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Maybachstrasse 11
88094 Oberteuringen
Germany
info@ihse.de
www.ihse.de
Tel. +49 7546-9248-0
Fax +49 7546-9248-48



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This manual describes how to install your (Cross) Repeater, how to operate it and how to perform trouble shooting.

This manual is valid for all devices listed on the front page. The product code is printed on the base of the devices.

The following symbols are used in this manual:



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



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



This symbol indicates best practice information to show recommended and optimal ways to use this product in an efficient way.


To ensure reliable and safe long-term operation of your (Cross) Repeater please note the following guidelines:

- Only use in dry, indoor environments.
- The (Cross) Repeater and the power supply units can get warm. Do not install components in an enclosed space without any airflow.
- Do not place the power supply directly on top of the device.
- Do not obscure ventilation holes.
- Only use power supplies originally supplied with the product or manufacturer-approved replacements. Do not use a power supply if it appears to be defective or has a damaged chassis.
- 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 connect the link interface to any other equipment, particularly network or telecommunications equipment.
- Take any required ESD precautions.



In order to disconnect the device completely from the electric circuit, all power cables have to be removed.

- Do not attempt to open or repair a power supply unit.
- Do not attempt to open or repair the (Cross) Repeater. There are no user serviceable parts inside.
- Please contact your dealer or manufacturer if there is a fault.



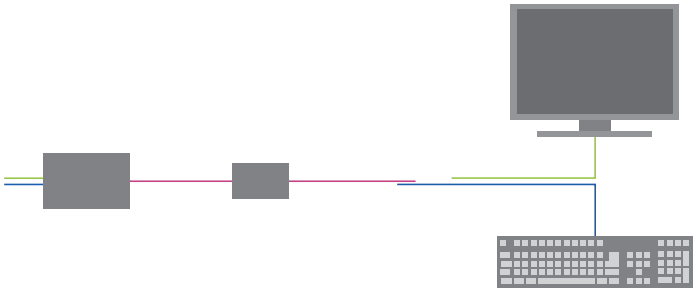
The (Cross) Repeater is basically used in order to double the maximum cabling distance between a KVM extender CON or CPU Unit or even a KVM matrix. In addition to that the device can also be used for media conversion from Cat X to fiber or vice versa.

The device is available as a pure Cat X or fiber version (repeater) and as a hybrid version of Cat X and fiber (cross repeater) for an additional electrical/optical signal conversion.

The (Cross) Repeater consists of at least one module depending on the application.

The device is connected between a KVM extender CON and CPU Unit via the interconnect cable or can be alternatively connected between a KVM extender unit and a KVM matrix.

The (Cross) Repeater communicates with both the KVM extenders and a KVM-Matrix via the interconnect cables.



474-BODY2	Empty chassis for up to 2 boards, 1x external power supply unit
474-BODY2R	Empty chassis for up to 2 boards, 1x external power supply unit, preparation for redundancy for a second power supply unit (external)
474-BODY2N	Empty chassis for up to 2 boards, 1x internal power supply unit, preparation for redundancy for a second power supply unit (external)
474-BODY4	Empty chassis for up to 4 boards, 1x external power supply unit
474-BODY4R	Empty chassis for up to 4 boards, 1x external power supply unit, preparation for redundancy for a second power supply unit (external)
474-BODY6R	Empty chassis for up to 6 boards, 1x internal power supply unit, preparation for redundancy for a second power supply unit (external)
474-BODY6BP	Empty chassis for up to 6 boards, active backplane, 2x internal power supply unit (redundancy)
474-BODY6BPF	Empty chassis for up to 6 boards, active backplane, 2x internal power supply unit (redundancy) with connectors on rear side
474-BODY21/4U	Empty chassis for up to 21 boards, 1x internal power supply unit, preparation for redundancy for a second power supply unit (internal)

