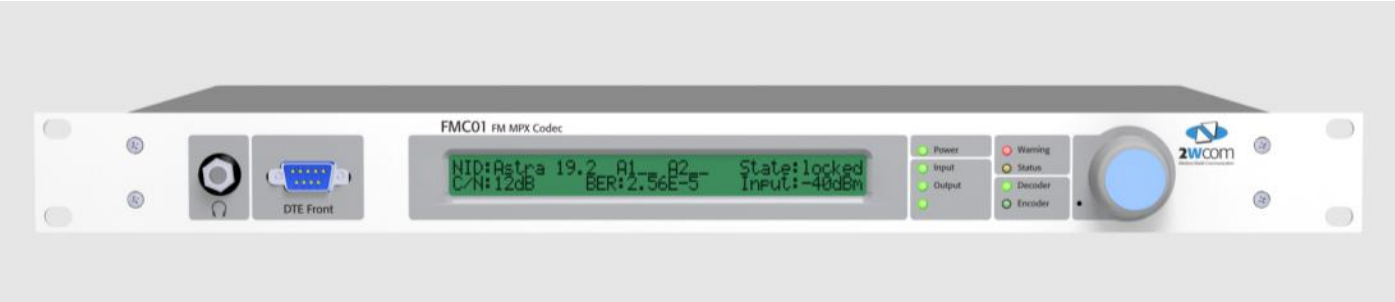
FMC01 FM MPX Codec

MPX over E1

MPX over IP



User Manual

V01.13

July 2015

Content

1. Symbols in this manual

1.1. 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

1.2. 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.

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

2. Introduction

Description

The FMC01s main function is to distribute FM MPX signal via **E1 (G703)** line with a data rate of 2.048 kbps and using the Internet Protocol (**IP**) via a 10/100/1000-Base-T network interface[1]. The device has two main operation modes:
- transmitting FM MPX over IP or E1 line;
- receiving FM MPX over IP or E1 line.

Thus, the FMC01 is used at **both ends** of the transmission chain: in the FM studios where signals are generated, and in the FM stations where signals are received and distributed. Both the E1 and IP data streams are protected by a forward error correction (FEC) scheme to account for bit errors (E1) or packet loss (IP).

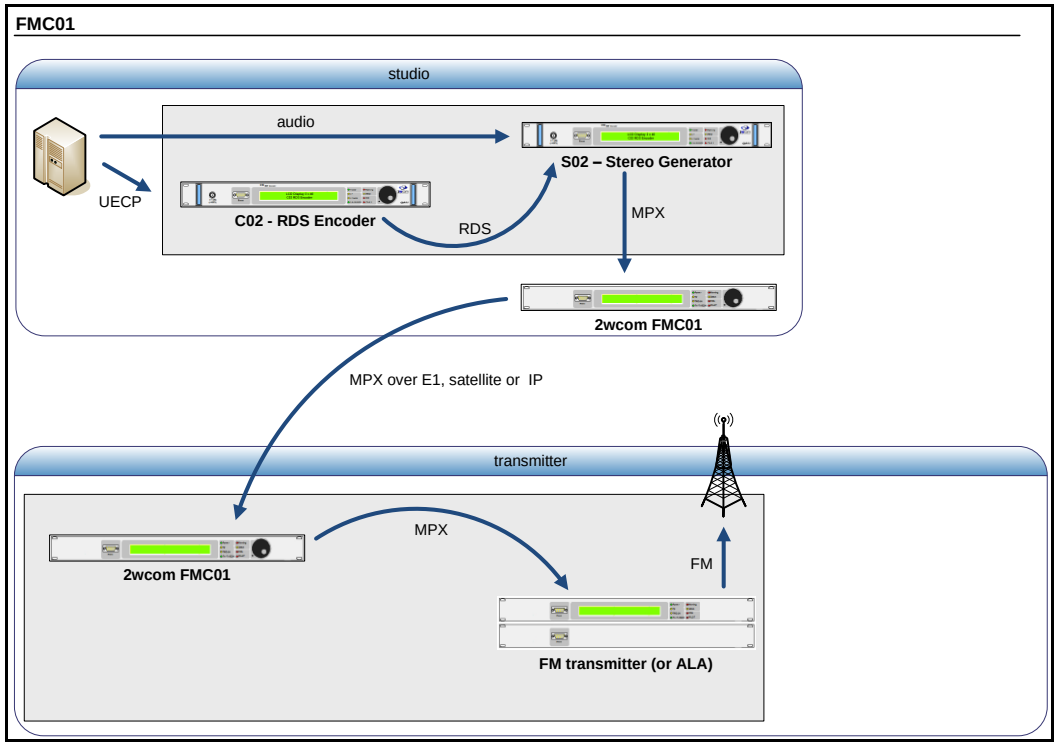


Figure 1: Overview of the FM MPX transmission chain for the FMC01

Control

HTTP Web interface
The unit is controlled via a built-in web user interface.

SNMP
Additional monitoring of the device using SNMP is possible. Rudimentary device control, status information and alarm trap generation is featured.

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

Functions

Table 1 shows the main functions of the FMC01:

[1] In this manual referred as E1/IP.

STANDARD	Encoding FM MPX→E1	The FMC01 can: - reduce the bandwidth of the FM MPX signal for E1/IP - reduce the bit depth to increase the quality of an error correction - digitize/encode the FM MPX signal and output it over E1/IP.
	Decoding E1→FM MPX	The FMC01 can: - receive data stream over E1 or IP, - decode FM MPX signal from the E1/IP data stream and output it.
OPTIONAL	The FMC01 can: - switch over input source between E1 and Gigabit IP in case of failure	

Table 1: Overview of the main functions of the FMC01

User

Only experienced technical personal or engineers should operate the FMC01. Basic knowledge about FM and E1/IP networks is required.

Process

FM MPX digitalization

- analog MPX signal reception via BNC or XLR connector
- reduction of MPX signal bandwidth to 66kHz bandwidth, with no attenuation up to 59,4 kHz
- reduction of MPX samples to 15 bits, for increased error protection, samples can be reduced further down to 12 bits (only impacts E1 transmission)

FM MPX → E1/IP encoding

- signal encoding
- adding CRC information to the data stream
- adding error correction data to the data stream
- output of the data stream over E1 or 1000-Base-T

E1/IP → FM MPX decoding

- data stream reception over E1/IP
- error detection and correction
- sample rate synchronization
- MPX signal decoding

Conversion to analog MPX signal

- digital to analog conversion of the signal
- output of the analog MPX signal over BNC and XLR connectors

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

3. Safety Instructions

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

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

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

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

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

Never operate the device, if it does not function properly. If the device or its part is out of order, put it out of operation. Never repair the device by yourself. If there are any damages in the device, sent 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 electrical shock** Plug the device into a grounded power socket only. Never remove the grounding wire/contact. Never open the housing of the device by yourself. Never touch open electrical parts. Dangerously high voltages are present inside the housing. Even after disconnecting the mains supply, dangerously high voltage levels may be present for a certain time. Do not touch the device with wet hands. Never expose the device to liquids. If any liquid comes inside the housing, immediately disconnect the device completely from the power supply. Do not continue operating the device.
	**FIRE HAZARD of overheating or electric shock** Ensure sufficient heat dissipation during operation. Avoid following when installing the device: – non-ventilated environment, for example a narrow shelve or built-in wardrobe; – extremely warm or cold place; – direct sunlight exposure; – too high or too low temperature;

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

⚠WARNING	
	**WARNING of explosive atmosphere** Risk of the explosion hazard. Do **not** use the device in an explosive environment.
	**WARNING of hot surface** The surface of the device can heat up during operation. The device is equipped with a passive cooling system. However, it does not switch off automatically, if it is overheated. 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

- FMC01
- Power supply cord
- Patch cable
- CD with supplementing data (SNMP MIB files, handbook as PDF)

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

5. Manufacturer

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

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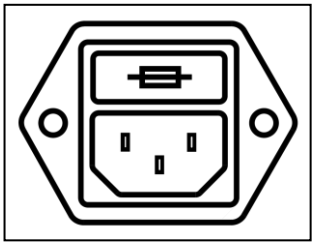
6. Installation

Best setup location

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

Mains supply connection

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



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 see Section 8.2

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 button save;
- if you don't want to save the changes, press the button reset in the input fields of the web interface. Saved changes cannot be reset by this button to a default.

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 dial and LCD on the device is similar to these descriptions.

7.2. Operation via LCD / jog dial

Some basic functions of the device can also be operated via the LCD/jog dial at the device. The operation works analogously to the web interface descriptions. If a function of the web interface is applicable for the LCD/ jog dial, 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 dial.
- To move the cursor "→" in the menu structure, turn the jog dial.
- To open a menu entry or to confirm a setting, push the jog dial.
- If a configurable menu entry is selected, it is displayed in brackets "**>** <" and you can adjust it by turning the jog dial.
- To confirm the adjustment, push the jog dial.
- To return to a previous menu level, activate the menu entry "**Back**".
- To change the operating language of the LCD-menu (if available), select "**Settings→Language**" (or in German Language: "**Einstellung→Sprache**") in the main menu. The available languages are English and German.

8. First Steps

The following section contains instructions for quick start.

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

8.1. Power supply

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

If the device is compatible, connect the power supply cord fully to the IEC power connector at the back panel of the device and a mains power outlet.

⇒ The "Power" LED will then turn on.

8.2. Network configuration

For delivery the device is configured with default settings for the first connection via the IP interface.

To configure the IP settings:

1. Use the jog wheel to select "**Interface→TCP/IP**".
2. Configure settings for your existing IP network (IP address, netmask, gateway etc.; consult the responsible network administrator if applicable).
3. Save the settings by using the jog wheel and reboot the device.
4. Connect a network patch cable to the "10/100-Base-T" connector on the back panel of the device and your existing IP network.

⇒ Your device is now connected to network.

8.3. Web interface

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

To operate the device via the web interface:

1. Start an internet browser (e.g. Firefox/Mozilla ≥ Version 3.0 or Microsoft Internet Explorer ≥ Version 7.0 (both with Java Script activated)).
2. Enter the configured IP address in the address bar of the browser. If the IP address has not been changed in step 8.2, please enter the default address in the address bar of the browser: **192.168.14.250**.

3. A login screen with *Username/Password* appears. Use the default accounts:
    i. for a read-only access use "guest"/"guest"
    ii. for a full access use "admin"/"admin"

⇒ After entering the correct login data (case sensitive), the main FMC01 page appears.

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

8.4. Connecting the devices

For data distribution, connect the devices as follows:

1. If the FMC01 should operate as an encoder, use the XLR or the BNC [MPX IN 1/2] jack to feed an MPX signal to the FM MPX.
2. To output the encoded signal over E1 or IP, use the BNC jack [E1 OUT 1/2] for distribution over E1 or [1000-Base-T] for distribution over IP.
3. If the FMC01 should operate as a decoder, use the BNC jack [E1 IN] to receive the signal over E1 or [1000-Base-T] to receive the signal over IP for decoding.
4. To output the decoded MPX signal, use the XLR or the BNC jack [MPX OUT 1/2].

8.5. Encoder activation

NOTE: The FMC01 can operate in both modes at the same time: as encoder and decoder (only for **MPX over E1**).

