Draco vario SDI

486 Series

SDI Extender

User manual

Edition: 2017-10-23

IHSE GmbH ■ Maybachstraße 11 ■ 88094 Oberteuringen ■ Germany
info@ihse.com ■ www.ihse.com ■ phone: +49 7546-9248-0 ■ fax: +49 7546-9248-48

Contents

1 About This Manual 6
1.1 Scope 6
1.2 Validity 6
1.3 Cautions and Notes 6
2 Safety Instructions 7
3 Description 8
3.1 Application 8
3.2 System Overview 9
3.3 Product Range 10
3.3.1 Part Numbers 10
3.3.2 SDI Extender Modules 10
3.3.3 Upgrade Modules 10
3.3.4 Monitoring Modules 11
3.3.5 Chassis 11
3.4 Accessories Upgrade Kits 12
3.5 Accessories 13
3.6 Device Views 14
3.6.1 Model L- / R486-BSDC 14
3.6.2 Model L- / R486-BSDCR 14
3.6.3 Model L- / R486-BSDS 15
3.6.4 Model L- / R486-BSDSR 15
3.6.5 Model L- / R474-BXH 15
3.6.6 Model L- / R474-BBX 16
3.6.7 Model L- / R474-BDX 16
3.6.8 Model 474-SNMP 16
3.6.9 2-fold Vario Chassis 474-BODY2/2R 17
3.6.10 2-fold Vario Chassis 474-BODY2N 17
3.6.11 4-fold Vario Chassis 474-BODY4/4R 18
3.6.12 6-fold Vario Chassis 474-BODY6R 19
3.6.13 6-fold Vario Chassis 474-BODY6BP 20

3.6.14 6-fold Vario Chassis 474-BODY6BPF 21
3.6.15 21-fold Vario Chassis 474-BODY21R 22
3.7 Status LEDs 23
3.7.1 Status SDI Extender Module 23
3.7.2 Status Upgrade Module USB-HID 24
3.7.3 Status Upgrade Module Digital Audio 25
3.7.4 Status Upgrade Module Balanced Audio 26
3.7.5 Status Monitoring Module SNMP 27
4 Installation 28
4.1 Package Contents 28
4.2 System Setup 29
4.2.1 SDI Extender Setup 29
4.2.2 Setup of Upgrade Modules 30
4.3 Example Applications 31
5 Configuration 33
5.1 Transmission Parameters 33
5.2 Command Mode 33
5.3 Configuration File 35
5.3.1 Parameters for CPU Units 35
5.3.2 Parameters for CON Units 36
6 Operation 37
7 Specifications 38
7.1 Interfaces 38
7.1.1 SDI 38
7.1.2 USB-HID 39
7.1.3 RJ45 (Interconnect) 39
7.1.4 Fiber SFP Type LC (Interconnect) 40
7.1.5 Digital Audio Interface 40
7.1.6 Balanced Audio Interface 41
7.2 Interconnect Cable 44
7.2.1 Cat X 44
7.2.2 Fiber 45

7.2.3 Coaxial 46
7.3 Connector Pinouts 47
7.4 Power Supply 49
7.5 Environmental Conditions 50
7.6 Size 51
7.7 Shipping Weight 52
8 Troubleshooting 53
8.1 General Failures 53
8.2 Blank Screen 54
8.3 Upgrade Module USB-HID 55
8.4 Digital Audio 56
9 Technical Support 57
9.1 Support Checklist 57
9.2 Shipping Checklist 57
10 Certificates 58
10.1 CE Declaration Of Conformity 58
10.2 North American Regulatory Compliance 59
10.3 Product Safety 60
10.4 WEEE 60
10.5 RoHS/RoHS 2 60
11 Glossary 61

1 About This Manual

1.1 Scope

This manual describes how to install your SDI Extender, how to operate it and how to perform trouble shooting.

1.2 Validity

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

1.3 Cautions and Notes

The following symbols are used in this manual:

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

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

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

2 Safety Instructions

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

Installation

- ➔ Only use in dry, indoor environments.
- ➔ Only use the device according to this User Manual. Failure to follow these procedures could result in damage to the equipment or injury to the user or installer.
- ➔ The SDI Extender and the power supply units can get warm. Do not install components in an enclosed space without any airflow.
- ➔ Do not place the power supply directly on top of the device.
- ➔ Do not obscure ventilation holes.
- ➔ Only use power supplies originally supplied with the product or manufacturer-approved replacements. Do not use a power supply if it appears to be defective or has a damaged chassis.
- ➔ Connect all power supplies to grounded outlets. In each case, ensure that the ground connection is maintained from the outlet socket through to the power supply's AC power input.
- ➔ Do not connect the link interface to any other equipment, particularly network or telecommunications equipment.
- ➔ Take any required ESD precautions.

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

Repair

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

3 Description

3.1 Application

The SDI Extender is used to increase the distance between a source (e.g. SDI camera) and its console (e.g. SDI monitor).

The SDI Extender is compatible to KVM Extenders and can be combined and switched to KVM Extenders.

The SDI Extender is designed for use with Cat X (Twisted Pair) interconnect cables or fiber interconnect cables.

The SDI Extender with Cat X interconnect cables is unsuitable for connection between buildings where a fiber optic based product should be used instead.

The SDI Extender with fiber interconnect cables can also be used with applications in environments which are subject to electromagnetic interference. Electromagnetic interference can limit the maximum distance and reliability of operation.

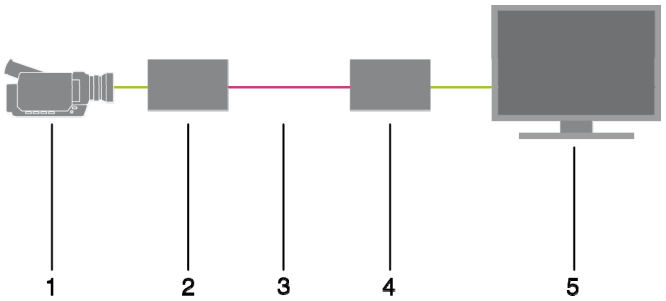
3.2 System Overview

The SDI Extender consists of at least one CPU module and one CON module. The various modules are summarized respectively in a vario chassis (2-fold, 4-fold or 6-fold) at CPU site and CON site (CPU and CON Unit).

The CPU module is connected directly to the source (SDI) using the existing cables.

The CON module is connected to the monitor (SDI).

The CPU Unit and the CON modules communicate with each other through the interconnect cables.



System Overview

1 Source (SDI)

2 SDI Extender CPU Unit

3 Interconnect cable

4 SDI Extender CON Unit

5 Console (SDI monitor)

See Chapter 4.3, Page 31 for installation examples.

3.3 Product Range

3.3.1 Part Numbers

Part numbers for Connections via Cat X or Fiber Cable

All devices are available in the following versions:

- Connection via Cat X cable (x = "C")
- Connection via Single-mode fiber cable (x = "S")
- High speed connection (3.125 Gbit/s) via Single-mode fiber cable (x = "X")

Fiber devices can be used with Multi-mode and Single-mode cables (see Chapter 7.2.2, Page 45).

Part numbers for CPU Unit and CON Unit

The part numbers for the CPU Unit and the CON Unit can be derived from the part number of the complete device.

- CPU Unit: **L**486
- CON Unit: **R**486

All devices of the K486 series are technically compatible with devices of the Draco vario KVM extender series.

