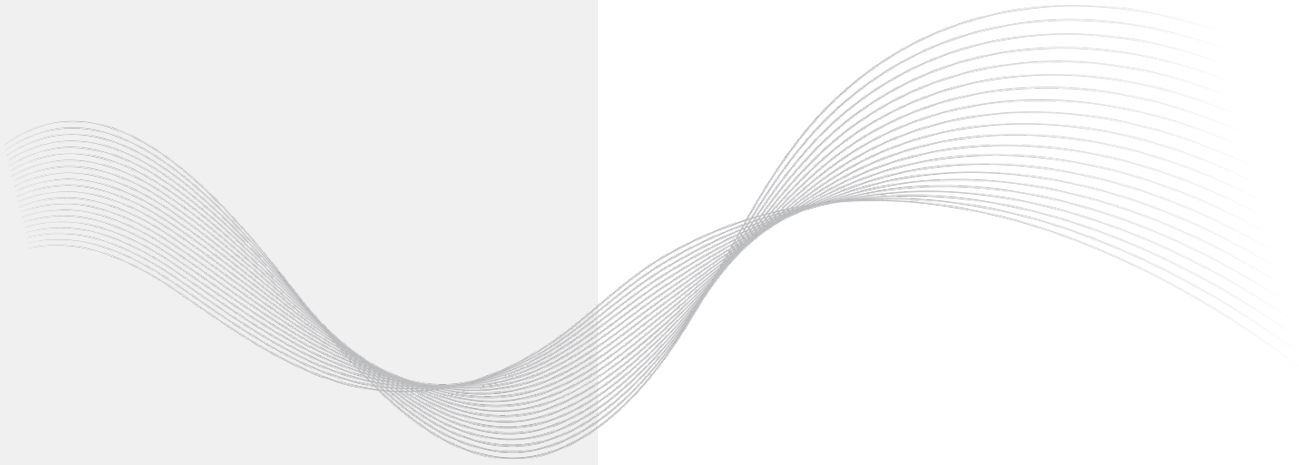
INFINET wireless



Quanta 5

Technical User Manual

Table of Contents

Quanta 5 is a InfiNet Wireless devices family, is used for deployment of wireless Point-to-Point links in 5 GHz frequency range, with a performance of up to 460 Mbps in the 40 MHz band.

Quanta 5 is based on the Octopus SDR technology which allows to extend functionality of the device at the physical, channel and upper levels by updating the system software. Thus, the main subsystems capabilities can be determined by the software without the need to dismount or replace the device.

NOTE

Product technical specifications can be obtained from our web site InfiNet Wireless

We recommend the online course for the self-study at the IW Academy portal " Quanta 5: Installation and Configuration".

1 About This Manual

This manual provides detailed technical information for the **Quanta 5** family devices, including system specifications, installation, commissioning, maintenance and troubleshooting.

The document is intended to be used by qualified RF engineers/technicians and IT professionals. Qualified personnel should have skills and experience with:

- Outdoor/indoor radio equipment installation
- Outdoor wireless networks
- TCP/IP networking protocols
- Safety procedures and instructions for installing antenna equipment
- Professional manipulation with electrical equipment and accessories
- Safety procedures and instructions for working at height.

2 Important Notice

2.1 Legal Rights

The information contained in this document is originated by, proprietary, confidential and owned by InfiNet Wireless. No part of this document should be disclosed, reproduced or distributed without the express written permission of InfiNet Wireless Ltd.

InfiNet Wireless Ltd. reserves the right to change the information contained in this document without prior notice. No part of this document may be considered as a part of any contract or warranty.

2.2 Statement of Conditions

InfiNet Wireless Ltd. shall not be liable for errors contained herein or for incidental or consequential damages in connection with the furnishing, performance or use of this manual or equipment supplied with it.

2.3 Disclaimer

The software is sold on an "AS IS" basis. InfiNet Wireless, its affiliates or its licensors make no warranties, whatsoever, whether express or implied, with respect to the software and the accompanying documentation. InfiNet Wireless specifically disclaims all implied warranties of merchantability and fitness for a particular purpose and non-infringement with respect to the software. Units of product (including all the software) delivered to purchaser hereunder are not fault_ tolerant and are not designed, manufactured or intended for use or resale in applications where the failure, malfunction or inaccuracy of products carries a risk of death or bodily injury or severe physical or environmental damage (“high risk activities”). High risk activities may include, but are not limited to, use as part of on-line control systems in hazardous environments requiring fail-safe performance, such as in the operation of nuclear facilities, aircraft navigation or communication systems, air traffic control, life support machines, weapons systems or other applications representing a similar degree of potential hazard. InfiNet Wireless specifically disclaims any express or implied warranty of fitness for high risk activities.

2.4 Indication of the countries

InfiNet Wireless equipment has no geographical limitations for selling and can be supplied to any country of the world.

2.5 Limitation of Liability

InfiNet Wireless shall not be liable to the purchaser or to any third party, for any loss of profits, loss of use, interruption of business or for any indirect, special, incidental, punitive or consequential damages of any kind, whether arising under breach of contract, tort (including negligence), strict liability or otherwise and whether based on this agreement or otherwise, even if advised of the possibility of such damages.

To the extent permitted by applicable law, in no event shall the liability for damages hereunder of InfiNet Wireless or its employees or agents exceed the purchase price paid for the product by purchaser, nor shall the aggregate liability for damages to all parties regarding any product exceed the purchase price paid for that product by that party (except in the case of a breach of a party's confidentiality obligations).

2.6 Disposal instructions

This symbol means that this product is subject to Waste of electrical and electronic equipment (WEEE) regulations. Do not dispose of your product with other regular/household waste. Instead, hand over your waste equipment to a designated collection point for recycling.

3 Introduction

3.1 Document structure

This document consists of the following chapters:

- Introduction - presents the information about this document's purpose and structure.
- Planning considerations - describes the principles of wireless system planning.
- Installation - describes the steps to be taken when installing the equipment at the installation sites and installation site requirements.
- Operation & Administration - presents the functionalities of the web interface, a simple and efficient way to monitor the device status, configure and maintain the equipment.
- Troubleshooting - describes the actions to be taken during occured problems investigation.

3.2 Document marks

CAUTION

All caution warnings are marked with a special warning sign. One should pay a great deal of attention to what is written in the Caution section.

NOTE

All notes are marked with a special note sign. Notes usually contain useful comments or hints to the described section of the document.

3.3 Key Features

Quanta 5 is a wireless point-to-point solution with an impressive performance of up to 460 Mbps in the 40 MHz bandwidth, a packet perfomance is up to 900 000 pps. Quanta 5 family is based on the newest InfiNet Wireless proprietary Octopus SDR hardware platform.

It operates in frequency range from 4900 MHz to 6000 MHz and supports the wide range of channel width between 3.5 MHz and 40 MHz. Wireless device can be used with:

- a dual polarization integrated antenna with an antenna gain 23 dBi;
- an external antenna connected to two N-type ports using low-loss RF cables

and operates in LOS and non-LOS conditions. SC-FDE radio technology is used for data transmission.

3.3.1 Radio

- Extended set of modulation coding schemes – Quanta 5 supports 14 modulation -coding schemes . In periodic interference conditions, the performance will stay on the highest level.
- Automatic Modulation Control (AMC) – modulation control algorithm selects the most appropriate modulation-coding scheme at each polarization and each end of the link in order to maximize the link performance.
- Hybrid-FDD (split-frequency mode) – separate allocation of downlink and uplink channels to utilize the least congested frequency channel at each end of the link.
- Automatic Repeat Request (ARQ) – a technology which enables packet re-transmission in case of previous unsuccessful delivery, allows to achieve reliable connectivity even in highly congested spectrum.
- Instant DFS – a set of algorithms operating on top of the mandatory DFS/Radar detection /LBT, providing background spectrum scanning and zero-downtime channel reselection in case of congestion or radar detection. For uplink and downlink traffic, different frequencies can be selected to achieve optimum performance.
- Automatic Transmit Power Control (ATPC) – a technology which allows to limit the overall power system mode, which takes into account the antenna gain and losses in the RF cable.

3.3.2 Networking

- VLAN support is an important tool which is used to isolate and filter traffic flows.
- STP support allows to avoid network loops.
- IEEE 1588v2 support provides synchronization between devices via the wired network segment.
- Stacked VLAN support (Q-in-Q) avoids the limitation in the number of available VLANs (4096), which can be useful for large networks. In addition, Q-in-Q allows you to organize L2 channels within a limited VLAN list, which is widely used in provider networks and on leased communication channels.
- Due to QoS support, traffic prioritization is available in accordance with the 802.1p (8 queues), ensures that the most important data arrives with priority.
- One of the network mechanisms to optimize bandwidth by reducing the share of overhead for service headers are Jumbo frames with size up to 9038 bytes.

3.3.3 Distance

Quanta 5 has a link budget of up to 168 dB. This budget allows it to achieve reliable connectivity at up to 40 km in clear line-of-sight conditions, as well as provides sufficient margin for near- and non-LOS deployments at shorter distances. Transmit power at the highest modulations is also one of the key performance metrics, allowing Quanta 5 to achieve the highest performance over long distances and in noisy spectrum. The Quanta 5 transmit power at QAM256 is up to 24 dBm.

3.3.4 Environment

- Operating temperature range -40 ... +60 ºC.
- Dust and water protection in compliance with IP66/IP67.
- Wind load up to 160 kph - operation, 200 kph - survival.

3.3.5 Power

The device has following electrical parameters:

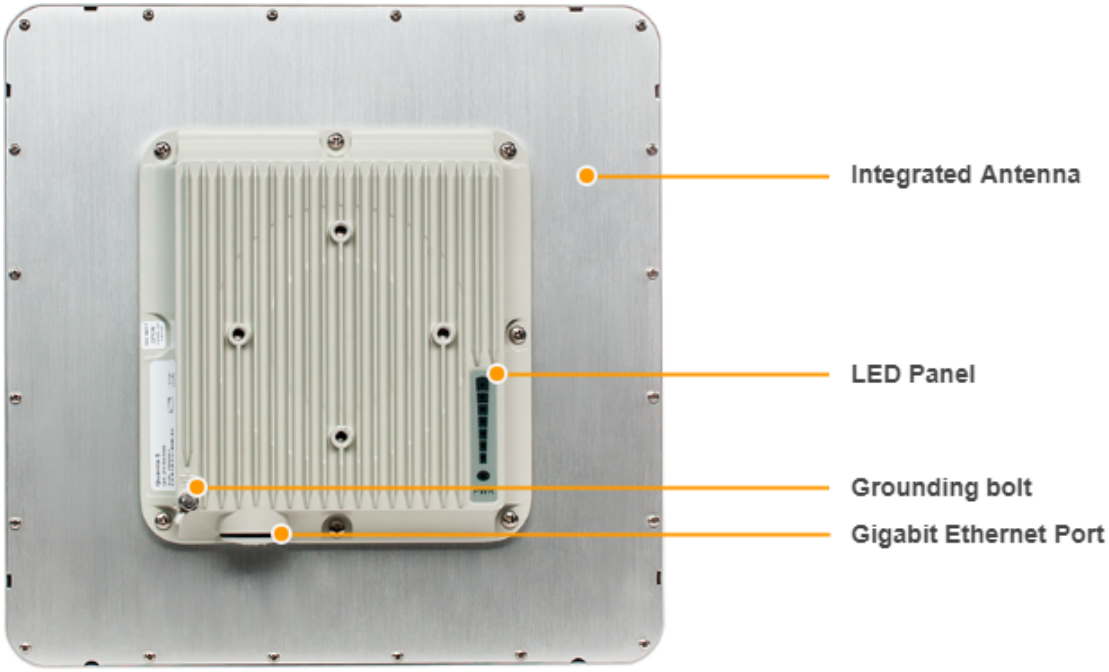
- Consumption is up to 15 W.
- Power options: 90-240 VAC~ @ 50/60 Hz, ±43..56 VDC.
- 802.3at support or InfiNet Wireless proprietary passive PoE.
- AC/DC injector IDU-CPE-G is included to the packing list.

