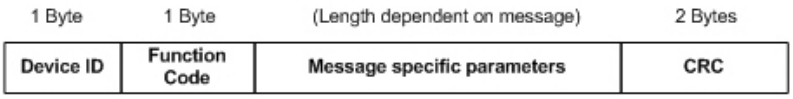
2.1.1. Modbus Master Requirements

Modbus Masters (Modbus/TCP, Modbus/RTU serial, and Modbus/ASCII) must meet these requirements:

- The Modbus Master must support the corresponding protocol.
- For raw/ASCII data, the Modbus Master must support the Read Holding Registers and Write Multiple Registers commands or, alternatively, the Read/Write Multiple Registers command.
- The Modbus Master must be able to write enough data in one message to handle the maximum sized messages required for the serial or Ethernet device.

2.1.2. What is Modbus/RTU?

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:



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 primarily for:

- *Serial port connectivity*. RS-485 is the most common serial mode, but RS-232 and RS-422 are also widely used. Commonly used by both Master and Slave devices.
- *Ethernet TCP/IP socket connections.* This is not the same as Modbus/TCP (please see section on Modbus/TCP), 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 typically is not supported by PLCs.*

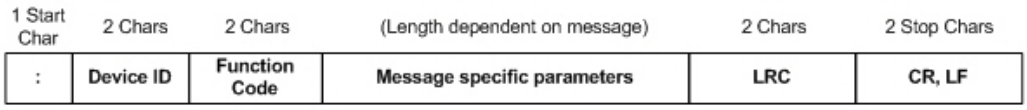
2.1.3. What is Modbus/ASCII?

Modbus/ASCII is native Modbus in ASCII format. This protocol is used primarily by legacy devices and is no longer supported as widely as Modbus/RTU.

Like Modbus/RTU, Modbus/ASCII contains the base Modbus messages that contain simple read and write requests. The differences between Modbus/ASCII and Modbus/RTU are:

1. The message data is sent in ASCII format, so the message length is twice as long. It requires two ASCII characters for each byte of data.
2. An 8 bit LRC is attached to verify the message instead of a 16 bit CRC. The LRC is also transmitted in ASCII format.
3. There are defined starting and ending characters to determine a Modbus/ASCII messages.

The format is as follows:



Modbus/ASCII 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.

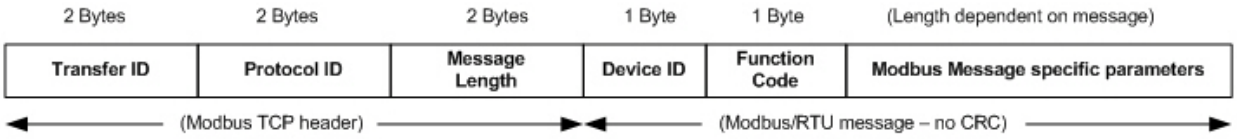
Modbus/ASCII is used primarily for:

- *Serial port connectivity*. RS-485 is the most common serial mode, but RS-232 and RS-422 are also used. Used primarily by legacy Slave devices.
- *Ethernet TCP/IP socket connections*. This is not the same as Modbus/TCP (please see section on Modbus/TCP), but does provide a very simple method of interfacing to remote devices. It is used by some applications and some OPC servers.

  Note: *This communication method typically is not supported by PLCs.*

2.1.4. What is Modbus/TCP?

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.
- Serial Modbus/RTU and/or Modbus/ASCII devices through gateways (such as the DeviceMaster UP running the Modbus/TCP or Modbus Router applications).
- Serial or Ethernet TCP/IP raw/ASCII devices (barcode scanners, printers, RFID readers, visions systems, etc) through a gateway (such as the DeviceMaster UP running the Modbus/TCP application).

2.2. Raw Data Interface

This subsection contains the following topics:

- *Supported Modbus Messages* on Page 19
- *Serial Port Raw/ASCII Interface* on Page 20
- *Ethernet Device Raw/ASCII Interface* on Page 21
- *Receive Data Message (Raw Data)* on Page 23
- *Transmit Data Message (Raw Data)* on Page 25
- *Sequence Number Messages (Raw Data)* on Page 27

2.2.1. Supported Modbus Messages

DeviceMaster UP supports the following Modbus messages over Modbus/TCP for raw data transfer.

Message Type	Function Code	Maximum Message Size	Maximum Serial Packet Size
Read Holding Registers	3	250 BYTEs (125 WORDs)	246 BYTEs (123 WORDs)
Write Multiple Registers	16 (10 hex)	240 BYTEs (120 WORDs)	236 BYTEs (118 WORDs)
Read/Write Multiple Registers	23 (17 hex)	236 BYTEs (118 WORDs)	232 BYTEs (116 WORDs)

Note: *Your PLC programming software may not allow maximum size serial packets.*

2.2.2. Serial Port Raw/ASCII Interface

Serial Port Raw/ ASCII Addressing	Serial Port 1	Serial Port 2	Serial Port 3	Serial Port 4	Access Rule
Unit ID	255 (FF hex)	255 (FF hex)	255 (FF hex)	255 (FF hex)	N/A
Receive Data Address	1000 (Base 0) 1001 (Base 1)	2000 (Base 0) 2001 (Base 1)	3000 (Base 0) 3001 (Base 1)	4000 (Base 0) 4001 (Base 1)	Read Only
Receive Data Sequence Number Address	1256 (Base 0 1257 (Base 1)	2256 (Base 0 2257 (Base 1)	3256 (Base 0 3257 (Base 1)	4256 (Base 0 4257 (Base 1)	Read/Write
Transmit Data Address	1300 (Base 0) 1301 (Base 1)	2300 (Base 0) 2301 (Base 1)	3300 (Base 0) 3301 (Base 1)	4300 (Base 0) 4301 (Base 1)	Read/Write
Transmit Data Sequence Number Address	1556 (Base 0) 1557 (Base 1)	2556 (Base 0) 2557 (Base 1)	3556 (Base 0) 3557 (Base 1)	4556 (Base 0) 4557 (Base 1)	Read/Write
Statistics Address	1600 (Base 0) 1601 (Base 1)	2600 (Base 0) 2601 (Base 1)	3600 (Base 0) 3601 (Base 1)	4600 (Base 0) 4601 (Base 1)	Read/Write

2.2.3. Ethernet Device Raw/ASCII Interface

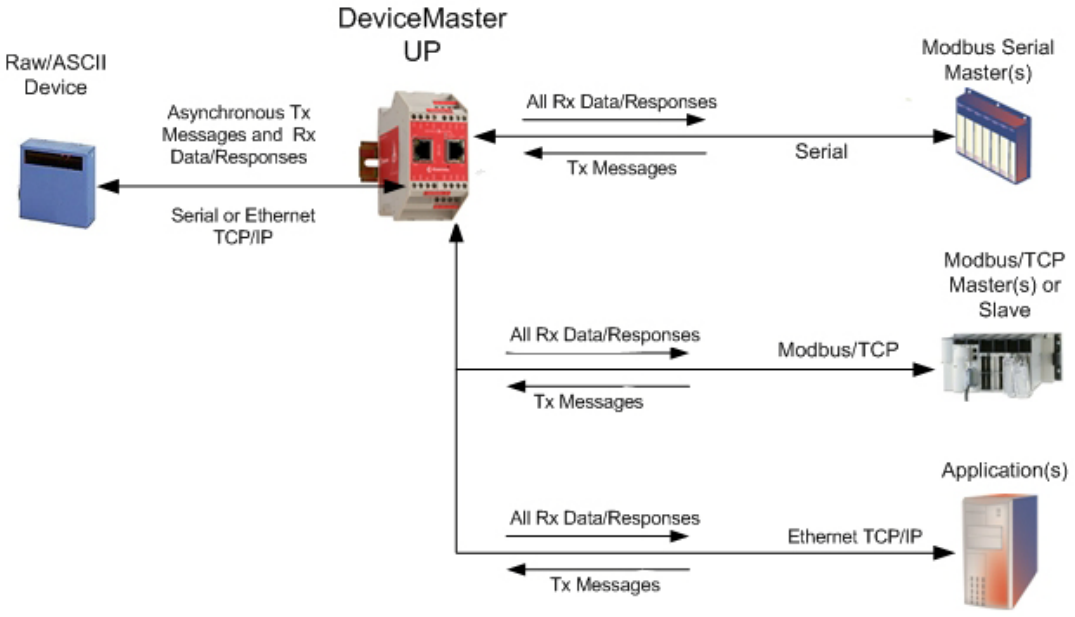
Socket Port Raw Data Addressing	Socket Port 1	Socket Port 2	Socket Port 3	Socket Port 4	Access Rule
Unit ID	254 (FE hex)	254 (FE hex)	254 (FE hex)	254 (FE hex)	N/A
Receive Data Address	1000 (Base 0) 1001 (Base 1)	2000 (Base 0) 2001 (Base 1)	3000 (Base 0) 3001 (Base 1)	4000 (Base 0) 4001 (Base 1)	Read Only
Receive Data Sequence Number Address	1256 (Base 0 1257 (Base 1)	2256 (Base 0 2257 (Base 1)	3256 (Base 0 3257 (Base 1)	4256 (Base 0 4257 (Base 1)	Read/Write
Transmit Data Address	1300 (Base 0) 1301 (Base 1)	2300 (Base 0) 2301 (Base 1)	3300 (Base 0) 3301 (Base 1)	4300 (Base 0) 4301 (Base 1)	Read/Write
Transmit Data Sequence Number Address	1556 (Base 0) 1557 (Base 1)	2556 (Base 0) 2557 (Base 1)	3556 (Base 0) 3557 (Base 1)	4556 (Base 0) 4557 (Base 1)	Read/Write

2.2.4. Raw/ASCII Transfer Modes

The DeviceMaster UP supports two different raw/ASCII message transfer modes. The default Data-Stream mode is the traditional transfer mode that asynchronously transmits messages and returns received data/responses. The Command/Response mode provides a synchronous transfer mode for sending and returning responses.

2.2.4.1. Data-Stream Mode

The Data-Stream transfer mode is the default transfer mode that asynchronously transmits messages from all Modbus and Application interfaces and returns received data/responses to all Modbus and Application interfaces. This mode is typically used in installations that utilize only one controller and for receive-only devices such as barcode scanners, RFID readers, weigh scales, and position encoders.

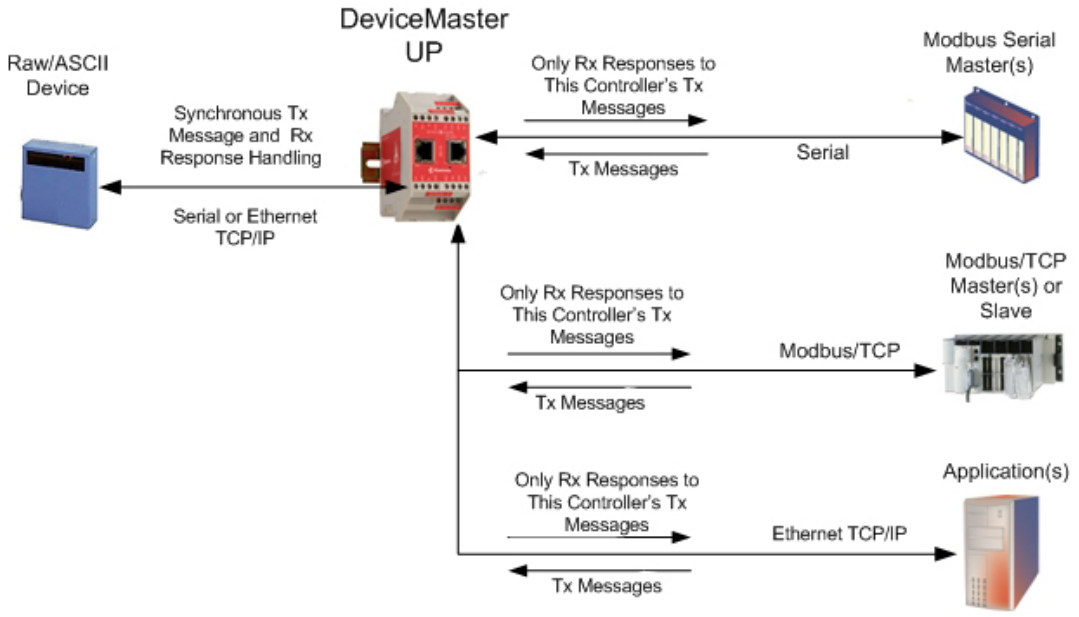


2.2.4.2. Command/Response Mode

The Command/Response mode provides the following functionality:

- A synchronous transfer mode for sending and returning responses from all Modbus and Application Ethernet TCP/IP interfaces to serial and Ethernet TCP/IP devices.
- Only one command message is transmitted at a time. Command messages are queued if a command message is active.
- Responses are routed only to the message sender.
- Responses are timed out and old responses, (ones not requested within a certain time frame), destined for the Modbus interface are discarded.
- The expected response count is configurable. While this is typically one, some devices may return multiple responses per message.

The Command/Response transfer mode is typically required in installations that require multiple controllers sending raw/ASCII messages with expected responses, and it is desired that each controller only receive its own responses.



2.2.5. Receive Data Message (Raw Data)

The following topics are discussed:

- *Format* on Page 23
- *Communication Methodology (Receive Raw Data in Slave Mode)* on Page 24
- *Communication Methodology (Receive Data Master Mode)* on Page 24

2.2.5.1. Format

The *Receive Data* message for raw data contains a simple protocol including a sequence number, length and serial data fields. The Modbus standard requires a WORD format.

The following table displays the format of the *Receive Data* message.

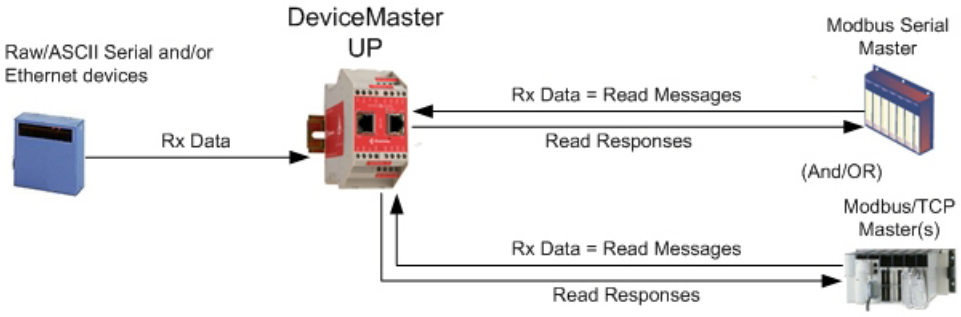
Name	Data Type	Data Value(s)	Access Rule
Receive (to PLC) message data. **Structure of:** Produced data sequence Data length (in bytes) Data array	 **WORD** **WORD** Array of **WORD**	 0-65535 (FFFF hex) 0-246 (slave Rx mode) 1-1024 (serial Rx master) 1-2048 (Ethernet Rx master) 0-65535	Read only

Receive messages have the following characteristics:

- It returns all data in WORD**s**.
- The DeviceMaster UP increments the sequence number when it returns new data.
- The message received from the PLC determines the actual length of the Modbus message returned to the PLC. (This is often greater than the length of the actual number of valid bytes in the Receive Data Message.)
- All unused bytes in a Modbus message returned to the PLC are filled with zeroes.
- The default order of the bytes is Least Significant Byte First. However, you can select the *Rx MS Byte First* option in the web page to return bytes by **Most Significant Byte First**. For more information, see *Rx MS Byte First* under *3.3.5. Serial Port Packet ID Settings (Raw-Data Only)* on Page 39.

2.2.5.2. Communication Methodology (Receive Raw Data in Slave Mode)

Raw serial and/or EtherNet device data is returned in the response to the *Read Holding Registers* message or, optionally, the *Read/Write Multiple Register* message. The data is requested by accessing the corresponding receive data address for the desired port.



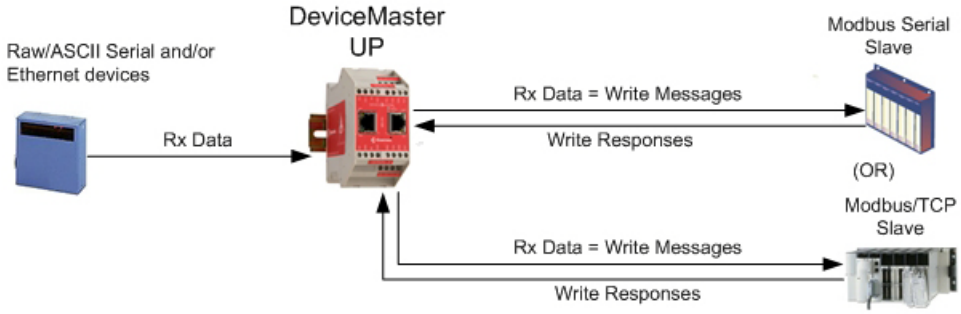
The following restrictions apply to this method:

- The *Device Index* must be 255 (FF hex) for raw/ASCII serial data and 254 (FE hex) for raw/ASCII Ethernet device data.
- The variable to receive the data on the PLC must be:
  - In the 40xxxx address range. (For Modicon type PLCs.)
  - An array of 16 bit words.
  - Of sufficient size to contain the sequence number, length, and data field associated with the received data structure. For more information, see the *2.2.5. Receive Data Message (Raw Data)* definition on Page 23.
- New data will be indicated with an incremented sequence number.

  The same data may be returned more than once. However, the same data packet will also return the same sequence number.
- No data will be indicated with a length of zero.

2.2.5.3. Communication Methodology (Receive Data Master Mode)

Raw serial and/or Ethernet device data is written to the PLC at the configured address.



The following restrictions apply to this method:

- The *Device Index* must be configured for the target PLC.
- The variable to receive the data on the PLC must be:
  - In the 40xxxx. (For Modicon type PLCs.)
  - An array of 16 bit words.
  - Of sufficient size to contain the sequence number, length, and data field associated with the received data structure.
- New data will be indicated with an incremented sequence number.

2.2.6. Transmit Data Message (Raw Data)

The following topics are discussed:

- *Format* on Page 25
- *Communication Methodology (Transmit Raw Data Slave Mode)* on Page 26
- *Communication Methodology (Transmit Data Master Mode)* on Page 26

2.2.6.1. Format

The *Transmit Data* message for raw data contains a simple protocol including a sequence number, length and serial data fields. The Modbus standard requires a WORD format.

The following table displays the format of the *Transmit Data* message.

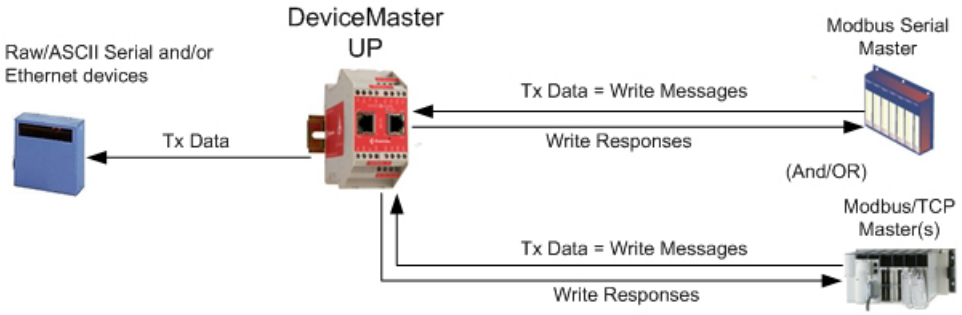
Name	Data Type	Data Value(s)	Access Rule
Transmit (PLC to DeviceMaster UP) message data. **Structure of:** Produced data sequence Data length (in bytes) Data array	 **WORD** **WORD** Array of **WORD**	 0-65535 (FFFF hex) 1-236 (Slave Tx Mode) 1-246 (Master Tx Mode) 0-65535	Read/Write

Transmit messages have the following characteristics:

- It transfers all data in WORDs.
- If the **Disable Tx Sequence Number Check** option is not selected, the sequence number must be incremented when there is new data to transmit.
- The data length field indicates the number of valid bytes contained in the message.
- The actual length of a message received from the PLC may contain extra, unused data.
- It ignores all unused bytes in a Modbus message.
- The default order of the bytes is **Least Significant Byte First**. However, you can select the *Tx MS Byte First* option in the web page to transmit bytes by **Most Significant Byte First**. For more information, see *Tx MS Byte First* under *3.3.5. Serial Port Packet ID Settings (Raw-Data Only)* on Page 39.
- A request for the *Transmit data* returns the last transmit data message.

2.2.6.2. Communication Methodology (Transmit Raw Data Slave Mode)

Raw serial and/or EtherNet device data is sent in the *Write Multiple Registers* message or, optionally, the *Read/Write Multiple Register* message. The data is requested by accessing the corresponding transmit data address for the desired port.

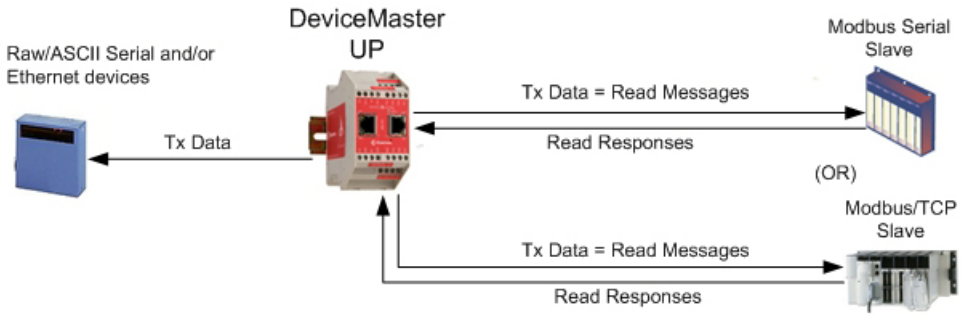


The following restrictions apply to this method:

- The *Device Index* must be 255 (FF hex) for raw/ASCII serial data and 254 (FE hex) for raw/ASCII Ethernet device data.
- The variable to transmit the data on the PLC must be:
  - In the 40xxxx address range. (For Modicon type PLCs.)
  - An array of words.
  - Of sufficient size to contain the sequence number, length, and data field associated with the transmit data structure, typically 128 words. See *2.2.6. Transmit Data Message (Raw Data)* on Page 25 for more information.
- If the **Disable Tx Sequence Number Check** option is not selected, the sequence number must be incremented when there is new data to transmit. The same transmit data message may be sent to the DeviceMaster UP more than once. However, the data packet will only be transmitted when a new sequence number is received.

2.2.6.3. Communication Methodology (Transmit Data Master Mode)

Raw serial and/or Ethernet transmit data is polled from the PLC at the configured address and, when the DeviceMaster UP receives a transmit message with an updated sequence number, the data is transmitted to the serial or Ethernet device.



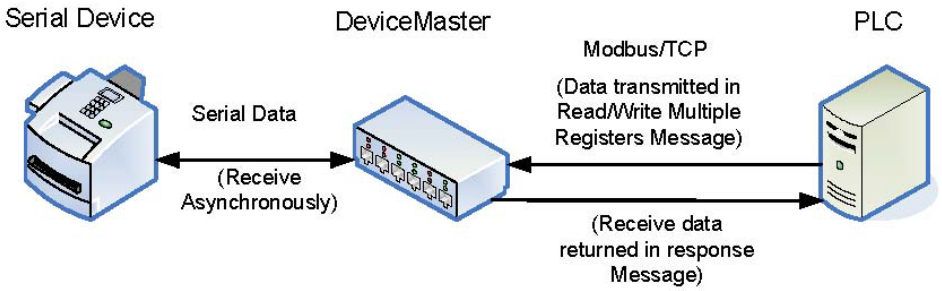
- The following restrictions apply to this method:
- The *Device Index* must be configured for the target PLC.
- The variable to receive the data on the PLC must be:
  - In the 40xxxx. (For Modicon type PLCs.)
  - An array of 16 bit words.
  - Of sufficient size to contain the sequence number, length, and data field associated with the transmit data structure.
- The PLC will indicate new data to transmit with an incremented sequence number. (The **Disable Tx Sequence Number Check** option does not apply to transmit data master mode.)
- The length will indicate the number of bytes to transmit.
- The DeviceMaster UP will expect the length parameter and data to transmit to be updated before the transmit sequence number is incremented. Therefore, as soon as the DeviceMaster UP receives an incremented transmit number, it will transmit the data to the serial or Ethernet device.

2.2.7. Sequence Number Messages (Raw Data)

Read Holding Registers and *Write Multiple Register* messages can read and modify both receive and transmit produced data sequence numbers. These are the same sequence numbers returned to the PLC in the *Receive Data Message* and sent to the DeviceMaster UP in the *Transmit Data* message. Access to these sequence numbers are provided primarily for initialization purposes at the start of the PLC program when you may want to initialize the sequence numbers on the PLC, DeviceMaster UP or both.

2.3. I/O Scanner (Raw Data)

The I/O Scanner is an optional PLC communications method that is implemented on some PLC programming software such as the Concept programming package for use with the Schneider Electric Modicon PLCs. The I/O Scanner provides a rather simple method that requires minimal programming effort. It automatically performs the polling and transmitting of data at set time intervals and typically utilizes the *Read/Write multiple Registers* message.



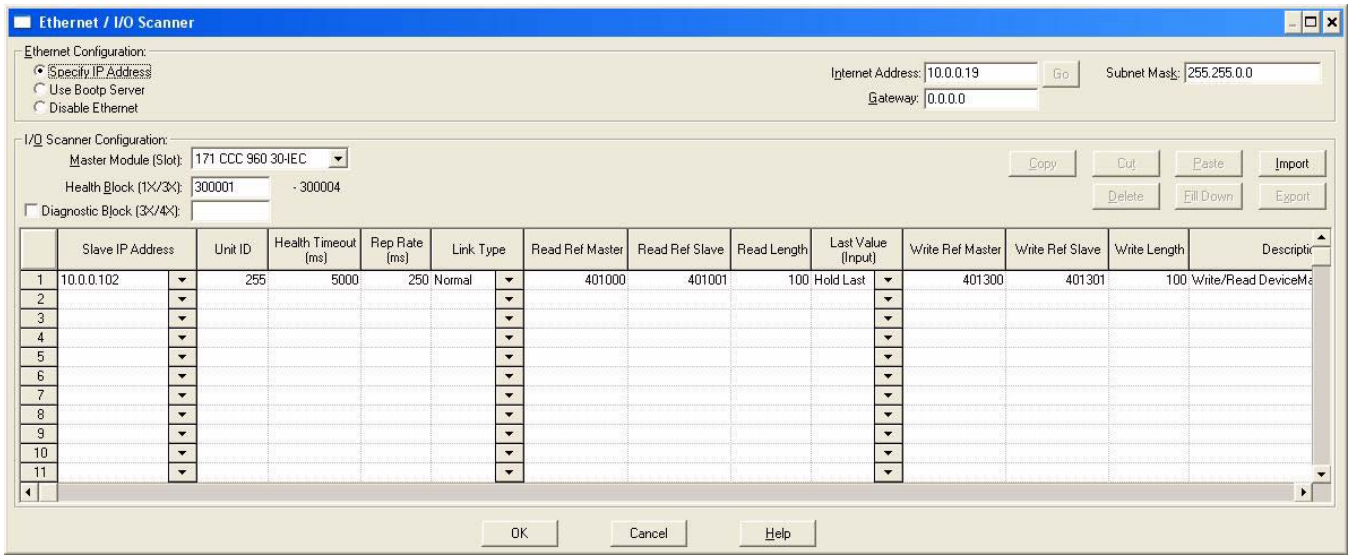
The following restrictions apply to this method:

- The *Receive* and *Transmit* mode for the serial and/or Ethernet device must both be set to *Slave* mode.
- The *Device Index* must be 255 (FF hex) for raw/ASCII serial data and 254 (FE hex) for raw/ASCII Ethernet device data.
- The variable to receive the data on the PLC must be:
  - In the 40xxxx address range. (For Modicon type PLCs.)
  - An array of words.
  - Of sufficient size to contain the sequence number, length, and data field associated with the received data structure, typically 128 words. For more information, see the *2.2.5. Receive Data Message (Raw Data)* definition on Page 23.
- New received data will be indicated with an incremented sequence number.