3.3.2 SDI Extender Modules

Model	Description
L486-BSDx	Single-Head module for 1x SDI (up to 1920x1080)
R486-BSDx	
L486-BSDxR	Single-Head module for 1x SDI (up to 1920x1080) and redundant connector for interconnect cables
R486-BSDxR	

3.3.3 Upgrade Modules

Model	Description
L474-BXH	Upgrade module with 2x USB-HID
R474-BXH	
L474-BBX	Upgrade module with balanced analog Audio (unidirectional)
R474-BBX	
L474-BDX	Upgrade module with Digital Audio (unidirectional)
R474-BDX	

3.3.4 Monitoring Modules

Model	Description
474-SNMP	SNMP module for monitoring of extenders in the chassis 474-BODY6BP/F and 474-BODY21

3.3.5 Chassis

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

3.4 Accessories Upgrade Kits

Model	Description
474-2RMK	19"/1U rack mount kit for 2-fold chassis
474-2NRMK	19"/1U rack mount kit for 2-fold chassis with internal PSU
474-4RMK	19"/1U rack mount kit for 4-fold chassis
474-6RMK	19"/1U rack mount kit for 6-fold chassis
474-VPLATE	Fastening strips for screw or snap on for 2-, 4- and 6-fold chassis
474-BRACKET	Mounting bracket with screws for 2-, 4- and 6-fold chassis
474-OPTRED	Retrofitting for redundant power supply option (without power supply) for 2- and 4-fold chassis
474-PSU2	Power supply for 2-fold chassis (spare or redundancy)
474-PSU4	Power supply for 4-fold chassis (spare or redundancy)
474-PSU6	Power supply for 6-fold chassis (spare or redundancy)
474-PSU21	Power supply for 6-fold-chassis (spare or redundancy)
474-BLND1	Blind plate 3U/4HP for 2-, 4- and 6-fold chassis
474-BLND2	Blind plate 3U/8HP for 2-, 4- and 6-fold chassis
474-6FAN	Fan option for chassis 474-BODY6BP/F

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

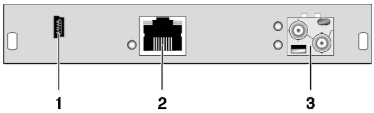
3.5 Accessories

Model	Description
026-2A	Serial cable 1.8 m (RS232)
247-U1	USB cable 1.8 m (Type A to B)
260-5G	International power supply unit 100...240VAC / 5VDC / 3 A
260-5U	International power supply unit 100...240VAC / 5VDC / 4 A
436-AA	VGA cable 1.8 m (VGA to DVI-I)
436-ID	DVI-D cable 1.8 m (DVI-D)
445-2H	DVI-D splitter cable
436-HD	HDMI cable 1.8 m
436-DP	DisplayPort cable 1.8 m
459-PLB	SFP SDI, 3G/HD/SD Video, Mini-BNC to BNC, non-MSA, passive loopback, re-clocked, long reach, for CPU Unit
459-DTX	SFP SDI, 3G/HD/SD video, Mini-BNC to BNC, non-MSA, with dual transmitter, re-clocked, long reach, for CON Units
459-BMB	Adapter cable BNC to HD-BNC to connect a standard BNC cable to HD-BNC SFPs
455-CK	Stereo jack cable 1.6 m (3.5 mm Stereo)
455-CR	RCA cable 2.5 m (Cinch male connector)
455-CT	TOSLINK cable 1.8 m (F05 male connector)
455-CX	Mini-XLR cable 1.8 m (3 pole)
474-IECLOCK	IEC connection cable for power supply, lockable

3.6 Device Views

3.6.1 Model L- / R486-BSDC

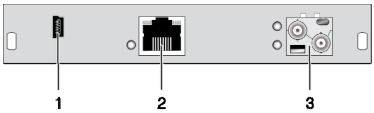
CPU Module



Rear View

1 Service port
2 Connect to interconnect cable
3 To CPU: SDI HD-BNC

CON Module

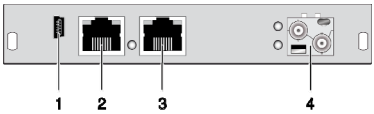


Rear View

1 Service port
2 Connect to interconnect cable
3 Connect to SDI monitor SDI HD-BNC

3.6.2 Model L- / R486-BSDCR

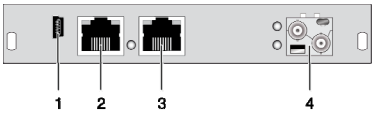
CPU Module



Rear View

1 Service port
2 Connect to interconnect cable 1
3 Connect to interconnect cable 2
4 To CPU: SDI HD-BNC

CON Module

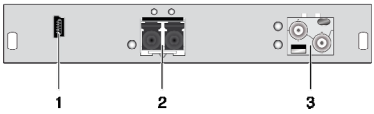


Rear View

1 Service port
2 Connect to interconnect cable 1
3 Connect to interconnect cable 2
4 Connect to SDI monitor SDI HD-BNC

3.6.3 Model L- / R486-BSDS

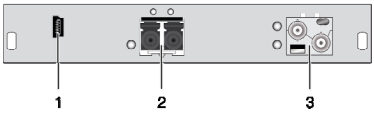
CPU Module



Rear View

1 Service port
2 Connect to interconnect cable
3 To CPU: SDI HD-BNC

CON Module

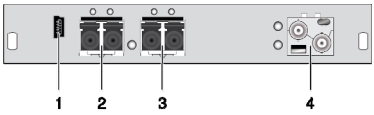


Rear View

1 Service port
2 Connect to interconnect cable
3 Connect to SDI monitor SDI HD-BNC

3.6.4 Model L- / R486-BSDSR

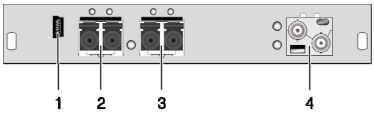
CPU Module



Rear View

1 Service port
2 Connect to interconnect cable 1
3 Connect to interconnect cable 2
4 To CPU: SDI HD-BNC

CON Module

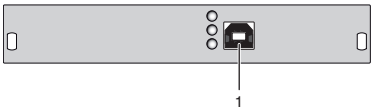


Rear View

1 Service port
2 Connect to interconnect cable 1
3 Connect to interconnect cable 2
4 Connect to SDI monitor SDI HD-BNC

3.6.5 Model L- / R474-BXH

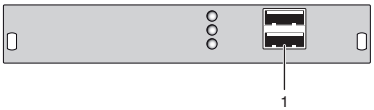
CPU Module



Rear View

1 To CPU: USB-HID

CON Module

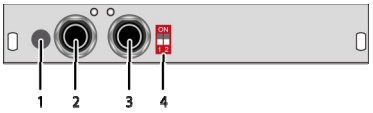


Rear View

1 Connect to USB-HID devices

3.6.6 Model L- / R474-BBX

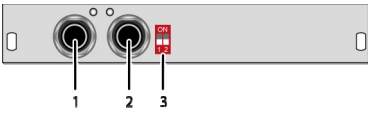
CPU Module



Rear View

1 Switch for phantom power
2 Audio IN #1
3 Audio IN #2
4 Dip switch for pre-amplification

CON Module



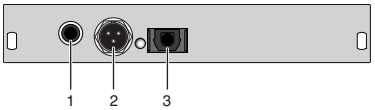
Rear View

1 Audio OUT #1
2 Audio OUT #2
3 Not in use

The CPU module with balanced audio can be also used on top of an extender CON Unit. It depends on the purpose of use.

