Draco vario DVI
Draco vario ultra DVI
KVM Extender
Series 474/494

Introduction

This manual contains important safety instructions as well as instructions for setting up the product and operating it. Read carefully through the User Manual before you switch on the product. Observe the general safety instructions (see chapter 2, page 10) and additional instructions in the respective chapters.

Product Identification

The model and serial number of your products are indicated on the bottom of our products. Always refer to this information when you need to contact your distributor or the support of IHSE GmbH (see chapter 14, page 83).

Trademarks and Trade Names

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

Validity of this Manual

This manual applies to all products of the series named on the cover page. Differences between the various models are clearly described. Please note the change log for this manual in chapter 18, page 89.

The manufacturer reserves the right to change specifications, functions or circuitry of the series described here without notice. Information in this manual can be changed, expanded, or deleted without notice. You can find the current version of the manual in the download area of our website.

Copyright

Available Documentation

Name	Format	Description	Provision
User Manual	PDF	Provides an overview of the product together with technical data and safety instructions. Contains all instructions required to operate the product to a basic level.	Download from website
Quick Setup	Print	Provides a quick installation guide and safety instructions	Contained in the scope of delivery

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1 Important Information

1.1 Firmware and Software

The information in this manual refers to the latest extender firmware available at the date of manual release. Please refer to the change log (see chapter 18, page 89) for user manual updates.

1.2 Symbols for Warnings and Helpful Information

The meaning of the symbols used for warnings and helpful information in this manual is described below:

⚠ WARNING
WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.

⚠ CAUTION
CAUTION, used with the safety alert symbol, indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE
NOTICE identifies information, if not observed, endangers the functionality of your device or the security of your data.

This symbol indicates information about special features on the device or when using device and function variants.

This symbol indicates instructions for procedures recommended by the manufacturer for an effective utilization of the device potential.

1.3 Terms and Spellings

Uniform terms and spellings are used in this manual for better readability or easier assignment.

The following terms are used for products and system descriptions:

Term	Description
Management software	Tera Tool, software to configure, monitor and operate the device
Source	Computer, graphics card (USB, video, audio, data sources)
Sink	Console (monitor, keyboard, mouse; optionally also video, audio, data)
CPU Unit	Encoder to connect to the source.
CON Unit	Decoder to connect at the peripherals.

The following spellings are used for keyboard commands:

Keyboard command	Description
key	Key on the keyboard
key + key	Press keys simultaneously
key, key	Press keys successively
2x key	Press key quickly, twice in a row (like a mouse double-click)

The following spelling is used for, e.g., descriptions of editing files or updating firmware:

Keyboard command	Description
`Config.txt`	E.g., file name
`#CFG`	E.g., file content

The following spellings are used for software descriptions:

Spelling	Description
Bold print	Description of terms that are used in the management software, e.g., menus and buttons
Bold print > Bold print	Management software: selection of a menu item in the menu bar or the toolbar, e.g., **Extras > Options**

Mouse button	Description
Left mouse button	Primary mouse button* (default in most operating systems)
Right mouse button	Secondary mouse button*
* Unless you have customized your mouse settings in the used operating system.	
Descriptions containing "click", "mouse click" or "double-click" each means a click with the primary (left) mouse button. If the right mouse button has to be used, this is explicitly declared in the description.	

1.4 Intended Use

Extender modules are used to increase the distance between sources and associated consoles. The signals can be extended using Cat X cables or fiber optic cables.

Extender modules with Cat X Interface:
Extender modules with Cat X connections are unsuitable for connection between buildings. Use a fiber optic-based extender module instead.

Extender modules with Fiber Interface:
Extender modules with fiber connections can also be used with applications in environments which are subject to electromagnetic interference.

NOTICE

Interferences when the immunity limit values are exceeded

If the limit values listed in EN55024 are exceeded, reliable and fault-free functioning of the devices cannot be guaranteed.

NOTICE

Radio interference in a domestic environment

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.

➡ Follow the safety and installation instructions given in this manual.

➡ Use connection cables according to the specifications for the length and type given in this manual.

1.5 Certificates/Directives

1.5.1 North American Regulatory Compliance

The "equipment" referred to in the "North American Regulatory" chapter consists of a fully assembled modular system and includes the chassis, extender modules and possibly add-on modules along with supplied cables. For more details about the modular system, please refer to chapter 4.1.2, page 12.

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.

1.5.2 EU Declaration of Conformity

Please find the EU Declaration of Conformity for the device under:
www.ihse.com/eu-declaration-of-conformity

A copy of the original, product-specific EU Declaration of Conformity can be provided upon request. For contact details, see page 2 of this manual.

1.5.3 WEEE

The device label carries a symbol (crossed-out dustbin) for marking electrical and electronic equipment. The manufacturer complies with the EU Directive 2012/19/EU on the prevention of waste electrical and electronic equipment (WEEE). The manufacturer is a WEEE registered company (registration number DE39900275).

Equipment Dispose/Take-back

- The symbol of a crossed-out dustbin displayed on electrical and electronic equipment indicates that product and the supplied electronic accessories (e.g., power supply units, cables) must not be disposed of with household or commercial waste at the end of its service life.
- By disposing of the product irresponsibly you may enable unauthorized persons to use it in contravention of the regulations, exposing themselves and third parties to the risk of severe injury and rendering the environment liable to contamination.
- The manufacturer takes back old devices and guarantees adequate waste disposal. Please contact the manufacturer's technical support to register the return for a device to be disposed.
- It is the customer's own responsibility to delete personal data on the equipment to be disposed of.

2 Safety instructions

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

- ➡ Read this user manual carefully.
- ➡ Read the manual for the chassis in which the extender modules are installed. The instructions, safety and warning notes contained therein must also be observed.
- ➡ Only use the device according to this user manual. Failure to follow the instructions described can result in personal injury, damage to the device, or endanger the security of your data.
- ➡ Take any required ESD precautions.

Installation Location

While operating the device can get warm. Damage to the device can occur in a damp environment.

- ➡ Use the device only in dry, indoor environments.
- ➡ Use the device only in a room with adequate ventilation.
- ➡ Place the device at a sufficient distance from the operator.

Connection

- ➡ Check the device for visible damage before connecting it.
- ➡ Only connect the device if the device and the ports are not damaged.
- ➡ Only use cables supplied by the manufacturer or cables that comply with the technical specification, see chapter 13, page 75.
- ➡ Only connect the device to KVM devices using the interconnecting cable - not to other devices, particularly not to telecommunications or network devices.

3 Consignes de Sécurité

Pour garantir un fonctionnement fiable et sûr de votre périphérique à long terme, veuillez respecter les directives suivantes :

- Lisez attentivement ce manuel d'utilisation.
- Lisez le manuel d'utilisation du châssis dans lequel les modules d'extension sont installés. Les instructions, les consignes de sécurité et les avertissements qu'il contient doivent également être respectés.
- N'utilisez le périphérique que conformément à ce manuel d'utilisation. Le non-respect des instructions décrites peut entraîner des blessures corporelles, endommager le périphérique ou mettre en danger la sécurité de vos données
- Prenez toutes les précautions nécessaires contre les décharges électrostatiques.

Emplacement de l'installation

Pendant le fonctionnement, le périphérique peut chauffer. Le périphérique peut être endommagé dans un environnement humide.

- N'utilisez le périphérique que dans un environnement sec et intérieur.
- N'utilisez le périphérique dans un lieu correctement ventilée.
- Placez le périphérique à une distance suffisante de l'opérateur.

Connexion

- Avant de connecter le périphérique et les unités d'alimentation, vérifiez qu'ils ne présentent pas de dommages visibles.
- Seulement connectez le périphérique que si le périphérique et les ports ne sont pas endommagés.
- Seulement utilisez des câbles fournis par le fabricant ou des câbles conformes aux spécifications techniques, voir chapitre 13, page 75.
- Ne connectez le périphérique qu'à des périphériques KVM à l'aide du câble d'interconnexion - pas à d'autres périphériques, en particulier pas à des périphériques de télécommunications ou de réseau.

4 Description

4.1 System Overview

4.1.1 KVM System

This is an example for a point-to-point connection of KVM extender modules. For more installation examples, see chapter 6.2, page 37.

The CPU Unit is connected directly to the source using the supplied cables. The CON Unit is connected to the sink. The CPU Unit and the CON Unit communicate with each other through the interconnect cable.

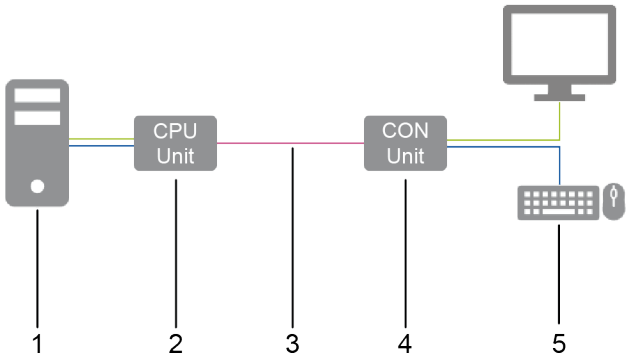


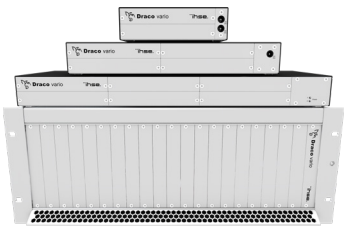
Fig. 1 Installation example (point-to-point connection, single head)

1 Source
2 CPU Unit
3 Interconnect cable
4 CON Unit
5 Sink (monitor, keyboard, mouse)

4.1.2 Modular Draco vario System

Draco vario chassis allow individual Draco vario series extender modules and add-on modules to be combined in standalone or rack mounted configuration. The flexible, modular system allows customized integration of devices to meet specific installation requirements. Chassis are available in sizes to accommodate 2, 4, 6 and 21 individual modules.

Therefore, please first select a chassis, then select one or more extender module(s), then select one or more add-on module(s) if required.
The Draco System Designer, available on the IHSE website at https://dsd.ihse.com, will help you with system configuration.



For more information, please refer to the manual 474-BODY.

Extender modules, described in this manual.

For more information, please refer to the manual 474-Add-on modules.

4.1.3 System Structure and Terms

A KVM pair consists of 2 KVM extender modules, each with at least one CPU extender module and at least one CON extender module. The various extender modules are installed respectively in a Draco vario chassis (2-slot, 4-slot, 6-slot, or 21-slot) on the CPU side (CPU Unit) and console side (CON Unit). With 2-slot, 4-slot and 6-slot chassis add-on modules are placed above an extender, with 21-slot chassis, add-on modules are placed to the right of an extender module. An add-on module will not work if it is mounted above an empty slot.

The assignment of the extenders or add-on modules can be recognized by the article number:

- Extender module or add-on module for the CPU Unit: **L**4XX (L = Local)
- Extender module or add-on module for the CON Unit: **R**4XX (R = Remote)

An add-on module can contain up to 2 independent function parts (part A and B), one on the left and one on the right, see Fig. 2.

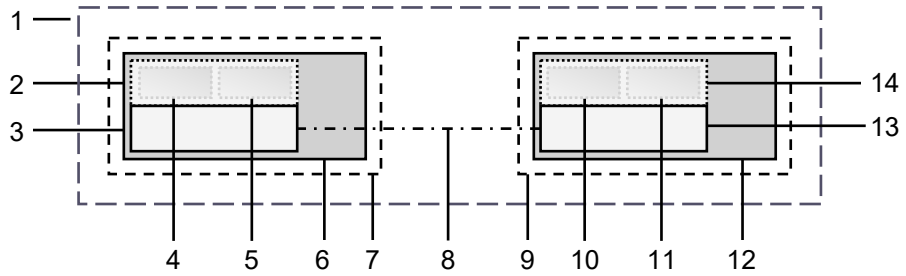


Fig. 2 KVM Extender pair with CPU Unit and CON Unit

1 KVM Extender pair
2 Extender module or add-on module (optional)
3 Extender module
4 Part A of the CPU add-on module (optional)
5 Part B of the CPU add-on module (optional)
6 Chassis
7 CPU Unit
8 Interconnect cable
9 CON Unit
10 Part A of the CON add-on module (optional)
11 Part B of the CON add-on module (optional)
12 Chassis
13 Extender module
14 Extender module or add-on module (optional)

4.1.4 Embedded Signals

If optional add-on modules are used, signals such as, e.g., audio (analog, serial, digital or symmetrical) or USB 2.0 are transferred to the underlying extender module and embedded as well as transmitted via the link connection to the CON Unit. The embedded signals are extracted in the CON Unit, transferred to the add-on module above and output there separately.

Example with optional Add-on Module L-/R474-BAE

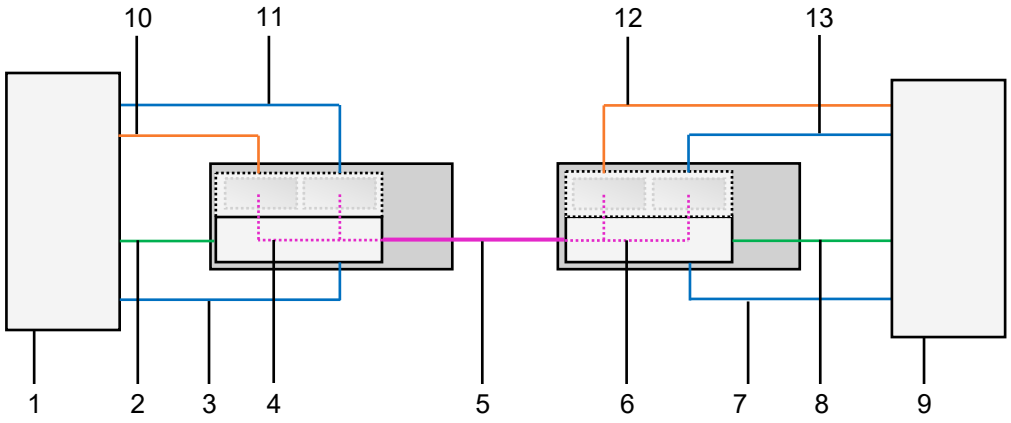


Fig. 3 Embedding/de-embedding of signals in a KVM extender pair (example L /R474-BAE)

1 Source
2 Video signal with embedded audio signal
3 USB HID signal
4 Embedding the audio and USB 2.0 signal
5 Interconnect cable
6 De-embedding the audio and USB 2.0 signal
7 USB HID signal
8 Video signal with embedded audio signal
9 Sink (console with monitor, keyboard, and mouse)
10 Audio signal
11 USB 2.0 signal
12 Audio signal, de-embedded
13 USB 2.0 signal, de-embedded

Example with optional Add-on Module R474-BDX

To output an audio signal with separate speakers, there is only the optional audio add-on module for the CON Unit required.

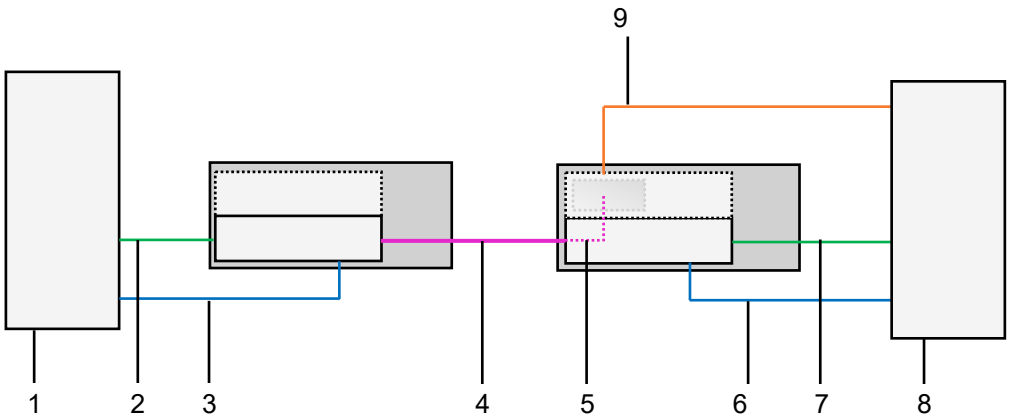


Fig. 4 De-embedding of audio signals in a KVM extender pair (example R474-BDX)

1 Source
2 Video signal with embedded audio
3 USB HID signal
4 Interconnect cable
5 De-embedding digital audio signal
6 USB HID signal
7 Video signal with embedded audio
8 Sink (console with monitor, keyboard, mouse, and speakers)
9 De-embedded digital audio signal

4.2 System Compatibility

4.2.1 Video Compatibility

Extender modules are operated with a different firmware and technology and are not completely compatible with each other. The following table lists video compatibility (X) and non-video compatibility (-) (see footnotes).

		R474	R477	R481	R482		R483		R486	R488	R490	R491	R491-BUHx	R492	R493		R495
		SH	SH	SH	SH	DH	SH	DH	DH	SH	SH	SH	SH	SH	SH	DH	SH
L474	SH	X	X	X	X	X	X	X	X	X	X	-	X	-	-	X	-
L477	SH	X	X	X	X	X	X	X	X	X	X	-	X	-	-	X	-
L481	SH	X	X	X	X	X	X	X	X	X	X	-	X	-	-	X	-
L482	SH	X	X	X	X	X	X	X	X	X	X	-	X	-	-	X	-
	DH	X	X	X	X	X	X	X	X	X	X	-	X	-	-	X	-
L483	SH	X	X	X	X	X	X	X	X	X	X	-	X	-	-	X	-
	DH	X	X	X	X	X	X	X	X	X	X	-	X	-	-	X	-
L484	SH	X	X	X	X	X	X	X	X	X	X	-	X	-	-	X	-
L486	DH	X	X	X	X	X	X	X	X	X	X	-	X	-	-	X	-
L488	SH	X	X	X	X	X	X	X	X	X	X		X			X	
L490	SH	-	-	-	-	-	-	-	-	-	X	X	X	X	X	X	X
L491	SH	-	-	-	-	-	-	-	-	-	X	X	X	X	X	X	X
L492	SH	-	-	-	-	-	-	-	-	-	X	X	X	X	X	X	X
L493	SH	-	-	-	-	-	-	-	-	-	X	X	X	X	X	X	X
	DH	-	-	-	-	-	-	-	-	-	X	X	X	X	X	X	X
L494	SH										X	X	X	X	X	X	X
L495*	SH	-	-	-	-	-	-	-	-	-	X	X	X	X	X	X	X

1) Compatibility is based on video/USB HID signal only, not on the embedded signals like audio or USB 2.0.

2) Compatible up to the maximum specified resolution of the console.
No image is displayed when a Single Link CON Unit (e.g., R482-B2HC with 1080p monitor) is switched to a Dual Link CPU Unit (e.g., L482-BDHC with a 4k30 video signal) unless the configuration is set up accordingly.

3) If using CPU Unit and CON Unit with different video signals (e.g., a DP 1.1 CON Unit with a HDMI CPU Unit), transmitting the EDID to the CPU Unit will result in an error.

4.2.2 Interconnection Compatibility

Extender modules are available in the following connection versions. The type of interconnection of extenders can be recognized by the article number:

- Interconnection (1.25 Gbit/s = "1G") via Cat X cable ("C")
- Interconnection (1.25 Gbit/s = "1G") via single-mode fiber cable ("S")
- High speed interconnection (3.125 Gbit/s = 3G) via single-mode fiber cable ("X")

Fiber devices can be used with Multi-mode and Single-mode cables (see chapter 13.2.2, page 77).

