IP-4c Audio over IP codec
User Manual

Professional multi-format four channel
audio over IP coder · decoder · transcoder

User Manual IP-4c V1.93

Screenshots: App Version 1.19, 1.22, 1.23, 1.27 beta 23

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2wcom

Content

1. Symbols in This Manual

1.1. References and Hyperlinks in This PDF File

The original text document of this manual uses bookmarks for reference purposes. If you read this manual as a non-print version, please note that this PDF file also contains all bookmarks! So you can navigate through the document via the content overview in your PDF viewing software if you activate "bookmarks view".

All references to pages, sections, figures and tables as well as hyperlinks in the text identify a location within this PDF file. Just click the reference to find the referred passage in the text!

1.2. Warning Signs and Their Meaning

The following warning signals are used in this user manual:

	Warning of general danger location
	Warning of electric shock
	Warning of hot surface
	Warning of fire hazard

1.3. Tags and Their Meaning

The following signal words are used in the product documentation in order to warn the reader about risks and dangers. The tags described here are always used only in connection with the related product documentation and the related product.

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.
NOTICE	Describes precautions necessary to protect the equipment.
	NOTE: Useful information for the user.

2. Introduction

Description   The IP-4c is a professional Audio over IP Codec. It is equipped with high quality multi-format audio encoder and decoder and is able to distribute audio data using the Internet Protocol (**IP**) via a 10/100/1000-Base-T network interface. The device has two main operation modes:
- transmitting Audio over IP;
- receiving Audio over IP.

The IP-4c is able to encode, decode and transcode several Audio over IP streams (RTP/RTCP, UDP). Furthermore, the IP-4c has up to 4 digital stereo channel inputs and up to 2 stereo analog channel inputs.
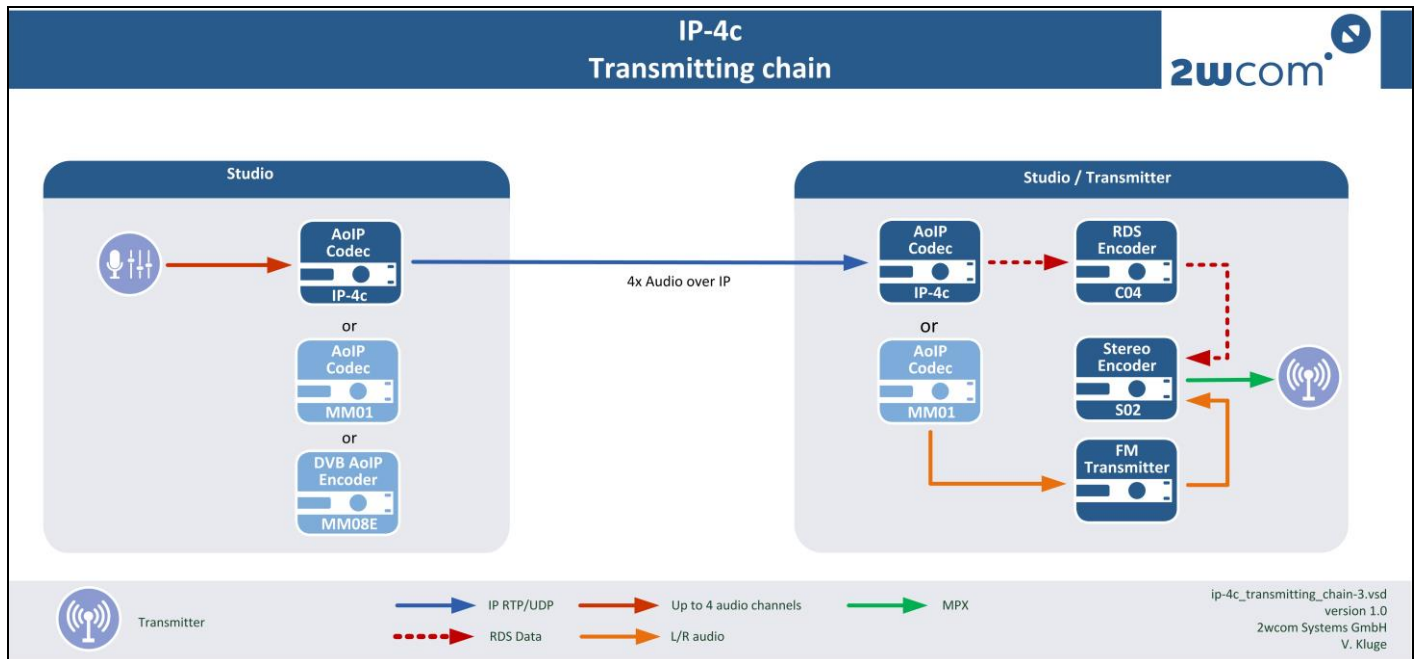
Figure 1: Overview of the possible solution for the IP-4c

Stream protection   The IP-4c is equipped with a combined mechanism for improving the stability and robustness of the audio data distribution over IP:

- Pro-MPEG FEC (forward error correction) scheme to account for bit errors or packet loss (IP).
- Dual Streaming on two physically separated Ethernet ports for elementary stream and transport stream over IP (RTP/UDP) for redundancy
(2x Ethernet LAN 10/100/1000 Base-T (RJ45) interface).

Audio

- The IP-4c is equipped with balanced analogue (2x Stereo L/R, integrated XLR) and digital (4x Stereo AES/EBU integrated XLR) interfaces with a configurable level for the audio inputs (over web interface).
- If you activate 4 channels, no analog audio input/output option is available.
- If you activate 2 channels, the inputs/outputs are switchable between analog and digital.

Stream4Sure   (optional) enables continuous audio transmission using sample precise seamless data selection:

- Software for secure redundancy: automatical switch to the data with the best quality
- up to 4 source streams with different codecs for each encoder
- combinable with FEC, Dualstreaming (IP packet based redundancy) and SFN
- must be activated in both devices: encoder as well as decoder (e.g. IP-4c)
- available only for output type "Elementary stream (RTP/UDP)" and "TS/IP".

Stream4Sure gives you continuous audio transmission using sample precise seamless data selection.
- up to 4 source streams with different codecs
- combinable with FEC, Dualstreaming (IP packet based redundancy) and SFN

Setup example for one Encoder

Stream4Sure (Main / PCM)
Stream4Sure (Backup1 / HE-AACv1)
Stream4Sure (Backup2 / HE-AACv1)
Stream4Sure (Backup3 / HE-AACv1)

IP-4c (Encoder)

IP-4c (Decoder)
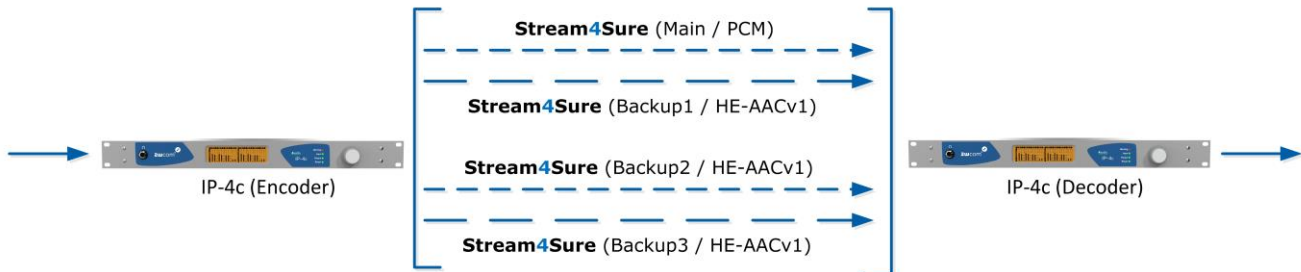
Stream4Sure in the IP-4c (optional):

The source for each Encoder 1-8 can be any Input 1-4. You can assign the **same** audio input to several encoders and activate **Stream4Sure** for continuos and secure audio transmission.

Figure 2: 2wcom Stream4Sure Overview

Monitoring

- Audio inputs
- Device functions (power failure, temperature etc.)
- LED, log messages

Alarm reporting via

- SNMP traps
- Activation of floating relay contacts
- LED, log messages

Control

Settings backup
The IP-4c is able to store and load all settings through the web interface to a local file.

SNMP, NMS
Additional monitoring of the device using SNMP. Rudimentary device control, status information and alarm trap generation is featured. Optional: control via centralized Network Management System (NMS).

LCD and jog wheel
Initial configurations and major status information can be called up via LCD menu and jog wheel.

GPIO Forwarding
GPI transmission/forwarding embedded in audio IP streams.

Ember+
Ember+ protocol allows 3rd party application to gain access to parameters of the respective device. You can also receive status information and react to it. These parameters are available via the GUI interface as well.

HTTP web interface
The unit is controlled via built-in web interface.
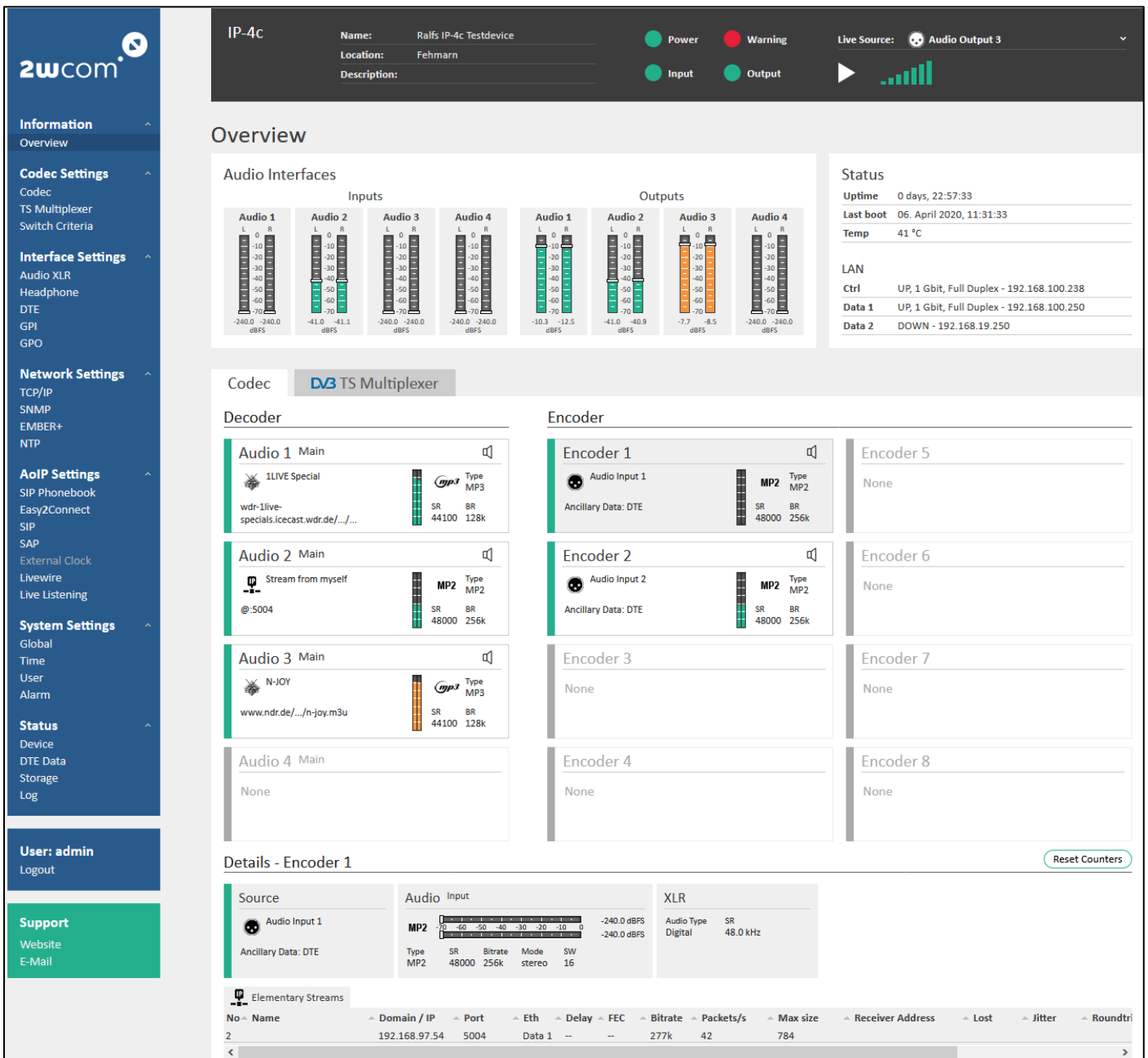
Figure 3: Web interface of the IP-4c

SIP   Audio streaming over IP is possible by means of SIP connection. For a quick SIP connection, an **Easy2Connect** (SIP) function is available. It uses saved contacts und preconfigured streaming settings to establish the connection by one click.

User   Only experienced technical personnel or engineers should operate the IP-4c.

⚠	**NOTE:** Read this manual carefully before attempting to operate the unit. Save this user manual for future reference – it contains important safety and operating instructions for the device.

3. Safety Instructions

For a secure operation of the device the user should read and hold on all safety instructions mentioned in this manual before the first operation.

⚠ WARNING	Non-compliance with the safety instructions can lead to serious injury.

Any changes on the device or operation of the parts not having been proved and released by the manufacturer can lead to unforeseen damage.

Every improper use of the device and all actions on the device not mentioned in this user manual are regarded as a not allowed misuse outside the statutory limits for liability of the manufacturer.

If you sell the device or give it to another person, attach this user manual to the device.

Never operate the device, if it does not function properly. If the device or its part is out of order, put it out of operation. Never repair the device by yourself. If there are any damages in the device, send it immediately to 2wcom Systems for maintenance or dispose it professionally according to the regional disposal regulations.

Keep the device away from unauthorized persons.

⚠ DANGER	
	DANGER of electric shock Plug the device into a grounded power socket only. Never remove the grounding wire/contact. Never open the housing of the device by yourself. Never 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 with wet hands. Never expose the device to liquids. If any liquid comes inside the housing, immediately disconnect the device completely from the power supply. Do not continue operating the device.

	FIRE HAZARD of overheating or electric shock
	
	Ensure sufficient heat dissipation during operation. Avoid following when installing the device:
	
	    – non-ventilated environment, for example a narrow shelve or built-in wardrobe;
	    – extremely warm or cold place;
	    – direct sunlight exposure;
	    – too high or too low temperature;
	    – extremely wet or dusty environment.
	
	Do not operate the device in the presence of flammable gases.
	
	Do not cover the ventilation openings of the device to avoid heat accumulation.
	
	Do not put objects with open flames such as burning candles on the device.
	
	Do not put heavy objects on the supply cord. A damaged cord can lead to fire or electric shock hazards.
	
	To disconnect the supply cord, drag always the plug and never the cable to avoid the cord damage.

⚠ WARNING

⚠	**WARNING of explosive atmosphere** Risk of the explosion hazard. Do **not** use the device in an explosive environment.
♨	**WARNING of hot surface** The device is equipped with an active cooling system. The surface of the device can still heat up during operation. Do not touch the surface of the device during operation.

NOTICE

	CAUTION: Risk of equipment damage *Before the first operation*: Check the housing, the front panel, the supply cord and the plug for visible damage (e.g. scratches, cracks, damaged isolation and abrasion) In case of damage, unplug immediately the supply cord. Never operate device with a damaged supply cord. All damaged components must be replaced immediately. *Installation*: Use only a grounded three-wire power supply cord and -plug that complies with the national regulations. If necessary, another than the supplied supply cord has to be used, in compliance with the regulations of the country where the device is operated. Make sure that the AC power outlet is next to the device and readily accessible to the user. *Installation of other devices:* 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. *Cleaning*: Do not use corrosive detergents on the device such as benzine, thinner, alcohol or acetone. Clean the surface of the device only with a soft dry cloth.

4. Supplied Parts

- IP-4c
- Power supply cord*
- Breakout cable for 4x DTE input and 4x DTE output (optional)
- User manual in PDF format to download; on request by paper

*available for different countries

(!)	**NOTE:** The scope of delivery may deviate in special cases.

5. Manufacturer

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6. Installation

Best setup location

The device should be installed in a 19" rack. Avoid direct sunlight, proximity to radiators and air conditioning, dust, water, and chemicals. Choose a rack location that permits a clear view of the indicators on the device and ensure a sufficient heat dissipation of the device.

Mains supply connection

The device is designed for operation with 100 to 240 V AC, 50 to 60 Hz. Check the corresponding device labeling for compatibility to the domestic line voltage and frequency before connecting the IEC power connector to the mains supply!
Check the corresponding device labeling for compatibility to the domestic line voltage and frequency before connecting the IEC power connector to the mains supply!

No power switch is available; unplug mains supply connector to remove power. Keep the mains supply plug readily accessible to the user.
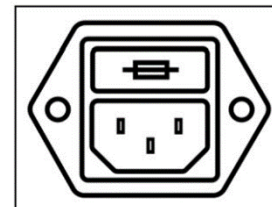
⚠ WARNING
WARNING Disconnect mains power plug before you open the housing. Repair of the equipment must only be carried out by authorized and qualified personnel. Read also Section „Safety Instructions" (see page 9).

7. Operation

7.1. Device Control via Web Interface

The device has an integrated web interface. All configurations and operations can be made using a web browser.

To control the device via web interface:

Connection: For network configuration and access to the web interface, see section 8.2 "Network Configuration" on page 19.

!	**NOTE:** To maintain security, you can activate session timeout function and the current user will be automatically logged out after the configured period of inactivity (for more information see section 19.10 "Set up the Session Timeout" on page 107).

Buttons:

– if you want to save any changes made in the configuration of the device, press the "Save" button;

– if you do not want to save the changes, press the "Cancel" button.

!	**NOTE:** Each block has to be saved individually. If you change data in several blocks, you must click the "Save" button under each block, in order to save all changed data. Otherwise, the unsaved block will be reset to the previously saved status.

Numbers: use a decimal point as the decimal separator in numbers in the input fields (i.e. "6.5" for six and a half).

Input fields: After entering a number or text in an input field, you must click on the corresponding "Save" or "OK" button to activate the changes. Alternatively you can use the ENTER-key of your computer keyboard.
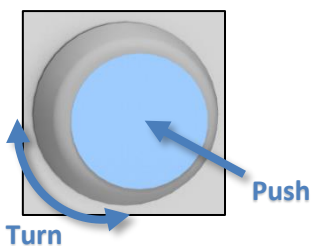
The next sections explain the separate web interface functions. The operation via jog wheel and LCD on the device is similar to these descriptions.

7.2. Operation via LCD/Jog Wheel
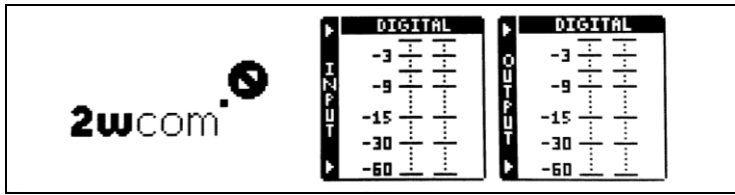
7.2.1. Description of the Menu Navigation

Some basic functions of the device can also be operated via the LCD/jog wheel at the device.

The possible movements of the jog wheel are:

The display consists of the two main navigation menus:

- Status overview (turn the jog wheel left or right)

- Configuration menu (push the jog wheel)

Via display and jog wheel you can:

- configure network settings for the first access to the device over the web user interface
- view the device status
- configure outputs headphone interface
- reset admin password
- reset to system defaults
- reboot the device

> **NOTE:** In this user manual, if a certain configuration is possible over the LCD/jog wheel, the corresponding menu path is shown at the end of the section, for example:
>
> LCD menu: Configuration Menu→Network→Data 1

After the warmstart/coldstart of the device the display shows the default screen of the "Status Overview" menu:

> **NOTE:** If you navigate in the LCD menu, the display changes after some minutes to the "Status Overview" menu.

- To change from the default "Status overview" menu to the "Configuration menu", push the jog wheel.
- To move the cursor in the menu structure, turn the jog wheel.
- To open a menu entry or to confirm a setting, push the jog wheel.
- To select a configurable menu entry, turn the jog wheel.
- To adjust a menu entry, push and then turn the jog wheel.
- To confirm the adjustment, push the jog wheel.
- To return to a previous menu level, activate the menu entry "<<".
- Some settings need a restart of the device to be activated.

7.2.2. Navigation Structure

Status Overview menu
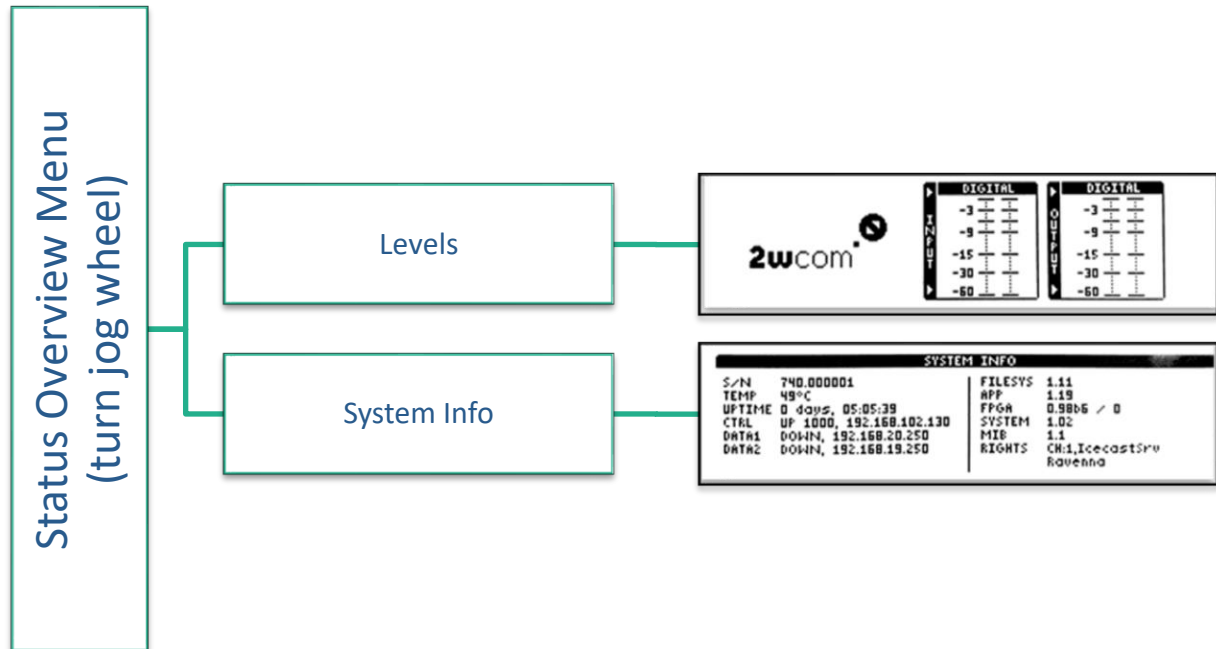
Configuration menu
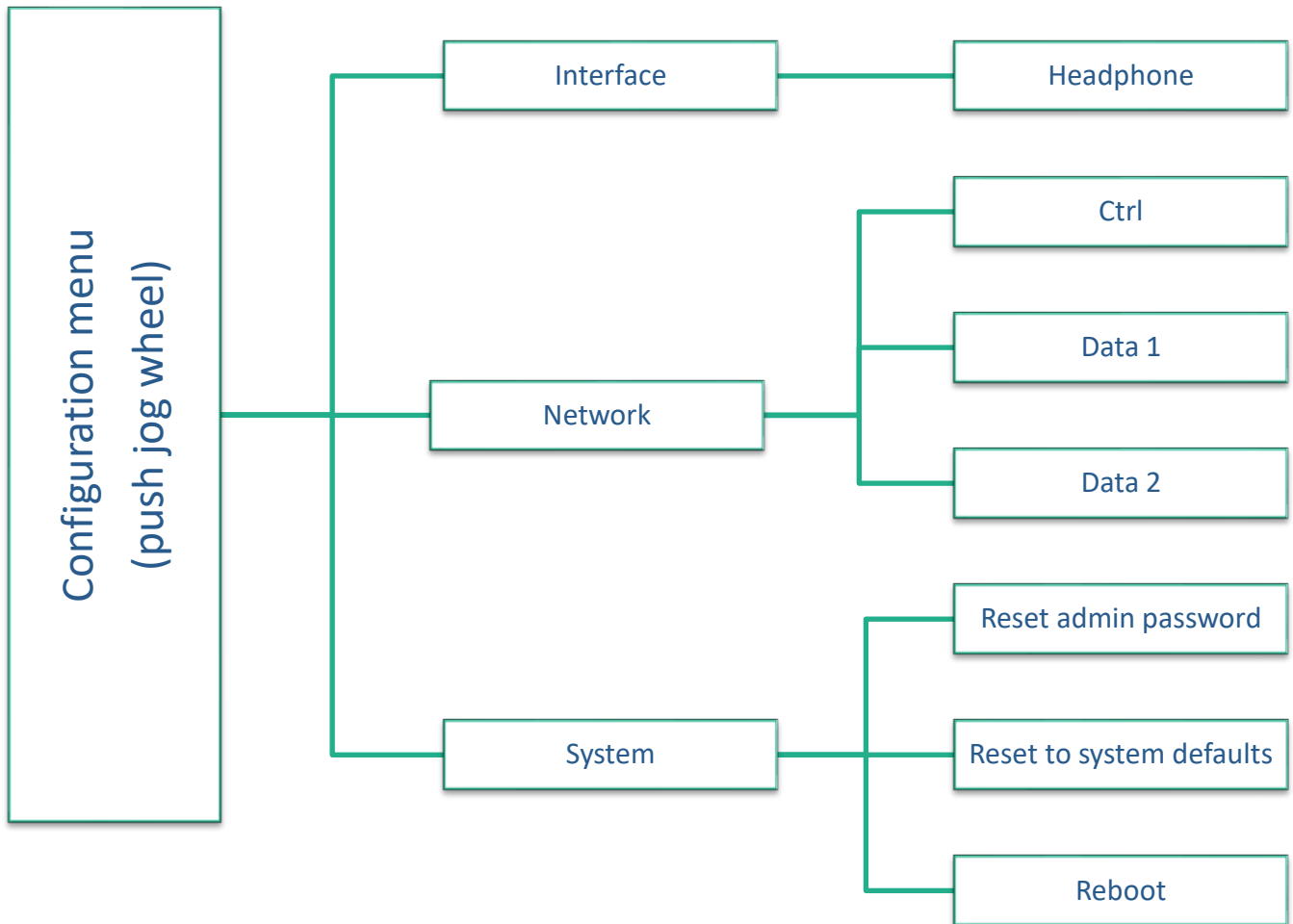
8. First Steps

The following section contains instructions for a quick start.

✓ You have already unpacked and installed the device in an appropriate place.

8.1. Power Supply

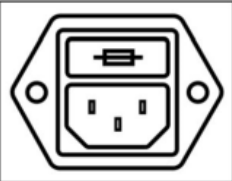| NOTICE	
	Make sure that the device and the contained cords are compatible to the domestic line voltage and frequency!

The device has <u>optionally</u> two plug-in exchangeable power supply units which can be equipped with different redundant power supply connectors:

	230 V AC, 90…260 V AC, 47…63 Hz If the device is compatible, connect the power supply cord fully to the IEC power connector at the back panel of the device and an independent mains power outlet.
	− 48 DC Neutrik powerCON socket, aut. switchover (NAC3MPA-1) − Neutrik powerCON connector (NAC3FCA) **NOTE:** No power cords are delivered!

Assembly Instruction for the 48V connector:

To connect your cable to the delivered terminal blocks for [Power IN], insert the wires into the delivered terminals and fasten the screws with a POZIDRIV® screwdriver No 1 to maximal torque of 0.5 Nm.

NOTE: the specification for the power supplies and the position of the poles in the connector and in the [Power IN] socket on the back panel of the housing as shown in Figure 4:
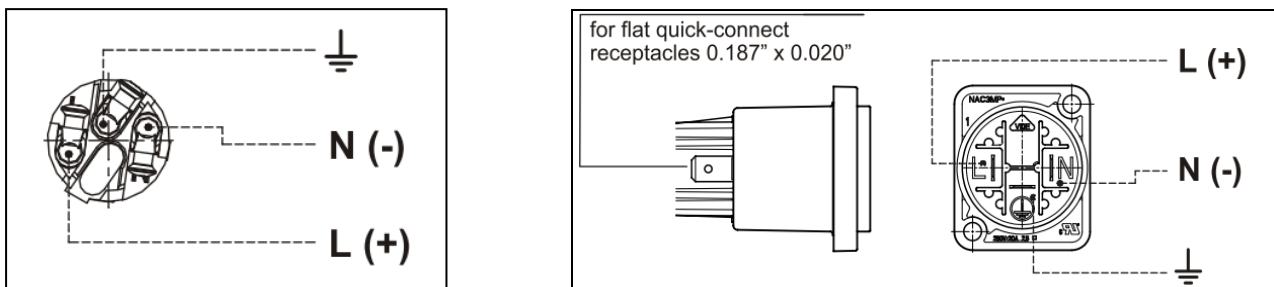
Figure 4: Wiring of the 48V connector (left) and of the 48V socket (right), rear side
N – "neutral"
L – phase conductor "line"

NOTICE	
	If you see 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.

⇒ The "Power" LED will turn on green if both power supply cords are connected.

⇒ The "Power" LED will blink green/red if only one power supply cord is connected.

If the IP-4c is equipped with the <u>optional</u> plug-in power supply units, the left and the right plug-in power supply units are independent from each other. You can exchange one of them in the IP-4c **during ongoing operation** if one power supply unit fails. To unplug the defect power supply unit, just pull out carefully the plug housing. Exchange the defect power supply unit by an intact power supply unit.

NOTICE	
	The current information about the operation of the both power supply units you can view over the web interface of the device under **Status→Device** (see Figure 90 on page 103).

8.2.   Network Configuration

NOTICE	
	False connection of the Ethernet interfaces will lead to incorrect operation
	Use the [Data 1/Data 2] connectors only for the data transfer. Use the [Ctrl] connector only for the access to the device via the web interface and for SNMP.

For the [Ctrl] interface DHCP is enabled per default. When you connect the device to your DHCP enabled network, it will automatically get the IP configuration for the [Ctrl] interface. To find out the obtained IP address turn the jog wheel to the left to see the "System Info" display. Here you will find (besides other system information) the obtained IP address.

To change the IP setup of the device via the LCD menu:

1.   Push the jog wheel to enter the menu.

2.   Turn the jog wheel to select the "Network" menu entry 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.   When asked if the settings should be saved and restart, select "Yes".

7.   Connect a network patch cable to the 10/100/1000-Base-T connector of the [Ctrl] interface on the back panel of the device and your existing network.

⇒ Your device is now connected to the IP network.

8.3.   Web Interface

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

To operate the device via the web interface:

1.   Start an internet browser (always use an up-to-date version with Java Script activated).

2. Enter the IP address of the device (either the one obtained via DHCP or the one you configured in the step above).

3. A login screen with Username/Password appears. Use the default accounts:

   i. for a read-only access use "user"/"user"

   ii. for a full access use "manager"/manager" or "admin"/"admin"

   ⇒ After entering the correct login data (case sensitive), the main page appears.

> **(!)** **NOTE:** Change the login data as soon as possible to avoid unauthorized access to the device and document the login data in a safe place.
>
> You can change your login data under **System Settings→User**.

8.4. Connecting the Device

For operation as an encoder and decoder, connect the device as follows:

1. For signal distribution over IP (input/output), use the RJ45 jacks [Data 1/2].

2. For input/output of the analog/digital audio signal, use the XLR jacks [A-L/R IN 1-2] / [A - L/R OUT 1-2] and [D IN 1-4] / [D OUT 1-4].

3. Use the headphone output for monitoring the input/output audio signals. Set up the source for the headphones output under **Interface Settings→Headphone** (possible options: Mute/"Audio Input 1-4"/"Audio Output 1-4").

> ## NOTICE
>
> **False connection of the Ethernet interfaces will lead to incorrect operation**
>
> Use the [Data 1/Data 2] connectors only for the data transfer (input/output).
>
> Use the [Ctrl] connector only for the access to the device via the web interface.

8.5. Codec Settings

All necessary settings for encoder and decoder can be done via a single menu "Codec Settings" on the web interface of the IP-4c.

Before you use the IP-4c as an encoder/decoder/transcoder, make some presets for each available input and codec.

Follow the six steps (see Figure 5) for quick operation of the IP-4c as encoder, decoder or transcoder:

1. Define presets for input sources (see section 11 "Preset Input Sources" on page 28).

2. Define codec profiles (see section 12.1 "Preset Codec Profiles" on page 40)

3. Assign preconfigured input sources and preconfigured codec profiles to each encoder (see section 12.2 "Assign Input Source/Codec Profile" on page 41).

4. Configure each encoder output (see section 12.3 "Set up Encoder Outputs" on page 43).

5. Assign preconfigured input sources to decoder (see section 13.1 "Assign and Activate Source Streams" on page 63).

6. Define switch criteria for decoder (see section 13.6 "Define Switch Criteria" on page 67).
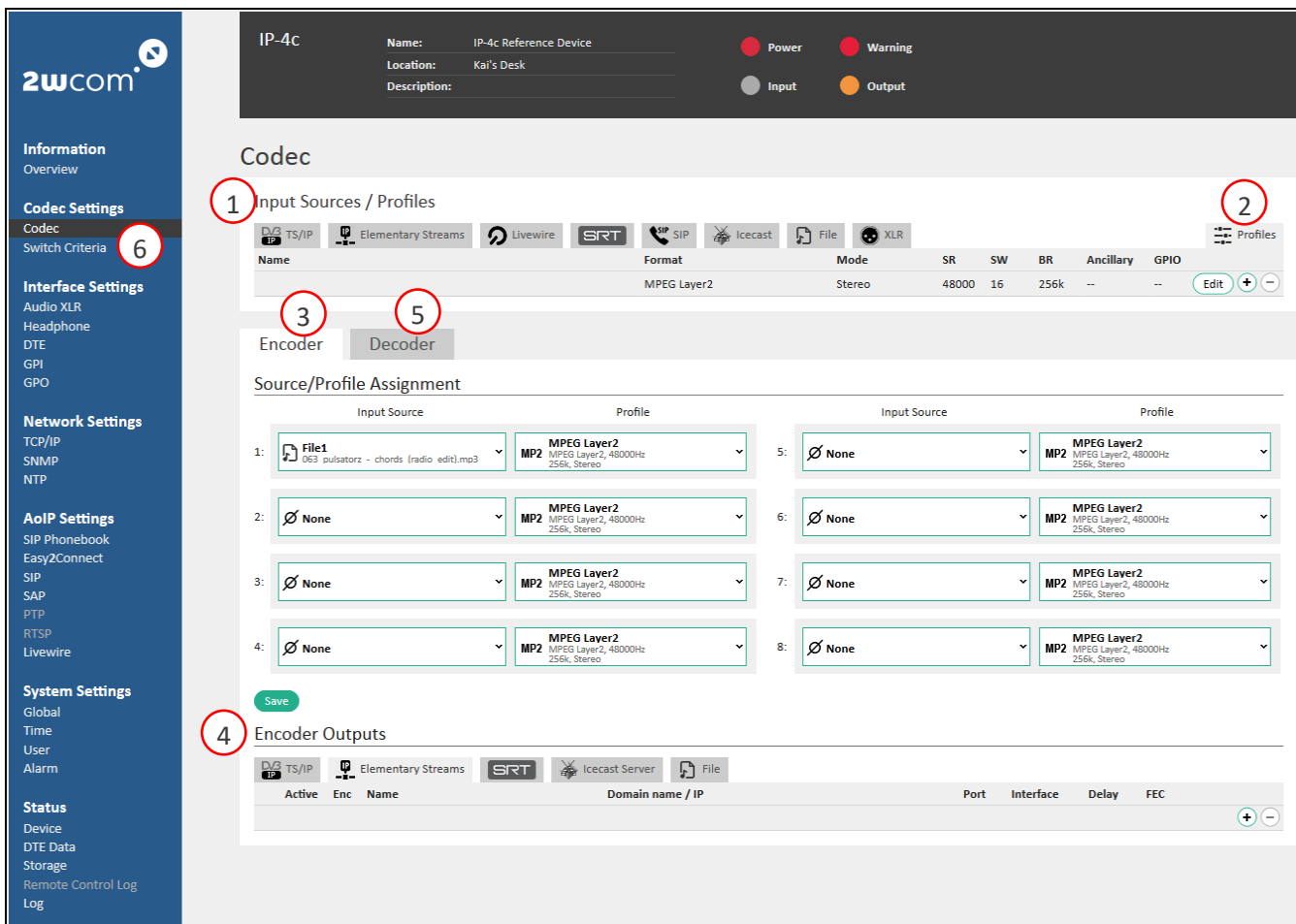
Figure 5: Codec Configuration
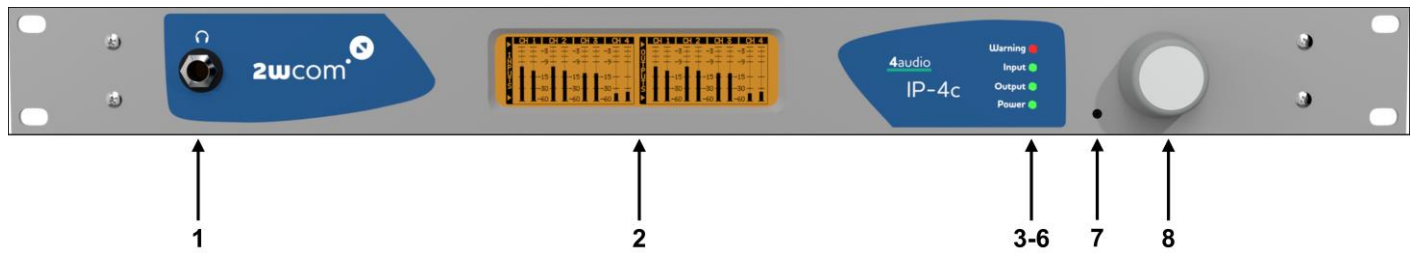
8.6. Set up Alarm

You can set up monitoring of certain device and input parameters which should be measured. In case of failure, an alarm can be sent over SNMP, GPO switching and/or will be indicated by a warning LED in the front of the device and/or through an entry in the log.

To set up alarms for the available parameters:

1.   Select **System Settings→Alarm** in the web interface to open the monitoring setup page.

2.   Activate monitoring for each parameter separately by selecting the corresponding checkboxes in the column "Enable".

3.   Select for each alarm function the severity level of the alarm in the dropdown menu "Priority" (for more information about alarm priority see Table 2 on page 74).

4.   Some alarms need a threshold value. Change or enter the threshold value in the corresponding fields.

5.   For each parameter default values are already preset. T1 vs. T2 is the time a parameter has to be "bad" vs. "good" before an alarm will be generated vs. retracted.

6.   Activate the way of the alarm distribution (SNMP, GPO, LED) by selecting the corresponding checkboxes.

7.   In the same menu you can set up the alarm in case of LAN connection failure or device overheating.

8.   Click the "Save" button to save the changes.

9.   In the same menu you can see status LEDs of each monitoring parameter and under **Status→Log** details about the sent alarms (for more information about log see section 19.4).
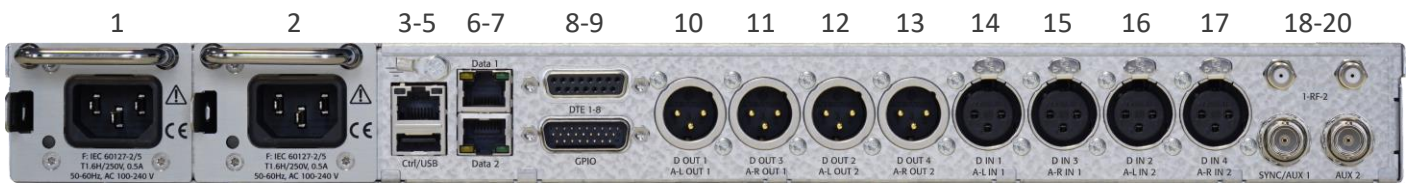
9. Control Elements and Connectors

9.1.   Front Panel

1	Headphones	6.3 mm / 1/4" socket for the connection of headphones.
2	LCD screen	Illuminated, Liquid Crystal Display (LCD), graphical, 264x64 pixel.
3	[Warning] LED	LED indicator (red); lit if alarm is triggered.
4	[Input] LED	Will correspond to the sum of the alarm status for the inputs. If no input alarms are enabled, the LED will be off. If input alarms are enabled, the LED will be green, if all inputs are OK, yellow if one or more inputs are bad, but at least one is good, and red, if all inputs are bad.
5	[Output] LED	Will correspond to the sum of the alarm status for the decoder outputs. If no output alarms are enabled, the LED will be off. If output alarms are enabled, the LED will be green, if all outputs are OK, yellow if one or more outputs are bad, but at least one is good, and red, if all outputs are bad.
6	[Power] LED	Activated (green) if both power supply cords are connected and the power supply is OK. Toggle (green/red) if only one power supply cord is connected and the power supply is OK.
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. Turn the jog wheel to place the cursor on the desired menu entry and push the jog wheel to activate the highlighted menu entry.

