KRAMER

USER MANUAL

TP-780TXR/TP-780RXR Quick Start Guide

This guide helps you install and use your **TP-780TXR/TP-780RXR** for the first time. For more detailed information, go to **http://www.kramerav.com/manual/TP-780TXR** to download the latest manual or scan the QR code on the left.

Step 1: Check what's in the box

☑ **TP-780TXR** or **TP-780RXR** Extended Range HDMI Line Transmitter/Receiver +POE
☑ 1 Power supply (48V DC) supplied with **TP-780TXR** or
  1 Power supply (12V DC) supplied with **TP-780RXR**

☑ 4 Rubber feet
☑ 1 Quick start guide
☑ 1 Bracket installation kit

Step 2: Install the TP-780TXR/RXR

To mount the **TP-780TXR/TP-780RXR** in a rack, use an **RK-T2B** rack adapter. Alternatively, attach the rubber feet to the underside of the machine and place it on a table. You can use the TOOL bracket Installation kit (supplied) to mount the **TP-780TXR/TP-780RXR** on a desktop, wall or similar area. Fasten a bracket on each side of the TOOL using the two M3x8 screws (supplied). Use the flat-head screws (supplied) to fix the TOOL to the mounting surface or enable it to slide in place.

Step 3: Connect inputs and outputs

Always switch OFF the power on each device before connecting it to your **TP-780TXR/TP-780RXR**. For optimum range and performance, use the recommended Kramer cables available at www.kramerav.com/TP-780TXR/.
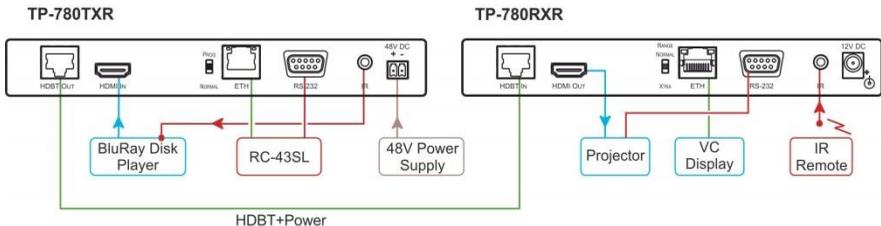
Step 4: Connect the power

Connect the 48V DC power adapter to the **TP-780TXR** and plug the adapter into the mains electricity. Power is distributed to the **TP-780RXR** over the HDBT interface for ranges up to 100m (328ft). For ranges over 100m, connect a power supply to the **TP-780RXR**.
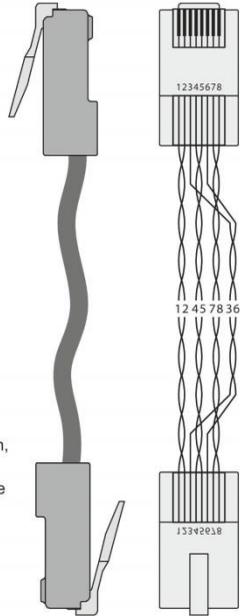
Step 5: Twisted Pair Pinout

EIA / TIA 568B	
PIN	Wire Color
1	Orange / White
2	Orange
3	Green / White
4	Blue
5	Blue / White
6	Green
7	Brown / White
8	Brown

For optimum range and performance, use the recommended Kramer cables available at www.kramerav.com/TP-780TXR/.

Note that the transmission range depends on the signal resolution, graphics card and display used. The distance using non-Kramer CAT 6 cable may not reach these ranges. Use only shielded cable where both ends of the shield are soldered to ground.

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1 Introduction

Welcome to Kramer Electronics! Since 1981, Kramer Electronics has been providing a world of unique, creative, and affordable solutions to the vast range of problems that confront video, audio, presentation, and broadcasting professionals on a daily basis. In recent years, we have redesigned and upgraded most of our line, making the best even better!

Our 1,000-plus different models now appear in 14 groups that are clearly defined by function: GROUP 1: Distribution Amplifiers; GROUP 2: Switchers and Routers; GROUP 3: Control Systems; GROUP 4: Format/Standards Converters; GROUP 5: Range Extenders and Repeaters; GROUP 6: Specialty AV Products; GROUP 7: Scan Converters and Scalers; GROUP 8: Cables and Connectors; GROUP 9: Room Connectivity; GROUP 10: Accessories and Rack Adapters; GROUP 11: Sierra Video Products; GROUP 12: Digital Signage; GROUP 13: Audio; and GROUP 14: Collaboration.

Congratulations on purchasing your Kramer **TP-780TXR/ TP-780RXR** transmitter/receiver pair, which is ideal for the following typical applications:

- Long-distance AV and LAN signal extension for multi-room, large dividable auditoriums and lecture hall connectivity
- AV and LAN extension in conference rooms, boardrooms, control rooms, hotels and large church facilities

> Note that **TP-780TXR** and **TP-780RXR** are purchased separately, and can be connected to other HDBaseT certified transmitters and receivers, respectively.

