PROFINET IO User Guide

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Introduction

Supported Models

This *User Guide* supports the DeviceMaster Industrial Gateway, which includes the following products:

- DeviceMaster UP 1-port panel mount
- DeviceMaster PNIO-2101and DeviceMaster PNIO-2201: 1-port DIN rail models
- DeviceMaster UP all 2-port DIN rail models: DeviceMaster PNIO-2xx2 series

  Note: *DeviceMaster UP 2-port models have been renamed.*

Old Product Name	New Model Name
DeviceMaster UP 2-Port with 1 Ethernet port	PNIO-2202
DeviceMaster UP 2-Port with 2 Ethernet port	PNIO-2402
DeviceMaster UP 2-Port DB9 with 1 Ethernet port	PNIO-2102
DeviceMaster UP 2-Port DB9 with 2 Ethernet ports	PNIO-2302

- DeviceMaster PNIO-2304: 4-port DIN rail
- DeviceMaster UP 4-port panel mount

Note: *DeviceMaster Industrial Gateway products (DeviceMaster UP and PNIO-2000 series) are typically referred to as DeviceMaster in this User Guide.*

Installation Overview

This *User Guide* is organized to reflect the installation step order:

1. Install the hardware (Page 9).
2. Configure the IP address (Page 27).
3. If necessary, upload the latest firmware (Page 30).
4. Attach the serial device (Page 37).
5. Configure the serial port or ports (Page 53).
6. Configure the Ethernet device (Page 61).
7. Configure the DeviceMaster in TIA Portal (Page 69).

In addition, this User Guide also provides the following information:

- IO data handling (Page 83)
- Provides an example project (Page 89)
- Advanced functions (Page 95)
- Provides information about the DeviceMaster PNIO application web pages (Page 103)
- DeviceMaster Diagnostics web pages (Page 111)
- DeviceMaster maintenance and Redboot procedures (Page 127)

Software and Documentation

You can access the appropriate firmware assembly, PortVision DX, and the DeviceMaster documentation from the download site using the links in the following tables.

DeviceMaster UP Software and Firmware		Link
Bootloader	*Bootloader,* the operating system that runs on the DeviceMaster hardware during the power on phase, which then starts the default application, PROFINET IO.	
PortVision DX	*PortVision DX* is the application for Windows that you use to configure network settings and update the firmware. Use PortVision DX to manage Comtrol Ethernet-attached devices to: • Scan the network for attached devices • View networked devices in real-time • Access product-specific network settings configurations • Assign IP addresses and network settings to one or multiple devices • Upload the latest firmware or Bootloader • Save and load configuration files • Access DeviceMaster configuration web pages • Access Telnet/SSH sessions • Remotely reboot devices • Download technical documentation • Enable event logging to assist in monitoring and troubleshooting • Create shortcuts to quickly access your favorite applications • Organize devices into folders and create multiple views • Enter notes about a folder or device	

PROFINET IO Firmware and Documentation		Link
Firmware	**PROFINET IO** (**.msi**) contains the firmware and supporting files. The firmware provides embedded configuration web pages. You may need to update the DeviceMaster with the latest version. Depending on the model you purchased, the DeviceMaster may or may not have the PROFINET IO firmware loaded. ***Note:*** *Models that have a protocol loaded on the DeviceMasterare identified in PortVision DX and the DeviceMaster is labeled accordingly.*	
Documentation	This *User Guide*.	

Hardware Installation

Product Name Change Notification

Comtrol has implemented a product name change for our DeviceMaster and DeviceMaster UP 2-port DIN rail models to align with our new 1-port and 4-port DIN rail model names.

Note: *The DeviceMaster UP 2-port DIN rail PROFINET IO models also have new part numbers.*

Old Name/ Description	New Model Name	Old Part Number	New Part Number
DeviceMaster UP 2-Port 1E PROFINET IO	DeviceMaster PNIO-2202	99531-9	99534-0
DeviceMaster UP 2-Port DB9 1E PROFINET IO	DeviceMaster PNIO-2102	99551-7	99628-6
DeviceMaster UP 2-Port 2E PROFINET IO	DeviceMaster PNIO-2402	99541-8	99544-9
DeviceMaster UP 2-Port DB9 2E PROFINET IO	DeviceMaster PNIO-2302	99561-6	99633-0

Installation Overview

Use the links below to locate installation procedures for the following models:

Ports	DeviceMaster or DeviceMaster UP Model	Installation Procedure
1	DeviceMaster UP DB9 serial port Panel mount	*1-Port - Panel Mount (DB9) Installation* on Page 10
1	DeviceMaster PNIO-2201 Screw terminal serial port DIN rail	*PNIO-2201: 1-Port DIN Rail (Terminal Block) Installation* on Page 12
1	DeviceMaster PNIO-2101 DB9 serial port DIN rail	*PNIO-2101: 1-Port DIN Rail (DB9) Installation* on Page 13
2	DeviceMaster PNIO-2202 DeviceMaster PNIO-2402 Screw terminal serial ports DIN rail	*PNIO-2202 and PNIO-2402: 2-Port DIN Rail (Terminal Block) Installation* on Page 15
2	DeviceMaster PNIO-2102 DeviceMaster PNIO-2302 DB9 serial ports DIN rail	*PNIO-2102 and PNIO-2302: 2-Port DIN Rail (DB9) Installation* on Page 17

Ports	DeviceMaster or DeviceMaster UP Model	Installation Procedure
4	DeviceMaster PNIO-2304 DB9 serial ports DIN rail	*PNIO-2304: 4-Port DIN Rail (DB9) Installation* on Page 19
4	DeviceMaster UP D B9 serial ports Panel mount	*4-Port Panel Mount Installation* on Page 20

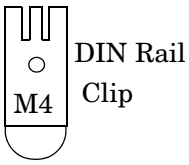
1-Port - Panel Mount (DB9) Installation

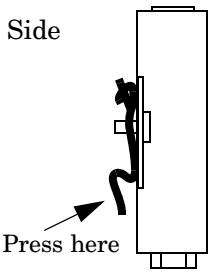
Use the following procedure to install the DeviceMaster 1-Port (panel mount).

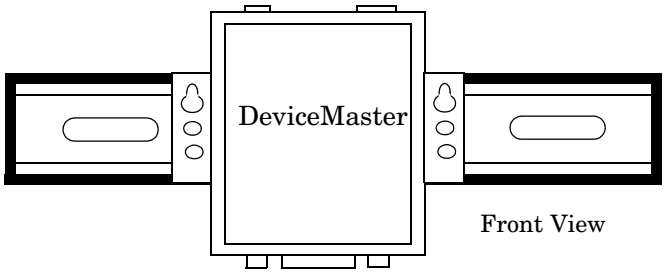
1. Place the DeviceMaster 1-Port on a stable surface and skip to Step 2 or optionally mount the DeviceMaster using the mounting flanges or DIN rail adapters.
   a. Pick up the DeviceMaster so that the front of the device is facing you.
   b. Pick up a DIN rail clip. (The three tines should be on top and the **M4** label should face you.)
   c. Slide the DIN rail clip behind the DeviceMaster and line it up with one of the screw holes on the DeviceMaster.
   d. Insert the **M4** screw into the hole and tighten with a Phillips screwdriver.
   e. Repeat Steps b through d with the second DIN rail clip. Make sure the screws on both DIN rail clips line up.

      Note: *If you need to remove the DeviceMaster from the DIN rail, exert pressure on the backside of the tabs at the bottom of both DIN rail clips.*

   f. Attach the DeviceMaster to the DIN rail.







Note: *Do not connect multiple units until you have changed the default IP address, see Preparing the DeviceMaster for Configuration on Page 23*

2. Connect the DeviceMaster port labeled **10/100 ETHERNET** to the same Ethernet network segment as the PLC using a standard network cable.
3. Apply power to the DeviceMaster using the following procedure.

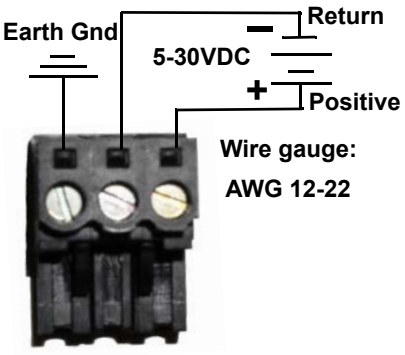
   Note: *See 1-Port Panel Mount 5-30VDC Power Supply on Page 149, if you want to provide your own power supply.*

Caution

Observe proper ESD techniques when connecting and disconnecting the DeviceMaster.

- Insert the earth ground wire into the earth ground screw terminal.
- Insert the DC positive wire into the positive screw terminal and the DC return wire into the return screw terminal.

  Refer to *1-Port Panel Mount 5-30VDC Power Supply* on Page 149 for detailed power requirements.
- Use a small flat head screw to lock the wires into place.
- Verify that each wire has been tightened securely.



- Plug the screw terminal power connector into the DeviceMaster.

  Note: *Align the plug properly. The scalloped side of the screw terminal power connector should be aligned with the scalloped side of the power jack on the unit.*

- Connect the power supply to a power source.
- Go to Step 4 to verify that the DeviceMaster is functioning properly.

4. Verify that the **Status** LED has completed the boot cycle and network connection for the DeviceMaster is functioning properly using the table below.

1-Port Enclosed LED Descriptions	
Status	The amber **Status** LED on the device is lit, indicating you have power and it has completed the boot cycle. ***Note:*** *The* **Status** *LED flashes while booting and it takes approximately 15 seconds for the Bootloader to complete the cycle. When the Bootloader completes the cycle, the LED flashes rapidly for several times then stays off and blinks approximately every 10 seconds when there is no PLC connection.*
Link/Act	If the red **Link/Act** LED is lit, it indicates a working Ethernet connection.
Duplex	If the red **Duplex** LED is lit, it indicates full-duplex activity.
100	If the red **100** LED is lit, it indicates a working 100 MB Ethernet connection (100 MB network, only). If the LED is not lit, it indicates a 10 MB Ethernet connection.
Note: *For additional LED information, go to the Status LED table on Page 156.*	

Caution

Do not connect RS-422/485 devices until the IP address is configured and an appropriate port interface type has been configured. The default port setting is RS-232.

5. Go to *Preparing the DeviceMaster for Configuration* on Page 23 to install PortVision DX, configure the network settings, and if necessary, upload the appropriate protocol firmware on the DeviceMaster.

PNIO-2201: 1-Port DIN Rail (Terminal Block) Installation

Use the following procedure to install PNIO-2201. See *PNIO-2101: 1-Port DIN Rail (DB9) Installation* on Page 13 if the DeviceMaster has DB9 serial connectors.

1. Attach the PNIO-2201 1-Port to the DIN rail adapter.
2. Connect the power supply and apply power to the PNIO-2201 using the power supply specifications on the product label and the following information.

Caution

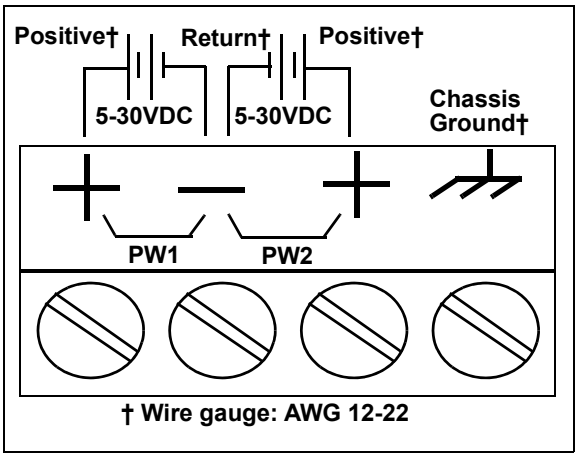
Observe proper ESD techniques when connecting and disconnecting the DeviceMaster.

a. If the DIN rail is not connected to earth ground, insert the earth ground wire into the chassis ground screw terminal.

Note: *The chassis ground connection is made only if the DIN rail is NOT connected to earth ground.*

b. Insert the DC positive wire into the + screw terminal and the DC return wire into the - screw terminal.

Refer to *PNIO-2101 and PNIO-2201: 1-Port DIN Rail Power Supply* on Page 150 for detailed power requirements.



c. Use a small flat head screw driver to lock the wires into place.

d. Verify that each wire has been tightened securely.

e. Connect a UL Listed power supply and UL Listed power cord to a power source to apply power.

Note: *Do not connect multiple units until you have changed the default IP address, see Preparing the DeviceMaster for Configuration on Page 23*

3. Connect the **10/100 port** to the same Ethernet network segment as the host PC using a standard network cable.
4. Verify that the **Status** LED has completed the boot cycle and network connection for the PNIO-2201 is functioning using the following table.

PNIO-2201 LED Descriptions	
STATUS	The **STATUS** LED on the device is lit, indicating you have power and it has completed the boot cycle. ***Note:*** *The* **Status** *LED flashes while booting and it takes approximately 15 seconds for the Bootloader to complete the cycle. When the Bootloader completes the cycle, the LED flashes rapidly for several times then stays off and blinks approximately every 10 seconds when there is no PLC connection.*
LINK	If the **LINK** (green) LED is lit, it indicates a working Ethernet connection.
ACT	If the **ACT** (yellow) LED flashes, it indicates network activity.
Note: *For additional LED information, go to the Status LED table on Page 156.*	

Caution

Do not connect RS-422/485 devices until the IP address is configured and an appropriate port interface type has been configured. The default port setting is RS-232.

5. Go to *Preparing the DeviceMaster for Configuration* on Page 23 for default network settings and how to configure the DeviceMaster for use.

PNIO-2101: 1-Port DIN Rail (DB9) Installation

Use the following procedure to install a PNIO-2101.

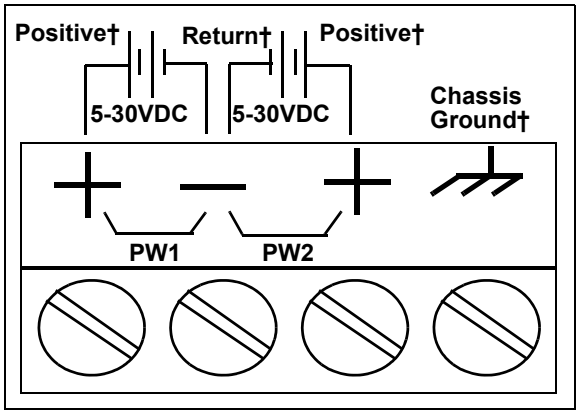
1. Attach the PNIO-2101 to the DIN rail adapter.
2. Connect the power supply and apply power to the PNIO-2101 using the power supply specifications on the product label and the following information.

Caution

Observe proper ESD techniques when connecting and disconnecting the DeviceMaster.

a. If the DIN rail is not connected to earth ground, insert the earth ground wire into the chassis ground screw terminal.

Note: *The chassis ground connection is made only if the DIN rail is NOT connected to earth ground.*



† Wire gauge: AWG 12-22

b. Insert the DC positive wire into one of the + screw terminals and the DC return wire into the - screw terminal.

- A second redundant power supply can be connected to the unit by inserting the DC positive wire into the other + screw terminal and the DC return wire into the - screw terminal.
- The PNIO-2101 continues to operate if one of the two connected power supplies should fail.

Refer to *PNIO-2101 and PNIO-2201: 1-Port DIN Rail Power Supply* on Page 150 for detailed power requirements.

c. Use a small flat head screw driver to lock the wires into place.

d. Verify that each wire has been tightened securely.

e. Connect a UL Listed power supply and UL Listed power cord to a power source to apply power.

Note: *Do not connect multiple units until you have changed the default IP address, see Preparing the DeviceMaster for Configuration on Page 23*

3. Connect the **10/100** port to the same Ethernet network segment as the host PC using a standard Ethernet cable.

4. Verify that the **Status** LED has completed the boot cycle and network connection for the PNIO-2101 is functioning properly using the following table.

PNIO-2101 LED Descriptions	
STATUS	The **STATUS** LED on the device is lit, indicating you have power and it has completed the boot cycle. ***Note:*** *The* **Status** *LED flashes while booting and it takes approximately 15 seconds for the Bootloader to complete the cycle. When the Bootloader completes the cycle, the LED flashes rapidly for several times then stays off and blinks approximately every 10 seconds when there is no PLC connection.*
LINK	If the **LINK** (green) LED is lit, it indicates a working Ethernet connection.
ACT	If the **ACT** (yellow) LED flashes, it indicates network activity.
Note: *For additional LED information, go to the Status LED table on Page 156.*	

Do not connect RS-422/485 devices until the IP address is configured and an appropriate port interface type has been configured. The default port setting is RS-232.

5. Go to *Preparing the DeviceMaster for Configuration* on Page 23 for default network settings and how to configure the DeviceMaster for use.

PNIO-2202 and PNIO-2402: 2-Port DIN Rail (Terminal Block) Installation

Use the following procedure to install DeviceMaster 2-port models (1E and 2E) with serial screw terminal connectors. See *PNIO-2102 and PNIO-2302: 2-Port DIN Rail (DB9) Installation* on Page 17 if the DeviceMaster has DB9 serial connectors.

1. Attach the DeviceMaster 2-Port to the DIN rail adapter.
2. Connect the power supply and apply power to the DeviceMaster using the power supply specifications on the product label and the following information.

Observe proper ESD techniques when connecting and disconnecting the DeviceMaster.

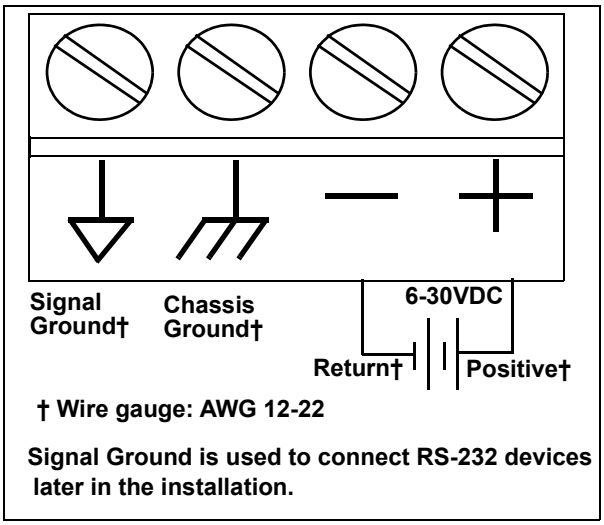
   a. If the DIN rail is not connected to earth ground, insert the earth ground wire into the chassis ground screw terminal.

   Note: *The chassis ground connection is made only if the DIN rail is NOT connected to earth ground.*

   b. Insert the DC positive wire into the + screw terminal and the DC return wire into the - screw terminal.

   Refer to *PNIO-2202 and PNIO-2402: 2-Port (Serial Terminals) Power Supply* on Page 151 for power requirements.

   c. Use a small flat head screw driver to lock the wires into place.



   d. Verify that each wire has been tightened securely.

   e. Connect a UL Listed power supply and UL Listed power cord to a power source to apply power.

Note: *Do not connect multiple units until you have changed the default IP address, see Preparing the DeviceMaster for Configuration on Page 23*

3. Use the appropriate method for network attachment of the DeviceMaster.
   - ***PNIO-2202:*** Connect the **10/100 port** to the same Ethernet network segment as the host PC using a standard network cable.
   - ***PNIO-2402:*** Connect the DeviceMaster using either Ethernet port to the same Ethernet network segment as the host PC using a standard Ethernet cable. You can daisy-chain another DeviceMaster or Ethernet device to the other Ethernet port.

   Note: *If your model provides two Ethernet ports, **E1** is the first port and **E2** is the second port.*

4. Verify that the **Status** LED has completed the boot cycle and network connection for the DeviceMaster is functioning properly using the following table.

2-Port with Serial Terminal Connectors LED Descriptions	
STATUS	The **STATUS** LED on the device is lit, indicating you have power and it has completed the boot cycle. ***Note:*** *The* **Status** *LED flashes while booting and it takes approximately 15 seconds for the Bootloader to complete the cycle. When the Bootloader completes the cycle, the LED flashes rapidly for several times then stays off and blinks approximately every 10 seconds when there is no PLC connection.*
LINK	If the **LINK** (green) LED is lit, it indicates a working Ethernet connection.
ACT	If the **ACT** (yellow) LED flashes, it indicates network activity.
Note: *For additional LED information, go to the Status LED table on Page 156.*	

Do not connect RS-422/485 devices until the IP address is configured and an appropriate port interface type has been configured. The default port setting is RS-232.

5. Go to *Preparing the DeviceMaster for Configuration* on Page 23 for default network settings and how to configure the DeviceMaster for use.

PNIO-2102 and PNIO-2302: 2-Port DIN Rail (DB9) Installation

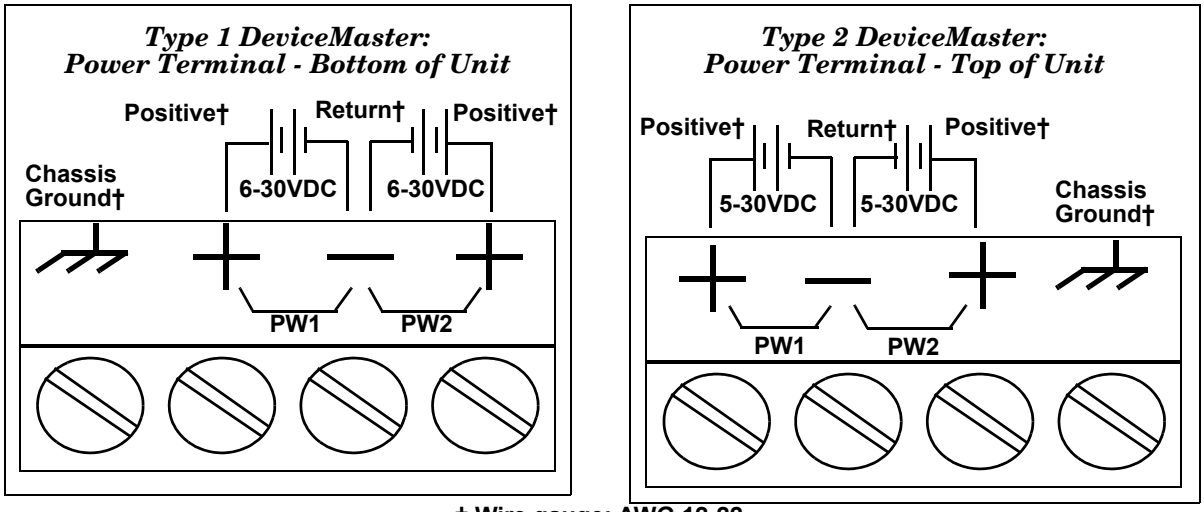
Use the following procedure to install DeviceMaster 2-port models (1E and 2E) with DB9 connectors.

1. Attach the DeviceMaster 2-Port to the DIN rail adapter.
2. Connect the power supply and apply power to the DeviceMaster using the power supply specifications on the product label and the following information.

Observe proper ESD techniques when connecting and disconnecting the DeviceMaster.

a. If the DIN rail is not connected to earth ground, insert the earth ground wire into the chassis ground screw terminal.

Note: *The chassis ground connection is made only if the DIN rail is NOT connected to earth ground.*



† Wire gauge: AWG 12-22

b. Insert the DC positive wire into one of the + screw terminals and the DC return wire into the - screw terminal.

Type 1: 6-30VDC - serial number less than xxxx-030000.

Type 2: 5-30VDC - serial number greater than xxxx-030000.

A second redundant power supply can be connected to the unit by inserting the DC positive wire into the other + screw terminal and the DC return wire into the - screw terminal. The DeviceMaster continues to operate if one of the two connected power supplies should fail.

Refer to the appropriate subsection for detailed power requirements.

- *PNIO-2102 and PNIO-2302: 2-Port DB9 Power Supply (Bottom)* on Page 152
- *PNIO-2102 and PNIO-2302: 2-Port DB9 Power Supply (Top)* on Page 153

c. Use a small flat head screw driver to lock the wires into place.

d. Verify that each wire has been tightened securely.

e. Connect a UL Listed power supply and UL Listed power cord to a power source to apply power.

Note: *Do not connect multiple units until you have changed the default IP address, see Preparing the DeviceMaster for Configuration on Page 23.*

3. Use the appropriate method for network attachment of your DeviceMaster 2-port:
   - ***PNIO-2102***: Connect the **10/100 port** to the same Ethernet network segment as the host PC using a standard network cable.
   - ***PNIO-2302***: Connect either **10/100 port** to the same Ethernet network segment as the host PC using a standard network cable. You can daisy-chain another DeviceMaster or Ethernet device to the other Ethernet port.

   Note: *If your model provides two Ethernet ports,* ***E1*** *is the first port and* ***E2*** *is the second port.*
4. Verify that the **Status** LED has completed the boot cycle and network connection for the DeviceMaster is functioning using the following table.

2-Port with DB9 Connectors LED Descriptions	
STATUS	The **STATUS** LED on the device is lit, indicating you have power and it has completed the boot cycle. ***Note:*** *The* **Status** *LED flashes while booting and it takes approximately 15 seconds for the Bootloader to complete the cycle. When the Bootloader completes the cycle, the LED flashes rapidly for several times then stays off and blinks approximately every 10 seconds when there is no PLC connection.*
LINK	If the **LINK** (green) LED is lit, it indicates a working Ethernet connection.
ACT	If the **ACT** (yellow) LED flashes, it indicates network activity.
Note: *For additional LED information, go to the Status LED table on Page 156.*	

Do not connect RS-422/485 devices until the IP address is configured and an appropriate port interface type has been configured. The default port setting is RS-232.

5. Go to *Preparing the DeviceMaster for Configuration* on Page 23 for default network settings and how to configure the DeviceMaster for use.

PNIO-2304: 4-Port DIN Rail (DB9) Installation

Use the following procedure to install PNIO-2304.

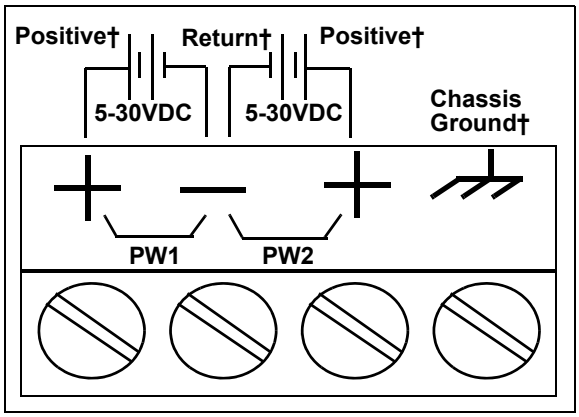
1. Attach the DeviceMaster to the DIN rail adapter.
2. Connect the power supply and apply power to the DeviceMaster using the power supply specifications on the product label and the following information.

   Observe proper ESD techniques when connecting and disconnecting the DeviceMaster**.**

   Caution

   a. If the DIN rail is not connected to earth ground, insert the earth ground wire into the chassis ground screw terminal.

   Note: *The chassis ground connection is made only if the DIN rail is NOT connected to earth ground.*

   † Wire gauge: AWG 12-22

   b. Insert the DC positive wire into one of the + screw terminals and the DC return wire into the - screw terminal.

   - A second redundant power supply can be connected to the unit by inserting the DC positive wire into the other + screw terminal and the DC return wire into the - screw terminal.
   - The DeviceMaster continues to operate if one of the two connected power supplies should fail.

   Refer to *PNIO-2304: 4-Port DIN Rail Models Power Supply* on Page 154 for detailed power requirements.

   c. Use a small flat head screw driver to lock the wires into place.

   d. Verify that each wire has been tightened securely.

   e. Connect a UL Listed power supply and UL Listed power cord to a power source to apply power.

Note: *Do not connect multiple units until you have changed the default IP address, see Preparing the DeviceMaster for Configuration on Page 23*

3. Connect one of the **10/100** ports to the same Ethernet network segment as the host PC using a standard Ethernet cable. You can daisy-chain another DeviceMaster or Ethernet device to the other port using a standard Ethernet cable.

   Note: *This model provides two Ethernet ports, E1 is the first port and E2 is the second port.*

4. Verify that the **Status** LED has completed the boot cycle and network connection for the DeviceMaster is functioning properly using the following table.

PNIO-2304 LED Descriptions	
STATUS	The **STATUS** LED on the device is lit, indicating you have power and it has completed the boot cycle. ***Note:*** *The* **Status** *LED flashes while booting and it takes approximately 15 seconds for the Bootloader to complete the cycle. When the Bootloader completes the cycle, the LED flashes rapidly for several times then stays off and blinks approximately every 10 seconds when there is no PLC connection.*
LINK	If the **LINK** (green) LED is lit, it indicates a working Ethernet connection.
ACT	If the **ACT** (yellow) LED flashes, it indicates network activity.
Note: *For additional LED information, go to the* *Status LED table on Page 156.*	

Do not connect RS-422/485 devices until the IP address is configured and an appropriate port interface type has been configured. The default port setting is RS-232.

5. Go to *Preparing the DeviceMaster for Configuration* on Page 23 for default network settings and how to configure the DeviceMaster for use.

4-Port Panel Mount Installation

Use the following procedure to install the DeviceMaster 4-port.

1. Optionally, attach the mounting brackets using the screws provided in the kit (6-32 1/4" flathead machine) or place the DeviceMaster on a stable surface.

Failure to use the correct screws can damage the PCB and void the warranty. Do NOT use screws that exceed the length of the screws provided with the mounting bracket kit.

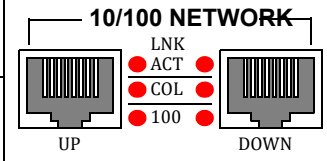
Note: *If you ordered the DeviceMaster Rackmount Shelf Kit accessory, use the document that accompanied that kit or download the document to mount the DeviceMaster on the shelf.*

2. Connect the DeviceMaster to the same Ethernet network segment as the PLC. If the DeviceMaster serial number is below xxxx-030000 use one of the following methods to connect the cable. Serial numbers above xxxx-030000, the Ethernet port are interchangeable.
   - **Ethernet hub or switch (10/100Base-T)**: Connect to the port labeled **UP** on the DeviceMaster using a standard Ethernet cable.
   - **Server NIC (10/100Base-T)**: Connect to the port labeled **DOWN** on the DeviceMaster using a standard Ethernet cable.
   - **Daisy-chaining DeviceMaster units**: Connect the port labeled **DOWN** on the first DeviceMaster to the port labeled **UP** on the second DeviceMaster or other device using a standard Ethernet cable. Refer to *Daisy-Chaining DeviceMaster 4-Port Units* on Page 158.

   Note: *Your model provides two Ethernet ports, UP is the first port and DOWN is the second port.*

Note: *Do not connect multiple units until you have changed the default IP address, see* *Preparing the DeviceMaster for Configuration on Page 23*

3. Apply power to the DeviceMaster by connecting the AC power adapter to the DeviceMaster, the appropriate power cord for your location to the power adapter, and plugging the power cord into a power source. If you want to provide a power supply, see *4-Port Panel Mount Power Supply* on Page 154.
4. Verify that the **PWR** LED has completed the boot cycle and the network connection for the DeviceMaster is functioning properly.

4-Port LED Descriptions		
PWR	LED on the front panel of the DeviceMaster is lit, indicating you have power and it has completed the boot cycle. ***Note:*** *The* **PWR** *LED flashes while booting and it takes approximately 15 seconds for the Bootloader to complete the cycle. When the Bootloader completes the cycle, the LED flashes rapidly for several times then stays off and blinks approximately every 10 seconds when there is no PLC connection.*	
LNK ACT	The red **LNK ACT** LED is lit, indicating that you have a working Ethernet connection.	
COL	If the red **COL LED** is lit, there is a network collision.	
100	If the red **100** LED is lit, it indicates a working 100 MB Ethernet connection (100 MB network, only). If the LED is not lit, it indicates a 10 MB Ethernet connection.	
Note: *For additional LED information, go to the Status LED table on Page 156.*		

Caution

Do not connect RS-422/485 devices until the IP address is configured and an appropriate port interface type has been configured. The default port setting is RS-232.

5. Go to *Preparing the DeviceMaster for Configuration* on Page 23 to install PortVision DX, configure the network settings, and if necessary, upload the appropriate protocol firmware on the DeviceMaster.

Adding a Unit to an Existing Installation

Use this procedure to add another DeviceMaster to an existing configuration.

1. Install the DeviceMaster to an Ethernet hub or server NIC using the appropriate subsection found in *Installation Overview* on Page 9.

   Note: *Technical support recommends installing one unit at a time and testing that unit when installing multiple units. In the event troubleshooting must be done, a single unit is easier to resolve than several at once.*
2. Power-up the new DeviceMaster and verify that the **PWR** or **Status** LED lights.
3. Program an IP address into the new DeviceMaster using PortVision DX.
4. If necessary, upload the latest firmware.
5. Configure serial ports to support the serial devices or upload configuration files from PortVision DX.
6. Connect the serial devices.

Replacing Hardware

Use this procedure to replace hardware.

1. Remove the old unit and attach a new or spare DeviceMaster.
2. Connect the new DeviceMaster to the network hub or server NIC.
3. Apply power to the new DeviceMaster and verify that it passes the power on self-test.
4. Program the IP address of the new DeviceMaster.
5. If necessary, upload the latest protocol firmware.
6. Configure any ports as necessary to match the previous unit or upload configuration files from PortVision DX.
7. Transfer *all* cabling from the old DeviceMaster to the new DeviceMaster.
8. *It is not necessary* to shut down and restart the host PC.

Preparing the DeviceMaster for Configuration

The DeviceMaster platform includes PortVision DX, which is the management application that you use to manage all Comtrol Ethernet-attached devices.

This section contains these topics:

Note: *If PortVision DX is already installed, go directly to Configuring the Network Settings on Page 27 to change the IP address on the DeviceMaster.*

PortVision DX Overview

PortVision DX automatically detects Comtrol Ethernet-attached products physically attached to the local network segment so that you can configure the network address, upload firmware, and manage the following products:

- DeviceMaster family
  - DeviceMaster DM-2000 series
  - DeviceMaster EIP-2000 series
  - DeviceMaster MOD-2000 series
  - DeviceMaster PNIO-2000 series
  - DeviceMaster PRO
  - DeviceMaster RTS
  - DeviceMaster Serial Hub
  - DeviceMaster UP
- DeviceMaster LT
- IO-Link Master
- RocketLinx switches

In addition to identifying Comtrol Ethernet-attached products, you can use PortVision DX to display any third-party switch and hardware that may be connected directly to those devices. All non-Comtrol products and unmanaged RocketLinx switches are treated as non-intelligent devices and have limited feature support. For example, you cannot configure or update firmware on a third-party switch.

PortVision DX Requirements

Use PortVision DX to identify, configure, update, and manage the DeviceMaster on the Windows operating systems.

Note: *Refer to the download site for information about Windows operating systems and PortVision DX.*

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

Before installing PortVision DX, consider the following:

- Use PortVision DX to upload firmware and apply changes to a DeviceMaster that is on the same local network segment as the system on which PortVision DX is installed. You cannot apply changes through PortVision DX to a DeviceMaster that is not on the same local network segment.
- Use PortVision DX to monitor any DeviceMaster on the network. The DeviceMaster does not have to be on the same local network segment as PortVision DX for monitoring purposes.

Installing PortVision DX

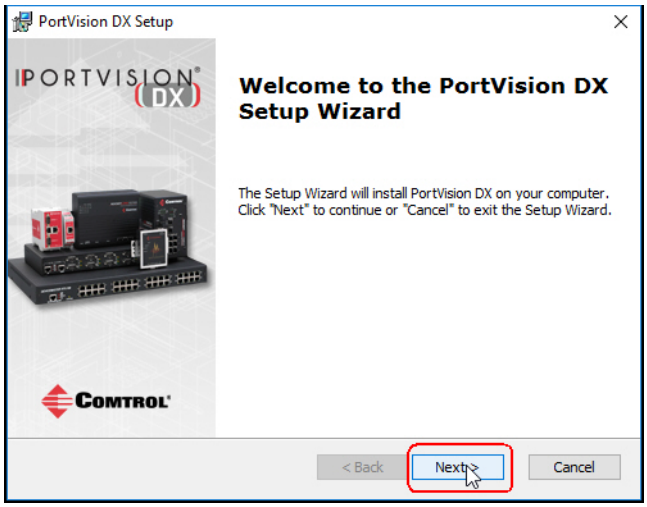
During initial configuration, PortVision DX automatically detects and identifies DeviceMaster units, if they are in the same network segment.

You can use the link below to download the latest version of PortVision DX.

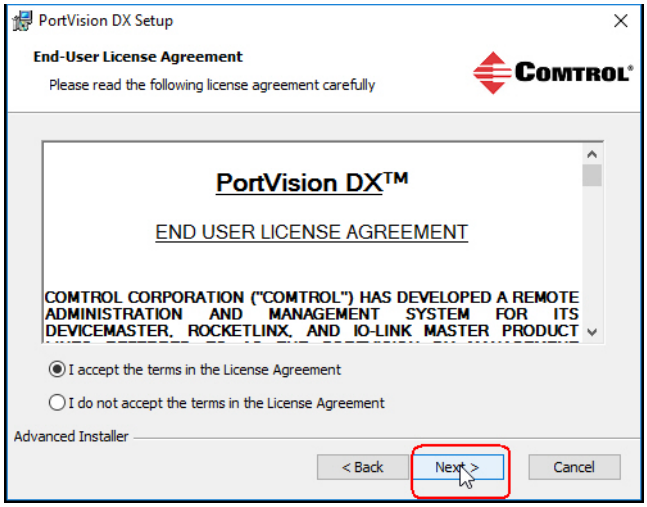
1. Download PortVision DX: http://downloads.comtrol.com/dev_mstr/portvision_dx.

   Note: *Depending on your operating system, you may need to respond to a Security Warning to permit access.*

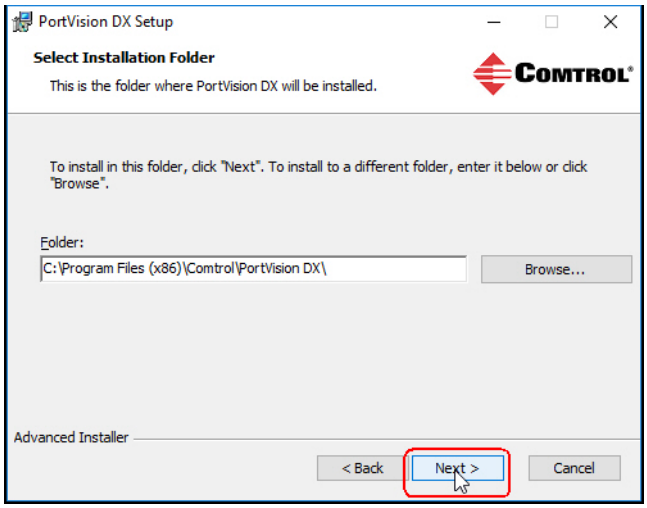
2. Execute the **PortVision_DX[*version*].msi** file.
3. Click **Next** on the *Welcome* screen.



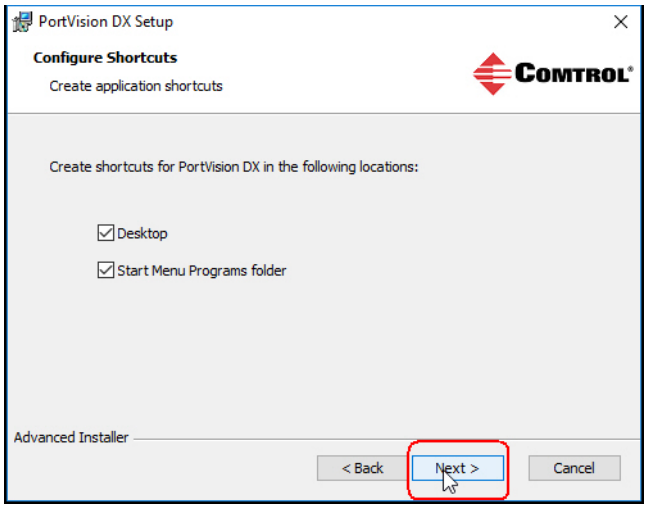
4. Click **I accept the terms in the License Agreement** and **Next**.



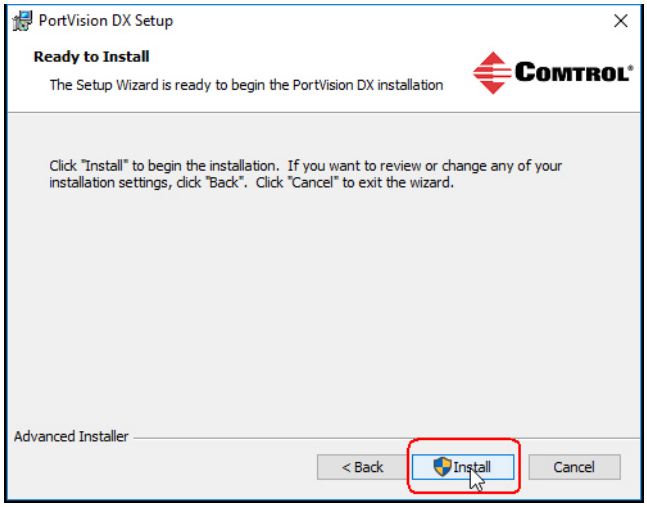
5. Click **Next** or optionally, browse to a different location and then click **Next**.



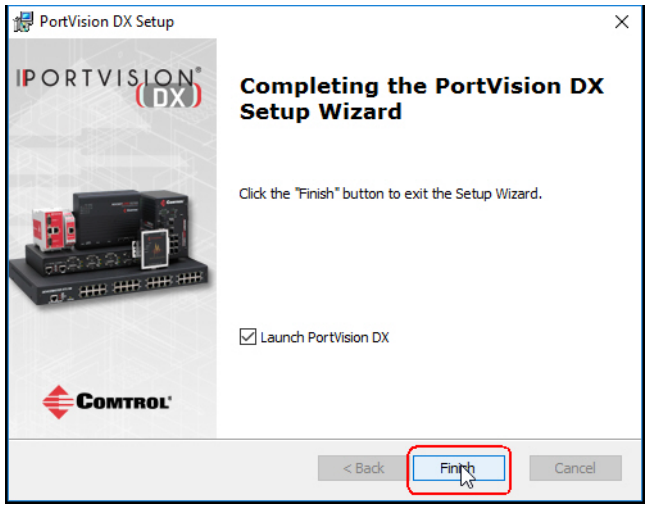
6. Click **Next** to configure the shortcuts.



7. Click **Install**.



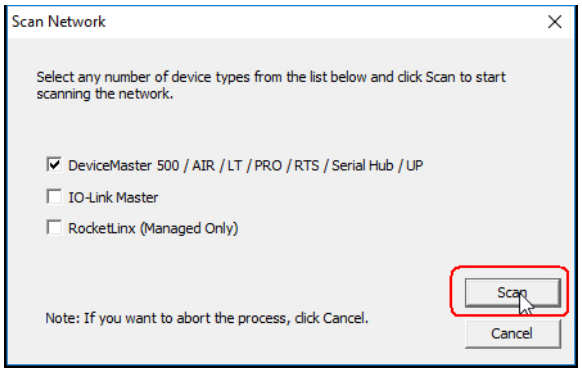
8. Depending on the operating system, you may need to click **Yes** to the *Do you want to allow the following program to install software on this computer?* query.
9. Click **Launch PortVision DX** and **Finish** in the last installation screen.



10. Depending on the operating system, you may need to click **Yes** to the *Do you want to allow the following program to make changes to this computer?* query.

11. Select the Comtrol Ethernet-attached products that you want to locate and then click **Scan**.

    You can save time if you only scan for DeviceMasters.



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

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

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

Configuring the Network Settings

Default Network Settings

IP address:
192.168.250.250

Subnet mask:
255.255.0.0

Gateway address:
192.168.250.1

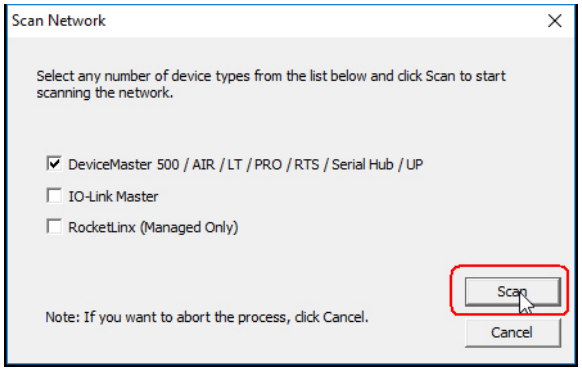
Use the following procedure to change the default network settings on the DeviceMaster for your network.

Note: *Technical Support advises configuring one new DeviceMaster at a time to avoid device driver configuration problems. If you want to configure multiple DeviceMasters using the* **Assign IP to Multiple Devices** *option, see* *Configuring Multiple DeviceMasters Network Addresses on Page 129.*

The following procedure shows how to configure a single DeviceMaster connected to the same network segment as the Windows system. If the DeviceMaster is not on the same physical segment, you can add it manually using Adding a New Device in PortVision DX on Page 129.

