# HDMI/HDBT 1x4 Splitter

# Installation & Operation Manual

# 500424

# SAFETY PRECAUTIONS

To insure the best from the product, please read all instructions carefully before using the device. Save this manual for further reference.

- Follow basic safety precautions to reduce the risk of fire, electrical shock and injury to persons.

- Do not dismantle the housing or modify the module. It may result in electrical shock or burn.

- To prevent fire or shock hazard, do not expose the unit to rain, moisture or install this product near water. Keep the product away from liquids.

- Spillage into the housing may result in fire, electrical shock, or equipment damage. If an object or liquid falls or spills on to the housing, unplug the module immediately.

- Do not use liquid or aerosol cleaners to clean this unit. Always unplug the power to the device before cleaning.

- Using supplies or parts not meeting the product's specifications may cause damage, deterioration or malfunction.

- Refer all servicing to qualified service personnel.

- Install the device in a place with good ventilation to avoid damage due to overheating.

- Unplug the power cord when left unused for a long period of time.

- Do not put any heavy items on the unit or on extension cable.

- Do not remove the housing of the device as you may be exposed to dangerous voltage or other hazards.

- Information on disposal of devices: do not burn or mix with general household waste, please treat them as normal electrical wastes.

- Unpack the equipment carefully and save the original box and packing material for possible future shipment.

- Please read this user manual carefully before using this product.

# **Contents**

# 1. Introduction

## 1.1.  Introduction to the HDMI/HDBT 1x4 Splitter

The HDMI/HDBT 1x4 Splitter is an HDBT Splitter accepting 1 HDMI input and distributing to 4 HDBT outputs, plus 1 HDMI local output which can be used to monitor local devices or to cascade with additional splitters.

The HDMI/HDBT 1x4 Splitter allows uncompressed 4K/30Hz (max) HDMI, IR, and RS232 signals to be transmitted over a single CAT5e/6 cable. It supports the transmission of a 4K signal up to 131ft (40m) and a 1080p signal up to 230ft (70m). If required, use the HDMI local output to cascade the HDMI signal up to 4 times with additional HDMI/HDBT 1x4 Splitters. The HDMI/HDBT 1x4 Splitter is also capable of bi-directional IR transmission and EDID management.

The HDBT Receiver 500454-RX is recommended to utilize the full functionality of the HDBT outputs of this device.

## 1.2.  Features

- Compliant with HDMI 1.4 & 3D.
- Transmit 4K @ 30Hz up to 131ft (40m), and 1080p @ 60Hz up to 230ft (70m).
- Supports cascading via HDMI Out, IR Cascade and RS232 Cascade.
- Supports bi-directional IR and RS232 control and cascade control of 500424.
- Supports bi-directional IR and RS232 control of end devices (i.e. source and display devices).
- Real-time display of working status via LED indicators.
- Supports EDID configuration, 5 types in total.
- Convection cooling, no fan needed.
- Antistatic case design: providing good protection for long-term and stable performance.

## 1.3.  Package Content

- One (1) HDMI/HDBT 1x4 Splitter
- Two (2) Mounting Brackets
- Eight (8) Screws
- One (1) 3.5mm male to male audio cable
- One (1) RS232 Cable (3-pin Terminal Block to DB9)
- One (1) RS232 Cable (3-pin Terminal Block type)
- One (1) 24VDC, 2.5A Power Adapter

- One (1) Power Cord
- Four (4) Plastic Feet
- One (1) User Manual

Please verify that the product and the accessories are all included; if not, please contact your dealer.
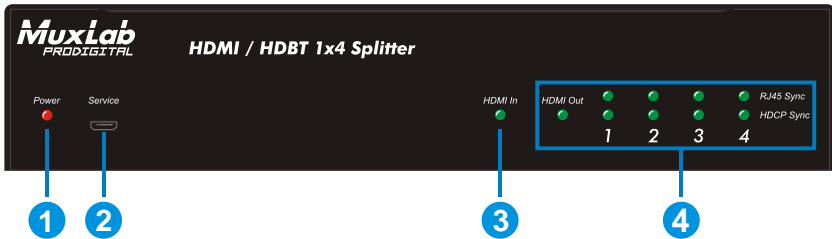
## 2. Specification

