Welcome to the Repeater/Cross- Repeater Family!

Thank you for purchasing a Repeater/Cross- Repeater! We appreciate your business, and we think you'll appreciate the many ways that your Repeater/Cross- Repeater system will save you money, time, and effort.

That's because our Repeater/Cross- Repeater allows, to double the total allowed distance of a DVXi KVM Extender system for remotely locating a console (DVI-monitor, keyboard and mouse).

Wherever long distances are usual, e.g. airports, industrial plants, call- centres or in distributed computer centres, the Repeater/Cross- Repeater is the best way, to solve all problems in remotely locating your console. 6 different types are available: There are three types for repeating the signals and doubling the distance and three types to extend the distance and simultaneously convert from one medium to another (e.g. CATx to Multimode).

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

Repeater Devices

K471-CT:	**CATx Repeater to double the distance to up to 280m**
K471-MM:	**Multimode Repeater double the distance to up to 800m**
K471-SS:	**Singlemode Repeater double the distance to up to 20km**

Cross- Repeater Devices

K471-CM:	**CATx/Multimode Cross Repeater; distance CATx up to 140m, Multimode up to 400m**
K471-DM:	**CATx/Multimode Dual Cross Repeater; distance CATx up to 140m, Multimode up to 400m**
K471-CS:	**CATx/Singlemode Cross Repeater; distance CATx up to 140m, Singlemode up to 10.000m**
K471-DS:	**CATx/Singlemode Dual Cross Repeater; distance CATx up to 140m, Singlemode up to 10.000m**
K471-MS:	**Multimode/Singlemode Cross Repeater; distance Multimode up to 400m, Singlemode up to 10km**

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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.

.

EUROPEAN UNION DECLARATION OF CONFORMITY

This is to certify that, when installed and used according to the instructions in this manual, together with the specified cables the Units:

K471-CT, K471-MM, K471-SS
K471-CM, K471-DM, K471-CS, K471-DS, K471-MS

are shielded against the generation of radio interferences in accordance with the application of Council Directive 89/336/EEC as well as these standards:

EN 55022:	1999	Class A
EN 55024:	1999	
IEC 61000-4-2:	2001	
IEC 61000-4-3:	2001	
IEC 61000-4-4:	2001	
EN 61000-3-2	2001	
EN 61000-3-3	2002	

The device was tested in a typical configuration with PC.

Oberteuringen, Monday, June 30th, 2008

The management

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 fibre 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 Repeater/Cross- Repeater and any power supplies can get warm. Do not locate them in an enclosed space without any airflow.
- Do not place a power supplies 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 interconnection link interface to any other products, especially telecommunications or network equipment.

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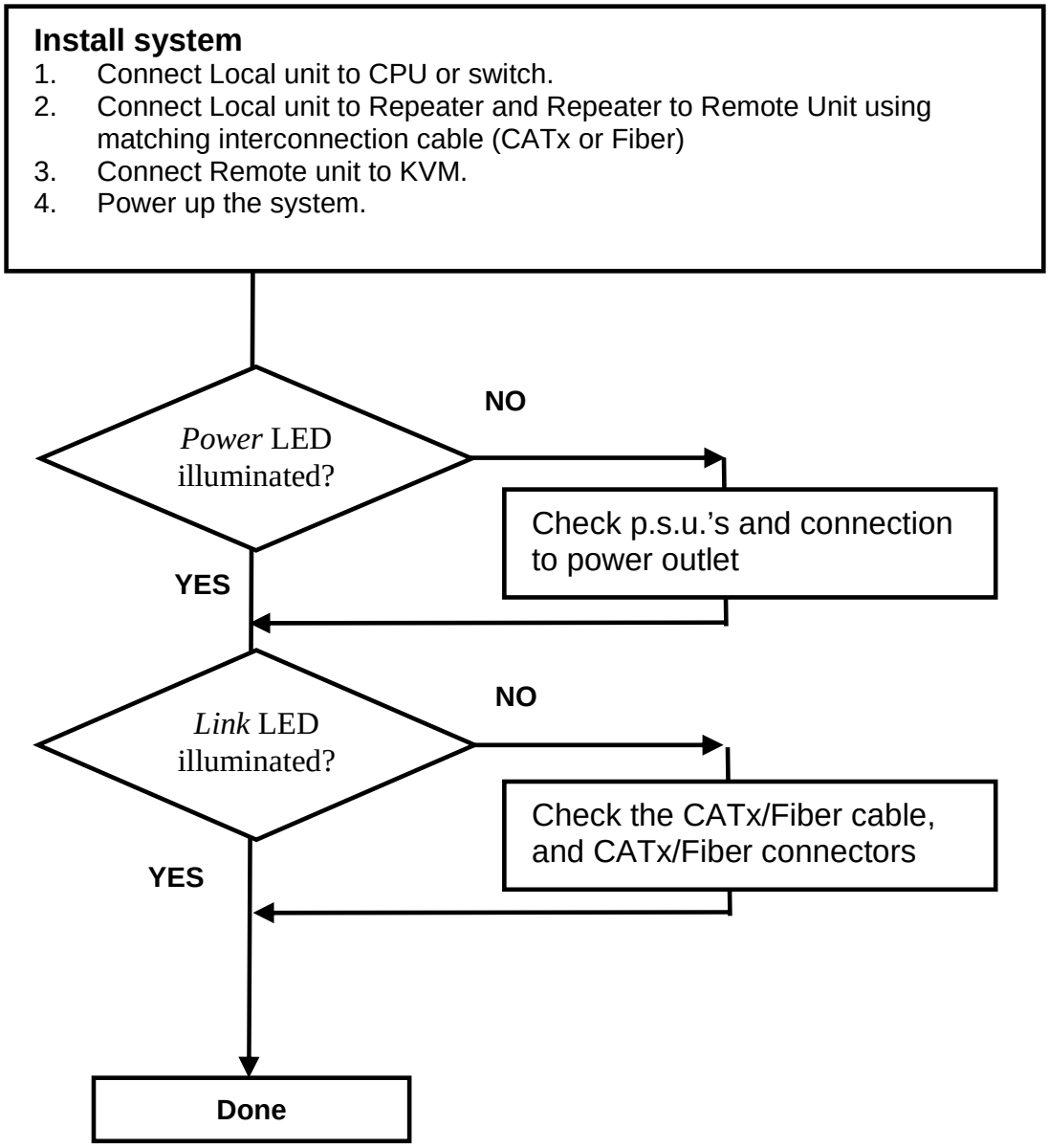
1. Quick Setup

This section briefly describes how to install your Repeater/Cross- Repeater 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 KVM Extender is used, to extend the distance between a CPU and its Keyboard / Monitor / Mouse considerably. The allowed distance is limited by the physics and the make of the cables.

If the total distance expires the allowed distance, Repeater may double the total allowed distance.

In some environments, the signal path may be inhomogeneous. This means, a part might be based on CATx, another part in Multimode. The Cross- Repeater hereby allow to convert from one medium to another, without laborious regaining the original signals and resending them.

