Installation and Configuration Guide
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# Introduction

This section provides an installation and configuration overview for the DeviceMaster platform:

- DeviceMaster PRO
- DeviceMaster RTS
- DeviceMaster Serial Hub

In addition, it provides links to download the latest files for the DeviceMaster installation. Optionally, you can use the Software and Documentation CD to install the DeviceMaster.

## Installation and Configuration Overview

There are four basic installations depending on your requirements. You can use the appropriate overview to install and configure the DeviceMaster for your environment.

- NS-Link COM port device driver
- Secure COM port redirector
- NS-Link tty port device driver
- TCP/IP socket port

### NS-Link COM Port Driver Installation

Use the following steps, which are discussed in detail in the subsequent sections, to install and configure the DeviceMaster to run the NS-Link device driver for Windows operating systems.

1. **Step 1: Hardware Installation**
2. **Step 2: Install PortVision Plus**
3. **Step 3: Program the DeviceMaster IP Address**
4. **Step 4: Install NS-Link Device Driver for Windows on Page 7**
5. **Step 5: Configure NS-Link Port Properties on Page 8**
6. **Step 6: Configure Socket Ports on Page 8**
7. **Step 7: Serial Device Connection on Page 8**

**Step 1: Hardware Installation**

Power up the DeviceMaster. Technical Support suggests installing one DeviceMaster at a time to avoid configuration problems. Refer to Hardware Installation on Page 13 for detailed installation procedures for your DeviceMaster model.

**Step 2: Install PortVision Plus**

Comtrol recommends connecting the DeviceMaster to a PC or laptop running Windows® 2000/XP/2003/Vista so that you can install PortVision Plus for easy IP address configuration. See PortVision Plus Requirements on Page 33 and use then refer to Installing PortVision Plus on Page 33 to install PortVision Plus.

**Step 3: Program the DeviceMaster IP Address**

See Configuring the Network Settings on Page 34 for detailed configuration procedures.

**Step 4: Install NS-Link Device Driver for Windows**

See Windows Installation on Page 39 for an installation overview of the NS-Link driver for each Windows operating system.
### Secure COM Port Redirector Installation Overview

Use the following steps, which are discussed in detail in the subsequent sections, to install and configure the secure COM port redirector for the DeviceMaster.

- **Step 1: Hardware Installation**
  - Power up the DeviceMaster. Technical Support suggests installing one DeviceMaster at a time to avoid configuration problems. Refer to Hardware Installation on Page 13 for detailed installation procedures for your DeviceMaster model.

- **Step 2: Install PortVision Plus**
  - Comtrol recommends connecting the DeviceMaster to a PC or laptop running Windows® 2000/XP/2003/Vista so that you can install PortVision Plus for easy IP address configuration. See PortVision Plus Requirements on Page 33 and use then refer to Installing PortVision Plus on Page 33 to install PortVision Plus.

- **Step 3: Program the DeviceMaster IP Address**
  - See Configuring the Network Settings on Page 34 for procedures on IP address configuration procedures.

- **Step 4: Update SocketServer**
  - If necessary, update SocketServer. You can use Checking the SocketServer Version on Page 36 and then refer to Locating Software and Documentation on Page 10 to locate the latest version on the web site. See Uploading SocketServer on Page 37 if you need to update SocketServer.

- **Step 5: Configure SocketServer**
  - Configure the serial port characteristics and enable the security feature in the SocketServer. Refer to Configuring Serial Ports and Enabling Security on Page 45 for detailed set-up procedures.

- **Step 6: Install the Port Redirector**
  - Refer to Installing the Secure COM Port Redirector on Page 47 for installation procedures.

- **Step 7: Add and Configure the COM Port**
  - Refer to Configuring Secure Redirector COM Ports on Page 48 to complete the set up of the secure COM port redirector.

- **Step 8: Serial Device Connection**
  - Connect the serial devices to the DeviceMaster. Refer to Connecting Serial Devices on Page 53 for cabling and connector information.
NS-Link tty Port Installation Overview

Use the following steps, which are discussed in detail in the subsequent sections, to install and configure the DeviceMaster to run the NS-Link device driver for Linux operating systems.

- **Step 1: Hardware Installation**
- **Step 2: Install PortVision Plus**
- **Step 3: Program the DeviceMaster IP Address**
- **Step 4: Install the NS-Link Device Driver for Linux**
- **Step 5: Configure Socket Ports**
- **Step 6: Serial Device Connection**

**Step 1: Hardware Installation**

Power up the DeviceMaster. Technical Support suggests installing one DeviceMaster at a time to avoid configuration problems. Refer to Hardware Installation on Page 13 for detailed installation procedures for your DeviceMaster model.

**Step 2: Install PortVision Plus**

Comtrol recommends connecting the DeviceMaster to a PC or laptop running Windows® 2000/XP/2003/Vista so that you can install PortVision Plus for easy IP address configuration. See PortVision Plus Requirements on Page 33 and use then refer to Installing PortVision Plus on Page 33 to install PortVision Plus.

**Step 3: Program the DeviceMaster IP Address**

See Configuring the Network Settings on Page 34 for procedures on IP address configuration procedures.

**Step 4: Install the NS-Link Device Driver for Linux**

Locate and unpack the driver assembly. Refer to the readme file packaged with the Linux driver assembly for driver installation and configuration procedures for the tty port.

**Step 5: Configure Socket Ports**

Optionally, you may need to configure one or more ports for socket mode. See Socket Port Configuration on Page 49 for information about configuring socket ports using the Server Configuration web page.

**Step 6: Serial Device Connection**

Connect the serial devices to the DeviceMaster. Refer to Connecting Serial Devices on Page 53 for cabling and connector information.

TCP/IP Socket Port Installation Overview

Use the following steps, which are discussed in detail in the subsequent sections, to configure DeviceMaster socket ports.

- **Step 1: Hardware Installation**
- **Step 2: Install PortVision Plus**
- **Step 3: Program the DeviceMaster IP Address**
- **Step 4: Update SocketServer on Page 10**
- **Step 5: Configure the Socket Ports on Page 10**
- **Step 6: Serial Device Connection on Page 10**

**Step 1: Hardware Installation**

Power up the DeviceMaster. Technical Support suggests installing one DeviceMaster at a time to avoid configuration problems. Refer to Hardware Installation on Page 13 for detailed installation procedures for your DeviceMaster model.

**Step 2: Install PortVision Plus**

Comtrol recommends connecting the DeviceMaster to a PC or laptop running Windows® 2000/XP/2003/Vista so that you can install PortVision Plus for easy IP address configuration. See PortVision Plus Requirements on Page 33 and use then refer to Installing PortVision Plus on Page 33 to install PortVision Plus.

**Step 3: Program the DeviceMaster IP Address**

See Configuring the Network Settings on Page 34 for procedures on IP address configuration procedures.
**Step 4: Update SocketServer**

If necessary, update SocketServer. You can use the [Checking the SocketServer Version on Page 36](#) and then refer to the [Locating Software and Documentation on Page 10](#) to locate the latest version on the web site. See the [Uploading SocketServer on Page 37](#) if you need to update SocketServer.

**Step 5: Configure the Socket Ports**

Configure the serial socket ports using the PortVision Plus property pages or enter the IP address in a web browser and use the SocketServer web pages.

**Step 6: Serial Device Connection**

Connect the serial devices to the DeviceMaster. Refer to the [Connecting Serial Devices on Page 53](#) for cabling and connector information.

---

**Locating Software and Documentation**

You can access the appropriate software assembly, PortVision Plus, and the *DeviceMaster* documentation from the CD shipped with the DeviceMaster. Optionally, if you know what you need for your installation, you can download the latest files using these internet links.

If you are not sure what files are required for your installation, each installation and configuration overview also provides links to the required files in this guide.

<table>
<thead>
<tr>
<th>Software</th>
<th>Operating Systems</th>
<th>Web</th>
</tr>
</thead>
<tbody>
<tr>
<td>PortVision Plus</td>
<td>Windows 2000 (32-bit)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Windows XP (32/64-bit)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Windows Server 2003 (32/64-bit)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Windows Vista (32-bit)</td>
<td></td>
</tr>
<tr>
<td>SocketServer</td>
<td>The firmware that comes pre-installed on your DeviceMaster platform, which provides an interface to TCP/IP socket mode configuration and services.</td>
<td></td>
</tr>
<tr>
<td>Bootloader</td>
<td>The operating system that runs on the DeviceMaster hardware during the power on phase, which then loads SocketServer.</td>
<td></td>
</tr>
</tbody>
</table>

**NS-Link Device Drivers and Installation Documentation**

<table>
<thead>
<tr>
<th>Windows 2000 (32-bit)</th>
<th>Device driver (COM ports)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Windows XP (32/64-bit)</td>
<td>NS-Link User Guide for Windows</td>
<td></td>
</tr>
<tr>
<td>Windows Server 2003 (32/64-bit)</td>
<td>Linux (32/64-bit)</td>
<td>Device driver (tty ports)</td>
</tr>
</tbody>
</table>

**Secure COM Port Redirector**

<table>
<thead>
<tr>
<th>Windows 2000 (32-bit)</th>
<th>Secure COM port redirector</th>
<th></th>
</tr>
</thead>
</table>
Developer's Kit

In addition to the standard capabilities of the DeviceMaster they are also a fully-programmable, embedded computing platform.

If you are interested in writing your own applications for the DeviceMaster or would like information on how to obtain the Comtrol DeviceMaster Developer's Kit, see http://www.comtrol.com/products/family/dmrtsdk or please contact your Comtrol sales representative.

Note: The DeviceMaster PRO is shipped with the Developer's Kit. The DeviceMaster RTS supports the Developer's Kit. The DeviceMaster Serial Hub is not supported in the Developer's Kit.
Hardware Installation

Installation Overview

The DeviceMaster enables communications with serial devices over an Ethernet network. The DeviceMaster provides for remote management, configuration, and connectivity through its 10/100BASE-T Ethernet connection.

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

<table>
<thead>
<tr>
<th>DeviceMaster PRO</th>
<th>DeviceMaster RTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DB9 serial ports with dual Ethernetª ports</td>
<td>8†</td>
</tr>
<tr>
<td>RJ45 serial ports with dual Ethernet†† ports</td>
<td>16</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DeviceMaster RTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DB9 serial port with a single Ethernet port</td>
</tr>
<tr>
<td>Embedded system</td>
</tr>
<tr>
<td>Screw terminal serial ports</td>
</tr>
<tr>
<td>DB9 serial ports</td>
</tr>
<tr>
<td>DB9 serial ports with dual Ethernet†† ports</td>
</tr>
<tr>
<td>RJ45 serial ports with dual Ethernet†† ports</td>
</tr>
<tr>
<td>RJ45 serial ports with a single Ethernet port</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DeviceMaster Serial Hub</th>
</tr>
</thead>
<tbody>
<tr>
<td>DB9 serial ports with dual Ethernet†† ports</td>
</tr>
<tr>
<td>DB9 serial ports with a single Ethernet port</td>
</tr>
</tbody>
</table>

† The DeviceMaster RTS 4 and 8-port models may also include DB9 to RJ45 adapters.
†† One of the Ethernet ports on the DeviceMaster is a built-in downstream port for daisy-chaining DeviceMaster systems or other network-ready devices.
‡ Either Ethernet port on the DeviceMaster RTS 2-port 2E model can be used for daisy-chaining DeviceMaster systems or other network-ready devices.

Default Network Settings

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

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

4-Port and 8-Port Models on Page 24
16-Port (DeviceMaster PRO) on Page 28
1-Port - Enclosed Models on Page 14
1-Port - Embedded Model on Page 16
2-Port (Serial Terminal) 1E/2E Models on Page 20
2-Port (DB9) 1E/2E Models on Page 22
4-Port and 8-Port Models on Page 24
16-Port (DeviceMaster RTS - External Power Supply) on Page 26
16/32-Port Rack Mount Models (Internal Power Supply) on Page 30
4-Port and 8-Port Models on Page 24
16/32-Port Rack Mount Models (Internal Power Supply) on Page 30
1-Port - Enclosed Models

Use the following procedure to install the DeviceMaster 1-Port.

1. Record the MAC address and serial number of the DeviceMaster on the customer service label provided.
   
   You may need the MAC address during driver configuration. The MAC address (starts with **00 C0 4E**) and serial number are located on a label on the DeviceMaster.

   **Note:** Do not connect multiple units until you have changed the default IP address, see Initial Configuration on Page 33.

2. Place the 1-Port on a stable surface and skip to Step 3 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.

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

   If you plan on using the NS-Link device driver, make sure that you do not connect RS-422/485 devices until the appropriate port interface type has been configured in the driver. The NS-Link default port setting is RS-232.

4. Apply power to the DeviceMaster using the appropriate procedure for your power supply.

   **Note:** The supported input voltage (5VDC or 5-30VDC) is printed on the DeviceMaster.

**5VDC Power Supply (Barrel Connector)**

- Connect the 5VDC power supply to the DeviceMaster and to a power outlet.
- Go to Step 5 to verify that the DeviceMaster is functioning properly.
**5-30VDC with Screw Terminal Power Connector**

Use the following procedure to power on this model.

**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.

If you purchased the Comtrol power supply (separately), the wires are identified below:
- Red = 5-30VDC positive
- White = 5-30VDC return
- Black = earth ground

If you did not purchase a power supply from Comtrol for the DeviceMaster, see 1-Port 5-30VDC Power Supply on Page 87 for 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 5 to verify that the DeviceMaster is functioning properly.

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

<table>
<thead>
<tr>
<th>Status</th>
<th>The amber <strong>Status</strong> LED on the device is lit, indicating you have power and it has completed the boot cycle. <strong>Note:</strong> The <strong>Status</strong> 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 has a solid, steady light that blinks approximately every 10 seconds.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Link/Act</strong></td>
<td>If the red <strong>Link/Act</strong> LED is lit, it indicates a working Ethernet connection.</td>
</tr>
<tr>
<td><strong>Duplex</strong></td>
<td>If the red <strong>Duplex</strong> LED is lit, it indicates full-duplex activity.</td>
</tr>
<tr>
<td><strong>100</strong></td>
<td>If the red <strong>100</strong> 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. <strong>Note:</strong> For additional LED information, go to the <strong>Status</strong> LED table on Page 97.</td>
</tr>
</tbody>
</table>

6. Go to Initial Configuration on Page 33 for default network settings and how to configure the DeviceMaster for use.
1-Port - Embedded Model

Installing the DeviceMaster 1-Port Embedded system follows these basic steps:
- Building the serial ribbon cable (below).
- Mounting the Embedded on Page 17 and installing light pipes.
- Attaching the Network and Serial Cables on Page 18.
- Connecting the Power and Verifying Installation on Page 18.

*Observe proper ESD techniques when handling the DeviceMaster.*

**Building the Serial Ribbon Cable**

Use the following information to build a DB9 serial ribbon cable to connect to the DeviceMaster 1-Port Embedded IDC10 connector (J3).

