DEVICE•MASTER™
RTS

Hardware Installation and Configuration

COMTROL

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Table of Contents

Hardware Installation

How to Use this Document

You can use the interactive *Table of Contents* to locate the information you need. Red, underscored items are links to URLs. Blue, underscored items are links within this document or to another document on the media.

Note: *If you copy this document from the ftp/web or CD and do not use the procedure discussed on the CD, you will get an error message when selecting hyperlinks outside of this document.*

Installation Overview

The DeviceMaster RTS enables communications with serial devices over an Ethernet network. The RTS 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:

Default Network Settings

IP address:
   192.168.250.250

Subnet mask:
   255.255.0.0

Gateway address:
   192.168.250.1

Ports	Model Description	Installation Procedure
1	DB9 serial port with one Ethernet port	*RTS 1-Port Installation* on Page 6
1	Embedded system	*Appendix A. RTS 1-Port Embedded System Installation* on Page 33
4	DB9 or RJ45 serial ports with two Ethernet† ports	*RTS 4/8-Port Installation* on Page 7.
8	DB9 or RJ45 serial ports with two Ethernet† ports	*RTS 4/8-Port Installation* on Page 7
16	RJ45 serial ports with two Ethernet† ports	*RTS 16-Port Installation - External Power Supply* on Page 8
16	RJ45 serial ports with one Ethernet port	*RTS 16/32RM Installation - Internal Power Supply* on Page 10
32	RJ45 serial ports with one Ethernet port	*RTS 16/32RM Installation - Internal Power Supply* on Page 10

† *One of the Ethernet ports on the DeviceMaster RTS 4/8/16 models is a built-in downstream port for daisy-chaining DeviceMaster systems or other network-ready devices.*

Note: *The DeviceMaster Primo is not supported in this document.*

RTS 1-Port Installation

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

1. Record the MAC address, model number, and serial number of the DeviceMaster RTS 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 CO 4E**.

2. Place the DeviceMaster RTS 1-Port on a stable surface or optionally mount the RTS using the DIN rail adapters or mounting flanges.

3. Connect the RTS 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.

⚠ **Caution**

4. Apply power to the RTS by connecting the AC power adapter to the RTS and a power source. If you want to provide your own power supply, see *Power Supply Specifications* on Page 19.

5. Verify that the network connection for the RTS is functioning properly.

    *   The amber **Status** LED on the device is lit, indicating you have power and it has completed the boot cycle.

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

    *   If the red **Link Act** LED is lit, it indicates a working Ethernet connection.

    *   If the red **Duplex** LED is lit, it indicates full-duplex activity.

    *   If the red **100** LED is lit, it indicates a working 100 MB Ethernet connection (100 MB network, only).

Larger Picture, Page 22

6. Go to *Configuring the Network Setup* on Page 12 for default network settings and how to configure the RTS for use.

RTS 4/8-Port Installation

Use the following procedure to install the RTS 4 or RTS 8.

1. Record the MAC address, model number, and serial number of the DeviceMaster RTS 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 CO 4E**.

2. Place the RTS on a stable surface.

   Larger Picture, Page 23   *Larger Picture, Page 23*

   Larger Picture, Page 24   *Larger Picture, Page 24*

3. Connect the 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 RTS using a standard Ethernet cable.

   - **Server NIC (10/100Base-T)**: Connect to the port labeled **DOWN** on the RTS using a standard Ethernet cable.

   - **Daisy-chaining DeviceMaster RTS units**: Connect the port labeled **DOWN** on the first RTS to the port labeled **UP** on the second RTS or other device using a standard Ethernet cable.

     Note: Do not connect multiple units until you have changed the default IP address, see Default Network Settings on Page 12.

   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.

⚠
Caution

4. Apply power to the RTS by connecting the AC power adapter to the RTS, 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 *Power Supply Specifications* on Page 19.

5. Verify that the network connection for the RTS is functioning properly.

   - The red **PWR** LED on the front panel of the RTS is lit, indicating you have power and it has completed the boot cycle.

     Note: The PWR LED flashes while booting and it takes approximately 15 seconds for the bootloader to complete the cycle.

   - The red **LNK ACT** LED is lit, indicating that you have a working Ethernet connection.

   - If the red **100** LED is lit, it indicates a working 100 MB Ethernet connection (100 MB network, only).

10/100 NETWORK
LNK
ACT
COL
100
UP   DOWN
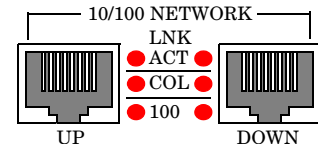
If the red COL LED is lit, there is a network collision.

6. Go to *Configuring the Network Setup* on Page 12 for default network settings and how to configure the RTS for use.

RTS 16-Port Installation - External Power Supply

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

1. Record the MAC address, model number, and serial number of the DeviceMaster RTS 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 CO 4E**.

2. Place the RTS on a stable surface, or *optionally* mount the RTS 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.

    Larger picture, Page 24

    c. Attach the L bracket into your rack.

    Follow these guidelines when mounting the RTS in a rack.

> **⚠ Caution**

*   ***If the RTS 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 RTS in an environment that is compatible with the maximum rated ambient temperature (Environmental Specifications on Page 21).***

*   ***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 RTS 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 RTS is reliably grounded when mounting within the rack.***

3. Connect the 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 RTS using a standard Ethernet cable.

    *   **Server NIC (10/100Base-T)**: Connect to the port labeled **DOWN** on the RTS using a standard Ethernet cable.

    *   **Daisy-chaining RTS units**: Connect the port labeled **DOWN** on the first RTS to the port labeled **UP** on the second RTS or other device using a standard Ethernet cable.

        Note: Do not connect multiple units until you have changed the default IP address, see Default Network Settings on Page 12.

> **⚠ Caution**

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 RTS by connecting the AC power adapter to the RTS, the power cord to the power adapter, and plugging the power cord into a power source. See *Power Supply Specifications* on Page 19 if you want to provide your own power supply.

5. Verify that the network connection for the RTS is functioning properly.

- The amber or red **PWR** LED on the front panel of the DeviceMaster RTS is lit, indicating you have power and it has completed the boot cycle.

