Cat5 Reach DVI HD

User Guide

Release 1.0.0

Copyright © 2018 Raritan, Inc.
C5RdviHD-0A-v1.0.0-E
November 2018
255-80-0058-00

This document contains proprietary information that is protected by copyright. All rights reserved. No part of this document may be photocopied, reproduced, or translated into another language without express prior written consent of Raritan, Inc.

© Copyright 2018 Raritan, Inc. All third-party software and hardware mentioned in this document are registered trademarks or trademarks of and are the property of their respective holders.

FCC Information

This Equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, 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 to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.

- Increase the separation between the equipment and 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.

VCCI Information (Japan)

この装置は、情報処理装置等電波障害自主規制協議会（ＶＣＣＩ）の基準に基づくクラスＢ情報技術装置です。この装置は、家庭環境で使用することを目的としていますが、この装置がラジオやテレビジョン受信機に近接して使用されると、受信障害を引き起こすことがあります。
取扱説明書に従って正しい取り扱いをして下さい。

Raritan is not responsible for damage to this product resulting from accident, disaster, misuse, abuse, non-Raritan modification of the product, or other events outside of Raritan's reasonable control or not arising under normal operating conditions.

If a power cable is included with this product, it must be used exclusively for this product.

CE

Rack-mount Safety Instructions

- *Elevated Operating Ambient:*

  If installed in a closed or multi-unit rack assembly, the operating ambient temperature of the rack environment may be greater than room ambient. Therefore, consideration should be given to installing the equipment in an environment compatible with the maximum ambient temperature (Tma) specified by the manufacturer.
- *Reduced Air Flow:*

  Installation of the equipment in a rack should be such that the amount of air flow required for safe operation of the equipment is not compromised.
- *Mechanical Loading:*

  Mounting of the equipment in the rack should be such that a hazardous condition is not achieved due to uneven mechanical loading.
- *Circuit Overloading:*

  Consideration should be given to the connection of the equipment to the supply circuit and the effect that overloading of the circuits might have on overcurrent protection and supply wiring. Appropriate consideration of equipment nameplate ratings should be used when addressing this concern.
- *Reliable Earthing:*

  Reliable earthing of rack-mounted equipment should be maintained. Particular attention should be given to supply connections other than direct connections to the branch circuit (e.g. use of power strips).

Contents

Rack-mount Safety Instructions iii

Chapter 1 Introduction 1

Product Features ... 1
Package Contents ... 2
Product Overview ... 3
Cat5 Reach DVI HD Transmitter (C5R-DVI-HD-TX) ... 3
Cat5 Reach DVI HD Receiver (C5R-DVI-HD-RX) ... 5

Chapter 2 Installation 8

Rack Mounting Cat5 Reach DVI HD ... 8
Basic Installation -- Unicast Mode ... 9
Connecting a Keyboard/Mouse/Video Source ... 9
Extending the Distance via Gigabit Ethernet Switches ... 13
(Optional) Making an RS-232 Connection ... 15
Advanced Installation -- Broadcast Mode ... 23
Changing the Operation Mode ... 24
Connecting Multiple Receivers to One Transmitter ... 28
KVM Switch Scenarios ... 30
Compatible Raritan KVM Switches or Products ... 30
Connecting KVM Switches ... 31
Audio Broadcasting ... 35

Chapter 3 Operation 36

Three Types of Console Modes ... 36
Using EDID for Video Synchronization in the Broadcast Mode ... 37
Resetting the Transmitter's EDID ... 38
Firmware Upgrade ... 39

Appendix A Specifications 45

Cat5 Reach DVI HD Transmitter and Receiver ... 45
DVI-to-VGA Adapters ... 47
Supported and Unsupported Video Connections to Transmitter ... 48

Appendix B Ground Screw 51

Index 53

Chapter 1 Introduction

The Cat5 Reach DVI HD KVM extender enables you to place your VGA or DVI monitor, USB keyboard, USB mouse, speakers, and microphone up to 3,300 feet (1,000 meters) away from your computer, server, or KVM switch.

There are two types of Cat5 Reach DVI HD devices: one is the transmitter (C5R-DVI-HD-*TX*), and the other is the receiver (C5R-DVI-HD-*RX*).

In This Chapter

Product Features.....1
Package Contents.....2
Product Overview 3

Product Features

The Cat5 Reach DVI HD supports the following features:

- Transmission of keyboard, mouse, analog video, and analog audio signals
- VGA and DVI-I video interfaces
- A maximum of video resolution at 1920 x 1200 @60Hz
- Connection of USB flash drives and USB 2.0 hubs
- Connection of USB HID devices, including (but not limited to):
  - USB 1.1 keyboard and mouse
  - USB 1.1 touch screen
  - USB 2.0 printer
  - USB 1.1 barcode reader
- Connection of RS-232 peripheral devices
- Easy switching between dual console and single console modes via a button press
- Two types of Cat5 Reach DVI HD operations: *Unicast* and *Broadcast* modes
- **Unicast mode** comprises a pair of transmitter and receiver, with or without any Gigabit Ethernet switch connected in between. Its maximum distance is:
  - 330 feet (100 meters), without Gigabit Ethernet switches connected.
  - 3,300 feet (1,000 meters), with Gigabit Ethernet switches connected.

Note: For the requirement of Gigabit Ethernet switches, see **Basic Installation -- Unicast Mode** *(on page 9).*

- **Broadcast mode** comprises one transmitter and multiple receivers, with one or multiple Gigabit Ethernet switches connected in between. A total distance of 1,000 feet (300 meters) is supported.

Important: To make the Broadcast mode work properly, some equipment must meet the requirements. See **Advanced Installation -- Broadcast Mode** *(on page 23).*

- Extended or display identification data (EDID) emulation to synchronize video resolutions of a monitor
- Compatibility with common operating systems, including DOS, Windows, Linux, Mac OS/OSX and Sun Microsystems
- BIOS level operation
- Use of Microsoft Intellimouse 3- to 5-key mouse and Microsoft Natural Keyboard Pro series
- Firmware upgradeable

Package Contents

Unpack the components. If anything is missing or damaged, contact the local dealer or Raritan Technical Support for help.

Items	Quantity
C5R-DVI-HD-TX transmitter	1
C5R-DVI-HD-RX receiver	1
DC 5V 3A power adapter	2
DVI-I to VGA adapter	2
1.8-meter audio/microphone cable	1
USB-B to USB-A adapter cable	1
DVI cable	1
Rackmount kit	2
Quick Setup Guide	1
Warranty card	1

Product Overview

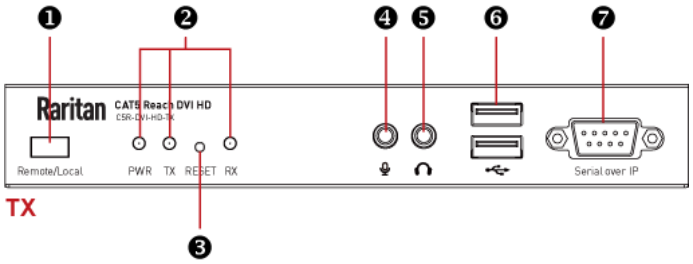
This section describes the ports or components implemented on the Cat5 Reach DVI HD transmitter and receiver.

Cat5 Reach DVI HD Transmitter (C5R-DVI-HD-TX)

The transmitter can be connected to a computer, server, KVM switch or multimedia device.

In the following tables, an "IT device" can be one of the devices the transmitter supports. For details, see *Basic Installation -- Unicast Mode* (on page 9).

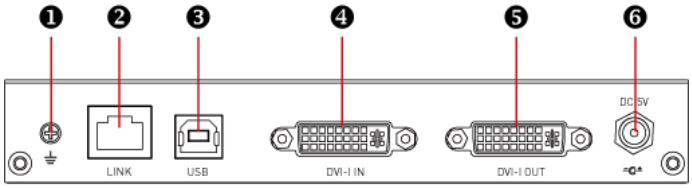
Front View



Number	Component	Description
❶	Remote/Local button	Press this button to switch among three types of console modes: ▪ Dual console ▪ Remote console ▪ Local console See *Three Types of Console Modes* (on page 36).
❷	LEDs	There are three LEDs. ▪ *PWR*: When the transmitter is powered on, this LED is powered on. ▪ *TX*: As long as the local console is enabled, this LED is lit. ▪ *RX*: As long as the remote console is enabled, this LED is lit.

Number	Component	Description
❸	Reset button	Press this button, using a pen or paper clip, to reset the transmitter.
❹	Microphone in	Connect to the Microphone jack of an IT device.
❺	Audio in	Connect to the Audio out jack of an IT device.
❻	USB keyboard/mouse/device ports	These USB ports support different types of USB devices. ▪ Connect a USB keyboard and a USB mouse, or connect to the USB keyboard/mouse port of a KVM drawer or a KVM switch's CIM. Connect other USB devices, such as a USB flash drive.
❼	Serial over IP port	Connect to the RS-232 serial port of an IT device. See *(Optional) Making an RS-232 Connection* (on page 15).

Rear View



TX

Number	Items	Description
❶	Ground screw	The screw helps to prevent any electrical shock when connected to a wiring system. See *Ground Screw* (on page 51).
❷	RJ-45 LINK port	Connect to the receiver via a Cat5e/6 cable.
❸	USB-B port	Connect to the USB-A port of the IT device for USB keyboard/mouse inputs.
❹	DVI-I IN port	Connect to the VGA or DVI port of an IT device.

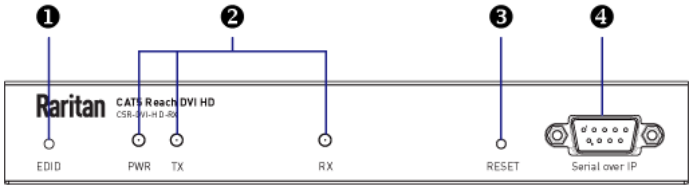
Number	Items	Description
❺	DVI-I OUT port	Connect a VGA or DVI monitor, or connect to the Video In port of a KVM drawer or a KVM switch's CIM. *Note: A DVI-to-VGA adapter is required if using a VGA monitor. The DVI-I to VGA adapters are included in the package. See* **DVI-to-VGA Adapters** *(on page 47).*
❻	Power input port	Connect the power adapter.

Important: When using the DVI-I to VGA adapter, always connect "both" adapters and "both" VGA devices to both DVI ports of the transmitter. See *Supported and Unsupported Video Connections to Transmitter* **(on page 48).**

Cat5 Reach DVI HD Receiver (C5R-DVI-HD-RX)

The receiver is connected to the remote console, which usually comprises a monitor, keyboard and mouse.

Front View

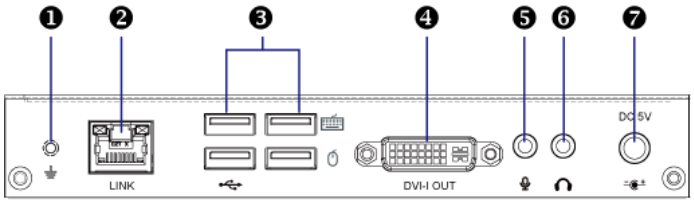


RX

Number	Items	Description
❶	EDID button	Press the EDID button to copy EDID data of the receiver to the transmitter. This action must be performed only when your configuration is the Broadcast mode. See ***Advanced Installation -- Broadcast Mode*** (on page 23).

Number	Items	Description
❷	LEDs	There are three LEDs. ▪ *PWR*: When the transmitter is powered on, this LED is powered on. ▪ *TX*: As long as the local console is enabled, this LED is lit. ▪ *RX*: As long as the remote console is enabled, this LED is lit.
❸	Reset button	Press this button, using a pen or paper clip, to reset the receiver.
❹	Serial over IP port	Connect to the RS-232 serial port of a peripheral device so that the transmitter's IT device can communicate with it via RS-232. See *(Optional) Making an RS-232 Connection* (on page 15).

Rear View



RX

Number	Items	Description
❶	Ground screw	The screw helps to prevent any electrical shock when connected to a wiring system. See *Ground Screw* (on page 51).
❷	RJ-45 LINK port	Connect to the transmitter via a Cat5e/6 cable.
❸	USB keyboard/mouse/device ports	These USB ports support different types of USB devices. ▪ Connect a USB keyboard and a USB mouse, or connect to the USB keyboard/mouse port of a KVM drawer or a KVM switch's CIM. ▪ Connect other USB devices, such as a USB flash drive.

Number	Items	Description
❹	DVI-I OUT port	Connect a VGA or DVI monitor, or connect to the Video In port of a KVM drawer or a KVM switch's CIM. *Note: A DVI-to-VGA adapter is required if using a VGA monitor. The DVI-I to VGA adapters are included in the package. See* **DVI-to-VGA Adapters** *(on page 47).*
❺	Microphone in	Connect a microphone.
❻	Audio out	Connect speakers.
❼	Power input port	Connect the power adapter.

Chapter 2 Installation

This section provides instructions on how to install the Cat5 Reach DVI HD in various ways. Basically, there are two types of configurations:

- Unicast Mode: One transmitter is connected to one receiver only, with or without Ethernet switches connected.
- Broadcast Mode: One transmitter is connected to multiple receivers via Ethernet switches.

