Kramer Electronics, Ltd.

USER MANUAL

Models:

TP-104, TP-104(HD), ***XGA Line Transmitter / DA***

TP-105, TP-105(HD), ***CAT5 Line Driver / DA***

TP-121, ***XGA / Audio Line Transmitter***

TP-122, ***XGA / Audio Line Receiver***

TP-123, ***XGA / Audio / Data Line Transmitter***

TP-124, ***XGA / Audio / Data Line Receiver***

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1 Introduction

Welcome to Kramer Electronics (since 1981): a world of unique, creative and affordable solutions to the infinite range of problems that confront the video, audio and presentation professional on a daily basis. In recent years, we have redesigned and upgraded most of our line, making the best even better! Our 500-plus different models now appear in 8 Groups[1], which are clearly defined by function.

Congratulations on purchasing your Kramer TOOLS: **TP-104, TP-104(HD)** *XGA Line Transmitter / DA*, and/or **TP-105, TP-105(HD)**, *CAT5 Line Driver / DA*, and/or **TP-121** *XGA / Audio Line Transmitter*, and/or **TP-122** *XGA / Audio Line Receiver*, and/or **TP-123**, *XGA / Audio / Data Line Transmitter*, and/or **TP-124**, *XGA / Audio / Data Line Receiver*, which are ideal for:

- Presentation and multimedia applications
- Long range graphics distribution for schools, hospitals, security, and stores

The package includes one or more of the following Kramer TOOLS:

- **TP-104/TP-104(HD)**, **TP-105/TP-105(HD)**, **TP-121**, **TP-122**, **TP-123**, or **TP-124**
- Power adapter (12V DC Input) and this user manual[2]

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
- Use Kramer high performance high resolution cables[3]

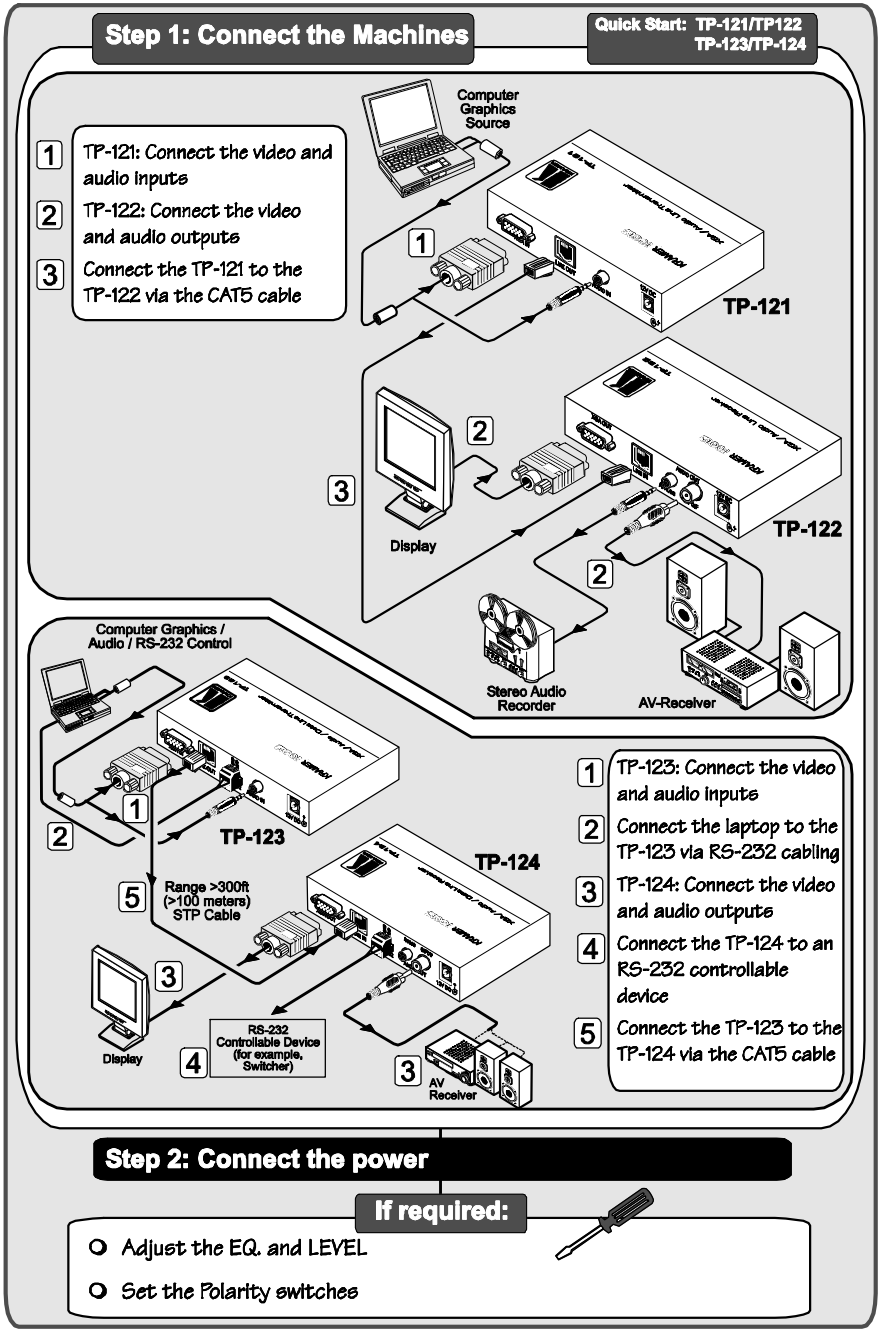
2.1 Quick Start

The quick start charts summarize the basic setup and operation steps of the **TP-121/TP-122** and **TP-123/TP-124**, and of the **TP-104** and **TP-105**.

1 GROUP 1: Distribution Amplifiers; GROUP 2: Video and Audio Switchers, Matrix Switchers and Controllers; GROUP 3: Video, Audio, VGA/XGA Processors; GROUP 4: Interfaces and Sync Processors; GROUP 5: Twisted Pair Interfaces; GROUP 6: Accessories and Rack Adapters; GROUP 7: Scan Converters and Scalers; and GROUP 8: Cables and Connectors

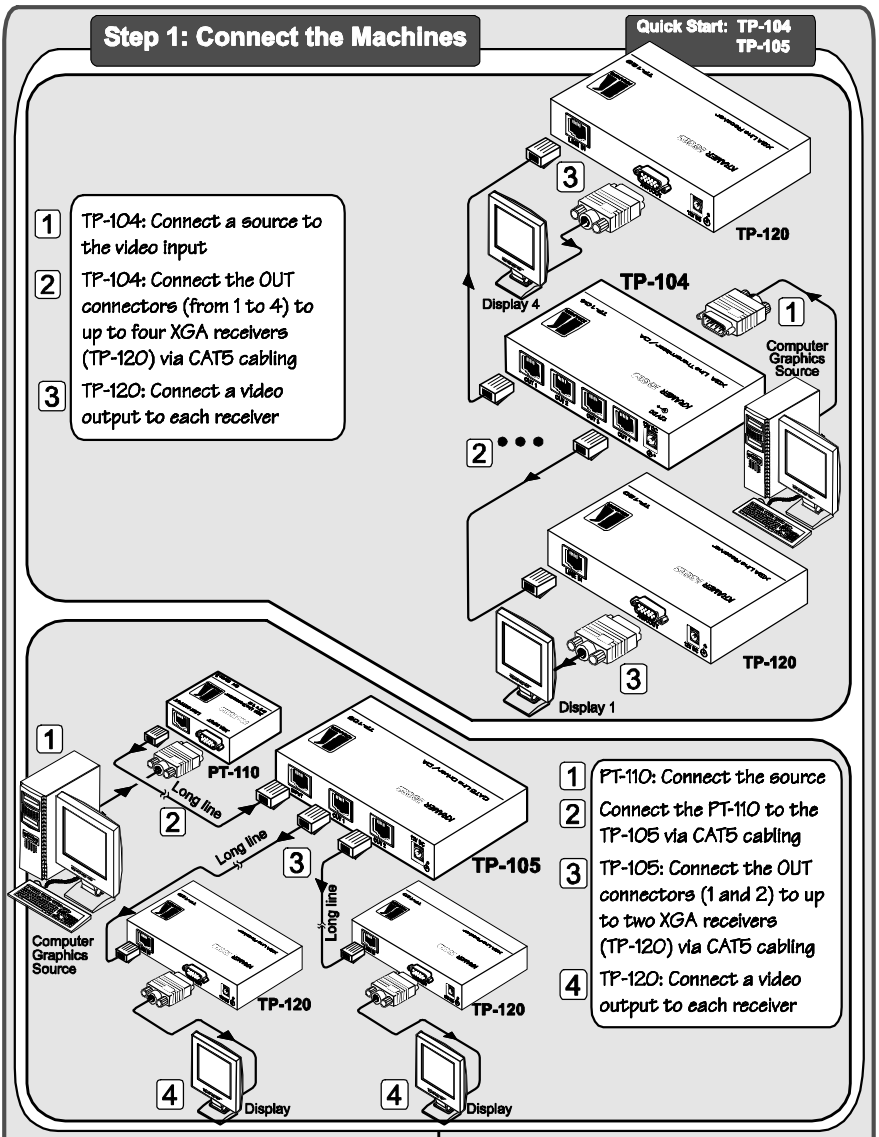
2 Download up-to-date Kramer user manuals from the Internet at this URL: http://www.kramerelectronics.com