| Environment | HDMI 1.4, HDCP 1.4 |
|---|---|
| Devices | DVD, projectors, monitors, TV, PC, laptops, servers supporting HDMI |
| Compatibility | Compatible with MuxLab HDBT products |
| Transmission | Transparent to the user |
| Video Bandwidth | 10.2Gbps |
| Maximum Pixel Clock | 297Mhz |
| Video Resolution | VESA and SMPTE 480p to 2160p (4K) With 3D<br>Bit depth: 16, 20, 24 |
| Signal | HDMI 1.4 protocol and HDCP 1.4 |
| Audio | PCM, Dolby TrueHD, DTS-HD Master Audio |
| **Maximum Distance**<br><br>*Based on a maximum length of 6.6ft. (2m) of HDMI cable per end.* | Cat 5e/6:    230ft (70 m) up to 1080p<br><br>                131ft (40m) up to 4K/30Hz<br><br>*Note:   When installed in an electrically noisy environment, an STP cable must be used. Also, cross-connections reduce the effective distance depending on the grade of twisted pair cable used.* |
| Cable | One (1) Cat 5e/6 or better twisted pair cable required |
| Compatible Receiver | 500451-RX (no Serial Port)<br>500454-RX (with Serial Port) |
| Control | RS232 & IR Pass thought<br>RS232 port ID selectable for cascading |
| Connectors | Two (2) HDMI connectors for HDMI Input & Output<br>Four (4) RJ45 shielded connectors for HDBT<br>Three (3) 3.5mm Jacks; for IR input, output & cascade<br>Two (2) 3-pin terminal block (3.81 mm) for RS232<br>One (1) USB Port for firmware upgrade |

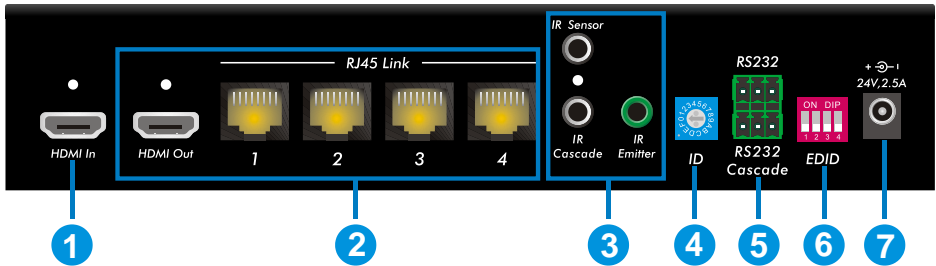| | |
|---|---|
| | One (1) 2.1mm barrel locking Jack for Power |
| **Power Supply** | One (1) 110-240VAC to 24VDC/2.5A power supply |
| **Temperature** | Operating: 0° to 40°C       Storage: -20° to 85°C<br>Humidity: Up to 95% non-condensing |
| **Enclosure** | Metal |
| **Dimensions** | 8.66" x 5.83" x 1.73" (220mm x 148mm x 44mm) |
| **Weight** | 2.16 lbs (0.98 kg) |
| **Compliance** | Regulatory: FCC, CE, RoHS |
| **Warranty** | 2 years |
| **Order Information** | 500424-US HDMI/HDBT 1x4 Splitter, US<br>500424-UK HDMI/HDBT 1x4 Splitter, UK<br>500424-EU HDMI/HDBT 1x4 Splitter, EU |

## 3.   Panel Description

### 3.1.  Front Panel



| No. | Name | Description |
|-----|------|-------------|
| 1 | Power indicator | Illuminates red once powered on. |
| 2 | Service | Used for firmware update. |
| 3 | Input | Illuminates green when there is an HDMI input signal |
| 4 | Outputs | • HDMI Out LED: Illuminates green when the HDMI source signal is detected and HDCP is present. Blinks green when the HDMI source signal is detected but HDCP is not present. The LED is OFF when there is no HDMI input signal detected.<br><br>• RJ45 Sync LED: Indicates link status of the four HDBT ports. Illuminates green when the corresponding HDBT port is connected successfully. The LED is OFF when there is no connection to the HDBT receiver.<br><br>• HDCP Sync LED: Illuminates green when both the HDBT link and HDCP are active. Blinks green when the HDBT link is active, but HDCP is inactive. The LED is OFF when the HDBT link is inactive and no HDBT receiver is connected. |

