Draco vario HDMI KVM Extender Series 481/491

ihse.



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 13.1, page 64).

Trademarks and Trade Names

All trademarks 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 named on the cover page. Differences between the various models are clearly described. Please note the change log for this manual in chapter 17, page 68).

The manufacturer reserves the right to change specifications, functions or circuitry of the products 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.

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| 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 | | |

Available Documentation

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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.

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

A 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 | | | |
|-----------|--|--|--|--|
| 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 Tera Tool software, e.g., menus and buttons |
| Bold print > Bold print | Tera Tool 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 | ton 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.

Chassis:

The chassis are designed and intended for mounting or sliding-in IHSE KVM extender modules, IHSE add-on modules, or IHSE devices with extended function therein. The intended use includes the restrictions and safety instructions according to this manual. Non-intended use, non-observance of this user manual, as well as unauthorized modifications exclude the liability of the manufacturer for any resulting damages. The Chassis are described in the manual 474-BODY-REVx.

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.

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 Product Safety

The product safety of the chassis is proven by compliance with the standards listed:

Standards

- IEC 62368-1:2014
- EN 62368-1:2014/A11:207
- UL 62368-1:2014
- CAN/CSA-C22.2 No. 62368-1:2014

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



1.5.4 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 of 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 the 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 of.
- It is the customer's own responsibility to delete personal data on the equipment to be disposed of.

2 Safety Instructions

2.1 English

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

- Read this user manual carefully.
- Read the chassis user manual in which the extender modules are installed. The instructions, safety instructions and warnings 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.

$m \Lambda$ warning

Risk of electric shock due to freely accessible power connections when the chassis is open Risk of bruising, abrasion or shearing of fingertips due to rotating fan when the chassis is open

If the chassis is opened while power is supplied to the device, electric shock may occur if the internal wiring is touched. If a running fan is touched while the case is open, bruises, abrasions or shearing of fingertips may occur.

There are no necessary maintenance procedures that require opening the chassis.

- ➡ Do NOT remove the cover of the chassis.
- ➡ Do NOT install the device in environments where children are likely to be present.

Risk of burns due to tremendously heated chassis surface after a long period of operation

When the chassis is fully equipped, the surface of the chassis can become very warm after a long period of operation. If the chassis surface is touched after a long period of operation, this can cause skin burns.

- ➡ Wear protective gloves to transport a fully equipped chassis after a long period of operation.
- Ensure that there is sufficient distance from the operator, e.g., for mounting under a table.
- ➡ Do NOT install the device in environments where children are likely to be present.

Installation Location

While operating the device and the power supply units 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.
- For rack-mount installations, at least 0.5 RU (rack unit) is required above the device for ventilation.
- Do not place the power supply units directly on top of the device.
- Existing ventilation openings on the device must always be free.
- ▶ If installing the device under the table, place the device at a sufficient distance from the operator.
- Place all power sockets including the sockets for the supplied external power supply units easily accessible and directly next to each other.

Connection

- Check the device and the power supply units for visible damage before connecting it.
- Only connect the device if the device and the ports are not damaged.
- Only use power supply units originally supplied with the product or manufacturer-approved replacements.
- Only use power supply units without any visible damage at the chassis or the cable.
- Connect all power supply units to grounded outlets.

- Ensure that the ground connection is maintained from the outlet socket through to the power supply unit's AC power input.
- Only connect the device to KVM devices using the interconnecting cable not to other devices, particularly not to telecommunications or network devices.

Disconnect the Device from the Circuit

NOTICE

The cable plugs on the device side can contain a lock. In the event of a necessary quick and complete disconnection from external electric circuits:

- ➡ Remove all corresponding cable plugs from the socket,
- ➡ Or set the power switch of the power outlets (if available) to the "Off" position.

2.2 Français - 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.
- 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.

Risque de choc électrique dues de l'accès libre aux connexions électriques lorsque le châssis est ouvert Risque de contusion, d'abrasion ou de cisaillement des bouts des doigts dues de la rotation du ventilateur lorsque le châssis est ouvert

Si le châssis est ouvert alors que le périphérique est sous tension, un choc électrique peut se produire si le câblage interne est touché.

Si vous touchez un ventilateur en marche alors que le châssis est ouvert, vous risquez de vous blesser, de vous abraser ou de vous cisailler le bout des doigts.

Aucune procédure d'entretien nécessaire ne requiert l'ouverture du châssis.

- Ne retirez PAS le couvercle du châssis.
- ▶ N'installez PAS le périphérique dans des environnements où des enfants sont susceptibles d'être présents.

Risque de brûlures dues à la surface du châssis très chaude après une longue période d'utilisation

Lorsque le châssis est entièrement équipé, la surface du châssis peut devenir très chaude après une longue période de fonctionnement.

Si la surface du châssis est touchée après une longue période d'utilisation, cela peut provoquer des brûlures de la peau.

- Des gants de protection doivent être portés pour transporter un châssis entièrement équipé après une longue période d'opération.
- ◆ Veillez à ce que la distance avec l'opérateur soit suffisante, par exemple pour un montage sous une table.
- N'installez PAS le périphérique dans des environnements où des enfants sont susceptibles d'être présents.

Emplacement de l'installation

Pendant le fonctionnement, le périphérique et les unités d'alimentation peuvent 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.
- Pour les installations en rack, au moins 0,5 RU (unité de rack) est nécessaire au-dessus du périphérique pour la ventilation.
- Ne placez jamais les unités d'alimentation sur le dessus du périphérique.
- Les ouvertures de ventilation existantes sur le périphérique doivent toujours être libres.
- Si vous installez le périphérique sous la table, placez le périphérique à une distance suffisante de l'opérateur.
- Placez toutes les prises de courant, y compris les prises de courant pour les unités d'alimentation externes fournis, de manière facilement accessible et directement les unes à côté des autres.

Connexion

- Avant de connecter le périphérique et les unités d'alimentation, vérifiez qu'ils ne présentent pas de dommages visibles.
- Seulement connectez le périphérique et les unités d'alimentation que si le périphérique et les ports ne sont pas endommagés.
- Utilisez uniquement les unités d'alimentation fournis à l'origine avec le produit ou des pièces de rechange approuvées par le fabricant.
- N'utilisez que des unités d'alimentation sans dommages visibles au niveau du châssis ou du câble.
- Connectez tous les unités d'alimentation à des prises de terre.
- Raccordez tous les unités d'alimentation à des prises de courant mises à la terre.
- Veillez à ce que la connexion à la terre soit maintenue depuis la prise de courant jusqu'à l'entrée d'alimentation CA du les unités d'alimentation.
- 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.

Déconnecter le périphérique du circuit

AVIS

Les fiches de câble du côté du périphérique peuvent contenir un verrou. En cas de nécessité d'une déconnexion rapide et complète des circuits électriques externes :

- Retirez toutes les fiches de câble correspondantes de la prise.
- ➡ Ou mettez l'interrupteur des prises de courant (si elles existent) sur la position « Off ».

3 Description

System Overview 3.1

3.1.1 **KVM System in General**

This is an example for a point-to-point connection of KVM extender modules.

The CPU Unit is connected directly to the source using the supplied cables. The CON Unit is connected to the sink (display, keyboard, mouse). CPU Unit and CON Unit communicate with each other through the interconnection cable (Cat X, fiber).



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

- 1 Source
- 2 **CPU Unit**

- 4 CON Unit
- 5 Sink (monitor, keyboard, mouse)

3 Interconnection cable

This is an example for a matrix connection of KVM extender modules.

