User manual

CFL Sprint MXM 5.8 Repeater radio unit

VER 1.1c

FW 3.6.6

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To get up to date information about accessories and their availability, please contact sales representative.

SAF RADIO UNIT does not contain serviceable parts. Warranty will not be applicable in the event SAF RADIO UNIT has been hermetically unsealed.

SAF Tehnika, JSC is not responsible for any radio or TV interference caused by unauthorized modifications to this equipment. Such modifications could void the user's authority to operate the equipment.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Contents

Chapter 1: OVERVIEW

This manual refers to CFL Sprint MXM 5.8 Repeater radio units with following product codes:

- I06E1218L and I06E1218H
- I06M1218L and I06M1218H
- I06S1218L and I06S1218H
- I06E2118L and I06E2118H
- I06M2118L and I06M2118H
- I06S2118L and I06S2118H

Labelling

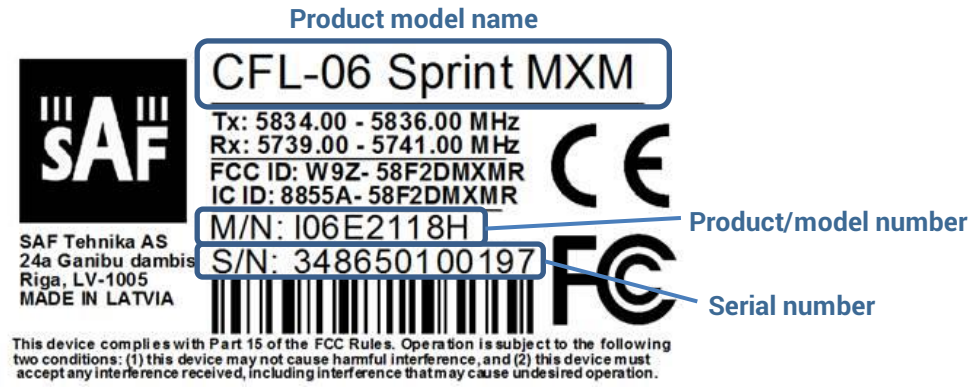
The label contains the following information (see samples in the picture below):

Product model name ("CFL-06 Sprint MXM"). The Repeater radio unit model name example is:

- CFL-06 Sprint MXM for 5.8GHz Repeater radio unit,

Product Number / Model Number (P/N or M/N) (I06E1218H): product/model number contains various information about the unit. Please see translation below.

Serial Number (348650100197): the serial number uniquely identifies the unit.



P/N or M/N translation:

"I" designates series of the product;

"06" designates frequency band (5.8 GHz) of the radio;

"E" designates electrical Ethernet management port type;

- **"S"** - optical Single-mode Ethernet management port type;
- **"M"** - optical Multi-mode Ethernet management port type

"21" is IF frequency designator;

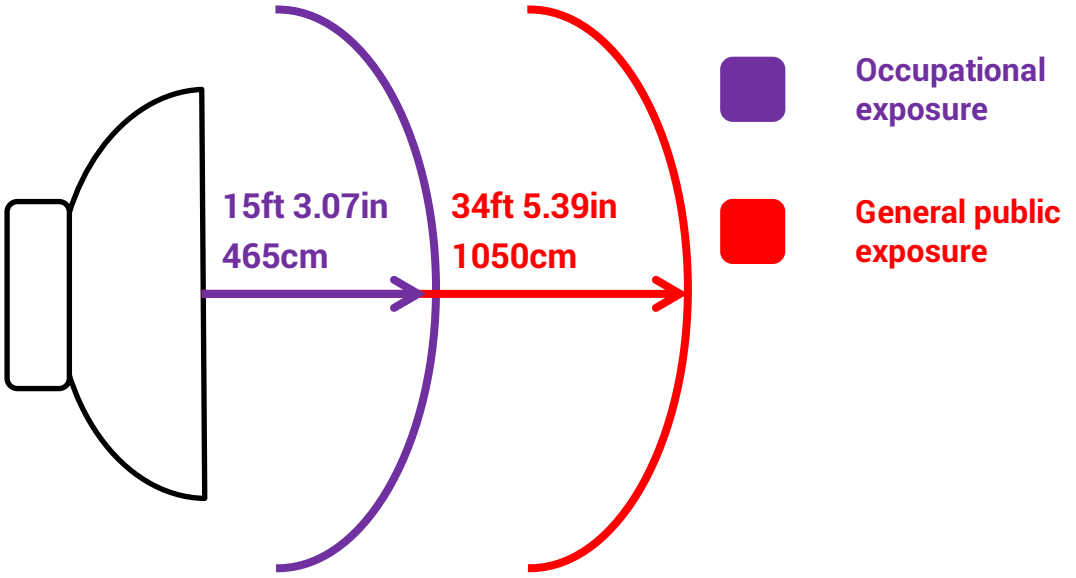
"18" designates the version number of the radio;

"H" designates high side radio;

- **"L"** - low side radio

Microwave Radiation

In April 1998, ICNIRP (International Commission on Non-Ionizing Radiation Protection) published its ´Guidelines for limiting exposure to time-varying electric, magnetic, and electromagnetic fields (up to 300GHz)´. As shown in Table below, the guidelines specify the ´Reference levels on power density for occupational exposure and general public exposure to time-varying electric and magnetic fields (unperturbed rms values)´ between 2 and 300 GHz.



It is the installer's responsibility to ensure compliance with the governing rules and regulations regarding output power and point-to-point installation and operation.

Quite a few other documents specify or refer to exposure limits comparable to those given above, e.g.:

- 1999/519/EC: Council Recommendation of 12 July 1999 on the limitation of exposure of the general public to electromagnetic
fields (0 Hz to 300 GHz)
- WHO: Environmental Health Criteria 137: ´Electromagnetic Fields (300 Hz to 300 GHz)´
- ANSI/IEEE C95.1, 1999:
´IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz´
- BRD, Bundesimmissionsschutzgesetz, 26. BImSchV Verordnung über elektromagnetische Felder
- Bundesamt für Umwelt, Wald und Landwirtschaft (BUWAL), Bern/Schweiz
Schriftenreihe Umwelt Nr. 164, Luft, Mai 1992
´Messung nichtionisierender elektromagnetischer Strahlung, 1. Teil: Frequenzbereich 100 kHz bis 300 GHz´
- DIN VDE 0848-2, Entwurf, Oktober 1991:
´Sicherheit in elektrischen, magnetischen und elektromagnetischen Feldern, ´Teil 2: Schutz von Personen im Frequenzbereich von
30 kHz bis 300 GHz´
- ENV 50166-2, January 1995 (withdrawed in December 1999 by CENELEC)
´Human Exposure to Electromagnetic Fields (10 kHz – 300 GHz)´

Interfaces

MXM Repeater has following interfaces:

1 & 5 N-type female connector

N-type female 50 Ω Intermediate Frequency (IF) ports. Any type of 50 Ω cable of good quality can be used; the cable should be equipped with N–type male connectors on each end. Commonly employing LMR400 type coaxial cable its length may reach 38 m. LCF12-50J cable also can be used, its length may reach 70 m.

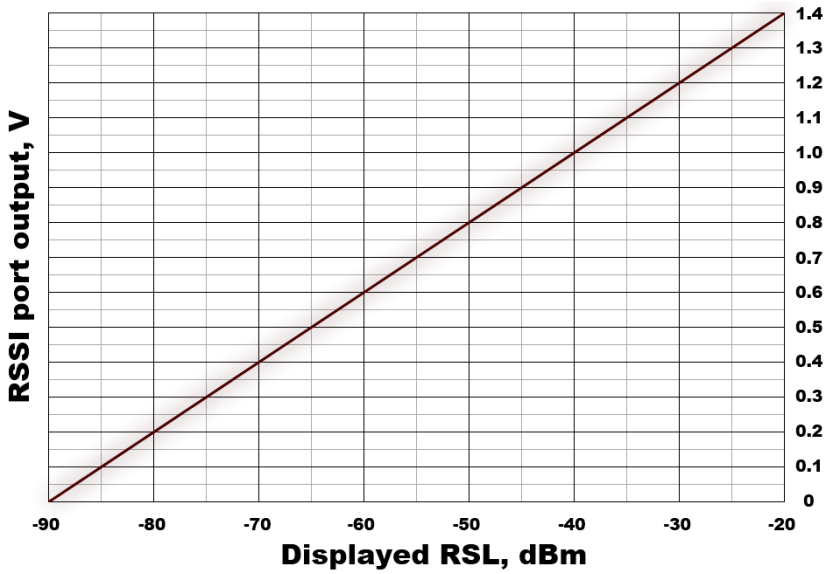
MXM Repeater radio unit IF cable

2 BNC port

BNC connector provides received signal strength indication (RSSI) (voltage) to assist unit alignment.

RSSI port is used to adjust the alignment of antenna for best performance (for both rough and fine adjustment); this can be done using digital multimeter which is connected to the RSSI port. The output of the RSSI port is DC voltage and varies depending on received signal level.

The following chart and table shows typical relationship of the received signal level (Rx level) displayed by MXM Repeater vs. RSSI port output voltage (RSSI – Received Signal Strength Indicator). The RSSI port is located on MXM Repeater radio unit. The evaluated Rx level has the error +/-2 dB.

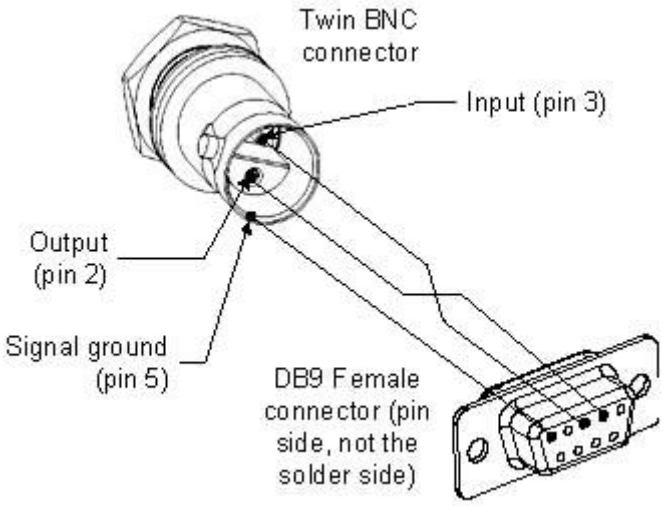


Displayed RSL, dBm	RSSI, V
-90	0
-85	0,1
-80	0,2
-75	0,3
-70	0,4
-65	0,5
-60	0,6
-55	0,7
-50	0,8
-45	0,9
-40	1
-35	1,1
-30	1,2
-25	1,3
-20	1,4

3 Twin-BNC port

Twin BNC connector provide terminal access (command line interface) to the unit which is the available management facility for MXM Repeater radio unit

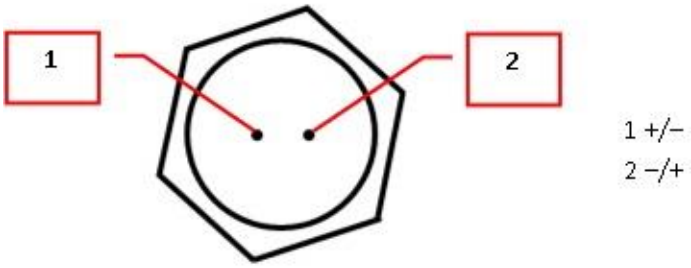
Twin BNC connector is used for RS-232 serial port. RS-232 – USB convector cable can be used. Pinouts are shown in picture below.



4 DC power connector

2-pin DC connector for -48V power supply connection. Polarity layout does not matter. Both polarity (+/-) layout supported. Input DC voltage operating range -40.5V to -57V.

DC power connector can be connected in any preferable layout.



5 N-type female connector

N-type female 50 Ω Intermediate Frequency (IF) port to connect with partner MXM Repeater.

6 Ethernet management port

Ethernet management 1Gbps port is intended for access of MXM Repeater management, web GUI. Upon customer request this port can be equipped with following interfaces:

Optical Ethernet interface ODC Electrical Ethernet interface RJ-45

Optical ODC interface can be equipped with Single Mode (SM) optical fibre or Multi Mode (MM) optical fibre. ODC-LC fibre optics cable (different sizes) for interconnection of MXM Repeater with the user equipment can be provided upon request, as shown in example:

3m ODC-LC SM cable P/N I0ACO001

Electrical outdoor Ethernet interface RJ-45 weatherproof assembly parts of the cable connector are included in MXM Repeater package.

Chapter 2: INSTALLATION

Attaching MXM Repeater radio unit to antenna

In order to attach MXM Repeater to antenna, a separate ODU mounting bracket (P/N S0SPKS03) and flexible coaxial cable is required

For instructions how to connect MXM Repeater to mounting bracket refer to “SAF mounting bracket installation V1.0” document

Powering MXM Repeater radio unit

MXM Repeater radio unit external power supply voltage must be between 40.5–57 V DC. 2-wire outdoor cable with dedicated 2-pin LTW DC connector assembly is needed to connect to MXM Repeater radio unit. Any polarity layout can be used. Preferable outer diameter of power cable is 6mm in order to match MXM Repeater radio unit side connector. Cross-sectional area shall be not less than 0.75 square mm (AWG 18) for installations up to 260 meters / 853 feet (35W load power). If this area is less than 0.75 square mm, the allowed maximum length of the cable is reduced due to a higher voltage drop.

Wire cross section	Lmax @ 50W	Lmax @ 35W	Lmax @ 25W
0.75mm^2	180m / 590ft	260m / 853ft	380m / 1246ft
0.5mm^2	120m / 393ft	180m / 590ft	250m / 820ft
0.25mm^2	60m / 196ft	90m / 295ft	125m / 410ft

AWG	Lmax @ 50W	Lmax @ 35W	Lmax @ 25W
18	206m / 677ft	294m / 967ft	412m / 1353ft
20	129m / 426ft	185m / 608ft	259m / 851ft
24	51m / 168ft	73m / 240ft	102m / 337ft

Pre-soldered power supply connector with cable are available for purchase if needed: P/N I0ACGE04 (0.3m) or P/N I0ACGE05 (1.0m)

Power connector can be soldered in any polarity layout.

It is mandatory requirement to ground power supply and MXM Repeater radio units appropriately.

Table below helps choosing the most appropriate power adapter from SAF Tehnika accessories list for MXM Repeater radio units. Note that table summarizes maximum power consumption; normally consumption is 10-20% less. One should be aware of such aspects as power losses in the cable from AC/DC adapter to MXM Repeater radio unit and must be taken in to consideration.

Band (GHz)	Max power consumption (W)	Recommended PSU power (W)
5.8	<40	**60**

Assembling of MXM Repeater DC connector is shown in following figures:

Assembling weatherproof DC power connector

1. You will need: (1-6) DC connector components and (7) ready 2-wire DC power cable.
2. Wider sealing rubber ring should be fitted inside from the front end of (6).

3. Narrower sealing rubber ring should be fitted inside from the rear end of (6).
4. Parts of the DC connector should be put on the cable in the sequence as shown
5. DC power cable should be soldered in any polarity layout.
6. Afterwards, part (6) should be tightened on to part (5).
7. Assembled DC power connector after tightening the last part (1)

Chapter 3: WEB GUI

Initial configuration

System requirements

To access MXM Repeater radio unit Web GUI you will need a PC with the following system requirements:

Operating system

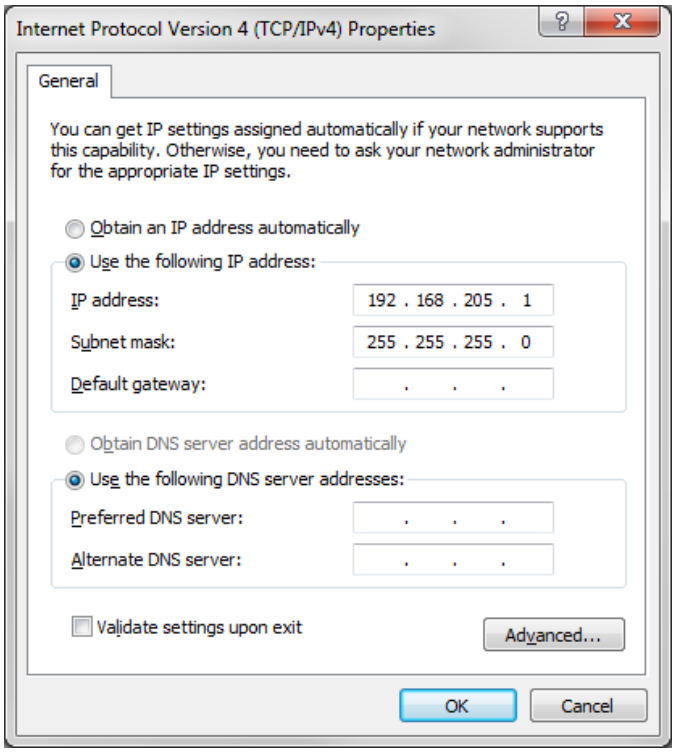
- Microsoft Windows XP / Vista / 7 / 8;
- Linux

Web browser

- Google Chrome;
- Mozilla Firefox;
- Internet Explorer 8 (or above)

Ethernet management connection configuration

Before proceeding with initial link setup in Web GUI, you must adjust IPv4 settings of your LAN adapter to 192.168.205.0 subnet. IP address should be other than default low/high side IP addresses (192.168.205.10/192.168.205.11).



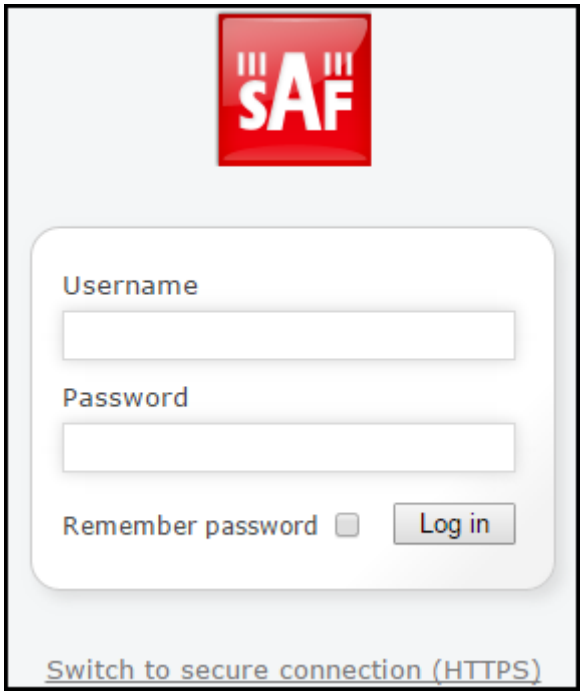
After applying these settings you are ready to connect to Web GUI or establish SSH/Telnet connection. Refer to Chapter 4: COMMAND LINE INTERFACE for details how to connect to other CLI interfaces (serial, SSH, Telnet).

Accessing MXM Repeater radio unit Web GUI

1. Launch your browser and in address field enter MXM Repeater radio unit IP address. Default IP addresses are as follows:
   - 192.168.205.10 for low side MXM Repeater radio unit (P/N I*******L*)

For secure connection use *https://* prefix.

