User manual

Integra

Integra-S

Integra-G

Integra-GS

VER 2.37

FW 3.20.19

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

FODU does not contain serviceable parts. Warranty will not be applicable in the event FODU 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. The 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 the receiver.
- Connect the equipment to an outlet on a circuit different from the one connected to the receiver.
- Consult the dealer or an experienced radio/TV technician for help.

This device complies with Industry Canada license-exempt RSS standard(s). The 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.

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Chapter 1: OVERVIEW

Labeling

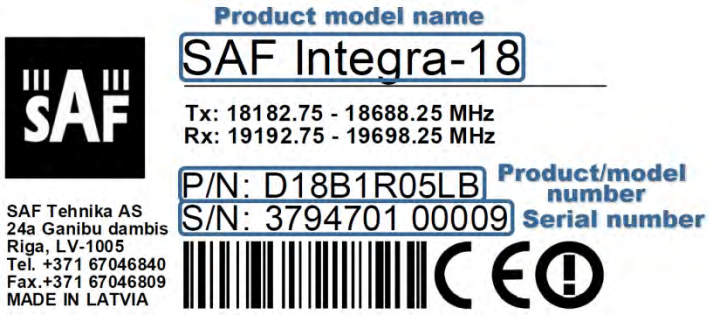
The label contains the following information (see samples in the picture below):

Product model name ("SAF Integra-18"). The FODU model name example is:

- SAF Integra-18 for Integra 18GHz FODU,
- SAF Integra-GS-23 for Integra-GS 23GHz FODU, etc

Product Number / Model Number (P/N or M/N) (D18B1R05LB): product/model number contains various information about the unit. Please see the translation below.

Serial Number (3794701 00009): the serial number uniquely identifies the unit.



P/N or M/N translation:

"**D**" designates Integra series product;

"**18**" designates the frequency band (18 GHz) of the radio;

"**B**" designates Integra/Integra-S product type;

- "**G**" - designates Integra-G/Integra-GS product type;

"**1**" designates 1ft antenna diameter and ETSI Class 3;

- "**0**" - <1ft (20cm) antenna diameter and ETSI Class 3;
- "**2**" - 2ft antenna diameter and ETSI Class 3;
- "**3**" - 3ft antenna diameter and ETSI Class 3;
- "**4**" - 4ft antenna diameter and ETSI Class 3;
- "**5**" - <1ft (20cm) antenna diameter and ETSI Class 4;
- "**6**" - 1ft antenna diameter and ETSI Class 4;
- "**7**" - 2ft antenna diameter and ETSI Class 4;
- "**8**" - 3ft antenna diameter and ETSI Class 4;
- "**9**" - 4ft antenna diameter and ETSI Class 4;
- "**S**" - split-mount, without an integrated antenna.

"**R**" designates Integra with full capacity license;

- "**N**" - 10 Mbps Basic License;
- "**L**" - 100 Mbps Basic License;
- "**K**" - 220 Mbps Basic License;
- "**X**" - without AES encryption

"**05**" designates the version number of the radio;

"**L**" designates low side radio;

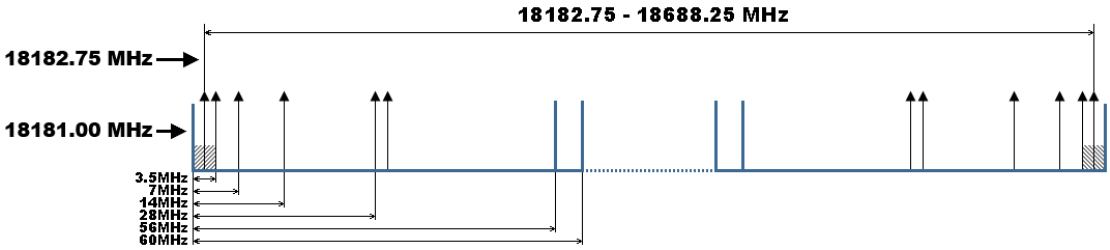
- "**H**" - high side radio

"**B**" designates B subband radio;

- "**A**" - A subband radio;
- "**C**" - C subband radio

Please note that the frequency range is set from the central frequency of the first 3.5 MHz channel to the central frequency of the last 3.5 MHz channel (see the diagram below).

The frequency range of subband B low side Integra 18 GHz FODU:

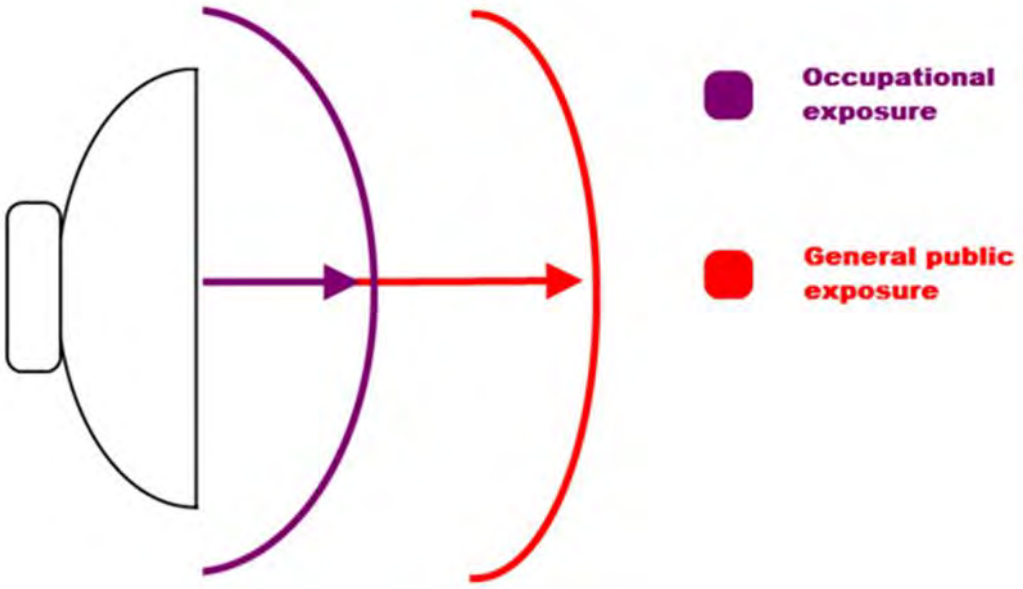


The minimum available bandwidth is 1.75 MHz*

* Inquire SAF representative for more information

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 2.2-1, the guidelines (Tables 6 and 7) 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.



ICNIRP Reference levels

Frequency range	Exposure characteristics	Equivalent plane wave power density Seq (W/m2)	Average time period (min)
5.8 GHz	occupational 458 cm (181 in)	50	$68/f^{1.05}$ (f in GHz)
	general public 1025 cm (404 in)	10	$68/f^{1.05}$ (f in GHz)
24 GHz	occupational 41 cm (16 in)	50	$68/f^{1.05}$ (f in GHz)
	general public 91 cm (36 in)	10	$68/f^{1.05}$ (f in GHz)

Note: For pulsed signals, it is suggested that the peak equivalent plane wave power density, as averaged over the pulse width, does not exceed 1000 times the Seq exposure levels given in the table.
Note: Within the frequency range the 10 – 300 GHz the basic restrictions are identical to the reference levels.
Remarks on the definition of basic restrictions:
1. Power densities are to be averaged over any 20 cm^2 of exposed area and any 68/f1.05 minute period (where f is in GHz) to compensate for progressively shorter penetration depth as the frequency increases.

2. Spatial maximum power densities, averaged over 1 cm^2, should not exceed 20 times the values above.

Compared to the ICNIRP restrictions, FCC CFR 47 and ISED (Canada) specifies the Maximum Permissible Exposure (MPE) levels for the occupational/controlled environment and general public/uncontrolled environment, as shown in the table below.

FCC MPE limits

Frequency range	Exposure characteristics	Equivalent plane wave power density Seq (W/m2)	Average time period (min)
5.8 GHz	occupational 458 cm (181 in)	f/300	6
	general public 1025 cm (404 in)	f/1500	30
24 GHz	occupational 41 cm (16 in)	50	6
	general public 91 cm (36 in)	10	30

ISED (Canada) MPE limits

Frequency range	Exposure characteristics	Equivalent plane wave power density Seq (W/m2)	Average time period (min)
5.8 GHz	occupational 464 cm (183 in)	$0.6455f^{0.5}$	6
	general public 1041 cm (410 in)	$0.02619f^{0.6834}$	30

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

- 1999/519/EC: Council Recommendation of July 12, 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)´

Integra-G 24 GHz FCC & IC IDs

Integra-G 24 GHz:
FCC ID: W9Z-INTEGRA24
IC ID: 8855A-INTEGRA24

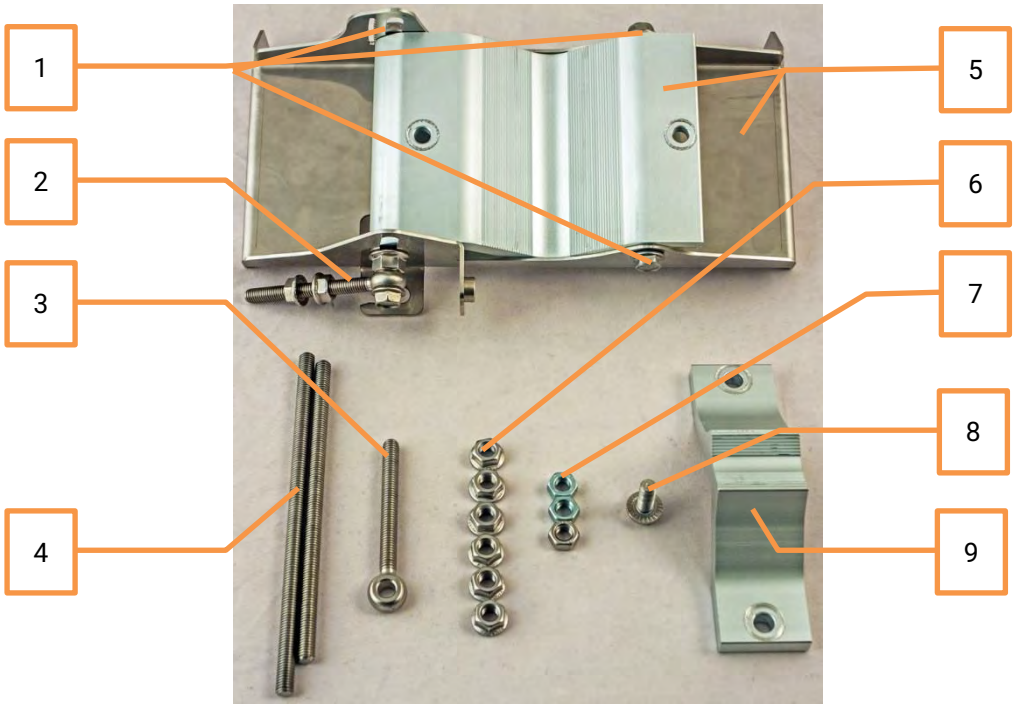
Chapter 2: INSTALLATION

Package contents

Integra/Integra-G	Integra-S/Integra-GS
- Integra FODU D**B1*****, D**B2*****, D**G1***** or D**G2*****, - Mounting bracket D0SPKR02 - Locking key for Integra D0ALK001 - Kit of replacement parts D0AZIP01 - RJ-45 connector 8P shield solid FOACNR02 - Installation manual D0DB2RM1	- Integra D**BS***** or D**GS***** - Locking key for Integra-S D0ALK002 - RJ-45 connector 8P shield solid FOACNR02 - Installation manual D0DBSRM1

Integra/Integra-G FODU: assembling mounting bracket and installing with an antenna on a pole

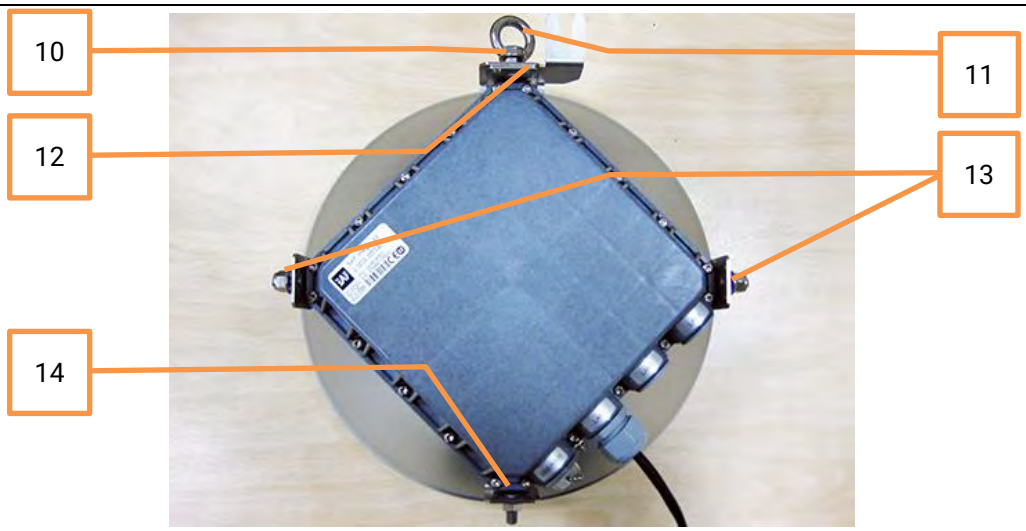
Disassembled mounting bracket and tools required for assembly



Parts of the disassembled mounting bracket

#	Parts of the disassembled mounting bracket
1	Three M8x1.25x16 hex flange bolts are already attached to clamps for housing and pipe [5]
2	One hex flange bolt M8x1.25x30, one M10x1.5 hex flange nut, and one M8x80 eye screw are already attached to clamps for housing and pipe [5]
3	One M8x80 eye screw

4	M8x160 and M8x130 threaded rods
5	Clamps for housing and pipe interconnected with three M8x1.25x16 hex flange bolts [1] and an eye screw for horizontal alignment [2]
6	Six M8x1.25 hex flange nuts
7	Three M8x1.25 hex nuts
8	One hex flange bolt M8x1.25x20
9	Mounting bracket clamp



#	Parts of Integra/Integra-G FODU
10	Spacer hex flange nut
11	Lifting eye nut
12	Fixation plate
13	Side screw flange nuts
14	Grounding flange nut

The numbers of the mounting bracket and Integra/Integra-G FODU parts in the next sections will be mentioned in square brackets [ ].

Changing the polarization of Integra/Integra-G FODU and antenna

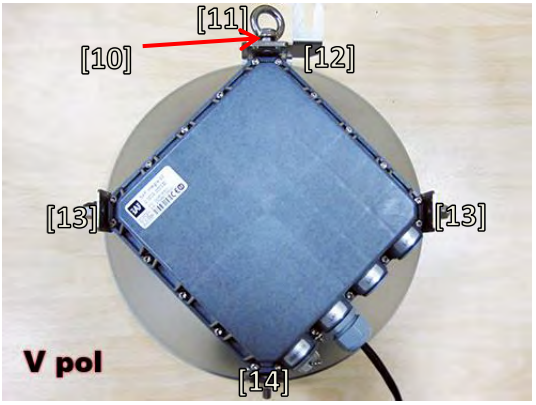
Tools required: 13mm (0.512”) wrench (comes in the package)

The default polarization for licensed frequency band radios is vertical.

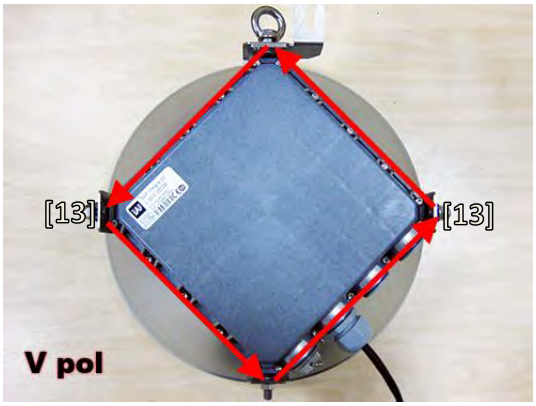
Integra series 17/24GHz FODUs should be installed in opposite polarizations.

By default, Integra series 17/24GHz FODU radios are shipped with opposite polarizations pre-installed for low and high side units.

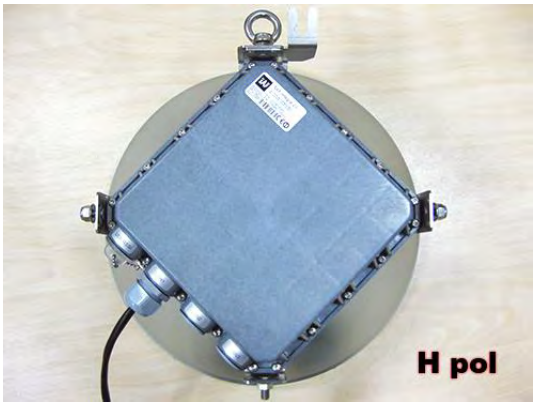
1 Remove Integra/Integra-G FODU with an antenna from the mounting bracket.
The default polarization is vertical.



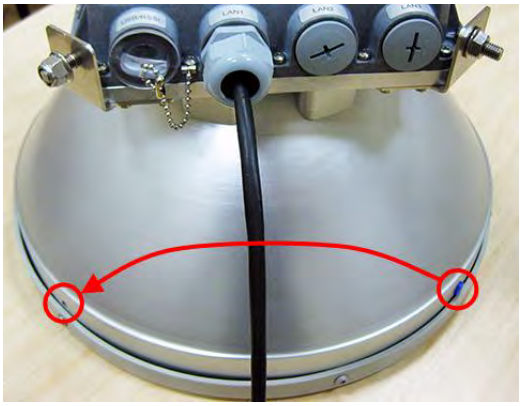
2 Using 13mm wrench remove indicated nuts and fixation plate [10, 11, 12, 13, 14].



3 Removed parts must be attached back with a 90-degree offset (see above). The gap between side screw flange nuts [13] and fastening angles should be 5mm.



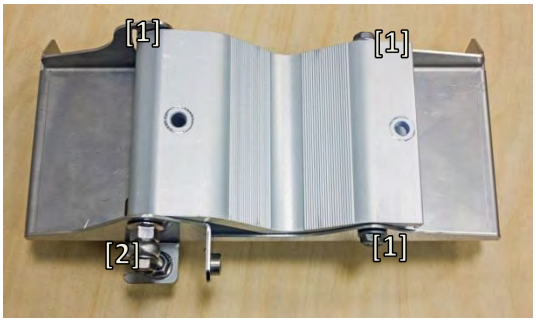
4 View of Integra/Integra-G FODU with swapped polarization.



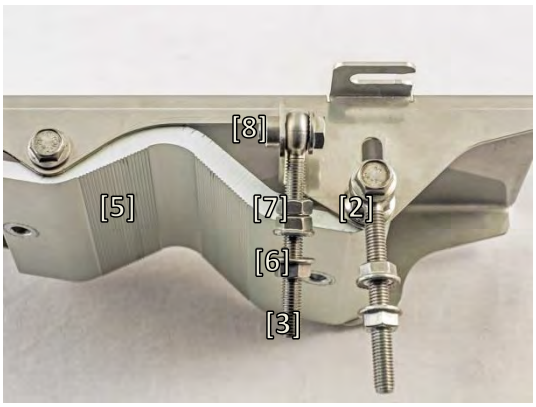
5 When polarization is changed, make sure that the drain hole cap located at the grounding flange nut is removed and inserted into the previous drain hole.

Assembly procedure

Tools required: 13mm (0.512”) wrench (comes in the package)

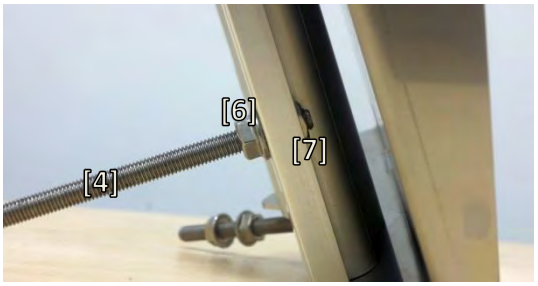


1 Using a 13mm wrench slightly loosen three hex flange bolts [1] and hex flange bolt, nut, and eye screw [2] interconnecting clamps for housing and pipe [5].

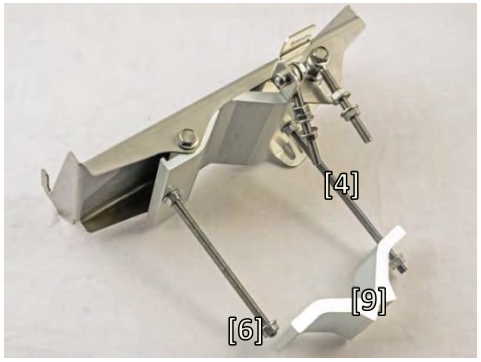


2 Attach vertical alignment eye screw [3] to clamps for housing and pipe [5] using hex flange bolt [8] and screw on one hex nut [7] and two hex flange nuts [6]. Make sure that both eye screws are positioned as shown in the image (turned to the back side of the clamps). The gap between each two flange nuts on eye screws should be 15..20mm (0.6..0.8 in.). Do not tighten both hex flange bolts [8] and [2].

3 Screw one hex flange nut [6] on each of the threaded rods [4]. Note that flange nuts should be screwed on exposing approx. 20mm (0.8 in.) of threaded rods.

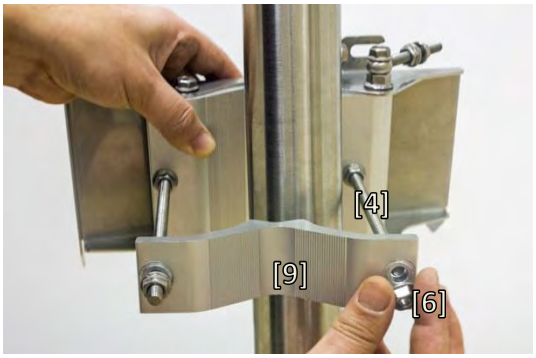


4 Insert both threaded bolts into two available holes of the mounting clamp. Put hex nuts [7] on the other side of the clamp and screw on the threaded bolts until it is visible from the other side of the clamp no more than 2mm. Tighten hex flange nuts [6] with torsion 20...25 N·m.



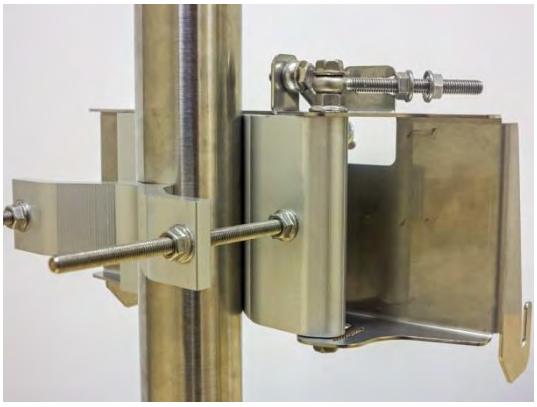
5 Attach the mounting bracket clamp [9] on the longest threaded rod [4] as shown in the picture and afterward screw on the remaining two hex flange nuts [6] on both threaded rods. No parts should remain unassembled.

Bracket clamps in the following position support mast ø 55..120mm. Reversing clamps allow support of smaller masts ø 25..75mm.



6 Unscrew the hex flange nut [6] from the shortest threaded rod [4]. Make sure that hex flange nuts on the longest threaded rod are not too far; otherwise, adjust the nut’s position accordingly. Put another end of the mounting bracket clamp [9] on the free threaded rod and screw on the hex flange nut.

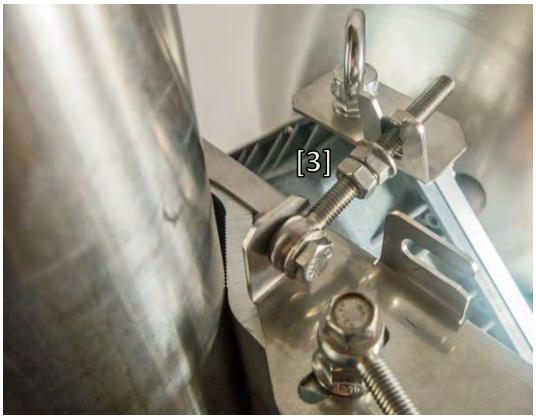
7 Hex flange nuts should be evenly aligned on threaded bolts so that the mounting bracket clamp [9] is tightly attached to the pipe. Tighten hex flange nuts with torsion not exceeding 20 N·m.



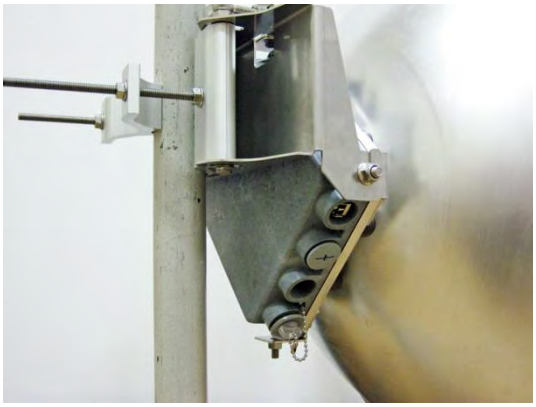
8 View of the assembled mounting bracket on the mast pole.

9 Make sure that both horizontal and vertical alignment eye screws are turned to the mast before attaching Integra/Integra-G FODU.

10 Attach Integra/Integra-G FODU with the antenna to the mounting bracket so that side screws fit into the grooves of the housing clamp [5].



11 Connect the vertical alignment eye screw [3] to the upper groove on Integra/Integra-G housing.



12 View of the assembled bracket on the mast pole with Integra/Integra-G FODU attached and secured.

It is recommended to protect the installed radio from direct sunlight.

Antenna alignment

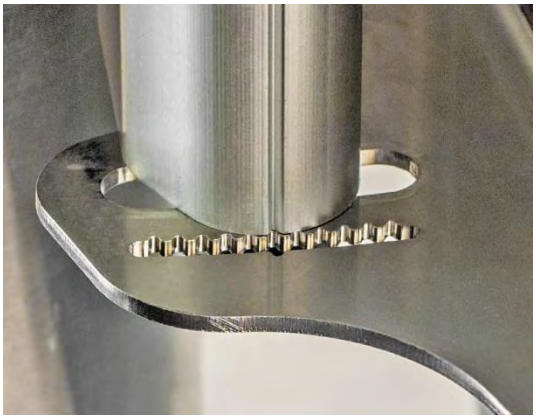
Tools required: 13mm (0.512”) wrench (comes in the package)

1 Before aligning the antenna, make sure that screws marked with red dots on the right side view of the mounting bracket are loosened - hex flange nuts and bolts of azimuth and elevation eye screws, right side screw on Integra/Integra-G FODU, and hex flange bolt on azimuth angle indicator.

2 Additionally loosen the following screws marked with red dots on the left side view of the mounting bracket: the left side screw on Integra/Integra-G FODU and two hex flange bolts between both mounting bracket clamps for housing and pipe.

3 For initial alignment make sure that elevation is approximately at zero degrees angle by adjusting hex flange nuts [9] on the vertical alignment eye screw so that Integra/Integra-G housing is parallel with the bracket.

4 Adjust the azimuth angle by manually moving the mounting bracket in the horizontal axis. Note that all azimuth position fixing hex flange bolts, as well as the horizontal alignment eye screw with flange bolts need to be loosened ensuring free movement in the horizontal axis.



5 Each notch corresponds to one degree of azimuth angle. The half distance between notches (each lip) corresponds to 0.5 degrees.

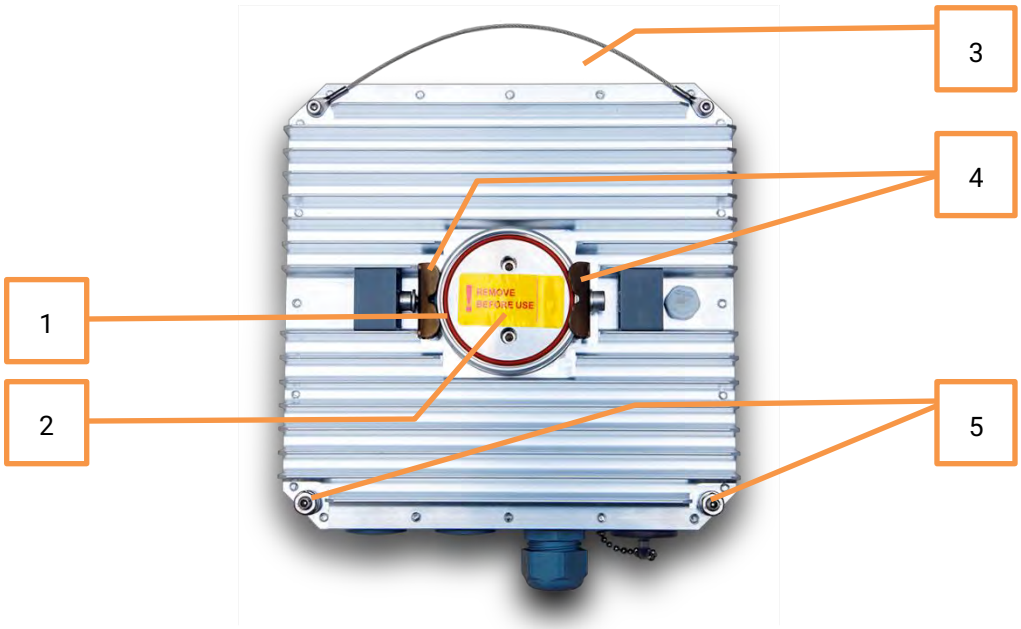
6 Fix the azimuth angle on the horizontal axis by adjusting the position of flange nuts [6] on both horizontal and vertical alignment eye screws.

7 When alignment is finished tighten screws marked with red dots on the right side view of the mounting bracket: hex flange nuts and bolts of azimuth and elevation eye screws, right side screw on Integra FODU, and hex flange bolt on azimuth angle indicator with torsion 20...25 N·m.

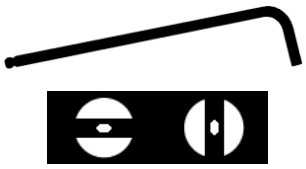
8 Additionally tighten the following screws marked with red dots on the left side view of the mounting bracket: the left side screw on Integra/Integra-G FODU and two hex flange bolts between both mounting bracket clamps for housing and pipe with torsion 20...25 N·m.

Integra-S/Integra-GS 15-42GHz* FODU: attaching to the antenna

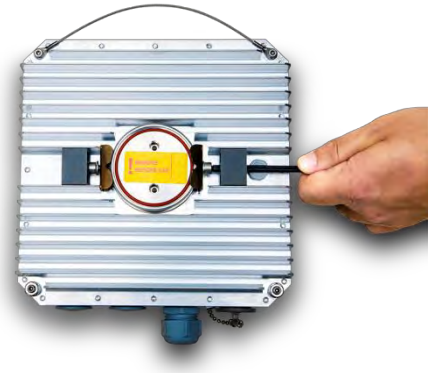
Parts of Integra-S/Integra-GS FODU: **1** – O-ring; **2** – flange protecting sticker; **3** – wire handle; **4** – fixation clamps; **5** – grounding screws.



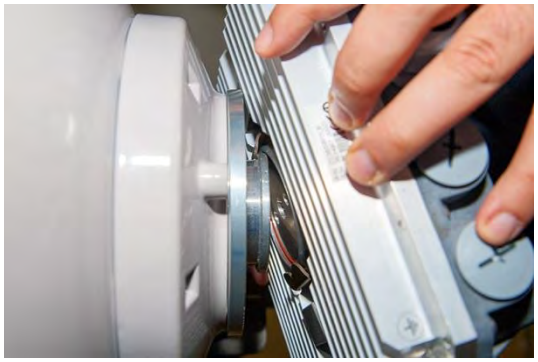
Tools required: Size 5 Allen wrench



Level (not supplied)



1 Using a size 5 allen wrench loosen one clamp completely and the second clamp by a half-turn.



2 Put Integra-S/Integra-GS on the antenna adapter flange by hooking a half-turn loosened clamp at the top and leaving the completely loosened clamp at the bottom. Make sure the O-ring is in place and the adapter flange fits into the Integra-S/Integra-GS transition flange socket.

Note! The protective sticker should be removed before attaching the Integra-S/Integra-GS FODU to the antenna.

3 Secure the interconnection by tightening the bottom clamp (not fully). Make sure rotation of the Integra-S/Integra-GS is still possible.

4 Rotate Integra-S/Integra-GS to match the required polarization.

5 The sticker on the back lid indicates the polarization of the Integra-S/Integra-GS. Adjust polarization so that the interface ports are located at the lower side of the Integra-S/Integra-GS.

6 Verify polarization accuracy with a level, by placing it on the top edge of the Integra-S/Integra-GS housing

7 Secure the position of Integra-S/Integra-GS by fully tightening both fixation clamps.

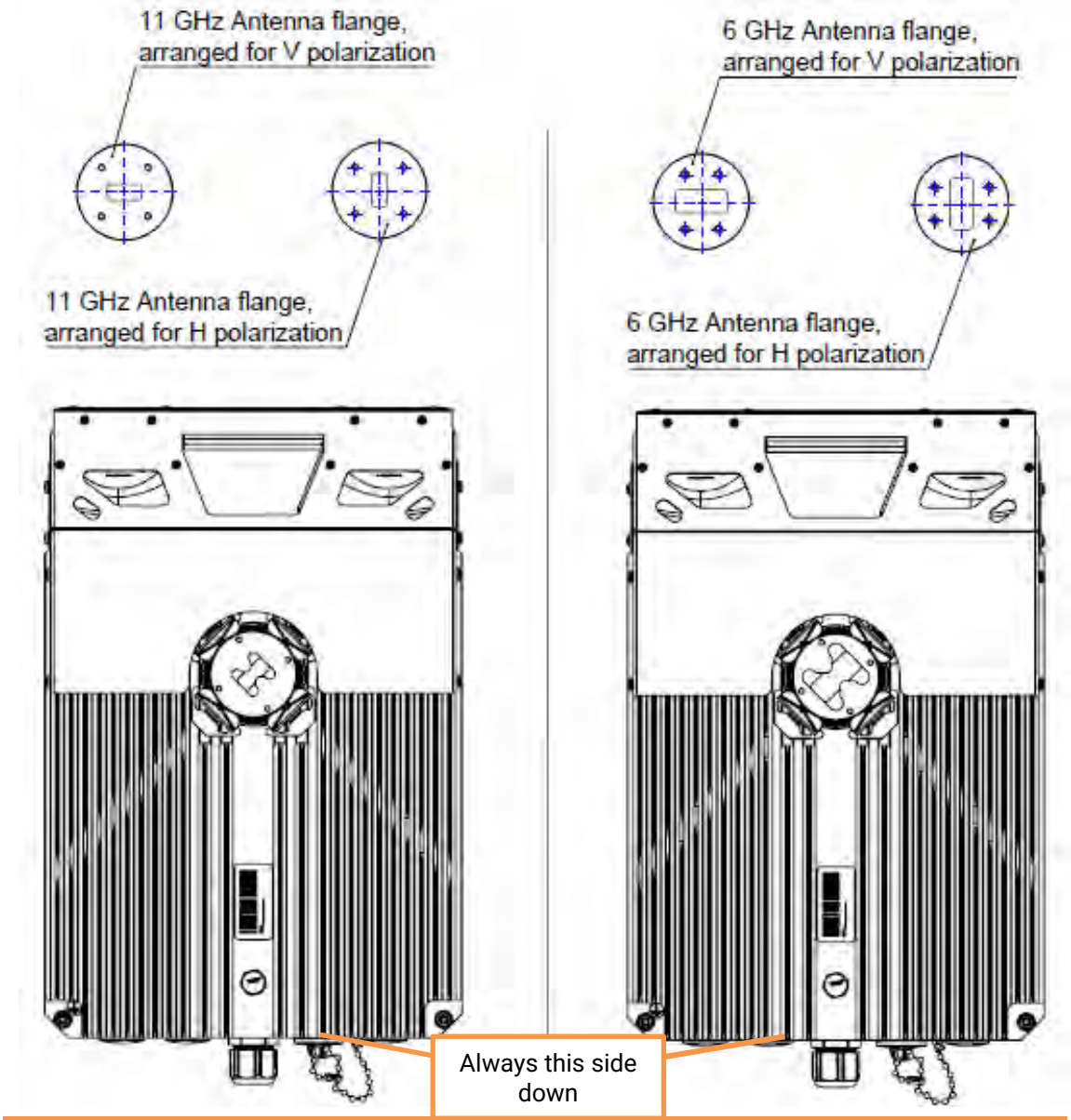
* Integra-S/Integra-GS 15/18/17/23/24/26/32/38/42GHz are separate FODU models

It is recommended to protect the installed radio from direct sunlight.

