



ACS4422A-R2, ACS4422A-R2-MM  
ACS4422A-R2-SM, ACS4442A-R2  
ACS4442A-R2-MM, ACS4442A-R2-SM  
ACS4481A-R2-SM, ACS4482A-R2-SM

# **DVI-D-CATx/Fiber KVM-Extender Quad-Head**

## **Manual**

**<http://www.blackbox.com>**

## Welcome to the DVI-D CATx/Fiber KVM-Extender Family!

Thank you for purchasing a DVI-D CATx/Fiber KVM-Extender! We appreciate your business, and we think you'll appreciate the many ways that your enhanced RGB Graphic system will save you money, time, and effort.

That's because our DVI-D CATx/Fiber KVM-Extender is all about breaking away from the traditional model of attaching a new display to DVI graphic source. Using the DVI-D CATx/Fiber KVM-Extender, you can remotely locate monitor, keyboard and mouse up to 140m (@ CATx) away from your CPU. Singlemode fibers allow up to 10km!

Wherever long distances are required, e.g. airports, industrial plants, call-centres or in distributed computer centres, the DVI-D CATx/Fiber KVM-Extender is the best way, to solve all problems in remotely locating your console. 2 families with 4 different types are available: Quad-Head devices for USB HID or USB 2.0 transparent – CATx, Multimode, Singlemode and CWDM.

This manual will tell you all about your new DVI-D CATx/Fiber KVM-Extender, including how to install, operate, and troubleshoot it. For an introduction to the Extender, see **Chapter 2**. The Extender product codes covered in this manual are:

<b>ACS4422A-R2:</b>	<b>KVM-Extender Quad-Head DVI-D, USB-HID, CATx</b>
<b>ACS4422A-R2-MM:</b>	<b>KVM-Extender Quad-Head DVI-D, USB-HID, Multimode</b>
<b>ACS4422A-R2-SM:</b>	<b>KVM-Extender Quad-Head DVI-D, USB-HID, Singlemode</b>
<b>ACS4442A-R2:</b>	<b>KVM-Extender Quad-Head DVI-D, USB-2.0, CATx</b>
<b>ACS4442A-R2-MM:</b>	<b>KVM-Extender Quad-Head DVI-D, USB-2.0, Multimode</b>
<b>ACS4442A-R2-SM:</b>	<b>KVM-Extender Quad-Head DVI-D, USB-2.0, Singlemode</b>
<b>ACS4481A-R2-SM:</b>	<b>KVM-Extender Quad-Head DVI-D, USB-HID, Singlemode- CWDM</b>
<b>ACS4482A-R2-SM:</b>	<b>KVM-Extender Quad-Head DVI-D, USB-2.0, Singlemode- CWDM</b>

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All trademark and trade names mentioned in this document are acknowledged to be the property of their respective owners.

## Disclaimer

While every precaution has been taken in the preparation of this manual, the manufacturer assumes no responsibility for errors or omissions. Neither does the manufacturer assume any liability for damages resulting from the use of the information contained herein. The manufacturer reserves the right to change the specifications, functions, or circuitry of the product without notice.

The manufacturer cannot accept liability for damage due to misuse of the product or due to any other circumstances outside the manufacturer's control (whether environmental or installation related). The manufacturer shall not be responsible for any loss, damage, or injury arising directly, indirectly, or consequently from the use of this product.

## Cautions and Notes

The following symbols are used in this guide:



**CAUTION.** This indicates an important operating instruction that should be followed to avoid any potential damage to hardware or property, loss of data, or personal injury.

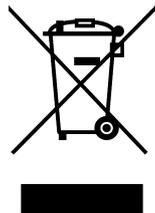


**NOTE.** This indicates important information to help you make the best use of this product.



# CONFORMITY

The products, mentioned in this manual are released according to the following standards:



**WARNING:** This equipment has been found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

## Safety Precautions and Installation Guidelines

To ensure reliable and safe long-term operation, please note the following installation guidelines:

- Do not use CATx-devices to link between buildings – please use fiber devices.
- Only use in dry, indoor environments.
- If the building has 3-phase AC power, try to ensure that equipment connected to the Local and Remote units is on the same phase.
- Try not to route a CATx link cable alongside power cables.
- The Remote unit, Local unit and any power supplies can get warm. Do not locate them in an enclosed space without any airflow.
- Do not place a power supply directly on top of a unit.
- Do not obstruct a unit's ventilation existing holes.



To safeguard against personal injury and avoid possible damage to equipment or property, please observe the following:

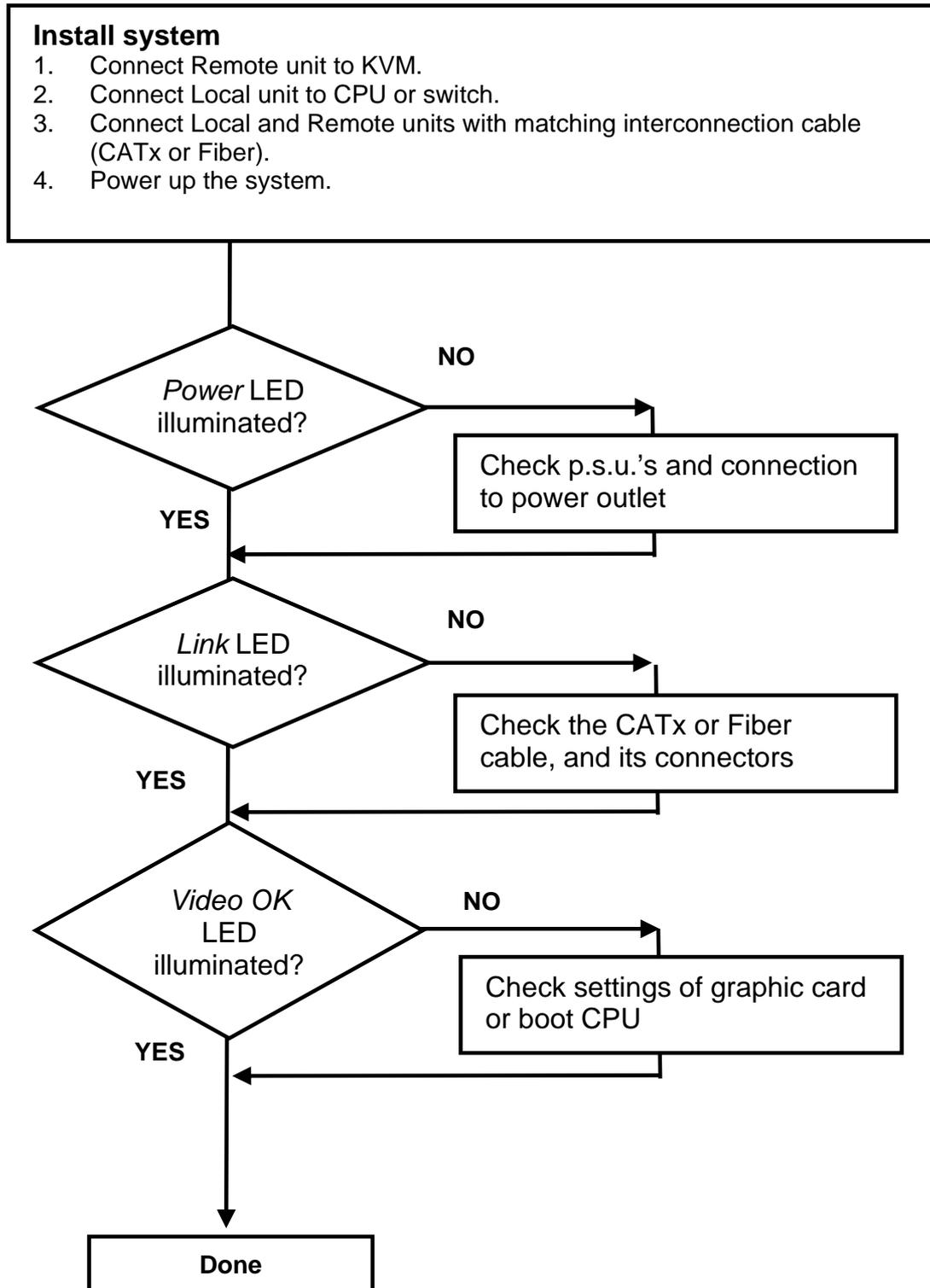
- Only use power supplies originally supplied with the product or manufacturer-approved replacements. Do not attempt to dismantle or repair any power supply. Do not use a power supply if it appears to be defective or has a damaged case.
- Connect all power supplies to grounded outlets. In each case, ensure that the ground connection is maintained from the outlet socket through to the power supply's AC power input.
- Do not attempt to modify or repair this product, or make a connection from the CATx link interface (RJ45) to any other products, especially telecommunications or network equipment.

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## 1. Quick Setup

This section briefly describes how to install your KVM extender system. Unless you are an experienced user, we recommend that you follow the full procedures described in the rest of this manual.



## 2. Overview

### 2.1 Introduction

A CATx/Fiber KVM Extender is mainly used, to extend the maximum distance between a CPU and his Keyboard / Monitor / Mouse considerably. In addition they are beneficial in installations in electromagnetic hazardous environments (EMI). Normal Keyboard-/ Monitor-/ Mouse extender cables (and Extender using traditional cables) cannot go so far and EMI interferences may reduce the maximum distance and/or reliability. Using a DVI-D CATx Extender system, these limitations are past. Retain your CPU in a secure rack cabinet or data center while accessing from a 140m remotely located place.

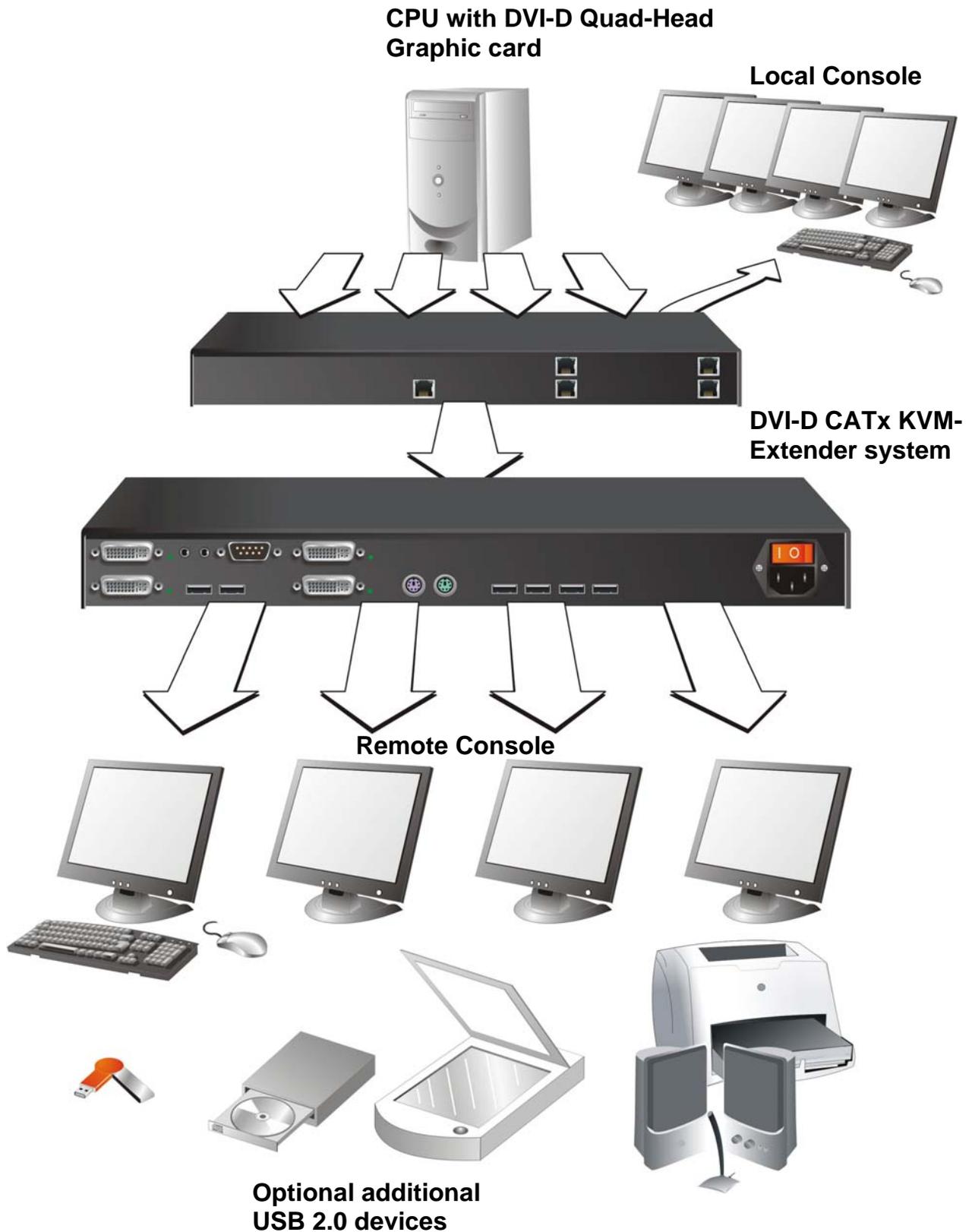
A basic KVM extension system comprises a *Local* unit and a *Remote* unit. The Local unit connects directly to the computer (or a KVM switch system) using the supplied cable(s). The user *console* (keyboard, mouse and monitor) attaches to the Remote unit. The Remote and Local units communicate video and data information along the interconnecting cables. Local units offer dual access, allowing the connection of a second monitor close to the computer.

