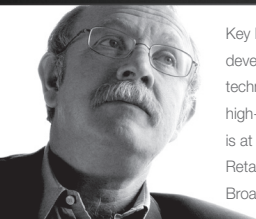


KD-X422WP

Power over HDBaseT/HDMI via CAT5e/6 Extenders,
(Wall Plate Tx + Rx Set)

Operating Instructions



Key Digital®, led by digital video pioneer Mike Tsinberg, develops and manufactures high quality, cutting-edge technology solutions for virtually all applications where high-end video and control are important. Key Digital® is at the forefront of the video industry for Home Theater Retailers, Custom Installers, System Integrators, Broadcasters, Manufacturers, and Consumers.



Key Digital® Systems :: 521 East 3rd Street :: Mount Vernon, NY 10553
Phone : 914.667.9700 Fax : 914.668.8666 Web : www.keydigital.com

Key digital®

The Experts in Digital Video Technology and Solutions™

Table of Contents

About KD-X422WP	1
Quick Setup Guide	3
Installation and Operation	3
Application Example	4
Connections	6
Extending IR or RS-232 Control.	8
Settings	12
LED Indicator Lights	16
Use with third-party HDBaset Tx or Rx	17
RS-232 Commands	17
Specifications	20
Important Product Warnings & Safety Instructions:	21
How to Contact Key Digital®	22
Warranty Information	23

**Always follow the instructions provided in this Operating Manual.
Please check the Key Digital Website for the most up-to-date Manual.**

About KD-X422WP

KD-X422WP HDBaseT/HDMI (Tx & Rx Set) is a HDCP 2.2 compliant extender set ideal for professional video installations in conference rooms, huddle spaces, class rooms, and more. KD-X422WP consists of KD-X422WP Tx and KD-XWPRx and extends 4K/UHD 24/25/30 (4:4:4) and 4K/UHD 60 (4:2:0) signals up to 150 ft. using Key Digital KD-CAT6STP1X Super CAT6A shielded cable or up to 125 ft. using a single third-party CAT5e/6 cable. 1080p/60, 1920x1200, 3D signals are extended up to 250 ft. using Key Digital KD-CAT6STP1X Super CAT6A shielded cable, or up to 230 ft. using third-party CAT5e/6 cable. In addition to HDMI video and audio signals, KD-X422WP extends IR and RS-232 for controlling remotely located equipment.

Key Features

- **HDBaseT via Single CAT5e/6 UTP/STP Extension:** With fully automatic adjustment of feedback, equalization, and amplification depending on cabling length
- **Power Over HDBaseT:** Power supply may be connected to either Tx or Rx unit
- **Installation:** Designed for installation in standard US dual-gang box
- **Signal Extension:**
 - » Up to **150 ft. @ 4K** 24/25/30(4:4:4)/60(4:2:0) using KD-CAT6STP1X cabling
 - » Up to **125 ft. @ 4K** 24/25/30(4:4:4)/60(4:2:0) using third-party CAT5e/6 UTP/STP cabling
 - » Up to **250 ft. @ 1080p** / 1920x1200 using KD-CAT6STP1X cabling
 - » Up to **230 ft. @ 1080p** / 1920x1200 using third-party CAT5e/6 UTP/STP cabling
- **HDCP 2.2:** Compliancy up to HDCP 2.2 and backward compliant
- **HDR10 (High Dynamic Range):** More life-like images through a greater range of luminance levels
- **4K/Ultra HD Resolution:** Support for 4096x2160 or 3840x2160 24/25/30Hz at 4:4:4/8 Bit or 60Hz at 4:2:0/8 Bit
- **Deep Color Support:** Up to UHD/4K 30Hz 4:2:2/12 bits or 60Hz 4:2:0/8 bit