3.4 Hardware Platform

3.4.1 Wireless device

An integrated wireless device contains the radio and networking electronics. Implemented in a robust all-weather metal enclosure, this equipment can be used to create point-to-point wireless links at distances in excess of 40 Km (depending on country regulations, antenna types, interference, terrain, climate zones, etc.). There are several possible version of Quanta 5 solution enclosures:

- with integrated antenna;
- with two N-type ports for an external antenna.



Grounding bolt

For grounding the ODU to the supporting structure.

Gigabit Ethernet Port

RJ45 socket for connecting to power supply and network via the PoE power supply. The network connection to the ODU is made via a 1000BaseT (Gigabit) Ethernet connection. Power is provided to the ODU over the 1000BaseT Ethernet connection using a standard IEEE 802.3 at passive PoE power supply.

LED Panel

PWR - power indicators will light red when the device is connected to a power source, yellow when 10/100 Mbps wired connection appears and green when 1000 Mbps wired connection appears. Other indicators are used to perform coarse antenna alignment. The more indicators are on, the better wireless connection is established. The blinking indicator means an intermediate state. The more often the indicator blinks the higher level connection is established.

3.4.2 Power Supply

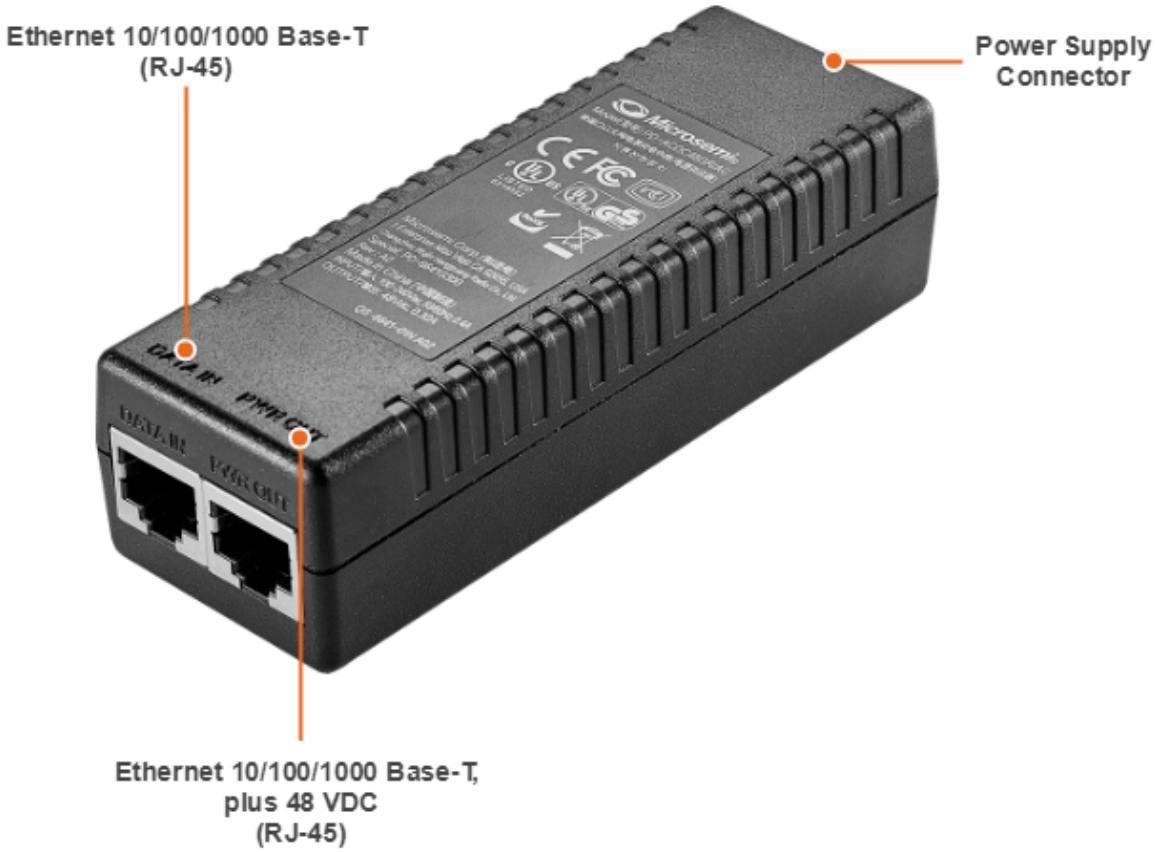


Figure - IDU-CPE-G

Indoor Gigabit PoE Injector with lightning protection for Quanta 5 product family.

Parameter	Description
Size	110*40*30 mm (L*W*H)
Weight	0,110 kg
Connectors and Interfaces	■ "ETH IN" - Ethernet input (Data only) ■ "ETH OUT" - Ethernet output (Data+VDC), PASSIVE PoE ■ "PWR" - AC Input
Supported Ethernet Modes	■ 10/100/1000Mbps

Parameter	Description
Input Power Requirements	■ AC Input Voltage: 100 ... 240 VAC ■ AC Input Current: 0.4A @ 100 VAC ■ AC Frequency: 50 to 60 Hz
Consumption	■ 15,4 W (Garanteed)
Operating temperature range	■ -10 °C ... +50 °C
Operating humidity	■ Maximum 95 %, Non-condensing
Storage temperature	■ -40 °C ... +85 °C
Storage humidity	■ Maximum 95 %, Non-condensing
Output Power Voltage	■ 48 VDC

<table>
<tr><th>Parameter</th><th>Description</th></tr>
<tr><td>Ethernet Connectors Pin-out</td><td>
<table>
<tr><th colspan="2">ETH IN</th><th colspan="2">ETH OUT</th></tr>
<tr><th>Pin</th><th>Description</th><th>Pin</th><th>Description</th></tr>
<tr><td>1</td><td>Data pair A+</td><td>1</td><td>Data pair A+</td></tr>
<tr><td>2</td><td>Data pair A-</td><td>2</td><td>Data pair A-</td></tr>
<tr><td>3</td><td>Data pair B+</td><td>3</td><td>Data pair B+</td></tr>
<tr><td>4</td><td>Data pair C+</td><td>4</td><td>+VDC + Data pair C+</td></tr>
<tr><td>5</td><td>Data pair C-</td><td>5</td><td>+VDC + Data pair C-</td></tr>
<tr><td>6</td><td>Data pair B-</td><td>6</td><td>Data pair B-</td></tr>
<tr><td>7</td><td>Data pair D+</td><td>7</td><td>-VDC + Data pair D+</td></tr>
<tr><td>8</td><td>Data pair D-</td><td>8</td><td>-VDC + Data pair D-</td></tr>
</table>
</td></tr>
<tr><td>Electromagnetic Emission & Immunity</td><td>

FCC Part 15, Class B
EN 55022 Class B
EN 55024
VCCI

</td></tr>
<tr><td>Regulatory Compliance</td><td>

RoHS Compliant, WEEE Compliant, CE Energy Efficiency Level VI

</td></tr>
<tr><td>Safety</td><td>

UL/IEC/EN 60950-1

</td></tr>
</table>

Table - IDU-BS-G(60W) Specification

Figure - IDU-CPE-G Front Panel

Figure - IDU-CPE-GRear Panel

3.4.3 Lightning protection unit

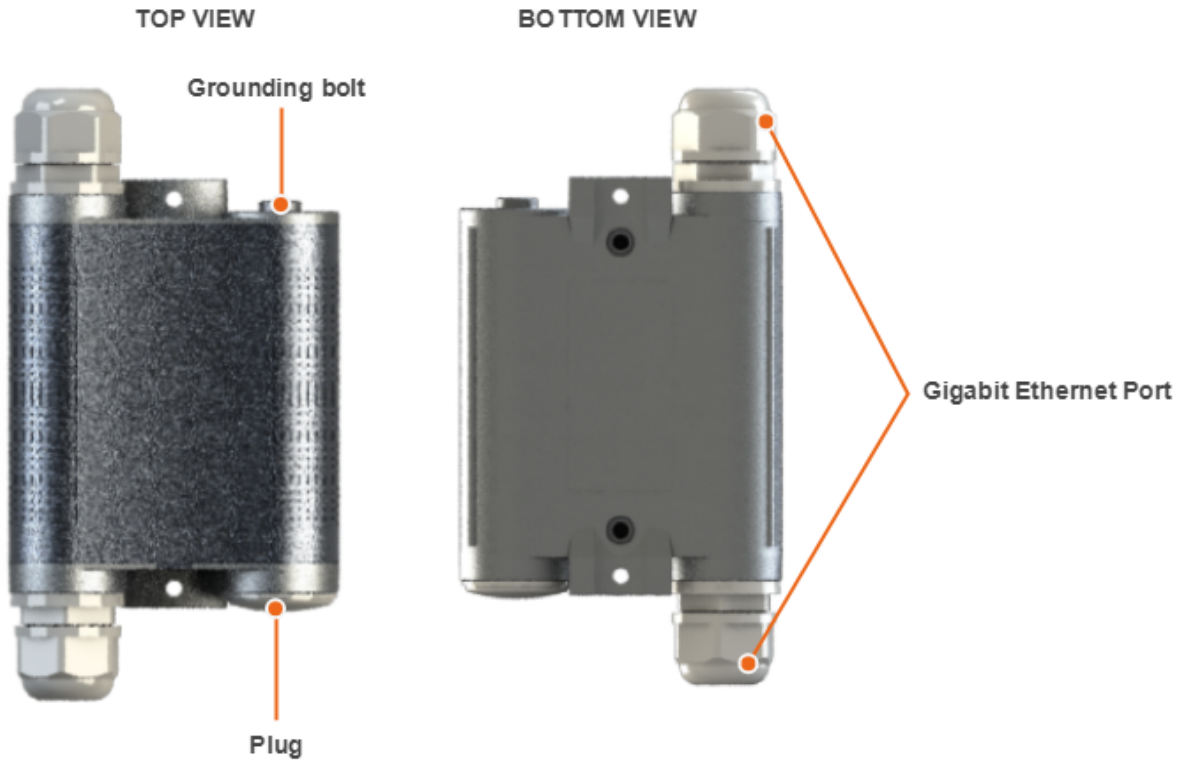


Figure - AUX-ODU-LPU-G

Optional indoor/outdoor Lightning Protection Unit for InfiNet Wireless systems designed to withstand the toughest conditions and protect the outdoor or the indoor unit from sudden power surges induced by lightning strikes. It provides the same level of protection as AUX-ODU-INJ-G.

Despite the fact every InfiNet Wireless unit has a built-in lightning protection, AUX-ODU-LPU-G, thanks to its superior GR-1089-grade protection, greatly reduces the risk of replacing damaged devices operating in harsh environments or difficult-to-reach locations.

NOTE

The device is not supplied by default and must be ordered separately.