In This Chapter

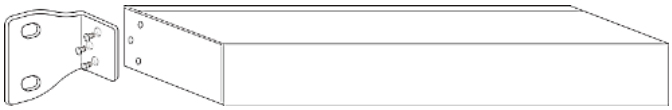
Rack Mounting Cat5 Reach DVI HD 8
Basic Installation -- Unicast Mode 9
Advanced Installation -- Broadcast Mode 23
KVM Switch Scenarios 30
Audio Broadcasting 35

Rack Mounting Cat5 Reach DVI HD

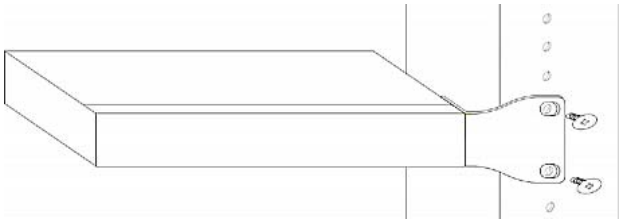
Cat5 Reach DVI HD transmitter and receiver can be mounted in a standard rack. To rack mount a transmitter or a receiver, use the brackets and screws in the package. You can mount the Cat5 Reach DVI HD units facing the front of the rack or the rear.

▶ **To rack mount Cat5 Reach DVI HD:**

1. Secure a bracket to the unit (transmitter or receiver) with three of the included screws. Only one bracket for each unit. You can attach the rackmount bracket to either side of the Cat5 Reach DVI HD device, depending on your need.



2. Fasten the Cat5 Reach DVI HD device to the rack via the rackmount bracket.



Basic Installation -- Unicast Mode

The basic configuration consists of one transmitter, one receiver and one Cat5e/6 cable. The maximum cable length supported between the transmitter and receiver is 330 feet (100 meters).

Connect the keyboard/mouse/video (KVM) or audio/video source to the transmitter, and you will be able to control it remotely through the receiver.

Tip: To increase the number of remote consoles, see **Advanced Installation -- Broadcast Mode** *(on page 23).*

Equipment that can be connected to the Cat5 Reach DVI HD transmitter, including (but not limited to):

- A computer or server
- A KVM switch
- A computer workstation

Equipment that can be connected to the Cat5 Reach DVI HD receiver:

- A set of USB keyboard, USB mouse, and VGA or DVI monitor
- Speakers
- A microphone
- A KVM switch
- A KVM drawer

Requirements for this configuration:

- To expand the distance between the transmitter and receiver up to 3,300 feet (1,000 meters), Gigabit Ethernet switches with "IGMP v2 and 8K Jumbo Frames" functions are required. See ***Extending the Distance via Gigabit Ethernet Switches*** (on page 13).
- All monitors connected to this configuration must share the same maximum video resolution.

Connecting a Keyboard/Mouse/Video Source

This section illustrates the connection to a device that sends keyboard/mouse/video signals, such as a computer.

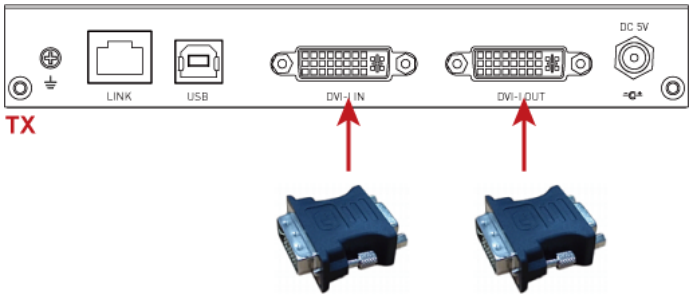
To configure a basic installation for a computer:

1. Turn off all devices, except for the computer.
   - The computer must be turned ON first for proper video detection.

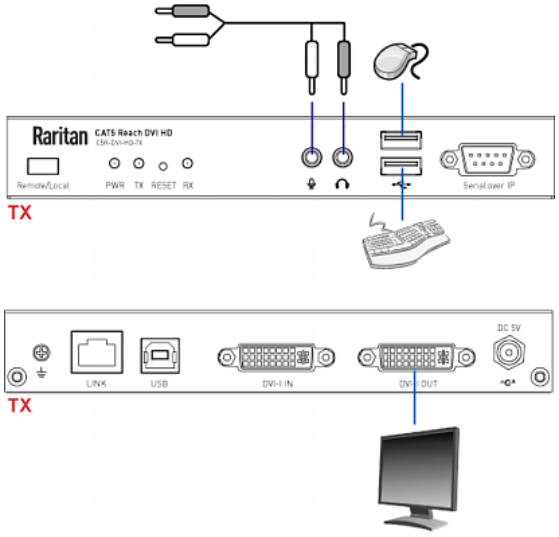
2. (Optional) To set up a local console, connect the KVM input/output devices to the **transmitter**.
   a. Connect a USB keyboard and mouse to the USB ports on the front panel.
   b. Connect a VGA or DVI monitor to the DVI-I OUT port on the back panel.

      If connecting a DVI monitor, the video source must also provide DVI connections.

      If connecting a VGA monitor, plug in the DVI-I to VGA adapter that is shipped with the Cat5 Reach DVI HD before connecting the monitor. Whenever the DVI-I to VGA adapter is used on the transmitter, always connect "two" adapters and "two" VGA devices to both DVI ports of the transmitter. See *Supported and Unsupported Video Connections to Transmitter* (on page 48).



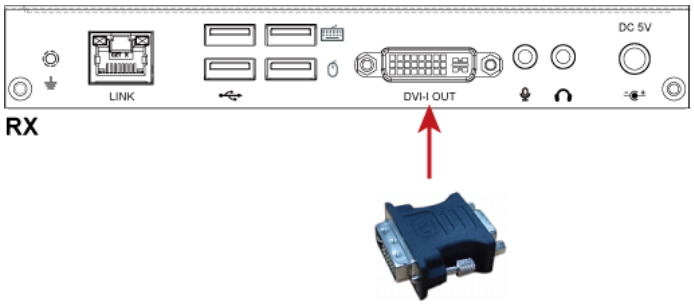
   c. (Optional) If the audio function is wanted, connect one end of the Raritan-provided audio/microphone cable to the Audio In and Microphone jacks on the front panel.



3. To set up the remote console, connect KVM input/output devices to the **receiver**.

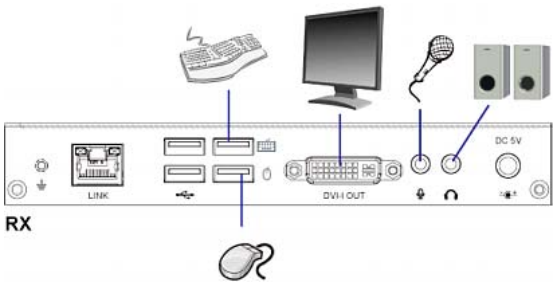
a. Connect a USB keyboard and mouse to the USB ports on the back panel.

b. Connect a VGA or DVI monitor to the DVI-I OUT port on the back panel. If connecting a VGA monitor, the DVI-I to VGA adapter that is shipped with the Cat5 Reach DVI HD is required.

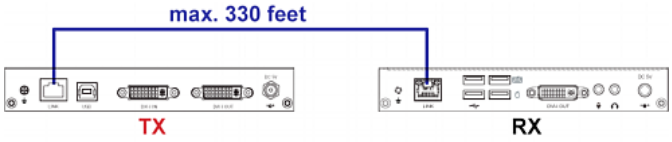


Note: In case you have used two DVI-I to VGA adapters on the transmitter, you need to purchase one more from Raritan if you will connect a VGA monitor to the receiver.

c. (Optional) For the audio function, connect the speakers and microphone to the Audio Out and Microphone jacks on the back panel.



4. Use a Cat5e/6 cable up to 330 feet (100 meters) long to connect the transmitter and receiver. Plug either end of the cable into the RJ-45 LINK ports.

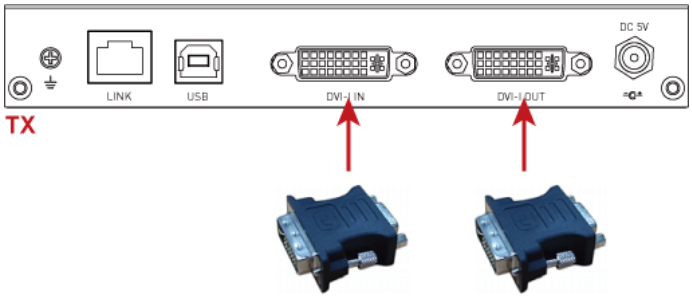


5. Connect the computer to the **transmitter**.

   a. Plug one end of the Raritan-provided DVI cable into the DVI-I IN port on the back panel, and the other end into the computer's video port.

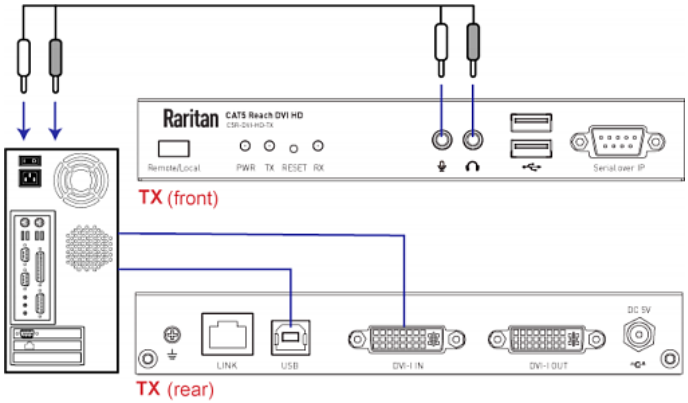
   If the computer's video port is DVI-I, which transmits both VGA and DVI-D video signals, by default the transmitter only receives the DVI-D signals.

A DVI-I to VGA adapter is required if only the VGA port is available on your computer. This adapter is included in the package. Whenever the DVI-I to VGA adapter is used on the transmitter, always connect "two" adapters and "two" VGA devices to both DVI ports of the transmitter. See ***Supported and Unsupported Video Connections to Transmitter*** (on page 48).



b. Plug the USB-B connector of the Raritan-provided USB cable into the USB-B port on the back panel, and the other end into the computer's USB-A port.

c. (Optional) If the audio/microphone cable has been connected to the transmitter in Step 2, plug the other end of the audio/microphone cable into the computer's Audio In and Microphone In jacks.



6. Connect the transmitter and receiver to a power source respectively. Each device's PWR LED is then lit.

   Note that TX and RX LEDs on both the transmitter and receiver should be also lit per factory default because the default console mode is dual console mode. See ***Three Types of Console Modes*** (on page 36).

To replace the VGA monitor connected to the receiver:

In the Unicast mode, if the video port of the computer connected to the transmitter is "VGA", and the new monitor that you want to replace with on the receiver is also a "VGA" monitor, you must follow the replacement procedure below for the new VGA monitor to work properly.

1. Go to the receiver, and replace its old monitor with the new "VGA" monitor.
2. Go to the transmitter, unplug the computer's video connector from the transmitter, and then re-plug it back into the transmitter.

Extending the Distance via Gigabit Ethernet Switches

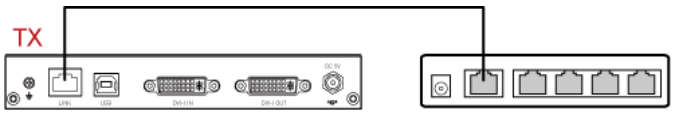
The maximum length of the Cat5e/6 cable connected directly between a transmitter and a receiver is limited to 330 feet (100 meters). You can expand the distance up to 3,300 feet (1,000 meters) by cascading up to 9 Gigabit Ethernet switches in between.

Gigabit Ethernet switches with "IGMP v2 and 8K Jumbo Frames" functions are required.

Warning: You CANNOT connect additional devices or utility to the remaining ports of any Ethernet switch connected between the Cat5 Reach DVI HD transmitter and receiver, or there will be communication problems between them.

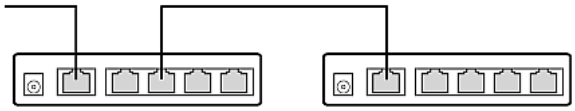
To extend the distance via Gigabit Ethernet switches:

1. Turn off all devices.
2. Set up an optional local console with the transmitter, and a remote console with the receiver. For details, see *Basic Installation -- Unicast Mode* (on page 9).
3. Use a Cat5e/6 cable up to 330 feet (100 meters) long to connect the transmitter to a Gigabit Ethernet switch.
   - Plug one end of the cable into the RJ-45 LINK port on the transmitter and the other end into the LINK port on the Ethernet switch.

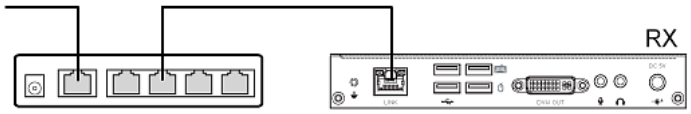


4. To extend the distance, use an additional Cat5e/6 cable up to 330 feet (100 meters) long to connect the Gigabit Ethernet switch attached with the transmitter to an additional Gigabit Ethernet switch.