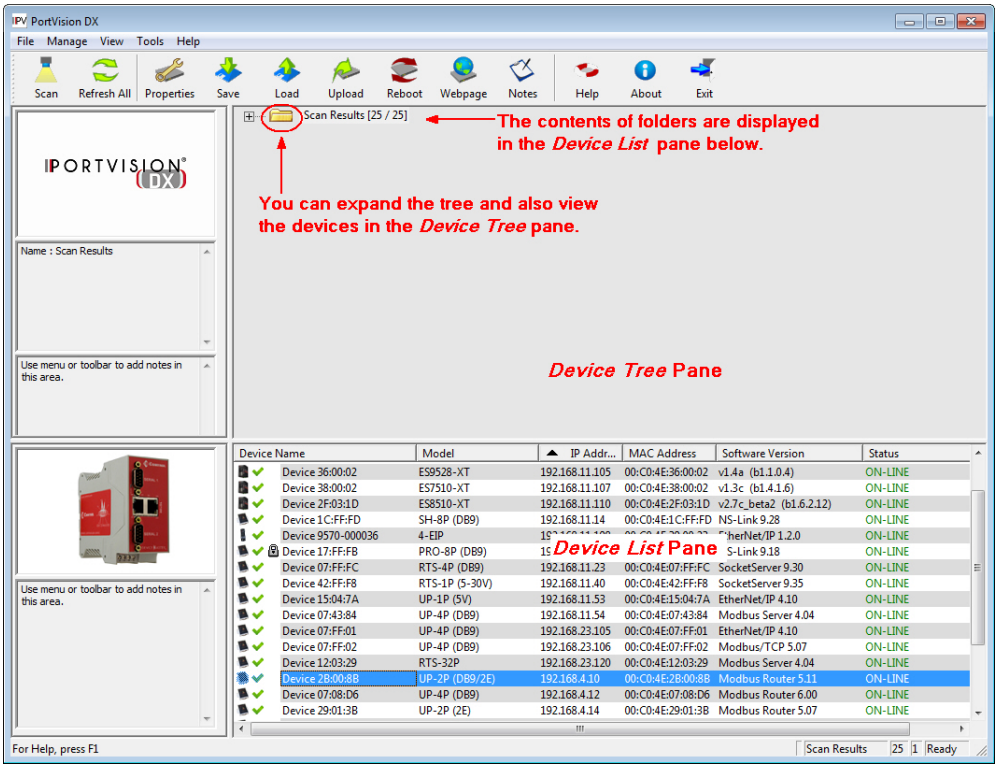
1. If you have not done so, install PortVision DX (*Installing PortVision DX* on Page 24).
2. Start PortVision DX using the **PortVision DX** desktop shortcut or from the **Start** button, click **Programs > Comtrol > PortVision DX > PortVision DX**.
3. Depending on your operating system, you may need to click **Yes** to the *Do you want to allow the following program to make changes to this computer?* query.

4. Click **Scan** to locate the Comtrol Ethernet-attached products including the DeviceMaster on the network.

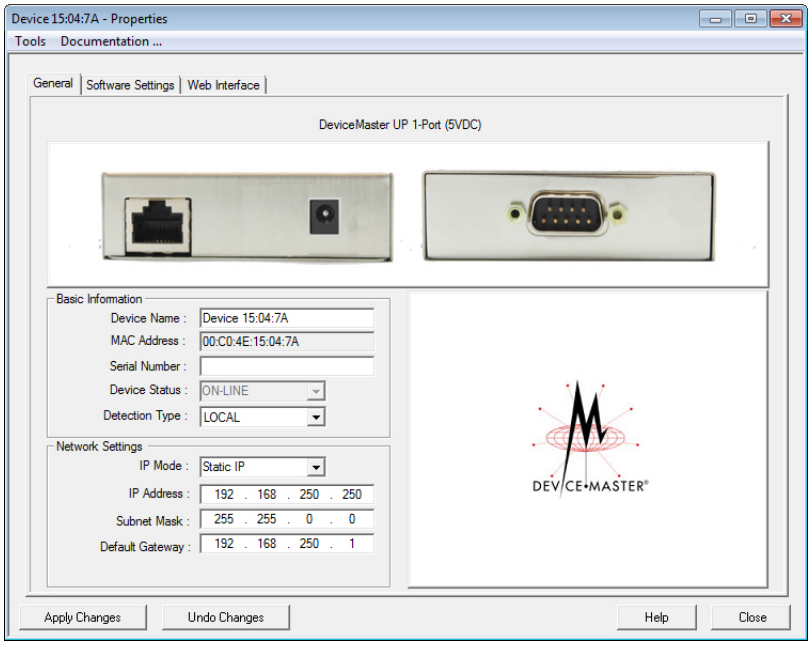


Note: *If you do not have any RocketLinx managed switches or IO-Link Masters, it saves scanning time if you do not scan for them.*

5. Highlight the DeviceMaster for which you want to program network information and open the **Properties** screen using one of these methods.
   - Double-click the DeviceMaster in the *Device Tree* or *Device List* pane.
   - Right-click the DeviceMaster in the *Device Tree* or *Device List* pane and click **Properties** in the popup menu
   - Highlight the DeviceMaster in the *Device Tree* or *Device List* pane and click the **Properties** button.
   - Highlight the DeviceMaster, click the **Manage** menu and then **Properties**.



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



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

7. Optionally, enter the serial number, which is on a label on the DeviceMaster.
8. If necessary, you can change the **Detection Type**.
   - **REMOTE** means that the DeviceMaster is not connected to this segment of the network and it uses IP communications, not MAC communications.
   - **LOCAL** is not a valid selection for PROFINET IO as it requires using an IP address.
9. Change the DeviceMaster network properties as required for your site.

Disable IP	Do not use this option. The DeviceMaster does not support using the MAC addressing scheme.
DHCP IP†	Click this option if you want to use the DeviceMaster with DHCP. Make sure that you provide the MAC address of the DeviceMaster to the network administrator.
Static IP†	Click this option to program a static IP address and type the appropriate IP address, subnet mask, and default gateway values for your site in the provided boxes.
† **PROFINET IO:** *The network address entered here must be compatible with the IP address configuration entered in the TIA Portal project. See* *IP Address Assignment on Page 70* *for information about assigning addresses.*	

Note: *For additional information, open the PortVision DX Help system.*

10. Click **Apply Changes** to update the network information on the DeviceMaster.
11. Click **Close** to exit the *Properties* window.
12. If if applicable, check your firmware version to make sure that it is the latest version using the next subsection, *Checking the Protocol Firmware Version*.
13. If necessary, use *Uploading Protocol-Specific Firmware on the DeviceMaster* on Page 31 to update or load the firmware for your DeviceMaster.

Checking the Protocol Firmware Version

Use PortVision DX to check the firmware version before configuring the ports.

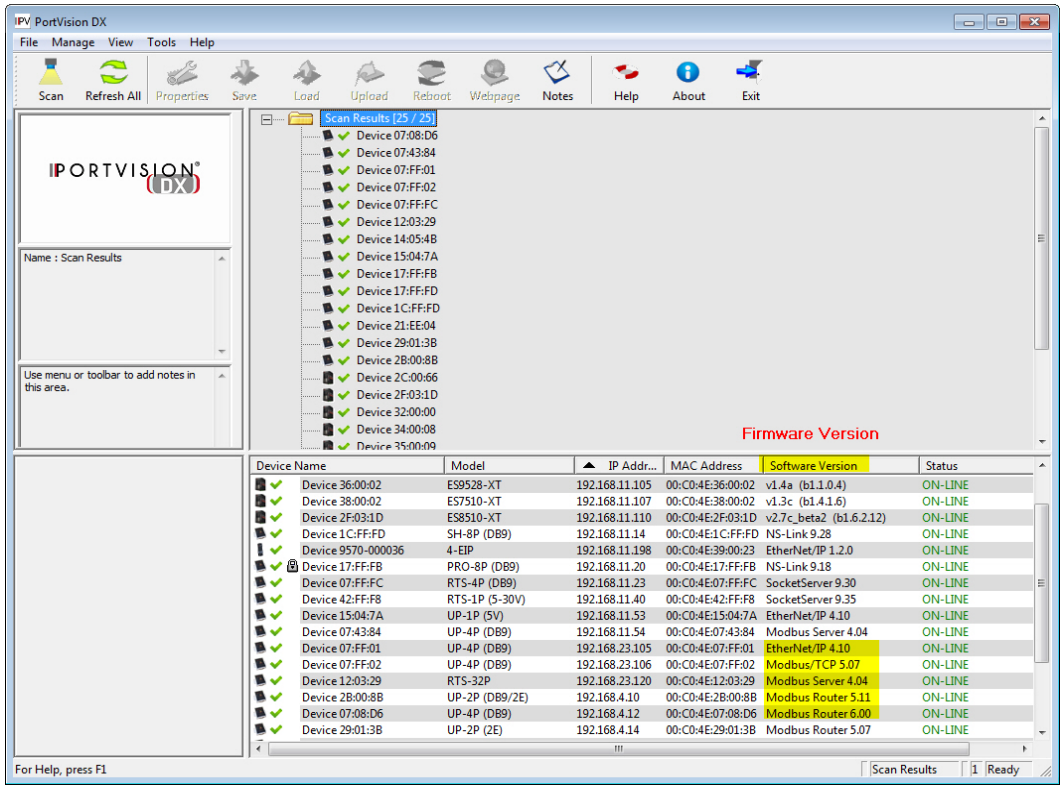
Depending on the model you purchased, the DeviceMaster may or may not have the protocol firmware loaded.

Note: *Models that have a protocol loaded on the DeviceMaster are identified in PortVision DX and the DeviceMaster is labeled accordingly.*

The following procedure shows how to use PortVision DX to check the firmware version on the DeviceMaster and check for the latest files.

Note: *If you have not done so, install PortVision DX (Installing PortVision DX on Page 24).*

1. Start PortVision DX by double-clicking the PortVision DX desktop icon or click **Start > Programs > Comtrol > PortVision DX > PortVision DX**.
2. Examine the *List View* pane to see if or/and what version of the firmware is loaded on the DeviceMaster. If you see SocketServer or NS-Link as the *Software Version*, you must load the appropriate firmware for your protocol.



3. Check the Comtrol FTP site to see if there is a later version available: http://downloads.comtrol.com/html/DM_UP_main.htm.
4. If applicable, download the latest version and go to Step 3 in *Uploading Protocol-Specific Firmware on the DeviceMaster on Page 31*.

Uploading Protocol-Specific Firmware on the DeviceMaster

Some DeviceMaster models come from the factory with SocketServer firmware, which provides an interface to TCP/IP socket mode configuration and services, installed on the device.

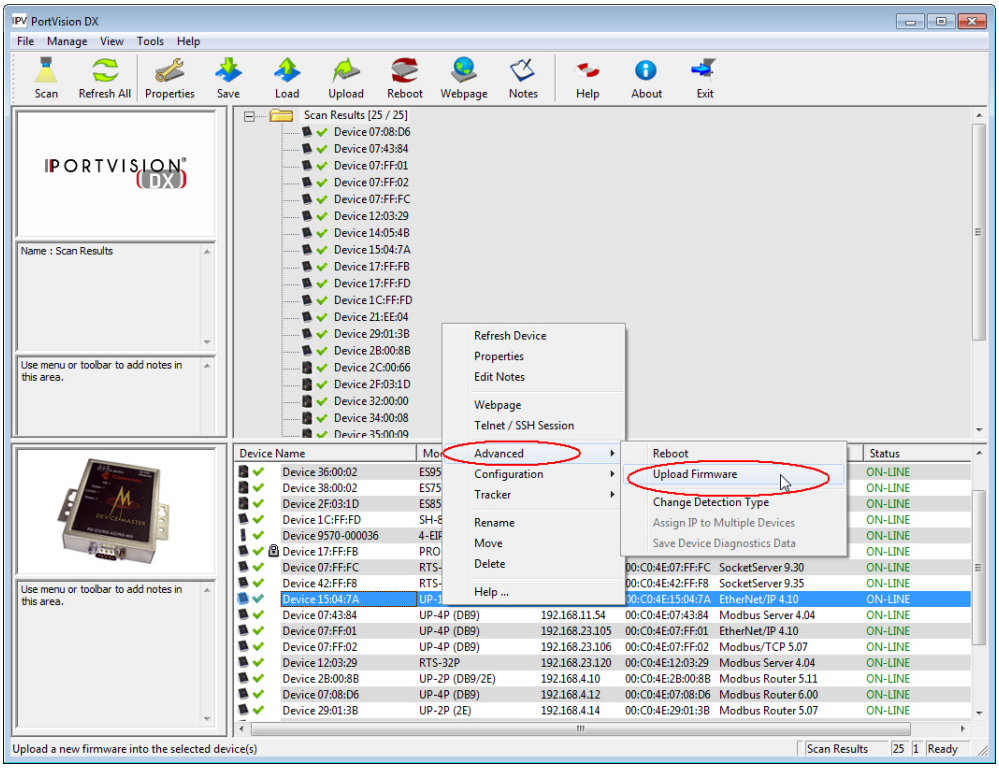
If your DeviceMaster contains SocketServer and you want to configure one of the following environments, you must replace SocketServer with protocol-specific firmware.

You can download the latest firmware and corresponding documentation for your protocol from the download site: http://downloads.comtrol.com/html/DM_UP_Main.htm.

If necessary, use the following procedure to update the firmware on your DeviceMaster for the appropriate protocol. See Locating Software and Documentation on Page 12, if you need to download the **.msi** file for your protocol.

Note: *If you have not done so, install PortVision DX (Installing PortVision DX on Page 24) and install the firmware.msi file.*

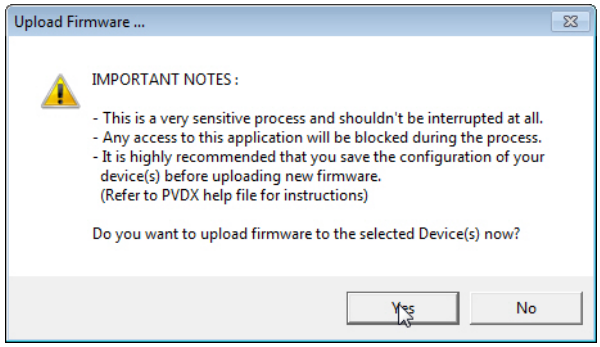
1. Execute the **.msi** file that you downloaded for the firmware.
2. Start PortVision DX by double-clicking the PortVision DX desktop icon or click **Start > Programs > Comtrol > PortVision DX > PortVision DX**.
3. Right-click the device or devices for which you want to upload firmware and click the **Advanced > Upload Firmware** menu option.



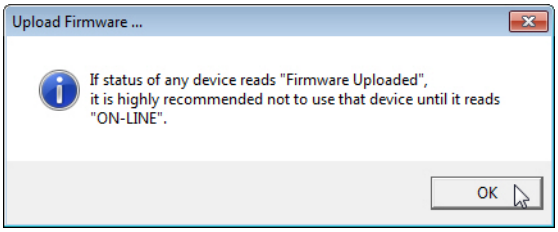
Note: *Optionally, you can highlight a device and use the* **Load** *button.*

4. Browse and select the protocol firmware (**.cmtl**) file and click **Open**.

5. Click **Yes** to upload the firmware.



6. Click **OK** to the advisory message about waiting until the DeviceMaster is online and in the next minute the DeviceMaster unit or units should display **ONLINE** in the **Status** field.



7. Go to the appropriate *Quick Start* or *User Guide* for your protocol for information about configuring the serial port or ports using the web page and programming your PLCs. See Locating Software and Documentation on Page 12 to locate the document for your protocol.

   If you are planning on installing multiple DeviceMasters, you may want to use the *Save/Load Configuration File* feature in PortVision DX.

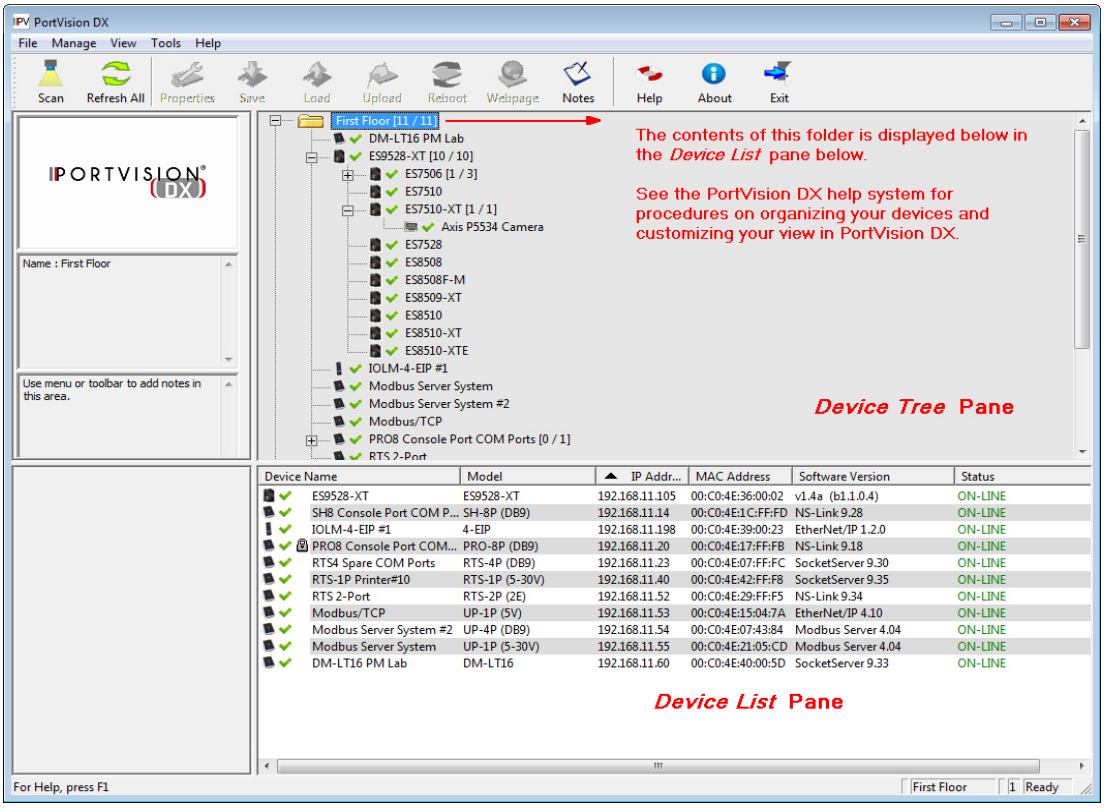
   A configuration file can contain network settings and protocol settings. Refer to the PortVision DX help system for information about saving and loading configuration files.

8. After configuring the serial port characteristics and preparing your PLC programs, you can use the next section in this guide, to attach the serial device or devices.

Customizing PortVision DX

You can customize how PortVision DX displays the devices. You can even create sessions tailored for specific audiences. You can also add shortcuts to other applications using **Tools > Applications > Customize** feature.

The following illustrates how you can customize your view.



See the PortVision DX Help system for detailed information about modifying the view. For example, the above screen shot illustrates devices layered in folders.

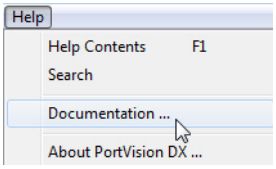
Accessing DeviceMaster Documentation from PortVision DX

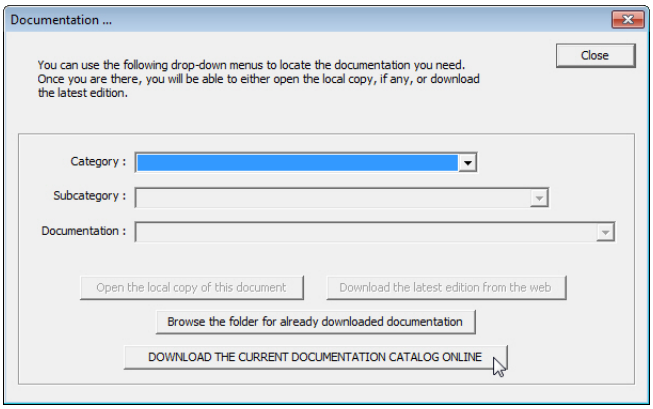
You can use this procedure in PortVision DX to download and open the previously downloaded documents for the DeviceMaster. You can also check to see if you have the latest version of the documentation using PortVision DX.

How to Download Documentation

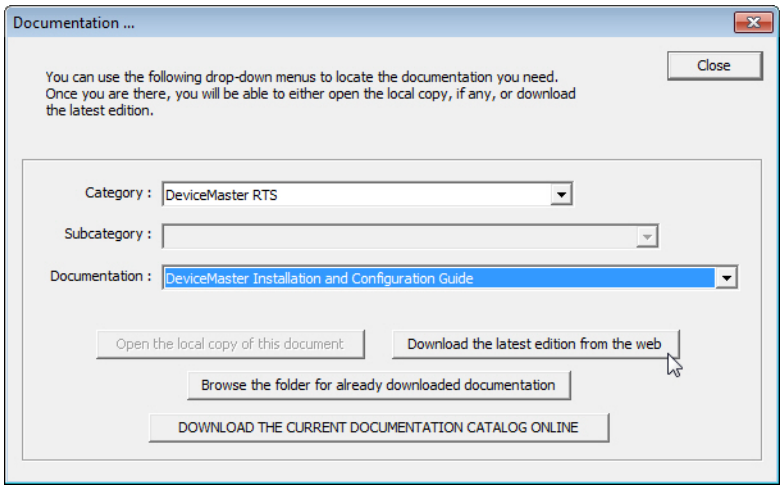
Use this procedure to initially download a document or documents.

1. If necessary, open **PortVision DX > Start/Programs > Comtrol > PortVision DX > PortVision DX** or use the desktop shortcut.
2. Click **Help > Documentation**.
3. Optionally, click the **DOWNLOAD THE CURRENT DOCUMENTATION CATALOG ONLINE** button to make sure that the latest documentation is available to PortVision DX.





4. Select the product **Category** from the drop list.
5. Select the document you want to download from the **Documentation** drop list.
6. Click the **Download the latest edition from the web** button.



Note: *It may take a few minutes to download, depending on your connection speed. The document opens automatically after it has downloaded.*

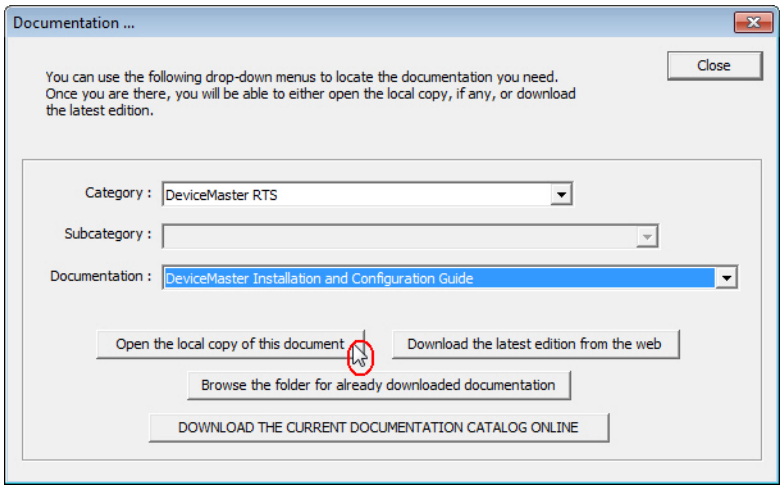
7. Click **Close** if you have downloaded all of the documents that you wanted.

How to Open Previously Downloaded Documents

Use the following procedure to access previously downloaded documents in PortVision DX.

Note: *Optionally, you can browse to the* **Program Files (x86) > Comtrol > PortVision DX > Docs** *subdirectory and open the document.*

1. If necessary, open **PortVision DX > Start/Programs > Comtrol > PortVision DX > PortVision DX** or use the desktop shortcut.
2. Click **Help > Documentation**.
3. Click the **Open the local copy of the document** button to view the document.



Note: *If the document fails to open, it may be that your browser has been disabled. You can still access the document by clicking the* **Browse the folder for already downloaded documentation** *button and opening the document with your custom browser.*

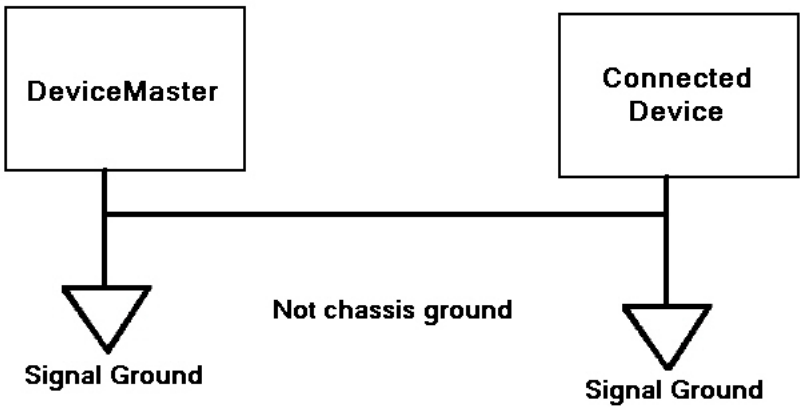
4. Click **Close** in the *Documentation...* popup, unless you want to open or download other documents.

Connecting Serial Devices

This section discusses connecting your serial devices to the DeviceMaster UP. It also provides you with information to build serial cables and loopback connectors to test the serial ports.

Caution

Make sure that you have configured the ports for the correct communications mode before connecting any devices. The default mode is RS-232. There is a remote possibility that connecting a serial device for the wrong mode could damage the serial device.



DB9 Connectors

This subsection provides the following information:

- Connector pin assignments (below)
- *DB9 Null-Modem Cables (RS-232)* on Page 39
- *DB9 Null-Modem Cables (RS-422)* on Page 39
- *DB9 Straight-Through Cables (RS-232/485)* on Page 39
- *DB9 Loopback Plugs* on Page 40
- *Connecting DB9 Serial Devices* on Page 40

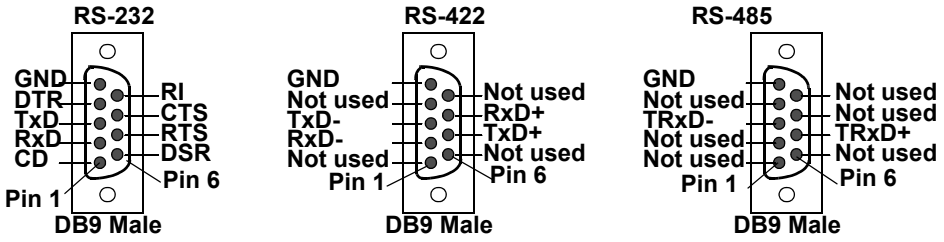
DB9 Connector Pinouts

Pin	RS-232	RS-422 *RS-485 Full-Duplex (Master/Slave)†*	RS-485 Half-Duplex
1	DCD	Not used	Not used
2	RxD	RxD-	Not used
3	TxD	TxD-	TRxD-
4	DTR	Not used	Not used
5	GND	GND	GND
6	DSR	Not used	Not used
7	RTS	TxD+	TRxD+
8	CTS	RxD+	Not used
9	RI	Not used	Not Used

† *The following models support RS-485 full-duplex:*

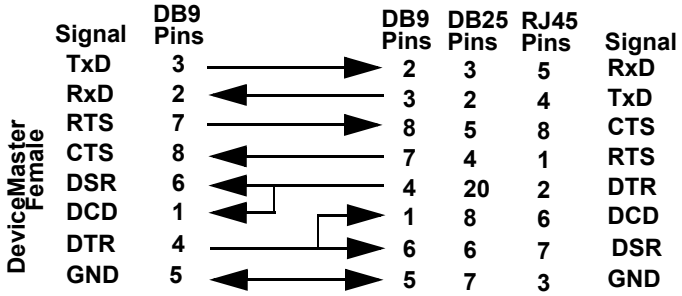
- *1-Port DIN rail models*
- *2-Port DIN rail models*
- *4-Port DIN rail models*

Refer to the hardware manufacturer's installation documentation if you need help with connector pinouts or cabling for the serial device. This illustrates the DB9 connector signals.



DB9 Null-Modem Cables (RS-232)

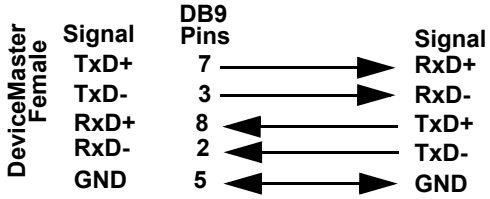
Use the following figure if you need to build an RS-232 null-modem cable. A null-modem cable is required for connecting DTE devices.



Note: *You may want to purchase or build a straight-through cable and purchase a null-modem adapter.*

DB9 Null-Modem Cables (RS-422)

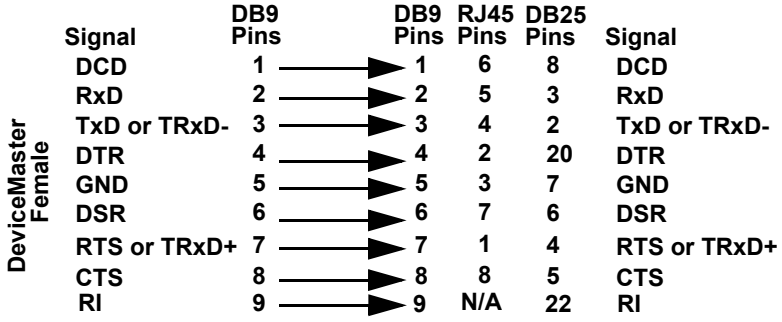
Use the following figure if you need to build an RS-422 null-modem cable.



Note: *RS-422 pinouts are not standardized. Each peripheral manufacturer uses different pinouts. Refer to the peripheral documentation to determine the pinouts for the signals above.*

DB9 Straight-Through Cables (RS-232/485)

Use the following figure if you need to build an RS-232 or RS-485 straight-through cable. Straight-through cables are used to connect modems and other DCE devices. For example, a straight-through cable can be used to connect COM2 to a modem.

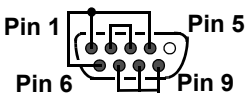


DB9 Loopback Plugs

Loopback connectors are DB9 female serial port plugs with pins wired together that are used in conjunction with application software to test serial ports. The DeviceMaster UP is shipped with a a single loopback plug (RS-232/422).

Wire the following pins together to build additional plugs or replace a missing RS-232 loopback plug:

- Pins 1 to 4 to 6
- Pins 2 to 3
- Pins 7 to 8 to 9

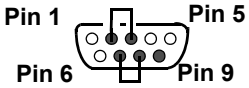


RS-232 Only (Back View)

The RS-232 loopback plug also works for RS-422.

Wire the following pins together for an RS-422 loopback plug:

- Pins 2 to 3
- Pins 7 to 8



RS-422 Only (Back View)

Connecting DB9 Serial Devices

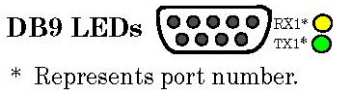
You can use this information to connect serial devices to DB9 connectors.

1. Connect your serial devices to the appropriate serial port on the DeviceMaster UP using the appropriate cable.

   Note: *Refer to the hardware manufacturer's installation documentation if you need help with connector pinouts or cabling for the peripheral device.*

2. DeviceMaster UP 4-port: verify that the devices are communicating properly.

   Note: *DeviceMaster UP 1-port, 2-port models, and the 4-port DIN models do not have TX/RX LEDs.*

   The RX (yellow) and TX (green) LEDs function accordingly when the cable is attached properly to a serial device.

   - After power cycling the DeviceMaster UP (appropriate models), the RX/TX LEDs are off.
   - The LEDs do not function as described until the port has been opened by an application.

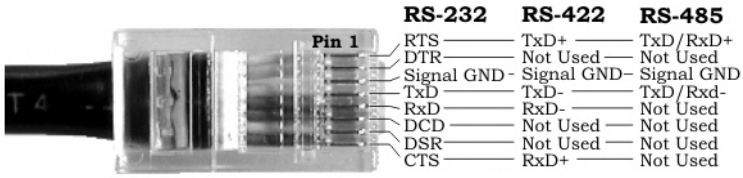
3. You can refer to *Network and Device LEDs* on Page 159 for information about the remaining LEDs.

RJ45 Connectors

This subsection provides the following information:

- Connector pin assignments (below)
- *RJ45 Null-Modem Cables (RS-232)*
- *RJ45 Null-Modem Cables (RS-422)* on Page 42
- *RJ45 Straight-Through Cables (RS-232/485)* on Page 42
- *RJ45 Loopback Plugs* on Page 42
- *RJ45 RS-485 Test Cable* on Page 42
- *Connecting RJ45 Devices* on Page 43

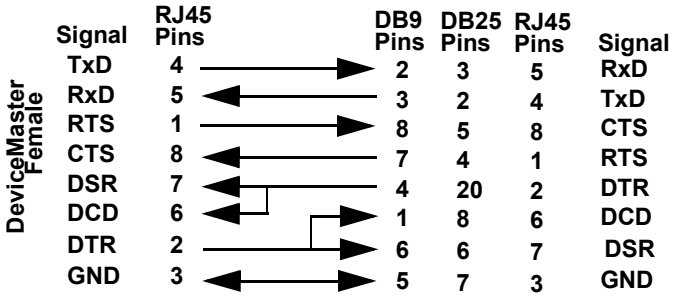
You can build your own null-modem or straight-through RJ45 serial cables if you are using the DB9 to RJ45 adapters using the following subsections.



Pin	RS-232	RS-422	RS-485
1	RTS	TxD+	TRxD+
2	DTR	Not used	Not used
3	Signal GND	Signal GND	Signal GND
4	TxD	TxD-	TRxD-
5	RxD	RxD-	Not used
6	DCD	Not used	Not used
7	DSR	Not used	Not used
8	CTS	RxD+	Not used

RJ45 Null-Modem Cables (RS-232)

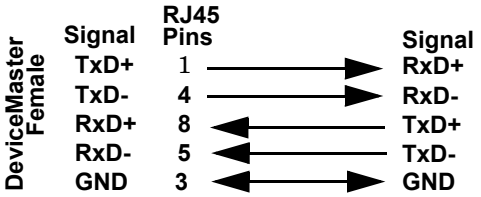
Use the following figure if you need to build an RS-232 null-modem cable. A null-modem cable is required for connecting DTE devices.



Note: *You may want to purchase or build a straight-through cable and purchase a null-modem adapter. For example, a null-modem cable can be used to connect COM2 of one PC to COM2 of another PC.*

RJ45 Null-Modem Cables (RS-422)

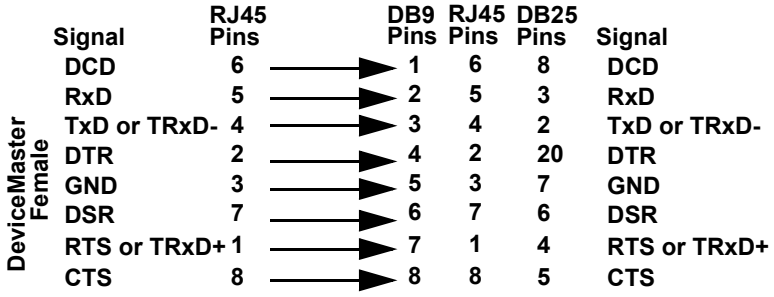
Use the following figure if you need to build an RS-422 null-modem RJ45 cable. A null-modem cable is required for connecting DTE devices.



Note: *RS-422 pinouts are not standardized. Each peripheral manufacturer uses different pinouts. Please refer to the documentation for the peripheral to determine the pinouts for the signals above.*

RJ45 Straight-Through Cables (RS-232/485)

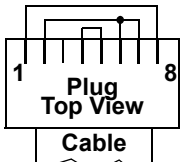
Use the following figure if you need to build an RS-232 or RS-485 straight-through cable. Straight-through cables are used to connect modems and other DCE devices. For example, a straight-through cable can be used to connect COM2 of one PC to COM2 to a modem.



RJ45 Loopback Plugs

Loopback connectors are RJ45 serial port plugs with pins wired together that are used in conjunction with application software to test serial ports. The DeviceMaster UP is shipped with a a single loopback plug (RS-232/422).

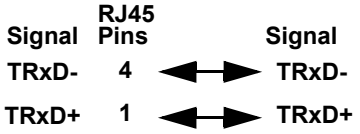
- Pins 4 to 5
- Pins 1 to 8
- Pins 2 to 6 to 7



The RS-232 loopback plug also works for RS-422.

RJ45 RS-485 Test Cable

You can use a straight-through cable as illustrated previously, or build your own cable.



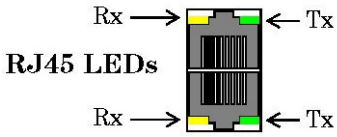
Note: *RS-422 pinouts are not standardized. Each peripheral manufacturer uses different pinouts. Please refer to the documentation for the peripheral to determine the pinouts for the signals above.*

Connecting RJ45 Devices

You can use this information to connect serial devices to RJ45 connectors.

1. Connect your serial devices to the appropriate serial port on the DeviceMaster UP using the appropriate cable.

   Note: *Refer to the hardware manufacturer's installation documentation if you need help with connector pinouts or cabling for the peripheral device.*



2. If the DeviceMaster UP has RX/TX LEDs, verify that the devices are communicating properly.

   The RX (yellow) and TX (green) LEDs function accordingly when the cable is attached properly to a serial device.

   - After power cycling the DeviceMaster UP, the RX/TX LEDs are off.
   - The LEDs do not function as described until the port has been opened by an application.

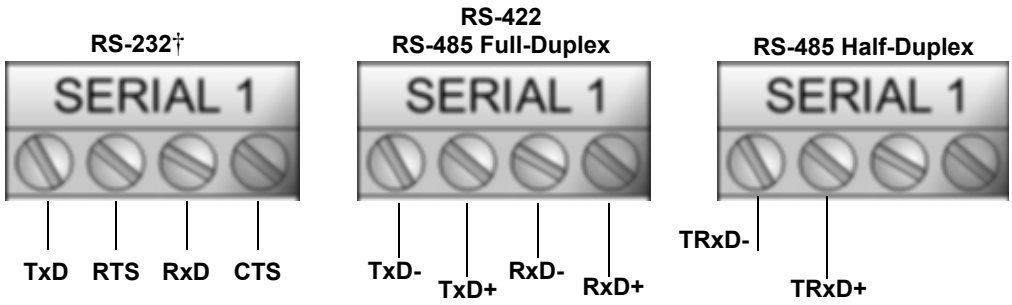
3. You can refer to *Network and Device LEDs* on Page 159 for information about the remaining LEDs.

Four Screw Terminals

This subsection discusses the following topics for the DeviceMaster with 4 serial screw terminals. See *Eight Screw Terminals* on Page 47 if the DeviceMaster has eight serial terminals.

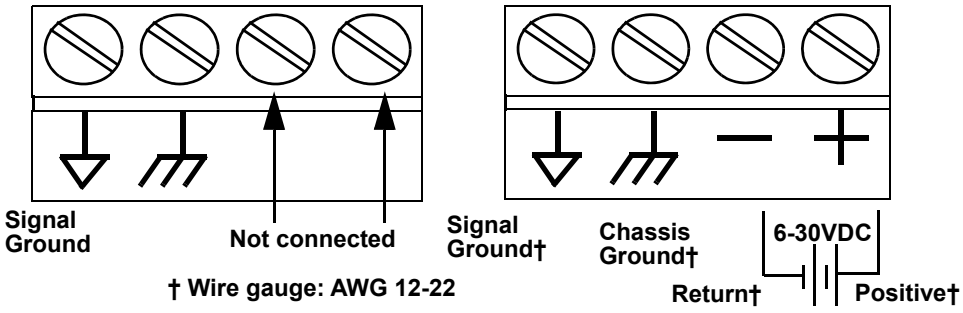
Serial Terminal (4) Connectors

Use the following table or drawings for signal information. The signals for **SERIAL2** are the same as **SERIAL1**.



† RS-232 ground must be connected to the appropriate signal ground

RS-232: Connecting the Ground

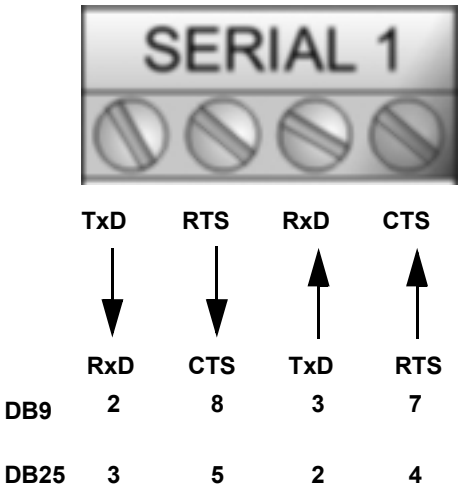


RS-232†	TxD	RTS	RxD	CTS
RS-422/RS-485 Full-Duplex	TxD-	TxD+	RxD-	RxD+
RS-485 Half-Duplex	TRxD-	TRxD+		
† RS-232 ground must be connected to the signal ground terminal.				

Serial Terminal (4) Null-Modem Cables (RS-232)

An RS-232 null-modem cable is required for connecting DTE devices.

RS-232 Null-Modem Cable

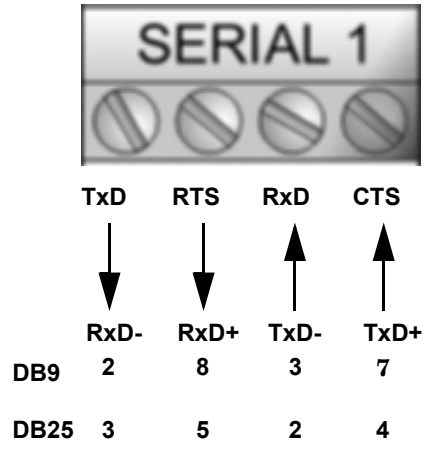


Serial Terminal (4) Null-Modem Cables (RS-422)

An RS-422 null-modem cable is required for connecting DTE devices.

Note: *RS-422 pinouts are not standardized. Each peripheral manufacturer uses different pinouts. Please refer to the documentation for the peripheral to determine the pinouts for the signals above.*

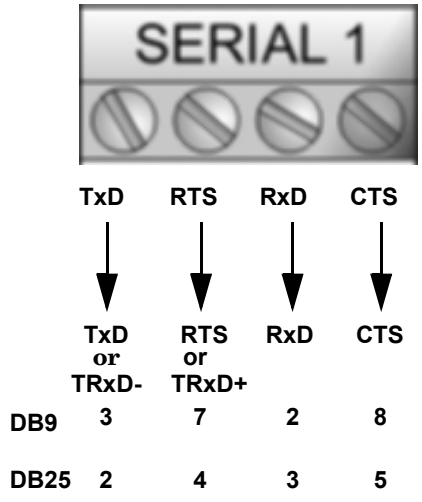
RS-422 Null-Modem Cable



Serial Terminal (4) Straight-Through Cables (RS-232/485)

RS-232 or RS-485 straight-through cables are used to connect modems and other DCE devices.

RS-232/422 Straight-Through Cable

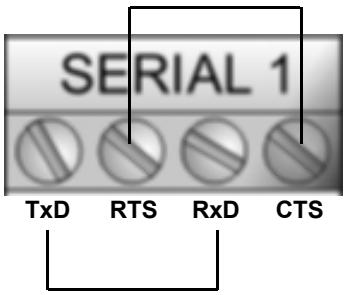


Serial Terminal (4) Loopback Signals

Use this drawing to wire a loopback, which is used in conjunction with application software to test serial ports.

Wire the terminals together to create a loopback.

- TxD to RxD
- RTS to CTS



Connecting Serial Devices

Use the following information to connect the DeviceMaster with serial terminals.

1. Connect your serial devices to the appropriate serial port on the DeviceMaster using the appropriate cable. You can build your own cables or loopbacks using the appropriate discussions.

Note: *Refer to the hardware manufacturer's installation documentation if you need help with connector pinouts or cabling for the serial device.*

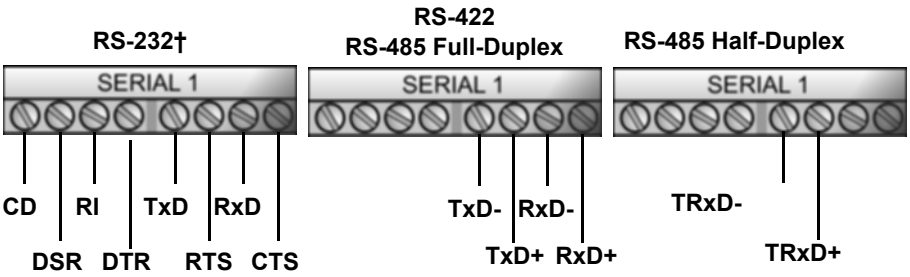
2. You can refer to *Network and Device LEDs* on Page 159 for information about the LEDs.

Eight Screw Terminals

This subsection discusses the following topics for the DeviceMaster with 8 serial screw terminals.