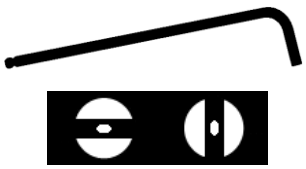
The default polarization for licensed frequency band radios is vertical.

Integra-S/Integra-GS 6-13GHz* FODU: attaching to the antenna

Integra-S/Integra-GS 6-13GHz* FODU features twisted polarization flange and the resulting signal polarization is determined by Interface on antenna/OMT. To change signal polarization, please rotate only the antenna interface, as the radio always remains in the vertical position.



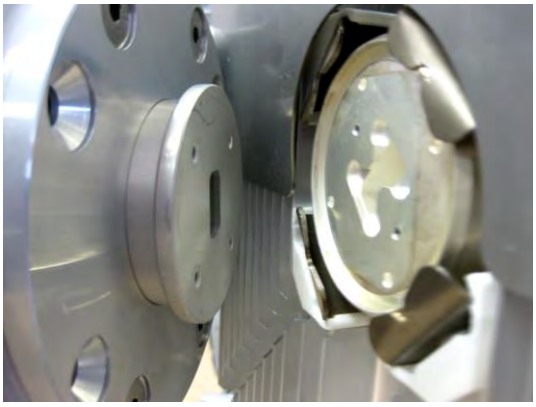
Tools required: Size 5 Allen wrench, 240mm



Level (not supplied)

1 Integra-S/Integra-GS 6-13GHz* FODU features a twisted polarization flange and the resulting signal polarization is determined by Interface on antenna/OMT. To change signal polarization, please rotate only the antenna interface, as the radio always remains in a vertical position.

Example of vertical polarization interconnection.



2 Example of horizontal polarization interconnection.

3 Put Integra-S/Integra-GS on the antenna adapter flange by hooking a half-turn loosened clamp at the top and leaving the completely loosened clamp at the bottom. Make sure the O-ring is in place and the adapter flange fits into the Integra-S/Integra-GS transition flange socket.

Note! The protective sticker should be removed before attaching the Integra-S/Integra-GS FODU to the antenna.

4 Tighten bottom fixation clamps.

5 Use the air level to verify that Integra-S/Integra-GS FODU is properly leveled. Tighten all four fixation clamps properly.

6 Final view of assembled Integra-S/Integra-GS 6-13GHz* 1+0 setup.

* Integra-S/Integra-GS 6U/6L/7/8/10/11/13 are separate FODU models

If any further assistance is required please contact techsupport@saftehnika.com

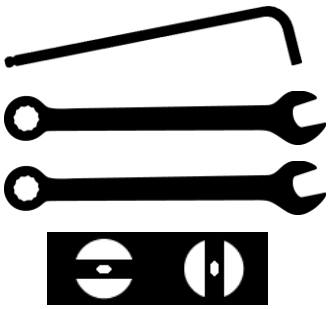
Integra-S/Integra-GS 6-13GHz* 2+0 & OMT interconnection

Tools required: Size 5 Allen wrench, 240mm

10mm (0.394”) wrench (not supplied)

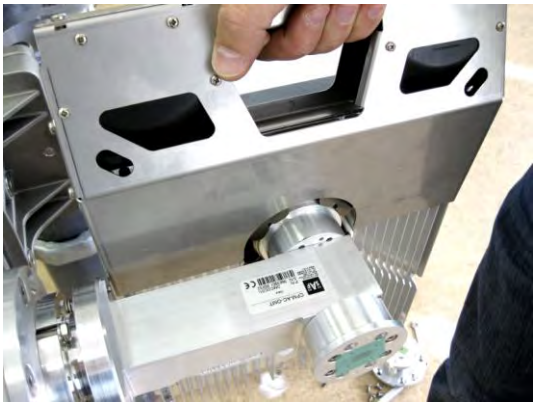
8mm (0.315”) wrench (not supplied)

Level (not supplied)



It is recommended to perform steps 1-2 on the ground.

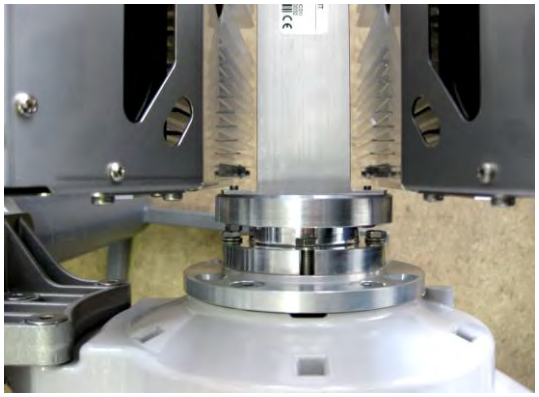
1 Prepare Integra-S/Integra-GS 6-13GHz* FODU by loosening both bottom clamps (should not overlap the flange plate) and tightening both upper clamps (will be used as a hook).



2 Attach Integra-S/Integra-GS 6-13GHz* FODU to the OMT using both upper clamps Integra-S/Integra-GS 6-13GHz* FODU features twisted polarization flange and resulting signal polarization is determined by Interface on antenna/OMT. To change signal polarization, please rotate only the antenna interface, as the radio always remains in a vertical position

3 Slightly tighten both bottom fixation clamps to secure FODU to the OMT.

4 Use the air level to verify that FODUs are properly leveled. Note that the radio position should be in parallel with the OMT. Thus, if the antenna is inclined or declined in elevation, the radio position should be kept at the same angle.



5 Tighten all 4 Integra-S/Integra-GS fixation clamps on both FODUs. When properly attached there's a gap between FODUs, OMT, and antenna.

6 Final view of assembled Integra-S/Integra-GS 6-13GHz* 2+0 setup.

* Integra-S/Integra-GS 6U/6L/7/8/10/11/13 are separate FODU models

For connecting Integra-S/-GS 15-42GHz to an OMT, please follow the instructions in Chapter Integra-S/Integra-GS 15-42GHz* FODU: attaching to the antenna

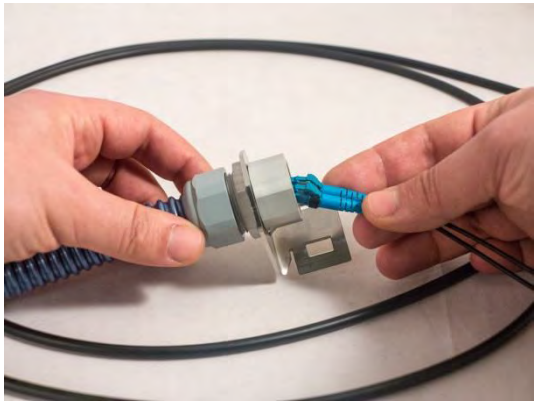
If any further assistance is required please contact techsupport@saftehnika.com

Connecting FO interface using fiber conduit kit

1 Fiber conduit kit.

2 Unscrew the cap of the SFP port (LAN2 or LAN3) that will be used and install an SFP module.

3 Disassemble the conduit kit and put its parts in the following sequence (left – FODU direction, right – CPE direction).



4 Push the FO cable from the LC connector side through the conduit.

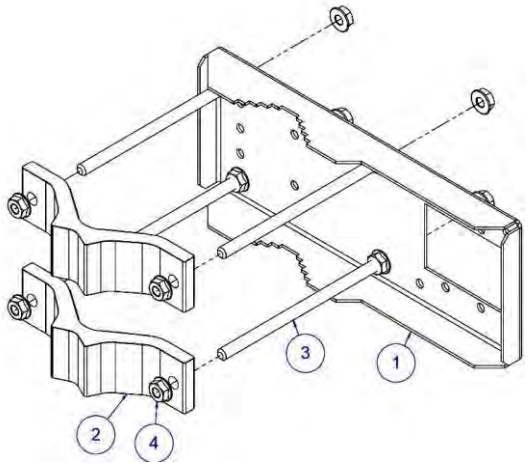
5 Connect LC connector to SFP module.

6 Tighten parts on both ends of the conduit. Fasten another end of the fiber conduit to the pole using included tie-wrap. Assembled view.

Integra-GS 6-13GHz* remote mount kit assembly

Tools required: Size 5 Allen wrench

13mm (0.512”) wrench (not supplied)

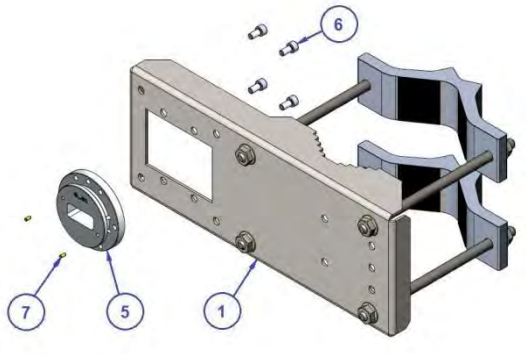


1

Assemble the mounting bracket using a 13mm wrench:

Screw one hex flange nut [4] on each of the four threaded rods [3]. Insert threaded rods into available holes of the mounting clamp [1]. Put hex nuts [4] on the other side of the clamp and screw on the threaded rods until these are visible from another side of the clamp, not more than 2mm. Tighten hex flange nuts with torsion 20...25 N·m.

Attach two mounting bracket clamps [2] on threaded rods [3] as shown in the picture and afterward screw on the remaining four hex flange nuts [4] on all threaded rods.



2

Attach waveguide transition flange to the mounting bracket using size 5 Allen wrench:

Put the flat side of the transition flange [5] on the flat side of the mounting clamp [1] as shown in the picture and screw in four socket head screws [6] from another side of the clamp. Put two dowel pins [7] in the appropriate holes of the transition flange. Pins are sitting in holes very loose; therefore, perform the last action immediately before FODU installation.

3

View of the assembled mounting bracket on the thick pole mast:

Bracket clamps in the following position support mast diameters of 55..120 mm.

4

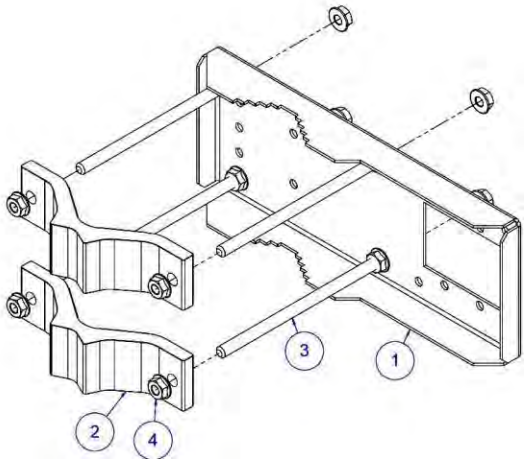
View of the assembled mounting bracket on the thin pole mast:
Bracket clamps in a reverse position support smaller mast diameters of 25...75mm.

*Integra-GS 6U/6L/7/8/10/11/13 are separate FODU models

Integra-GS 15-42GHz* remote mount kit assembly

Tools required: Size 5 Allen wrench

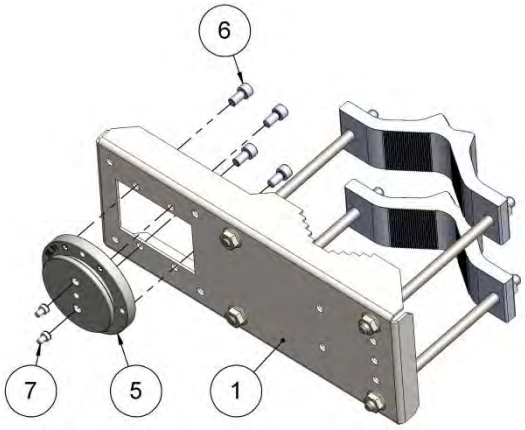
13mm (0.512”) wrench (not supplied)



1 Assemble Mounting Bracket using a 13mm wrench:

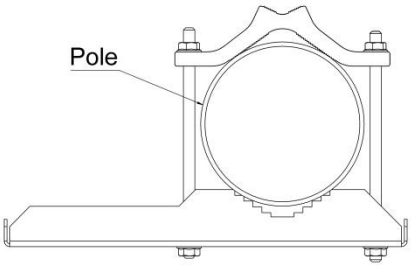
Screw one hex flange nut [4] on each of the four threaded rods [3]. Insert threaded rods into available holes of the mounting clamp [1]. Put hex nuts [4] on the other side of the clamp and screw on the threaded rods until these are visible from another side of the clamp, not more than 2mm. Tighten hex flange nuts with torsion 20...25 N·m.

Attach two mounting bracket clamps [2] on threaded rods [3] as shown in the picture and afterward screw on the remaining four hex flange nuts [4] on all threaded rods.



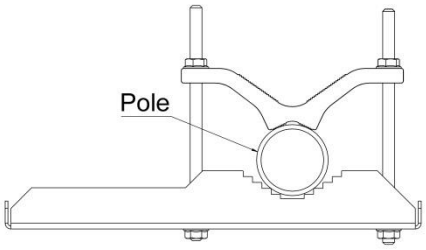
2 Attach the waveguide transition flange to the mounting bracket using a size 5 Allen wrench:

Put the flat side of the transition flange [5] on the flat side of the mounting clamp [1] as shown in the picture and screw in four socket head screws [6] from another side of the clamp. Two screws [7] have to be screwed into the antenna flange of ODU (not shown here). Screws' heads serve as guiding pins while the ODU is attached to the transition flange [5].



3 View of the assembled mounting bracket on the thick pole mast:

Bracket clamps in the following position support mast diameters of 55..120 mm.

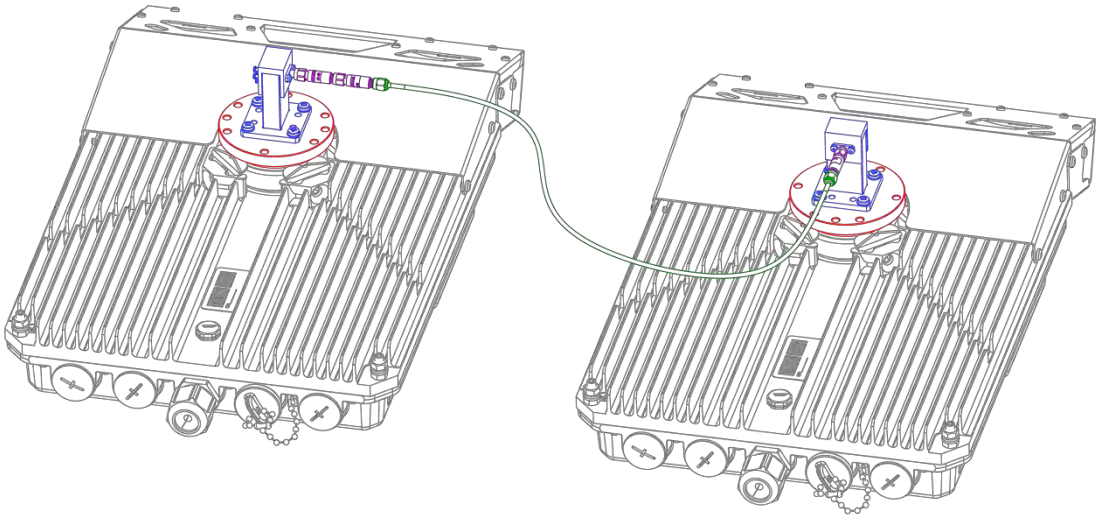


4 View of the assembled mounting bracket on the thin pole mast:
Bracket clamps in a reverse position support smaller mast diameters of 25...75mm.

*Integra-GS 15/18/17/23/24/26/32/38/42GHz are separate FODU models

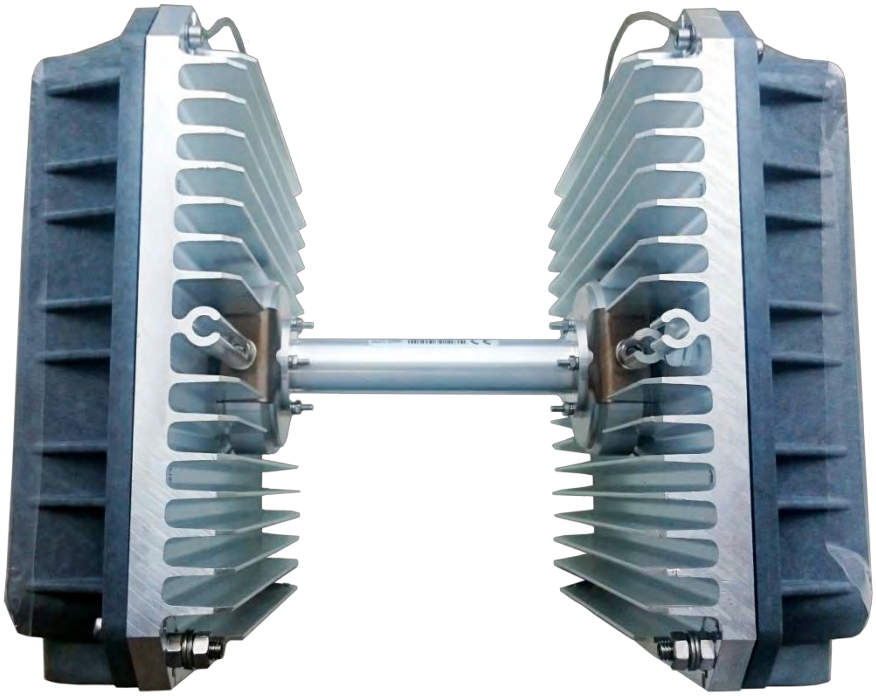
Initial setup in the indoor environment

Integra-S/Integra-GS FODUs can be interconnected using a test kit (available for purchase as an optional accessory). P/N is DxxTST01, where xx – frequency band, e.g. D11TST01 for 11GHz. The exception is 17 and 24GHz radios.



The test kit consists of an adapter flange, waveguide-to-coaxial adapter, attenuators, and coaxial cable.

In the case of 17 and 24 GHz radios a test tube (P/N D0S17TST01 or D0S24TST01) should be used:



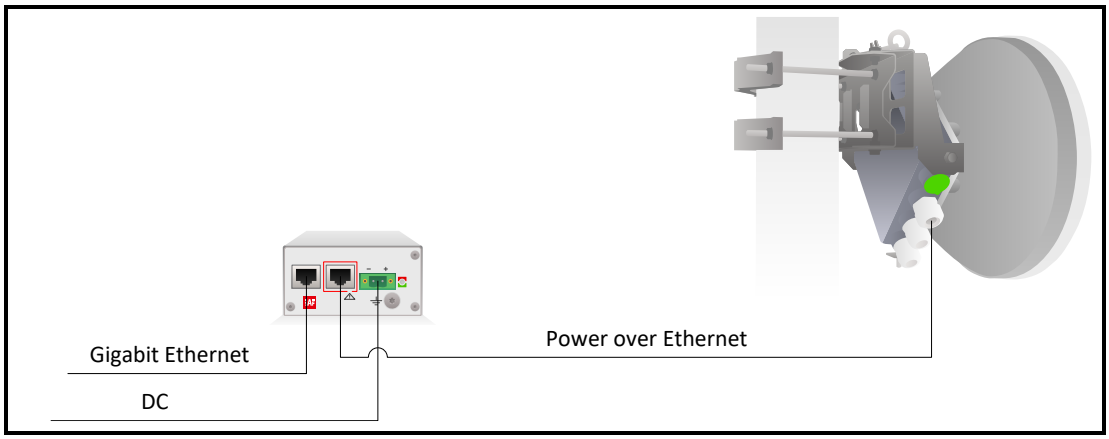
Chapter 3: WEB GUI

Initial configuration

Powering Integra/Integra-S/Integra-G/Integra-GS FODU and connecting to PC

Use Power over Ethernet (PoE) injector P/N I0ATPI22/24 with an appropriate power supply (22…60VDC, at least 80W). Please see the interconnection scheme below.

Use 5-10 A rated type B circuit breaker in the chain between the 48 V power supply and the PoE injector.



The Ethernet cable from the PoE injector should be connected to the RJ-45 port on Integra/Integra-S/Integra-G/Integra-GS FODU (LAN1). The total length of Ethernet cables from CPE to PoE injector (DATA port) and from Integra/Integra-S/Integra-G/Integra-GS to PoE injector (DATA+PWR port) combined should not exceed 100m. It is recommended to use outdoor-rated STP/FTP Ethernet cable Cat5e or better.

When powered, the RSSI LED will light up a solid green color for approx. 20sec. Afterward, RSSI LED will go out for approx. 35sec. and eventually, start blinking indicating the current Rx level.

Please refer to the chapter RSSI LED for further details on blinking patterns and corresponding Rx levels.

PoE injector (P/N I0ATPI22)

The injector has a built-in DC/DC converter which can be enabled with a switch at the back by switching it to the “54V” position. In this mode, 22..60VDC input voltage will be converted to the 54VDC output voltage. It is required to use this mode when the input voltage is below 48V DC or when a longer Ethernet cable is used to ensure sufficient input voltage to the Integra/Integra-S/Integra-G/Integra-GS FODU (36…57VDC). In “48V” mode, the output voltage of the PoE injector is the same as the input voltage.

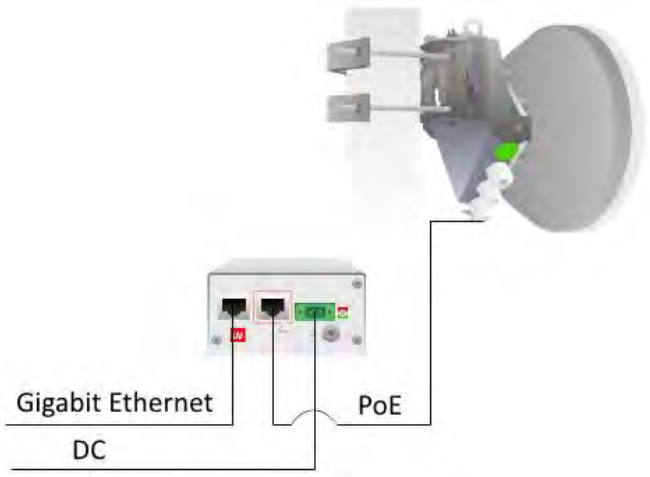
In case the input voltage is between 22..36V DC, the output current is limited to 1.2A, which will not be sufficient for low-frequency band radios (6-13GHz). Use 36..60V DC input voltage instead.

Universal programmable PoE injector (P/N I0ATPI24/I0ATPI44)

The I0ATPI24 and I0ATPI44 injectors are designed to operate with any PoE-capable product with a Fast Ethernet / Gigabit Ethernet interface. Built-in protection conforms to the IEC 61000-4-5 standard.

The accepted input voltage is 20…65VDC. The output voltage is stabilized to 54VDC.

Interconnection scheme:



The front panel has 3 indication LEDs. LED3 indicates the position of DIP switch S1. Color indication of all LEDs must be ignored in Forced mode (DIP switch S4 in DOWN position).

Load detected and voltage fed at the output of PoE injector (POWER GOOD)		No load at the output of the PoE injector (OPEN)
PoE controller detected and voltage fed at the output of PoE injector (POWER ON)		Short at the output of PoE injector (SHORT)
Auto PoE mode if S4 is UP; see table below.		Manual PoE mode if S4 is UP; see table below.

The back panel has 4 switches to operate the PoE injector in different modes.

The appropriate I_{max} selection, while manual PoE mode is enabled (S1 UP, S4 UP), will provide the most effective surge protection for the radio. In case I_{max} exceeds the set value, upper LEDs (LED1&LED2) will blink in green color.

Connecting a device in Manual or Forced modes will introduce approx. 5-second delay of LED indication.

In case of Auto PoE mode is enabled (S1 position DOWN, S4 position UP) I_{max} mode (PD class) is negotiated automatically with the device connected.

The position of DIP switches should be changed only while the PoE injector is turned off.

Nr.	S1	S2	S3	S4	Description
1	↓	×	×	↑	**Auto PoE mode** (PoE controller enabled). I_{max}= **auto**.
2	↑	↓	↓	↑	**Manual PoE mode** (PoE controller disabled). I_{max}=**750mA**.
3	↑	↓	↑	↑	**Manual PoE mode** (PoE controller disabled). I_{max}=**1000mA**.
4	↑	↑	↓	↑	**Manual PoE mode** (PoE controller disabled). I_{max}=**1250mA**.
5	↑	↑	↑	↑	**Manual PoE mode** (PoE controller disabled). I_{max}=**1700mA**.

6	×	×	×	↓	**Forced mode**. I_{max}=**2000mA**. **DIP switches S1, S2, and S3 are ignored.** LED3 color will be **blue** or **green** depending on the position of **S1**.

↓ — DIP switch position DOWN, ↑ — DIP switch position UP, × — any position

Recommended modes

Mode Nr. **1** or **5*** (Auto or Manual PoE mode. I_{max}= auto or I_{max}=1700mA);

* depending on HW revision

Electrical specification

Data rate	Up to 1000 Mb/s
Auto PoE mode	Green indicator LED*
Manual PoE mode	Blue indicator LED*
Input Voltage	22 – 65 V
Output Voltage	54 V
Max Current	1.2 A (22…36V DC), 1.6 A (36…60V DC)
Power Connector	2ESDV-02P with screw locks
Ethernet Connectors	Shielded RJ45 jacks
Data Lines	Pins (1, 2), (3, 6), (4, 5) and (7, 8)
Power Lines	+ (1, 2) and (4, 5); - (3, 6) and (7, 8)
Power Clamping Voltage	+/- 70 V
Max data cable length	100 m

* Color indication can be disregarded in Forced mode (DIP S4 position DOWN), will indicate only Power ON.

Mechanical specification

Ports	-RJ45 - Data -RJ45 - Data + Power -DC - 2ESDV-02P socket with screw locks** -Grounding screw
Dimensions (W/H/D):	82 mm/41 mm/154 mm
Weight	0.4 kg
Enclosure	Steel
Operating Temperature	-10ºC to + 50ºC
Mounting	-With bracket (included) -19” rack mounting shelf (p/n I0KTPI11.003) -DIN-rail clip (p/n I0STPI11.01)

** 2ESDV-02P plug with screw locks included.

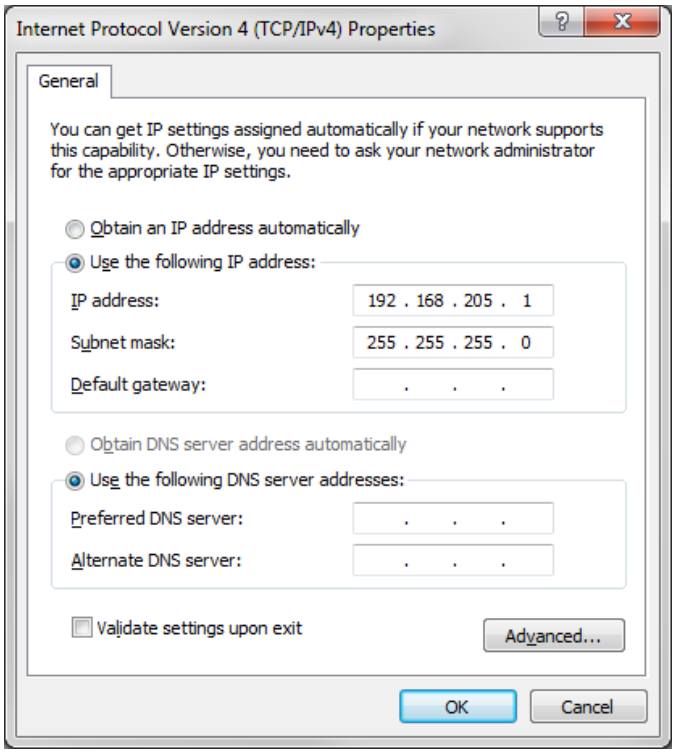
System requirements

To access the Integra/Integra-S/Integra-G/Integra-GS Web GUI you will need a PC with the following Web browser:

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

Ethernet management connection configuration

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



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

Accessing Web GUI

1. Launch your browser and in the address field enter the IP address of a FODU. Default IP addresses are as follows:
   - 192.168.205.10 for low side FODU (P/N D*******L*)
   - 192.168.205.11 for high side FODU (P/N D*******H*)

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

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

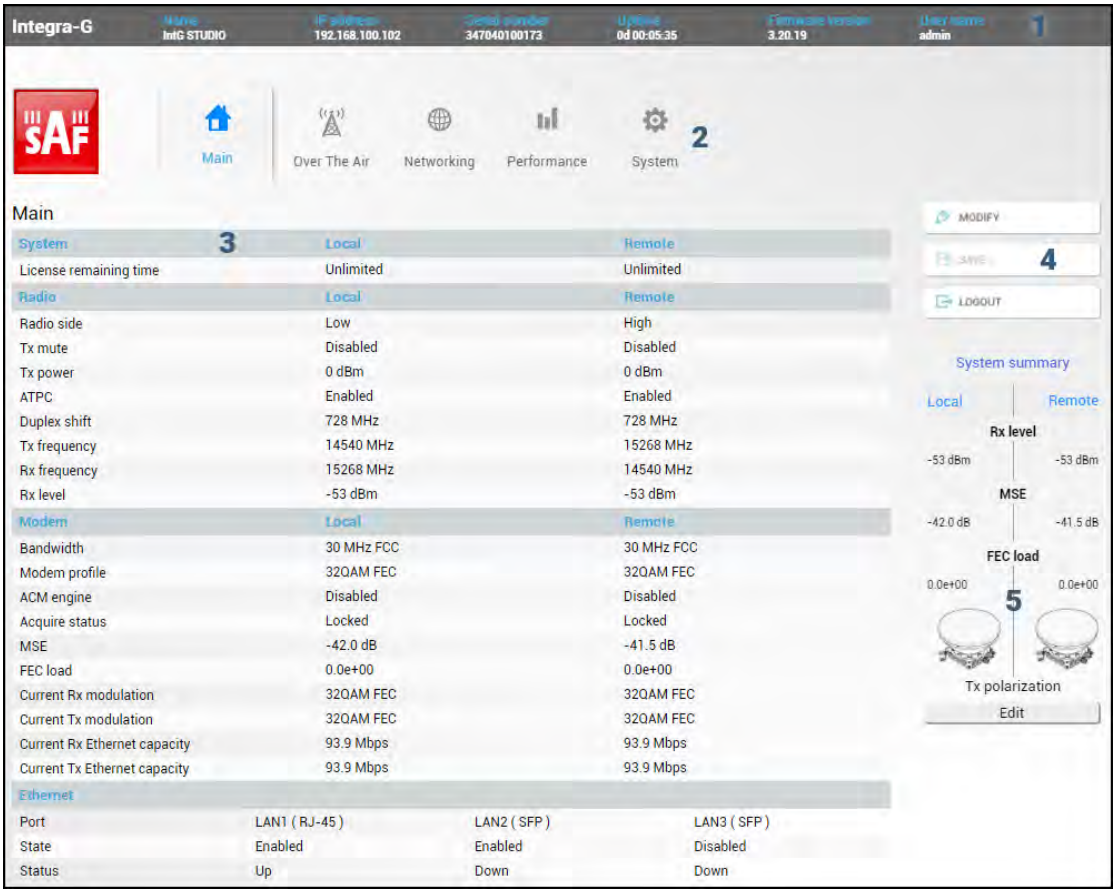
5. Select “Remember password” if you want the browser to remember entered login credentials.
6. Press “Log in” button.

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

Minimum supported horizontal resolution is 1024px.

Main page

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



Web GUI is divided into 5 sections:

1 Top panel

Shows information about the Integra/Integra-S/Integra-G/Integra-GS FODU you are connected to including:

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

2 Menu panel

Allows navigating between the Main page (“Main”) and subpages of 4 sections:

- *Over the air* (Radio/modem (NP) configuration)
- *Networking* (Ethernet configuration)
- *Performance*
- *System*

3 Main Web GUI window

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

4 MODIFY / SAVE / LOGOUT

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

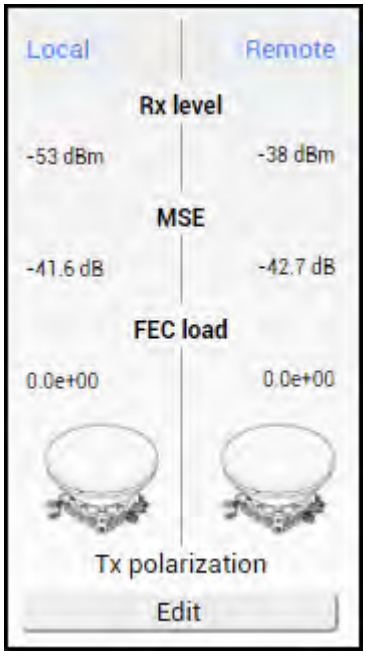
5 System summary

Shows one to four (default value – three) selected parameters of the local and remote systems, as well as Tx polarization (as read from the internal accelerometer).

Values appear in red color in case of exceeding alarm threshold values Performance → Alarm → Alarm threshold configuration or in case of a warning (e.g. if loopback is active).

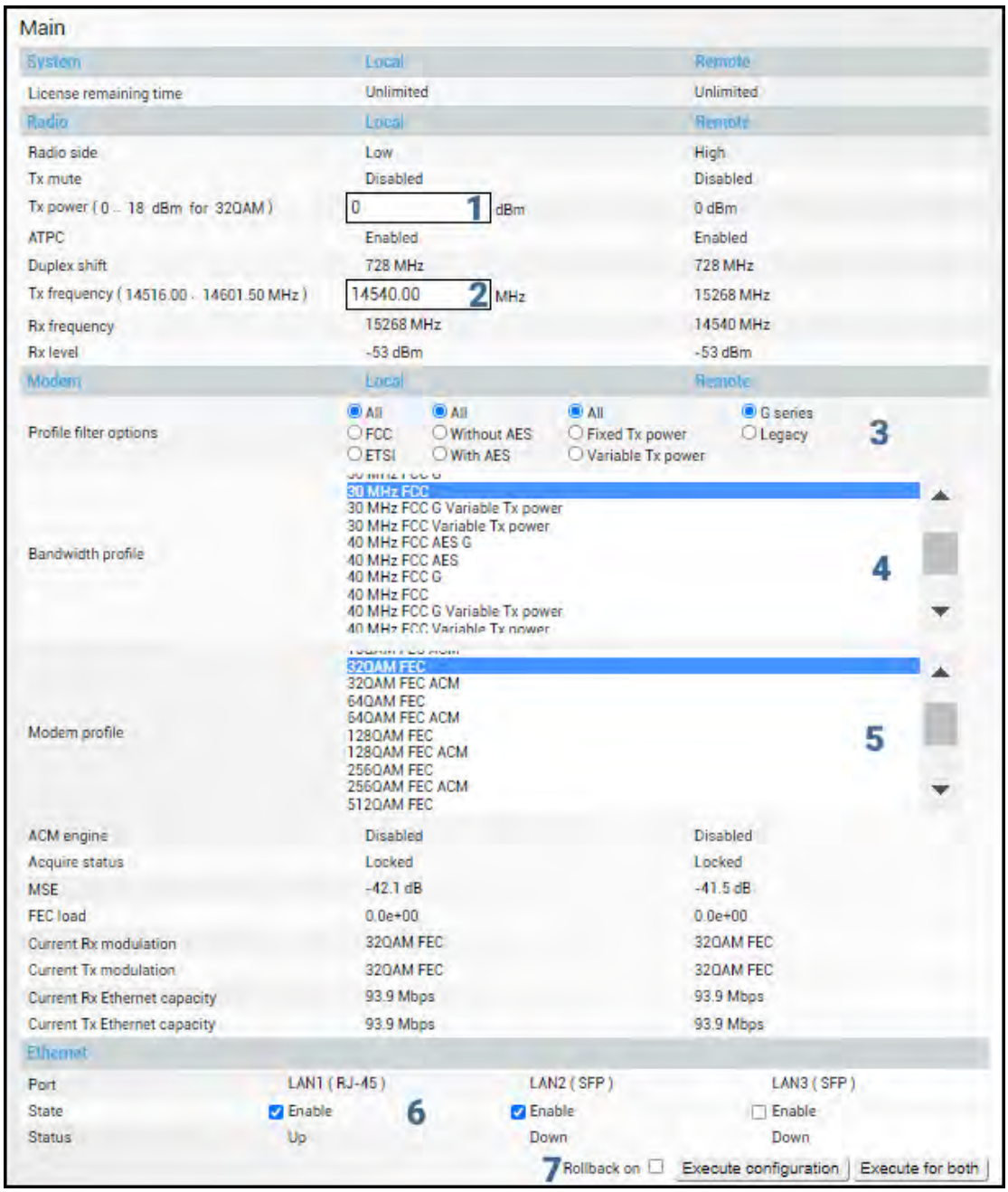
Values appear in orange color in case alarm threshold values were exceeded during the last 15 seconds.