  The same data may be returned more than once. However, the same data packet will also return the same sequence number.
- No receive data will be indicated with a length of zero.
- The variable to transmit the data on the PLC must be:
  - In the 40xxxx address range. (For Modicon PLCs.)
  - An array of words.
  - Of sufficient size to contain the sequence number, length, and data field associated with the transmit data structure, typically 128 words. See *2.2.6. Transmit Data Message (Raw Data)* on Page 25 for more information.
- If the **Disable Tx Sequence Number Check** option is not selected, the sequence number must be incremented when there is new data to transmit.

  The same transmit data message may be sent to the DeviceMaster UP more than once. However, the data packet will only be transmitted when a new sequence number is received.
- The DeviceMaster UP should be reset before starting a PLC program using the I/O Scanner due to PLC program execution scheduling. If the DeviceMaster UP is not reset, the sequence numbers may be out of sync. This may result in receiving outdated serial data as well as an unexpected transmission of serial data. A Transmit Unexpected Sequence Number error may also occur.

The following depicts a typical I/O Scanner screen.



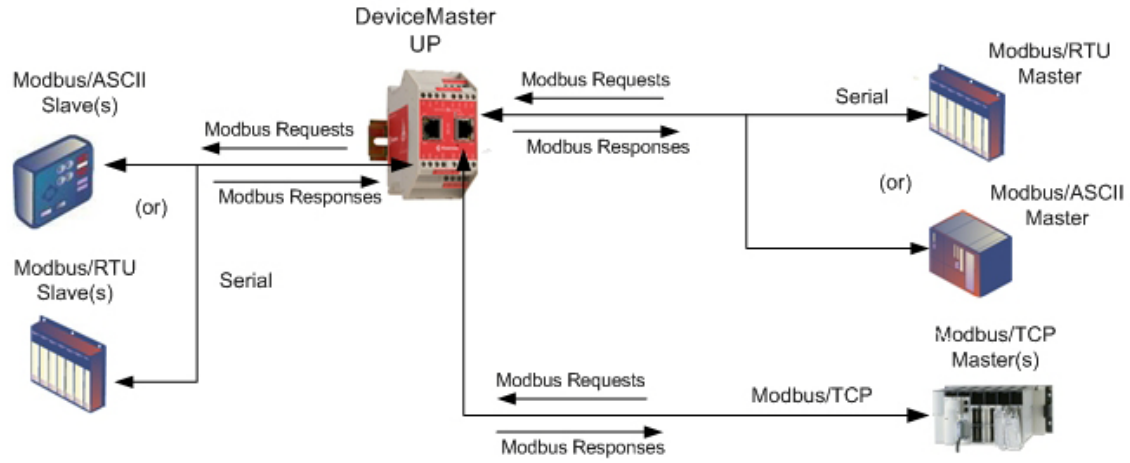
2.4. Modbus/RTU and Modbus/ASCII To-Slaves Protocol Interface

The DeviceMaster UP provides access to serial Modbus/RTU and Modbus/ASCII slave devices via Modbus/TCP, serial Modbus/RTU masters, and serial Modbus/ASCII masters. Modbus master messages are translated to Modbus/RTU or Modbus/ASCII messages, devices are automatically located, and appropriate Modbus responses are returned to the Modbus masters.

2.4.1. Communication Methodology

The DeviceMaster UP translates Modbus master messages into Modbus/RTU or Modbus/ASCII messages and forwards them to slave devices attached to the Modbus/RTU or Modbus/ASCII slave serial ports. Each Modbus message is transmitted and a response is expected. The DeviceMaster UP times out the Modbus/RTU or Modbus/ASCII messages if there is no response returned within the configured timeout period.

The following diagram displays the Modbus message transfer.



The following apply to Modbus slaves serial ports.

- All valid Modbus master messages are translated to Modbus slave messages for serial port transmission.
- Modbus slave devices are automatically located on a DeviceMaster UP 2-port or 4-port.
- Messages are timed out if no response is returned within the configured timeout period.
- Appropriate Modbus responses are returned to the Modbus master.
- Broadcast Modbus messages, those with a unit identifier of zero, are transmitted out all Modbus slave serial ports on the DeviceMaster UP.

The following restrictions apply to the Modbus slave interface:

- The DeviceMaster UP serves as a *slave* Modbus/TCP device, a *master* on Modbus To-Slaves serial ports, and a slave on Modbus To-master serial ports.
- All Modbus slave devices attached to a DeviceMaster UP gateway (1, 2, or 4-port) must have unique *Unit Identifiers*. Valid Unit Identifiers are 1 to 247 and the Broadcast Identifier is zero.

To communicate to Modbus slave device(s) through a DeviceMaster UP, perform the following steps.

1. Using the embedded web page, select the appropriate **Port**.
2. Under *Serial Configuration*, configure the serial port parameters such as the Mode, Baud rate, Data Bits, and so forth.
3. Under *General Protocol Settings*, set the *Select Serial Port Protocol* to **Modbus slave**.
4. Under *Modbus Slave Protocol Settings*, set the **Device Response Timeout** to the desired value.

   Note: ***2- and 4-Port only****: set the* ***Lost Device Search Enable*** *setting. For a discussion on this setting, see* *2.4.2. Modbus Slave Device Search Methodology on Page 30.*

5. In the PLC program, address messages to the Modbus slave device using the IP Address of the DeviceMaster UP and the Unit Identifier of the slave device(s).

2.4.2. Modbus Slave Device Search Methodology

Locating a Modbus slave device on a DeviceMaster UP 1-port is relatively simple. Either the Modbus slave device is connected to the port or it is not. However, if more than one port is configured for Modbus slave on a DeviceMaster UP 2- or 4-port, the device must be found. The following is an explanation of how the search algorithm works on a DeviceMaster UP 2- or 4-port.

Locating a Modbus slave device after a reboot or port reset:

When the DeviceMaster UP receives a message for a Modbus slave device for the first time since reboot or port initialization, it will transmit the Modbus slave message out all Modbus slave serial ports and wait for a response to be returned. Once the response is returned, the device port is known and all messages sent to the device will be routed through the serial port.

Lost Devices:

Lost devices, or devices that time out, are a special case. The DeviceMaster UP provides two methods for handling lost devices via the **Lost Device Search Enable** option on the web page.

- Disabling this option on a Modbus slave port:
  - Prevents the DeviceMaster UP from searching for a lost device on other Modbus slave ports.
  - Prevents lost devices known to have been on other ports from being searched for on this port.

  Note: *This is the recommended setting whenever it is desired to prevent timeout delays on other Modbus slave ports in the event that a device times out.*
- Enabling this option on a Modbus slave port:
  - Allows the DeviceMaster UP to search for lost devices on all Modbus slave ports with the **Lost Device Search Enable** option turned on.

    Note: *This can be useful for locating devices if a device has been moved onto another port by moving the serial cable or, perhaps, by moving the device onto a different Modbus slave serial loop.*
  - This will cause timeout delays on all Modbus slave ports with the **Device Search Enable** option turned on until the device is found.

2.5. Retrieve Statistics Message

The data returned from the *Retrieve Statistics* message contains various counters. The *Retrieve Statistics* message formats the data into 32-bit integers and returns data in an array of WORDs. The first WORD contains the most significant word and the second WORD contains the least significant word.

DeviceMaster UP Addressing for the Statistics Modbus/TCP Messages	Serial Port 1	Serial Port 2	Serial Port 3	Serial Port 4	Access Rule
Unit ID	255 (FF hex)	255 (FF hex)	255 (FF hex)	255 (FF hex)	N/A
Statistics Address	1600	2600	3600	4600	Read Only

Note: *Some Modicon PLC programming software, such as Concept, requires one to be added to the address offset. This is because their address range begins at 40001, while the address range on the DeviceMaster UP begins at zero.*

The following table displays the format of the *Retrieve Statistics* message.

Index	Name	Data Type	Data Value(s)	Access Rule
1	Receive Byte Count	UDINT	0=default	Read only
2	Receive Packet Count	UDINT	0=default	Read only
3	Transmit Byte Count	UDINT	0=default	Read only
4	Transmit Packet Count	UDINT	0=default	Read only
5	Dropped Packet Count to PLC	UDINT	0=default	Read only
6	Parity Error Count	UDINT	0=default	Read only
7	Framing Error Count	UDINT	0=default	Read only
8	Overrun Error Count	UDINT	0=default	Read only
9	Unexpected Transmit Sequence Number errors	UDINT	0=default	Read only
10	Invalid Modbus/RTU Device Responses	UDINT	0=default	Read only
11	Modbus/RTU Device Timeouts	UDINT	0=default	Read only
12	Reserved	UDINT	0	Read only

The *Retrieve Statistics* messages have the following characteristics.

Retrieve Statistics Message Description	
Receive Byte Count	This attribute counts the number of bytes received on the serial port.
Receive Packet Count	This attribute counts the number of packets received on the serial port.
Transmit Byte Count	This attribute counts the number of bytes transmitted on the serial port.
Transmit Packet Count	This attribute counts the number of packets transmitted on the serial port.
Dropped Packet Count to PLC	This attribute counts the number of dropped receive packets on the serial port intended for the PLC due to: • No STX byte(s) found • No ETX byte(s) found • Time-outs • Too large of packet • Receive buffer queue overflows
Parity Error Count	This attribute counts the number of packets with parity errors received on the serial port.
Framing Error Count	This attribute counts the number of packets with framing errors received on the serial port.

Retrieve Statistics Message Description (Continued)	
Overrun Error Count	This attribute counts the number of packets with overrun type errors received on the serial port.
Unexpected Transmit Sequence Number Error Count	This attribute counts the number of Unexpected Transmit Sequence Number errors. The DeviceMaster UP increments this number when it receives a raw data transmit message with a sequence number that is not equal to either the previous sequence number or the previous sequence number plus one. (The DeviceMaster UP expects this sequence number to be incremented by one with each new transmit message.)
Invalid Modbus/RTU Device Responses	The number of invalid messages returned from Modbus/RTU devices on this port. Such invalid responses could be the result of any or all of the following: • Invalid CRC • Invalid returned function code • Invalid Unit Identifier • Duplicate Unit Identifier
Modbus/RTU Device Timeouts	The number of messages that timed out waiting for a response from a Modbus/RTU device on this port.

Chapter 3. Embedded Configuration Pages

This chapter provides detailed information about the embedded web pages for serial and Ethernet device configuration. Ethernet devices are configured via an Ethernet TCP/IP socket connection. The latest Modbus/TCP firmware must be installed before you can configure network or serial/socket port characteristics. For firmware installation and setup information, see the *DeviceMaster UP Hardware Installation and Configuration Guide* or the PortVision Plus help system.

Use the *Modbus/TCP Interface Configuration Quick Start* to locate configuration procedures for your site and use this chapter as a reference if you need information about specific fields. The *Interface Configuration Quick Start* is intended to provide you with a way to quickly configure DeviceMaster UP for your devices.

3.1. Overview

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

If you have not configured the network information into the DeviceMaster UP during initial setup, you must configure the network information before configuring serial/socket port characteristics. See the *DeviceMaster UP Hardware Installation and Configuration Guide* or the PortVision Plus help system for help configuring the network settings.

1. From PortVision Plus, highlight the DeviceMaster UP that you want to configure and select **Web Manager**.

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

2. Select the appropriate procedure for your environment.

   Serial Device

   a. Select **Serial Device Configuration**.

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

   c. Change the serial port configuration properties (Page 35) as required for your site.

   Ethernet Device

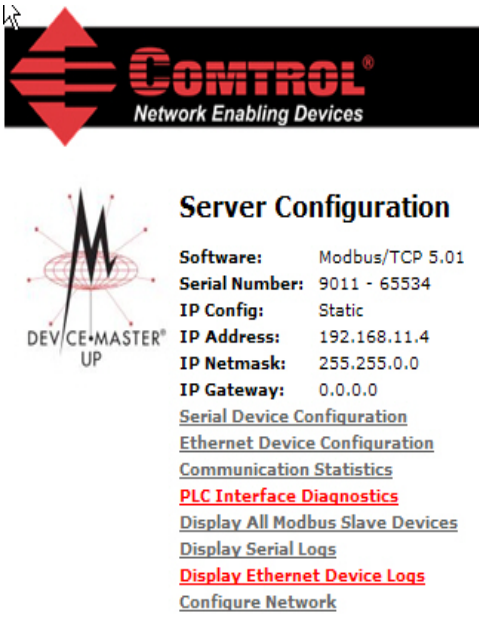
   a. Select **Ethernet Device Configuration**.

   b. Select the appropriate socket to access the *Edit Socket Port Configuration* page for that port.

   c. Change the socket port configuration properties (Page 41) as required for your site.

3. Select **Submit** to commit the changes and repeat for each port.

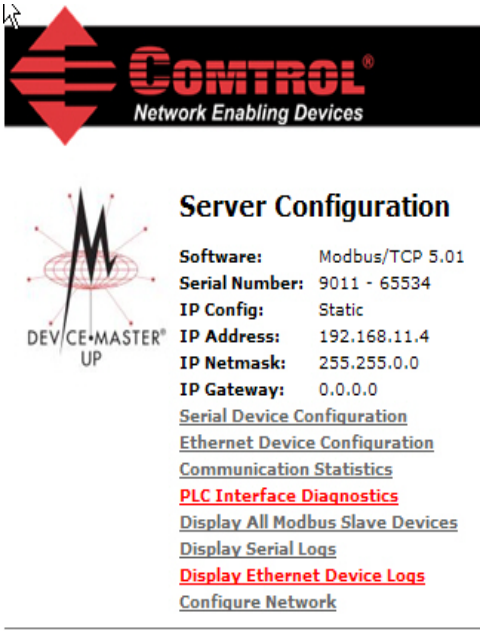
4. Go to *Appendix A. Programming the PLC via Concept* on Page 81 to complete the DeviceMaster UP installation.



3.2. Embedded Web Pages Overview

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

The *Server Configuration* page displays the software version and current network configuration for the DeviceMaster UP. In addition, the *Server Configuration* page links to the configuration, statistics, and diagnostics pages, which are discussed in the table below.



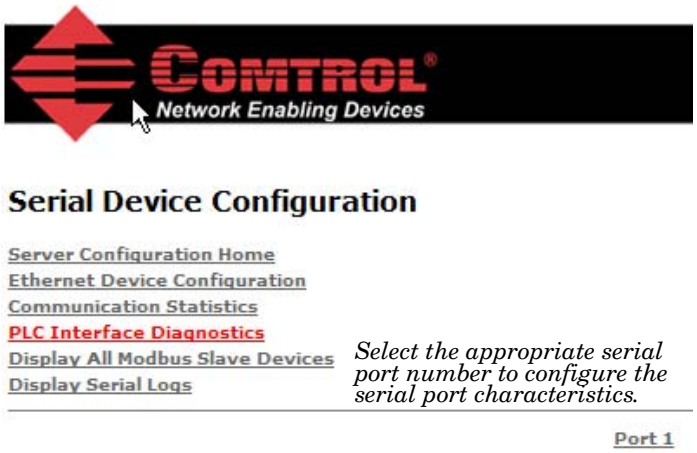
Server Configuration Page	
Software	Modbus/TCP firmware version currently running on the DeviceMaster UP.
Serial Number	DeviceMaster UP serial number.
IP Config	Type of IP configuration currently in use (static or DHCP).
IP Address, **IP Netmask**, and **IP Gateway**	IP address, netmask, and gateway configured in the DeviceMaster UP.
Serial Device Configuration	Opens the *Serial Device Configuration* page (*3.3. Serial Device Configuration Page* on Page 35), which *provides an overview of the serial device interface settings and access to the Edit Serial Port Configuration* page for serial port configuration on the selected port.
Ethernet Device Configuration	Opens the *Ethernet Device Configuration* page (*3.4. Ethernet Device Configuration Page* on Page 41), which *provides an overview of the Ethernet device interface settings and access to the Edit Socket Port Configuration* page for Ethernet device configuration on the selected socket port.
Communication Statistics	Opens the *Communication Statistics* page (*4.1. Serial/ Ethernet Device Communication Statistics* on Page 58), which contains the serial and Ethernet device interface statistics.
PLC Interface Diagnostics	Opens the *PLC Interface Diagnostics* page (*4.5. PLC Interface Diagnostics* on Page 67), which contains the statistics and error reporting for the Modbus/TCP PLC interface.
Display All Modbus Slave Devices	Opens the *Known Modbus Slave Device List* page (Page 63), which contains statistics for the automatically located serial Modbus devices and configured remote Modbus devices.
Display Serial Logs	Opens the *Serial Interface Logs* page (Page 65), which provides access to the receive and transmit serial logs.
Display Ethernet Device Logs	Opens the *Ethernet Device Interface Logs* page (Page 66), which provides access to the receive and transmit logs.
Configure Network	Opens the *Configure Network* page (*3.7. Edit Network Configuration Page* on Page 55), which can be used to modify DeviceMaster UP network configuration after initial configuration using PortVision Plus.
Reboot	Reboots the DeviceMaster UP.

3.3. Serial Device Configuration Page

The *Serial Device Configuration* page provides:

- Links to other pages
- Access to the *Edit Serial Port Configuration* page for each port (**Port #**)
- An overview of serial device configuration settings for each port displays the current settings

To change these settings for a port, select the corresponding **Port #** link, which opens the *Edit Serial Port Configuration* page. See *3.3.1. Edit Serial Port Configuration Page* on Page 35 to locate information for each setting area.



3.3.1. Edit Serial Port Configuration Page

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

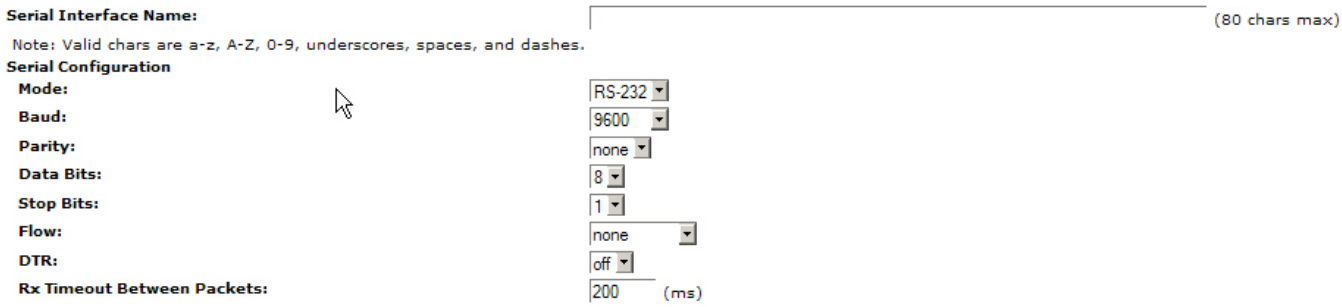
To access the *Edit Serial Port Configuration* page, select the appropriate port number link (for example, **Port 1**) on the *Serial Device Configuration* page.

The next two subsections discuss the *Serial Port* and *Serial Port Packet ID Settings* areas on this page. The remainder of the page is discussed in the following subsections, which are located under the *3.6. Common Configuration Areas (Serial or Ethernet Device)* section:

- *3.6.3. Filtering/Data Extraction Configuration* on Page 49
- *3.6.4. Application TCP Connection Configuration* on Page 52
- *3.6.5. Saving Port Options* on Page 54

3.3.2. Serial Configuration

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

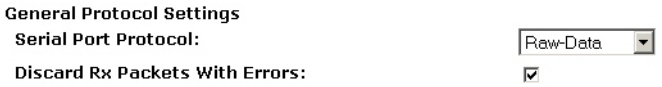


Serial Configuration	
Serial Interface Name	Up to 80 character ASCII string. A user definable string used to describe the serial interface. Valid characters include a-z, A-Z, 0-9, underscores, spaces and dashes. All other characters will be discarded. The default name is blank.
Mode	Select the communications mode for the serial device that you are connecting to the port. The available modes are RS-232, RS-422, and RS-485.
Baud	Select a baud rate from the list. The baud rate that you select determines how fast information is transferred through a port.
Parity	Select a method for error checking. • **None** - When the parity is set to none, there is no parity bit, and DeviceMaster UP does not perform parity checking. • **Odd** - Indicates that the sum of all the 1-bits in the byte plus the parity bit must be odd. When the total is odd, the parity bit is set to zero, when it is even, the parity bit is set to one. • **Even** - When the sum of all the 1-bits is even, the parity bit must be set to zero; when it is odd, the parity bit must be set to one.
Data Bits	Select the number of bits that make up the data. Choose from 5, 6, 7 or 8-bits.
Stop Bits	Select the number of bits to mark the end of data transmission.
Flow	Specifies the ability to start and stop the flow of data without the loss of bytes. Select a method for controlling the flow of data from the following list: • **None** - Indicates flow control is not in affect. • **RTS/CTS** - Request To Send (RTS) tells the receiving device that the sending device has data that is ready to send and Clear To Send (CTS) indicates the device is ready to accept data. • **XON/XOFF** - When selected, applies the standard method of controlling data flow between two modems. • **Half Duplex** - Transmits data in half-duplex mode.
DTR	Select the state of Data Terminal Ready (DTR). • **on** - Enables DTR. • **off** - Disables DTR. • **WhenEnabled** - Select this option when enabling the serial port through the PLC.

Serial Configuration	
Rx Timeout Between Packets	Specifies the following information, once the start of a packet is received: • How long the DeviceMaster UP should wait (in milliseconds) before timing-out, if the **ETX Rx Detect** length is one byte or two bytes and the ETX byte(s) are not received. • The time to wait in milliseconds between serial packets if the **ETX Rx Detect** length is set to **none**.

3.3.3. General Protocol Settings

Use the *General Protocol Settings* area of the *Edit Serial Configuration* page to configure general protocol settings for the serial port.

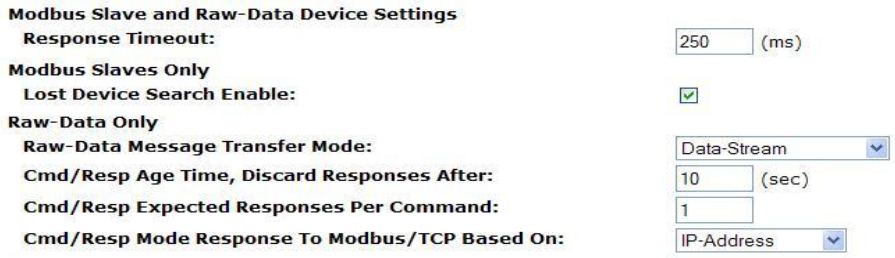


General Protocol Settings	
Serial Port Protocol	This is the serial port protocol. • If you select **Raw-Data**, the port receives raw/ASCII type data. • If you select **Modbus/RTU-to-Slaves**, the serial port operates in Modbus/RTU slave(s) mode. • If you select **Modbus/ASCII-to-Slaves**, the serial port operates in to Modbus/ASCII slave(s) mode. • If you select **Modbus/RTU-to-Master**, the serial port operates in to Modbus/RTU master mode. • If you select **Modbus/ASCII-to-Master,** the serial port operates in to Modbus/ASCII master mode. See *4.2. Known Modbus Slave Device List* on Page 63 for information about the *Display Devices* option.
Discard Rx Pkts With Errors	This check box is selected by default, which means the DeviceMaster UP discards serial packets with errors. Clear the check box when you need to receive a serial packet with errors to troubleshoot an issue.

If you select **Modbus/RTU-to-Slaves** or **Modbus/ASCII-to-Slaves**, a *Display Devices* option appears on the *Serial Device Configuration* page as shown below.

3.3.4. Modbus Slave and Raw-Data Device Settings

Use the *Modbus Slave and Raw-Data Device Settings* area of the *Edit Port Configuration* page to set the response timeout (ms) for Modbus slave and raw-data devices.

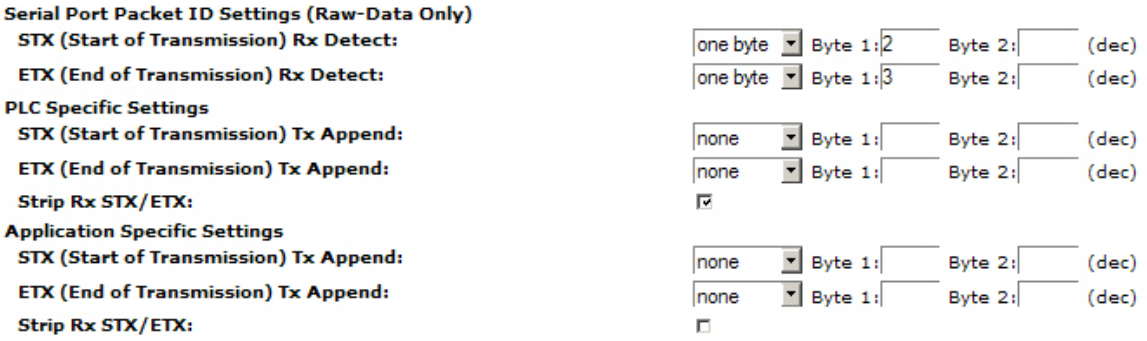


*This graphic shows the **Lost Device Search Enable** option, which is only available on the 2- and 4-port models.*

Modbus Slave and Raw-Data Device Settings	
Response Timeout (ms)	Modbus Slave and Raw-Data Command/Response mode timeout setting. The DeviceMaster UP will wait for the response(s) until this time has elapsed before transmitting another message. The default is 250 ms.
Modbus Slaves Only	
Lost Device Search Enable (2- and 4-port, only)	If this is set, lost devices that were on this Modbus to-slave port will be searched for on other Modbus to-slave ports that also have this option set. For a discussion of this setting, see *2.4.2. Modbus Slave Device Search Methodology* on Page 30.
Raw-Data Only	
Raw-Data Message Transfer Mode	If you select **Data-Stream** (default), the serial port will operate in Data-Stream mode, see *2.2.4.1. Data-Stream Mode* on Page 21. If you select **Command/Response**, the serial port will operate in Command/Response mode, see s*2.2.4.2. Command/Response Mode* on Page 22.
Cmd/Resp Age Time, Discard Responses After (seconds)	The Age Time, or elapsed time, when responses destined for Modbus interface(s) are discarded. This typically occurs when a Modbus controller stops communicating and leaves a response in the response queues. The default is 10 seconds.
Cmd/Resp Expected Responses Per Command	The number of responses expected for each transmitted command. The default is 1.
Cmd/Resp Mode Response To Modbus/TCP Based On	Method or returning responses to Modbus/TCP interfaces. • If you select **IP-Address** (default), all responses will be returned to the IP-Address of the original command was received from. This may the same or different TCP connection. • If you select **TCP-Connection**, all responses will be returned to the same TCP connection the original command was received from. ***Note:*** ***TCP-Connection*** *is typically required when multiple controllers are communicating from the same PLC or computer.*

3.3.5. Serial Port Packet ID Settings (Raw-Data Only)

Use the *Serial Port Packet ID Settings (Raw-Data Only)* area of the *Edit Serial Configuration* page to configure the raw data serial port packet identification (ID) settings for a serial port.



Serial Port Packet ID Settings (Raw-Data Only)	
STX (Start of Transmission) Rx Detect	When enabled, the DeviceMaster UP detects an STX (start of transmission) byte sequence which is configured as **one byte** or **two bytes** when it receives a serial packet. The length indicates the number of STX bytes, valid values for length are: • **none** - Disables this function and the DeviceMaster UP accepts the first byte received after the last ETX byte(s) as the start of the next data packet. • **one byte** - Scans serial data for one STX byte and when the DeviceMaster UP finds an STX byte it collects the data. If the first byte is not the STX byte, it discards the byte. The DeviceMaster UP continues to discard the bytes until it finds an STX byte. • **two bytes** - Scans serial data for two STX bytes and when the DeviceMaster UP finds two STX bytes it collects the data. If the STX bytes cannot be found, it discards the bytes. The DeviceMaster UP continues to discard the bytes until it finds the two STX bytes. **Byte 1** - Specifies the character that represents the first STX byte. The DeviceMaster UP looks for this character in the first STX byte, if the length is **one byte** or **two bytes**. You can specify a value between 0 and 255 in decimal format. **Byte 2** - Specifies the character that represents the second STX byte. The DeviceMaster UP looks for this character in the second STX byte, only if the length is **two bytes**. You can specify a value between 0 and 255 in decimal format.
ETX (End of Transmission) Rx Detect	When enabled, the DeviceMaster UP detects an ETX (end of transmission) byte sequence that is configured as **one byte** or **two bytes** marking the end of the serial packet. The length indicates the number of ETX bytes, valid values for length are: • **none** - Disables this function and the DeviceMaster UP uses the *Rx Timeout Between Packets* to indicate the end of data packet. • **one byte** - Scans serial data for one ETX byte and when the DeviceMaster UP finds the ETX byte, it identifies the data as a serial packet. • **two bytes** - Scans serial data for two ETX bytes and when the DeviceMaster UP finds the ETX bytes, it identifies the data as a serial packet. **Byte 1** - Specifies the character to scan for in the first ETX byte, if the length is **one byte** or **two bytes**. You can specify a value between 0 and 255 in decimal format. **Byte 2** - Specifies the character to scan for in the second ETX byte, if the length is **two bytes**. You can specify a value between 0 and 255 in decimal format.
Discard Rx Pkts with Errors	By default, this box is checked and the DeviceMaster UP discards serial packets with errors. Clear the check box when you need to receive a serial packet with errors to troubleshoot an issue.

