

SAT-4d DVB Audio Satellite Receiver

User Manual

SAT-4d User Manual V1.4.2

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1 About this Manual

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

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1.1 References and Hyperlinks in this PDF File

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

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

1.2 Tags and Their Meanings

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

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



Warning of general danger situation



Warning of electric shock



Warning of hot surface



Warning of fire hazard

2 For Your Safety

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

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



Danger from electric current!

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



Fire hazard due to overheating or electric current!

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



Danger from explosive atmosphere!

- Do not use the device in an explosive environment.



Warning of hot surface!

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

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



Risk of equipment damage!

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

3 Product Overview

3.1 About the SAT-4d

The SAT-4d is the perfect DVB satellite receiver for radio networks. The SAT-4d offers uncompromised and reliable reception from up to 4 of your audio programs from satellite.

High compatibility: The SAT-4d supports all known DVB-S/S2 standards and protocols for satellite reception and offers symbol rates from 1 up to 45 Msym/s. Furthermore, the SAT-4d supports transport of various private data formats such as ancillary and auxiliary (PID) data as well as contact closures (GPIO).

Redundancy: Even when satellite fails, your radio distribution is safe. Supported by 3 backups, the SAT-4d guarantees that there will always be 'Music in the air'. A range of backup sources can be selected such as Icecast/Shoutcast, TS over IP and file playback from the internal memory.

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

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

Transmission robustness: For the IP backup, Dual Streaming and Pro-MPEG FEC ensure rock-solid backup scenarios. Two hot pluggable power supplies guarantee fail-safe operation.

Smart management: For remote control, the codec offers various possibilities – HTTP, FTP, NMS, REST-API, Ember+ and SNMP.

3.2 Software Rights

Software rights enable additional functions. Some rights may be included in the base version of the product, others are available as an optional purchase. The following table displays an overview of the software rights that are available for the SAT-4d.

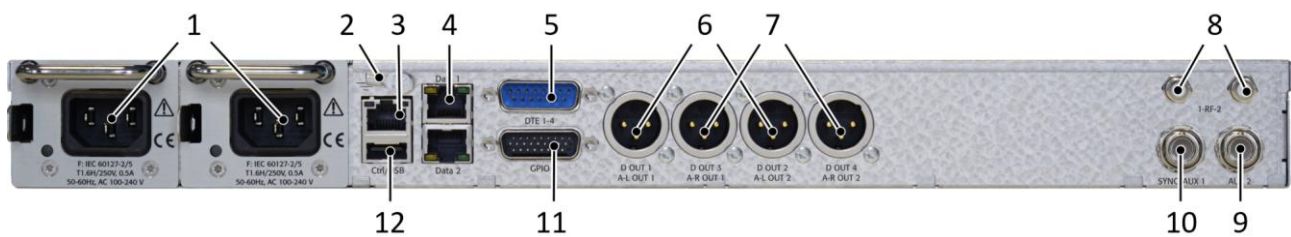
Right	Description
BISS	BISS descrambling (Basic Interoperable Scrambling System) for TS/SAT and TS/ASI input sources
n Channels	Number of channels
n Dolby Decoder	Number of Dolby decoders
ES Input	Elementary streams (RTP/UDP) as an input source
File Input	File from the internal storage as an input source
HLS decoder	Option to decode HTTP Live Streaming (HLS).
Icecast Input	Icecast as an input source
Livewire	IP streaming over Livewire
Loudness	Option to measure the loudness of audio outputs according to EBU R128 and ITU-R BS.1770/BS.1771.
MPE	MPE (Multiprotocol Encapsulation) decoding
NAS (NFS, S3)	Option to include a Network Attached Storage like NFS or AWS S3.
Ravenna	SAP stream announcement and discovery and AES67, RTSP and PTP, PTPv2 support.
SFN	Single-frequency network: synchronous playout over the same frequency channel. Accuracy: < 1 μ s
SRT Decoder	SRT and RIST functionalities for decoders
TS Decoder	Transport stream over IP using UDP/RTP, unicast/multicast for decoders
TS Forwarding	Forwarding an entire TS stream to another device over IP.

3.3 Front Panel



- 1 Headphone: 6.3 mm / 1/4" socket for the connection of headphones
- 2 LCD Screen: Illuminated LCD screen, graphical, 264x64 pixels
- 3 [Warning] LED: LED indicator for alarms. For more information see 10.1 Status LEDs.
- 4 [Input] LED: LED indicator for signal inputs. For more information see 10.1 Status LEDs.
- 5 [Output] LED: LED indicator for signal outputs. For more information see 10.1 Status LEDs.
- 6 [Power] LED: LED indicator for the dual power supply. For more information see 10.1 Status LEDs.
- 7 Reset pin hole: Recessed button for resetting the device (warm start and recovery mode)
- 8 Jog wheel: For operating the device via the LCD screen

3.4 Back Panel

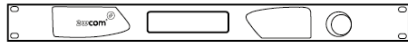


- 1 **Power supply unit:** Mains supply voltage IEC socket.
Optional redundant power supply through a second power supply unit:
 - Option 1: standardized IEC hot-swappable power supply connector; 90-260 V, 47-63 Hz; automatic switchover.
 - Option 2: power supply 48 V DC.
 Combination of power supply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

4 First Steps

4.1 Checking the Delivery Contents

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



SAT-4d



Link to product data



Power cord



Network patch cable

4.2 Installing the Device

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

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

4.3 Connecting the Signals

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

1. For output of the digital/analog audio signal, connect the signal outputs to [D OUT]/[A-L/R OUT].
 2. Connect a network patch cable to [Ctrl] and to your existing network.
 3. Connect network patch cables to [Data] and to your existing network.
 4. Connect the antenna signal to [RF].
 5. For GPIO communication, connect a serial cable to [GPIO]. Please find information on the pin assignment in the technical details.
 6. For serial RS232C data communication, connect a serial breakout cable to [DTE]. Please find information on the pin assignment in the technical details.
 7. Optionally, connect the interfaces [SYNC/AUX], and [AUX] if needed.
 8. Use the headphone output for monitoring the output audio signals.
- ✓ You have connected the device. Continue with connecting the power supply.

4.4 Connecting the Power Supply

NOTICE Risk of equipment damage!

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

Optionally, the device comes with 2 exchangeable plug-in power supply units which can be equipped with different redundant power supply connectors: either IEC sockets or Neutrik powerCON sockets.



If the device is equipped with a primary and a secondary power supply, then the primary power supply is used. If the primary power supply fails, then the device promptly switches to the secondary power supply and the status changes immediately on the **Device** status page. If the secondary power supply fails, then the device does not need to switch the power supply source and it takes at least 1 minute for the status to update on the **Device** status page.



If the device is equipped with hot-pluggable power supplies, both power supply cassettes must be installed and used during operation. Operating the device with only one cassette may result in improper cooling, reduced mechanical integrity, and compromised overall system reliability.

IEC socket



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

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

Neutrik powerCON socket

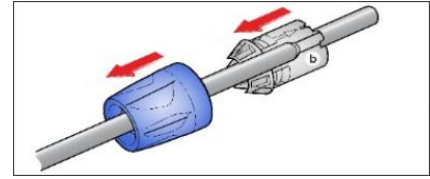


48 V DC Neutrik powerCON socket with aut. switchover (NAC3MPA 1) and Neutrik powerCON connector (NAC3FCA)

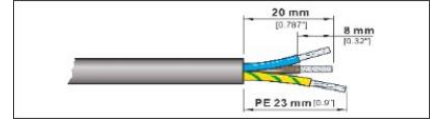
NOTE: The corresponding power cords are not part of the delivery contents!

To prepare and connect the Neutrik powercon connector:

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



2. Remove part of the insulation.

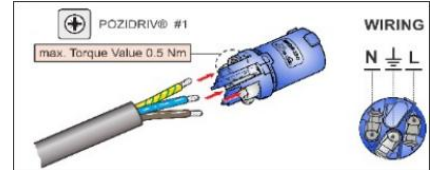


3. Insert the wires into the clamping holes on the inset and fasten them with screw and clamping plate using a screwdriver.

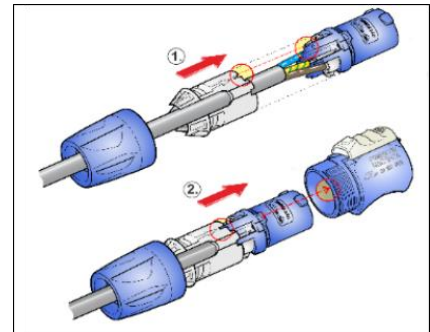


If you use the voltage of +48 V and 0 V, fasten the +48 V wire to L in the connector.

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



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



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

4.5 Configuring the Network

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

- Use the [Data] interfaces only for data transfer.
- Use the [Ctrl] interface only for the access to the device via the web interface and for SNMP.
To change the supported services per interface, see 7.1 Configuring the Interface Services.

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

For the [Ctrl] interface, DHCP is enabled by default. When you connect the device to your DHCP-enabled network, it will automatically get the IP configuration for the [Ctrl] interface.

To view the obtained IP address, turn the jog wheel to the left to see the “System Info” display. Here you will find the obtained IP address and further system information.

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

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

4.6 Accessing the Web Interface

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

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

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

The default login data (case sensitive) are:

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



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

4.7 General Operation

4.7.1 Operation via web interface

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

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

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

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

4.7.2 Operation via LCD menu

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

The display has 2 main menus:

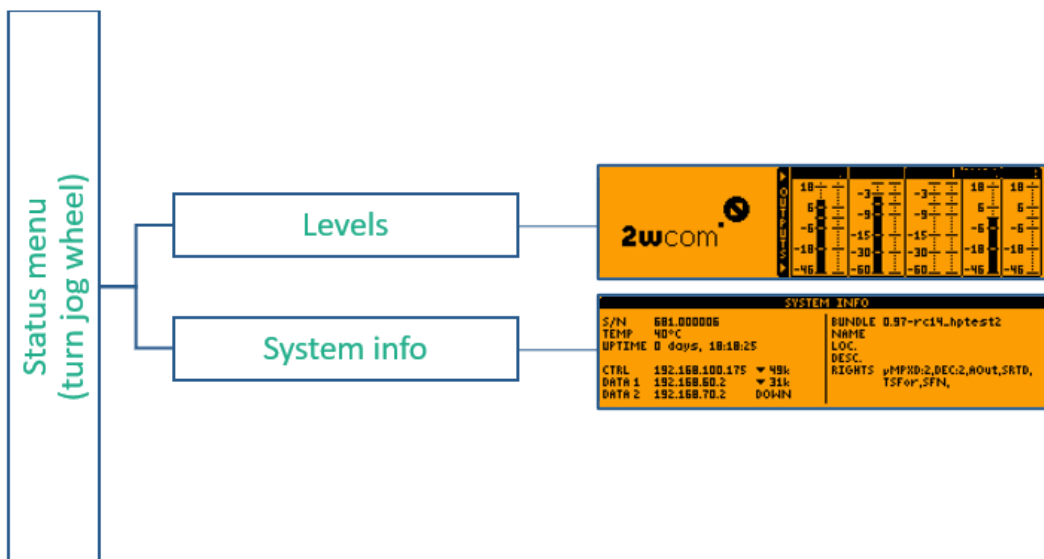
- Status menu (turn jog wheel left or right)
- Configuration menu (push jog wheel)

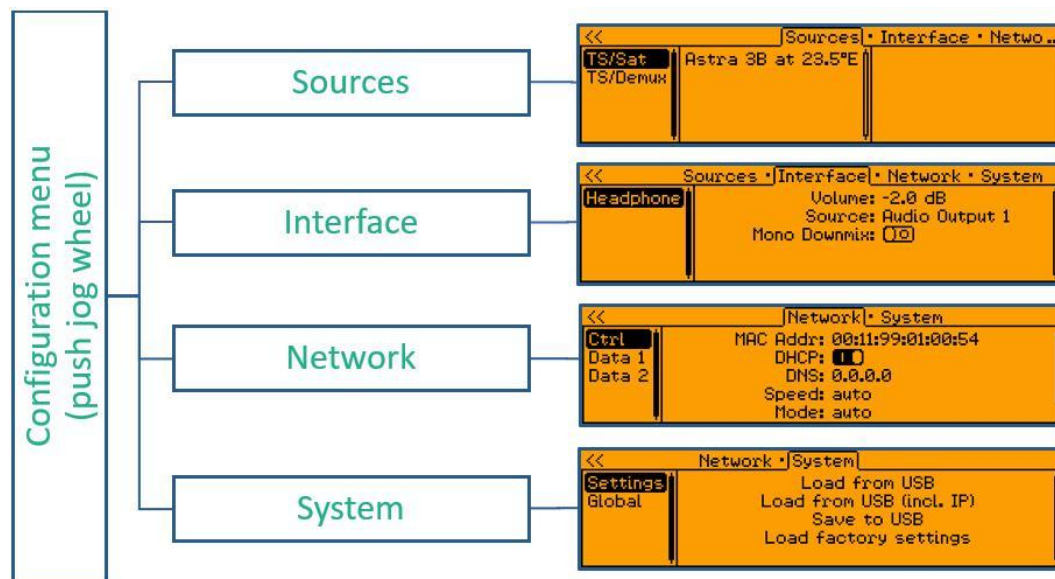
After a warm or cold start of the device, the display shows the default screen of the status menu. When you navigate in the LCD menu, the display returns to the Status Overview after few minutes of inactivity.

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

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

Navigation structure





5 Codec Settings

5.1 Input Source Settings

5.1.1 Creating input source configurations for TS/SAT

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

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

To create a new configuration profile for an input source:

1. Navigate to the page **Codec** in the section **Codec Settings**.
 2. In the block **Input Sources**, select the input source for which you want to create a configuration profile.
 3. To create a configuration profile, click .
 4. To set up the new configuration profile, click **Edit**.
 5. Configure the parameters.
 6. Click **Save**.
 7. Create a demux configuration that uses this input source configuration as a source.
For more information see 5.1.5 Creating demux configurations.
- ✓ You have created an input source configuration.

Continue with 5.3 Assigning input sources to a decoder.

Parameters

General

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

FEC	Select the FEC settings used by the transponder. If unknown, select Auto . This may result in slightly increased tuning times.
ISI filter (0 = off)	To enable the Input Stream Identifier, enter the number of the desired stream.
PLS code	Enter a code for Physical Layer Scrambling.
BISS (Basic Interoperable Scrambling System)	
BISS descrambling	Enable BISS descrambling. BISS is a method for securing and scrambling media transmission. Components are scrambled by a Session Word that is either clear or encrypted. The clear or encrypted session word is transmitted out of band to the receivers.
BISS mode	Select the BISS mode: mode 1 (clear) or mode E (encrypted).
Clear Session Word	If mode 1 (clear) is selected, then enter the clear session word.
Injected ID	If mode E (encrypted) is selected, then enter the injected ID for decryption of the encrypted session word.
Encrypted Session Word	If mode E (encrypted) is selected, then enter the encrypted session word.

