



User manual

Integra-W
Integra-WS

VER 1.2

FW 3.5.17

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To get up to date information about accessories and their availability, please contact 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. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

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

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

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

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

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Chapter 1: OVERVIEW

Labelling

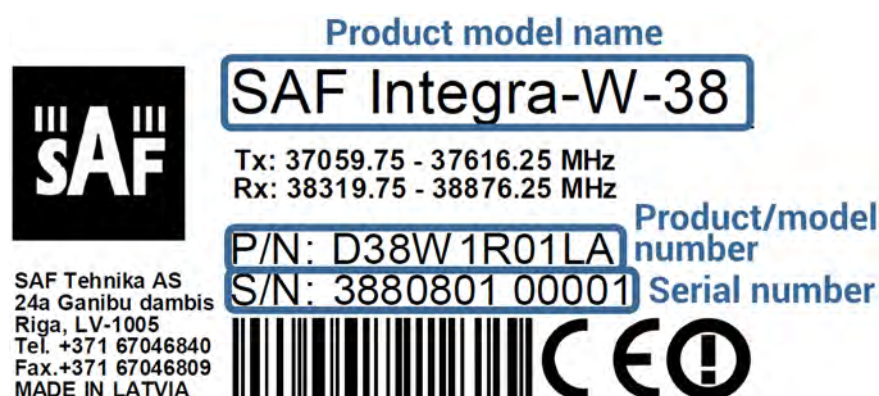
The label contains the following information (see samples in the picture below):

Product model name ("SAF Integra-W-38"). The FODU model name example is:

- SAF Integra-W-38 for Integra-W 38GHz FODU,
- SAF Integra-WS-23 for Integra-WS 23GHz FODU, etc

Product Number / Model Number (P/N or M/N) (D38W1R01LA): product/model number contains various information about the unit. Please see translation below.

Serial Number (3880801 00001): the serial number uniquely identifies the unit.

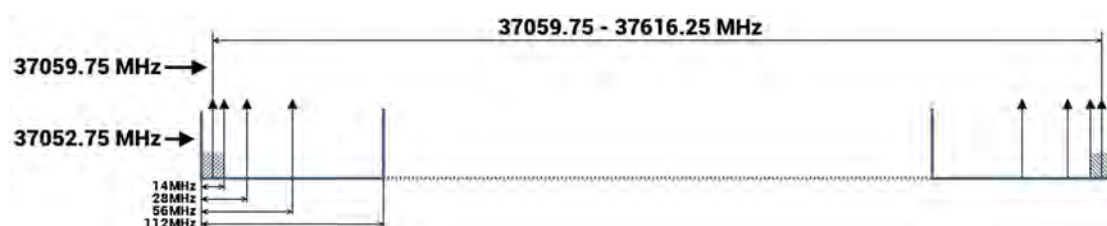


P/N or M/N translation:

- "D" designates Integra series product;
- "38" designates frequency band (38 GHz) of the radio;
- "W" designates Integra-W 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 integrated antenna.
- "R" designates Integra with full capacity licence;
- "05" designates the version number of the radio;
- "L" designates low side radio;
 - "H" - high side radio
- "A" designates A subband radio;
 - "B" - B subband radio;
 - "C" - C subband radio

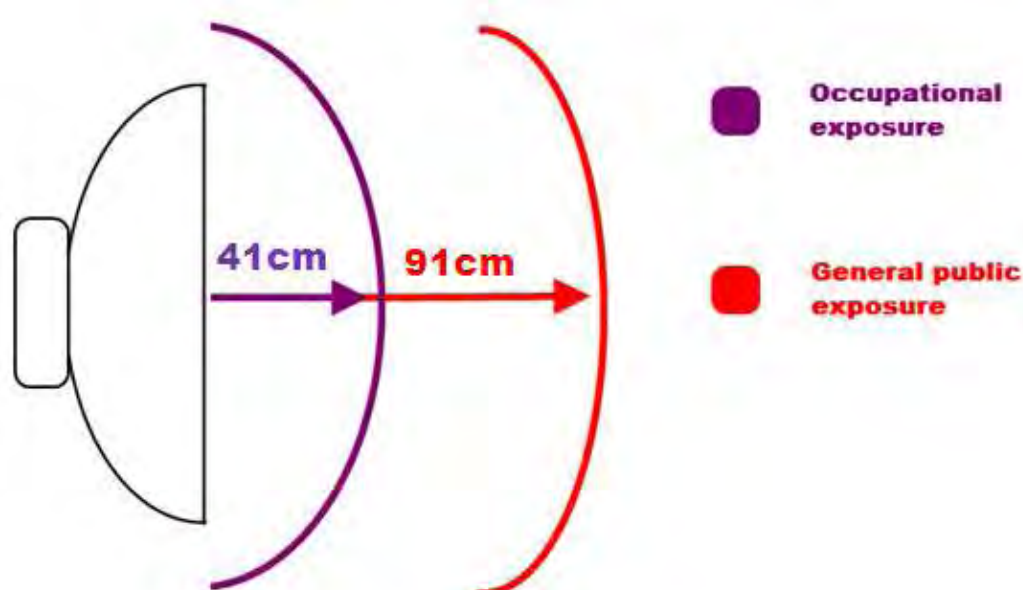
Please note that frequency range is set from the central frequency of the first 14 MHz channel to the central frequency of the last 14 MHz channel (see the diagram below).

Frequency range of subband B low side Integra-W 38 GHz FODU:



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 within the frequency range 24 GHz

Frequency range	Exposure characteristics	Equivalent plane wave power density Seq (W/m ²)	Average time period (min)
24GHz	occupational 41cm	50	$68/f^{1.05}$ (f in GHz)
	general public 91cm	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 to the definition of basic restrictions:

1. Power densities are to be averaged over any 20 cm² of exposed area and any $68/f^{1.05}$ 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 cm², should not exceed 20 times the values above.

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

FCC MPE limits within the frequency range 1.5-100 GHz

Frequency range	Exposure characteristics	Equivalent plane wave power density Seq (W/m ²)	Average time period (min)
24GHz	occupational 41cm	50	6
	general public 91cm	10	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 12 July 1999 on the limitation of exposure of the general public to electromagnetic fields (0 Hz to 300 GHz)
- WHO: Environmental Health Criteria 137: 'Electromagnetic Fields (300 Hz to 300 GHz)';
- ANSI/IEEE C95.1, 1999: 'IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz'
- BRD, Bundesimmissionsschutzgesetz, 26. BImSchV Verordnung über elektromagnetische Felder
- Bundesamt für Umwelt, Wald und Landwirtschaft (BUWAL), Bern/Schweiz
Schriftenreihe Umwelt Nr. 164, Luft, Mai 1992
'Messung nichtionisierender elektromagnetischer Strahlung, 1. Teil: Frequenzbereich 100 kHz bis 300 GHz'
- DIN VDE 0848-2, Entwurf, Oktober 1991:
'Sicherheit in elektrischen, magnetischen und elektromagnetischen Feldern, Teil 2: Schutz von Personen im Frequenzbereich von 30 kHz bis 300 GHz';
- ENV 50166-2, January 1995 (withdrawn in December 1999 by CENELEC)
'Human Exposure to Electromagnetic Fields (10 kHz – 300 GHz)'

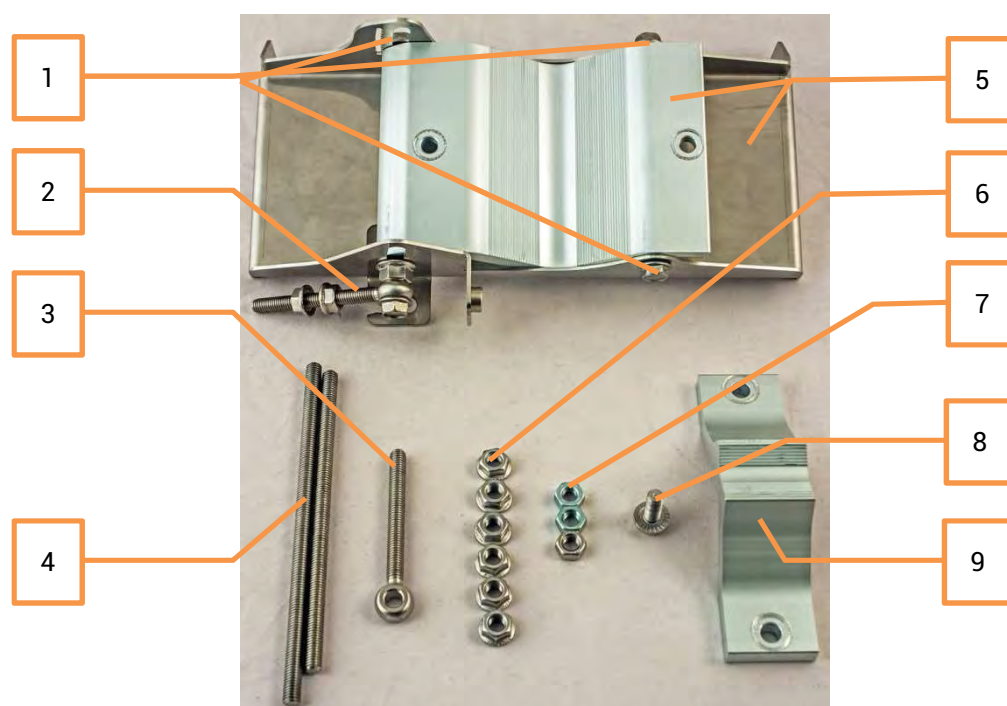
Chapter 2: INSTALLATION

Package contents

Integra-W	Integra-WS
<ul style="list-style-type: none"> - Integra-W FODU D**W1 ***** (0.3m), D**W2***** (0.6m) - Mounting bracket D0SPKR02 - Locking key for Integra-W D0ALK001 - Kit of replacement parts D0AZIP01 - RJ-45 connector 8P shield solid FOACNR02 - Installation manual D0DB2RM1 	<ul style="list-style-type: none"> - Integra-WS FODU D**WS***** - Locking key for Integra-WS D0ALK002 - RJ-45 connector 8P shield solid FOACNR02 - Installation manual D0DBSRM1

Integra-W FODU: assembling mounting bracket and installing with antenna on a pole

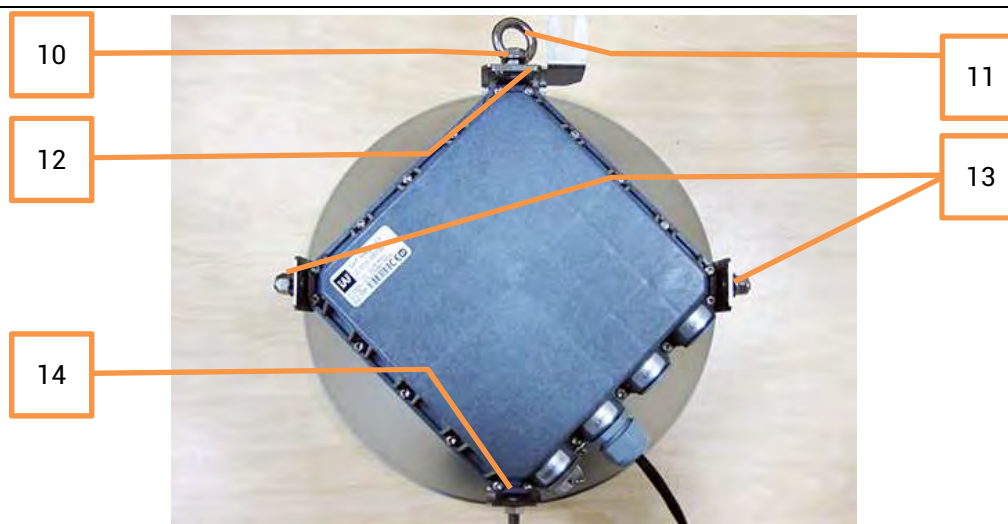
Disassembled mounting bracket and tools required for assembly



Parts of disassembled mounting bracket

#	Parts of disassembled mounting bracket
1	Three M8x1.25x16 hex flange bolts 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 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-W FODU

- 10 Spacer hex flange nut
- 11 Lifting eye nut
- 12 Fixation plate
- 13 Side screw flange nuts
- 14 Grounding flange nut

Numbers of mounting bracket and Integra-W FODU parts in next sections will be mentioned in square brackets [].

Changing polarization of Integra-W FODU and antenna

Tools required: 13mm (0.512") wrench (comes in 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-W FODU with antenna from mounting bracket.
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 90 degree offset (see above). Gap between side screw flange nuts [13] and fastening angles should be 5mm.



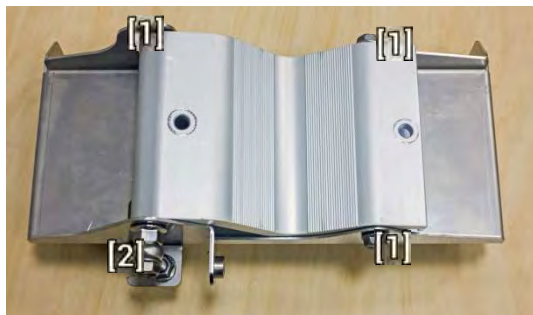
- 4 View of Integra-W FODU with swapped polarization.



- 5 When polarization is changed, make sure that drain hole cap located at grounding flange nut should be removed and inserted in previous drain hole.

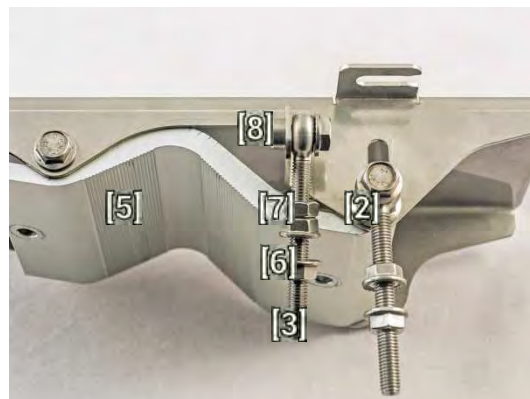
Assembly procedure

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



1

Using 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 clamps) and 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].



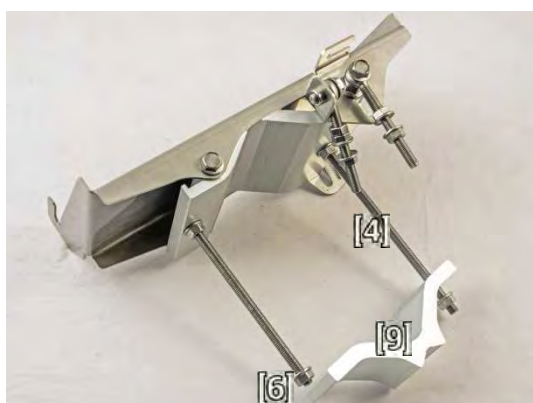
3

Screw on one hex flange nut [6] on each of 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 mounting clamp. Put hex nuts [7] on the other side of the clamp and screw on the threaded bolts until it is visible from other side of the clamp not more than 2mm. Tighten hex flange nuts [6] with torsion 20..25 N·m.



5

Attach mounting bracket clamp [9] on longest threaded rod [4] as shown on the picture and afterwards screw on remaining two hex flange nuts [6] on both threaded rods. No parts should remain not assembled.



6

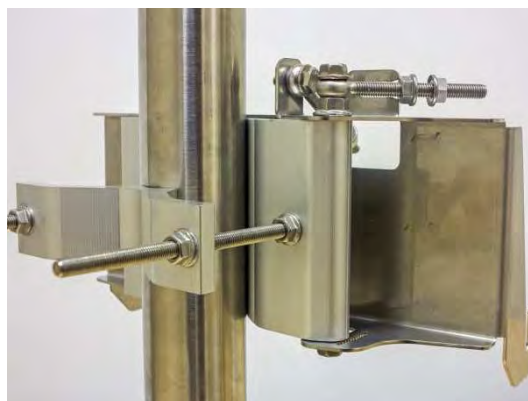
Unscrew hex flange nut [6] from shortest threaded rod [4]. Make sure that hex flange nuts on longest threaded rod is not too far; otherwise adjust nut's position accordingly. Put other end of mounting bracket clamp [9] on free threaded rod and screw on hex flange nut.

Bracket clamps in following position support mast \varnothing 55..120mm. Reversing clamps allows support of smaller masts \varnothing 25..75mm.



7

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



8

View of 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-W FODU.



10

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



11

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



12

View of assembled bracket on the mast pole with Integra-W 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 package)



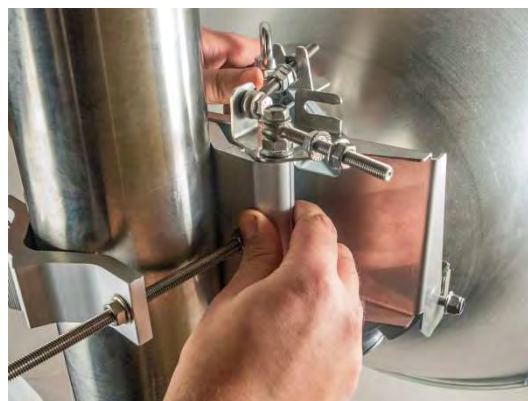
- 1 Before aligning the antenna, make sure that screws marked with red dots on the right side view of mounting bracket are loosened - hex flange nuts and bolts of azimuth and elevation eye screws, right side screw on Integra-W FODU and hex flange bolt on azimuth angle indicator.



- 2 Additionally loosen following screws marked with red dots on the left side view of mounting bracket: left side screw on Integra-W 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 degree angle by adjusting hex flange nuts [9] on vertical alignment eye screw so that Integra's housing is parallel with the bracket.



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



- 5 Each notch corresponds to one degree of azimuth angle. Half distance between notches (each lip) corresponds to 0.5 degree.



- 6 Fix azimuth angle on horizontal axis by adjusting 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 mounting bracket: hex flange nuts and bolts of azimuth and elevation eye screws, right side screw on Integra-W FODU and hex flange bolt on azimuth angle indicator with torsion 20..25 N·m.

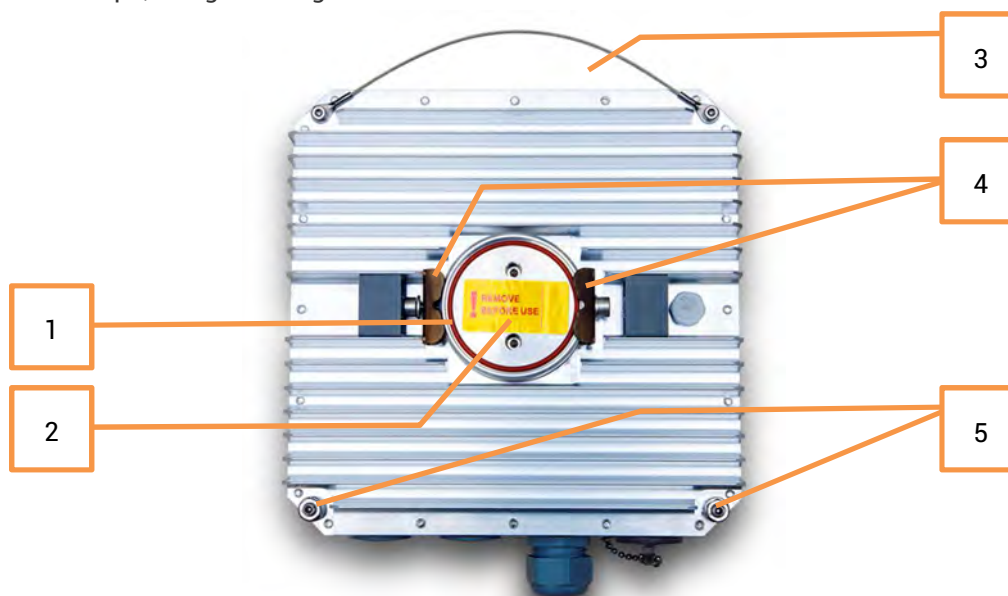


8

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

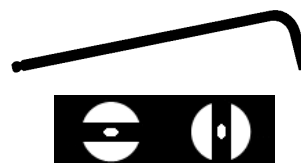
Integra-WS 15-42GHz* FODU: attaching to the antenna

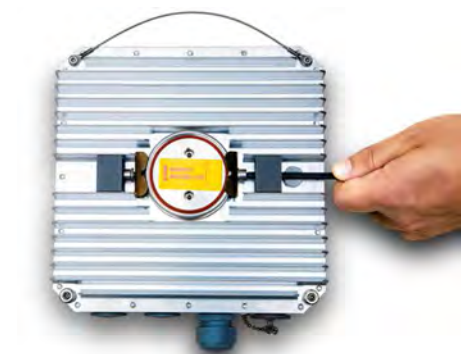
Parts of Integra-WS FODU: **1** – O-ring; **2** – flange protecting sticker; **3** – wire handle; **4** – fixation clamps; **5** – grounding screws.



Tools required: Size 5 allen wrench

Level (not supplied)





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



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

Note! Protective sticker should be removed before attaching the Integra-WS FODU to the antenna.



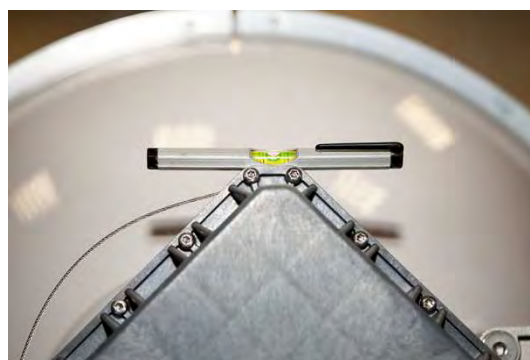
- 3 Secure the interconnection by tightening the bottom clamp (not fully). Make sure rotation of the Integra-WS is still possible.



- 4 Rotate Integra-WS to match the required polarization.



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



- 6 Verify polarization accuracy with a level, by placing it against the top edge of the Integra-WS housing



- 7 Secure the position of the Integra-WS by fully tightening both fixation clamps.

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



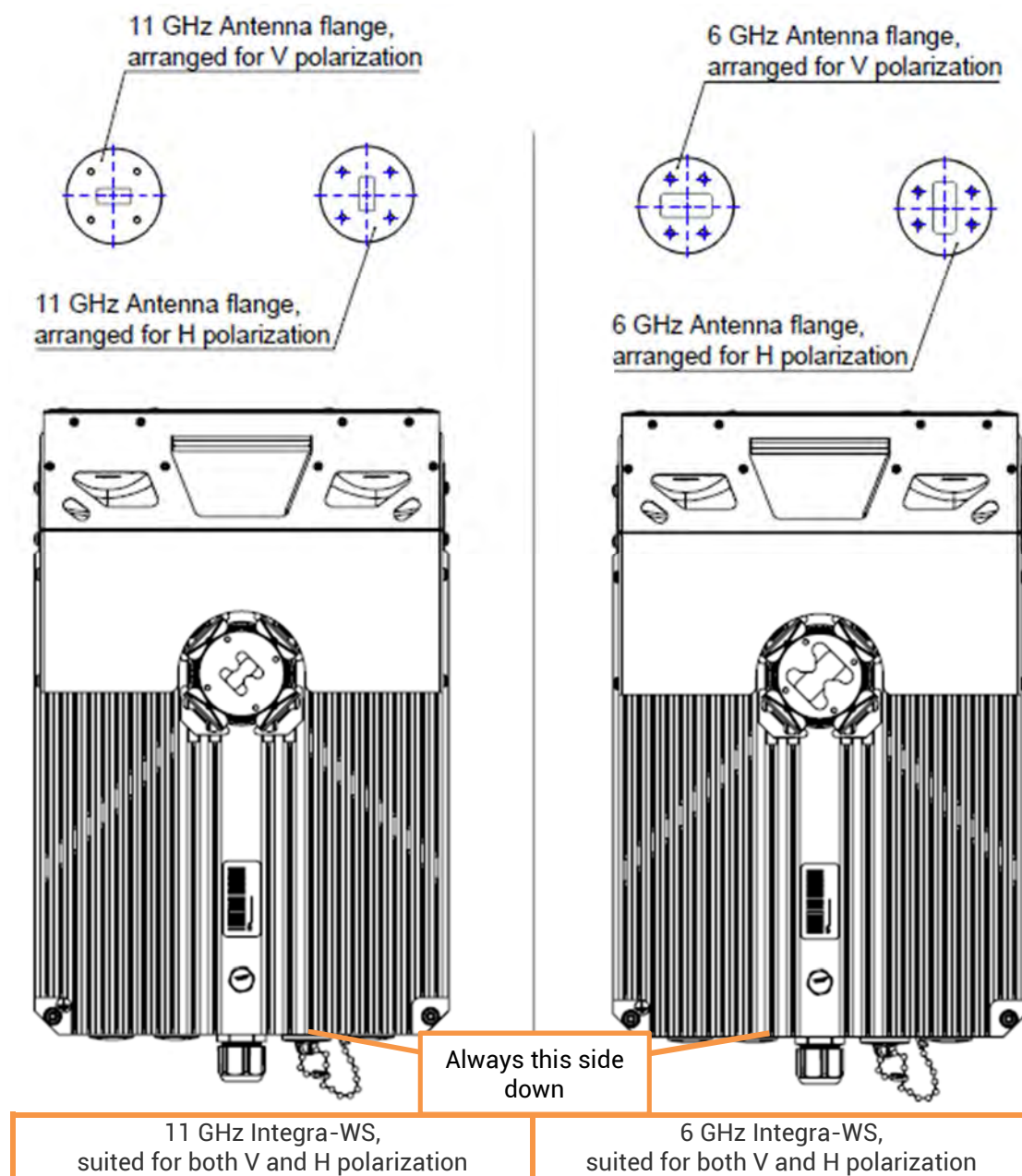
It is recommended to protect the installed radio from direct sunlight.



The default polarization for licensed frequency band radios.

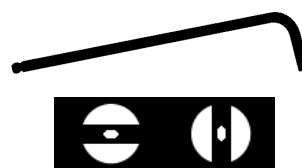
Integra-WS 6-13GHz* FODU: attaching to the antenna

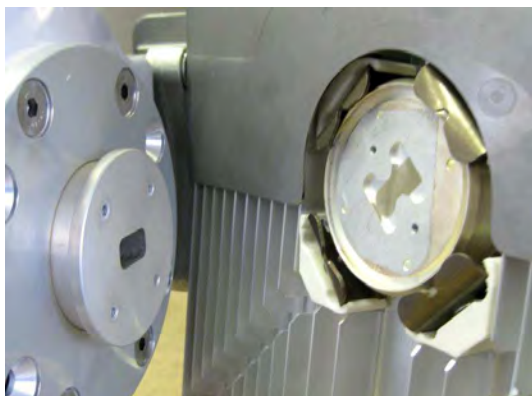
Integra-WS 6-13GHz* FODU features twisted polarization flange and resulting signal polarization is determined by Interface on antenna/OMT. To change signal polarization, please rotate only the antenna interface, as radio always remains in vertical position.



Tools required: Size 5 allen wrench, 240mm

Level (not supplied)





1

Integra-WS 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 radio always remains in vertical position.

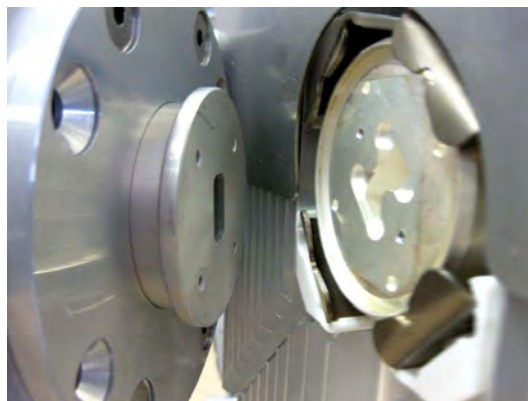
Example of vertical polarization interconnection.



3

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

Note! Protective sticker should be removed before attaching the Integra-WS FODU to the antenna.



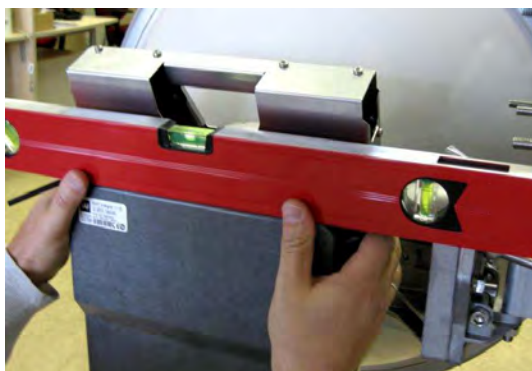
2

Example of horizontal polarization interconnection.



4

Tighten bottom fixation clamps.