The two square indicators show the number of active alarms on local and remote radios. The indicator is colored green if no alarms (“0”) are present, otherwise, it is colored red.



Modifying basic system parameters

To proceed with the initial configuration, press the MODIFY button and the entry fields will appear for adjustable values:



1 Tx power

The available range depends on the radio model and selected modulation. The actual range will be indicated in the brackets. If a Variable Tx power bandwidth profile was selected, the available range is the maximum Tx power at 4QAM modulation when ACM downshift occurs.

2 Tx frequency

The available range depends on the frequency band, subband, radio side, and channel bandwidth selected. The actual range will be indicated in the brackets.

Tx frequency range indicates the range of central frequencies for the configured channel bandwidth.

The default frequency range (indicated on the label) is defined for 3.5MHz channel bandwidth.

3 Profile filter options

Allows filtering the bandwidth selection list by FCC or ETSI standard and with or without AES encryption enabled, as well as selecting “All” to disable filtering.

If allowed by the license, AES-encrypted bandwidth options will be available. Please refer to the Over the Air→Security→AES encryption chapter for further details and activation steps of AES encryption.

4 Bandwidth profile

Allows choosing between available channel bandwidth options along with the indication of fixed modulation or maximum modulation for ACM, bandwidth standard ETSI or FCC, AES encryption functionality, and Tx power mode – fixed or variable – in case ACM profile is chosen.

Please refer to the Over the Air→Security→AES encryption chapter for further details and activation steps of AES encryption.

5 Modem profile

Allows choosing between available modulations for the selected channel bandwidth.

The “FEC” suffix indicates a better sensitivity mode (longer FEC overhead), while “Weak FEC” indicates a higher capacity mode (shorter FEC overhead).

“Weak FEC” is available only for the highest modulation for the selected channel bandwidth.

ACM stands for Adaptive Coding and Modulation and enables the adaptive modulation change according to MSE value. Modulation indicates maximum modulation, while the minimum is 4QAM.

6 State

Allows enabling/disabling each of three available LAN ports.

In case 2+0 aggregation is enabled, the LAN2 state is “Restricted” as it can be used only for interconnection between two Integra/Integra-S/Integra-G/Integra-GS FODUs. Please refer to the Over The Air → Modem → Aggregation configuration chapter for further details.

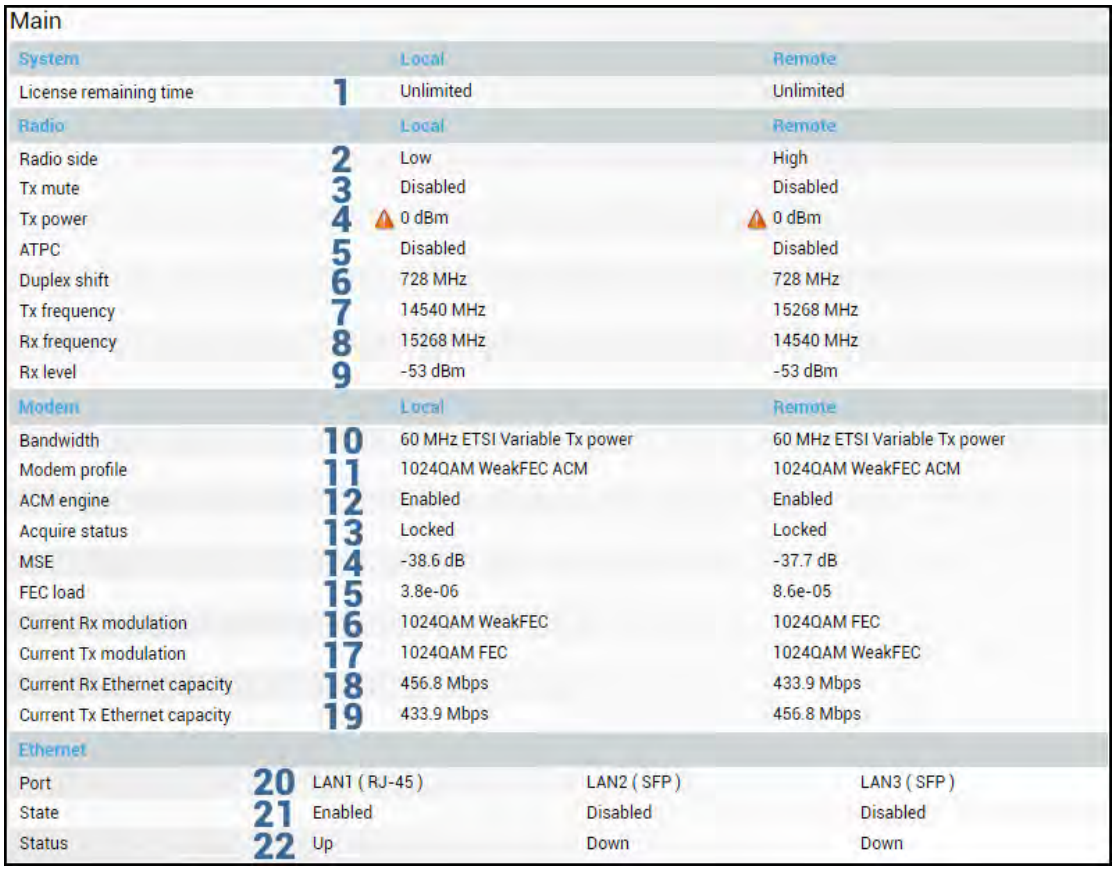
7 Execute

By pressing *„Execute configuration”*, changes made to the corresponding section apply only to the local side Integra/Integra-S/Integra-G/Integra-GS. If *„Rollback on”* is selected, the configuration will be reverted in case erroneous configuration changes are applied.

Rollback triggers when configuration changes applied interrupt management connectivity. For this reason, rollback will not work if the remote side of the link is not reachable.

Pressing *„Execute for both”* applies changes made to the corresponding section both for local and remote side Integra/Integra-S/Integra-G/Integra-GS FODUs.

Parameters on Main page



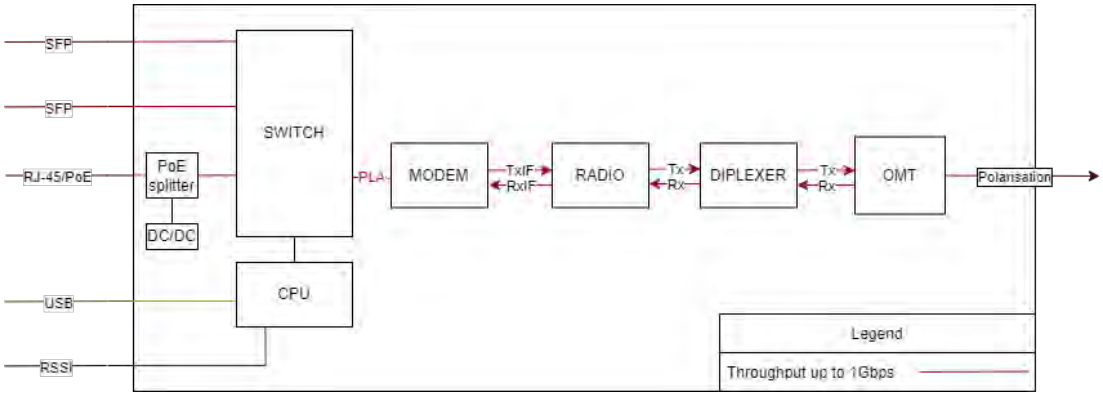
Main

System		Local	Remote
License remaining time	1	Unlimited	Unlimited
Radio		**Local**	**Remote**
Radio side	2	Low	High
Tx mute	3	Disabled	Disabled
Tx power	4	⚠ 0 dBm	⚠ 0 dBm
ATPC	5	Disabled	Disabled
Duplex shift	6	728 MHz	728 MHz
Tx frequency	7	14540 MHz	15268 MHz
Rx frequency	8	15268 MHz	14540 MHz
Rx level	9	-53 dBm	-53 dBm
Modem		**Local**	**Remote**
Bandwidth	10	60 MHz ETSI Variable Tx power	60 MHz ETSI Variable Tx power
Modem profile	11	1024QAM WeakFEC ACM	1024QAM WeakFEC ACM
ACM engine	12	Enabled	Enabled
Acquire status	13	Locked	Locked
MSE	14	-38.6 dB	-37.7 dB
FEC load	15	3.8e-06	8.6e-05
Current Rx modulation	16	1024QAM WeakFEC	1024QAM FEC
Current Tx modulation	17	1024QAM FEC	1024QAM WeakFEC
Current Rx Ethernet capacity	18	456.8 Mbps	433.9 Mbps
Current Tx Ethernet capacity	19	433.9 Mbps	456.8 Mbps

Ethernet				
Port	20	LAN1 (RJ-45)	LAN2 (SFP)	LAN3 (SFP)
State	21	Enabled	Disabled	Disabled
Status	22	Up	Down	Down

1) ***License remaining time*** – shows the amount of time remaining for an active time-limited license; in case of an unlimited time license, "Unlimited" is being shown. When the license expires, the modulation will drop to "4QAM FEC Limited", the link capacity will drop to 256Kbps and you will see a warning.
2) ***Radio side*** – shows the radio side of the local and remote Integra-G.
3) ***Tx mute*** – Tx shows if the transmitter is currently muted ("Enabled") or active ("Disabled").
4) ***Tx power*** – shows current transmitter power in dBm. ⚠ will appear if the value is dynamically changed according to the current ACM modulation. Move the mouse over for an explanation.
5) ***ATPC*** – shows if ATPC is enabled or disabled.
6) ***Duplex shift*** – shows the margin between the transmitting and receiving frequencies.
7) ***Tx frequency*** – shows the transmitting frequency.
8) ***Rx frequency*** – shows the receiving frequency.
9) ***Rx level*** – shows the current level of the received signal. It must not differ significantly from the previously calculated value.
10) ***Bandwidth*** – shows the width of currently utilized bandwidth in MHz.
11) ***Modem profile*** – Indicates currently configured modulation.
    The "FEC" suffix indicates a better sensitivity mode (longer FEC overhead), while "WeakFEC" indicates a higher capacity mode (shorter FEC overhead).
    "WeakFEC" is available only for the highest modulation in the selected channel bandwidth.
    An option with "ACM" (please refer to the chapter Integra-G block diagram
    The general internal block diagram of Integra-G is shown below. It has a built-in Gigabit Ethernet Network Processor that has three LAN ports: LAN1 - 1Gbps PoE-in

port that you need to use for powering Integra-G, please refer to *Powering Integra/Integra-S/Integra-G/Integra-GS FODU and connecting to PC* for more information, ***Error! Reference source not found.*** LAN2, and LAN3 SFP ports, please refer to *SFP ports* to see the SFP compatibility. To get more information about other interfaces, please refer to *Chapter* 8: INTERFACES section.



ACM (Adaptive Coding and Modulation) for further details) enables adaptive modulation change according to Signal Quality value. Modulation indicates maximum modulation, while the minimum is 4QAM.

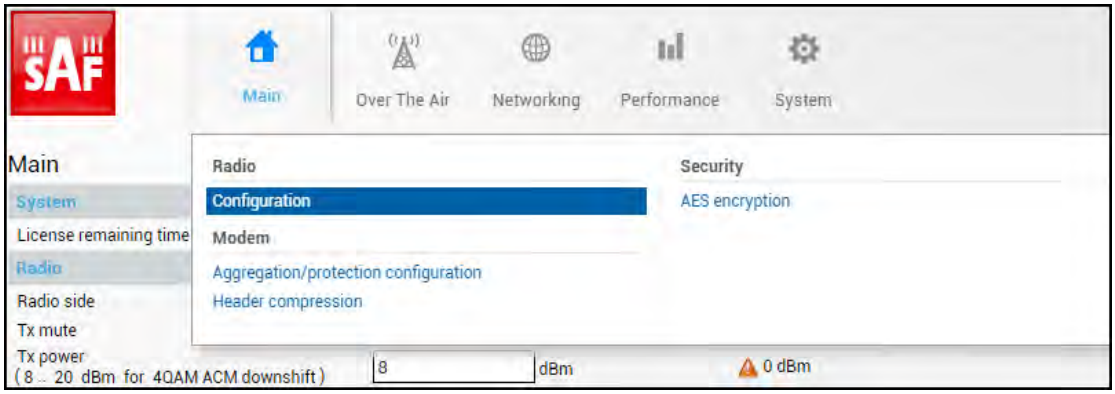
12) ***ACM engine*** – shows the status of the ACM engine.
13) ***Acquire status*** – indicates the acquired status of the modem. During normal operation, "Locked" will be shown.
14) ***MSE*** – shows Mean squared error value lower value means better signal quality.
15) ***FEC load*** – shows the load of Forward Error Correction.
16) ***Current Rx modulation*** – current received signal modulation.
17) ***Current Tx modulation*** – current transmitted signal modulation.
18) ***Current Rx Ethernet capacity*** – ingress capacity of the WAN port, depends on current Rx modulation and bandwidth.
19) ***Current Tx Ethernet capacity*** – egress capacity of the WAN port, depends on current Tx modulation and bandwidth.
20) ***Port*** – Name and interface type of the Ethernet port, RJ-45 or SFP/SFP+.
21) ***State*** – Ethernet port state – Enabled or Disabled. An exclamation mark designates the restricted state of the port. Move the mouse pointer over the icon to see the explanation.
22) ***Status*** – Ethernet port status, up or down (if the port is enabled).

Over The Air

Over The Air → Radio → Configuration

The Radio configuration page is available in the menu (Over The Air→ Radio→Configuration).

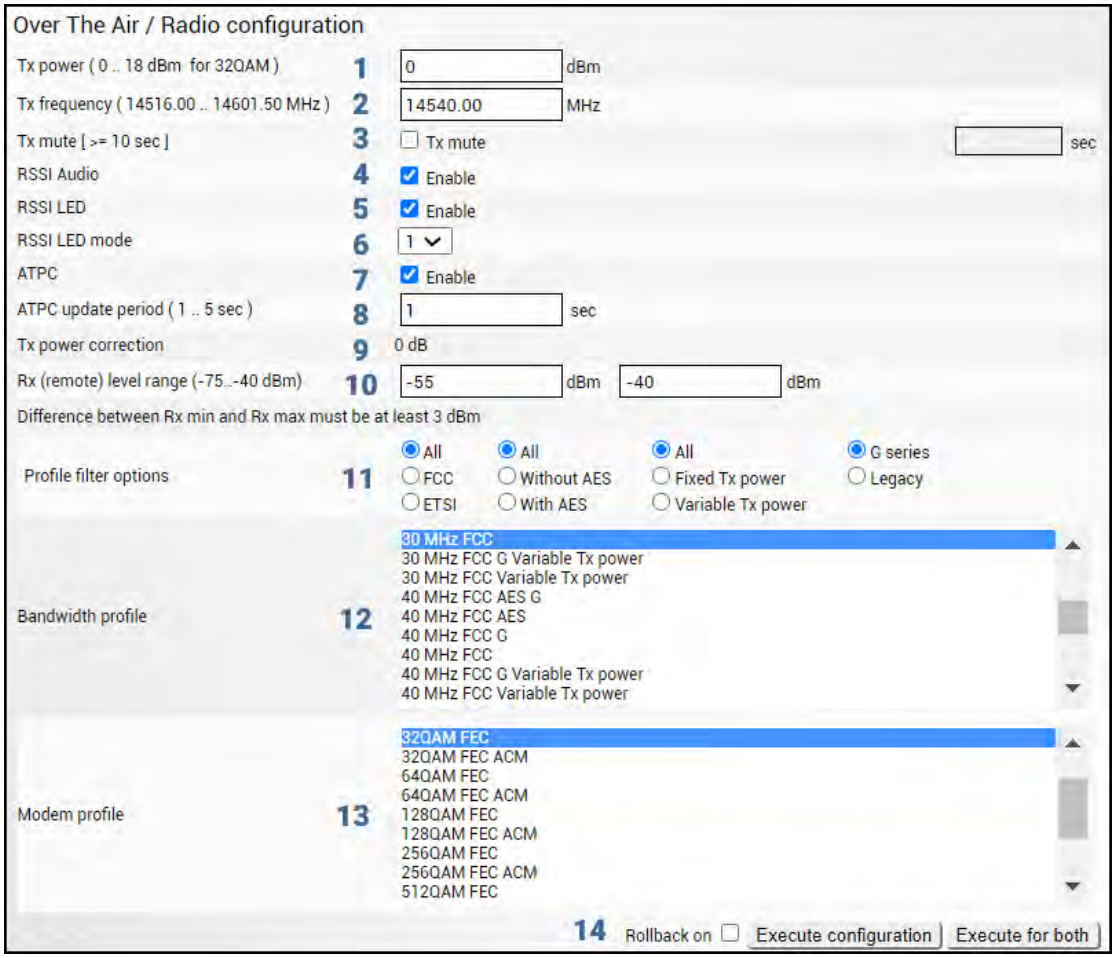
Refer to the chapter Radio configuration – extra fields for a description of the extra fields of the 17/24 GHz Integra/Integra-S/Integra-G/Integra-GS FODUs.



Status mode

Press MODIFY button.

Modify mode

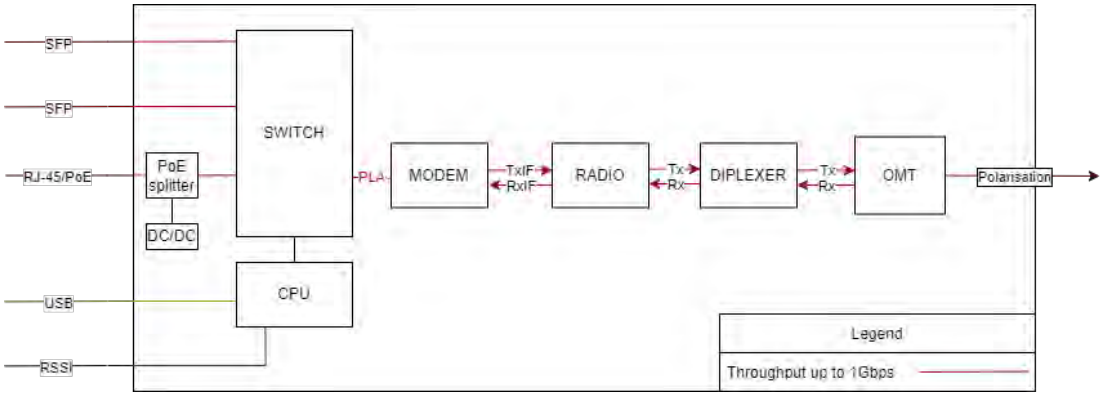


1) ***Tx power*** – Indicates current Tx (transmit) power value (status mode); allows specifying Tx power value (modify mode). The available range depends on the radio model and selected modulation. The actual range will be indicated in the brackets. ⚠ sign indicates that the Tx power value was adjusted by ATPC. Move the mouse over the sign for further details.
2) ***Tx frequency*** – Indicates current Tx (transmit) frequency (status mode); allows specifying Tx frequency (modify mode). The available range depends on the frequency band, subband, radio side, and channel bandwidth selected. The actual range will be indicated in the brackets.
   Tx frequency range indicates the range of central frequencies for the configured channel bandwidth.
   The default frequency range (indicated on the label) is defined for 3.5MHz channel bandwidth.
3) ***Tx mute [>=10 sec]*** – Indicates whether Tx mute is enabled or disabled (status mode); allows muting the transmitter to a limited time interval in seconds (modify mode). The minimum value is 10 seconds. Note that the transmitter will be muted only if a valid value in seconds is entered.
4) ***RSSI Audio*** – Indicates whether RSSI audio is enabled or disabled (status mode); allows disabling or enabling RSSI audio (modify mode). RSSI audio is available using the 3.5mm jack beside the USB port. By default, RSSI Audio is disabled. Please refer to the RSSI/audio port description for further details.
5) ***RSSI LED*** – Indicates whether the RSSI LED is enabled or disabled (status mode); allows disabling or enabling RSSI LED operation (modify mode). By default, the RSSI LED is enabled. Please refer to the RSSI LED section for further details.

6) ***RSSI LED mode*** – Indicates which RSSI LED mode is active (status mode); allows selecting RSSI LED operation mode (modify mode). By default Mode 1 is enabled. Please refer to the RSSI LED section for further details.
7) ***ATPC*** – Indicates whether ATPC (Automatic Transmit Power Control) is enabled (status mode); allows enabling/disabling ATPC (modify mode). By default this feature is disabled. Please refer to the ATPC (Automatic Transmit Power Control) description for further details.
8) ***ATPC update period*** – Indicates the ATPC update period (status mode); allows defining the period in seconds with which ATPC parameters are being updated (modify mode). By default, the update period is 5 seconds. The range is 1..5 seconds. Please refer to the ATPC (Automatic Transmit Power Control) description for further details.
9) ***Tx power correction*** – Indicates Tx power correction made by the ATPC function. Please refer to the ATPC (Automatic Transmit Power Control) description for further details.
10) ***Rx (remote) level range (-75..-40dBm)*** – Indicates minimum and maximum Rx level of the remote side Integra/Integra-S/Integra-G/Integra-GS for ATPC operation (status mode); allows defining the minimum and maximum Rx level of the remote side Integra/Integra-S/Integra-G/Integra-GS (modify mode). There should be at least a 3dB difference between min and max values. ATPC Tx power correction will be performed only in case of exceeding these thresholds. Values should be defined between -75 and -40 dBm. Please refer to the ATPC (Automatic Transmit Power Control) description for further details.

The Minimum Rx level threshold should be set at least 10dB above the sensitivity threshold to avoid ACM/ATPC switching loops.

11) ***Profile filter options*** – Allows filtering the bandwidth selection list by standard (ETSI or FCC) or by AES encryption (with or without). "All" disables filtering.
12) ***Bandwidth profile*** – Indicates currently configured channel bandwidth (status mode); allows choosing between available profiles, as well as according to the standard of channel bandwidth – ETSI or FCC, with or without AES encryption (modify mode).
13) ***Modem profile*** – Indicates currently configured modulation (status mode); allows choosing between available modulations for selected channel bandwidth (modify mode).
    The "FEC" suffix indicates a better sensitivity mode (longer FEC overhead), while "WeakFEC" indicates a higher capacity mode (shorter FEC overhead).
    "WeakFEC" is available only for the highest modulation in the selected channel bandwidth.
    An option with "ACM" (please refer to the chapter Integra-G block diagram
    The general internal block diagram of Integra-G is shown below. It has a built-in Gigabit Ethernet Network Processor that has three LAN ports: LAN1 - 1Gbps PoE-in port that you need to use for powering Integra-G, please refer to *Powering Integra/Integra-S/Integra-G/Integra-GS FODU and connecting to PC* for more information, ***Error! Reference source not found.*** LAN2, and LAN3 SFP ports, please refer to *SFP ports* to see the SFP compatibility. To get more information about other interfaces, please refer to *Chapter* 8: INTERFACES section.



ACM (Adaptive Coding and Modulation) for further details) enables adaptive modulation change according to MSE value. Modulation indicates maximum modulation, while the minimum is 4QAM.

In case the current Tx power value is above the maximum value for any of the modulations, the maximum value will be indicated.

14) By pressing *„Execute configuration”,* changes made to the corresponding section apply only to the local side Integra/Integra-S/Integra-G/Integra-GS. If *„Rollback on”* is selected, the configuration will be reverted in case erroneous configuration changes are applied.

Pressing *„Execute for both”* applies changes made to the corresponding section both for local and remote side Integra/Integra-S/Integra-G/Integra-GS FODUs.

CLI commands (Chapter 4: COMMAND LINE INTERFACE)

radio [status]	Use to show radio status.
radio power <Tx power>	Use to set Tx power in dBm.
radio frequency <frequency>	Use to set Tx frequency in kHz.
radio rssi-led {disable | enable [mode {1|2|3}]}	Use to enable or disable RSSI LED operation.
radio rssi-led enable mode {1|2|3} **polarization** <seconds>	Use to enable the red RSSI LED's operation for n seconds. Its main purpose is an indication of polarization alignment accuracy +/- 3deg. Functionality may not be available in older HW revisions.
radio tx-mute {<time>|disable}	Use to mute the transmitter to a specific time in seconds or unmute.
radio factory	Use to reset radio settings to factory defaults – Tx power will be disabled and frequencies set to factory defaults.
radio upgrade <firmware>	Use to upgrade the radio firmware version. The firmware file must be located in the FTP directory.
radio version	Use to check the radio software version
radio atpc [status]	Use to check the status of ATPC (Automatic Transmit Power Control).
radio atpc state {enable|disable}	Use to enable/disable ATPC.
radio atpc delay <1..5>	Use to define the ATPC update period.
radio atpc rx_level <-75..-43> <-72..-40>	Use to define ATPC remote Rx level min and max thresholds.
modem configuration set <bandwidth> <min_mod> <max_mod>	Use to set modem configuration – bandwidth, minimum and maximum modulation. “e” suffix indicates “AES”.

	"s" suffix indicates "ETSI or "ETSI class 4L" (for 56 MHz). "_VP" suffix indicates "Variable Tx power". "_W" suffix indicates "Weak FEC" modulation.
modem configuration set factory	Use to reset modem settings to factory defaults – bandwidth and modulation will be reset to a minimum.
modem loopback [{none | digital <time>}]	Use to check, disable, or enable modem loopback for n seconds.
modem allowed	Use to check the list of available modem configurations.

Over The Air → Modem → Aggregation/protection configuration

Integra/Integra-S/Integra-G/Integra-GS **2+0 aggregation** (link bonding) provides ACM-aware binding of user-available capacities of two parallel links each using an individual frequency pair. Traffic is split per-frame over two links on the modem level.

2+0 aggregation **is not** based on MAC-MAC connections. A single MAC address (e.g. router) can be used.

Integra/Integra-S/Integra-G/Integra-GS 2+0 aggregation features full link synchronization/power/cable redundancy by reconfiguring to 1+0 operation mode in case of failure.

Full 2+0 to 1+0 redundancy will operate only when an external switch is used. Please see below interconnection schemes **c** and **d**.

Integra/Integra-S/Integra-G/Integra-GS **1+1 protection** provides Hot Standby redundancy of user-available capacities of two parallel links each using the same frequency pair. Traffic is using only one link at a time. Transmitters of the second link will be automatically muted.

Full 1+1 redundancy (including cables, power, HW protection) will be available only when an external switch is used. Please see below interconnection schemes **c** and **d**.

Header compression cannot be used with 2+0 aggregation configured.

Two pairs of Integra/Integra-G or Integra-S/Integra-GS FODUs are required. In the case of 2+0 aggregation with Integra-S/Integra-GS OMT, a dual-polarized antenna, or a coupler can be used. In the case of 1+1 HSB with Integra-S/Integra-GS, only a coupler can be used (as only a single frequency pair in the same polarization is being utilized).

Necessary equipment for Integra/Integra-S/Integra-G/Integra-GS 2+0 or 1+1

1. 4 Integra/Integra-S/Integra-G/Integra-GS FODUs – 2 low side, 2 high side;
2. 2 or 4 SFP modules and appropriate FO cables (multi-mode or single-mode) for Integra/Integra-S/Integra-G/Integra-GS interconnection (depending on interconnection scheme **a**, **b**, **c** or **d**; see below);
3. Electrical or optical Ethernet cables (together with corresponding SFP modules) for user traffic (depending on chosen interconnection scheme);
4. In the case of Integra-S/Integra-GS – additionally, 4 antennas, or 2 antennas and OMT/couplers. Please refer to the chapter Integra-S/Integra-GS 6-13GHz* 2+0 & OMT interconnection for instructions on Integra/Integra-S/Integra-G/Integra-GS installation to an antenna or an OMT.

General configuration guide

1. Do not interconnect Integra/Integra-S/Integra-G/Integra-GS with each other and do not plug Integra/Integra-S/Integra-G/Integra-GS into switches before you have finished the configuration of each node.
2. Choose one link (low/high side radio) which will operate as the "Master". The second link will operate as the "Slave";
3. Configure radio/modem parameters for each link. Channel bandwidths must be the

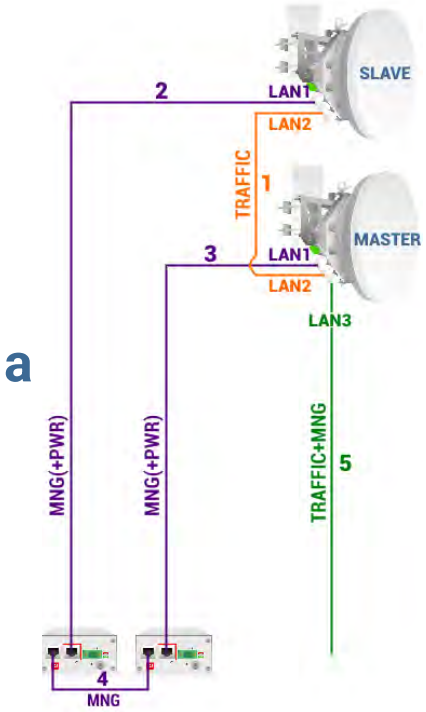
same (e.g. 40MHz) for both links. All other parameters can differ but keep in mind that in the 2+0 configuration frequencies must differ, but in the 1+1 configuration frequencies must be the same;

4. Both links should be polarized according to ACCP (Adjacent Channel Co-Polarized) or ACAP (Adjacent Channel Alternate-Polarized) principles. CCDP (Co-Channel Dual-Polarization) operation of both on the same frequency channel and opposite polarizations is not allowed. In the case of ACCP a guard band equal to ¼ BW should be introduced (e.g. 20MHz in the case of 80MHz channels).
5. Configure different IP addresses for all 4 Integra/Integra-S/Integra-G/Integra-GS FODUs.
6. The remote IP address for all units must be entered manually. To do that, remove the selection in the "Auto" checkbox and afterward enter the appropriate remote IP address in the menu "IP configuration" (please refer to Chapter System → Configuration → IP configuration).

On both sides "Master" and "Slave" managements must be interconnected via an external switch or directly on LAN1 or LAN3 ports (in addition to LAN2 interconnection) for aggregation/protection to work. This connection is used to interchange 2+0/1+1 aggregation/protection statuses for proper operation.

Interconnection schemes

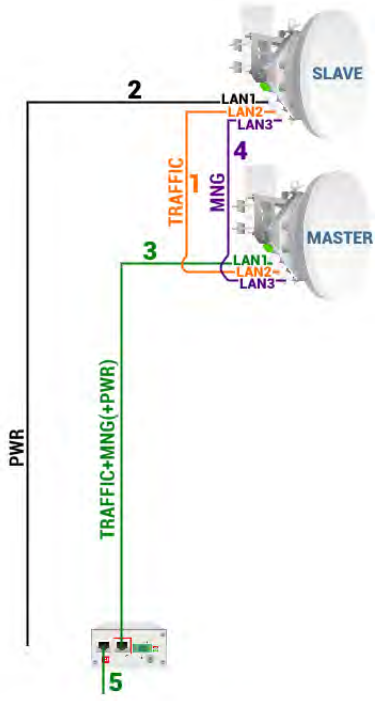
There are 4 possible interconnection schemes:



1. Mandatory fiber optic cable between LAN2 (optical) ports on both units.
2. Electrical Ethernet cable (1000Base-T) between PoE injector's (#1) DATA+PWR port and LAN1 (electrical) port of the Slave FODU. Both data and power are carried, therefore the total length of cables #2, #3, and #4 combined should not exceed 100m.
3. Electrical Ethernet cable (1000Base-T) between PoE injector's (#2) DATA+PWR port and LAN1 (electrical) port of Master FODU. Both data and power are carried, therefore the total length of cables #2, #3, and #4 combined should not exceed 100m.
4. Electrical Ethernet cable (1000Base-T) between PoE injectors' (#1 and #2) DATA ports. Provides management access to Slave FODU. The total length of cables #2, #3, and #4 combined should not exceed 100m.
5. Fiber optic cable between LAN3 (optical) port of the Master or Slave FODU and CPE for both traffic and management traffic.

Advantages: 1) external switch not required; 2) length of optical cable for traffic/management up to 10km.

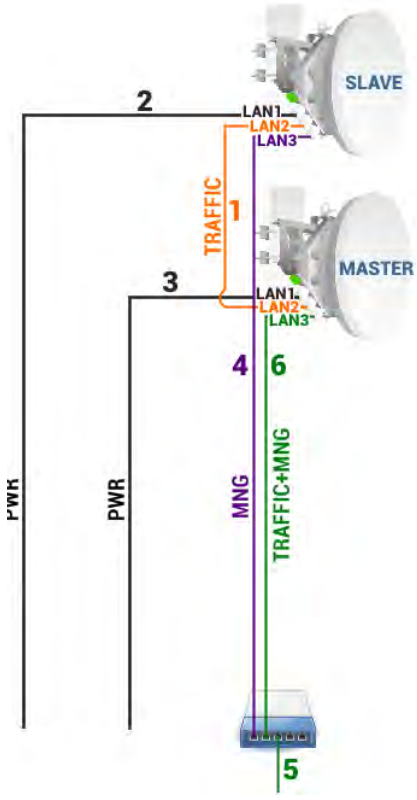
b



1. Mandatory fiber optic cable between LAN2 (optical) ports on both units.
2. Cable for powering Slave FODU. You can use a 2-wire power cable with DC power adapter (P/N D0ACPW01) or a standard Ethernet cable with the PoE injector. Depending on power consumption cable length can be extended up to 700m. Refer to chapter RJ-45 port for details.
3. Electrical Ethernet cable (1000Base-T) between PoE injector's (#2) DATA+PWR port and LAN1 (electrical) port of the Master FODU. Both data and power are carried, therefore the total length of cables #3 and #5 combined should not exceed 100m.
4. Fiber optic cable between LAN3 (optical) ports on both units. Provides management access to the Slave FODU.
5. Electrical Ethernet cable (1000Base-T) between PoE injector's (#1 or #2) DATA port and CPE or both traffic and management traffic. The total length of cables #3 and #5 combined should not exceed 100m.

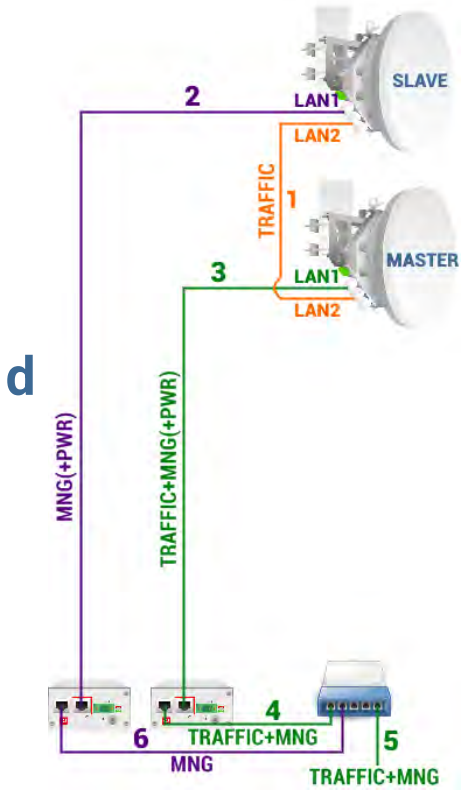
Advantages: 1) external switch not required; 2) optical cable used only for interconnection between both FODUs; 3) only two cables are installed between FODUs and an indoor facility.

c



1. Mandatory fiber optic cable between LAN2 (optical) ports on both units.
2. Cable for powering the Slave FODU. You can use a 2-wire power cable with a DC power adapter (P/N D0ACPW01) or a standard Ethernet cable with the PoE injector. Depending on power consumption cable length can be extended up to 700m. Refer to chapter RJ-45 port for details.
3. Cable for powering the Master FODU. You can use a 2-wire power cable with a DC power adapter (P/N D0ACPW01) or a standard Ethernet cable with the PoE injector. Depending on power consumption cable length can be extended up to 700m. Refer to chapter RJ-45 port for details.
4. Fiber optic cable between LAN3 (optical) port of the Slave FODU and external switch. Provides management access to the Slave FODU. If the Master link is down, traffic will be redirected through this cable.
5. Electrical Ethernet cable (1000Base-T) between the external switch and CPE for both traffic and management traffic.
6. Fiber optic cable between LAN3 (optical) port of the Master FODU and an external switch for both traffic and management traffic.