3.6.7 Model L- / R474-BDX

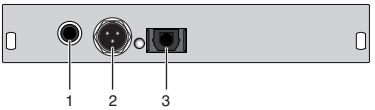
CPU Module



Rear View

1 S/PDIF input (RCA)
2 AES/EBU input (Mini-XLR)
3 S/PDIF input (TOSLINK)

CON Module

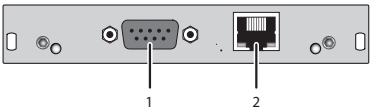


Rear View

1 S/PDIF output (RCA)
2 AES/EBU output (Mini-XLR)
3 S/PDIF output (TOSLINK)

3.6.8 Model 474-SNMP

Control Unit



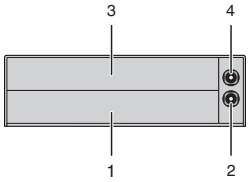
Rear View

1 Connect to serial (D-Sub 9)
2 Connect to network (RJ45)

The 474-SNMP module can be only used with the chassis 474-BODY6BP/F and 474-BODY21 with a production date later than March 2014.

3.6.9 2-fold Vario Chassis 474-BODY2/2R

CPU and CON Unit



Rear View

1 Slot for modules #1

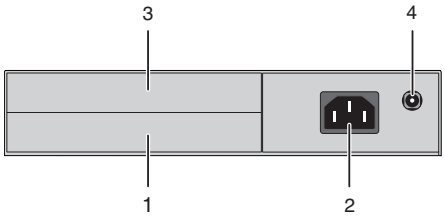
2 Connect to 5VDC power supply (standard)

3 Slot for modules #2

4 Connect to 5VDC power supply (redundancy, optional)

3.6.10 2-fold Vario Chassis 474-BODY2N

CPU and CON Unit



Rear View

1 Slot for modules #1

2 Connect to power supply (standard)

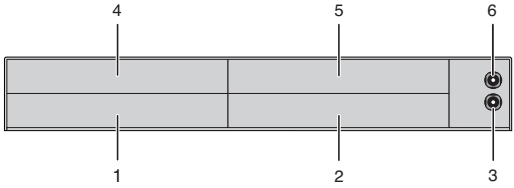
3 Slot for modules #2

4 Connect to 5VDC power supply (redundancy)

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

3.6.11 4-fold Vario Chassis 474-BODY4/4R

CPU and CON Unit



Rear View

1 Slot for modules #3

2 Slot for modules #1

3 Connect to 5VDC power supply (standard)

4 Slot for modules #4

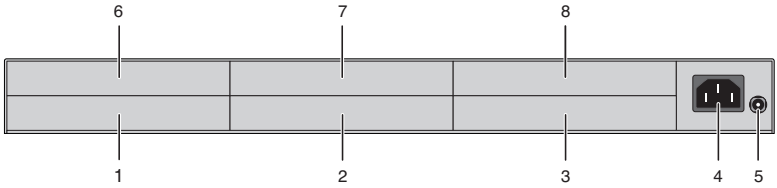
5 Slot for modules #2

6 Connect to 5VDC power supply (redundancy, optional)

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

3.6.12 6-fold Vario Chassis 474-BODY6R

CPU and CON Unit



Rear View

1 Slot for modules #5

2 Slot for modules #3

3 Slot for modules #1

4 Connect to power supply (standard)

5 Connect to 5VDC power supply (standard)

6 Slot for modules #6

7 Slot for modules #4

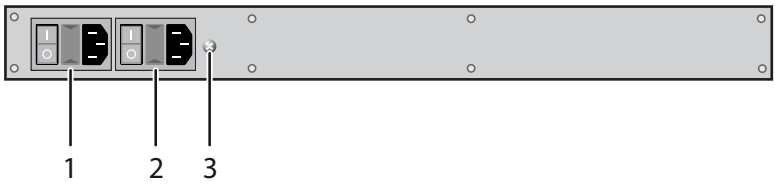
8 Slot for modules #2

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

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

3.6.13 6-fold Vario Chassis 474-BODY6BP

CPU and CON Unit

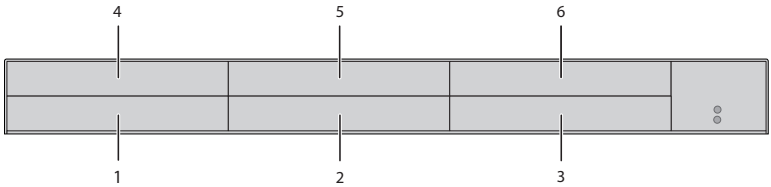


Front View

1 Connect to power supply 1

2 Connect to power supply 2 (redundancy)

3 Grounding



Rear View

1 Slot for modules #5

2 Slot for modules #3

3 Slot for modules #1

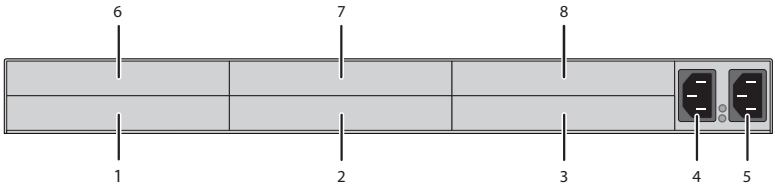
4 Slot for modules #6

5 Slot for modules #4

6 Slot for modules #2

3.6.14 6-fold Vario Chassis 474-BODY6BPF

CPU and CON Unit

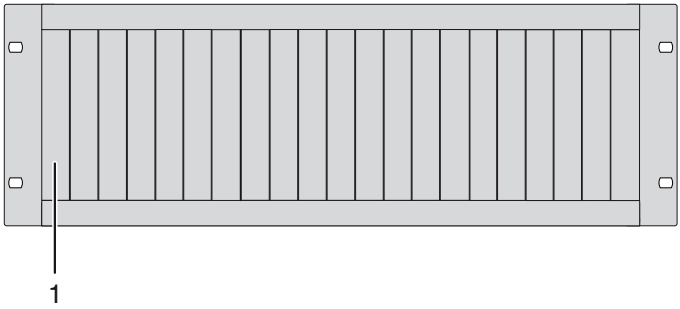


Rear View

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

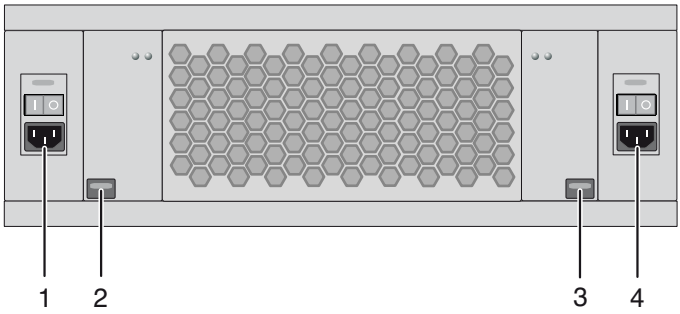
3.6.15 21-fold Vario Chassis 474-BODY21R

CPU and CON Unit



Rear View

1 Slots for modules #1 - #21



Front View

1 Connect to power supply 2

2 Locking for power supply 2 (redundancy)

3 Locking for power supply 1 (standard)

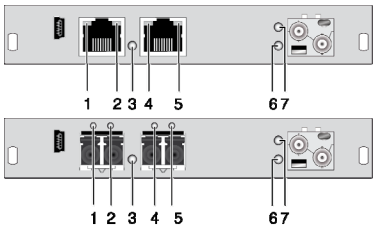
4 Connect to power supply 1

3.7 Status LEDs

3.7.1 Status SDI Extender Module

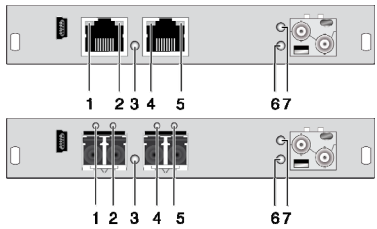
The SDI Extender module is fitted with a multi color LED on both sides for overall status indication and with two further LEDs on the back side for indication of the connection status.