Point-to-point Interconnection between Extender Modules

	Cat X 1G	Fiber 1G	Fiber 3G
Cat X 1G	Compatible	Not compatible	Not compatible
Fiber 1G	Not compatible	Compatible	Not compatible
Fiber 3G	Not compatible	Not compatible	Compatible

Interconnection of Extender Modules via Matrix or Cross-Repeater 485-BX/485-BXX

	Cat X 1G	Fiber 1G	Fiber 3G
Cat X 1G	Compatible	Compatible	Not compatible
Fiber 1G	Compatible	Compatible	Not compatible
Fiber 3G	Not compatible	Not compatible	Compatible

Interconnection of Extender Modules via Draco tera Matrix with Bridge Card

	Cat X 1G CON Unit	Fiber 1G CON Unit	Fiber 3G CON Unit
Cat X 1G CPU Unit	Compatible	Compatible	Compatible
Fiber 1G CPU Unit	Compatible	Compatible	Compatible
Fiber 3G CPU Unit	Not compatible	Not compatible	Compatible

A special card (bridge card) is available to be used with the matrix Draco tera enterprise and Draco tera flex to connect up to 8 CPU Units with 1G transmission speed (Cat X or fiber version). The transmission speed will be increased within the bridge card from 1G to 3G. The signals are transmitted to the backplane of the matrix and can be output to up to 8 CON Units, connected to the matrix.
This function is only available in one direction.
1G CPU Unit - Draco tera enterprise and Draco tera flex with bridge card - 3G CON Unit

4.3 Product Types

4.3.1 DVI-D Extender Modules (Classic Series)

Product type	Interconnection		Video signal with resolution/frame rate	USB HID
L474-BSHC	1x	1G Cat X	1x DVI-D Single Link up to 1920 x 1200 @ 60 Hz	1x USB Type B
R474-BSHC				2x USB Type A
L474-BSHCR	2x			1x USB Type B
R474-BSHCR				2x USB Type A
L474-BSHS	1x	1G Single-mode fiber	1x DVI-D Single Link up to 1920 x 1200 @ 60 Hz	1x USB Type B
R474-BSHS				2x USB Type A
L474-BSHSR	2x			1x USB Type B
R474-BSHSR				2x USB Type A
L474-BSHX	1x	3G Single-mode fiber	1x DVI-D Single Link up to 1920 x 1200 @ 60 Hz	1x USB Type B
R474-BSHX				2x USB Type A

4.3.2 DVI-I Extender Modules (Classic Series)

Product type	Interconnection		Video signal with resolution/frame rate	USB HID
L474-BSHCV	1x	1G Cat X	1x DVI-I (VGA/DVI) Single Link up to 1920 x 1200 @ 60 Hz	1x USB Type B
L474-BSHSV	1x	1G Single-mode fiber	1x DVI-I (VGA/DVI) Single Link up to 1920 x 1200 @ 60 Hz	1x USB Type B
L474-BSHXV	1x	3G Single-mode fiber	1x DVI-I (VGA/DVI) Single Link up to 11920 x 1200 @ 60 Hz	1x USB Type B
L474-BVHC	1x	1G Cat X	1x DVI-I (VGA/DVI onboard) Single Link up to 1920 x 1200 @ 60 Hz	1x USB Type B
R474-BVHC	1x	1G Cat X	1x DVI-I output (VGA/DVI) Single Link up to 1920 x 1200 @ 60 Hz	2x USB Type A
L474-BVHCR	2x	1G Cat X	1x DVI-I (VGA/DVI onboard) Single Link up to 1920 x 1200 @ 60 Hz	1x USB Type B
R474-BVHCR	2x	1G Cat X	1x DVI-I output (VGA/DVI) Single Link up to 1920 x 1200 @ 60 Hz	2x USB Type A
L474-BVHS	1x	1G Single-mode fiber	1x DVI-I (VGA/DVI onboard) Single Link up to 1920 x 1200 @ 60 Hz	1x USB Type B
R474-BVHS	1x	1G Single-mode fiber	1x DVI-I output (VGA/DVI) Single Link up to 1920 x 1200 @ 60 Hz	2x USB Type A
L474-BVHSR	2x	1G Single-mode fiber	1x DVI-I (VGA/DVI onboard) Single Link up to 1920 x 1200 @ 60 Hz	1x USB Type B
R474-BVHSR	2x	1G Single-mode fiber	1x DVI-I output (VGA/DVI) Single Link up to 1920 x 1200 @ 60 Hz	2x USB Type A

4.3.3 DVI-I Extender Modules (Ultra Series)

Product type	Interconnection		Video signal with resolution/frame rate	USB HID
L494-BVHC	1x	1G Cat X	1x DVI-I (VGA/DVI onboard) Single Link up to 1920 x 1200 @ 60 Hz	1x USB Type B
L494-BVHCR	2x			
L494-BVHS	1x	1G Single-mode fiber	1x DVI-I (VGA/DVI onboard) Single Link up to 1920 x 1200 @ 60 Hz	1x USB Type B
L494-BVHSR	2x			
L494-BVHX	1x	3G Single-mode fiber	1x DVI-I (VGA/DVI onboard) Single Link up to 1920 x 1200 @ 60 Hz	1x USB Type B

4.3.4 Supplementary with Extended Function for Extender Modules

SNMP Module

To monitor all function- and safety-critical components of extender modules and add-on modules of a chassis, an SNMP module installed in the same chassis can be used.

The SNMP module can be used to query the status of the extender modules, configure extender module settings, and query and update the firmware of the extender modules and add-on modules. For more information, please refer to the SNMP manual.

Part number	Description
474-SNMPV3	SNMP module for sliding-in into slot 5 of the chassis 474-BODY6BP/474-BODY6BP-S and 474-BODY6BPF/474-BODY6BPF-S and into slot 21 of the chassis 474-BODY21/4U(-R1) and 474-BODY21/4UR(-R1). The transmission of the traps is encrypted (SNMP v3).

U-Switch Module

Extender modules can be combined with a U-Switch module that can seamlessly control multiple sources as one source using just a single USB HID set (keyboard and mouse), while the video outputs of the sources are directly connected to the monitors. For more information, please refer to the Draco U-Switch manual.

Part number	Description
B476-4U4T	Draco vario U-Switch Module 4-Port USB HID + USB 2.0

4.4 Accessories

Part. No.	Description	Interface
436-AA	DVI-A cable to VGA cable male/male, 2.0 m	Video
436-ID	DVI-D cable male/male, 1.8 m	Video
436-D3	DVI-D cable male/male, 3.0 m	Video
445-2H	DVI-D splitter cable	Video
247-U1	USB cable Type A-B, 1.8 m	USB/USB HID
247-U2	USB cable Type A-B, 3.0 m	USB/USB HID
436-USB20	USB extension cable Type A-A, 3.0 m	USB/USB HID
459-1C	SFP, bidirectional, 1G	Cat X, 1G
459-1S	SFP single-mode, LC duplex, bidirectional, 1G	Fiber, 1G
459-10X	SFP single-mode, LC duplex, bidirectional, 10G, compatible with 3G fiber extender modules	Fiber, 3G

4.5 Scope of Delivery

Depending on the order, the scope of delivery contains the following items and may vary depending on country of delivery and customer specification:

Product type	Scope of delivery
KVM Extender pair	• 1x CPU Unit in Draco vario chassis • 1x CON Unit in Draco vario chassis • 1x DVI-D cable male/male, 1.8 m • 1x USB cable 1.8 m (type A-B) • Quick Setup
CPU Unit	• 1x CPU Unit in Draco vario chassis • 1x DVI-D cable male/male, 1.8 m • 1x USB cable 1.8 m (type A-B) • Quick Setup
CON Unit	• 1x CON Unit in Draco vario chassis • Quick Setup

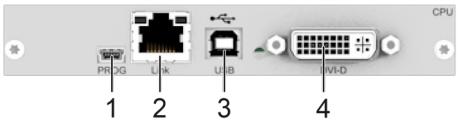
If anything is missing, please contact your distributor.

The scope of delivery for the power supply voltage of the chassis depends on the ordered chassis, Therefore, please refer to the user manual 474-BODY.

4.6 Product Views Extender Modules

4.6.1 Extender Module L-/R474-BSHC/-BVHC

Source side (CPU module)



Sink side (CON module)

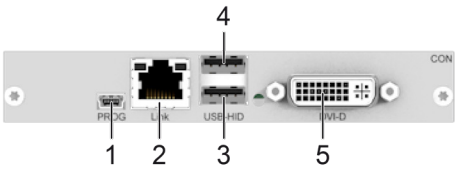
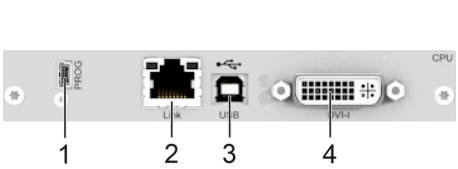


Fig. 5 Interface side L-/R474-BSHC



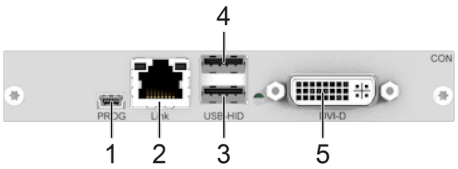


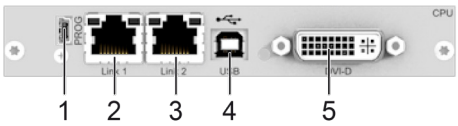
Fig. 6 Interface side L-/R474-BVHC

1 Mini-USB, service interface
2 Cat X, interconnection
3 USB Type B, USB HID
4 DVI-D or DVI-I input (only L474-BVHC)

1 Mini-USB, service interface
2 Cat X, interconnection
3 USB Type A, USB HID device 1
4 USB Type A, USB HID device 2
5 DVI-D or DVI-I output (only R474-BVHC)

4.6.2 Extender Module L-/R474-BSHCR/-BVHCR

Source side (CPU module)



Sink side (CON module)

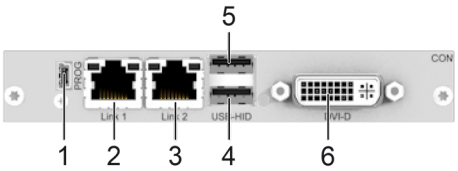
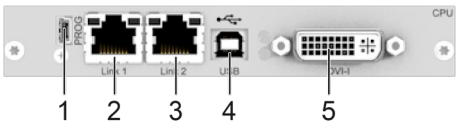


Fig. 7 Interface side L-/R474-BSHCR



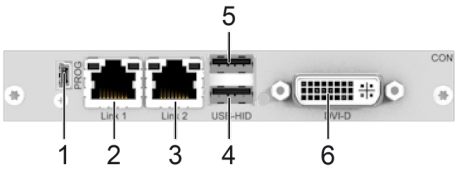


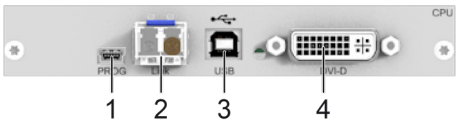
Fig. 8 Interface side L-/R474-BVHCR

1 Mini-USB, service interface
2 Cat X, primary interconnection 1
3 Cat X, secondary interconnection 2
4 USB Type B, USB HID
5 DVI-D or DVI-I input (only L474-BVHCR)

1 Mini-USB, service interface
2 Cat X, primary interconnection 1
3 Cat X, secondary interconnection 2
4 USB Type A, USB HID device 1
5 USB Type A, USB HID device 2
6 DVI-D or DVI-I output (only R474-BVHCR)

4.6.3 Extender Module L-/R474-BSHS/-BSHX/-BVHS/-BVHX

Source side (CPU module)



Sink side (CON module)

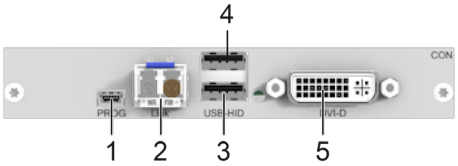
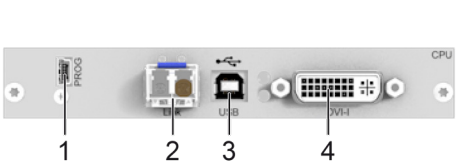


Fig. 9 Interface side L-/R474-BSHS/-BSHX



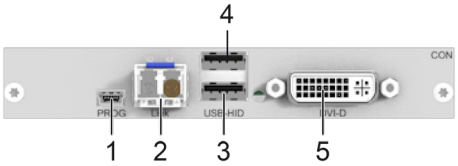


Fig. 10 Interface side L-/R474-BVHS/-BVHX

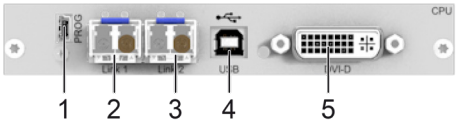
1 Mini-USB, service interface
2 Fiber, interconnection
3 USB Type B, USB HID
4 DVI-D or DVI-I input (only L474-BVHS/-BVHX)

1 Mini-USB, service interface
2 Fiber, interconnection
3 USB Type A, USB HID device 1
4 USB Type A, USB HID device 2
5 DVI-D or DVI-I output (only R474-BVHS/-BVHX)

The configuration of the onboard DVI-I extender module is described in the user manual for the Media/DVI converter K238-5V (Download).

4.6.4 Extender Module L-/R474-BSHSR/-BVHSR

Source side (CPU module)



Sink side (CON module)

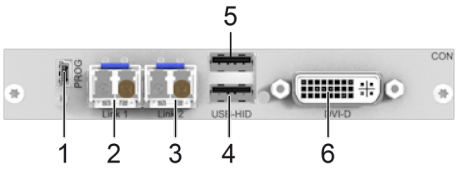
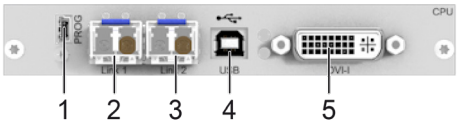


Fig. 11 Interface side L-/R474-BSHSR



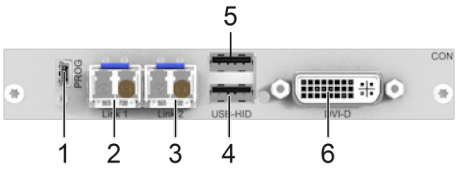


Fig. 12 Interface side L-/R474-BVHSR

1 Mini-USB, service interface
2 Fiber, primary interconnection 1
3 Fiber, secondary interconnection 2
4 USB Type B, USB HID
5 DVI-D or DVI-I input (only L474-BVHSR)

1 Mini-USB, service interface
2 Fiber, primary interconnection 1
3 Fiber, secondary interconnection 2
4 USB Type A, USB HID device 1
5 USB Type A, USB HID device 2
6 DVI-D or DVI-I output (only R474-BVHSR)

4.6.5 Extender Module L474-BSHCV

Source side (CPU module)

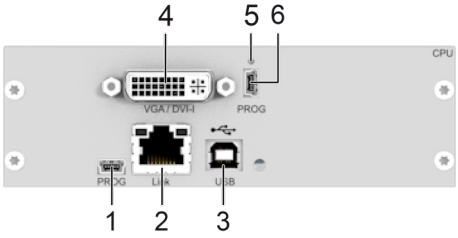


Fig. 13 Interface side L-/R474-BSHCV

1 Mini-USB, service interface
2 Cat X interconnection
3 USB Type B, USB HID
4 DVI-I input (VGA/DVI)
5 IR Receiver for remote control
6 Service interface

For add-on module usage, please contact the manufacturer's technical support.

4.6.6 Extender Module L474-BSHSV/-BSHXV

Source side (CPU module)

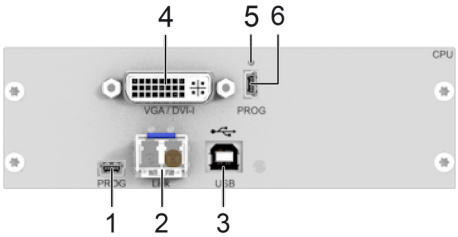


Fig. 14 Interface side L474-BSHSV/-BSHXV

1 Mini-USB, service interface
2 Fiber interconnection
3 USB Type B, USB HID
4 DVI-I input (VGA/DVI)
5 IR Receiver for remote control
6 Service interface

For add-on module usage, please contact the manufacturer's technical support.

4.6.7 Extender Module L494-BVHC

Source side (CPU module)

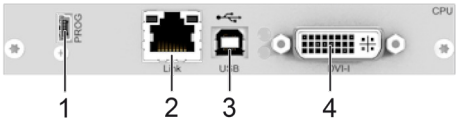


Fig. 15 Interface side L494-BVHC

1 Mini-USB, service interface
2 Cat X, interconnection
3 USB Type B, USB HID
4 DVI-I input

4.6.8 Extender Module L494-BVHCR

Source side (CPU module)

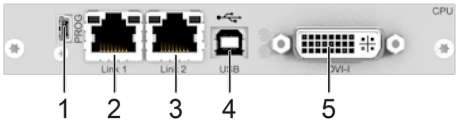


Fig. 16 Interface side L494-BVHCR

1 Mini-USB, service interface
2 Cat X, primary interconnection 1
3 Cat X, secondary interconnection 2
4 USB Type B, USB HID
5 DVI-I input

4.6.9 Extender Module L494-BVHS/-BVHX

Source side (CPU module)

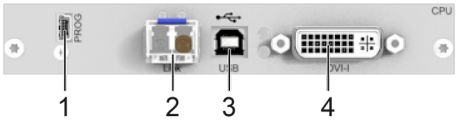


Fig. 17 Interface side L494-BVHS/-BVHX

1 Mini-USB, service interface
2 Fiber, interconnection
3 USB Type B, USB HID
4 DVI-I input

The configuration of the onboard DVI-I extender module is described in the user manual for the Media/DVI converter K238-5V (Download).

4.6.10 Extender Module L494-BVHSR

Source side (CPU module)

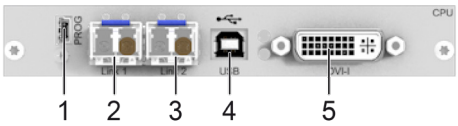


Fig. 18 Interface side L494-BVHSR

1 Mini-USB, service interface
2 Fiber, primary interconnection 1
3 Fiber, secondary interconnection 2
4 USB Type B, USB HID
5 DVI-I input

4.7 Status Indication of the Extender Modules

Status LED on Board

The extender modules have a multicolor LED for status indication on the PCB that is visible on the front side of the chassis at the CON and CPU Unit of following chassis:

474-BODY2, 474-BODY2R, 474-BODY2N, 474-BODY4, 474-BODY4R and 474-BODY6R-R1.

Fig. 19 Chassis front view with module LEDs

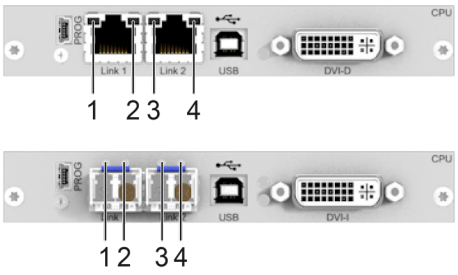
1 Status LED of PCBs of modules

LED Status	Description
Dark red	Video processor in failure status (e.g., incorrect firmware uploaded.
Red	No video signal available, no USB HID connection available.
Green	Video signal available, no USB HID connection available.
Violet	No video signal available, USB HID connection available.
Light blue	Video signal available, USB HID connection available.