5 Use air level to verify that Integra-WS FODU is properly levelled. Tighten all four fixation clamps properly.



6 Final view of assembled Integra-WS 6-13GHz* 1+0 setup.

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



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

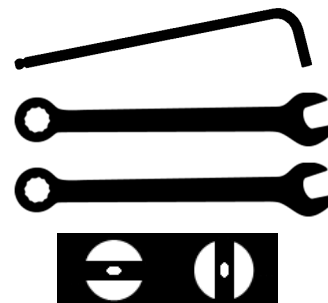
Integra-WS 6-13GHz* 2+0 & OMT interconnection

Tools required: Size 5 allen wrench, 240mm

10mm (0.394") wrench (not supplied)

8mm (0.315") wrench (not supplied)

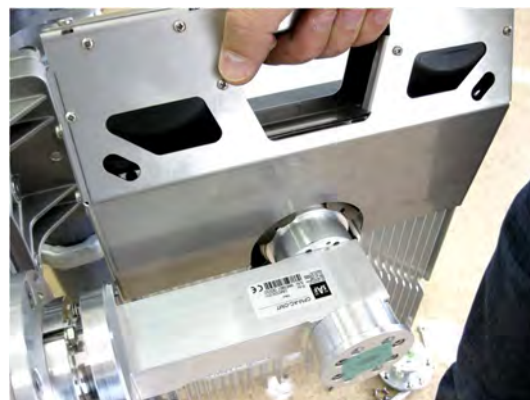
Level (not supplied)



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



1 Prepare Integra-WS 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-WS 6-13GHz* FODU to the OMT using both upper clamps. Integra S 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 radio always remains in vertical position



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



- 4** Use air level to verify that FODUs are properly levelled.



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



- 6** Final view of assembled Integra-WS 6-13GHz* 2+0 setup.

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



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 a SFP module.



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



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



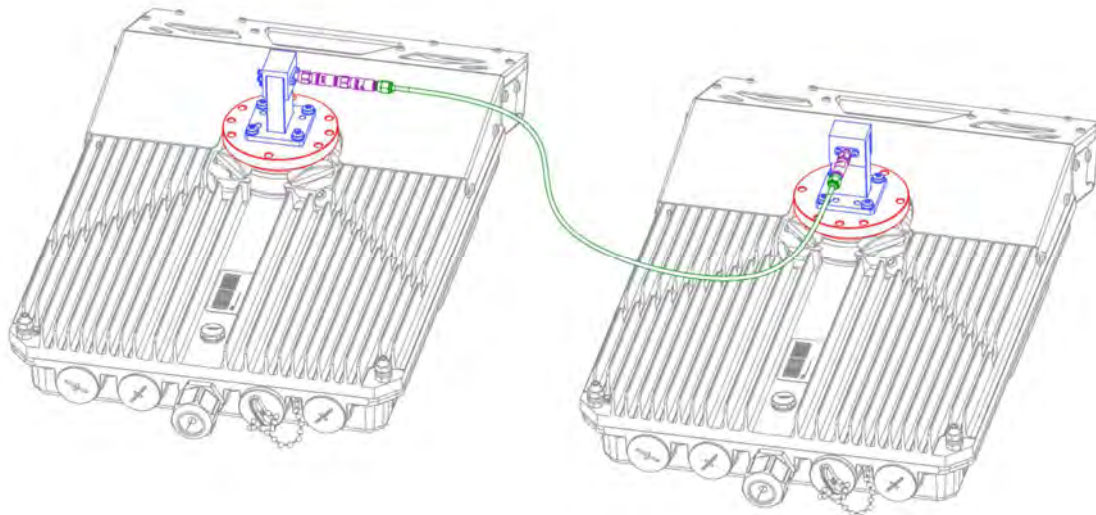
5 Connect LC connector to SFP module.



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

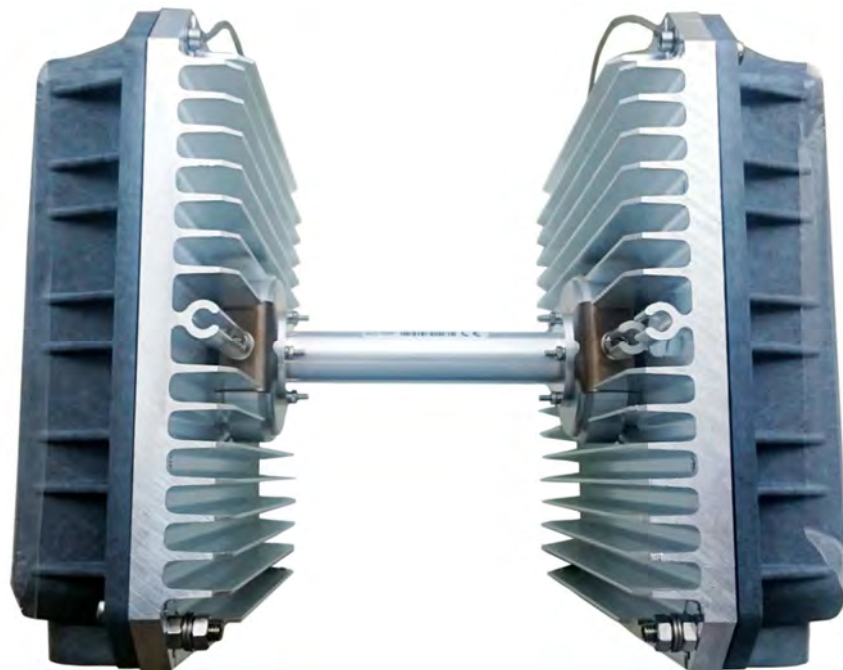
Initial setup in indoor environment

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



Test kit consists of **adapter flange**, **waveguide-to-coaxial adapter**, **attenuators** and **coaxial cable**.

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

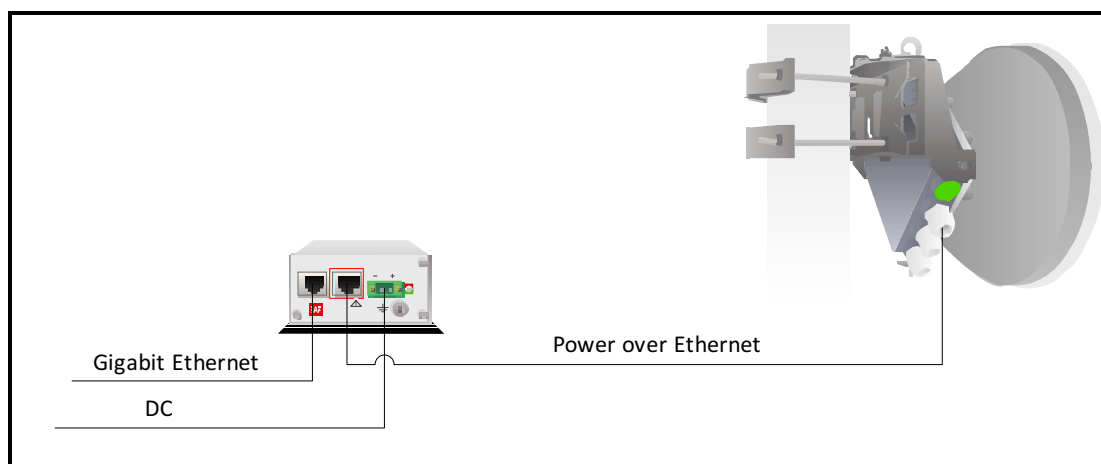


Chapter 3: WEB GUI

Initial configuration

Powering Integra-W/Integra-WS FODU and connecting to PC

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



Ethernet cable from PoE injector should be connected to RJ-45 port on Integra-W/Integra-WS FODU (MM or LAN(TP)).



For some HW revisions PoE may be available on data (LAN(TP)) port only.

Total length of Ethernet cables from CPE to PoE injector (DATA port) and from Integra-W/Integra-WS 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 RSSI LED will light up in solid green colour for approx. 20sec. Afterwards RSSI LED will go out for approx. 35sec. and eventually start blinking indicating current Rx level.

Please refer to 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 "54V" position. In this mode 22..60VDC input voltage will be converted to 54VDC output voltage. It is required to use this mode when input voltage is below 48VDC or when longer Ethernet cable is used in order to ensure sufficient input voltage to Integra-W/Integra-WS FODU (36...57VDC). In "48V" mode output voltage of PoE injector is the same as input voltage.



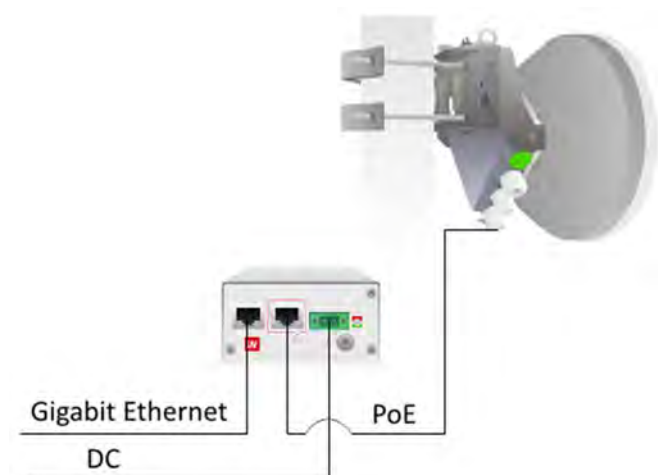
In case input voltage is between 22..36V DC, output current is limited to 1.2A, which will not be sufficient for low frequency band radios (6-13GHz). Use 36..60V DC input voltage instead.

Universal programmable PoE injector (P/N IOATPI24)

IOATPI24 injector is designed to operate with any PoE capable product with Fast Ethernet / Gigabit Ethernet interface. Built-in protection conforms with IEC 61000-4-5 standard.

Accepted input voltage 24...60VDC. Output voltage is stabilized to 54VDC.

Interconnection scheme:



Front panel has 3 indication LEDs. LED3 indicates 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 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)
Classified PoE mode (PoE CLASSIFIED) (if S4 is UP; see table below).		Unclassified PoE mode (PoE MANUAL) (if S4 is UP; see table below).

Back panel has 4 switches in order to operate PoE injector in different modes.

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

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

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

Position of DIP switches should be changed only while PoE injector is turned off.

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

5	↑	↑	↑	↑	Unclassified PoE mode (PoE controller disabled). $I_{\max}=1700\text{mA}$.
6	×	×	×	↓	Forced mode. $I_{\max}=2000\text{mA}$. DIP switches S1, S2, S3 ignored. LED3 color will be blue or green depending on position of S1.

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

Recommended modes

Mode Nr. 2 or 6* (Classified or Unclassified PoE mode. $I_{\max}= \text{auto}$ or $I_{\max}=1700\text{mA}$);

* depending on HW revision

Electrical specification

Data rate	Up to 1000 Mb/s
Classified PoE mode	Green indicator LED*
Unclassified 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	-10°C to + 50°C
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 Integra-W/Integra-WS Web GUI you will need a PC with the following system requirements:

Operating system

- Microsoft Windows XP / Vista / 7 / 8;

- Linux

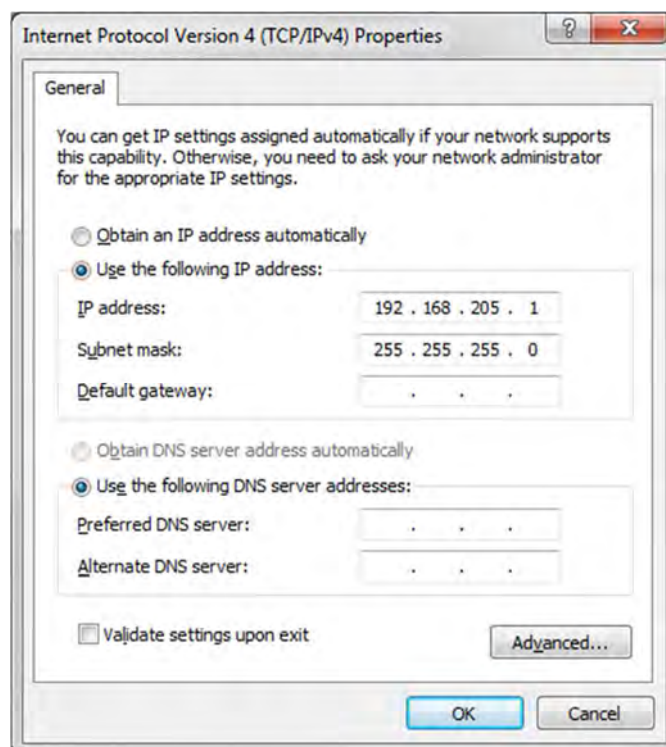
Web browser

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



Ethernet management connection

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



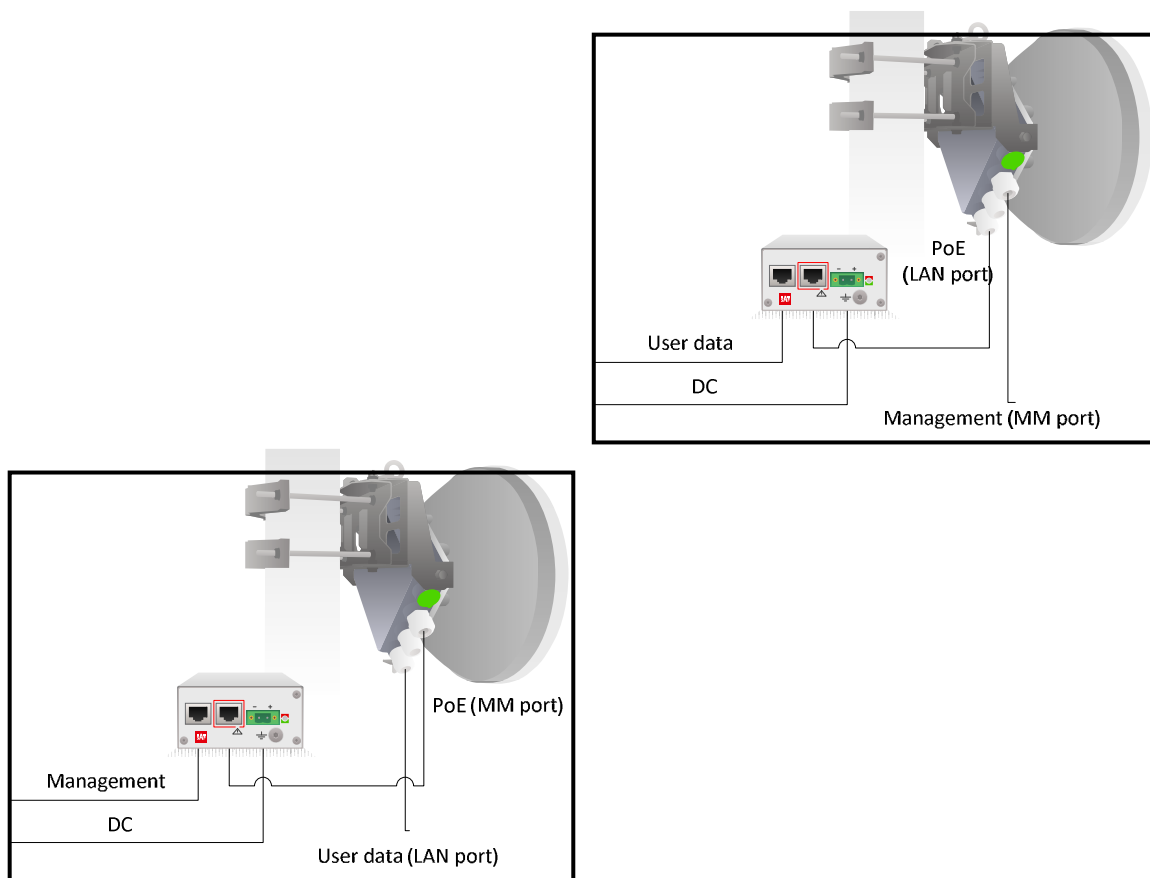
After applying these settings you are ready to connect to Web GUI or establish SSH/Telnet connection. Refer to Chapter 4: **COMMAND LINE INTERFACE** for details how to connect to other CLI interfaces (serial, SSH, Telnet).

Depending on the P/N Integra-W(S) may come pre-installed with in-band management or out-band management. In case of out-band management option management access will be available only on dedicated management port (labelled "MM").

If "MM" port was used for PoE, management will be available directly on PoE injector's port, but an additional cable will be required to be installed for user data traffic. If "LAN(TP)" port was used for PoE, user data traffic will be available directly on PoE injector's port, but an additional cable will be required to be installed for management access.

Note that by default management is transmitted over radio interface and you will have access to management of local and remote sides simultaneously. Back-to-back interconnection at remote side of the link will be required only if you have a chain of at least two Integra-W(S) links.

In case of in-band management access port labelled "MM" cannot be used for user data traffic, only for management access, while both LAN ports can be used for user data traffic and management access.

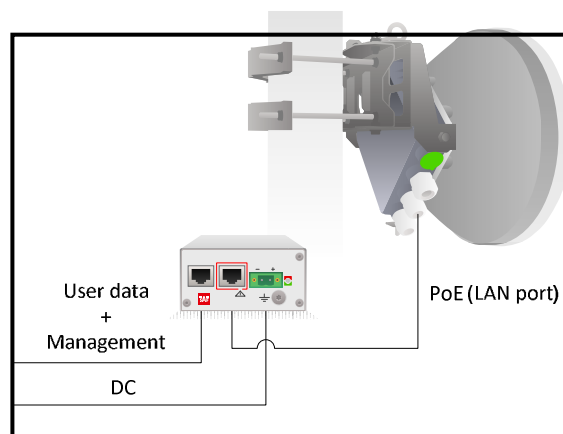


Traffic and management cable installation for out-band Integra-W(S)

Traffic and
cable installation for
W(S)

Accessing Web

1. Launch your address field enter IP address. Default as follows:



management
in-band Integra-

GUI

browser and in
Integra-W FODU
IP addresses are

- 192.168.205.10 for low side Integra-W/Integra-WS FODU (P/N D*****L*)
- 192.168.205.11 for high side Integra-W/Integra-WS FODU (P/N D*****H*)



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

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

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



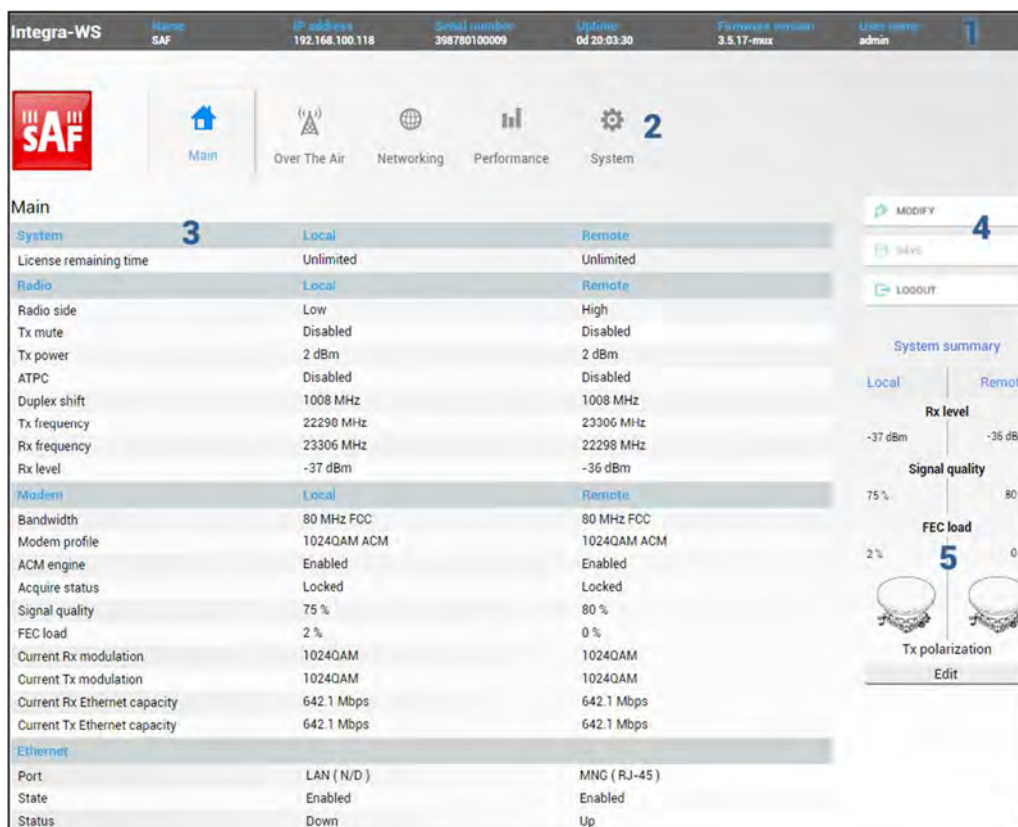
"Switch to secure connection (HTTPS)" indicates that HTTP protocol is being used. Press on the link and you will be redirected to secure HTTPS URL.



Minimum supported horizontal resolution is 1024px.

Main page

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



Web GUI is divided into 5 sections:

1 Top panel

Shows information about Integra-W/Integra-WS 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 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 Main page ("Main") is shown. Contents will change according to menu panel selection.

4 MODIFY / SAVE / LOGOUT

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

5 System summary

Shows three selected parameters of local and remote systems and Tx polarization (as read from internal accelerometer).



Values appear in **red colour** in case of exceeding [alarm threshold values](#) or in case of a warning (e.g. if loopback is active).

Values appear in **orange colour** in case [alarm threshold values](#) were exceeded during last 15 seconds.

Modifying basic system parameters

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

SAF

Main Over The Air Networking Performance System

Main

System	Local	Remote
License remaining time	Unlimited	Unlimited
Radio	Local	Remote
Radio side	Low	High
Tx mute	Disabled	Disabled
Tx power (2 .. 17 dBm for 1024QAM)	2 dBm	2 dBm
ATPC	Disabled	Disabled
Duplex shift	1008 MHz	1008 MHz
Tx frequency (22040.00 .. 22556.00 MHz)	22298.00 MHz	23306 MHz
Rx frequency	23306 MHz	22298 MHz
Rx level	-37 dBm	-36 dBm
Modem	Local	Remote
Filter	All FCC ETSI	
Bandwidth	40 MHz FCC 50 MHz FCC 56 MHz ETSI 60 MHz FCC 80 MHz FCC 100 MHz FCC 112 MHz ETSI	
Modem profile	64QAM ACM 128QAM 128QAM ACM 256QAM 256QAM ACM 512QAM 512QAM ACM 1024QAM 1024QAM ACM	
ACM engine	Enabled	Enabled
Acquire status	Locked	Locked
Signal quality	75 %	80 %
FEC load	0 %	0 %
Current Rx modulation	1024QAM	1024QAM
Current Tx modulation	1024QAM	1024QAM
Current Rx Ethernet capacity	642.1 Mbps	642.1 Mbps
Current Tx Ethernet capacity	642.1 Mbps	642.1 Mbps
Ethernet		
Port	LAN (SFP)	MNG (RJ-45)
State	Enable	Enable
Status	Down	Up

Rollback on Execute configuration Execute for both

1 Tx power

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

2 Tx frequency

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

Tx frequency range indicates range of central frequencies for configured channel bandwidth. Default frequency range (indicated on the label) is defined for 14MHz channel bandwidth.

3 Standard

Allows choosing whether only FCC, ETSI or both channel bandwidth options are visible in "Configuration" selection field.

4 Bandwidth

Allows choosing between available channel bandwidth options along with indication of fixed modulation or maximum modulation for ACM, bandwidth standard ETSI or FCC.

5 Modem profile

Allows choosing between available modulations for selected channel bandwidth.

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

6 State

Allows enabling/disabling each of two available ports. You can switch LAN port between electrical and SFP interfaces in Networking→Ethernet→Port status and configuration.

7 Execute

By pressing „Execute configuration" changes made to the corresponding section apply only for the local side Integra-W/Integra-WS. If „Rollback on" is selected, configuration will be reverted in case erroneous configuration changes are applied.



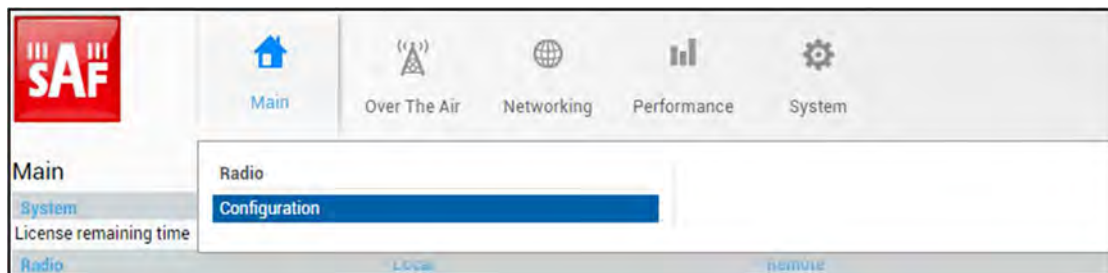
Rollback triggers when configuration changes applied interrupt management connectivity. For this reason rollback will not work if remote side of the link is not reachable.

Pressing „Execute for both" applies changes made to the corresponding section both for local and remote side Integra-W/Integra-WS FODUs.

Over The Air

Over The Air → Radio → Configuration

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



Status mode

Over The Air / Radio configuration		
Tx power (2 .. 17 dBm for 1024QAM)	1	2 dBm
Tx frequency (22040.00 .. 22556.00 MHz)	2	22298 MHz
Tx mute [>= 10 sec]	3	Disabled
RSSI Audio	4	Disabled
RSSI LED	5	Enabled
RSSI LED mode	6	1
ATPC	7	Disabled
ATPC update period (1 .. 5 sec)	8	5 sec
Rx (remote) level range (-75..-40 dBm)	9	-55 dBm -45 dBm
Difference between Rx min and Rx max must be at least 3 dBm		
Bandwidth	11	80 MHz FCC
Modem profile	12	1024QAM ACM

Press  **MODIFY** button.

Modify mode

Over The Air / Radio configuration		
Tx power (2 .. 17 dBm for 1024QAM)	1	<input type="text" value="2"/> dBm
Tx frequency (22040.00 .. 22556.00 MHz)	2	<input type="text" value="22298.00"/> MHz
Tx mute [>= 10 sec]	3	<input type="checkbox"/> Tx mute <input type="text" value=""/> sec
RSSI Audio	4	<input type="checkbox"/> Enable
RSSI LED	5	<input checked="" type="checkbox"/> Enable
RSSI LED mode	6	<input type="text" value="1"/> ▼
ATPC	7	<input type="checkbox"/> Enable
ATPC update period (1 .. 5 sec)	8	<input type="text" value="5"/> sec
Rx (remote) level range (-75..-40 dBm)	9	<input type="text" value="-55"/> dBm <input type="text" value="-45"/> dBm
Difference between Rx min and Rx max must be at least 3 dBm		
Filter	10	<input checked="" type="radio"/> All <input type="radio"/> FCC <input type="radio"/> ETSI
Bandwidth	11	40 MHz FCC 50 MHz FCC 56 MHz ETSI 60 MHz FCC 80 MHz FCC 100 MHz FCC 112 MHz ETSI
Modem profile	12	64QAM ACM 128QAM 128QAM ACM 256QAM 256QAM ACM 512QAM 512QAM ACM 1024QAM 1024QAM ACM
13 Rollback on <input type="checkbox"/> Execute configuration Execute for both		

- 1) **Tx power** – Indicates current Tx (transmit) power value (status mode); allows specifying Tx power value (modify mode). Available range depends on radio model and selected modulation. Actual range will be indicated in the brackets. ⚠ sign indicates that Tx power value was adjusted by ATPC. Move mouse over the sign for further details.
- 2) **Tx frequency** – Indicates current Tx (transmit) frequency (status mode); allows specifying Tx frequency (modify mode). Available range depends on frequency band,

subband, radio side and channel bandwidth selected. Actual range will be indicated in the brackets.

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

Default frequency range (indicated on the label) is defined for 40MHz channel bandwidth.

- 3) **Tx mute [≥ 10 sec]** – Indicates whether Tx mute is enabled or disabled (status mode); allows muting transmitter to limited time interval in seconds (modify mode). Minimum value is 10 seconds. Note that transmitter will be muted only if 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 3.5mm jack beside USB port. By default RSSI Audio is disabled. Please refer to [RSSI/audio port](#) description for further details.
- 5) **RSSI LED** – Indicates whether RSSI LED is enabled or disabled (status mode); allows disabling or enabling RSSI LED operation (modify mode). By default RSSI LED is enabled. Please refer to [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 [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.
- 8) **ATPC update period (1..5 sec)** – Indicates 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. Range is 1..5 seconds.
- 9) **Rx (remote) level range (-75..-40 dBm)** – Indicates minimum and maximum Rx level of remote side Integra-W/Integra-WS for ATPC operation (status mode); allows defining the minimum and maximum Rx level of remote side Integra-W/Integra-WS (modify mode). There should be at least 3dB difference between min and max values. ATPC Tx power correction will be performed only in case of exceeding these thresholds.