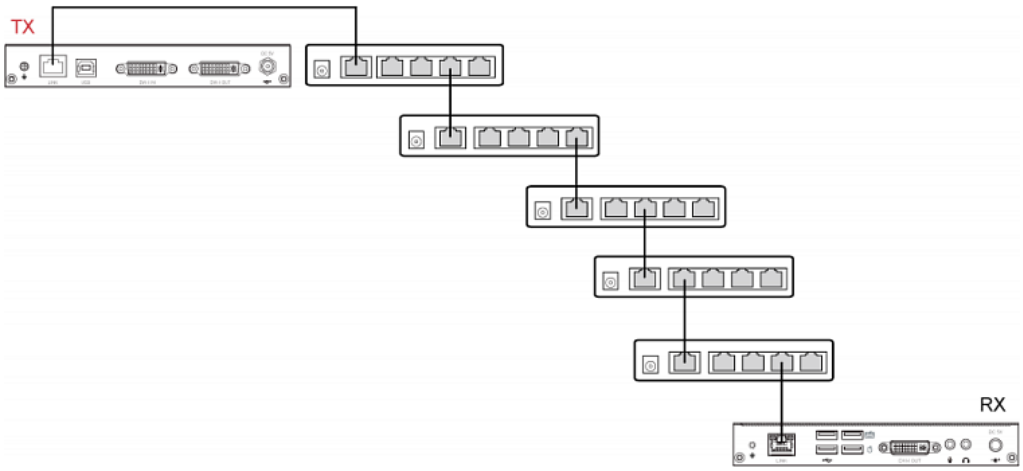
- Plug one end of the cable into one of the LAN ports on the prior Ethernet switch and the other end into the LINK port on the subsequent Ethernet switch.



5. Repeat the above step to connect additional Gigabit Ethernet switches.
6. Use a Cat5e/6 cable up to 330 feet (100 meters) long to connect the receiver to the final Gigabit Ethernet switch.
   - Plug one end of the cable into one of the LAN ports on the final Ethernet switch and the other end into the RJ-45 LINK port on the receiver.
   - Note that the total distance of this chain cannot exceed 3,300 feet (1,000 meters).



The diagram below illustrates the connection pattern.



7. Connect the computer or audio/video device to the transmitter. See *Basic Installation -- Unicast Mode* (on page 9).
8. Turn on the connected computer or audio/video device first for proper video detection.
9. Connect the transmitter and receiver to an appropriate power source respectively. Each device's Power LED is then lit.

(Optional) Making an RS-232 Connection

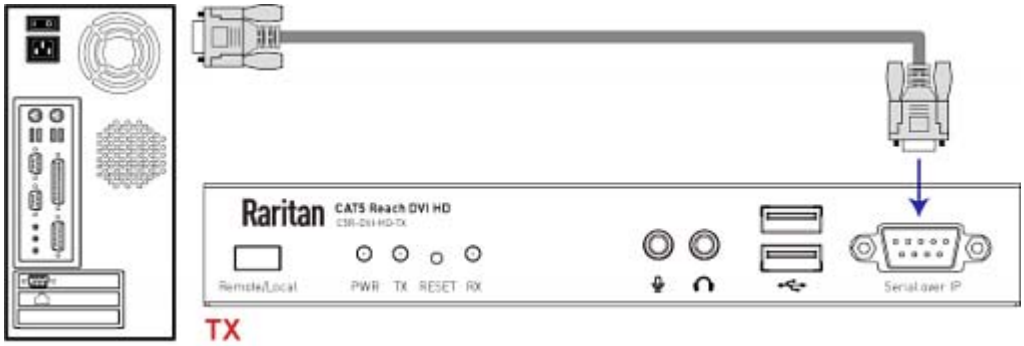
If your computer (or any appropriate device) must communicate with another peripheral device via RS-232 interface, then make an RS-232 connection among Cat5 Reach DVI HD, the computer and that peripheral device.

In the following illustration, it is assumed that your peripheral device is Raritan's PDU. Then you can have the computer access that PDU's command line interface by making an RS-232 connection.

To make an RS-232 connection:

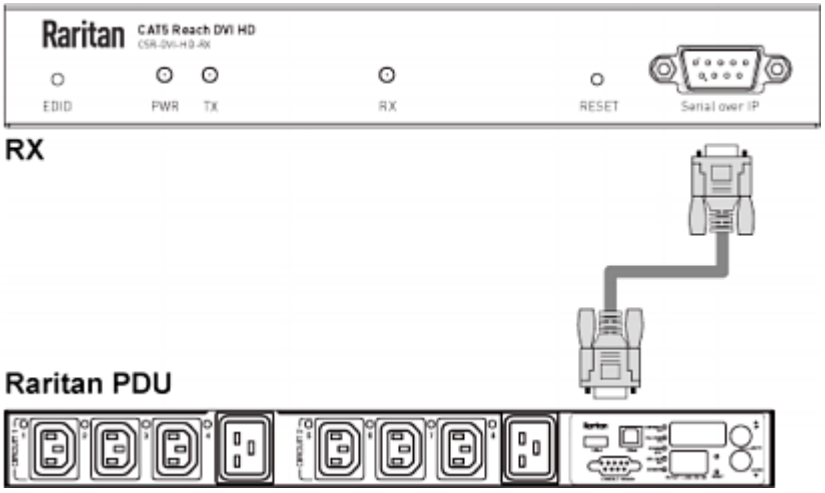
1. By default, "Serial over IP" (RS-232) ports of both Cat5 Reach DVI HD devices are configured as below.
   - Baud rate: *115,200 bps*
   - Data bits: *8*
   - Parity: *None*
   - Stop bits: *1*

   To change the default setting, see ***Changing the Default Baud Rate Settings*** (on page 16).
2. Connect an RS-232 cable between the computer's RS-232 port and the transmitter's "Serial over IP" port.



3. Connect an RS-232 cable between the receiver's "Serial over IP" port and the Raritan PDU's RS-232 port.

Note: Depending on the Raritan PDU model you purchased, an RJ-45 to RS-232 adapter cable may be required.



4. Make sure the transmitter and receiver are connected to each other via a Cat5e/6 cable. See ***Basic Installation -- Unicast Mode*** (on page 9).

Changing the Default Baud Rate Settings

Below are the factory default baud rate settings of Cat5 Reach DVI HD serial ports.

- Baud rate: *115,200 bps*
- Data bits: *8*
- Parity: *None*
- Stop bits: *1*

If the default settings do not meet your needs, change the baud rate settings of both the transmitter and receiver. To do so, you need a computer with:

- A zero-configuration (zeroconf) networking tool installed
- TCP/IP settings properly configured

▶ **Main procedure:**

- ***Step (1): Downloading a Zeroconf Networking Tool*** (on page 17)
- ***Step (2): Computer Connection and TCP/IP Configuration*** (on page 17)
- ***Step (3): Modifying the Baud Rate Settings*** (on page 20)

Step (1): Downloading a Zeroconf Networking Tool

It is necessary to find the IP addresses of Cat5 Reach DVI HD devices for their operation mode configuration. Therefore, the computer must have a zeroconf networking tool installed, such as Bonjour Browser.

To download Bonjour Browser:

1. Make sure the computer is connected to the LAN.
2. Google and download Bonjour Browser (or any zeroconf tool you prefer) to the computer.
   - Bonjour Browser is a free tool.

3. Disconnect your computer from the LAN.

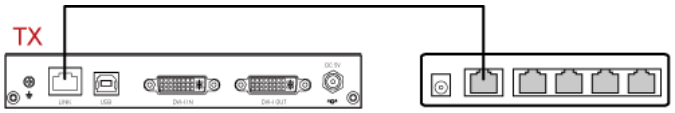
Step (2): Computer Connection and TCP/IP Configuration

A Gigabit Ethernet switch with "IGMP v2 and 8K Jumbo Frames" functions is required. Prior to the operation mode configuration, do the following:

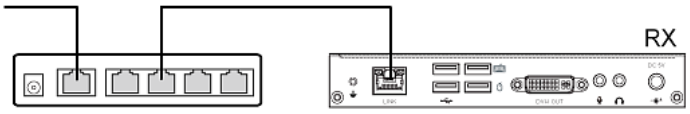
a. Connect all devices, including Cat5 Reach DVI HD and the computer, to the Gigabit Ethernet switch.
b. Configure the computer's TCP/IP settings properly.

Step (a): Connect all devices to the switch:

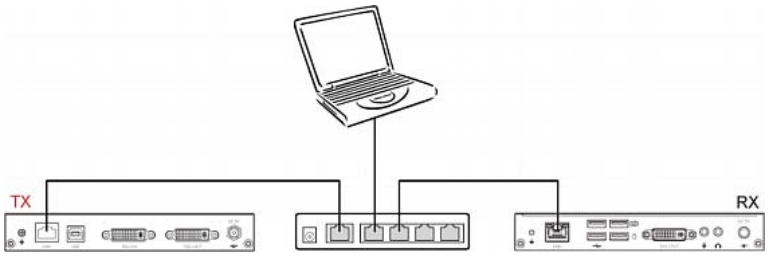
1. Connect the transmitter to a Gigabit Ethernet switch, using a Cat5e/6 cable up to 330 feet (100 meters) long.



2. Connect the receiver to the same Ethernet switch, using a Cat5e/6 cable up to 330 feet (100 meters) long.



3. Connect the computer to the same Ethernet switch.



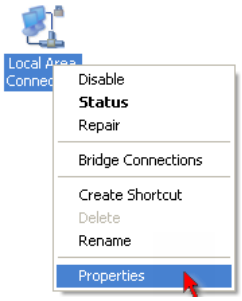
4. Power on all devices.

Step (b): Configure TCP/IP settings:

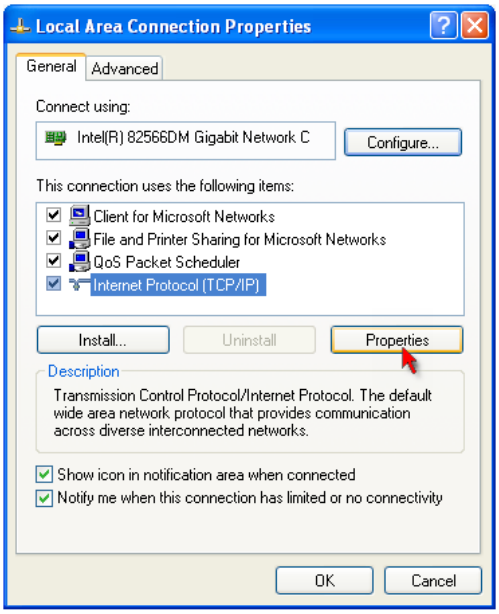
The illustration below is based on Windows XP, which may be different from your operating system. For proper procedure to configure TCP/IP settings, refer to the user documentation for your operating system.

1. Go to the above-mentioned computer that is connected to the Ethernet switch.
2. Choose Start > Control Panel > Network Connections.

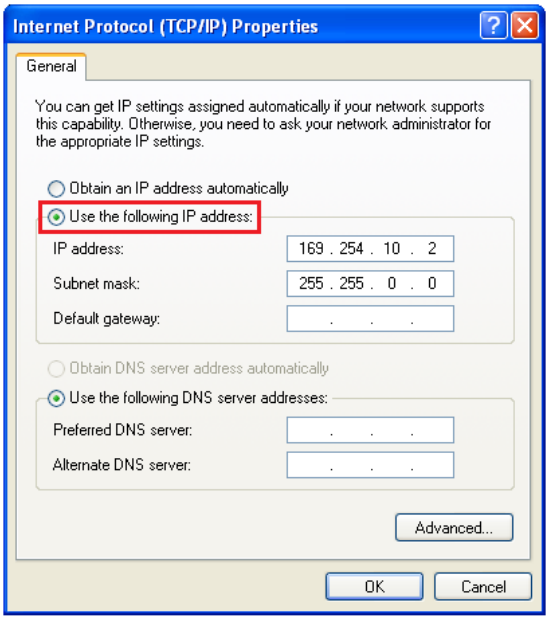
3. Right click on the Local Area Connection, and choose Properties.



4. Select "Internet Protocol (TCP/IP)" and click "Properties."



5. Select "Use the following IP address", and then specify the IP address and subnet mask according to the following rules:
   - IP address is *169.254.X.X*, where X can be any custom IP address number you prefer.
   - Subnet mask is *255.255.0.0*.