## 3.2. Rear Panel



| No. | Name | Description |
|---|---|---|
| 1 | HDMI Input | Connects to the HDMI source device. |
| 2 | Outputs | • HDMI: Connects to an HDMI display for monitoring or cascades to another 500424 device.<br>• RJ45 Link: Four (4) HDBT output ports with Video/Audio, IR and RS232 support. |
| 3 | IR | • IR Sensor: Connects to the IR Sensor.<br>• IR Emitter: Connects to the IR Emitter; the IR Signal is coming from the HDBT Receiver.<br>• IR Cascade: Cascades the IR control signal by connecting to the IR Sensor input of another 500424. |
| 4 | ID Preset | Assigns the ID of the 500424, the ID ranges from 0 to F (in Hex).<br><br>After assigning the ID, restart the 500424 for the ID to take effect. |
| 5 | RS232 | • Connects from the 3 pin terminal block of the 500424 to the DB9 RS232 port of the controlling device.<br>• Cascade: Cascades the RS232 control signal from one 500424 to another, using the 3 pin terminal block of each unit.<br>Note: Set the communication protocol parameters correctly and send the RS232 commands as per the instructions in section 6. |
| 6 | EDID | Four positions DIP Switches, "1" represents ON and "0" represents OFF. Set the switch as follows to configure the EDID. |

| No. | Name | Description |
|-----|------|-------------|
|     |      | 0000 (Default): pass through<br>0001: 1080p 2D<br>0010: 1080p 3D<br>0011: 720p 2D<br>0100: 720p 3D<br>0101: DVI, 1920x1080 |
| 7   | 24VDC, 2.5A | Power port, connects with 24V DC power adapter. |

# 4. System Connections

## 4.1.    Safety Precautions

The system should be installed in a clean environment with temperature and humidity levels within the specified operating range.

All devices should be connected before turning on the power.

## 4.2.    System Diagram
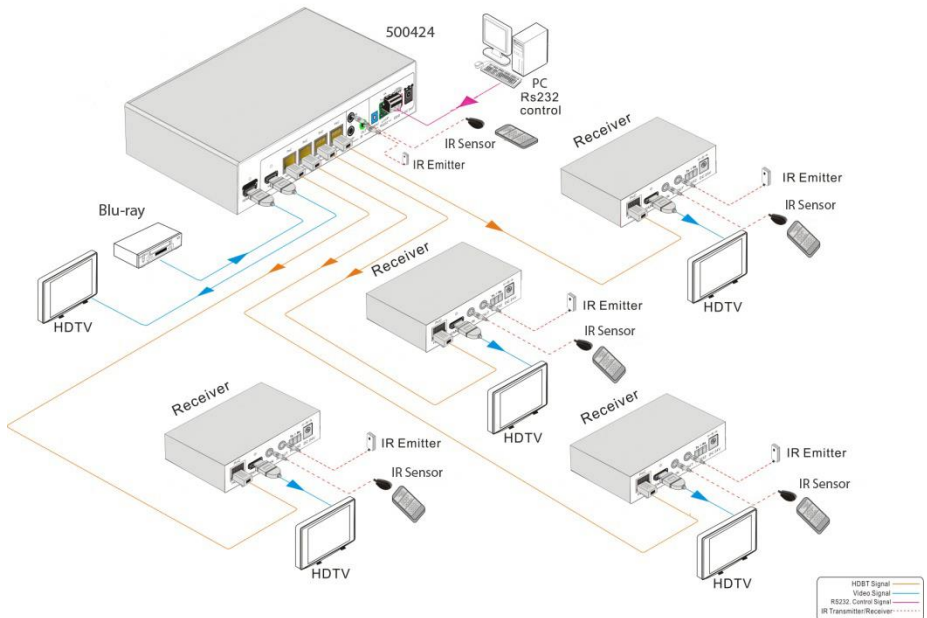


## 4.3.    Connection Procedure

**a)**    Connect an HDMI source device (e.g. Blue-ray player) to the **HDMI Input** connector of the HDMI/HDBT 1x4 Splitter, with an HDMI cable.