5.1.2 Creating input source configurations for TS/ASI

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

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

To create a new configuration profile for an input source:

1. Navigate to the page **Codec** in the section **Codec Settings**.
 2. In the block **Input Sources**, select the input source for which you want to create a configuration profile.
 3. To create a configuration profile, click .
 4. To set up the new configuration profile, click **Edit**.
 5. Configure the parameters.
 6. Click **Save**.
 7. Create a demux configuration that uses this input source configuration as a source.
For more information see 5.1.5 Creating demux configurations.
- ✓ You have created an input source configuration.

Continue with 5.3 Assigning input sources to a decoder.

Parameters

Name	Enter the name of the stream for better reference.
BISS descrambling	Enable BISS descrambling. BISS is a method for securing and scrambling media transmission. Components are scrambled by a Session Word that is either clear or encrypted. The clear or encrypted session word is transmitted out of band to the receivers.
BISS mode	Select the BISS mode: clear or encrypted.
Clear Session Word	If mode 1 (clear) is selected, then enter the clear session word.
Injected ID	If mode E (encrypted) is selected, then enter the injected ID for decryption of the encrypted session word.

Encrypted Session Word If mode E (encrypted) is selected, then enter the encrypted session word.

5.1.3 Creating input source configurations for TS/IP

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

Input Source	Description	Source Interface
 TS/IP	TS/IP – Transport stream over IP using UDP/RTP, Unicast/Multicast (prerequisite: <i>TS Decoder</i> right)	[Data]

To create a new configuration profile for an input source:

1. Navigate to the page **Codec** in the section **Codec Settings**.
 2. In the block **Input Sources**, select the input source for which you want to create a configuration profile.
 3. To create a configuration profile, click .
 4. To set up the new configuration profile, click **Edit**.
 5. Configure the parameters.
 6. Click **Save**.
 7. Create a demux configuration that uses this input source configuration as a source.
For more information see 5.1.5 Creating demux configurations.
- ✓ You have created an input source configuration.

Continue with 5.3 Assigning input sources to a decoder.

Parameters

General

Name	Enter the name of the stream for better reference.
IP type	Select Unicast/Multicast.
Multicast IP	Enter the IP for Multicast, if selected as IP type.
Port	Sender UDP port (the same as set in the encoder settings for output streaming)
IP interface	Select the interface for the input signal.
Protocol	Select the MPEG2 transport stream encapsulation.
Packet reorder/dejitter delay	The dejitter buffer for IP transforms the variable delay into a fixed delay. It holds the first packet received for a period of time before it sends it out to the decoder. This time period is necessary for reordering the packets as well as to compensate the jitter and optionally to apply FEC correction and/or to combine it with the second, dual streaming input. Enter the value for this holding period in ms. NOTE: The delay time of the input source must not exceed 200 ms if the sample rate is 192 kHz.
RIST	Enable RIST to recover lost packets by resending them.
FEC Mode	Configure the FEC mode depending on the sample rate and the acceptable value for delay. For more information about the delay values, see 5.7 Setting Up a Buffer.
FEC column/row port offset	Enter the offset to the main destination port the data should be sent to. For example, if the main port is 5004, the value "2" for FEC column port offset means that the port is then 5006 (5004 + 2). If you do not want to use this offset, enter "0".

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

5.1.4 Creating input source configurations for TS/SRT

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

Input Source	Description	Source Interface
 TS/SRT	TS/SRT – Transport stream over IP using SRT (prerequisite: <i>TS Decoder</i> and <i>SRT Decoder</i> rights)	[Data]

To create a new configuration profile for an input source:

1. Navigate to the page **Codec** in the section **Codec Settings**.
 2. In the block **Input Sources**, select the input source for which you want to create a configuration profile.
 3. To create a configuration profile, click .
 4. To set up the new configuration profile, click **Edit**.
 5. Configure the parameters.
 6. Click **Save**.
 7. Create a demux configuration that uses this input source configuration as a source.
For more information see 5.1.5 Creating demux configurations.
- ✓ You have created an input source configuration.

Continue with 5.3 Assigning input sources to a decoder.

Parameters

General

Name	Enter the name of the stream for better reference.
Mode	Select whether you want to use SRT in listener or caller mode.
Port	Specify the port number for SRT connection.
IP interface	Select the interface for the input signal.
Latency	Define the time interval for the latency before the SAT-4d starts to decode the signal distributed via SRT protocol.
Maximum reorder tolerance	Enter the maximum number of packets that should be reordered.
Use encryption	If the input stream is protected by AES encryption, enable end-to-end encryption.
Passphrase	Enter the password used to secure the SRT stream.

5.1.5 Creating demux configurations

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

1. Navigate to the page **Codec**.
2. In the block **Input Sources**, select the tab of a TS-based input source.
3. In the block **Demux Configurations**, select the tab **Audio** to use the audio and optionally the ancillary data of a stream. Select the tab **Data** to only use the ancillary data of a stream. For more information see 5.4 Configuring Ancillary Data.
4. To create a new demux configuration, click .

5. To configure the demux configuration, click **Edit**.
 6. Configure the parameters.
 7. Click **Save**.
- ✓ You have created a demux configuration.

Continue with 5.3 Assigning input sources to a decoder.

Parameters

General

TS source	Select the source for the demultiplexer configuration profile in the dropdown menu.
Configuration mode	Select the configuration mode. • Manual/PID: Enter the specific audio PID and a name for better reference. • Service from list (fixed PID): Refresh the service list. Select the service and audio track. • Service from list (auto PID according to PMT): Refresh the service list. Select the service. This mode is used for services that switch to another audio track at times. In that case, the SAT-4d automatically switches to the new audio PID.
Encapsulation mode	Select an encapsulation mode: Multiprotocol Encapsulation or Packetized Elementary Stream.
Audio sync mode	Select the audio sync mode: Buffer level: synchronization with the rate of the incoming data. SFN: synchronization via the SFN.

Codec

Decoder type	Predefine the codec type for the decoder by choosing the audio codec or selecting "Automatic" from the dropdown menu.
Buffer [ms]	Enter a value for the audio buffer.
Gain	Enter a value for the gain of this input source.

Ancillary Data

Ancillary data decoding	If the input stream of the decoder contains ancillary data, the SAT-4d can forward them to the corresponding outputs. If ancillary data are enabled, private data cannot be enabled.
GPIO tunneling	Enable or disable GPIO tunneling for GPIO switch between encoder and decoder.

Private Data

Private data output (as ancillary data)	Toggle the switch to enable Private data output. Note: If private data are enabled, ancillary data cannot be enabled.
Configuration mode	Select a configuration mode from the drop-down menu.
Data PID	Enter the data PID.

SCTE-35

SCTE-35 decoding	Toggle the switch to enable SCTE-35 decoding.
Configuration mode	Select a configuration mode from the drop-down menu.
Data PID	Enter the data PID.

5.1.6 Creating input source configurations for Elementary Streams (UDP/RTP)

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

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

To create a new configuration profile for an input source:

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

Continue with 5.3 Assigning input sources to a decoder.

Parameters

Available Streams

Name	Enter the name of the stream for better reference.
IP type	Select Unicast/Multicast.
Multicast IP	Enter the IP for Multicast, if selected as IP type.
Port	Sender UDP port (the same as set in the encoder settings for output streaming)
IP interface	Select the interface for the input signal.
Protocol	Select the MPEG2 transport stream encapsulation. Note: If RTP is used, make sure to also allow RTP Port+1 in your firewall settings, as this port is used for RTCP.
Packet reorder/dejitter delay	The dejitter buffer for IP transforms the variable delay into a fixed delay. It holds the first packet received for a period of time before it sends it out to the decoder. This time period is necessary for reordering the packets as well as to compensate the jitter and optionally to apply FEC correction and/or to combine it with the second, dual streaming input. Enter the value for this holding period in ms.
RIST	Enable RIST to recover lost packets by resending them.
Stream4Sure	Enable this function to allow the decoder to use this stream as one of up to 4 IP streams for Stream4Sure.
Dual streaming	If dual streaming is enabled, configure the IP parameters. You can set up the same or different [Data] sources for the Ethernet input.
Silence mode	When enabled empty packets will be inserted in case of missing stream input. This may only be useful in cases where this input source is used as an encoder input. With this setting enabled, an interruption in the stream input will not result in no encoder output.
FEC Mode	Configure the FEC mode depending on the sample rate and the acceptable value for delay. For more information about the delay values, see 5.7 Setting Up a Buffer.

FEC column/row port offset Enter the offset at the main destination port the data should be sent to. For example, if the main port is 5004, the value "2" for FEC column port offset means that the port is then 5006 (5004 + 2).
If you do not want to use this offset, enter "0".

Codec

Decoder type Predefine the codec type for the decoder by choosing the audio codec or selecting "Automatic" from the dropdown menu.

Synchronous Payout/SFN Enable Synchronous Payout using SFN or enter a buffer size [ms].

Buffer [ms] Enter a value for audio buffer.

Gain Set the source-specific gain. This is useful if the level of this source is either higher or lower than the levels of the other sources in the decoder chain (main - backup).

Ancillary Data

Ancillary data decoding If the input stream of the decoder contains ancillary data, the SAT-4d can forward them to the [DTE] outputs.

GPIO tunneling Enable GPIO Tunneling for GPIO switch between encoder and decoder.

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

5.1.7 Creating input source configurations for Livewire



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

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

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

To create a new configuration profile for an input source:

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

Continue with 5.3 Assigning input sources to a decoder.

Parameters

General

Destination (DST) name	Enter a destination name.
Livewire Source (SRC)	In this menu, available advertised Livewire streams will be displayed and can be selected for automatic configuration. To enter the Livewire settings manually, select Manual .
Source (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 [Data] interface for Livewire connection.
Packet reorder/ dejitter delay	The dejitter buffer for IP transforms the variable delay into a fixed delay. It holds the first packet received for a period of time before it sends it out to the decoder. This time period is necessary for reordering the packets as well as to compensate the jitter and optionally to apply FEC correction and/or to combine it with the second, dual streaming input. Enter the value for this holding period in ms.
Gain	Specify gain for the Livewire source in dB.
Silence mode	Toggle the switch to enable Silence mode. If Silence mode is enabled, then empty packets will be inserted in case of missing stream input.

5.1.8 Creating input source configurations for SRT



This option is only available if the right *SRT Decoder* is enabled.

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

Input Source	Description	Source Interface
	Elementary stream over IP using SRT (optional: "SRT Decoder" right)	[Data]

To create a new configuration profile for an input source:

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

Continue with 5.3 Assigning input sources to a decoder.

Parameters

General

Name	Enter the name of the stream for better reference.
Mode	Select whether you want to use SRT in listener or caller mode.
Port	Specify the port number for SRT connection.

IP interface	Select the interface for the input signal.
Latency	Define the time interval for the latency before the SAT-4d starts to decode the signal distributed via SRT protocol.
Maximum reorder tolerance	Enter the maximum number of packets that should be reordered.
Encryption	If the input stream is protected by AES encryption, enable end-to-end encryption.
Passphrase	Enter the password used to secure the SRT stream.
Codec	
Decoder profile	Select the codec profile from the dropdown menu.
Buffer	Enter a value for audio buffer in ms.
Gain	Set the source-specific gain. This is useful if the level of this source is either higher or lower than the levels of the other sources in the decoder chain (main - backup).

Ancillary data (Decoder only)

Ancillary data output	If the input stream of the decoder contains ancillary data, the SAT-4d can forward them to the [DTE] outputs.
-----------------------	---

5.1.9 Creating input source configurations for Icecast

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

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

To create a new configuration profile for an input source:

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

Continue with 5.3 Assigning input sources to a decoder.

Parameters

General

Name	Assign a name to the Icecast server for better reference.
URL	Enter the URL of an Icecast server in the local network or the internet, e.g. "192.168.99.131" or "www.backup-audio.com".
Username	Enter the username.
Password	Enter the password.
IP Interface	Select the [Data] interface for the audio stream input.
Buffer	Enter a value for audio buffer.

Gain Set the source-specific gain. This is useful if the level of this source is either higher or lower than the levels of the other sources in the decoder chain (main – backup).

Ancillary Data

Ancillary data To add ancillary serial data to the stream, activate the switch.

GPIO tunneling Enable GPIO tunneling for GPIO switch between encoder and decoder.

5.1.10 Creating input source configurations for HLS



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

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

Input Source	Description	Source Interface
 MPEG DASH / HLS	HTTP Live Streaming (HLS)	[Data]

To create a new configuration profile for an input source:

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

Continue with 5.3 Assigning input sources to a decoder.

Parameters

General

Name Assign a name to the configuration profile for better reference.

URL Enter the URL of the HLS stream.

IP interface Select the [Data] interface for the audio stream input.

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

Gain Set the source-specific gain. This is useful if the level of this source is either higher or lower than the levels of the other sources in the decoder chain (main – backup).

5.1.11 Creating input source configurations for internal storage (File)

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

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

To create a new configuration profile for an input source:

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

Continue with 5.3 Assigning input sources to a decoder.

Parameters

General

Name	Assign a name to the configuration profile for better reference.
File	Select an audio file in the dropdown menu.
Buffer	Enter a value for audio buffer.
Gain	Set the source-specific gain. This is useful if the level of this source is either higher or lower than the levels of the other sources in the decoder chain (main - backup).
Play once	If enabled, the file will only be played once.

5.1.12 Creating input source configurations for audio interfaces

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

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

To create a new configuration profile for an input source:

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

Continue with 5.3 Assigning input sources to a decoder.

Parameters

General

Name	Assign a name to the configuration profile for better reference.
Direct processing	If enabled, the input is processed without an intermediate buffer (Buffer=0).
Buffer	Enter a value for audio buffer in ms.

Ancillary Data (Decoder only)

Ancillary data source	Select the source for ancillary data in the dropdown menu.
-----------------------	--

5.2 Creating Codec Profiles

You can create codec profiles to assign them to SRT input source configurations.

1. Navigate to the page **Codec**.
2. Click on the tab **Profiles**.



This tab is only visible if the right *SRT* is activated.

3. To create a new codec profile, click **+**.
4. To set up the new codec profile, click **Edit**.
 - A dialog window opens.
5. Configure the parameters.
6. Click **Save**.
- ✓ You have created and edited a codec profile.