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 are connected to the matrix with interconnection cables. The matrix switches the CON unit to the CPU unit.



- **CPU Unit** 2
- Interconnection cable 3

- 5 CON Unit
- 6 Sink (monitor, keyboard, mouse)

3.1.2 Modular Draco vario System

Draco vario chassis allow you to combine individual Draco vario series extender modules and add-on modules to be in standalone or rack mounted configuration. The flexible, modular system offers 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 <u>https://dsd.ihse.com</u>, 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.

3.1.3 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: L4XX (L = Local)
- Extender module or add-on module for the CON Unit: R4XX (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. 3.



Fig. 3 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)

3.1.4 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-BAE2



Fig. 4 Embedding/de-embedding of signals in a KVM extender pair (example L /R474-BAE2)

- 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
- 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

7 USB-HID signal

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. 5 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-
- 7 HID signal
- 8 Video signal with embedded audio
- 9 Sink (console with monitor, keyboard, mouse, and speakers)
- 10 De-embedded digital audio signal

3.2 System Compatibility

3.2.1 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 | | K482 | 001 | X403 | R486 | R488 | R490 | R491 | R491-BUHx | R492 | | 7435 | R495 |
|-------|----|------|------|------|----|------|-----|------|------|------|------|------|-----------|------|----|------|------|
| | | SH | SH | SH | SH | DH | SH | DH | DH | SH | SH | SH | SH | SH | SH | DH | SH |
| L474 | SH | Х | Х | Х | Х | Х | Х | Х | Х | Х | Х | - | Х | - | - | Х | - |
| L477 | SH | Х | Х | Х | Х | Х | Х | Х | Х | Х | Х | - | Х | - | - | Х | - |
| L481 | SH | Х | Х | Х | Х | Х | Х | Х | Х | Х | Х | - | Х | - | - | Х | - |
| 1 482 | SH | Х | Х | Х | Х | Х | Х | Х | Х | Х | Х | - | Х | - | - | Х | - |
| L402 | DH | Х | Х | Х | Х | Х | Х | Х | Х | Х | Х | - | Х | - | - | Х | - |
| 1 /83 | SH | Х | Х | Х | Х | Х | Х | Х | Х | Х | Х | - | Х | - | - | Х | - |
| L403 | DH | Х | Х | Х | Х | Х | Х | Х | Х | Х | Х | - | Х | - | - | Х | - |
| L484 | SH | Х | Х | Х | Х | Х | Х | Х | Х | Х | Х | - | Х | - | - | Х | - |
| L486 | DH | Х | Х | Х | Х | Х | Х | Х | Х | Х | Х | - | Х | - | - | Х | - |
| L488 | SH | Х | Х | Х | Х | Х | Х | Х | Х | Х | Х | | Х | | | Х | |
| L490 | SH | - | - | - | - | - | - | - | - | - | Х | Х | Х | Х | Х | Х | Х |
| L491 | SH | - | - | - | - | - | - | - | - | - | Х | Х | Х | Х | Х | Х | Х |
| L492 | SH | - | - | - | - | - | - | - | - | - | Х | Х | Х | Х | Х | Х | Х |
| 1 403 | SH | - | - | - | - | - | - | - | - | - | Х | Х | Х | Х | Х | Х | Х |
| L493 | DH | - | - | - | - | - | - | - | - | - | Х | Х | Х | Х | Х | Х | Х |
| L494 | SH | | | | | | | | | | Х | Х | Х | Х | Х | Х | Х |
| L495 | SH | - | - | - | - | - | - | - | - | - | Х | Х | Х | Х | Х | Х | Х |

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

 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) Compatible up to the maximum transmission speed and interface compatibility (see chapter 3.2.2, page 17).

4) 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.

3.2.2 Audio Compatibility

The audio compatibility depends on the combination of extender modules and add-on modules, see following figure.



- * Extender modules of HDMI 1.3 series 481/491 and DP 1.1 series 483/493 support 5.1 channel digital audio whereas extender modules of HDMI 2.0 series 495 and DP 1.2 series 490 only support 2-channels.
- Requires an audio add-on module on the CPU Unit or the CON Unit
- ——— True embedded audio
- - Connection represents audio content only

Analog audio add-on modules are not necessarily audio compatible with each other since they use difference protocols. The following table lists the audio compatibility (X) and non-audio compatibility (-) for analog audio add-on modules:

| | R474-BAX RS232 @ 19.2 kBd | R474-BRX RS232 @ 115 kBd |
|------------------------------|------------------------------|-----------------------------|
| L474-BAX RS232 @ 19.2 kBd | Х | - |
| L474-BRX RS232 @ 115 kBd | - | Х |
| L474-BSX RS422 @ 115 kBd | - | х |

3.2.3 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 12.2.2, page 57).

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 Produkt Types

4.1 KVM Extender HDMI Series 481

| Part number | Module type | Codec | Max. resolution | USB- HID | Link | Local video port | Redun- dancy |
|-------------|----------------|---------|-----------------|-------------|----------|---------------------|-----------------|
| L481-BHHC | CPU, HDMI | Classic | 1920x1200 | Х | Cat X 1G | - | - |
| R481-BHHC | CON, HDMI | Classic | 1920x1200 | Х | Cat X 1G | - | - |
| L481-BHHCL | CPU, HDMI | Classic | 1920x1200 | Х | Cat X 1G | Х | - |
| R481-BHHCW | CON, HDMI | Classic | 1920x1200 | Х | Cat X 1G | Х | - |
| L481-BHHCLR | CPU, HDMI | Classic | 1920x1200 | Х | Cat X 1G | Х | Х |
| R481-BHHCWR | CON, HDMI | Classic | 1920x1200 | Х | Cat X 1G | Х | Х |
| L481-BHHCR | CPU, HDMI | Classic | 1920x1200 | Х | Cat X 1G | - | Х |
| R481-BHHCR | CON, HDMI | Classic | 1920x1200 | Х | Cat X 1G | - | Х |
| L481-BHHS | CPU, HDMI | Classic | 1920x1200 | Х | Fiber 1G | - | - |
| R481-BHHS | CON, HDMI | Classic | 1920x1200 | Х | Fiber 1G | - | - |
| L481-BHHSW | CPU, HDMI | Classic | 1920x1200 | Х | Fiber 1G | Х | - |
| R481-BHHSW | CON, HDMI | Classic | 1920x1200 | Х | Fiber 1G | Х | - |
| L481-BHHSWR | CPU, HDMI | Classic | 1920x1200 | Х | Fiber 1G | Х | Х |
| R481-BHHSWR | CON, HDMI | Classic | 1920x1200 | Х | Fiber 1G | Х | Х |
| L481-BHHSR | CPU, HDMI | Classic | 1920x1200 | Х | Fiber 1G | - | Х |
| R481-BHHSR | CON, HDMI | Classic | 1920x1200 | Х | Fiber 1G | - | Х |
| L481-BHXC | CPU, HDMI | Classic | 1920x1200 | - | Cat X 1G | - | - |
| R481-BHXC | CON, HDMI | Classic | 1920x1200 | - | Cat X 1G | - | - |
| L481-BHXS | CPU, HDMI | Classic | 1920x1200 | - | Fiber 1G | - | - |
| R481-BHXS | CON, HDMI | Classic | 1920x1200 | - | Fiber 1G | - | - |
| L481-BUHCL | CPU, HDMI 4K30 | Classic | 4K 30 Hz | Х | Cat X 1G | Х | - |
| R481-BUHCL | CON, HDMI 4K30 | Classic | 4K 30 Hz | Х | Cat X 1G | Х | - |
| L481-BUHCLR | CPU, HDMI 4K30 | Classic | 4K 30 Hz | Х | Cat X 1G | Х | Х |
| R481-BUHCLR | CON, HDMI 4K30 | Classic | 4K 30 Hz | Х | Cat X 1G | Х | Х |
| L481-BUHSL | CPU, HDMI 4K30 | Classic | 4K 30 Hz | Х | Fiber 1G | Х | - |
| R481-BUHSL | CON, HDMI 4K30 | Classic | 4K 30 Hz | Х | Fiber 1G | Х | - |
| L481-BUHSLR | CPU, HDMI 4K30 | Classic | 4K 30 Hz | Х | Fiber 1G | Х | Х |
| R481-BUHSLR | CON, HDMI 4K30 | Classic | 4K 30 Hz | Х | Fiber 1G | Х | Х |

All devices in the K481 series are technically compatible with devices in the K474 and K477 series.