2 Getting Started

We recommend that you:

- Unpack the equipment carefully and save the original box and packaging materials for possible future shipment

- Review the contents of this user manual

  Go to www.kramerav.com/downloads/TP-780TXR to check for up-to-date user manuals, application programs, and to check if firmware upgrades are available (where appropriate).

2.1 Achieving the Best Performance

To achieve the best performance:

- For optimum range and performance, use the recommended Kramer cables available at www.kramerav.com/product/TP-780TXR

- Do not secure the cables in tight bundles or roll the slack into tight coils

- Avoid interference from neighbouring electrical appliances that may adversely influence signal quality

- Position your away from moisture, excessive sunlight and dust

  This equipment is to be used only inside a building. It may only be connected to other equipment that is installed inside a building.

2.2 Safety Instructions

Caution: There are no operator serviceable parts inside the unit

Warning: Use only the Kramer Electronics power supply that is provided with the unit

Warning: Disconnect the power and unplug the unit from the wall before installing

2.3   Recycling Kramer Products

The Waste Electrical and Electronic Equipment (WEEE) Directive 2002/96/EC aims to reduce the amount of WEEE sent for disposal to landfill or incineration by requiring it to be collected and recycled. To comply with the WEEE Directive, Kramer Electronics has made arrangements with the European Advanced Recycling Network (EARN) and will cover any costs of treatment, recycling and recovery of waste Kramer Electronics branded equipment on arrival at the EARN facility. For details of Kramer's recycling arrangements in your particular country go to our recycling pages at *www.kramerav.com/support/recycling/*.

3   Overview

TP−780TXR and **TP-780RXR** are a high−performance, extended−reach HDBaseT transmitter and receiver pair for HDMI (4K @60Hz 4:2:0), Ethernet, RS−232 and IR signals over twisted pair. The **TP−780TXR** converts all input signals into an HDBaseT signal that it transmits over twisted pair. The extended HDBaseT signal is decoded by the receiver **TP−780RXR**, back to HDMI (4K @60Hz 4:2:0), Ethernet, RS−232 and IR output signals. The **TP-780TXR** and the **TP-780RXR** can form a transmission and reception system either together or each device separately with another certified HDBaseT device.

The transmitter and receiver feature:

- High Performance Standard Extender - High−quality professional extension of max 4K@60Hz (4:2:0) 24bpp video resolution signal to maximum 100m (330ft) extended−reach over CAT copper cable, and even further reach for lower HD video resolution. Extender is standard, capable of being connected to any market−available HDBaseT compliant extending products

- HDMI Signal Transmission - HDMI 2.0 and HDCP 2.2 compliant signal, supporting deep color, x.v.Color™, lip sync, HDMI uncompressed audio channels, Dolby TrueHD, DTS−HD, CEC, Full HD, 2K, 4K, and 3D. EDID and CEC signals are passed through from the source to the display.

- Multi−channel Audio Transmission - Up to 32 channels of digital stereo uncompressed signals for supporting surround sound at studio level.

- Ethernet Transmission - Ethernet interface data flows in both directions to allow extension of up to 100Mbps Ethernet connectivity for LAN communication and device control.

- Bidirectional RS−232 Transmission - Serial interface data flows in both directions to allow data transmission and device control.

- Bidirectional Infrared Transmission - IR interface data flows in both directions to allow remote control of peripheral devices located at either end of the extended line.

For optimum range and performance, use the recommended Kramer cables available at www.kramerav.com/product/TP−780TXR.

- Firmware Upgrade - Local transmitter upgrade via RS−232 control connection and the K−Upload tool to ensure field−proven deployment.

- LED Indicators - Status indicators for HDMI input and the HDBT output link facilitate maintenance and troubleshooting.

- Easy Installation - Single cable for transmitting HDBaseT signals and PoE to the receiver. Compact Mega TOOLS™ fan−less enclosure for over−ceiling mounting, or side−by−side mounting of 2 units in a 1U rack space with the optional **RK−T2B** rack adapter.

3.1   About HDBaseT™ Technology

HDBaseT™ is an advanced all-in-one connectivity technology (supported by the HDBaseT Alliance). It is particularly suitable in the consumer home environment as a digital home networking alternative where it enables you to replace numerous cables and connectors by a single LAN cable used to transmit, for example, uncompressed full high-definition video, audio, IR, as well as various control signals.

The products described in this user manual are HDBaseT certified.

