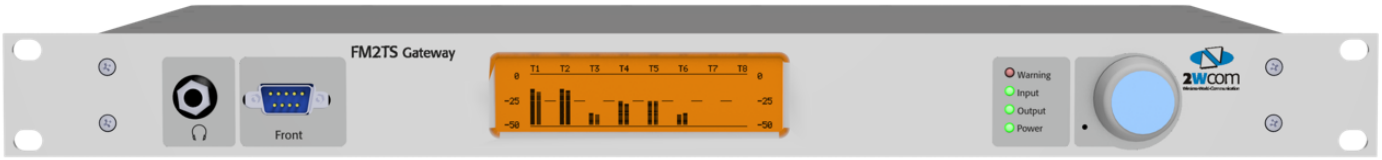
FM2TS Gateway



User Manual

Screenshots: FM2TS Version 1.05 – FPGA 1.08 – Web interface Version 2.33

May 2019

User Manual FM2TS V01.24

Content

1. Symbols in this manual

1.1. References and Hyperlinks in this PDF File

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

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

1.2. Warning signs and their meaning

The following warning signals are used in this user manual:

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

1.3. Tags and their meaning

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

⚠ DANGER	Indicates a hazardous situation which, if not avoided, will result in death or serious injury.
⚠ WARNING	Indicates a hazardous situation which, if not avoided, could result in death or serious injury.
NOTICE	Describes precautions necessary to protect the equipment.
	**NOTE:** Useful information for the user.

2. Introduction

Description

The FM2TS Gateway can receive up to 8 FM radio programs and can unify these in any desired combination in a DVB compatible MPEG-2 transport stream. The converted transport stream will be transported over IP and/or ASI outputs to the transmitter.

TS error protection

The FM2TS is able to protect the transport stream by several ways in outputting of loss of data and disturbance.

- packet oriented forward error correction (FEC) for the IP output
- parallel transmission of a transport stream as redundancy over two outputs for each IP and ASI (→ 2xIP und 2xASI OUT).

Control

HTTP Web interface

The unit is controlled via a built-in web user interface (see Figure 1).

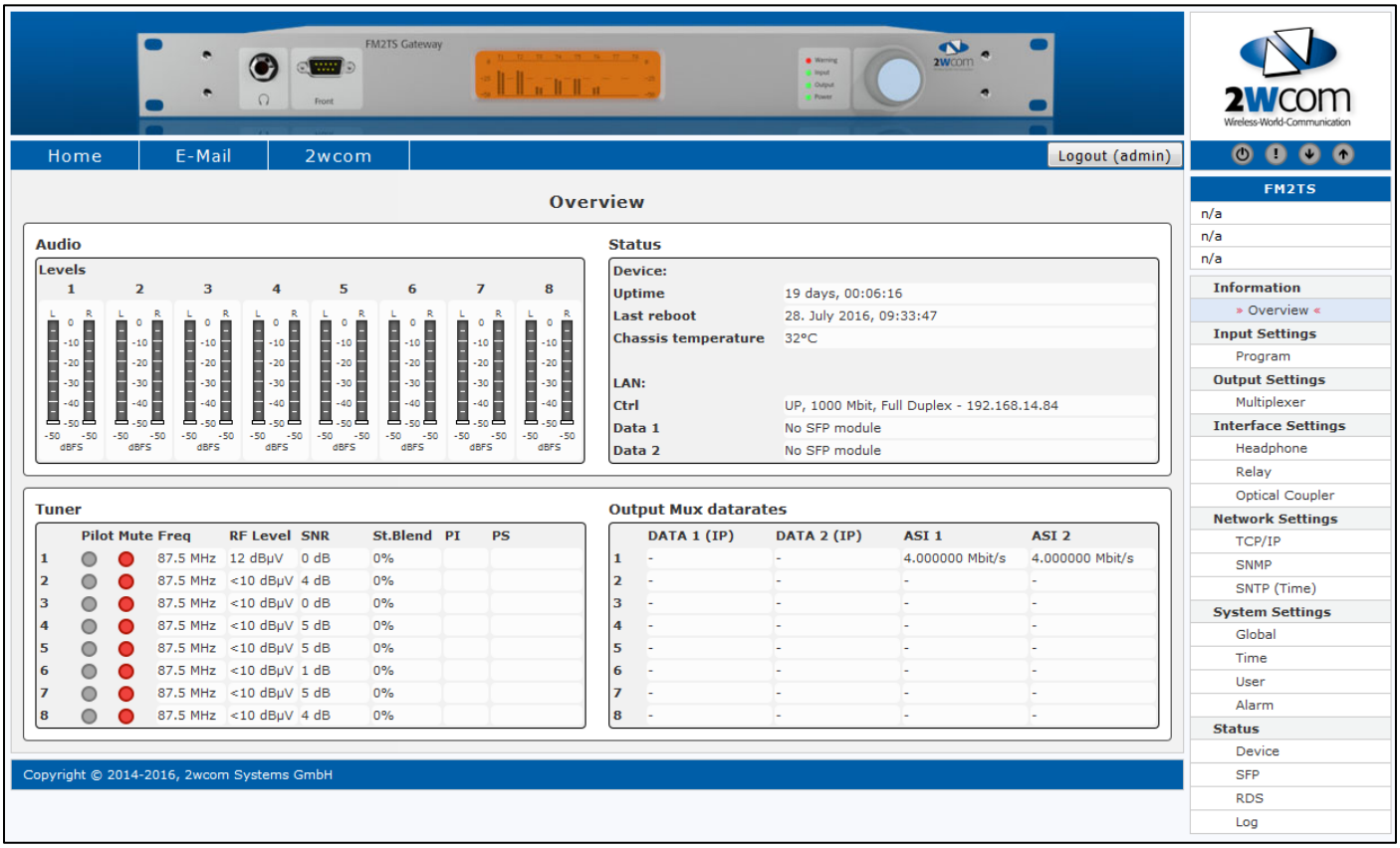


Figure 1: FM2TS Web interface

SNMP

Additional monitoring of the device using SNMP is possible. Rudimentary device control, status information is provided by means of SNMP GET commands and/or SNMP TRAPs (for further information please see section 10.2 on page 24).

LCD and jog wheel
Simple configurations can be made via LCD menu and jog wheel.

Monitoring — Alarm triggering and notification over Email, SNMP, Web interface and over relay circuit.

Audio signal output over a headphone output for monitoring.

Hardware — The customer can choose both electric and optical SFO modules.

User — Only experienced technical personal or engineers should operate the FM2TS devices. Basic knowledge about FM technology and IP networks is required.

Process — The transmission of the data and processing of audio in FM2TS can be divided into following functional blocks:

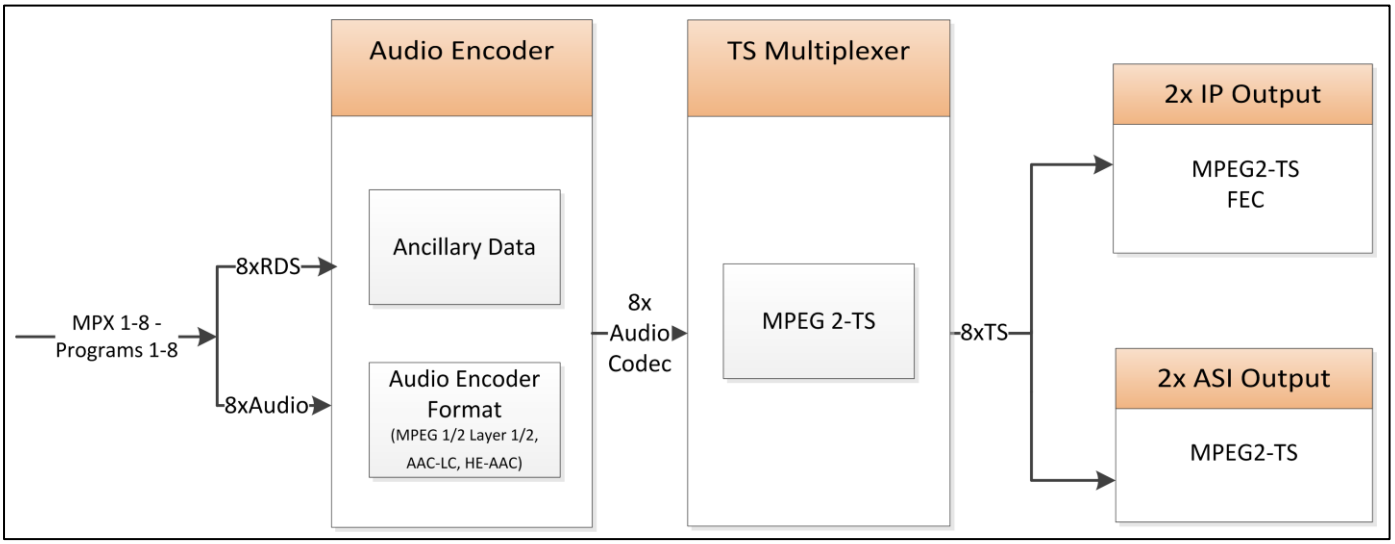


Figure 2: Process of data processing in FM2TS

RF Input

The FM2TS has about 8 RF inputs (FM tuner) and can thus receive **8 FM signals** (MPX). You can set for each program different frequencies.

Audio Encoder

Audio Encoder receives the audio data and the RDS data from the RF tuner and encodes them. The RDS data are added in to the Ancillary Data. Audio data are converted in different audio formats.

The FM2TS Audio Encoder supports following audio formats:

- MPEG Layer 1/2 Encoder
- MP3 (Layer 3)
- AAC-LC Decoder
- AAC-LD Decoder

- HE-AAC v1/v2
- G.711 Encoder
- G.722 Encoder

TS Multiplexer

In the next step the encoded audio data will be processed in the TS Multiplexer and encoded in a MPEG-2 transport stream.

Optional: Up to 8 MPEG-2 transport streams can be configured from different programs.

Outputs

The MPEG-2 TS is protected with a FEC. The TS is output over two parallel IP outputs (via RTP) or over two parallel DVB-ASI outputs. The dual outputs serve as redundancy for the additional protection if the data transmission. The FEC function in the standard version is only available for the IP outputs.

3. Safety Instructions

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

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

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

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

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

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

Keep the device away from unauthorized persons.

⚠ DANGER	
	**DANGER of electric shock** Plug the device into a grounded power socket only. Never remove the grounding wire/contact. Never open the housing of the device by yourself. Never touch open electrical parts. Dangerously high voltages are present inside the housing. Even after disconnecting the mains supply, dangerously high voltage levels may be present for a certain time. Do not touch the device with wet hands. Never expose the device to liquids. If any liquid comes inside the housing, immediately disconnect the device completely from the power supply. Do not continue operating the device.
	**FIRE HAZARD of overheating or electric shock** Ensure sufficient heat dissipation during operation. Avoid following when installing the device: – non-ventilated environment, for example a narrow shelve or built-in rack; – extremely warm or cold place;

	– direct sunlight exposure; – too high or too low temperature; – extremely wet or dusty environment. Do not operate the device in the presence of flammable gases. Do not cover the ventilation openings of the device to avoid heat accumulation. Do not put objects with open flames such as burning candles on the device. Do not put heavy objects on the supply cord. A damaged cord can lead to fire or electric shock hazards. To disconnect the supply cord, drag always the plug and never the cable to avoid the cord damage.

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

NOTICE	
	CAUTION: Risk of equipment damage *Before the first operation:* Check the housing, the front panel, the supply cord and the plug for visible damage (e.g. scratches, cracks, damaged isolation and abrasion) In case of damage, unplug immediately the supply cord. Never operate device with a damaged supply cord. All damaged components must be replaced immediately.

	Installation: Use only a grounded three-wire power supply cord and -plug that complies with the national regulations. If necessary, another than the supplied supply cord has to be used, in compliance with the regulations of the country where the device is operated. Make sure that the AC power outlet is next to the device and readily accessible to the user. *Installation of other devices:* External devices which are connected to the device could be damaged by the device or damage the device itself if the output levels exceed the specified limits. *Cleaning:* Do not use corrosive detergents on the device such as benzine, thinner, alcohol or acetone. Clean the surface of the device only with a soft dry cloth.

4. Supplied Parts

- FM2TS
- Power supply cord*
- Patch cable
- Serial breakout cable (x2)
- PC Software to download: FM2TS for Win98, 2000, XP and Vista for configuring and remote operation
- User manual in PDF format to download; on request by paper

*available for different countries

NOTE: The scope of delivery may deviate in special cases.

5. Manufacturer

2wcom Systems GmbH • Am Sophienhof 8 • 24941 Flensburg • Germany

Phone (+49) 461 – 662830-0 • Fax (+49) 461 – 662830-11

contact@2wcom.com • www.2wcom.com

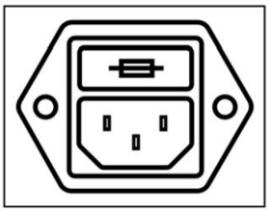
6. Installation

Best setup location

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

Mains supply connection

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



No power switch is available; unplug mains supply connector to remove power. Keep the mains supply plug readily accessible to the user.

WARNING

WARNING
Disconnect mains power plug before you open the housing.
Repair of the equipment must only be carried out by authorized and qualified personnel.
Read also Section „Safety Instructions”.

7. Operation

7.1. Device Control via Web Interface

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

To control the device via web interface:

Connection: for network configuration and access to the web interface.

NOTE: To maintain security, you are automatically logged out after 15 minutes of no activity.

Navigation: to navigate through the web interface, use only the menu buttons of the web interface and not those of the web browser (i.e. forward and back).

Buttons:

- if you want to save any changes made in the configuration of the device, press the "Save" button;
- if you don't want to save the changes, press the "Reset" button

NOTE: Each field has to be saved individually.

If you change data in several fields, you must click "Save" under each field, in order to save all changed data.

Otherwise, the unsaved field will be reset to the previously saved status.

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

Input fields: After entering a number or text in an input field, you must click on the corresponding "Save" or "Ok" button to activate the changes. Alternatively you can use the ENTER-key of your computer keyboard.

The next sections explain the separate web interface functions. The operation via jog wheel and LCD on the device is similar to these descriptions.

7.2. Operation via LCD/jog wheel

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

Via LCD and jog wheel you can:

- configure network settings for the first access to the device over the web user interface
- view the device status and the level of the input/output signal.

If a function of the web interface is applicable for the LCD/ jog wheel, the corresponding **menu path** is shown at the web interface description.

- To change from the default status screen to the main menu screen, push the jog wheel.
- To move the cursor in the menu structure, turn the jog wheel.
- To open a menu entry or to confirm a setting, push the jog wheel.
- To select a configurable menu entry, turn the jog wheel.
- To adjust a menu entry, push and then turn the jog wheel.
- To confirm the adjustment, push the jog wheel.
- To return to a previous menu level, activate the menu entry "<<".

Some settings need a restart of the device to be activated.