Parameters

Profile Settings

Name	Assign a name to the codec profile for better reference.
Encoder format	Select the encoder format. Different settings are configurable depending on the selected encoder format.
Codec	Select a codec from the drop-down menu.
DAB compliant (ETSI TS 103 466)	Toggle the switch to enable DAB compliance.
G.711 companding algorithm	Select an algorithm from the drop-down menu.
Frame size	Select the required frame size.
AAC TS transport format	Select format for AAC TS transport from the drop-down menu.
Audio mode	Select the audio mode in the dropdown menu.
Sampling rate	Set up sampling rate in the dropdown menu. The sampling rate for Livewire can only be configured for 48 kHz. For some 2wcom devices, the sampling rate is set to 192,000 Hz.
Sampling width	Set up sampling width in the dropdown menu in the range of 16-24 bits depending on the selected encoder format.
Endianness	Select the endianness (order of bytes).

Bitrate	Select the bit rate in the dropdown menu depending on the chosen audio mode. For some encoder formats, this field shows the calculated bitrate depending on the selected settings.
HLS container format	Select a format for the HLS container from the drop-down menu.
Encoder SRC	Toggle the switch to enable sample rate conversion to NTP clock for the assigned encoder input source. Can be enabled to minimize the clock difference between encoder and decoder in case the decoder cannot follow the encoder clock.

xHE-AAC Settings

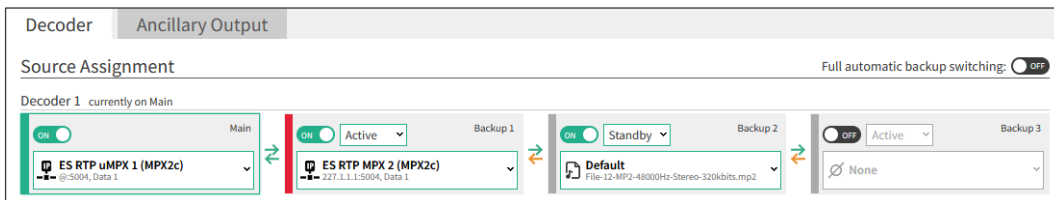
Live Loudness	Toggle the switch to enable Live Loudness.
Target loudness	Select a target loudness from the drop-down menu.
Loudness mode	Select a loudness mode from the drop-down menu.
Relative max gain	Set a value for the relative max gain in dB.
DRC mode	Select a mode for the dynamic range control from the drop-down menu.

Ancillary Data

GPIO Tunneling	Enable GPIO tunneling for GPIO switch between encoder and decoder. Select a GPIO tunneling mode from the drop-down menu. Set a value for the GPIO tunneling delay in ms.
----------------	--

5.3 Assigning input sources to a decoder

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



Prerequisite: You have already created input source configurations (see 5.1 Input Source Settings).

To assign input sources to a decoder:

1. Navigate to the page **Codec**.
2. Click on the tab **Decoder**.
3. Under **Source Assignment**, activate an input signal in the column **Main** by setting the switch to **ON**.
4. To assign an input source to the main source, select it in the dropdown menu. Alternatively, drag and drop the input source into the field.
5. Assign up to 3 backup sources following the same principle.
6. Choose between **Active** or **Standby** mode for your backup sources. This setting determines how the decoder handles these sources.
When a backup source is set to **Active** mode, the decoder continuously processes it. This ensures that the backup source is readily available for immediate use. It offers quick switching to the backup source when required.
In **Standby** mode, the decoder still receives the backup source, but it remains in a dormant state,

consuming fewer system resources. The decoder will only start processing the standby source when it's needed. While Standby mode conserves resources, it may introduce a slight delay when switching to the standby source due to the initial processing time.

7. Optionally, disable **Full automatic backup switching** to gain more control over the source switching. Click on the arrows between the sources to prevent a backup from automatically switching back to the input of higher priority, even if it improves in quality. This prevents unwanted back-and-forth switching between unstable sources. The source switching can be configured manually and remotely.
 8. Click **Save**.
- ✓ The decoder now processes the main and backup sources.
Continue with 5.5 Defining Switch Criteria for the main and backup sources.



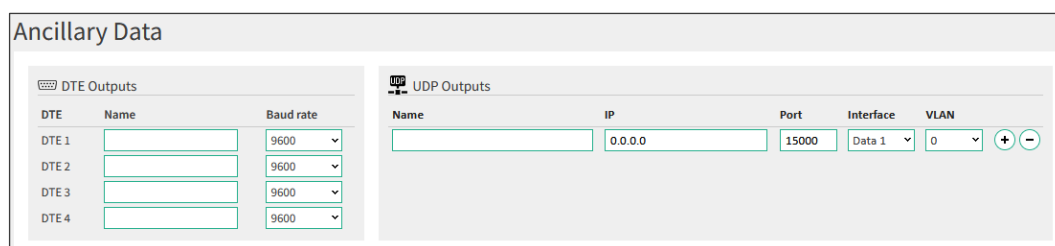
You can decode and play files from the internal storage. This option is recommended as an advanced redundancy for backup sources in case of input failure.



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

5.4 Configuring Ancillary Data

In addition to the DTE outputs, you can configure additional UDP ancillary outputs.



To configure the ancillary data outputs:

1. Navigate to the page **Ancillary Data**.
 2. Enter name for the DTE outputs and set a baud rate.
 3. To add UDP outputs for ancillary data, click **+**.
 4. Configure the parameters for the UDP outputs.
 5. Click **Save**.
 6. Navigate to the page **Codec**.
 7. In the tab **Ancillary Output**, assign sources to the ancillary data outputs. You can either select a specific ancillary data source or one of the decoder audio outputs. If one of the decoder audio outputs is selected, then the SAT-4d outputs the ancillary data of the currently active main or backup source.
 8. Click **Save**.
- ✓ The ancillary data are now assigned to outputs.

Parameters

Name	Enter a name for the output for better reference.
IP	Enter the IP address. This can be a multicast IP.
Port	Specify the port for ancillary data via UDP.

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

5.5 Defining Switch Criteria

The SAT-4d decoder can automatically switch between alternative sources as a redundancy solution in case of failure. The decoder receives and processes all enabled input sources from the encoder but only outputs the audio signal of the highest priority that is error-free (main source – backup 1/2/3). Additionally to the global switch criteria, you can define switch criteria for individual sources that override the global switch criteria.

You can enable the following switch criteria for input sources. The availability of switch criteria depends on the selected input source.

AES/EBU no signal	The SAT-4d will switch the input source to the next backup source if no signal is detected in the active input.
C/N	The SAT-4d will switch to the next input source if the carrier-to-noise ratio falls below the set value.
No decoder output	The SAT-4d will switch to the next input source if the decoder does not output any data.
No input data	The SAT-4d will switch to the next input source if no signal is available in the activated IP input [Data].
Packet jitter	The SAT-4d will switch to the next input source if the packet jitter exceeds the set value.
Packet loss (PER)	The SAT-4d will switch to the next input source if packet errors are detected in the input signal over the activated IP input [Data].
RF Level	The SAT-4d will switch to the next input source if the frequency is below the set value.
Silence detection	The SAT-4d will switch the input source to the next backup source if silence is detected in the audio signal of the input stream.
TS Sync	The SAT-4d will switch to the next input source if the transport stream is not synchronized.

To define global switch criteria for each audio input type:

1. Navigate to the page **Switch Criteria**.
 2. Click on the tab of the input source for which you want to define switch criteria.
 3. If any of the listed criteria should be monitored, enable the corresponding switch.
 4. In the field **Value**, enter the threshold above or below which the input source should be switched.
 5. For each enabled criterion, define the delay time **T1** for switching release. After this delay time, the input source switches to the next backup source.
 6. For each enabled criterion, define the delay time **T2** for switching end. After this delay time, the input source switches back to the previous source, if its signal is good.
 7. Click **Save**.
- ✓ The SAT-4d now automatically switches to the next good input source. For some switch criteria, you can set an alarm (see 9.18 Setting Up Alarms).

To define individual switch criteria for a specific input source:

1. Navigate to the page Codec.
 2. Click **Edit** on the input source for which you want to define individual switch criteria.
 3. Select the **Switch criteria** tab.
 4. Toggle the switch **Override global switch criteria**.
 5. Define the individual switch criteria.
 6. Click **Save**.
- ✓ The switch criteria for this input source now override the global switch criteria.



On the page Codec, the switch criteria scope (SCS) of an input source is indicated with  for global and with  for individual.

5.6 Setting Up Dual Streaming

Dual streaming is the simultaneous transmission and reception of 2 identical IP streams that come from the same encoder. This allows a seamless exchange of IP packets in case of errors: If the main stream drops packets, then the decoder immediately replaces them using the packets from the second stream. Ideally, the two streams use different networks, so one stream is still available in case of the other network failing.

Alternatively, it is possible to send both streams over the same network, with one stream being slightly delayed by setting up a send delay for it. Lost packets in the primary stream can be replaced in case of a burst error by using a dejitter buffer. The downside of using one network for both streams is that both streams will be affected in case of the network failing.

To set up dual streaming:

1. Set up dual streaming in the input source settings. For more information see 5.1 Input Source Settings.
 2. To use the input source, select it in the source assignment.
- ✓ Dual streaming is now enabled in the SAT-4d.

5.7 Setting Up a Buffer

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

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

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

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

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

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

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

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

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

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

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

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

5.8 Setting Up Stream4Sure



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

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

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

To set up Stream4Sure:

1. Enable Stream4Sure in the input source settings of up to 4 IP streams. For more information see 5.1 Input Source Settings.
 2. To use the input sources for a decoder, assign them to the main and backup sources.
- ✓ Stream4Sure is now enabled in the SAT-4d.



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

5.9 Receiving and Decoding an AES67 Stream

To receive and to decode AES67/Dante streams:

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



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

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

6 Interface Settings

6.1 Configuring the Output Settings

You can configure various settings for the output signals to ensure proper transmission and processing. The SAT-4d supports up to 4 digital channels, up to 2 analog channels and a mixed operation of up to 2 digital and 1 analog channels.

To configure the signal outputs:

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

Parameters

Signal Type	Select the signal type for the output interfaces.
Analog/Digital Gain	Adjust the gain of the output signals. This is useful if the signal's level is too high or too low.
Sample Rate Converter	To convert the sample rate to a specific frequency, enable the Sample Rate Converter. For more information, see 6.2 Enabling the Sample Rate Converter.
Sampling Rate	If the Sample Rate Converter is enabled, select the sampling rate.
Clock Source	Select the clock source for the Sample Rate Converter. To configure the external clock, see 9.13 Configuring Time / Clock settings.
AES/EBU Mute	Enable this function to mute an output if no input source is available.
Mono Downmix	Enable this function to output mono audio.

6.2 Enabling the Sample Rate Converter

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

To enable the sample rate converter:

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



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

Sample processing with enabled Sample Rate Converter:

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

Sample processing without enabled Sample Rate Converter:

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



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

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

6.3 Setting the Critical Level Marker

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

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

To set the critical level marker:

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

6.4 Configuring AES67 outputs

You can configure the device output audio over AES67 streams instead of over the physical audio output interfaces. To configure the AES67 outputs, you must set the signal type for the audio interfaces to AES67 and configure the AES67 interface settings.

Audio'. At the bottom left is a 'Save' button." data-bbox="94 170 757 348"/>

Audio AES67

Inputs Outputs

Output Settings

	Redundancy	Multicast IP	Port	IP Interface	VLAN	Payload ID	Packet Time	Audio Mode	Width	QoS DSCP	TTL	Empty Packets
1.	☐ Off	239.2.175.1	5004	Data 1	--	96	1 ms	Stereo	24 bit	Best effort (0)	42	☐ Off
2.	☒ On	239.2.175.2	5004	Data 1	--	96	1 ms	Stereo	24 bit	Best effort (0)	42	☒ On
	☐ Off	239.2.175.2	5004	Data 2	--							
3.	☐ Off	239.2.175.3	5004	Data 1	--	96	1 ms	Stereo	24 bit	Best effort (0)	42	☐ Off
4.	☐ Off	239.2.175.4	5004	Data 1	--	96	1 ms	Stereo	24 bit	Best effort (0)	42	☐ Off

Note:
Audio with "Signal Type" other than AES67 are disabled. [Audio](#)

Save

To set up the AES67 outputs:

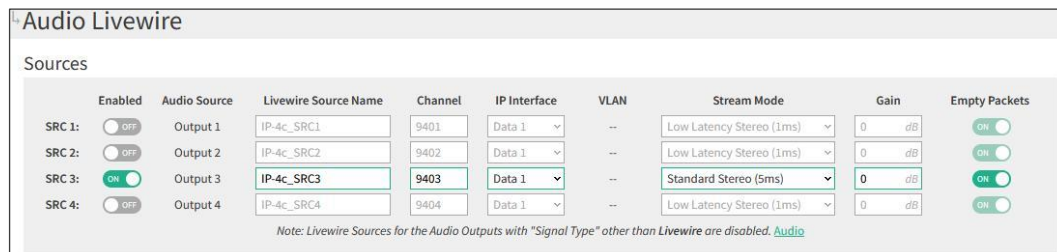
1. Navigate to the **Audio** page.
 2. Set the signal type of the audio outputs that you want to use to **AES67**.
 3. Select **Save**.
 4. Navigate to the **Audio AES67** page.
 5. To enable an output, toggle the switch next to it in the block **Output settings**.
 6. Configure the parameters on this page as described below.
 7. Select **Save**.
- ✓ The AES67 streams are now available to use as an input source under the **Interfaces** tab on the **Codec** page.

Parameters

Redundancy	Enable this function to set up a redundant AES67 stream input.
Multicast IP	Enter the Multicast IP address for the AES67 stream.
Port	Enter the port number for the AES67 stream. The default port number for AES67 streams is 5004.
IP Interface, VLAN	Select the IP interface and VLAN to be used for the AES67 stream input.
Link offset	Set a value for the link offset in ms.
Payload ID	Enter the payload ID. The default ID is 96.
Packet Time	The packet time defines the duration of audio contained in each packet. Shorter times can reduce latency but may increase network load.
Audio Mode	Choose stereo or mono channel audio.
Width	Select the bit width of the audio samples.
QoS DSCP	Select a Differentiated Services Code Point (DSCP) to determine the Quality of Service (QoS).
TTL	Choose the Time to Live (TTL) for the packets.
Empty packets	Toggle the switch to enable the device to maintain the connection even with empty packets.

6.5 Configuring the Interface Settings for Livewire

You can configure the device to output and advertise Livewire streams using audio from the audio output interfaces. You must first set the signal type for the audio output to Livewire and then configure the Livewire interface settings. You can also advertise the Livewire streams to your Livewire network.