CPU Module



Rear View

CON Module



Rear View

LED 1, 4 and 2, 5: Connection Status

Pos.	LED	Status	Description
1, 4	**Failure LED** (green)	Off	Connection available
		On or Flashing	Connection failure (flashing for about 20 s following a connection failure)
2, 5	**Status LED** (green)	Flashing	No connection via interconnect cable
		On	Connection available

LED 3: Connection Status

LED color		Description
Red		Device ready
Green		Connection available
Light Blue		Connection to matrix available

LED 6: Video Status (upper SFP connector)

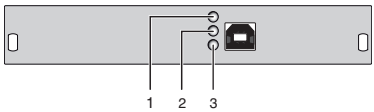
LED 7: Video Status (lower SFP connector)

LED color		Description
Red		Device ready
Blue		Unknown video signal
Green		Video signal detected

3.7.2 Status Upgrade Module USB-HID

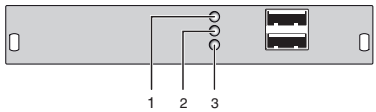
The upgrade module USB-HID is fitted with three further LEDs on the rear side for indication of the connection status:

CPU Module



Rear View

CON Module



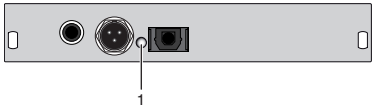
Rear View

Pos.	LED	Status	Description
1, 2	**Device LED** (orange)	Off	No USB-HID device or not supported USB device connected
		Flashing fast	USB-HID device active
		On	USB-HID device ready or KVM Extender in command mode
3	**Status LED** (orange)	Off	• No power supply voltage • CPU Unit: KVM Extender in command mode or no connection • CON Unit: Keyboard in command mode
		Flashing slowly	CON Unit: KVM Extender in command mode or no connection
		Flashing fast	Operating status

3.7.3 Status Upgrade Module Digital Audio

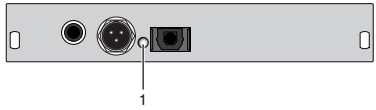
The upgrade module digital audio is fitted with a further multi-color LED on the rear side for indication of the connection status:

CPU Module



Rear View

CON Module



Rear View

LED 1: Digital Audio Status

LED color		Description
Red		No signal
Light Blue		**Static**: CPU Unit: S/PDIF signal (RCA) available **Flashing**: CPU Unit: Digital noise
Violet		**Static**: CPU Unit: AES/EBU signal (Mini-XLR) available **Flashing**: CPU Unit: Digital noise
Blue		**Static**: CPU Unit: S/PDIF signal (TOSLINK) available **Flashing**: CPU Unit: Digital noise
Green		CON Unit: Signal available

3.7.4 Status Upgrade Module Balanced Audio

The upgrade module balanced audio is fitted with two LEDs on the rear side for indication of the connection status:

CPU Module

Rear View

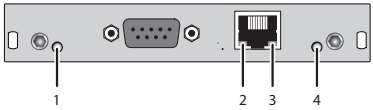
CON Module

Rear View

Pos.	LED	Status	Description
1, 2	Status LED	Green	Signal available
		Orange	Signal level too high
		Off	No signal

3.7.5 Status Monitoring Module SNMP

The monitoring module SNMP is fitted with a multi color LED on both sides for overall status indication and with two further LEDs for indication of the network status:



Rear View

Status LEDs of the SNMP board

Pos.	LED	Status	Description
1	**Status 1**	White	SNMP board is in registration process
		Blue flashing	Registration of the SNMP board has started
		Red flashing	Registration in progress
		Green flashing	Operating condition
		Green	SNMP board de-registered
4	**Status 2**	White	SNMP board is in registration process
		Status	Description
		White	SNMP board is in registration process

Due to variations in LED type "white" might also appear as light purple or light blue.

Status LEDs of the network port

Pos.	LED	Status	Description
2	**Link status** (orange)	Off	Port not activated
		Flashing	Port activated, no connection via network cable
3	**Link status** (green)	Off	Port not activated
		Flashing	Port activated, no connection via network cable

4 Installation

4.1 Package Contents

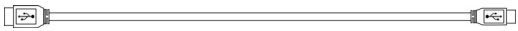
Your extender package contains the following items:

SDI Extender:

- SDI Extender device(s) (CPU Unit and/or CON Unit)
- Draco vario chassis incl. power supply
- 1x (redundancy 2x) country-specific power cord
- Quick Setup

Additional content for upgrade module USB-HID:

- USB cable (1.8 m, USB type A to type B)



Additional content for upgrade module Digital Audio:

- RCA cable (2.5 m, Cinch male connector)

- TOSLINK cable (1.8 m, F05 male connector)

If anything is missing, contact your dealer.

4.2 System Setup

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

➔ Please verify that interconnect cables, interfaces, and handling of the devices comply with the requirements (see Chapter 7, Page 38).

4.2.1 SDI Extender Setup

1. Switch off all devices.

CON Unit Installation

2. Connect your SDI monitor to the CON Unit.
3. Connect the CON Unit with the interconnect cable(s).
4. Connect the power supply to the CON Unit.

CPU Unit Installation

5. Connect the source (e.g. SDI camera) to the CPU Unit with your cables. Please ensure the cables are not strained.
6. Connect the CPU Unit to the interconnect cable(s).
7. Connect power supply to the CPU Unit.
8. Power up the system.

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

4.2.2 Setup of Upgrade Modules

The modules can be hot plugged.

Upgrade Module USB-HID:

1. Connect the CPU to the CPU Unit (USB-HID 2).
2. Connect the USB-HID devices to the CON Unit (Connect to USB-HID devices 2).

Upgrade Module Digital Audio:

1. Connect the digital audio source to the audio input of the CPU Unit.
2. Connect the audio output of the CON Unit to suitable speakers or audio amplifiers.

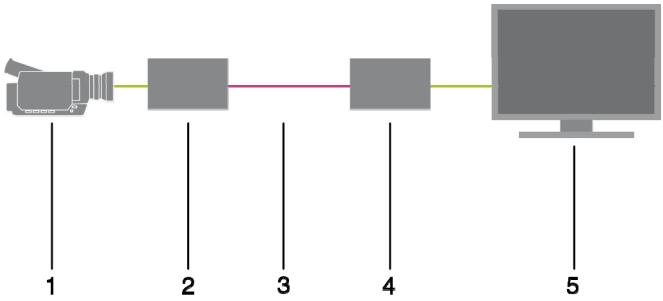
If several active sources are connected, Mini-XLR input takes priority. The audio signal is available at all outputs.

Upgrade Module Balanced Audio:

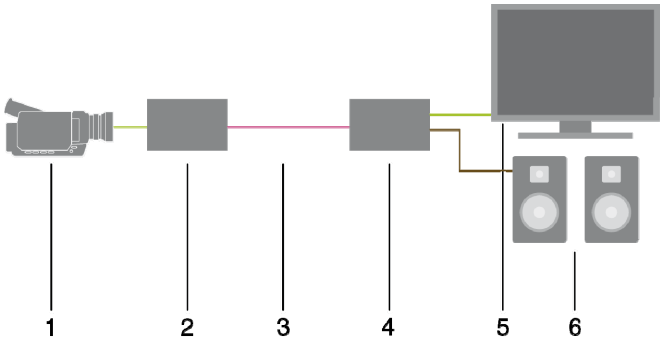
1. Connect the digital audio source to the balanced audio input of the CPU Unit.
2. Connect the audio output of the CON Unit to suitable speakers or audio amplifiers.