Serial Port Packet ID Settings (Raw-Data Only) (Continued)	
PLC Specific Settings and Application Specific Settings	
STX Tx Append	When enabled, the DeviceMaster UP appends an STX (start of transmission) byte sequence which is configured as **one byte** or **two bytes** to the beginning of the serial packet before it is sent. The length indicates the number of STX bytes, values for length are: • **none** - Disables this function. • **one byte** - Inserts one STX byte before the data. • **two bytes** - Inserts two STX bytes before the data. **Byte 1** - Specifies the transmit character associated with the first STX byte, if the length is **one byte** or **two bytes**. You can specify a value between 0 and 255 in decimal format. **Byte 2** - Specifies the transmit character associated with the second STX byte, if the length is **two bytes**. You can specify a value between 0 and 255 in decimal format.
ETX Tx Append	When enabled, the DeviceMaster UP appends an ETX (end of transmission) byte sequence which is configured as **one byte** or **two bytes** to the end of the serial packet before it is sent. The length indicates the number of ETX bytes, valid values for length are: • **none** - Disables this function. • **one byte** - Inserts one ETX byte at the end of the data. • **two bytes** - Inserts two ETX bytes at the end of the data. **Byte 1** - Specifies the transmit character associated with the first ETX byte, if the length is set to **one byte** or **two bytes**. You can specify a value between 0 and 255 in decimal format. **Byte 2** - Specifies the transmit character associated with the second ETX byte, if the length is **two bytes**. You can specify a value between 0 and 255 in decimal format.
Strip Rx STX/ETX	When you select this check box, the DeviceMaster UP strips STX/ETX characters from received serial packets. Clear the check box when you do not want the DeviceMaster UP to strip STX/ETX characters from received serial packets. Serial Packets sent from the PLC or application to the DeviceMaster UP (over Ethernet), and then sent out the serial port, are not checked for STX/ETX. No STX/ETX character stripping occurs in these serial packets, and framing/parity/overrun error checking does not apply.

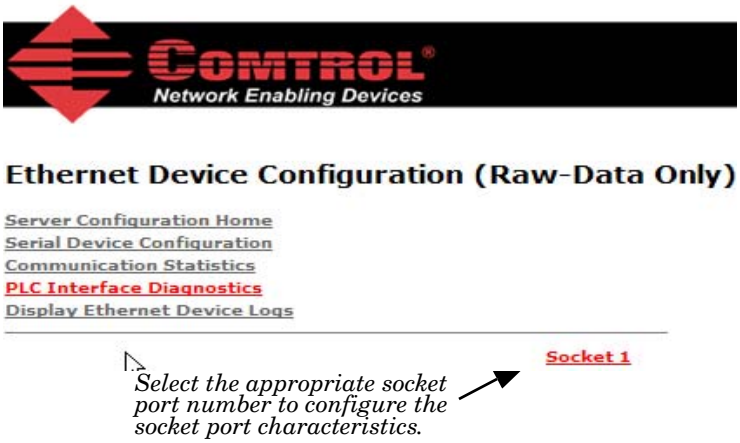
3.4. Ethernet Device Configuration Page

The *Ethernet Device Configuration* page provides:

- Links to other pages
- Access to the *Edit Socket Port Configuration* page for each port (**Socket #**)
- An overview of Ethernet device configuration settings

The overview area for each port displays the current settings.

To change these settings for a port, select the corresponding **Socket #** link, which opens the *Edit Socket Port Configuration* page. See *3.3.1. Edit Serial Port Configuration Page* on Page 35 to locate information for each setting area.



3.5. Edit Socket Port Configuration Page

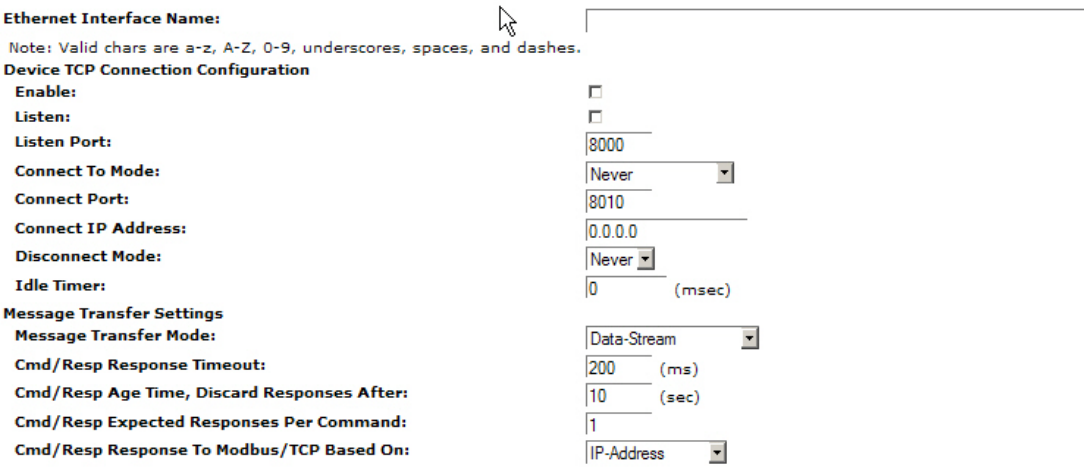
This section discusses the following:

- *3.5.1. Device TCP Connection Configuration*
- *3.5.2. Socket Packet ID Settings* on Page 43

3.5.1. Device TCP Connection Configuration

Access to the *Edit Socket Port Configuration* page is provided by selecting the corresponding socket number on the *Ethernet Device Configuration* page (for example, **Socket 1**).

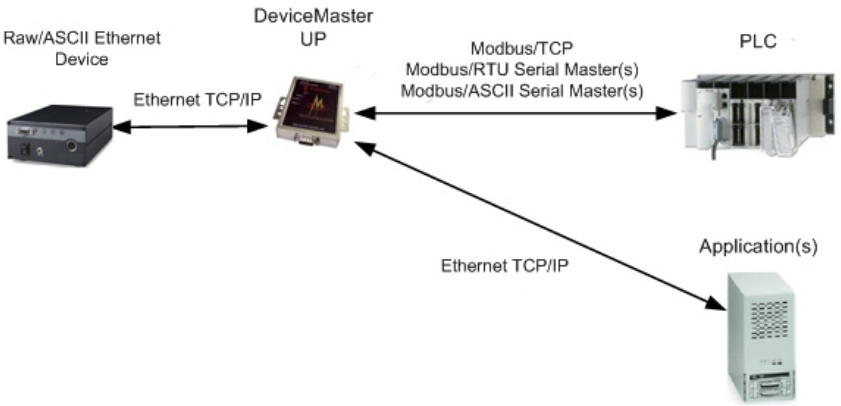
The remainder of this subsection discusses the *Device TCP Connection Configuration* area on this page.



The other areas of this page are discussed in the following subsections, which are located under the *3.6. Common Configuration Areas (Serial or Ethernet Device)* section:

- *3.6.1. Serial Modbus Master and Modbus/TCP Settings* on Page 46
- *3.6.3. Filtering/Data Extraction Configuration* on Page 49
- *3.6.4. Application TCP Connection Configuration* on Page 52
- *3.6.5. Saving Port Options* on Page 54

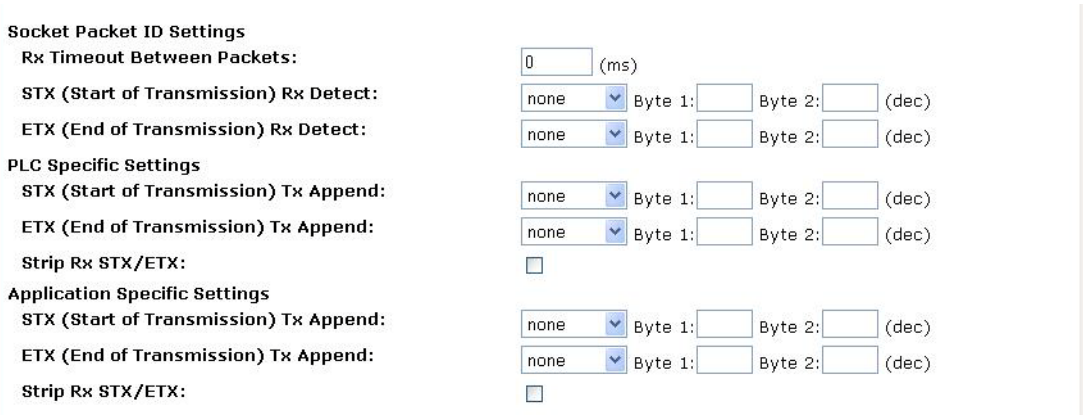
The following table provides information about configuring the *Device TCP Connection Configuration* area.

Device TCP Connection Configuration	
Ethernet Interface Name	A user definable string used to describe the serial interface. Valid characters include a-z, A-Z, 0-9, underscores, spaces and dashes. All other characters will be discarded. Up to 80 character ASCII string. The default is blank.
Enable	This setting enables/disables the *Device Ethernet Device*. Enabling this function allows an Ethernet TCP/IP device to be connected to a PLC and/or application. If both the PLC and application are connected to the device, both can transmit to and receive data from the device socket port. However, the PLC and application cannot communicate directly to each other. 
Listen	Enabling this setting allows the device to connect to the DeviceMaster UP via an Ethernet TCP/IP socket. • **Not selected** - Disables listening; the DeviceMaster UP will not accept connection attempts. • **Selected** - Enables listening; the DeviceMaster UP will accept connection attempts from the specified **Listen Port**.
Listen Port	This is the socket port number on the DeviceMaster UP the application will connect to if the **Device Listen Enable** is selected.
Connect To Mode	This setting specifies if and how the DeviceMaster UP attempts to connect to the device at the specified **Connect IP Address** and **Connect Port**. • **Never** - The DeviceMaster UP will not attempt to connect to the device. • **Connect-Always** - The DeviceMaster UP will attempt to connect to the device until a connection is made. • **Connect-On-Data** - The DeviceMaster UP will not attempt to connect to the device until there is data to send to the device. Once data is received for the device, the DeviceMaster UP will attempt to connect to the device until a connection is made.
Connect Port	The device socket port number the DeviceMaster UP will connect to if the **Device Connect To Mode** is set to either **Connect-Always** or **Connect-On-Data**.
Connect IP Address	The device IP address the DeviceMaster UP will connect to if the **Device Connect To Mode** is set to either **Connect-Always** or **Connect-On-Data**.
Disconnect Mode	This setting specifies if and how the DeviceMaster UP disconnects from the device. • **Never** - The DeviceMaster UP will not disconnect from the device. • **Idle** - The DeviceMaster UP will disconnect when there has been no transmit or received data between the device and PLC/application for a specified Idle Timer period.
Idle Timer	The idle timeout period in milliseconds that is used if the **Device Disconnect Mode** is set to **Idle**.

Device TCP Connection Configuration (Continued)	
Message Transfer Settings	
Raw-Data Message Transfer Mode	If you select **Data-Stream** (default), the serial port will operate in Data-Stream mode, see *2.2.4.1. Data-Stream Mode* on Page 21. If you select **Command/Response**, the serial port will operate in Command/Response mode, see *2.2.4.2. Command/Response Mode* on Page 22.
Cmd/Resp Response Timeout	The **Command/Response** mode response timeout setting. The DeviceMaster UP will wait for the response(s) until this time has elapsed before transmitting another message. The default is 200 msec.
Cmd/Resp Age Time, Discard Responses After (seconds)	The Age Time, or elapsed time, when responses destined for Modbus interface(s) are discarded. This typically occurs when a Modbus controller stops communicating and leaves a response in the response queues. The default is 10 seconds.
Cmd/Resp Expected Responses Per Command	The number of responses expected for each transmitted command. The default is 1.
Cmd/Resp Response To Modbus/TCP Based On	Method for returning responses to Modbus/TCP interfaces. • If you select **IP-Address** (default), all responses will be returned to the IP-Address the original command was received from. This may the same or different TCP connection. • If you select **TCP-Connection**, all responses will be returned to the same TCP connection the original command was received from. ***Note:*** *TCP-Connection is typically required when multiple controllers are communicating from the same PLC or computer.*

3.5.2. Socket Packet ID Settings

This subsection discusses the *Socket Packet ID Settings* area of the *Ethernet Device Configuration* page.



Socket Packet ID Settings	
Rx Timeout Between Packets	Specifies the following information, once the start of a packet is received: • How long the DeviceMaster UP should wait (in milliseconds) before timing-out, if the ETX Rx Detect length is one byte or two bytes and the ETX byte(s) are not received. • The time to wait in milliseconds between Ethernet packets if the ETX Rx Detect length is set to none.

Socket Packet ID Settings	
STX (Start of Transmission) Rx Detect	When enabled, the DeviceMaster UP detects an STX (start of transmission) byte sequence which is configured as **one byte** or **two bytes** when it receives an Ethernet packet. The length indicates the number of STX bytes, valid values for length are: • **none** - Disables this function and the DeviceMaster UP accepts the first byte received after the last ETX byte(s) as the start of the next Ethernet packet. • **one byte** - Scans Ethernet data for one STX byte and when the DeviceMaster UP finds an STX byte it collects the data. If the first byte is not the STX byte, it discards the byte. The DeviceMaster UP continues to discard the bytes until it finds an STX byte. • **two bytes** - Scans Ethernet data for two STX bytes and when the DeviceMaster UP finds two STX bytes it collects the data. If the STX bytes cannot be found, it discards the bytes. The DeviceMaster UP continues to discard the bytes until it finds the two STX bytes. **Byte 1** - Specifies the character that represents the first STX byte. The DeviceMaster UP looks for this character in the first STX byte, if the length is **one byte** or **two bytes**. You can specify a value between 0 and 255 in decimal format. **Byte 2** - Specifies the character that represents the second STX byte. The DeviceMaster UP looks for this character in the second STX byte, only if the length is two bytes. You can specify a value between 0 and 255 in decimal format.
ETX (End of Transmission) Rx Detect	When enabled, the DeviceMaster UP detects an ETX (end of transmission) byte sequence that is configured as one byte or two bytes marking the end of the Ethernet packet. The length indicates the number of ETX bytes, valid values for length are: • **none** - Disables this function and the DeviceMaster UP uses the Rx Timeout Between Packets to indicate the end of data packet. • **one byte** - Scans Ethernet data for one ETX byte and when the DeviceMaster UP finds the ETX byte, it identifies the data as an Ethernet packet. • **two bytes** - Scans Ethernet data for two ETX bytes and when the DeviceMaster UP finds the ETX bytes, it identifies the data as an Ethernet packet. **Byte 1** - Specifies the character to scan for in the first ETX byte, if the length is one byte or two bytes. You can specify a value between 0 and 255 in decimal format. **Byte 2** - Specifies the character to scan for in the second ETX byte, if the length is two bytes. You can specify a value between 0 and 255 in decimal format.
PLC Specific Settings and Application Specific Settings	
STX Tx Append	When enabled, the DeviceMaster UP appends an STX (start of transmission) byte sequence which is configured as one byte or two bytes to the beginning of the Ethernet packet before it is sent. The length indicates the number of STX bytes, values for length are: • **none** - Disables this function. • **one byte** - Inserts one STX byte before the data. • **two bytes** - Inserts two STX bytes before the data. **Byte 1** - Specifies the transmit character associated with the first STX byte, if the length is **one byte** or **two bytes**. You can specify a value between 0 and 255 in decimal format. **Byte 2** - Specifies the transmit character associated with the second STX byte, if the length is **two bytes**. You can specify a value between 0 and 255 in decimal format.

Socket Packet ID Settings	
ETX Tx Append	When enabled, the DeviceMaster UP appends an ETX (end of transmission) byte sequence which is configured as **one byte** or **two bytes** to the end of the Ethernet packet before it is sent. The length indicates the number of ETX bytes, valid values for length are: • **none** - Disables this function. • **one byte** - Inserts one ETX byte at the end of the data. • **two bytes** - Inserts two ETX bytes at the end of the data. **Byte 1** - Specifies the transmit character associated with the first ETX byte, if the length is set to **one byte** or **two bytes**. You can specify a value between 0 and 255 in decimal format. **Byte 2** - Specifies the transmit character associated with the second ETX byte, if the length is **two bytes**. You can specify a value between 0 and 255 in decimal format.
Strip Rx STX/ETX	When you select this check box, the DeviceMaster UP strips STX/ETX characters from received Ethernet packets. Clear the check box when you do not want the DeviceMaster UP to strip STX/ETX characters from received Ethernet packets. Packets sent from the PLC to the DeviceMaster UP (over Ethernet), and then sent out the Ethernet port, are not checked for STX/ETX. No STX/ETX character stripping occurs in these Ethernet packets.

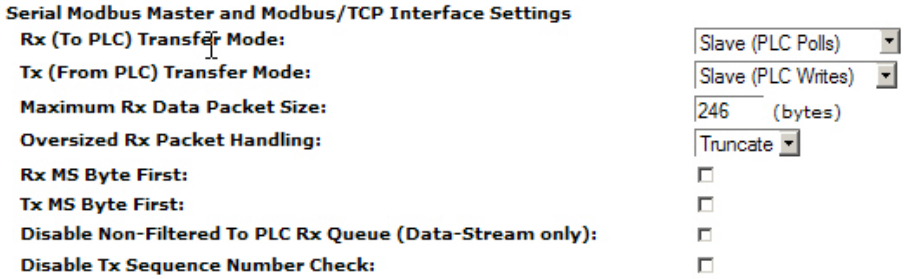
3.6. Common Configuration Areas (Serial or Ethernet Device)

The *Edit Serial Port Configuration* and *Edit Socket Port Configuration* pages have the following areas in common. This section discusses the following:

- *3.6.1. Serial Modbus Master and Modbus/TCP Settings* on Page 46
- *3.6.3. Filtering/Data Extraction Configuration* on Page 49
- *3.6.4. Application TCP Connection Configuration* on Page 52

3.6.1. Serial Modbus Master and Modbus/TCP Settings

Use this area to set up the Modbus/TCP raw-data settings for a serial or socket port.

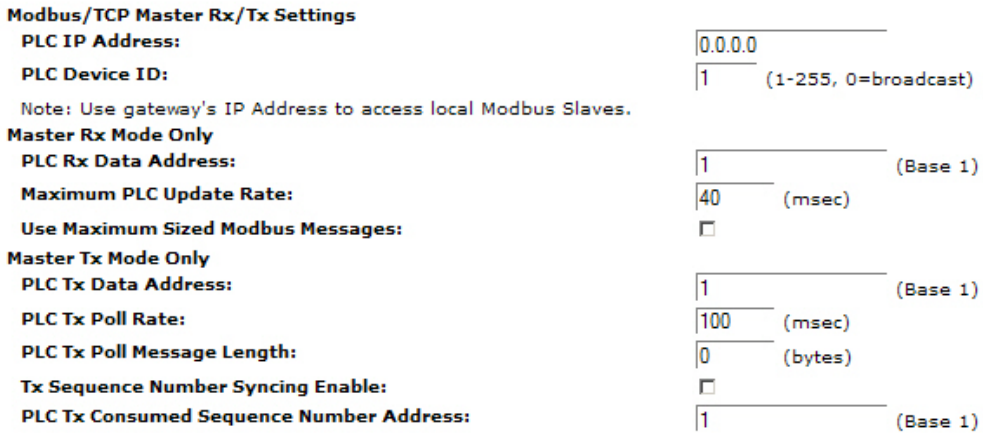


Serial Modbus Master and Modbus/TCP Settings	
Rx (To PLC) Transfer Mode	Specifies the Modbus/TCP raw-data receive data transfer mode to the PLC. There are three possible settings. • **Slave (PLC Polls)** – The PLC will poll the DeviceMaster UP for received data by sending read requests on a continual basis. • **Master (Write to PLC)** – The DeviceMaster UP will write received data into the specified PLC address using write messages. • **Off** – Received data will not be sent to the PLC. The default is Slave Mode. ***Note:*** *Slave (PLC Polls) must be selected to interface to serial Modbus masters.*
Tx (From PLC) Transfer Mode	Specifies the Modbus/TCP raw-data transmit data transfer mode to the PLC. There are three possible settings. • **Slave (PLC Writes)** – The PLC sends write messages to transmit data. A message received with an incremented sequence number indicates new data to send, unless the **Disable Tx Sequence Number Check** option is selected. • **Master (Poll the PLC)** – The DeviceMaster UP sends read messages to poll the PLC at the specified address, rate, and message length. A message received with an incremented sequence number indicates new data to send, unless the **Disable Tx Sequence Number Check** option is selected. • **Off** – Transmit data will not be accepted from the PLC. The default is Slave Mode. ***Note:*** *Slave (PLC Writes) must be selected to interface to serial Modbus masters.*
Maximum Rx Data Packet Size	Specifies the maximum acceptable size of a received serial or Ethernet packet. Default is 246 bytes. Maximums, *Slave Receive* mode = 246, *Serial receive master* mode=1024, *Ethernet receive master* mode = 2048.

Serial Modbus Master and Modbus/TCP Settings (Continued)	
Oversize Rx Packet Handling	Specifies how to process oversized received packets. • **Truncate** – truncate the packet to the *Maximum Rx Data Packet Size*. • **Drop** – drop the packet. Default = Truncate
Rx MS Byte First	When you select this check box, the DeviceMaster UP receives the Most Significant (MS) byte of a WORD first. This check box is clear by default. Clear the check box when you need to receive the Least Significant (LS) byte of a WORD first.
Tx MS Byte First	This check box is clear by default. When you select this check box, DeviceMaster UP transmits the Most Significant (MS) byte of a WORD first. Clear the check box when you need to transmit the Least Significant (LS) byte of a WORD first.
Disable Non-Filtered To PLC Rx Queue	If filtering is disabled, only the last message received is sent to the PLC. This box is clear by default.
Disable Tx Sequence Number Check	Controls the transmit sequence number checking. • If selected, the transmit sequence number checking is disabled. All transmit messages will be transmitted if the sequence number has been incremented or not. • If not selected, the sequence number is checked and the message will only be transmitted if the sequence number has been updated. Default is *Not selected*.

3.6.2. Modbus/TCP Master Rx/Tx Settings

Use this area to set up Modbus/TCP master receive and transmit settings.

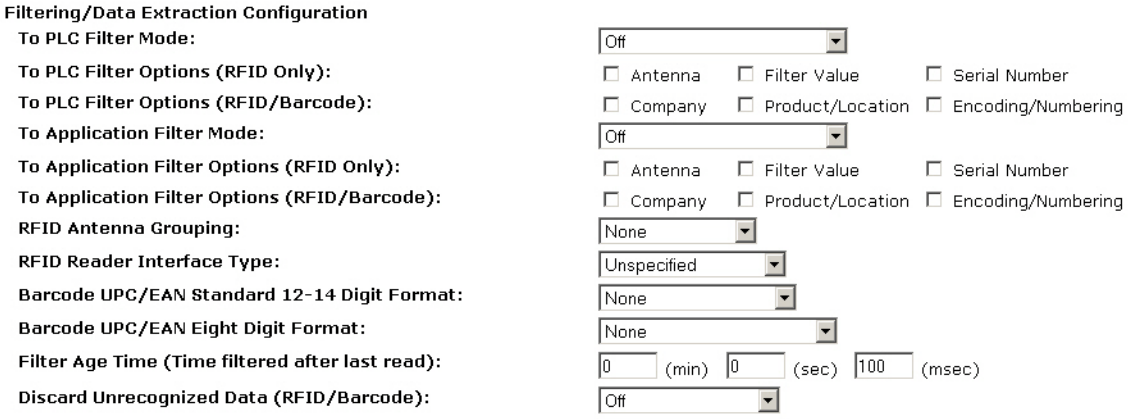


Modbus/TCP Master Rx/Tx Settings	
PLC IP Address	Specifies the PLC IP Address of the PLC for operating in either *Receive* or *Transmit Master* mode.
PLC Device ID	Specifies the PLC Device ID of the PLC for operating in either *Receive* or *Transmit Master* mode. The default is 1.

Modbus/TCP Master Rx/Tx Settings (Continued)	
Master Tx Mode Only	
PLC Rx Data Address	Specifies the PLC address to write the received data at while operating in the *Master Receive Transfer* mode. The data area must be comprised of 16 bit words and large enough to contain the largest possible received message plus two 16 bit words for the sequence and length parameters. The address is base 1. Therefore, if your address scheme starts at zero, you will need to add one to your address.
Maximum PLC Update Rate	The maximum rate (or minimum time interval) in milliseconds that messages are sent to the PLC in the *Master Receive Transfer* mode. This setting configures the DeviceMaster UP to space the messages to the PLC in order to prevent overrunning of data before the PLC can process it.
Use Maximum Sized Modbus Messages	Controls the size of Modbus/TCP messages used to write to the Modbus/TCP slave device. • If selected, maximum sized Modbus messages of 242 bytes per message. • If not selected, Modbus messages of no more than 200 bytes will be used. The default is *Not selected*. ***Note:*** *This option only takes affect when large messages are received. Selecting this option may decrease the number of messages sent to the Modbus/TCP slave, thereby reducing network traffic and latency. However, not all Modbus/TCP slaves support maximum sized Modbus messages. So, this setting must be tested with the Modbus/TCP slave to ensure operability*
PLC Tx Data Address	Specifies the PLC address to request transmit data messages while operating in the *Master Transmit Transfer* mode. The data area must be comprised of 16 bit words and contain a sequence number, length, and data to transmit. An updated sequence number will indicate new data to transmit. Therefore, the length and data must be written to the transmit data area before updating the sequence number. The address is base 1. Therefore, if your address scheme starts at zero, you will need to add one to your address.
PLC Tx Poll Rate	Specifies the rate, in milliseconds, that the DeviceMaster UP will poll the PLC for transmit data. The default is 100ms
PLC TX Poll Message Length	Specifies the length, in bytes, of the transmit message the DeviceMaster UP will request from the PLC. This must be large enough to contain the largest size data packet plus four bytes for the sequence number and length fields. Any extra bytes received from the PLC will be ignored. The default is 250 bytes
Tx Sequence Number Syncing Enable	If the **Tx (From PLC) Transfer Mode** is operating in *Master (Poll the PLC)*; this specifies whether or not to enable synchronizing transmit data messages between the PLC and the DeviceMaster UP. This setting is clear by default.
PLC Tx Consumed Sequence Number Address	Specifies the PLC memory address at which the DeviceMaster UP will write the transmit consumed sequence number. This memory address must point to a 16-bit word and, like the other address definitions, is base 1. When the Tx Produced Sequence Number (at the **PLC Tx Data Address**) and this consumed sequence number are equal, the DeviceMaster UP has transmitted the last message and is ready for the next transmit message.

3.6.3. Filtering/Data Extraction Configuration

Use this area to configure filtering or data extraction settings for a serial or socket port using the appropriate *Edit Port Configuration* page.