To activate und to configure the unit as an encoder for MPX over E1/IP:

1. Select **Codec Settings→Encoder** in the web interface menu. The window *Encoder settings* appears.
2. Activate the encoding function by selecting the radio button "ON" in the field **Activation**.
3. Choose an activated input for the MPX signal in the field **Source**: BNC, XLR or a 400 Hz testing signal.
4. Choose the output "Gigabit IP" or "E1" in the field **Destination**. If you chose "Gigabit IP", additional fields for connection configuration appear.
5. Click the save button to save the changes.

⇒ The device is functioning now as an encoder.

8.6. Decoder activation

NOTE: The FMC01 can operate in both modes at the same time: as encoder and decoder (only for **MPX over E1**).

To activate und to configure the unit as a decoder for MPX over E1/IP:

1. Select **Codec Settings→Decoder** in the web interface menu. The window *Decoder settings* appears.
2. Activate the decoding function by selecting the radio button "ON" in the field **Activation**.
3. Choose an activated input for the encoded MPX signal in the field **Source**: "Gigabit IP" or "E1".
4. Click the save button to save the changes.

⇒ The device is functioning now as a decoder.

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.

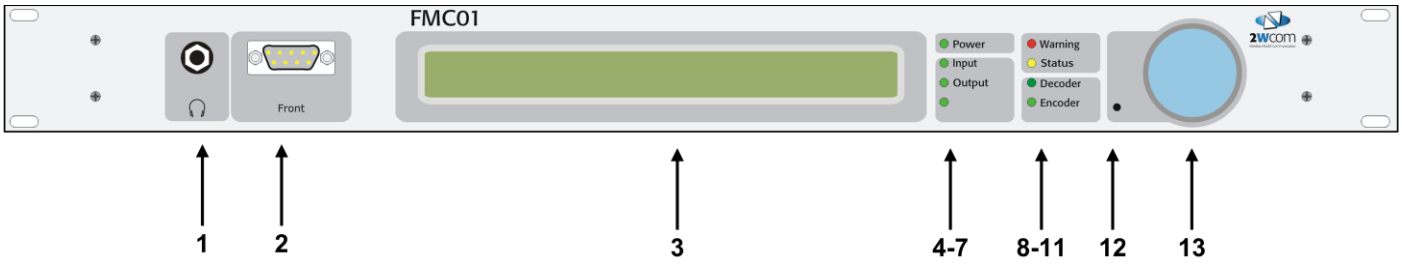
8.7. Adjust volume levels

To adjust the volume level:

1. Select **Interface Settings→Stereo Decoder** to set up the audio source: "Encoder" or "Decoder".
2. Select **Interface Settings→Level** in the web interface menu or use the jog wheel to select **"Interface→Volume"**.
3. Configure the audio volume for the headphone output.

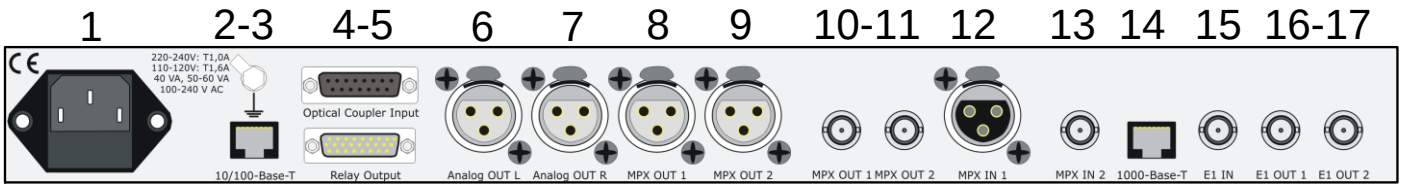
9. Control Elements and Connectors

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 data on this output.
2	[Front]	9 pole D-Sub male connector; only for device servicing purposes.
3	LCD screen	Illuminated, Liquid Crystal Display (LCD) with two rows of up to 40 characters.
4	[Power] LED	Activated (green color) if the power supply is ok.
5	[Input] LED	Activated (green color) if a signal is detected on an input interface (MPX IN/E1 IN or IP).
6	[Output] LED	Activated (green color) if a signal is detected on an output interface (MPX OUT/E1 OUT or IP).
7	LED	No function
8	[Warning] LED	Flashes (red color) if the monitoring function detected the triggering of a configured alarm.
9	[Status] LED	Active (yellow color) during the start-up and expires, when the device is ready for operation.
10	[Decoder] LED	Activated (green color) if the device operates as a decoder.
11	[Encoder]	Activated (green color) if the device operates as an encoder.
12	Reset button	Recessed reset button for resetting the device in case of a malfunction.
13	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.

9.2. Back Panel



1	IEC power supply connector	Standardized IEC supply connector with integrated fuse holder. Fuse ratings depending on mains supply voltage: 100-120V: T1.6A, time lag type, 5x20 mm, 250 V 220-240V: T1A, time lag type, 5x20 mm, 250 V
2	[Grounding stud]	The stud can be used to connect a grounding system if necessary.

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

3	[10/100-Base-T]	RJ-45 connector for control and monitoring the device via Ethernet. The device can communicate with the IP network and can be configured with an internet browser via the integrated web interface. The LED´s at the socket show the link status (green; active if a physical network connection exists) and the activity status (yellow, active if data communication is active).
4	[Optical Coupler Input]	15 pole D-Sub connector optical input; without function.
5	[Relay Output]	26 pole D-Sub connector; switch 12 (optional 24) contacts of the integrated relays. The relays can be activated for monitoring in case of an alarm.
6-7	[Analog OUT L/R]	XLR female socket; output of the left/right channel of the analog audio signal with configurable signal level. This is an additional option for monitoring an outputting audio signal.
8-9	[MPX OUT 1/2]	XLR female socket; output of the decoded MPX signal (symmetrical signal transmission).
10-11	[MPX OUT 1/2]	BNC connector; output of the decoded MPX signal (unsymmetrical signal transmission).
12	[MPX IN 1]	XLR male socket; input of an MPX signal for encoding and further distribution over E1/IP.
13	[MPX IN 2]	BNC connector; input of an MPX signal for encoding and further distribution over E1/IP.

14	[1000-Base-T]	RJ-45 connector for Gigabit Ethernet data communication. This interface is used to transceive MPEG2 transport streams or RAW data via UDP, UDP/RTP, as Unicast or Multicast IGMPv2. The LED´s at the socket show the link status (green; active if a physical network connection exists) and the activity status (yellow, blinks if data communication is active).
15	[E1 IN]	BNC connector; for the input of the encoded signal over E1 (G.703).
16-17	[E1 OUT 1/2]	BNC connectors; for the output of the encoded signal over E1 (G.703).

10. Network Settings

✓ You have already connected the device to the network [10/100-Base-T] and configured the access to the web user interface (see Section 8.2 and 8.3).

10.1. TCP/IP: configuration of the Ethernet interfaces

You can configure the Ethernet interface (control/monitoring) of the device under **Network Settings→TCP/IP**

10.1.1. Control interface (10/100Base-T)

In block **Control Interface (10/100Base-T)** the following parameters can be configured or changed:

MAC address:	The current MAC address is shown in this field.
DHCP:	Activate or deactivate the Dynamic Host Configuration Protocol which enables the device to get an IP Address automatically.
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 that is used for the internet access (e.g. the router).
Primary DNS:	IP address of the primary Domain Name Service (DNS) server.
Secondary DNS:	IP address of the secondary Domain Name Service (DNS) server.

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

⇒ Save the settings by clicking the save button.

LCD-menu: Interface→TCP/IP

10.1.2. Data interface (1000Base-T)

In block **Data Interface (1000Base-T)** you can configure or change the following parameters of the Gigabit-Ethernet interface (TS-streaming):

MAC address:	The current MAC address is shown in this field.
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 that is used for the internet access (e.g. the router).

Ethernet speed selection	Available settings in the dropdown menu: Autonegotiation/10/100/1000 Mbit/s.
VLAN:	Activate or deactivate the Virtual Local Area Network (VLAN).

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

⇒ Save the settings by clicking the save button.

10.2. SNTP settings: configuration of date and time

This menu item is available under **Network Settings→SNTP** and is used to enable the automatic synchronization of the date and time of the device with an external SNTP server (see Fig. 1).

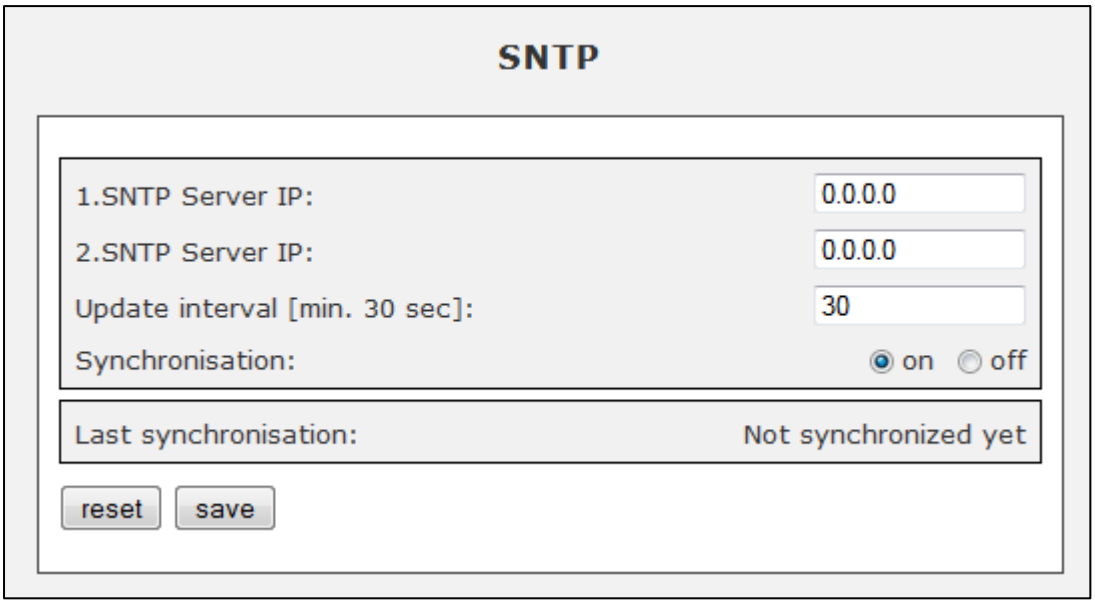


Fig. 1 Network settings - SNTP

In block **Control Interface (10/100Base-T)** the following parameters can be configured or changed:

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

⇒ Save the settings by clicking the save button.

`LCD menu: Interface→TCP/IP (SNTP IP1, SNTP IP2).`

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**.

10.3. Monitoring function: configuration of SNMP

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

This menu item is available under **Network Settings→SNMP** and is used to setup the IP addresses of the SNMP managers (see Fig. 2).