  Note: *The **PWR** LED flashes while booting and it takes approximately 15 seconds for the bootloader to complete the cycle.*
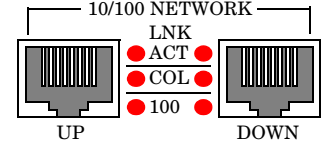
If the red COL LED is lit, there is a network collision.

- The red **LNK ACT** LED is lit, indicating that you have a working Ethernet connection.

- If the red **100** LED is lit, it indicates a working 100 MB Ethernet connection (100 MB network, only).

6. Go to *Configuring the Network Setup* on Page 12 for default network settings and how to configure the RTS for use.

RTS 16/32RM Installation - Internal Power Supply

Use the following procedure to install the RTS 16/32RM with an internal power supply.

1. Record the MAC address, model number, and serial number of the DeviceMaster RTS 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 CO 4E**.

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

   ⚠️ **Caution**

   - *If the RTS 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 RTS in an environment that is compatible with the maximum rated ambient temperature (Environmental Specifications on Page 21).*

   - *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 RTS 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 RTS is reliably grounded when mounting within the rack.*

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

   Larger picture, Page 24

   Larger picture, Page 24

⚠ Caution

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 RTS by connecting the appropriate power cord into the power socket on the RTS, plugging the power cord into a power source, and turning on the power switch.

5. Verify that the network connection for the RTS is functioning properly.

   - The amber **Status** LED on the device is lit, indicating you have power and it has completed the boot cycle.

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

   LNK
   ● ACT
   ● Duplex
   ● 100
   10/100 ETHERNET

   - The red **LNK ACT** LED is lit, indicating that you have a working Ethernet connection.

   - If the red **100** LED is lit, it indicates a working 100 MB Ethernet connection (100 MB network, only).

   - If the red **Duplex** LED is lit, it indicates full-duplex activity.

6. Go to *Configuring the Network Setup* on Page 12 for default network settings and how to configure the RTS for use.
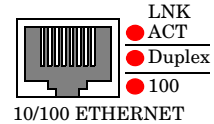
Adding a Unit to an Existing Installation

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

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

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

2. Power-up the new RTS and verify that the **PWR** or **Status** LED lights.

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

4. Configure serial ports to support the serial devices.

Replacing Hardware

Follow this procedure, to replace an RTS with another RTS in an existing configuration.

1. Configure the IP address in the new RTS.

2. Remove the old unit and attach a new or spare DeviceMaster RTS.

3. Connect the new DeviceMaster RTS to the network hub or server NIC.

4. Apply power to the new RTS and verify that it passes the power on self-test.

5. If you are using NS-Link, change the MAC or IP address of the new RTS in the NS-Link driver to reflect the new unit.

6. If using socket mode, configure any RS-422 or RS-485 ports as necessary to match the previous unit.

7. Transfer *all* cabling from the old RTS to the new DeviceMaster RTS.

8. *It is not necessary* to shut down and restart the server.

Configuring the Network Setup

This section provides an overview of the DeviceMaster RTS configuration.

Depending upon how you plan on communicating to the DeviceMaster RTS will determine what procedures you need to perform to configure the RTS. Refer to the installation document for your operating system for an overview of the advantages of MAC or IP addressing. See *Locating the NS-Link Drivers and Installation Documentation* to locate the appropriate document.

Default Network Settings

All RTS models have the following network settings from the factory.

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

Programming the IP Address

If you are planning on using an IP address to control the RTS, you should take into consideration how you plan on using the serial ports. The ports can be configured with COM or TTY characteristics and as sockets.

- To configure the ports for COM or TTY characteristics, you must install an NS-Link driver. After configuring the IP address and the port characteristics, you can also configure the socket characteristics using the NS-Link SocketServer. See *Locating the NS-Link Drivers and Installation Documentation* (below) for details.

- To configure the ports for *only* socket characteristics, you will use Redboot to program the IP address and then configure the socket characteristics using SocketServer. See the *Configuring RTS Network Information*. You can download the latest copy of the guide at, ftp://ftp.comtrol.com/Dev_Mstr/RTS/Setup_Docs/Config_Network/Config_Network.pdf.

Configuring for MAC Address Usage

If you are planning on using a MAC address to communicate with the DeviceMaster RTS, the RTS must be on the same network segment as the host server. To use MAC addressing, install one of the NS-Link device drivers below.

Locating the NS-Link Drivers and Installation Documentation

You can use the drivers on the CD, but you may want to download the latest driver and installation document using these hyperlinks to the ftp site.

Operating System	ftp://ftp.comtrol.com/Dev_Mstr/RTS/Drivers/	
	Driver	Installation Document
Linux	/linux/	/Linux/SW_Doc/
Windows 2000	/Win2000	/Win2000/SW_Doc/
Windows NT	/WinNT	/WinNT/SW_Doc/

If you want the use the files on the CD that shipped with your product, insert the CD and follow the menu system to install the driver. If the menu system does not launch after you insert the CD, use the **readme.pdf** file at the root of the CD to locate the NS-Link driver and associated installation documentation.

Connecting Serial Devices

This section contains the following topics:

- Connecting your serial devices
- Building cables
- Serial connector pinouts
- Building loopback connectors to test ports

Note: *Go to* <u>Building the Serial Ribbon Cable</u> *on Page 33 for connector information for the RTS 1-Port Embedded adapter.*

Connecting Devices

Use this procedure to connect asynchronous serial devices to the RTS 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 peripheral for the wrong mode could damage the peripheral.

1. Connect your serial devices to the appropriate port on the DeviceMaster RTS using the appropriate cable. You can build your own cables using the *Building Cables for Serial Devices* discussion (Page 14).

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

2. Verify that the devices are communicating properly:

   - The amber Rx LEDs shows that the port is connected to another RS-232 device or receiving data in RS-422/485 mode.
   - The green Tx LED shows that the data is transmitting.

   Note: *The port LED activity on the RTS 16/32RM may be inconsistent until the port has been opened. After a port is opened the LED activity works as documented.*
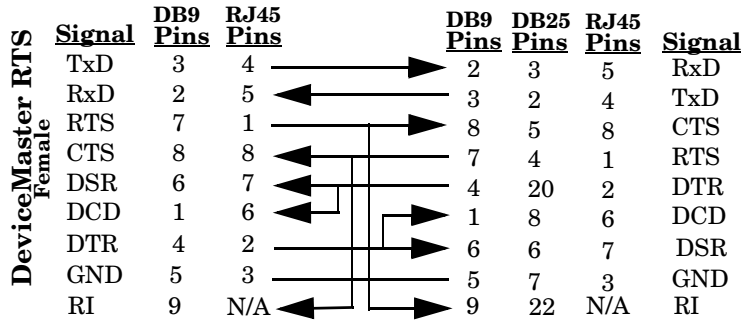
DB9 LEDs RX1* ○ TX1* ●

* Represents port number.