9.2. Back Panel

1-2	Left power supply unit; Right power supply unit	Option: 1x internal power supply unit; fuse ratings depending on mains supply voltage: 90-260 V,47-63 Hz: T1.6A, time lag type, 5x20 mm, 230 V
		Option: 2x redundant standardized IEC hot-swappable power supply connector with integrated fuse holder; 90-260 V, 47-63 Hz; automatic switchover.
		Optional: redundant power supply 48VDC
		Combination of power supply 230 VAC and 48 VDC is possible.
3	[Grounding stud]	The stud can be used to connect a grounding system if necessary.
4	[Ctrl]	RJ-45 connector; 10/100/1000 Base-T interface for control and monitoring the device via Ethernet. The device can communicate with the IP network and can be configured in an internet browser via the integrated web interface. The LEDs at the socket show the link status (green; active if a physical network connection exists) and the activity status (yellow, active if data communication is active).
5	[USB]	USB 2.0 interface for service, configuration and firmware.
6-7	[Data 1/2]	2x RJ-45 connectors; 10/100/1000 Base-T interface for two redundant outputs for data, audio and GPIO transmission via gigabit Ethernet.
8	[DTE 1-8]	15 pole D-Sub male connector for the serial RS-232C data communication, e.g. private data, MPEG ancillary data, UECP/RDS (acc. to TR 101 154). Use the supplied serial breakout cable (optional) to provide each input with a serial interface.
9	[GPIO]	26 pole sub-D male connector; Remote Control Inputs/Outputs for GPIO transmission; 8 inputs; 7+1 floating relays; switch contacts of the integrated relays.
10-13	[D OUT 1-4]	4x AES/EBU male interface for the output of the digital audio
14-17	[D IN 1-4]	4x AES/EBU female interface for input of the digital audio
10,12	[A-L OUT 1-2]	double function: 2x integrated balanced XLR male socket; output of the left channel of the analog audio signal, balanced <20Ω
11,13	[A-R OUT 1-2]	double function: 2x integrated balanced XLR male socket output of the right channel of the analog audio signal, balanced 110Ω
14,16	[A-L IN 1-2]	double function: 2x integrated balanced XLR female socket; input of the left channel of the analog audio signal, balanced >10kΩ
15,17	[A-R IN 1-2]	double function: 2x integrated balanced XLR female socket; input of the right channel of the analog audio signal, balanced >10kΩ
18	[RF 1/2]	(optional) antenna input for SAT or FM tuner
19	[SYNC/AUX 1]	(optional) connector for SFN synchronization (GPS input)
20	[AUX 2]	(optional) signal output depending on built-in tuner

10. Network Settings

✓ You have already connected the device to the network [Ctrl] and configured the access to the web interface (see page 18, section "First Steps").

10.1. TCP/IP: Configuration of the Ethernet Interfaces

The IP-4c has three Gigabit Ethernet RJ45 interfaces: one for configuration and two for data exchange.

NOTICE
False connection of the Ethernet interfaces will lead to incorrect operation
Use the [Data 1/Data 2] connectors only for the data transfer.
Use the [Ctrl] connector only for the access to the device via the web interface.

Under **Network Setting→TCP/IP** you can configure the Ethernet interfaces: Control interface to access the web interface of the device [block **Ctrl**], [block **DNS Server**] and both data interfaces [block **Data 1/Data 2**].

> **NOTE:** The IP-4c supports ADSL/VDSL connections by assigning static and dynamic IP addresses. To use a dynamic IP, a DynDNS account is needed.

The following parameters can be configured or changed (see Figure 6):

|	
MAC address:	The current MAC address is shown in the brackets after the block name (e.g. 00,11,99,00,6D,50)
VLAN:	Support on request
IP Address:	Individual address that is necessary to identify hardware in an IP network like the internet or intranet.
Netmask:	Bit mask, which separates an IP address into a network part and a host part.
Gateway:	Address of the local system that is used for the internet access (e.g. the router)
Primary:	IP address of the primary Domain Name Service (DNS) server.
Secondary:	IP address of the secondary Domain Name Service (DNS) server.
DHCP:	Activate or deactivate the Dynamic Host Configuration Protocol which enables the device to get an IP address automatically.
Routing	Activate or deactivate "Routing" switch, which enables the DNS Server to send and to answer the requests over different Data Interfaces [Data 1] or [Data 2].
	Activate "Routing" and select the Data Interface in the drop down menu "Routing Interface".
	If "Routing" is deactivated, the requests will be sent to the interface that is connected to the same network as the DNS Server.
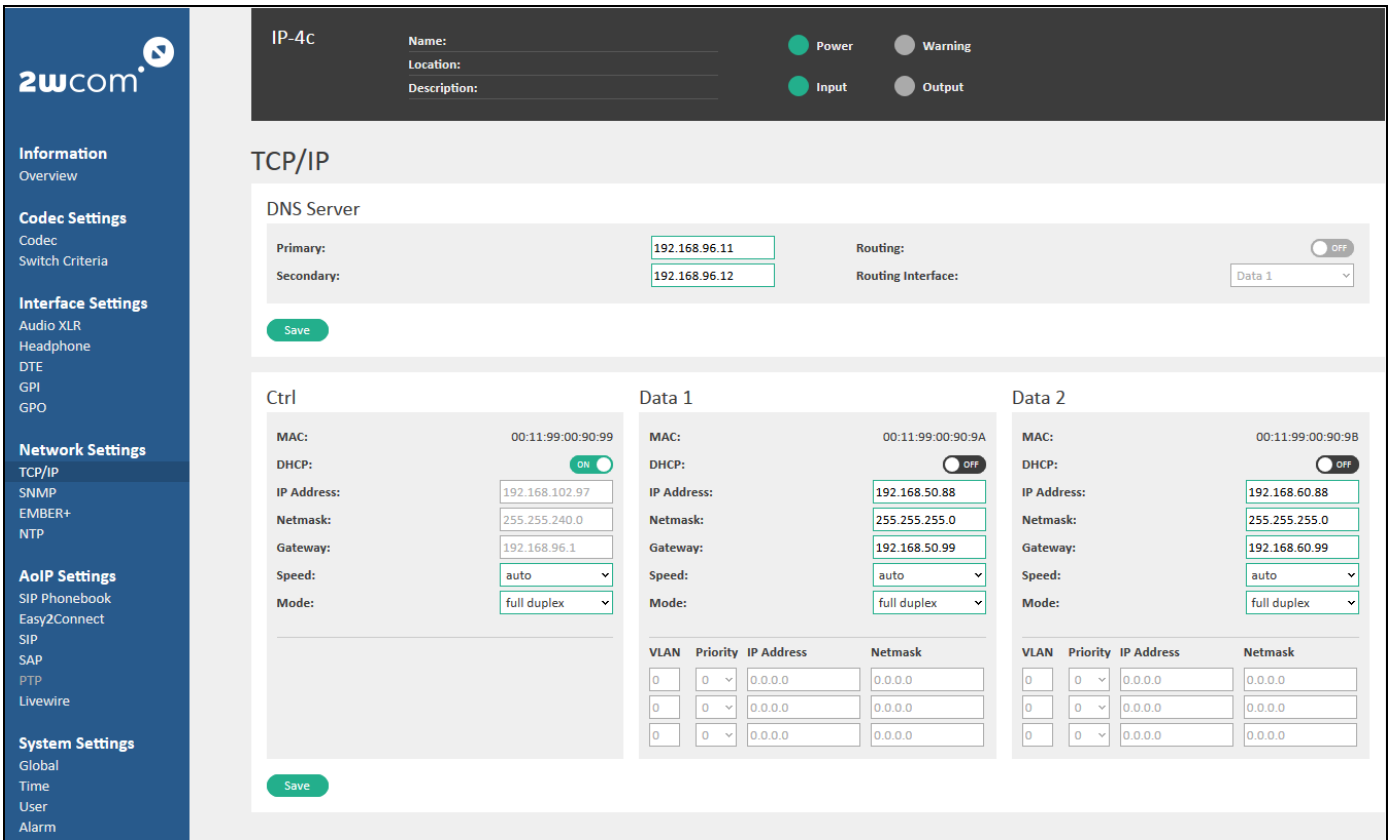
Figure 6: Network Settings - TCP/IP

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

⇒ Save the changed settings by clicking „Save" button.

10.2. Monitoring Function: Configuration of SNMP

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.

This menu item is available under **Network Settings→SNMP** and is used to setup the IP addresses of the SNMP managers (see Figure 7).
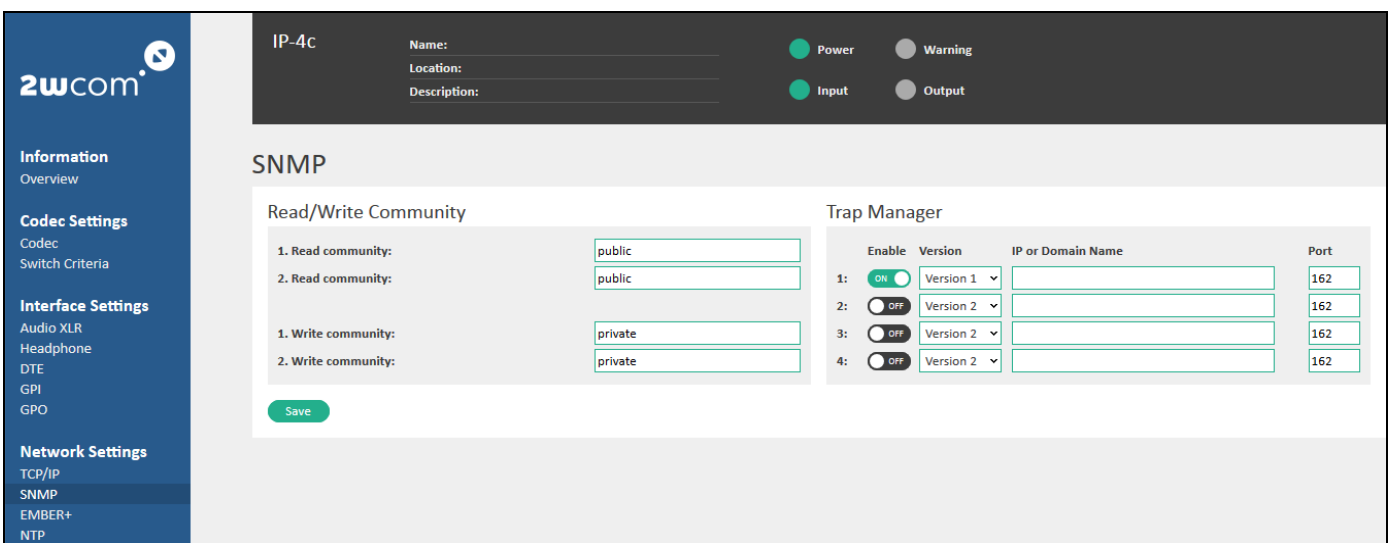
Figure 7: Network Settings – SNMP

Additionally, access data (read community/write community) that is necessary for external SNMP requests to device can be configured here.

You can configure or change in this menu the following parameters for SNMP:

Trap manager: IP address of the SNMP manager that receives SNMP traps. The trap sending to this address can also be deactivated by a checking "off" at "Send trap:". You can activate up to four addresses.

Read community: SNMP access data for the external read SNMP access to the device.

Write community: SNMP access data for the external write SNMP access to the device.

⇒ Save the settings by clicking the „Save" button.

!	**NOTE:** In order for the SNMP manager tool to operate correctly, it requires the specific MIB files. These MIB files need to be compiled by the SNMP manager tool. You can save the active MIB files under **System Settings→Global** in the "System information" block in the "MIB version" field.

!	**NOTE:** Each activated trap will be sent once at startup for initialization.

You can configure and activate the monitoring functions under **System Settings→Alarm**. More information about alarm settings you can find in section 14 "Monitoring and Alarm Control" on page 72.

10.3. Monitoring Function: Configuration of EMBER+

As part of the monitoring and remote control function, the device is capable to be controlled over the Ember+ protocol (optional on request).

This menu item is available under **Network Settings→EMBER+** and is used to configure the Ember+ access to the IP-4c (see Figure 8).
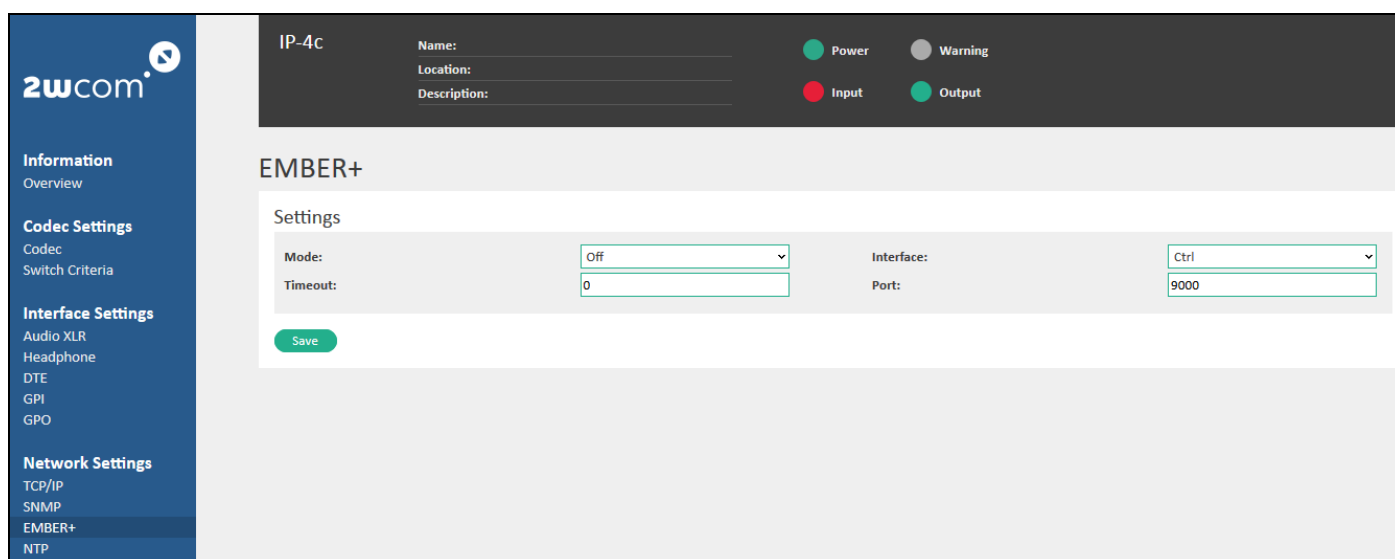

Figure 8: Network Settings – EMBER+

In this menu you can configure or change the following parameters:

Mode: Dropdown list options: *Off, UDP, TCP, UDP/TCP*.

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

Interface   Dropdown list options for the Ethernet connector: *Ctrl, Data 1, Data 2.*

Port: Enter the port number for the connection.

⇒ Save the changes by clicking the "Save" button.

10.4. NTP Settings: Configuration of Date and Time

This menu item is available under **Network Settings➔NTP** and is used to enable the automatical synchronization of the date and time of the device with an external NTP server (see Figure 9).
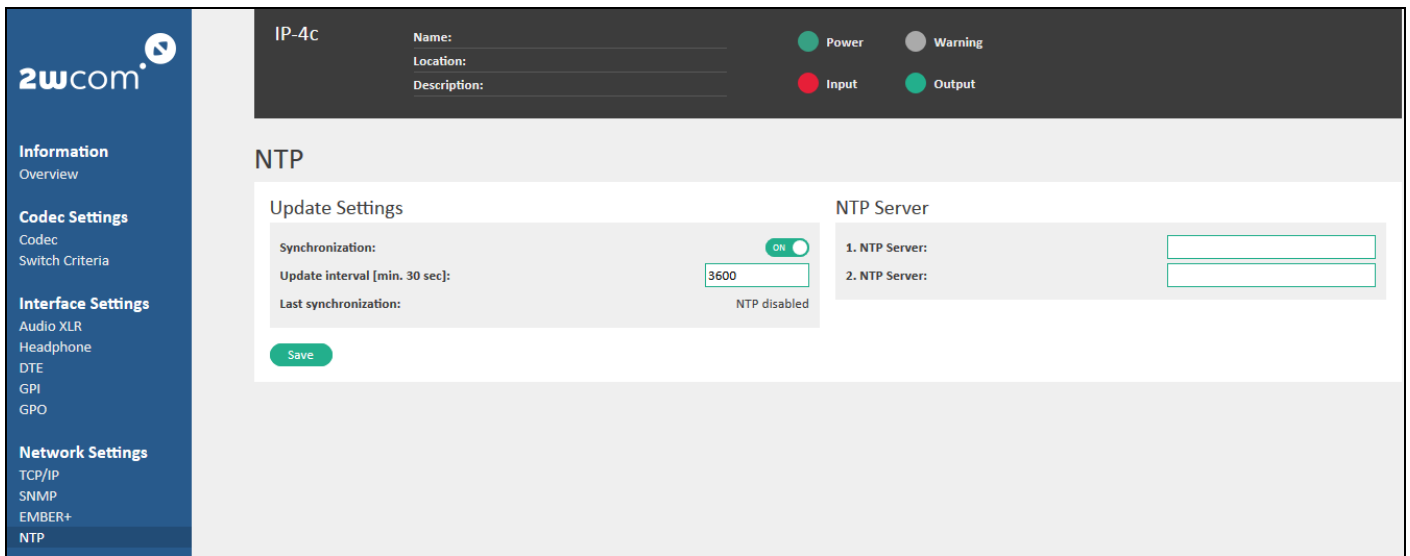
Figure 9: Network Settings – NTP

In this menu you can activate the automatical synchronization of the device clock via NTP by activating a virtual switch to "ON" and configure or change the following parameters:

1. SNTP Server IP   IP address of the first NTP server to be used.

2. SNTP Server IP   IP address of the second NTP server to be used.

Update interval [min. 30 sec]   Time interval for synchronizing the device clock with the NTP server in seconds.

Last synchronization   Information about the last synchronization.

⇒ Save the changes by clicking the "Save" button.

NOTE: Additionally, you can read out and <u>manually</u> set up the current date and time in the internal clock of the device under **System Settings➔Time** (see section 19.8 "Set up Time" on page 106).

11. Preset Input Sources

All input sources you can preset in the web interface of the IP-4c under **Codec Settings➔Codec** in the "Input Sources/Profiles" block (see Figure 10).
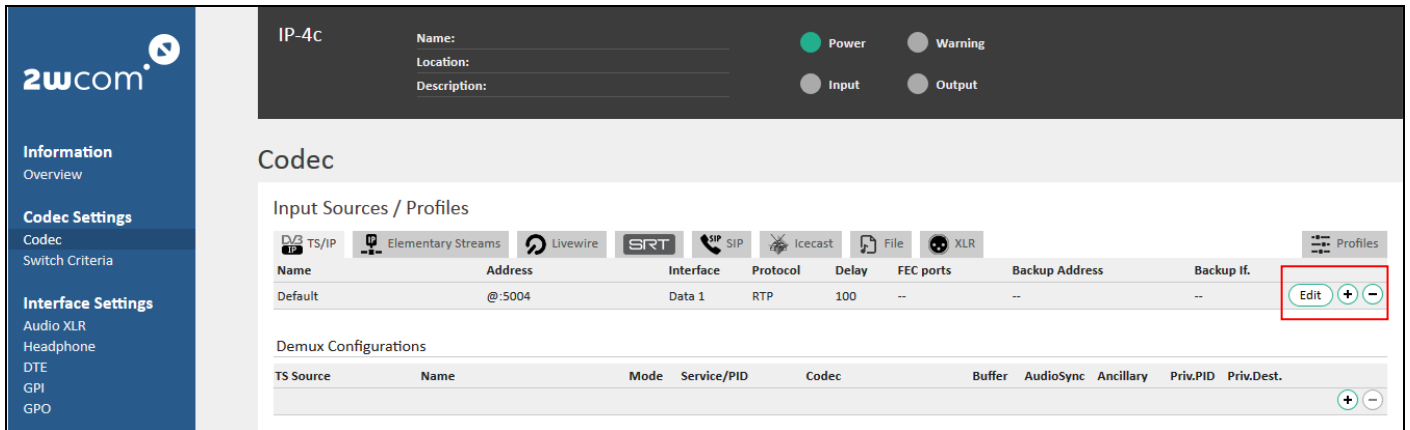

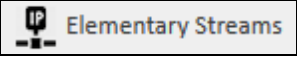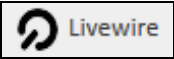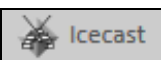*Figure 10: Input codec profiles*

You can create and save up to 16 presets for each input source and use them for encoder and decoder:

Input Source	Description	Source Interface
DVB TS/IP	TS/IP – Transport stream over IP using UDP/RTP, Unicast/Multicast (optional: "TS Decoder" right)	[Data 1/Data 2]
DVB TS/SRT	TS/SRT – Transport stream over IP using SRT (Secure Reliable Transport) (optional: "TS Decoder" and "SRT Decoder" rights)	[Data 1/Data 2]
Elementary Streams	RTP Elementary audio stream over IP using Unicast/Multicast	[Data 1/Data 2]
Livewire	IP Streaming over Livewire (optional: "Livewire" rights)	[Data 1/Data 2]
SRT	Elementary stream over IP using SRT (optional: "SRT Decoder" rights)	[Data 1/Data 2]
SIP	Stream over IP using SIP – Session Initiation Protocol ("EBU Tech 3326" right)	[Audio In 1-4] [Data 1/Data 2]
Icecast	Stream over IP using TCP (Icecast/Shoutcast)	[Data 1/Data 2]
File	Files from internal storage	Internal storage (eMMC, optional SSD)
XLR	Analog and digital (AES/EBU) audio over XLR connector	[Audio IN 1-4] ([D IN 1-4] [A-L/R IN 1-2])

1. Click ⊕ to create a new configuration preset.

2. Click ⊖ to delete a configuration preset, if it is not yet assigned to any coder.

3. Click "Edit" to set up the new preset.

4. Save the changes after each configuration by clicking "Save" in the "Edit" dialog.

11.1. Presets for TS/IP

To configure the presets for input source "Transport Stream" (tab "TS/IP") make the following configurations:

1. Create and edit a new preset for input source "TS/IP" as described on page 28 (see Figure 5 "Codec Configuration" on page 21 , #1).

2. Enter the following data in the fields of the configuration of the input source TS/IP in the "Edit" menu (see Figure 11: Input Source for coder - TS/IP):

Name: Enter the name of the stream for better reference.

IP type: Unicast/Multicast.

Multicast IP: IP for Multicast, if selected in the field **Type**.

Port: Sender UDP port (the same as configured in the encoder settings for output streaming).

IP Interface: Choose the interface for the input signal: Data 1 or Data 2.

Protocol: MPEG2 transport stream encapsulation, either UDP only or UDP/RTP.

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 the combine with the second, dual streaming input.
Enter the value for this holding period in ms (for more information see section 18 "Buffer Delay Management" on page 100).
NOTE: The delay time of the input source must not exceed 200 ms if the sample rate is 192 kHz (see "Demux Configuration" in section 12.2 "Assign Input Source/Codec Profile" on page 41).

Pro-MPEG FEC: Enable by selecting "ON" in the virtual switch (see section 13.2 on page 65).

Dual streaming: Enable by selecting "ON" in the virtual switch (see section 13.3 on page 65).

Figure 11: Input Source for coder - TS/IP

3. Click the `save` button to save the changes.

4. Configure up to 16 demultiplexer presets for each TS source (TS/IP and TS/SRT) in the "Demux Configurations" block in the same menu (see Figure 12 on page 30).

5. Select the source for the demultiplexer preset in the dropdown menu "TS source": TS/IP or TS/SRT.

6. Enter the **name** of the stream for better reference.

7. Select the **configuration mode**: "Manual/PID" ("Automatic/Service" not available yet).

Figure 12: TS Demux configuration

---

8. If you select the configuration mode "Manual/PID", enter the PID number and configure the processing (audio decoding, data retrieval) of this PID out of the received transport stream.

> *Example*: Configurations for PID mode:
>
> Name: PCR1; PID Number: 1035; Audio Synchronisation mode: PCR.
>
> Name: AUDIO1; PID Number: 1036; Audio Synchronisation mode, Decoder Audio buffer: 10 ms.
>
> Name: DATA1; PID Number: 1037; Private data: ON, Data format: PES Extension, Data destination: UDP.

9. To predefine the codec type for Decoder, choose the audio codec or set "Automatic" in the dropdown menu **Decoder Type**. For available formats see Figure 15 on page 33).

10. Set up a value for audio buffer in the decoder in ms (for more information about buffer see section 13.5 "Set up Buffer" on page 67).

11. If the input stream of the decoder contains ancillary data, the IP-4c can forward them to the serial outputs [DTE 1-4]. In this case, choose the serial output DTE or UDP in the dropdown menu "Data destination" in the "Ancillary Data" block (for more information see section 16.3 "DTE" on page 86).

12. Click "Save" to save the changes.

11.2. Presets for TS/SRT

To configure the presets for input source "Transport Stream SRT" (tab "TS/SRT") make the following configurations:

1. Create and edit a new preset for input source "TS/SRT" as described on page 28 (see Figure 5 "Codec Configuration" on page 21 , #1).

2. Enter the following data in the fields of the configuration of the input source TS/SRT in the "Edit" menu (see Figure 13 "Input Source for coder – TS/SRT" on page 32):

Name:	Enter the name of the stream for better reference.
Mode:	You can use SRT in listener and caller mode.
Port:	Specify the port number for SRT connection.
IP Interface:	Choose the interface for the input signal: Data 1 or Data 2.
Latency (ms):	Define the time interval for the latency (milliseconds) before the IP-4c starts to decode the signal distributed via SRT protocol.
Use Encryption:	If the input stream is protected by AES encryption, activate end-to-end encryption by switching "ON".
Passphrase:	Enter a (defined) password used to secure the SRT stream.

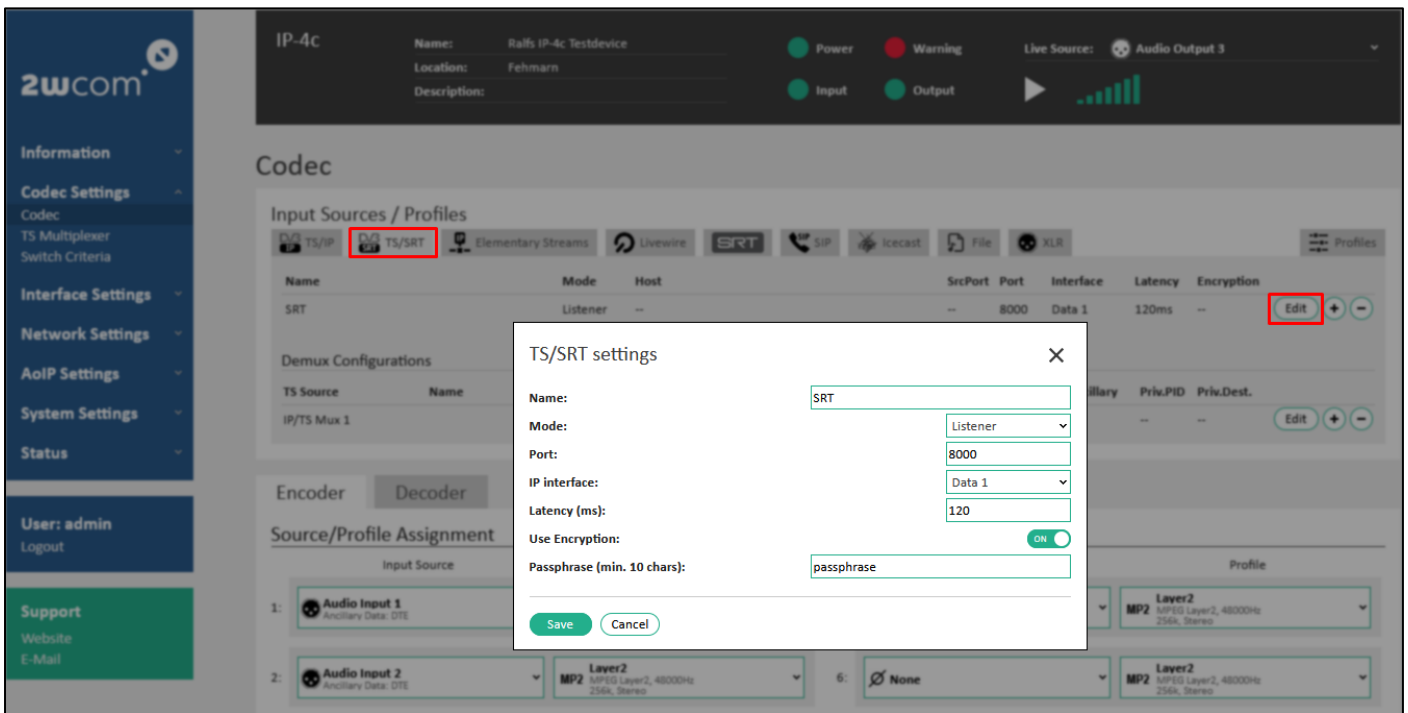3. Click the "Save" button to save the changes.

Figure 13: Input Source for coder – TS/SRT

4. Configure up to 16 demultiplexer presets for the TS/SRT source in the "Demux Configurations" block in the same menu as described in steps 4. -12. on page 30 (see Figure 12 on page 30).

11.3. Presets for Elementary Stream

To configure the presets for input source "RTP Elementary stream" (tab "Elementary Streams") make the following configurations:

1. Create and edit a new preset for input source "Elementary stream" as described on page 28 (see Figure 5, #1).

2. Enter the following data in the fields of the configuration of the input source "Elementary stream" in the "Edit" menu (see Figure 14: Input Source for coder – RTP Elementary Stream on page 33):

Name:	Enter the name of the stream for better reference.
Type:	Unicast/Multicast.
Multicast IP:	IP for the destination Multicast group, if selected in the field **Type**.
Port:	Sender UDP port (the same as configured in the encoder settings for output streaming).
Protocol:	Elementary stream encapsulation, either UDP only or UDP/RTP.
IP interface:	Choose the Ethernet connector for the input signal: Data 1 or Data 2.
VLAN:	Select a configured VLAN ID.

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 the combine with the second, dual streaming input.
	Enter the value for this holding period in ms (for more information see section 18 "Buffer Delay Management" on page 100).
	NOTE: The delay time of the input source must not exceed 200 ms if the sample rate is 192 kHz (see "Demux Configuration" in section 12.2 "Assign Input Source/Codec Profile" on page 41).
Pro-MPEG FEC:	Enable by selecting "ON" in the virtual switch (see section 13.2)
Dual streaming:	Enable by selecting "ON" in the virtual switch (see section 13.3).
	Activate Dualstreaming by selecting "ON" in the virtual switch "Dualstreaming" in the last field. The menu will be expanded to the additional configuration field.
	Configure the IP parameters for Dualstreaming. For the Ethernet input you can set up the same or different sources Data 1/2.

Figure 14: Input Source for coder – RTP Elementary Stream

3. To predefine the codec type for Decoder, choose the audio codec or set "Automatic" in the dropdown menu **Decoder Type**. For available formats see Figure 15.

4. Set up a value for audio buffer in the decoder in ms (for more information about buffer see section 18 "Buffer Delay Management" on page 100).

5. If the input stream of the decoder contains ancillary data, the IP-4c can forward them to the serial outputs [DTE 1-4]. In this case, choose the serial output DTE or UDP in the dropdown menu "Data destination" in the "Ancillary Data" block (for more information see section 16.3 "DTE" on page 86).

6. For GPIO switch between encoder and decoder activate the function "GPIO Tunneling" by selecting "ON" in the virtual switch "Activation" (for more information see section "GPIO Tunneling" on page 91).

7. Click the "Save" button to save the changes.

11.4. Presets for Livewire

To configure the presets for input source (=SRC) "Livewire" (tab "Livewire") make the following configurations:

1. Create and edit a new preset for input source "Livewire" as described on page 28 (see Figure 5, #1).

2. Click the "Edit" button to configure the selected Livewire input source.

3. Enter the following data in the fields of the "Livewire source settings" (see Figure 16: Input Source for coder - Livewire on page 34):
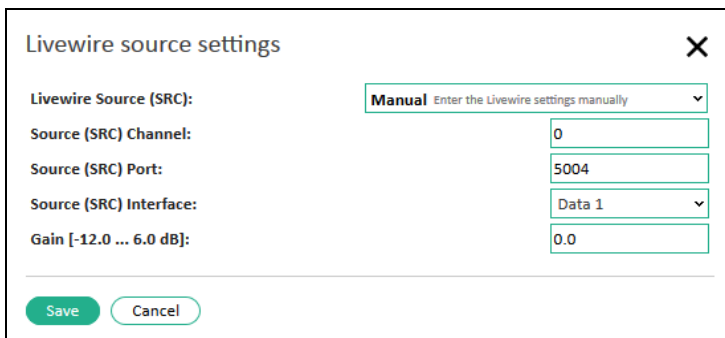

Figure 16: Input Source for coder - Livewire

Livewire Source (SRC):	Manual: Enter the Livewire settings manually. In this menu, available advertised Livewire streams will be displayed and can be selected for automatic configuration.
Source (SRC) Channel:	Enter a number (16 bit, in the range of 0...65535) describing a stream/channel.
Source (SRC) Port:	Specify the port number for Livewire connection.
Source (SRC) Interface:	Select the interface for Livewire connection: *Data 1/2.*
Gain:	Specify gain for the Livewire source (-12.0...6.0 dB).

4. Click the "Save" button to save the changes.

Figure 15: Audio Decoder Format

11.5. Presets for SRT

To configure the presets for input source "SRT" (open source Secure Reliable Transport protocol) make the following configurations:

1. Create and edit a new preset for input source "SRT" as described on page 28 (see Figure 5, #1).

2. Enter the following data in the fields of the configuration of the input source "SRT settings" in the "Edit" menu (see Figure 17 "Input Source for coder – SRT" on page 35):
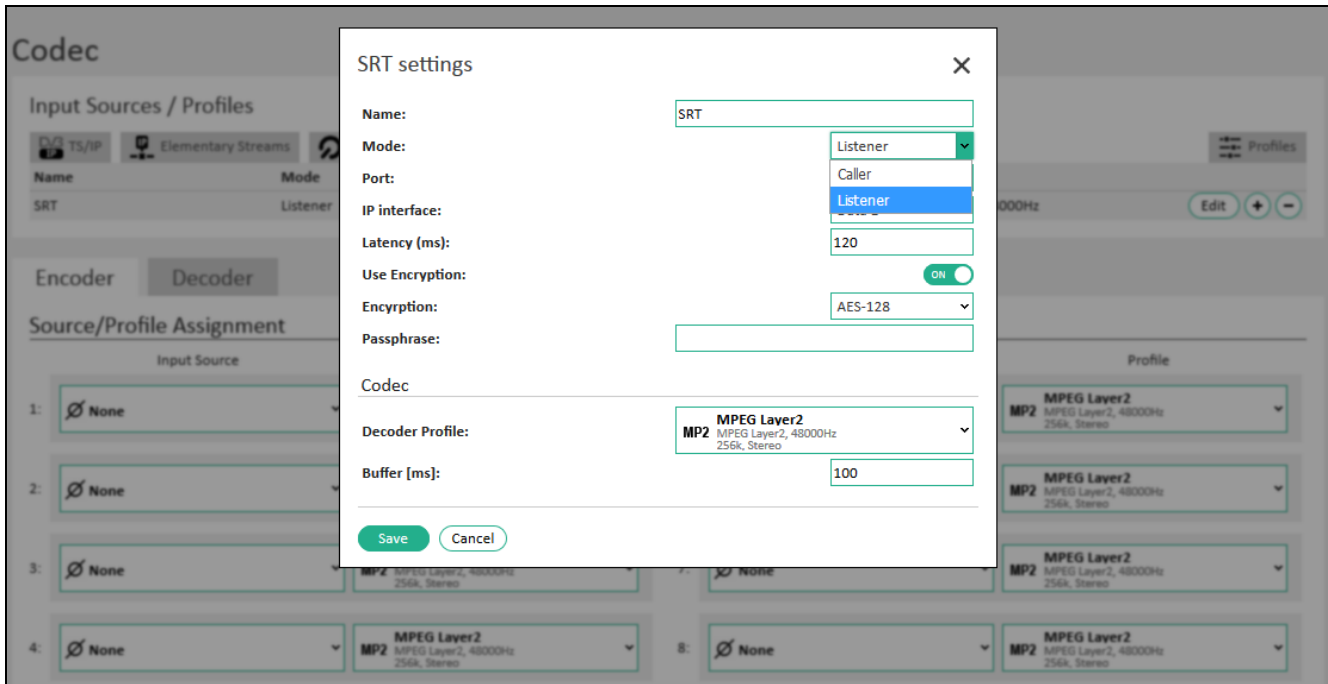

Figure 17: Input Source for coder – SRT

Name:	Enter the name of the input stream for better reference.
Mode:	You can use SRT in listener and caller mode.
Port:	Specify the port number for SRT connection.
IP interface:	Select the interface for SRT connection: Data 1/2.
Latency (ms):	Define the time interval for the latency (milliseconds) before the IP-4c starts to decode the signal distributed via SRT protocol.
Use Encryption:	To protect your content from contribution to distribution activate end-to-end encryption by switching "ON".
Encryption:	Available options: 128/192/256 bit AES (Advanced Encryption Standard). 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:	Enter a (defined) password used to secure the SRT stream.

3. Assign an available codec profile in the "Decoder Profile" dropdown menu. To predefine the codec profiles for Decoder click the 🔧 icon or in the „Profiles" tag under **Codec Settings→Codec** (for more information see section 12.1 "Preset Codec Profiles" on page 40).

4. Set up a value for audio buffer in the decoder in ms (for more information about buffer see section 18 "Buffer Delay Management" on page 100).

5. Click the "Save" button to save the changes.

11.6. Presets for SIP

The IP-4c supports Audio IP streaming using SIP (Session Initiation Protocol).

> ⊘ **NOTE:** The option "IP streaming over SIP" is only available, if the right "EBU Tech 3326" is activated.

You can use SIP connection for bidirectional data flows between Encoder and Decoder: directly over the Data 1/2 interfaces or over server (registrar).

To use the SIP protocol, register with a SIP server and configure the presets for input source "SIP" as follows:

1. Create and edit a new preset for input source "SIP" as described on page 28 (see Figure 5, #1).

2. Enter the following data for the SIP registrar settings in the "Edit" menu (see Figure 18 on page 37).
   If you use the direct connection over Data1/Data2 interface, leave the first five fields for SIP registrar empty:

Registrar:	Internet domain name of a SIP server if the connection should be established over a SIP server.
Phone number:	Your phone number for registration with a SIP server.
Display name:	Assign a name to the SIP server for better reference
Username:	Your username for registration with a SIP server.
Password:	Your password for registration with a SIP server.
Interface:	For different accounts you can choose different interfaces Data 1/Data 2 or the same interface to set up the connection.
Expires:	Interval in seconds for the renewal registration.
Connection timeout:	Interval in seconds for disconnecting if there is no incoming audio signal.
Mono mix mode:	*Left, Right, Downmix* (send audio stream).