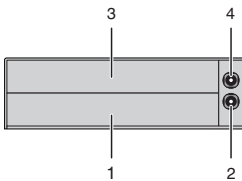
485-BC	Repeater module Cat X for range extension up to 280 m
485-BS	Repeater module fiber (Single-Mode) for range extension up to 20,000 m
485-BX	Repeater module Cat X/fiber (Single-Mode) for an electrical/optical media conversion, maximum extension 10,140 m
485-BCC	Dual repeater module Cat X for range extension up to 280 m
485-BSS	Dual repeater module fiber (Single-Mode) for range extension up to 20,000 m
485-BXX	Repeater module Cat X/fiber (Single-Mode) for an electrical/optical media conversion, maximum extension 10,140 m

474-2RMK	19"/1U rack mount kit for 2-fold chassis
474-2NRMK	19"/1U rack mount kit for 2-fold chassis with internal PSU
474-4RMK	19"/1U rack mount kit for 4-fold chassis
474-6RMK	19"/1U rack mount kit for 6-fold chassis
474-VPLATE	Fastening strips for screw or snap on for 2-, 4- and 6-fold chassis
474-OPTRED	Retrofitting for redundant power supply option (without power supply) for 2- and 4-fold chassis
474-PSU2	Power supply for 2-fold chassis (spare or redundancy)
474-PSU4	Power supply for 4-fold chassis (spare or redundancy)
474-PSU6	Power supply for 6-fold chassis (spare or redundancy)
474-PSU21	Power supply for 6-fold-chassis (spare or redundancy)
474-BLND1	Blind plate 3U/4HP for 2-, 4- and 6-fold chassis
474-BLND2	Blind plate 3U/8HP for 2-, 4- and 6-fold chassis



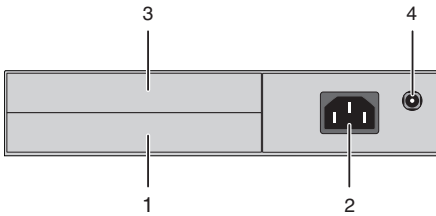
(Cross) Repeaters and the power supply units can get warm and must not be installed in closed rooms with no air circulation. For rack-mount installations, at least 0.5 U (height unit) is required above the (Cross) Repeater for ventilation.

260-5G	International power supply unit 100...240 VAC / 5 VDC / 3 A
260-5U	International power supply unit 100...240 VAC / 5 VDC / 4 A
474-PSULOCK	IEC connection cable for power supply, lockable



Rear View

- 1 Slot for modules #1
- 2 Connect to 5VDC power supply (standard)
- 3 Slot for modules #2
- 4 Connect to 5VDC power supply (redundancy, optional)

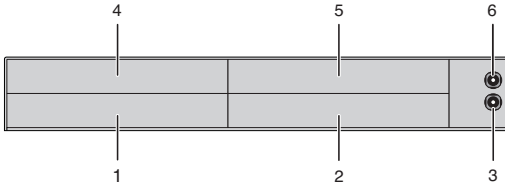


Rear View

- 1 Slot for modules #1
- 2 Connect to power supply (standard)
- 3 Slot for modules #2
- 4 Connect to 5VDC power supply (redundancy)



The 2-fold vario chassis with an internal power supply is not equipped with a fuse on its primary side. Therefore the protection against excessive currents has to be provided by the electrical installation of the building.

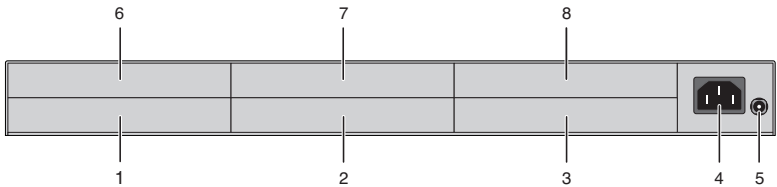


Rear View

- 1 Slot for modules #3
- 2 Slot for modules #1
- 3 Connect to 5VDC power supply (standard)
- 4 Slot for modules #4
- 5 Slot for modules #2
- 6 Connect to 5VDC power supply (redundancy, optional)



For operation with three KVM Extender CON modules and a USB 2.0 CON module in a 4-fold vario chassis, two power supplies are necessary. In this case, redundancy is inapplicable.