- **HDMI® and HDCP Licensing:** Fully licensed and compatible with HDCP 2.2 and HDMI latest technology such as 4K/UHD 4:2:0/8bit at 60f/s
- **EDID Control:** Internal library features 15 default EDID configurations and native EDID data from Output/Display devices connected via Rx
- **Hot Plug Detection Control:** Enables integrator to choose if active signal voltage is forced to connected input devices
- **Full Buffer System™:** Manages TMDS re-clocking / signal re-generation, HDCP authentication with source & display, EDID Control handshake, and Hot Plug control
- **IR Sensor:** Sensor powering via +5V on Tx unit's IR In port collects line-of-sight IR from remote(s) without external IR connecting block
- **Up/Down IR:** Two channels of IR enable control to/from devices connected to Tx and Rx units
- **RS-232:** Bi-Directional control to/from Tx and Rx unit on Phoenix connector
- **Rotary Switch RS-232 Control Mode:** Provides control of Tx unit as well as connectivity status
- **Lossless compressed digital audio:** Support for Dolby® TrueHD, Dolby® Digital Plus, Dolby Atmos®, and DTS-HD Master Audio™
- **CEC Support:** For inter-device control between input and output HDMI channel
- **I2C Communication:** EDID and HDCP authentication to Display and Source
- **Control System Support:** Fully controllable by all RS-232 supported control systems via open API: Compass Control®, AMX®, Crestron®, KNX®, RTI®, Savant, URC®, Leviton® etc.

Accessories

- (1) 12V 2A DC Power Supply, 20 ft. long, 16 AWG gauge with stripped wire end, (1) Mounting Bracket, (1) IR Emitter with stripped wire end, (1) IR Sensor with stripped wire end
- **Only requires power on either the Tx unit, or the Rx unit**

Quick Setup Guide

- Step 1:** Ensure that all desired functionality is achieved before installing the KD-X422WP Tx wall plate
- Step 2:** Find a safe and convenient location to mount or place the Rx unit
- Step 3:** Begin with the Tx, Rx units and all input/output devices turned off with power cables removed
- Step 4:** Connect HDMI source to the input port of the Tx unit
- Step 5:** Connect HDMI display to the output port of Rx unit
- Step 6:** Connect CAT5e/6 cabling to Tx and Rx units. Use 568-B standard termination on both ends.
- Step 7:** If controlling external devices, connect IR emitter and sensor, and RS-232 cabling as needed
- Step 8:** **BEFORE** connecting power supply to power outlet, secure power wiring into phoenix connector and insert into Tx or the Rx units
- Step 9:** **AFTER** all connections are made, plug-in power supply to power outlet
- Step 10:** Power on input/output devices

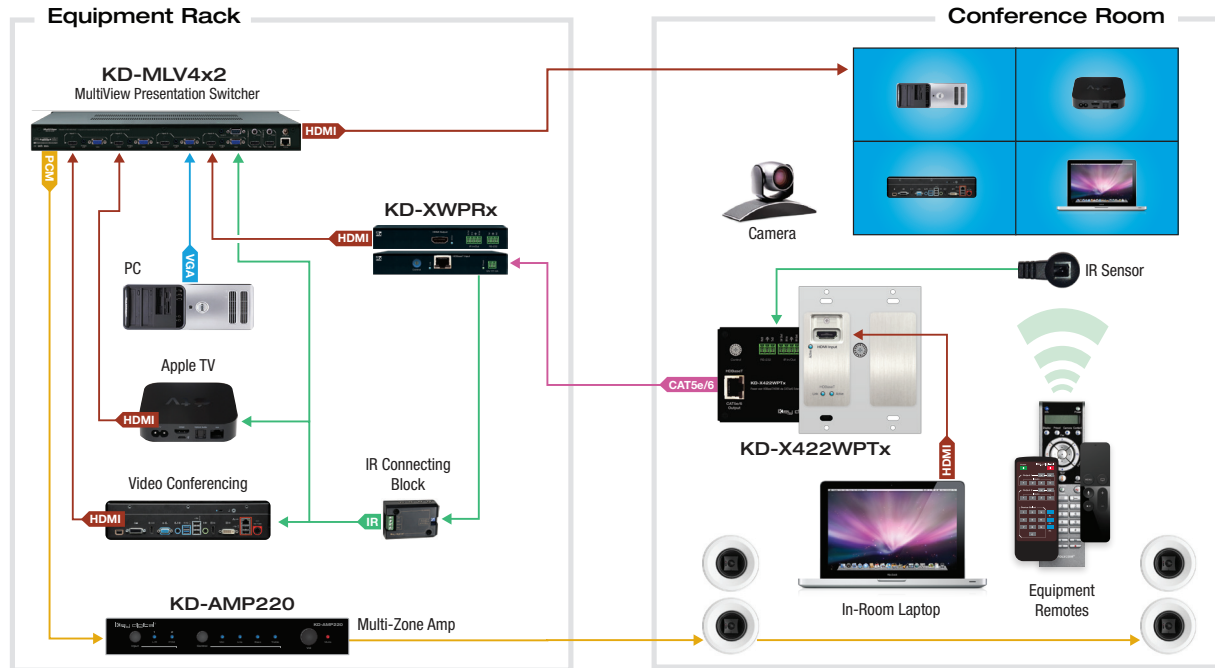
Installation and Operation

Before permanently securing the unit for final installation, test for proper operation of the unit and cables in your system. It is recommended that you leave enough ventilation space to provide sufficient airflow and cooling.