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



ATPC operates only when ACM is at maximum modulation (if ACM is enabled).

- 10) **Filter** – Allows choosing whether only FCC, ETSI or both channel bandwidth options are visible in "Configuration" selection field. Controls are available in modify mode only.
- 11) **Bandwidth** – Indicates currently configured channel bandwidth (status mode); allows choosing between available channel bandwidth options along with indication of maximum modulation, as well as according standard of channel bandwidth – ETSI or FCC (modify mode).
- 12) **Modem profile** – Indicates currently configured modulation (status mode); allows choosing between available modulations for selected channel bandwidth (modify mode).

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

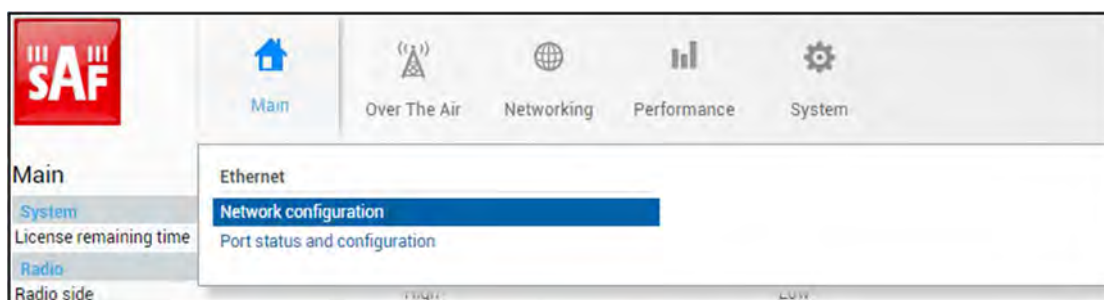
- 13) By pressing „Execute configuration” changes made to the corresponding section apply only for the local side Integra-W/Integra-WS. If „Rollback on” is selected, configuration will be reverted in case erroneous configuration changes are applied. Pressing „Execute for both” applies changes made to the corresponding section both for local and remote side Integra-W/Integra-WS FODUs.

CLI commands ([System](#) → [Tools](#) → [Console](#))

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 <enable disable>	Use to enables or disable RSSI LED operation.
radio tx-mute <time disable>	Use to mute transmitter on 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 radio software version.
radio version	Use to check radio software version
radio atpc status	Use to check 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 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.
modem configuration set factory	Use to reset modem settings to factory defaults – bandwidth and modulation will be reset to minimum.
modem loopback <digital none>	Use to enable or disables modem loopback.
modem allowed	Use to check list of available modem configurations.

Networking

Networking → Ethernet → Network configuration



Status mode

Networking / Network configuration		
Data port interface configuration		
Data port priority	1	Electrical
Frame size configuration		
Jumbo frame support	2	Enabled

Press  **MODIFY** button.

Modify mode

Networking / Network configuration		
Data port interface configuration		
Data port priority	1	<input type="radio"/> SFP <input checked="" type="radio"/> Electrical
Frame size configuration		
Jumbo frame support	2	<input checked="" type="checkbox"/>
		3 Execute configuration

- 1) **Data port priority** – Indicates current priority interface of LAN (data) port – SFP or electrical RJ-45 (status mode); allows setting priority interface for LAN (data) port – SFP or electrical RJ-45 (modify mode). Note that only single LAN port can be active, the other one is ignored. By default priority is set to electrical RJ-45 interface.



Priority setting means that if both interfaces are linked, only the priority interface will be used. This way redundancy can be set up – if prioritized interface goes down, the secondary one will take over.



Note that the active interface is indicated in "Main status" and "Port status and configuration" pages.

- 2) **Jumbo frame support** – Indicates whether jumbo frame support is enabled (status mode); allows enabling or disabling jumbo frame support (modify mode). By default jumbo frame support (up to 9600B) is enabled. When disabled, maximum supported frame size is 1522B.
- 3) By pressing „Execute configuration“ changes made to the corresponding section apply only for the local side Integra-W/Integra-WS. If „Rollback on“ is selected, configuration will be reverted in case erroneous configuration changes are applied.

CLI commands ([System](#) → [Tools](#) → [Console](#))


network port set LAN jumbo <enable disable>	Use to enable or disable jumbo frame support on LAN port.
network port set LAN interf-prio <electrical sfp>	Use to set active LAN port – electrical RJ-45 or SFP.

Networking → Ethernet → Port status and configuration

The screenshot shows the SAF web GUI interface. At the top, there is a navigation bar with icons for Main, Over The Air, Networking, Performance, and System. Below this, a sidebar menu is visible with options like Main, System, License remaining time, Radio, and Radio side. The main content area displays the 'Ethernet' configuration page, which includes sub-sections for 'Network configuration' and 'Port status and configuration'. The 'Port status and configuration' section is currently selected and highlighted.

Status mode

Networking / Port status and configuration				
Port 1	State 2	Link status 3	Link speed 4	Flow control 5
LAN	Enabled	Down	Auto	Disabled
MNG	Enabled	1000 Mbps	Auto	

Press  **MODIFY** button.

Modify mode

Networking / Port status and configuration				
Port 1	State 2	Link status 3	Link speed 4	Flow control 5
LAN	<input checked="" type="checkbox"/> Enable	Down	Auto	<input type="checkbox"/> Enable
MNG	<input checked="" type="checkbox"/> Enable	1000 Mbps	Auto	
				6 Rollback on <input type="checkbox"/> Execute configuration

- 1) **Port** – Indicates available switch ports. Note that LAN port configuration (SFP or electrical RJ-45) should be done in [Network configuration](#) page.
- 2) **State** – Indicates operation status of each LAN port (status mode); allows enabling/disabling each port (modify mode).
- 3) **Link status** – Indicates whether link with appropriate port is established and 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 manual setting (modify mode). Note that it is only possible to change speed of MNG port (only to 100FDX).



Only MNG port can be modified to 100FDX. LAN ports support Auto Gigabit (1000FDX) only and cannot be modified.



Maximum L2 frame size supported for LAN ports is 9600B, for MNG port – 1518B.

- 5) **Flow control** – Indicates whether flow control is enabled or disabled on LAN port (status mode); allows enabling/disabling flow control on LAN port (modify mode). By default flow control is disabled.
- 6) By pressing „Execute configuration“ changes made to the corresponding section apply only for the local side Integra-W/Integra-WS. If „Rollback on“ is selected, configuration will be reverted in case erroneous configuration changes are applied.

CLI commands ([System](#) → [Tools](#) → [Console](#))

network port show info	Use to show status of all ports.
network port show config	Use to show configuration of all ports.
network port set <port> admin-state <enable disable>	Use to enable or disable particular port.
network port set MNG speed <auto 100fdx 100hdx 10fdx 10hdx>	Use to change speed and duplex setting on MNG port. Default value is "auto" (autonegotiation).
network port set LAN flow-control <enable disable>	Use to enable or disable flow control on LAN port.
network port set LAN dpll <async master slave>	Use to set DPLL operation mode on LAN port.

Performance

Performance → Alarm → Alarm status

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

Performance / Alarm status

Date 1	Time 2	Alarm 3
2015-07-07	13:05:44	State of LAN port [No Link] [0x00000001]

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

CLI commands ([System](#) → [Tools](#) → [Console](#))

log sensor setlist	Use to show alarm status.
---------------------------	---------------------------

Performance → Alarm → Alarm log

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

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

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

Performance / Alarm event log

2 Toggle period selection | Load the latest data 3


No.	Date and Time	Source	Status	Event
5046	2015-07-07 13:27:46	radiod[rpc]		Radio Rx frequency set: 17793000 kHz
5047	2015-07-07 13:27:46	Radio	RESET	Rx level [-51 dBm]
5048	2015-07-07 13:27:46	Radio	RESET	Mute status [Mute(Off)] [0x00000000]
5049	2015-07-07 13:27:46	configd[rpc]		Cfg '7820' accepted from 'radio.web.admin'
5050	2015-07-07 13:28:00	configd[rpc]		Cfg without changes from 'config.list'
5051	2015-07-07 13:28:29	rupd[rpc]		Applying configuration for both (#047780A1:0)
5052	2015-07-07 13:28:30	radiod[rpc]		ATPC disabled (#6DAA718F:-3)
5053	2015-07-07 13:28:30	web		admin executed configuration
5054	2015-07-07 13:28:32	Radio	SET	Mute status [Mute(On)] [0x00000001]
5055	2015-07-07 13:28:33	Radio	SET	Rx level [-85 dBm]
5056	2015-07-07 13:28:33	configd[rpc]		Cfg '7821' accepted from 'modem.web.admin'
5057	2015-07-07 13:28:33	radiod[rpc]		Radio power set: 13 dBm
5058	2015-07-07 13:28:33	Modem	SET	Modem synchronization loss [0x00000001]
5059	2015-07-07 13:28:33	Modem	SET	FEC load [100 %]
5060	2015-07-07 13:28:33	Modem	SET	Modem signal quality [0 %]
5061	2015-07-07 13:28:33	radiod[rpc]		Radio Tx frequency set: 19389000 kHz
5062	2015-07-07 13:28:33	radiod[rpc]		Radio Rx frequency set: 17829000 kHz
5063	2015-07-07 13:28:34	Radio	RESET	Rx level [-52 dBm]
5064	2015-07-07 13:28:34	Radio	RESET	Mute status [Mute(Off)] [0x00000000]
5065	2015-07-07 13:28:34	configd[rpc]		Cfg '7822' accepted from 'radio.web.admin'

<< Previous 20 | Next 20 >> 5

Select page (1 - 254) 254 Select 6

Alarm event log file 8

7 Filter: No filter

Press  **MODIFY** button.

Modify mode

Performance / Alarm event log

Clear alarm event log | 2 Toggle period selection | Load the latest data 3

No.	Date and Time	Source	Status	Event
5046	2015-07-07 13:27:46	radiod[rpc]		Radio Rx frequency set: 17793000 kHz
5047	2015-07-07 13:27:46	Radio	RESET	Rx level [-51 dBm]
5048	2015-07-07 13:27:46	Radio	RESET	Mute status [Mute(Off)] [0x00000000]
5049	2015-07-07 13:27:46	configd[rpc]		Cfg '7820' accepted from 'radio.web.admin'
5050	2015-07-07 13:28:00	configd[rpc]		Cfg without changes from 'config.list'
5051	2015-07-07 13:28:29	rupd[rpc]		Applying configuration for both (#047780A1:0)
5052	2015-07-07 13:28:30	radiod[rpc]		ATPC disabled (#6DAA718F:-3)
5053	2015-07-07 13:28:30	web		admin executed configuration
5054	2015-07-07 13:28:32	Radio	SET	Mute status [Mute(On)] [0x00000001]
5055	2015-07-07 13:28:33	Radio	SET	Rx level [-85 dBm]
5056	2015-07-07 13:28:33	configd[rpc]		Cfg '7821' accepted from 'modem.web.admin'
5057	2015-07-07 13:28:33	radiod[rpc]		Radio power set: 13 dBm
5058	2015-07-07 13:28:33	Modem	SET	Modem synchronization loss [0x00000001]
5059	2015-07-07 13:28:33	Modem	SET	FEC load [100 %]
5060	2015-07-07 13:28:33	Modem	SET	Modem signal quality [0 %]
5061	2015-07-07 13:28:33	radiod[rpc]		Radio Tx frequency set: 19389000 kHz
5062	2015-07-07 13:28:33	radiod[rpc]		Radio Rx frequency set: 17829000 kHz
5063	2015-07-07 13:28:34	Radio	RESET	Rx level [-52 dBm]
5064	2015-07-07 13:28:34	Radio	RESET	Mute status [Mute(Off)] [0x00000000]
5065	2015-07-07 13:28:34	configd[rpc]		Cfg '7822' accepted from 'radio.web.admin'

<< Previous 20 | Next 20 >> 5

Select page (1 - 254) 254 Select 6

Alarm event log file 8

7 Filter: No filter

- 1) **Clear alarm log** – deletes all alarm log entries;
- 2) **Toggle period selection** – opens period selection controls;
- 3) **Load the latest data** – refreshes alarm log and shows last 20 log entries;
- 4) List of alarm log entries – entry number, date and time, source node, status and event name. Clicking on "Cfg # accepted from <>" will redirect to Configuration file page and highlight changes made.
- 5) Navigation controls. "<<" navigates to start of alarm log, while ">>" – to the end; "Previous 20" navigates to previous alarm log page showing 20 previous alarm log

- entries, while "Next 20" – to next alarm log page showing 20 next alarm log entries (if available).
- 6) Shows number of currently viewed alarm log page. In Web GUI only last 20 pages (400 entries) are shown. Download alarm log to view full list. You can enter specific page number to navigate to required page.
 - 7) **Filter** – press to filter alarms from certain source node (e.g. Radio);
 - 8) **Alarm event log file** – press on the link to download full alarm log text file.

CLI commands ([System](#) → [Tools](#) → [Console](#))

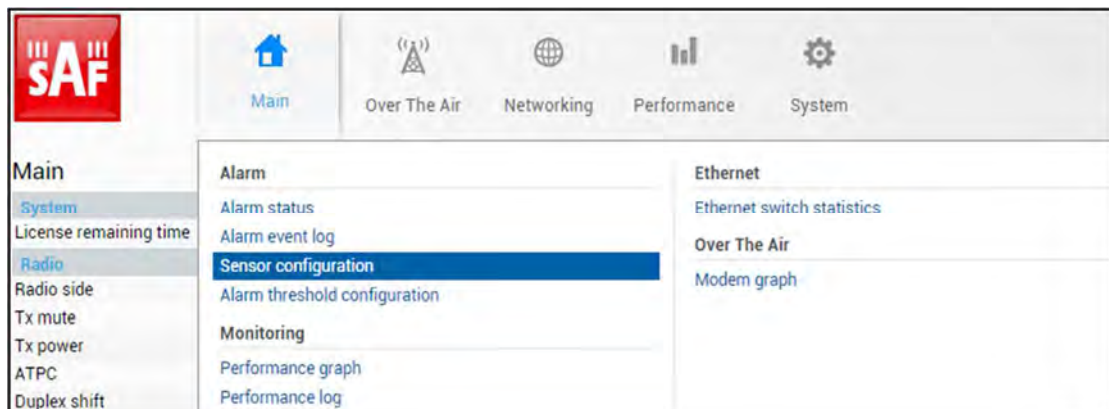
log event show last <#_of_entries>	Use to show certain number of last alarm log entries.
log event show time <time>	Use to show entries from a certain time point. Following formats are supported: YYYY-MM-DD/hh:mm:ss; MM-DD/hh:mm:ss; MM-DD/hh:mm; hh:mm:ss; hh:mm
log event show sensor <sensor> <last time> <#_of_entries time>	Use to show entries for a specific sensor. Regarding subcommands "last" and "time" refer to commands above.
log event show module <modem ns psu radio system> <last time> <#_of_entries time>	Use to show entries for a specific module. Regarding subcommands "last" and "time" refer to commands above.
log event clear	Use to clear alarm log
log event configure <enable disable>	Use to enable/disable grouped repetitive alarm-event log entries.
log event configure dump <minutes>	Use to configure timer during which repetitive log entries are counted.
log event configure pattern <1...10>	Use to specify amount of non-repetitive entries to be counted.
log event configure status	Use to display current configuration of grouped repetitive alarm-event log entries (filter).

Performance → Alarm → Sensor configuration

Following section allows specifying behaviour of available sensor parameters.



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



Status mode

Performance / Sensor configuration

1	Group description (name)	State	Group data destinations		
			event	perf	snmp
+	Alarm log only (alarm_only)	Enabled	✓	✗	✗
+	PM log only (log_only)	Enabled	✗	✓	✗
+	Full monitoring (default_all)	Enabled	✓	✓	✓
+	Alarm log and... (alarm_snmp)	Enabled	✓	✗	✓
+	PM log and SNMP (pm_snmp)	Enabled	✗	✓	✓

Ungrouped sensor list(3) 2

Modem ACM Rx	✓
Modem MSE	✗
Modem distortion	✓

Press  **MODIFY** button.

Modify mode

Performance / Sensor configuration

1	Group description (name)	State	Group data destinations		
			event	perf	snmp
+	Alarm log only (alarm_only)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
+	PM log only (log_only)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
+	Full monitoring (default_all)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
+	Alarm log and... (alarm_snmp)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
+	PM log and SNMP (pm_snmp)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Ungrouped sensor list(3) 2

Modem ACM Rx	<input checked="" type="checkbox"/>
Modem MSE	<input type="checkbox"/>
Modem distortion	<input checked="" type="checkbox"/>

3 Add group 4 Remove group 5 Set all to default 6 Execute configuration

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

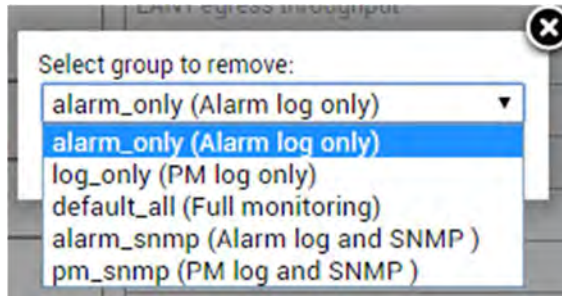
Group name (<33 characters):
Allowed: A-Z;a-z;0-9;-_

Group description (<129 characters):

Add group

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

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



- 5) **Set all to default** – Restores default settings for all groups and sensors.
6) By pressing „Execute configuration” changes made to the corresponding section apply only for the local side Integra-W/Integra-WS. If „Rollback on” is selected, configuration will be reverted in case erroneous configuration changes are applied.

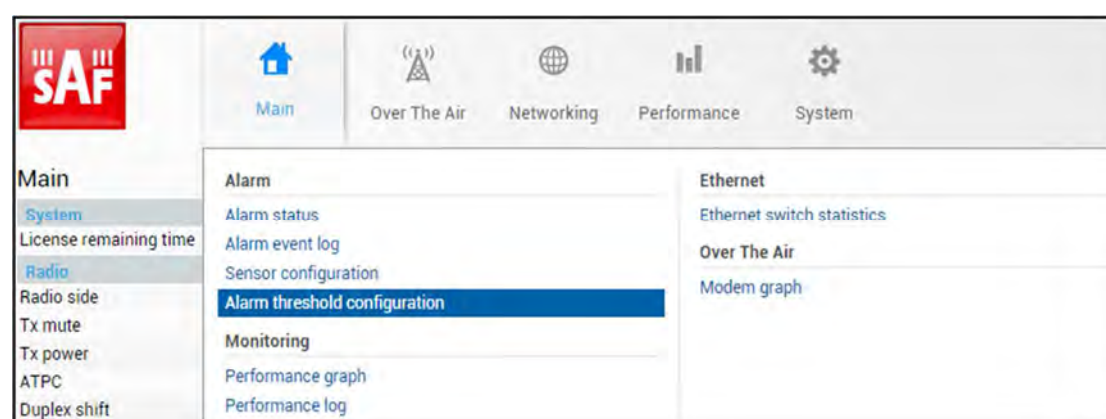
CLI commands ([System](#) → [Tools](#) → [Console](#))

log group info	Use to show sensor group configuration.
log group create <name> <description>	Use to create a new group.
log group mgmt <name> add destination <event perf snmp>	Use to add a destination for a group.
log group mgmt <name> add sensor <sensor>	Use to add a sensor to a group.
log group mgmt <name> config <enable disable>	Use to enable or disable a group.
log group mgmt <name> delete	Use to delete a group.
log group mgmt <name> remove destination <event perf snmp>	Use to remove a destination from a group.
log group mgmt <name> remove sensor <sensor>	Use to remove a sensor from a group.
log sensor list	Use to list all available sensors.

Performance → Alarm → Alarm threshold configuration

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

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



Status mode

Performance / Alarm threshold configuration				
Alarm name	Low value	High value	Delta value	Current value
PSU current	0.350 A	1.100 A	0.050 A	0.592 A
PSU voltage	36.00 V	58.00 V	2.00 V	45.40 V
PSU power	20.00 W	40.00 W	2.00 W	26.88 W
Modem signal quality	50 %		0 %	100 %
FEC load		90 %		0 %
Modem distortion				18 %
Radio temperature	-40.0 C	80.0 C	2.0 C	39.0 C
Rx level	-84 dBm	-35 dBm	2 dB	-47 dBm
6.5 V	5.90 V	7.10 V	0.02 V	6.54 V
5.0 V	4.50 V	5.50 V	0.02 V	5.03 V
3.3 V	3.00 V	3.60 V	0.02 V	3.29 V
2.5 V	2.29 V	2.70 V	0.02 V	2.50 V
1.8 V	1.71 V	1.89 V	0.02 V	1.83 V
1.5 V	1.13 V	1.89 V	0.02 V	1.56 V
1.0 V	0.97 V	1.03 V	0.02 V	1.00 V
System free physical memory				92.7 %
System CPU idle				88.3 %
System temperature	-40.0 C	100.0 C	2.0 C	35.5 C
System CPU temperature	-40.0 C	100.0 C	2.0 C	63.6 C
License remaining time	15d 00:00:00			6d 03:44:54
System uptime				0d 00:04:23

Press  **MODIFY** button.

Modify mode

Performance / Alarm threshold configuration

Alarm name	Low value	High value	Delta value	Current value	Default value
PSU current	0.350 A	1.100 A	0.050 A	0.640 A	3 <input checked="" type="checkbox"/>
PSU voltage	36.00 V	58.00 V	2.00 V	45.00 V	<input checked="" type="checkbox"/>
PSU power	20.00 W	40.00 W	2.00 W	28.80 W	<input checked="" type="checkbox"/>
Modem signal quality	50 %		0 %	69 %	<input checked="" type="checkbox"/>
FEC load		90 %		1 %	<input checked="" type="checkbox"/>
Modem distortion				20 %	<input checked="" type="checkbox"/>
Radio temperature	-40.0 C	80.0 C	2.0 C	39.0 C	<input checked="" type="checkbox"/>
Rx level	-75 dBm	-35 dBm	2 dB	-45 dBm	<input checked="" type="checkbox"/>
6.5 V	5.90 V	7.10 V	0.02 V	6.53 V	<input checked="" type="checkbox"/>
5.0 V	4.50 V	5.50 V	0.02 V	5.02 V	<input checked="" type="checkbox"/>
3.3 V	3.00 V	3.60 V	0.02 V	3.29 V	<input checked="" type="checkbox"/>
2.5 V	2.29 V	2.70 V	0.02 V	2.50 V	<input checked="" type="checkbox"/>
1.8 V	1.71 V	1.89 V	0.02 V	1.83 V	<input checked="" type="checkbox"/>
1.5 V	1.13 V	1.89 V	0.02 V	1.56 V	<input checked="" type="checkbox"/>
1.0 V	0.97 V	1.03 V	0.02 V	0.98 V	<input checked="" type="checkbox"/>
System free physical memory				93.2 %	
System CPU idle				83.3 %	
System temperature	-40.0 C	100.0 C	2.0 C	35.5 C	<input checked="" type="checkbox"/>
System CPU temperature	-40.0 C	100.0 C	2.0 C	68.5 C	<input checked="" type="checkbox"/>
License remaining time	15d 00:00:00			6d 03:56:24	<input checked="" type="checkbox"/>
System uptime				0d 00:02:25	

Set all to default **2** 4 Execute configuration

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

CLI commands (System → Tools → Console)

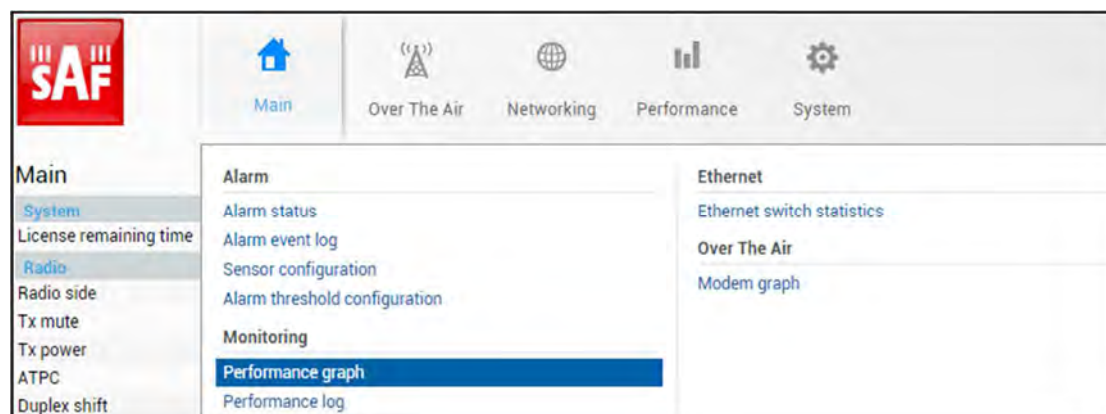
log sensor info	Use to show configuration of sensor thresholds.
log sensor mgmt <sensor> control <auto user>	Use to set sensor thresholds to user defined or automatically adjusted.
log sensor mgmt <sensor> thold <min> <max> <delta>	Use to set sensor's min, max thresholds and delta value manually.
log sensor mgmt <sensor> time <0...30>	Use to set sensor hysteresis time in seconds. Will be used to show value in orange colour indicating that sensor value recently exceeded its thresholds.
log default <all group sensors>	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

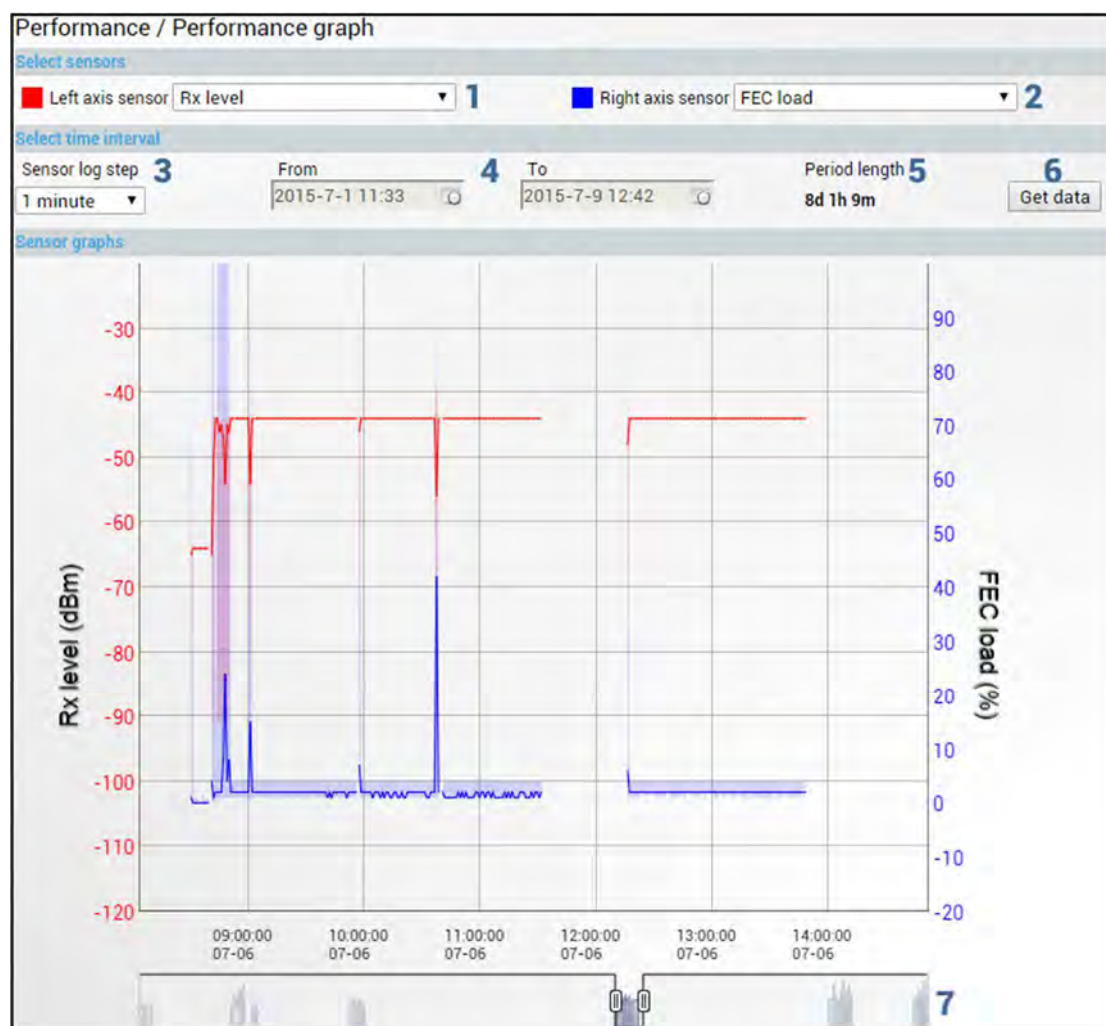
Performance graph allows visualising various parameters over chosen time period as curves. Available parameters will depend on [Sensor Configuration](#). Any two parameters can be shown at a time. By default Rx level (dBm) and Radial MSE (dB) are selected.