3.2   About Power over Ethernet (PoE)

Power over Ethernet (HDBaseT) passes electrical power along with data on Ethernet cabling. This allows a single twisted pair cable to provide both a data connection and electrical power to compatible devices. PoE is convenient, flexible and safe requiring the use of fewer power outlets, simpler configuration and low power connections over standard category cables. A 48V DC power supply connects to the PoE transmitter and can power the PoE receiver up to a distance of 100 meters (330 feet). Beyond this range, a 12V DC power supply must be connected to the PoE receiver.

The **TP-780TXR** is a PoE injector. It cannot receive power from another PoE injector but only from a 48V DC power supply.

3.3 Using Twisted Pair Cable

For optimum range and performance, use the recommended Kramer cables available at www.kramerav.com/product/TP-780TXR.

We strongly recommend that you use shielded twisted pair cable.
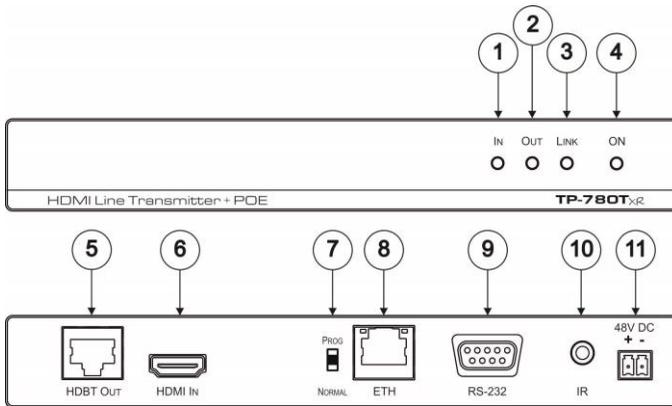
3.4 Defining the TP-780TXR HDMI Line Transmitter + POE

Figure 1: TP-780TXR HDMI Line Transmitter + POE

#	Feature	Function
1	*IN* LED	Lights green when an active HDMI input device is connected
2	*OUT* LED	Lights green when an acceptor device is detected on remote receiver HDMI output
3	*LINK* LED	Lights green when the HDBT link is active
4	*ON* LED	Lights green when the device receives power
5	*HDBT OUT* RJ-45 Connector	Connects to the *HDBT OUT* RJ-45 connector on the HDBT receiver such as TP-780RXR
6	*HDMI IN* Connector	Connects to the HDMI source
7	*PROG/NORMAL* Switch	Slide to PROG to upgrade to the latest Kramer firmware via RS-232, or slide to NORMAL for normal RS-232 extension operation
8	*ETH* RJ-45 Connector	Connects to a LAN to extend network traffic to the receiver
9	*RS-232* 9-pin D-sub Connector	Connects to an RS-232 port for firmware upgrade and serial link extension to the receiver
10	*IR* 3.5mm Mini Jack Connector	Connects to an external infrared transmitter / sensor (receiver) for IR signal extension
11	*48V DC Terminal Block*	+48V DC connector for powering the unit

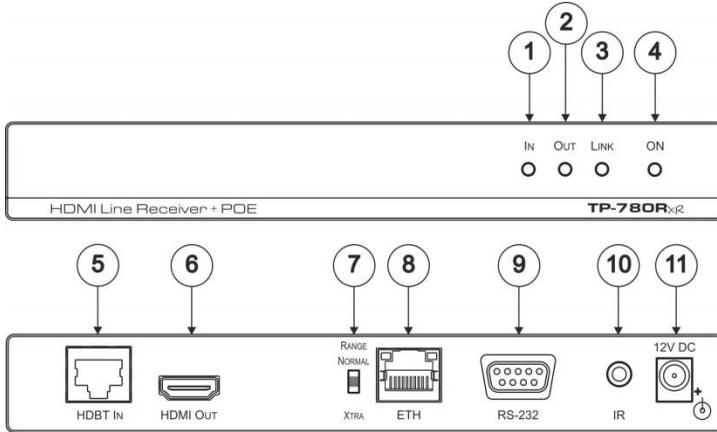## 3.5 Defining the TP-780RXR HDMI Line Receiver + POE

Figure 2: TP-780RXR HDMI Line Receiver + POE

#	Feature	Function
1	*IN* LED	Lights green when an active HDMI input device is connected
2	*OUT* LED	Lights green when an active HDMI output device is detected
3	*LINK* LED	Lights green when the HDBT link is active
4	*ON* LED	Lights green (DC power) and orange (HDBaseT PoE) when the device receives power. When both power sources are detected, lights orange (HDBaseT PoE) if within range (100m) and green if exceeds range
5	*HDBT IN* RJ-45 Connector	Connects to the *HDBT OUT* RJ-45 connector on the HDBT transmitter such as TP-780TXR
6	*HDMI OUT* Connector	Connects to the HDMI acceptor
7	*RANGE NORMAL/XTRA* Switch	Slide to RANGE NORMAL for HDBT normal-range extension mode, or slide to *XTRA* for HDBT ultra extension mode of full HD video resolution
8	*ETH* RJ-45 Connector	Connects to a LAN to extend network traffic to the transmitter
9	*RS-232* 9-pin D-sub Connector	Connects to an RS-232 port for serial link extension to the transmitter
10	*IR* 3.5mm Mini Jack Connector	Connects to an external infrared transmitter / sensor (receiver) for IR signal extension
11	*12V DC*	+12V DC connector for powering the unit

4   Connecting the TP-780TXR and TP-780RXR

> Always switch off the power to each device before connecting it to your transmitter and receiver. After connecting your transmitter and receiver, connect their power and then switch on the power to each device.