8. First Steps

The minimum parameters are preset in the device. The following sections describe the first required steps for a quick start.

✓ You already have unpacked and installed the device in an appropriate place (see chapter 6).

8.1. Connecting the device

Before you connect the device to the power supply, connect the inputs and outputs of the device with all required connections:

1. Connect the available antenna input connector for the feeding RF signals of the [RF 1-8] inputs on the back panel of FM2TS.

2. Connect the device with the 10/100/1000Base-T network for output of the modulated data streams over the data interface [Data 1/2] on the back panel of the FM2TS.

NOTE: The FM2TS is equipped with two SFP ports for the network connection (according to SFF-8724 Multi Source Agreement).

Use the suitable SFP modules for the Ethernet connection over copper line or fiber optic line.

A copper SFP module with an RJ45 socket (for 1000Base-TX) is included.

3. For the output of the data stream in DVB-ASI format, use the two [ASI-Out 1/2] outputs on the back panel of FM2TS.

4. For monitoring alarms and sending alarms via relay switch, connect your computer with the device over the [relay] connector.

⇒ The FM2TS is now connected for the input and output of audio signals.

8.2. Connecting the power supply

The device has a redundant power supply.

NOTICE	
	Check if the device and the contained protection(s) is/are suitable for the type of your existing mains voltage and mains frequency.

If the device is suitable for the existing mains voltage, connect both mains voltage sockets to two independent power supplies to ensure the power supply of the device in case of power failure.

⇒ Both LEDs "Power 1" and "Power 2" on the device light green.

8.3. Configure the access to the Web interface

The device can be fully operated with an internet browser via the integrated Web interface.

Connect the device with the network cable at the Socket "Ctrl" to the existing IP network. Use for this step a PC which is connected to the same IP network such as the device.

Control the device over the Web interface as follows:

1. Start any internet browser (e.g. Firefox/Mozilla from version 3.0 or Microsoft Internet Explorer from Version 7.0 (both with Java Script activated)).

2. Enter the IP address in the address bar of the browser. If the IP address has not been changed, please enter the default address in the address bar of the browser: `192.168.14.250`.

3. Alternatively you can you can watch and change your existing network over LCD Menu and jog wheel under **`Interface→IP`**.

4. A login screen with Username/Password appears. Enter the preconfigured login data (consider upper case und lower case):

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

    ii. for a access with write permissions use „manager"/"manager" or „admin"/„admin"

⇒ After entering the correct login data, the main page appears.

NOTE: Change the login data as soon as possible to avoid unauthorized access to the device. You can change your login data under **Systems Settings→User** (for further information please see section 14.7 on page 46).

8.4. Configure Program 1 for encoder

The device has 8 FM tuner modules for 8 RF antenna inputs.

Configure the input signal and the encoder parameters for the input [RF 1] as follows:

1. Open the box **Program** under **Input Settings→Program.**

2. Click in the line "Tuner 1" on the "Edit" button, to configure Program 1. The window *Edit Program* appears.

3. Enter in the first block "Tuner" the desired frequency in the **Frequency** field.

4. Select in the block "Audio Encoder" the target format of the audio data from the Dropdown Menu **Audio Encoder Format**.

5. Set in the block "TS Service" the PID for the audio program in the **Elementary PID (Audio Program)** field.

6. RDS decoding is deactivated in the delivery.
   Activate this function in the block "RDS Databridge" by choosing the checkbox "Enable RDS Databridge".

7. Save the settings by clicking the save button.

8. In this way you can configure further programs for Tuner 2-8.

8.5. Configure audio signals

Create the first TS configuration for configured programs and set the output for this signals as follows:

1. Open the tab **Multiplexer** under **Output Settings → Multiplexer**.

2. Click in the block "Multiplex 1" the "Edit" button, to configure a transport stream.

3. Select the appropriate checkbox "1" in the block "General" in the field **Program selection** field, to add in the previous step configured program to the transport stream.

Note: If you have carried out the tuner configuration for several programs in the previous step (fields *Program* 2…8), you can select in the menu various programs that should be output as a TS.

4. Enter in the block "General" in the **Bit Rate** field the desired bit rate.

5. If the TS should be send over IP, activate one or both IP outputs by choosing in the same window *Edit Multiplex* in the block "Destination 1" or "Destination 2" the check box "Enable".

6. Configure the IP output by entering in the **Destination IP Address** field in the block "Destination 1" or "Destination 2" the *destination IP address* and the port number of the specified host.

Note: The destination IP address must belong to the same network, as set under **Network Settings→TCP/IP**.

7. Save the settings by clicking the save button in this block.

8. If the TS should be send over ASI, select in the window *Multiplexer* in the block ”Streaming (ASI)” the configured TS „Multiplex 1“ from the Dropdown Menu **ASI 1** or **ASI 2**, to activate one or both ASI outputs.

9. Save the settings by clicking the save button in this block.

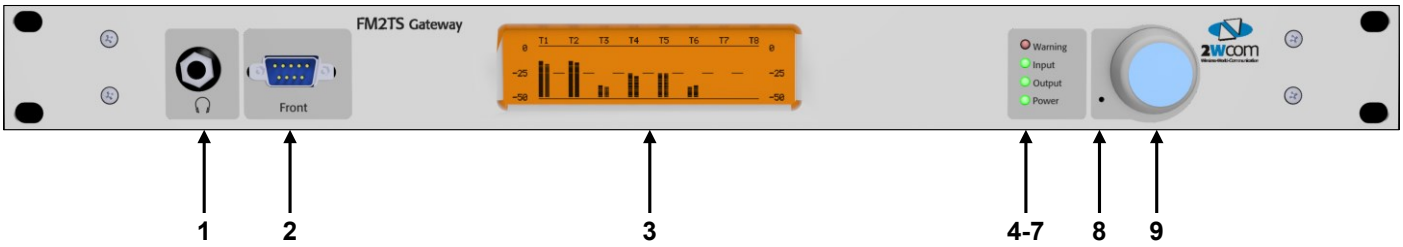
Note: You can output the signal over both outputs IP and ASI simultaneously.

⇒ FM2TS is sending now the set programs as TS over the IP or ASI outputs.

Note: These “first steps” are only intended for a quick first start and do not cover all device functions. Pease read carefully the entire manual to be able to use all functions of the device.

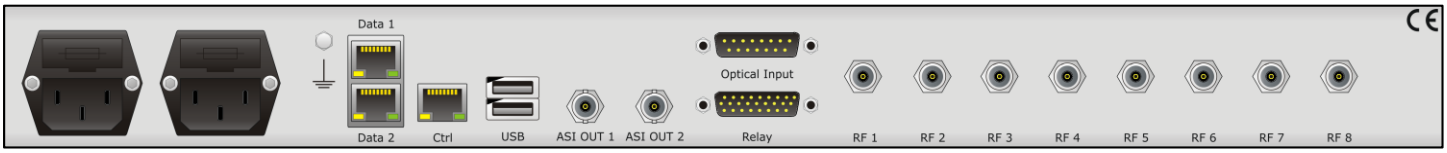
9. Control Elements and Connectors

9.1. Front Panel



1	Headphones	6.3 mm / 1/4” socket for the connection of headphones. The device can be configured to output the received and decoded audio signal on this output.
2	[Front]	9 pole D-Sub male connector; only for device servicing purposes.
3	LCD screen	Illuminated, Liquid Crystal Display (LCD), graphical, 264x64 pixel.
4	[Warning] LED	LED indicator (red); lit if alarm is triggered.
5	[Input] LED	Activated (green) if the device is configured for an input source and the audio signal in the input is ok.
6	[Output] LED	Activated (green) if the device is configured for an output, the outgoing signal is available and is ok.
7	[Power] LED	Activated (green) if the power supply cord is connected and the power supply is ok.
8	Reset-Taster	Recessed reset button for resetting the device in case of a malfunction.
9	Jog dial	Jog dial for the device operation via the LCD screen on the device. Turn the jog dial to place the cursor on the desired menu entry and push the jog dial to activate the highlighted menu entry. Adjustable values can be changed by pushing the jog dial and subsequently turning of the jog dial. The change can be confirmed by pushing the jog dial again.

9.2. Back Panel



1-2	[Network 1-2]	Redundant power supply. First and second IEC power supply connector with integrated fuse holder. Fuse ratings depending on mains supply voltage: 110-120 V: T1,6 A, 5x20 mm, 250 V 220-240 V: T1 A, 5x20 mm, 250 V.
3	Grounding stud	The stud can be used to connect a grounding system if necessary.

NOTE: The required protection grounding (PE) is accomplished via the 3-wire mains supply cord.

4-5	[Data 1/2]	2x SFP-sockets; two data interfaces for gigabyte Ethernet network connection of the device. 2x outputs for redundant output of the TS over IP.
6	[Ctrl]	10/100/1000-Base-T interface for control, RJ-45 connector for the Ethernet network connection of the device. The device can communicate with the IP network and can be configured with an internet browser via the integrated Web interface. The integrated LEDs show the status of the link (green; active if a physical network connection exists) and activity status (yellow; active if data communication is active).
7-8	[USB]	2x parallel USB connections for internal service purposes: configuration or firmware uploads.
9-10	[ASI-Out 1/2]	2x BNC-sockets for the output of the data stream in DVB-ASI format (270 MHz). 2x parallel outputs for redundant output of TS over ASI.
11	[Optical Input]	7 pole D-Sub connector; only for service purpose.
12	[Relay]	26 pole D-Sub male connector of integrated relays. The relays can be activated by the monitoring function in case of an alarm.
13-20	[RF 1-8]	8x F-sockets; connector for the input of 8 FM signals.

10. Network settings

✓ You have already connected the device to the network [10/100/1000-Base-T] and configured the access to the web user interface (see section 8.3 "Configure access to Web interface" on page 17).

10.1. TCP/IP: Configure Ethernet interface

The FM2TS has three Gigabit Ethernet interfaces: one control interface and two SFP data interface.

10.1.1. Configure control interface

Under **Network Settings→TCP/IP** you can configure the 10/100/1000-Base-T interface [Ctrl] (Control/Monitoring) for the access to the Web interface of the device (see Figure 3).

Following parameters can be set or changed in this menu in the column "Ctrl":

MAC address: MAC address (Media-Access-Control-address) for clear identification of the device.

IP address: Individual address that is necessary to identify hardware in an IP network like the internet or intranet.

Subnet mask: Bit mask, which separates an IP address into a network part and a host part.

Gateway: Address of the local system or router that is used for the internet access.

Primary DNS: IP address of the primary Domain Name Service (DNS) server.

Secondary DNS: IP address of the secondary Domain Name Service (DNS) server.

⇒ Save the settings by clicking the save button.

10.1.2. Configure the data interface

The FM2TS has two parallel IP outputs (via RTP) for redundant TS outputs and additional protection of the data transmission for the same IP address. It is also possible to send different data transport streams over both IP outputs to different IP addresses. You can configure a TS (optional: up to 8 TS) for different outputs under **Output Settings→Multiplexer** (see page 35).

You can configure under **Network Settings→TCP/IP** both gigabit interface [Data 1/2] for TS outputs (see Figure 3).

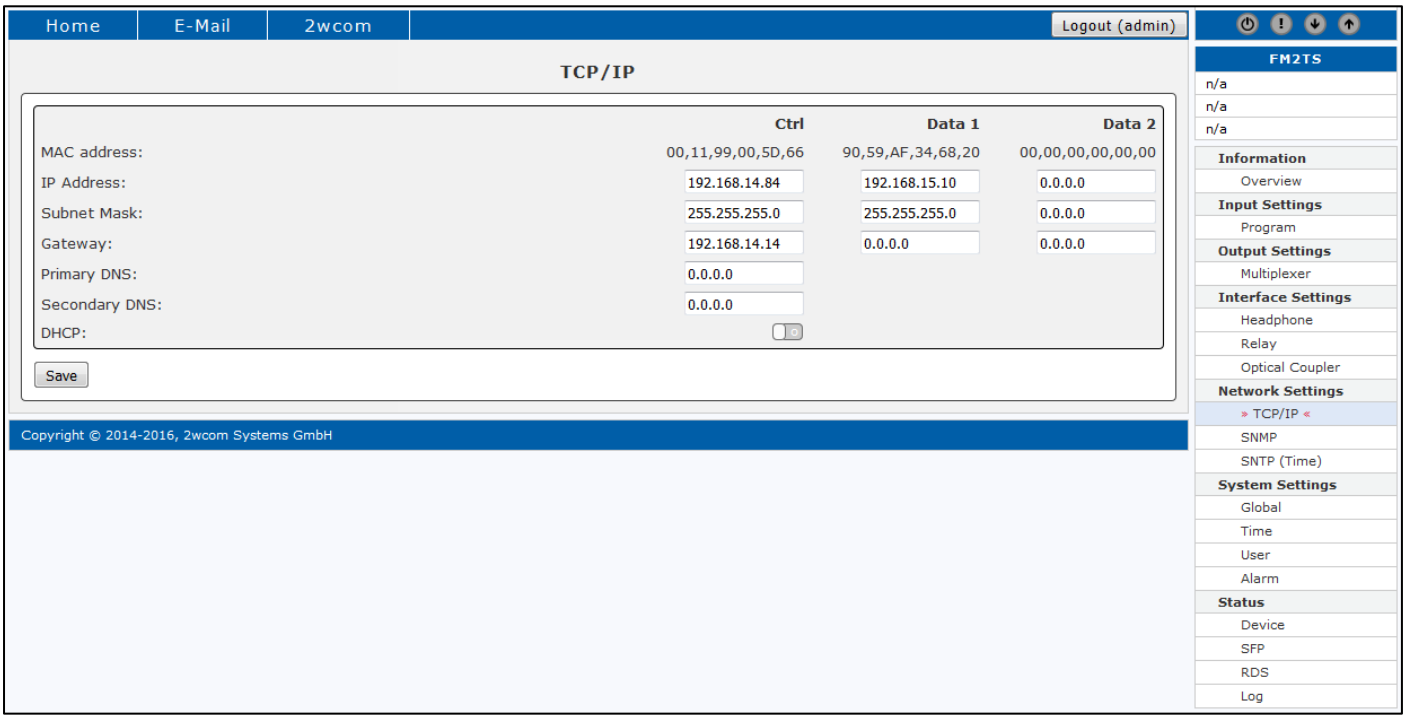


Figure 3: Configuration if gigabit interface [Ctrl], [Data 1] and [Data 2]

You can find the status information of both data outputs in block "Status-LAN" under **Information→Overview** and under **Status→SFP** (see section 10.1.3).

10.1.3. Viewing SFP status

Check the current SFP status of [Data1/2] interface such as module name, temperature, voltage etc. under **Status→SFP** (see Figure 4).