4.2 KVM Extender HDMI Series 491

| Part number | Module type | Codec | Max. resolution | USB- HID | Link | Local video port | Redun- dancy |
|-------------|----------------|-------|-----------------|-------------|----------|---------------------|-----------------|
| L491-BUHCL | CPU, HDMI 4K30 | Ultra | 4K 30Hz | Х | Cat X 1G | Х | - |
| R491-BUHCL | CON, HDMI 4K30 | Ultra | 4K 30Hz | Х | Cat X 1G | Х | - |
| L491-BUHCLR | CPU, HDMI 4K30 | Ultra | 4K 30Hz | Х | Cat X 1G | Х | Х |
| R491-BUHCLR | CON, HDMI 4K30 | Ultra | 4K 30Hz | Х | Cat X 1G | Х | Х |
| L491-BUHSL | CPU, HDMI 4K30 | Ultra | 4K 30Hz | Х | Fiber 1G | Х | - |
| R491-BUHSL | CON, HDMI 4K30 | Ultra | 4K 30Hz | Х | Fiber 1G | Х | - |
| L491-BUHSLR | CPU, HDMI 4K30 | Ultra | 4K 30Hz | Х | Fiber 1G | Х | Х |
| R491-BUHSLR | CON, HDMI 4K30 | Ultra | 4K 30Hz | Х | Fiber 1G | Х | Х |

4.3 Accessories

4.3.1 Chassis

Accessories for the Chassis are described in the manual 474-BODY.

4.4 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 HDMI cable male/male, 2.0 m 1x USB cable 1.8 m (type A-B) Quick Setup |
| CPU Unit alone | 1x CPU Unit in Draco vario chassis 1x DisplayPort cable male/male, 2.0 m 1x USB cable 1.8 m (type A-B) Quick Setup |
| CON Unit alone | 1x CON Unit in Draco vario chassisQuick Setup |

[1] If anything is missing, please contact your distributor.

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

4.5 **Product Views (exemplary)**

L/R481-BHHC

Source side (CPU module)



- Fig. 7 Interface side extender modules HDMI series 481
- 1 Mini-USB, service interface
- 2 RJ45, interconnection
- 3 USB type B, USB-HID
- 4 HDMI input

Sink side (CON module)



- 1 Mini-USB, service interface
- 2 RJ45, interconnection
- 3 USB type A, USB-HID device 1
- 4 USB type A, USB-HID device 2
- 5 HDMI output

L481-BHHSLR

Source side (CPU module)

R481-BHHSWR

Sink side (CON module)



Fig. 8 Interface side extender modules HDMI series 481

- 1 Mini-USB, service interface
- 2 Fiber, primary interconnection
- 3 Fiber, secondary interconnection (redundancy)
- 4 USB type B, USB-HID
- 5 HDMI input
- 6 HDMI output (local)



- 1 Mini-USB, service interface
- 2 Fiber, primary interconnection
- 3 Fiber, secondary interconnection (redundancy)
- 4 USB type A, USB-HID device 1
- 5 USB type A, USB-HID device 2
- 6 USB type B, (for connection of local computer)
- 7 HDMI output
- 8 HDMI input (for connection of local computer)

L491-BUHCLR

Source side (CPU module)



Fig. 9 Interface side extender modules HDMI series 491

- 1 Mini-USB, service interface
- 2 Cat X, primary interconnection
- 3 Cat X, secondary interconnection (redundancy)
- 4 USB type B, USB-HID
- 5 HDMI input
- 6 HDMI output (local)

R491-BUHCLR

Sink side (CON module)



- 1 Mini-USB, service interface
- 2 Cat X, primary interconnection
- 3 Cat X, secondary interconnection (redundancy)
- 4 USB type A, USB-HID device 1
- 5 USB type A, USB-HID device 2
- 6 HDMI output
- 7 HDMI input (for connection of local workstation)

4.6 Status LEDs

KVM Extender Module LED on the PCB

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

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



Fig. 10 2-slot chassis front view with module LEDs

- 1 Status LED of upper module
- 2 Status LED of lower module

| 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. |
| | |
| O 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. |

Status LEDs at interface side

Source

(CPU module with local port and redundancy)



Fig. 11 Interface side of HDMI extender modules – Status LEDs

- 1 Failure LED link 1
- 2 Status LED link 1
- 3 Failure LED link 2
- 4 Status LED link 2
- 5 Status LED USB-HID and video signal

Sink

(CON module without local port and no redundancy)



- 1 Failure LED link
- 2 Status LED link
- 3 Status LED USB-HID and video signal
- The tables in the following section show the respective Link LED states/colors (left LED 1, 3 and right LED 2, 4 in the figures above) of the CPU Unit and the CON Unit for the respective situation.

| Pos. 1/3 | Pos. 2/4 | Description |
|----------------|----------------|---|
| Off | O Green | KVM connection available. |
| Off | Flashing green | No KVM connection available. |
| Flashing greeb | O Green | KVM connection failure (flashing for approx. 20 s following each occurring connection failure). |

4.6.1 KVM Connection via Cat X

4.6.2 KVM Connection via Fiber

| Pos. 1/3 | Pos. 2/4 | Description |
|--------------|--------------|---|
| Off | O Green | KVM connection available. |
| Off | Flashing red | No KVM connection available. |
| Flashing red | O Green | KVM connection failure (flashing for approx. 20 s following each occurring connection failure). |

4.6.3 Video and USB-HID Connection

The following table shows the respective LED color of the CPU Unit (LED 5 in the illustration on the previous page) and the CON Unit (LED 3 in the illustration on the previous page) for the respective situation.

| LED color | Description |
|------------|--|
| Red | Device ready |
| | |
| Violet | Connection and USB signal (interconnection) available. |
| | |
| O Green | Connection and video signal available. |
| | |
| Light blue | Connection, USB and video signal available (operating status). |

4.6.4 LEDs at Upgrade Module for CON Unit for local Computer

Sink

(CON module with add-on module for USB data transfer from a local computer, R481-BUHSL)





| Pos. | Color | | Status | Description |
|------|--------------|-----------|-----------------|--|
| | | | Off | No USB-HID device or not supported USB device connected. |
| 1, 2 | 2 🥥 Orango | Orange | Flashing fast | USB-HID device active. |
| | | | On | USB-HID device ready or KVM extender in command mode. |
| | | | | |
| | | | Off | - No power supply voltage |
| • | | 0.000.000 | | - Keyboard in command mode |
| 3 | \mathbf{i} | Jorange | Flashing slowly | KVM extender in command mode or no connection. |
| | | | Flashing fast | Operating status |

5 Installation

NOTICE

Please verify that interconnection cables, interfaces, and handling of the devices comply with the requirements (see chapter 12, page 54).