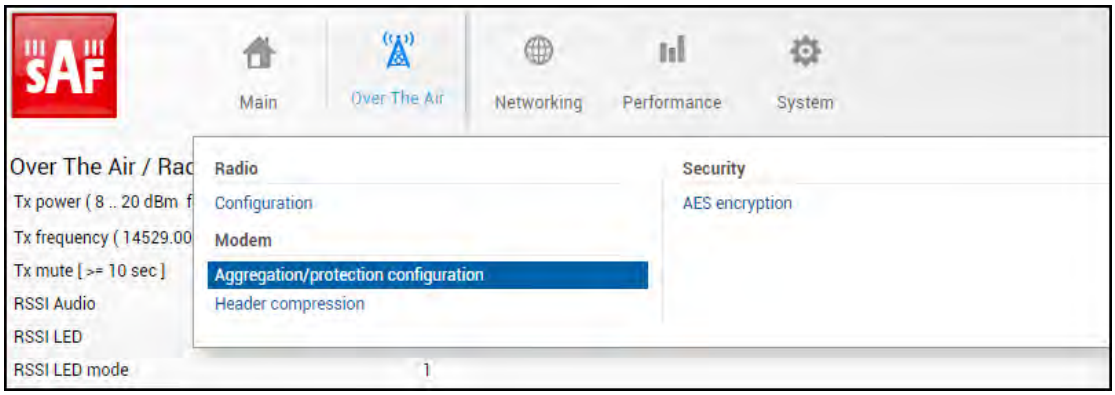
Advantages: 1) solution provides the greatest cable length for powering Integra/Integra-S/Integra-G/Integra-GS and the length of optical cable for traffic/management can be up to 10km. For details on the length of the power cable refer to chapter RJ-45 port; 2) Slave link will be able to reconfigure to 1+0 in case the Master unit goes down (2+0 redundancy).



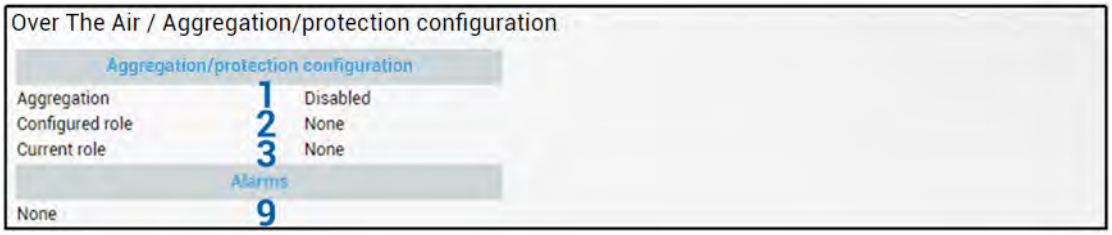
1. Mandatory fiber optic cable between LAN2 (optical) ports on both units.
2. Electrical Ethernet cable (1000Base-T) between PoE injector's (#1) DATA+PWR port and LAN1 (electrical) port of the Slave FODU. Both data and power are carried, therefore the total length of cables #2 and #6 combined should not exceed 100m. If the Master link is down, traffic will be redirected to this cable.
3. Electrical Ethernet cable (1000Base-T) between PoE injector's (#2) DATA+PWR port and LAN1 (electrical) port of the Master FODU. Both data and power are carried, therefore the total length of cables #3 and #4 combined should not exceed 100m.
4. Electrical Ethernet cable (1000Base-T) between PoE injector's (#2) DATA port and external switch. The total length of cables #3 and #4 combined should not exceed 100m.
5. Electrical Ethernet cable (1000Base-T) between the external switch and CPE for both traffic and management traffic.
6. Electrical Ethernet cable (1000Base-T) between PoE injector's (#1) DATA port and external switch. The total length of cables #2 and #6 combined should not exceed 100m.

Advantages: 1) only a single fiber optic cable is required; 2) only two cables are installed between FODUs and indoor facility; 3) Slave link will be able to reconfigure to 1+0 in case the Master unit goes down (2+0 redundancy).

Configuration in Web GUI

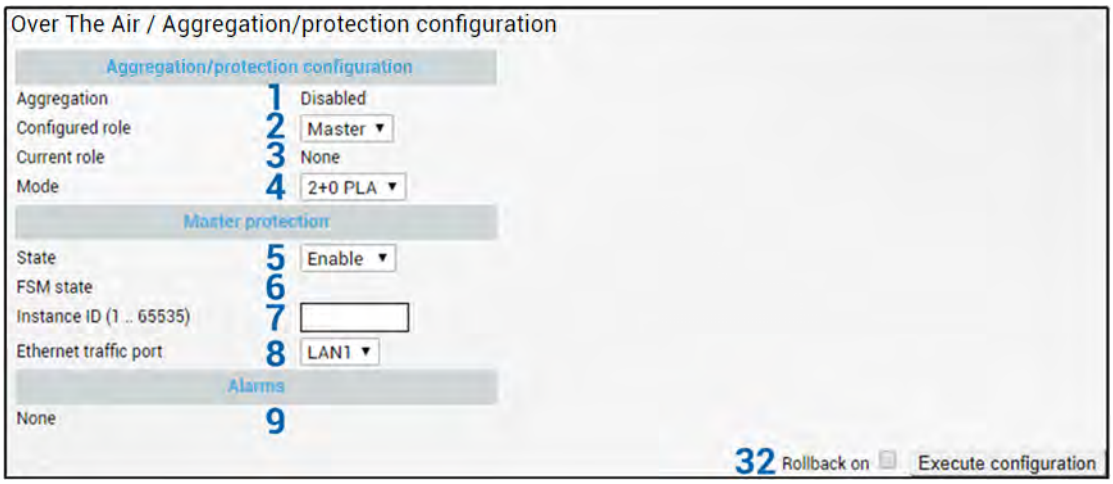


Status mode

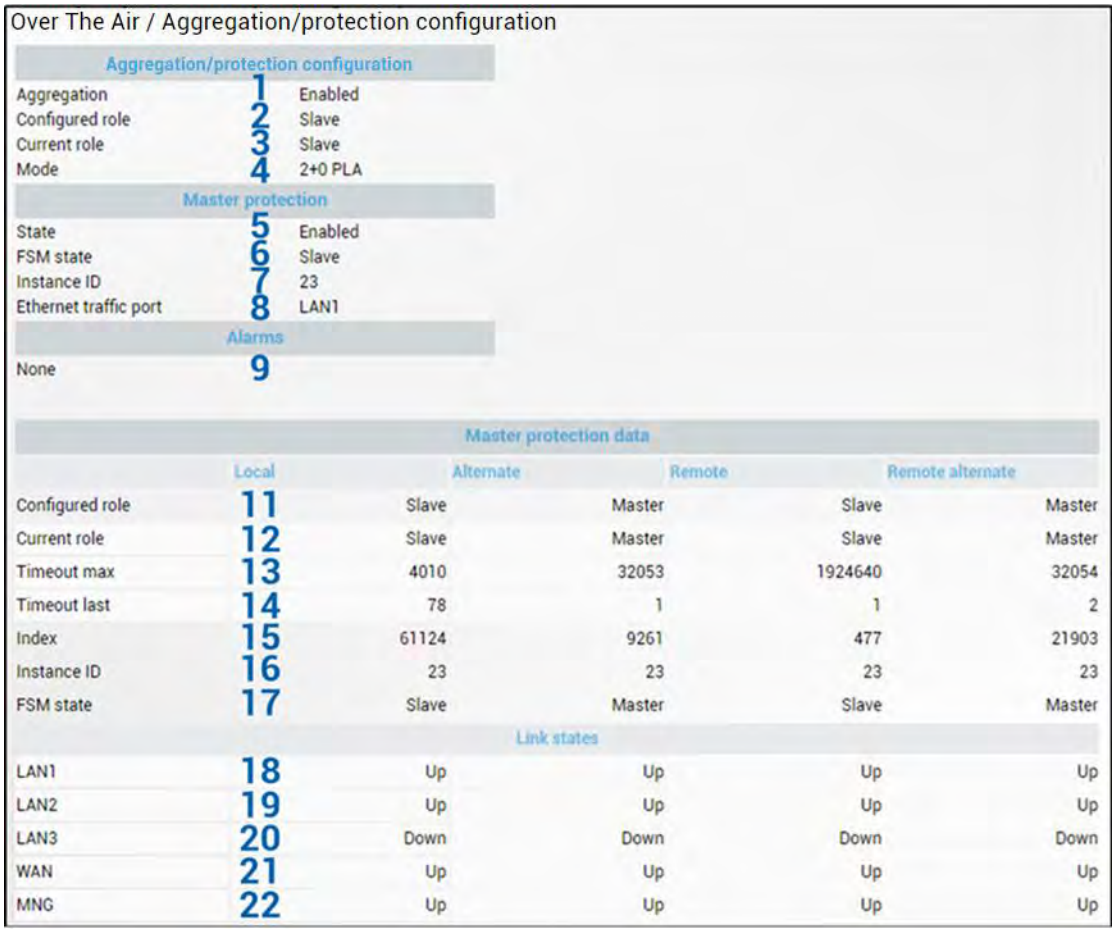


Press MODIFY button.

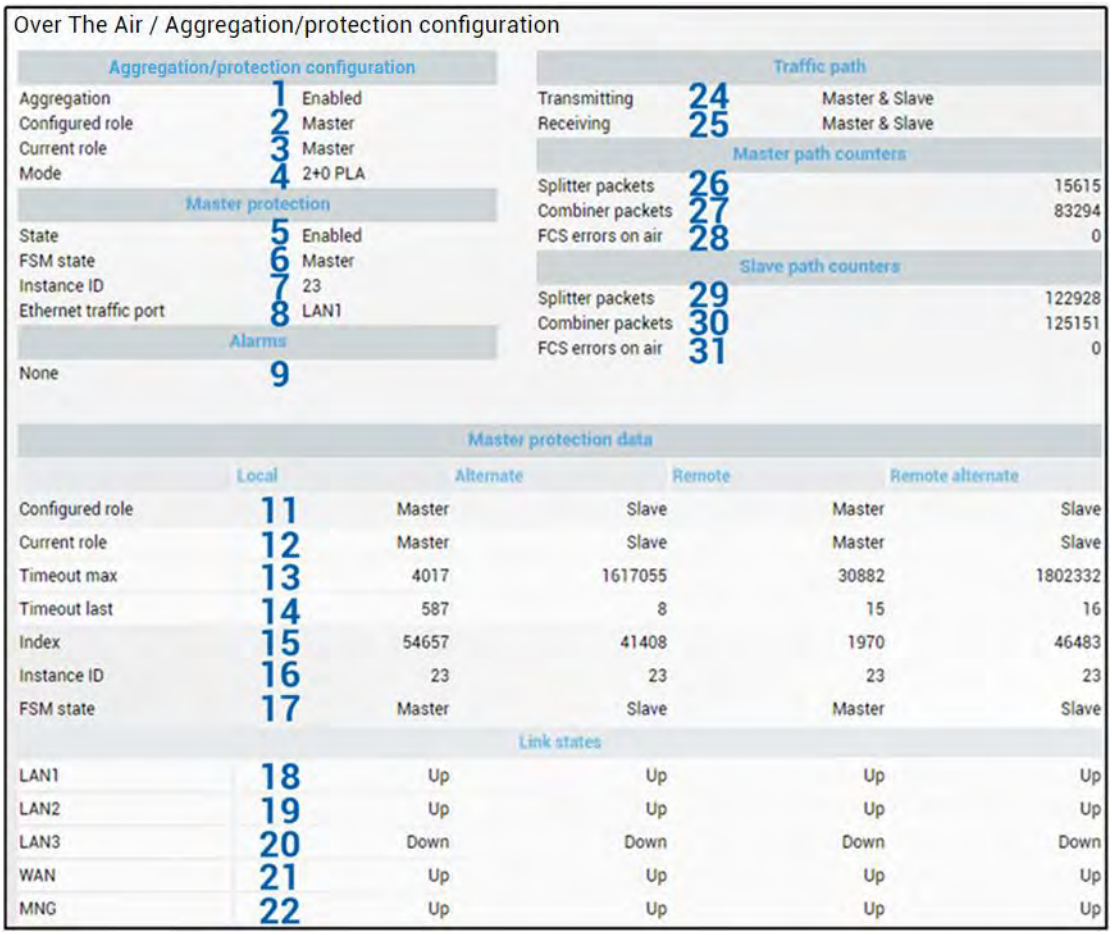
Modify mode



Slave status after enabling aggregation

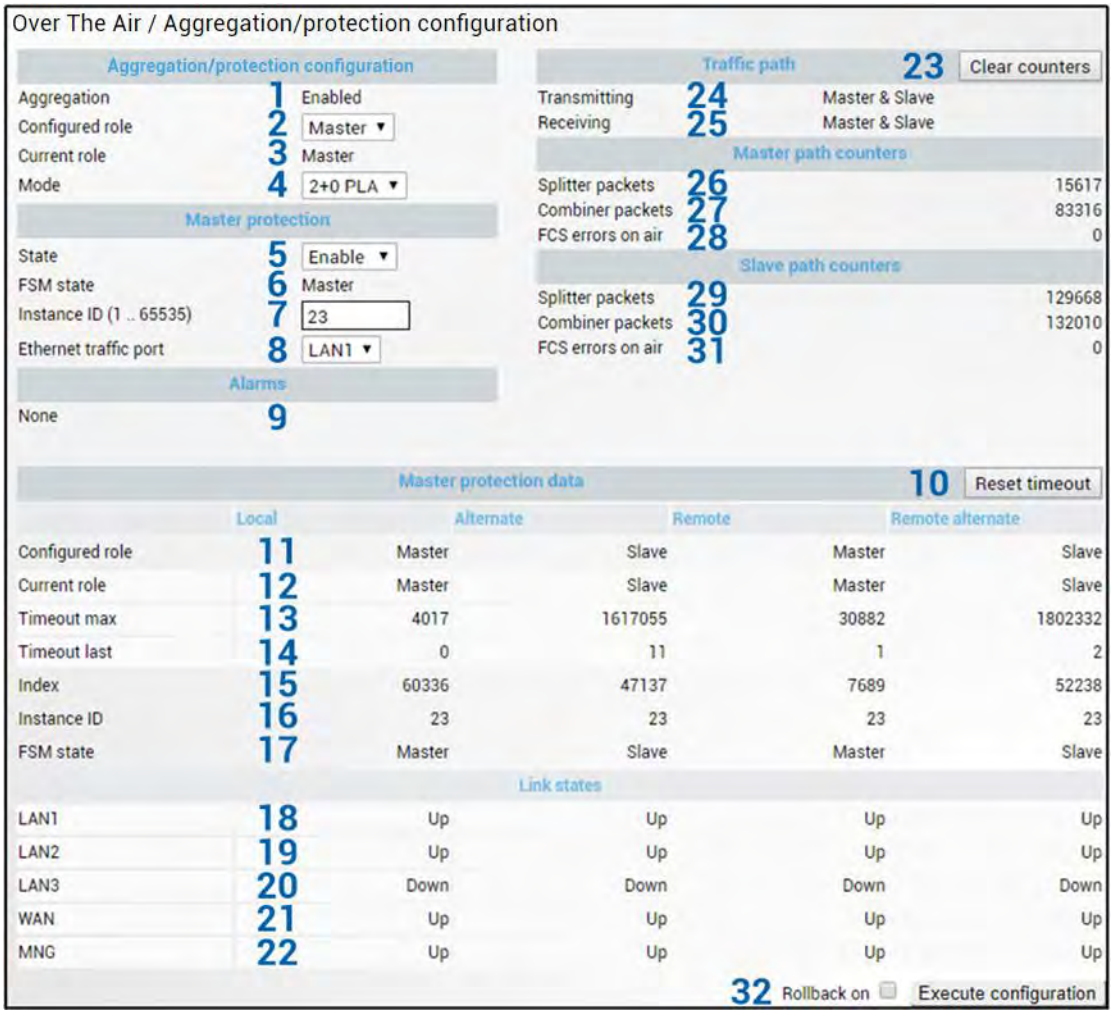


Master status after enabling aggregation



Press MODIFY button.

Master modify mode after enabling aggregation



When all four Integra/Integra-S/Integra-G/Integra-GS FODUs are successfully configured and interconnected, the status of the Master unit should look as shown above.

Explanation of status/configuration fields

Aggregation configuration

1) ***Aggregation*** - Indicates whether aggregation is enabled or disabled.
2) ***Configured role*** – Indicates the configured role (status mode); allows specifying aggregation role (modify mode).
3) ***Current role*** – Indicates the current role. It may differ from the configured role in case Master protection is enabled, the alternate device is or was not available and reconfiguration to 1+0 configuration took place.
4) ***Mode*** – "2+0 PLA" for 2+0 Physical Layer Aggregation. "1+1 HSB" for 1+1 Hot StandBy protection.

Master protection

5) ***State*** – Indicates whether Master protection is enabled or disabled (status mode); allows enabling or disabling Master protection (modify mode). (For 1+1 configuration always in Enable state)
6) ***FSM state*** – Indicates current Finite State Machine's state. Will be visible only when Master protection is enabled.

8 states are possible – Master, Slave, Active (transition to Passive, Slave, or Active Try), Passive (transition to Slave), Active Try (1+1 transition to Active Tx), Active Tx (1+1 transmitting), Standby (ready for 1+1 protection), and TpDown (Slave state when Traffic port is down). In the case of TpDown aggregation port (LAN2) is shut down as well.

7) ***Instance ID (0…65535)*** – Indicates configured instance ID (status mode); allows entering instance ID (modify mode). Will be available only when Master protection is enabled.

Instance ID should be the same on all 4 devices in a single link.

Instance ID should differ for other 2+0 links in the network.

8) ***Ethernet traffic port*** – Indicates which LAN port is configured as the traffic/management port (status mode); allows setting LAN1 or LAN3 port as the traffic/management port (modify mode).

Alarms

9) Indicates which alarms are active. If none, “None” is shown.

Aggregation port link is down – the link status of the aggregation port (LAN2) of the local device is down.

AIS condition – synchronization loss of Master or Slave device or link status of aggregation port (LAN2) of the remote device is down.

Master protection data

The status of all four units is shown. Local – the unit you are currently connected to; alternative – unit interconnected with the local unit; remote – unit on the remote side of the link synchronized to the local unit; remote alternate – unit interconnected with the remote unit.

The section is visible when aggregation is enabled.

If no data is available “N/D” will be displayed in red color.

10) ***Reset timeout*** – Allows resetting protection data refresh time counters. The button is available only in modify mode.
11) ***Configured role*** – Indicates configured role;
12) ***Current role*** – Indicates current role. May differ from the configured role in case Master protection is enabled, the alternate device is or was not available and reconfiguration to 1+0 configuration took place;
13) ***Timeout max*** – Maximum refresh time of protection data in milliseconds;
14) ***Timeout last*** – Most recent refresh time of protection data in milliseconds;
15) ***Index*** – Aggregation data identifier. Value sequentially increments to 65535 and resets to 0;
16) ***Instance ID*** – Indicates configured instance ID;
17) ***FSM state*** – Indicates current Finite State Machine’s state. Will be visible only when Master protection is enabled.
18) ***LAN1*** – Indicates link status of LAN1 port – up or down;
19) ***LAN2*** – Indicates link status of LAN2 port – up or down;
20) ***LAN3*** – Indicates link status of LAN3 port – up or down;
21) ***WAN*** – Indicates link status of WAN port – up or down;
22) ***MNG*** – Indicates link status of MNG port – up or down;

Traffic path

23) ***Clear counters*** - Allows resetting master and slave path counters. The button is available only in modify mode.
24) ***Transmitting*** – For 2+0 configuration: Indicates whether Master, Slave, or both are transmitting traffic. For 1+1 configuration: Indicates whether the current role Master (Local master) or Slave (Alternate Slave) is transmitting.
25) ***Receiving*** – For 2+0 configuration: Indicates whether Master, Slave, or both are receiving traffic. For 1+1 configuration: Indicates whether the current role Master (Local master) or Slave (Alternate Slave) is receiving.

Master path counters

26) ***Splitter packets*** – Indicates the number of packets transmitted by Master FODU.
27) ***Combiner packets*** – Indicates the number of packets received by Master FODU.
28) ***FCS errors on air*** – Indicates the number of FCS errors received by Master FODU.

Slave path counters

29) ***Splitter packets*** – Indicates the number of packets transmitted by Slave FODU.
30) ***Combiner packets*** – Indicates the number of packets received by Slave FODU.
31) ***FCS errors on air*** – Indicates the number of FCS errors received by Slave FODU.

Slave path counters

32) By pressing *„Execute configuration”,* changes made to the corresponding section apply only to the local side Integra/Integra-S/Integra-G/Integra-GS. If *„Rollback on”* is selected, the configuration will be reverted in case erroneous configuration changes are applied.

Configuration example

Configuration for both Slave FODUs

For 2+0:

Aggregation/protection configuration	
Aggregation	Enabled
Configured role	Slave
Current role	Slave
Mode	2+0 PLA
Master protection	
State	Enabled
FSM state	Slave
Instance ID	23
Ethernet traffic port	LAN1

192.168.205.100

For 1+1:

Aggregation/protection configuration	
Aggregation	Enabled
Configured role	Slave
Current role	Slave
Mode	1+1 HSB
Master protection	
State	Enabled
FSM state	Standby
Instance ID	11
Ethernet traffic port	LAN1

192.168.205.200

192.168.205.10 192.168.205.20

Configuration for both Master FODUs

For 2+0:

Aggregation/protection configuration	
Aggregation	Enabled
Configured role	Master
Current role	Master
Mode	2+0 PLA
Master protection	
State	Enabled
FSM state	Master
Instance ID	23
Ethernet traffic port	LAN1

For 1+1:

Aggregation/protection configuration	
Aggregation	Enabled
Configured role	Master
Current role	Master
Mode	1+1 HSB
Master protection	
State	Enabled
FSM state	Active Tx
Instance ID	11
Ethernet traffic port	LAN1

CLI commands (Chapter 4: COMMAND LINE INTERFACE)

aggr status	Use to show aggregation status, statistics, and alarms.
aggr status clear	Use to clear the aggregation statistics.
Aggr role {none|master|slave}	Use to specify 2+0 aggregation role – Master or Slave. "none" disables aggregation.
Aggr role {none|master 1+1| slave 1+1}	Use to specify 1+1 Hot StandBy role – Master or Slave. "none" disables aggregation.
Aggr force {none|master|slave}	Use to force traffic to transmit solely via Master or Slave FODU.
Aggr mprot enable <id> {LAN1|LAN3}	Use to enable master protection by specifying instance ID and traffic port – LAN1 or LAN3.
Aggr mprot disable	Use to disable master protection.
aggr mprot data	Use to show master protection refresh data.
aggr mprot data reset	Use to reset master protection refresh data counters.
aggr mprot smpdata	Use to show the status of all 2+0 devices.
aggr mprot state <state>	Use to change FSM state. For testing purposes only!

Over The Air → Modem → Header compression

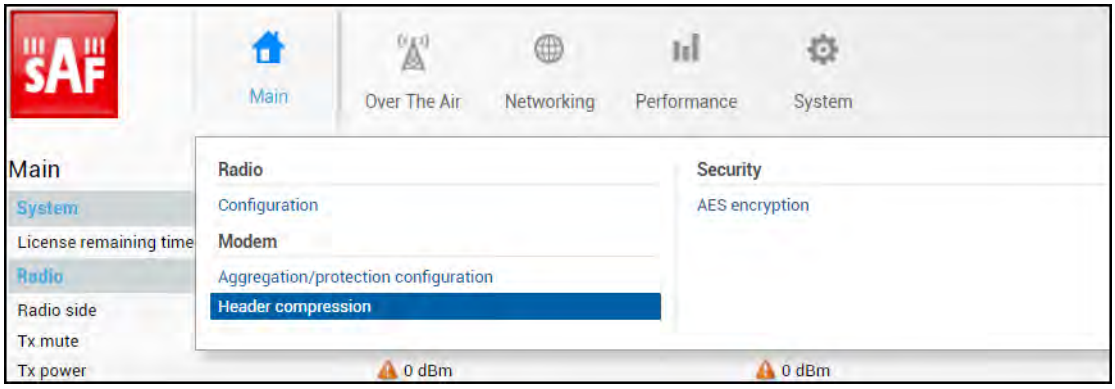
In many applications such as Voice over IP (VoIP), interactive gaming, or messaging, the size of the header is significant compared to the size of the payload. Over the end-to-end

connection comprised of multiple hops, these headers are significant, but they can be omitted over a single link. It is beneficial to compress those headers to provide high-capacity packet saving, achieve better bandwidth utilization, and efficiently use expensive resources. Reduction in packet loss and improved interactive response time are additional important benefits gained by header compression.

In summary, header compression is the process of compressing excess protocol headers before transmitting them on a link and uncompressing them to their original state on reception at the other end of the link.

For more details see Header Compression section in Chapter 6: FUNCTIONAL DESCRIPTION.

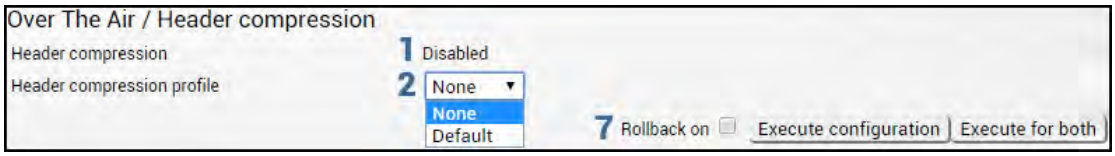
Header compression cannot be used with 2+0 aggregation configured.



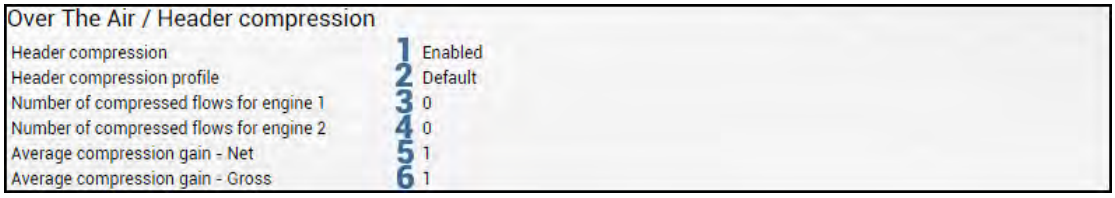
Status mode

Press MODIFY button.

Modify mode

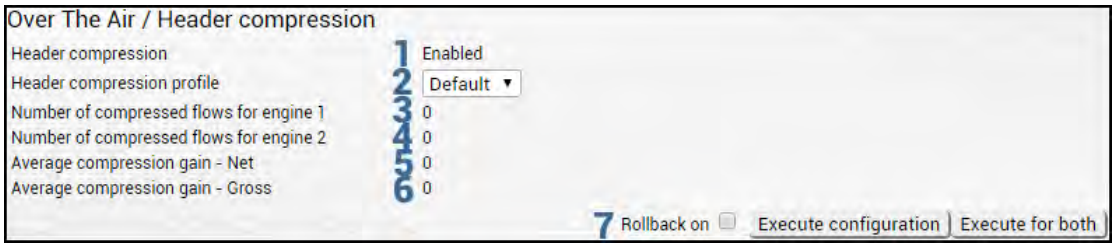


Status mode after enabling header compression



Press MODIFY button.

Modify mode after enabling header compression



Explanation of status/configuration fields:

1) ***Header compression*** – Indicates whether header compression is enabled or disabled.
2) ***Header compression profile*** – Indicates which header compression profile is selected (status mode); allows choosing compression profile and thus enabling header compression or disabling it using the "None" profile (modify mode).
3) ***Number of compressed flows for engine 1*** – Indicates the number of compressed entries for engine #1. The maximum is 2048.
4) ***Number of compressed flows for engine 2*** – Indicates the number of compressed entries for engine #2. The maximum is 2048.
5) ***Average compression gain - Net*** – Indicates compression percentage between ingress and egress data.
6) ***Average compression gain - Gross*** – Indicates compression percentage between ingress and egress data including GFP (Generic Framing Procedure) overhead.
7) By pressing *„Execute configuration"*, changes made to the corresponding section apply only to the local side Integra/Integra-S/Integra-G/Integra-GS. If *„Rollback on"* is selected, the configuration will be reverted in case erroneous configuration changes are applied.
   Pressing *„Execute for both"* applies changes made to the corresponding section both for local and remote side Integra/Integra-S/Integra-G/Integra-GS FODUs.

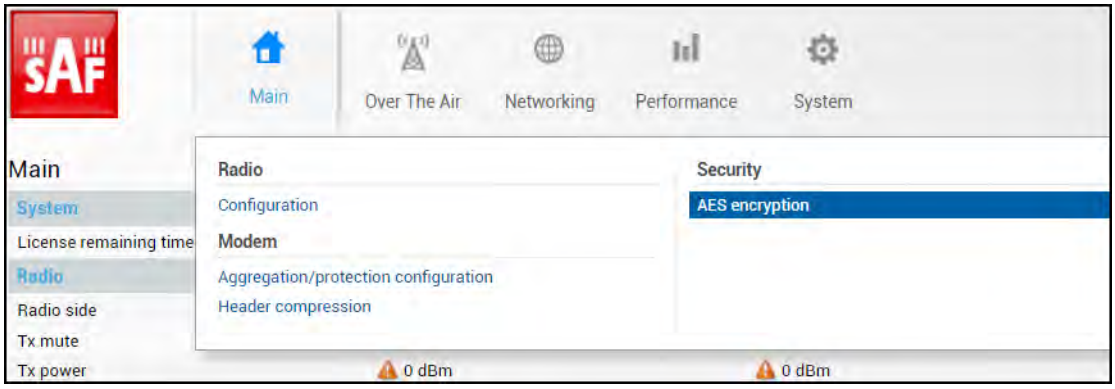
CLI commands (Chapter 4: COMMAND LINE INTERFACE)

modem hc preset {none|default}	Use to enable (preset "default") or disable (preset "none") header compression.
modem hc statistics	Use to show head compression statistics.

Over The Air → Security → AES encryption

Enabling AES encryption provides payload data encryption over the air using Advanced Encryption Standard (AES).

For more details see AES - Advanced Encryption Standard section in Chapter 6: FUNCTIONAL DESCRIPTION.



Status mode

Press MODIFY button.

Modify mode

1) Indicates current AES status – enabled or disabled.
2) ***AES 256 bit key (64 hexadecimal characters)*** – Indicates AES key used. The key should be exactly 64 hexadecimal characters long. A dialog window will not allow more than 64 characters.
3) By pressing *„Execute configuration"*, changes made to the corresponding section apply only to the local side Integra/Integra-S/Integra-G/Integra-GS. If *„Rollback on"* is selected, the configuration will be reverted in case erroneous configuration changes are applied.

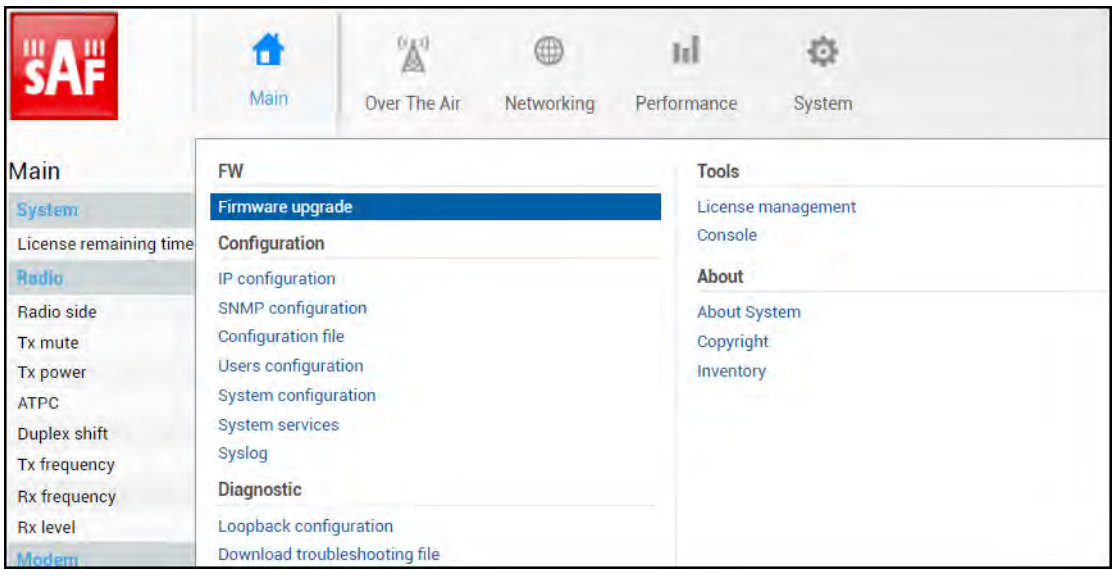
Activation of AES for Integra/Integra-S/Integra-G/Integra-GS FODU

1) Make sure the firmware version is V2.5.13 or later.

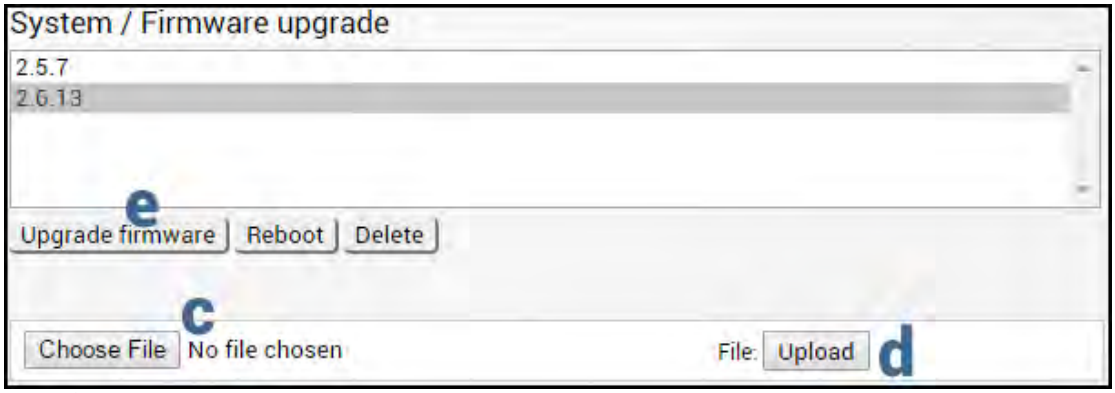
   0) If required perform the firmware upgrade.

      ⚠ Skip this step if the firmware version is V2.5.13 or later.

   a) Go to "System→FW→Firmware upgrade" on the remote side of the link.



b) Press MODIFY button.



c) Locate *.bin firmware file on your hard disk drive.
d) Upload selected *.bin firmware file.
e) Select the uploaded *.bin firmware file from the list and press “Upgrade firmware”.

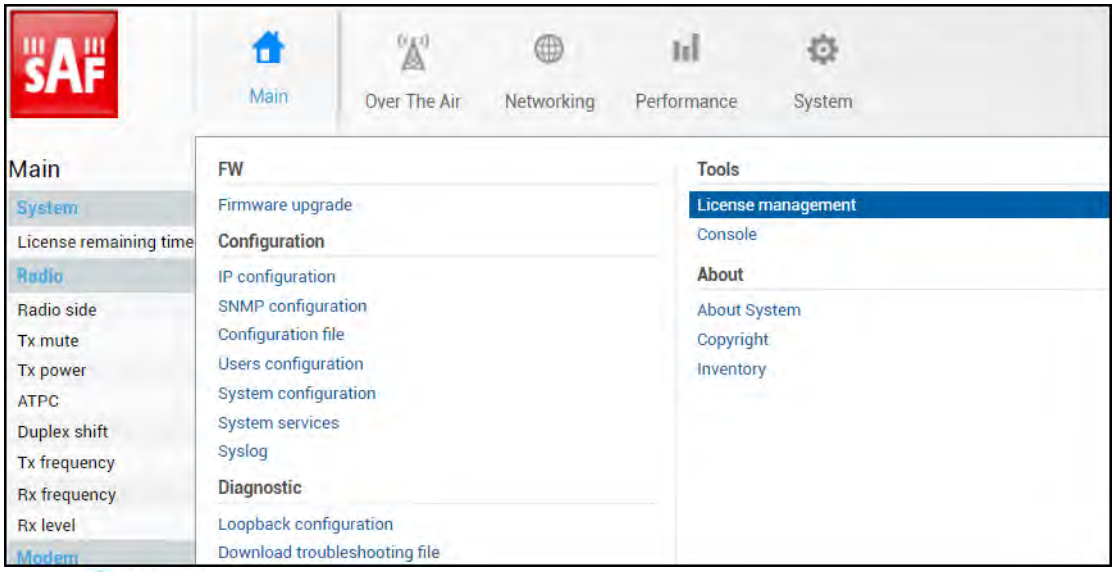
> ⚠ The remote side should be upgraded first.

f) Repeat steps a)-e) for the local side of the link.