**b)**    Connect an HDMI display to the **HDMI Output** connector of the HDMI/HDBT 1x4 Splitter, with an HDMI cable.

**c)**    Connect HDBT Receiver(s) to the RJ45 Link output port(s) of the HDMI/HDBT 1x4 splitter, with a UTP Cable.

**d)**    Connect the controlling device (e.g. PC) to the **RS232 Input** port of the HDMI/HDBT 1x4 Splitter, with the supplied RS232 cable (DB9 end to PC).

If you want to cascade the RS232 control signal between several HDMI/HDBT

1x4 Splitters, then connect the **RS232 Cascade** connector of the first device to the **RS232 port** of the next device, and continue in this manner until all the HDMI/HDBT 1x4 Splitters are connected together. If the HDBT Receivers used support RS232 transmission and you intend to control the end devices (i.e. displays), then connect an RS232 cable (sold separately) from the RS232 port of each HDBT Receiver to the RS232 port of each end display device to be remotely managed.

**e)**    Connect an IR Sensor to the **IR Sensor** port, and an IR Emitter to the **IR Emitter** port. The IR signal can be transmitted bi-directionally between the HDMI/HDBT 1x4 Splitter and the HDBT Receiver(s).

If you want to cascade the IR signal between several HDMI/HDBT 1x4 Splitters, then connect the **IR Cascade** connector of the first device to the **IR Sensor** connector of the next device, and continue in this manner until all HDMI/HDBT 1x4 Splitters are connected together.

**f)**    Connect a DC 24V power adapter to the power port of the 500424, or of each 500424 if more than one unit is cascaded.

## 4.4.    Cascading Connections

### 4.4.1. Cascading the AV Signal

The HDMI source signal can be cascaded to several splitters via the HDMI Output to HDMI Input connectors.

Connect the **HDMI Output** connector of the first HDMI/HDBT 1x4 Splitter to the **HDMI Input** connector of the next device, and so on, until all HDMI/HDBT 1x4 Splitters have been connected.

Doing this allows HDMI signals entering the first HDMI/HDBT 1x4 Splitter to also be output from all cascaded HDMI/HDBT 1x4 Splitters.

### 4.4.2. Cascading the Control Signal

The HDMI/HDBT 1x4 Splitter supports control cascading via IR Cascade or RS232 Cascade. Users can choose one or both cascade methods according to their specific needs. The cascade connection diagram follows:
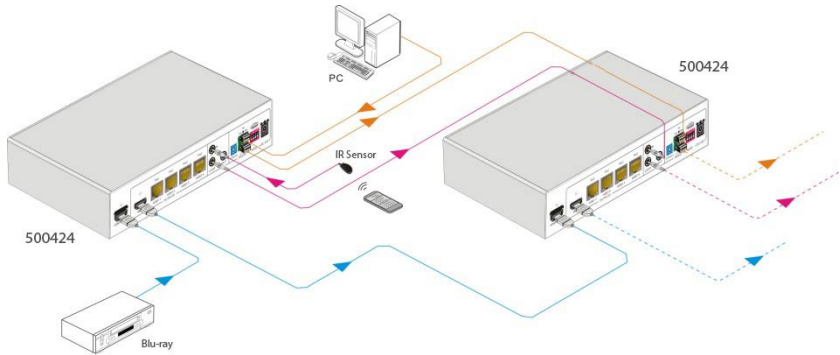
- **Cascading through IR Cascade**

    Connect the **IR Cascade** connector of the first HDMI/HDBT 1x4 Splitter to the **IR Sensor** connector of the next device, and so on, until all units have been cascaded.

    Sending IR signals to the IR Sensor of the first HDMI/HDBT 1x4 Splitter will control all cascaded units.

- **Cascading through RS232 Cascade**

    Connect the **RS232 Cascade** connector of the first HDMI/HDBT 1x4 Splitter to the **RS232** connector of the next device, and so on, until all units have been cascaded.

    Sending RS232 commands will synchronously control the first unit and all cascaded HDMI/HDBT 1x4 Splitters down the chain.

Note: To identify a particular HDMI/HDBT 1x4 Splitter in a cascaded configuration, please set a unique ID for each unit, so that they can each be individually addressed.