### 2.2 Glossary

The following terms are used in this guide:

<b><i>CATx</i></b>	Any Category 5, 5e, 6 or higher cable, solid wires type AWG24. Although flexible AWG27/7 cables can be used too, the lengths of flexible cables count twice in the calculation of the total distance.
<b><i>Fiber</i></b>	9 $\mu$ Singlemode or 50 $\mu$ /62,5 $\mu$ Multimode fiber cable.
<b><i>KVM</i></b>	Keyboard, Video and Mouse.
<b><i>Console</i></b>	Keyboard, Mouse and Monitor
<b><i>Dual Access</i></b>	A system allowing connection of Local and Remote user consoles.
<b><i>Single-Head</i></b>	An extender system that supports one monitor + Keyboard/Mouse
<b><i>Quad-Head</i></b>	An extender system that supports four monitors + Keyboard/Mouse
<b><i>DVI</i></b>	Digital Video standard, installed by <b>Digital Display Working Group</b> ( <a href="http://www.ddwg.org">www.ddwg.org</a> ) R, G, B, CLOCK in a data stream with up to 3x 1,6 Gbit/sec. Signals are TMDS Level.
<b><i>PSU</i></b>	The desktop power supply connected to the Local/Remote unit.
<b><i>HID</i></b>	Human Interface Devices are units, which are used for human access to the CPU. They are a USB-device class of its own (e.g. Memory Devices etc.). Besides of keyboard and mouse also touchscreen, light pen, fingerprint sensor, graphic tablets etc. are HID devices

# DVI-D CATX/FIBER KVM-EXTENDER



**DVI-D CATx – KVM Extender system (example)**

## 2.3 Features

All members of the DVI-D CATx/Fiber - DVI KVM Extender Series offer the following features:

- Support for 4x DVI-D Graphic cards
- Support for PS2-Keyboard and PS2-Mouse
- Support for USB-Keyboard and USB-Mouse
- Bi-directional stereo audio (16-bit digitized) support enables high-quality, low-noise, audio extension.
- Support of transparent serial port enables any serial device to be extended (up to 19.2K Baud). The serial port may be used to extend one device (requiring software handshaking) Support for Tx/Rx only (XON/XOFF)



*Devices with USB-HID support ONLY Keyboard and Mouse. It's possible, that other HID devices (Human Interface Device) like touch-screens, graphics tablets, barcode readers or similar are supported – but there is no guarantee for this! The DVI-D CATx/Fiber KVM-Extender for USB-HID is NOT suitable for use with other USB devices like Scanner, webcams, data sticks etc.*



*The USB-HID device never supports more than two devices – Keyboard and Mouse or Keyboard and Touch screen, etc. but not e.g. Keyboard, Mouse and Touch screen simultaneously. A hub is allowed but does not raise the number of supported devices*

- Optionally additional USB 2.0 transparent high speed transmission (requiring an additional CATx cable or fiber pair) available. 4 devices can be attached directly at the Remote Unit – more by using regular USB- Hubs.
- Maximum resolution: DVI-D: 1920x1200@60Hz over all allowed distances all resolutions below of 1600x1200 with refresh rates of at least 75Hz
- Supporting 16 Bit/24 Bit auto switching or fixed 24 Bit color depth (user selectable)
- Status indicator LEDs on each device.
- 19"/1U footprint chassis.
- Rackmount kit available.
- CPU cables + Adapters included.

## 2.4 Product Range

There are eight products in the range and various upgrade kits:

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***DVI-D Quad-Head - Extender***

ACS4422A-R2:	KVM-Extender Quad-Head DVI-D, USB-HID, CATx
ACS4422A-R2-MM:	KVM-Extender Quad-Head DVI-D, USB-HID, Multimode
ACS4422A-R2-SM:	KVM-Extender Quad-Head DVI-D, USB-HID, Singlemode
ACS4442A-R2:	KVM-Extender Quad-Head DVI-D, USB-2.0, CATx
ACS4442A-R2-MM:	KVM-Extender Quad-Head DVI-D, USB-2.0, Multimode
ACS4442A-R2-SM:	KVM-Extender Quad-Head DVI-D, USB-2.0, Singlemode
ACS4481A-R2-SM:	KVM-Extender Quad-Head DVI-D, USB-HID, Singlemode-CWDM
ACS4482A-R2-SM:	KVM-Extender Quad-Head DVI-D, USB-2.0, Singlemode-CWDM

***Upgrade Kits***

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ACS2209A-RMK	19"/1U Rack mount- Kit to mount one device
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## 2.5 Compatibility

### Interface Compatibility

- **Digital Video (DVI-D):** Digital Video standard, installed by Digital Display Working Group ([www.ddwg.org](http://www.ddwg.org)) R, G, B, CLOCK in a data stream with up to 3x 1,6 GBit/sec. Signals are TMDS Level.
- **USB Keyboard:** Compatible with all standard keyboards. Certain keyboards with enhanced features may also be supported with custom firmware. Keyboards with built-in hub are also supported – but there are never more than two HID devices supported.
- **USB Mouse:** Compatible with all standard 2-button, 3-button and wheel mice.
- **USB HID:** Human Interface Device like touch-screens, graphics tablets, barcode readers or similar are supported – but there is no guarantee for this! The USB-HID is NOT suitable for use with other USB devices like Scanner, webcams, data sticks etc



*Devices with USB-HID support ONLY Keyboard and Mouse. It's possible, that other HID devices (Human Interface Device) like touch-screens, graphics tablets, barcode readers or similar are supported – but there is no guarantee for this! The DVI-D CATx/Fiber KVM-Extender for USB-HID is NOT suitable for use with other USB devices like Scanner, webcams, data sticks etc.*



*The USB-HID device never supports more than two devices – Keyboard and Mouse or Keyboard and Touch-screen, etc. but not e.g. Keyboard, Mouse and Touch-screen simultaneously. A hub is allowed but does not raise the number of supported devices*

## 2.6 How to Use This Guide

This guide describes the installation and configuration of the DVI-D CATx/Fiber – Extender Series. Although the connection and operation of the system is relatively straightforward, you should consider the following before getting started:

### Connection & Compatibility

If you have purchased an *Extender Kit*, this will contain all the cables required to connect the Local unit to your PC or KVM switch. Please see also: **Package Contents** (page 15)

For information about connection and installation, see **Interconnection Cable Requirements**, page 17.

### DDC Information

Normally it is not necessary to make any adjustments to the DVI-D CATx/Fiber- Extender. However, in some circumstances, it may be necessary to redefine the source of DDC Information for the CPU. By default, the DVI-D CATx/Fiber KVM-Extender uses its own internal DDC table. If this setting does not satisfy your requirements, the DDC table can either be switched to the locally attached screen or could be downloaded from remotely located screen and stored in the internal DDC table.

To modify the DDC-Setup, see **Service Setup** (page 27).

### Selecting the moment of switching to the next frame

The transmission of screen data is not synchronous to the screen change of the graphic card. Normally, the transmission is terminated during displaying a frame on the screen. If the device switches to the new frame during the displaying period of the old frame (somewhere on the screen), it's possible, and that you can see horizontal screen breaks in the moment of switching (default). On the other hand the device must idle, until the actual frame is displayed completely (until VSYNC) -> the number of frames per second transmitted sinks.

To modify the switching behaviour, see **Service Setup** (page 27).

### Selection of Color reduction for transfer acceleration

You can select, whether always 24 Bit colors (=full color depth) are transmitted or whether the compression algorithm automatically switches between 16 and 24 Bit colors to accelerate the data transfer (default). Normally the difference between 24 Bit and 16 Bit is not recognizable but under some special circumstances e.g. in photo processing installations there might be disturbing color aberrations. However, the automatic color switching enhances the count of frames; transmitted per second, fixed 24 Bit color depth gives smooth color grades under all circumstances. Please select to you choice the better mode.

To modify the color depth, see **Service Setup** (page 27).

## 3. Installation

For first-time users, we recommend that you carry out a test placement, confined to a single room, before commencing full installation. This will allow you to identify and solve any cabling problems, and experiment with the KVM extender system more conveniently.

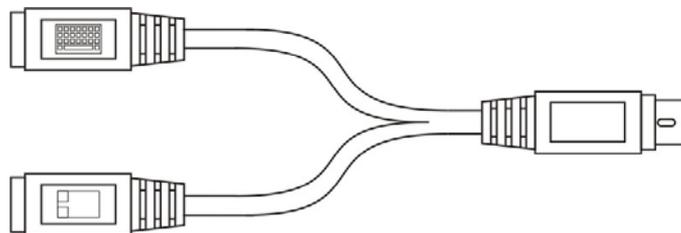
### 3.1 Package Contents

You should receive the following items in your extender package (all types):

- DVI-D CATx/Fiber KVM-Extender- pair (Local Unit + Remote Unit)
- 2x US type power cords and power supplies
- User manual (Quick Setup)
- 1x KVM CPU cable set (1.8m) with one side: PS/2 (6-pin mini-DIN male) keyboard and mouse connector and DVI-D video (DVI-D dual link male) connector – other side: DVI-D video (DVI-D dual link male) connector



- 1x PS2-Keyboard-/ Mouse adapter to connect K/M to the Local Unit (keyboard can be plugged in directly, without using an adapter)

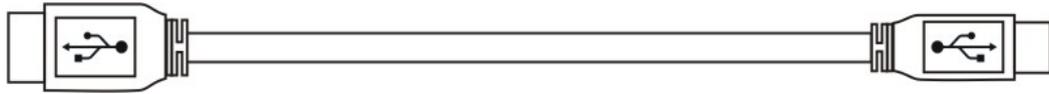


- 3x DVI-D (1,8m) video cable (DVI-D dual link male-to-male)



## DVI-D CATX/FIBER KVM-EXTENDER

- 1x USB (1,8m) cable (USB type A to type B)

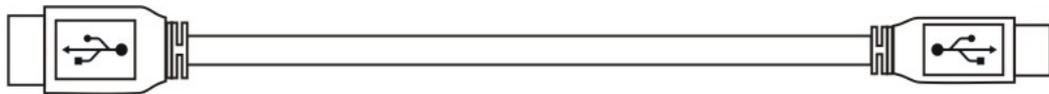


- 1x Serial link/ audio ZIP-type cable (1.8m) with one side DSUB9pin female connector + 2x 3.5mm stereo plugs – other side miniDIN8pin male connector



**ACS4442A-R2, ACS4442A-R2-MM, ACS4442A-R2-SM and ACS4482A-R2-SM (additionally):**

- 1x USB (1,8m) cable (USB type A to type B)



If anything is missing, please contact Technical Support (see **Appendix D – Calling Technical Support**).

## 3.2 Interconnection Cable Requirements

To connect the Local and Remote units you will need:

- **DVI, PS2-Keyboard, PS2-Mouse:** Connect the supplied KVM CPU cable set to your CPU (KVM.- Switch, etc.). Please ensure that the connection is tension-free!
- **DVI, USB-Keyboard, USB-Mouse:** Connect the supplied KVM CPU cable set to your CPU (KVM.- Switch, etc.). Please ensure that the connection is tension-free!
- **DVI:** Connect the supplied DVI CPU cable set to your CPU (KVM.- Switch, etc.). Please ensure that the connection is tension-free!
- **CATx Cable:** Recommended cable: S/UTP (CATx) according EIA/TIA 56A, TSB 36 or Digital STP 17-03170. Four pairs AWG 24 connection according EIA/TIA 568A (10BaseT). Use of cables from a higher category (Cat5e, Cat6, Cat7) is possible.



*The use of unshielded CATx Cable is possible, because of the higher electromagnetic noise/sensitivity the device class may not be reached*



*The use of flexible Cables (Patch cable) Type AWG26/7 is possible. Because of the higher loss of the stranded cables, the maximum distance is reduced to approx. half the value of solid cables.*



*A point to point connection is required. Having one or more patch panels in the line is possible and allowed. Not allowed is a connection from the CATx link interface (RJ45) to any other products, especially telecommunications or network equipment.*

- **Fiber Cable:** Two strands of fiber are required for Single-Head devices, eight strands for Quad-Head devices.