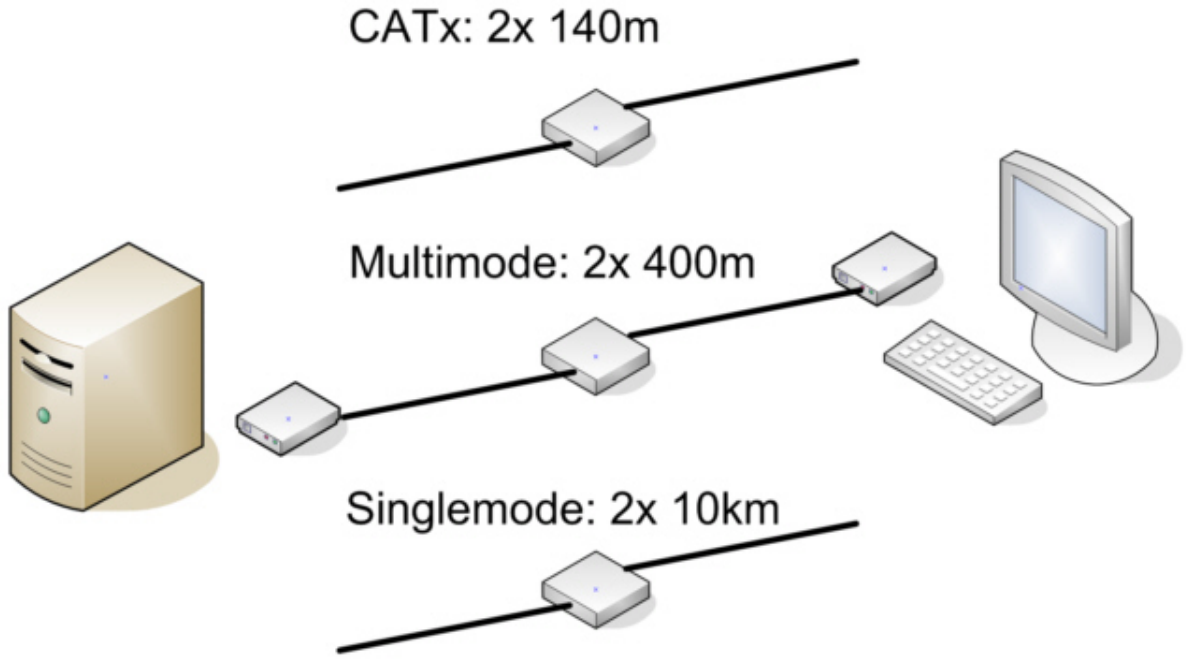
The Repeater/Cross- Repeater described in this manual are especially designed for the DVXi KVM Extender Family. Operation with other products is not possible.

2.2 Glossary

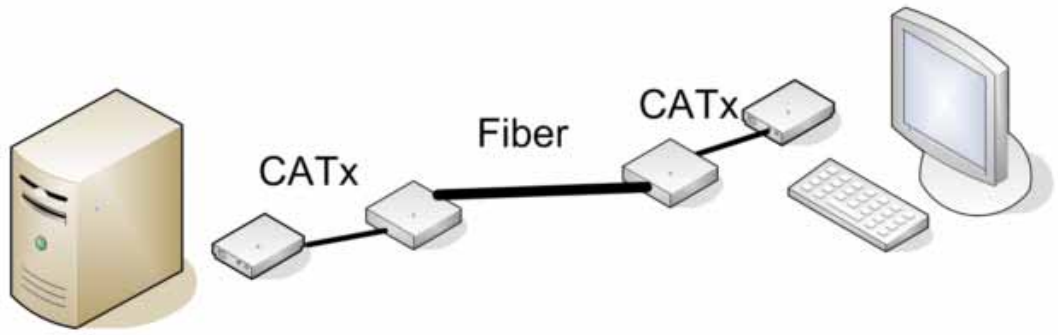
The following terms are used in this guide:

CATx	Any Category 5, 5e, 6 or higher cable, solid wires type AWG24.
Fiber	Singlemode or Multimode fiber cable.
Singlemode	9µ Singlemode-fiber cable
Multimode	62,5µ Multimode- or 50µ Multimode-fiber cable
KVM	Keyboard, Video and Mouse.
Console	Keyboard, Mouse and Monitor
Singlehead	***An extender system that supports one monitor + Keyboard/Mouse***
Dualhead	***An extender system that supports two monitors + Keyboard/Mouse***
DVI	Digital Video standard, installed by ***Digital Display Working Group*** (***www.ddwg.org***) R, G, B, CLOCK in a data stream with up to 3x 1,6 Gbit/sec. Signals are TMDS Level.
PSU	The desktop power supply connected to the Repeater/Cross- Repeater.
HID	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.

2.3 Example of a Repeater/Cross- Repeater System



Installation as Repeater to double the total allowed distance



Installation as Cross- Repeater for inhomogeneous cable path

2.4 Features

The Repeater/Cross- Repeater offer the following features:

- Support for DVXi KVM- and Media- Extender (all devices)
- Support for Draco™ KVM- and Media- Extender (all devices)
- When installing the Repeater device in the middle of a link, it will allow to double the total distance. (e.g. CATx up to 2x140m = 280m). Under all other circumstances, the cable on each side of the Repeater/Cross- Repeater may have the usual maximum distance (e.g. CATx up to 140m, Multimode 50µ up to 400m, ...).
- When installing a Cross- Repeater device, the cable on each side of the Repeater/Cross- Repeater may have the usual maximum distance (e.g. CATx up to 140m, Multimode 50µ up to 400m, ...).

Attention!
actually DVXi CATx and Fiber devices must not be used assorted. This means, it's not allowed, to connect a DVXi CATx Local Unit with a DVXi Fiber Remote Unit. So actually Cross- Repeater can be used only in pairs.

For Dual- Head devices you need two pieces Repeater (one for each of the two interconnection cables). A Dual Cross- Repeater CATx to Fiber (Multimode or Singlemode) is available.

- The maximum screen resolution as well as the support of other interfaces like USB-HID, serial, audio, ... only depends on the type of used Extender.
- Status indicator LEDs on each device.
- Small footprint chassis.
- Rack mount options available.
- Universal switch mode p.s.u. included.

2.5 Product Range

Repeater/Cross- Repeater	
K471-CT	CATx Repeater to raise the total allowed distance to up to 280m
K471-MM	Multimode Repeater to raise the total allowed distance to up to 800m
K471-SS	Singlemode Repeater to raise the total allowed distance to up to 20km
K471-CM	CATx/Multimode Dual Cross Repeater to convert from 2x CATx to 2x Multimode or back
K471-DM	CATx/Multimode Cross Repeater to convert from CATx to Multimode or back
K471-CS	CATx/Singlemode Cross Repeater to convert from CATx to Singlemode or back
K471-DS	CATx/Singlemode Dual Cross Repeater to convert from 2x CATx to 2x Singlemode or back
K471-MS	Multimode/Singlemode Cross Repeater to convert from Multimode to Singlemode or back
Zubehör	
473-5G	19”/1HE Rackmout- Kit to mount up to 5 devices
473-1K	Mounting plate to mount by screws
473-2K	Mounting plate to mount by snap-on

2.6 How to Use This Guide

This guide describes the installation and configuration of the Repeater/Cross- Repeater. 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 *Repeater/Cross- Repeater Kit*, this will contain the device and the universal switch mode p.s.u. to install your Repeaters/Cross- Repeater. Please see also: **Package Contents** (page 12)

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 Repeater/Cross- Repeater more conveniently.

