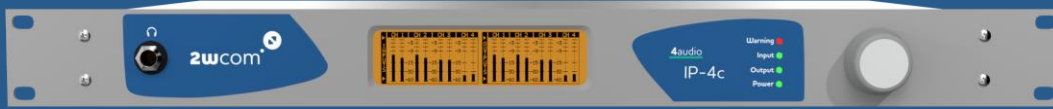


IP-4c

User Manual



*Professional multi-format four-channel
audio over IP encoder · decoder*

IP-4c User Manual V2.1

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1 About this manual

This user manual is available in PDF format to download and on request by paper.

You can download the latest version of this user manual here:

https://download.2wcom.com/products/IP-4c_BCZS/



1.1 References and hyperlinks in this PDF file

If you are reading this manual as a non-print version, please note that this PDF file contains bookmarks. You can navigate through the document via the content overview in your PDF viewing software if you enable bookmarks view.

All references to pages, sections, figures, and tables in the text identify a location within this PDF file. Click on the reference to jump to the referred passage in the text.

1.2 Tags and their meanings

The following signal words and signs warn you about risks and dangers:

DANGER	Indicates a hazardous situation which, if not avoided, will result in death or serious injury.
WARNING	Indicates a hazardous situation which, if not avoided, could result in death or serious injury.
CAUTION	Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
NOTICE	Describes precautions necessary to protect the equipment.



Contains useful information for the user.



Warning of general danger situation



Warning of electric shock



Warning of hot surface



Warning of fire hazard

2 For your safety

The device conforms to the relevant European directives and is safely constructed. Nevertheless, some residual dangers remain. 2wcom Systems GmbH accepts no liability for any damage caused by non-observance of the safety instructions.

- Read through this user manual carefully before using the device. If you pass on the device, be sure to also include this user manual.
- Any improper use of the device and all actions on the device not described in this user manual are considered as misuse outside the statutory limits for liability of the manufacturer.
- Only operate the device if it is in a technically perfect condition. If the device or a part of it is defective, take the device out of operation. Do not repair the device yourself. In case of any damages, send the device to 2wcom immediately for inspection or dispose of it properly according to the regional disposal regulations.
- Keep the device away from unauthorized persons.



Danger from electric current!

- Plug the device into a grounded power socket only. Never remove the grounding wire/contact.
- Do not open the housing of the device by yourself. Do not touch open electrical parts.
- Dangerously high voltages are present inside the housing. Even after disconnecting the mains supply, dangerously high voltage levels may be present for a certain time.
- Do not touch the device when your hands are wet.
- Never expose the device to liquids. If any liquid gets inside the housing, immediately disconnect the device completely from the power supply. Do not continue operating the device.



Fire hazard due to overheating or electric current!

- Ensure sufficient heat dissipation during operation. Avoid the following when installing the device:
 - Non-ventilated environment, e.g. a narrow shelf or built-in cabinet
 - Extremely warm or cold place
 - Direct exposure to sunlight
 - Too high or too low temperatures
 - Extremely wet or dusty environment
- Do not cover the ventilation openings of the device to avoid heat accumulation.
- Do not operate the device in the presence of flammable gases.
- Do not place objects with open flames, such as burning candles, on the device.
- Do not place any heavy objects on the supply cord. A damaged cord can lead to fire or electric shock hazards.
- When disconnecting the supply cord, always pull on the plug, never on the cable, to avoid cord damage.



Danger from explosive atmosphere!

- Do not use the device in an explosive environment.

**Warning of hot surface!**

The device may heat up greatly during normal operation despite an active cooling system.

- Do not touch the surfaces of the device during or shortly after operation.

**Risk of equipment damage!**

- Before each use, check the housing, the front panel, the cable and the power plug for visible damage and defects (e.g. scratches, cracks, wear and tear, damaged insulation, improper plug connections or extension cables).
- If the power cord is damaged, immediately disconnect the power plug. Never use the device with a damaged power cord.
- All damaged components must be replaced immediately.
- Only use a grounded three-wire power supply cord and plug that complies with the national regulations.
- Make sure that the power socket is next to the device and readily accessible to the user.
- External devices which are connected to the device could be damaged by the device or damage the device itself if the output levels exceed the specified limits.
- Do not use corrosive detergents on the device such as benzene, thinner, alcohol or acetone. Clean the surface of the device with a soft, dry cloth only.

3 Product overview

3.1 About the IP-4c

The IP-4c is a point-to-point or point-to-multipoint audio codec that uses IP-based audio network technologies for real-time streaming. The IP-4c offers you a variety of features and opportunities to ease your daily work.

Flexible in application: The codec is designed for studio-to-studio links, studio-to-transmitter links and cross-media tasks. An implemented latency control even makes synchronization with microsecond accuracy possible. This is useful for simultaneous signal output of all decoders of a network or for audio description. Optionally enhance the IP-4c with a SAT tuner or an FM tuner that offers further functions for fallback or backup and rebroadcasting. The Easy2connect feature provides operators as well as reporters with an easy-to-use connection establishment (SIP phonebook) while being in the field.

High compatibility: The IP-4c supports a wide range of protocols for streaming, control, and monitoring such as EBU TECH 3326, AES67, Ravenna, Livewire+, Dante, SMPTE ST 2110, PTPv2, RTSP, SAP, SIP, Discovery, Bonjour, SNMP, HTTP, HTTPS, FTP, FTPS or Ember+ and more. Furthermore, the exchange of additional information like GPIO and ancillary data between the audio networks is possible.

Pay as you grow: All software and hardware components are individually combinable. The scalability from up to four audio channels using software licenses gives you flexibility in planning your network and reducing your costs.

Multi-format audio coding: Another advantage is the variety of possible algorithms like MPEG1 Layer 2, MPEG2 Layer 3, most AAC profiles including the new xHE-AAC and AAC-ELDv2, OPUS, Ogg Vorbis, PCM, Enhanced aptX, Dolby Digital plus (on request) and more.

Transmission robustness: Dual Streaming and Pro-MPEG FEC ensure rock-solid IP transmission, or you go beyond with Stream4Sure. RIST and SRT allow for efficient packet recovery with low bandwidth. Two hot-pluggable power supplies that guarantee fail-safe operation perfect the whole concept.

Smart management: Configuration set-up via an easy-to-use web interface for general settings as well as for backup or fall back. For remote control, the codec offers various possibilities – HTTP, HTTPS, SFTP, Ember+, NMOS, NMS, and SNMP. Perfect synchronization can be achieved by PTPv2 and latency control.

3.2 Rights options

The following table displays an overview of the rights options that are available for your IP-4c:

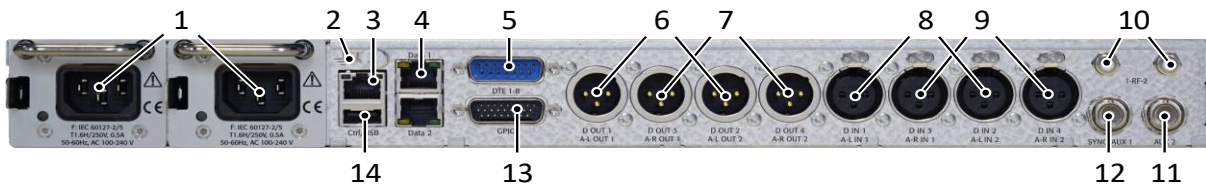
Right	Description
n Channels	Number of channels
Ravenna	Option to unlock SAP stream announcement and discovery, and PTP support
EBU Tech 3226	Option to unlock full SIP/SDP support including Easy2Connect
Livewire	Option to use IP streaming over Livewire
n HLS connections	Option to encode HTTP Live Streaming (HLS). Giving the number of supported HLS connections.
Stream4Sure	Option that allows for simultaneous reception of up to 4 IP streams of different coding and quality and seamless exchange of audio samples in case of failure
TS Decoder	Option to use transport stream over IP using UDP/RTP, unicast/multicast for decoders
TS Encoder	Option to use transport stream over IP using UDP/RTP, unicast/multicast for encoders
SRT Decoder	Option to use SRT or RIST for decoders
SRT Encoder	Option to use SRT or RIST for encoders
Live Listening	Option to monitor input sources of the encoder and decoder as well as audio outputs via the web interface or Icecast.

3.3 Front panel



- 1 **Headphone:** 6.3 mm / 1/4" socket for the connection of headphones
- 2 **LCD Screen:** Illuminated LCD screen, graphical, 264x64 pixels
- 3 **[Warning] LED:** LED indicator; will be red if alarm is triggered
- 4 **[Input] LED:** LED indicator; will correspond to the sum of the alarm status for the inputs:
 - off if no input alarms are enabled
 - green if input alarms are enabled and all inputs are OK
 - yellow if one or more inputs are bad but at least one is good
 - red if all inputs are bad
- 5 **[Output] LED:** LED indicator; will correspond to the sum of the alarm status for the outputs.
 - off if no output alarms are enabled
 - green if output alarms output alarms are enabled and all outputs are OK
 - yellow if one or more outputs are bad, but at least one is good
 - red if all outputs are bad
- 6 **[Power] LED:** LED indicator:
 - green if all power supply cords are connected and the power supply is OK.
 - flashes (green/red) if only one power supply cord is connected and the power supply is OK (only when there is more than one power supply)
- 7 **Reset pin hole:** Recessed button for resetting the device (warm start and recovery mode)
- 8 **Jog wheel:** Jog wheel for the device operation via the LCD screen on the device

3.4 Back panel

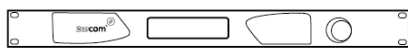


- 1 **Power supply unit:** Mains supply voltage IEC socket.
Optional redundant power supply through a second power supply unit:
- Option 1: standardized IEC hot-swappable power supply connector; 90-260 V, 47-63 Hz; automatic switchover.
- Option 2: power supply 48 V DC.
Combination of power supply 230 V AC and 48 V DC is possible
- 2 **Grounding stud:** This stud can be used to connect a grounding system if necessary.
- 3 **[Ctrl]:** RJ-45 connector, 10/100/1000 Base-T interface for controlling and monitoring the device via Ethernet.
The device can communicate with the IP network and can be configured via the integrated web interface using an internet browser.
The LEDs show the link status (green, active if a physical network connection exists) and the activity status (yellow, active if data communication is active).
- 4 **[Data]:** 2x RJ-45 connector; 10/100/1000 Base-T interface for two redundant outputs for data, audio and GPIO transmission via Ethernet.
- 5 **[DTE]:** 15 pole D-Sub male connector for serial RS-232C data communication, e.g. private data, MPEG ancillary data, UECP/RDS (acc. to TR 101 154). Use a serial breakout cable to provide each input and output with a serial interface.
- 6 **[D OUT][A-L OUT]:** AES/EBU male interface for the output of digital audio. Integrated XLR male socket; output of the left channel of the analog audio signal, balanced < 20 Ω.
- 7 **[D OUT][A-R OUT]:** AES/EBU male interface for the output of digital audio. Integrated XLR male socket; output of the right channel of the analog audio signal, balanced < 20 Ω.
- 8 **[D IN][A-L IN]:** AES/EBU female interface for the input of digital audio. Integrated XLR female socket; input of the left channel of the analog audio signal, balanced < 20 Ω.
- 9 **[D IN][A-R IN]:** AES/EBU female interface for the input of digital audio. Integrated XLR female socket; input of the right channel of the analog audio signal, balanced < 20 Ω.
- 10 **[RF]:** (optional) antenna input for SAT or FM tuner.
- 11 **[AUX]:** (optional) signal output depending on built in hardware component.
- 12 **[SYNC/ AUX]:** (optional) connector for SFN synchronization (GPS input) or optional ASI input.
- 13 **[GPIO]:** 26-pole D-Sub male connector; combined connector for inputs (GPI) and outputs (GPO).
- 14 **[USB]:** USB 2.0 interface for service, configuration and firmware.

4 First steps

4.1 Checking the delivery contents

Use the following list to check the completeness of delivery. The delivery contents may vary in exceptional cases.



IP-4c



Link to product data



Power cord



Network patch cable

4.2 Installing the device

For the device to operate safely, note the following regarding the location:

- Mount the device securely and stable in a 19-inch rack designed for this purpose.
- Avoid direct sunlight, direct proximity to radiators and air conditioners, dust, water and chemicals
- When setting up the device, make sure that it is placed at a suitable viewing angle to the displays and that the device has sufficient heat dissipation.

4.3 Connecting the device

Before connecting the device to the power supply, first connect the inputs and outputs of the device to the corresponding connectors:

1. For input of the digital/analog audio signal, connect the signal inputs to [D IN]/[A-L/R IN].
 2. For output of the digital/analog audio signal, connect the signal outputs to [D OUT]/[A-L/R OUT].
 3. Connect a network patch cable to [Ctrl] and to your existing network.
 4. Connect network patch cables to [Data] and to your existing network.
 5. Optionally, connect the interfaces [DTE], [GPIO], [RF], [SYNC/AUX], and [AUX] if needed.
 6. Use the headphone output for monitoring the input/output audio signals.
- ✓ You have connected the device. Continue with connecting the power supply.

4.4 Connecting the power supply

NOTICE Risk of equipment damage!



- Make sure that the device and the contained cords are compatible to the domestic line voltage and frequency!

Optionally, the device comes with two exchangeable plug-in power supply units which can be equipped with different redundant power supply connectors.

IEC socket



IEC socket: 230 V AC, 90-260 V AC, 47-63 Hz

- Connect the power supply cord fully to the IEC socket at the back panel of the device and to an independent mains power outlet.
- ✓ You have connected the power supply to the device. The [Power] LED is green if both power supply cords are connected. The [Power] LED flashes green/red if only one power supply cord is connected.

Neutrik powerCON socket

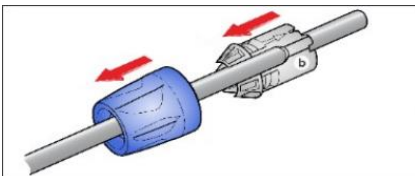


48 V DC Neutrik powerCON socket with aut. switchover (NAC3MPA 1) and Neutrik powerCON connector (NAC3FCA)

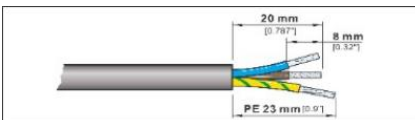
NOTE: The corresponding power cords are not part of the delivery contents!

The PowerCON device connector system is used to transmit supply voltages of 48 V DC to a device or between individual devices.

1. Slide the clamping sleeve and collet onto the cable.



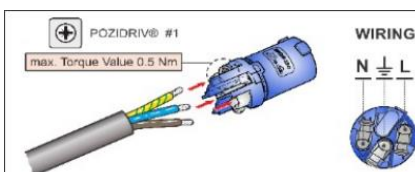
2. Remove part of the insulation.



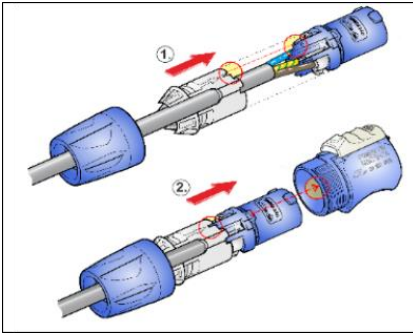
3. Insert the wires into the clamping holes on the inset and fasten them with screw and clamping plate using a screwdriver.



If you use the voltage of 48+ V and 0 V, fasten the +48 V wire to **L** in the connector.
If you use the voltage 0 V and 48 V, fasten the 0 V wire to **L** in the connector.



4. Push the inset and collet into the housing (observe guide ribs and guide slot).



5. Tighten the clamping sleeve with a wrench.
 6. Connect the power supply cord fully to the powerCON socket at the back panel of the device and to an independent mains power outlet.
- ✓ You have connected the power supply to the device. The [Power] LED is green if both power supply cords are connected. The [Power] LED flashes green/red if only one power supply cord is connected.

4.5 Configuring the network

NOTICE False connection of the Ethernet interfaces will lead to incorrect operation!



- Use the [Data] interfaces only for data transfer.
- Use the [Ctrl] interface only for the access to the device via the web interface and for SNMP.

To transfer data over IP and access the device via the web interface, you must connect the device to your IP network.

For the [Ctrl] interface, DHCP is enabled by default. When you connect the device to your DHCP-enabled network, it will automatically get the IP configuration for the [Ctrl] interface. To view the obtained IP address, turn the jog wheel to the left to see the “System Info” display. Here you will find the obtained IP address and further system information.