Not all sensors available in [Sensor Configuration](#) can be displayed in Performance graph.

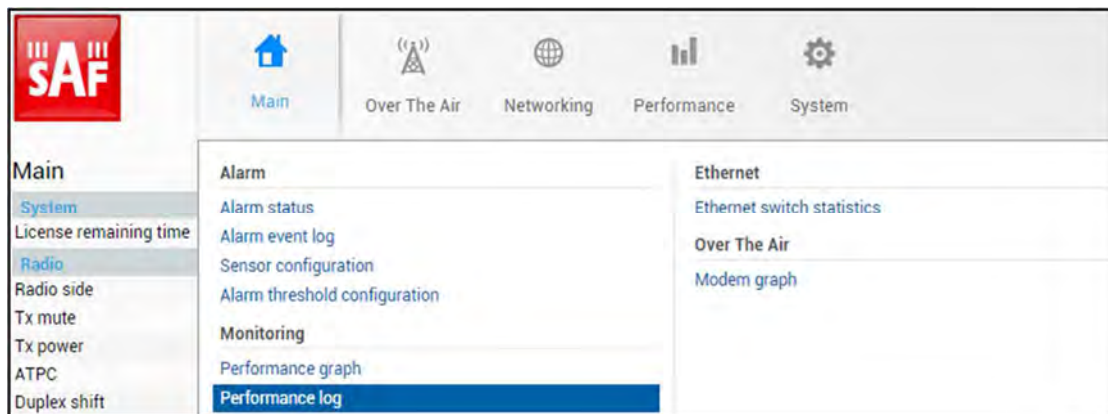


MODIFY button is deactivated in Performance graph page.

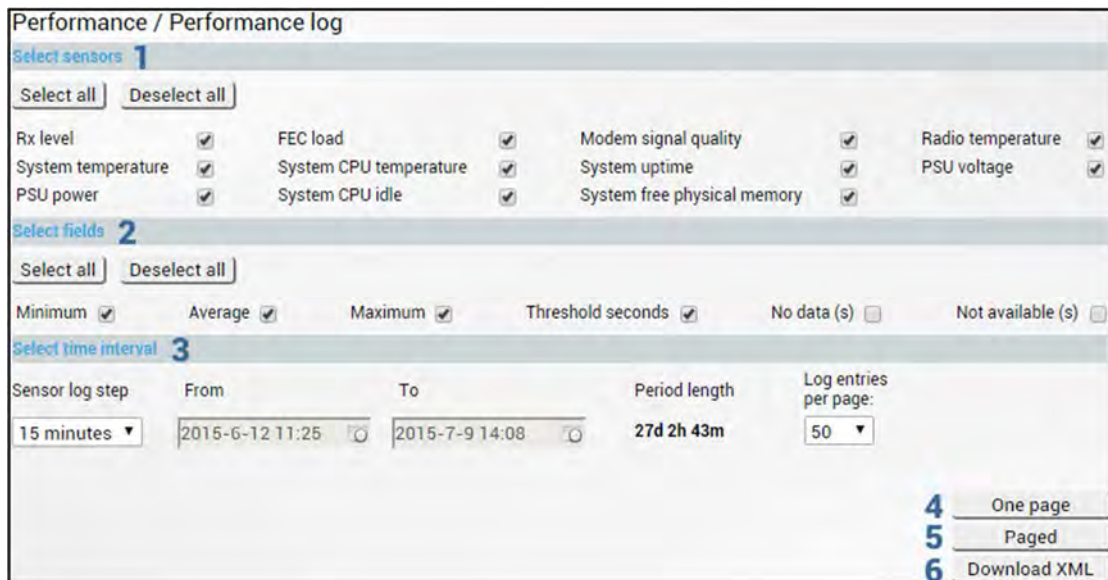


- 1) **Left axis sensor** – Allows choosing sensor parameter coloured in red and displayed on left axis.
- 2) **Right axis sensor** – Allows choosing sensor parameter coloured in blue and displayed on right axis.
- 3) **Sensor log step** – Allows choosing graph granularity – 1, 15 or 60 minutes.
- 4)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

Performance → Monitoring → Performance log



MODIFY button is deactivated in Performance log page.



- 1) **Select sensors** – Allows choosing sensor parameters to be displayed in performance log.
- 2) **Select fields** – Allows choosing parameter fields to be displayed in performance log. “Minimum” and “Maximum” represent minimum and maximum values in specified sensor log step, while “Average” displays average value; “Threshold seconds” will show amount of seconds in chosen time interval when parameter exceeded minimum or maximum alarm thresholds; “No data (s)” and “Not available (s)” show

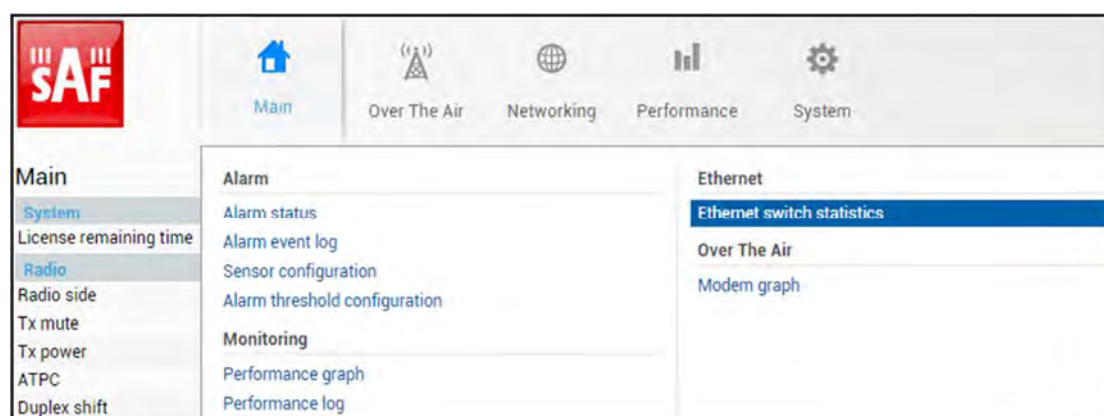
respectively time when there was no data of according parameter and it was not available.

- 3) **Select time interval** – Allows choosing graph granularity – 1, 15 or 60 minutes.
- 4) **One page** – Will display performance log on a single page in a separate tab.
- 5) **Paged** – Will display performance log divided in pages in a separate tab.
- 6) **Download XML** – Press to download performance log in a extensible markup language (.xml) file.

CLI commands ([System](#) → [Tools](#) → [Console](#))

log perf show <1M 15M 60M> last <1...1440>	Use to show specified number of last performance log entries with specified sensor log step.
log perf show <1M 15M 60M> time <time>	Use to show entries from a certain time point. Following formats are supported: YYYY-MM-DD/hh:mm:ss; MM-DD/hh:mm:ss; MM-DD/hh:mm; hh:mm:ss; hh:mm
log perf clear	Use to clear performance log.

Performance → Ethernet → Ethernet switch statistics



Status mode

Performance / Ethernet switch statistics			
		LAN	MNG
Statistics for	1	0d 00:30:04	0d 00:30:04
Rx Detected	2	8.59 G	7.07 k
Rx Dropped	3	4.29 G	0
Tx Detected	4	8.59 G	9.51 k
Tx Dropped	5	0	0
Rx Bytes	6	890.13 M	1.51 M
Tx Bytes	7	860.71 M	9.20 M
Rx 64 byte frames	8	0	N/A
Rx 65 - 127 byte frames	9	0	N/A
Rx 128 - 255 byte frames	10	0	N/A
Rx 256 - 511 byte frames	11	0	N/A
Rx 512 - 1023 byte frames	12	0	N/A
Rx 1024 - Max byte frames	13	0	N/A
Rx Undersize frames	14	0	N/A
Rx Oversize frames	15	612.85 k	N/A
Tx 64 byte frames	16	0	N/A
Tx 65 - 127 byte frames	17	0	N/A
Tx 128 - 255 byte frames	18	0	N/A
Tx 256 - 511 byte frames	19	0	N/A
Tx 512 - 1023 byte frames	20	0	N/A
Tx 1024 - Max byte frames	21	0	N/A
Tx Undersize frames	22	0	N/A
Tx Oversize frames	23	592.60 k	N/A
Rx Good frames	24	612.50 k	N/A
Rx Errors	25	N/A	0
Rx FIFO errors	26	N/A	0
Rx CRC errors	27	0	N/A
Rx Broadcast frames	28	0	N/A
Rx Multicast frames	29	0	0
Rx Control frames	30	0	N/A
Rx Length errors	31	0	N/A
Rx VLAN frames	32	0	N/A
Rx Pause frames	33	0	N/A
Rx Op errors	34	0	N/A
Rx Frame errors	35	N/A	0
Tx Good frames	36	592.60 k	N/A
Tx Errors	37	N/A	0
Tx FIFO err	38	N/A	0
Tx Broadcast frames	39	0	N/A
Tx Multicast frames	40	0	N/A
Tx Underrun errors	41	0	N/A
Tx Control frames	42	0	N/A
Tx VLAN frames	43	0	N/A
Tx Pause frames	44	0	N/A
Tx Single collisions	45	0	N/A
Tx Multi collisions	46	0	N/A
Tx Deferred	47	0	N/A
Tx Late collisions	48	0	N/A
Tx Excess collisions	49	0	N/A
Tx Excess deferral	50	0	N/A
Tx Alignment errors	51	0	N/A
Tx Carrier errors	52	N/A	0
Tx Collisions	53	N/A	0

Press  **MODIFY** button.

Modify mode (buttons appear at the bottom of the page)

Clear all data	Clear	Clear
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- 1) **Statistics for** – time during which statistics have been gathered;
- 2) **Rx detected** – The total number of packets detected on port's ingress;

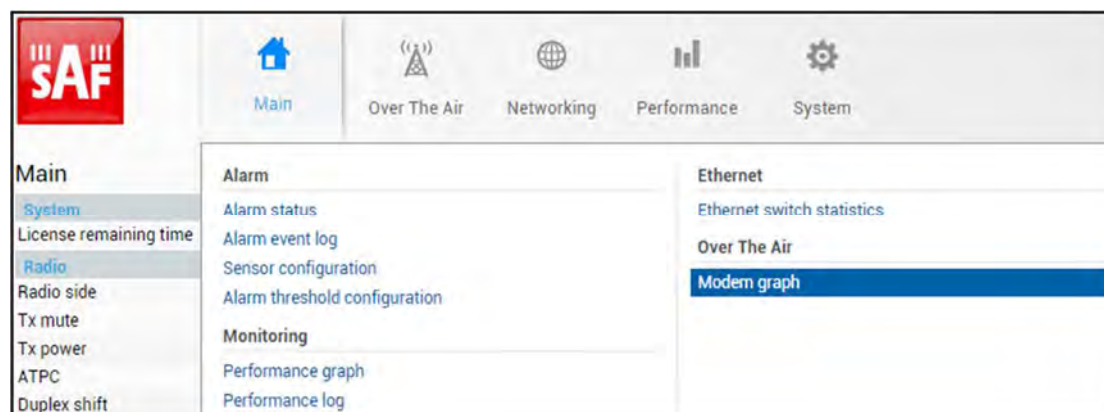
- 3) **Rx dropped** – The total number of packets dropped on port's ingress;
- 4) **Tx detected** – The total number of packets detected on port's egress;
- 5) **Tx dropped** – The total number of packets dropped on port's egress;
- 6) **Rx Bytes** – Bytes on port's ingress;
- 7) **Tx Bytes** – Bytes on port's egress;
- 8) **Rx 64 byte frames** – The total number of 64 byte frames on port's ingress;
- 9) **Rx 65 - 127 byte frames** – The total number of 65...127 byte frames on port's ingress;
- 10) **Rx 128 - 255 byte frames** – The total number of 128...255 byte frames on port's ingress;
- 11) **Rx 256 - 511 byte frames** – The total number of 256...511 byte frames on port's ingress;
- 12) **Rx 512 - 1023 byte frames** – The total number of 512...1023 byte frames on port's ingress;
- 13) **Rx 1024 - Max byte frames** – The total number of 1024...1522 byte frames on port's ingress;
- 14) **Rx Undersize frames** – The total number of packets received that were less than 64 octets long (excluding framing bits, but including FCS octets) and were otherwise well formed;
- 15) **Rx Oversize frames** – The total number of packets received that were longer than 1522 octets (excluding framing bits, but including FCS octets) and were otherwise well formed;
- 16) **Tx 64 byte frames** – The total number of 64 byte frames on port's egress;
- 17) **Tx 65 - 127 byte frames** – The total number of 65...127 byte frames on port's egress;
- 18) **Tx 128 - 255 byte frames** – The total number of 128...255 byte frames on port's egress;
- 19) **Tx 256 - 511 byte frames** – The total number of 256...511 byte frames on port's egress;
- 20) **Tx 512 - 1023 byte frames** – The total number of 512...1023 byte frames on port's egress;
- 21) **Tx 1024 - Max byte frames** – The total number of 1024...1522 byte frames on port's egress;
- 22) **Tx Undersize frames** – The total number of packets sent that were less than 64 octets long (excluding framing bits, but including FCS octets) and were otherwise well formed;
- 23) **Tx Oversize frames** – The total number of packets transmitted that were longer than 1522 octets (excluding framing bits, but including FCS octets) and were otherwise well formed;
- 24) **Rx Good frames** – The number of frames that have been received by this port from its segment excluding fragmented and FCS error frames;
- 25) **Rx Errors** – The number of fragmented and FCS error frames;
- 26) **Rx FIFO errors** – The number of frames out of the sequence received by this port;
- 27) **Rx CRC errors** – The number of frames with wrong CRC received by this port;
- 28) **Rx Broadcast frames** – The total number of good packets received that were directed to the broadcast address. Note that this does not include multicast packets;
- 29) **Rx Multicast frames** – The total number of good packets received that were directed to a multicast address. Note that this number does not include packets directed to the broadcast address;

- 30) **Rx Control frames** – The total number of frames received as control frames;
- 31) **Rx Length errors** – The total number of frames received with incorrect length field;
- 32) **Rx VLAN frames** – The total number of frames received containing at least one VLAN tag;
- 33) **Rx Pause frames** – The total number of frames received as control frames with valid PAUSE opcodes;
- 34) **Rx Op errors** – The total number of frames recognized as control frames but contained an Unknown Opcode;
- 35) **Rx Frame errors** – The total number of frames received with errors;;
- 36) **Tx Good frames** – The number of frames that have been transmitted by this port from its segment excluding fragmented and FCS error frames;
- 37) **Tx Errors** – The number of fragmented and FCS error frames;
- 38) **Tx FIFO err** – The number of frames out of the sequence transmitted by this port;
- 39) **Tx Broadcast frames** – The total number of good packets transmitted that were directed to the broadcast address. Note that this does not include multicast packets;
- 40) **Tx Multicast frames** – The total number of good packets transmitted that were directed to a multicast address. Note that this number does not include packets directed to the broadcast address;
- 41) **Tx Underrun errors** – The number of packets transmitted that are less than the allowed 64 octets minimum length. Underrun packets occur due to jam signals generated by collisions, backpressure etc.;
- 42) **Tx Control frames** – The total number of frames transmitted as control frames;
- 43) **Tx VLAN frames** – The total number of frames transmitted containing at least one VLAN tag;
- 44) **Tx Pause frames** – The total number of frames transmitted as control frames with valid PAUSE opcodes;
- 45) **Tx Single collisions** – The total number of packets successfully transmitted by this port that experienced exactly one collision;
- 46) **Tx Multi collisions** – The total number of frames successfully transmitted by this port that experienced more than one collision;
- 47) **Tx Deferred** – The total number of frames transmitted by a this port for which the first transmission attempt was delayed because the medium was busy;
- 48) **Tx Late collisions** – The total number of times that a collision was detected later than 512 bit-times into the transmission of a frame;
- 49) **Tx Excess collisions** – The total number of frames that were not transmitted from this port because 16 unsuccessful attempts were made to transmit the frame;
- 50) **Tx Excess deferral** – The total number of frames that deferred transmission for an excessive period of time;
- 51) **Tx Alignment errors** – Asserted for received frames of size 64-bytes and greater which contained an odd number of received nibbles and which also contained an invalid FCS field;
- 52) **Tx Carrier errors** – A Number of frames transmitted in which the carrier signal was lost or in which the carrier signal was not present;
- 53) **Tx Collisions** – The total number of collisions experienced by this port during packet transmissions.

CLI commands ([System](#) → [Tools](#) → [Console](#))

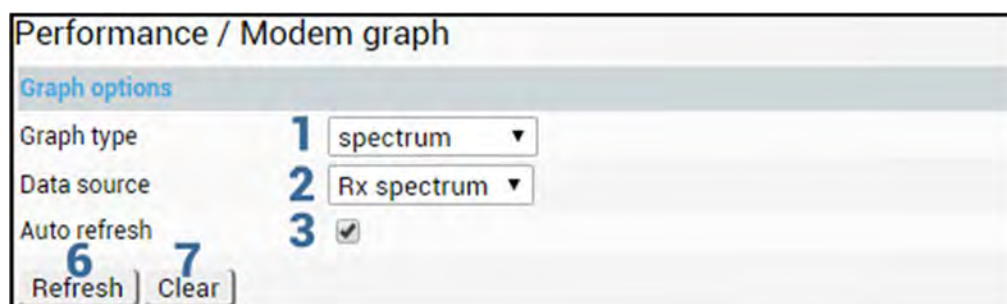
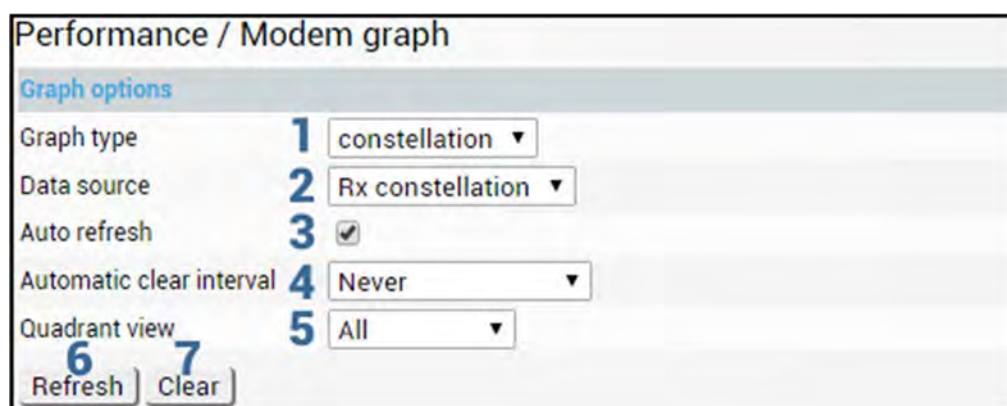
network port show statistics	Use to show Ethernet statistics on all ports.
network port reset statistics <LAN1 LAN2 LAN3 MNG WAN all>	Use to reset Ethernet statistics for a particular port or all ports.

Performance → Over The Air → Modem graph



MODIFY button is deactivated in Modem graph page.

Modem graph can be activated in two modes – “constellation diagram” and “spectrum”.



- 1) **Graph type** – Allows choosing between “constellation” and “spectrum” graph types;
- 2) **Data source** – Indicates source of the signal;
- 3) **Auto refresh** – Allows disabling auto refresh of constellation/spectrum;
- 4) **Automatic clear interval** – Allows choosing how often is constellation automatically cleared;
- 5) **Quadrant view** – Allows zooming constellation diagram to specific quadrant or part of the quadrant;

- 6) **Refresh** – Allows refreshing constellation diagram/spectrum;
- 7) **Clear** – Allows clearing constellation diagram/spectrum.

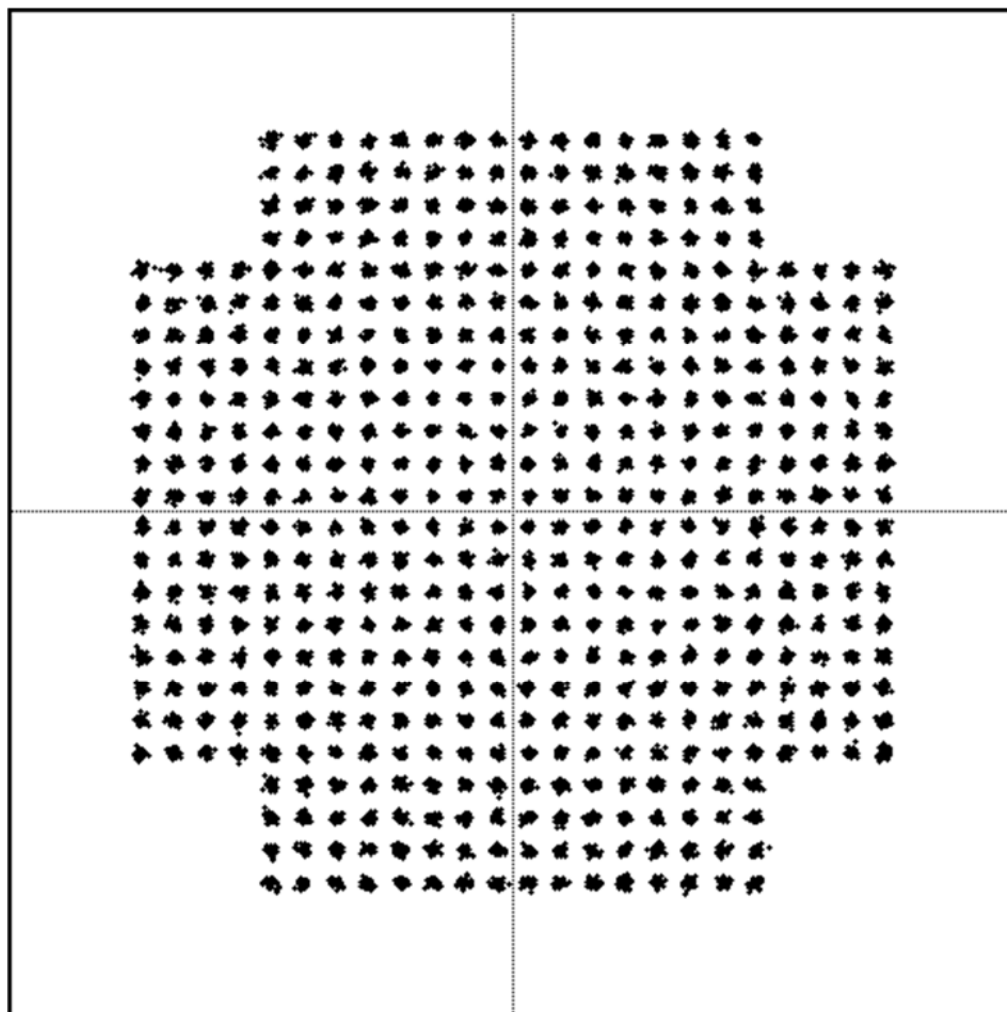


Only a single user can see Constellation diagram and Spectrum curve at a time.

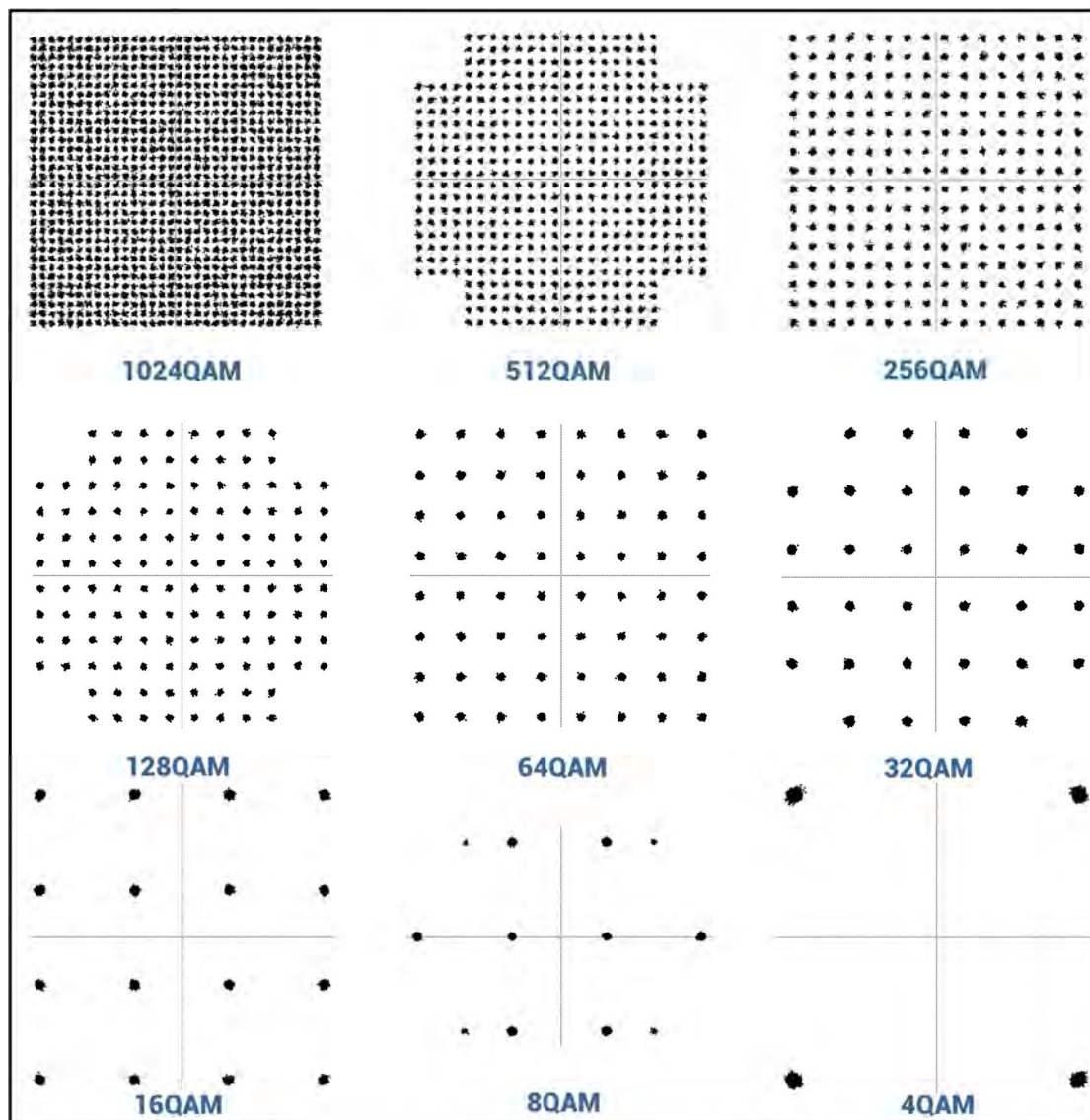
Constellation diagram

A constellation diagram is a representation of a signal modulated by the digital modulation schemes 1024QAM, 512QAM, 256QAM, 128QAM, 64QAM, 32QAM, 16QAM, 8QAM or 4QAM. It displays the signal as a two-dimensional scatter diagram in the complex plane at symbol sampling instants. Measured constellation diagram can be used to recognize the type of interference and distortion in a signal.