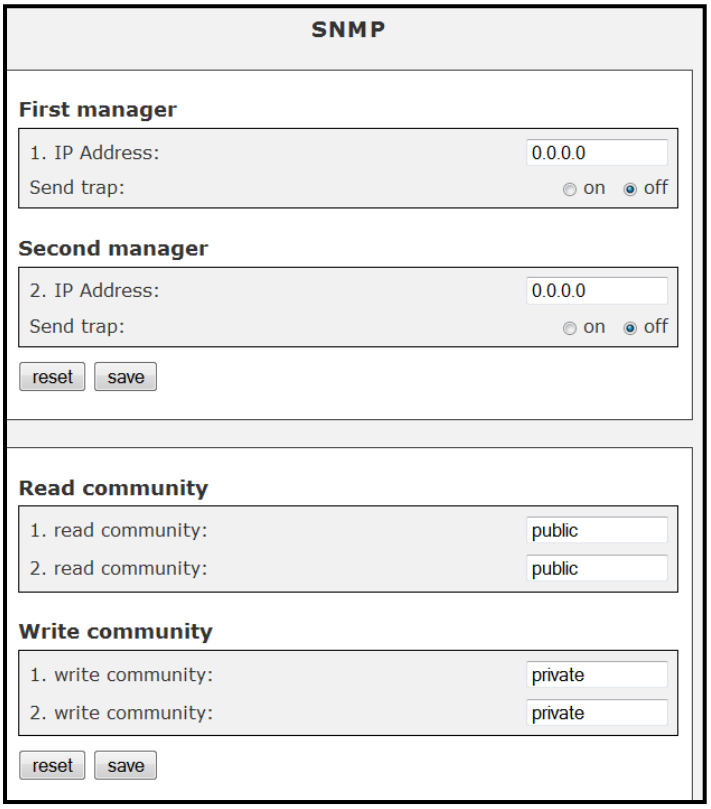


Fig. 2: Network Settings – SNMP.

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

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

First manager:	IP address of the first SNMP manager that receives SNMP traps. The trap sending to this address can also be deactivated by a checking "off" at "Send trap:".
Second manager:	IP address of the second SNMP manager that receives SNMP traps. The trap sending to this address can also be deactivated by a checking "off" at "Send trap:".
Read community:	SNMP access data for the external read SNMP access to the device.

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

⇒ Save the settings by clicking the save button.

NOTE: In order for the SNMP manager tool to operate correctly, it requires the specific MIB files. These MIB files need to be compiled by the SNMP manager tool and are provided on the setup CD or via email.

SNMP traps used by the monitoring function:

Trap No.	Trap Name	Monitoring Function
1	RDS available	Signals the RDS status in the input MPX signal (available/not available)
2	RDS PI	Signals the program identification code
3	RDS PS	Signals the program service name
4	E1 In available	Signals the input signal status received over E1 (available/not available)
5	E1 packet errors	Signals packet errors in the input signal received over E1 (available/not available)
6	E1 In FEC BER	Bit error rate of the input signal received over E1 (value)
7	IP In available	Signals the input signal status received over IP (available/not available)
8	IP In Packet error	Signals packet errors in the input signal received over IP (available/not available)

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

You can configure and activate the monitoring functions under **System Settings→Alarm**. More information about alarm settings you can find in Sections 11.5 and 12.5.

11. Encoder Settings

The FMC01 is able to receive, to encode and to distribute the FM MPX signals over E1 (G.703) or over IP (10/100/1000-Base-T).

✓ You have already connected the FMC01 to the network [10/100-Base-T] and configured the access to the web user interface (see Section 10.1)

Necessary steps for operating the FMC01 as an encoder are:

1. Connect the encoder
2. Activate the encoder for E1 or IP output
3. Set up the IP output
4. Set up the error correction
5. Set up the RDS monitoring and alarm control
6. View the encoder status

The following sections describe the separate steps for encoding:

11.1. Connect the encoder

For data distribution, connect the device as follows:

1. To feed an MPX signal that should be encoded for further distribution over E1/IP, use the XLR or the BNC [MPX IN 1/2] jack (see Section 9.2)

2. To output the encoded signal, use the BNC jack [E1 OUT 1/2] for distribution over E1 or [1000-Base-T] for distribution over IP.

11.2. Activate the encoder for E1 or IP output

NOTE: The FMC01 can operate in both modes at the same time: as encoder and decoder (only for **MPX over E1**).

1. Open the window *Encoder settings* under **Codec Settings→Encoder** in the web user interface of the FMC01 (see Fig. 3).
2. Activate the encoding function by selecting the radio button "ON" in the **Activation** field.
3. Choose the connected input source for the MPX signal in the **Source** field: XLR, BNC or a 400 Hz test tone that replaces the input signal.
4. Choose the preferred bit depth in the **Bit depth** field. You can set up the bit depth in the range between 12 and 15 bit.
5. Choose the output "Gigabit IP" or "E1" in the field **Destination**. If you choose "Gigabit IP", additional fields for connection configuration will appear (see Fig. 3). For E1 output no further settings are necessary.

6. Click the save button to save the changes.

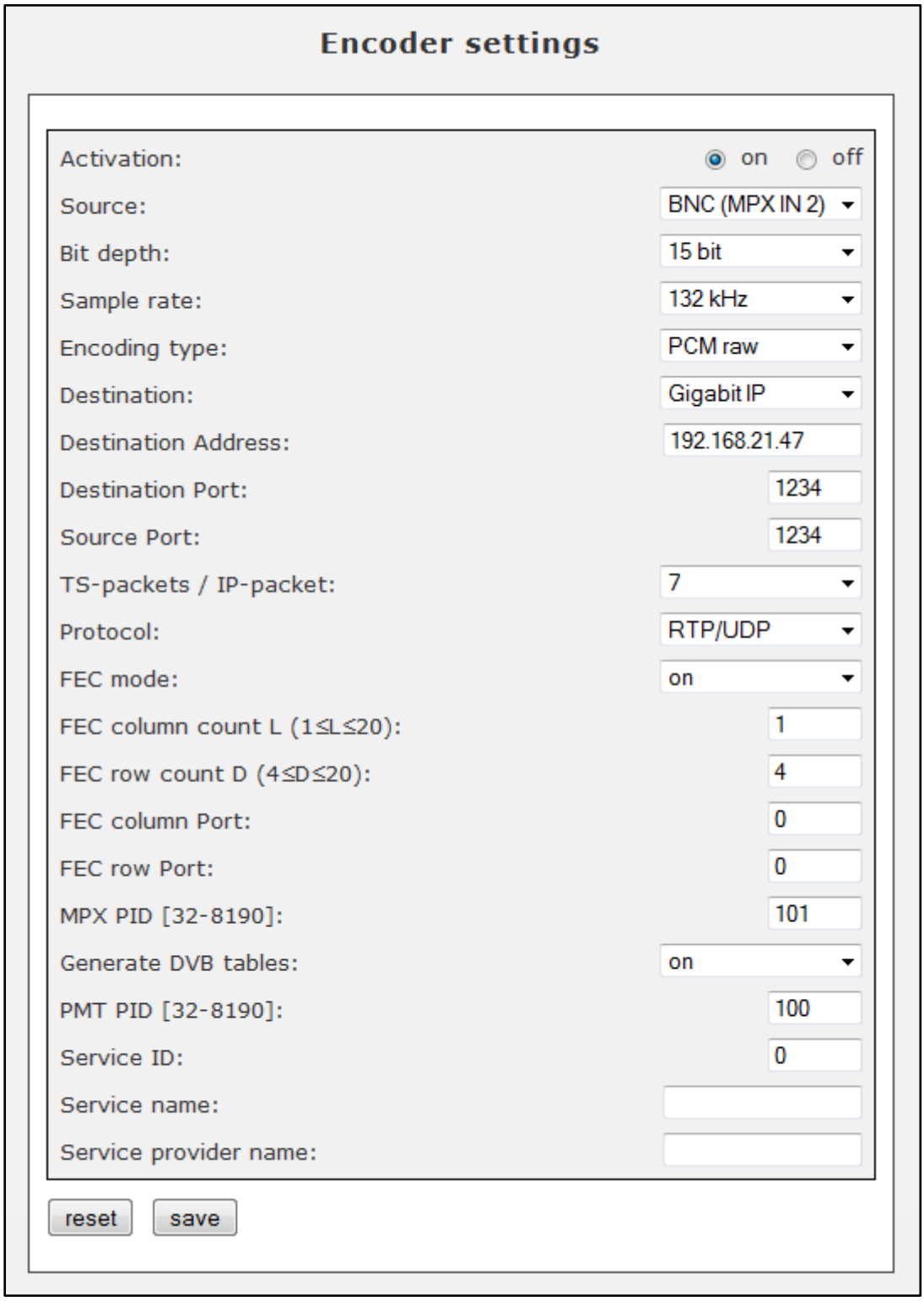


Fig. 3: Codec Settings – Encoder configuration

NOTE: If you use the XLR connector for the distribution of the FM MPX signal, set up „ground" or „float" for the common potential of the grounding under **Interface Settings→MPX**.

11.3. Set up the IP output

If you chose the output ”Gigabit IP” as a destination in the previous step, enter the following parameter to set up the IP output:

1. Open the window *Encoder settings* under **Codec Settings→Encoder** in the web user interface of the FMC01 (see Fig. 3).
2. Enter the following data in the fields for the configuration of the IP 1000Base-T output:

Destination address: Destination IP address.

Destination port: Destination UDP port. Usually 1234 for DVB streaming.

Source port: Sender UDP port.

TS-packets/IP-packet: You can send up to 7 packets in one transport stream. Note that the number of the packets influences the quality of the TS distribution. The following table demonstrates the interdependence between the decisive parameters:

Number of TS-packets	Delay	Overhead	Error/packet lost
1	minimal	maximal	low
4	average	average	average
7	maximal	minimal	high

Protocol: MPEG2 transport stream encapsulation, either UDP only or UDP/RTP. Note that beside the UDP/RTP also the RTCP packets are generated and sent in 5 second intervals. UDP/RTP allows reordering packets by means of sequence numbers.

MPX PID: MPX packet identifier number (adjustable between 32 … 8190)

Generate DVB tables: This function can be activated in the dropdown menu. If activated, PAM (Grogram Association Table), PMT (Program Map Table) and SDT (Service Description Table) are generated.

PMT PID: The PMT packet identifier number (adjustable between 32 … 8190)

Service ID/ Service name/ Service provider name: Additional fields for service information.

3. Click the save button to save the changes.
4. Under **Status→IP 1000Base-T** you can call up the current status of the IP 1000Base-T connection as *Ethernet link status* and *Ethernet speed.*

11.4. Set up the error correction

The FMC01 is able to identify possible errors in the data stream while encoding and outputting signals and to correct them (FEC). The data for error correction is implemented into the data stream. The amount of error correction data increases the probability that the errors will be

corrected. In order to increase the amount of data for error correction, you can reduce manually the bit depth of the encoded signal.

To change the bit depth:

1. Open the window *Encoder settings* under **Codec Settings→Encoder** in the web user interface of the FMC01 (see Fig. 3).
2. Choose the desired value for **Bit depth**. You can set up the bit depth in the range of 12 … 15 bit.
3. Click the save button to save the changes.

11.4.1. FEC for E1 output

The coder implements Read Solomon FEC (Forward Error Correction) into the transport stream to reduce bit errors in E1 data stream. If you configure E1 as an output, no further configurations for FEC are necessary.

11.4.2. FEC for IP output

The coder implements ProMPEG FEC (Practice #3 release 2) to reduce packet loss and burst errors in IP data stream. Under **Codec Settings→Encoder**, you can set up the following FEC parameters for the IP output: *FEC mode, FEC column count L, FEC row count D, FEC column Port*, and *FEC row Port*. Click the save button to save the changes.

Under **Status→IP 1000Base-T** you can call up the current status of the ProMPEG FEC in the *Pro-MPEG FEC* block.