2. Press “Enter” key.
3. Login screen will appear.
4. Enter username and password. Default credentials are as follows:
   - Username: **admin**
   - Password: **changeme**



5. Select “Remember password” if you want browser to remember entered login credentials.
6. Press “Log in” button.

“Switch to secure connection (HTTPS)” indicates that HTTP protocol is being used. Press on the link and you will be redirected to secure HTTPS URL.

Main page

After login you will be automatically redirected to the Main page of Web GUI:

Web GUI is divided into 5 sections:

1 Top panel

Shows information about MXM Repeater radio unit you are connected to including:

- Model name
- System name
- IP address
- Serial number
- Uptime
- Firmware version
- User name

2 Menu panel

Allows navigating between Main page (“Main”) and subpages of 2 sections:

- Performance
- System

3 Main Web GUI window

By default Main page (“Main”) is shown. Contents will change according to menu panel selection.

4 MODIFY / SAVE / LOGOUT

Allows modifying parameters in the main window. If none can be modified, MODIFY button appears inactive. After modification SAVE button becomes active and indicates number of unsaved changes as well as their type (when moving cursor over the button).

5 System summary

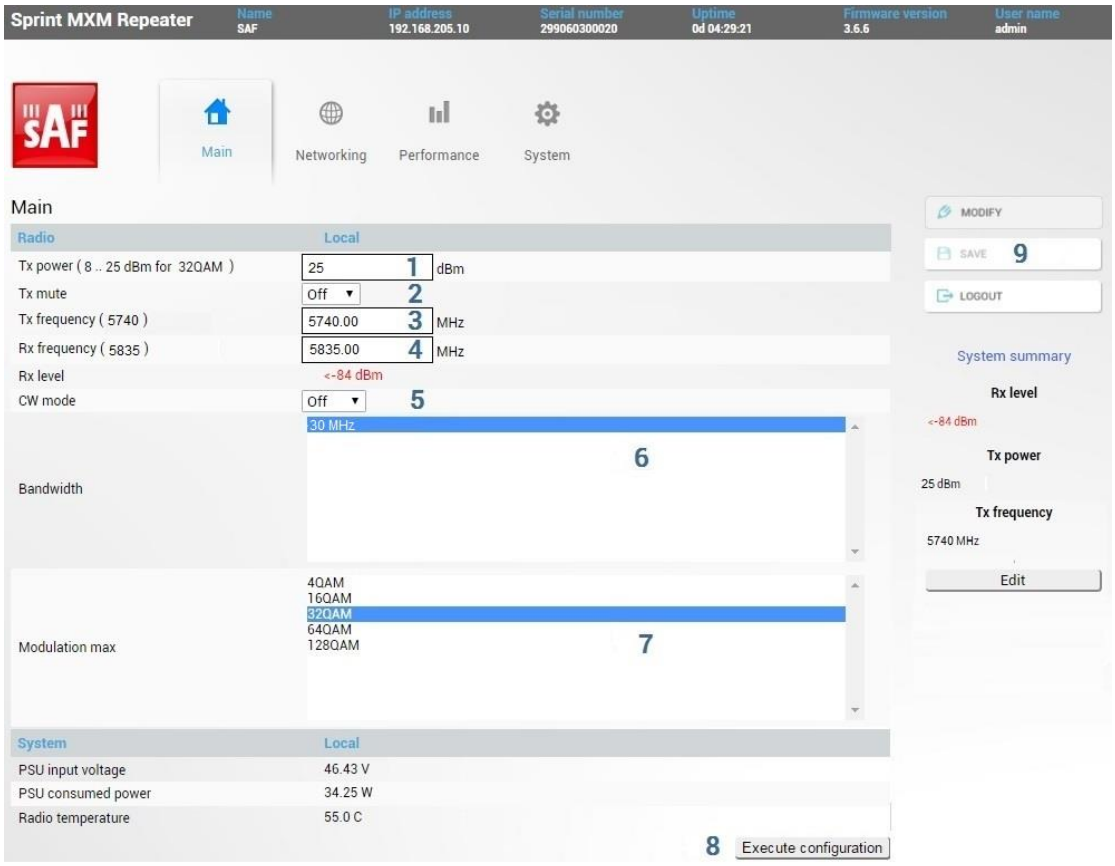
Shows three selected parameters of local system.

Values appear in red colour in case of exceeding alarm threshold values or in case of a warning.

Values appear in orange colour in case alarm threshold values were exceeded during last 15 seconds.

Modifying basic system parameters

In order to proceed with initial configuration, press MODIFY button and entry fields will appear for adjustable values:



1 Tx power

Available range depends on radio model and selected modulation. Actual range will be indicated in the brackets.

2 Tx mute

- *Auto* option is default. This mode mutes RF Tx in case of no incoming signal
- *Off* option disables RF Tx mute functionality
- *On* option allows muting RF transmitter to limited time interval in seconds. This option is not saved in configuration file. After timeout RF Tx returns to previously saved mode – *Auto* or *Off*.

3 Tx frequency

Allows configuring transmitting frequency. Available frequency range depends on frequency band, subband, radio side and channel bandwidth selected. Actual range will be indicated in the brackets.

4 Rx frequency

Allows configuring receiving frequency. Available frequency range depends on frequency band, subband, radio side and channel bandwidth selected. Actual range will be indicated in the brackets.

5 CW mode

Allows to enable diagnostics and antenna alignment mode.

- *RF Tx* option provides set Tx RF output power even if the partner repeater unit is not connected and there is no RF Rx level.
- *Off* option disables CW mode functionality

6 Bandwidth

Allows configuring channel bandwidth of the received/transmitted RF signal.

7 Modulation max

Allows choosing between available modulations for selected channel bandwidth. When changing modulation, max Tx power range is changed accordingly to chosen modulation.

8 Execute

By pressing *„Execute configuration"* changes made to the corresponding section apply only for the local side MXM Repeater radio unit.

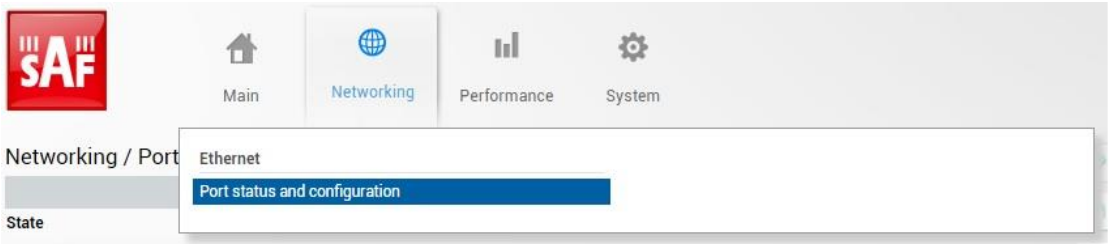
9 Save

By pressing *„Save"* changes applied to the corresponding section are saved in configuration file.

Networking

Networking → Port status and configuration

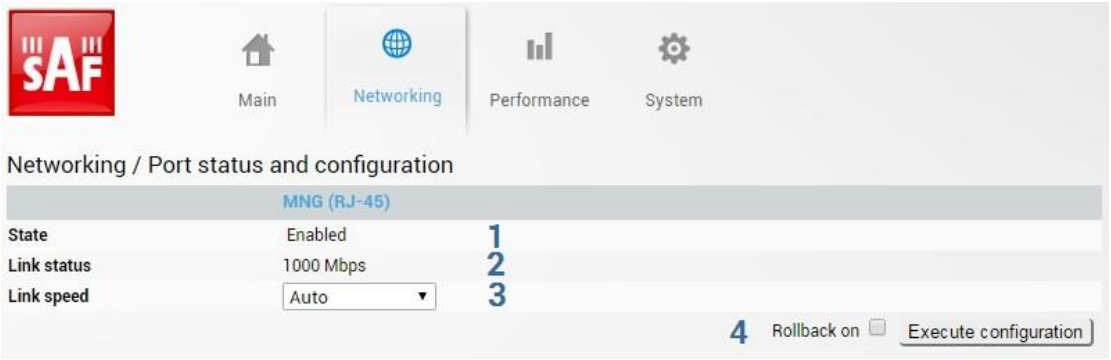
Shows status of Ethernet management port, allows modifying link speed/duplex.



Status mode

Press MODIFY button.

Modify mode



1) ***State*** – Indicates operation status of Ethernet management port;
2) ***Link status*** – Indicates whether link with Ethernet management port is established and its link speed;
3) ***Link speed*** – Indicates whether link speed is configured to automatic speed setting or manual (status mode); allows changing link speed to manual setting (modify mode);
4) By pressing *„Execute configuration"* changes made to the corresponding section apply only for the local side MXM Repeater radio unit. If „Rollback on" is selected, configuration will be reverted in case erroneous configuration changes are applied.

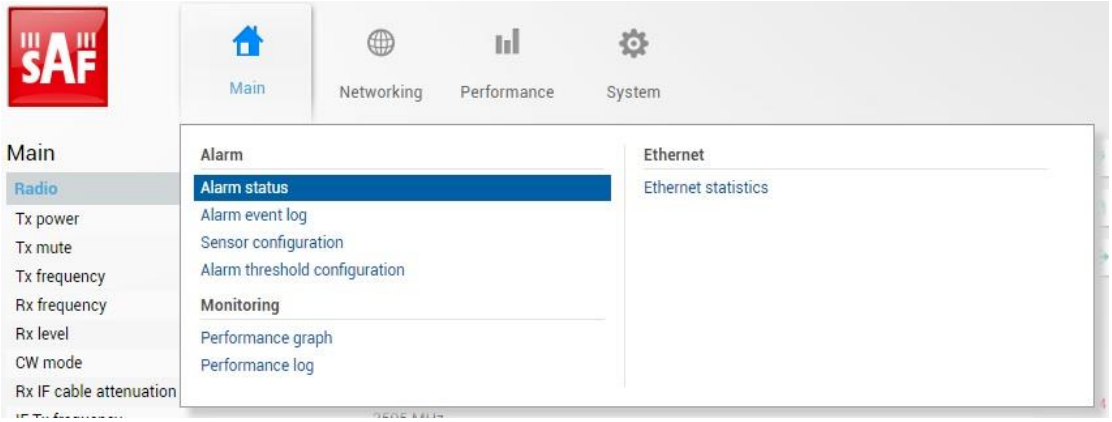
CLI commands (***System → Tools → Console***)

Network port set mng speed <auto|100fdx|100hdx>	Use to change speed and duplex setting on Ethernet management port. Default value is "auto" (autonegotiation).

Performance

Performance → Alarm → Alarm status

Alarm status page summarizes current alarms by showing date and time the alarm occurred and its name.



5) ***Date*** – shows date when alarm was initiated;
6) ***Time*** – shows time when alarm was initiated;
7) ***Alarm*** – shows name of the alarm.

CLI commands (***System → Tools → Console***)

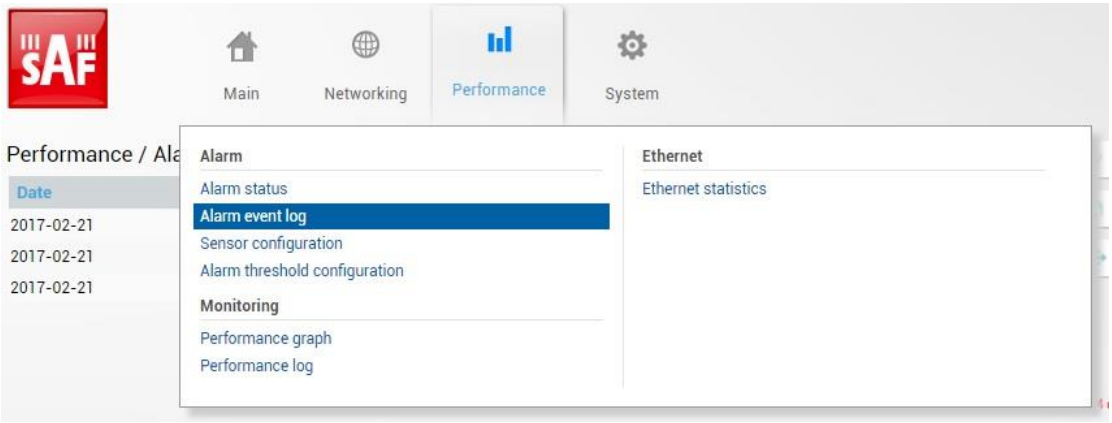
log sensor setlist	Use to show alarm status.

Performance → Alarm → Alarm event log

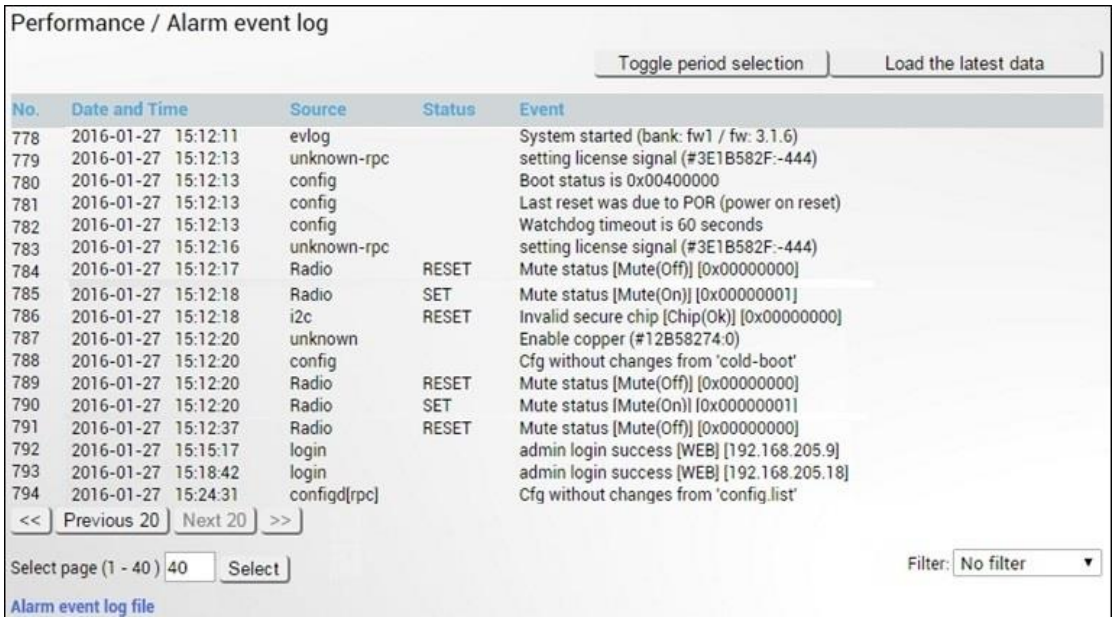
Alarm log shows 20 alarm entries per page and about 2000 alarm entries in total. Full alarm log can be downloaded by pressing on "Alarm event log file". Last page of log entries is shown by default.

Alarm entries are mostly distributed in two groups – *"Set"* when alarm appears and *"Reset"* when alarm disappears.

There is alarm filtering option available, where it is possible to choose which alarm groups user is willing to filter out of all log entries.

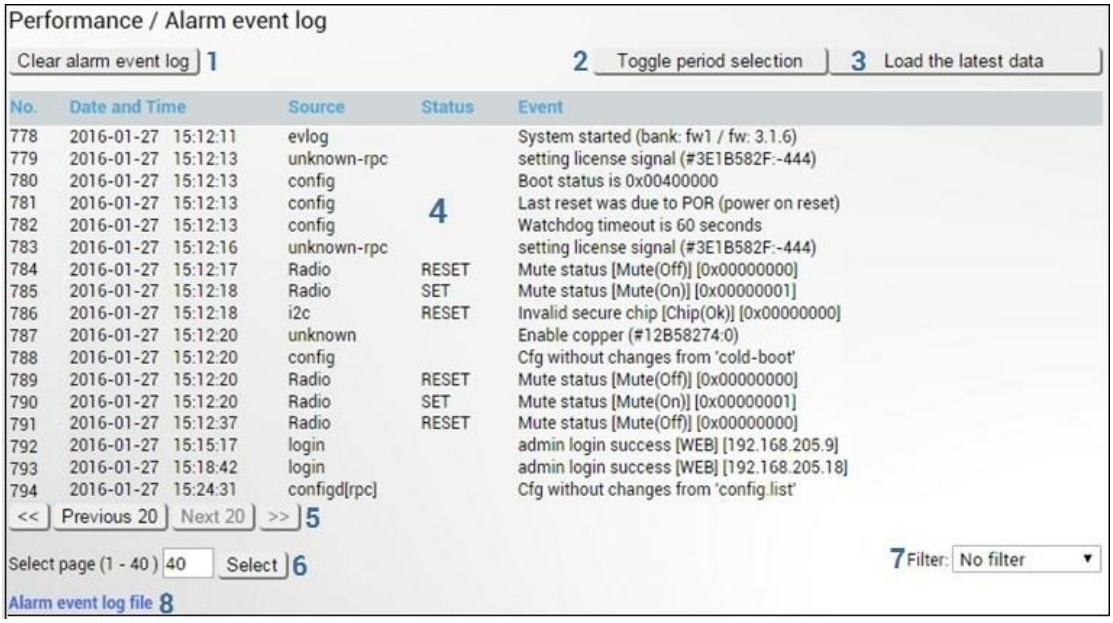


Status mode



Press MODIFY button.

Modify mode



1) ***Clear alarm log*** – deletes all alarm log entries;
2) ***Toggle period selection*** – opens period selection controls;
3) ***Load the latest data*** – refreshes alarm log and shows last 20 log entries;
4) List of alarm log entries – entry number, date and time, source node, status and event name;
5) Navigation controls. "<<" navigates to start of alarm log, while ">>" – to the end; "Previous 20" navigates to previous alarm log page showing 20 previous alarm log entries, while "Next 20" – to next alarm log page showing 20 next alarm log entries (if available).
6) Shows number of currently viewed alarm log page. In Web GUI only last 20 pages (400 entries) are shown. Download alarm log to view full list;

7) ***Filter*** – press to filter alarms from certain source node (e.g. Radio);
8) ***Alarm event log file*** – press on the link to download full alarm log text file.