*Please note that the allowed distance will depend on device type AND on used fiber type.*

- Recommended cables:

ACSxxxxA-MM: Multimode type 50/125μ	allowed distance app. 400m (1,300ft)
ACSxxxxA-MM: Multimode type 62.5/125μ	allowed distance app. 200m (650ft)
ACSxxxxA-SM: Singlemode type 9/125μ	allowed distance app. 10km (32,750ft)



*A point to point connection is required. Having one or more patch panels in the line is possible and allowed. Not allowed is a connection from the Fiber link interface (LC) to any other products, especially telecommunications or network equipment.*



*Our experiences show, that Singlemode devices regularly work well on Multimode Fibers where vice versa it will never do. In addition we found, that Singlemode devices on Multimode fibers may extend the allowed*

## DVI-D CATX/FIBER KVM-EXTENDER

*distance on Multimode fibers to twice the regular length. Anyway this cannot be guaranteed and must be evaluated by the end-user at own expense.*

- **Power Supply**

Connect the AC outlet jack to the **Plug** terminal on the front of both Local and Remote units.

### 3.3 System Setup

To install your DVI-D CATx/Fiber – Extender system:

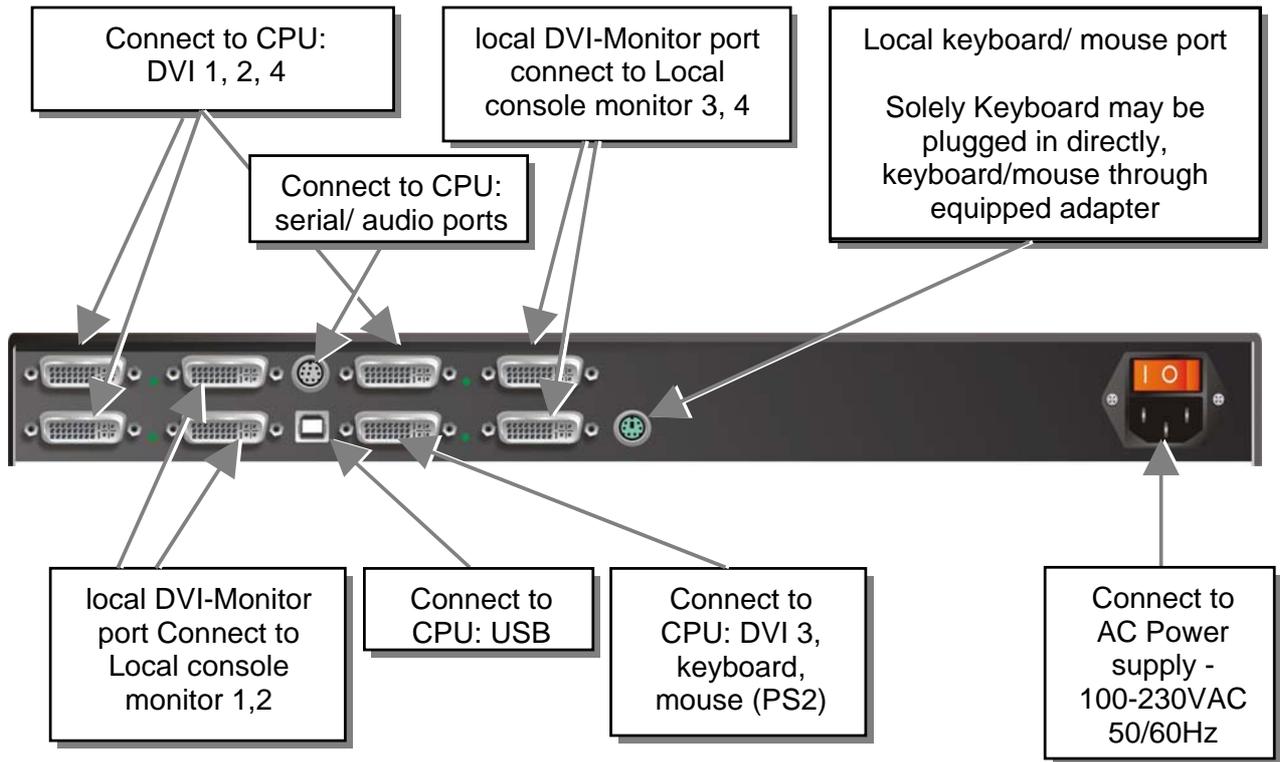
1. Switch off all devices.
2. Connect your keyboard, monitor(s) and mouse to the Remote unit (depending on device type). Please ensure, to not swap Mouse- and Keyboard connector. The Keyboard connector is purple and the Mouse connector is green.
3. Using the supplied CPU KVM cable(s), connect the keyboard, monitor(s) and mouse connectors on the computer (or KVM switch). Please ensure, to not swap (PS2) Mouse- and (PS2) Keyboard connector. The (PS2) Keyboard connector is purple and the (PS2) Mouse connector is green.
4. Connect the interconnect cable to the INTERCONNECT socket(s)
5. Connect the AC power supply to power the unit.
6. For a dual access system, connect the monitors for the Local console to the appropriate ports on the Local unit. The ports may also be used to feed into a KVM switch.

To the local (PS2-) Keyboard-/ Mouse port you can attach a Keyboard directly or Mouse/ Keyboard together, using the delivered adapter.

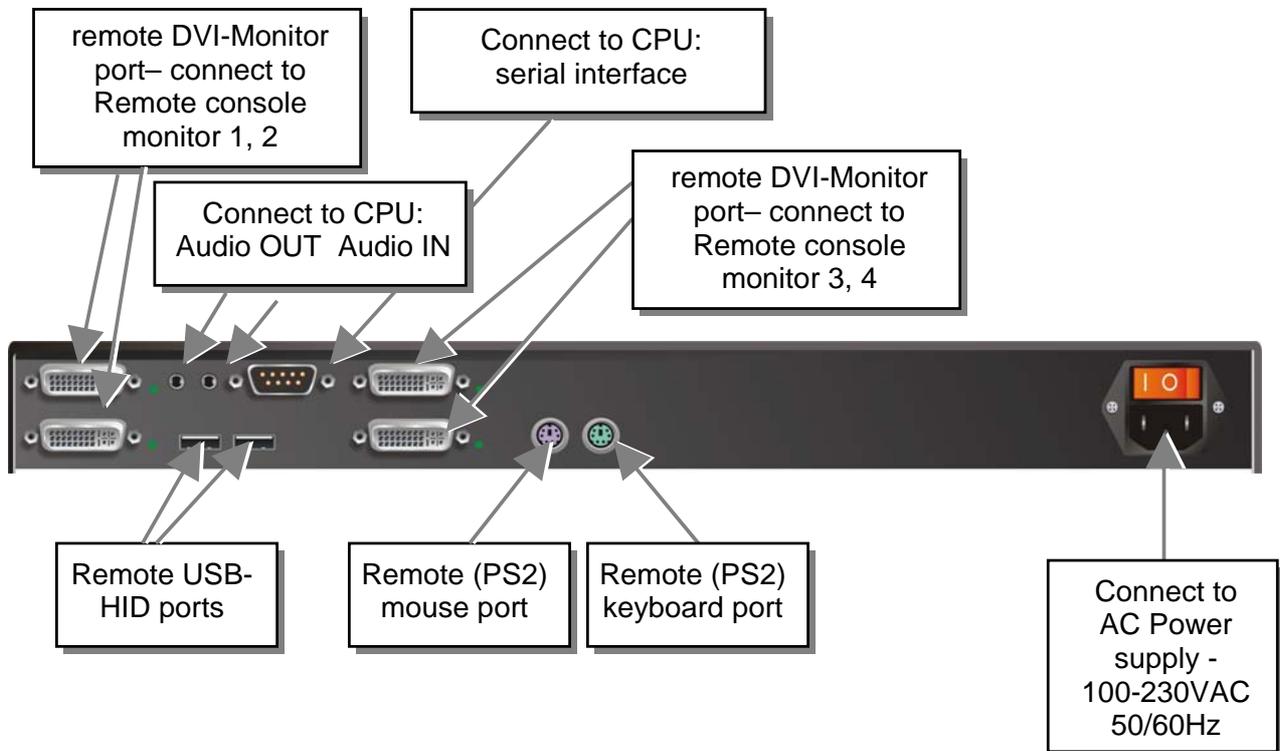
To attach a local (USB-) Keyboard/Mouse, please use additional USB port(s) at your CPU or use a USB hub in-between CPU and local unit's USB connector.