11.5. Set up the RDS monitoring and alarm control

The FMC01 is equipped with an RDS decoder and is able to recognize and to monitor the RDS data in an MPX signal. If you operate the FMC01 as an encoder, you can monitor and control the RDS decoder.

The following alarm functions can be activated:

RDS available	Alarm is set off, if no RDS is available in the MPX stream
RDS PI	Alarm is set off, if no or a false program identification code is detected in the RDS stream
RDS PS	Alarm is set off, if no or a false program service name is detected in the RDS stream

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

More information about the available SNMP traps you can find in Section 10.2.

To set up the monitoring and alarm function for the controlling the RDS signal:

1. Open the window *RDS Decoder* under **Interface Settings→RDS Decoder** in the web user interface of the FMC01.
2. Choose "MPX In" in the dropdown menu as a source for the RDS decoder (see Fig. 4).
3. Click the save button to save the changes.

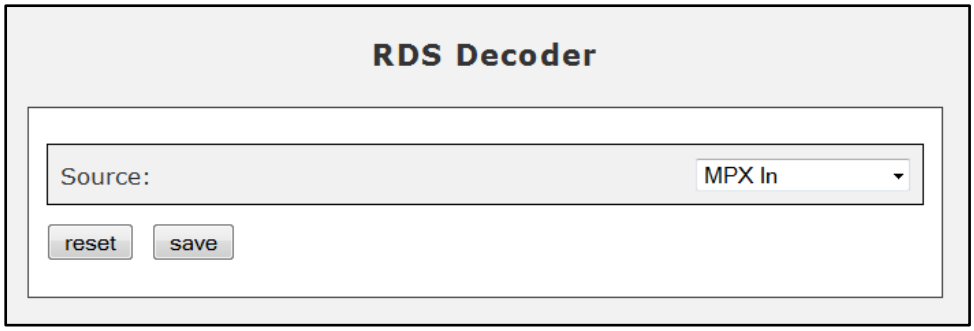


Fig. 4: RDS Decoder settings

4. Open the configuration field **RDS** in the window *Alarm settings* under **System Settings→Alarm** in the web interface of the FMC01 (see Fig. 5).
5. Enable each alarm function separately in the corresponding checkbox "Enabled", if this parameter should be monitored.
6. Define for each monitoring function the delay time *T1* (in seconds) 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.
7. Define for each monitoring function the delay time *T2* (in seconds) for alarm end, how long a "good" signal for this parameter should be available, before the system switches off the alarm.
8. Enable checkbox "SNMP", if the alarm should be signaled by sending SNMP traps.
9. Enable checkbox "LED", if the alarm should be signaled by the Warning LED on the web user interface page or on the front panel of the device.
10. Choose in the dropdown menu "Relay" one of the available relays that should switch to signal the alarm.

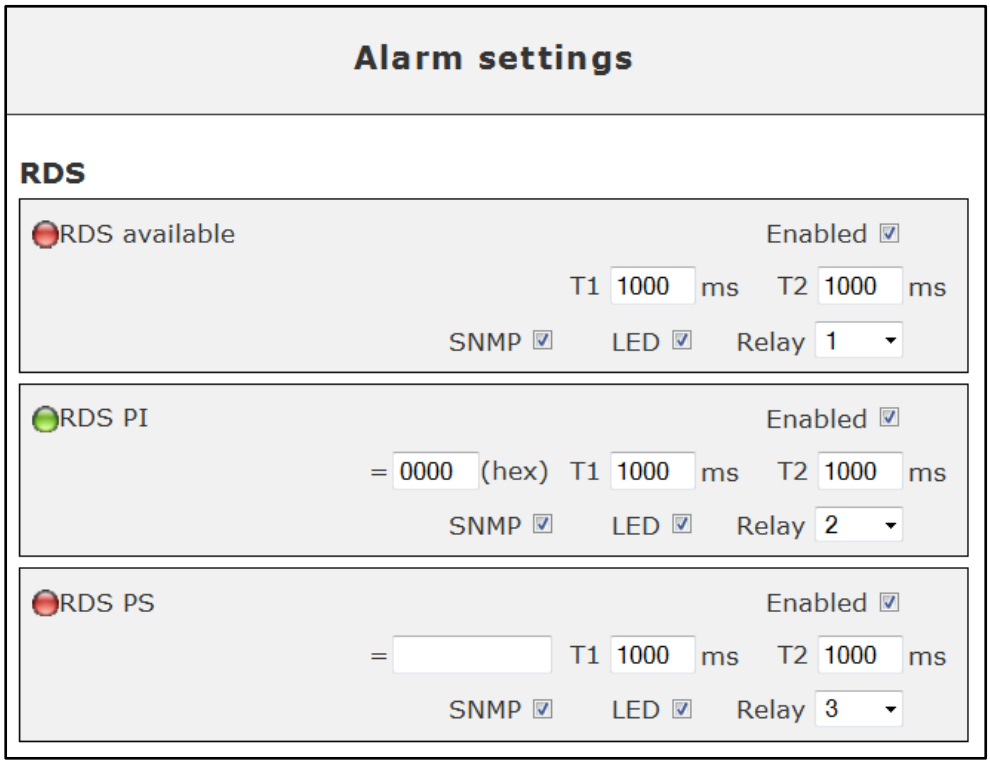


Fig. 5: Alarm Settings – indication of the RDS data in the MPX stream

The LED color means:

- ***- Monitoring is activated, no alarm is released***
- ***- Monitoring is deactivated***
- ***- Monitoring is activated, alarm is released***

11. In the „RDS>RDS PI" block enter the correct RDS PI as a four-digit hexadecimal number in the first box = 0000 (hex), to allow the monitoring system to recognize the correct program identification code (PI).
12. In the „RDS>RDS PS" block enter the correct RDS PS in the first box =, in order to allow the monitoring system to recognize the correct program service name (PS).
13. Click the save button to save the changes.

11.6. View the encoder status

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

1. Under **Information→System** you can see the details of the configured parameters of the encoding signal in *Encoder State* (see Fig. 6) field or directly on the LC display.

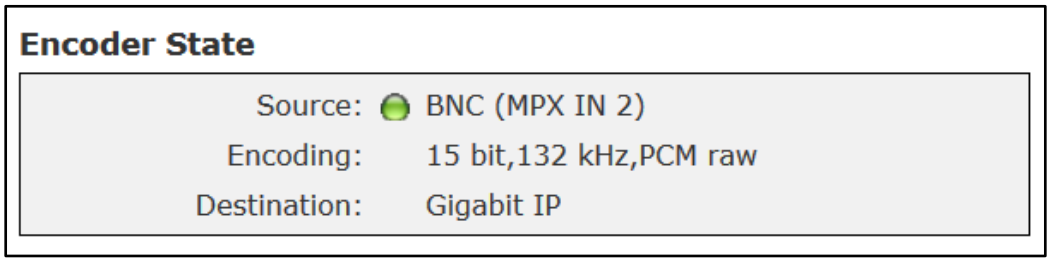


Fig. 6: System Information – Encoder State

The LED color means:

- ***MPX input is active***
- ***encoder is deactivated***
- ***error in the MPX input***

2. Under **Status→RDS** you can call up the current information about the decoded RDS data.

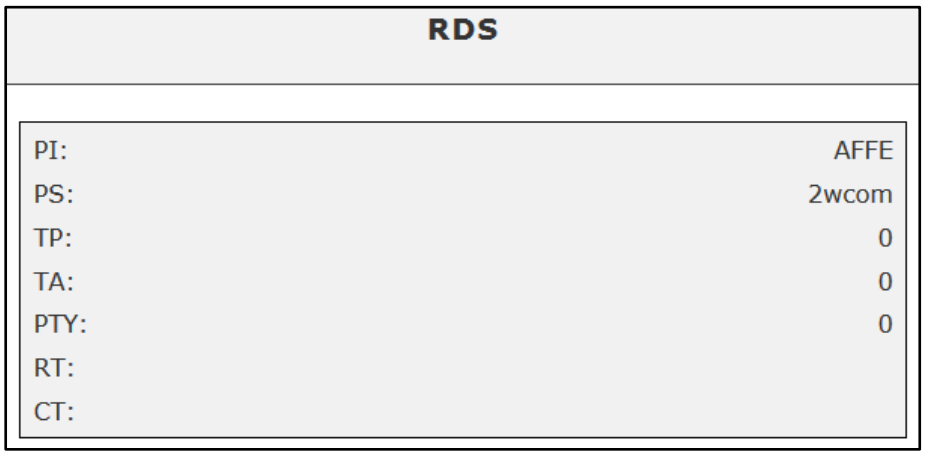


Fig. 7: Status - RDS

3. Under **Status→Event Log** you can call up information about the device operation, data distribution and errors since the last event log deleting. A list with a description of the events with the timestamps is displayed in this menu (see Fig. 8). To delete the last events click the delete Log button

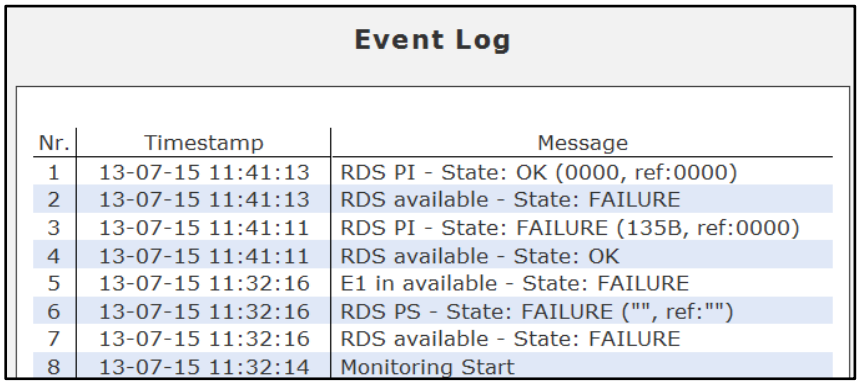


Fig. 8: Status – Event Log

12. Decoder Settings

The FMC01 is able to receive, to encode and to distribute the FM MPX signals over E1 (G.703) or over IP (10/100/1000-Base-T).

✓ You have already connected the FMC01 to the network [10/100-Base-T] and configured the access to the web user interface (see Section 10.1)

Necessary steps for operating the FMC01 as a decoder are:

1. Connect the decoder
2. Activate the decoder for E1 or IP input
3. Set up the IP input
4. Set up the error correction
5. Set up the monitoring and alarm control
6. View the decoder status

The following sections describe the separate steps for decoding:

12.1. Connect the decoder

For data distribution, connect the device as follows:

1. To feed an encoded signal over E1 or [1000-Base-T], use the BNC jack [E1 IN] or [1000-Base-T] to receive the signal over IP for decoding (see Section 9.2).

2. To output the decoded MPX signal, use the XLR or the BNC jack [MPX OUT 1/2].

12.2. Activate the decoder for E1 or IP input

NOTE: The FMC01 can operate in both modes at the same time: as encoder and decoder (only for **MPX over E1**).