Parameter	Description
Size and Weight	▪ 34x94x121 mm, 0.28 kg

<table>
<tr><th>Parameter</th><th>Description</th></tr>
<tr><td>Connectors and Interfaces</td><td>

ETH IN - Ethernet input
ETH OUT - Ethernet output (protected leg)
GND - Ground clamp

</td></tr>
<tr><td>Supported Ethernet Modes</td><td>

10/100/1000 Mbps (Gigabit Ethernet pass-through)

</td></tr>
<tr><td>Water and Dust Protection</td><td>

IP66 and IP67

</td></tr>
<tr><td>Operating temperature range</td><td>

-55 °C ... +60 ºC

</td></tr>
<tr><td>Ethernet Connectors Pin-out</td><td>
<table>
<tr><th colspan="2">ETH IN</th><th colspan="2">ETH OUT</th></tr>
<tr><th>Pin</th><th>Description</th><th>Pin</th><th>Description</th></tr>
<tr><td>1</td><td>Data pair A+</td><td>1</td><td>Data pair A+</td></tr>
<tr><td>2</td><td>Data pair A-</td><td>2</td><td>Data pair A-</td></tr>
<tr><td>3</td><td>Data pair B+</td><td>3</td><td>Data pair B+</td></tr>
<tr><td>4</td><td>Data pair C-</td><td>4</td><td>Data pair C-</td></tr>
<tr><td>5</td><td>Data pair C+</td><td>5</td><td>Data pair C+</td></tr>
<tr><td>6</td><td>Data pair B-</td><td>6</td><td>Data pair B-</td></tr>
<tr><td>7</td><td>Data pair D+</td><td>7</td><td>Data pair D+</td></tr>
<tr><td>8</td><td>Data pair D-</td><td>8</td><td>Data pair D-</td></tr>
</table>
</td></tr>
</table>

Parameter	Description
Lightning Protection	In compliance with: ▪ GR-1089 ▪ IEC 61000-4-2 (ESD) 15kV (air), 8kV (contact) ▪ IEC 61000-4-4 (EFT) 40A (tp = 5/50ns) ▪ IEC 61000-4-5 (Lightning) L5, 95A (tp = 8/20us) ▪ ETSI ETS 300 386

Table - AUX-ODU-LPU-G Specification

Packing list

Figure - Packing list AUX-ODU-LPU-G

3.4.4 Part number description

Quanta 5 part number has the following structure

Structure items are described below

Item	Description
1	Product family name: ■ **Q** - Quanta.
2	Frequency range: ■ **5** - device in the range of 5 GHz.
3	■ **23** - antenna gain (**E** - in case of devices for an external antenna connection).

3.5 Packing List

This section describes the components that are supplied by default with the Quanta 5 model.

Before the installation, please make sure you have all necessary parts and accessories.

- **Outdoor unit Quanta 5 (ODU)**.
- **Power supply**.
- **Cable gland**.
- **Shielded RJ-45 connector.**
- **Unshielded RJ-45 connector**.
- **Mounting kit** - universal assembling kit for mounting the ODU on standard pole, wall or thick pipe (vertical/horizontal).
- **Power cord** - the model depends on the region, according to the Purchase Order.

4 Planning considerations

During link planning such factors as distance, obstacles and the link margin should be taken into account. We strongly recommend to use the InfiPLANNER tool for link planning.

4.1 InfiPLANNER

InfiPLANNER is a link planning tool, which allows to design networks using InfiNet Wireless devices for optimal deployment and cost effectiveness. It performs different scenarios based on geography, distance, antenna height, transmit power, device models and other factors. It outputs an installation report that defines the parameters to be used for configuration, alignment and operation. Use the installation report to compare predicted and actual link performance. InfiPLANNER is available at https://infiplanner.infinetwireless.com.

NOTE

You can find more detailed information about InfiPLANNER in the "InfiPLANNER: Link Planning Tool" online course.

4.1.1 Range and obstacles

Make sure line of sight is provided during planning the antennas placement for a point-to-point link, to achieve maximum range and performance between two antennas. Perform a survey to identify all the obstructions (such as trees or buildings) in the path and to assess the risk of interference.

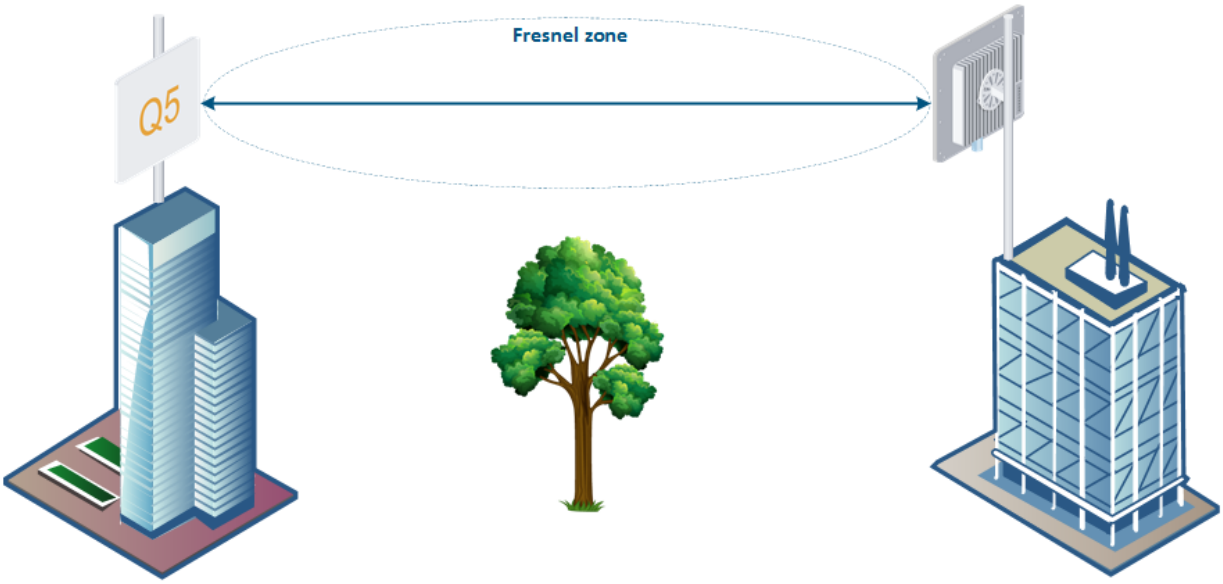
The radio beam is an invisible form of electromagnetic wave propagation and is not as thin as a laser beam, for example. The main energy in a radio beam is concentrated along the straight line between the two antennas, inside an area the shape of an ellipsoid (or a rugby ball). This area is called a 1st Fresnel zone and its exact form and size depends upon the frequency and the signal propagation path length.

If most of the 1st Fresnel zone is obstructed, a major part of the radio wave’s electromagnetic energy is lost, which leads to a severe signal quality degradation and as a result to decreased coverage range or performance.

Below is an incomplete list of possible obstructions on the signal propagation path:

- Neighboring buildings.
- Trees.
- Bridges.
- Power lines.

To obtain the best results, it is necessary to perform a precise analysis of the signal propagation path and possible obstructions that may cover the 1st Fresnel zone.



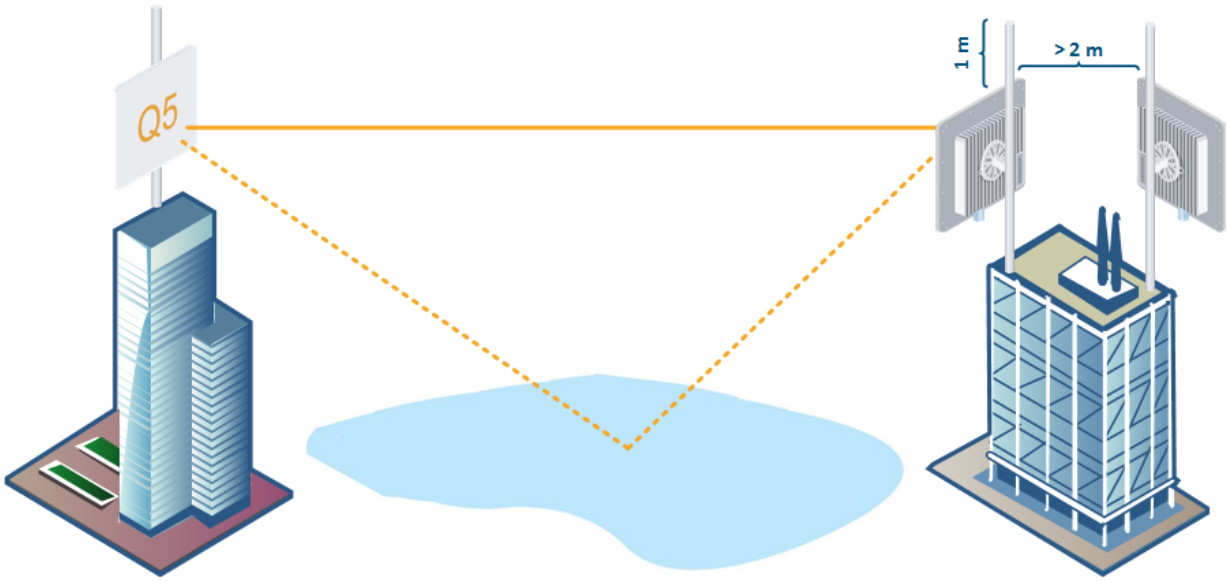
NOTE

More detailed information about radio signal propagation is available at "Wireless Networking Fundamentals" online course.

4.2 Antenna Placement

General recommendations for antenna placement:

- Try to keep the LOS clear of obstructions. In case of installations over vegetation and forest, make sure the direct LOS stays above the trees; in urban environments - above the tallest buildings along the radio path.
- The influence of trees can be variable, depending on seasons (ice, dew, leaves). Keep in mind that, during spring and summer, leaves can absorb high levels of radio energy. Therefore, when installing during the cold season, over forests and trees without leaves, try to achieve a higher fade margin.
- Install antennas as far as possible from other antennas (the recommended distance is at least 2 meters).
- Reflecting surfaces should be considered (buildings with reflective windows, water surfaces or wet grounds). These can be useful in NLOS situations, if there is no direct clear path between the 2 antennas, so the radio signal needs to be reflected off a surface. However, these can also decrease the signal quality when encountered along a clear LOS link, because of fading caused by multipath.
- When installing antennas over water, tune the height bracket within 1-3 meters range variation, because it can yield significant signal level variations due to multipath fading.
- Weather factors such as rain or snow do not usually affect system performance. If seasonal changes influence the signal quality, then the connectors probably are not protected well enough from humidity, or the cables, connectors or antennas are covered by vegetation during summer or ice during winter.



NOTE

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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.

Please note that FCC ID for the model Q5-23 with integrated dual-pol antenna, 23 dBi is **FCC ID: X8Q-Q5-23** and is for the frequency range 5.725 – 5.85 GHz UNII-3 operation.

NOTE

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

- This device may not cause interference.
- This device must accept any interference, including interference that may cause undesired operation of the device.

This Class B digital apparatus complies with Canadian ICES-003.

Following also applies to this radio equipment:

- the band 5150–5250 MHz is only for indoor use to reduce the potential for harmful interference to co-channel mobile satellite systems;
- for devices with detachable antenna, the maximum antenna gain permitted for devices in the bands 5250-5350 MHz and 5470-5725 MHz shall be such that the equipment still complies with the e.i.r.p. limit;
- for devices with detachable antenna, the maximum antenna gain permitted for devices in the band 5725-5850 MHz shall be such that the equipment still complies with the e.i.r.p. limits as appropriate; and
- where applicable, antenna type(s), antenna models(s), and worst-case tilt angle(s) necessary to remain compliant with the e.i.r.p. elevation mask requirement set forth in section 6.2.2.3 of the RSS-247 shall be clearly indicated.
  High-power radars are allocated as primary users (i.e. priority users) of the bands 5250-5350 MHz and 5650-5850 MHz and these radars could cause interference and/or damage LE-LAN devices.

REMARQUE

Cet appareil contient des émetteurs / récepteurs exemptés de licence conformes à la (aux) source(s) RSS de Innovation, Sciences et Développement économique Canada. Le fonctionnement est soumis aux deux conditions suivantes:

- Cet appareil ne doit pas causer d'interférences.
- Cet appareil doit accepter toutes les interférences, y compris celles susceptibles de provoquer un fonctionnement indésirable de l'appareil.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

Ce qui suit s'applique également à cet équipement radio:

- la bande 5150–5250 MHz est uniquement destinée à une utilisation en intérieur afin de réduire le risque de brouillage préjudiciable des systèmes de télécommunication par satellite mobiles dans le même canal;
- pour les dispositifs avec une antenna détachable, le gain d'antenne maximal autorisé pour les dispositifs des bandes 5250-5350 MHz et 5470-5725 MHz doit être tel que l'équipement soit toujours conforme à la norme e.i.r.p. limite;
- pour les dispositifs avec une antenna détachable, le gain d'antenne maximal autorisé pour les dispositifs de la bande 5725-5850 MHz doit être tel que l'équipement soit toujours conforme à la norme e.i.r.p. limites, le cas échéant; et
- le cas échéant, type (s) d'antenne, modèle (s) d'antenne et angle (s) d' inclinaison dans le cas le plus défavorable nécessaire pour rester conforme à la norme e.i.r.p. L'exigence de masque d'altitude énoncée à la section 6.2.2.3 du CNR-247 doit être clairement indiquée.
  Les radars à haute puissance sont attribués en tant qu'utilisateurs principaux (utilisateurs prioritaires) des bandes 5250-5350 MHz et 5650-5850 MHz, et ces radars peuvent provoquer des interférences et / ou endommager les dispositifs LE-LAN.