3 The complete list of Kramer cables is on our Web site at http://www.kramerelectronics.com


Step 1: Connect the Machines
Quick Start: TP-121/TP122
TP-123/TP-124
1 TP-121: Connect the video and audio inputs
2 TP-122: Connect the video and audio outputs
3 Connect the TP-121 to the TP-122 via the CAT5 cable
Computer Graphics Source
TP-121
TP-122
Display
Stereo Audio Recorder
AV-Receiver
Computer Graphics / Audio / RS-232 Control
TP-123
TP-124
Range >300ft (>100 meters) STP Cable
RS-232 Controllable Device (for example, Switcher)
AV Receiver
1 TP-123: Connect the video and audio inputs
2 Connect the laptop to the TP-123 via RS-232 cabling
3 TP-124: Connect the video and audio outputs
4 Connect the TP-124 to an RS-232 controllable device
5 Connect the TP-123 to the TP-124 via the CAT5 cable
Step 2: Connect the power
If required:
Adjust the EQ. and LEVEL
Set the Polarity switches

Step 1: Connect the Machines

Quick Start: TP-104 TP-105



1. TP-104: Connect a source to the video input
2. TP-104: Connect the OUT connectors (from 1 to 4) to up to four XGA receivers (TP-120) via CAT5 cabling
3. TP-120: Connect a video output to each receiver

1. PT-110: Connect the source
2. Connect the PT-110 to the TP-105 via CAT5 cabling
3. TP-105: Connect the OUT connectors (1 and 2) to up to two XGA receivers (TP-120) via CAT5 cabling
4. TP-120: Connect a video output to each receiver

Step 2: Connect the power

If required:

- Adjust the EQ. and LEVEL
- Set the Polarity switches

3 Overview

This user manual describes the following Kramer TOOLS:

- **TP-104/TP-104(HD)** *XGA Line Transmitter / DA*, which is a line transmitter / 1:4 DA that receives an XGA signal and transmits it over 4 CAT5 cables to appropriate receivers, see section 4
- **TP-105/TP-105(HD)** *CAT5 Line Driver / DA*, which receives a CAT5 input[1], and distributes it to 2 identical outputs, see section 5
- **TP-121** *XGA / Audio Line Transmitter* and the **TP-122** *XGA / Audio Line Receiver*, see section 6
- **TP-123** *XGA / Audio / Data Line Transmitter* and the **TP-124** *XGA / Audio / Data Line Receiver*, see section 7

This section describes:

- The power connect feature, see section 3.1
- Using shielded twisted pair (STP) / unshielded twisted pair (UTP), see section 3.2
- Recommendations for achieving the best performance, see section 3.3

3.1 About the Power Connect Feature

The Power Connect feature lets you power a transmitter / receiver system by connecting just one power adapter— to either the transmitter or the receiver. The other unit is fed via the cable connecting between the transmitter/receiver. The Power Connect feature applies as long as the cable can carry power. The distance does not exceed 50 meters on standard CAT5 cable, for longer distances, heavy gauge cable should be used[2].

For a CAT5 cable exceeding a distance of 50 meters, separate power supplies should be connected to the transmitter and to the receiver simultaneously.

1 Video only

2 CAT5 cable is still suitable for the video/audio transmission, but not for feeding the power at these distances

3.2 Shielded Twisted Pair (STP) / Unshielded Twisted Pair (UTP)

The decision whether to use shielded twisted pair (STP) cable or unshielded twisted pair (UTP) cable depends on the nature of the application.

It is recommended that in applications with high interference, shielded twisted pair (STP) cable is used. However, the shield itself does create a capacitance that degrades the frequency response of the machines. For shorter distances, of 50m or so, shielded twisted pair (STP) cable is preferred because it provides protection from interference (degradation is not apparent).

For long range applications, unshielded twisted pair (UTP) cable is preferred. However, the unshielded twisted pair (UTP) cable should be installed far away from electric cables, motors and so on, which are prone to create electrical interference.

3.3 Recommendations for Achieving the Best Performance

To achieve the best performance:

- Connect only good quality connection cables, thus avoiding interference, deterioration in signal quality due to poor matching, and elevated noise- levels (often associated with low quality cables)
- Avoid interference from neighboring electrical appliances and position your Kramer TOOLS away from moisture, excessive sunlight and dust

Caution – No operator-serviceable parts inside unit.

Warning – Use only the Kramer Electronics input power wall adapter that is provided with this unit[1].

Warning – Disconnect power and unplug unit from wall before installing or removing device or servicing unit.

1 For example: model number AD2512C, part number 2535-000251

4 Your TP-104/TP-104(HD[1]) XGA Line Transmitter / DA

The **TP-104** is a line transmitter / 1:4 DA that receives an XGA signal[2] and transmits it over 4 CAT5 cables to appropriate receivers.

In particular, the **TP-104**:

- Has a video bandwidth of more than 150MHz, with a transmission range of more than 300 ft. (more than 100 meters)
- Can power or be powered by the receiver over the same CAT5 cable and is 12VDC fed

Figure 1 and Table 1 define the **TP-104**:

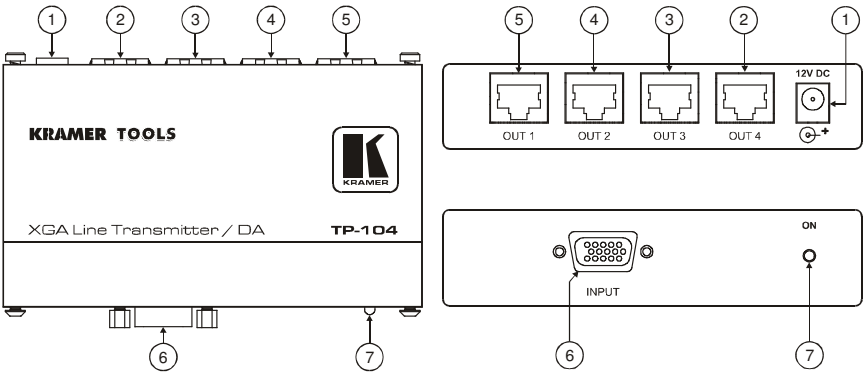


Figure 1: TP-104 XGA Line Transmitter / DA

Table 1: TP-104 XGA Line Transmitter / DA Features

#	Feature	Function
1	*12V DC*	+12V DC connector for powering the unit
2	*OUT* 1 RJ-45 Connector	Connects to[3] the LINE IN RJ-45 connector on the **TP-122** *XGA / Audio Line Receiver* or the **TP-120** *XGA Line Receiver*[4]
3	*OUT* 2 RJ-45 Connector	Connects to[3] the LINE IN RJ-45 connector on the **TP-122** *XGA / Audio Line Receiver* or the **TP-120** *XGA Line Receiver*[4]
4	*OUT* 3 RJ-45 Connector	Connects to[3] the LINE IN RJ-45 connector on the **TP-122** *XGA / Audio Line Receiver* or the **TP-120** *XGA Line Receiver*[4]
5	*OUT* 4 RJ-45 Connector	Connects to[3] the LINE IN RJ-45 connector on the **TP-122** *XGA / Audio Line Receiver* or the **TP-120** *XGA Line Receiver*[4]
6	*INPUT* HD15F Connector	Connect to the XGA source
7	*ON* LED	Illuminates when receiving power

1 The TP-104(HD) (identified by a sticker on its underside) is identical in appearance to the TP-104. However, the TP-104(HD) can also receive HD signals (high definition resolutions: 480p, 576p, 720p, 1080i and 1080p)

2 The terminology XGA is used throughout this manual, where this implies any RGBHV signal on an HD15 connector having a resolution from VGA up to XGA

3 Using a UTP CAT5 cable with RJ-45 connectors at both ends (the PINOUT is defined in Table 12 and Figure 13)

4 Refer to the separate user manual: PT-110, WP-110, PT-120, TP-120, which can be downloaded at: http://www.kramerelectronics.com. Also, see the example illustrated in Figure 16

Figure 2 and Table 2 define the **TP-104** underside panel:

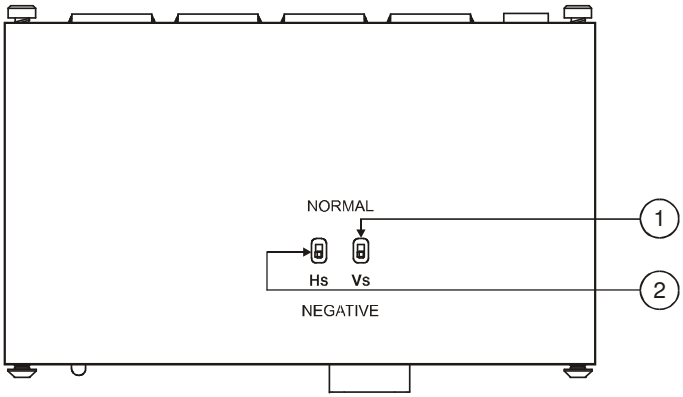


Figure 2: TP-104 (Underside Panel)

Table 2: TP-104 (Underside Panel) Features

#	Feature	Function
1	*VS* Switch	Slide the switch up (to NORMAL) to retain the polarity Slide the switch down[1] to change the VS polarity to NEGATIVE polarity[2]
2	*HS* Switch	Slide the switch up (to NORMAL) to retain the polarity Slide the switch down[1] to change the HS polarity to NEGATIVE polarity[2]

1 By default, both switches are set to NORMAL

2 Downgoing syncs

5 Your TP-105/TP-105(HD[1]) CAT5 Line Driver / DA

The **TP-105** receives a CAT5 input, and distributes it to 2 identical outputs.