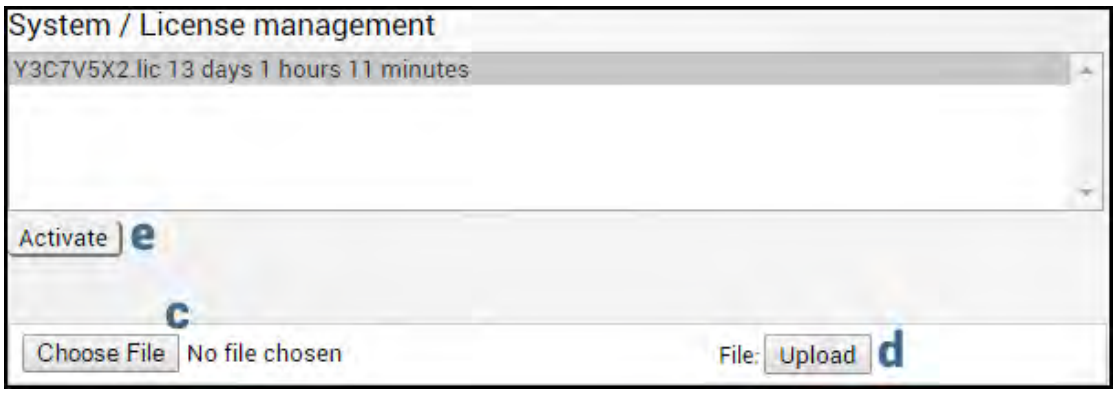
2) Upload and activate license key enabling AES functionality

> ⚠ Skip this step if the AES license is already uploaded.

a) Go to “System→Tools→License management” on the remote side of the link.

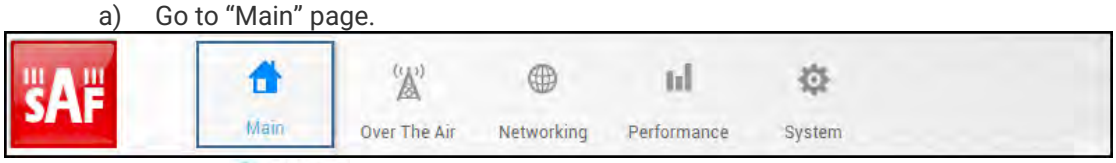


Press MODIFY button.

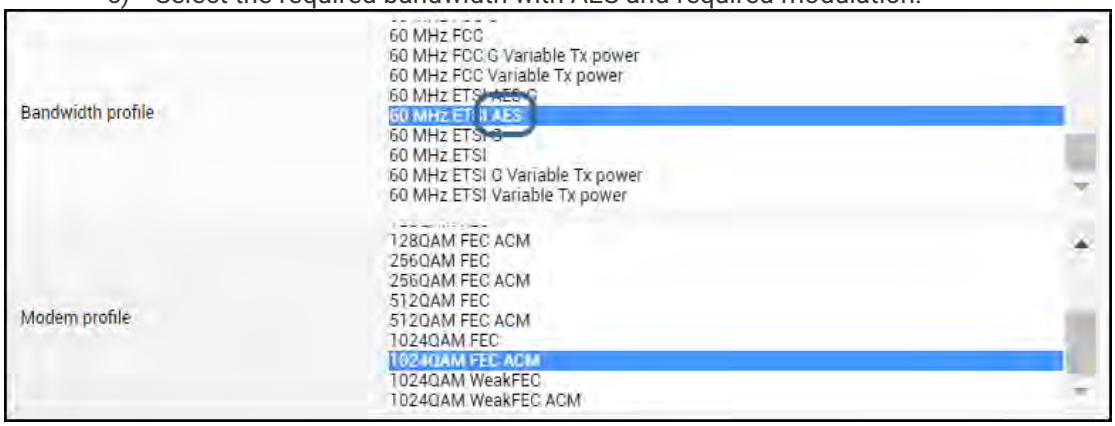


b) Locate *.lic license file on your hard disk drive.
c) Upload selected *.lic license file.
d) Select the uploaded *.lic license file from the list and press “Activate”.
e) Repeat a)-e) for the local side of the link.

3) Set bandwidth with AES
a) Go to “Main” page.



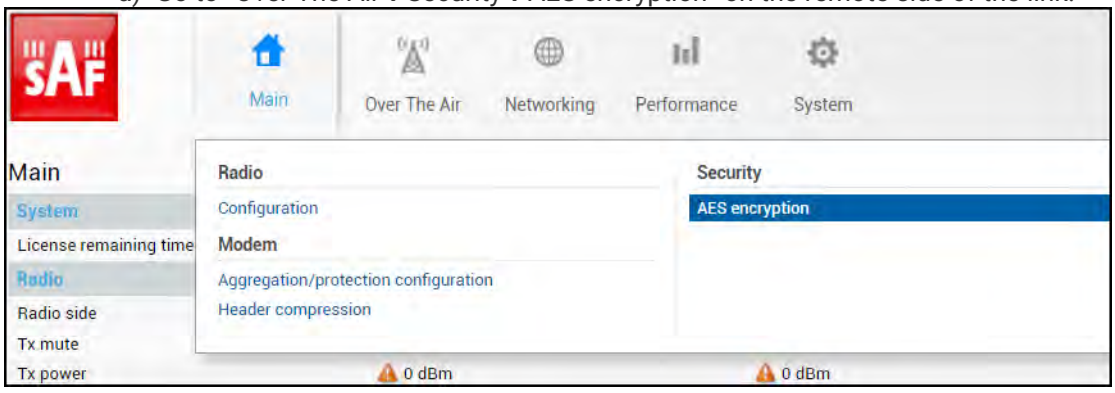
b) Press MODIFY button.
c) Select the required bandwidth with AES and required modulation.



d) Press “Execute for both” button.

4) Apply AES 256-bit key

a) Go to “Over The Air→Security→AES encryption” on the remote side of the link.



b) Press MODIFY button.

c) Enter a 64-symbol key consisting of hexadecimal values (0-9, A-F) or press "Generate random key" button.
d) Select and copy the generated key.
e) Press "Execute configuration" button.
f) Repeat steps a)-e) for the local side of the link using the same copied AES key.

CLI commands (Chapter 4: COMMAND LINE INTERFACE)

modem aes key <64hexkey>	Use to set AES 256-bit key.
modem aes	Use to show AES state and key.

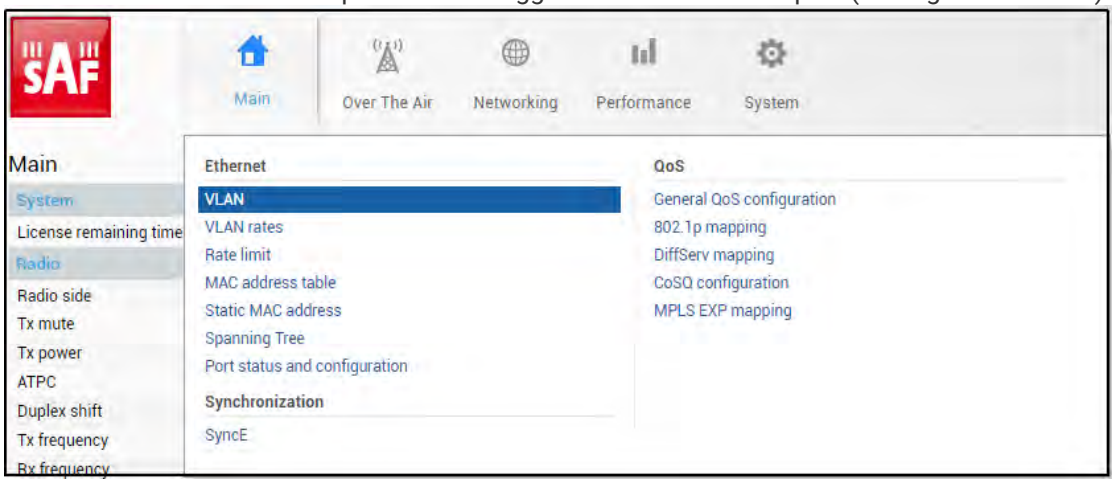
Networking

Networking → Ethernet → VLAN

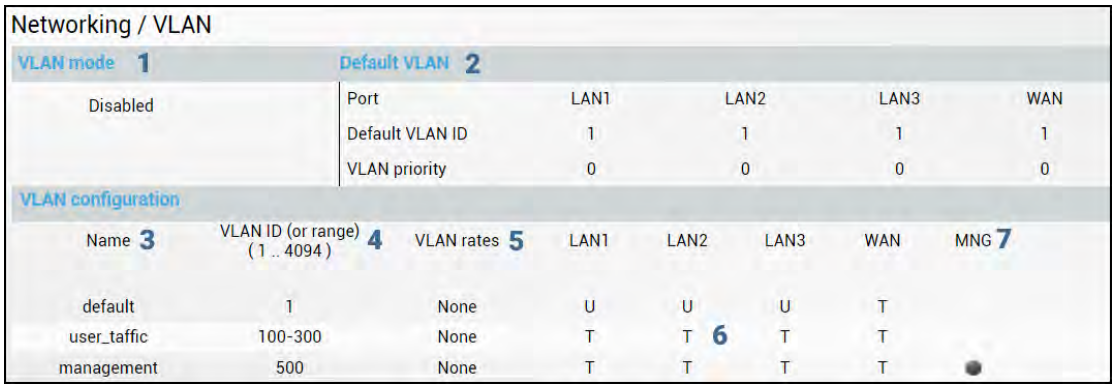
The VLAN configuration window provides the configuration of port-based Ethernet Virtual Local Area Networks (VLANs), allowing up to 4094 different VLAN IDs. It is possible to set VLAN IDs as tagged or untagged members on each LAN port.

To add a VLAN tag to untagged packets in the ingress direction, "Default VLAN" (2) should be specified. By default, the "Default VLAN" value on all ports is VLAN ID 1.

An example below shows a sample configuration with VLAN IDs 100-300 configured as tagged members on LAN2 and WAN ports (user traffic) and VLAN ID 500 as a tagged member on LAN2 and WAN ports and untagged member on MNG port (management traffic).

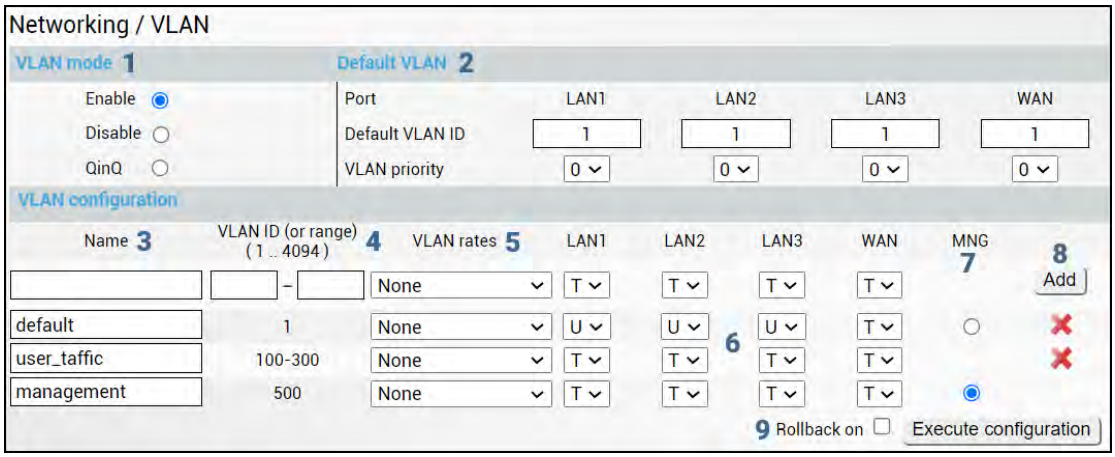


Status mode



Press MODIFY button.

Modify mode



1) ***VLAN mode*** – Indicates VLAN operational mode. The default is "Disable" – 802.1Q disabled. Change to "Enable" to enable 802.1Q VLAN support. Change to "QinQ" to enable 802.1ad QinQ VLAN support.

> ⚠ As soon as you enable VLAN operational mode connectivity with untagged traffic will be lost.

2) ***Default VLAN*** – Indicates Default VLAN IDs and VLAN priorities on LAN and WAN ports (status mode); allows specifying the default VLAN ID and priorities on each of LAN and WAN ports (modify mode). Specified VLAN ID and priority will be added to untagged ingress packets. VLAN priority will be removed from tagged egress packets on particular ports as well, but the VLAN ID will be removed according to the tagged/untagged configuration (see below) of that particular port.
3) ***Name*** – Indicates configured (if assigned) VLAN ID or VLAN ID range names (status mode); allows entering a name for each entry, i.e. individual VLAN ID or VLAN ID range (modify mode).
4) ***VLAN ID (or range) (1 .. 4094)*** – Indicates configured VLAN IDs and VLAN ID ranges (status mode); allows entering individual VLAN IDs or VLAN ID ranges, e.g. "100-300", "500" (modify mode).
5) ***VLAN rates*** – Indicates configured VLAN rate (status mode); allows selecting a defined VLAN rate (modify mode). Please refer to the chapter *Networking → Ethernet → VLAN rates*.

- ***T/U/D*** – Indicates whether VLAN ID entries are configured in U - untagged (access) mode, T - tagged (trunk) mode, or D - disabled (status mode); allows changing VLAN

mode on LAN and WAN ports (modify mode). On the LAN ports changing from T to U will change the previous untagged VLAN ID on the same port to T (trunk) mode and will highlight this change in yellow color. Note that only a single U (untagged) VLAN ID can be configured on each available port.

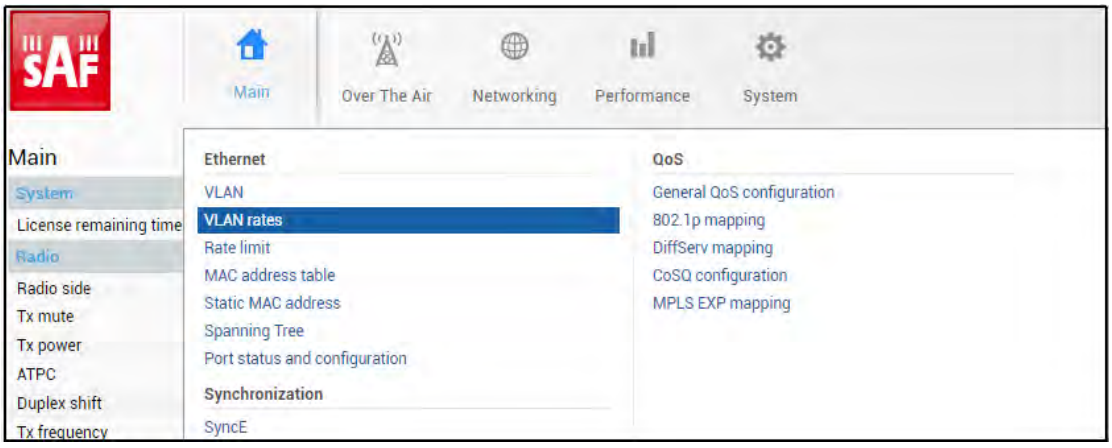
6) ***MNG*** – indicates management VLAN ID (status mode); allows specifying which individual VLAN ID will be used for management access (modify mode).
7) ***Add*** – Press "Add" to add entered individual VLAN ID or VLAN ID range or press red cross (✖) to delete VLAN entry;
8) By pressing *„Execute configuration",* changes made to the corresponding section apply only to the local side Integra/Integra-S/Integra-G/Integra-GS. If *„Rollback on"* is selected, the configuration will be reverted in case erroneous configuration changes are applied.

CLI commands (Chapter 4: COMMAND LINE INTERFACE)

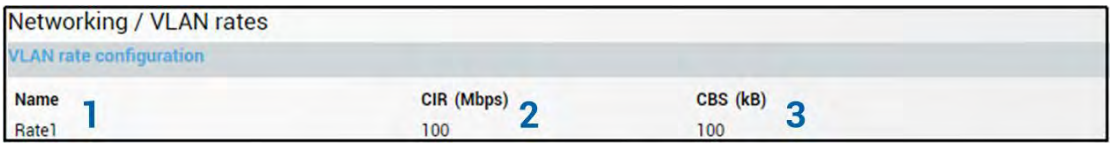
network vlan set mng <1…4094>	Use to set Management (MNG) VLAN ID.
network vlan set mode {disable|enable|qinq}	Use to set VLAN operation mode. "disable" – packets ingress/egress unmodified; "enable" – packets are handled according to VLAN configuration; "qinq" - packets are handled according to VLAN configuration for QinQ.
network vlan set mode qinq tpid <0x0001…0xFFFF>	Use to set tag protocol identifier (TPID) for S-TAG.
network vlan set vid <1…4094> **add** {tagged|untagged} {LAN1|LAN2|LAN3}	Use to add VLAN ID as a tagged (trunk) or untagged (access) type on a specified port.
network vlan set vid <1…4094> **delete** {LAN1|LAN2|LAN3|WAN}	Use to delete VLAN ID on a specified port.
network vlan set vid <1…4094> **name** <name>	Use to name a VLAN ID. The same name can be applied for multiple VLAN IDs.
network vlan set vid <1…4094> **rate** <name>	Use to apply existing rate profile to a VLAN ID. Please refer to Chapter *Networking → Ethernet → VLAN rates*.
network vlan set vid <1…4094> **remove**	Use to remove the defined rate profile from a VLAN ID.
network vlan set default priority <0…7>	Use to set default VLAN priority value for untagged packets.
network vlan set default vid <1…4094>	Use to set default VLAN ID for untagged packets.
network vlan show summary	Use to show general VLAN configuration summary.
network vlan show default	Use to show the configuration of untagged packets.
network vlan show mng	Use to show Management (MNG) VLAN ID.
network vlan show mode	Use to show current VLAN operational mode and custom EtherType ID.
network vlan show vids	Use to show currently configured VLAN IDs on all ports.

Networking → Ethernet → VLAN rates

The VLAN rates page allows configuring rates for selected VLANs.

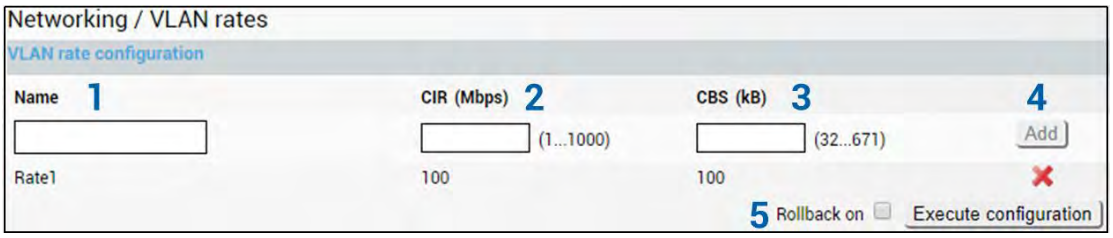


Status mode



Press MODIFY button.

Modify mode



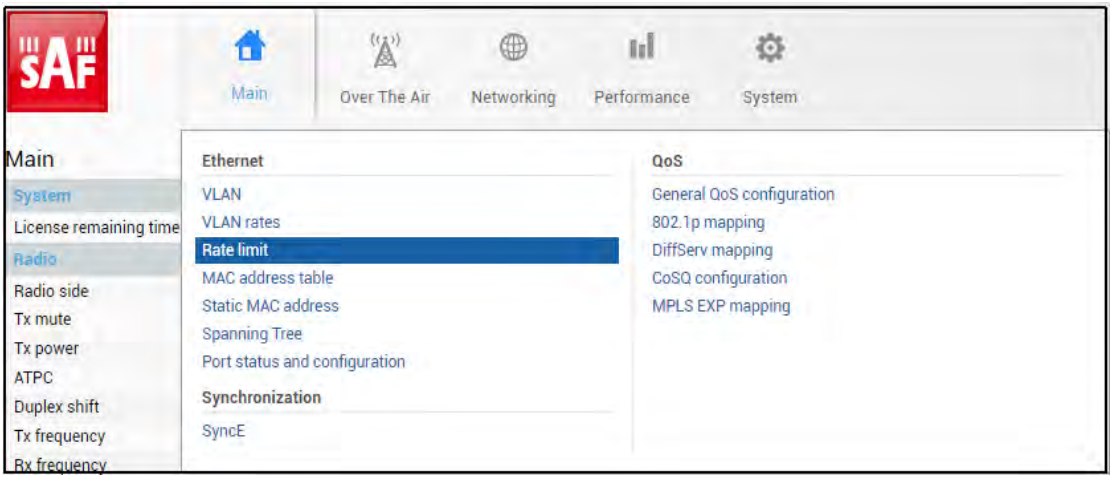
1) ***Name*** – Indicates whether the egress rate is enabled or disabled on a particular port (status mode); allows enabling/disabling egress rate on a particular port (modify mode).
2) ***CIR (Mbps)*** – Indicates configured rate CIR (Committed Information Rate) on a particular VLAN rate item in Mbps (status mode); allows setting rate CIR on a particular VLAN rate item in Mbps (modify mode).
3) ***CBS (kB)*** – Indicates configured rate CBS (Committed Burst Size) on a particular VLAN rate item in kB (status mode); allows setting rate CBS on a particular VLAN rate item in kB (modify mode).
4) ***Add / Delete*** – Press "Add" to add entered VLAN rate or press the red cross (✖) to delete this entry;
5) By pressing *„Execute configuration"*, changes made to the corresponding section apply only to the local side Integra/Integra-S/Integra-G/Integra-GS. If *„Rollback on"* is selected, the configuration will be reverted in case erroneous configuration changes are applied.

CLI commands (Chapter 4: COMMAND LINE INTERFACE)

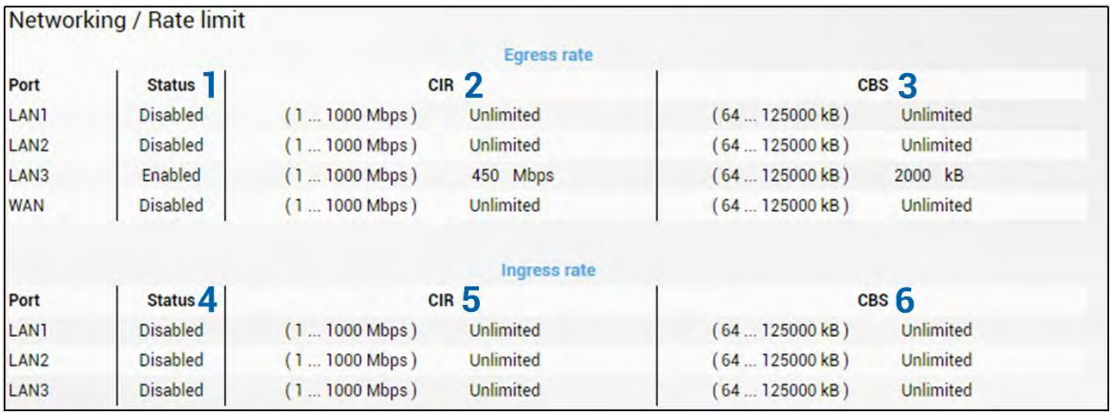
network vlan show rates	Use to show created rate profiles.
network vlan set rate {add|delete} <name> **cir** <1000…1000000kbps> **cbs** <32…671kB>	Use to create new or delete existing rate configuration profiles. Please refer to Chapter Networking → Ethernet → VLAN to apply the created rate profile to a VLAN ID.

Networking → Ethernet → Rate limit

The rate limit page allows configuring ingress and egress rates on available Ethernet switch ports. In case a license with an Ethernet rate limitation is applied, the Ethernet limitation will be indicated as the egress rate of the WAN port.

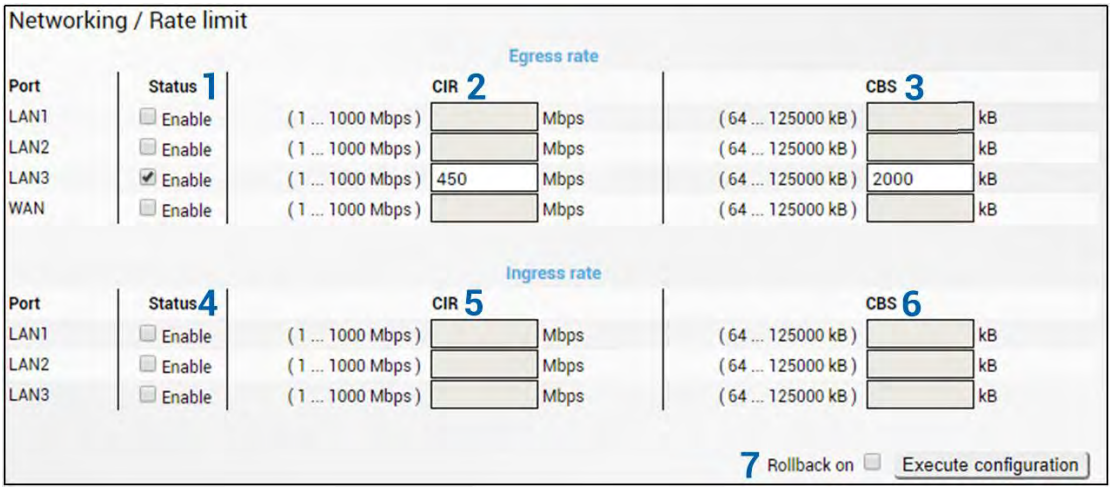


Status mode



Press MODIFY button.

Modify mode



1) ***Egress rate / Status*** – Indicates whether egress rate is enabled or disabled on a particular port (status mode); allows enabling/disabling egress rate on a particular port (modify mode).

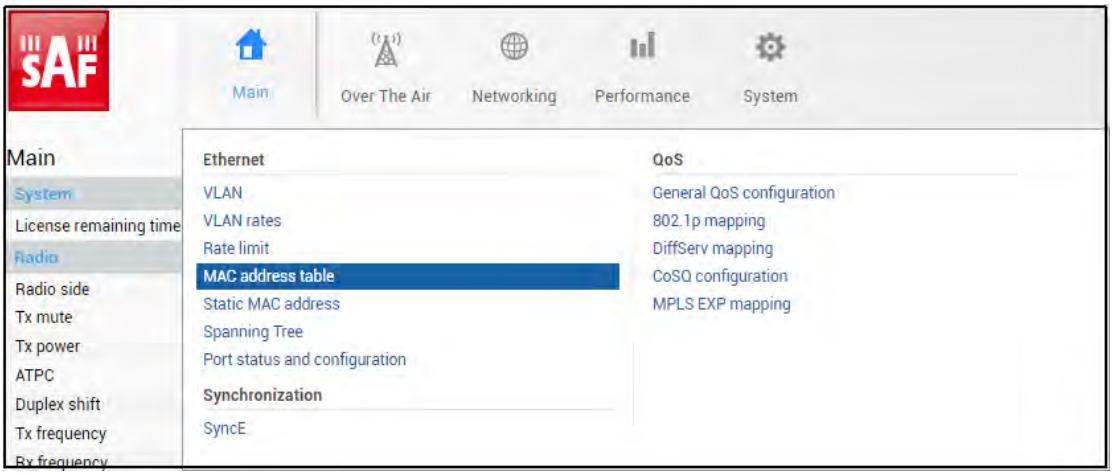
2) ***Egress rate / CIR*** – Indicates configured egress rate CIR (Committed Information Rate) on a particular port in Mbps (status mode); allows setting egress rate CIR on a particular port in Mbps (modify mode). The default setting is "1000".
3) ***Egress rate / CBS*** – Indicates configured egress rate CBS (Committed Burst Size) on a particular port in kB (status mode); allows setting egress rate CBS on a particular port in kB (modify mode). The default setting is "2000".
4) ***Ingress rate / Status*** – Indicates whether ingress rate is enabled or disabled on a particular port (status mode); allows enabling/disabling ingress rate on a particular port (modify mode).
5) ***Ingress rate / CIR*** – Indicates configured ingress rate CIR (Committed Information Rate) on a particular port in Mbps (status mode); allows setting ingress rate CIR on a particular port in Mbps (modify mode). The default setting is "1000".
6) ***Ingress rate / CBS*** – Indicates configured ingress rate CBS (Committed Burst Size) on a particular port in kB (status mode); allows setting ingress rate CBS on a particular port in kB (modify mode). The default setting is "2000".
7) By pressing *„Execute configuration",* changes made to the corresponding section apply only to the local side Integra/Integra-S/Integra-G/Integra-GS. If *„Rollback on"* is selected, the configuration will be reverted in case erroneous configuration changes are applied.

CLI commands (Chapter 4: COMMAND LINE INTERFACE)

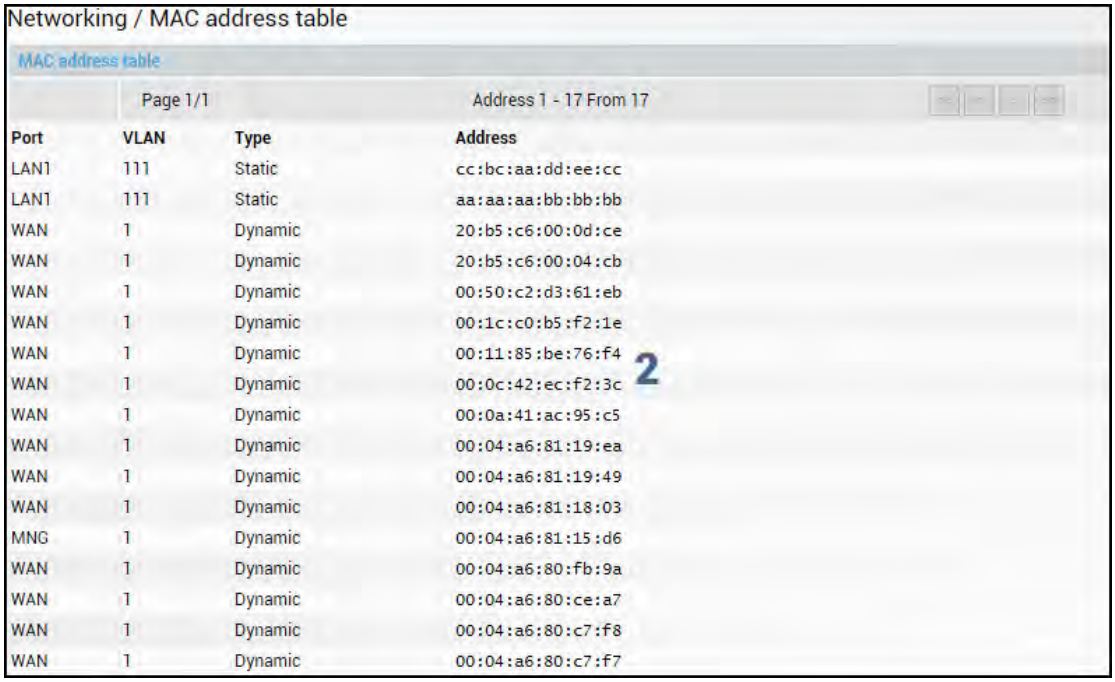
network port show egress-rate <port>	Use to show egress rate limit settings and the status of a particular port.
network port show ingress-rate <port>	Use to show ingress rate limit settings and the status of a particular port.
network port set <port> **egress-rate cir** <96…1000000kbps> **cbs** <64…125000kB>	Use to set Committed Information Rate (CIR) and Committed Burst Size (CBS) setting for egress rate limit on a particular port.
network port set <port> **ingress-rate cir** <96…1000000> **cbs** <64…125000>	Use to set Committed Information Rate (CIR) and Committed Burst Size (CBS) setting for ingress rate limit on a particular port.
network port set <port> **egress-rate state** {enable|disable}	Use to enable or disable egress rate limiting on a particular port.
network port set <port> **ingress-rate state** {enable|disable}	Use to enable or disable ingress rate limiting on a particular port.

Networking → Ethernet → MAC address table

The MAC address table displays the forwarding table of MAC addresses learned by the switch (Dynamic) and manually entered (Static).

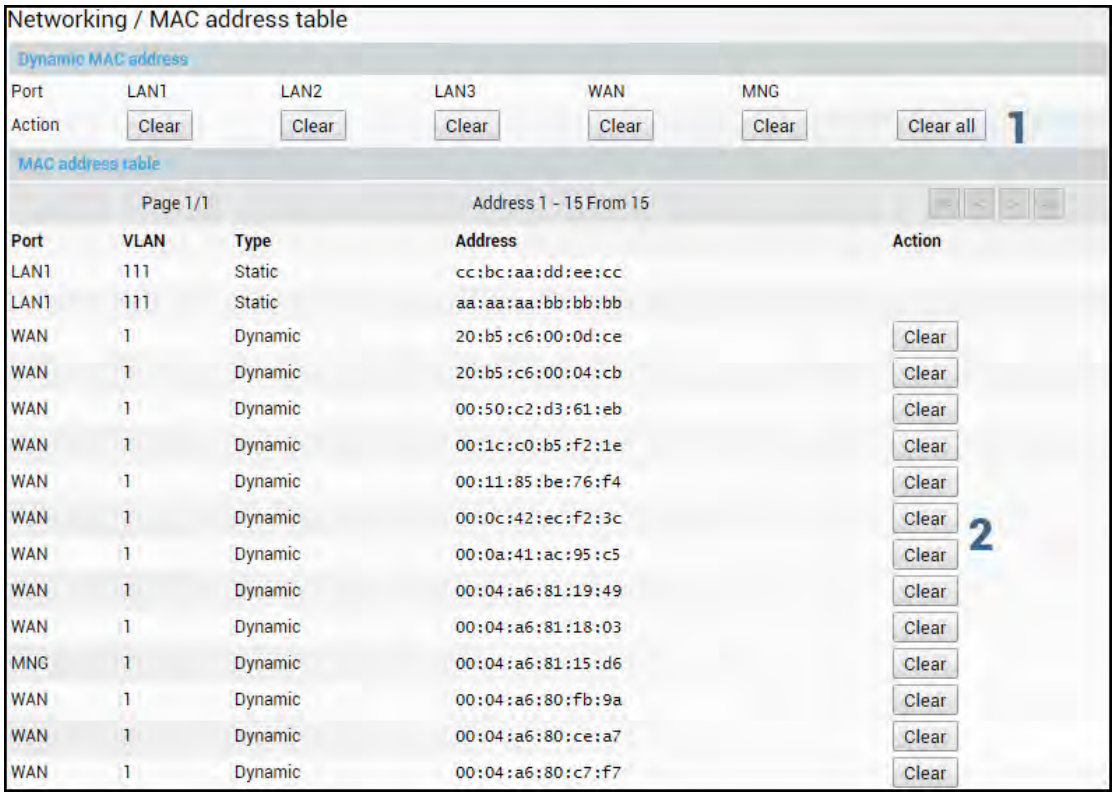


Status mode



Press MODIFY button.