NOTE: You can register your device with several SIP servers and receive/send audio streams from/to several external devices (users).
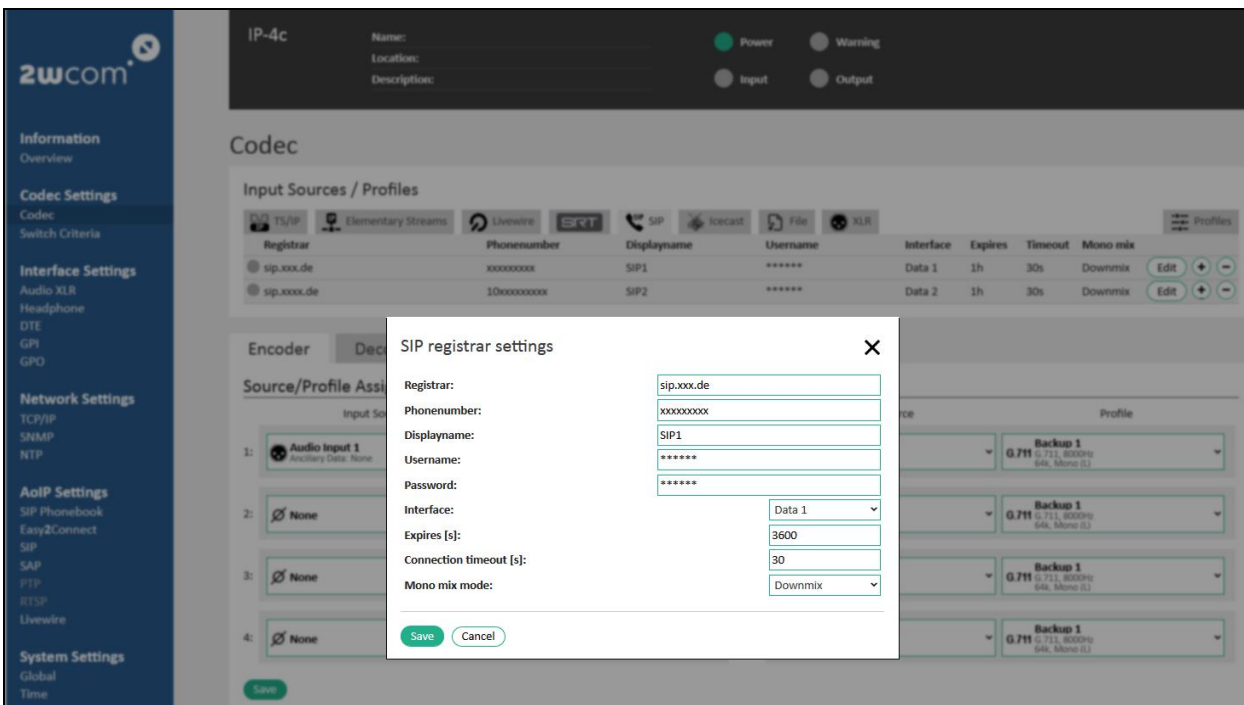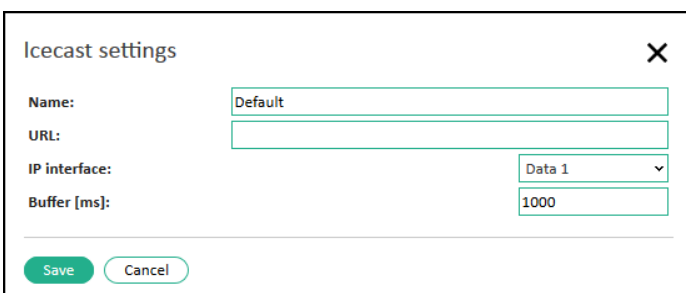
Figure 18: Input Source for coder – SIP registrar settings

3. Click the "Save" button to save the changes.

11.7. Presets for Icecast

To configure the presets for input source "Icecast server" (audio over IP) make the following configurations:

1. Create and edit a new preset for input source "Icecast" as described on page 28 (see Figure 5, #1).

2. Enter the following data in the fields of the configuration of the input source "Icecast settings" in the "Edit" menu (see Figure 19: Input Source for coder – Audio over IP (Icecast) on page 37).

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, i.e. "247.56.38.14" or "www.backup-audio.com".

IP interface: Choose the Ethernet connector for the audio stream input: Data 1 or Data 2.

Buffer: Set up a value for audio buffer in the decoder in ms before playback is started (for more information about buffer see section 18 "Buffer Delay Management" on page 100).
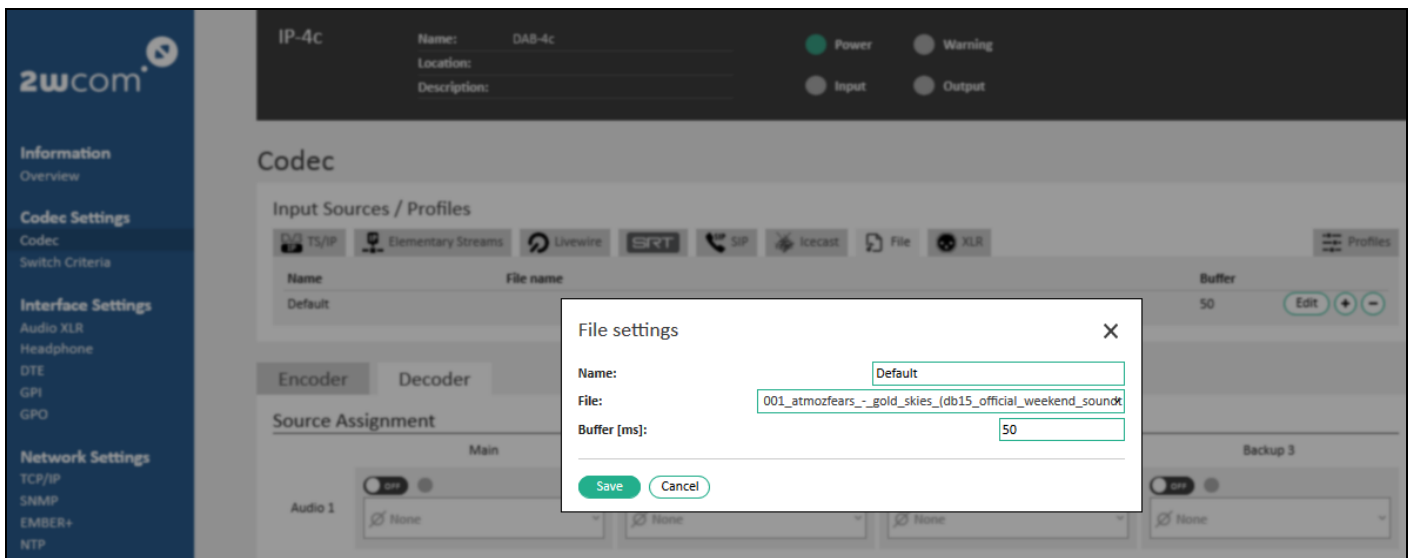

Figure 19: Input Source for coder – Audio over IP (Icecast)

3. Click the "Save" button to save the changes.

11.8. Presets for Internal Storage

The IP-4c can use the audio files uploaded to the internal storage as a source for the audio stream.

Audio files can be uploaded to the internal storage from the local storage of your PC.

To configure the presets for input source "Internal Storage" (tab "File") make the following configurations:

1. Upload the audio files that should be played from the local storage in case of failure under **Status→Storage**).

2. Create and edit a new preset for input source "File" as described on page 28 (see Figure 5, #1).

3. Enter the following data in the fields of the configuration of the input source "File" in the "Edit" menu (see Figure 20 on page 38):

Name:	Assign a name to the setting of the audio source "File" for better reference
File:	Choose an audio file in the dropdown menu from the list of the uploaded files (under **Status→Storage**)
Buffer:	Set up a value for audio buffer in the decoder in ms before playback is started (for more information about buffer see section 18 "Buffer Delay Management" on page 100).

Figure 20: Input Source for coder – Audio files from internal storage

4. Click the "Save" button to save the changes.

11.9. Presets for XLR

You can use the intergrated XLR interfaces as audio inputs for encoder and decoder. The IP-4c is equipped with 4 digital **or** 2 analog/digital audio inputs and outputs (channels).

To configure the presets for Audio Inputs 1-4 (analog/digital) make the following configurations:

1. Configure the XLR interfaces for digital or/and analog audio inputs (**Interface Settings→Audio XLR**, see section 16.1 "Audio XLR" on page 84).

2. Edit a new preset for input source 1-4 as described on page 28 (see Figure 5, #1).

3. Enter the following data in the fields of the configuration of the input source "Audio Input 1-4" in the "Edit" menu (see Figure 21: Input Source for coder – Audio Input 1-4 on page 39).

Name: Assign a name to the Audio Input Setting for better reference.

Ancillary Data Source: Choose the Source for ancillary data in the dropdown menu: none, DTE or UDP.
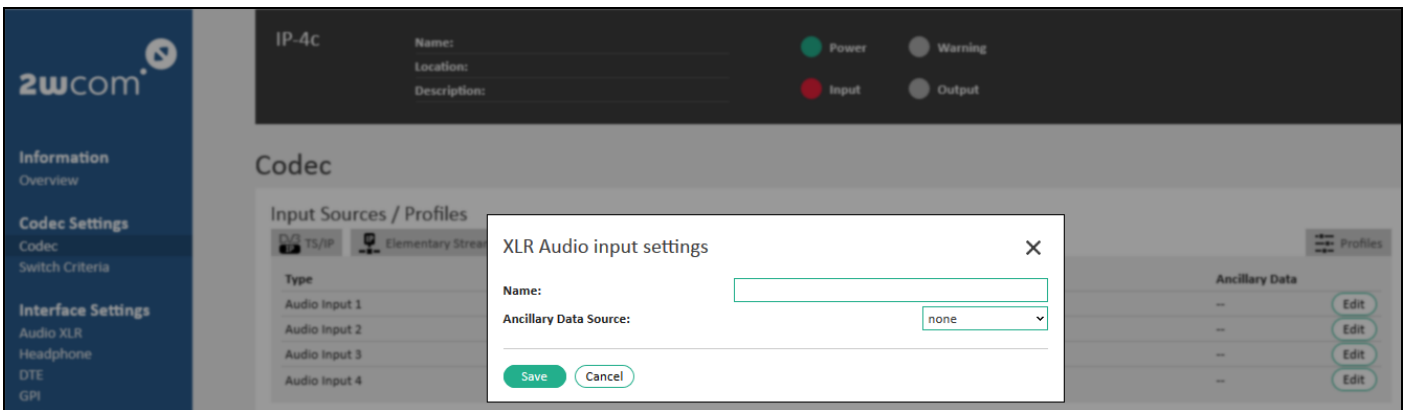

Figure 21: Input Source for coder – Audio Input 1-4

4. Click the "Save" button to save the changes.

NOTE: For further audio interface settings see section 16.1 "Audio XLR" on page 84.

12. Encoder Configuration

✓ You have already connected the IP-4c to the network 10/100/1000-Base-T via the [Ctrl] interface and configured the access to the web interface (see section 8.2 "Network Configuration" on page 19).

The IP-4c can operate as decoder, encoder and transcoder at the same time.

Necessary steps for operating the IP-4c as an encoder are:

1. Preset codec profiles
2. Assign input source/codec profile
3. Set up encoder outputs
4. Set up encoder input level
5. Set up FEC for encoder
6. View the encoder status

The following sections describe the separate steps for encoding:

12.1. Preset Codec Profiles

You can preset all codec profiles in the web interface of the IP-4c under **Codec Settings→Codec** in the "Input Sources/Profiles" block (see Figure 22).
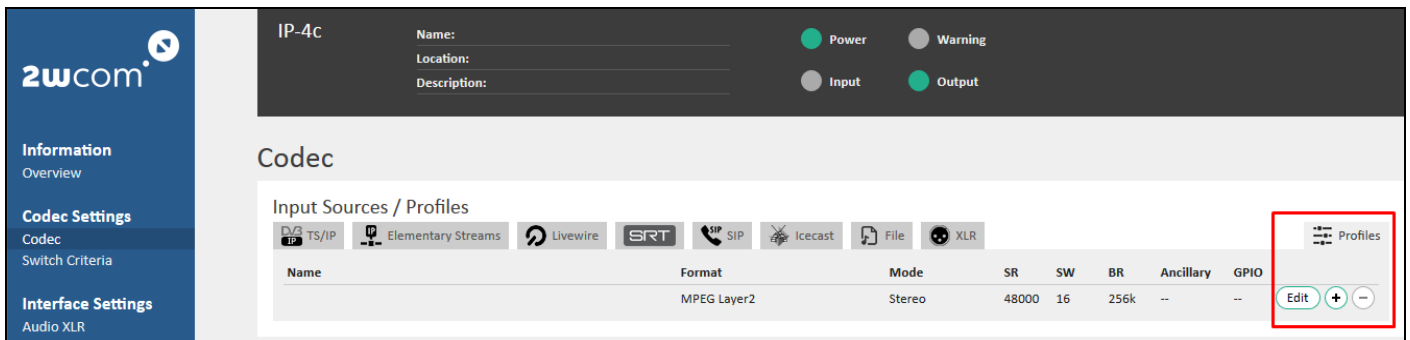
Figure 22: Codec Profile Presets

The IP-4c has 8 encoders and you can create and save up to 16 presets for codec profiles and use them for encoder.

To define codec profiles make the following configurations:

1. Click ⊕ to create a new configuration profile.

2. Click "Edit" to set up the new profile (see Figure 23 on page 41).

3. Enter the following data in the fields of the configuration of the codec profile:

Name: Assign a name to the codec profile for better reference

Encoder Format: For available encoder formats see Figure 15 on page 34.

Audio Mode: Set up audio mode in the next dropdown menu. Available audio modes are: Mono (L), Mono (R), Mono (Downmix), Dual Mono, Stereo, Joint Stereo.

Sampling Rate Set up sampling rate in the dropdown menu in the range of 8000 … 192000 Hz

NOTE: The sampling rate for Livewire can be configured only for 48 kHz.

NOTE: The delay time of the input source must not exceed 200 ms if the sample rate is 192 kHz.

Sampling Width: Set up sampling width in the dropdown menu in the range of 16 … 24 bit depending on the chosen audio format.

Bit rate: Set up bit rate in the dropdown menu depending on the chosen audio format.

Ancillary data: To add the ancillary serial data to the stream, activate the function "Ancillary Data" by selecting "ON" in the virtual switch "Activation".

GPIO: For GPIO switch between encoder and decoder activate the function "GPIO Tunneling" by selecting "ON" in the virtual switch "Activation" (for more information see section 0 "GPIO Tunneling" on page 91).
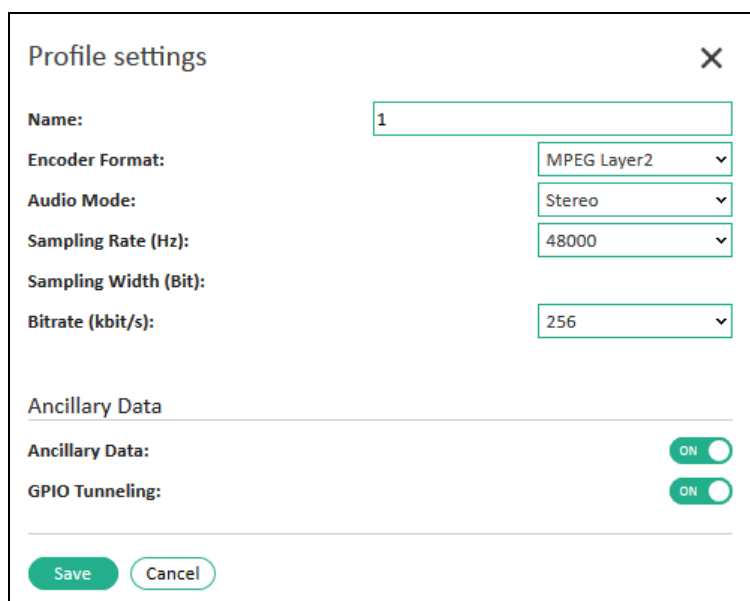
Figure 23: Codec profile settings

4. Save the changes after each configuration by clicking "Save".

12.2. Assign Input Source/Codec Profile

The IP-4c is equipped with 8 parallel encoders that can operate at the same time. One input can be source for several encoders.

✓ You have already configured the presets for input sources (see section 11 "Preset Input Sources" on page 28) and codec profiles (see section 12.1 "Preset Codec Profiles" on page 40).
✓ If you have not preset input sources, the default input source is the [XLR] interface.

(!)	**NOTE:** The current version of the IP-4c is equipped with 2 analog and 4 digital input sources. The corresponding rights must be available (see section 19.3 "Set up Rights" on page 103). If 3 or 4 channels are activated (Rights), no analog option is available.

NOTE: 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 (see section 12.3 "Set up Encoder Outputs" on page 43).

To activate und to configure the encoder:

1. Select **Codec Settings➔Codec** in the web interface menu and open tab "Encoder":

Figure 24: Encoder Configuration

2. In the "Source/Profile Assignment" block assign a preconfigured "Input Source" in the dropdown menu or drag and drop the "Input Source" from the "Input Sources" block to each Encoder 1-8.

   NOTE: The source for each Encoder 1-8 can be any "Input Source". You can assign the **same** audio input to several encoders (also for option **Stream4Sure**).

   NOTE: Input failure can be signaled by sending alarm via SNMP, LED or switching GPO (Relay). To set up alarm control for the inputs see section 14.2 "Set up Monitoring for Audio Inputs" on page 73.

   For example, Encoder 1 **and** Encoder 2 can process an audio signal from audio input 1 (interface [D IN 1/A-L IN 1-2], see section 9.2).

3. Assign a preconfigured "Codec Profile" in the dropdown menu or drag and drop the "Profile" from the "Profiles" tab (see Figure 22) to each Encoder 1-8.

4. Click the "Save" button to save the changes.

12.3. Set up Encoder Outputs

The following outputs for encoder are available in the IP-4c:

- [Data 1-2]
  - TS Multiplexer
  - Elementary Streams
  - SRT
  - Icecast Source Client
  - Icecast Server (not yet available)
  - File (not yet available)

You can configure and activate several output streams for each encoder in the web interface under
Codec Settings→Codec in the "Encoder Outputs" block (see Figure 25 "Encoder Outputs Configuration" on page 43).

For TS Multiplexer outputs configuration see menu **Codec Settings→TS Multiplexer** (section 12.3.1).

Figure 25: Encoder Outputs Configuration

1. Click ⊕ to create a new configuration preset for an encoder output.

2. Click ⊖ to delete a configuration preset.

3. Click "Edit" to set up the new preset.

4. Save the changes after each configuration by clicking "Save".

NOTE: The same encoder can be assigned to several audio outputs.

12.3.1. Output TS Multiplexer

IP-4c is able to output up to 8 multiplexed streams over IP and optionally over ASI output at the same time. One multiplexed stream can contain up to 16 programs and to each program you can add up to 16 payload contents. You can use both IP interfaces Data 1 and Data 2 outputs for the same stream content and the same destination as a redundancy or send different stream contents to the same or different destinations.

- ✓ You have already defined and preconfigured input sources (see section 11 "Preset Input Sources" on page 28).
- ✓ You have already assigned preconfigured input sources and the coder profiles to the encoder presets (see section 12.2 "Assign Input Source/Codec Profile" on page 41).

12.3.1.1. Multiplexer Configuration

To each multiplexer output stream 1-8 you can assign several configured encoder profiles and one of the Ethernet outputs Data 1 or Data 2 or ASI Output.

To configure and to activate multiplexer output streams 1-8, follow the steps below:

1. Select **Codec Settings→TS Multiplexer** in the web interface menu of the IP-4c. The page *TS Multiplexer* appears (see Figure 26):

Figure 26: Available encoder presets for TS Multiplexer

2. In the "Payload sources" block (green frame in Figure 26) you can see available encoder presets in the "Encoder Audio" tab and available DTE Input Sources for private data in the "Data" tab (red frame in Figure 27).

3. To create a new configuration for Multiplex 1, click the "+" tab below the "Payload sources" block (red frame in Figure 26). A new tab "Multiplex 1" with TS settings appears.

    NOTE: You can add and configure up to 8 Multiplex streams (see blue frame in Figure 27).

4. Add new service to the TS payload content by clicking the "Add Service" button in the "TS Payload content".

5. To add encoder audio to the stream, select available encoder presets configured in section 12.2 in the "Payload" dropdown menu or drag and drop the corresponding encoder preset from the "Encoder audio" tab (see green frame in Figure 27).

6. To add a further payload to the content, click the "Add Payload" button.

7. To add private data to the stream, select available DTE input source in the "Payload" dropdown menu or drag and drop the corresponding DTE input source from the "Data" tab (see red frame in Figure 27 and green frame in Figure 28).

8. Complete the payload configuration by specifying the Service ID, Service Name, Service Provider Name, PMT PID, PCR PID and PID for the corresponding program.

9. Set up general configurations for "Multiplex 1" output streams in the "General" block (see blue frame inFigure 27):

   "Packetizing format"   —   possible options: *TS/RTP* and *TS/UDP*.

   "DVB tables"   —   possible options: *All tables, No tables, PAT/PMT* and *PAT/PMT/SDT*

10. Save the changes after each configuration by clicking "Save".

11. Repeat instructions 1. -10. on pages 44-45 to configure the rest TS Multiplexer 2-8.

Figure 27: Multiplexer payload configuration – encoder audio and private data
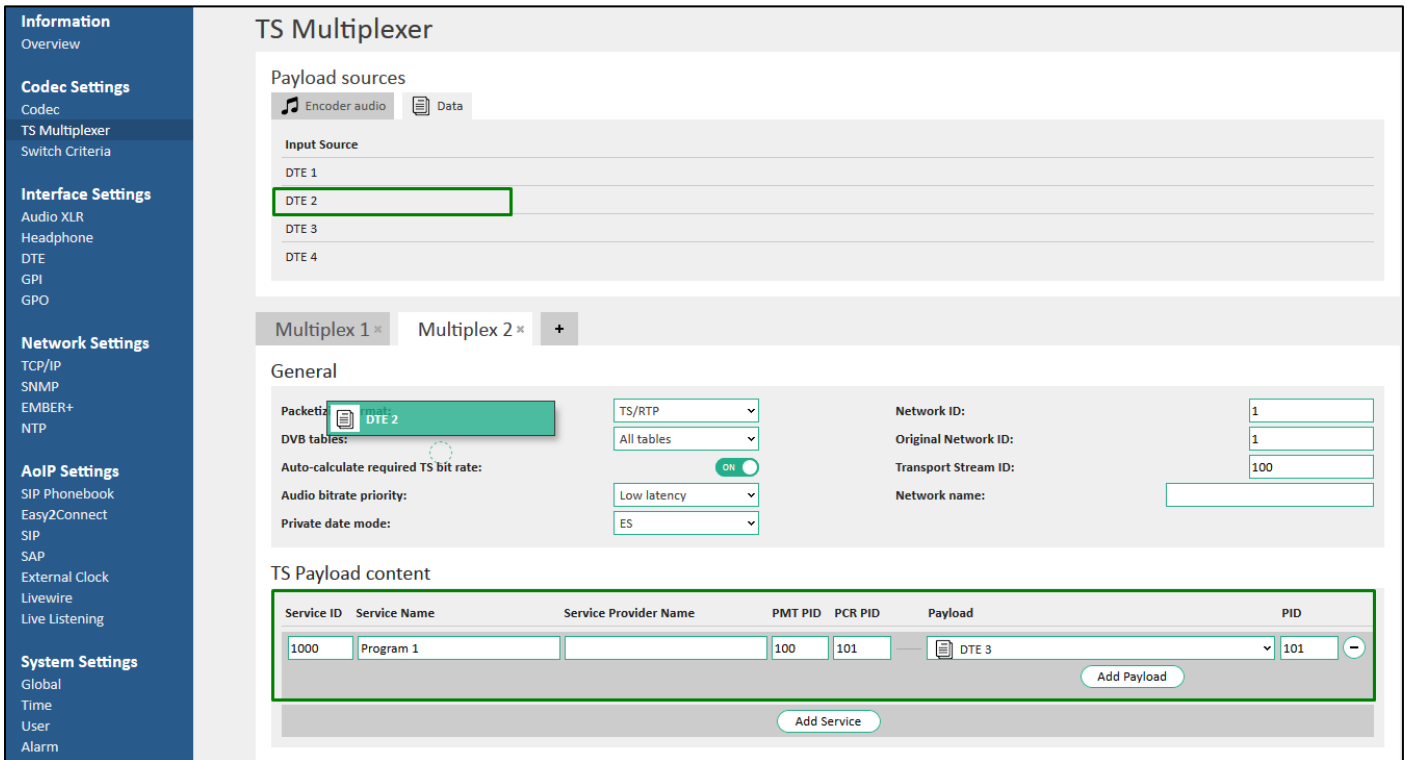
Figure 28: Drag and drop payload sources to the TS payload content

12.3.1.2. **TS Multiplexer Output over IP**

The IP-4c can output Transport Stream over two IP interfaces [Data 1/2] and optionally over BNC interface [ASI OUT].

For each TS Multiplex 1-8 you can preset several output destinations for IP and ASI streams in the web interface of the IP-4c under **Codec Settings→TS Multiplexer** in the "Multiplexer Outputs" block (see *Figure 29*).

Figure 29: Presets for multiplexer outputs

For each TS Multiplex 1-8 you can create and save up to 32 destination streams for all TS outputs over IP and also activate an ASI output (optional):

Output Stream	Description	Output Interface
	TS/IP – Transport stream over IP using UDP/RTP, Unicast/Multicast (optional: "TS Encoder" right)	[Data 1/Data 2]
	TS/SRT – Transport stream over IP using SRT (Secure Reliable Transport) (optional: "TS Encoder" and "SRT Encoder" rights)	[Data 1/Data 2]
	Transport stream over ASI Output (optional)	[ASI OUT]

Possible streams for IP outputs are TS/IP and TS/SRT. Configure multiplex 1-8 outputs for TS over IP interfaces under **Codec Settings→TS Multiplexer** as follows:

1. To configure TS/IP or TS/SRT outputs for the corresponding Multiplexer, open the "TS/IP" or "TS/SRT" tab in the "Multiplexer Outputs" block (see red frame in Figure 29).

2. Click the ⊕ icon, to create a new TS/IP or TS/SRT destination stream for Multiplexer 1-8 (see red frame in Figure 29).

   NOTE: You can enable and configure up to 32 destinations.

3. Click ⊖ to delete a destination stream for a multiplex output.

4. Click "Edit" to set up a new destination stream.

5. Enter the following data in the fields of the configuration of one **TS/IP** destination in the "Edit" menu of the "TS/IP" tab (see Figure 30):
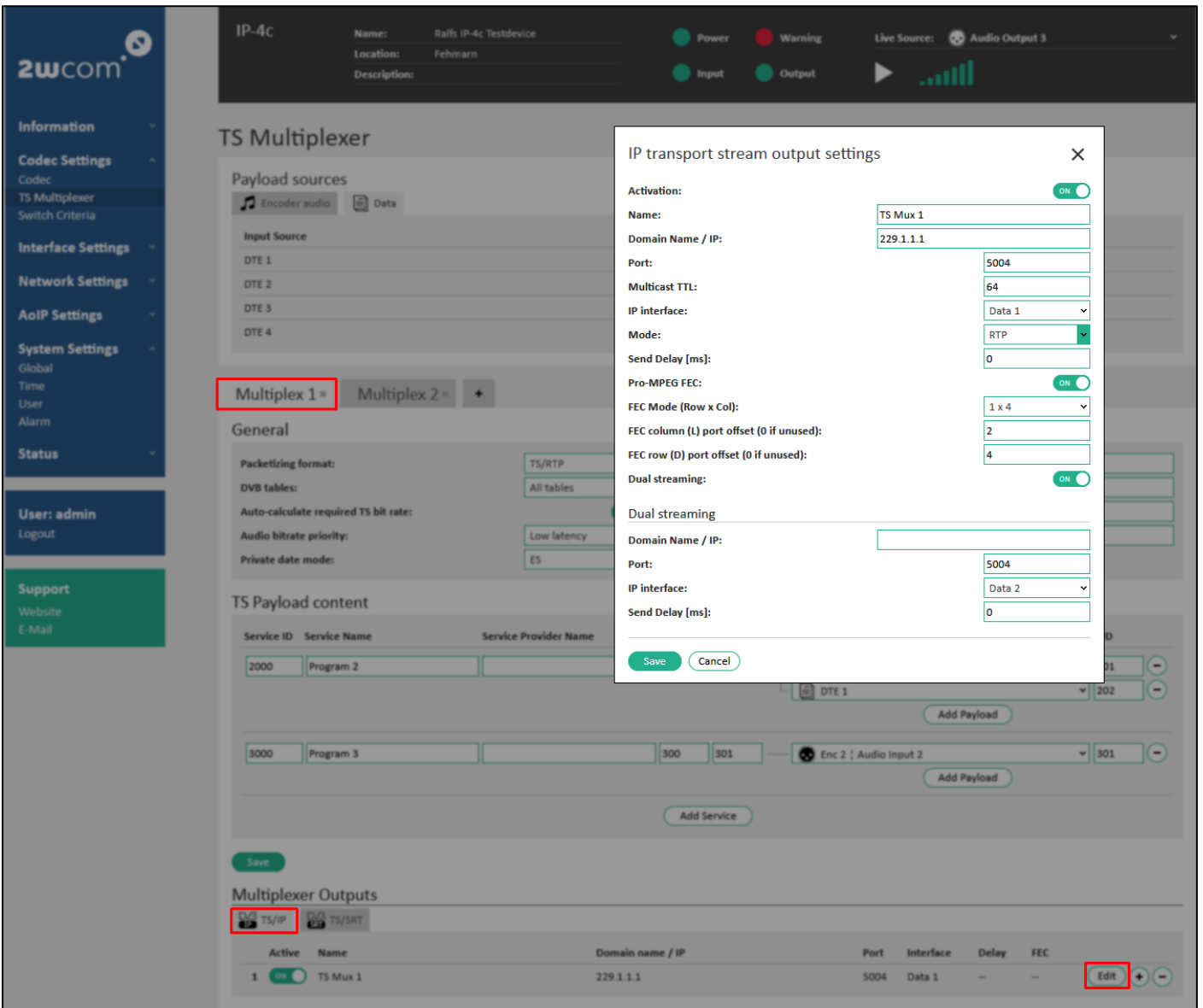

Figure 30: Edit output TS/IP

Activation:	Activate this output stream by selecting "ON" in the virtual switch.
Name:	Enter the name of the stream for better reference.

Domain Name/IP: Define the IP for a destination.

Port: Specify the port number of the destination.

Multicast TTL   TTL (Time to Live) for multicast packets

IP interface: Select the interface for the output: Data 1/2.

Mode: Select mode of the output stream in the dropdown menu: RTP or UDP.

NOTE that besides the RTP also the RTCP packets are generated for the encoder output and are sent in 5 second intervals. RTP allows reordering packets by means of sequence numbers.

Send Delay: Set up the **send delay** time in *ms*, which the encoder should wait in order to send Audio over IP as an offset stream for redundancy.

Pro-MPEG FEC: Enable "Forward Error Correction" by selecting "ON" in the virtual switch ((for more information see section 12.5 "Set up FEC for Encoder" on page 56).

NOTE: Activate Pro-MPEG FEC in the corresponding decoder.

Dual streaming: Enable by selecting "ON" in the virtual switch. The configuration menu will be extended to "Dual streaming" menu. Set up connection for dual streaming.

Configure the IP parameters for Dualstreaming. For the Ethernet input you can set up the same or different sources Data 1/2.

NOTE: Activate Dual streaming in the corresponding decoder.

> **(!)** **NOTE:** To configure the IP outputs Data 1/2 open the menu **Network Settings→TCP/IP** and see section 10.1.

6. Enter the following data in the fields of the configuration of one **TS/SRT** destination in the "Edit" menu of the "TS/SRT" tab (see *Figure 31*):

Activation: Activate this output stream by selecting "ON" in the virtual switch.

Name: Enter the name of the stream for better reference.

Mode   You can use SRT in listener and caller mode

Host   Enter the host domain of the SRT destination.

Auto-configure source port: Activate automatic configuration of the source port by selecting "ON".

If deactivated: enter the port number manually (relevant for e.g. Firewall).

Destination Port: Specify the port number of the destination.

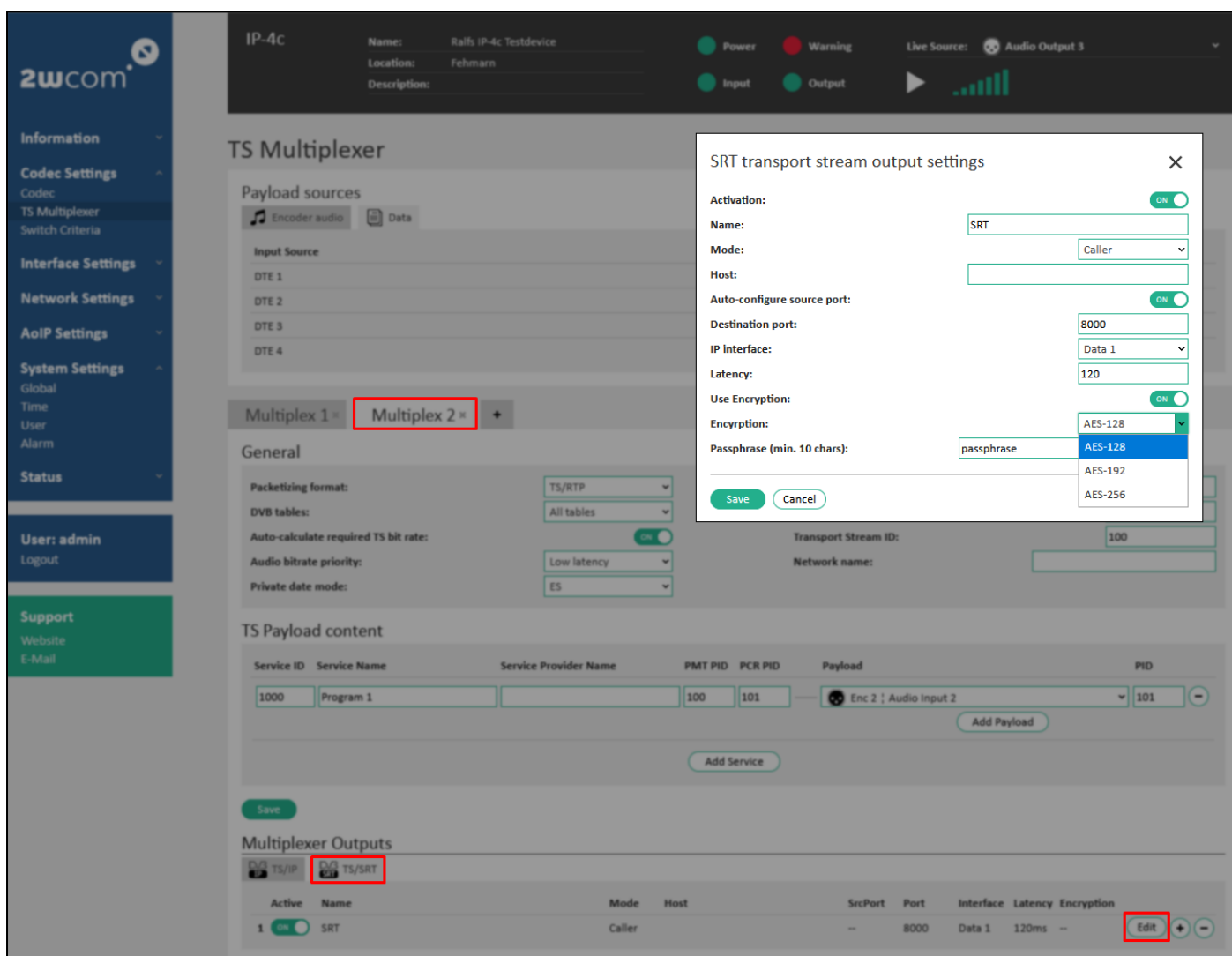**IP interface:**   Select the interface for the output: Data 1/2.

Figure 31: Edit output TS/SRT

Latency: Define the time interval for the latency (milliseconds) before the IP-4c starts to output the SRT stream.

Use Encryption: For the SRT TS output you can use 128 bit, 192 bit or 256 bit AES (Advanced Encryption Standard) end-to-end 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.

For this purpose activate the radio button "ON" and enter an encryption key in the "Passphrase" field (min 10 characters).

Note: The same encryption key should be set for this input TS in the corresponding decoder.

Send Delay: Set up the **send delay** time in *ms*, which the encoder should wait in order to send Audio over IP as an offset stream for redundancy.

NOTE: To configure the IP outputs Data 1/2 open **Network Settings➔TCP/IP** and see section 10.1.

7. Click the „Save" button to save the changes or „Cancel" to restore the last settings.

12.3.1.3. TS Multiplexer Output over ASI (optional)

If available, you can use ASI output for each multiplexed stream Multiplex 1-8 for the same stream content and the same destination as a redundancy or send different stream contents to the same or different destinations.

Set up ASI output for TS Multiplex 1-8 under **Codec Settings➔TS Multiplexer** as follows:

1. To configure ASI output for the corresponding Multiplexer, open the "ASI Output" tab in the "Multiplexer Outputs" block (see red frame in Figure 32).

Figure 32: Activate ASI output for a TS Multiplex

2. Activate the ASI output stream by selecting "ON" in the virtual switch or under **Interface Settings➔ASI Output**

3. Assign the corresponding ASI output to a TS Multiplex 1-8 under **Interface Settings➔ASI Output** (see Figure 76: ASI Output Settings on page 92).
   For more information, see section 16.6 "ASI Output" on page 92.

   ⇒ Activation of the virtual switch "Active" under **Codec Settings➔TS Multiplexer** or "Output enabled" under **Interface Settings➔ASI Output** makes the changes immediately valid. No "save the changes" confirmation is necessary.

12.3.2. Output Elementary Streams

For the output "Elementary Streams" you can predefine up to 64 output streams (destinations) over [Data 1/2] interfaces.

Each "Elementary Stream" output can be assigned to one preconfigured Encoder 1-8 (see 12.2 "Assign Input Source/Codec Profile" on page 41) and to Ethernet outputs Data 1 or Data 2.

To set up output for "Elementary Streams" and destinations under **Codec Settings➔Codec** in the block "Encoder Outputs" (tab "Elementary Streams") make the following configurations:

1. Create and edit a new preset for encoder output "Elementary stream" as described on page 43 (see Figure 25 "Encoder Outputs Configuration" on page 43).

2. Enter the following data in the fields of the configuration of the output source "Elementary stream" in the "Edit" menu (see Figure 33):

Figure 33: Encoder output settings – Elementary stream

Activation:	Activate this output stream by selecting "ON" in the virtual switch.
Encoder:	Select a configured Encoder 1-8 preset for the output stream in the dropdown menu (for configuration see section 12.2 "Assign Input Source/Codec Profile" on page 41).
Name:	Enter the name of the stream for better reference.
Domain Name/IP:	Define the IP for a destination.
Port:	Specify the port number of the destination.
IP interface:	Select the interface for the output: Data 1/2.
VLAN:	Select a configured VLAN ID. Use value "zero", if the VLAN connection should be disabled.
Mode:	Select mode of the output stream in the dropdown menu: RTP or UDP.

NOTE that besides the UDP/RTP also the RTCP packets are generated for the encoder output and are sent in 5 second intervals. UDP/RTP allows reordering packets by means of sequence numbers.

Send Delay:	Set up the **send delay** time in *ms*, which the encoder should wait in order to send Audio over IP as an offset stream for redundancy (for more information see section 18 "Buffer Delay Management" on page 100).
Pro-MPEG FEC:	Enable "Forward Error Correction" by selecting "ON" in the virtual switch (see section 13.2 "Set up FEC for Decoder" on page 65).
Dual streaming:	Enable by selecting "ON" in the virtual switch (see section 13.3).
	The configuration menu will be extended to "Dual streaming" menu.
	Set up connection for dual streaming.

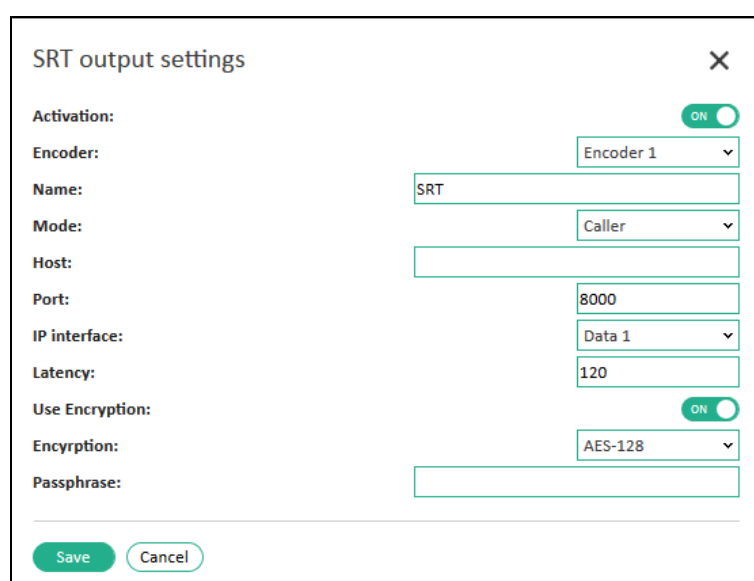3. Save the changes after each configuration by clicking "Save".

12.3.3. Output SRT

For the output of the streams over "SRT" (Secure Reliable Transport) you can predefine up to 32 streams (destinations) for [Data 1/2] interfaces.

Each SRT stream can be assigned to one preconfigured Encoder 1-8 (see section 12.2 "Assign Input Source/Codec Profile" on page 39) and to Ethernet outputs Data 1 or Data 2.

To set up output for "SRT" streaming under **Codec Settings→Codec** in the block "Encoder Outputs" (tab "SRT") make the following configurations:

1. Create and edit a new preset for encoder output "SRT" as described on page 41 (see Figure 23 "Encoder Outputs Configuration" on page 40).