5 Link Pre-configuration in the lab

Usually, before going into the field, it is recommended to pre-configure in the lab the InfiNet Wireless units to verify the link establishment. Therefore, let's take the units to be used for this course out of the package and place them on the t able.

NOTE

A minimum set of requirements must be met during devices pre-configuration in the lab:

- Make sure the devices are not directed at each other in order to prevent radio modules damage.
- A minimum transmit output power must be set.
- In case of two devices with external antennas, it is recommended to connect them in the link directly, with RF cables and RF attenuators with attenuation of at least 40 dB for each polarization (installation\deinstallation of the RF attenuators and RF cables should only be performed when the devices are switched off).

Step 1: Scheme connection assembling

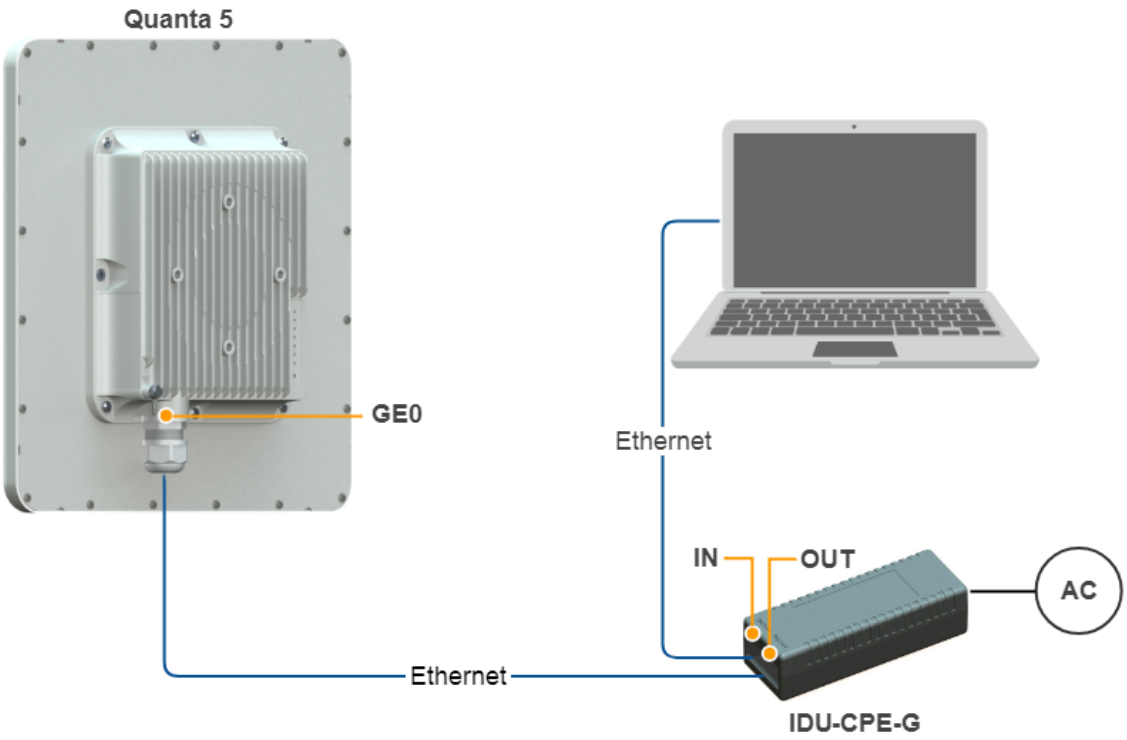
The equipment list required for the lab configuration:

1. Outdoor units - 2 pcs.
2. Power supply - 2 pcs.
3. Power cord - 2 pcs.
4. Ethernet cables - 4 pcs.
5. Laptop with Ethernet port available.

We will perform the settings mentioned below for each unit of the link and check if wireless link was established correctly.

Use the following instruction to assemble a test scheme:

1. Connect Gigabit Ethernet port at the ODU to the power supply port labeled as "OUT".
2. Connect Ethernet port at the laptop to the power supply port labeled as "IN".
3. Connect the power cord to power supply and plug it to AC mains.



Step 2: Access to the device

Let's access each unit to the default IP address 10.10.10.1 with mask 255.255.255.0 via a web browser. Before, make sure the Ethernet port of the Laptop has an IP address assigned from the same subnetwork as the one for the unit (e.g., set 10.10.10.10 with mask 255.255.255.0).

NOTE

We assume that each unit used in this setup has not been configured before and runs with the factory settings.

Use any letters or numbers for the initial authentication on each unit, for example:

- Login: login.
- Password: password.

NOTE

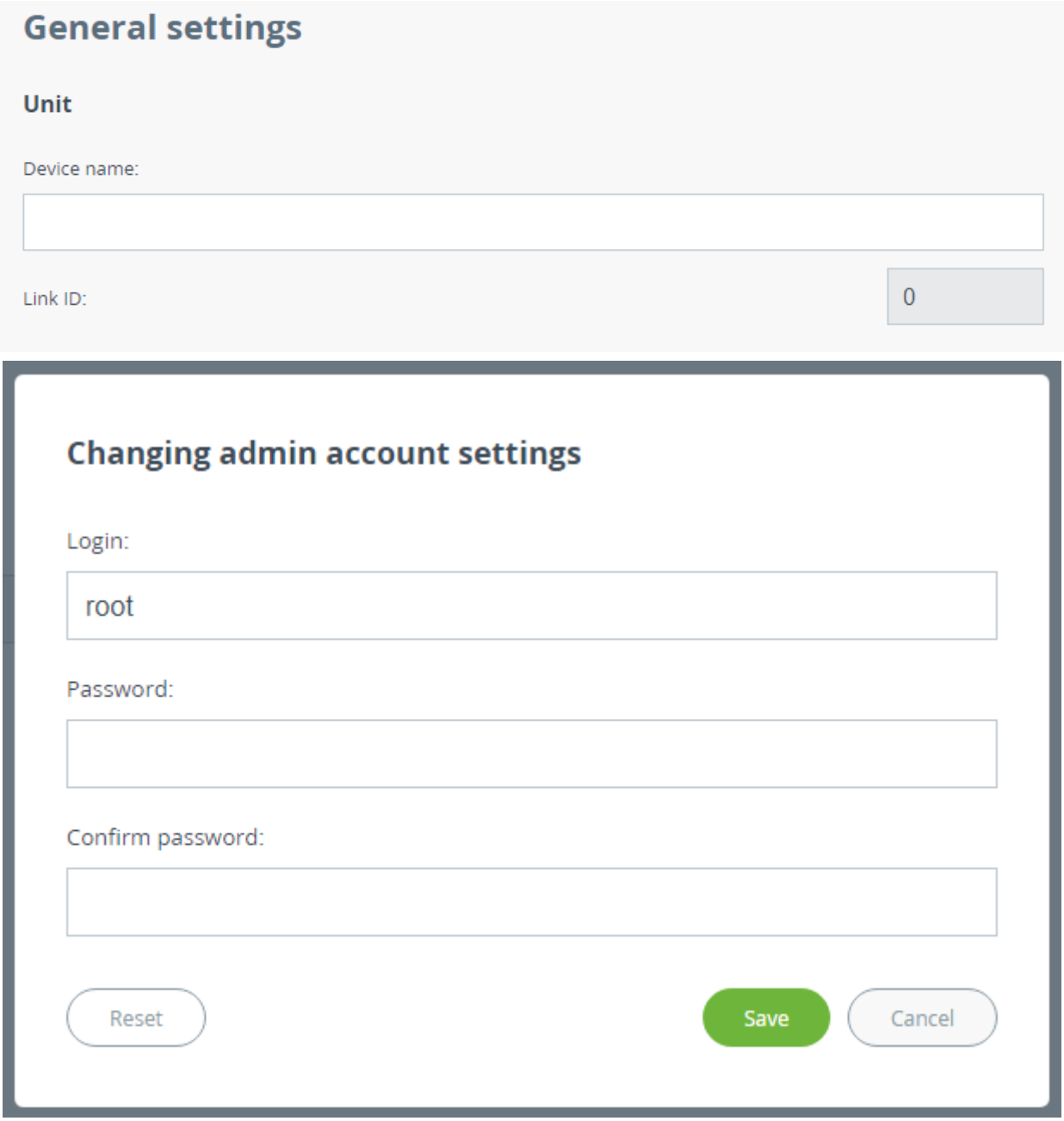
We strongly recommend to change your login and password after the first login.

After the first login, let's configure a distinctive name for each unit and set a custom login and password. Go to the "Settings" → "General" section and configure:

- Device Name (e.g., Master/Slave).

Go to the "Settings" → "Security" section and configure:

- Login (e.g., admin).
- Password (e.g., admin).



NOTE

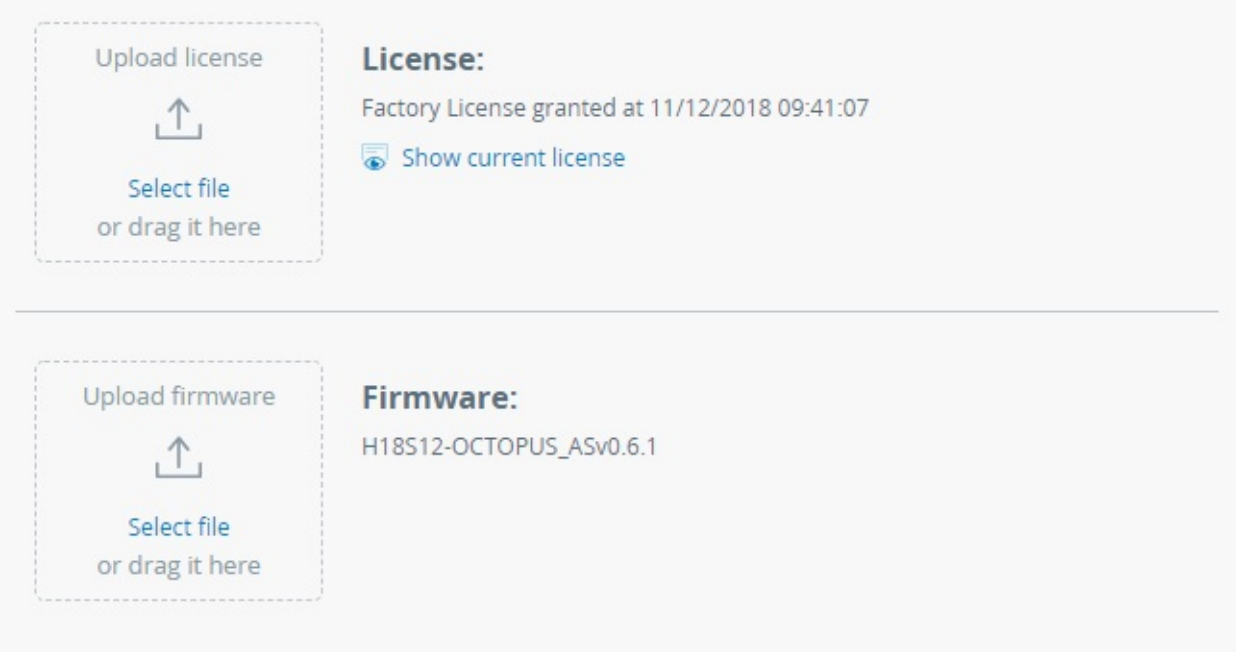
At the next login, type "admin" for the Login and Password (if these are the credentials set before) to access the unit in the privileged mode.