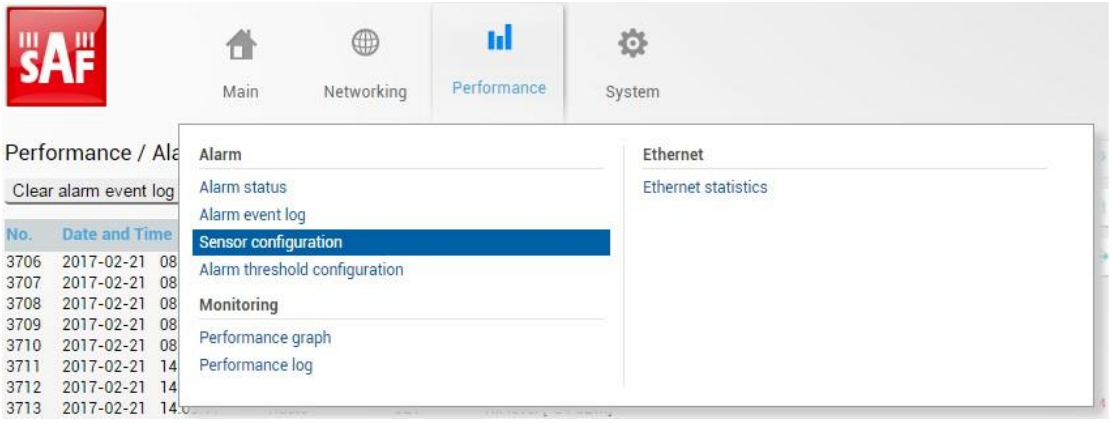
CLI commands (***System → Tools → Console***)

log event show last <#_of_entries>	Use to show certain number of last alarm log entries.
log event show time <time>	Use to show entries from a certain time point. Following formats are supported: YYYY-MM-DD/hh:mm:ss; MM-DD/hh:mm:ss; MM-DD/hh:mm; hh:mm:ss; hh:mm
log event show sensor <sensor> <last|time> <#_of_entries|time>	Use to show entries for a specific sensor. Regarding subcommands "last" and "time" refer to commands above.
log event show module <modem|ns|psu|radio|system> <last|time> <#_of_entries|time>	Use to show entries for a specific module. Regarding subcommands "last" and "time" refer to commands above.
log event clear	Use to clear alarm log

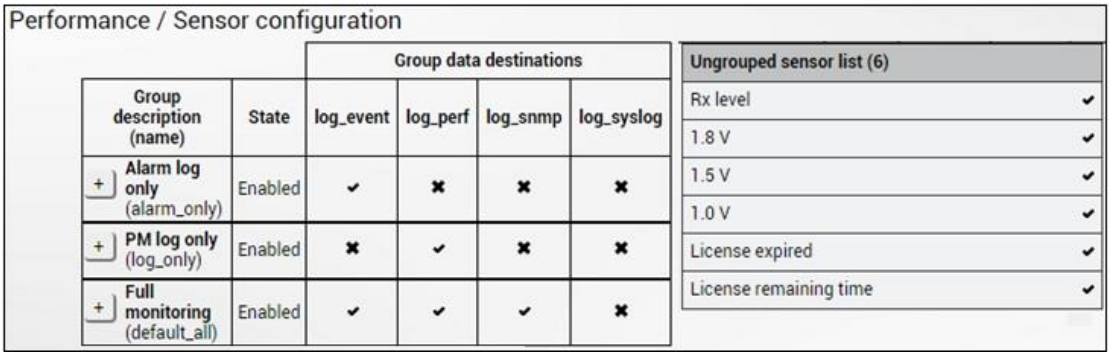
Performance → Alarm → Sensor configuration

Following section allows specifying behaviour of available sensor parameters.

After firmware upgrade it is required to reset sensor configuration to defaults using "Set all to default" button and reconfigure sensors as required.

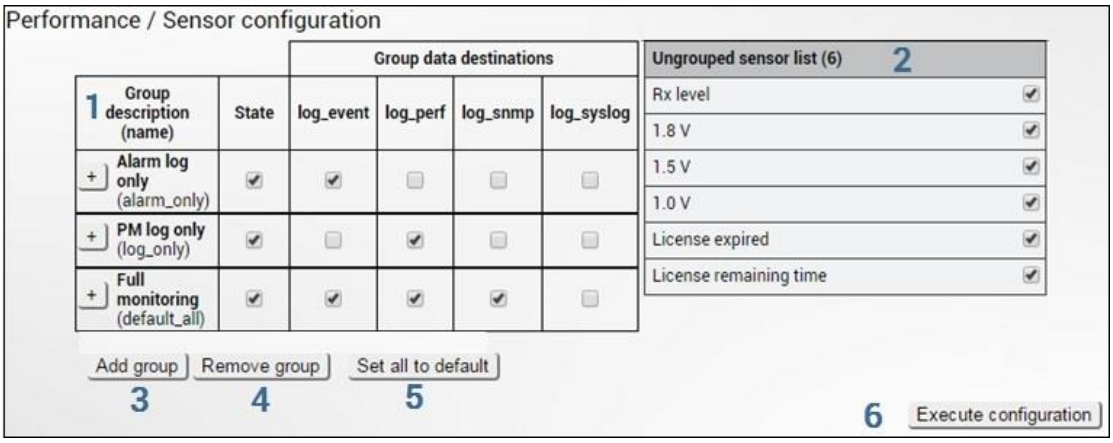


Status mode

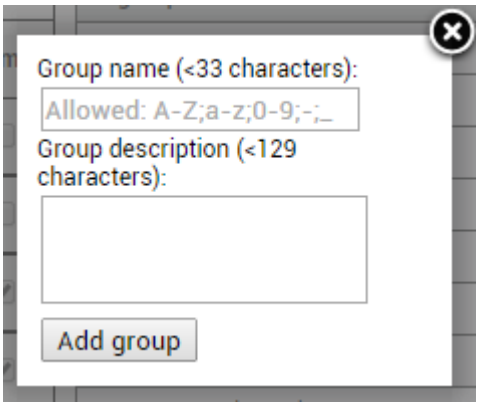


Press MODIFY button.

Modify mode

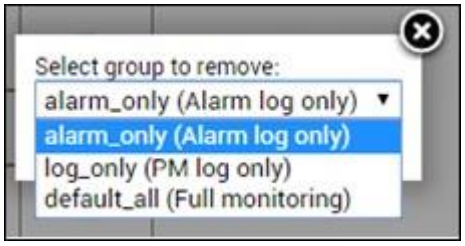


1) ***Group description (name)*** – Shows 3 groups of sensors divided by different group data destinations (event; perf; snmp), as well as indicates whether group is enabled (state);
2) ***Ungrouped sensor list*** – Shows list of sensors not added to any of existing groups (status mode); allows dragging to any of existing groups, thus specifying how the sensor will be treated. Unchecking checkbox next to the sensor disables the sensor (modify mode).
3) ***Add group*** – Allows creating a new group with custom name and description.



Afterwards sensors from ungrouped sensor list or other groups can be added to the group by dragging in.

4) ***Remove group*** – Allows deleting existing groups via a dialog window.



5) ***Set all to default*** – Restores default settings for all groups and sensors.
6) By pressing *„Execute configuration"* changes made to the corresponding section apply only for the local side MXM Repeater radio unit.

CLI commands (***System → Tools → Console***)

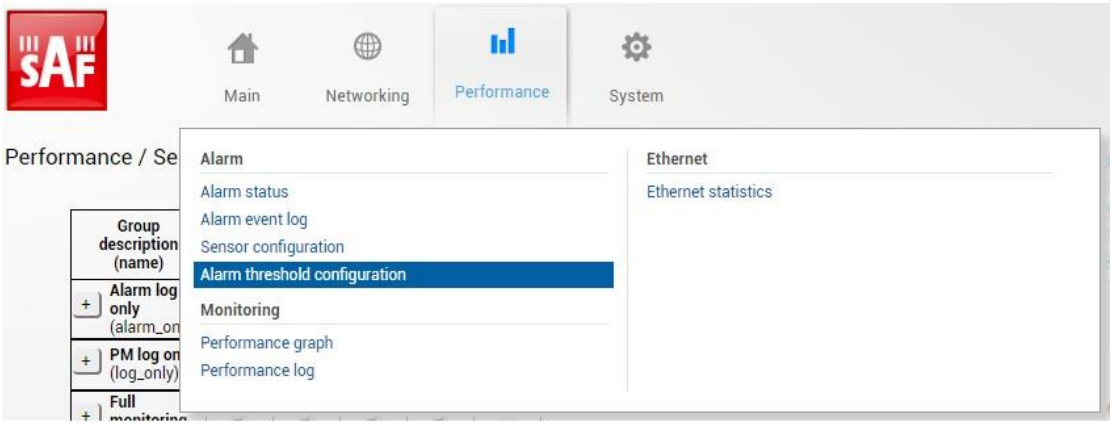
log group info	Use to show sensor group configuration.
log group create <name> <description>	Use to create a new group.

log group mgmt <name> **add destination** <event|perf|snmp>	Use to add a destination for a group.
log group mgmt <name> **add sensor** <sensor>	Use to add a sensor to a group.
log group mgmt <name> **config** <enable|disable>	Use to enable or disable a group.
log group mgmt <name> **delete**	Use to delete a group.
log group mgmt <name> **remove destination** <event|perf|snmp>	Use to remove a destination from a group.
log group mgmt <name> **remove sensor** <sensor>	Use to remove a sensor from a group.
log sensor list	Use to list all available sensors.

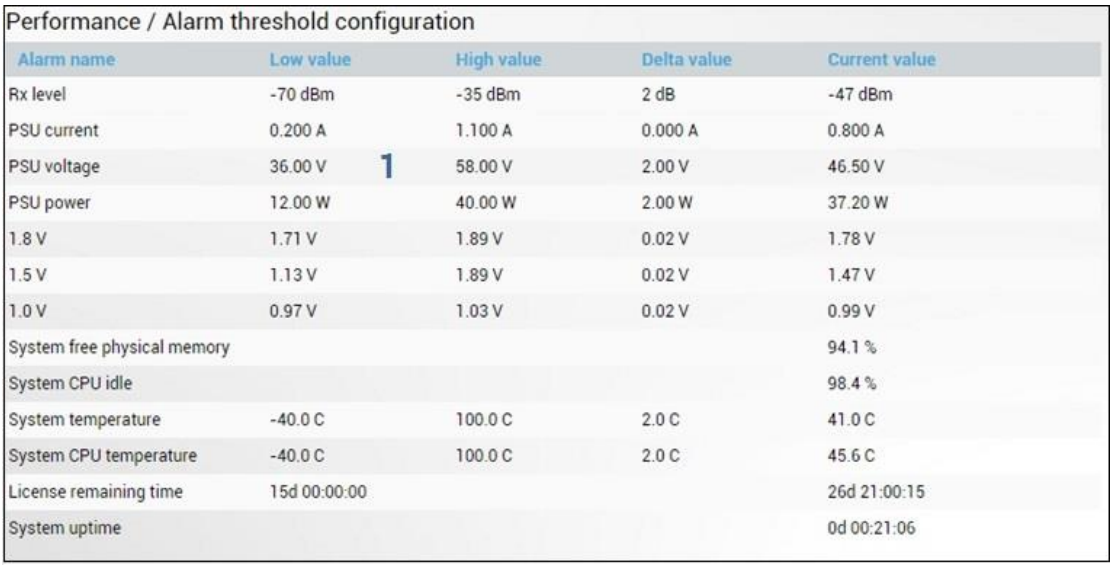
Performance → Alarm → Alarm threshold configuration

Page provides summary of parameters' alarm thresholds. All thresholds are predefined and some change dynamically according to system configuration. Thresholds can be modified if required.

Alarm activates when current value exceeds low-delta or high+delta values. Alarm deactivates when current value exceeds low+delta or high-delta values.

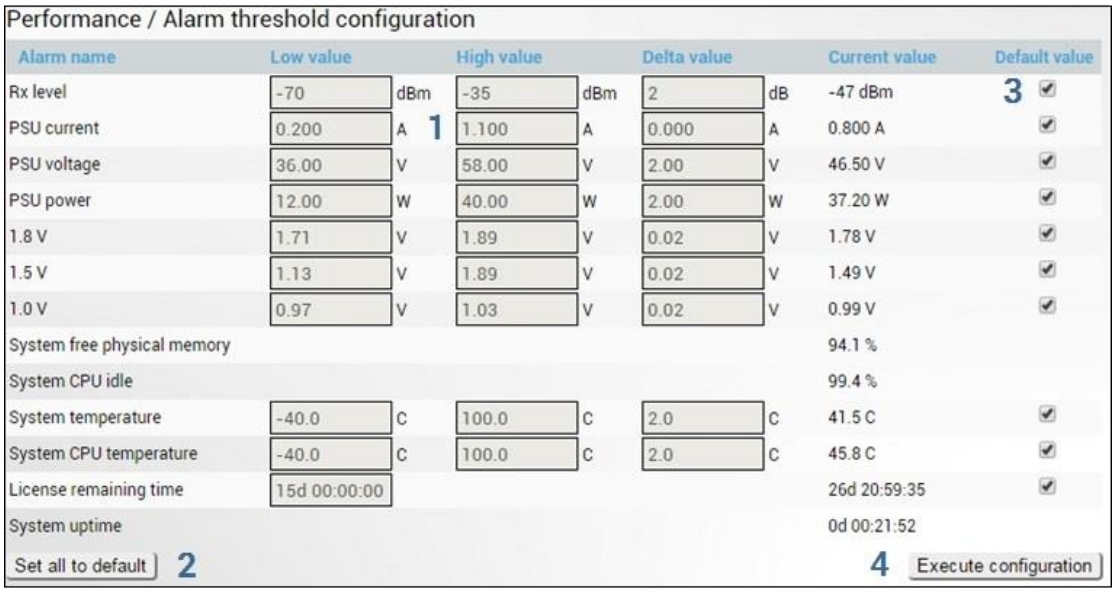


Status mdoe



Press MODIFY button.

Modify mode



1) Indicates low, high and delta values of the parameters (status mode); “Low value”, “High value” and “Delta value” fields for all parameters become editable when “Default value” is deselected (modify mode);
2) ***Set all to default*** – resets “Low value”, “High value” and “Delta value” for all parameters to factory defaults;
3) ***Default value*** – deselect to activate manual threshold modification;
4) By pressing *„Execute configuration”* changes made to the corresponding section apply only for the local side MXM Repeater radio unit.

CLI commands (***System → Tools → Console***)

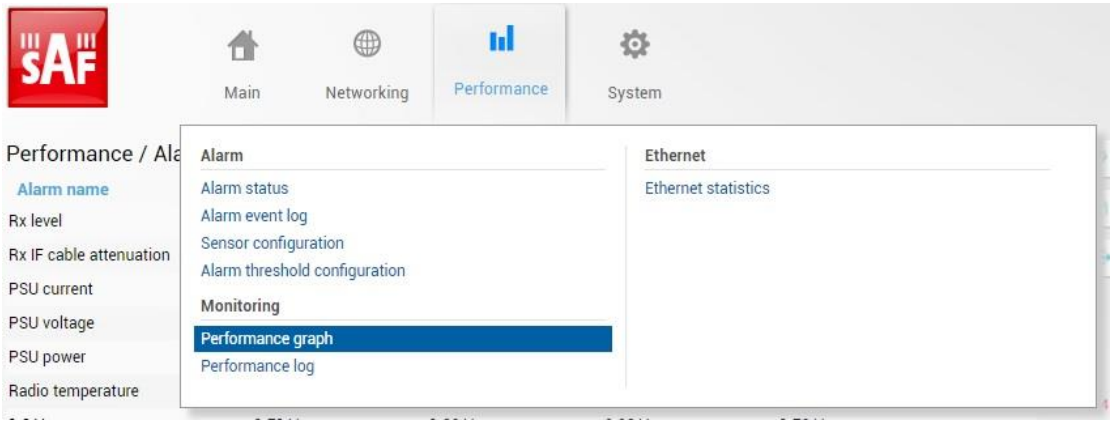
log sensor info	Use to show configuration of sensor thresholds.
log sensor mgmt <sensor> **control** <auto|user>	Use to set sensor thresholds to user defined or automatically adjusted.

log sensor mgmt <sensor> **thold** <min> <max> <delta>	Use to set sensor's min, max thresholds and delta value manually.
log sensor mgmt <sensor> **time** <0…30>	Use to set sensor hysteresis time in seconds. Will be used to show value in orange colour indicating that sensor value recently exceeded its thresholds.

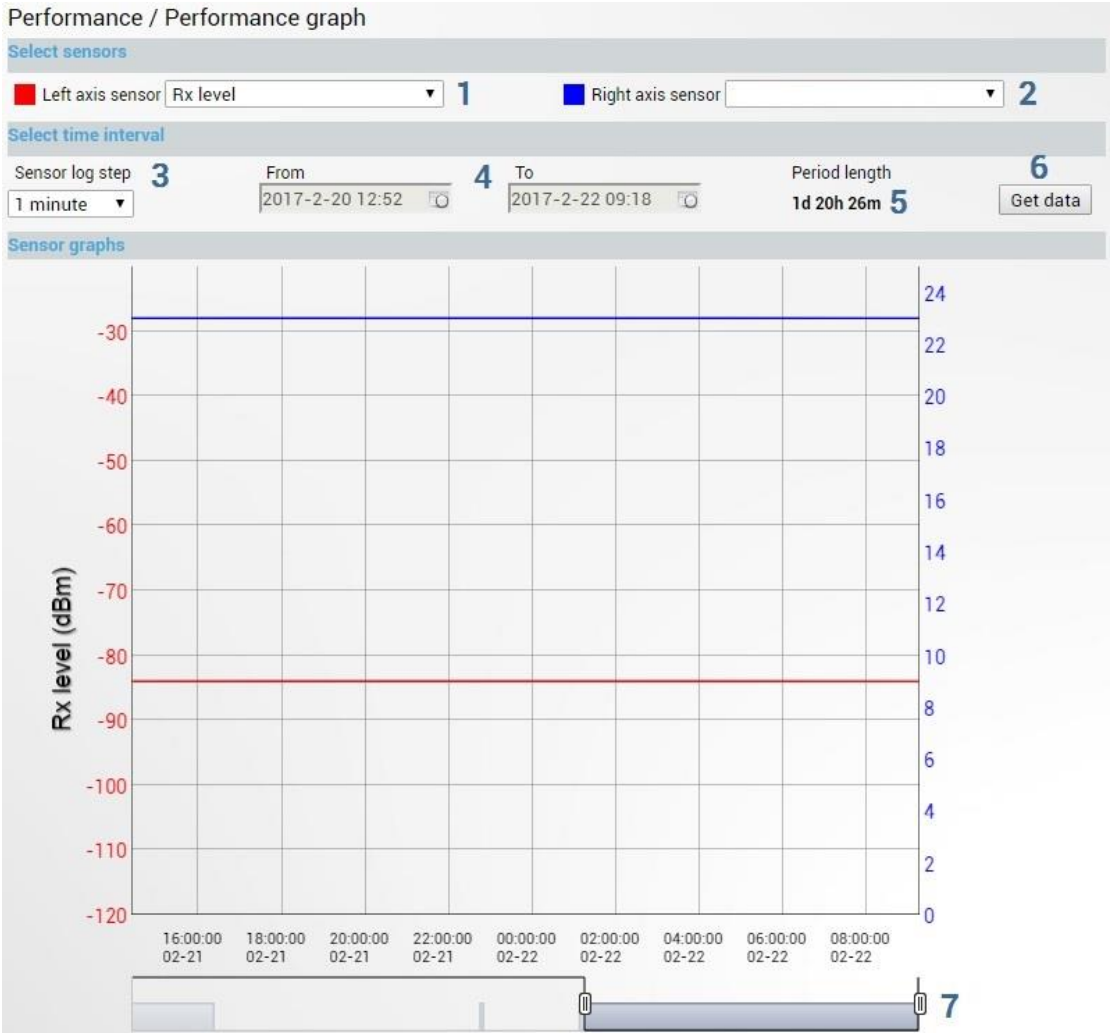
Performance → Monitoring → Performance graph

Performance graph allows visualising various parameters over chosen time period as curves. Available parameters will depend on Sensor Configuration. Any two parameters can be shown at a time. By default Rx level (dBm) and Radial MSE (dB) are selected.

Not all sensors available in Sensor Configuration can be displayed in Performance graph.