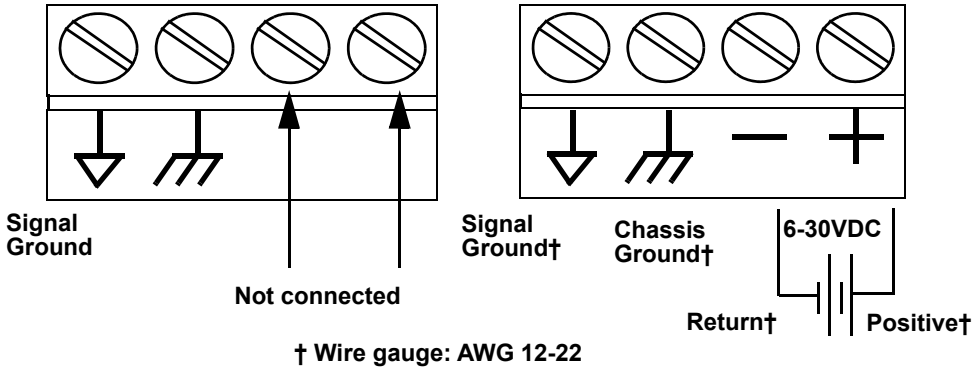
Screw Terminal (8) Connectors

Use the following drawings or table for signal information. The signals for **SERIAL2** are the same as **SERIAL1**.



† *RS-232 ground must be connected to the signal ground terminal.*

RS-232: Connecting the Ground



† Wire gauge: AWG 12-22

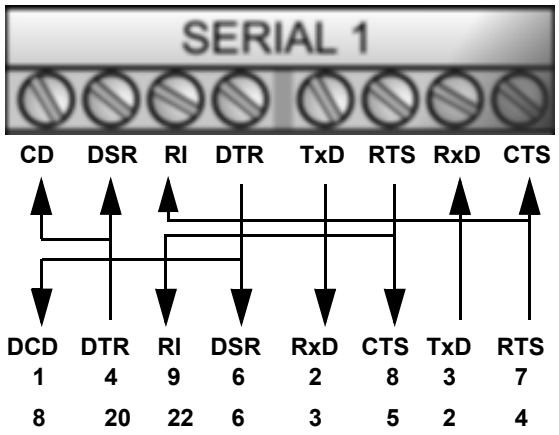
RS-232	CD	DSR	RI	DTR	TxD	RTS	RxD	CTS
RS-422/RS-485 Full-Duplex	N/A	N/A	N/A	N/A	TxD-	TxD+	RxD-	RxD+
RS-485 Half-Duplex	N/A	N/A	N/A	N/A	TRxD-	TRxD+	N/A	N/A

† *RS-232 ground must be connected to the appropriate signal ground terminal.*

Screw Terminal (8) Null-Modem Cables (RS-232)

An RS-232 null-modem cable is required for connecting DTE devices.

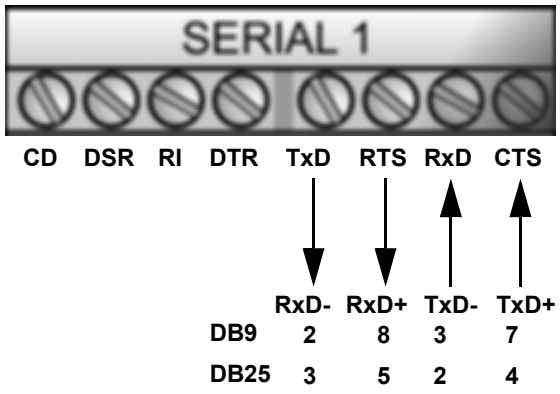
RS-232 Null-Modem Cable



Screw Terminal (8) Null-Modem Cables (RS-422)

An RS-422 null-modem cable is required for connecting DTE devices.

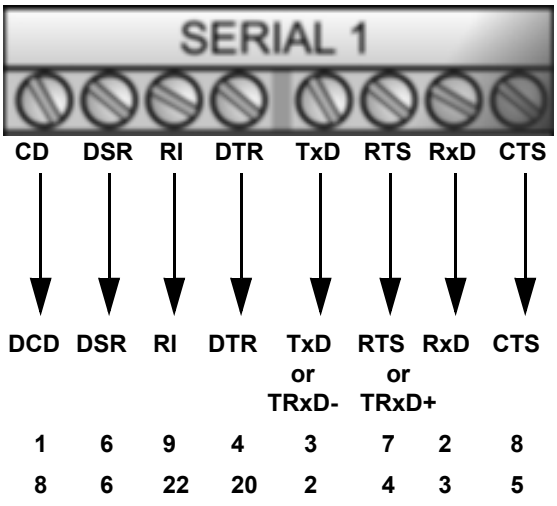
RS-422 Null-Modem Cable



Screw Terminal (8) Straight-Through Cables (RS-232/485)

RS-232 or RS-485 straight-through cables are used to connect modems and other DCE devices.

RS-232/485 Straight-Through Cable

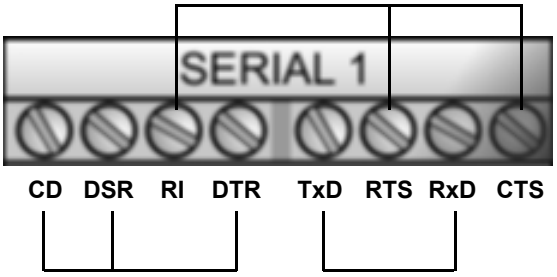


Screw Terminal (8) Loopback Signals

Use the drawing below to wire a loopback, which is used in conjunction with application software to test serial ports.

Wire the terminals together to create a loopback.

- TxD to RxD
- RTS to CTS to RI
- DTR to CD to DSR



Connecting Serial Devices

Use the following information to connect the DeviceMaster with 8 serial screw terminals.

1. Connect your serial devices to the appropriate serial port on the DeviceMaster using the appropriate cable.

Note: *Refer to the hardware manufacturer's installation documentation if you need help with connector pinouts or cabling for the serial device.*

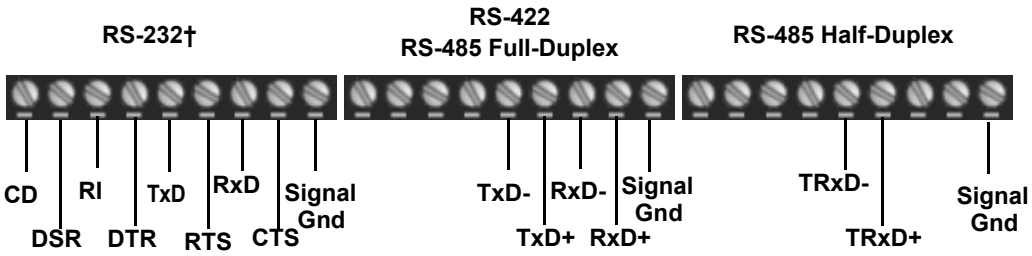
2. You can refer to *Network and Device LEDs* on Page 159 for information about the LEDs.

Nine Screw Terminals

This subsection discusses the following topics for the DeviceMaster with 9 serial screw terminals.

Screw Terminal Connectors (9)

Use the following table or drawings for signal information.

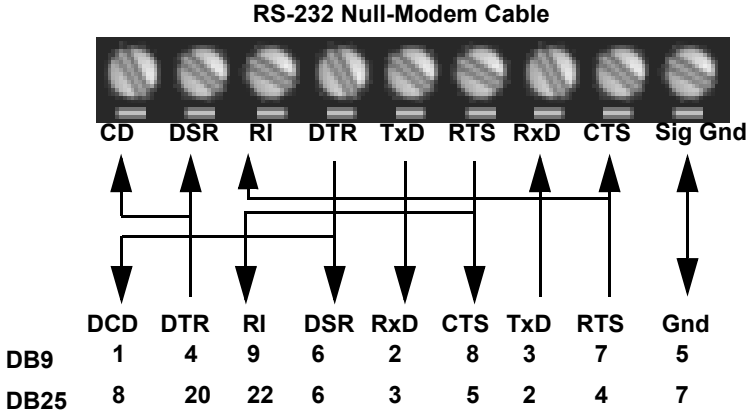


† *RS-232 ground must be connected to the signal ground terminal.*

RS-232	CD	DSR	RI	DTR	TxD	RTS	RxD	CTS	Sig Gnd
RS-422/RS-485 Full-Duplex	N/A	N/A	N/A	N/A	TxD-	TxD+	RxD-	RxD+	Sig Gnd
RS-485 Half-Duplex	N/A	N/A	N/A	N/A	TRxD-	TRxD+	N/A	N/A	Sig Gnd
† RS-232 ground must be connected to the signal ground terminal.									

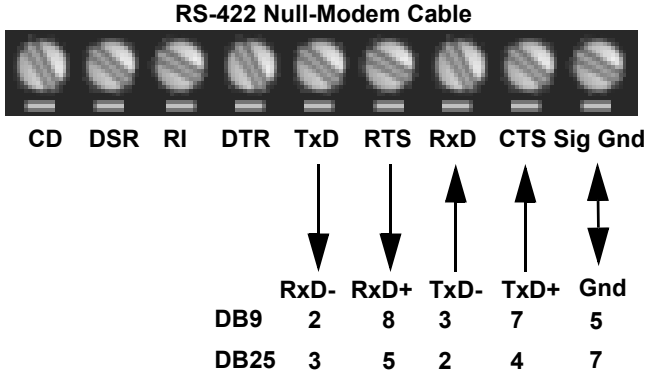
Screw Terminal (9) Null-Modem RS-232 Cables

An RS-232 null-modem cable is required for connecting DTE devices.



Screw Terminal (9) Null-Modem RS-422 Cables

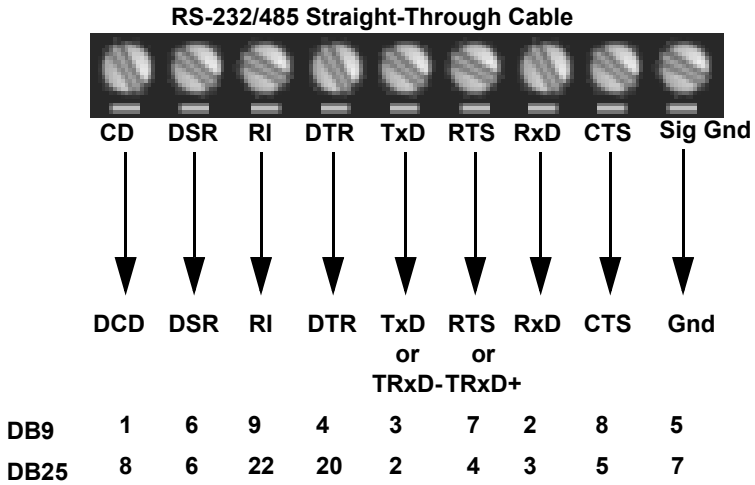
An RS-422 null-modem cable is required for connecting DTE devices.



Note: *RS-422 pinouts are not standardized. Each peripheral manufacturer uses different pinouts. Please refer to the documentation for the peripheral to determine the pinouts for the signals above.*

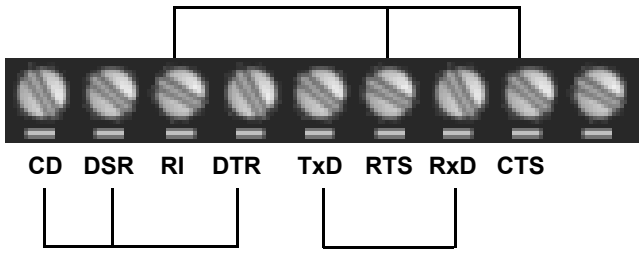
Screw Terminal (9) RS-232/485 Straight-Through Cables

RS-232 or RS-485 straight-through cables are used to connect modems and other DCE devices.



Screw Terminal (9) Loopback Signals

Use this drawing to wire a loopback, which is used in conjunction with application software to test serial ports.



Wire the terminals together to create a loopback.

- TxD to RxD
- RTS to CTS to RI
- DTR to CD to DSR

Connecting Serial Devices

Use the following information to connect the DeviceMaster with serial terminals.

1. Connect your serial devices to the appropriate serial port on the DeviceMaster using the appropriate cable. You can build your own cables or loopbacks using the appropriate discussions.

Note: *Refer to the hardware manufacturer's installation documentation if you need help with connector pinouts or cabling for the serial device.*

2. You can refer to *Network and Device LEDs* on Page 159 for information about the LEDs.

Configuring a Serial Port

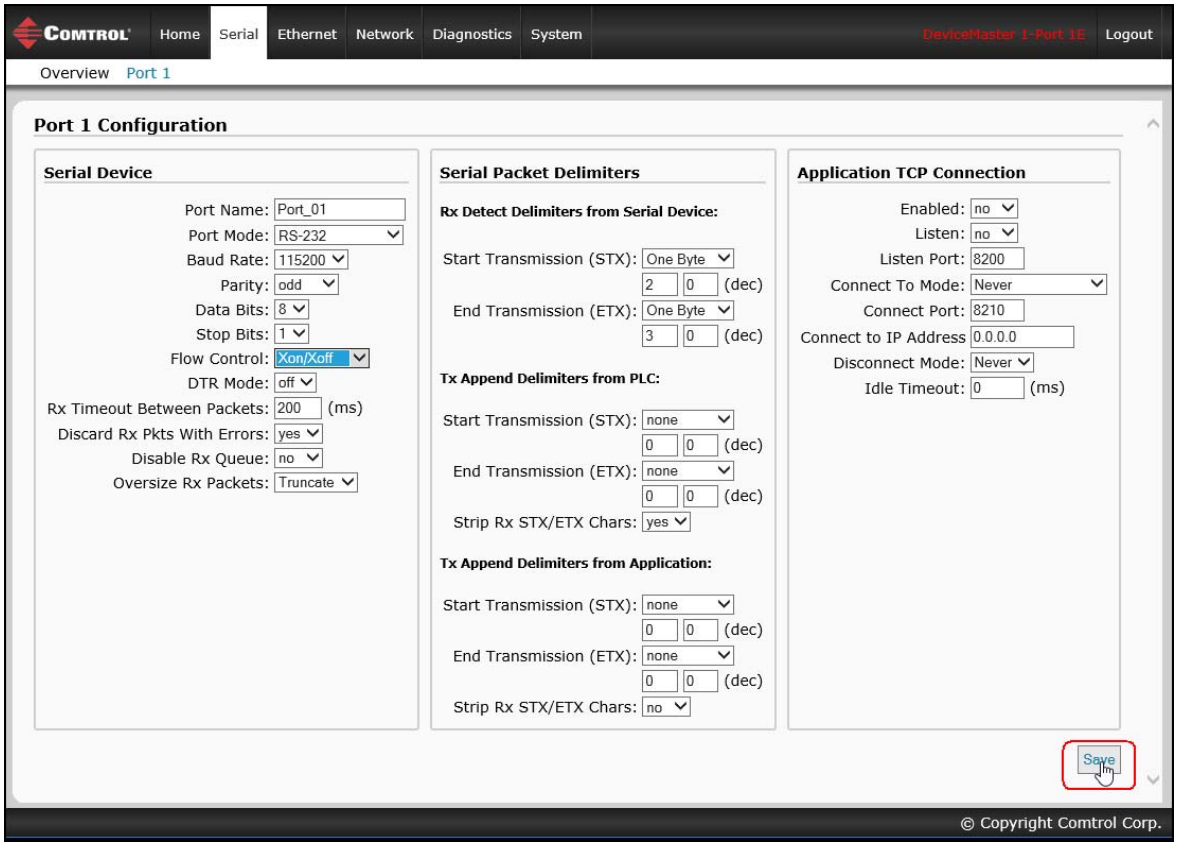
Use the following procedure to configure the serial ports.

1. Open the DeviceMaster web page using your browser.

   Note: *The default IP address is 192.168.250.250. You can use PortVision DX to program your IP address, if necessary (* *Preparing the DeviceMaster for Configuration, Page 23**).*

2. Click **Serial** and the **Serial Port Overview** page displays.

3. Click the port number that you want to configure and the corresponding port page displays.



4. Configure the serial port to match the serial device that you plan on attaching to that serial port and click **Save** when you are done. Refer to the following tables if you need information about the options on the **Port Configuration** page.
   - *Serial Port Configuration - Serial Device Options* on Page 54
   - *Serial Port Configuration - Serial Packet* on Page 56
   - *Serial Port Configuration - Application TCP Connection* on Page 59

Serial Port Configuration - Serial Device Options	
Port 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 are discarded. Up to 80 character ASCII string. The default is blank.
Port 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 Rate	Select a baud rate from the list. The baud rate that you select determines how fast information is transferred through a port.

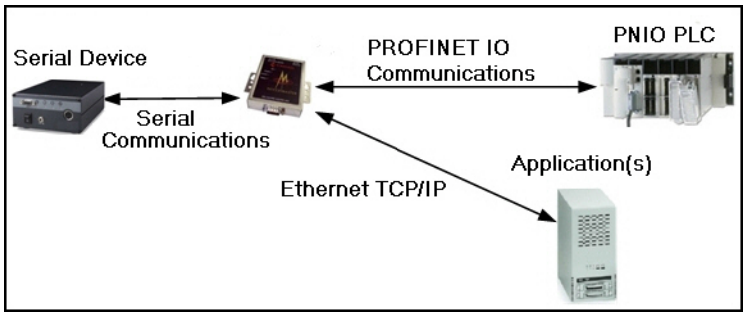
Serial Port Configuration - Serial Device Options (Continued)	
Parity	Select a method for error checking. • **None** - When the parity is set to none, there is no parity bit, and DeviceMaster does not perform parity checking. • **Odd** - Indicates that the sum of all the 1-bits in the byte plus the parity 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 Control	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.
RS-485 Terminator Resistor	This option displays on supported models. Select the state of the terminator resistor in RS-485 mode. The terminator resistor is available on the DIN rail models. • **on** - Enable RS-485 Terminator Resistor • **off** - Disable RS-485 Terminator Resistor
DTR Mode	Select the state of Data Terminal Ready (DTR). • **on** - Enables DTR. • **off** - Disables DTR.
Rx Timeout Between Packets	Specifies the following information, once the start of a packet is received: • How long the DeviceMaster 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**.
Discard Rx Pkts With Errors	By default, this box is checked and the DeviceMaster discards serial packets with errors. Clear the check box when you need to receive a serial packet with errors to troubleshoot an issue.
Disable Rx Queue	• **no** - Received packets are stored in a queue and are sent to the PLC one packet at each IO update cycle. • **yes** - The receiving queue is disabled. Only the last received packet during an IO update cycle is sent to the PLC.

Serial Port Configuration - Serial Device Options (Continued)	
Oversize Rx Packets	• **Truncate** - Oversize packets are truncated and sent to IO controller as cyclic IO data. • **SaveRec** - Oversize packets are truncated and sent to IO controller as cyclic IO data. The original packets are also saved as acyclic record data. • **Drop** - Oversize packets are dropped.

Serial Port Configuration - Serial Packet	
Rx Detect Delimiters from Serial Device **Start of Transmission (STX)**	When enabled, the DeviceMaster 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 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 finds an STX byte it collects the data. If the first byte is not the STX byte, it discards the byte. The DeviceMaster continues to discard the bytes until it finds an STX byte. • **two bytes** - Scans serial data for two STX bytes and when the DeviceMaster finds two STX bytes it collects the data. If the STX bytes cannot be found, it discards the bytes. The DeviceMaster 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 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 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.

Serial Port Configuration - Serial Packet (Continued)	
Rx Detect Delimiters from Serial Device **End of Transmission (ETX)**	When enabled, the DeviceMaster 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 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 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 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.
Tx Append Delimiters from PLC **Start Transmission (STX)**	When enabled, the DeviceMaster 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.
Tx Append Delimiters from PLC **End Transmission (ETX)**	When enabled, the DeviceMaster 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.

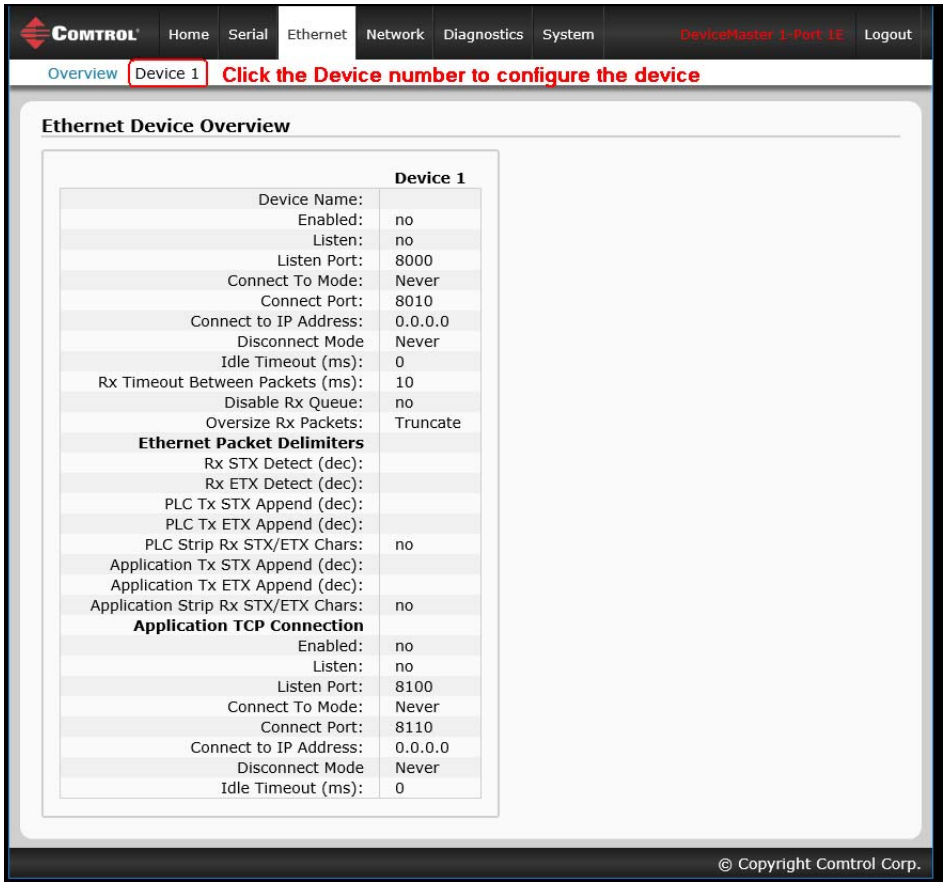
Serial Port Configuration - Serial Packet (Continued)	
Tx Append Delimiters from PLC **Strip Rx STX/ETX Chars**	When you select this check box, the DeviceMaster strips STX/ETX characters from received serial packets. Clear the check box when you do not want the DeviceMaster to strip STX/ETX characters from received serial packets. Serial Packets sent from the PLC to the DeviceMaster (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.
Tx Append Delimiters from Application **Start Transmission (STX)**	When enabled, the DeviceMaster 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.
Tx Append Delimiters from Application **End Transmission (ETX)**	When enabled, the DeviceMaster 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.
Tx Append Delimiters from Application **Strip Rx STX/ETX Chars**	When you select this check box, the DeviceMaster strips STX/ETX characters from received serial packets. Clear the check box when you do not want the DeviceMaster to strip STX/ETX characters from received serial packets. Serial Packets sent from the application to the DeviceMaster (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.

Serial Port Configuration - Application TCP Connection	
Enabled	This setting enables/disables the application TCP connection for a serial port. Enabling this function allows a TCP application to be connected to a serial device. If both the PLC and application are connected to the device, both can transmit to and receive data from the serial device. However, the PLC and application cannot communicate directly to each other. 
Listen	Enabling this setting allows the application to connect to the DeviceMaster via an Ethernet TCP/IP socket. • **No** - Disables listening; the DeviceMaster does not accept connection attempts. • **Yes** - Enables listening; the DeviceMaster accepts connection attempts from the specified **Listen Port**.
Listen Port	This is the socket port number on the DeviceMaster the application connects to if the **Device Listen** is enabled.
Connect To Mode	This setting specifies if and how the DeviceMaster attempts to connect to the device at the specified **Connect to IP Address** and **Connect Port**. • **Never** - The DeviceMaster does not attempt to connect to the device. • **Connect-Always** - The DeviceMaster attempts to connect to the device until a connection is made. • **Connect-On-Data** - The DeviceMaster does 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 attempts to connect to the device until a connection is made.
Connect Port	The device socket port number the DeviceMaster connects to if the **Device Connect To Mode** is set to either **Connect-Always** or **Connect-On-Data**.
Connect to IP Address	The device IP address the DeviceMaster connects 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 disconnects from the device. • **Never** - The DeviceMaster does not disconnect from the device. • **Idle** - The DeviceMaster disconnects when there has been no transmit or received data between the device and PLC/ application for a specified **Idle Timer** period.
Idle Timer (Milliseconds)	The idle timeout period that is used if the **Device Disconnect Mode** is set to **Idle**.

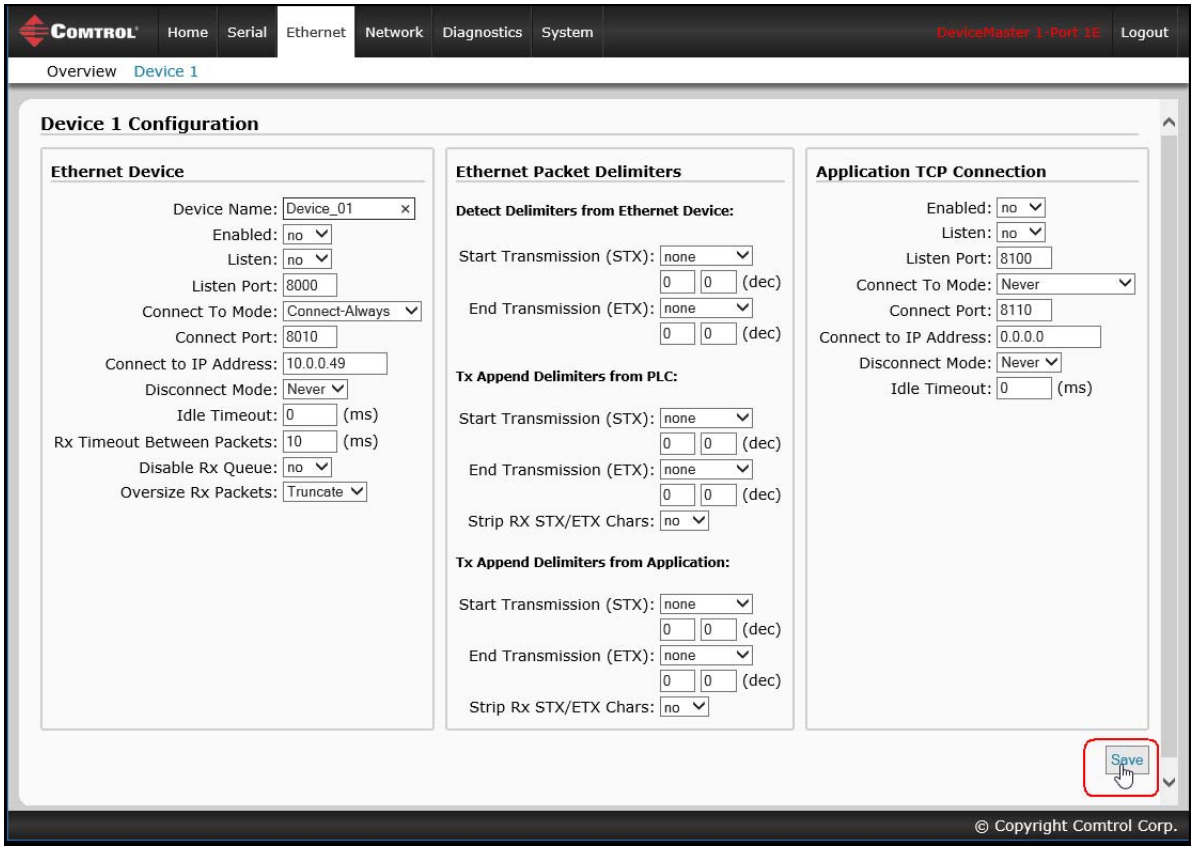
Configuring an Ethernet Device

Use the following procedure to configure Ethernet characteristics for the port.

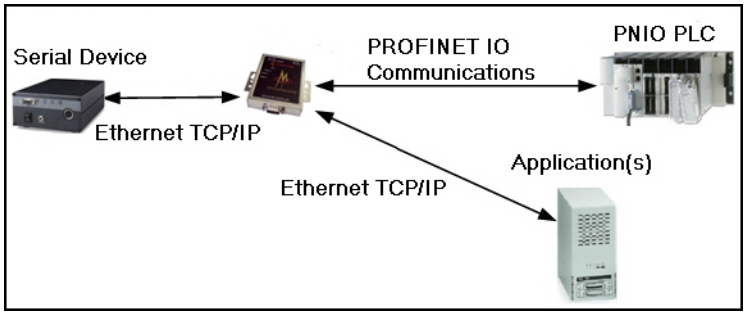
1. Open the DeviceMaster web page using your browser.
2. Click **Ethernet** and the **Ethernet Device Overview** page displays.



3. Click the device number that you want to configure and the corresponding page displays.



4. Configure the Ethernet settings to match the device that you plan on using and click **Save** when you are done. Refer to the following tables if you need information about the options.
   - *Ethernet Device Configuration - Ethernet Device* on Page 63
   - *Ethernet Device Configuration - Ethernet Packet* on Page 65
   - *Ethernet Device Configuration - Application TCP Connection* on Page 68

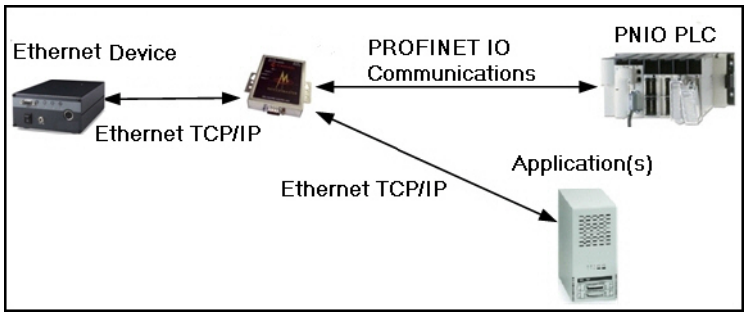
Ethernet Device Configuration - Ethernet Device	
Device Name	A user definable string used to describe the serial interface. Valid characters include a-z, A-Z, 0-9, underscores, spaces and dashes. All other characters are discarded. Up to 80 character ASCII string. The default is blank.
Enabled	This setting 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 via an Ethernet TCP/IP socket. • **No** - Disables listening; the DeviceMaster does not accept connection attempts. • **Yes** - Enables listening; the DeviceMaster accepts connection attempts from the specified **Listen Port**.
Listen Port	This is the socket port number on the DeviceMaster the application connects to if the **Device Listen Enable** is selected.
Connect To Mode	This setting specifies if and how the DeviceMaster attempts to connect to the device at the specified **Connect to IP Address** and **Connect Port**. • **Never** - The DeviceMaster does not attempt to connect to the device. • **Connect-Always** - The DeviceMaster attempts to connect to the device until a connection is made. • **Connect-On-Data** - The DeviceMaster does 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 attempts to connect to the device until a connection is made.
Connect Port	The device socket port number the DeviceMaster connects to if the **Device Connect To Mode** is set to either **Connect-Always** or **Connect-On-Data**.
Connect to IP Address	The device IP address the DeviceMaster connects to if the **Device Connect To Mode** is set to either **Connect-Always** or **Connect-On-Data**.

Ethernet Device Configuration - Ethernet Device (Continued)	
Disconnect Mode	This setting specifies if and how the DeviceMaster disconnects from the device. • **Never** - The DeviceMaster does not disconnect from the device. • **Idle** - The DeviceMaster disconnects 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**.
Rx Timeout Between Packets	Specifies the following information, once the start of a packet is received: • How long the DeviceMaster 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**.
Disable Rx Queue	• **no** - Received packets are stored in a queue and are sent to the PLC one packet at each IO update cycle. • **yes** - The receiving queue is disabled. Only the last received packet during an IO update cycle is sent to the PLC.
Oversize Rx Packets	**Truncate** - Oversize packets are truncated and sent to IO controller as cyclic IO data. **SaveRec** - Oversize packets are truncated and sent to IO controller as cyclic IO data. The original packets are also saved as acyclic record data. **Drop** - Oversize packets are dropped.

Ethernet Device Configuration - Ethernet Packet	
Rx Detect Delimiters from Ethernet Device **Start of Transmission (STX)**	When enabled, the DeviceMaster detects an STX (start of transmission) byte sequence which is configured as **one byte** or **two bytes** when it receives a Ethernet packet. The length indicates the number of STX bytes, valid values for length are: • **none** - Disables this function and the DeviceMaster accepts the first byte received after the last ETX byte(s) as the start of the next data packet. • **one byte** - Scans Ethernet data for one STX byte and when the DeviceMaster finds an STX byte it collects the data. If the first byte is not the STX byte, it discards the byte. The DeviceMaster continues to discard the bytes until it finds an STX byte. • **two bytes** - Scans Ethernet data for two STX bytes and when the DeviceMaster finds two STX bytes it collects the data. If the STX bytes cannot be found, it discards the bytes. The DeviceMaster 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 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 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.
Rx Detect Delimiters from Ethernet Device **End of Transmission (ETX)**	When enabled, the DeviceMaster 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 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 finds the ETX byte, it identifies the data as a Ethernet packet. • **two bytes** - Scans Ethernet data for two ETX bytes and when the DeviceMaster finds the ETX bytes, it identifies the data as a 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.

Ethernet Device Configuration - Ethernet Packet (Continued)	
Tx Append Delimiters from PLC **Start Transmission (STX)**	When enabled, the DeviceMaster 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.
Tx Append Delimiters from PLC **End Transmission (ETX)**	When enabled, the DeviceMaster 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.
Tx Append Delimiters from PLC **Strip Rx STX/ETX Chars**	When you select this check box, the DeviceMaster strips STX/ETX characters from received Ethernet packets. Clear the check box when you do not want the DeviceMaster to strip STX/ETX characters from received Ethernet packets. Ethernet Packets sent from the PLC to the DeviceMaster (over Ethernet), and then sent out the Ethernet device, are not checked for STX/ETX. No STX/ETX character stripping occurs in these Ethernet packets.

Ethernet Device Configuration - Ethernet Packet (Continued)	
Tx Append Delimiters from Application **Start Transmission (STX)**	When enabled, the DeviceMaster 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.
Tx Append Delimiters from Application **End Transmission (ETX)**	When enabled, the DeviceMaster 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.
Tx Append Delimiters from Application **Strip Rx STX/ETX Chars**	When you select this check box, the DeviceMaster strips STX/ETX characters from received Ethernet packets. Clear the check box when you do not want the DeviceMaster to strip STX/ETX characters from received Ethernet packets. Ethernet Packets sent from the application to the DeviceMaster (over Ethernet), and then sent out the Ethernet device, are not checked for STX/ETX. No STX/ETX character stripping occurs in these Ethernet packets.

Ethernet Device Configuration - Application TCP Connection	
Enabled	This setting enables/disables the application TCP connection for an Ethernet device. Enabling this function allows a TCP application to be connected to an Ethernet device. If both the PLC and application are connected to the device, both can transmit to and receive data from the Ethernet device. However, the PLC and application cannot communicate directly to each other. 
Listen	Enabling this setting allows the device to connect to the DeviceMaster via an Ethernet TCP/IP socket. • **No** - Disables listening; the DeviceMaster does not accept connection attempts. • **Yes** - Enables listening; the DeviceMaster accepts connection attempts from the specified **Listen Port**.
Listen Port	This is the socket port number on the DeviceMaster the application connects to if the **Device Listen Enable** is selected.
Connect To Mode	This setting specifies if and how the DeviceMaster attempts to connect to the device at the specified **Connect to IP Address** and **Connect Port**. • **Never** - The DeviceMaster does not attempt to connect to the device. • **Connect-Always** - The DeviceMaster attempts to connect to the device until a connection is made. • **Connect-On-Data** - The DeviceMaster does 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 attempts to connect to the device until a connection is made.
Connect Port	The device socket port number the DeviceMaster connects to if the **Device Connect To Mode** is set to either **Connect-Always** or **Connect-On-Data**.
Connect to IP Address	The device IP address the DeviceMaster connects 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 disconnects from the device. • **Never** - The DeviceMaster does not disconnect from the device. • **Idle** - The DeviceMaster disconnects 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**.

Configuring the DeviceMaster in TIA Portal

This section contains the following topics;

Installing the GSD File

Use the following steps to install the DeviceMaster GSD file into TIA Portal.

1. Open the DeviceMaster home page, download and unzip the **GSDML-V2.32-Comtrol-DM-yyyymmdd.zip** file to a working directory.

   Note: *If you have not previously configured an IP address using PortVision DX, the default IP address is 192.168.250.250 with a subnet mask of 255.255.0.0. If you do not use PortVision DX to program the IP address, you may need to change your system IP address to initially communicate with the Comtrol device.*

2. Open TIA Portal V13 and click **Project View**.
3. Use the **Options | Install general station description file (GSD)** menu to install the GSD file.

Adding the DeviceMaster

Use these steps to add the DeviceMaster.

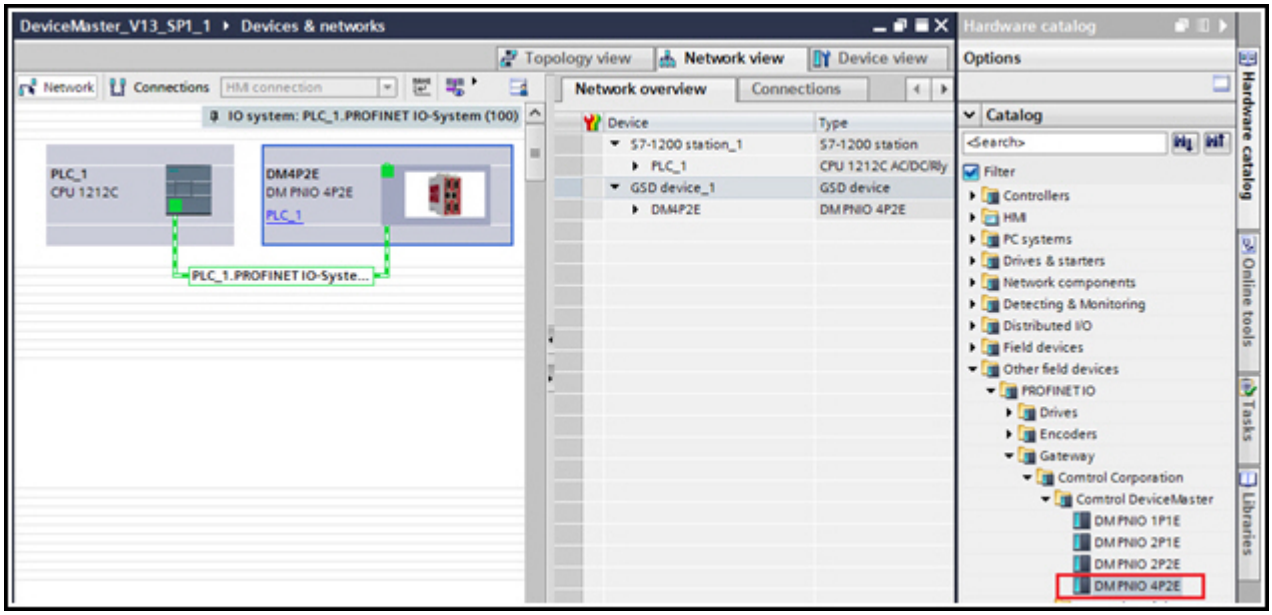
1. From the **Hardware** catalog, under **Other field devices | PROFINET IO | Gateway | Comtrol Corporation | Comtrol DeviceMaster**, select the model corresponding to your device, and drag it into the **Network** view area.

   Use the following table to choose the correct model from the hardware catalog in TIA Portal for your device. The number of serial ports (1P, 2P or 4P) and number of Ethernet ports (1E or 2E) must match your device. The form factor (panel vs DIN rail), power supply, or the type of serial port connectors (DB9 vs terminal blocks), does not matter.

Description	GSD Model
DeviceMaster 1-Port 5-30VDC	DM PNIO 1P1E
DeviceMaster PNIO-2101	
DeviceMaster PNIO-2201	
DeviceMaster UP DB9M 2-Port 1E (PNIO-2102)	DM PNIO 2P1E
DeviceMaster UP 2-Port 1E (PNIO-2202)	

Description	GSD Model
DeviceMaster UP DB9M 2-Port 2E (PNIO-2302)	DM PNIO 2P2E
DeviceMaster UP 2-Port 2E (PNIO-2402)	
DeviceMaster UP 4-Port	DM PNIO 4P2E
DeviceMaster PNIO-2304	

2. To connect the device to PLC, click the link on the device and select **PLC_1.PROFINET interface_1** from the pop-up menu, as shown in this screen shot.



A valid IP address and a device name are required to establish a connection (Application Relationship) between a DeviceMaster gateway and an IO controller. The next two subsections describe various methods to assign IP address and device name to the DeviceMaster.

IP Address Assignment

The DeviceMaster Industrial Gateway gateways supports three methods for IP address assignment according to GSDML Specification V2.32.

- **LOCAL** - A device specific method for IP address assignment. See *Assigning an IP Address Statically* on Page 71 for more information.
- **DHCP** - The Dynamic Host Configuration Protocol for IP address assignment. See *Assigning an IP Address via DHCP* on Page 73 for more information.
- **DCP** - IP address assignment via Discovery and basic Configuration Protocol (DCP). See *Assigning an IP Address via IO Controller* on Page 74 for information.

Note: *The DeviceMaster's default IP address is 192.168.250.250 and the default subnet mask is 255.255.0.0. You may need to change your laptop or PC IP address range to access the web interface or you can use PortVision DX to change the IP address without changing your settings. Refer to Preparing the DeviceMaster for Configuration on Page 23 to install PortVision DX and program the IP address.*

Assigning an IP Address Statically

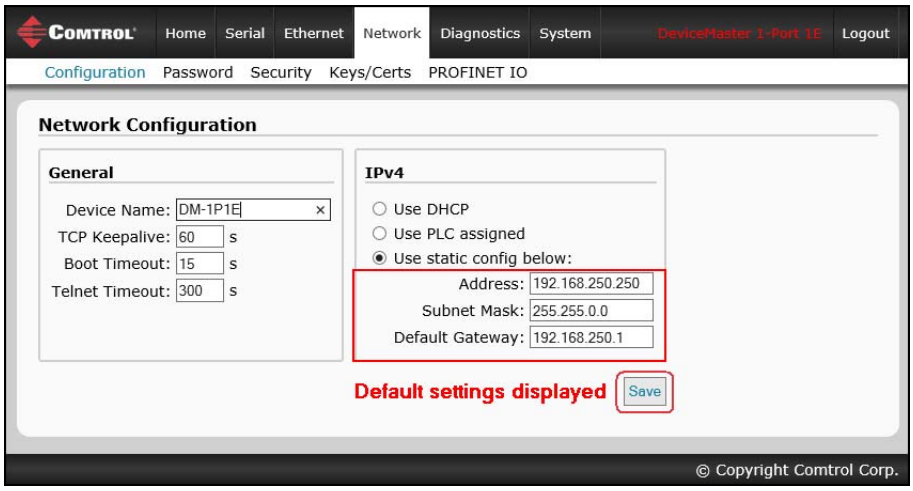
IP addresses can be assigned statically using one of the following methods:

- Embedded web interface (or PortVision DX)
- Assign IP address function of TIA Portal on-line access

Assigning IP Address Statically Using the Web Page

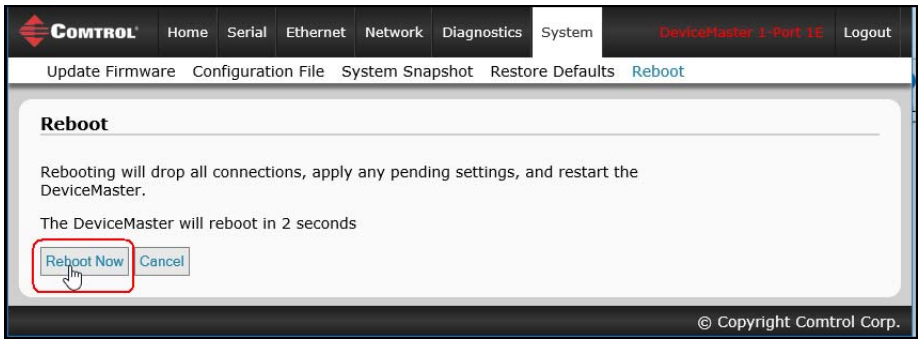
You can use the following procedure to configure a static IP address using the web interface.

1. Open a web browser and enter the DeviceMaster gateway address.
2. Click **Network | Configuration**.
3. Select the **Use static config below** radio button.
4. Enter an IP address, subnet mask, and gateway address.
5. Click the **Save** button.



A reboot is required for the new IP address to take effect.

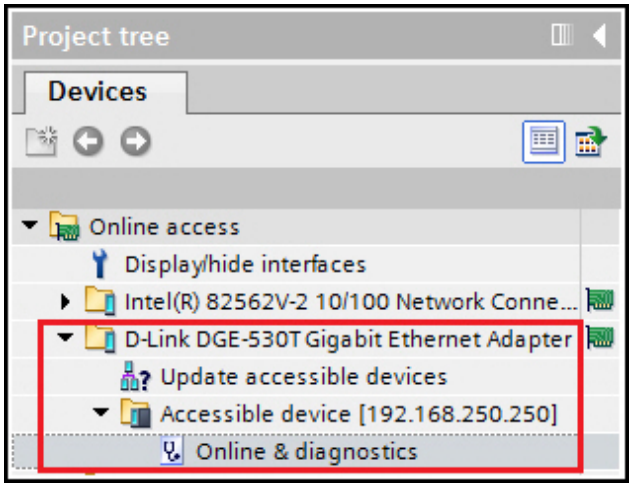
6. Click **System | Reboot** and the DeviceMaster will reboot in 10 seconds or you can click on the **Reboot Now** button to reboot immediately.