You can use the **TP-780TXR** and **TP-780RXR** *Extended Range HDMI Line Transmitter/Receiver + POE* to configure an HDMI transmitter/receiver system, as shown in the example in Figure 3.

To connect the **TP-780TXR**, connect the:

1. HDMI source (for example, a DVD player) to the HDMI IN connector.

2. RS-232 9-pin D-sub connector to a control device (for example, a Kramer **RC-43SL** control keypad to control the projector).

3. IR 3.5mm mini jack to an IR emitter (for example, to control the DVD).

4. HDBT OUT RJ-45 connector over twisted pair to the *HDBT IN* connector.
   Alternatively, you can use any other certified HDBaseT receiver device (for example, the Kramer **TP-590Rxr**)

5. 48V DC power adapter to the power socket and connect the adapter to the mains electricity (not shown in Figure 3).

To connect the **TP-780RXR**, connect the:

1. HDMI OUT connector to the HDMI acceptor (for example, a projector).

2. RS-232 9-pin D-sub connector to an RS-232 port (for example, a projector that is controlled by the **RC-43SL** connected to **TP-780TXR**).

3. IR 3.5mm mini jack to an IR sensor (for example, to receive the IR remote signal for controlling the remote DVD connected to **TP-780TXR**).

4. HDBT IN RJ-45 connector over Kramer HDBaseT cable to the **TP-780TXR** *HDBT OUT* connector.
   Alternatively, you can use any other certified HDBaseT transmitter device (for example, the Kramer **TP-590Txr**)

5. If operating the **TP-780RXR** over a range of more than 100m (330ft), connect the 12V DC power adapter to the power socket and connect the adapter to the mains electricity (not shown in Figure 3).
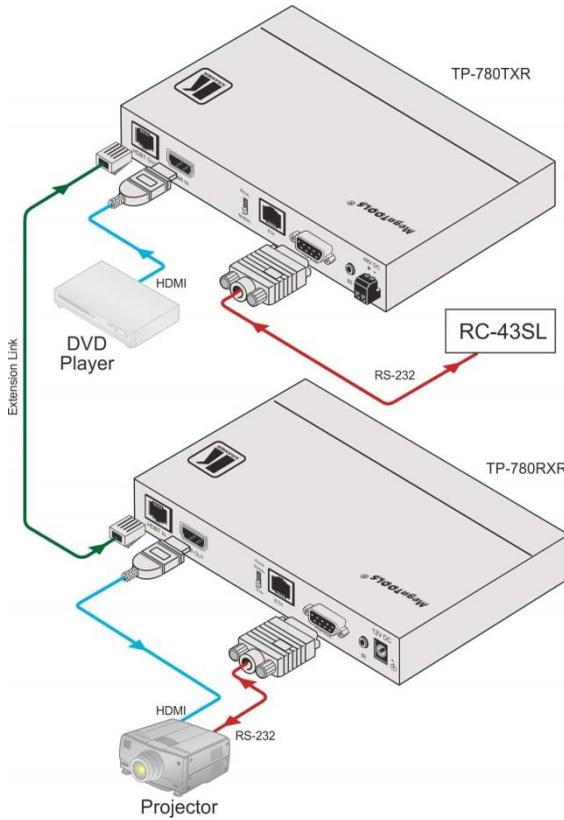
Figure 3: Connecting the TP-780TXR/TP-780RXR Transmitter/Receiver Pair

4.1 Remote Control via an IR Transmitter

Since the IR signal on the **TP-780TXR/TP-780RXR** transmitter/receiver pair is bidirectional, you can use a remote control transmitter (that is used for controlling a peripheral device, for example, a DVD player) to send commands from either end of the transmitter/receiver system.

For more information on emitter/sensor extension cables, see the recommended Kramer cables available at www.kramerav.com/product/TP-780TXR.