We recommend that first-time users set up the system in a test environment that is limited to a single room. This simplifies identifying and solving cabling problems and you can comfortably experiment with your system.

5.1 KVM Extender Setup

➡ Switch off all devices.

CON Unit Installation

- 1. Connect your monitor, keyboard and mouse to the CON unit.
- 2. Connect the CON unit to the power supply.

CPU Unit Installation

- 1. Connect the source (computer, CPU) to the CPU unit using the cables supplied. Please ensure the cables are not strained.
- 2. Connect the CPU unit to the power supply.

5.1.1 Creating Point to Point Connection

- 1. Connect CON unit and CPU unit using a Cat X or fiber connection cable.
- Power up the system, following the recommended sequence: monitor - CON unit - CPU unit – computer
- 3. Boot the source and check that everything works correctly.

5.1.2 Creating Matrix Connection

The matrix does not have to be switched off. Connecting new extender modules is possible while the matrix is running.

- 1. Connect installed CON and CPU units to a free port of the matrix using a KVM connection cable (Cat X, fiber).
- 2. Optional: With redundant extender modules, connect port 2 with a second KVM connection to the matrix preferably to another I/O board.
- 3. Switch on the extender modules or connect them with the power supply.

The matrix recognizes the extender modules and an EXT unit with the serial number of the extender module is created. Via the matrix, a respective CON or CPU Device can be created that allows you to switch a CON to a CPU unit. For more on matrix operation, please consult the matrix user manual.

5.2 Installation Examples

This section illustrates typical installations of KVM extender modules.

5.2.1 Single Head Point-to-Point Installation with Audio Add-on Module



Fig. 13 Installation example (point-to-point connection, single head audio add-on module)

- 1 Source
- 2 CPU Unit
- 3 Interconnect cable
- 4 CON Unit

- 5 Sink (monitor, keyboard, mouse)
- 6 Audio sink (optional, only with devices with add-on module analog audio/Serial option, digital audio, or balanced analog audio

5.2.2 Dual Head Point-to-Point Installation with Add-on Module USB 2.0



Fig. 14 Installation example (point-to-point connection, dual head with add-on module USB 2.0)

- 1 Source
- 2 CPU Unit
- 3 Interconnect cable
- 4 CON Unit

- 5 Sink (monitor, keyboard, mouse)
- 6 Second monitor (optional, only with dual head extender modules)
- 7 USB 2.0 devices (optional, only with add-on modules USB 2.0)

5.2.3 Matrix Installation



- 1 Sources
- 2 CPU Units
- 3 Interconnect cable
- 4 Matrix





Fig. 16 CPU unit with local feed-through combined with USB-HID CON upgrade module

It is possible to combine a CPU module with local feed-through with a USB-HID CON upgrade module to achieve full local KVM control.

CON Units

Sinks (monitor, keyboard, mouse)

5

6

- 1. Connect a monitor to the port HDMI OUT of the CPU module.
- 2. Connect keyboard and mouse to the USB ports of the USB-HID CON upgrade module.

6 Access Options

You have the 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. |
| Software Tera Tool | Firmware updates for extender modules can be performed via Tera Tool Software. Tera Tool is available in the form of a single executable program file. For extender modules connected to a matrix, additional functions are available in the Tera Tool 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. |

6.1 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 accessed 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 command mode | 2x Left Shift (Hot Key, factory setting) |
| Exit command mode | Esc and sometimes also Left Shift + Esc |
| Change of 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 manually 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.

7 Configuration

7.1 Transmission Parameters

7.1.1 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 Ultra Series

The device works with a manufacturer-optimized compression method, the so-called Lici® (Lightweight Image Coding) video codec from the Fraunhofer Institute for Integrated Circuits IIS. The transmission is optically loss-free, with no image loss (no frame drops) and 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 and the video signal details. If present, additional configuration parameters are displayed in the line directly below #CFG.

| 00 | Computer > 10174198 (F:) | |
|---------|---|--|
| Organis | ieren 🔻 🦳 Öffnen 🔻 Druck | en Brennen Neuer Ordner |
| E | Name BOOT_32K CONFIG.TXT DDC-EDID.BIN EXTHCPU.PFW EXTMSD.PFW MODULE_4.PFW MODULE_5.PFW | #CFG DotClk : 0 kHz H-Freq : 0 Hz V-Freq : 0 Hz Hres : 0 Vres : 0 Vtotal : 0 Vstart : 0 Vsync : 0 Htotal : 0 Hstart : 0 Hsync : 0 |
| | CONFIG.TXT Änderungsdatur Textdokument Gröf | m: 01.06.2022 00:00 3e: 512 Bytes |

Fig. 17 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 38).

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

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

The data area of the CPU 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. 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 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.
- 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

| //// *C | onfig.txt - Ed | itor | | | | | | _ | | Х |
|------------------------|----------------|--------|---------|-------|-------------------|------|----------------|------|---|--------|
| Datei | Bearbeiten | Format | Ansicht | Hilfe | | | | | | |
| #CFG ENAFR ENASY | ame 'NC | | | | | | | | | ~ |
| | | | | | | | | | | \sim |
| < | | | | | | | | | | > |
| | | | | | Zeile 4, Spalte 1 | 100% | Windows (CRLF) | UTF- | 8 | |



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.

EDID Management

| Parameter | Function |
|-----------|--|
| ENAHPDET | Enables hotplug switch for K238-5x series. |
| LOCKEDID | Activates EDID write protection. |

Compression

| Parameter | Function |
|-----------|--|
| MEDCPRATE | Activates medium compression rate. |
| MINCPRATE | Activates low compression rate. |
| MAXCPRATE | Activates high compression rate. |
| ENADITHER | Activates dithering filter for Mac OS systems. |

Digital Audio

| Parameter | Function |
|-----------|--|
| SRC32000 | Activates sample rate conversion, sample rate 32 kHz (only with digital audio upgrade module). |
| SRC44100 | Activates sample rate conversion, sample rate 44.1 kHz (only with digital audio upgrade module). |
| SRC48000 | Activates sample rate conversion, sample rate 48 kHz (only with digital audio upgrade module). |
| SRC96000 | Activates sample rate conversion, sample rate 96 kHz (only with digital audio upgrade module). |
| SRC_NONE | Deactivates sample rate conversion (only with digital upgrade module). |

Shared Operation

Only available for redundant CPU Units.

| Parameter | Function |
|----------------|--|
| KBDCON | Activates keyboard connect. |
| MOUCON | Activates mouse connect. |
| RELEASETIME=n* | Sets the release timer n = 09 seconds for mouse and keyboard connect. RELEASETIME=X deactivates the shared operation. |
| + 16 | |

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

7.6.2 Parameter for CON Units

The following parameters can be written into the configuration file of a CON Unit.

Output Settings

| Parameter | Function |
|------------|---|
| 1080p50Hz | Always display 50 Hz when using 1920x1080. |
| DISEXTOSD | Deactivates extender module OSD. |
| ENAFRAME | Shows orange colored frame when losing extender module connection. |
| ENAHOLDPIC | Shows last transmitted picture highlighted by an orange-colored frame when losing connection. |
| ENALOSTMR | Activates loss of signal timer to display the time passed since losing the connection or video signal. |
| ENADDCTX | Activates EDID transmission by unplugging and connecting the monitor back to the CON Unit. |
| ENAAUDIO | Enables RS232 or RS422 and analog audio during video only connections. |
| ENADVI | Output of a DVI signal with HDMI extenders (481 series) if DVI monitors are connected and the automatic monitor detection does not work. |
| ENAHDMI | Output of a DVI signal with HDMI extenders (481 series) if HDMI monitors are connected and the automatic monitor detection does not work. |

Redundancy

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

7.6.3 Parameters for CPU and CON Units

You have to write the following parameters into the configuration file of both CON Unit and CPU Unit.