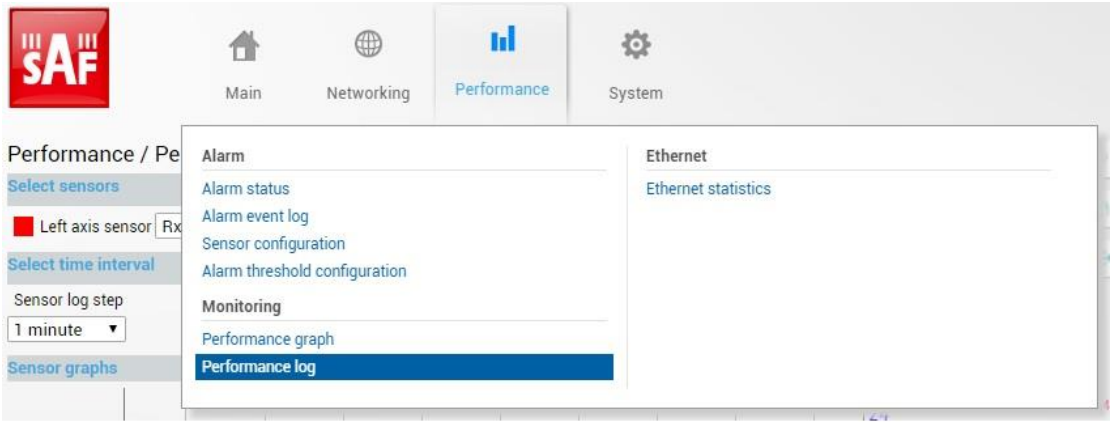


MODIFY button is deactivated in Performance graph page.

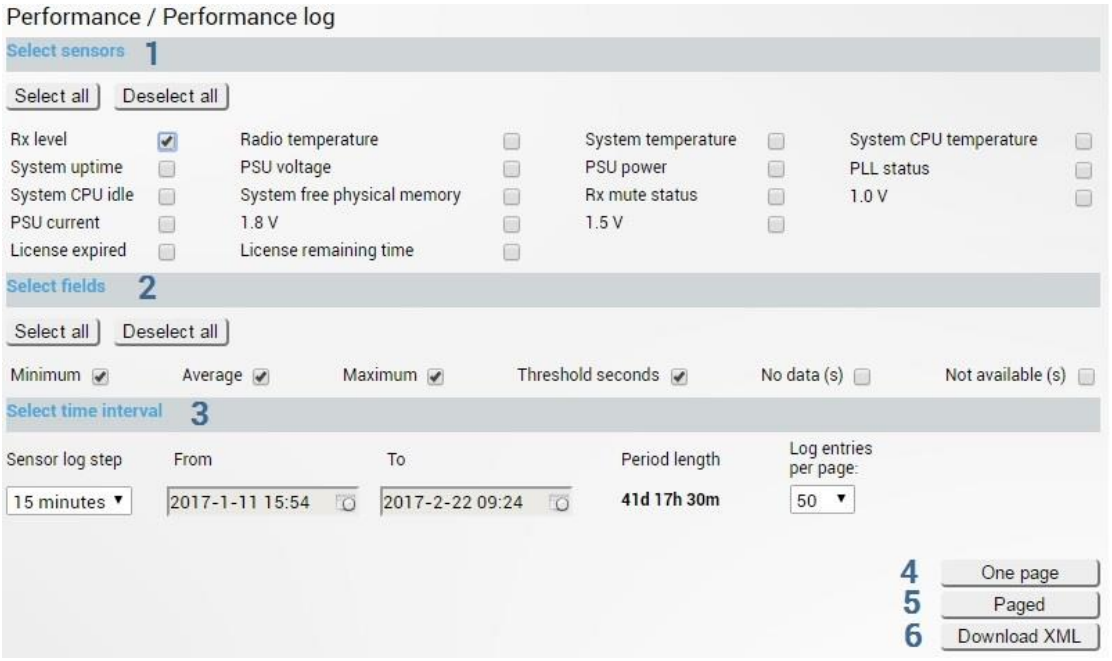


1) ***Left axis sensor*** – Allows choosing sensor parameter coloured in red and displayed on left axis.
2) ***Right axis sensor*** – Allows choosing sensor parameter coloured in blue and displayed on right axis.
3) ***Sensor log step*** – Allows choosing graph granularity – 1, 15 or 60 minutes.
4) Indicates start and end date/time of period displayed and allows selecting specific period to show.
5) ***Period length*** – Indicates length of currently displayed period.
6) ***Get data*** – Press to apply selected time interval changes.
7) Left and right sliders allow to "zoom" currently selected time period.

Performance → Monitoring → Performance log



MODIFY button is deactivated in Performance log page.



1) ***Select sensors*** – Allows choosing sensor parameters to be displayed in performance log.
2) ***Select fields*** – Allows choosing parameter fields to be displayed in performance log. "Minimum" and "Maximum" represent minimum and maximum values in specified sensor log step, while "Average" displays average value; "Threshold seconds" will show amount of seconds in chosen time interval when parameter exceeded minimum or maximum alarm thresholds; "No data (s)" and "Not available (s)" show respectively time when there was no data of according parameter and it was not available.
3) ***Select time interval*** – Allows choosing graph granularity – 1, 15 or 60 minutes.
4) ***One page*** – Will display performance log on a single page in a separate tab.
5) ***Paged*** – Will display performance log divided in pages in a separate tab.
6) ***Download XML*** – Press to download performance log in an extensible markup language (.xml) file.

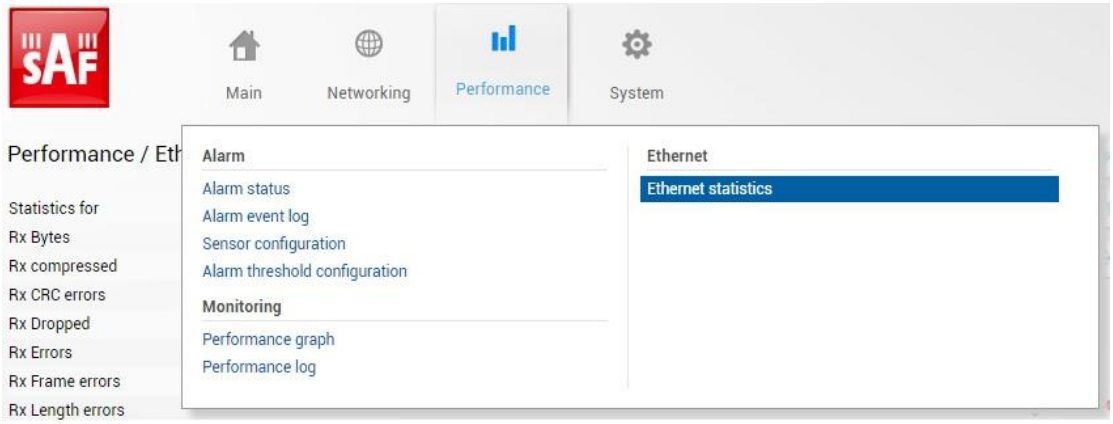
CLI commands (***System → Tools → Console***)

log perf show <1M|15M|60M> **last**	Use to show specified number of last performance log entries with specified sensor log step.

<1…1440>	
log perf show <1M|15M|60M> **time** <time>	Use to show entries from a certain time point. Following formats are supported: YYYY-MM-DD/hh:mm:ss; MM-DD/hh:mm:ss; MM-DD/hh:mm; hh:mm:ss; hh:mm
log perf clear	Use to clear performance log.

Performance → Ethernet → Ethernet statistics

Shows Ethernet management port statistics



Status mode

Press MODIFY button.

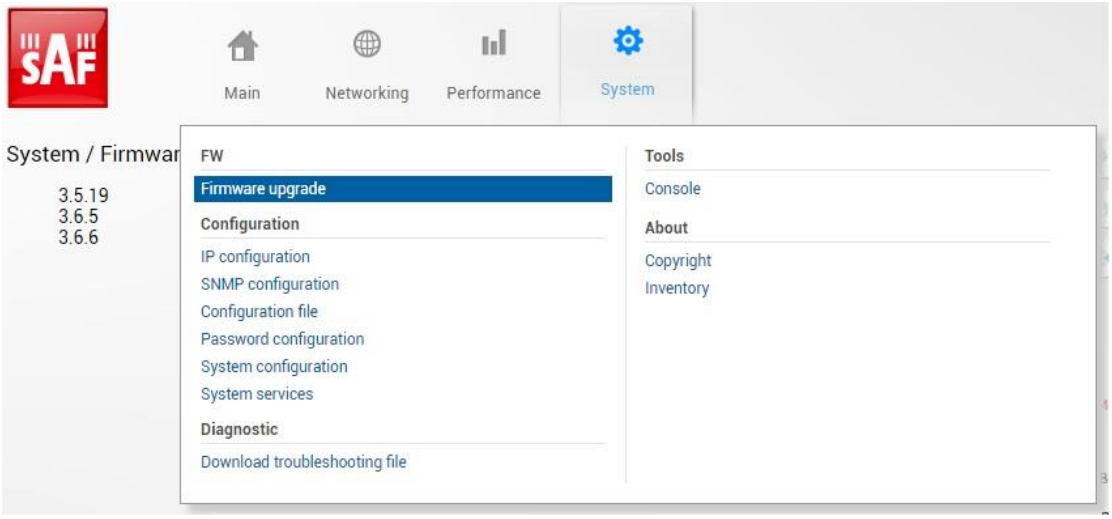
Modify mode

1) ***Statistics for*** – Time during which statistics have been gathered;
2) ***Rx Bytes*** – Indicates the number of received bytes;
3) ***Rx compressed*** – Indicates the number of received compressed packets;
4) ***Rx CRC errors*** – Indicates the number of packets received with a CRC (FCS) error;
5) ***Rx Dropped*** – Indicates the number of received packets but which are dropped, those packets are not forwarded to the upper layers for packet processing;
6) ***Rx Errors*** – Indicates the number of received errors;

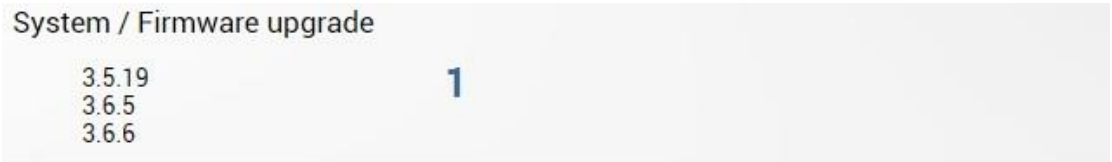
7) ***Rx Frame errors*** - Indicates the number of received frames with error, such as alignment errors;
8) ***Rx Length errors*** **-** Indicates the number of received error packets with a length error - oversized or undersized;
9) ***Rx missed errors*** **-** Indicates the number of received packets that have been missed due to lack of capacity in the receive side;
10) ***Rx packets*** **-** Indicates the total number of good received packets;
11) ***Tx bytes*** **-** Indicates the number of transmitted bytes;
12) ***Tx compressed*** **-** Indicates the number of transmitted compressed packets;
13) ***Tx Dropped*** **-** Indicates the number of packets dropped during transmission;
14) ***Tx Errors*** **-** Indicates the number of packets in error during transmission;
15) ***Tx fifo errors*** **-** Indicates the number of packets having caused a transmit FIFO error;
16) ***Tx packets*** **-** Indicates the number of transmitted packets
17) ***Clear all data*** **–** Clears statistics
18) ***Clear*** **–** Clears statistics

System

System → FW → Firmware upgrade



Status mode



Press MODIFY button.

Modify mode

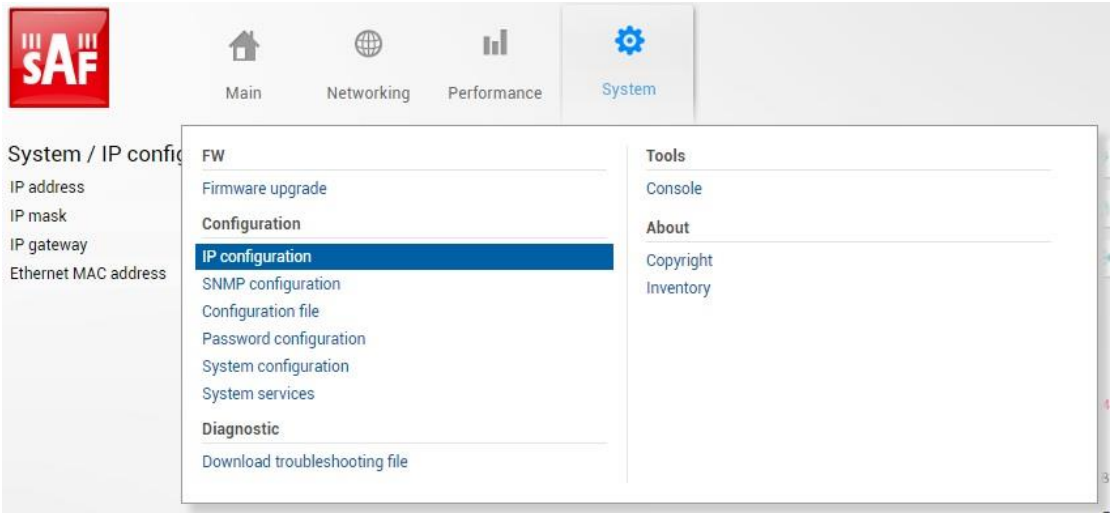
1) Shows list of available firmware files;
2) ***Upgrade firmware*** – click on preferred firmware in the list and press "Upgrade firmware" button to initiate firmware upgrade process.
3) ***Reboot*** – Reboots management CPU.
4) ***Delete*** – Deletes selected firmware file from the list.
5) ***Choose File*** – Press to browse for a firmware file on your hard disk drive.
6) ***Upload*** – Press to upload a firmware file to MXM Repeater.

CLI commands (***System → Tools → Console***)

firmware info [<version>]	Use to show detailed information on current or specific MXM Repeater firmware.
firmware install <version>	Use to install firmware version uploaded. Note that exact version needs to be entered. Check available firmware versions using command "firmware list".
firmware list	Use to list uploaded firmware versions.
firmware remove <version>	Use to remove firmware version uploaded. Note that exact version needs to be entered. Check available firmware versions using command "firmware list".
firmware remove.list	Use to remove all uploaded firmware versions.
firmware switch	Use to check running firmware bank and bank that will be used at the next boot.
firmware switch <fs|fw1|fw2|toggle>	Use to define bank that will be used at the next boot. "fw1" and "fw2" subcommands set appropriate bank, "toggle" forces to set other bank than the running one, "fs" is factory defined emergency bank, which is used if both "fw1" and "fw2" fail.

System → Configuration → IP configuration

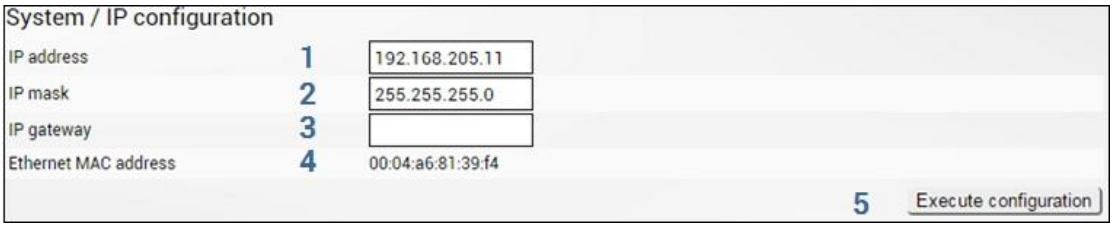
IP address configuration page is available in "System" menu (System→Configuration→IP configuration).



Status mode

Press MODIFY button.

Modify mode



1) ***IP address*** – Indicates IP address of MXM Repeater radio unit you are currently logged in (status mode); allows specifying IP address of MXM Repeater radio unit you are currently logged in (modify mode). Default IP address is 192.168.205.10.
2) ***IP Mask*** – Indicates IP mask of MXM Repeater radio unit you are currently logged in (status mode); allows specifying IP mask of MXM Repeater radio unit you are currently logged in (modify mode). Default IP mask is 255.255.255.0.
3) ***IP gateway*** – Indicates gateway address of MXM Repeater radio unit you are currently logged in (status mode); allows specifying gateway address of MXM Repeater radio unit you are currently logged in (modify mode). By default gateway is not specified (blank).
4) ***Ethernet MAC address*** – shows the MAC address of MXM Repeater radio unit you are currently connected to.
5) By pressing *„Execute configuration"* changes made to the corresponding section apply only for the local side MXM Repeater radio unit.

CLI commands (***System → Tools → Console***)

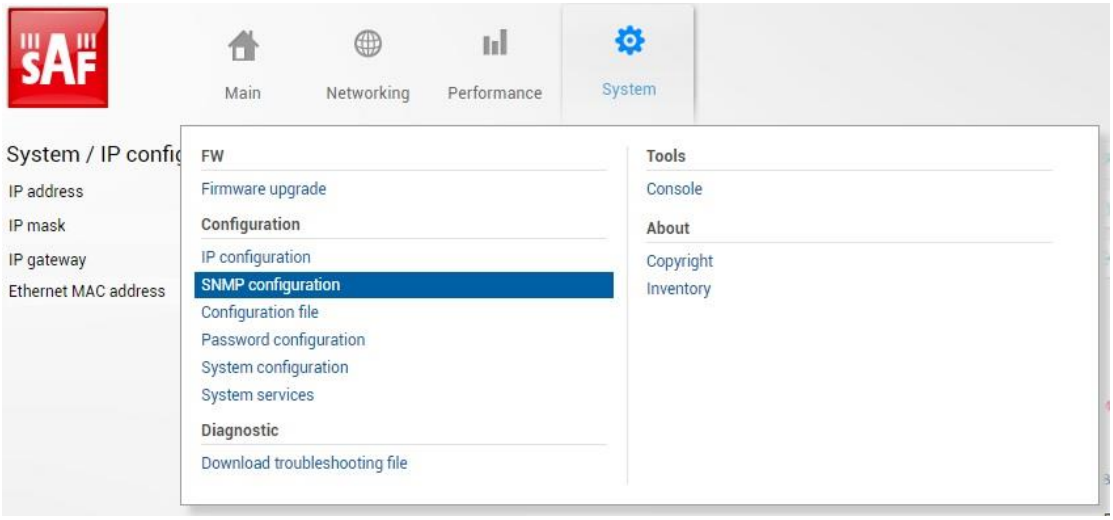
system ip addr <IP>	Use to set IP address of management CPU.
system ip gw <IP>	Use to set IP address of gateway.
system ip mask <mask>	Use to set subnet mask.
system ip mac	Use to show MAC address of management CPU.

system ip cfg <ip address> <mask> or <ip address> <mask> <gateway> or <ip address/CIDR> or <ip address/CIDR> <gateway>	Use to set IP address and sub or optionally IP address, subnet mask and gateway simultaneously.
system diag ping <IP_address>	Use to ping an IP address.

System → Configuration → SNMP configuration

The SNMP configuration pages provide configuration of SNMP communities, host and trap addresses. SAF NMS system will work only when SNMP is properly configured.