Assigning IP Address Statically Using TIA Portal

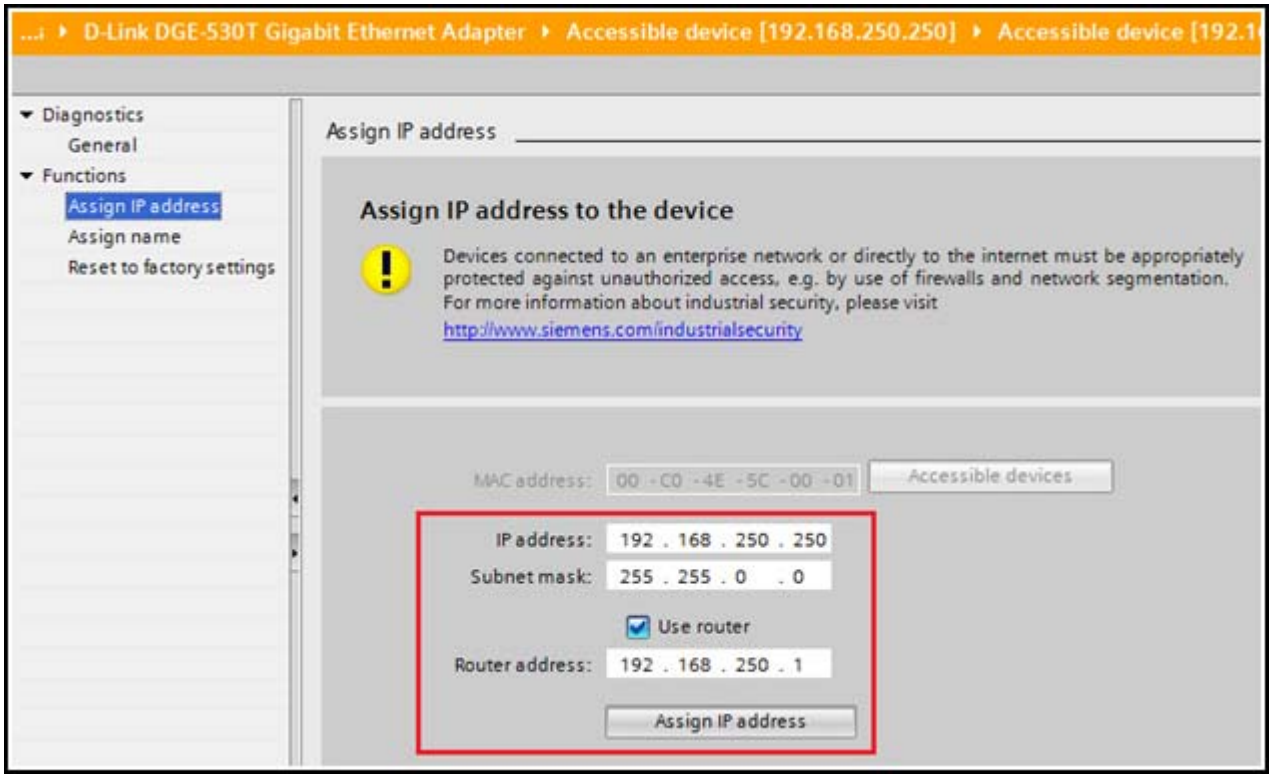
You can also use the following procedure to configure a static IP address using TIA Portal.

1. Double-click **Project tree | Online access | Your Ethernet Adapter | Accessible device [192.168.250.250] | Online & diagnostics** to open the Online access window, where **Your Ethernet Adapter** is the name of your networking interface, and **Accessible device** [192.168.250.250] is the gateway, as shown in this figure (right).



2. Click **Functions | Assign IP address** and enter the desired IP configurations, as shown in the next screen shot.
3. Click the **Assign IP address** button and then the IP configuration is assigned to the gateway.

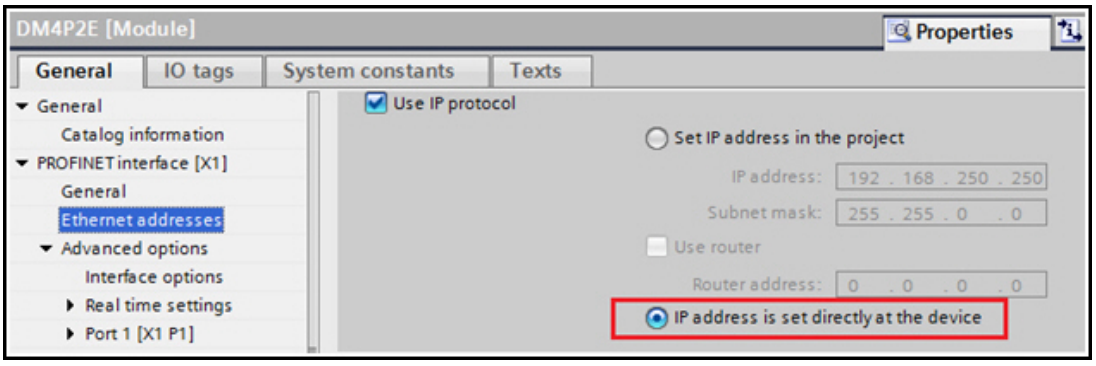
   You can access the gateway using the new IP address immediately. A reboot is not required.



Configuring TIA Portal Project Not to Set IP Address

When using static IP address assignment either through the web interface or TIA Portal on-line access, you will need to configure the TIA Portal project not to set IP address in project.

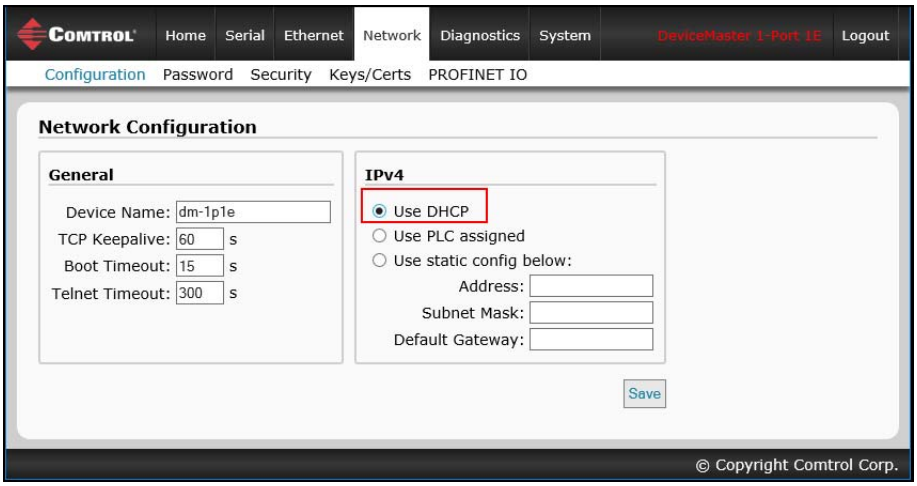
1. In TIA Portal, double-click the DeviceMaster module to open the **Device View**.
2. On the **Properties | General** tab, click the **PROFINET interface [X1] | Ethernet** addresses, which opens the **Ethernet addresses properties** window.
3. Make sure the **Use IP protocol** check box is checked and the **IP address is set directly at the device** radio button is selected, as shown in this figure.



Assigning an IP Address via DHCP

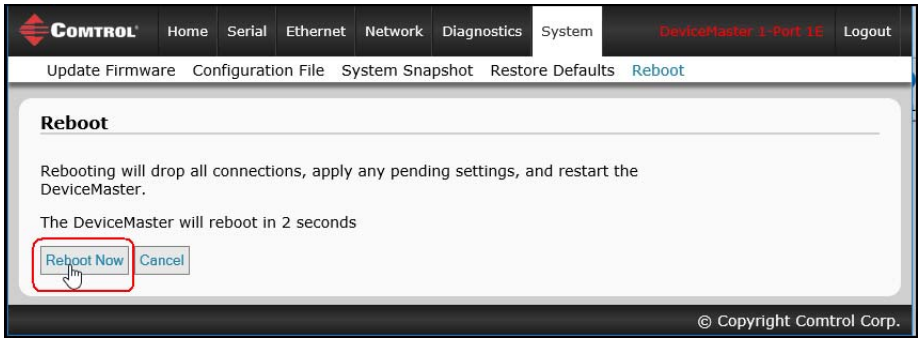
The DeviceMaster gateway supports DHCP for IP address assignment. DHCP is disabled by default. Use the following steps to enable DHCP.

1. Open a web browser and enter the DeviceMaster IP address. The default IP address is 192.168.250.250.
2. Click **Network | Configuration**.
3. Select the **Use DHCP** radio button and click the **Save** button.



A reboot is required for the change to take effect.

4. Click **System | Reboot** and the DeviceMaster will reboot in 10 seconds or you can click on the **Reboot Now** button to reboot immediately.



Once rebooted, the gateway attempts to obtain an IP address from a DHCP server. You can use PortVision DX to find out the new IP address of the gateway or do a network scan in TIA Portal.

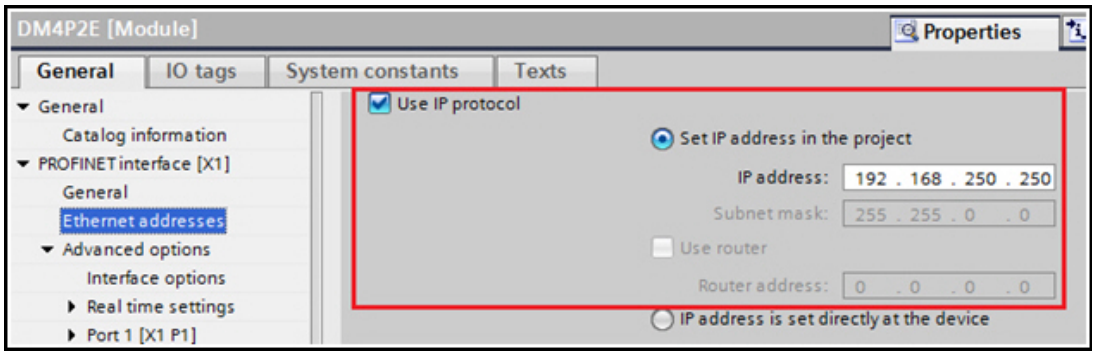
Notes:

- DHCP can only be enabled or disabled via the web interface. Certain versions of SIMATIC STEP 7 have a function to enable DHCP if a PROFINET IO device supports it. However, the DeviceMaster does not support enabling DHCP through STEP 7.
- Similar to static IP address assignment, when DHCP is enabled, you will need to configure the TIA Portal project not to set IP address in project. Refer to *Configuring TIA Portal Project Not to Set IP Address* on Page 73 to set the **IP address is set directly at the device** option.

Assigning an IP Address via IO Controller

An IO controller can assign IP address to the DeviceMaster via DCP. The IO controller and the DeviceMaster gateway have to be on the same subnet.

1. In TIA Portal, double-click the DeviceMaster module to open the **Device View**.
2. On the **Properties | General** tab, click the **PROFINET interface [X1] | Ethernet addresses**, which opens the **Ethernet addresses properties** window.



3. Make sure the **Use IP protocol** check box is checked and the Set IP address in the project radio button is selected.
4. Manually enter the IP address for the DeviceMaster gateway.
5. Compile and download the project.

   The new IP configuration takes effect when a connection is established between the DeviceMaster and the IO controller. A reboot is not required.

   Note: *The **Use PLC assigned** radio box on the **Network | Configuration** page (Page 73) is for information only. Use the above steps to set the IP address in TIA Portal project. If you select the **Use PLC assigned** option and reboot the DeviceMaster, the gateway will start with the 0.0.0.0 IP address and*

the web interface will not work. Refer to the next subsection for more information.

Special Considerations Regarding IP Assignment

When an IP address is assigned by an IO controller, the DeviceMaster does not store the assigned IP address in the non-volatile memory. If the DeviceMaster is rebooted, it starts with the 0.0.0.0 IP address after the reboot. The DeviceMaster stays in that state until a connection is reestablished with the IO controller, at which point the (same) IP address is reassigned by the IO controller. This behavior is a requirement of the PROFINET specification.

Since the 0.0.0.0 is not a valid IP address, the DeviceMaster is not assessable via the web interface, Telnet, or SSH. You can use PortVision DX and TIA Portal to discover the DeviceMaster and assign a static IP address (*Preparing the DeviceMaster for Configuration* on Page 23.

Comtrol recommends using static IP address assignment when possible. The web interface always works regardless of the presence of an IO controller or not.

In addition, DCP IP assignment overwrites the static or DHCP IP assignment. For example: an IO controller is configured to set IP address in the project. The IO controller is powered off temporarily. A new IP address is assigned to the DeviceMaster using PortVision DX. Later when the IO controller is turned back on, it changes the gateway's IP address back to the address that was configured in the project.

Device Name Assignment

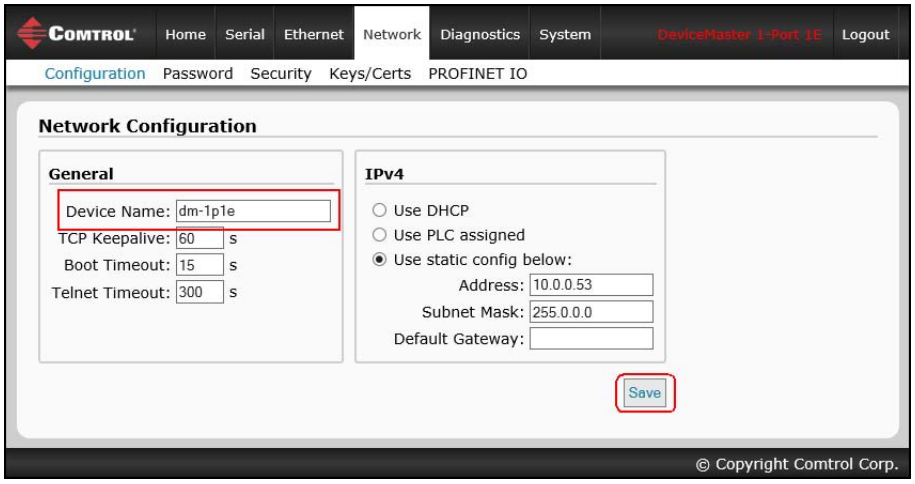
Use one of the following methods to configure the Device Name.

- Web interface
- TIA Portal

Assigning the Device Name Using the Web Interface

You can use the **Network | Configuration** page to assign the device name for PROFINET IO.

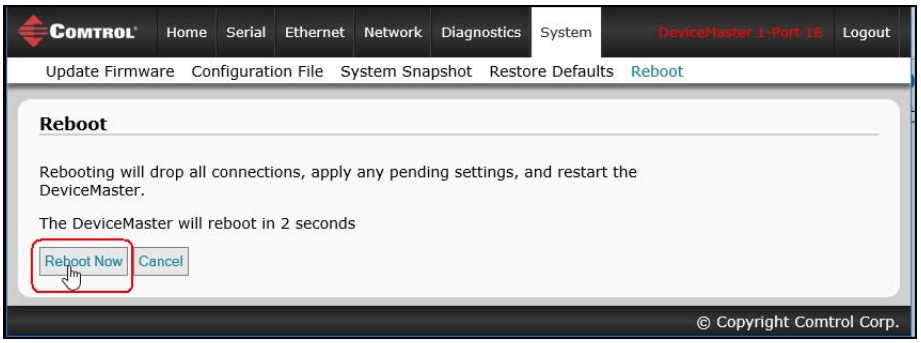
1. If necessary, open the gateway web interface with your web browser using the IP address.
2. Click **Network | Configuration**.
3. Enter the PROFINET IO Device Name. The PROFINET IO device name is not case-sensitive and the default is empty. The device name must be specified according to DNS conventions.
   - Restricted to a total of 240 characters (letters, digits, dash or period).
   - Parts of the name within the device name; in other words, a string between two periods, must not exceed a maximum of 63 characters.
   - No special characters such as umlauts (ä, ö etc.), brackets, underscore, slash, blank etc. The dash is the only permitted special character.
   - The device name must not begin or end with the "-" character.
   - The device name must not begin with numbers.
   - The device name must not have the structure n.n.n.n (n = 0...999).
   - The device name must not begin with the character string "port-xyz-" (x , y, z = 0...9).



4. Click the **Save** button.

   A reboot is required for the new name to take effect.

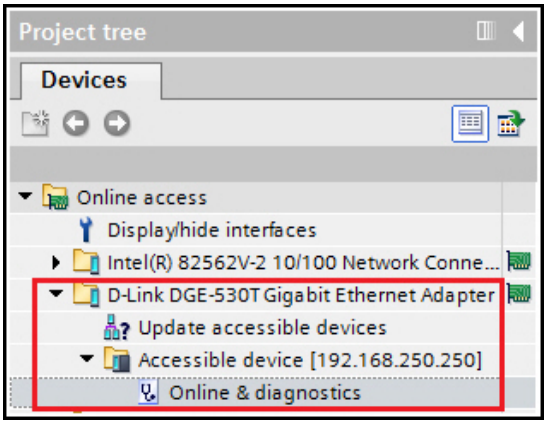
5. Click **System | Reboot** to reboot the gateway.



Assigning the Device Name in TIA Portal

Use the following procedure to configure the Device Name using TIA Portal.

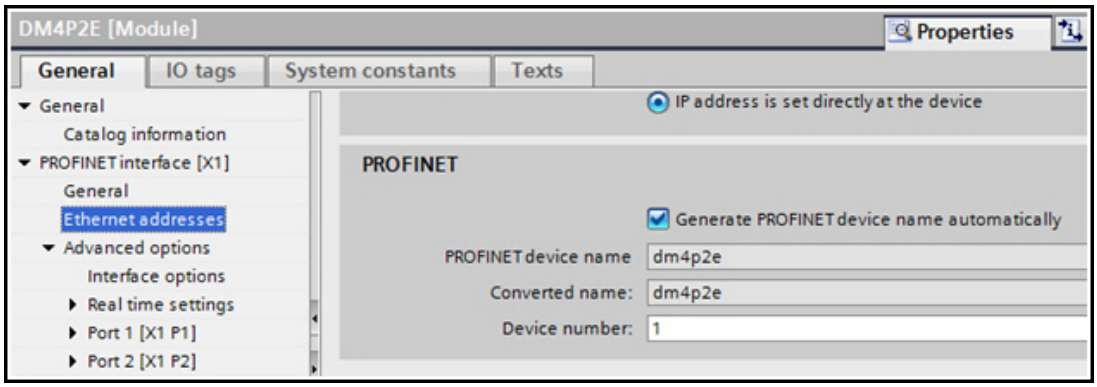
1. In TIA Portal, open on-line access.
2. Click **Function | Assign name**, enter the desired PROFINET device name.
3. Click the **Assign name** button. The new device name takes effects immediately. A reboot is not required.



Configuring Device Name in TIA Portal Project

After assigning a device name to the DeviceMaster, the same device name also needs to be configured in the TIA Portal project.

1. In TIA Portal, double-click the DeviceMaster module to open the **Device View**.
2. On the **Properties | General** tab, click the **PROFINET interface [X1] | Ethernet addresses**, which opens the **Ethernet addresses properties** window.
3. When the **Generate PROFINET device name automatically** check box is selected, a default device name is entered automatically. If the DeviceMaster has been assigned a different device name, then un-check the check box and manually enter the device name.



4. Compile and download the project.

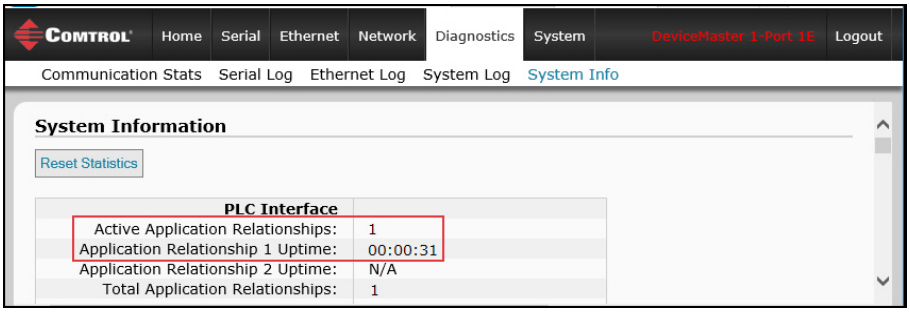
Notes:

- Configuring a PROFINET device name in the project does not automatically assign that name to the DeviceMaster. Use the procedures in *Assigning the Device Name Using the Web Interface* on Page 75 or *Assigning the Device Name in TIA Portal* on Page 76 to assign a device name to the DeviceMaster.
- The device name must be unique on the network.

Establishing A PROFINET IO Connection

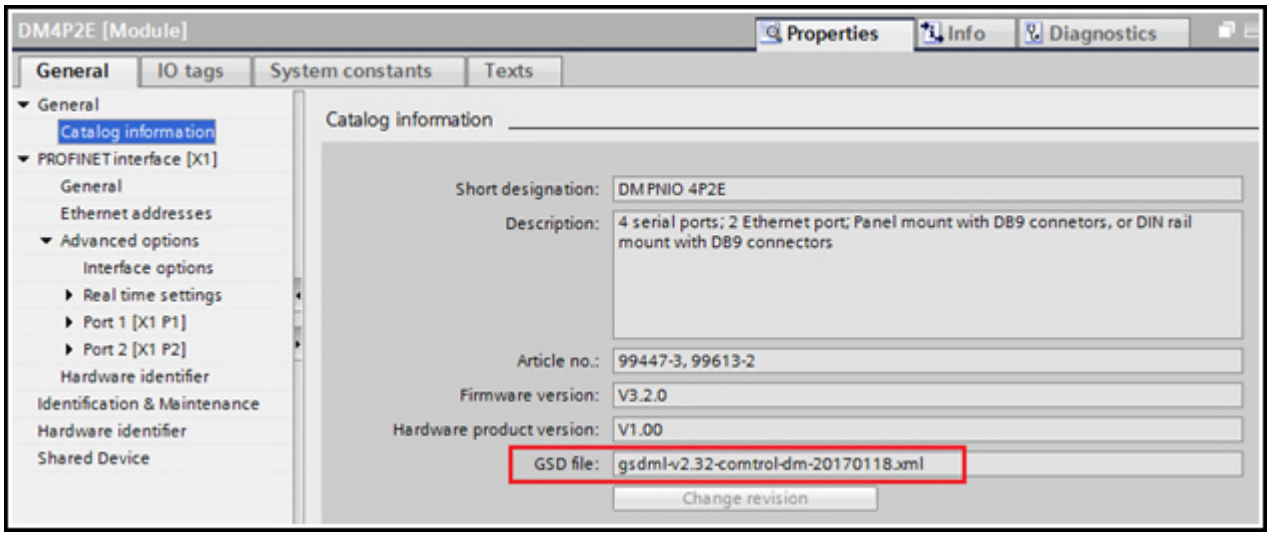
A this point, a DeviceMaster gateway was added to a TIA Portal project, the IP address and device name were assigned. The next step is to establish a connection between the gateway and IO controller before starting configuration of the IO modules. You may need to compile and download the project and if necessary, reboot the DeviceMaster.

Open the **Diagnostics | System Info** web page on the Comtrol device. Verify under the *PLC Interface* section, that a PROFINET IO connection has been successfully established between the gateway and IO controller, the Active Application Relationships should be 1. The Status (or PWR) LED has a solid, steady light on the DeviceMaster and the status LED(s) on the IO controller should be solid green.



If a connection has not been established, here are some troubleshooting tips:

- Check if the correct GSD file is installed in TIA Portal.
- Check if the DeviceMaster module in TIA Portal is using the right GSD revision. If an older version of the GSD file was installed before, you may need to remove the DeviceMaster device(s) from an existing project, and reinsert it after the new GSD file is installed.



- Check if the right model is added in the project. See the table on Page 69 for supported models.
- Remove any modules and submodules of the DeviceMaster in TIA project. Only keep the head module.
- Check if the gateway has a valid IP address. See *IP Address Assignment* on Page 70 for IP address assignment.

- Verify that the gateway has a valid device name. See *Device Name Assignment* on Page 75 for assigning device name.
- Make sure there are no other devices on the same network using the same IP address or device name.
- Make sure the matching device name is configured in TIA Portal project.
- Make sure there is no other IO controller that is having or trying to establish a connection with the gateway.
- Go to **Diagnostics | System Log** web page, look for any possible error messages.

Status LED Behavior

The DeviceMaster has one Status (or PWR, depending on the model) LED.

Status or PWR LED	Description
Blinks every 10 seconds	No PLC connection.
On (solid)	One or more PLC connections have been established.
Flashing	• LED flashing mode is enabled. • Error detected or diagnostics information available.

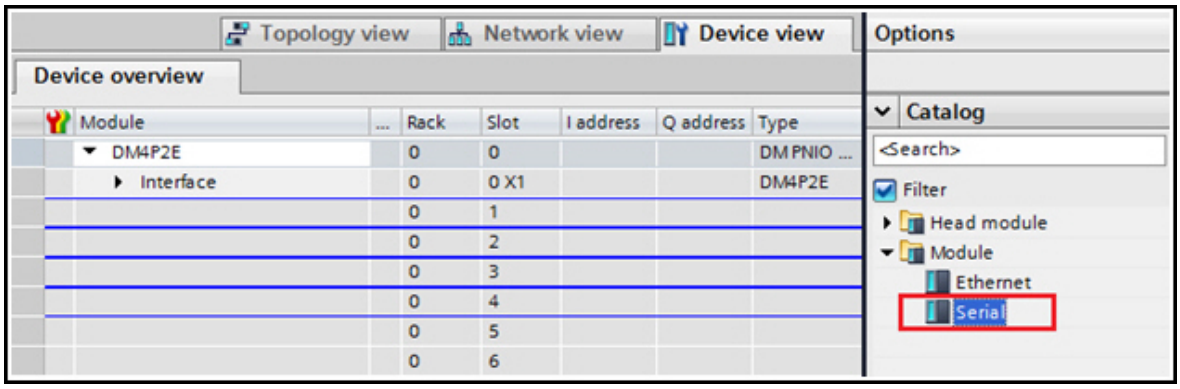
Configuring IO Modules

IO modules are used to exchange input and output data with serial devices and Ethernet devices. The DeviceMaster gateway has two categories of IO modules:

- Serial Port Module – for accessing serial devices
- Ethernet Device Module – for accessing Ethernet devices

Inserting IO Modules and Submodules

1. Double-click the DeviceMaster module in the **Network** view to open the **Device overview** window.
2. From the **Catalog | Module**, select the Serial or Ethernet module and drag it into one of the highlighted slots in the Device overview window.



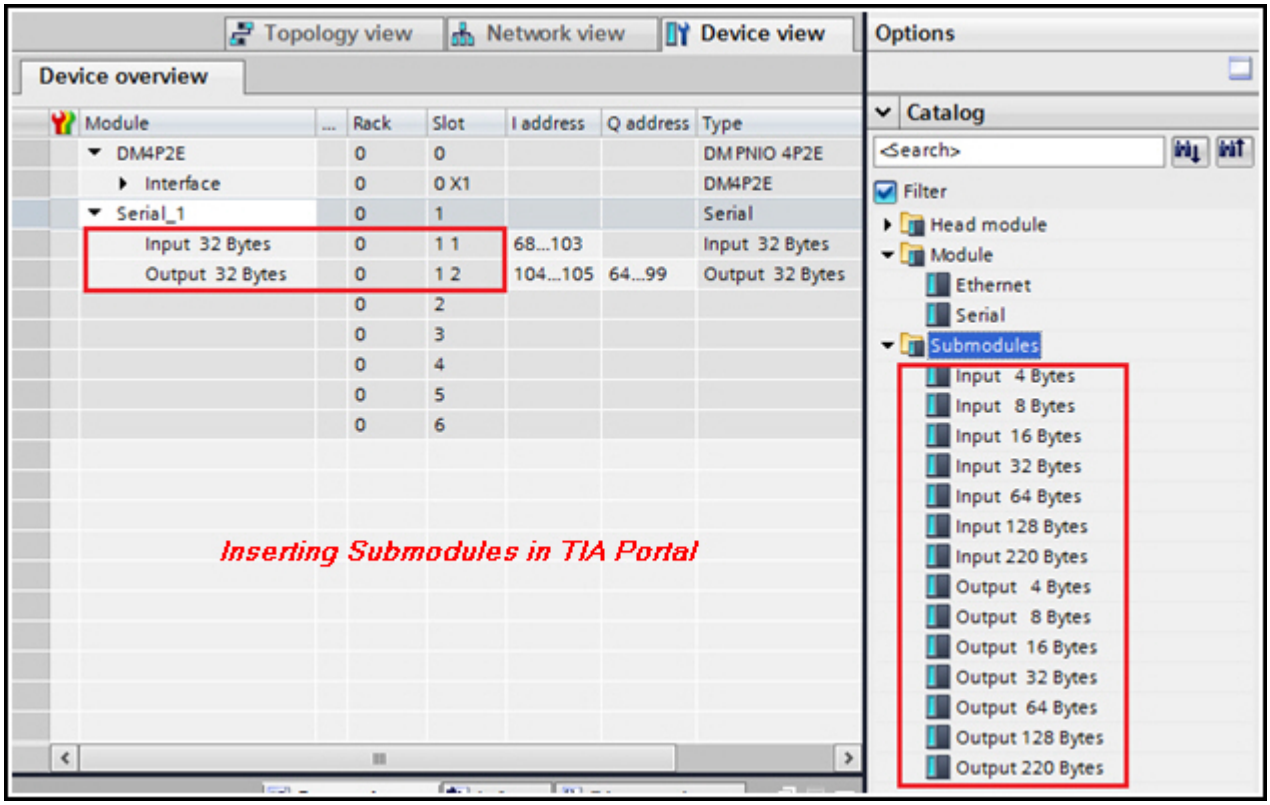
- **Slot 1..N** are reserved for serial ports, where **N** is the number of available serial ports. **Slot 1** for serial port 1, **Slot 2** for serial port 2, so on and so forth.
- **Slot N+1** and **N+2** are reserved for Ethernet devices. The number of

supported Ethernet devices equals the number of Ethernet ports. For example, a PNIO-2101 supports one Ethernet device; a PNIO-2304 supports two Ethernet devices. **Slot N+1** is for Ethernet device 1. **Slot N+2** is for Ethernet device 2 when applicable.

The following table summarizes the available slots and corresponding IO modules for different DeviceMaster gateways.

	PNIO-2101 **PNIO-2201** **DeviceMaster UP 1-Port Panel**	**DeviceMaster UP 2P1E** **PNIO-2102** **PNIO-2202**	**DeviceMaster UP 2P2E** **PNIO-2302** **PNIO-2404**	**PNIO-2304** **DeviceMaster UP 4-Port Panel**
Slot 1	Serial Port 1	Serial Port 1	Serial Port 1	Serial Port 1
Slot 2	Ethernet Device 1	Serial Port 2	Serial Port 2	Serial Port 2
Slot 3	N/A	Ethernet Device 1	Ethernet Device 1	Serial Port 3
Slot 4	N/A	N/A	Ethernet Device 2	Serial Port 4
Slot 5	N/A	N/A	N/A	Ethernet Device 1
Slot 6	N/A	N/A	N/A	Ethernet Device 2

Once an IO module is inserted into a slot, you can configure the submodules for that IO module. There are input and output submodules with various IO sizes.



Each submodule can be inserted to one of the two available sub-slots of an IO module. **Sub-slot 1** is reserved for an input submodule; **Sub-slot 2** is for an output submodule. The following table illustrates the available submodules and their allowed sub-slots.

Sub-slot	Allowed Submodules
1	Input submodule (4, 8, 16, 32, 64, 128, 220 bytes)
2	Output submodule (4, 8, 16, 32, 64, 128, 220 bytes)

In the *Inserting Submodules in TIA Portal* figure (above), a 32 bytes input submodule is inserted in **Slot 1 Sub-slot 1**; a 32 bytes output submodule is inserted in **Slot 1 Sub-slot 2**. Therefore Serial Port 1 is able to receive up to 32 bytes input data and transmit up to 32 bytes output data.

Similarly, you can configure an Ethernet device by inserting an Ethernet module, then inserting desired input and output submodule into the Ethernet module.

Here are some tips when configuring IO modules and submodules.

- A Serial or Ethernet module must be inserted first in order to configure the submodules.
- If you do not find an exact matching IO size, select the next size (larger). For instance, use the Input 128 Bytes submodule for a device that has 80 bytes input data.
- The input data size and output data size are independent. You can configure a serial module to have 64 bytes input data and 32 bytes output data.
- For input only devices, leave the **Sub-slot 2** open. For output only devices, leave the **Sub-slot 1** open.
- If a serial port or an Ethernet device is not in use, simply leave the corresponding slot open.

Note: *Certain versions of TIA Portal may not allow both sub-slots open. You must insert at least one submodule for a serial or Ethernet module.*

Input and Output Submodule Data Format

The following data type definitions apply.

Data Type	Data Type Definition
BYTE	An integer 0 - 255 (8-bit) e.g. ASCII strings are a series of bytes.
WORD	Unsigned integer (16-bit)
DWORD	Unsigned integer (32-bit)

The next table shows the data format of an input submodule. The sequence number range is from 0 to 65535 (16#FFFF). Once the sequence number reaches 65535, it restarts at 0. The data length range is from 0 to 220, indicating the number of bytes received. The actual data starts from offset 4.

Byte Offset	Input Submodule Data Type	Description
0-1	WORD	Sequence Number (Big endian)
2-3	WORD	Data Length (Big endian)
4..N	Array of BYTE	Data Array (Maximum 220 bytes)

When a packet that is larger than the configured input submodule is received, the packet is truncated by default. However, the length field always contains the original packet size. For example, a serial port is configured with a 32 byte input submodule. A packet of 40 bytes is received. The IO controller will receive the first 32 bytes input data and the length field will be 40. A length field larger than the size of input submodule indicates that the data has been truncated. Refer to

Handling Oversize Packets on Page 95 for more information regarding oversize packets handling and the method to retrieve an entire oversize packet without losing data.

This table shows the data format of an output submodule.

Byte Offset	Output Submodule Data Type	Description
0-1	WORD	Sequence Number (Big endian)
2-3	WORD	Data Length (Big endian)
4..N	Array of BYTE	Data Array (Maximum 220 bytes)

The output data has the same format as the input data of an input submodule. The DeviceMaster transmits the number of output data indicated by the length field when the sequence number field changes. The gateway only transmits the output data once. No further data is transmitted until the sequence number is changed again.

An output submodule also has a 2-byte input data, as shown in following table. This 16-bit integer is the sequence number of the last output data packet that was transmitted. If you want to confirm that the last data written to the output data area has been transmitted, compare the sequence number of the transmitted output data with the input data of that submodule. If they are the same, the data has been transmitted successfully.

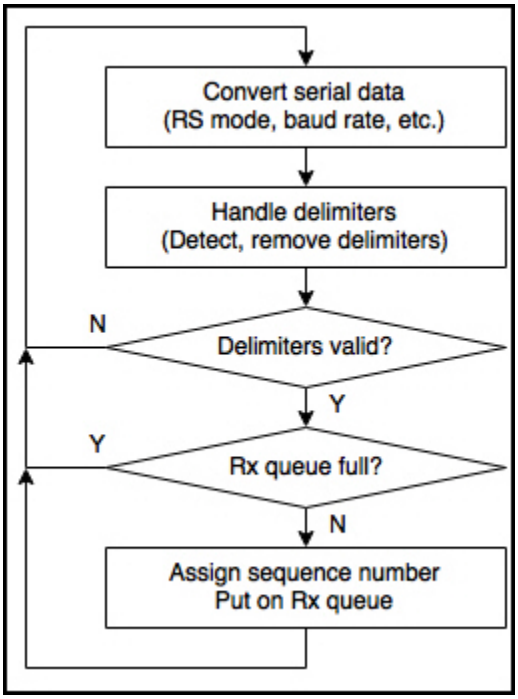
Byte Offset	Data Type	Description
0-1	WORD	Last Transmitted Sequence Number (Big endian)

IO Data Handling

This section describes how the DeviceMaster handles IO data.

Input Data Handling

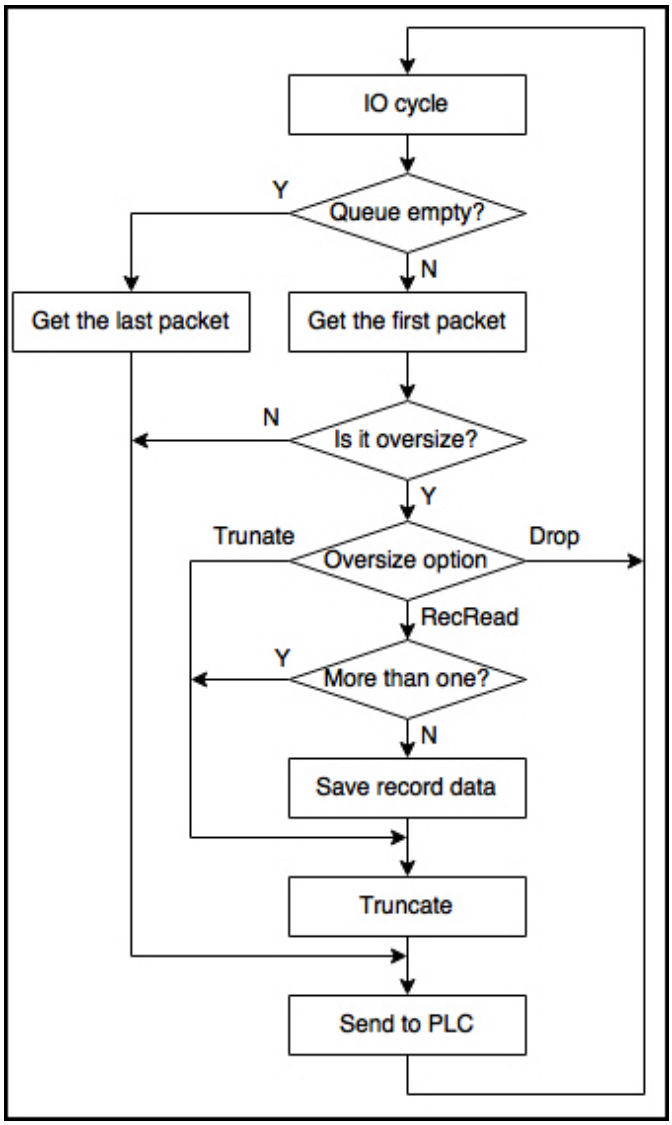
When the DeviceMaster receives input data from a serial port, it first converts the low level serial signals into bytes of raw serial data. Then serial packets are created from the raw data based on delimiters and/or receiving timer. Packets that do not have valid delimiters are dropped. Valid packets are put on a receiving queue, waiting to be sent to IO controller in the next IO update cycle. The following figure shows the process.



The input data from Ethernet devices are handled similarly. Instead of converting serial signals, the DeviceMaster receives the input data through a TCP connection from an Ethernet device. The DeviceMaster manages the connection mode, TCP port, disconnect mode, etc. Refer to *Configuring an Ethernet Device* on Page 61 for details regarding Ethernet device configurations. The reset of process is basically identical between a serial port and an Ethernet device.

At every IO update cycle, the DeviceMaster gets the first packet from the receiving queue of each serial port and Ethernet device and sends it to IO controller. If the receiving queue is empty, it retransmits the last packet of that port/device.

Depending on the configuration, an oversize packet could be truncated, dropped, or saved as record data. The following figure shows how a packet is sent to IO controller during an IO update cycle.



Packets from different serial ports and Ethernet devices are combined and sent to IO controller in one PROFINET IO frame.

For example, a PNIO-2304 or DeviceMaster UP 4-port panel mount has 6 220-byte input submodules configured for 4 serial ports and 2 Ethernet devices. There are multiple packets waiting in the receiving queue on all 6 ports/devices. At the first IO update cycle, the DeviceMaster takes one packet from each receiving queue, combines them into one PROFINETI IO frame and sends it to the IO controller. The total amount of input data in that PROFINET IO frame is:

```
(4 bytes sequence number and length + 220 bytes data) x 6 = 1344 bytes
```

At the next IO cycle update cycle, the DeviceMaster sends another PROFINET IO frame with all new input data.

Handling Input Data in PLC

Input data received by an IO controller is available at the input address range and can be read directly by the IO controller. Due to the nature of PROFINET IO cyclical communication, the DeviceMaster sends input data to the IO controller at every IO update cycle regardless if there is new input data or not. If there is new data, the DeviceMaster increments the sequence number and sends the new data. If not, it resends the last data using the same sequence number. Therefore, the sequence number is the key for the IO controller to determine whether there is new input data or not.

The IO controller should monitor the sequence number field closely during each scan. If the sequence number changes, the input data should be processed immediately or copied to other memory location before the next IO update cycle. If the IO controller fails to do so, the data could be overwritten in the next IO update cycle. To prevent that from happening, the IO controller must consume the input data faster than the DeviceMaster can produce them.

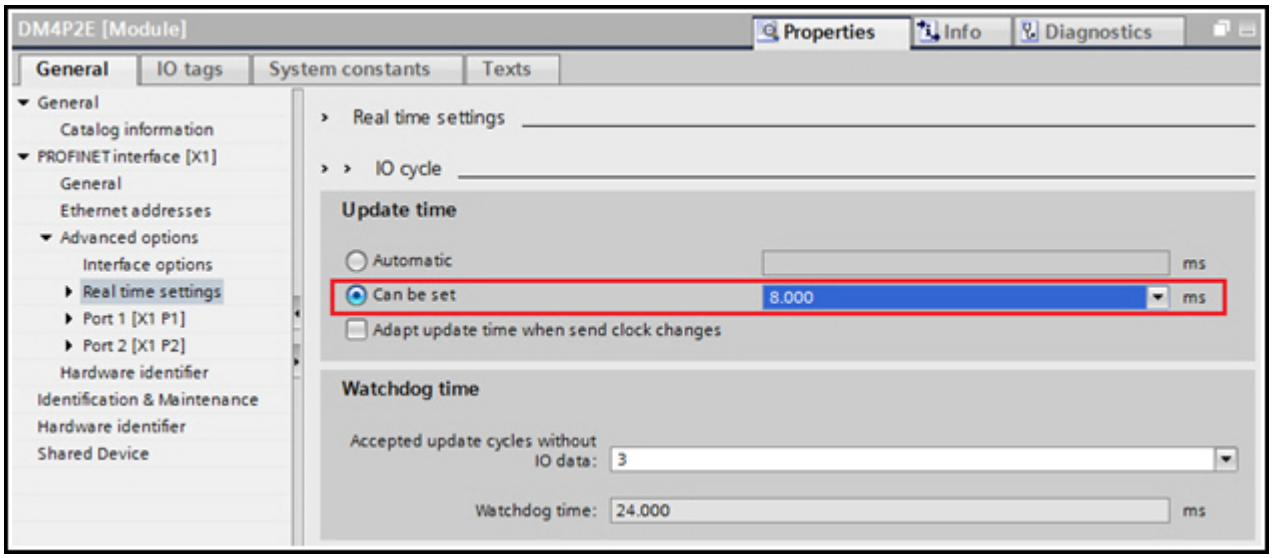
The **IO Cycle Update Time** setting can be used to control how fast the DeviceMaster produces input data. Using the above example with the PNIO-2304 with six 220 bytes input modules, assuming the IO cycle update time is 8ms. The DeviceMaster can produce 1344 bytes of new data every 8ms. If the IO controller does not have the power to process them in 8ms, you can set the IO cycle update time to 16ms, which means that the DeviceMaster will send data once every 16ms, giving the IO controller more time to process the data.

However, keep in mind that the DeviceMaster can only hold a limited number of packets in the receiving queue for each port/device. Each receiving queue can hold 20 packets for a serial port or 10 packets for an Ethernet device. If packets are arriving at ports/devices at a rate faster than the rate that DeviceMaster is configured to send data to IO controller, packet losses may occur due to overflowed queues.

Setting the IO Cycle Update Time

Use the following procedure to set the **IO Cycle Update Time**.

1. Double-click the DeviceMaster module to open the **Device View**.
2. On the **Properties | General** tab, click the **PROFINET interface [X1] | Real time settings**, which opens the **Real time settings** window.
3. Select the **Can be set** radio button and select the desired update time. The fastest IO cycle update time is 8ms.



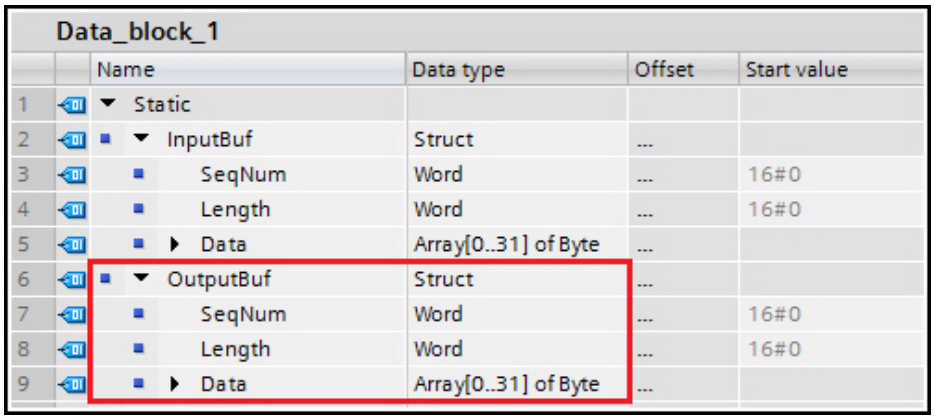
Output Data Handling

This subsection discusses the following topics:

Formatting an Output Packet

To write output data, an output packet needs to be first assembled in the IO controller's memory using the format as shown in the Output Data Format table (Page 82) of an Output Submodule. A typical way is to create a data block and define a structure for output packet, as shown in the following figure.

