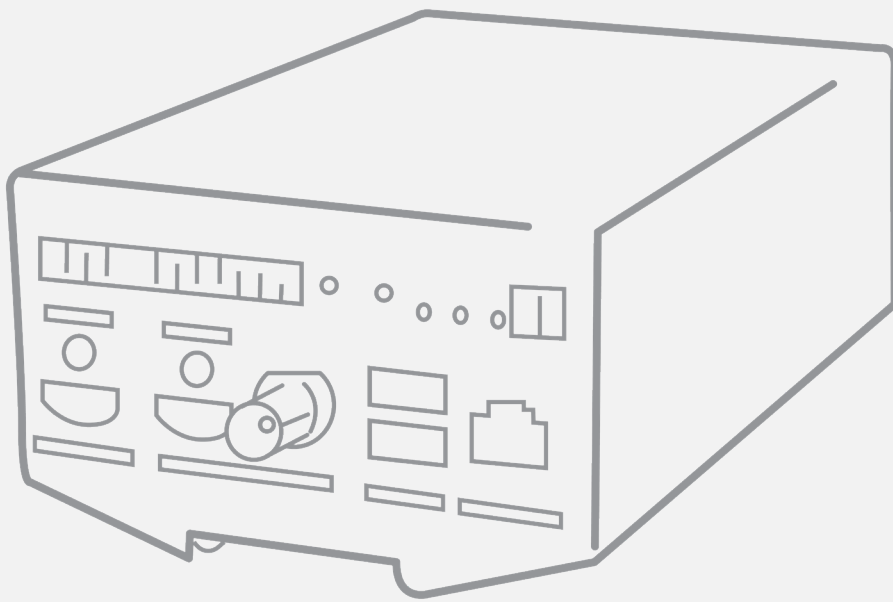# euresys

Empowering Computer Vision

Picolo.net HD1

This documentation is provided with Picolo.net HD1 2.7.3 (doc build 3038).
www.euresys.com

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Contents

PART I

DESCRIPTION

1. Short Description

Left: 1669-DR Picolo.net HD1 (DIN rail) and right: 1669-DW Picolo.net HD1 (Desktop/Wall)

Picolo.net HD1

Deliverables

Quantity	Items
1	Enclosure: ☐　1669-DR Picolo.net HD1 (DIN rail) ☐　1669-DW Picolo.net HD1 (Desktop/Wall)
1	8-pin (1x8) 3.81 mm pitch terminal plug
1	4-pin (1x4) 3.81 mm pitch terminal plug
1	2-pin (1x2) 3.81 mm pitch terminal plug
1	Picolo.net HD1 Installation Guide

Product accessories

Order Code and Name	Short Description
1675 Power Supply for Picolo.net HD1	Universal power supply: ☐ 110-240 Vac, 50/60 Hz input ☐ 12 Vdc, 40 W output
1660 Power Cable (EUR)	IEC C13 AC power cord with CEE 7/7 plug – 1.8 m
1661 Power Cable (US)	IEC C13 AC power cord with US 3-pin plug – 6 ft
1662 Power Cable (UK)	IEC C13 AC power cord with UK 3-pin plug – 6 ft

Key features

Picolo.net HD1 provides the following key features:

☐ High-quality HEVC (H.265) / AVC (H.264) encoder, up to 9 encoded streams

☐ Video streaming from one full HD (up to 1080p60/1080i60) HDMI or SDI source

☐ ONVIF Profile S and Profile T interface

☐ Video encryption

☐ Hi-Fi AAC or uncompressed audio

☐ USB edge storage / USB GPS support

☐ Serial connection for PTZ cameras
☐ PoE+ Power over Ethernet
☐ Fanless aluminum housing

Video features

Picolo.net HD1 acquires high-definition video from one of HDMI or SDI video sources.

It supports progressive-scan formats up to 1080p60 and interlaced formats up to 1080i60 with a large set of frame rates for both 50Hz and 60Hz regions. The source selection and the format selection are automatic.

Interlaced-scan video streams are converted to progressive-scan with motion-compensation.

Two scalers provide two additional video stream sources at lower (or higher) resolutions :

☐ The scaler #1 scales the source resolution to 1280 x 720 (720p) (or lower).

☐ The scaler #2 scales the source resolution to 640 x 360 (360p) (or lower).

The three streams can be encoded concurrently with any of the following encoding methods:

- ☐ HEVC (H.265) main profile,
- ☐ AVC (H.264) baseline, main, or high profiles,
- ☐ MJPEG.

The high-quality HEVC (H.265) / AVC (H.264) hardware encoder engine is capable of encoding multiple streams with an aggregate pixel rate up to 160,000,000 pixels per second (equivalent to 1080p77).

The MJPEG encoder is capable of encoding multiple streams with an aggregate pixel rate up to 62,208,000 pixels per second (equivalent to 1080p30).

Audio features

Picolo.net HD1 acquires 2-channel audio from one of HDMI, SDI or analog audio sources.

The source selector provides three options:

- ☐ HDMI: two digital audio channels embedded in the HDMI audio/video signal,
- ☐ SDI: two digital audio channels are embedded in the SDI audio/video signal,
- ☐ Analog: two digital audio channels delivered by the 48 kHz 16-bit analog-to-digital converter in the analog audio input interface.

The sample rate converter allows to change the sample rate of the selected audio stream. The resulting audio stream can be delivered in the uncompressed format (e.g. 16-bit LPCM), in the AAC-LC compressed format or in the G.711 format.

IO Features

Picolo.net HD1 provides the following I/O features:

- ☐ Two USB 2.0 ports for external storage device and GPS receiver,
- ☐ Two serial COM ports for the control of PTZ cameras: one with a full-duplex RS-422/half-duplex RS-485 interface using the Pelco-D protocol and one with a full-duplex RS-232 interface using the VISTA protocol.
- ☐ One alarm input port,
- ☐ One relay output port.

Network features

Picolo.net HD1 provides a gigabit capable RJ-45 Ethernet port for connection to an IP network.

Streaming features

Picolo.net HD1 uses the Real-time Transport Protocol - RTP - to stream audio, video and metadata over the IP network. The following RTP transport modalities are supported:

- RTP over UDP Unicast
- RTP over UDP Multicast
- RTP interleaved in RTSP over HTTP or HTTPS

The streaming is controlled by means of the RTSP protocol. Each RTSP session may include:

- One encoded video stream
- One encoded audio stream
- One metadata stream

User authentication and access policy

Picolo.net HD1 implements the following user authentication mechanisms to control the access to its resources:

- HTTP and RTSP authentication using the "HTTP Digest Authentication" mechanism
- WS authentication using the WS-Security "Username Token" mechanism, with the "Password Digest" password type.
- Web Pages through login/password dialog box.

Encryption

Picolo.net HD1 implements the following encryption mechanisms:

- Web Service messages encryption using TLS 1.0
- HTTPS Web Pages encrypted access using TLS 1.0
- Optional AES-128 encryption and transparent decryption of the files written on USB mass storage devices.

Compliance

Picolo.net HD1 is an encoder device complying with the version 1.0 of the ONVIF Profile S Specification.

Physical

Picolo.net HD1 (DIN rail) is packaged in an aluminum enclosure that can be fitted on a DIN-rail.

Picolo.net HD1 (Desktop/Wall) is packaged in an aluminum enclosure that can be installed on a desktop or attached to any flat surface such as a wall.

Picolo.net HD1 products are:

- intended for indoor use exclusively,
- fan-less devices that support ambient temperatures up to 50°C or 122°F,
- powered from an external 12V DC power source or from a PoE+ network device.

2. Video Processing Chain

Video Processing Chain
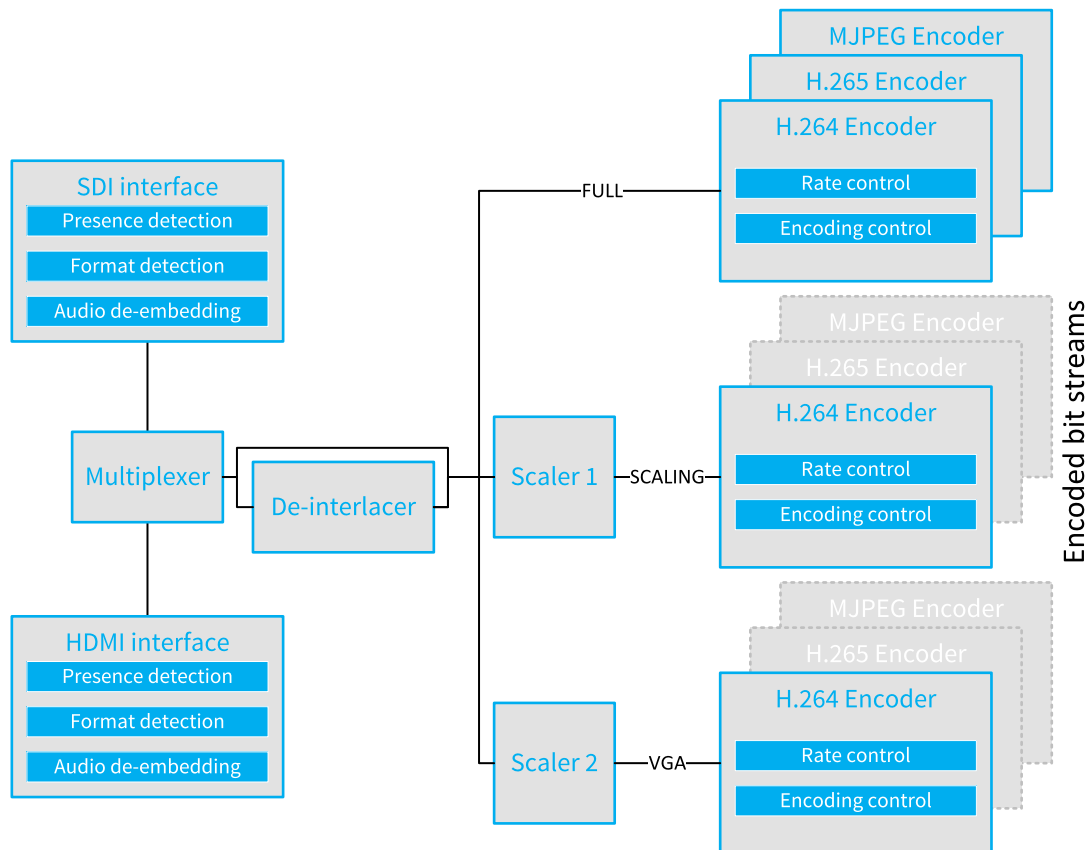
The video processing chain is composed of the following elements:

- One video front end including 2 video interfaces, 1 video source multiplexer, 1 video de-interlacer,

- Two video scalers,

- Three video encoders.