You MUST use the Power Supply provided with your unit or you VOID the Key Digital® Warranty and risk damage to your unit and associated equipment.

Application Example



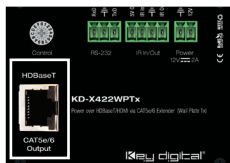
Connections

Tx Unit:

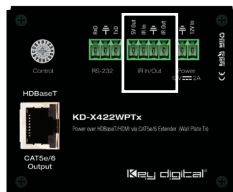
- Using a HDMI cable, connect your source device to the HDMI port labeled "HDMI Input". For DVI-D/DVI-I sources, use appropriate adapters. For Display Port, use active converters.



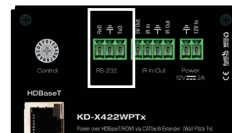
- Connect the CAT5e/6 UTP or STP cable that connects to the Rx Unit at the port labeled "CAT5e/6 Output".



- Make IR In and Out connections to receive (IR In port) or send (IR Out port) control signals. Refer to the "Extending IR & RS-232 Control" for more information.



- Connect a stripped wire to DB9 adapter cable for bi-directional RS-232 control. Refer to the "Extending IR or RS-232 Control" and the "RS-232 Commands" section for more information.



- Connect power wires into respective phoenix connector pins.
 - » Ground = Wire with dashed/striped outer jacket
 - » Power = Wire with solid (no marking) outer jacket
 - » Note: Power connection is only necessary on either the Tx or Rx unit. Redundant power connection is supported.



Rx Unit:

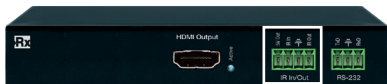
- Using a short HDMI cable, connect your output / display device to the HDMI port labeled "HDMI Output".



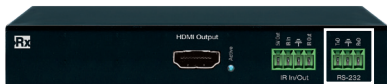
- Connect the CAT5e/6 cable at the port labeled “CAT5e/6 Input”.



- If you are sending or receiving IR, connect included IR Sensor and/or IR Emitter



- If you are transmitting or receiving RS-232, connect to the RS-232 port using a 3-wire pigtail to DB9 adapter



- Connect power wires into respective phoenix connector pins.
- » Ground = Wire with dashed/striped outer jacket
 - » Power = Wire with solid (no marking) outer jacket
 - » Note: Power connection is only necessary on either the Tx or Rx unit. Redundant power connection is supported.



Extending IR or RS-232 Control

RS-232:

Bi-directional RS-232 is achieved utilizing the RS-232 port on the Tx and Rx units. The connector is 3-pin phoenix and the pinout is the same on the Tx and Rx unit.

Three RS-232 functionality modes are selectable using the Control rotary.

→ RS-232 Pass-through Mode

- » Send and receive (bi-directional) RS-232 commands for controlling remote equipment. Supports baud rate up to 115,200bps.

→ Control Mode

- » Provides control of Tx units as well as connectivity status
- » See RS-232 Commands section for more information

→ Firmware Upgrade Mode

- » Two different types of firmware may be updated: MCU, and HDBaseT

RS-232 Cabling

RS-232 cables are available through Key Digital and other wire suppliers, and can also be fabricated by skilled technicians.

Key Digital RS-232 Cable Pinout Charts

Model	Wire	DB9 Pin	Signal
KD-3.5FDB96 3.5mm Stereo To Female DB9 (sold separately)	Red	2	TxD
	White	3	RxD
	Black	5	Ground
	Green	N/C	NA




KD-3.5FDB96 with 3.5mm TRS Connector




KD-3.5FDB96 after stripping wire

Model	Wire	DB9 Pin	Signal
KD-3.5MDB96 3.5mm Stereo to Male DB9 (sold separately)	Red	2	TxD
	Black	3	RxD
	Shield	5	Ground



KD-3.5MDB96 with 3.5mm TRS Connector



KD-3.5MDB96 after stripping wire

IR

Bi-directional IR control extension is supported.

- » "IR In" port on the Tx unit extends to the "IR Out" port of the Rx unit
- » IR signal, ground, and 5V power are required

→ **IR In:** Ports on Tx and Rx unit support IR Sensor signals only. IR Inputs do not support Serial IR signals.