Fill the structure with sequence number, length, and actual output data. Then use the **DPWR_DAT** instruction to copy the entire packet to the output address of the corresponding submodule. The packet is transmitted to the DeviceMaster in the next IO update cycle.



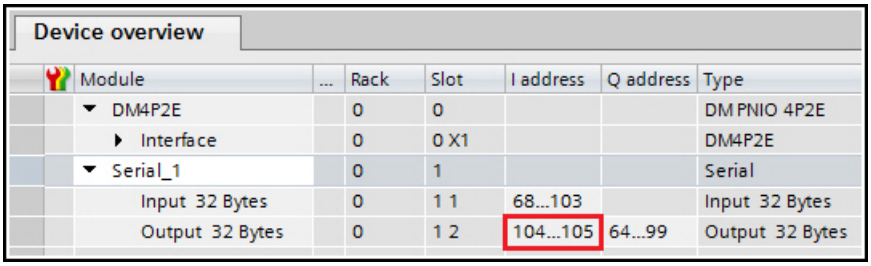
Data_block_1

	Name	Data type	Offset	Start value
1	Static			
2	InputBuf	Struct	...	
3	SeqNum	Word	...	16#0
4	Length	Word	...	16#0
5	Data	Array[0..31] of Byte	...	
6	OutputBuf	Struct	...	
7	SeqNum	Word	...	16#0
8	Length	Word	...	16#0
9	Data	Array[0..31] of Byte	...	

Transmitting an Output Packet

The actual transmission of output data through a port/device is triggered when the sequence number changes. The DeviceMaster transmits the output data (excluding the sequence number and length) to the corresponding port/device only when the sequence number changes.

If the transmission is successful, the DeviceMaster copies the sequence number into the input space of the submodule. The following figure shows the 2-byte input data at address IW104 contains the last transmitted sequence number. After the **DPWR_DAT** instruction, compare the last transmitted sequence number with the sequence number of the output packet, if they are the same, then the output data has been transmitted successfully.



Device overview

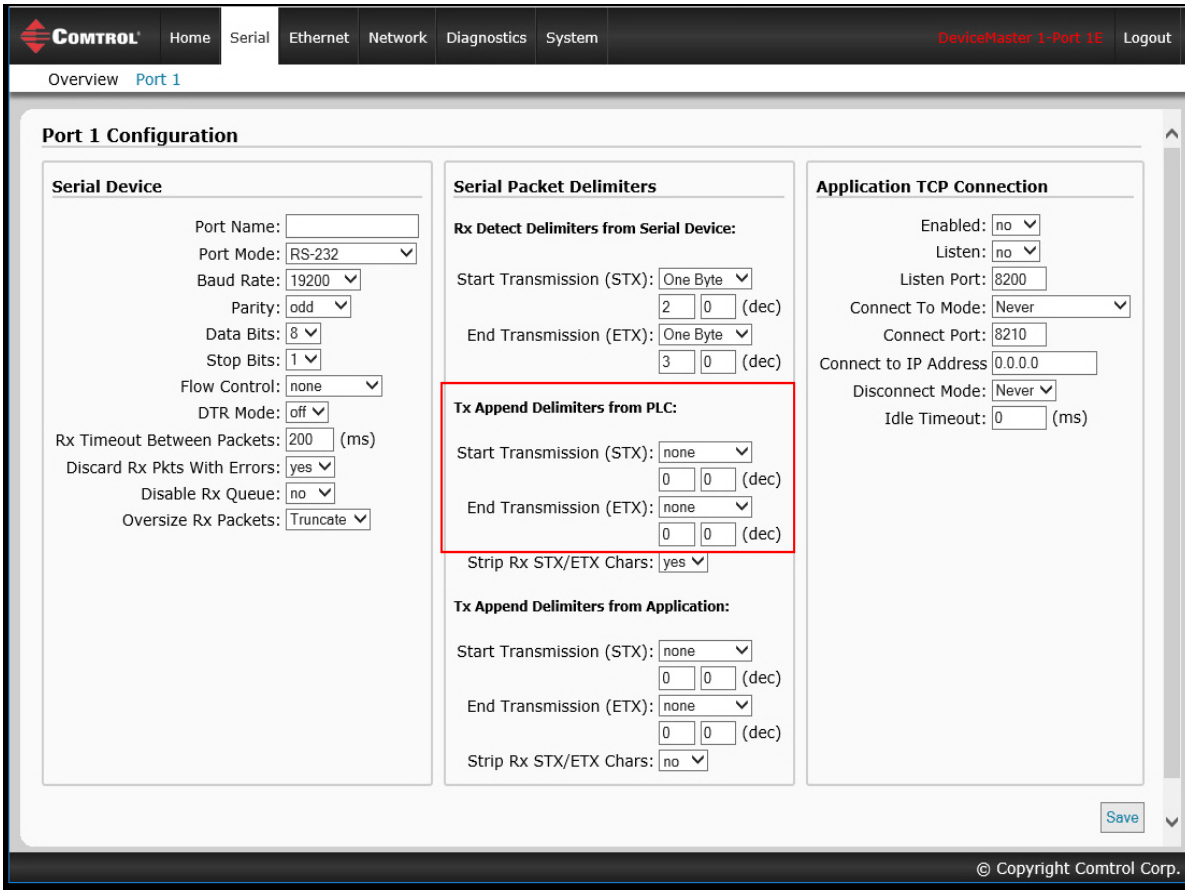
Module	...	Rack	Slot	I address	Q address	Type
DM4P2E		0	0			DM PNIO 4P2E
Interface		0	0 X1			DM4P2E
Serial_1		0	1			Serial
Input 32 Bytes		0	1 1	68...103		Input 32 Bytes
Output 32 Bytes		0	1 2	104...105	64...99	Output 32 Bytes

The DeviceMaster expects the sequence number to be incrementing for each output packet. If a sequence number is out of order, the DeviceMaster still transfers that packet, then logs an error message in the system log. If the length field is invalid, that is, greater than the size of the output submodule, the DeviceMaster will not transmit that packet. An error is logged and the last transmitted sequence number input is not updated.

Appending Delimiters

For output devices that require STX and/or ETX delimiters. They can be added when formatting the output packet in IO controller. Or, you can configure the DeviceMaster to append delimiters to output packets automatically.

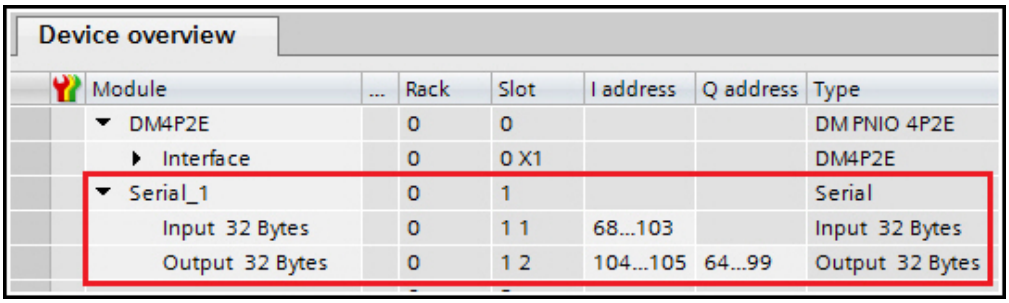
1. Open the web interface, click **Serial | Port X**.
2. Configure the STX and ETX as desired in the **Tx Append Delimiters from PLC** section, as shown in the following figure. The DeviceMaster appends the configured STX and/or ETX to all output packets before transmitting.



Project Example

This section demonstrates how to use a serial device to read and write IO data in the PLC. The serial device can receive and transmit ASCII string up to 32 bytes. The serial device uses STX (16#02) and ETX (16#03) to mark the beginning and end of each ASCII string. This example uses a PNIO-2304 and the serial device is connected to serial Port 1.

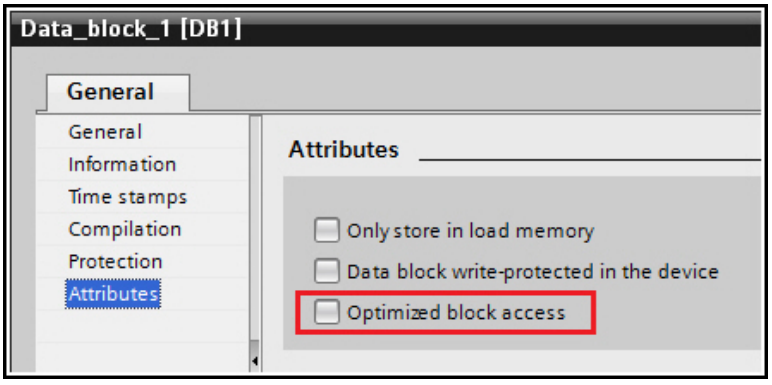
1. In a new TIA Portal project, add an IO controller and the PNIO-2304.
2. Insert a serial module to Slot 1.
3. Insert a 32-byte input submodule and 32-byte output submodule into Slot 1 1 and Slot 1 2, as shown in the figure below.



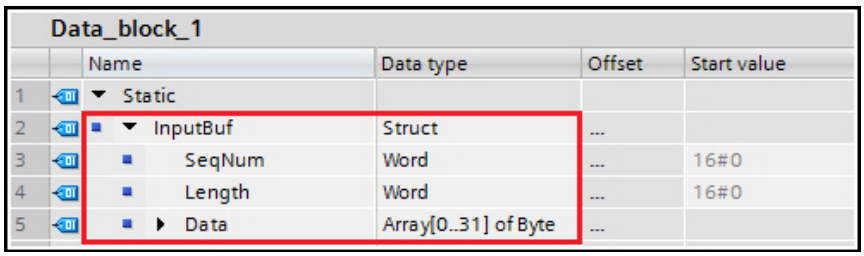
Reading Input Data

The input submodule has an IO address range 68..103. That's a total of 36 bytes, including 4 bytes of sequence number, length, and 32-bytes of data. The input data can be accessed directly using the IO address. However, in this example we use a different approach.

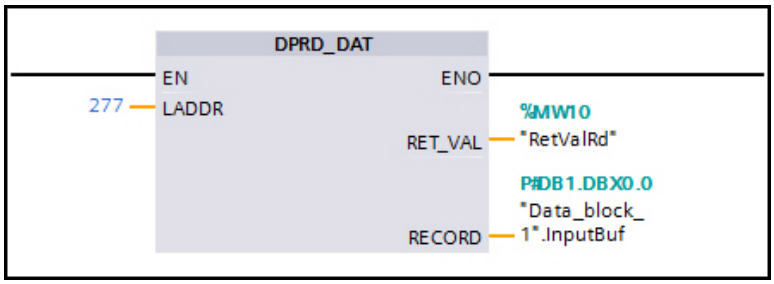
1. Add a data block **Data_block_1** to the project.
2. Right-click the data block, select **properties**.
3. Un-check the **Optimized block access** attribute, as shown in the following figure. Disabling the **Optimized Block Access** insures that the elements of the data structure that we are going to define will have a fixed address in the block.



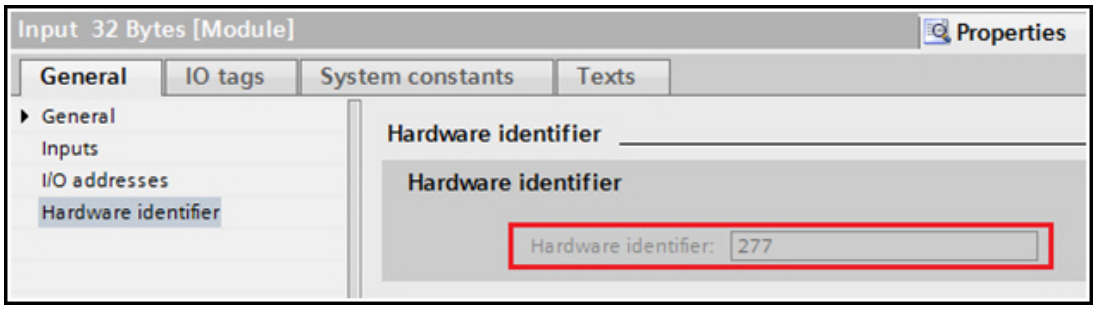
4. Create an input buffer structure called **InputBuf** that has the same format as the input data, as shown in the following figure.



5. Add a **DPRD_DAT** instruction into the main block to copy data from input address into the **InputBuf** structure in the data block, as shown in the following figure.

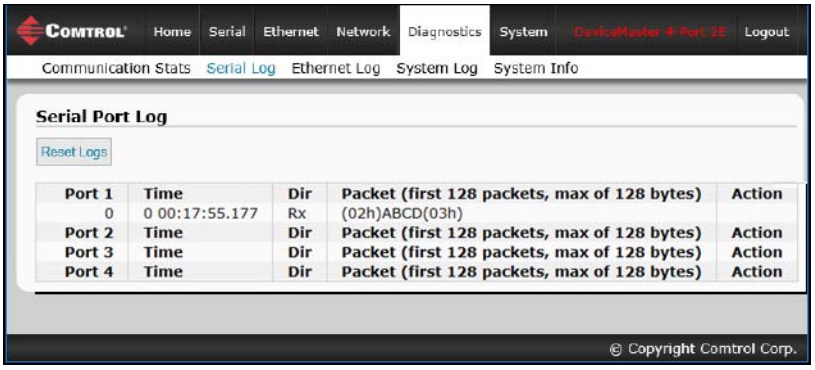


- Parameter **LADDR** - Enter the hardware identifier of the input submodule, which can be found in the **Properties tab | General | Hardware identifier**, as show in the following figure.
- Parameter **RECORD** - Enter **Data_block_1.InputBuf**.



6. Compile and download the project.
7. Now let's test it by sending an ASCII string of **ABCD** to the serial device.
8. Open the DeviceMaster web page and click **Diagnostics | Serial Log**.

There should be a **(02h)ABCD(03h)** message in the Serial Log on Port 1, as shown in the following figure. Where **(02h)** and **(03h)** are the STX and ETX. **ABCD** are the actual serial data. **Rx** means it is input data.



If you do not see above message in the **Serial Log**, here are some troubleshooting tips:

- If there are no messages in the serial log or if there are messages that appear to be random/corrupted data, check the serial port configuration, including RS mode, baud rate, data bits and stop bits, flow control, and etc.
- If there are messages in the serial log but are marked as **Dropped** in the **Action** column, then the serial port delimiters are not configured correctly.

It is always a good idea to confirm that the serial port configuration is correct and that the DeviceMaster can receive data from the serial device before starting reading data in IO controller.

In TIA Portal, go on-line and watch the **Data_block_1**. The following figure shows a packet with sequence number 1 and data length 4 is received. The received input data is stored in the Data array. Note that the DeviceMaster removed the STX and ETX, therefore the size of input data is 4 bytes, not 6 bytes.

In a real case scenario, a PLC program should keep track of the **InputBuf.SeqNum** field. It only needs to process the input data when **InputBuf.SeqNum** changes. The IO controller must finish processing the input data before the next IO update cycle, otherwise data lose may occur, as previously discussed in *Input Data Handling* on Page 83.

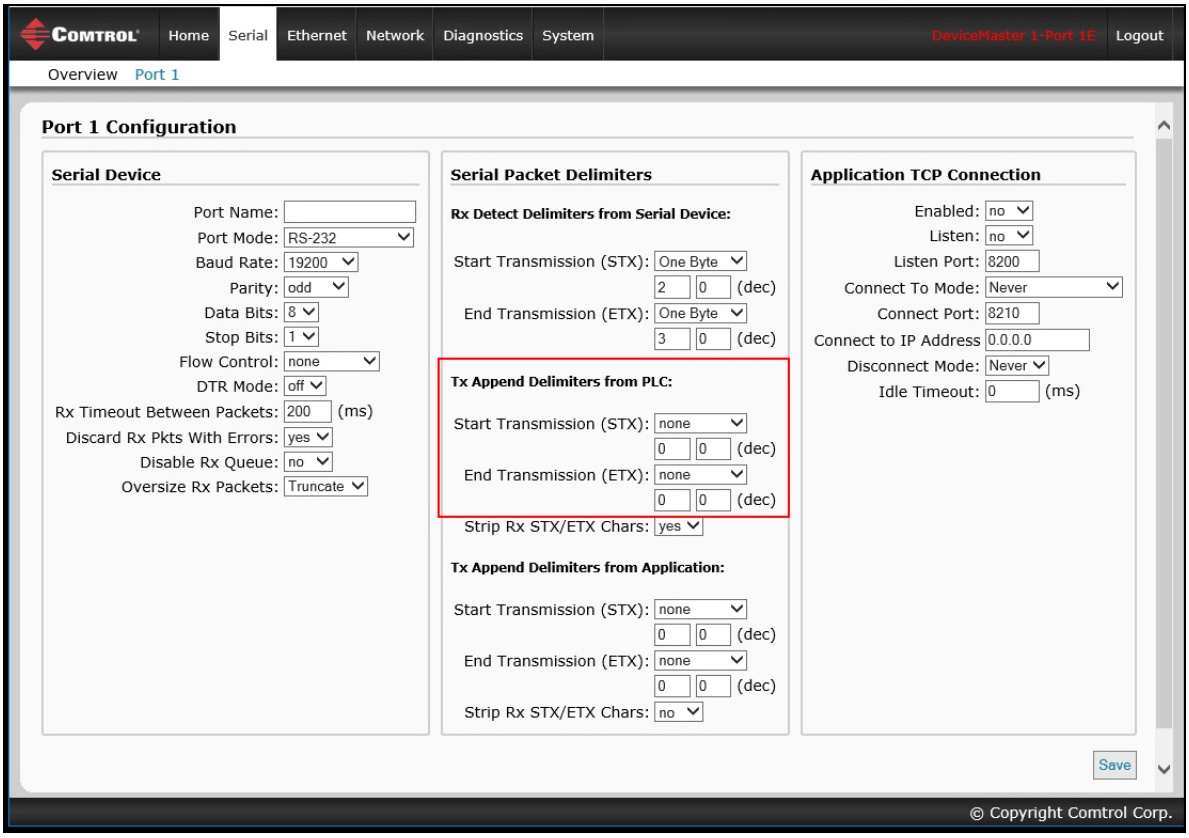
Data_block_1

	Name	Data type	Offset	Start value	Monitor value
1	Static				
2	InputBuf	Struct	0.0		
3	SeqNum	Word	0.0	16#0	16#0001
4	Length	Word	2.0	16#0	16#0004
5	Data	Array[0..31] of Byte	4.0		
6	Data[0]	Byte	0.0	16#0	16#41
7	Data[1]	Byte	1.0	16#0	16#42
8	Data[2]	Byte	2.0	16#0	16#43
9	Data[3]	Byte	3.0	16#0	16#44
10	Data[4]	Byte	4.0	16#0	16#00
11	Data[5]	Byte	5.0	16#0	16#00
12	Data[6]	Byte	6.0	16#0	16#00

Writing Output Data

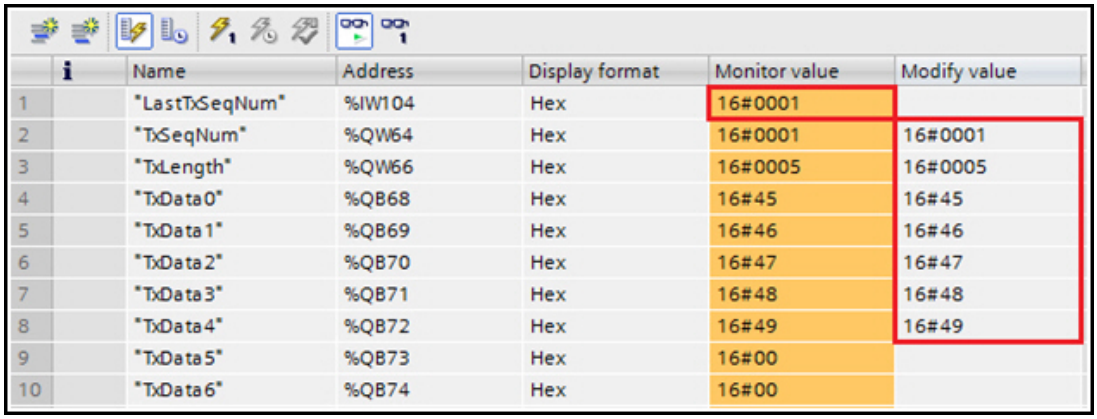
Since the serial device uses STX and ETX, configure the DeviceMaster to automatically append STX and ETX for all output data.

1. Open the DeviceMaster web page, click **Serial | Port 1**.
2. Configure the **Tx Append Delimiters from PLC** section as shown in the following figure.



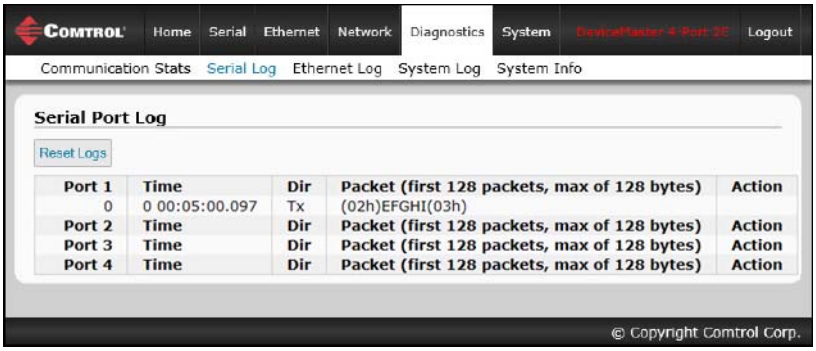
3. For the demonstration purposes, use a watch table to modify output value directly as shown in the following figure. Enter the following values:
   - Change tag **TxSeqNum** value from 0 to 1.
   - Set tag **TxLength** value to 5.
   - Enter an ASCII string **EFGHI** as the value in tags **TxData0..TxData4**.

4. Click the **Modify Once** button. The tag **LastTxSeqNum** (IW104), which is the input data of the output submodule, changes from 0 to 1 immediately. That means the DeviceMaster has successfully transmitted the output through the serial port.



	Name	Address	Display format	Monitor value	Modify value
1	"LastTxSeqNum"	%IW104	Hex	16#0001	
2	"TxSeqNum"	%QW64	Hex	16#0001	16#0001
3	"TxLength"	%QW66	Hex	16#0005	16#0005
4	"TxData0"	%QB68	Hex	16#45	16#45
5	"TxData1"	%QB69	Hex	16#46	16#46
6	"TxData2"	%QB70	Hex	16#47	16#47
7	"TxData3"	%QB71	Hex	16#48	16#48
8	"TxData4"	%QB72	Hex	16#49	16#49
9	"TxData5"	%QB73	Hex	16#00	
10	"TxData6"	%QB74	Hex	16#00	

5. Open the DeviceMaster web page, click **Diagnostics | Serial Log**. The following figure shows that a **(02h)EFGHI(03h)** packet has been transmitted through Port 1. Note that the DeviceMaster appended STX 16#02 and ETX 16#03 as configured.



If you do not see the above message in the serial log, here are some troubleshooting tips:

- If the expected output data is not in the serial log, make sure the value of **TxLength** tag is valid. The DeviceMaster will not transmit the output data if the length field is invalid, that is, larger than the size of the output submodule.
- Make sure to increment the **TxSeqNum** tag every time. The DeviceMaster will not transmit output data unless the sequence number changes.
- If the expected output data is shown in the serial log, but does not seem to be received by the serial device, then check the serial port configuration, including RS mode, baud rate, start bits and stop bits, flow control, and delimiters.

In a real case scenario, a better way to write output data is to define an output buffer structure in a data block, then use a **DPWR_DAT** instruction to copy the entire output buffer to the output address.

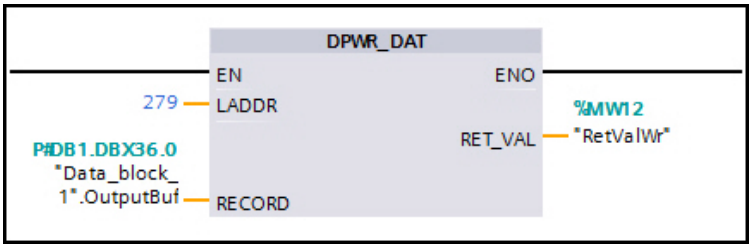
The following figure shows an output buffer structure called **OutputBuf**.

Data_block_1

	Name	Data type	Offset	Start value
1	Static			
2	InputBuf	Struct	...	
3	SeqNum	Word	...	16#0
4	Length	Word	...	16#0
5	Data	Array[0..31] of Byte	...	
6	OutputBuf	Struct	...	
7	SeqNum	Word	...	16#0
8	Length	Word	...	16#0
9	Data	Array[0..31] of Byte	...	

In a PLC program, fill out the sequence number, length and data fields. Make sure that the length field is correct and the sequence number is incremented every time. The following figure shows how to use a **DPWR_DAT** instruction to copy **OutputBuf** structure to the output address.

- Parameter **LADDR** - Enter the hardware identifier of the output submodule, which can be found in the **Properties tab | General | Hardware identifier**.
- Parameter **RECORD** - Enter **Data_block_1.OutputBuf**.



Optionally, after each write, confirm the data was transmitted successfully by comparing the **LastTxSeqNum** tag with the **OutputBuf.SeqNum**.

Advanced Functions

This section discussed the following topics:

Handling Oversize Packets

When a packet larger than the input size of the submodule is received, the DeviceMaster's default behavior is to truncate the packet to the maximum allowed size and send it to the IO controller as normal IO data. The length field is not changed when a packet is truncated. The IO controller can determinate if a packet has been truncated by checking the length field. If the length field is greater than the submodule input size, then the packet has been truncated.

The DeviceMaster supports two other options for oversize input packets received from serial or Ethernet device. These are the options **Oversize Rx Packets**.

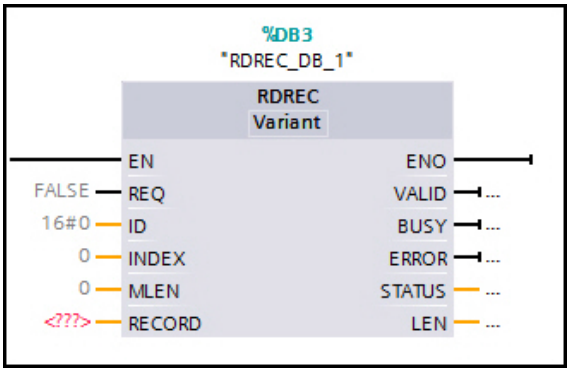
- **Truncate** (default) - Oversize packets are truncated and send to IO controller as cyclic IO data.
- **SaveRec** - Oversize packets are truncated and send to IO controller as cyclic IO data. The original packets are also saved as acyclic record data.
- **Drop** - Oversize packets are dropped.

When the **SaveRec** option is selected, an oversize packet is truncated and sent to the IO controller via normal cyclic IO update, just like the default behavior. Besides, the original packet is also be stored as an acyclic record data and available for record data read. The following record indexes are used to read the saved oversize packet.

Record Indexes for Oversized Rx Packets	Description
10000 .. 10000+N-1	Saved oversize packet for an specified input submodule. Where, N is the size of the saved oversized packet, including the 4-byte sequence number and length field followed by the actual input data, the same format as shown in the table of an Input Data Format of an Input Submodule (Page 81).

The following figure shows the read data record instruction (**RDREC**) and the table lists its parameters. For more information regarding the **RDREC** instruction, refer to TIA Portal help system.

If you want to read an entire packet, the target range specified by the **RECORD** parameter must be large enough to hold a maximum size packet, including the 4 byte sequence number and length field. For a serial port, the maximum possible size is 1518 + 4 bytes; for an Ethernet device the maximum size is 2048 + 4 bytes.



RDREC Instruction Parameters	Declaration	Description
REQ	Input	REQ = 1: Transfer data record
ID	Input	Hardware identifier of the input submodule.
INDEX	Input	Record indexes of the input submodule in the Record Indexes for Oversize Rx Packets table on Page 95.
MLEN	Input	The length in bytes of the data record to be read.
VALID	Output	New data record was received and is valid.
BUSY	Output	BUSY = 1: the reading process is not yet complete.
ERROR	Output	ERROR = 1: An error occurred during the reading process.
STATUS	Output	Block status of error information.
LEN	Output	Length of the read data record information.
RECORD	InOut	Target range for the data record read.

Example #1: A 128-byte serial data with sequence number 1 is saved as record data. The target range of **RDREC** instruction is 256 bytes. **INDEX** = 10000, **MLEN** = 256 (size of the target range). On return, **LEN** = 132. The first 4 bytes of the target range [0..3] is the sequence number (1) and length (128). The next 128 bytes [4..131] are the serial data. The rest of the target range [132..255] are not used.

Example #2: A 256 bytes serial data with sequence number 2 is saved as record data. The target range of **RDREC** instruction is only 128 bytes. **INDEX** = 10000, **MLEN** = 128. On return, **LEN** = 128. Target range [0..3] contains the sequence number (2) and length (256). Target range [4..127] contains the first 124 bytes of the 256 bytes serial data. The rest of the serial data are lost.

Reading a part of a packet at an offset is supported. When you specify the **INDEX** parameter = 10000 + offset and the **MLEN** parameter = 4 + n, only the n bytes of the data starting at the specified offset will be returned.

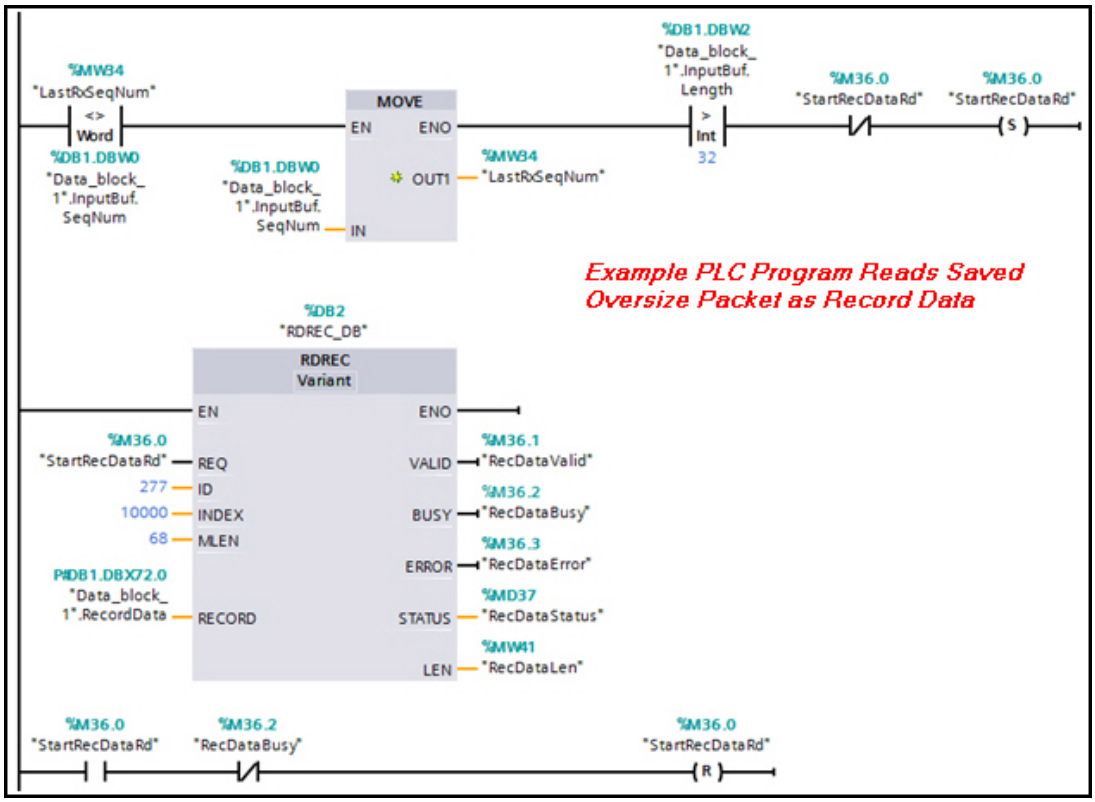
Example #3: A 80 bytes serial data with sequence number 3 is saved as record data. The target range of **RDREC** instruction is 64 bytes. **INDEX** = 10030, **MLEN** = 64. This record read attempts to read up to 60 bytes of data at offset 30. On return, **LEN** = 54. Target range [0..3] contains the sequence number (3) and length (80). Target range [4..53] contains the 50 bytes serial data starting at offset 30. The target range [54..63] are not used.

Notes:

- The of target range [0..3] always contains the sequence number and the original packet length. Reading a partial packet will not change the length field. The **LEN** parameter indicates the number of bytes that are actually read.
- The DeviceMaster only saves one oversize packet per port/device. If a saved packet has not been read by IO controller, the following oversize packets will still be truncated and sent to IO controller as normal IO data, however they will not be saved as record data. The **Error Saving as Record Data** count on the **Diagnostics | Communication Stats** page will be incremented.
- A saved packet can only be read once by IO controller. Whether the record read reads the whole packet or only a part of it, the DeviceMaster clears the entire packet after a successful record data read. Any parts of the packet that are not read are lost.
- The minimum target range is 5 bytes, include 4 bytes sequence number and length, plus 1 byte data. The data can start at any location by using **INDEX** = 10000 + offset, **MLEN** = 5.
- An invalid record data read, such as an **INDEX** that is outside of a packet range, or there is no save packet, will increment the **PLC Record Read Error** count on the **Diagnostics | Communication Stats** page.

Sample PLC Program Handling Oversize Packets

The following figure shows a sample PLC program that detects oversize packets and saves them to a data block using the **RDREC** instruction.



For normal input data received during IO update cycles, we use the same **InputBuf** structure (Page 90) and the **DPRD_DAT** instruction to store them in a data block. Besides, a **RecordData** structure is defined in the same data block and is used as the target range of **RDREC** instruction, as shown in the figure below. The **RecordData** structure can hold up to 64 bytes of input data plus the sequence number and length.

10	RecordData	Struct	...	
11	SeqNum	Word	...	16#0
12	Length	Word	...	16#0
13	Data	Array[0..63] of Byte	...	

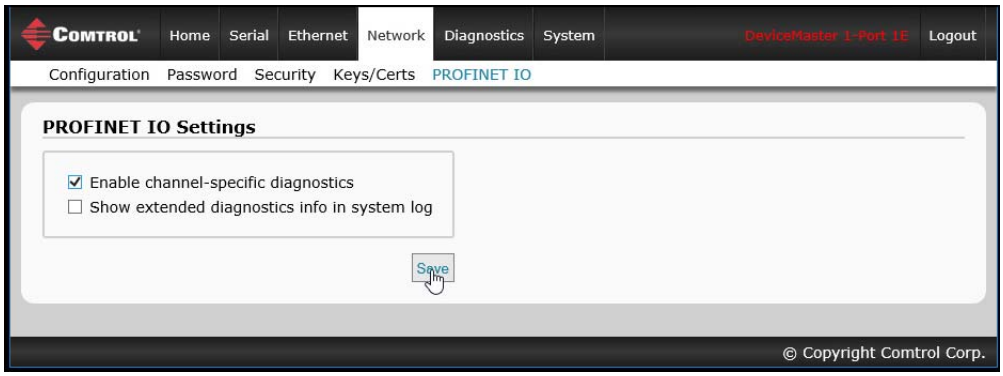
The tag **LastRxSeqNum** contains the sequence number of the last packet received on that port. Compare **LastRxSeqNum** with the sequence number of current packet **Data_block_1.InputBuf.SeqNum**, if they are not equal and the packet length **Data_block_1.InputBuf.Length** is also larger than the input size (32), then the tag **StartRecDataRd** is set, which starts the **RDREC** instruction.

In this example, up to 64 bytes of a saved packet will be read and stored in **Data_block_1.RecordData**. Once the **RDREC** instruction completes, the **StartRecDataRd** tag is cleared.

Enable Alarm for Oversize Packets

The DeviceMaster can also notify the IO controller through an alarm when an oversize packet is available. The feature is disabled by default. Use this procedure to enable the alarm.

1. Open the web page and click **Network | PROFINET IO**.
2. Check the **Enable channel-specific diagnostics** and click the **Save** button.



Once enabled, the DeviceMaster sends a diagnostic alarm to the IO controller when an oversize packet is saved. The alarm is a channel-specific diagnostic alarm with an error type **4096** (16#1000). Using the slot information associated with the alarm, the IO controller can start a record data read instruction to retrieve the saved packet for a certain port/device. After the packet is read, the DeviceMaster clears the alarm automatically.

Shared Device Functionality

The DeviceMaster supports the *shared device* functionality, which allows two IO controllers to access different serial ports or Ethernet devices through the same gateway simultaneously.

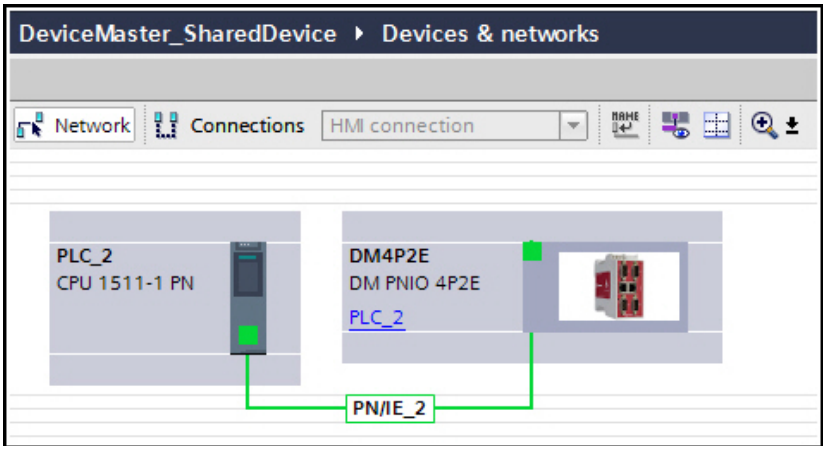
Assuming we have a PNIO-2304 and two IO controllers. IO Controller 1 wants to access two serial devices connected to Serial Port 1 and 2. IO Controller 2 wants to access a third serial device connected to Serial Port 3. Separate TIA Portal projects need to be created for the two IO controllers.

The first IO controller is considered as the *main* PLC.

1. Create a new TIA Portal project.
2. Add the PLC1 and the PNIO-2304.
3. Insert two serial modules in Slot 1 and Slot 2 for the two serial devices.
4. Configure the IO submodules.
5. Compile and download the project to PLC1.
6. Check the **Diagnostics | System Info** page to confirm that an application relationship has been established between the DeviceMaster and PLC1.

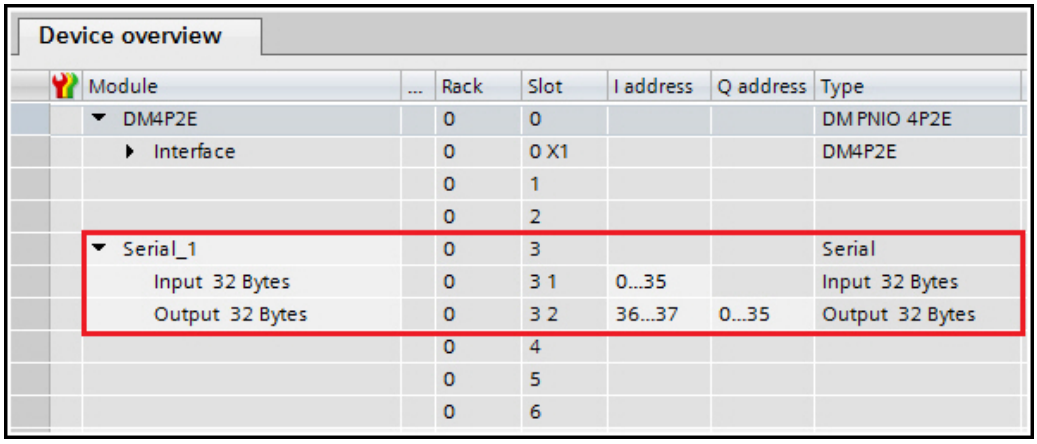
The second IO controller is considered as the *secondary* PLC and needs special configurations.

1. Create a second TIA Portal project.
2. Add the PLC2 and the PNIO-2304.
3. Name the PLC2 as PLC_2, as shown in the following figure.

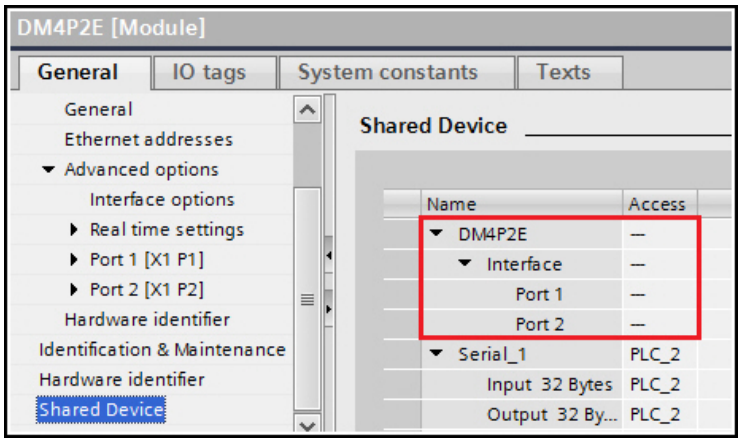


4. Configure the PLC2 with a different IP address as the PLC1.
5. Configure the DeviceMaster with the same IP assignment and device name as the first project.

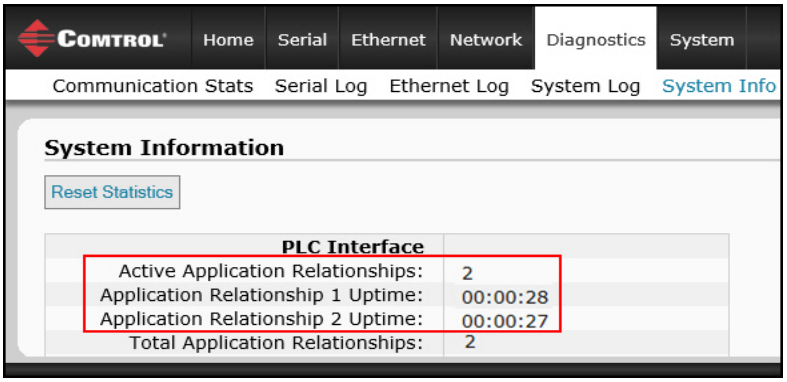
6. Insert a serial module to Slot 3 and configure the IO submodules, as shown in following figure.



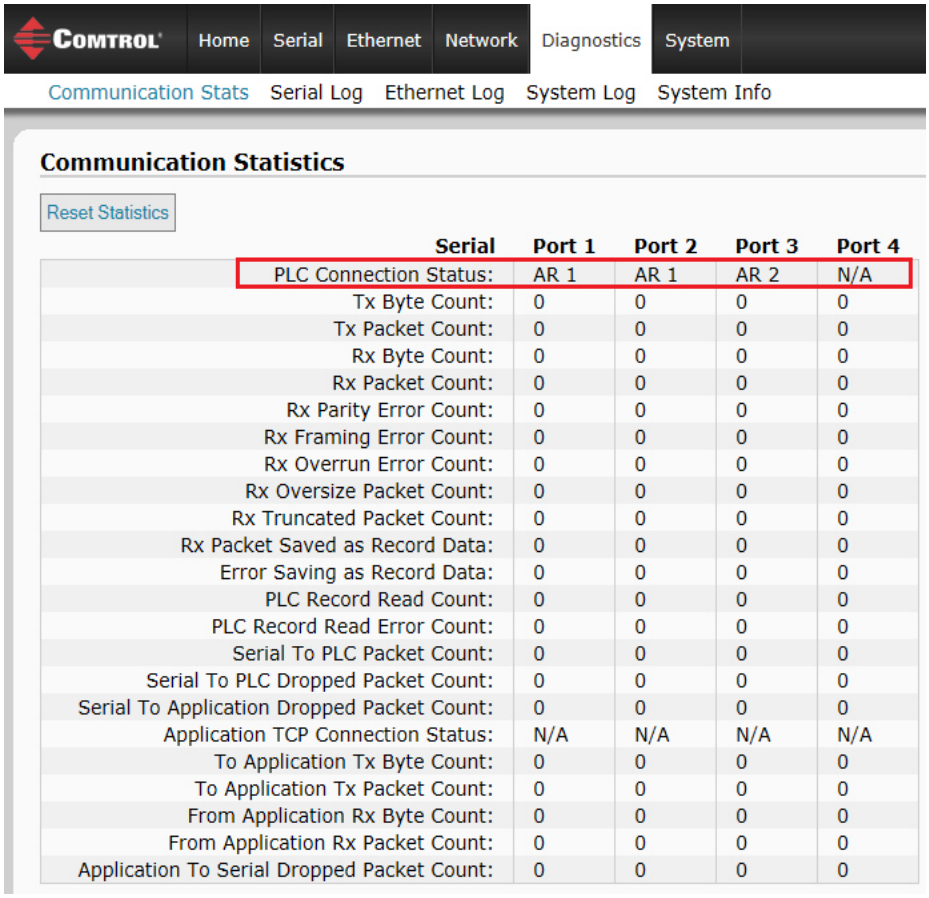
7. Leave Slot 1 and Slot 2 open as they are controlled by PLC1.
8. Double-click the DeviceMaster, on the **General tab | Shared Device**, change the **Access** option from **PLC_2** to **—** for the head module **DM4P2E**, as shown in the following figure. This makes the PLC1 the only one that controls the head module.