<table>
<thead>
<tr>
<th>J3 Header</th>
<th>RS-232</th>
<th>RS-422</th>
<th>RS-485</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CD</td>
<td>Not used</td>
<td>Not used</td>
</tr>
<tr>
<td>2</td>
<td>DSR</td>
<td>Not used</td>
<td>Not used</td>
</tr>
<tr>
<td>3</td>
<td>RxD</td>
<td>RxD-</td>
<td>Not used</td>
</tr>
<tr>
<td>4</td>
<td>RTS</td>
<td>TxD+</td>
<td>TRX+</td>
</tr>
<tr>
<td>5</td>
<td>TxD</td>
<td>TxD-</td>
<td>TRX-</td>
</tr>
<tr>
<td>6</td>
<td>CTS</td>
<td>RxD+</td>
<td>Not used</td>
</tr>
<tr>
<td>7</td>
<td>DTR</td>
<td>Not used</td>
<td>Not used</td>
</tr>
<tr>
<td>8</td>
<td>RI</td>
<td>Not used</td>
<td>Not used</td>
</tr>
<tr>
<td>9</td>
<td>GND</td>
<td>Not used</td>
<td>Not used</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>Not connected</td>
<td></td>
</tr>
</tbody>
</table>
Mounting the Embedded

Use the following procedure to mount the DeviceMaster 1-Port Embedded with the 5-30VDC power supply.

**Observe proper ESD techniques when handling the DeviceMaster.**

1. Carefully remove the DeviceMaster from the anti-static bag, following standard electrostatic device handling procedures.

   **Note:** Write down the MAC address located on a label on the bottom (solder side) center of the DeviceMaster because you may need it during configuration.

2. Mount the DeviceMaster for your environment using 1/4” stand-offs to separate the DeviceMaster from the base.

   1. Non-plated/non-grounded mounting holes 0.116” diameter (+/-0.003”).
   2. Plated/chassis grounded mounting hole 0.116” diameter (+/-0.003”).
   3. WARNING: Holes in hatched area are not mounting holes.
   4. Maximum component height above board is 0.55”.
   5. Ethernet connection J2: J2 overhangs board edge by 0.14” and the height is 0.55”.
   6. Power connector; the mating connector is Weidmuller P/N: 152651.
   7. LED light pipe mounting holes. The LED light pipes are not provided.
   8. Serial port connector J3: 0.1” pin spacing, 0.025” square pin diameter, and 0.230” pin height.
   9. Debug port connector J4: 0.1” pin spacing, 0.025” square pin diameter, and 0.230” pin height.

3. Use one of the following methods to ground the DeviceMaster.
   - Through the **power supply** by connecting the ground wire on the power cable using plastic or metal stand-offs.
   - Through the **chassis**, using metal stand-offs. If plastic stand-offs are used to mount the board, then you must ground the DeviceMaster using the power cable.

   **Note:** *The maximum diameter of the metal stand-offs should be 0.175” with a 4-40 machine screw. Metal stand-offs are not provided with the DeviceMaster.*

4. Optionally, attach the light pipes. The following light pipes have been tested and found to function; Bivar, Inc. (P/N:LP-230) and Ledtronics, Inc. (P/N:LTP003-0CW-001).
After mounting the DeviceMaster, you are ready to connect the cables.

**Attaching the Network and Serial Cables**

Use the following procedure to attach the serial ribbon and Ethernet cables. For a larger illustration of the system, see 1-Port Embedded on Page 92.

1. Attach the ribbon cable built in Building the Serial Ribbon Cable on Page 16 to the header labeled J3.

2. Connect a standard Ethernet cable from the RJ45 port on the DeviceMaster to your Ethernet hub.

   *The default serial port setting on the DeviceMaster is RS-232. Do not connect the serial device until you have configured the serial port settings. You must configure network settings and upload firmware before configuring the serial port settings.*

   Use the next subsection to wire the power terminal connector and verify the hardware installation.

**Connecting the Power and Verifying Installation**

Use the following procedure to wire the power terminal connector and connect the DeviceMaster to a power source.

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

1. Insert the earth ground wire into the earth ground screw terminal.

2. Insert the DC positive wire into the positive screw terminal and the DC return wire into the return screw terminal.

   If you purchased the Comtrol power supply (separately), the wires are identified below:
   - Red = 5-30VDC positive
   - White = 5-30VDC return
   - Black = earth ground

   If you did not purchase a power supply from Comtrol for the DeviceMaster, see 1-Port 5-30VDC Power Supply on Page 87 for power requirements.

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

4. Verify that each wire has been tightened securely.
5. Plug the screw terminal power connector into the DeviceMaster.

6. Connect the power supply to a power source.

7. Plug the screw terminal power connector into JP1 on the DeviceMaster by aligning the scalloped sides.

   **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.

8. Apply power to the DeviceMaster.

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

   The LEDs are located between the RJ45 connector and the power terminal block.

### LED Descriptions

<table>
<thead>
<tr>
<th>LED</th>
<th>Description</th>
</tr>
</thead>
</table>
| Status| When lit, the amber **Status** LED (D1) on the DeviceMaster indicates the device is fully powered and has completed the boot cycle.  
   **Note:** The **Status** LED flashes for approximately 15 seconds while booting. When the Bootloader completes the cycle, the LED has a solid, steady light that blinks approximately every 10 seconds. |
| Link/Act | When lit, the red **Link/Act** LED (D2) indicates a working Ethernet connection. |
| Duplex | When lit, the red **Duplex** (D3) LED indicates full-duplex activity.         |
| 100   | When lit, the red **100** (D4) LED 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 97. |

10. Go to [Initial Configuration on Page 33](#) for default network settings and how to configure the DeviceMaster for use.
Use the following procedure to install DeviceMaster 2-port models with serial terminal connectors. See 2-Port (DB9) 1E/2E Models on Page 22 if the DeviceMaster has DB9 serial connectors.

1. Record the MAC address and serial number of the DeviceMaster unit on the customer service label provided.
   You may need the MAC address during driver configuration. The MAC address (starts with 00 C0 4E) and serial number are located on a label on the DeviceMaster.

2. Attach the DeviceMaster 2-Port to the DIN rail adapter.

3. 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. Insert the earth ground wire into the chassis ground screw terminal. The chassis ground connection is made only if the DIN rail is NOT connected to signal ground.
   b. Insert the DC positive wire into the + screw terminal and the DC return wire into the - screw terminal.
      If you purchased the Comtrol power supply (separately), the wires are identified below:
      • Red = 5-30VDC positive
      • White = 5-30VDC return
      • Black = chassis ground
      If you did not purchase a power supply from Comtrol for the DeviceMaster, see 2-Port (Serial Terminals) Power Supply on Page 88 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 the power supply to a power source.
   **Note:** Do not connect multiple units until you have changed the default IP address, see Initial Configuration on Page 33.

4. Use the appropriate method for network attachment of your DeviceMaster 2-port:
   **DeviceMaster 1E:** Connect the 10/100 port to the same Ethernet network segment as the host PC using a standard network cable.
   **DeviceMaster 2E:** Connect the DeviceMaster 2E using one of these methods:
   • **Ethernet hub, switch (10/100Base-T). Server NIC (10/100Base-T):** Connect a 10/100 port to the same Ethernet network segment as the host PC using a standard Ethernet cable.
   • **Daisy-chaining DeviceMaster units:** Connect the port labeled E1 (or E2) on the first DeviceMaster to the port labeled E1 (or E2) on the second DeviceMaster or other device using a standard Ethernet cable.
Do not connect RS-422/485 devices until the appropriate port interface type has been configured. The default port setting is RS-232.

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

<table>
<thead>
<tr>
<th>2-Port LED Descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>STATUS</strong></td>
</tr>
<tr>
<td>The STATUS LED on the device is lit, indicating you have power and it has completed the boot cycle.</td>
</tr>
<tr>
<td><strong>Note:</strong> 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 has a solid, steady light that blinks approximately every 10 seconds.</td>
</tr>
<tr>
<td><strong>LINK</strong></td>
</tr>
<tr>
<td>If the LINK (green) LED is lit, it indicates a working Ethernet connection.</td>
</tr>
<tr>
<td><strong>ACT</strong></td>
</tr>
<tr>
<td>If the ACT (yellow) LED flashes, it indicates network activity.</td>
</tr>
<tr>
<td><strong>Note:</strong> For additional LED information, go to the STATUS LED table on Page 97.</td>
</tr>
</tbody>
</table>

6. Go to Initial Configuration on Page 33 for default network settings and how to configure the DeviceMaster for use.
2-Port (DB9) 1E/2E Models

Use the following procedure to install DeviceMaster 2-port models with DB9 connectors.

1. Record the MAC address and serial number of the DeviceMaster unit on the customer service label provided.
   You may need the MAC address during driver configuration. The MAC address (starts with 00:C0:4E) and serial number are located on a label on the DeviceMaster.

2. Attach the DeviceMaster 2-Port to the DIN rail adapter.

3. 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. 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 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 will continue to operate if one of the two connected power supplies should fail.
      If you purchased the Control power supply (separately), the wires are identified below:
      - Red = 6-30VDC positive
      - White = 6-30VDC return
      - Black = chassis ground
      If you did not purchase a power supply from Control for the DeviceMaster, see 2-Port (DB9) Power Supply on Page 88 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 the power supply to a power source.
      **Note:** Do not connect multiple units until you have changed the default IP address, see Initial Configuration on Page 33.
4. Use the appropriate method for network attachment of your DeviceMaster 2-port:
   - **DeviceMaster 1E:** Connect the **10/100 port** to the same Ethernet network segment as the host PC using a standard network cable.
   - **DeviceMaster 2E:** Connect the DeviceMaster 2E using one of these methods:
     - **Ethernet hub, switch (10/100 Base-T), Server NIC (10/100 Base-T):** Connect a **10/100 port** to the same Ethernet network segment as the host PC using a standard Ethernet cable.
     - **Daisy-chaining DeviceMaster units:** Connect the port labeled **E1** (or **E2**) on the first DeviceMaster to the port labeled **E1** (or **E2**) on the second DeviceMaster or other device using a standard Ethernet cable.

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

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

<table>
<thead>
<tr>
<th>2-Port LED Descriptions</th>
</tr>
</thead>
</table>
| **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 has a solid, steady light that blinks approximately every 10 seconds. |
| **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 97. |

6. Go to **Initial Configuration on Page 33** for default network settings and how to configure the DeviceMaster for use.
4-Port and 8-Port Models

Use the following procedure to install the DeviceMaster 4-port or 8-port:

1. Record the MAC address and serial number of the DeviceMaster unit on the customer service label provided.
   
   You may need the MAC address during driver configuration. The MAC address (starts with 00 C0 4E) and serial number are located on a label on the DeviceMaster.
   
   **Note:** Do not connect multiple units until you have changed the default IP address, see Initial Configuration on Page 33.

2. 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.

   **DeviceMaster RTS**

   ![DeviceMaster RTS](Larger Picture, Page 93)

   **DeviceMaster PRO and DeviceMaster Serial Hub**

   ![DeviceMaster PRO and DeviceMaster Serial Hub](Larger Picture, Page 93)

   **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.

3. Connect the DeviceMaster to the same Ethernet network segment as the host PC using one of the following methods:

   - **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 2E/4/8/16-Port Units on Page 101 for more detailed information.

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

4. 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 your own power supply, see 4-Port Power Supply on Page 88.
5. Verify that the PWR LED has completed the boot cycle and network connection for the DeviceMaster is functioning properly using the table below.

### 4-Port and 8-Port LED Descriptions

<table>
<thead>
<tr>
<th>LED</th>
<th>Description</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PWR</strong></td>
<td>LED on the front panel of the DeviceMaster is lit, indicating you have power and it has completed the boot cycle. <strong>Note:</strong> 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 has a solid, steady light that blinks approximately every 10 seconds.</td>
<td></td>
</tr>
<tr>
<td><strong>LNK ACT</strong></td>
<td>The red LNK ACT LED is lit, indicating that you have a working Ethernet connection.</td>
<td></td>
</tr>
<tr>
<td><strong>COL</strong></td>
<td>If the red COL LED is lit, there is a network collision.</td>
<td></td>
</tr>
<tr>
<td><strong>100</strong></td>
<td>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. <strong>Note:</strong> For additional LED information, go to the PWR LED table on Page 97.</td>
<td></td>
</tr>
</tbody>
</table>

6. Go to Initial Configuration on Page 33 for default network settings and how to configure the DeviceMaster for use.
16-Port (DeviceMaster RTS - External Power Supply)

Use the following procedure to install the DeviceMaster RTS 16-port with an external power supply.

1. Record the MAC address and serial number of the DeviceMaster unit on the customer service label provided.
   You may need the MAC address during driver configuration. The serial number and MAC address (starts with 00 C0 4E) are located on a label on the DeviceMaster.
   **Note:** Do not connect multiple units until you have changed the default IP address, see Initial Configuration on Page 33.

2. Place the DeviceMaster RTS on a stable surface, or optionally mount the DeviceMaster in a rack.
   **Rack Installation:**
   a. Attach the L brackets to the interface using the screws supplied with the unit.
   b. You can mount the unit facing in either direction.
   c. Attach the L bracket into your rack.

   **Follow these guidelines when mounting the DeviceMaster RTS in a rack.**
   - If the DeviceMaster is installed in a closed or multi-rack assembly, the operating temperature of the rack environment may be greater than the ambient temperature. Be sure to install the DeviceMaster in an environment that is compatible with the maximum rated ambient temperature. See http://www.comtrol.com/products/specifications/99450-3 for temperature specifications.
   - Make sure that the mechanical loading is level to avoid a hazardous condition; such as, loading heavy equipment in the rack unevenly. The rack should safely support the combined weight of all equipment in the rack.
   - Slots and openings in the cabinet are provided for ventilation. To ensure reliable operation of the DeviceMaster and to protect it from overheating, maintain a minimum of 1 inch of clearance on all sides of the unit.
   - AC power inputs are intended to be used with a three-wire grounding type plug, which has a grounding pin. Equipment grounding ensures safe operation. Do not defeat the grounding means and verify that the DeviceMaster is reliably grounded when mounting within the rack.

3. Connect the DeviceMaster RTS to the same Ethernet network segment as the host PC using one of the following methods.
   - **Ethernet hub or switch (10/100Base-T):** Connect to the port labeled UP on the DeviceMaster RTS using a standard Ethernet cable.
   - **Server NIC (10/100Base-T):** Connect to the port labeled DOWN on the DeviceMaster RTS using a standard Ethernet cable.
   - **Daisy-chaining DeviceMaster units:** Connect the port labeled DOWN on the first DeviceMaster RTS to the port labeled UP on the second DeviceMaster or other device using a standard Ethernet cable.

   **Caution:** Do not connect RS-422/485 devices until the appropriate port interface type has been configured. The default port setting is RS-232.

4. Apply power to the DeviceMaster RTS by connecting the AC power adapter to the DeviceMaster, the power cord to the power adapter, and plugging the power cord into a power source. See External Power Supply Specifications on Page 87 if you want to provide your own power supply.
5. Verify that the PWR LED has completed the boot cycle and network connection for the DeviceMaster RTS is functioning properly using the table below.

### DeviceMaster RTS 16-Port (External Power Supply) LED Descriptions

<table>
<thead>
<tr>
<th>Red LED</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red LED on the front panel of the DeviceMaster is lit, indicating you have power and it has completed the boot cycle. <strong>Note:</strong> The 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 has a solid, steady light that blinks approximately every 10 seconds.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LNK ACT</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>The red LNK ACT LED is lit, indicating that you have a working Ethernet connection.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COL</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>If the red COL LED is lit, there is a network collision.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>100</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>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. <strong>Note:</strong> For additional LED information, go to the PWR/Status LED table on Page 97.</td>
<td></td>
</tr>
</tbody>
</table>

6. Go to Initial Configuration on Page 33 for default network settings and how to configure the DeviceMaster for use.
16-Port (DeviceMaster PRO)

Use the following procedure to install the DeviceMaster PRO 16-port with an external power supply.