3.1 Package Contents

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

- Repeater/Cross- Repeater
- 5V DC universal power supply
- German type power cord
- User manual (Quick Setup)

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

3.2 Interconnection Cable Requirements

To install the Repeater/Cross- Repeater you will need:

- **CATx Cable:** Recommended cable: S/UTP (Cat5) 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 compliance with CE regulations is not longer guaranteed.

The use of flexible Cables (Patch cable) Type AWG26/8 is possible. Because of the higher loss of the stranded cables, the maximum distance is reduced to app. half the value of solid cables.

- **Fiber Cable:** Two strands of fiber are required for singlehead devices, four strands for Dualhead devices.

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

- Recommended cables:

Multimode type 50/125µ	allowed distance app. 400m (1,300ft)
Multimode type 62.5/125µ	allowed distance app. 200m (650ft)
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 distance on Multimode fibers to twice the regular length. Anyway this cannot be guaranteed and must be evaluated by the end-user at his own expense.

- **Power Supply:** Connect the supplied 5V/DC power supplies to the ***Plug*** terminal on the rear of both local and remote units.

3.3 System Setup

To install your Repeater/Cross- Repeater system:

1. Switch off all devices.
2. Connect the interconnect cable to the INTERCONNECT socket(s) of the Local Unit and the Repeater/Cross- Repeater
3. Connect the interconnect cable to the INTERCONNECT socket(s) of the Remote Unit and the Repeater/Cross- Repeater

If you have bought a Cross Repeater, your device will have two CATx connectors but only one fiber connector. Possibly you have to swap the fiber GBIC from one port to the other to make the unit working properly. To do this, please refer to ***installation instruction on page 19****.*

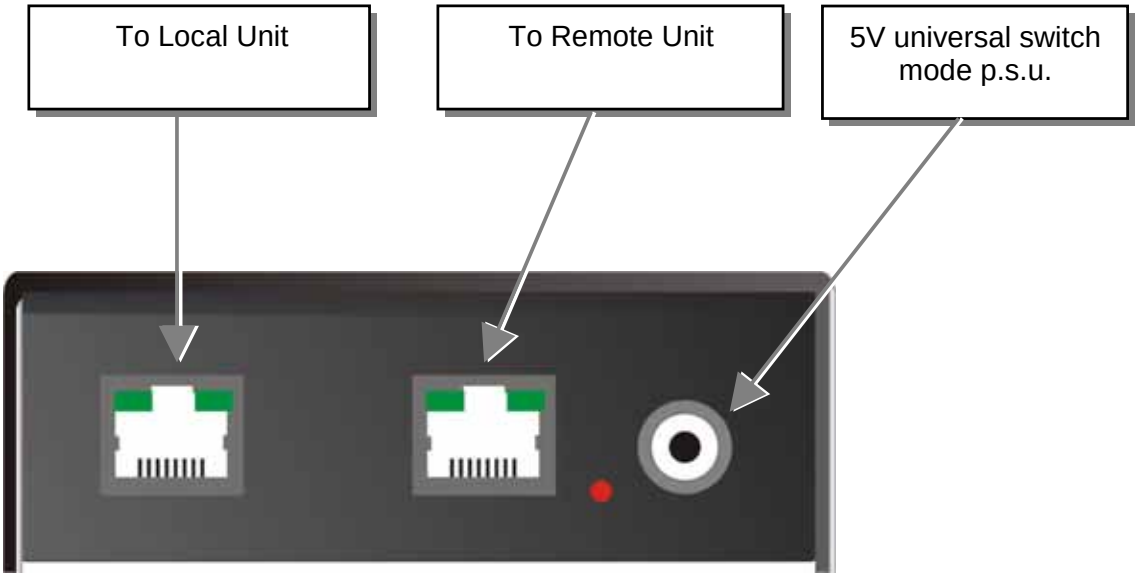
If you have bought a Dual Cross Repeater, your device will have two CATx connectors and two fiber connectors. The units are marked as „Local“ or „Remote“. For a correct installation, please refer to ***installation instruction on page 19****. If you want to upgrade a Cross Repeater to Dual Cross Repeater, you need to reconfigure the jumper settings.To do this, please refer to* ***Setup at the Repeater/Cross- Repeater on page 18.***

4. Connect the 5V power supply unit to power the unit.

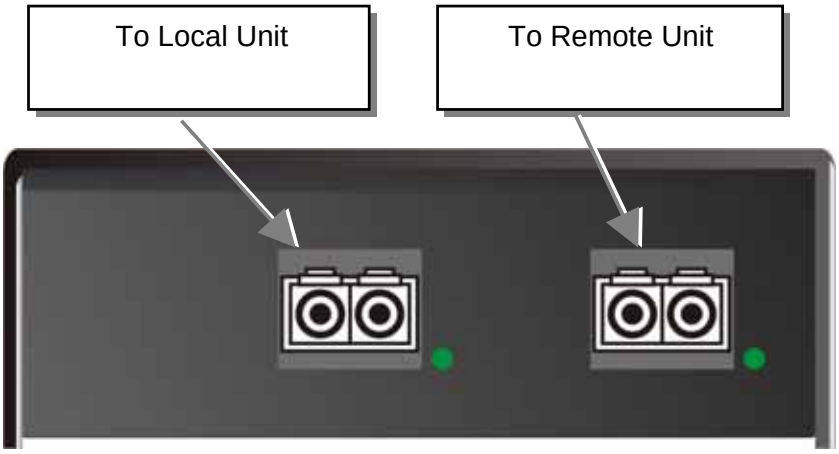
Only use the power supply originally supplied with this equipment or a manufacturer-approved replacement.

5. For a dual head system, connect in the same way like described under 2. and 3. the CATx/Fiber cables for the secondary monitor.
6. Power up the system