Audio Livewire

Sources

	Enabled	Audio Source	Livewire Source Name	Channel	IP Interface	VLAN	Stream Mode	Gain	Empty Packets
SRC 1:	☐ OFF	Output 1	IP-4c_SRC1	9401	Data 1	--	Low Latency Stereo (1ms)	0 dB	☐ ON
SRC 2:	☐ OFF	Output 2	IP-4c_SRC2	9402	Data 1	--	Low Latency Stereo (1ms)	0 dB	☐ ON
SRC 3:	☒ ON	Output 3	IP-4c_SRC3	9403	Data 1	--	Standard Stereo (5ms)	0 dB	☒ ON
SRC 4:	☐ OFF	Output 4	IP-4c_SRC4	9404	Data 1	--	Low Latency Stereo (1ms)	0 dB	☐ ON

Note: Livewire Sources for the Audio Outputs with "Signal Type" other than Livewire are disabled. [Audio](#)

To setup the livewire output:

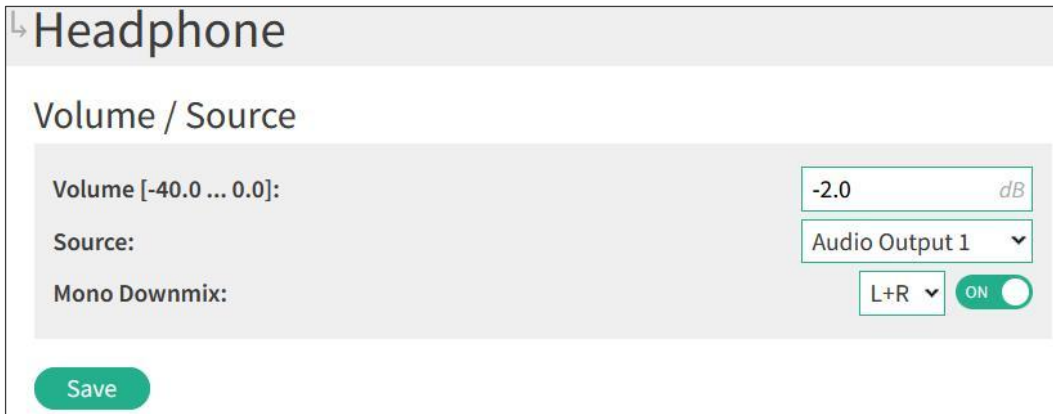
1. Navigate to the **Audio** page.
 2. Set the signal type of the audio outputs that you want to use to **Livewire**.
 3. Select **Save**.
 4. Navigate to the **Audio Livewire** page.
 5. Configure the parameters on this page as described below.
 6. Select **Save**.
 7. To advertise the stream in your Livewire network, configure the parameters on the **Livewire** page. (See 8.3 Configuring Livewire Settings)
- ✓ The Livewire streams are now available as Livewire sources in your network.

Parameters

Enabled	Enable the audio sources that you want to use as a Livewire Source.
Livewire Source Name	Enter a Livewire Source name or use the default.
Channel	Enter the channel number that will be used on the Livewire network. Channel numbers may range from 1 to 32767.
IP Interface, VLAN	Select the IP interface and VLAN to be used for the Livewire stream output.
Stream Mode	Select either low latency stereo (1 ms) or standard stereo (5 ms).
Gain	Adjust the gain within a range from -9.0 to 6.0 dB.
Empty Packets	Decide whether to send empty packets (silence) when no audio is available or to not send any packets. Make sure that this setting matches your alarm concept.

6.6 Changing the Headphone Volume

The input signal can be monitored via the headphone interface.

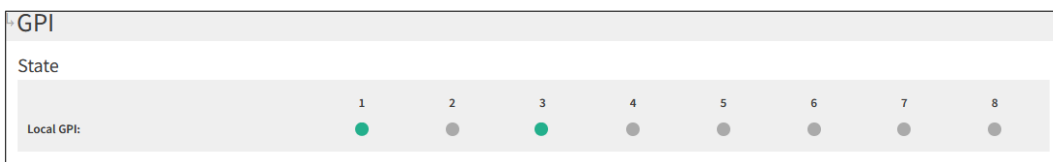


To change the volume of the headphone output:

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

6.7 Viewing the GPI Status

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



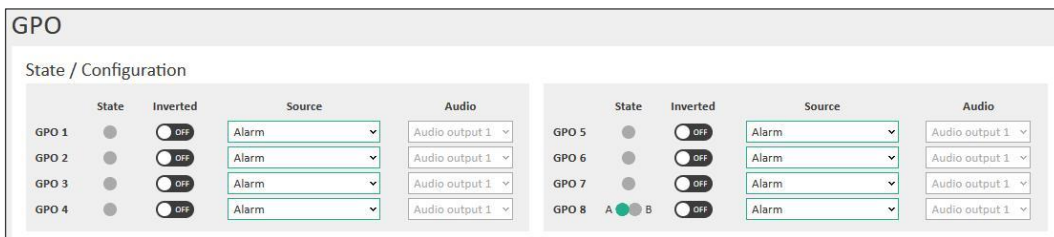
- To actuate a GPI, pull the corresponding control pin electrically to ground (pin 9). The resulting control current is less than 5 mA.
- To view the status of the GPIs, navigate to the page **GPI**.

For information on the GPI pin layout, see 12.2 Interface Pin Layouts.

6.8 Configuring the GPO settings

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

1. Navigate to the page **GPO**.
 2. To invert a GPO, enable the corresponding switch.
 3. Select the source for the GPO switch in the field **Source**. Only GPOs that are selected for the source **Alarm** can be used to indicate a triggered alarm.
 4. If you set **Active SIP call signaling**, **SIP call ringing**, **SCTE-35** or **GPIO Tunneling** as the source, then select the audio to be used for this function in the field **Parameter**.
 5. Click **Save**.
- ✓ You have configured the GPO settings.



State / Configuration				
	State	Inverted	Source	Audio
GPO 1	☐	☐ OFF	Alarm	Audio output 1
GPO 2	☐	☐ OFF	Alarm	Audio output 1
GPO 3	☐	☐ OFF	Alarm	Audio output 1
GPO 4	☐	☐ OFF	Alarm	Audio output 1

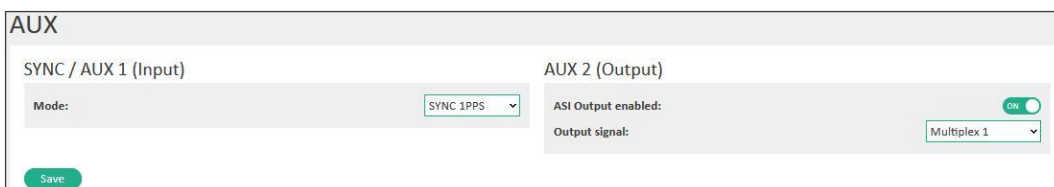
	State	Inverted	Source	Audio
GPO 5	☐	☐ OFF	Alarm	Audio output 1
GPO 6	☐	☐ OFF	Alarm	Audio output 1
GPO 7	☐	☐ OFF	Alarm	Audio output 1
GPO 8	☒ A ☐ B	☐ OFF	Alarm	Audio output 1

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

For information on the GPO pin layout, see 12.2 Interface Pin Layouts.

6.9 Defining the Use of the AUX Interfaces

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



AUX

SYNC / AUX 1 (Input)

Mode:

AUX 2 (Output)

ASI Output enabled: ☒ ON

Output signal:

Save

To configure the use of the AUX interfaces:

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

7 Network Settings

7.1 Configuring the Interface Services

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

Services

Interface services

	HTTP (Web)	HTTPS (Web)	SSH (SFTP)	SNMP	Ember+	Streaming Data
Ctrl:	☒	☒	☒	☒	☒	☒
Data 1:	☐	☐	☐	☐	☐	☒
Data 2:	☐	☐	☐	☐	☐	☒

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

Save

To select the supported services:

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

7.2 TCP/IP: Configuring the Ethernet Interfaces

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

NOTICE

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

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

To change the supported services per interface, see 7.1 Configuring the Interface Services.

TCP/IP

DNS Server

Primary:

Secondary:

Routing: ☐

Routing Interface:

Proxy Server

Enable proxy: ☒

Host:

Port:

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

Save

Interface settings

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

Save

To configure the ethernet interfaces:

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



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

3. Click **Save**.

✓ The ethernet interfaces are now configured.

Parameters

DNS Server

Primary

Enter the IP address of the primary domain name server (DNS).

Secondary

Enter the IP address of the secondary domain name server (DNS).

Proxy Server

Enable proxy

To enable the proxy server, toggle the switch.

Note: The proxy server will only be used for Icecast and MPEG DASH / HLS input streams.

Host

Port

Enter the port of the proxy server.

Interface Settings

Routing

Enable the Routing, which enables the DNS server to send and answer the requests over different [Data] interfaces.

VLAN

Enable VLAN and enter a VLAN ID (1-4095).

Priority

Assign a priority (1-7) to this stream to add a priority code point (PCP) according to the IEEE 802.1Q specification. Select 0 to disable the priority and use best-effort delivery.

DHCP

Enable dynamic host configuration protocol (DHCP) which enables the device to get an IP address automatically.

IP Address

If DHCP is disabled, then assign an IP address to the interface.

Subnetmask	Enter the subnetmask for the IP address.
Gateway	Enter the address of the local system that is used for the internet access (for example the router).
DNS Server	Enter the IP address of the DNS server used.
Speed	Set the network connection speed in Mbps or select Auto .

7.3 Using TCP/IP Tools for Network Testing

The SAT-4d features built-in TCP/IP tools for testing and diagnosing network connections. Use the ping tool for quick connectivity checks and basic latency measurements. Use the traceroute tool for a detailed analysis of the network path and to diagnose routing issues.



The screenshot shows the 'TCP/IP' configuration window with the 'Tools' tab selected. It contains two sections: 'Ping' and 'Traceroute'.

Ping Section:

- Settings:**
 - Destination:
 - Interface:
 - Count:
 - TTL:
 - Data size (0=default):
- Output:**

```
1000 bytes from 193.99.144.85: seq=0 ttl=248 time=9.929 ms
1008 bytes from 193.99.144.85: seq=4 ttl=248 time=9.748 ms
1008 bytes from 193.99.144.85: seq=5 ttl=248 time=10.099 ms
1008 bytes from 193.99.144.85: seq=6 ttl=248 time=9.746 ms
1008 bytes from 193.99.144.85: seq=7 ttl=248 time=10.223 ms
1008 bytes from 193.99.144.85: seq=8 ttl=248 time=10.048 ms

--- www.heise.de ping statistics ---
10 packets transmitted, 10 packets received, 0% packet loss
round-trip min/avg/max = 9.746/9.986/10.223 ms
```

Traceroute Section:

- Settings:**
 - Destination:
 - Interface:
 - Max. hops:
 - Time to wait:
- Output:**

```
traceroute to www.heise.de (193.99.144.85), 20 hops max, 38 byte packets
1 192.168.96.1 (192.168.96.1) 0.220 ms (64) 0.209 ms (64) 0.164 ms (64)
2 mx204-2.ham.purtele.com (185.39.84.9) 3.393 ms (254) 3.451 ms (254) 3.515 ms (254)
3 * * *
4 100.83.140.3 (100.83.140.3) 3.457 ms (252) 4.195 ms (252) 100.83.140.11 (100.83.140.11) 3.6
5 ipv4.de-cix.fra.de.asi2306.plusline.net (80.81.192.132) 10.957 ms (251) 10.632 ms (251) 9.4
6 82.98.102.7 (82.98.102.7) 10.271 ms (250) 10.882 ms (250) 11.714 ms (250)
7 * * *
8 * * *
9 * * *
10 * * *
11 * * *
```

Using the Ping Tool

The ping tool helps you determine the connectivity status and latency between the SAT-4d and a specified network destination.

1. Navigate to the **TCP/IP** page and select the **Tools** tab.
2. Configure the parameters in the **Ping** block:

Destination	Enter the hostname or IP address of the destination you want to ping.
Interface	Select the network interface to use for the ping request
Count	Specify the number of ping requests to send. The default is 10.
TTL	Set the maximum number of hops (routers) the ping request can pass through. The default is 255.
Data size	Define the size of the ping packet in bytes. Enter 0 to use the default size.

3. Select **Start** to initiate the ping test.
 4. Select **Stop** to end the ping test at any time.
- ✓ The results are displayed in the **Output** block. The ping results show each packet's response time and any packet loss, indicating the connection quality and latency.

Using the Traceroute Tool

The Traceroute tool helps you trace the path that data packets take from the SAT-4d to a specified network destination. This helps identify any delays or issues occurring along the path.

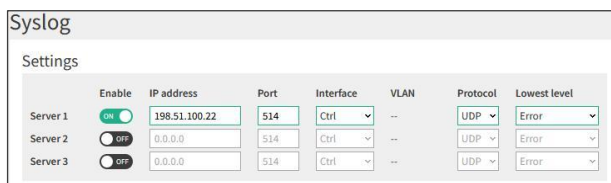
1. Navigate to the **TCP/IP** page and select the **Tools** tab.
2. Configure the parameters in the **Traceroute** block:

Destination	Enter the hostname or IP address of the destination you want to trace.
Interface	Select the network interface to use for the traceroute.
Max. hops	Specify the maximum number of hops (routers) the traceroute should attempt.
Time to wait	Set the maximum time (in seconds) to wait for each hop's response.

3. Select **Start** to initiate the traceroute test.
 4. Select **Stop** to end the traceroute test at any time.
- ✓ The results are displayed in the **Output** block. The traceroute results list each hop's IP address and response time.