# 5. IR Control Modes

The HDMI/HDBT 1x4 Splitter supports various applications, including extending computer screens, monitoring, conference room, large screen displays, education, command & control centers, and smart homes, to name a few.

The HDMI/HDBT 1x4 Splitter can be controlled via IR and RS232 commands, and supports EDID management.

## 5.1.  IR Control

The HDMI/HDBT 1x4 Splitter supports an IR Sensor port. By connecting an IR Sensor to the IR Sensor port, users local to the HDMI/HDBT 1x4 Splitter can control remote display devices with a handheld IR remote. Conversely the HDMI/HDBT 1x4 Splitter supports an IR Emitter port. By connecting an IR Emitter to the IR Emitter port, users remote from the HDMI/HDBT 1x4 Splitter can control source devices near the HDMI/HDBT 1x4 Splitter, with a handheld IR remote.

### 5.1.1. Control far-end display device while local to Splitter

Control a local HDMI/HDBT 1x4 Splitter, or a far-end display device from a position near the Splitter, using a handheld IR remote.
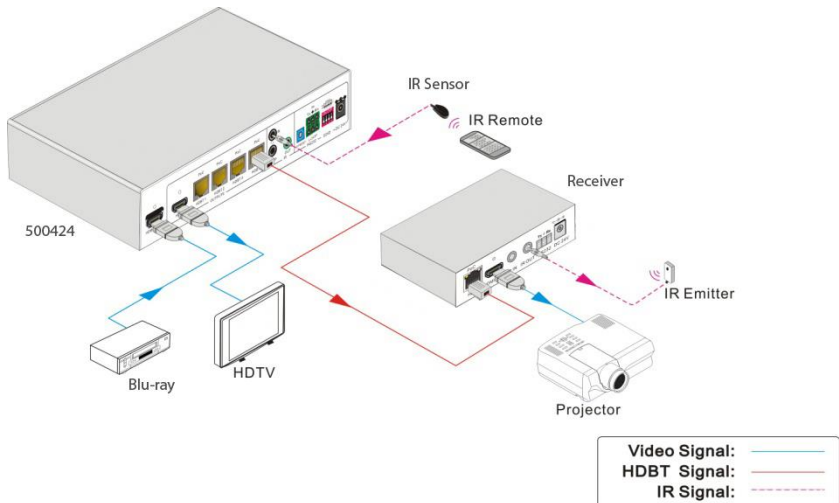


**Figure 5- 1 Control far-end display device while local to Splitter**

### 5.1.2. Control far-end source device while remote from Splitter

Control a remote HDMI/HDBT 1x4 Splitter, or a far-end source device from a position at a distance from the Splitter, using a handheld IR remote.
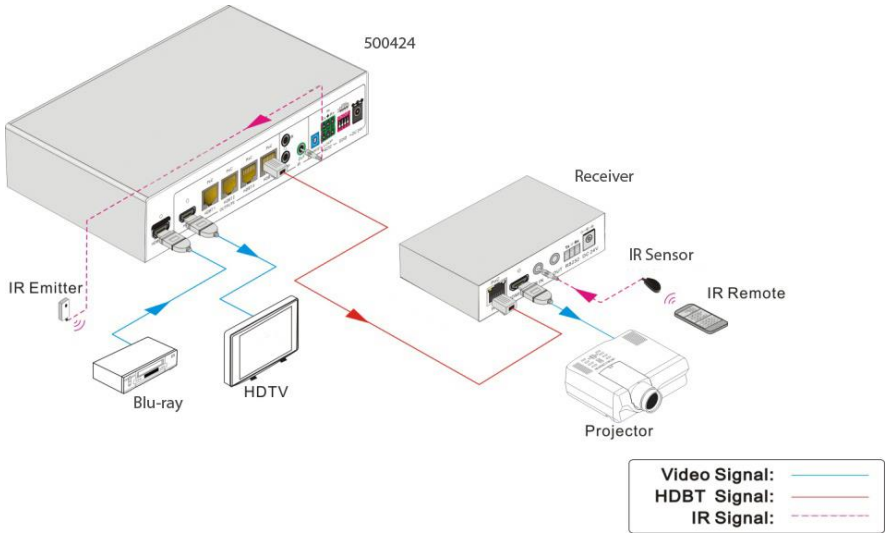