Link LEDs at the Interface Side

The LED status of the interconnection is described using the redundant Cat X extender modules and fiber extender modules as an example.

Source side (CPU module)



Sink side (CON module)

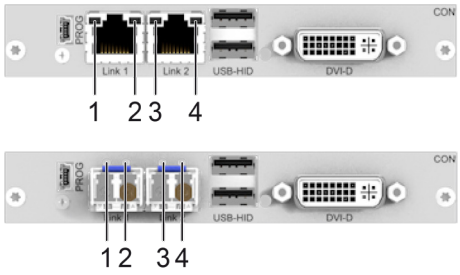


Fig. 20 Interface side - Status LEDs Link connection

1 Failure LED link 1
2 Status LED link 1
3 Failure LED link 2
4 Status LED link 2

1 Failure LED link 1
2 Status LED link 1
3 Failure LED link 2
4 Status LED link 2

4.7.1 Interconnection Cat X

The following table shows the respective Link LED states/colors (left LED 1, 3 and right LED 2, 4) of the CPU Unit and the CON Unit for the respective situation.

Pos. 1	Pos. 2	Description
Off	Green	Link connection available.
Off	Flashing green	No link connection available.
Flashing green	Green	Link connection failure (flashing for approx. 20 s following each occurring connection failure).

4.7.2 Interconnection Fiber 1G and 3G

The following table shows the respective Link LED states/colors (left LED 1, 3 and right LED 2, 4) of the CPU Unit and the CON Unit for the respective situation.

Pos. 1	Pos. 2	Description
Off	Green	Link connection available.
Off	Flashing red	No link connection available.
Flashing red	Green	Link connection failure (flashing for approx. 20 s following each occurring connection failure).

4.7.3 Video and USB HID - Point-to-Point Connection - DVI-D Extender Modules

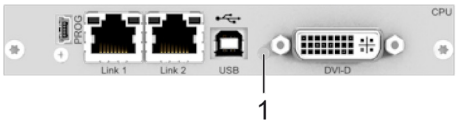
When extender modules are connected directly, the LEDs behave differently depending on whether there is a link connection between the CON Unit and the CPU Unit, whether a video signal is present or whether a USB HID connection exists.

The USB connection is missing, when the command mode is started, or when the CON Unit currently has no USB HID control with shared operation of a redundant CPU Unit.

LEDs for USB/Video Connection Extender Modules L-/R474-BSHx

The LED status is described using the redundant Cat X extender module as an example.

Source side (CPU module)



Sink side (CON module)

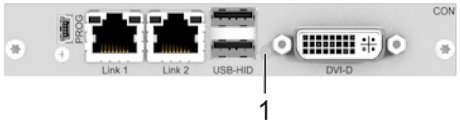


Fig. 21 Interface side - USB/Video Connection Status LEDs L-/R474-BSHx

1 Status LED USB HID and video signal

1 Status LED USB HID and video signal

The following tables show the LED states/colors of the CPU Unit and CON Unit for the respective situation.

CPU Unit

LED 1	Red	Violet	Flashing green/yellow	Green	Light blue
Link	---	X	---	X	X
Video	---	---	X	X	X
USB HID	---	---	---	---	X

CON Unit

LED 1	Flashing red/violet/blue	Violet	Flashing green/light blue	Light blue
Link	---	X	X	X
Video	---	---	X	X
USB HID	---	---	---	X

4.7.4 Video and USB HID - Point-to-Point Connection - DVI-I Extender Modules

When extender modules are connected directly, the LEDs behave differently depending on whether there is a link connection between the CON Unit and the CPU Unit, whether a video signal is present or whether a USB HID connection exists.

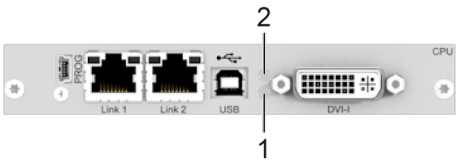
The following tables show the LED states/colors of the CPU Unit and CON Unit for the respective situation.

The USB connection is missing, when the command mode is started, or when the CON Unit currently has no USB HID control with shared operation of a redundant CPU Unit.

LEDs for USB/Video Connection Extender Modules L-/R474-BVHx and L494-BVHx

The LED status is described using the redundant Cat X extender module as an example.

Source side (CPU module)



Sink side (CON module)

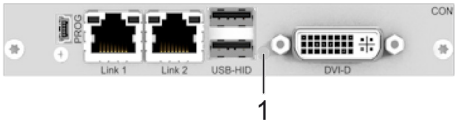


Fig. 22 Interface side - USB/Video Connection Status LEDs L-/R474-BVHx and L494-BVHx

1 Status LED USB HID and video signal
2 Status LED converter part

1 Status LED USB HID and video signal

CPU Unit

LED 2	Red	Violet	Yellow	Yellow	White
LED 1	**Red**	**Violet**	**Flashing green/yellow**	**Green**	**Light blue**
Link	---	X	---	X	X
Video	---	---	X	X	X
USB HID	---	---	---	---	X

CON Unit

LED 1	Flashing red/violet/blue	Violet	Flashing green/light blue	Light blue
Link	---	X	X	X
Video	---	---	X	X
USB HID	---	---	---	X

LEDs for USB/Video Connection Extender Module L474-BSHxV

The LED status is described using the redundant fiber extender module as an example.

Source side (CPU module)

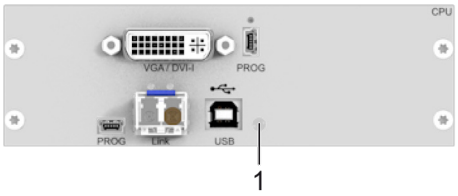


Fig. 23 Interface side - USB/Video Connection Status LED L474-BSHxV

1 Status LED USB HID and video signal

CPU Unit

LED 1	Flashing green/yellow	Flashing green/yellow	Flashing green/yellow	Green	Light blue
Link	---	X	---	X	X
Video	---	---	X	X	X
USB HID	---	---	---	---	X

4.7.5 Video and USB HID - Matrix Connection - DVI-D Extender Modules

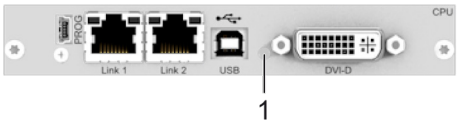
Extender modules are connected to a matrix, the LEDs behave differently depending on whether there is a link connection between the CON Unit/CPU Unit and the matrix, whether the CON Device is switched to the CPU Device, whether a video signal is present, or whether a USB HID connection exists.

The USB connection is missing, when the command mode is started, the OSD is opened, only Video-only Access is present, or Full Access is present in sharing operation without current USB HID control, or the CON Device is not switched to the CPU Device.

LEDs for USB/Video Connection Extender Modules L-/R474-BSHx

The LED status is described using the redundant Cat X extender module as an example.

Source side (CPU module)



Sink side (CON module)

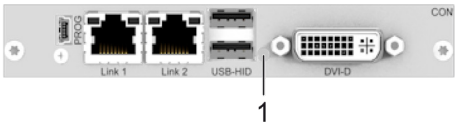


Fig. 24 Interface side - USB/Video Connection Status LEDs L-/R474-BSHx

1 Status LED USB HID and video signal

1 Status LED USB HID and video signal

The following tables show the LED states/colors of the CPU Unit and CON Unit for the respective situation.

CPU Unit

LED 1	Red	Violet	Violet	Flashing green/yellow	Green	Light blue
Link to matrix	---	X	X	---	X	X
Device switched	---	---	X	---	X	X
Video	---	---	---	X	X	X
USB HID	---	---	---	---	---	X

CON Unit

LED 1	Flashing red/violet/blue	Flashing green/light blue	Violet	Flashing green/light blue	Light blue
Link to matrix	---	X	X	X	X
Device switched	---	---	X	X	X
Video	---	---	---	X	X
USB HID	---	---	---	---	X

4.7.6 Video and USB HID - Matrix Connection - DVI-I Extender Modules

Extender modules are connected to a matrix, the LEDs behave differently depending on whether there is a link connection between the CON Unit/CPU Unit and the matrix, whether the CON Device is switched to the CPU Device, whether a video signal is present, or whether a USB HID connection exists.

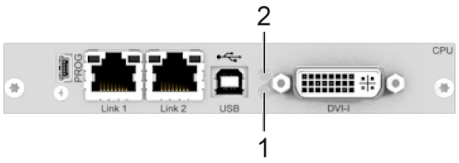
The following tables show the LED states/colors of the CPU Unit and CON Unit for the respective situation.

The USB connection is missing, when the command mode is started, when the OSD is opened, only Video-only Access is present, or Full Access is present in sharing operation without current USB HID control, or the CON Device is not switched to the CPU Device.

LEDs for USB/Video Connection Extender Modules L-/R474-BVHx

The LED status is described using the redundant Cat X extender module as an example.

Source side (CPU module)



Sink side (CON module)

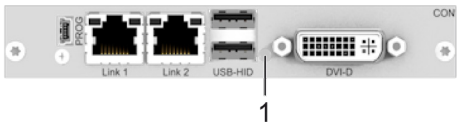


Fig. 25 Interface side - USB/Video Connection Status LEDs L-/R474-BVHx and L494-BVHx

1 Status LED USB HID and video signal
2 Status LED converter part

1 Status LED USB HID and video signal

CPU Unit

LED 2	Red	Violet	Violet	Yellow	Yellow	White
LED 1	**Red**	**Violet**	**Violet**	**Flashing green/yellow**	**Green**	**Light blue**
Link to matrix	---	X	X	---	X	X
Device switched	---	---	X	---	X	X
Video	---	---	---	X	X	X
USB HID	---	---	---	---	---	X

CON Unit

LED 1	Flashing red/violet/blue	Flashing green/light blue	Violet	Flashing green/light blue	Light blue
Link to matrix	---	X	X	X	X
Device switched	---	---	X	X	X
Video	---	---	---	X	X
USB HID	---	---	---	---	X

USB/Video LEDs of Extender Modules L474-BSHxV at the Interface Side

The LED status is described using the redundant fiber extender module as an example.

Source side (CPU module)

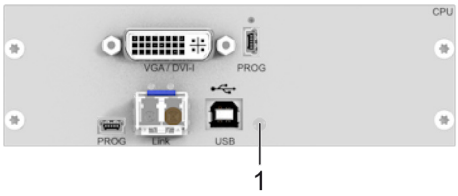


Fig. 26 Interface side - USB/Video Connection Status LED L474-BSHxV

1 Status LED USB HID and video signal

CPU Unit

LED 1	Flashing green/yellow	Flashing green/yellow	Flashing green/yellow	Flashing green/yellow	Green	Light blue
Link to matrix	---	X	X	---	X	X
Device switched	---	---	X	---	X	X
Video	---	---	---	X	X	X
USB HID	---	---	---	---	---	X

5 Access Options

You have following options to configure and/or operate extender modules:

Access option	Description
Command mode	The CON extender modules include a command mode that enables access to several functions of connected KVM devices, e.g., Draco U-Switch or Draco tera matrix switch when using additional keyboard commands. In addition, individual extender module functions for USB HID Ghosting and the EDID, as well as switching via command mode and additional keyboard commands can be executed.
Management software	Firmware updates for extender modules can be performed via the management software. The management software is available in the form of a single executable program file. The management software can be downloaded from the link https://www.ihse.com/software. For extender modules connected to a matrix, additional functions are available in the management software. For more information, please refer to the manual of the respective IHSE Draco tera matrix.
Mini-USB interface	Extender modules can be parametrized or updated via Mini-USB interface.

5.1 Command Mode

To start the command mode, use a keyboard sequence (Hot Key) at the keyboard of a CON Unit plugged in a KVM device. The command mode can also be called up using a keyboard with USB HID interface connected to the R474-BXH add-on module.

NOTICE
While in command mode, ➡ the Caps Lock and Scroll Lock LEDs on the keyboard are flashing, ➡ the USB HID devices are not operable, mouse and keyboard functions are deactivated, ➡ only selected keyboard commands are available.

If there is no keyboard command entered within 10 seconds after activating the command mode, it will be deactivated automatically.

The following keyboard commands are used to enter, and to exit the command mode, and to change the Hot Key.

Function	Keyboard command
Start the command mode	2x Left Shift (Hot Key, factory setting)
Exit the command mode	Esc and also Left Shift + Esc, if necessary
Change the Hot Key	current Hot Key, c, new Hot Key Code, Enter

NOTICE
In a combined KVM matrix/U-switch configuration, select different Hot Keys for the connected extender modules, e.g., 2x Left Shift for access to the matrix and e.g., 2x Right Shift for access to the U-Switch.

Hot Keys currently can only be changed at the console and only for that console.

Hot Key Code

The Hot Key to start the command mode can be changed. The following table lists the Hot Key codes for the available Hot Keys.

Hot Key Code	Hot Key
0	Freely selectable, except Esc, Del, Backspace and Enter
2	2x Scroll
3	2x Left Shift (default)
4	2x Left Ctrl
5	2x Left Alt
6	2x Right Shift
7	2x Right Ctrl
8	2x Right Alt

Change the current Hot Key via Hot Key Code (exemplary)

To change the current Hot Key to, e.g., 2x Left Alt, enter Hot Key, c, 5, Enter.

Set a freely selectable Hot Key (exemplary)

To set a freely selectable Hot Key (e.g., 2x Space), enter Hot Key, c, 0, Space, Enter.

Keyboard commands are fixed to the position of the keys on the keyboard. Keyboard mapping tables may vary for country-specific layouts.

➡ Note the key position of a freely defined Hot Key when changing the keyboard layout, e.g., from QWERTZ to AZERTY. E.g., if defining 2x a as Hot Key on a German or US keyboard layout, the French keyboard layout (AZERTY) requires then 2x q as Hot Key to be pressed instead

Reset the Hot Key

To set a Hot Key back to default settings, press Right Shift + Del within 5 s after switching on the CON Unit or plugging in a keyboard.

The Hot Key is set back to Left Shift.

5.2 Management Software

The menu structure of the management software is subdivided into various sections.

➡ Open the management software by a double-click on the program icon on the desktop or the file in the directory.

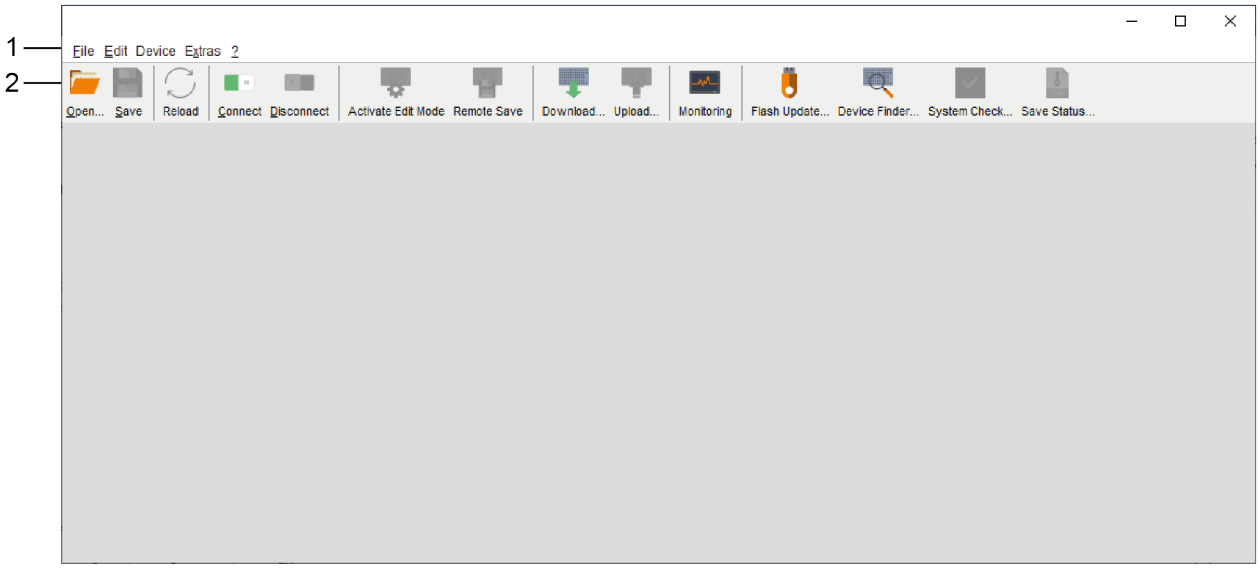


Fig. 27 Management software Menu structure

1 Menu bar (top line) 2 Toolbar (second line)

The following mouse buttons are selectable for menu functions:

Mouse command	Function
Left mouse button	Select function, open drop-down menus, enter input field, activate/deactivate option checkboxes, etc.
Right mouse button	Open context specific selection menus

6 Installation

NOTICE
Please verify that interconnect cables, interfaces, and handling of the devices comply with the requirements (see chapter 10, page 49).

First-time users are recommended to set up the system in a test environment that is limited to a single room. This makes it easier to identify and solve any cabling problems, and experiment with your system more conveniently.

6.1 Setting up the System

➡ Switch off all devices.

Installing the CON Unit

1. Connect the monitor(s), keyboard, and mouse to the CON Unit.
2. Connect the chassis of the CON Unit to the power supply unit(s)/power socket(s).

Installing the CPU Unit

1. Connect the source to the CPU Unit with the supplied cables. Please ensure the cables are not strained.
2. Connect the chassis of the CPU Unit to the power supply unit(s)/power socket(s).

Establishing a Point-to-Point Connection of CON Unit and CPU Unit

1. Connect the CON Unit to the CPU Unit by using interconnect cables.
2. Power up the system, following the recommended sequence:
   Monitor - CON Unit - CPU Unit - source
3. Boot the source and check that everything works correctly.

Establishing a matrix connection of CON Unit and CPU Unit is described in the respective Draco tera matrix manual. The OSD of the matrix can only be opened when the video signal is present on the primary channel.

The extender module with VGA/DVI-I input is connected as above. For a complete and detailed description of the setup and configuration of the VGA option, see manual for the Media/DVI Converter K238-5V (Download).

6.2 Installation Examples

This section illustrates typical installations of KVM extender modules.