Constellation diagram (512QAM):

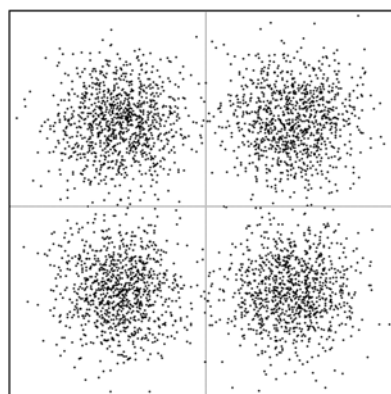


Examples of Integra-W/Integra-WS constellation diagrams under ideal conditions are shown below:

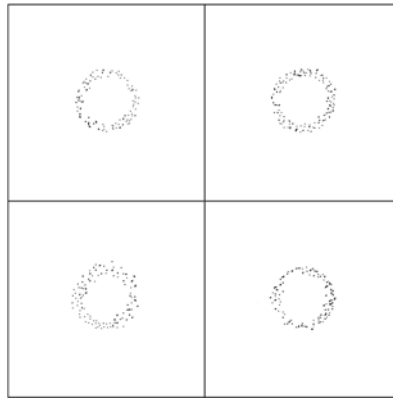


For the purpose of analysing the received signal quality, some types of corruption are evident in the constellation diagram. For example:

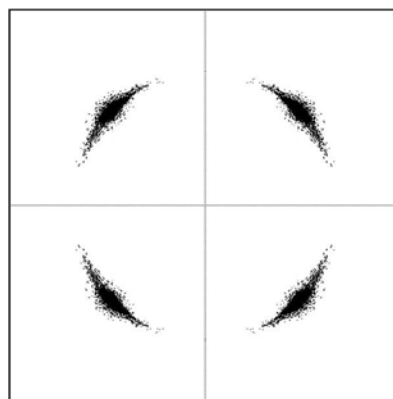
- 1) Gaussian noise is displayed as fuzzy constellation points:



- 2) Non-coherent single frequency interference is displayed as circular constellation points:



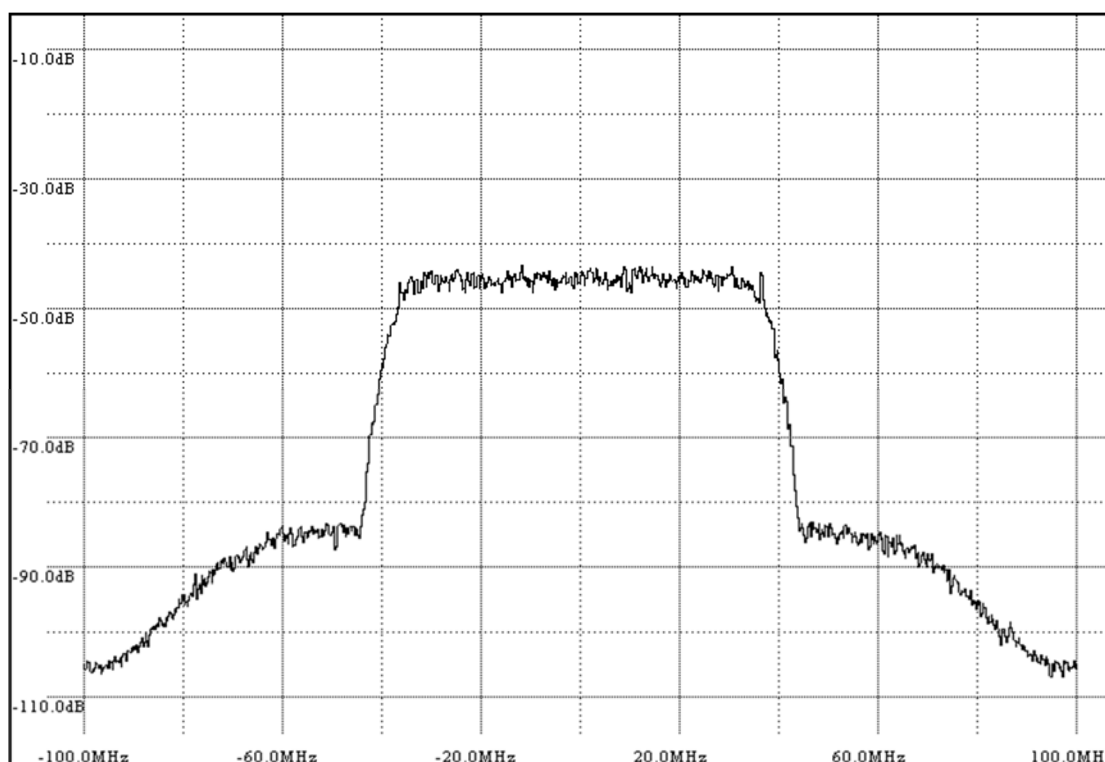
3) Phase noise is displayed as rotationally spreading constellation points:



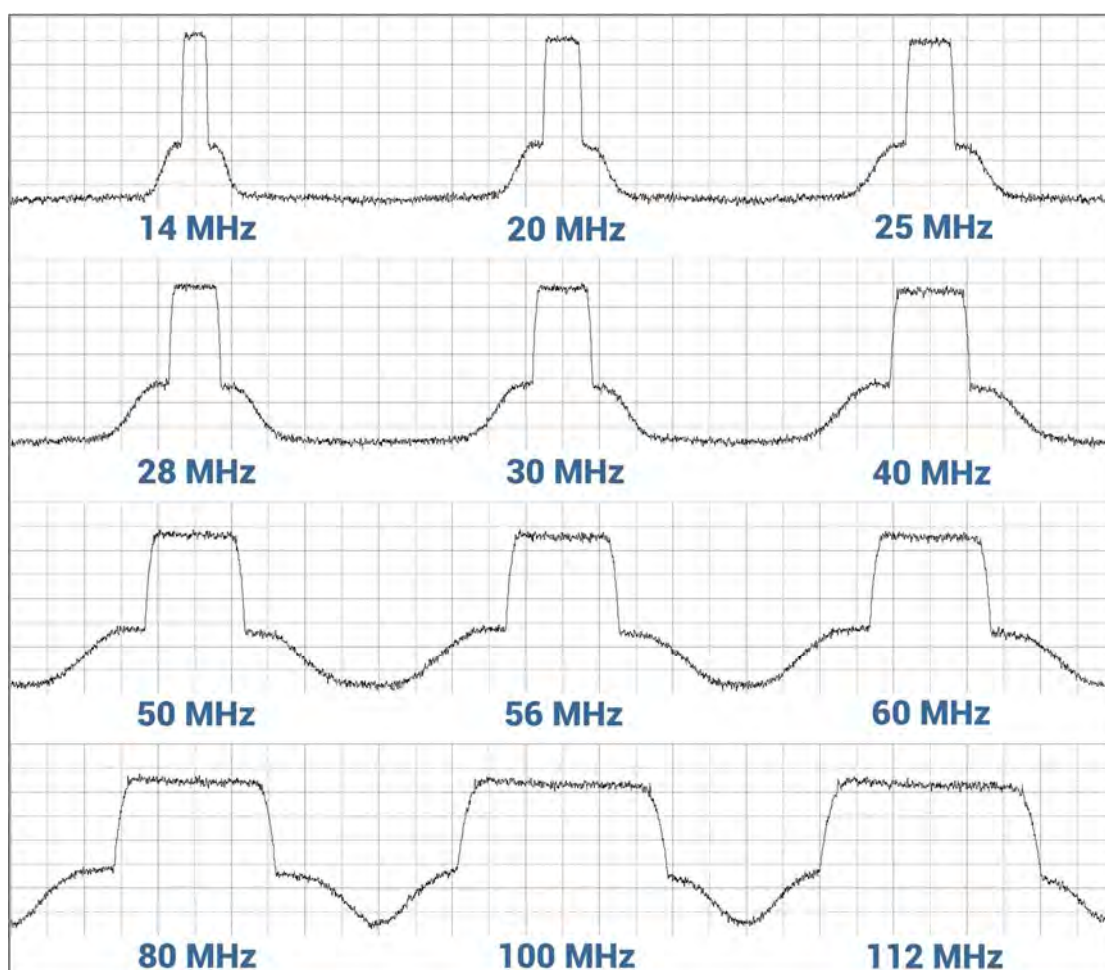
Spectrum

A spectrum curve is a representation received signal on the input of the modem. For this reason spectrum signal levels will not correspond to actual radio receiver's signal level. Signal appearance will depend on configured channel bandwidth. Measured spectrum curve can be used to recognize in-band interference or very powerful out-band interference (due to filters applied).

Spectrum (80MHz):

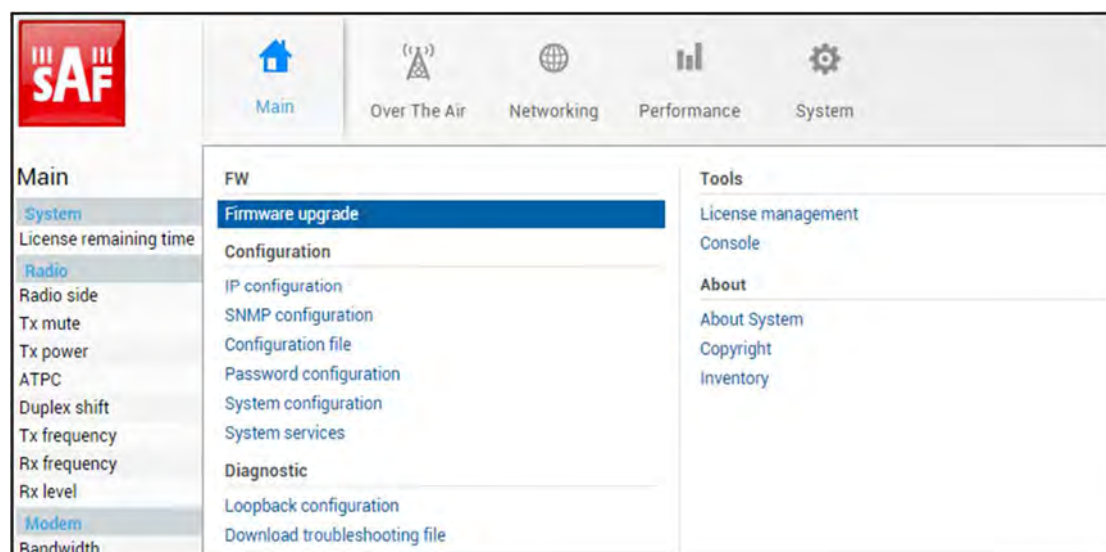


Examples of Integra-W/Integra-WS spectrum curves in various channel bandwidths:




System

System → FW → Firmware upgrade

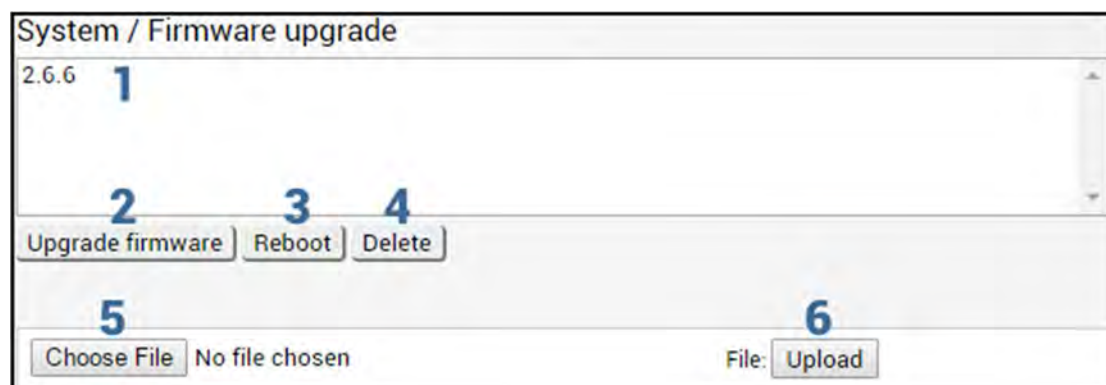


Status mode



Press  **MODIFY** button.

Modify mode



- 1) Shows list of available firmware files;
- 2) **Upgrade firmware** – click on preferred firmware in the list and press “Upgrade firmware” button to initiate firmware upgrade process.



Latest Integra-W/Integra-WS firmware can be downloaded in <https://saftehnika.com/en/downloads> in “Firmwares” section. Login required.

- 3) **Reboot** – Reboots management CPU.
- 4) **Delete** – Deletes selected firmware file from the list.
- 5) **Choose File** – Press to browse for a firmware file on your hard disk drive.
- 6) **Upload** – Press to upload a firmware file to Integra-W/Integra-WS.

CLI commands ([System](#) → [Tools](#) → [Console](#))

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

Integra series firmware upgrade via Web GUI

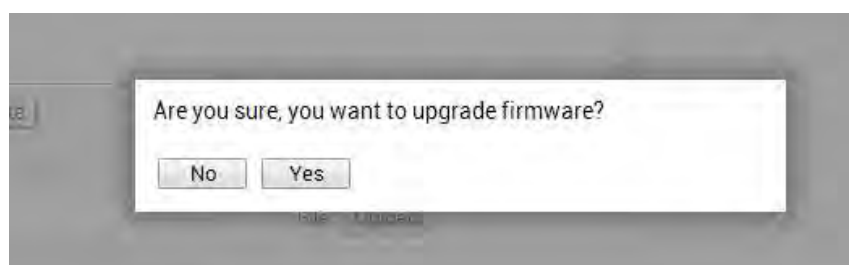
Firmware update package contains firmware file (.bin extension), release notes and firmware upgrade instructions.

Latest Integra firmware update package can be downloaded in the following URL:

<https://www.saftehnika.com/en/downloads> (registration required)

Main method for firmware upgrade is upload via Web GUI, which automates the whole firmware upgrade process. To perform software upgrade from Web GUI, please follow these steps:

- 1) Go to "System → FW → Firmware upgrade";
- 2) Press "MODIFY" button on right side of the page;
- 3) Press "Choose File" button, locate *.bin firmware file on your hard disk (extracted from the firmware update package) and press "Open" button;
- 4) Press "Upload" button;
- 5) Select uploaded firmware from firmware list and press "Upgrade firmware" button;
- 6) Confirm the upgrade and reboot the system.



Remote side should be upgraded first.

Please do not unplug power until firmware upgrade procedure is finished - Web GUI will automatically reconnect and login page will appear.

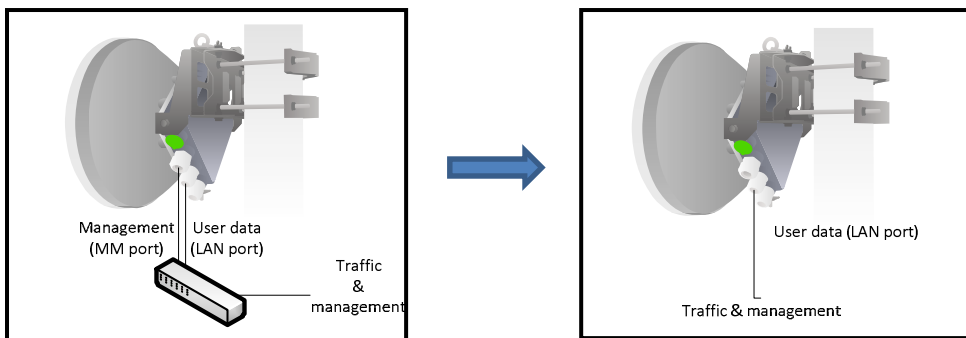
Transition between out-band management and in-band management firmware versions

In-band management firmware version: management is available both on dedicated management (MM) port and on data (LAN) ports. User traffic is available only on data (LAN) ports.

Out-band management firmware version: management is available only on dedicated management (MM) port. User traffic is available only on one of data (LAN) ports. By default – LAN (TP) is enabled, while LAN (SFP) is disabled.

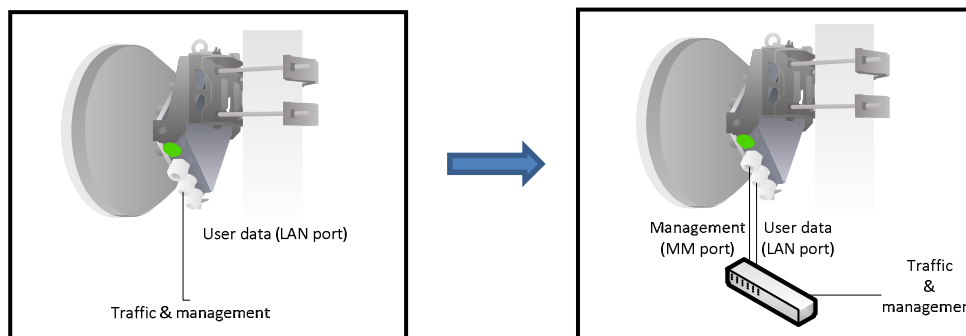
Upgrading from out-band management to in-band management firmware version

- Follow instructions in section [Integra series firmware upgrade via Web GUI](#).
- A single Ethernet cable should be interconnected between Integra LAN port and CPE in order to avoid Ethernet loops



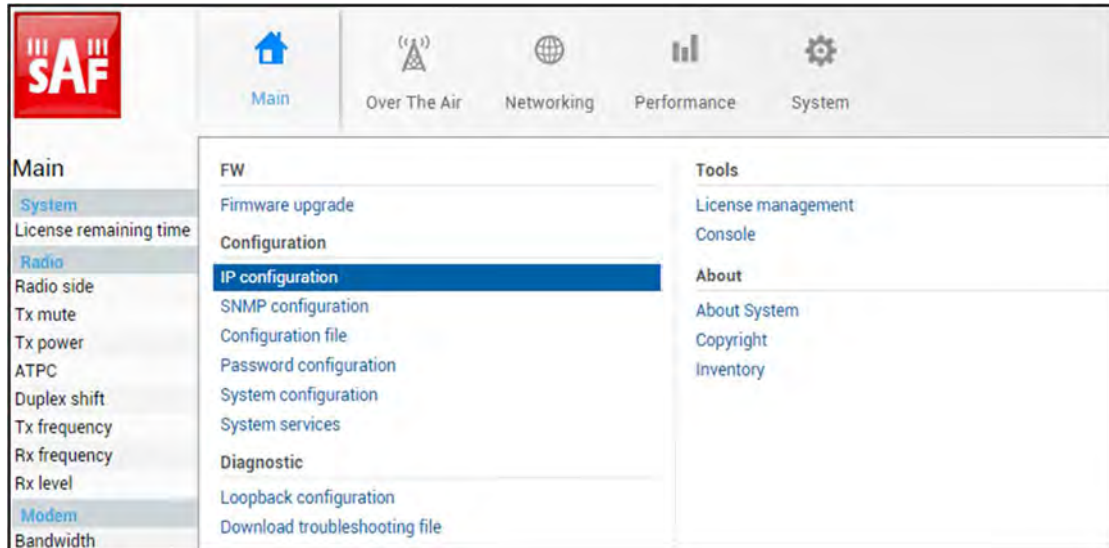
Upgrading from in-band management to out-band management firmware version

- Follow instructions in section [Integra series firmware upgrade via Web GUI](#).
- Management will be available only on dedicated management (MM) port, thus in order to maintain management access after firmware upgrade, management (MM) port should be interconnected with CPE on one side of the link if management traffic is transmitted over the link (default setting). If management traffic is not transmitted over the link, management (MM) port should be interconnected with CPE on both sides of the link.



configuration → System → Configuration → IP configuration

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



Status mode

System / IP configuration		
IP address	1 192.168.205.11	
IP mask	2 255.255.255.0	
IP gateway	3 192.168.205.1	
Ethernet MAC address	4 00:04:a6:81:31:22	
Remote IP address	5 192.168.205.10	✓ Auto

Press  **MODIFY** button.

Modify mode

System / IP configuration		
IP address	1 <input type="text" value="192.168.205.11"/>	
IP mask	2 <input type="text" value="255.255.255.0"/>	
IP gateway	3 <input type="text" value="192.168.205.1"/>	
Ethernet MAC address	4 <input type="text" value="00:04:a6:81:31:22"/>	
Remote IP address	5 <input type="text" value="192.168.205.10"/>	<input checked="" type="checkbox"/> Auto
		6 <input type="button" value="Execute configuration"/>

- 1) **IP address** – Indicates IP address of Integra-W/Integra-WS you are currently logged in (status mode); allows specifying IP address of Integra-W/Integra-WS you are currently logged in (modify mode). Default IP address is 192.168.205.10 or 192.168.205.11 – depending on which side the specific Integra-W/Integra-WS is – low side has 192.168.205.10 IP address and high side – 192.168.205.11.



Integra-W/Integra-WS IP addresses need to be in the same subnet.

- 2) **IP Mask** – Indicates IP mask of Integra-W/Integra-WS you are currently logged in (status mode); allows specifying IP mask of Integra-W/Integra-WS you are currently logged in (modify mode). Default IP mask is 255.255.255.0.
- 3) **IP gateway** – Indicates gateway address of Integra-W/Integra-WS you are currently logged in (status mode); allows specifying gateway address of Integra-W/Integra-WS you are currently logged in (modify mode). By default gateway is not specified (blank).
- 4) **Ethernet MAC address** – shows the MAC address of Integra-W/Integra-WS you are currently connected to.
- 5) **Remote IP address** – shows IP address of remote (far-end) Integra-W/Integra-WS. By default remote IP address is being retrieved automatically and therefore "Auto"

checkbox is selected. In modify mode you can unselect "auto" option and enter remote IP address manually.

- 6) By pressing „Execute configuration" changes made to the corresponding section apply only for the local side Integra-W/Integra-WS.

CLI commands ([System](#) → [Tools](#) → [Console](#))

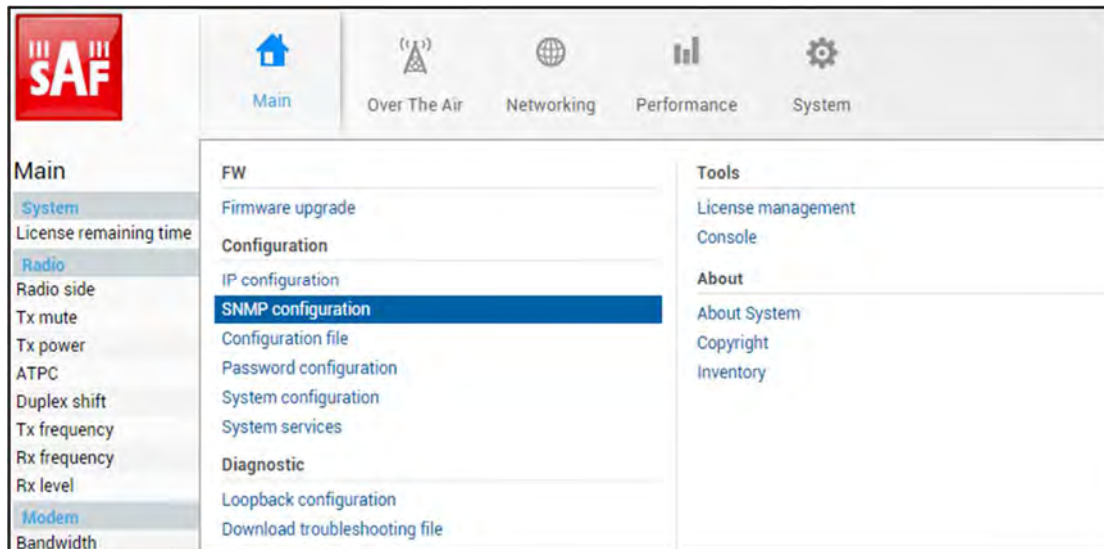
system ip addr <IP>	Use to set IP address of management CPU.
system ip gw <IP>	Use to set IP address of gateway.
system ip mask <mask>	Use to set subnet mask.
system ip mac	Use to show MAC address of management CPU.
system ip cfg <ip address> <mask> or <ip address> <mask> <gateway> or <ip address/CIDR> or <ip address/CIDR> <gateway>	Use to set IP address and sub or optionally IP address, subnet mask and gateway simultaneously.
system remoteip show	Use to show remote IP address.
system remoteip auto	Use to set automatic retrieving of remote IP address.
system remoteip set <IP>	Use to define remote IP address.
system diag ping <IP_address>	Use to ping an IP address.

System → Configuration → SNMP configuration

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



Relevant MIB files can be downloaded directly from Web GUI. See (7) below.



Status mode

System / SNMP configuration

SNMP v1 setup	SNMP v2c setup	1
Read community		2 saf-public
Write community		3 saf-private
Trap community		4 saf-traps
List of SNMP managers		5
List of trap V1 managers		6
Download MIB file		7

Press  **MODIFY** button.

Modify mode

System / SNMP configuration

SNMP v1 setup	SNMP v2c setup	1
Read community		2 saf-public
Write community		3 saf-private
Trap community		4 saf-traps
List of SNMP managers		5
List of trap V1 managers		6
Download MIB file		7
		8 Execute configuration

- 1) **SNMP v1 setup / SNMP v2c setup** – Allows switching between status/configuration of SNMP v1 and v2c.
- 2) **Read community** – Indicates currently specified read community for SNMP v1 or v2c (status mode); allows specifying read community for SNMP v1 or v2c of the agent to enable parameters to be read (modify mode). Default read community name is "saf-public".
- 3) **Write community** – Indicates currently specified write community for SNMP v1 or v2c (status mode); allows specifying write community for SNMP v1 or v2c of the agent to enable parameters to be written (modify mode). Default write community name is "saf-private".
- 4) **Trap community** – Indicates currently specified trap community for SNMP v1 or v2c (status mode); allows specifying trap community for SNMP v1 or v2c for trap authentication in monitoring applications (modify mode). Default trap community name is "saf-traps".
- 5) **List of SNMP managers** – Shows list of configured SNMP host IP addresses (status mode); allows adding/deleting SNMP host IP addresses (modify mode). Specified IP

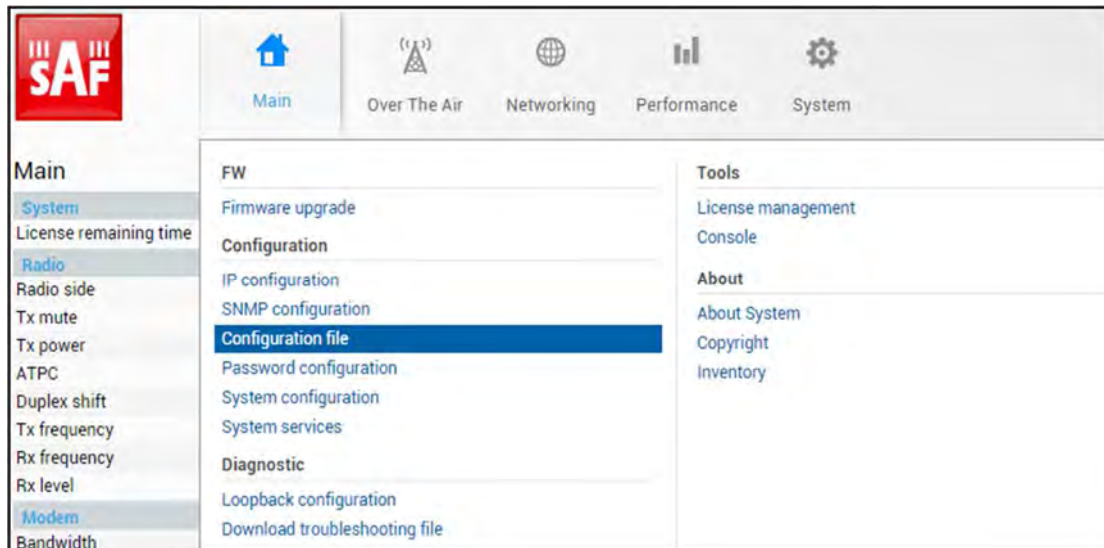
addresses have access to read and modify configuration parameters using appropriate read and write community names.

- 6) **List of trap v1/v2c managers** – Shows list of configured SNMP trap IP addresses (status mode); allows adding/deleting SNMP trap IP addresses (modify mode). The Integra-W/Integra-WS management controller sends SNMP traps to the Trap Manager with IP address specified here.
- 7) **Download MIB file** – Click to download Integra-W/Integra-WS MIB files.
- 8) By pressing „Execute configuration” changes made to the corresponding section apply only for the local side Integra-W/Integra-WS. If „Rollback on” is selected, configuration will be reverted in case erroneous configuration changes are applied.

CLI commands ([System](#) → [Tools](#) → [Console](#))

snmp manager [add del <IP>]	Use to check, add or delete IP addresses of SNMP v1/v2c managers.
snmp manager read-community [set del <name>]	Use to check, set or delete name of SNMP v1/v2c read community.
snmp manager write-community [set del <name>]	Use to check, set or delete name of SNMP v1/v2c write community.
snmp traps trap-community [set del <name>]	Use to check, set or delete name of SNMP v1/v2c trap community.
snmp traps trapv1manager [set del <IP>]	Use to check, set or delete IP addresses of SNMP v1 trap managers.
snmp traps trapv2manager [set del <IP>]	Use to check, set or delete IP addresses of SNMP v2c trap managers.
snmp showconfig active	Use to check currently active SNMP configuration.
snmp showconfig stored	Use to check saved SNMP configuration.

System → Configuration → Configuration file



Status mode

System / Configuration file

Download / Upload cfg file

Download configuration file

Upload configuration file


Advanced cfg file features

Restore uploaded configuration file

Load factory configuration file

Compare saved / running configurations

Saved configuration 6	Running configuration 7
<pre>{ evlogd: {}, snmpd: {}, perfd: {}, sysd: {}, modem: { version: "1", name: "80_MHz", profiles: "0x01FF", }, modulations: [], }, network: {}, radio: {} }</pre>	<pre>{ evlogd: {}, snmpd: {}, perfd: {}, sysd: {}, modem: { version: "1", name: "112_MHz", profiles: "0x01FF", }, modulations: [], }, network: {}, radio: {} }</pre>

Press  **MODIFY** button.