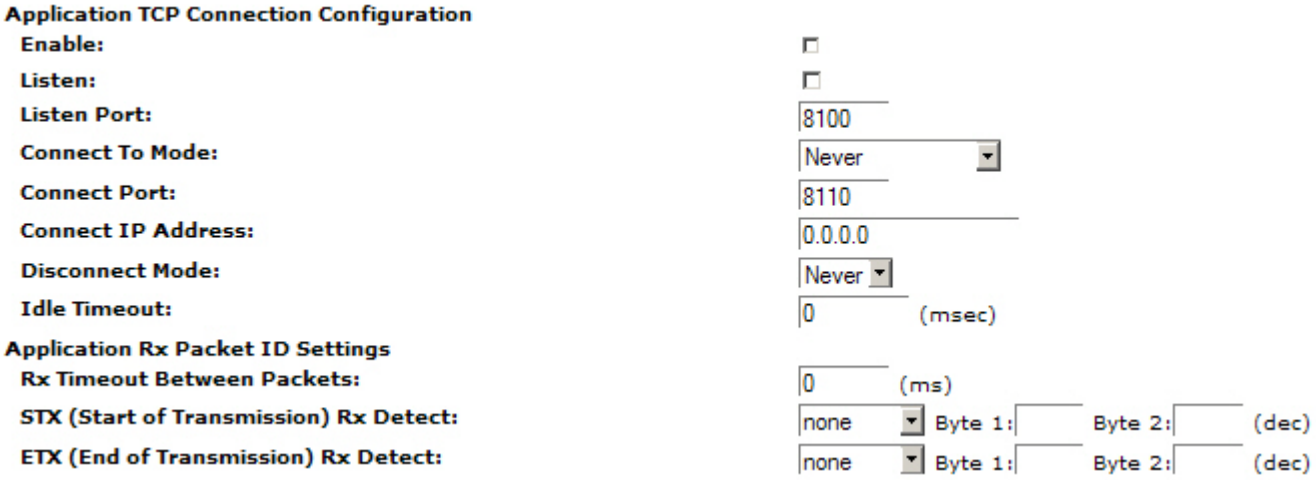
Filtering/Data Extraction Configuration (Serial or Socket Port)	
To PLC Filter Mode	Defines the filter/data extraction mode to be employed on data to be sent to the PLC. • **Off** • **String (128 char max)** - Raw/ASCII data is filtered up to 128 characters (or bytes) in length. • **RFID (EPCglobal formats)** - RFID data in any of the EPCglobal formats is filtered, the associated parameters are extracted, and the extracted data and RFID tag are sent to the PLC in a specified format. • **Barcode (UPC/EAN formats)** - Barcode data in specified UPC/EAN formats is filtered, the associated parameters are extracted, and the extracted data and barcode are sent to the PLC in a specified format.
To PLC Filtering Options (RFID Only)	Defines the RFID filtering criteria to the PLC. If an option is enabled, it is used to decide when an RFID tag can be filtered or sent to the PLC. • **Antenna** - Include the antenna number in the filtering criteria. This is data from the RFID reader and not from the RFID tag itself. • **Filter Value** - Include the filter value in the filtering criteria, which is part of the RFID tag data. • **Serial Number** - Include the serial number in the filtering criteria, which is part of the RFID tag data.
To PLC Filtering Options (RFID/ Barcode)	Defines the RFID filtering criteria and the barcode filtering criteria to the application. If an option is enabled, it is used to decide when a valid RFID tag or barcode can be filtered or sent to the PLC. • **Company** - Include the company code in the filtering criteria, which is part of the RFID tag or barcode data. • **Product/Locatio**n - Include the product/location code in the filtering criteria, which is part of the RFID tag or barcode data. • **Encoding/Numbering** - Include the encoding/numbering code in the filtering criteria, which is part of the RFID tag or barcode data.

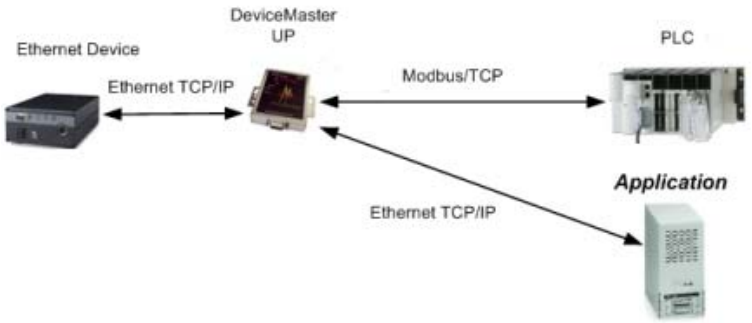
Filtering/Data Extraction Configuration (Serial or Socket Port) (Continued)	
To Application Filter Mode	The filter/data extraction mode to be employed on data to be sent to the application. • **Off** • **String (128 char max)** - Raw/ASCII data is filtered up to 128 characters (or bytes) in length. • **RFID (EPCglobal formats)** - RFID data in any of the EPCglobal formats are filtered, the associated parameters are extracted, and the extracted data and RFID tag are sent to the application in a specified format. • **Barcode (UPC/EAN formats)** - Barcode data in specified UPC/EAN formats is filtered, the associated parameters are extracted, and the extracted data and barcode are sent to the application in a specified format. ***Note:*** *The application filter mode can be set independently of the PLC filtering mode. The only exceptions are:* • *If the PLC filter mode is set to **RFID**, the application filter mode cannot be set to **Barcode**.* • *If the PLC filter mode is set to **Barcode**, the application filter mode cannot be set to **RFID**.*
To Application Filtering Options (RFID Only)	Defines the RFID filtering criteria to the application. If an option is enabled, it is used to decide when an RFID tag can be filtered or sent to the PLC. • **Antenna** - Include the antenna number in the filtering criteria. This is data from the RFID reader and not part of the RFID tag. • **Filter Value** - Include the filter value in the filtering criteria, which is part of the RFID tag data. • **Serial Number** - Include the serial number in the filtering criteria, which is part of the RFID tag data.
To Application Filtering Options (RFID/Barcode)	Defines the barcode filtering criteria and part of the RFID filtering criteria to the application. If an option is enabled, it is used to decide when a valid RFID tag or barcode can be filtered or sent to the application. • **Company** - Include the company code in the filtering criteria, which is part of the RFID tag or barcode data. • **Product/Location** - Include the product/location code in the filtering criteria, which is part of the RFID tag or barcode data. • **Encoding/Numbering** - Include the encoding/numbering code in the filtering criteria, which is part of the RFID tag or barcode data.
RFID Antenna Grouping	This setting is applicable only to RFID filtering and only if the antenna filtering option is enabled. It allows the DeviceMaster UP to filter RFID tags based on antenna groupings. The possible groupings are: SettingGroup 1Group 2Group 3Group N AntennasAntennasAntennasAntennas None1234 Groups of Twos1,23,45,6Etc. Groups of Threes1,2,34,5,67,8,9Etc. Groups of Fours1,2,3,45,6,7,89,10,11,12Etc. First Two Only1,234N+1 First Three Only1,2,345N+2

Filtering/Data Extraction Configuration (Serial or Socket Port) (Continued)	
RFID Reader Interface Type	Defines the expected RFID data format to be used while operating in the RFID filtering mode. Each Reader Interface Type is unique and pertains to the RFID reader manufacturer. If a different RFID reader is to be used and it provides a similar format to any of the RFID readers listed below, it can also be used in the RFID filtering mode. • **Unspecified** - The DeviceMaster UP will assume a HEX ASCII format and will attempt to locate the antenna number. • **Alien (Text Mode)** - Specifies the Alien RFID reader **Text Mode**. • **Alien (Terse Mode)** - Specifies the Alien RFID reader **Terse Mode**. • **Intermec (Hex ASCII Mode)** - Specifies the Intermec reader returning data in the **Hex ASCII Mode**. See the *DeviceMaster UP Filtering and Data Extraction Reference Guide* for further details.
Barcode Formats: UPC/EAN Standard 12-14 Digit UPD/EAN Eight Digit	Defines barcode format to be used for both standard and eight digit UPC labels. The term "standard" refers to UPC-A, EAN-13, JAN, and EAN-14 barcodes which all have ten company/product digits. The standard and eight digit formats are selected independently and each operates independently. It is important to note that the barcode filtering/data extraction will not function if no format is selected. **Format Numbering Company Product Check Digits Digits Digit** ***Standard Formats*** NoneN/AN/AN/AN/A Company-5/ Product-51-3551 Company-6/ Product-41-3641 Company-7/ Product-31-3731 Company-8/ Product-21-3821 Company-9/ Product-11-3911 ***Eight Digit Formats*** EAN-8 Number-2/Product 52051 EAN-8 Number-3/Product 43041 UPC-E1VariableVariable1 See the *DeviceMaster UP Filtering and Data Extraction Reference Guide* for further details.
Filter Age Time (Time filtered after last read)	Defines the time a filter string, RFID tag, or barcode will continue to be filtered after the last time it was received. If an entry is received before the **Filter Age Time** has passed, the entry is filtered and the data will not be sent to the PLC and/or application. However, if the **Filter Age Time** has passed, it will pass filtering and be sent to the PLC and/or application.
Discard Unrecognized Data Mode (RFID/Barcode)	Specifies what to do with unrecognized RFID or barcode data. • **Off** - Sends unrecognized data to the PLC and/or application. • **To-PLC** - Discards unrecognized data to the PLC. Allows sending of unrecognized data to the application. • **To-Application** - Discards unrecognized data to the application. Allows sending of unrecognized data to the PLC. • **To-PLC/Application** - Discards unrecognized data to both the PLC and application.

3.6.4. Application TCP Connection Configuration

Use this area to configure application TCP connection settings for a serial or socket port using the appropriate *Edit Port Configuration* page.



Application TCP Connection Configuration (Serial or Socket Port)	
Enable	Enables/disables the *Application Socket Interface*. Enabling this function allows an application to be connected to the device serial/socket port. If both the PLC and application are connected to the device serial/socket port, both can transmit to and receive data from the serial/socket port. However, the PLC and application cannot communicate directly to each other. 
Listen	Enabling this setting allows the application to connect to the DeviceMaster UP via an Ethernet TCP/IP socket. • **Not selected** - Disables listening and the DeviceMaster UP will not accept connection attempts. • **Selected** - Enables listening and the DeviceMaster UP will accept connection attempts from the specified **Listen Port**.
Listen Port	The socket port number on the DeviceMaster UP the application will connect to if the **Application Listen Enable** is selected.

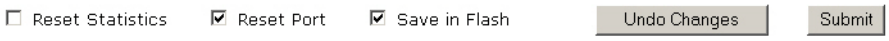
Application TCP Connection Configuration (Serial or Socket Port) (Continued)	
Connect To Mode	Specifies if and how the DeviceMaster UP attempts to connect to the application at the specified **Connect IP Address** and **Connect Port**. • **Never** - The DeviceMaster UP will not attempt to connect to the application. • **Connect-Always** - The DeviceMaster UP will attempt to connect to the application until a connection is made. • **Connect-On-Data** – The DeviceMaster UP will not attempt to connect to the application until there is data to send to the application. Once data is received from the serial/socket device, the DeviceMaster UP will attempt to connect to the application until a connection is made.
Connect Port	The application socket port number the DeviceMaster UP will connect to if the **Application Connect To Mode** is set to either **Connect-Always** or **Connect-On-Data**.
Connect IP Address	The application IP address the DeviceMaster UP will connect to if the **Application Connect To Mode** is set to either **Connect-Always** or **Connect-On-Data**.
Disconnect Mode	Controls if and how the DeviceMaster UP disconnects from an application. • **Never** – The DeviceMaster UP will not disconnect from the application. • **Idle** - The DeviceMaster UP will disconnect when there has been no transmit or received data between the serial/socket device and application for a specified **Idle Timer** period.
Idle Timer	The idle timeout period in milliseconds that is used if the application **Disconnect Mode** is set to **Idle**.
Application Rx Packet ID Settings	
Rx Timeout Between Packets	Specifies the following information, once the start of the packet is received: • How long the DeviceMaster UP should wait (in milliseconds) before timing-out, if the ETX Rx Detect length is one byte or two bytes and the ETX byte(s) are not received. • The time to wait in milliseconds between Ethernet packets if the ETX Rx Detect length is set to none.
STX (Start of Transmission) Rx Detect	When enabled, the DeviceMaster UP detects an STX (start of transmission) byte sequence which is configured as **one byte** or **two bytes** when it receives an Ethernet packet. The length indicates the number of STX bytes, valid values for length are: • **none** - Disables this function and the DeviceMaster UP accepts the first byte received after the last ETX byte(s) as the start of the next Ethernet packet. • **one byte** - Scans Ethernet data for one STX byte and when the DeviceMaster UP finds an STX byte it collects the data. If the first byte is not the STX byte, it discards the byte. The DeviceMaster UP continues to discard the bytes until it finds an STX byte. • **two bytes** - Scans Ethernet data for two STX bytes and when the DeviceMaster UP finds two STX bytes it collects the data. If the STX bytes cannot be found, it discards the bytes. The DeviceMaster UP continues to discard the bytes until it finds the two STX bytes. **Byte 1** - Specifies the character that represents the first STX byte. The DeviceMaster UP looks for this character in the first STX byte, if the length is **one byte** or **two bytes**. You can specify a value between 0 and 255 in decimal format. **Byte 2** - Specifies the character that represents the second STX byte. The DeviceMaster UP looks for this character in the second STX byte, only if the length is two bytes. You can specify a value between 0 and 255 in decimal format.

Application TCP Connection Configuration (Serial or Socket Port) (Continued)	
ETX (End of Transmission) Rx Detect	When enabled, the DeviceMaster UP detects an ETX (end of transmission) byte sequence that is configured as one byte or two bytes marking the end of the Ethernet packet. The length indicates the number of ETX bytes, valid values for length are: • **none** - Disables this function and the DeviceMaster UP uses the Rx Timeout Between Packets to indicate the end of data packet. • **one byte** - Scans Ethernet data for one ETX byte and when the DeviceMaster UP finds the ETX byte, it identifies the data as an Ethernet packet. • **two bytes** - Scans Ethernet data for two ETX bytes and when the DeviceMaster UP finds the ETX bytes, it identifies the data as an Ethernet packet. **Byte 1** - Specifies the character to scan for in the first ETX byte, if the length is one byte or two bytes. You can specify a value between 0 and 255 in decimal format. **Byte 2** - Specifies the character to scan for in the second ETX byte, if the length is two bytes. You can specify a value between 0 and 255 in decimal format.

3.6.5. Saving Port Options

After configuring the serial/socket and protocol characteristics for the port, scroll to the bottom of the *Edit Serial Port Configuration* or *Edit Socket Port Configuration* page to save the changes.

The following options are available.



Saving Port Options	
Reset Statistics	Selecting this check box, clears the statistics counters for this port when you select **Submit**.
Reset Port	When you select this check box, the DeviceMaster UP resets the serial port hardware and statistics counters for this port when you click **Submit**. You must reset the port after modifying the serial port configuration options, including: baud rate, interface mode, parity, data bits, stop bits, flow control, or DTR control. Any socket port connections to a device or application will also be reset.
Save in Flash	When you select this check box, the DeviceMaster UP saves changes to port configuration settings in flash memory. These settings are restored when you reboot the DeviceMaster UP.
Undo Changes	Restores modified port settings to current values.
Submit	Saves changes to port in RAM. If **Save in Flash** was not selected when you clicked **Submit**, the changes will revert to original settings when you reboot the DeviceMaster UP.

3.7. Edit Network Configuration Page

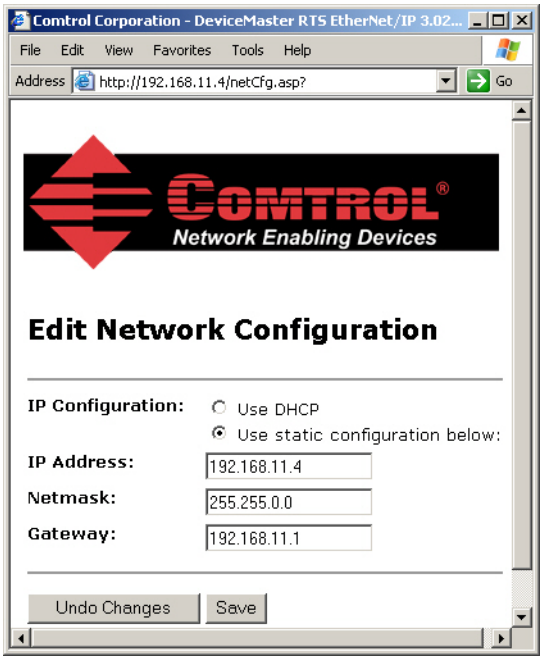
You can use the *Edit Network Configuration* page to change the DeviceMaster UP network configuration after using PortVision Plus for initial network configuration.

Use the following procedure to change the network configuration.

1. Select the IP configuration type (**DHCP** or **Static**).
2. If you select **Static**, 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 UP or **Continue** if you want to reboot later.

Note: *Changed network settings will not take affect until the DeviceMaster UP is rebooted.*



Chapter 4. Embedded Diagnostic and Statistics Pages

You can access the *Serial/Ethernet Device Communication Statistics* and *PLC Interface Diagnostics* web pages from the following pages:

- *Server Configuration* (main)
- *Serial Device Configuration*
- *Ethernet Device Configuration (Raw-Data Only)*
- *Serial/Ethernet Device Communication Statistics and PLC Interface Diagnostics*

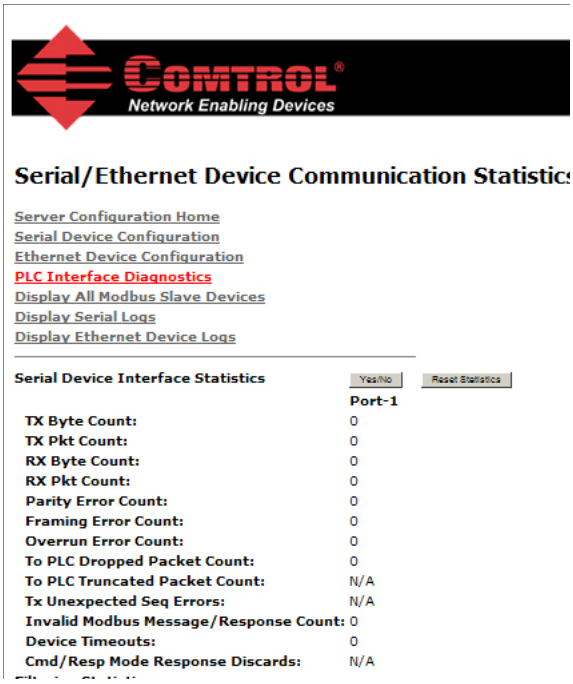
This section discusses the following pages:

- *4.1. Serial/Ethernet Device Communication Statistics* on Page 58
- *4.2. Known Modbus Slave Device List* on Page 63
- *4.3. Serial Interface Logs* on Page 65
- *4.4. Ethernet Device Interface Logs* on Page 66
- *4.5. PLC Interface Diagnostics* on Page 67

4.1. Serial/Ethernet Device Communication Statistics

The top portion of this page provides links to other pages.

Note: *The refresh rate on this page is set to 20 seconds. To stop the page refresh, select* ***Refresh*** *in your browser. To restart refreshing the page display; exit and return to this page.*

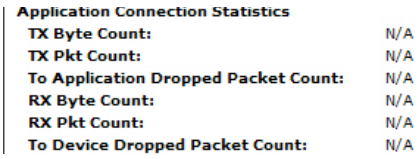


Serial Device Interfaces Statistics (Top)	
Yes/No	Toggles to display or not to display serial statistics.
Reset Statistics	Clears the serial port statistics, which sets the value to 0 for all ports.
TX Byte Count	Displays the number of bytes sent out of the serial port.
TX Pkt Count	Displays the number of serial packets sent out of the serial port.
RX Byte Count	Displays the number of bytes received over the serial port.
RX Pkt Count	Displays the number of packets received over the serial port.
Parity Error Count	Displays the number of received serial packets dropped due to parity errors.
Framing Error Count	Displays the number of received serial packets dropped due to framing errors.
Overrun Error Count	Displays the number of received serial packets dropped due to overrun error incidents.
To PLC Dropped Packet Count	Displays the number of received serial packets intended for the PLC dropped: • No STX byte(s) found • No ETX byte(s) found • Time-outs • Packet to large • Receive buffer queue overflows
To PLC Truncated Packet Count	Displays the number of received packets that were truncated before being sent to the PLC.
Tx Unexpected Seq Errors	Displays the number of *Unexpected Transmit Sequence Number* errors. The DeviceMaster UP increments this number when the DeviceMaster UP receives a transmit message with a sequence number that is not equal to either the previous transmit sequence number or the previous transmit sequence number plus one. (The DeviceMaster UP expects this sequence number to be incremented by one with each new transmit message.)
(*Continued*)	

Serial Device Interfaces Statistics (continued)	
Tx Unexpected Seq Errors	Displays the number of *Unexpected Transmit Sequence Number* errors. The DeviceMaster UP increments this number when the DeviceMaster UP receives a transmit message with a sequence number that is not equal to either the previous transmit sequence number or the previous transmit sequence number plus one. (If the **Disable Tx Sequence Number Check** option is not selected, the DeviceMaster UP expects this sequence number to be incremented by one with each new transmit message.)
Invalid Modbus Message/ Response Count	Displays the number of invalid Modbus To-Master messages or Modbus To-Slaves responses that were received on this port.
Device Timeouts	The number of Command/Response or Modbus To-Slaves messages that timed out waiting for a response.
Cmd/Resp Mode Response Discards	Displays the number of raw-data Command/Response mode responses that were discarded as a result of either: • The connection to the controller was closed. • The response timed out after the Age Time had been reached.

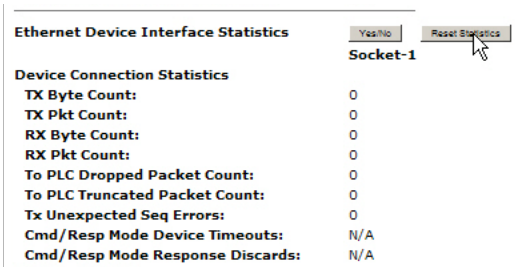
Filtering Statistics (Serial)	
Filtering Statistics Valid Data Items Sent to PLC Interface: N/A Valid Data Items Filtered From PLC: N/A Invalid Data Items Discarded From PLC: N/A Valid Data Items Sent to App Interface: N/A Valid Data Items Filtered From App: N/A Invalid Data Items Discarded From App: N/A RFID Tags With Unknown Formats: N/A	
Valid Data Items Sent To PLC Interface	Displays the number of valid string, RFID, or barcode data sent to the PLC. Applies when filtering is enabled.
Valid Data Items Filtered From PLC	Displays the number of valid string, RFID, or barcode data filtered from (not sent) to the PLC. Applies when filtering is enabled.
Invalid Data Items Discarded From PLC	Displays the number of invalid RFID or barcode data not sent to the PLC. Applies when RFID or barcode filtering is enabled.
Valid Data Items Sent To App Interface	Displays the number of valid string, RFID, or barcode data sent to the application. Applies when filtering is enabled.
Valid Data Items Filtered From App	Displays the number of valid string, RFID, or barcode data filtered from (not sent) to the application. Applies when filtering is enabled.
Invalid Data Items Discarded From Application	Displays the number of invalid RFID or barcode data not sent to the PLC. Applies when RFID or barcode filtering is enabled.
RFID Tags With Unknown Formats	Data received that was in the general form of 64 or 96 bit RFID tags, but was not in any of the EPCglobal formats. Applies only when RFID filtering is enabled.

Application Connection Statistics (Serial)



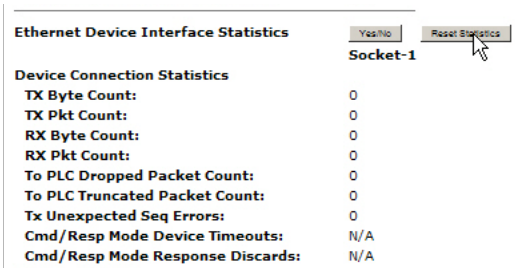
TX Byte Count	Displays the number of bytes sent out the application socket port.
TX Pkt Count	Displays the number of packets sent out the application socket port.
To Application Dropped Packet Count	Displays the number of received serial or Ethernet device packets intended for the application dropped: • No STX byte(s) found • No ETX byte(s) found • Time-outs • Packet to large • Receive buffer queue overflows • Application connection is offline
To PLC Truncated Packet Count	Displays the number of received packets that were truncated before being sent to the PLC.
RX Byte Count	Displays the number of bytes received over the application socket port.
RX Pkt Count	Displays the number of packets received over the application socket port.
To Device Dropped Packet Count	Displays the number of dropped packets that were intended for the device.

Ethernet Device Interface Statistics



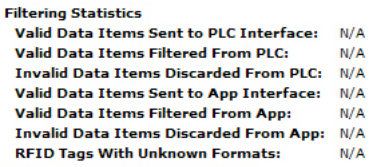
Yes/No	Toggles to display or not to display socket statistics.
Reset Statistics	Clears the socket port statistics, which sets the value to 0 for all ports.
TX Byte Count	Displays the number of bytes sent out the device socket port.
TX Pkt Count	Displays the number of packets sent out the device socket port.
RX Byte Count	Displays the number of bytes received over the device socket port.
RX Pkt Count	Displays the number of packets received over the device socket port.
To PLC Dropped Packet Count	Displays the number of dropped packets that were intended for the PLC.
To PLC Truncated Packet Count	Displays the number of received packets that were truncated before being sent to the PLC.
Tx Unexpected Seq Errors	Same as the serial port statistics (Page 59).

Ethernet Device Interface Statistics



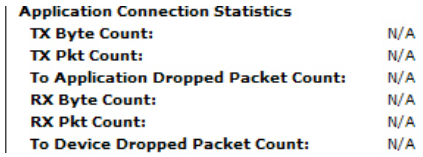
Cmd/Resp Mode Device Timeouts	The number of Command/Response messages that timed out waiting for a response.
Cmd/Resp Mode Response Discards	Displays the number of Command/Response mode responses that were discarded as a result of either: The connection to the controller was closed. The response timed out after the Age Time had been reached.

Filtering Statistics (Ethernet Device Interface Statistics)



Valid Data Items Sent To PLC Interface	Displays the number of valid string, RFID, or barcode data sent to the PLC. Applies when filtering is enabled.
Valid Data Items Filtered From PLC	Displays the number of valid string, RFID, or barcode data filtered from (not sent) to the PLC. Applies when filtering is enabled.
Invalid Data Items Discarded From PLC	Displays the number of invalid RFID or barcode data not sent to the PLC. Applies when RFID or barcode filtering is enabled.
Valid Data Items Sent To App Interface	Displays the number of valid string, RFID, or barcode data sent to the application. Applies when filtering is enabled.
Valid Data Items Filtered From App	Displays the number of valid string, RFID, or barcode data filtered from (not sent) to the application. Applies when filtering is enabled.
Invalid Data Items Discarded From Application	Displays the number of invalid RFID or barcode data not sent to the PLC. Applies when RFID or barcode filtering is enabled.
RFID Tags With Unknown Formats	Data received that was in the general form of 64 or 96 bit RFID tags, but was not in any of the EPCglobal formats. Applies only when RFID filtering is enabled.

Application Connection Statistics (Ethernet Device Interface Statistics)



TX Byte Count	Displays the number of bytes sent out the application socket port.
TX Pkt Count	Displays the number of packets sent out the application socket port.
To Application Dropped Packet Count	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
To PLC Truncated Packet Count	Displays the number of received packets that were truncated before being sent to the PLC.
RX Byte Count	Displays the number of bytes received over the application socket port.
RX Pkt Count	Displays the number of packets received over the application socket port.
To Device Dropped Packet Count	Displays the number of dropped packets that were intended for the device.

4.2. Known Modbus Slave Device List

Access the *Known RTU Device List* page from the *Serial/Ethernet Device Communications Statistics* or *Serial Device Configuration* page.

Use the *Known RTU Device List* page to monitor any Modbus slave devices connected to the DeviceMaster UP. This page is updated every 20 seconds.