7. Power up the system.

# DVI-D CATX/FIBER KVM-EXTENDER

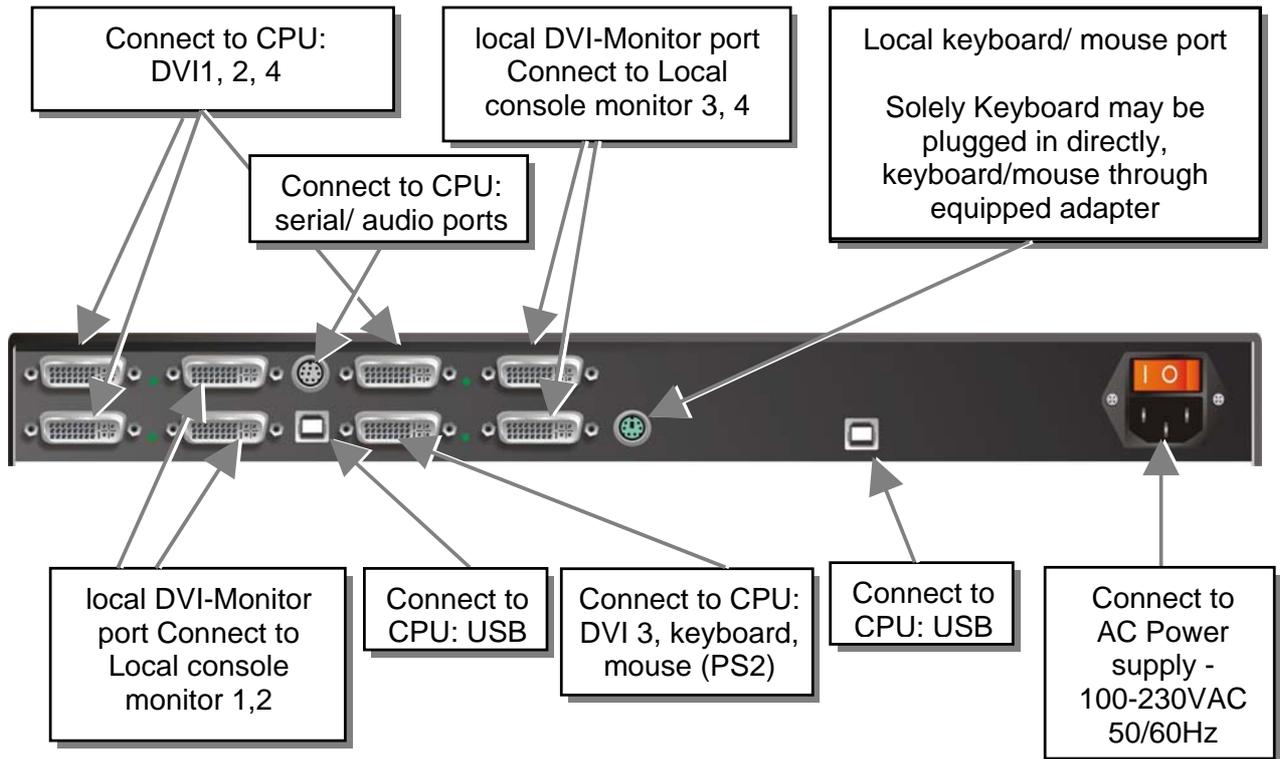


## DVI-D KVM-Extender Type ACS4422A-R2/4422A-R2-xx Local Unit

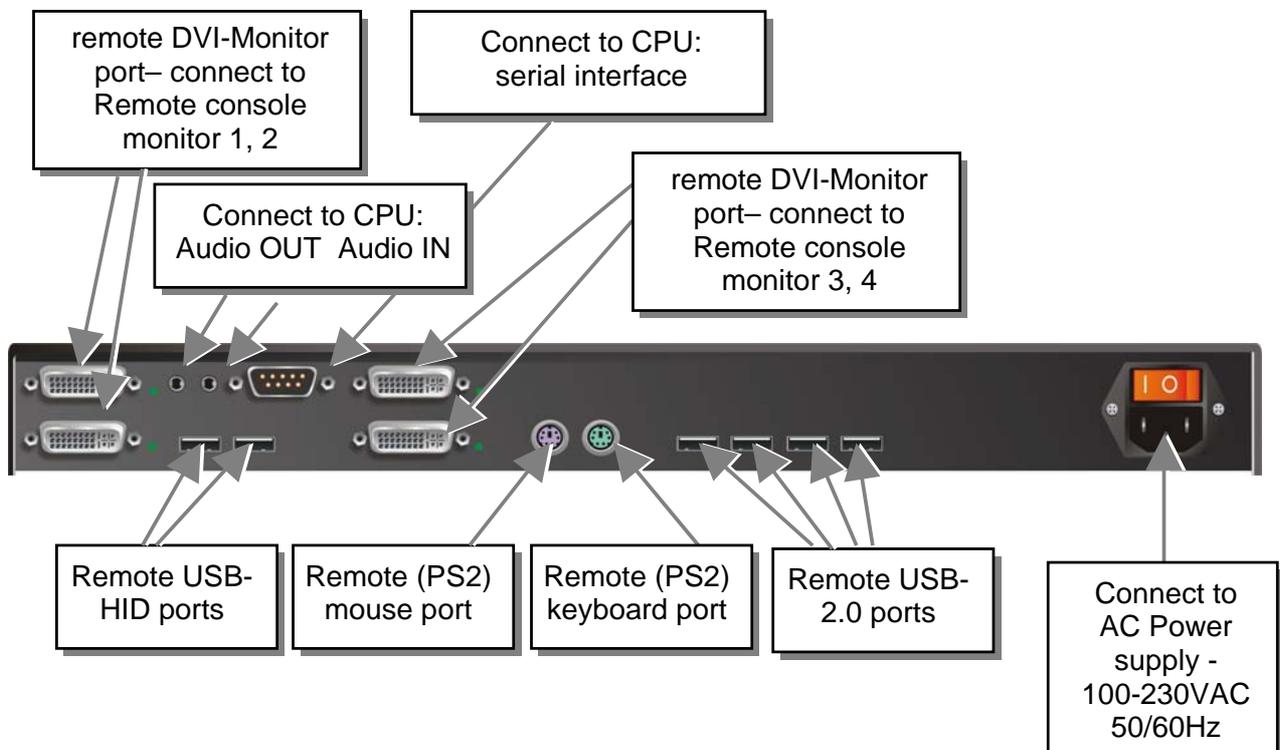


## DVI-D KVM-Extender Type ACS4422A-R2/4422A-R2-xx Remote Unit

# INSTALLATION

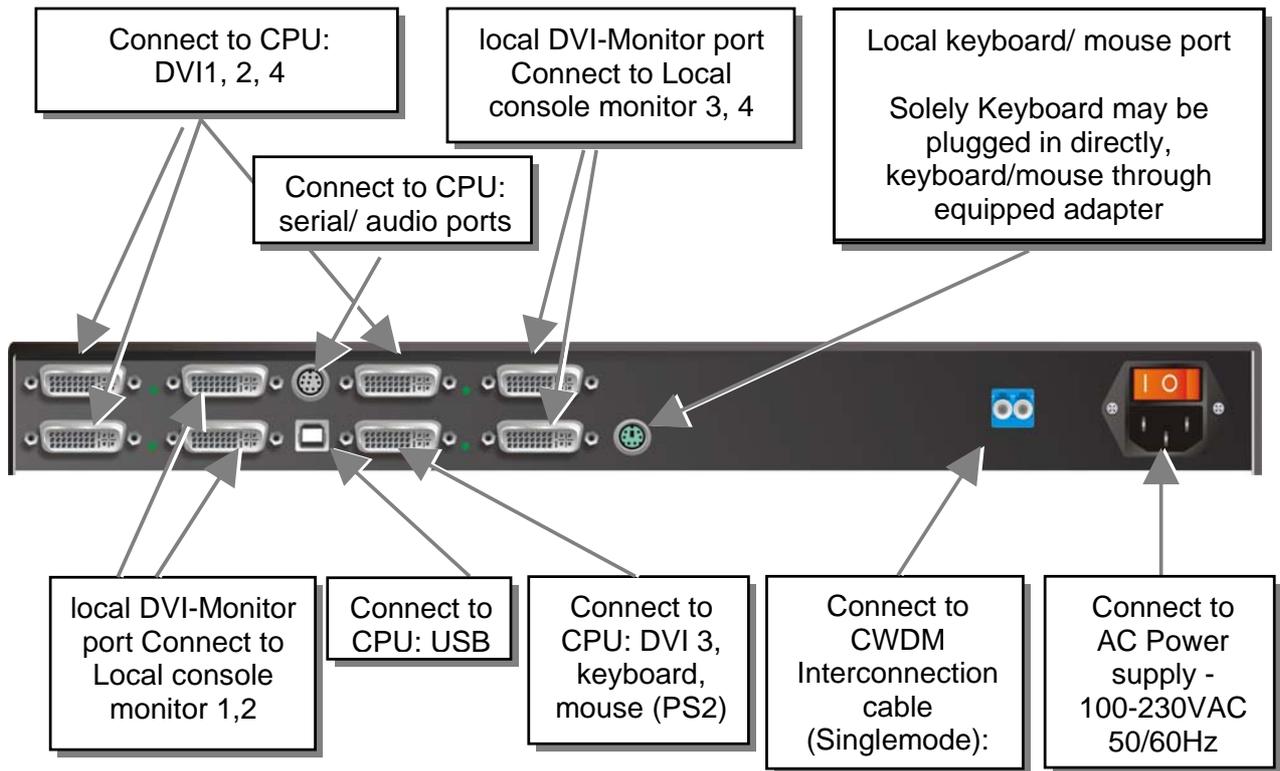


## DVI-D KVM-Extender Type ACS4442A-R2/4442A-R2-xx Local Unit

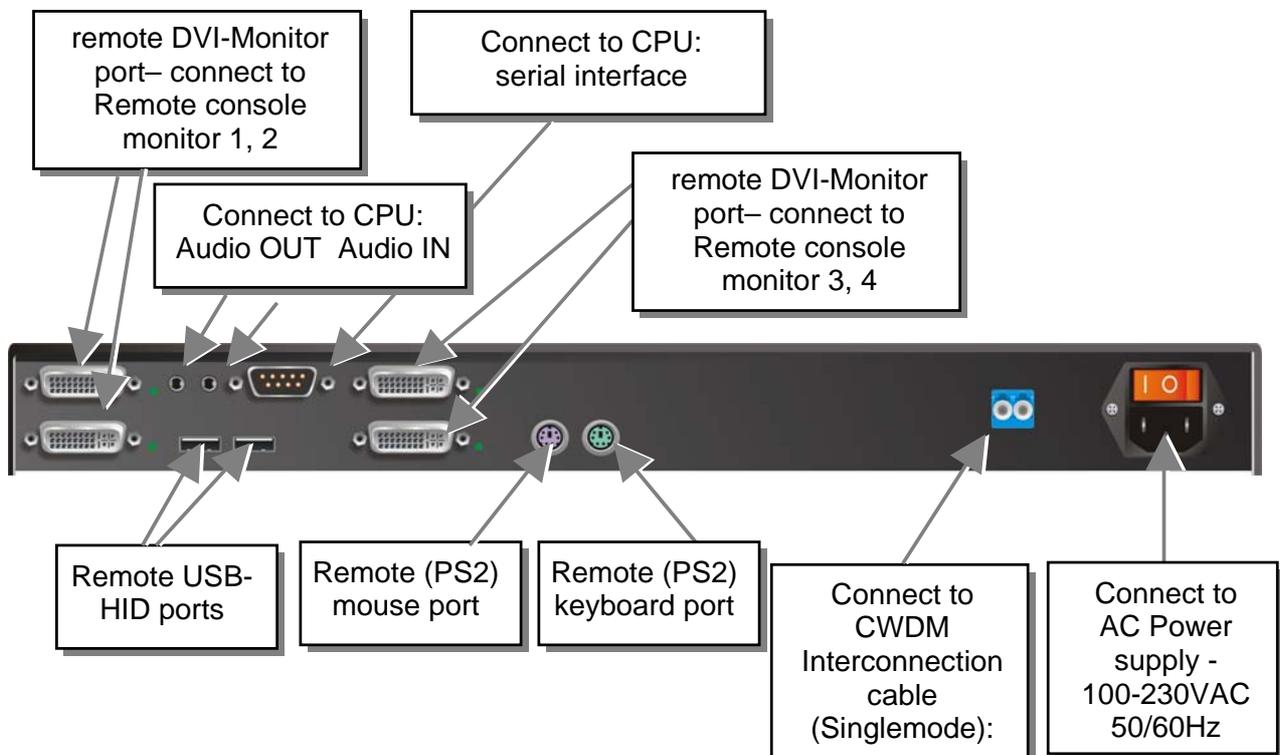


## DVI-D KVM-Extender Type ACS4442A-R2/4442A-R2-xx Remote Unit

# DVI-D CATX/FIBER KVM-EXTENDER

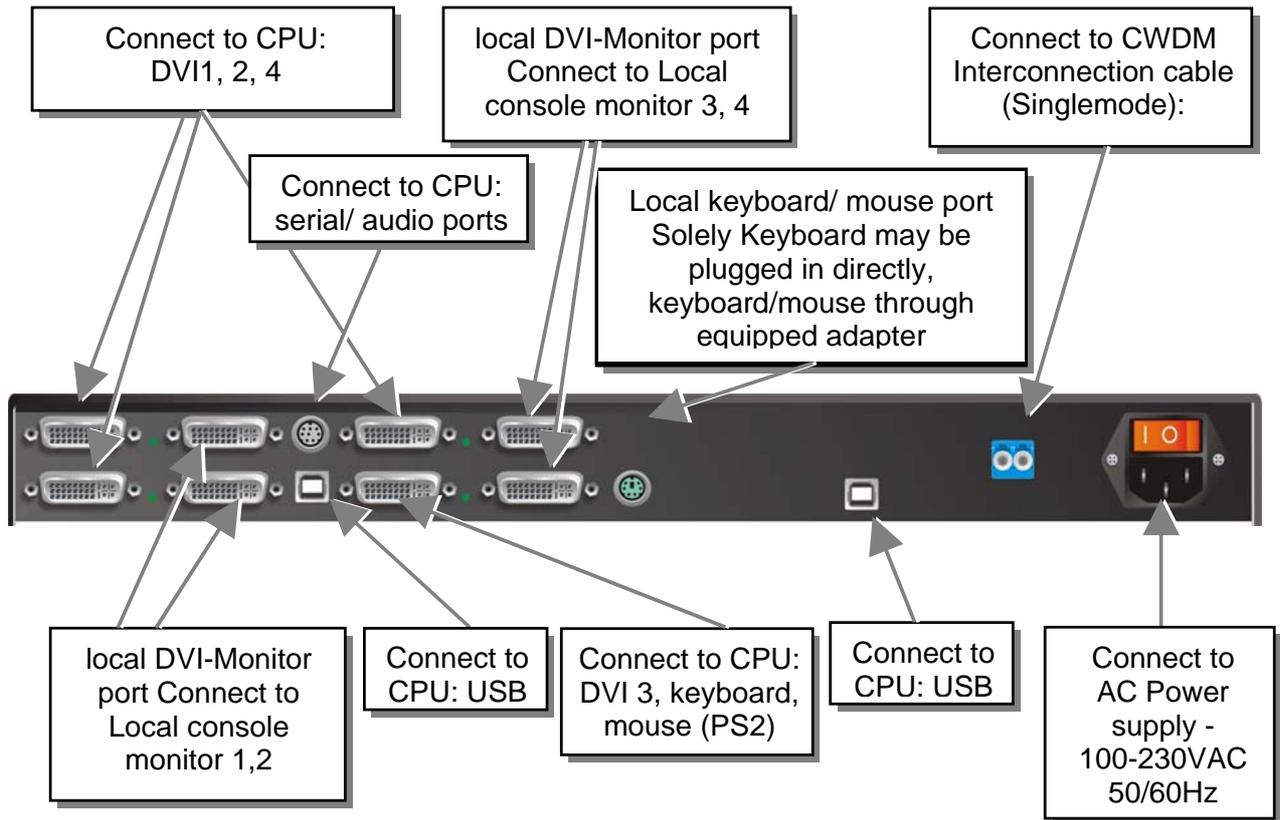


## DVI-D KVM-Extender Type ACS4481A-R2-SM Local Unit

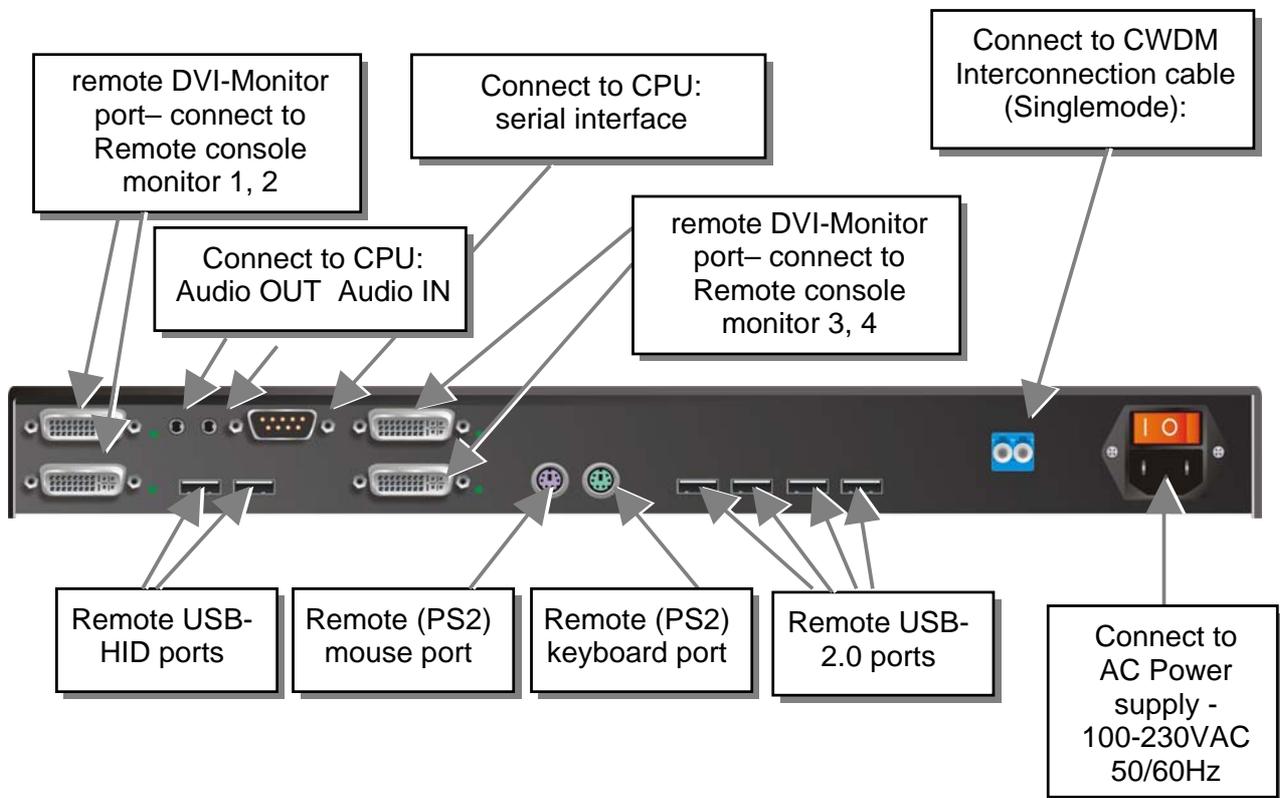


## DVI-D KVM-Extender Type ACS4481A-R2-SM Remote Unit

# INSTALLATION

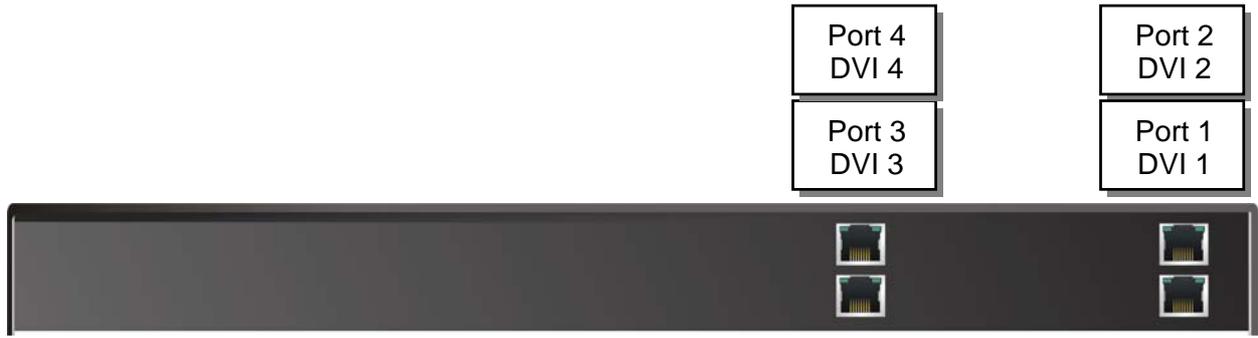