The example in [Figure 4](#) illustrates how to remotely control the DVD player that is connected to **TP-780TXR** using a remote control, via the **TP-780RXR**. In this example, the IR sensor cable is connected to the IR connector of the **TP-780RXR** and an IR emitter cable is connected between the **TP-780TXR** and the DVD player. The DVD remote control transmitter sends a command while pointing towards the cable-located IR sensor. The IR signal passes through the extension link and the IR emitter to the DVD player, which responds to the command sent.
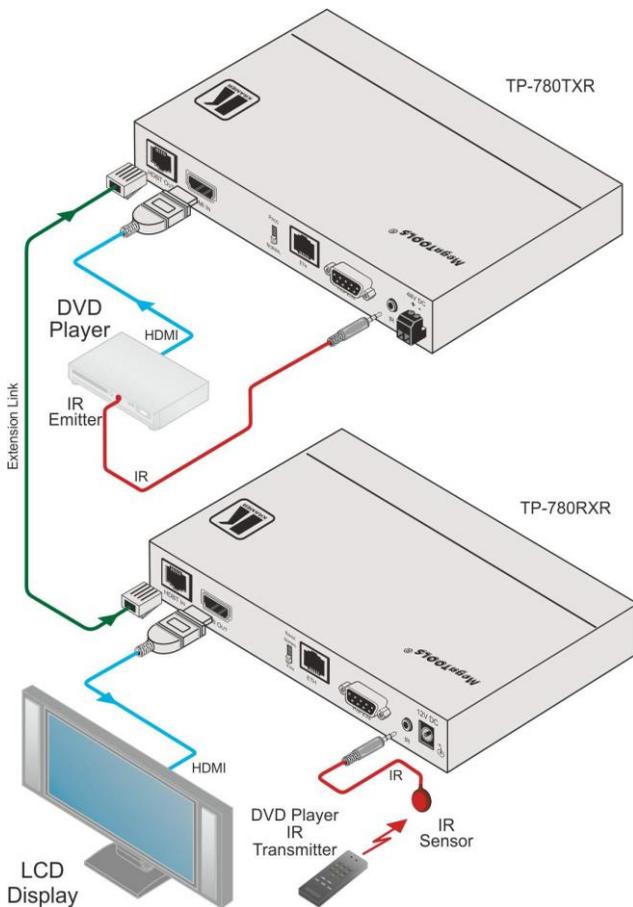
Figure 4: Controlling a DVD Player via the TP-780TXR/RXR

The example in [Figure 5](#) illustrates how to remotely control the LCD display that is connected to the **TP-780RXR** using a remote control transmitter, via the **TP-780TXR**. In this example, the IR sensor cable is connected to the IR connector of the **TP-780TXR** and an IR emitter cable is connected between the **TP-780RXR** and the LCD display. The LCD display remote control transmitter sends a command while pointing towards the cable-located IR sensor. The IR signal passes through the extension link and the IR emitter to the LCD display, which responds to the command sent.
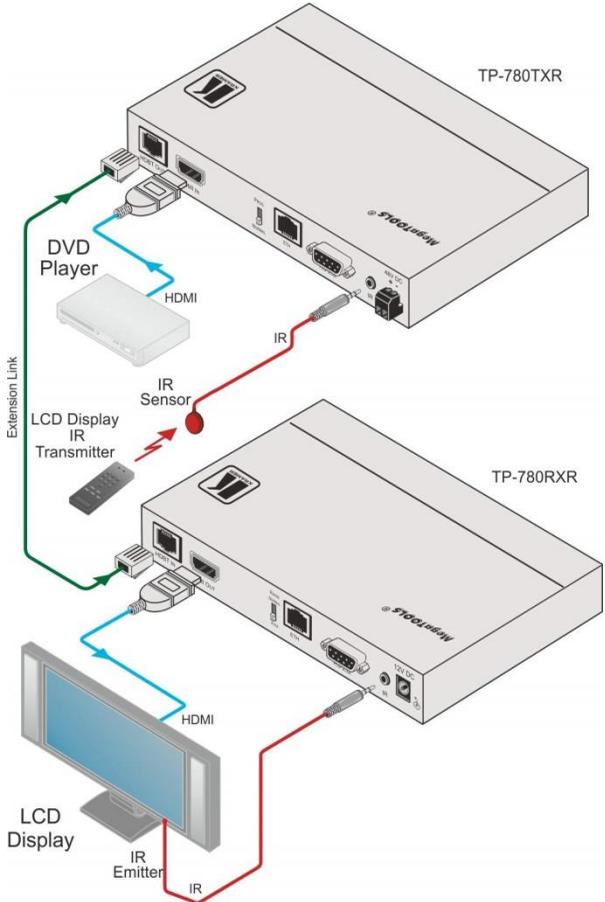
Figure 5: Controlling an LCD Display via the TP-780TXR/RXR

4.2 Remote Control via RS-232

You can connect to the near-side of the extender system via an RS-232 connection to remotely control far-end connected equipment using, for example, a Kramer **RC-43SL** control keypad.

Note: A null-modem adapter/connection is not required.

To connect a **RC-43SL** via RS-232:

- Connect the RS-232 9-pin D-sub rear panel port on the transmitter or receiver system unit via a 9-wire straight cable.