To activate und to configure the unit as a decoder for MPX over E1/IP:

1. Select **Codec Settings→Decoder** in the web interface menu. The window *Decoder settings* is displayed (Fig. 9).

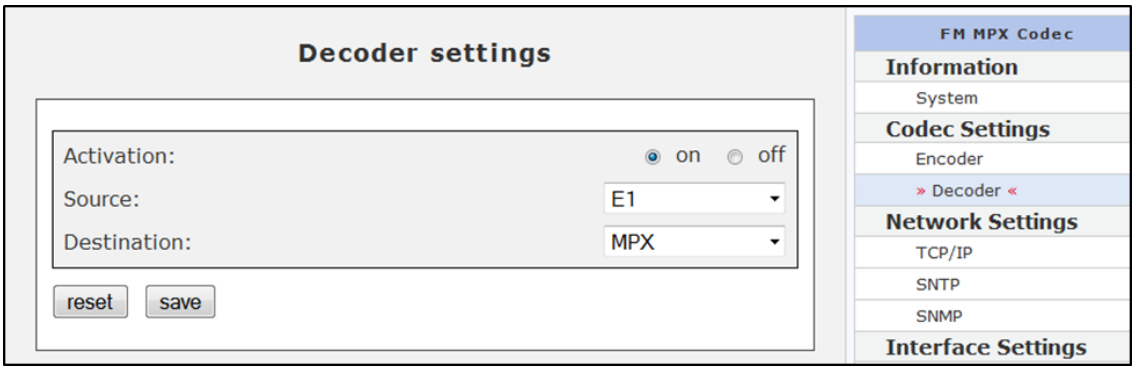


Fig. 9: Decoder Settings

2. Activate the decoding function by selecting the radio button "ON" in the **Activation** field.
3. Choose the input source "E1" or "Gigabit IP" in the **Source** field. If you choose "Gigabit IP", additional fields for connection configuration will appear (see Fig. 10). For E1 output no further settings are necessary.
4. Choose the output MPX in the **Destination** field.
5. Click the save button to save the changes.

⇒ The device operates now as a decoder for the incoming signal over E1 or IP.

12.3. Set up the IP input

If you chose the input source "Gigabit IP" in the previous step, enter the following parameter to set up the IP input:

1. Open the window *Decoder settings* under **Codec Settings→Decoder** in the web user interface of the FMC01 (see Fig. 10).

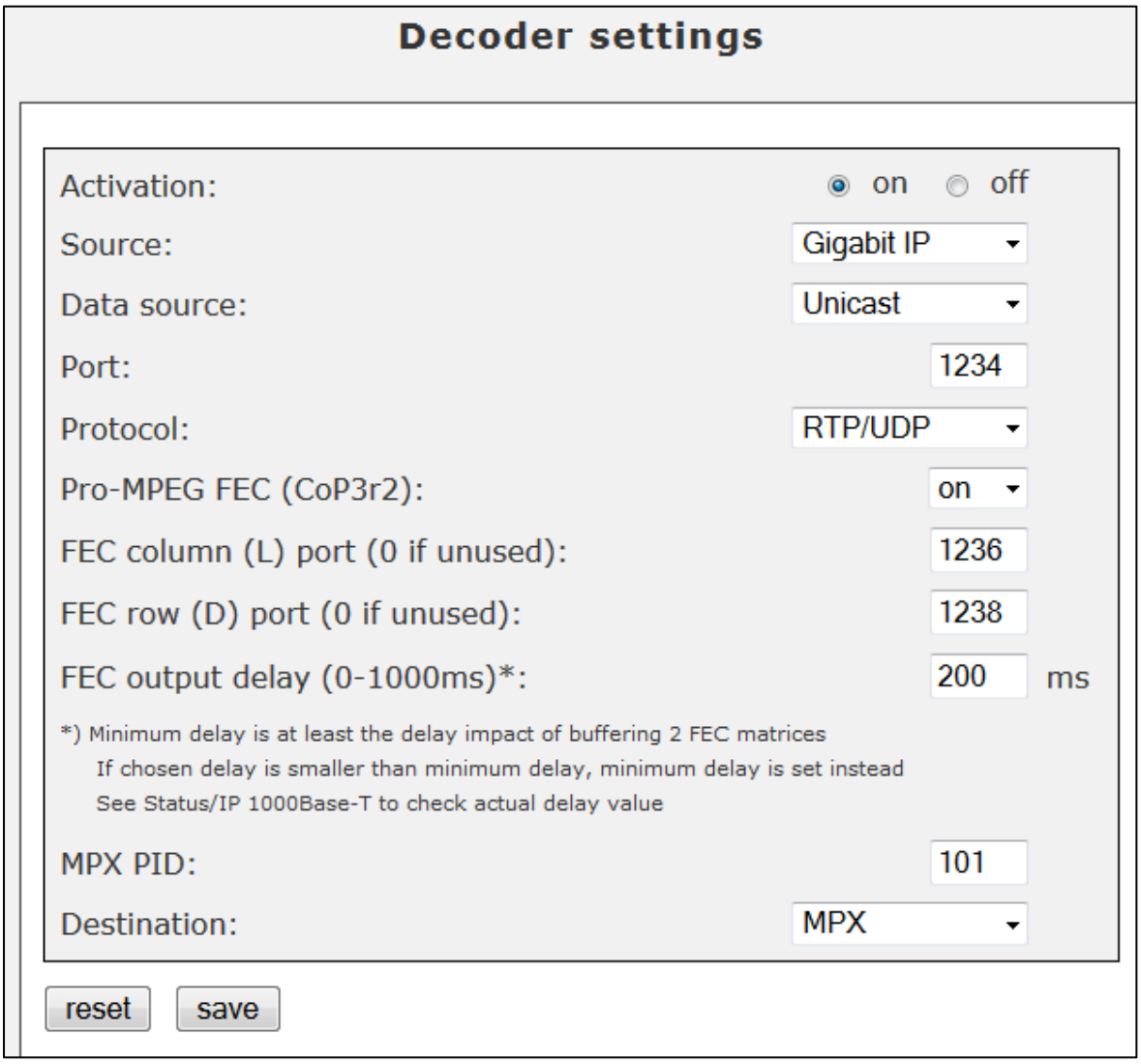


Fig. 10: Codec Settings – Decoder configuration

2. Enter the following data in the fields of the configuration of the IP 1000Base-T input:

Data source:	Unicast/Multicast.
Port:	Sender UDP port. Usually 1234 for DVB streaming (the same as configured in the encoder settings).
Protocol:	MPEG2 transport stream encapsulation, either UDP only or UDP/RTP. Note that beside the UDP/RTP also the RTCP packets are generated and sent in 5 second intervals. UDP/RTP allows reordering packets by means of sequence numbers.
MPX PID:	MPX packet identifier number (the same as configured in the encoder settings).

3. Click the save button to save the changes.
4. Under **Status→IP 1000Base-T** you can call up the current status of the IP 1000Base-T connection as *Ethernet link status* and *Ethernet speed.*

12.4. Set up the error correction

The FMC01 is able to identify possible errors in the data stream while encoding and outputting signals and to correct them (FEC). The data for error correction is implemented into the data stream. The amount of error correction data increases the probability that the errors will be corrected.

For the E1 data stream, the coder uses Read Solomon FEC (Forward Error Correction). If you configured E1 as an input, no further configurations for FEC are necessary.

For the IP data stream, the coder uses ProMPEG FEC (Practice #3 release 2) to reduce packet loss and burst errors. This can be activated in the encoder settings (**Codec Settings→Encoder→FEC mode "on"**). If you configured IP as an input and FEC is available in the incoming data stream, set up the FEC as follows:

1. Open the window *Decoder settings* under **Codec Settings→Decoder** in the web user interface of the FMC01 (see Fig. 10).
2. Activate the ProMPEG FEC by choosing "on" in the corresponding checkbox.
3. Set up the following FEC parameters: *FEC column (L) Port* and *FEC row (D) Port* (the same as configured in the encoder settings). If the ports are unused, enter zero.
4. Enter the FEC output delay in the range between 0 and 1000 ms.
5. Click the save button to save the changes.
6. Under **Status→IP 1000Base-T** you can call up the current status of the ProMPEG FEC in the *Pro-MPEG FEC* block.

12.5. Set up the monitoring and alarm control

The FMC01 is equipped with an RDS decoder and is able to recognize and to monitor the RDS data in the decoded MPX signal. If you operate the FMC01 as a decoder, you can monitor and control the RDS decoder.

A further monitoring function in the decoder recognizes, if an incoming E1/IP signal is available, and analyzes the errors that occur during the distribution.

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

More information about the available SNMP traps you can find in Section 10.3.

12.5.1. Set up alarm for RDS

The following alarm functions for RDS can be activated:

RDS available	Alarm is set off, if no RDS is available in the MPX stream
RDS PI	Alarm is set off, if no or a false program identification code is detected in the RDS stream

RDS PS	Alarm is set off, if no or a false program service name is detected in the RDS stream

HINWEIS: If you operate the device as an encoder, please, follow the instructions for configuration of the RDS monitoring function in Section 11.5.

To set up the RDS monitoring and alarm function in case of operating the FMC01 as a decoder:

1. Open the window *RDS Decoder* under **Interface Settings→RDS Decoder** in the web user interface of the FMC01.
2. Choose "Decoder" in the dropdown menu as a source for the RDS decoder (see Fig. 11).

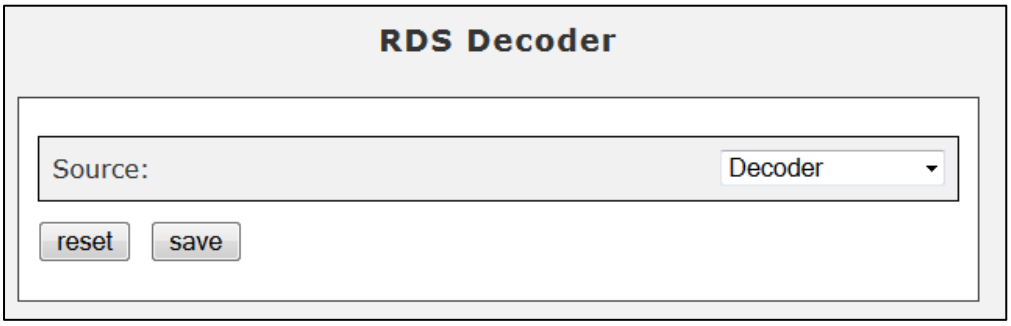


Fig. 11: RDS Decoder settings

3. Click the save button to save the changes.
4. To set up the RDS decoder settings, follow the instructions in Section 11.5 on page 29.

12.5.2. Set up alarm for E1 input

The following alarm functions for E1 input can be activated:

E1 In available	Alarm is set off, if no signal is available in the E1 input
E1 packet errors	Alarm is set off, if packet errors are detected in the input signal received over E1
E1 In FEC BER	Alarm is set off, if bit error rate of the input signal received over E1 is less or equal the configured value (see the instructions below this table)

To set up the monitoring and alarm function for the E1 input:

1. Open the configuration field **E1 Input** in the window *Alarm settings* under **System Settings→Alarm** in the web interface of the FMC01 (see Fig. 12).