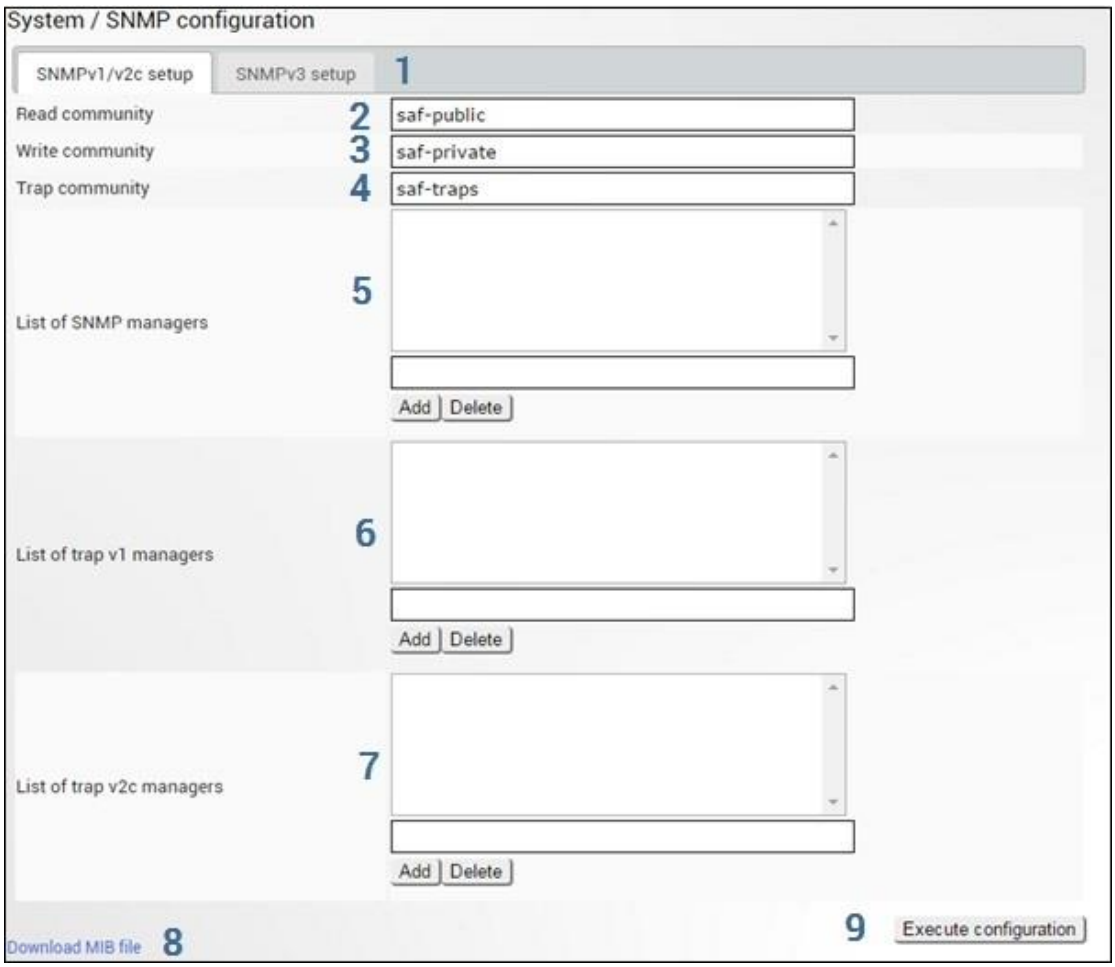
Relevant MIB files can be downloaded directly from MXM Repeater Web GUI. See (8) below.



Status mode

Press MODIFY button.

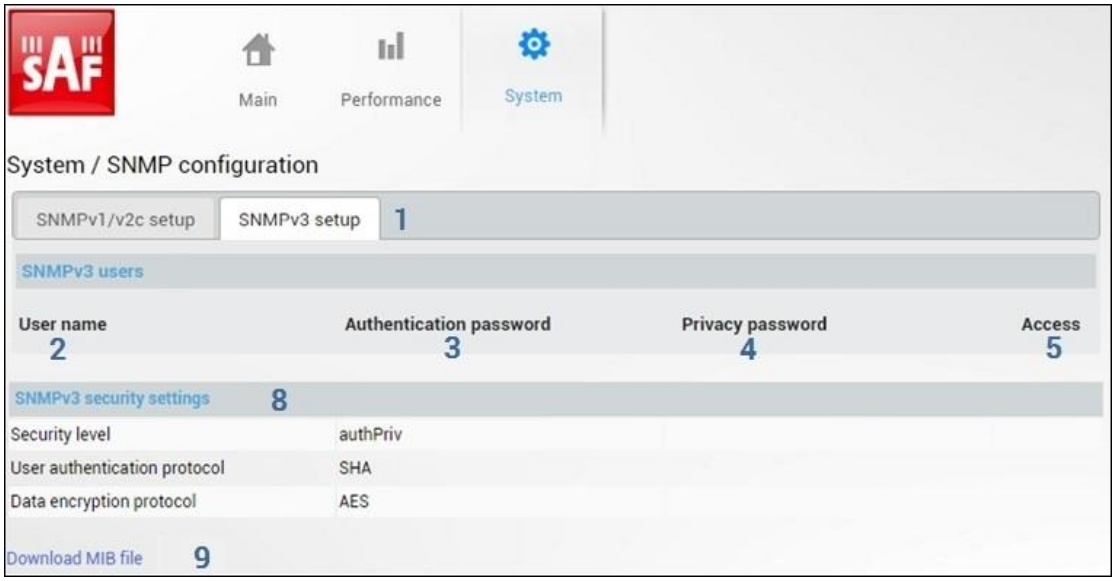
Modify mode



1) ***SNMP v1/v2c setup / SNMP v3 setup*** – Allows switching between status/configuration of SNMP v1/v2c and v3.
2) ***Read community*** – Indicates currently specified read community for SNMP v1/v2c (status mode); allows specifying read community for SNMP v1/v2c of the agent to enable parameters to be read (modify mode). Default read community name is "saf-public".
3) ***Write community*** – Indicates currently specified write community for SNMP v1/v2c (status mode); allows specifying write community for SNMP v1/v2c of the agent to enable parameters to be written (modify mode). Default write community name is "saf-private".
4) ***Trap community*** – Indicates currently specified trap community for SNMP v1/v2c (status mode); allows specifying trap community for SNMP v1/v2c for trap authentication in monitoring applications (modify mode). Default trap community name is "saf-traps".
5) ***List of SNMP managers*** – Shows list of configured SNMP host IP addresses (status mode); allows adding/deleting SNMP host IP addresses (modify mode). Specified IP addresses have access to read and modify configuration parameters using appropriate read and write community names.
6) ***List of trap v1 managers*** – Shows list of configured SNMP trap IP addresses (status mode); allows adding/deleting SNMP trap IP addresses (modify mode). The MXM Repeater management controller sends SNMP traps to the Trap Manager with IP address specified here.

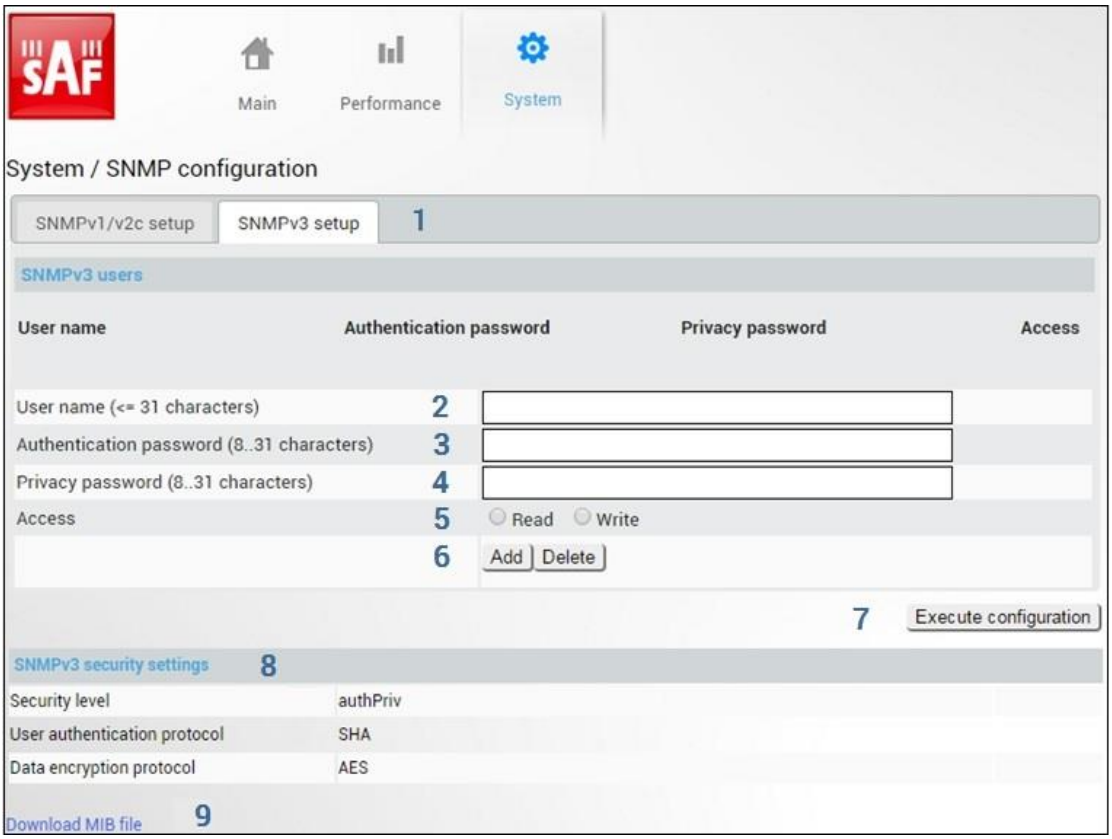
7) ***List of trap v2c managers*** – Shows list of configured SNMP trap IP addresses (status mode); allows adding/deleting SNMP trap IP addresses (modify mode). The MXM Repeater management controller sends SNMP traps to the Trap Manager with IP address specified here.
8) ***Download MIB file*** – Click to download MXM RepeaterMIB files.
9) By pressing *„Execute configuration"* changes made to the corresponding section apply only for the local side MXM Repeater.

Status mode



Press MODIFY button.

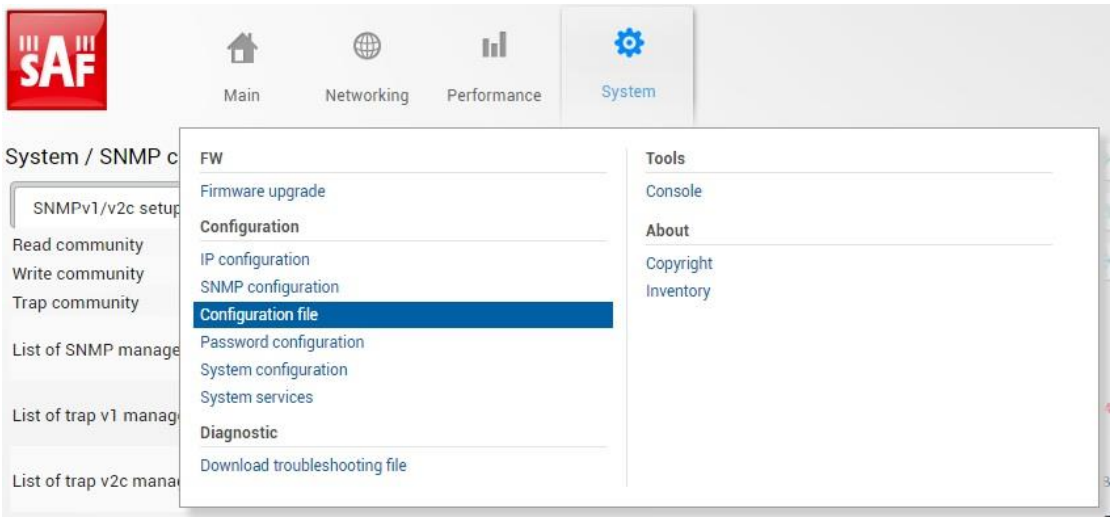
Modify mode



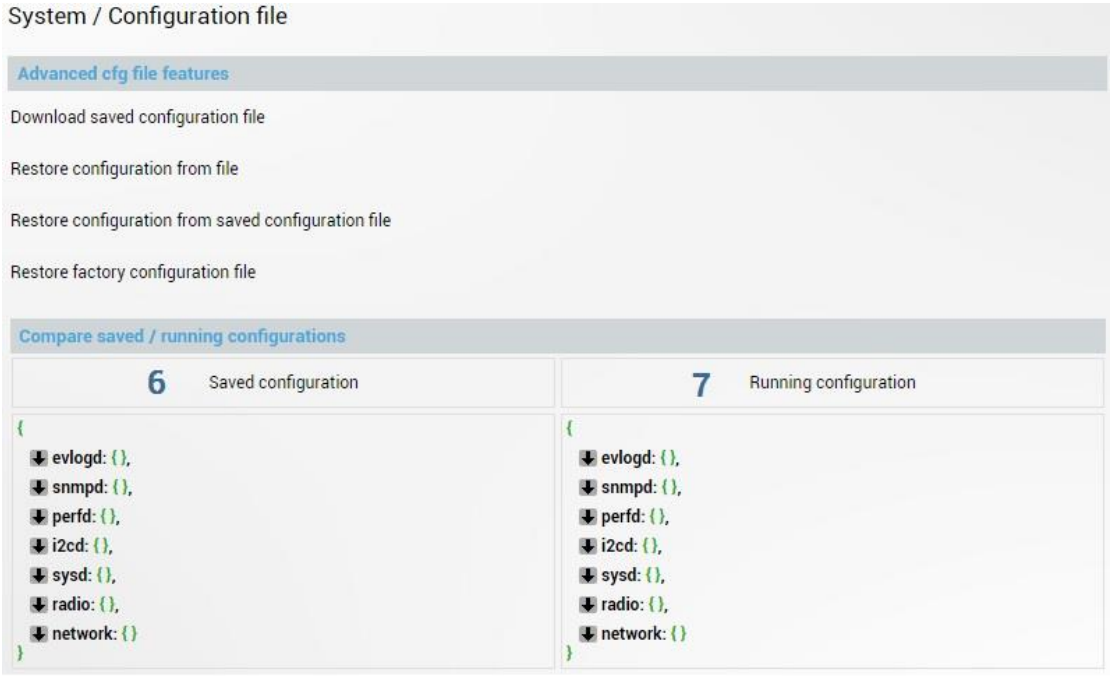
1) ***SNMP v1/v2c setup / SNMP v3 setup*** – Allows switching between status/configuration of SNMP v1/v2c and v3.
2) ***User name*** – Indicates currently specified SNMPv3 user name (status mode); allows specifying user name which will be used for SNMPv3 user authentication (modify mode).
3) ***Authentication password***– Indicates currently specified SNMPv3 authentication password (status mode); allows specifying authentication password for SNMPv3 user (modify mode).
4) ***Privacy password*** – Indicates currently specified password for SNMPv3 data AES encryption (status mode); allows specifying password for SNMPv3 data AES encryption (modify mode). AES encryption protocol is used on SNMP agent's side.
5) ***Access*** – Shows enabled access rights (status mode); allows choosing between Read and Write access. Read option is for read-only access, Write option is for read-write access (modify mode).
6) By pressing *"Add"* new user will be added with specified username, passwords and access rights and will be indicated in users list. By pressing *"Delete"* marked user with its credentials will be deleted from the list.
7) By pressing *„Execute configuration"* changes made to the corresponding section apply only for the local side MXM Repeater.
8) ***SNMPv3 security settings*** – shows the Security level, User authentication protocol and Data encryption protocol used on SNMPv3 agent's side. These settings cannot be changed. This information is required while configuring SNMP manager's side.
9) ***Download MIB file*** – Click to download MXM RepeaterMIB files.

SNMP manager's IP address must be entered in "SNMPv1/v2c setup" section in lists of "SNMP managers" and "trap v1 managers" or "trap v2 managers".

System → Configuration → Configuration file

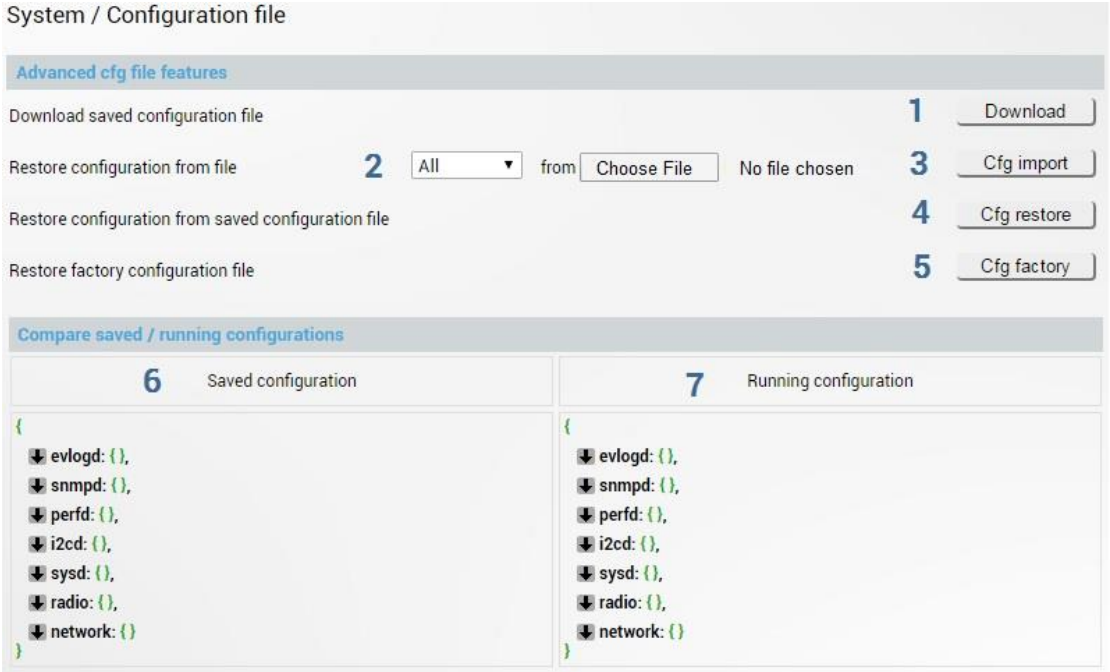


Status mode



Press MODIFY button.

Modify mode



1) ***Download configuration file*** – Press to download system configuration txt file and saving it on your hard drive.
2) ***Choose File*** – Press to browse for a saved configuration file on your hard disk drive.
3) ***Cfg import*** – Press to import a configuration file to MXM Repeater.

Uploaded configuration overwrites saved configuration.

4) ***Restore uploaded configuration file*** – Press to restore uploaded system configuration. If configuration was not uploaded, saved configuration will be restored, i.e. unsaved changes will be discarded!

Restoring configuration overwrites running configuration with saved configuration.