3.4 Device Views



Repeater/Cross- Repeater CATx view

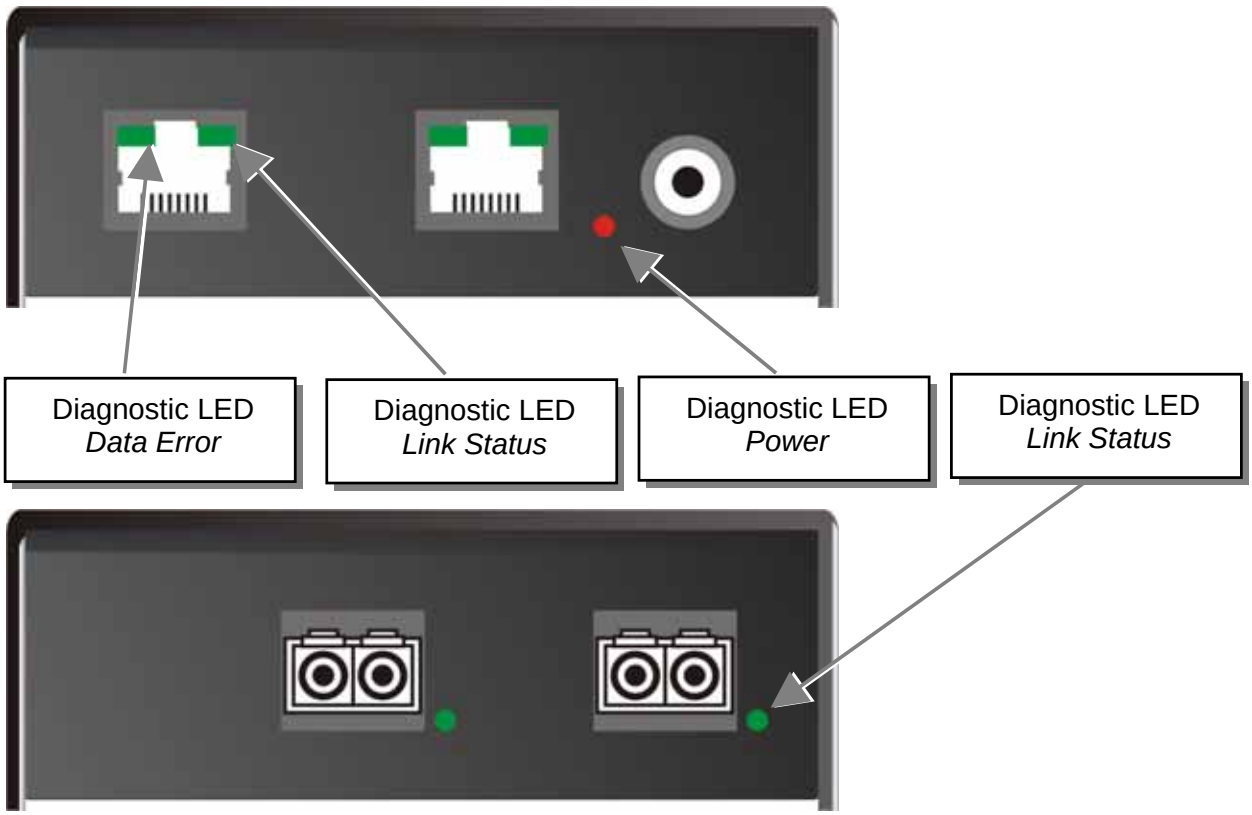


Repeater/Cross- Repeater Fiber view

3.5 Diagnostics

Each Repeater/Cross- Repeater is fitted with three indicator LEDs: *Power*, *Data Error*, *Link Status*: The *Power* LEDs are next to the Power socket.

The location of the LEDs is shown below:



Diagnostic - LEDs at the Repeater/Cross- Repeater

LED	*Appearance*	*Diagnostics*
Power LED (Red LED)	Off On	Device not ready Device ready
Link Status (Green LED)	Blinking On	No INTERCONNECT connection via CATx or fiber cable Device ready
Data Error (Green LED)		Indicator LED actually without function

4. Service Setup

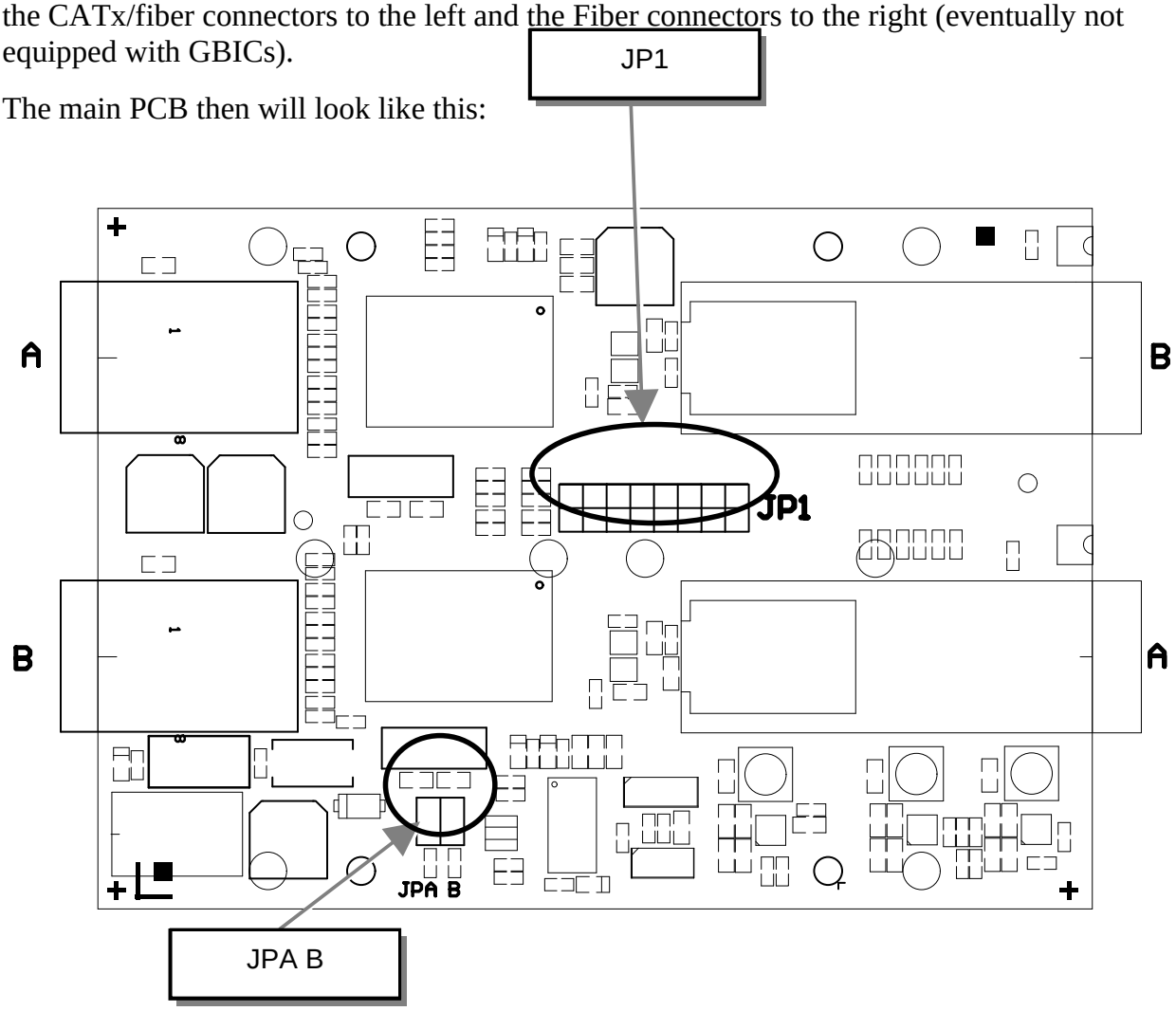
For most applications, you shouldn't need not to make any adjustments to set up your Repeater/Cross- Repeater. Under some special circumstances it could be necessary to setup configuration specials.

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. Unscrew the UNC type screws at both sides of the monitor connectors. Carefully displace the lower and upper shells of the case.