Known Modbus Slave Device List

Server Configuration Home
Serial Device Configuration
Communication Statistics
PLC Interface Diagnostics
Display All Modbus Slave Devices
Display Serial Logs

Reset Device Statistics

Port1 Modbus/RTU Slave(s):

DeviceId	Active?	Tx Requests	Rx Responses	Timeouts	Last Rsp Time	Avg Rsp Time	Min Rsp Time	Max Rsp Time	Tx Broadcasts	Invalid Responses
1	No	544837	544836	1	0.15 sec	0.14 sec	0.12 sec	0.57 sec	0	0
2	No	545082	545081	1	0.16 sec	0.14 sec	0.12 sec	0.37 sec	0	0
3	No	545059	545058	1	0.15 sec	0.14 sec	0.12 sec	0.55 sec	0	0
20	Yes	186380	186380	0	0.20 sec	0.20 sec	0.18 sec	0.24 sec	0	0
21	Yes	186414	186414	0	0.21 sec	0.20 sec	0.18 sec	0.26 sec	0	0
22	Yes	183331	183331	0	0.20 sec	0.20 sec	0.17 sec	0.25 sec	0	0
23	Yes	188881	188881	0	0.16 sec	0.16 sec	0.14 sec	0.64 sec	0	0
24	Yes	188882	188882	0	0.18 sec	0.19 sec	0.16 sec	0.67 sec	0	0
26	Yes	188974	188974	0	0.18 sec	0.18 sec	0.15 sec	0.64 sec	0	0
27	Yes	84711	84711	0	0.15 sec	0.14 sec	0.12 sec	0.63 sec	0	0

Port2 Modbus/ASCII Slave(s):

DeviceId	Active?	Tx Requests	Rx Responses	Timeouts	Last Rsp Time	Avg Rsp Time	Min Rsp Time	Max Rsp Time	Tx Broadcasts	Invalid Responses
25	Yes	866719	866719	1	0.07 sec	0.07 sec	0.05 sec	3.29 sec	0	1

Port3 Modbus/RTU Master:
(N/A)

Port4 Modbus/ASCII Master:
(N/A)

Known Modbus Slave Device List	
Device Id	Unit identifier associated with this device.
Active?	Status of device. • **Yes** means that the last request did not time out. • **No** means that the last request timed out.
Tx Requests	Number of Modbus requests transmitted to this device.
Rx Responses	Number of Modbus responses received from this device.
Timeouts	Number of response timeouts associated with this device.
Last Rsp Time	The last response time from Modbus slave device.

Known Modbus Slave Device List (Continued)	
Avg Rsp Time	The average response time from Modbus slave device.
Min Rsp Time	The minimum response time from Modbus slave device.
Max Rsp Time	The maximum response time from Modbus slave device.
Tx Broadcasts	Number of broadcast messages transmitted to this device.
Invalid Responses	Number of invalid responses received from this device.

4.3. Serial Interface Logs

The *Serial Interface Logs* page provides a log of received and transmitted serial port messages. Up to 128 bytes per message and up to 128 messages are logged. It is intended to help with debugging serial connectivity problems, determining the proper start and end of transmission bytes, and diagnosing device problems.

The format is as follows:

```
Pkt(n): ddd:hh:mm:ss.mmm Rx/Tx:<data>
```

Where:

ddd – days since last system restart

hh – hours since last system restart

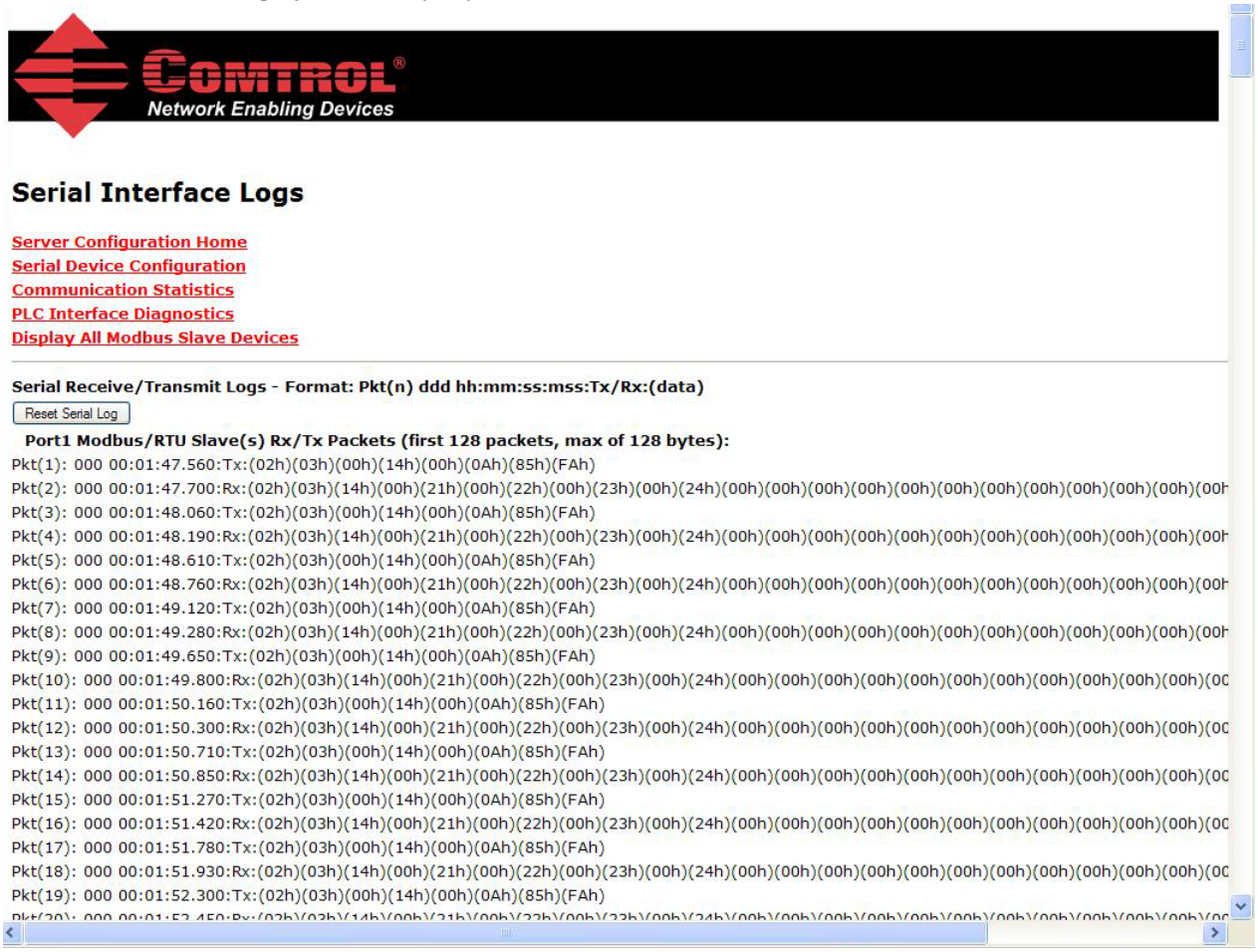
mm – minutes since last system restart

ss – seconds since last system restart

mmm – milliseconds since last system restart

<**data**> - Data packet received.

- For Modbus slave data, all data bytes shown in hex (xxh) format.
- For Raw/ASCII and Modbus/ASCII data
  - ASCII characters displayed as characters
  - Non-ASCII displayed in hex (xxh) format



4.4. Ethernet Device Interface Logs

The *Ethernet Device Interface Logs* page provides a log of received and transmitted Ethernet device messages. Up to 128 bytes per message and up to 128 messages are logged. It is intended to help with debugging Ethernet connectivity problems, determining the proper start and end of transmission bytes, and diagnosing device problems.

The format is as follows:

Pkt(n): ddd:hh:mm:ss.mmm Rx/Tx:<data>

Where:

ddd – days since last system restart

hh – hours since last system restart

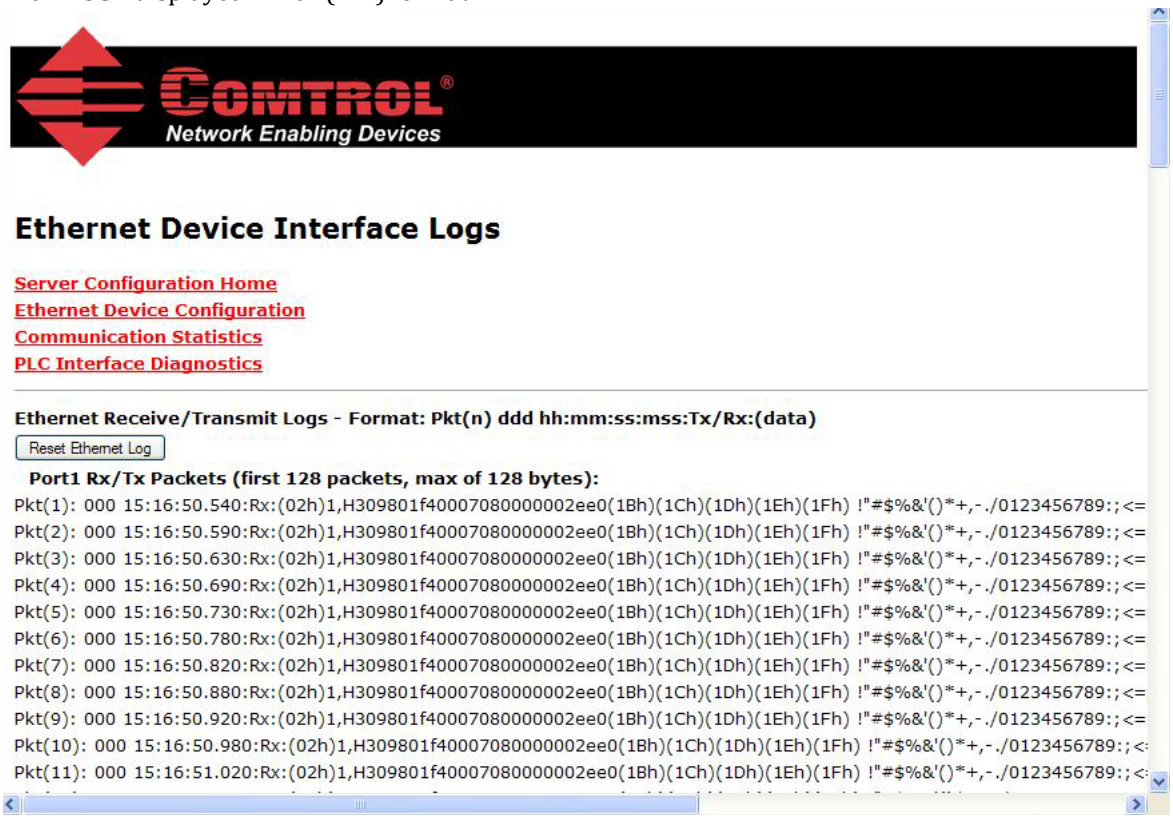
mm – minutes since last system restart

SS – seconds since last system restart

mmm – milliseconds since last system restart

<**data**> - Data packet received.

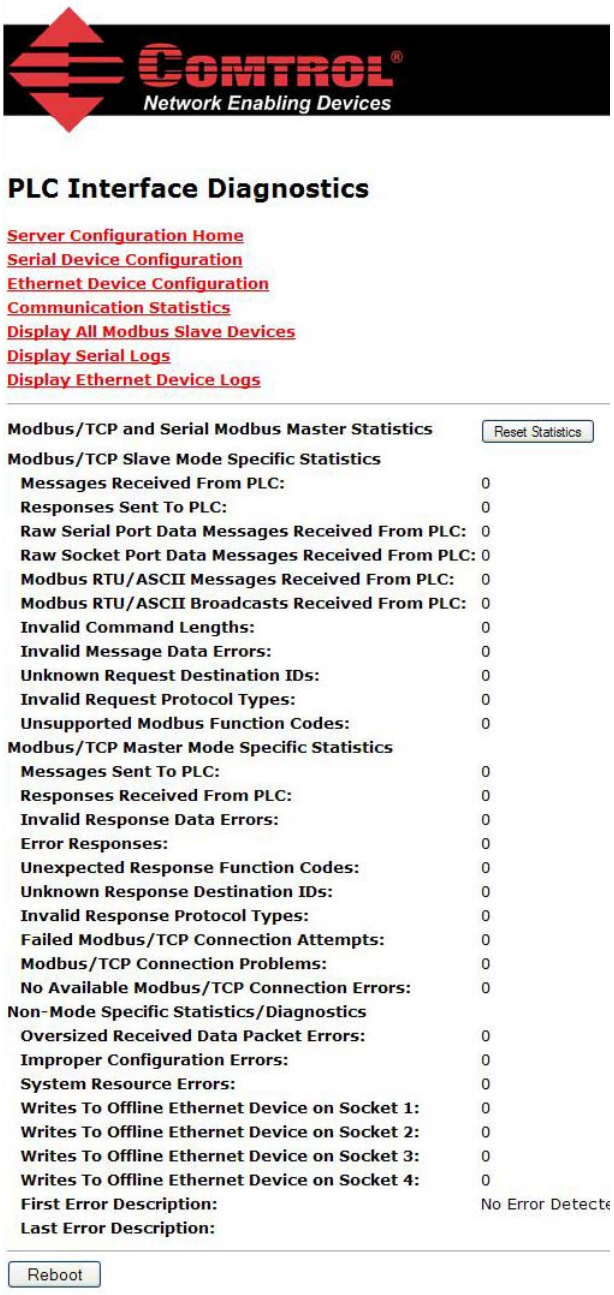
- ASCII characters displayed as characters
- Non-ASCII displayed in hex (xxh) format



4.5. PLC Interface Diagnostics

The *PLC Interface Diagnostics* page provides detailed statistics and error reporting for the Modbus/TCP PLC interface. It is intended to help with debugging PLC programs, monitoring the PLC interface, and solving configuration problems.

Slave Mode Specific Statistics	
Messages Received From PLC	Displays the total number of raw data and Modbus RTU/ASCII messages received from the PLC.
Responses Sent to PLC	Displays the total number of raw data and Modbus RTU/ASCII responses sent to the PLC.
Raw Serial Port Data Messages Received From PLC	Displays the number of serial port raw data messages received.
Raw Socket Port Data Messages Received From PLC	Displays the number of socket port raw data messages received.
Modbus RTU/ ASCII Messages Received From PLC	Displays the number of Modbus RTU/ASCII device specific messages received.
Modbus RTU/ ASCII Broadcasts Received From PLC	Displays the number of Modbus RTU/ASCII broadcast messages received.
Invalid Command Lengths	Displays the number of messages received with invalid command lengths.
Invalid Message Data Errors	Displays the number of messages received with invalid message data errors. These errors occur when the DeviceMaster UP receives a message that cannot be processed due to improper message data.
Unknown Request Destination IDs	Displays the number of messages received with unknown request destination IDs.
Invalid Request Protocol Types	Displays the number of messages received with invalid protocol errors. This occurs when a message is received with a protocol other than the Modbus protocol value of zero.
Unsupported Modbus Function Codes	Displays the number of messages received with unsupported function codes.



Master Mode Specific Statistics	
Messages Sent To PLC	Displays the total number of raw data messages sent to the PLC.
Responses Received From PLC	Displays the total number of raw data responses received from the PLC.
Invalid Response Data Errors	Displays the number of response data errors to polling requests returned from the PLC. Possible causes include: • Incorrectly formed transmit data memory format. (Possibly missing the sequence number and/or length fields.) • More data to transmit indicated via the length field than was returned in the message. • Transmit sequence number error. Sequence number increased by more than one. This could indicate an unsent transmit message. • Insufficient polling length configuration. (DeviceMaster UP polling length is to small.) • Attempting to transmit to large of message for a single Modbus/TCP message. (More than 246 bytes of data.)
Error responses	Displays the number of responses received from the PLC with errors indicated. This occurs when the PLC returns a response with an error indication. This may be caused by such things as: • Invalid PLC address configuration • Improper PLC configuration
Unexpected Response Function Codes	Displays the number of unexpected response function codes from either a *Master Receive* or *Master Transmit* mode message. This occurs when a response was received without an expected function code.
Unknown Response Destination Ids	Displays the number of responses with unknown destination IDs. This occurs when the PLC returns a response with an unknown destination ID.
Invalid Response Protocol Types	Displays the number of responses with invalid protocol errors. This occurs when a response is returned with a protocol other than the Modbus protocol value of zero.
Failed Modbus/TCP Connection Attempts	Displays the number of failed Modbus/TCP connection attempts to the specified PLC IP address.
Modbus/TCP Connection Problems	Displays the number of Modbus/TCP connection attempt problems. This occurs when the device responds and the connection is made, but there are problems setting up the connection options. Possible problems include: • Setting the TCP connection to *TCP_NODELAY*. • Setting the socket connection to *SO_OOBINLINE*. • Setting the socket connection to *SO_KEEPALIVE*
No Available Modbus/TCP Connection Errors	Displays the number of connections aborted when there are no available Modbus/TCP connections. This error occurs when the maximum number of 32 Modbus/TCP connections has been reached and the DeviceMaster UP is attempting to form another Modbus/TCP connection.

Non-Mode Specific Statistics/Diagnostics	
Oversized Received Data Packet Errors	Displays the number of received serial or Ethernet data packets that were larger than the configured maximum receive data packet.
Improper Configuration Errors	Displays the number of improper configuration errors. These errors occur when the DeviceMaster UP receives a message that cannot be performed due to an invalid configuration.
System Resource Errors	Displays the number of system resource errors. These errors indicate a system error on the DeviceMaster UP such as an inoperable serial port or a full transmit queue. These errors typically occur when the PLC(s) are sending data to the DeviceMaster UP faster than the DeviceMaster UP can process it.
Writes to Offline Ethernet Device on Socket N	Displays the number of write attempts by a PLC to the Ethernet device when the device was offline.
First Error Description	Text description of the first error that occurred.
Last Error Description	Text description of the last or most recent error that occurred.

Chapter 5. Alias Device ID Functionality

5.1. Overview

One of the most common challenges people face when setting up Modbus systems are problems caused by the limited device ID range. The *Alias Device ID* functionality has been developed to help solve those problems.

The Modbus specification has the following limitations:

- Requires all devices attached to the gateway to be addressed by a device ID.
- Allows only 256 device IDs with a range of 0 to 255.
- Not all device IDs can be used for addressing devices.
  - Device ID 0 is reserved for broadcast messages
  - 1-247 are for device addressing
  - 248 to 255 are reserved for such things as gateway functions. The Modbus/TCP firmware reserves device ID 254 for Ethernet TCP/IP raw/ASCII devices and 255 for serial raw/ASCII devices.

The following are common problems that can occur as a result of the device ID limitations:

- A gateway must route Modbus messages based on the device ID. Therefore, it cannot route to multiple Modbus devices with the same device ID.
- It not always possible or practical to change the device ID of serial Modbus slave devices.
- It is not always possible or practical to modify the device IDs on existing Modbus master programs. This is often true when adding a SCADA system to an existing PLC controlled system.
- A Modbus master with one connection, such as serial PLC, requires connectivity to multiple Modbus slave devices with the same device ID and one or more of the slave devices are connected remotely to different gateways.

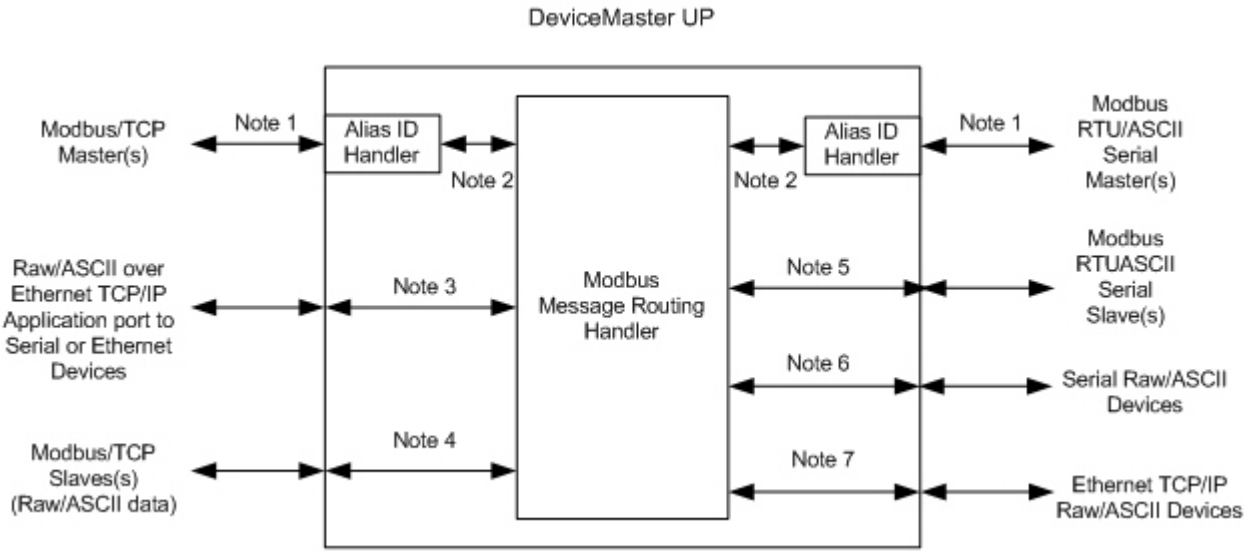
Note: *The Modbus Router firmware has been designed to provide network-wide Modbus connectivity for serial Modbus masters.*

The Alias Modbus Device ID functionality allows modification of device IDs only when messages are received from Modbus masters. When configured, a Modbus message from a master with the specified device ID is converted to the alias device ID, the message is then routed internally using the alias device ID. All responses are returned to the master with the original received message device ID.

The following table demonstrates several device ID aliasing examples:

Received Device ID	Alias Device ID	Routed Message Device ID	Description
1	10	10	Convert messages with received device ID 1 to 10. Route message with device ID 10.
50	5	5	Convert messages with received device ID 50 to 5. Route message with device ID 5.
100	254	254	Convert messages with received device ID 100 to 254. Route message with device ID 254.
10	10	10	Invalid configuration attempt. No change to device ID is performed.

The functionality is described in the following diagram:



Alias Device ID Functionality

Note 1: These are the originally received Modbus messages. All responses will be returned with the original device ID.

Note 2: Modbus messages sent to and responses received from Modbus Message Routing Handler. Depending on the Alias Device ID configuration, these messages may contain the originally received device ID or the alias device ID.

Note 3: The Alias Device ID functionality does not apply to raw/ASCII data received from Ethernet TCP/IP application connections.

Note 4: The Alias Device ID functionality does not apply to Modbus/TCP slaves when a raw/ASCII serial or Ethernet TCP/IP device is set to Master Rx and/or Tx mode. This is when the DeviceMaster UP is writing or reading raw/ASCII data from the Modbus/TCP slave device's memory.

Note 5: Modbus messages received from the Modbus Message Routing Handler and sent to Modbus slaves. Depending on the Alias ID configuration, these messages may contain the originally received device ID from the Modbus master or the alias device ID. All responses contain the device ID as received from the Modbus Message Routing Handler.

Note 6: Serial raw/ASCII devices must be addressed with a device ID of 255. The device ID of 255 may be either in the original message or derived from the alias device ID configuration.

Note 7: Ethernet TCP/IP raw/ASCII devices must be addressed with a device ID of 254. The device ID of 254 may be either in the original message or derived from the alias device ID configuration.

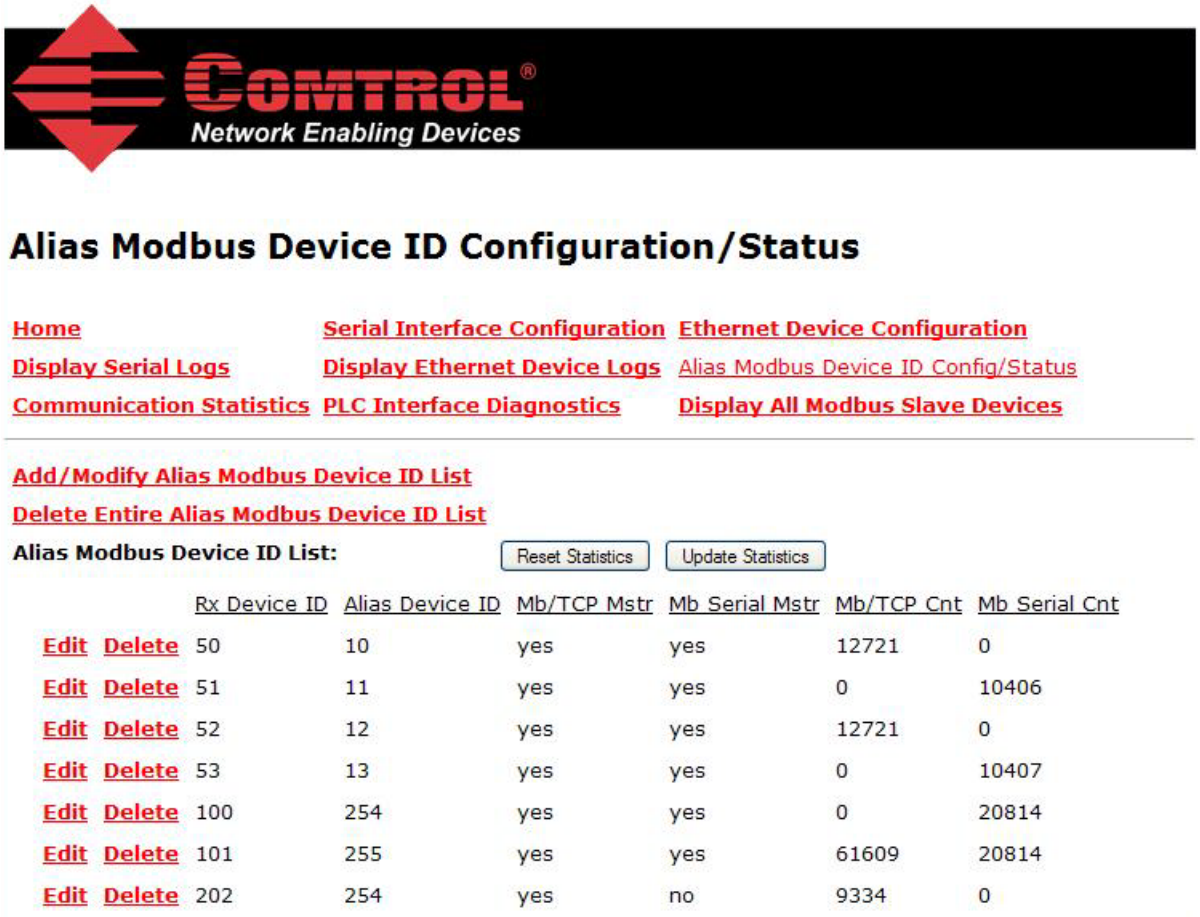
5.2. Alias Modbus Device ID Configuration/Status

This subsection discusses the following:

- *5.2.1. Alias Modbus Device ID Configuration/Status Page* on Page 73
- *5.2.2. Add/Modify Alias Device ID Configuration Page* on Page 74
- *5.2.3. Edit Alias Device ID Configuration Page* on Page 75
- *5.2.4. Delete Alias Device ID Configuration Page* on Page 76
- *5.2.5. Delete All Alias Device ID Configurations Page* on Page 76

5.2.1. Alias Modbus Device ID Configuration/Status Page

Use the *Alias Modbus Device ID Configuration/Status* page to review alias Modbus Device ID configuration and status, and access the configuration page or delete the entire alias Modbus Device ID list.



Where:

Name	Description
Mb/TCP Cnt	The number of Alias conversions performed for this configuration to messages received from Modbus/TCP masters.
Mb Serial Cnt	The number of Alias conversions performed for this configuration to messages received from serial Modbus masters.

5.2.2. Add/Modify Alias Device ID Configuration Page

Use the Add/Modify Alias Device Configuration page to configure or modify existing alias Device IDs.