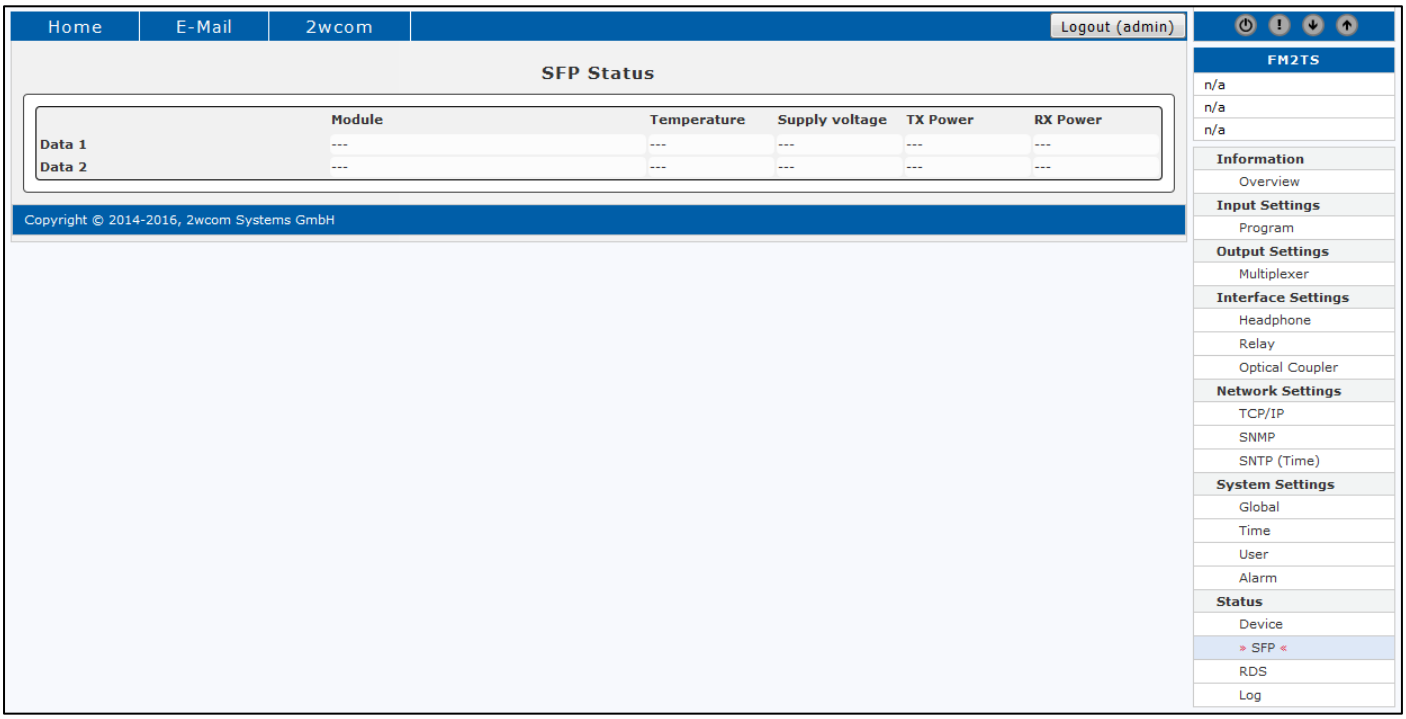


Figure 4: Status → SFP Module

10.2. Monotoring function: configuration of SNMP

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

You can define under **Network Settings→SNMP** how the IP addresses of both SNMP Managers should be named to which the device can send traps over IP network SNMP. Additionally, you can define in this menu the SNMP login data (read community / write community) which are needed for external SNMP queries to the device (see Figure 5).

Following parameters can be set or changed in this menu:

First manager IP address of the first SNMP manager that can send SNMP traps to the device. The part function can be also activated and deactivated.

Second manager IP address of the second SNMP manager that can send SNMP traps to the device. The part function can be also activated and deactivated.

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

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

Note: For the correct processing of the received SNMP traps of the device, device-specific MIB files are necessary which must be integrated to the used SNMP manager program. These MIB files need to be compiled by the SNMP manager tool and are provided as download on the Web interface in the "MIB" block under **Network Settings→SNMP** (see Figure 5) or via email.

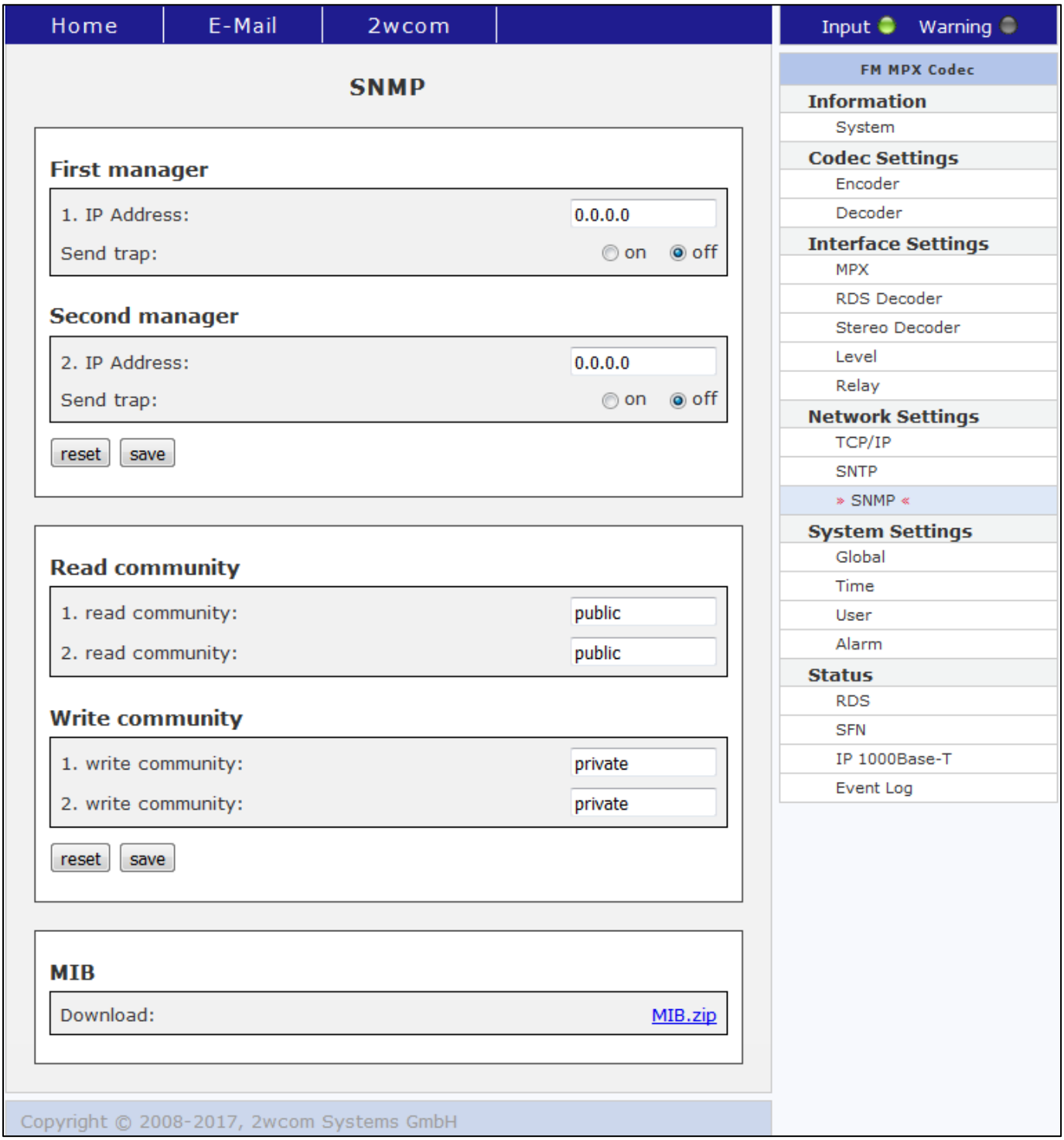


Figure 5: SNMP Settings

Note: Each activated trap will be sent once at startup for initialization.

You can configure and activate the monitoring function under **System Settings→Alarm**. For further information see section 13.2 and 13.3.

10.3. SNTP settings: configuration of date and time

You can synchronize the date and time automatically under Network Settings→SNTP (Time) of the device over IP with an NTP to Server.

Following parameters can be set or changed in this menu:

Synchronization	Selection if the device clock should be synchronized via SNTP or not.
1. SNTP Server IP	IP address of the first NTP server to be used.
2. SNTP Server IP	IP address of the second NTP server to be used.
Update interval [min. 30 s]	Time interval for synchronizing the device clock with the NTP server in seconds.
Last synchronization	Information about the last date and time synchronization.

⇒ Save the settings by clicking the save button.

NOTE: Additionally, you can read out and manually set up the current date and time in the internal clock of the device under **System Settings→Time**.

11. Configure program for encoder

The FM2TS gateway has over 8 RF inputs and 8 independent FM tuners. Maximum 8 programs can be configured and output digital in any combination in MPEG format. You can configure up to 8 audio programs for the tuner and arrange it as one MPEG-TS. The FM2TS can output MPEG-TS over two redundant IP outputs or ASI outputs.

Note: Optional 8 encoding channels for the output over IP can be built into the MPEG encoder so that it is configurable for the IP outputs up to 8 Multiplex combinations.
Thus 8 TS can be sent over one IP interface simultaneously. But only one TS can be sent over ASI simultaneously.

You can set up any tuner for the receipt of a program. Altogether 8 programs are configurable. The numbers of the programs in the Web interface menu comply with the tuner numbers and the RF inputs e.g. *Program 4~Tuner 4~input* [RF 4].

Set up the tuner 1-8 for the receipt of maximum 8 programs and configure the encoder parameter as follows:

1. Connect the device to the antenna cable over RF 1-8 inputs.
2. Open the window *Program* under **Input Settings→Program**.
3. Click the "Edit" button in the line "Tuner 1-8" , to configure the appropriate program. The window *Edit Program* appears (see Figure 6).
4. Follow the instructions in the following sections, to carry out the next steps separately for the program configurations.

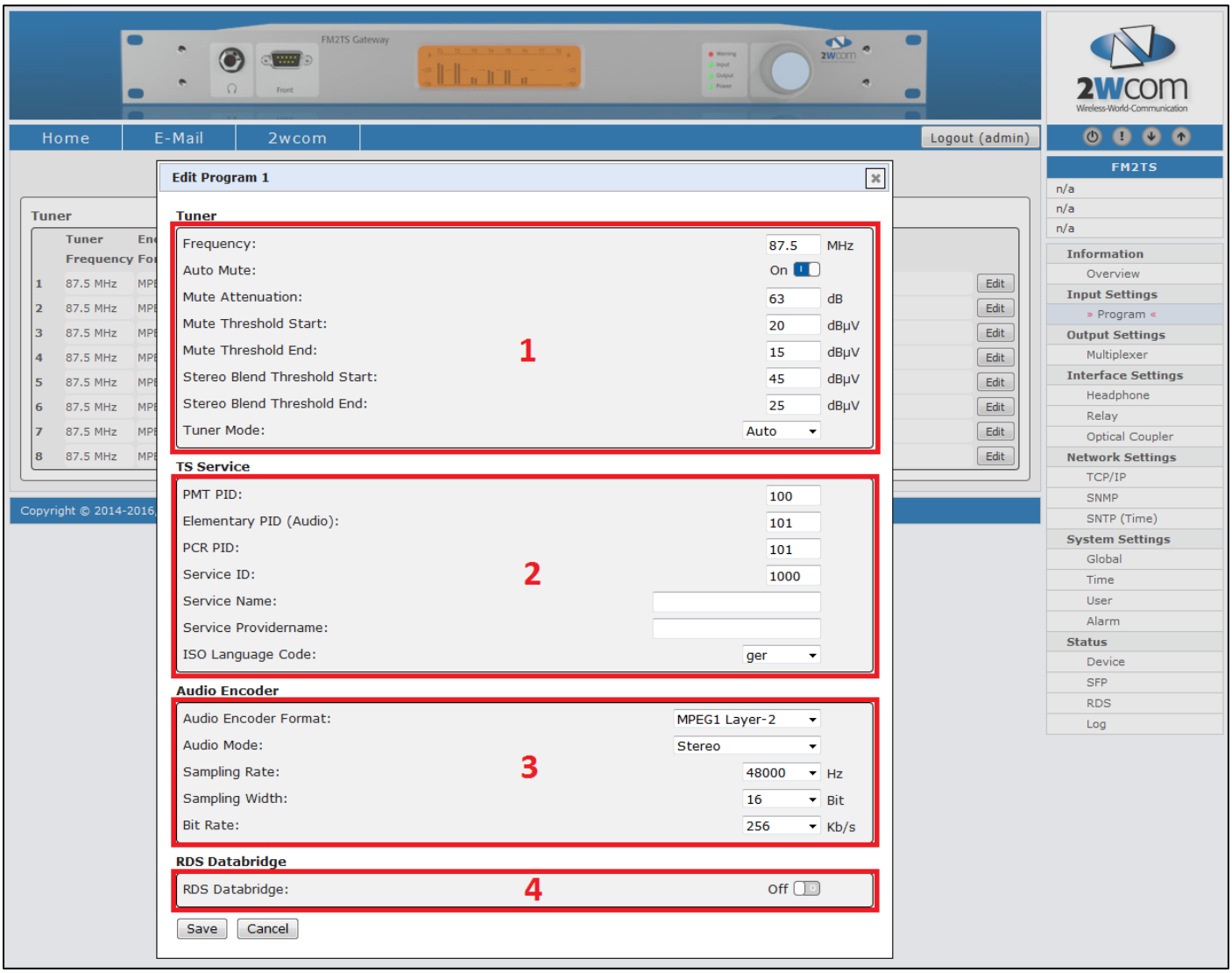


Figure 6: FM2TS Web interface – Program configurations

11.1. Tuner settings

To open the configuration menu, follow steps 1-4 on page 27).

Enter or change in the first block “Tuner” following parameters for the receipt of the audio program (see field 1 in Figure 6):

Frequency:	Frequency of the desired tuned audio program.
Mute Enable:	Activates the mute of the audio signal.
Mute Attenuation:	Value for the mute.
Mute Threshold Start:	RF level threshold limit, from that the mute is activated. The signal power is reduced linear to the indicated value *Mute Attention*. The mute setting can

trigger an alarm (settings under **System Settings→Alarm**). The alarm LED on the front site of the device lights red.

Mute Threshold End: RF level threshold limit, until the mute setting stays activated. The alarm LED on the front site of the device turns off.

Stereo Blend Threshold Start RF level threshold limit, from that the stereo blend is turned on. The stereo signal goes linear over to a mono signal. At the stereo blend switching, an alarm can be triggered (settings under **System Settings→Alarm**). The alarm LED on the front site of the device lights red.

Stereo Blend Threshold End RF level threshold limit, up to that the stereo blend stays activated. The alarm LED on the front site of the device turns off.

Tuner Mode: Tuner operation mode; settable in drop down menu between *Auto/Mono/Stereo.*

⇒ Save the settings by clicking the save button at the end the menu bar.