To connect the device to your IP network and change the IP setup via the LCD menu:

1. Push the jog wheel to enter the configuration menu.
 2. Turn the jog wheel to focus the **Network** tab and push the jog wheel.
 3. Push the jog wheel to enter the menu for the [Ctrl] interface.
 4. Configure the settings for your existing IP network (IP address, netmask, gateway etc.). Consult the responsible network administrator if applicable.
 5. Turn the jog wheel until the **Save** menu item is selected and push the jog wheel.
 6. In the dialog window, select **Yes** to save the settings and restart the device.
- ✓ The device is now connected to the IP network.

4.6 Accessing the web interface

The device can be fully operated via the integrated web interface using an internet browser. For this purpose, use a computer that is connected to the same IP network that the device is connected to.

Requirement: You have already connected the [Ctrl] interface to the network.

1. Access the web interface by entering the IP address of the device into a web browser.
 - A login screen appears.
2. Enter the username and password.
- ✓ The main page of the web interface appears.

The default login data (case sensitive) are:

- For read-only access: **user** / **user**
- For full access: **manager** / **manager** or **admin** / **admin**



Change the login data as soon as possible to avoid unauthorized access to the IP-4c and document the login data in a safe place.

4.7 General operation

4.7.1 Operation via web interface

The IP-4c has an integrated web interface. You can make all configurations and operations using a web browser.

Note the following rules when operating the device via web interface:

- If you want to keep any changes made in the configuration of the device, click the corresponding **Save** button.

The changes in each block must be saved individually. If you changed data in several blocks or tabs, click the **Save** button under each block to save all changed data. Otherwise, any unsaved block will be reset to the previously saved status when leaving the page.
- If you do not want to keep the changes, leave the page without saving or reload the page.
- Use a decimal point as the decimal separator in numbers in the input fields (i.e. “6.5” for “six and a half”).

4.7.2 Operation via LCD menu

Some basic functions of the device can be operated via the LCD menu and jog wheel.

The display has 2 main menus:

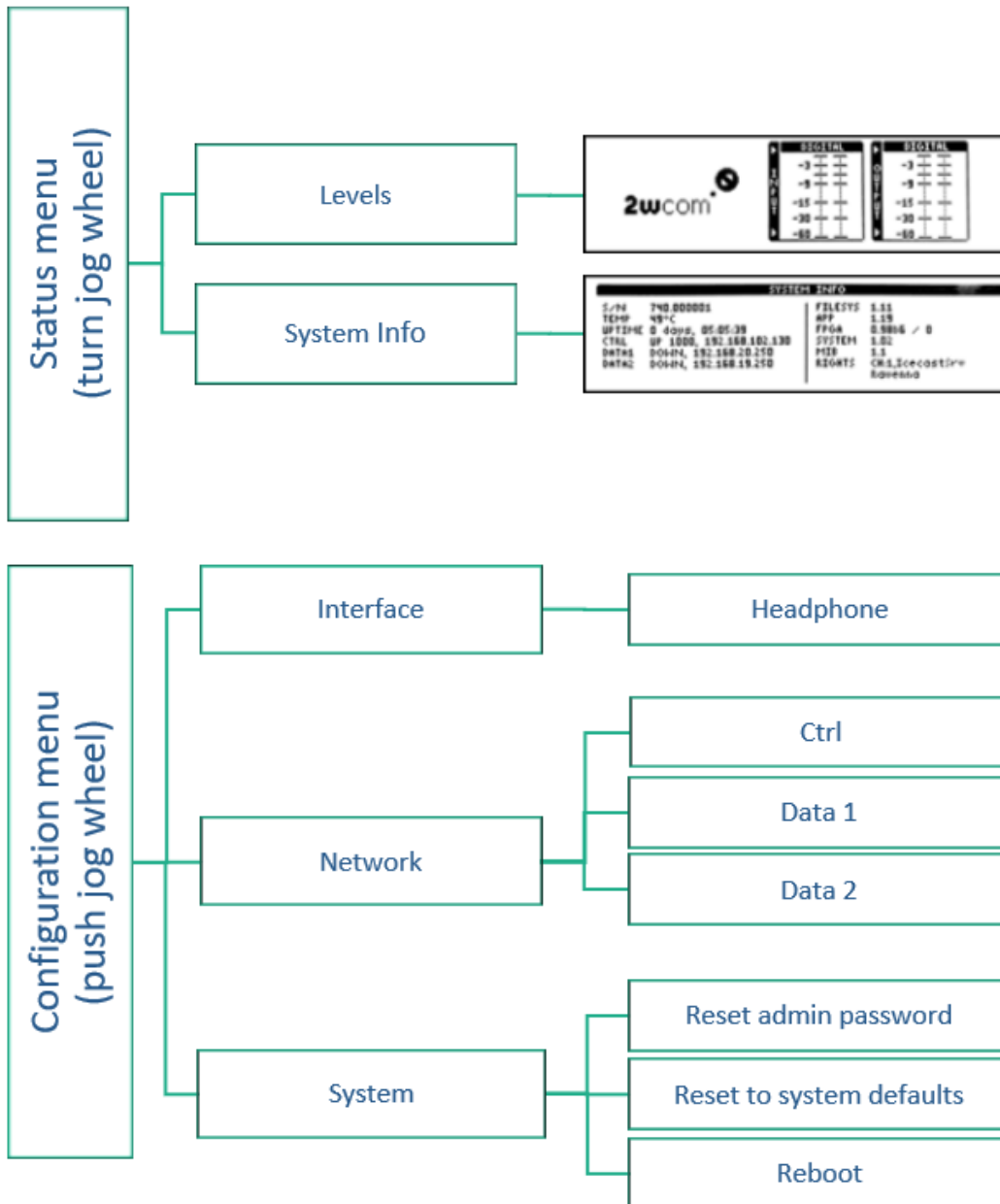
- Status menu (turn jog wheel left or right)
- Configuration menu (push jog wheel)

After a warm or cold start of the device, the display shows the default screen of the status menu. When you navigate in the LCD menu, the display returns to the Status Overview after few minutes of inactivity.

Note the following when operating the device via the LCD menu:

- To switch from the status menu to the configuration menu, push jog wheel.
- To move the focus in the menu structure, turn jog wheel.
- To open a menu tab, focus the tab and push jog wheel.
- To select a configurable menu entry, focus the entry and push jog wheel.
- To configure the selected menu entry, turn jog wheel.
- To confirm changes in a menu entry, push jog wheel.
- To return to the previous menu level, select <<.

Navigation structure



5 Network settings

5.1 Configuring the interface services

For each ethernet interface, you can select the services by which the interface can receive and send data.

Services

Interface services

Ctrl:

Data 1:

Data 2:

HTTP (Web)

HTTPS (Web)

SSH (SFTP)

SNMP

Streaming Data

ON

ON

ON

ON

OFF

OFF

OFF

OFF

OFF

ON

OFF

OFF

OFF

OFF

ON

SNMP: Only affects get and set commands, traps are not affected

To select the supported services.

1. Navigate to the page **Services**.
 2. For each individual interface, define which data can be received and sent.
 3. Click **Save**.
- ✓ The interfaces now only support the selected services.

5.2 TCP/IP: Configuring the ethernet interfaces

The IP-4c has several Ethernet interfaces: 1 for configuration and the others for data exchange. Configure the interfaces for data transmission.

NOTICE False connection of the Ethernet interfaces will lead to incorrect operation!



- Use the [Data] interfaces only for data transfer.
- Use the [Ctrl] interface only for the access to the device via the web interface and for SNMP.

TCP/IP

DNS Server

Primary:

Secondary:

8.8.8.8

9.9.9.9

Routing:

Routing Interface:

OFF

Data 1

Proxy Server

Enable proxy:

Host:

Port:

ON

8080

Note: The Proxy server will only be used for Icecast input streams

Save

Interface settings

Link	Interface name	Mac address	VLAN	DHCP	IP address	Subnetmask	Gateway	Speed:	Mode:
●	Ctrl	00:11:99:00:94:1E	OFF	ON	192.168.100.238	255.255.240.0	192.168.96.1	auto	full duplex
●	Data 1	00:11:99:00:94:1F	ON	OFF	192.168.100.250	255.255.240.0	192.168.96.1	auto	full duplex
			ID				Priority		
			200	OFF	192.168.200.100	255.255.255.0	0.0.0.0	0	
●	Data 2	00:11:99:00:94:20	OFF	OFF	10.80.118.173	255.255.255.0	10.80.118.177	auto	full duplex

Save

To configure the ethernet interfaces:

1. Navigate to the page **TCP/IP**.
2. Configure the parameters for the DNS Server, Ctrl and Data interfaces.



The necessary address settings depend on the individual network and should be assigned by the responsible network administrator, if applicable.

3. Click **Save**.

✓ The ethernet interfaces are now configured.

Parameters

Primary	Enter the IP address of the primary domain name server (DNS).
Secondary	Enter the IP address of the secondary domain name server (DNS).
Routing	Enable the Routing, which enables the DNS server to send and answer the requests over different [Data] interfaces.
VLAN	Enable VLAN and enter the VLAN ID (1-4095).
Priority	Assign a priority (1-7) to this stream to add a priority code point (PCP) according to the IEEE 802.1Q specification. Select 0 to disable the priority and use best-effort delivery.
DHCP	Enable dynamic host configuration protocol (DHCP) which enables the device to get an IP address automatically.
IP Address	If DHCP is disabled, then assign an IP address to the interface.
Subnetmask	Enter the subnetmask for the IP address.
Gateway	Enter the address of the local system that is used for the internet access (e.g. the router).
Speed	The speed is set to auto.
Mode	The mode is set to full duplex.

5.3 Monitoring the device via syslog

In addition to saving information about events in the log, you can also send them to a syslog server. Syslog eases monitoring the IP-4c.

To send event information to a syslog server:

1. Navigate to the page **Syslog**.
 2. Enable at least one of the servers.
 3. Configure the parameters.
 4. Click **Save**.
- ✓ The IP-4c now sends event information to the syslog server(s).

Parameters

IP address	Enter the IP address of the syslog server.
Port	Enter the port number.
Protocol	Select the protocol to be used.
Lowest level	Select the lowest level of a message that will be sent to the syslog server. For more information, see 11.8 Priority of alarm messages.
Interface	Select the [Data] interface to be used.

VLAN

If the selected [Data] interface is an interface with VLAN, then select the VLAN to be used.

5.4 SNMP: Configuring access data for external requests

You can configure access data (read community/write community) that is necessary for external SNMP requests to the IP-4c.



For the SNMP manager tool to operate correctly, it requires the specific MIB files. These MIB files must be compiled by your SNMP manager tool. You can save the MIB files in the block **MIB File**.

1. Navigate to the page **External APIs**.
 2. Click on the tab **SNMP**.
 3. Select the protocol version in the block **SNMP Protocol**.
 4. Configure the parameters in the block **Read/Write Community** or **SNMP3 / Security**. The parameters differ depending on the selected protocol version.
 5. Click **Save**.
- ✓ You have configured the access data for external SNMP requests.

Parameters

Read Community	Enter SNMP access data for the external read-only SNMP access to the device.
Write Community	Enter SNMP access data for the external write SNMP access to the device.
Read/Write user	Enter user name and password for the external write SNMP access to the device.
Read/Write user	Enter user name and password for the external read-only SNMP access to the device.
Security protocols	Select an authentication protocol and a privacy protocol.

5.5 SNMP: Configuring trap managers

As part of the monitoring function, the device is capable to send SNMP traps to the defined IP addresses of the SNMP managers. It is also possible to readout device settings via SNMP Get.



For the SNMP manager tool to operate correctly, it requires the specific MIB files. These MIB files must be compiled by your SNMP manager tool. You can save the MIB files in the block **MIB File**.

1. Navigate to the page **External APIs**.
 2. Click on the tab **SNMP**.
 3. Select the protocol version in the block **SNMP Protocol**.
 4. Select the location of the table indices in the block **Trap Configuration**: OID or OID plus additional index.
 5. Configure the parameters in the block **Trap Manager**.
 6. Click **Save**.
- ✓ You have configured the trap managers. If you changed the location of table indices, the IP-4c must reboot. Each enabled trap is sent once at startup for initialization.

Parameters

Version	Select the format version of the SNMP traps.
----------------	--

IP or Domain Name Enter the IP address or domain name of the trap receiver.

Port Enter the port number.

5.6 Ember+: Configuring access for monitoring

As part of the monitoring and remote-control function, the device is capable to be controlled via the Ember+ protocol.

1. Navigate to the page **External APIs**.
 2. Click on the tab **Ember+**.
 3. Configure the parameters in the block **Settings**.
 4. Click **Save**.
- ✓ You have configured the Ember+ access.

Parameters

Mode Select the mode from the dropdown menu.

Timeout Enter the value for interval in seconds for a timeout.

Interface Select an Ethernet interface from the dropdown menu.

Port Enter the port number for the connection.

5.7 NTP: Synchronizing date and time

The IP-4c can automatically synchronize its date and time with an external NTP server.

1. Navigate to the page **NTP**.
 2. Configure the parameters.
 3. Click **Save**.
- ✓ You have synchronized the date and time with an external NTP server.

Parameters

Synchronization Start or stop the synchronization with the NTP server.

Bind to interface To bind the NTP synchronization to a specific IP interface, set the switch to **ON**. Select the [data] interface and VLAN.

QoS DSCP Select the quality of service (QoS). The selected packet will be prioritized.

NTP Server Quality Select the quality of the NTP server: Internet or local.

Enable expert settings Set the switch to ON to show further parameters.

1. NTP Server Enter the IP address or network name of the first NTP server to be used.


2.-4. NTP Server Enter the IP addresses or network names of the 2nd, 3rd and 4th NTP servers to be used.

6 Encoder settings


6.1 Creating input source profiles

6.1.1 Creating input source profiles for TS/SAT

You can create an input source profile and use it for encoding and decoding.

Input Source	Description	Source Interface
 TS/SAT	TS/SAT – Transport stream over satellite (optional: <i>Sat Tuner</i> right)	[RF Sat]

To create a new configuration profile for an input source:


1. Navigate to the page **Codec**.
 2. In the block **Input Sources**, select the input source for which you want to create a configuration profile.
 3. To create a configuration profile, click .
 4. To set up the new configuration profile, click **Edit**.
 5. Configure the parameters.
 6. Click **Save**.
 7. Create a demux configuration that uses this input source profile as a source. (See 6.1.5 Creating demux configurations)
- ✓ You have created an input source profile. Continue with 6.3 Assigning input source and codec profile to an encoder.

Parameters


Name	Enter the name of the stream for better reference.
RF input	Select the RF input to be used.
DVB standard	Select the DVB standard.
Modulation	Select the modulation type of the signal to be received.
Frequency input method	Choose whether you want to enter the L-Band frequency or the transponder frequency and LNB data. The transponder frequency will be automatically translated into the corresponding L-Band frequency.
L-Band Frequency	Enter the L-Band frequency of the channel to be received.
Transponder Frequency	Enter the transponder frequency of the channel to be received. Click LNB Config to enter the LNB information.
Symbol rate	Enter the symbol rate used by the transponder.
Roll-Off	Select the roll-off factor used by the receiver filter.
Polarization	Select either horizontal or vertical polarization used by the transponder.
Frequency Range	22 kHz signal used to tell the LNB via Digital Satellite Equipment Control (DiSEqC) to pass on lower band (22 kHz off) or upper band (22 kHz on) signals.
Pilot Mode	If the standard DBV-S2 is used, then select whether a pilot tone is used or not. If unknown, select Auto .
FEC	Select the FEC settings used by the transponder. If unknown, select Auto . This may result in slightly increased tuning times.

6.1.2 Creating input source profiles for TS/ASI

You can create an input source profile and use it for encoding and decoding.

Input Source	Description	Source Interface
 TS/ASI	TS/ASI – Transport stream over ASI input	[SYNC/AUX]

To create a new configuration profile for an input source:


1. Navigate to the page **Codec**.
 2. In the block **Input Sources**, select the input source for which you want to create a configuration profile.
 3. To create a configuration profile, click .
 4. To set up the new configuration profile, click **Edit**.
 5. Configure the parameters.
 6. Click **Save**.
 7. Create a demux configuration that uses this input source profile as a source. (See 6.1.5 Creating demux configurations)
- ✓ You have created an input source profile. Continue with 6.3 Assigning input source and codec profile to an encoder.

Parameters


Name Enter the name of the stream for better reference.

6.1.3 Creating input source profiles for TS/IP

You can create an input source profile and use it for encoding and decoding.

Input Source	Description	Source Interface
 TS/IP	TS/IP – Transport stream over IP using UDP/RTP, Unicast/Multicast (optional: “TS Decoder” right)	[Data]

To create a new configuration profile for an input source:

1. Navigate to the page **Codec**.
 2. In the block **Input Sources**, select the input source for which you want to create a configuration profile.
 3. To create a configuration profile, click .
 4. To set up the new configuration profile, click **Edit**.
 5. Configure the parameters.
 6. Click **Save**.
 7. Create a demux configuration that uses this input source profile as a source. (See 6.1.5 Creating demux configurations)
- ✓ You have created an input source profile. Continue with 6.3 Assigning input source and codec profile to an encoder.