Rear View

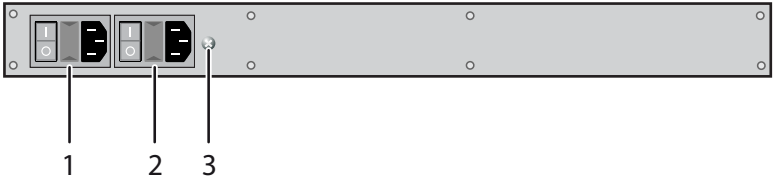
- 1 Slot for modules #5
- 2 Slot for modules #3
- 3 Slot for modules #1
- 4 Connect to power supply (standard)
- 5 Connect to 5VDC power supply (standard)
- 6 Slot for modules #6
- 7 Slot for modules #4
- 8 Slot for modules #2



For operation with KVM Extender modules in a 6-fold vario chassis, two power supplies are necessary. In this case, redundancy is inapplicable.

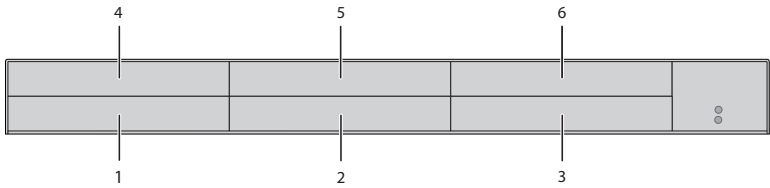


The 6-fold vario chassis is not equipped with a fuse on its primary side. Therefore the protection against excessive currents has to be provided by the electrical installation of the building.



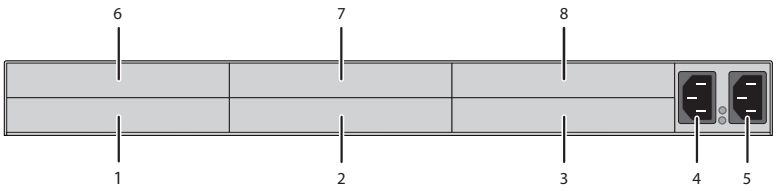
Front View

- 1 Connect to power supply 1
- 2 Connect to power supply 2 (redundancy)
- 3 Grounding



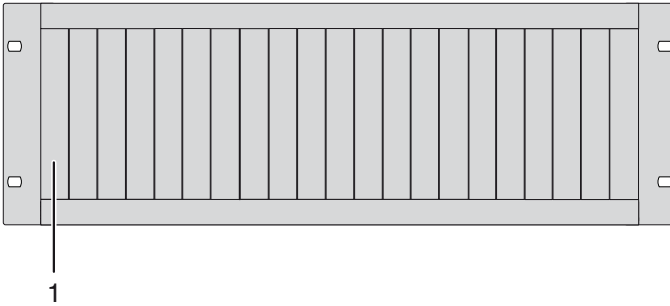
Rear View

- 1 Slot for modules #5
- 2 Slot for modules #3
- 3 Slot for modules #1
- 4 Slot for modules #6
- 5 Slot for modules #4
- 6 Slot for modules #2



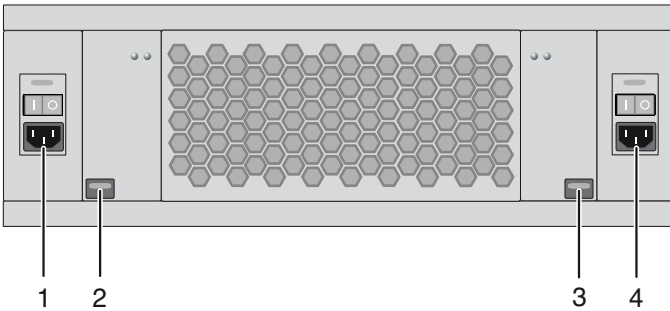
Rear View

- 1 Slot for modules #5
- 2 Slot for modules #3
- 3 Slot for modules #1
- 4 Connect to power supply 1
- 5 Connect to power supply 2 (redundancy)
- 6 Slot for modules #2
- 7 Slot for modules #4
- 8 Slot for modules #6