1. Record the MAC address and serial number of the DeviceMaster unit on the customer service label provided.
   You may need the MAC address during driver configuration. The serial number and MAC address are located on a label on the device. The MAC address starts with 00 C0 4E.

2. Place the DeviceMaster PRO on a stable surface, or optionally mount the DeviceMaster PRO in a rack.
   **Rack Installation:**
   a. Attach the L brackets to the interface using the screws supplied with the unit.
   b. You can mount the unit facing in either direction.
   c. Attach the L bracket into your rack.

   **Follow these guidelines when mounting the DeviceMaster in a rack.**
   - If the DeviceMaster PRO is installed in a closed or multi-rack assembly, the operating temperature of the rack environment may be greater than the ambient temperature. Be sure to install the DeviceMaster in an environment that is compatible with the maximum rated ambient temperature (http://www.comtrol.com/products/specifications/99451-0).
   - Make sure that the mechanical loading is level to avoid a hazardous condition; such as, loading heavy equipment in the rack unevenly. The rack should safely support the combined weight of all equipment in the rack.
   - Slots and openings in the cabinet are provided for ventilation. To ensure reliable operation of the DeviceMaster and to protect it from overheating, maintain a minimum of 1 inch of clearance on all sides of the unit.
   - AC power inputs are intended to be used with a three-wire grounding type plug, which has a grounding pin. Equipment grounding ensures safe operation. Do not defeat the grounding means and verify that the DeviceMaster is reliably grounded when mounting within the rack.

3. Connect the DeviceMaster PRO to the same Ethernet network segment as the host PC using one of the following methods.
   - **Ethernet hub or switch (10/100Base-T):** Connect to the port labeled UP on the DeviceMaster PRO using a standard Ethernet cable.
   - **Server NIC (10/100Base-T):** Connect to the port labeled DOWN on the DeviceMaster PRO using a standard Ethernet cable.
   - **Daisy-chaining DeviceMaster units:** Connect the port labeled DOWN on the first DeviceMaster PRO to the port labeled UP on the second DeviceMaster PRO or other device using a standard Ethernet cable.
     **Note:** Do not connect multiple units until you have changed the default IP address, see Initial Configuration on Page 33.

   If you plan on using the NS-Link device driver, make sure that you do not connect RS-422/485 devices until the appropriate port interface type has been configured in the driver. The NS-Link default port setting is RS-232.

4. Connect the power cord into a power source.
5. Apply power to the DeviceMaster PRO by turning on the power switch.
6. Verify that the PWR LED has completed the boot cycle and network connection for the DeviceMaster is functioning properly using the table below.

<table>
<thead>
<tr>
<th>DeviceMaster PRO 16-Port LED Description</th>
</tr>
</thead>
</table>
| **Red LED (Front panel)** | Red LED on the front panel of the DeviceMaster PRO is lit, indicating you have power and it has completed the boot cycle.  
**Note:** The 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 has a solid, steady light that blinks approximately every 10 seconds. |
| **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 PWR/Status LED table on Page 97.

7. Go to Initial Configuration on Page 33 for default network settings and how to configure the DeviceMaster for use.
16/32-Port Rack Mount Models (Internal Power Supply)

Use the following procedure to install the DeviceMaster 16-port or 32-port with an internal power supply.

1. Record the MAC address and serial number of the DeviceMaster unit on the customer service label provided.
   
   You may need the MAC address during driver configuration. The serial number and MAC address (starts with 00 C0 4E) are located on a label on the DeviceMaster.
   
   **Note:** Do not connect multiple units until you have changed the default IP address, see Initial Configuration on Page 33.

2. Place the DeviceMaster on a stable surface, or optionally mount the DeviceMaster in a rack.

   **Rack Installation:**
   
   a. Attach the L brackets to the interface using the screws supplied with the unit.

   b. You can mount the unit facing in either direction.

   c. Attach the L bracket into your rack.

   **Follow these guidelines when mounting the DeviceMaster in a rack.**

   • **If the DeviceMaster is installed in a closed or multi-rack assembly, the operating temperature of the rack environment may be greater than the ambient temperature. Be sure to install the DeviceMaster in an environment that is compatible with the maximum rated ambient temperature. Refer to the appropriate link for temperature specifications.**


   • **Make sure that the mechanical loading is level to avoid a hazardous condition; such as, loading heavy equipment in the rack unevenly. The rack should safely support the combined weight of all equipment in the rack.**

   • **Slots and openings in the cabinet are provided for ventilation. To ensure reliable operation of the DeviceMaster and to protect it from overheating, maintain a minimum of 1 inch of clearance on all sides of the unit.**

   • **AC power inputs are intended to be used with a three-wire grounding type plug, which has a grounding pin. Equipment grounding ensures safe operation. Do not defeat the grounding means and verify that the DeviceMaster is reliably grounded when mounting within the rack.**
3. Connect the DeviceMaster port labeled **10/100 NETWORK** to the same Ethernet network segment as the host PC using a standard network cable.

If you plan on using the NS-Link device driver, make sure that you do not connect RS-422/485 devices until the appropriate port interface type has been configured in the driver. The NS-Link default port setting is RS-232.

4. Apply power to the DeviceMaster by connecting the appropriate power cord into the power socket on the DeviceMaster, plugging the power cord into a power source, and turning on the power switch.

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

6. Go to **Initial Configuration on Page 33** for default network settings and how to configure the DeviceMaster for use.
Initial Configuration

There are several ways to configure network information. Comtrol Technical Support recommends connecting the DeviceMaster to a PC or laptop running Windows® and installing PortVision Plus for initial configuration.

This section shows you how to:

- Install PortVision Plus
- Configure the network address
- Check the SocketServer version on the DeviceMaster
- If necessary, download the latest version SocketServer and upload it into the DeviceMaster

If you do not want to install PortVision Plus, see RedBoot Procedures on Page 75 for alternate methods to configure the network or upload the latest firmware.

PortVision Plus Requirements

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

- Windows 2000
- Windows XP
- Windows Server 2003
- Windows Vista

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

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

Installing PortVision Plus

During initial configuration, PortVision Plus automatically detects and identifies DeviceMaster units, if they are in the same network segment by using the Scan Network button in PortVision Plus.

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

1. Execute the pvplus_[version].msi file and follow the installation wizard using one of the following methods:
   - **CD Installation**: Use the CD menu system to check the version on the CD against the latest released version.

2. Click Launch and Finish in the last installation screen.
3. Click Scan so that PortVision Plus locates the DeviceMaster.

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

4. Go to Step 4 in the next section, Configuring the Network Settings, to program the DeviceMaster network settings.

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

Configuring the Network Settings

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

**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 68.

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

1. If you have not done so, install PortVision Plus (Installing PortVision Plus on Page 33).
2. Start PortVision Plus using the PortVision Plus desktop shortcut or from the Start button, click Programs, Control, PortVision Plus.
3. If this is the first time you have opened PortVision Plus, click Scan and then Yes to locate DeviceMasters on the network.

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

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

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

   **Note:** See the PortVision Plus Help system for information about using PortVision Plus.
5. Optionally, rename the DeviceMaster in the Device Name field.

6. Change the DeviceMaster network properties as required for your site.
   - If you want to run the DeviceMaster using the MAC addressing scheme, click Disable IP.
   - To use the DeviceMaster with DHCP, click DHCP IP, and make sure that you provide the MAC address of the device to the network administrator. Make sure that the administrator reserves the IP address, subnet mask and gateway address of the DeviceMaster in the DHCP server.
   - To program a static IP address, click Static IP and enter the appropriate values for your site.
   
   Note: For additional information, open the PortVision Plus Help system. Access the Help system using the Help button or go directly to the help for a specific property page by clicking the Context menu button ( ).

7. Click Apply Changes to update the network information on the DeviceMaster.

8. Optionally, click Save Settings to a File to create a configuration file that you can use to configure other DeviceMasters.
   
   If you are deploying multiple DeviceMasters that share common values, you can save the configuration file and load that configuration onto other DeviceMasters.

9. Click Close to exit the Configure Device window.

10. Go to Checking the SocketServer Version on Page 36 to see if you need to update SocketServer before setting up the secure COM port redirector or configuring an environment for socket use only.
Checking the SocketServer Version

SocketServer refers to the web page that is integrated in the firmware that comes pre-installed on your DeviceMaster platform, which provides an interface to TCP/IP socket mode configuration and services.

Comtrol recommends verifying that your DeviceMaster contains the latest SocketServer version before setting up the secure COM port redirector or configuring socket ports to avoid installation problems.

Note: It is not necessary to update SocketServer if you plan on using an NS-Link device driver.

Use the following procedure to check the SocketServer version on the DeviceMaster.

1. If necessary, start PortVision Plus and scan the network.
2. Check the SocketServer version number of the Software Version for the DeviceMaster.
3. Check the Comtrol web site to see if a later version is available.
4. If the version on the web site is later than the version on the DeviceMaster, download the file and then go to Uploading SocketServer on Page 37.

If the SocketServer version on the DeviceMaster is current, you are ready to start setting up the secure COM ports redirector or to configure the sockets using the SocketServer web page. Use the appropriate discussion to complete the DeviceMaster configuration process.

• Secure COM Port Set Up on Page 45
• Socket Port Configuration on Page 49
Uploading SocketServer

Use this section to upload a new version of SocketServer on the DeviceMaster using PortVision Plus. Technical Support recommends updating SocketServer before setting up the secure COM ports redirector or to configure the sockets using the SocketServer web page to avoid configuration problems.

**Note:** This section contains SocketServer update information for installations that are **NOT** running an NS-Link driver. If you are running an NS-Link device driver, see the NS-Link User Guide for Windows (also available on the CD).

1. Make sure that you have located or downloaded the latest SocketServer version.
2. Right-click the DeviceMaster for which you want to update, click **Upload Firmware**, browse to the SocketServer .bin file, and then click **Open**.
3. Click **Yes** to the **Upload Firmware** message that warns you that this is a sensitive process.
   
   It may take a few moments for the firmware to upload onto the device. The device will reboot itself during the upload process.
4. Click **Ok** to the advisory message about waiting to use the device until the status reads **ON-LINE**. In the next polling cycle, PortVision Plus updates the **List View** pane and displays the new SocketServer version.

You are now ready to complete the DeviceMaster configuration by setting up the secure COM port redirector or configuring sockets using the SocketServer web page, depending on your environment.

Go to [Secure COM Port Set Up on Page 45](#) to locate information about setting up secure COM ports.

If you do not plan on setting up secure COM ports NS-Link, go to [Socket Port Configuration on Page 49](#) for information about configuring sockets using the SocketServer web page.
Device Driver Installation

Before installing the NS-Link device driver, the following conditions must be met:

- The DeviceMaster is connected to the network and powered on (Hardware Installation on Page 13)
- The network information has been configured in the DeviceMaster (Configuring the Network Settings on Page 34)
- If this is the initial device driver installation, verify that the DeviceMaster contains the latest version of SocketServer (Checking the SocketServer Version on Page 36)

After NS-Link driver installation and configuration, the same ports can be configured as TCP/IP sockets using an NS-Link version of the SocketServer web page (Socket Port Configuration on Page 49).

Linux Installation

Refer to the README file provided with the Linux® driver for installation and configuration procedures. Locate the latest device driver for Linux:

- **CD Installation**: Use the CD to check the driver version on the CD against the latest released version. Open the /html/default.htm file to use the menu system.

Windows Installation

This subsection provides an installation overview for the NS-Link device driver for the Windows 2000, Windows XP, Windows Server 2003, and Window Vista operating systems.

**Note:** If you require secure COM ports, go to Secure COM Port Set Up on Page 45. You do not need to install the NS-Link device driver if you plan on configuring secure COM ports.

1. Locate the latest device driver for Windows and **NS-Link User Guide for Windows**:
   - **CD Installation**: You can use the CD to check the driver version on the CD against the latest released version.
2. Unzip the driver assembly.
3. Go to the appropriate procedure to install the driver. The device driver for Windows installation follows these steps for each DeviceMaster. If you have multiple DeviceMasters, you must repeat this process for each DeviceMaster.
   - Windows Vista: NS-Link Installation on Page 40
   - Windows XP and Windows Server 2003: NS-Link Installation on Page 41
   - Windows 2000: NS-Link Installation on Page 42

Windows Vista: NS-Link Installation

After locating the latest driver (Page 39) and extracting the files, use this procedure to install and configure the NS-Link device driver for your DeviceMaster.

1. From the Start button, click Settings, Control Panel and then double-click Add Hardware.
2. Click Next when the Add Hardware wizard starts.
3. Click Install the hardware that I manually select from a list (Advanced) and Next
4. Highlight Multi-port serial adapters and then click Next.
5. Click Have Disk, Browse and locate the unzipped driver files, click Open and then click OK.
   
   *Note:* Select any .inf file and the driver executes the appropriate file for your DeviceMaster installation.
6. Highlight the DeviceMaster in the Models list and click Next
7. Click Next to start the driver installation.
8. If necessary, click Install this driver software anyway at the prompts to proceed for the DeviceMaster and first port.

   *Note:* It may take up to several moments for the operating system to load the driver on the first port.
9. Click Finish to complete this part of the installation process.
10. At the Windows needs to install driver software for your Comtrol NS-Link Port, click Locate and install driver software automatically (Recommended) and Next.
11. If necessary, click Install this driver software anyway to proceed.
12. Click Close when The software for this device has been successfully installed screen appears and close the Control Panel.
13. Go to Configuring the NS-Link Driver for Windows on Page 43 to begin NS-Link driver configuration.

If you are installing multiple DeviceMaster, repeat this procedure for each DeviceMaster.
Windows XP and Windows Server 2003: NS-Link Installation

After locating the latest driver (Page 39) and extracting the files, use this procedure to install and configure the NS-Link device driver for your DeviceMaster.

1. From the Start button, click Control Panel and then double-click Add Hardware.
2. Click Next when the Add Hardware Wizard starts.
3. Click Yes, I have already connected the hardware and then Next.
4. Highlight Add a new hardware device (at the bottom of the list) and click Next.
5. Click Install the hardware that I manually select from a list (Advanced) and Next.
6. Highlight Multi-port serial adapters and then click Next.
7. Click Have Disk, Browse and locate the unzipped driver files, click Open and then click OK.
   
   Note: You do not need to select a specific .inf file, the driver uses the appropriate file for your DeviceMaster installation.

8. Highlight the DeviceMaster in the Models list and click Next.
9. Click Next to start the driver installation.
10. If necessary, click Continue Anyway to proceed for the DeviceMaster and the first port.

   Note: It may take up to several moments for the operating system to load the driver on the first port.

11. Click Finish to complete this part of the installation process for the DeviceMaster.
12. Click Install the software automatically (Recommended) and then click Next.
13. If necessary, click Continue Anyway to proceed.
14. Click Finish to complete the driver installation process for this port.

   Note: You may need to wait a few moments while the operating system creates a port for the DeviceMaster.