6. Click OK.

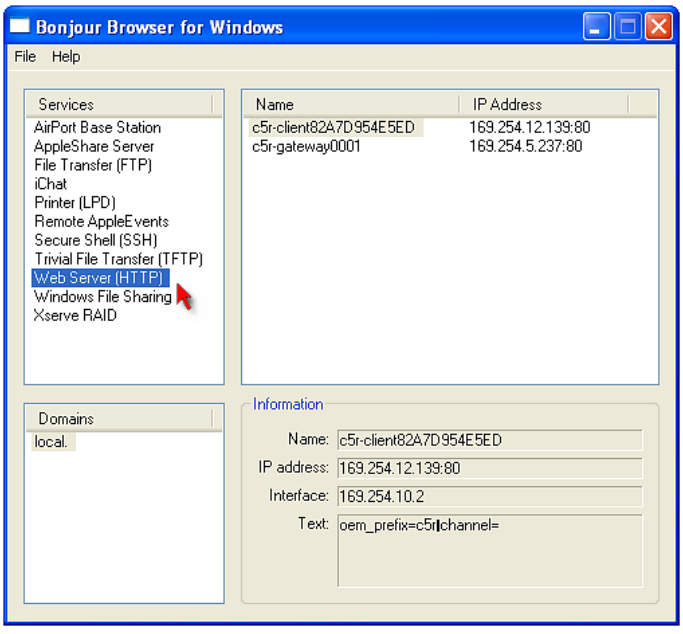
Step (3): Modifying the Baud Rate Settings

The baud rating settings of Cat5 Reach DVI HD devices must be identical to those of your RS-232 peripheral device for proper communications.

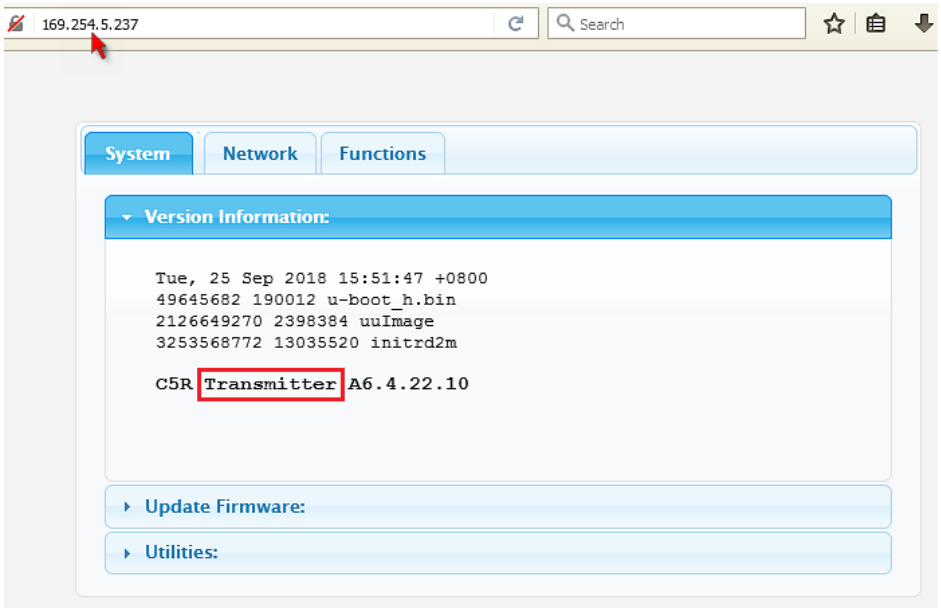
To change the baud rate settings:

1. Go to the computer that is connected to the Ethernet switch. See ***Step (2): Computer Connection and TCP/IP Configuration*** (on page 17).
2. Launch Bonjour Browser, or any zeroconf tool you have downloaded.

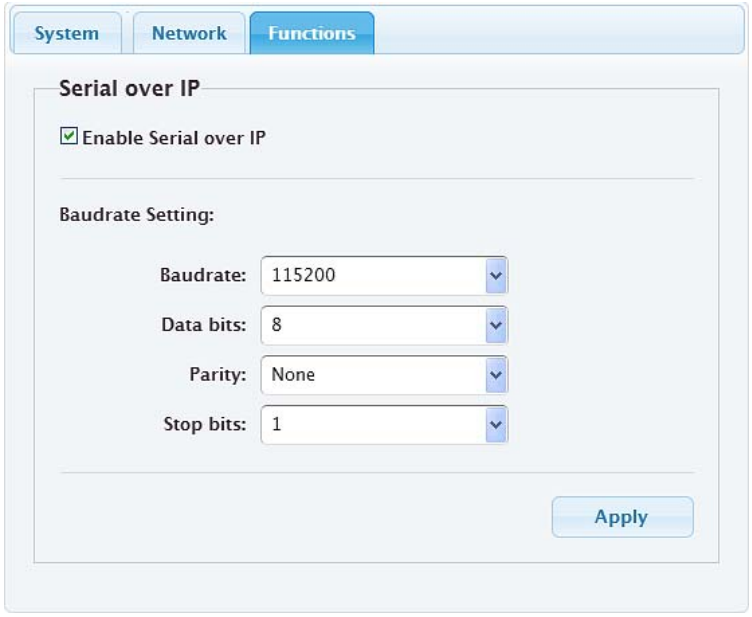
3. Select "Web Server (HTTP)" to display the IP addresses of both the transmitter and receiver.
   - **c5r-gateway**XXX: This refers to the transmitter. XXX is the transmitter's number.
   - **c5r-client**XXX: This refers to the receiver. XXX is the receiver's number.



4. Launch the web browser, and type the transmitter's IP address. The transmitter's web user interface displays.

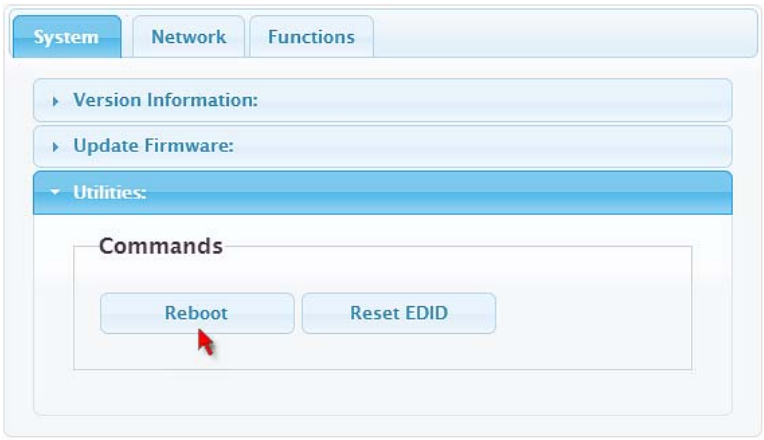


5. Click the Functions tab. Now you can change the baud rate settings.
   - To disable the serial port, deselect the Enable Serial over IP checkbox. By default, it is enabled.

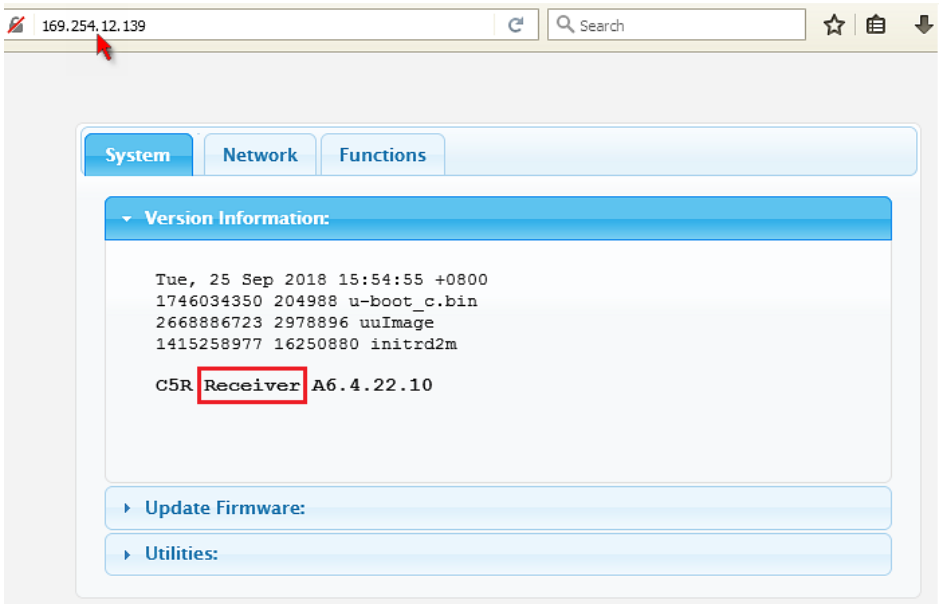


6. Click Apply to save the changes.
7. Click the System tab > Utilities section > Reboot.

- Reboot is required for the changed function to take effect.



8. Type the receiver's IP address in the browser to show the receiver's web user interface.



9. Repeat the same steps to change the receiver's baud rating settings.
   - The receiver's baud rate settings must be identical to the transmitter's.
10. Now you may disconnect both the transmitter and receiver from the Ethernet switch.

Next steps:

1. Connect other receivers to the same Ethernet switch.
2. Repeat the same steps as above to change the operation modes of these receivers.

3. Connect all receivers whose operation modes have been set to "Matrix" to the transmitter. See *Connecting Multiple Receivers to One Transmitter* (on page 28).

Advanced Installation -- Broadcast Mode

In this section, you will learn how to increase the number of remote consoles in a chain, using Gigabit Ethernet switches. This is the "Broadcast mode".

To make the Broadcast mode work properly, the following hardware requirements must be met.

Hardware requirements:

- Gigabit Ethernet switches with "IGMP v2 and 8K Jumbo Frames" functions are required.
- All monitors connected to this configuration must share the same maximum video resolution.

Cabling distance restrictions:

- The maximum distance between an Ethernet switch and the transmitter connected to the switch cannot exceed 330 feet (100 meters).
- The maximum distance between an Ethernet switch and each receiver connected to the switch cannot exceed 330 feet (100 meters).
- The maximum distance of the daisy chain cannot exceed 1,000 feet (300 meters).

Limitations in the Broadcast mode:

In the Broadcast mode, a few functions either do NOT work or work in a limited way.

- The following two functions on all receivers do NOT work anymore.
  - All USB functions except for USB keyboard/mouse functions
  - Microphone function
- All USB keyboards/mice connected to all receivers function on the *first-come-first-served* basis.
- The RS-232 extension function works on the *first-come-first-served* basis.

Main Procedure:

1. *Changing the Operation Mode* (on page 24) of the transmitter and all receivers.
2. *Connecting Multiple Receivers to One Transmitter* (on page 28).

Changing the Operation Mode

Before establishing a "Broadcast mode" connection, you must set the operation modes of all Cat5 Reach DVI HD devices to "Matrix".

The procedure to change the operation mode is similar to the procedure to change the baud rate settings.

Main procedure:

- *Step (1): Downloading a Zeroconf Networking Tool* (on page 17)
- *Step (2): Computer Connection and TCP/IP Configuration* (on page 17)
- *Step (3): Switching Operation Modes* (on page 24)

Step (3): Switching Operation Modes

By default, a Cat5 Reach DVI HD device is set to the "Extender" operation mode, which is for *Basic Installation -- Unicast Mode* (on page 9).

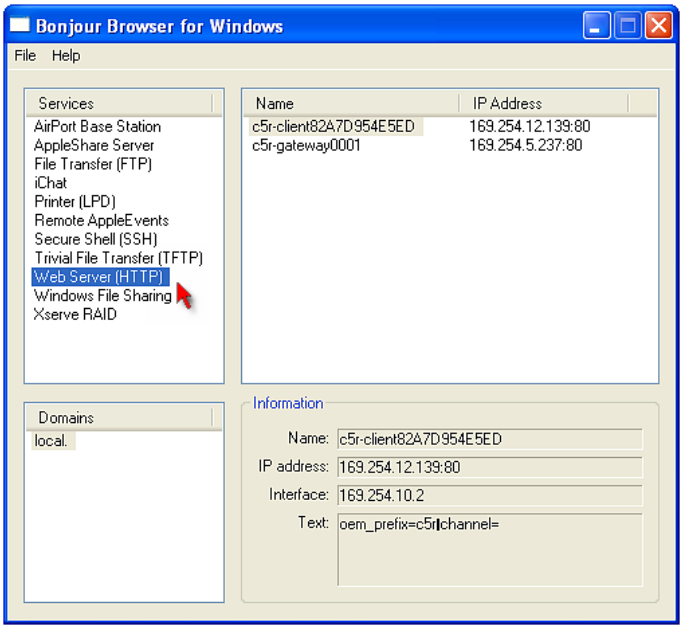
To make the "Broadcast mode" work properly, you must set all Cat5 Reach DVI HD devices to the "Matrix" operation mode, including the transmitter and all receivers.