RJ45 LEDs Rx ⟶ ← Tx / Rx ⟶ ← Tx
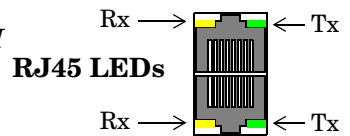
Building Cables for Serial Devices

You can build your own null-modem or straight-through serial cables using:

- <u>Building Null-Modem Cables (RS-232)</u> on Page 15
- <u>Building Straight-Through Cables (RS-232/485)</u> on Page 15
- <u>DB9 Connector Pinouts</u> on Page 16
- <u>Building Additional DB9 Loopback Plugs</u> on Page 16
- <u>RJ45 Connector Pinouts</u> on Page 16
- <u>Building Additional RJ45 Loopback Plugs</u> on Page 17
- <u>Building an RS-485 Test Cable</u> on Page 17
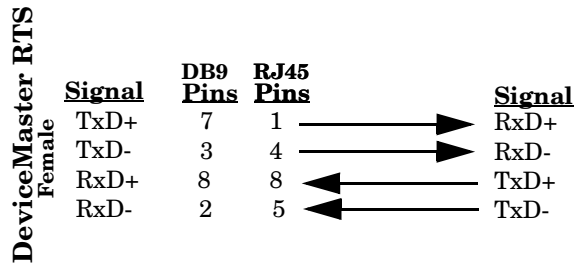
Building Null-Modem Cables (RS-232)

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.

DeviceMaster RTS Female

Signal	DB9 Pins	RJ45 Pins		DB9 Pins	DB25 Pins	RJ45 Pins	Signal
TxD	3	4	→	2	3	5	RxD
RxD	2	5	←	3	2	4	TxD
RTS	7	1	→	8	5	8	CTS
CTS	8	8	←	7	4	1	RTS
DSR	6	7	←	4	20	2	DTR
DCD	1	6	←	1	8	6	DCD
DTR	4	2	→	6	6	7	DSR
GND	5	3	—	5	7	3	GND
RI	9	N/A	←→	9	22	N/A	RI

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

Building Null-Modem Cables (RS-422)
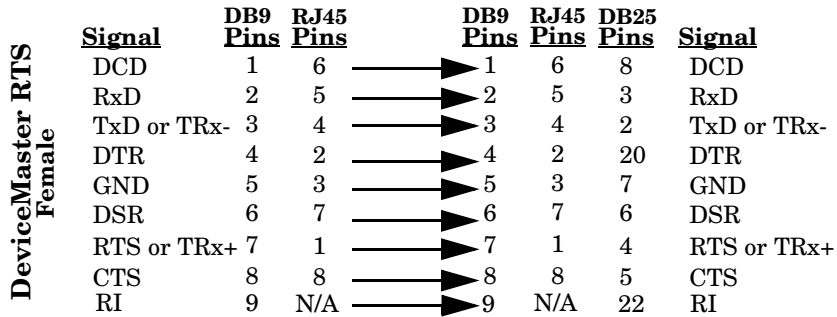
Use the following figure if you need to build an RS-422 null-modem cable. A null-modem cable is required for connecting DTE devices.

DeviceMaster RTS Female

Signal	DB9 Pins	RJ45 Pins		Signal
TxD+	7	1	→	RxD+
TxD-	3	4	→	RxD-
RxD+	8	8	←	TxD+
RxD-	2	5	←	TxD-

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.*

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

Use the following figure if you need to build an RS232 or RS-485 straight-through cable. Straight-through cables are used to connect modems and other DCE devices.

DeviceMaster RTS Female

| Signal	DB9 Pins	RJ45 Pins		DB9 Pins	RJ45 Pins	DB25 Pins	Signal
DCD	1	6	→	1	6	8	DCD
RxD	2	5	→	2	5	3	RxD
TxD or TRx-	3	4	→	3	4	2	TxD or TRx-
DTR	4	2	→	4	2	20	DTR
GND	5	3	→	5	3	7	GND
DSR	6	7	→	6	7	6	DSR
RTS or TRx+	7	1	→	7	1	4	RTS or TRx+
CTS	8	8	→	8	8	5	CTS
RI	9	N/A	→	9	N/A	22	RI

RTS Connector Pinouts

Use the appropriate subsection if you need information about the serial connectors on the RTS, including:

- Signal information for each communications mode.
- How to build a loopback plug or cable to test a port.

DB9 Connector Pinouts

Use the following pinout information for the DB9 serial port connectors on the DeviceMaster RTS.
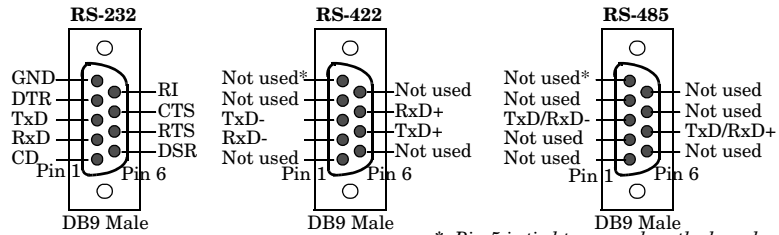
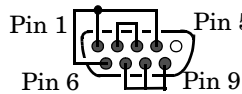* Pin 5 is tied to ground on the board, but is not used in the cable.

Building Additional 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 to test serial ports. The DeviceMaster RTS is shipped with a a single loopback plug (RS-232/422).

Note: Drivers for Windows 98 and Windows NT are bundled with the Test Terminal (WCOM32) program. Linux users can use MiniCom. See the NS-Link driver documentation for your operating system for information about using these applications.