In particular, the **TP-105**:

- Has a transmission range of more than 300 ft. (more than 100 meters) over UTP cabling
- Includes EQ. and level controls and is 12VDC fed

Figure 3 and Table 3 define the **TP-105**:

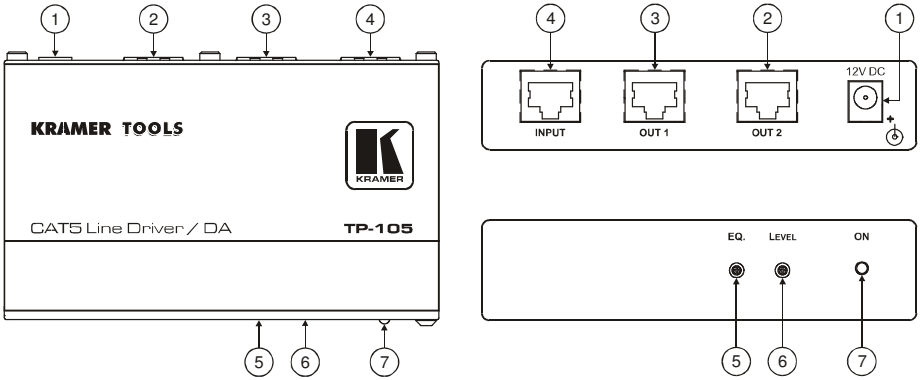


Figure 3: TP-105 CAT5 Line Driver / DA

Table 3: TP-105 CAT5 Line Driver / DA Features

#	Feature	Function
1	*12V DC*	+12V DC connector for powering the unit
2	*OUT* 2 RJ-45 Connector	Connects to[2] the LINE IN RJ-45 connector on the **TP-120** *XGA Line Receiver*
3	*OUT* 1 RJ-45 Connector	Connects to[2] the LINE IN RJ-45 connector on the **TP-120** *XGA Line Receiver*
4	*INPUT* RJ-45 Connector	Connects to[2] the LINE OUT RJ-45 connector on the **PT-110** *XGA Line Transmitter*
5	*ON* LED	Illuminates when receiving power
6	*LEVEL* Trimmer	Adjusts[3] the video signal level
7	*EQ.* Trimmer	Adjusts the video EQ. (equalization) compensation

1 The TP-105(HD) (identified by a sticker on its underside) is identical in appearance to the TP-105. However, the TP-105(HD) can also receive HD signals (high definition resolutions: 480p, 576p, 720p, 1080i and 1080p), for example, from a TP-112HD XGA/HD Line Transmitter-DA, and not only computer graphics signals (for example, from a PT-110 as Figure 17 illustrates)

2 Using a UTP CAT5 cable with RJ-45 connectors at both ends (the PINOUT is defined in Table 12 and Figure 13)

3 Insert a screwdriver into the hole and carefully rotate it, to trim the level

6 Your TP-121 / TP-122

This section defines the **TP-121** *XGA / Audio Line Transmitter* (see section 6.1), and the **TP-122** *XGA / Audio Line Receiver* (see section 6.2).

6.1 Your TP-121 XGA / Audio Line Transmitter

The **TP-121** is an XGA / audio stereo line transmitter that receives an XGA signal and an unbalanced stereo analog audio signal and transmits them over CAT5 cable to a **TP-122** receiver, converting the unbalanced stereo analog audio signal to digital audio (S/PDIF) stream before transmitting, thus preserving the quality of the audio signal. In particular, the **TP-121**:

- Has a 350MHz video bandwidth, with a transmission range of more than 300 ft. (more than 100 meters), and a 20kHz audio bandwidth with an S/N ratio that exceeds 80dB on the same transmission range
- Can power or be powered by the receiver over the same CAT5 cable
- Is 12VDC fed

Figure 4 and Table 4 define the **TP-121**:

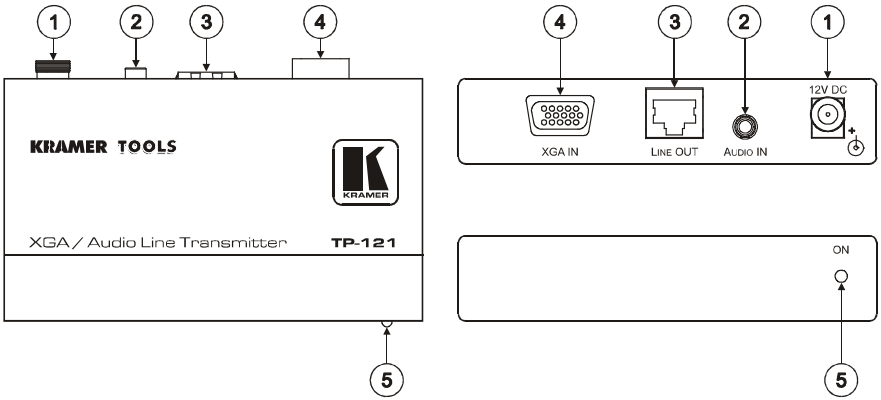


Figure 4: TP-121 XGA / Audio Line Transmitter

Table 4: TP-121 XGA / Audio Line Transmitter Features

#	Feature	Function
1	*12V DC*	+12V DC connector for powering the unit
2	*AUDIO IN* 3.5mm Mini Jack	Connects to the audio source
3	*LINE OUT* RJ-45 Connector	Connects to[1] the LINE IN RJ-45 connector on the **TP-122** *XGA / Audio Line Receiver*
4	*XGA IN* HD15F Connector	Connect to the XGA source
5	*ON* LED	Illuminates when receiving power

1 Using a UTP CAT5 cable with RJ-45 connectors at both ends (the PINOUT is defined in Table 12 and Figure 13)

6.1.1 The TP-121 Internal Polarity Switches

Figure 5 and Table 5 define the internal sync polarity switches inside the **TP-121**.

Note, that you need to open the **TP-121** unit to gain access to the Vs and Hs Polarity switches. After setting the switches, close the TP-121 unit.

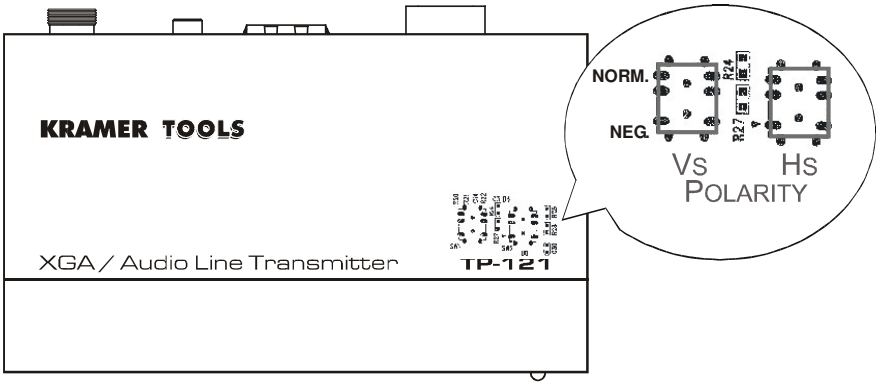


Figure 5: TP-121 Internal Polarity Switches

Table 5: Features of the TP-121 Internal Polarity Switches

Feature	Function
VS Switch	Slide the switch down[2], to set the V SYNC to negative polarity (NEG.); slide the switch up, to set the V SYNC to its input polarity (NORM.)
HS Switch	Slide the switch down[1], to set the H SYNC to negative polarity (NEG.); slide the switch up, to set the H SYNC to its input polarity (NORM.)

6.2 Your TP-122 XGA / Audio Line Receiver

This section describes the topside (see section 6.2.1), and the underside[2] (see section 6.2.2) of the **TP-122** *XGA / Audio Line Receiver*.

6.2.1 Your TP-122 XGA / Audio Line Receiver (Topside)

The **TP-122** is an XGA / audio line receiver that receives the coded CAT5 signal transmitted by a **TP-121**, decodes it and converts it to XGA, stereo analog and S/PDIF digital audio outputs. The **TP-122**, with a **TP-121**, allows an operation range of more than 300 ft. (more than 100 meters) over standard CAT5 cable.