15. Repeat Steps 12 through 14 for each remaining port on the DeviceMaster.
16. If Windows XP, close the Control Panel.
17. Go to Configuring the NS-Link Driver for Windows on Page 43 to begin NS-Link driver configuration.

   If you are installing multiple DeviceMaster, repeat this procedure for each DeviceMaster.
After locating the latest driver (Page 39) and extracting the files, use this procedure to install and configure the NS-Link device driver for your DeviceMaster.

1. Click Start, Settings, and Control Panel, and then double-click Add/Remove Hardware.
2. Click Next.
3. Click Add/Troubleshoot a device and then Next.
4. Highlight Add a new device and click Next.
5. Click No, I want to select the hardware from a list and then Next.
6. Click Multi-port serial adapters and select then Next.
7. Click Have Disk, Browse to locate the unzipped installation files or enter the path, and then click Ok.
   
   For example, if you extracted the driver to the default subdirectory, enter: C:\Comtrol.

   **Note:** You do not need to select a specific .inf file, the driver uses the appropriate file for your DeviceMaster installation.
8. From the Models list, highlight the DeviceMaster and click Next.
9. Click Next to start the driver installation.
10. Click Yes to continue the installation.

   **Note:** It may take up to several moments for Windows 2000 to load the driver for each port on the DeviceMaster. A Found New Hardware message will display for each port on the DeviceMaster.
11. Click Finish to complete the driver installation process for this port.
12. Close the Control Panel.
13. Go to Configuring the NS-Link Driver for Windows on Page 43 to begin NS-Link driver configuration.

If you are installing multiple DeviceMaster, repeat this procedure for each DeviceMaster.
Configuring the NS-Link Driver for Windows

The DeviceMaster must be connected to the local network segment or directly to a NIC on the host system to operate in MAC mode to perform the following procedure.

1. Access the Properties page for the DeviceMaster.
   a. Right-click My Computer or Computer, click Manage, and then highlight Device Manager.
   b. Expand the Multi-port serial adapters entry, right-click the DeviceMaster you want to configure, and then click Properties.
2. Click the Network Connections tab.
3. Enter the address from the MAC address label on the DeviceMaster or select the MAC address from the drop list.
   Note: If you enter the MAC address, make sure that you use the correct format: 00 C0 4E xx xx xx. A space must separate each pair of digits.
4. Click OK to program the driver with the MAC address of the DeviceMaster.
   The Properties page closes automatically.
5. Re-open the Properties page for the DeviceMaster and select the Network Connections tab.
6. Click Program Addresses into Device.
7. Click the appropriate addressing method in the Program IP Address into Device dialog for your environment and click Ok.
8. To run the driver using an IP address, click IP Mode in the Network Connection Mode group and Ok when you are returned to the Network Connections tab.
9. Go to the next subsection to configure the COM port properties.
Configuring COM Port Properties for Windows

The following is a COM port properties configuration overview. Use the NS-Link User Guide for Windows (also available on the CD) or the NS-Link Help system for detailed configuration information.

1. Access the Properties page for the DeviceMaster.
   a. Right-click My Computer or Computer, click Manage, and then highlight Device Manager.
   b. Expand the Multi-port serial adapters entry, right-click the DeviceMaster you want to configure, and then click Properties.

2. Click the Port Setting tab.

3. Highlight the COM port that you want to configure and click Properties.

4. Complete the screen appropriately for the serial device that you plan on connecting to the port and click Ok.

5. If necessary, click the Device Settings tab to change the default device settings. See the NS-Link help system or the NS-Link User Guide for information.

6. Click Ok to close the DeviceMaster property page.

7. Close the Device Manager.

8. Refer to on Page 44 or Connecting Serial Devices on Page 53 to attach your serial device.
Secure COM Port Set Up

Before configuring security and installing the secure COM port redirector, the following conditions must be met:

- The DeviceMaster is connected to the network and powered on ([Hardware Installation on Page 13])
- The network information has been configured in the DeviceMaster ([Configuring the Network Settings on Page 34])
- If this is the initial device driver installation, verify that the DeviceMaster contains the latest version of SocketServer ([Checking the SocketServer Version on Page 36])

Secure COM Port Redirector Overview

If you require secure COM ports, you will need to do the following to set up secure COM ports on the DeviceMaster.

- Configure the serial port characteristics and enable the security feature in the SocketServer web page
- Install the secure COM port redirector
- Add and configure the DeviceMaster serial port with the secure port redirector

If your site does not require security and you want to configure COM ports, you should install the NS-Link device driver.

Configuring Serial Ports and Enabling Security

The first step to setting up a secure connection on the DeviceMaster is to use SocketServer to enable the appropriate port or ports and configure DeviceMaster security.

*Note:* Make sure that the DeviceMaster contains the latest version of SocketServer before setting up security on the DeviceMaster.

1. Open the DeviceMaster Server Configuration page using one of these methods:
   - Web browser, open a web browser and enter the IP address of the DeviceMaster that you want to configure.
   - PortVision Plus, start PortVision Plus, right-click the DeviceMaster that you want to configure, and click *Web Manager*.

2. Click the port for which you want to configure.

   *Note:* Click the ? in a configuration area for field specific information or the Help button at the bottom of the page to view page level help.

3. If connecting an RS-422 or RS-485 serial device to this port, select the appropriate setting from the *Mode* drop list

4. If necessary, set additional *Serial Configuration* parameters to match your serial device.

5. Click *Enable* in *TCP Connection Configuration*.

6. Optionally, click *Clone* if you want to set up all of the DeviceMaster serial ports with the same serial characteristics.

   *Note:* You will need the DeviceMaster IP address and the TCP port number to if you
want to configure the secure COM port redirector.

7. Click **Save**.

8. Click **Ok** at the *Configuration Updated* page.

9. Click **Configure Security**.

10. Click **Enable Secure Data Mode** so that TCP connections that carry data to/from the serial ports are encrypted using SSL or TLS security protocols. If this is enabled the following DeviceMaster features are disabled:
   - The Comtrol proprietary MAC mode Ethernet driver protocol used in NS-Link and both UDP and MAC mode serial data transport
   - The e-mail feature in SocketServer
   - The RFC1006 features in SocketServer

11. Click **Enable Secure Config Mode** if you want to provide this level of security, which disables the following features:
   - 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.

12. If necessary, click **Enable Telnet/ssh**.

13. If required, click **Set** to configure RSA key pair used by SSL and SSH servers.

   This is used to sign the Server RSA Certificate in order to verify that the DeviceMaster is authorized to use the server RSA identity certificate. 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.

   a. Click **Browse** to locate the server RSA key.
   b. Click **Upload**

14. If required, click **Set** to configure 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.

   a. Click **Browse** to locate the RSA server certificate.
   b. Click **Upload**

15. If required, click **Set** to enter the private/public key pair that is used by some cipher suites to encrypt the SSL/TLS handshaking messages. 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.

16. If required, click **Set** to upload the Client Authentication Certificate.
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.

a. Click **Browse** to locate the *Client Authentication Certificate*.

b. Click **Upload**

17. After completing the key and certification management, click **Save**.

18. To configure another port as a secure COM port, update the *Serial Configuration* (Step 2).

19. Click **Reboot** for the changes to take affect.

20. If you want to configure a secure COM port, you are ready to install the secure port redirector using the *Installing the Secure COM Port Redirector* subsection.

### Installing the Secure COM Port Redirector

You can refer to the help system in the secure COM port redirector or use the following procedure to install the secure port redirector for Windows.

1. Locate the secure COM port redirector on the CD or [download](#) the latest version.

2. Double-click the **setup-spr.msi** file.

3. Click **Next** at the *Setup Wizard*.

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

5. Optionally, browse and select a different installation path and then click **Next**

6. Verify the installation selections and then click **Install**

7. Click **Finish** to complete the installation and open the secure port redirector.

8. Configure the port with the secure port redirector using the next subsection.
Configuring Secure Redirector COM Ports

Use the following procedures to:

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

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

Adding a Secure Port

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

*Note:* You must have enabled the security feature in SocketServer and have the IP address and TCP port numbers to perform the following procedure.

1. If necessary, open the Secure Port Redirector; click Start, Programs, Secure Port Redirector, and Secure Port Redirector.
2. Click Port and Add.
3. Select an available COM port in the Virtual serial port drop list.
4. Enter the Remote IP address of the DeviceMaster.
5. Enter the TCP port number for which you want to communicate on the DeviceMaster.
6. Click Ok.
7. Repeat Step 2 for each port that you want to use as a secure COM port.

Configuring the Secure COM Port

Use the following procedure to configure the port

1. Double-click the port that you want to configure.
2. Optionally click the Connection Settings tab and then click Auto-reconnect when connection is broken.
3. Click the SSL Security tab and then click Use SSL for connection to remote side.
4. Click the Settings tab and select the appropriate serial port settings.
5. Optional click the Extra Strings tab and enter the appropriate values.
6. Click OK to save the settings for the DeviceMaster.
7. Repeat the above procedure for each port that you want to use as a secure COM port.

You are now ready to connect the serial devices to the DeviceMaster ports. If necessary, refer to Connecting Serial Devices on Page 53 for cabling information.
Socket Port Configuration

This section discusses the following topics:
- SocketServer Overview
- SocketServer Versions on Page 52
- Accessing Socket Configuration on Page 51

SocketServer Overview

SocketServer is the name of the TCP/IP socket web page that is integrated in the firmware that comes pre-installed on your DeviceMaster.

If you want to use any of the ports as COM or tty ports, you should first install and configure the NS-Link device driver for your operating system, and then configure the ports that you want to use as TCP/IP sockets. When you install an NS-Link device driver, an NS-Link version of SocketServer loads on the DeviceMaster. See Device Driver Installation on Page 39 for device driver installation procedures.

The main SocketServer web page provides access to configure:
- Socket port characteristics for:
  - Serial
  - TCP connection
  - UDP connection
  See SocketServer Architecture on Page 50 for more information about socket port support.
- Network settings (after initial configuration)
- Email notification services
- RFC1006 (ISO over TCP)

Note: For socket service configuration procedures, see the web page Help system or the PortVision Plus Help system.
SocketServer Architecture

TCP/IP socket mode operation is used to connect serial devices with an application that supports TCP/IP socket communications addressing.

Serial tunneling mode is used to establish a socket connection between two DeviceMasters through an ethernet network.

UDP mode is designed for applications that need faster data transmission, or that make use of UDP’s broadcast capabilities. UDP differs from TCP in that a UDP transmission does not first require a connection to be opened before sending data and the receiving device does not issue acknowledgements to the sender.
Accessing Socket Configuration

There are several ways to access the socket configuration pages (SocketServer or NS-Link). Use the method that fits your environment best.

- **Web Browser**
- **PortVision Plus**

### Web Browser

To access the socket configuration page for the DeviceMaster using a web browser, follow this procedure.

1. Start your web browser.
2. Enter the IP address of the DeviceMaster in the URL field.

   **Note:** If you do not know the IP address, you can view the IP address in PortVision Plus or retrieve the IP address with the NS-Link driver for Windows.

3. Click the port number that you want to configure as a socket.

   **Note:** See the web page Help system, if you need information about configuring sockets or serial tunneling. The Help system provides detailed configuration procedures and descriptions for all fields.

### PortVision Plus

There are several ways to access the socket configuration page for the DeviceMaster using PortVision Plus.

#### Web Manager Button

1. If necessary, start PortVision Plus, right-click the DeviceMaster that you want to configure, and click **Web Manager**.

2. Click the port for which you want to configure socket port settings (serial, TCP connection configuration, and UDP connection configuration).

   **Note:** For socket configuration information see the Help system. Click the ? in a configuration area for field specific information or the Help button at the bottom of the page to view page level help. To locate configuration procedures, scroll to the top of the Help file and view the Table of Contents.

3. Click **Save** to return to the main page.

4. Optionally, access the following pages to configure additional settings.
   a. Click the **Network** page to change the network settings.
   b. Click the **Email Settings** page to configure email notification services.
   c. Click the **RFC1006 Settings** page to configure RFC1006 settings.

#### Configure Device Page

1. If necessary, start PortVision Plus, double-click the DeviceMaster that you want to configure in the **List View** pane.

2. Click the port **Settings tab** to configure socket port settings (serial, TCP connection configuration, and UDP connection configuration).

   **Note:** For socket configuration information click the Help button at the left.

3. Optionally, access the following pages to configure additional settings.
   a. Click the **Email Settings** property page to configure email notification services.
   b. Click the **RFC1006 Settings** property page to configure RFC1006 settings.
   c. Click the **Port Settings** property page to configure serial port characteristics for socket services.
SocketServer Versions

The SocketServer Overview discusses that the default SocketServer web page is the same as the NS-Link web page. If the NS-Link driver is not running (not installed or disabled), the default SocketServer loads when you open a web browser session.

Your SocketServer or NS-Link version may be different than these examples.
Connecting Serial Devices

This section discusses connecting your serial devices to the DeviceMaster. In addition, it provides you with information to build serial or test cables and loopback connectors to test the serial ports.

**Note:** Go to Building the Serial Ribbon Cable on Page 16 for connector information for the DeviceMaster 1-Port Embedded adapter.

### Connecting Devices

Use the appropriate procedure to connect asynchronous serial devices to the DeviceMaster ports.