Step 3: Firmware upgrade

Let's upgrade each unit to the latest stable firmware version. Go to the "Maintenance" section and click on the "Check latest release" button. In case a new firmware version is available initiate the firmware upgrade process.

Before, make sure the laptop which is connected to the unit has an Internet connection, too. Otherwise, the manual firmware upgrade process should be performed:

- Download latest release from the ftp server ftp://ftp.infinet.ru/pub/Firmware .
- In the "Maintenance" section click the "Select file" button and set the path to the downloaded file , or drug it to the specified area.
- File will be uploaded to the device. Changes will take force after reboot.



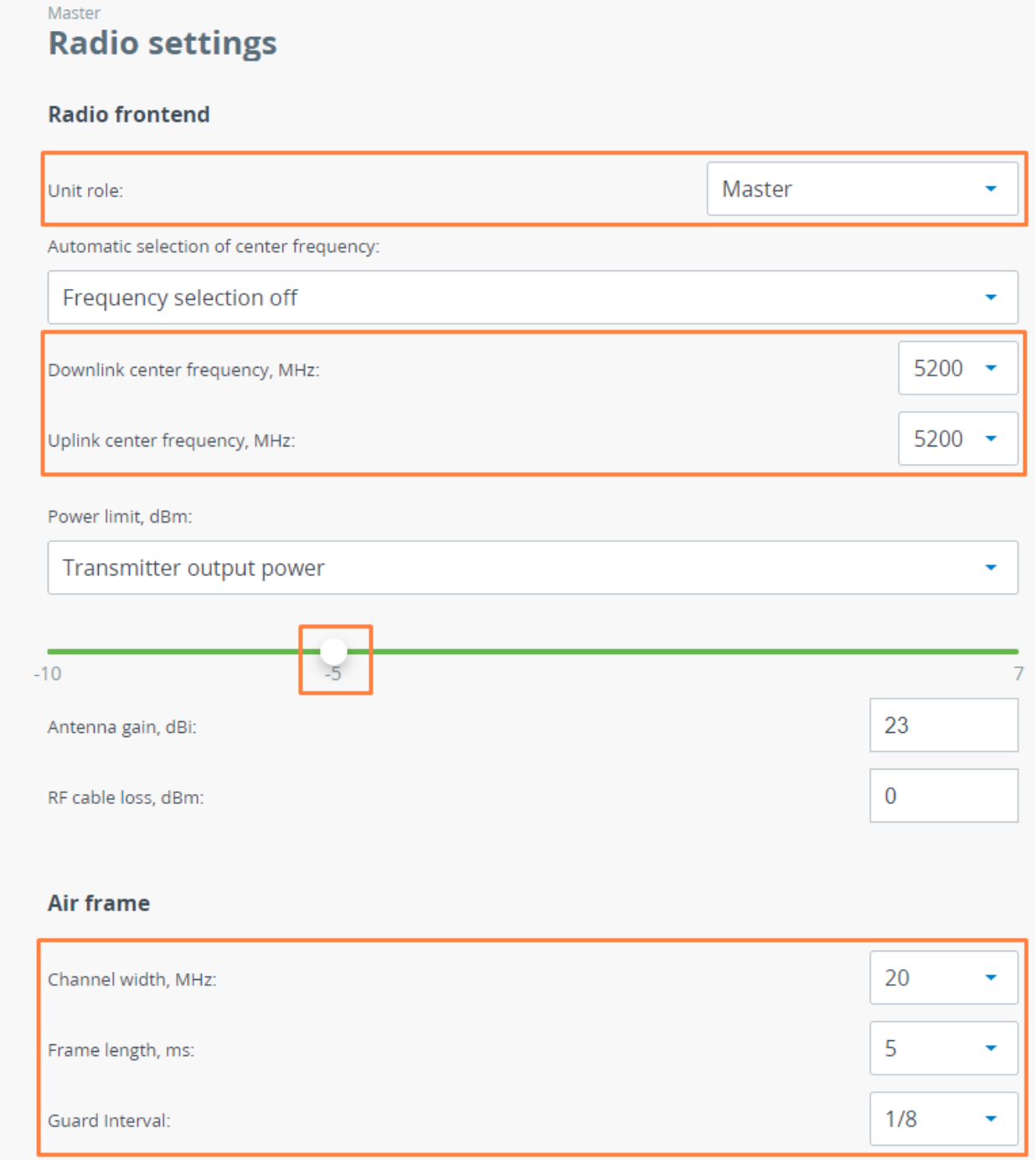
Step 4: Radio parameters configuration

Let's configure the minimum needed radio parameters to establish the link.

At the unit named Master at step #2 above, go to the "Settings" → "General" section and set the "Link ID" parameter, it must be the same on both sides of the link. Then to "Radio" and set this unit with:

- Unit role: Master.
- Downlink center frequency: 5200 MHz (use values selected at the Link Planning stage).
- Uplink center frequency: 5200 MHz.
- Power limit: -5 dBm (set the minimum value in the range, as currently, we are in the lab, and we don't need high output power).
- Channel width: 20 MHz (use value selected at the Link Planning stage).
- Frame length: 5 ms.
- Guard interval: 1/8.

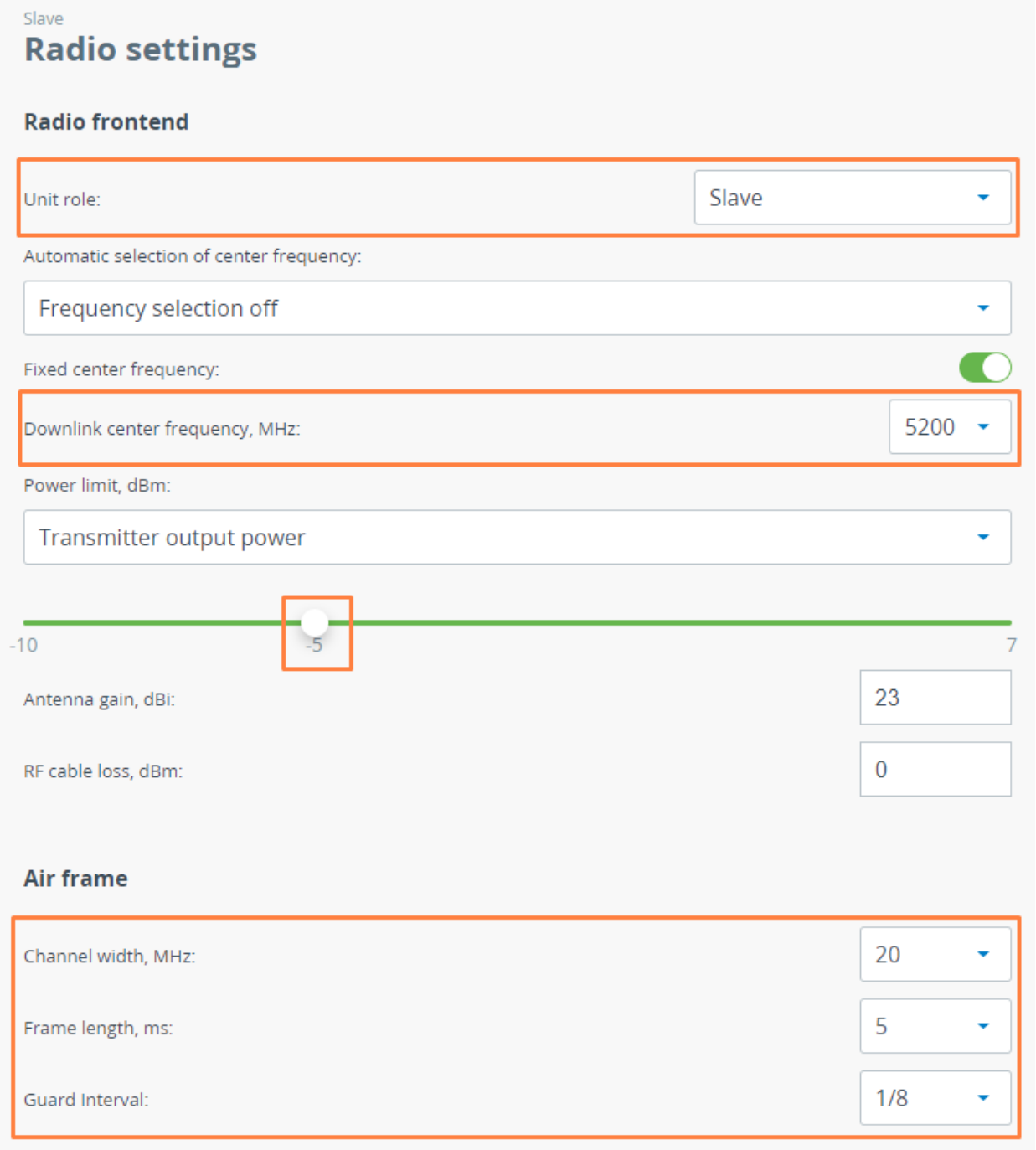
The rest of parameters remain with the default values.



At the unit named Slave at step #2 above, go to the "Settings" → "General" section and set the "Link ID" parameter, it must be the same on both sides of the link. Then to "Radio" and set this unit with:

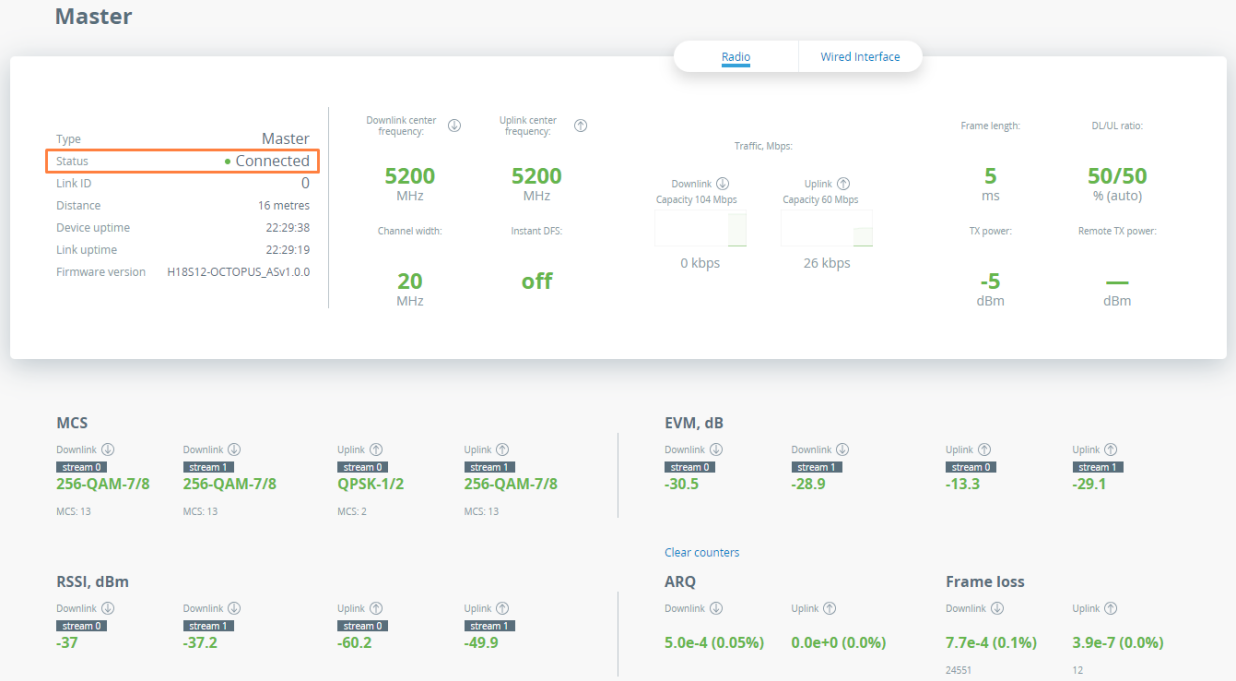
- Unit role: Slave.
- Downlink center frequency: 5200 MHz (use value selected at the Link Planning stage).
- Power limit: -5 dBm (set the minimum value in the range, as currently, we are in the lab, and we don't need high output power).
- Channel width: 20 MHz (use value selected at the Link Planning stage).
- Frame length: 5 ms.
- Guard interval: 1/8.