7.4 Monitoring the Device via Syslog

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



	Enable	IP address	Port	Interface	VLAN	Protocol	Lowest level
Server 1	ON	198.51.100.22	514	Ctrl	--	UDP	Error
Server 2	OFF	0.0.0.0	514	Ctrl	--	UDP	Error
Server 3	OFF	0.0.0.0	514	Ctrl	--	UDP	Error

To send event information to a syslog server:

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

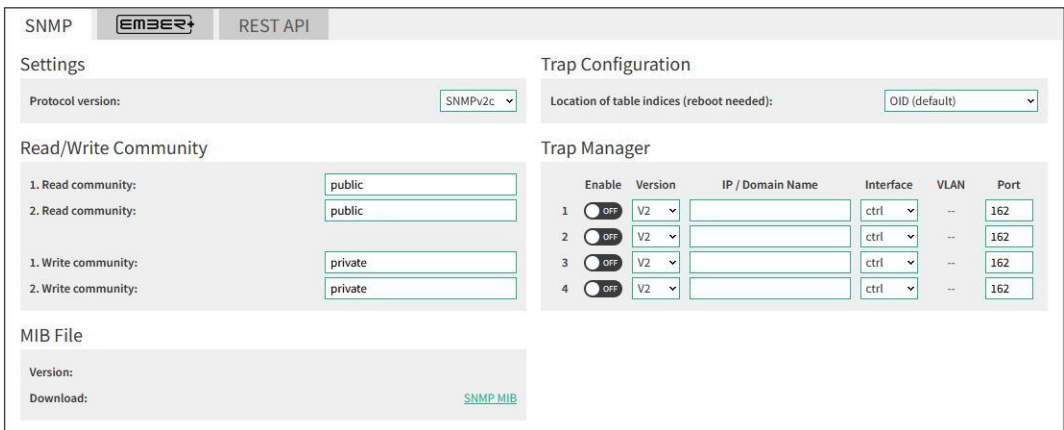
Parameters

IP address	Enter the IP address of the syslog server.
Port	Enter the port number.
Interface	Select the [Data] interface to be used.
VLAN	If the selected [Data] interface is an interface with VLAN, then select the VLAN to be used.
Protocol	Select the protocol to be used.
Lowest level	Select the lowest level of a message that will be sent to the syslog server. For more information see 10.8 Priority of Alarm Messages.

7.5 SNMP: Configuring Access Data for External Requests

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

SNMP (Simple Network Management Protocol) is a protocol used for managing and monitoring network devices. SNMP requests can be used to retrieve information such as the SAT-4d's current settings and performance metrics. This information can be used to diagnose problems and optimize network performance. SNMP requests can also be used to configure the SAT-4d remotely, allowing administrators to adjust settings.




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

1. Navigate to the page **External APIs**.
 2. Click on the tab **SNMP**.
 3. Select the protocol version in the block **Settings**.
 4. Configure the parameters in the block **Read/Write Community** or **SNMPv3 User / Security**. The parameters differ depending on the selected protocol version.
 5. Click **Save**.
- ✓ You have configured the access data for external SNMP requests.

Parameters

Read/Write Community

Read Community Enter SNMP access data for the external read-only SNMP access to the device.

Write Community Enter SNMP access data for the external write SNMP access to the device.

SNMPv3 User/Security

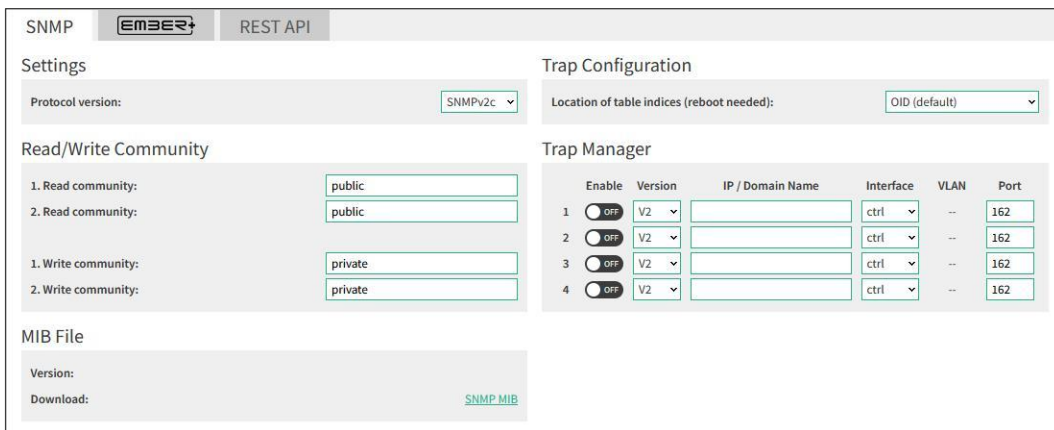
Read/Write user Enter username and password for the external write SNMP access to the device.

ReadOnly user Enter username and password for the external read-only SNMP access to the device.

Security protocols Select an authentication protocol and a privacy protocol.

7.6 SNMP: Configuring Trap Managers

As part of the monitoring function, the device can send SNMP traps to the defined IP addresses of the SNMP managers. SNMP traps are messages that are sent from a network device to a central management system when a specific event or condition occurs. SNMP traps are used as a means of notifying network administrators of important events, such as errors or performance issues, allowing them to take corrective action as needed. You can also read out the settings via SNMP Get.




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

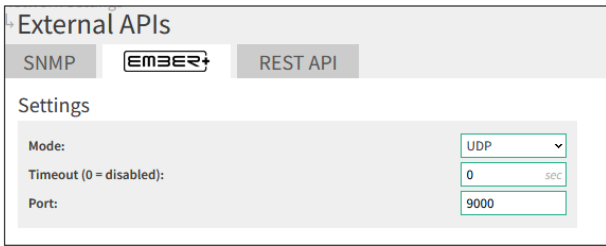
1. Navigate to the page **External APIs**.
 2. Click on the tab **SNMP**.
 3. Select the protocol version in the block **Settings**.
 4. Select the location of the table indices in the block **Trap Configuration**: **OID** or **OID plus additional index**.
 5. Configure the parameters in the block **Trap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

Parameters

Version	Select the format version of the SNMP traps.
IP or Domain Name	Enter the IP address or domain name of the trap receiver.
Interface	Select the [Data] interface to be used.
VLAN	If the selected [Data] interface is an interface with VLAN, then select the VLAN to be used.
Port	Enter the port number.

7.7 Ember+: Configuring Access for Monitoring

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



The screenshot shows the 'External APIs' configuration page with the 'EMBER+' tab selected. Under the 'Settings' section, there are three input fields: 'Mode' set to 'UDP', 'Timeout (0 = disabled)' set to '0' with a 'SEC' unit, and 'Port' set to '9000'.

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

Parameters

Mode	Select the mode from the dropdown menu.
Timeout	Enter the value for interval in seconds for a timeout.
Port	Enter the port number for the connection.

7.8 Enabling the REST API

A REST API is a standardized method for software applications to communicate over the internet. It operates based on REST principles, using HTTP requests and responses. The REST API enables seamless integration with other applications. It simplifies control through familiar HTTP methods, offers remote management, and facilitates automation, real-time monitoring, scalability, and extensibility. With help of the REST API, you can automate tasks and efficiently manage your audio codec system.

2wcom's REST API is compliant to Open API 3.0. For more information on Open API 3.0, refer to the official documentation: <https://swagger.io/specification/>

To enable the REST API:

1. Navigate to the page **External API**.
 2. Select the tab **REST API**.
 3. Set the switch **Enabled** to **ON**.
 4. Click **Save**.
 5. Download the file **openapi.json** from the page.
- ✓ You have now access to the REST API of the SAT-4d. For detailed information for developers, refer to the API documentation: https://download.2wcom.com/general/2WCOM_REST_API.pdf

8 Audio over IP Settings

8.1 Setting Up SAP



This function is only available if the *Ravenna* right is activated.

The SAT-4d supports SAP (Session Announcement Protocol) for stream announcement.

Prerequisite: You are logged in as an admin.

To set up the SAP connection:

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

Parameters

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

8.2 Using an External Clock Source



This option is only available if either of the rights *SFN* or *SPN* is enabled or if the device is equipped with a GPS module.

You can synchronize the SAT-4d with an external clock. Precise synchronization of time across devices on a network is critical to avoid audio distortion or loss of quality. By using an external clock source, audio codecs can ensure that they are operating with the same timebase, allowing them to maintain a consistent audio stream. By keeping all devices synchronized to an external clock source, audio codecs can ensure that their output remains high-quality and reliable. You can configure 1 main and up to 2 backup clocks.

External clock

Main	Backup 1	Backup 2
External Clock Source: NTP	External Clock Source: 1PPS	External Clock Source: none
Switch criteria NTP quality rating OK T1: 30 s T2: 30 s	Switch criteria 1PPS signal present T1: 30 s T2: 30 s	

Note:
The device continues to work in free-running mode with the internal clock in case all configured external clock sources fail.

To synchronize the SAT-4d with an external clock:

1. Navigate to the page **External Clock**.
 2. Select an external clock source for the main and backup clock sources.
 3. Configure the parameters for the main and backup clock sources.
 4. Configure the switch criteria for the main and backup source. The configurable criteria may vary depending on the selected clock source.
T1 is the delay time for alarm trigger. T2 is the delay time for alarm end.
 5. Click **Save**.
- ✓ The SAT-4d is now synchronized with an external clock. You can view the status information of the external clock on the page **Overview**. To use the external clock as the clock source for the audio outputs, see 6.1 Configuring the Output Settings.



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

Parameters - PTP

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

8.3 Configuring Livewire Settings



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

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

Livewire

General	GPIO	Advertisement
Routing Protocol: ☒ ON Hardware identification: 0 Ethernet: Data 1	Enable: ☒ ON Ethernet: Data 1 Name (GPIO 1-5): GPIO 1 Name (GPIO 6-8): GPIO 2	Enable: ☒ ON Address: 239.192.255.3 Ethernet: Data 1 Advertising port: 4001 Configuration port: 4000

Save

Prerequisite: You are logged in as an admin.

To configure livewire settings:

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

Parameters

General

Hardware identification Enter the hardware ID.

Ethernet Select the [Data] interface to be used.

GPIO

Enable To enable GPIO, toggle the switch.

Ethernet Select the [Data] interface to be used.

GPO 1/GPO 2 Assign names to [GPO 1-5] and [GPO 6-8].

Snake Mode

Advertisement

Enable To enable advertising, toggle the switch.

Address

Ethernet Select the [Data] interface to be used.

**Advertising/
Configuration port** Enter the ports for Livewire Advertising and for its configuration.

8.4 Monitoring Audio via Live Listening

Activated input sources of the 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 SAT-4d web interface. The SAT-4d is equipped with an adjustable bit rate encoder that can encode the input audio signal in five different formats. You can manually set up the parameters for audio encoding depending on the bandwidth available for data distribution.

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

To set up audio monitoring via Live Listening:

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



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

Parameters

Icecast Server for Live Listening

TLS/SSL encryption	To enable TLS/SSL encryption, toggle the switch.
Port	Enter the port number for streaming. The URL for Icecast streaming is "IP address of the device:streaming port". The standard port for live streaming is 8000. Example: <code>http://192.168.12.23:8000</code> .

Audio Encoder

Encoder Format	Select an audio format for streaming.
Audio Mode	Select a stereo or mono audio mode.
Sampling Rate	Select a sampling rate for streaming.
Bitrate	Select a bit rate for the selected audio format quality.

9 System Settings

9.1 Entering Device Information

For better identification of the SAT-4d, you can enter device-specific data.

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

Parameters

Name	Enter the name of the device for better reference.
Location	Enter the location of the device.
Description	Enter further important information on the device.

9.2 Setting Up Session Timeout

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

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

9.3 Changing the Title of the Browser Tab

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

1. Navigate to the page **Global**.
 2. Configure the parameters in the field **Browser tab config**.
 3. Click **Save**.
- ✓ The title of the browser now displays the configured information.

Parameters

Favicon	Set the look of the favicon (tab icon). Some favicons dynamically display the sum status of the status LEDs. If there is a red status LED, the favicon status also turns red. If there is no red status LED but an orange one, the favicon status turns orange. Otherwise, the favicon remains blue.
Title	Enter the information you want to display. You can use variables for specific information. Variables will update automatically if the corresponding information changes. View the possible variables by hovering over the input field.

9.4 Generating and Downloading a Diagnostic Report

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

To generate and download a diagnostic report:

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

9.5 Rebooting the Device

To reboot the device:

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

9.6 Restoring Factory Settings

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

To reset the device to factory settings:

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



9.7 Updating the Firmware with a File

There are different ways to update the firmware of your 2wcom device.

You can update the firmware directly via the web interface. For more information see 11.3.1 Checking for Updates.

Alternatively, you can upload ARM firmware stored locally and activate it via the web interface or load a firmware file from a USB stick.

To install a firmware file via the web interface:

1. Navigate to the page **Global**.
 2. In the block **Upload / Activate**, click **Browse/Drop** and select the firmware file you want to upload. Alternatively, you can select a firmware file that was previously uploaded to the **Storage** page.
 3. Click **Upload / Activate** to install the firmware file. This may take a while. Do not interrupt this process.
 4. After a successful activation, follow the prompt to restart the device.
- ✓ After the reboot, the new firmware is active.

To manually install firmware from a USB stick via the LCD menu:

1. Insert a USB stick with the firmware file into the [USB] port.
 2. Use the jog wheel to select **Config menu** → **System** → **Global** → **Update firmware from USB**.
 3. Select the firmware file you want to upload.
 4. Select **Update**. The installation may take a while. Do not interrupt this process.
 5. Select **OK** to reboot the device.
 6. Remove the USB stick from the device.
- ✓ After the reboot, the new firmware is active.

9.8 Activating rights

Some functions of the SAT-4d are optional and licensed. To use these functions, you must activate additional rights by uploading a rights file. To receive rights files, please contact your 2wcom sales representative. For more information see 3.2 Software Rights.

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

9.9 Uploading and Activating an SSL Certificate

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

To upload and activate an SSL certificate:

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

9.10 Generating and Saving a Settings File

You can download the current settings and save them as a file either to your local storage or to the internal storage of the SAT-4d. You can use this file later to restore the settings or upload it to another device to copy the settings.

1. Navigate to the page **Global**.
 2. In the block **Settings Download**, enter a file name and click **Generate**.
 - A file is being created. This may take a few seconds.
 - The download option with the time and date of file creation appears.
 3. Click **Download**.
 4. Save the file to a location of your choice.
 5. Click **Save**.
- ✓ You have saved settings to a local file. To upload and activate the settings stored locally, see 9.11 Loading Settings from a File.

9.11 Loading Settings from a File

You can upload a settings file to restore previous settings or copy the settings from another device. You can do this either via the web interface or the LCD menu. You can load the settings either without or including IP settings such as IP addresses and VLANs. This enables you to easily swap out a device. Note that if you load settings including IP via the web interface, you will lose the connection to the device due to the new IP address. For information on how to generate a settings file, see 9.10 Generating and Saving a Settings File.

To load a settings file via the web interface:

1. Navigate to the page **Global**.
 2. In the block **Upload / Activate**, click **Browse/Drop** and select the settings file you want to upload. Alternatively, you can select a previously uploaded or saved file from the internal storage of the device.
 3. Click **Upload / Activate** to install the settings file. The file upload may take a while. Do not interrupt this process.
- ✓ The new settings are now active. If you chose to also load the IP settings, the device now has a new IP address.