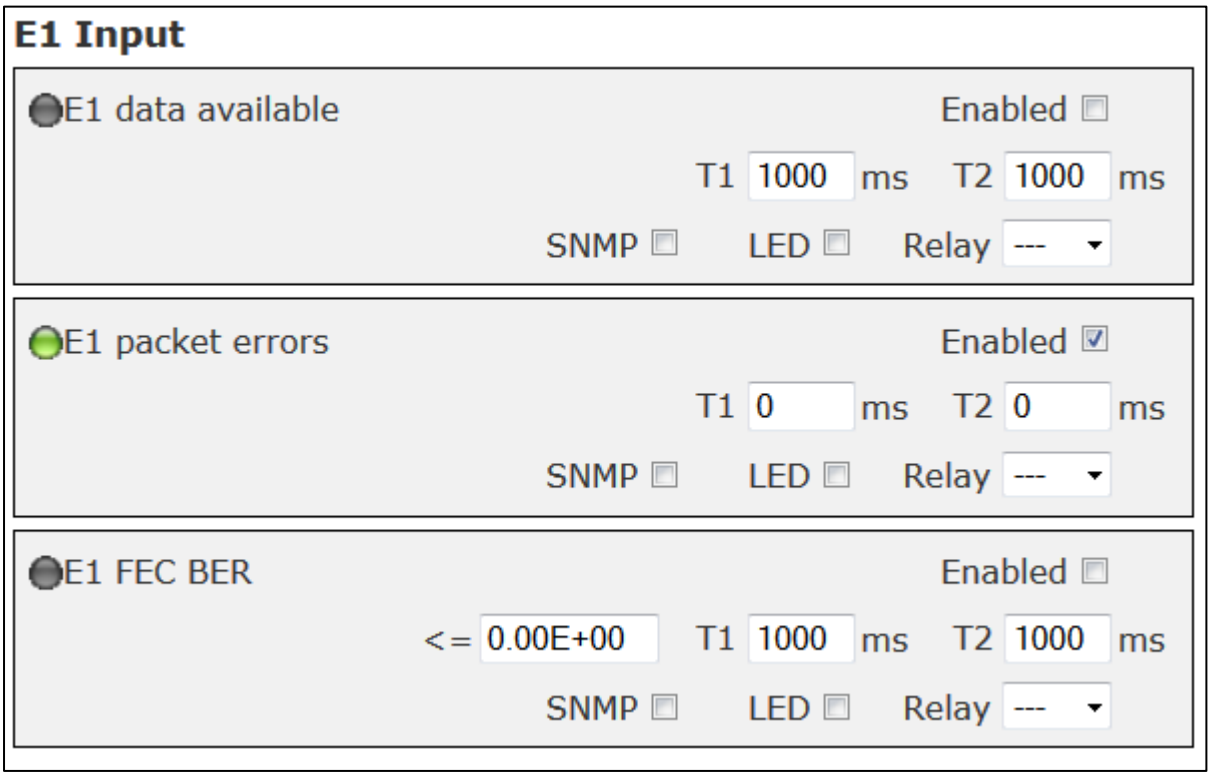


Fig. 12: Alarm Settings – indication of the E1 data in the E1 input.
The LED color means:

- ***- Monitoring is activated, no alarm is released***
- ***- Monitoring is deactivated***
- ***- Monitoring is activated, alarm is released***

2. Enable each alarm function separately in the corresponding checkbox "Enabled", if this parameter should be monitored.
3. Define for each monitoring function the delay time *T1* (in seconds) 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.
4. Define for each monitoring function the delay time *T2* (in seconds) for alarm end, how long a "good" signal for this parameter should be available, before the system switches off the alarm.
5. Enable checkbox "SNMP", if the alarm should be signaled by sending SNMP traps.
6. Enable checkbox "LED", if the alarm should be signaled by the Warning LED on the web user interface page or on the front panel of the device.
7. Choose in the dropdown menu "Relay" one of the available relays that should switch to signal the alarm.
8. Enter in the **E1 FEC BER** field the value for the "bad" bitt error rate (smaller or equal) and the delay time *T1* and *T2*.
9. Click the save button to save the changes.

12.5.3. Set up alarm for Gigabit IP input

The following alarm functions for Gigabit IP input can be activated:

IP In available	Alarm is set off, if no signal is available in the Gigabit IP input
IP In packet errors	Alarm is set off, if packet errors are detected in the input signal received over Gigabit IP input.

To set up the monitoring and alarm function for the Gigabit IP input:

1. Open the configuration field **Gigabit IP Input** in the window *Alarm settings* under **System Settings→Alarm** in the web interface of the FMC01 (see Fig. 13).

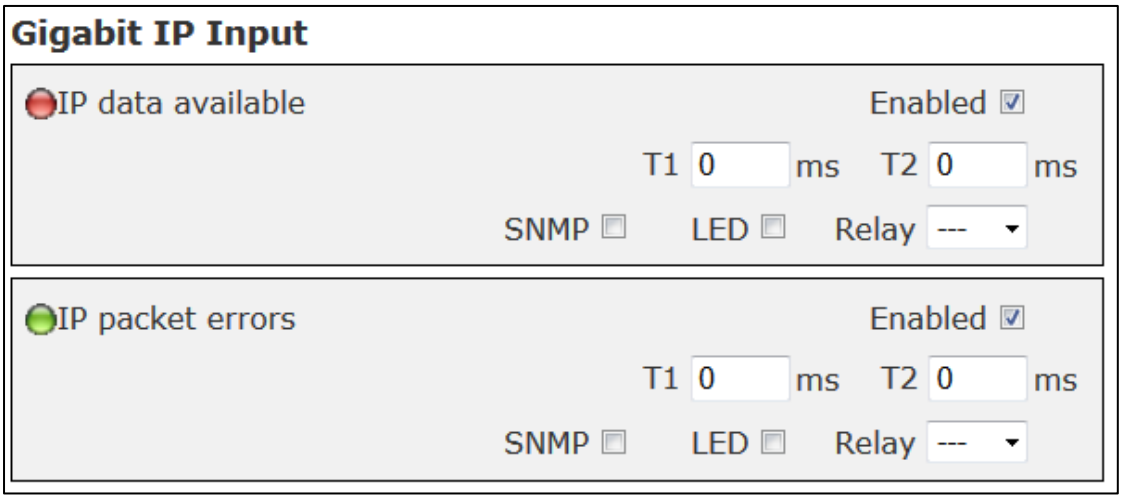


Fig. 13: Alarm Settings – indication of the data in the Gigabit IP input.

The LED color means:

- ***- Monitoring is activated, no alarm is released***
- ***- Monitoring is deactivated***
- ***- Monitoring is activated, alarm is released***

2. Enable each alarm function separately in the corresponding checkbox "Enabled", if this parameter should be monitored.
3. Define for each monitoring function the delay time *T1* (in seconds) 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.
4. Define for each monitoring function the delay time *T2* (in seconds) for alarm end, how long a "good" signal for this parameter should be available, before the system switches off the alarm.
5. Enable checkbox "SNMP", if the alarm should be signaled by sending SNMP traps.
6. Enable checkbox "LED", if the alarm should be signaled by the Warning LED on the web user interface page or on the front panel of the device.
7. Choose in the dropdown menu "Relay" one of the available relays that should switch to signal the alarm.
8. Click the save button to save the changes.

12.6. View the decoder status

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

1. Under **Information→System** you can see the details of the configured parameters of the decoding signal in *Decoder State* (see Fig. 14) field or directly on the LC display.

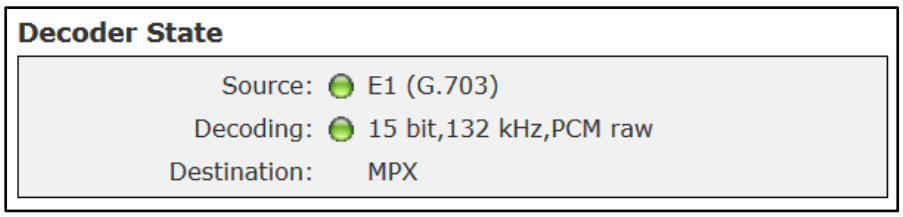


Fig. 14: System Information – Decoder State

The LED color means:

- active
- deactivated
- error

2. Under **Status→RDS** you can call up the current information about the decoded RDS data.

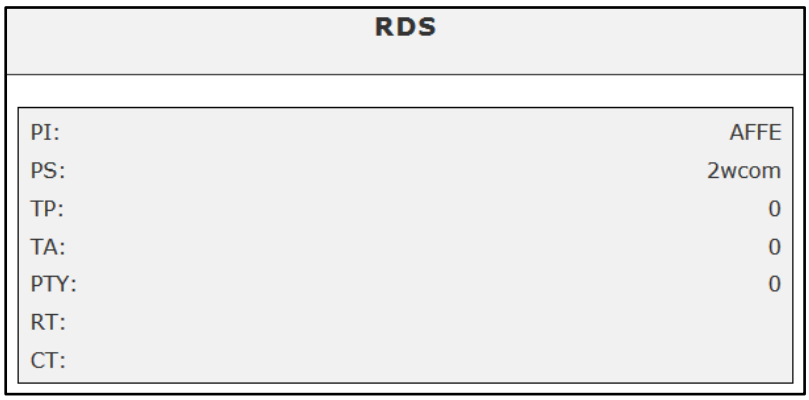


Fig. 15: Status - RDS

3. Under **Status→Event Log** you can call up information about the device operation, data distribution and errors since the last event log deleting. A list with a description of the events with the timestamps is displayed in this menu (see Fig. 8). To delete the last events click the delete Log button

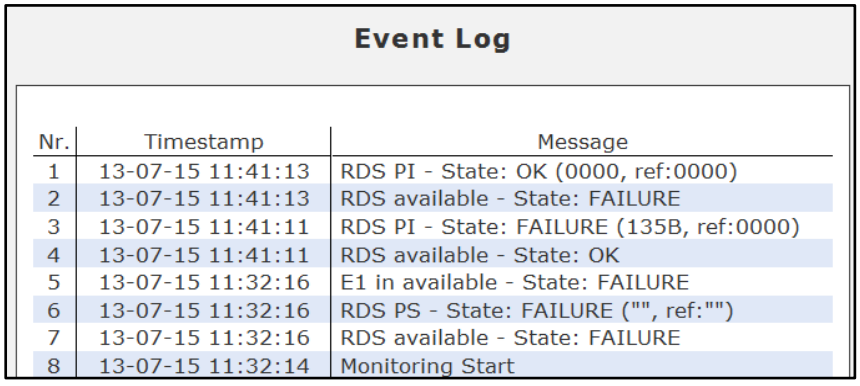


Fig. 16: Status – Event Log

13. Global Settings

13.1. View the system information

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

To view the system information:

1. Open the window *Global settings* under **System Settings→Global.**
2. The device information is displayed in the **System information** field (see Fig. 17).