Modify mode



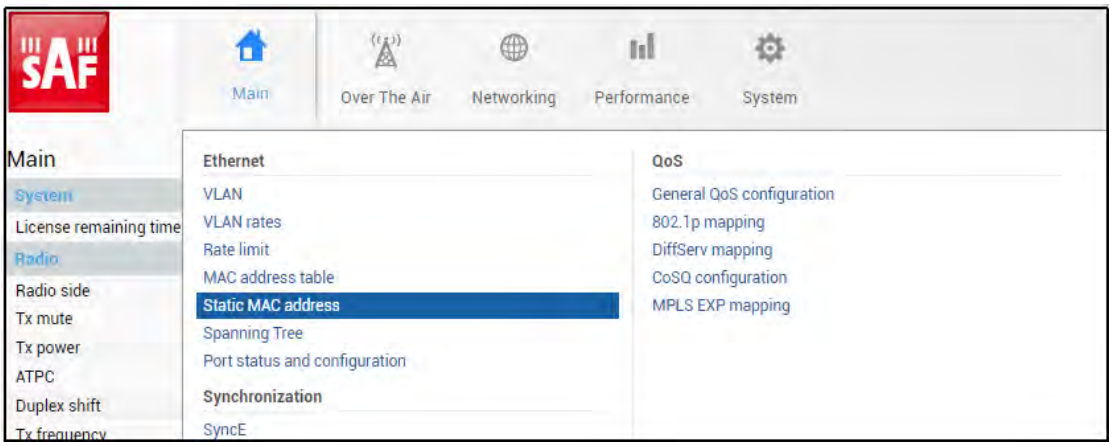
1) Use to clear the dynamic MAC address table on a particular port (“Clear”) or all ports simultaneously (“Clear all”).
2) Shows list of MAC address entries (status mode); allows clearing specific MAC address entries (modify mode).

CLI commands (Chapter 4: COMMAND LINE INTERFACE)

network mac table show	Use to show MAC table entries.
network mac table info	Use to show MAC table statistics.
network mac table clear vlan <vid>	Use to clear MAC table entries for a specific VLAN ID.
network mac table clear port <port>	Use to clear MAC table entries for a specific port.
network mac table clear mac-address <MAC>	Use to clear a dynamic MAC address for all VLAN IDs and ports.
network mac table clear all	Use to clear the whole dynamic MAC address table.

Networking → Ethernet → Static MAC Address

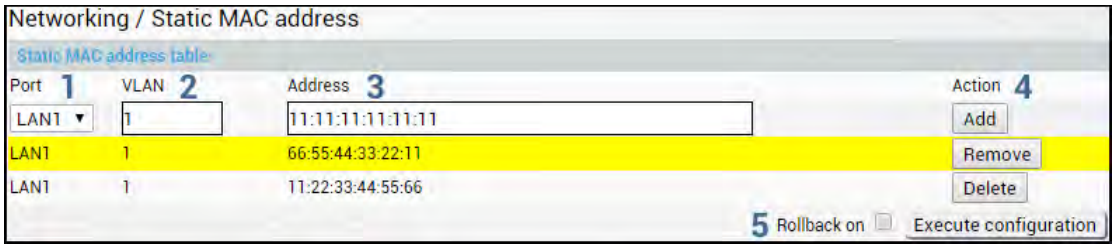
Allows adding and editing static MAC address entries.



Status mode

Press MODIFY button.

Modify mode



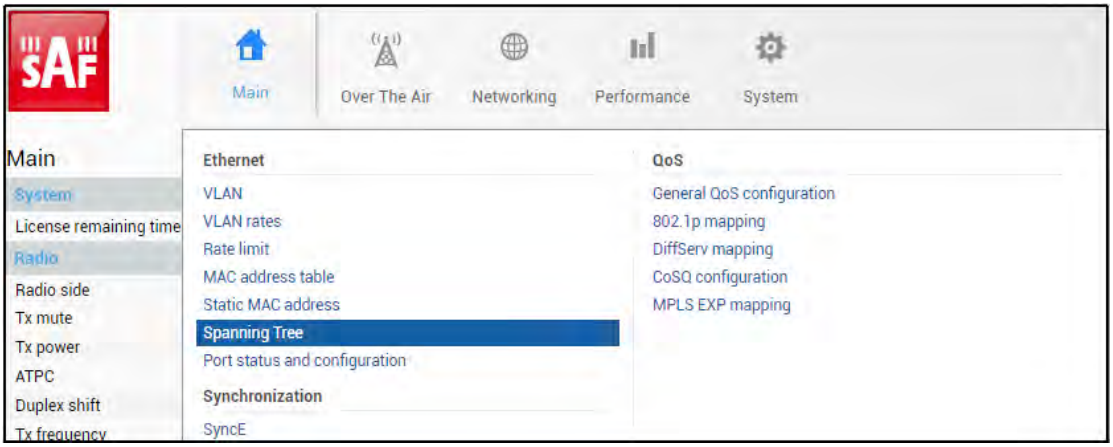
1) ***Port*** – Indicates ports of configured static MAC addresses (status mode); allows specifying the port for static MAC address (modify mode).
2) ***VLAN*** – Indicates VLAN IDs of configured static MAC addresses (status mode); allows specifying VLAN for static MAC address (modify mode).
3) ***Address*** – Indicates configured static MAC addresses (status mode); allows specifying static MAC addresses (modify mode).
4) ***Action*** – Allows adding a new static MAC address ("Add"), removing temporarily entered static MAC address ("Remove"), or deleting permanently entered static MAC address ("Add").
5) By pressing *„Execute configuration"*, changes made to the corresponding section apply only to the local side Integra/Integra-S/Integra-G/Integra-GS. If *„Rollback on"* is selected, the configuration will be reverted in case erroneous configuration changes are applied.

CLI commands (Chapter 4: COMMAND LINE INTERFACE)

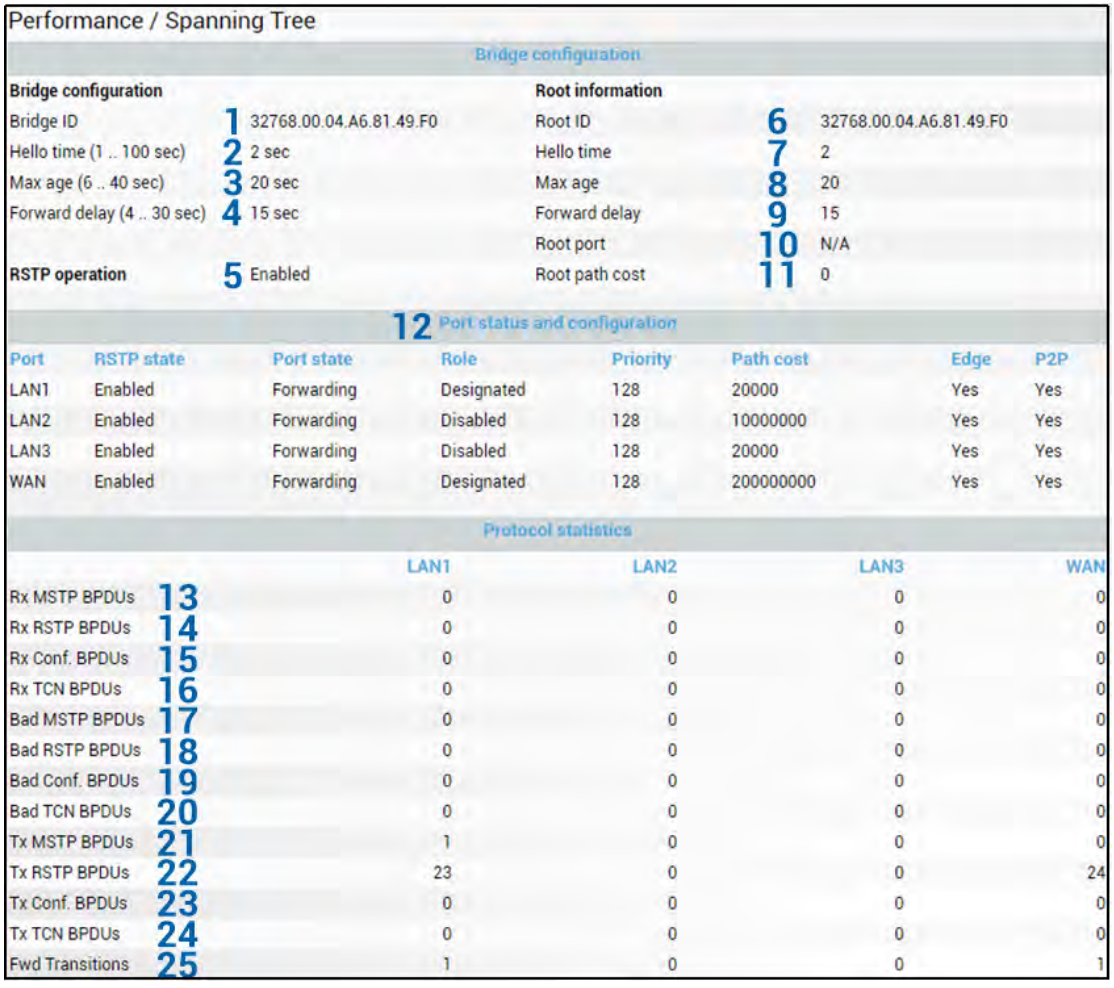
network mac static show	Use to show static MAC address table.
network mac static add mac-address <MAC> **vlan** <vlan> **port** <port>	Use to add static MAC address for selected VLAN ID and port.
network mac static delete mac-address <MAC> **vlan** <vlan> **port** <port>	Use to remove static MAC address from selected VLAN ID and port.

Networking → Ethernet → Spanning Tree

The Spanning Tree page provides the configuration of Rapid Spanning Tree Protocol (Rapid STP).



Status mode



Press MODIFY button.

Modify mode

1) ***Bridge ID*** **–** Indicates the configured value of Bridge ID (status mode); allows specifying the value of Bridge ID (modify mode). This parameter and MAC address determines whether a given Bridge is Root Bridge. The advantage is given to the combination of Priority and Address, which is numerically smaller.
2) ***Hello Time (1 – 100 sec)*** **–** Indicates configured time gap between which the BPDU packets are being sent (status mode); allows specifying the value of Hello Time in seconds (modify mode).
3) ***Max Age (6 – 40 sec)*** **–** Indicates configured time period, during which the received BPDU packets' information is stored for a separate port (status mode); allows specifying the value of Max Age in seconds (modify mode).
4) ***Forward Delay (4 – 30 sec)*** **–** Indicates configured time period that determines the time a separate port stays in Listening and Learning conditions (status mode); allows specifying the value of Forward Delay in seconds (modify mode).
5) ***RSTP operation*** **–** Indicates configured status of RSTP (status mode); allows enable or disable RSTP operation (modify mode).

Root information **–** displays the data only when RSTP is enabled:

6) ***Root ID*** **–** Indicates the Bridge ID of the current Root bridge;
7) ***Hello Time*** **–** Indicates the current hello time;
8) ***Max Age*** **–** Indicates the current max age;
9) ***Forward Delay*** **–** Indicates the current forward delay;
10) ***Root Port*** **–** Indicates elected root port is being shown;
11) ***Root Path Cost*** **–** Indicates the path cost from the current bridge to the root bridge;

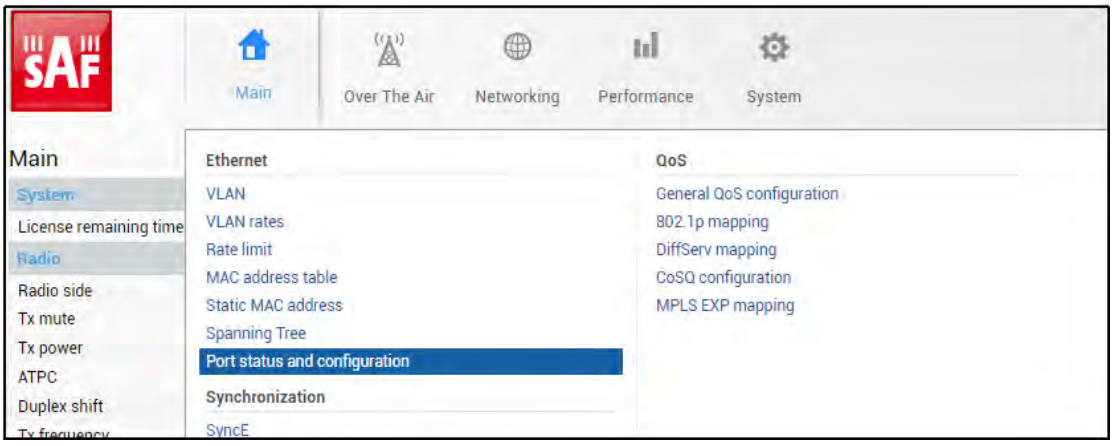
12) ***Port status and configuration*** **–** STP parameters of every port:
    - ***RSTP state*** **–** Indicates RSTP state of the particular port (status mode); allows enable or disable RSTP operation for the particular port (modify mode);
    - ***Port state*** **–** Indicates port condition. Can be one of the following: *Disabled, Blocking, Listening, Learning,* or *Forwarding*;
    - ***Role*** **–** the role of the particular port. Can be one of the following: *Root, Designated, Alternate, Backup,* or *Disabled*;
    - ***Priority*** **–** Indicates Port Priority (status mode); allows specifying Port Priority (modify mode). A combination of Priority, Port number, and Path Cost determines whether the port will be selected as the Root port or will be blocked on the occasion of a loop, etc;
    - ***Path cost*** **–** Indicates Path cost of the particular port (status mode); allows specifying Path cost for the particular port by setting Path cost value or by selecting *Auto* mode (modify mode). This parameter setting depends on the capacity of a separate port;
    - ***Edge*** **–** displays that this particular port is Edge port;
    - ***Point-to-point*** **–** displays whether there is a point-to-point connection from the particular port or not;
13) ***Rx MSTP BPDUs*** **–** Indicates how many MSTP BPDUs packets were received;
14) ***Rx RSTP BPDUs*** **–** Indicates how many RSTP BPDUs packets were received;
15) ***RX Conf BPDUs*** **–** Indicates how many STP BPDUs packets were received;
16) ***RX TCN BPDUs*** **–** Indicates how many topology changing notification BPDUs packets were received;
17) ***Bad MSTP BPDUs*** **–** Indicates how many bad MSTP BPDUs packets were received;
18) ***Bad RSTP BPDUs*** **–** Indicates how many bad RSTP BPDUs packets were received;
19) ***Bad Conf BPDUs*** **–** Indicates how many bad STP BPDUs packets were received;
20) ***Bad TCN BPDUs*** **–** Indicates how many bad topology changing notifications BPDUs packets received;
21) ***Tx MSTP BPDUs*** **–** Indicates how many MSTP BPDUs packets were sent;
22) ***Tx RSTP BPDUs*** **–** Indicates how many RSTP BPDUs packets were sent;
23) ***Tx Conf BPDUs*** **–** Indicates how many STP BPDUs packets were sent;
24) ***Tx TCN BPDUs*** **–** Indicates how many topology changing notification BPDUs packets were sent;
25) ***Fwd Transitions*** **–** Indicates how many times the port has been changed to forward status;
26) By pressing *„Execute configuration",* changes made to the corresponding section apply only to the local side Integra/Integra-S/Integra-G/Integra-GS. If *„Rollback on"* is selected, the configuration will be reverted in case erroneous configuration changes are applied.

CLI commands (Chapter 4: COMMAND LINE INTERFACE)

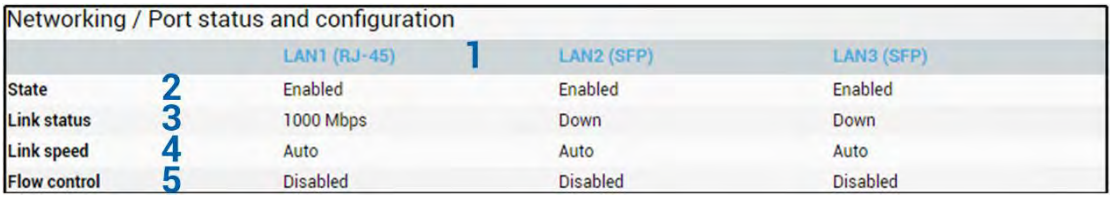
stp status	Use to show the status of STP configuration.
stp bridgeID {0 | 4096 | 8192 | 12288 | 16384| 20480 | 24576 | 28672 | 32768 | 36864 | 40960 | 45056 | 49152 | 53248 | 57344 |61440}	Use to set the value of Bridge ID.
stp helloTime <1..100>	Use to set the value of the time gap in seconds between which the BPDU packets are being sent.
stp maxAge <6..40>	Use to set the time period in seconds, during which the received BPDU packets' information is stored for a separate port.
stp forwardDelay <4..30>	Use to set the time period that determines the time in seconds a separate port stays in Listening and Learning conditions.
stp state {enable|disable}	Use to enable or disable RSTP operation.

Networking → Ethernet → Port status and configuration

Shows the status of Ethernet switch ports, allows enabling and disabling the ports, Flow control, and modifying link speed/duplex.

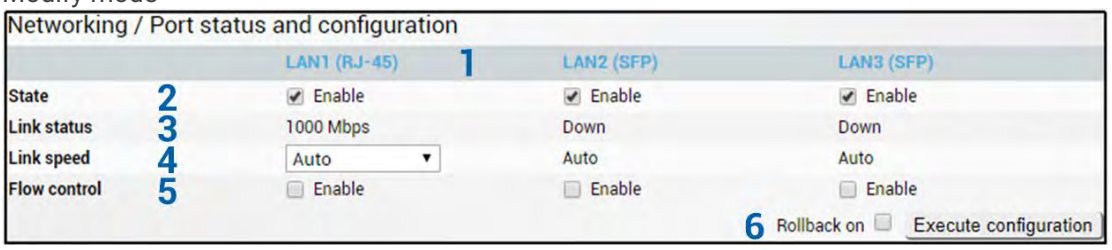


Status mode



Press MODIFY button.

Modify mode



1) ***Port*** – Indicates available switch ports.
2) ***State*** – Indicates operation status of each LAN port (status mode); allows enabling/disabling each LAN port (modify mode). "(Restricted)" will be indicated on the LAN2 port if 2+0 aggregation or 1+1 protection is enabled.
3) ***Link status*** – Indicates whether a link with the appropriate port is established as well as its link speed.
4) ***Link speed*** – Indicates whether link speed is configured to automatic speed setting or manual (status mode); allows changing link speed to the manual setting (modify mode).

LAN2 and LAN3 (SFP ports) support Auto Gigabit (1000FDX) only and cannot be modified.

Maximum L2 frame size supported in 1000FDX mode is 9600B, while in 100FDX mode (LAN1) – 9070B.

5) ***Flow control*** – Indicates whether flow control is enabled or disabled on a particular port (status mode); allows enabling/disabling flow control on each available port (modify mode). The default setting is disabled.

6) By pressing *„Execute configuration”*, changes made to the corresponding section apply only to the local side Integra/Integra-S/Integra-G/Integra-GS. If *„Rollback on”* is selected, the configuration will be reverted in case erroneous configuration changes are applied.

SFP module specification will be shown at the bottom of the page if the SFP module is present and if the SFP module supports DOM.

CLI commands (Chapter 4: COMMAND LINE INTERFACE)

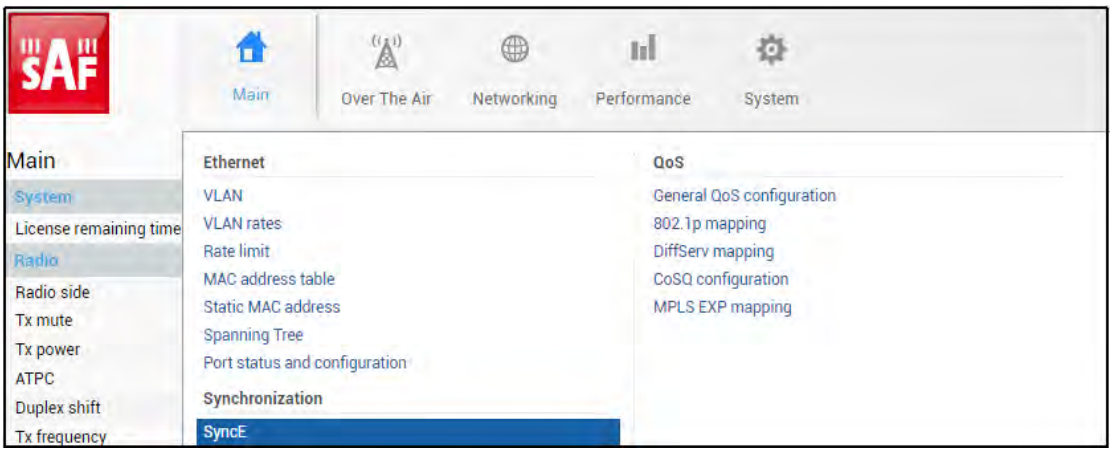
network port show info	Use to show the status of all ports.
network port show config	Use to show the configuration of all ports.
network port set <port> **admin-state** {enable|disable}	Use to enable or disable a particular port.
network port set LAN1 speed {auto|100fdx|100hdx|10fdx|10hdx}	Use to change speed and duplex setting on LAN1 port. The default value is “auto” (auto-negotiation).
network port set <port> **flow-control** {enable|disable}	Use to enable or disable flow control on a particular port.

Networking → Synchronization → SyncE

Synchronous Ethernet (SyncE) allows synchronizing the Ethernet switch clock to an external source clock by specifying an ingress port.

Incorrect SyncE configuration may result in a loss of connectivity.

Auto-negotiation ***will not*** function properly when the clock source ports on both Integra/Integra-S/Integra-G/Integra-G FODUs are pointing at each other (e.g. WAN-WAN in a link or LAN-LAN in a back-to-back connection).



Status mode

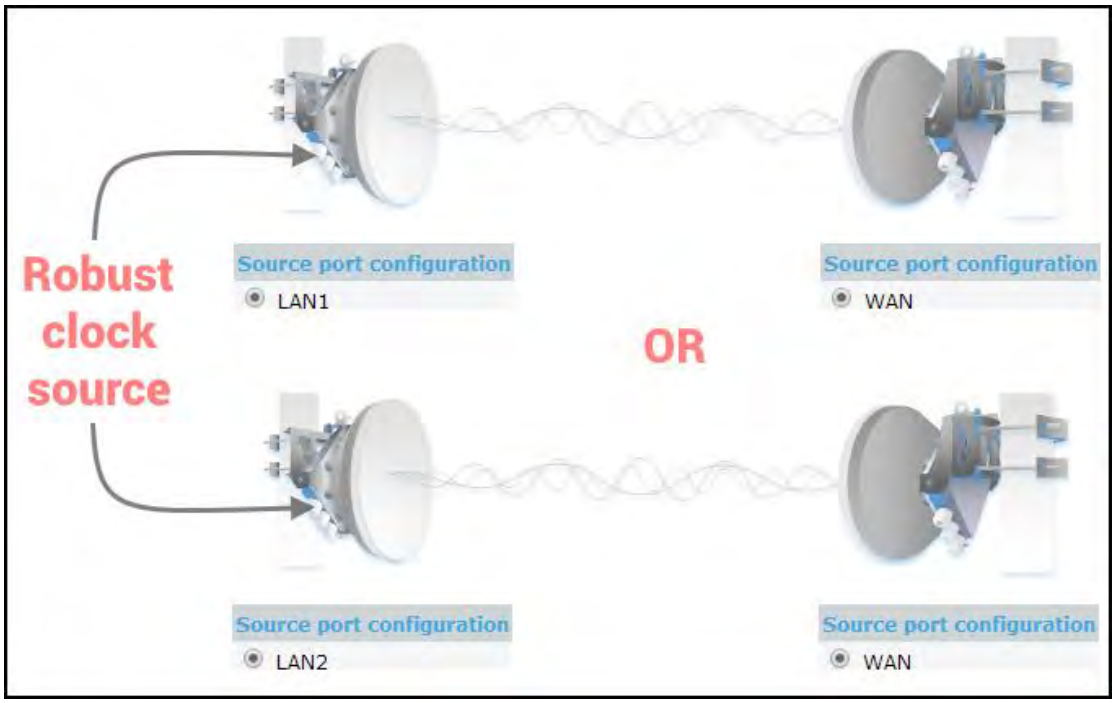
Press MODIFY button.

Modify mode

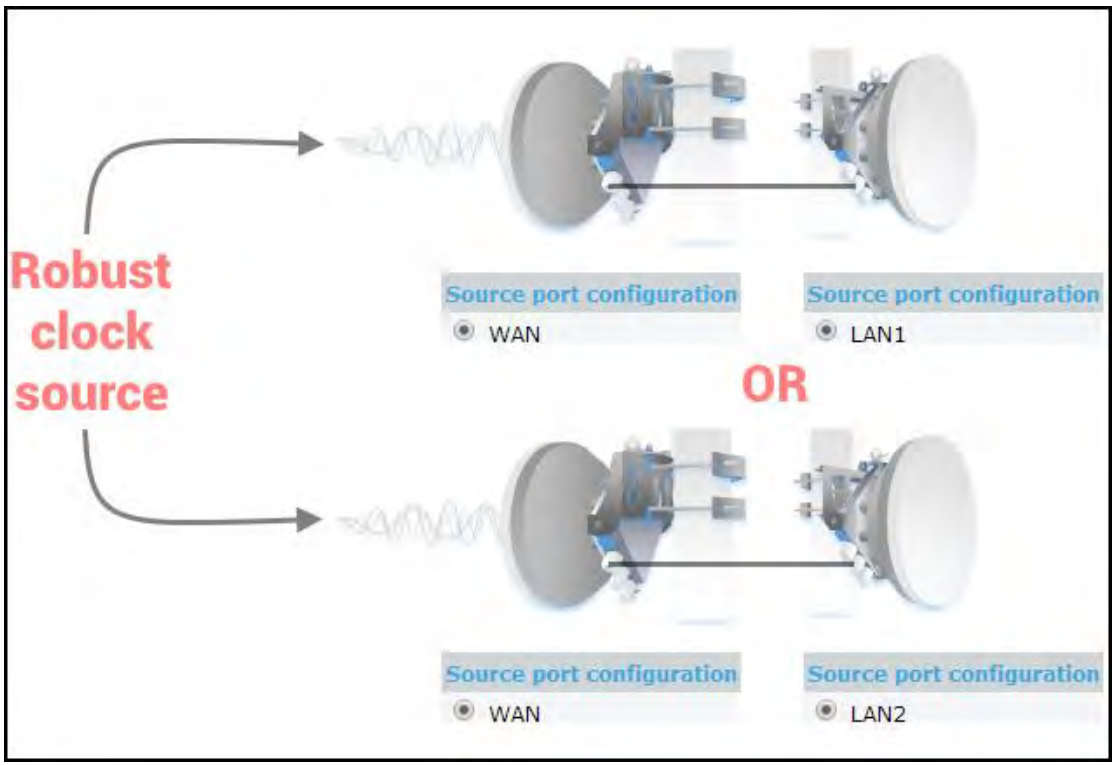
1) ***Port*** - Indicates SyncE source port (if enabled);
2) ***State*** – Indicates if SyncE is enabled.
3) ***Status*** – Indicates "Locked" if SyncE is operating normally.
4) ***Source port configuration*** – Allows specifying SyncE source port.
5) ***Disable/Enable*** – Allows enabling or disabling SyncE operation.

Configuration examples

1) Integra/Integra-S/Integra-G/Integra-GS link with an external clock source



2) Integra/Integra-S/Integra-G/Integra-GS back-to-back interconnection with an external clock source



3) Integra/Integra-S/Integra-G/Integra-GS as a master clock source

Auto-negotiation will not function properly when the clock source ports on both Integra/Integra-S/Integra-G/Integra-GS FODUs are pointing at each other (e.g. WAN-WAN in a link or LAN-LAN in a back-to-back connection).

SyncE will function properly on LAN2 and LAN3 ports only with appropriate SFP modules.

CLI commands (Chapter 4: COMMAND LINE INTERFACE)

network sync enable {LAN1|LAN2|WAN}	Use to enable SyncE on a port connected to a clock source. The selected port will become “slave”, while other ports – “master”. Auto-negotiation will not function properly between two “slave” ports.
network sync disable	Use to disable SyncE on all ports.
network port show info	'SyncE_Act' and 'SyncE_Prio' field nonzero values indicate synchronous Ethernet activity.
network sync status	*Enabled* – shows if SyncE is enabled;

Polling failed – indicates last data polling failure;

Speed Grade – shows Ethernet speed on LAN1 port - 1000BASE-T(1G) or 100BASE-T(100M);

Port – current port used as a clock source;

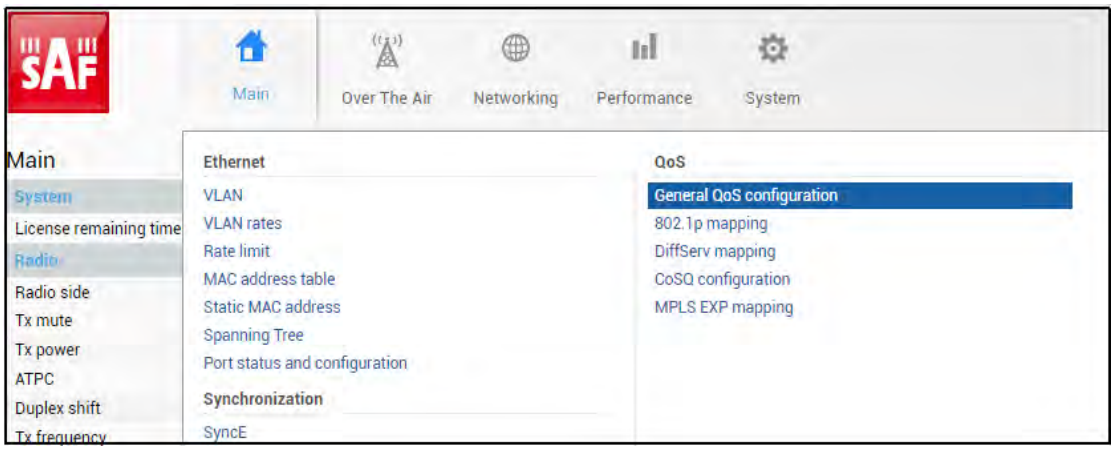
State – clock status, "Locked" if SyncE operates normally;

State info – additional information

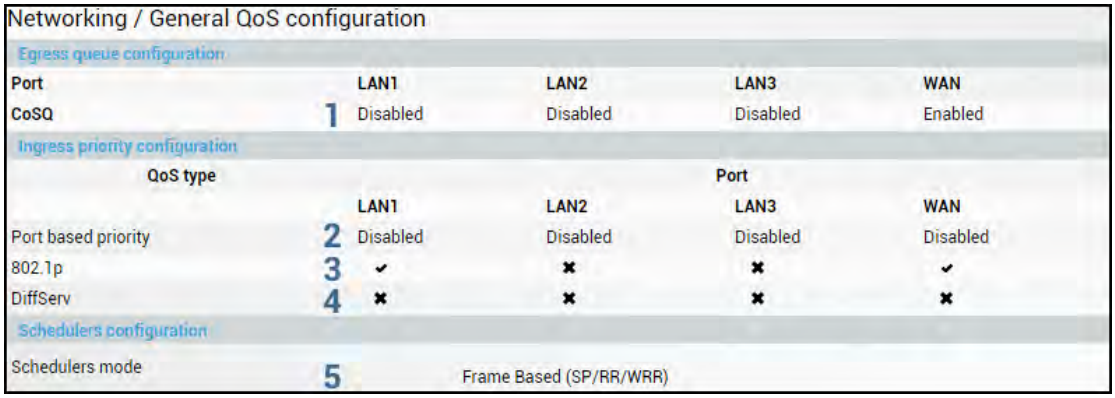
Networking → QoS → General QoS configuration

The General QoS configuration page allows defining QoS queueing rules.

Only one priority classification method (port/802.1p/DiffServ) can be enabled on a single port.

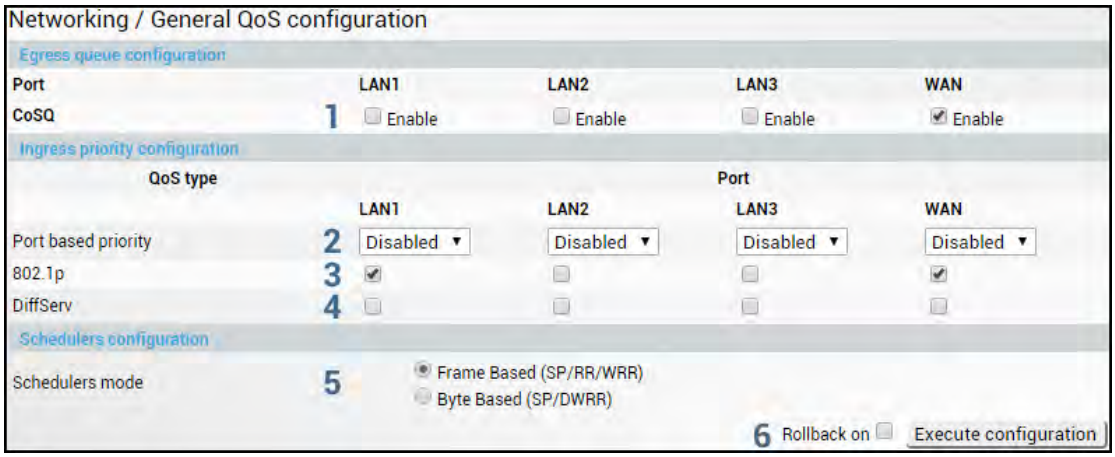


Status mode



Press MODIFY button.

Modify mode



1) ***CoSQ*** – Indicates whether CoSQ (Class of Service Queue) is enabled on the egress direction of a particular port (status mode); allows enabling or disabling CoSQ on available ports (modify mode). CoSQ is enabled by default on the WAN port.
2) ***Port based priority*** – Indicates whether port-based prioritization is enabled (status mode); allows enabling or disabling port-based prioritization on available ports (modify mode). If enabled all packets on the egress of a port are put in a specified queue. 802.1p (PCP) and DiffServ (DSCP) values are ignored. Available values are 0…7 according to eight available priority queues from the lowest to the highest.
3) ***802.1p*** – Indicates whether the 802.1p mapping is enabled (status mode); allows enabling or disabling 802.1p mapping on available ports (modify mode). If enabled configured mapping (Networking→QoS→802.1p mapping) is taken into account.
4) ***DiffServ*** – Indicates whether DiffServ prioritization is enabled (status mode); allows enabling or disabling DiffServ prioritization on available ports (modify mode). If enabled DSCP value is taken into account according to configured mapping (Networking→QoS→DiffServ mapping).
5) ***Schedulers mode*** – Indicates whether frame-based (SP/RR/WRR – Strict Priority/Round Robin/Weighted Round Robin) or byte-based scheduling schemes (SP/DWRR – Strict Priority/Deficit Weighted Round Robin) are available (status mode); allows switching between frame-based to byte-based scheduling schemes (modify mode). A specific scheduling scheme can be set in Networking→QoS→CoSQ configuration. The scheduler's mode specifies how frames are handled at egress flow. DWRR compared to WRR is configured in kilobytes (KB), rather than the number of frames passed. The default setting is the frame-based mode.
6) By pressing *„Execute configuration"*, changes made to the corresponding section apply only to the local side Integra/Integra-S/Integra-G/Integra-GS. If *„Rollback on"* is selected, the configuration will be reverted in case erroneous configuration changes are applied.

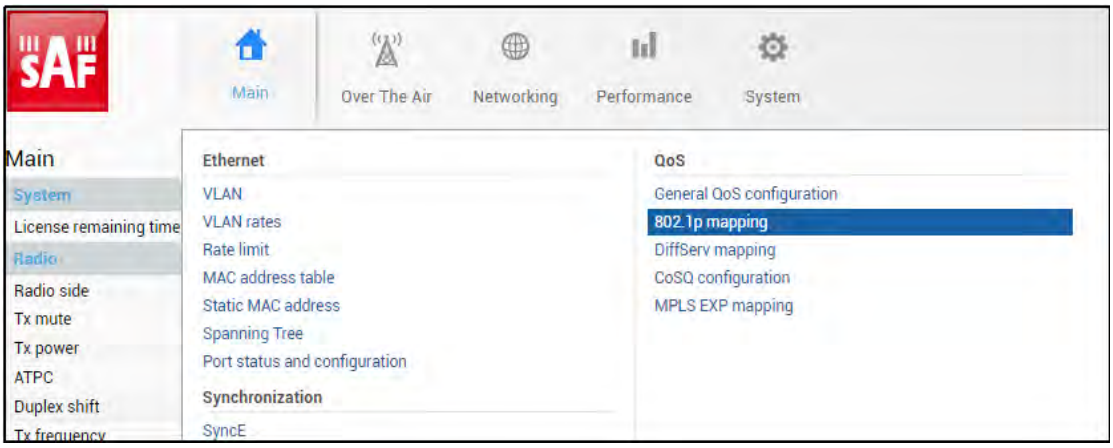
CLI commands (Chapter 4: COMMAND LINE INTERFACE)

network qos set <port> **cosq state** {enable|disable}	Use to enable or disable CoSQ priority queues on a particular port.
network qos set <port> **vlan state** {enable|disable}	Use to enable or disable ingress 802.1p mapping on a particular port.
network qos set <port> **diffserv state** {enable|disable}	Use to enable or disable ingress DiffServ mapping (DSCP) on a particular port.
network qos reset config {LAN1|LAN2|LAN3|WAN|all}	Use to reset QoS configuration on a particular port or all ports simultaneously.

network qos set <port> **base state** {enable|disable}	Use to enable or disable port-based priorities.
network qos set <port> **base priority** <0…7>	Use to specify the queue of port-based priority.
network qos set sched_mode {frame|byte}	Use to select the scheduler's mode – frame (SP/RR/WRR) or byte (SP/DWRR).
network qos show config {LAN1|LAN2|LAN3|WAN|all}	Use to show QoS user configuration.
network qos show info {LAN1|LAN2|LAN3|WAN|all}	Use to show the actual status of QoS configuration.
network qos show sched_mode	Use to show CoSQ Scheduling Mode.