Modify mode

System / Configuration file

Download / Upload cfg file

Download configuration file **1**

Upload configuration file **2** No file chosen **3**

Advanced cfg file features

Restore uploaded configuration file **4**

Load factory configuration file **5**

Compare saved / running configurations

Saved configuration 6	Running configuration 7
<pre>{ evlogd: {}, snmpd: {}, perfd: {}, sysd: {}, modem: { version: "1", name: "80_MHz", profiles: "0x01FF", }, modulations: [], }, network: {}, radio: {} }</pre>	<pre>{ evlogd: {}, snmpd: {}, perfd: {}, sysd: {}, modem: { version: "1", name: "112_MHz", profiles: "0x01FF", }, modulations: [], }, network: {}, radio: {} }</pre>

- 1) **Download configuration file** – Press to download system configuration txt file and saving it on your hard drive.
- 2) **Choose File** – Press to browse for a saved configuration file on your hard disk drive.
- 3) **Upload** – Press to upload a configuration file to Integra-W/Integra-WS.



Uploaded configuration overwrites saved configuration.

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



Restoring configuration overwrites running configuration with saved configuration.

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

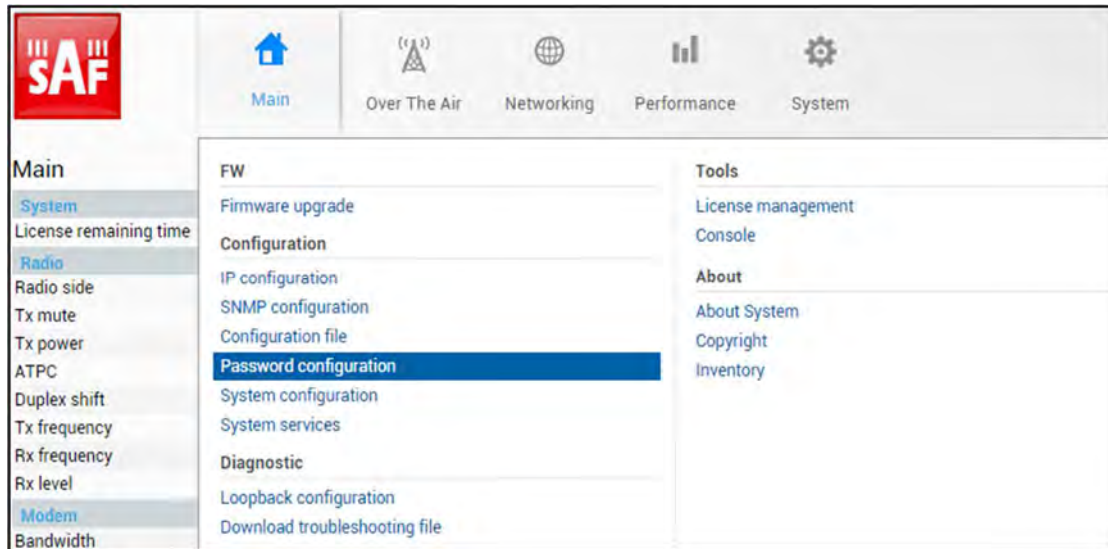


Distinct sections in saved and running configurations are highlighted with orange colour. In order to examine particular differences expand highlighted sections of configuration by clicking on down arrow of appropriate configuration section.

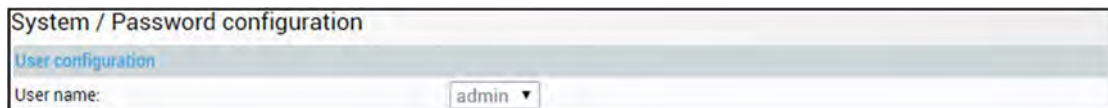
CLI commands ([System](#) → [Tools](#) → [Console](#))

configuration factory	Use to reset system configuration to factory defaults.
configuration factory aggr	Use to reset aggregation configuration to factory defaults.
configuration factory modem	Use to reset modem configuration to factory defaults.
configuration factory netsys {mac-table port-state qos rate vlan}	Use to reset whole Ethernet configuration to factory defaults or particular sections using subcommands – “mac-table” for MAC table; “port-state” for port state configuration; “qos” for QoS configuration; “rate” for rate limit configuration; “vlan” for VLAN configuration.
configuration factory sync_e	Use to reset SyncE configuration to factory defaults.
configuration factory sysd	Use to reset whole system configuration to factory defaults.
configuration load	Use to load uploaded system configuration. If no configuration was uploaded via Web GUI, command will restore saved configuration, thus discarding unsaved changes.
configuration status	Use to check whether running configuration is saved.
configuration store	Use to save running configuration.

System → Configuration → Password configuration

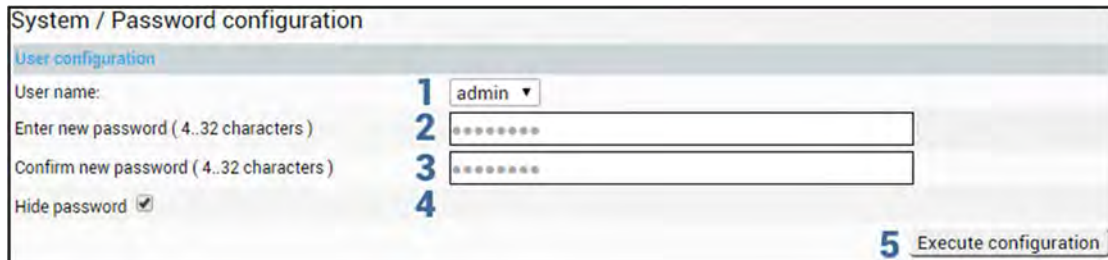


Status mode



Press  **MODIFY** button.

Modify mode



- 1) **User name** – Choose between "admin" and "guest" user accounts. "guest" user has monitoring privileges and cannot apply configuration changes.



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

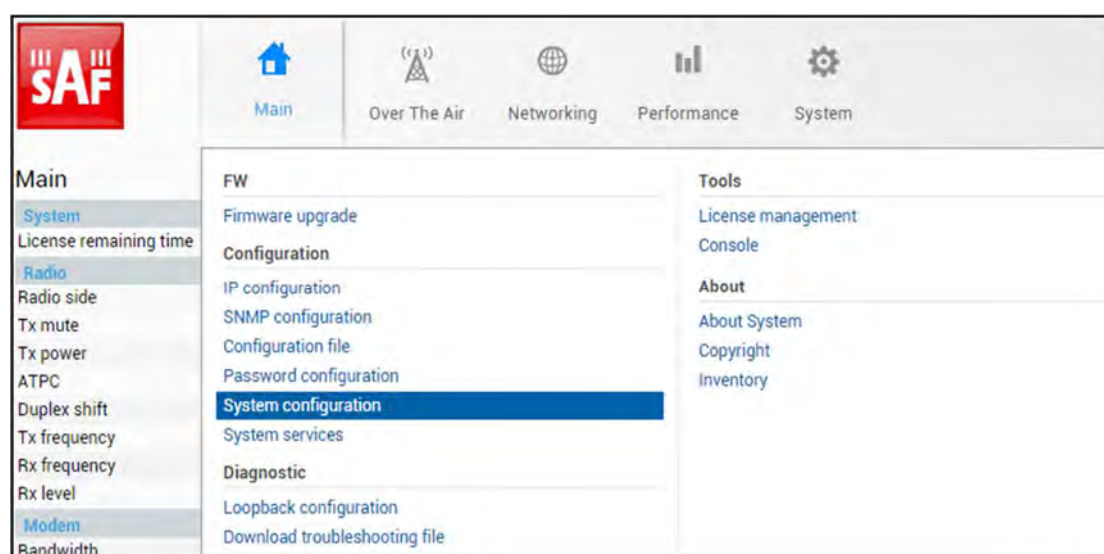
- 2) **Enter new password** – Enter new password.
- 3) **Confirm new password** – Confirm new password.
- 4) **Hide password** – Uncheck to display entered password in plaintext.
- 5) By pressing „Execute configuration" changes made to the corresponding section apply only for the local side Integra-W/Integra-WS. If „Rollback on" is selected, configuration will be reverted in case erroneous configuration changes are applied.

CLI commands ([System](#) → [Tools](#) → [Console](#))

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

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

System → Configuration → System configuration



Status mode


System / System configuration

[System configuration](#)

System name (<= 16 characters)	1	SAF
Location name (<= 16 characters)	2	
Timezone	3	GMT+02:00
Time (YY-MM-DD hh:mm:ss)	4	2014-12-01 13:01:06

[NTP setup](#)

NTP client	6	<input checked="" type="checkbox"/> Enable
List of NTP servers	7	192.168.205.111

Press  **MODIFY** button.

Modify mode

System / System configuration

System configuration

System name (<= 16 characters) **1** SAF

Location name (<= 16 characters) **2**

Timezone **3** GMT+02:00

Time (YY-MM-DD hh:mm:ss) **4** 2014-12-01 13:01:06

5 Set local machine time

NTP setup

NTP client **6** ☒ Enable

List of NTP servers **7** 192.168.205.111

Add Delete

Obtain time from NTP server **8**

9 Execute configuration

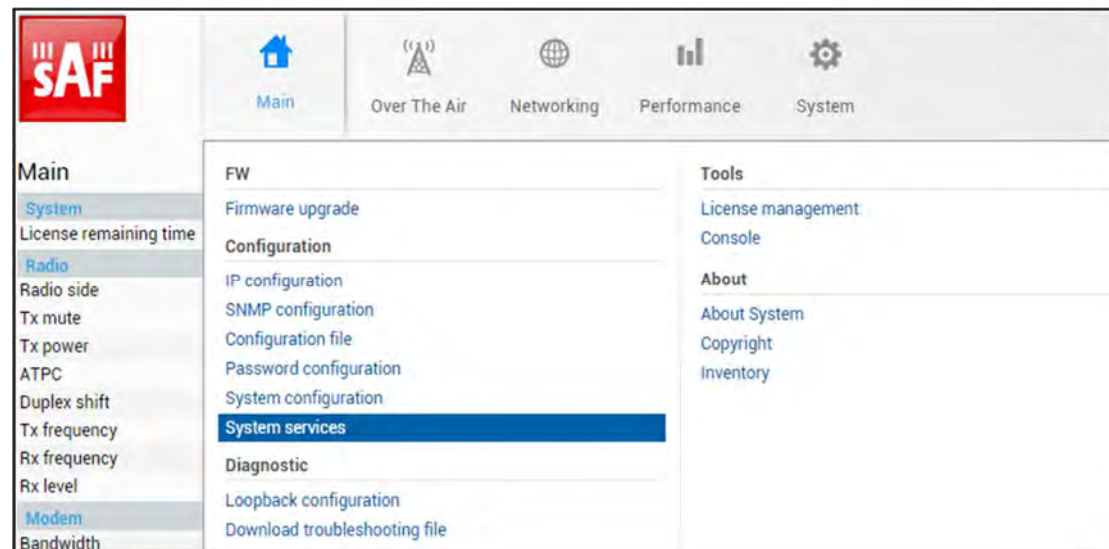
- 1) **System name** – Allows entering preferable system name. Maximum length of the system name cannot exceed 16 symbols. Default name is 'SAF'.
- 2) **Location name** – Allows entering preferable system location name. Maximum length of the location name cannot exceed 16 symbols. By default system location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

CLI commands ([System](#) → [Tools](#) → [Console](#))

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


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

System → Configuration → System services



Status mode

System / System services		
WEB service port configuration		
HTTP	1	Enabled
HTTP port	2	80
HTTPS	3	Enabled
HTTPS port	4	443
Redirect HTTP to HTTPS	5	Disabled
RADIUS server configuration		
RADIUS	6	Enabled
RADIUS port	7	1812
RADIUS server IP address	8	192.168.205.222

Press  **MODIFY** button.

Modify mode

System / System services

WEB service port configuration

1 ☒ Enable

2

3 ☒ Enable

4

5 ☐ Enable

RADIUS server configuration

6 ☒ Enable

7

8

9

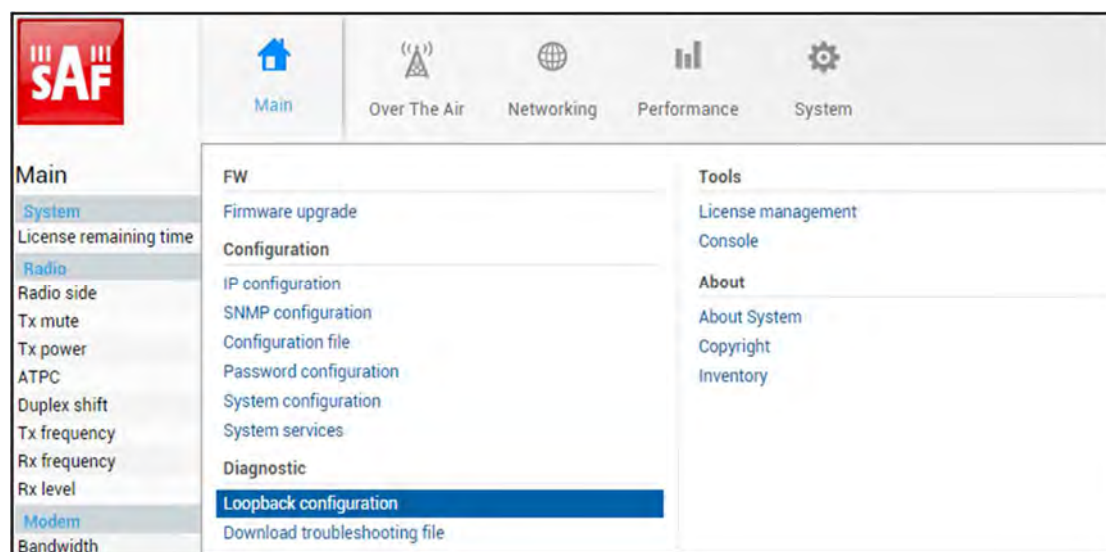
10

11 ☒ Hide password

12 Execute configuration

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

System → Diagnostic → Loopback configuration



Status mode



Press  **MODIFY** button.

Modify mode



- 1) **Modem loopback** – Indicates whether modem loopback is active (status mode); Allows enabling modem loopback by changing status to “On” and specifying loopback duration time (modify mode). During modem loopback signal is looped back to local end after the modem and Integra-W/Integra-WS should be able to synchronize to itself. Both Radial MSE and LDPC stress should not generate an alarm (values should not be coloured in red). When loopback is activated, “Loopback duration time” countdown timer will appear.
- 2) By pressing „Execute configuration” changes made to the corresponding section apply only for the local side Integra-W/Integra-WS.

Below is an example of Main status page during modem loopback:

Main		
System	Local	Remote
License remaining time	20 days 22:41:24	N/D
Radio	Local	Remote
Radio side	High	N/D
Tx mute	Disabled	N/D
Tx power	17 dBm	N/D
ATPC	Disabled	N/D
Duplex shift	1560 MHz	N/D
Tx frequency	19600 MHz	N/D
Rx frequency	18040 MHz	N/D
Rx level	-54 dBm	N/D
Modem	Local	Remote
Bandwidth	80 MHz FCC	N/D
Modem profile	1024QAM ACM	N/D
Modem loopback	Enabled, digital	N/D
ACM engine	Enabled	N/D
Acquire status	Locked	N/D
Signal quality	100 %	N/D
FEC load	0 %	N/D
Current Rx modulation	1024QAM	N/D
Current Tx modulation	1024QAM	N/D
Current Rx Ethernet capacity	643.1 Mbps	N/D
Current Tx Ethernet capacity	643.1 Mbps	N/D
Ethernet		
Port	LAN (Electrical)	MNG (Electrical)
State	Enabled	Enabled
Status	Down	Up



While modem loopback is active "Modem loopback: Enabled, digital" indication will be shown on Main status page.

CLI commands ([System](#) → [Tools](#) → [Console](#))

modem loopback digital <10..1000000>	Use to enable modem loopback for specified time in seconds.
modem loopback digital none	Use to disable modem loopback.

System → Diagnostic → Download troubleshooting file

[Main](#)
[Over The Air](#)
[Networking](#)
[Performance](#)
[System](#)

Main

- System
- License remaining time
- Radio
- Radio side
- Tx mute
- Tx power
- ATPC
- Duplex shift
- Tx frequency
- Rx frequency
- Rx level
- Modem
- Bandwidth

FW

- Firmware upgrade
- Configuration
- IP configuration
- SNMP configuration
- Configuration file
- Password configuration
- System configuration
- System services
- Diagnostic
- Loopback configuration
- Download troubleshooting file**

Tools

- License management
- Console
- About
- About System
- Copyright
- Inventory

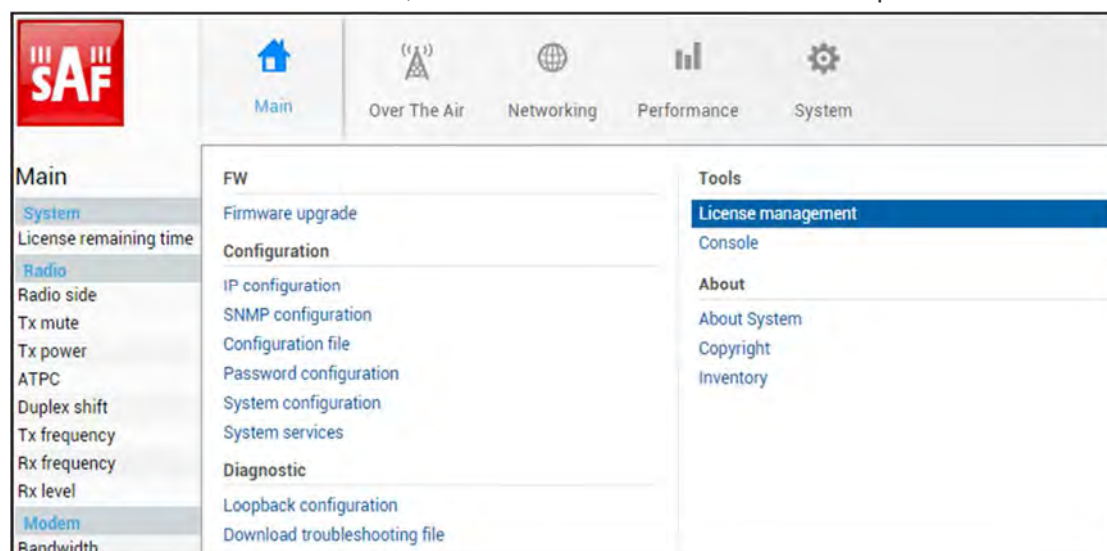
Clicking on the link will download troubleshooting file archive package to your hard disk drive ("Downloads" folder of your browser).

Contents:

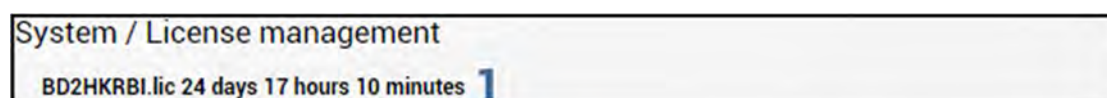
config.txt	Saved system configuration file
devel.tar	For debugging only
Ethernet.switch.html	Ethernet configuration
eventlog.txt	Alarm-event log file
Firmwares.html	Information on currently running firmware and stored firmware files.
Licenses.html	Information on currently active license and added license files
Modem.html	Information on modem including modem status and configuration, counters, list of allowed modem profiles, header compression
NetworkStatistic.html	Ethernet counters of LAN, WAN and MNG ports
Perflog.xml	Performance log with maximum 1440 entries for 1, 15 and 60 minute intervals
Performance.html	Information on alarm status, alarm threshold and sensor configurations
Radio.html	Information on radio status, configuration and counters
SNMP.html	Information on SNMP v1/v2c configuration
System.html	Information on system configuration including Web services, RADIUS, IP address, user, NTP configuration and inventory info

System → Tools → License management

Provides list of available licenses, time left for each license and license upload controls.

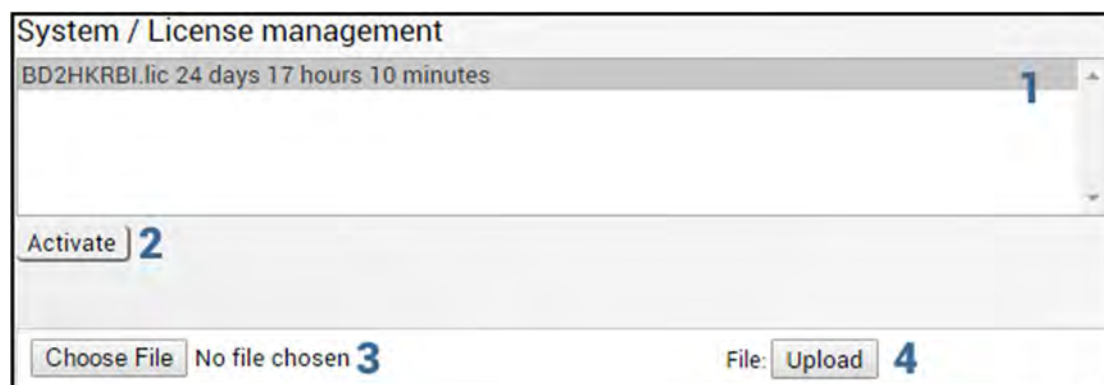


Status mode



Press  **MODIFY** button.

Modify mode



- 1) Shows list of available licenses and remaining time.
- 2) **Activate** – Select license from the list and press “Activate” to switch to preferable license.
- 3) **Choose file** – Press to browse for a license file (*.lic) on your hard disk drive.
- 4) **Upload** – Press to upload a license file (*.lic) to Integra-W/Integra-WS.

If new license supports previously running modem configuration, no changes will be applied.
If previously modem was configured to modem configuration, which is not supported by new license key, modem will be reconfigured to the maximal allowed configuration in chosen channel bandwidth.



When license expires modulation will drop to “4QAM Limited” and link capacity will drop to 256Kbps.

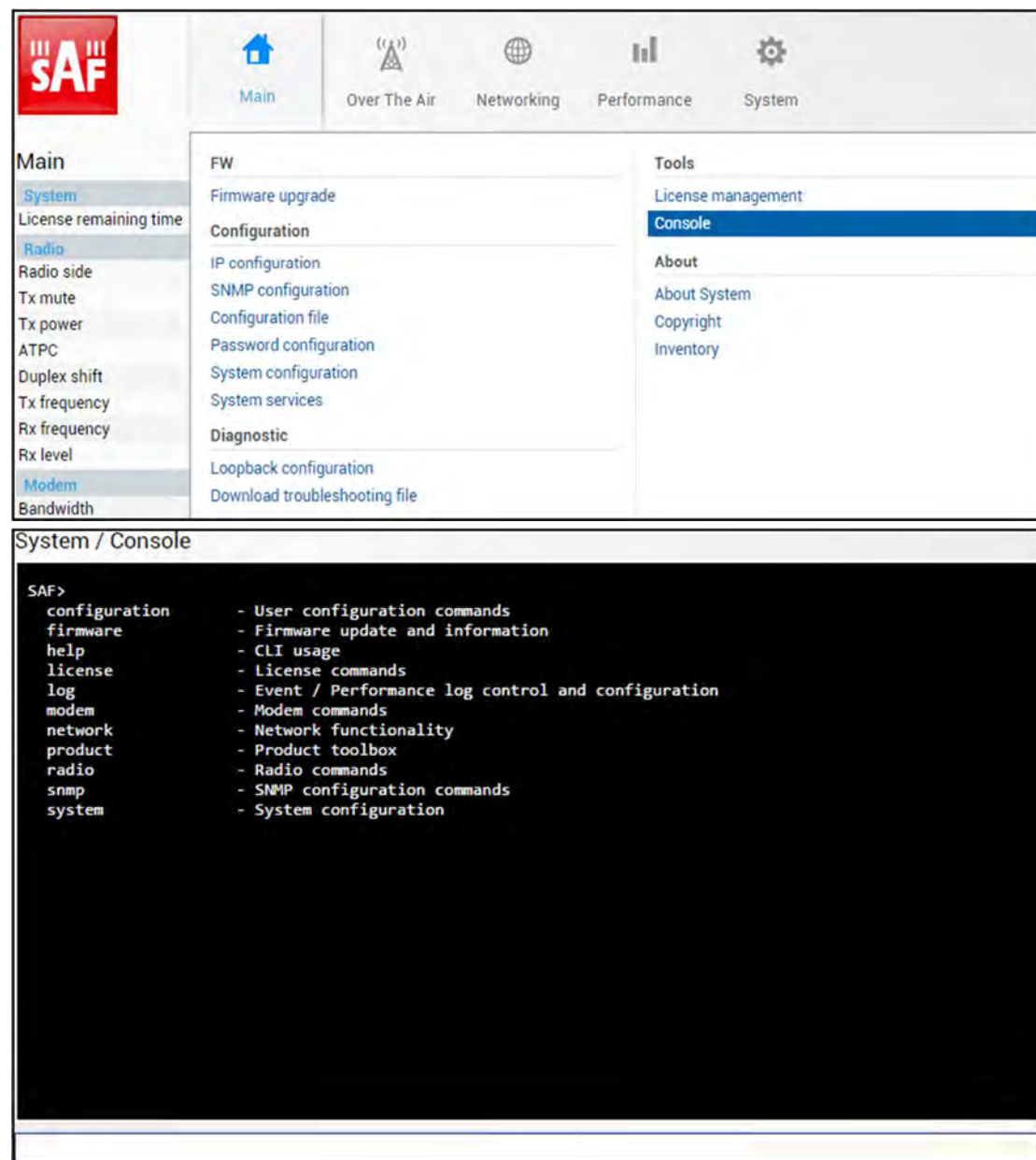


When license expires next license in the list needs to be activated manually.

CLI commands ([System](#) → [Tools](#) → [Console](#))

license list	Use to list available licenses.
license list active	Use to view settings of currently active license.
license list sequence <license> <up/down>	Use to move available licenses up or down the list. When current license expires, next license below the expired license in the list will be used.
license file list	Use to list available license files.
license file add <filename>	Use to add uploaded license file to license file list.
license file activate <filename>	Use to activate license file.
license file deactivate <filename>	Use to deactivate license file.

System → Tools → Console



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

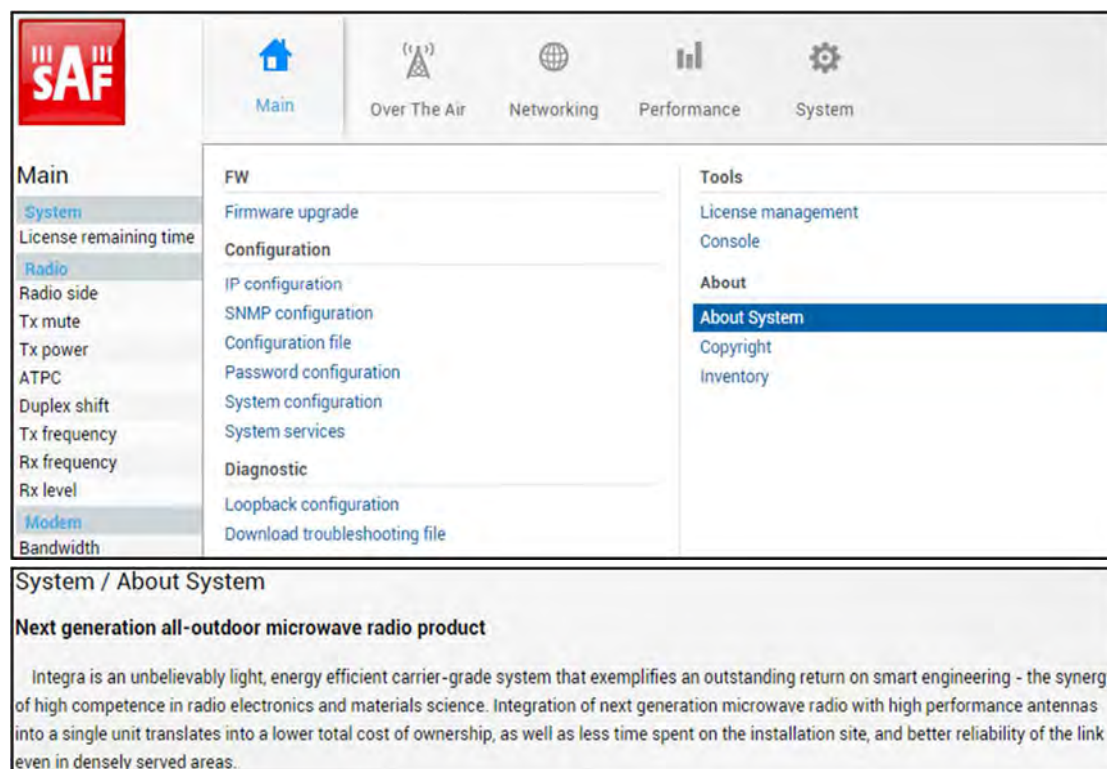
Use **↵** ENTER key to execute entered command.

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

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

System → About → About System

Provides short description of Integra-W/Integra-WS series products.