4.3 Example Applications

This section illustrates typical installations of SDI Extenders:

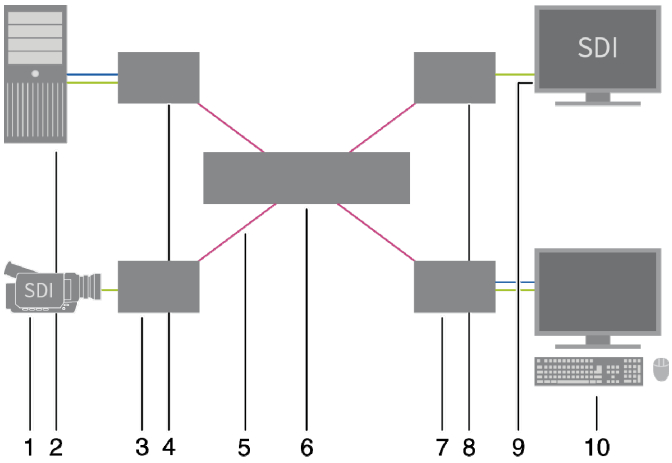


SDI Extender



SDI Extender (with Digital / Balanced Audio)

1 Source (SDI)
2 SDI Extender CPU Unit
3 Intercorrect cable
4 SDI Extender CON Unit
5 Console (SDI monitor)
6 Audio sink (optional, only with devices with Digital Audio or Balanced option)



SDI Extender in a KVM Matrix environment

1 Source (SDI)

2 Source (Computer, CPU)

3 SDI Extender CPU Unit

4 KVM Extender CPU Unit

5 Interconnect cable

6 Draco tera Matrix

7 KVM Extender CON Unit

8 SDI Extender CON Unit

9 Console (SDI monitor)

10 Console (computer monitor, keyboard, mouse)

SDI Extender can be switched to KVM extenders by using a Draco tera KVM matrix.

5 Configuration

5.1 Transmission Parameters

The device operates with a proprietary video coding 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.

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

5.2 Command Mode

During normal use, the console keyboard functions in the usual manner. However, for all KVM Extenders with USB-HID support, you can set the keyboard into a Command Mode by using a specific 'Hot Key' sequence. While in Command Mode, several functions are performed via keyboard commands. To exit Command Mode, press <Esc>.

While in Command Mode, the **Shift** and **Scroll** LEDs on the console keyboard will flash.

In Command Mode normal keyboard and mouse operation will cease. Only selected keyboard commands are available.
If no keyboard command is executed within 10 s after activating Command Mode, it will be automatically deactivated.

The following table lists the keyboard commands to enter and to exit Command Mode and to change the 'Hot Key' sequence:

Function	Keyboard Command
Enter Command Mode (default)	2x <Left Shift> / ('Hot Key')
Exit Command Mode	<Esc>
Change 'Hot Key' sequence	<current 'Hot Key'>, <c>, <new 'Hot Key' code>, <Enter> Until 2011-30-09: <Left Ctrl> + <Left Shift> + <c>, <'Hot Key' Code>, <Enter>

<Key> + <Key>	Press keys simultaneously
<Key>, <Key>	Press keys successively
2x <Key>	Press key quickly, twice in a row (similar to a mouse double-click)

The 'Hot Key' sequence to enter Command Mode can be changed. The following table lists the 'Hot Key' Codes for the available key sequences:

'Hot Key' Code	'Hot Key'
0	Freely selectable (from 2012-01-12)
2	2x <Scroll>
3	2x <Left Shift>
4	2x <Left Ctrl>
5	2x <Left Alt>
6	2x <Right Shift>
7	2x <Right Ctrl>
8	2x <Right Alt>

Set freely selectable 'Hot Key' (exemplary)

In order to set a freely selectable 'Hot Key' (e.g. 2x <Space>), use the following keyboard sequence:

<current 'Hot Key'>, <c>, <0>, <Space>, <Enter>

Reset 'Hot Key'

In order to set a 'Hot Key' back to default settings of the extender, press the key combination <Right Shift> + <Del> within 5 s after plugging in a keyboard.

5.3 Configuration File

The SDI Extender contains a configuration file (Config.txt) to set specific parameters and to read out device and video information. You can find it on the flash drive of the SDI Extender. 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.

After setting a parameter, the SDI Extender needs to be restarted.

To ensure correct identification and acceptance of the parameters, the start command **#CFG** has to be written into the first line of the Config.txt file.

5.3.1 Parameters for CPU Units

You can write the following parameters into the configuration file of a CPU Unit. The parameters activate the respective video scaling at the output of the CPU Unit. The default scaling is 1920x1080@60Hz.

Output Settings

Parameter	Function
800X600@60	Activate scaling to 800 x 600 @ 60 Hz
1024X768@60	Activate scaling to 1024 x 768 @ 60 Hz
720P50	Activate scaling to 720p50 (1280 x 720 @ 50Hz)
720P60	Activate scaling to 720p60 (1280 x 720 @ 60Hz)
1280x1024@60	Activate scaling to 1280 x 1024 @ 60 Hz
1280x1024@75	Activate scaling to 1280 x 1024 @ 75 Hz
1600X900@60	Activate scaling to 1600 x 900 @ 60 Hz
1680x1050@60	Activate scaling to 1680 x 1050 @ 60 Hz
1080P30	Activate scaling to 1080p30 (1920x1080 @ 30 Hz)
1080P50	Activate scaling to 1080p30 (1920x1080 @ 50 Hz)
1080P60	Activate scaling to 1080p30 (1920x1080 @ 60 Hz)

5.3.2 Parameters for CON Units

You can write the following parameters into the configuration file of a CON Unit. The parameters activate the respective video scaling at the output of the CON Unit. The default scaling is 1920x1080@60Hz.

Output Settings

Parameter	Function
576I50	Output 576i with 50Hz
720P50	Output 720p with 50Hz
720P60	Output 720p with 60Hz
1080I50	Output 1080i with 50Hz
1080I60	Output 1080i with 60Hz
1080P25	Output 1080p with 25Hz
1080P30	Output 1080p with 30Hz
1080P50A	Output 1080p with 50Hz (3GA)
1080P50B	Output 1080p with 50Hz (3GB)
1080P60A	Output 1080p with 60Hz (3GA)
1080P60B	Output 1080p with 60Hz (3GB)

6 Operation

The SDI Extender does not contain any setting to be done during operation. For the configuration of the SDI Extender see Chapter 5, Page 33.

7 Specifications

7.1 Interfaces

7.1.1 SDI

Video

Communication of the SDI devices requires a mini coax connection with HD-BNC connectors or 3G SFPs with transmission speeds of 0.36 Gbit/s (SD-SDI, SMPTE 259M), 1.485 Gbit/s (HD-SDI, SMPTE 292M) and 2.97 Gbit/s (3G SDI).

Supported SDI resolutions CPU Unit:

480i@59,94 Hz (525i)
576i@50 Hz (625i)
720p@23,98 / 24 / 25 / 29,97 / 30 / 50 / 59,94 / 60 Hz
1080i@50 / 59,94 / 60 Hz
1080p@47,95 / 48 / 50 / 59,94 / 60 Hz 3GA
1080p@50 / 60 Hz 3GB

Audio

Various audio formats can be transmitted through the interface.

Standards	Stereo Linear Pulse Code Modulation (LPCM), AES
Bit Depth	Up to 24 bit
Sample-Rate	48 kHz

There is no audio support for the video mode 576i (PAL).

7.1.2 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.

Mouse

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

Other USB-HID devices

The proprietary USB emulation also supports certain other USB-HID devices, such as specific touch screens, graphic tablets, barcode scanners or special keyboards. Support cannot be guaranteed, however, for every USB-HID device.

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

7.1.3 RJ45 (Interconnect)

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.

7.1.4 Fiber SFP Type LC (Interconnect)

Communication of fiber devices is performed via Gigabit SFPs that are connected to suitable fibers fitted with connectors type LC (see Chapter 7.2.2, Page 45).