2. Enter the following data in the fields of the configuration of the output source "SRT" in the "Edit" menu (see Figure 26):

Figure 34: Encoder output settings – SRT

Activation:	Activate this output stream by selecting "ON" in the virtual switch.
Encoder:	Select a configured Encoder 1-8 preset for the output stream in the dropdown menu (for configuration see section 12.2 "Assign Input Source/Codec Profile" on page 41).
Name:	Enter the name of the stream for better reference.
Mode:	Select "Caller" or "Listener" mode.
Host:	Enter the host domain of the SRT destination.
Auto-configure source port:	Activate automatic configuration of the source port by selecting "ON". If deactivated: enter the port number manually (relevant for e.g. Firewall).
Destination Port:	Specify the port number of the destination.
IP interface:	Select the interface for the output: Data 1/2.
Latency:	Define the time interval for the latency (milliseconds) before the IP-4c starts to output the SRT stream.
Use Encryption:	To protect your content from contribution to distribution activate end-to-end encryption by switching "ON".
Encryption:	Available options: 128/192/256 bit AES (Advanced Encryption Standard). 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. For example, for AES-128 encryption you must enter a 16-character passphrase etc.

3. Save the changes after each configuration by clicking "Save".

12.3.4. Output Icecast Source Client

It the output stream should be sent to an Icecast server, activate and set up an output "Icecast source client" for a selected encoder under **Codec Settings→Codec** in the block "Encoder Outputs" (tab "Icecast source client settings"):
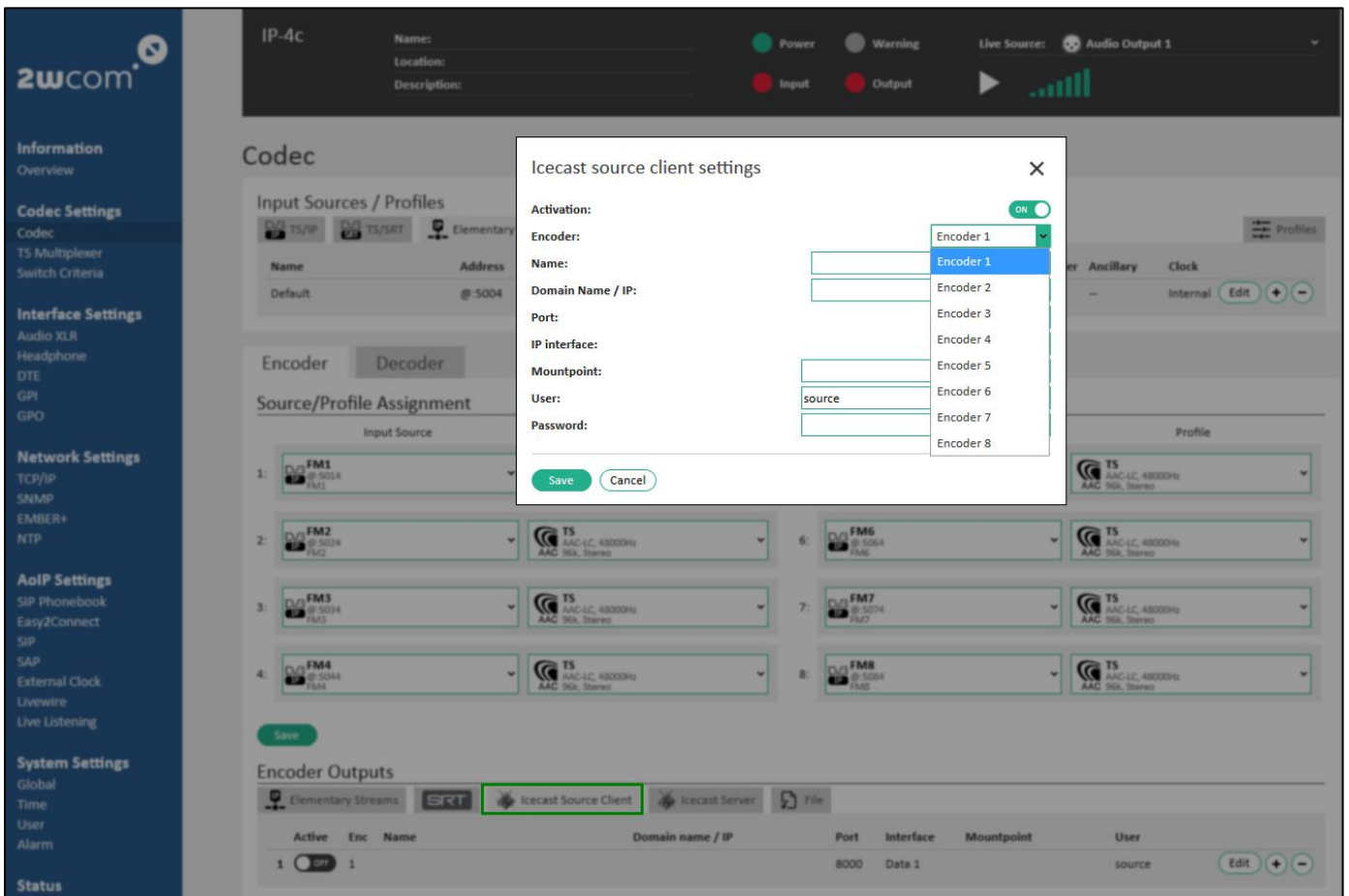
Figure 35: Encoder output settings - Icecast source client settings

12.3.5. Output Icecast

Not yet available

12.3.6. Output Internal Storage

Not yet available

12.4. Set up Encoder Input Level

For analog and digital input source you can set up the audio type and the input gain.

Follow the steps below:

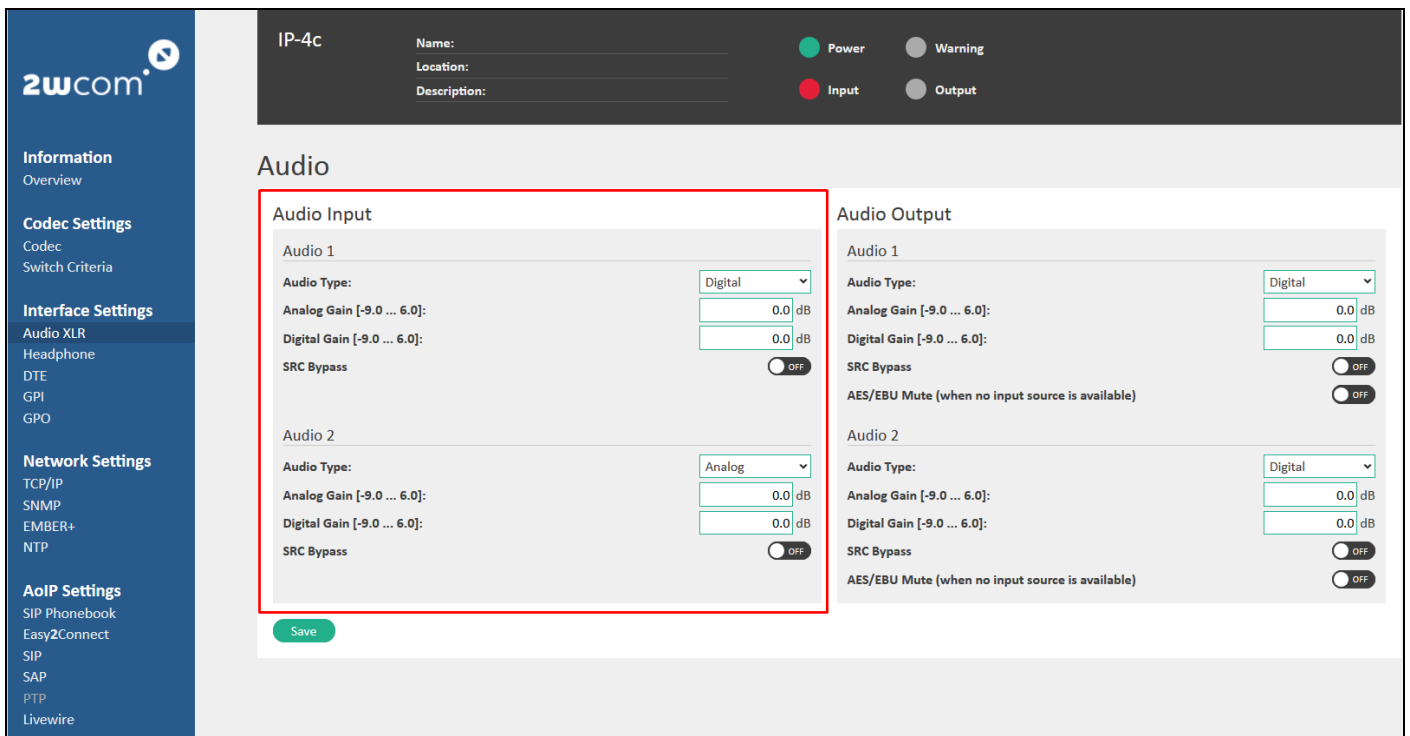1. Select **Interface Settings→Audio XLR** (see Figure 36):

Figure 36: Audio input settings

2. Configure the audio/analog gain for each audio input in the "Audio 1-2" or "Audio 1-4" block:

- **Type** of the audio input: Analog or Digital (if available)

- Gain Analog/Digital: -9.0 dB – 6.0 dB

  NOTE: If you activate 3-4 channels, no analog audio input option is available

3. Enable "SRC Bypass" by activating the virtual switch "ON" if this mode should be enabled (more about "SRC Bypass" see section 16.1 "Audio XLR" on page 84).

4. Click the "Save" button to save the settings.

⇒ The current level of the input gain is displayed on the display of the unit and in the user web interface under **Information→Overview** in the field "Audio Levels" (see Figure 41).

12.5. Set up FEC for Encoder

The IP-4c coder implements Pro MPEG FEC (Practice #3 release 2) to reduce packet loss and burst errors in the outcoming IP data stream.

You can activate and configure the Pro MPEG Forward Error Correction for "TS/IP" and "Elementary Stream" output stream.

For more information about Pro-MPEG FEC configuration in the encoder outputs see section 12.3.1.2 "TS Multiplexer Output over IP" on page 46 and section 12.3.2 "Output Elementary Stream" on page 51).

To configure the Pro MPEG FEC for encoder inputs, follow the steps below:

1. Activate the Pro MPEG Forward Error Correction by selecting the checkbox "Pro-MPEG FEC Enable". The current menu window will be extended:

Figure 37: Pro-MPEG FEC configuration for input streams

2. You can set up the following FEC parameters for the IP output: FEC mode, FEC column (L) port offset and FEC row (D) port offset.

    NOTE: Configure the FEC mode depending on the sample rate and the acceptable value for delay. For more information about the delay values see section 13 "Buffer Delay Management" on page 47.

3. Enter zero for the *FEC column/row port offset*, if it is unused, or enter the OFFSET to the main destination port, where 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).

4. Click the "Save" button to save the changes.

    ⇒ Under **Information→Overview** you can call up the status of the FEC in the Encoder Details block (recovered/unrecovered IP packets, see Figure 38 on page 58 and Figure 39-Figure 40 on page 59).

12.6. View the Encoder Status

You can call up the current status of the encoder and of the incoming audio data at any time on the web interface page or in the LCD menu of the device.

1. Under **Information→Overview** you can see the configured inputs and codec profiles for all Encoders 1-8 in the "Encoder" field (see Figure 38, red frame).

2. To see more details about the encoder status, select one encoder (e.g. "Encoder 1" in Figure 38, green frame) and the parameters of the currently encoding signal in the selected Encoder will be displayed in the field below ("Details-Encoder 1" in Figure 39, green frame).
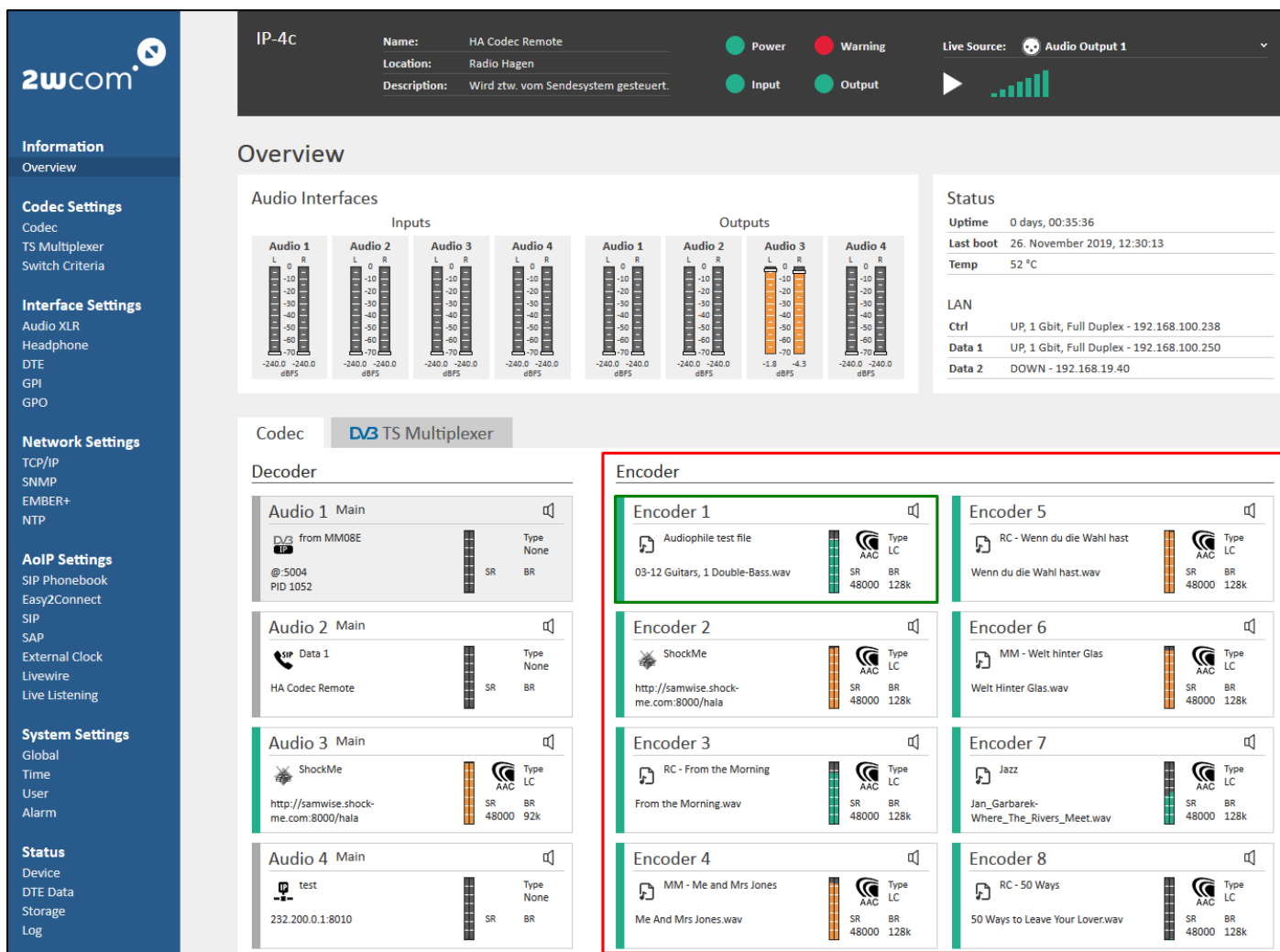
Figure 38: Overview – Encoder 1-8 State (version with activated "TS Multiplexer" rights: tab "Codec")
Orange color – The level meter is above the recommended maximum
- of -9 dBFS for digital interface
- of +9 dBu for analog interface
Green color – The level meter is under the recommended maximum

3. In the "Details" view of the selected Encoder you can see the status of the input source, codec profile and of the assigned audio outputs.

4. The following Abbreviations are used for the coder parameters:

   − SR – Sampling Rate
   − SW – Sampling Width
   − FEC – Forward Error Correction

5. To reset the counters in the status fields, click the "Reset Counters" button.

6. Details of the assigned outputs are displayed in the last table in Figure 39 (blue frame).
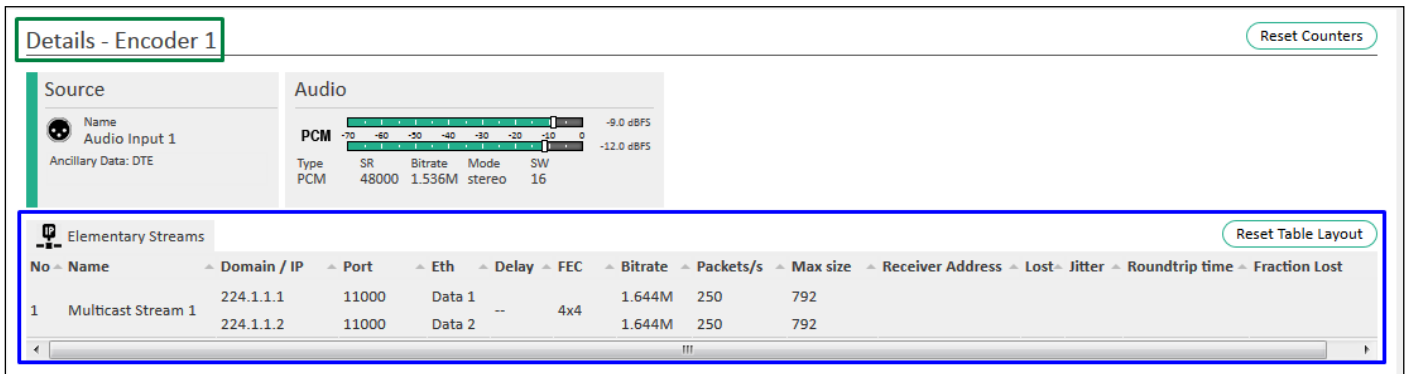   To select the view of an assigned output, click to the corresponding tab.
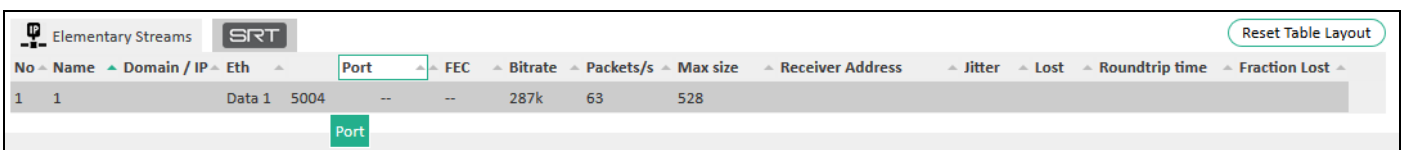
Figure 39: Overview – Status Details of the selected Encoder 1

7. You can change the sequence and the width of the columns in the table with the outputs.
   To change the sequence, drag and drop the corresponding column by pointing with cursor to the header.
   To change the width, move the corresponding frame line.

8. To restore the table view, click the "Reset Table Layout" button.

9. If the right "TS Multiplexer" is activated, you can see the status of the enabled Multiplex outputs in the "DVB TS Multiplexer" tab under **Information➔Overview** (see Figure 40).

10. To see more details about the configured programs in one Multiplex, select the corresponding Multiplex (e.g. "Multiplex 1" in Figure 40, blue frame #1). The menu will extend to the block "Details – Multiplex 1".

11. To see further details about the payload of one program, select the corresponding Program (e.g. Program 1 in Figure 40, blue frame #2). The menu will extend to the block "Details – Program 1" (see Figure 40, blue frame #3).
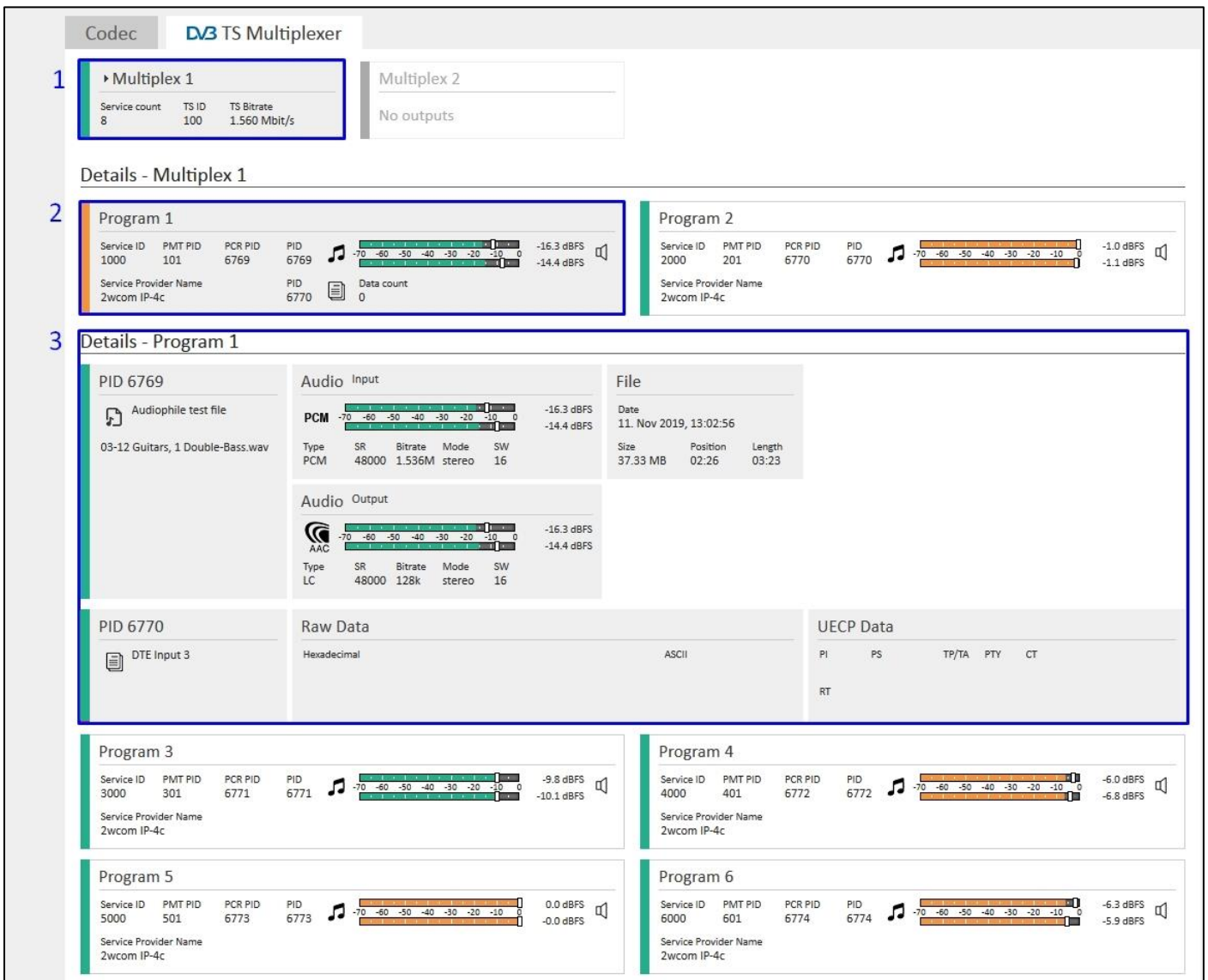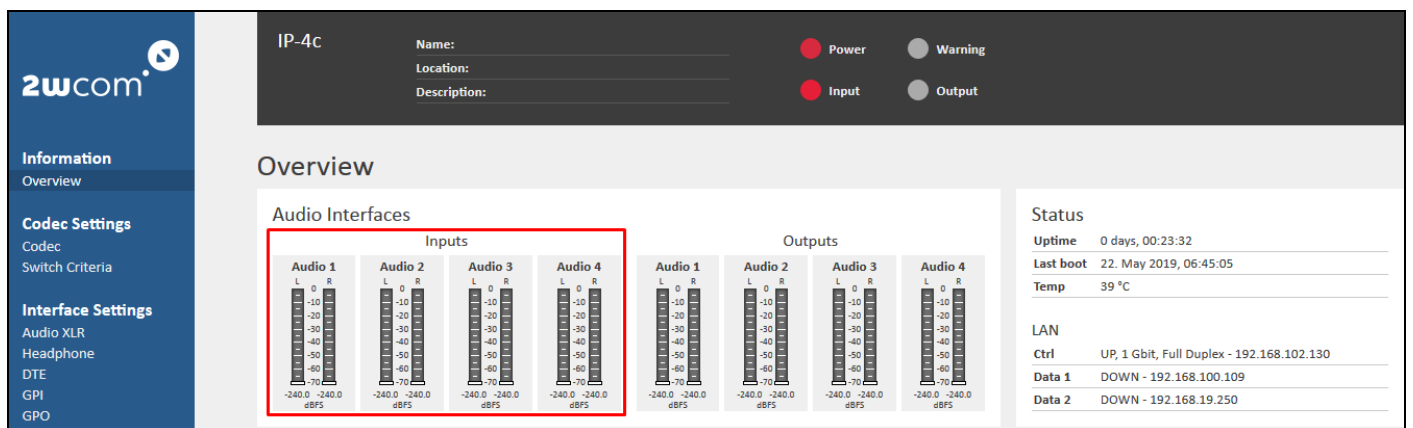
Figure 40: Overview – DVB TS Multiplexer (version with activated "TS Multiplexer" rights)

12. The current level of the inputs is displayed on the display of the unit and in the web interface under **Information→Overview** in the field "Audio Interfaces" (see Figure 41).
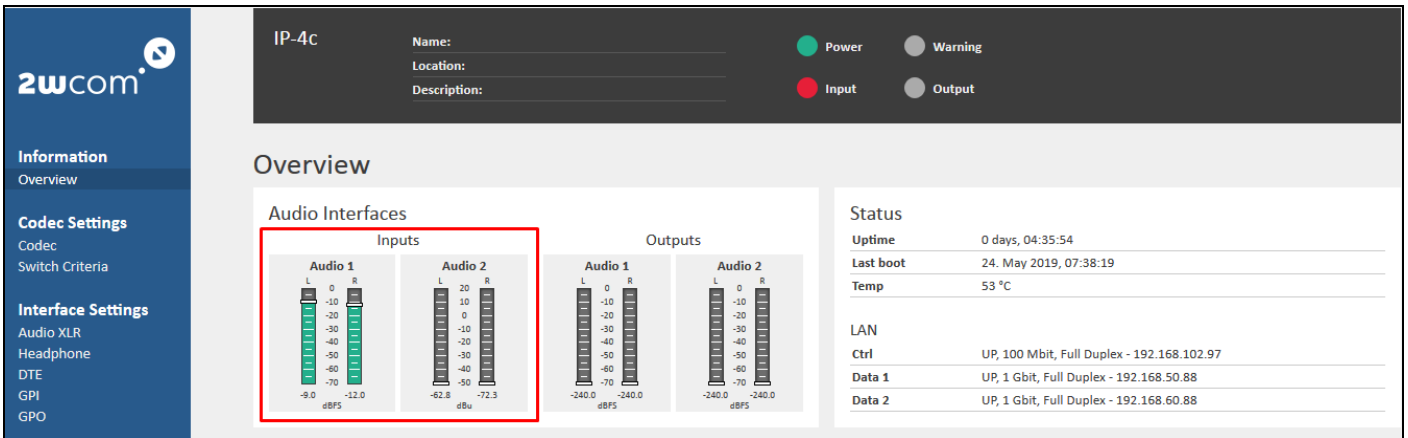
Figure 41: Overview – Audio level (4 and 2 activated channels)
Orange color – The level is above the recommended maximum
- of -9 dBFS for digital interface
- of +9 dBu for analog interface
Green color – The level is under the recommended maximum

13. Under **Status➔DTE Data** you can view the status of the encoder for the DTE Ancillary Data for DTE 1-4 inputs (s. Figure 42 below).
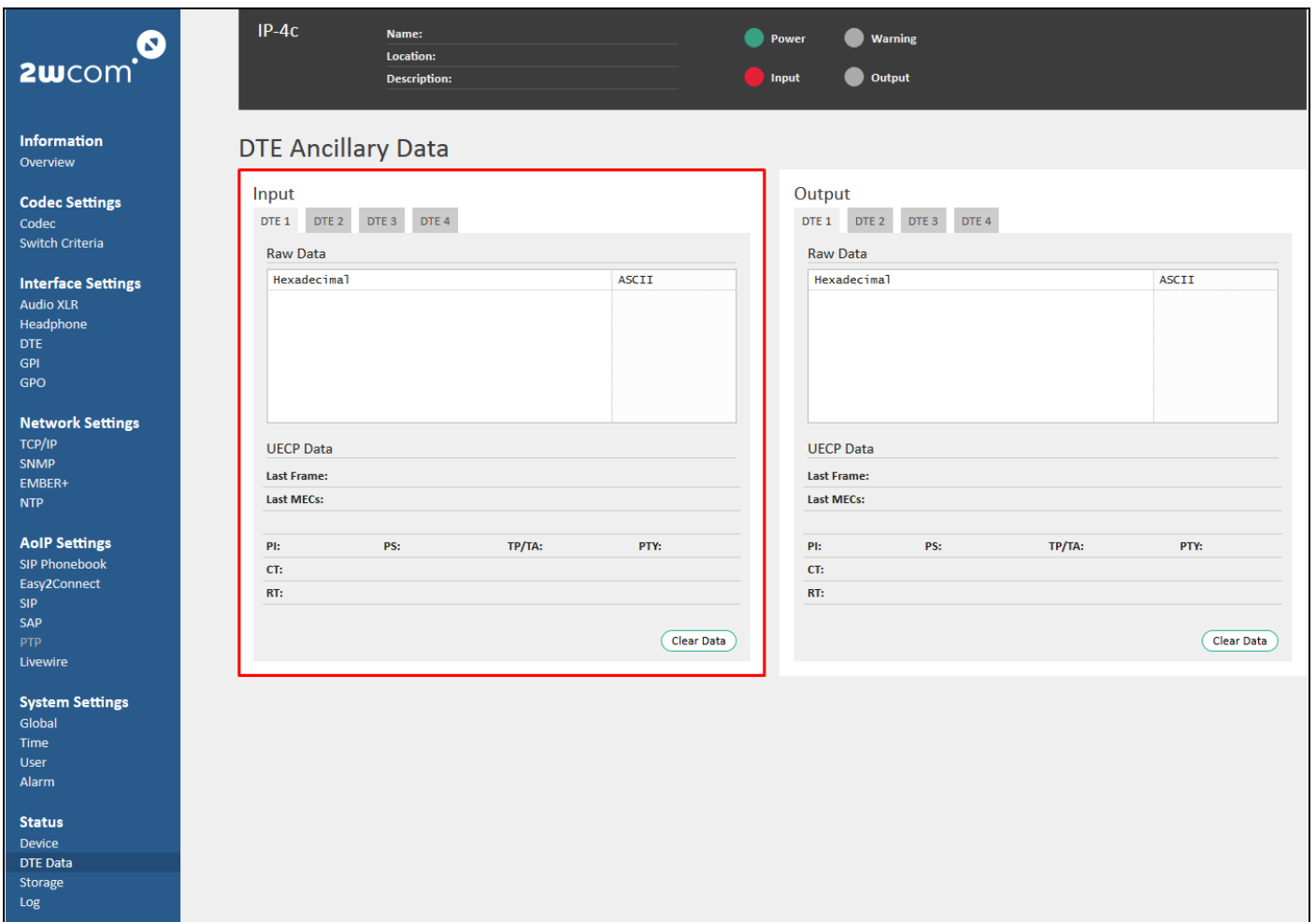

Figure 42: Status - DTE Ancillary Data

14. To monitor the current input audio signal over headphone, open the field **Headphone** under **Interface Settings→Headphone** (see Figure 69 on page 86). Select the audio input for monitoring in the "Source" dropdown menu.

15. Under **Status→Log** you can call up information about the encoder status, device operation, data distribution and errors since the last event log deleting. A list with a description of the events with the timestamps is displayed in this menu (see section 19.4 "View the Log" on page 104, Figure 92).

!	**NOTE:** Configure alarm monitoring under **System Settings→Alarm** (see section 14.2). If the alarm monitoring for any parameter is deactivated, no information about the corresponding error will be shown in the log. To invert the GPOs and see the status of the switched GPO in case of a triggered alarm, open the menu **Interface Settings→GPO** and see step 4. on page 90 in section 16.4 "GPO".

13. Decoder Settings

The IP-4c receives audio streams from the encoder over two independent IP interfaces (as TS/IP, Elementary Streams, Livewire and via SRT, Icecast or SIP) or internal storage (optional), decodes and outputs the signal as an analog or/and digital audio over Analog OUT or AES/EBU OUT outputs.

> ⓘ **NOTE:** If the IP-4c is activated for 2 channels, you can switch the audio inputs and outputs between analog and digital and use them as backup input sources as a redundancy solution from an external device (for example a satellite receiver) or for a loop-back test.

To set up decoder, you need to log in to the "admin" account.

- ✓ You have already connected the IP-4c to the network [10/100-Base-T] and configured the access to the web user interface (see section 8.2 "Network Configuration" on page 19)
- ✓ You have already defined alternative presets for input sources (see section 11 "Preset Input Sources" on page 28).

Further necessary steps for operating the IP-4c as a decoder are:

1. Assign and activate source streams
2. Set up FEC for decoder
3. Set up dual streaming und Stream4sure
4. Set up decoder output level
5. Set up buffer
6. Define switch criteria
7. View the decoder status

The following sections describe the separate steps for decoding:

13.1. Assign and Activate Source Streams

For each audio output, you can activate up to 4 input streams for decoding and assign one of them to the "Main Source" and the remaining streams use as alternative backups for decoding.

The decoder receives and processes all activated input sources from the encoder and outputs one audio signal that has the higher priority (Main Source – Backup 1…3) and is error-free.

To define the switch criteria see section 13.6 "Define Switch Criteria" on page 67.

- ✓ You have already configured the presets for input sources (see section 11 "Preset Input Sources" on page 28).

> ⓘ **NOTE:** The current version of the IP-4c is equipped with 2 analog and 4 digital input sources. The corresponding rights must be available (see section 19.3 "Set up Rights" on page 103).
>
> If 3-4 channels are activated (Rights), no analog option is available.

To assign the predefined input streams to the Main Source (and/or Backup Sources 1-3) and to configure the decoder settings:

1. Select **Coder Settings→Codec** in the web interface menu and open tab "Decoder" (see Figure 43: Decoder Configuration on page 64).

2. Activate an input signal in the "Main Source" block for decoding by selecting "ON" in the virtual switch.

Figure 43: Decoder Configuration

3. To configure the "Main Source" for each audio output, assign a preconfigured "Input Source" in the "Source/Profile Assignment" block, that should be received and decoded, in the corresponding dropdown menu by clicking the arrow ⌄ or drag and drop the "Input Source" from the "Input Sources" block.

    NOTE: You can use [XLR] audio inputs as a backup source fed from an external device (for example a satellite receiver) or for a loop-back test.

    NOTE: You can decode and play files from an internal storage. This option is recommended as an advanced redundancy for Backup Sources in case of IP input failure.

> ⚠ **NOTE:** If you have activated FEC and use buffer, see section 13.5 "Set up Buffer" on page 67 for more information about the delay configuration.

4. Analogously configure the Backup Sources 1-3.

5. Click the "Save" button to save the changes.

    ⇒ You can quickly edit the Main source or Backup Sources 1-3 directly for each decoder in the "Input Source Assignment" block by clicking the 🔧 symbol in the corresponding source field (see Figure 44).

    ⇒ You can also change the "Source Assignment" directly in the dropdown menu for each decoder in the "Input Source Assignment" block by clicking the arrow ⌄ in the corresponding source field (see Figure 44).
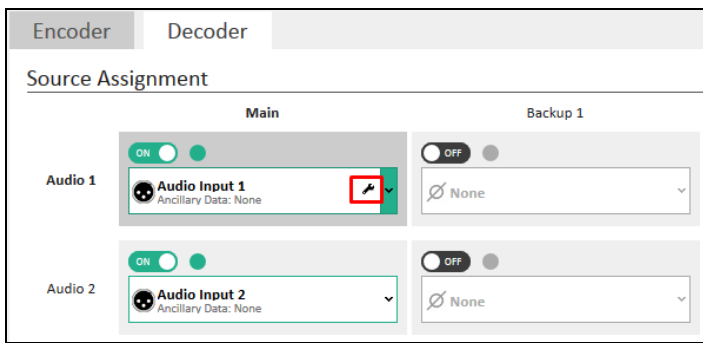
Figure 44: Edit Source Assignment

13.2. Set up FEC for Decoder

The IP-4c coder implements Pro MPEG FEC (Practice #3 release 2) to reduce packet loss and burst errors in the incoming IP data stream. If the incoming data stream is provided with Pro-MPEG FEC, you can activate it in the "TS/IP" and "Elementary Stream" input stream.

For the Pro-MPEG FEC configuration of the streams in the decoder inputs see section 11.1 "Presets for TS/IP" on page 29 and section 11.2 "Presets for Elementary Stream" on page 30.

✓ To activate und to configure the error correction FEC for decoding the input audio over IP, follow the steps 1. -4. on page 57 in section 12.5 "Set up FEC for Encoder".

> **(!)** **NOTE:** If you activated FEC and use buffer, see section 13.5 "Set up Buffer" on page 67 for more information about the delay configuration.

⇒ Under **Information→Overview** you can call up the current status of the FEC in the *Decoder* Details block (recovered/unrecovered IP packets, see section 13.6 "Define Switch Criteria" on page 67.

13.3. Set up Dual Streaming und Stream4sure

The IP-4c is equipped with two IP Ports that serve for dual streaming redundancy. The device is able to receive the same audio signal over dual IP inputs from different IP addresses and in different quality as a redundancy and to decode it to one digital/analog audio.

> **(!)** **NOTE:** For receiving and decoding of 4 source streams with different codecs, use **Stream4Sure** (optional; for more information see section "Introduction" on page 7). This function is combinable with dual streaming.

In case of alarm the IP-4c can automatically switch to a configured backup stream. The Main Stream and Backup Sources can use different stream types and different IP inputs.

> **(!)** **NOTE:** The decoder can receive and process one or dual stream over the same IP input or dual stream over two IP inputs as a redundancy.

Preset the dual streaming or/and (optional) activate **Stream4Sure** for separate input streams in the source stream configuration (see section 11 "Preset Input Sources" on page 28) and then select the input stream under the menu "Source Assignment" (see section 13.1 "Assign and Activate Source Streams" on page 63).

13.4. Set up Decoder Output Level

You can use the intergraded XLR interfaces as audio outputs for encoder and decoder. The IP-4c is equipped with 4 digital **or** 2 analog/digital audio inputs and outputs (channels).

The IP-4c outputs the decoded audio signal as a digital and analog audio over both outputs [A-L/R OUT 1-2] and/or [D OUT 1-2] **or** 4 digital outputs (extra rights).

For analog and digital output you can set up the audio type and the output gain.

Follow the steps below:

1. Select **Interface Settings→Audio XLR** (see Figure 45 for 4 channels and the right block in Figure 36 on page 56 for 2 channels):

Figure 45: Audio output settings

2. Configure the audio/analog gain for each audio output in the "Audio 1-2" or "Audio 1-4" block:

- **Type** of the audio output: Analog or Digital (if available)

- **Gain:** Analog/Digital: -9.0 dB – 6.0 dB

NOTE: If you activate 4 channels, no analog audio output option is available

3. Enable "SRC Bypass" by activating the virtual switch "ON" if this mode should be enabled (more about "SRC Bypass" see section 16.1 "Audio XLR" on page 84).

4. Enable "AES/EBU Mute" by activating the virtual switch "ON" if the corresponding output source is not available.

5. Click the "Save" button to save the settings.

⇒ The current levels of the output gain are displayed on the display of the unit and in the user web interface under **Information→Overview** in the field "Audio Interfaces" (see Figure 51 on page 70).

⇒ If the input stream of the decoder contains ancillary data, the IP-4c can forward them to the serial outputs [DTE 1-8]. To set up the forwarding see section 11.1 "Presets for TS/IP" on page 29 and section 11.2 "Presets for TS/SRT" on page 31). For more information see section 16.3 "DTE" on page 86).

13.5. Set up Buffer

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

- Audio buffer is a delay buffer for decoded audio. It saves for example 100ms decoded audio to output it in case of failure; the device can use this time buffer for example to switch to the backup source or external source.
  Set up the value for audio delay separately for each input stream, under **Codec Settings→Codec→Input Sources** (see section 11 "Preset Input Sources" on page 28 and section 12.1 "Preset Codec Profiles" on page 40).

- 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 the jitter.
  You can set up the value for this holding period in ms separately for each input stream under **Codec Settings→Codec→Input Sources** (see section 11 "Preset Input Sources" on page 28).

For more information see section 18 „Buffer Delay Management" on page 100.

⇒ You can view the current state of the Audio and IP buffer separately for each decoder and encoder under **Information→Overview** in the details view (see Figure 52 on page 71). For more information see section 13.7 "View the Decoder Status" on page 69 and section 13.6 "Define Switch Criteria" on page 67.

13.6. Define Switch Criteria

The IP-4c decoder is able to automatically switch over between alternative sources as redundancy solution in case of failure. For each audio output (digital or analog) you can configure up to 4 input streams and assign one of them to the Main Source and 3 Backup Sources for decoding (section 13.1 "Assign and Activate Source Streams" on page 63).