1 By default, both switches are set down (for a negative V SYNC and H SYNC polarity)

2 The underside is identical on the TP-122 and TP-124

In addition, the **TP-122**:

- Can power or be powered by the transmitter over the same CAT5 cable
- Can change the polarity of decoding H and V Sync for video
- Includes EQ. and level controls
- Is 12VDC fed

Figure 6 and Table 6 define the **TP-122** *XGA / Audio Line Receiver* topside:

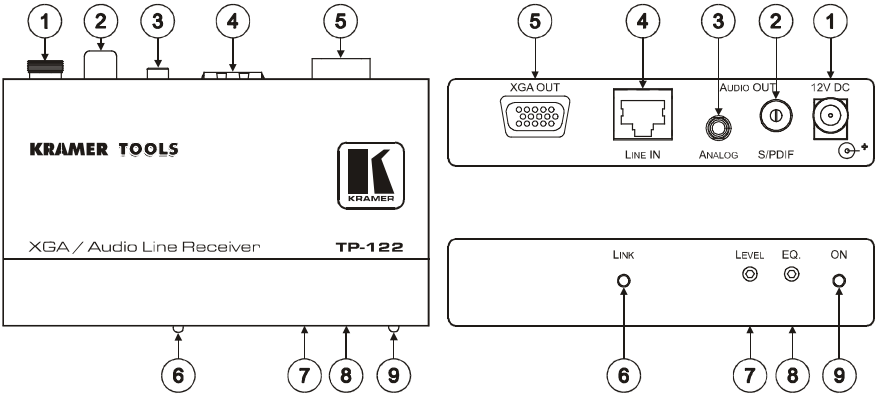


Figure 6: TP-122 XGA / Audio Line Receiver (Topside)

Table 6: TP-122 XGA / Audio Line Receiver (Topside) Features

#	Feature		Function
1	*12V DC*		+12V DC connector for powering the unit
2	AUDIO OUT	*S/PDIF* RCA connector	Connects to the digital audio acceptor
3	AUDIO OUT	*ANALOG* 3.5mm Mini Jack	Connects to the analog audio acceptor
4	*LINE IN* RJ-45 Connector		Connects to[1] the **TP-121** or the **TP-104**[2]
5	*XGA OUT* HD15F Connector		Connects to the XGA acceptor
6	*LINK* LED		Illuminates when receiving the correct input signal
7	*LEVEL* Trimmer		Adjusts[4] the output signal level
8	*EQ.*[3] Trimmer		Adjusts[4] the cable compensation equalization level
9	*ON* LED		Illuminates when receiving power

1 Using a UTP CAT5 cable with RJ-45 connectors at both ends (the PINOUT is defined in Table 12 and Figure 13)

2 The TP-104 does not accept the audio signals

3 Degradation and VGA/XGA signal loss can result from using long cables (due to stray capacitance), sometimes leading to a total loss of sharpness in high-resolution signals

4 Use a screwdriver to carefully rotate the trimmer, adjusting the appropriate level

6.2.2 Your TP-122 XGA / Audio Line Receiver (Underside)

Figure 7 and Table 7 define the underside[1] of the **TP-122** *XGA / Audio Line Receiver*:

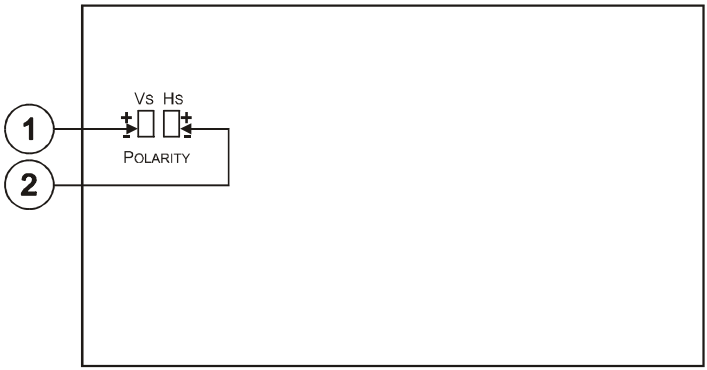


Figure 7: TP-122 XGA / Audio Line Receiver (Underside[1])

Table 7: TP-122 XGA / Audio Line Receiver (Underside) Features

#	Feature	Function
1	*VS* Switch	Slide the switch up[2], to set the V SYNC to positive polarity; slide the switch down, to set the V SYNC to negative polarity
2	*HS* Switch	Slide the switch up[2], to set the H SYNC to positive polarity; slide the switch down, to set the H SYNC to negative polarity

1 The underside is identical on the TP-122 and TP-124

2 By default, both switches are set down (for a negative V SYNC and H SYNC polarity)

7 Your TP-123 / TP-124

This section describes the **TP-123** *XGA / Audio / Data Line Transmitter* (see section 7.1), and the **TP-124** *XGA / Audio / Data Line Receiver* (see section 7.2).

7.1 Your TP-123 XGA / Audio / Data Line Transmitter

The **TP-123** is a high performance transmitter that accepts a computer graphics input signal, an unbalanced stereo analog audio signal, unidirectional (RxD) RS-232 control commands and 12V DC power, over CAT5 cable, and transmits to a **TP-124** receiver. The stereo analog audio signal is converted to the digital audio (S/PDIF) stream before transmitting, thus preserving the quality of the audio source signals.

The **TP-123 / TP-124** pair has a transmission range of more than 300 ft. (more than 100 meters) over UTP cabling. In addition, the **TP-123**:

- Has a video bandwidth that exceeds 350MHz
- Can power or be powered by the **TP-124** receiver over the same CAT5 cable and is 12VDC fed

Figure 8 and Table 8 define the **TP-123**:

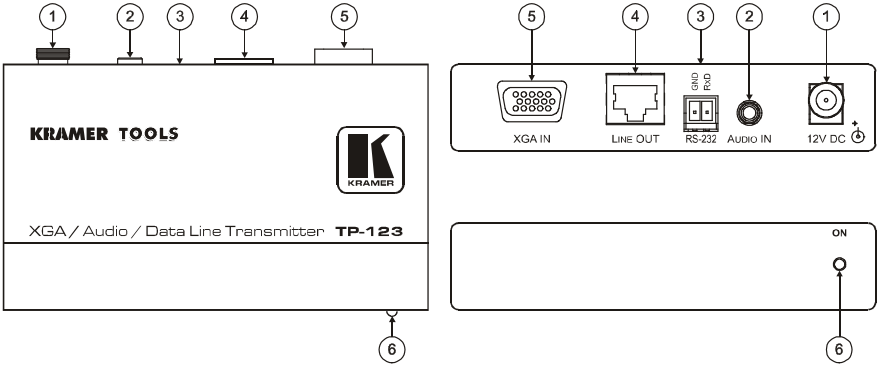


Figure 8: TP-123 XGA / Audio / Data Line Transmitter

Table 8: TP-123 XGA / Audio / Data Line Transmitter Features

#	Feature	Function
1	*12V DC*	+12V DC connector for powering the unit
2	*AUDIO IN* 3.5mm Mini Jack	Connects to the audio source
3	*RS-232* Terminal Block Connector	Connects to the PC or the Remote Controller (see section 9.1)
4	*LINE OUT* RJ-45 Connector	Connects to[1] the LINE IN RJ-45 connector on the **TP-124** *XGA / Audio Line Receiver*
5	*XGA IN* HD15F Connector	Connect to the XGA source
6	*ON* LED	Illuminates when receiving power

7.1.1 The TP-123 Internal Polarity Switches

Figure 9 and Table 9 define the internal sync polarity switches inside the **TP-123**.

Note, that you need to open the **TP-123** unit to gain access to the Vs and Hs Polarity switches. After setting the switches, close the **TP-123** unit.

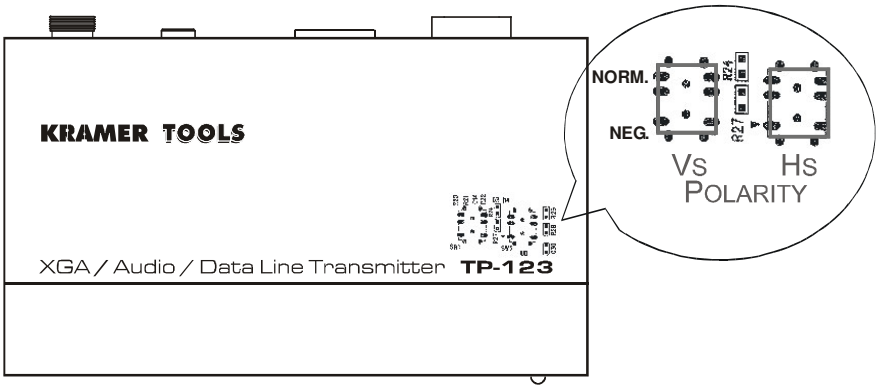


Figure 9: TP-123 Internal Polarity Switches

Table 9: Features of the TP-123 Internal Polarity Switches

Feature	Function
VS Switch	Slide the switch down[2], to set the V SYNC to negative polarity (NEG.); slide the switch up, to set the V SYNC to its input polarity (NORM.)
HS Switch	Slide the switch down[2], to set the H SYNC to negative polarity (NEG.); slide the switch up, to set the H SYNC to its input polarity (NORM.)