9. Compile and download the project to PLC2.
10. Open the web page and click **Diagnostics | System Info**. If the second PLC connection has been established successfully, the **Active Application Relationship** should be 2, as shown in following figure.



The PLC connection status is also displayed on the **Diagnostics | Communication Stats** page for each serial port and Ethernet device. The following figure shows that Serial Port 1 and Port 2 are controlled by PLC1 through the first application relationship (AR 1), while Port 3 is controlled by PLC2 through the second application relationship (AR 2). Note that Serial Port 4 is not configured in either project, therefore its PLC connection status is N/A.



Serial	Port 1	Port 2	Port 3	Port 4
PLC Connection Status:	AR 1	AR 1	AR 2	N/A
Tx Byte Count:	0	0	0	0
Tx Packet Count:	0	0	0	0
Rx Byte Count:	0	0	0	0
Rx Packet Count:	0	0	0	0
Rx Parity Error Count:	0	0	0	0
Rx Framing Error Count:	0	0	0	0
Rx Overrun Error Count:	0	0	0	0
Rx Oversize Packet Count:	0	0	0	0
Rx Truncated Packet Count:	0	0	0	0
Rx Packet Saved as Record Data:	0	0	0	0
Error Saving as Record Data:	0	0	0	0
PLC Record Read Count:	0	0	0	0
PLC Record Read Error Count:	0	0	0	0
Serial To PLC Packet Count:	0	0	0	0
Serial To PLC Dropped Packet Count:	0	0	0	0
Serial To Application Dropped Packet Count:	0	0	0	0
Application TCP Connection Status:	N/A	N/A	N/A	N/A
To Application Tx Byte Count:	0	0	0	0
To Application Tx Packet Count:	0	0	0	0
From Application Rx Byte Count:	0	0	0	0
From Application Rx Packet Count:	0	0	0	0
Application To Serial Dropped Packet Count:	0	0	0	0

If the second connection could not be established, here are some troubleshooting tips:

- Make sure the same DeviceMaster module is added in both projects. The DeviceMaster module must be assigned with the same IP address and same device name.
- Both IO controllers should be on the same subnet with different IP addresses.
- Any serial port or Ethernet device can only be controlled by one IO controller. The easiest way is to leave some slots open in one project, then use these unused slots in another project.
- In the second project, the access option of head module must be set to —. Like serial/Ethernet modules, the head module also can be controlled only by one IO controller.
- Some IO controllers, such as the S7-1200 CPU, do not support shared device. They can still be used as the main PLC, but cannot be used as the secondary PLC. Only IO controllers that support shaved device, such as S7-1500 CPU, can be configured as the secondary PLC.
- Please refer to the *STEP 7 Professional V13 SP1 System Manual* (chapter titled: *Configuring Shared Devices*) for more information regarding shared device functionality.

Network Menu

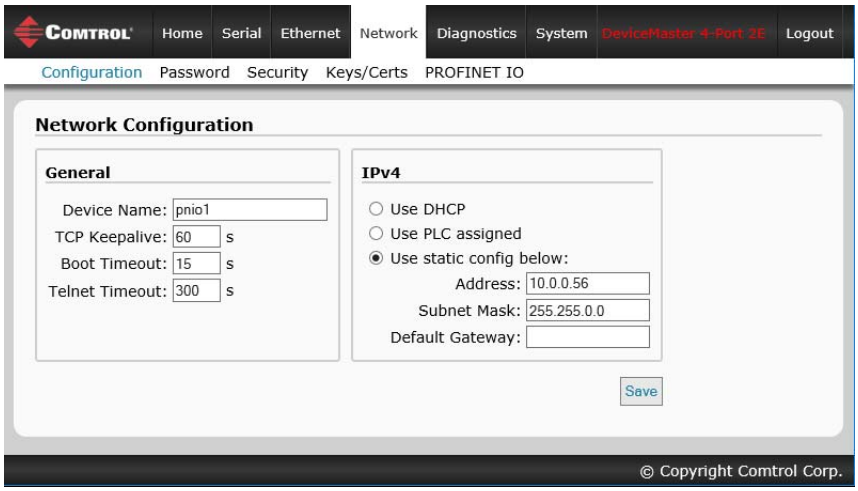
Portions of the web pages under the **Network** menu may be discussed in *Configuring the DeviceMaster in TIA Portal* on Page 69.

This section provides information about each **Network** menu web page:

- *Configuration Page* on Page 103
- *Password Page* on Page 105
- *Security Page* on Page 106
- *Keys/Certs Page* on Page 107
- *PROFINET IO Page* on Page 109

Configuration Page

The **Network | Configuration** page provides the options discussed in the next table.



Option	Description
General	
Device Name Default = empty	You can enter a PROFINET IO device name for this DeviceMaster. The device name must be specified according to DNS conventions. • Restricted to a total of 240 characters (letters, digits, dash or period). • Parts of the name within the device name; in other words, a string between two periods, must not exceed a maximum of 63 characters. • No special characters such as umlauts (ä, ö etc.), brackets, underscore, slash, blank etc. The dash is the only permitted special character. • The device name must not begin or end with the "-" character. • The device name must not begin with numbers. • The device name must not have the structure n.n.n.n (n = 0...999). • The device name must not begin with the character string "port-xyz-" (x , y, z = 0...9).
TCP Keepalive Default = 60	This option allows you to set the amount of time in seconds that the DeviceMaster waits until it closes this connection and frees all the ports associated with it. The TCP protocol has an optional keepalive feature where the two network stacks periodically ping each other to make sure the connection is still up. In the UNIX world, this feature is usually known as the SOKEEPALIVE socket option. By default, this keepalive feature is not enabled, and the only time you know a connection is down is when you try to write something and the other end does not acknowledge you. The potential issue with the DeviceMaster occurs when data flow was mostly one-way, and the receiver of the data was configured to initiate the TCP connection. If the sender of the data was rebooted, it would wait for the initiation a connection, discarding data. The receiver would wait forever for data and never realize that the other end wasn't connected any more and that the TCP connection needed to be re-established. Enabling the TCP keepalive feature for a connection solves this problem: the TCP stack periodically pings the other end. If the connection has gone away, the DeviceMaster is notified, so that it can attempt to re-establish the TCP connection.
Boot Timeout Default 15 seconds	Allows you to change the bootloader time-out value before the default application, PROFINET IO loads. You may need to increase this time-out value to 45 for compatibility with spanning tree devices (normally switches). If you change the time-out value to 0, this prevents PROFINET IO from loading.
Telnet Timeout Default = 300 seconds	Sets the telnet timeout period (seconds).

Option	Description
IPv4	
Use DHCP	Configures the DeviceMaster to use DHCPv4 mode. See your System Administrator to acquire a unique reserved IPv4 address if you are using DHCP. They will need the MAC address of the unit to provide you with an IPv4 address.
Use PLC assigned	The **Use PLC assigned** radio box is for information only. Use *Assigning an IP Address via IO Controller* on Page 74 to set the IP address in the TIA Portal project. If you select the **Use PLC assigned** option and reboot the DeviceMaster, the gateway will start with the 0.0.0.0 IP address and the web interface will not work.
Use static config below	Configures the DeviceMaster with the static IPv4 address information that you provide in the **Address**, **Subnet Mask**, and **Default Gateway** fields below. The DeviceMaster is shipped from the factory with the following default IPv4 network settings: • IPv4 address = 192.168.250.250 • IPv4 Netmask = 255.255.0.0 • IPv4 Gateway address = 192.168.250.1

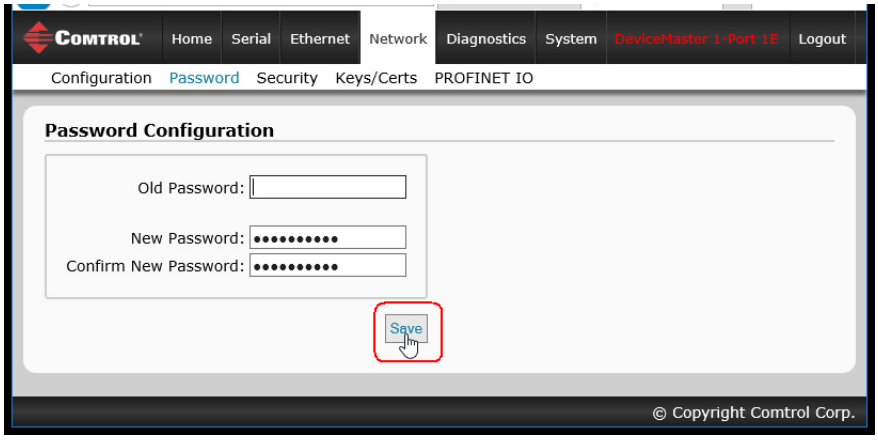
Password Page

You can easily set up a password to secure the DeviceMaster.

Note: *There is no password set from the factory.*

Use the following information to configure a password for this DeviceMaster.

1. Click **Network | Password**.
2. If changing an existing password, enter that password in the **Old Password** field.
3. Enter a new password and enter the confirmation password.
4. Click the **Save** button.

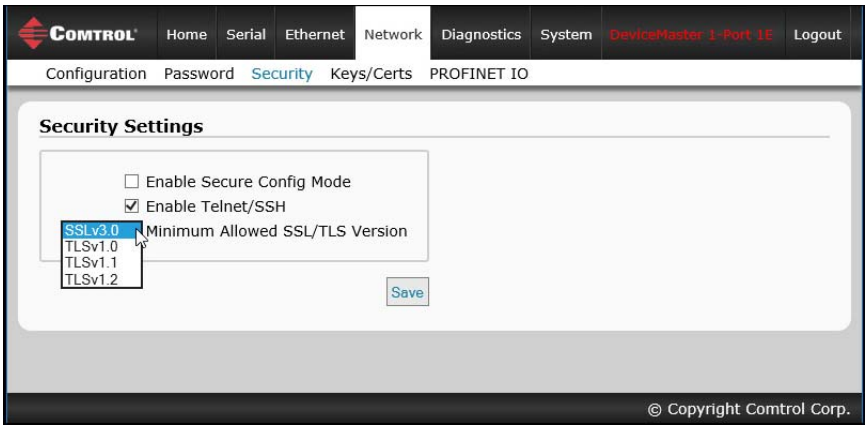


When anyone attempts to log into the DeviceMaster, you must enter the following:

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

Security Page

The following table discusses **Security Settings** options.



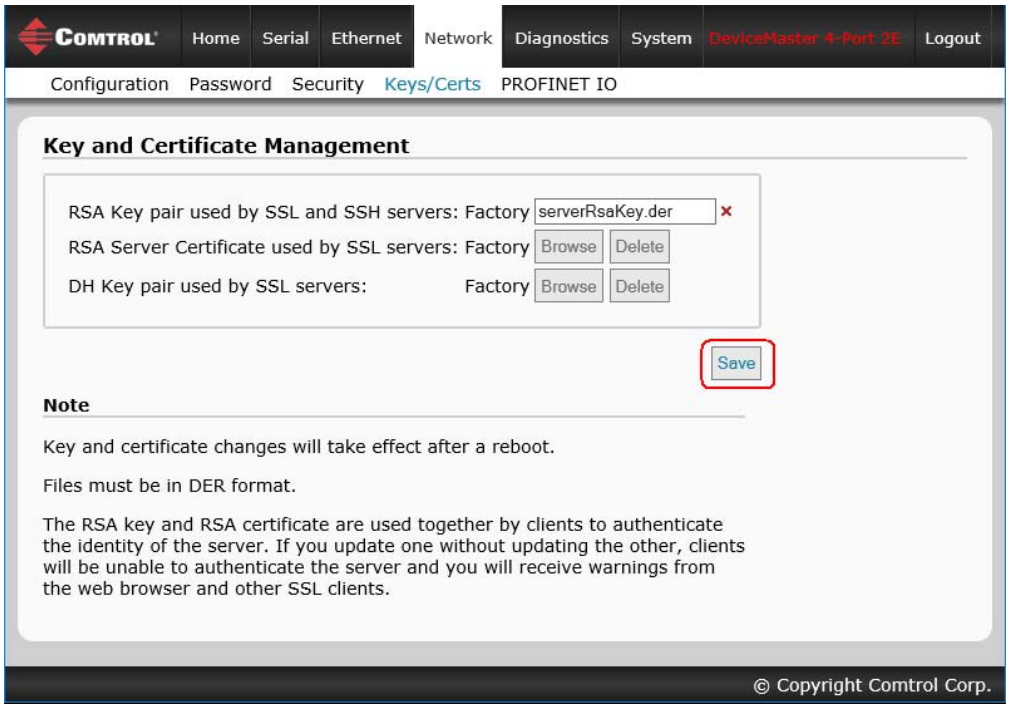
Option	Description
Enable Secure Config Mode	If **Secure Config** mode is enabled, unencrypted access to administrative and diagnostic functions is disabled. **Secure Config** mode changes DeviceMaster behavior as follows: • Telnet access to administrative and diagnostic functions is disabled. SSH access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

Use the following steps to change security settings in the DeviceMaster.

1. Click the **Network | Security**.
2. Click the appropriate check boxes in the **Security Settings** page to enable or disable security accordingly.
3. After making changes to the **Security Configuration** area, you must click Save.
4. You may need to configure security keys or certificates depending on your choices.

Keys/Certs Page

The **Key and Certificate Management** page is discussed in the following table.



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

Key and Certificate Management	Description
RSA Server Certificate used by SSL servers	This is the RSA identity certificate that the DeviceMaster uses during SSL/TLS handshaking to identify itself. It is used most frequently by SSL server code in the DeviceMaster when clients open connections to the DeviceMaster's secure web server or other secure TCP ports. If a DeviceMaster serial port configuration is set up to open (as a client) a TCP connection to another server device, the DeviceMaster also uses this certificate to identify itself as an SSL client if requested by the server. In order to function properly, this certificate must be signed using the **Server RSA Key**. This means that the server RSA certificate and server RSA key must be replaced as a pair.
DH Key pair used by SSL servers	This is a private/public key pair that is used by some cipher suites to encrypt the SSL/TLS handshaking messages. ***Note:*** *Possession of the private portion of the key pair allows an eavesdropper to decrypt traffic on SSL/TLS connections that use DH encryption during handshaking.*
Client Authentication Certificate used by SSL servers	If configured with a CA certificate, the DeviceMaster requires all SSL/TLS clients to present an RSA identity certificate that has been signed by the configured CA certificate. As shipped, the DeviceMaster is not configured with a CA certificate and all SSL/TLS clients are allowed. See *Client Authentication* for more detailed information.

Note: *All DeviceMaster units are shipped from the factory with identical configurations. They all have the identical, self-signed, Comtrol Server RSA Certificates, Server RSA Keys, Server DH Keys, and no Client Authentication Certificates.*

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

Client Authentication

If desired, controlled access to SSL/TLS protected features can be configured by uploading a client authentication certificate to the DeviceMaster. By default, the DeviceMaster is shipped without a CA (Certificate Authority) and therefore allows connections from any SSL/TLS client.

If a CA certificate is uploaded, the DeviceMaster only allows SSL/TLS connections from client applications that provide to the DeviceMaster an identity certificate that has been signed by the CA certificate that was uploaded to the DeviceMaster.

This uploaded CA certificate that is used to validate a client's identity is sometimes referred to as a *trusted root certificate*, a *trusted authority certificate*, or a *trusted CA certificate*. This CA certificate might be that of a trusted commercial certificate authority or it may be a privately generated certificate that an organization creates internally to provide a mechanism to control access to resources that are protected by the SSL/TLS protocols.

To control access to the DeviceMaster's SSL/TLS protected resources you should create your own custom CA certificate and then configure authorized client applications with identity certificates signed by the custom CA certificate.

Changing Keys and Certificates

Use the following steps to update security keys and certificates in the DeviceMaster.

1. Click the **Network | Keys/Cert**.
2. Click **Browse** to locate the key or certificate file, highlight the file, and click **Open**.

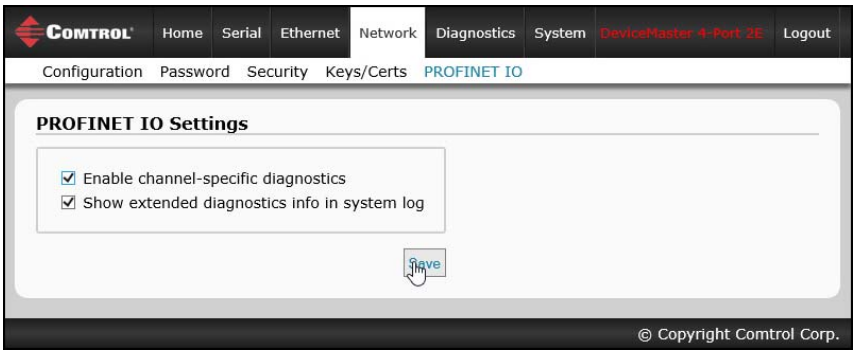
   Refer to the *Keys/Certs Page* on Page 107 subsection for detailed information.
3. Click **Upload** when you return to the **Key and Certificate Management** area.

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

   Changes will not take effect until the DeviceMaster is rebooted.
4. Click **System | Reboot** to reboot the DeviceMaster.

PROFINET IO Page

The following table explains the options on this page.



Miscellaneous Setting	Description
Enable channel-specific diagnostics	If you enable this feature, the DeviceMaster can notify the IO controller via alarm when an oversize packet is available. Once enabled, the DeviceMaster sends a diagnostic alarm to the IO controller when an oversize packet is saved. The alarm is a channel-specific diagnostic alarm with an error type 4096 (16#1000). Using the slot information associated with the alarm, the IO controller can start a record data read instruction to retrieve the saved packet for a certain port/device. After the packet is read, the DeviceMaster clears the alarm automatically.

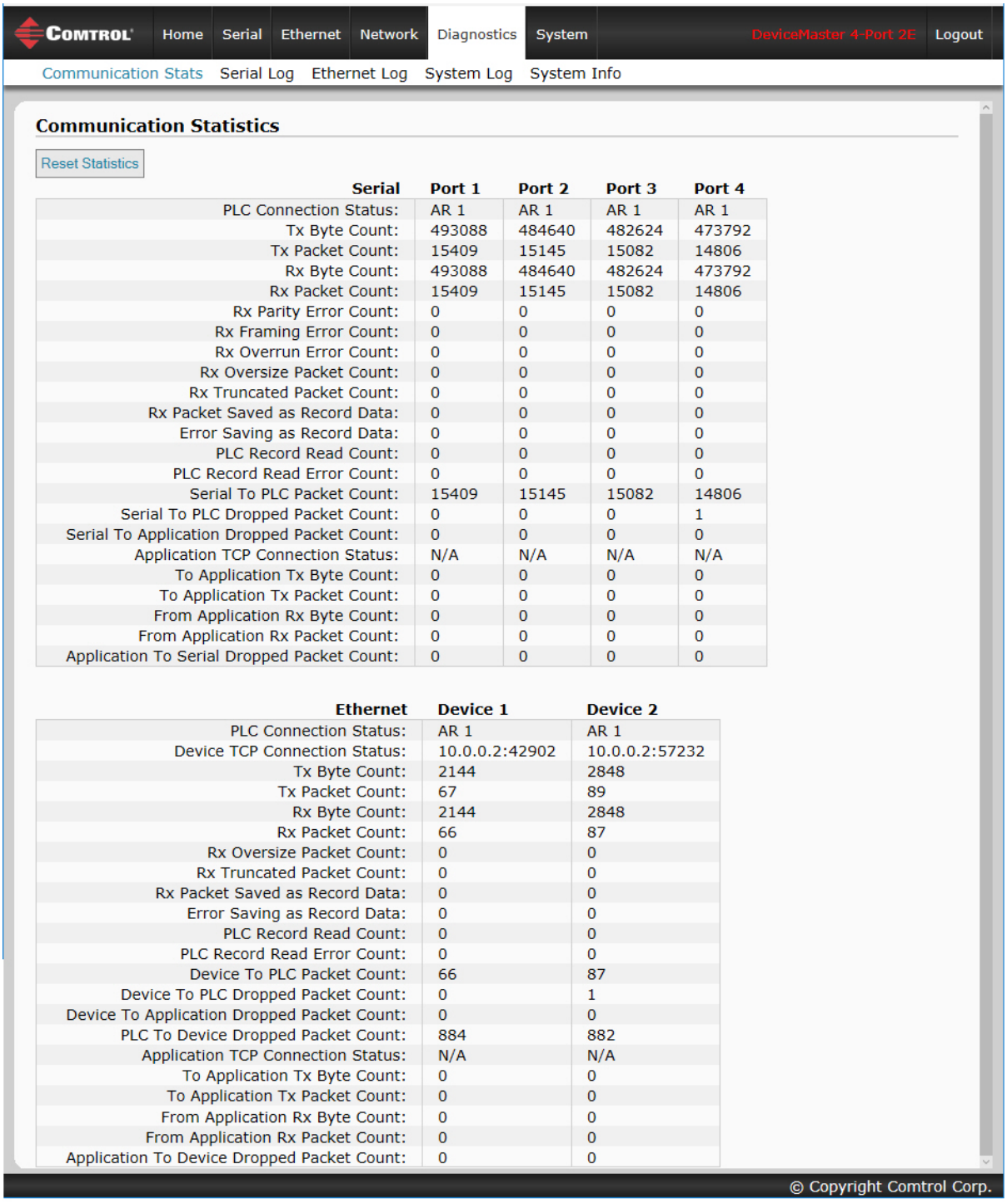
Miscellaneous Setting	Description
Show extended diagnostics in System log	Enabling this option provides more detailed system log information in **Diagnostics | System Log**, such as: • Thread name • ID • State • Priority • Stacksize • Stackused • SuspendCnt • WakeupCnt • SleepReason • WakeReason • TimerID • Type • Base • Count • Callback • UserID • Message_Queue • TaskID • Length • MaxLen • Sent • Received • Error

Diagnostics Menu

This section provides information about the web pages under the **Diagnostics** menu:

Communication Statistics Page

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



Serial	Port 1	Port 2	Port 3	Port 4
PLC Connection Status:	AR 1	AR 1	AR 1	AR 1
Tx Byte Count:	493088	484640	482624	473792
Tx Packet Count:	15409	15145	15082	14806
Rx Byte Count:	493088	484640	482624	473792
Rx Packet Count:	15409	15145	15082	14806
Rx Parity Error Count:	0	0	0	0
Rx Framing Error Count:	0	0	0	0
Rx Overrun Error Count:	0	0	0	0
Rx Oversize Packet Count:	0	0	0	0
Rx Truncated Packet Count:	0	0	0	0
Rx Packet Saved as Record Data:	0	0	0	0
Error Saving as Record Data:	0	0	0	0
PLC Record Read Count:	0	0	0	0
PLC Record Read Error Count:	0	0	0	0
Serial To PLC Packet Count:	15409	15145	15082	14806
Serial To PLC Dropped Packet Count:	0	0	0	1
Serial To Application Dropped Packet Count:	0	0	0	0
Application TCP Connection Status:	N/A	N/A	N/A	N/A
To Application Tx Byte Count:	0	0	0	0
To Application Tx Packet Count:	0	0	0	0
From Application Rx Byte Count:	0	0	0	0
From Application Rx Packet Count:	0	0	0	0
Application To Serial Dropped Packet Count:	0	0	0	0

Ethernet	Device 1	Device 2
PLC Connection Status:	AR 1	AR 1
Device TCP Connection Status:	10.0.0.2:42902	10.0.0.2:57232
Tx Byte Count:	2144	2848
Tx Packet Count:	67	89
Rx Byte Count:	2144	2848
Rx Packet Count:	66	87
Rx Oversize Packet Count:	0	0
Rx Truncated Packet Count:	0	0
Rx Packet Saved as Record Data:	0	0
Error Saving as Record Data:	0	0
PLC Record Read Count:	0	0
PLC Record Read Error Count:	0	0
Device To PLC Packet Count:	66	87
Device To PLC Dropped Packet Count:	0	1
Device To Application Dropped Packet Count:	0	0
PLC To Device Dropped Packet Count:	884	882
Application TCP Connection Status:	N/A	N/A
To Application Tx Byte Count:	0	0
To Application Tx Packet Count:	0	0
From Application Rx Byte Count:	0	0
From Application Rx Packet Count:	0	0
Application To Device Dropped Packet Count:	0	0

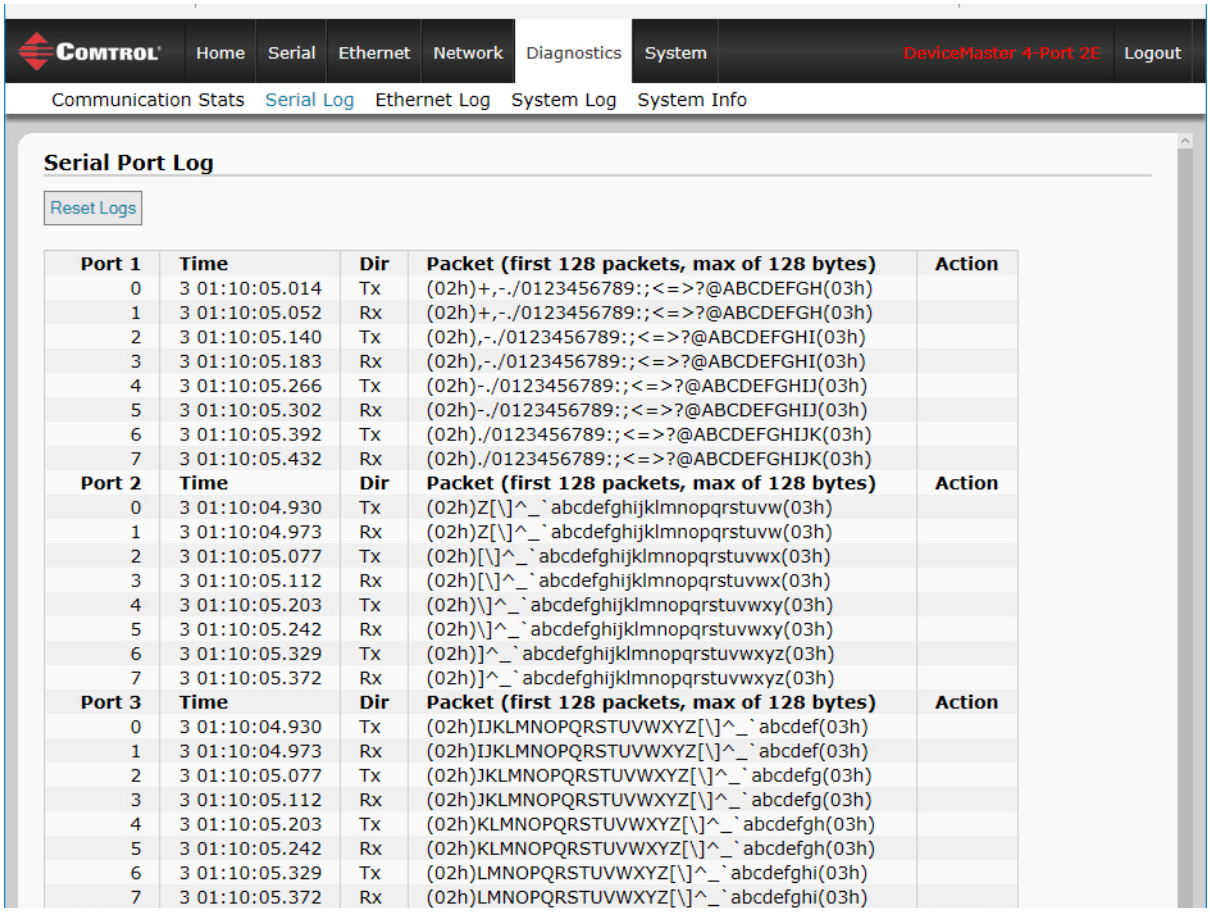
Communication Statistics	
Serial	
PLC Connection Status	Displays the application relationship number of the current PLC connection.
Tx Byte Count	Displays the number of bytes sent out of the serial port.
Tx Packet Count	Displays the number of serial packets sent out of the serial port.
Rx Byte Count	Displays the number of bytes received over the serial port.
Rx Packet Count	Displays the number of packets received over the serial port.
Rx Parity Error Count	Displays the number of received serial packets dropped due to parity errors.
Rx Framing Error Count	Displays the number of received serial packets dropped due to framing errors.
Rx Overrun Error Count	Displays the number of received serial packets dropped due to overrun error incidents.
Rx Oversize Packet Count	Displays the number of received serial data packets that were larger than the configured input module.
Rx Truncated Packet Count	Displays the number of received serial packets that were truncated before being sent to the PLC.
Rx Packet Saved as Record Data	Displays the number of received serial packets that were saved as record data when the **Oversize Rx Packets** option is set to **SaveRec**.
Error Saving as Record Data	Displays the number of errors occurred when saving serial packets as record data.
PLC Record Read Count	Displays the number serial packets that were read by PLC as record data.
PLC Record Read Error Count	Displays the number of errors occurred when reading serial packets as record data.
Serial To PLC Packet Count	Displays the number of serial packets sent to the PLC.
Serial 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
Serial To Application Dropped Packet Count	Displays the number of received serial device packets intended for the application dropped: • No STX byte(s) found • No ETX byte(s) found • Time-outs • Packet too large • Receive buffer queue overflows • Application connection is offline
Application TCP Connection Status	Displays the information of the application TCP connection.

Communication Statistics (Continued)	
To Application Tx Byte Count	Displays the number of bytes sent to application TCP connection.
To Application Tx Packet Count	Displays the number of serial packets sent to application TCP connection.
From Application Rx Byte Count	Displays the number of bytes received from application TCP connection.
From Application Rx Packet Count	Displays the number of serial packets received from application TCP connection.
Application To Serial Dropped Packet Count	Displays the number of dropped serial packets that were intended for the device.
Ethernet	
PLC Connection Status	Displays the application relationship number of the current PLC connection.
Device TCP Connection Status	Displays the information of the device TCP connection.
Tx Byte Count	Displays the number of bytes sent out of the Ethernet device.
Tx Packet Count	Displays the number of Ethernet packets sent out of the Ethernet device.
Rx Byte Count	Displays the number of bytes received over the Ethernet device.
Rx Packet Count	Displays the number of packets received over the Ethernet device.
Rx Oversize Packet Count	Displays the number of received Ethernet data packets that were larger than the configured input module.
Rx Truncated Packet Count	Displays the number of received Ethernet packets that were truncated before being sent to the PLC.
Rx Packet Saved as Record Data	Displays the number of received Ethernet packets that were saved as record data when the **Oversize Rx Packets** option is set to **SaveRec**.
Error Saving as Record Data	Displays the number of errors occurred when saving Ethernet packets as record data.
PLC Record Read Count	Displays the number Ethernet packets that were read by PLC as record data.
PLC Record Read Error Count	Displays the number of errors occurred when reading Ethernet packets as record data.
Device To PLC Packet Count	Displays the number of Ethernet packets sent to the PLC.
Device To PLC Dropped Packet Count	Displays the number of received Ethernet packets intended for the PLC dropped: • No STX byte(s) found • No ETX byte(s) found • Time-outs • Packet too large • Receive buffer queue overflows

Communication Statistics (Continued)	
Device To Application Dropped Packet Count	Displays the number of received Ethernet device packets intended for the application dropped: • No STX byte(s) found • No ETX byte(s) found • Time-outs • Packet too large • Receive buffer queue overflows • Application connection is offline
PLC To Device Dropped Packet Count	Displays the number of Ethernet packets received from the PLC intended for the Ethernet device dropped: • Transmit buffer queue overflows • Ethernet device connection is offline
Application TCP Connection Status	Displays the information of the application TCP connection.
To Application Tx Byte Count	Displays the number of bytes sent to application TCP connection.
To Application Tx Packet Count	Displays the number of Ethernet packets sent to application TCP connection.
From Application Rx Byte Count	Displays the number of bytes received from application TCP connection.
From Application Rx Packet Count	Displays the number of Ethernet packets received from application TCP connection.
Application To Device Dropped Packet Count	Displays the number of dropped Ethernet packets that were intended for the device.

Serial Log

The **Serial Port Log** 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.

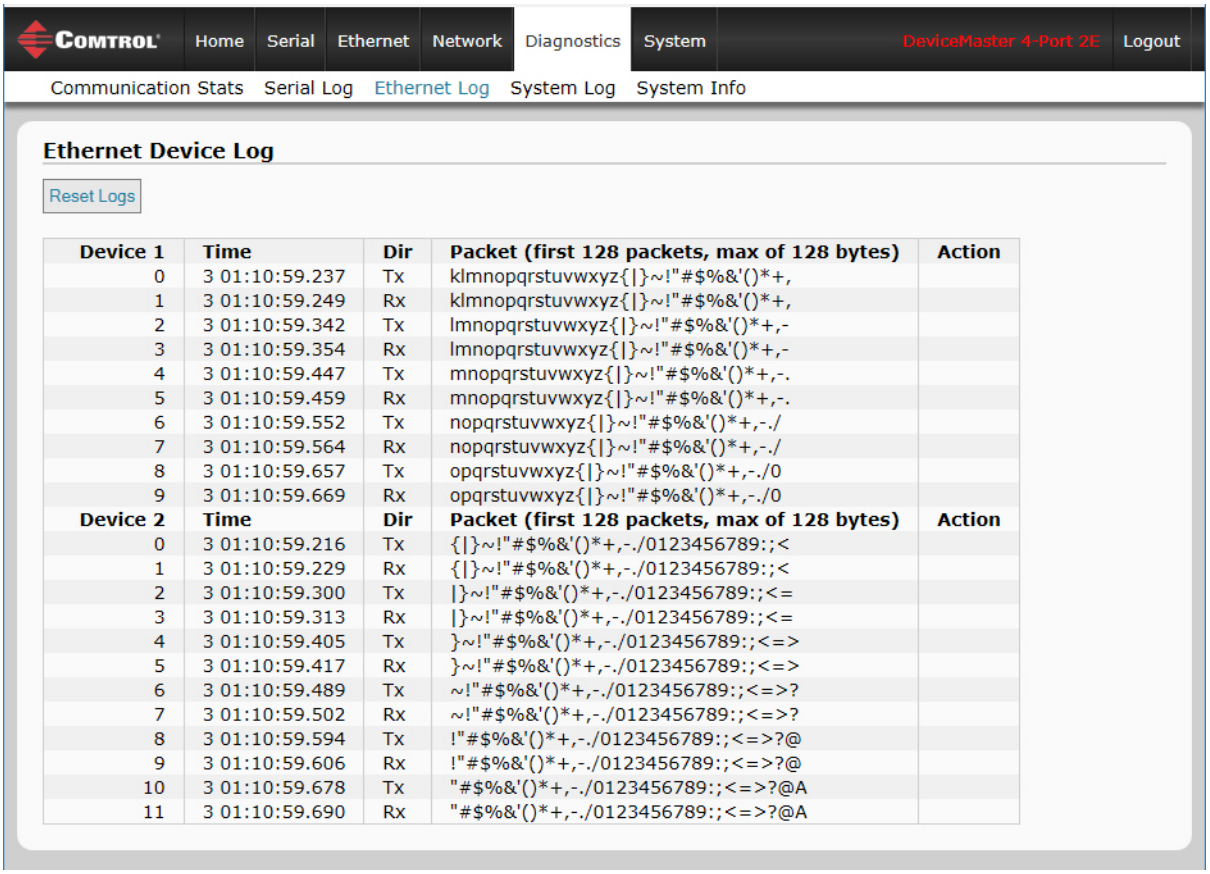


Port 1	Time	Dir	Packet (first 128 packets, max of 128 bytes)	Action
0	3 01:10:05.014	Tx	(02h)+,-./0123456789:;<=>?@ABCDEFGH(03h)	
1	3 01:10:05.052	Rx	(02h)+,-./0123456789:;<=>?@ABCDEFGH(03h)	
2	3 01:10:05.140	Tx	(02h),-./0123456789:;<=>?@ABCDEFGHI(03h)	
3	3 01:10:05.183	Rx	(02h),-./0123456789:;<=>?@ABCDEFGHI(03h)	
4	3 01:10:05.266	Tx	(02h)-./0123456789:;<=>?@ABCDEFGHIJ(03h)	
5	3 01:10:05.302	Rx	(02h)-./0123456789:;<=>?@ABCDEFGHIJ(03h)	
6	3 01:10:05.392	Tx	(02h)./0123456789:;<=>?@ABCDEFGHIJK(03h)	
7	3 01:10:05.432	Rx	(02h)./0123456789:;<=>?@ABCDEFGHIJK(03h)	
Port 2	**Time**	**Dir**	**Packet (first 128 packets, max of 128 bytes)**	**Action**
0	3 01:10:04.930	Tx	(02h)Z[\]^_`abcdefghijklmnopqrstuvw(03h)	
1	3 01:10:04.973	Rx	(02h)Z[\]^_`abcdefghijklmnopqrstuvw(03h)	
2	3 01:10:05.077	Tx	(02h)[\]^_`abcdefghijklmnopqrstuvwx(03h)	
3	3 01:10:05.112	Rx	(02h)[\]^_`abcdefghijklmnopqrstuvwx(03h)	
4	3 01:10:05.203	Tx	(02h)\]^_`abcdefghijklmnopqrstuvwxy(03h)	
5	3 01:10:05.242	Rx	(02h)\]^_`abcdefghijklmnopqrstuvwxy(03h)	
6	3 01:10:05.329	Tx	(02h)]^_`abcdefghijklmnopqrstuvwxyz(03h)	
7	3 01:10:05.372	Rx	(02h)]^_`abcdefghijklmnopqrstuvwxyz(03h)	
Port 3	**Time**	**Dir**	**Packet (first 128 packets, max of 128 bytes)**	**Action**
0	3 01:10:04.930	Tx	(02h)IJKLMNOPQRSTUVWXYZ[\]^_`abcdef(03h)	
1	3 01:10:04.973	Rx	(02h)IJKLMNOPQRSTUVWXYZ[\]^_`abcdef(03h)	
2	3 01:10:05.077	Tx	(02h)JKLMNOPQRSTUVWXYZ[\]^_`abcdefg(03h)	
3	3 01:10:05.112	Rx	(02h)JKLMNOPQRSTUVWXYZ[\]^_`abcdefg(03h)	
4	3 01:10:05.203	Tx	(02h)KLMNOPQRSTUVWXYZ[\]^_`abcdefgh(03h)	
5	3 01:10:05.242	Rx	(02h)KLMNOPQRSTUVWXYZ[\]^_`abcdefgh(03h)	
6	3 01:10:05.329	Tx	(02h)LMNOPQRSTUVWXYZ[\]^_`abcdefghi(03h)	
7	3 01:10:05.372	Rx	(02h)LMNOPQRSTUVWXYZ[\]^_`abcdefghi(03h)	

Column	Description
Port X	Packet number of the specified serial port.
Time	Elapsed time since system started in d hh:mm:ss.mmm format. Where: • d - days • hh - hours • mm - minutes • ss - seconds • mmm - milliseconds
Dir	Direction. Rx - Input, Tx - output
Packet	Data packet received or transmitted. • ASCII characters displayed as characters • Non-ASCII displayed in hex (xxh) format
Action	**Empty** - Packet was sent to PLC and/or application **Dropped** - Packet was dropped

Ethernet Log

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.

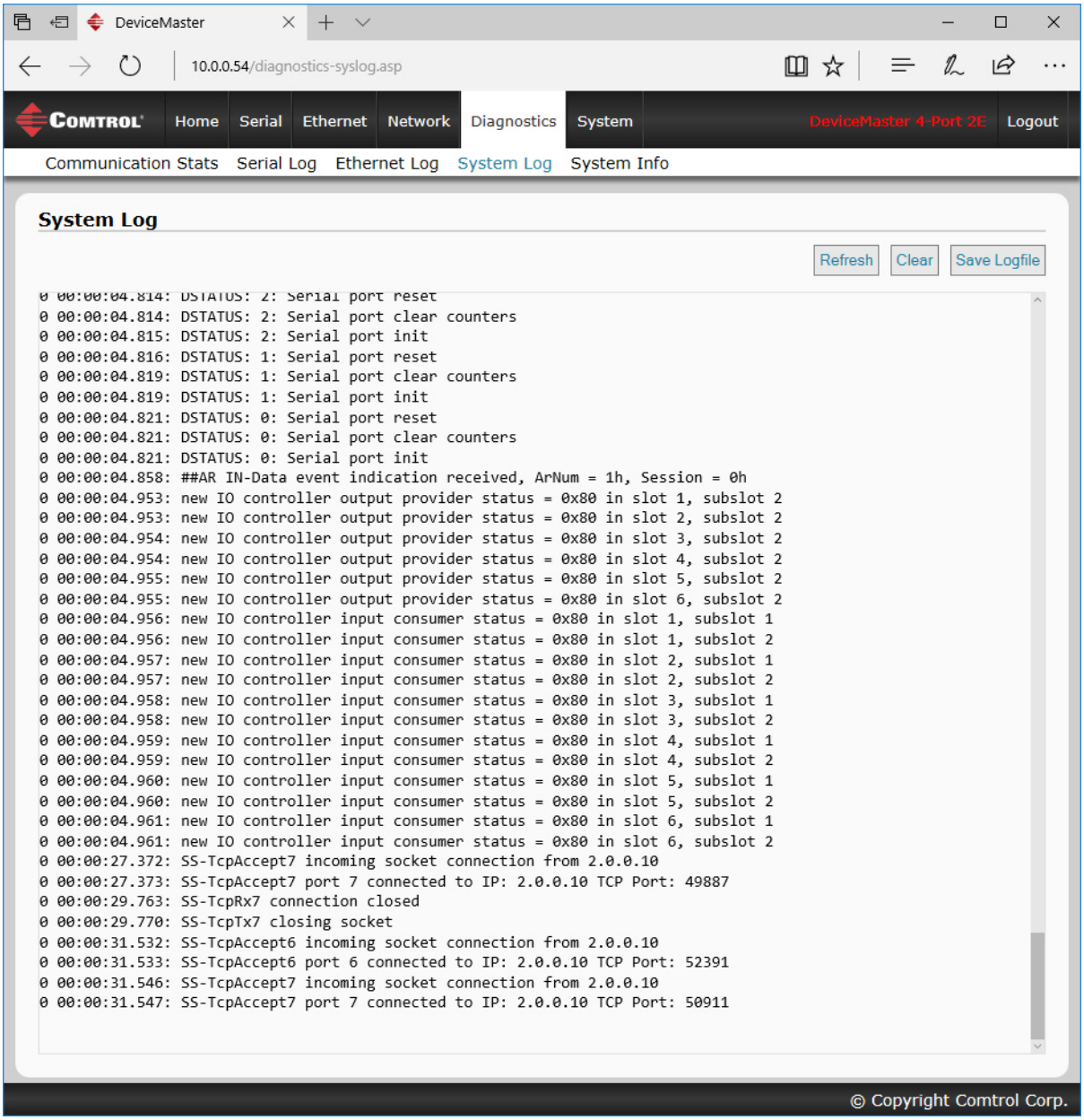


Device 1	Time	Dir	Packet (first 128 packets, max of 128 bytes)	Action
0	3 01:10:59.237	Tx	klmnopqrstuvwxyz{|}~!"#$%&'()*+,	
1	3 01:10:59.249	Rx	klmnopqrstuvwxyz{|}~!"#$%&'()*+,	
2	3 01:10:59.342	Tx	lmnopqrstuvwxyz{|}~!"#$%&'()*+,-	
3	3 01:10:59.354	Rx	lmnopqrstuvwxyz{|}~!"#$%&'()*+,-	
4	3 01:10:59.447	Tx	mnopqrstuvwxyz{|}~!"#$%&'()*+,-.	
5	3 01:10:59.459	Rx	mnopqrstuvwxyz{|}~!"#$%&'()*+,-.	
6	3 01:10:59.552	Tx	nopqrstuvwxyz{|}~!"#$%&'()*+,-./	
7	3 01:10:59.564	Rx	nopqrstuvwxyz{|}~!"#$%&'()*+,-./	
8	3 01:10:59.657	Tx	opqrstuvwxyz{|}~!"#$%&'()*+,-./0	
9	3 01:10:59.669	Rx	opqrstuvwxyz{|}~!"#$%&'()*+,-./0	
Device 2	**Time**	**Dir**	**Packet (first 128 packets, max of 128 bytes)**	**Action**
0	3 01:10:59.216	Tx	{|}~!"#$%&'()*+,-./0123456789:;<	
1	3 01:10:59.229	Rx	{|}~!"#$%&'()*+,-./0123456789:;<	
2	3 01:10:59.300	Tx	|}~!"#$%&'()*+,-./0123456789:;<=	
3	3 01:10:59.313	Rx	|}~!"#$%&'()*+,-./0123456789:;<=	
4	3 01:10:59.405	Tx	}~!"#$%&'()*+,-./0123456789:;<=>	
5	3 01:10:59.417	Rx	}~!"#$%&'()*+,-./0123456789:;<=>	
6	3 01:10:59.489	Tx	~!"#$%&'()*+,-./0123456789:;<=>?	
7	3 01:10:59.502	Rx	~!"#$%&'()*+,-./0123456789:;<=>?	
8	3 01:10:59.594	Tx	!"#$%&'()*+,-./0123456789:;<=>?@	
9	3 01:10:59.606	Rx	!"#$%&'()*+,-./0123456789:;<=>?@	
10	3 01:10:59.678	Tx	"#$%&'()*+,-./0123456789:;<=>?@A	
11	3 01:10:59.690	Rx	"#$%&'()*+,-./0123456789:;<=>?@A	

Column	Description
Device X	Packet number of the specified Ethernet device.
Time	Elapsed time since system started in d hh:mm:ss.mmm format. Where: • d - days • hh - hours • mm - minutes • ss - seconds • mmm - milliseconds
Dir	Direction. Rx - Input, Tx - output
Packet	Data packet received or transmitted. • ASCII characters displayed as characters • Non-ASCII displayed in hex (xxh) format
Action	**Empty** - Packet was sent to PLC and/or application **Dropped** - Packet was dropped

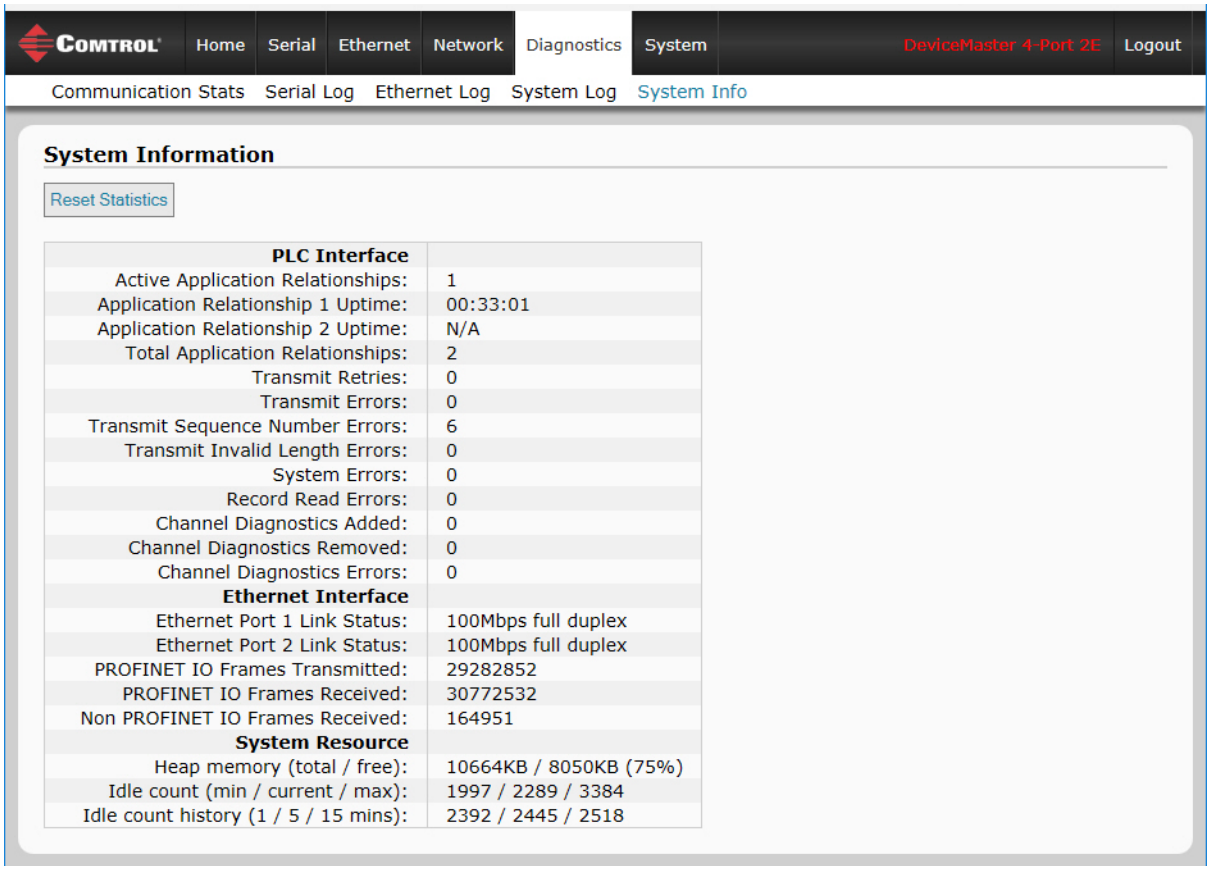
System Log

The **System Log** displays the log of system activities.