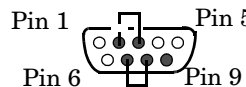Wire the following pins together to build additional plugs or replace a missing RS-232 loopback plug:

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

RS-232 Only (Back View)   *The RS-232 loopback plug also works for RS-422.*

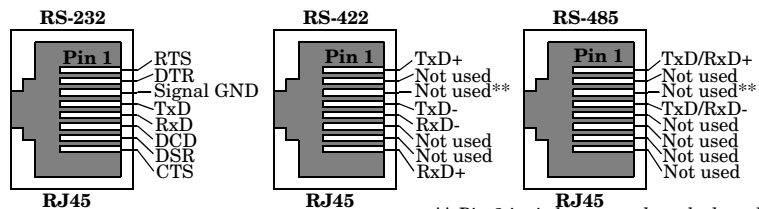Wire the following pins together for an RS-422 loopback plug:

- Pins 2 to 3
- Pins 7 to 8

RS-422 Only (Back View)

RJ45 Connector Pinouts

Use the following pinout information for the RJ45 serial port connectors on the DeviceMaster RTS.


** Pin 3 is tied to ground on the board, but is not used in the cable.

Building Additional RJ45 Loopback Plugs

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

- Pins 4 to 5
- Pins 1 to 8
- Pins 2 to 6 to 7
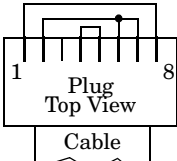
Note: *Drivers for Windows 98 and Windows NT are bundled with the Test Terminal (WCOM32) program. Linux users can use MiniCom. See the NS-Link driver documentation for your operating system for information about using these applications.*

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

Building an RS-485 Test Cable

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

Signal	RJ45 Pins	Signal
TxD or TRX-	4 ⟶	TxD or TRX-
RTS or TRX+	1 ⟶	RTS or TRX+
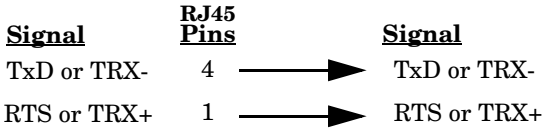
RTS Specifications

The following subsections contain specifications and safety notices for the DeviceMaster RTS family.

Electromagnetic Compliances

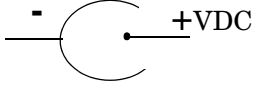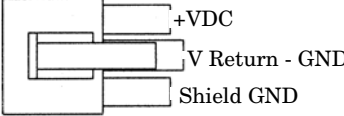This table lists electromagnetic compliances for the DeviceMaster RTS family.

Electromagnetic Compliances	Status

Emission:
Canadian EMC requirements ICES-003: 1997
CISPR-22: 1997
European Standard EN55022: 1998
    Amendment A1: 2000
    IEC 1000-3-2/EN61000-3-2: Harmonic
    IEC 1000-3-3/EN61000-3-3: Flicker
FCC Part15 Subpart B: Class A limit
	Yes

Immunity: EN55024: 1998 IEC 1000-4-2: EN61000-4-2: 1995 ESD IEC 1000-4-3: EN61000-4-3: 1996 RF IEC 1000-4-4: EN61000-4-4: 1994 Fast Transient IEC 1000-4-5: EN61000-4-5: 1995 Surge IEC 1000-4-6: EN61000-4-6: 1996 Conducted disturbance IEC 1000-4-8: EN61000-4-8: 1994 Magnetic field IEC 1000-4-11: EN61000-4-11: 1994 Dips and Voltage Variations	Yes
Safety: IEC 60950/EN60950 CSA C22.2 No. 60950/UL 60950, Third Edition	Yes

Power Supply Specifications

This subsection discusses information that you may need if you wish to use your own external power supplies on the following products:

- DeviceMaster RTS 1-port models
- DeviceMaster RTS 4 and 8-port models
- DeviceMaster RTS Rack Mount 16 (RM16)

This table provides other data that you may require about the external power supply (if supplied).

Power Connector	Model	External Power Supply	Specification
Coaxial 5.5±0.1 x 2.1 mm - +VDC	1-Port	Input line frequency Input line voltage Output voltage† Output current†	60 Hz 90 - 132VAC 5VDC†† 420 mA (Min) @ 5VDC
+VDC V Return - GND Shield GND Housing Molex P/N: 39-01-4030 Pins Molex P/N: 44485-1211	4-Port	Input line frequency Input line voltage Output voltage† Output current†	47 - 63 Hz 90 - 260VAC 9-30VDC†† 200 mA (Min) @ 24VDC
	8-Port	Input line frequency Input line voltage Output voltage† Output current†	47 - 63 Hz 90 - 260VAC 9-30VDC†† 290 mA (Min) @ 24VDC
	RM16	Input line frequency Input line voltage Output voltage† Output current†	47 - 63 Hz 90 - 260VAC 9-30VDC†† 490 mA (Min) @ 24VDC

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

††   *The output voltage is plus or minus 5%.*

Hardware Specifications

The following table lists hardware specifications for the RTS. See *Power Supply Specifications* above for detailed power supply specification information.

Topic	Specification

Current consumption:
   RTS 1 models
   RTS 4
   RTS 8
   RTS 16 with external power supply
   RTS 16RM with internal power supply
   RTS 32RM
	420 mA @ 5VDC
	200 mA @ 24VDC
	290 mA @ 24VDC
	490 mA @ 24VDC
	130 mA @ 110VAC
	200 mA @ 110VAC

Power consumption:
   RTS 1 models
   RTS 4
   RTS 8
   RTS 16 with external power supply
   RTS 16RM with internal power supply
   RTS 32RM
	2.1 W
	4.8 W
	6.96 W
	11.76 W
	14.3 W
	22.0 W

Processor type	ARM7
Memory	8MB SDRAM/4MB flash
Real time clock (RTS 4/8/16 with external power supply, only)	Battery backup, 256B RAM, watchdog time/power off monitor
Baud rate/port (maximum)	230.4 Kbps
Ethernet host interface (Downstream port available with some models)	10/100Base-T (10/100 Mbps - RJ45)
Serial interface	RS-232, RS-422, and RS-485

Serial connector types:
   RTS 1
   RTS 1 Embedded System
   4/8-Port models
   16/32-Port models
	DB9
	Header, IDC10
	DB9 and DB9 to RJ45 adapter
	RJ45

Network default values:
   IP address
   Subnet mask
   Gateway
	192.168.250.250
	255.255.0.0
	192.168.250.1

Network protocols	TCP, UDP, BOOTP, TFTP, ICMP, ARP, SNMP (MIB-II), Telnet, HTTP

NS-Link control:
   Data bits
   Parity
   Stop bits
	7 or 8
	Odd, Even, None
	1 or 2

SNMP support	Monitoring only.