1 Using a UTP CAT5 cable with RJ-45 connectors at both ends (the PINOUT is defined in Table 12 and Figure 13)

2 By default, both switches are set down (for a negative V SYNC and H SYNC polarity)

7.2 Your TP-124 XGA / Audio / Data Line Receiver

The **TP-124** is a high performance receiver obtaining the computer graphics signal/audio/control data from the Kramer **TP-123** via UTP cabling at its CAT5 Line input. The **TP-124** outputs a computer graphics signal, an unbalanced stereo analog audio signal, a converted digital audio (S/PDIF) signal and RS-232 control commands. The unidirectional (TxD) RS-232 interface makes it possible to control virtually any devices over a transmission range of more than 300 ft. (more than 100 meters) over UTP cabling. The **TP-124** can power or be powered by the **TP-123** transmitter over the same CAT5 cable.

In addition, the **TP-124** features:

- Level and EQ. control for the XGA signals
- The capability to change the polarity of decoding H and V Sync
- 24 bit 48kHz S/PDIF digital audio that supplies the highest quality audio
- Is 12VDC fed

This section describes the topside of the **TP-124** *XGA / Audio / Data Line Receiver*. The underside[1] of the **TP-124** is described in section 6.2.2.

Figure 10 and Table 10 define the topside of the **TP-124** *XGA / Audio / Data Line Receiver*:

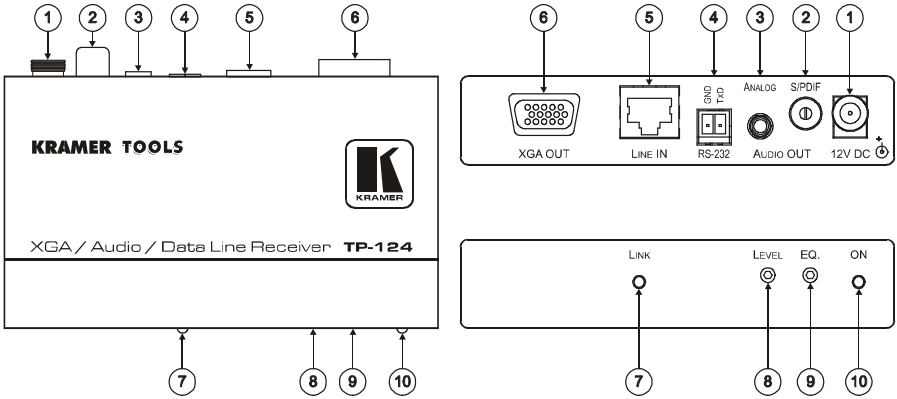


Figure 10: TP-124 XGA / Audio / Data Line Receiver (Topside)

1 The underside is identical on the TP-124 and TP-122

Table 10: TP-124 XGA / Audio / Data Line Receiver (Topside) Features

#	Feature		Function
1	*12V DC*		+12V DC connector for powering the unit
2	AUDIO OUT	*S/PDIF* RCA connector	Connects to the digital audio acceptor
3	AUDIO OUT	*ANALOG* 3.5mm Mini Jack	Connects to the analog audio acceptor
4	*RS-232* Terminal Block Connector		Connects to the controlled unit
5	*LINE IN* RJ-45 Connector		Connects to[1] the *LINE OUT* RJ-45 connector on the **TP-123** or the **TP-104**[2]
6	*XGA OUT* HD15F Connector		Connect to the XGA acceptor
7	*ON* LED		Illuminates when receiving power
8	*EQ.*[3] Trimmer		Adjusts[4] the cable compensation equalization level
9	*LEVEL* Trimmer		Adjusts[4] the output signal level
10	*LINK* LED		Illuminates when receiving the correct input signal

7.2.1 Your TP-124 XGA / Audio / Data Line Receiver (Underside)

Figure 11 and Table 11 define the underside[5] of the **TP-124** *XGA / Audio / Data Line Receiver*:

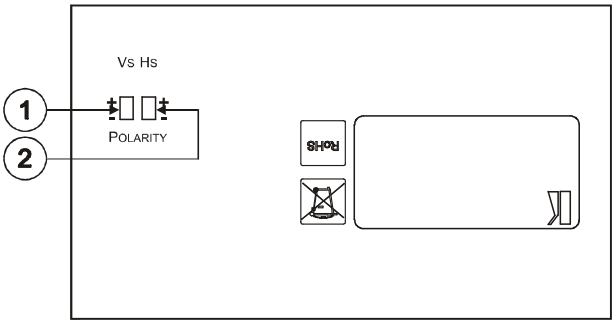


Figure 11: TP-124 XGA / Audio / Data Line Receiver (Underside[1])

Table 11: TP-124 XGA / Audio / Data Line Receiver (Underside) Features

#	Feature	Function
1	*VS* Switch	Slide the switch up[2], to set the V SYNC to positive polarity; slide the switch down, to set the V SYNC to negative polarity
2	*HS* Switch	Slide the switch up[6], to set the H SYNC to positive polarity; slide the switch down, to set the H SYNC to negative polarity

1 Using a UTP cable with CAT 5 connectors at both ends (the PINOUT is defined in Table 12 and Figure 13)

2 The TP-104 does not accept the audio signals

3 Degradation and VGA/XGA signal loss can result from using long cables (due to stray capacitance), sometimes leading to a total loss of sharpness in high-resolution signals

4 Use a screwdriver to carefully rotate the trimmer, adjusting the appropriate level

5 The underside is identical on the TP-122 and TP-124

6 By default, both switches are set down (for a negative V SYNC and H SYNC polarity)

8 Connecting the XGA / Audio Line Transmitter / Receiver

You can use the **TP-121** and **TP-122** to configure an *XGA/Audio Line*-to-Twisted Pair Transmitter and Receiver system.

To connect the **TP-121** *XGA / Audio Line Transmitter* with the **TP-122** *XGA / Audio Line Receiver*, as the example in Figure 12 illustrates, do the following:

1. On the **TP-121**, connect the XGA source (for example, a laptop's graphics card) to the XGA INPUT HD15F connector and an audio source to the AUDIO IN 3.5mm mini jack, for example, using a Kramer C-GMA/GMA cable (VGA HD15M +Audio jack to VGA HD15M +Audio jack)[1]. Alternatively, you can connect an XGA source to the XGA INPUT HD15F connector, and a separate audio source to the AUDIO IN 3.5mm mini jack.
2. On the **TP-122**, connect the XGA OUT HD15F connector to the XGA acceptor (for example, a display), and connect the AUDIO OUT S/PDIF RCA connector to the digital audio acceptor (for example, an AV Receiver), and the ANALOG 3.5mm mini jack to the analog audio acceptor (for example, a stereo audio recorder).
3. Connect the LINE OUTPUT RJ-45 connector on the **TP-121** to the LINE IN RJ-45 connector on the **TP-122**, via UTP cabling (with a range of more than 300ft (>100m)), see section 8.1.
4. Connect the 12V DC power adapter to the power socket and connect the adapter to the mains electricity on both[2] the **TP-121** and the **TP-122**. The signal from the XGA source is transmitted via CAT5 cable, decoded and converted at the XGA OUT HD15F connector to the XGA acceptor.
5. On the **TP-122**:
   - Adjust[3] the video output signal level and/or cable compensation equalization level, if required
   - If necessary, set the H SYNC and V SYNC switches[4], on the underside