System Info

The following table provides you information about the **Diagnostics | System Info** page.



System Info	
PLC Interface	
Active Application Relationships	The number of active application relationships.
Application Relationship 1 Uptime	The uptime of application relationship 1.
Application Relationship 2 Uptime	The uptime of application relationship 2.
Total Application Relationships	The total number of application relationships that have been established.
Transmit Retries	The number of retries occurred when transmitting PROFIET IO frames.
Transmit Errors	The number of errors occurred when transmitting PROFINET IO frames.
Transmit Sequence Number Errors	The number of output sequence numbers that were out of order.
Transmit Invalid Length Errors	The number of output data lengths that were invalid.

System Info	
System Errors	The number of system errors detected: • Port MAC address information not available • Errors occurred when accessing Ethernet interface • Invalid application relationship number • Invalid module, submodule, slot, or subslot number
Record Read Errors	The number of errors occurred when reading record data.
Channel Diagnostics Added	The number of channel diagnostics alarms that have been added.
Channel Diagnostics Removed	The number of channel diagnostics alarms that have been removed (cleared).
Channel Diagnostics Errors	The number of errors occurred when adding/removing channel diagnostics alarms.
Ethernet Interface	
Ethernet Port Link 1 Status	The link status of Ethernet port 1.
Ethernet Port Link 2 Status	The link status of Ethernet port 2. Only available on 2E (dual Ethernet ports) models.
PROFINET IO Frames Transmitted	The number of PROFINET IO frames transmitted.
PROFINET IO Frames Received	The number of PROFINET IO frames received.
Non PROFINET IO Frames Received	The number of non PROFINET IO frames received.
System Resource	
Heap memory (total / free)	Memory usage (total and free memory).
Idle count (min / current / max)	The minimum, current, and maximum CPU idle count.
Idle count history (1 / 5 / 15 mins)	The average CPU idle count in the last 1, 5, and 15 minutes.

System Menu

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

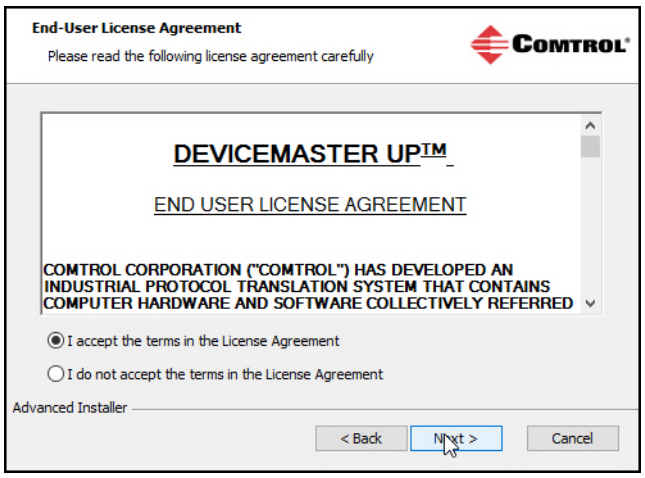
Update Firmware

You can upload firmware (PROFINET IO or Bootloader) using the **System | Update Firmware** page.

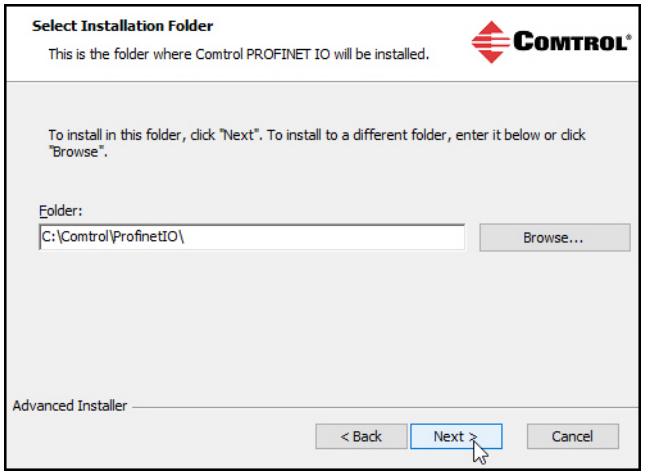
Use the following procedure to upload the latest firmware onto the DeviceMaster.

1. If necessary, download the firmware from the Comtrol download site.
2. Execute the **PROFINET_IO_x.x.msi** file.
3. Click the **Next** button.

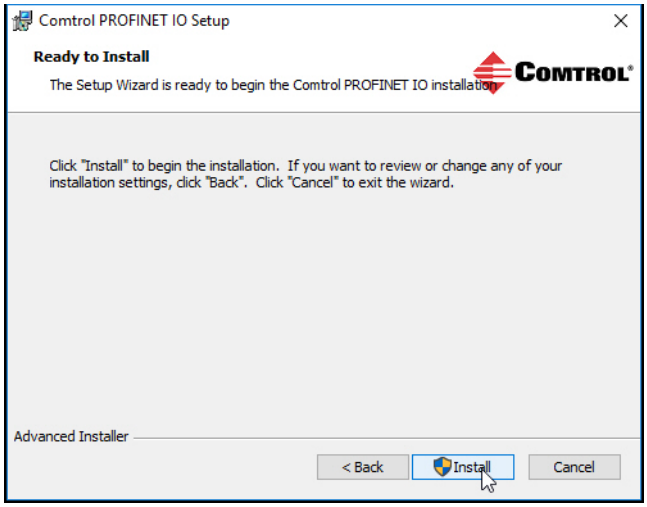
4. After reviewing the license, click **I accept the terms in the License Agreement** and the **Next** button.



5. Click the **Next** button or browse to the location you want the files stored.

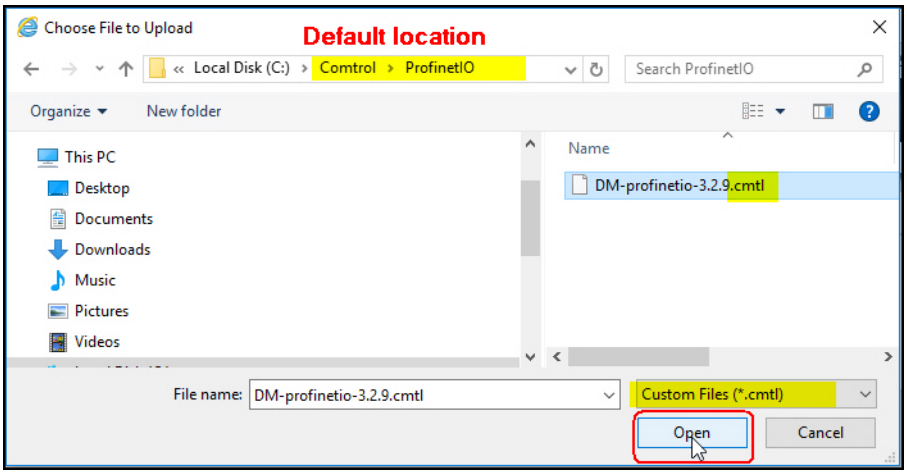


6. Click the **Install** button.

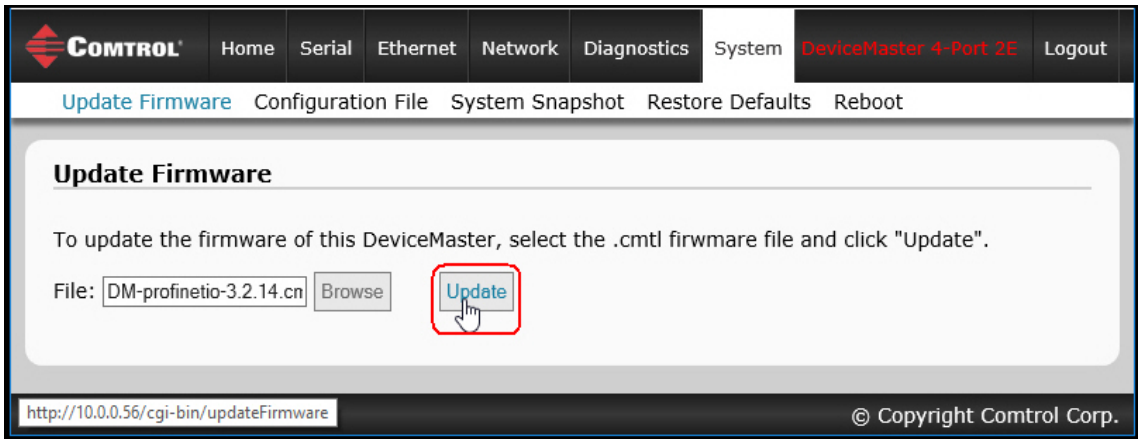


7. Click **Yes** to the **Do you want to allow this app to make changes to your device** pop up message.

8. Click the **Finish** button.
9. Click the **Browse** button, navigate to the file, select it and click the **Open** button.



10. Click the **Update** button.



An *Update In Progress* pop up notifies you with the upload duration, not to reset or disconnect the device or to close the page.

Configuration File

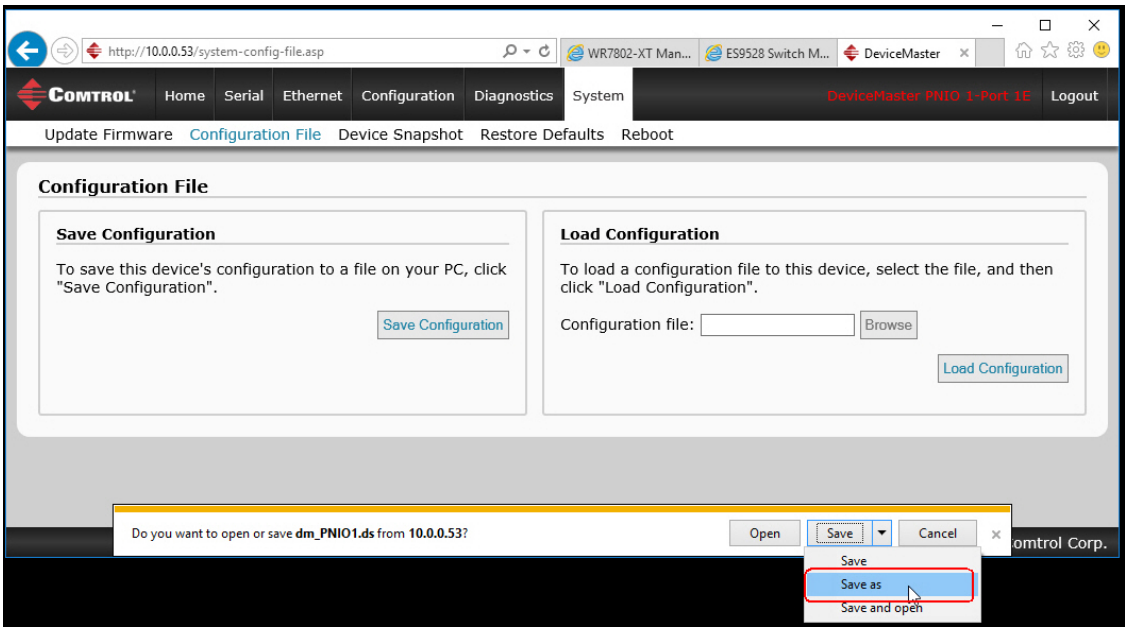
You can use the **Save Configuration** option to save a DeviceMaster configuration file for recovery purposes or to quickly configure other DeviceMasters that require the same configuration using the **Load Configuration** option.

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

Saving a Configuration File

You can use this procedure to save a DeviceMaster configuration file.

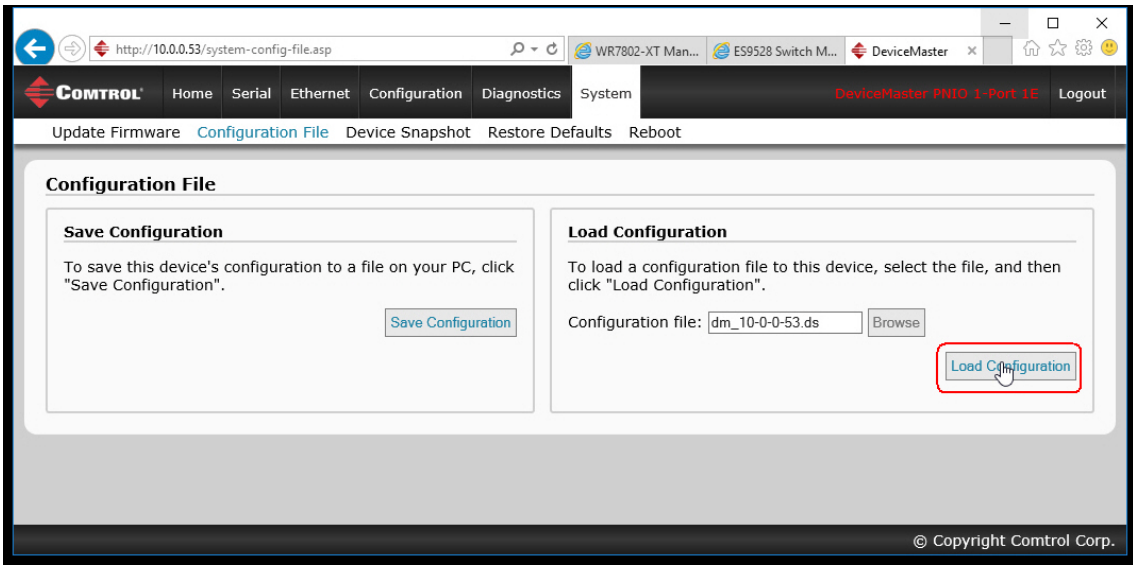
1. Click **System | Configuration File**.
2. Click the **Save Configuration** button.
3. Save the configuration file following your browser prompts.



Loading a Configuration File

You can use this procedure to load a previously saved DeviceMaster configuration file.

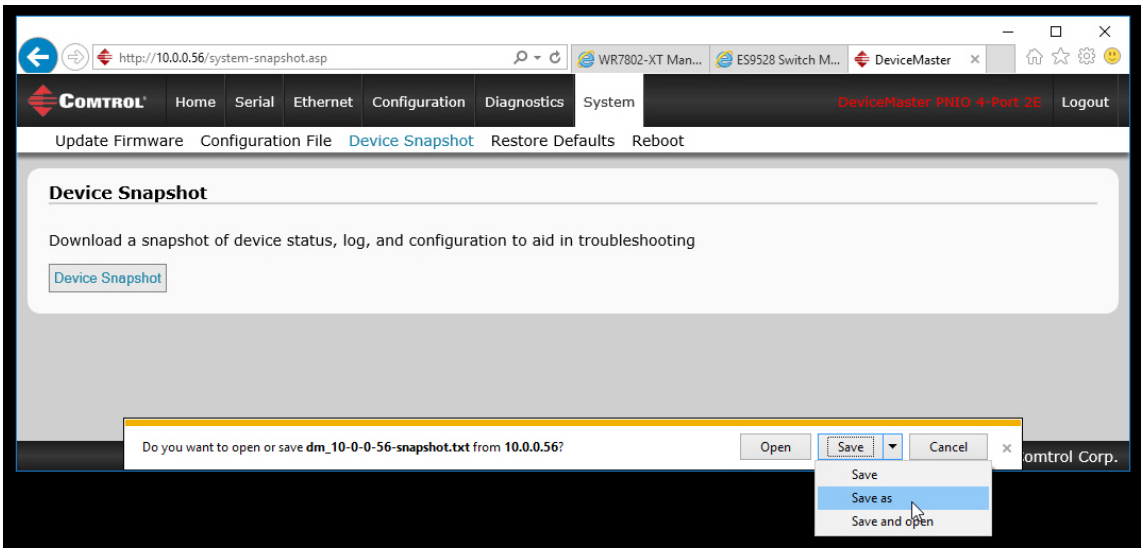
1. Click **System | Configuration File**.
2. Click the **Browse** button, highlight the configuration file you want to load, and click the **Open** button.
3. Click the **Load Configuration** button.



Device Snapshot

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

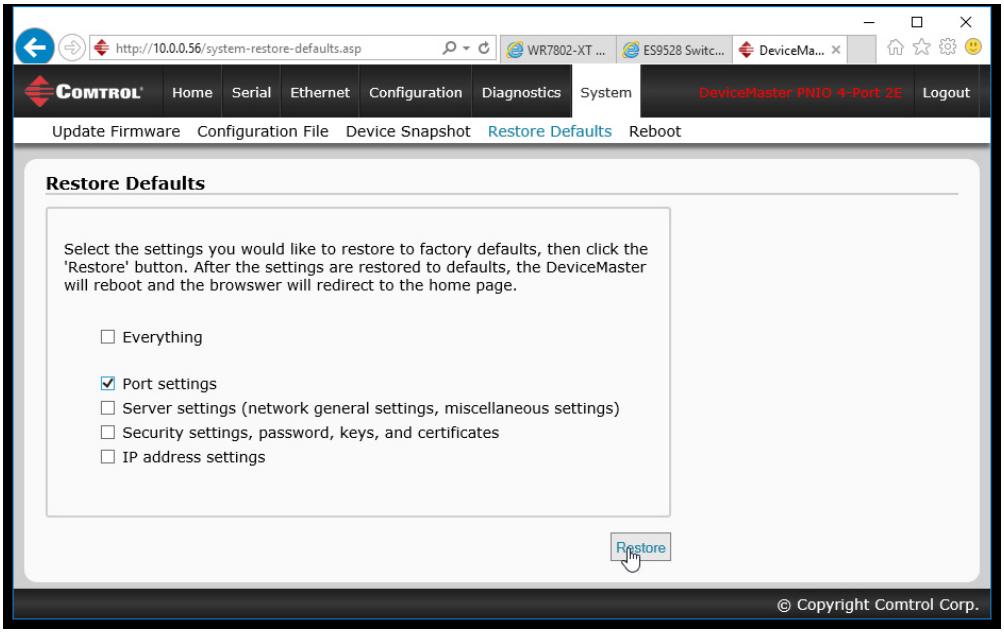
1. Click the **Device Snapshot** button.
2. Save the file using the method for your browser.



Restore Defaults

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

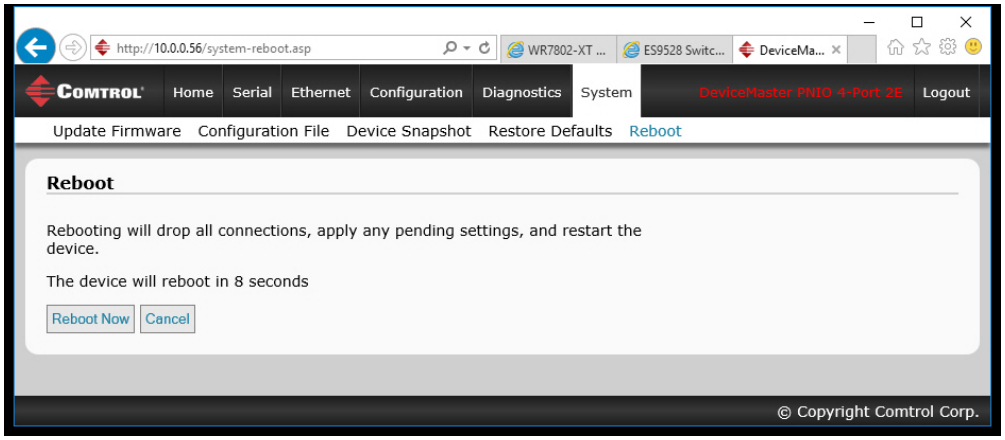
1. Click **System | Restore**.
2. Select **Everything** or the specific setting you want to restore.
3. Click the **Restore** button.
4. The DeviceMaster reboots and re-opens the web interface.



Reboot

You can reboot the DeviceMaster remotely using the Reboot web page.

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



Managing the DeviceMaster

This section discusses the following DeviceMaster maintenance procedures:

- *Rebooting the DeviceMaster*
- *Uploading Firmware to Multiple DeviceMasters* on Page 128
- *Configuring Multiple DeviceMasters Network Addresses* on Page 129

  Note: *You can configure the network addresses for multiple DeviceMasters, configure common settings for the DeviceMasters, and save the settings to a configuration file that you can use to load settings up to all or selected DeviceMasters.*
- *Adding a New Device in PortVision DX* on Page 129
- *Managing Bootloader* on Page 132, which also discusses checking the Bootloader version and downloading the latest Bootloader
- *Restoring Factory Defaults (Specific Models)* on Page 134
- *Accessing RedBoot Commands in Telnet/SSH Sessions (PortVision DX)* on Page 135

Note: *You can optionally refer to RedBoot Procedures on Page 139 if you want to perform procedures at the RedBoot level.*

Rebooting the DeviceMaster

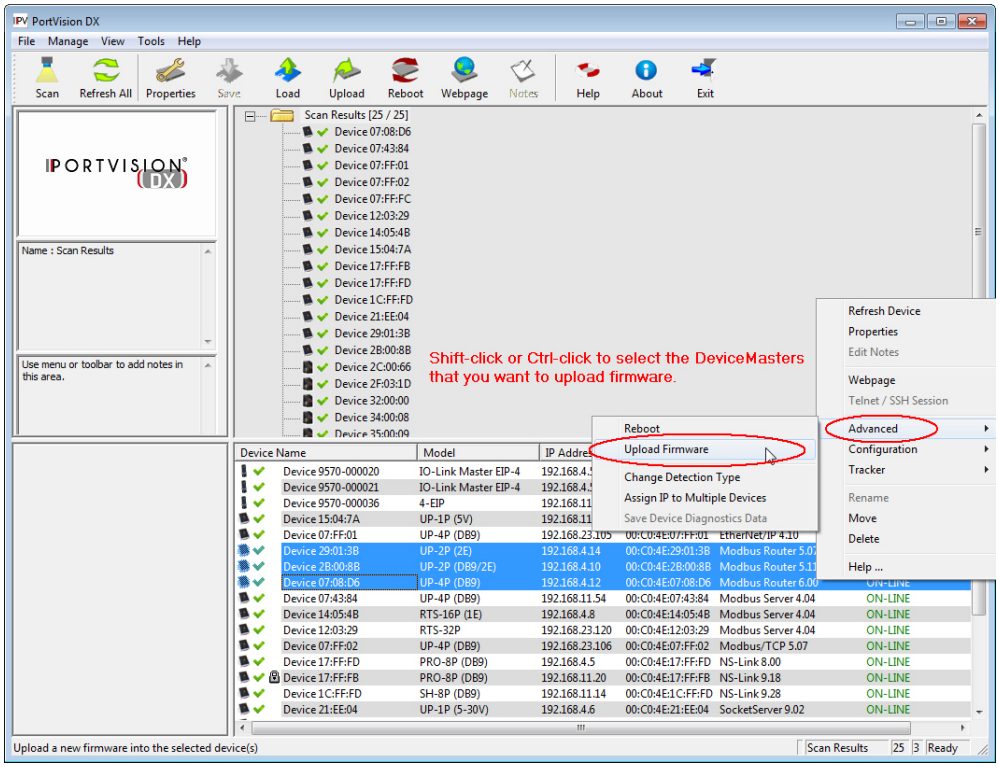
There are many ways to reboot the DeviceMaster.

Method	Procedure
PortVision DX	Right-click the DeviceMaster or DeviceMasters in the *Device List* pane, click **Advanced >Reboot** and then **Yes**. ***Note:*** *If security has been enabled in the web page, you will need to reboot the DeviceMaster in the web page.*
Web page	**System | Reboot:** You have 10 seconds to Cancel before the DeviceMaster automatically reboots. Optionally, you can click **Reboot Now**.
Telnet	Type **reset**.
DeviceMaster DIN Rail Models	DeviceMaster DIN rail models have a **Reset/Restore** switch. • If the **Reset/Restore** switch is depressed for less than 2 seconds, the DeviceMaster reboots. • If the **Reset/Restore** switch is depressed for greater than approximately 5 seconds it restores the DeviceMaster to the factory default values.

Uploading Firmware to Multiple DeviceMasters

You can use this procedure if your DeviceMaster is connected to the host PC, laptop, or if the DeviceMaster resides on the local network segment.

1. If you have not done so, install PortVision DX (*Installing PortVision DX* on Page 24) and **Scan** the network.
2. Shift-click the multiple DeviceMasters on the **Main** screen that you want to update and use one of the following methods:
   - Click the **Upload** button.
   - Right-click and then click **Advanced > Upload Firmware**.
   - Click **Advanced >Upload Firmware** in the **Manage** menu.



3. Browse, click the firmware (**.cmtl**) file, **Open** (*Please locate the new firmware*), and then click **Yes** (*Upload Firmware*).

   It may take a few moments for the firmware to upload onto the DeviceMaster. The DeviceMaster reboots itself during the upload process.
4. Click **Ok** to the advisory message about waiting to use the device until the status reads **ON-LINE**.

In the next polling cycle, PortVision DX updates the *Device List* pane and displays the new firmware version.

Configuring Multiple DeviceMasters Network Addresses

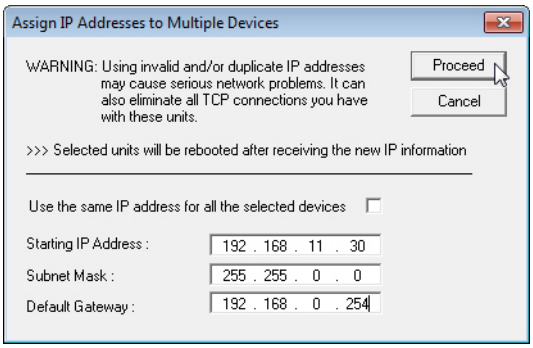
You can configure the network addresses for multiple DeviceMasters using the **Assign IP to Multiple Devices** option.

In addition, you can also configure common settings for the DeviceMaster web page and save the settings to a configuration file that you can load to all or selected DeviceMasters. See *Configuration File* on Page 124 for more information.

The DeviceMasters must be on the same network segment for this procedure to work. Use the following steps to configure multiple DeviceMasters.

1. If you have not done so, install PortVision DX (*Installing PortVision DX* on Page 24) and **Scan** the network.
2. Shift-click the DeviceMasters for which you want to program network information, right-click, and click **Advanced > Assign IP to Multiple Devices**.
3. Enter the starting IP address, subnet mask, IP Gateway and click **Proceed**.

   PortVision DX displays the programmed IP addresses in the *Device List* pane after the next refresh cycle.



Adding a New Device in PortVision DX

You can add a new DeviceMaster manually, if you do not want to scan the network to locate and add new DeviceMasters, but there may be cases where you want to use the *Add New Device* window to:

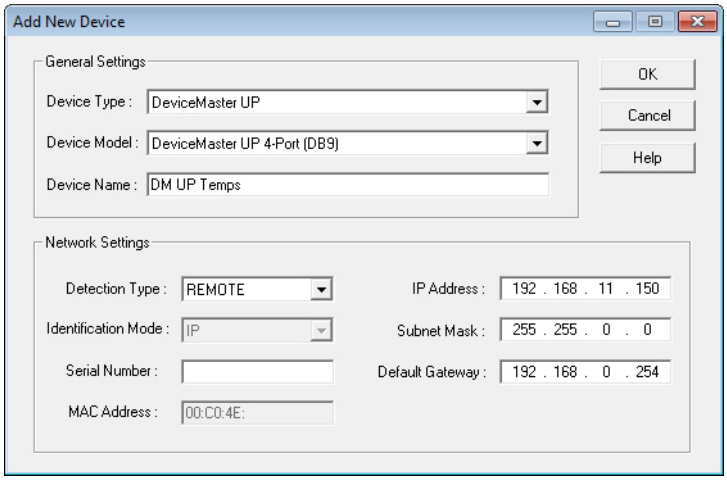
- Configure DeviceMaster units that are not on the local network (remote) using *Remote Using the IP Address* on Page 129.
- Pre-configure a DeviceMaster in PortVision DX (local) using *Local Using the IP Address or MAC Address* on Page 130.

Remote Using the IP Address

Use the following procedure to add a remote DeviceMaster to PortVision DX.

1. Access the *New Device* window using one of these methods:
   - Click **Add New > Device** in the *Manage* menu.
   - Right-click a folder or a RocketLinx switch in the *Device Tree* pane (anywhere in the pane, as long as a DeviceMaster is not highlighted and you are in a valid folder) and click **Add New > Device**.
2. Select the appropriate DeviceMaster in the **Device Type** drop list.
3. Select the appropriate model in the **Device Model** drop list.
4. Enter a friendly device name in the **Device Name** list box.
5. Select **REMOTE** for the *Detection Type*.
6. Optionally, enter the serial number in the **Serial Number** list box.

7. Enter the IP Address for the DeviceMaster. It is not necessary to enter the Subnet Mask and Default Gateway.

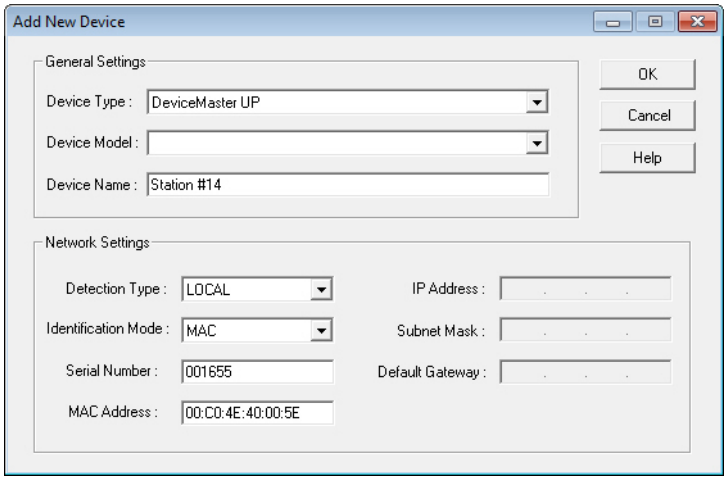


8. Click **Ok** to close the *Add New Device* window. It may take a few moments to save the DeviceMaster.
9. If necessary, click **Refresh** for the new DeviceMaster to display in the *Device Tree* or *Device List* panes. The DeviceMaster shows OFF-LINE if it is not attached to the network or if an incorrect IP address was entered.

Local Using the IP Address or MAC Address

Use the following procedure to add a local DeviceMaster to PortVision DX if you do not want to scan the network.

1. Locate the network information or MAC address of the DeviceMaster you want to add.
2. Access the *New Device* window using one of these methods:
   - Click **Add New > Device** in the *Manage* menu.
   - Right-click a folder or a RocketLinx switch in the *Device Tree* pane (anywhere in the pane, as long as a DeviceMaster is not highlighted and you are in a valid folder) and click **Add New > Device**.
3. Select the DeviceMaster in the **Device Type** drop list.



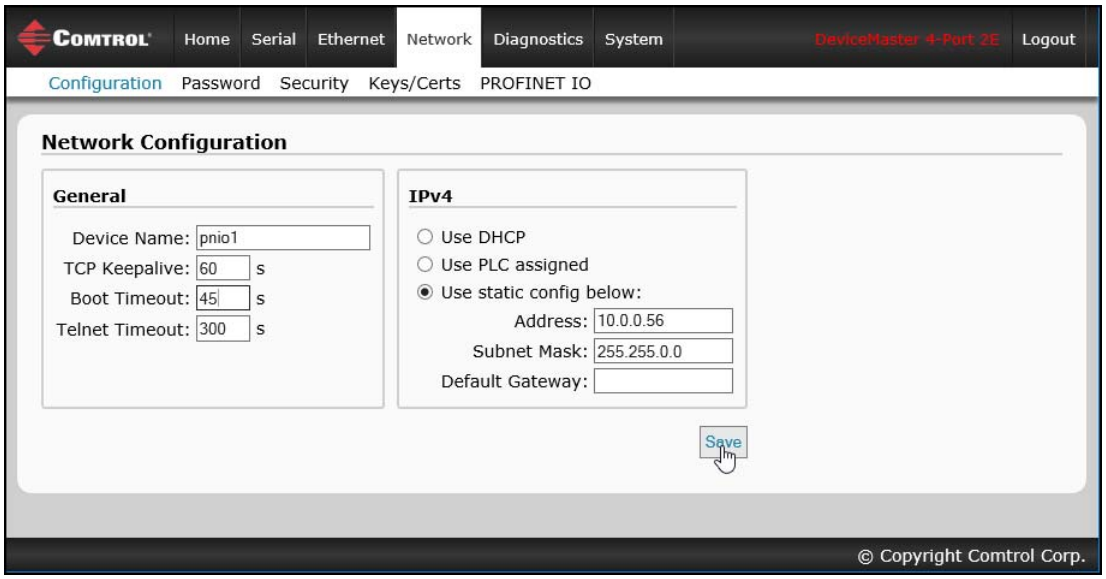
4. Select the appropriate model in the **Device Model** drop list.
5. Enter a friendly device name in the **Device Name** list box.

6. Select **LOCAL** for the *Detection Type*.
7. Enter the MAC address or network information.

   Note: *A MAC address label is attached to all DeviceMaster units. The first three pairs of digits start with 00 C0 4E.*
8. Optionally, enter the serial number in the **Serial Number** list box.
9. Click **Ok**.
10. If necessary, click **Refresh** for the new DeviceMaster to display in the *Device Tree* or *Device List* panes. The DeviceMaster shows OFF-LINE if it is not attached to the network or if an incorrect IP address was entered.

Changing the Bootloader Timeout

1. If necessary, use your browser to access the DeviceMaster using the IP address.
2. Click **Network**.
3. Enter 45 in the **Boot Timeout** field and click **Save**.



Note: *You should return the Bootloader Timeout value back to 15 seconds after you upload the firmware.*

Managing Bootloader

Bootloader refers to the operating system that runs on the DeviceMaster hardware during the power on phase, which then loads the default application (for example, PROFINET IO firmware).

Note: *Typically, you should not update the Bootloader unless advised to do so by Comtrol Technical Support.*

Checking the Bootloader Version

The following procedure uses PortVision DX to check the Bootloader version. Optionally, you can use RedBoot, see *Determining the Bootloader Version* on Page 143.

1. If you have not done so, install PortVision DX (*Installing PortVision DX* on Page 24) and **Scan** the network.
2. Right-click the DeviceMaster in the *Device List* pane and click **Advanced > Reboot**.
3. Click **Yes** to the *Confirm Reboot* query.
4. Right-click the DeviceMaster in the *Device List* pane, click **Refresh.** You may need to do this several times until you catch the reboot cycle in the *Device List* pane. The Bootloader version is briefly displayed during the reboot cycle before the application (for example, PROFINET IO firmware) loads.
5. Check the Comtrol web site to see if a later version is available.
6. Go to the next subsection if you need upload a new version of Bootloader.

Uploading Bootloader

Use the following procedure to upload Bootloader to the DeviceMaster. Typically, you should not update the Bootloader unless advised to do so by Comtrol Technical Support or a notice has been posted to the firmware download page on the ftp site.

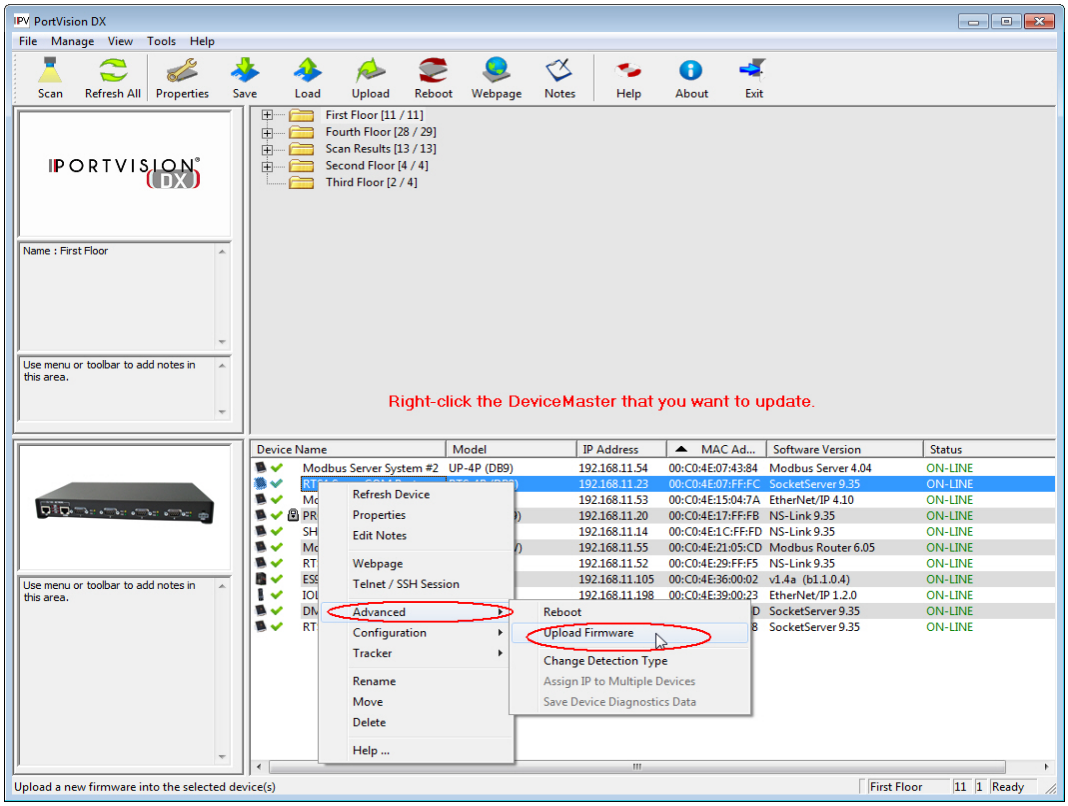
Note: *Technical Support does not recommend updating Bootloader across a WAN. For best results, connect the DeviceMaster directly to a PC or laptop to upload Bootloader.*

Make sure that power is not interrupted while uploading Bootloader. Power interruption while uploading Bootloader will require that the DeviceMaster must be sent into Comtrol so that it can be reflashed.

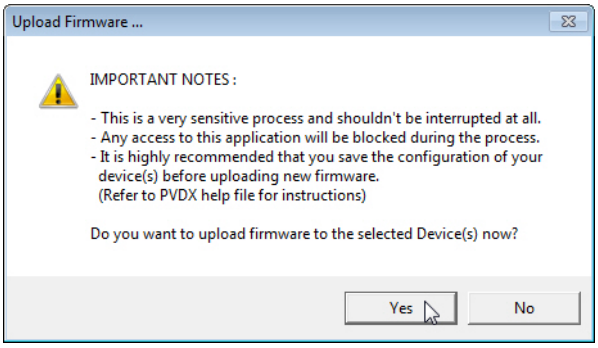
If you are not successful uploading firmware into the DeviceMaster, do not upload Bootloader.

1. If you have not done so, install PortVision DX (*Installing PortVision DX* on Page 24) and **Scan** the network.
2. If necessary, check the Bootloader version (*Checking the Bootloader Version*) and download the latest version.

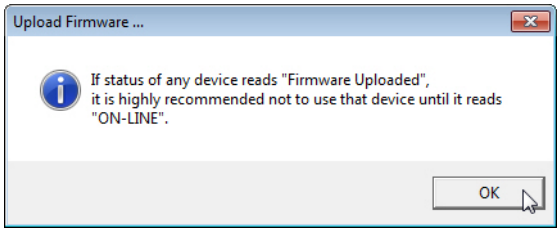
3. Right-click the DeviceMaster for which you want to update, click **Advanced > Upload Firmware**, browse to the Bootloader **.cmtl** file, and then click **Open**.



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



5. Click **Ok** to the second *Upload Firmware* message.
6. Right-click the DeviceMaster and click **Refresh** until the Bootloader version displays in the *Device List* pane and verify that the new version loaded.



Restoring Factory Defaults (Specific Models)

Use the following procedures to restore the following DeviceMaster models to the factory defaults:

- DeviceMaster 1-port DIN rail models
- DeviceMaster 2-port DIN rail models
- DeviceMaster 4-port DIN rail models

If Technical Support advises you to restore the DeviceMaster factory defaults, depress the **Reset/Restore** switch for greater than 5 seconds.