## DVI-D KVM-Extender Type ACS4482A-R2-SM Local Unit

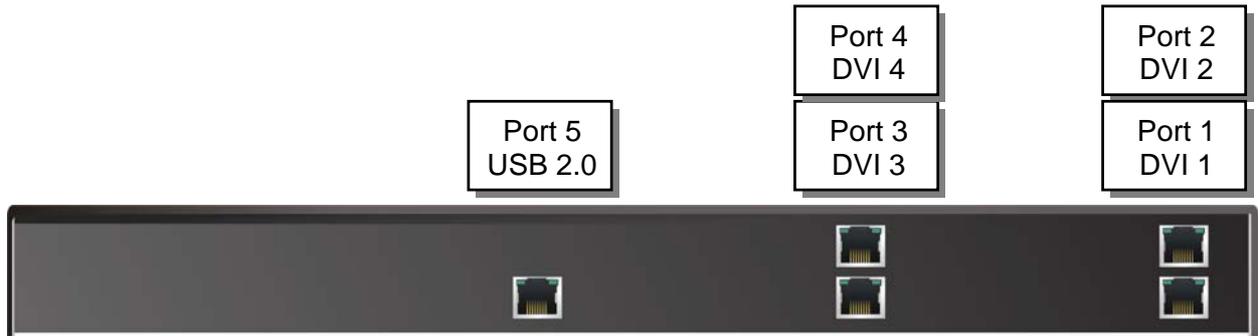


## DVI-D KVM-Extender Type ACS4482A-R2-SM Remote Unit

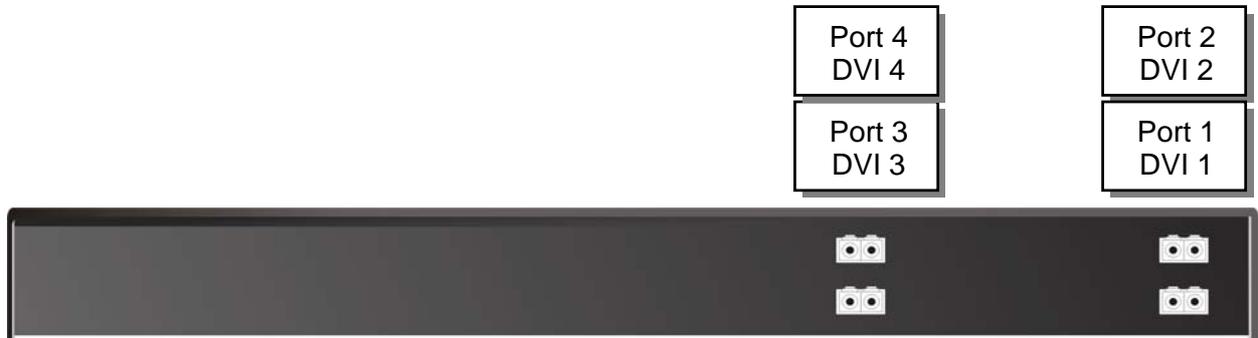
# DVI-D CATX/FIBER KVM-EXTENDER



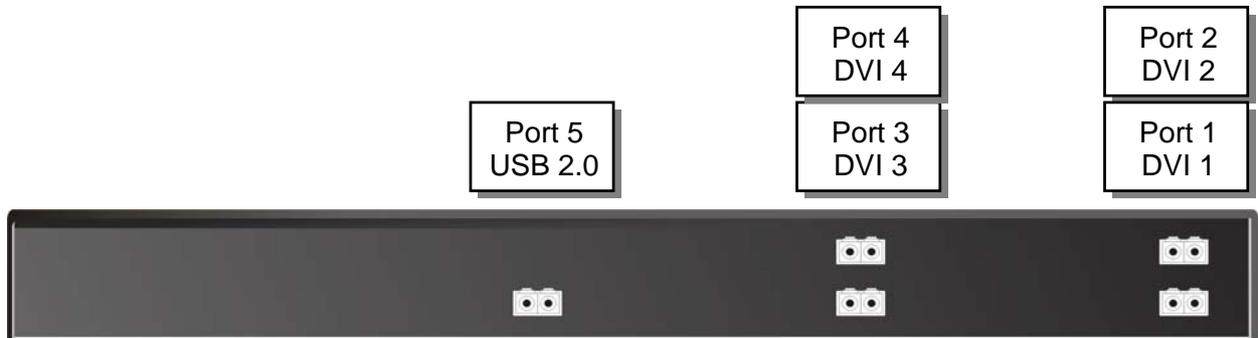
## DVI-D KVM-Extender Type ACS4422A-R2 Local/Remote Unit



## DVI-D KVM-Extender Type ACS4442A-R2 Local/Remote Unit



## DVI-D KVM-Extender Type ACS4422A-R2-xx Local/Remote Unit

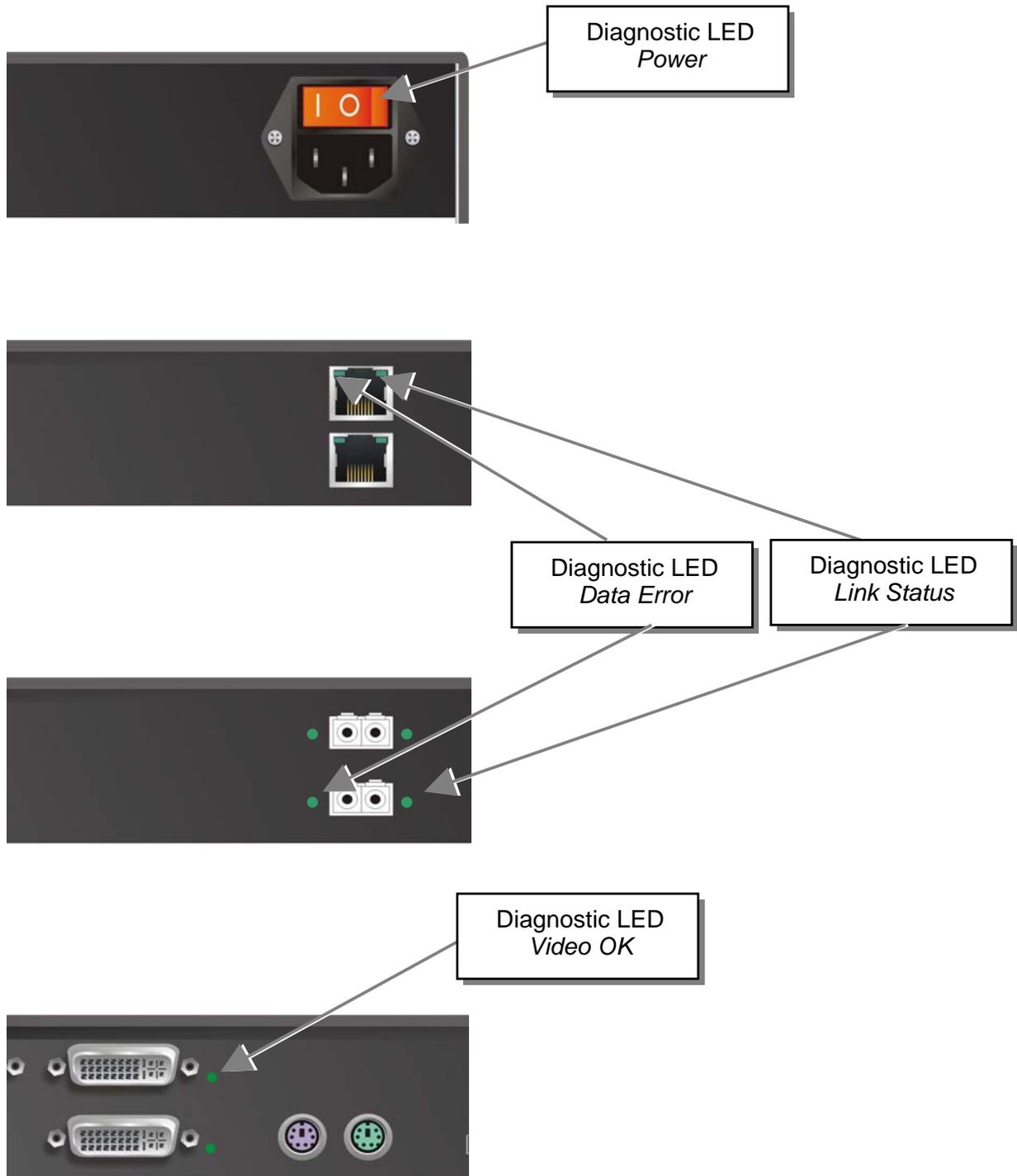


## DVI-D KVM-Extender Type ACS4442A-R2-xx Local/Remote Unit

### 3.4 Diagnostic LEDs

Each DVI-D CATx KVM-Extender is fitted with indicator LEDs: *Power*, *Video OK*, *Data Error*, *Link Status*. The *Power* LEDs are built into the Power switch.