6.2.1 Single Head Installation with Add-on Module Audio

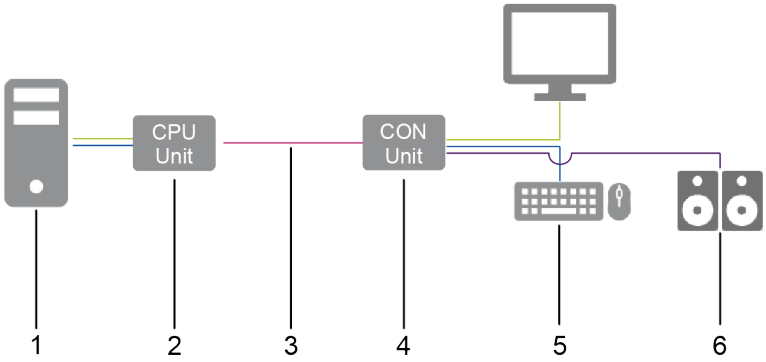


Fig. 28 Installation example (point-to-point connection, single head audio add-on module)

1 Source
2 CPU Unit
3 Interconnect cable
4 CON Unit
5 Console (monitor, keyboard, mouse)
6 Audio sink (optional, only with devices with add-on module analog audio/Serial option, digital audio, or balanced analog audio

6.2.2 Dual Head Installation with Add-on Module USB 2.0

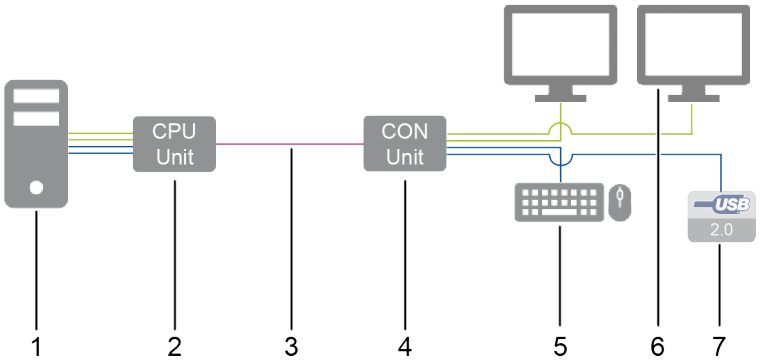


Fig. 29 Installation example (point-to-point connection, dual head with add-on module USB 2.0)

1 Source
2 CPU Unit
3 Interconnect cable
4 Console (monitor, keyboard, mouse)
5 Second monitor (optional, only with dual head extender modules)
6 USB 2.0 devices (optional, only with add-on modules USB 2.0)

6.2.3 Matrix Installation

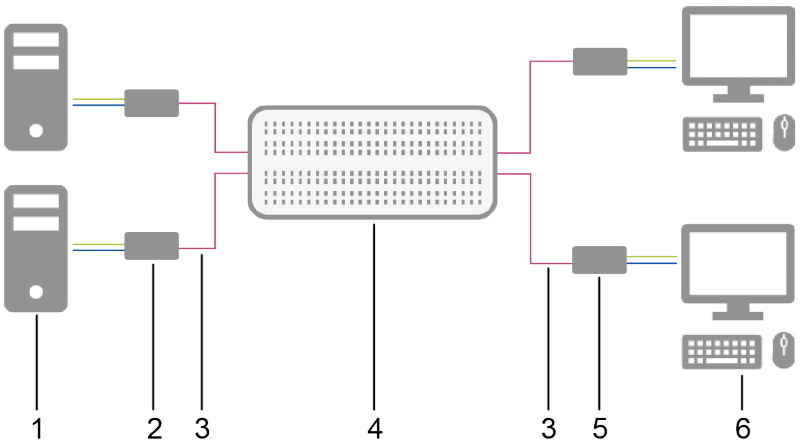


Fig. 30 Installation example (matrix connection, single head)

1 Sources
2 CPU Units
3 Interconnect cable
4 Matrix
5 CON Units
6 Sinks (monitor, keyboard, mouse)

7 Configuration

7.1 Transmission Parameters

7.1.1 Transmission Parameters (Classic Series)

The device operates with a proprietary compression method.

In default configuration, the device adapts dynamically to monitor resolution and image content. This configuration is suitable for almost all conditions and should only be modified if image quality is not fully satisfactory.

NOTICE
In exceptional cases the displayed video image may exhibit "frame dropping" (loss of single pictures) or color effects.

7.1.2 Transmission Parameters (Ultra Series)

The device operates with a manufacturer optimized compression method, the so-called Video-Codec Lici® (Lightweight Image Coding) of the Fraunhofer Institute for Integrated Circuits IIS. The transmission is managed visibly and up to mathematically lossless, at the same time without the loss of frames (no frame drops) and at low latency.

In default configuration, the device adapts dynamically to monitor resolution and image content. This configuration is suitable for almost all conditions and should only be modified if image quality is not fully satisfactory.

7.2 Configuration Options via Mini-USB Service Port

Both the CPU Unit and the CON Unit can be configured and updated via the Mini-USB service port. When a CPU Unit/CON Unit is connected to a computer using a mini-USB cable, the CPU Unit/CON Unit is displayed in the computer's file manager as an external drive "401xxxxx" or "101xxxxx" (Serial No.).

This directory contains the configuration file `Config.txt`, the EDID and firmware files.

The `Config.txt` file shows the Serial No., the manufacturing p/n, and the video signal details. If present, additional configuration parameters are displayed in the line directly below `#CFG`.

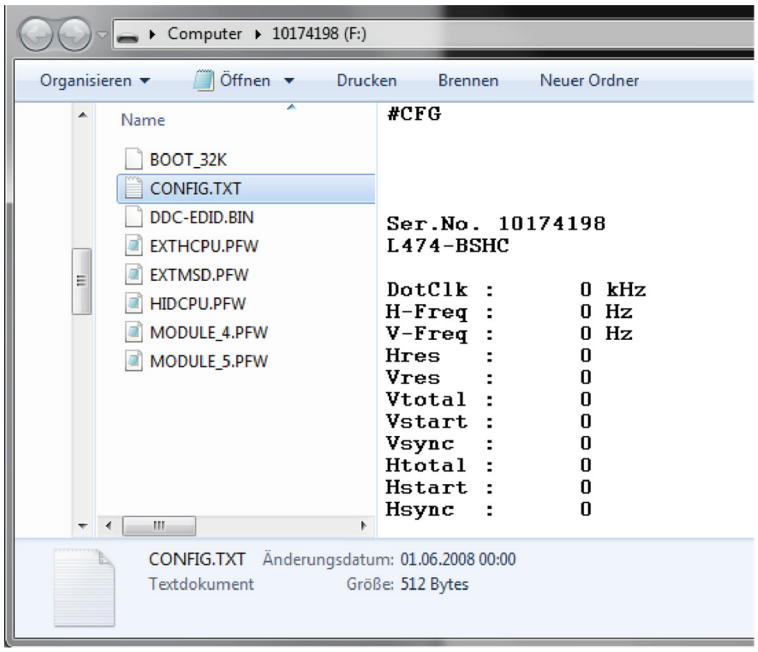


Fig. 31 Example: Opened Flash drive of a CPU Unit

7.3 EDID Settings

By default, the CPU Unit provides the EDID for the sources by default. This information is suitable in most cases. Loading the EDID from the console monitor can be performed during normal operation (see chapter 8.1, page 46).

For specific requirements, the EDID can be retrieved and uploaded as a binary file to both the CPU Unit and the CON Unit.

➡ Connect your computer with a Mini-USB cable to the service port of the CPU Unit or CON Unit.

The data area of the CPU Unit or CON Unit is now accessible as a flash drive "Extender".

Uploading the EDID

➡ Copy the binary file containing your specific EDID to the flash drive of the CPU Unit or CON Unit.

The current EDID is replaced.

Retrieving the EDID

➡ Copy the file `DDC-EDID.bin` on the flash drive of the CPU Unit to your computer.

To open the binary file, you have to install a suitable software, e.g., WinDDCwrite, on your computer. Please, contact your distributor for this purpose.

Reset the EDID to Factory Settings

1. Delete the file called DDC-EDID.bin on the flash drive of the CPU Unit.
2. Manually power off the extender module.
3. Power on the extender module to restart the extender module.

   The extender module starts automatically, and the factory EDID is restored.

7.4 USB HID Ghosting

This function allows specific keyboard and mouse descriptors (device descriptions) to be permanently stored in the CPU Unit. This permanent storage eliminates the need to register and deregister the keyboard and mouse on an operating system each time there is a shared use of a source by two or more consoles within a KVM matrix.

The following table lists the keyboard commands for the configuration of USB HID ghosting:

Keyboard command	Function
Hot Key, h, w, Enter	Writes the device descriptions of the input devices connected to the CON Unit into the CPU Unit. Activates the emulation of these device descriptions in the CPU Unit.
Hot Key, h, e, Enter	Activates the emulation of already stored device descriptions in the CPU Unit.
Hot Key, h, d, Enter	Deactivates the emulation of active device descriptions in the CPU Unit. The input devices connected to the CON Unit will be now passed transparently to the source.
Hot Key, h, r, Enter	Deactivates the emulation of active device descriptions in the CPU Unit. Deletes the descriptions out of the CPU Unit. The input devices connected to the CON Unit will be now passed transparently to the source.

NOTICE

When using a USB combo device as a USB HID input device, switching to a CPU Unit with activated USB HID ghosting may cause limited functionality.

Keyboard commands are fixed to the position of the keys on the keyboard. Keyboard mapping tables may vary for country-specific layouts.

➥ E.g., press Hot Key, h, z, Enter on a French keyboard layout (AZERTY) instead of Hot Key, h, w, Enter to write the device descriptions of the input devices connected to the CON Unit into the CPU Unit and to activate the emulation of these device descriptions in the CPU Unit.

7.5 Configuration File

The extender module contains a configuration file (`Config.txt`) to set specific parameters and to read out device and video information. The configuration file is located on the flash drive of the extender module. The flash drive can be opened by a Mini-USB connection to a computer. The configuration file can be edited with all common text editors.

NOTICE
If the start command `#CFG` is missing or is written to the wrong place, if parameters are not separated in extra lines, or if the extender module will not be restarted, the parameterization will fail. For a successful parameterization, the following sequence must be strictly observed.

To enter or change a parameter of an extender module, proceed as follows:

1. Connect the extender module to any source using a Mini-USB cable.
   The extender module opens a flash drive containing the `Config.txt` file.
2. Open the `Config.txt` file in a text editor.
3. Ensure that `#CFG` is written in the first line of the file.
4. Add a line break directly behind `#CFG`.
5. Add the parameter/s in capitals in the line below `#CFG` (one line per parameter).
6. Add a line break directly behind each parameter.
7. Delete everything that follows the entered parameter/s, including blanks and blank lines.
8. Save the `Config.txt` file.
9. Manually power off the extender module.
10. Power on the extender module to restart the extender module.
    The extender module starts automatically, and the extender module parameters will be rewritten in the `Config.txt` file.

Example

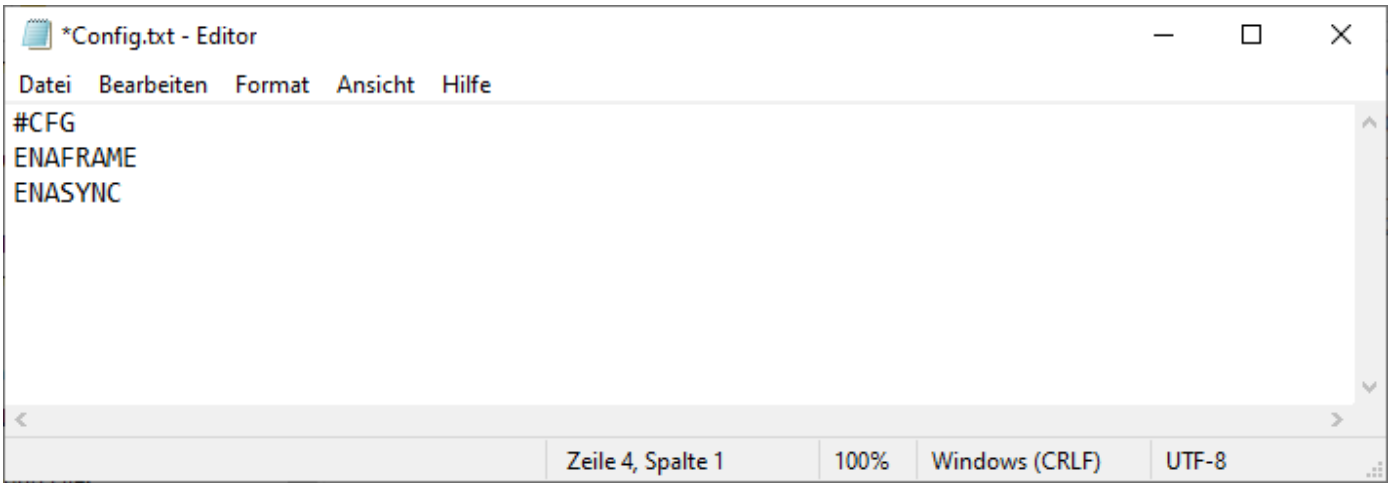


Fig. 32 Example: Config.txt with parameters

7.6 Parameters

For information about parameters available for the usage with add-on modules, please refer to the 474-Add-on Module manual.

7.6.1 Parameters for CPU Units

The following parameters can be written into the configuration file of a CPU Unit. In the **Series** column is listed if there is a restriction to certain devices (e.g., L474) or if the mentioned parameters are available for the complete series (e.g., L474/L494).

EDID Management

Parameter	Function	Series
ENAHPDET	Enables Hot plug switch for 238-5V (CPU Unit) or L474-BSHCV upon transmitting the EDID.	L474
LOCKEDID	Activates EDID write protection.	L474/L494

Compression

Parameter	Function	Series
MEDCPRATE	Activates medium compression rate.	L474
MINCPRATE	Activates low compression rate.	L474
MAXCPRATE	Activates high compression rate.	L474

Shared Operation

Only available for redundant CPU Units.

Parameter	Function	Series
KBDCON	Activates keyboard connect	L474/L494
MOUCON	Activates mouse connect	L474/L494
RELEASETIME=n*	Sets the release timer n = 0...9 seconds for mouse and keyboard connect. RELEASETIME=X deactivates the shared operation.	L474/L494

* If no parameter for the release time has been entered for a redundant extender, the release time is 2 seconds.

7.6.2 Parameters for CON Units

The following parameters can be written into the configuration file of a CON Unit. In the **Series** column you can see if there is a restriction to certain devices (e.g., R474-BVHxR) or if the mentioned parameters are available for the complete series (e.g., R474).

Output Settings

Parameter	Function	Series
DISEXTOSD	Deactivates extender module OSD.	R474
ENAFRAME	Shows orange colored frame when losing extender module connection.	R474
ENAHOLDPIC	Shows last transmitted picture highlighted by an orange-colored frame when losing connection.	R474
ENALOSTMR	Activates LOS timer	R474
ENADDCTX	Activates EDID transmission by unplugging and connecting the monitor back to the CON Unit.	R474
DISPLAY2	Shows second video channel of dual head source by default when connected to a single head CON.	R474
PARAM=V	Enables simultaneous output of DVI-D and VGA signal.	R474-BVHx, R474-BVHxR

Redundancy

Parameter	Function	Series
DISRED	Disables redundancy on the extender module where the parameter is set.	R474-BxHxR
ENAREDFRM	Enables colored (default: blue) frame in case of using the redundant extender module link.	R474-BxHxR

7.6.3 Parameters for parallel Operation of redundant CPU Units

CPU Units with a redundant port for interconnect cables offer the possibility for a competing control by two connected CON Units.

Taking over control is performed using a keyboard and/or mouse. The release timer function determines the release time of the input devices at one of the CON Units after that control can be taken over from the second CON Unit.

To configure a redundant CPU Unit for the operation with two parallelly controlling CON Units, proceed as follows:

1. Connect a redundant CPU Unit to any source by using a Mini-USB connection.

   The extender module opens a flash drive containing the `Config.txt` file.
2. Open the `Config.txt` file in a text editor.
3. Ensure that `#CFG` is in the first line of the file.
4. Activate the release timer by writing the parameter `RELEASETIME=n` into the second line. The variable `n` defines the time in seconds and has to be replaced by the numbers 0 to 9 (e.g., `RELEASETIME=5`).

   If this parameter is not activated at all, the release time is set to 2 seconds by default. The parameter RELEASETIME=X deactivates the shared operation.
5. Delete everything that follows the entered parameter/s.
6. Save the `Config.txt` file.
7. Manually power off the extender module.
8. Power on the extender module to restart the extender module.

   The extender module starts automatically, and the extender module parameters will be rewritten in the `Config.txt` file.

Example

Fig. 33 Example: Config.txt with parameter for sharing operation

NOTICE

When using the redundant CPU Unit in combination with a KVM matrix, the function of competing control will be automatically deactivated in the extender module and will have to be configured by the KVM matrix.

8 Operation

8.1 Downloading the EDID

In the delivery state, the factory-set EDID in the CPU Unit is reported to the source. If these are not the optimal settings for the console monitor, the EDID can be loaded from the console monitor and stored in the internal memory of the CPU Unit.

On extender modules with USB HID ports, you can load the EDID of the console monitor via keyboard command under operating conditions.

1. Enter the Hot Key to start the command mode (see chapter 5.1, page 33).

   The **Caps Lock** and **Scroll Lock** LEDs on the keyboard are flashing.

2. Press a to load the EDID of the console monitor into the CPU Unit.

   The screen will go black for a short time and the LEDs of the CPU Unit and CON Unit flash briefly.
   At the same time the command mode is closed, and the keyboard LEDs return to previous status.

3. Restart the corresponding source.

   The video mode has been readjusted. Screen quality should be optimal. The source should now show the console monitor as the current screen, together with the available video resolutions.

   If the EDID was loaded once, the EDID can be reloaded by repeating the process.

Keyboard commands are fixed to the position of the keys on the keyboard. Keyboard mapping tables may vary for country-specific layouts.

➡ E.g., press Hot Key + q on a French keyboard layout (AZERTY) instead of Hot Key + a to download the EDID of the monitor connected to the CON Unit into the CPU Unit.

8.2 Switching of two different CPU Units via redundant CON Unit

CON Units with a redundant port for interconnect cables offer the possibility to connect two different CPU Units with different sources.

To switch a redundant CON Unit with two different CPU Units, proceed as follows:

Keyboard command	Function
Hot Key, k, 1, Enter	Switches to the extender module connection 1.
Hot Key, k, 2, Enter	Switches to the extender module connection 2.

Point-to-point connection
With extender modules connected directly, the switching of redundant CON Units to extender module connection 2 is not available for keyboards connected to add-on modules with USB HID interface.
Matrix connection
With extender modules connected via a matrix, the switching of redundant CON Units to extender module connection 2 is also available for keyboards connected to add-on modules with USB HID interface.

9 Summary of Keyboard Commands

In the following you find a summary of keyboard commands that can be used in conjunction with 474/494 extender modules and add-on modules.

Keyboard commands are fixed to the position of the keys on the keyboard. Keyboard mapping tables may vary for country-specific layouts.

➡ Note the key position of keys when changing the keyboard layout, e.g., from QWERTZ to AZERTY with the French keyboard layout.

9.1 Command Mode

9.1.1 Starting and Exiting the Command Mode

Keyboard command	Function
2x Left Shift	Starts the command mode (Hot Key, factory setting).
Esc	Exits the command mode.

9.1.2 Changing and Resetting the Hot Key

Hot Key

Keyboard command	Function
Current Hot Key, c, new Hot Key code, Enter	Changes the Hot Key according to the predefined Hot Key Code table.
Hot Key, c, 0, new Hot Key, Enter	Defines a freely selectable Hot Key.
Right Shift + Del within 5 s after switching on the CON Unit or plugging in a keyboard	Resets the Hot Key back to default settings.

Hot Key Code

Hot Key Code	Hot Key
0	Freely selectable, except Esc, Del, Backspace and Enter
2	2x Scroll
3	2x Left Shift (default)
4	2x Left Ctrl
5	2x Left Alt
6	2x Right Shift
7	2x Right Ctrl
8	2x Right Alt

9.2 Managing of EDID and USB HID Ghosting

9.2.1 EDID

Keyboard command	Function
Hot Key, a	Downloads the EDID of a monitor connected to the CON Unit into the CPU Unit.