Restoring the DeviceMaster DIN rail models resets the following to their factory defaults:

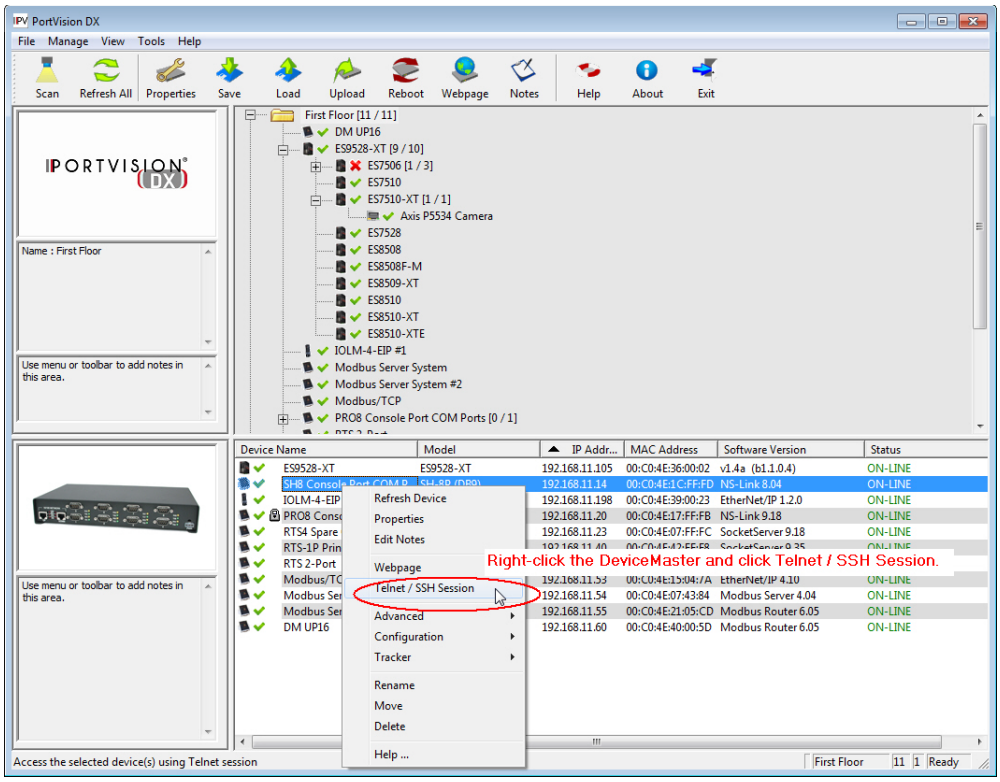
- Port settings
- Network settings
- Password
- Telnet enable
- Start up time-out
- SSL enable
- Telnet time-out

Accessing RedBoot Commands in Telnet/SSH Sessions (PortVision DX)

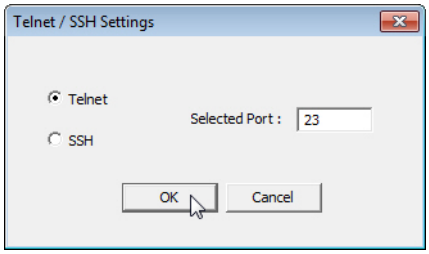
You can open a Telnet or SSH session using PortVision DX to access RedBoot commands.

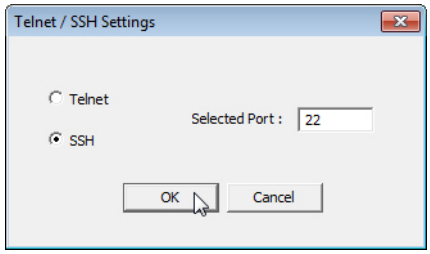
Use the following procedure to access a telnet or SSH session with PortVision DX.

1. In PortVision DX, PortVision DX, right-click the DeviceMaster in the *Device List* pane for which you want to open a telnet session, and click **Telnet/SSH Session**.

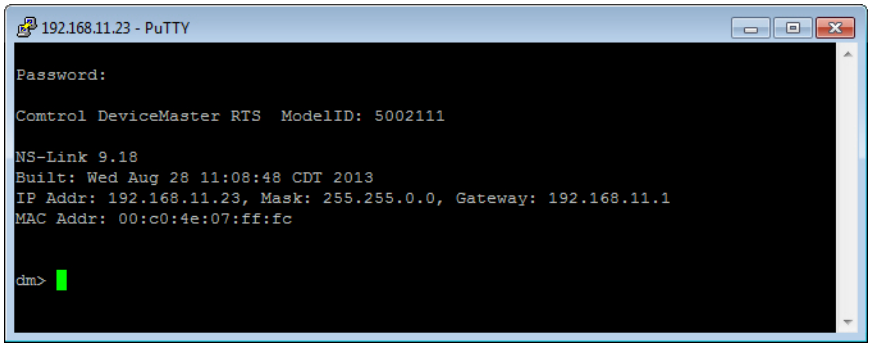


2. Select **Telnet** or **SSH**, leave the **Selected Port** number, and click **Ok**.

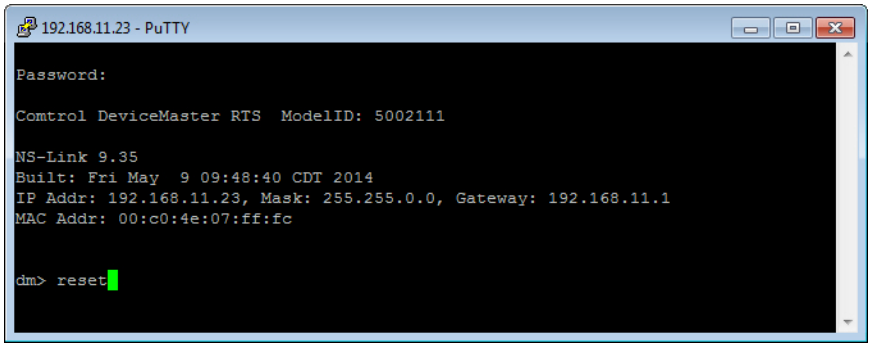




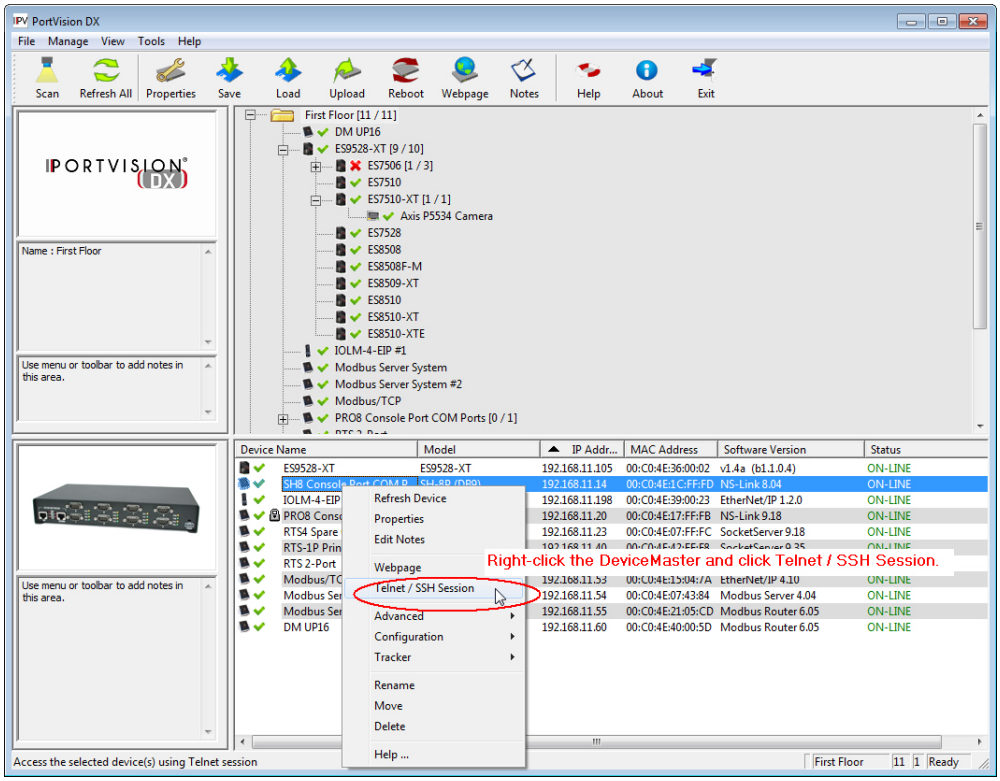
3. If necessary, enter the password and press **Enter**. If a password has not been set, press **Enter**. If using an SSH session, press **Enter** to the **login** as prompt.



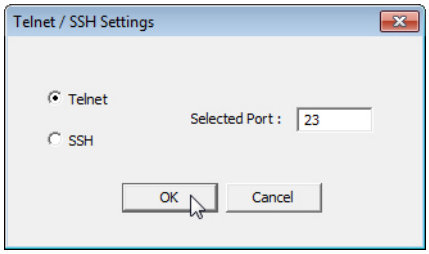
4. Type **Reset**, press **Enter**, and close the telnet session.

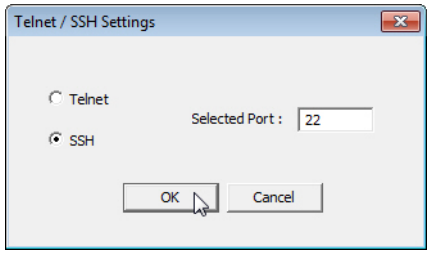


5. Quickly re-open the telnet or SSH session using the previous steps.

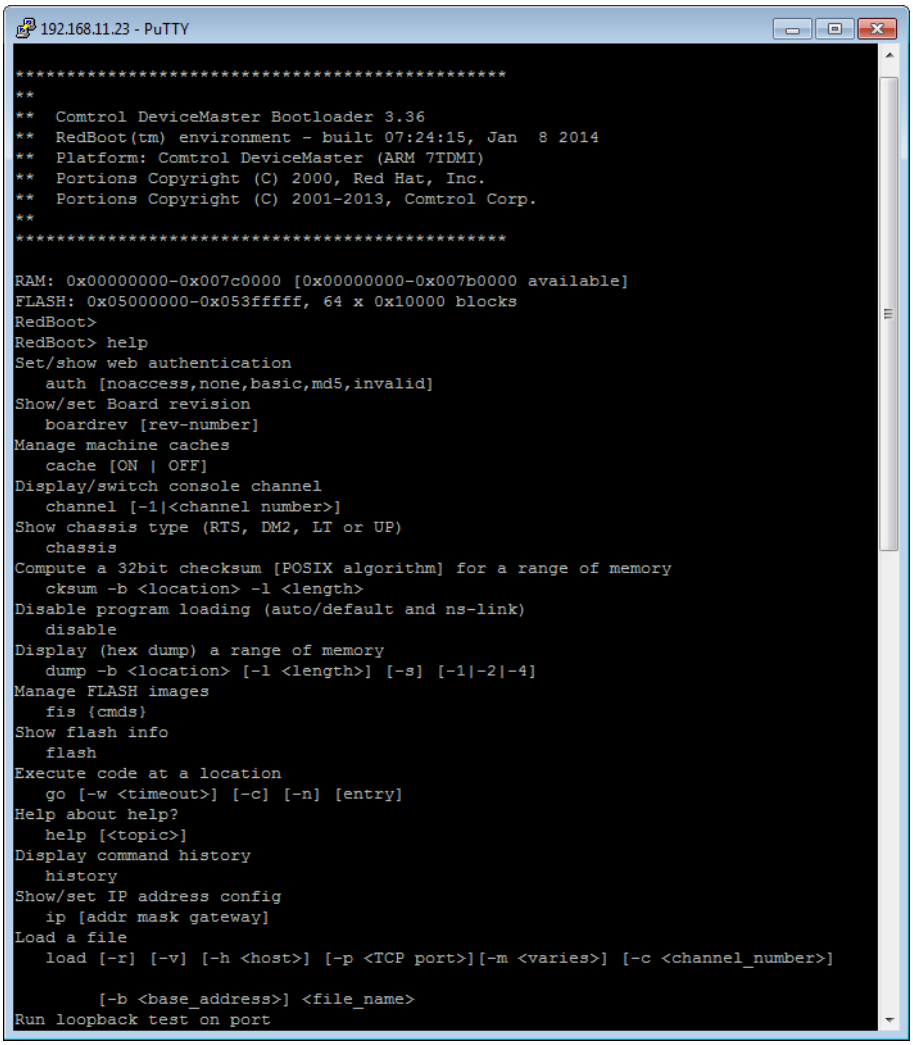


6. Select **Telnet** or **SSH**, leave the **Selected Port** number, and click **Ok**.





7. Press **Enter**. You can type **help** to review the RedBoot commands. You can also refer to *RedBoot Command Overview* on Page 145.



Note: *The dm prompt should be replaced by a redboot prompt. If not, you can reset the Bootloader timeout for a longer time period and retry this procedure.*

RedBoot Procedures

You can use this section as a reference if you want to perform tasks in RedBoot.

Optionally, you can install PortVision DX on a Windows system on the network and perform all of these tasks. PortVision DX provides a Telnet/SSH session, which is discussed in *Accessing RedBoot Commands in Telnet/SSH Sessions (PortVision DX)* on Page 135.

Accessing RedBoot Overview

To access RedBoot, you can use one of the following methods:

- A *serial* connection between Port 1 on the DeviceMaster and a COM port on a PC (Page 140). If you plan on using the serial method, you will need a null modem cable, a terminal program installed and configured on the PC, and a **Bootloader Timeout** value in excess of 15 seconds. If the **Bootloader Timeout** value has been reduced to 1 second, this procedure will NOT be possible.

  Note: *Use the serial connection method, if the DeviceMaster is not on the same Ethernet network segment as the PC.*

  If you do not know the IP address of the DeviceMaster you must use a serial connection to communicate with the DeviceMaster.

- A *telnet* connection (Page 141), if the DeviceMaster is locally accessible by Ethernet. A *telnet connection* requires that you know the IP address. In addition, the IP address must also be valid for the network to which it is attached.

  For example: The network segment must be 192.168.250.x to telnet to the DeviceMaster default IP address if you have not changed the IP address to operate on your network.

Establishing a Serial Connection

Use the following procedure to set up a serial connection with a terminal server program. You can use HyperTerminal (Windows) or optionally, Test Terminal (WCom2), which can be accessed from PortVision DX using **Tools > Applications > Test Terminal (WCom2)**.

1. Connect a null-modem cable from an available COM port on your PC to **Port 1** on the DeviceMaster.

   Note: *See Connecting Serial Devices on Page 37, if you need to build a null-modem cable.*

2. Configure the terminal server program to the following values:
   - Bits per second = 57600
   - Data bits = 8
   - Parity = None
   - Stop bits = 1
   - Flow control = None

   Note: *If you do not disable Bootloader from loading (Steps 3 through 5) within the time-out period (default is fifteen seconds), an application will be loaded from flash and started. If this happens, repeat Steps 3 through 5. The **#!DM** command is the only case-sensitive command and must be in uppercase.*

3. Reset the DeviceMaster.

   Note: *Depending on the model, disconnect and reconnect the power cable (external power supply and no power switch) or turn the power switch on and then off (internal power supply).*

4. Immediately type **#!DM** and press **Enter** in the terminal program.

```
#!DM
RedBoot>dis
Loading disabled
```

5. At the **RedBoot>** prompt, type **dis**, and press **Enter**.
6. Verify that loading has been disabled.
7. You can use the appropriate procedure listed on Page 139 or use the *RedBoot Command Overview* on Page 145 to perform the desired task.

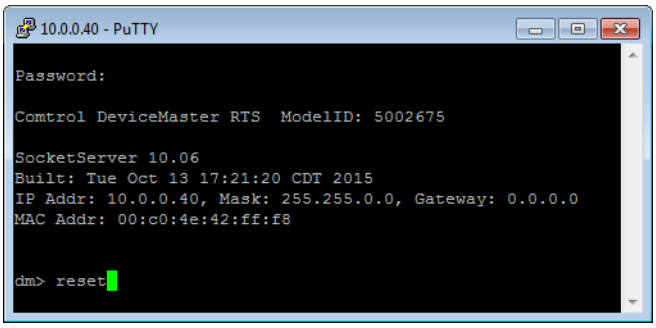
Establishing a Telnet Connection

Use the following procedure to telnet to the DeviceMaster.

1. Open a telnet session, enter the DeviceMaster IP address.

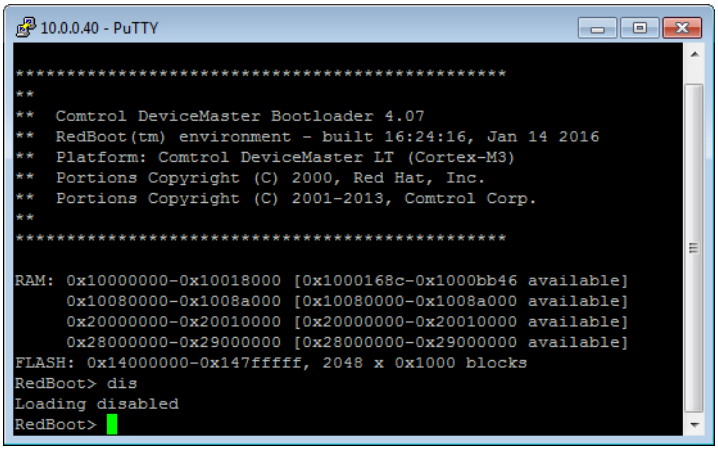
   If using Windows, you can use PortVision DX, see *Accessing RedBoot Commands in Telnet/SSH Sessions (PortVision DX)* on Page 135.

2. Press the **Enter** key if you did not program a password or type the password and press **Enter**.



   Note: *The DeviceMaster does not come pre-programmed with a password.*

3. Type **reset**, and close the session.
4. Open a new telnet session, enter the DeviceMaster IP address, and the password.
5. Type **dis** to disable the Bootloader.
6. Verify that the system responds with a **Loading disabled** message.



Determining the Network Settings

If you are not sure what the network information is on a DeviceMaster, you can perform the following procedure.

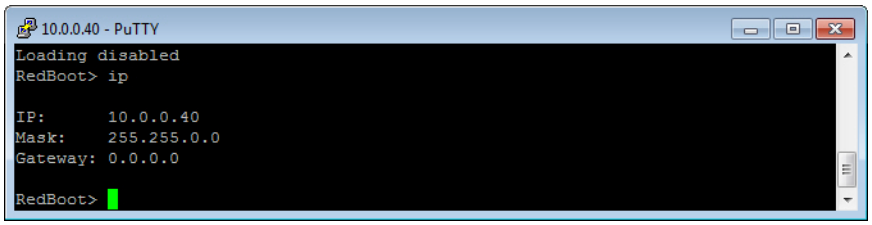
1. Establish communications with the DeviceMaster using the serial (Page 140) or telnet (Page 141) method.
2. At the **RedBoot** prompt, type **ip**.

Default Network Settings

IP address:
192.168.250.250

Subnet mask:
255.255.0.0

Gateway address:
192.168.250.1



The IP address, subnet mask, and IP gateway values will display.

Note: *Optionally, you can install PortVision DX on a Windows system on the network and see the IP information in the Device List pane.*

Configuring the Network Settings

Use the following procedure to program the IP address using RedBoot.

1. Establish communications with the DeviceMaster using the serial (Page 140) or telnet (Page 141) method.
2. Enter **ip [*addr mask gateway*]** and press the **Enter** key to configure the IP address. *Where*:

   addr = IP address you want to use

   mask = matches you network subnet mask

   gateway = assigned by your network administrator

   Make sure that each value is separated by a space.

```
RedBoot>dis
Loading disabled
RedBoot> ip 192.168.11.152 255.255.0.0 192.168.0.254
RedBoot>
IP:      192.168.11.152
Mask:    255.255.00
Gateway: 192.168.0.254
RedBoot> reset
.. Resetting
```

3. Verify that RedBoot responds with your configured network information or reissue the command.
4. Type **reset** to reset the DeviceMaster, if you do not have any other related RedBoot tasks.

Changing the Bootloader Timeout

Use the following procedure to change the Bootloader timeout value.

1. Establish communications with the DeviceMaster using the serial (Page 140) or telnet (Page 141) method.
2. At the **RedBoot** prompt, type **timeout.**

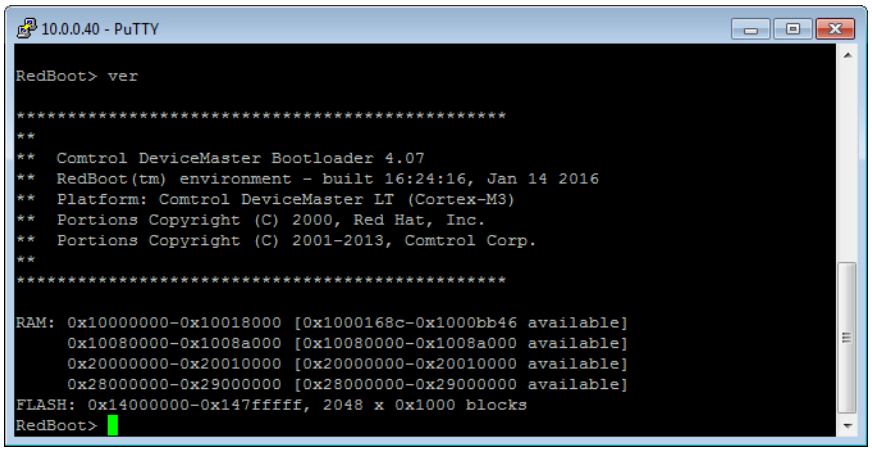
```
RedBoot> dis
Loading disabled
RedBoot> timeout
Timeout 15 seconds
RedBoot> timeout 45
timeout 45 seconds
RedBoot>_
```

   RedBoot responds with the current Bootloader timeout value.
3. Type **timeout** and a value to change the timeout value. For example, **timeout 45** to change the Bootloader timeout to 45 seconds.

Determining the Bootloader Version

Use the following procedure to determine what Bootloader version is loaded in the DeviceMaster.

1. Establish communications with the DeviceMaster using the serial (Page 140) or telnet (Page 141) method.
2. At the **RedBoot** prompt, type **version**.



   The Bootloader information displays.
3. Type **reset** to reset the DeviceMaster, if you do not have any other related RedBoot tasks.

Note: *Optionally, you can install PortVision DX on a Windows system on the network and see the Bootloader version in the Device List pane. Reboot the DeviceMaster, right-click the DeviceMaster and click Refresh Device until the Bootloader version displays. The Bootloader version is only displayed for a few moments.*

Resetting the DeviceMaster

When you have completed your tasks in RedBoot, you must enter a **reset** command at the **RedBoot>** prompt for the DeviceMaster to begin operation.

Note: *The LEDs on the DeviceMaster will go through the power up sequence. The DeviceMaster has completed its reset cycle when the* **Status** *LED is lit and it stops flashing.*

```
RedBoot> dis
Loading disabled
RedBoot> reset
```

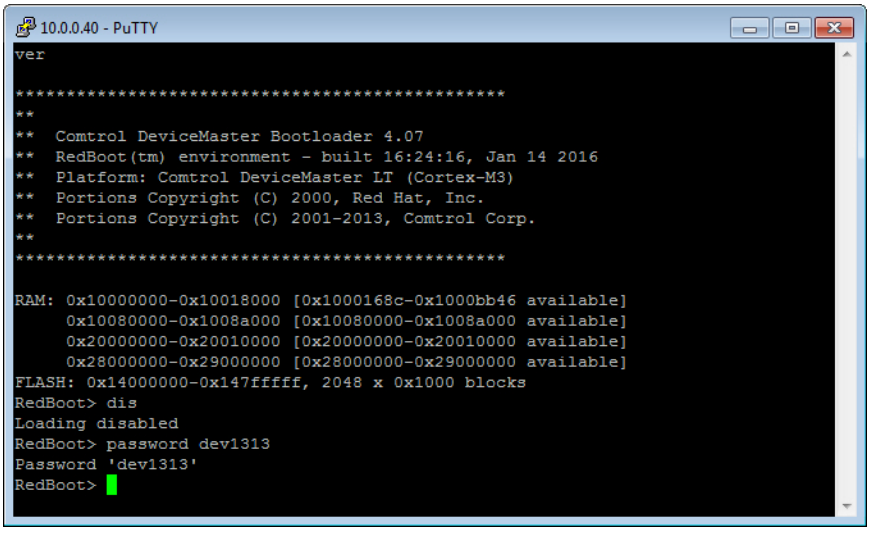
Configuring Passwords

This section discusses how to configure a password for the web and telnet server.

Use the following procedure to establish the DeviceMaster password for the Web and telnet server. Establishing a password prevents unauthorized changes to the DeviceMaster configuration.

1. Establish communications with the DeviceMaster using the serial (Page 140) or telnet method (Page 141).
2. Type **password** [**your_password**] and press **Enter**.

   Note: *If you forget your password, you can reprogram the password using the serial method which bypasses the password.*



Note: *The Bootloader version on your DeviceMaster may be different than the version displayed in this graphic.*

See the **auth** command in the *RedBoot Command Overview* on Page 145, if you want to set up Web browser authentication.

RedBoot Command Overview

The following table is an overview of RedBoot commands available. After accessing RedBoot, you can review the list of commands online by entering **help** and pressing the **Enter** key.

For more detailed information, see the *eCos Reference Manual* that you can download from: http://downloads.comtrol.com/dev_mstr/UP/software/redboot/user_guide.

RedBoot Commands	
auth **{noaccess, none, basic, md5, invalid}**	Sets or displays web authentication. The default is set to **none**, which means that there is no authentication required to access the web server. To deny access to the web server, click **noaccess** or **invalid**. If access is attempted, a message appears to notify the user that access is denied. To configure the web server to request an un-encrypted password, click **basic**. To configure the web server to request an encrypted password, click **md5**. (Some browsers do not support the **md5** command.)
baudrate [-b <rate>]	Set/Query the system console baud rate.
boardrev†	Displays the board revision.
cache [ON | OFF]	Manages machine caches.
channel [-1|<channel number>]	Displays or switches the console channel.
chassis	Displays chassis information.
cksum -b <location> -l <length>	Computes a 32-bit checksum [POSIX algorithm] for a range of memory.
cpufreq	Show/Set CPU clock frequency.
delaycal <passes>	Calibrate SDRAM clock delay.
disable	Disables automatic load of the default application.
dump -b <location> [-l <length>] [-s] [-1|-2|-4]	Displays (hex dump) of a range of memory.
eepromvers [ver]	Show/set EEPROM version.
fis {cmds}	Manages flash images. See Chapter 2 of the eCos Reference Manual for **{cmds}** information.
flash	Shows flash information.
go [-w <timeout>] [-c] [-n] [entry]	Executes code at a location.
help <topic>	Displays available RedBoot commands.
history	Displays command history.
hwflags [flags]	Show/set hardware feature flags.
ip [addr mask gateway]	Displays or sets the IP address configuration.
load [-r] [-v] [-h <host>] [-p <TCP port>] [-m <varies>] [-c <channel_number>] [-b <base_address>] <file_name>	Loads a file from TFTP server or XModem.

RedBoot Commands (Continued)	
loop 232|422|int port-number	Runs loopback test on port. The DeviceMaster Serial Hub does not support this command.
mac†	Displays Ethernet MAC address.
mcmp -s <location> -s <location> -d <location> -l <length> [-1|-2|-4]	Compares two blocks of memory.
mcopy -s <location> -d <location> -l <length> [-1|-2|-4]	Copies memory from one address to another.
mfill -b <location> -l <length> -p <pattern> [-1|-2|-4]	Fills a block of memory with a pattern.
model†	Shows model number.
numether [num]†	Shows number of Ethernet ports.
numserial [num]†	Shows number of serial ports.
oemid [id]†	Shows OEM id.
password {password}	Sets or deletes the password.
ping [-v] [-n <count>] [-l <length>] [-t <timeout>] [-r <rate>] [-i <IP_addr>] -h <IP_addr>	Network connectivity test.
ramtest <passes>	Test the RAM.
ramtime [reg [<value>]]	Shows RAM timing register values.
reset	Resets the DeviceMaster.
secureconf [disable|enable]	Sets or displays secure config enable.
securedata [disable|enable]	Sets or displays secure data enable.
sernum [prefix] [serial_number] **sernum [serial_number]†**	Displays device serial number (if available).
?	Displays short help.
snmp [disable|enable]	Sets or displays SNMP enable.
summary	Displays a summary that includes the bootloader version, network address information, MAC address, and security settings.
telnet [disable | enable}	Sets or displays telnet server enable. Disables telnet.
teltimeout [seconds]	Shows or sets telnet time-out.
terse	Terse command response mode.
t485 port #1 port #2	Runs port-to-port RS-485 test. This is not available on the DeviceMaster Serial Hub. Port numbering is Port 0 through 15 and you must connect a straight-through cable such as Ethernet patch cord.
timeout {seconds}	Displays or sets Bootloader time-out value.
version	Displays RedBoot version information.
x -b <location> [-l <length>] [-s] [-1|2|4]	Displays (hex dump) a range of memory.
kszdump	Dumps a pre-determined set of KSZ8863 registers

RedBoot Commands (Continued)	
kszrd <r1> [r2]	Reads specified KSZ8863 registers.
kszrestart	Restarts KSZ8863.
kszwr <r1> <val>	Reads specified KSZ8863 registers.
† Read-only items that you cannot change in Redboot.	

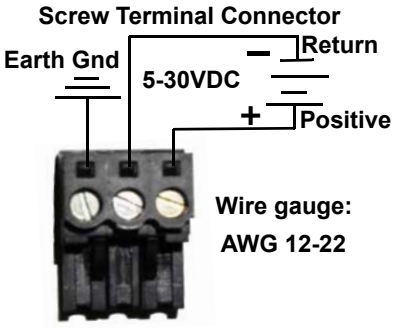
External Power Supply Specifications

This section discusses information that you may need if you wish to use your own external power supplies.

1-Port Panel Mount 5-30VDC Power Supply

This table provides specifications for the power supply shipped with the DeviceMaster 1-port panel mount.

Comtrol Power Supply: 1-Port 5-30VDC	
Input line frequency	43-63 Hz
Input line voltage	90-260 VAC
Output voltage	24VDC
Output current	500 mA @ 24VDC

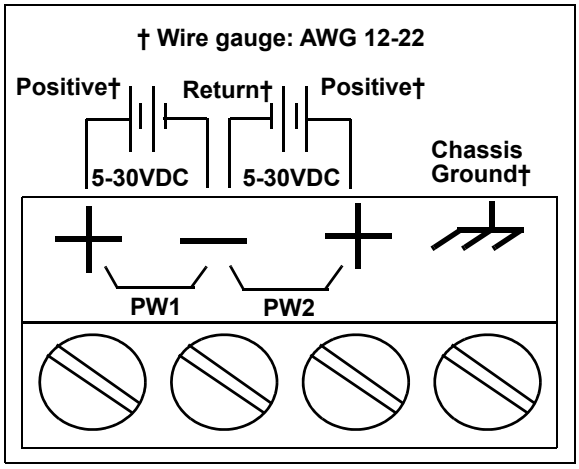


This table provides the specifications, if you intend on using your own power supply.

DeviceMaster UP 1-Port 5-30VDC External Power Supply	
Output voltage†	5-30VDC
Current†	100 mA (Min) @ 24VDC
Power	2.5 W
† Any power supply that meets current consumption, voltage, power, and connector pinouts requirements can be used.	

PNIO-2101 and PNIO-2201: 1-Port DIN Rail Power Supply

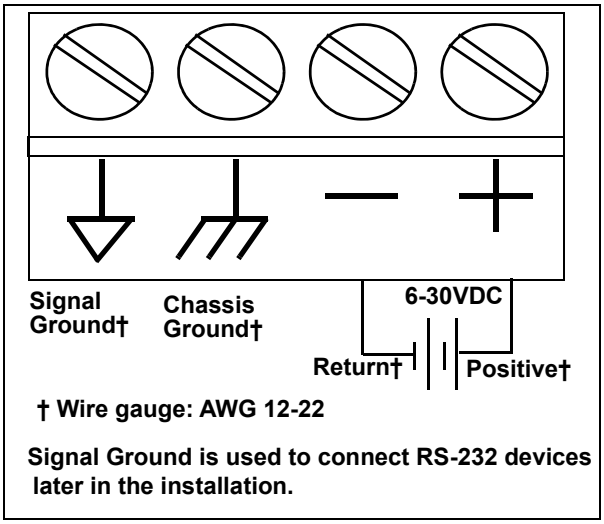
This table provides the specifications to purchase a power supply for a DeviceMaster PNIO-2101 and PNIO-2201 1-port DIN rail.



DeviceMaster PNIO-2101 and PNIO-2201 1-Port DIN Rail External Power Supply	
Output voltage† Current† Power	5-30VDC 100 mA (Min) @ 24VDC 2.5 W
† Any power supply that meets current consumption, voltage, power, and connector pinouts requirements can be used.	

PNIO-2202 and PNIO-2402: 2-Port (Serial Terminals) Power Supply

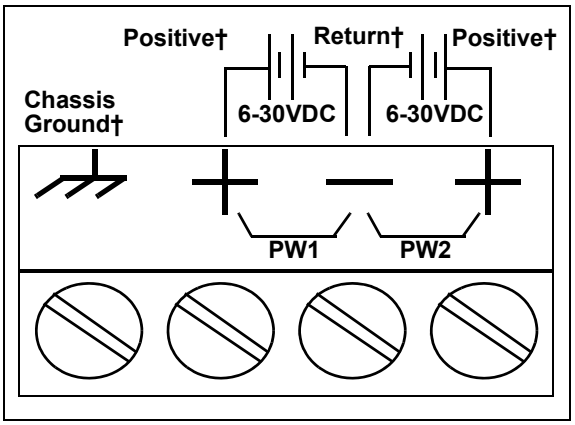
This table provides the specifications to purchase a power supply for a DeviceMaster 2-port (PNIO-2202 and PNIO-2402) with serial terminals DIN rail.



DeviceMaster UP 2-Port DIN Rail (Serial Terminals) (PNIO-2202 and PNIO-2402) External Power Supply	
Output voltage† Current† Power	6-30VDC 100 mA (Min) @ 24VDC 2.5 W
† Any power supply that meets current consumption, voltage, power, and connector pinouts requirements can be used.	

PNIO-2102 and PNIO-2302: 2-Port DB9 Power Supply (Bottom)

This table provides the specifications to purchase a power supply for a DeviceMaster 2-port 1E/2E models (PNIO-2102 and PNIO-2302) with DB9 connectors.



† Wire gauge: AWG 12-22

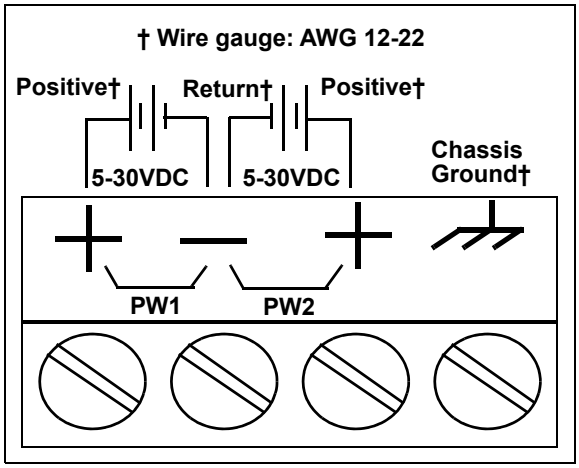
Note: *The power supply for these model is on the bottom of the unit. The product serial numbers are before xxxx-030000, where xxxx is the first four digits of the serial number.*

2-Port DB9 Models (Power Terminal - Bottom) External Power Supply	
Output voltage† Current† Power	6-30VDC 100 mA (Min) @ 24VDC 2.5 W
† Any power supply that meets current consumption, voltage, power, and connector pinouts requirements can be used.	

PNIO-2102 and PNIO-2302: 2-Port DB9 Power Supply (Top)

This table provides the specifications to purchase a power supply for a DeviceMaster PNIO-2102 and PNIO-2302 2-port DB9 DIN rail.

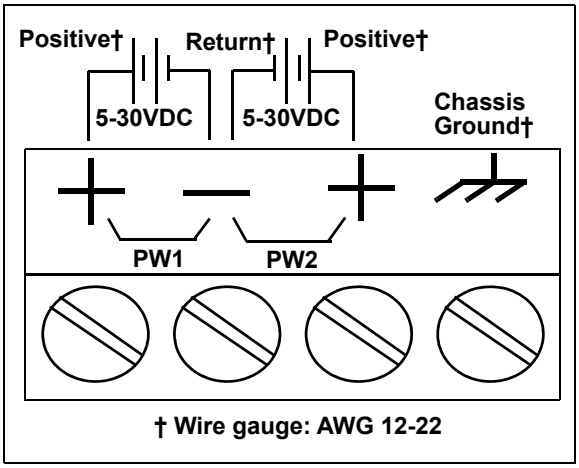
Note: *The power supply for this model is on the top of the unit. The product serial numbers are above xxxx-030000, where xxxx is the first four digits of the serial number.*



PNIO-2102 and PNIO-2302: 2-Port DIN Rail External Power Supply	
Output voltage† Current† Power	5-30VDC 100 mA (Min) @ 24VDC 2.5 W
† Any power supply that meets current consumption, voltage, power, and connector pinouts requirements can be used.	

PNIO-2304: 4-Port DIN Rail Models Power Supply

This table provides the specifications to purchase a power supply for a DeviceMaster PNIO-2304 4-port (DIN rail).

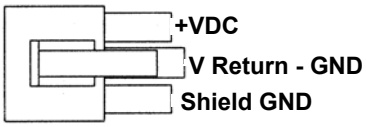


PNIO-2304: 4-Port DIN Rail External Power Supply	
Output voltage† Current† Power	5-30VDC 100 mA (Min) @ 24VDC 2.5 W
† Any power supply that meets current consumption, voltage, power, and connector pinouts requirements can be used.	

4-Port Panel Mount Power Supply

This table provides the specifications for the power supply shipped with the DeviceMaster 4-port.

Comtrol Power Supply: 4-Port	
Input line frequency Input line voltage Output voltage Output current	47 - 63 Hz 90 - 260 VAC 24VDC 500 mA @ 24VDC



Housing Molex P/N: 39-01-4030
Pins Molex P/N: 44485-1211

This table provides the specifications, if you intend on using your own power supply.

External Power Supply: 4-Port	
Output voltage† Current† Power	9-30VDC 200 mA (Min) @ 24VDC 4.8 W
† Any power supply that meets current consumption, voltage, power, and connector pinouts requirements can be used.	

Troubleshooting and Technical Support

This section contains troubleshooting information for your DeviceMaster. You may want to 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.

If you cannot diagnose the problem, you can contact *Technical Support* on Page 160.

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.*

Model	Connected to	Ethernet Cable	Connector Name
1-Port	Ethernet hub or NIC	Standard	10/100 ETHERNET
1-Port (DIN Rail)	Ethernet hub or NIC	Standard	10/100
2-Port - 1E (Single Ethernet Port)	Ethernet hub or NIC	Standard	10/100
2-Port - 2E (Dual Ethernet Ports)	Ethernet hub or NIC	Standard	10/100 - E1/E2
4-Port (DIN Rail)	Ethernet hub or NIC	Standard	10/100 - E1/E2
4-Port	NIC	Standard	DOWN
	Ethernet hub	Standard	UP

- Verify that the network IP address, subnet mask, and gateway is correct and appropriate for the network. Make sure that the IP address programmed into the DeviceMaster matches the unique reserved IP configured address assigned by the system administrator.
  - If IP addressing is being used, the system should be able to ping the DeviceMaster.
  - If using DHCP, the host system needs to provide the subnet mask and gateway.
- Verify that the Ethernet hub and any other network devices between the system and the DeviceMaster are powered up and operating.

- Reboot the system, then reset the power on the DeviceMaster and watch the **PWR** or **Status** (Page 159) 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.

Status or PWR LED	Description
Blinks every 10 seconds	No PLC connection.
On (solid)	One or more PLC connections have been established.
Flashing	• LED flashing mode is enabled. • Error detected or diagnostics information available.

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

General Troubleshooting

This table illustrates some general troubleshooting tips.

Note: *Make sure that you have reviewed the Troubleshooting Checklist on Page 155.*

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. ***Note:*** *If the PWR or Status LED is still flashing, contact Technical Support.*
PWR or **Status** LED not lit and not blinking every 10 seconds	Indicates that power has not been applied or there is a hardware failure. Contact Technical Support.
Cannot ping the device through Ethernet hub	Isolate the DeviceMaster from the network. Connect the device directly to the NIC in the host system.
Cannot ping or connect to the DeviceMaster	The default DeviceMaster IP address is often not accessible due to the subnet masking from another network unless **192.168** is used in the network. In most cases, it will be necessary to program in an address that conforms to your network.
DeviceMaster continuously reboots when connected to some Ethernet switches or routers	Invalid IP information may also cause the switch or router to check for a gateway address. Lack of a gateway address is a common cause.

Daisy-Chaining DeviceMaster 4-Port Units

The DeviceMaster 4-port (panel mount) models with external power supplies follow the IEEE specifications for standard Ethernet 10/100BASE-TX topologies.

Note: *If the serial number of your product is above xxxx-030000, the UP and DOWN Ethernet ports are interchangeable.*

When using the **UP** and **DOWN** ports, the DeviceMaster 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 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 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. Note that standards and URLs do occasionally 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.

    Additional information may be found by searching the web.

DeviceMaster LEDs

The DeviceMaster has network and port LEDs to indicate status. This subsection discusses:

- *TX/RX LEDs*
- *Network and Device LEDs* on Page 159

TX/RX LEDs

This subsection discusses RX and TX LEDs on the DeviceMaster 4-port.

Note: *DeviceMaster DIN rail models do not have TX/RX LEDs.*

The RX (yellow) and TX (green) LEDs function accordingly when the cable is attached properly to a serial device.

- After power cycling the DeviceMaster, the RX/TX LEDs are off.
- The LEDs do not function as described until the port has been opened by an application.
  - If the port is configured for RS-232/422 mode:
    - RX LEDs (yellow) are lit
    - TX LEDs (green) are lit when as the data exits the port
  - If the port is configured for RS-485 mode:
    - RX LEDs (yellow) are lit while receiving
    - TX LEDs (green) are lit during active data transmission

Network and Device LEDs

The LEDs indicate that the default DeviceMaster application is running. If you have loaded PortVision DX, you can check the DeviceMaster status on-line.

Ports	Model	Network LEDs
1 Panel Mount	DeviceMaster UP	• The **Status** LED on the front of the unit is lit, which indicates that it has power and has completed the boot cycle. ***Note:*** *The* **Status** *LED flashes while booting and it takes approximately 15 seconds for the Bootloader to complete the cycle. When the Bootloader completes the cycle, the LED flashes rapidly for several times then stays off and blinks approximately every 10 seconds when there is no PLC connection.* • The red **Link Act** LED is lit, which indicates a working Ethernet connection. • If the red **Duplex** LED is lit, it indicates full-duplex activity. • If the red **100** LED is lit, it indicates a working 100 MB Ethernet connection (100 MB network, only).
1 DIN Rail	PNIO-2101 PNIO-2201	• The **Status** LED on the front of the unit is lit, which indicates that it has power and has completed the boot cycle. ***Note:*** *The* **Status** *LED flashes while booting and it takes approximately 15 seconds for the Bootloader to complete the cycle. When the Bootloader completes the cycle, the LED flashes rapidly for several times then stays off and blinks approximately every 10 seconds when there is no PLC connection.* • If the **LINK** (green) LED is lit, it indicates a working Ethernet connection. • If the **ACT** (yellow) LED flashes, it indicates network activity.

Ports	Model	Network LEDs
2	PNIO-2102 PNIO-2202 PNIO-2302 PNIO-2402	• The **STATUS** LED on the device is lit, indicating you have power and it has completed the boot cycle. ***Note:*** *The* **STATUS** *LED flashes while booting and it takes approximately 15 seconds for the Bootloader to complete the cycle. When the Bootloader completes the cycle, the LED flashes rapidly for several times then stays off and blinks approximately every 10 seconds when there is no PLC connection.* • If the **LINK** (green) LED is lit, it indicates a working Ethernet connection. • If the **ACT** (yellow) LED flashes, it indicates network activity.
4 DIN Rail	PNIO-2304	• The **STATUS** LED on the device is lit, indicating you have power and it has completed the boot cycle. ***Note:*** *The* **STATUS** *LED flashes while booting and it takes approximately 15 seconds for the Bootloader to complete the cycle. When the Bootloader completes the cycle, the LED flashes rapidly for several times then stays off and blinks approximately every 10 seconds when there is no PLC connection.* • If the **LINK** (green) LED is lit, it indicates a working Ethernet connection. • If the **ACT** (yellow) LED flashes, it indicates network activity.
4 Panel Mount	DeviceMaster UP†	• The **PWR** LED on the front of the unit is lit, which indicates it has power and has completed the boot cycle. ***Note:*** *The* **PWR** *LED flashes while booting and it takes approximately 15 seconds for the Bootloader to complete the cycle. When the Bootloader completes the cycle, the LED flashes rapidly for several times then stays off and blinks approximately every 10 seconds when there is no PLC connection.* • The red **LNK/ACT** LED is lit, which indicates a working Ethernet connection. • If the red **100** LED is lit, it indicates a working 100 MB Ethernet connection (100 MB network, only).

Technical Support

If you need technical support use one of the following methods.

Comtrol Contact Information	
Downloads (FTP)	ftp://ftp.comtrol.com/html/DM_UP_Main.htm
Downloads (HTTP)	http://downloads.comtrol.com/html/DM_UP_Main.htm
Web site	http://www.comtrol.com
Phone	(763) 957-6000