⇒ Check the current settings and the audio level for all 8 tuner under **Information→Overview** (see "Tuner" field and "Audio" field in Figure 7) or on the integrated LCD monitor in the device.

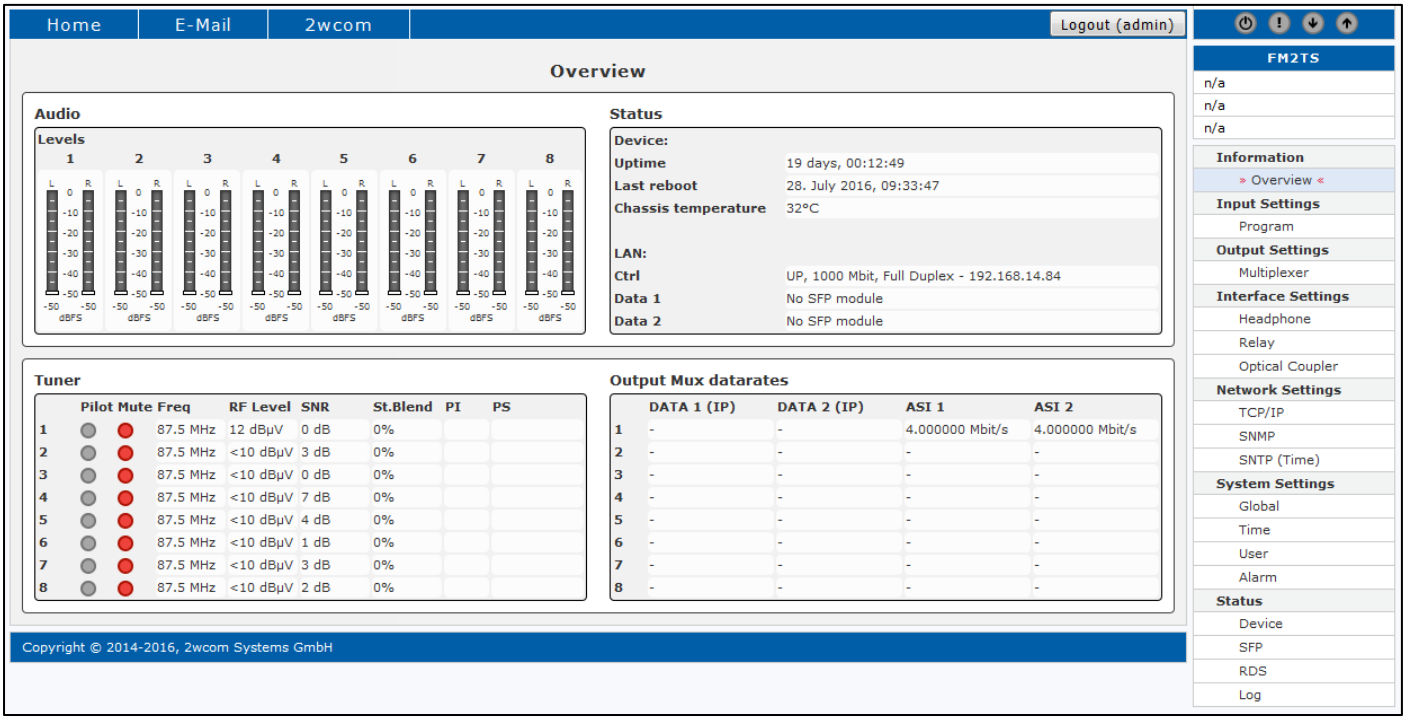


Figure 7: Overview of the current tuner settings and encoder status
Audio levels "green" – the audio level is under the maximum value -9dBFS
Audio levels "red" – the audio level is over the maximum value -9dBFS (this value is not settable)

11.2. Audio encoder settings

To open the configuration menu, follow steps 1-4 on page 25.

You can make the required settings for encoding up to 8 audio programs.

Set up in the block "Audio Encoder" following parameters of the audio encoder for each of the 8 audio programs (see field 2 in Figure 6 on page 28):

Audio Encoder Format: Target format of the audio data; Dropdown Menu between following formats adjustable: *MPEG1 Layer-2/AAC-LC/AAC-LD/HEAAC/MP3/G.711/G.722* (see Table 1 and Table 2).

Audio Encoder Format	Sampling Frequency (in kHz)	Chanel Modes
MPEG-1 Layer-2	16, 22.05, 24, 32, 44.1, 48	Mono, Stereo, Joint Stereo, Dual Mono
MP3 (Layer 3)	16, 22.05, 24, 32, 44.1, 48	Mono, Stereo, Joint Stereo, Dual Mono
AAC-LC	16, 22.05, 24, 32, 44.1, 48	Mono, Stereo, Dual Mono
AAC-LD	16, 22.05, 24, 32, 44.1, 48	Mono, Stereo, Dual Mono
HE-AAC v1/v2	16, 22.05, 24, 32, 44.1, 48	Mono, Stereo, Dual Mono
G.711	8	Mono
G.722	16	Mono

Table 1: Adjustable parameters for the audio formats

Media Format	Min. Bitrate (in kbps)	Max. Bitrate (in kbps)
MPEG1 Layer2	32 * Number of channels	192 * Number of channels
MP3	32	320
AAC-LC	16 * Number of channels	6 * Sampling Frequency * Number of Channels
AAC-LD	16 * Number of channels	6 * Sampling Frequency * Number of Channels
HE-AAC v1	16	3 * Sampling Frequency * Number of Channels
HE-AAC v2	16	3 * Sampling Frequency
G.711	64	64
G.722	64	64

Table 2: Adjustable bitrate for the audio formats

Audio Mode: Audio mode; adjustable in the Dropdown Menu between *Mono(L)/Mono(R)/Mono (Downmix)/Dual Mono/Stereo/Joint Stereo.*

Sampling Rate: Sampling rate of the audio signal; adjustable in the Dropdown Menu between *8000/16000/22050/24000/32000/44100/48000 kHz.*

Sampling Width: Sampling width of the audio signal; adjustable in the Dropdown Menu between 16/20/24 Bit.

Bit Rate: Bitrate of the audio signal; adjustable in the Dropdown Menu in the range between 32-384 Kb/s.

⇒ Save the settings by clicking the save button at the end the menu page.

11.3. TS Service settings

To open the configuration menu, follow step 1-4 on page 27.

Enter or change in the block "TS Service" following TS parameters for each of the 8 audio programs (see field 3 in Figure 6 on page 28):

PMT PID Program Map Table Packet Identifier contains information about the program

Elementary PID (Audio) Packet Identifier contains information about the data stream type

PCR PID Program Clock Reference Packet Identifier enables the decoder a temporal and speed correctly presentation

Service ID Service ID number is intended for identification of the program

Service Name e.g. channel name

Service Provider name Name of the provider

ISO Language Code Possible setting "ger"

⇒ Save the settings by clicking the save button at the end the page.

11.4. RDS data transmission settings

FM2TS has an RDS data bridge which is able to convert the RDS data received over the tuner such as PS, RT, RT+, MS, TA/TP and TMC directly into UECP commandos and to forward them to the MPEG transport stream for the further distribution. In the audio encoder RDS data are filtered and converted into MPEG Ancillary Data, before they will be output together with the audio data in a transport stream.

You can set up all parameters over the FM2TS Web interface for the RDS data bridge which should be transported with the MPEG-TS.

To open the configuration menu, follow steps 1-4 on page 27).

Activate and configure in the block “RDS Databridge” the transfer of the RDS data for each program separately as follows (see field 3 in Figure 8 on page 28):

1. Activate the RDS data transfer by selecting “ON” in the virtual switch “RDS Databridge” or select “OFF” to turn off the function (see Figure 8).

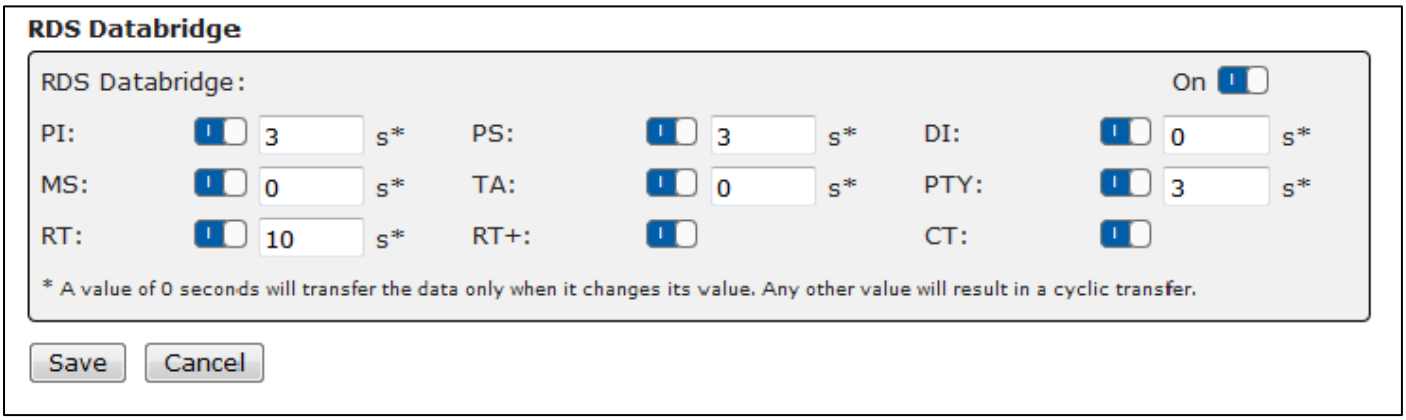


Figure 8: FM2TS Web interface – Settings for the RDS data transfer

CT	Clock time and date
DI	Decoder identification
MS	Music/Speech
PI	Programme identification
PS	Programme identification
PTY	Programme type
RT/RT+	Radiotext
TA	Traffic-announcement identification
TP	Traffic-programme identification

2. To activate an RDS parameter, select “ON” in the corresponding virtual switch. If one parameter is not activated, it is also not transfered.

3. Set up the update time of the signals at each activated RDS parameter in seconds. The value 0 seconds means that the appropriate RDS parameter is sent once.

4. Save the settings by clicking the save button at the end the page.

   ⇒ You can check the status of each configured program 1-8 of the RDS data transfer under **Status→RDS** (see Figure 9). The lines Tuner 1-8 comply with the programs 1-8 (settings under **Input Settings→Program**, see section 11.1 “Tuner settings” on page 28).

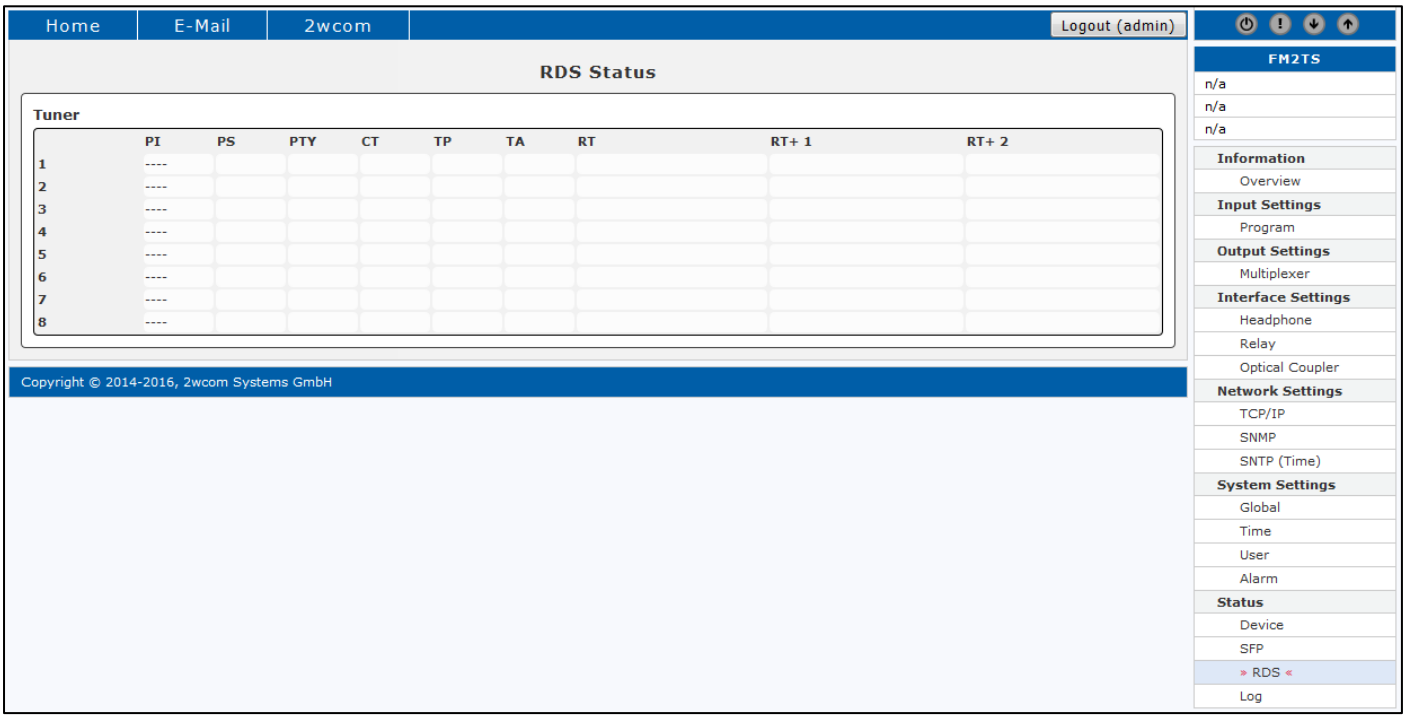


Figure 9: FM2TS Web interface – Status of the RDS data transfer

12. Configure output signal

12.1. Configure transport stream

The configured audio programs are sent together with the RDS data as one transport stream over IP or ASI outputs. All 8 programs (see section 11.1 “Tuner settings” on page 28) can be output in any combination in a TS packet. Configure the TS packets as follows:

1. Open the window **Multiplexer** under **Output Settings→ Multiplexer** (see Figure 10).

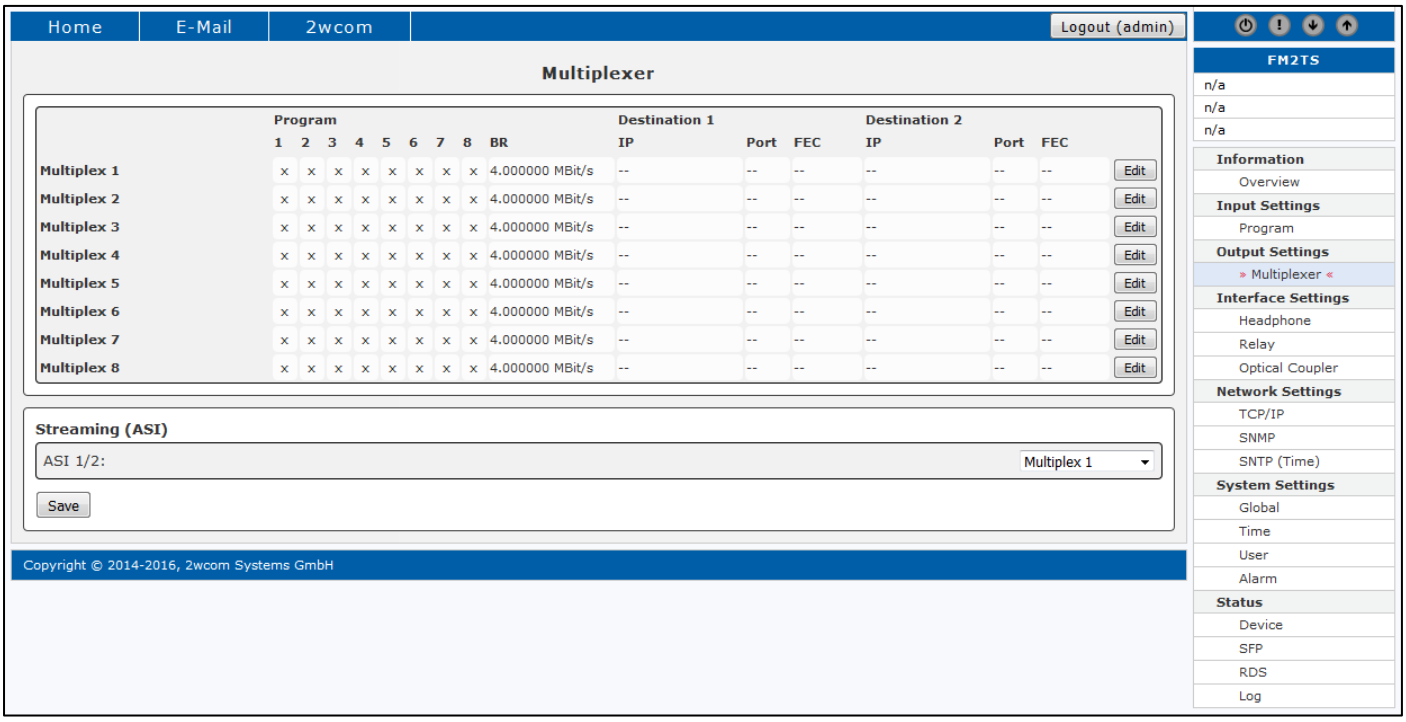


Figure 10: FM2TS Web interface – Multiplexer configuration

2. Click in the line “Multiplex 1” on the “Edit” button, to configure the appropriate transport stream. The window *Edit Multiplex* appears (see Figure 11).

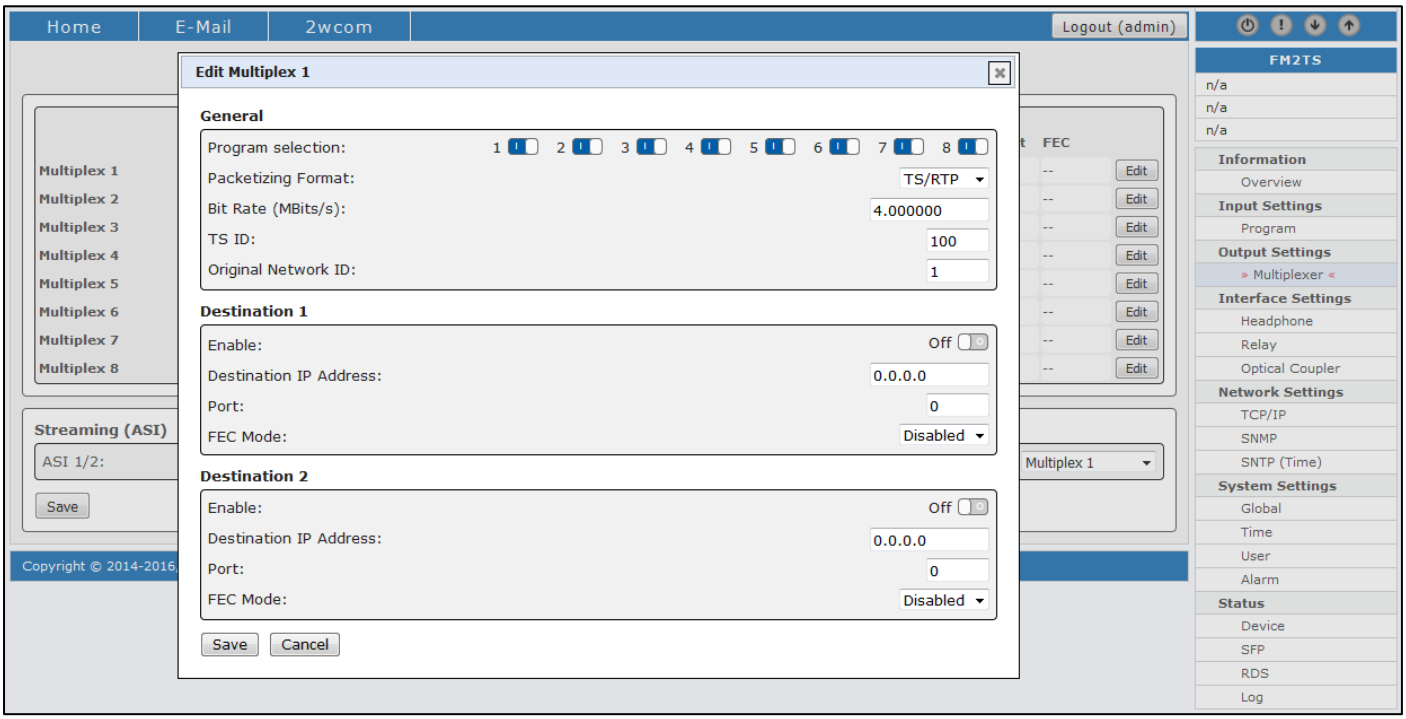


Figure 11: FM2TS Web interface – Transport stream configuration

3. Set up the Multiplexer for the programs 1-8 which were configured in the previous steps by selecting in the block "General" in the **Program selection** field the checkbox "1-8".

Note: If you have configured the tuner for several programs in the previous step, you can select in the Multiplexer several programs that should be output in one TS.

4. Enter or change in the block "General" following parameters for multiplexing of the audio programs (see Figure 11):

Packetizing Format: Adjustable in the Dropdown Menu between TS, TS/RTP and RTP

Bit Rate: Input of the desired bit rate

TS ID: Transport stream identification number

Original Network ID: (ONID) a 16 bit number, describes original source of a data stream

5. Save the settings by clicking the save button at the end the page.

12.2. Set up the signal outputs

Configure the gigabit IP outputs for the MPEG2 transport stream "Multiplex 1" as follows:

1. Open the window **Multiplexer** under **Output Settings→ Multiplexer** (see Figure 10).

2. Click in the line "Multiplex 1" on the "Edit" button, to configure the appropriate transport stream. The window *Edit Multiplex* appears (see Figure 11).

3. To send the TS over both IP outputs, activate the IP output 1 or 2 in the same window by choosing the checkbox "Enable" in the block "Destination 1" or "Destination 2".

4. Set up in the block "Destination 1" or "Destination 2" following parameters for both IP outputs (see Figure 11):

Destination IP Address: Enter the target IP address of the specified host

Note:
The target IP address must belong to the same network as set up under **Network Settings→TCP/IP**.

Consider that for the redundant TS distribution to the same IP address both blocks "Destination 1" or "Destination 2" must include identical information.

Port: UDP port of the received device.

FEC Mode Dropdown Menu with the settings for the forward error correction (FEC).

- Deactivate: *Disabled*
- Error correction quality: *Low, High*

Note:
You can configure the IP parameter for the gigabit IP data interface under **Network Settings→TCP/IP** (see section 10.1.2).

5. Save the settings by clicking the save button in this block.

6. If the TS should be sent over ASI, select in the block "Streaming (ASI)" the configured TS "Multiplex 1-8" from the Dropdown Menu **ASI 1** or **ASI 2**, to activate both ASI outputs.

Note:
You can send only one TS over ASI.
But you can output the signal over both outputs IP and ASI simultaneously.

7. Save the settings by clicking the save button in this block.

8. Check the current data rate of the IP outputs signals or ASI outputs signals under **Information→Overview** in the block **Output Mux datarates** (see Figure 12).

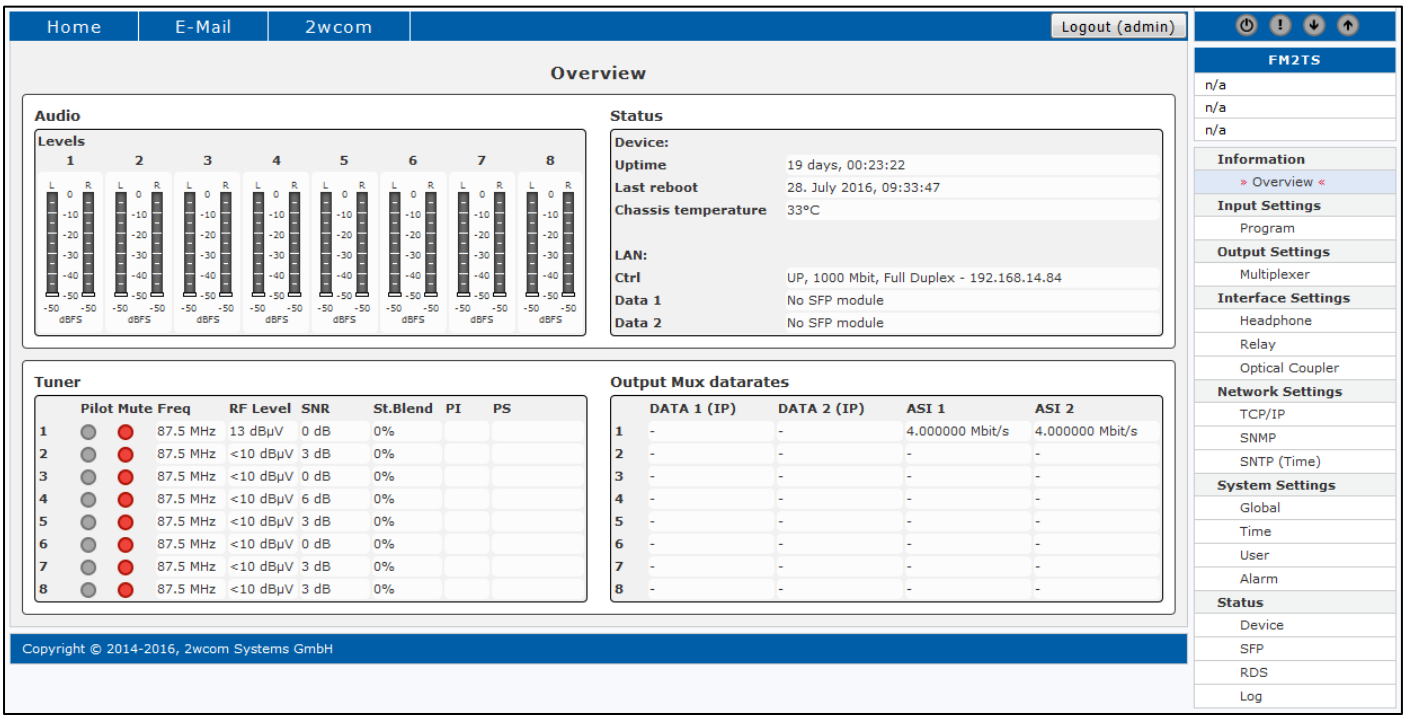


Figure 12: Current data rate of the IP outputs signals and ASI output signals

⇒ The FM2TS is sending now the set up programs as TS over IP outputs or ASI outputs.

13. Monitoring and Alarm settings

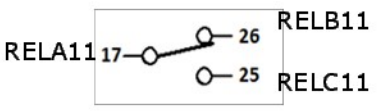
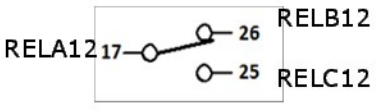
The FM2TS can trigger alarms at different malfunctions. A released alarm is signaled by sending SNMP traps, switching of an available relay and, if configured, the "Warning" LED on the Web interface page or on the front panel of the device.

13.1. Relay settings

The FM2TS is equipped with a 26 pole D-Sub male connector High Density plug for 12 relays.

NOTICE	
	The relay contacts have maximum rating of 0.5 A at 30 V AC!

The relays can be used for alarm signaling of monitoring functions. Figure 12 shows the scheme of possible switching contacts.

Relais Nr.	Schaltkontakte	Kontakttyp
1	RELA1, RELB1	SPST, NO
2	RELA2, RELB2	SPST, NO
...	...	...
10	RELA10, RELB10	SPST, NO
11		SPDT
12		SPDT

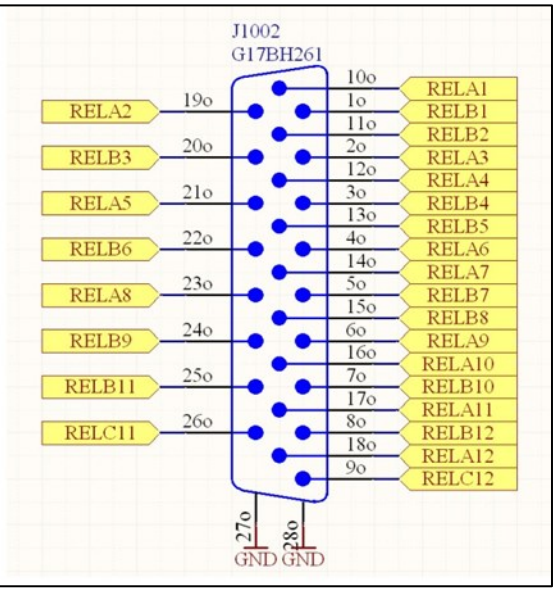


Figure 13: Relay output - D-Sub male connector, 26 pole – Relay switching contacts

Certain alarms can not only generate SNMP traps but also switch all 12 relays. You can change alarm signaling over relay under **System Settings→Alarm** (see section 13.2 and 13.3).

You can check the current status of the relays (ON/OFF) and change the settings as follows:

1. Open the window *Relay* under **Interface Settings→Relay** in the Web interface of the FM2TS.
2. The virtual LEDs in the first field **State** show the current status of the relays ("green"=ON; "grey"=OFF) (see Figure 14).

Relays 1-10 are simple switches. Relays 11-12 are changeover relays (Position A/B) (see Figure 13).

If the alarm of a relay was triggered, the status of the relay is ON.