9.2.2 USB HID Ghosting

Keyboard command	Function
Hot Key, h, w, Enter	Writes the device descriptions of the input devices connected to the CON Unit into the CPU Unit. Activate the emulation of these device descriptions in the CPU Unit.
Hot Key, h, e, Enter	Activates the emulation of already stored device descriptions in the CPU Unit.
Hot Key, h, d, Enter	Deactivates the emulation of active device descriptions in the CPU Unit. The input devices connected to the CON Unit will be now passed transparently to the source.
Hot Key, h, r, Enter	Deactivates the emulation of active device descriptions in the CPU Unit. Deletes the descriptions out of the CPU Unit. The input devices connected to the CON Unit will be now passed transparently to the source.

9.3 Switching of two different CPU Units via redundant CON Unit

Keyboard command	Function
Hot Key, k, 1, Enter	Switches to the extender module connection 1.
Hot Key, k, 2, Enter	Switches to the extender module connection 2.

* Switching of redundant CON Units via a keyboard on an add-on module with USB HID interface is only available for an extender module connection via matrix, not for a point-to-point connection, see chapter 8.2, page 46.

10 Overview of Keyboard Commands

10.1 Keyboard Commands for Configuration

Keyboard command	Function
Hot Key, c, new Hot Key code, Enter	Changes the Hot Key according to the predefined Hot Key Code table.
Hot Key, c, 0, new Hot Key, Enter	Defines a freely selectable Hot Key.
Right Shift + Del within 5 s after switching on the CON Unit or plugging in a keyboard	Resets the Hot Key back to default settings.

10.2 Keyboard Commands for Operation

Keyboard command	Function
2x Left Shift	Starts the command mode (Hot Key, factory setting).
Esc	Exits the command mode.
Hot Key, a	Downloads the EDID of a monitor connected to the CON Unit into the CPU Unit.
Hot Key, h, w, Enter	Writes the device descriptions of the input devices connected to the CON Unit into the CPU Unit. Activate the emulation of these device descriptions in the CPU Unit.
Hot Key, h, e, Enter	Activates the emulation of already stored device descriptions in the CPU Unit.
Hot Key, h, d, Enter	Deactivates the emulation of active device descriptions in the CPU Unit. The input devices connected to the CON Unit will be now passed transparently to the source.
Hot Key, h, r, Enter	Deactivates the emulation of active device descriptions in the CPU Unit. Deletes the descriptions out of the CPU Unit. The input devices connected to the CON Unit will be now passed transparently to the source.
Hot Key, k, 1, Enter	Switches to the extender module connection 1.
Hot Key, k, 2, Enter	Switches to the extender module connection 2.

11 Maintenance

11.1 Cleaning of Modules

NOTICE

Damage to the mechanical and electronic components

The modules as well as the accessories can be damaged by cleaning with damp or aggressive cleaning agents. If the modules are nevertheless cleaned with damp or aggressive cleaning agents and damaged in the cleaning process, the manufacturer's warranty will be voided.

➡ Remove dust deposits from the device with a dry, antistatic cloth or dehumidified air spray.

11.2 Replacing or Mounting additional Modules in Chassis

For information on the replacement, retrofitting of additional extender modules as well as for mounting of add-on modules with extender modules, please refer to 474-BODY manual. The safety instruction and conditions described in the chassis manual are to be observed to avoid personal injury and damage of components.

11.3 Updating the Firmware via Management Software

11.3.1 Management Software Requirements

If you want to use the management software on Windows operating systems with integrated Java Runtime, the following requirements must be fulfilled:

Computer/Software/Network		Requirements/Recommendations
Free memory	RAM	Recommended: 1 GB
Operating system	Microsoft	Windows 10, Windows 11
Management software with integrated Java Runtime	Tera Tool	Downloaded from https://www.ihse.de/software
Connection	Mini USB port	Available via Mini USB cable between computer and extender module.
	Network port	Via network cable between computer and matrix, computer and SNMP board, or computer and SNMP chassis.

If you want to use the management software without integrated Java Runtime, the following requirements must be fulfilled:

Computer/Software/Network		Requirements/Recommendations
Free memory	RAM	Recommended: 1 GB
Operating system	Microsoft	Windows 10, Windows 11
	macOS	macOS 10.14 (Mojave) or higher, Intel platform
Specification	Java	Java 11 is the minimum version required. However, we recommend using a newer version of Java. (https://adoptopenjdk.net, https://github.com/ojdkbuild/ojdkbuild)
Management software	Tera Tool	Downloaded from https://www.ihse.com/software
Connection	Mini USB port	Available via Mini USB cable between computer and extender module.
	Network port	Via network cable between computer and matrix, computer and SNMP board, or computer and SNMP chassis. For more information, refer to the respective manual.

Contact your system administrator concerning JRE and network connection.

11.3.2 Connecting to the Extender Module

➡ Connect the Mini-USB cable to the Mini-USB port of the extender module and the USB-A port of the computer.

11.3.3 Updating Firmware via Management Software

NOTICE

To process successful firmware updates and avoid failures:

➡ For firmware update of the extender module, use only stand-alone computers that are not integrated into the extender module setup.

➡ Ensure that the computer used for the firmware update is not set into standby mode or sleep mode during the update.

➡ Always update the firmware with firmware of the same name. The firmware of 474 and 494 series are not compatible with each other. The firmware of 1G extender modules of one series is not compatible with the firmware of 3G extender modules.

☑ For a parallel flash update of several extender modules, proceed as follows.

➡ Using mini-USB cables, connect as many extender modules to USB ports on your computer running the management software as USB ports are available.

➡ Run the management software as often as extender modules are connected.

➡ Proceed as described below and select a different extender module to be updated in each running management software.

To perform a firmware update of extender modules using the management software, proceed as follows.

1. Run the management software.
2. Click **Flash Update** in the toolbar.
3. Click **Extender Module Via Mini-USB Flash Drive**.

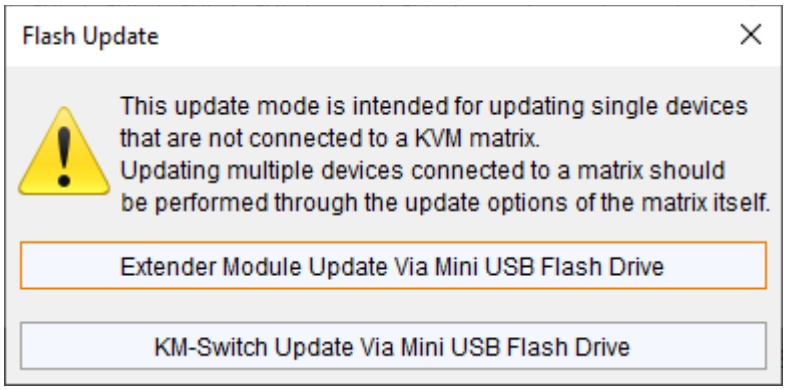


Fig. 34 Management software Flash Update

The update dialog appears.

4. Connect the extender module to your computer running the management software using a Mini-USB cable.
5. Power up the extender module.
6. Click **Search Extender Module**.

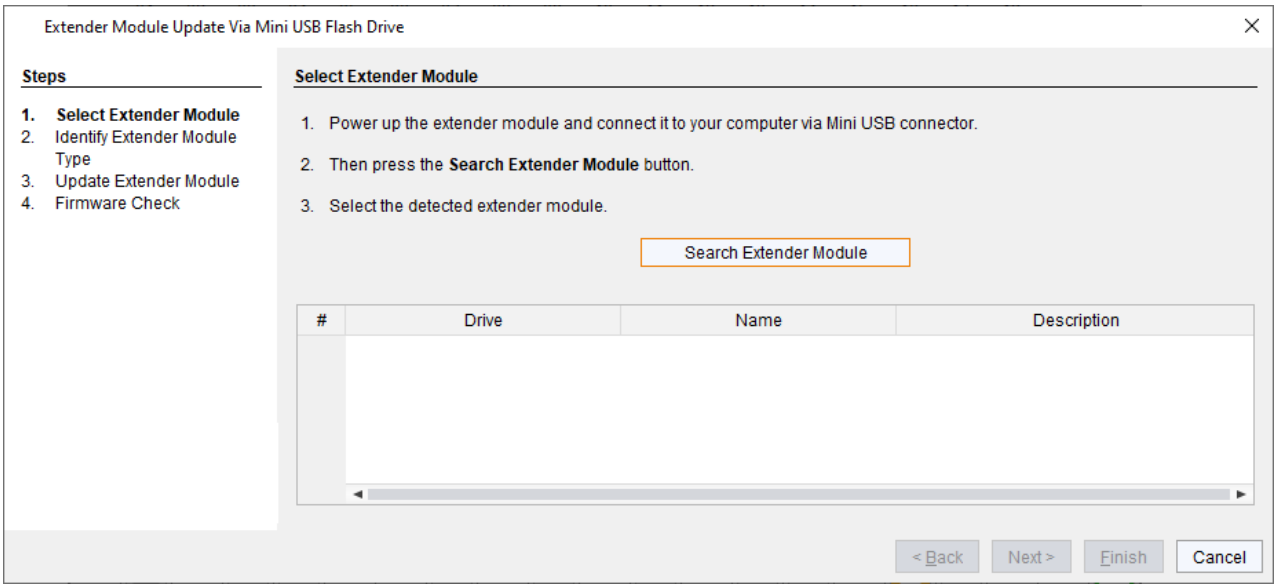


*Fig. 35 Management software **Flash Update - Search Extender Module***

The flash drive of the connected extender module is displayed in the drive overview.

7. Select the flash drive of the extender module to be updated.
8. Click **Next >**.

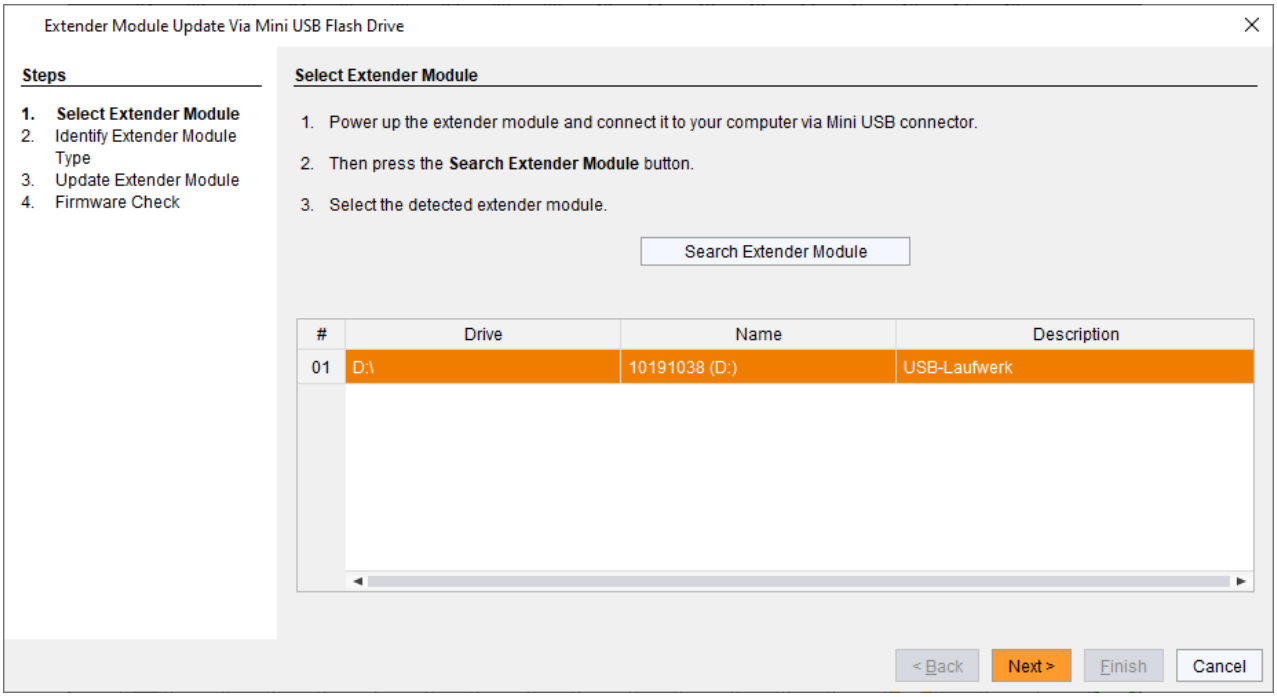


*Fig. 36 Management software **Flash Update - Select Extender Module***

The identification of the extender module type automatically starts.

After successful identification, the extender module specific firmware is displayed in the **Status Log** area.

9. Click **Next >** after successful identification.

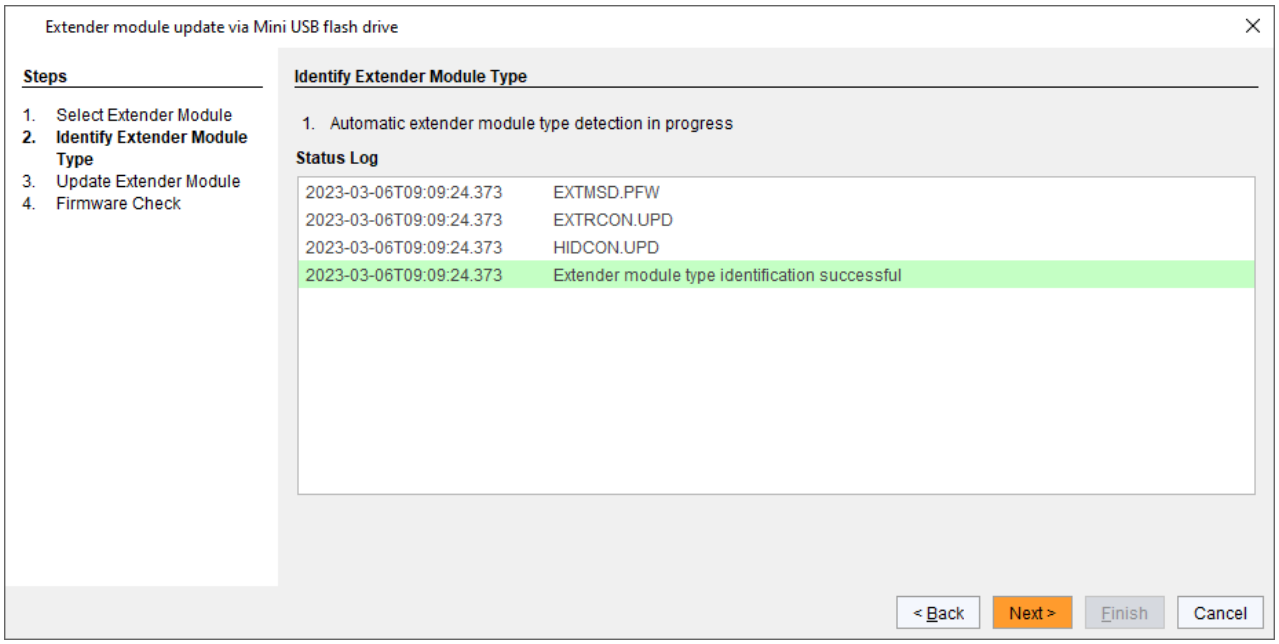


*Fig. 37 Management software **Flash Update - Identify Extender Module Type***

10. Click **Browse…** to go to the location the update files are saved.

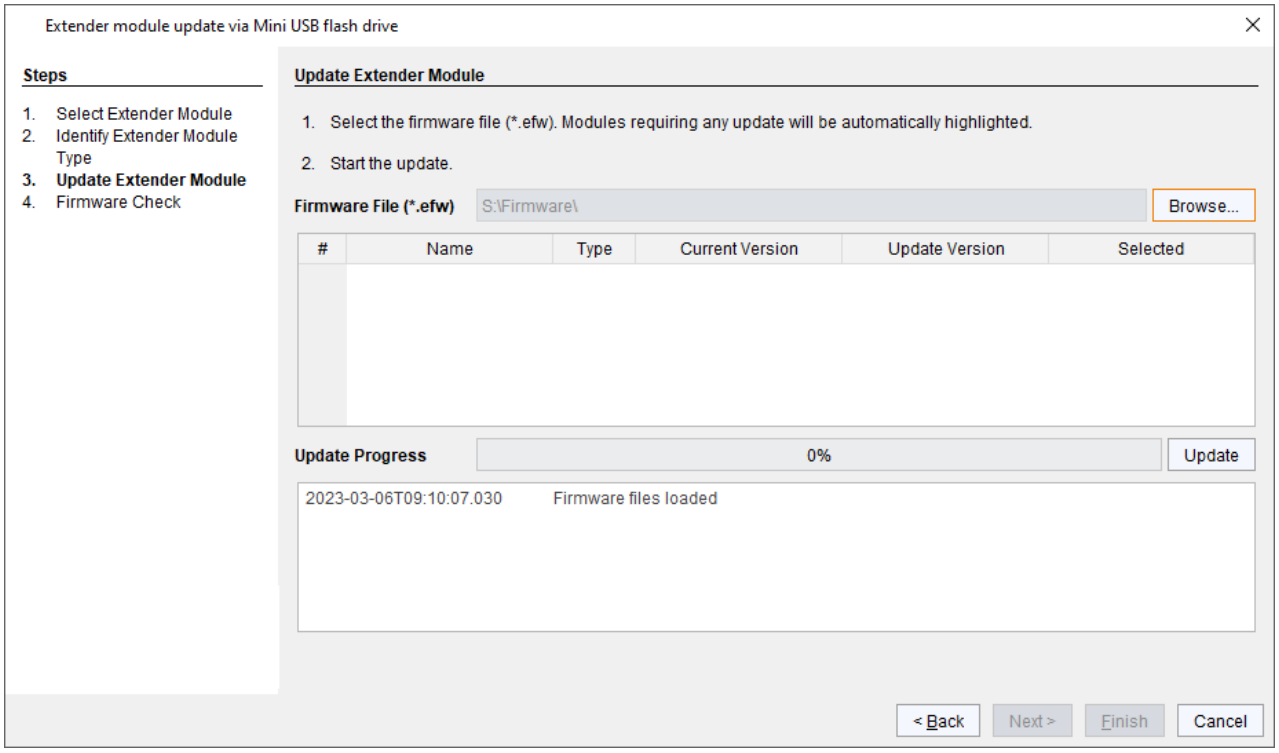


*Fig. 38 Management software **Flash Update - Update Extender Module - Select files***

11. Select the update files and click **Select** in the selection dialog.

    The firmware available for the extender module is displayed.

    Firmware requiring any update will be automatically highlighted.

12. Click **Update** to start the update process.

After the update of an MSD firmware, the extender module will automatically be restarted.