Networking → QoS → 802.1p mapping

The 802.1p mapping page allows customizing the mapping of IEEE 802.1p priority tags and available QoS queues.



Status mode

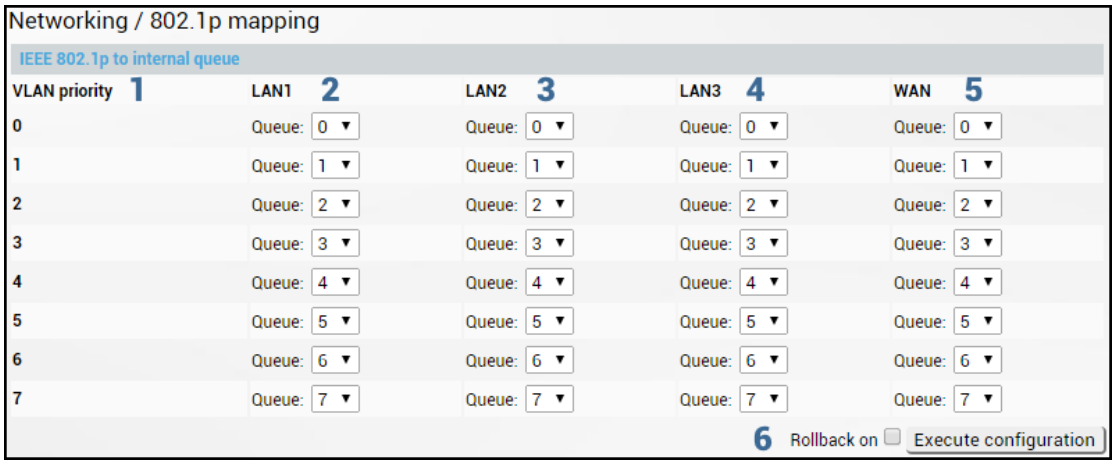
Networking / 802.1p mapping

IEEE 802.1p to internal queue

VLAN priority 1	LAN1 2	LAN2 3	LAN3 4	WAN 5
0	Queue: 0	Queue: 0	Queue: 0	Queue: 0
1	Queue: 1	Queue: 1	Queue: 1	Queue: 1
2	Queue: 2	Queue: 2	Queue: 2	Queue: 2
3	Queue: 3	Queue: 3	Queue: 3	Queue: 3
4	Queue: 4	Queue: 4	Queue: 4	Queue: 4
5	Queue: 5	Queue: 5	Queue: 5	Queue: 5
6	Queue: 6	Queue: 6	Queue: 6	Queue: 6
7	Queue: 7	Queue: 7	Queue: 7	Queue: 7

Press MODIFY button.

Modify mode



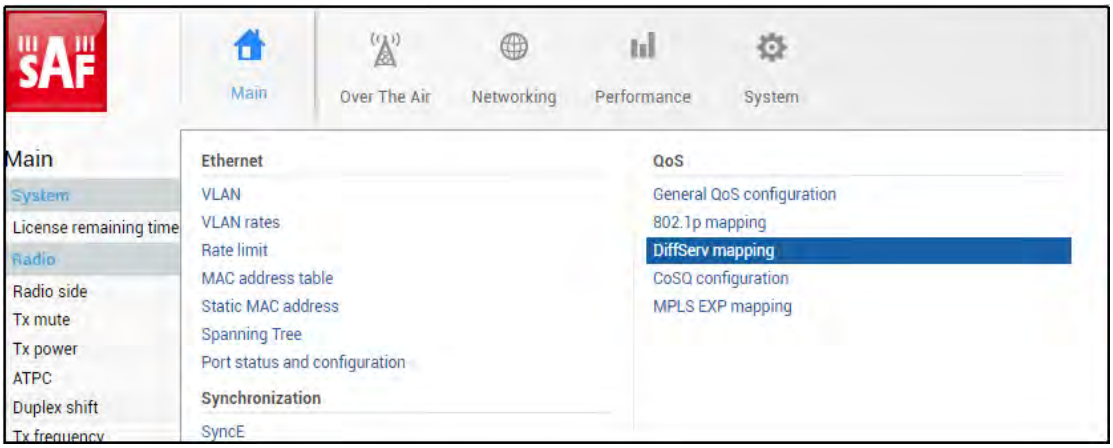
1) ***VLAN priority*** – Indicates PCP (Priority Code Point) values 0 – 7.
2) ***LAN1*** – Indicates to which egress queue packets will, according to 802.1p priority, be put in if 802.1p QoS prioritization is enabled on LAN1 port (status mode); allows modifying default mapping of priority values and queues (modify mode).
3) ***LAN2*** – Indicates to which egress queue packets will, according to 802.1p priority, be put in if 802.1p QoS prioritization is enabled on LAN2 port (status mode); allows modifying default mapping of priority values and queues (modify mode).
4) ***LAN3*** – Indicates to which egress queue packets will, according to 802.1p priority, be put in if 802.1p QoS prioritization is enabled on LAN3 port (status mode); allows modifying default mapping of priority values and queues (modify mode).
5) ***WAN*** – Indicates to which egress queue packets will, according to 802.1p priority, be put in if 802.1p QoS prioritization is enabled on WAN port (status mode); allows modifying default mapping of priority values and queues (modify mode).
6) By pressing *„Execute configuration”*, changes made to the corresponding section apply only to the local side Integra/Integra-S/Integra-G/Integra-GS. If *„Rollback on”* is selected, the configuration will be reverted in case erroneous configuration changes are applied.

CLI commands (Chapter 4: COMMAND LINE INTERFACE)

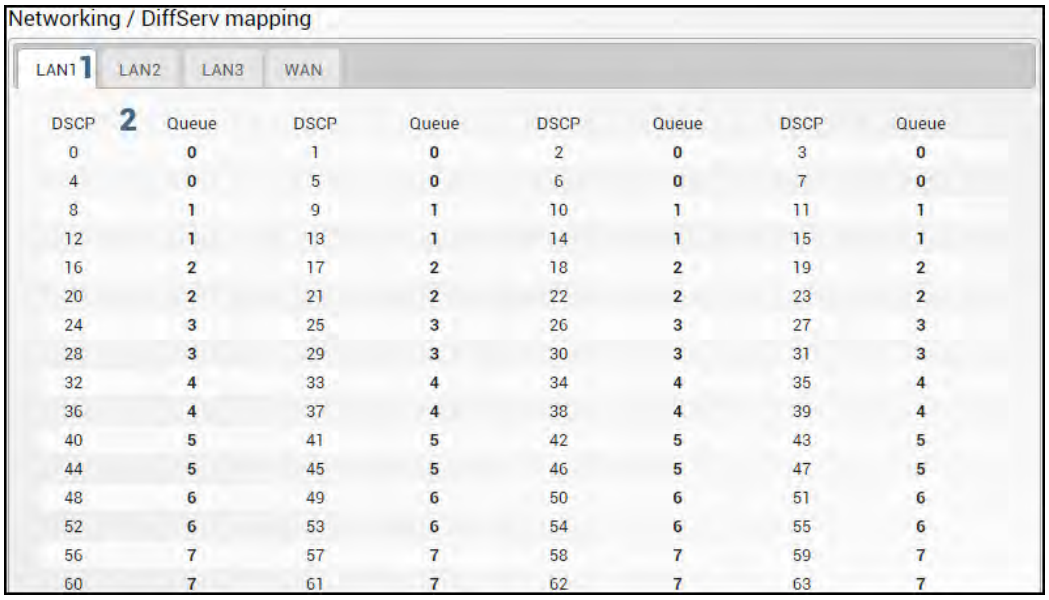
network qos set <port> **vlan priority** <0..7> **priority** <0..7>	Use to change default 802.1p priority mapping.

Networking → QoS → DiffServ mapping

The DiffServ mapping page allows customizing the mapping of DSCP priority tags and available QoS queues.



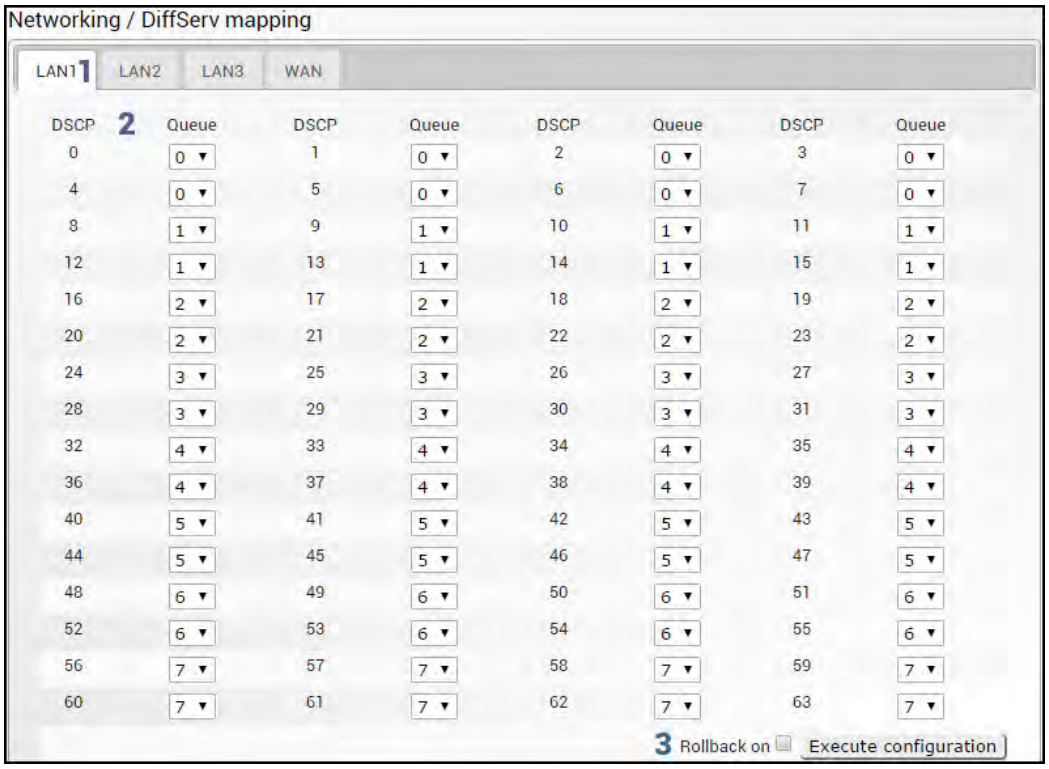
Status mode



DSCP	Queue	DSCP	Queue	DSCP	Queue	DSCP	Queue
0	0	1	0	2	0	3	0
4	0	5	0	6	0	7	0
8	1	9	1	10	1	11	1
12	1	13	1	14	1	15	1
16	2	17	2	18	2	19	2
20	2	21	2	22	2	23	2
24	3	25	3	26	3	27	3
28	3	29	3	30	3	31	3
32	4	33	4	34	4	35	4
36	4	37	4	38	4	39	4
40	5	41	5	42	5	43	5
44	5	45	5	46	5	47	5
48	6	49	6	50	6	51	6
52	6	53	6	54	6	55	6
56	7	57	7	58	7	59	7
60	7	61	7	62	7	63	7

Press MODIFY button.

Modify mode



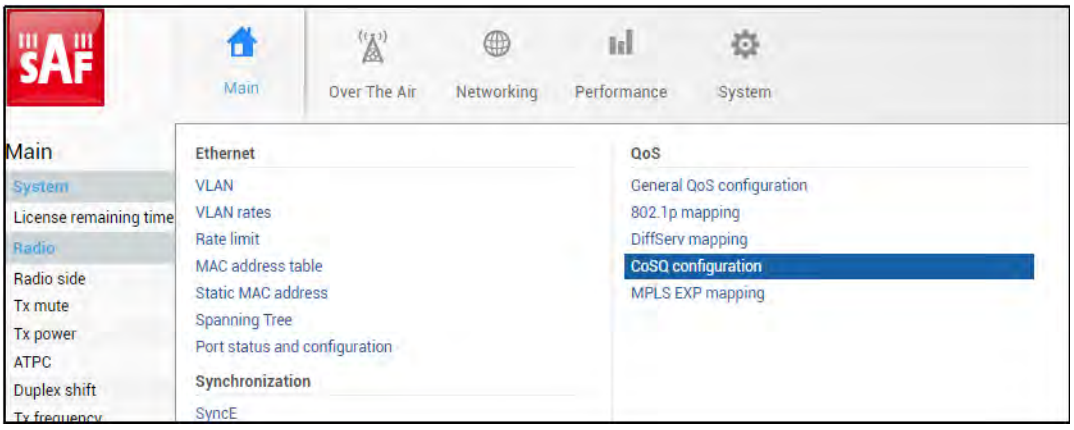
1) ***LAN1/LAN2/LAN3/WAN*** – Tabs allow selecting a particular port.
2) The table shows the mapping between DSCP values and CoS queues (status mode); allows modifying the default mapping of DSCP priority values and queues (modify mode).
3) By pressing *„Execute configuration"*, changes made to the corresponding section apply only to the local side Integra/Integra-S/Integra-G/Integra-GS. If *„Rollback on"* is selected, the configuration will be reverted in case erroneous configuration changes are applied.

CLI commands (Chapter 4: COMMAND LINE INTERFACE)

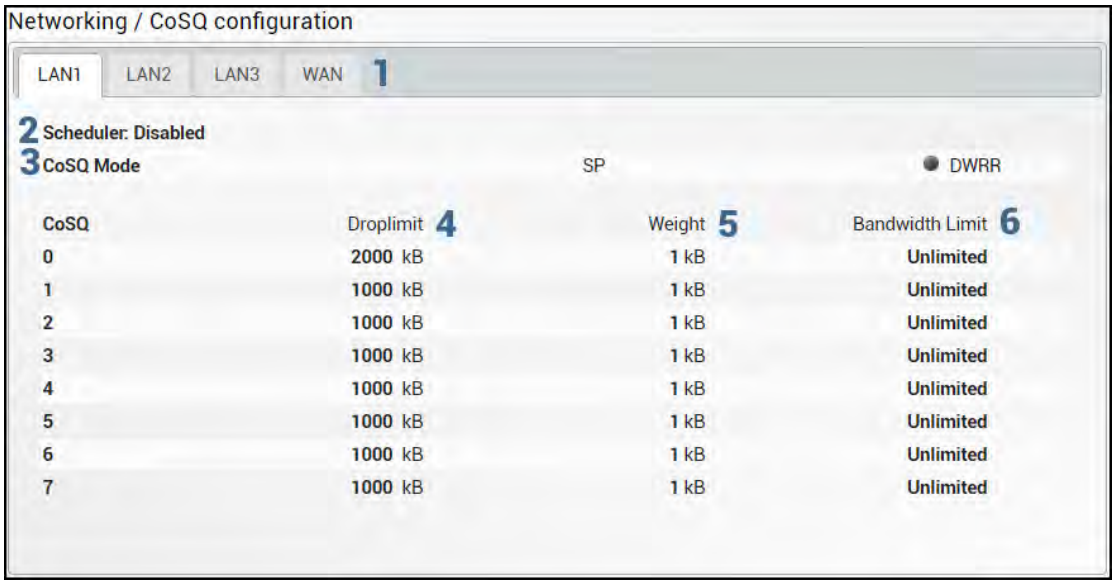
network qos set <port> **diffserv dscp** <0..63> **priority** <0..7>	Use to change default DiffServ priority (DSCP) mapping.

Networking → QoS → CoSQ configuration

The CoSQ configuration page allows modifying droplimit (buffer) size, queue weights or sizes (depending on queueing), and queueing scheduler. On the WAN port, it is possible to enable packet fragmentation and interleaving (by disabling low latency queues).

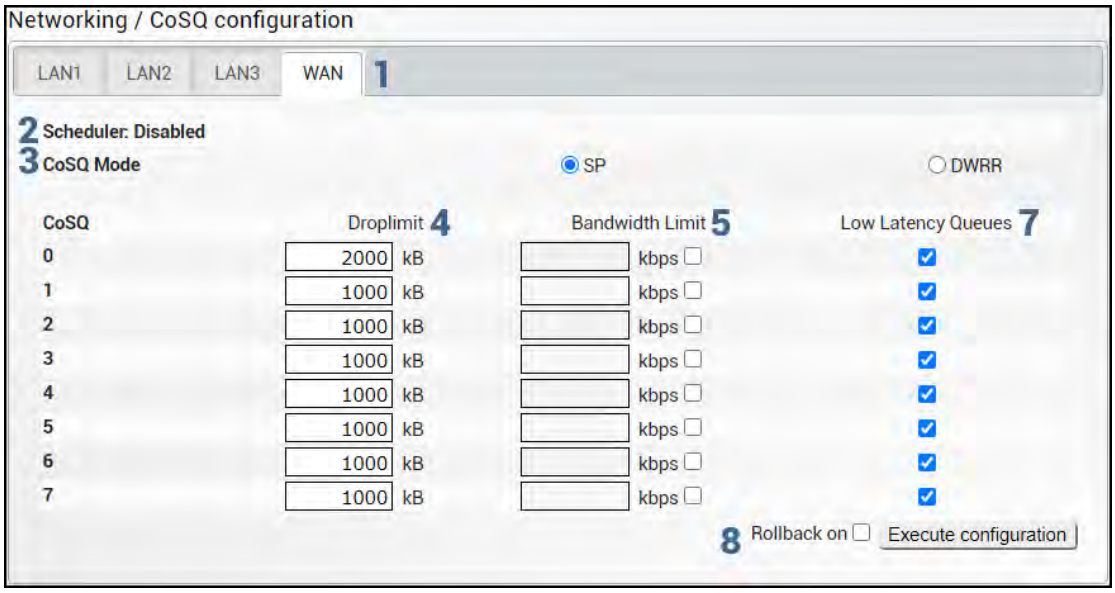


Status mode



Press MODIFY button.

Modify mode



1) ***LAN1/LAN2/LAN3/WAN*** – Tabs allow selecting a particular port.

2) ***Scheduler*** – Indicates whether CoSQ scheduler is enabled on the particular port. Corresponds to the "CoSQ" setting in the Networking→QoS→General QoS configuration page.
3) ***CoSQ Mode*** – Indicates which CoSQ scheduler mode is set on a particular port (status mode); allows setting Strict Priority (SP); Round Robin (RR) or Weighted Round Robin (WRR) if "Frame Based (SP/RR/WRR)" schedulers mode is set or Strict Priority (SP) or Deficit Weighted Round Robin (DWRR) if "Byte Based (SP/DWRR)" is set in Networking→QoS→General QoS configuration (modify mode).

   SP – scheduler drains all packets queued in the highest priority queue before continuing to service lower priority queues. Such an approach can be used for latency-sensitive traffic.

   RR – scheduler drains all queues consecutively with the same ratio (1:1:1:1:1:1:1:1). Such an approach allows utilizing droplimit buffers of all available queues.

   WRR – scheduler drains all queues consecutively according to the specified ratio (queue weights) specified in a number of packets. The default ratio is equal for all queues (1:1:1:1:1:1:1:1). Such an approach allows for minimizing stacking delay for high-priority traffic and at the same time retaining traffic flow at lower-priority queues.

   DWRR – scheduler drains all queues consecutively according to the specified ratio (queue weights) specified in kilobytes (KB). Compared to WRR excess bandwidth used in the current pass is remembered and subtracted from the allocated weight in the next pass and as a result statistically over time bandwidth used by each queue will be closer to the configured value. Default ratio is equal for all queues (1:1:1:1:1:1:1:1).
4) ***Droplimit*** – Indicates droplimit buffer size assigned for each queue (status mode); allows modifying droplimit buffer size for each queue (modify mode). By default, a 2000KB droplimit buffer size is assigned for queue #0 (lowest priority) and 1000KB for all other queues. Maximum size 4000KB.

Increasing buffer size increases data transmission latency.

5) ***Weight*** – Indicates weights in packets or kilobytes configured for WRR or DWRR respectively (status mode); allows configuring weights in packets or kilobytes for WRR or DWRR respectively (modify mode). The default weight is set to "1" for each queue. The value range is 1..255.
6) ***Bandwidth limit*** – Indicates whether the rate limit is enabled on any of the available queues (status mode); allows specifying rate limit value on any of the available queues (modify mode). The bandwidth limit is available only on LAN ports.
7) ***Low latency queues*** – Indicates whether modem low latency queue is enabled for the priority queues (status mode); allows disabling low latency queues, thus enabling packet fragmentation and interleaving (modify mode). Please refer to Chapter Fragmentation and interleaving for further details. Low latency queues are available only on the WAN port.
8) By pressing *„Execute configuration",* changes made to the corresponding section apply only to the local side Integra/Integra-S/Integra-G/Integra-GS. If *„Rollback on"* is selected, the configuration will be reverted in case erroneous configuration changes are applied.

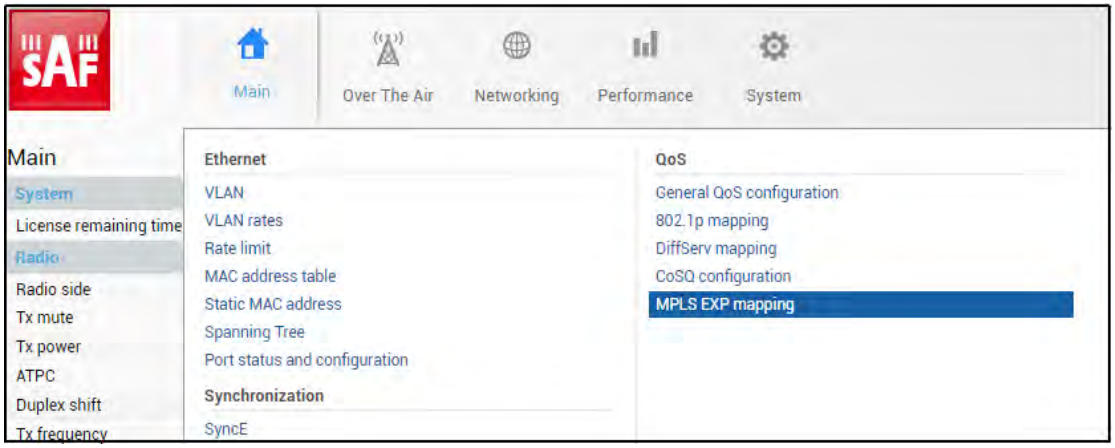
CLI commands (Chapter 4: COMMAND LINE INTERFACE)

network qos set <port> **cosq**	Use to set CoSQ scheduler mode on a particular port.

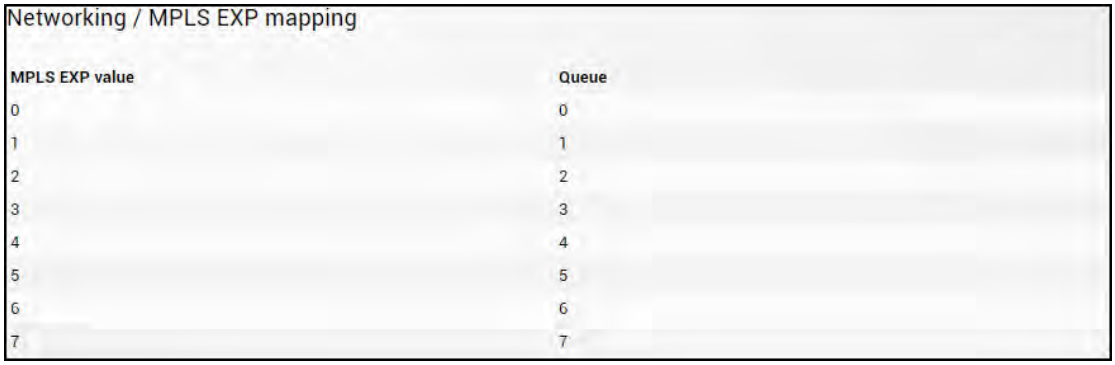
scheduler mode {sp|{{rr|wrr}|dwrr}}	
network qos set <port> **cosq scheduler weight** <1..255> **queue** <0..7>	Use to assign a weight for a particular queue #. CoSQ scheduler should be enabled for that particular port and CoSQ scheduler mode should be set to WRR or DWRR.
network qos set <port> **cosq droplimit** <0..4000KB>	Use to set droplimit buffer size for a particular port.
network qos set WAN cosq lowlatency {enable|disable} **queue** <0..7>	Use to enable or disable low latency queue, thus disabling or enabling packet fragmentation. This functionality is available for WAN port only and by default low latency queues are enabled therefore packet fragmentation is disabled.
network qos show info {LAN1|LAN2|LAN3|WAN|all}	Use to show the actual status of QoS configuration.

Networking → QoS → MPLS EXP mapping

The MPLS EXP mapping page allows customizing the mapping of MPLS EXP priority bits and available QoS queues.

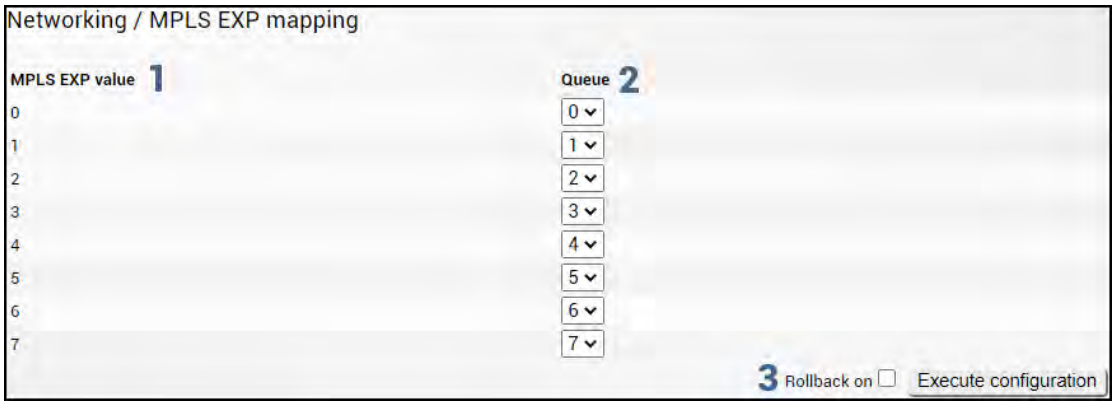


Status mode



Press MODIFY button.

Modify mode

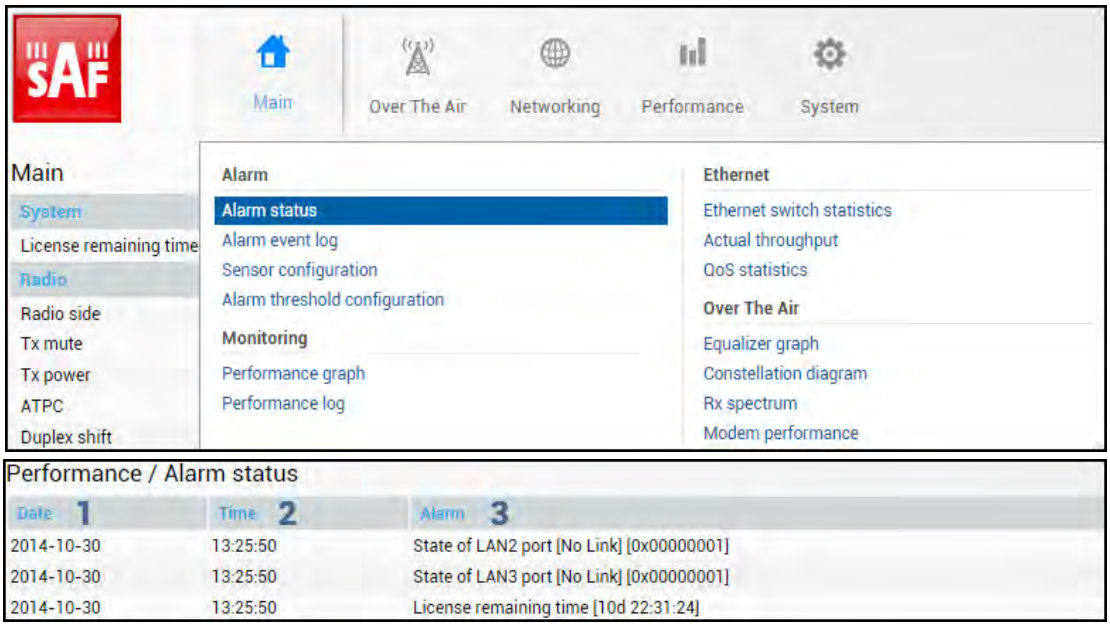


1) ***MPLS EXP value*** – Indicates MPLS EXP values 0 – 7;
2) ***Queue*** – Indicates to which egress queue will packets with according MPLS EXP value be put (status mode); allows modifying default mapping of MPLS EXP values and queues (modify mode).
3) By pressing *„Execute configuration"*, changes made to the corresponding section apply only to the local side Integra/Integra-S/Integra-G/Integra-GS. If *„Rollback on"* is selected, the configuration will be reverted in case erroneous configuration changes are applied.

Performance

Performance → Alarm → Alarm status

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



1) ***Date*** – shows the date when the alarm was initiated;
2) ***Time*** – shows the time when the alarm was initiated;
3) ***Alarm*** – shows the name of the alarm.

CLI commands (Chapter 4: COMMAND LINE INTERFACE)

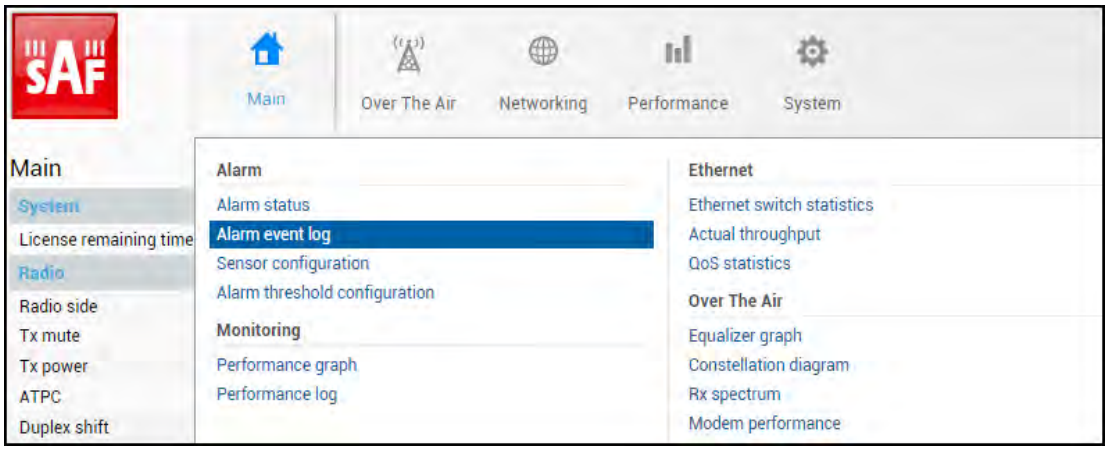
log sensor setlist	Use to show alarm status.

Performance → Alarm → Alarm event log

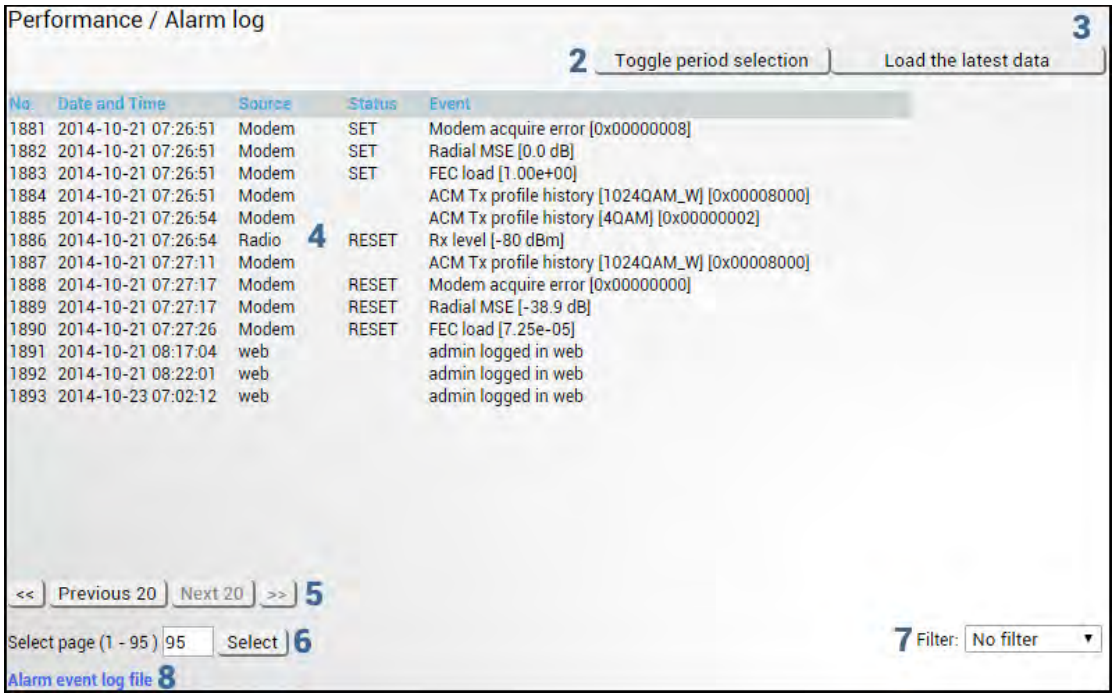
Alarm event log shows 20 alarm entries per page and about 5000 alarm entries in total. The full alarm log can be downloaded by pressing on "*Alarm event log file*". The last page of log entries is shown by default.

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

You also have fast access to alarm filtering, where it is possible to choose which alarm groups you are willing to filter out of all log entries.

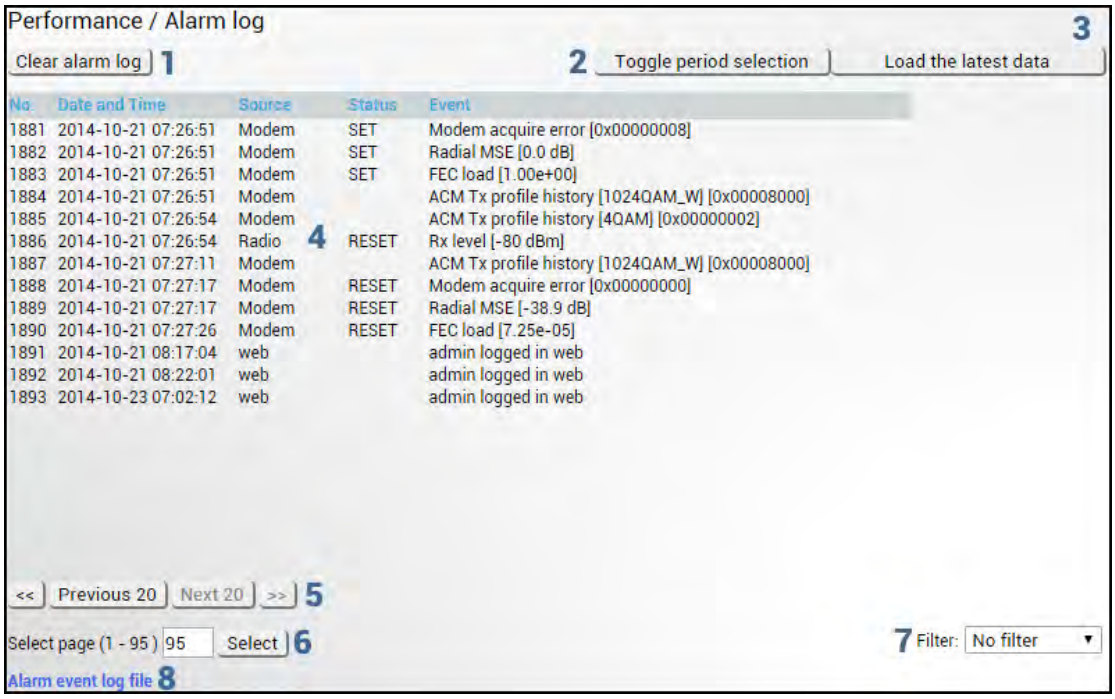


Status mode

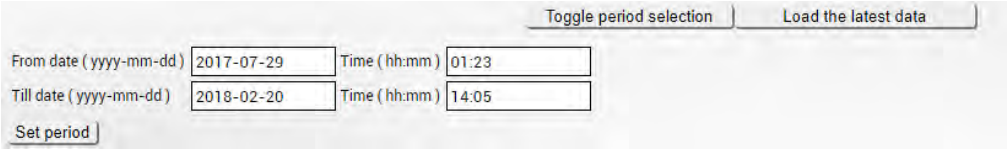


Press MODIFY button.