- On the cable, the only pins that must be connected to the RS-232 port on the **RS-43SL** are:

  - Pin 2 to pin 2

  - Pin 3 to pin 3

  - Pin 5 to pin 5
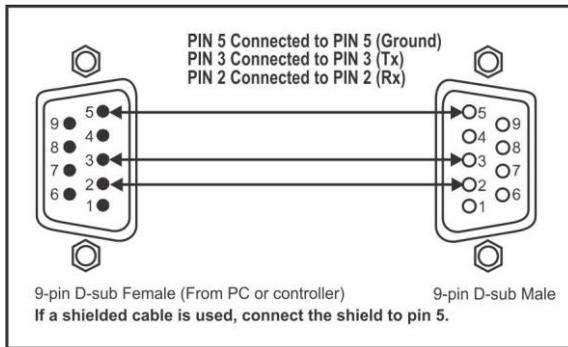
Figure 6: RS-232 Cabling Pinout

- Connect the RS-232 9-pin D-sub rear panel port on the other-side extender unit via a 9-wire straight cable to the RS-232 port on your projector.

shows bidirectional RS-232 control of the projector that is connected to **TP-780RXR**, via a **RC-43SL** connected to the **TP-780TXR**. The **RC-43SL** sends commands via RS-232 to control the projector.
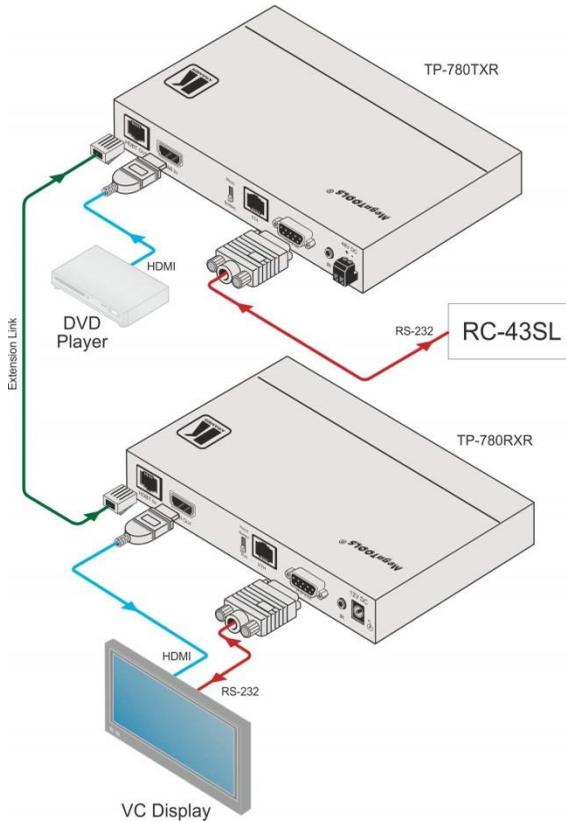
Figure 7: RS-232 Control via the TP-780TXR/RXR

4.3 Remote Control via Ethernet

Figure 8 shows bidirectional Ethernet control of the projector that is connected to **TP-780RXR**, via a **RC-43SL** connected to the **TP-780TXR**. The **RC-43SL** sends commands via Ethernet to control the projector.
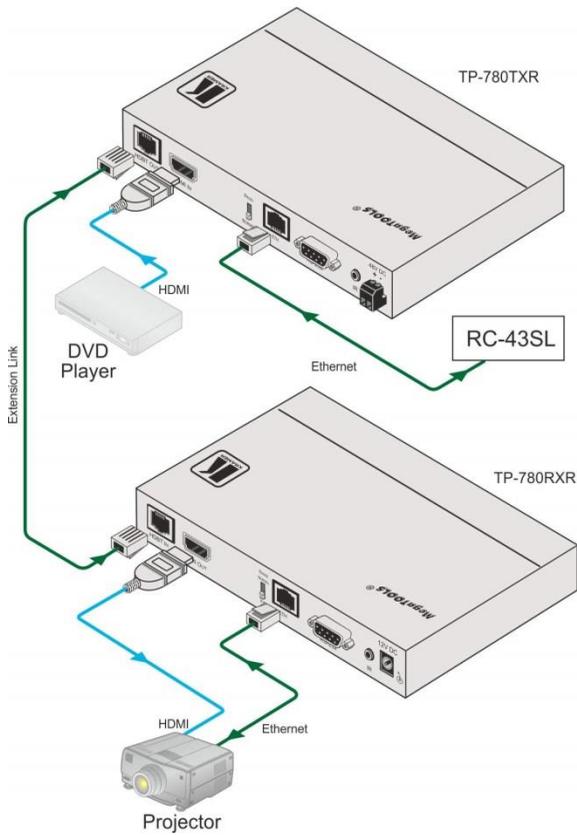
Figure 8: Ethernet Control via the TP-780TXR/RXR

5 Wiring the Extension Line RJ-45 Connectors

This section defines the extension line pinout, using a **straight** pin-to-pin cable with RJ-45 connectors.