Parameters

Name Enter the name of the stream for better reference.

IP type Select Unicast/Multicast.


Multicast IP Enter the IP for Multicast, if selected as IP type.

Port Sender UDP port (the same as set in the encoder settings for output streaming)


IP interface	Select the interface for the input signal.
Protocol	Select the MPEG2 transport stream encapsulation.
Packet reorder/ de jitter delay	<p>The de jitter buffer for IP transforms the variable delay into a fixed delay. It holds the first packet received for a period of time before it sends it out to the decoder. This time period is necessary for reordering the packets as well as to compensate the jitter and optionally to apply FEC correction and/or to combine it with the second, dual streaming input.</p> <p>Enter the value for this holding period in ms.</p> <p>NOTE: The delay time of the input source must not exceed 200 ms if the sample rate is 192 kHz.</p>
RIST	Enable RIST to recover lost packets by resending them.
FEC Mode	Configure the FEC mode depending on the sample rate and the acceptable value for delay. For more information about the delay values, see 7.4 Setting up a buffer.
FEC column/row port offset	<p>Enter the offset to the main destination port the data should be sent to. For example, if the main port is 5004, the value "2" for FEC column port offset means that the port is then 5006 (5004 + 2).</p> <p>If you do not want to use this offset, enter "0".</p>
Dual streaming	If dual streaming is enabled, configure the IP parameters. You can set up the same or different [Data] sources for the Ethernet input.

6.1.4 Configuring input source profiles for TS/SRT

You can create an input source profile and use it for encoding and decoding.

Input Source	Description	Source Interface
 TS/SRT	TS/SRT – Transport stream over IP using SRT (optional: “TS Decoder” and “SRT Decoder” rights)	[Data]

To create a new configuration profile for an input source:

1. Navigate to the page **Codec**.
 2. In the block **Input Sources**, select the input source for which you want to create a configuration profile.
 3. To create a configuration profile, click .
 4. To set up the new configuration profile, click **Edit**.
 5. Configure the parameters.
 6. Click **Save**.
 7. Create a demux configuration that uses this input source profile as a source. (See 6.1.5 Creating demux configurations)
- ✓ You have created an input source profile. Continue with 6.3 Assigning input source and codec profile to an encoder.

Parameters

Name	Enter the name of the stream for better reference.
Mode	Select whether you want to use SRT in listener or caller mode.
Port	Specify the port number for SRT connection.
IP interface	Select the interface for the input signal.
Latency	Define the time interval for the latency before the IP-4c starts to decode the signal distributed via SRT protocol.
Encryption	If the input stream is protected by AES encryption, enable end-to-end encryption.

Maximum reorder tolerance	Enter the maximum number of packets that should be reordered.
Password	Enter the password used to secure the SRT stream.

6.1.5 Creating demux configurations

To use an input source profile that is TS-based, you must first create a corresponding demux configuration.


1. Navigate to the page **Codec**.
 2. In the block **Input Sources**, select the tab of a TS-based input source.
 3. In the block **Demux Configurations**, select the tab **Audio** to use the audio and optionally the ancillary data of a stream. Select the tab **Data** to only use the ancillary data of a stream. For more information, see 6.7 Configuring ancillary data.
 4. To create a new demux configuration, click **+**.
 5. To configure the demux configuration, click **Edit**.
 6. Configure the parameters.
 7. Click **Save**.
- ✓ You have created a demux configuration. Continue with 6.3 Assigning input source and codec profile to an encoder.

Parameters


TS source	Select the source for the demultiplexer configuration profile in the dropdown menu.
Configuration mode	Select the configuration mode. <ul style="list-style-type: none"> • Manual/PID: Enter the specific audio PID and a name for better reference. • Service from list (fixed PID): Refresh the service list. Select the service and audio track. • Service from list (auto PID): Refresh the service list. Select the service. This mode is used for services that switch to another audio track at times. In that case, the IP-4c automatically switches to the new audio PID.
Encapsulation mode	Select an encapsulation mode: Multiprotocol Encapsulation or Packetized Elementary Stream.
Audio sync mode	Select the audio sync mode: Buffer level: synchronization with the rate of the incoming data PCR: synchronization with the PCR PID. This is more precise.
Decoder type	Predefine the codec type for the decoder by choosing the audio codec or selecting "Automatic" from the dropdown menu.
Buffer [ms]	Enter a value for audio buffer.
Ancillary data	If the input stream of the decoder contains ancillary data, the IP-4c can forward them to the corresponding outputs. If ancillary data are enabled, private data cannot be enabled.
GPIO tunneling	Enable or disable GPIO tunneling for GPIO switch between encoder and decoder.
Private data	If private data is enabled, enter the data PID and select the configuration mode from the dropdown menu. If private data are enabled, ancillary data cannot be enabled.

6.1.6 Configuring input source profiles for Elementary Streams

You can create an input source profile and use it for encoding and decoding.

Input Source	Description	Source Interface
 Elementary Streams	RTP Elementary audio stream over IP using Unicast/Multicast	[Data]

To create a new configuration profile for an input source:

1. Navigate to the page **Codec**.
 2. In the block **Input Sources**, select the input source for which you want to create a configuration profile.
 3. To create a configuration profile, click .
 4. To set up the new configuration profile, click **Edit**.
 5. Configure the parameters.
 6. Click **Save**.
- ✓ You have created an input source profile. Continue with 6.3 Assigning input source and codec profile to an encoder.

Parameters

Name	Enter the name of the stream for better reference.
IP type	Select Unicast/Multicast.
Multicast IP	Enter the IP for Multicast, if selected as IP type.
Port	Sender UDP port (the same as set in the encoder settings for output streaming)
IP interface	Select the interface for the input signal.
Protocol	Select the MPEG2 transport stream encapsulation.
Packet reorder/ de jitter delay	<p>The de jitter buffer for IP transforms the variable delay into a fixed delay. It holds the first packet received for a period of time before it sends it out to the decoder. This time period is necessary for reordering the packets as well as to compensate the jitter and optionally to apply FEC correction and/or to combine it with the second, dual streaming input.</p> <p>Enter the value for this holding period in ms.</p> <p>NOTE: The delay time of the input source must not exceed 200 ms if the sample rate is 192 kHz.</p>
Decoder type	Predefine the codec type for the decoder by choosing the audio codec or selecting "Automatic" from the dropdown menu.
Buffer [ms]	Enter a value for audio buffer.
Synchronous Payout/SFN	Enable Synchronous Payout using SFN or enter a buffer size [ms].
Clock Source	Select the clock source: internal or external.
Ancillary data	If the input stream of the decoder contains ancillary data, the IP-4c can forward them to the [DTE] outputs.
GPIO tunneling	Enable GPIO Tunneling for GPIO switch between encoder and decoder.
FEC Mode	Configure the FEC mode depending on the sample rate and the acceptable value for delay. For more information about the delay values, see 7.4 Setting up a buffer.
FEC column/row port offset	Enter the offset to the main destination port the data should be sent to. For example, if the main port is 5004, the value "2" for FEC column port offset means that the port is

then 5006 (5004 + 2).

If you do not want to use this offset, enter "0".

Dual streaming

If dual streaming is enabled, configure the IP parameters. You can set up the same or different [Data] sources for the Ethernet input.


If the right *Ravenna* is activated, then you can configure the settings automatically by using the Ravenna protocol. For this function, first configure the SAP service. Available streams will then be displayed in the dropdown menu **available streams**. Copy the settings into the input fields by clicking **Copy/use selected stream settings**.

6.1.7 Creating input source profiles for Livewire




This option is only available if the right *Livewire* is enabled.

You can create an input source profile and use it for encoding and decoding.

Input Source	Description	Source Interface
 Livewire	IP Streaming over Livewire (optional: "Livewire" right)	[Data]

To create a new configuration profile for an input source:

1. Navigate to the page **Codec**.
 2. In the block **Input Sources**, select the input source for which you want to create a configuration profile.
 3. To create a configuration profile, click .
 4. To set up the new configuration profile, click **Edit**.
 5. Configure the parameters.
 6. Click **Save**.
- ✓ You have created an input source profile. Continue with 6.3 Assigning input source and codec profile to an encoder.

Parameters

Livewire Source	In this menu, available advertised Livewire streams will be displayed and can be selected for automatic configuration. To enter the Livewire settings manually, select Manual .
Source Channel	Enter a number (16 bit, in the range of 0...65535) describing a stream/channel.
Source Port	Specify the port number for Livewire connection.
Source Interface	Select the [Data] interface for Livewire connection.
Gain	Specify gain for the Livewire source.

6.1.8 Creating input source profiles for SIP



This option is only available if the right *EBU Tech 3326* is enabled.

The IP-4c supports Audio IP streaming using SIP (Session Initiation Protocol). You can use an SIP connection for bidirectional data flows between encoder and decoder: either directly or via the [Data] interfaces or over a server (registrar).

Input Source	Description	Source Interface
--------------	-------------	------------------



Stream over IP using SIP – Session Initiation Protocol (optional: “EBU Tech 3326” right)

[Audio IN]
[Data]

To create a new configuration profile for an input source:

1. Navigate to the page **Codec**.
 2. In the block **Input Sources**, select the input source for which you want to create a configuration profile.
 3. To create a configuration profile, click .
 4. To set up the new configuration profile, click **Edit**.
 5. Configure the parameters.
 6. Click **Save**.
- ✓ You have created an input source profile. Continue with 6.3 Assigning input source and codec profile to an encoder.

Parameters


Registrar	Enter the Internet domain name of a SIP server if you want the connection to be established over a SIP server.
Proxy	If Use proxy is enabled, specify the IP address.
Phone number	Enter your phone number for registration with a SIP server.
Display name	Assign a name to the SIP server for better reference.
Username	Enter your username for registration with a SIP server.
Password	Enter your password for registration with a SIP server.
Interface	For different accounts, you can use different [Data] interfaces or the same interface to set up the connection.
Packet reorder / dejitter delay	The dejitter buffer for IP transforms the variable delay into a fixed delay. It holds the first packet received for a period of time before it sends it out to the decoder. This time period is necessary for reordering the packets as well as to compensate the jitter and optionally to apply FEC correction and/or to combine it with the second, dual streaming input. Enter the value for this holding period in ms.
Expires	Enter the interval in seconds for the registration renewal.
Connection timeout	Enter the interval in seconds for disconnection if there is no incoming audio signal.
Mono mix mode	Choose Left, Right or Downmix (send audio stream).
RTP port	If Auto-configure RTP port is disabled, specify the port number.
RIST	Enable RIST to recover lost packets by resending them. You can enter a limit for the bandwidth used by the stream including re-sent packets.
Buffer	Enter a value for audio buffer.

6.1.9 Creating input source profiles for Icecast

You can create an input source profile and use it for encoding and decoding.

Input Source	Description	Source Interface
Icecast	Stream over IP using TCP (Icecast/Shoutcast)	[Data]

To create a new configuration profile for an input source:


1. Navigate to the page **Codec**.
 2. In the block **Input Sources**, select the input source for which you want to create a configuration profile.
 3. To create a configuration profile, click .
 4. To set up the new configuration profile, click **Edit**.
 5. Configure the parameters.
 6. Click **Save**.
- ✓ You have created an input source profile. Continue with 6.3 Assigning input source and codec profile to an encoder.

Parameters


Name	Assign a name to the Icecast server for better reference.
URL	Enter the URL of an Icecast server in the local network or the internet, e.g. "192.168.99.131" or "www.backup-audio.com".
IP Interface	Select the [Data] interface for the audio stream input.
Buffer	Enter a value for audio buffer.
Ancillary data	To add ancillary serial data to the stream, activate the switch.
GPIO tunneling	Enable GPIO tunneling for GPIO switch between encoder and decoder.

6.1.10 Creating input source profiles for Radio

You can create an input source profile and use it for encoding and decoding.

Input Source	Description	Source Interface
 Radio	Audio over FM or DAB tuner.	[RF]

To create a new configuration profile for an input source:

1. Navigate to the page **Codec**.
 2. In the block **Input Sources**, select the input source for which you want to create a configuration profile.
 3. To create a configuration profile, click .
 4. To set up the new configuration profile, click **Edit**.
 5. Configure the parameters.
 6. Click **Save**.
- ✓ You have created an input source profile. Continue with 6.3 Assigning input source and codec profile to an encoder.

Parameters


Name	Assign a name to the configuration profile for better reference.
RF Input	Select the RF input to be used.
Tuner type	Select the tuner type.
FM Frequency	Enter the frequency of the input signal.
FM Mode	Select the FM mode. Auto switches between stereo and mono depending on the signal quality.
FM Deemphasis	Select the deemphasis to reverse previously added emphasis on the signal.

6.1.11 Creating input source profiles for internal storage (File)

You can create an input source profile and use it for encoding and decoding.

Input Source	Description	Source Interface
 File	Files from internal storage	Internal storage (eMMC, optional SSD)

To create a new configuration profile for an input source:



1. Navigate to the page **Codec**.
 2. In the block **Input Sources**, select the input source for which you want to create a configuration profile.
 3. To create a configuration profile, click .
 4. To set up the new configuration profile, click **Edit**.
 5. Configure the parameters.
 6. Click **Save**.
- ✓ You have created an input source profile. Continue with 6.3 Assigning input source and codec profile to an encoder.

Parameters


Name	Assign a name to the configuration profile for better reference.
File	Select an audio file in the dropdown menu.
Buffer	Enter a value for audio buffer.

6.1.12 Creating input source profiles for audio interfaces

You can create an input source profile and use it for encoding and decoding.

Input Source	Description	Source Interface
 XLR	Digital (AES/EBU) or analog audio over XLR connector	[D IN] [A IN]
 AES 67	Digital (AES67) audio	[D IN]

To create a new configuration profile for an input source:


1. Navigate to the page **Codec**.
 2. In the block **Input Sources**, select the input source for which you want to create a configuration profile.
 3. To create a configuration profile, click .
 4. To set up the new configuration profile, click **Edit**.
 5. Configure the parameters.
 6. Click **Save**.
- ✓ You have created an input source profile. Continue with 6.3 Assigning input source and codec profile to an encoder.

Parameters

Name	Assign a name to the configuration profile for better reference.
Ancillary data source	Select the source for ancillary data in the dropdown menu.

6.2 Creating codec profiles

You can create codec profiles to assign to the different encoders of the IP-4c.

1. Navigate to the page **Codec**.
 2. Click on the tab **Profiles**.
 3. To create a new codec profile, click .
 4. To set up the new codec profile, click **Edit**.
 - A dialog window opens.
 5. Configure the parameters.
 6. Click **Save**.
- ✓ You have created and edited a codec profile.

Parameters

Name	Assign a name to the codec profile for better reference.
Encoder format	Select the encoder format. Different settings are configurable depending on the selected encoder format.
Frame size	Select the required frame size.
Audio mode	Select the audio mode in the dropdown menu.
Sampling rate	Set up sampling rate in the dropdown menu. The sampling rate for Livewire can only be configured for 48 kHz. The delay time of the input source must not exceed 200 ms if the sample rate is 192 kHz. For some 2wcom devices, the sampling rate is set to 192,000 Hz.
Sampling width	Set up sampling width in the dropdown menu in the range of 16-24 bits depending on the selected encoder format.
Endianness	Select the endianness (order of bytes).
Bitrate	Select the bit rate in the dropdown menu depending on the chosen audio mode. For some encoder formats, this field shows the calculated bitrate depending on the selected settings.
GPIO Tunneling	Enable GPIO tunneling for GPIO switch between encoder and decoder.

6.3 Assigning input source and codec profile to an encoder

The IP-4c is equipped with parallel encoders that can operate at the same time. One input can be the source for several encoders.

Prerequisite: You have already created configuration profiles for the input sources you want to use.

1. Navigate to the page **Codec**.
 2. Click on the tab **Encoder**.
 3. In the block **Source/Profile Assignment**, assign an input source profile to each encoder by selecting it in the dropdown menu **Input source**. Alternatively, drag/drop the input source profile into this field.
 4. Select the source for ancillary data from the dropdown menu **Ancillary Source**. To configure the ancillary data inputs and outputs, see 6.7 Configuring ancillary data.
 5. Assign a codec profile to each encoder by selecting it from the dropdown menu **Profile**. Alternatively, drag/drop the codec profile into this field.
 6. Click **Save**.
- ✓ You have activated and configured the encoders.