The screenshot shows the SAF WEB GUI interface. The top navigation bar includes icons for Main, Over The Air, Networking, Performance, and System. The left sidebar lists various system parameters under the 'Main' section, including System, Radio, and Modem. The main content area displays the 'System / About System' page, which includes a description of the next generation all-outdoor microwave radio product.

Main

- System
- License remaining time
- Radio
- Radio side
- Tx mute
- Tx power
- ATPC
- Duplex shift
- Tx frequency
- Rx frequency
- Rx level
- Modem
- Bandwidth

FW

- Firmware upgrade

Configuration

- IP configuration
- SNMP configuration
- Configuration file
- Password configuration
- System configuration
- System services

Diagnostic

- Loopback configuration
- Download troubleshooting file

Tools

- License management
- Console

About

- About System
- Copyright
- Inventory

System / About System

Next generation all-outdoor microwave radio product

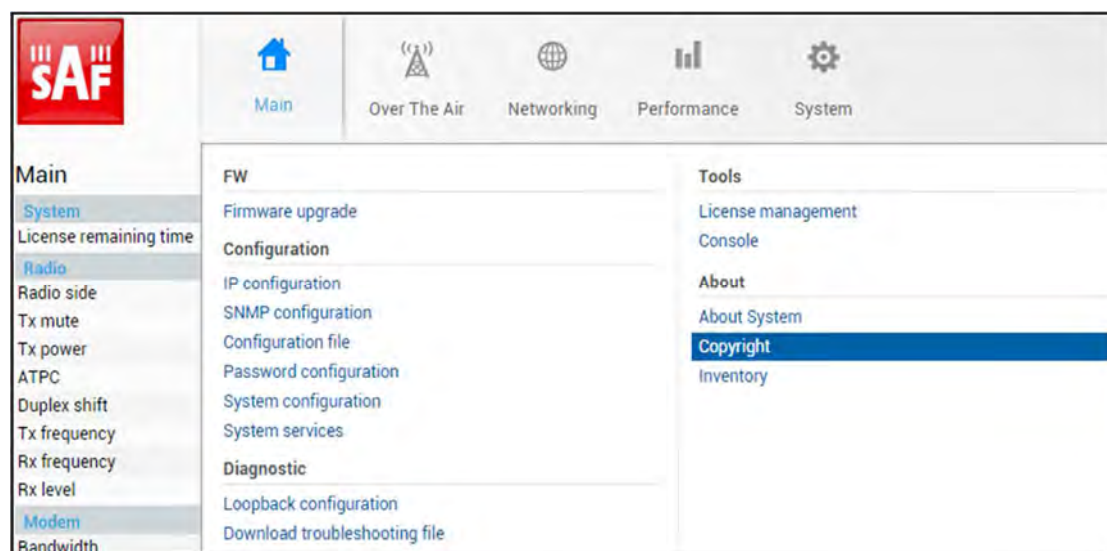
Integra is an unbelievably light, energy efficient carrier-grade system that exemplifies an outstanding return on smart engineering - the synergy of high competence in radio electronics and materials science. Integration of next generation microwave radio with high performance antennas into a single unit translates into a lower total cost of ownership, as well as less time spent on the installation site, and better reliability of the link even in densely served areas.

CLI commands ([System](#) → [Tools](#) → [Console](#))

product info	Use to show detailed information on Integra-W/Integra-WS FODU.
system number	Use to show Integra-W/Integra-WS serial number.

System → About → Copyright

Displays copyright information.



This screenshot is similar to the previous one, but the 'Copyright' option under the 'About' section is highlighted in blue, indicating it is the active selection.

System / Copyright

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System → About → Inventory

Displays inventory information.

System / Inventory	
MB ID	1
MB Sub ID	0
MB revision	2
MAC	000.004.166.129.049.035 - 00.04.A6.81.31.23
Model	Integra
System Contact	contact
Device Name	SAF
Description	SAF microwave radio
Copyright	Copyright (c) 2013 SAF Tehnika JSC. All rights reserved.
ODU ID	SAF
Enterprise ID	7571
Product Code	D18WSR03L
Product Serial Number	289250200003

Chapter 4: COMMAND LINE INTERFACE

Command line interface (CLI) is available via 4 individual interfaces:

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

The available CLI commands are found in "CLI commands" tables in appropriate Web GUI page sections in [Chapter 3: WEB GUI](#).

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



CLI commands are not case sensitive.

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

Connecting to serial RS232 interface

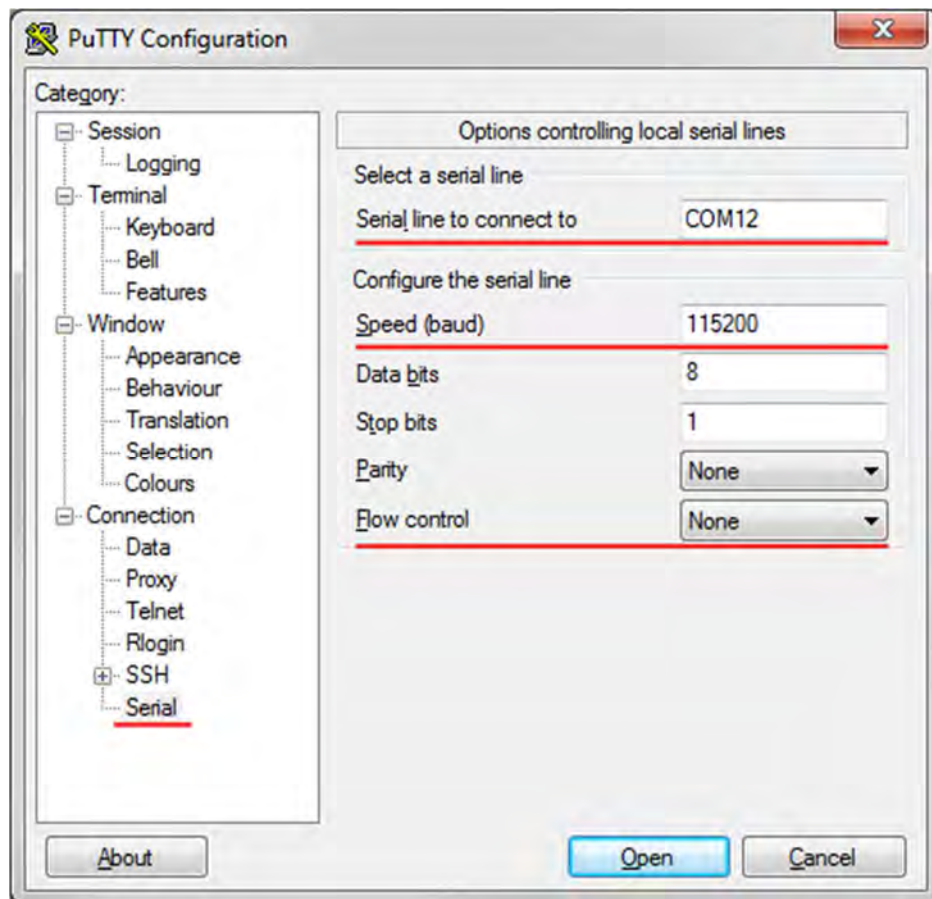
In order to connect to Integra-W/Integra-WS serial terminal you will require USB cable with USB Type B connector. Please refer to Chapter [USB port](#) for pinouts.

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

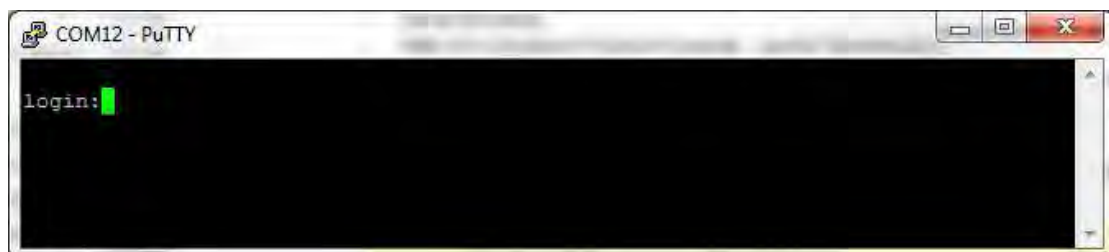
- Baud rate: 115200
- Data bits: 8
- Parity: None
- Stop bits: 1
- Data flow control: None

Below are connection steps with [PuTTY](#) - Windows freeware software.

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



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



3. Enter username and password. Default credentials are as follows:
- login: **admin**
 - password: **changeme**
4. After successful login "SAF>" prompt should appear (if system name is default, otherwise prompt will differ):



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



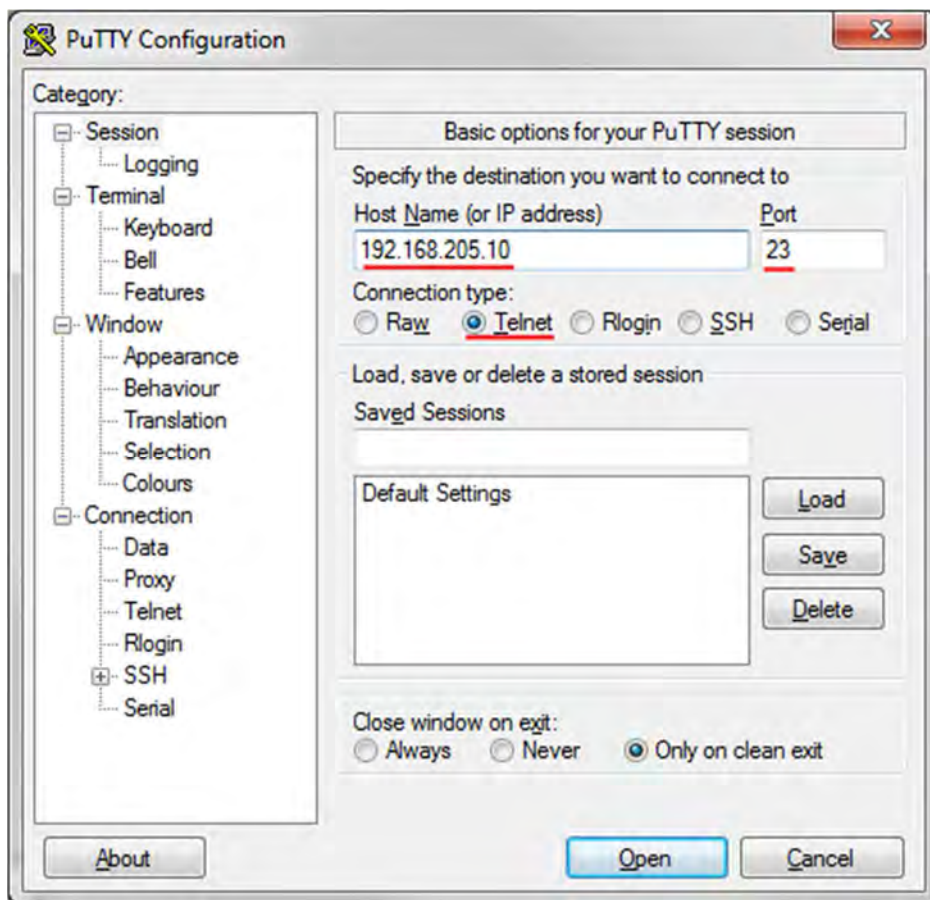
Closing [PuTTY](#) window does not log off from current serial terminal session.

Connecting to SSH

SSH connection to Integra-W/Integra-WS FODU is carried out using Ethernet management connection. Please refer to Chapter "Ethernet management connection" for Ethernet management port connection details.

You can use any SSH client. Below are connection steps with [PuTTY](#) - Windows freeware software.

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



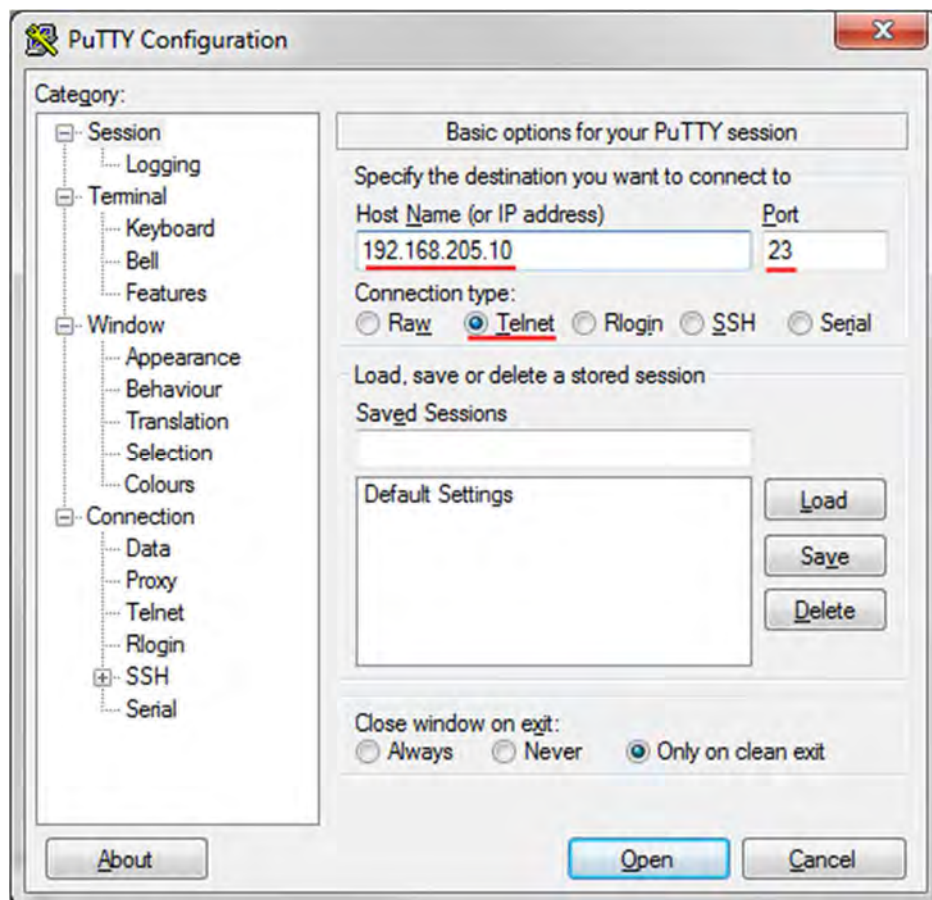
2. Press "Open", enter login credentials (default user name is *admin* and password - *changeme*). After successful login following prompt should appear:

Connecting to Telnet

Telnet connection to Integra-W/Integra-WS FODU is carried out using Ethernet management connection. Please refer to Chapter "Ethernet management connection" for Ethernet management port connection details.

You can use any Telnet client. Below are connection steps with [PuTTY](#) - Windows freeware software.

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



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

Chapter 5: 17/24GHz

Setting bandwidth to 60MHz

1) Access Web GUI of remote side radio first. Configure the Tx frequency to 17130MHz (17GHz) or 24080MHz (24GHz) if it is low side unit or to 17270MHz (17GHz) or 24220MHz (24GHz) if it is high side unit. Press "Execute for both".

2) Go to "System -> Console" (still for remote radio) and execute command "radio duplex-shift 140000". You will lose the connection with your remote side now.

3) Access Web GUI of local side radio. Configure the Tx frequency to 17130MHz (17GHz) or 24080MHz (24GHz) if it is low side unit or to 17270MHz (17GHz) or 24220MHz (24GHz) if it is high side unit. Press "Execute for both".

4) Go to "System -> Console" for local side unit and execute command "radio duplex-shift 140000".

5) Save the configuration on both radios.

Setting bandwidth to 80MHz

1) Access Web GUI of remote side radio first. Configure the Tx frequency to 17140MHz (17GHz) or 24090MHz (24GHz) if it is low side unit or to 17260MHz (17GHz) or 24210MHz (24GHz) if it is high side unit. Press "Execute for both".

2) Go to "System -> Console" (still for remote radio) and execute command "radio duplex-shift 120000". You will lose the connection with your remote side now.

3) Access Web GUI of local side radio. Configure the Tx frequency to 17140MHz (17GHz) or 24090MHz (24GHz) if it is low side unit or to 17260MHz (17GHz) or 24210MHz (24GHz) if it is high side unit. Press "Execute for both".

4) Go to "System -> Console" for local side unit and execute command "radio duplex-shift 120000".

5) Save the configuration on both radios.

Chapter 6: TOOLS

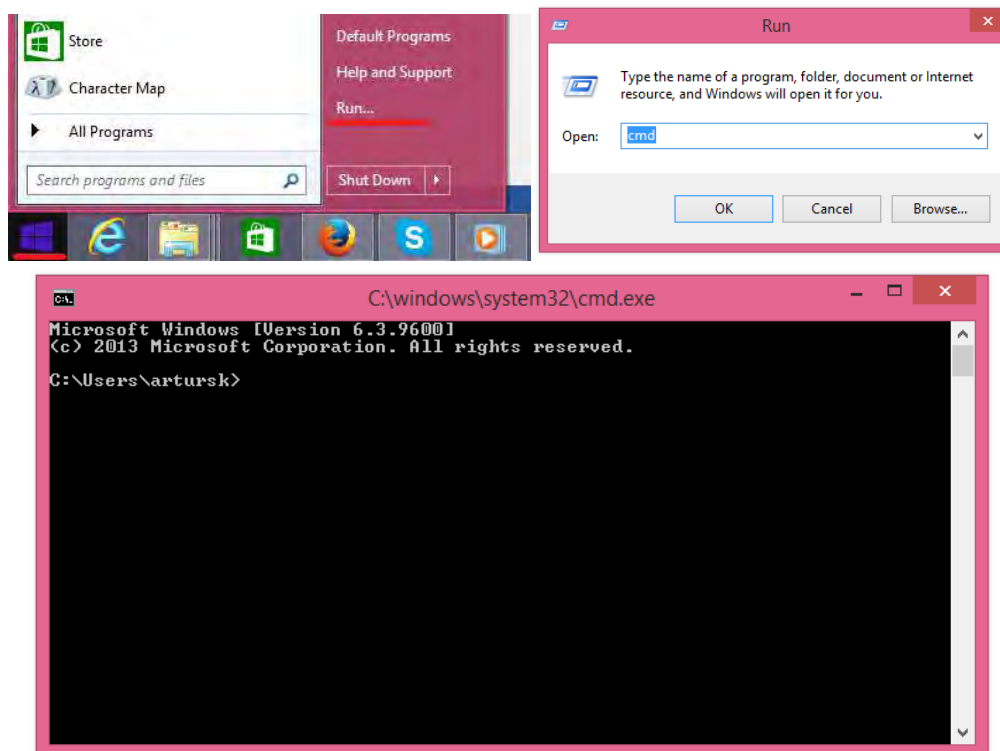
Link Layer Discovery tool

Link Layer Discovery Client is a command line application for Microsoft Windows operating systems (Windows Vista/7/8). It sends requests to Link Layer Discovery server application which runs on all Integra series radios.

The client is used to discover Integra series radios and reset its passwords or settings.

[WinPCAP](#) should be installed.

The application is started via the command line – Start menu→Run. Type “cmd” and press enter. Command line console window should appear.



The default directory in the console is the current user directory. To change it, type:
`cd <directory path>`

For example – `cd c:\recoverytool`

Put the downloaded “recovery” file into your default user directory. If the file is put in any other directory (for example, `c:\recoverytool`), change the console directory by using the above console command.

Run the recovery tool by typing “recovery” without quotes in the console and press ENTER.

```

C:\windows\system32\cmd.exe

c:\recoverytool>recovery
Usage:
  recovery <if> - get surroundings
  recovery <if> reset <mac> <reset list> - perform sub 3 min reset
  recovery <if> safrst <mac> <rk2> <reset list> - perform saf support reset

Reset command list:
  acc      - Reset all users/passwords
  factory  - Factory reset(auto-store, no reset)
  mgmt     - Reset management ip addresses
  network  - Reset QoS and ULAN
  reboot   - Perform HW reboot
  store    - Store configuration

Network adapter list:
1. 74:DA:38:49:FC:2F \DEVICE\NPF_{1A985EC4-7237-4281-BE59-8D5DEEDB5E81}
   ip : 192.168.205.26
2. 44:8A:5B:A4:27:3E \DEVICE\NPF_{FE956E08-A41C-411F-B0C4-87C29132555A}
   ip : 192.168.1.168
3. 08:00:27:00:00:75 \DEVICE\NPF_{CF93C592-8233-4EDD-9502-AB9E2CC4063A}
   ip : 192.168.56.1

c:\recoverytool>

```

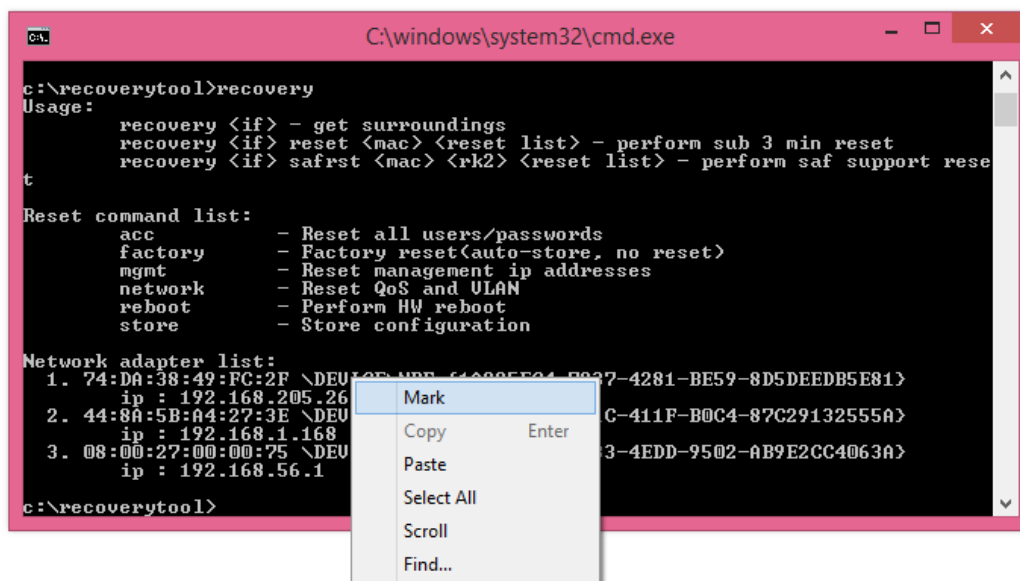
Available commands and network adapter list should be shown. To scan for Integra devices, the command should be run as follows:

recovery <network interface>

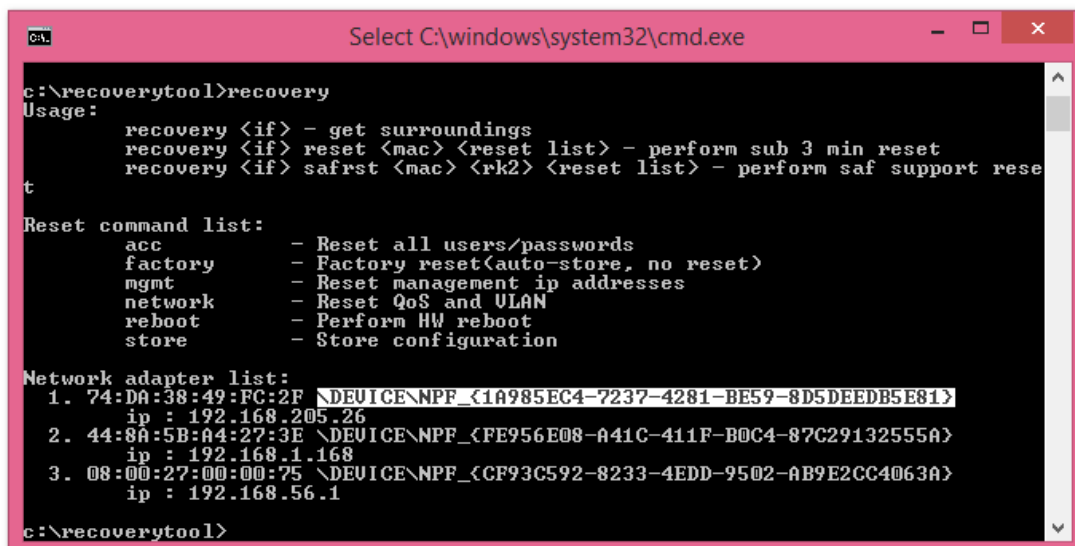
For example:

recovery \DEVICE\NPF_{CF93C592-8233-4EDD-9502-AB9E2CC4063A}

To copy the interface address from network adapter list, click the right mouse button over the console and select "Mark",



then by holding the left button select the interface address.



```

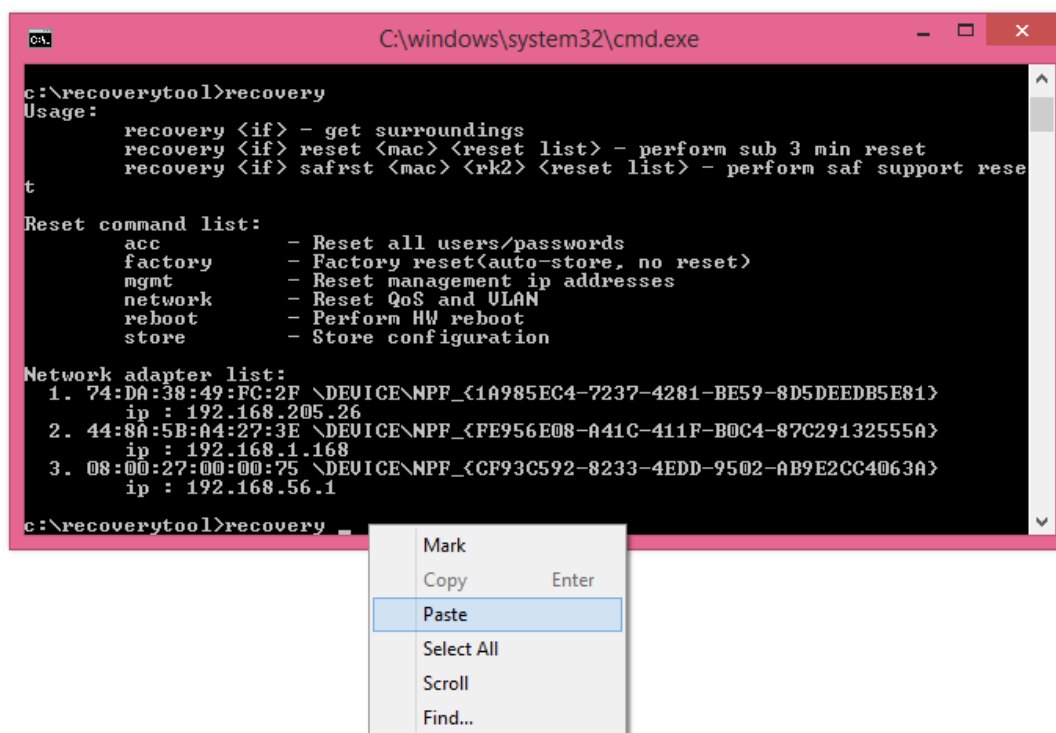
c:\recoverytool>recovery
Usage:
    recovery <if> - get surroundings
    recovery <if> reset <mac> <reset list> - perform sub 3 min reset
    recovery <if> safrst <mac> <rk2> <reset list> - perform saf support reset

Reset command list:
    acc      - Reset all users/passwords
    factory  - Factory reset(auto-store, no reset)
    mgmt     - Reset management ip addresses
    network  - Reset QoS and ULAN
    reboot   - Perform HW reboot
    store    - Store configuration

Network adapter list:
1. 74:DA:38:49:FC:2F \DEVICE\NPF_{1A985EC4-7237-4281-BE59-8D5DEEDB5E81}
   ip : 192.168.205.26
2. 44:8A:5B:A4:27:3E \DEVICE\NPF_{FE956E08-A41C-411F-B0C4-87C29132555A}
   ip : 192.168.1.168
3. 08:00:27:00:00:75 \DEVICE\NPF_{CF93C592-8233-4EDD-9502-AB9E2CC4063A}
   ip : 192.168.56.1

c:\recoverytool>
  
```

After selecting, release the left button and click the mouse right button anywhere on the console. The address should be copied. Paste it by clicking the right button on the command line after typing "recovery" and selecting "Paste". The result should be similar as in the below images.



```

C:\windows\system32\cmd.exe

c:\recoverytool>recovery
Usage:
    recovery <if> - get surroundings
    recovery <if> reset <mac> <reset list> - perform sub 3 min reset
    recovery <if> safrst <mac> <rk2> <reset list> - perform saf support reset

Reset command list:
    acc      - Reset all users/passwords
    factory  - Factory reset(auto-store, no reset)
    mgmt     - Reset management ip addresses
    network  - Reset QoS and ULAN
    reboot   - Perform HW reboot
    store    - Store configuration

Network adapter list:
1. 74:DA:38:49:FC:2F \DEVICE\NPF_{1A985EC4-7237-4281-BE59-8D5DEEDB5E81}
   ip : 192.168.205.26
2. 44:8A:5B:A4:27:3E \DEVICE\NPF_{FE956E08-A41C-411F-B0C4-87C29132555A}
   ip : 192.168.1.168
3. 08:00:27:00:00:75 \DEVICE\NPF_{CF93C592-8233-4EDD-9502-AB9E2CC4063A}
   ip : 192.168.56.1

c:\recoverytool>recovery
  
```

```

C:\windows\system32\cmd.exe

c:\recoverytool>recovery
Usage:
    recovery <if> - get surroundings
    recovery <if> reset <mac> <reset list> - perform sub 3 min reset
    recovery <if> safrst <mac> <rk2> <reset list> - perform saf support reset

Reset command list:
    acc          - Reset all users/passwords
    factory       - Factory reset(auto-store, no reset)
    mgmt          - Reset management ip addresses
    network       - Reset QoS and ULAN
    reboot        - Perform HW reboot
    store         - Store configuration

Network adapter list:
1. 74:DA:38:49:FC:2F \DEVICE\NPF_{1A985EC4-7237-4281-BE59-8D5DEEDB5E81}
   ip : 192.168.205.26
2. 44:8A:5B:A4:27:3E \DEVICE\NPF_{FE956E08-A41C-411F-B0C4-87C29132555A}
   ip : 192.168.1.168
3. 08:00:27:00:00:75 \DEVICE\NPF_{CF93C592-8233-4EDD-9502-AB9E2CC4063A}
   ip : 192.168.56.1

c:\recoverytool>recovery \DEVICE\NPF_{1A985EC4-7237-4281-BE59-8D5DEEDB5E81}

```

The recovery tool will now scan for Integra devices. Available devices and their information will appear in the console. If they do not, retry the command after a while, the devices may take some time to boot up after power down.