1 Not supplied. The complete list of Kramer cables is on our Web site at http://www.kramerelectronics.com

2 If you cannot connect the power to both the TP-121 and TP-122, you can just connect the power to the TP-122

3 Use a screwdriver to carefully rotate the trimmer, adjusting the appropriate level

4 By default, both switches are set down (for negative V SYNC and H SYNC polarity)

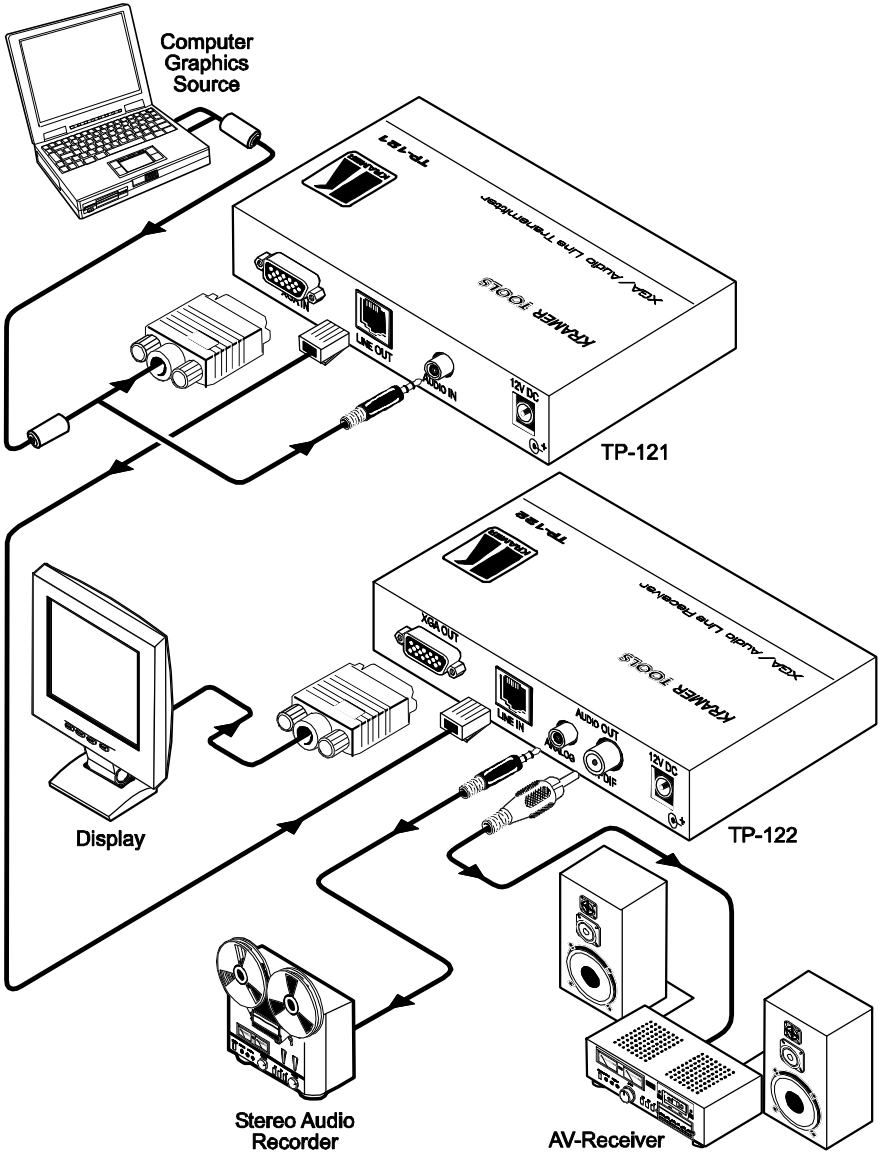


Figure 12: Connecting the XGA / Audio Line Transmitter / Receiver System

8.1 Wiring the CAT5 LINE IN / LINE OUT RJ-45 Connectors

Table 12 and Figure 13 define the UTP CAT5 PINOUT, using a straight pin to pin cable with RJ-45 connectors:

Figure 13: CAT5 PINOUT

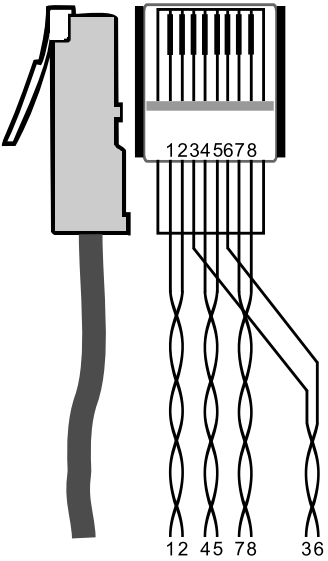


Table 12: CAT5 PINOUT

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

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
Pair 1	4 and 5
Pair 2	1 and 2
Pair 3	3 and 6
Pair 4	7 and 8

9 Connecting the XGA / Audio / Data Line Transmitter / Receiver

You can use the **TP-123** *XGA / Audio / Data Line Transmitter* and the **TP-124** *XGA / Audio / Data Line Receiver* to configure a twisted pair transmitter and receiver system, to transmit the video, audio and RS-232 control signals via CAT5 UTP cable. To connect the **TP-123** and the **TP-124** to configure a twisted pair transmitter and receiver system, as the example in Figure 14 illustrates, do the following:

1. On the **TP-123**, connect:
   - An XGA source (for example, a laptop's graphics card) to the XGA IN HD15F connector and an audio source to the Audio IN 3.5mm mini jack, for example, using a Kramer C-GMA/GMA cable (VGA HD15M +Audio jack to VGA HD15M +Audio jack)[1]
   - An RS-232 cable with a DB9 connector at one end to the laptop, and a 2 PIN terminal block connector at the other end to the **TP-123** RS-232 port[2]
2. On the **TP-124**, connect:
   - The XGA OUT HD15F connector to a Display
   - The S/PDIF Audio OUT RCA connector to a digital AV Receiver (leave the ANALOG Audio OUT 3.5mm mini jack unconnected)
   - An RS-232 cable with a 2 PIN terminal block connector at one end to the **TP-124** RS-232 port[2], and a DB9 connector at the other end to the RS-232 port on an RS-232 controllable device (for example, a switcher)
3. Connect the Line OUT RJ-45 connector on the **TP-123** to the LINE IN RJ-45 connector on the **TP-124,** via UTP cabling[3] (with a range of more than 300ft (>100m)).
4. Connect the 12V DC power adapter to the power socket and connect the adapter to the mains electricity on both[4] the **TP-123** and the **TP-124**.
5. On the **TP-124**:
   - Adjust[5] the video output signal level and/or cable compensation equalization level, if required
   - If necessary, set the H SYNC and V SYNC switches[6], on the underside

1 Not supplied. The full list of Kramer cables is on our Web site at http://www.kramerelectronics.com. Alternatively, you can connect an XGA source to the XGA IN HD15F connector, and a separate audio source to the AUDIO IN 3.5mm mini jack

2 As defined in Figure 15 and Table 13 (see section 8.1)

3 For details of how to wire a CAT5 LINE IN / LINE OUT RJ-45 connector, see section 8.1

4 If you cannot connect the power to both the TP-123 and TP-124, you can just connect the power to any one unit

5 Use a screwdriver to carefully rotate the trimmer, adjusting the appropriate level

6 By default, both switches are set down (for negative V SYNC and H SYNC polarity)

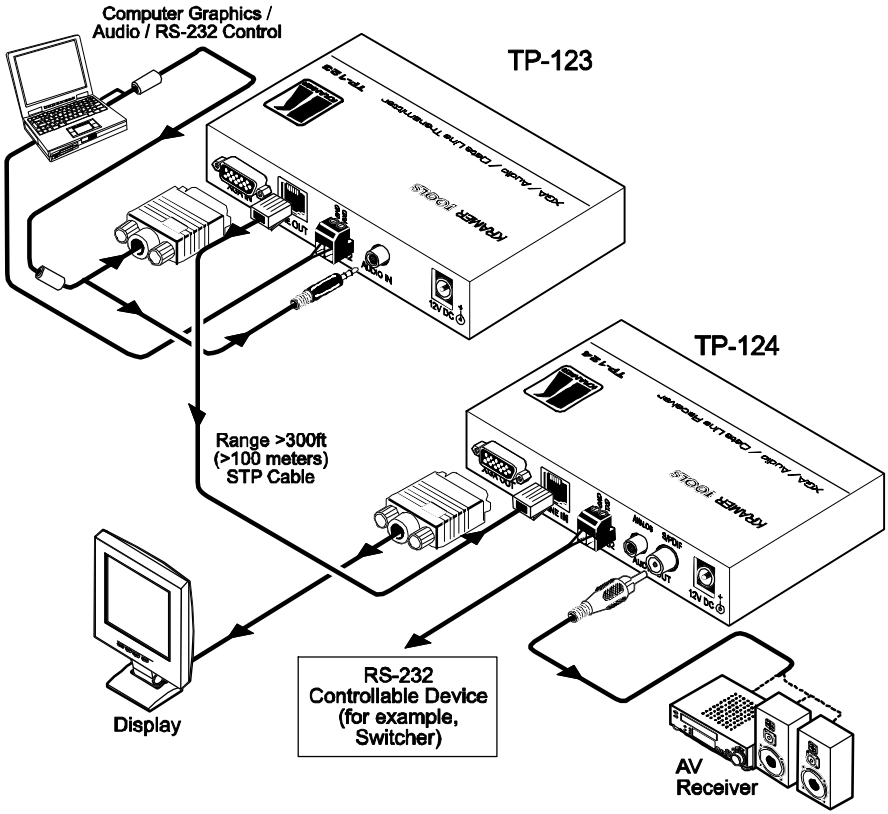


Figure 14: Connecting the XGA / Audio / Data Line Transmitter / Receiver System

9.1 Controlling via RS-232 (for example, using a PC)

Prepare an RS-232 cable with a DB9 connector at one end, and a 2 PIN terminal block connector at the other end, as defined in Figure 15 and Table 13:

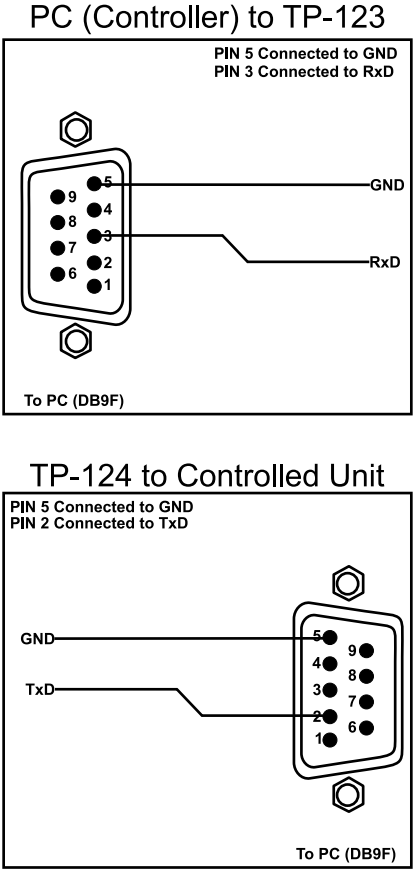


Figure 15: RS-232 PINOUT Connection

Table 13: RS-232 PINOUT Connection

Connect this PIN on the Terminal Block Connector:	To this PIN on the DB9 Connector
TxD	PIN 2
RxD	PIN 3
GND	PIN 5

10 Configuring a 1:4 XGA to TP Transmitter / Receiver / DA

You can use the **TP-104** *XGA Line Transmitter / DA* with the **TP-120** *XGA Line Receiver*[1] to configure a 1:4 XGA-to-Twisted Pair DA system.