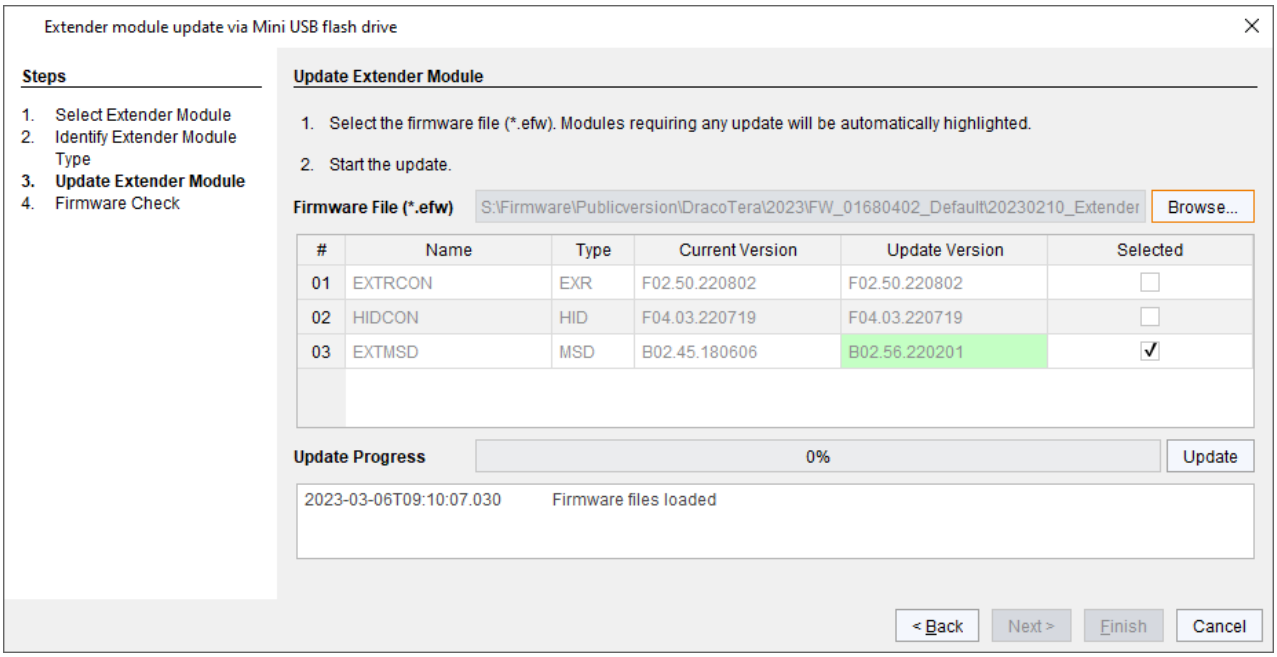


*Fig. 39 Management software **Flash Update - Update Extender Module - Load files***

A green highlighted message appears when the firmware update has been completed.

13. Click **Next >** to verify the update.

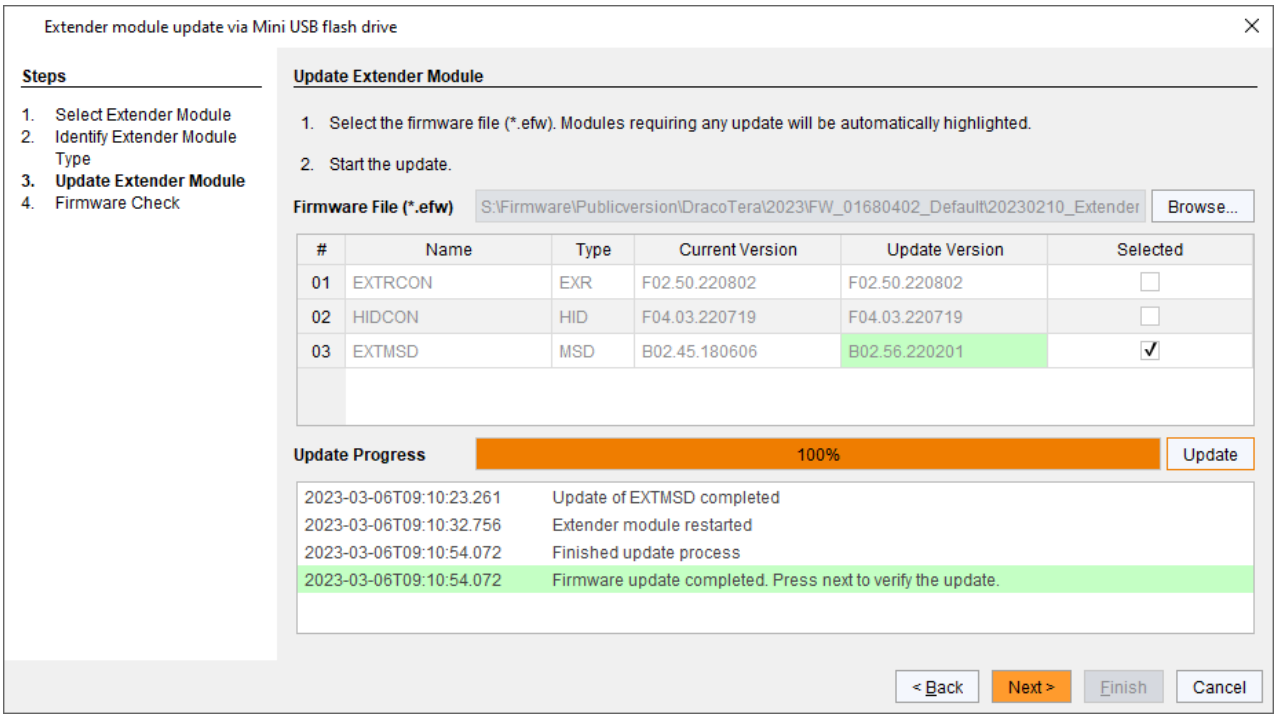


*Fig. 40 Management software **Flash Update - Update Extender Module - Firmware update completed***

14. Click **Next >**.
15. Manually power off the extender module.

16. Power on the extender module.

    The extender module restarts, and validation begins automatically. The completion of the validation is displayed in the **Status Log** area.

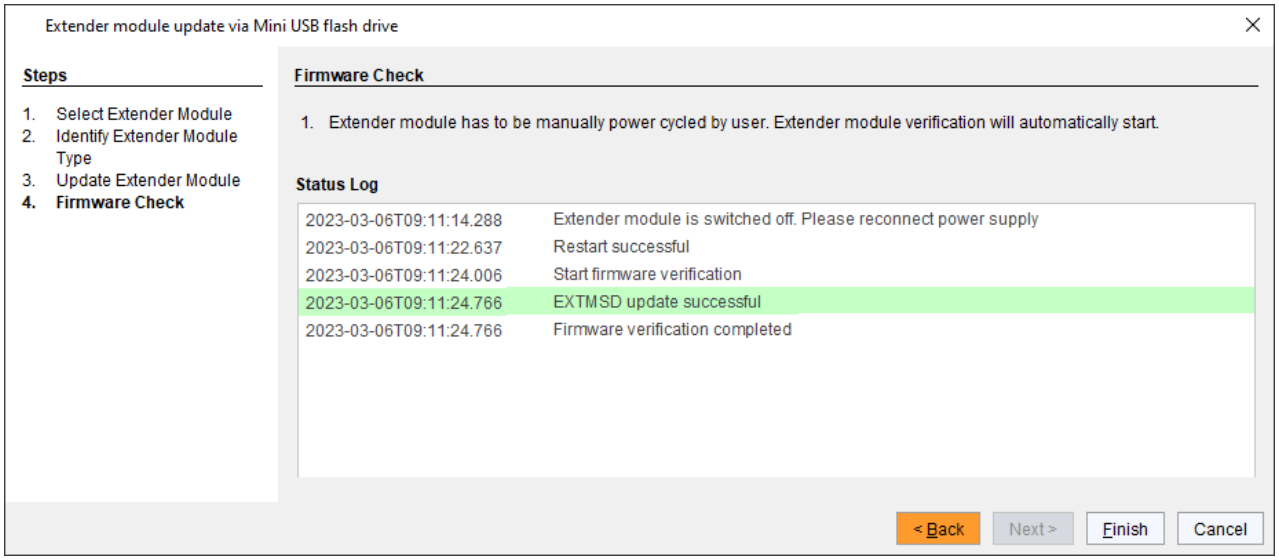


*Fig. 41 Management software **Flash Update - Firmware Check - Firmware verification completed***

17. Click **Finish**.

    The firmware update of the extender module is completed.

    A dialog appears offering to update another extender module.

18. Click **Yes** to update another extender module or click **No** and **Finish** to quit the Update dialog.

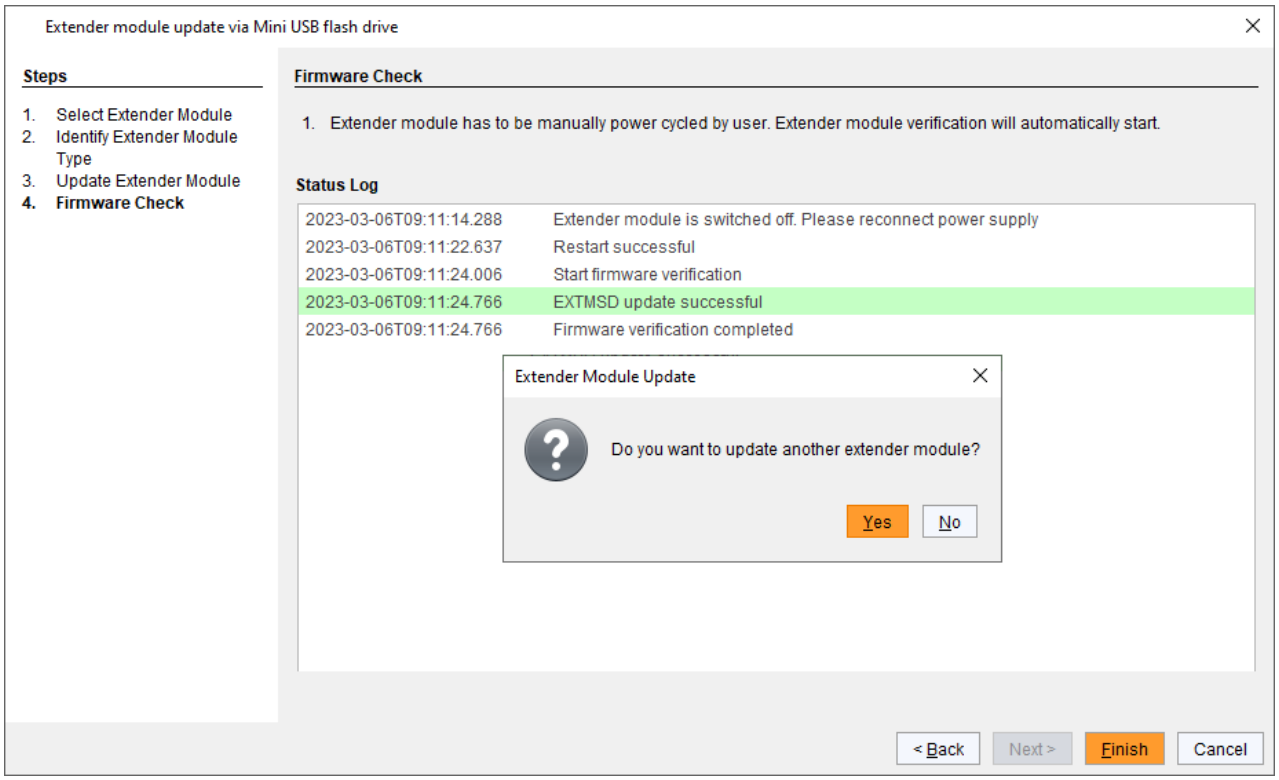


*Fig. 42 Management software **Flash Update - Firmware Check - Complete firmware update***

11.4 Updating the Firmware of Extender Modules via Copy & Paste

The extender modules can be updated via copy & paste using the Mini-USB service port of the extender modules. The firmware type is part of the file name, e.g., for the MSD firmware `EXTMSD.pfw` with the file extension .pfw

Updating the firmware manually via copy & paste is usually not necessary. We recommend using the efficient flash update via management software and to manually copy & paste only if a single firmware file should be updated. By means of the management software, the parameters set in the `Config.txt` file are retained, and the extender module is automatically updated with firmware of the same name.

In rare cases, e.g., for the xxxMSD firmware, an update may be necessary to expand the functionality of certain extender modules for specific requirements. In this case, please contact the technical support of the manufacturer in advance

NOTICE

To process successful firmware updates and avoid failures:

- ➡ For firmware update of the extender module, use only stand-alone computers that are not integrated into the extender module setup.
- ➡ Ensure that the computer used for the firmware update is not set into standby mode or sleep mode during the update.
- ➡ Always update the firmware with firmware of the same name. The firmware of 474 and 494 series are not compatible with each other. The firmware of 1G extender modules of one series is not compatible with the firmware of 3G extender modules.

NOTICE

Failures when updating the extender firmware

In case the xxxMSD firmware part of an extender module requires an update, there may be dependencies between the new contents of xxxMSD firmware files and other extender firmware files. In this case, installing other firmware files before updating xxxMSD firmware files could lead to failed updates.

To proceed successful firmware updates:

- ➡ Please check the release notes of the firmware package for dependencies between the extender firmware files.
- ➡ If you got information from the manufacturer's technical support that an update of xxxMSD firmware files of a certain extender module is required, please follow the instructions in this chapter.

By updating an xxxMSD firmware via copy & paste, the `Config.txt` file will be overwritten. If there are parameters set in the `Config.txt` file, they are lost and have to be set again. To avoid resetting the parameters:

- ➡ Store the `Config.txt` file locally before updating an xxxMSD firmware.
- ➡ Copy the stored `Config.txt` file after updating MSD firmware back to the flash drive of the extender module.

To achieve a successful firmware update, proceed as follows.

- ➡ Always update the firmware with firmware of the same name.
- ➡ First update the required xxxMSD firmware part.
- ➡ Update all firmware files sequentially, one by one, file by file.
- ➡ Wait between each copy process until the respective copy process has been completed.
- ➡ Restart the extender module after all copying operations of the other firmware files are completed.

However, if manually updating a single firmware part via Mini-USB service port on an extender module, we recommend updating all firmware on this extender module.

Preserving the Parameters of the Config.txt File

To store the `Config.txt` file before updating MSD firmware, if parameters have been set, proceed as follows:

1. Connect the extender module to any source using a Mini-USB cable.
   The extender module opens a flash drive containing the `Config.txt` file.
2. Copy the `Config.txt` file from the flash drive and paste it to a local directory of the connected computer.

Performing Firmware Updates via Copy & Paste

To perform a manually firmware update of an extender module via copy & paste using the Mini-USB service port, proceed as follows.

1. Connect the extender module to your computer via Mini-USB cable.
   The flash drive of the extender module opens.
2. Go to the location of the firmware update files.
3. If you got instructions from the manufacturer's technical support to update xxxMSD firmware part:
   3.1. Copy the first `xxxMSD.pfw` firmware file and paste it to the flash drive of the extender module.
   3.2. Wait until the copying process is complete.
   3.3. The extender module will be restarted after the copy process of the `xxxMSD.pfw` firmware file is completed.
   3.4. If several xxxMSD firmware parts have to be updated, copy and paste them individually. In each case, wait until the copying process has been completed and the extender module has been restarted.
4. Afterwards update the other firmware files changed if required, regarding the following steps:
   4.1. Copy additional firmware files one by one and paste it to the extender module flash drive.
   4.2. After copying each firmware file, wait until the copying process is complete.
5. Optionally: copy the stored `Config.txt` file from the local directory and paste it to the flash drive of the extender module.
6. Manually power off the extender module after copying all required firmware files.
7. Remove the Mini-USB cable from the extender module.
8. Power on the extender module.
   The extender module starts automatically with the new firmware.

11.5 Resetting an Extender Module to the Factory Settings

NOTICE
If a firmware update has been performed since the delivery, the latest installed firmware version is retained.

To reset extender modules back to default, there are the following possibilities:

Parameter

1. Connect the extender module to any source using a Mini-USB cable.
   The extender module opens a flash drive containing the `Config.txt` file.
2. Delete the `Config.txt` file.
3. Manually power off the extender module.
4. Power on the extender module.
   The extender module restarts and the extender module's parameters, such as Serial No., the manufacturing p/n, and the video signal details, are written in the `Config.txt` file.

USB HID Ghosting

1. Reset the USB HID Ghosting by entering this keyboard command: Hot Key, h, r, Enter.

EDID of Extender Modules

1. Connect the extender module to any source using a Mini-USB cable.
   The extender module opens a flash drive containing the `*.bin` file.
2. Delete the `*.bin` file.
3. Manually power off the extender module.
4. Power on the extender module.
   The extender module starts automatically, and the factory EDID is restored.

12 Troubleshooting

12.1 General Failures

Diagnosis	Possible reason	Measure
`Config.txt` parameter without function.	Parameter not set or saved.	➡ Write the parameter into `Config.txt` file and save changes.
	Start command `#CFG` not set.	➡ Write the start command #CFG into first line of the `Config.txt` file.
	Parameter written incorrectly.	➡ Check correct spelling and capitalization.
	Extender module not restarted.	➡ Restart the extender module.

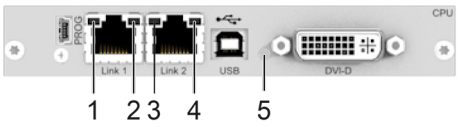
12.2 Blank Screen with Point-to-Point Connection

See also status indication of the extender modules in chapter 4.7, from page 25.

12.2.1 Blank Screen at DVI-D Extender Modules L-/R474-BSHx

The LED status is described using the example of redundant Cat X extender modules.

CPU side (CPU module)



Sink side (CON module)

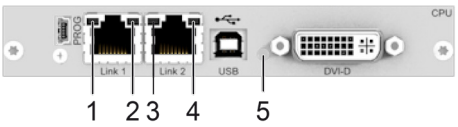


Fig. 43 Interface side extender modules - Failure indication L-/R474-BSHx

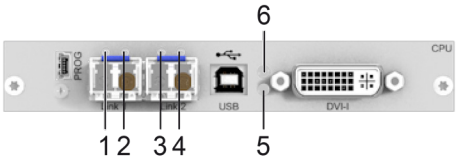
Diagnosis	Possible reason	Measure
All LEDs are off.	Power supply voltage not available.	➡ Check the power supply units. ➡ Check the connection to the power network.
LED **1/3** or **2/4** are flashing.	No link connection between CON Unit and CPU Unit available.	➡ Check the interconnect cables. ➡ Check the connectors.
CON Unit: LED **5** flashing red/violet/blue.	No link connection between CON Unit and CPU Unit available.	➡ Check the interconnect cables. ➡ Check the connectors.
	No video signal detected.	➡ Check the video cable to the source. ➡ Check the connectors. ➡ Download the EDID from console monitors (see chapter 8.1, page 46). ➡ Reboot the source if necessary.
CON Unit: LED **5** lights up violet.	No video signal detected.	➡ Check the video cable to the source. ➡ Check the connectors. ➡ Download the EDID from console monitors (see chapter 8.1, page 46). ➡ Reboot the source if necessary.

Diagnosis	Possible reason	Measure
CPU Unit: LED **5** light up red.	No link connection between CON Unit and CPU Unit available.	➡ Check the interconnect cables. ➡ Check the connectors.
	No video signal detected.	➡ Check the video cable to the source. ➡ Check the connectors. ➡ Download the EDID from console monitors (see chapter 8.1, page 46). ➡ Reboot the source if necessary.
CPU Unit: LED **5** lights up violet.	No video signal detected.	➡ Check the video cable to the source. ➡ Check the connectors. ➡ Download the EDID from console monitors (see chapter 8.1, page 46). ➡ Reboot the source if necessary.
CPU Unit: LED **5** flashing green/yellow.	No link connection between CON Unit and CPU Unit available.	➡ Check the interconnect cables. ➡ Check the connectors.

12.2.2 Blank Screen at DVI-I Extender Modules L-/R474-BVHx and L494-BVHx

The LED status is described using the example of redundant fiber extender modules.