Continued

Topic	Specification
Dimensions:	
RTS 1 (without mounting tabs)	3.6" x 2.8" x 0.8"
RTS 1 Embedded System	3.5" x 2.6" x 0.6""
RTS 4	10.8" x 6.3" x 1.5"
RTS 8	10.8" x 6.3" x 1.8"
RTS 16 with external power supply	17.25" x 8.0" x 1.74"
RTS 16/32RM with internal power supply	17.25" x 10.8" x 1.74"
Weight (hub, only):	
RTS 1	7.4 oz
RTS 1 Embedded System	1.4 oz
RTS 4 DB9	54.6 oz
RTS 4 RJ45	54.1 oz
RTS 8 DB9	59.6 oz
RTS 8 RJ45)	58.6 oz
RTS 16 with external power supply	36.3 oz
RTS 16RM with internal power supply	36 oz
RTS 32RM	41 oz

Environmental Specifications

This table list environmental conditions.

Environmental Conditions	Value
Air temperature:	
System on (operational)	0 to 45°C
System off (storage)	-20 to 85°C
Altitude	0 to 10,000 feet
Heat output:	
RTS 1 models	7.16 BTU/Hr
RTS 4	16.4 BTU/Hr
RTS 8	23.8 BTU/Hr
RTS 16 with external power supply	40.1 BTU/Hr
RTS 16RM with internal power supply	48.8 BTU/Hr
RTS 32RM	75.0 BTU/Hr
Humidity (non-condensing):	
System on (operational)	20% to 80%
System off (storage)	8% to 80%
Mean time between failures (MTBF):	
RTS 1	48.4 years
RTS 1 Embedded System	48.2 years
RTS 4	25.0 years
RTS 8	21.5 years
RTS 16 with external power supply	13.2 years
RTS 16RM with internal power supply	8.1 years
RTS 32RM	6 years

RTS Product Pictures

This subsections provides you with detailed pictures of the different RTS models:
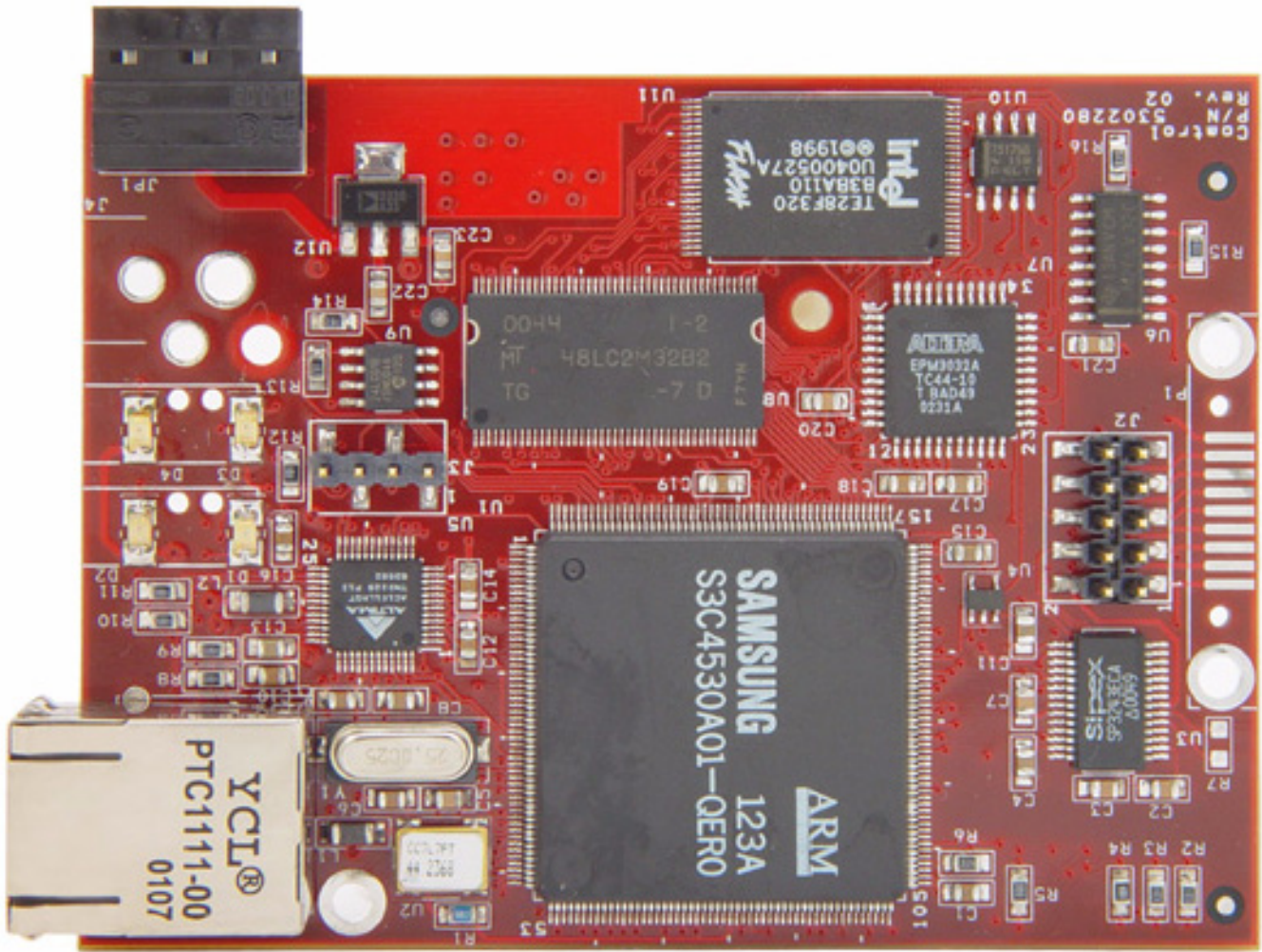
RTS 1

This illustrates the DeviceMaster RTS 1-Port.

RTS 1-Port Embedded

This illustrates the DeviceMaster RTS 1-port Embedded system.