To change the operation modes:

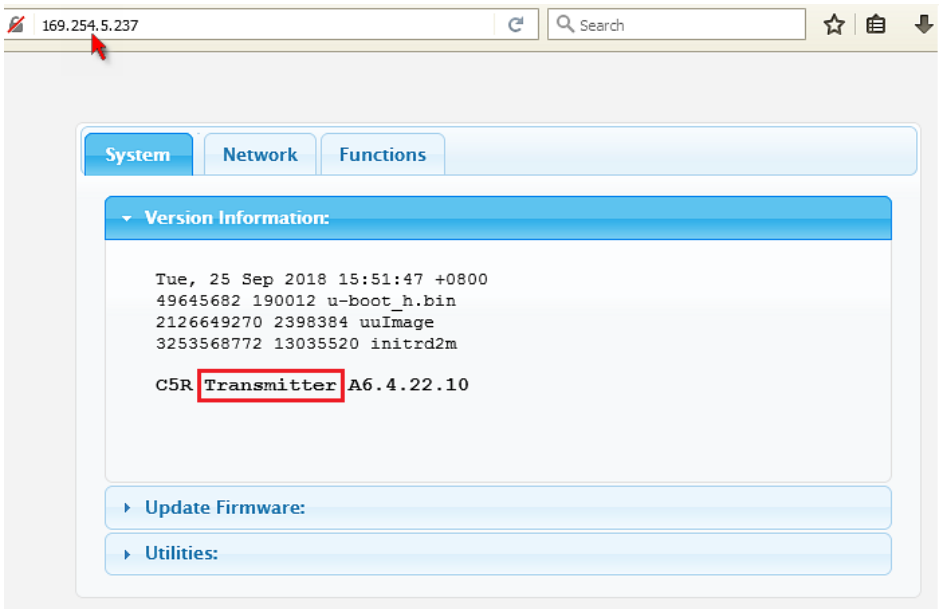
1. Go to the computer that is connected to the Ethernet switch. See *Step (2): Computer Connection and TCP/IP Configuration* (on page 17).
2. Launch Bonjour Browser, or any zeroconf tool you have downloaded.

3. Select "Web Server (HTTP)" to display the IP addresses of both the transmitter and receiver.
   - **c5r-gateway**XXX: This refers to the transmitter. XXX is the transmitter's number.

- **c5r-client**XXX: This refers to the receiver. XXX is the receiver's number.

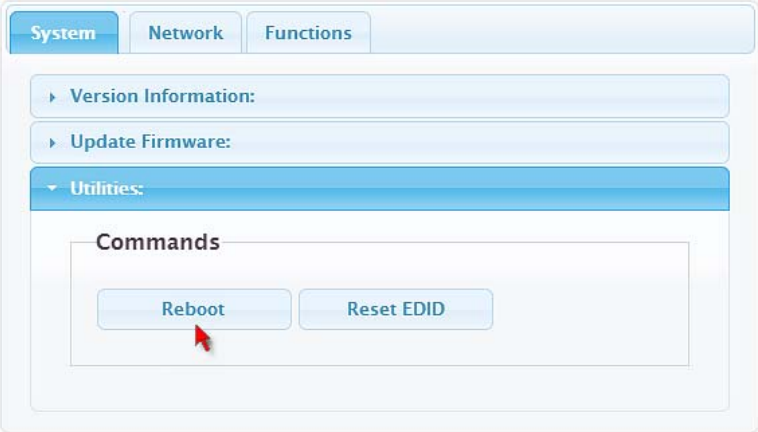


4. Launch the web browser, and type the transmitter's IP address. The transmitter's web user interface displays.

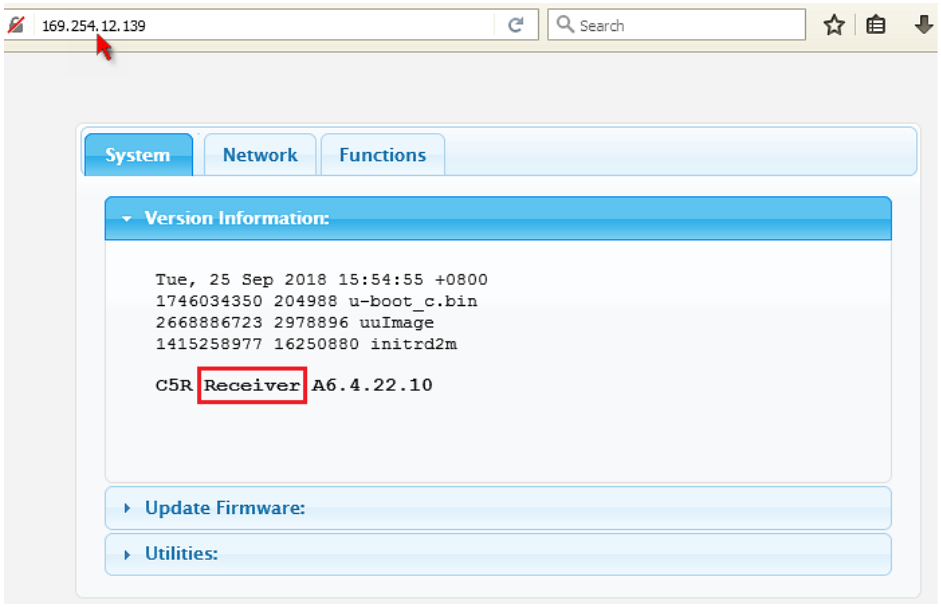


5. Click the Network tab > "Matrix" button > Apply.

6. Click the System tab > Utilities section > Reboot.
   - Reboot is required for the changed function to take effect.



7. Type the receiver's IP address in the browser to show the receiver's web user interface.



8. Repeat the same steps to also change the receiver's operation mode to "Matrix" and reboot it.
9. Now you may disconnect both the transmitter and receiver from the Ethernet switch.

Next steps:

1. Connect other receivers to the same Ethernet switch.
2. Repeat the same steps as above to change the operation modes of these receivers.
3. Connect all receivers whose operation modes have been set to "Matrix" to the transmitter. See *Connecting Multiple Receivers to One Transmitter* (on page 28).

Connecting Multiple Receivers to One Transmitter

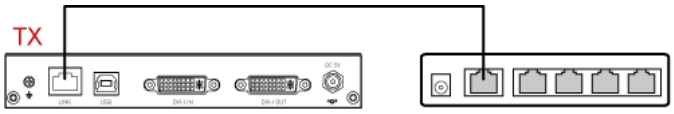
One transmitter can be connected to multiple receivers so that more than one remote user can view and control the computer or audio/video device connected to the transmitter.

This configuration requires the use of one or multiple Gigabit Ethernet switches with "IGMP v2 and 8K Jumbo Frames" functions. The maximum distance between the transmitter and the farthest receiver can be 1,000 feet (300 meters) by cascading Ethernet switches.

Warning: You CANNOT connect additional devices or utility to the remaining ports of any Ethernet switch connected between the Cat5 Reach DVI HD transmitter and receiver, or there will be communication problems between them.

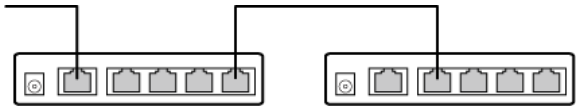
To connect multiple receivers:

1. Make sure all of Cat5 Reach DVI HD devices have been set to the "Matrix" operation mode. See *Changing the Operation Mode* (on page 24).
2. Turn off all devices, except for the computer or audio/video device that will be connected to the transmitter.
   - The computer or audio/video device must be turned on first for proper video detection.
3. Set up a local console with the transmitter, and a remote console with all receivers. For details, see *Basic Installation -- Unicast Mode* (on page 9).
4. Use a Cat5e/6 cable up to 330 feet (100 meters) long to connect the transmitter to a Gigabit Ethernet switch.
   - Plug one end of the cable into the RJ-45 LINK port on the transmitter and the other end into the LINK port on the Ethernet switch.

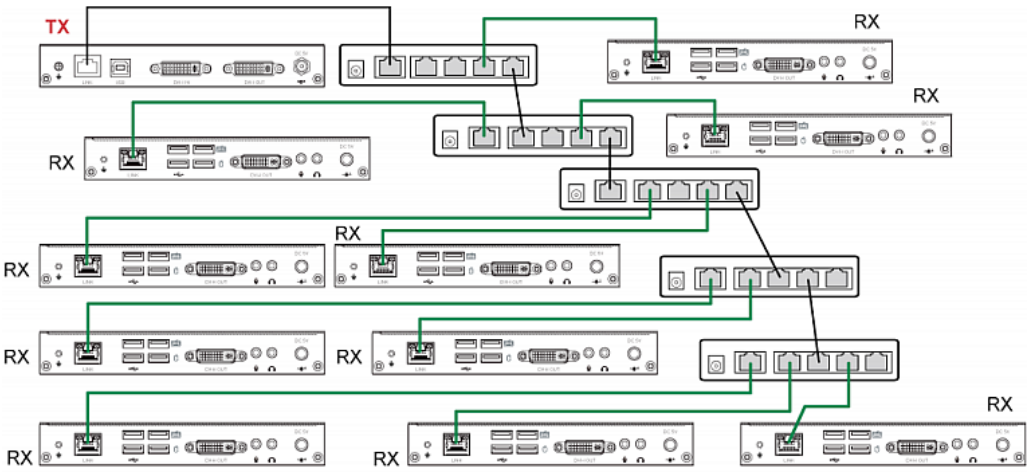


5. To extend the distance, use an additional Cat5e/6 cable up to 330 feet (100 meters) long to connect the Gigabit Ethernet switch attached with the transmitter to an additional Gigabit Ethernet switch.

- Plug one end of the cable into one of the LAN ports on the prior Ethernet switch and the other end into the LINK port on the subsequent Ethernet switch.



6. Repeat the above step to connect additional Gigabit Ethernet switches.
7. Connect each receiver you want to the Gigabit Ethernet switches via a Cat5e/6 cable up to 330 feet (100 meters).
   - Plug one end of the cable into one of the LAN ports on the Ethernet switch and the other end into the RJ-45 LINK port on the receiver.
   - Note that the total distance between the transmitter and the farthest receiver(s) cannot exceed 1,000 feet (300 meters).



8. Connect the computer or audio/video device to the transmitter. See *Basic Installation -- Unicast Mode* (on page 9).
9. Connect the transmitter and all receivers to appropriate power sources.
10. Power on all devices, including all monitors.
11. Use a pointed object, such as a pen, to press the EDID button on one of the receivers to synchronize the video resolutions of all monitors. See *Using EDID for Video Synchronization in the Broadcast Mode* (on page 37).

Important: For any re-copy operation of the EDID data after you have pressed the EDID button for the first time in the Broadcast mode, you must first "power cycle" the receiver whose EDID data you want to copy, and then press its EDID button. Without power cycling of the

receiver, the re-copy operation will not work properly.

KVM Switch Scenarios

The Cat5 Reach DVI HD transmitter and receiver can be used to expand the distance among the equipment involved in a KVM switch system. For example, you can connect a KVM switch, KVM drawer or user station to the Cat5 Reach DVI HD.

Compatible Raritan KVM Switches or Products

The Cat5 Reach DVI HD is compatible with the following Raritan KVM products.

- KVM drawers:
  - T1700-LED
  - T1900-LED
- KVM switches:
  - Dominion KX III series
  - Dominion LX series
  - MasterConsole Digital (MCD) series
  - Raritan Secure Switch (RSS) series

Connecting KVM Switches

There are three scenarios involving KVM switches.

- Connect the Cat5 Reach DVI HD between a KVM switch and its local console.
- Connect the Cat5 Reach DVI HD between two KVM switches.
- Connect the Cat5 Reach DVI HD between a computer/server and a KVM switch.

Turn off all devices before making the connections. For detailed information on setting up the local and remote consoles, see ***Connecting a Keyboard/Mouse/Video Source*** (on page 9).

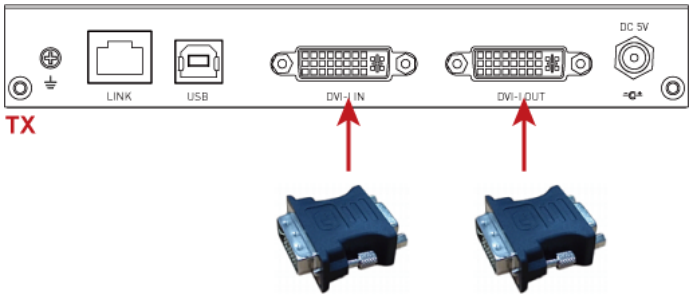
Note: The appropriate operation mode for the KVM switch scenarios is the default mode -- "Extender". See **Step (3): Switching Operation Modes** *(on page 24).*

Most of the following diagrams are based on Raritan's Dominion KX III (DKX3) KVM switch, except for the scenario of tiered KVM switches.