The IP-4c decoder receives and processes input streams from all activated input sources (for each of the audio outputs 1-4) and outputs one audio signal that has the higher priority (Main Source – Backup 1…4) and is error-free. The device is able automatically to switch over between the Main and Backup sources for each audio output, if one of the signals fails.

You can define the switch criteria separately for each streaming source and audio input under **Codec Settings→Switch Criteria** in the IP-4c web interface.

The following switch criteria for input sources in the decoder can be activated:

No input data	The decoder will switch to the next best input source, if no signal is available in the activated Gigabit IP input Data 1/2
Packet jitter	The decoder will switch to the next best input source, if the period of packet jitter in the activated input stream is above of the minimal threshold value of this delay in ms.
Packet loss	The decoder will switch to the next best input source, if packet errors are detected in the input signal received over the activated Gigabit IP input Data1/2. You can set up the minimal threshold value for the PER (packet error rate).
No decoder audio output	The decoder will switch to the next best input source, if the it doesn't detect audio in the activated input stream or can't decode audio (digital or analog)
Audio silence detection	The decoder will switch to the next best input source, if it detects silence in the decoded audio signal (L/R analog or digital) in the input stream. You can set up the threshold value to define the silence level.

To set up switch criteria for each input streaming and audio input in the decoder:

1. Open the window *Switch Criteria* under **Codec Settings➔Switch Criteria** in the web interface of the IP-4c.

2. See the switch criteria for input streaming sources and audio inputs in Figure 46 - Figure 50 on page 68.

3. Enable each switch criterion separately by activating the virtual switch "Enable", if this parameter should be monitored.

4. Enter the maximal threshold values to define minimal delay period for "Packet jitter" in ms, the minimal percentage value for the "Packet loss" and the silence level in dBFS in the decoded audio signal.

5. Define for each criterion the delay time *T1* (in milliseconds) for switching release. The delay time from this defined value will be regarded by the system as "bad", so that after the delay time *T1* the device switches the input stream to the configured backup source.

6. Define for each criterion the delay time *T2* (in milliseconds) for switching end, how long a "good" signal for this parameter in the previous input stream should be available, before the system switches back.

7. Click the "Save" button to save the changes.

⇒ The device switches to the next best input source.
⇒ The virtual LED lights green or red in the field "Source Assignment" in the tab "Decoder" under Codec Settings➔Codec near the active source (see Figure 43 "Decoder Configuration" on page 64).
⇒ Some switch criteria can be also configured for sending alarm. These alarms for audio inputs will be signaled via SNMP, by switching LED and/or a relay if enabled (see section 14.2 "Set up Monitoring for Audio Inputs" on page 73).

Figure 46: Switch criteria for input streams "TS/IP", "Elementary Streams", "Livewire" and "SIP" in the decoder

Figure 47: Switch criteria for input streams over "SRT" in the decoder

Figure 48: Switch criteria for input streams over "Icecast" in the decoder
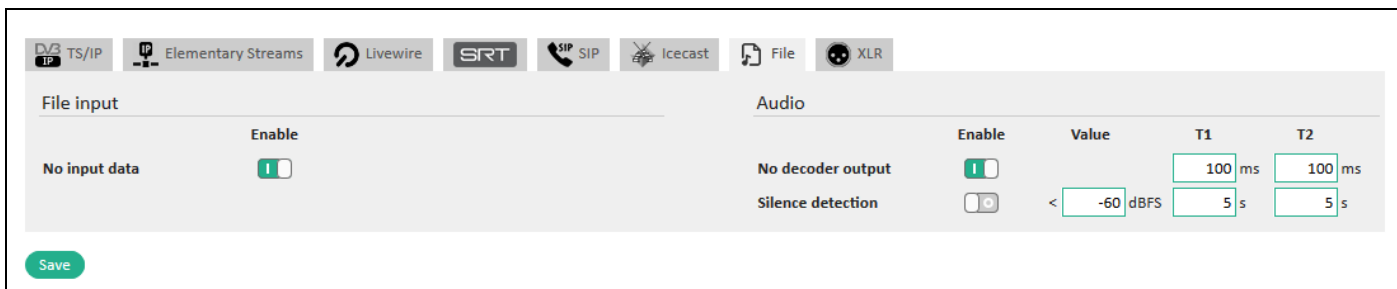
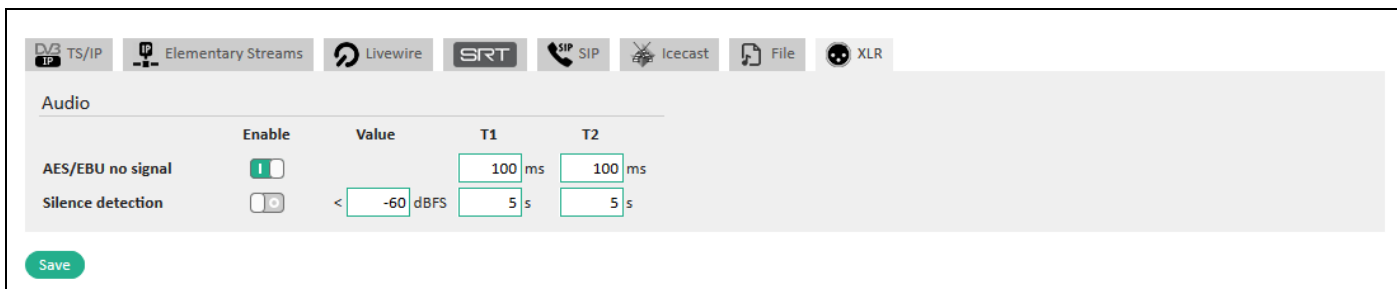*Figure 49: Switch criteria for redundant audio input from the internal storage "File" in the decoder*

Figure 50: Switch criteria for redundant audio inputs from the XLR interfaces (digital/analog) in the decoder

13.7. View the Decoder Status

You can view the current status of the decoder and of the incoming data at any time on the web user interface page or in the LCD menu of the device.

1. Under **Information→Overview** you can see the details of the configured parameters of the decoding signal for all audio outputs in "Decoder" field (see Figure 51, red frame).

2. To see more details about the decoder status, select one "Audio 1-4" output (e.g. "Audio 1" in Figure 51, green frame) and the active source as well as the parameters of the currently decoding signal in the selected audio output will be displayed in the field below ("Details-Decoder / Audio 1" in Figure 39, green frame).

3. In the "details" view of the selected decoder audio output you can see the status of the input source, of the codec details and of the assigned audio outputs.

4. The following abbreviations are used for the coder parameters:

   – SR – Sampling Rate
   – SW – Sampling Width
   – FEC – Forward Error Correction

5. To reset the counters in the status fields, click the "Reset Counters" button.
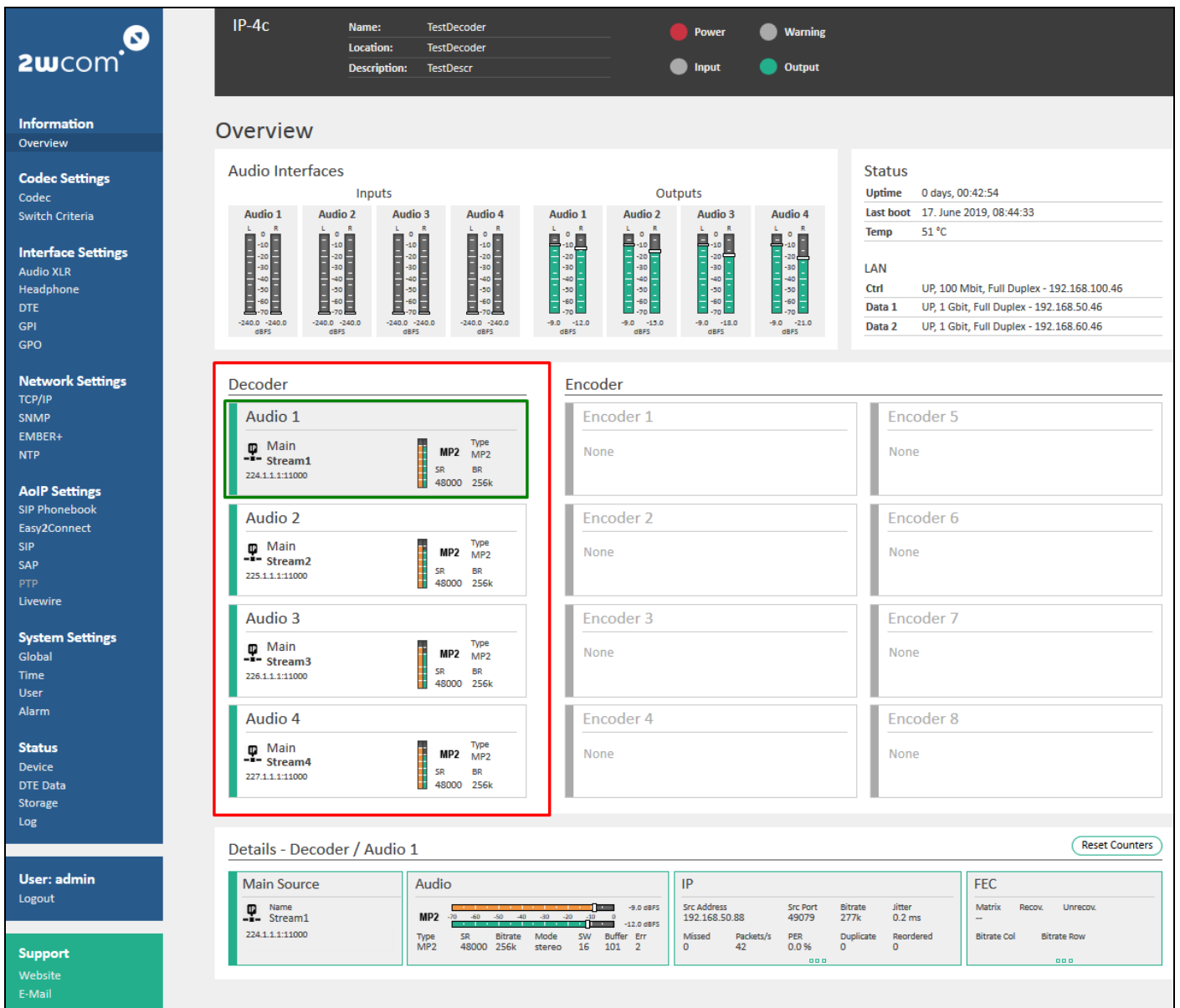
Figure 51: System Information – Decoder State

> **The status color means:**
>
> 🟢 **- active for decoding and is currently used for audio output**
>
> ⚪ **- deactivated**
>
> 🔴 **- error**

6. In the left block you can view the name of the input stream, the type and the address of the activated data inputs Data 1/2.

7. In the "Audio" block you can view the status and the current parameters of the decoding audio (see decoder settings under **Codec Settings→Codec→Input Sources**, see section 11 "Preset Input Sources" on page 28).

The following abbreviations are used for the configured coder parameters:

- Bitrate - audio bit rate
- SR – Sampling Rate
- Buffer – Delay Buffer for decoded audio
- Error – the number of errors in the decoder (e.g. failed samples, no audio, PER etc.)
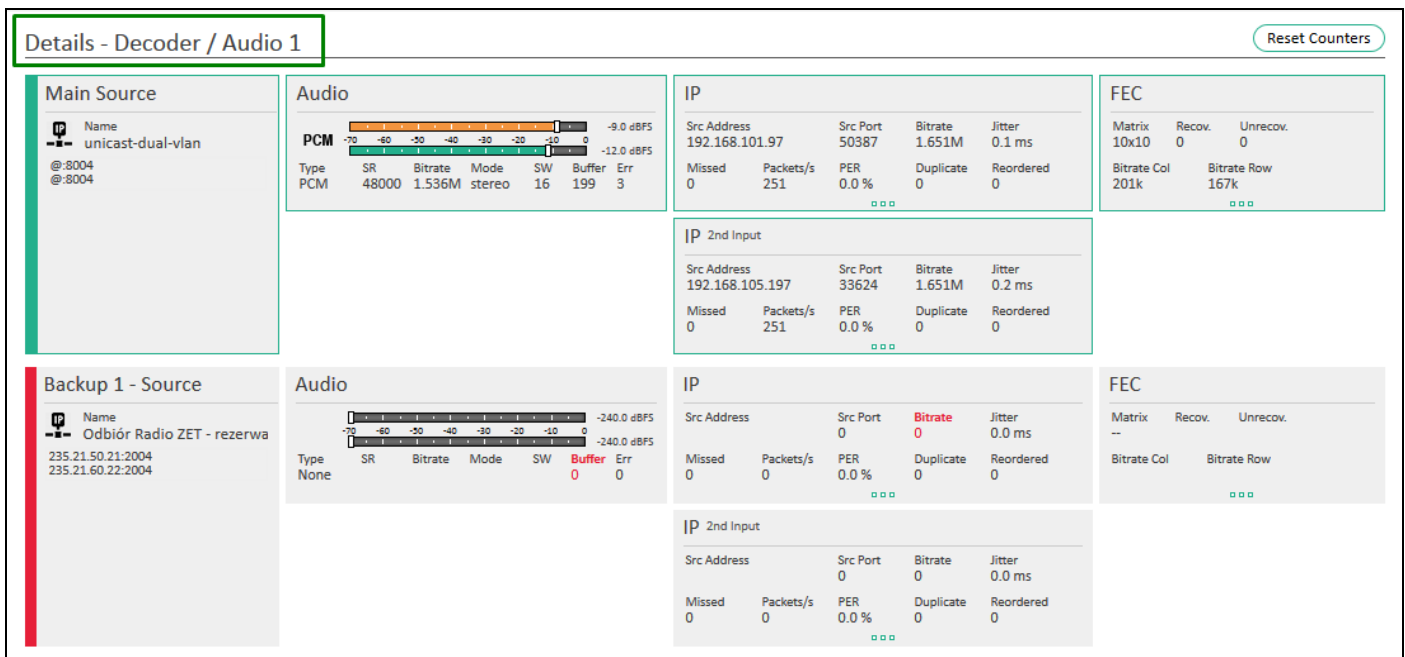
Figure 52: Overview – Status Details of the selected decoder output 1

8. In the "IP" block you can view the current settings of the input streams over IP (Some IP settings can be set up under **Codec Settings→Codec→Input Sources**, see section 11 "Preset Input Sources" on page 28).

The following abbreviations are used for the configured coder parameters:

Bitrate – bit rate of the incoming IP packets (> than Audio bitrate because it includes the IP Header)
Jitter – packet jitter of the incoming IP stream
Missed – the number of the lost/missing packets
PER – packet error rate of the input stream
Reordered – the number of the carried out reorderings of the IP packets
FEC – the current FEC matrix in the stream
Recov. – the number of the recovered packets
Unrecov. – the number of the unrecoverable packets

9. To monitor the current outputting audio signal over headphone, set up the headphone interface under **Interface Settings→Headphone** (see section 16.2 "Headphone" on page 86).

10. Under **Status→Log** you can call up information about the decoder status, device operation, output status, data distribution and errors since the last event log deleting. A list with a description of the events with the timestamps is displayed in this menu (see section 19.4, "View the Log" on page 104, Figure 92).

> **NOTE:** Configure alarm monitoring under **System Settings→Alarm** (see section 14.2). If the alarm monitoring for any parameter is deactivated, no information about the corresponding error will be shown in the log.
>
> To invert the GPOs and see the status of the switched GPO in case of a triggered alarm, open the menu **Interface Settings→GPO** and see step 4. on page 90 in section 16.4 "GPO".

14. Monitoring and Alarm Control

The IP-4c is able to monitor the audio signal and to recognize errors in the inputs and outputs. You can individually set up separate parameters for monitoring the audio inputs/outputs and for sending alarm.

A triggered alarm is signaled by sending SNMP traps, activating of an available relay and, if configured, of the "Warning" LED on the web user interface page or on the front panel of the device.

14.1. Status LEDs

The IP-4c is equipped with 4 front-panel status LEDs that indicate the status of the inputs, outputs, power supply and alarm control (see section 9.1 "Front Panel" on page 22).

The same LEDs are displayed in the top the web interface (see Figure 53):
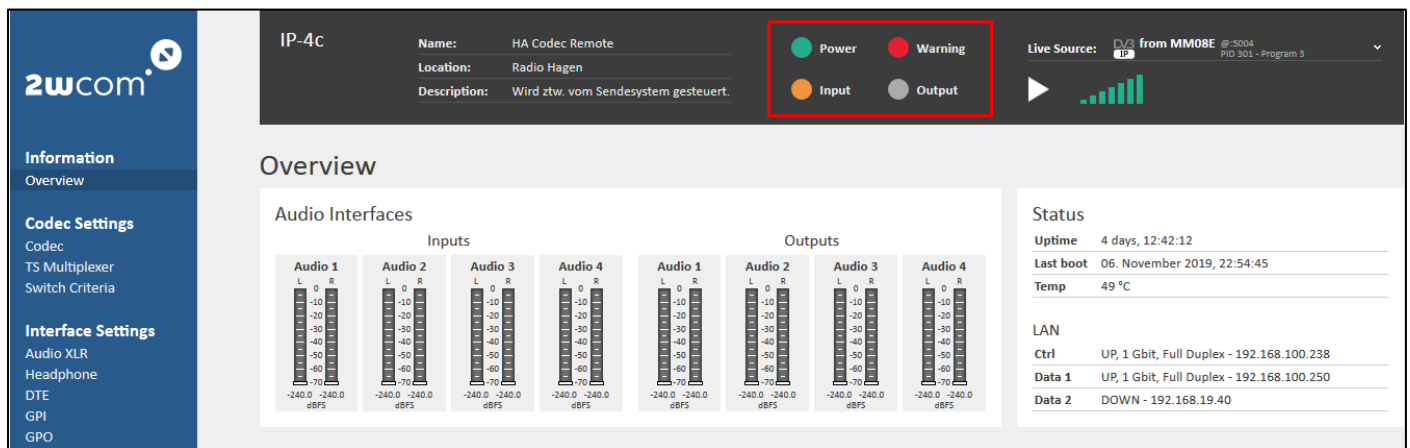

Figure 53: Status LEDs

The meaning of the colors of each LED is explained in the table below (see Figure 1).

LEDs	Color	Meaning
Power	🟢	Both supply cords are connected and the power supply is OK
	🔴🟢	Toggles (green/red) if only one power supply cord is connected and the power supply is OK
Warning	⚪	LED is off, if no alarms are triggered
	🔴	At least one monitoring 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

Table 1: Monitoring LEDs on the IP-4c Web Interface

14.2. Set up Monitoring for Audio Inputs

The IP-4c is able to monitor and to recognize errors in the audio inputs.

The following alarm functions for audio inputs can be activated for each audio input (Audio 1-4 depending on activated channels):

Silence detection	Alarm is set off, if the device detects silence in the left and/or right channel of the analog audio input. You can set up the minimum value of the audio level under that the alarm should be triggered.
AES/EBU no signal	Alarm is set off, if no decoded digital audio is available in the audio input [D IN 1-4].

To set up the monitoring and alarm function for each available audio input:

1. Open the configuration menu "Audio Input" in the window "Alarm" under **System Settings→Alarm** in the web interface of the IP-4c (Figure 54).

Figure 54: Alarm Settings – Indication of audio data in the audio inputs

The LED color means:

🟢 *- Monitoring is activated, no alarm is triggered*

⚪ *- Monitoring is deactivated*

🔴 *- Monitoring is activated, alarm is triggered*

2. Enable each alarm function separately by activating the virtual switch "Enable" if this parameter should be monitored.

3. Select for each alarm function the severity level of the alarm in the dropdown menu "Priority":

Level/Code	Priority	Meaning
0	Emergency	System is unusable
1	Alert	Action must be taken immediately

2	Critical	Critical conditions
3	Error	Error conditions
4	Warning	Warning conditions
5	Notice	Normal but significant condition
6	Informational	Informational messages
7	Debug	Debug-level messages

Table 2: Alarm Priority

The value 0 or Priority Emergency is the most critical and emergent level. 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 is the alarming case and what measures are necessary.

4. Define for each monitoring function the delay time T1 (in seconds) for alarm trigger. The delay time from this defined value will be regarded by the system as "bad", so that after the delay time T1 an alarm will be set off.

5. Define for each monitoring function the delay time T2 (in seconds) for alarm end, how long a "good" signal for this parameter should be available, before the system switches off the alarm.

6. Enable checkbox "SNMP", if the alarm should be signaled by sending SNMP traps.

7. Enable checkbox "LED", if the alarm should be signaled by the Warning LED on the web interface page or on the front panel of the device (see Table 1: Monitoring LEDs on the IP-4c Web Interface on page 72).

8. Choose in the dropdown menu "Relay" one of the available relays 1-8 that should switch to signal the alarm.
NOTE: The corresponding Relay/GPO must be activated for the source "Alarm" under **Interface Settings→GPO** (see step 4. on page 90 in section 16.4 "GPO".)

9. Click the "Save" button to save the changes.

14.3. Set up Monitoring for Audio Outputs

The following alarm functions can be activated for each audio output (Audio 1-4 depending on activated channels):

Silence detection	Alarm is set off, if the device detects silence in the left and/or right channel of the audio output. You can set up the minimum value of the audio level under that the alarm should be triggered.

To set up the monitoring and alarm function for each available audio output:

1. Open the configuration menu Audio Output 1-4 in the window "Alarm" under **System Settings→Alarm** in the web interface of the IP-4c (see Figure 55).
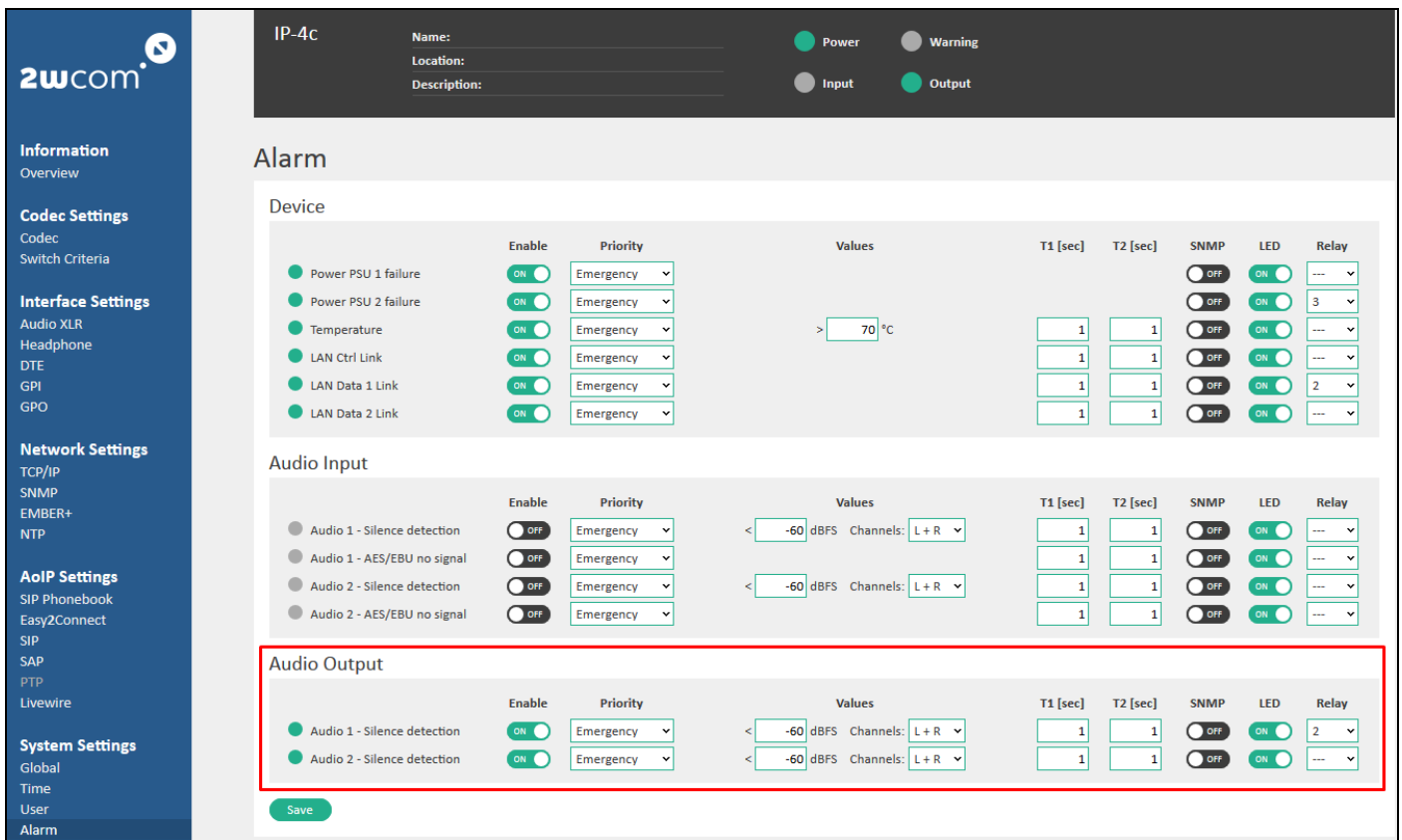
Figure 55: Alarm Settings – monitoring of audio data in the audio outputs

> **The LED color means:**
>
> 🟢 **- Monitoring is activated, no alarm is triggered**
>
> ⚪ **- Monitoring is deactivated**
>
> 🔴 **- Monitoring is activated, alarm is triggered**

2. For the further settings follow the same instructions as described in section 14.2. "Set up Monitoring for Audio Inputs" on page 73

14.4. Set up the Alarm Control of the Device

The following parameters and alarms for device monitoring of the IP-4c can be activated:

Power failure	Alarm is set off, if the device detects an error in a power supply unit.
Temperature	Alarm is set off if the device temperature exceeds the configured value.
LAN Link	Alarm is set off in case of Ethernet data communication error

To set up the monitoring and alarm functions for the device:

1. Open the configuration field "Device" in the window "Alarm" under **System Settings→Alarm** in the web interface of the IP-4c (see Figure 56).
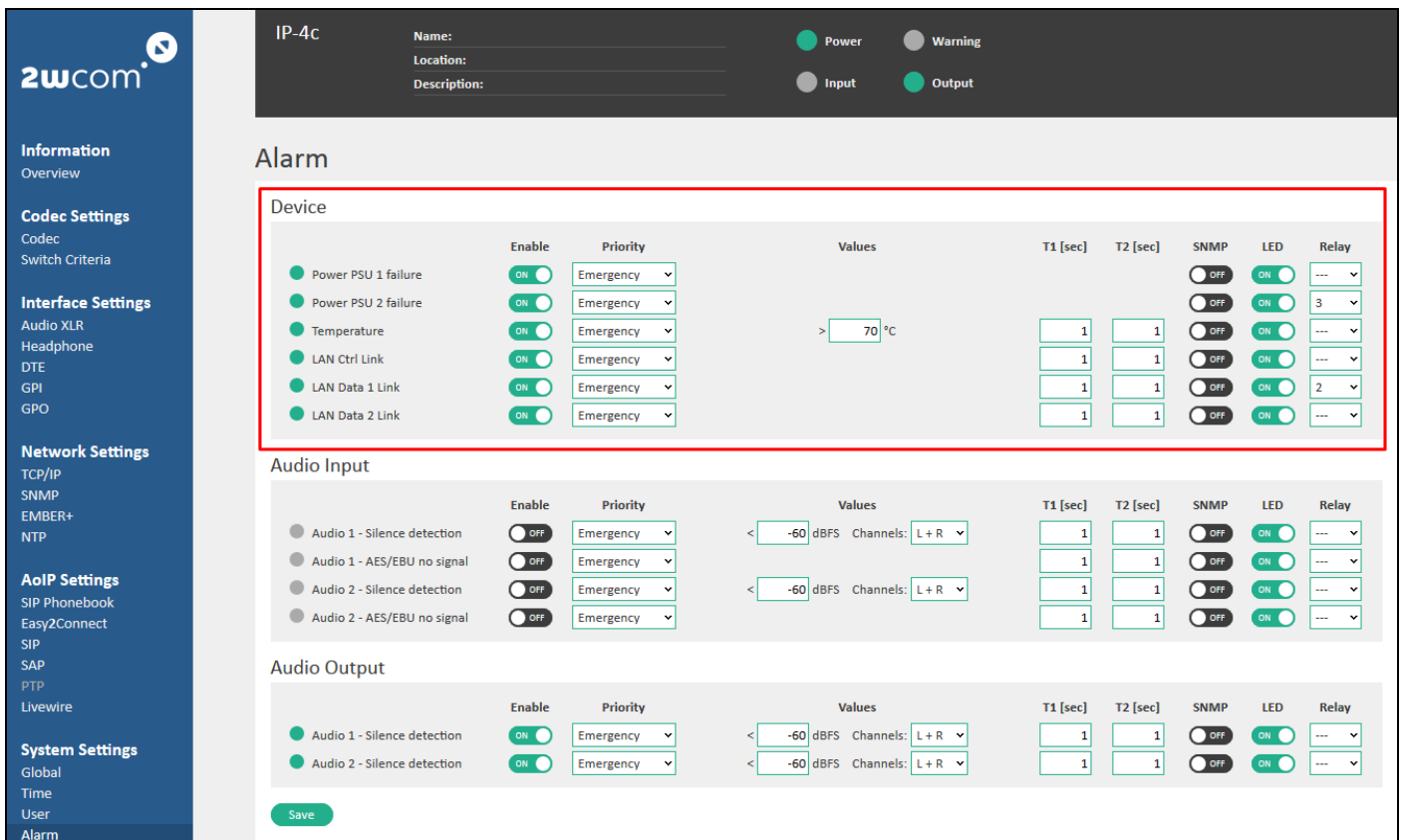
Figure 56: Alarm Settings – Monitoring of the device

The LED color means:

🟢 *- Monitoring is activated, no alarm is triggered*

⚪ *- Monitoring is deactivated*

🔴 *- Monitoring is activated, alarm is triggered*

2. For the further settings follow the same instructions as described in section 14.2. "Set up Monitoring for Audio Inputs" on page 73.

14.5. Audio Monitoring via Live Listening

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: MPEG Layer2, MPEG Layer 3, AAA-LC, HE-AACv1 and HE-AACv2.

You can manually set up the parameters for audio encoding depending on the bandwidth available for data distribution.

Set up "Live listening" over the IP-4c web interface as follows:

✓ The device should be connected to the available network via the [10/100/1000-Base-T] connector.
✓ The input sources are configured and assigned to the encoder and to the decoder.

1. To activate and to set up the live streaming, open the configuration menu under **AoIP Settings→Live Listening** (see Figure 57).
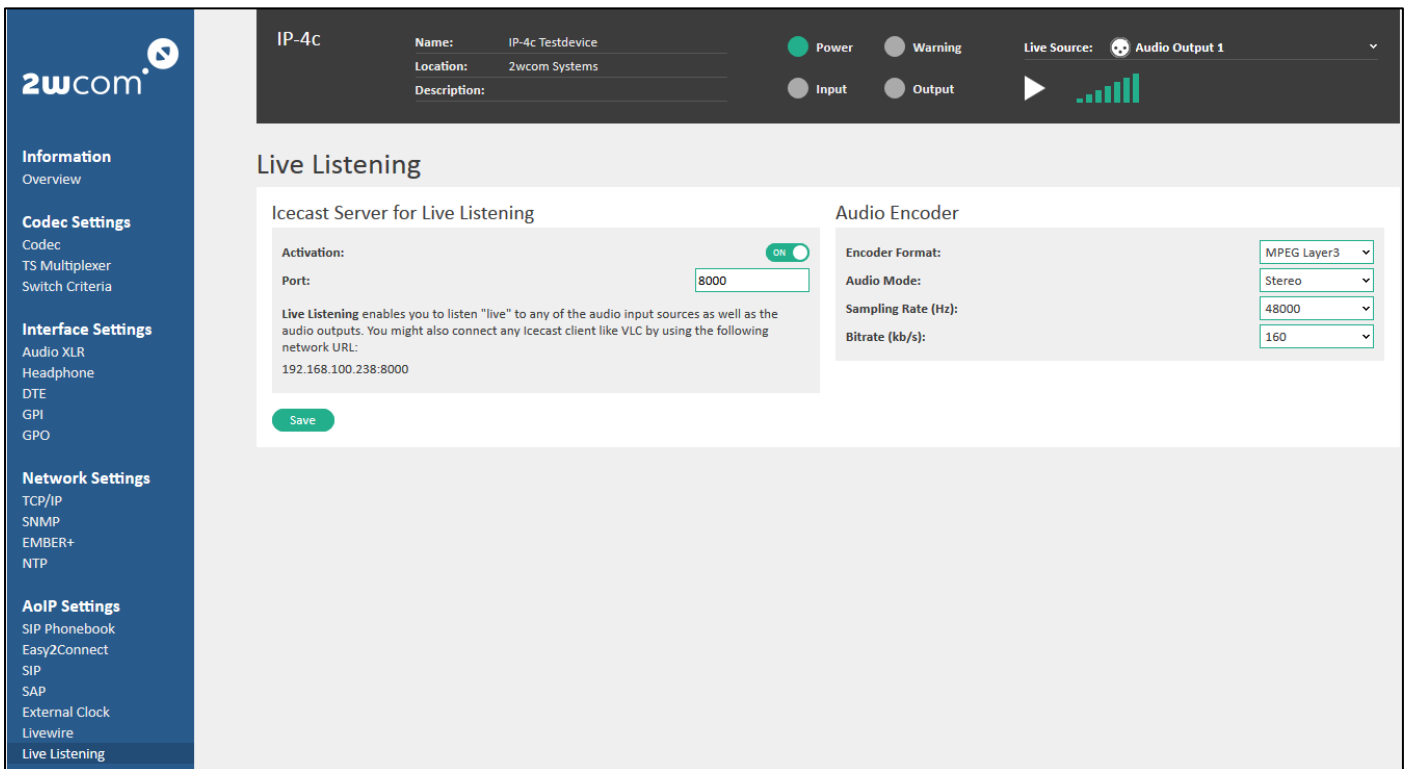
Figure 57: Live listening settings

2. Enable the live streaming by activating the virtual switch "ON".

3. Enter the port number for streaming.
    NOTE: The URL for Icecast streaming "IP address of the device:streaming port" (standard port for live streaming is 8000, e.g. http://192.168.12.23:8000).

4. Select an audio format for streaming in the dropdown menu "Encoder Format": MPEG Layer2, MPEG Layer 3, AAA-LC, HE-AACv1 and HE-AACv2.

5. Select stereo or mono audio mode for live streaming in the dropdown menu "Audio Mode": Mono (L/R), Mono (Downmix), Dual Mono, Stereo, Joint Stereo.

6. Select a sample rate for the streaming in the dropdown menu "Sampling Rate".
    Available options are: 16 kHz/24 kHz/32 kHz/44.1 kHz/48 kHz.

7. Select bit rate for the selected audio format quality in the dropdown menu "Bitrate".

8. Click the "Save" button to save the changes.

9. To start audio streaming, use the menu in the right top corner of the IP-4c web interface (see red frame in Figure 59):

    a) In the "Live Source" field, select available configured audio sources for Streaming (see Figure 58).
    b) Start/stop the streaming by clicking the play/pause button.
    c) Change the playback value by clicking the green volume levels.
    d) Alternatively, you can start/stop live streaming directly for each audio input individually by clicking the "Loudspeaker" icon in the corresponding source field (see red frame in Figure 59).
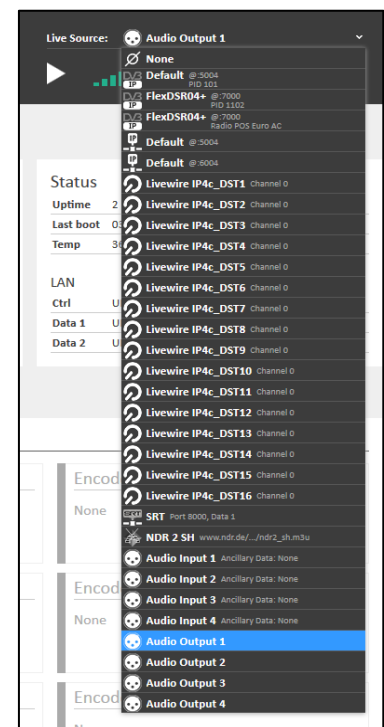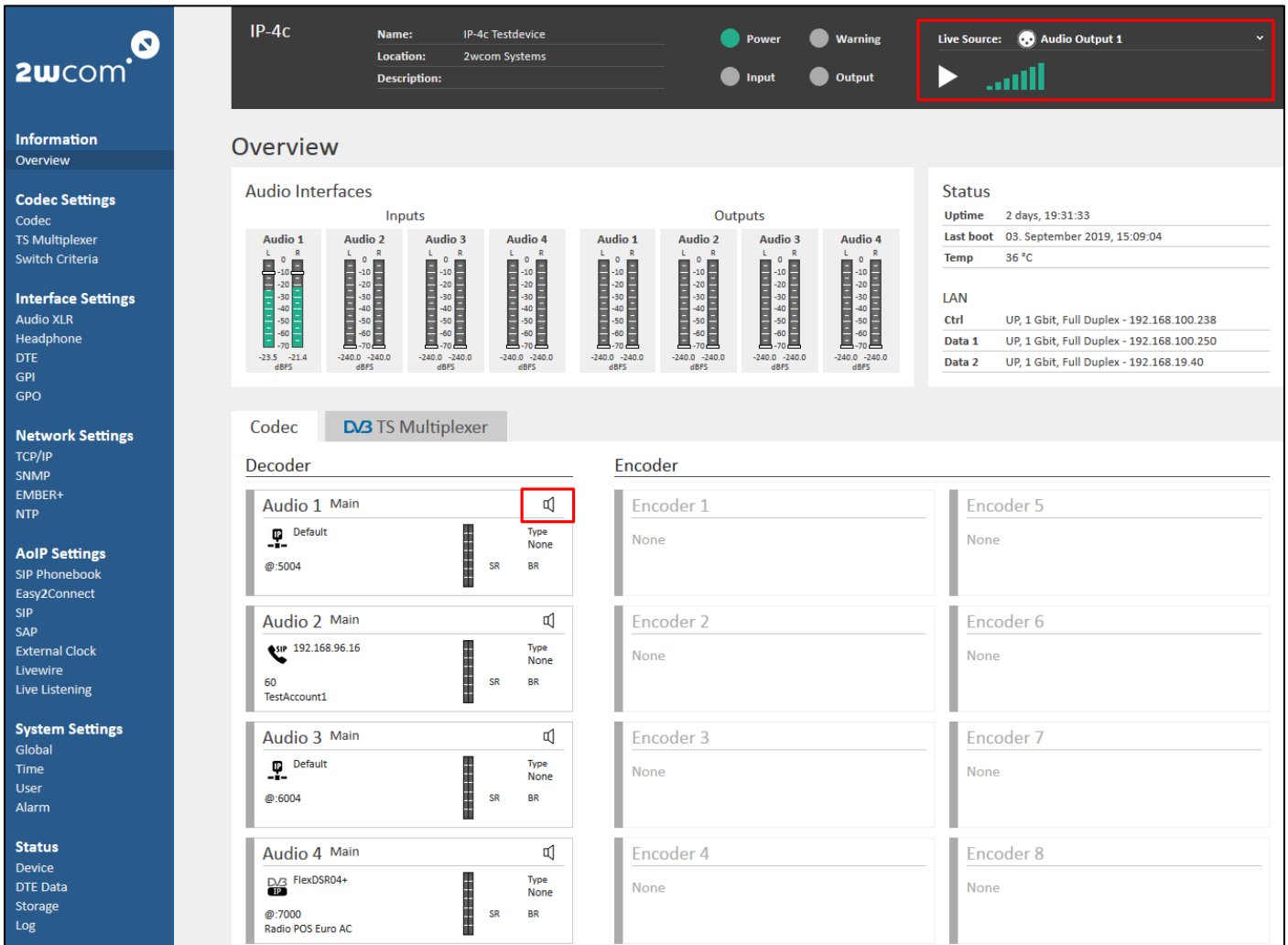

Figure 58: Live source choice

Figure 59: Live listening – internal media player

14.6. Audio Bypass Relay (optional)

The bypass relay is a hardware option in the IP-4c.

In case of a power failure, the bypass relay automatically switches the audio inputs to the outputs. The bypass relay is therefore looping through the audio signal from inputs to the outputs (see Figure 60).

If the power is back again and the device boots up, the normal mode will be switched back (see Figure 61).