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

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

7.1.5 Digital Audio Interface

The digital audio option supports the unidirectional transmission of digital audio data.

Up to three sources can be connected to the CPU Unit. The active source is transmitted. If several sources are active, the XLR signal takes priority, otherwise the first active signal.

The three connectors on the CON Unit provide concurrent digital audio.

SDI Extenders with the digital audio option include an inbuilt sample rate converter that provides predefined sample frequencies at the output of the CON Unit.

The user can set directly the following parameters by using a configuration file:

- Activate or deactivate sample rate converter in the Config.txt file on the flash drive of the SDI Extender.
- If the sample rate converter is activated, the following characteristics are valid:
  140 dB dynamic range and -120 dB total harmonic distortion + noise.
- Set sample frequency of the sample rate converter by writing the parameter in a new line. The following sample frequencies are available:
  - 32.0 kHz (write **SRC32000** in Config.txt file of the CPU unit)
  - 44.1 kHz (write **SRC44100** in Config.txt file of the CPU unit)
  - 48.0 kHz (write **SRC48000** in Config.txt file of the CPU unit)
  - 96.0 kHz (write **SRC96000** in Config.txt file of the CPU unit)

- You can use a delay for converting the sample rate. The time is set in milliseconds and separated from the parameter for the sample rate by a semicolon (e.g. **SRC44100;12**). You can set the following delays for the sample rates:
  - 32.0 kHz: 3 - 60 ms
  - 44.1 kHz: 2 - 44 ms
  - 48.0 kHz: 2 - 40 ms
  - 96.0 kHz: 1 - 20 ms
- To deactivate the sample rate converter, write **SRC_NONE** in the Config.txt file of the CPU unit.

Compatibility	AES/EBU, S/PDIF, EIAJ CP1201, IEC 60958
Standards	Dolby Digital, DTS, PCM
Bit Depth	24 bit
Sample Rate	32 to 96 kHz
CPU Unit (Inputs)	• Mini-XLR (AES/EBU; symmetrical, lockable) • Coaxial (S/PDIF; RCA, Cinch) • Optical (S/PDIF; TOSLINK)
CON Unit (Outputs)	• Mini-XLR (AES/EBU; symmetrical, lockable) • Coaxial (S/PDIF; RCA, Cinch) • Optical (S/PDIF; TOSLINK)

For testing purposes it is possible to generate a sinus tone on the digital audio input module. In order to do so you have to set Jumper 1 on the respective input module.

7.1.6 Balanced Audio Interface

SDI Extenders with a balanced audio interface support a unidirectional 2-channel mono or 1-channel stereo transmission in studio quality.

The audio interface is at the same time a 'Line-Level' and 'Mic-Level' interface and is designed to transmit signals of a microphone or mixing desk for example with a high tolerance for interferences, even at larger distances. In addition to that you can connect active speakers at the CON Unit.

The Line-In connector of each mono input contains a 6.35 mm jack socket and can be used symmetrically or asymmetrically.

Phantom power of a microphone:

Phantom power is used for condenser microphones in order to operate the internal electronic components. Therefore you have to connect the microphone to the input “IN” of the CPU module.

- Phantom power can only be activated on the audio input side (CPU module).
- In order to activate phantom power, the switch on the CPU module has to be set to the ON position.
- The provided power is 48 VDC.

It is necessary to ensure that Line-Level devices are not operated with phantom power in order to avoid unexpected damages to the devices.

Pre-amplification of a microphone:

The balanced audio interface offers the possibility of a pre-amplification of a microphone at the input “IN” of the CPU module.

- The pre-amplification can be activated for each audio channel separately.
- In order to activate the pre-amplification, the dip switch (1 and 2 for the left and right channel) of the respective audio channel has to be set to the ON position at the CPU module.
- The default pre-amplification is 10 dB.
- The pre-amplification can be configured in the Config.txt file of the extender with the balanced audio CPU module. Therefore the respective parameter **GAIN** has to be entered into a new line. The setting can be configured in single steps between 10 and 65 dB, for example:
  - 36 dB (enter **GAIN=36** in Config.txt file)
  - 48 dB (enter **GAIN=48** in Config.txt file)

Configuration of the sample rate:

The sample rate of the balanced audio module can be configured individually.

- The default sample rate is 48.0 kHz.

- The sample rate can be configured in the Config.txt file of the extender with the balanced audio CPU module. Therefore the respective parameter **SRC** has to be entered into a new line. If there is not entered any parameter, the sample rate 48.0 kHz will be used. The following additional sample rates can be configured:
  - 32.0 kHz (enter **SRC32000** in Config.txt file)
  - 44.1 kHz (enter **SRC44100** in Config.txt file)
  - 88.2 kHz (enter **SRC88200** in Config.txt file)
  - 96.0 kHz (enter **SRC96000** in Config.txt file)
  - 176.4 kHz (enter **SRC176400** in Config.txt file)
  - 192.0 kHz (enter **SRC192000** in Config.txt file)

Compatibility

KVM extenders with balanced audio interface are compatible to KVM extenders with digital audio interface regarding the transmission of the audio standard 2-channel PCM.

- The compatibility shall be applied to the upgrade module digital audio and the KVM extenders of the 481 and 483 series.
- The compatibility is regardless of the input or output side, this means that a digital audio input is compatible to a balanced audio output and vice versa.

Specifications Balanced Audio

Bit Depth	24 bit
Sample Rate	32 to 192 kHz
Input Signal Level	Max. 6.4 dBu balanced (Gain: 0 dB) Max. 0.4 dBu unbalanced (Gain: 0 dB)
Output Signal Level	8.1 dBu balanced 2.1 dBu unbalanced
Phantom Power	48 VDC
Pre-amplification	10 – 65 dB
Connections CPU Unit	2x 6.35 mm stereo jack plug (2x audio IN)
Connections CON Unit	2x 6.35 mm stereo jack plug (2x audio OUT)

7.2 Interconnect Cable

7.2.1 Cat X

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

➔ Avoid routing Cat X cables along power cables.

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

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

Type of Interconnect Cable

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

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

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

Maximum Acceptable Cable Length

Cat X Installation Cable AWG24	140 m (400 ft)
Cat X Patch Cable AWG26/8	70 m (200 ft)

7.2.2 Fiber

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

Type of Interconnect Cable

(Cable notations according to VDE)

Type of cable	Specifications
Single-mode 9µm	• Two fibers 9µm • I-V(ZN)H 2E9 (in-house patch cable) • I-V(ZN)HH 2E9 (in-house breakout cable) • I/AD(ZN)H 4E9 (in-house or outdoor breakout cable, resistant) • A/DQ(ZN)B2Y 4G9 (outdoor cable, with protection against rodents)
Multi-mode 50µm	• Two fibers 50µm • I-V(ZN)H 2G50 (in-house patch cable) • I/AD(ZN)H 4G50 (in-house or outdoor breakout cable, resistant)
Multi-mode 62.5µm	• Two fibers 62.5µm • I-V(ZN)HH 2G62.5 (in-house breakout cable) • A/DQ(ZN)B2Y 4G62.5 (outdoor cable, with protection against rodents)

Maximum Acceptable Cable Length

Type of cable	Maximum Acceptable Cable Length
Single-mode 9µm	10,000 m (32,800 ft)
Single-mode 9µm XV	5,000 m (16,400 ft)
Multi-mode 50µm (OM3)	1,000 m (3,280 ft)
Multi-mode 50µm	400 m (1,300 ft)
Multi-mode 62.5µm	200 m (650 ft)

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

Type of Connector

Connector	LC Connector

7.2.3 Coaxial

A point-to-point connection is necessary.