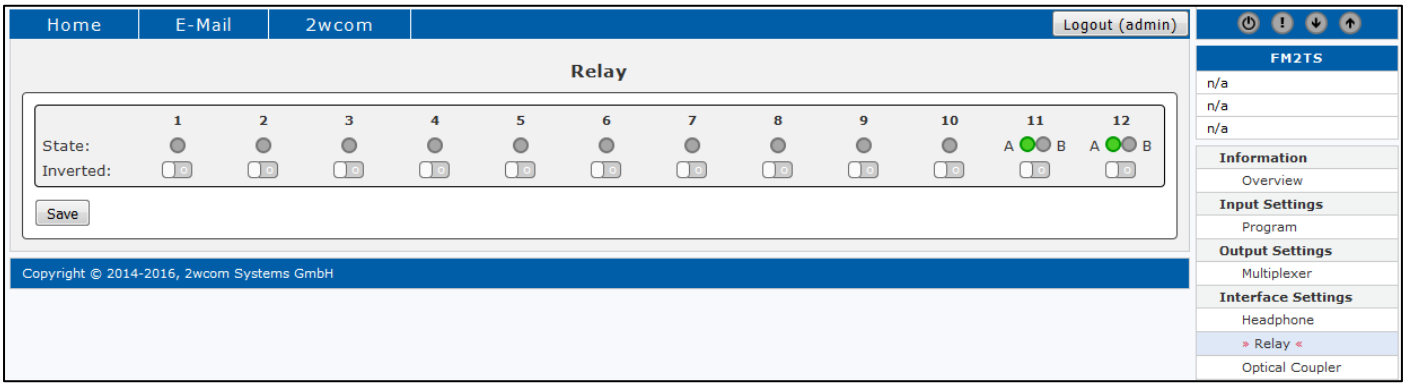


Figure 14: Interface Settings – Relay status

3. You can invert in the same window the function of the relay by selecting the corresponding virtual switch in the field "Inverted:".

4. Save the settings by clicking the save button in this block.

13.2. Monitoring the device

You can activate following parameters for monitoring the device and set up the alarms which should be sent in case of an error:

Power PSU 1/2 Failure	Alarm is triggered, if power supply 1/2 is failed.
Fan 1/2 Failure	Alarm is triggered, if fan 1/2 is failed.
Case temperature	Alarm is triggered, if the temperature of the device exceeds the specified value.

Set up each error monitoring in operation of the device separately as follows:

1. Open the configuration "**Device**" field in the window *Alarm* under **System Settings→Alarm** in the Web interface of FM2TS (see Figure 15).

2. Activate each alarm function separately in the checkbox "Enable", if a certain parameter should be monitored.

3. Select for each monitoring parameter the severity level of the alarm in the Dropdown Menu "Priority":

Level/Code	Priority	Meaning
0	Emergency	System is unusable
1	Alert	Action must be taken immediately
2	Critical	Critical condtitons
3	Error	Error conditions
4	Warning	Warning conditions
5	Notice	Normal but significant condition
6	Informational	Informational messages
7	Debug	Debug-level messages

Table 3: Alarm Priority

The value 0 or Priority **Emergency** is the most critical or the most urgent level. In case of an alarm an error report is sending the priority of the alarm with the priority of the error to a Network Operations Center (NOC). The responsible Second Level Support is deciding with this information how urgent the case of alarm is and which procedures are necessary.

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

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

6. Activate the virtual switch "SNMP", if the alarm should be signaled by sending the SNMP traps.

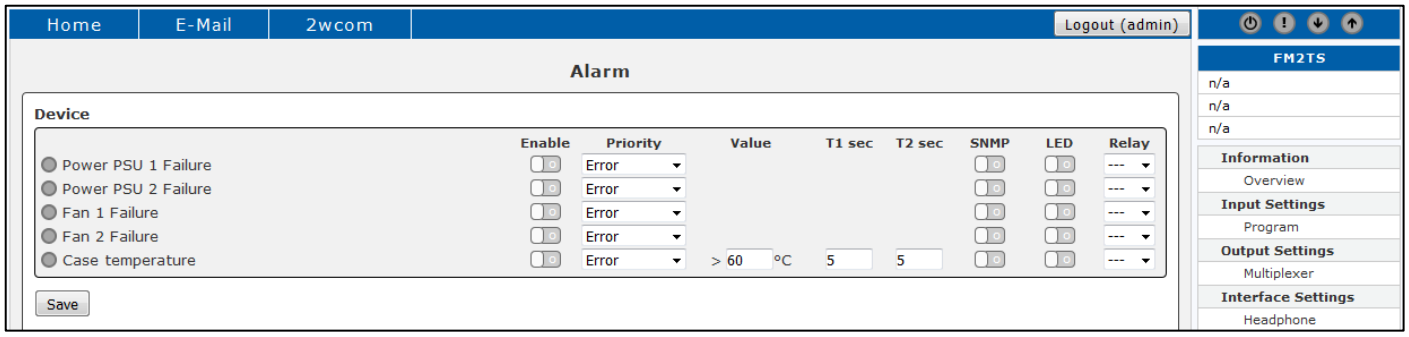


Figure 15: Alarm settings for the operation of the device

The color of the LED signalizes following:

- Monitoring is active, alarm is not triggered
- Monitoring is deactivated
- Monitoring is active, alarm is triggered

7. Activate the virtual switch "LED", if the alarm should be signaled over the Warning LED in the Web interface page or in the front panel of the device.

8. Choose in the dropdown menu "Relay" one of the available relays that should register the alarm.

NOTE: You can assign the power failure function (normally relay 7) to one of the first six relays. However, in this case all other assignments for the appropriate relays are ignored.

9. Enter in the "Case temperature" field the value for the temperature of the device from which the alarm should be triggered when the device is overheating.

10. Save the settings by clicking the save button.

13.3. Monitoring the tuner

You can activate following parameters for monitoring the tuner and set up the alarms which should be sent in case of a malfunction:

RF Level	Alarm is triggered, if the input field strength exceeds the specified value
Signal Muting	Alarm is triggered, if mute is activated
RDS Sync	Alarm is triggered, if no RDS data is identified in the RF signal
Pilot	Alarm is triggered, if no pilot sound in the RF signal is identified
Audio silence detection	Alarm is triggered, if no audio signal but only noise is identified at the input

Set up the error monitoring separately for each connected tuner:

1. Open the "**Tuner 1-8**" configuration field in the window *Alarm* under **System Settings→Alarm** in the Web interface of the FM2TS (see Figure 16).

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

3. Select for each monitoring parameter the severity level of the alarm in the Dropdown Menu "Priority" (see Table 3).

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

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

6. Set up for each monitoring in the *T1* field (if applicable) an alarm tripping delay and in the *T2* field alarm redemption delay.

7. Choose for each monitoring parameter the alert by SNMP, LED and/or relay by activating the related virtual switch and/or one of the available relays in the Dropdown Menu.

8. Enter in the "RF Level" field the minimum value for the input field strength of the RF signals below which the alarm should be triggered.

9. Enter in the "Audio silence detection" field the level value for the identification of the missing audio signal (noise) under that the alarm should be triggered.

10. Save the settings by clicking the save button.

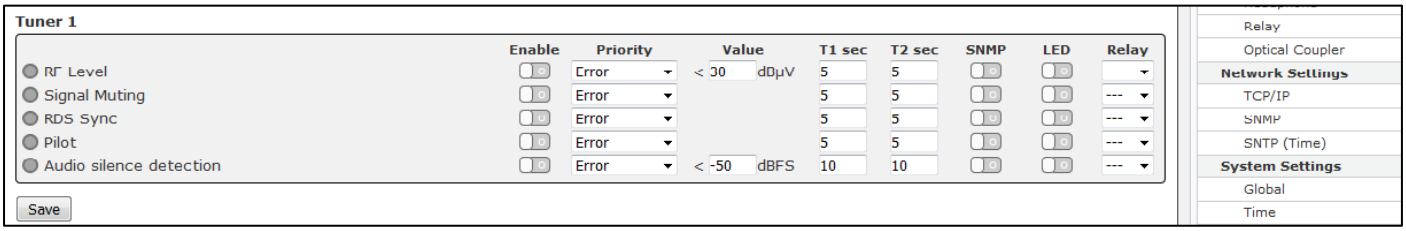


Figure 16: Alarm settings for tuner 1-8

The color of the LED signalizes following:

- Monitoring is active, alarm is not triggered
- Monitoring is deactivated
- Monitoring is active, alarm is triggered

NOTE: For further information about the error report see in the logbook under **Status→Log**.

14. Global settings

14.1. Enter the device information

Enter the name and description of the device to identify the device:

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

2. Enter the identification information of the device in the "System parameter" field (see Figure 17).

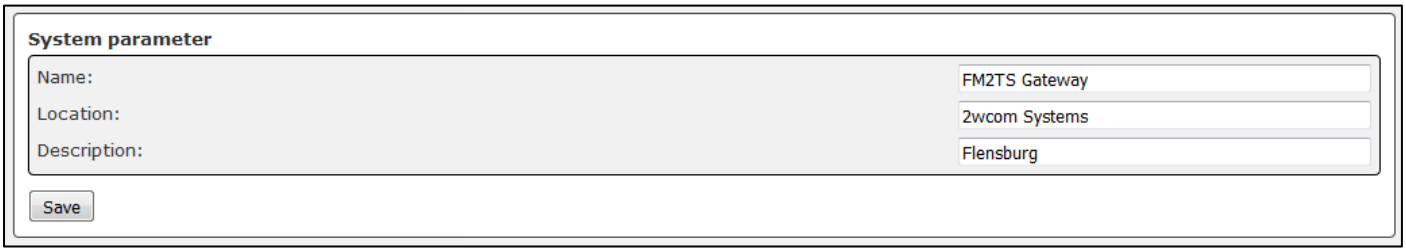


Figure 17: Global System Settings – System parameter

3. Save the settings by clicking the save button.

   ⇒ The saved information is available under **Information→System** in the Web interface.

14.2. Set up time of the web session

If the Web interface of the FM2TS stays for a certain time inactive, the page logs out automatically.

To set up the time of the web session for the inactive time, proceed as follows:

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

2. Enter in the "Web Session Timeout" field the time of the online session in minutes (see Figure 18).

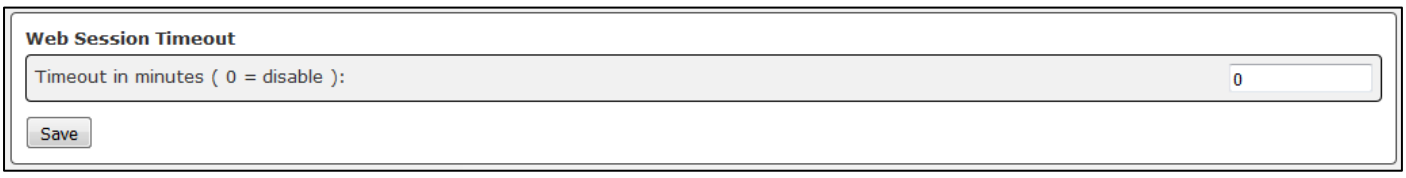


Figure 18: Setting of the timeout for automatic logoff

3. To deactivate the automatic logout, enter "0".

4. Save the settings by clicking the save button.

14.3. Upload and activate settings

You can restore device settings saved locally.

To upload the saved device settings, proceed as follows:

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

2. Click the Browse button in the **Settings** field, to open the "Open file" dialogue of your operating system (see Figure 19).

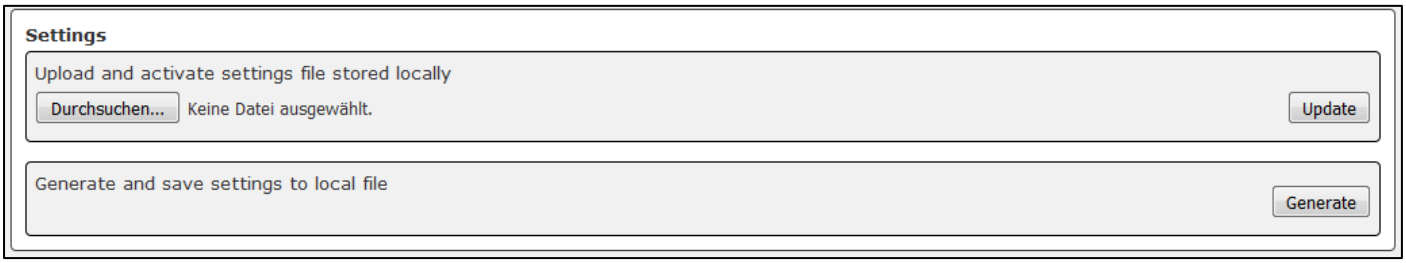


Figure 19: Upload and save device settings

3. Click the Update button, to upload the file. The upload process can take a while. Please do not interrupt the process.

4. Follow the instruction to restart the device after a successful upload.

   ⇒ After the restart, the new settings are active.

14.4. Save the settings

You can save the current settings and save them as a file on the hard disk, in order to transfer these e.g. to other devices or to restore them on the same device.

To save the current device settings, proceed as follows:

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

2. Click the Generate button in the **Settings** field, to generate a copy of the current settings. The saved settings are shown as an XML file with the created date in the same block (see Figure 19).

3. You can open the context menu with a right click on the XML file and save the target data on the hard disk.

   ⇒ Saved settings can be uploaded in the same **Settings** field (see section 14.3).

14.5. Upload and activate firmware

You can upload an ARM firmware from a local storage (hard disk, USB storage) or from a TFTP server into the device.

To upload the new firmware, proceed as follows:

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

2. Click the Browse button in the "Firmware update" field, to open the "Open file" dialogue of your operating system (see Figure 20).

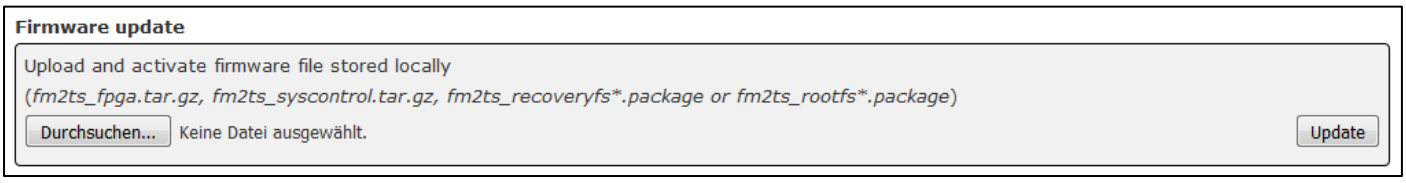


Figure 20: Global System Settings – Firmware update

3. Select the firmware file.

4. Click the Update button, to upload the file and to update the firmware. The upload process can take a while. Do not interrupt the process!

5. Follow the instruction to restart the device after a successful upload.

6. You can also update the firmware from an USB storage. Click therefore the Update button in the corresponding block in the same "Firmware update" field.

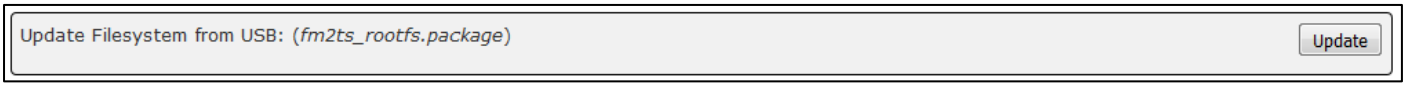


Figure 21: Firmware update over USB

⇒ After the restart, the new firmware is active.