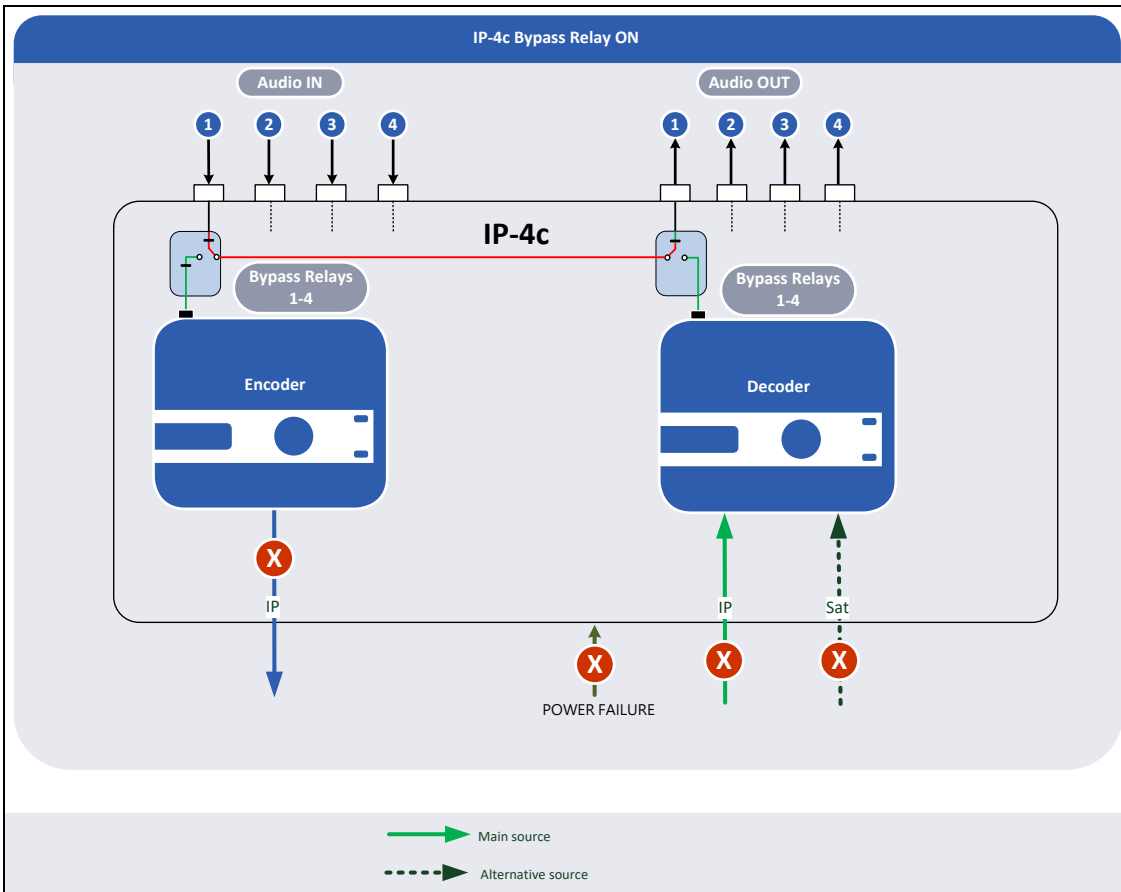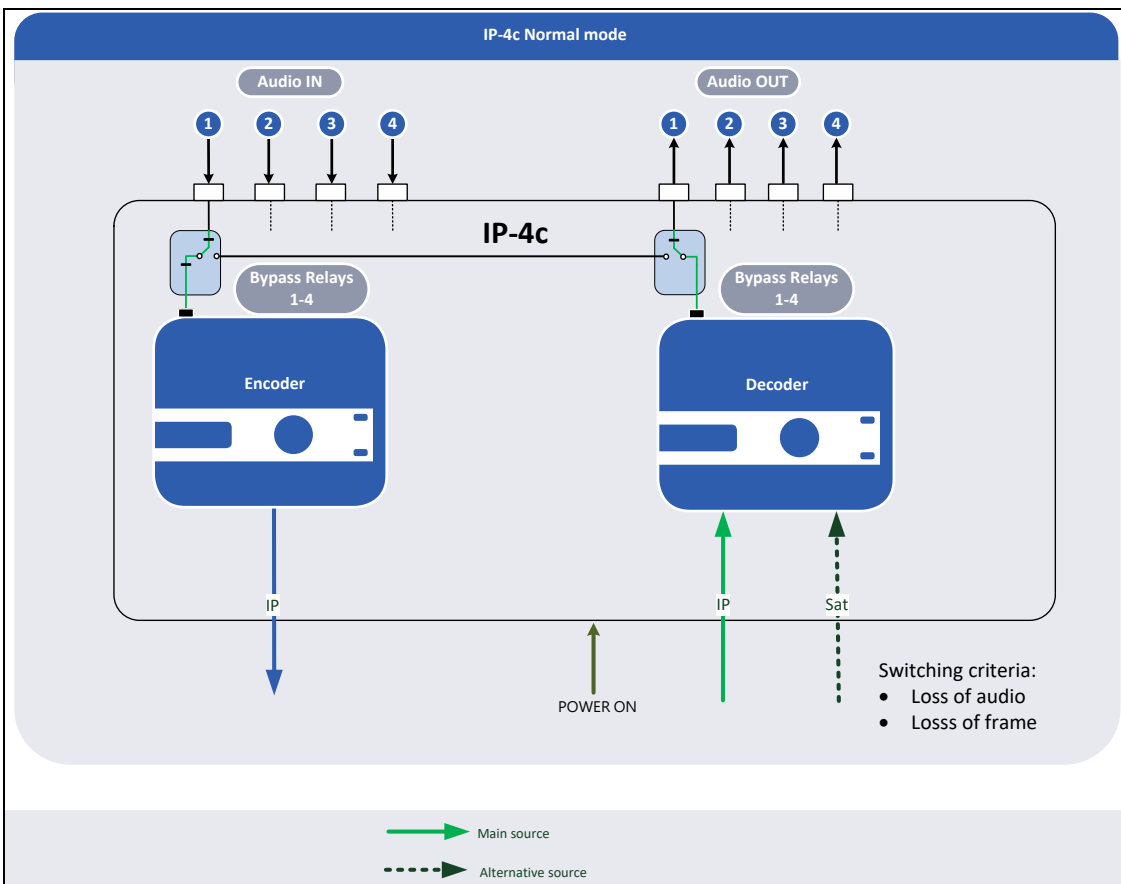| NOTICE	
	If the IP-4c boots up incorrectly after voltage recovery, the relay will not switch back.
	To get to normal mode, restart the device.

Figure 60: Bypass relay and power failure.

Figure 61: Normal mode after the voltage recovery and correct reboot.

15. Handling of AES67

The encoder can generate and the decoder can receive elementary streams. If the output streams should be compatible with Dante, RAVENNA etc., use AES67 in the IP-4c.

There is no automatic integration of AES67 streams into Dante systems. You have to add separate configuration profiles for the encoder and the decoder.

15.1. Generate AES67 Stream

To generate AES67 streams, use PCM for encoder format and make the following configurations for the codec settings in the web interface:

1. Create a profile under **Codec Settings→Codec** with the following parameters (see section 12.1 "Preset Codec Profiles" on page 40):

   NOTE: Set <u>exactly</u> the same values as listed here.

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

   The remaining parameters can be configured with other values, e.g. "1 ms" for "frame size".
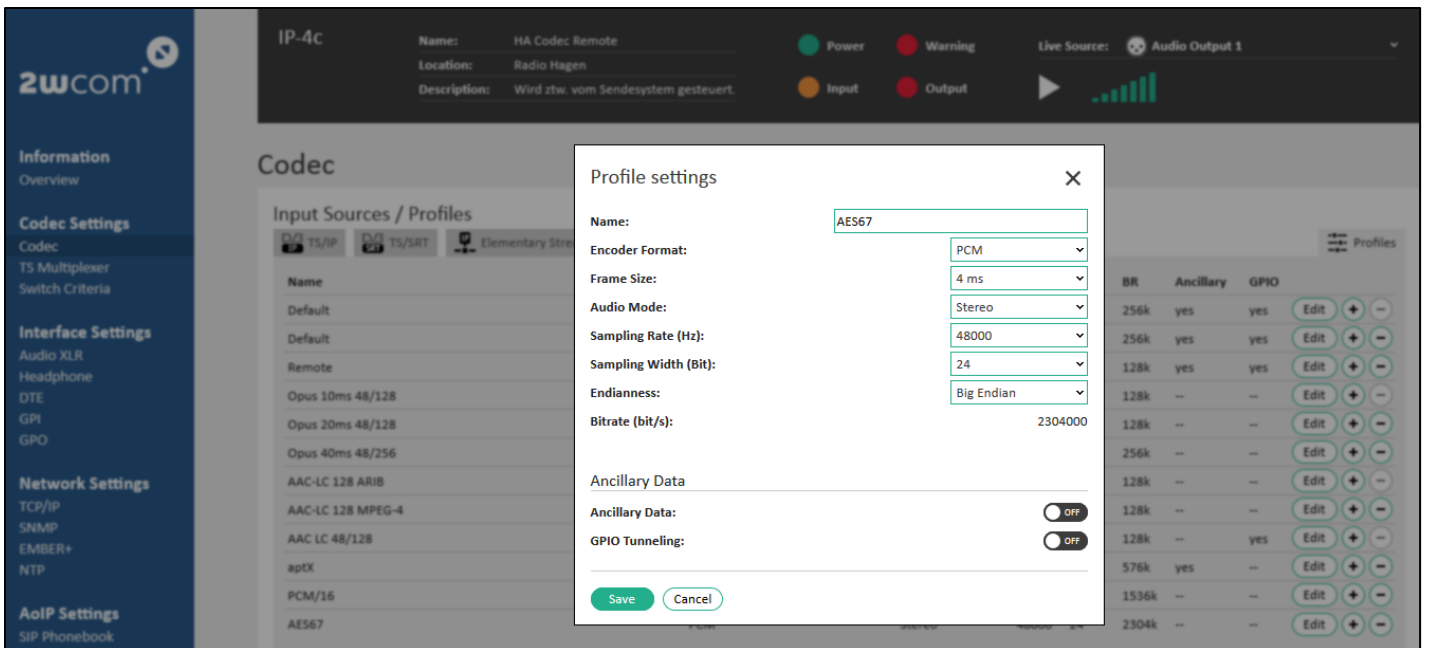

Figure 62: Profile Configuration for the AES67 Stream

2. Assign the coder profile configured for AES67 to an encoder as described in Section 12.2 "Assign Input Source/Codec Profile" on page 41.

   NOTE: You can drag and drop the coder profile directly to the encoder (see red frames in Figure 63).
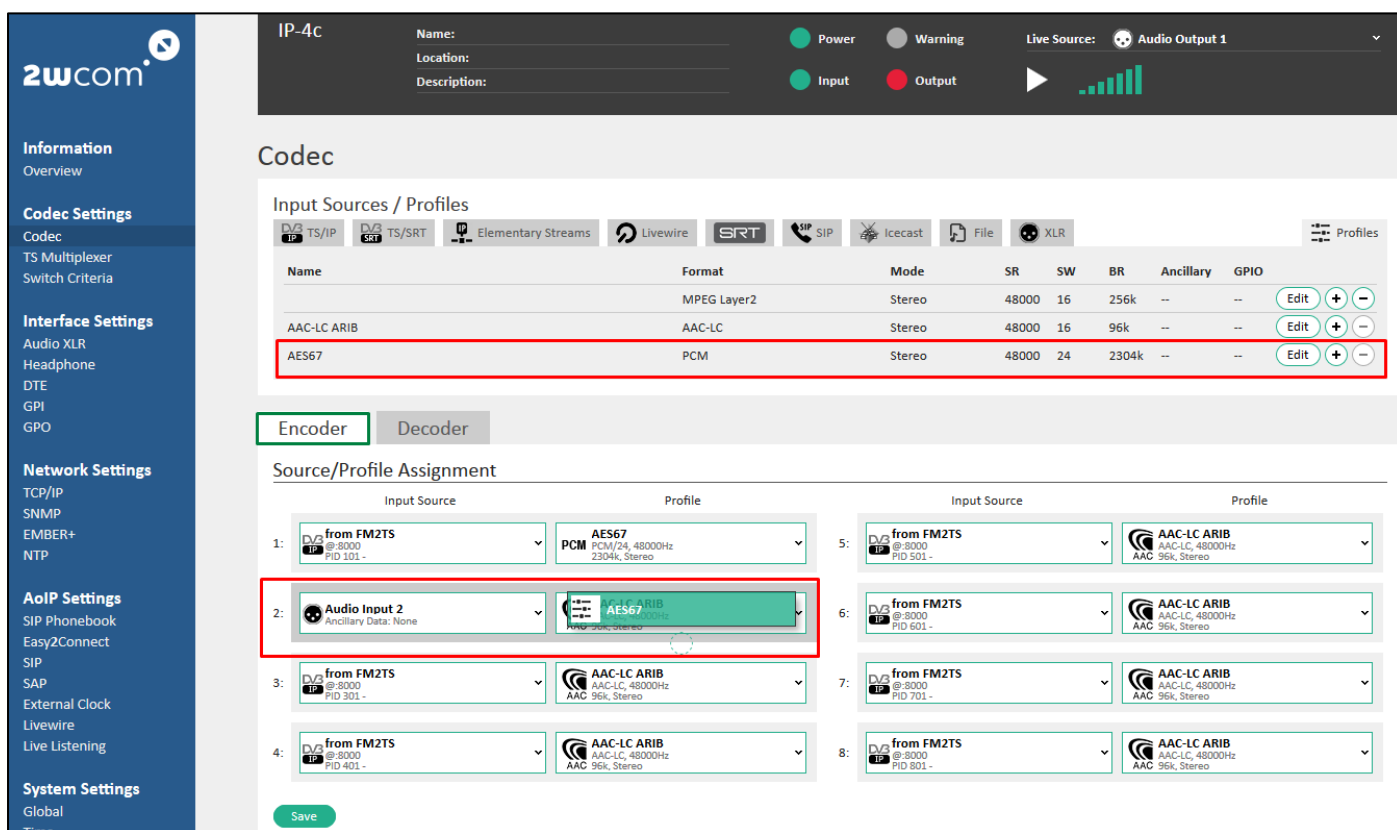

Figure 63: Encoder Input and Coder Profile Setup for AES67

3. Click the "Save" button to save the settings.

4. Configure the encoder outputs as described in section 12.3 "Set up Encoder Outputs" on page 43.

15.2. Receive and decode AES67 Streams

To receive and to decode AES67/Dante streams, make the following configurations for the decoder:

1. To receive AES67/Dante streams, create and configure corresponding presets for input source "Elementary Stream" under **Codec Settings→Codec** as described in section 11.3 "Presets for Elementary Stream" on page 32.

2. If RAVENNA streams are available in the input stream, you can copy and save the settings of this stream as a preset for Elementary Stream for the decoder.

   NOTE: Consider the default settings for SAP (**AoIP Settings→SAP**): SAP must be set into the "Client/Server" mode and use the right receive address and port (RAVENNA is using 239.255.255.255 for SAP announcements, see Figure 85: SAP Settings on page 99).

   a) Choose a RAVENNA stream in the "available streams" menu (see red frame in Figure 64).

   b) Click "copy/use selected stream settings" to apply the stream settings to the input source preset (see green frame in Figure 65).

   c) If no RAVENNA streams are available, configure the input source settings manually.
      NOTE: Set the correct multicast address and port (normally 5004).

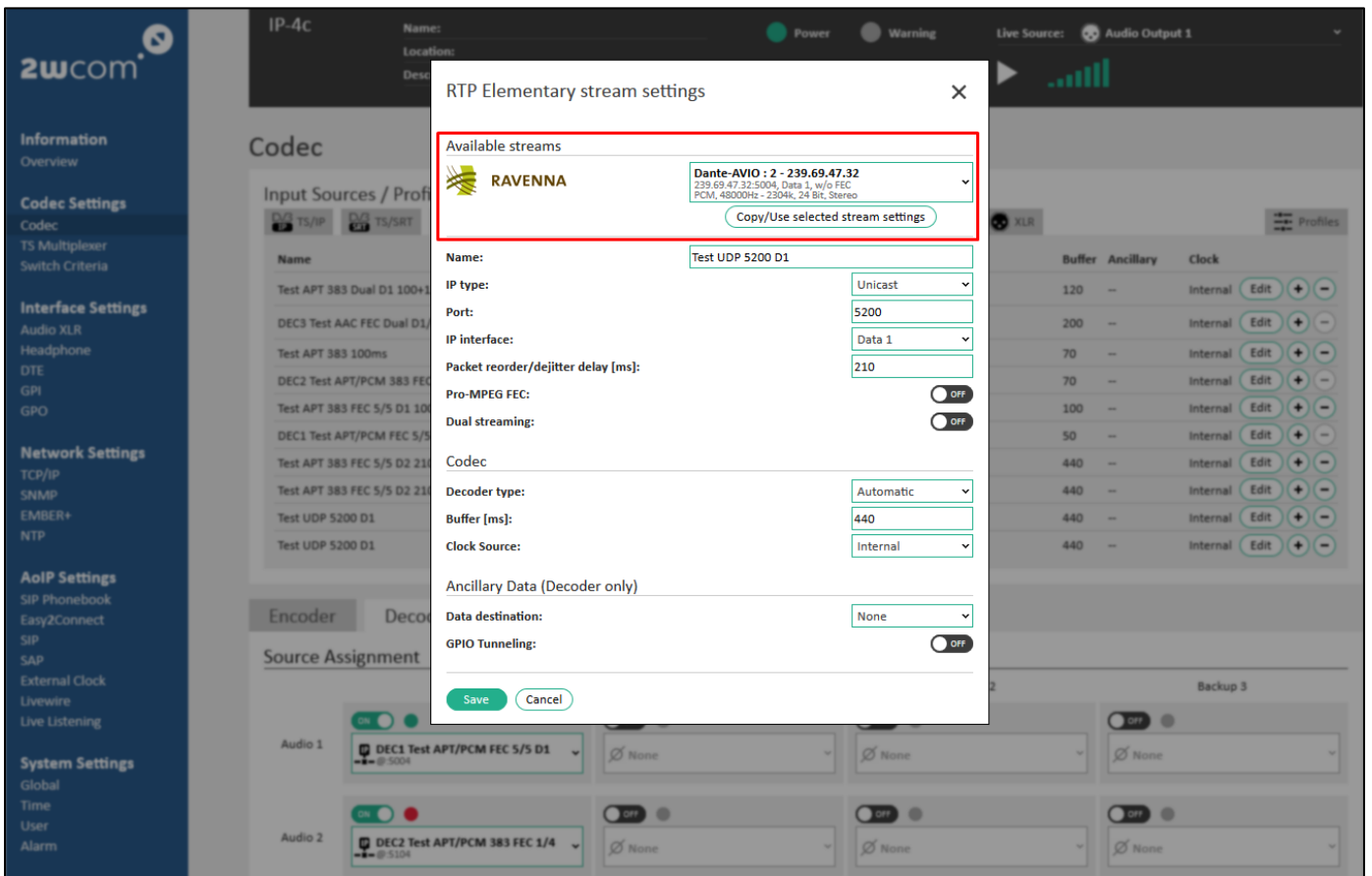   d) Click the "Save" button to save the settings.
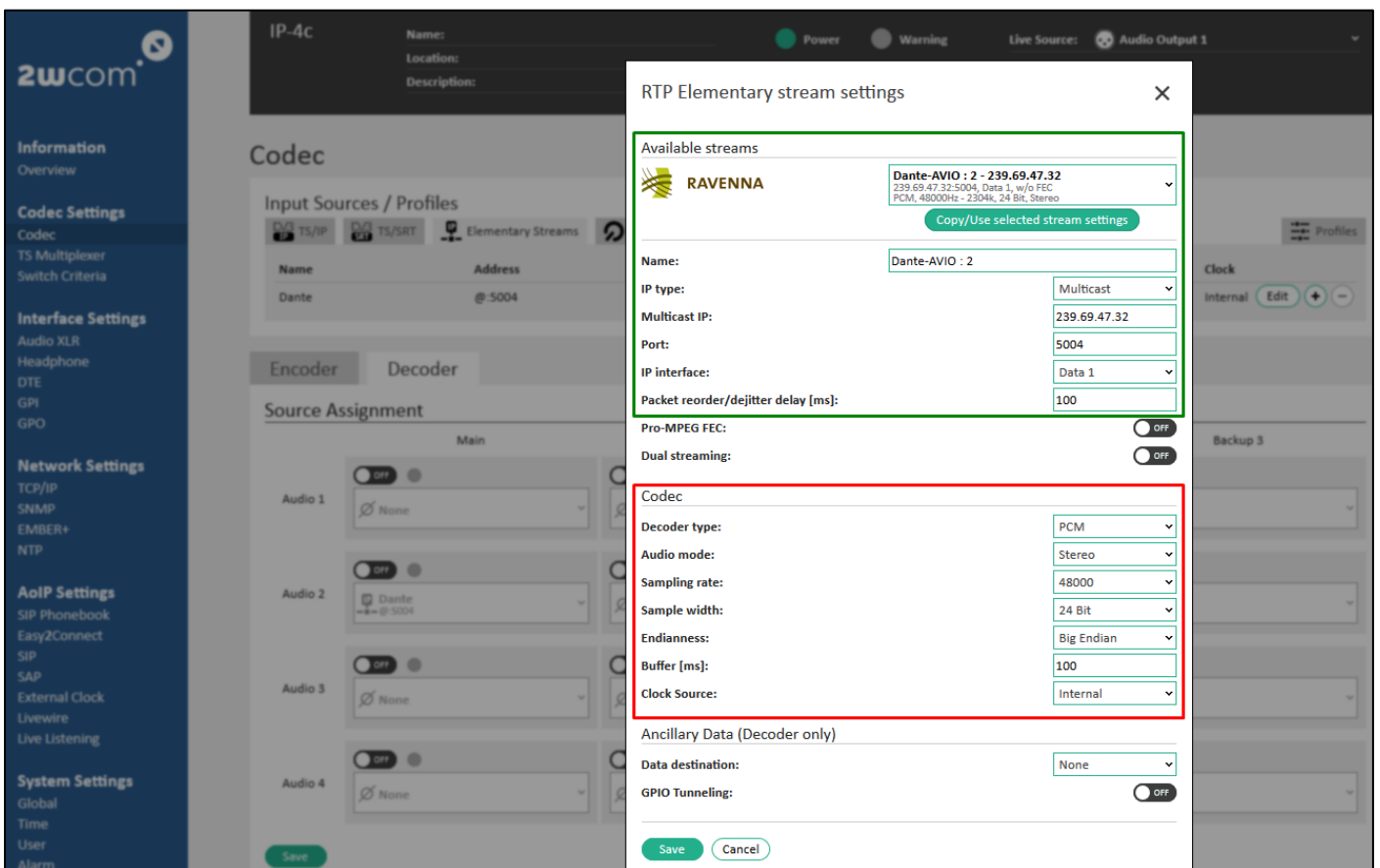
Figure 64: Input Source Settings for Elementary Streams

Figure 65: Copied RAVENNA Input Stream Settings and Decoder Configuration

3. In the "Codec" block set PCM for decoder type and make the following configuration for the decoder (see red frame in Figure 65) :

    NOTE: Set <u>exactly</u> the same values as listed here.

Decoder type:	**PCM**
Audio mode:	**Stereo**
Sampling rate:	**48 kHz**
Sampling width:	**24 Bit**
Endianness:	**Big Endian**

    The remaining parameters can be configured with other values.

4. Assign the corresponding Input Source configured for AES67 to a decoder as described in Section 13.1 "Assign and Activate Source Streams" on page 63.

    NOTE: You can drag and drop the "Input Sources" presets directly to the decoder (see red frames in Figure 66).
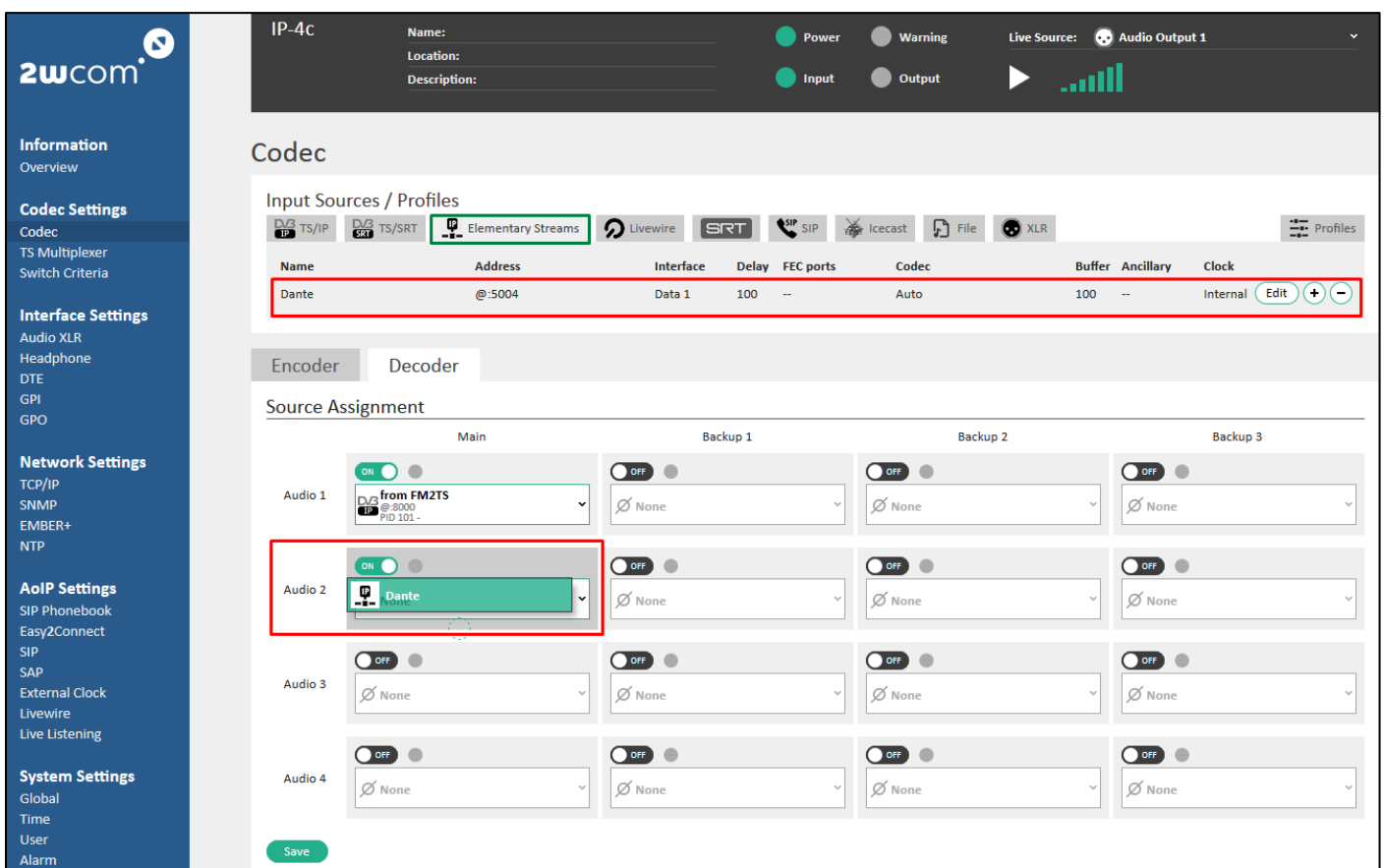

Figure 66: Decoder Input Setup for AES67/Dante Stream

5. Click the "Save" button to save the settings.

    ⟹ The IP-4c is now decoding digital/analog audio from the AES67 input stream.

16. Interface Settings

16.1. Audio XLR

You can use the intergraded XLR interfaces as audio inputs for encoder and decoder. The IP-4c is equipped with 4 digital **or** 2 analog/digital audio inputs and outputs (channels).

16.1.1. Set up Input and Output Gain

If you operate the device as an encoder or/and as a decoder you can set up the level for digital/analog inputs and for digital/analog outputs.

> To set up the level for audio inputs and outputs, follow steps below:

1. Select **Interface Settings→Audio XLR** (see Figure 68).

2. For each audio input and output select the type of audio interface: Analog or Digital (if available).

   NOTE: If you activate 4 channels, no analog audio input option is available

3. Set the gain for analog/digital audio inputs and outputs: -9.0 dB – 6.0 dB

4. Click the "Save" button to save the settings.

16.1.2. SRC Bypass

The IP-4c is equipped with an internal sample rate converter that converts stereo audio from one sample frequency to another. The IP-4c sample rate converter allows different rates ranging from 1:7.5 (down) to 8:1 (up) at the digital AES/EBU inputs/outputs (16kHz, 24kHz, 32kHz, 44.1kHz and 48kHz are now supported).

- Sample processing <u>with</u> 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 an exact sampling rate for the output, which the user has configured in the web interface (see section 12.1 "Preset Codec Profiles" on page 40).
    - If the user has configured 48 kHz in the encoder, the sample rate converter generates the same frequency of 48 kHz in the output of the decoder.
    - In the input of the SRC the jitter of sampling rate is being converted into a constant determined sampling rate for the output.
- Sample processing <u>without</u> enabled "Sample Rate Converter":
    - The IP-4c transports the decoded audio samples (PCM) <u>without</u> converting the sample rate <u>directly</u> to the output interface.

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 "Sample Rate Converter" is <u>activated</u>.

The sample rate of the decoder follows the sample rate of the encoder by using a PLL. The PLL is a software block in the decoder that determines the encoder speed. It does that by evaluating the Speed/Timing Interval of the incoming IP Packets matching against the resulting buffer level. The PLL has some phases. At startup the control has an init phase until the encoder speed is found. Here the sampling frequency can vary up to +/- 20ns according to the AES/EBU standard. After the init phase the PLL is locked and does only vary less.

NOTE that the configured sample rate and sample width must be correct and correspond to the real values of the signal.

> To generate a constant determined sampling rate for digital AES/EBU inputs/outputs, follow steps below:

1. Select **Interface Settings→Audio XLR** in the web interface of the IP-4c (see Figure 67).

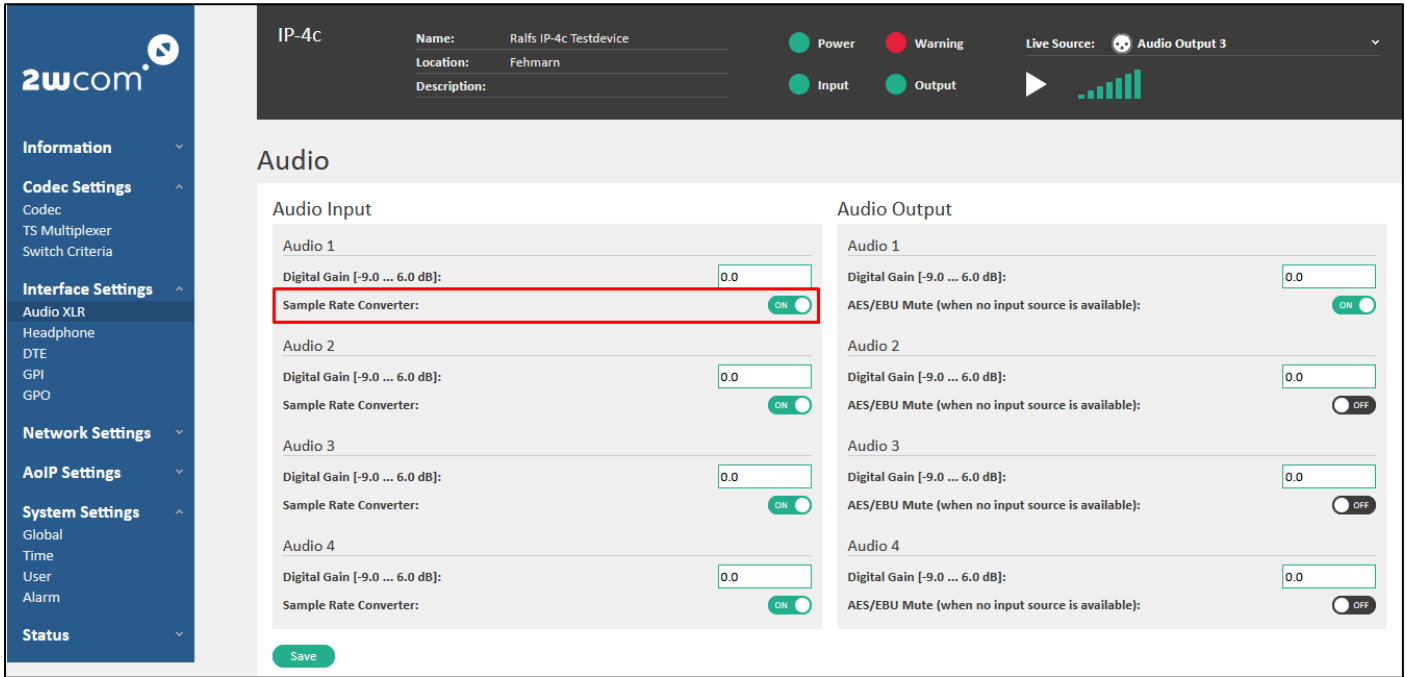*Figure 67: Interface settings – Audio XLR (> 1.26 App version)*

2. Activate "Sample Rate Converter" by selecting "ON" in the corresponding virtual switch for available digital audio inputs and outputs.

3. Click the "Save" button to save the settings.

⇒ The sample rate converter generates an exact sampling rate in the input/output audio, which the user has configured in the web interface.

NOTE: "Sample Rate Converter" switched off corresponds to the activated "Transparent Mode" in the MM01 devices and to the activated "SRC Bypass" in earlier IP-4c versions (< 1.26 App version, see Figure 68).
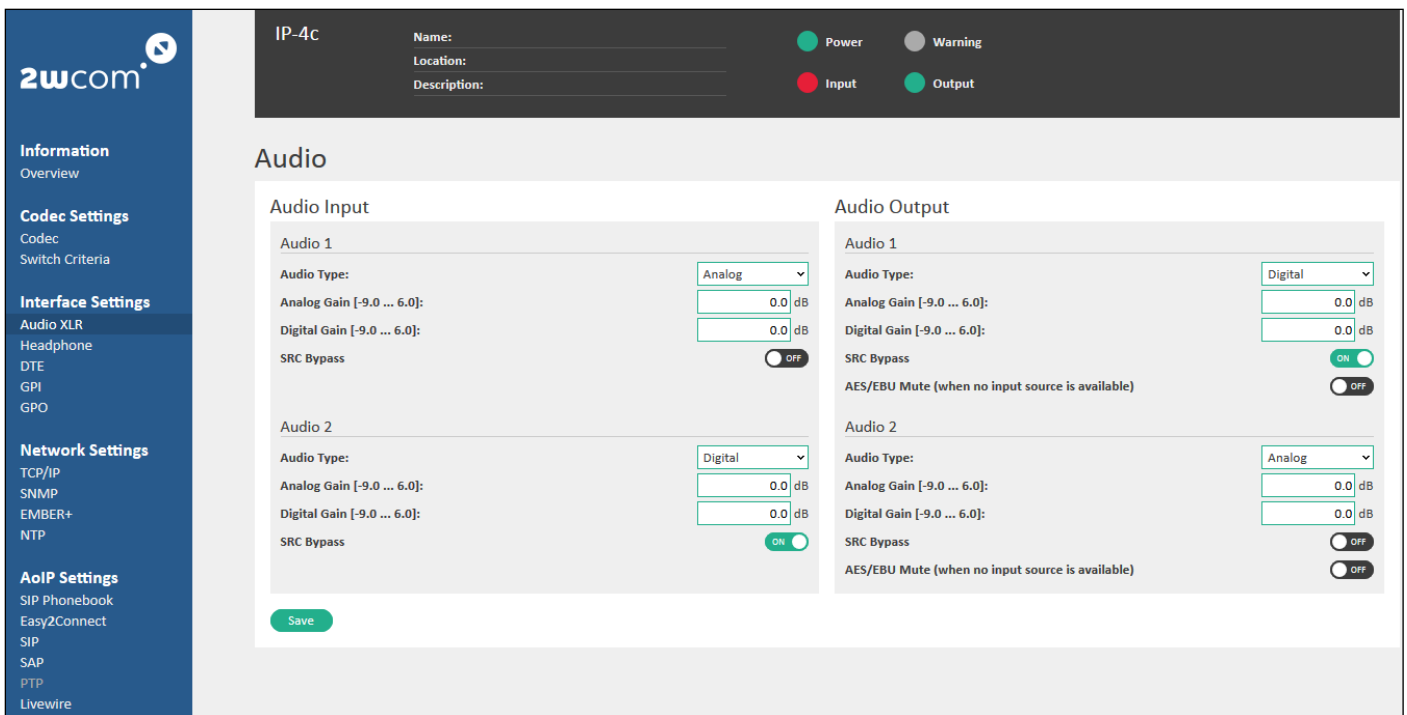

Figure 68: Interface settings - Audio XLR (< 1.26 App version)

16.2. Headphone

If you operate the device as an encoder or decoder you can monitor the audio signal over headphone or set it mute.

To configure the headphone interface, follow the steps below:

1. To monitor the current audio signal over headphone, open the field **Headphone** under **Interface Settings→Headphone** (see Figure 69). Select the audio input or output for monitoring in the "Source" dropdown menu.

2. Set the volume of the headphone output: [-40.0 … 0.0 dB].

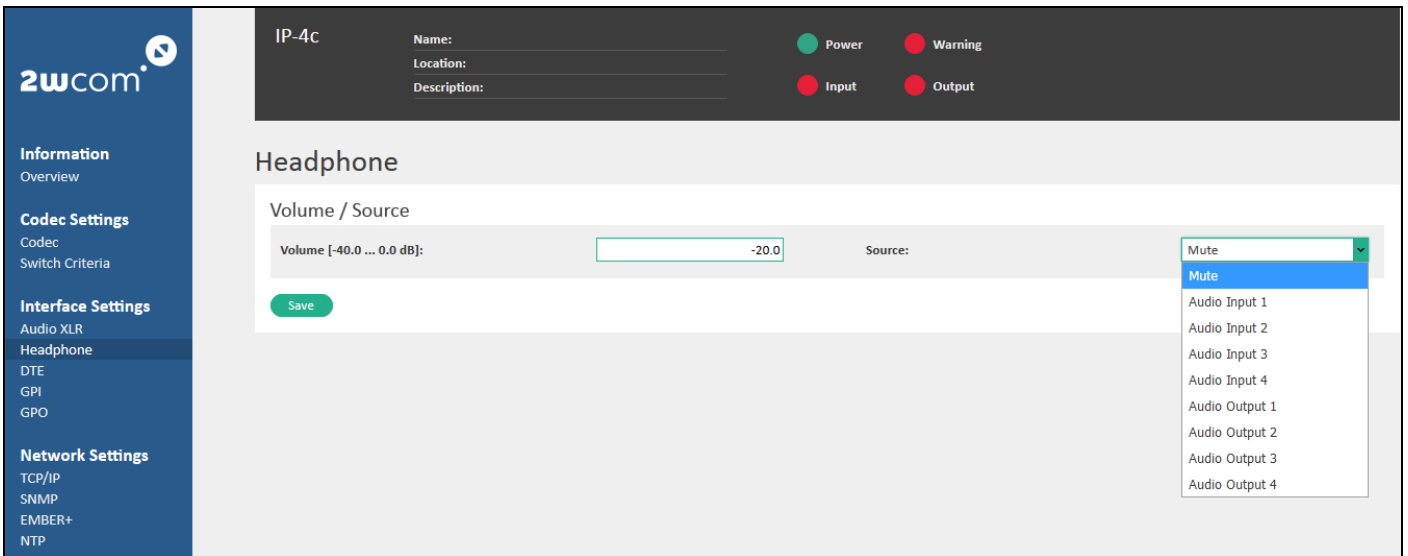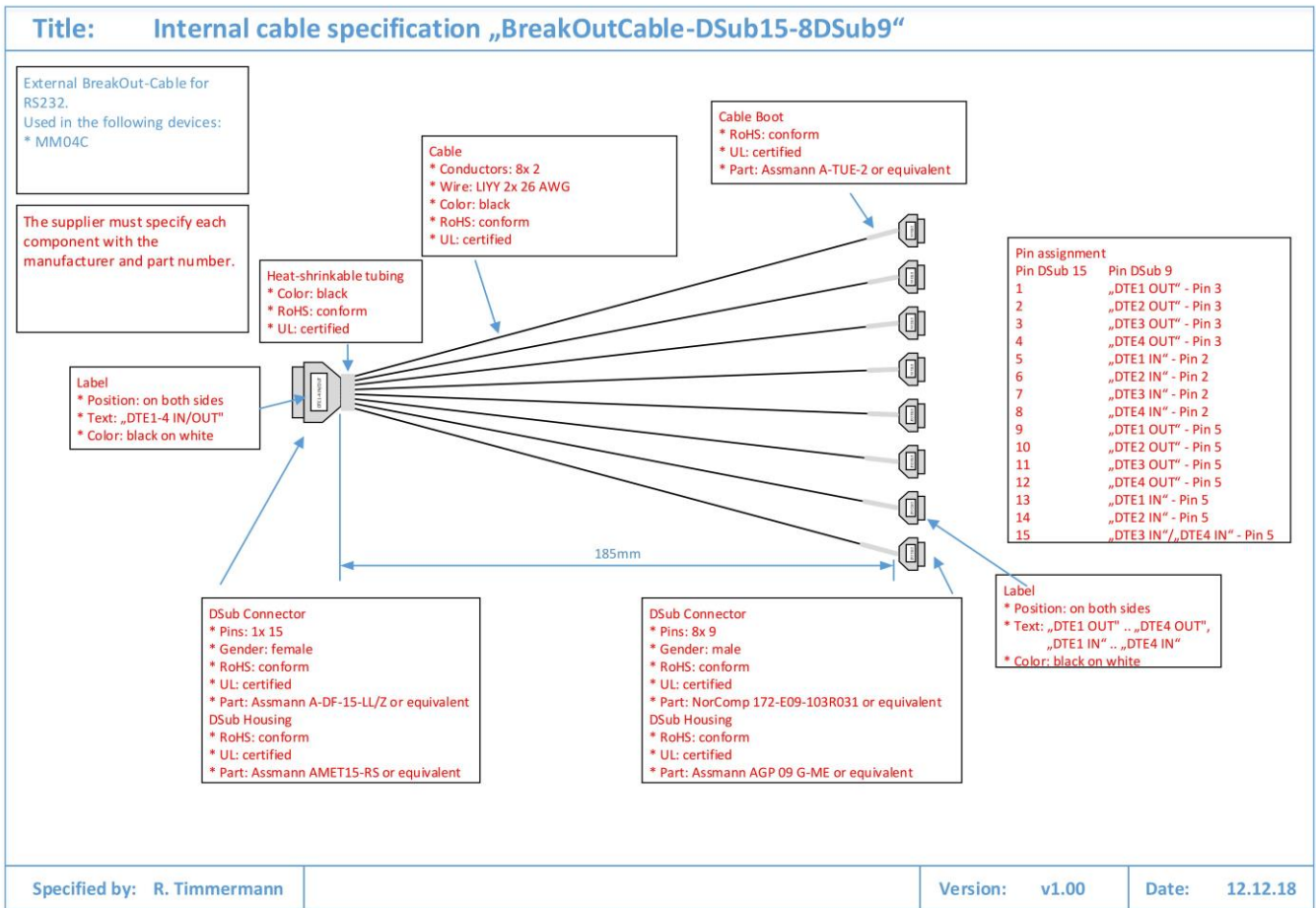3. Click the "Save" button to save the settings.