![Caution]

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

- **DeviceMaster 1/4/8/16/32-Port Models**
- **DeviceMaster 2-Port with Serial Terminals on Page 56**
- **DeviceMaster 2-Port with Serial Terminals on Page 56**

### DeviceMaster 1/4/8/16/32-Port Models

1. Connect your serial devices to the appropriate serial port on the DeviceMaster using the appropriate cable. You can build your own DB9 or RJ45 cables using the appropriate discussion:
   - **DB9 Serial Cables and Loopback Plugs on Page 59**
   - **RJ45 Serial Cables and Loopback Plugs on Page 61**

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

2. Verify that the devices are communicating properly. Go to the appropriate table for information about the LEDs, which may provide information about the installation.
   - **1-Port (Standard) LEDs on Page 54**
   - **1-Port Embedded LEDs on Page 54**
   - **LEDs - 4/8-Port with DB9 Connectors on Page 54**
   - **LEDs - 8/16/32-Port with RJ45 Connectors on Page 55**

For additional LED information, go to the PWR or Status LED table on Page 97.
## 1-Port (Standard) LEDs

<table>
<thead>
<tr>
<th>LED</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Status</strong></td>
<td>The amber Status LED on the device is lit, indicating you have power and it has completed the boot cycle. <strong>Note:</strong> 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 has a solid, steady light that blinks approximately every 10 seconds.</td>
</tr>
<tr>
<td><strong>Link Act</strong></td>
<td>If the red Link Act LED is lit, it indicates a working Ethernet connection.</td>
</tr>
<tr>
<td><strong>Duplex</strong></td>
<td>If the red Duplex LED is lit, it indicates full-duplex activity.</td>
</tr>
<tr>
<td><strong>100</strong></td>
<td>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.</td>
</tr>
</tbody>
</table>

## 1-Port Embedded LEDs

<table>
<thead>
<tr>
<th>LED</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Status</strong></td>
<td>When lit, the amber Status LED (D1) on the DeviceMaster indicates the devices is fully powered and has completed the boot cycle. <strong>Note:</strong> The Status LED flashes for approximately 15 seconds while booting. When the Bootloader completes the cycle, the LED has a solid, steady light that blinks approximately every 10 seconds.</td>
</tr>
<tr>
<td><strong>Link/Act</strong></td>
<td>When lit, the red Link/Act LED (D2) indicates a working Ethernet connection.</td>
</tr>
<tr>
<td><strong>Duplex</strong></td>
<td>When lit, the red Duplex (D3) LED indicates full-duplex activity.</td>
</tr>
<tr>
<td><strong>100</strong></td>
<td>When lit, the red 100 (D4) LED indicates a working 100 MB Ethernet connection (100 MB network, only). If the LED is not lit, it indicates a 10 MB Ethernet connection.</td>
</tr>
</tbody>
</table>

## LEDs - 4/8-Port with DB9 Connectors

<table>
<thead>
<tr>
<th>LED</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LINK ACT</strong></td>
<td>If the LINK ACT LED (UP or DOWN) is lit, it indicates a working Ethernet connection.</td>
</tr>
<tr>
<td><strong>COL</strong></td>
<td>If the COL LED is lit, it indicates a network collision.</td>
</tr>
<tr>
<td><strong>100</strong></td>
<td>If the 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.</td>
</tr>
<tr>
<td><strong>Rx/Tx</strong></td>
<td>The Rx (amber) and Tx (green) LEDs next to each port provides information about the network connection of the serial port.</td>
</tr>
<tr>
<td><strong>PWR</strong></td>
<td>When lit, the PWR LED (reverse side from the serial connectors) on the DeviceMaster indicates the devices is fully powered and has completed the boot cycle. <strong>Note:</strong> The PWR LED flashes for approximately 15 seconds while booting. When the Bootloader completes the cycle, the LED has a solid, steady light that blinks approximately every 10 seconds.</td>
</tr>
</tbody>
</table>
### LEDs - DeviceMaster Serial Hub 16-Port with DB9 Connectors

<table>
<thead>
<tr>
<th>LED</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LINK ACT</td>
<td>If the LINK ACT LED (UP or DOWN) is lit, it indicates a working Ethernet connection.</td>
</tr>
<tr>
<td>100</td>
<td>When lit, the red <strong>100 (D4)</strong> LED indicates a working 100 MB Ethernet connection (100 MB network, only). If the LED is not lit, it indicates a 10 MB Ethernet connection.</td>
</tr>
<tr>
<td>Duplex</td>
<td>If the red Duplex LED is lit, it indicates full-duplex activity.</td>
</tr>
<tr>
<td>Rx/Tx</td>
<td>The Rx (amber) and Tx (green) LEDs next to each port provides information about the network connection of the serial port. * Represents port number.</td>
</tr>
<tr>
<td>Status</td>
<td>When lit, the Status LED (reverse side from the serial connectors) on the DeviceMaster Serial Hub indicates the devices is fully powered and has completed the boot cycle. <em>Note: The Status LED flashes for approximately 15 seconds while booting. When the Bootloader completes the cycle, the LED has a solid, steady light that blinks approximately every 10 seconds.</em></td>
</tr>
</tbody>
</table>

### LEDs - 8/16/32-Port with RJ45 Connectors

<table>
<thead>
<tr>
<th>LED</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LINK ACT</td>
<td>If the LINK ACT LED is lit, it indicates a working Ethernet connection.</td>
</tr>
<tr>
<td>COL</td>
<td>If the COL LED is lit, it indicates a network collision.</td>
</tr>
<tr>
<td>100</td>
<td>If the <strong>100</strong> 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.</td>
</tr>
<tr>
<td>Rx/Tx</td>
<td>Rx and Tx LEDs next to each port provides information about the network connection of the serial port.</td>
</tr>
<tr>
<td>PWR (16-Port with external power supply)</td>
<td>When lit, the PWR LED on the DeviceMaster indicates the devices is fully powered and has completed the boot cycle. <em>Note: The PWR LED flashes for approximately 15 seconds while booting. When the Bootloader completes the cycle, the LED has a solid, steady light that blinks approximately every 10 seconds.</em></td>
</tr>
</tbody>
</table>

*Note: The port LED activity on the DeviceMaster 16/32-Port may be inconsistent until the port has been opened. After a port is opened the LED activity works as documented.*
DeviceMaster 2-Port with Serial Terminals

Use the following information to connect the DeviceMaster UP 2-port.

1. Connect your serial devices to the appropriate serial port on the DeviceMaster UP using the appropriate cable. You can build your own cables or loopbacks using the appropriate discussions:
   - Serial Terminal (4) Signals (1E) on Page 56
   - Serial Terminal (8) Signals (2E) on Page 57
   - DeviceMaster 1E (Serial Terminals) Cables and Loopbacks on Page 63
   - DeviceMaster 2E (Serial Terminals) Cables and Loopbacks on Page 65

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

2. Verify that the devices are communicating properly. Use the appropriate table for information about the LEDs, which may provide information about the installation.

### 2-Port LED Descriptions

<table>
<thead>
<tr>
<th>STATUS</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>STATUS</td>
<td>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 has a solid, steady light that blinks approximately every 10 seconds.</td>
</tr>
</tbody>
</table>

| 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 97. |

### Serial Terminal (4) Signals (1E)

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

- **RS-232†**: Use the following table or drawings for signal information. The signals for SERIAL2 are the same as SERIAL1.
  - Signal Ground Not connected
  - Positive†
  - † Wire gauge: AWG 12-22
  - † RS-232 ground must be connected to the appropriate signal ground terminal.

- **RS-422**: Use the following table or drawings for signal information. The signals for SERIAL2 are the same as SERIAL1.
  - Signal Ground Chassis Ground†
  - Return†
  - Positive†

- **RS-485 Full-Duplex**: Use the following table or drawings for signal information. The signals for SERIAL2 are the same as SERIAL1.
  - Signal Ground†
  - Not connected

- **RS-485 Half-Duplex**: Use the following table or drawings for signal information. The signals for SERIAL2 are the same as SERIAL1.
  - Signal Ground†
  - Chassis Ground†
  - 5-30VDC Return†
  - Positive†
Serial Terminal (8) Signals (2E)

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

<table>
<thead>
<tr>
<th>Signal Ground</th>
<th>Chassis Ground†</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not connected</td>
<td>Return†</td>
</tr>
<tr>
<td></td>
<td>Positive†</td>
</tr>
<tr>
<td></td>
<td>5-30VDC</td>
</tr>
</tbody>
</table>

† RS-232 ground must be connected to the appropriate signal ground terminal.
DeviceMaster 2-Port (1E/2E) DB9 Connectors

Use the following information to connect the DeviceMaster UP 2-port.

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

   Use the following table and the appropriate discussion to build cables or loopback plugs.

   - **DB9 Loopback Plugs on Page 59**
   - **DB9 Null-Modem Cables (RS-232) on Page 60**
   - **DB9 Null-Modem Cables (RS-422) on Page 60** (also supports RS-485 full-duplex)
   - **DB9 Straight-Through Cables (RS-232/485) on Page 60**

   ![DB9 Connector Pinouts](image)

   **DB9 Connector Pinouts**

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

   † Pin 5 is tied to ground on the board, but is not used in the cable.

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

2. Verify that the devices are communicating properly. Use the appropriate table for information about the LEDs, which may provide information about the installation.

   ![2-Port LED Descriptions](image)

   **2-Port 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 has a solid, steady light that blinks approximately every 10 seconds.
   | 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 97.
DB9 Serial Cables and Loopback Plugs

You can build your own null-modem or straight-through DB9 serial cables for 1-port and 4/8-port models using the following subsections.

**Note:** See *DeviceMaster 2-Port with Serial Terminals on Page 56* for 2-port models with DB9 connectors.

### DB9 Connector Pinouts

<table>
<thead>
<tr>
<th>Pin</th>
<th>RS-232††</th>
<th>RS-422</th>
<th>RS-485</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DCD</td>
<td>Not used</td>
<td>Not used</td>
</tr>
<tr>
<td>2</td>
<td>RxD</td>
<td>RxD-</td>
<td>Not used</td>
</tr>
<tr>
<td>3</td>
<td>TxD</td>
<td>TxD-</td>
<td>TRxD-</td>
</tr>
<tr>
<td>4</td>
<td>DTR</td>
<td>Not used</td>
<td>Not used</td>
</tr>
<tr>
<td>5</td>
<td>GND</td>
<td>Not used†</td>
<td>Not used†</td>
</tr>
<tr>
<td>6</td>
<td>DSR</td>
<td>Not used</td>
<td>Not used</td>
</tr>
<tr>
<td>7</td>
<td>RTS</td>
<td>TxD+</td>
<td>TRxD+</td>
</tr>
<tr>
<td>8</td>
<td>CTS</td>
<td>RxD+</td>
<td>Not used</td>
</tr>
<tr>
<td>9</td>
<td>RI</td>
<td>Not used</td>
<td>Not used</td>
</tr>
</tbody>
</table>

† Pin 5 is tied to ground on the board, but is not used in the cable.
†† The DeviceMaster Serial Hub only supports RS-232.

This illustrates the DB9 connector signals.

DB9 Loopback Plugs

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

**Note:** You can use Test Terminal (Windows) or minicom (Linux) to test the serial ports. You can use the Support page on the CD shipped with the DeviceMaster or see *Locating Software and Documentation on Page 10* to locate the NS-Link User Guide for Windows or the Linux readme file.

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

* Pin 5 is tied to ground on the board, but is not used in the cable.

**Note:** If you are using a DB9 to RJ45 adapter, see *RJ45 Serial Cables and Loopback Plugs on Page 61*.

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

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.

<table>
<thead>
<tr>
<th>Signal</th>
<th>DB9 Pins</th>
<th>DB25 Pins</th>
<th>RJ45 Pins</th>
<th>Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>TxD</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>RxD</td>
</tr>
<tr>
<td>RxD</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>TxD</td>
</tr>
<tr>
<td>RTS</td>
<td>7</td>
<td>8</td>
<td>5</td>
<td>CTS</td>
</tr>
<tr>
<td>CTS</td>
<td>8</td>
<td>7</td>
<td>4</td>
<td>RTS</td>
</tr>
<tr>
<td>DSR</td>
<td>6</td>
<td>4</td>
<td>20</td>
<td>DTR</td>
</tr>
<tr>
<td>DTR</td>
<td>4</td>
<td>1</td>
<td>8</td>
<td>DCD</td>
</tr>
<tr>
<td>GND</td>
<td>5</td>
<td>6</td>
<td>6</td>
<td>DSR</td>
</tr>
</tbody>
</table>

**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.

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. Please refer to the documentation for the peripheral 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.

<table>
<thead>
<tr>
<th>Signal</th>
<th>DB9 Pins</th>
<th>DB25 Pins</th>
<th>RJ45 Pins</th>
<th>Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>DCD</td>
<td>1</td>
<td>1</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>RxD</td>
<td>2</td>
<td>2</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>TxD or TRxD-</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>DTR</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>20</td>
</tr>
<tr>
<td>GND</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>DSR</td>
<td>6</td>
<td>6</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>RTS or TRxD+</td>
<td>7</td>
<td>7</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>CTS</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td>RI</td>
<td>9</td>
<td>9</td>
<td>N/A</td>
<td>22</td>
</tr>
</tbody>
</table>
You can build your own null-modem or straight-through RJ45 serial cables using the following subsections.

### 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.

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 as shown, that are used in conjunction with application software (Test Terminal or Minicom) to test serial ports. The DeviceMaster is shipped with a single loopback plug (RS-232/422).

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

Note: You can use Test Terminal (Windows) or minicom (Linux) to test the serial ports. You can use the Support page on the CD shipped with the DeviceMaster or see Locating Software and Documentation on Page 10 to locate the NS-Link User Guide for Windows or the Linux readme file.

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.
DeviceMaster 1E (Serial Terminals) Cables and Loopbacks

Use the appropriate discussion to build the following cables:

- **Serial Terminal (4) Null-Modem Cables (RS-232) on Page 63**
- **Serial Terminal (4) Null-Modem Cables (RS-422) on Page 63**
- **Serial Terminal (4) Straight-Through Cables (RS-232/485) on Page 64**
- **1E Loopback Signals on Page 64**

**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**

![RS-232 Null-Modem Cable Diagram]

<table>
<thead>
<tr>
<th>TXD</th>
<th>RTS</th>
<th>RXD</th>
<th>CTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>7</td>
<td>2</td>
<td>8</td>
</tr>
</tbody>
</table>

DB9: 3 5 2 4

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

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

**RS-422 Null-Modem Cable**

![RS-422 Null-Modem Cable Diagram]

<table>
<thead>
<tr>
<th>TXD</th>
<th>RTS</th>
<th>RXD+</th>
<th>RXD-</th>
<th>CTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>7</td>
<td>2</td>
<td>8</td>
<td>5</td>
</tr>
</tbody>
</table>

DB9: 3 5 2 4

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

**RS-232/422 Straight-Through Cable**

Wire the terminals together to create a loopback.

- TxD to RxD
- RTS to CTS

**1E Loopback Signals**

Use this drawing to wire a loopback, which is used in conjunction with application software (Test Terminal or minicom) to test serial ports.

See the [NS-Link User Guide for Windows](#) about using Test Terminal or [Using minicom to Test Control Ports](#) to test the serial ports. Optionally, this information is on the [Software and Documentation CD](#) shipped with the product.

Wire the terminals together to create a loopback.
DeviceMaster 2E (Serial Terminals) Cables and Loopbacks

Use the appropriate discussion to build the following cables:

- **Serial Terminal (8) Null-Modem Cables (RS-232) on Page 65**
- **Serial Terminal (8) Null-Modem Cables (RS-422) on Page 65**
- **Serial Terminal (8) Straight-Through Cables (RS-232/485) on Page 66**
- **2E Loopback Signals on Page 66**

**Serial Terminal (8) Null-Modem Cables (RS-232)**

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

**RS-232 Null-Modem Cable**

![RS-232 Null-Modem Cable Diagram](image)

**Serial Terminal (8) Null-Modem Cables (RS-422)**

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

**RS-422 Null-Modem Cable**

![RS-422 Null-Modem Cable Diagram](image)
Serial 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.

2E Loopback Signals

Use the drawing below to wire a loopback, which is used in conjunction with application software (Test Terminal or minicom) to test serial ports.

See the NS-Link User Guide for Windows about using Test Terminal or Using minicom to Test Control Ports to test the serial ports. Optionally, this information is on the Software and Documentation CD shipped with the product.

Wire the terminals together to create a loopback.

- TxD to RxD
- RTS to CTS to RI
- DTR to CD to DSR
Managing the DeviceMaster

This section discusses the following DeviceMaster maintenance procedures:

- Rebooting the DeviceMaster
- Uploading SocketServer to Multiple DeviceMasters on Page 68
- Configuring Multiple DeviceMasters Network Addresses on Page 68
- Using Configuration Files on Page 69
- Managing Bootloader on Page 70, which also discusses checking the Bootloader version and downloading the latest Bootloader
- Adding a DeviceMaster to an Existing Installation on Page 72
- Replacing a DeviceMaster on Page 72
- Restoring Factory Defaults (2-Port, Only) on Page 73

Note: You can optionally refer to RedBoot Procedures on Page 75 if you want to perform procedures at the RedBoot level.

Rebooting the DeviceMaster

There are many ways to reboot the DeviceMaster. Use the method that most fits your situation.