Video front end

- The video multiplexer selects the SDI source or the HDMI source. The SDI interface implements a 3G-SDI receiver capable of automatically identifying and decoding HD-SDI and 3G-SDI audio/video signals up to 1080p60. The HDMI interface implements a single-link HDMI 1.4 receiver capable of automatically identifying and decoding audio/video signals up to 1080p30.

- The de-interlacer converts interlaced-scan video streams to progressive-scan video streams keeping the native resolution and the native frame rate of the video

- The progressive scan video stream is fed to the three encoders and to the two scalers.

Video scalers

- The two video scalers scale down (or up) the full resolution progressive scan video stream:

- The video scaler #1 delivers a video data stream having a resolution up to 1280 pixels wide (720p).

- The video scaler #2 deliver a video data stream having a resolution up to 640 pixels wide (480p).

- The video scalers are exposed to the user as additional encoders that have access to a restricted set of resolutions.

Video encoders

- There are three video encoders: one AVC (H.264), one HEVC (H.265) and one MJPEG encoder.

- Multiple video encoders can be instantiated, processing either unscaled video streams, or one of the video scalers output.

- Free mixing of AVC (H.264) and HEVC (H.265) encoding is allowed as long as the total amount of data to encode does not exceed 160 Mega-pixels per second.

Video Processing Capabilities

Property	Value	Note
AVC (H.264) encoded streams count	3	0 or 1 stream for each available resolution (full, scaler #1, scaler #2)
Frame rate control	Yes	
Total H.264/H.265 encoding power [Mpixels/second]	160	Equivalent to 77 frames of 1920 x 1080 pixels per second
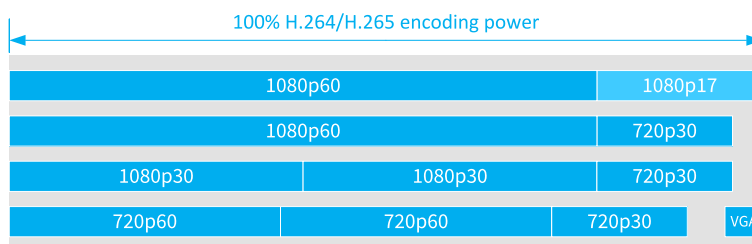
H.264/H.265 encoding power requirements for some stream combinations

Programming Model

The application software manages the video processing resources using one ONVIF Media Profile for each encoded video stream.

An ONVIF Media Profile associates one `VideoSourceConfiguration` and one `VideoEncoderConfiguration`.

3. Access Control

Access Policy

Picolo.net HD1 products implement the default access policy that is recommended by the ONVIF 2.2 Core Specification.

The policy implements four user levels Administrator, Operator, User, and Anonymous.

- Administrator, Operator, and User levels requires the user to be registered in the device user database and to authenticate before to gain access to protected device services. Non-authenticated users belongs to the Anonymous-level.

- Anonymous-level users have only access to the services belonging to the following service class:

  □ "PRE_AUTH" class: a set of service functions not requiring user authentication, for instance: `Device:GetCapabilities, Device:GetServices...`

- In addition to the access rights of Anonymous-level users, User-level have access to the following service classes:

  □ The "READ_SYSTEM" class: a set of service functions reading the system configuration from the device.

  □ The "READ_MEDIA" class; a set of service functions reading the media configuration data.

- In addition to the access rights of User-level users, Operator-level have access to the following service class:

  □ The "ACTUATE" class: a set a service functions affecting the runtime behaviour.

- An Administrator-level user has access to all function classes. It has an exclusive access to the following service classes:

  □ The "READ_SYSTEM_SECRET" class: a set of service functions reading confidential system configuration from the device.

  □ The "WRITE_SYSTEM" class: a set of service functions causing changes to the system configuration of the device.

  □ The "UNRECOVERABLE" class: a set of service functions causing unrecoverable changes to the system configuration of the device.

User Authentication

Picolo.net HD1 products implement the following user authentication mechanisms to control the access to its resources:

- ☐ HTTP and RTSP authentication using the "HTTP Digest Authentication" mechanism.

- ☐ WS authentication using the WS-Security "Username Token" mechanism, with the "Password Digest" password type.

- ☐ Web Pages through login/password dialog box.

Enabling access control

- Access control is automatically enabled when at least one Administrator-level user exists in the user database.

- An out-of-box Picolo.net HD1 product is delivered with an empty user database.

- The access control remains disabled until an Administrator-level user is created.

Disabling access control

- Access control can be disabled by deleting all the Administrator-level users of the user database.

- Access control is also disabled after performing the "Reset to Factory Settings" procedure.

4. Precautions of Use

Damage caused by improper handling is not covered by the manufacturer warranty.

Risk of electrical shock

- ☐ Do not operate the device with removed enclosure cover.

- ☐ Use exclusively isolated DC power sources with the adequate voltage and power ratings.

- ☐ Operate the device and its power supply only in a dry, weather-protected location.

Risk of permanent damage

- ☐ Electronic devices can be damaged by electrostatic discharges.

- ☐ Euresys devices are compliant with electrostatic discharges regulatory requirements. However, it is required to apply any general procedure aimed at reducing the risk associated to electrostatic discharge.

Risk of malfunction due to EMI

- ☐ Electronic devices can be disturbed by electromagnetic interferences.

- ☐ Euresys devices are compliant with electromagnetic susceptibility regulatory requirements. However, it is required to apply any general procedure aimed at reducing the risk associated to electromagnetic interferences.

Risks due to overheating

- ☐ In case of inadequate cooling, the temperature of the device may become excessive, leading to a device malfunction, permanent damage, and risk of fire.

- ☐ The device is designed for fan-less operation and natural air convection cooling. However, it is required to apply any general procedure aimed at facilitating the circulation of the air flow around the enclosure.

Risks due to poor grounding protection

- ☐ Poor ground interconnection, ground loop or ground fault may induce unwanted voltage between equipments, causing excessive current in the interconnecting cables. This faulty situation can damage the electronic devices and its peripherals.

- ☐ The computer and the camera can be located in distant areas with distinct ground connections.

- ☐ The user must follow proper equipment grounding practices at all ends of the interconnecting cables. In addition, it is recommended to use cable assemblies with overall shield solidly connected to the conductive shell of all connectors. Besides the beneficial effect of cable shielding on electromagnetic compatibility, the shield connection can increase the protection level against grounding problems in temporarily absorbing unwanted faulty current.

PART II

INSTALLING A PICOLO.NET

Picolo.net HD1

Contents

1. Declarations of Conformity

CE Compliance (EMC Class A)

Notice for Europe
This product is in conformity with the Council Directive 2014/30/EU

This equipment has been tested and found to comply with Class A EN55022/CISPR22 and Class A EN55024/CISPR24.

This product has been tested in a typical class A compliant host system. It is assumed that this product will also achieve compliance in any class A compliant unit.

To meet EC requirements, shielded cables must be used to connect a peripheral to the card.

FCC Compliance (Class A)

Notice for USA
Compliance Information Statement (Declaration of Conformity Procedure) DoC FCC Part 15

This equipment has been tested and 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 in a residential installation or 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 instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.

- Increase the separation between the equipment and receiver.

- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

- Consult the dealer or an experienced radio/TV technician for help.

KC Compliance

Notice for Korea
The following products have been registered under the Clause 3, Article 58-2 of Radio Wave Acts:

Product	KC Registration Number
PC1669-DW - Picolo.net HD1 (Desktop/Wall)	R-R-EUr-PC1669
PC1669-DR - Picolo.net HD1 (DIN rail)	R-R-EUr-PC1669

RoHS Compliance

This product is in conformity with the European Union RoHS 2011/65/EU Directive, that stands for "the restriction of the use of certain hazardous substances in electrical and electronic equipment".

WEEE

According the European directive 2012/19/EU, the product must be disposed of separately from normal household waste. It must be recycled according to the local regulations.

2. Installation

Box content

Quantity	Items
1	1669-DR Picolo.net HD1 (DIN rail) or 1669-DW Picolo.net HD1 (Desktop/Wall) enclosure
1	8-pin (1x8) 3.81mm pitch terminal plug
1	4-pin (1x4) 3.81mm pitch terminal plug
1	2-pin (1x4) 3.81mm pitch terminal plug
1	Picolo.net HD1 Installation Guide

DIN-rail mounting

The out-of-the box product is ready for installation on a DIN rail.

The DIN rail must be horizontal; two possible orientations are allowed: left facing connectors or right facing connectors.