RTS 4 with DB9 Ports

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

RTS 4 with RJ45 Ports

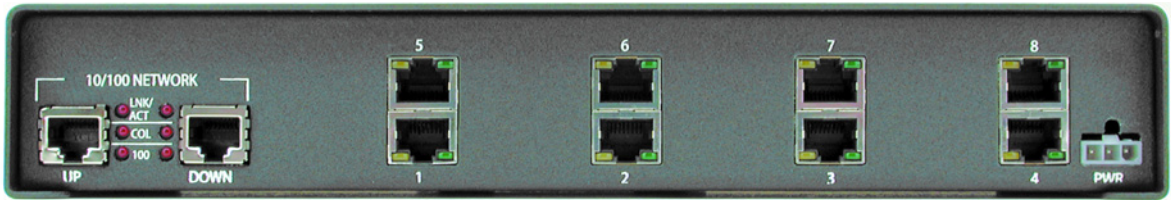The **PWR** LED for the RTS 4 with RJ45 ports is on the other side of the unit.

**RTS 8 with DB9
Ports**

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

**RTS 8 with RJ45
Ports**

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

**RTS RM16 - External
Power Supply**

The **PWR** LED for this model is on the other side of the unit.
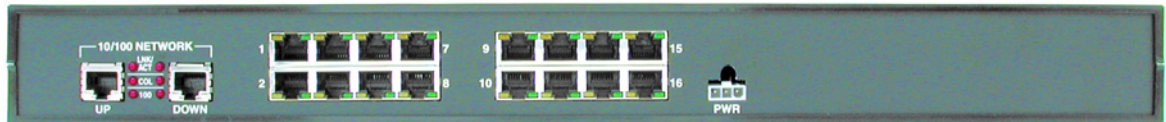
RTS 16RM

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

RTS 32RM

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

Notices

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.

Underwriters Laboratory

This equipment is Underwriters Laboratory "UL" listed.

Important Safety Information

To avoid contact with electrical current:

Warning

- 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 Comtrol device. 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
- *General Troubleshooting* on Page 28
- *NS-Link Driver Troubleshooting* on Page 29
- *Daisy-Chaining DeviceMaster RTS 4/8/16 Units* on Page 31

If you cannot diagnose the problem, you can contact *Technical Support* on Page 32.

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 using the hardware documentation.

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

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

Product Type	Connected to	Ethernet Cable	Connector Name
DeviceMaster RTS 1	Ethernet hub or NIC	Standard	10/100 ETHERNET
DeviceMaster RTS 1 Embedded	Ethernet hub or NIC	Standard	RJ45 port (not labeled)
DeviceMaster RTS 4/8/ 16 with external power supply	NIC	Standard	DOWN
	Ethernet hub	Standard	UP
DeviceMaster 16/32RM with internal power supply	Ethernet hub or NIC	Standard	10/100 NETWORK

- Verify that the Ethernet hub and any other network devices between the system and the Comtrol device are powered up and operating.
- Verify that the hardware MAC address in NS-Link matches the address on the Comtrol device.
- Verify that the network IP address is correct. If IP addressing is being used, the system should be able to ping the Comtrol device.
- Verify that the IP address programmed into the Comtrol device matches the unique reserved IP configured address assigned by the system administrator.

- If using a driver for Microsoft systems, 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.

- Reset the power on the Comtrol device and watch the **PWR** or **Status** light activity.

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

  - If the unit does not have a power switch, disconnect and reconnect the power cord while watching the LED diagnostics.

Product Type	PWR or Status LED	Description
DeviceMaster RTS 1-Port Models 4/8/16 (2 Ethernet ports) 16/32RM	5 sec off, 3 flashes, 5 sec off, 3 flashes.	Redboot checksum failure.
	5 sec off, 4 flashes, 5 sec off, 4 flashes.	Call Technical Support.
	5 quick flashes	The default application is starting up.
	10 sec on, .1 sec off, 10 sec on .1 sec off.	The default application is running.

- If using NS-Link for a Microsoft system, you can use one of the tools bundled with the drivers:

  - Device Advisor, which helps identify problems is a tab in the **Device** window of the driver.

  - Test Terminal program (**wcom32.exe**), which can be used to troubleshoot communications on a port-by-port basis.

  - Port Monitor program (**portmon.exe**), which checks for errors, modem control, and status signals. In addition, it provides you with raw byte input and output counts.

  - Peer Tracer program (**peer.exe**), which traces driver events.

- If using NS-Link for Windows hosts, enable the **Verbose Event Log** feature under the **Setup Options** tab and then reboot the system.

- Reboot the system and the Comtrol device.

- Remove and reinstall NS-Link.

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

General Troubleshooting

This table illustrates some general troubleshooting tips.

Note: *Make sure that you have reviewed the Troubleshooting Checklist on Page 26.*

General Condition	Explanation/Action
PWR or **Status** LED flashing	Indicates that boot program has not downloaded to the unit. 1. Make sure that you have downloaded the most current driver from: http://support.comtrol.com/download.asp. 2. Install the driver and configure the device using the MAC address. Make sure that you reboot the system. *Note:* *If the PWR or Status LED is still flashing, contact Technical Support.* 3. If you want to program an IP address into the Comtrol device, you can use the procedure outlined in *NS-Link Driver Troubleshooting* on Page 29. 4. Remove the NS-Link driver.
PWR or **Status** LED not lit	Indicates that power has not been applied or there is a hardware failure. Contact Technical Support.
Can ping the Comtrol device, but cannot open the ports from a remote location. (You must have previously programmed the IP address, subnet mask, and IP gateway.)	The NS-Link driver uses Port 4606 (**11FE** h) to communicate with the Comtrol device. 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. 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. This will most often be seen with firewalls, but is also seen in some routers.
Cannot ping the device through Ethernet hub	Isolate the unit from the network. Connect the device directly to the NIC in the host system (see Page 26).
Cannot ping or connect to the DeviceMaster RTS.	The default IP address is often not accessible due to the subnet masking from another network unless **192.168** is used in the network. In most cases, it will be necessary to program in an address that conforms to your network. If you do not use the NS-Link driver to program the IP address, you only have 10 seconds to disable the bootloader with Redboot to get into the setup utility. See ftp://ftp.comtrol.com/Dev_Mstr/RTS/ RTS_Library.pdf for the Redboot method of programming an IP address.

NS-Link Driver Troubleshooting

This table includes some tips related to NS-Link drivers.