The IP-4c can also operate as a **transcoder** and change the codec format of an input audio stream. For transcoding, assign the corresponding input stream to the encoder and configure the format of the output stream. This function is currently limited to PCM only.

6.4 Setting up encoder outputs

6.4.1 Setting up an Elementary Stream output

You can activate and configure output streams for each encoder.

To set up a converter output:

1. Navigate to the page **Codec**.
 2. In the block **Outputs**, select the tab (if applicable) of the output you want to set up.
 3. Click  to create a new encoder output.
 4. To set up the new output, click **Edit**.
 5. Edit the parameters of the output settings.
 6. Click **Save**.
- ✓ You have set up an encoder output.

Parameters

Activation	To activate this output, set the switch to ON .
Encoder	Select the encoder. The same encoder can be assigned to several outputs.
Name	Enter the name of the stream for better reference.
Domain Name / IP	Define the domain name or IP address of the destination.
Port	Specify the port number of the destination.
QoS DSCP	Select the quality of service (QoS). The selected packet will be prioritized.
Multicast TTL	TTL (Time to Live) for multicast packets.
IP interface	Select the interface for the output.
Mode	Select the mode of the output stream in the dropdown menu: RTP or UDP. NOTE: Besides UDP/RTP, RTCP packets are also generated for the encoder output and are sent in intervals of 5 s. UDP/RTP allows reordering packets by means of sequence numbers.
Maximum payload size	Select the size limit for the payload. To set no limit, select Maximum .
Send Delay	Set up the send delay, which the encoder should wait in order to send Audio over IP as an offset stream for redundancy
RIST	Enable RIST to recover lost packets by resending them. You can enter a limit for the bandwidth used by the stream including re-sent packets.
Synchronous Playout / SFN	Enable SFN and enter the global delay to ensure synchronous playout.
Stream4Sure	Enable this function to allow the decoder to use this stream as one of up to 4 IP streams for Stream4Sure.
FEC Mode	Configure the FEC mode depending on the sample rate and the acceptable value for delay. For more information about the delay values, see 7.4 Setting up a buffer.
FEC column/row port offset	Enter the offset to the main destination port the data should be sent to. For example, if the main port is 5004, the value "2" for FEC column port offset means that the port is

then 5006 (5004 + 2).

If you do not want to use this offset, enter "0".


Dual streaming

If dual streaming is enabled, configure the IP parameters. You can set up the same or different [Data] sources for the Ethernet input.

6.4.2 Setting up an SRT output

You can activate and configure output streams for each encoder.

To set up a converter output:

1. Navigate to the page **Codec**.
 2. In the block **Outputs**, select the tab (if applicable) of the output you want to set up.
 3. Click  to create a new encoder output.
 4. To set up the new output, click **Edit**.
 5. Edit the parameters of the output settings.
 6. Click **Save**.
- ✓ You have set up an encoder output.


Parameters

Activation	To activate this output, set the switch to ON .
Encoder	Select the encoder. The same encoder can be assigned to several outputs.
Name	Enter the name of the stream for better reference.
Mode	Choose between "Caller" and "Listener" mode.
Host	Enter the host domain of the SRT destination.
Auto-configure source port	Activate automatic configuration of the source port.
Source port	If auto-configuration is disabled, enter the source port number manually.
Destination port	Enter the port number of the destination.
IP interface	Select the [data] interface for the output.
Latency	Define the time interval for the latency before the IP-4c starts to output the SRT stream.
Encryption	The type of AES encryption determines the length of the key (passphrase). AES-182 uses a 16-character passphrase (128 bit), AES-192 uses a 14-character (192 bit) and AES-256 uses a 32-character (256 bit) passphrase.
Passphrase	Define a password used to secure the SRT stream.

6.4.3 Setting up an Icecast Source Client output

You can activate and configure output streams for each encoder.

To set up a converter output:

1. Navigate to the page **Codec**.
2. In the block **Outputs**, select the tab (if applicable) of the output you want to set up.
3. Click  to create a new encoder output.
4. To set up the new output, click **Edit**.

5. Edit the parameters of the output settings.
 6. Click **Save**.
- ✓ You have set up an encoder output.


Parameters

Activation	To activate this output, set the switch to ON .
Encoder	Select the encoder. The same encoder can be assigned to several outputs.
Name	Enter the name of the stream for better reference.
Domain Name / IP	Define the domain name or IP address of the destination.
Port	Specify the port number of the destination.
IP interface	Select the [data] interface for the output.
Mountpoint	Specify the mountpoint of the stream in the domain.
User	Enter the username for using the domain.
Password	Enter the password for using the domain.

6.4.4 Setting up an Icecast Server output

You can activate and configure output streams for each encoder.

To set up a converter output:

1. Navigate to the page **Codec**.
 2. In the block **Outputs**, select the tab (if applicable) of the output you want to set up.
 3. Click  to create a new encoder output.
 4. To set up the new output, click **Edit**.
 5. Edit the parameters of the output settings.
 6. Click **Save**.
- ✓ You have set up an encoder output.

Parameters

Activation	To activate this output, set the switch to ON .
Encoder	Select the encoder. The same encoder can be assigned to several outputs.
Name	Enter the name of the stream for better reference. This name will be used as the icy name as well.
Port	Specify the port number of the destination.
IP interface	Select the [Data] interface to be used for the output.
TLS/SSL encryption	Enable TLS/SSL encryption.
Burst on connect	Enable burst on connect and enter the number of burst frames to load the buffer and ensure error-free connection.
Ancillary data	To add ancillary serial data to the stream, activate the switch.
GPIO tunneling	Enable GPIO tunneling for GPIO switch between encoder and decoder.

6.5 Setting up a Dolby® encoder



This option is only available if the right *Dolby encoder* is enabled.

The Dolby encoder allows different signals to be encoded so that speech is always equally loud regardless of the content—even though different kinds of content (such as sporting events, news, and commercials) all have different dynamic ranges. You can choose between "Dolby Digital" and "Dolby Digital Plus" as the encoder format.

To set up a Dolby encoder

1. Navigate to the page **Codec**.
 2. Create and configure a codec profile.
 3. Set Dolby Digital as the **Encoder Format**.
 - Dolby settings appear.
 4. Configure the Dolby-related parameters.
 5. Click **Save**.
 6. Assign the codec profile and an input source to an encoder.
 7. Configure and activate an encoder output for this encoder.
- ✓ You have set up a Dolby encoder.

Parameters

Encoder Mode	Choose between "Dolby Digital" and "Dolby Digital Plus".
Dialog Normalization	Select a value between -1 and -31 dB to set the average audio output of the decoder to a preset level. This aids in matching audio volume between program sources. Dialog Normalization is only used if Leveler Bypass is enabled.
Line Mode Profile / RF Mode Profile	Set the profiles to affect the DRC (Dynamic Range Control). This information is essential to allow decoders to decode the signal individually.
Dolby Surround Mode	Indicate whether the input signal is Dolby surround encoded or not. Alternatively, select "Not indicated".
Leveler Bypass	Disable Leveler Bypass to use real-time loudness leveling.
Loudness Target Regulation	Select a preset for loudness target regulation, or configure target loudness, peak limit and dialog intelligence manually. <ul style="list-style-type: none"> • ATSC: -24LKFS, -2.0dBTP, on. Typically used in North America. • EBU: -23LKFS, -3.0dBTP, off. Typically used in Europe.

6.6 Generating an AES67 stream

To generate an AES67 stream:

1. Navigate to the page **Codec**.
2. Create a codec profile for Elementary Streams using exactly the following parameters:

- **Encoder Format:** PCM
- **Audio Mode:** Stereo
- **Sampling Rate:** 48 kHz
- **Sampling Width:** 24 Bit
- **Endianness:** Big Endian

3. Configure the remaining parameters with individual settings.
 4. Assign the codec profile to an encoder.
 5. Select the input source for the encoder.
 6. Click **Save**.
 7. Configure the encoder outputs (see 6.4 Setting up encoder outputs).
- ✓ The encoder now generates an AES67 stream.

6.7 Configuring ancillary data

You can configure ancillary data and add them to the inputs and outputs.

To configure the ancillary data inputs and outputs:

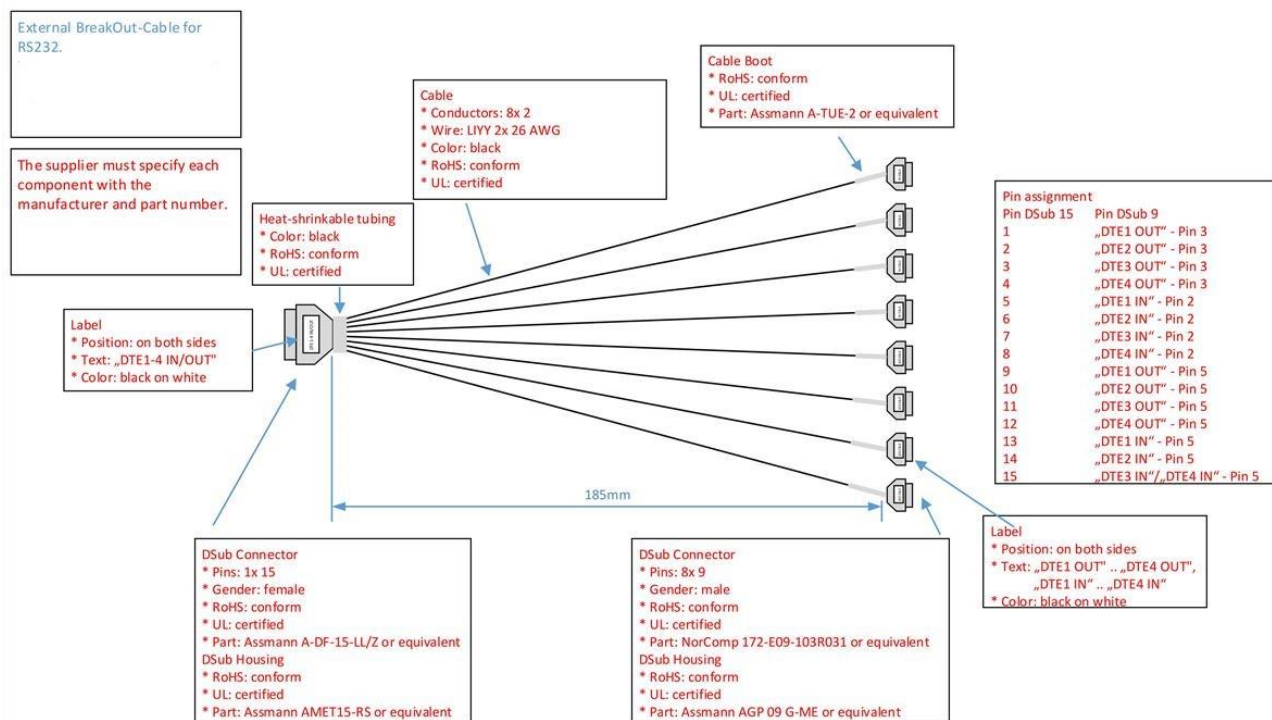
1. Navigate to the page **Ancillary Data**.
 2. In the tabs **Inputs** and **Outputs**, enter a name for the DTE input/output and set a baud rate.
 3. To add UDP inputs/outputs for ancillary data, click (+).
 4. Configure the parameters for the UDP inputs/outputs.
 5. Click **Save**.
 6. Navigate to the page **Codec**.
 7. In the tab **Encoder**, add an ancillary source to the input source. Alternatively, select the **Pipe** function to use ancillary data that already exist in the input source.
 8. Click **Save**.
 9. In the tab **Ancillary Output**, assign sources to the ancillary data outputs. You can either select a specific ancillary data source or one of the decoder audio outputs. If one of the decoder audio outputs is selected, then the IP-4c outputs the ancillary data of the currently active main or backup source.
 10. Click **Save**.
- ✓ The ancillary data are now added to the stream.

Parameters

Name	Enter a name for the input/output for better reference.
Max. Datarate	Enter the maximum data rate that is allowed for this input. The TS encoder uses this parameter to determine the data rate to reserve for private data when using the ancillary source with " Auto calculate required TS bit rate".
Multicast	Choose whether to use multicast.

Multicast IP	Enter the multicast IP.
IP	Enter the IP address. This can be a multicast IP.
Port	Specify the port for ancillary data via UDP.
Interface	Select the [Data] interface to be used.
VLAN	If the selected [Data] interface is an interface with VLAN, then select the VLAN to be used.

The pin assignment for DTE is as follows:



6.8 Configuring the TS Multiplexer

The IP-4c is able to output up to 8 multiplexed streams over IP at the same time. One multiplexed stream can contain up to 16 programs. To each program, you can add up to 16 payload contents. You can use the IP interfaces [Data] redundantly for the same stream content and the same destination or send different stream contents to the same or different destinations.

6.8.1 Setting up a Multiplex with payload content

Prerequisite: You have already configured the input sources.

Prerequisite: You have already assigned input sources and codec profiles to the encoders.

To set up a multiplexed stream with payload:

1. Navigate to the page **TS Multiplexer**.
2. To create a new Multiplex, click **+**.
 - A new tab with TS settings appears.
3. To add a new service to the TS payload content, click **Add Service**.
4. To add encoder audio to the stream, select an available encoder in the dropdown menu **Payload**. Alternatively, drag/drop the corresponding encoder from the tab **Encoder audio**.
5. To add another payload to the content, click **Add Payload**.

6. To add private data to the stream, select the corresponding input source in the dropdown menu **Payload**. Alternatively, drag/drop the input from the tab **Data**.
 7. Specify the service ID, service name, service provider name, PMT PID, PCR PID, and PID for the corresponding program.
 8. Select between the modes PES (program elementary stream) and MPE (multiprotocol encapsulation). If MPE is selected, enter the destination PID, destination port and the protocol.
 9. In the block **General**, configure the parameters.
 10. Click **Save**.
- ✓ You have set up a multiplexed stream. Continue with 6.8.3 Setting up Multiplex outputs.

Parameters

Encoding standard	Select the encoding format: TS/RTP or TS/UDP.
MPEG TS tables	Select the MPEG TS tables that are to be used.
Bit rate	If auto-calculated TS bit rate is disabled, enter the bit rate manually.
Audio bitrate priority	Select a priority for the audio bitrate: low latency or low bitrate overhead.
Private data mode	Select the private data mode: Elementary stream (ES) or TS adaption.
Network ID	Enter the network ID.
Original Network ID	Enter the original network ID.
Transport Stream ID	Enter the transport stream ID.
Network name	Enter the network name.

6.8.2 Adding SIRC data

SIRC (Satellite In-Band Remote Control) is a system for remote device control over satellite. SIRC allows you to remotely manage and service equipment without the need of a physical network or internet connection. By adding device control data into the MPEG2 transport stream at the satellite uplink station, the data can later be extracted and processed by the receiving equipment and thus completely remove the need for physical connections. This is especially useful when managing equipment in remote locations that have no or very poor outside connectivity.

Prerequisite: You have already set up a multiplex (see 6.8.1 Setting up a Multiplex with payload content).

To add SIRC data to a multiplexed stream:

1. Navigate to the page **TS Multiplexer**.
 2. Select the tab of the multiplex to which you wish to add SIRC data.
 3. In the block **SIRC (Satellite In-Band Remote Control)**, enable the SIRC data channel.
 4. Configure the parameters.
- ✓ The multiplexed stream now contains SIRC data. To view the status of the SIRC data, navigate to the page **SIRC data**(11.5 SIRC data status).

Parameters

SIRC PID	Enter the PID for SIRC data.
SIRC Bitrate (reserved)	Enter the bitrate to be reserved for SIRC data.
SIRC UDP Data Receive Port	Enter the port number of the UDP data port that receives the SIRC data.


SIRC UDP Data IP interface Select the [Data] interface to be used for SIRC data.

SIRC UDP Data VLAN Select the VLAN ID. To disable VLAN, select "0".

6.8.3 Setting up Multiplex outputs

For each TS Multiplex, you can create and save up to 32 destination streams.

To set up Multiplex outputs:

1. Navigate to the page **TS Multiplexer**.
 2. In the block Multiplexer Outputs, click on the tab of the output you want to set up.
 3. To create a new output, click .
 4. To configure the output, click **Edit**.
 - A dialog window opens.
 5. Configure the parameters.
 6. Click **Save**.
- ✓ The IP-4c now outputs multiplexed streams.

TS/IP output parameters



This option is only available if the right *TS Encoder* is activated.