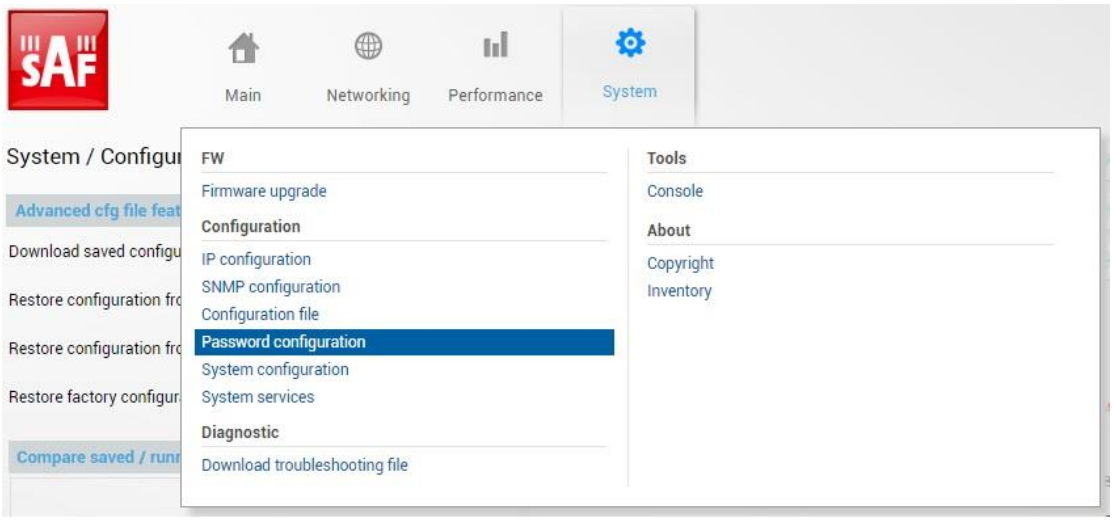
5) ***Load factory configuration file*** – Resets system configuration to factory defaults.
6) ***Saved configuration*** – Shows saved system configuration.
7) ***Running configuration*** – Shows currently running system configuration.

Distinct sections in saved and running configurations are highlighted with orange colour. In order to examine particular differences expand highlighted sections of configuration by clicking on down arrow of appropriate configuration section.

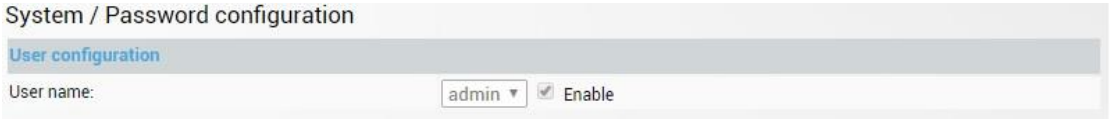
CLI commands (***System → Tools → Console***)

configuration factory	Use to reset system configuration to factory defaults.
configuration factory modem	Use to reset modem configuration to factory defaults.
configuration factory sysd	Use to reset whole system configuration to factory defaults.
configuration load	Use to load uploaded system configuration. If no configuration was uploaded via Web GUI, command will restore saved configuration, thus discarding unsaved changes.
configuration status	Use to check whether running configuration is saved.
configuration store	Use to save running configuration.

System → Configuration → Password configuration



Status mode



Press MODIFY button.

Modify mode

1) ***User name*** – Choose between "admin" and "guest" user accounts. "guest" user has monitoring privileges and cannot apply configuration changes. "guest" user can be disabled or enabled. "admin" user is always enabled

> ⚠ By default password for "admin" account is '*changeme*', while no password is defined for "guest" account (user disabled).

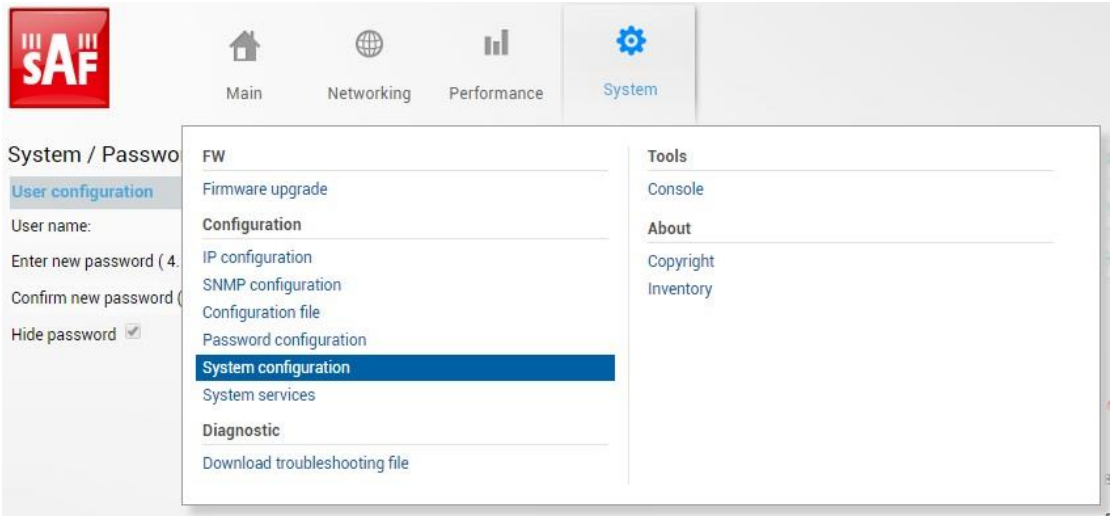
2) ***Enter new password*** – Enter new password.
3) ***Confirm new password*** – Confirm new password.
4) ***Hide password*** – Uncheck to display entered password in plaintext.
5) By pressing *„Execute configuration"* changes made to the corresponding section apply only for the local side MXM Repeater.

CLI commands (***System → Tools → Console***)

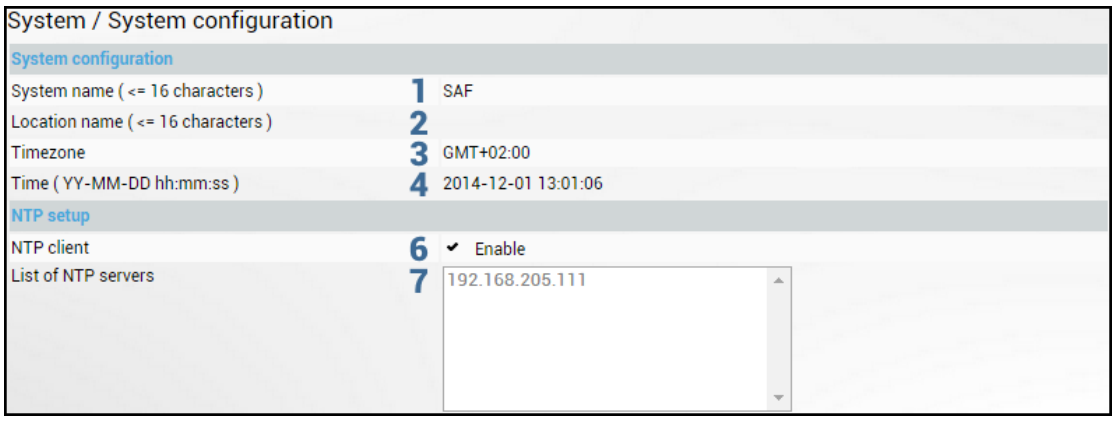
system user info	Use to show information on current user.
system user mgmt <username> **access** <r|w>	Use to set read ("r") or write ("w") access right for particular <username>.
system user mgmt <username> **delete**	Use to delete particular <username>. "admin" user cannot be deleted.
system user mgmt <username> <enable|disable>	Use to enable or disable particular <username>.

system user mgmt <username> **info**	Use to show information on particular <username>.
system user mgmt <username> **password** <password>	Use to set password for particular <username>.
system user new <username> <password> <r|w> <fullname>	Use to create new user with specified <username>, <password>, <fullname> and read (“r”) or write (“w”) permissions.
system user factory	Use to reset user to factory defaults.
system password change <password>	Use to change password for current user.
system password reset	Use to reset all passwords to default.

System → Configuration → System configuration

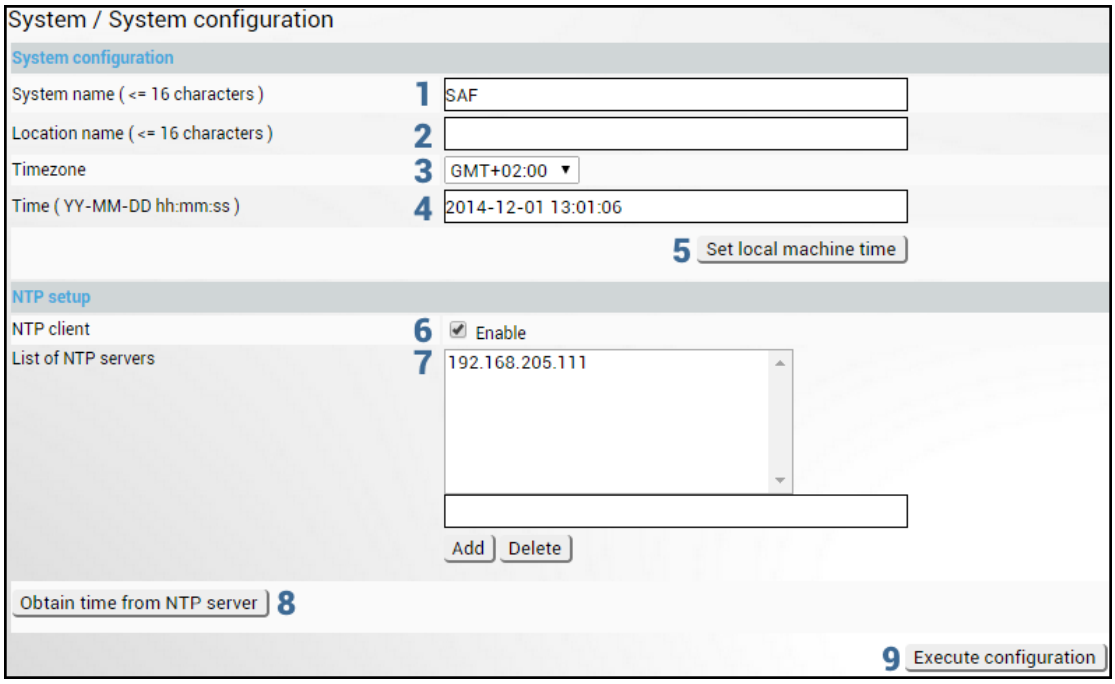


Status mode



Press MODIFY button.

Modify mode



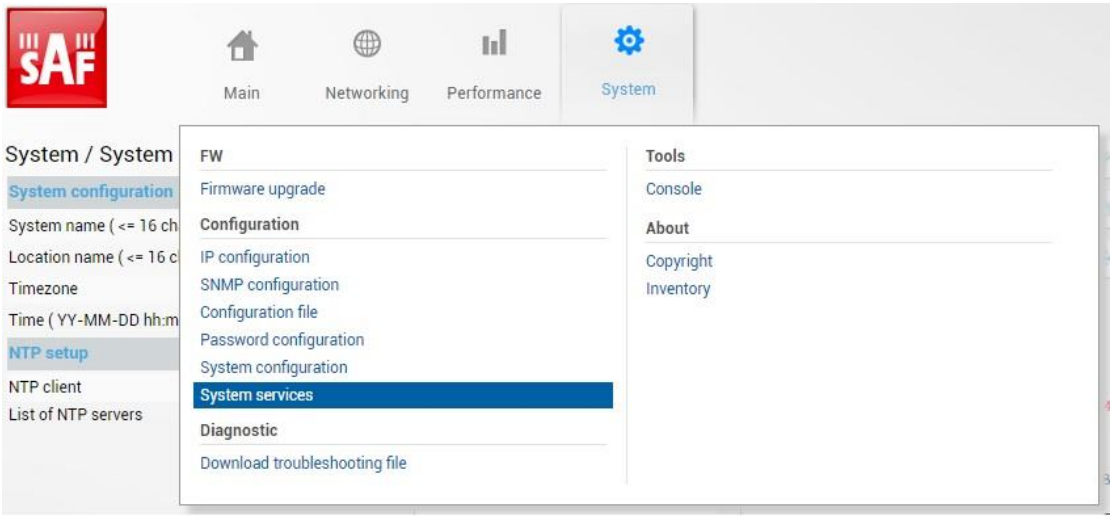
1) ***System name*** – Allows entering preferable system name. Maximum length of the system name cannot exceed 16 symbols. Default name is 'SAF'.
2) ***Location name*** – Allows entering preferable system location name. Maximum length of the location name cannot exceed 16 symbols. By default system location is not specified.
3) ***Timezone*** – Allows specifying GMT time zone.
4) ***Time (YY-MM-DD hh:mm:ss)*** – Allows changing system date and time manually by entering date and time in specific syntax.
5) ***Set local machine time*** – Press to force system to use the time set on your PC or laptop, from which you are connected to the Web GUI.
6) ***NTP client*** – Allows enabling or disabling NTP (Network Time Protocol) client.
7) ***List of NTP servers*** – Allows adding or deleting IP addresses of NTP servers.
8) ***Obtain time from NTP server*** – Press to force system to obtain the time from a NTP server.
9) By pressing *„Execute configuration"* changes made to the corresponding section apply only for the local side MXM Repeater.

CLI commands (***System → Tools → Console***)

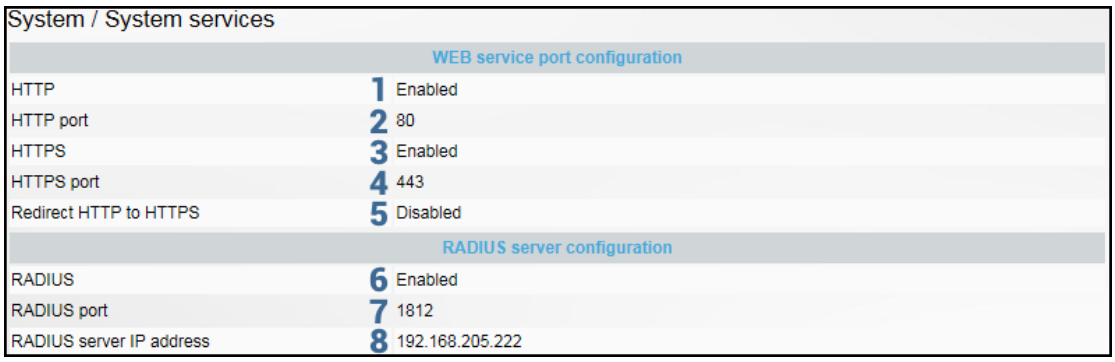
system datetime <datetime>	Use to enter system time and date. Use "YYYY-MM-DD/hh:mm:ss" syntax for date/time.
system name <name>	Use to define system name.
system location <location>	Use to define system location.
system uptime	Use to show system uptime since last system start.
system ntp status	Use to display NTP status.
system ntp <enable|disable>	Use to enable or disable NTP client.
system ntp server add <IP_address>	Use to add an IP address of a NTP server.
system ntp server remove <IP_address>	Use to remove an IP address of a NTP server.
system ntp server clear	Use to clear list of NTP servers.

system ntp timezone <-12:00 ... 14:00>	Use to specify GMT timezone.
system ntp sync	User to force system to obtain the time from a NTP server.

System → Configuration → System services

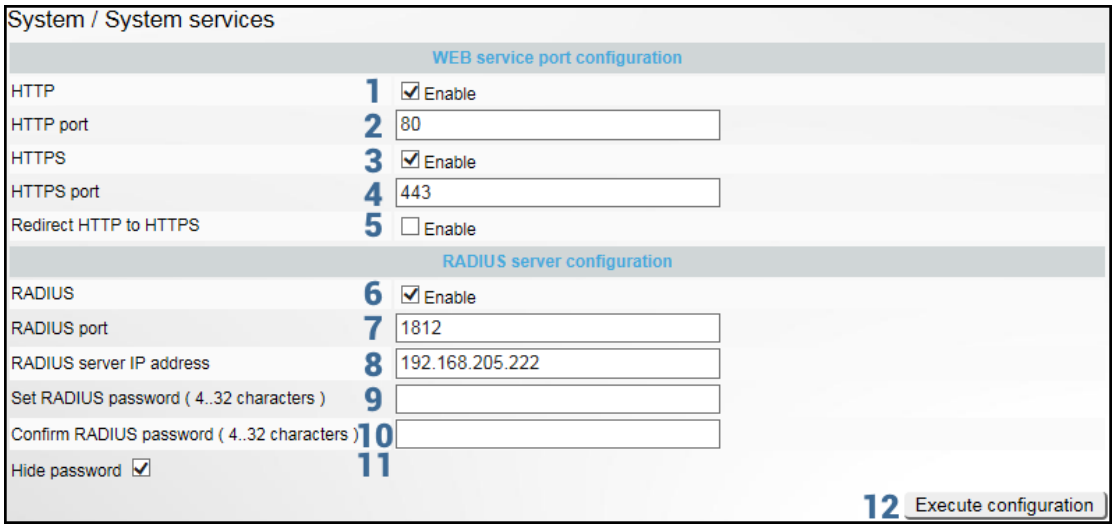


Status mode



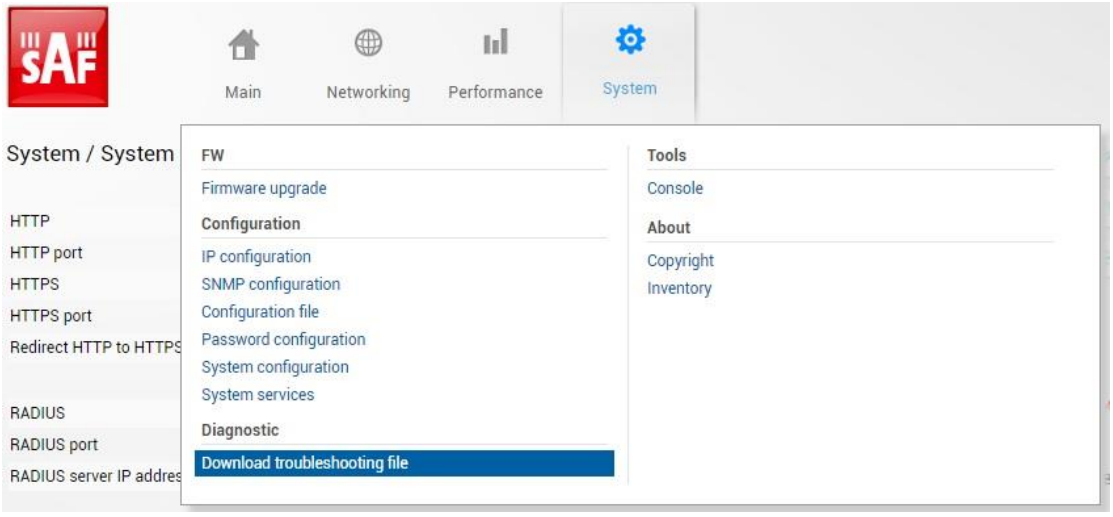
Press MODIFY button.

Modify mode



1) ***HTTP*** – Allows disabling or enabling HTTP access to Web GUI. By default HTTP access is enabled.
2) ***HTTP port*** – Allows specifying TCP port for Web GUI access via HTTP. By default TCP port 80 is defined.
3) ***HTTPS*** – Allows disabling or enabling HTTPS access to Web GUI. By default HTTPS access is enabled.
4) ***HTTPS port*** – Allows specifying TCP port for Web GUI access via HTTPS. By default TCP port 443 is defined.
5) ***Redirect HTTP to HTTPS*** – Allows enabling automatic redirect from HTTP to HTTPS.
6) ***RADIUS*** - Allows enabling or disabling RADIUS (Remote Authentication Dial In User Service). By default RADIUS is disabled.
7) ***RADIUS port*** – Allows specifying RADIUS port. By default port 1812 is defined.
8) ***RADIUS server IP address*** – Allows specifying RADIUS server IP address.
9) ***Set RADIUS password*** – Allows specifying RADIUS password.
10) ***Confirm RADIUS password*** – Allows confirming RADIUS password.
11) ***Hide password*** - Uncheck to display entered password in plaintext.
12) By pressing *„Execute configuration"* changes made to the corresponding section apply only for the local side MXM Repeater.