To load a settings file via the LCD menu:

1. Insert a USB stick with the settings file into the [USB] port.
 2. Use the jog wheel to select **Config menu** → **System** → **Settings** → **Load from USB** or **Load from USB (incl. IP)**.
 3. Select the settings file you want to upload.
 4. Select **Upload**. The file upload may take a while. Do not interrupt this process.
- ✓ The new settings are now active. If you chose to also load the IP settings, the device now has a new IP address.

9.12 Uploading a Debug Script

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

To upload a debug script:

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

9.13 Configuring Time / Clock settings

The page **Time / Clock** lets you set the time and date, configure settings for GPS, PTP, NTP, 1PPS and External Clock, and define Switch Criteria. You can view the status of these options in the section **Status** on the page **Time / Clock** (see 10.4 Time / Clock Status).

Time

To change time zone, time and date:

1. Navigate to the tab **Time**.
 2. Set the preferred time zone in the block **Local time**.
 3. To change the time and date, enter new time and date in the block **Time and date settings**.

Note: This setting might not be available when PTP or NTP synchronization is enabled.
- ✓ You have changed the time zone and time and date.

PTP

The SAT-4d can use a PTP (Precision Time Protocol) server as an external clock source. PTP is used to synchronize the internal clock of the device and to manage transmission delays for SFN (Single Frequency Network).



This function is only available if the right *Ravenna* is enabled.

To configure a PTP server as an external clock source:

1. Navigate to the tab **PTP**.
 2. Configure the parameters.
 3. Click **Save**.
- ✓ You have configured a PTP server as an external clock source.

Parameters

Enable	Toggle the switch next to the ethernet interface you want to use for PTP.
VLAN	If the selected interface is an interface with VLAN, then select the VLAN to be used.
Domain number	Enter the domain number.

Delay mechanism	The delay mechanisms measure the path delay between the PTP grandmaster, the internal clock of the device and all clocks along that path. The available mechanisms differ in accuracy of synchronization and supported networks. Select a delay mechanism to use: Auto: Depending on the signals the system receives the delay mechanism is automatically set. E2E: End-to-end delay mechanism measures the delay between the internal clock of the device and the PTP grandmaster directly, disregarding any other clocks along the path. P2P: Peer-to-peer delay mechanism measures the delay between directly connected peers along the path from the internal clock of the device to the PTP grandmaster. P2P is a very accurate delay mechanism but it only works if all clocks along the path support P2P. None: The delay mechanism Auto is automatically selected.
QoS DSCP general	Select a Differentiated Services Code Point (DSCP) to determine the Quality of Service (QoS) for general messages.
QoS DSCP event	Select a Differentiated Services Code Point (DSCP) to determine the Quality of Service (QoS) for event messages.
Unicast	Toggle the switch to enable Unicast. If PTP Unicast is enabled, enter the unicast URL or IP address.

NTP

The SAT-4d can use an external NTP (Network Time Protocol) server as an external clock source. NTP is used to synchronize the internal clock of the device and to manage transmission delays for SPN (Synchronous Playout Network). The configurable parameters on this page may differ depending on the activated rights.

To configure an external NTP server as an external clock source:

1. Navigate to the tab **NTP**.
 2. Configure the parameters.
 3. Click **Save**.
- ✓ You have configured an external NTP server as an external clock source.

Parameters

Enable	Select to enable NTP.
Bind to interface	To bind the NTP synchronization to a specific IP interface, set the switch to ON . Select the IP interface or VLAN.
QoS DSCP	Select a Differentiated Services Code Point (DCSP) to determine the Quality of Service (QoS). The selected packet will be prioritized.
NTP Quality rating	Select the quality of the NTP server. Low: Event logging, device time synchronization. Medium: For NTP servers that are accessed through the Internet and are used as External Clock source. High: For Stratum 1 NTP servers that are connected locally and are used as External Clock source. (SPN) Note: For Medium and High settings NTP will be rated as valid once the clock discipline algorithm has converged to acceptable RMS offset and skew values. For the Low setting, NTP becomes valid much quicker with reduced accuracy, however it will increase over time.

Expert settings	Set the switch to ON to show further parameters.
1.-4. Server URL / IP	Enter the URL or IP address of the NTP servers to be used.

External Clock

You can synchronize the SAT-4d with an external clock. Precise synchronization of time across devices on a network is critical to avoid audio distortion or loss of quality. By using an external clock source, audio codecs can ensure that they are operating with the same time base, allowing them to maintain a consistent audio stream. By keeping all devices synchronized to an external clock source, audio codecs can ensure that their output remains high-quality and reliable. You can configure 1 main and up to 2 backup clocks. Available external clock sources for the main and backup clock sources are **PTP**, **1PPS**, **NTP** and **GPS**. If you do not want to set any of the clock sources, select **None**. Note that if you want to set both **NTP** and **PTP** as external clock sources, **PTP** has to be set as the superior source.



The function PTP is only available when the right *Ravenna* is enabled.

The function 1PPS is only available when the right *SFN* is enabled.

The function GPS is only available when the correct expansion module is installed.

To configure the external clock sources:

1. Navigate to the tab **External Clock**.
 2. Select the main clock source.
 3. Select clock sources for Backup 1 and 2.
 4. Click **Save**.
- ✓ You have configured the external clock sources.

Switch Criteria

The SAT-4d can automatically switch between different clock sources in case of failure. The device receives data from all configured clock sources but only uses the source of the highest priority that is error-free. The source with the highest priority is the main source. As soon as an error is detected the clock source is changed to the source with the next highest priority. The switch criteria define how the clock sources are monitored, which values are considered faulty and when the sources are switched.

To define switch criteria:

1. Navigate to the tab **Switch Criteria**.
 2. Configure the parameters.
 3. Click **Save**.
- ✓ You have defined the switch criteria.

Parameters

Common

Fallback mode	Select the mode that the device should switch to in case all configured external clock sources fail. Select Holdover to use the last available clock source. Select Internal clock to use the internal clock of the system.
Expert settings	Select to enable expert settings.

Criteria(s)

State/Server	Shows the state of PTP, 1PPS and GPS and the NTP server availability.
Master offset	Time difference between the internal clock of the device and the PTP grandmaster clock in μ s.
RMS offset	The root-mean-square offset is a long-term average offset to the currently estimated time.
Initial skew	The frequency offset to the clock standard.

Time settings

T1	The T1 setting defines how long a sync source may be faulty before it is rated as bad and switched to a backup. Faulty means that one of the criteria must be met.
T2	If a source is rated as bad, no criterion must be fulfilled for the T2 time (everything is OK) until the source is rated as good again.

9.14 Changing Login Data

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

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

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

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

To change the login data:

1. Log in as an admin.
 2. Navigate to the page **User** in the section **System Settings**.
 3. In the tab **Login Data** change the login data for an account in the corresponding block and repeat the new password.
 4. Click **Save**.
- ✓ You have changed the login data.

9.15 Setting a PIN Code for the LCD Menu

You can set a PIN code to ensure that only authorized personnel can change any settings through the LCD menu.

LCD Menu Access Settings

PIN lock enabled:
☒ ON

PIN code:

Timeout (back to locked state):
 s

Hide IP addresses when locked:
☒ OFF

LCD Menu Access Status

Lock Status
Locked

Unlock

To set a PIN code:

1. Navigate to the page **User**.
 2. In the block **LCD Menu Access Settings** in the tab **Login Data**, enable the function **PIN lock enabled**.
 3. Enter a PIN code and the timeout duration after which the LCD menu locks.
 4. Determine whether the IP addresses should be hidden or shown when the LCD menu is locked.
 5. Select **Save**.
- ✓ The LCD menu is now secured by a PIN code. The status of the LCD menu is displayed in the block on the right. To unlock or lock the LCD menu through the web interface, select **Unlock/Lock**.

9.16 Adapting the Access for User Accounts

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

Prerequisite: You are logged in as an admin.

To adapt the access for manager and guest accounts each individual SAT-4d menu:

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

9.17 Accessing the recovery mode via reset pin hole

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

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



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

9.18 Setting Up Alarms

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

Device	
Temperature	Alarm is triggered if the device temperature exceeds the configured value.
Primary power supply (left)	Alarm is triggered in case of an error in the primary power supply unit.
Secondary power supply (right)	Alarm is triggered in case of an error in the secondary power supply unit.
LAN link	Alarm is triggered in case of an error in Ethernet data communication.
1 PPS clock status	Alarm is triggered if 1PPS signal is not present.
PTP clock status	Alarm is triggered if PTP signal is not present.
NTP clock status	Alarm is triggered if no NTP server is available.
SAT Tuner/ASI Input	
RF level	Alarm is triggered if the RF level of the tuner falls below or exceeds the configured values.
C/N	Alarm is triggered if the Carrier-to-Noise ratio (C/N) of the tuner signal falls below the configured threshold.
TS sync	Alarm is triggered if a loss of transport stream synchronization is detected.
Inputs/Outputs	
Silence detection	Alarm is triggered if the device detects silence in the left and/or right channel of the audio output.
Ancillary timeout	Alarm is triggered if the encoder/decoder has not received any ancillary data for a set amount of time.
DTE output timeout	Alarm is triggered if no ancillary data has been sent over this DTE interface for a set amount of time.
Encoder/Decoder	
No input data	Alarm is triggered if no input data is detected.
PER stream input	Alarm is triggered if the packet error rate per streams exceeds the set value.
PER Dual Streaming	Alarm is triggered if the packet error rate for dual streaming exceeds the set value.
SFN accuracy	Alarm is triggered if SFN accuracy exceeds the set value for a set amount of time.
Buffer level	Alarm is triggered if there will soon be not enough retained data to play out as buffer.
Audio error count	Alarm is triggered if the error counter increases by one. The alarm ends if the error counter stops increasing for a set period of time.
Loudness	
Momentary loudness	Alarm is triggered if the momentary loudness exceeds the set value.
ShortTerm loudness	Alarm is triggered if the ShortTerm loudness exceeds the set value.
Integrated loudness	Alarm is triggered if the integrated loudness exceeds the set level.
True Peak	Alarm is triggered if the true peak of the left, right or both channels exceeds the set level.

To set up alarms:

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

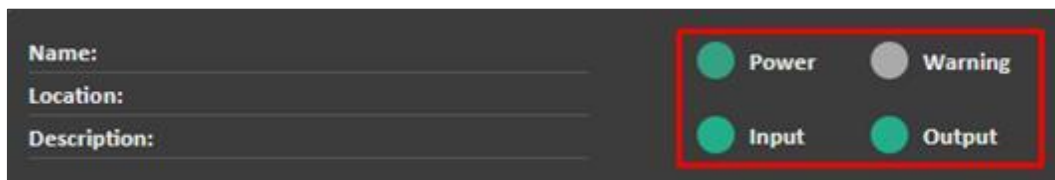
Parameters

Enable	Enable or disable an alarm.
Priority	Select the priority of the alarm message. (see 10.8 Priority of Alarm Messages)
Values	Enter the value below or above which the alarm triggers.
T1	Set the delay time for alarm trigger.
T2	Set the delay time for alarm end.
SNMP, LED, GPO	Enable the corresponding switch if the alarm should be signaled by SNMP traps, an LED or GPO switch. The corresponding GPO must be activated for the source "Alarm" (see 6.8 Configuring the GPO settings).

10 Status Information

10.1 Status LEDs

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



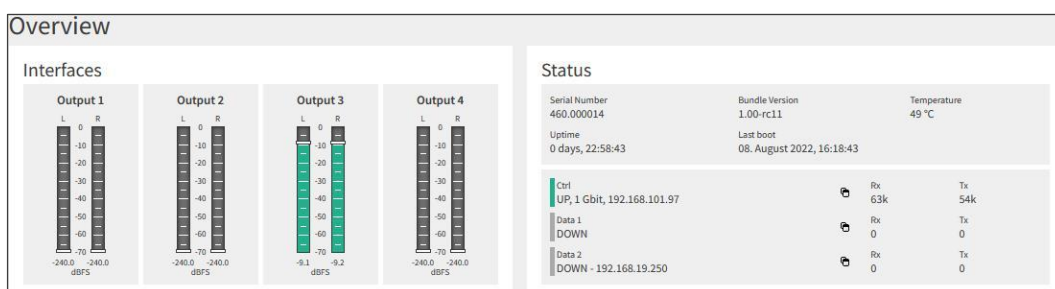
The following table displays the meaning of each LED:

LED	Color	Meaning
Power		All supply cords are connected and the power supply is OK.
		Toggles (green/red) if only one power supply is connected or OK.
Warning		LED is off if no alarms are triggered.
		At least one alarm is triggered.
Input		This LED is inactive as the SAT-4d does not have any inputs.
Output		No 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.

10.2 General Overview

Overview page

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



The audio levels of the inputs and/or outputs are displayed in the left block. To change the threshold above which the bar turns orange, see 6.3 Setting the Critical Level Marker.

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

Decoder Status

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

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

Green: Enabled

Gray: Disabled

Red: Error

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

The blocks display the following counters:

IP block	Missed indicates packets lost for the corresponding RTP receiver. This is the main error information when neither RIST, FEC, nor dual streaming are active.
FEC block	Recov. indicates the number of packets that were recovered by FEC. If dual streaming is active, then the same FEC is used on both IP connections. Unrecov. indicates the number of packets that could not be recovered. This is the main error information if FEC is active.
RIST block	Requested indicates the number of packets that are lost or late on the receiver side. These packets are requested for retransmission. Retransmitted indicates the number of packets that were retransmitted by the sender. Unrecovered indicates the number of packets that could not be recovered. This is the main error information if RIST is active.
Dual streaming block	Unrecovered indicates the number of packets that could not be recovered. This is the main error information if dual streaming is active.

The following abbreviations may appear in the decoder status overview:

SR	Sampling rate
SW	Sampling width
FEC	Forward error correction
Err	The number of errors in the decoder (e.g. failed samples, no audio, PER)
PER	Packet error rate of the input stream

External Clock Status

If an external clock is used, then it is displayed as  on the page **Overview**. The tab **External Clock** gives quick status information on the external clock. This block shows the active clock source and the configured backup sources as well as their status information. For more information on the NTP servers, see 10.4 Time / Clock Status.