<table>
<thead>
<tr>
<th>Method</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>PortVision Plus</td>
<td>Main screen: Right-click the DeviceMaster or DeviceMasters, click <strong>Reboot Device</strong> and then <strong>Yes</strong>. Configure Device screen: Click <strong>Reboot Device</strong> and then <strong>Yes</strong>.</td>
</tr>
<tr>
<td>Web page</td>
<td>Main page: Scroll to the bottom of the screen, click <strong>Reboot</strong> and then <strong>Yes: Reboot</strong>.</td>
</tr>
<tr>
<td>Telnet</td>
<td>Type <strong>reset</strong></td>
</tr>
</tbody>
</table>
| DeviceMaster 2-Port Models | DeviceMaster 2-port models have a reset/restore switch.  
  • If the reset/restore switch is depressed for less than 2 seconds, DeviceMaster RTS 2-port models reboot  
  • If the reset/restore switch is depressed for greater than approximately 5 seconds it restores the default password and network setting values. |

 Optionally, you can power cycle the DeviceMaster.
Uploading SocketServer to Multiple DeviceMasters

If the Windows NS-Link driver has been installed, make sure that the driver is disabled through the Device Manager before uploading SocketServer.

1. If you have not done so, install PortVision Plus (Installing PortVision Plus on Page 33) 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 Upload Firmware
   - Click Upload Firmware on the Device menu
3. Browse, click the firmware (.bin) 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 device. The device will reboot itself during the upload process.
4. Click Ok to the advisory message about waiting to use the device until the status reads ON-LINE.
   In the next polling cycle, PortVision Plus will update the List View pane and display the new firmware version.

Configuring Multiple DeviceMasters Network Addresses

The DeviceMasters must be on the same network segment for the following procedure to work.

Optionally, you may want to create a configuration file and also configure the Email, RFC1006, and Port Settings. See Using Configuration Files on Page 69 for more information.

Use the following steps to configure multiple DeviceMasters.

1. If you have not done so, install PortVision Plus (Installing PortVision Plus on Page 33) and Scan the network.
2. Shift-click the DeviceMasters for which you want to program network information, right-click, and click Assign IP to Multiple Devices.
3. Enter the starting IP address, subnet mask, IP Gateway and click Proceed.
   PortVision Plus displays the programmed IP addresses in the List View pane after the next refresh cycle.
Using Configuration Files

If you are deploying multiple DeviceMaster units that share common values, you can save the configuration file (.dmc) from the Main or Configure Device screens in PortVision Plus and load that configuration onto other DeviceMaster units.

If you save a configuration file from the Main or Configure Device screen, you can choose what properties you want saved.

Use this procedure to save a configuration file using the Main screen.

1. If you have not done so, install PortVision Plus (Installing PortVision Plus on Page 33) and Scan the network.
2. Highlight the device on the Main screen that you want to save its configuration and use one of the following methods:
   • Click the Save button
   • Right-click and then click Save Configuration to File
3. Browse to the location you want to save the file, enter a file name and click Save.
4. Click the All checkbox or click only the properties that you want saved for each property page in the configuration file and click Done.
   **Note:** Selecting the All option with multiple DeviceMasters highlighted will apply the same IP address to all of the selected DeviceMasters.
5. Click Ok to close the Save Configuration Completed message.

Use the following procedure to load a previously saved a DeviceMaster configuration file.

Load a configuration file and apply it to a selected DeviceMaster or DeviceMasters from the Main or Configure Device screen.

Use this procedure to load a configuration file using the Main screen to one or more DeviceMaster units.

1. Highlight the device or devices on the Main screen that you want to load and use one of the following methods:
   • Click the Load button
   • Right-click and then click Load Configuration to File
2. Click Yes to the warning that it will take 25 seconds per device and it may also reboot the devices.
3. Browse to the location of the configuration file, click the file name and then Open.
4. Click the All checkbox or click only the properties that you want to load for each property page in the configuration file and then click Done.
5. Close the Load Configuration popup message.
Managing Bootloader

**Bootloader** refers to the operating system that runs on the DeviceMaster hardware during the power on phase, which then loads SocketServer.

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

There are several methods and tools that you can use to check the Bootloader version or update the Bootloader:

- **PortVision Plus** is the easiest way to check the Bootloader version and uploads the latest version.
- Redboot can be used to check the Bootloader version and update the Bootloader, if necessary. See RedBoot Procedures on Page 75 for procedures.

### Checking the Bootloader Version

The following procedure uses PortVision Plus to check the Bootloader version. Optionally, you can use Redboot, see Determining the Bootloader Version on Page 78.

1. If you have not done so, install PortVision Plus (Installing PortVision Plus on Page 33) and Scan the network.
2. Right-click the DeviceMaster and click Reboot Device.
3. Click Yes to the Confirm Reboot query.
4. Right-click the DeviceMaster, click Refresh Device as many times as necessary to catch the reboot cycle in the List View pane. The Bootloader version is briefly displayed during the reboot cycle before SocketServer loads.
5. Check the Comtrol web site to see if a later version is available.
6. Go to the next subsection to 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.

*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 SocketServer into the DeviceMaster, do not upload Bootloader.

If the NS-Link driver for Windows has been installed, make sure that the driver is disabled through the Device Manager before uploading Bootloader.

1. If you have not done so, install PortVision Plus (Installing PortVision Plus on Page 33) and Scan the network.
2. If necessary, check the Bootloader version and download the latest version.
3. Right-click the DeviceMaster for which you want to update, click **Upload Firmware**, browse to the Bootloader .bin 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 and then click **Refresh** until the Bootloader version displays in the **List View** pane, which should show the new version.
Adding a DeviceMaster 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. If necessary, see Hardware Installation on Page 13.

   **Note:** Technical support recommends installing and testing one DeviceMaster at a time when installing multiple DeviceMasters. In the event troubleshooting must be done, a single DeviceMaster is easier to resolve than several at once.

2. Power-up the new DeviceMaster and verify that boot cycle completes.

   **Note:** The PWR or Status LED flashes while booting and it takes approximately 15 seconds for the Bootloader to complete the boot cycle.

3. If required, program an IP address into the new DeviceMaster.

4. Configure serial ports to support the serial devices.

Replacing a DeviceMaster

Follow the appropriate procedure to replace DeviceMaster with another DeviceMaster in an existing configuration.

**Device Programmed with IP Address**

Use this procedure to replace hardware if the existing device is programmed for use with an IP address.

1. Configure the IP address in the new DeviceMaster.
2. Remove the old DeviceMaster and attach a new or spare DeviceMaster.
3. Connect the new DeviceMaster to the network hub or server NIC.
4. Power-up the new DeviceMaster and verify that boot cycle completes.

   **Note:** The PWR or Status LED flashes while booting and it takes approximately 15 seconds for the Bootloader to complete the boot cycle.

5. If using socket mode, configure any ports as necessary to match the previous DeviceMaster.
6. Transfer all cabling from the old DeviceMaster to the new DeviceMaster.
7. It is not necessary to shut down and restart the host PC.

**Device Programmed with MAC Address**

Use this procedure to replace hardware if the existing device is using a MAC address for communications.

1. Remove the old DeviceMaster and attach a new or spare DeviceMaster.
2. Connect the new DeviceMaster to the network hub or server NIC.
3. Power-up the new DeviceMaster and verify that boot cycle completes.

   **Note:** The PWR or Status LED flashes while booting and it takes approximately 15 seconds for the Bootloader to complete the boot cycle.

4. If you are using NS-Link, change the MAC address of the new DeviceMaster in the NS-Link driver to reflect the new DeviceMaster.
5. If using socket mode, configure any ports as necessary to match the previous DeviceMaster.
6. Transfer all cabling from the old DeviceMaster to the new DeviceMaster.
7. Restart the host PC.
Restoring Factory Defaults (2-Port, Only)

Use the following procedures to restore the DeviceMaster to the factory defaults.

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

Restoring the DeviceMaster resets the following to their factory defaults:
- Network settings
- Password
- Telnet enable
- Start up time-out
- SSL enable
- Telnet time-out

Restoring Serial Port Settings

Use the web page and/or the NS-Link device driver for Windows to restore the serial port settings to their default values.

The NS-Link serial port settings are independent of the socket serial port settings on the web page. If you are using COM ports and also have configured the port for socket services, you must restore the default port settings in the driver and web page.

NS-Link COM Port

Click Defaults (and if appropriate, Clone) and Ok in the NS-Link COM Properties screen to reset the serial port settings.

If necessary, refer to the NS-Link User Guide for Windows (also available on the CD) for additional information about NS-Link.

Socket Port

Use the following procedure to reset the socket port serial settings.

1. Open the DeviceMaster web page (Accessing Socket Configuration on Page 51).
2. Scroll to the bottom of the Server Configuration page and click Reboot.
3. Click Set configuration for all ports to factory default settings and the click Yes, Reboot.
RedBoot Procedures

Use this section as a reference if you want to perform tasks in Redboot. Typically, most of these procedures can be performed using PortVision Plus.

Overview

You can use a serial connection between Port 1 on the DeviceMaster and a COM port on a PC. If you plan on using the serial method, you will need a null modem cable and a terminal program installed and configured on the PC.

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

You can use a telnet connection, if the DeviceMaster is locally accessible by Ethernet.

If necessary, see Establishing a Serial Connection on Page 75 or Establishing a Telnet Connection on Page 76 to disable the Bootloader before performing any of these procedures.

Establishing a Serial Connection

Use the following procedure to set up serial connection with a terminal server program (for example, Test Terminal (WCom2), HyperTerminal or Minicom) and the DeviceMaster. Test Terminal (WCom2) is available in PortVision Plus or you can also install the Control Utility package.

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

   Note: See DB9 Serial Cables and Loopback Plugs on Page 59 or RJ45 Serial Cables and Loopback Plugs on Page 61 to build a null-modem cable.

2. Configure a terminal server program (such as, HyperTerminal or Minicom) to the following values:
   - Bits per second = 57600
   - Data bits = 8
   - Parity = None
   - Stop bits = 1
   - Flow control = None

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.

5. At the RedBoot> prompt, type dis, and press Enter.

   Note: If you do not disable the loading feature of the Bootloader 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.

6. Verify that the system responds with a Loading disabled message.
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, open a Command window and type `telnet [ip_address]`.

   **Note:** Press the Enter key if you have not programmed a password or use the password previously configured. The DeviceMaster does not come pre-programmed with a password.

2. Type `reset`, and close the session.

3. Open a new telnet session, enter the DeviceMaster IP address, and the password.

4. Type `dis` to disable the Bootloader.

```
*********************************************
**  Control DeviceMaster Bootloader Version 3.05  
**  RedBoot(tm) environment - built 08:13:02, Apr  4 2008  
**  Platform: Control DeviceMaster (ARM 7TDMI)  
**  Portions Copyright (C) 2000. Red Hat, Inc.  
**  Portions Copyright (C) 2001-2008 Comtrol Corp.  
*********************************************
FLASH:  64 blocks of 65536 bytes each
FLASH:  4194304 bytes (0x05000000 - 0x05400000)
RAM:    8126464 bytes (0x00000000 - 0x007c0000)
RedBoot> dis
Loading disabled
RedBoot> _
```

5. Verify that the system responds with a **Loading disabled** message.

6. Go to the appropriate task:

   - [Determining the Network Settings on Page 77](#)
   - [Configuring the Network Settings on Page 77](#)
   - [Determining the Bootloader Version on Page 78](#)
   - [Resetting the DeviceMaster on Page 78](#)
   - [Uploading Firmware on Page 79](#)
   - [Configuring Passwords on Page 82](#)
   - [Redboot Command Overview on Page 83](#)
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 75) method.
2. At the RedBoot prompt, type `ip`.

```
RedBoot> dis
Loading disabled
RedBoot> ip
IP Config: 192.168.250.250 IpMask 255.255.0.0 IpGate 192.168.250.1
RedBoot>
```

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

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

Configuring the Network Settings

The following subsections show you how to establish a communications link with RedBoot on the DeviceMaster, by using one of these methods:

- **Serial connection** between Port 1 on the DeviceMaster and a COM port on a PC.
  
  If you do not know the IP address of the DeviceMaster you must use a serial connection to communicate with the DeviceMaster.

- **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.

**Note:** Optionally, you can install PortVision Plus on a Windows system on the network and use the Configure Device window to configure network settings.

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

1. Establish communications with the DeviceMaster using the serial (Page 75) or telnet (Page 76) 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 ###.###.###.### ###.###.###.### ###.###.###.###
RedBoot> ip
IP Config: 192.168.250.250 IpMask 255.255.0.0 IpGate 192.168.250.1
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.
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 75) or telnet (Page 76) method.
2. At the RedBoot prompt, type version.

```
RedBoot> version
*******************************************************************************
** Comtrol DeviceMaster Bootloader Version 3.05
** RedBoot(tm) environment - built 08:13:02, Apr 4 2008
** Platform: Comtrol DeviceMaster (ARM 7TDMI)
** Portions Copyright (C) 2000. Red Hat, Inc.
** Portions Copyright (C) 2001-2008 Comtrol Corp.
*******************************************************************************
FLASH: 64 blocks of 65536 bytes each
FLASH: 4194304 bytes (0x05000000 - 0x05400000)
RAM: 8126464 bytes (0x00000000 - 0x007c0000)
RedBoot>
```

The Bootloader information displays.

3. To update the Bootloader on the DeviceMaster, make sure that you download the latest version and see Managing Bootloader on Page 70.
4. Type reset to reset the DeviceMaster, if you do not have any other related Redboot tasks.

**Note:** Optionally, you can install PortVision Plus on a Windows system on the network and see the Bootloader version in the List View 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 PWR or Status LED is lit and it stops flashing.
Uploading Firmware

Use the appropriate procedure for your environment:

- **Serial Method on Page 79**
- **Telnet Method on Page 80**

**Note:** Optionally, you can install PortVision Plus on a Windows system on the network and upload firmware. PortVision Plus is the recommended method for uploading firmware.

**Serial Method**

The procedure for updating the Bootloader and SocketServer are the same, but the `.bin` files are unique.

1. Verify that you have the `.bin` file (Locating Software and Documentation on Page 10) and cable Establishing a Serial Connection on Page 75).
2. Connect a null modem cable from an available COM port on your PC to Port 1 on the DeviceMaster.
3. Start the terminal program and configure your terminal server program (for example, HyperTerminal or minicom) to the following values:
   - Bits per second = 57600
   - Data bits = 8
   - Parity = None
   - Stop bits = 1
   - Flow control = None
4. Reset the DeviceMaster (disconnect and reconnect the power cable).
5. Immediately type `#!DM` and press Enter in your terminal program.

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

6. At the **RedBoot>** prompt, type `dis`, and press Enter.

**Note:** If you are unsuccessful in disabling the Bootloader within ten seconds, type `reset`, `#!DM`, and `dis` again. The `#!DM` command is the only case-sensitive command and must be in uppercase.

7. Verify that the system responds with an `Loading disabled` message.
8. Type `load -r -b 0 -m x` at the **RedBoot>** prompt and press Enter.

```
RedBoot> load -r -b 0 -m x
CC
```

9. Upload the file using Xmodem for the protocol. For example, if you are using HyperTerminal:
   a. Click Transfer.
   b. Click Send File.
   c. Browse to the location where you stored the file from Locating Software and Documentation on Page 10.
   d. Click Xmodem as the protocol.