Wall mounting

The out-of-the box product is ready for a desktop or a wall-mount usage. The enclosure is fitted with 4 oblong holes, 2 on each side, that can be used to attach the product on any flat surface.
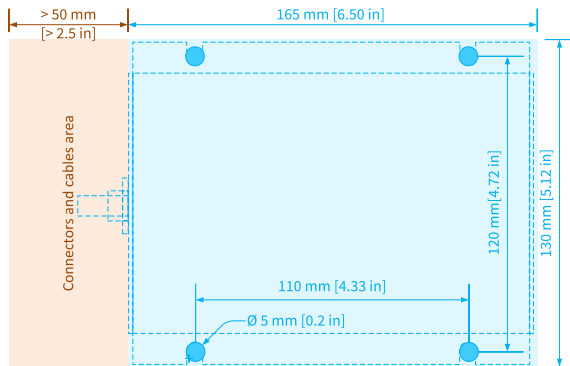
Drill and mounting template

3. Connectors Location and Markings
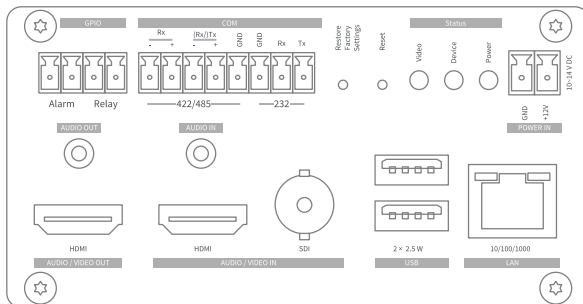
Picolo.net HD1 front panel
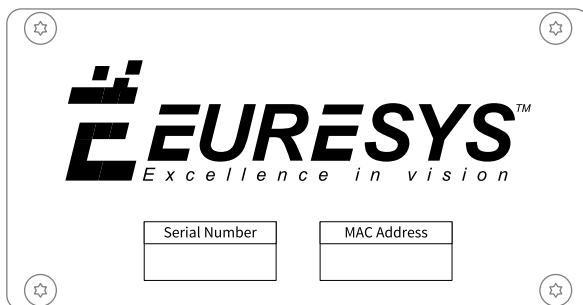
Picolo.net HD1 rear panel

4. Connections

Audio/Video

Audio/Video Inputs

Select one of the following options:

- Connect a HD-SDI or a 3G-SDI audio/video source to the SDI AUDIO/VIDEO IN female BNC connector.

- Connect an HDMI HD audio/video source to the HDMI type A (full size) input.

Audio/Video Output

Connect an HDMI HD audio/video sink to the HDMI type A (full size) output.

Analog Audio Input

Using a 3.5 mm jack, connect an analog stereo (or mono) line-level audio sources to the AUDIO IN connector.
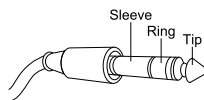
3.5 mm stereo jack

Analog Audio Output

Using a 3.5 mm jack, connect an analog stereo (or mono) line-level audio sink to the AUDIO OUT connector.

Network

Connect the device to the local area network by attaching a RJ-45 network cable into the LAN connector.

USB External Storage

USB for external storage

With a USB type A (full size) connector, connects a USB storage device to any of the USB connectors.

Devices exceeding 2.5 W must be powered externally.

USB for GPS

With a USB type A (full size) connector, connects a USB GPS device to any of the USB connectors.

Serial COM

Connect one serial device to the COM connector via a 8-pin 3.81 mm pitch terminal plug using one of the following wiring options:

- For a full-duplex RS-422 device:
  - **a.** Connect the TxD- and the TxD+ output signals respectively to the RxD- (pin 1) and the RxD+ (pin 2) inputs of the 8-pin terminal plug
  - **b.** Connect the RxD- and the RxD+ input signals respectively to the TxD- (pin 3) and the TxD+ (pin 4) outputs of the 8-pin terminal plug
  - **c.** Connect the GND signal and/or the cable shield to the GND (pin 5 and/or pin 6) of the 8-pin terminal plug
- For a half-duplex RS-485 device:

a. Connect the Data- and the Data+ signals respectively to the Rx/TxD-(pin 3) and the Rx/TxD+ (pin 4) outputs of the COM connector 8-pin terminal plug

b. Connect the GND signal and/or the cable shield to the GND (pin 5 and/or pin 6) of the 8-pin terminal plug

- For a RS-232 device:

    a. Connect the GND signal and/or the cable shield to the GND (pin 5 and/or pin 6) of the 8-pin terminal plug

    b. Connect the Tx output signal to the RxD input (pin 7) of the 8-pin terminal plug

    c. Connect the Rx output signal to the TxD output (pin 8) of the COM 8-pin terminal plug

COM connector

General Purpose I/O

Connect one alarm sensor device and/or one relay-driven device to the GPIO connector via a 4-pin 3.81 mm pitch terminal plug:

- To connect one alarm sensor, insert the 2 wires into INA (pin 1) and INB (pin 2) of the 4-pin plug.

- To connect one relay-driven device, insert the 2 wires into OUTA (pin 3) and OUTB (pin 4) of the 4-pin plug.

GPIO connector

The wiring polarity is irrelevant.

Power Input

Risk of damage to the product
Turn off or disconnect the power source before proceeding.

Connect a 12 V DC power source to the POWER IN connector via a 2-pin 3.81 mm pitch terminal plug:

    a. Connect the GND to the GND input (pin 1) of the 2-pin terminal plug

    b. Connect the +12 V output to the +12 V input (pin 2) of the 2-pin terminal plug
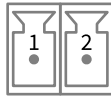
POWER IN connector

1675 Power Supply for Picolo.net HD1, a 12V DC 40 W universal power block is available as accessory.

Risk of Permanent Damage
Electronic devices can be damaged by applying excessive or incorrectly polarized DC voltages.
Use exclusively 12-24V DC power sources. Check power supply wiring before applying power.

5. Configuration

First Boot

1. Apply power and check if the Power OK green LED turns on.

2. Wait about one minute until the completion of the boot procedure.

3. Check if the Video Present LED indicators of all inputs attached to a valid video source are turned ON.

First Network Session

1. Install the **Euresys ONVIF Device Scanner** application software utility on a Windows or Linux computer attached to the same LAN.

2. Ensure that at least one of the following conditions is satisfied on the LAN:

   ☐ A DHCP server is active and authorized to deliver an IP address for the MAC address of the LAN interface.

   ☐ The computer TCP/IP stack is configured for dynamic IP allocation.

3. Run the **Euresys ONVIF Device Scanner** utility. At the completion of the scanning process, all discovered ONVIF devices appear in the discovered ONVIF devices list.

4. Select a device in the list by clicking its [IP] field. The right pane displays the properties of the selected device.

5. Open the device Home page by clicking the [Show] button.
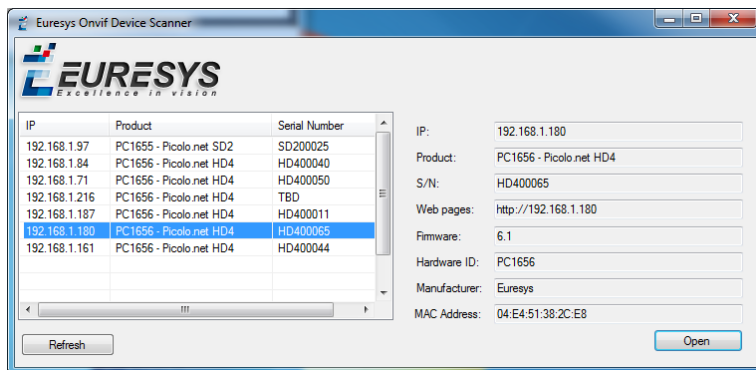
The ONVIF Device Manager application software utility can also be used . ONVIF Device Manager is available on :
http://sourceforge.net/projects/onvifdm/

Manage the media profiles (optional)

The Profile Management page allows the user to view/edit/delete and create media profiles. An auto-setup procedure that automatically creates media profiles suited to the connected cameras is also available.

Manage the configurations (optional)

The Configuration Management page allows the user to:

- View the video source configurations,

- View and edit the video encoder configurations,

- View and edit the metadata configurations.

Manage the device (optional)

The Device Management page has four tabs:

- The Network tab allows the user to view/edit the device host name, the IP address, the DNS, and the default gateway settings.

- The Time tab allows the user to view/edit the time and date, and NTP settings.

- The Discovery tab allows the user to enable/disable the device discovery, and to manage the ONVIF scopes.

- The Maintenance tab allows the user to reboot the device, to revert the device to factory settings, and to upload firmware.

Manage the X.509 certificates (optional)

If you want a fully secured HTTPS connection through the Picolo.net HD1 web interface, you need to make sure the self-signed certificate delivered with Picolo.net HD1 gets signed by an intermediate certificate authority (CA).

See Using X.509 Certificates for more information.

6. Final Check

Video stream from all cameras

Repeat the procedure for all active video sources:

1. Open the Profile Management page.

2. Select a media profile corresponding to the targeted video source, and click the [View/Edit] button.

3. Show the Live Media pane. The video stream is displayed inside a window.

The VLC plug-in must be installed on your computer. The VLC plug-in is available for download from http://www.videolan.org/vlc/.

7. Upgrading the Firmware

The product is shipped with the latest version of the firmware available at the product manufacturing time.

- To upgrade, re-install or downgrade the embedded firmware, use the Firmware Upload panel available on the Device Management page, Maintenance tab, in the built-in web server.

Upgrading the firmware does not explicitly erase the existing user configurations settings.

- For additional upgrade and downgrade information and limitation, please refer to the section Important Notices.

8. Configuring Backup and Restore

To backup and restore your user-defined configurations, use the ONVIF Backup/Restore capability.

The configuration backup data includes:

- ☐ Network settings
- ☐ ONVIF Media Profiles
- ☐ Video Source Configurations
- ☐ Encoder Configurations
- ☐ Metadata Configurations
- ☐ PTZ Configurations

The configuration backup data excludes user account settings:

- ☐ User name
- ☐ User passwords
- ☐ User level

PART III

HARDWARE SPECIFICATIONS

1. Mechanical Specifications

1.1. Dimensions and Weight

1669-DR Picolo.net HD1 HD1 (DIN rail)

Dimensions	Value [mm]	Value [inch]
Width	105	4.13
Height	63.9	2.52
Depth	185	7.28

Weight	Value [g]	Value [lb]
Weight	760	1.68

1669-DW Picolo.net HD1 (Desktop/Wall)

Dimensions	Value [mm]	Value [inch]
Width	130.4	5.13
Height	55.3	2.18
Depth	185	7.28

Weight	Value [g]	Value [lb]
Weight	800	1.76

1.2. Mounting Methods

1669-DR Picolo.net HD1 (DIN rail)

The out-of-the box product is ready for installation on a DIN rail.

DIN-Rail Mount

The DIN rail must be horizontal. Two possible orientations are allowed: left facing connectors or right facing connectors.