» IR Sensor:

- » IR Sensor can be connected directly into the Tx or Rx unit's IR In port, without the need for an external IR distribution block

IR Sensor / IN Pinout	Wire	Signal
	Red	5V Power
	White	IR Signal
	Black	Ground

→ IR Out:

- » Pass-through from signal of corresponding IR In port or bi-directional RS-232
- » Driving power: 5V with 32mA minimum current
- » Typically connected with an IR emitter

IR Emitter / OUT Pinout	Wire	Signal
	Dashed/ Marked	IR Signal
	Solid/ Black	Ground

IR Cabling

Your KD-X422WP includes an IR Sensor and an IR Emitter.

Signal acceptance: The IR Sensor receives signals from a 90° angle at up to 30 ft. away. It accepts a maximum IR burst frequency of 55kHz.

Only the included IR sensors are compatible with the KD-X422WP. Third-party IR Sensors may not be compatible.



The included IR Sensor.

Connects to the IR In port on either the Tx or Rx unit



The included blinking-type IR Emitter.

Connects to the IR Out port on either the Tx or Rx unit

Settings

EDID Control

EDID authentication is provided from the KD-X422WP Tx unit to the connected input / source device. The EDID file (AKA "handshake") is selected using the EDID Control rotary on the Tx unit (located on the face of the Tx unit, beneath the decora plate) and provides a list of compatible video and audio formats as well as digital data, informing the source device what it should output. Most sources will comply with a new EDID file without a power-cycle, but each source may behave differently.

Default EDID Control Table, selected via EDID Control rotary

Position	EDID Description	EDID Control Rotary
0	Copy EDID from CAT5e/6 Output	
1	1080i, 2CH AUDIO	
2	1080i, DOLBY/DTS 5.1	
3	1080i, HD AUDIO	
4	1080p, 2CH AUDIO	
5	1080p, DOLBY/DTS 5.1	
6	1080p, HD AUDIO	
7	4Kx2K@30, 2CH AUDIO	
8	4Kx2K@30, DOLBY/DTS 5.1	
9	4Kx2K@30, HD AUDIO	
A	4Kx2K@60, 2CH AUDIO	
B	4Kx2K@60, DOLBY/DTS 5.1	
C	4Kx2K@60, HD AUDIO	
D	1280x720p@60 DVI (no audio)	
E	1920x1080@30 DVI (no audio)	
F	3840x2160p@30 DVI (no audio)	

Control Rotary



The Control rotary enables the integrator to choose the desired setting for Hot plug detection control, RS-232 mode, and HDBaseT auto-reset mode.

Note: The Tx and Rx units of the KD-X422WP system ping each other multiple times per second. If auto-reset is set ON and a ping is unsuccessful the HDBaseT extension is reset.

The Control Rotary is located on the Tx unit.

IMPORTANT! Please apply light pressure to the Control rotary when making your selection

Control Rotary Settings Table:

Position	Hot Plug Detection Control	RS-232 Mode	HDBaseT Auto-Reset
0	Pass-thru	Controlling peripheral	On
1	Pass-thru	Controlling peripheral	On
2	Forced ON	Controlling peripheral	On
3	Forced ON	Controlling peripheral	On
4	Pass-thru	Controlling peripheral	Off
5	Pass-thru	Controlling peripheral	Off
6	Forced ON	Controlling peripheral	Off
7	Forced ON	Controlling peripheral	Off
8	Pass-thru	Controlling Tx	On
9	Pass-thru	Controlling Tx	On
A	Forced ON	MCU firmware upgrade	On
B	Forced ON	MCU firmware upgrade	On
C	Pass-thru	HDBaseT firmware upgrade	Off

D	Pass-thru	HDBaseT firmware upgrade	Off
E	Forced ON	HDBaseT firmware upgrade	Off
F	Forced ON	HDBaseT firmware upgrade	Off

Forced Hot Plug Detection (HPD)

Hot Plug Detection (HPD) may be forced on the Tx Rx unit in order to provide connected devices with necessary voltage to inform the device that a partner (display) is connected and active. If the Control rotary is set to any HPD Bypass setting, HPD signals from the output to the input device will pass as normal. In cases of many layers of connectivity, HPD may be lost leading to no signal at the display. In those cases, fix the Control rotary to any Forced HPD setting.