NS-Link Condition	Explanation/Action
Need to program IP address into the device.	Before programming an IP address it is critical that the unit be operational and passes the power on tests when configured for the MAC address. *Note: If the unit is NOT operational, do NOT attempt to program or use an IP address with the unit.* This is a general procedure for drivers on Microsoft operating systems. 1. In the Comtrol Setup, highlight the Comtrol device. 2. Select **Properties**. 3. Select **IP Programming**. 4. Select **Retrieve** and confirm or modify addresses as necessary. *Note: Enter in all 3 categories. The unit must have Address, Mask and Gateway IP values entered. If you do not have a default gateway address, try using the IP address assigned to the PC that has the NS-Link driver installation.* 5. Select **Program**. 6. Select **Reset** - power LED should begin blinking. 7. Select **Device Setup**. 8. Uncheck **MAC**. 9. Check **IP** and enter IP number that you configured earlier. 10. Select **Ok** (several times) and reboot the system. IP addressing will now be in effect.
Cannot open port	1. Verify that MAC address in the NS-Link driver matches the address on the Comtrol device. 2. Verify that you are using the correct NS-Link driver. If necessary, remove and reinstall a new driver. 3. Isolate the unit from the network (see Page 26). 4. Check to see if another program or computer is active on this port.
The device will not load the NS-Link device driver and continually reboots	**Analysis:** The device is missing or has the wrong subnet mask or gateway address. **Solution:** Make sure that the subnet mask and gateway address are valid entries in the driver.

NS-Link Condition	Explanation/Action
The device will not load the NS-Link device driver and continually reboots	**Analysis:** The normal NS-Link load process is: • If NS-Link determines that it needs to load an RTS, it resets the device. It does this to get the RTS into RedBoot mode. Only RedBoot accepts *load binary* commands, which are needed to load the NS-Link binary into the RTS. • After a 6 second delay, NS-Link sends an ID query to the RTS. This query is to verify that the RTS is in RedBoot and can accept *load binary* commands. • The RTS sends an ID query response. • NS-Link loads the RTS. If the RTS is not loaded after *timeout* seconds (default 15), it loads SocketServer. The problem is caused by an L2 bridging feature called *Spanning Tree Algorithm* (STA) in some Ethernet switches. In some cases, this feature is enabled by default in the switch. This features causes timeout problems on certain L2 protocols, such as the Comtrol MAC mode. The above process fails when STA is running because the switch blocks packets for 30 seconds after the RTS is rebooted. Therefore, the ID query is not received by the RTS and after 15 seconds the RTS loads SocketServer. After 30 seconds, NS-Link finally can do an ID query, which reveals that the RTS is not in RedBoot. NS-Link therefore reboots the device, and the process repeats. **Solution:** L2 bridging is rarely used in the industry, and is basically obsolete. There are a number of ways to resolve the problem. More than one method may be required and these may be used in combination with each other: 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 RTS, set the timeout value to 0 (to disable loading of SocketServer) or 120. The command from the RedBoot prompt is *Timeout 120* without the quotes.
The Comtrol device has a lower limitation of network bandwidth requirement of 64 Kbps.	At this speed the entire available bandwidth is required for the purpose of uploading the firmware from the driver to the Comtrol device. At lower speeds, timing issues will prevent the firmware from being successfully installed to the Comtrol device, thus preventing the device from normal operation. When using the Comtrol device over a WAN link that is less than the recommended 64 Kbps, a timing modification may be made that will allow uploading of the firmware. Load the driver locally to the device for the purpose of getting the firmware installed. The PC on the other side of the slow link can then *share* the port. The sharing may be exclusive as the firmware loader PC may not need to access the ports.

Daisy-Chaining DeviceMaster RTS 4/8/16 Units

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

When using the **UP** and **DOWN** ports, the DeviceMaster RTS 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 DeviceMaster RTS 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 RTS 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.

        See http://www.optronics.gr/Tutorials/ethernet.htm for more specific information.

        Additional information may be found at: http://compnetworking.about.com/cs/ethernet1/ or by searching the web.

Technical Support

If you need technical support, contact Comtrol using one of the following methods.

Contact Method	Corporate Headquarters	Comtrol Europe
FAQ/Online	http://support.comtrol.com/support.asp	
Downloads	http://support.comtrol.com/download.asp	
Email	support@comtrol.com	support@comtrol.co.uk
Web site	http://www.comtrol.com	http://www.comtrol.co.uk
Fax	(763) 494-4199	+44 (0) 1 869-323-211
Phone	(763) 494-4100	+44 (0) 1 869-323-220

Appendix A. RTS 1-Port Embedded System Installation

This Appendix only discusses the RTS 1-Port Embedded. See *Hardware Installation* on Page 5 for installation procedures for other RTS models.

Installation Overview

Installing the RTS 1-Port Embedded system follows these basic steps:

- Building the serial ribbon cable.
- Mounting the RTS and installing light pipes.
- Attaching the serial and network cables.
- Applying power to the RTS and verifying installation.

Building the Serial Ribbon Cable

Use the following information to build a DB9 serial ribbon cable to connect to the RTS 1-Port Embedded IDC connector (**J2**).

IDC10	1	2	3	4	5	6	7	8	9
DB9M	1	6	2	7	3	8	4	9	5

J2 Header	RS-232	RS-422	RS-485
1	CD	Not used	Not used
2	TxD	TxD-	TRX-
3	GND	Not used	Not used
4	RTS	TxD+	TRX+
5	RI	Not used	Not used
6	RxD	RxD-	Not used
7	DTR	Not used	Not used
8	DSR	Not used	Not used
9	CTS	RxD+	Not used
10	Not connected		
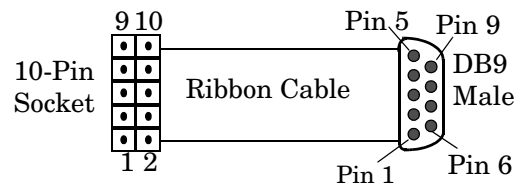
Mounting the RTS

Use the following procedure to mount the RTS 1-Port Embedded.