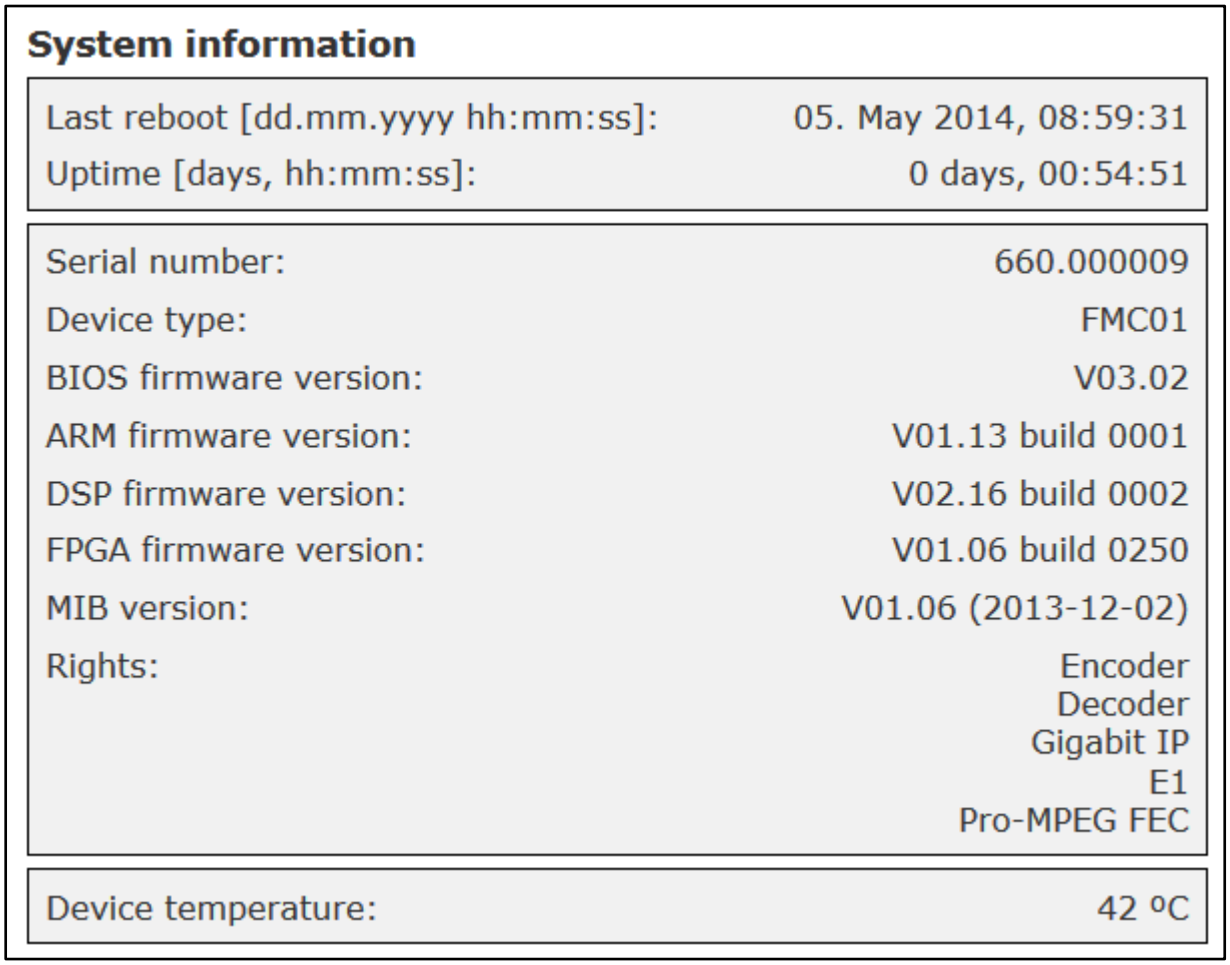


Fig. 17: Global System Settings – System Information

13.2. Enter the device information

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

1. Open the window *Global settings* under **System Settings→Global**.
2. Enter the identification information of the device in the **System parameter** field (see Fig. 18).

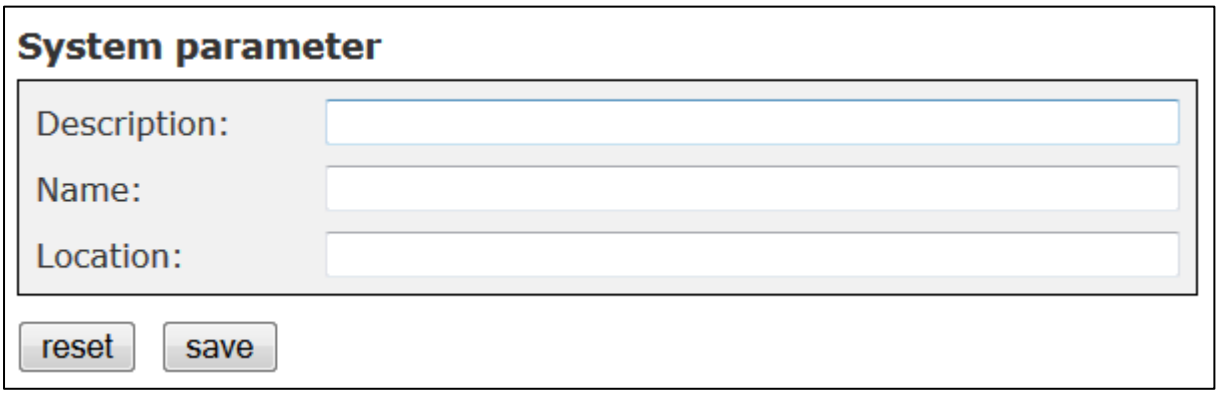


Fig. 18: Global System Settings – System parameter

3. Click the save button to save the changes or the reset button to restore the last settings.

⇒ The saved information can be viewed under **Information→System** in the web user interface.

13.3. Upload and activate settings stored locally

You can restore device settings saved locally.

To upload settings stored locally:

1. Open the window *Global settings* under **System Settings→Global.**
2. Click the Browse button in the **Settings** field. The "Open file" dialog of your system software will be displayed.
3. Choose the settings file in your browser.
4. Click the upload button to upload the file. The file upload can take longer and may not be interrupted.
5. Follow the prompt to restart the device after successful upload.

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

13.4. Save settings to local file

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

To save setting to local file:

1. Open the window *Global settings* under **System Settings→Global.**
2. Click the download button in the **Settings** field to start the file download in the web browser.
3. Choose the archive location on the directory tree and confirm the choice.

⇒ The saved settings can be uploaded in the "Upload Settings" field (see Section 13.3).

13.5. Upload and activate firmware stored locally

You can upload an ARM firmware stored locally.

To upload and to activate the new firmware:

1. Open the window *Global settings* under **System Settings→Global.**
2. Click the Browse button in the **Firmware update** field. The "Open file" dialog of your system software will be displayed.
3. Choose the firmware file.
4. Click the upload button, to start the file upload in the web browser. The file upload can take longer and may not be interrupted.
5. Follow the prompt to restart the device after successful upload.

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

13.6. 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:

1. Open the window *Time* under **System Settings→Time** (see Fig. 19).

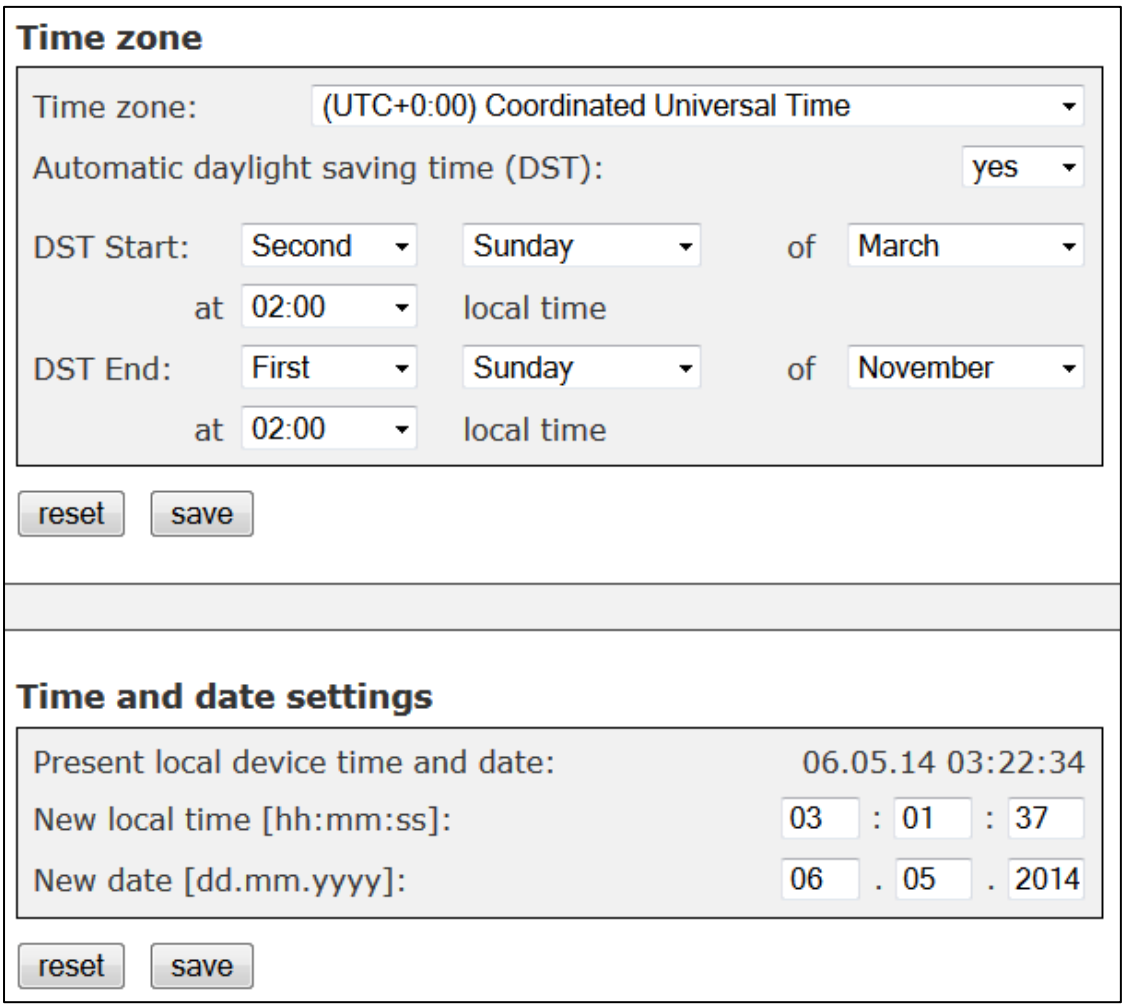


Fig. 19: System Settings - Time

2. Choose the current time zone of the device in the **Time zone** field in the dropdown menu.
3. Choose YES in the dropdown menu "Automatic daylight saving time (DST)" to activate the automatic changing the clocks.
4. Choose the beginning and the end of the summertime in the dropdown menu.
5. Click the save button to save the changes or the reset button to restore the last settings.
6. In the **Time and date settings** field, set up the internal time in the 24h format and the datum.
7. Click the save button to save the changes or the reset button to restore the last settings.

⇒ The current time and datum of the internal clock is displayed under "Present local device time and date" in the same **Time and date settings** field (see Fig. 19).

13.7. Configure user accounts

The default accounts are a read-only access (Guest account) and a full access (Admin account). Change the login data for the access after the first login to the web user interface. To change the login data:

1. Open the window *User settings* under **System Settings→User.**
2. Change the login data for the full access in the **Admin account** field and repeat the new password.
3. Click the save button to save the changes or the reset button to restore the last settings.
4. Change the login data for the read-only access in the **Guest account** field and repeat the new password.
5. Click the save button to save the changes or the reset button to restore the last settings.

Note: Consider the sensitive case while entering a new password!

13.8. Set up the sound level of the audio outputs

The FMC01 is equipped with a stereo decoder that can decode audio signals from an MPX stream. Therefore, you can immediately listen to the audio program distributed over the MPX signal, in order to monitor, if the distribution proceeds without errors.