1669-DW Picolo.net HD1 (Desktop/Wall)

The out-of-the box product is ready for a desktop or a wall-mount usage. The enclosure is fitted with 4 oblong holes, 2 on each side, that can be used to attach the product on any flat surface.
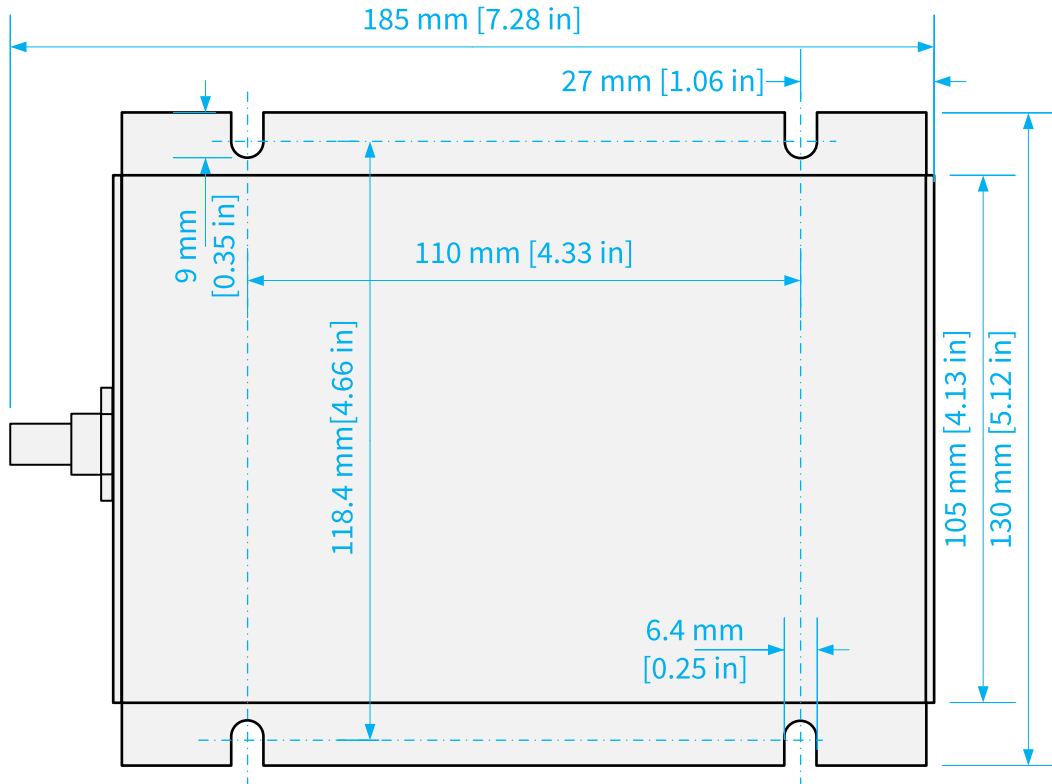
1669-DW Picolo.net HD1 (Desktop/Wall) mounting template

1.3. Connectors Location and Pinout
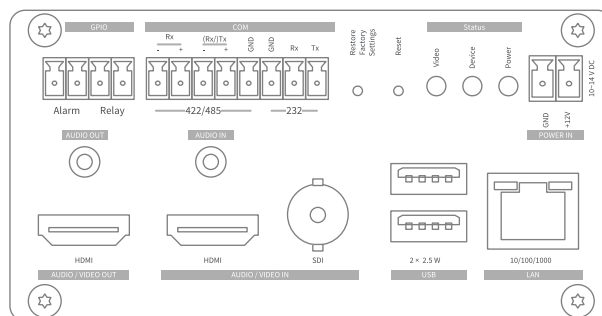
Picolo.net HD1 front panel

SDI AUDIO/VIDEO IN Connector

Property	Value
Name	SDI AUDIO/VIDEO IN
Type	2-pin female receptacle, right-angled PCB-mount, BNC connector
Usage	HD/3G-SDI audio/video input
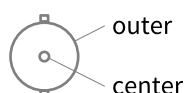
outer
center

Pin	Signal	Usage
Center	SDI IN	SD/HD/3G-SDI Audio/Video Input
Outer	GND	Ground

HDMI AUDIO/VIDEO IN Connector

Property	Value
Name	HDMI AUDIO/VIDEO IN
Type	HDMI type A (full size) receptacle (female) connector
Usage	HDMI audio/video input
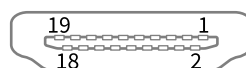
HDMI AUDIO/VIDEO OUT Connector

Property	Value
Name	HDMI AUDIO/VIDEO OUT
Type	HDMI type A (full size) receptacle (female) connector
Usage	HDMI audio/video output
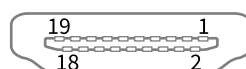
AUDIO IN Connector

Property	Value
Name	AUDIO IN
Type	Black TRS 3.5mm jack socket connector
Usage	Analog audio input

Pin	Signal	Usage
Ring	AUDIO IN - Right channel	Unused
Tip	AUDIO IN - Left channel	Analog audio input
Sleeve	GND	Chassis ground

AUDIO OUT Connector

Property	Value
Name	AUDIO OUT
Type	Black TRS 3.5mm jack socket connector
Usage	Analog audio output

Pin	Signal	Usage
Ring	AUDIO OUT - Right channel	Unused
Tip	AUDIO OUT - Left channel	Analog audio output
Sleeve	GND	Chassis ground

COM Connector

Property	Value
Name	COM
Type	8-pin (1x8) 3.81 mm pitch terminal socket
Usage	RS-232/RS-422/RS-485 serial COM port

Pin	Signal	Usage
1	RxD-	422:RxD-(A)input
2	RxD+	422:RxD+(B) input
3	(Rx/)TxD-	485:Data-(A) input/output 422:TxD-(A)output
4	(Rx/)TxD+	485:Data+(B)input/output 422:TxD-(B)output
5	GND	Cable shield
6	GND	Cable shield
7	RxD	232:RxD input
8	TxD	232:TxD output

GPIO Connector

Property	Value
Name	GPIO
Type	4-pin (1x4) 3.81 mm pitch terminal socket
Usage	Alarm input and relay output

Pin	Signal	Usage
1	INA	Alarm Input - Terminal A
2	INB	Alarm Input - Terminal B
3	OUTA	Relay Output - Terminal A
4	OUTB	Relay Output - Terminal B

Power IN Connector

Property	Value
Name	POWER IN
Type	2-pin 3.81mm pitch terminal socket
Usage	DC power input
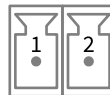
Pin	Signal	Usage
1	GND	DC Power Input - Ground terminal
2	+	DC Power Input - Positive terminal

1.4. LED Indicators

Front panel

Indicator	Type and Colour	Marking
Video Status	Circular green LED	Video
Device Status	Circular bi-color red & green LED	Device
Power Status	Circular green LED	Power
Link Activity	Rectangular amber LED (LAN connector)	*No marking*
Link Status	Rectangular green LED (LAN connector)	*No marking*

Video status

State	Meaning
OFF	No or invalid video signal
ON	Valid and supported video signal

Device status

State	Meaning
OFF	Power OFF or Operating System kernel startup
Green color, fast blink (10 Hz) 50% ON time	Operating System Kernel startup completed, system boot in progress
Green color, ON	System is Ready
Orange color, slow blink (1 Hz) 10% ON time	Firmware update in progress
Orange color, fast blink (10 Hz) 50% ON time	USB Service needed
Red color, slow blink (1 Hz) 90% ON time	System error
Red color, , fast blink (10 Hz) 50% ON time	USB device with wrong power requirements detected or with unknown class detected

Power status

State	Meaning
OFF	No power
ON	Power OK

LAN link activity

State	Meaning
OFF	No activity on the link
Blink	Activity on the link

LAN link status

State	Meaning
OFF	The link is not OK
Blink	The link is OK and operating at the lowest speed
ON	The link is OK and operating at the highest speed

1.5. Switches

Restore Factory Settings   Reset
○   ○
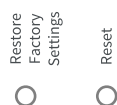
Front panel

Switch	Type	Marking
Device Maintenance	Recessed push-button	Restore Factory Settings
Device Reset	Recessed push-button	Reset

Device maintenance switch action

Switch Action	Meaning
Long push (t > 3 s after the Device Status indicator turns to the orange state)	Restore the device factory settings including network settings

Device reset switch action

Switch Action	Meaning
Push	Reboot the device

2. Electrical Specifications

2.1. Power Input

Dual Power Source

The device can be powered from 1 or 2 external power sources:

 □ A +12 V DC power source attached to the POWER IN connector and/or …

 □ … through the LAN connector and the network cable from a PoE+ (IEEE 802.3at-2009) capable network switch.

Having two power sources ensures power supply redundancy:
- If one source fails, the device automatically switches to the remaining source without any impact on the device operation.
- When power is available at both connectors, the device is powered by POWER IN and it does not draw any current from the PoE connector.

POWER Requirements

Power source		Min.	Typ.	Max.	Unit
POWER IN	DC voltage range	9		14	V
	DC power consumption (when no power is delivered to the LAN connector)		10.5		W
	Power supply ratings (the power supply must be a LPS - Limited Power Source)	20			W
LAN	PoE+ power consumption (when no power is delivered to the POWER IN connector)		10.5		W

The specification applies to the whole operating temperature range when the device encodes audio and video at full encoding power.

Device disconnection

To disconnect the device from the mains, unplug the power socket of the power supply connected to the POWER IN connector.

Install the power socket near the equipment and keep it easily accessible.

2.2. SDI Input Port

The SDI input port implements a single-link SDI sink interface for 3G-SDI and HD-SDI devices.

Operating Characteristics

Property	Min.	Typ.	Max.	Unit
Peak-to-peak signal amplitude (short cable)	720	800	950	mV
Serial data rate	1.485		2.970	Gbps
Achievable cable length with Belden 1694 coaxial cable @1.485 Gbps			100	m
Achievable cable length with Belden 1694 coaxial cable @2.970 Gbps			***TBD***	m
Input impedance		75		Ω

Absolute maximum ratings

Property	Min.	Typ.	Max.	Unit
DC voltage	-2.0		+2.0	V

Exceeding the above limits may irreversibly damage the product.