Range and Resolution:

Distance performance is significantly increased when using Key Digital KD-CAT6STP1X Super CAT6/STP Cabling.

- Up to 150 ft. @ 4K 24/25/30(4:4:4)/60(4:2:0) using KD-CAT6STP1X cabling
- Up to 125 ft. @ 4K 24/25/30(4:4:4)/60(4:2:0) using third-party CAT5e/6 UTP/STP cabling
- Up to 250 ft. @ 1080p / 1920x1200 using KD-CAT6STP1X cabling
- Up to 200 ft. @ 1080p / 1920x1200 using third-party CAT5e/6 UTP/STP cabling



NOTE: Use shielded metal RJ45 connectors with soldered ground wires when terminating shielded CAT5e/6.
Key Digital part: KD-RJ45SC (compatible with KD-CAT6STP1X and other third-party CAT6/STP)

LED Indicator Lights

Power:

- » **Color:** Green
- » Rx Unit: Solid illumination during power on state, as provided by healthy connection with power supply on Tx unit.
- » Note: There is NO Power Indicator LED on the Tx unit.

HDMI Active:

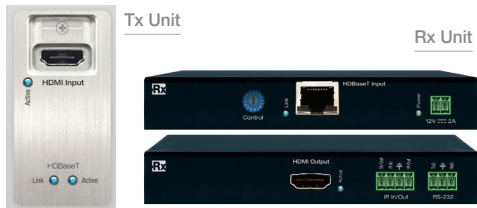
- » **Color:** Blue
- » Tx Unit: Solid illumination from active signal (TMDS + HPD) reception from connected source device
- » Rx Unit: Solid illumination from active Hot Plug Detection voltage with connected display/output device

HDBaseT Link:

- » **Color:** Blue
- » Tx Unit: Solid illumination from active link with Rx unit
- » Rx Unit: Solid illumination from active link with Tx unit

HDBaseT Active:

- » **Color:** Blue
- » Tx Unit: Solid illumination from active link with Rx unit + Hot Plug Detection voltage with connected display/output device



Use with third-party HDBaset Tx or Rx

KD-X422WP is **NOT** compatible with third-party HDBaseT products because of its unique POH (power over HDBaseT) feature.

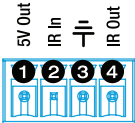


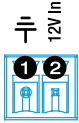

RS-232 Commands

Connection protocol is as follows:

- Baud Rate = 57600 bits per second (default)
- Data Bits = 8
- Stop Bits = 1
- Parity = None
- Flow Control = None
- Carriage Return: Required
- Line Feed: Required

Phoenix Terminal Connection Guide

Pin	Signal	Corresponding Wire (Accessory)
	<p style="text-align: center;">RS-232</p>	<p>Accessory not included. See Extending RS-232 and IR Control section for info on available Key Digital RS-232 cables.</p>
1	RxD	TxD / Pin 3 (Female DB9*) TxD / Pin 2 (Male DB9*)
2	Ground	Ground / Pin 5 (Female/Male DB9)
3	TxD	RxD / Pin 2 (Female DB9*) RxD / Pin 3 (Male DB9*)

Pin	Signal	Corresponding Wire (Accessory)
	 <p>IR In/Out</p>	 <p>IR Sensor</p>  <p>IR Emitter</p>
1	Sensor Power	Red (Sensor)
2	IR In / Sensor	White (Sensor)
3	Ground	Black (Sensor) / Solid (Emitter)
4	IR Out / Emitter	Dashed (IR Emitter)
Pin	Signal	Corresponding Wire (Accessory)
	 <p>Power</p>	 <p>Stripping on jacket of ground wire</p>
1	Ground	Dashed (power supply)
2	Unit Power	Solid (power supply)

Commands are not case-sensitive. Spaces shown below may be excluded.
Carriage return and line feed is required at the end of each string.

Status Command:

KD-X422WP > STA

```
-----
--                               Key Digital Systems  STATUS                               --
-----
--  KD-X422WP      System Address : 00          F/W Version : 1.00      --
--  RS232 : Baud Rate=57600bps, Data=8bit, Parity=None, Stop=1bit      --
--  Running Day : 000, Time : 00:03                                     --
--  HD-BaseT Mode : Normal      , Link = ON      , Auto Reset = ON      --
--                                                           --
--  Video Input Status                                              --
--  EDID = 00, PWR5V = ON      , Link = ON      , HDCP = 2.x, Video = HDMI --
--                                                           --
--  CAT5e/6 Video Output Status                                     --
--  DISP = SAM 2014, HPD = ON      , HDCP = ON      , DDC = GOOD, OUT = ON , HDMI--
-----
```