Where:

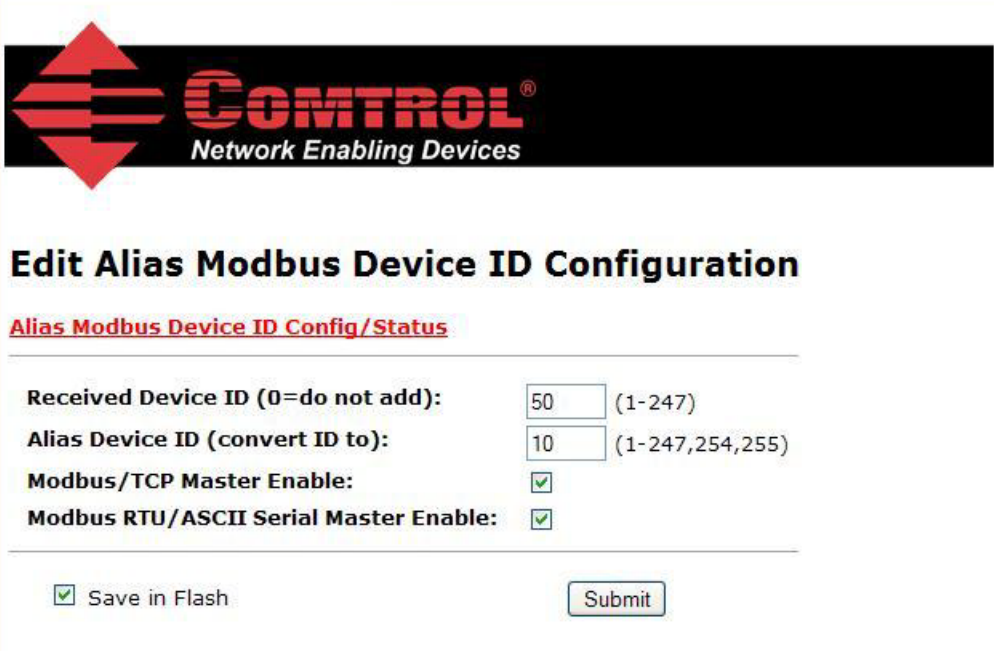
- Up to four alias device IDs may be configured at one time.
- A received or alias device ID of zero indicates no configuration.
- **Save in Flash** must be selected to make the configuration persistent.

The following configuration options apply:

Name	Value(s)	Description
Received Device ID	1-247	The device ID (also often called the unit ID) of the received message from a master.
Alias Device ID	1-247,254,255	The alias device ID to convert the received device ID to.
Modbus/TCP Master Enable	On/Off (Default = Off)	If selected, will apply the alias device ID configuration to messages received from Modbus/TCP masters.
Modbus RTU/ASCII Serial Master Enable	On/Off (Default = Off)	If selected, will apply the alias device ID configuration to messages received from serial Modbus masters.

5.2.3. Edit Alias Device ID Configuration Page

This web page can be used to edit a current alias device ID configuration.

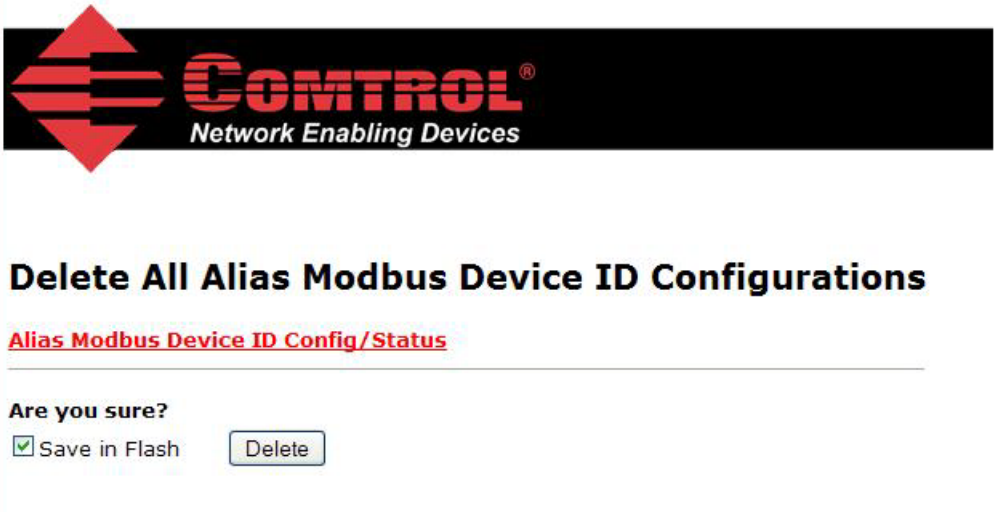


5.2.4. Delete Alias Device ID Configuration Page

This web page allows the deletion of the selected alias device ID configuration.

5.2.5. Delete All Alias Device ID Configurations Page

This web page allows the deletion of all alias device ID configurations.



Chapter 6. Troubleshooting and Technical Support

This section contains troubleshooting information for your DeviceMaster UP. 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.

- *6.1. Troubleshooting Checklist* on Page 77
- *6.2. General Troubleshooting* on Page 78
- *6.3. Daisy-Chaining DeviceMaster UP 2E/4-Port Units* on Page 78

If you cannot diagnose the problem, you can contact *6.4. Technical Support* on Page 79.

6.1. 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 Comtrol Technical Support are eventually traced to cabling or network problems.*

- Isolate the DeviceMaster UP 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 UP are powered up and operating.
- Reset the power on the DeviceMaster UP 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 UP 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 UP.
- Verify that the IP address programmed into the DeviceMaster UP 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 UP.
- If you have a spare DeviceMaster UP, try replacing the device.

6.2. General Troubleshooting

This table illustrates some general troubleshooting tips.

Note: *Make sure that you have reviewed the 6.1. Troubleshooting Checklist on Page 77.*

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. ***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 UP from the network. Connect the device directly to the NIC in the host system (see Page 77).
Cannot ping or connect to the DeviceMaster UP	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 UP 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.

6.3. Daisy-Chaining DeviceMaster UP 2E/4-Port Units

The DeviceMaster UP 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 UP 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 UP 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 UP 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.

6.4. 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.

Comtrol Contact Information	
Downloads	ftp://ftp.comtrol.com/html/up_modbus_tcp_main.htm
Web site	http://www.comtrol.com
Phone	763.494.4100

Appendix A. Programming the PLC via Concept

A.1. Overview

After reviewing *Chapter 2. Programming Interface* on Page 17, you can use information in the *A.2. Concept Program Screens* subsection on Page 81 to help set up your PLC and program the various messages.

A.1.1. What is Concept?

Concept is the PLC programming software package designed to support the Schneider Electric Momentum, Quantum, and Compact PLCs. It does not support any other Schneider Electric PLC or any other manufacturers PLC. However, the example PLC program and installation process may be helpful when working with other PLCs

A.1.2. Requirements

The following requirements must be met to run the example programs.

- The Modbus/TCP firmware must be installed on the DeviceMaster UP and configured as described in the *DeviceMaster UP Hardware Installation and Configuration Guide*.
- The DeviceMaster UP must be installed on the same Ethernet network segment as the PLC.
- Concept must be installed on your computer.

  Note: *The instructions in this guide require that you have some familiarity with this programming application.*
- A loopback plug is required for the first port on the DeviceMaster UP when running an example PLC program. See the *DeviceMaster UP Hardware Installation and Configuration Guide*, for more information if you need to build loopback plugs.

The PLC program examples (*A.2.3.1. LPBKCNCP* on Page 90 and *A.2.3.2. SCANCNCP* on Page 90) are optional. You can copy the PLC program examples from the CD or download the latest program examples from the Internet.

A.1.3. Example Program Considerations (Raw Data)

The example programs are for raw data only.

- While the receive and transmit sequence numbers are cleared on the DeviceMaster UP at the start of the program, the only requirement is that the sequence numbers be in sync between the PLC and DeviceMaster UP.
- The DeviceMaster UP should be reset before starting SCANCNCP example program due to PLC program execution scheduling. If the DeviceMaster UP is not reset, the sequence numbers may be out of sync. This may result in receiving outdated serial data as well as an unexpected transmission of serial data. A Transmit Unexpected Sequence Number error may also occur.

Statistics retrieval is not included in the example programs, but can be easily added by inserting a request statistics message.

A.2. Concept Program Screens

The following screens are intended to aid the PLC programmer in setting up their PLC and programming the various messages.

A.2.1. Processor and Ethernet Setup

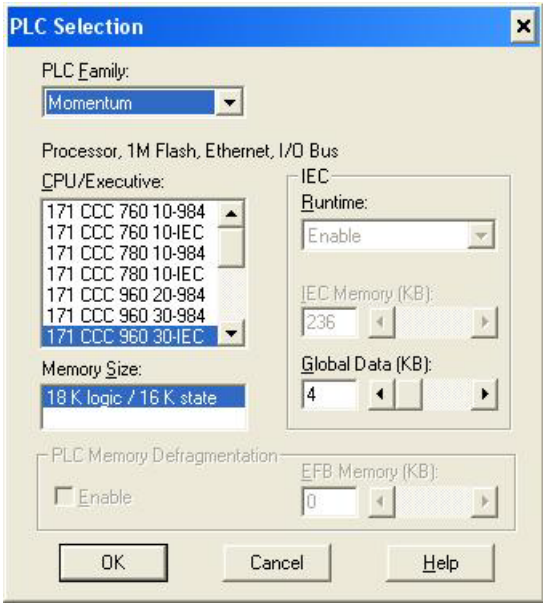
The Processor and Ethernet communications port needs to be set up properly in order for Modbus/TCP to function. It is highly recommended to read and follow your PLC manufacturer's documentation.

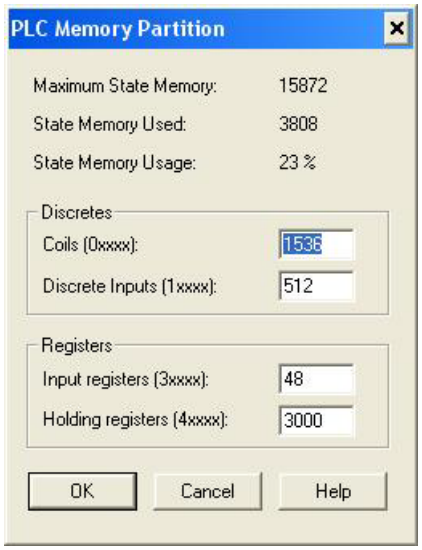
The following documents are recommended for the Concept programming software.

- *Concept User Manual* – 840 USE 503 00
- *Concept IEC Block Library Part: Comm* – 840 USE 504 00

In addition to that information, it is recommended that the following settings be made to allow Modbus/TCP to function properly on a Schneider Electric Momentum, Quantum, or Compact PLC.

1. Verify that the correct processor type has been selected.
2. Verify the proper memory is configured to interface to the DeviceMaster UP. At least 256 registers must be available.





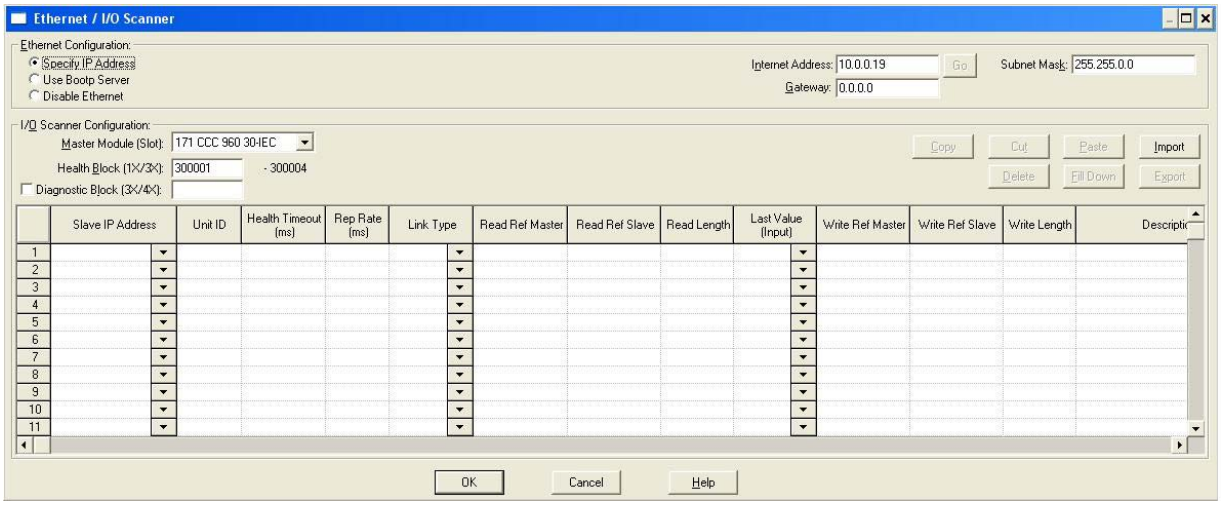
3. Select the proper extension for Modbus/TCP Ethernet. This is generally 1 for Momentum.

4. Set the Network Configuration. The following is recommended for this screen:
   - Select the **Specify IP Address** option.
   - Set the **Internet Address**

     Subnet Mask

     Gateway

     Optionally set a diagnostic block.
   - In this screen, the I/O Scanner can be configured to directly access the serial port communications on the DeviceMaster UP. For more information, see *2.3. I/O Scanner (Raw Data)* on Page 27.



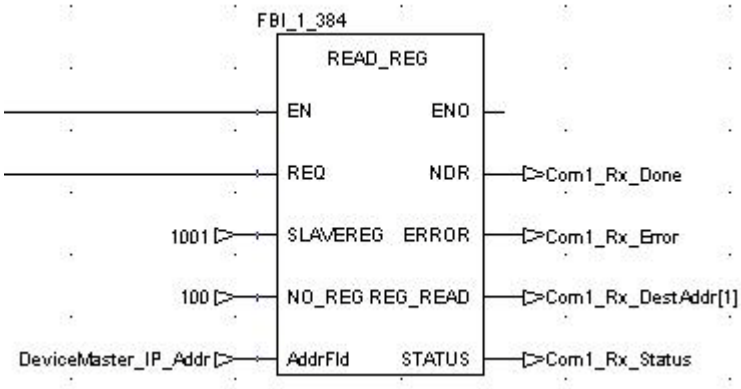
A.2.2. Message Screens

The following message screens are discussed in the upcoming subsections.

- *Read Serial Data via Read Holding Registers Message* on Page 84
- *Transmit Serial Data via Write Multiple Registers Message* on Page 85
- *Set Receive Sequence Number via Write Multiple Registers Message* on Page 86
- *Set Transmit Sequence Number via Write Multiple Registers Message* on Page 87
- *Read Serial Port Statistics via Read Holding Registers Message* on Page 88
- *Modbus/TCP Slot/Index and DeviceMaster UP IP Address Definition* on Page 89

A.2.2.1. Read Serial Data via Read Holding Registers Message

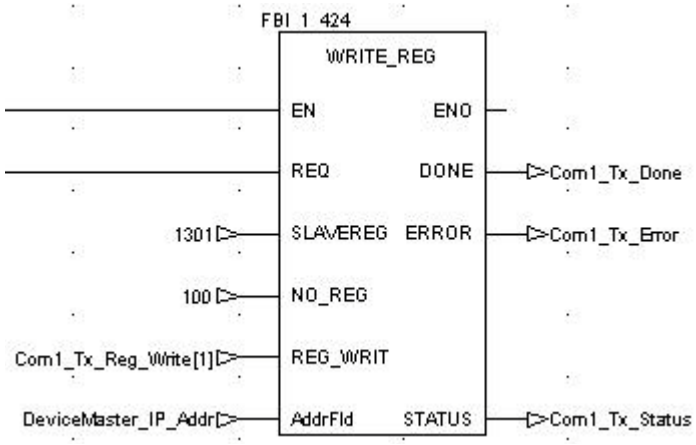
The following screen depicts a *Read Holding Registers* message used to receive raw serial data in ladder logic.



Where:	
SLAVEREG	Refers to the port receive data address (+1 for use with Concept).
NO_REG	The maximum receive message size in 16 bit words. The maximum size of 100 will include two words for the sequence number and length and then up to 196 bytes of serial data.
NDR	The **done** flag.
ERROR	The **error** flag.
REG_READ	The destination address to place the received data.
STATUS	The message status word.
AddrFld	This contains the PLC Modbus/TCP slot/index and IP address of the DeviceMaster UP.

A.2.2.2. Transmit Serial Data via Write Multiple Registers Message

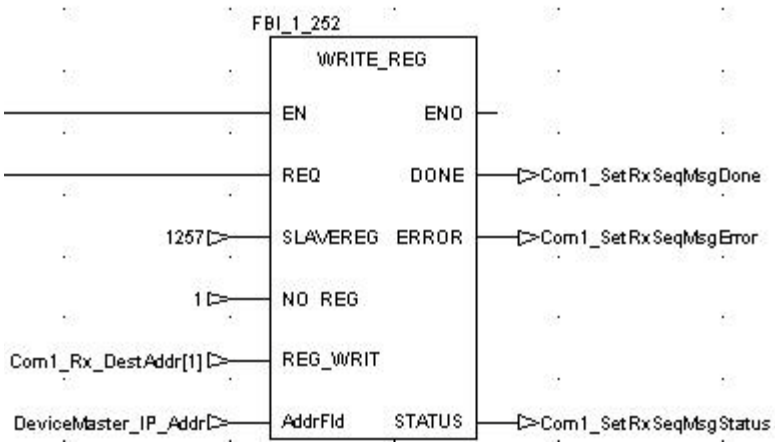
The following screen depicts a *Write Multiple Registers* message used to transmit raw serial data in ladder logic.



Where:	
SLAVEREG	Refers to the port transmit data address (+1 for use with Concept).
NO_REG	The maximum receive message size in 16 bit words. The maximum size of 100 will include two words for the sequence number and length and then up to 196 bytes of serial data.
REG_WRIT	The memory location where the data message to transmit resides on the PLC. (This includes the sequence number, length in bytes, and serial data to transmit.)
DONE	The **done** flag.
ERROR	The **error** flag.
STATUS	The message status word.
AddrFld	This contains the PLC Modbus/TCP slot/index and IP address of the DeviceMaster UP.

A.2.2.3. Set Receive Sequence Number via Write Multiple Registers Message

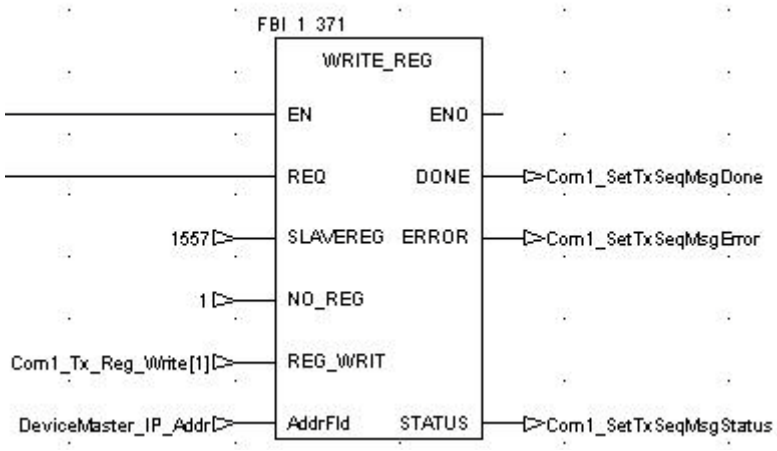
The following screen depicts a *Write Multiple Registers* message used to initialize the receive data sequence number in ladder logic.



***Where*:**	
SLAVEREG	Refers to the port receive sequence number address (+1 for use with Concept).
NO_REG	Set to 1.
REG_WRIT	The memory location where the receive sequence number resides on the PLC.
DONE	The **done** flag.
ERROR	The **error** flag.
STATUS	The message status word.
AddrFld	This contains the PLC Modbus/TCP slot/index and IP address of the DeviceMaster UP.

A.2.2.4. Set Transmit Sequence Number via Write Multiple Registers Message

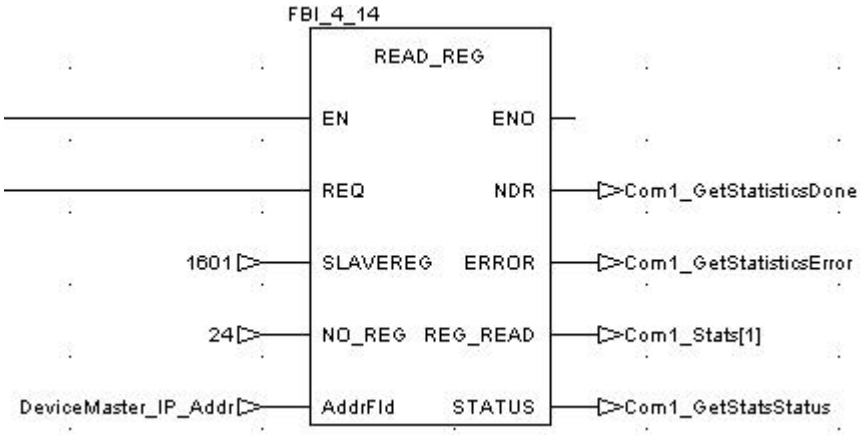
The following screen depicts a *Write Multiple Registers* message used to initialize the transmit data sequence number in ladder logic.



***Where*:**	
SLAVEREG	Refers to the port transmit sequence number address (+1 for use with Concept).
NO_REG	Set to 1.
REG_WRIT	The memory location where the transmit sequence number resides on the PLC.
DONE	The **done** flag.
ERROR	The **error** flag.
STATUS	The message status word.
AddrFld	This contains the PLC Modbus/TCP slot/index and IP address of the DeviceMaster UP.

A.2.2.5. Read Serial Port Statistics via Read Holding Registers Message

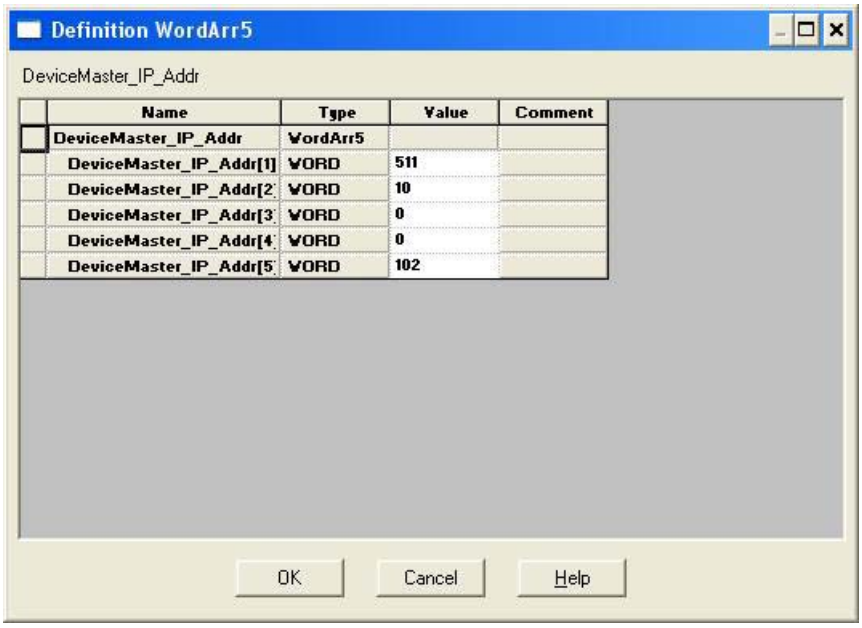
The following screen depicts a *Read Holding Registers* message used to retrieve the serial port statistics in ladder logic.



***Where*:**	
SLAVEREG	Refers to the serial port statistics address on the DeviceMaster UP (+1 for use with Concept).
NO_REG	Set to 24 (size of statistics data in words).
NDR	The done flag.
ERROR	The error flag.
REG_READ	The destination address on the PLC to place the statistics data. (Must be at least 24 words in length.)
STATUS	The message status word.
AddrFld	This contains the PLC Modbus/TCP slot/index and IP address of the DeviceMaster UP.

A.2.2.6. Modbus/TCP Slot/Index and DeviceMaster UP IP Address Definition

The following screen displays the **AddrFld** used in all Concept Modbus/TCP messages.



***Where*:**	The first entry (511 or 1FF hex) denotes the following:
Byte 1	LS byte must be 255 (FF hex) to indicate to the DeviceMaster UP that this is raw/ ASCII serial data. • MS byte: Momentum PLC = 1 • Quantum PLC = Slot number of Ethernet card • Compact PLC = Slot number of Ethernet card
Byte 2	MS byte of IP Address.
Byte 3	Second byte of IP Address.
Byte 4	Third byte of IP Address.
Byte 5	LS byte of IP Address.

A.2.3. Concept Example Programs

Caution

***Disclaimer:* Comtrol supplies example PLC programs for demonstration purposes only. They are intended for the sole purpose of an example loop-back demonstration in a controlled lab environment. They are not intended for use in a production environment and may not function correctly on all PLCs. Comtrol does not warrant these example programs or any part thereof. The user assumes all liability for any modification to and use of a modified example program.**

The following PLC programs have been included with the released binary. They are designed to interface to a DeviceMaster UP 1-port or port one of a DeviceMaster UP 2- or 4-port. Additional programming will be required to interface to additional ports on a DeviceMaster UP 2- or 4-port.

Note: *The following example programs were developed with version 2.6 of Concept and a Schneider Electric Momentum PLC.*

A.2.3.1. LPBKCNCP

This example program demonstrates a loop-back PLC program using *Read Holding Registers* and *Write Multiple Registers* messages in a standard "polling" type receive method. This program initializes receive and transmit data sequence numbers at startup and then loops raw data via a loop-back plug on the serial port. The data is transmitted and received and the sequence numbers are incremented.

The following files apply:

- **LPBKCNCP.SEC** – Ladder logic and variable definitions in Concept programming format.
- **LPBKCNCP.CCF** – Configuration file.
- **LPBKEXPL.RDF** – Reference data template file.

See *Appendix B. LPBKCNCP Example Program* on Page 99 for more information.

A.2.3.2. SCANCNCP

This example program demonstrates a loop-back PLC program using the I/O Scanner utility on the Concept PLC programming software. This program uses the I/O Scanner to send and receive serial data at a predefined rate. The data is transmitted and received and the sequence numbers are incremented.

The following files apply:

- **SCANCNCP.SEC** – Ladder logic and variable definitions in Concept programming format
- **SCANCNCP.CCF** – Configuration file
- **LPBKEXPL.RDF** – Reference data template file.

Note: *The DeviceMaster UP should be reset before starting a PLC program using the I/O Scanner due to PLC program execution scheduling. If the DeviceMaster UP is not reset, the sequence numbers may be out of sync. This may result in receiving outdated raw serial data as well as an unexpected transmission of serial data. A Transmit Unexpected Sequence Number error may also occur.*

See *Appendix C. SCANCNCP Example Program* on Page 105 for more information.

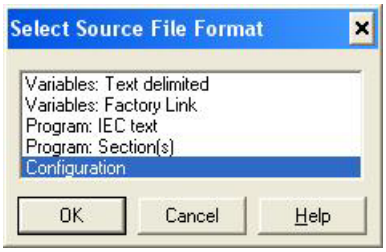
A.2.3.3. Setting up and Running the Concept Example Programs

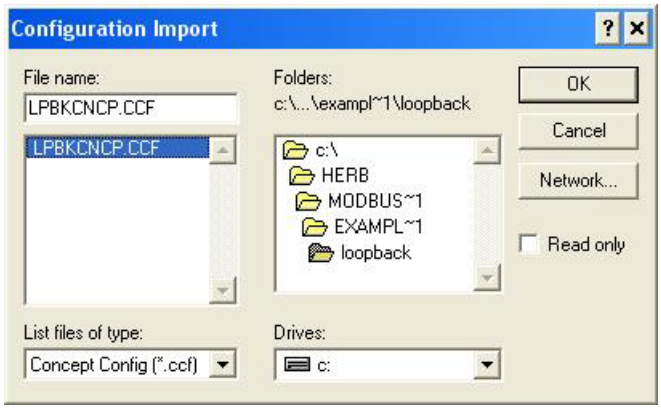
The following steps are required to set up and run the Concept example programs.

If you have not done so, configure the DeviceMaster UP by setting the IP address, mask, and gateway for your network and load the Modbus/TCP binary file.