CPU side (CPU module)



Sink side (CON module)

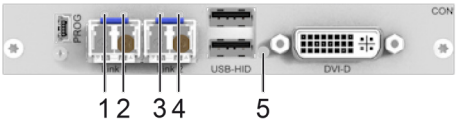


Fig. 44 Interface side extender modules - Failure indication L-/R474-BVHx and L494-BVHx

Diagnosis	Possible reason	Measure
All LEDs are off.	Power supply voltage not available.	➡ Check the power supply units. ➡ Check the connection to the power network.
LED **1/3** or **2/4** are flashing.	No link connection between CON Unit and CPU Unit available.	➡ Check the interconnect cables. ➡ Check the connectors.
CON Unit: LED **5** flashing red/violet/blue.	No link connection between CON Unit and CPU Unit available.	➡ Check the interconnect cables. ➡ Check the connectors.
	No video signal detected.	➡ Check the video cable to the source. ➡ Check the connectors. ➡ Download the EDID from console monitors (see chapter 8.1, page 46). ➡ Reboot the source if necessary.
CON Unit: LED **5** lights up violet.	No video signal detected.	➡ Check the video cable to the source. ➡ Check the connectors. ➡ Download the EDID from console monitors (see chapter 8.1, page 46). ➡ Reboot the source if necessary.
CPU Unit: LED **5 and 6** light up red.	No link connection between CON Unit and CPU Unit available.	➡ Check the interconnect cables. ➡ Check the connectors.
	No video signal detected.	➡ Check the video cable to the source. ➡ Check the connectors. ➡ Download the EDID from console monitors (see chapter 8.1, page 46). ➡ Reboot the source if necessary.
CPU Unit: LED **5** flashing green/yellow and LED **6** lights up yellow.	No link connection between CON Unit and CPU Unit available.	➡ Check the interconnect cables. ➡ Check the connectors.
CPU Unit: LED **5 and 6** light up violet.	No video signal detected.	➡ Check the video cable to the source. ➡ Check the connectors. ➡ Download the EDID from console monitors (see chapter 8.1, page 46). ➡ Reboot the source if necessary.

12.2.3 Blank Screen at DVI-I Extender Module L474-BSHxV

The LED status is described using the fiber extender module as an example.

CPU side (CPU module)

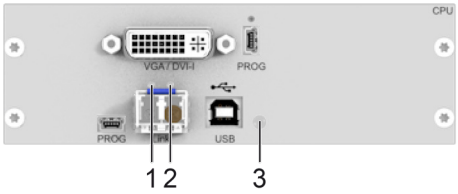


Fig. 45 Interface side extender module - Failure indication L474-BSHxV

Diagnosis	Possible reason	Measure
All LEDs are off.	Power supply voltage not available.	➡ Check the power supply units. ➡ Check the connection to the power network.
LED **1/3** are flashing.	No link connection between CON Unit and CPU Unit available.	➡ Check the interconnect cables. ➡ Check the connectors.
CPU Unit: LED **3** flashing green/yellow.	No link connection between CON Unit and CPU Unit available.	➡ Check the interconnect cables. ➡ Check the connectors.
	No video signal detected.	➡ Check the video cable to the source. ➡ Check the connectors. ➡ Download the EDID from console monitors (see chapter 8.1, page 46). ➡ Reboot the source if necessary.

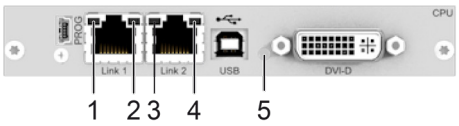
12.3 Blank Screen with Matrix Connection

See also status indication of the extender modules in chapter 4.7, from page 25.

12.3.1 Blank Screen at DVI-D Extender Modules L-/R474-BSHx

The LED status is described using the example of redundant Cat X extender modules.

CPU side (CPU module)



Sink side (CON module)

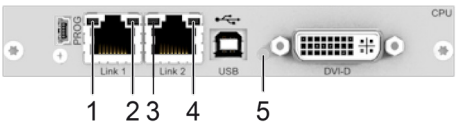


Fig. 46 Interface side extender modules - Failure indication L-/R474-BSHx

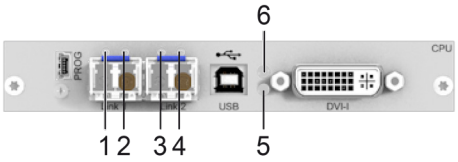
Diagnosis	Possible reason	Measure
All LEDs are off.	Power supply voltage not available.	➡ Check the power supply units. ➡ Check the connection to the power network.
LED **1/3** or **2/4** are flashing.	No link connection between CON Unit and CPU Unit available.	➡ Check the interconnect cables. ➡ Check the connectors.
CON Unit: LED **5** flashing red/violet/blue.	No link connection between CON Unit and CPU Unit available.	➡ Check the interconnect cables. ➡ Check the connectors.
	CON Device not switched to CPU Device.	➡ Switch the CON Device to the CPU Device.
	No video signal detected.	➡ Check the video cable to the source. ➡ Check the connectors. ➡ Download the EDID from console monitors (see chapter 8.1, page 46). ➡ Reboot the source if necessary.
CON Unit: LED **5** flashing green/light blue.	CON Device not switched to CPU Device.	➡ Switch the CON Device to the CPU Device.
	No video signal detected.	➡ Check the video cable to the source. ➡ Check the connectors. ➡ Download the EDID from console monitors (see chapter 8.1, page 46). ➡ Reboot the source if necessary.
CON Unit: LED **5** lights up violet.	No video signal detected.	➡ Check the video cable to the source. ➡ Check the connectors. ➡ Download the EDID from console monitors (see chapter 8.1, page 46). ➡ Reboot the source if necessary.

Diagnosis	Possible reason	Measure
CPU Unit: LED **5** light up red.	No link connection between CON Unit and CPU Unit available.	➡ Check the interconnect cables. ➡ Check the connectors.
	CON Device not switched to CPU Device.	➡ Switch the CON Device to the CPU Device.
	No video signal detected.	➡ Check the video cable to the source. ➡ Check the connectors. ➡ Download the EDID from console monitors (see chapter 8.1, page 46). ➡ Reboot the source if necessary.
CPU Unit: LED **5** flashing green/yellow.	No link connection between CON Unit and CPU Unit available.	➡ Check the interconnect cables. ➡ Check the connectors.
	CON Device not switched to CPU Device.	➡ Switch the CON Device to the CPU Device.
CPU Unit: LED **5** light up violet.	CON Device not switched to CPU Device.	➡ Switch the CON Device to the CPU Device.
	No video signal detected.	➡ Check the video cable to the source. ➡ Check the connectors. ➡ Download the EDID from console monitors (see chapter 8.1, page 46). ➡ Reboot the source if necessary.

12.3.2 Blank Screen at DVI-I Extender Modules L-/R474-BVHx and L494-BVHx

The LED status is described using the example of redundant fiber extender modules.

CPU side (CPU module)



Sink side (CON module)

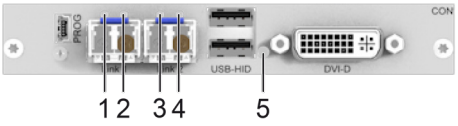


Fig. 47 Interface side extender modules - Failure indication L-/R474-BVHx and L494-BVHx

Diagnosis	Possible reason	Measure
All LEDs are off.	Power supply voltage not available.	➡ Check the power supply units. ➡ Check the connection to the power network.
LED **1/3** or **2/4** are flashing.	No link connection between CON Unit and CPU Unit available.	➡ Check the interconnect cables. ➡ Check the connectors.
CON Unit: LED **5** flashing red/violet/blue.	No link connection between CON Unit and CPU Unit available.	➡ Check the interconnect cables. ➡ Check the connectors.
	CON Device not switched to CPU Device.	➡ Switch the CON Device to the CPU Device.
	No video signal detected.	➡ Check the video cable to the source. ➡ Check the connectors. ➡ Download the EDID from console monitors (see chapter 8.1, page 46). ➡ Reboot the source if necessary.
CON Unit: LED **5** flashing green/light blue.	CON Device not switched to CPU Device.	➡ Switch the CON Device to the CPU Device.
	No video signal detected.	➡ Check the video cable to the source. ➡ Check the connectors. ➡ Download the EDID from console monitors (see chapter 8.1, page 46). ➡ Reboot the source if necessary.
CON Unit: LED **5** lights up violet.	No video signal detected.	➡ Check the video cable to the source. ➡ Check the connectors. ➡ Download the EDID from console monitors (see chapter 8.1, page 46). ➡ Reboot the source if necessary.
CPU Unit: LED **5 and 6** light up red.	No link connection between CON Unit and CPU Unit available.	➡ Check the interconnect cables. ➡ Check the connectors.
	CON Device not switched to CPU Device.	➡ Switch the CON Device to the CPU Device.
	No video signal detected.	➡ Check the video cable to the source. ➡ Check the connectors. ➡ Download the EDID from console monitors (see chapter 8.1, page 46). ➡ Reboot the source if necessary.

Diagnosis	Possible reason	Measure
CPU Unit: LED **5** flashing green/yellow and LED **6** lights up yellow.	No link connection between CON Unit and CPU Unit available.	➡ Check the interconnect cables. ➡ Check the connectors.
	CON Device not switched to CPU Device.	➡ Switch the CON Device to the CPU Device.
CPU Unit: LED **5 and 6** lights up violet.	CON Device not switched to CPU Device.	➡ Switch the CON Device to the CPU Device.
	No video signal detected.	➡ Check the video cable to the source. ➡ Check the connectors. ➡ Download the EDID from console monitors (see chapter 8.1, page 46). ➡ Reboot the source if necessary.

12.3.3 Blank Screen at DVI-I Extender Module L474-BSHxV

The LED status is described using the fiber extender module as an example.

CPU side (CPU module)

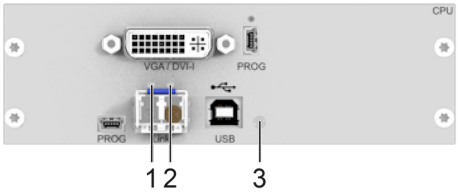


Fig. 48 Interface side extender module - Failure indication L474-BSHxV

Diagnosis	Possible reason	Measure
All LEDs are off.	Power supply voltage not available.	➡ Check the power supply units. ➡ Check the connection to the power network.
LED **1/3** are flashing.	No link connection between CON Unit and CPU Unit available.	➡ Check the interconnect cables. ➡ Check the connectors.
CPU Unit: LED **3** flashing green/yellow.	No link connection between CON Unit and CPU Unit available.	➡ Check the interconnect cables. ➡ Check the connectors.
	CON Device not switched to CPU Device.	➡ Switch the CON Device to the CPU Device.
	No video signal detected.	➡ Check the video cable to the source. ➡ Check the connectors. ➡ Download the EDID from console monitors (see chapter 8.1, page 46). ➡ Reboot the source if necessary.

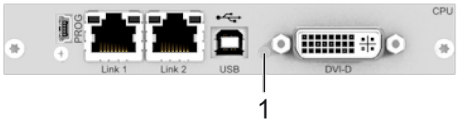
12.4 USB HID Failure with Point-to-Point Connection

See also status indication of the extender modules in chapter 4.7, from page 25.

12.4.1 USB HID Failure at DVI-D Extender Module L-/R474-BSHx

The LED status is described using the example of redundant Cat X extender modules.

CPU side (CPU module)



Sink side (CON module)

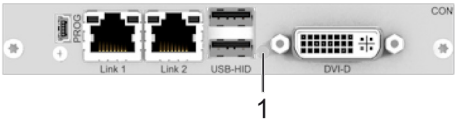


Fig. 49 Interface side extender modules - Failure indication L-/R474-BSHx

In the following, diagnoses, causes and measures are described for the case that a video signal is present.

Diagnosis	Possible reason	Measure
The **Caps Lock** and **Scroll Lock** LEDs on the keyboard are flashing.	The keyboard is in command mode.	➡ Press Esc to leave the command mode. ➡ Or press Left Shift + Esc to leave the command mode.
USB device without function.	No USB HID device detected.	➡ Check the connection of the USB HID cable to the USB HID device. ➡ Connect a USB HID device. ➡ Contact your distributor if necessary.
	The USB HID device is not supported.	➡ Check the compatibility. ➡ New connection of the USB HID device. ➡ Contact your distributor if necessary.
	No USB HID connection to the source available.	➡ Check the connection of the USB cable to the source, select another USB HID port if necessary. ➡ Remove the USB and power cables, first connect the power cable, then connect the USB cable, and restart the CPU Unit.
	Problems with the USB HID connection at the CON Unit.	➡ Check the connection of the USB HID cable to the USB HID device. ➡ Remove the USB HID and power cables, connect the power cable, then connect the USB cable, and restart the CON Unit.
CON Unit: LED **1** flashing green/light blue.	The keyboard is in command mode.	➡ Press Esc to leave the command mode. ➡ Or press Left Shift + Esc to leave the command mode.
	Shared operation of a redundant CPU Unit.	➡ Move the mouse or press a key to get back USB-HID control.

Diagnosis	Possible reason	Measure
CPU Unit: LED **1** lights up green.	The keyboard is in command mode.	➡ Press Esc to leave the command mode. ➡ Or press Left Shift + Esc to leave the command mode.
	Shared operation of a redundant CPU Unit.	➡ Move the mouse or press a key to get back USB-HID control.

12.4.2 USB HID Failure at DVI-I Extender Module L-/R474-BVHx and L494-BVHx

The LED status is described using the example of redundant fiber extender modules.

CPU side (CPU module) **Sink side (CON module)**

Fig. 50 Interface side extender modules - Failure indication L-/R474-BVHx and L494-BVHx

In the following, diagnoses, causes and measures are described for the case that a video signal is present.

Diagnosis	Possible reason	Measure
The **Caps Lock** and **Scroll Lock** LEDs on the keyboard are flashing.	The keyboard is in command mode.	➡ Press Esc to leave the command mode. ➡ Or press Left Shift + Esc to leave the command mode.
USB device without function.	No USB HID device detected.	➡ Check the connection of the USB HID cable to the USB HID device. ➡ Connect a USB HID device. ➡ Contact your distributor if necessary.
	The USB HID device is not supported.	➡ Check the compatibility. ➡ New connection of the USB HID device. ➡ Contact your distributor if necessary.
	No USB HID connection to the source available.	➡ Check the connection of the USB cable to the source, select another USB HID port if necessary. ➡ Remove the USB and power cables, first connect the power cable, then connect the USB cable, and restart the CPU Unit.
	Problems with the USB HID connection at the CON Unit.	➡ Check the connection of the USB HID cable to the USB HID device. ➡ Remove the USB HID and power cables, connect the power cable, then connect the USB cable, and restart the CON Unit.
CON Unit: LED **1** flashing green/light blue.	The keyboard is in command mode.	➡ Press Esc to leave the command mode. ➡ Or press Left Shift + Esc to leave the command mode.
	Shared operation of a redundant CPU Unit.	➡ Move the mouse or press a key to get back USB-HID control.
CPU Unit: LED **1** lights up green and LED **2** lights up yellow.	The keyboard is in command mode.	➡ Press Esc to leave the command mode. ➡ Or press Left Shift + Esc to leave the command mode.
	Shared operation of a redundant CPU Unit.	➡ Move the mouse or press a key to get back USB-HID control.

12.4.3 USB HID Failure at DVI-I Extender Module L474-BSHxV

The LED status is described using the fiber extender module as an example.

CPU side (CPU module)

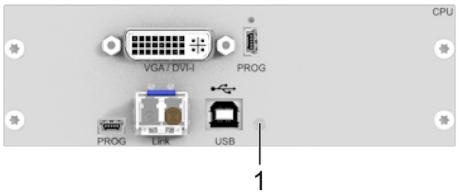


Fig. 51 Interface side extender module - Failure indication L474-BSHxV

In the following, diagnoses, causes and measures are described for the case that a video signal is present.

Diagnosis	Possible reason	Measure
The **Caps Lock** and **Scroll Lock** LEDs on the keyboard are flashing.	The keyboard is in command mode.	➡ Press Esc to leave the command mode. ➡ Or press Left Shift + Esc to leave the command mode.
USB device without function.	No USB HID device detected.	➡ Check the connection of the USB HID cable to the USB HID device. ➡ Connect a USB HID device. ➡ Contact your distributor if necessary.
	The USB HID device is not supported.	➡ Check the compatibility. ➡ New connection of the USB HID device. ➡ Contact your distributor if necessary.
	No USB HID connection to the source available.	➡ Check the connection of the USB cable to the source, select another USB HID port if necessary. ➡ Remove the USB and power cables, first connect the power cable, then connect the USB cable, and restart the CPU Unit.
	Problems with the USB HID connection at the CON Unit.	➡ Check the connection of the USB HID cable to the USB HID device. ➡ Remove the USB HID and power cables, connect the power cable, then connect the USB cable, and restart the CON Unit.
CPU Unit: LED **1** lights up green.	The keyboard is in command mode.	➡ Press Esc to leave the command mode. ➡ Or press Left Shift + Esc to leave the command mode.
	Shared operation of a redundant CPU Unit.	➡ Move the mouse or press a key to get back USB-HID control.

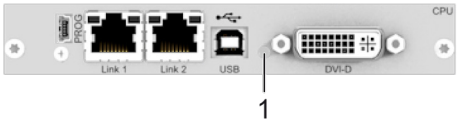
12.5 USB HID Failure with Matrix Connection

See also status indication of the extender modules in chapter 4.7, from page 25.

12.5.1 USB HID Failure at DVI-D Extender Modules L-/R474-BSHx

The LED status is described using the example of redundant Cat X extender modules.

CPU side (CPU module)



Sink side (CON module)

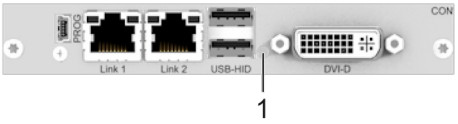


Fig. 52 Interface side extender modules - Failure indication L-/R474-BSHx

In the following, diagnoses, causes and measures are described for the case that a video signal is present.

Diagnosis	Possible reason	Measure
The **Caps Lock** and **Scroll Lock** LEDs on the keyboard are flashing.	The keyboard is in command mode.	➡ Press Esc to leave the command mode. ➡ Or press Left Shift + Esc to leave the command mode.
USB device without function.	No USB HID device detected.	➡ Check the connection of the USB HID cable to the USB HID device. ➡ Connect a USB HID device. ➡ Contact your distributor if necessary.
	The USB HID device is not supported.	➡ Check the compatibility. ➡ New connection of the USB HID device. ➡ Contact your distributor if necessary.
	No USB HID connection to the source available.	➡ Check the connection of the USB cable to the source, select another USB HID port if necessary. ➡ Remove the USB and power cables, first connect the power cable, then connect the USB cable, and restart the CPU Unit.
	Problems with the USB HID connection at the CON Unit.	➡ Check the connection of the USB HID cable to the USB HID device. ➡ Remove the USB HID and power cables, connect the power cable, then connect the USB cable, and restart the CON Unit.
CON Unit: LED **1** flashing green/light blue.	The keyboard is in command mode.	➡ Press Esc to leave the command mode. ➡ Or press Left Shift + Esc to leave the command mode.
	Device switched in **Video-only** Mode.	➡ Change access mode from **Video-only** to **Full Access**.
	Shared operation of a redundant CPU Unit.	➡ Move the mouse or press a key to get back USB-HID control.