The location of the LEDs is shown below:



**Diagnostic - LEDs at DVI-D CATx - Extender**

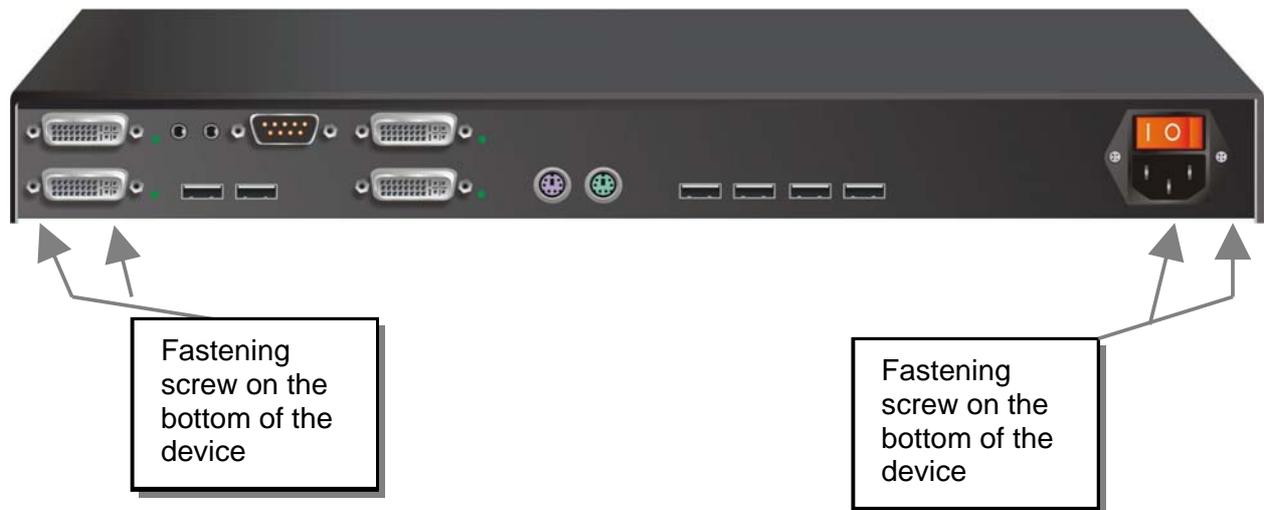
## DVI-D CATX/FIBER KVM-EXTENDER

<i>LED</i>	<i>Appearance</i>	<i>Diagnostics</i>
<b>Power LED</b> (Red LED)	Off On	Device not ready Device ready
<b>Video Okay</b> (Green LED)	Off On	No or invalid video signal detected Device ready
<b>Link Status</b> (Green LED)	blinking On	No CATx connection Device ready
<b>Data Error</b> (Green LED)	Off blinking / On	Device ready Errors through data transmission over CATx Cable (Cable too long, too high attenuation or too much EMI interferences )

## 4. Service Setup

For most applications, you shouldn't need not to make any adjustments to set up your DVI-D CATx/Fiber- Extender. Under some special circumstances it could be necessary to setup configuration specials.

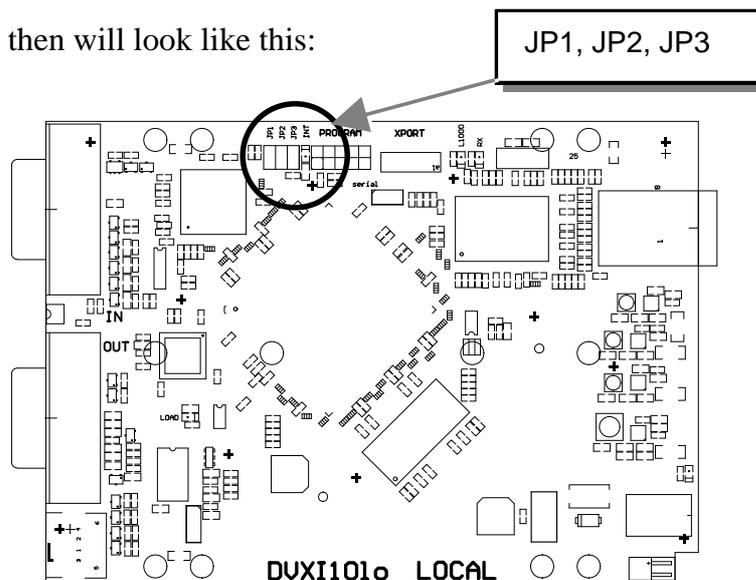
For some applications, you may need to open the Local Unit and/or the Remote Unit. Unscrew the Philips-type screws at both sides at the bottom of the device. Carefully displace the lower and upper shells of the case.



### 4.1 Setup at the Local Unit

After unscrewing and opening the upper shell, please place the device in this orientation: with the CATx connectors to the right and the electrical connectors to the left.

The main PCBs then will look like this:



Use the diagram to locate jumpers.

# DVI-D CATX/FIBER KVM-EXTENDER

## DDC

You can select, whether the DDC is taken from internal DDC table or from local monitor or the DDC information could be downloaded from remote monitor and stored into internal table.

DDC	JP1	JP2
<i>From internal Table</i>		
<i>From local Monitor</i>		
<i>Loading the DDC Information from the Remote Monitor into the internal DDC Table (see also below: Loading the DDC Information from the Remote Monitor into the internal DDC Table) (default)</i>		

## Loading the DDC Information from the Remote Monitor(s) into the internal DDC Table

To load the DDC Information from the Remote Monitor(s) into the internal DDC Table, please precede the following steps:

- Power up the CPU, the Local Unit, the Remote (cables to the CPU connected) and the Monitor
- Pull the Monitor Cable(s) from the Remote Unit (Quad-Head devices: All Monitors!)
- Switch ON the Monitor(s) (if switched OFF), ALL Monitors!
- Plug the Video-Cable of the Remote Monitor(s) into the remote unit (Remote and Local Unit powered! - ALL Monitors!)
- The DDC Information of the Remote Monitor(s) is read automatically, transferred to the Local Units and stored into the DDC-EEPROM
- After a successful programming of the DDC EEPROM, the ,Video-OK' LED at the Local Unit is blinking rapidly for approx. 1 second
- Done

## Selection of Color depth

You can select, whether 16/24Bit AUTOSELECT colors (=64K/16M colors) are transmitted (default) or 24Bit colors (=16M colors). AUTOSELECT means, that as far as the screen content allows high data compression, 24Bits are transmitted. When the video data do not allow reducing data enough, the colors are automatically reduced to 16Bit. This is auto selected in each line of the screen picture at any time. This mode makes the best compromise between speed and color depth.

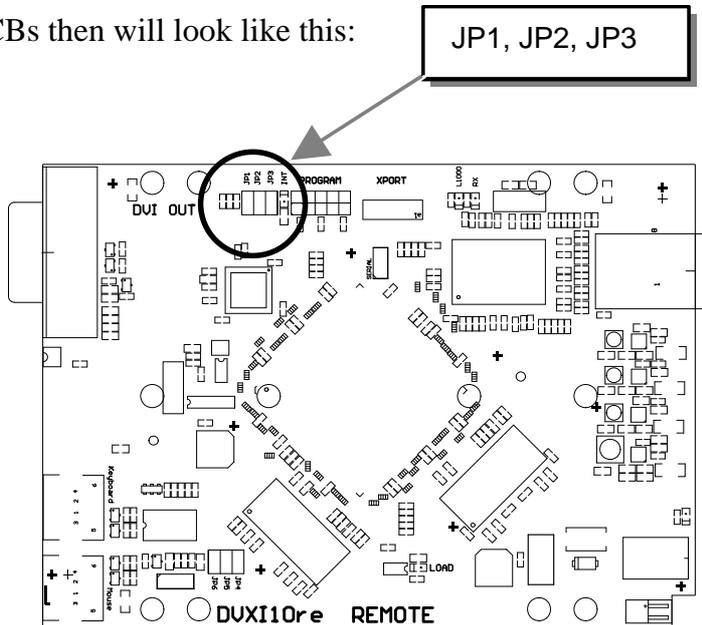
Please select 24Bit, if you want to have under all circumstances highest colours (but perhaps with reduced frame rates).

Color depth	JP3
<i>16Bit/24Bit AUTOSELECT, color depth depending on actual screen content (default)</i>	<input type="checkbox"/>
<i>24Bit</i>	<input checked="" type="checkbox"/>

## 4.2 Setup at the Remote Unit

After unscrewing and opening the upper shell, please place the device in this orientation: with the CATx/Fiber connectors to the right and the electrical connectors to the left.

The main PCBs then will look like this:



Use the diagram to locate jumpers.

### Selecting the moment of switching to the next frame

The transmission of screen data is not synchronous to the screen change of the graphic card. Normally, the transmission is terminated during displaying a frame on the screen. If the device switches to the new frame during the displaying period of the old frame (somewhere on the screen), it's possible, that you can see horizontal screen breaks in the moment of switching. On the other hand the device must idle, until the actual frame is displayed completely (until VSYNC) -> the number of frames per second transmitted sinks.

Moment to switch	JP3	behaviour
<i>Switching during HSYNC (default)</i>		Higher Framerate but (possibly) horizontal breaks detectable
<i>Switching during VSYNC</i>		Lower Framerate no horizontal breaks detectable but (possibly) stepping pictures

## 5. Troubleshooting

### Monitor

#### *There isn't a picture.*

Check the power supply connection at the local and remote unit. Is the *Power* (Red LED) at the Local unit illuminated (see page 25)? If not, the internal power-supply may be damaged or there may be an internal error.

Check that the Interconnection cable is connected at the Local Unit and the Remote Unit. Is the *Link Status* LED illuminated (see page 25)? If not, there may be a problem with the Interconnection cable:

Are there Errors through data transmission over CATX Cable (Cable too long, too high attenuation or too much EMI interference)? Is the *Data Error* LED illuminated or blinking (see page 25)? If yes, check cable length and environment.

*Video Okay* LED is dark: CPU does not provide a video signal – Check settings of the graphic card. Try out, connecting a monitor to the local output, to see, whether there is a signal or not.

#### *'Stepping' pictures on displaying movies*

On high resolutions, the amount of data transmitted each second, expires the capability of the data link. Therefore the data have to be reduced before transmitting. This is done in a first step by a so called RLE (=Run Length Encoding) algorithm. If this (loss less) compression does not reach the required amount, frames are dropped: The frame actually transmitted is transmitted completely even if the graphic card generates a new frame. This new frame is discarded. Because of this behaviour, the count of frames per second (fps) may be reduced to a value, where 'stepping' pictures are seen.

How to solve the problem: Please use a lower resolution, which is slightly higher than the resolution of the recorded movie. Please see, that most (actual) movies do have only a low resolution of approx. 720x480 (NTSC) or 704x576 (PAL) or even 320x256 (VHS). If the monitor provides a higher resolution, it may provide the scaling of the pictures. The picture quality is the same, if the monitor or the CPU does the scaling.

How to solve the problem: Set the color depth to 16/24Bit AUTOSELECT. On moving pictures, the human eye is not able, to see differences between so many colors. A reduction to 16Bit reduces the amount of data without (visible) effects.

### PS2-Keyboard

#### *The PC boots fine with no error messages but the keyboard does not work at all*

Wrong cable plugged in, keyboard and mouse cables reversed.

## DVI-D CATX/FIBER KVM-EXTENDER

Try a different model of keyboard. If the new keyboard works then original one may be incompatible

Check that the Interconnection cable is connected at the Local Unit and the Remote Unit. Is the *Link Status* LED illuminated (see page 25)?

The other console is active. Claim control by any keyboard action or by pressing left and right mouse buttons simultaneously.

### PS2-Mouse

*A mouse cursor appears on the screen, but the mouse does not work*

Wrong cable plugged in, keyboard and mouse cables reversed.

Try a different model of mouse

You have connected the Local unit while the CPU was running. Therefore you have connected first the keyboard cable and then the mouse cable. Disconnect the keyboard cable and connect it again. Please reboot you CPU if the mouse is still not running.

The other console is active. Claim control by any keyboard action or by pressing left and right mouse buttons simultaneously.

*The system does not detect a PS/2 mouse, or the application cannot find the mouse.*

Wrong cable plugged in, keyboard and mouse cables reversed.

Ensure that the Local Unit is connected to the PC keyboard port to provide power.

You have plugged keyboard and mouse cable to the CPU ports while the CPU was powered. There you first have plugged the Keyboard cable, then the Mouse cable. Please unplug and re-plug the keyboard cable. If the mouse still does not work, please reboot the CPU: The K/M sub electronics are powered by the CPU keyboard port. If you first plug in the keyboard cable, the circuit tries to find a mouse port. If it fails, it disables the mouse functionality.

### USB-Keyboard/USB-Mouse

*Your USB-keyboard/USB-mouse does not work*

Although we tried to design the devices as transparent as possible, we can't ensure that all devices are running. Please ask Technical Support for a list of tested devices.

*Your mouse is 'stepping' on your screen*

On high resolutions, the amount of data transmitted each second, expires the capability of the data link. Therefore the data have to be reduced before transmitting. This is done in a first step by a so called RLE (=Run Length Encoding) algorithm. If this (loss less) compression does not reach the required amount, frames are dropped: Because of this, 'stepping' mouse movements are seen.