Local switching

| Parameter | Function |
|-------------|--|
| BLANKSCR | Activates dark switching between local and remote console by keyboard or mouse event (only with HDMI extenders and local control by an USB-HID CON upgrade module). |
| PRIVATEMODE | Activates switching of video and control between local and remote console by keyboard commands (only with HDMI extenders and local control by an USB-HID CON upgrade module. |

USB 2.0 embedded

| Parameter | Function |
|-----------|--|
| ENAUSB11 | Activates USB 1.1 mode for USB 2.0 embedded upgrade modules (only with USB 2.0 embedded upgrade module). |

7.7 Parallel Operation of Redundant CPU Units

CPU Units with a redundant port for interconnection cables offer the possibility for 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

| Co | onfig.txt - Edit | tor | | | | | | - | - C |] | × |
|---------------|------------------|--------|---------|-------|-------------------|------|--------------|----|-------|---|----|
| Datei | Bearbeiten | Format | Ansicht | Hilfe | | | | | | | |
| #CFG RELEA | SETIME=5 | | | | | | | | | | ^ |
| | | | | | | | | | | | ~ |
| < | | | | | | | | | | | > |
| | | | | | Zeile 1, Spalte 1 | 100% | Windows (CRL | F) | UTF-8 | | .: |

Fig. 19 Example: Config.txt with parameter for shared 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 6.1, page 29).

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 interconnection 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 given in the table:

| 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.

8.3 Local KVM Switching

CON Units with local input have the possibility to connect a local source (computer, CPU). This allows an active manual switching between the extender connection and the local source (computer, CPU).

When using the local KVM switch function, the CPU upgrade module L474-BXH is necessary to get USB-HID access to the local CPU.

The following keyboard commands are available for switching.

| 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 (only with redundant CON Units) |
| Hot Key, I, Enter | Switches to the local source (computer, CPU). |

9 Summary of Keyboard Commands

In the following you find a summary of keyboard commands that can be used.

- 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 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 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. |
| Hot Key, I, Enter | Switches to the local source (computer, CPU) |

* 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.

9.4 Configuration

| Keyboard command | Function |
|---|---|
| current Hot Key, c, new Hot Key code, Enter | Changes the Hot Key according to the predefined Hot Key code table. |
| Current 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. |

9.5 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. |
| Hot Key, I, Enter | Switches to the local source (computer, CPU) |

10 Maintenance

10.1 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.

10.2 Firmware Update via Matrix

The firmware of the extender modules connected to a matrix can be updated via the matrix using the Tera Tool software. This is described in the Matrix and Tera Tool user manuals and should be the preferred method. It is also possible to do this directly (see next chapter).

10.3 Updating Firmware via Tera Tool Software

10.3.1 Tera Tool Requirements

For Windows

| Computer/Software/Net | work | Requirements/Recommendations |
|-----------------------|---------------|--|
| Free memory | RAM | Recommended: 1 GB |
| Operating system | Microsoft | Windows 10, Windows 11 |
| Connection | Mini USB port | Between computer and extender module with Mini USB/USB-A cable |

For MacOS, Linux

| Computer/Software/Net | twork | Requirements/Recommendations |
|-----------------------|---------------|---|
| Free memory | RAM | Recommended: 1 GB |
| Operating system | Linux | e.g. Ubuntu, Debian, Mint, openSUSE |
| 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. (<u>https://adoptopenjdk.net</u> , <u>https://github.com/ojdkbuild/ojdkbuild</u> |
| Connection | Mini USB port | Available via Mini USB cable between computer and extender module. |

10.3.2 Updating Firmware

NOTICE

To process successful firmware updates and avoid failures:

- For firmware update of the extender module, only use 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 1G extender modules of one series is not compatible with the firmware of 3G extender modules.

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

- 1. Run the Tera Tool software.
- 2. Click Flash Update in the toolbar.

| Flash U | odate X |
|---------|--|
| 1 | This update mode is intended for updating single devices that are not connected to a KVM matrix. Updating multiple devices connected to a matrix should be performed through the update options of the matrix itself. |
| | Extender Module Update Via Mini USB Flash Drive |
| | KM-Switch Update Via Mini USB Flash Drive |

Fig. 20 Tera Tool Software - Flash Update

3. Click Extender Module Via Mini-USB Flash Drive.

The update dialog appears.

| 🔀 Extender Module Update Via Mini USB Flash Drive | | | | × | |
|---|-------------------------------|---|---|-------------------------------|-----|
| Steps | Select Ex | tender Module | | | |
| Select Extender Module Identify Extender Module Type Update Extender Module Firmware Check | 1. Powe 2. Ther 3. Sele | er up the extender mod a press the Search Exte ct the detected extende | ule and connect it to your com nder Module button. r module. Search Extender Module | puter via Mini USB connector. | |
| | # | Drive | Name | Description | |
| "ihse. | • | | < <u>B</u> ack | Next > Einish Can | cel |

Fig. 21 Flash Update - Search Extender Module

- 4. Connect a Mini-USB/USB-A cable to the Mini-USB port of the extender module and the USB-A port of the computer running the Tera Tool software.
- 5. Power up the extender module.
- 6. Click Search Extender Module.

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

| 🔀 Extender Module Update Via Mir | ixtender Module Update Via Mini USB Flash Drive | | | | |
|--|---|--|--|------------------------------|-----------|
| Steps 1. Select Extender Module 2. Identify Extender Module Type 3. Update Extender Module 4. Firmware Check | <u>Select</u> 1. Po 2. Th 3. Se | Extender Module ower up the extender modul hen press the Search Exter elect the detected extender | le and connect it to your comp n der Module button. module. Search Extender Module | uter via Mini USB connector. | |
| | # 01 | Drive D:\ | Name 10191038 (D:) | Description USB-Laufwerk | |
| ïhse. | | • | < Back | Next > Einish Car | ► ncel |

Fig. 22 Flash Update - Select Flash Drive

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

The identification of the extender module type starts automatically.