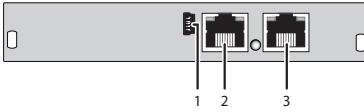
Rear View

- 1 Slots for modules #1 - #21



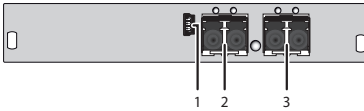
Front View

- 1 Connect to power supply 2
- 2 Locking for power supply 2 (redundancy)
- 3 Locking for power supply 1 (standard)
- 4 Connect to power supply 1



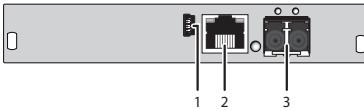
Rear View

- 1 Service port
- 2 Connect to interconnect cable 1
- 3 Connect to interconnect cable 2



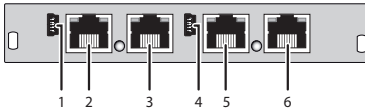
Rear View

- 1 Service port
- 2 Connect to interconnect cable 1
- 3 Connect to interconnect cable 2



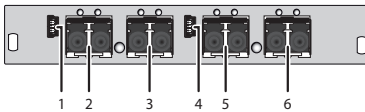
Rear View

- 1 Service port
- 2 Connect to interconnect cable 1
- 3 Connect to interconnect cable 2



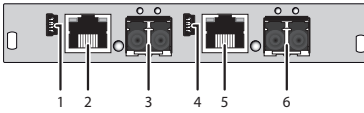
Rear View

- 1 Service port (repeater #1)
- 2 Connect to interconnect cable 1 (repeater #1)
- 3 Connect to interconnect cable 2 (repeater #1)
- 4 Service port (repeater #2)
- 5 Connect to interconnect cable 1 (repeater #2)
- 6 Connect to interconnect cable 2 (repeater #2)



Rear View

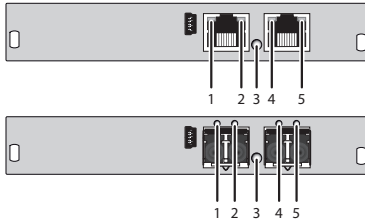
- 1 Service port (repeater #1)
- 2 Connect to interconnect cable 1 (repeater #1)
- 3 Connect to interconnect cable 2 (repeater #1)
- 4 Service port (repeater #2)
- 5 Connect to interconnect cable 1 (repeater #2)
- 6 Connect to interconnect cable 2 (repeater #2)



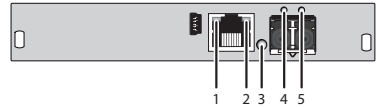
Rear View

- 1 Service port (repeater #1)
- 2 Connect to interconnect cable 1 (repeater #1)
- 3 Connect to interconnect cable 2 (repeater #1)
- 4 Service port (repeater #2)
- 5 Connect to interconnect cable 1 (repeater #2)
- 6 Connect to interconnect cable 2 (repeater #2)

The (Cross) Repeater module is fitted with a multi color LED for overall status indication and with two further LEDs for indication of the connection status.







Rear View



Rear View

1/4	(green)	Off	Connection available
		On or Flashing	Connection failure (flashing for about 20 s following a connection failure)
2/5	(green)	Flashing	No connection via interconnect cable
		On	Connection available

Red		Device ready
Blue		Link 1 (left connector) available, Link 2 (right connector) not detected
Green		Link 2 (right connector) available, Link 1 (left connector) not detected
Light Blue		Link 1 (left connector) and Link 2 (right connector) available

- (Cross) Repeater in the vario chassis
- 1x (redundancy 2x) 5 VDC international power supply unit per KVM Extender unit (depending on chassis)
- 1x (redundancy 2x) country-specific power cord (depending on chassis)
- Quick Setup



If anything is missing, contact your dealer.



First time users are recommended to setup the system in the same room as a test setup. This will allow you to identify and solve any cabling problems, and experiment with your system more conveniently.