14.6. Set up time

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

To set up the internal clock of the device, proceed as follows:

1. Open the window *Time* under **System Settings→Time** (see Figure 22).

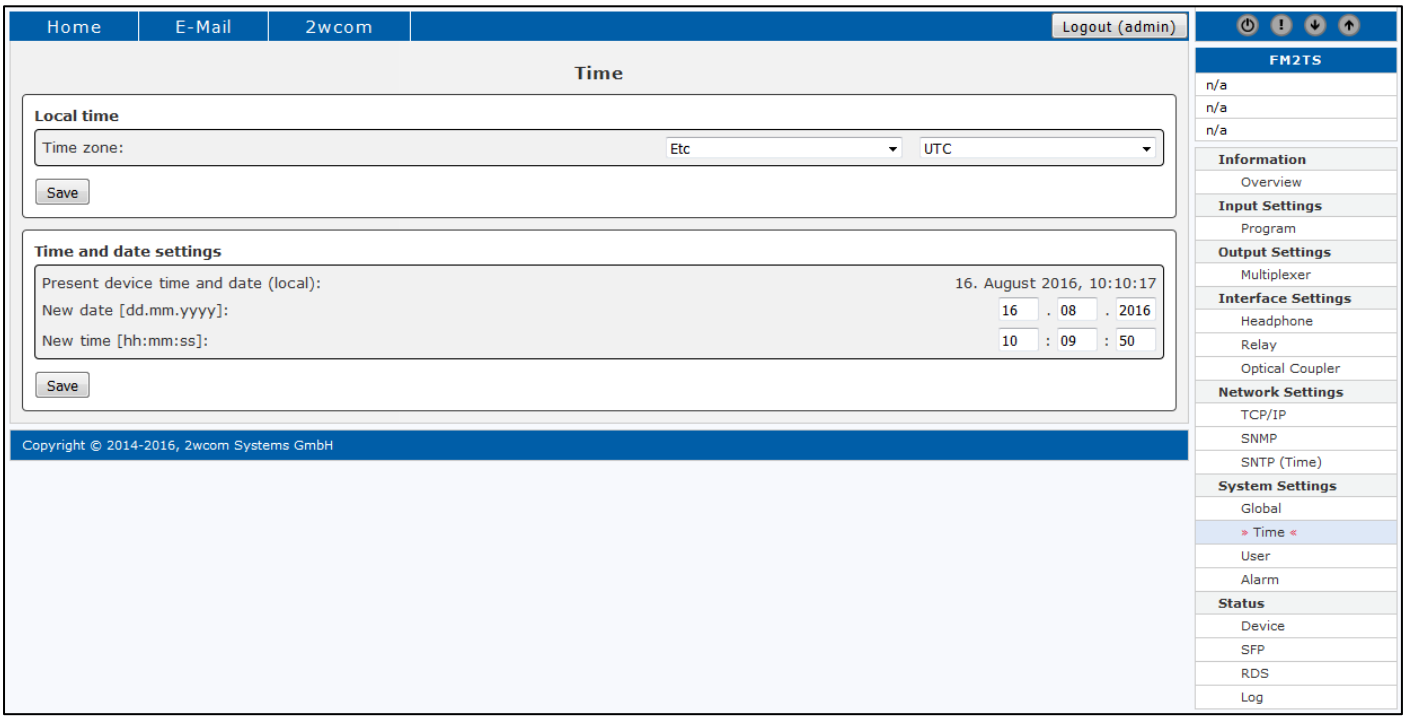


Figure 22: System Settings – Time and date

2. You can set up manually the 24 hour format and the date of the internal clock of the device "Time and date settings" field.

3. Save the settings by clicking the save button.

   ⇒ The current time and date of the internal clock of the device is shown under "Present local device time and date" in the same "Time and date settings" field.

14.7. Configure user accounts

The default accounts are a read-only access (Guest account), a full access without a permission to manage the user accounts (Manager account) and a full access (Admin account). The login data for the first access are preset (please note upper and lower case):

1. For the read-only access **"guest"/"guest"**

2. For the access with write permissions **"manager"/"manager" or "admin"/"admin"**

Change the login data for the access to the Web interface of the device after the first login (user name/password). Proceed as follows:

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

2. Change the login data for the access with write permissions in the "Manage account" field or "Admin account" field and repeat the entered password.

3. Save the settings by clicking the save button.

4. Change the login data for the read-only access in the “Guest account” field and repeat the entered password.

5. Save the settings by clicking the save button.

Note: Please note upper and lower case by entering the password!

14.8. Set up audio volume level

The FM2TS has a headphone socket on the front panel of the device to listen to input audio programs immediately, to monitor the input audio signal. You can change over the Web interface, the volume level and the tuner.

Set up the volume level of the audio signals as follows:

1. Open the window *Headphone* under **Interface Settings→Headphone** (see Figure 23).

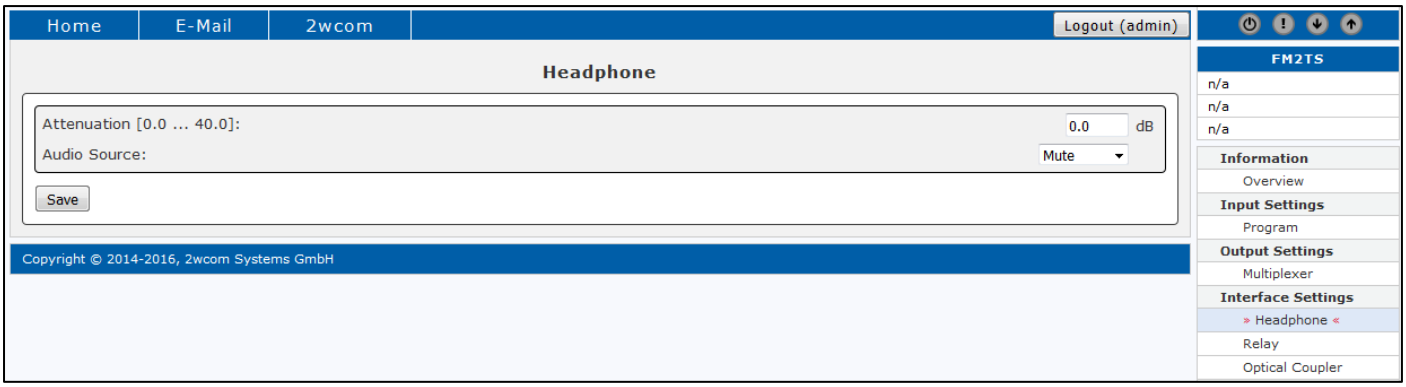


Figure 23: Volume level settings for the headphone output

2. Set up in the “Volume” field the volume level for the headphone output in the range between -36dB and 6dB.

3. Save the settings by clicking the save button.

14.9. Reboot the device

To reboot the device, proceed as follows:

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

2. Click the Reboot button in the “Reboot” field on the page, to reboot the device.

   ⇒ The device reboots.

15. Systeminformation

15.1. View local device data

You can find the local device data such as name and description in the Web interface of the device on the right side above the navigation menu in the block “FM2TS” (see Figure 24).

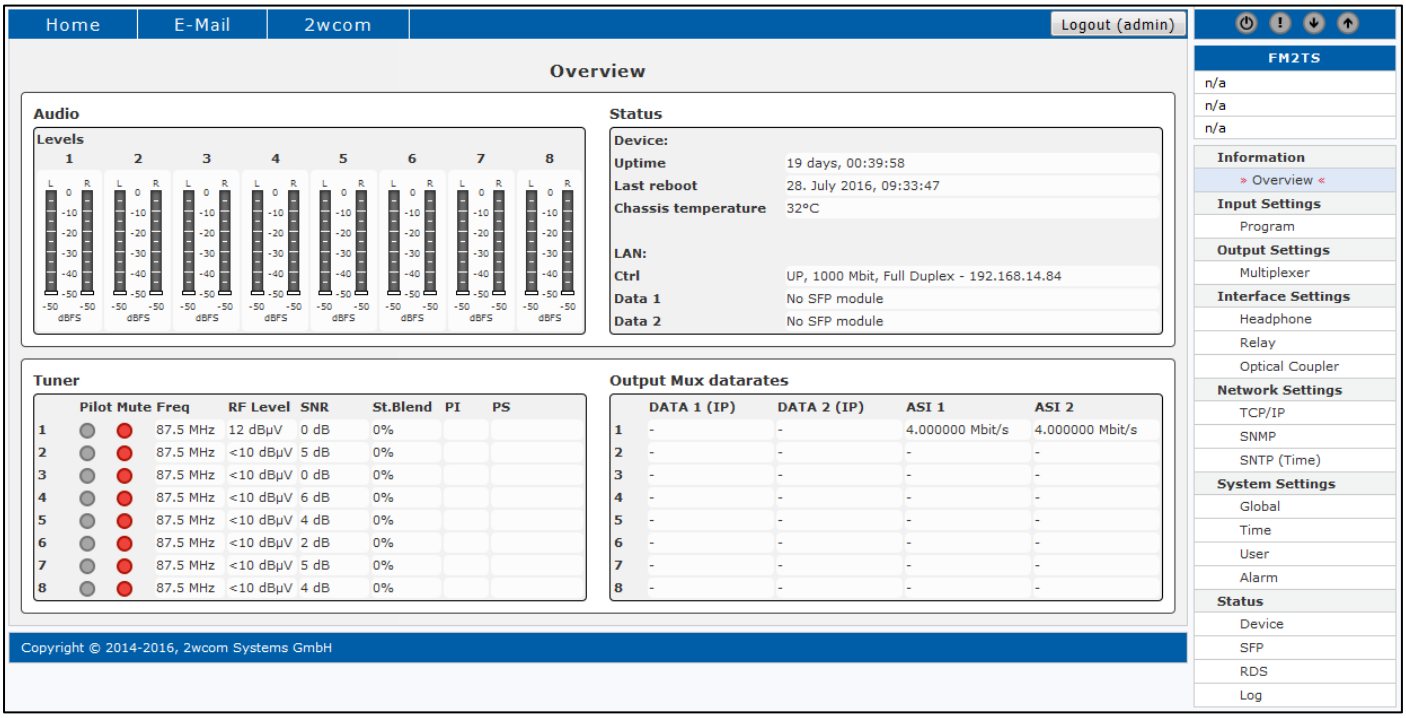


Figure 24: Overview of the device data

You can change these data under **System Settings→Global** (see section 14.1).

15.2. View status of the device

Check the current status of the device such as running time of the device, temperature and last reboot under **Information→Overview** (see Figure 25).

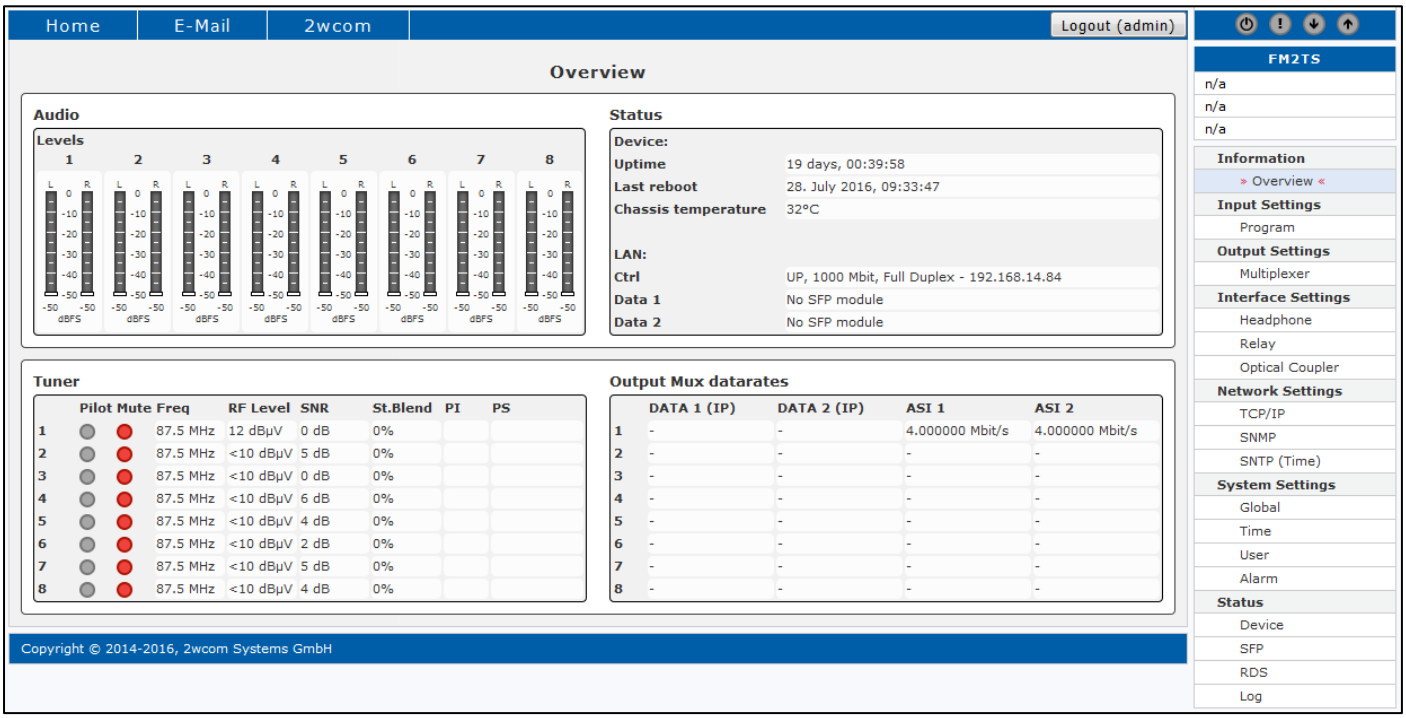


Figure 25: Status of the device – Basic parameter

You can check further details for the current status of the device such as electric potential, fan rotation per minute etc. under **Status→Device Status** (see Figure 26).