Help Command:

KD-X422WP > H

```
-----
--                               Key Digital Systems  HELP                               --
-----
--  KD-X422WP      System Address : 00          F/W Version : 1.00      --
--  Azz           : All Commands may have Prefix System Address zz=[01-99] --
--  H             : Help                                              --
--  STA           : Global Status                                     --
--  SPCA xx       : Set System Address, xx = [00-99] (00=Single)      --
--                                                           --
--  Video I/O Setup Commands:                                       --
--  SPO DBG ON/OFF : Set Output DGB ON/OFF                          --
--  SPO ON/OFF     : Set CAT5e/6 Output ON/OFF                      --
--                                                           --
--  SPC ART ON/OFF : Set HD-BaseT Auto Reset ON/OFF                --
--  SPC RSB z      : Set RS232 Baud Rate to z bps, z=[0-4]          --
--                                                           --
--                               [0:57600, 1:38400, 2:19200, 3:9600, 4:4800] --
-----
```

Specifications

Technical:

- Inputs Tx (Each): 1 HDMI, 1 IR In, 1 Bi-Directional RS-232
- Outputs Tx (Each): 1 CAT5e/6 UTP/STP, 1 IR Out
- Inputs Rx (Each): 1 CAT5e/6 UTP/STP
- Outputs Rx (Each): 1 HDMI, 1 Bi-Directional RS-232, 1 IR Out, 1 5V Trigger
- DDC Signal (Data): Input DDC Signal: 5 Volts p-p (TTL)
- HDMI Video/Audio Signal: Input Video Signal: 1.2 Volts p-p
- HDMI Connector: Type A, 19 Pin Female
- RJ45 Connector: Shielded Link Connector, HDBaseT
- IR Connectors: 4-pin phoenix terminal
- RS-232 Connector: 3-pin phoenix terminal

General

- Regulation: CE, RoHS, WEEE
- Enclosure: Tx unit: Brushed aluminum face with black metal backing
Rx unit: Black metal
- KD-X422WPTx: 3.21" x 2.06" x 0.787" (Wallplate), Weight: 0.7 lbs
- KD-XWPRx: 5.07" x 4.08" x 0.787", Weight: 0.4 lbs
- KD-X422WP Power: KD-PS12V2A, 12V/2A, 100-240VAC, 50-60Hz, Interchangeable outlet head with stripped wires
- Accessories: (1) Rx unit mounting bracket, (1) IR emitter, (1) IR sensor, (1) 2 pin terminal plug, (2) 3 pin terminal plug, (1) 4 pin terminal plug



Important Product Warnings:

1. Connect all cables before providing power to the unit.
2. Test for proper operation before securing unit behind walls or in hard to access spaces.
3. If installing the unit into wall or mounting bracket into sheet-rock, provide proper screw support with bolts or sheet-rock anchors.



Safety Instructions:

Please be sure to follow these instructions for safe operation of your unit.

1. Read and follow all instructions.
2. Heed all warnings.
3. Do not use this device near water.
4. Clean only with dry cloth.
5. Install in accordance with the manufacturer's instructions.
6. Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.
7. Only use attachments/accessories specified by the manufacturer.
8. Refer all servicing to qualified service personnel. Servicing is required when the device has been damaged in any way including:
 - » Damage to the power supply or power plug
 - » Exposure to rain or moisture



Power Supply Use:

You MUST use the Power Supply provided with your unit or you VOID the Key Digital® Warranty and risk damage to your unit and associated equipment.

How to Contact Key Digital®

Customer Support

For customer support questions please contact us at:

- Phone: 914-667-9700
- E-mail: customersupport@keydigital.com

Technical Support

For technical questions about using Key Digital® products, please contact us at:

- Phone: 914-667-9700
- E-mail: tech@keydigital.com

Repairs and Warranty Service

Should your product require warranty service or repair, please obtain a Key Digital® Return Material Authorization (RMA) number by contacting us at:

- Phone: 914-667-9700
- E-mail: rma@keydigital.com

Feedback

Please email any comments/questions about the manual to:

- E-mail: customersupport@keydigital.com

Warranty Information

All Key Digital® products are built to high manufacturing standards and should provide years of trouble-free operation. They are backed by a Key Digital Limited 3 Year Product Warranty Policy. <http://www.keydigital.com/warranty.htm>