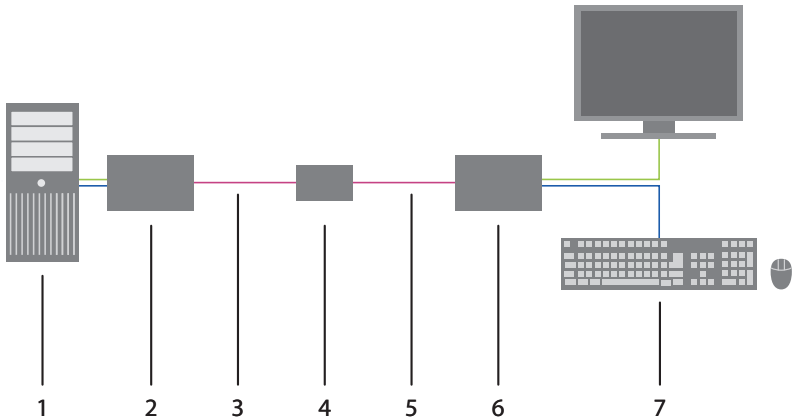
→ Please verify that interconnect cables, interfaces, and handling of the devices comply with the requirements (see Chapter 7, Page 26).

1. Switch off all devices.
2. Connect the (Cross) Repeater with the interconnect cable(s).
3. Connect the chassis of the (Cross) Repeater to the power supply.
4. Power up the system.



To power up the system, the following sequence is recommended:
Monitor – CON Unit – (Cross) Repeater – CPU Unit – source.

This section illustrates typical installations of (Cross) Repeaters:

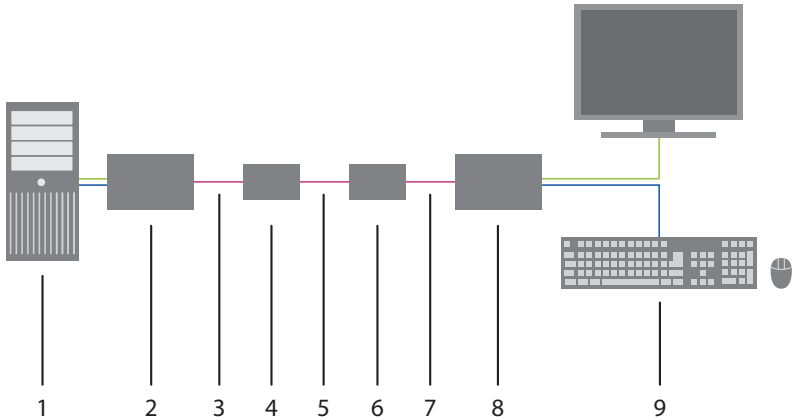


Single Media Conversion

- 1 Source (computer, CPU)
- 2 KVM Extender CPU Unit
- 3 Interconnect cable (Cat X)
- 4 (Cross) Repeater
- 5 Interconnect cable (fiber)
- 6 KVM Extender CON Unit
- 7 Console (monitor, keyboard, mouse)




The example shown in this application scenario will be primarily recommended, if connections through KVM matrix must be bypassed in case of major matrix problems. Therefore KVM extenders with Cat X and with fiber connector can be directly connected to each other.




Dual Media Conversion

- 1 Source (computer, CPU)
- 2 KVM Extender CPU Unit
- 3 Interconnect cable (Cat X)
- 4 (Cross) Repeater #1
- 5 Interconnect cable (fiber)
- 6 (Cross) Repeater #2
- 7 Interconnect cable (Cat X)
- 8 KVM Extender CON Unit
- 9 Console (monitor, keyboard, mouse)



The (Cross) Repeater does not require any configuration and is ready for use per default.

The (Cross) Repeater does not have any adjustable operating modes and is ready for use per default.



Communication between Cat X devices requires a 1000BASE-T connection.

Connector wiring must comply with EIA/TIA-568-B (1000BASE-T), with RJ45 connectors at both ends. All four cable wire pairs are used.

Communication of fiber devices is performed via Gigabit SFPs that are connected to suitable fibers fitted with connectors type LC (see Chapter 7.2.2, Page 28).



The correct function of the device can only be guaranteed with SFPs provided by the manufacturer.



SFP modules can be damaged by electrostatic discharge (ESD).
→ Please consider ESD handling specifications.



A point-to-point connection is required. Operation with several patch fields is possible. Routing over an active network component, such as an Ethernet Hub, Router or Matrix, is not allowed.

- ➔ Avoid routing Cat X cables along power cables.
- ➔ If the site has 3-phase AC power, try to ensure that CPU Unit and CON Unit are on the same phase.