1. Carefully remove the RTS 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 RTS because you may need it during configuration.*

2. Mount the RTS as appropriate for your environment using 1/4" stand-offs to separate the RTS from the base.
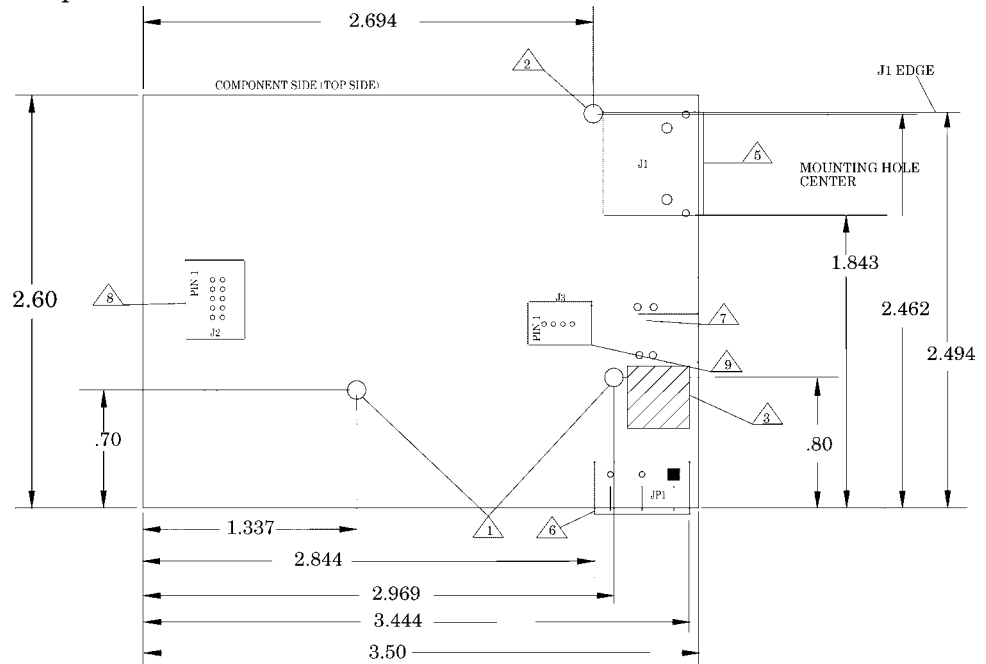
⚠1 Non-plated/non-grounded mounting holes 0.116" diameter (+/-0.003").

⚠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 J1: J1 overhangs board edge by 0.14" and the the height is 0.55".

⚠7 LED light pipe mounting holes.

⚠8 Serial port connector J2: 0.1" pin spacing, 0.025" square pin diameter, and 0.230" pin height.

⚠9 Debug port connector J3: 0.1" pin spacing, 0.025" square pin diameter, and 0.230" pin height.

Note: *The maximum diameter of the metal stand-offs should be 0.175" with a 4-40 machine screw.*

*   **Chassis ground connection through the power cable**: stand-offs can be metal or plastic.

*   **No Chassis ground connection through power supply**: stand-offs must be metal.

3. 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 RTS, 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 *RTS 1-Port Embedded* on Page 23.

1. Attach the ribbon cable built in *Building the Serial Ribbon Cable* on Page 33 to the header labeled **J2**.
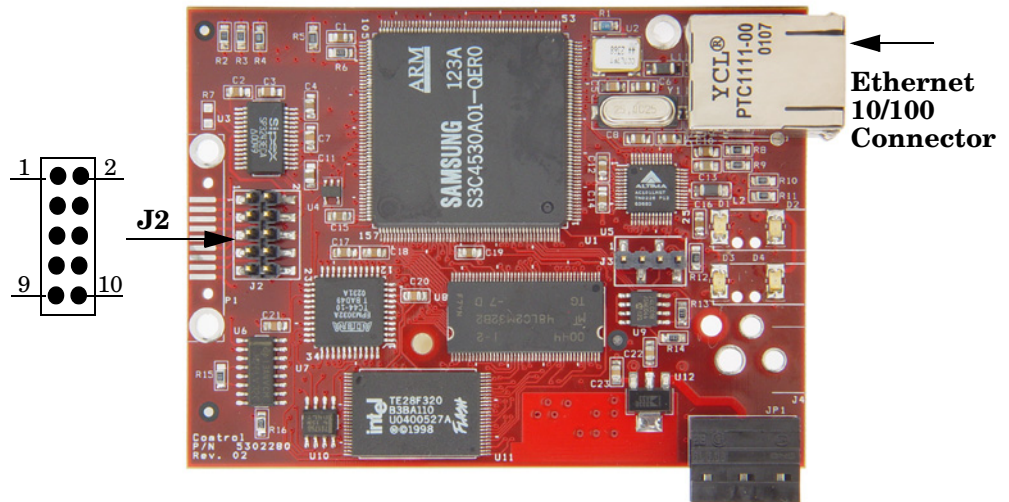
2. Connect a standard Ethernet cable from the RJ45 port on the RTS to your Ethernet hub or a crossover cable to a server NIC.

    The NS-Link device driver's default port setting is RS-232. Make sure that you do not connect RS-422/485 devices until the appropriate port interface type has been configured in NS-Link.

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 supply power to the RTS and verify the hardware installation.

1. Wire the supplied screw terminal connector to a 5VDC local power source as shown below.

    Note: *Observe proper ESD techniques when connecting and disconnecting the RTS.*

Caution
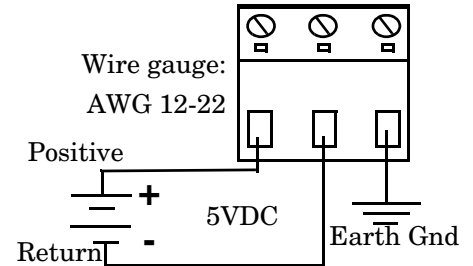
2. Plug the screw terminal connector into **JP1** by aligning the scalloped edge.

3. Apply power to the RTS.

4. Verify that the network connection for the RTS is functioning properly.

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

    - An amber **Status** LED (D1) on the RTS should be lit, indicating you have power and it has completed the boot sequence.

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

    - The red **Link Active** LED (D2) should be lit, indicating that you have a working Ethernet connection.

    - If the **Duplex** (D3) LED is lit, it indicates full duplex activity.

    - If the red **100** (D4) LED is lit, it indicates a working 100 MB Ethernet connection (100 MB network, only).

5. Go to *Configuring the Network Setup* on Page 12 for default network settings and how to configure the RTS for use.

Index