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

| 🙀 Extender module update via Mini USB flash drive | | | | |
|--|--|--|---|--|
| Steps | Identify Extender Module Type | | | |
| 1. Select Extender Module 2. Identify Extender Module | 1. Automatic extender modul | e type detection in progress | | |
| 3. Update Extender Module 4. Firmware Check | 2024-08-21T14:33:48:352 | EXTMSD.PFW EXTRCPU PEW | | |
| | 2024-08-21T14:33:48:352 2024-08-21T14:33:48:352 | HIDCPU.PFW Extender module type identification successful | | |
| | | | | |
| "ihse. | | | | |
| | | < <u>Back</u> Next> <u>Finish</u> Cance | I | |

Fig. 23 Flash Update - Identification of Extender Module Type

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

| 🔀 Extender module update via Min | ii USB flasł | h drive | | | | × |
|---|---|-----------------|--------------|-----------------|-----------------------|----------|
| Steps | Update | Extender Modul | le | | | |
| Select Extender Module Identify Extender Module Type Update Extender Module | Select the firmware file (*.efw). Modules requiring any update will be automatically Start the update. | | | | | |
| 4. Firmware Check | Firmwa | re File (*.efw) | S:\Firmware\ | | | Browse |
| | # | Name | Туре | Current Version | Update Version | Selected |
| | | | | | | |
| •••• | Update | Progress | | 0% | | Update |
| inse. | | | | | | |
| | | | | < <u>B</u> ack | Next > <u>F</u> inish | Cancel |

Fig. 24 Flash Update - Update Extender Module - Select files

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

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.

| 🔀 Extender module update via Mini USB flash drive | | | | | × | |
|---|---|---------------------------------------|-------------------------|--------------------------|------------------------------|-------------|
| Steps 1. Select Extender Module 2. Identify Extender Module | <u>Updat</u> 1. S | e Extender Modu elect the firmware | le e file (*.efw). N | lodules requiring any up | date will be automatically | / highlight |
| Type 3. Update Extender Module 4. Firmware Check | 2. Start the update. Firmware File (*.efw) S:\Firmware\DracoTera\FV | | | \DracoTera\FW_016804 | FW_01680402_20240610_Extende | |
| | # | Name | е Туре | Current Version | Update Version | Selected |
| | 01 | EXTRCON | EXR | F02.50.220802 | F02.50.220802 | |
| | 02 | HIDCON | HID | F04.03.220719 | F04.03.220719 | |
| | 03 | EXTMSD | MSD | B02.56.220201 | B02.56.240506 | V |
| ihse. | Updat | e Progress I-08-21T14:33:54 | .030 Fii | 0% mware files loaded | | Update |
| - | | | | < <u>B</u> ack | Next > <u>F</u> inish | Cancel |

Fig. 25 Flash Update - Update Extender Module - Load files

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

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

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

| teps Select Extender Module Identify Extender Module Type Update Extender Module | <u>Updat</u> 1. S 2. S | e Extender Modu elect the firmward tart the update. | ile e file (*.efw). M | odules requiring any u | pdate will be automaticall | y highlighted |
|--|------------------------------|---|--------------------------|------------------------|-------------------------------|---------------|
| Firmware Check | Firmw | are File (*.efw) | S:\Firmware | DracoTera\FW_01680 | 402_20240610_Extende | Browse |
| | # | Name | Туре | Current Version | Update Version | Selected |
| | 01 | EXTRCON | EXR | F02.50.220802 | F02.50.220802 | |
| | 02 | HIDCON | HID | F04.03.220719 | F04.03.220719 | |
| | 03 | EXTMSD | MSD | B02.56.220201 | B02.56.240506 | \checkmark |
| | Updat | e Progress | | 100% | 6 | Update |
| | 2024 | -08-21T15:23:48 | .352 Up | date of EXTMSD comp | leted | |
| | 2024 | -08-21T15:23:48 | .756 Ex | tender module restarte | d | |
| | 2024 | -08-21T15:24:12 | .072 Fir | ished update process | | |
| INSE. | | -08-21T15:24:12 | 072 Fir | mware update comple | ted. Press next to verify the | e update. |

Fig. 26 Flash Update - Update Extender Module - Firmware update completed

- 13. Click **Next >** to verify the update.
- 14. Manually power off the extender module by disconnecting the power cord.
- 15. Reestablish the power supply by plugging in the power cord.

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

| 🔀 Extender module update via Mini USB flash drive | | | | | |
|---|---|--|--|--|--|
| Steps | Firmware Check | | | | |
| Select Extender Module Identify Extender Module Type | Extender module has to be automatically start. | e manually power cycled by user. Extender module verification will | | | |
| 3. Update Extender Module | Status Log | | | | |
| | 2024-08-21T15:24:29.288 2024-08-21T15:24:37.637 2024-08-21T15:24:39.006 2024-08-21T15:24:39.766 2024-08-21T15:24:39.766 | Extender module is switched off. Please reconnect power supply Restart successful Start firmware verification EXTMSD update successful Firmware verification completed | | | |
| "ihse. | | < <u>B</u> ack Next > <u>F</u> inish Cancel | | | |

Fig. 27 Flash Update - Firmware Check – Firmware verification completed

16. Click Finish.

The firmware update of the extender module is completed.

A dialog appears offering to update another extender module.

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

10.4 Updating Firmware 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 Tera Tool software and to manually copy & paste only if a single firmware file should be updated. By means of the Tera Tool 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:

- 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. Manually power off the extender module after the copying process of the xxxMSD.pfw firmware file is completed. Power it on again.
 - 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, power off the extender module and power it on again.
- 4. Afterwards update the other firmware files 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, power off the extender module and power it on again.
- 5. After the last update, remove the Mini USB cable before powering the extender module on.

The extender module starts automatically with the new firmware.

10.5 Resetting an Extender Module to the Factory Settings

NOTICE

When 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 ${\tt Config.txt}$ 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 into the Config.txt file. The Config.txt file is in the default state and does not contain any parameters.

USB-HID Ghosting

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

EDID of CPU Extender Modules

- Connect the CPU 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.

11 Troubleshooting

11.1 General Failures

| Diagnosis | Possible reason | What to do | |
|---|--------------------------------|--|--|
| 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. | |

11.2 Blank Screen

See also status indication of the extender modules in chapter 4.6, from page 23.

Source side (CPU module)

Sink side (CON module)



Fig. 28 Interface side HDMI extender modules - Failure indication

| Diagnosis | Possible reason | What to do | | |
|--|---|---|--|--|
| 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 interconnection cables. Check the connectors. | | |
| CON Unit: LED 3 red or yellow | No link connection between CON Unit and CPU Unit available. | Check the interconnection cables. Check the connectors. | | |
| | No monitor detected. | Check connection, length and quality of the HDMI cable to the monitor, tighten cable thumbscrews. | | |
| | 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 38). Reboot the source if necessary | | |
| CPU Unit: LED 5 red or yellow | 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 38). Reboot the source if necessary. | | |

11.3 USB-HID Failure

See also status indication of the extender modules in chapter 4.6, from side 23.

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

Source side (CPU module)



Sink side (CON module)



Fig. 29 HDMI extender modules - Failure indication

| Diagnosis | Possible reason | What to do | |
|---|---|---|--|
| 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 3 green or violet. | 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 3 green or violet. | 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. | |

11.4 Upgrade Module USB-HID (L/R474-BXH)

Source side (CPU module)



Sink side (CON module)



Fig. 30 Upgrade module USB-HID - Failure indication

| Diagnosis | Possible reason | What to do |
|---|---|---|
| LED 1 / 2 off | Device at higher / lower USB-HID port not detected. | Check connection of USB cable to USB- HID device. Connect USB-HID device. Contact your dealer if necessary. |
| CPU Unit: LED 3 off | Connection between CON Unit and CPU Unit | Check interconnection cables and connectors. |
| CON Unit: LED 3 off | Keyboard in command mode | Press <esc> to leave command mode.</esc> |
| CON Unit: LED 3 flashing slowly | Connection between CON Unit and CPU Unit | Check interconnection cable and connections. |
| | Keyboard in Command Mode | ➡ Press <esc> to leave Command Mode.</esc> |

The USB-HID CON module (R474-BXH) can be combined with a CPU module with local feed-through port to achieve full KVM control at the spot (see section 5.2.4, page 28).

12 Technical Data

12.1 Interfaces

12.1.1 HDMI Single-Link

Video

The audio / video interface can transmit monitor resolutions such as 1920x1200@60Hz, Full HD (1080p) or 2K HD (up to 2048x1152). Data rate is limited to 165 MPixel/s and 8 bits.