How to solve the problem: Please use a lower resolution or use a desktop background which is better suitable for compression: Avoid photos for background

or horizontally graduated colors – better use monochrome backgrounds. They allow higher compression -> higher frame rates.

### *Your mouse is moving like ‘hanging on a rubber band’*

This problem derives from different single problems, which accumulate to a delay between the true mouse movement and displaying the movement of the mouse pointer on the screen. Depending to our measurements, a delay of approx. 100-150msec are recognized as disturbing.

The total delay comes from (time values are approx. values):

- 5 to 15msec for mouse movement and data transmission to CPU
- 50 to 70msec data processing time in the CPU until the changed data reach the graphic card output connector
- 15 to 45msec getting the graphic data into the local unit of the extender system and transmitting to the remote unit (60 to 20fps)
- 10 to 100msec data processing time in the display until the data are displayed on the screen (where 15msec normally are only reached by CRT tubes)

In total there are delay times between 85 and up to 230msec possible, where most of this delay is NOT caused by the extender system (Extender based delay is 5 to 15msec data transfer to the CPU and 15 to 45msec frame transfer to the remote unit – in total 20 to 60msec. Depending to our experiences, even a step from 100msec delay to 140msec (i.e. by inserting an extender system to a CPU-monitor link) may cause visible effects.

Please note, that even a monitor directly connected to a CPU has a delay of 70 to 175msec. So (under special conditions) even the bare CPU/monitor link shows this ‘rubber band behaviour’. If you now insert an extender system, the problem may occur and is (in false) dedicated to the extender system, where it only gives a small part to the total problem

How to solve the problem: Use a display with a low delay time (NOTE: This is NOT the reaction time indicated by the manufacturer. This reaction time is only the time the display needs, to switch a black pixel to get white or vice versa, but not how long it takes from receiving the data on the connector until they are displayed on the screen.) Please use a lower resolution or use a desktop background which is better suitable for compression: Avoid photos for background or horizontally graduated colors – better use monochrome backgrounds. They allow higher compression -> higher frame rates. If – and only if the link has frame dropping, a reduction from 30fps to 60fps saves 17msec and from 20fps to 60fps saves 34msec.

## USB-HID device

### *Your USB-HID device does not work*

Although our interface supports HID devices, we can’t ensure that every connected device is running. In case of a malfunction please contact our technical support.

## **DVI-D CATX/FIBER KVM-EXTENDER**

### **Other USB-devices**

#### *Your USB- device does not work*

You have connected a non-HID device. There are supported HID devices only. All other devices are dismissed

## Appendix A: Example Applications

This section illustrates some specific applications using the DVI-D CATx- Extenders:

- DVI-D CATx KVM-Extender with optional, secondary screen set.



**DVI-D CATx KVM-Extender with optional, secondary screen set**

## DVI-D CATX/FIBER KVM-EXTENDER

- A Quad-Head CPU is remotely located. The USB 2.0 access provides the power of a complete workspace including printer, scanner, memory stick, CD-ROM, ....



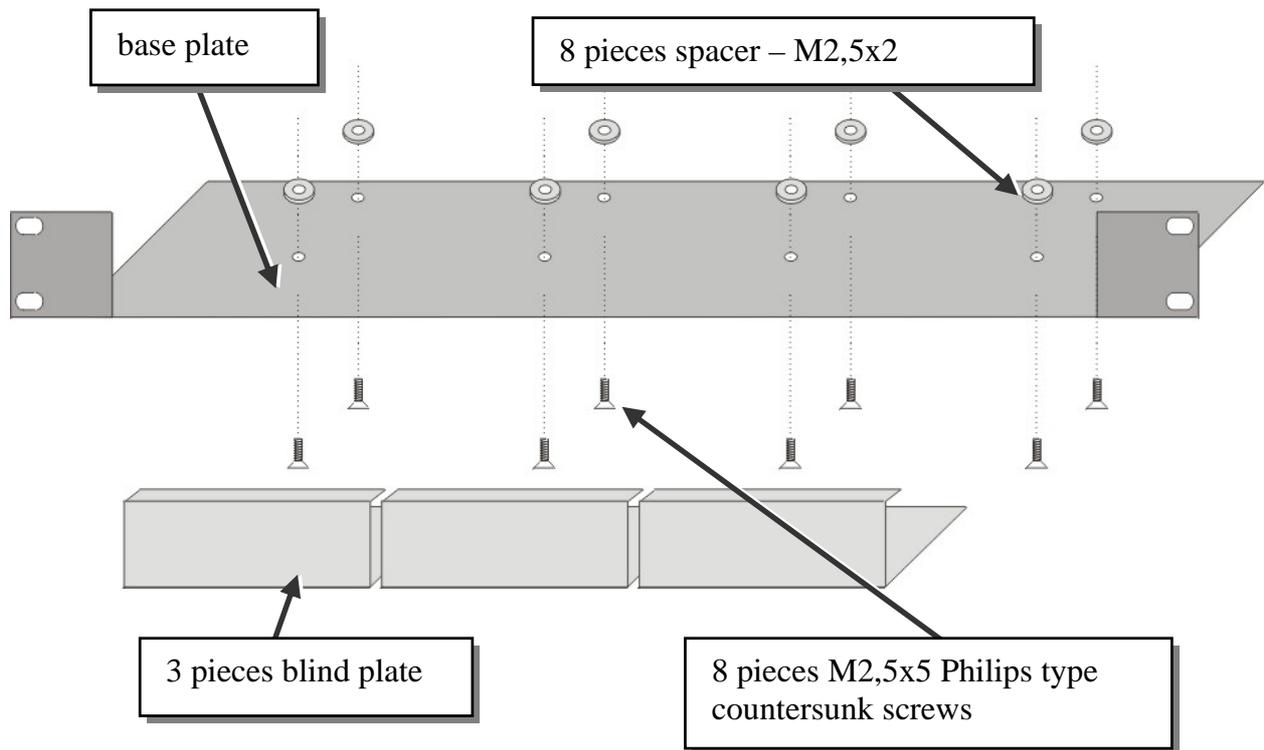
**DVI-D CATx KVM-Extender – with full USB 2.0 high speed access**

## Appendix B: Rack Mount Options

DVI-D CATx KVM- Extender units can be mounted in a 19" rack using the mounting kit: ACS2209A-RMK.

### Mounting Instruction Rackmount-Kit ACS2209A-RMK

Using the Rackmount-Kit ACS2209A-RMK, one device (local or remote unit) can be mounted into a 19"-Server Rack.



### Mounting instruction:

- Align the holes on the base plate with the vacant screw holes on the base of the device.
- Fasten the base of the unit to the plate of the mounting kit



Only use the supplied, short screws, to prevent damages on the PCB's

- Blanking plates are not used for this application.

## Appendix C: Audio/Serial Support

The Audio/Serial allows bi-directional stereo audio and a 3 wire (Tx/Rx - XON/XOFF) serial data link to be sent across the regular interconnection cable in addition to keyboard, mouse and DVI video.

### **Serial Interface - Set Up and Operation**

No setting up or user adjustments are required. Please note that the serial link is always active.

Please bear in mind that the Remote Unit's serial port is wired as DTE (i.e. the same as that on a PC). To connect a serial printer (or other DTE rather than DCE device) to the Remote Unit, you will need a Null-Modem (crossover) cable between the Remote Unit and the printer.

A serial touch screen may be plugged directly into the Remote Unit.



Please note, that the devices support a 3-wire- connection only (Tx/Rx/GND). Attached devices must support software handshake (XON(XOFF)).

### **Audio Interface - Set Up and Operation**

The audio interface is line-level and is designed to take the output from a sound card (or other line-level) source and be connected to a set of powered speakers at the other end of the link. Stereo audio may be transmitted either way across the link (simultaneously). No set up is required unless a microphone is connected to the remote unit.

Connect up the extender as follows:

Take the line-level output from your sound card (green connector) and connect to 'Line In' on the extender. A set of powered speakers may be connected directly to 'Line Out' at the opposite end of the link.

### **Audio Interface - Using a Microphone**

A microphone may be plugged into the 'Line In' connector on the Remote Unit. There are two ways of setting up a microphone:

- The Local Unit's 'Line Out' connection should normally be wired to the microphone input (Red) on your sound card. The sound card should then be set up to provide additional amplification (+20dB). This is the preferred connection method.
- Alternatively, the Remote Unit itself can provide microphone amplification. To set this, open up the Remote Unit and locate the jumper labeled 'MIC' on the daughter board. Connect this jumper across the pins. The Local Unit's 'Line Out' connection should then be wired to 'Line In' (Blue) on your sound card.

If your microphone is already amplified, follow the second method but DO NOT install the amplification jumper in the Remote Unit.

## Appendix D: Calling Technical Support

If you determine that your DVI-D –CATx KVM Extender is malfunctioning, *do not attempt to alter or repair it*. It contains no user-serviceable parts. Contact Technical Support at Black Box!

Before you do, make a record of the history of the problem. We will be able to provide more efficient and accurate assistance if you have a complete description, including:

- The firmware-revision level printed on the bottom of the Extender (very important, especially for keyboard and mouse problems); The DVI-D CATx- KVM extender's firmware revision level:

### Version Number Format:

Board: ***xxLO/RE Myyy Pzzz Auuu Gvvvvvv***

Transceiver: ***C/M/S xx Pyy Mzz***

Keyboard/Mouse: ***P/U xx Vyyy***

- The nature and duration of the problem.
- When the problem occurs.
- The components involved in the problem—that is, what type of computers, what type of keyboard, brand of mouse, make and model of monitor, type and make of cable, etc.
- Any particular application that, when used, appears to create the problem or make it worse.
- The results of any testing you've already done.

To solve some problems, it might be necessary to upgrade the Extender's firmware. If this turns out to be the case for your difficulty, our Technical Support technicians will arrange for you to receive the new firmware and will tell you how to install it.

## Shipping and Packaging

If you need to transport or ship your DVI-D CATx- KVM Extender:

- Package it carefully. We recommend that you use the original container.
- If you are shipping it for repair, please include the Unit's external power supplies. If you are returning it, please include everything you received with it. Before you ship the Extender back to your dealer for repair or return, contact him to get a Return Authorization (RA) number.

# DVI-D CATX/FIBER KVM-EXTENDER

## Black Box Technical Support

Country	Web Site/E-Mail	Phone	Fax
US	<a href="http://www.blackbox.com">www.blackbox.com</a> <a href="mailto:info@blackbox.com">info@blackbox.com</a>	724-746-5500	724-746-0746
Austria	<a href="http://www.black-box.at">www.black-box.at</a> <a href="mailto:support@black-box.at">support@black-box.at</a>	+43 1 256 98 56	+43 1 256 98 56
Belgium	<a href="http://www.blackbox.be">www.blackbox.be</a> <a href="mailto:support.english@blackbox.be">support.english@blackbox.be</a> <a href="mailto:support.french@blackbox.be">support.french@blackbox.be</a> <a href="mailto:support.nederlands@blackbox.be">support.nederlands@blackbox.be</a>	+32 2 725 85 50	+32 2 725 92 12
Denmark	<a href="http://www.blackbox.dk">www.blackbox.dk</a> <a href="mailto:blackbox@blackbox.dk">blackbox@blackbox.dk</a>	+45 56 63 30 10	+45 56 65 08 05
Finland	<a href="http://www.blackbox.fi">www.blackbox.fi</a> <a href="mailto:tuki@blackbox.fi">tuki@blackbox.fi</a>	+358 201 888 800	+358 201 888 808
France	<a href="http://www.blackbox.fr">www.blackbox.fr</a> <a href="mailto:tech@blackbox.fr">tech@blackbox.fr</a>	+33 820 07 09 11	+33 820 05 07 09
Germany	<a href="http://www.black-box.de">www.black-box.de</a> <a href="mailto:techsupp@black-box.de">techsupp@black-box.de</a>	+49 811 5541 110	+49 811 5541 499
Ireland	<a href="http://www.blackbox.co.uk">www.blackbox.co.uk</a> <a href="mailto:techhelp@blackbox.co.uk">techhelp@blackbox.co.uk</a>	+353 1 662 2466	+353 1 662 2477
Italy	<a href="http://www.blackbox.it">www.blackbox.it</a> <a href="mailto:supporto.tecnico@blackbox.it">supporto.tecnico@blackbox.it</a>	+39 02 27 404 700	+39 02 27 400 219
Netherlands	<a href="http://www.blackbox.nl">www.blackbox.nl</a> <a href="mailto:techsupport@blackbox.nl">techsupport@blackbox.nl</a>	+31 30 241 7799	+31 30 241 4746
Norway	<a href="http://www.blackboxnorge.no">www.blackboxnorge.no</a> <a href="mailto:support@blackboxnorge.no">support@blackboxnorge.no</a>	+47 55 300 710	+47 55 300 701
Spain	<a href="http://www.blackbox.es">www.blackbox.es</a> <a href="mailto:tecnico@blackbox.es">tecnico@blackbox.es</a>	+34 916590732	+34 916239784
Sweden	<a href="http://www.blackboxab.se">www.blackboxab.se</a> <a href="mailto:support@blackboxab.se">support@blackboxab.se</a>	+46 8 44 55 890	+46 08 38 04 30
Switzerland	<a href="http://www.black-box.ch">www.black-box.ch</a> <a href="mailto:support@black-box.ch">support@black-box.ch</a>	+41 55 451 70 71	+41 55 451 70 75
UK	<a href="http://www.blackbox.co.uk">www.blackbox.co.uk</a> <a href="mailto:techhelp@blackbox.co.uk">techhelp@blackbox.co.uk</a>	+44 118 965 6000	+44 118 965 6001

## Appendix E: Specifications

### Power Supply

<i>Voltage</i>	100-240VAC-0.8A-50-60Hz/5VDC-7A
<i>Power required</i>	Local Unit: max. 5V/3.5A Remote Unit: max. 5V/5.5A

### Interface

(Depending on type of device)

<i>Video source/Monitor</i>	DVI-D up to 1920x1200@60Hz
<i>Keyboard</i>	PS2 or USB
<i>Mouse</i>	PS2 or USB 2-/3-button and wheel mouse
<i>LC (Glass fibre)</i>	1000 MBit High speed transmission. Corresponds to Gigabit Ethernet
<i>RJ45</i>	1000 MBit high speed transmission. Wiring according to EIA/TIA 568B Gigabit Ethernet.