The rest of parameters remain with the default values.



Step 5: Check the wireless link status

Let's apply all settings described above for each unit and go to the "Dashboard" section and check if the device status has changed to "Connected".

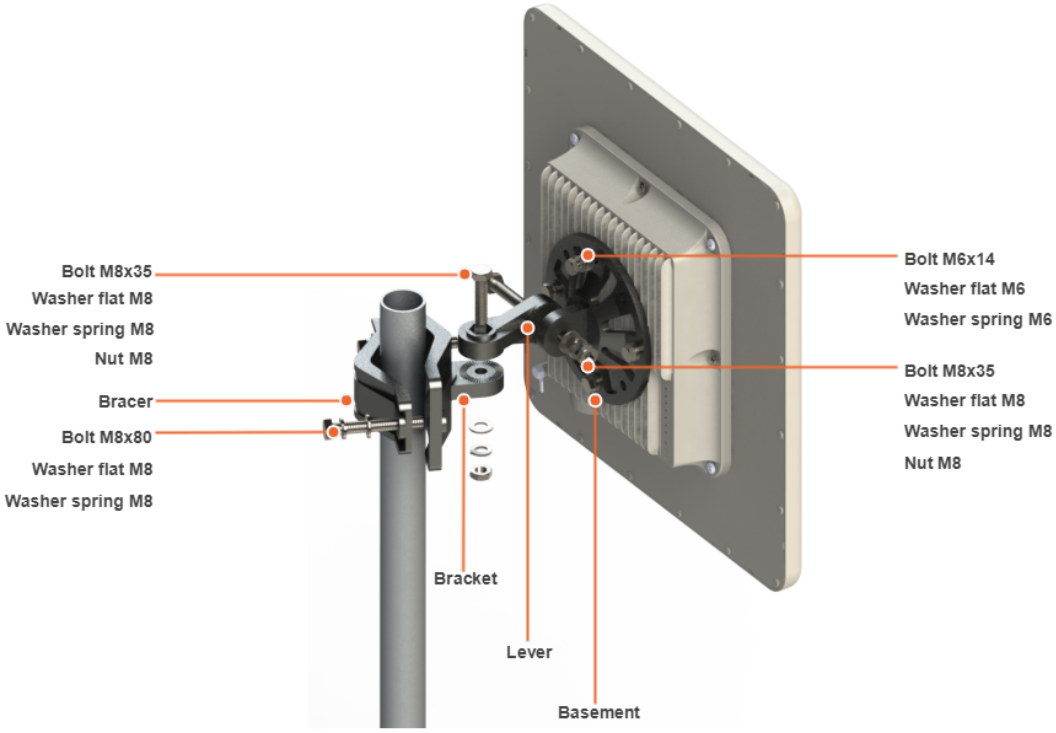

Master
Radio
Wired Interface
Type
Master
Status
Connected
Link ID
0
Distance
16 metres
Device uptime
22:29:38
Link uptime
22:29:19
Firmware version
H18S12-OCTOPUS_ASv1.0.0
Downlink center frequency:
5200
MHz
Uplink center frequency:
5200
MHz
Channel width:
20
MHz
Instant DFS:
off
Traffic, Mbps:
Downlink
Capacity 104 Mbps
0 kbps
Uplink
Capacity 60 Mbps
26 kbps
Frame length:
5
ms
DL/UL ratio:
50/50
% (auto)
TX power:
-5
dBm
Remote TX power:
—
dBm
MCS
Downlink stream 0
256-QAM-7/8
MCS: 13
Downlink stream 1
256-QAM-7/8
MCS: 13
Uplink stream 0
QPSK-1/2
MCS: 2
Uplink stream 1
256-QAM-7/8
MCS: 13
EVM, dB
Downlink stream 0
-30.5
Downlink stream 1
-28.9
Uplink stream 0
-13.3
Uplink stream 1
-29.1
Clear counters
RSSI, dBm
Downlink stream 0
-37
Downlink stream 1
-37.2
Uplink stream 0
-60.2
Uplink stream 1
-49.9
ARQ
Downlink
5.0e-4 (0.05%)
Uplink
0.0e+0 (0.0%)
Frame loss
Downlink
7.7e-4 (0.1%)
24551
Uplink
3.9e-7 (0.0%)
12

6 Installation

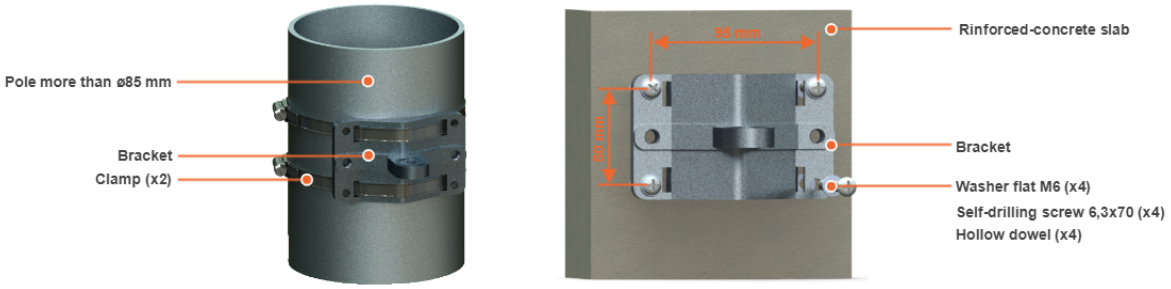
- Mounting kit
- Cable Gland Assembly
- Mounting
- Grounding and Lightning Protection
- Antenna Alignment

6.1 Mounting kit

MONT-KIT-85 is supplied with device by default. It allows to make reliable and easy installation of the unit with two-axis adjustment. Assemble the Mounting kit according to the scheme below. The nut must be tightened until the spring washer clicks, without over-tightening.



Mounting is carried out on a pole with a diameter 30-85 mm. There are also possible options for mounting on a wall or pole with a diameter more than 85 mm.



NOTE

Clamps and other optional fasteners are not included in the Mounting kit MONT-KIT-85.

6.2 Cable Gland Assembly

Required components are listed below.

1. Unshielded RJ-45 connector.
2. Shielded RJ-45 connector.
3. FTP Cat5e cable.
4. Cable gland:
    - Cable sealing nut.
    - Cable sealing grommet with rubber seal.
    - Cable gland case.
5. Crimping tool for RJ-45 connector.

NOTE

The outside diameter value of the FTP Cat5e cable should not exceed 7 mm.

6.2.1 Assemble procedure

In order to ensure that the device case remains sealed under any environmental conditions follow the assemble procedure:

- **Step 1**: Insert the sealing insert into the clamping claw.
- **Step 2**: Assemble the cable gland by putting the thread-lock sealing nut, clamping claw with sealing insert and body onto the cable as shown on the figure.
- **Step 3**: Insert the clamping claw with sealing insert into the body as shown on the figure.
- **Step 4**: Crimp the standard RJ-45 connector onto the cable using crimping tool. Pin-out scheme: T568B wiring standards

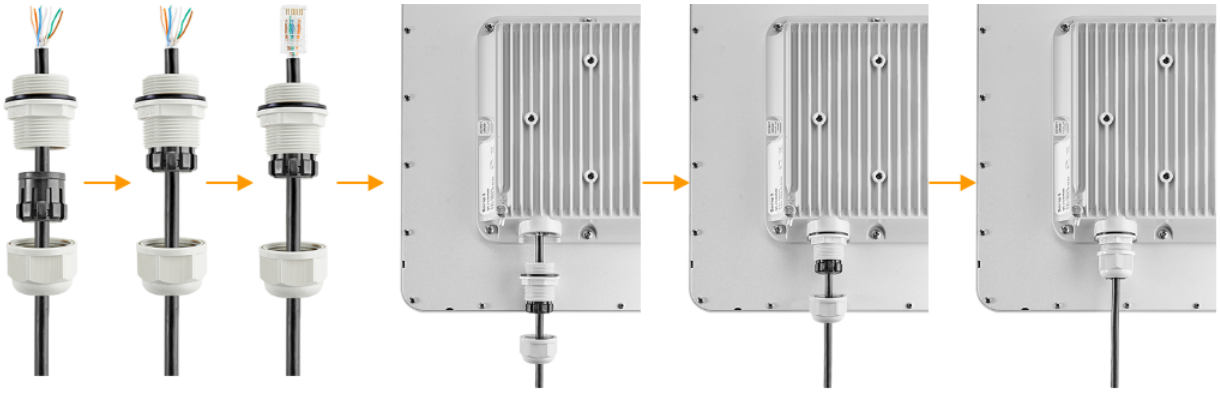
NOTE

Do not use the shielded RJ-45 connector on this end of the cable as it should be attached on the power supply unit end.

CAUTION

Make sure that the RJ-45 connector is well-crimped. A loose connector can damage the device. Please note that such damage is not covered by the warranty.

- **Step 5**: Insert the Rj-45 connector into the device socket until you hear a click.
- **Step 6**: Screw the cable gland body into the port and tighten it. Do not apply excessive force.
- **Step 7**: Tighten the thread-lock sealing nut. Do not apply excessive force.



6.3 Mounting

6.3.1 //<![CDATA[AJS.toInit(function(){ /* For anonymous users */ if (AJS.params.remoteUser == ''){ /* Remove action menu on selected text */ AJS.$('#action-menu-link').hide(); /* Remove comments section */ AJS.$('#comments-section').hide(); /* Find elements with inline comments */ var commentedElements = Array.from (document.getElementsByClassName("inline-comment-marker")); /* If any found */ if (commentedElements.length > 0) { /* For each inline-commented element clear data-ref and class */ for (var i=0; i < commentedElements.length; i++) { commentedElements[i].dataset.ref= ""; commentedElements[i].className = ""; } } /* Else do nothing */ } }); //]]> Pre-installation

Reqiered tools

- Screwdriwer set.
- Pliers / pipe wrench.
- Wrench set.

Additional equipment

- GPS receiver.
- High magnification binoculars.

Before mounting the equipment in an outdoor environment, please make sure that:

- You acknowledge the regulations imposed by the Regulatory Authority for Communications in your country for the radio spectrum to be used.
- You chose known locations for the installation of the links; although InfiNet Wireless devices can also operate in Near-LoS or Non-LoS conditions, to achieve the best performance, it's highly recommended to install the link in locations where Clear-Line-of-Site and clear channels are available.
- You performed link planning using the InfiPLANNER tool (https://infiplanner.infinetwireless.com) to determine the link path profiles, radio equipment placement requirements, etc.

6.3.2 Quanta 5 Installation Pro cedure

1. In case of device with external antenna. Prepare RF cables of the required length, recommended maximal length is 1 meter. Install and isolate the connectors on the RF cable.