To extend the distance between a KVM switch and its user console/user station:

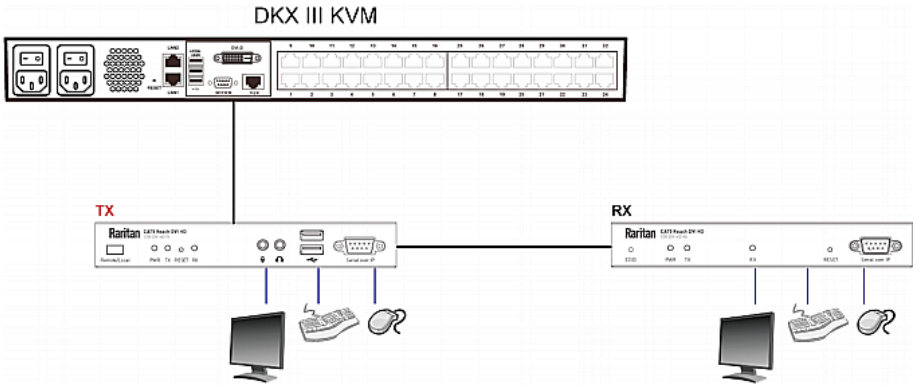
1. Set up the local and remote consoles with the Cat5 Reach DVI HD transmitter and receiver respectively. See ***Basic Installation -- Unicast Mode*** (on page 9).
2. Connect the transmitter and receiver via a Cat5e/6 cable up to 330 feet (100 meters) long.
3. Connect the local console ports of the KVM switch to the transmitter.
   a. Plug one end of the Raritan-provided DVI cable into the DVI-I IN port on the transmitter, and the other end into the KVM switch's video port.

b. A DVI-I to VGA adapter is required if only the VGA port is available on your KVM switch. This adapter is included in the package. Whenever the DVI-I to VGA adapter is used on the transmitter, always connect "two" adapters and "two" VGA devices to both DVI ports of the transmitter. See ***Supported and Unsupported Video Connections to Transmitter*** (on page 48).



c. Plug the USB-B connector of the Raritan-provided USB cable into the USB-B port on the transmitter, and the other end into the KVM switch's local USB-A port.

4. Turn on the KVM switch.
   - You must turn on the KVM switch first for proper video detection.

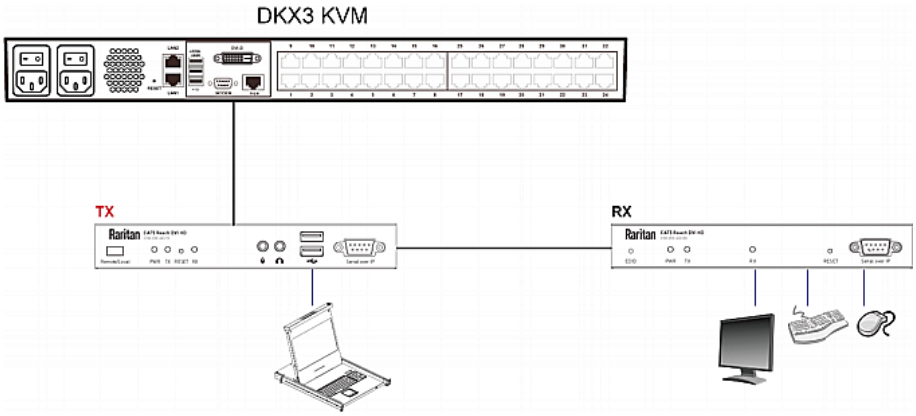


5. Connect the transmitter and receiver to a power source respectively. Each device's PWR LED is then lit.

   Note that TX and RX LEDs on both the transmitter and receiver should be also lit per factory default because the default console mode is dual console mode. See ***Three Types of Console Modes*** (on page 36).

Tip:

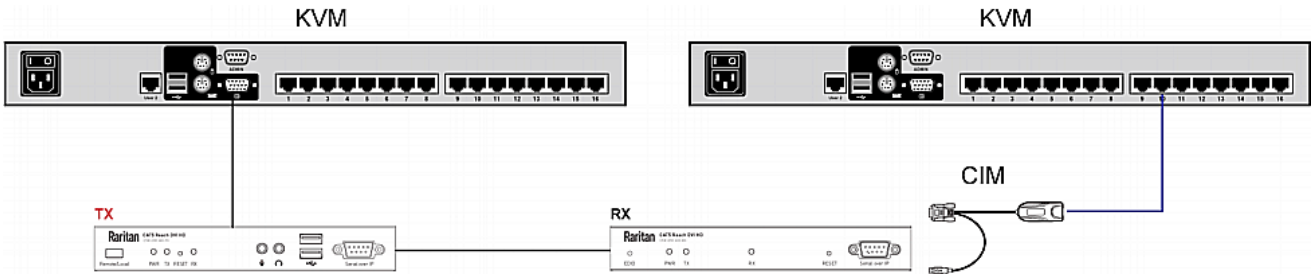
The local or remote console in the above procedure can be equipped with a KVM drawer instead of a set of USB keyboard, USB mouse and monitor. Refer to the diagram below.



To extend the distance between two tiered KVM switches:

Note that Raritan's Dominion KX III KVM switches do NOT support the feature of tiered KVM switches. Only some KVM switches support this feature.

1. Set up a remote console by connecting the receiver to a KVM switch.
   a. Connect a USB CIM to the receiver.
   b. Connect this USB CIM to any channel port on the KVM switch via a Cat5 cable.
2. Connect the transmitter and receiver via a Cat5e/6 cable up to 330 feet (100 meters) long.
3. Connect the KVM switch to the transmitter.
4. Turn on KVM switches.
   - The KVM switch connected to the transmitter must be turned on first for proper video detection.
5. Connect the transmitter and receiver to a power source respectively. Each device's PWR LED is then lit.

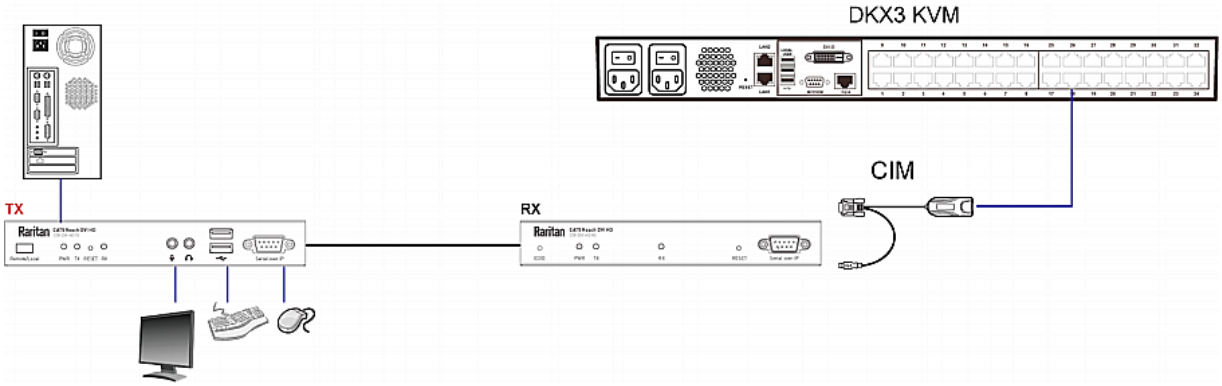


To extend the distance between any computer and a KVM switch:

Restriction: In this scenario, the receiver and the KVM switch connected to the receiver must share the same grounding system. That is, their grounding pathway is identical.

1. Set up an optional local console with the transmitter.
2. Connect the computer to the transmitter, and turn it on.
   - The computer must be turned ON first for proper video detection.
3. Set up a remote console by connecting the receiver to a KVM switch.
4. Connect the transmitter and receiver via a Cat5e/6 cable up to 330 feet (100 meters) long.
5. Connect the transmitter and receiver to a power source respectively. Each device's PWR LED is then lit.

   Note that TX and RX LEDs on both the transmitter and receiver should be also lit per factory default because the default console mode is dual console mode. See *Three Types of Console Modes* (on page 36).



Video display limitations for this scenario:

When switching to the local console mode, the remote console is disabled so the CIM is powered off. Therefore, when re-enabling the remote console, such as the dual console mode, the following issues occur:

- It requires around 10 seconds to re-enable the CIM. Therefore, the KVM switch can receive video signals from Cat5 Reach DVI HD only after around 10 seconds.
- The transmitter returns to its factory default EDID so the computer displays video with the video resolution of **1920 x 1080**.

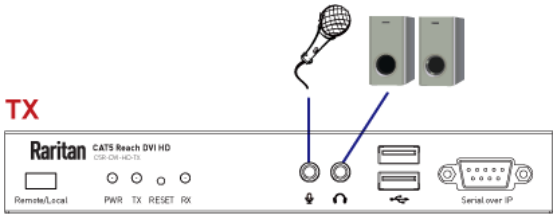
For information on diverse console modes, see *Three Types of Console Modes* (on page 36).

Audio Broadcasting

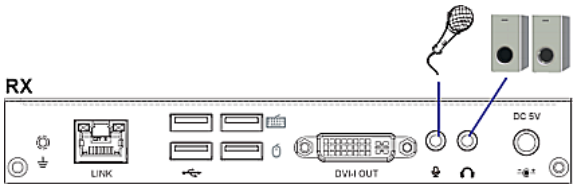
Bi-directional audio transmission capability of the Cat5 Reach DVI HD allows you to create an audio broadcasting system between the transmitter and its receiver(s). All you need to do is to connect speakers and microphones to both the transmitter and receiver(s). The audio signals input from the microphone connected to the transmitter is transmitted to the speakers connected to the receiver, and vice versa.

To establish an audio broadcasting system between the Cat5 Reach DVI HD devices:

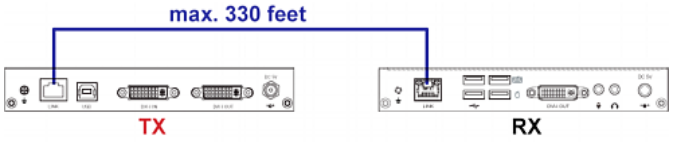
1. Turn off all devices.
2. Connect the microphone and speakers to the Microphone In and Audio In jacks of the transmitter.



3. Connect the speakers and microphone to the Audio Out and Microphone In jacks of the receiver.



4. Use a Cat5e/6 cable up to 330 feet (100 meters) long to connect the transmitter and receiver. Plug either end of the cable into the RJ-45 LINK ports.



5. Connect the transmitter and receiver to a power source respectively. Each device's PWR LED is then lit.
6. Turn on all speakers and microphones.

Chapter 3 Operation

After finishing the hardware installation of the transmitter and receiver(s), you can start operating either the local or remote console, or maintain both Cat5 Reach DVI HD devices by upgrading their firmware.

In This Chapter

Three Types of Console Modes 36
Using EDID for Video Synchronization in the Broadcast Mode 37
Resetting the Transmitter's EDID 38
Firmware Upgrade 39

Three Types of Console Modes

The factory default is to enable both consoles -- remote and local. In this mode, users of both remote and local consoles are able to control the connected device, such as a computer or KVM switch, based on the first-come-first-served basis.

You can choose to enable only one console to prevent that console's operation from being disturbed by users of the other console.

3 types of console modes:

To switch among 3 types of console modes, press the **Remote/Local** button on the transmitter, and the console mode changes in the following sequence:

dual console (default) > remote console > local console

- *Dual console*: Both remote and local users can control the connected device. When one user is operating it, the other user can view the operation only.
- *Remote console*: Only remote users can view and control the connected device.
- *Local console*: Only local users can view and control the connected device.

To identify the 3 console modes:

The current console mode can be indicated by the status of TX and RX LEDs on both the transmitter and receiver.

- *Dual console (default):*

  Both TX and RX LEDs are lit.

- *Remote console:*

  Only the RX LED is lit. Besides, the local console's monitor becomes dark.
- *Local console:*

  Only the TX LED is lit. Besides, the remote console's monitor shows this message "Local Only".

Using EDID for Video Synchronization in the Broadcast Mode

In the Broadcast mode, the computer (or audio/video device) connected to the transmitter must read the EDID data stored in the transmitter to synchronize the video resolutions of all connected monitors. Therefore, you must press the EDID button to copy the receiver's EDID data to the transmitter.

Use a pointed object to press the EDID button in the Broadcast mode. See ***Advanced Installation -- Broadcast Mode*** (on page 23).

RX

If a video issue occurs in the Broadcast mode:

- If any connected monitor(s) cannot display video, it may be because the maximum video resolution stored in the transmitter's EDID is NOT supported by the connected monitor(s). Then try to resolve this issue by pressing the EDID button on the receiver whose monitor does not show video.
- For any re-copy operation of the EDID data after you have pressed the EDID button for the first time in the Broadcast mode, you must first "power cycle" the receiver whose EDID data you want to copy, and then press its EDID button. Without power cycling of the receiver, the re-copy operation will not work properly.

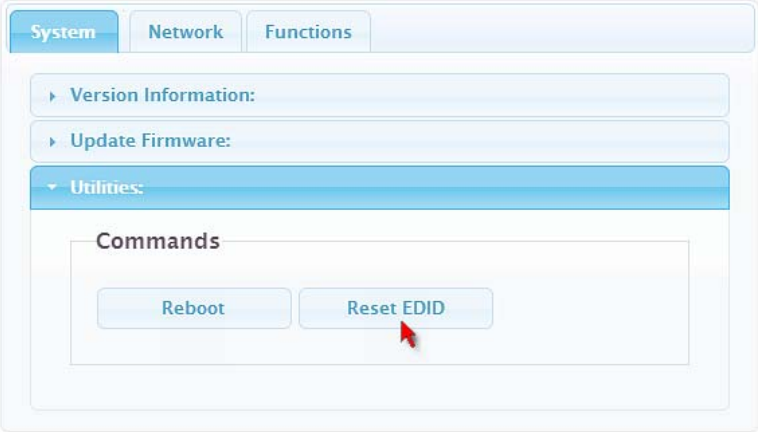
Usually a video issue does not occur as long as all of the connected monitors share the same maximum video resolution, no matter they are DVI or VGA monitors.