### Audio Interface

<i>Description</i>	Bi-directional stereo audio link
<i>Transmission Method</i>	Digitized virtually CD quality audio (16-bit, 38.4KHz)
<i>Signal Levels</i>	Line-Level (5 Volts Pk-Pk maximum)
<i>Input Impedance</i>	47K
<i>Local Unit Connectors</i>	2 x 3.5mm stereo jack socket (Line In & Line Out)
<i>Remote Unit Connectors</i>	2 x 3.5mm stereo jack socket (Line/Mic In & Line Out)
<i>Microphone Support</i>	A microphone may be connected to the Remote Unit. Pull-up resistor provides bias for condenser microphone. Option to set microphone amplification to +17dB.

# DVI-D CATX/FIBER KVM-EXTENDER

## Serial Interface

<i>Serial Speed</i>	Up to a maximum of 19,200 Baud
<i>Serial Data Format</i>	Format Independent
<i>Flow Control</i>	NO flow control (XON/XOFF)

## Type and Maximum Length of Interconnection Cable

<i>CATx Installation cable AWG24 max : 120m (400ft)</i>	S/UTP (CATx) cable acc. EIA/TIA 56A, TSB 36 or Digital STP 17-03170. Four pairs AWG 24. wiring acc. EIA/TIA 568A (1000BaseT).
<i>CATx Patch cable AWG26/7 max: 60m (200ft)</i>	S/UTP (CATx) cable acc. EIA/TIA 56A, TSB 36 or Digital STP 17-03170. Four pairs AWG 26/7. wiring acc. EIA/TIA 568A (1000BaseT)..

## Maximum Length of Fibre Cable (LC Connector)

<i>Singlemode 9µm</i>	10.000m (32.750ft)
<i>Multimode 50µm</i>	400m (1.300ft)
<i>Multimode 62.5µm</i>	200m (650ft)

## Size and Shipping Weight

<i>ACS4422 + ACS4442</i> (CATx / Multi-/ Singlemode)	420 x 143 x 43mm (19"x5.6"x1U) (2 devices) Weight: 1,5 kg (3.3lb) each
Shipping box	470x250x115mm (18.5"x9.8"x4.5") Weight: 3,3kg
<i>ACS4481 + ACS4482</i> (CWDM)	420 x 265 x 43mm (19"x10.4"x1U) (2 devices) Weight: 2,15 kg (4.7lb) each
Shipping box	500x370x105mm (19.7"x14.6"x4.1") Weight: 5,0kg

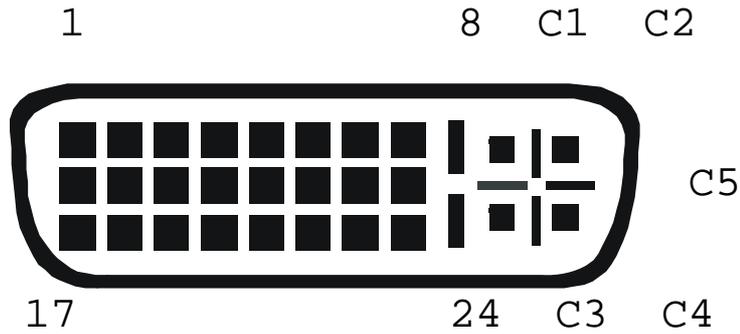
## Environmental

<i>Operating Temperature</i>	41 to 113°F (5 to 45 °C)
<i>Storage Temperature</i>	-13 to 140°F (-25 to 60 °C)
<i>Relative Humidity</i>	max. 80% non-condensing

# Appendix F: Connectors

## *DVI-D CATx/Fiber KVM-Extender Connector Pin outs*

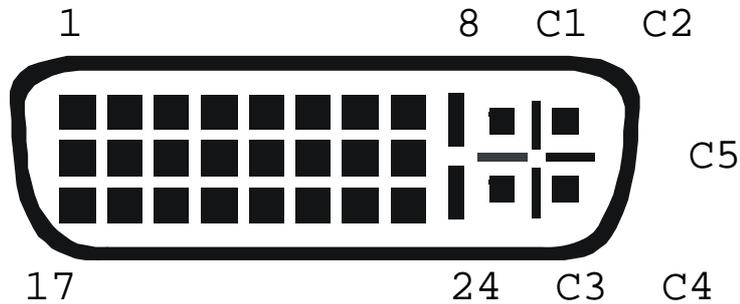
DVI-I female connector (used for Input/ Output connector for DVI only)



<i>Pin</i>	<i>Signal</i>	<i>Pin</i>	<i>Signal</i>	<i>Pin</i>	<i>Signal</i>
1	T.M.D.S data 2-	9	T.M.D.S data 1-	17	T.M.D.S data 0-
2	T.M.D.S data 2+	10	T.M.D.S data 1+	18	T.M.D.S data 0+
3	T.M.D.S data 2 GND	11	T.M.D.S data 1 GND	19	T.M.D.S data 0 GND
4	n.c.	12	n.c.	20	n.c.
5	n.c.	13	n.c.	21	n.c.
6	DDC Input (SCL)	14	+5V high impedance	22	T.M.D.S clock GND
7	DDC Output(SDA)	15	GND	23	T.M.D.S clock +
8	Internal use.	16	Hot Plug recognition	24	T.M.D.S clock -
C1	Internal use.			C3	Internal use.
C2	n.c.	C5	GND	C4	Internal use.

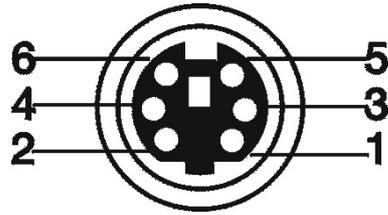
# DVI-D CATX/FIBER KVM-EXTENDER

DVI-I female connector (used for Input connector DVI + PS2 combo port)



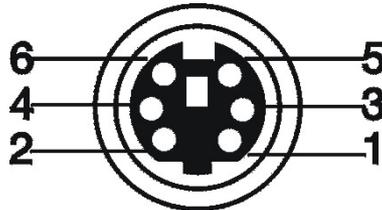
<i>Pin</i>	<i>Signal</i>	<i>Pin</i>	<i>Signal</i>	<i>Pin</i>	<i>Signal</i>
1	T.M.D.S data 2-	9	T.M.D.S data 1-	17	T.M.D.S data 0-
2	T.M.D.S data 2+	10	T.M.D.S data 1+	18	T.M.D.S data 0+
3	T.M.D.S data 2 GND	11	T.M.D.S data 1 GND	19	T.M.D.S data 0 GND
4	PS2-KBD CLK	12	PS2-MOUSE CLK	20	PS2-MOUSE VCC-IN +5V (not required)
5	PS2-KBD DATA	13	PS2-MOUSE-DATA	21	PS2-KBD VCC-IN +5V (always required)
6	DDC Input (SCL)	14	+5V In for DDC	22	T.M.D.S clock GND
7	DDC Output(SDA)	15	GND	23	T.M.D.S clock +
8	Analog VSYNC	16	Hot Plug recognition	24	T.M.D.S clock -
C1	n.c.			C3	n.c.
C2	n.c.	C5	GND	C4	n.c.

## Combined Keyboard/Mouse connector (output connector Local Unit)



<i>Pin</i>	
1	KBD-DATA
2	MOUSE-DATA
3	KBD/MOUSE-GND
4	VCC (+5V)
5	KBD-CLK
6	MOUSE-CLK

## Keyboard/Mouse connector (output connector Remote Unit)

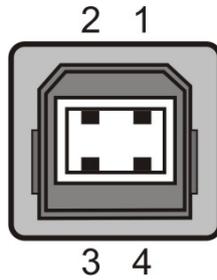


<i>Pin</i>	<i>Keyboard</i>	<i>Pin</i>	<i>Mouse</i>
1	KBD-DATA	1	MOUSE-DATA
2		2	
3	KBD-GND	3	MOUSE-GND
4	VCC (+5V)	4	VCC (+5V)
5	KBD-CLK	5	MOUSE-CLK
6		6	

# DVI-D CATX/FIBER KVM-EXTENDER

## USB Connector, USB Typ B

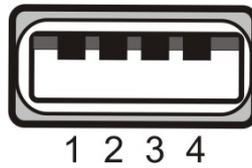
(connector at Local Unit)



<i>Pin</i>	<i>Signal</i>	
1	VCC (+5V)	Red
2	Data -	White
3	Data +	Green
4	GND	Black

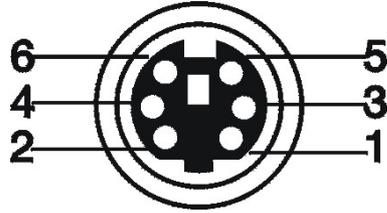
## USB Connector, USB Typ A

(connector at Remote Unit)



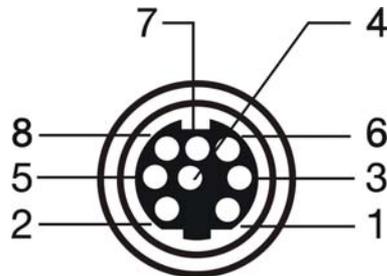
<i>Pin</i>	<i>Signal</i>	
1	VCC (+5V)	Red
2	Data -	White
3	Data +	Green
4	GND	Black

## Keyboard/Mouse Adapter to connect Keyboard/Mouse to Local Unit



<i>Pin</i>	<i>Connector (device)</i>	<i>Pin</i>	<i>Keyboard</i>	<i>Pin</i>	<i>Mouse</i>
1	KBD-DATA	1	KBD-DATA	2	
2	MOUSE-DATA	2		1	MOUSE-DATA
3	KBD-GND	3	KBD -GND	3	MOUSE-GND
4	VCC (+5V)	4	VCC (+5V)	4	VCC (+5V)
5	KBD-CLK	5	KBD -CLK	6	
6	MOUSE-CLK	6		5	MOUSE-CLK

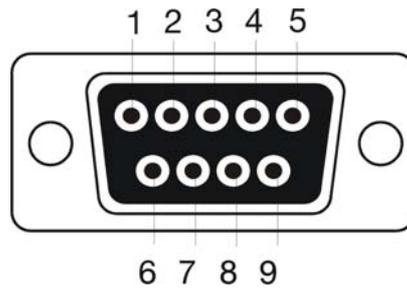
## Audio/serial Adapter to connect audio/RS232 to Local Unit



<i>Pin</i>	
1	AUDIO GND
2	RS232 GND
3	AUDIO OUT RIGHT CHANEL
4	AUDIO OUT LEFT CHANEL
5	RS232 RxD
6	AUDIO IN RIGHT CHANEL
7	AUDIO IN LEFT CHANEL
8	RS232 TxD

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## RS232 (Remote Unit only)

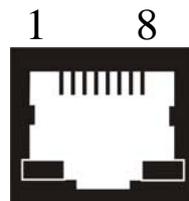


9 pin DSUB male (Remote Unit)

<i>Pin</i>	<i>Signal</i>
1	Not connected
2	RxD
3	TxD
4	DTR
5	GND
6	DSR
7	RTS
8	CTS
9	Not connected

## CATx- Interface

Pin out according to EIA/TIA 568A (1000BaseT).



<i>Pin</i>		<i>Pin</i>	
1	D1+	5	D3-
2	D1-	6	D2-
3	D2+	7	D4+
4	D3+	8	D4-

# NOTES