To maintain regulatory EMC compliance, correctly installed shielded Cat X cable must be used throughout the interconnection link.



To maintain regulatory EMC compliance, all Cat X cables need to carry ferrites on both cable ends close to the device.

The (Cross) Repeater requires interconnect cabling specified for Gigabit Ethernet (1000BASE-T). The use of solid-core (AWG24), shielded, Cat 5e (or better) is recommended.

	S/UTP (Cat 5e) cable according to EIA/TIA-568-B. Four pairs of wires AWG24. Connection according to EIA/TIA-568-B (1000BASE-T).
	S/UTP (Cat 5e) cable according to EIA/TIA-568-B. Four pairs of wires AWG26/8. Connection according to EIA/TIA-568-B (1000BASE-T).



The use of flexible cables (patch cables) type AWG26/8 is possible, however the maximum possible extension distance is halved.

	140 m (400 ft)
	70 m (200 ft)



A point-to-point connection is necessary. Operation with multiple patch panels is allowed. Routing over active network components, such as Ethernet Hubs, Switches or Routers, is not allowed.

(Cable notations according to VDE)


Single-mode 9µm	<ul style="list-style-type: none"> • Two fibers 9µm • I-V(ZN)H 2E9 (in-house patch cable) • I-V(ZN)HH 2E9 (in-house breakout cable) • I/AD(ZN)H 4E9 (in-house or outdoor breakout cable, resistant) • A/DQ(ZN)B2Y 4G9 (outdoor cable, with protection against rodents)
Multi-mode 50µm	<ul style="list-style-type: none"> • Two fibers 50µm • I-V(ZN)H 2G50 (in-house patch cable) • I/AD(ZN)H 4G50 (in-house or outdoor breakout cable, resistant)
Multi-mode 62.5µm	<ul style="list-style-type: none"> • Two fibers 62.5µm • I-V(ZN)HH 2G62.5 (in-house breakout cable) • A/DQ(ZN)B2Y 4G62.5 (outdoor cable, with protection against rodents)

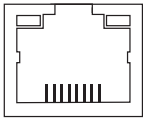
Single-mode 9µm	10,000 m (32,800 ft)
Multi-mode 50µm (OM3)	1,000 m (3,280 ft)
Multi-mode 50µm	400 m (1,300 ft)
Multi-mode 62.5µm	200 m (650 ft)

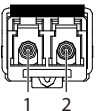


If you use single-mode SFPs with multi-mode fibers, you normally can double the maximum acceptable cable length.

	LC Connector
--	--------------

	1	VCC (+5VDC)	Red
	2	Data -	White
	3	Data +	Green
	4	n.c.	-
	5	GND	Black

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


	1	Data OUT
	2	Data IN

474-BODY2N	700 mA max.	100-240 V	50/60 Hz
474-BODY6R	1,400 mA max.	100-240 V	47-63 Hz
474-BODY6BP	800 mA max.	100-240 V	50/60 Hz
474-BODY6BPF	800 mA max.	100-240 V	50/60 Hz
474-BODY21/4U	4,000 mA max.	2x 100-240 V	50/60 Hz

474-BODY2/2R	3,000 mA	5 VDC
474-BODY2N	5,000 mA	5 VDC
474-BODY4/4R	5,000 mA	5 VDC
474-BODY6R	8,000 mA	5 VDC

	(Cross) Repeater • Max. 300 mA
--	-----------------------------------

	41 to 113°F (5 to 45°C)
	-13 to 140°F (-25 to 60°C)
	Max. 80% non-condensing



	145 x 147 x 41 mm (5.7" x 5.8" x 1.7")
	210 x 140 x 165 mm (8.3" x 5.5" x 6.5")


	221 x 147 x 41 mm (8.7" x 5.8" x 1.7")
	550 x 365 x 115 mm (21.7" x 14.4" x 4.5")

	293 x 147 x 41 mm (11.5" x 5.8" x 1.7")
	550 x 365 x 115 mm (21.7" x 14.4" x 4.5")

	442 x 147 x 41 mm (17.4" x 5.8" x 1.7")
	760 x 365 x 115 mm (29.9" x 14.4" x 4.5")