4.1 Setup at the Repeater/Cross- Repeater

After unscrewing and opening the upper shell, please place the device in this orientation: with the CATx/fiber connectors to the left and the Fiber connectors to the right (eventually not equipped with GBICs).

The main PCB then will look like this:



Use the diagram to locate jumpers.

Operating mode Repeater or Cross- Repeater

If you want to alter the mode of operation after the date of purchase, e.g. from Repeater to Cross- Repeater or vice versa, you need (probably) to install optical Transceiver (GBICs) and reconfigure the device.

Operating Mode	JP1	JPA B
Repeater or Fiber- Cross- Repeater		
CATx/Fiber Cross- Repeater		

Operating mode Dualhead Cross- Repeater

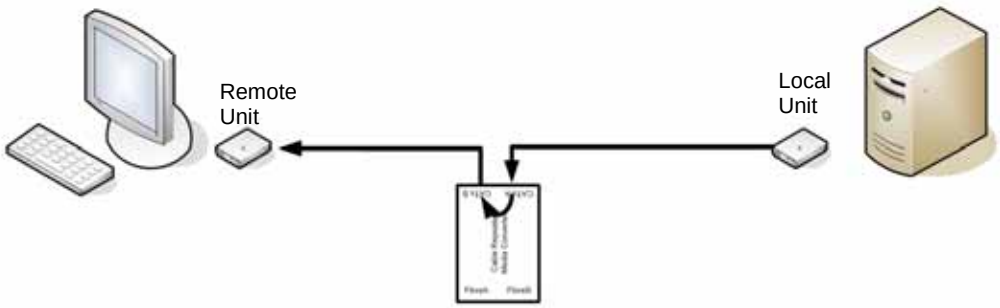
If you want to alter the mode of operation after the date of purchase, e.g. to use it as a Dualhead Cross- Repeater, you need (probably) to install optical Transceiver (GBICs) and reconfigure the device.

Operating mode	JP1	JPA B
Dualhead Cross- Repeater Local CATx		
Dualhead Cross- Repeater Remote CATx		

4.2 installation instruction

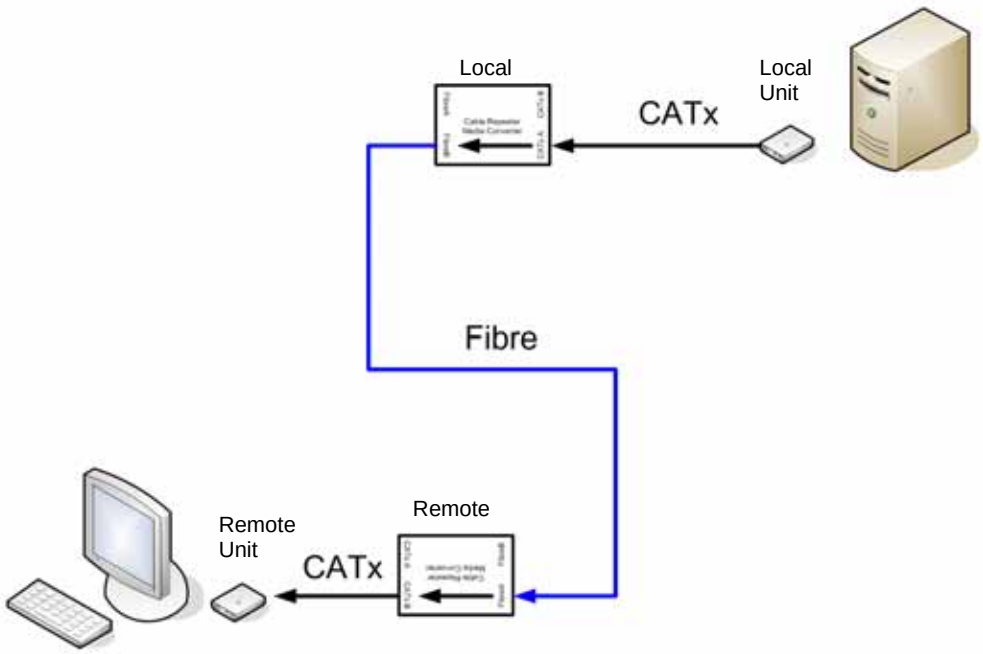
Basically you need to pay attention to attach at connectors marked with "A" only cables which link to a Local Unit and to attach at connectors marked with „B" only cables which link to a Remote Unit.

CATx or Fiber Repeater, Multimode/Singlemode Cross- Repeater



The Local Unit is connected via CATx (Fiber) connector A, the Remote Unit is connected via CATx (Fiber) connector B.

CATx / Fiber Cross- Repeater



The Local Unit is connected via CATx (Fiber) connector A, The fiber connector B is connected to the fiber connector A of the second Repeater. The Remote Unit is connected via CATx (Fiber) connector B.

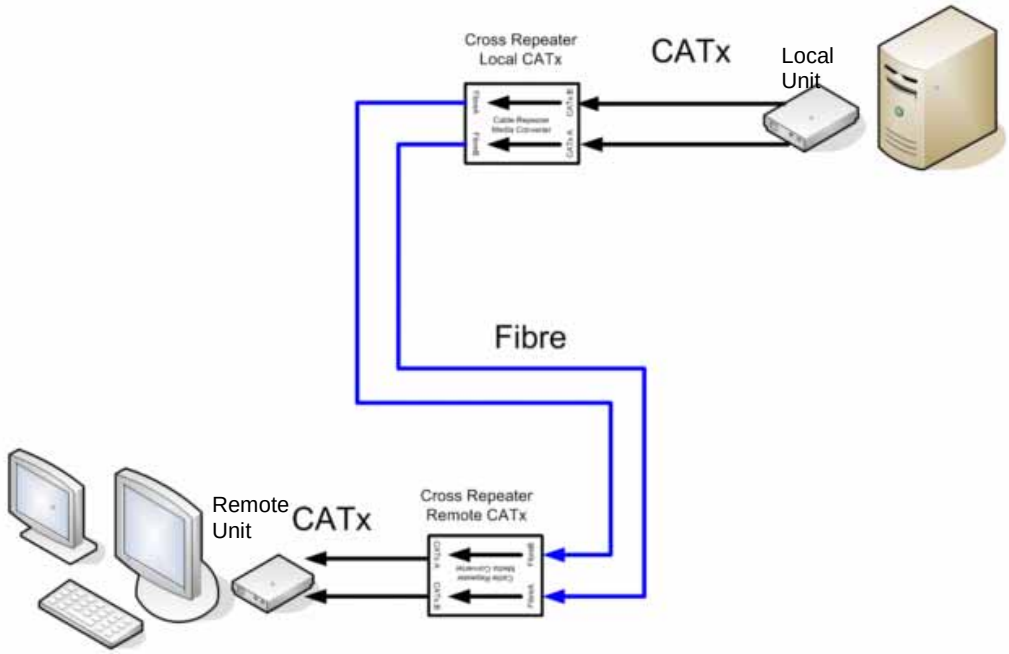
Reconfiguration of a Cross Repeater from „Local“ to „Remote“ or vice versa

The „Local“ device must carry the fiber GBIC in the connector B, the „Remote“ device in the connector A. If the GBICs in your devices are plugged incorrect, you may alter the configuration easily:

- flap the shackle at the GBIC downwards
- now pull the GBIC, using the shackle, out of the cage
- plug the GBIC with soft force into the other cage until it snaps into place
- flap the shackle at the GBIC upwards to lock the GBIC

Do not try to pull the GBIC out of the cage while the shackle remains in the lock position (not flapped downwards). As long as the shackle is flapped upwards, the GBIC is locked. Rough pulling the GBIC out of the cage without flapping the shackle downwards may result in damages at the GBIC and/or at the device.