Main PTP			Backup 1 NTP		Backup 2 10 MHz
PTP Status	PTP Grandmaster		NTP Source	RMS Offset	
	ec4670.fffe.00fffb			3 µs / < 500 µs	
PTP Master Offset	PTP Path Delay	PTP Domain	Last Valid Sample	Skew	
-46 ns	5772 ns	0	176 s / < 480 s	0.01 PPM / < 0.50 PPM	10MHz Valid

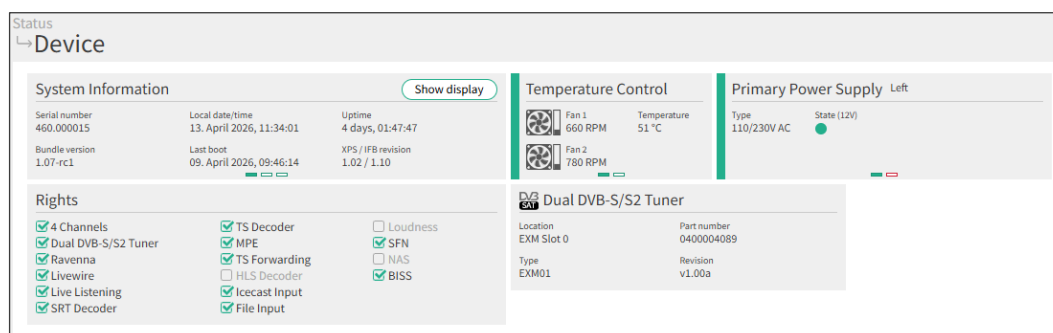
10.3 Device Status

The page **Device** displays information about the software and hardware of the device as well as a list of all currently activated and available rights. Furthermore, the status of the temperature control, voltages and the power supply of the device are displayed.

To show the LCD display of the device, click on **Show display** in the block **System Information**. This view mirrors the current display on the front of the device exactly. For remote control, the jog dial can be rotated using the mouse wheel. A left click simulates a click on the jog dial.

To show the Open Source Acknowledgement, click on **Show OSA** in the block **Bundle Versions**.

- The first block displays the **System Information**, information about the **Bundle Versions** and information about the **Codec Versions**.
- The block **Rights** lists all available rights for the device. The rights with the green checkmark next to them are the activated rights. The rights that are grayed out are available but currently inactive. For more information on activating rights see 9.8 Activating rights.
- The block **Temperature Control** displays the speed of the fans in rpm and the temperature of the device in Celsius. The colored bar indicates the status: green - ok, red - there is a problem with one of the fans.
- The block **Voltages** displays the voltages of various parts of the device and mainboard. The green bars next to the voltages indicate that the voltages are in an acceptable range.
- The block **Power Supply** displays the status and type of the power supply units installed in the device. The colored bar indicates the status: green - ok, red - no power. If only one power supply module is built in, only one block is displayed on this page.
- The block **network** displays information about the last received heartbeat, the interval of the heartbeat and the configured group memberships. If network is not enabled for the device, this block is not shown.
- The block next to the rights or network displays built-in hardware options. If no hardware options modules are built in, this block is not shown.



The screenshot shows the 'Device' status page with the following sections:

- System Information**: Includes a 'Show display' button. Fields include Serial number (460.000015), Local date/time (13. April 2026, 11:34:01), Uptime (4 days, 01:47:47), Bundle version (1.07-rc1), Last boot (09. April 2026, 09:46:14), and XPS / IFB revision (1.02 / 1.10).
- Rights**: A list of rights with checkboxes. Activated rights (checked) include: 4 Channels, Dual DVB-S/S2 Tuner, Ravenna, Livewire, Live Listening, SRT Decoder, TS Decoder, MPE, TS Forwarding, HLS Decoder, Icecast Input, File Input, Loudness, SFN, NAS, and BISS.
- Temperature Control**: Shows Fan 1 at 660 RPM and Fan 2 at 780 RPM, with a Temperature of 51 °C.
- Primary Power Supply**: Shows Type 110/230V AC and State (12V) as green.
- Dual DVB-S/S2 Tuner**: Shows Location EXM Slot 0, Part number 0400004089, Type EXM01, and Revision v1.00a.

10.4 Time / Clock Status

The page **Time / Clock** gives information on the status of 1PPS, GPS, PTP, NTP and External Clock. In the tab **PTP / NTP**:



Depending on the activated rights, the tab might only say NTP.

- The block **Present Date / Time** displays the current set date, time and time zone.
- The block **Leap Second Status** displays information about the leap second. The table below explains the data that is displayed in this block:

TAI-UTC Offset	Shows the time difference between the atomic time (TAI) and the coordinated universal time (UTC).
Data valid until	Shows the end of validation of the current leap second file.
Next Offset	Shows the next leap second offset if already announced.
Next Leap Second	Shows the date of the next leap second if already announced.

- The block **Synchronization Status** displays information about the synchronization source. The table below explains the data that is displayed in this block:

Sync source	Displays the source that is currently used for synchronization.
Last reference time (UTC)	The time (UTC) at which the last measurement from the reference source was processed.
Stratum	The stratum value indicates how many levels away the NTP server is from the primary reference source. Lower stratum values indicate a closer and more accurate clock source.
Frequency	The rate by which the clock would be wrong if it were not corrected.
Skew	The frequency offset to the clock standard.
RMS offset	The root-mean-square offset is a long-term average offset to the currently estimated time.

- The block **Clock Sources** displays the configured NTP or PTP clock sources. If no NTP or PTP clock source is configured, this block is not shown. The table below explains the data that is displayed in this block:

Source state	Current best: the best source which is currently selected for synchronization Combined: other sources selected for synchronization which are combined with the best source. Not combined: any other source.
Stratum	The stratum value indicates how many levels away the server is from the primary reference source. Lower stratum values indicate a closer and more accurate clock source.
Frequency	This is the estimated residual frequency for the server.
Freq. skew	The frequency offset to the clock standard.
Measured offset	The measured time difference between the local clock and the server's clock at the time of synchronization.
Estimated error	The total worst-case timing error accumulated between the stratum 1 server and the client.
Poll	Polling interval, which is the frequency at which the device queries the server for time updates.
Reach	Indicates the reachability of the server. This is a bitmask value that shows how successfully the device has been able to reach and communicate with the server.
Last RX	Shows how long ago the last good sample was received from the source.

In the tab **External Clock**:

- The block **Main** displays information about the external clock source that is set as the main source.
- The blocks **Backup 1** and **Backup 2** display information about the external clock sources that are set as backup sources.

10.5 Ancillary Data Status

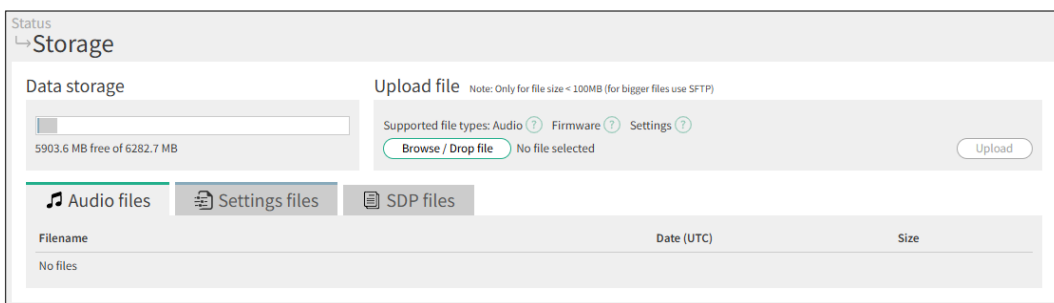
The status page **Ancillary Data** gives information on the status of the ancillary data inputs and outputs.

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

10.6 Internal Storage

You can upload audio files to the internal storage to use them e.g. as a backup input source. You can also upload settings files and firmware files to install later. Generated settings files also appear on the **Storage** page.

If the *Ravenna* right is activated, the **Storage** page also lists downloadable SDP files that contain vital information on the stream.



- Prerequisite: You are logged in as an admin.

To upload a file to the internal storage:

1. Navigate to the **Storage** page.
 2. In the **Upload file** block, select **Browse/Drop file**.
 3. Select the audio file, firmware file, or settings file that you want to upload.
 4. Click **Upload**. The upload may take a while. Do not interrupt this process.
 - The uploaded file is now displayed in the corresponding tab.
- ✓ You have uploaded a file to the internal storage. The percentage of used storage is displayed in the block **Data storage** and color coded according to the colors of the corresponding tabs. You can delete and download files on this page and install uploaded settings or firmware files on the page **Global**.

10.7 Log

Event Log

The event log is a record of significant system events, such as system restarts and error messages, which are crucial for monitoring the performance of the device. These events have an alarm priority and may require immediate attention or action to resolve issues or ensure proper operation (see also 9.18 Setting Up Alarms).

Event Log				
Extended Log volatile				
Filter: Example: Cold Start OK Operations: '&' for AND, ' ' for OR States: OK, FAIL Auto Refresh ☒ Download Clear				
No	Time	Priority	State	Message
887	2023-09-07 11:06:03	Informational		Successful login as Admin from 192.168.96.90
886	2023-09-06 13:15:14	Informational		Successful login as Admin from 192.168.99.120
885	2023-09-06 08:16:55	Informational		Successful login as Admin from 192.168.99.120
884	2023-09-05 14:07:24	Informational		Successful login as Admin from 192.168.96.90
883	2023-09-05 12:40:30	Informational	●	BNC Input 1: Silence Detection (Ref: 0.0, Level: 5.0 [dBu])
882	2023-09-05 12:40:02	Emergency	●	BNC Input 1: Silence Detection (Ref: 0.0, Level: -11.9 [dBu])

Extended Log

The extended log contains less critical information compared to the event log, and is primarily intended to provide insights into general events. The log entries in the extended log are informational and do not carry alarm priorities, they are volatile and do not persist over restarts.

Event Log				
Extended Log volatile				
Filter: Example: RtpMissedPkt&SSRC:0x7ee9fcd Operations: '&' for AND, ' ' for OR States: OK, FAIL Auto Refresh ☒ Download				
No	Time	Source	Type	Message
54	2023-09-05 16:33:50	Default	RtpRxTimedOut	RTP Rx stream timed out from IP 192.168.101.72:52238, SSRC:0x00000000
53	2023-09-05 16:00:09	Default	RtpUnrecoveredPkt	RTP Rx 1 packet(s) unrecovered (eq. 3ms), 1st missed SEQ:36339
52	2023-09-05 16:00:09	Default	RtpMissedPkt	RTP Rx 1 packet(s) missed, 1st missed SEQ:36339 (from 192.168.101.72:52238)
51	2023-09-05 15:21:27	Default	RtpRxStart	Start RTP Rx from IP 192.168.101.72:52238, SSRC:0x00000000
50	2023-09-05 15:21:27	Default	RtpRxStart	Start RTP Rx from IP, SSRC:0x65ebd7cc
49	2023-09-05 15:21:11	Default	RtpRxTimedOut	RTP Rx stream timed out from IP 192.168.101.72:52238, SSRC:0x00000000
48	2023-09-05 15:21:00	Default	RtpRxStart	Start RTP Rx from IP 192.168.101.72:52238, SSRC:0x00000000

- To automatically refresh the page and immediately see new entries, toggle the switch **Auto Refresh**.
- To sort the log entries, click on the column header of the parameter by which you want to sort the entries. To reverse the order, click the same header again.
- To search for a specific entry, enter a term into the search bar.
- To save the list to a log file, click **Download**.
- To delete all log entries, click **Clear**. Confirm your decision in the dialog window.

10.8 Priority of Alarm Messages

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

Priority	ID/Code	Definition
Emergency	0	System is unusable
Alert	1	Actions must be taken immediately
Critical	2	Critical condition
Error	3	Error condition

Warning	4	Warning condition
Notice	5	Normal but significant condition
Informational	6	Informative message
Debug	7	Debug-level message

11 Maintenance and Support

11.1 Maintenance and Disposal

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

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

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

11.2 Troubleshooting and Warranty

More often than not, it is only a small detail that has been overlooked and leads to a problem.

Therefore, read the user manual carefully, as this will help you to understand, prevent and eliminate typical problems. Use the following table to self-check common error sources prior to contacting our support.

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

Problem	Possible Causes	Solution
Device does not turn on	- Power cable is connected improperly - Mains supply failure - Blown fuse	- Check power supply cord. - Make sure that the power plug is fully inserted. - Check mains supply. - Replace fuse by same type.
Device is not accessible via Ethernet	- Network cable is not connected - IP address/TCP port is unknown - A device with the same IP address was connected a few minutes before. Thus, the ARP table still assigns the old MAC address to the IP address.	- Connect the network cable. - Check IP address obtained from DHCP via LCD menu. - The operation system refreshes the ARP table every few minutes. For instant access to the device, reset the ARP table of your computer, e.g. by entering <code>arp-d</code> in the Windows command prompt.
Device does not respond		- Reboot the device. - Update the software.

11.3 Support

The section **Support** is located in the lower left corner of the web interface. In this section you can check for updates, manuals and documents and access the 2wcom support center.

Alternatively, you can go to the [2wcom Download Center](#) to check for manuals, documents and firmware bundles of every 2wcom device.

11.3.1 Checking for Updates

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

Alternatively, you can upload ARM firmware stored locally and activate it via the web interface or load a firmware file from a USB stick to update the firmware. For more information see 9.7 Updating the Firmware with a File.

To install an available update:

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



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



In the window **Available Firmware Versions**, you can enable an **automatic update check** every 24 hours. If a new update is available, it will be indicated by the ★ icon next to the **Check for Updates** menu item. You can also enable a notification dialog that informs you of any new updates.

11.3.2 Checking for manuals and documents

You can check which manuals and documents are available for your device.

To show the current version of the manual and other available documents:

1. Click on **Manuals / Documents** in the section **Support**.
 - The window **Manuals / Documents** opens.
 2. Choose a manual or document you want to view.
 - ① The list shows the language the document is written in, the name, date, version and type of the document.
 3. Click **Open** to open the manual or document.
- ✓ You have opened the current version of the manual or another document.

11.3.3 Accessing the support center

Report failures and request support via the 2wcom support center.

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

To access the support center:

1. Click on **Support Center** in the section **Support**.
 - The page **Support** of the 2wcom website opens as a new browser tab.
 2. Click on **2wcom Support Center**.
 - The 2wcom support center opens as a new browser tab.
- ✓ You have accessed the 2wcom support center.