Type of Interconnect Cable

Cable Type	Specifications
Mini coaxial cable AWG 18	RG 6 impedance 75 Ω

Maximum Acceptable Cable Length

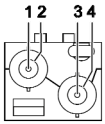
Band Width	Maximum Acceptable Cable Length
0.270 Gbit/s	400 m (1,312 ft)
1.485 Gbit/s	140 m (459 ft)
2.970 Gbit/s	120 m (394 ft)

Type of Connector

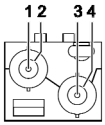
Connector	HD-BNC connector

7.3 Connector Pinouts

HD-BNC (SDI CPU)

Picture	Pin	Signal
	1	Data IN
	2	GND
	3	Data OUT
	4	GND

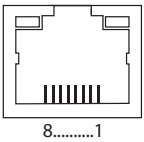
HD-BNC (SDI CON)

Picture	Pin	Signal
	1	Data OUT
	2	GND
	3	Data OUT
	4	GND

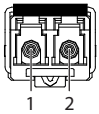
Connector Mini USB Type B

Picture	Pin	Signal	Color
	1	VCC (+5VDC)	Red
	2	Data –	White
	3	Data +	Green
	4	n.c.	–
	5	GND	Black

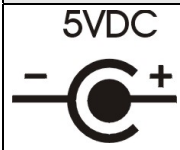
RJ45

Picture	Pin	Signal	Pin	Signal
	1	D1+	5	D3–
	2	D1–	6	D2–
	3	D2+	7	D4+
	4	D3+	8	D4–

Fiber SFP Typ LC

Picture	Diode	Signal
	1	Data OUT
	2	Data IN

Power Supply

Picture	Pin	Signal
	Inside	VCC (+5VDC)
	Outside	GND

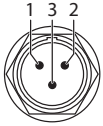
3.5 / 6.35 mm Stereo Jack Plug

Picture	Pin	Signal
	1	GND
	2	Audio IN / OUT L
	3	Audio IN / OUT R

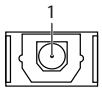
RCA (Cinch)

Picture	Pin	Signal
	1	GND
	2	Data IN / OUT

Mini-XLR

Picture	Pin	Signal
	1	GND
	2	Data +
	3	Data –

TOSLINK

Picture	Diode	Signal
	1	Data IN / OUT

7.4 Power Supply

AC Power Supply

Model	Max. Current	Max. Voltage	Frequency
474-BODY2N	700 mA max.	100-240 V	50/60 Hz
474-BODY6R	1,500 mA max.	96-264 V	47-63 Hz
474-BODY6BP	1,300 mA max.	100-240 V	50/60 Hz
474-BODY6BPF	1,300 mA max.	100-240 V	50/60 Hz
474-BODY21/4U	4,000 mA max.	2x 100-240 V	50/60 Hz

DC Power Supply

Model	Max. Current	Max. Voltage
474-BODY2/2R	3,000 mA	5 VDC
474-BODY2N	5,000 mA	5 VDC
474-BODY4/4R	5,000 mA	5 VDC
474-BODY6R	12,000 mA	5 VDC

Power Requirement

Power Requirement (per Unit)	**SDI Extender:** • Single-Head devices: max. 800 mA **Upgrade Modules:** • USB-HID: max. 300 mA • Balanced Audio: max 500 mA • Digital Audio: max. 300 mA

7.5 Environmental Conditions

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

Noise Emission

Sound Pressure Level (SPL)	max. 21 dBA per fan (474-6FAN)

Heat Dissipation

Thermal output	Corresponds to power consumption in Watt (W) (see extender configurator on the website)

7.6 Size

Devices in the 2-fold Vario Chassis 1

CPU Unit / CON Unit	145 x 147 x 41 mm (5.7" x 5.8" x 1.7")
Shipping Box	210 x 140 x 165 mm (8.3" x 5.5" x 6.5")

Devices in the 2-fold Vario Chassis 2

CPU Unit / CON Unit	221 x 147 x 41 mm (8.7" x 5.8" x 1.7")
Shipping Box	550 x 365 x 115 mm (21.7" x 14.4" x 4.5")

Devices in the 4-fold Vario Chassis

CPU Unit / CON Unit	293 x 147 x 41 mm (11.5" x 5.8" x 1.7")
Shipping Box	550 x 365 x 115 mm (21.7" x 14.4" x 4.5")

Devices in the 6-fold Vario Chassis 6R

CPU Unit / CON Unit	442 x 147 x 41 mm (17.4" x 5.8" x 1.7")
Shipping Box	760 x 365 x 115 mm (29.9" x 14.4" x 4.5")

Devices in the 6-fold Vario Chassis 6BP / 6BPF

CPU Unit / CON Unit	442 x 250 x 44 mm (17.4" x 9.8" x 1.7")
Shipping Box	550 x 372 x 155 mm (21.7" x 14.6" x 6.1")

Devices in the 21-fold Vario Chassis

CPU Unit / CON Unit	482 x 462 x 176 mm (19.0" x 18.2" x 6.9")
Shipping Box	645 x 574 x 368 mm (25.4" x 22.6" x 14.5")

7.7 Shipping Weight

Devices in the 2-fold Vario Chassis 1

CPU Unit / CON Unit	0.7 kg (1.5 lb)
Shipping Box	2.5 kg (5.5 lb)

Devices in the 2-fold Vario Chassis 2

CPU Unit / CON Unit	1.1 kg (2.4 lb)
Shipping Box	2.9 kg (6.4 lb)

Devices in the 4-fold Vario Chassis

CPU Unit / CON Unit	0.9 kg (2.0 lb)
Shipping Box	3.4 kg (7.5 lb)

Devices in the 6-fold Vario Chassis 6R

CPU Unit / CON Unit	1.9 kg (4.2 lb)
Shipping Box	5.1 kg (11.2 lb)

Devices in the 6-fold Vario Chassis 6BP / 6BPF

CPU Unit / CON Unit	2.5 kg (5.5 lb)
Shipping Box	3.5 kg (7.7 lb)

Devices in the 21-fold Vario Chassis

CPU Unit / CON Unit	10.0 kg (22.1 lb)
Shipping Box	14.5 kg (32.0 lb)

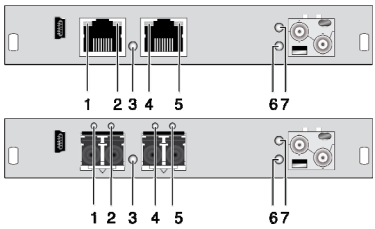
8 Troubleshooting

8.1 General Failures

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

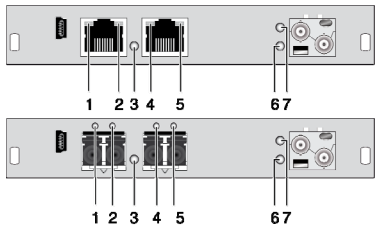
8.2 Blank Screen

CPU Module



Rear View

CON Module

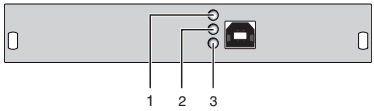


Rear View

Diagnosis	Possible Reason	Measure
LED **3** off	Power supply	➔ Check power supply units and the connection to the power network.
LED **1, 4** on or LED **2, 5** off	Connection between CON Unit and CPU Unit	➔ Check interconnect cables and connections.
LED **3** red or yellow	Connection between CON Unit and CPU Unit or KVM matrix	➔ Check interconnect cables and connections.
LED **6, 7** red	No video signal detected from CPU Unit	➔ Check connection, length and quality of interconnect cables between the units. ➔ Check source of the video signal ➔ Check video cable between CPU Unit and video source
LED **6, 7** blue	Unknown resolution	➔ Check alternative resolution

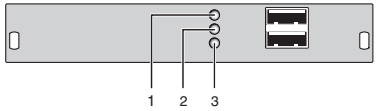
8.3 Upgrade Module USB-HID

CPU Module



Rear View

CON Module

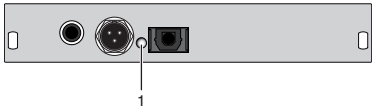


Rear View

Diagnosis	Possible Reason	Measure
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 dealer if necessary.
CPU Unit: LED **3** off	Connection between CON Unit and CPU Unit	➔ Check interconnect cable and connectors.
CON Unit: LED **3** off	Keyboard in Command Mode	➔ Press <Esc> to leave Command Mode.
CON Unit: LED **3** flashing slowly	Connection between CON Unit and CPU Unit	➔ Check interconnect cable and connections.
	Keyboard in Command Mode	➔ Press <Esc> to leave Command Mode.