Activation	Enable this output stream.
Name	Enter the name of the stream for better reference.
Domain name/IP	Enter the IP of the destination.
Port	Specify the port number of the destination.
Multicast TTL	TTL (Time to Live) for multicast packets.
IP interface	Select the [Data] interface for the output.
Mode	Select the mode of the output stream in the dropdown menu: RTP or UDP. NOTE: Besides the RTP, the RTCP packets are also generated for the encoder output and are sent in 5 s intervals. RTP allows reordering packets by means of sequence numbers.
Send delay	Enter the send delay, that the encoder should wait in order to send Audio over IP as an offset stream for redundancy (for more information, see 7.4 Setting up a buffer).
FEC Mode	Configure the FEC mode depending on the sample rate and the acceptable value for delay (for more information, see 7.4 Setting up a buffer). NOTE: Enable Pro-MPEG FEC in the corresponding decoder.
FEC column (L)/ FEC row (D) port offset	Enter the offset to the main destination port the data should be sent to. For example, if the main port is 5004, the value "2" for FEC column port offset means that the port is then 2006 (5004 + 2). If you do not want to use this offset, enter "0".
Dual Streaming	Enable or disable dual streaming. If dual streaming is enabled, the menu will expand. Set up the connection for dual streaming in the expanded menu. For the Ethernet input, you can select the same or a different source. NOTE: Enable dual streaming in the corresponding decoder.

TS/SRT output parameters

This option is only available if the rights *TS Encoder* and *SRT Encoder* are activated.

Activation	Enable this output stream.
Name	Enter the name of the stream for better reference.
Mode	Select either caller or listener mode.
Host	Enter the host domain of the SRT destination.
Auto-configure source port	Activate automatic configuration of the source port.
Source port	If auto-configuration is disabled, enter the source port number manually (relevant for e.g. firewall)
Destination port	Enter the port number of the destination.
IP interface	Select the [Data] interface for the output
Latency	Define the time interval for the latency before the IP-4c starts to output the SRT stream.
Encryption	Enable SRT encryption. The type of AES encryption determines the length of the key (passphrase). AES-128 uses a 16-character (128-bit) passphrase, AES-192 uses a 24-character (192-bit) and AES-256 uses a 32-character (256-bit) passphrase.
Passphrase	Define a password used to secure the SRT stream. NOTE: The same encryption key should be set for this input TS in the corresponding decoder.

ASI output parameters

This option is only available if an ASI output is built in as a hardware option.

Active	Enable this output stream. This change will be saved directly. It is not necessary to click Save .
Configuration	To configure the ASI output signal, see 8.8 Defining the use of the AUX interfaces.

6.9 Generating an HLS stream

This option is only available if the right *HLS Connections* is enabled.

The IP-4c can encode the same signal multiple times in different qualities and create an HLS stream that automatically changes its audio quality depending on the circumstances.

To create an HLS stream:

1. Assign input sources and profiles to the encoders. The same source must be encoded in different qualities.

Codec

Input Sources / Profiles

TS/TSP TS/RT Elementary Stream Live SRT SIP SecoD File XLR Profiles

Name	Format	Mode	SR	SW	BR	Auxiliary	GPIO
High Quality	MPEG Layer2	Stereo	48000	16	384k	—	—
Medium Quality	MPEG Layer2	Stereo	48000	16	192k	—	—
Low Quality	MPEG Layer2	Stereo	48000	16	64k	—	—

Encoder Source/Profile Assignment

Input Source	Profile	Input Source	Profile
1: Default (profile.m3u)	MP2 High Quality MPEG Layer2, 48000Hz, 384k, Stereo	5: Dante-AVIO : 2 (31.80.31.171.5024)	MP2 Medium Quality MPEG Layer2, 48000Hz, 192k, Stereo
2: Default (profile.m3u)	MP2 Medium Quality MPEG Layer2, 48000Hz, 192k, Stereo	6: Faulty (IP 1024)	MP2 High Quality MPEG Layer2, 48000Hz, 384k, Stereo
3: Default (profile.m3u)	MP2 Low Quality MPEG Layer2, 48000Hz, 64k, Stereo	7: None	MP2 High Quality MPEG Layer2, 48000Hz, 384k, Stereo
4: Dante-AVIO : 2 (31.80.31.171.5024)	MP2 High Quality MPEG Layer2, 48000Hz, 384k, Stereo	8: None	MP2 High Quality MPEG Layer2, 48000Hz, 384k, Stereo

Save

2. Navigate to the page **HLS**.
 3. To create a new tab for the HLS stream, click +.
 4. Configure the parameters of the HLS stream.
 5. Click **Save**.
- ✓ The encoder now generates a HLS stream. Information on active HLS streams are displayed on the page **Overview**.

Parameters

HLS stream name	Enter the name of the stream for better reference.
Input source	Select the input source in the dropdown menu. Alternatively, drag/drop the input source from the block Input sources into this field.
Playlist name	Enter the playlist name that will appear in the playlist url.
Playlist url	Use this URL to listen to the stream. Some web browsers need a plug-in to listen to the stream.
Enable stream	Activate the HLS stream.
HLS encoder	Activate the encoders that should feed into the HLS stream. Only the encoders that use the selected input source are listed in this block.

HLS 1 + HLS 2 +

General

HLS stream name:

Input source:

Playlist name:

Playlist url:

Enable stream: ☒

HLS Encoder

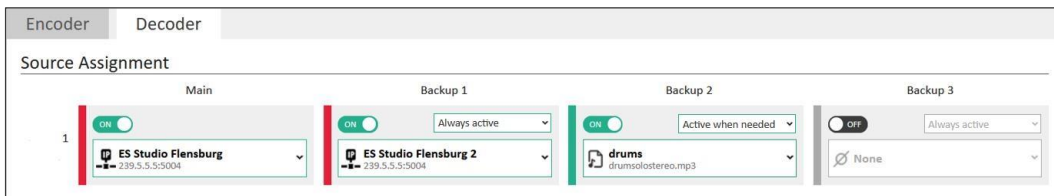
Active	Profile name	Encoder
1: <input checked="" type="checkbox"/>	High Quality	MPEG Layer2, 48000Hz - 384k, Stereo (1)
2: <input checked="" type="checkbox"/>	Medium Quality	MPEG Layer2, 48000Hz - 160k, Stereo (2)
3: <input checked="" type="checkbox"/>	Low Quality	MPEG Layer2, 48000Hz - 64k, Stereo (3)

Save

7 Decoder settings

7.1 Assigning source streams to a decoder

For each audio output, you can activate up to 4 input streams for decoding and assign one of them to the "Main Source". The remaining streams are alternative backups for decoding. The decoder receives and processes all enabled input sources from the encoder but only outputs the highest-priority audio signal that is error-free. The priorities of the streams are as follows: main source, backup 1, backup 2, backup 3.



Prerequisite: You have already created input source profiles (see 6.1 Creating input source profiles).

To assign source streams to a decoder:

1. Navigate to the page **Codec**.
 2. Click on the tab **Decoder**.
 3. In the block **Source Assignment**, activate an input signal in the **Main** column by setting the switch to **ON**.
 4. To assign an input source profile to the main source, select it in the dropdown menu. Alternatively, drag/drop the input source profile into the field.
 5. Configure up to 3 backup sources following the same principle.
 6. Click **Save**.
- ✓ The decoder now processes the main and backup sources. Continue with defining switch criteria for the main and backup sources (see 7.2 Defining switch criteria).



You can decode and play files from the internal storage. This option is recommended as an advanced redundancy for backup sources in case of input failure.



You can use XLR audio inputs as a backup source fed from an external device or for a loopback test.

7.2 Defining switch criteria

The IP-4c decoder can automatically switch between alternative sources as a redundancy solution in case of failure. The decoder receives and processes all enabled input sources from the encoder but only outputs the audio signal of the highest priority that is error-free (main source – backup 1/2/3).

You can enable the following switch criteria for input sources:

No input data	The IP-4c will switch to the next input source if no signal is available in the activated IP input [Data].
Packet jitter	The IP-4c will switch to the next input source if the packet jitter exceeds the set value.
Packet loss	The IP-4c will switch to the next input source if packet errors are detected in the input signal over the activated IP input [Data].
No decoder output	The IP-4c will switch to the next input source if the decoder does not output any data.

Audio silence detection	The input source will be switched to the next backup source if silence in the audio signal of the input stream is detected.
AES/EBU no signal	The input source will be switched to the next backup source if no signal is detected in the active input.
RF Level	The IP-4c will switch to the next input source if the frequency is below the set value.
C/N	The IP-4c will switch to the next input source if the carrier-to-noise ratio falls below the set value.
TS Sync	The IP-4c will switch to the next input source if the transport stream is not synchronized.

To define switch criteria for each audio input:

1. Navigate to the page **Switch Criteria**.
 2. Click on the tab of the input source for which you want to define switch criteria.
 3. If any of the listed criteria should be monitored, enable the corresponding switch.
 4. In the field **Value**, enter the threshold above or below which the input source should be switched.
 5. For each enabled criterion, define the delay time **T1** for switching release. After this delay time, the input source switches to the next backup source.
 6. For each enabled criterion, define the delay time **T2** for switching end. After this delay time, the input source switches back to the previous source, if its signal is good.
 7. Click **Save**.
- ✓ The IP-4c now automatically switches to the next good input source. For some switch criteria, you can set an alarm (see 10.1 Setting up alarms).

7.3 Setting up dual streaming

Dual streaming is the simultaneous transmission and reception of 2 identical IP streams that come from the same encoder. This allows a seamless exchange of IP packets in case of errors: If the main stream drops packets, then the decoder immediately replaces them using the packets from the second stream. Ideally, the two streams use different networks, so one stream is still available in case of the other network failing. Alternatively, it is possible to send both streams over the same network, with one stream being slightly delayed. Lost packets in the primary stream can be replaced in case of a burst error by using a dejitter buffer. The downside of using one network for both streams is that both streams will be affected in case of the network failing.

To set up dual streaming:

1. Set up dual streaming in the input source settings. For more information, see 6.1 Creating input source profiles.
 2. To use the input source, select it in the source assignment.
- ✓ Dual streaming is now enabled in the IP-4c.

7.4 Setting up a buffer

The IP-4c is equipped with an audio buffer and a dejitter delay for IP.

The audio buffer is a delay buffer for decoded audio. It saves decoded audio to output it in case of failure. The IP-4c can use this time buffer, for example, to switch to the backup source or external source.

The dejitter delay for IP transforms the variable delay into a fixed delay. It holds the first packet received for a period of time before it sends it out to the decoder. This time period is necessary for reordering the packets and to compensate jitter.

When using the IP-4c, there are different stages where delay is introduced during processing for security (e.g. FEC or dejitter delay). For uninhibited operation, make sure that delay settings are in a save range.

For a basic setup, delay is calculated in the following matter:

Encoder processing delay + transmission delay on IP network + decoder processing delay

Encoder delay is typically < 5 ms. Transmission delay on the IP network can vary by a large degree, depending on the network. Decoder processing delay needs to be broken down into multiple stages:

Dejitter/Reorder or FEC output delay + additional delay + decoder processing delay

If no FEC is used, you can use a dejitter/reorder buffer which will add delay in the length it is set up to. If FEC is used, there is a minimum delay that is required for safe operation (in the length of two full FEC matrices). Any delay on top of that is used for additional dejittering reordering of the input stream, as the FEC also includes this task as well. If the user setting is too small, it is overwritten internally to ensure safe operation. The current active setting to each decoder can always be viewed on the page **Overview** in the block "Details – Decoder". You can use the additional delay setting to further delay the output up to 1000 ms. The decoder will also have a small delay of < 5 ms.

Recommended default buffer configuration: Packet reorder delay: 100 ms, Audio delay: 100 ms

The minimal needed additional buffer sizes depend on the selected FEC Mode (Row x Col):

FEC Mode (2 x matrix size)	1x4 (8)	4x4 (32)	5x5 (50)	10x10 (200)
Codec (Packets/s)				
PCM (250)	0.03	0.13	0.20	0.80
MPEG1 Layer-2 (42)	0.19	0.76	1.19	4.76
MP3 (42)	0.19	0.76	1.19	4.76
AAC LC (47)	0.17	0.68	1.06	4.25
AAC HE v1 (24)	0.33	1.33	2.08	8.33
AAC HE v2 (24)	0.33	1.33	2.08	8.33

7.5 Setting up Stream4Sure



This option is only available if the right *Stream4Sure* is enabled.

Stream4Sure is a solution developed by 2wcom that allows the decoder to receive up to 4 IP streams of different coding and quality. The decoder can check the main stream for lost packets and precisely repair any lost samples by seamlessly copying them from the backup streams.

Prerequisite: An encoder sends up to 4 IP streams with Stream4Sure enabled to your IP-4c.

To set up Stream4Sure:

1. Enable Stream4Sure in the input source settings of up to 4 IP streams. For more information, see 6.1 Creating input source profiles.
 2. To use the input sources for a decoder, assign them to the main and backup sources.
- ✓ Stream4Sure is now enabled in the IP-4c.



The number of streams used for Stream4Sure reduces the number of other backup sources that can be used.

7.6 Receiving and decoding an AES67 stream

To receive and to decode AES67/Dante streams:

1. Navigate to the page **Codec**.
2. Create an input source profile for Elementary Streams.
3. Edit the input source profile. If a RAVENNA stream is available in the input stream, you can copy and save its settings. If no RAVENNA streams are available or the corresponding right is missing, configure the input source parameters manually.



Consider the default settings for SAP: SAP must be in Client/Server mode and use the correct receive address and port. RAVENNA uses 239.255.255.255 for SAP announcements.

4. Use exactly the following parameters:
 - **Encoder Format:** PCM
 - **Audio Mode:** Stereo
 - **Sampling Rate:** 48 kHz
 - **Sampling Width:** 24 Bit
 - **Endianness:** Big Endian
5. Configure the remaining parameters with individual settings.
6. Assign the configured input source to a decoder.
7. Click **Save**.
- ✓ The decoder now receives an AES67/Dante stream.

7.7 Setting up a Dolby® decoder



This option is only available if the right *Dolby decoder* is enabled.

You can set up a Dolby decoder to receive a Dolby Digital stream. The IP-4c reproduces the program audio according to the metadata parameters set by the program creator, and according to settings for speaker configuration and dynamic range that you chose.

To set up a Dolby decoder:

1. Navigate to the page **Codec**.
2. Create an input source profile for elementary streams.
3. Configure the parameters for this input source. Select **Dolby Digital** as the **Decoder type**.
 - Dolby-related parameters appear.
4. Configure the Dolby-related parameters.
5. Click **Save**.
6. Assign the input source profile to a decoder.
7. Click **Save**.
- ✓ You have set up a Dolby decoder.

Codec	
Decoder type:	Dolby Digital ▼
Buffer:	100 <small>ms</small>
<input checked="" type="checkbox"/> DOLBY Decoder Settings	
Stereo Mode:	Stereo ▼
DRC Mode:	Line ▼
DRC Scale Factor Low [0 ... 100]:	100 %
DRC Scale Factor High [0 ... 100]:	100 %

Parameters

Stereo Mode

Select either Stereo or Dolby Surround. Alternatively, select Auto for the decoder to recognize the stereo mode automatically.

DRC Mode

Select the compression profile to affect the DRC (Dynamic Range Control). This information is essential to allow the decoder to decode the signal individually.

DRC Scale Factor Low

Enter the factor for low-level signal boost compression scaling.

DRC Scale Factor High

Enter the factor for high-level signal cut compression scaling.

8 Interface settings

8.1 Configuring input/output settings

You can configure various settings for the input and output signals to ensure proper transmission and processing. The IP-4c can either provide only digital channels or reduce the number of channels to also provide analog channels (L/R).

To configure the signal inputs and outputs:

1. Navigate to the page **Audio**.
 2. Select the device mode in the drop-down menu **Interface Signal Type**: digital only or analog/digital.
 3. Configure the parameters in the blocks **Inputs** and **Outputs**.
 4. Click **Save**.
- ✓ You have configured the signal inputs and outputs.

Parameters

Signal Type	Select the signal type for the input and output interfaces.
Digital Gain	Adjust the gain of the input and output signals. This is useful if the signal's level is too high or too low.
Sample Rate Converter	To convert the sample rate to a specific frequency, enable the Sample Rate Converter. For more information, see 8.2 Enabling the sample rate converter.
Sampling Rate	If the Sample Rate Converter is enabled, select the sampling rate.
Clock Source	Select the clock source for the Sample Rate Converter. To configure the external clock, see 9.5 Using an external clock source.
AES/EBU Mute	Enable this function to mute an output if no input source is available.
Digital Reference Input	Select a reference input for digital signals to which the input and output clocks will be matched respectively.

8.2 Enabling the sample rate converter

The IP-4c is equipped with an internal sample rate converter (SRC) that converts stereo audio from one sample rate to another. The IP-4c sample rate converter allows different rates at the digital AES/EBU inputs and outputs.