11.4 Manufacturer

2wcom Systems GmbH
Am Sophienhof 8
24941 Flensburg
Germany

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12 Technical Details

12.1 Specifications

12.1.1 Reception

12.1.1.1 Satellite Tuner

	Dual DVB-S/S2/S2X Tuner (default)	Advanced DVB-S/S2 Single Tuner (optional)
Connector RF1	F connector female (input)	F connector female (input)
Connector RF2	F connector female (2nd input)	F connector female (loop-through)
Frequency range	950 – 2.150 MHz, in 1 kHz steps All LNB oscillator frequencies possible	950 – 2.150 MHz, in 1 kHz steps All LNB oscillator frequencies possible
Input level, impedance	-75 – -20 dBm, 75 Ω	-75 – -20 dBm, 75 Ω
LNB Control	13 V vertical, 18 V horizontal, off 0 kHz low band, 22 kHz high band	13 V vertical, 18 V horizontal, off 0 kHz low band, 22 kHz high band
Noise figure	Typically 6 dB, max. 12 dB	Typically 6 dB, max. 12 dB
DVB-S Demodulation/Decoding	QPSK: 1/2, 2/3, 3/4, 4/5, 5/6, 7/8 CCM VITERBI and Reed-Solomon decoder DIRECTV™ (DSS) compliant	QPSK: 1/2, 2/3, 3/4, 4/5, 5/6, 7/8 CCM VITERBI and Reed-Solomon decoder DIRECTV™ (DSS) compliant
DVB-S2/S2X Demodulation/Decoding	QPSK: 1/4, 1/3, 2/5, 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 8/10 8PSK: 3/5, 2/3, 3/4, 5/6, 8/9, 9/10 16APSK: 2/3, 3/4, 4/5, 5/6, 8/9, 9/10 32APSK: 3/4, 4/5, 5/6, 8/9, 9/10 Roll-off 0.05 – 0.35 Normal frames only (no short frames) CCM / VCM / ACM LDPC and BCH decoder S2 Professional Profile/S2X Broadcast Profile	QPSK: 1/4, 1/3, 2/5, 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 8/10 8PSK: 3/5, 2/3, 3/4, 5/6, 8/9, 9/10 16APSK: 2/3, 3/4, 4/5, 5/6, 8/9, 9/10 32APSK: 3/4, 4/5, 5/6, 8/9, 9/10 Roll-off 0.20 / 0.35 CCM / VCM / ACM LDPC and BCH decoder S2 Professional Profile
Symbol rates	QPSK, 8PSK, 16APSK: 1 – 45 MSym/s 32APSK: 1 – 40 MSym/s	QPSK, 8PSK, 16APSK: 0.64 – 45 MSym/s 32APSK: 0.64 – 38 MSym/s
Data processing	single and multiple MPEG TS GSE-HEM (S2X only) – on request	single and multiple MPEG TS single and multiple GSE
PL scrambling	ID 0 - 262144	ID 0 - 262144
IF Filter bandwidth	Automatic selection	Automatic selection
MPEG decoding	according to ETSI TR 101 154	according to ETSI TR 101 154

12.1.2 Formats and Protocols

12.1.2.1 Audio

Codecs (included)	Linear PCM, G.711, G.722 Opus, Ogg Vorbis MPEG 1/2 Layer 2, 3 MPEG-2/MPEG-4 AAC-LC, MPEG-4 HE-AAC v1 & v2, MPEG-4/MPEG-D xHE-AAC MPEG-4 AAC-LD/ELD/ELDV2 Enhanced aptX (E-aptX)
Codecs (optional)	Dolby Digital (AC-3) Dolby Digital Plus (E-AC-3) Dolby E (on request)
Bit depth	16, 20, 24 bit
Sample rates	16, 22.05, 24, 32, 44.1, 48 kHz (On request: up to 192 kHz)

12.1.2.2 Streaming

IP protocols	TCP, UDP unicast, multiple unicast & multicast
Audio over IP formats	RTP (RFC 3550, RFC 3551, RFC 3640, RFC 2250) SIP/SAP according to EBU Tech 3326 SMPTE ST 2110 (optional) AES67 based on RAVENNA, Livewire, or Dante (optional) Livewire / RAVENNA (SAP, RTSP, AES67, PTP, PTPv2) (optional) MPEG-TS
Web streaming	Icecast/Shoutcast Client HLS decoder (optional)
Transmission robustness	SRT, RIST Pro-MPEG FEC #3 release 2 Dual Streaming 2wcom Stream4Sure µMPX FEC Adaptive bitrate switching, source switching concept, management of packet size, buffers, QoS

12.1.2.3 Synchronization

Internal	free-running
External	1PPS, PTP, PTPv2, NTP, digital reference input
Decoder synchronization between different devices	< 20 ms using SPN via NTP (optional) < 1 µs using SFN via 1PPS or PTP, PTPv2 (optional)
Sample rate converter	Asynchronous, any ratio

12.1.3 Interfaces

12.1.3.1 Audio

Digital (out)	4x AES/EBU, 110 Ω balanced integrated XLR male, shared with analog out (configurable)
Analog (out)	2x L/R, < 20 Ω balanced integrated XLR male shared with digital out (configurable)
Analog reference level	+9 dBu
Digital reference level	-9 dBFS
Adjustable gain	20 – +6 dB
Dynamic range	16 Bit: > 89 dB; 24 Bit: > 130 dB
Frequency response	Depends on sample rate. For example: 48 kHz: 0.1 dB; 20 Hz – 22.5 kHz

12.1.3.2 Interface Extensions

ASI input	75 Ω BNC socket, 270 Mbit/s, MPEG2 TS Note: Configurable to be either ASI input or 1 PPS SYNC input.
ASI output	75 Ω BNC socket

12.1.3.3 Ethernet

Connector	3x RJ45 (1x Control, 2x Data)
Type	Auto-switching 10/100/1000 BASE-T Unicast, Multicast

12.1.3.4 Synchronization

1PPS input	Note: Configurable to be either 1PPS SYNC input or ASI input.
GPS (optional)	75 Ω BNC socket
10 MHz output (optional)	50 Ω SMA socket, from GPS module
1PPS output (optional)	75 Ω BNC socket, from GPS module

12.1.3.5 Serial and GPIO

USB	USB 2.0 interface for service, configuration, and firmware updates
GPIO	26 pole D-Sub male; combined connector for inputs (GPI) and outputs (GPO)

12.1.3.6 Internal Storage

Size	7 GB (optional 128 GB)
Type	eMMC (optional SSD)

12.1.3.7 Front Panel

Headphone	6.3 mm / 1/4" socket, < 10 Ω
LEDs	Power, Input, Output, Warning
Operation	Display and Jog Wheel
Display	LCD, graphical, 264x64 pixel

12.1.4 General Data

12.1.4.1 Integrated Web GUI

Languages	English
Web technologies	HTML5, Java Script

12.1.4.2 Device

Power consumption	< 20 W
Case dimensions	19", 1 RU, depth: 310 mm, width: 424 mm, front panel: 484 mm
Weight	< 5 kg
Material	Steel plate, aluminum-zinc coated
Operating temp. range	0 – +45 °C
Storage temp. range	-40 – +70 °C

12.1.4.3 Power Supply

Standard AC	1x internal IEC power connector voltage range 90 – 260 VAC (nominal 100 – 240 VAC) frequency range 47 – 63 Hz (nominal 50 – 60 Hz)
Standard DC (optional)	1x internal (Neutrik powerCON) voltage range -40 – -60 VDC (nominal -48 VDC)
Dual internal (optional)	2x internal redundant power supplies (AC or DC) automatic switchover and prioritization AC: 90 – 260 VAC (nominal 100 – 240 VAC), 47 – 63 Hz (nominal 50 – 60 Hz) DC: -40 – -60 VDC (nominal -48 VDC)
Dual hot-plug (optional)	2x hot-swappable redundant power supplies (AC or DC) automatic switchover and prioritization AC: 90 – 260 VAC (nominal 100 – 240 VAC), 47 – 63 Hz (nominal 50 – 60 Hz) DC: -40 – -60 VDC (nominal -48 VDC)

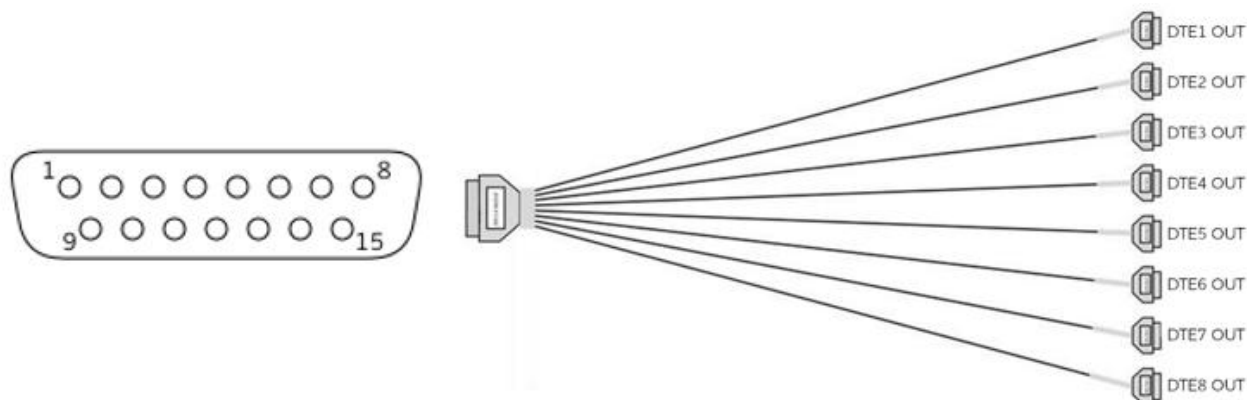
12.2 Interface Pin Layouts

12.2.1 DTE

The device features a 15-pole D-Sub male interface for DTE data communication. Connect a breakout cable to use 8 9-pole interfaces.

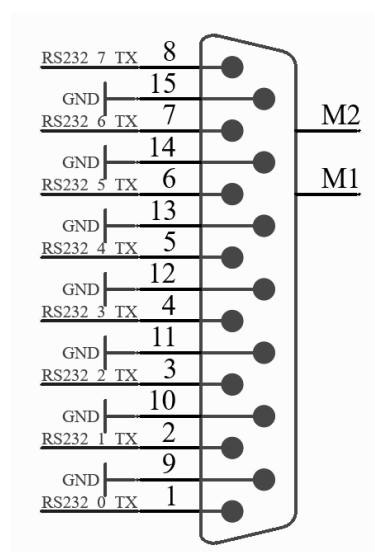


The SAT-4d only supports DTE1 through DTE4.



The pin layout for DTE is as follows:

Sub-D	RS232
1	0 TX
2	1 TX
3	2 TX
4	3 TX
5	4 TX
6	5 TX
7	6 TX
8	7 TX



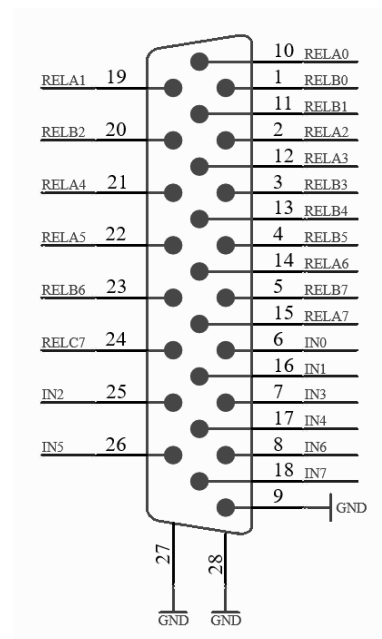
The SAT-4d only supports the Sub-D pins 1 through 4 (0 TX through 3 TX).

12.2.2 GPIO

The SAT-4d features 8 GPI and 8 GPO contacts that are housed in the same 26-pole D-Sub male connector. The inputs can be used for remote control (in combination with remote control software). The outputs include 7 SPST relays (form A) and 1 SPDT relay (form C) that can be used for alarms of the monitoring function.

The pin layout for **GPI** is as follows:

GPI No.	Sub-D pin name (pin no.)
1	IN0 (6)
2	IN1 (16)
3	IN2 (25)
4	IN3 (7)
5	IN4 (17)
6	IN5 (26)
7	IN6 (8)
8	IN7 (18)
–	GND (9)



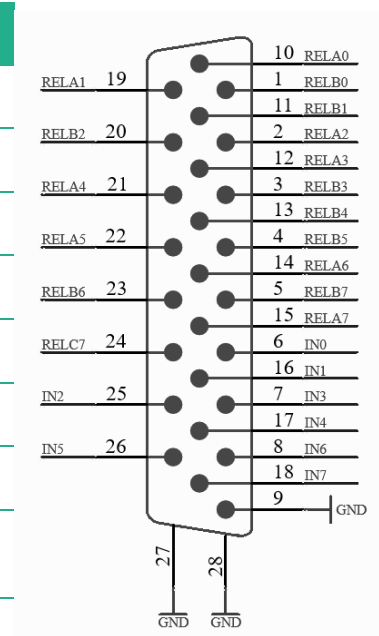
- To actuate a GPI, pull the corresponding control pin electrically to ground (pin 9). The resulting control current is less than 5 mA.

NOTICE Risk of equipment damage!

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

The pin layout for **GPO** is as follows:

GPO No.	Sub-D pin name (pin no.)	Switch type
1	RELA0 (10), RELB0 (1)	SPST, NO
2	RELA1 (19), RELB1 (11)	SPST, NO
3	RELA2 (2), RELB2 (20)	SPST, NO
4	RELA3 (12), RELB3 (3)	SPST, NO
5	RELA4 (21), RELB4 (13)	SPST, NO
6	RELA5 (22), RELB5 (4)	SPST, NO
7	RELA6 (14), RELB6 (23)	SPST, NO
8	RELA7 (15), RELB7 (5), RELC7 (24)	SPDT
–	GND (9)	–



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

SPDT: single pole, double throw

NO: normally open

NOTICE

Risk of equipment damage!

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

12.3 Certificates and Declarations



EC declaration of conformity

The manufacturer

2wcom Systems GmbH
Am Sophienhof 8
24941 Flensburg
Germany

hereby confirms that the product:

SAT-4d

in its conception, construction and form put into circulation is in accordance with all the relevant essential health and safety requirements of the following EC/EU directives as amended and the national laws and regulations adopting these directives:

- | | |
|---|---------------------|
| • Audio/video, information and communication technology equipment – Part 1: Safety requirements | EN IEC 62368-1:2021 |
| • Electromagnetic Compatibility (EMC) Directive | 2014/30/EU |
| • Low Voltage (LVD) Directive | 2014/35/EU |
| • Radio Equipment Directive (RED) | 2014/53/EU |
| • Restriction of Hazardous Substances (RoHS 2) Directive | 2011/65/EU |

This EC-declaration of conformity is the result of a test, which was accomplished in accordance with the standards EN 301489-1:2020-06, EN 300422-1:2022-05, EN 300422-2:2017-07, EN 55011:2023-10, EN 55035:2022-06, EN 55032:2022-08, EN IEC 61000-3-2:2023-10, EN 61000-3-3:2023-02, EN 61000-4-2:2009-12, EN 61000-4-3:2021-11, EN 61000-4-4:2013-04, EN 61000-4-5:2021-04, EN 61000-4-6:2014-08, EN 61000-4-11:2021-10, EN 61000-4-16:2016-10, EN 63000:2019-05.

This declaration is no longer valid if the machine is modified without our consent.

2wcom Systems GmbH

September 3, 2026