CAUTION

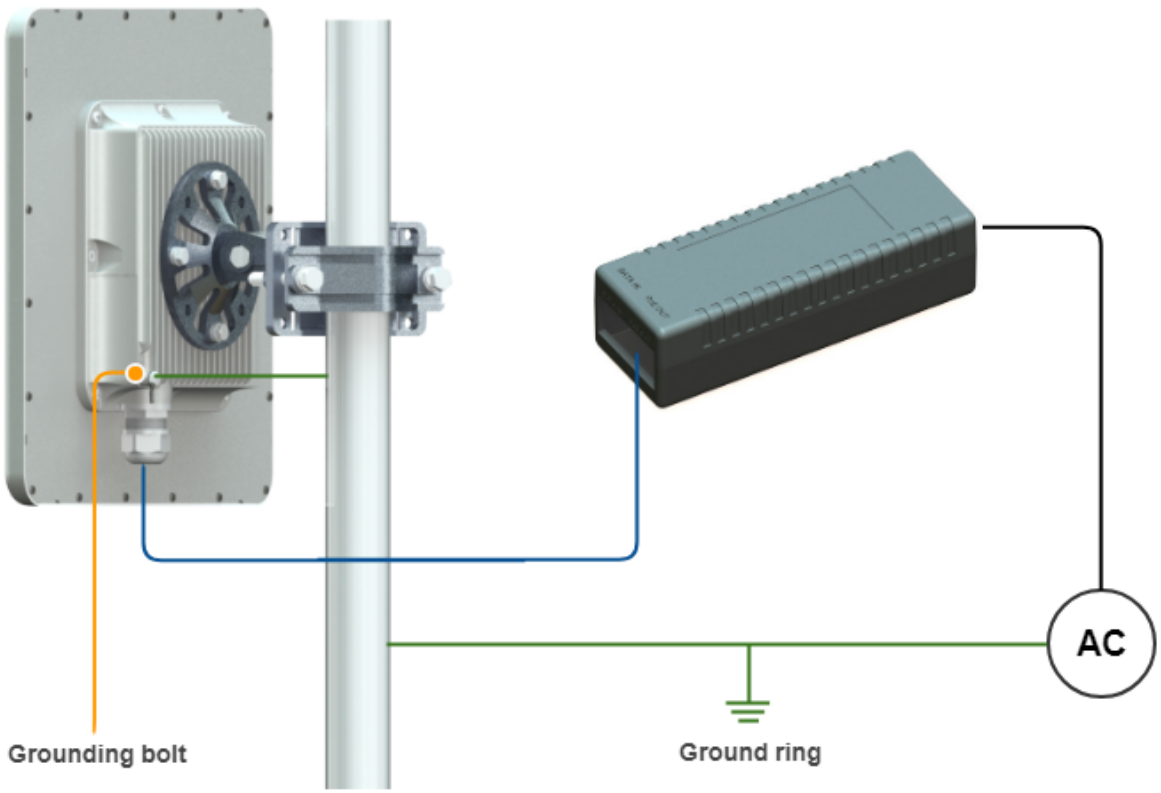
In order to prevent device damage make sure that antenna is connected to both N-type connectors with serviceable RF cables before switching on .

2. Install ODU connector facing down using the MONT-KIT-85. Do not tighten the fasteners to the end until the alignment is completed.
3. Connect the Cat5e FTP cable with the cable gland to ODU.
4. Perform ODU grounding.
5. Lay the Cat5e FTP cable from ODU to the power supply.
6. Connect the Cat5e FTP cable with a shielded connector covered by a cap to the "OUT" port of the power supply, having previously touched the power supply connector case with FTP cable connector case.
7. Perform the power supply grounding.
8. Connect the laptop using Cat5e FTP cable to the power supply "IN" port.
9. Connect the power cord to the power supply and then to the power circuit.

CAUTION

Use mains supply cords that adhere to safety regulations of the country where the equipment is getting deployed.

Make sure a small loop (at least 10 cable diameters) is provided before the Cat5e FTP cable enter into the building.



6.4 Grounding and Lightning Protection

This section describes factors to be considered when planning the proposed link end sites, including grounding, lightning protection and equipment location for the wireless device, power supply and AUX-ODU-LPU-G unit (if installed).

CAUTION

Electro-magnetic discharge (lightning) damage is not covered under warranty. The recommendations in this document, when followed correctly, give the user the best protection from the harmful effects of EMD. However 100% protection is neither implied nor possible.

6.4.1 Grounding and lightning protection recommendations

- The wireless device should be placed on the pole at a height that is at least 1 meter below the top of the pole. In this case, there is a significant probability that the lightning strikes the pole and not the wireless device. The pole should be properly grounded: connected to the building lightning protection circuit according to your local regulations.
- All equipment must be connected at stabilized and surge protected power sources which must be properly grounded.
- The end of the FTP service cable that is connected to the power supply should be assembled with a shielded RJ-45 connector. The other end of the FTP service cable (connected to the wireless device) should be assembled with unshielded (standard) RJ-45 connector.
- The power supply is grounded via a three-conductor power cord and a grounded socket.
- AUX-ODU-LPU-G grounding is performed using grounding bolt.
- Antenna pole and wireless device should be connected to the common ground ring. Grounding cables should be no less than 10AWG thick and must use corrosion-resistant connectors.
- Special attention should be paid if the external antenna used is not DC-shorted. In this case, an additional lightning arrestor should be used between the antenna and ODU.

6.4.2 Requirements to the lightning protection unit location

AUX-ODU-LPU-G is an optional accessory which may be used to serve as a line protection unit for the ODU and for the indoor network equipment connected to the Ethernet port of the IDU.

AUX-ODU-LPU-G should be properly assembled, mounted and grounded.

General recommendations for installations of lightning protection units:

- Install the lightning protection unit on both ends of the cable to protect both the outdoor and the indoor unit. The purpose of the LPU at the top is to protect the ODU from a surge of lightning strike which can hit the long FTP cable run along the height of the pole or on the roof of the building. The purpose of the LPU at the bottom is to protect the IDU and customer equipment.
- Use the lightning protection unit to protect all circuits for signal transmission and power supply (video, audio, management signals, Ethernet, etc.)
- Regularly (especially before the periods with high thunderstorm activity) check the integrity of lightning protection units, grounding elements and bonding conductors.

Make sure to install the two LPU devices in the correct polarity, as shown in the diagram:

- Top LPU with "ETH OUT" facing the ODU.
- Bottom LPU with "ETH OUT" facing the IDU.
- LPU units connected to each other via "ETH IN".

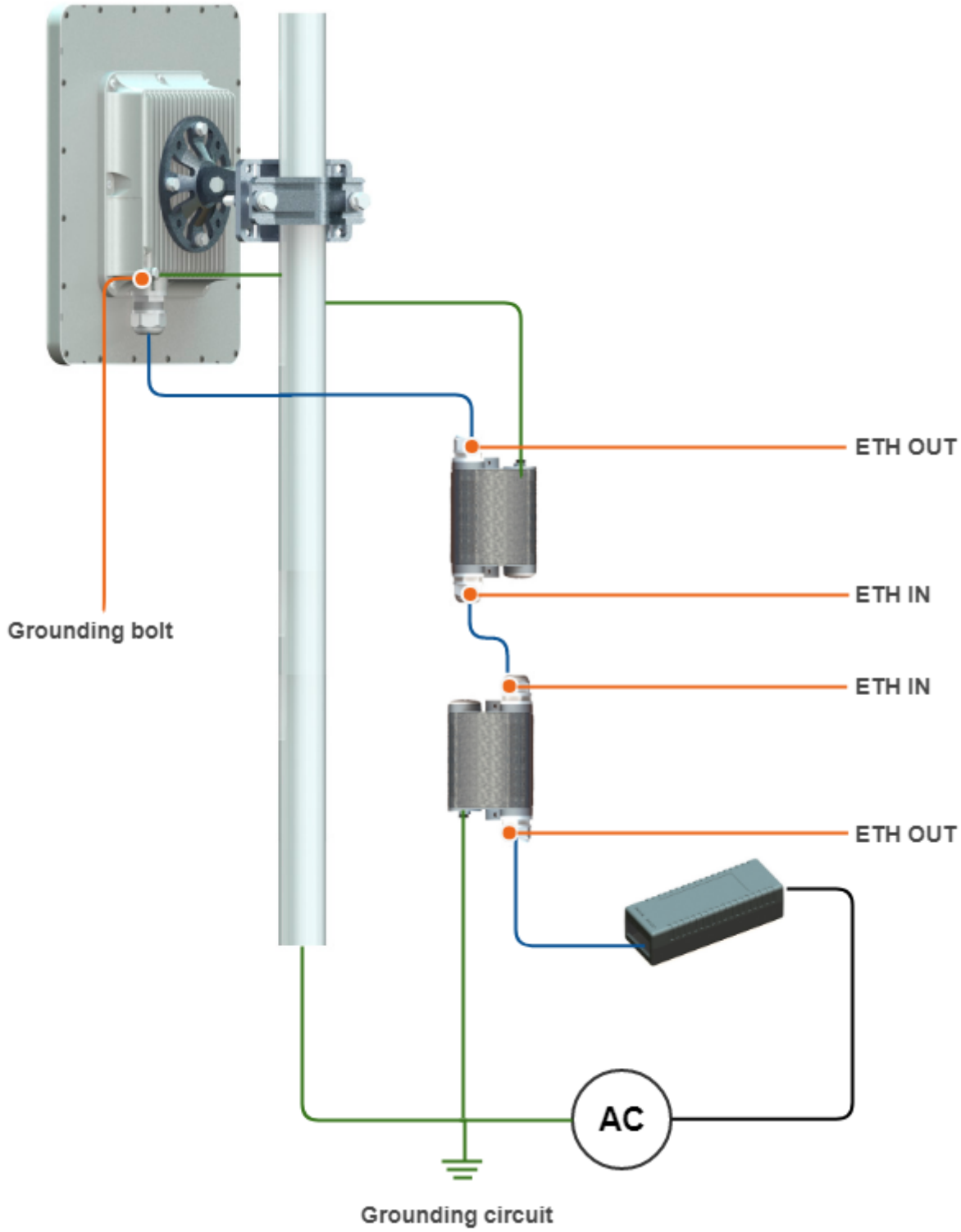


Figure - AUX-ODU-LPU-G Assembly Scheme

AUX-ODU-LPU-G Mounting

AUX-ODU-LPU-G can be installed on a pole, using hose clamps. Attach the grounding cable (min cross-section 2.5 mm^2) to the case, using grounding bolt.