To enable the sample rate converter:

1. Navigate to the page **Audio**.
 2. Set the switch **Sample Rate Converter** to **ON**.
 3. Select a sampling rate in the dropdown menu.
 4. Click **Save**.
- ✓ The sample rate converter generates an exact sampling rate in the input/output audio.



The configured sample rate and sample width must be correct and correspond to the real values of the signal!

Sample processing with enabled Sample Rate Converter:

- The IP-4c transports the decoded audio samples (PCM) through the sample rate converter (SRC) to the output.
- The sample rate converter generates the exact sampling rate for the output, which was configured in the web interface.
- In the SRC input, the jitter of the sampling rate is converted into a constant determined sampling rate for the output.

Sample processing without enabled Sample Rate Converter:

- The IP-4c transports the decoded audio samples (PCM) directly to the output interface without converting the sample rate.



According to the AES-3 standard, data jitter varies between max ± 20 ns. Depending on the bit depth, the signal-to-noise ratio has a better quality if the SRC is enabled.

During startup, the sampling frequency can vary up to ± 20 ns according to the AES/EBU standard. After complete startup of the sample rate converter, the sampling frequency varies less.

8.3 Setting the critical level marker

The audio level of the inputs and outputs is displayed on the overview page. You can set the critical level marker to specify when the bar should turn orange.

Critical Level Marker	
Analog Threshold:	6.0 dBu
Digital Threshold:	-9.0 dBFS

To set the critical level marker:

1. Navigate to the page **Audio**.
 2. In the block **Critical Level Marker**, define the threshold above which the bar should turn orange.
 3. Click **Save**.
- ✓ The bar indicating the audio level of the inputs and outputs now turns orange whenever the audio level is above the set value.

8.4 Changing the headphone volume

The input signal can be monitored via the headphone interface.

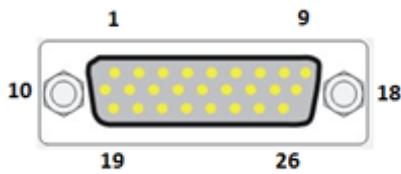
Headphone	
Source:	Stereo Decoder 1
Volume [-40.0 ... 0.0]:	-20.0 dB

To change the volume of the headphone output:

1. Navigate to the page **Headphone**.
 2. In the block **Headphone**, select the source for the headphone output.
 3. Set the volume for the headphone output in a range from -40.0 to 0.0 dB.
- ✓ The volume of the headphone output is now adjusted.

8.5 Viewing the GPI status

The IP-4c is equipped with 8 GPI contacts housed in the same 26-pole D-sub male connector as the GPOs. The inputs can be used for remote control (in combination with remote control software).



NOTICE

Risk of equipment damage!



- The voltage on GPI contacts must not be negative or exceed +0.7 V

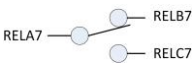
The table below displays the scheme of possible GPI contacts:

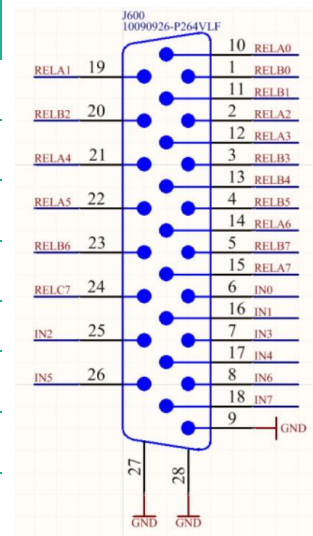
GPI No.	Control Pin No.	
1	IN0	
2	IN1	
3	IN2	
4	IN3	
5	IN4	
6	IN5	
7	IN6	
8	IN7	

- To actuate a GPI, pull the corresponding control pin electrically to ground (pin 9). The resulting control current is less than 5 mA.
- To view the status of the GPIs, navigate to the page **GPI**.

8.6 Configuring GPO settings

The IP-4c features 8 GPOs: 7 SPST relays (form A) and 1 SPDT relay (form C). You can use the relays for alarms of the monitoring function. For more information, see 10.1 Setting up alarms.

GPO No.	Switch contacts	Switch type
1	RELA0, RELB0	SPST, NO
2	RELA1, RELB1	SPST, NO
3	RELA2, RELB2	SPST, NO
4	RELA3, RELB3	SPST, NO
5	RELA4, RELB4	SPST, NO
6	RELA5, RELB5	SPST, NO
7	RELA6, RELB6	SPST, NO
8		SPST



SPST: a simple on/off switch: single pole, single throw

SPDT: single pole, double throw

NO: normally open

NOTICE Risk of equipment damage!



- The relay contacts have a maximum load of 0.5 A at 30 V DC. Do not exceed these values.

To configure the GPO settings and view the status of the GPOs:

1. Navigate to the page **GPO**.
 2. To invert a GPO, enable the corresponding switch.
 3. Select the source for the GPO switch in the field **Source**. Only GPOs that are selected for the source **Alarm** can be used to indicate a triggered alarm.
 4. If you set GPIO Tunneling as the source, then select the audio to be used for this function.
 5. Click **Save**.
- ✓ You have configured the GPO settings.

GPO

State / Configuration

State
Inverted
Source
Audio

GPO 1
OFF
Alarm
Audio output 1

GPO 2
OFF
Alarm
Audio output 1

GPO 3
OFF
Alarm
Audio output 1

GPO 4
OFF
Alarm
Audio output 1

State
Inverted
Source
Audio

GPO 5
OFF
Alarm
Audio output 1

GPO 6
OFF
Alarm
Audio output 1

GPO 7
OFF
Alarm
Audio output 1

GPO 8
A B
OFF
Alarm
Audio output 1

The virtual LED **State** indicates the status of the GPOs (green: ON, grey: OFF). The state of a relay is ON if the alarm which is assigned to this relay is triggered.

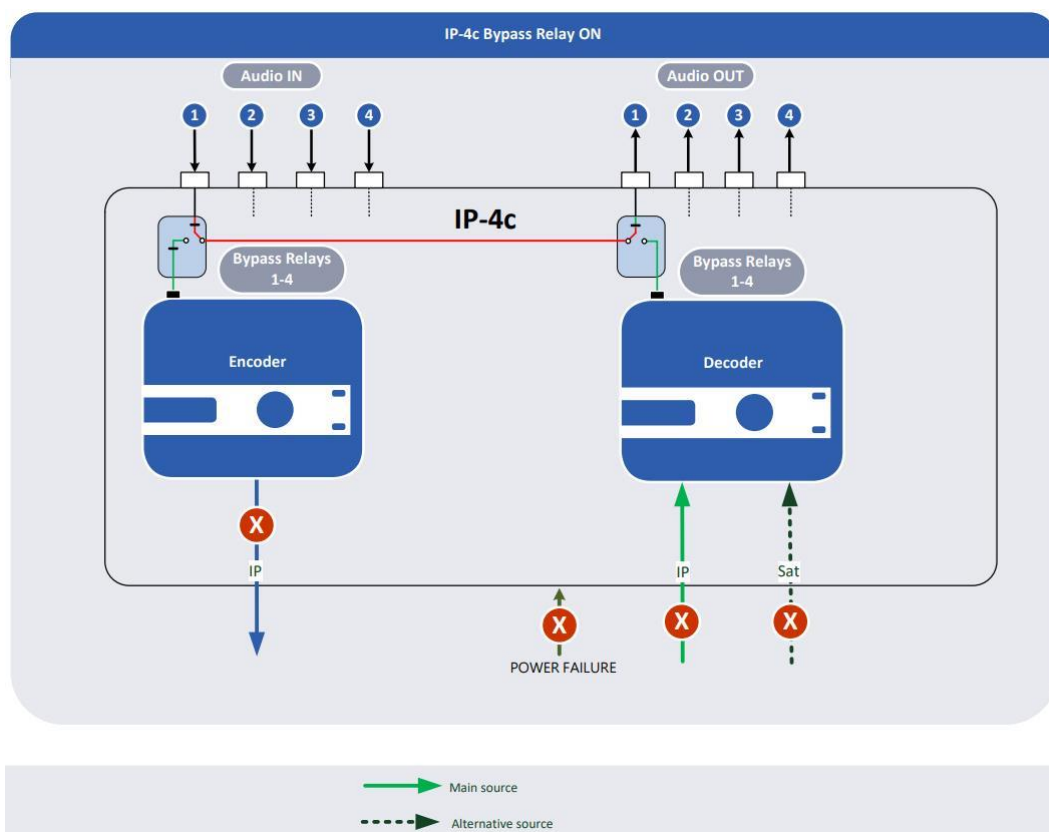
8.7 Audio bypass relay

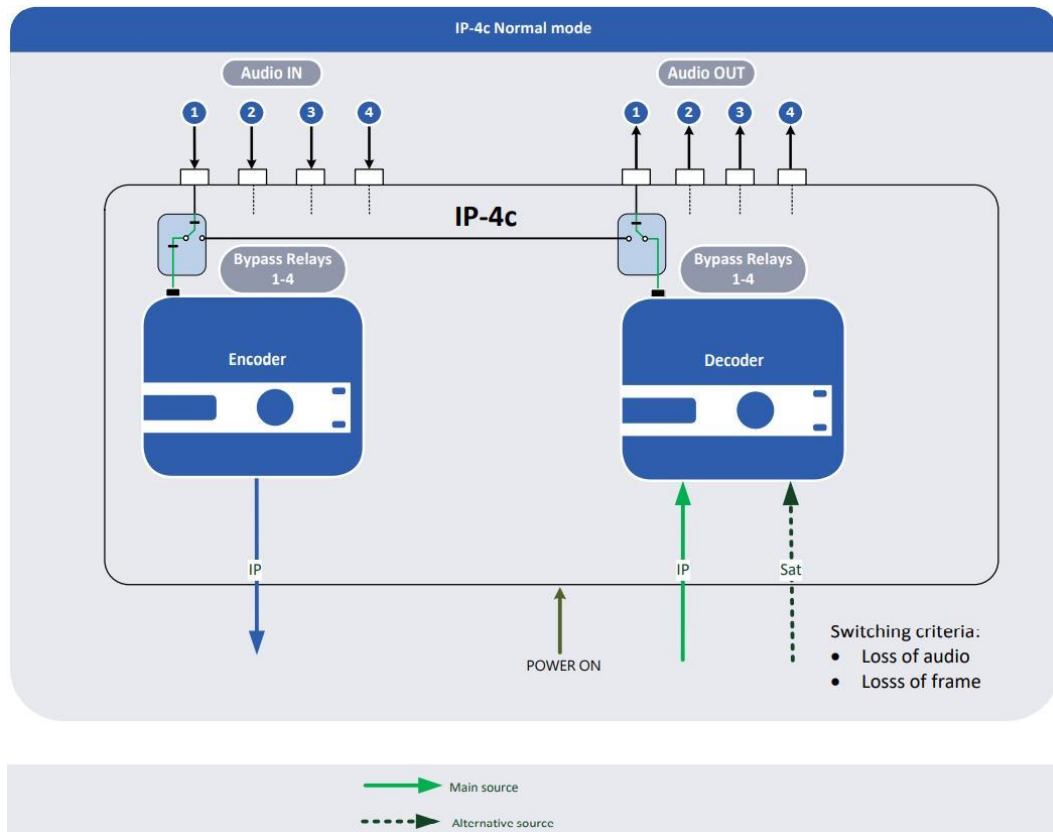
In case of a power failure, the bypass relay automatically switches the audio inputs to the outputs. The bypass relay therefore loops through the audio signal from the inputs to the outputs.

When the power is available again and the device boots up, the audio bypass relay will switch back to normal mode.



If the IP-4c boots up incorrectly after voltage recovery, the audio bypass relay may not switch back. To switch the audio bypass relay back to normal mode, restart the device.





8.8 Defining the use of the AUX interfaces

You can define for which purpose the AUX interfaces should be used. The [SYNC/AUX 1] interface can either be used as the ASI input or for 1PPS synchronization. The [AUX 2] interface is used as the ASI output.

AUX	
SYNC / AUX 1 (Input) Mode: SYNC 1PPS	AUX 2 (Output) ASI Output enabled: ON Output signal: Multiplex 1
Save	

To configure the use of the AUX interfaces:

1. Navigate to the page **AUX**.
 2. In the block **SYNC / AUX 1 (Input)**, select whether this interface should be used for 1PPS synchronization or as an ASI input.
 3. In the block **AUX 2 (Output)**, enable the ASI output.
 4. In the dropdown menu **Output signal**, assign to each ASI output one TS Multiplex that is to be sent over ASI output.
 5. Click **Save**.
- ✓ The IP-4c now uses the AUX interfaces as configured.

9 Audio over IP settings

9.1 Setting up a SIP connection



This option is only available if the right *EBU Tech 3326* is enabled.

The IP-4c supports audio IP streaming using SIP (Session Initiation Protocol). You can use a SIP connection for the encoder output and decoder input directly over the [Data] interfaces or over server (registrar). For a direct SIP connection, no registrar entry is necessary.

To set up a SIP connection:

1. Create an input source profile for SIP.
 2. Assign the SIP input source profile to an audio output of the decoder.
 3. Navigate to the page **SIP**.
 4. In the field **Port**: Enter the local SIP port number for the IP-4c. Enter "0" for a direct SIP connection.
 5. In the field **Call acceptance mode per audio channel**: Select a mode for the case that more than one SIP account is assigned to one of the four possible audio channel input priorities (Main – Backup1/2/3).
 - **Multiple**: Multiple calls will be accepted. The highest priority call will feed the audio output.
 - **First Call, First Serve**: Multiple calls will be accepted. The first accepted call will feed the audio output, even if a higher-priority call is coming in. Once the first call hangs up, the active call with the highest priority will feed the audio output.
 - **Single**: Only one active call per audio channel is accepted. Other incoming calls will be rejected.
 6. Click **Save**.
- ✓ You have set up a SIP connection.



In the modes "Multiple" and "First Call, First Serve", all incoming calls will receive the same audio from the corresponding audio input. For example, if a SIP account is assigned to one of the four input priorities of audio output 2, then it will answer with the audio of audio input 2.

9.2 Adding SIP phonebook entries



This option is only available if the right *EBU Tech 3326* is enabled.

You can preconfigure up to 450 entries in the SIP phonebook. You can use SIP phonebook entries to quickly establish connections via SIP dial.

To add and configure phonebook entries:

1. Navigate to the page **SIP Phonebook**.
2. If no entries are available, then click **Create first entry**. If there are already one or more entries available, then click
3. Click **Edit**.
 - A dialog window opens.

4. Configure the parameters.
 5. Click **Save**.
- ✓ You have added and configured a new SIP phonebook entry. To use phonebook entries, see 9.3 Establishing connections via SIP dial.

Parameters

Name	Enter the name of the contact.
Connect	Enter the username/address of the connecting device (registered second user agent). For direct connections to different SIP ports, add ":" and the corresponding SIP destination port number.
Encoder/Decoder Profile	Select the codec profile in the dropdown menu. To select different profiles for encoder and decoder, click on the arrow next to the field to expand the menu. Encoder Profile defines the audio format that the IP-4c (encoder) sends. Decoder Profile defines the audio format that the external encoder device sends.
Delay	Set up the send delay which the encoder should wait in order to send audio over SIP (For more information, see 7.4 Setting up a buffer).
Port	This setting is only applicable if you connect a remote encoder directly via the IP address. Enter the UDP/RTP port of the sender/destination. Enter "0" for an automatic port.
Reconnect Count	Set the number of reconnections.
FEC Mode	Configure the FEC mode depending on the sample rate and the acceptable value for delay. For more information about the delay values, see 7.4 Setting up a buffer.
FEC column/row port offset	Enter the offset to the main destination port the data should be sent to. For example, if the main port is 5004, the value "2" for FEC column port offset means that the port is then 5006 (5004 + 2). If you do not want to use this offset, enter "0".

9.3 Establishing connections via SIP dial






This option is only available if the right *EBU Tech 3326* is enabled.

Prerequisite: You have already assigned and activated a SIP input source profile to a decoder audio output (see 7.1 Assigning source streams to a decoder).

Prerequisite: You have already added SIP contacts and assigned codec profiles to the SIP phonebook entries (see 9.2 Adding SIP phonebook entries).

To establish a connection and start data transmission:

1. Navigate to the page **Easy2Connect**.
 2. The contacts from the SIP phonebook are listed in the block **Phonebook**. Select an entry for data transfer and click the  button next to it.
 - The selected contact appears in the block **Call** and is now ready for connection.
 3. To establish the connection, click the  button in the block **Call**.
 4. To hang up on the connection, click the  button in the block **Call**.
 5. For a quick dial, manually change the encoder configuration in the field **Encoder/Decoder Profile** and enter the dial number into the field **Connect**. For manual access to the connection settings for the decoder, disable the switch **Use default settings**.
- ✓ You have established a connection via SIP dial.