Use the MAC address of the device with the reset command to reset this specific device. The MAC address can be copied the same way as the interface address.

```

C:\windows\system32\cmd.exe

factory       - Factory reset(auto-store, no reset)
mgmt          - Reset management ip addresses
network       - Reset QoS and ULAN
reboot        - Perform HW reboot
store         - Store configuration

Network adapter list:
1. 74:DA:38:49:FC:2F \DEVICE\NPF_{1A985EC4-7237-4281-BE59-8D5DEEDB5E81}
   ip : 192.168.205.26
2. 44:8A:5B:A4:27:3E \DEVICE\NPF_{FE956E08-A41C-411F-B0C4-87C29132555A}
   ip : 192.168.1.168
3. 08:00:27:00:00:75 \DEVICE\NPF_{CF93C592-8233-4EDD-9502-AB9E2CC4063A}
   ip : 192.168.56.1

c:\recoverytool>recovery \DEVICE\NPF_{1A985EC4-7237-4281-BE59-8D5DEEDB5E81}
Collecting surrounding data...
Dev #0
Dev #1

      RK1 : 3E20F2FAC522543B9FC3FA97EC804F540F2FA818
      RK1 Fresh : true
      device name : SAF
      model : Integra
      product number : D18WSR03H
      su version : Full 2.1.18-resu
      MAC : 0004A6813122
      ip address : 192.168.205.11
      ip mask : 255.255.255.0

c:\recoverytool>

```

The device is reset by using the required reset command with the recovery tool:

recovery <interface> reset <MAC> <reset command>

Where <interface> - network interface form the network adapter list

<MAC> - required Integra device address

<reset command> - variants of what reset is to be made

Different reset choices are available depending on the reset requirement. The commands are available in the reset command list. Use the command after the MAC address of the device as shown in the previous reset command example.

```
Reset command list:
acc          - Reset all users/passwords
factory      - Factory reset(auto-store, no reset)
mgmt         - Reset management ip addresses
network      - Reset QoS and VLAN
reboot       - Perform HW reboot
store        - Store configuration
```

For example, to reset users and passwords on Integra device #1, enter the following command:

```
recovery \DEVICE\NPF_{1A985EC4-7237-4281-BE59-8D5DEEDB5E81} reset 0004A6813122
acc
```

```
C:\windows\system32\cmd.exe

factory      - Factory reset(auto-store, no reset)
mgmt         - Reset management ip addresses
network      - Reset QoS and VLAN
reboot       - Perform HW reboot
store        - Store configuration

Network adapter list:
1. 74:DA:38:49:FC:2F \DEVICE\NPF_{1A985EC4-7237-4281-BE59-8D5DEEDB5E81}
   ip : 192.168.205.26
2. 44:8A:5B:A4:27:3E \DEVICE\NPF_{FE956E08-A41C-411F-B0C4-87C29132555A}
   ip : 192.168.1.168
3. 08:00:27:00:00:75 \DEVICE\NPF_{CF93C592-8233-4EDD-9502-AB9E2CC4063A}
   ip : 192.168.56.1

c:\recoverytool>recovery \DEVICE\NPF_{1A985EC4-7237-4281-BE59-8D5DEEDB5E81}
Collecting surrounding data...
Dev #0
Dev #1
      RK1 : 3E20F2FAC522543B9FC3FA97ECA04F540F2FA818
      RK1 fresh : true
      device name : SAF
      model : Integra
      product number : D18WSR03H
      sw version : fw1 / 3.1.18-esw
      MAC : 0004A6813122
      ip address : 192.168.205.11
      ip mask : 255.255.255.0

c:\recoverytool>recovery \DEVICE\NPF_{1A985EC4-7237-4281-BE59-8D5DEEDB5E81} reset
0004A6813122 acc
```

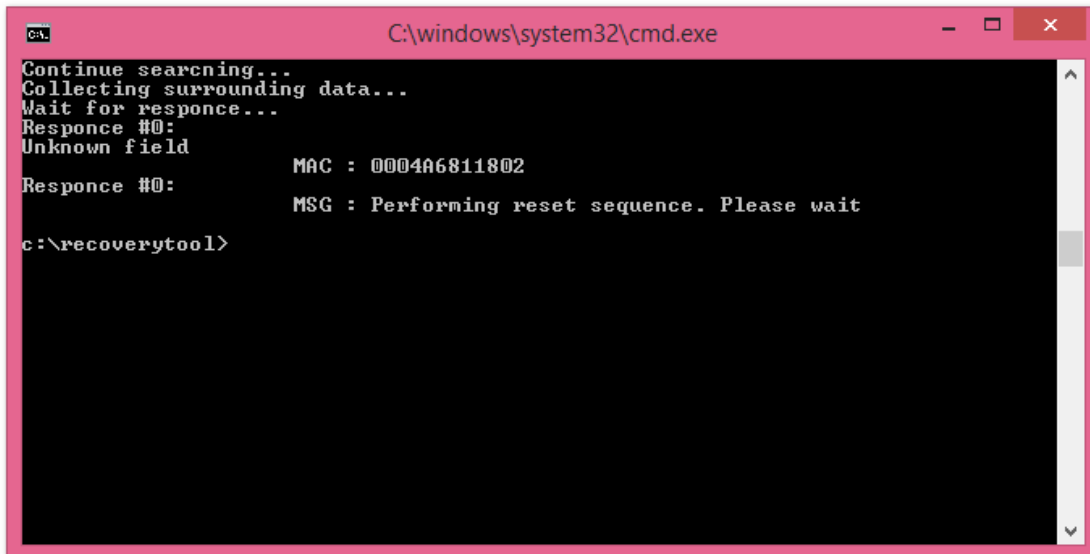
Make sure the command is run within 3 minutes after Integra reboot (RK1 fresh:true in the console), if not, the following error will occur. The recovery tool will continue to retry the command.

```
C:\windows\system32\cmd.exe - recovery \DEVICE\NPF_{1A985EC4-7237-4281-BE59-8D5DEEDB5E81}

Collecting surrounding data...
Rk1 is not fresh, try to reboot device
Collecting surrounding data...
Rk1 is not fresh, try to reboot device
Collecting surrounding data...
Rk1 is not fresh, try to reboot device
Collecting surrounding data...
Rk1 is not fresh, try to reboot device
Collecting surrounding data...
Rk1 is not fresh, try to reboot device
Collecting surrounding data...
Rk1 is not fresh, try to reboot device
Collecting surrounding data...
```

Power down the device and power it up again, the reset should be completed soon.

If the reset is successful, it will be shown in the command console.



```
C:\windows\system32\cmd.exe
Continue searching...
Collecting surrounding data...
Wait for response...
Response #0:
Unknown field
Response #0:          MAC : 0004A6811802
Response #0:          MSG : Performing reset sequence. Please wait
c:\recoverytool>
```

If the reset cannot be completed, try powering down the device, powering it up again and retry the reset procedure in less than 3 minutes after the power up.

MIB files



Relevant MIB files can be downloaded directly from Integra-W/WS Web GUI. See Chapter "System → Configuration → SNMP configuration" for further details.

Chapter 7: INTERFACES

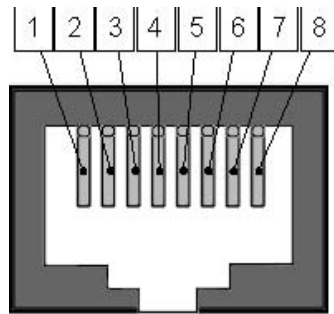
RJ-45 ports (MNG & LAN)

RJ-45 ports (MNG & LAN) comply with IEEE 802.3-2005 1000Base-T Ethernet and IEEE 802.3at, LTPoE++ Power over Ethernet standards. MNG port additionally complies with 100Base-T Ethernet standard.



For some HW revisions PoE may be available on data (LAN(TP)) port only.

The pinouts are as follows:



Pin	Data	PoE
1	Bi-directional A+	VB1+
2	Bi-directional A-	VB1+
3	Bi-directional B+	VB1-
4	Bi-directional C+	VB2+
5	Bi-directional C-	VB2+
6	Bi-directional B-	VB1-
7	Bi-directional D+	VB2-
8	Bi-directional D-	VB2-

In case Ethernet cable is used for power & data (with PoE injector), combined Ethernet cable length from PoE injector to Integra-W/Integra-WS FODU and from PoE injector to CPE is limited to 100m / 328ft.

In case SFP interface (LAN) is configured for data traffic, it is possible to use RJ-45 port solely for power supply. Two options are possible:

- 1) Ethernet cable with PoE injector.

Please refer to table below for maximum Ethernet cable length from PoE injector to Integra-W/Integra-WS FODU based on AWG wire size and Integra-W/Integra-WS FODU power consumption.

AWG	Lmax @ 45W	Lmax @ 40W	Lmax @ 35W
26	202m / 662ft	227m / 745ft	259m / 851ft
24	321m / 1053ft	361m / 1184ft	413m / 1353ft
22	510m / 1674ft	574m / 1884ft	656m / 2153ft

- 2) 2-wire power cable together with DC power adapter cable for Integra-W/Integra-WS (P/N D0ACPW01).

Please refer to the tables below for maximum power cable length based of AWG wire size or cross-section and Integra-W/Integra-WS FODU power consumption.

AWG	Lmax @ 45W	Lmax @ 40W	Lmax @ 35W
24	80m / 263ft	90m / 296ft	103m / 338ft
22	127m / 419ft	143m / 471ft	164m / 538ft
20	203m / 666ft	228m / 749ft	260m / 856ft
18	322m / 1058ft	362m / 1190ft	414m / 1360ft
16	512m / 1682ft	576m / 1892ft	659m / 2163ft
14	815m / 2675ft	917m / 3010ft	1048m / 3440ft

Cross-section area	Lmax @ 45W	Lmax @ 40W	Lmax @ 35W
0.25mm ²	101m / 331ft	113m / 370ft	129m / 423ft
0.5mm ²	201m / 659ft	226m / 741ft	259m / 849ft
0.75mm ²	302m / 990ft	339m / 1112ft	388m / 1273ft

1.0mm ²	402m / 1318ft	452m / 1482ft	517m / 1696ft
1.5mm ²	603m / 1978ft	679m / 2227ft	776m / 2545ft



Maximum cable length calculation is done using copper resistance.

SFP port (LAN)

SFP port provides SFP transceiver connectivity.

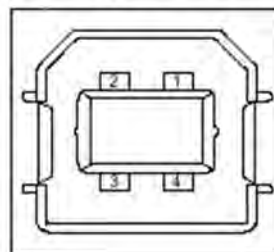
SFP port complies to the following Gigabit Ethernet standards:

1000BASE-SX, 1000BASE-LX, 1000Base-T (note: 1000FDX only).

USB port

USB port provides serial terminal access to CLI. Socket is B type.

USB Type B Socket



1=Vbus (5V)

2=D-

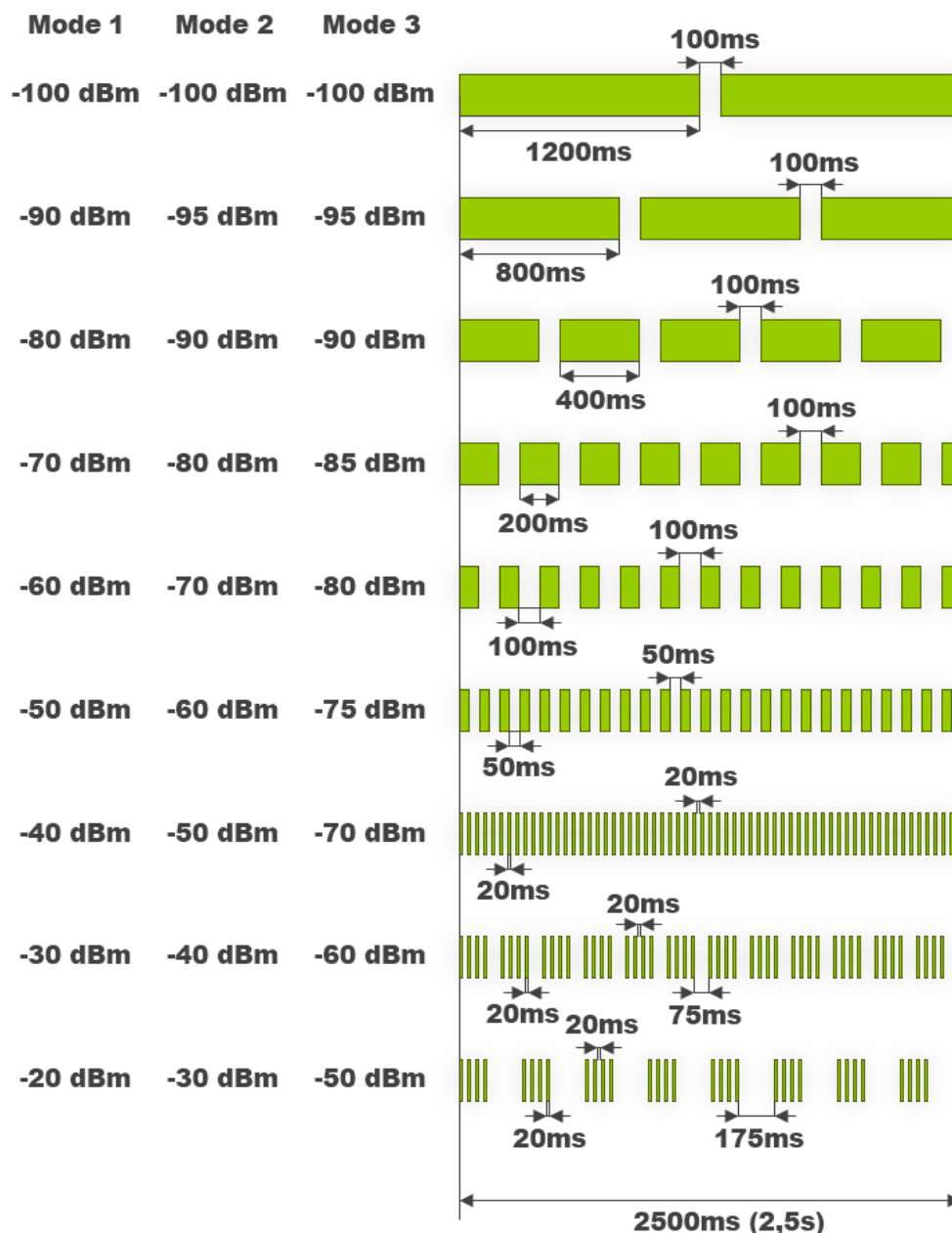
3=D+

4=GND

RSSI LED

RSSI LED can be activated in three operational modes – Mode 1, Mode 2 and Mode 3. By default RSSI LED is enabled in Mode 1. For further details please refer to [Radio configuration](#) page.

Corresponding Rx signal levels and LED blinking pattern for each mode is represented in the figure below:



RSSI/audio port

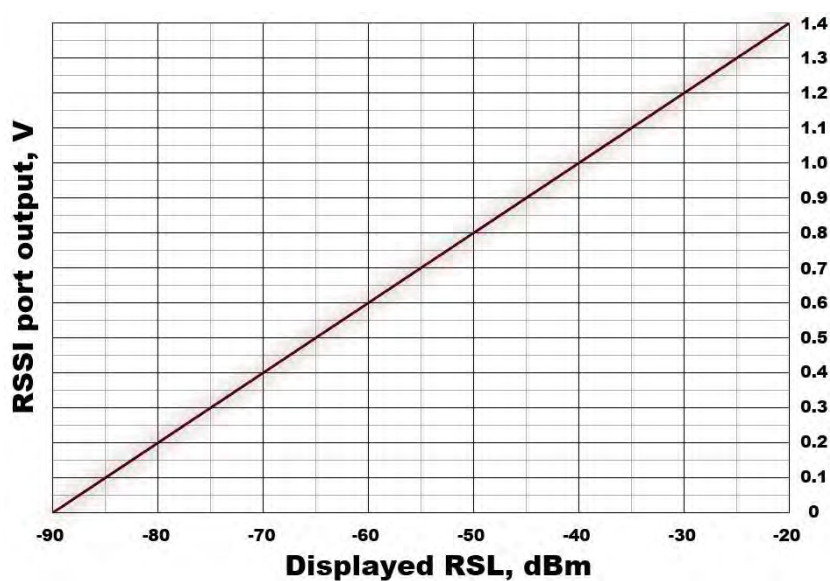
RSSI (Received Signal Strength Indicator) port is used to adjust the alignment of antenna for best performance (for both rough and fine adjustment); this can be done using digital multimeter or headphones connected to the RSSI port. RSSI port is 3.5mm socket. The output of the RSSI port is DC voltage and audio frequency and varies depending on received signal level. Both are linear curves.

In order to connect a voltmeter you will require appropriate RSSI cable (P/N D0ACRS01):



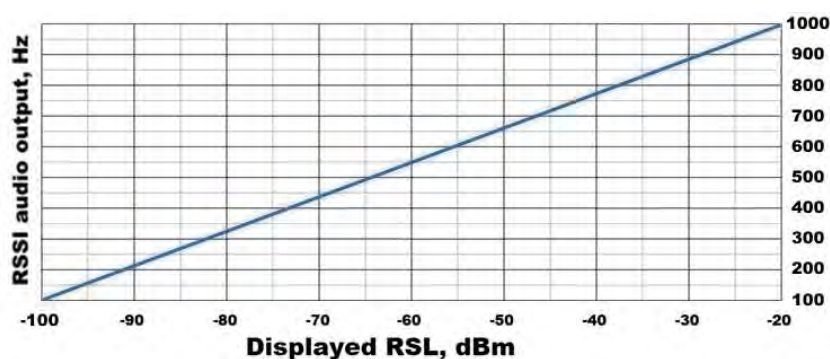
The following charts and tables show typical relationship of the received signal level (Rx level) displayed by Integra-W/Integra-WS vs. RSSI port output voltage (RSSI – Received Signal Strength Indicator) and audio frequency. The RSSI port is located on FODU. The evaluated Rx level has the error ± 2 dB.

Output voltage



Rx level (dBm)	RSSI voltage (V)
-90	0
-85	0.1
-80	0.2
-75	0.3
-70	0.4
-65	0.5
-60	0.6
-55	0.7
-50	0.8
-45	0.9
-40	1.0
-35	1.1
-30	1.2
-25	1.3
-20	1.4

Output audio frequency



Rx level (dBm)	Audio frequency (Hz)
-100	100
-96	145
-92	190
-88	235
-84	280
-80	325
-76	370
-72	415
-68	460
-64	505
-60	550
-56	595
-52	640
-48	685
-44	730
-40	775
-36	820
-32	865
-28	910
-24	955
-20	1000

Appendix A: TECHNICAL SPECIFICATION

		Integra-W	Integra-WS
General			
Concept / form factor		FODU with antenna integration	FODU slip-fit
Capacity		883 Mbps at 112 MHz 1024 QAM 643 Mbps at 80 MHz 1024 QAM (for Integra-WS 17GHz and 24GHz)	
Frequency bands		6GHz*, 11GHz, 15GHz, 17GHz UL, 18GHz, 23GHz, 24GHz UL, 25GHz, 26GHz, 28GHz*, 32GHz*, 38GHz, 42GHz and more*	
Modulation		From 4QAM up to 1024QAM with hitless ACM	
Configurations		1+0	
ATPC		Yes*	
Channel bandwidth		ETSI: from 56 MHz up to 112 MHz FCC: from 40 MHz up to 80 MHz	
Frequency stability		± 10 ppm	
Ports			
Gigabit Ethernet	2x RJ-45	Electrical with built-in PoE splitter and surge arrestor	
	1x SFP	Alternative to 1xRJ-45	
Service ports	3.5mm	Audible alignment and RSSI	
	USB B	RS232 serial over USB B-Type	
	LED	Power On, Link Synchronization, RSL	
Ethernet			
Ethernet		Unmanaged Gigabit Ethernet	
Gigabit Switch functionality		Transparent	
Management		SNMP v1/2c/3*, SSH, Telnet, HTTPS, Serial, RADIUS, Network Time Protocol	
Performance monitoring		Performance graphs, constellation diagram, alarms, detailed counters	
Synchronization		SyncE*, IEEE 1588v2 PTP*	
Carrier Ethernet functionality		Transparent	
Jumbo frames		Yes, 9600 bytes	
Antenna			
Sizes		0.3m / 1ft	0.6m / 2ft External antenna
Antenna		High Performance and Super High Performance*	
Electrical			
Power consumption		31...74 W depending on model and frequency band. See table below.	
Power range	Integra	36 ... 57 V DC	
	PoE Injector ¹	36 ... 60 V DC all Integra models; 22...60 V DC models with ≤50 W consumption	
Temperature range		-33 ... +55 °C / -28 ... +130 °F	

¹ Voltage range using I0ATPI24 Power over Ethernet Injector

Mechanical specification

	Integra-W		Integra-WS
Antenna	0.3m / 1ft	0.6m / 2ft	External antenna
Mechanical & Enviromental			
Antenna performance	High Performance and <i>Super High Performance</i> ²		
Stationary use	Conforms to ETSI EN 300 019 Class 4.1, IP66, NEMA 4X		
Size, w/o mount	378 x 378 x 227 mm / 14.9" x 14.9" x 9"	669 x 669 x 289 mm / 26.3" x 26.3" x 11.4"	235 x 250 x 72 mm / 9.26" x 9.85" x 2.84"
Size, Integra -WS 17/24 GHz UL	N/A ³	N/A ³	235 x 250 x 111 mm / 9.26" x 9.85" x 4.37"
Size, 6/7/11 GHz	N/A	N/A	280 x 437 x 100 mm / 11.02" x 17.2" x 3.9"
Weight, w/o mount	5 kg / 11 lbs	5 kg / 11 lbs	2.9 kg / 6.4 lbs
Weight, Integra -WS 17/24 GHz UL	N/A ³	N/A ³	4.9 kg / 10.8 lbs
Weight, 6/7/11 GHz	N/A	N/A	6.5 kg / 14.3 lbs
Mount	Mount size	292 x 176 x 250 mm / 11.5" x 7" x 10" max	
	Pole size	Ø 40 – 120 mm / Ø 1.6" – 4.7"	
	Weight	2.55 kg / 5.6 lbs	
			Mount on antenna

² Inquire SAF representative for more information

³ Among Integra-W family, only Integra-WS model with external antenna is currently available for 17/24 GHz unlicensed bands.

Power consumption at 48V DC⁴

L6 GHz	U6, 7 GHz	11 GHz	15 GHz	17 GHz	18 GHz	23 GHz	24 GHz	38 GHz
70W ⁵	64W	51W	31W ⁵	-	31W	32W ⁵	-	38W ⁵

⁴ Power consumption for Integra radio shown only. For power consumption of complete system add up to 8% (at 48V DC input) for PoE in DC/DC mode, around 4W for 100m cable (depends on cable) and approx. 1W for SFP transceiver, if used.

⁵ Preliminary data

Integra-W preliminary RSL Threshold (dBm) and Link Capacity (Mbps)

	ETSI channels					FCC channels									
	56 MHz		112 MHz ⁶			40 MHz		50 MHz		60 MHz		80 MHz		100 MHz ⁶	
Modulation	RSL	Mbps	RSL	Mbps		RSL	Mbps	RSL	Mbps	RSL	Mbps	RSL	Mbps	RSL	Mbps
4QAM	-82.0	89	-79.0	176		-83.5	63	-83.0	78	-82.0	96	-80.5	128	-79.5	168
8QAM	-78.0	134	-75.0	265		-79.5	94	-78.5	118	-77.5	144	-76.5	192	-75.5	252
16QAM	-75.5	178	-72.0	359		-77.0	126	-76.0	157	-75.0	192	-74.0	257	-72.5	336
32QAM	-72.5	224	-69.5	441		-74.0	157	-73.0	197	-72.0	240	-70.5	321	-69.5	420
64QAM	-69.5	269	-66.5	530		-71.0	189	-70.0	236	-69.0	288	-68.0	385	-67.0	504

128QAM	-66.5	314	-63.5	618	-68.0	220	-67.0	276	-66.5	336	-64.5	450	-64.0	588
256QAM	-63.5	359	-60.5	707	-65.0	252	-64.0	315	-63.5	385	-62.0	514	-60.5	672
512QAM	-60.5	404	-57.0	795	-62.0	284	-61.0	355	-60.0	433	-58.5	578	-57.5	756
1024QAM	-57.0	449	-53.5	883	-58.5	315	-57.5	394	-57.0	481	-55.0	643	-54.0	840

⁶ 100 MHz and 112 MHz channel bandwidths are available for all Integra-W/-WS models except 17GHz and 24GHz UL.

Maximum Tx Power for Integra-W and Integra-WS

Modulation	Tx power, dBm							
	L6 GHz	U6 GHz	11 GHz	15, 18, 23, 25, 26 GHz	17 GHz ⁸ , 24 GHz ⁸	28, 32 GHz ⁷	38 GHz	42 GHz
4 QAM	+33	+31	+28	+22	-26 ... +5	+22	+17	+11
16 QAM	+32	+30	+27	+21	-26 ... +5	+21	+17	+11
32 QAM	+32	+30	+27	+21	-26 ... +5	+21	+17	+11
64 QAM	+31	+29	+26	+20	-26 ... +5	+20	+16	+9
128 QAM	+31	+29	+26	+20	-26 ... +5	+20	+16	+9
256 QAM	+30	+28	+25	+19	-26 ... +5	+19	+15	+8
512 QAM	+30	+28	+25	+19	-26 ... +5	+19	+15	+8
1024 QAM	+28	+26	+23	+17	-26 ... +5	+17	+14	+7

⁷ Preliminary data.

⁸ Max Tx power settings depend on EIRP allowed by national regulatory and antenna size.

High Performance integrated antenna specification

Size	Frequency, GHz	Gain, dBi	Half power beamwidth	XPD dB	F/B ratio, dB	Compliance	
						ETSI	FCC
0.3m	15	32.1	4.3°	30	58	Class 3	N/A
	17	33.4	3.5°	30	60	Class 3	B2
	18	34.2	3.3°	30	61	Class 3	B2
	23	35.3	3.0°	30	62	Class 3	A
	24	36.1	2.6°	30	62	Class 3	N/A
	26	36.6	2.5°	30	63	Class 3	N/A
	38	40.1	1.6°	30	61	Class 3B	A
	42	40.8	1.5°	30	60	Class 3	A
0.6m	15	37.5	2.4°	30	62.5	Class 3	N/A
	17	38.2	2.3°	30	65	Class 3	A
	18	39.1	1.9°	30	64.5	Class 3	A
	23	41.4	1.6°	30	66.5	Class 3	A
	24	41.1	1.4°	30	66	Class 3	N/A
	26	41.6	1.5°	30	68	Class 3	A
	38	45.2	0.9°	30	64	Class 3B	A
	42	46	0.8°	30	65	Class 3	A

	15-42 GHz	Integra-W
	15, 18-23, 26-42 GHz	Integra-WS
	17, 24 GHz	
	6-13 GHz	



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