Audio

Various audio formats can be transmitted through the interface.

| Standards | Stereo Linear Pulse Code Modulation (LPCM), DTS, DTS-HD (5.1), Dolby Digital, Dolby Digital Plus (5.1) |
|-------------|---|
| Bit Depth | 16 to 24 bits |
| Sample Rate | 32 to 192 kHz |

3D

The interface is compatible with 3D. The 3D formats Side-by-Side and Top-and-Bottom can be transmitted.

HDCP coded content is currently not supported.

12.1.2 HDMI 4K30

Video

The video interface supports the HDMI standard up to 4K30 resolutions. All signals that comply with this standard can be transmitted. This includes monitor resolutions up to 4096x2160@24Hz or 3840x2160@30Hz (UHD). Data rate is limited to 14,4 Gbit/s, bit depth is 24 bits (4:4:4).

Audio and 3D

Same as described in section 12.1.1.

12.1.3 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 with other extension cables cannot be guaranteed.

Conly 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.

12.1.4 USB 2.0

Extender modules with transparent USB 2.0 support allow the connection of **all** types of USB 2.0 devices (without restriction). USB 2.0 data transfer is supported, depending on the upgrade module, with USB high speed (max. 480 Mbit/s) or USB embedded (max. 36/100/480 Mbits, depending on extender type).

Each USB embedded port provides a maximum current of 500 mA (high power). When using a USB high speed interface with 4 USB ports, respectively 2 connectors, provide a maximum of 500 mA (high power) and 2 connectors a maximum of 100 mA.

12.1.5 Mini-USB

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

12.1.6 RJ45 (Interconnection)

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

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

12.1.7 Fiber SFP Type LC (Interconnection)

The communication of fiber devices is performed via Gigabit SFPs that are connected to suitable fibers fitted with connectors type LC (see chapter 12.2.2, page 57).

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.

12.2 Interconnection Cables

12.2.1 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 Interconnection Cable

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

12.2.2 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 Interconnection 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 um | 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 | Туре |
|-------------------|--------------|
| Plug-in connector | LC-Connector |

12.3 Pinouts

12.3.1 HDMI Single-Link

| Connector | Pin | Signal | Pin | Signal |
|--------------------------|-----|--------------------|-----|-------------------------|
| 19 17 15 12 11 9 7 5 2 1 | 1 | T.M.D.S data 2+ | 11 | T.M.D.S clock GND |
| | 2 | T.M.D.S data 2 GND | 12 | T.M.D.S clock- |
| | 3 | T.M.D.S data 2- | 13 | CEC |
| | 4 | T.M.D.S data 1+ | 14 | - |
| | 5 | T.M.D.S data 1 GND | 15 | DDC Input (SCL) |
| | 6 | T.M.D.S data 1- | 16 | DDC Output (SDA) |
| | 7 | T.M.D.S data 0+ | 17 | DDC/CEC/HEC GND |
| | 8 | T.M.D.S data 0 GND | 18 | +5V (DC) high impedance |
| | 9 | T.M.D.S data 0- | 19 | Hot Plug recognition |
| | 10 | T.M.D.S clock+ | | |

12.3.2 HDMI 4K30

| Connector | Pin | Signal | Pin | Signal |
|--------------------------|-----|--------------------|-----|-------------------------|
| 19 17 15 13 11 9 7 5 3 1 | 1 | T.M.D.S data 2+ | 11 | T.M.D.S clock GND |
| | 2 | T.M.D.S data 2 GND | 12 | T.M.D.S clock- |
| | 3 | T.M.D.S data 2- | 13 | CEC |
| | 4 | T.M.D.S data 1+ | 14 | HEC Data+ |
| | 5 | T.M.D.S data 1 GND | 15 | DDC Input (SCL) |
| | 6 | T.M.D.S data 1- | 16 | DDC Output (SDA) |
| | 7 | T.M.D.S data 0+ | 17 | DDC/CEC/HEC GND |
| | 8 | T.M.D.S data 0 GND | 18 | +5V (DC) high impedance |
| | 9 | T.M.D.S data 0- | 19 | HEC Data- |
| | 10 | T.M.D.S clock+ | | |

12.3.3 USB, Type A

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

12.3.4 USB, Type B

| Connector | Pin | Signal | Color |
|-----------|-----|-----------|-------|
| 21 | 1 | +5 V (DC) | Red |
| | 2 | D - | White |
| 34 | 3 | D + | Green |
| | 4 | GND | Black |

12.3.5 Mini-USB, Type B

| Connector | Pin | Signal | Color |
|-----------|-----|---------------|-------|
| 15 | 1 | +5 V (DC) | Red |
| | 2 | Data – | White |
| | 3 | Data + | Green |
| | 4 | Not connected | - |
| | 5 | GND | Black |

12.3.6 RJ45 (Interconnection)

| Connector | Pin | Signal | Pin | Signal |
|-----------|-----|--------|-----|--------|
| 81 | 1 | D1+ | 5 | D3- |
| | 2 | D1- | 6 | D2- |
| | 3 | D2+ | 7 | D4+ |
| | 4 | D3+ | 8 | D4- |

12.3.7 Fiber SFP Type LC (Interconnection)

| Connector | Diode | Signal |
|-----------|-------|----------|
| | 1 | Data OUT |
| | 2 | Data IN |

12.4 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) |

12.5 Current Draw and Power Consumption

NOTICE

Overheating of power supply units and electronic components, exceeding the maximum permissible current consumption

In addition to the current draw of the extender/add-on modules used in the same chassis, there is also the current draw of the connected peripherals.

To avoid overheating of power supply units and electronic components:

- In the case of redundant power supply units, the maximum current supply must not exceed the value of one of the two power supply units due to heat dissipation.
- Do NOT exceed the recommended maximum current supply of the chassis.
- To optimize the chassis equipment considering the chassis limitations, please refer to the Draco System Designer at <u>https://dsd.ihse.com</u>.

The table shows the power supply voltage 1 and 2 of the chassis and the recommended maximum power supply of the chassis.

12.5.1 Power Supply of Chassis

AC Power Supply

| Chassis model | Maximum current | Maximum voltage | Frequency |
|---------------|-----------------|-----------------|-----------|
| 474-BODY2N | 700 mA | 100 - 240 V | 50/60 Hz |
| 474-BODY6R | 1400 mA | 100 V - 240 V | 47-63 Hz |
| 474-BODY6BP | 1300 mA | 100 - 240 V | 50/60Hz |
| 474-BODY6BPF | 1300 mA | 100 - 240 V | 50/60Hz |
| 474-BODY21/4U | 4000 mA | 2x 100 - 240 V | 50/60 Hz |

DC Power Supply

| Chassis model | Maximum current | Maximum voltage |
|---------------|-----------------|-----------------|
| 474-BODY2/2R | 3000 mA | 5 V DC |
| 474-BODY2N | 5000 mA | 5 V DC |
| 474-BODY4/4R | 5000 mA | 5 V DC |
| 474-BODY6R* | 8000 mA | 5 V DC |

* The 6-slot chassis require a fan should the extender modules exceed a current draw of 6,000 mA. We recommend a chassis fan (part no. 474-6FAN).