To see the details of the currently active SIP connection for the decoder and of the current data transfer, click on the tab **Details/Overview**.

- Green: SIP connection is active
- Orange: SIP connection is not active. SIP registration was successful.
- Red: SIP connection is not active. SIP registration has failed.



To reset the counters, click **Reset** in the block **Counters**.

9.4 Setting up SAP

The IP-4c supports SAP (Session Announcement Protocol) for stream announcement.

Prerequisite: You are logged in as an admin.

To set up the SAP connection:

1. Navigate to the page **SAP**.
 2. Configure the parameters.
 3. Click **Save**.
- ✓ You have set up the SAP connection.

Parameters

Mode	To enable SAP, select the service mode. "Client/Server" is recommended.
Announce interval	Enter the time interval between sending SAP announcement.
Multicast loop	Multicast loop to makes the IP-4c receive its own SAP announcements. The default setting is OFF.
Receive address and port	Set the multicast address and port to receive SAP announcements.
Ethernet port	Select the [Data] interface for transmission of SAP announcements in the dropdown menu.
Bandwidth limit	To avoid overhead, set a bandwidth limit for SAP announcements.
Destination address and port	Set the destination multicast address and port for SAP announcements.

9.5 Using an external clock source

You can synchronize the IP-4c with an external clock. You can configure 1 main and up to 2 backup clocks.

To synchronize the IP-4c with an external clock:

1. Navigate to the page **External Clock**.
 2. Select an external clock source for the main and backup clock sources.
 3. Configure the parameters for the main and backup clock sources.
 4. Configure the switch criteria for the main and backup source. The configurable criteria may vary depending on the selected clock source.
T1 is the delay time for alarm trigger. **T2** is the delay time for alarm end.
 5. Click **Save**.
- ✓ The IP-4c is now synchronized with an external clock. You can view the status information of the external clock on the page **Overview**. To use the external clock as the clock source for the audio inputs and/or audio outputs, see 8.1 Configuring input/output settings.



In case all configured external clock sources fail, the device will continue to work in free-running mode using the internal clock.

Parameters - PTP

- Domain Number** Enter the domain number.
- PTP Interface** Select the Ethernet interface to use for PTP.
- PTP Unicast** If PTP Unicast is enabled, enter the unicast address.

9.6 Configuring Livewire settings



This option is only available if the right *Livewire* is enabled.

Livewire is an audio-over-IP system used for routing and distributing broadcast-quality audio. The livewire routing protocol is used to route audio as well as GPIO ports.

Livewire

General

Routing Protocol: ☒ ON

Hardware Identification:

Ethernet:

GPIO

Enable: ☒ ON

Ethernet:

Name (GPO 1-5):

Name (GPO 6-8):

Advertisement

Enable: ☒ ON

Address:

Ethernet:

Advertising port:

Configuration port:

Prerequisite: You are logged in as an admin.

To configure livewire settings:

1. Navigate to the page **Livewire**.
 2. Enable **Routing Protocol**.
 3. Configure the parameters.
 4. Click **Save**.
- ✓ You have configured the livewire settings.

Parameters

- Hardware identification** Enter the hardware ID.
- Ethernet** Select the [Data] interface to be used.
- GPIO** Assign names to [GPO 1-5] and [GPO 6-8].
- Advertisement** Enter the ports for Livewire Advertising and for its configuration.

9.7 Monitoring audio via Live Listening



This option is only available if the right *Live Listening* is enabled.

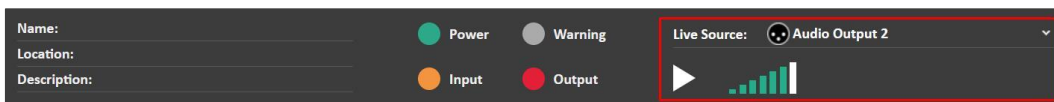
Activated input sources of the encoder and decoder as well as audio outputs can be monitored via Live listening. Live Listening enables you to listen "live" to any of the audio input sources as well as the audio outputs directly over the IP-4c web interface. The IP-4c is equipped with an adjustable bit rate encoder that

can encode the input audio signal in five different formats. You can manually set up the parameters for audio encoding depending on the bandwidth available for data distribution.

Prerequisite: You have already configured the input sources and assigned them to the encoder and decoder.

To set up audio monitoring via Live Listening:

1. Navigate to the page **Live Listening**.
2. Configure the parameters.
3. Set the switch **Activation** to **ON**.
4. Click **Save**.
5. In the banner, select an available audio source from the dropdown menu **Live Source**.



6. To change the playback volume, click the green volume levels.
 7. To start streaming, click the play button.
- ✓ The IP-4c now plays the audio over the web interface.

Parameters

Port	Enter the port number for streaming. The URL for Icecast streaming is "IP address of the device:streaming port". The standard port for live streaming is 8000. Example: <code>http://192.168.12.23:8000.</code>
Encoder Format	Select an audio format for streaming.
Audio Mode	Select a stereo or mono audio mode.
Sampling Rate	Select a sampling rate for streaming.
Bitrate	Select a bit rate for the selected audio format quality.

10 System settings

10.1 Setting up alarms

You can set several alarms that trigger in case of defined events. You can monitor the following:

Temperature	Alarm is triggered if the device temperature exceeds the configured value.
Power failure	Alarm is triggered in case of an error in a power supply unit.
LAN Link	Alarm is triggered in case of an error in Ethernet data communication.
1 PPS clock status	Alarm is triggered if 1 PPS signal is not present.
PTP clock status	Alarm is triggered if PTP signal is not present.
NTP clock status	Alarm is triggered if NTP server is available.
AES/EBU No Signal	Alarm is triggered if no decoded digital audio is available in the audio input.
AES/EBU CRC Error	Alarm is triggered if a cyclic redundancy check error is detected.
Silence Detection	Alarm is triggered if the device detects silence in the left and/or right channel of the audio output.
No Input Data	Alarm is triggered if no input data is detected.

To set up alarms:

1. Navigate to the page **Alarm**.
 2. For each alarm, configure the corresponding parameters.
 3. Click **Save**.
- ✓ Enabled alarms will now be saved in a log entry and signaled over SNMP, LED or GPO if triggered.

Parameters

Enable	Enable or disable an alarm.
Priority	Select the priority of the alarm message.
Values	Enter the value below or above which the alarm triggers.
T1	Set the delay time for alarm trigger.
T2	Set the delay time for alarm end.
SNMP, LED, GPO	Enable the corresponding switch if the alarm should be signaled by SNMP traps, an LED or GPO switch. The corresponding GPO must be activated for the source "Alarm" (see 8.6 Configuring GPO settings).

10.2 Entering device information

For better identification of the IP-4c, you can enter device-specific data.

1. Navigate to the page **Global**.
 2. Configure the parameters in the block **System info**.
 3. Click **Save**.
- ✓ The saved information is now displayed in the banner.

Parameters

Name	Enter the name of the device for better reference.
-------------	--

Location	Enter the location of the device.
Description	Enter further important information on the device.

10.3 Setting up session timeout

Session timeout is a security feature that automatically logs out the user after a period of inactivity. You can define the period of inactivity or disable session timeout.

1. Navigate to the page **Global**.
 2. In the field **Session timeout**, enter the value in minutes for the period of inactivity necessary to automatically log out the user. Enter "0" to disable this function.
 3. Click **Save**.
- ✓ You will now be automatically logged out after the set period of inactivity.

10.4 Changing the title of the browser tab

You can change the title of the browser tab to display the information you need for better reference.

1. Navigate to the page **Global**.
 2. In the field **Browser Tab Title**, enter the information you want to display. You can use variables for specific information. Variables will update automatically if the corresponding information changes. View the possible variables by hovering over the input field.
 3. Click **Save**.
- ✓ The title of the browser now displays the configured information.

10.5 Updating the firmware

You can upload ARM firmware stored locally or from a TFTP server to the device.

1. Navigate to the page **Global**.
 2. In the block **Firmware** update, click **Browse/Drop file**.
 3. Select the firmware file you want to upload.
 4. Click **Upload** to upload the firmware file. The upload may take a while. Do not interrupt this process.
 5. After a successful upload, follow the prompt to restart the device.
- ✓ After the restart of the device, the new firmware is active.

10.6 Checking for updates

You can check for updates and install them, if available. You can also view the release notes and details about the available updates. Additionally, it is possible to download the firmware file to install at a later point of time.

To install an available update:

1. In the menu **Support**, click **Check for updates**.
 - The window **Available Firmware Versions** opens.
 2. Select the update you want to install.
 - The dialog window **Firmware Update** opens.
 3. Click **Yes, update now**. The update may take a while. Do not interrupt this process. Since the device reboots during this process, you will be logged out.
- ✓ The firmware is now updated.



In the window **Available Firmware Versions**, firmware bundles that are newer than the currently installed one are marked with ★. Important updates are marked with !. Click **Open** to view the change notes and details about a bundle version. To download a firmware bundle for later installation, click

10.7 Setting up rights

Some functions of the IP-4c are optional. To use these functions, you must activate additional rights by uploading a rights file. To receive rights files, please contact your 2wcom sales representative.

1. Navigate to the page **Global**.
 2. In the block **Rights**, click **Browse/Drop file**.
 3. Select the rights file (*.2wcom_key) you want to upload.
 4. Click **Upload**. The upload may take a few minutes. Do not interrupt this process.
 5. After a successful upload, follow the prompt to restart the device.
- ✓ The new rights will be active after restart. You can view the current rights in the block **System information**.

10.8 Uploading and activating an SSL-Certificate

An SSL certificate is a digital certificate that provides authentication for a website and enables an encrypted connection.

To upload and activate an SSL certificate:

1. Navigate to the page **Global**.
 2. In the block **SSL-Certificate**, click **Browse/Drop file**.
 3. Select the SSL certificate file (*.pem) you want to upload.
 4. Click **Upload**. The upload may take a while. Do not interrupt this process.
- ✓ You have uploaded an SSL certificate.

10.9 Saving settings to a local file

You can download the current settings and save them as a file. You can upload this file later to restore the settings or upload it to another device to copy the settings.

1. Navigate to the page **Global**.
 2. In the block **Settings download**, click **Generate**.
 - A file is being created. This may take a few seconds.
 - The download option with the time and date of file creation appears.
 3. Click **Download**.
 4. Save the file to a location of your choice.
 5. Click **Save**.
- ✓ You have saved settings to a local file. To upload and activate the settings stored locally, see 10.10 Uploading and activating settings from a file.

10.10 Uploading and activating settings from a file

You can upload a settings file to restore previous settings or copy the settings from another device. For information on how to generate a settings file, see 10.9 Saving settings to a local file.

1. Navigate to the page **Global**.
 2. In the block **Settings update**, click **Browse/Drop file**.
 3. Select the settings file you want to upload.
 4. Click **Upload** to upload the settings file. The file upload may take a while. Do not interrupt this process.
 5. After a successful upload, follow the prompt to restart the device.
- ✓ After the restart of the device, the new settings are active.

10.11 Generating and downloading a diagnostic report

In case of any problems or failures, you can generate and download a diagnostic report to send to 2wcom.

To generate and download a diagnostic report:

1. Navigate to the page **Global**.
 2. In the block **Diagnostic Report**, select the time period for which the device captures all activities.
 3. Click **Generate**. A file is being created. This may take a while. Do not interrupt this process.
 - The download option with the time and date of file creation appears.
 4. Click **Download**.
 5. Save the file to a location of your choice.
- ✓ You have generated and downloaded a diagnostic report.

10.12 Uploading a debug script

To identify a specific error, you can upload a debug script that you have received from 2wcom. Depending on the expected error, the debug script monitors extra status information and records the incoming data. When the error occurs, the recording stops and a debug.log file is generated which contains all information that 2wcom needs to fix it.

To upload a debug script:

1. Navigate to the page **Global**.
 2. In the block **Debug Report**, click **Browse/Drop file**.
 3. Select the debug script file (*.upd) you want to upload.
 4. Click **Upload**. The upload may take a while. Do not interrupt this process.
 5. To start the debugging process, click **Start**. This may take a while. Do not interrupt this process.
 - When an error occurs, the script is automatically stopped. A download link for the debug.log file appears.
 6. To download the debug.log file, click on the link.
 7. Send the file to your 2wcom contact person.
- ✓ 2wcom can now identify the error and determine further action.

10.13 Rebooting the device

To reboot the device:

1. Navigate to the page **Global**.
 2. In the block **Control**, click **Now** in the field **Reboot Device**.
- ✓ The device restarts. After the restart, you will have to log in again.

10.14 Restoring factory settings

Restoring the factory settings will delete all configurations that were made by a user except for the IP address of the CTRL interface. This also applies to the access accounts.

To reset the device to factory settings:

1. Navigate to the page **Global**.
 2. In the block **Control**, click **Now** in the field **Load Factory Settings**.
- ✓ You have restored the factory settings.



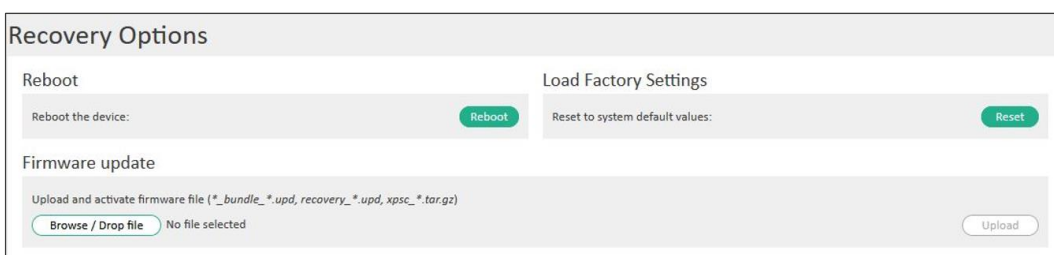
Control

Reboot Device: Load Factory Settings:

10.15 Accessing the recovery mode via reset pin hole

If you cannot access the IP-4c via the web interface, you can reboot the device using the reset pin hole. You can also use the reset pin hole to access the recovery mode in which you can flash the device or restore factory settings.

- To restart the device, press the reset button for a second.
1. To access the recovery mode, press the reset button for a few seconds until all LEDs on the front panel turn off and only power LED starts flashing quickly.
 - The device starts in recovery mode.
 2. Access the recovery web interface by entering the IP address of the device into a web browser. In recovery mode, you can upload and activate firmware, reset the system to factory settings or reboot the device.



Recovery Options

Reboot

Reboot the device:

Load Factory Settings

Reset to system default values:

Firmware update

Upload and activate firmware file (*.bundle_*.upd, recovery_*.upd, xpsc_*.tar.gz)

No file selected

3. After flashing or resetting the device, reboot the device by clicking **Reboot**.
- ✓ After a few seconds, the device will be ready for operation.

10.16 Setting the time and date

You can set the time, time zone and date of the internal clock.

1. Navigate to the page **Time**.
 2. In the block **Local time**, select the present time zone in the dropdown menus.
 3. Click **Save**.
 4. In the block **Time and date settings**, enter the current date and time.
 5. Click **Save**.
- ✓ You have set the time and date. The current time and date of the internal clock is shown in the field **Present local date and time**.

10.17 Changing login data

The default accounts are a read-only access (Guest account), a full access without a permission to manage the user accounts (Manager account), and a full access (Admin account). The user account SFTP service is used only for the access from an external SFTP client for uploading audio files and saving them in the internal storage.

Change the login data after the first login to the web interface.

The default login data for the first login are (case sensitive):

- Guest account: "guest" / "guest"
- Manager account: "manager" / "manager"
- Admin account: "admin" / "admin"
- FTP service: "sftpuser" / "sftpuser"

To change the login data:

1. Log in as an admin.
 2. Change the login data for an account in the corresponding block and repeat the new password.
 3. Click **Save**.
- ✓ You have changed the login data.

10.18 Adapting the access for user accounts

You can configure the access to certain web interface pages for the manager and guest accounts.

Prerequisite: You are logged in as an admin.

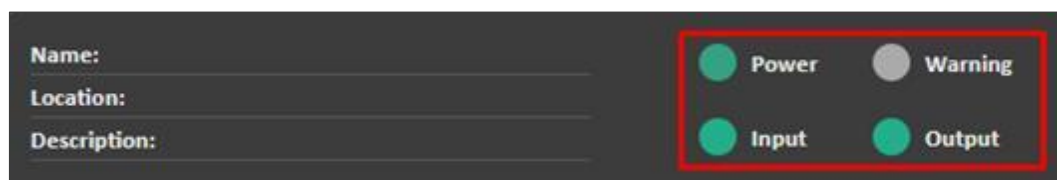
To adapt the access for manager and guest accounts each individual IP-4c menu:

1. Navigate to the page **User**.
 2. Click on the tab **Menu Access**.
 3. Enable or disable the access to the separate menus by setting the corresponding switch to either **ON** or **OFF**.
 4. Click **Save**.
- ✓ The new access configuration is now active.