Dualhead Cross- Repeater



The Cross Repeater look the same for the Local and the remote placement. Because of internal jumper settings the data direction is fixed. Please note to install the device, marked with „Cross Repeater Local CATX“ at a position where the CATx cable link to the Local Unit and the device, marked with „Cross Repeater Remote CATx“ at a position where the CATx cable link to the Remote Unit.

5. Troubleshooting

Monitor

There isn’t a picture.

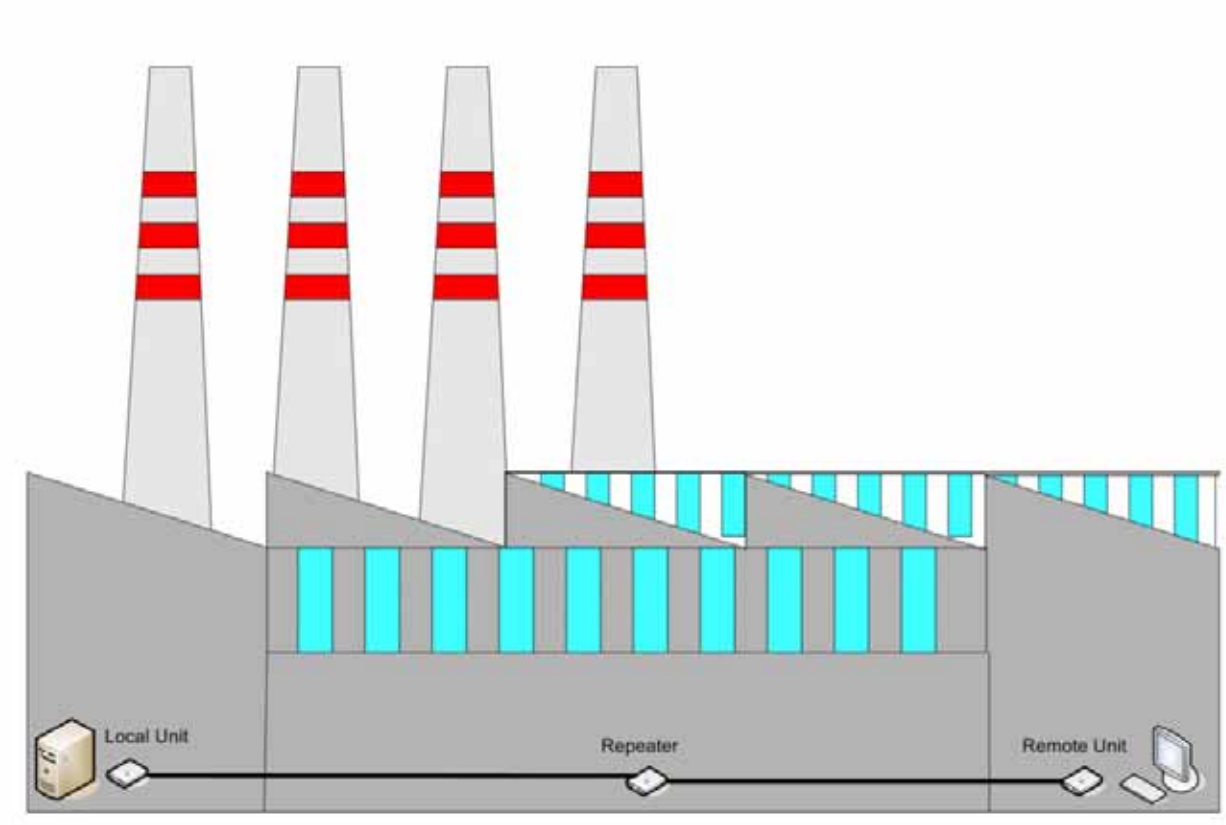
Check the power supply connection at the local and remote unit and at the Repeater/Cross- Repeater. Is the *Power* (Red LED) at the devices illuminated (see page 15)? If not, the internal power-supply may be damaged or there may be an internal error.

Check that the INTERCONNECT cable is connected at the Local Unit and the Remote Unit and at the Repeater/Cross- Repeater. Is the *Link Status* LED illuminated (see page 15)? If not, there may be a problem with the Interconnection cable:

Appendix A: Example Applications

This section illustrates some specific applications using the Repeater/Cross- Repeater:

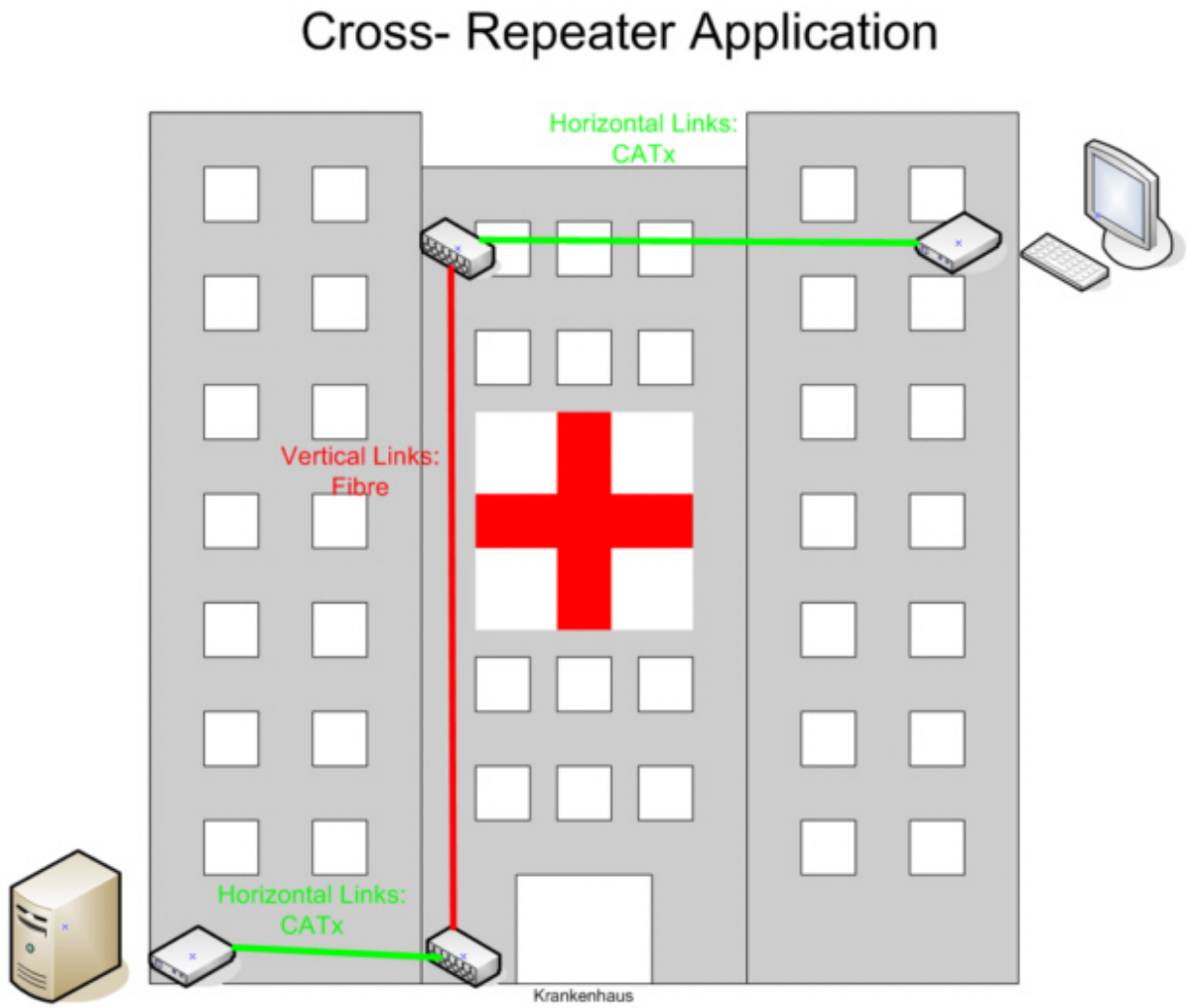
- Repeater in Industrial Plant to raise the allowed distance of the interconnection