Diagnosis	Possible reason	Measure
CPU Unit: LED **1** lights up green.	The keyboard is in command mode.	➡ Press Esc to leave the command mode. ➡ Or press Left Shift + Esc to leave the command mode.
	Device switched in **Video-only** Mode.	➡ Change access mode from **Video-only** to **Full Access**.
	Shared operation of a redundant CPU Unit.	➡ Move the mouse or press a key to get back USB-HID control.

12.5.2 USB HID Failure at DVI-I Extender Modules L-/R474-BVHx and L494-BVHx

The LED status is described using the example of redundant fiber extender modules.

CPU side (CPU module) **Sink side (CON module)**

Fig. 53 Interface side extender modules - Failure indication L-/R474-BVHx and L494-BVHx

In the following, diagnoses, causes and measures are described for the case that a video signal is present.

Diagnosis	Possible reason	Measure
The **Caps Lock** and **Scroll Lock** LEDs on the keyboard are flashing.	The keyboard is in command mode.	➡ Press Esc to leave the command mode. ➡ Or press Left Shift + Esc to leave the command mode.
USB device without function.	No USB HID device detected.	➡ Check the connection of the USB HID cable to the USB HID device. ➡ Connect a USB HID device. ➡ Contact your distributor if necessary.
	The USB HID device is not supported.	➡ Check the compatibility. ➡ New connection of the USB HID device. ➡ Contact your distributor if necessary.
	No USB HID connection to the source available.	➡ Check the connection of the USB cable to the source, select another USB HID port if necessary. ➡ Remove the USB and power cables, first connect the power cable, then connect the USB cable, and restart the CPU Unit.
	Problems with the USB HID connection at the CON Unit.	➡ Check the connection of the USB HID cable to the USB HID device. ➡ Remove the USB HID and power cables, connect the power cable, then connect the USB cable, and restart the CON Unit.
CON Unit: LED **1** flashing green/light blue.	The keyboard is in command mode.	➡ Press Esc to leave the command mode. ➡ Or press Left Shift + Esc to leave the command mode.
	Device switched in **Video-only** Mode.	➡ Change access mode from **Video-only** to **Full Access**.
	Shared operation of a redundant CPU Unit.	➡ Move the mouse or press a key to get back USB-HID control.

Diagnosis	Possible reason	Measure
CPU Unit: LED **1** lights up green and LED **2** lights up yellow.	The keyboard is in command mode.	➡ Press Esc to leave the command mode. ➡ Or press Left Shift + Esc to leave the command mode.
	Device switched in **Video-only** Mode.	➡ Change access mode from **Video-only** to **Full Access**.
	Shared operation of a redundant CPU Unit.	➡ Move the mouse or press a key to get back USB-HID control.

12.5.3 USB HID Failure at DVI-I Extender Module L474-BSHxV

The LED status is described using the fiber extender module as an example.

CPU side (CPU module)

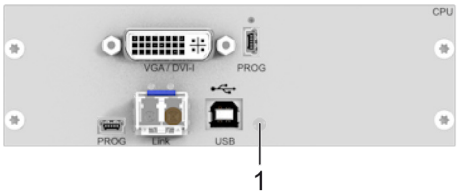


Fig. 54 Interface side extender module - Failure indication L474-BSHxV

In the following, diagnoses, causes and measures are described for the case that a video signal is present.

Diagnosis	Possible reason	Measure
The **Caps Lock** and **Scroll Lock** LEDs on the keyboard are flashing.	The keyboard is in command mode.	➡ Press Esc to leave the command mode. ➡ Or press Left Shift + Esc to leave the command mode.
USB device without function.	No USB HID device detected.	➡ Check the connection of the USB HID cable to the USB HID device. ➡ Connect a USB HID device. ➡ Contact your distributor if necessary.
	The USB HID device is not supported.	➡ Check the compatibility. ➡ New connection of the USB HID device. ➡ Contact your distributor if necessary.
	No USB HID connection to the source available.	➡ Check the connection of the USB cable to the source, select another USB HID port if necessary. ➡ Remove the USB and power cables, first connect the power cable, then connect the USB cable, and restart the CPU Unit.
CPU Unit: LED **1** lights up green.	The keyboard is in command mode.	➡ Press Esc to leave the command mode. ➡ Or press Left Shift + Esc to leave the command mode.
	Device switched in **Video-only** Mode.	➡ Change access mode from **Video-only** to **Full Access**.
	Shared operation of a redundant CPU Unit.	➡ Move the mouse or press a key to get back USB-HID control.

13 Technical Data

13.1 Interfaces

13.1.1 DVI-D Single Link

The video interface supports the DVI-D protocol. All signals that comply with DVI-D Single Link norm can be transmitted. This includes monitor resolutions such as 1920 x 1200 @ 60 Hz, Full HD (1080p60) or up to 2048 x 1152 @ 60 Hz. Data rate is limited to 165 MPixel/s.

13.1.2 DVI-I Single Link

The video interface supports the DVI-I protocol. All analog (VGA) or digital (DVI) signals that comply to DVI-I Single Link norm can be transmitted. This includes monitor resolutions such as 1920 x 1200 @ 60 Hz, Full HD (1080p60) or up to 2048 x 1152 @ 60 Hz. Data rate is limited to 165 MPixel/s.

13.1.3 USB HID

Our devices with USB HID interface support a maximum of two devices with USB HID protocol. Each USB HID port provides a maximum current of 100 mA.

Keyboard

Compatible with most USB keyboards. Certain keyboards with additional functions may require custom firmware to operate. Keyboards with an integral USB Hub (Mac keyboards e.g.) are also supported, however, a maximum of two devices are supported.

Mouse

Compatible with most 2-button, 3-button and scroll mice.

Other USB HID Devices

The proprietary USB emulation supports certain other USB HID devices, such as specific touch screens, graphic tablets, barcode scanners or special keyboards. However, support cannot be guaranteed for every USB HID device. In certain cases, such devices can be operated with special firmware.

Extension

If it is required to extend the USB HID signals on CPU or console side (e.g., mounting requirement), the signals can be extended either via a 3.0 m A-B cable (247-U2) or a 3.0 m USB A-A extension cable (436-USB20). The compatibility to other extension cables cannot be guaranteed.

Only two USB HID devices are supported concurrently, such as keyboard and mouse or keyboard and touch screen. A hub is allowed, but it does not increase the number of devices allowed.
To support other USB 'non-HID' devices, such as scanners, web cams or memory devices, use the USB 2.0 interfaces.

13.1.4 Mini-USB

The Mini-USB interface enables a customer specified communication with extender modules. The firmware could also be updated using this interface.

13.1.5 RJ45 (Interconnect)

Cat X devices offer a 1000BASE-T interface to establish an interconnection between Cat X devices. All four wire pairs are used in both directions. The cabling is suitable for a full duplex operation.

13.1.6 Fiber SFP Type LC (Interconnect)

The communication of fiber devices is performed via Gigabit SFPs that are connected to suitable fibers fitted with connectors type LC (see chapter 13.2.2, page 77).

NOTICE

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

NOTICE

SFP modules can be damaged by electrostatic discharge (ESD).

➡ Please consider ESD handling specifications.

13.2 Interconnect Cables

13.2.1 Cat X

NOTICE

Transmission problems

Routing over an active network component, such as an ethernet hub, switch, or router is not allowed. Operation with several patch fields is possible.

➡ Establish a point-to-point connection.

➡ Avoid routing Cat X cables along power cables.

NOTICE

Exceeding the limit of the device class

The use of unshielded Cat X cables with higher electromagnetic emissions/radiation can exceed the limit values for the specified device class.

➡ Correctly install shielded Cat X cable throughout interconnection, to maintain regulatory EMC compliance.

NOTICE

Exceeding limit values for electromagnetic radiation

The limit values for the electromagnetic radiation of the device are complied with if ferrites are mounted on both sides of all Cat X cables near the device. With installed ferrites, the devices meet the EU guidelines for electromagnetic compatibility. The operation of the devices without mounted ferrites leads to a loss of conformity with the EU directives.

➡ Mount ferrites on both sides of all Cat X cables near the device to maintain regulatory EMC compliance.

Type of Interconnect Cable

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

Type of cable	Specification
Cat X installation cable AWG24	S/UTP (Cat 5e) cable according to EIA/TIA-568, standard 568-A or 568-B. Four pairs of wires AWG24. We recommend using standard 568-A, but standard 568-B is also supported.
Cat X patch cable AWG26/8	S/UTP (Cat 5e) cable according to EIA/TIA-568, standard 568-A or 568-B. Four pairs of wires AWG26/8. We recommend using standard 568-A, but standard 568-B is also supported.

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

Maximum Transmission Range for Video and USB HID Signals (End-to-End Connection)

Type of cable	Maximum transmission range
Cat X installation cable AWG24	140 m (460 ft)
Cat X patch cable AWG26/8	70 m (230 ft)

13.2.2 Fiber

NOTICE

Transmission problems

Routing over an active network component, such as an ethernet hub, switch, or router is not allowed. Operation with several patch fields is possible.

➡ Establish a point-to-point connection.

Type of Interconnect Cable*

Type of cable	Specification
Single-mode 9 µm	• Two fibers 9 µm • 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 50 µm	• Two fibers 50 µm • I-V(ZN)H 2G50 (in-house patch cable) • I/AD(ZN)H 4G50 (in-house or outdoor breakout cable, resistant)

* Cable notations according to VDE

Maximum Transmission Range for Video and USB HID Signals (End-to-End Connection)

NOTICE

Transmission ranges when using add-on modules with transparent USB

When using L474/R474 add-on modules with transparent USB, the binding specifications stated in the data sheets of the add-on modules apply.

Type of cable	Bandwidth	Maximum transmission range
Single-Mode 9 µm	1G	10,000 m (32,808 ft)
Single-Mode 9 µm	3G	5,000 m (16,404 ft)
Multi-Mode 50 µm (OM3)	1G/3G	1,000 m (3,280 ft)
Multi-Mode 50 µm	1G/3G	400 m (1,312 ft)

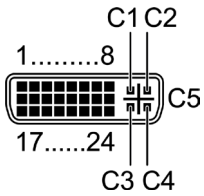
When using single-mode SFPs with multi-mode fiber optic cables, the maximum transmission range can usually be doubled.

Type of Connector

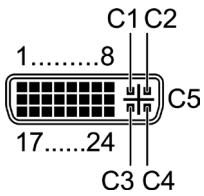
Connector	Type
Plug-in connector	LC-Connector

13.3 Connector Pinouts

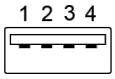
13.3.1 DVI-D Single Link

Connector	Pin	Signal	Pin	Signal
	1	T.M.D.S data 2 –	16	Hot Plug recognition
	2	T.M.D.S data 2 +	17	T.M.D.S data 0 –
	3	Shield T.M.D.S data 2/4	18	T.M.D.S data 0 +
	4	T.M.D.S data 4 –	19	Shield T.M.D.S data 0/5
	5	T.M.D.S data 4 +	20	T.M.D.S data 5 –
	6	DDC Clock	21	T.M.D.S data 5 +
	7	DDC Data	22	Shield T.M.D.S clock
	8	Not connected	23	T.M.D.S clock +
	9	T.M.D.S data 1 –	24	T.M.D.S clock –
	10	T.M.D.S data 1 +	C1	Not connected
	11	Shield T.M.D.S data 1/3	C2	Not connected
	12	T.M.D.S data 3 –	C3	Not connected
	13	T.M.D.S data 3 +	C4	Not connected
	14	+5 V DC	C5	Not connected
	15	GND	-	-

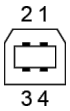
13.3.2 DVI-I Single Link

Connector	Pin	Signal	Pin	Signal
	1	T.M.D.S data 2 –	16	Hot Plug recognition
	2	T.M.D.S data 2 +	17	T.M.D.S data 0 –
	3	Shield T.M.D.S data 2/4	18	T.M.D.S data 0 +
	4	T.M.D.S data 4 –	19	Shield T.M.D.S data 0/5
	5	T.M.D.S data 4 +	20	T.M.D.S data 5 –
	6	DDC Clock	21	T.M.D.S data 5 +
	7	DDC Data	22	Shield T.M.D.S clock
	8	Analog vertical sync (VSync)	23	T.M.D.S clock +
	9	T.M.D.S data 1 –	24	T.M.D.S clock –
	10	T.M.D.S data 1 +	C1	Analog Red
	11	Shield T.M.D.S data 1/3	C2	Analog Green
	12	T.M.D.S data 3 –	C3	Analog Blue
	13	T.M.D.S data 3 +	C4	Analog horizontal sync (HSync)
	14	+5 V DC	C5	Analog GND (analog Red. Green, Blue return)
	15	GND	-	-

13.3.3 USB, Type A

Connector	Pin	Signal	Color
	1	+5 V (DC)	Red
	2	D -	White
	3	D +	Green
	4	GND	Black

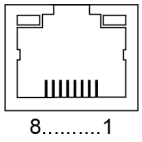
13.3.4 USB, Type B

Anschluss	Pin	Signal	Color
	1	+5 V (DC)	Red
	2	D -	White
	3	D +	Green
	4	GND	Black

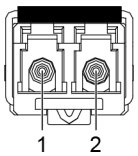
13.3.5 Mini-USB, Type B

Connector	Pin	Signal	Color
	1	+5 V (DC)	Red
	2	Data -	White
	3	Data +	Green
	4	Not connected	-
	5	GND	Black

13.3.6 RJ45 (Interconnect)

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

13.3.7 Fiber SFP Type LC (Interconnect)

Connector	Diode	Signal
	1	Data OUT
	2	Data IN

13.4 Environmental Conditions and Emissions

Parameter	Value
Operating temperature	5 to 45 °C (41 to 113 °F)
Storage temperature	-25 to 60 °C (-13 to 140 °F)
Relative humidity	Max. 80% non-condensing
Operating altitude	Max. 2.500 m (7,500 ft)
Heat dissipation	Corresponds to power consumption in Watt (W)

13.5 Current Draw and Power Consumption

NOTICE

Exceeding the maximum permissible current consumption

In addition to the current consumption of the extender and additional modules, there is also the current consumption by the connected periphery.

➡ Observe the maximum current consumption of the chassis (see chassis manual 474-BODY).

13.5.1 Current Draw and Power Consumption, Series 474

	CPU Unit L474-		CON Unit R474-	
Product type	Max. current draw	Max. power consumption	Max. current draw	Max. power consumption
BSHC	760 mA	4.6 W	910 mA	5.6 W
BSHCR	1,110 mA	6.5 W	1,190 mA	7.4 W
BSHS	690 mA	4.6 W	820 mA	4.6 W
BSHSR	890 mA	5.6 W	980 mA	5.6 W
BSHX	840 mA	4.6 W	920 mA	5.6 W
BSHCV	1,790 mA	10.2 W	n/a	n/a
BSHSV	1,740 mA	10.2 W	n/a	n/a
BSHXV	1,890 mA	11.1 W	n/a	n/a
BVHC	1,120 mA	6.5 W	920 mA	5.6 W
BVHCR	1,440 mA	8.3 W	1,190 mA	7.4 W
BVHS	1,010 mA	5.6 W	840 mA	4.6 W
BVHSR	1,200 mA	7.4 W	980 mA	5.6 W

n/a = not available

13.5.2 Current Draw and Power Consumption, Series 494

	CPU Unit L494- Max. current draw	CPU Unit L494- Max. power consumption
BVHC	1,110 mA	6.5 W
BVHCR	1,370 mA	8.3 W
BVHS	1,010 mA	5.6 W
BVHSR	1,180 mA	6.5 W
BVHX	1,010 mA	5.6 W

13.6 Dimensions

Product type	Dimensions
Extender modules	128.6 x 20 x 145 mm (5.1" x 0.8" x 5.7")

13.7 Weight

Product type	CPU Unit L474-	CON Unit R474-	CPU Unit L494-
BSHC	95 g	95 g	n/a
BSHCR	95 g	95 g	n/a
BSHS	95 g	95 g	n/a
BSHSR	95 g	95 g	n/a
BSHX	95 g	95 g	n/a
BSHCV	195 g	n/a	n/a
BSHSV	195 g	n/a	n/a
BSHXV	195 g	n/a	n/a
BVHC	120 g	120 g	125 g
BVHCR	125 g	125 g	125 g
BVHS	125 g	125 g	125 g
BVHSR	125 g	125 g	125 g
BVHX	n/a	n/a	125 g

n/a = not available

13.8 MTBF

Specific MTBF values (mean time between failure) can be requested from the manufacturer’s technical support if required.

14 Technical Support

Prior to contacting support please ensure you have read this manual, and then installed and set-up your KVM extender as recommended.

14.1 Support Checklist

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
- Date and number of sales receipt and 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

14.2 Shipping Checklist

1. To return your device, you need an RMA number (Return-Material-Authorization). Therefore, please contact your dealer.
2. Package your devices carefully. Add all pieces which you received originally. Preferably use the original box.
3. Note your RMA number visibly on your shipment.

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

15 Glossary

The following terms are commonly used in this manual or in video and KVM technology.

Term	Description
Cat X	Any Cat 5e (Cat 6, Cat 7) cable.
CON Device	Logical object that summarizes several EXT Units of physical extender modules (CON Units) to switch more complex sink systems via matrix.
CON Unit	Decoder extender module to connect to the console (monitor(s), keyboard, and mouse; optionally also with USB 2.0 devices).
Console	Monitor, keyboard, mouse, media control, external switching solution, etc.
CPU Device	Logical object that summarizes several EXT Units of physical extender modules (CPU Units) to switch more complex source systems via matrix.
CPU Unit	Encoder extender module to connect to a source.
Dual head	A system with two video ports.
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).
EDID	Extended Display Identification Data (EDID) is a metadata format (128 Byte) for display devices to describe their capabilities to a video source (e.g., graphics card).
ESD	Electrostatic discharge (ESD) describes a sudden flow of electricity between two electrically charged objects. This can be caused by an electrical short circuit or a dielectric breakdown. This must be considered when unpacking the extender modules, during assembly and first usage.
Fiber	Single-mode or multi-mode fiber cables.
KVM	Keyboard, video, and mouse.
MTBF	Mean Time Between Failure (MTBF) is measured in power-on hours and describes the system reliability.
Multi-Mode	50 µm multi-mode fiber cable.
OSD	The On-Screen-Display is used to display information or to operate a device.
SFP	SFPs (Small Form Factor Pluggable) are pluggable interface modules for Gigabit connections. SFP modules are available for Cat X and fiber cables.
Single head	A system with one video port.
Single-Mode	9 µm single-mode fiber cable.
USB HID	USB HID devices (Human Interface Device) allow users to interact with computers. There is no need for a special driver during installation. When connecting, the message “New USB HID device found” is reported. Typical USB HID devices include keyboards, mice, graphics tablets and touch screens. Storage, video, and audio devices are not USB HID devices.
VGA	Video Graphics Array (VGA) is a computer graphics standard with a typical resolution of 640x480 pixels and up to 262,144 colors.

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18 Change Log

This table offers an overview about the most important changes available, such as new functions, changed configuration or operation.

Edition	Date	Firmware version	Chapter	New functions/changes
REV02.01	2023-04-03	Latest version	1.3, 4.2.1, 4.5, 4.7.3 to 4.7.5, 12.2.1, 12.2.2, 12.3.1, 12.2.2	Chapter changed
REV02.00	2023-02-20	Latest version	11.3.1, 12.2 ff to 12.4 ff	Chapter changed
REV01.00	2023-02-17	Latest version	-	Initial user manual, Series 474 and 494 combined.