The file name in this screen shows the Bootloader.
e. Click **Send**


telnet method

10. When the **RedBoot>** prompt appears (after approximately one minute for the Bootloader and approximately three minutes for SocketServer), type `go`.

   ```
   CCCCCC
   Raw load done: 542721 bytes read
   Address range: 00000000-00084800, Entry point: 00000000,
   xyzModem - CRC mode, 4241(SOH)/0(STX)/0(CAN) packets, 8 tries
   RedBoot> go
   ...
   Program from 0x00000000-0x00084800 at 0x05060000: ...
   ...
   Program from 0x007a0000-0x007b0000 at 0x053f0000: .
   ```

   **Note:** In a few seconds, the ethernet and PWR LEDs cycle through a light sequence once and then upgrade is complete.

11. **If you updated** SocketServer: type `fis list` and press **Enter** at the RedBoot> prompt.

   ```
   Name   FLASH addr   Mem addr    Length      Entry point
   FIS_directory   0x053f0000   0x053f0000  0x00010000  0x00000000
   default           0x05030000   0x00000000  0x00090000  0x00000000
   ```

   **Note:** You should see file information for a file called `default`. If you do not see this file, repeat the process starting with **Step 6**.

12. Reset the DeviceMaster by typing `reset` at the RedBoot> prompt.

   ```
   RedBoot> reset
   . . .Resetting
   ```

   **Note:** In a few seconds the ethernet and PWR LEDs cycle through a light sequence once and the update is complete.

13. Start your internet browser and enter the IP address of the DeviceMaster to verify that the new version of SocketServer loads.

**Telnet Method**

Use the following procedure to update the Bootloader or SocketServer with telnet to the DeviceMaster.

**Note:** A TFTP server is required to perform firmware updates using Redboot.

1. Verify that you have the `.bin` file (*Locating Software and Documentation on Page 10*).
2. Open a telnet session, type **reset**, and close the session.
3. Open a new telnet session and enter the DeviceMaster IP address.

```bash
$ telnet 192.168.250.250
Trying 192.168.250.250...
Connected to 192.168.250.250.
Escape character is '^]'.
```

4. Enter the webserver password.

   **Note:** Press the Enter key if you have not programmed a password.

   ![Password]

5. At the Redboot prompt: type `dis` and press Enter to disable the Bootloader.

6. Verify that the system responds with an `Loading disabled` message.

7. Load the file from a TFTP server using the following command and press the Enter key:

   ```bash
   load -r -b 0 -h <TFTP-Server_IP_Addr> <Downloaded_File_Name>
   ```

   **Note:** The default IP address is: 192.168.250.250.

   ![Loading disabled]

8. When the RedBoot> prompt appears (after approximately one minute if you are uploading the Bootloader and approximately three minutes if you are uploading SocketServer), type `go`.

   **If uploading Bootloader:** In a few seconds the ethernet and PWR LEDs cycle through a light sequence once and the update is complete.
Configuring Passwords

If uploading SocketServer:

a. At the RedBoot> prompt, type: fis list and press Enter.

<table>
<thead>
<tr>
<th>Name</th>
<th>FLASH addr</th>
<th>Mem addr</th>
<th>Length</th>
<th>Entry point</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIS_directory</td>
<td>0x053F0000</td>
<td>0x053F0000</td>
<td>0x00010000</td>
<td>0x00000000</td>
</tr>
<tr>
<td>default</td>
<td>0x05030000</td>
<td>0x00000000</td>
<td>0x00090000</td>
<td>0x00000000</td>
</tr>
</tbody>
</table>

Note: You should see file information for a file called default. If you do not see this file, repeat the process starting with Step 7.

b. Reset the DeviceMaster by typing reset at the RedBoot> prompt.

Note: In a few seconds the ethernet and PWR LEDs cycle through a light sequence once.

c. Start your internet browser and enter the IP address of the DeviceMaster to verify that the new version of SocketServer loads.

Configuring Passwords

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

Note: See the PortVision Plus or socket Help system for information about email notification.

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 79) or telnet method (Page 76).
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 83 if you want to set up Web browser authentication.
## Redboot Command Overview

The following table is an overview of Redboot commands available. You can access the list of commands online by entering `help` and pressing the Enter key. For more detailed information, see the eCos Reference Manual that is located on the Comtrol product CD or download it from the web.

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>auth</strong></td>
<td>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 <strong>noaccess</strong> or <strong>invalid</strong>. 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 <strong>basic</strong>. To configure the web server to request an encrypted password, click <strong>md5</strong>. (Some browsers do not support the <strong>md5</strong> command.)</td>
</tr>
<tr>
<td><strong>boardrev</strong>†</td>
<td>Displays board revision.</td>
</tr>
<tr>
<td>**cache [ON</td>
<td>OFF]**</td>
</tr>
<tr>
<td><strong>chassis</strong></td>
<td>Displays chassis information.</td>
</tr>
<tr>
<td><strong>disable</strong></td>
<td>Disables automatic load of the default application.</td>
</tr>
<tr>
<td><strong>dump -b &lt;location&gt; -l &lt;length&gt;</strong></td>
<td>Displays (hex dump) of a range of memory.</td>
</tr>
<tr>
<td><strong>fis {cmds}</strong></td>
<td>Manages flash images. See Chapter 2 of the eCos Reference Manual for {cmds} information.</td>
</tr>
<tr>
<td><strong>go [-w &lt;timeout&gt;] [entry]</strong></td>
<td>Executes code at a location.</td>
</tr>
<tr>
<td><strong>help &lt;topic&gt;</strong></td>
<td>Displays available Redboot commands.</td>
</tr>
<tr>
<td><strong>ip {addr mask gateway}</strong></td>
<td>Displays or sets the IP address configuration.</td>
</tr>
<tr>
<td>**load {-r} {-v} {-h &lt;host&gt;} {-m {TFTP</td>
<td>xmodem}} {-b &lt;base_addr&gt;} &lt;file_name&gt;**</td>
</tr>
<tr>
<td>**loop 232</td>
<td>422</td>
</tr>
<tr>
<td><strong>mac†</strong></td>
<td>Displays ethernet MAC address.</td>
</tr>
<tr>
<td><strong>model†</strong></td>
<td>Shows model number.</td>
</tr>
<tr>
<td><strong>password {password}</strong></td>
<td>Sets the password.</td>
</tr>
<tr>
<td><strong>reset</strong></td>
<td>Resets the DeviceMaster.</td>
</tr>
<tr>
<td>**telnet [disable</td>
<td>enable]**</td>
</tr>
<tr>
<td><strong>teltimeout [seconds]</strong></td>
<td>Shows or sets telnet time-out.</td>
</tr>
<tr>
<td><strong>terse</strong></td>
<td>Terse command response mode.</td>
</tr>
<tr>
<td><strong>timeout {seconds}</strong></td>
<td>Displays or sets Bootloader time-out value.</td>
</tr>
<tr>
<td><strong>t485 port #1 port #2</strong></td>
<td>Runs port-to-port RS-485 test.</td>
</tr>
<tr>
<td><strong>version</strong></td>
<td>Displays RedBoot version information.</td>
</tr>
</tbody>
</table>

† †Do not use these commands to change the values. Doing so may cause the DeviceMaster to stop functioning.
The following subsections contain specifications and safety notices for the DeviceMaster family.

RoHS compliant products conform to EU Directive 2002/95/EC. These products do not contain any restricted substances (lead, cadmium, hexavalent chromium, mercury, PBB, and PBDE) except as specifically provided in the Directive.

Locating DeviceMaster Specifications

Specifications can be found on the Comtrol web site at:


Serial Communications

This table provides DeviceMaster serial communications specifications.

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<td><strong>DeviceMaster RTS</strong></td>
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<tr>
<td>1-Port</td>
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<tr>
<td>1-Port Embedded System</td>
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<tr>
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<td>16/32-Port models</td>
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<tr>
<td><strong>DeviceMaster Serial Hub</strong></td>
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<td></td>
</tr>
<tr>
<td>Baud rate/port</td>
</tr>
<tr>
<td>Receive buffer</td>
</tr>
<tr>
<td>Transmit buffer</td>
</tr>
</tbody>
</table>

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<tr>
<th>Serial Communications</th>
</tr>
</thead>
<tbody>
<tr>
<td>NS-Link control:</td>
</tr>
<tr>
<td>Data bits</td>
</tr>
<tr>
<td>Parity</td>
</tr>
<tr>
<td>Stop bits</td>
</tr>
</tbody>
</table>
| Flow control          | 7 or 8
|                       | Odd, even, none
|                       | 1 or 2
|                       | Hardware or software |
| Network default values:|
| IP address            | 192.168.250.250 |
|                       | 255.255.0.0    |
|                       | 192.168.250.1  |
| Subnet mask           |                |
| Gateway               |                |
| Network protocols     | TCP/IP and UDP Socket services, BOOTP, TFTP, ICMP, ARP, SNMP (MIB-II), Telnet, HTTP, DHCP/RARP/Ping, RFC 1006 |
| Event notification    | SocketServer   |
| SNMP support          | Monitoring only |
External Power Supply Specifications

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

- **1-Port 5VDC Power Supply** (below)
- **1-Port 5-30VDC Power Supply on Page 87**
- **2-Port (Serial Terminals) Power Supply on Page 88**
- **2-Port (DB9) Power Supply on Page 88**
- **4-Port Power Supply on Page 88**
- **8-Port Power Supply on Page 88**
- **16-Port Power Supplies on Page 89**

### 1-Port 5VDC Power Supply

This subsection only provides information for the DeviceMaster 1-port 5VDC model.

<table>
<thead>
<tr>
<th>Control Power Supply: 1-Port 5VDC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input line frequency</td>
</tr>
<tr>
<td>Input line voltage</td>
</tr>
<tr>
<td>Input line voltage</td>
</tr>
<tr>
<td>Output voltage</td>
</tr>
<tr>
<td>Output current</td>
</tr>
</tbody>
</table>

The following table provides the specifications, if you intend on purchasing your own external power supply.

<table>
<thead>
<tr>
<th>External Power Supply: 1-Port 5VDC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output voltage†</td>
</tr>
<tr>
<td>Current†</td>
</tr>
<tr>
<td>Power</td>
</tr>
</tbody>
</table>

† Any power supply that meets current consumption, voltage, power, and connector pinouts requirements can be used.

### 1-Port 5-30VDC Power Supply

This table provides specifications for the optional power supply from Control.

<table>
<thead>
<tr>
<th>Control Power Supply: 1-Port 5-30VDC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input line frequency</td>
</tr>
<tr>
<td>Input line voltage</td>
</tr>
<tr>
<td>Output voltage</td>
</tr>
<tr>
<td>Output current</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>External Power Supply: 1-Port 5-30VDC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output voltage†</td>
</tr>
<tr>
<td>Current†</td>
</tr>
<tr>
<td>Power</td>
</tr>
</tbody>
</table>

† Any power supply that meets current consumption, voltage, power, and connector pinouts requirements can be used.
2-Port (Serial Terminals) Power Supply

This table provides the specifications to purchase a power supply for a DeviceMaster 2-port 1E/2E model with serial terminal connectors.

<table>
<thead>
<tr>
<th>External Power Supply: 2-Port (Serial Terminal Connectors) 5-30VDC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output voltage†</td>
</tr>
<tr>
<td>Current†</td>
</tr>
<tr>
<td>Power</td>
</tr>
</tbody>
</table>

† Any power supply that meets current consumption, voltage, power, and connector pinouts requirements can be used.

2-Port (DB9) Power Supply

This table provides the specifications to purchase a power supply for a DeviceMaster 2-port 1E/2E model with serial terminal connectors.

<table>
<thead>
<tr>
<th>External Power Supply: 2-Port (Serial Terminal Connectors) 6-30VDC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output voltage†</td>
</tr>
<tr>
<td>Current†</td>
</tr>
<tr>
<td>Power</td>
</tr>
</tbody>
</table>

† Any power supply that meets current consumption, voltage, power, and connector pinouts requirements can be used.

4-Port Power Supply

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

<table>
<thead>
<tr>
<th>Control Power Supply: 4-Port</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input line frequency</td>
</tr>
<tr>
<td>Input line voltage</td>
</tr>
<tr>
<td>Output voltage</td>
</tr>
<tr>
<td>Output current</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>External Power Supply: 4-Port</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output voltage†</td>
</tr>
<tr>
<td>Current†</td>
</tr>
<tr>
<td>Power</td>
</tr>
</tbody>
</table>

† Any power supply that meets current consumption, voltage, power, and connector pinouts requirements can be used.

8-Port Power Supply

The following table provides the specifications for the Comtrol-supplied power supply for the DeviceMaster 8-port.

<table>
<thead>
<tr>
<th>Control Power Supply: 8-Port</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input line frequency</td>
</tr>
<tr>
<td>Input line voltage</td>
</tr>
<tr>
<td>Output voltage</td>
</tr>
<tr>
<td>Output current</td>
</tr>
</tbody>
</table>

+VDC V Return - GND Shield GND

Housing Molex P/N: 39-01-4030
Pins Molex P/N: 44485-1211
The following table provides the specifications, if you intend on purchasing your own power supply.

<table>
<thead>
<tr>
<th>External Power Supply: 8-Port</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output voltage†</td>
</tr>
<tr>
<td>Current†</td>
</tr>
<tr>
<td>Power</td>
</tr>
</tbody>
</table>

† Any power supply that meets current consumption, voltage, power, and connector pinouts requirements can be used.

16-Port Power Supplies

The following table provides the specifications for the Comtrol-supplied power supply for the DeviceMaster 16-port models.

<table>
<thead>
<tr>
<th>Control Power Supply: 16-Port Models</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input line frequency</td>
</tr>
<tr>
<td>Input line voltage</td>
</tr>
<tr>
<td>Output voltage</td>
</tr>
<tr>
<td>Output current</td>
</tr>
</tbody>
</table>

Note: The DeviceMaster RTS 16-port and 32-port models with a single Ethernet port have internal power supplies.

The following tables provide the specifications, if you intend on purchasing your own power supply for your DeviceMaster.

<table>
<thead>
<tr>
<th>External Power Supply: 16-Port DeviceMaster PRO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input line frequency</td>
</tr>
<tr>
<td>Input line voltage</td>
</tr>
<tr>
<td>Output voltage†</td>
</tr>
<tr>
<td>Output current†</td>
</tr>
</tbody>
</table>

† Any power supply that meets current consumption, voltage, power, and connector pinouts requirements can be used.

<table>
<thead>
<tr>
<th>External Power Supply: 16-Port DeviceMaster RTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output voltage†</td>
</tr>
<tr>
<td>Current†</td>
</tr>
<tr>
<td>Power</td>
</tr>
</tbody>
</table>

† Any power supply that meets current consumption, voltage, power, and connector pinouts requirements can be used.