Modify mode



1) ***Clear alarm log*** – deletes all alarm log entries;
2) ***Toggle period selection*** – opens/closes 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 the start of the alarm log, while ">>" – to the end; "Previous 20" navigates to the previous alarm log page showing 20 previous alarm log entries (if available), while "Next 20" – to next alarm log page showing 20 next alarm log entries (if available).
6) Shows the number of the currently viewed alarm log page. You can enter the specific page number to navigate to the required page;
7) ***Filter*** – press to filter alarms from a certain source node (e.g. Radio);
8) ***Alarm event log file*** – press the link to download the full alarm log text file.

CLI commands (Chapter 4: COMMAND LINE INTERFACE)

log event show last <#_of_entries>	Use to show a certain number of last alarm log entries.
log event show time <starttime> [<endtime>]	Use to show entries from a certain time point. The 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 <#_of_entries>] [time <starttime> [<endtime>]]	Use to show entries for a specific sensor. Regarding subcommands "last" and "time" refer to the commands above.
log event show module {modem| psu | radio | system | alarm_only | iman} [last <#_of_entries>] [time	Use to show entries for a specific module. Regarding subcommands "last" and "time" refer to the commands above.

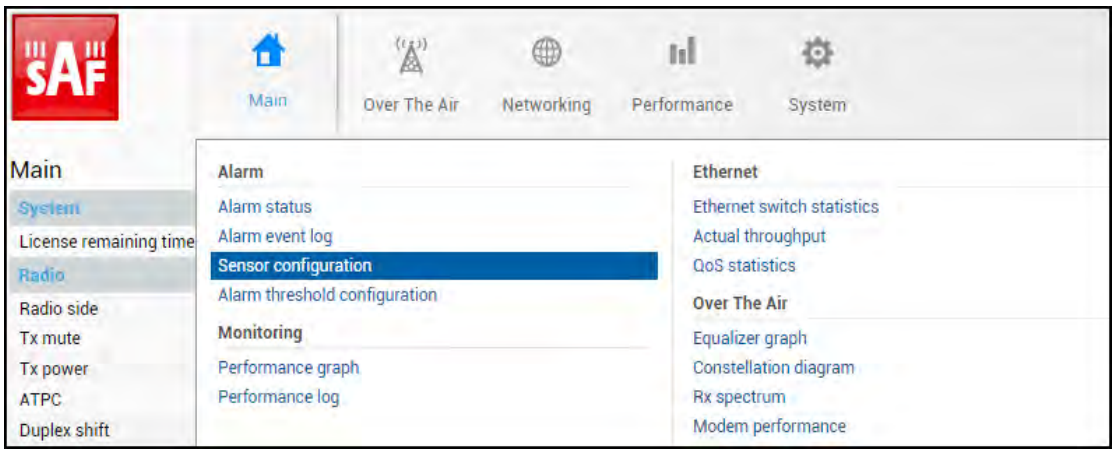
<starttime> [<endtime]]	
log event clear	Use to clear alarm log
log event configure {enable|disable}	Use to enable or disable the event log filter.
log event configure dump <1…60>	Use to configure duration in minutes during which filter is monitoring repetitions.
log event configure pattern <1…10>	Use to configure a number of log entry repetitions to be monitored.
log event configure status	Use to display the current configuration of grouped repetitive alarm-event log entries (filter).

Performance → Alarm → Sensor configuration

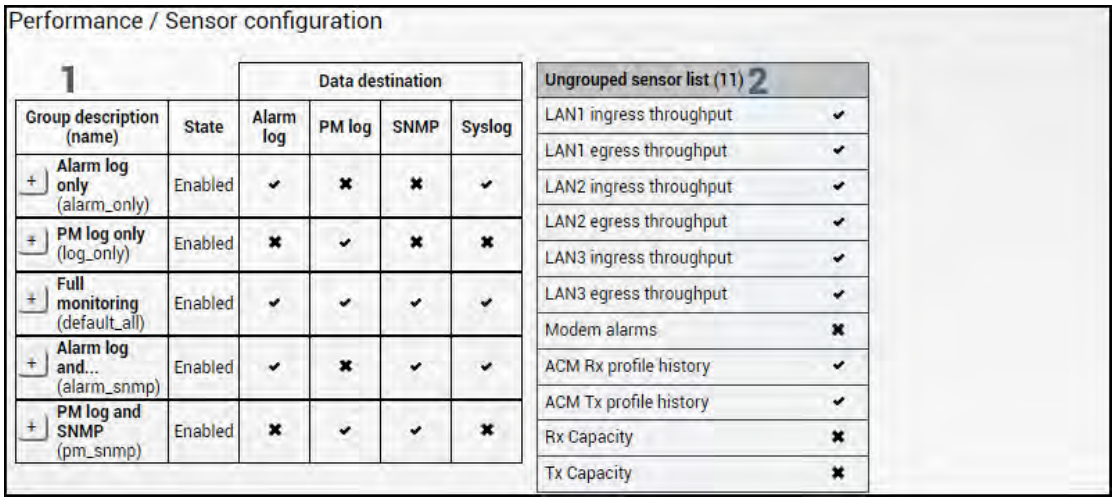
The following section allows for specifying the behavior of available sensor parameters.

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

It is not recommended to add "License remaining time" sensor parameter to performance ("perfd") type parameters.

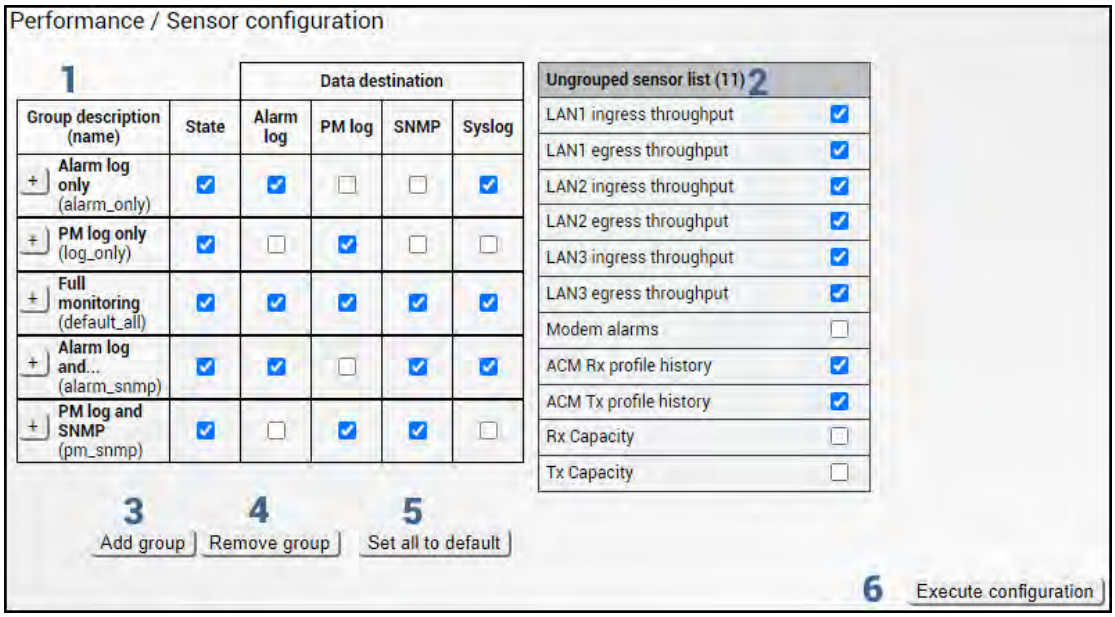


Status mode

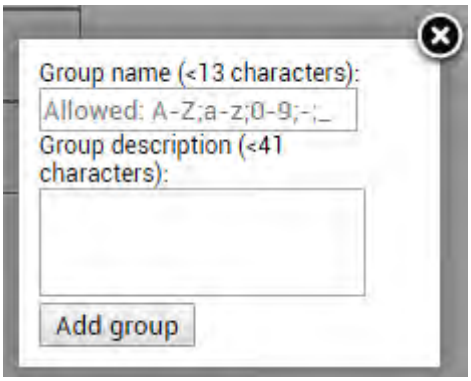


Press MODIFY button.

Modify mode

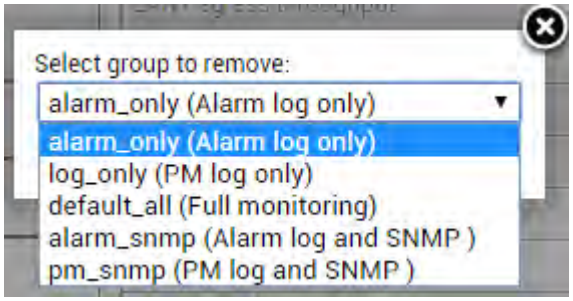


1) ***Group description (name)*** – Shows 5 groups of sensors divided by different group data destinations (event; perf; snmp), as well as indicates whether the group is enabled (State);
2) ***Ungrouped sensor list*** – Shows the list of sensors not added to any of the existing groups (status mode); allows dragging to any of the existing groups, thus specifying how the sensor will be treated. Unchecking the checkbox next to the sensor disables the sensor (modify mode).
3) ***Add group*** – Allows creating a new group with a custom name and description.



Afterward, sensors from the ungrouped sensor list or other groups can be added to the group by dragging them 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 to the local side Integra/Integra-S/Integra-G/Integra-GS.

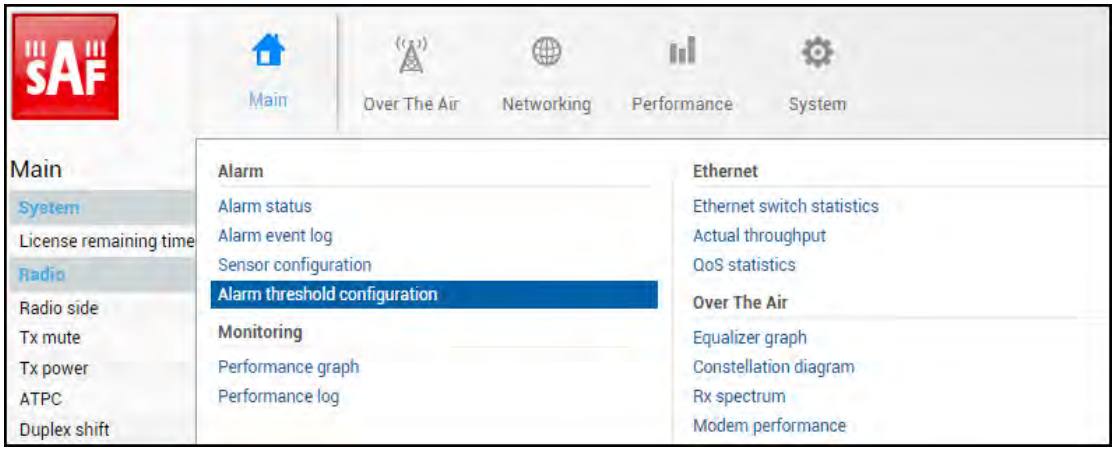
CLI commands (Chapter 4: COMMAND LINE INTERFACE)

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|syslog}	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|syslog}	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 info	Use to show current sensor status.
log sensor list	Use to list all available sensors.
log default {all|group|sensors [<sensor>]}	Use to set group, individual sensor, or all sensor configuration to default.

Performance → Alarm → Alarm threshold configuration

The page provides a summary of the parameters' alarm thresholds. All thresholds are predefined and some change dynamically according to the 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 mode

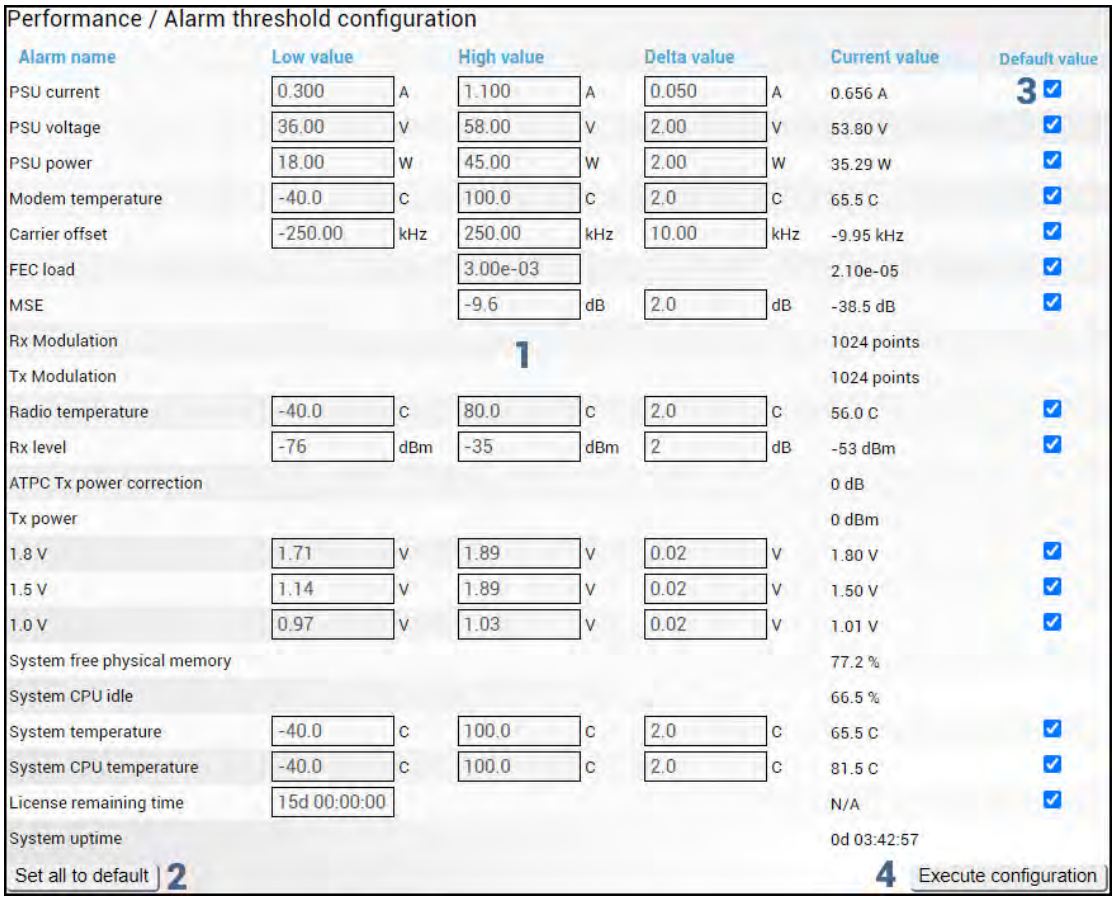
Performance / Alarm threshold configuration

Alarm name	Low value	High value	Delta value	Current value
PSU current	0.300 A	1.100 A	0.050 A	0.656 A
PSU voltage	36.00 V	58.00 V	2.00 V	53.80 V
PSU power	18.00 W	45.00 W	2.00 W	35.29 W
Modem temperature	-40.0 C	100.0 C	2.0 C	66.0 C
Carrier offset	-250.00 kHz	250.00 kHz	10.00 kHz	-7.35 kHz
FEC load		3.00e-03		2.41e-05
MSE		-9.6 dB	2.0 dB	-38.6 dB
Rx Modulation				1024 points
Tx Modulation				1024 points
Radio temperature	-40.0 C	80.0 C	2.0 C	56.0 C
Rx level	-76 dBm	-35 dBm	2 dB	-53 dBm
ATPC Tx power correction				0 dB
Tx power				0 dBm
1.8 V	1.71 V	1.89 V	0.02 V	1.80 V
1.5 V	1.14 V	1.89 V	0.02 V	1.50 V
1.0 V	0.97 V	1.03 V	0.02 V	1.00 V
System free physical memory				77.2 %
System CPU idle				80.9 %
System temperature	-40.0 C	100.0 C	2.0 C	66.0 C
System CPU temperature	-40.0 C	100.0 C	2.0 C	80.9 C
License remaining time	15d 00:00:00			N/A
System uptime				0d 03:38:52

1

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 to the local side Integra/Integra-S/Integra-G/Integra-GS.

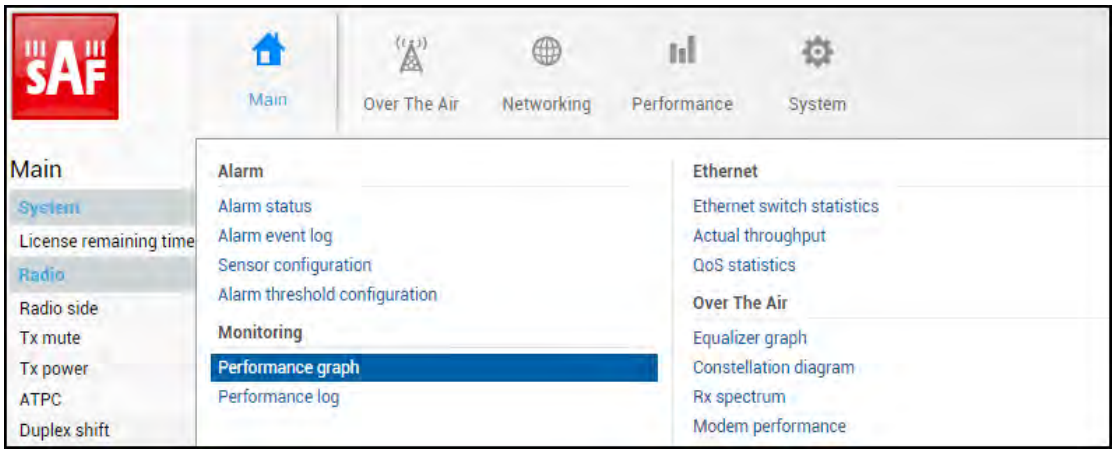
CLI commands (Chapter 4: COMMAND LINE INTERFACE)

log sensor info	Use to show the configuration of sensor thresholds.
log sensor mgmt <sensor> **control {enable|disable}**	Use to enable or disable a sensor.
log sensor mgmt <sensor> **thold** <min> <max> <delta>	Use to set sensor's min, max thresholds, and delta values manually.
log sensor mgmt <sensor> **time** <0…30>	Use to set sensor hysteresis time in seconds. Will be used to show a value in orange color indicating that the sensor value recently exceeded its thresholds.
log default {all| group| sensors [sensor]}	Use to set group, individual sensor, or all sensor configuration to default.
log sensor list	Use to list all available sensors.

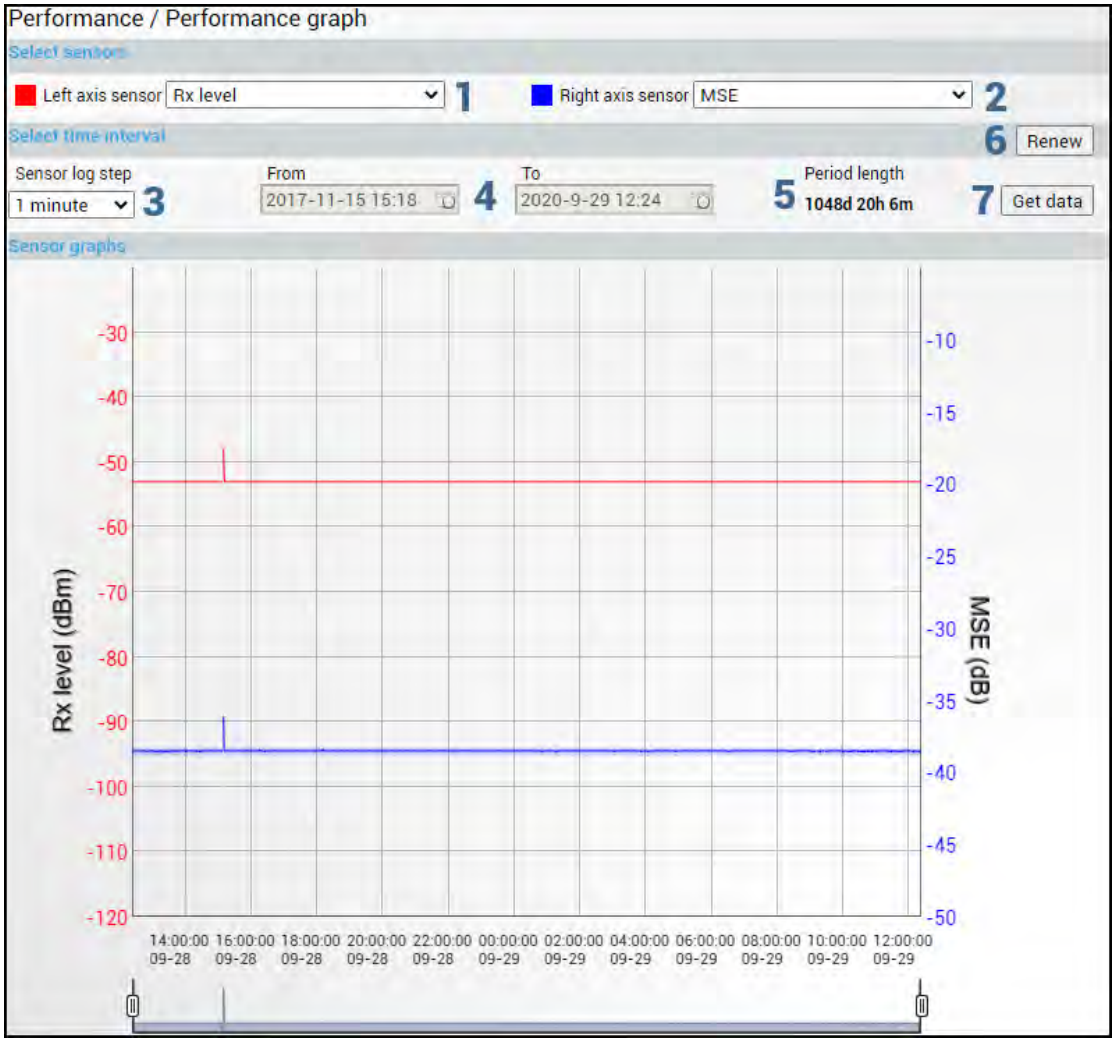
Performance → Monitoring → Performance graph

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

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



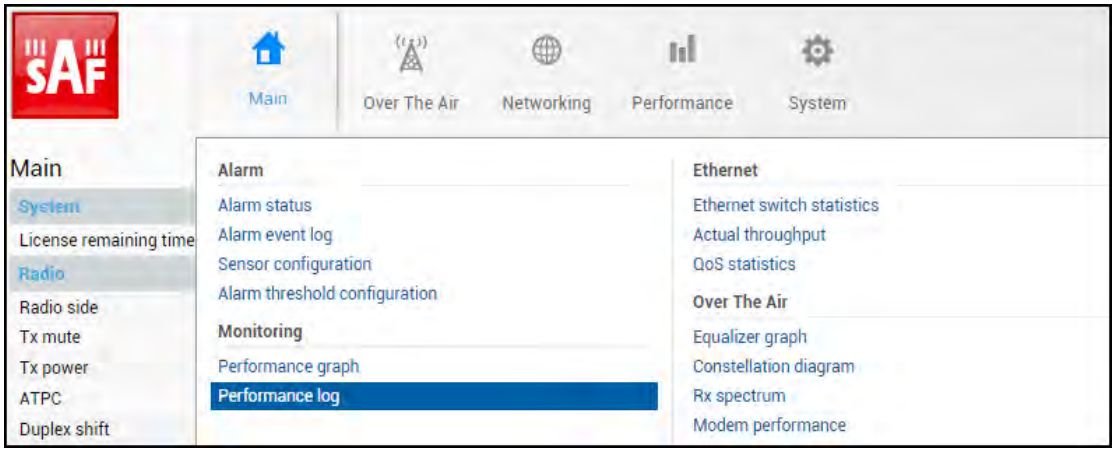
MODIFY button is deactivated in the Performance graph page.



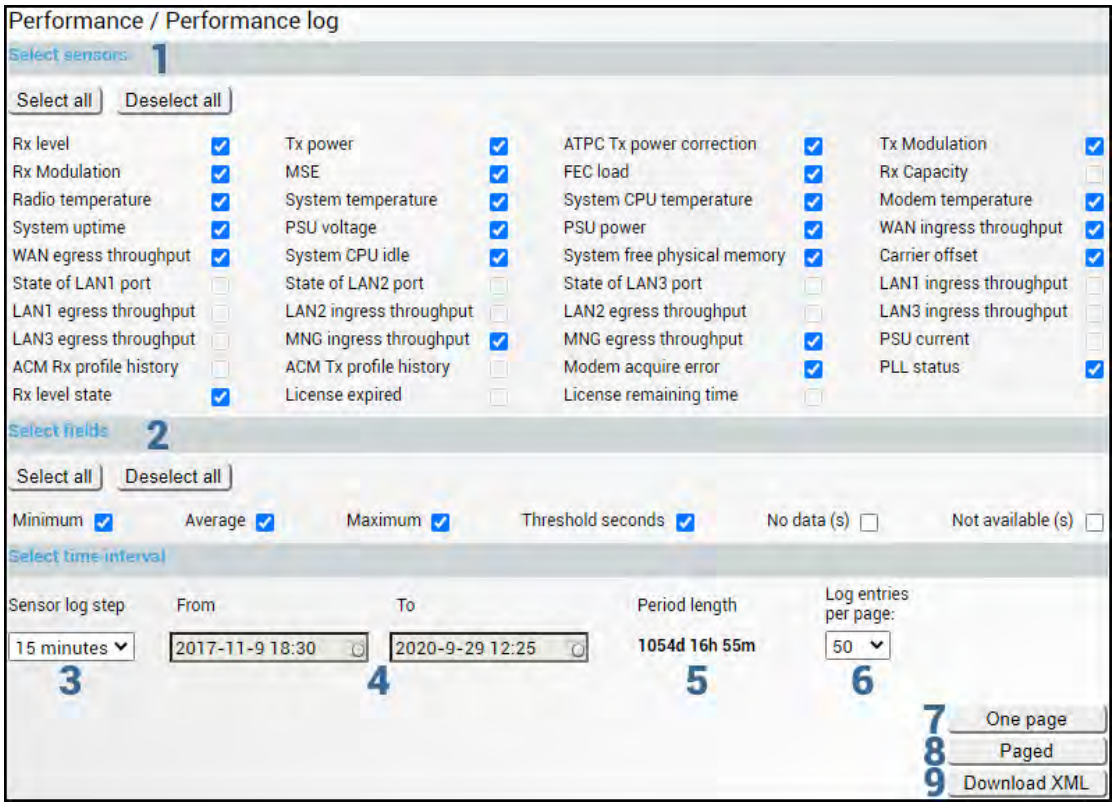
1) ***Left axis sensor*** – Allows choosing a sensor parameter colored in red and displayed on the left axis.
2) ***Right axis sensor*** – Allows choosing a sensor parameter colored in blue and displayed on the right axis.
3) ***Sensor log step*** – Allows choosing graph granularity – 1, 15, or 60 minutes.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

Performance → Monitoring → Performance log

Allows viewing and downloading performance log.



MODIFY button is deactivated on the Performance log page.



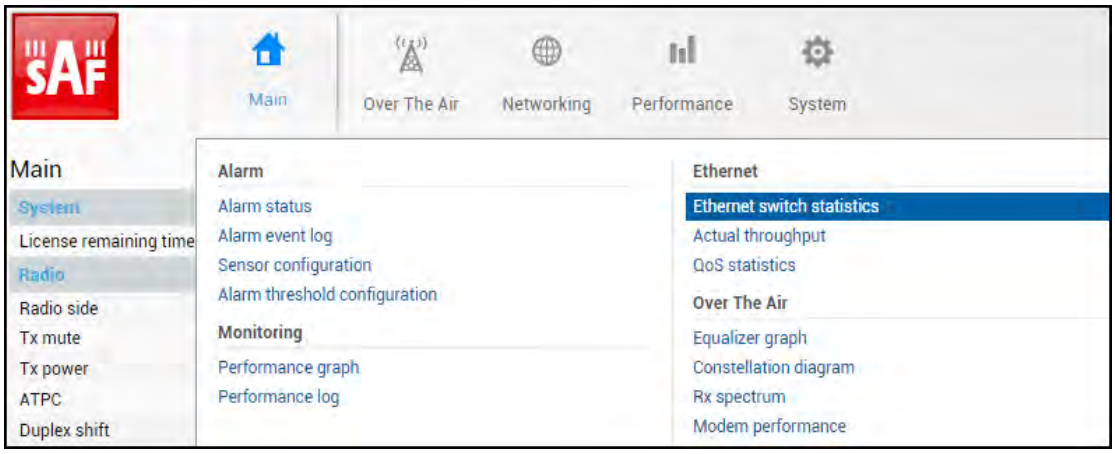
1) ***Select sensors*** – Allows choosing the sensor parameters to be displayed in the performance log.
2) ***Select fields*** – Allows choosing the parameter fields to be displayed in the performance log. "Minimum" and "Maximum" represent the minimum and maximum values in the specified sensor log step, while "Average" displays the average value; "Threshold seconds" will show the number amount of seconds in a chosen time interval when the parameter exceeded minimum or maximum alarm thresholds; "No data (s)" and "Not available (s)" show respectively the time when there was no data of according parameter and it was not available.
3) ***Sensor log step*** – Allows choosing log step – 1, 15, or 60 minutes.
4) Indicates start and end date/time of period displayed and allows selecting a specific period to show.
5) ***Period length*** – Indicates the length of the currently displayed period.
6) ***Log entries per page*** – Allows choosing 20, 50, or 100 entries per page for Paged representation.
7) ***One page*** – Will display the performance log on a single page in a separate tab.
8) ***Paged*** – Will display the performance log divided into pages in a separate tab.
9) ***Download XML*** – Press to download the performance log in an extensible markup language (.xml) file.

CLI commands (Chapter 4: COMMAND LINE INTERFACE)

log perf show {1M|15M|60M} **last** <1…1440> <sensor>	Use to show a specified number of last performance log entries with the specified sensor log step.
log perf show {1M|15M|60M} **time** <start_time> <end_time> <sensor>	Use to show entries for a certain time frame. 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 switch statistics



Status mode

Performance / Ethernet switch statistics

		LAN1	LAN2	LAN3	WAN	MNG
Statistics for	1	0d 01:25:09	0d 01:25:09	0d 01:25:10	0d 01:25:10	0d 01:25:10
Ingress Pkts.	2	1219	0	0	30656	42283
Ingress Bytes	3	278098	0	0	41682836	44127807
Egress Pkts.	4	1517	0	0	31201	42009
Egress Bytes	5	1562130	0	0	41861499	42866069
Total Multicast Pkts.	6	345	0	0	N/A	32776
Total Broadcast Pkts.	7	231	0	0	N/A	0
Total Pkts. 64 Octets	8	833	0	0	N/A	20861
Total Pkts. 65 to127 Octets	9	256	0	0	N/A	1087
Total Pkts. 128 to 255 Octets	10	291	0	0	N/A	283
Total Pkts. 256 to 511 Octets	11	190	0	0	N/A	199
Total Pkts. 512 to 1023 Octets	12	214	0	0	N/A	10331
Total Pkts. 1024 to 1518 Octets	13	952	0	0	N/A	15
Total Oversize Pkts.	14	0	0	0	N/A	51514
Rx Oversize Pkts.	15	0	0	0	0	26219
Tx Oversize Pkts.	16	0	0	0	25270	25295
Total Octets	17	1840228	0	0	N/A	86993812
Total Pkts.	18	2736	0	0	N/A	84292
Tx No Errors	19	1517	0	0	N/A	42009
Rx No Errors	20	1219	0	0	N/A	42283
Total Pkts. 1519 to 1522 Octets	21	0	0	0	N/A	0
In. Octets	22	278098	0	0	N/A	44127807
Out. Octets	23	1562130	0	0	N/A	42866069
Dot1 Port In Frames	24	1219	0	0	N/A	42283
Dot1 Port Out Frames	25	1517	0	0	N/A	42009
Received Pkts. 64 Octets	26	493	0	0	0	10435
Transmitted Pkts. 64 Octets	27	340	0	0	302	10428
Received Pkts. 65 to 127 Octets	28	236	0	0	0	352
Transmitted Pkts. 65 to 127 Octets	29	20	0	0	267	735
Received Pkts. 128 to 255 Octets	30	284	0	0	0	7
Transmitted Pkts. 128 to 255 Octets	31	7	0	0	276	276
Received Pkts. 256 to 511 Octets	32	18	0	0	0	173
Transmitted Pkts. 256 to 511 Octets	33	172	0	0	26	26
Received Pkts. 512 to 1023 Octets	34	185	0	0	5059	5085
Transmitted Pkts. 512 to 1023 Octets	35	45	0	0	5087	5303
Received Pkts. 1024 to 1518 Octets	36	3	0	0	25455	12
Transmitted Pkts. 1024 to 1518 Octets	37	1046	0	0	0	3
In. Broadcast Pkts.	38	226	0	0	1	0
Out. Broadcast Pkts.	39	6	0	0	230	0
In. Multicast Pkts.	40	345	0	0	0	16232
Out. Multicast Pkts.	41	0	0	0	340	16889
Dot3 In. Pause Frames	42	0	0	0	N/A	0
Dot3 Out. Pause Frames	43	0	0	0	N/A	0
EtherStatsUndersize Pkts.	44	0	0	0	N/A	0
Fragments	45	0	0	0	N/A	0
CRC Align. Errors	46	0	0	0	N/A	0
Jabbers	47	0	0	0	N/A	0
Ingress BPS	48	633	N/A	N/A	8514	12860
Ingress PPS	49	1	N/A	N/A	6	12
Egress BPS	50	4122	N/A	N/A	8541	9347
Egress PPS	51	4	N/A	N/A	6	9
MAC learn limit drop (Ingress Pkts.)	52	0	0	0	0	0
L2 cache drop (Ingress Pkts.)	53	0	0	0	0	0
Illegal SA drop (Ingress Pkts.)	54	0	0	0	0	0
Port rate limit drop (Ingress Pkts.)	55	0	0	0	0	0
Port rate limit drop (Ingress Bytes)	56	0	0	0	0	0
PAUSE/PFC frames generated (Ingress Pkts.)	57	0	0	0	0	0
PAUSE/PFC frames generated (Egress Pkts.)	58	0	0	0	0	0
Rate limit drop for unknown unicast (Ingress Pkts.)	59	0	0	0	0	0
Rate limit drop for unknown unicast (Ingress Bytes)	60	0	0	0	0	0
Rate limit drop for broadcast (Ingress Pkts.)	61	0	0	0	0	0
Rate limit drop for broadcast (Ingress Bytes)	62	0	0	0	0	0
Rate limit drop for known multicast (Ingress Pkts.)	63	0	0	0	0	0
Rate limit drop for known multicast (Ingress Bytes)	64	0	0	0	0	0
Rate limit drop for unknown multicast (Ingress Pkts.)	65	0	0	0	0	0
Rate limit drop for unknown multicast (Ingress Bytes)	66	0	0	0	0	0
All CoSQ out Pkts.	67	2144	0	0	31948	43293
All CoSQ out bytes	68	2151700	0	0	42848639	43798556
All CoSQ dropped Pkts.	69	0	0	0	0	0
All CoSQ dropped bytes	70	0	0	0	0	0
Processed Rx Pkts.	71	1547	0	0	31382	43855
Processed Rx bytes	72	373548	0	0	42671492	45721532