Figure 69: Headphone interface settings

16.3. DTE

The IP-4c unit is equipped with a 15 pole male D-Sub connector for data communication. To connect the serial interfaces, use the serial breakout cable (optional).

The pin assignment of the DTE interface is defined in the IP-4c as follows:

Title: Internal cable specification „BreakOutCable-DSub15-8DSub9"

External BreakOut-Cable for RS232.
Used in the following devices:
* MM04C

The supplier must specify each component with the manufacturer and part number.

Cable
* Conductors: 8x 2
* Wire: LIYY 2x 26 AWG
* Color: black
* RoHS: conform
* UL: certified

Cable Boot
* RoHS: conform
* UL: certified
* Part: Assmann A-TUE-2 or equivalent

Heat-shrinkable tubing
* Color: black
* RoHS: conform
* UL: certified

Label
* Position: on both sides
* Text: „DTE1-4 IN/OUT"
* Color: black on white

Pin assignment

Pin DSub 15	Pin DSub 9
1	„DTE1 OUT" - Pin 3
2	„DTE2 OUT" - Pin 3
3	„DTE3 OUT" - Pin 3
4	„DTE4 OUT" - Pin 3
5	„DTE1 IN" - Pin 2
6	„DTE2 IN" - Pin 2
7	„DTE3 IN" - Pin 2
8	„DTE4 IN" - Pin 2
9	„DTE1 OUT" - Pin 5
10	„DTE2 OUT" - Pin 5
11	„DTE3 OUT" - Pin 5
12	„DTE4 OUT" - Pin 5
13	„DTE1 IN" - Pin 5
14	„DTE2 IN" - Pin 5
15	„DTE3 IN"/„DTE4 IN" - Pin 5

185mm

DSub Connector
* Pins: 1x 15
* Gender: female
* RoHS: conform
* UL: certified
* Part: Assmann A-DF-15-LL/Z or equivalent
DSub Housing
* RoHS: conform
* UL: certified
* Part: Assmann AMET15-RS or equivalent

DSub Connector
* Pins: 8x 9
* Gender: male
* RoHS: conform
* UL: certified
* Part: NorComp 172-E09-103R031 or equivalent
DSub Housing
* RoHS: conform
* UL: certified
* Part: Assmann AGP 09 G-ME or equivalent

Label
* Position: on both sides
* Text: „DTE1 OUT" .. „DTE4 OUT",
  „DTE1 IN" .. „DTE4 IN"
* Color: black on white

Specified by: R. Timmermann   **Version:** v1.00   **Date:** 12.12.18

You can configure the serial RS-232 interfaces [DTE 1-8] under **Interface Settings→DTE** (see Figure 70).

IP-4c
Name:
Location:
Description:

Power   Warning
Input   Output

Information
Overview

Codec Settings
Codec
Switch Criteria

Interface Settings
Audio XLR
Headphone
DTE
GPI
GPO

Network Settings
TCP/IP
SNMP
EMBER+
NTP

AoIP Settings
SIP Phonebook
Easy2Connect
SIP
SAP
PTP
Livewire

DTE

Input baud rates

DTE 1:	9600
DTE 2:	9600
DTE 3:	9600
DTE 4:	9600

1200
2400
4800
9600
14400
19200
28800
38400
57600
115200

Save

Output baud rates

DTE 1:	9600
DTE 2:	9600
DTE 3:	9600
DTE 4:	9600

Figure 70: Interface Settings for DTE 1-4 outputs and inputs

Configurable settings are the baud rate for DTE 1-4 inputs and outputs.

Possible baud rates: 1200, 2400, 4800, 9600, 14400, 19200, 28800, 38400, 57600 and 115200 baud.

⇒ Save the settings by clicking the „Save" button.
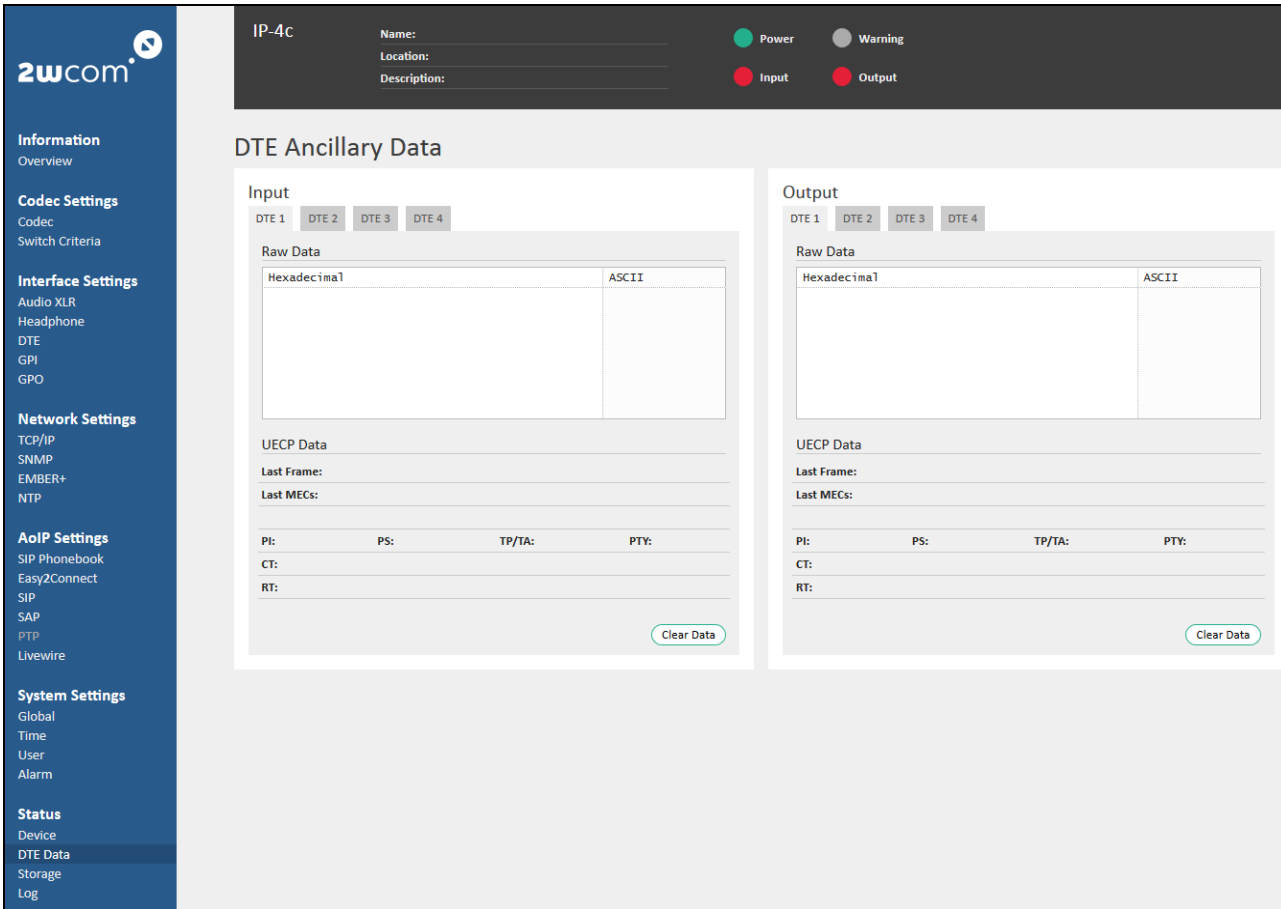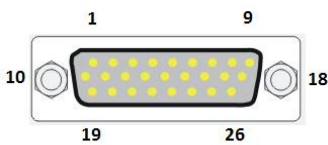⇒ To view the status of the 8 Data Interfaces, open the menu **Status→DTE Data**:

Figure 71: Status of the Data Interfaces

16.4. GPO

The IP-4c unit is equipped with a 26 pole D-sub male connector with 8 floating relay contacts. The relays can be used for alerts of the monitoring function.

GPIO

D-Sub male connector, high density, 26 pole

Table 3 displays the scheme of the possible switch contacts:

Relay/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	RELA7 — RELB7 / RELC7	SPDT	

Table 3: Relay Output – switch contacts

SPST   a simple on-off switch: single pole, single throw
SPDT   single pole, double throw
NO   normally open

NOTICE

	The relay contacts have maximum rating of 0.5 A at 30 V DC.

The IP-4C is equipped with 8 GPO outputs, that you can use for GPIO forwarding or alarm signaling. To set the source of the inputs:

1. Open the menu "GPO" under **Interface Settings→GPO** (see Figure 72.
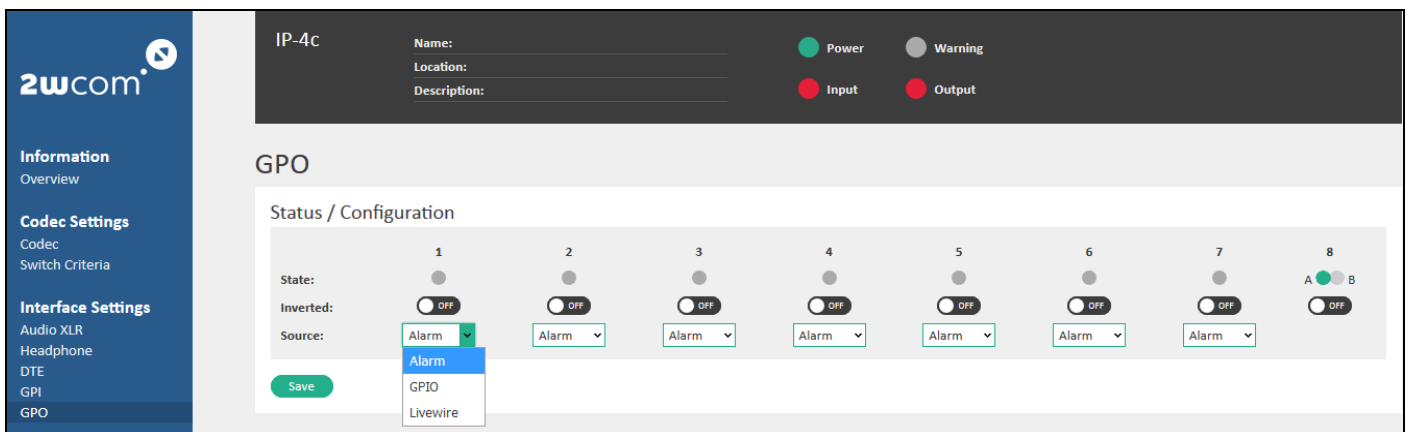
Figure 72: Interface Settings – GPO status

🟢 *- ON*

⚪ *- OFF*

2. Select GPO to enable the control of the relay via GPIO-forwarding over the encoder inputs.

3. Choose the source in the drop down menu for the relays 1-7.

    NOTE: Relays 1-7 are normal switchers, whereas relay 8 is a changeover relay (position A/B). The state of a relay is ON if the alarm, which is assigned to this relay, is triggered (see Table 3 on page 89).

4. Select "Alarm" for the relays that should be used for alarm forwarding.

    NOTE: Under **System Settings→Alarm** you can configure monitoring and alarm functions of some operation processes and use an available GPO for alarm signaling (see section 14 "Monitoring and Alarm Control" on page 72). An example in Figure 73 shows a case of failure, when a triggered alarm activates a configured GPO (in the example GPO4).

5. Select "GPIO" to enable the control of the relay via GPIO-forwarding over the encoder inputs (see section 16.5 "GPI" on page 90).

6. Save the settings by clicking the "Save" button.
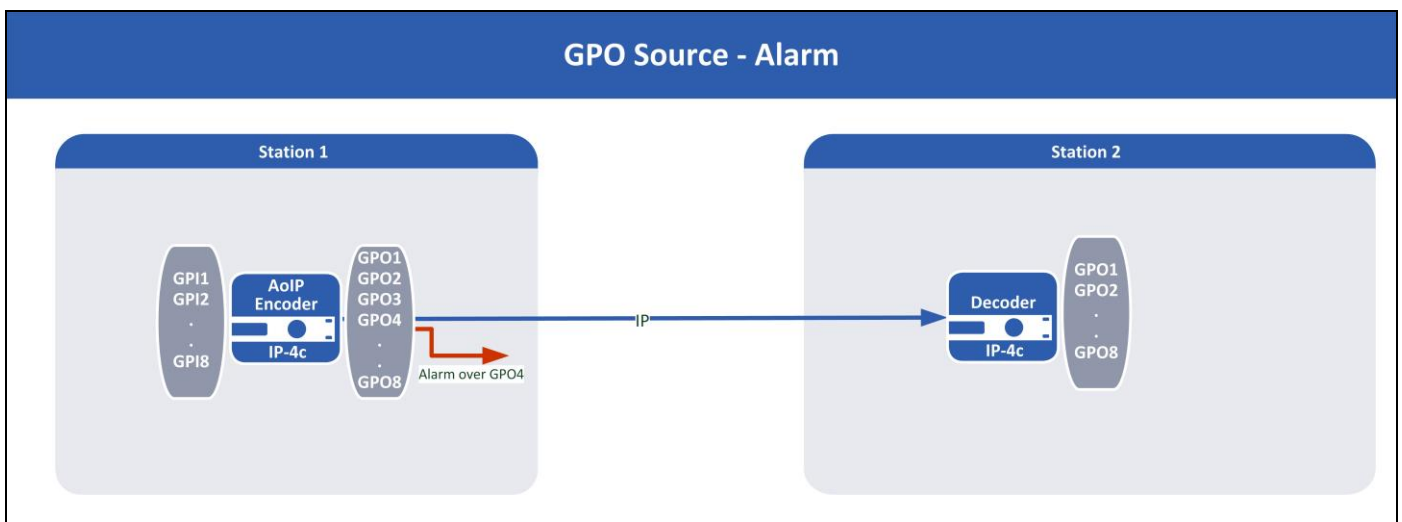
Figure 73: Figure: Alarm trigger over GPO

16.5. GPI

The IP-4c is equipped with 8 GPI inputs, housed in the same D-Sub connector as the GPOs.
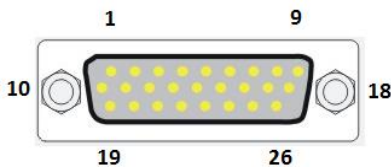
D-Sub male connector, high density, 26 pole

GPIO

Table 4 displays the scheme of the pin assignment in the GPI contacts:

GPI No.	Control Pin No.	
1	IN0	

2	IN1	
3	IN2	
4	IN3	
5	IN4	
6	IN5	
7	IN6	
8	IN7	
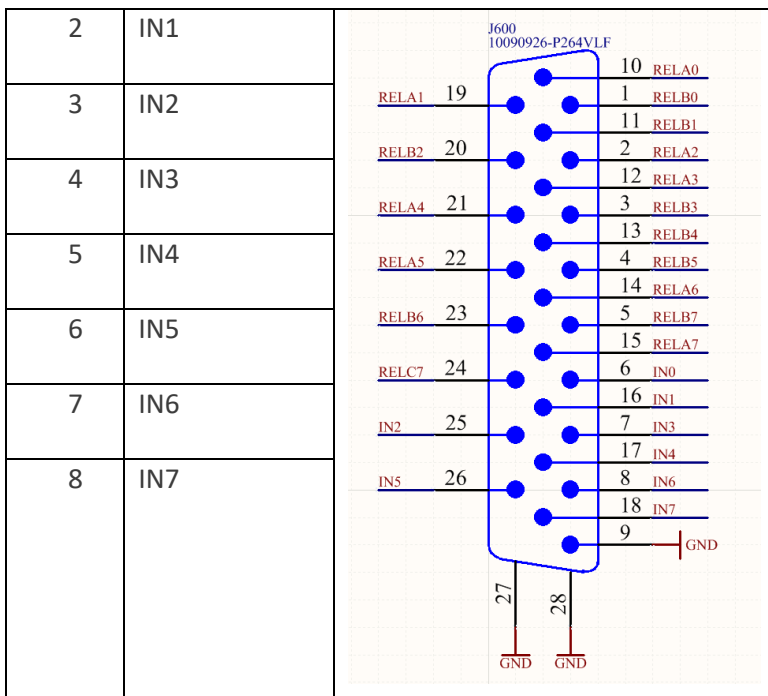
Table 4: GPI – Pin assignment

To actuate a GPI, pull the corresponding control pin electrically to ground (pin 9). The resulting control current is less than 5 mA.

NOTICE

	Voltage on inputs must not be negative or exceeding +0.7 V!

You can view the current state of the inputs under **Interface Settings→GPI** (see Figure 74).

Figure 74: Interface Settings – GPI

● - ON

● - OFF

GPIO Tunneling

If you enable "GPIO tunneling" mode in the input streams under **Codec Settings→Codec** (see section 11 "Preset Input Sources" on page 28), an actuation of a GPI at the encoder activates a corresponding GPO in the destination device for example for relay switch (GPI1→GPO1, GPI2→GP02,… as shown in Figure 75).
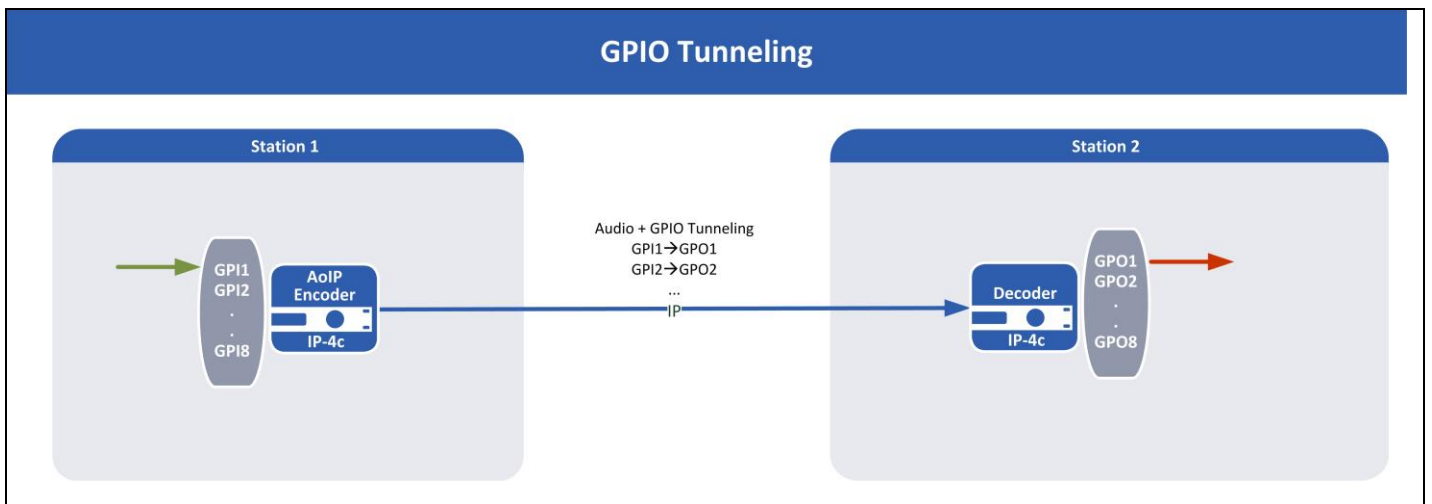
Figure 75: Figure GPIO Tunneling

16.6. ASI Output

The IP-4c can be optionally equipped with an ASI interface (BNC 75 Ω) for TS output.

To set up ASI output, follow steps below:

1. Select **Interface Settings➔ASI Output** (see Figure 76).
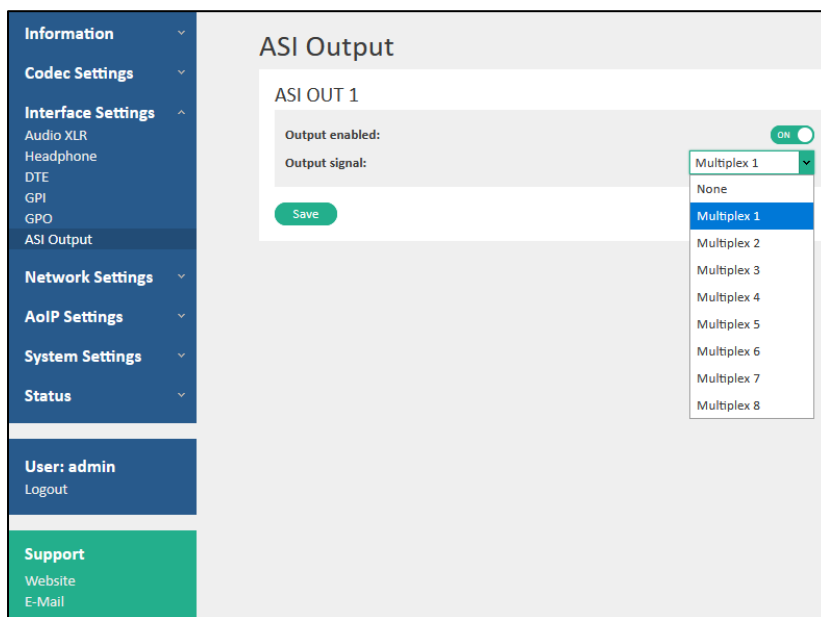
Figure 76: ASI Output Settings

2. Activate an ASI Output by selecting "ON" in the corresponding virtual switch "Output enabled".
   NOTE: Alternatively, you can activate ASI output under **Codec Settings➔TS Multiplexer** in the "Multiplexer Outputs" block (tab "ASI Output").

3. In the dropdown menu "Output signal" assign to each output one preset for transport stream Multiplex 1-8 that should be sent over ASI output (more information about TS Multiplex configuration see section 12.3.1 "Output TS Multiplexer" on page 44).

4. Save the changes after each configuration by clicking "Save".

17. Audio over IP Settings

17.1. Set up SIP Configuration

The IP-4c supports Audio IP streaming using SIP (Session Initiation Protocol).

> **(!)** **NOTE:** The option "IP streaming over SIP" is only available, if the right "EBU Tech 3326" is activated.

You can use SIP connection for the Encoder output and Decoder input directly over the Data 1/2 interfaces or over server (registrar). For direct SIP connection no registrar entry is necessary.

17.1.1. Prepare the SIP connection

Prepare and establish the first SIP connection with your device as follows:

1. Define presets of your device for SIP connection. For more details about configuration of the presets for SIP input sources of your device see section 11.6 "Presets for SIP" on page 36.

Figure 77: SIP Profiles as input sources

2. Preset codec profiles that should be sent from the encoder and to the decoder (see section 12.2 "Assign Input Source/Codec Profile" on page 41).

3. Assign the "SIP presets" to the "Audio Outputs 1-4" in the decoder by using the drop menu or dragging the preset to the corresponding field (see section 13.1 "Assign and Activate Source Streams" on page 63).

> **(!)** **NOTE:** As soon as a SIP preset is assigned to one of the audio outputs (Decoder), the device is reachable for calls.

4. Configure the local SIP port for the IP-4c under **AoIP Settings→SIP** (see *Figure 78*). Set "zero" for direct SIP-connection.

Figure 78: Audio over IP Settings – local SIP port configuration

NOTE: The IP-4c is compliant with the mandatory directives N/ACIP EBU Tech 3326.

5.   Click the "Save" button to save the changes.

17.1.2.   Create new SIP Phonebook Entries

You can preconfigure up to 60 entries in the SIP phonebook.

Create and configure new contacts in the SIP phonebook as follows:

1.   Open the menu **AoIP Settings**➔**SIP Phonebook** (see Figure 79).
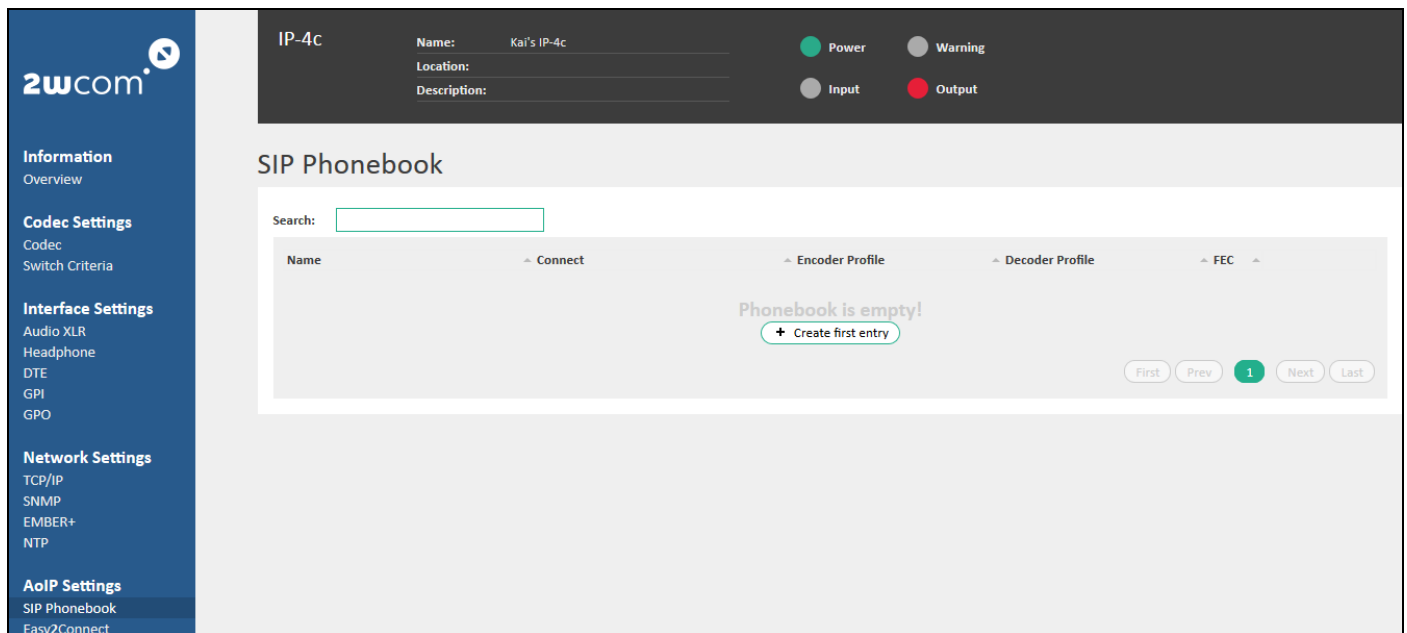
Figure 79: Preconfiguration of SIP contacts

2.   For the first contact entry click the button "Create first entry".

3.   Click the "Edit" button to configure a new SIP contact. The window "SIP Contact settings" appears:
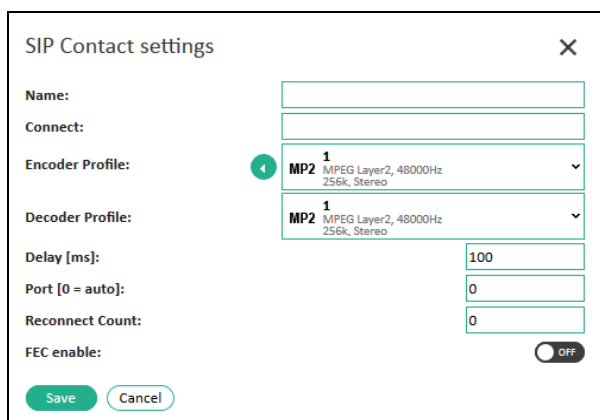
Figure 80: SIP Phonebook – Contact settings

4.   Define the name of the contact in the "Name" field.

5. Enter Username/Address of the connecting device (registered second user agent) in the "Connect" field.

> **NOTE:**
>
> For direct connections to different SIP ports add ":" and the corresponding SIP destination port.

6. Click the "Save" button to save the new entry in the SIP Phonebook.

17.1.3. Assign the Codec Profiles to the SIP Contacts

To each entry in the SIP phonebook you can assign the preconfigured codec profiles for encoder/decoder and specify other options for connection:

1. To configure a SIP Phonebook entry open the "SIP Contact settings" menu under **AoIP Settings→SIP Phonebook** by clicking the corresponding "Edit" button.
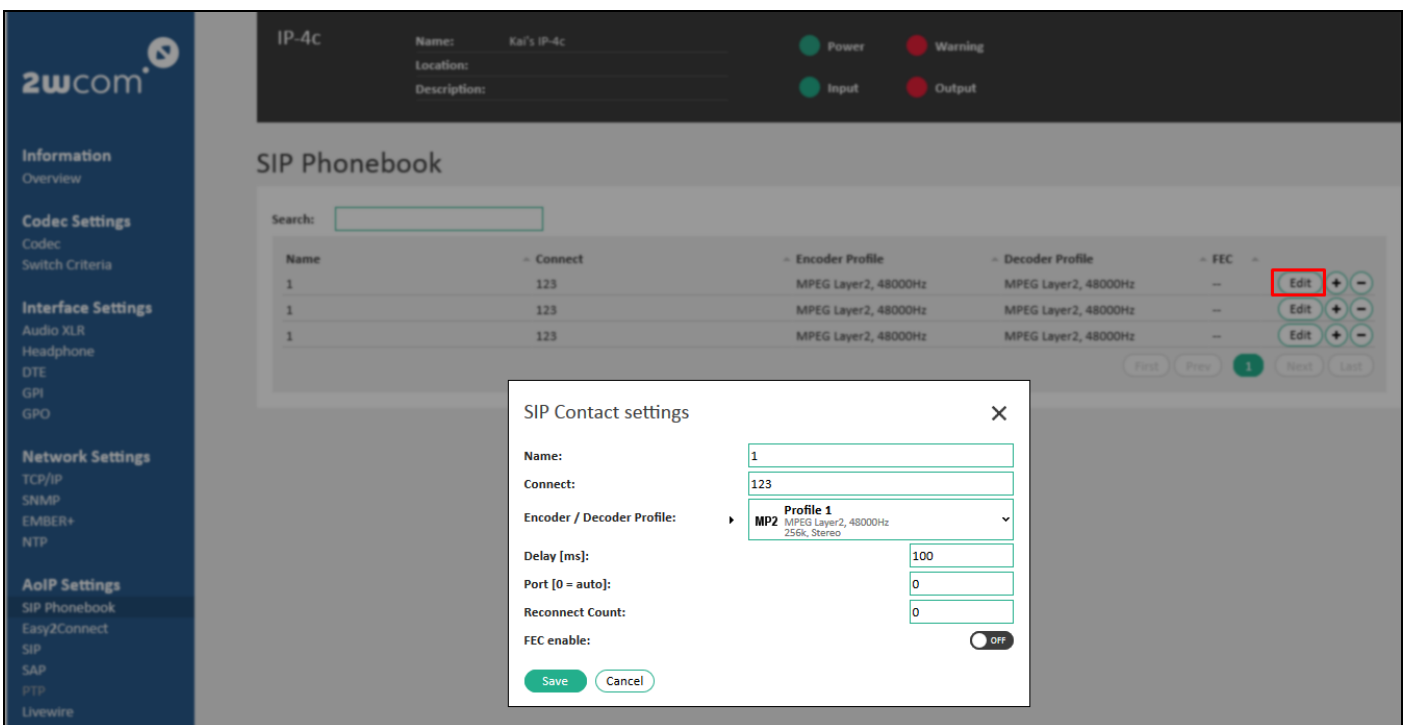
Figure 81: SIP Phonebook - Edit SIP Contacts

2. Enter the following data in the fields of the configuration of the SIP Audio Stream for the chosen contact:

> **NOTE:**
>
> – "Profile Encoder" defines the audio format that the IP-4c (encoder) should send;
>
> – "Profile Decoder" defines the audio format that the external encoder device should send.

Delay:	Set up the send delay time in ms, which the encoder should wait in order to send Audio over IP (SIP). For more information see section 13.5 "Set up Buffer" on page 67.

Port:	Applicable only if you connect a remote encoder directly via the IP address. Enter the UDP/RTP port of the sender/destination. Enter "zero" for automatic port.
FEC:	Enable by selecting "ON" in the virtual switch (see section 13.2 "Set up FEC for Decoder" on page 65).

3. Click the "Save" button to save the changes.

17.1.4. Establish Connection via SIP Dial (Easy2Connect)

✓ You have already assigned and activated presets for SIP input sources to decoder audio outputs (see section 13.1 "Assign and Activate Source Streams" on page 63)
✓ You have already defined SIP contacts (see section 17.1.2 "Create new SIP Phonebook Entries" on page 94).
✓ You have already assigned the codec profiles to the SIP phonebook entries for encoder and decoder (see Figure 82).
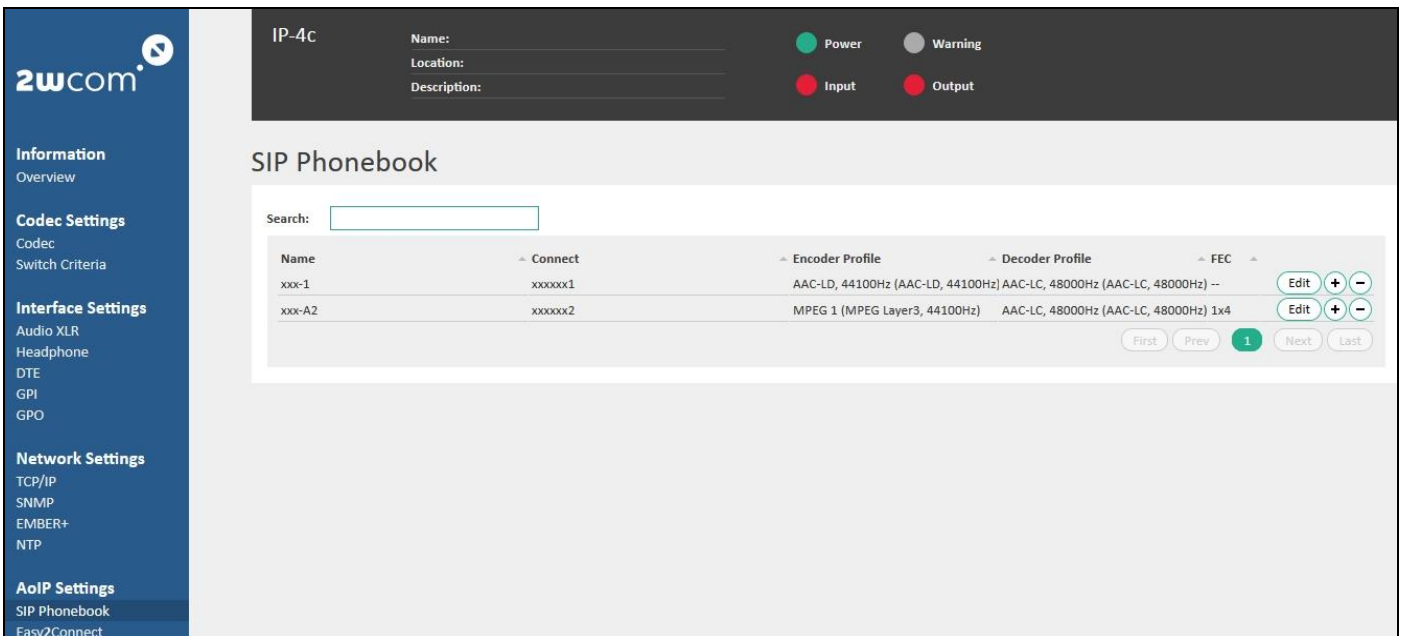
Figure 82: Configured SIP contacts for encoder and decoder

To establish the connection and to start data transmission:

1. Select **AoIP Settings→Easy2Connect** in the web interface. The page "Overview/Easy2Connect (SIP)" appears:
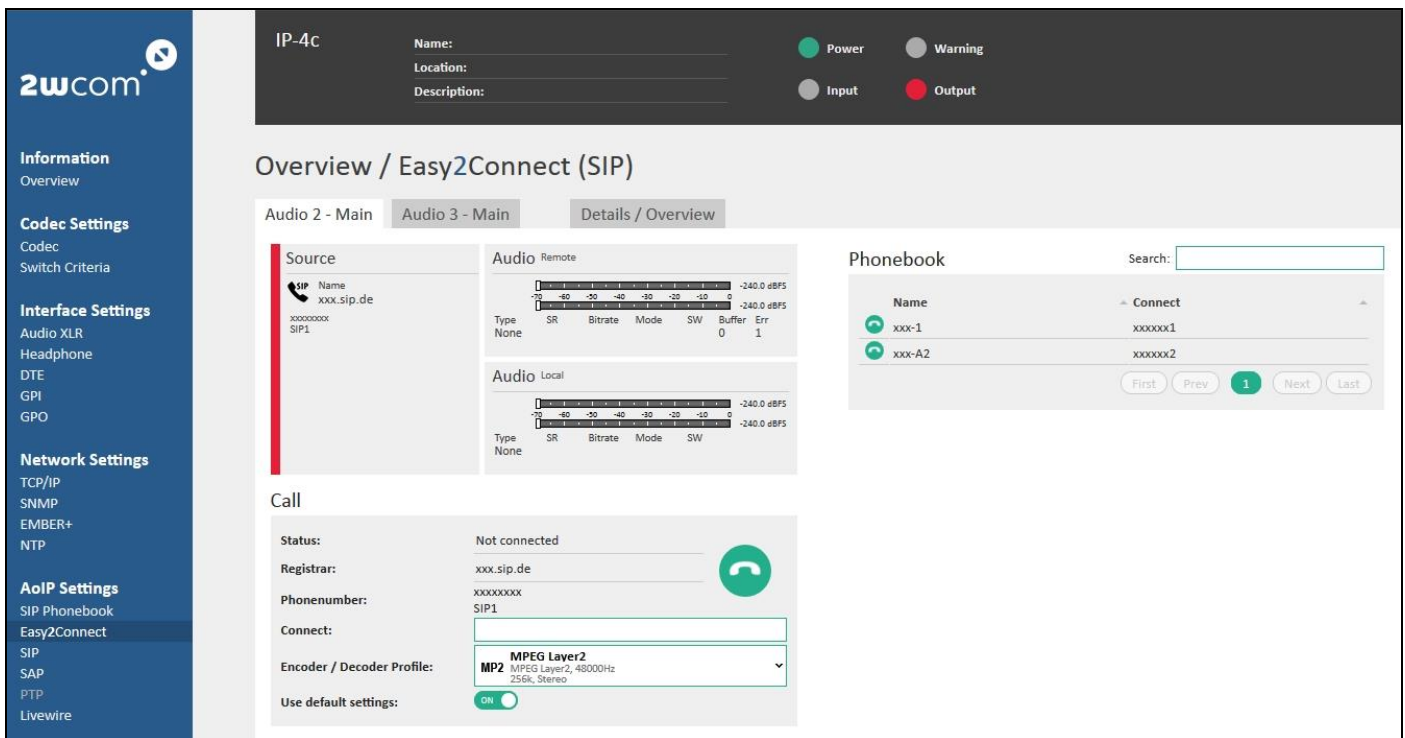
Figure 83: SIP Dial Easy2Connect – connection and data transfer

2. In the "Phonebook" block you can see the contacts configured in section 17.1.2 "Create new SIP Phonebook Entries" on page 94. Select a SIP contact entry for data transfer and click the green icon near the entry.