**Figure 5- 2 Control remote source device while remote from Splitter**

# 6. RS232 Control Commands

Use PC based terminal software to control the HDMI/HDBT 1x4 Splitter and to control end devices, such as displays. In order to control end devices, the HDBT Receivers must support RS232 Transmission, and the RS232 port of each HDBT Receiver must be connected via an RS232 cable (sold separately) to the RS232 port of each end device to be remotely managed. Please set the parameters of the COM Port (baud rate, data bits, stop bit and the parity bit) to 9600, 8, 1, none (respectively).
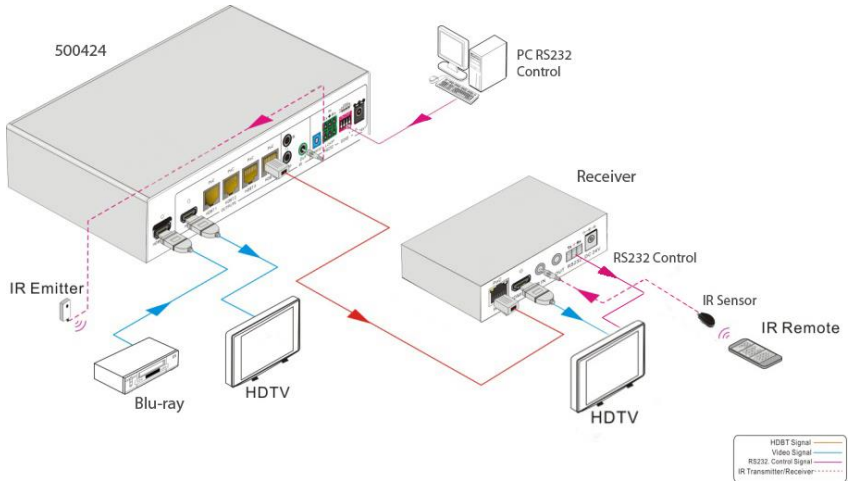


**Command format:**

*senddata –u **<unit #> –p <port #>** -b <baud rate> -d "**<data to send >**"*

*Description:*      ***Send pass through data to a specific output port***

Arguments:      ***<Unit # >: 0 to 15***

                           **<port # >: 1 to 4**

                           ***<baud rate>: 9600, 19200, 38400, 57600 or 115200***

                           ***<data to send>: Hex string (max 500 characters)***

*Example:*       Send the following 4 bytes to port #3 0xA1, 0x55, 0xF2, and 0xC8

                      senddata –u 0 –p 3 –b 9600 –d "A155F2C8"

*output –u* **<unit #> –p <port #> <state>**

*Description:* **Set output state**

Arguments:   **<Unit # >: 0 to 15**

**<port # >: 1 to 5 (1:HDMI, 2-5:HDBT)**

**<state>: on or off**

*Example:*    Turn off video on HDBT port 4

output –u 0 –p 5 off

*edidupdate –u* **<unit #> -p <predefined edid>**

*Description:* **Update the specified predefined EDID values via the serial port**

Arguments:   **<Unit # >: 0 to 15**

**<predefined edid>: 1, 2, 3, 4, 5 (1:1080p 2D, 2:1080p 3D, 3:720p 2D, 4:720p 3D, 5:DVI 1920x1080)**

*Example:*    Update the specified predefined EDID "1080p 3D" via the serial port

edidupdate –u 0 –p 2

(Will read the EDID binary file from the serial port)

**Note:** To control the HDMI/HDBT 1x4 Splitter via the RS232 port, the communication protocol parameters should be configured as follows: Baud rate: 9600; Data bit: 8; Stop bit: 1; Parity bit: none.