> Note, that the cable ground shielding must be connected / soldered to the connector shield.

EIA /TIA 568B	
PIN	**Wire Color**
1	Orange / White
2	Orange
3	Green / White
4	Blue
5	Blue / White
6	Green
7	Brown / White
8	Brown

Figure 9: Extension Line Pinout
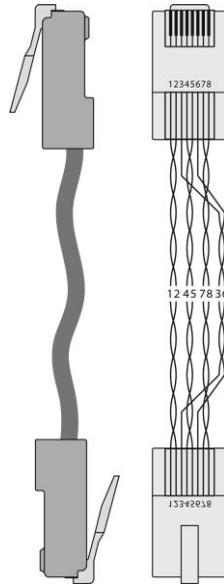
6   Technical Specifications

	TP-780TXR	TP-780RXR
INPUTS:	1 HDMI connector	1 HDBaseT RJ−45 connector for extension line.
OUTPUTS:	1 HDBaseT RJ−45 connector for extension line	1 HDMI connector
PORTS:	1 IR on a 3.5mm mini jack for IR link extension, 1 RS−232 on a 9−pin D−sub connector for serial link extension and transmitter firmware upgrade, 1 10Base−T/100BaseTx Ethernet on an RJ−45 female connector for LAN extension	
MAX. DATA RATE:	10.2Gbps (3.4Gbps per graphic channel)	
RANGE EXTENSION:	Up to 100m (330ft) at 4K@60Hz (4:2:0), Up to 130m (430ft) at full HD (1080p @60Hz 36bpp), Up to 180m (590ft) at HDBaseT ultra mode and full HD (1080p @60Hz 24bpp), Note: When using Kramer HDBaseT cables	
MAX. VIDEO RESOLUTION:	4K@60Hz (4:2:0) 24bpp	
EXTENDED ETHERNET:	Up to 100Mbps extended line rate bandwidth	
EXTENDED RS-232:	300 to 115200 baud rate	
EXTENDED IR:	20KHz to 1.2MHz frequency range	
CONTROL RS-232:	Up to 115200 baud rate	
STANDARD COMPLIANCE:	HDBaseT 1.0, HDMI 2.0 and HDCP 2.2	
POWER SOURCE:	48V DC, 1.36A (external power supply)	12V DC, 2A (external power supply) or POE
POWER CONSUMPTION:	48V DC, 280mA	12V DC, 500mA
ENCLOSURE:	MegaTool unit size	
COOLING:	Convection ventilation	
OPERATING TEMPERATURE:	0° to 40°C (32° to 104°F)	
STORAGE TEMPERATURE:	−40° to +70°C (−40° to 158°F)	
HUMIDITY:	10% to 90%, RHL non−condensing	
PRODUCT DIMENSIONS:	18.75cm x 11.50cm x 2.54cm (7.38" x 4.53" x 1.00") W, D, H	
PRODUCT WEIGHT:	0.4kg (0.9lbs) approx.	
SHIPPING DIMENSIONS:	34.50cm x 16.50cm x 5.20cm (13.58" x 6.50" x 2.05") W, D, H	
SHIPPING WEIGHT:	1.0kg (2.2lbs) approx.	
INCLUDED ACCESSORIES:	Power supply 48V/1.36A, bracket installation kit	Power supply 12V/2A, bracket installation kit
OPTIONS:	RK−T2B 19" rack mount	

Specifications are subject to change without notice. For the latest specifications, see our Web site at www.kramerav.com

LIMITED WARRANTY

The warranty obligations of Kramer Electronics for this product are limited to the terms set forth below:

What is Covered

This limited warranty covers defects in materials and workmanship in this product.

What is Not Covered

This limited warranty does not cover any damage, deterioration or malfunction resulting from any alteration, modification, improper or unreasonable use or maintenance, misuse, abuse, accident, neglect, exposure to excess moisture, fire, improper packing and shipping (such claims must be presented to the carrier), lightning, power surges, or other acts of nature. This limited warranty does not cover any damage, deterioration or malfunction resulting from the installation or removal of this product from any installation, any unauthorized tampering with this product, any repairs attempted by anyone unauthorized by Kramer Electronics to make such repairs, or any other cause which does not relate directly to a defect in materials and/or workmanship of this product. This limited warranty does not cover cartons, equipment enclosures, cables or accessories used in conjunction with this product.

Without limiting any other exclusion herein, Kramer Electronics does not warrant that the product covered hereby, including, without limitation, the technology and/or integrated circuit(s) included in the product, will not become obsolete or that such items are or will remain compatible with any other product or technology with which the product may be used.