System → Diagnostic → Download troubleshooting file



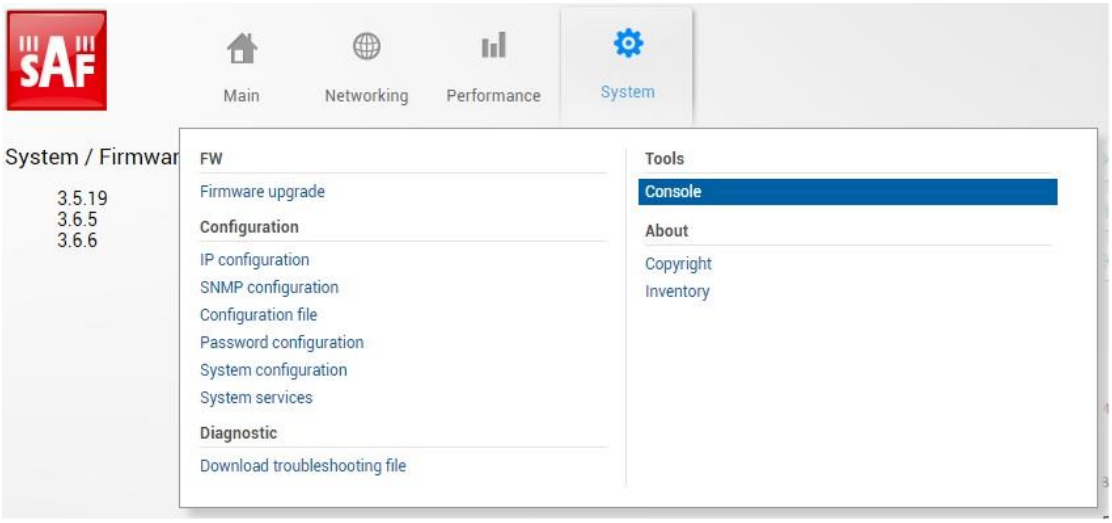
Clicking on the link will download troubleshooting file archive package to your hard disk drive ("Downloads" folder of your browser).

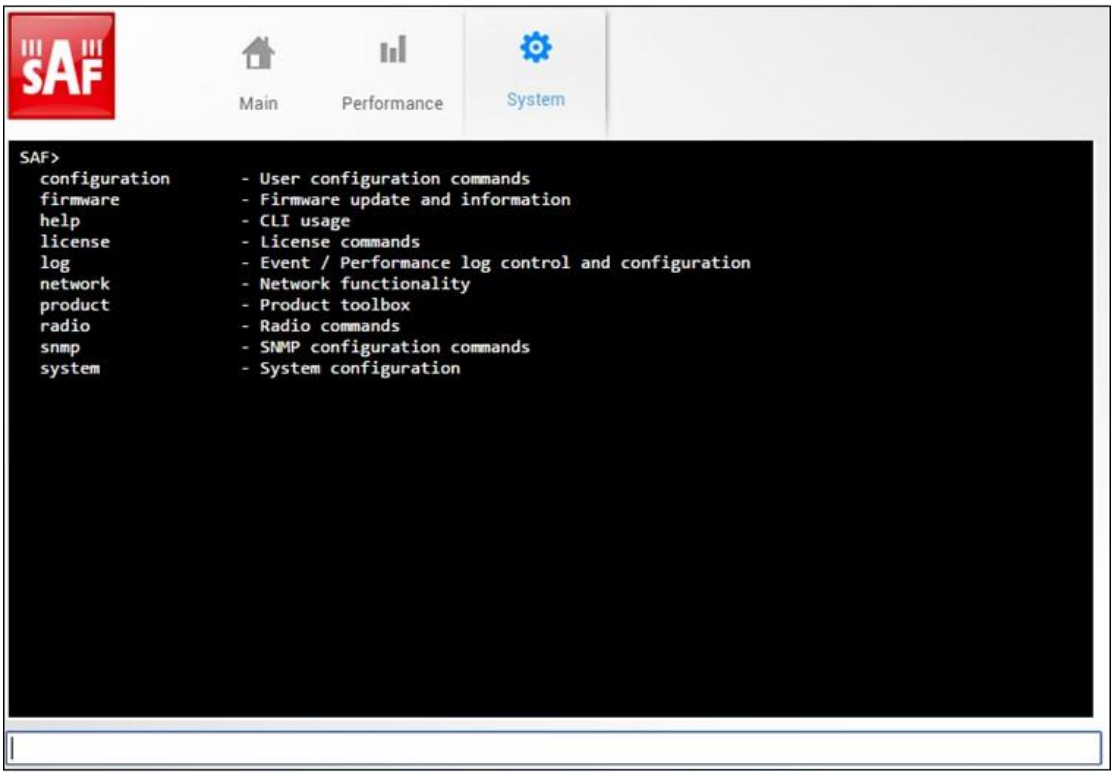
Contents:

config.txt	Saved system configuration file.
devel.tar	For debugging only
eventlog.txt	Alarm-event log file
Firmwares.html	Information on currently running firmware and stored firmware files
Perflog.xml	Performance log with maximum 1440 entries for 1, 15 and 60 minute intervals
Performance.html	Information on alarm status, alarm threshold and sensor configurations
Radio.html	Information on radio status, configuration and counters
SNMP.html	Information on SNMP v1/v2c/v3 configuration

System.html	Information on system configuration including Web services, RADIUS, IP address, user, NTP configuration and inventory info

System → Tools → Console





Console allows to access command line interface (CLI) for configuration of the MXM Repeater using commands. CLI commands are given in each Web GUI describing section of this document.

Use syntax "<command> ?" to see information on subcommands.

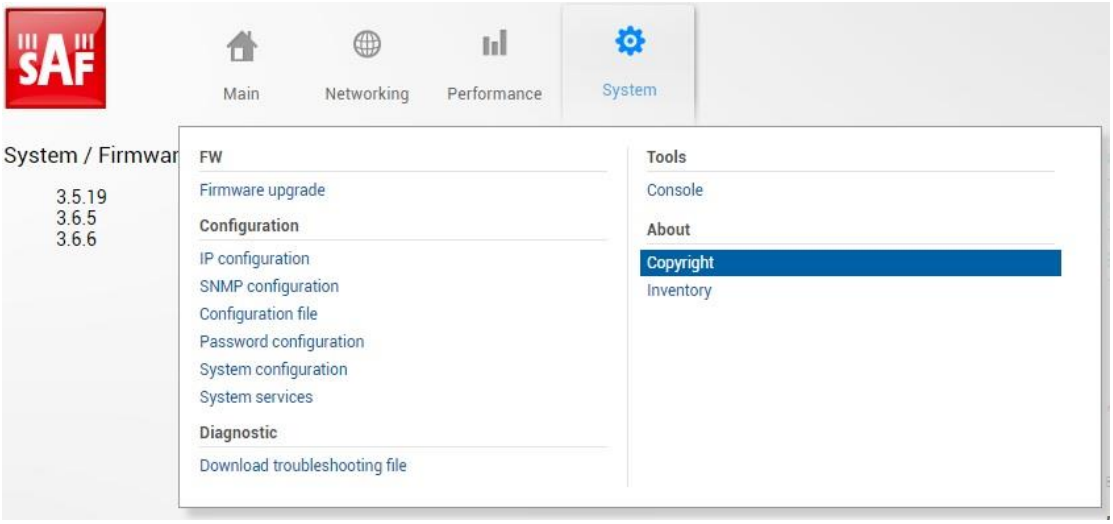
Use ↵ ENTER key to execute entered command.

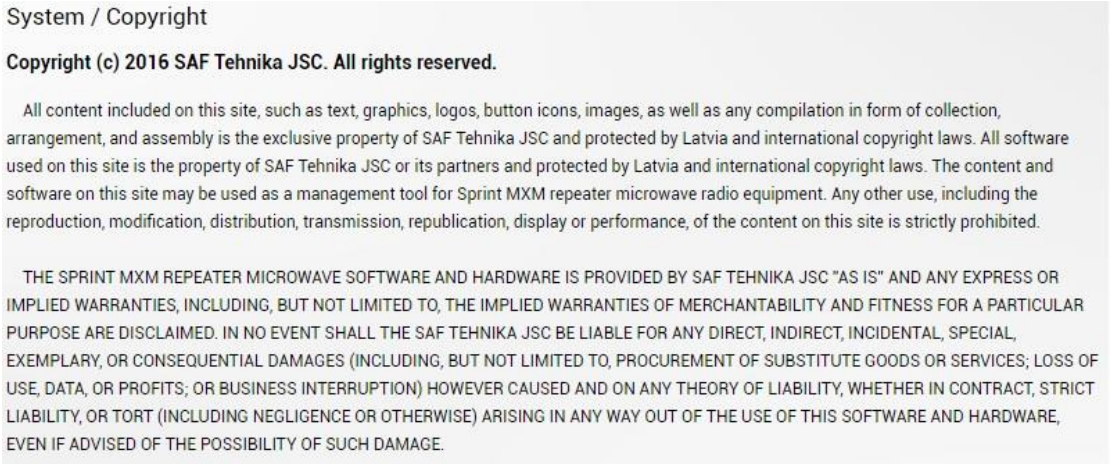
List of valid CLI commands can be found at the end of each Web GUI page description.

Refer to Chapter 4: COMMAND LINE INTERFACE for details how to connect to other CLI interfaces (serial, SSH, Telnet).

System → About → Copyright

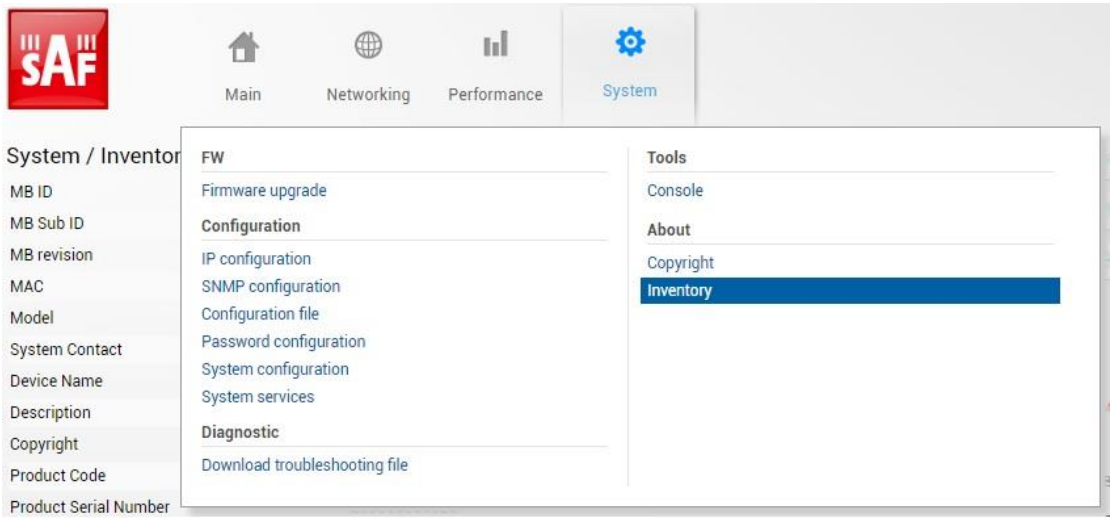
Displays copyright information.

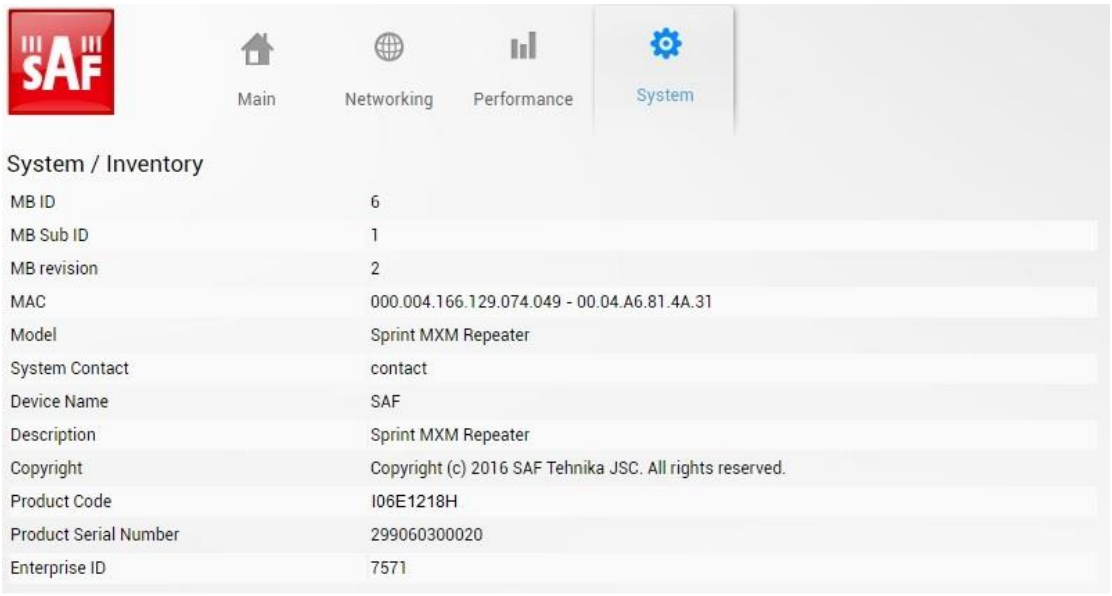




System → About → Inventory

Displays hardware related information.




Main
Networking
Performance
System
System / Inventory
MB ID 6
MB Sub ID 1
MB revision 2
MAC 000.004.166.129.074.049 - 00.04.A6.81.4A.31
Model Sprint MXM Repeater
System Contact contact
Device Name SAF
Description Sprint MXM Repeater
Copyright Copyright (c) 2016 SAF Tehnika JSC. All rights reserved.
Product Code I06E1218H
Product Serial Number 299060300020
Enterprise ID 7571

Chapter 4: COMMAND LINE INTERFACE

Command line interface (CLI) is available via 2 individual interfaces – Ethernet management port and RS-232 serial management port:

Following CLI accessing options are available:

- Secure Shell (SSH);
- Telnet;
- Serial terminal;
- Web GUI (System→Tools→Console, partial functionality)

The available CLI commands are found in "CLI commands" tables in appropriate Web GUI page sections in Chapter 3: WEB GUI.

For SSH, Telnet or serial connection you can use any client supporting according interfaces (e.g. PuTTY, Tera Term etc.).

CLI commands are not case sensitive.

A User can abbreviate commands and parameters as long as they contain enough letters to be distinguished from any other currently available commands or parameters.

Connecting to serial RS232 interface

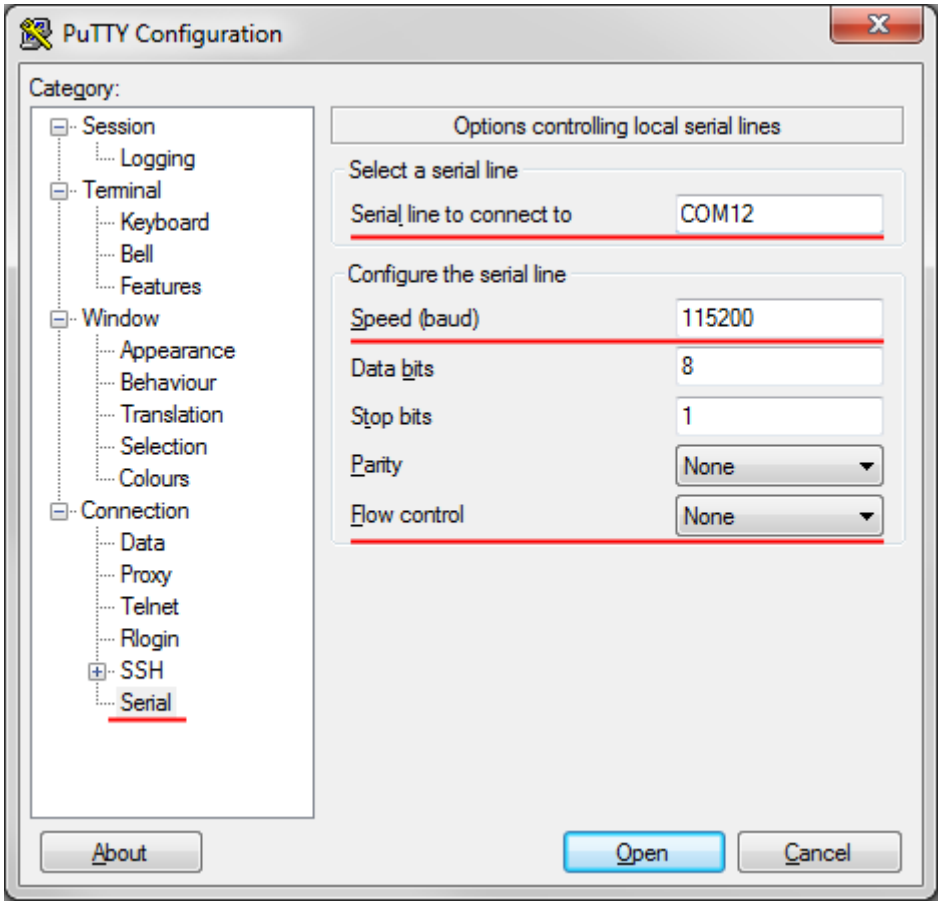
In order to connect to MXM Repeater serial terminal you will require serial Twin-BNC to DB9 cable. Please refer to Chapter 6: INTERFACES for pinouts.

To connect the PC to the RS232 management port, using serial terminal-emulation software (e.g. *PuTTY*), use the following parameters:

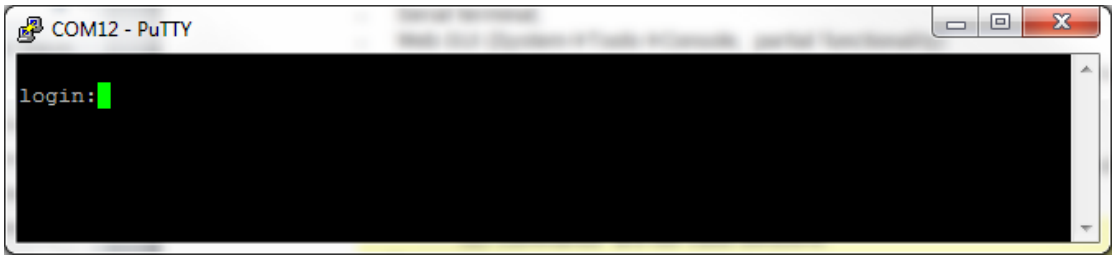
- Baud rate: 115200
- Data bits: 8
- Parity: None
- Stop bits: 1
- Data flow control: None

Below are connection steps with *PuTTY* - Windows freeware software.