# 7. EDID Management

The HDMI/HDBT 1x4 Splitter supports a 4 position EDID Dip Switch, where "1" represents ON, and "0" represents OFF. Configure the switches to set the desired EDID data, as indicated in the following table:

| Switch Status | EDID information |
|---|---|
| 0000 (default) | pass through, auto process |
| 0001 | 1080P 2D |
| 0010 | 1080P 3D |
| 0011 | 720P 2D |
| 0100 | 720P 3D |
| 0101 | DVI 1920x1080 |

# 8. Panel Drawing
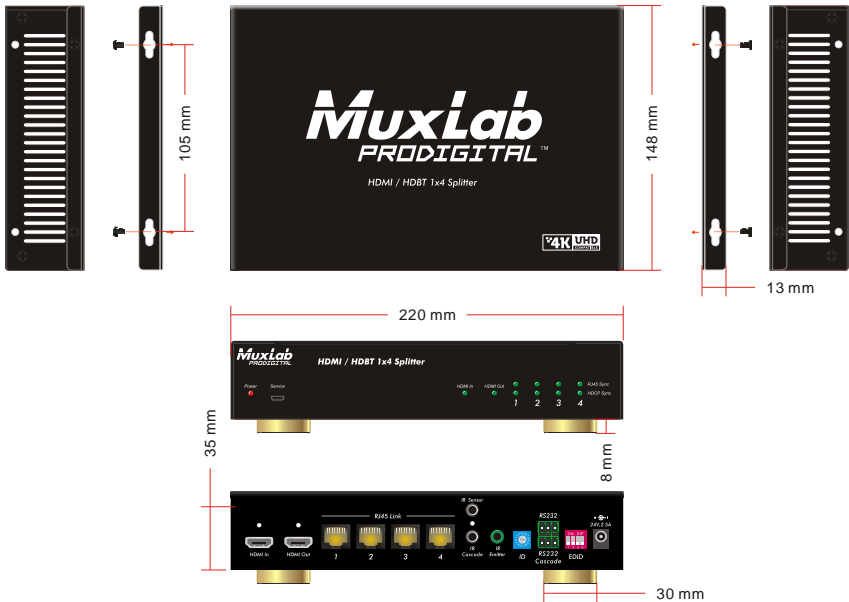
# 9. Troubleshooting & Maintenance

The following table describes some of the symptoms, probable causes and possible solutions with respect to the installation of the 500424 HDMI/HDBT 1x4 Splitter.

| Problems | Causes | Solutions |
|---|---|---|
| Color loss or no video signal output to HDMI display. | The connecting cables may not be connected correctly or may be damaged. | Verify that the cables are connected correctly, and in good working order. Test against another set of cables, if available. |
| No HDMI signal output over HDBaseT ports, while the local HDMI input is confirmed to be working normally. | | |
| Cannot remotely control the 500424 through the RS232 port, using a controlling device (e.g. a PC). | Wrong RS232 communication parameters | Make sure the RS232 communication parameters are correct. |
| | The HDMI/HDBT 1x4 Splitter, with RS232, UHD-4K may be damaged. | Contact a MuxLab authorized dealer for repair. |
| Static increases when connecting the video connector. | Bad or poor grounding. | Check the grounding and make sure it is connected properly. |

If you still cannot diagnose the problem, please call MuxLab Customer Technical Support at 877-689-5228 (toll-free in North America) or at (+1) 514-905-0588 (International).

# Regulatory Compliance

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## CE/FCC & Recycling Information

### CE Certification

This equipment complies with the requirements relating to Electromagnetic Compatibility Standards EN55022/EN55024 and the further Standards cited therein. It must be used with shielded cables only.
It has been manufactured under the scope of RoHS compliance.

### FCC Certification

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.
You are cautioned that changes or modification not expressly approved by the party responsible for compliance could void your authority to operate the equipment.
This device complies with part 15 of the FCC Rules.
Operation is subject to the following two conditions:
1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation

### WEEE (Waste of Electrical and Electronic Equipment), Recycling of Electronic Products

In 2006 the European Union introduced regulations (WEEE) for the collection and recycling of all waste electrical and electronic equipment. It is no longer allowable to simply throw away electrical and electronic equipment. Instead, these products must enter the recycling process.
Each individual EU member state has implemented the WEEE regulations into national law in slightly different ways. Please follow your national law when you want to dispose of any electrical or electronic products. More details can be obtained from your national WEEE recycling agency.

C E FC

8495 Dalton Road, Mount Royal, Quebec, Canada. H4T 1V5
Tel: (514) 905-0588
Fax: (514) 905-0589
Toll Free (North America): (877) 689-5228