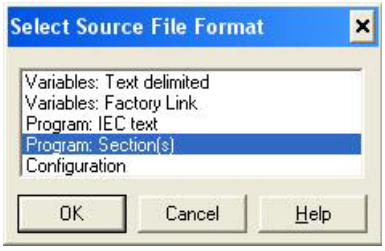
1. Attach the loop-back plug on the serial port.
   a. Attach the PLC and DeviceMaster UP to the same Ethernet subnet.
2. Open the *Serial Configuration* web page by entering the DeviceMaster UP IP address in your web browser to configure the DeviceMaster UP serial port.
3. Set the following *Serial Port Settings*:
   - **Mode**: RS-232
   - **Baud**: 57600
   - **Parity**: none
   - **Data Bits**: 8
   - **Stop Bits**: 1
   - **Flow Control**: none
   - **DTR**: off
   - **Rx Timeout Between Packets**: 200
4. Set the following *General Protocol Settings*:
   - **Serial Port Protocol**: Raw-Data
   - **Discard Rx Packets With Errors**: Enable

5. Set the following *Raw-Data Settings*:
   - **STX Rx Detect**: one byte, Byte 1 = 2
   - **ETX Rx Detect**: one byte, Byte 1 = 3
   - **STX Tx Append**: one byte, Byte 1 = 2
   - **ETX Tx Append**: one byte, Byte 1 = 3
   - **Strip Rx Stx/ETX**: Enable
   - **Rx MS Byte First**: *Optional*
   - **Tx MS Byte First**: *Optional*
6. Select **Enable** for the **Reset Port** option.
7. Select the **Save in Flash** option.
8. Select **Submit**.
9. Choose either the loop-back (**LPBKCNCP**) or I/O Scanner (**SCANCNCP**) example programs.
10. Load the **.SEC**, **.CCF,** and **.RDF** files into the desired directory.
11. Open Concept.
12. Open a new project by selecting **File->New Project**.
    a. In the *Create a new project database* pane, enter a file name under *File name*.
    b. Navigate to the directory where you wish to place the new project.
    c. Select **OK**.
13. Import the configuration by selecting **File->Import...**
    a. In the *Select Source File Format* pane, select **Configuration.**
    b. Select **OK**.
    c. In the *Configuration Import* pane, select the **.CCF** file.
    d. Select **OK**.
    e. Select **OK** in the *Configuration Import completed* pane.

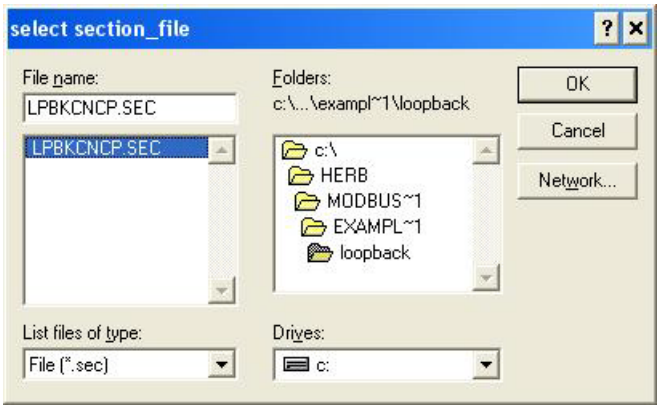




14. Import the program sections by selecting **File->Import...**
    a. In the *Select Source File Format* pane, select **Program Section(s).**
    b. Select **OK**.
    c. In the *select section_file* pane, select the **.SEC** file.

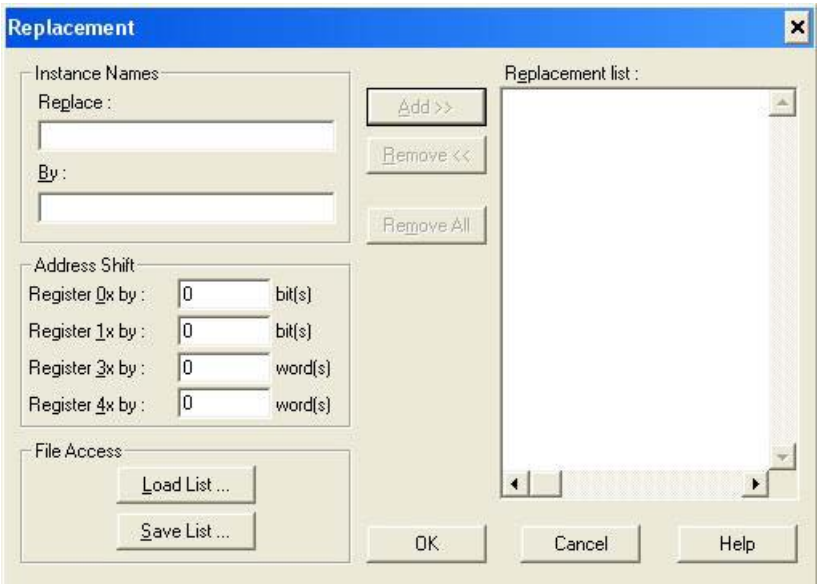


d. Select **OK**.



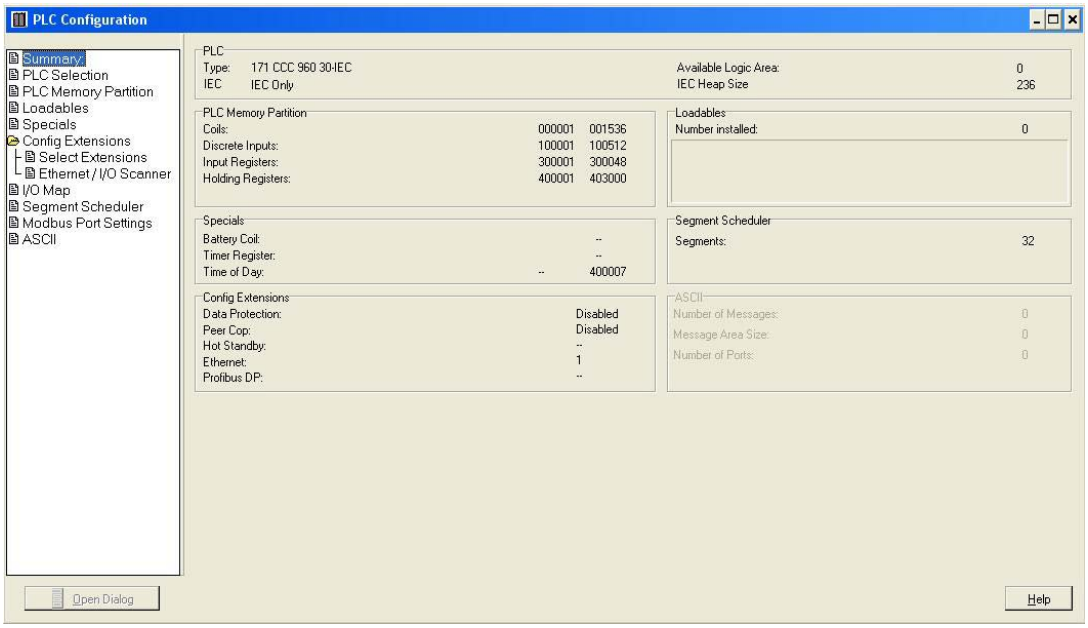
e. Select **YES** when asked whether to *save project file first*.

f. In the *Replacement* pane, select **OK**.



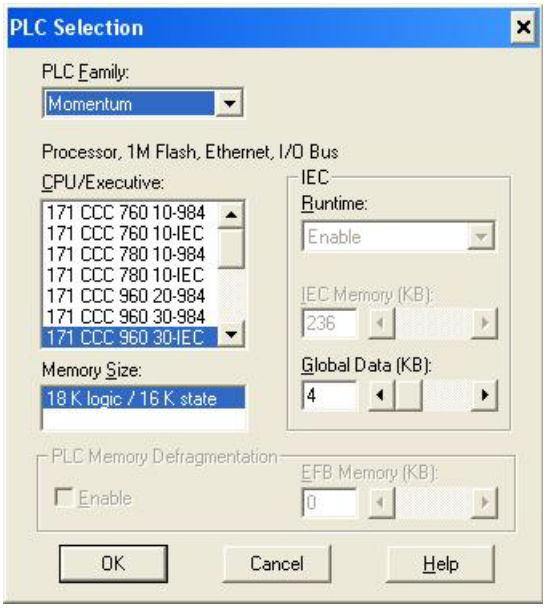
g. Select **OK** in the status window.

15. Modify the configuration for your PLC.
    a. Select **Project->Configurator**.

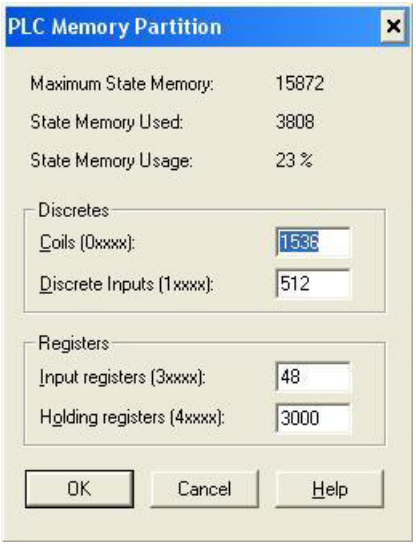


In the *PLC Selection* pane:

b. Select your **PLC Family**.
c. Select your **CPU/Executive**.
d. Select your **Memory Size**.
e. Select **OK**.

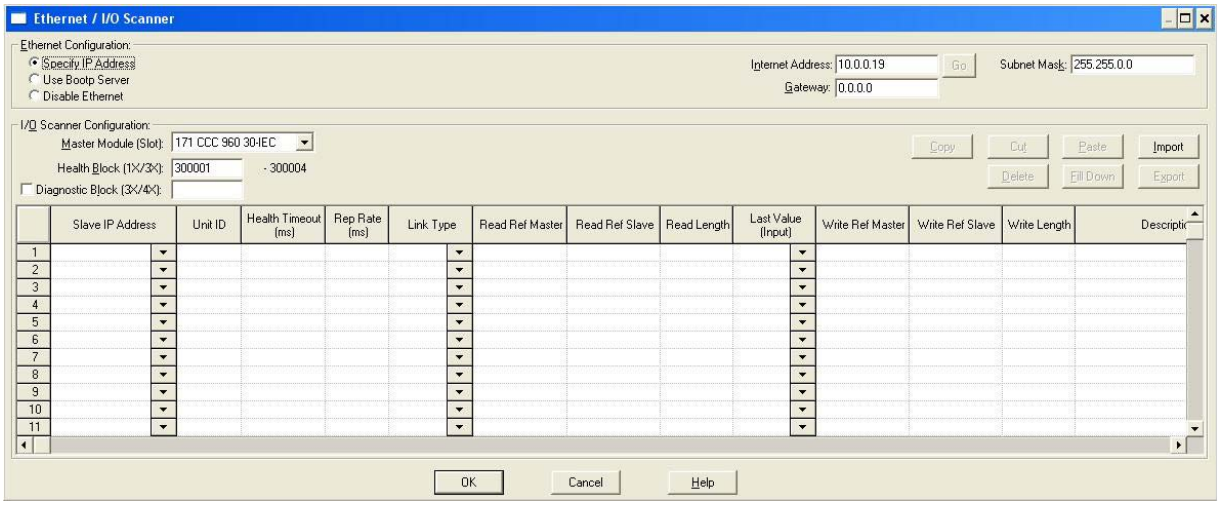


16. In the *PLC Memory Partition* pane:



   a. Verify that your PLC has sufficient memory. The example program requires 3000 holding registers.
   b. Select **OK**.

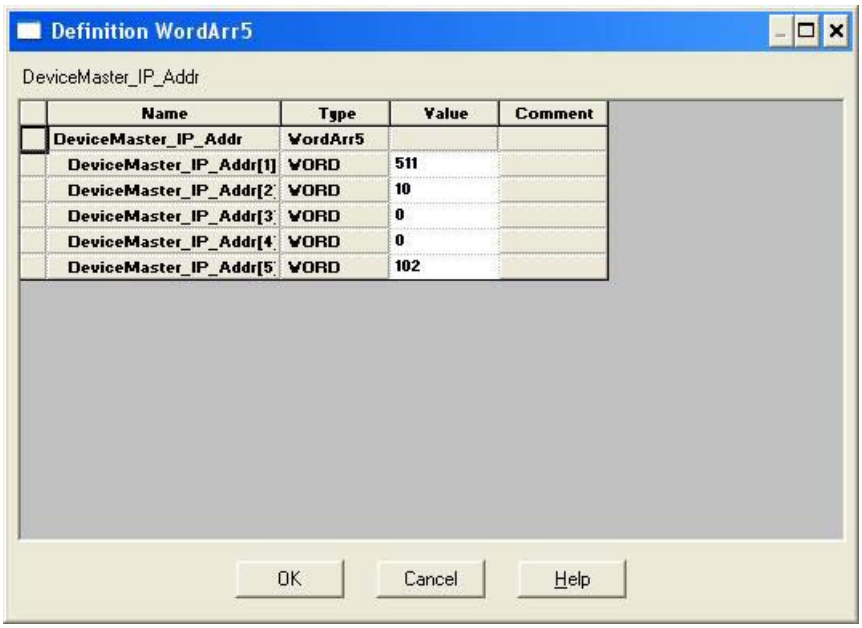
17. In the *Config Extensions->Ethernet/ IO Scanner* pane:
   a. Select your method of specifying an IP address.
      If you are specifying an IP Address:
      - Enter the PLC IP Address under **Internet Address**.
      - Enter the Gateway address.
      - Enter the Subnet Mask.
   b. Verify the **Master Module** is configured properly.
   c. Select **OK**.



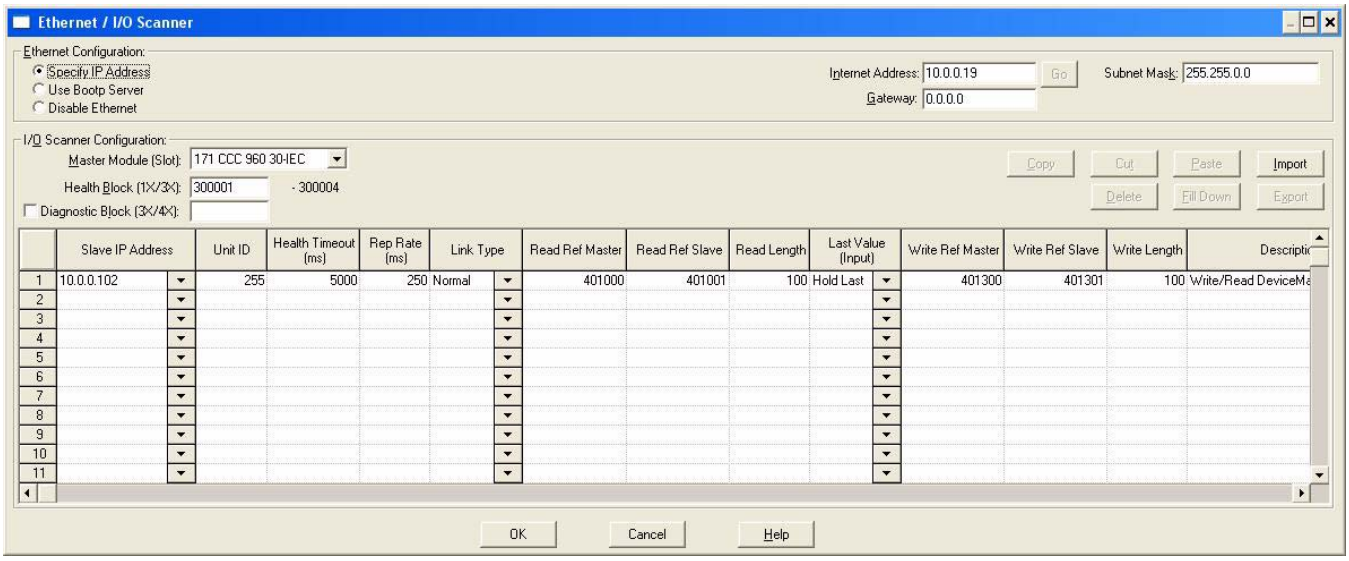
18. Modify the DeviceMaster UP IP Address in the *DeviceMaster_IP_Addr* array:
    a. Select **Project->Variable Declarations...**
    b. Click on the variable **DeviceMaster_IP_Addr->Set...**, which is the slot/device index number.

       For the Schneider Electric Momentum PLC, the first word does not change.

       For the Schneider Electric Quantum or Compact PLC, set the upper eight bits to the slot number of the Ethernet module.
    c. WORDS two through five contain the IP address in the standard 255.255.255.255 mask format.

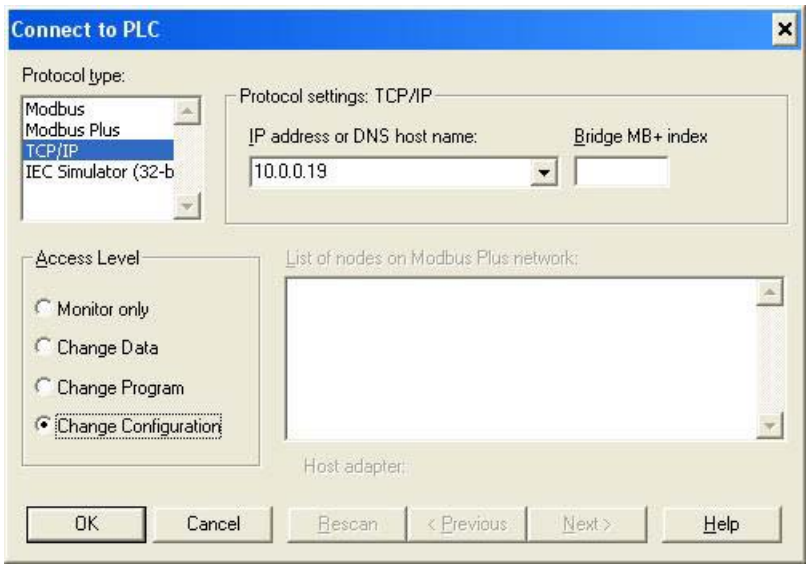


19. *For the SCANCNCP example program only,* modify the DeviceMaster UP IP address in the I/O scanner window. Change the default 10.0.0.102 IP address to that of your DeviceMaster UP.

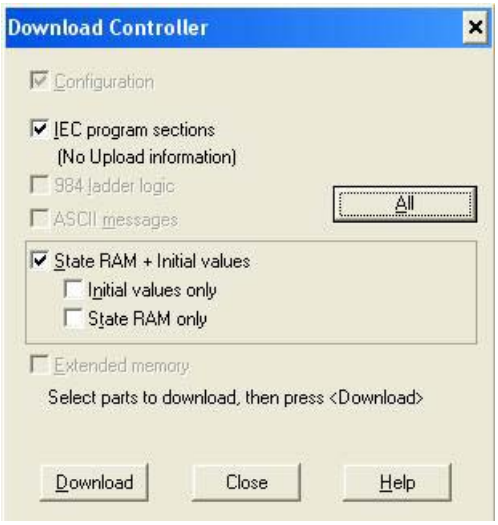


20. Analyze the program by selecting **Project->Analyze Program**.
    a. There should be no errors.
    b. There may be a few "Multi-assignment" warnings, but these can be ignored.

21. Connect to the PLC by selecting **Online->Connect….**
    Configure the *Connect to PLC* pane.
    a. Under *Protocol Type*, select **TCP/IP**.
    b. Under *IP Address or DNS host name*, enter the PLC IP address.
    c. Select **Change Configuration**.
    d. Select **OK**.



22. Download the PLC program by selecting **Online->Download...**
    In the *Download Controller* pane:
    a. Select **ALL**.
    b. Select **Download...**



23. Set up the program monitoring:
    a. Select the **Open Reference Data Template** button on the menu.

       In the *Open Reference Data Template* pane:

       - Locate and select the **LPBKEXPL.RDF** template file supplied with the example files.
       - Select **OK**.

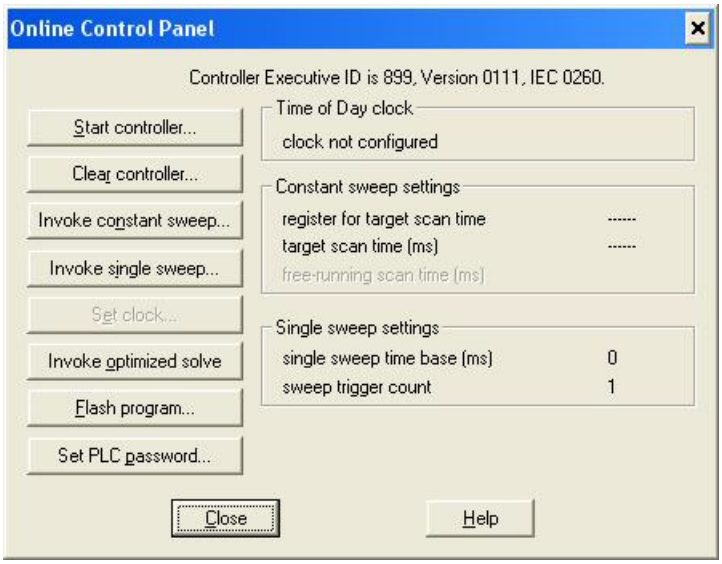
       Note: *There may be warnings when loading the reference template file and running the **SCANCNCP** example program. These warnings can be ignored.*

RDE Template (LPBKEXPL.RDF) - Animation OFF

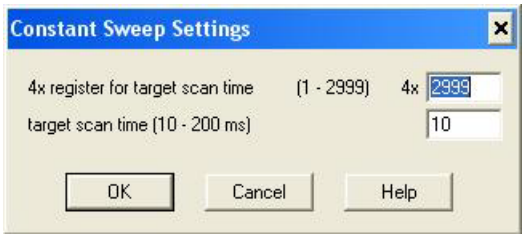
	Variable Name	Data Type	Address	Value	Set Value	Format	Disable	Cyclic Set	Animation Status
1	Com1_ReadData	BOOL		Off		Bool			
2	Com1_TransmitData	BOOL		Off		Bool			
3	Com1_RxProdSeqNum	UINT		0		Uns Dec			
4	Com1_RxConSeqNum	UINT		0		Uns Dec			
5	Com1_TxProdSeqNum	UDINT		0		Uns Dec			
6	Com1_RxTotalMsgs	UDINT		0		Uns Dec			
7	Com1_Rx_Error_Cnt	DINT		0		Dec [32			
8	Com1_Tx_Error_Cnt	DINT		0		Dec [32			
9	SystemTimerIn	TIME		1s		Time			
10	SystemTimerOut	TIME		0s		Time			
11									
12	Com1_Rx_DestAddr[1]	WORD	401000	0		Hex			
13			401001	0		Dec			
14			401002	0		Dec			
15			401003	0		Dec			
16			401004	0		Dec			
17			401005	0		Dec			
18			401006	0		Dec			
19			401007	0		Dec			
20			401008	0		Dec			
21			401009	0		Dec			
22			401010	0		Dec			
23			401011	0		Dec			
24			401012	0		Dec			
25			401013	0		Dec			
26			401014	0		Dec			
27			401015	0		Dec			

    b. Animate the reference template by clicking once on the template and then selecting **Online->Animate**.
    c. Click once on the **RxTxDataSection** section. Select **Online->Animate Booleans**.

24. Start the processor by selecting **Online->Online Control Panel...**



In the *Online Control Panel*, select **Invoke Constant Sweep...**

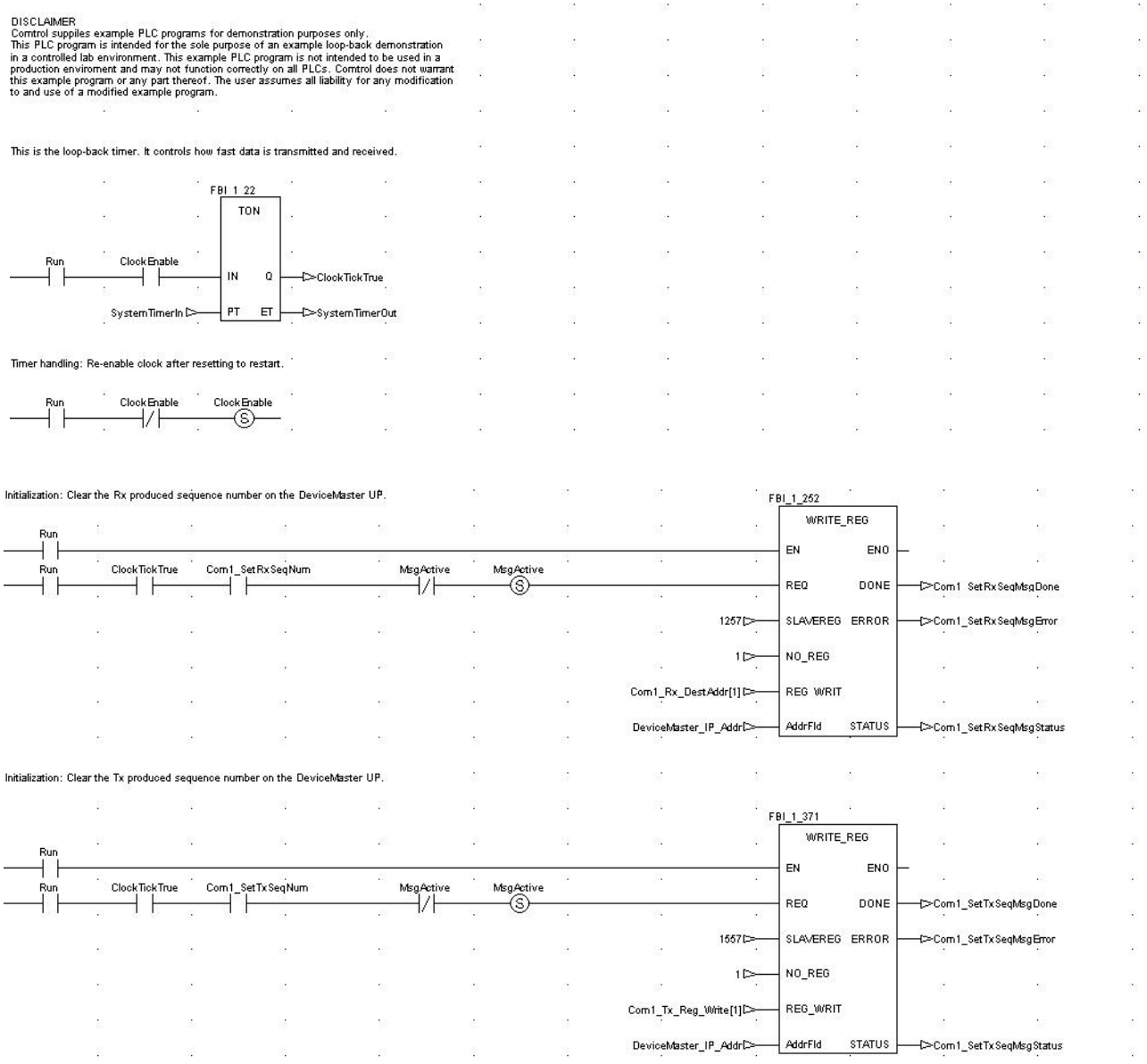


a. Verify the 4x register is 2999. (This is an unused register.)
b. Verify the sweep rate is 10 msec.
c. Select **OK**.
d. Select **Start Controller**.
e. Select **Close**.

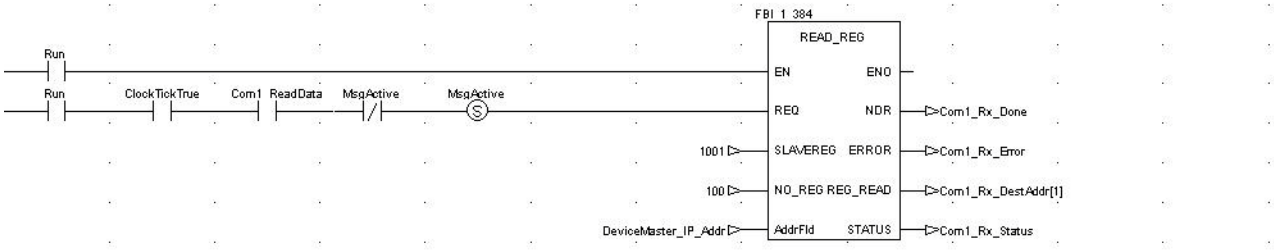
25. Observe the data being transmitted and received.