The usage of DC-coupled video sources outside the above mentioned limits is strictly prohibited.

2.3. HDMI Input Port

The HDMI input port implements a single TMDS link complying with the electrical specifications of the High Definition Multimedia Interface 1.3 for HDMI Sink.

Operating Characteristics

Property	Min.	Typ.	Max.	Unit
TMDS Clock Rate	25.175		165	MHz

Absolute maximum ratings

Property	Min.	Typ.	Max.	Unit
DC voltage	-2.0		+2.0	V

Exceeding the above limits may irreversibly damage the product.

2.4. HDMI Output Port

The HDMI output port implements a single TMDS link complying with the electrical specifications of the High Definition Multimedia Interface 1.3 for HDMI Source.

Operating Characteristics

Property	Min.	Typ.	Max.	Unit
TMDS Clock Rate	25.175		165	MHz

Absolute maximum ratings

Property	Min.	Typ.	Max.	Unit
DC voltage	-2.0		+2.0	V

Exceeding the above limits may irreversibly damage the product.

2.5. Analog Audio Input Port

The analog audio input port implements a high-impedance 2-channel line-level audio input interface.

Operating Characteristics

Property	Min.	Typ.	Max.	Unit
Full-scale input voltage	1.35	1.4	1.5	V_{ptp}
Input impedance (@ 1 kHz)		100		kΩ
Sampling frequency		48		kHz

Absolute Maximum Ratings

Property	Min.	Typ.	Max.	Unit
DC voltage	-10		+10	V
Input signal level			2.0	V_{ptp}

Exceeding the above limits may irreversibly damage the product.

2.6. Analog Audio Output Port

The analog audio output port implements a high-impedance 2-channel line-level audio output interface.

Operating Characteristics

Property	Test condition	Min.	Typ.	Max.	Unit
Full-scale output voltage	10 kΩ load, default gain	1.41	1.48	1.55	V_{ptp}
Output impedance	1 kHz		470		Ω

Absolute Maximum Ratings

Property	Min.	Typ.	Max.	Unit
DC voltage	-10		+10	V

Exceeding the above limits may irreversibly damage the product.

2.7. Alarm Input Port

The alarm input port implements a digital polarity-free non-isolated interface.

It supports the direct connection of single-ended digital drivers operating at TTL, 3V CMOS, 5V CMOS, and 12V CMOS levels

Operating Characteristics

Property	Min.	Typ.	Max.	Unit
Voltage threshold		1.5		V

Absolute maximum ratings

Property	Min.	Typ.	Max.	Unit
DC voltage	0		20	V

Exceeding the above limits may irreversibly damage the device.

2.8. Relay Output Port

Functional Description

The relay output implements a potential-free and polarity-free solid-state contact. It is capable of switching both AC- and DC-powered resistive loads.
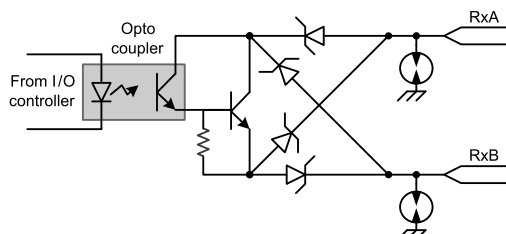
The contact remains in the OPEN state during the board initialization procedure.

In the CLOSED state, the output port exhibit a voltage drop across its pins. Typical voltage drops for current values of 1, 10 and 100 mA are shown in the following table:

Operating the relay output with load currents below 1 mA is not recommended since it exhibits a large equivalent resistance!

Operating Characteristics

Property	Condition	Min.	Typ.	Max.	Unit
Load Current - Recommended range	(1)	1	10	50	mA
Voltage across pins	1 mA; (2)		0.65		V
	10 mA; (2)		1.3		V
	50 mA; (2)		1.75		V

Condition (1): Ambient temperature up to 55 °C
Condition (2): 25 °C ambient temperature

Absolute Maximum Ratings

Property	Test Condition	Min.	Typ.	Max.	Unit
Voltage	Contact open	-30		+30	V
AC voltage	Contact open			21	V_{RMS}
DC current	Contact closed	-100		+100	mA
AC current	Contact closed			70	mA_{RMS}
Isolation voltage			500		V_{RMS}

Exceeding the absolute maximum ratings may irreversibly damage the device.

2.9. RS-232 COM Port

The RS-232 communication port implements a full-duplex single-ended serial communication interface complying with the TIA/EIA-232-F standard.

Operating Characteristics

Property	Min.	Typ.	Max.	Unit
Data rate			250	kbits/s
Driver output voltage (3 kΩ to GND load)	-5		+5	V
Receiver voltage threshold		1.5		V
Receiver common-mode voltage range	-25		+25	V
ESD voltage rating	-15		+15	kV

Absolute maximum ratings

Property	Min.	Typ.	Max.	Unit
DC voltage	-30		+30	V

Exceeding the above limits may irreversibly damage the product.

2.10. RS-422/RS-485 COM Port

The RS-422/RS-485 communication port implements a differential serial communication interface.

The interface supports two wiring methods selectable by software:

- RS-422 full-duplex using two pair of pins: Rx and Tx,

- RS-485 half-duplex using only the Tx pair for both Rx and Tx functions.

Operating Characteristics

Property	Min.	Typ.	Max.	Unit
Full-duplex receiver termination load impedance		100		Ω
Half-duplex receiver termination load impedance		100		Ω
Driver differential output voltage	-1.5		+1.5	V
Receiver common-mode voltage range	-7		+12	V
ESD voltage rating	-15		+15	kV

Absolute maximum ratings

Property	Min.	Typ.	Max.	Unit
DC voltage	-8		+12.5	V

Exceeding the above limits may irreversibly damage the product.

2.11. USB Port

The USB ports implement USB 2.0 compliant interface.

Operating Characteristics

Property	Min.	Typ.	Max.	Unit
Data rate			480	Mbps
Output power			2.5	W

2.12. Power Supply Adapters

1675 Power Supply for Picolo.net HD1

Property	Description
AC input	100-240 VAC / 50-60 Hz
DC output	12 V
Rated power (max.)	40 W (LPS power supply - Limited Power Source)
Efficiency (typ.)	89.5 %
Working temperature range	-30 ~ +70°C (derating to 60 % load above 50°C)
AC inlet	IEC320-C14
DC output plug	2-pin 3.81 mm pitch terminal plug
DC cord length	0.9 meter
Certifications	Global certificates including: CE, FCC, KC

Product Accessories

Order Code and Name	Description
1660 Power Cable (EUR) for Power Supply 1658, 1659	IEC C13 AC Power Cord with CEE 7/7 Plug - 1.8M
1661 Power Cable (US) for Power Supply 1658, 1659	IEC C13 AC Power Cord with US 3-pin Plug – 6ft
1662 Power Cable (UK) for Power Supply 1658, 1659	IEC C13 AC Power Cord with UK 3-pin Plug – 6ft

3. Environmental Specifications

3.1. Operating Conditions

Requirements

Property	Min.	Max.	Unit
Ambient air temperature range	0	50	°C
	32	122	°F
FPGA die temperature		85	°C
		185	°F
Processor die temperature		105	°C
		221	°F
Ambient humidity range (1)	10	90	% RH

Condition (1): non-condensing

Dissipated power

Property	Typ.	Unit
Thermal value (2)	35.8	BTU/h
	10.5	W

Condition (2): operating temperature range, full encoding workload

3.2. Storage Conditions

The following requirements are applicable during storage conditions when the product is not operating:

Requirements

Property	Min.	Max.	Unit
Temperature range	-20	+75	°C
	-4	+158	°F
Humidity range	10	90	% RH

Condition (1): non-condensing

3.3. Compliance

Electromagnetic

The product complies with:

- The European Council EMC Directive 2004/108/EC

- The Unites States FCC rule 47 CFR 15

It has been tested and found to comply with the following standards:

Radiated emission

Standard	Limit / Level
EN 55022	Class A
FCC 47 CFR 15 Sub-part A	Class A

Immunity

Standard	Description
EN 61000-4-3	Radiated, radio-frequency, electromagnetic field immunity test
EN 61000-4-4	Electrical fast transient/burst immunity test
EN 61000-4-5	Surge immunity test
EN 61000-4-6	Immunity to conducted disturbances, induced by radio-frequency fields
EN 61000-4-11	Voltage dips, short interruptions and voltage variations immunity tests

RoHS

The product is manufactured according to the European Union RoHS 2011/65/EU Directive.

WEEE

According the European 2002/96/EC Directive, the product must be disposed of separately from normal household waste. It must be recycled according to the local regulations.

4. Functional Specifications

4.1. Video Source Specification

Video Source Requirements

SDI Video Input

Characteristics	Description
Number	1
SDI standards and bit rates	HD-SDI (SMPTE 292M) @ 1.485 and 1.485/1.001 Gbit/s 3G-SDI (SMPTE 424M) @ 2.970 and 2.970/1.001 Gbit/s
Video formats	1080p @ 23.98, 24, 25, 29.97, 30, 50, 59.94 and 60 frames per second 1080i @ 50, 59.94 and 60 fields per second 720p @ 50, 59.94 and 60 frames per second

HDMI Video Input

Characteristics	Description
Number	1
HDMI standards	HDMI 1.2
Video formats	1080p @ 23.98, 24, 25, 29.97, 30, 50, 59.94 and 60 frames per second 1080i @ 50, 59.94 and 60 fields per second 720p @ 50, 59.94 and 60 frames per second 576p @ 50 frames per second 576i @ 50 fields per second 480p @ 59.94 and 60 fields per second 480i @ 59.94 and 60 fields per second

Video Format Selection

The video format is automatically detected.

The actual frame rate and the resolution are reported into the `FrameRate` and `Resolution` properties of the ONVIF `VideoSource` object.

The native resolution is:

- For 720p video formats: 1280 (H)x 720 (V)

- For 1080i and 1080p video formats: 1920 (H) x 1080 (V)

Video Presence Detection

The presence of a valid Video Signal is reported by the **Video** LED indicator.