Resetting the Transmitter's EDID

Resetting the transmitter's EDID will restore the EDID data stored in the transmitter to its original EDID data (that is, **1920 x 1080**). Usually it is not necessary to reset EDID unless you have to remove old EDID data from the transmitter.

▶ **Main procedure:**

- *Step (1): Downloading a Zeroconf Networking Tool* (on page 17)
- *Step (2): Computer Connection and TCP/IP Configuration* (on page 17)
- To launch the transmitter's web user interface, follow steps 1 to 4 of *Step (3): Modifying the Baud Rate Settings* (on page 20). Then click the System tab > Utilities section > Reset EDID.



Firmware Upgrade

Firmware files for updating the Cat5 Reach DVI HD transmitter and receiver are usually different, unless otherwise specified.

- The file for the transmitter contains the word "tx".
- The file for the receiver contains the word "rx".

Firmware files are available on Raritan website's *Support page* (*http://www.raritan.com/support/*).

The firmware upgrade procedure is similar to the procedure of changing operation modes. Do the following two steps first prior to firmware upgrade.

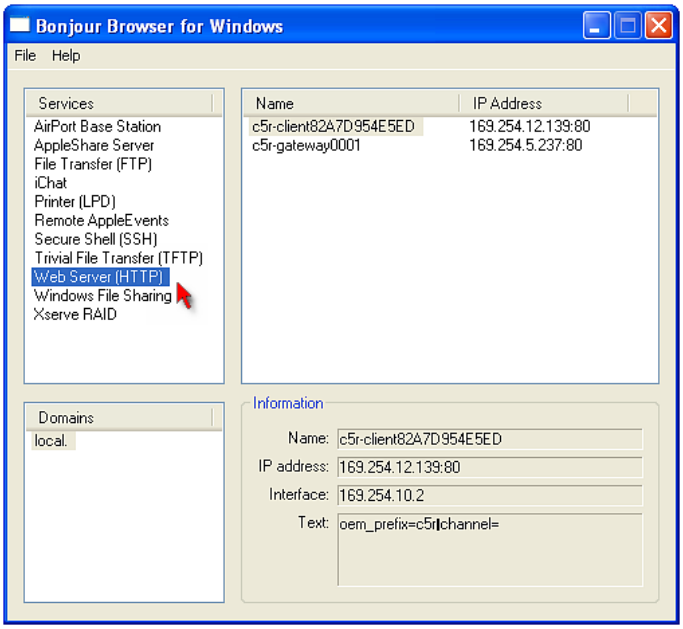
- *Step (1): Downloading a Zeroconf Networking Tool* (on page 17)
- *Step (2): Computer Connection and TCP/IP Configuration* (on page 17)

To upgrade the firmware of either Cat5 Reach DVI HD device:

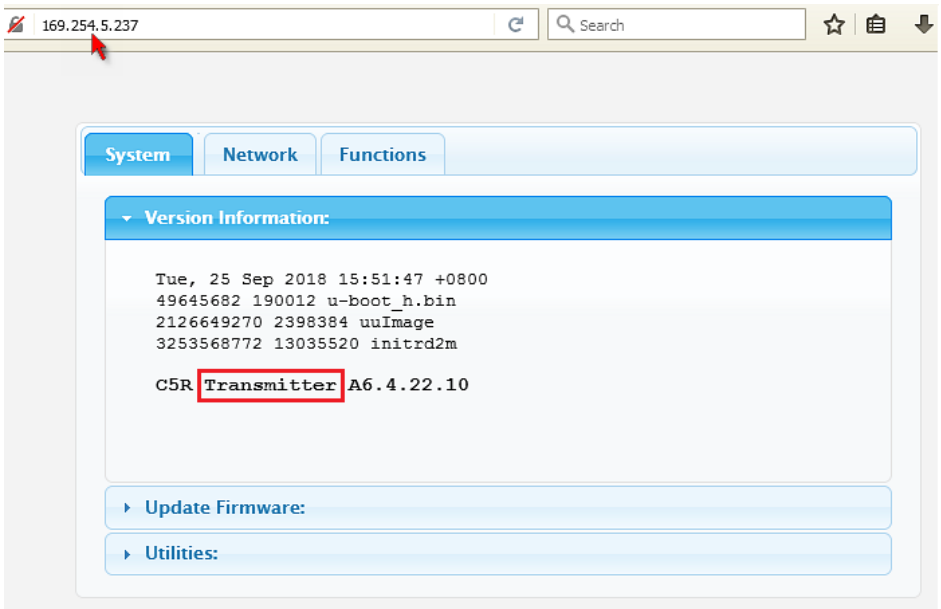
1. Go to the computer that is connected to the Ethernet switch. See *Step (2): Computer Connection and TCP/IP Configuration* (on page 17).
2. Launch Bonjour Browser, or any zeroconf tool you have downloaded.

3. Select "Web Server (HTTP)" to display the IP addresses of both the transmitter and receiver.
   - **c5r-gateway**XXX: This refers to the transmitter. XXX is the transmitter's number.

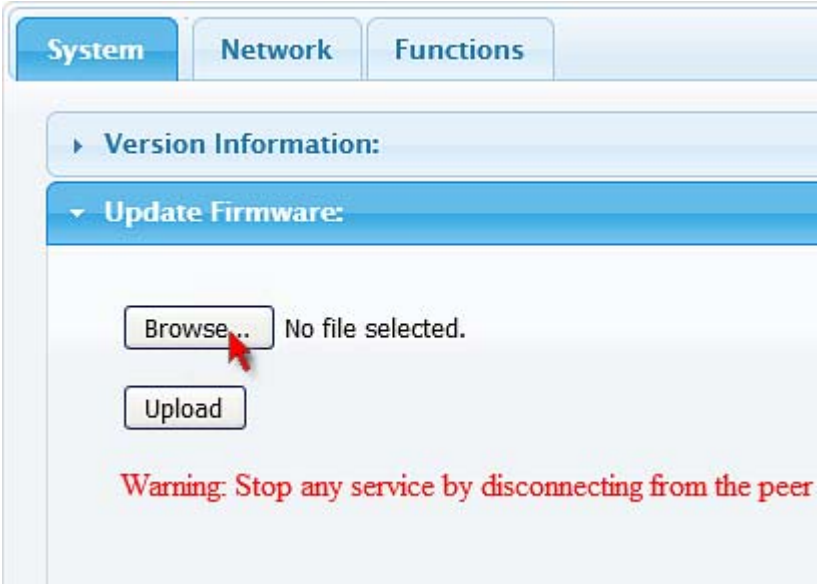
- **c5r-client**XXX: This refers to the receiver. XXX is the receiver's number.



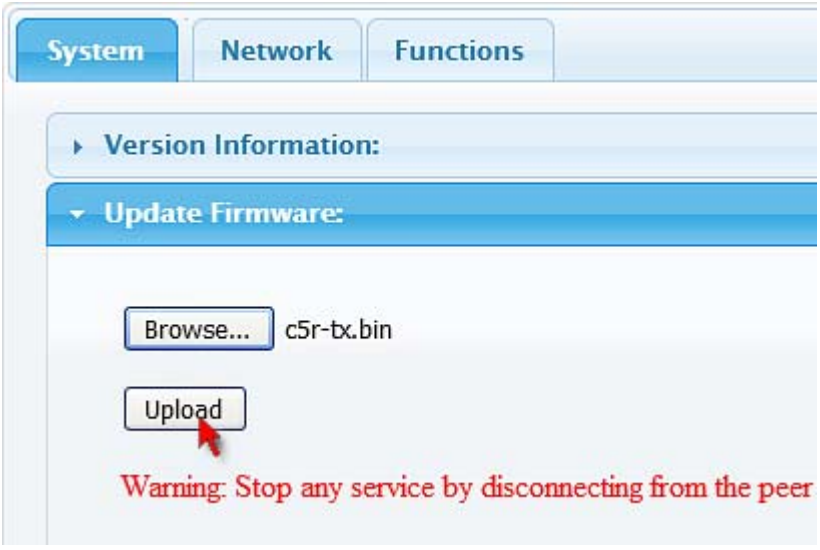
4. Launch the web browser, and type the transmitter's IP address. The transmitter's web user interface displays.



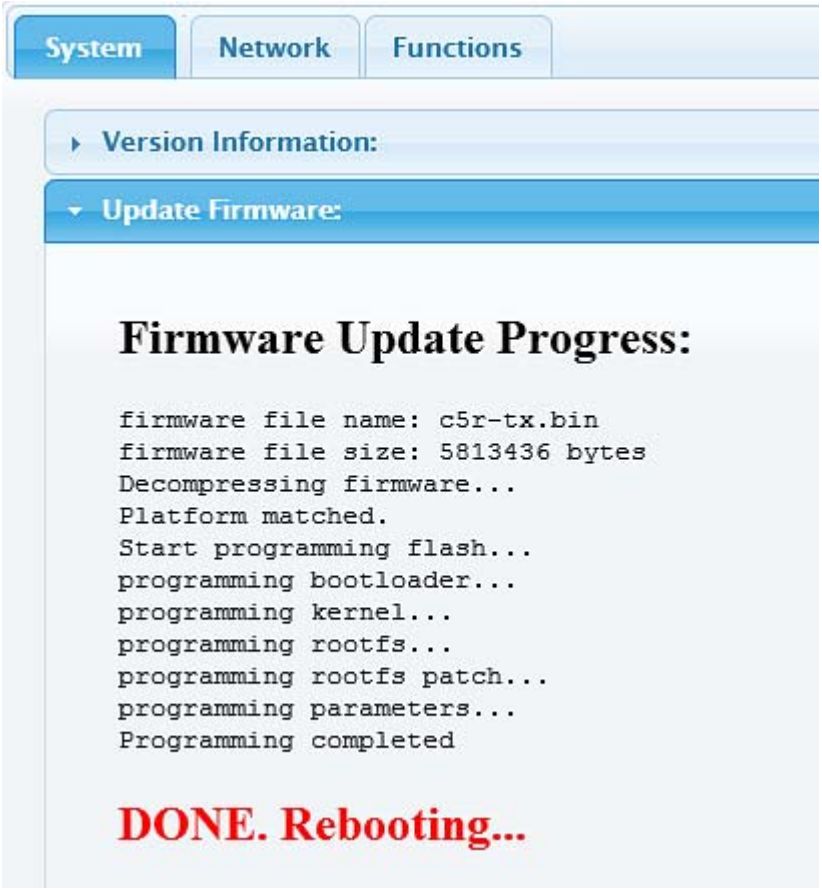
5. To select the appropriate firmware file for the transmitter, click the System tab > Update Firmware section > Browse.



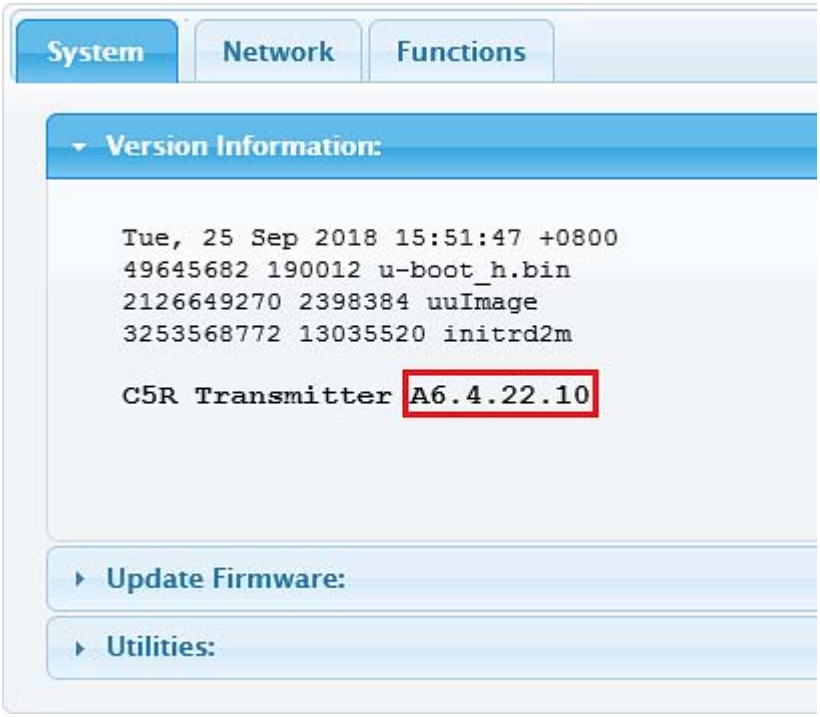
6. Click Upload to start the firmware upgrade.