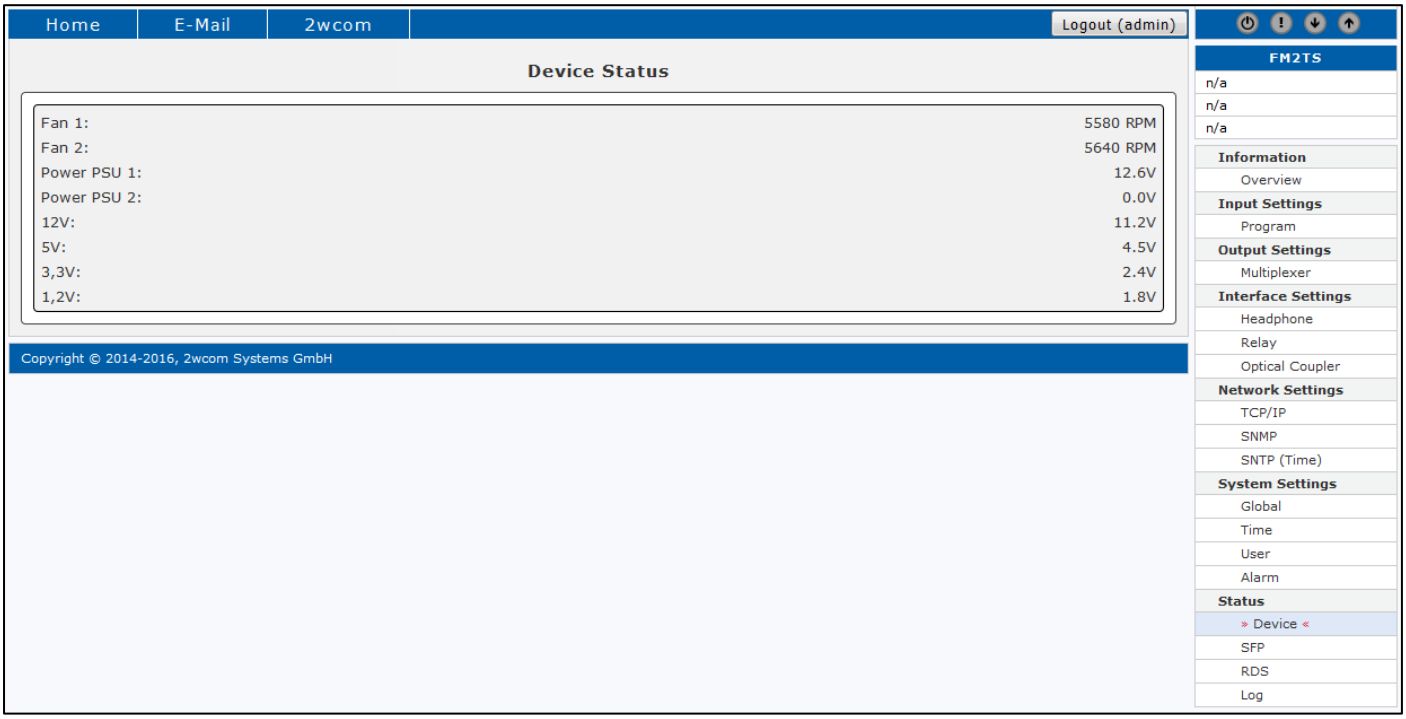


Figure 26: Overview of the status of the device

15.3. View system data

You can view at any time general system information such as serial number, firmware version, Web interface version etc.

To view the system data, proceed as follows:

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

2. You can find the device data in the "System information" field (see Figure 27).

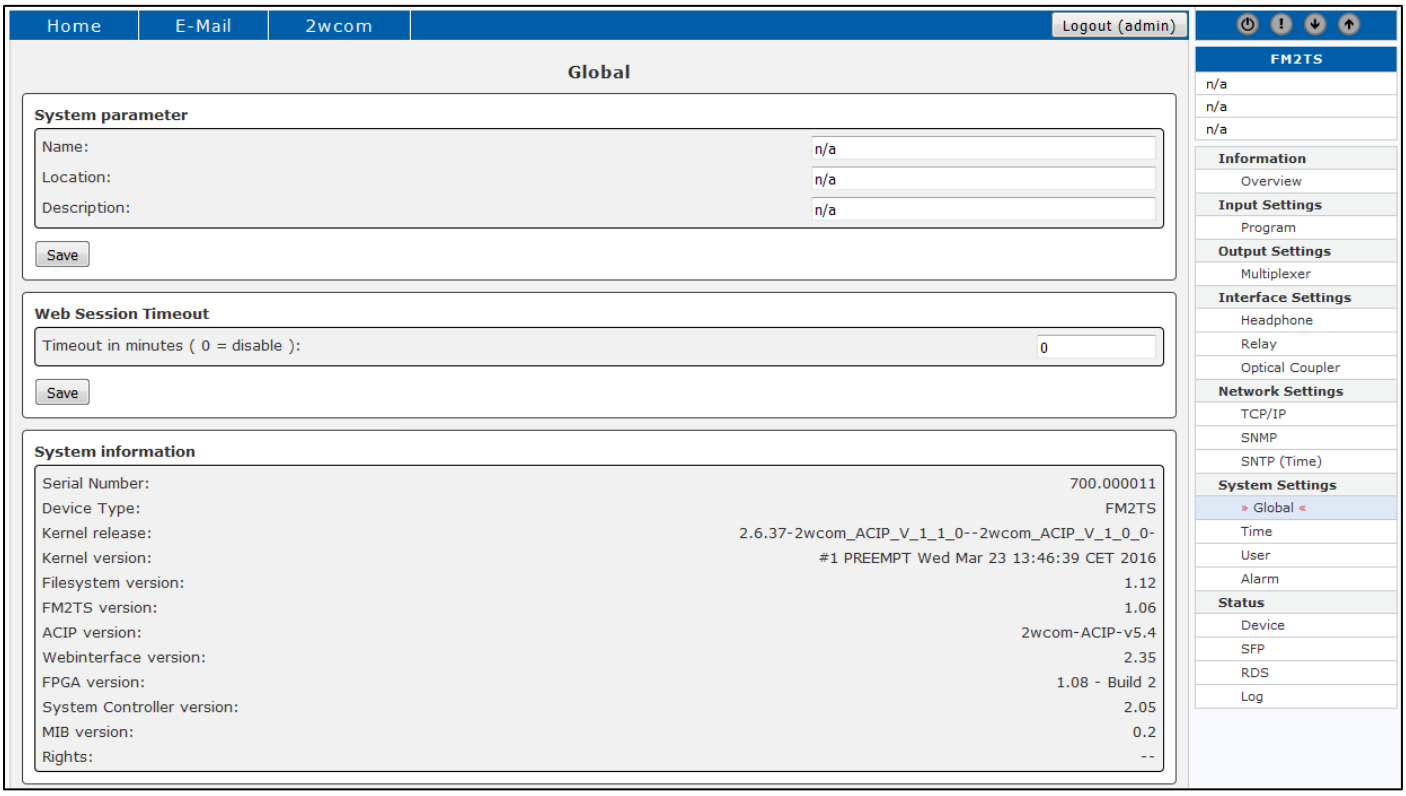


Figure 27: Global System Settings – System Information

15.4. Operating protocol – View logbook

In the logbook you can find a chronological list with the last processes and error messages under **Status→Log** (see Figure 28).

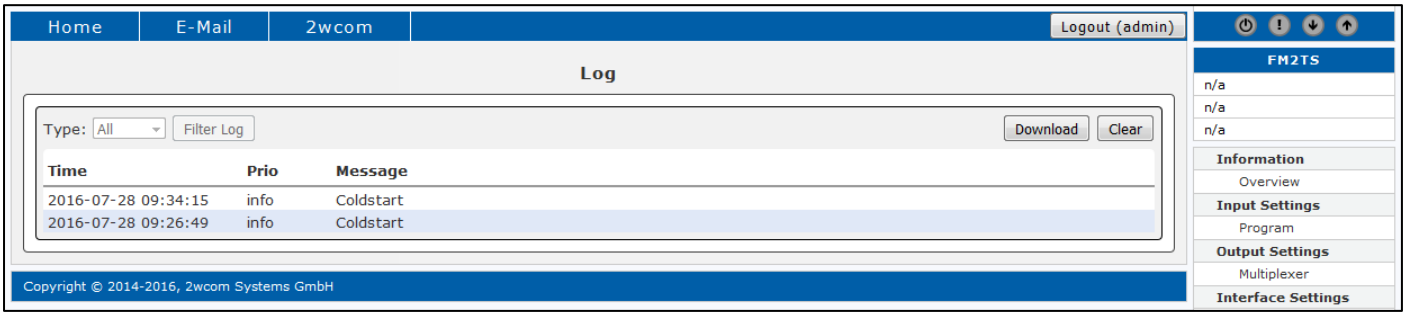


Figure 28: Logbook – Overview of the processes and warnings

16. Troubleshooting

The following chart is designed to help you to correct minor problems with the use of the device prior to contact our service department (report failures by email to *contact@2wcom.com* or fax to +49 461-662830-11). Also be sure to read the entire manual carefully, as this often helps in understanding and fixing typical problems.

Problem	**Possible Cause**	**Solution**
Device does not turn on	• Power cable is improperly connected • Mains supply failure • Blown fuse	• Check supply cord • Make sure that the power plug at the device is fully inserted • Check mains supply • Replace fuse by same type
Device cannot be operated via Ethernet	• Network cable not connected • IP address / TCP port is not known. • A device with the same IP address was connected a few minutes before. Then the ARP table still assigns the old MAC address to the IP address.	• Connect the network cable. • Use the default address 192.168.14.250. If the address was changed and is not known please see page 8. • Usually the ARP table is refreshed automatically after a few minutes by the operation system. For an instant access to the device please reset the ARP table of your computer e.g. by entering “arp –d” in the Windows Command Prompt.

17. Maintenance and servicing

Maintenance

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

Servicing

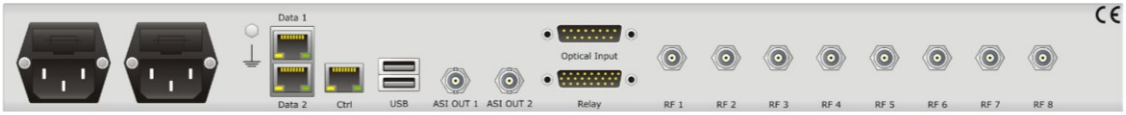
The modules of the device are complex and should be serviced only by authorized personnel.

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

Calibration

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

18. Technical data



according to CENELEC EN 60950, EMV EN55022 and EN55024

FM2TS Gateway – Technical Details

Inputs

RF

Tuner	8 independent FM tuner
Connector	8x F-Connector
Impedance	75 Ω
Frequency Range	87.5...108.0 MHz 50 kHz steps
RF sensitivity (S/N 40 dB, stereo)	20 dBµV
RF input level range	25 ... 120 dBµV
Input Frequency Accuracy	< ± 2 kHz
Amplitude response	< ± 0,3 dB
SNR (A)	> 65 dB (>63 dB)
SNR quasi peek unweighted	> 63 dB (with 15 kHz low pass)
SNR quasi peek weighted (ITU (CCIR) Rec. 468-2	> 56 dB
Total harmonic distortion	> 68 dB
Crosstalk attenuation	> 38 dB
Return loss	> 15 dB
De-Emphasis	50 µs, 75 µs

Outputs

MPEG-Encoder

	MPTS and multiple SPTS RTP, UDP IP Unicast/Multicast
Supported Codecs	MPEG 1/2 Layer 1/2/3, AAC-LC, HeAAC-v1/v2, AAC-LD, G.711, G.722,
Sampling frequencies	16, 22.05, 24, 32, 44.1 and 48 kHz
PCM processing	Loudness Measurement and Compensation (optional) Compliant to CALM and EBU R128
Framework System	TS Multiplexing
Framework TS Format	ISO/IEC 13818-1 MPEG-2 Transport Stream (TS)
FEC	Pro-MPEG Code of Practice #3 release 2 compliant
Configuration	user configuration for selection of encode and TS-output parameters: PAT/PMT, SDT, PSI/SI tables
Audio streaming (for monitoring)	MPTS and multiple SPTS RTP, UDP IP Unicast/Multicast Adjustable MPEG Encoder quality Adjustable sample rates
Audio level	-6 dB fullscale at ± 40 kHz input signal frequency shift

RDS/Ancillary data

Data output format	UECP (Ver. 6.+ compliant), transparent (other formats possible)
Data output	via serial interface or TCP/IP

Headphone (front)

Connector	6.35 mm
Impedance	600 Ω
Output channel selection	switchable

Alarm functions / Control

FM/RDS

FM control	Mute Enable, Mute Attenuation, Mute Threshold (Start, End), Stereo Blend Threshold (Start, End), Tuner Mode (Auto, Stereo, Mono)
RDS control	PI, PS, DI, MS, TA, PTY, RT, RT+, CT
RDS decoder	PI, PS, TA, TP, PTY, CT, RT, RT+
RF level Alarm	25...120 dBµV, resolution 1 dBµV
FM / Audio alarm	Failure monitoring (Pilot, RDS sync, silence detection, L, R)
Signal Muting alarm	Muting of input signals ≥ 10 dB below reference value
Hardware alarm	Power supply failure, fan failure
Alarm types	Serial interface, potential free relay contact, SNMP, E-mail (e.g. to send automaticly SMS)
Alarm report	Can be read out via TCP/IP Enhanced logging functions and local event logging (permanent storage)
NTP Server	Two NTP-Server configurable

Interfaces

Front panel

LCDisplay	Graphical, 264x64 pixel
Jog wheel	impulse, ENTER button
8 LED's	Power 1, Power 2, Warning, Status

Remote control input

	7 opto-isolated inputs (excludes option: 24 relay contacts)
Connector	15 pole sub-D female

Remote control output

	12 floating relays (10x SPST, 2x SPDT) (for DC: max. 30 V, 0.5 A) 26 pole sub-D male
optional:	24 floating relays (excludes: 7 opto isolated inputs)

Setup

RS-232C (Front)	1x serial interface for setup data and setup function
USB	2x USB 2.0 Interface for service, configuration and firmware updates

TCP/IP

	2x data and 1x control
Type	Auto switching 10/100/1000 BASE-T, Unicast, Multicast
Data format	ARP (RFC 826), IPv4 (RFC 791), IPv6 (RFC 2460), ICMP (RFC 792), TCP (RFC 793, RFC 1323), UDP (RFC 768), NTP v3 (RFC 1305), TFTP (RFC 1350, RFC 2347), Telnet (RFC 854 to RFC 861), SNMPv2c (RFC 1901, 1905, 1906), HTTP 1.1 (RFC 2616)
Modules	2x SFP slot (according SFF-8724 Multi Source Agreement) 1000BASE-T, 1000BASE-SX (data) 1x RJ45 (control)

ASI out

Data	MPEG2 TS
Connector	BNC 270 Mbps

General data

Power consumption	60 VA
Case dimensions	19", 1 HU, 310/424/484 mm
Weight	5 kg
Housing	Steel plate (aluminum-zinc coated)
Operating temp. range	0...+45°C
Storage temp. range	-40...+70°C
Redundant power supply	2x internal, 90...260 V, 47...63 Hz 2x power port, aut. switchover
Redundant fan technology	2x internal cooling fan aut. switchover

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These data are subject to modifications and amendments.
Errors excepted

2Wcom
Wireless-World-Communication

www.2wcom.com • contact@2wcom.com • Am Sophienhof 8 • 24941 Flensburg • Germany • Fon (+49) 461 - 66 28 30 - 0 • Fax (+49) 461 - 66 28 30 - 11