11 Status information

11.1 Status LEDs

The IP-4c is equipped with 4 status LEDs on the banner of the web interface that display the status of the inputs, outputs, power supply and alarms.

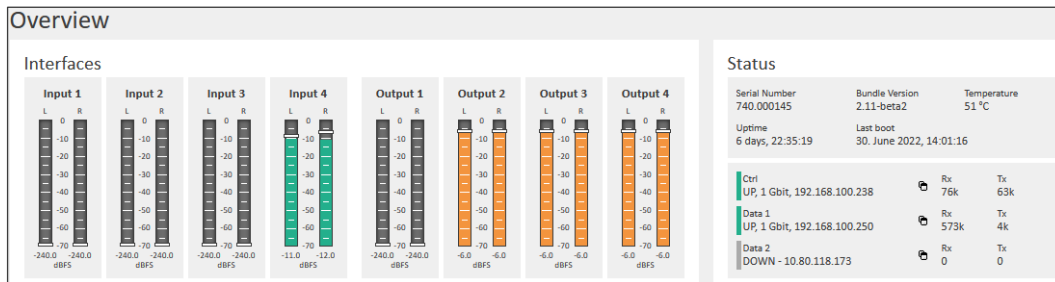


The following table displays the meaning of each LED:

LED	Color	Meaning
Power		All supply cords are connected and the power supply is OK.
		Toggles (green/red) if only one power supply is connected or OK.
Warning		LED is off if no alarms are triggered.
		At least one alarm is triggered.
Input		No input monitoring alarms are enabled.
		Input monitoring alarms are enabled and all inputs are OK.
		One or more inputs are bad, but at least one is good.
		All inputs are bad.
Output		No decoder output monitoring alarms are enabled.
		Output monitoring alarms are enabled and all outputs are OK.
		One or more outputs are bad, but at least one is good.
		All outputs are bad.

11.2 General overview

The page **Overview** gives you general information on the status of your IP-4c. The appearance of this page might differ depending on the activated rights, built-in modules and settings.



The audio levels of the inputs and outputs are displayed in the left block. To change the threshold above which the bar turns orange, see 8.3 Setting the critical level marker.

The block **Status** gives general device-specific information as well as information on the ethernet interfaces.

Decoder Status

To get a quick and detailed overview, you can view the current status of the decoder and the incoming data. To view the decoder status, navigate to the page **Overview** and click on the tab **Codec**.

In the block **Decoder**, you can see the status of the currently active decoders:

Green: Enabled

Gray: Disabled

Red: Error

- To view more details on a decoder, click on the corresponding panel.
 - The **Details** view below the block **Decoder** now displays the status of the decoded audio.
- To reset the counters in the status fields, click **Reset Counters**.

The following abbreviations and terms may appear in the status overview:

SR	Sampling Rate
SW	Sampling width
FEC	Forward error correction
Bitrate	Audio bit rate
Buffer	Delay buffer for decoded audio
Err	The number of errors in the decoder (e.g. failed samples, no audio, PER)
Jitter	Packet jitter of the incoming IP stream
Missed	The number of lost/missing packets
PER	Packet error rate of the input stream
Reordered	Number of carried out reorderings of IP packets
Recov.	Number of recovered packets
Unrecov.	Number of unrecovered packets

Encoder Status

To get a quick and detailed overview, you can view the current status of the encoder and the incoming audio data. To view the encoder status, navigate to the page **Overview** and click on the tab **Codec**.

In the block **Encoder**, you can see the status of the currently active encoders.


- To view more details of an encoder, click on the corresponding panel.
 - The **Details** view below the block **Encoder** now displays the status of the input source, codec profile and the assigned audio outputs.
- To reset the counters in the status fields, click **Reset Counters**.
- Details of the assigned outputs are displayed in the table. To view the status of an assigned output, select the corresponding tab.
- To change the order of the table columns, drag/drop the column headings.
- To change the column width, hover over the frame line until the cursor changes to a two-headed arrow. Click and move the frame line.

TS Multiplexer status

The Tab **TS Multiplexer** on the page **Overview** gives a detailed overview on the status of the enabled multiplex outputs.

- To see more details on the configured programs in one multiplex, click on the corresponding Multiplex.
- To see more details on the payload of a program, click on the corresponding program.

External Clock Status

If an external clock is used, then it is displayed as  on the page **Overview**. The tab **External Clock** gives quick status information on the external clock. This block shows the active clock source and the configured backup sources as well as their status information. For more information on the NTP servers, see 11.6 NTP Status.

System Information

The page **Global** gives specific information on the device, such as the uptime and time of the last boot, serial number, activated rights and software version. The current version of your IP-4c is the **App Version**.

System information	
Present local date and time:	03. March 2022, 10:35:49
Last boot:	19. February 2022, 17:27:18
Uptime:	11 days, 17:08:32
Serial number:	740.000012
▼ Bundle version:	2.08
File/Recovery system version:	2.16 / 2.01
App version:	2.08.4
Webinterface version:	2.97
FPGA version:	1.08b0 / 0
System Controller version:	1.02
SNMP MIB version:	2.8 (SNMP MIB)
Kernel version:	2wcom-01.12-rt60
► Codec versions	
HW Revision XPS/IF:	1.00 / 1.00
Rights:	4 Channels, Ravenna, EBU Tech 3326, Livewire, Stream4Sure, TS Decoder, TS Encoder, SRT Decoder, SRT Encoder, Live Listening
Missing rights:	
Open source acknowledgements:	Link

11.3 Device status

The page **Device** gives information on the current status of the hardware.

- The block **Mainboard** displays the voltages on the mainboard and the device temperature.
- The block **Fans** displays the speed of the fans.
- The blocks **Power Supply** display the status and type of the left and right power supplies. The colored bar indicates the status: green - ok, red - no power. If only one power supply module is built in, the only one block is displayed on this page.
- The block **Expansion Modules** displays built-in hardware options. If no expansion modules are built in, this block is not shown.

Device Status			
Base Components			
Mainboard		Fans	Power Supply 1 (Left)
12V 11.96V	5V 5.01V	Fan 1 Speed 420 RPM	Type 110/230V AC
3.3V 3.33V	2.5V 2.56V	Fan 2 Speed 720 RPM	Power Supply 2 (Right)
1.8V 1.80V	1.2V 1.21V		Type 110/230V AC
1.0V 1.01V			
Temperature 50 °C			
Expansion Modules			
FM/DAB Tuner			
Hardware revision 0.20a	Module type EXM12	Part number 0400001980	

11.4 Ancillary data status

The status page **Ancillary Data** gives information on the status of the ancillary data inputs and outputs.

- The block **RAW Data** displays the data in the hexadecimal and ASCII code as well as the total bytes.
- The block **RDS/UECP Data** displays the information on the active RDS/UECP data as well as the total frames.
- To pause the data recording, click **Pause**.
- To clear the log, click **Clear**.

11.5 SIRC data status

The page **SIRC Data** gives information on the current status of SIRC.



11.6 NTP Status

Navigate to the page **NTP Status** to view the status of the NTP servers used for time synchronization.

The first block gives information on the quality of the current synchronization. The IP-4c always uses the best available source. The quality status of the current NTP server synchronization is displayed via a color-coded bar:

- green = the quality is good
- red = at least one of the listed data is bad

The list below explains the data that is displayed in this block:

NTP Source	States whether an NTP source is available.
RMS Offset	The root-mean-square offset is a long-term average offset to the currently estimated time.
Skew	The frequency offset to the clock standard.
Estimated Error	The total worst case timing error accumulated between the stratum 1 server and the client.
Peer Delay Jitter	Jitter to the next NTP server.
Last Valid Sample	Time since the last status update.
Reference ID	The reference ID and IP address of the server to which the computer is currently synchronized.
Ref time (UTC)	The time (UTC) at which the last measurement from the reference source was processed.
Stratum	indicates how many levels away the NTP server is from the clock standard.
Frequency	the rate by which the clock would be wrong if it were not corrected.
Residual Frequency	difference between what should be frequency according to the measurements from the reference source and the frequency that is currently used.
Last offset	the time (UTC) at which the last measurement from the reference source was processed.
Leap status	Normal: no leap second. Insert second: leap second will be inserted at the end of the month. Delete second: leap second will be deleted at the end of the month. Not synchronized: unknown status (no valid measurement was made).

The block **NTP Server Status** lists all NTP servers and gives detailed information on them. The status of the NTP server source is displayed via a color-coded bar:

- green = current best
- orange = combined
- red = not combined

The list below explains the most important data that is displayed in this block. For more information on terms that are not listed below, visit chrony.tuxfamily.org/doc/4.1/chronyc.html

Source State	current best: the best source which is currently selected for synchronization combined: other sources selected for synchronization which are combined with the best source. not combined: any other source.
Name/IP address	the name or the IP address of the source
Measured Offset	Description.

11.7 Log

The IP-4c records all important system events, such as restart and error messages in a log. You can view the log, sort the entries, search for a specific entry, save the list as a log file, and clear the log.

- To sort the log entries, click on the column header of the parameter by which you want to sort the entries. To reverse the order, click that header again.
- To search for a specific entry, enter a term into the search bar.
- To save the list to a log file, click **Download**.
- To delete all log entries, click **Clear**. Confirm your choice in the dialog window.

Nr	Time	Priority	Message
5000	2021-08-24 13:42:12	Informational	Cold Start
4999	2021-08-18 08:16:52	Informational	Warm Start
4998	2021-08-18 08:16:34	Informational	Firmware update
4997	2021-08-17 19:06:11	Informational	Cold Start
4996	2021-08-17 13:08:57	Informational	Cold Start

For more information on alarm messages, see 11.8 Priority of alarm messages.

11.8 Priority of alarm messages

Priority	ID/Code	Definition
Emergency	0	System is unusable
Alert	1	Actions must be taken immediately
Critical	2	Critical condition
Error	3	Error condition
Warning	4	Warning condition
Notice	5	Normal but significant condition
Informational	6	Informative message
Debug	7	Debug-level message

In case of an alarm, an error report with the priority of the error will be sent to the Network Operations Center (NOC). The responsible second-level support will decide by means of this information how urgent the alarming case is and what measures are necessary. The event will be recorded in a log entry.

12 Further information

12.1 Maintenance and disposal

No special maintenance is necessary on the device. Do not use corrosive detergents on the device such as benzene, thinner, alcohol or acetone.

Remove dust on the housing of the device with a soft, dry cloth.

Electrical appliances do not belong in domestic waste. Dispose of the device in an environmentally friendly manner via suitable collection systems in accordance to the local regulations.

12.2 Troubleshooting, support and warranty

More often than not, it is only a small detail that has been overlooked and leads to a problem. Therefore, read the entire user manual carefully, as this will help you to understand, prevent and eliminate typical problems. Use the following table to self-check common error sources prior to contacting our support.

Report failures by email to support@2wcom.com. For a support request to 2wcom, please have the serial number of the device ready. You can find the serial number of your device on the page **Global** and on the sticker on the rear side of the device: "S/N xxx.xxxxxx".

For information on the warranty of 2wcom products, visit <https://www.2wcom.com/terms-and-conditions/>.

Problem	Possible Causes	Solution
Device does not turn on	<ul style="list-style-type: none"> Power cable is connected improperly Mains supply failure Blown fuse 	<ul style="list-style-type: none"> Check power supply cord. Make sure that the power plug is fully inserted. Check mains supply. Replace fuse by same type.
Device is not accessible via Ethernet	<ul style="list-style-type: none"> Network cable is not connected IP address/TCP port is unknown A device with the same IP address was connected a few minutes before. Thus, the ARP table still assigns the old MAC address to the IP address. 	<ul style="list-style-type: none"> Connect the network cable. Check IP address obtained from DHCP via LCD menu. The operation system refreshes the ARP table every few minutes. For an instant access to the device, reset the ARP table of your computer, e.g. by entering <code>arp-d</code> in the Windows command prompt.
Device does not respond		<ul style="list-style-type: none"> Reboot the device. Update the software.

12.3 Manufacturer

2wcom Systems GmbH
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Germany

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13 Technical details

Technical details 1/2



Audio (encoder / decoder)

Codecs

Standard

MPEG 1/2 Layer 2, 3
Linear PCM
G.711, G.722
Opus
Ogg Vorbis
MPEG 2/4 AAC LC
MPEG 4 AAC LD/ELD/ELD v2
MPEG 4 HE-AAC v1&v2
Extended HE-AAC (xHE-AAC)
Enhanced aptX (E-aptX)
Optional: Dolby Digital Pro / E encoder supporting AC 3, Dolby E, Dolby Digital (DD) and Dolby Digital Plus (DD+)
Optional: MPX

On request

Bit transparent transmission of AES/EBU input

Sample rates

kHz: 16, 22,05, 24, 32, 44.1, 48 (On request: up to 192 kHz)

Sample rate converter

8:1 (with bypass modes)

Interfaces

Audio

Digital (in/out)

4x AES/EBU, 110 Ω bal., integrated XLR

Analog (in)

2x L/R, > 10 kΩ bal., integrated XLR

Analog (out)

2x L/R, < 20 Ω bal., integrated XLR

Optional FM tuner

2x 75Ω F-Type

Optional SAT tuner

2x 75Ω F-Type, ASI input

Optional ASI input

BNC, 270 Mbps, MPEG2 TS

Headphone (out)

L/R, < 10 Ω, 6,3 mm

Analog reference level

+9 dBu

(input / output)

Max. +18 dBu

Digital reference input

No dedicated input, selectable by user

Digital reference level

-9 dBFS

Digital level

Max. 0 dBFS (input/output)

Digital Silence detection

-90 ... 0 dBFS

Adjustable gain

-9 ... +6 dB

Dynamic range

16 Bit, > 89 dB
24 Bit, > 130 dB

Frequency response

Depends on sample rate
– e.g. 48 kHz: 0,1 dB; 20 Hz ... 22,5 kHz

Ethernet

Data

Audio, serial data and GPIO transmission, controlling and setup functions

Connector

3x RJ45

Type

Auto switching
10/100/1000 BASE-T

Protocol

RTP/RTCP/UDP, SRT
Secure Reliable Transport, IGMP, ICMP, DHCP, HTTPS, SFTP, SNMP, NTP, TCP (Icecast), HLS, PTPv2, SMTP ST 2110



Technical details 2/2

Serial

Interface	8x RS-232C (rear) Sub D-15 (breakout cable needed)
Data	Private data, MPEG ancillary data, UECF/RDS (acc.to TR 101 154)
Transmission rate	1200 to 115200 baud, asynchronous
USB	1x USB 2.0 interface for service

Protocol

2wcom NMS, Telnet,
HTTPS, SNMP, UDP,
RTCP, SRT Secure
Reliable Transport, SFTP
IGMP, ICMP, NTP, DHCP,
SNMP, SSH, PTPv2, TCP
(Icecast, HLS)

Front panel

LCDisplay
Jog wheel
4 Duo LEDs

Graphical, 264x64 pixel
Impulse, enter button
Power, input, output,
warning

Interfaces

Contact closure

Connector	26 pole sub-D male
Inputs	8 inputs
Outputs	7+1 floating relays 7 relays SPST (from A) 1 relay SPDT (from C) DC: max. 30 V, 1 A, 10 W

General data

Power consumption	<20W
Case dimensions	19", 1 HU, Depth: 310 mm, Width: 424 mm, Front panel: 484 mm
Weight	< 5 kg
Material	Steel plate (aluminium-zinc coated)
Operating temp. range	0...+45°C
Storage temp. range	-40...+70°C
Languages	English

Internal storage

Data	internal audio files
Size	7 GB (optional 1000 GB)
Type	eMMC (optional SSD)

Time synchronization (optional)

PTPv2	Network synchronization according to IEEE 1588- 2008
SYNC/AUX 1	BNC – 75 Ω

Power supply

Standard	1x internal, 90...260 VAC, 47...63 Hz, 1x power port (rubber connector)
Optional version 1	Two internal redundant power supplies (230 VAC or 48 VDC), aut. switchover
Optional version 2	Two external hot swappable redundant power supplies (230 VAC or 48 VDC), aut. switchover

Control & monitor

Ethernet

User interface	Integrated WebGUI, LCD display
Data	Control and setup functions
Optional	Private data, MPEG ancillary data (IRT)
USB	USB 2.0 interface for service, configuration and firmware updates

Datasheet Version 11.07.2022

These data are subject to modifications and amendments. Errors excepted.

Your audio. Our solution.