	442 x 250 x 41 mm (17.4" x 9.8" x 1.7")
	550 x 372 x 155 mm (21.7" x 14.6" x 6.1")

	482 x 462 x 176 mm (19.0" x 18.2" x 6.9")
	645 x 574 x 368 mm (25.4" x 22.6" x 14.5")



	0.4 kg (0.9 lb)
	2.2 kg (4.9 lb)

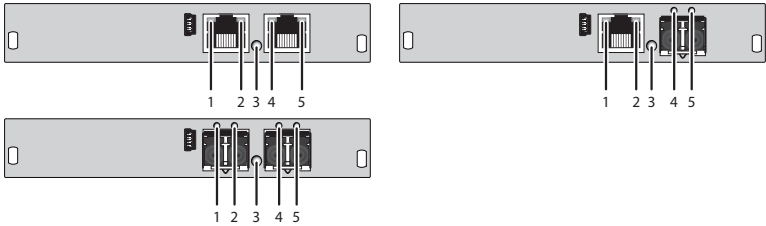
	0.8 kg (1.8 lb)
	2.6 kg (5.7 lb)

	0.9 kg (2.0 lb)
	3.4 kg (7.5 lb)

	1.4 kg (3.1 lb)
	4.6 kg (10.1 lb)


	2.5 kg (5.5 lb)
	3.5 kg (7.7 lb)

	10.0 kg (22.1 lb)
	14.5 kg (32.0 lb)



Rear View

LED off	Power supply	➔ Check power supply units and the connection to the power network.
LED off or LED off	Connection between (Cross) Repeater and KVM extender unit or KVM matrix	➔ Check interconnect cables and connections.



Prior to contacting support please ensure you have read this manual, and then installed and set-up your (Cross) Repeater as recommended.

To efficiently handle your request it is necessary that you complete a support request checklist ([Download](#)). Please ensure that you have the following information available before you call:

- Company, name, phone number and email
 - Type and serial number of the device (see bottom of device)
 - Date and number of sales receipt, name of dealer if necessary
 - Issue date of the existing manual
 - Nature, circumstances and duration of the problem
 - Components included in the system (such as graphic source/CPU, OS, graphic card, monitor, USB-HID/USB 2.0 devices, interconnect cable) including manufacturer and model number
 - Results from any testing you have done
-
1. To return your device, contact your dealer to obtain a RMA number (Return-Material-Authorization).
 2. Package your devices carefully, preferably using the original box. Add all pieces which you received originally.
 3. Note your RMA number visibly on your shipment.



Devices that are sent in without a RMA number cannot be accepted. The shipment will be sent back without being opened, postage unpaid.

The products listed below in the form as delivered comply with the provisions of the following European Directives:

2004/108/EG Council Directive on the approximation of the laws of the Member States relating to electromagnetic compatibility



CE Marking 2009

Product list:

485 Series

The products comply with the following harmonized standards for Information Technology Equipment:

- EN 55022:2010 + A1:2007 (Class A)
- EN 55024:2010 + A1:2001 + A2:2003

This declaration certifies the conformity to the specified directives but contains no assurance of properties. The safety instructions and installation guidelines noted in this manual shall be considered in detail. Compliance with the specifications for cable lengths and types is mandatory.

Manufacturer:
IHSE GmbH
Maybachstrasse 11
88094 Oberteuringen
Deutschland

Oberteuringen, 26 January 2010
The Management

A handwritten signature in blue ink, appearing to read 'Emo L. Anca'.



This is a Class A product. In a domestic environment, this product may cause radio interference in which case the user may be required to take adequate measures.

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.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Shielded cables must be used with this equipment to maintain compliance with radio frequency energy emission regulations and ensure a suitably high level of immunity to electromagnetic disturbances.


All power supplies are certified to the relevant major international safety standards.

The product safety of the devices is proven by the compliance to the following standards:

- IEC 60950-1A1:2010
- EN 60950-1/A12:2011
- UL 60950-1-2007
- CAN/CSA-C22.2 60950-1-07

The compliance is verified and confirmed by TÜV Süd, Germany.