To connect the **TP-104** to four **TP-120** units, as the example in Figure 16 illustrates, do the following:

1. On the **TP-104**, connect the XGA source (for example, a computer graphics source) to the XGA INPUT HD15F connector, and connect the line output RJ-45 connector[2]:
   - OUT 1 to the LINE IN RJ-45 connector on the **TP-120** Unit I
   - OUT 2 to the LINE IN RJ-45 connector on the **TP-120** Unit II
   - OUT 3 to the LINE IN RJ-45 connector on the **TP-120** Unit III
   - OUT 4 to the LINE IN RJ-45 connector on the **TP-120** Unit IV
2. On the four **TP-120** units, connect the:
   - XGA OUT HD15F connector of Unit I to the XGA acceptor (for example, Display 1)
   - XGA OUT HD15F connector of Unit II to the XGA acceptor (for example, Display 2)
   - XGA OUT HD15F connector of Unit III to the XGA acceptor (for example, Display 3)
   - XGA OUT HD15F connector of Unit IV to the XGA acceptor (for example, Display 4)
3. On each of the five Kramer TOOLS, connect the 12V DC power adapter to the power socket and connect the adapter to the mains electricity.
   The signal from the XGA source is transmitted via the four CAT5 cables, decoded and converted at the each of the XGA OUT HD15F connectors to the XGA acceptors.
4. On each of the five Kramer TOOLS:
   - Adjust[3] the video output signal level and/or cable compensation equalization level, if required
   - If necessary, on the **TP-120** units, set the H SYNC and V SYNC switches[4], on the underside

1 Refer to the separate user manual: PT-110, WP-110, PT-120, TP-120, which can be downloaded at: http://www.kramerelectronics.com.

2 Via UTP cabling (with a range of more than 300ft (>100m)). For details of how to wire a CAT5 LINE IN / LINE OUT RJ-45 connector, see section 8.1

3 Use a screwdriver to carefully rotate the trimmer, adjusting the appropriate level

4 By default, both switches are set down (for negative V SYNC and H SYNC polarity)

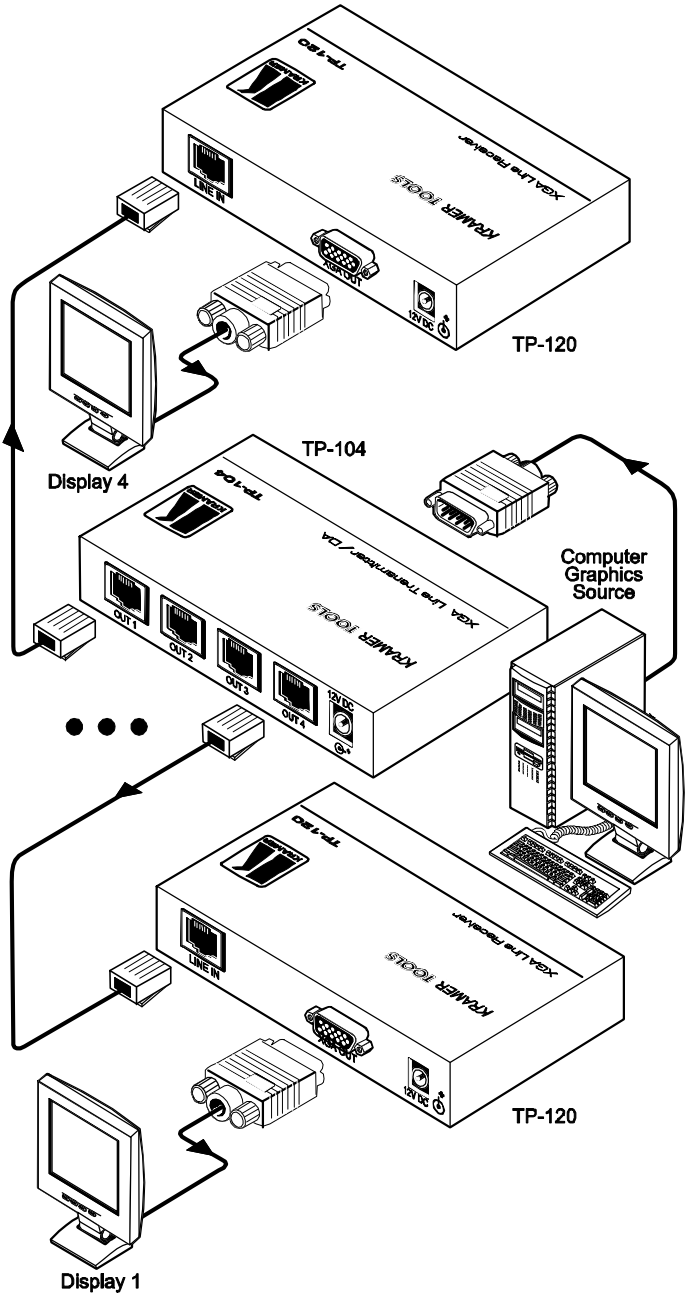


Figure 16: Configuring a 1:4 XGA to Twisted Pair Transmitter / Receiver / DA

11 Configuring a TP-105 CAT5 Line Driver / DA

You can connect the **TP-105** *CAT5 Line Driver / DA*—using a **PT-110** *XGA Line Transmitter* and two **TP-120** *XGA Line Receiver*[1] units—to transmit a computer graphics signal to two displays via long line CAT5 UTP cabling.

To connect the **TP-105**, as the example in Figure 16 illustrates, do the following:

1. On the **PT-110**, connect the:
   - Computer graphics source to the XGA INPUT HD15F connector
   - LINE OUTPUT RJ-45 connector[2] to the INPUT RJ-45 connector on the **TP-105**
2. On the **TP-105**, connect the:
   - OUT 1 RJ-45 connector to the LINE IN RJ-45 on the first **TP-120**
   - OUT 2 RJ-45 connector to the LINE IN RJ-45 on the second **TP-120**
3. On the two **TP-120** units, connect the:
   - XGA OUT HD15F connector on the first **TP-120** unit to the XGA acceptor (for example, Display 1)
   - XGA OUT HD15F connector on the second **TP-120** unit to the XGA acceptor (for example, Display 2)
4. On each of the four Kramer units, connect the 12V DC power adapter to the power socket and connect the adapter to the mains electricity.
   The signal from the XGA source is transmitted via the two CAT5 cables, decoded and converted at the each of the XGA OUT HD15F connectors to the XGA acceptors.
5. If necessary:
   - Adjust[3] the video output signal level and/or cable compensation equalization level on the **TP-105** and on both the **TP-120** units
   - Set the H SYNC and V SYNC switches[4] on the underside of the **TP-120** units

1 Refer to the separate user manual: PT-110, WP-110, TP-120, which can be downloaded from the Internet at this URL: http://www.kramerelectronics.com

2 Via UTP cabling (with a range of more than 300ft (>100m)). For details of how to wire a CAT5 LINE IN / LINE OUT RJ-45 connector, see section 8.1

3 Use a screwdriver to carefully rotate the trimmer, adjusting the appropriate level

4 By default, both switches are set down (for negative V SYNC and H SYNC polarity)

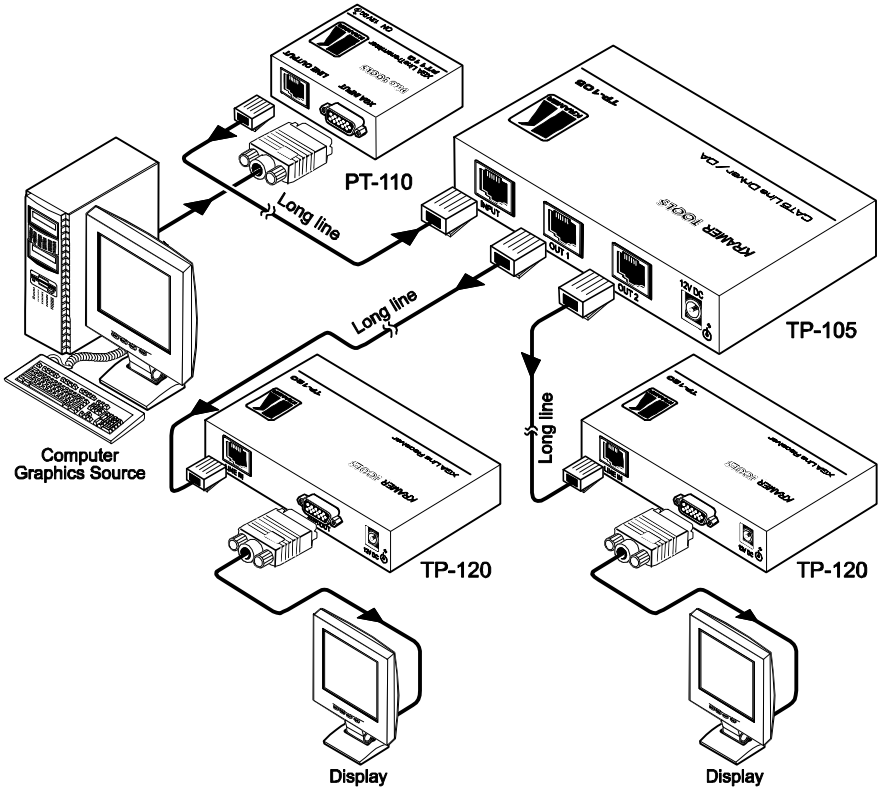


Figure 17: Configuring a TP-105 CAT5 Line Driver / DA

12 Technical Specifications[1]

Table 14 includes the technical specifications of the **TP-104**, Table 15 includes the technical specifications of the **TP-105**, and Table 16 includes the technical specifications of the **TP-121**, **TP-122**, **TP-123**, and **TP-124**:

Table 14: Technical Specifications of the TP-104[2] and the TP-104(HD)

	TP-104
INPUTS:	1 VGA / UXGA on an HD15 connector
OUTPUTS:	4 RJ-45 OUT connectors
MAX. OUTPUT LEVEL:	1.4Vpp
BANDWIDTH (-3dB)[3]:	>150MHz, up to 1080p[4]
DIFF. GAIN[3]:	3.2%
DIFF. PHASE[3]:	0.5 Deg
K-FACTOR[3]:	<0.05%
S/N RATIO[3]:	80dB
CONTROLS[3]:	EQ.: 0 to 33dB; LEVEL: –7.5dB to 4.4dB
COUPLING[3]:	AC
POWER SOURCE:	12 VDC 180mA
DIMENSIONS:	12.1cm x 7.18cm x 2.42cm (4.76" x 2.83" x 0.95"), W, D, H
WEIGHT:	0.3 kg. (0.67 lbs.) approx.
ACCESSORIES:	Power supply

Table 15: Technical Specifications of the TP-105[2] and the TP-105(HD)

	TP-105
INPUTS:	1 RJ-45 OUT connector
OUTPUTS:	2 RJ-45 OUT connectors
MAX. OUTPUT LEVEL:	1.6Vpp
BANDWIDTH (-3dB)[5]:	Appropriate for VGA-UXGA, up to 1080p[4]
DIFF. GAIN[5]:	3.7%
DIFF. PHASE[5]:	0.5 Deg
K-FACTOR[5]:	<0.05%
S/N RATIO[5]:	69dB
CONTROLS[5]:	EQ.: 0 to 4.4dB @ 50MHz; LEVEL: –5.5dB to 1.4dB
COUPLING[5]:	AC
POWER SOURCE:	12 VDC 220mA
DIMENSIONS:	12.1cm x 7.18cm x 2.42cm (4.76" x 2.83" x 0.95"), W, D, H
WEIGHT:	0.3 kg. (0.67 lbs.) approx.
ACCESSORIES:	Power supply

1 Specifications are subject to change without notice

2 With 60m CAT5 cable

3 For the TP-104 Transmitter/ TP-120 Receiver SETUP

4 The HD resolutions apply to the HD version of the machine

5 For the PT-110 to TP-105 to TP-120 Receiver SETUP

Table 16: Technical Specifications of the TP-121 / TP-122 / TP-123 / TP-124

	TP-121	**TP-122**	**TP-123**	**TP-124**
INPUTS:	VIDEO: 1 VGA / UXGA on an HD15 connector AUDIO: 1 audio ANALOG 3.5mm mini jack	1 RJ-45 LINE IN connector	VIDEO: 1 VGA / UXGA on an HD15 connector AUDIO: 1 audio ANALOG 3.5mm mini jack	1 RJ-45 LINE IN connector
OUTPUTS:	1 RJ-45 OUT connector	VIDEO: 1 VGA / UXGA on an HD15 connector AUDIO: 1 audio S/PDIF RCA connector 1 audio ANALOG 3.5mm mini jack	1 RJ-45 OUT connector	VIDEO: 1 VGA / UXGA on an HD15 connector AUDIO: 1 audio S/PDIF RCA connector 1 audio ANALOG 3.5mm mini jack
MAX. OUTPUT LEVEL:		VIDEO: 1V AUDIO: 2.5V		VIDEO: 1V AUDIO: 2.5V
CONTROLS:		Level: –7.5dB to +4.4dB, EQ.: 0dB to +33dBm (130m) @ 50MHz	RS-232 2 PIN Terminal Block	RS-232 2 PIN Terminal Block Level: –7.5dB to +4.4dB, EQ.: 0dB to +33dBm (130m) @ 50MHz
BANDWIDTH (-3dB)[1]:	AUDIO: 20Hz – 20kHz@0.5dB			
S/N RATIO:	AUDIO: <–80dB			
TOTAL GAIN:	AUDIO: Analog/analog: 0dB Analog/SPDIF: –12dBFS			
COUPLING:	AC			
TND+N:	AUDIO: <0.01%			
POWER SOURCE:	12 VDC 60mA			
DIMENSIONS:	12.1cm x 7.18cm x 2.42cm (4.76" x 2.83" x 0.95"), W, D, H			
WEIGHT:	0.3 kg. (0.67 lbs.) approx.			
ACCESSORIES:	Power supply			

1 For the Transmitter/Receiver pair

LIMITED WARRANTY

Kramer Electronics (hereafter *Kramer*) warrants this product free from defects in material and workmanship under the following terms.

HOW LONG IS THE WARRANTY

Labor and parts are warranted for seven years from the date of the first customer purchase.

WHO IS PROTECTED?

Only the first purchase customer may enforce this warranty.

WHAT IS COVERED AND WHAT IS NOT COVERED

Except as below, this warranty covers all defects in material or workmanship in this product. The following are not covered by the warranty:

1. Any product which is not distributed by Kramer, or which is not purchased from an authorized Kramer dealer. If you are uncertain as to whether a dealer is authorized, please contact Kramer at one of the agents listed in the Web site www.kramerelectronics.com.
2. Any product, on which the serial number has been defaced, modified or removed.
3. Damage, deterioration or malfunction resulting from:
   i) Accident, misuse, abuse, neglect, fire, water, lightning or other acts of nature
   ii) Product modification, or failure to follow instructions supplied with the product
   iii) Repair or attempted repair by anyone not authorized by Kramer
   iv) Any shipment of the product (claims must be presented to the carrier)
   v) Removal or installation of the product
   vi) Any other cause, which does not relate to a product defect
   vii) Cartons, equipment enclosures, cables or accessories used in conjunction with the product

WHAT WE WILL PAY FOR AND WHAT WE WILL NOT PAY FOR

We will pay labor and material expenses for covered items. We will not pay for the following:

1. Removal or installations charges.
2. Costs of initial technical adjustments (set-up), including adjustment of user controls or programming. These costs are the responsibility of the Kramer dealer from whom the product was purchased.
3. Shipping charges.

HOW YOU CAN GET WARRANTY SERVICE

1. To obtain service on you product, you must take or ship it prepaid to any authorized Kramer service center.
2. Whenever warranty service is required, the original dated invoice (or a copy) must be presented as proof of warranty coverage, and should be included in any shipment of the product. Please also include in any mailing a contact name, company, address, and a description of the problem(s).
3. For the name of the nearest Kramer authorized service center, consult your authorized dealer.

LIMITATION OF IMPLIED WARRANTIES

All implied warranties, including warranties of merchantability and fitness for a particular purpose, are limited in duration to the length of this warranty.

EXCLUSION OF DAMAGES

The liability of Kramer for any effective products is limited to the repair or replacement of the product at our option. Kramer shall not be liable for:

1. Damage to other property caused by defects in this product, damages based upon inconvenience, loss of use of the product, loss of time, commercial loss; or:
2. Any other damages, whether incidental, consequential or otherwise. Some countries may not allow limitations on how long an implied warranty lasts and/or do not allow the exclusion or limitation of incidental or consequential damages, so the above limitations and exclusions may not apply to you.

This warranty gives you specific legal rights, and you may also have other rights, which vary from place to place.

NOTE: All products returned to Kramer for service must have prior approval. This may be obtained from your dealer.

This equipment has been tested to determine compliance with the requirements of:

EN-50081:	"Electromagnetic compatibility (EMC); generic emission standard. Part 1: Residential, commercial and light industry"
EN-50082:	"Electromagnetic compatibility (EMC) generic immunity standard. Part 1: Residential, commercial and light industry environment".
CFR-47:	FCC Rules and Regulations: Part 15: "Radio frequency devices Subpart B Unintentional radiators"

CAUTION!

- Servicing the machines can only be done by an authorized Kramer technician. Any user who makes changes or modifications to the unit without the expressed approval of the manufacturer will void user authority to operate the equipment.
- Use the supplied DC power supply to feed power to the machine.
- Please use recommended interconnection cables to connect the machine to other components.

For the latest information on our products and a list of Kramer distributors, visit our Web site: www.kramerelectronics.com, where updates to this user manual may be found.
We welcome your questions, comments and feedback.

Safety Warning:
Disconnect the unit from the power supply before opening/servicing.

Kramer Electronics, Ltd.
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E-mail: info@kramerel.com
P/N: 2900-000037 REV 6