 A video signal is considered as valid when all the following conditions are met:
- The signal timing complies with the above listed specification.
- No CRC errors are detected by the SDI receiver.

4.2. Video Encoders Specification

AVC (H.264) and HEVC (H.265) video encoders specification

Resolution

The AVC (H.264) encoder supports the following resolutions:

Name	Width	Height	Image Aspect Ratio	Note
1080p	1920	1080	16:9	Native for 1080p sources
720p	1280	720	16:9	Native for 720p sources
540p	960	540	16:9	
360p	640	360	16:9	1080p scaled down by 3, 720p scaled down by 2
270p	480	270	16:9	
240p	320	240	4:3	
180p	320	180	16:9	Fits within a QVGA display

The default resolution setting is the native video source resolution.

Profile

The AVC (H.264) encoder supports the following encoding profiles:

- ☐ Baseline profile (default)

- ☐ Main profile

- ☐ High profile

The HEVC (H.265) encoder supports the following encoding profile:

- ☐ Main profile

Frame rate control

The `EncodingInterval` and `FrameRateLimit` properties of the `VideoEncoderConfiguration` object determine the frame rate of the encoded video stream.

`FrameRateLimit` is an integer value expressed in frames per second [fps] specifying the upper limit of the frame rate of the encoded video stream.

By default, `FrameRateLimit` is set to the actual frame rate of the video source. It can be set to any integer value up to the frame rate of the video source.

For video sources having a non-integer frame rate value, the default and maximum value of `FrameRateLimit` is rounded up to the next integer value. For instance for 29.97 fps sources, `FrameRateLimit` is set to 30.

Setting `FrameRateLimit` to 0 is equivalent to setting `FrameRateLimit` to its maximum value.

`EncodingInterval` specifies the interval between encoded frames. A value of 1 means that all frames are encoded; a value of 2 means that 1 frame out of 2 are effectively encoded.

By default, the `EncodingInterval` property is set to 1. It can be set to any integer value in the range [1, 150].

The frame rate of the encoded stream can be evaluated using the following formula:

Encoded Stream Frame Rate [fps] = FrameRateLimit / EncodingInterval

Rate control – bit rate

The target bit rate is specified in kbps by the `BitRateLimit` property of the `VideoEncoderConfiguration` object.

By default, the `BitRateLimit` property is set to 4,000 kbps. It can be set to any integer value up to 20,000 kbps.

Setting too low bit rates may result in lower fidelity, blocky or jerky video.

The AVC (H.264) encoder supports the following bit rate control methods:

- ☐ CBR (Constant Bit Rate)
- ☐ VBR (Variable Bit Rate)

The encoding quality is specified by the `BitrateLimit` property of the `VideoEncoderConfiguration` object.

GOP size

The property `GovLength` specifies the total number of frames in a Group Of video Pictures (GOP). Possible values range from 1 to 300; the default setting is 100.

In the H.264 Baseline profile, a GOP is composed of one I(or IDR)-frame followed by (`Govlength`-1) P frames.

In the H.264 Main and High profiles, a GOP is composed of one I(or IDR)-frame followed by (`Govlength`-1) P or B frames.

Setting `GovLength` to 1 forces all pictures to be coded as I(or IDR)-frames.

MJPEG video encoder specification

Resolution

The MJPEG encoder supports the following resolutions:

Name	Width	Height	Image Aspect Ratio	Remark
1080p	1920	1080	16:9	Native for 1080p sources
720p	1280	720	16:9	Native for 720p sources
540p	960	540	16:9	
360p	640	360	16:9	1080p scaled down by 3 or 720p scaled down by 2
270p	480	270	16:9	
240p	320	240	4:3	
180p	320	180	16:9	Fits within a QVGA display

The default resolution setting is the native video source resolution.

4.3. Audio Specifications

Audio processing chain
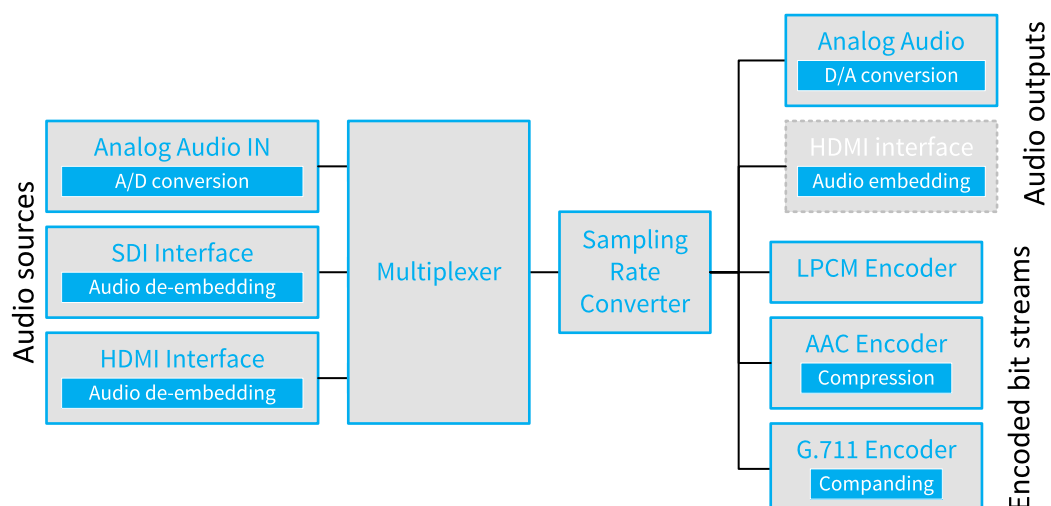
The audio processing chain is composed of the following elements:

☐ One audio input front-end including one analog two digital embedded audio sources and oe audio multiplexer

- ☐ One sample rate converter
- ☐ Three encoders
- ☐ One set of audio outputs

Audio inputs front-end

The audio multiplexer selects a digital audio stream from one of the following three audio sources:

- ☐ Analog audio source

- ☐ SDI audio source

- ☐ HDMI audio source

The analog audio interface digitizes the analog audio stereo signal at 48 kHz.

The HDMI and SDI interfaces extract up to two audio channels of the embedded audio/video signal. The sampling rate for such audio signal is determined by the HDMI/HD-SDI source.

Sampling rate converter

The sample rate converter adapts the sample rate of the audio stream to the desired rate.

The sample rate is defined once for all the encoded audio streams and the audio outputs. If e.g. we want to use G.711 encoder (8kHz), simultaneous output as linear PCM or AAC is only possible at 8kHz!

Audio encoders

There are 3 audio encoders: one G.7xx encoder, one AAC encoder and one Linear PCM encoder.

Up to 3 encoders can be used providing that they are requiring the same sampling rate. This is tested and enforced by the web service layer, that will not allow simultaneous use of two encoders requiring conflicting sampling rates.

Important side-effect: producing G.711 out of de-embedded audio might thus be available only when embedded audio is sampled by the source at 8kHz.

Audio outputs set

The audio stream can feed:

- ☐ Two digital audio channels of the HDMI Output

- ☐ Left and Right channels of the analog audio output through a stereo DAC converter.

Audio Inputs

Analog Audio Input Port

Characteristics	Description
Type	Stereo line-level analog input
Level control	Fixed
Sampling rate	Fixed: 48 kHz

G.711 encoder

Characteristics	Description
Encoding standard	PCM G.711 µ-law
Sampling rate	8 kHz
Bit rate	64 kbps

AAC encoder

Characteristics	Description
Encoding standards	AAC-LC
Sampling rate	selectable: ***TBD***
Bit rate	140 kbps

LPCM encoder

Characteristics	Description
Encoding standards	16-bit Linear PCM
Sampling rate	selectable: ***TBD***
Bit rate	16x sampling rate

4.4. Streaming Specifications

Media Transport Protocols

Media Transport Protocol

Picolo.net HD1 products use the Real-Time Transport Protocol - RTP - standard for streaming media data over the network.

In fact, the standard - RFC 3550 - describes two protocols:

□   The RTP protocol itself.

□   The Real-time Transport Control Protocol - RTCP.

The RTP protocol is a simple protocol which defines a standardized packet format for delivering audio and video over IP networks.

The RTCP protocol provides statistics and control information over the RTP stream.

RTP is used extensively in communication and entertainment systems that involve streaming media.

RTP comes in various flavors, depending on the following choices:

□   The *transport modality* of the RTP stream over the network.

□   The *type of media* transported by the RTP stream.

Media Transport Control Protocol

Picolo.net products use the Real-time Streaming Protocol - RTSP - as the control protocol for all the flavors of RTP streams.

RSTP is described by RFC 2326. It allows controlling another protocol (usually RTP), implementing commands such as Play (start a stream), Pause (pause a stream) and Describe (describe the streams controlled by the current RTSP session).

RTSP uses TCP as its transport protocol.

Media Transport Security Protocol

Picolo.net HD1 uses the Transport Layer Security - TLS - to encrypt, when required, the media stream.

The TLS Protocol encrypts an HTTP stream using various cryptographic algorithms. As such, only the "RTP interleaved in RTSP over HTTP" transport modality is applicable for media stream encryption purposes.

RTP Transport Modalities

The following modalities are available to transport the RTP stream over an IP network:

RTP over UDP Unicast

In this modality, the RTP stream is sent using the User Datagram Protocol - UDP - described in RFC 768.

The UDP protocol is a "fire and forget" protocol. The sender sends the data through the network and doesn't care whether that data arrives to the client or not. The data is never resent, and thus can be lost if a problem happens during the transport.

In the Unicast mode, the sender sends the data to a single receiver.

RTP over UDP MultiCast

This modality is almost identical to the "RTP over UDP Unicast" case. The only difference is that the data is sent to multiple receivers instead of a single one using UDP multicasting.

UDP multicasting uses the "IP multicast" technique described in RFC 1112.

In this technique, the sender sends the data to a special multicast address. The data is then sent by the routing protocols to receivers that previously informed the network that they are interested in the given multicast address. IP multicast is thus a subscription-based technique.

RTP interleaved in RTSP over HTTP

This modality is almost identical to the "RTP interleaved in RTSP over TCP" modality. The only difference is that instead of being directly sent on the TCP stream, the RTP and RTSP packets are first encapsulated in HTTP.