How Long Does this Coverage Last

Seven years as of this printing; please check our Web site for the most current and accurate warranty information.

Who is Covered

Only the original purchaser of this product is covered under this limited warranty. This limited warranty is not transferable to subsequent purchasers or owners of this product.

What Kramer Electronics will do

Kramer Electronics will, at its sole option, provide one of the following three remedies to whatever extent it shall deem necessary to satisfy a proper claim under this limited warranty:

1. Elect to repair or facilitate the repair of any defective parts within a reasonable period of time, free of any charge for the necessary parts and labor to complete the repair and restore this product to its proper operating condition. Kramer Electronics will also pay the shipping costs necessary to return this product once the repair is complete.

2. Replace this product with a direct replacement or with a similar product deemed by Kramer Electronics to perform substantially the same function as the original product.

3. Issue a refund of the original purchase price less depreciation to be determined based on the age of the product at the time remedy is sought under this limited warranty.

What Kramer Electronics will not do Under This Limited Warranty

If this product is returned to Kramer Electronics or the authorized dealer from which it was purchased or any other party authorized to repair Kramer Electronics products, this product must be insured during shipment, with the insurance and shipping charges prepaid by you. If this product is returned uninsured, you assume all risks of loss or damage during shipment. Kramer Electronics will not be responsible for any costs related to the removal or re-installation of this product from or into any installation. Kramer Electronics will not be responsible for any costs related to any setting up this product, any adjustment of user controls or any programming required for a specific installation of this product.

How to Obtain a Remedy under this Limited Warranty

To obtain a remedy under this limited warranty, you must contact either the authorized Kramer Electronics reseller from whom you purchased this product or the Kramer Electronics office nearest you. For a list of authorized Kramer Electronics resellers and/or Kramer Electronics authorized service providers, please visit our web site at www.kramerelectronics.com or contact the Kramer Electronics office nearest you.

In order to pursue any remedy under this limited warranty, you must possess an original, dated receipt as proof of purchase from an authorized Kramer Electronics reseller. If this product is returned under this limited warranty, a return authorization number, obtained from Kramer Electronics, will be required. You may also be directed to an authorized reseller or a person authorized by Kramer Electronics to repair the product.

If it is decided that this product should be returned directly to Kramer Electronics, this product should be properly packed, preferably in the original carton, for shipping. Cartons not bearing a return authorization number will be refused.

Limitation on Liability

THE MAXIMUM LIABILITY OF KRAMER ELECTRONICS UNDER THIS LIMITED WARRANTY SHALL NOT EXCEED THE ACTUAL PURCHASE PRICE PAID FOR THE PRODUCT. TO THE MAXIMUM EXTENT PERMITTED BY LAW, KRAMER ELECTRONICS IS NOT RESPONSIBLE FOR DIRECT, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES RESULTING FROM ANY BREACH OF WARRANTY OR CONDITION, OR UNDER ANY OTHER LEGAL THEORY. Some countries, districts or states do not allow the exclusion or limitation of relief, special, incidental, consequential or indirect damages, or the limitation of liability to specified amounts, so the above limitations or exclusions may not apply to you.

Exclusive Remedy

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IF ANY PRODUCT TO WHICH THIS LIMITED WARRANTY APPLIES IS A "CONSUMER PRODUCT" UNDER THE MAGNUSON-MOSS WARRANTY ACT (15 U.S.C.A. §2301, ET SEQ.) OR OTHER APPICABLE LAW, THE FOREGOING DISCLAIMER OF IMPLIED WARRANTIES SHALL NOT APPLY TO YOU, AND ALL IMPLIED WARRANTIES ON THIS PRODUCT, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR THE PARTICULAR PURPOSE, SHALL APPLY AS PROVIDED UNDER APPLICABLE LAW.

Other Conditions

This limited warranty gives you specific legal rights, and you may have other rights which vary from country to country or state to state.

This limited warranty is void if (i) the label bearing the serial number of this product has been removed or defaced, (ii) the product is not distributed by Kramer Electronics or (iii) this product is not purchased from an authorized Kramer Electronics reseller. If you are unsure whether a reseller is an authorized Kramer Electronics reseller, please visit our Web site at www.kramerelectronics.com or contact a Kramer Electronics office from the list at the end of this document.

Your rights under this limited warranty are not diminished if you do not complete and return the product registration form or complete and submit the online product registration form. Kramer Electronics thanks you for purchasing a Kramer Electronics product. We hope it will give you years of satisfaction.

KRAMER

⚠ **SAFETY WARNING**
Disconnect the unit from the power supply before opening and servicing

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For the latest information on our products and a list of Kramer distributors, visit our Web site to find updates to this user manual.

We welcome your questions, comments, and feedback.

www.kramerav.com
info@kramerav.com