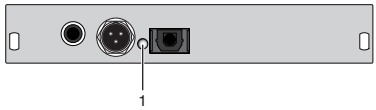
8.4 Digital Audio

CPU Module



Rear View

CON Module



Rear View

Diagnosis	Possible Reason	Measure
CPU Unit: LED **1** red	No audio connection to CPU / audio source	➔ Connect digital audio source. ➔ Check connection of audio cable.
	No signal	➔ Switch digital audio source on. ➔ Activate digital output at CPU / audio source.
CON Unit: LED **1** red	No audio connection to audio sink (e.g. speakers)	➔ Connect digital audio sink. ➔ Check connection of audio cable.
	No signal	➔ Check signal at CPU Unit.
No signal / LEDs **1** OK	Digital Silence at active audio source	➔ Check LEDs at CPU Unit. ➔ Check audio format. ➔ Change audio input.

9 Technical Support

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

9.1 Support Checklist

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

- Company, name, phone number and email
- Type and serial number of the device (see bottom of device)
- Date and number of sales receipt, name of dealer if necessary
- Issue date of the existing manual
- Nature, circumstances and duration of the problem
- Components included in the system (such as graphic source/CPU, OS, graphic card, monitor, USB-HID/USB 2.0 devices, interconnect cable) including manufacturer and model number
- Results from any testing you have done

9.2 Shipping Checklist

1. To return your device, contact your dealer to obtain a RMA number (Return-Material-Authorization).
2. Package your devices carefully, preferably using the original box. Add all pieces which you received originally.
3. Note your RMA number visibly on your shipment.

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

10 Certificates

10.1 CE Declaration Of Conformity

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

2014/30/EU Council Directive on the approximation of the laws of the Member States relating to electromagnetic compatibility

2014/35/EU Council Directive on the harmonization of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits

CE Marking

Product list:

486 Series

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

- EN 55032:2012
- EN 55024:2010 + A1:2015
- EN 61000-3-2:2014
- EN 61000-3-3:2013
- EN 61000-6-2:2005
- EN 60950-1:2006/A2:2013

Manufacturer:

IHSE GmbH
Maybachstrasse 11
88094 Oberteuringen
Deutschland

Oberteuringen, March 1st, 2017

The Management

Use 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.

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

10.2 North American Regulatory Compliance

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.

10.3 Product Safety

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

- IEC 60950-1/A1:2010
- EN 60950-1/A12:2011/A1:2010/A11:2009
- UL 60950-1-2007
- CAN/CSA-C22.2 60950-1-07

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

10.4 WEEE

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

The device labels carry a respective marking.

10.5 RoHS/RoHS 2

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

The device labels carry a respective marking.

11 Glossary

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

Term	Explanation
AES/EBU	Digital audio standard that is officially known as AES3 and that is used for carrying digital audio signals between devices.
Cat X	Any Cat 5e (Cat 6, Cat 7) cable
CGA	Color Graphics Adapter (CGA) is an old analog graphic standard with up to 16 displayable colors and a maximum resolution of 640x400 pixels.
Component Video	Component Video (YPbPr) is a high-quality video standard that consists of three independently and separately transmittable video signals, the luminance signal and two color difference signals.
Composite Video	Composite Video is also called CVBS and it is part of the PAL TV standard.
CON Unit	Component of a KVM Extender or Media Extender to connect to the console (monitor(s), keyboard and mouse; optionally also with USB 2.0 devices)
Console	Keyboard, mouse and monitor
CPU Unit	Component of a KVM Extender or Media Extender to connect to a source (computer, CPU)
CVBS	The analog color video baseband signal (CVBS) is also called Composite Video and it is part of the PAL TV standard.
DDC	Display Data Channel (DDC) is a serial communication interface between monitor and source (computer, CPU). It allows a data exchange via monitor cable and an automatic installation and configuration of a monitor driver by the operating system.
DisplayPort	A VESA standardised interface for an all-digital transmission of audio and video data. It is differentiated between the DisplayPort standards 1.1 and 1.2. The signals have LVDS level.
Dual Access	A system to operate a source (computer, CPU) from two consoles

Term	Explanation
Dual Link	A DVI-D interface for resolutions up to 2560x2048 by signal transmission of up to 330 MPixel/s (24-bit)
Dual-Head	A system with two video connections
DVI	Digital video standard, introduced by the Digital Display Working Group (http://www.ddwg.org). Single Link and Dual Link standard are distinguished. The signals have TMDS level.
DVI-I	A combined signal (digital and analog) that allows running a VGA monitor at a DVI-I port – in contrast to DVI-D (see DVI).
EGA	The Enhanced Graphics Adapter (EGA) is an old analog graphic standard, introduced by IBM in 1984. A D-Sub 9 connector is used for connection.
Fiber	Single-mode or multi-mode fiber cables
HDMI	An interface for an all-digital transmission of audio and video data. It is differentiated between the HDMI standards 1.0 to 1.4a. The signals have TMDS level.
KVM	Keyboard, video and mouse
Mini-XLR	Industrial standard for electrical plug connections (3 pole) for the transmission of digital audio and control signals
Multi-mode	62.5µ multi-mode fiber cable or 50µ multi-mode fiber cable
OSD	The On-Screen-Display is used to display information or to operate a device.
Quad-Head	A system with four video connections
RCA (Cinch)	A non-standard plug connection for transmission of electrical audio and video signals, especially with coaxial cables
S/PDIF	A digital audio interconnect that is used in consumer audio equipment over relatively short distances.
SDI	The Serial Digital Interface (SDI) is a serial digital interface for transmission of uncompressed and unencrypted video data via coax or fiber cable.
SFP	SFPs (Small Form Factor Pluggable) are pluggable interface modules for Gigabit connections. SFP modules are available for Cat X and fiber interconnect cables.

Term	Explanation
Single Link	A DVI-D interface for resolutions up to 1920x1200 by signal transmission of up to 165 MPixel/s (24-bit). Alternative frequencies are Full HD (1080p), 2K HD (2048x1080) and 2048x1152.
Single-Head	A system with one video connection
Single-mode	9µ single-mode fiber cable
S-Video (Y/C)	S-Video (Y/C) is a video format transmitting luminance and chrominance signals separately. Thereby it has a higher quality standard than CVBS.
TOSLINK	Standardized fiber connection system for digital transmission of audio signals (F05 plug connection)
Triple-Head	A system with three video connections
USB-HID	USB-HID devices (Human Interface Device) allow for data input. There is no need for a special driver during installation; "New USB-HID device found" is reported. Typical HID devices include keyboards, mice, graphics tablets and touch screens. Storage, video and audio devices are **not** HID.
VGA	Video Graphics Array (VGA) is a computer graphics standard with a typical resolution of 640x480 pixels and up to 262,144 colors. It can be seen as a follower of the graphics standards MDA, CGA and EGA.