HTTP being a widely used protocol over the internet, encapsulating the data inside HTTP allows it to pass through firewalls.

Moreover, encapsulating the data inside HTTP allows taking advantage of the TLS Protocol to secure the media stream.

Since HTTP is based on TCP, this modality can also be categorized as reliable.

RTP Transport Media Types

RTP can transport different media types, each coming with a corresponding sub-norm of RTP.

Picolo.net products implement the following sub-norms of RTP:

RTP Payload Format for H.264 Video

The RFC 3984 describes the methodology used to encapsulate H264 (MPEG-4 Part 10) data in a RTP stream.

RTP Payload Format for JPEG-compressed Video

The RFC 2435 describes the methodology used to encapsulate JPEG-compressed Video data in a RTP stream.

4.5. Network Specifications

LAN interface characteristics and Network protocols

Characteristics	Description
LAN interface	1 x Ethernet 10BASE-T/100BASE-TX/1000BASE-T, automatic speed negotiation
LAN connector	1 x RJ45 with Link and Activity LED indicators
Application layer protocols	DHCP, DNS, HTTP, HTTPS, NTP,RTCP, RTP, RTSP, TLS 1.2, SAP[1]
Transport layer protocols	TCP, UDP
Internet layer protocols	IPv4, ICMP, IGMPv2, IPV6, ICMPv6, IGMPv3

IP Address Allocation Methods

An IP address must be allocated to the LAN interface using one of the following methods:

- ☐ *DHCP method:* Automatic IP address allocation using the Dynamic Host Configuration Protocol

- ☐ *Static IP method:* Manual IP address allocation

The following IP address allocation methods are available:

DHCP Method

The *DHCP method* is an automatic IP address allocation method: the unique IP address is automatically assigned by a DHCP Server.

At Power On, providing that the LLA/DHCP setting is enabled in the IP settings of the LAN interface, the device repeatedly attempts to contact the DHCP Server.

This method requires a correctly configured and running DHCP Server on the same network. More specifically:

- ☐ The DHCP Server must have sufficient IP addresses to deliver.

- ☐ When the DHCP Server uses MAC address filtering, it is mandatory to add the MAC address of the LAN interface to the list of enabled MAC addresses on the DHCP Server.

The LLA and DHCP methods are enabled for an out-of-the-box product or after completion of the "Restore Factory Settings" procedure. If required, the LLA and DHCP methods can be disabled by changing the IP settings of the LAN interface.

---

[1]Session Announcement Protocol described by IETF RFC 2974

The Static IP Method

With the *static IP method*, the IP address is assigned by the user.

The static IP method is disabled for an out-of-the-box product or after completion of the "Restore Factory Settings" procedure. If required, the static IP method can be enabled by changing the IP settings of the LAN interface.

To manually assign a static IP address to the LAN interface, the user must proceed as follows:

1. Establish a network session using any of the automatic IP address allocation method

2. Gain access to the device Web Pages, and select the Device Network tab of the Management page

3. Disable the automatic IP Address allocation by unchecking the "From DHCP" check-box in the IP Address panel

4. Fill-in the IP and Subnet Mask fields with the appropriate value

5. Apply the changes by clicking on the Apply button

6. Reboot the device

HTTPS Protocol

Picolo.net HD1 products implement the following TLS protocols:

- ☐ TLS 1.0 as described by RFC 2246

- ☐ TLS 1.1 as described by RFC 4346

- ☐ TLS 1.2 as described by RFC 5246

The TLS protocol uses a hybrid encryption scheme, using a public-key algorithm to exchange securely between the server and the client a session key. That key is then used by a symmetric key algorithm to encrypt and decrypt the subsequent messages.

The combination of HTTP and TLS is more widely known as HTTPS.

4.6. System Integration Specifications

System Integration

Characteristics	Description
Alarm inputs	1 non-isolated polarity insensitive input for closing contacts or electronic sensor with CMOS digital outputs
Alarm inputs connector	GPIO: 4-pin 3.81 mm pluggable terminal block socket & plug with screw, rising cage clamp, cable termination.
Relay outputs	1 potential-free normally open contacts
Relay outputs connector	GPIO: 4-pin 3.81 mm pluggable terminal block socket & plug with screw, rising cage clamp, cable termination
COM	2 serial COM ports: ☐ 1 with RS-232 full-duplex interface ☐ 1 with a combined RS-422 full duplex/ RS-485 half duplex interface
COM connector	COM: 8-pin 3.81 mm pluggable

Characteristics	Description
	terminal block socket & plug with screw, rising cage clamp, cable termination
PTZ COM Protocols	Pelco-D, Sony VISCA
Watchdog	Yes

4.7. Watchdog Operation

Watchdog monitoring

A software monitoring program running on Picolo.net HD1 continuously monitors the state of key system elements and restarts some of them if necessary. As a last resort, a hardware watchdog will reboot the device to get the system back up and running.

Watchdog durations

- During the boot process, the watchdog counter is configured with a 2-minute timeout.

- When the boot is complete, the watchdog counter is configured with a 16-second timeout.

Monitored items

The monitored items are the following:

- **Video capture and encoding**: if one of the video streams that have been requested (via ONVIF profiles) is stalled, the "video capture and encoding" subsystem is considered as running incorrectly. A video stream is considered as stalled if it doesn't produce any frame over a 5-second period, unless there is no video signal connected to the corresponding video input.

- **Web services (ONVIF) and web pages**: the device web pages, as well as the components implementing the ONVIF services are periodically checked. If one of these components indicates problems or seems frozen, the "web services and web pages" subsystem is considered as running incorrectly. In this case, the monitoring tool restarts all relevant daemons (but doesn't reload the watchdog counter).

- The operating system is also implicitly monitored.

Device state after reboot

When the watchdog resets the device, the following situation prevails after the reboot:

- Unicast streams are interrupted: you must re-establish the session to get the stream again.

- Multicast streams for which the **Start Multicast** option was activated are automatically resumed.

- Multicast RTSP sessions are deleted: you must re-establish the session as soon as possible to get the benefits of RTSP.

- Recording for active jobs is automatically resumed.

You can use the ONVIF 'Hello' message to detect a reboot of the device. You can safely assume that the RTSP server is ready to process the session re-establishment requests when this message is received.

4.8. Temperature Monitor

Picolo.net HD1 embeds a temperature sensor located inside the enclosure in the vicinity of the processor.

The temperature monitor circuit repeatedly measures the temperature and issues an alert when it exceeds the upper limit.

The measured temperature value is expressed in °C. It is available from:

- ☐ The device Web Pages: inside the Device Information panel of the Home Page.

- ☐ The Web Services: by means of the `GetTemperature` function of the Proprietary Device service.

- ☐ The Event Service: by means of the `Temperature` item in the Temperature topic of the Device topic set.

When a temperature alert occurs, the user is invited to shut-down the device as soon as possible in order to prevent permanent damages.

4.9. Time and Date

Automatic Time and Date Synchronization Method

The automatic synchronization method keeps the device time and date in sync with the time and date of up to two NTP servers or a USB GPS unit.

This method requires to have access to at least one NTP server on the network.

The IP address of the NTP servers can be:

- ☐ Obtained automatically using DHCP providing that the DHCP server on the network provides this service.

- ☐ Manually configured.

An out-of-the-box device, or a device after a "restore factory settings" procedure, is configured for an automatic synchronization using NTP.

Time Source Configuration

Time and Date panel on Device Management page reports the current time source as either `NTP`, `GPS` or `local`.

Select the Time Source in the drop-down list on the Edit Date & Time web page:

- `NTP` to only use Network Time Protocol and configured NTP servers to define the device local time.

Attaching a GPS unit has no effect on the system time.

- `NTP + GPS` uses preferably the locally-attached GPS unit to define the device local time.

  □ If no GPS is attached, the system time is aligned on the configured NTP servers.

To configure GPS only:
- Select `NTP + GPS` on Edit Date & Time page.
- Uncheck `From DHCP` option for `NTP servers`.
- Delete the list of NTP servers in the Network Time Protocol panel of the Device Management page.

- `Manual` to configure directly the device system time.

Manual Time and Date Synchronization Method

When the device is configured in the `manual` method, manually restore the date and time at the next power-up after a long power-off time.

The super-cap protecting the real-time clock device has an autonomy of at least 48 hours.

Time Zones and Daylight Savings Time

Picolo.net HD1 products support time zone and daylight savings time settings. To configure the time zone, the user must provide the appropriate POSIX.1 TZ string describing the UTC offset and, when applicable, the daylight saving rule.

The Daylight Savings Time (DST) can be enabled or disabled on request.