Repeater in Industrial Plant

- Repeater/Cross- Repeater in public buildings.

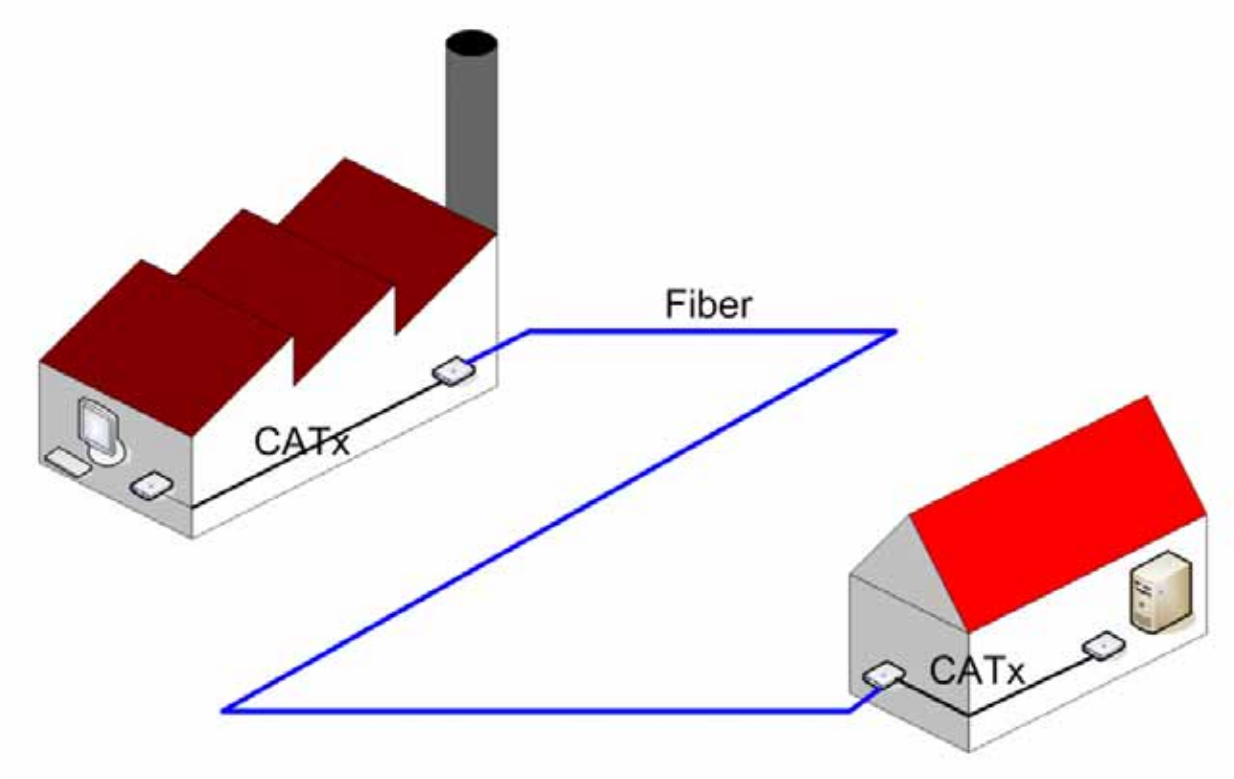
In some environments – especially public buildings - , the signal path may be inhomogeneous. This means, a part might be based on CATx, another part in Multimode. The Cross- Repeater hereby allow to convert from one medium to another, without laborious regaining the original signals and resending them.



Cross- Repeater in public building

- Repeater/Cross- Repeater for interconnection of two buildings.

It is not allowed according VDE to make the interconnection of two buildings with CATx Cables. Because of this, the interconnection must be done in fiber. A server from the server room shall be connected with the user console in the plant. The Cross- Repeater hereby allow to convert from one medium to another, without laborious regaining the original signals and resending them.