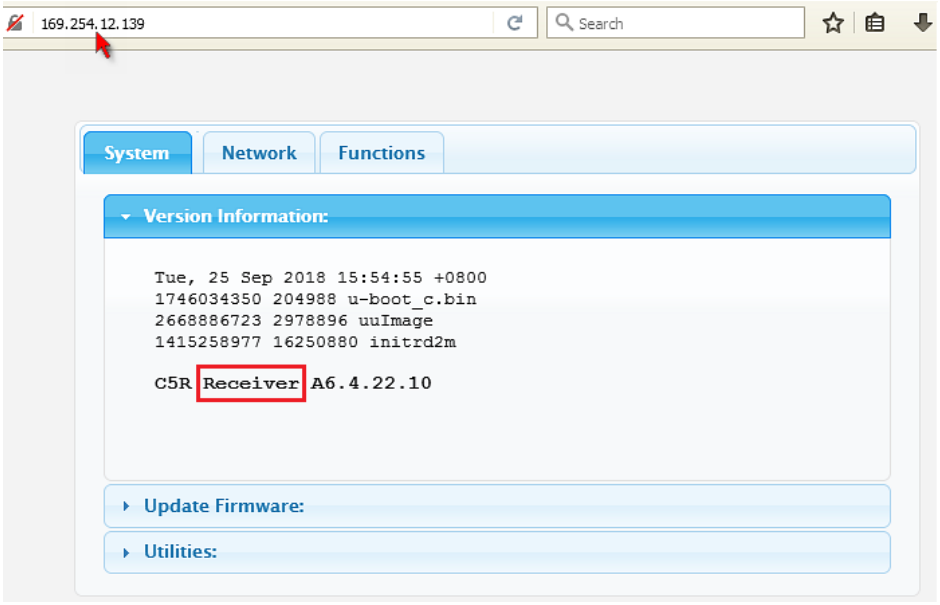
7. A firmware update progress message is shown onscreen. Wait until the firmware upgrade is done and finishes its reboot process.



8. Now you can verify the current version by clicking the System tab > Version Information section.



9. Type the receiver's IP address in the browser to show the receiver's web user interface.



10. Repeat the same firmware upgrade steps for the receiver. Note that the firmware file is different from the receiver.

Appendix A Specifications

This section describes the specifications of the Cat5 Reach DVI HD transmitter, receiver and two DVI-to-VGA adapters included in the product package.

In This Chapter

Cat5 Reach DVI HD Transmitter and Receiver 45
DVI-to-VGA Adapters 47

Cat5 Reach DVI HD Transmitter and Receiver

- Transmitter: *C5R-DVI-HD-TX*
- Receiver: *C5R-DVI-HD-RX*

Items		Transmitter	Receiver
Console Connectors	Video Out	1 x DVI-I	1 x DVI-I
	Serial Control Port (RS-232)	1 x D-SUB 9-pin (female) ▪ Baud rate 115,200 bps (default)	1 x D-SUB 9-pin (female) ▪ Baud rate 115,200 bps (default)
Host Connection	Video Input	1 x DVI-I	N/A
USB Interface	Host	1 x USB Type B (female)	N/A
	Device	2 x USB Type A (female) ▪ Both are USB 2.0	4 x USB Type A (female) ▪ 2 x USB 1.1 (with the keyboard or mouse icon) ▪ 2 x USB 2.0
Link Port	RJ-45	CAT 5e/6 cable -- max. length: 330 feet (100 meters)	
Audio	Speakers	1 x 3.5mm Audio jack (female) -- pink	1 x 3.5mm Audio jack (female) -- pink
	Microphone	1 x 3.5mm Microphone jack (female) -- green	1 x 3.5mm Microphone jack (female) -- green

Items		Transmitter	Receiver
LED indicators	White LED	Power, TX, RX	Power, TX, RX
Push button	*Remote/Local* switching button	Switching sequence: Transmitter+Receiver, Receiver, Transmitter	N/A
Video Resolutions	16:9	1280 x 720 (60Hz) 1360 x 768 (60Hz) 1366 x 768 (60Hz) 1600 x 900 (60Hz) **1920 x 1080 (60Hz) (max.)**	
	4:3	800 x 600 (60Hz) 1024 x 768 (60Hz) 1152 x 864 (60Hz) 1280 x 960 (60Hz) 1680 x 1050 (60Hz) **1920 x 1200 (60Hz) (max.)**	
	Other	1440 x 900 (60Hz) 1280 x 768 (60Hz) 1280 x 1024 (60Hz) 1600 x 1024 (60Hz)	

Items	Transmitter	Receiver
DDC support	Supports DDC, DDC2, DDC2B	
Supported operating systems	Windows, Linux, Mac OS/OSX	
Power supply	Power adapter with lock mechanism and universal plug, Input: 110-240V~, 50-60Hz, 0.6A Output: 5V, 3.0A	
Dimension	7.09'' x 3.54'' x 1.10'' 180 x 90 x 28 mm	
Weight	393 g	379 g
Housing material	Metal	
Operating temperature	32-122°F (0-50°C)	
Humidity	5-90% RH	
Safety	FCC, CE, VCCI and RoHS	
Warranty	Standard Two Years and Extended Warranties (optional)	
MTBF	57774.34727 hours	70240.8291 hours
Power Consumption	4.59 W	3.35 W

DVI-to-VGA Adapters

A DVI-to-VGA adapter is required when connecting a VGA monitor (or VGA computer) to the Cat5 Reach DVI HD. In the Cat5 Reach DVI HD product package, two DVI-I to VGA adapters have been included.

This DVI-I to VGA adapter can connect a VGA device to the transmitter or receiver. Note that it does NOT support the conversion of VGA signals to DVI signals or vice versa.

Connector types	DVI-I x1
	VGA x1

Important: Whenever the DVI-I to VGA adapter is used on the transmitter, always connect "two" adapters and "two" VGA devices to both DVI ports of the transmitter. See *Supported and Unsupported Video Connections to Transmitter* **(on page 48).**

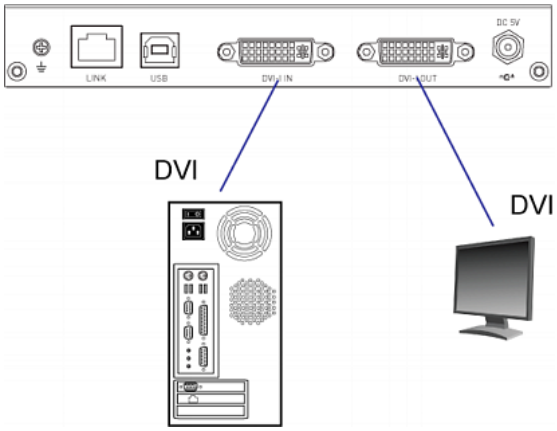
Supported and Unsupported Video Connections to Transmitter

This section describes video connection scenarios SUPPORTED and NOT SUPPORTED by the Cat5 Reach DVI HD transmitter.

In the diagrams, a computer represents the video source, which can be other equipment like a KVM switch, and a monitor represents the video input device, which can be other equipment like a KVM drawer.

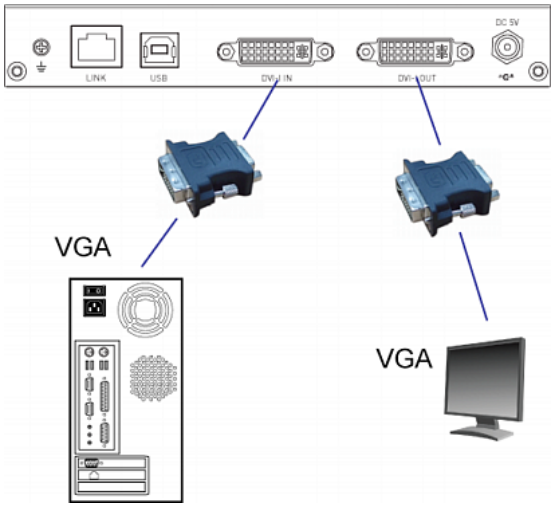
Supported scenario - DVI connection:

The video source transmits DVI signals to the transmitter, and the video input device receives DVI signals from the transmitter. No DVI-I to VGA adapters are required in this scenario.



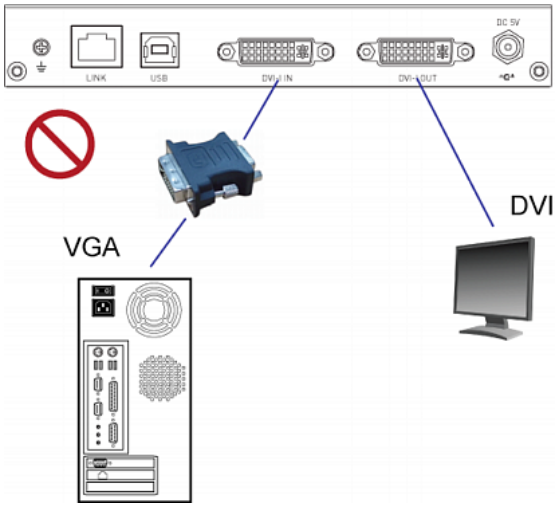
Supported scenario - VGA connection:

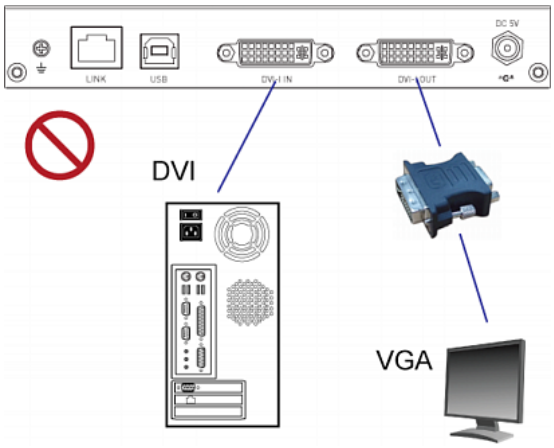
The video source transmits VGA signals to the transmitter, and the video input device receives VGA signals from the transmitter. "Two" DVI-I to VGA adapters are required.



Unsupported scenarios - mix of DVI and VGA signals:

Use of only one DVI-I to VGA adapter for a mix of DVI and VGA signal transmission on the transmitter is NOT supported. Therefore, DO NOT make the following video connections.



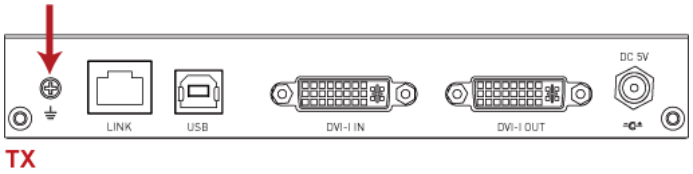

LINK
USB
DC 5V
DVI
VGA

Appendix B Ground Screw

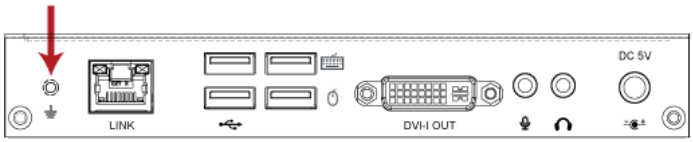
If you want to prevent any electrical shock, you can use the ground screw on the rear panel to provide a safe electrical path to the ground.

▶ To prevent any potential shock hazard:

- Connect the ground screw to a wiring system or wiring device.



TX



RX

Index

(

(Optional) Making an RS-232 Connection • 4, 6, 15

A

Advanced Installation -- Broadcast Mode • 2, 5, 9, 23, 37
Audio Broadcasting • 35

B

Basic Installation -- Unicast Mode • 2, 3, 9, 13, 14, 16, 24, 28, 29, 31

C

Cat5 Reach DVI HD Receiver (C5R-DVI-HD-RX) • 5
Cat5 Reach DVI HD Transmitter (C5R-DVI-HD-TX) • 3
Cat5 Reach DVI HD Transmitter and Receiver • 45
Changing the Default Baud Rate Settings • 15, 16
Changing the Operation Mode • 23, 24, 28
Compatible Raritan KVM Switches or Products • 30
Connecting a Keyboard/Mouse/Video Source • 9, 31
Connecting KVM Switches • 31
Connecting Multiple Receivers to One Transmitter • 23, 27, 28

D

DVI-to-VGA Adapters • 5, 7, 47

E

Extending the Distance via Gigabit Ethernet Switches • 9, 13

F

Firmware Upgrade • 39
Front View • 3, 5

G

Ground Screw • 4, 6, 51

I

Installation • 8
Introduction • 1

K

KVM Switch Scenarios • 30

O

Operation • 36

P

Package Contents • 2
Product Features • 1
Product Overview • 3

R

Rack Mounting Cat5 Reach DVI HD • 8
Rack-mount Safety Instructions • iii
Rear View • 4, 6
Resetting the Transmitter's EDID • 38

S

Specifications • 45
Step (1)
  Downloading a Zeroconf Networking Tool • 16, 17, 24, 38, 39
Step (2)
  Computer Connection and TCP/IP Configuration • 16, 17, 20, 24, 38, 39
Step (3)
  Modifying the Baud Rate Settings • 16, 20, 38
  Switching Operation Modes • 24, 31
Supported and Unsupported Video Connections to Transmitter • 5, 10, 12, 32, 48

T

Three Types of Console Modes • 3, 12, 32, 34, 36

U

Using EDID for Video Synchronization in the Broadcast Mode • 29, 37