Appendix B. LPBKCNCP Example Program

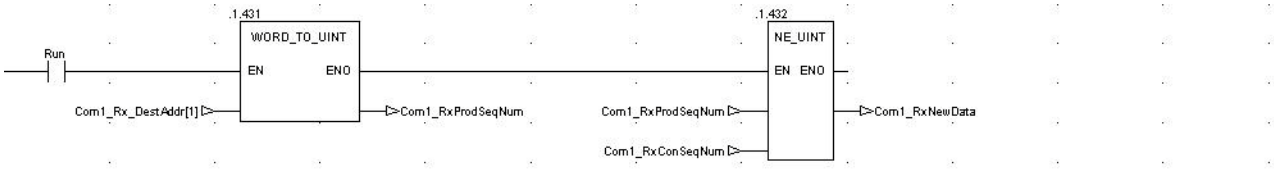
The following is the ladder logic for the LPBKCNCP example program:



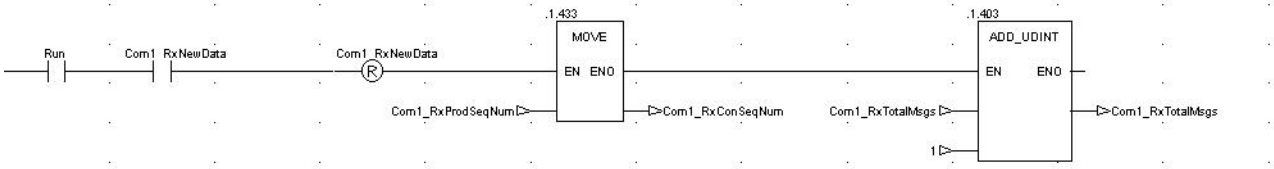
Operational loop: Read the latest data from port 1 on the DeviceMaster UP.



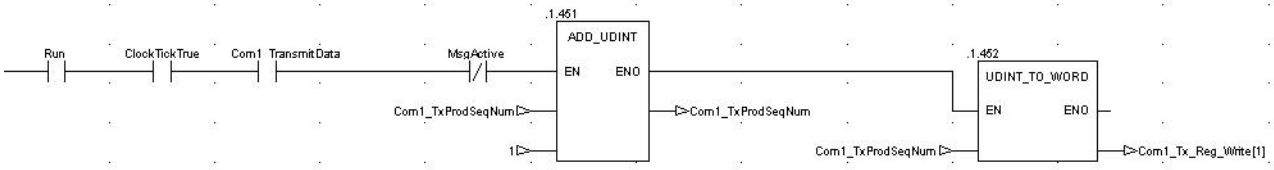
Operational loop: Check for new data received here. If new data is received, the sequence number (first 16 bt word) will have been incremented.

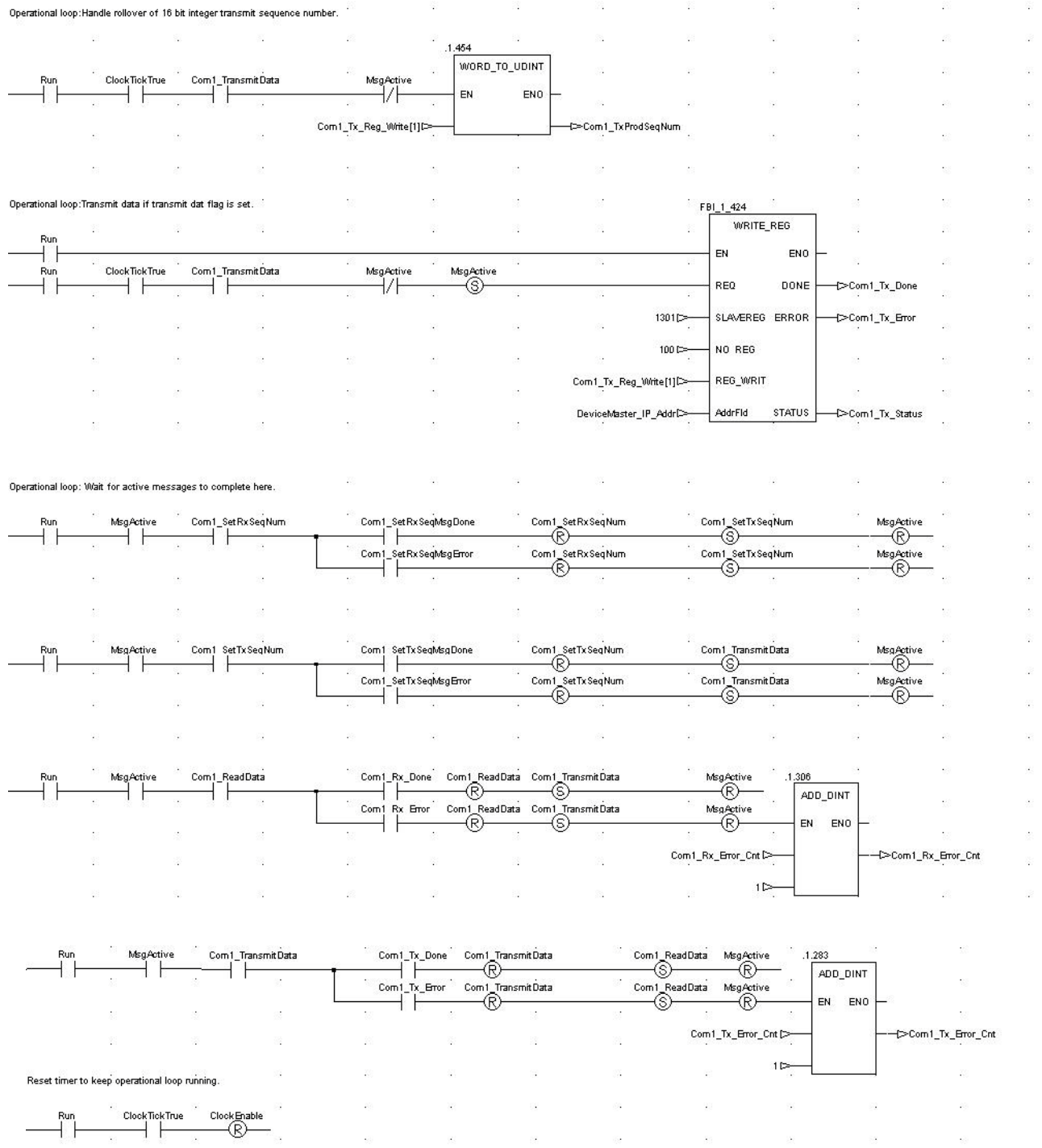


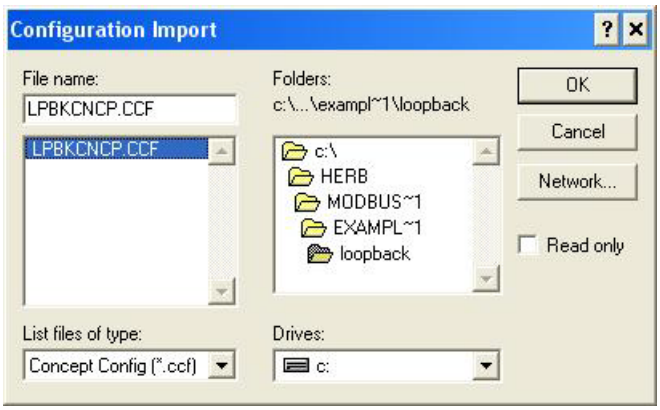
Operational loop: If the new data flag is set, process new data here (Just bumping a total message counter as example)



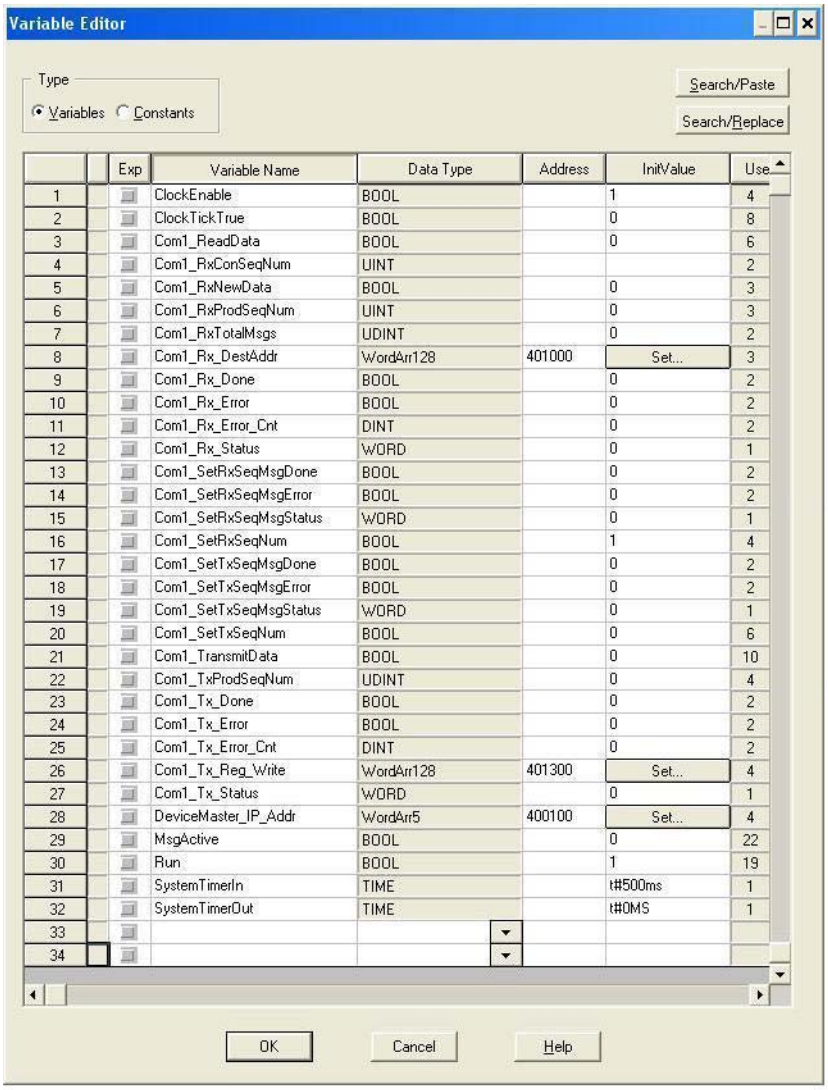
Operational loop: If there is new data to transmit, load the data into the message (starting at the third word), and then increment the Transmit Sequence number.



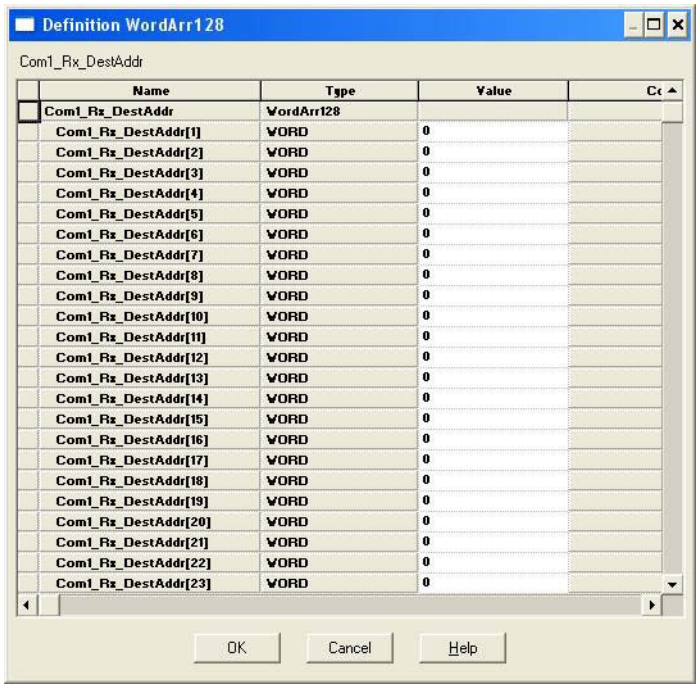

Operational loop:Handle rollover of 16 bit integer transmit sequence number.
.1.454
WORD_TO_UDINT
Run
ClockTickTrue
Com1_TransmitData
MsgActive
EN
ENO
Com1_Tx_Reg_Write[1]
Com1_Tx_Prod_Seq_Num
Operational loop:Transmit data if transmit dat flag is set.
FBI_1_424
WRITE_REG
Run
ClockTickTrue
Com1_TransmitData
MsgActive
MsgActive
EN
ENO
REQ
DONE
Com1_Tx_Done
1301
SLAVEREG
ERROR
Com1_Tx_Error
100
NO_REG
Com1_Tx_Reg_Write[1]
REG_WRIT
DeviceMaster_IP_Addr
AddrFld
STATUS
Com1_Tx_Status
Operational loop: Wait for active messages to complete here.
Run
MsgActive
Com1_SetRxSeqNum
Com1_SetRxSeqMsgDone
Com1_SetRxSeqMsgError
Com1_SetTxSeqNum
MsgActive
Com1_SetTxSeqNum
Com1_SetTxSeqMsgDone
Com1_SetTxSeqMsgError
Com1_TransmitData
Com1_ReadData
Com1_Rx_Done
Com1_Rx_Error
.1.306
ADD_DINT
EN
ENO
Com1_Rx_Error_Cnt
1
.1.283
Com1_Tx_Done
Com1_Tx_Error
Com1_Tx_Error_Cnt
Reset timer to keep operational loop running.
ClockEnable



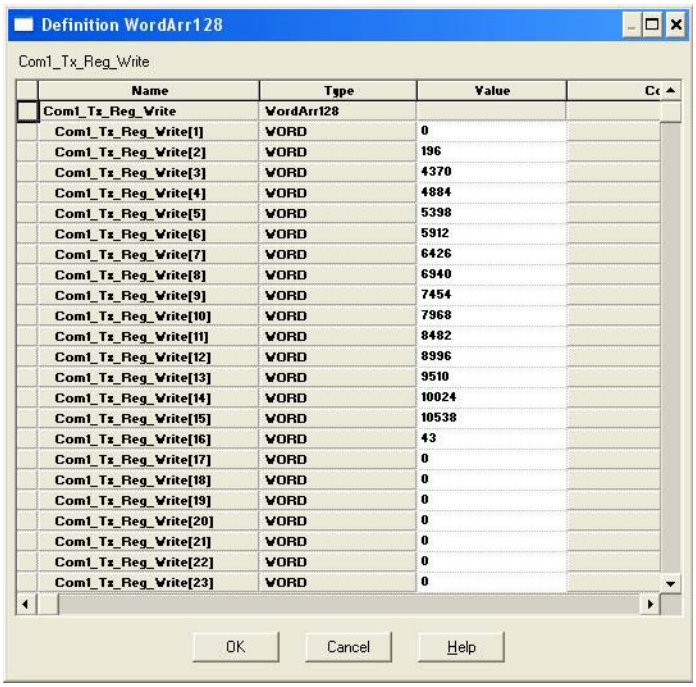
The following screens depict the variables for the **LPBKCNCP** example program.



	Exp	Variable Name	Data Type	Address	InitValue	Use
1		ClockEnable	BOOL		1	4
2		ClockTickTrue	BOOL		0	8
3		Com1_ReadData	BOOL		0	6
4		Com1_RxConSeqNum	UINT			2
5		Com1_RxNewData	BOOL		0	3
6		Com1_RxProdSeqNum	UINT		0	3
7		Com1_RxTotalMsgs	UDINT		0	2
8		Com1_Rx_DestAddr	WordArr128	401000	Set...	3
9		Com1_Rx_Done	BOOL		0	2
10		Com1_Rx_Error	BOOL		0	2
11		Com1_Rx_Error_Cnt	DINT		0	2
12		Com1_Rx_Status	WORD		0	1
13		Com1_SetRxSeqMsgDone	BOOL		0	2
14		Com1_SetRxSeqMsgError	BOOL		0	2
15		Com1_SetRxSeqMsgStatus	WORD		0	1
16		Com1_SetRxSeqNum	BOOL		1	4
17		Com1_SetTxSeqMsgDone	BOOL		0	2
18		Com1_SetTxSeqMsgError	BOOL		0	2
19		Com1_SetTxSeqMsgStatus	WORD		0	1
20		Com1_SetTxSeqNum	BOOL		0	6
21		Com1_TransmitData	BOOL		0	10
22		Com1_TxProdSeqNum	UDINT		0	4
23		Com1_Tx_Done	BOOL		0	2
24		Com1_Tx_Error	BOOL		0	2
25		Com1_Tx_Error_Cnt	DINT		0	2
26		Com1_Tx_Reg_Write	WordArr128	401300	Set...	4
27		Com1_Tx_Status	WORD		0	1
28		DeviceMaster_IP_Addr	WordArr5	400100	Set...	4
29		MsgActive	BOOL		0	22
30		Run	BOOL		1	19
31		SystemTimerIn	TIME		t#500ms	1
32		SystemTimerOut	TIME		t#0MS	1
33						
34						

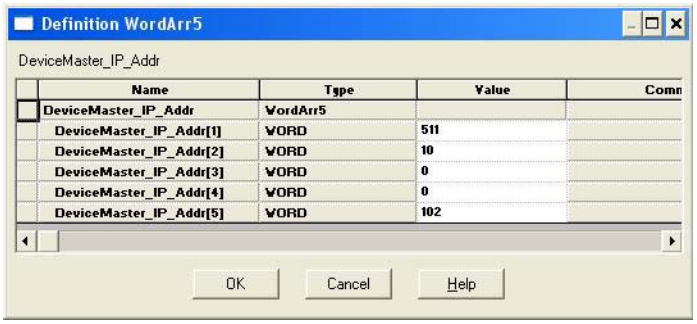


Note: *There will be no valid data in this variable array until received data is requested from the DeviceMaster UP.*



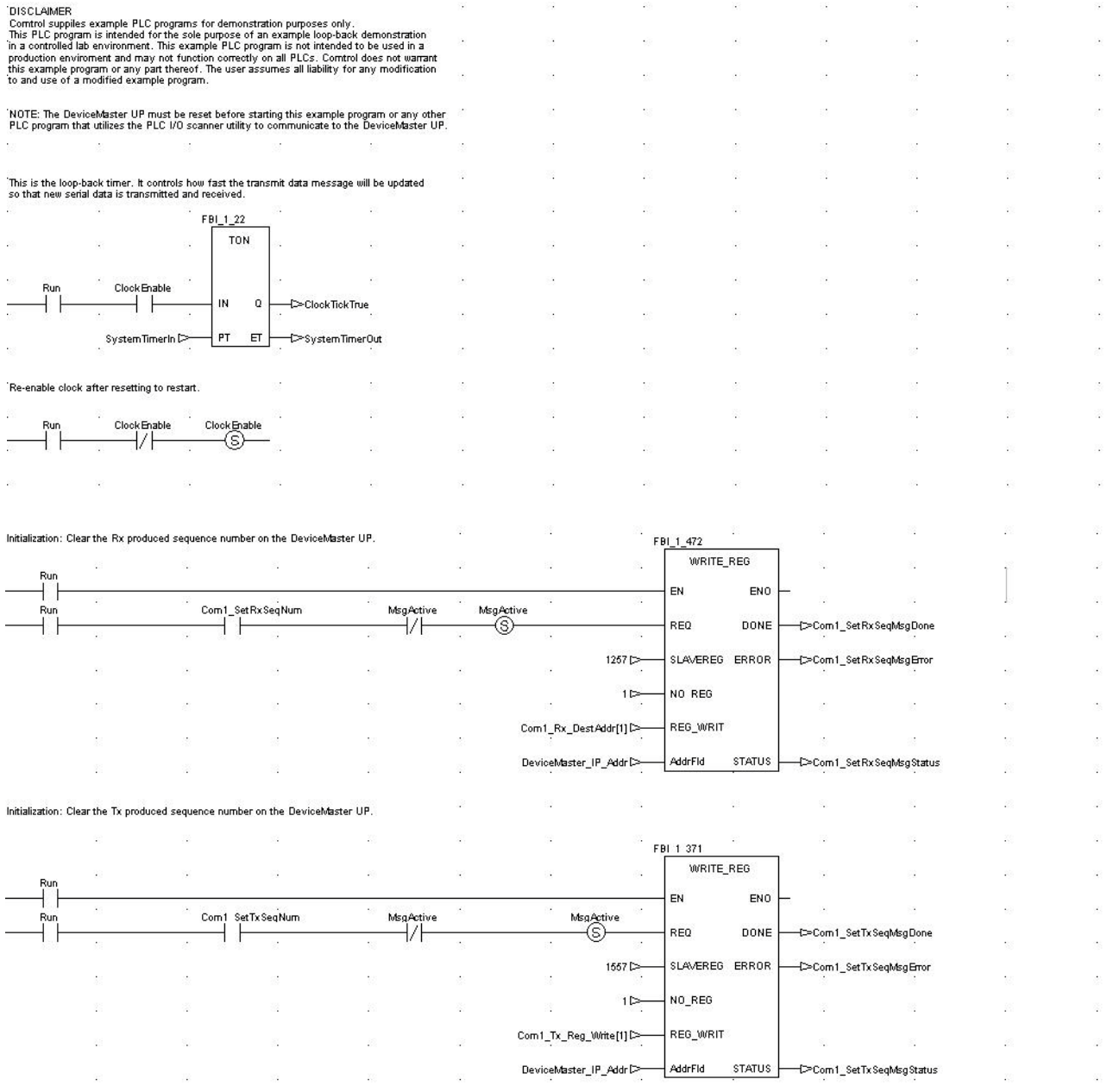
Where:

- The first word contains the sequence number starting at zero.
- The second word contains the length that is set to the maximum number of bytes transmitted by the Concept software package. (100 words = 200 bytes. 196 bytes maximum transmit data size.)
- Words three to 100 contain transmit data.

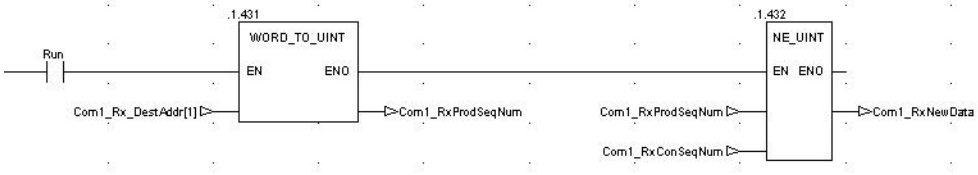

Definition WordArr5
DeviceMaster_IP_Addr
Name
Type
Value
Comn
DeviceMaster_IP_Addr
WordArr5
DeviceMaster_IP_Addr[1]
WORD
511
DeviceMaster_IP_Addr[2]
WORD
10
DeviceMaster_IP_Addr[3]
WORD
0
DeviceMaster_IP_Addr[4]
WORD
0
DeviceMaster_IP_Addr[5]
WORD
102
OK
Cancel
Help

Appendix C. SCANCNCP Example Program

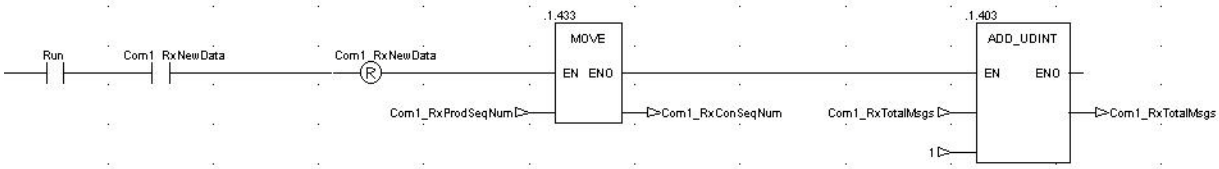
The following is the ladder logic for the SCANCNCP example program.



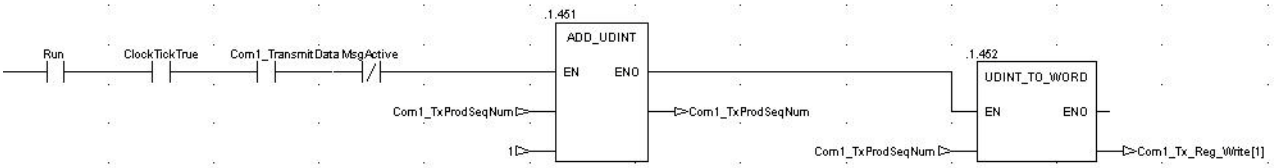
Operational loop: Check for new data received here. If new data is received, the sequence number (first 16 bt word) will have been incremented.



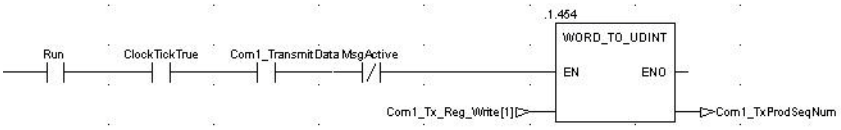
Operational loop: If the new received data flag is set, process new received data here (Just bumping a total message counter as example)



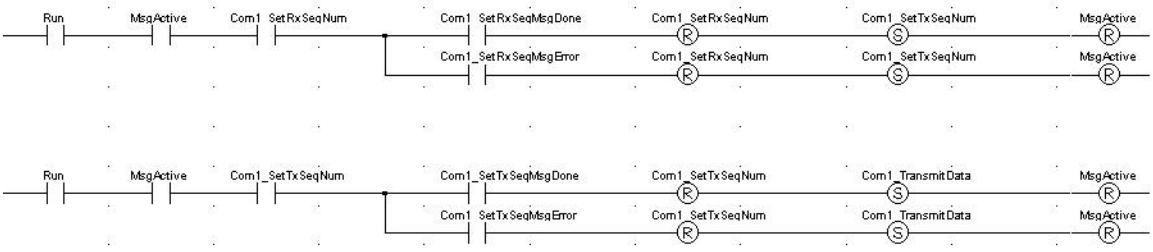
Operational loop: If there is new data to transmit, load the data into the message (starting at the third word), and then increment the Transmit Sequence number.



Operational loop: Handle rollover of 16 bit integer sequence number.

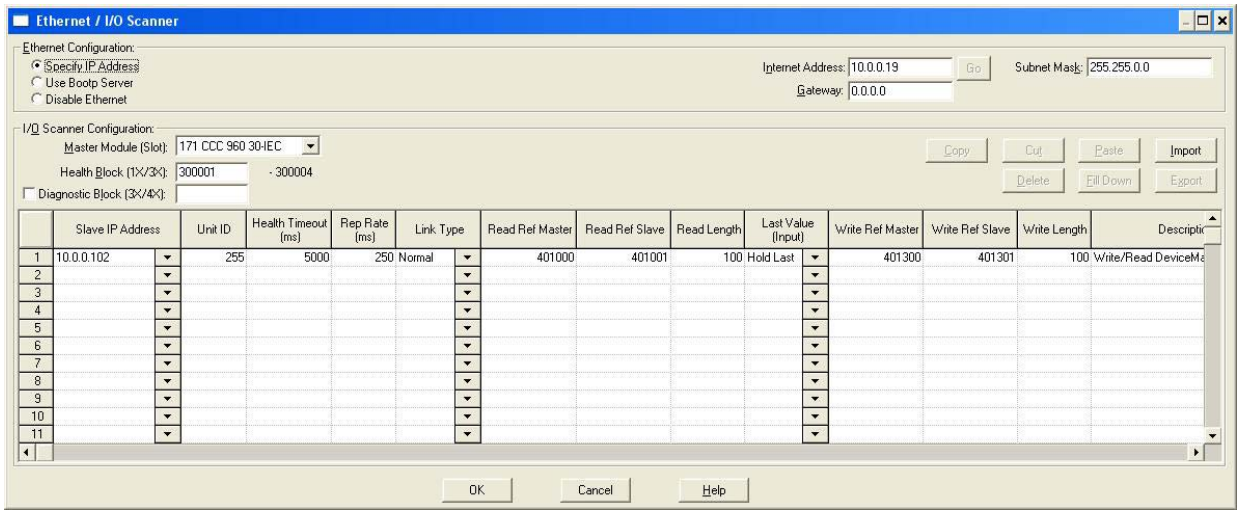


Operational loop: Wait for active messages to complete here.
(Initialization messages only for this example program.)



Reset timer.

The I/O Scanner screen displays.



The variable definitions are the same as for the **LPBKSCAN** program in Appendix B. LPBKCNCP Example Program on Page 99.

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