12.5.2 Current Draw and Power Consumption of Extender Modules

| | CPU Unit | | CON Unit | CON Unit | |
|-----------------|-------------------|------------------------|-------------------|------------------------|--|
| Product | Max. current draw | Max. power consumption | Max. current draw | Max. power consumption | |
| L/R481-BHHC | 800 mA | 4 W | 870 mA | 5 W | |
| L/R481-BHHCL/W | 870 mA | 5 W | 1060 mA | 5.3 W | |
| L/R481-BHHCL/WR | 1170 mA | 6 W | 1380 mA | 6.9 W | |
| L/R481-BHHCR | 1080 mA | 5 W | 1150 mA | 5.8 W | |
| L/R481-BHHS | 750 mA | 3.8 W | 800 mA | 4 W | |
| L/R481-BHHSL/W | 810 mA | 4.1 W | 950 mA | 4.8 W | |
| L/R481-BHHSL/WR | 1010 mA | 5.1 W | 1160 mA | 5.8 W | |
| L/R481-BHHSR | 950 mA | 4.8 W | 960 mA | 4.8 W | |
| L/R481-BHXC | 680 mA | 4.3 W | 560 mA | 2.8 W | |
| L/R481-BHXS | 590 mA | 3 W | 460 mA | 2.4 W | |
| | | | | | |
| L/R481-BUHCL | 1210 mA | 6.1 W | 1430 mA | 7.2 W | |
| L/R481-BUHCLR | 1330 mA | 6.7 W | 1640 mA | 8.2 W | |
| L/R481-BUHSL | 1300 mA | 6.5 W | 1430 mA | 7.2 W | |
| L/R481-BUHSLR | 1420 mA | 7.1 W | 1630 mA | 8.2 W | |
| | | | | | |
| L/R491-BUHCL | 1210 mA | 6.1 W | 1430 mA | 7.2 W | |
| L/R491-BUHCLR | 1330 mA | 6.7 W | 1640 mA | 8.2 W | |
| L/R491-BUHSL | 1300 mA | 6.5 W | 1210 mA | 6.1 W | |
| L/R491-BUHSLR | 1420 mA | 7.1 W | 1630 mA | 8.2 W | |

12.6 Dimensions

12.6.1 Chassis with Extender

| Product | Dimension (WxDxH) | Dimension of the shipping box incl. accessories (WxDxH) |
|--|---|---|
| 474-BODY2/ 474-BODY2R | 145 x 147 x 44 mm (5.7" x 5.8" x 1.7") | |
| 474-BODY2N 474-BODY2DC-12 474-BODY2DC-24 474-BODY2DC-48 | 221 x 147 x 44 mm (8.7" x 5.8" x 1.7") | CON Units: 270 x 219 x 67 mm (10.5" x 8.5" x 2.5") CPU Units: 253 x 194 x 113 mm (10.0" x 7.6" x 4.4") |
| 474-BODY2BPF 474-BODY2BPF-S 474-BODY2BPF-SNMP | 221 x 182 x 44 mm (8.7" x 7.2" x 1.7") | |
| 474-BODY4/ 474-BODY4R | 296 x 147 x 44 mm (11.6" x 5.8" x 1.7") | |
| 474-BODY6R-R1 474-BODY6DC-12 474-BODY6DC-24 474-BODY6DC-48 | 442 x 147 x 44 mm (17.4" x 5.8" x 1.7") | 445 x 240 x 110 mm (17.5" x 9.4" x 4.3") |
| 474-BODY6BP 474-BODY6BP-S 474-BODY6BP-SNMP 474-BODY6BPF 474-BODY6BPF-S | 442 x 270 x 44 mm (17.4" x 10.6" x 1.7") | 545 x 368 x 143 mm (21.5" x 14.8" x 5.6") |
| 474-BODY21/4U 474-BODY21/4UR 474-BODY21/4U-R1 474-BODY21/4UR-R1 | 482 x 462 x 176 mm (19.0" x 18.2" x 6.9") | 630 x 560 x 340 mm (24.8" x 22.0" x 13.4") |

12.7 Weight

The following table contains the weight when the respective chassis is fully equipped with the maximum number of modules, and with redundant power supply units depending on the chassis, for both the CPU Unit and the CON Unit.

| Chassis | Max. weight of fully equipped chassis | Max. weight of shipping box with fully equipped chassis incl. accessories* |
|--|---------------------------------------|--|
| 474-BODY2 | 0.8 kg (1.7 lb) | 2.5 kg (5.5 lb) |
| 474-BODY2R | 1.0 kg (2.2 lb) | 2.7 kg (6.0 lb) |
| 474-BODY2N | 1.4 kg (3.1 lb) | 2.8 kg (6.2 lb) |
| 474-BODY2DC-12 474-BODY2DC-24 474-BODY2DC-48 | 1.4 kg (3.1 lb) | 2.8 kg (6.2 lb) |
| 474-BODY2BPF 474-BODY2BPF-S | 1.7 kg (3.7 lb) | 3.2 kg (7.1 lb) |
| 474-BODY2BPF-SNMP | 1.8 kg (3.9 lb) | 3.3 kg (7.3 lb) |
| 474-BODY4 | 1.5 kg (3.3 lb) | 3.4 kg (7.5 lb) |
| 474-BODY4R* | 1.7 kg (3.7 lb) | 3.6 kg (7.9 lb) |
| 474-BODY6R-R1 | 2.4 kg (5.3 lb) | 4.5 kg (9.9 lb) |
| 474-BODY6DC-12 474-BODY6DC-24 474-BODY6DC-48 | 2.4 kg (5.3 lb) | 4.5 kg (9.9 lb) |
| 474-BODY6BP 474-BODY6BP-S 474-BODY6BP-SNMP 474-BODY6BPF 474-BODY6BPF-S | 4.3 kg (9.5 lb) | 7.9 kg (17.4 lb) |
| 474-BODY21/4U 474-BODY21/4U-R1 | 10.3 kg (22.7 lb) | 20.5 kg (45.2 lb) |
| 474-BODY21/4UR 474-BODY21/4UR-R1 | 10.3 kg (22.7 lb) | 21.8 kg (48.1 lb) |

* Plus, up to 0.2 kg (0.4 lb) for each cable included in the shipping boxes for CPU Units depending on the ordered extender and add-on modules.

12.8 MTBF

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

13 Technical Support

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

13.1 Support Checklist

To efficiently handle your request, it is necessary that you complete a support request checklist (<u>Download</u>). 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, interconnection cable) including manufacturer and model number.
- Results from any testing you have done.

13.2 Shipping Checkliste

- 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.

14 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 / DH | A system with two video ports. |
| 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. |
| LPCM | LPCM (Linear Pulse Code Modulation) is a pulse modulation method, also known as an uncompressed data format. The LPCM method is used for converting analog audio into digital audio with uniformly large value ranges. |
| Mini-USB | Interface used for maintenance (e.g., updates). |
| 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 / SH | 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. |

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17 Change Log

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

| Edition | Date | Firmware version | Chapter | New functions/modifications |
|---------|-----------|-----------------------|-------------------|---|
| Rev 5 | 13/5/2025 | 2025 Current versions | Multiple chapters | Description of new modules 481-BUHx added |
| | | | Complete manual | New layout features adopted |
| | | | Complete manual | Description of chassis and add-on modules deleted, reference to respective manual added |
| | | | 5.2.4 | Description added of CPU modules with local feed-through |
| Rev 4 | 20/7/2021 | Current versions | n/a | n/a |
| Rev 3 | 6/7/2021 | Current versions | n/a | n/a |
| Rev 2 | 22/4/2021 | Current versions | n/a | n/a |
| Rev 1 | 31/7/2017 | Current versions | n/a | n/a |
| Rev 0 | 13/8/2013 | Current versions | - | Initial version |