For the audio output three ways are possible:

- Analogous audio connectors [Analog OUT L/R] on the back panel of the device
- Headphone jack on the front panel of the device
- BNC or XLR connectors [MPX OUT 1/2] on the back panel of the device

This function enables monitoring of the inputting and outputting signals:

- If you operate the FMC01 as an encoder, you can listen to the audio program distributed over the inputting MPX stream (source configuration: **Interface Settings→Stereo Decoder→Source: Encoder**).

- If you operate the FMC01 as a decoder, you can listen to the audio program distributed over the outputting decoded MPX stream (source configuration: **Interface Settings→Stereo Decoder→Source: Decoder**).

To set up the sound level of the audio signal:

1. Open the window *Level* under **Interface Settings→Level** (see Fig. 20).
2. In the **Audio** field, enter values of the sound level for the analogous audio output and headphone jack.
3. In the **MPX** field, enter values of the sound level for the MPX audio outputs.
4. Click the save button to save the changes or the reset button to restore the last settings.

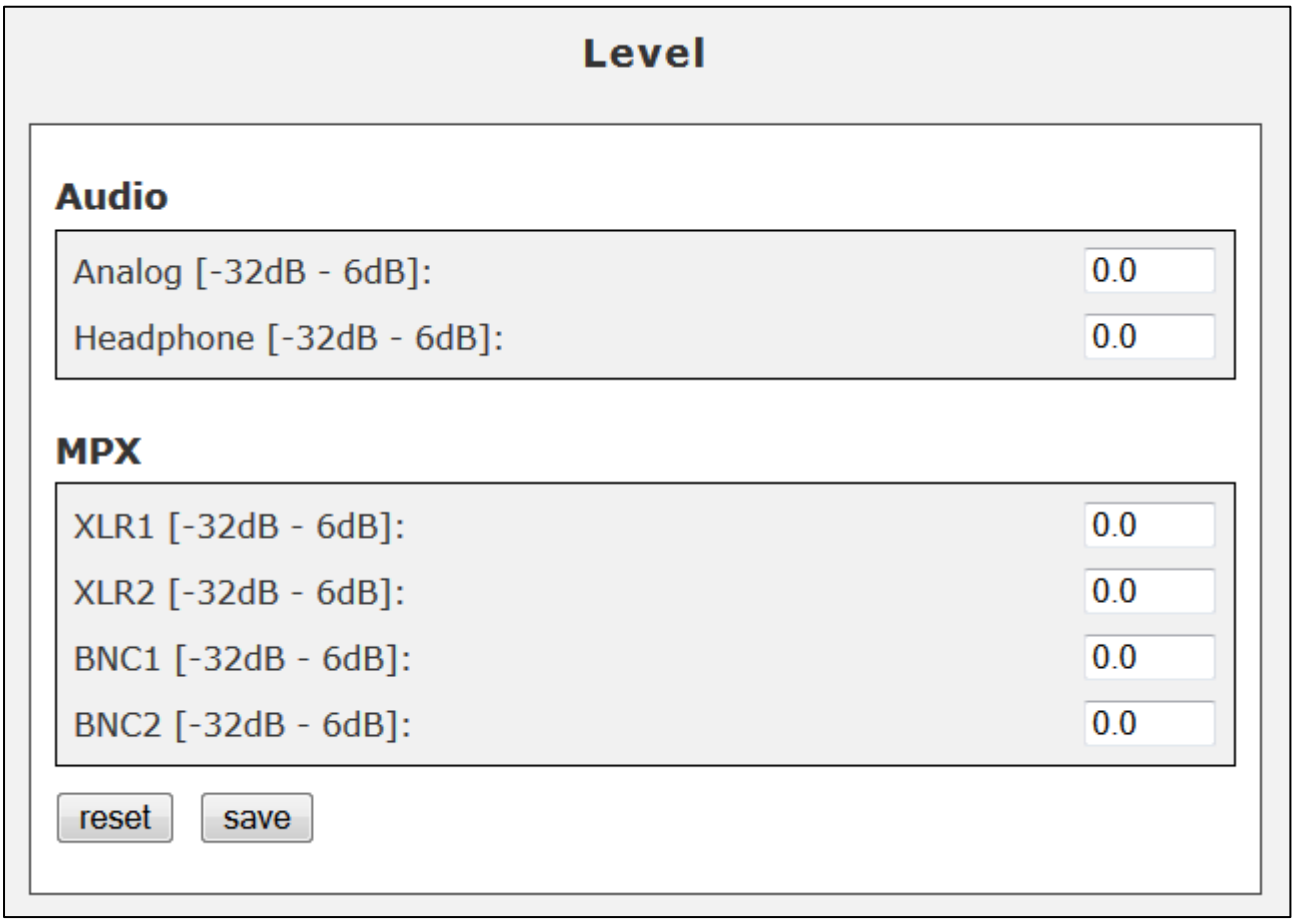


Fig. 20: Level settings for the audio outputs

13.9. Restart the device

To restart the device:

1. Open the window *Global Settings* under **System Settings→Global.**
2. Click the restart button in the last field of the web page to reboot the device (see Fig. 21).

Fig. 21: Restart menu in the web user interface under System Settings – Global

⇒ The device restarts

13.10.Restore factory settings

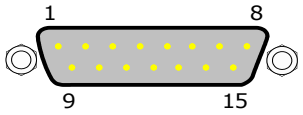
NOTICE	
	CAUTION: If you restore factory settings, all saved configurations made earlier by user will be deleted except for the IP address! This applies also for the access accounts!

To reset the device to the factory settings:

1. Open the window *Global Settings* under **System Settings→Global.**
2. Click the load factory settings button in the last field of the web page to restore factory settings (see Fig. 21).

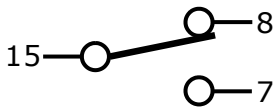
14. Relay Output

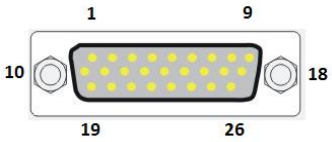
The FMC01 unit is either equipped with a D-Sub 15 pole male connector or a high density D-Sub 26 pole male connector. Additional relay outputs have to be ordered with the unit or the unit has to be sent back for servicing/upgrading at a later date.



D-Sub male connector, 15 pole

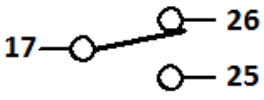
Relay Output

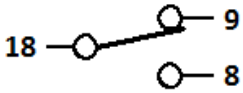
Relay No.	*Switch contacts*	*Switch type*
1	1,9	SPST, NO
2	2,10	SPST, NO
3	3,11	SPST, NO
4	4,12	SPST, NO
5	5,13	SPST, NO
6	6,14	SPST, NO
7		SPDT



D-Sub male connector, high density, 26 pole

Relay Output

Relay No.	***Switch contacts***	***Switch type***
1	1,10	SPST, NO
2	11,19	SPST, NO
3	2,20	SPST, NO
4	3,12	SPST, NO
5	13,21	SPST, NO
6	4,22	SPST, NO
7	5,14	SPST, NO
8	15,23	SPST, NO
9	6,24	SPST, NO
10	7,16	SPST, NO
11		SPDT

12		SPDT

NOTICE	
	The relay contacts have a rating of 0.5 A at max. 24 V DC. The maximum current is 1 A!

15. 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.

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 7. • 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. Technical Data

FMC01 - FM MPX Codec - Technical Details

Encoder Inputs

FM MPX signal

Signal	FM MPX
Frequency response	20 Hz - 60 kHz: <0,05 dB
Input Voltage range	0 ... 14 dBu
Connectors MPX IN	1x BNC, 75 Ω, unbalanced 1x XLR, balanced, <20 Ω

Encoder Outputs

E1

Protocol	G.703, G.704 (on request)
Data rate	2.048 kbps
Coding format	HDB3
Connectors E1 OUT	2x BNC, 75 Ω, unbalanced

Optional: Gigabit IP

Type	10/100/1000 Base-T
Data	MPEG TS or RAW Data via UDP, UDP/RTP, as Unicast or Multicast IGMPv2
Connectors	RJ45

Audio

Volume	-32...+6 dB
Headphone	L/R, <10 Ω, 6.3 mm
Analogue	L/R, <20 Ω, balanced, XLR

Decoder Inputs

E1

Protocol	G.703, G.704 (optional)
Data rate	2.048 kbps
Coding format	HDB3
Connectors E1 IN	1x BNC, 75 Ω, unbalanced

Optional: Gigabit IP

Data	MPEG TS or RAW Data via UDP, UDP/RTP, as Unicast or Multicast IGMPv2

Decoder Outputs

FM MPX signal

Signal	FM MPX
Frequency Response	20 Hz - 60 kHz: <0,05 dB
Stereo seperation	>55 dB
Harmonic distortion	<0,0025 dB
SNR (CCIR-weighted)	>75 dB
SNR (A-weighted)	>90 dB
Connectors MPX OUT	1x XLR, balanced, >10 kΩ

Audio

Volume	-32...+6 dB
Headphone	L/R, <10 Ω, 6.3 mm
Analogue	L/R, <20 Ω, balanced, XLR

Codec

Data

Type	100% Loss less audio encoding & decoding
Bit depth	E1: 12-15 bit IP: 12-15 bit (optional: 16-24 bit)
Sample rate	132 kHz (IP: optional: up to 192 kHz)
Encoding type	PCM raw
FEC	E1: Read Solomon FEC IP: ProMPEG FEC Practice #3 release 2
Bandwidth E1	2,048 Mbit/s
Bandwidth IP	4x4 FEC, add. 15 ms delay: 4,48 Mbit/s 4x4 FEC, add. 149 ms delay: 3,54 Mbit/s 10x10 FEC, add. 133 ms delay: 3,55 Mbit/s 10x10 FEC, add. 933 ms delay: 2,83 Mbit/s

Control & Monitor

Ethernet

Data	Controlling and Setup functions
Connector	RJ45
Type	Auto Switching 10/100 BASE-T
Protocol	HTTP, SNMPv2c, SMTP, UDP, SNTP, TCP

Contact closure

Inputs	7 opto isolated inputs (excludes option: 24 relay contacts) 15 pole sub-D female
Outputs	12 floating relay contacts (for DC: max. 24 V, 1 A, 10W) 26 pole sub-D male
optional:	24 floating relay contacts (excludes: 7 opto isolated inputs)
Serial	1x RS-232C (1 front)
Data	service
Connector	9 pole sub-D male
Transmission rate	1200 to 115200 baud, asynchronous

Front panel

LCDisplay	2x 40 characters
Jog Wheel	Impulse, ENTER button
7 LEDs	Power, Input, Output, Warning, Status, Encoder, Decoder

FM & RDS

FM	Internal Demodulation of MPX Signal and output via XLR and Headphone
RDS	Decoding and control of PI and PS on the web frontend, optional decoding of all data via RDS-LAB

General data

Power consumption	20 VA
Case dimensions	19", 1 HU, depth: 310 mm, width: 424 mm, front panel: 484 mm
Weight	<4 kg
Housing	steel plate (aluminum-zinc coated)
Operating temp. range	0...+45°C
Storage temp. range	-40...+70°C
Power supply	internal, 90...260 V, 47...63 Hz
Languages	English

Version 11.04.2014
These data are subject to modification and amendments.
Errors excepted.

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