<table>
<thead>
<tr>
<th>External Power Supply: 16-Port DeviceMaster Serial Hub</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input line frequency</td>
</tr>
<tr>
<td>Input line voltage</td>
</tr>
<tr>
<td>Output voltage†</td>
</tr>
<tr>
<td>Output current†</td>
</tr>
</tbody>
</table>

† Any power supply that meets current consumption, voltage, power, and connector pinouts requirements can be used.
This subsections provides you with detailed pictures of the different DeviceMaster models:

- **1-Port (DB9) 5VDC on Page 90**
- **1-Port (DB9) 5-30VDC on Page 91**
- **1-Port Embedded on Page 92**
- **2-Port (Serial Terminals) Power Supply on Page 88**
- **4-Port (DB9) on Page 93**
- **8-Port (DB9) on Page 93**
- **16-Port (RJ45) External Power Supply on Page 94**
- **DeviceMaster Serial Hub 16-Port (DB9) on Page 94**
- **16-Port (RJ45) Internal Power Supply on Page 94**
- **DeviceMaster PRO 16-Port (RJ45) on Page 94**
- **DeviceMaster RTS 32-Port (RJ45) on Page 94**

See the appropriate discussion in the Hardware Installation section (Page 13) for information about the LEDs.

**1-Port (DB9) 5VDC**

This illustrates the DeviceMaster 1-Port 5VDC.
1-Port (DB9) 5-30VDC

This illustrates the DeviceMaster 1-Port 5-30VDC.

**Note:** The supported input voltage (5VDC or 5-30VDC) is printed on the top and bottom of the DeviceMaster.
1-Port Embedded

This illustrates the DeviceMaster 1-port Embedded system that uses a 5-30VDC power supply. See 1-Port 5-30VDC Power Supply on Page 87 so that you can provide a power supply for the DeviceMaster.

2-Port (Single Ethernet Port) with Serial Terminals

The DeviceMaster 2-port 1E with serial terminals uses a 5-30VDC power supply. See 2-Port (Serial Terminals) Power Supply on Page 88 for information about the power supply.

2-Port (Dual Ethernet Ports) with Serial Terminals

The DeviceMaster 2-port 2E with serial terminals uses a 5-30VDC power supply. See 2-Port (Serial Terminals) Power Supply on Page 88 for information about the power supply.
2-Port (Single Ethernet Port) DB9

The DeviceMaster 2-port 1E DB9 uses a 5-30VDC power supply. See 2-Port (Serial Terminals) Power Supply on Page 88 for information about the power supply.

2-Port (Dual Ethernet Ports) DB9

The DeviceMaster 2-port 2E DB9 uses a 5-30VDC power supply. See 2-Port (Serial Terminals) Power Supply on Page 88 for information about the power supply.

4-Port (DB9)

The PWR LED for the DeviceMaster 4 with DB9 ports is on the other side of the unit.

8-Port (DB9)

The PWR LED for the DeviceMaster 8 with DB9 ports is on the other side of the unit.
16-Port (RJ45) External Power Supply

The **PWR** LED for this model is on the other side of the unit.

16-Port (RJ45) Internal Power Supply

The power switch for this model is on the other side of the unit.

DeviceMaster PRO 16-Port (RJ45)

The power connector for this model is on the other side of the unit.

DeviceMaster Serial Hub 16-Port (DB9)

The power switch for this model is on the other side of the unit.

DeviceMaster RTS 32-Port (RJ45)

The power switch for this model is on the other side of the unit.
Radio Frequency Interference (RFI) (FCC 15.105)

This equipment has been tested and found to comply with the limits for Class A digital devices pursuant to Part 15 of the FCC Rules. This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try and correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Labeling Requirements (FCC 15.19)

This equipment complies with part 15 of FCC rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.

Modifications (FCC 15.21)

Changes or modifications to this equipment not expressly approved by Comtrol Corporation may void the user's authority to operate this equipment.

Serial Cables (FCC 15.27)

This equipment is certified for Class A operation when used with unshielded cables on models with the RJ45 connectors and with shielded cables on all models with DB9 connectors.

Underwriters Laboratory

This equipment is Underwriters Laboratory “UL” listed.

Important Safety Information

To avoid contact with electrical current:

- Never install electrical wiring during an electrical storm.
- Never install the power plug in wet locations.
- Use a screwdriver and other tools with insulated handles.
Troubleshooting and Technical Support

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

- **Troubleshooting Checklist on Page 97**
- **General Troubleshooting on Page 99**
- **Daisy-Chaining DeviceMaster 2E/4/8/16-Port Units on Page 101**

If you cannot diagnose the problem, you can contact **Technical Support on Page 102**.

Troubleshooting Checklist

The following checklist may help you diagnose your problem:

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

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

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

<table>
<thead>
<tr>
<th>Model</th>
<th>Connected to</th>
<th>Ethernet Cable</th>
<th>Connector Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-Port</td>
<td>Ethernet hub or NIC</td>
<td>Standard</td>
<td>10/100 ETHERNET</td>
</tr>
<tr>
<td>1-Port Embedded</td>
<td>Ethernet hub or NIC</td>
<td>Standard</td>
<td>RJ45 port (not labeled)</td>
</tr>
<tr>
<td>2-Port - 1E</td>
<td>Ethernet hub or NIC</td>
<td>Standard</td>
<td>10/100</td>
</tr>
<tr>
<td>2-Port - 2E (dual Ethernet ports)</td>
<td>NIC or Ethernet hub</td>
<td>Standard</td>
<td>10/100 - E1/E2</td>
</tr>
<tr>
<td>4/8-Port</td>
<td>NIC</td>
<td>Standard</td>
<td>DOWN</td>
</tr>
<tr>
<td></td>
<td>Ethernet hub</td>
<td>Standard</td>
<td>UP</td>
</tr>
<tr>
<td>16-Port (external power supply)</td>
<td>NIC</td>
<td>Standard</td>
<td>DOWN</td>
</tr>
<tr>
<td></td>
<td>Ethernet hub</td>
<td>Standard</td>
<td>UP</td>
</tr>
<tr>
<td>16/32-Port (internal power supply)</td>
<td>Ethernet hub or NIC</td>
<td>Standard</td>
<td>10/100 NETWORK</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>PWR or Status LED</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 sec. off, 3 flashes, 5 sec. off, 3 flashes ...</td>
<td>Redboot™ checksum failure.</td>
</tr>
<tr>
<td>5 sec. off, 4 flashes, 5 sec. off, 4 flashes ...</td>
<td>SREC load failure.</td>
</tr>
</tbody>
</table>
Troubleshooting Checklist

<table>
<thead>
<tr>
<th>PWR or Status LED</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 quick flashes</td>
<td>The default application is starting up.</td>
</tr>
<tr>
<td>10 sec. on, .1 sec. off, 10 sec. on .1 sec. off ...</td>
<td>The default application is running.</td>
</tr>
</tbody>
</table>

- If the device has a power switch, turn the device’s power switch off and on, while watching the LED diagnostics.
- If the DeviceMaster does not have a power switch, disconnect and reconnect the power cord.
- Verify that the hardware MAC address in NS-Link matches the address on the DeviceMaster.
- Verify that the network IP address, subnet mask, and gateway is correct and appropriate for the network. If IP addressing is being used, the system should be able to ping the DeviceMaster.
- Verify that the IP address programmed into the DeviceMaster matches the unique reserved IP configured address assigned by the system administrator.
- If using DHCP, the host system needs to provide the subnet mask and gateway.
- If using a driver for Windows, verify that you are addressing the port correctly. In many applications, device names above COM9 require the prefix `\\` in order to be recognized. For example, to reference COM20, use `\\COM20` as the file or port name.
- If using a driver for Windows, you can use one of the Control tools, which are discussed in the NS-Link User Guide.
  - *Device Advisor*, which helps identify problems is a tab in the Advisor window of the Windows driver.
  - *Test Terminal* program, which can be used to troubleshoot communications on a port-by-port basis.
  - *Port Monitor* program, which checks for errors, modem control, and status signals. In addition, it provides you with raw byte input and output counts.
- If using a driver for Windows hosts, enable the *Verbose Event Log* feature under the Options tab and then reboot the system.
- Reboot the system and the DeviceMaster.
- Remove and reinstall NS-Link.
- If you have a spare DeviceMaster, try replacing the device.

### PWR or Status LED Description

- **5 quick flashes** The default application is starting up.
- **10 sec. on, .1 sec. off, 10 sec. on .1 sec. off ...** The default application is running.
General Troubleshooting

This table illustrates some general troubleshooting tips.

**Note:** Make sure that you have reviewed the *Troubleshooting Checklist on Page 97.*

<table>
<thead>
<tr>
<th>General Condition</th>
<th>Explanation/Action</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PWR or Status LED flashing</strong></td>
<td>Indicates that boot program has not downloaded to the DeviceMaster.</td>
</tr>
<tr>
<td></td>
<td>2. Install the driver and configure the device using the MAC address. Make sure that you reboot the system. <strong>Note:</strong> If the PWR or Status LED is still flashing, contact Technical Support.</td>
</tr>
<tr>
<td></td>
<td>3. If you want to program an IP address into the DeviceMaster, you can use the procedure outlined in the <em>NS-Link User Guide</em> (Page 10).</td>
</tr>
<tr>
<td></td>
<td>4. Remove the NS-Link driver.</td>
</tr>
<tr>
<td><strong>PWR or Status LED not lit</strong></td>
<td>Indicates that power has not been applied or there is a hardware failure. Contact Technical Support.</td>
</tr>
<tr>
<td><strong>Can ping the Comtrol device, but cannot open the ports from a remote location.</strong></td>
<td>The NS-Link driver uses Port 4606 (11FE h) to communicate with the DeviceMaster.</td>
</tr>
<tr>
<td></td>
<td>When using a “sniffer” to track NS-Link packets, filtering for Port 4606 will easily track the packet. The packet should also contain the MAC address of the device and the originating PC so that it can be determined if the packet is able to travel the full distance one way or not.</td>
</tr>
<tr>
<td></td>
<td>If the 4606 packet is found on one side of a firewall or router, using sniffer, and not on the other side, then that port needs to be opened up to allow the 4606 to pass.</td>
</tr>
<tr>
<td></td>
<td>This will most often be seen with firewalls, but is also seen in some routers.</td>
</tr>
<tr>
<td><strong>Cannot ping the device through Ethernet hub</strong></td>
<td>Isolate the DeviceMaster from the network. Connect the device directly to the NIC in the host system (see Page 97).</td>
</tr>
<tr>
<td><strong>Cannot ping or connect to the DeviceMaster</strong></td>
<td>The default IP address is often not accessible due to the subnet masking from another network unless 192.168 is used in the network.</td>
</tr>
<tr>
<td></td>
<td>In most cases, it will be necessary to program in an address that conforms to your network.</td>
</tr>
<tr>
<td></td>
<td>If you do not use the NS-Link driver to program the IP address, you only have 15 seconds to disable the Bootlader with Redboot to get into the setup utility.</td>
</tr>
<tr>
<td></td>
<td>See <em>RedBoot Procedures on Page 75</em> for the Redboot method of programming an IP address.</td>
</tr>
</tbody>
</table>
### General Troubleshooting

<table>
<thead>
<tr>
<th>General Condition</th>
<th>Explanation/Action</th>
</tr>
</thead>
</table>
| DeviceMaster continuously reboots when connected to some Ethernet switches | The problem is caused by a L2 bridging feature called Spanning Tree Algorithm (STA) in the Switch. This feature is enabled by default in some switches. This feature causes time-out problems on certain L2 protocols, such as our MAC mode.  
Resolution: There will be no firmware fix for this problem. Only one of the following fixes is required for resolution.  
1. Disable STA in the switch.  
2. Enable STA fast forwarding on the port.  
3. Change the STA Forward Delay and Message Age to minimum time values.  
4. On the device, set the time-out value to 0 (to disable loading of SocketServer) or 120. The command from the redboot prompt is “Timeout 120” without the quotes.  
Problem Details: STA by default blocks packets for 30 seconds after an ethernet port auto negotiates. Blocking of these packets causes the NS-Link driver load process to fail.  
The normal NS-Link load process is:  
1. If NS-Link determines that it needs to load a device, it resets the device. It does this to get the device into Redboot mode. Only Redboot accepts “load binary” commands, which are needed to load the NS-Link binary into the device.  
2. After a 6 second delay, NS-Link sends an ID query to the device. This query is to verify that the device is in Redboot and can accept “load binary” commands.  
3. The device sends an ID query response.  
4. NS-Link loads the device.  
If the device is not loaded after “timeout” seconds (default 15), it loads SocketServer.  
The above process fails when STA is running because the switch blocks packets for 30 seconds after the DeviceMaster is rebooted. Therefore, the ID query is not received by the DeviceMaster and after 15 seconds the device loads SocketServer. After 30 seconds, NS-Link finally can do an ID query, which reveals that the device is not in Redboot. NS-Link therefore reboots the device, and the process repeats. |
| DeviceMaster continuously reboots when connected to some Ethernet switches or routers | Invalid IP information may also cause the switch or router to check for a gateway address. Lack of a gateway address is a common cause. |
Daisy-Chaining DeviceMaster 2E/4/8/16-Port Units

The DeviceMaster 2E/4/8/16-port models with external power supplies follow the IEEE specifications for standard Ethernet topologies.

When using the UP and DOWN ports, the DeviceMaster 2E/4/8/16 is classified as a switch. When using the UP port only, it is a simple end node device.

The maximum number of daisy-chained DeviceMaster 2E/4/8/16 units, and the maximum distance between units is based on the Ethernet standards and will be determined by your own environment and the conformity of your network to these standards.

Comtrol has tested with seven DeviceMaster 2E/4/8/16 units daisy-chained together using 10 foot CAT5 cables, but this is not the theoretical limit. You may experience a performance hit on the devices at the end of the chain, so it is recommended that you overload and test for performance in your environment. The OS and the application may also limit the total number of ports that may be installed.

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

- **Ethernet 10BASE-T Rules**
  - The maximum number of repeater hops is four.
  - You can use Category 3 or 5 twisted-pair 10BASE-T cables.
  - The maximum length of each cable is 100m (328ft).
  
  **Note:** Category 3 or 5 twisted pair cables look the same as telephone cables but they are not the same. The network will not work if telephone cables are used to connect the equipment.

- **Fast Ethernet 100BASE-TX rules**
  - The maximum number of repeater hops is two (for a Class II hub). A Class II hub can be connected directly to one other Class II Fast Ethernet hub. A Class I hub cannot be connected directly to another Fast Ethernet hub.
  - You must use Category 5 twisted-pair 100BASE-TX cables.
  - The maximum length of each twisted-pair cable is 100m (328ft).
  - The total length of twisted-pair cabling (across directly connected hubs) must not exceed 205m (672ft).
  
  **Note:** Category 5 twisted pair cables look the same as telephone cables but they are not the same. The network will not work if telephone cables are used to connect the equipment.

- **IEEE 802.3 specification:** A network using repeaters between communicating stations (PCs) is subject to the "5-4-3" rule of repeater placement on the network:
  - Five segments connected on the network.
  - Four repeaters.
  - Three segments of the 5 segments can have stations connected. The other two segments must be inter-repeater link segments with no stations connected.


  Additional information may be found at [http://compnetworking.about.com/cs/ethernet1/](http://compnetworking.about.com/cs/ethernet1/) or by searching the web.
Technical Support

If you are using an NS-Link driver for a Windows system, you should review the troubleshooting section in the *NS-Link User Guide for Windows* (Page 10) before contacting Technical Support.

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

<table>
<thead>
<tr>
<th>Control Contact Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Web site</td>
</tr>
<tr>
<td>Phone</td>
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