    ⇒ The selected contact appears in the "Call" block and is now ready for connection.

3. Click the green icon in the "Call" block to establish the connection.

4. To hang up the connection click the red icon in the "Call" block.

5. For a **quick dial** change the encoder configuration manually in the "Encoder/Decoder" block and enter the dial number directly into the "Connect" field. For manual access to the connection settings for decoder, deactivate the virtual switch "Use default settings":
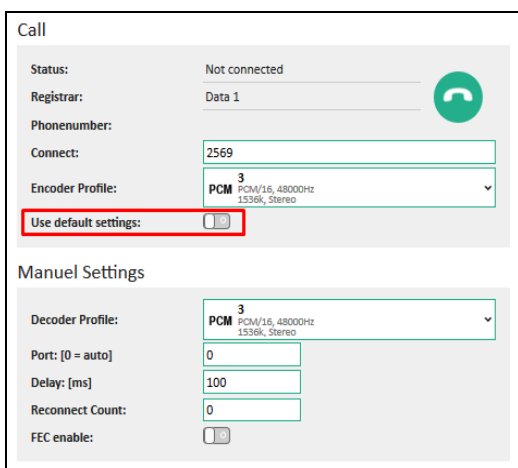
6. In the "Details/Overview" tab in the same menu you can see the details of the activated SIP connections for decoder and of the current data transfer (see Figure 84):
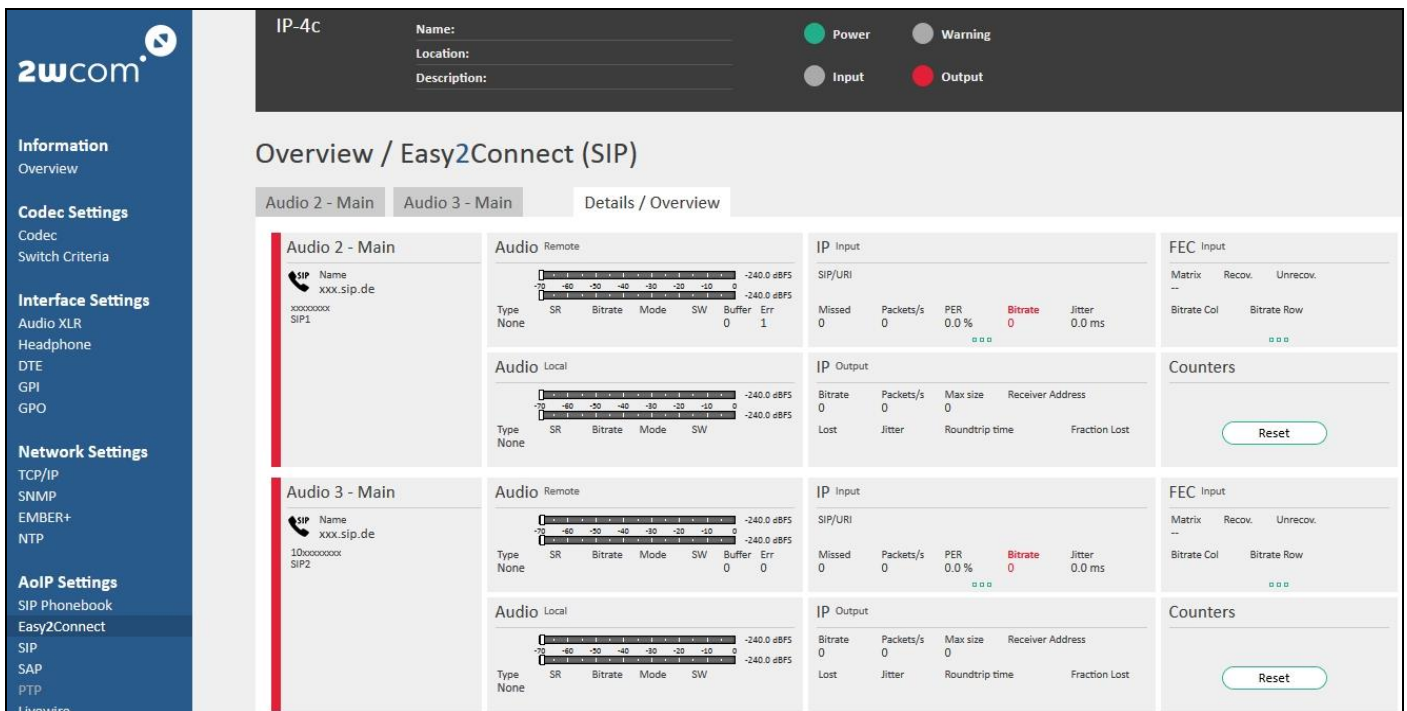
Figure 84: Overview – Details of the configured SIP connections and current data transfer
The status color means:
green   - the SIP connection is active
red   - the SIP connection is not active; SIP registration has failed
orange   - the SIP connection is not active; SIP registration is successful

7. In the corresponding SIP connection "Overview" block you can see the details of all configured SIP connections and the status of the encoded and decoded audio streams.

8. To see all details click the ___ symbol.

9. To rest the counters click the „Reset" button.

17.2. Set up SAP Service

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

To set up the SAP connection, you need administrator rights.

Log in to the "admin" account and open the menu "Session Announcement Protocol (SAP)" under
AoIP Settings→SAP (see Figure 85).

Enter the following data in the fields of the configuration of the SAP:

Mode:	To activate SAP, select mode: "Client", "Sever" or "Client/Server" in the dropdown list. "Client/Server" mode is recommended.
Announce interval:	Set up the time interval in seconds between sending SAP messages.
Multicast loop:	Activate "Multicast loop", if the IP-4c should receive its own SAP announcements. Default setting is "OFF".
Receive address and port:	Set the multicast address and port to receive SAP messages.
Ethernet port:	Select the Ethernet connector in the dropdown list: "Data 1"or "Data 2" for transmission of SAP announcements

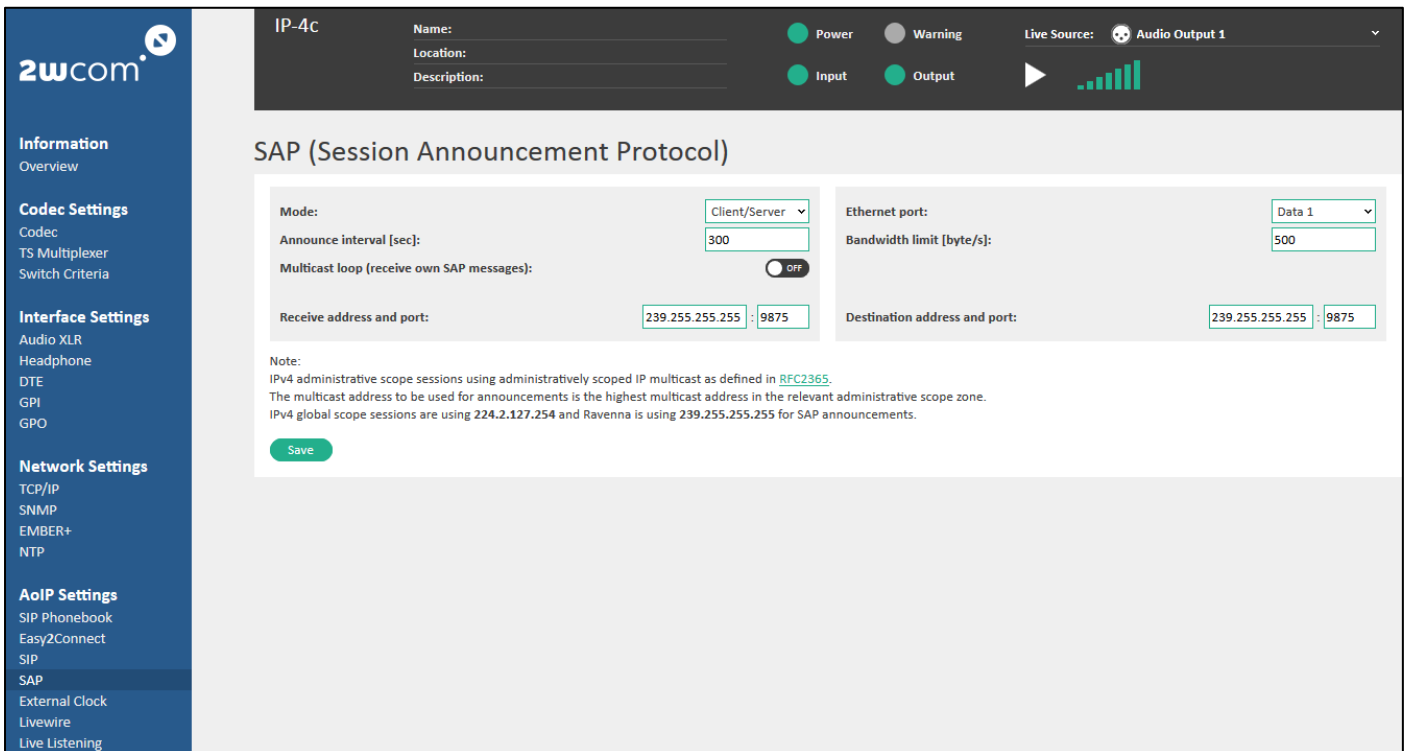|	
Bandwidth limit:	Enter the maximal value for bandwidth in bytes for SAP messages that should be sent per second to avoid overhead.
Destination address and port:	Set the destination multicast address and port for SAP announcements.

Figure 85: SAP Settings

17.3. Set up PTP Configuration

Optionally, the IP-4c supports the PTP V2 (Precision Time Protocol) network synchronization that allows fully synchronized stream operations. To set up the PTP connection, you need administrator rights.

Not yet available.

17.4. Set up Livewire Configuration

To set up the Livewire connection, you need administrator rights. Log in to the "admin" account and open the menu "Livewire" under **AoIP Settings→Livewire** (see Figure 86).
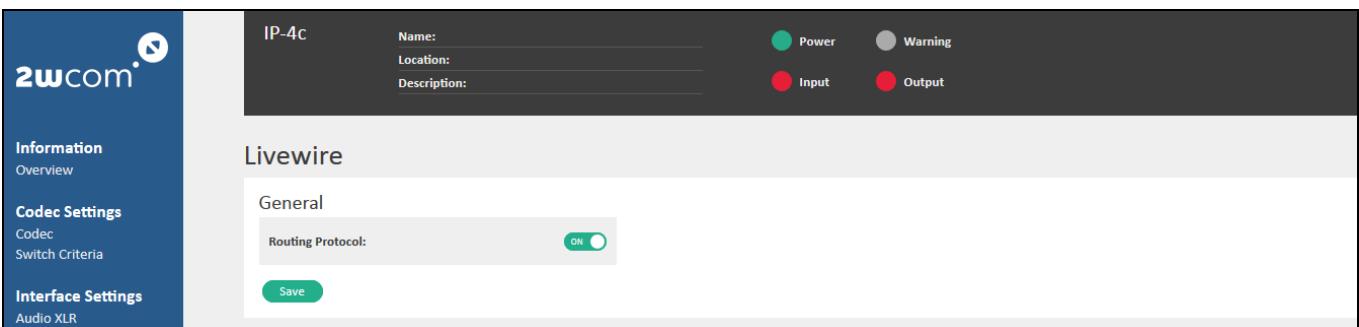
18. Buffer Delay Management

When using the IP-4c there are different stages where delay is introduced by processing or for security (i.e. FEC or dejitter buffer). For uninhibited operation, the user needs to make sure, that delay settings are in a safe area.

Delay is calculated in the following matter for a basic setup:

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

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

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

When no FEC is used a Dejitter/Reorder buffer can be used which will add delay in the length it is setup to. When FEC is used, there is a minimum delay that is required for safe operation (in the length of two full FEC matrices), anything 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 seen in **Information→Overview** in the "Details – Decoder / Audio 1-4" block. The user can use the additional delay setting to further delay the output up to 1000ms and the decoder will also have a small delay of <5ms.

Recommended default buffer configuration:

Packet reorder delay: 100 ms, Audio delay: 100 ms

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

FEC Mode (2 x matrix size)	1x4	4x4	5x5	10x10
Codec (Packets/Sec.)	(8)	(32)	(50)	(200)
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

Table 5: Minimum FEC delays sizes
    2 x size of matrix / IP packets per seconds = additional delay in seconds

19. Device Settings

19.1. Enter the Device Information

To enter the name and description of the device for identification:

1. Open the window *Global* under **System Settings➔Global**.

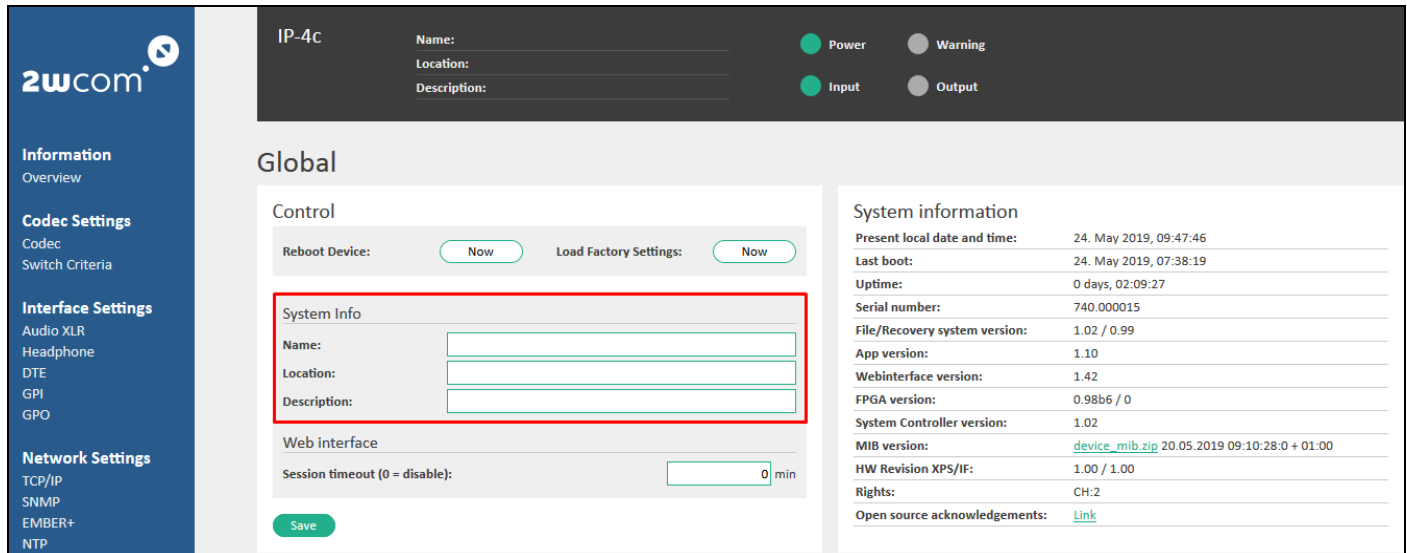2. Enter the identification information of the device in the **System parameter** field (see Figure 87).

Figure 87: Global System Settings – System parameter

3. Click the "Save" button to save the changes or the „Reset" button to restore the last settings.

⇒ The saved information is always displayed in the web interface above the main menu.

19.2. View the System Information

On the web interface, you can view general settings of the device and current system information like uptime, serial number, firmware version, the temperature etc.

To view the system information:

1. Open the window *Global* under **System Settings➔Global** (see Figure 91 on page 103).

2. The device information is displayed in the "System information" field (see Figure 88).

NOTE: The current version of the IP-4c is the "App version".
The parameter "HW Revision XPS/IF" specifies hardware information:
XPS - eXtendable Processor System;
IF - Interface Board.

Figure 88: Global System Settings – System information

3.   To view the status of the device, open the field **Status** under **Information→Overview**.

Figure 89: Information – status of the device

4. To view the current status of the device, the status of both power supply units and of electric voltages on the main board, open the window *Device Status* under **Status**→**Device** (see Figure 90).
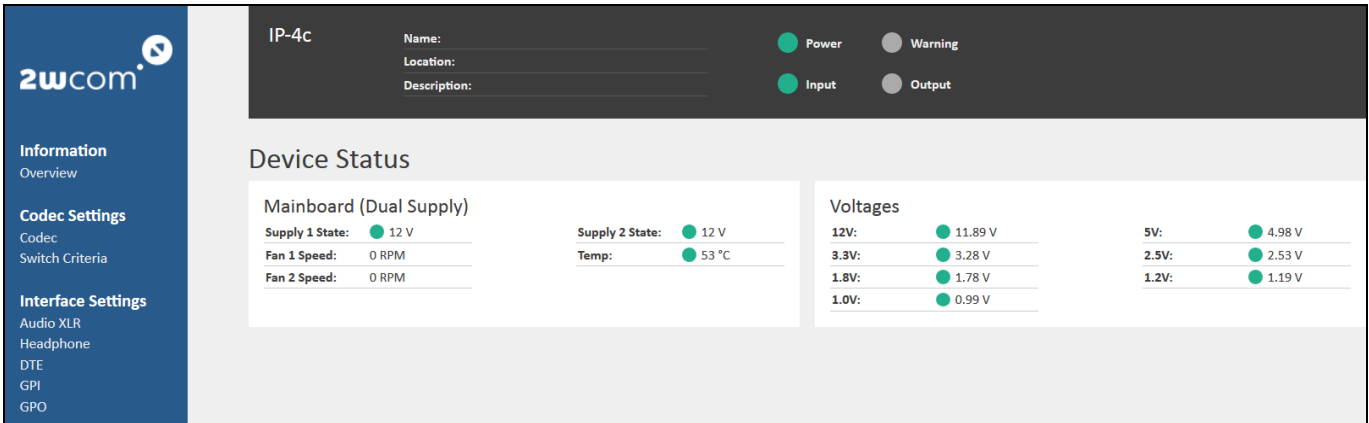

Figure 90: Status – Current electric voltages on the main board and power supply status

19.3. Set up Rights

Some functions are optional such as 2 or 4 Channels and other. To use these functions, additional rights must be set.

To upload and activate a rights file stored locally:

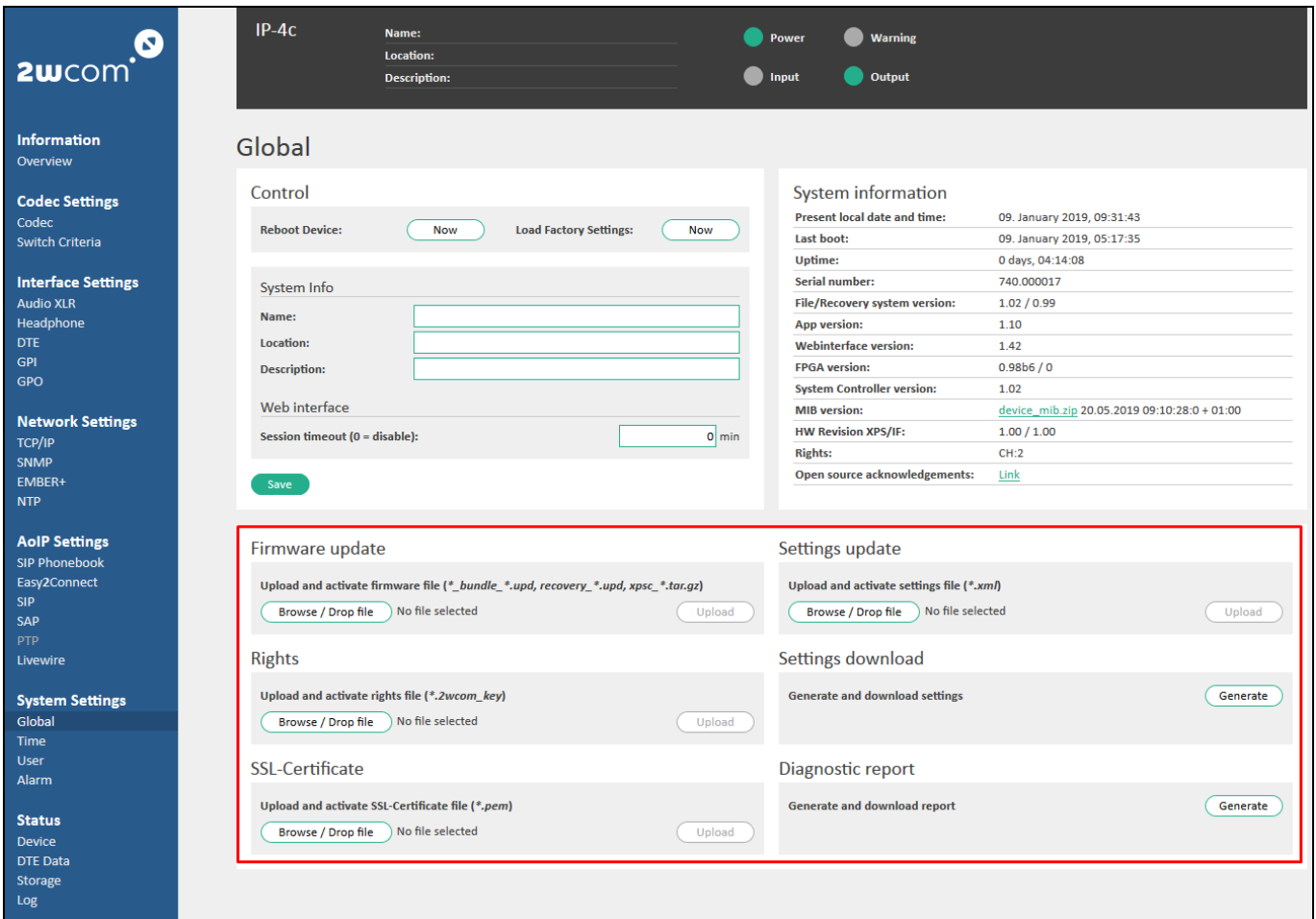1. Open the window *Global* under **System Settings**→**Global**.

Figure 91: System Settings - Global

2. Click the Browse button in the **Rights** field (see Figure 91 on page 103).
   The "Open file" dialog of your system software will be displayed.

3. Choose the rights file in your browser.

4. Click the "Upload" button to upload and to activate rights file. The file upload can take longer and may not be interrupted.

5. Follow the prompt to restart the device after successful upload

   ⇒ The new rights will be activated after the restart of the device.
   ⇒ You can view the active rights in the same menu in the "System information" block in the "Rights" field (see Figure 91**)**.

19.4. View the Log

The unit records the important system events such as cold start, warm start, firmware update, error messages etc. in a "Log".

To view and to edit the log:

1. Open the window *Log* under **Status→Log** in the end of the menu (see Figure 92).

Figure 92: Status – Log

2. For more information about the priority of the messages see Table 2 "Alarm Priority" on page 74.

3. To save the list of messages as log file, click the "Download" button and choose the archive location on the directory tree and confirm the choice.

4. To clear the log, click the "Clear" button and confirm the choice.

19.5. Upload and Activate Settings Stored Locally

IP-4c is able to store and load all settings through the web interface to any local storage.

To upload settings stored locally:

1. Open the window *Global* under **System Settings→Global**.

2. Click the Browse button in the **Settings update** field (see Figure 91 on page 103).
   The "Open file" dialog of your system software will be displayed.

3. Choose the settings file in your browser.

4. Click the "Upload" button to upload the file. The file upload can take longer and may not be interrupted.

5. Follow the prompt to restart the device after successful upload.

   ⇒ The new settings will be activated after the restart of the device.

19.6. Save Settings to Local File

You can download the current settings and save them as a file.

To save settings to local file:

1. Open the window *Global* under **System Settings→Global**.

2. Click the "Generate" button in the **Settings download** field to start the generation of a settings file (see #4 in Figure 91 on page 103).

3. A link to that file will be shown. Right-click on it to save it to a location of your choice.

   ⇒ The saved settings can be uploaded in the "Settings update" field (see section 19.3).

19.7. Upload and Activate Firmware Stored Locally

You can upload an ARM firmware stored locally.

To upload and to activate the new firmware:

1. Open the window *Global* under **System Settings→Global**.

2. Click the Browse button in the **Firmware update** field (see Figure 91 on page 103).
   The "Open file" dialog of your system software will be displayed.
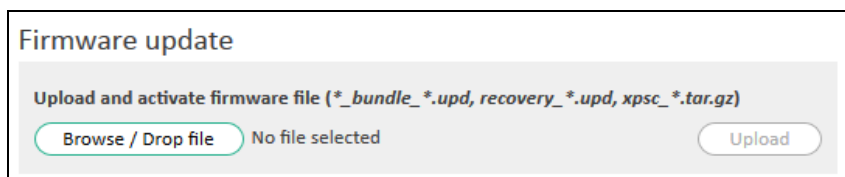

Figure 93: Global System Settings – Firmware update

3. Choose the firmware file.

4. Click the "Update" button, to start the file upload in the web browser. The file upload can take longer and may not be interrupted.

5. Follow the prompt to restart the device after successful upload.

   ⇒ The new firmware will be activated after the restart of the device.

19.8. Set up Time

You can set up or change manually the present local time zone and date of the internal clock of the device.

To set up the internal clock of the device:

1. Open the window *Time* under **System Settings→Time** (see Figure 94).

Figure 94: System Settings – Time

2. Choose the current time zone of the device in the **Time zone** field in the dropdown menu.

3. Click the "Save" button to save the changes or the "Reset" button to restore the last settings.

4. In the **Time and date settings** field, set up the internal time in the 24h format and the datum.

5. Click the "Save" button to save the changes or the "Reset" button to restore the last settings.

19.9. Configure User Accounts

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). Change the login data for the access after the first login to the web interface.

NOTE: Certain settings are **not** available in the "Manager" account. The access to separate menus can be adapted by the "admin" (see Figure 96 on page 108).

To change the login data:

1. Open the window User settings under **System Settings→User**.

2. Change the login data for the full access in the **Admin account** field and repeat the new password.

3. Click the "Save" button to save the changes or the „Reset" button to restore the last settings.

4. Change the login data in the **Manager account** and **Guest account** field and repeat the new passwords.

Figure 95: User accounts configuration

5. Click the "Save" button to save the changes or the "Reset" button to restore the last settings.

⚠	**NOTE:** Consider the sensitive case while entering a new password!

⚠	**NOTE:** 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. The default password at delivery is "sftpuser".

If you are logged in as an "admin", there are additional fields "Manager-" and "Guest adapted menu access" in the same menu under **System Settings➔User**. Here you can configure the access to certain web interface pages for the manager and guest accounts.

To adapt the access for manager and guest accounts to the separate IP-4c menus:

1. Open the window "User settings" under **System Settings➔User**.

2. In the additional fields "Manager-" and "Guest adapted menu access", below the configuration menus for user accounts, you can activate or deactivate the access to the separate menus by activating a virtual switch to "ON" or "OFF"(see Figure 96):
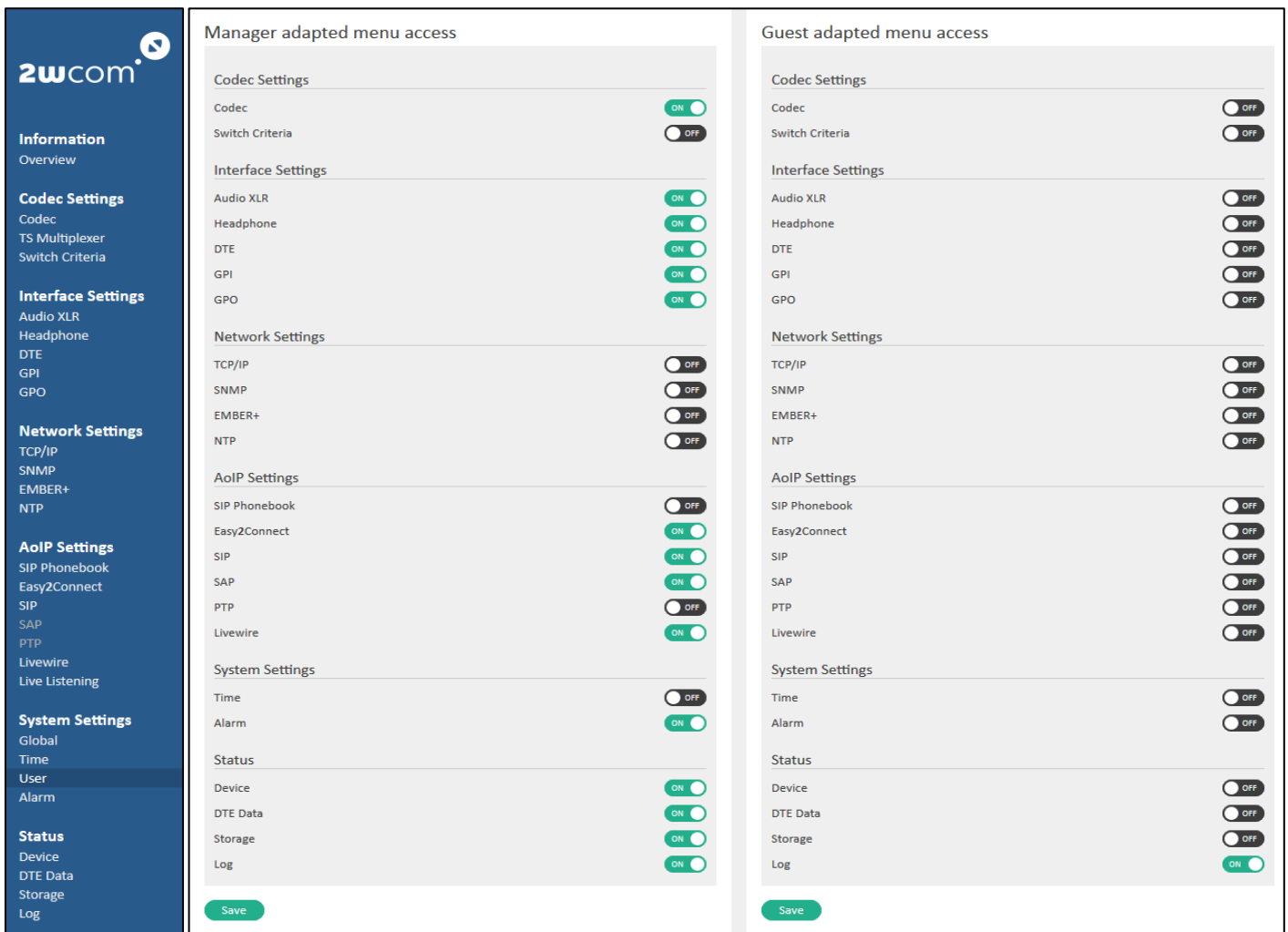
Figure 96: User - Configuration of the menu access

3. Click the „Save" button to save the changes.

19.10.   Set up the Session Timeout

To set up the session timeout for the web interface of the device:

1. Open the window *Global* under **System Settings→Global** (see Figure 97 on page 109).

2. Enter the value in min for the session timeout in the **Web interface** field:
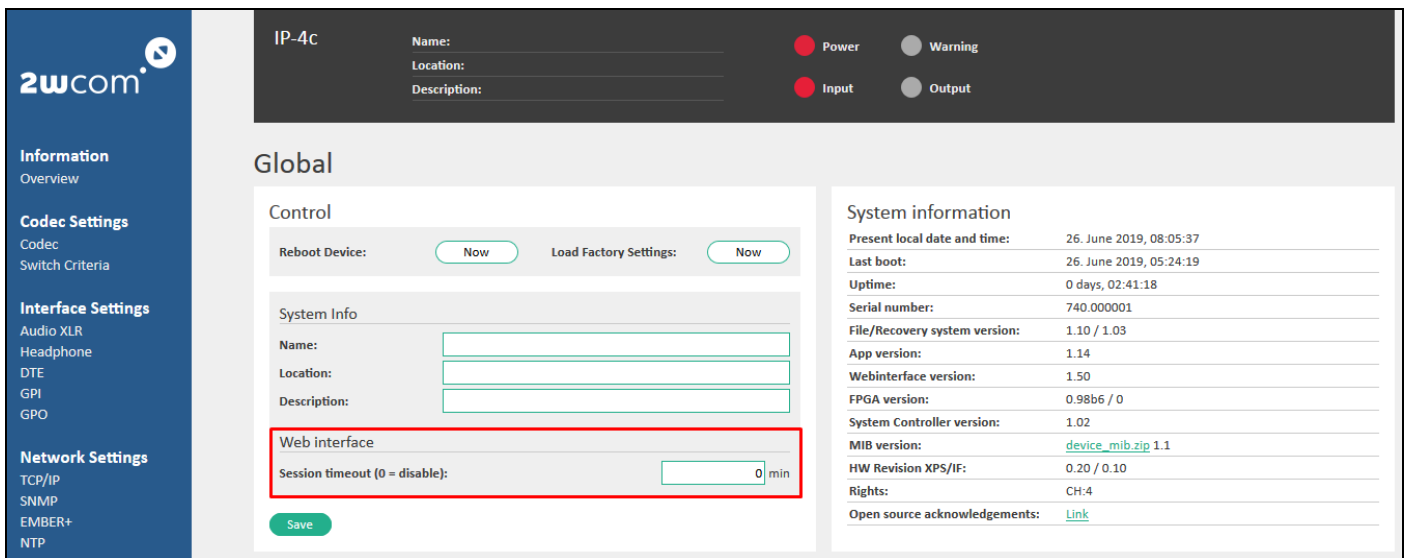
Figure 97: Session timeout for the web interface

3. Enter "zero" to deactivate the function.

4. Click the „Save" button to save the changes.

⇒ The current user will be automatically logged out after the configured period of inactivity (session timeout).

19.11. Reboot the Device

To reboot the device:

1. Open the window *Global* under **System Settings→Global** (see Figure 97 on page 109).

2. Click the „Reboot" button in the last field of the web page to reboot the device

⇒ The device restarts.

19.12. Restore Factory Settings

NOTICE	
	CAUTION: If you restore factory settings, all saved configurations made earlier by user will be deleted except for the IP address!
	This applies also for the access accounts!

To reset the device to the factory settings:

1. Open the window *Global* under **System Settings→Global** (see Figure 97 on page 109).

2. In the "Control" block click „Now" in the **Load Factory Settings** field to restore factory settings.

20. Maintenance and Servicing

Maintenance

No special maintenance is necessary on the device. Dust can be removed with a dry duster. For cleaning use only neutral, non-corrosive detergents applied to a cloth - not the device.

Servicing

The modules of the device are complex and should be serviced only by authorized personnel.

NOTICE	
	You can exchange one of the two plug-in power supply units in the IP-4c during ongoing operation if one power supply unit fails.
	The current information about the operation of the both power supply units you can view over the web interface of the device under **System Settings→Global** (see Figure 90 on page 103).

The IP-4c is optionally equipped with a left and right plug-in power supply unit that are independent from each other. You can exchange one of them in the IP-4c **during ongoing operation** if one power supply unit fails. To unplug the defect power supply unit, just pull out carefully the plug housing. Exchange the defect power supply unit by an intact power supply unit.

The 2wcom Systems GmbH is equipped with special measurement and repair kits. Therefore a repair by the user is not intended.

Calibration

Due to the design and construction of the device, no calibration is necessary.

21. Troubleshooting

The following chart is designed to help you to correct minor problems with the use of the device prior to contact our service department (report failures by email to *contact@2wcom.com* or fax to +49 461-662830-11).

Read also the entire manual carefully, as this often helps in understanding and fixing typical problems.

Problem	Possible Cause	Solution
Device does not turn on	- Power cable is improperly connected - Mains supply failure - Blown fuse	- Check supply cord - Make sure that the power plug at the device is fully inserted - Check mains supply - Replace fuse by same type - Replace one of the plug-in power supply units (see section 21)
Device cannot be operated via Ethernet	- Network cable not connected - IP address / TCP port is not known. - A device with the same IP address was connected a few minutes before. Then the ARP table still assigns the old MAC address to the IP address.	- Connect the network cable. - Check IP address obtained from DHCP via LCD. If the address was changed and is not known, please see page 19. - Usually the ARP table is refreshed automatically after a few minutes by the operation system. For an instant access to the device please reset the ARP table of your computer e.g. by entering "arp –d" in the Windows Command Prompt.

For a support request to 2wcom team, please write the serial number of the device. The sticker with the serial number is normally on the rear side of the device: „S/N xxx.xxxxxx".

22. Technical Data

IP-4c Audio over IP codec 1/2

Audio networks based on different protocols

▶ Broadcast based on EBU TECH 3326, SMPTE ST 2110
▶ AES67 based on RAVENNA, Livewire or Dante

Audio coding – fitting to your needs

High quality multi-format audio de- /encoding

▶ MPEG ½ Layer 2, 3
▶ G.711, G.722, Linear PCM
▶ Opus
▶ Ogg Vorbis
▶ MPEG 2/4 AAC LC
▶ MPEG 4 AAC LD/ELD
▶ MPEG 4 HE-AAC v1&v2
▶ Extended HE-AAC (xHE-AAC)
▶ Enhanced aptX (E-aptX)
▶ On request: Bit transparent transmission of digital audio and MPX signals
▶ On request: Dolby Digital plus (AC3)

IP streaming (unicast, multiple unicast & multicast)

Rock solid network connection even in stress conditions according to standards RFC 3550, RFC 3551, RFC 3640, RFC 2250

▶ Professional audio IP streaming using UDP, RTP and SIP/SDP (standardized by EBU N/ACIP Tech 3326)
▶ Unicast, Multiple Unicast & Multicast
▶ PRO MPEG FEC
▶ Dual streaming
▶ Optional: Livewire/ Ravenna (SIP, SAP, RTSP, AES67, PTPv2)
▶ Optional Stream**4**Sure: 2wcom streaming technology with different codecs/qualities and seamless switching of up to 4 Streams
▶ Icecast source client

Backup / advanced redundancy management

▶ Flexible automatic switch over concept with free definition of alternative input sources as redundancy solution in case of failures
▶ Playing files from internal storage or using alternative streams (Icecast / Shoutcast)
▶ Dual IP ports for data + 1 IP port for control interface
▶ Optional: redundant power supply 230 VAC or 48 VDC

Control

▶ Remote control with various possibilities: HTTP/S, FTP, Telnet, NMS, SNMP,
▶ Revised configuration via web user interface for easier setup
▶ Insertion of localized advertisement
▶ SNMP v2c, relays, inputs

Special

▶ Energy efficient DSP based 24/7 broadcast quality
▶ RDS decoding (built in RDS/UECP decoder)
▶ Embedded auxiliary data (RBDS/RDS or PAD) and GPIO forwarding
▶ Optional: Perfect network synchronization for SFN applications

Monitoring

▶ IP and MPEG parameters via SNMP v2c and relay
▶ Headphone output
▶ Icecast Live Listening

Your audio. Our solution.

IP-4c – Audio over IP codec 2/2

Advanced control functionalities

High quality multi-format audio de-/encoding:

▶ HTTP/HTTPS: via web interface
▶ FTP: XML file control
▶ NMS: Control via centralized
▶ Network Management System

Perfect audio quality

▶ Balanced analogue and digital AES/EBU (integrated XLR connector)

Advanced IP robustness functionalities

▶ Even to operate in standard IP networks
▶ PRO MPEG FEC
▶ Management of packet size, buffer and QoS
▶ Optional: Stream4Sure – 2wcom streaming technology with different codes / qualities
▶ And seamless switching of up to 4 streams

Perfect audio & latency management

▶ Optional: GPS based 2wcom latency control solution usage in SFN FM networks
▶ ACIP compliant high audio quality and extremely low latency (PTPv2 network synchronization

Highly sophisticated monitoring and alarm concept

▶ Adjustable silence detection
▶ IP buffer and jitter check
▶ PLL control
▶ SNMP, alarm, source switch & event logging

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)
On request	Dolby digital plus (AC3) ask for other codecs
On requestl	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

Performance

Digital (in/out)	4x AES/EBU, 110 Ω bal., integrated XLR
Analog (in)	2x L/R, > 10 Ω bal., integrated XLR
Analog (out)	2x L/R, < 20 Ω bal., integrated XLR
Headphone (out)	L/R, < 10 Ω, 6,3 mm
Digital reference input	No dedicated input, selectable by user

Digital reference level	9 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), PTPv2, SMTP ST 2110

Serial

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

Your audio. Our solution.

Technical details 2/2

Interfaces

Contact closure

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

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
1PPS	SMA connector

Control & monitor

Ethernet

User interface	Integrated WebGUI, LCD display
Data	Control and setup functions
USB	USB 2.0 interface for service, configuration and firmware updates
Protocol	2wcom NMS, Telnet, HTTPS, SNMP, UDP, RTCP, SRT Secure Reliable Transport, SFTP IGMP, ICMP, NTP, DHCP, SNMP, SSH, PTPv2, TCP (Icecast)

Front panel

LCDisplay	Graphical, 264x64 pixel
Jog wheel	Impulse, enter button
4 Duo LEDs	Power, input, output, warning

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

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

Datasheet Version 27.11.2019
These data are subject to modifications and amendments. Errors excepted.

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