The manufacturer complies with the EU Directive 2012/19/EU on the prevention of waste electrical and electronic equipment (WEEE).

The device labels carry a respective marking.

This device complies with the Directive 2011/65/EU of the European Parliament and of the council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS 2, RoHS II).

The device labels carry a respective marking.

The following terms are commonly used in this guide or in video and KVM technology:

AES/EBU	Digital audio standard that is officially known as AES3 and that is used for carrying digital audio signals between devices.
Cat X	Any Cat 5e (Cat 6, Cat 7) cable
CGA	Color Graphics Adapter (CGA) is an old analog graphic standard with up to 16 displayable colors and a maximum resolution of 640x400 pixels.
Component Video	Component Video (YPbPr) is a high-quality video standard that consists of three independently and separately transmittable video signals, the luminance signal and two color difference signals.
Composite Video	Composite Video is also called CVBS and it is part of the PAL TV standard.
CON Unit	Component of a KVM Extender or Media Extender to connect to the console (monitor(s), keyboard and mouse; optionally also with USB 2.0 devices)
Console	Keyboard, mouse and monitor
CPU Unit	Component of a KVM Extender or Media Extender to connect to a source (computer, CPU)
CVBS	The analog color video baseband signal (CVBS) is also called Composite Video and it is part of the PAL TV standard.
DDC	Display Data Channel (DDC) is a serial communication interface between monitor and source (computer, CPU). It allows a data exchange via monitor cable and an automatic installation and configuration of a monitor driver by the operating system.
Dual Access	A system to operate a source (computer, CPU) from two consoles
Dual Link	A DVI-D interface for resolutions up to 2560x2048 by signal transmission of up to 330 MPixel/s (24-bit)
Dual-Head	A system with two video connections

DVI	Digital video standard, introduced by the Digital Display Working Group (http://www.ddwg.org). Single Link and Dual Link standard are distinguished. The signals have TMDS level.
DVI-I	A combined signal (digital and analog) that allows running a VGA monitor at a DVI-I port – in contrast to DVI-D (see DVI).
EGA	The Enhanced Graphics Adapter (EGA) is an old analog graphic standard, introduced by IBM in 1984. A D-Sub 9 connector is used for connection.
Fiber	Single-mode or multi-mode fiber cables
HDMI	An interface for an all-digital transmission of audio and video data. It is differentiated between the HDMI standards 1.0 to 1.4a. The signals have TMDS level.
KVM	Keyboard, video and mouse
Mini-XLR	Industrial standard for electrical plug connections (3 pole) for the transmission of digital audio and control signals
Multi-mode	62.5 μ multi-mode fiber cable or 50 μ multi-mode fiber cable
OSD	The On-Screen-Display is used to display information or to operate a device.
Quad-Head	A system with four video connections
RCA (Cinch)	A non-standard plug connection for transmission of electrical audio and video signals, especially with coaxial cables
S/PDIF	A digital audio interconnect that is used in consumer audio equipment over relatively short distances.
SFP	SFPs (Small Form Factor Pluggable) are pluggable interface modules for Gigabit connections. SFP modules are available for Cat X and fiber interconnect cables.
Single Link	A DVI-D interface for resolutions up to 1920x1200 by signal transmission of up to 165 MPixel/s (24-bit). Alternative frequencies are Full HD (1080p), 2K HD (2048x1080) and 2048x1152.
Single-Head	A system with one video connection
Single-mode	9 μ single-mode fiber cable

S-Video (Y/C)	S-Video (Y/C) is a video format transmitting luminance and chrominance signals separately. Thereby it has a higher quality standard than CVBS.
TOSLINK	Standardized fiber connection system for digital transmission of audio signals (F05 plug connection)
Triple-Head	A system with three video connections
USB-HID	USB-HID devices (Human Interface Device) allow for data input. There is no need for a special driver during installation; "New USB-HID device found" is reported. Typical HID devices include keyboards, mice, graphics tablets and touch screens. Storage, video and audio devices are HID.
VGA	Video Graphics Array (VGA) is a computer graphics standard with a typical resolution of 640x480 pixels and up to 262,144 colors. It can be seen as a follower of the graphics standards MDA, CGA and EGA.