Sample Time Zone rules in POSIX.1 TZ string format

`CET-1CEST,M3.5.0/2,M10.5.0/3` applies to Central Europe including Belgium:

  □ Local time: CET = UTC + 1 hour

  □ Daylight Saving Time: CEST = CET + default DST offset of 1 hour

  □ DST starts on last Sunday of March at 02:00:00 CET

  □ DST ends on last Sunday of October at 03:00:00 CEST

`SGT-8` applies to Singapore:

  □ Local time: SGT = UTC + 8 hours

  □ No DST

`EST+5EDT,M3.2.0/2,M11.1.0/2` applies to US Eastern Time Zone including New York City:

  □ Local time: EST = UTC - 5 hours

- ☐ Daylight Saving Time: EDT = EST + default DST offset of 1hour
- ☐ DST starts on second Sunday of March at 02:00:00 EST
- ☐ DST ends on first Sunday of November at 02:00:00 EDT

For a description of the POSIX.1 TZ string syntax, refer to:

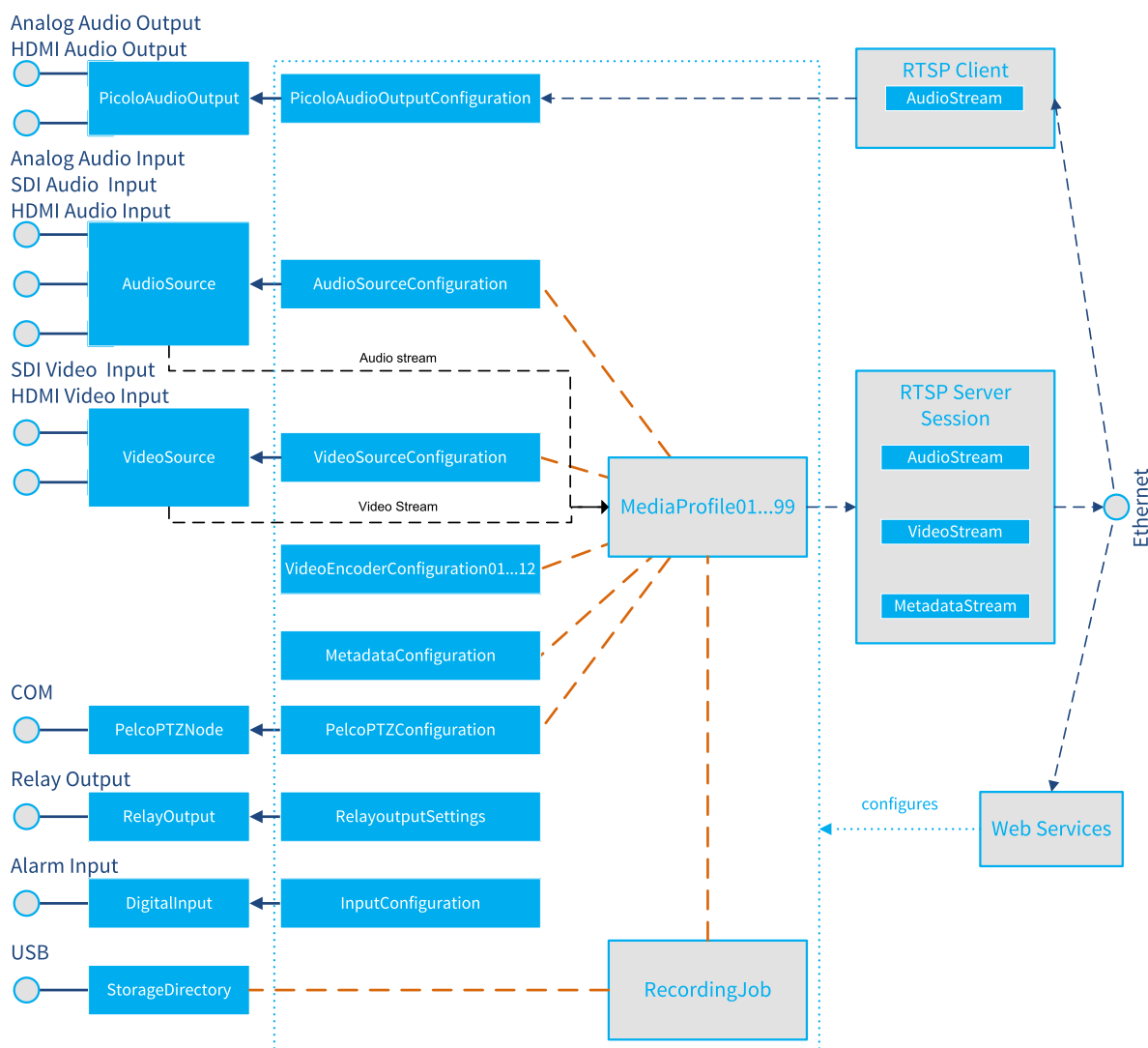http://www.gnu.org/software/libc/manual/html_node/TZ-Variable.html

PART IV

SOFTWARE SPECIFICATIONS

1. Software Components

ONVIF Device

1669-DR Picolo.net HD1 (DIN rail) and 1669-DW Picolo.net HD1 (Desktop/Wall) are Network Video Transmitter (NVT) devices as defined by ONVIF.

Components Overview

ONVIF Media Profiles

The ONVIF Media Profile can be viewed as the object interconnecting the different types of configuration objects. Each one may contain configuration for:

● Up to one Video Source

- Up to one Video Stream

- Up to one Audio Stream

- Up to one Metadata Stream

- Up to one PTZ configuration

The user may create up to 99 ONVIF Media Profiles.

ONVIF Recording Job

This configures the recording of one media profile into ISO IEC 14496 (mp4) files on a USB Mass Storage device locally attached to the Picolo.net HD1.

Video Configuration Objects

1669-DR Picolo.net HD1 (DIN rail) and 1669-DW Picolo.net HD1 (Desktop/Wall) have:

- One `VideoSource` object

- One `VideoSourceConfiguration` object

Video Encoder Configuration Objects

1669-DR Picolo.net HD1 (DIN rail) and 1669-DW Picolo.net HD1 (Desktop/Wall) have 9 `VideoEncoderConfiguration` objects.

Each `VideoEncoderConfiguration` object is automatically associated to the `VideoSourceConfiguration`. The codec used is implied by the `VideoEncoderConfiguration`.

Audio Input Configuration Object

1669-DR Picolo.net HD1 (DIN rail) and 1669-DW Picolo.net HD1 (Desktop/Wall)have:

- One `AudioSource` object

- One `AudioSourceConfiguration` object

The `AudioSource` object is associated with the `AudioSourceConfiguration` object. The association cannot be modified.

Audio Encoder Configuration Objects

1669-DR Picolo.net HD1 (DIN rail) and 1669-DW Picolo.net HD1 (Desktop/Wall) have three `AudioEncoderConfiguration` objects, one per encoding technology: G.711, PCM or AAC.

Each `AudioEncoderConfiguration` object is associated with one `AudioSourceConfiguration` object and one codec type. The associations cannot be modified.

Metadata Configuration Object

1669-DR Picolo.net HD1 (DIN rail) and 1669-DW Picolo.net HD1 (Desktop/Wall) have one `MetadataConfiguration` object

Picolo Audio Output Configuration Object

1669-DR Picolo.net HD1 (DIN rail) and 1669-DW Picolo.net HD1 (Desktop/Wall) have:

- One `PicoloAudioOutput` object

- One `PicoloAudioOutputConfiguration` object

The `PicoloAudioOutput` object is associated with the `PicoloAudioOutputConfiguration` object. The association cannot be modified.

PTZ Configuration Object

1669-DR Picolo.net HD1 (DIN rail) and 1669-DW Picolo.net HD1 (Desktop/Wall) have:

- One `PTZNode` object
- One `PTZConfiguration` object

The `PTZConfiguration` allows to address any RS-485 target device attached on the COM port.

The `PTZNode` object is associated with the `PTZConfiguration` object. The association cannot be modified.

Streaming

Video, audio and metadata are streamed using the RTP protocol family as defined by ONVIF.

Prior to streaming video, audio, and/or metadata, an ONVIF Media Profile must be created and configured.

To stream video, an ONVIF Media Profile must be associated to one `VideoSourceConfiguration` object and one `VideoEncoderConfiguration` object.

To stream audio, an ONVIF Media Profile must be associated to one `AudioSourceConfiguration` object and one `AudioEncoderConfiguration` object.

To stream metadata, an ONVIF Media Profile must be associated to one `MetaDataConfiguration` object.

An ONVIF Media Profile is associated to a unique stream URI. The URI remains valid as long as the ONVIF Media Profile exists. The bit stream can be delivered to one (or more) clients using one RTSP session per client.

The number of RTSP sessions is not explicitly limited.

2. Client Interfaces

Client Interfaces

Picolo.net products provide the following client interfaces:

Web Services

The "Web Services" client interface is a programmatic interface based on the W3C-standardized Web Services technology intended to be used by programmers of Video Management Software.

It provides the following categories of services:

- Configuration services
- Maintenance and diagnostic services

Web Pages

The "Web Pages" client interface is a graphical user interface based on the HTTP Web Server technology.

It is intended for:

- Out-of-the-box experience without programming
- Demonstration
- Diagnostic

Discovery Interface

This client interface allows a device to:

- Announce its presence in the network. So, applications are aware and can access the device.
- Scan the network for available devices. When an application starts, it knows what devices are there to be used.
- Learn which multicast streams are available without RTSP sessions through RFC2974 Session Announcement Protocol.

RTSP Server

This client interface allows an application to query the device for available data streams and to control (start, stop, pause...) data streaming.

3. AES Storage Control Interface

By default, Picolo.net HD1 boots with AES storage disabled. Any new media clip is then stored as plain MP4 file and AES-protected present on the USB media will read as an ciphered data if one tries to get them. When AES storage is enabled, new media clips are encrypted with AES and past AES-protected files are decrypted on the fly when one tries to download/preview them.

> **NOTE** AES-protected content is always encrypted on the USB media, whatever the AES storage status. Files are only decrypted on-the-fly, leaving no decrypted copy on the media or on the device itself. Similarly, new media clips are only stored on the USB media after being encrypted and leave no temporary plain copies behind.

Get AES Storage Status

Reports the current state of the media storage.

The `GetAESStorageStatusRequest` is an empty message.

The `GetAESStorageStatusResponse` holds:

- exactly one `Directory` string, which is the name of the folder that can be protected by AES (and used to store media clips) within the `VIDEO` directory of the USB media;

exactly one encryption status string that can be either None (encryption disabled) or AES128 (encryption enabled)

Trying to read the AES storage status when there is no USB media attached, no filesystem or that the existing filesystem has been unmounted to allow device being ejected will result in a `ter:Action` SOAP fault

Unlock AES Storage

Enable AES encryption on the device.

The `UnlockAESStorageRequest` contains one `Directory` indicating which sub-folder of VIDEO should be unlocked and a PassPhrase.

The `UnlockAESStorageResponse` is an empty message, indicating that we successfully applied AES encryption with the given passphrase.

Only directory names reported by `GetAESStorageStatusResponse` are safe to use as argument of `UnlockAESStorageRequest`

The pass phrase should be base-64 encoded, using the conventions of `xs:base64Binary`, and will be used in its base64 form on the eCryptfs back-end tool.

There will be no check on whether the given passphrase match any previously used passphrase on this device. A typo in the passphrase will result in new contents to be encrypted with the "wrong" passphrase while decryption of previously encrypted content will be skipped.