Cross- Repeater for interconnection of two buildings

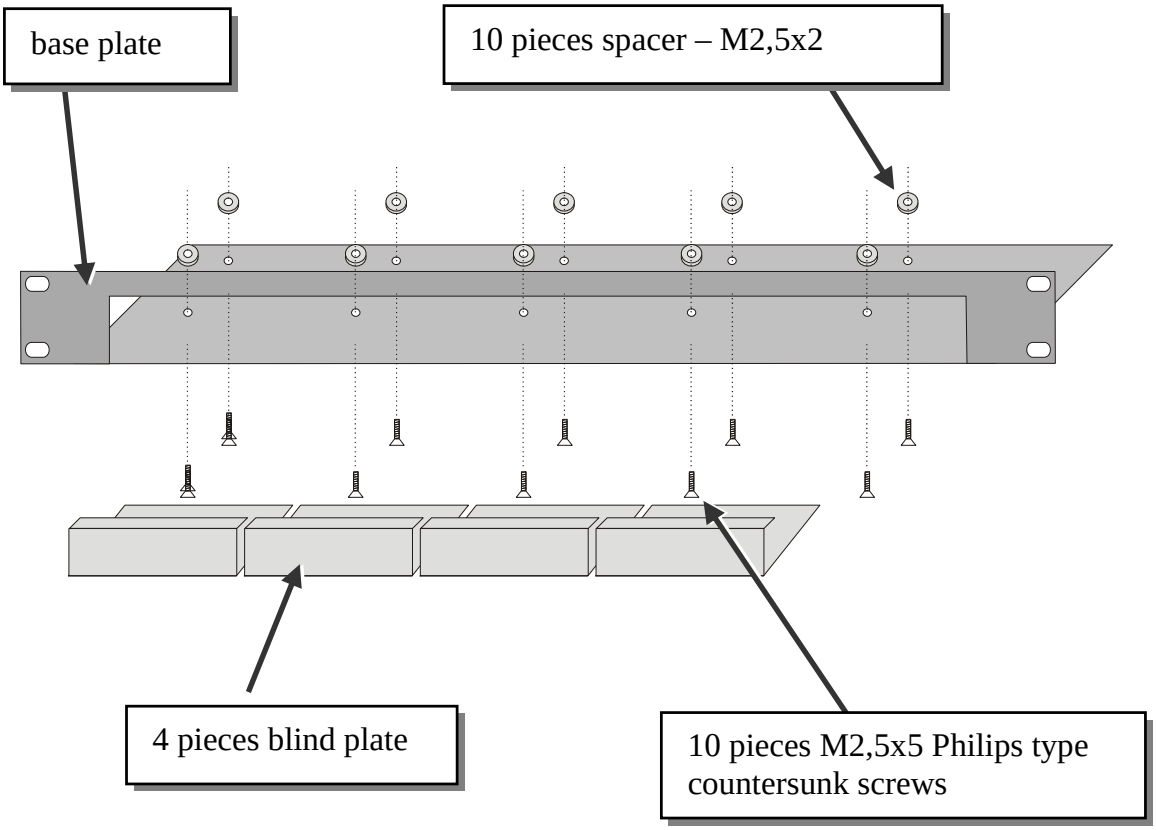
Appendix B: Rack Mount Options

Repeater/Cross- Repeater units can be mounted in a 19” rack using the mounting kit.

Mounting Instruction Rackmount-Kit 473-5G

Using the Rackmount-Kit 473-5G, up to 4 devices of the device size 80x110x29mm can be mounted into a 19“-Server Rack. The Rackmount Kit requires 1U Rackspace. Blindplates (in the list of parts delivered) allow to cover unused device positions.

Rackmount-Kit 473-5G – List of parts delivered:



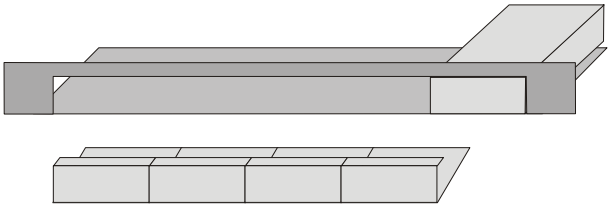
Mounting instruction:

- 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

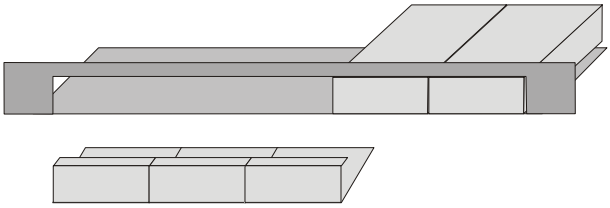
Only use the supplied, short screws, to prevent damages on the PCB’s

- Close the remaining gaps with blanking plates.

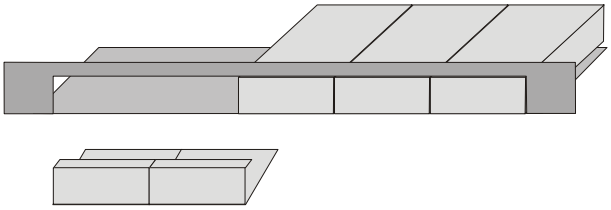
The Rackmount- Kit 473-5G allows, to mount a different count of devices (1…5 pieces):



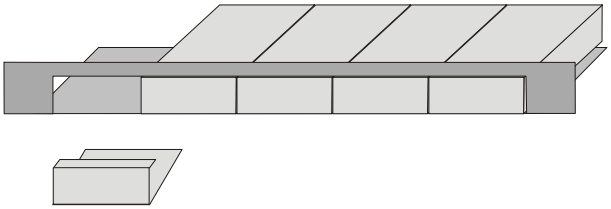
Einbau 1 Gerät
mounting 1 device



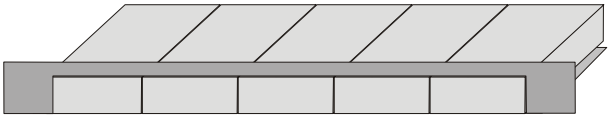
Einbau 2 Geräte
mounting 2 devices



Einbau 3 Geräte
mounting 3 devices



Einbau 4 Geräte
mounting 4 devices



Einbau 5 Geräte
mounting 5 devices

Appendix D: Calling Technical Support

If you determine that your Repeater/Cross- Repeater is malfunctioning, ***do not attempt to alter or repair it***. It contains no user-serviceable parts. Contact Technical Support at.

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 Repeater/Cross- Repeater'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 Repeater/Cross- Repeater:

- 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.

Appendix F: Specifications

Power

Voltage	90-240VAC-0.5A-47-63Hz/5VDC-2000 mA
Power required	Repeater/ Cross- Repeater Unit : max. 5V/750mA operation mode CATx – Repeater: ca. 500mA operation mode Fiber Repeater ca. 300mA operation mode Cross Repeater ca. 750mA

Interface

(Depending on type of device)

LC	Multimode or Singlemode – depending on device
RJ45	1000 MBit high speed transmission. Wiring according to EIA/TIA 568B Gigabit Ethernet.

Maximum Length of Interconnection Cable (CATx)

CATx Installation cable AWG24	140m (400ft)
CATx Patchcable AWG26/8	70m (200ft)

Type of Interconnection Cable (CATx)

CATx Installation cable AWG24	S/UTP (Cat5) cable acc. EIA/TIA 56A, TSB 36 or Digital STP 17-03170. Four pairs AWG 24. Wiring acc. EIA/TIA 568A (1000BaseT).
CATx Patchcable AWG26/7	S/UTP (Cat5) 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 Interconnection Cable (Fiber - LC Connectors)

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

Size and Shipping Weight

Repeater/Cross- Repeater	80 x 110 x 29mm (3”x4.3”x1.1”) Weight: 0,2kg (0.6lb)
Shipping box	165x165x110mm (6.5”x6.5”x4.3”) Weight: 0.6 kg (1.3lb)

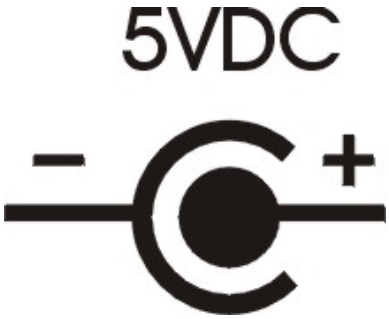
Environmental

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

Appendix G: Connectors

Repeater/Cross- Repeater Connector Pin outs

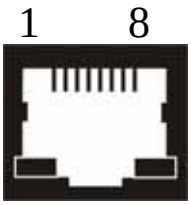
Power Supply



Pin	*Signal*
inner	+5V
outer	GND

CATx- Interface

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



Pin		*Pin*	
1	D1+	5	D3-
2	D1-	6	D2-
3	D2+	7	D4+
4	D3+	8	D4-

NOTES