1. Open *PuTTY* and go to "Serial" category. Specify your COM port number you will be using, change "Speed (baud)" to "115200" and "Flow control" to "None":



2. Press “Open” and after pressing “Enter” key following login dialog should appear:



3. Enter username and password. Default credentials are as follows:
   - login: **admin**
   - password: **changeme**

4. After successful login “SAF>” prompt should appear (if system name is default, otherwise prompt will differ):

5. Press “Ctrl+C” to log off from current session.

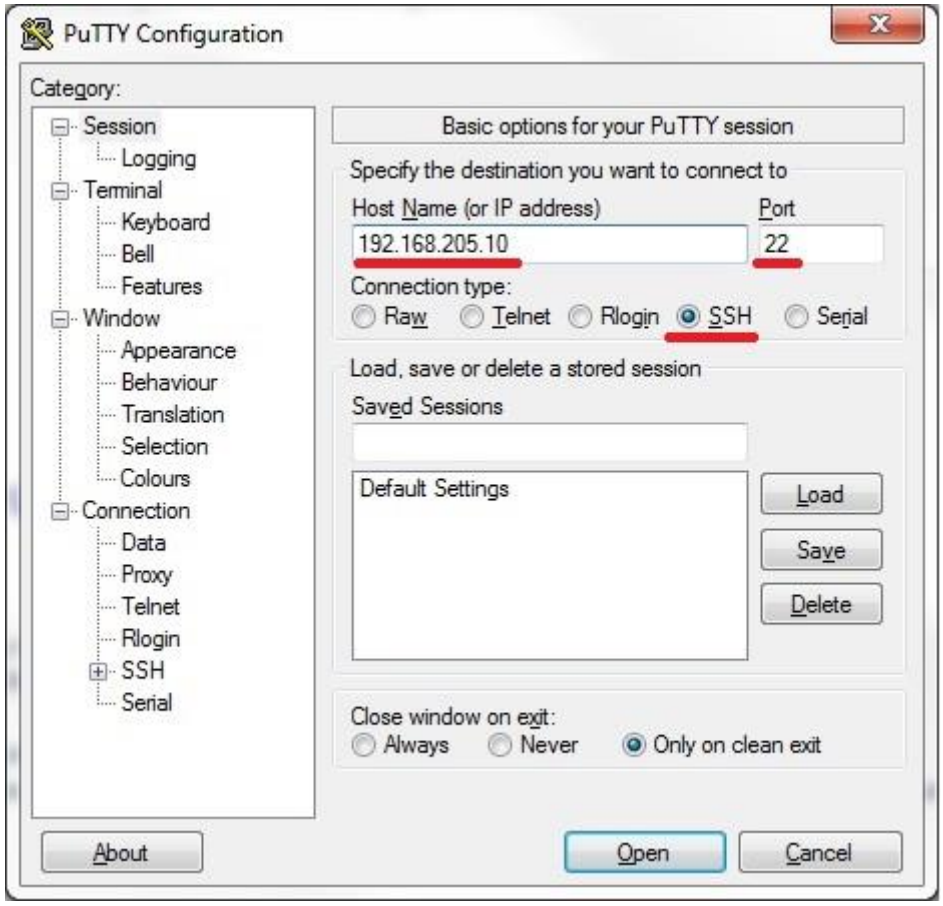
Closing *PuTTY* window does not log off from current serial terminal session.

Connecting to SSH

SSH connection to MXM Repeater radio unit is carried out using Ethernet management connection. Please refer to Chapter "Ethernet management connection configuration" for Ethernet management port connection details.

You can use any SSH client. Below are connection steps with *PuTTY* - Windows freeware software.

1. Open *PuTTY*, choose "Connection Type": "SSH", enter IP address and make sure that correct port number is used ("22" by default):



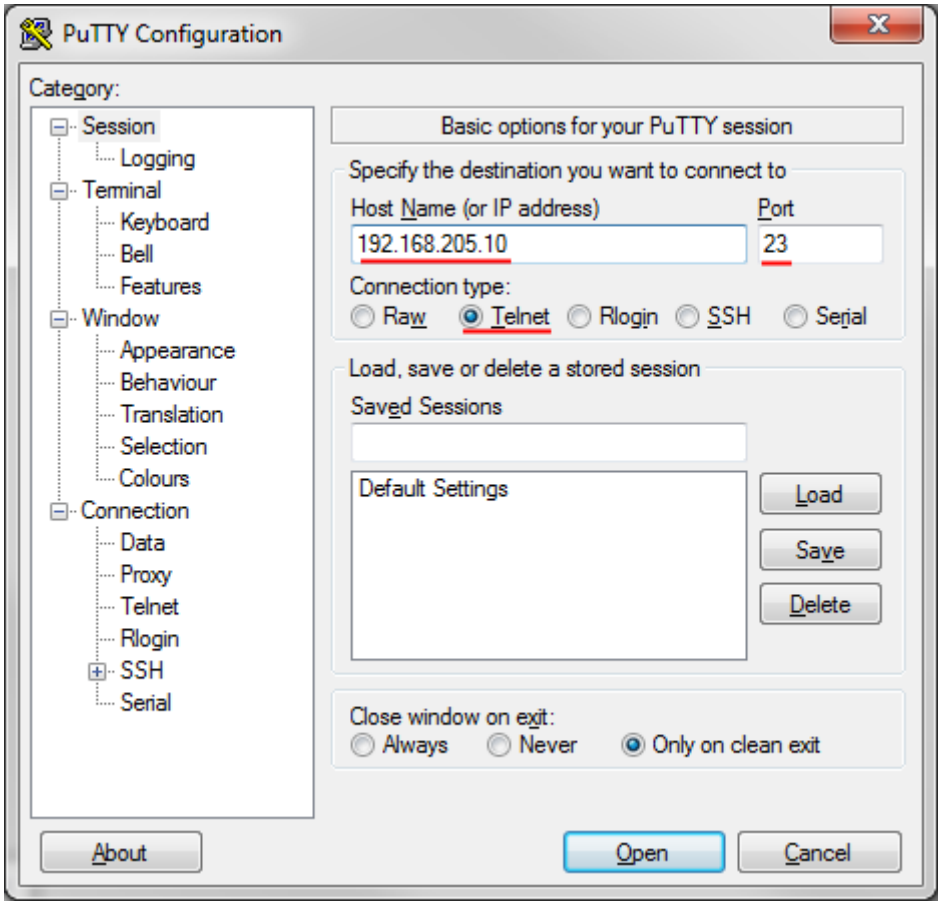
2. Press "Open", enter login credentials (default user name is *admin* and password - *changeme*). After successful login following prompt should appear:

Connecting to Telnet

Telnet connection to MXM Repeater radio unit is carried out using Ethernet management connection. Please refer to Chapter "Ethernet management connection configuration" for Ethernet management port connection details.

You can use any Telnet client. Below are connection steps with *PuTTY* - Windows freeware software.

1. Open *PuTTY*, choose "Connection Type": "Telnet", enter IP address and make sure that correct port number is used ("23" by default):



2. Press "Open", enter login credentials (default user name is *admin* and password - *changeme*). After successful login following prompt should appear:

Chapter 5: TOOLS

Link Layer Discovery tool

Link Layer Discovery (LLD) tool is a command line application for Microsoft Windows operating systems. This feature allows gathering information from connected MXM Repeater radio units. The tool discovers the IP address and inventory data of connected MXM Repeater radio unit. Additionally, it is possible to reset username/password, management IP address, to perform hardware reboot, factory reset and to store configuration with this tool if it is not possible to do via web GUI or serial command line.

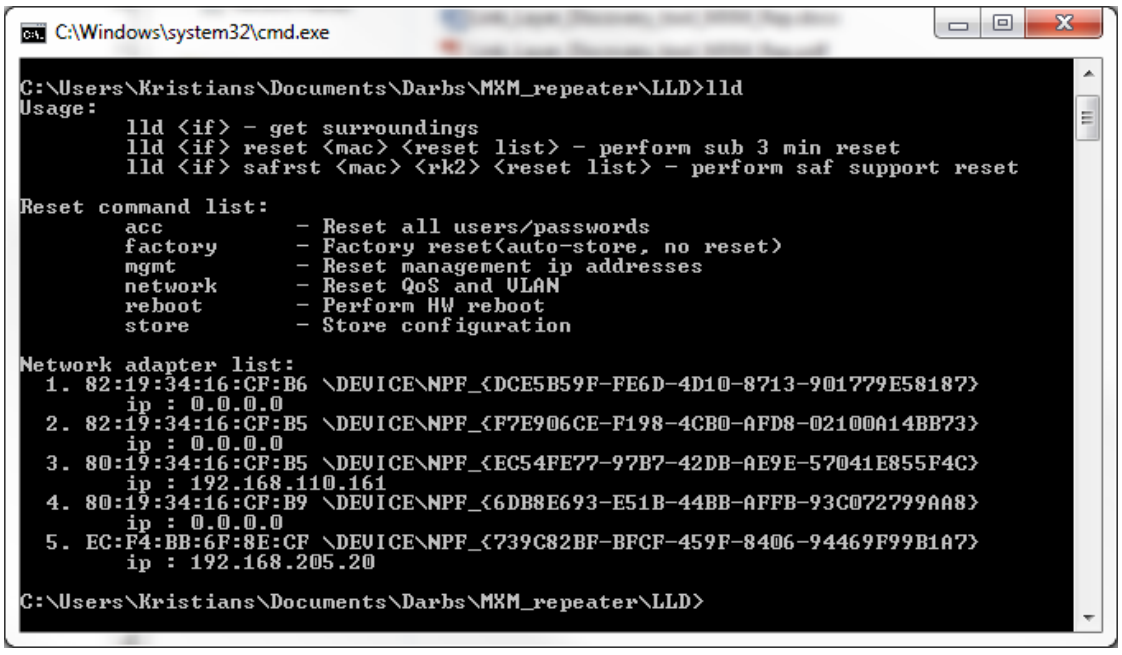
It sends requests to Link Layer Discovery server application which runs on all MXM Repeater radios.

WinPCAP must be installed on the PC

MXM Repeater discovery procedure

In order to discover the IP address, MAC address and inventory information of MXM Repeater radio unit proceed with the following steps:

- Connect your PC to MXM Repeater radio unit
- Download Link Layer Discovery tool (available from saftehnika.com webpage in **„Support→Downloads→Support→Tools”** section (registration required) or can be provided by SAF techsupport)
- Open the cmd window on your PC (Go to "Start->Run.." and enter "cmd")
- Navigate to the folder containing previously downloaded and unzipped Link Layer Discovery tool using “cd” command
- Run Link Layer Discovery tool by typing “lld” and pressing ENTER. Available commands and network adapter list will be displayed:

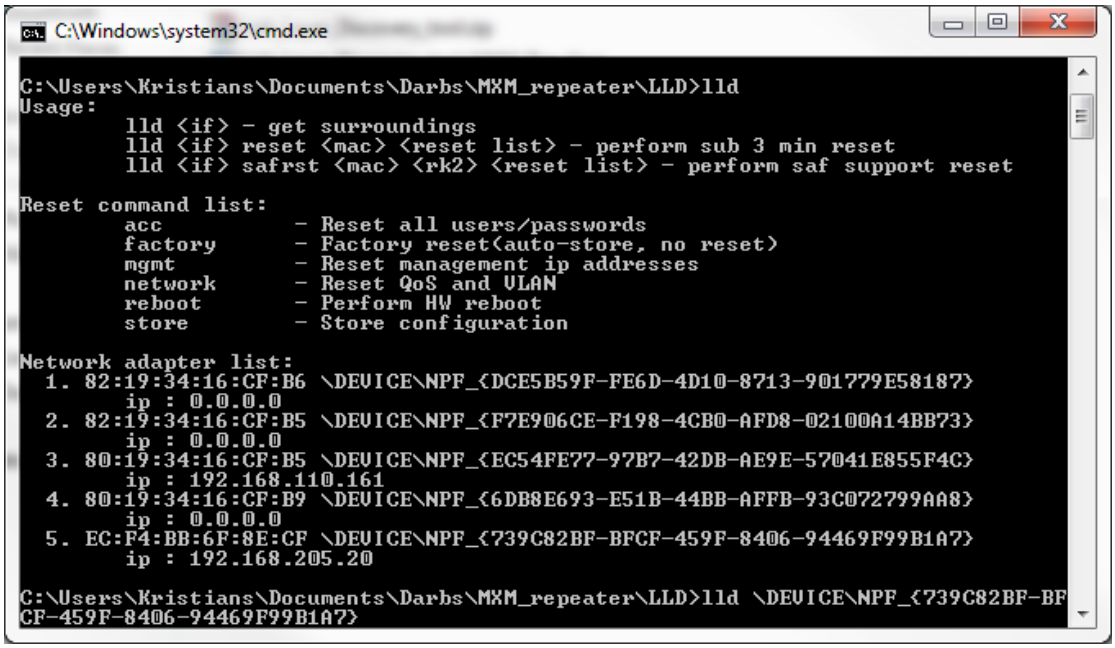


- To discover MXM Repeater device following command must be entered: lld <network interface>, where <network interface> is the Network interface of PC connected to the

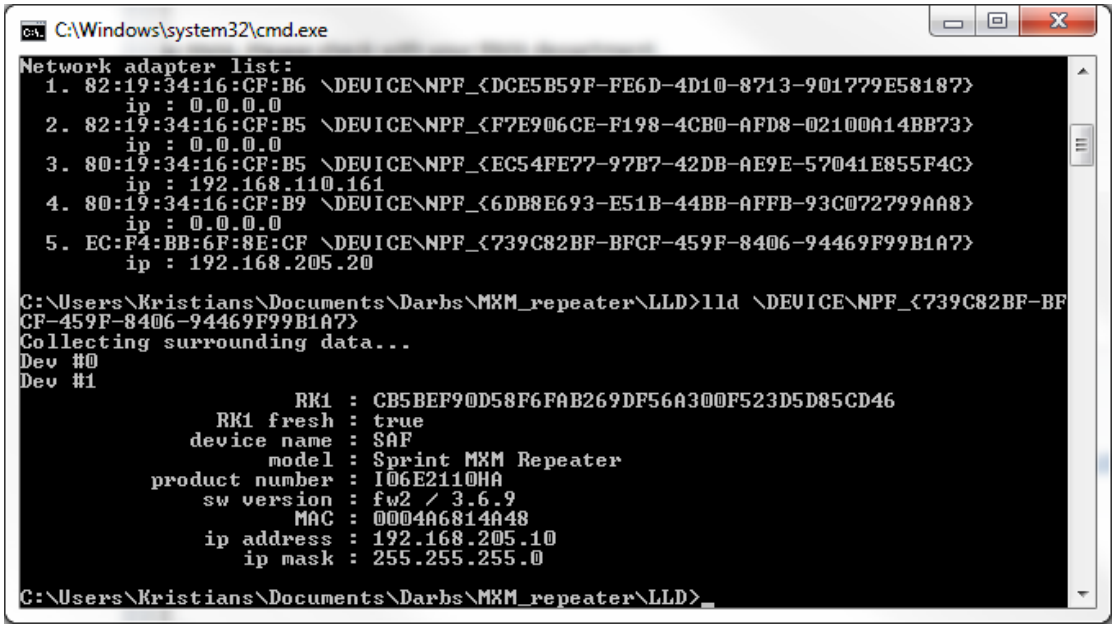
MXM repeater or to the network for discovering the MXM Repeater unit. Choose it from the network adapter list. Example: lld \DEVICE\NPF_{739C82BF-BFCF-459F-8406-94469F99B1A7}

"Network interface" name will be easier to enter by using copy/paste option:

- click the right mouse button over the console and select "Mark",
- then by holding the left button select the interface address,
- Paste it by clicking the right button on the command line after typing "lld" and selecting "Paste"



- Available devices and its information will appear in the console after pressing ENTER:



Link Layer Discovery tool commands	
Command	**Description**
lld	Use to run Link Layer Discovery (LLD) tool. It will display available commands and network adapter list
lld <network interface>	Use to scan and discover MXM Repeater devices. <network interface> is the PC's network interface connected to the MXM Repeater locally or remotely
lld <network interface> reset <MAC_addr> acc	Use to reset all users/passwords of MXM Repeater. <MAC_addr> is the MAC address of the MXM Repeater
lld <network interface> reset <MAC_addr> factory	Use to perform factory reset of MXM Repeater.
lld <network interface> reset <MAC_addr> mgmt	Use to reset management IP address of MXM Repeater
lld <network interface> reset <MAC_addr> reboot	Use to perform hardware reboot for MXM Repeater
lld <network interface> reset <MAC_addr> store	Use to store configuration

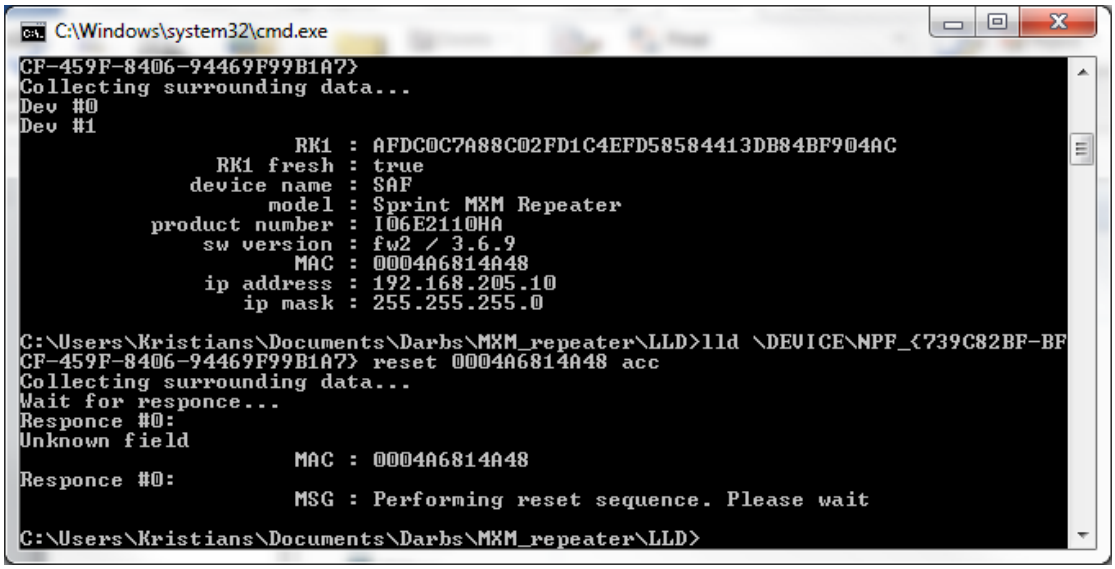
MXM Repeater resetting procedure

In order to reset username/password or management IP address, or to perform factory reset or hardware reboot for MXM Repeater unit proceed with the following steps:

- Power-cycle the MXM Repeater unit by disconnecting power supply
- Resetting procedure can be performed during 3 minutes after MXM Repeater reboot. It is indicated as value "RK1 fresh: true" in inventory information which is displayed during MXM Repeater discovery procedure as described above. Resetting procedure will not be possible if value "RK1 fresh" will be indicated as "false" (RK1 fresh: false)

- Use the MAC address of MXM Repeater with the reset command to reset the device. MAC address is shown in inventory information

- While value “RK1 fresh: true” enter command for resetting MXM Repeater: lld <network interface> reset <MAC_addr> <reset command>, where <MAC_addr> is MAC address of particular MXM Repeater unit, and <reset command> is one of commands given in the Link Layer Discovery tool command’s table above. The example of command which resets username/password and successful result is shown in the following screenshot:



MIB files

Relevant MIB files can be downloaded directly from MXM Repeater Web GUI. See Chapter “System → Configuration → SNMP configuration” for further details.

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