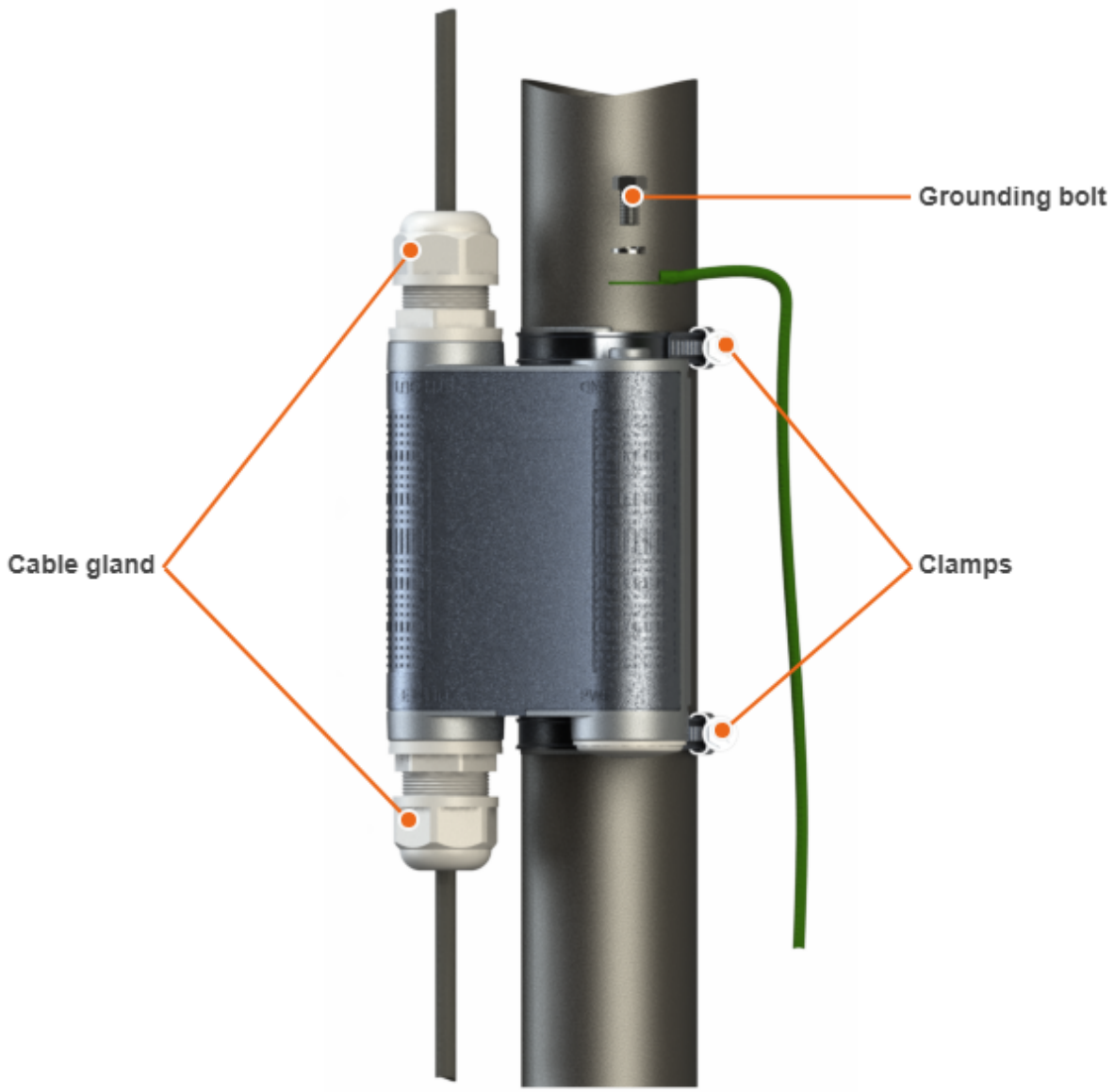


Figure - AUX-ODU-LPU-G Mounting

During AUX-ODU-LPU-G mounting it is necessary to provide a small loop of the FTP Cat5e cable that should be below the cable gland. These ensure that water is not constantly channeled towards the connectors. It will also serve as a cable compensator for the cable linear expansion as the temperature difference result.

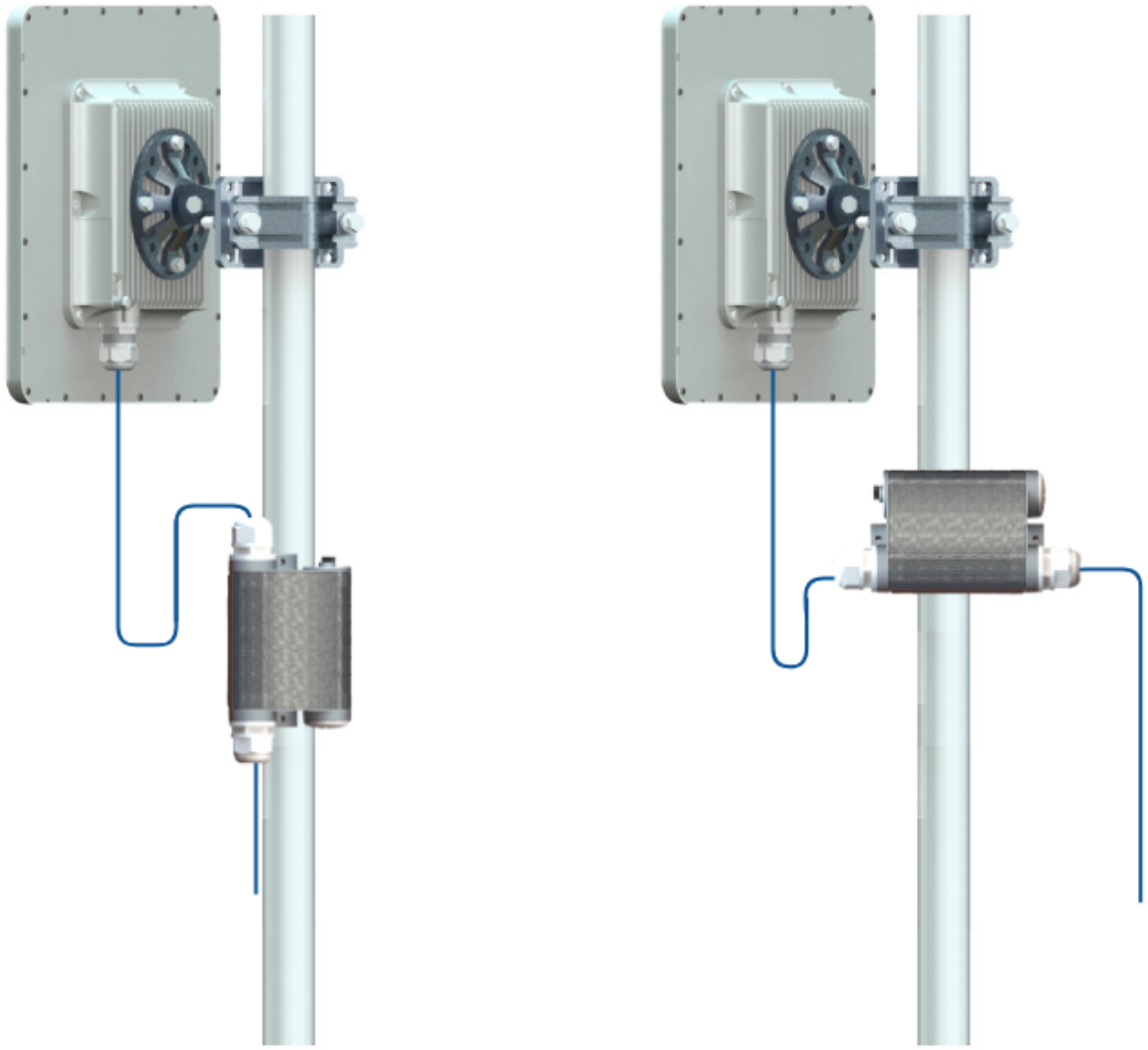


Figure - Cable loop

CAUTION

Missing or bad grounding may leave the unit vulnerable to lightning damage.

AUX-ODU-LPU-G Cable Ggland Assembly

In order to ensure that the cable gland remains sealed under any environmental conditions, please, follow the assembly sequence according to the procedure below:

- **Step 1**: Insert the sealing insert into the clamping claw.
- **Step 2**: Assemble the cable gland by putting the thread-lock sealing nut, clamping claw with sealing insert and body onto the cable as shown on the figure.
- **Step 3**: Insert the clamping claw with sealing insert into the body as shown on the figure.
- **Step 4**: Crimp the standard RJ-45 connector onto the cable using crimping tool. Pin-out scheme: T568B wiring standards.

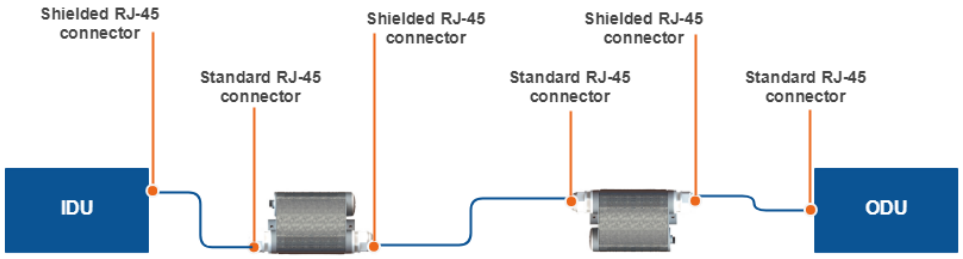
CAUTION

Make sure that the RJ-45 connector is well-crimped. A loose connector can damage the device. Please note that such damage is not covered by the warranty.

NOTE

For connection to "ETH IN" terminate the cable with the standard RJ-45 connector (4) according to the EIA/TIA-568B.

For connection to "ETH OUT" terminate the cable with the shielded RJ45 connector (5) according to the EIA/TIA-568B (to provide grounding circuit).



- **Step 5**: Insert the Rj-45 connector into the corresponding socket until you hear a click.
- **Step 6**: Screw the cable gland body into the port and tighten it. Do not apply excessive force.
- **Step 7**: Tighten the thread-lock sealing nut. Do not apply excessive force.

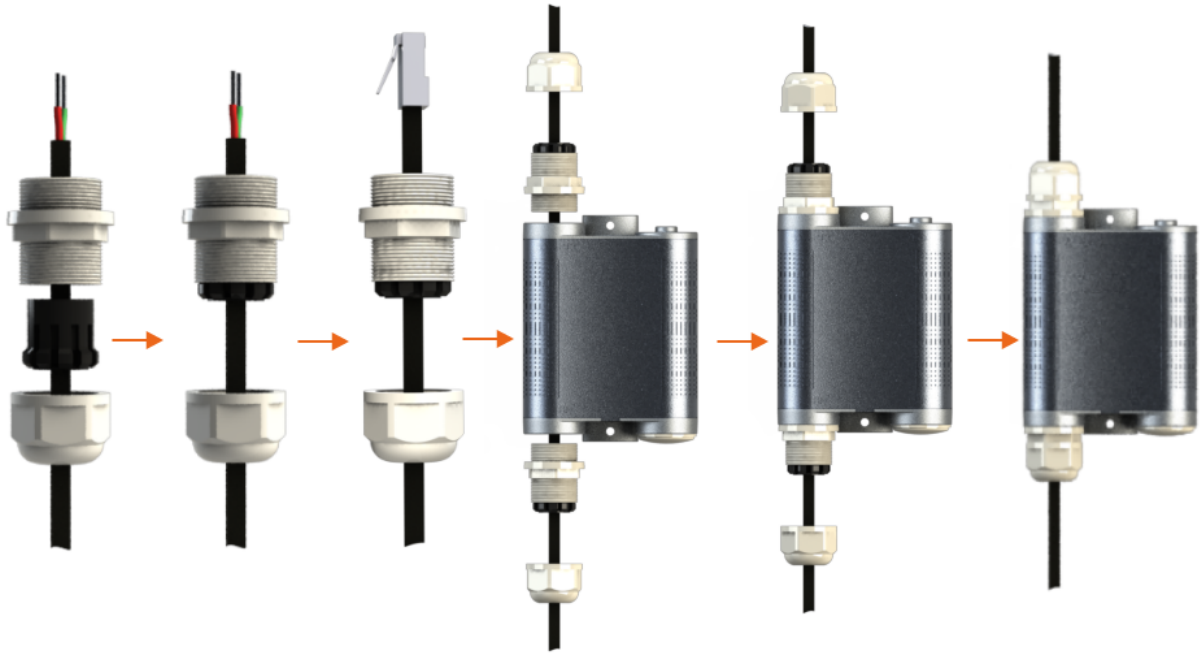


Figure - AUX-ODU-LPU-G Cable Gland Assembly Scheme

6.5 Antenna Alignment

6.5.1 //<![CDATA[AJS.toInit(function(){ /* For anonymous users */ if (AJS.params.remoteUser == ''){ /* Remove action menu on selected text */ AJS.$('#action-menu-link').hide(); /* Remove comments section */ AJS.$('#comments-section').hide(); /* Find elements with inline comments */ var commentedElements = Array.from (document.getElementsByClassName("inline-comment-marker")); /* If any found */ if (commentedElements.length > 0) { /* For each inline-commented element clear data-ref and class */ for (var i=0; i < commentedElements.length; i++) { commentedElements[i].dataset.ref= ""; commentedElements[i].className = ""; } } /* Else do nothing */ } }); //]]> General recommendations

- It is recommended to have two teams prepared for alignment procedure, each team with at least two members: one should take the signal readings and communicate with the remote end, the other should manipulate the antenna.
- For rough alignment use the azimuth, elevation angle and suspension height from InfiPLANNER report.
- On the device case there is a scale indicating the received signal level. The more often indicator flashes, the better quality of the connection. Blinking indicator shows an intermediate state, the more often indicator is blinking, the higher the connection level.
- For more accurate alignment, use the alignment tool built into the device web interface.
- After the initial alignment, the device at the remote side must be fixed. Firstly, the alignment is performed for one device, then for another.

6.5.2 Alignment tool

Use the Alignment tool to point and optimize the antenna in the direction of maximum link signal. The built-in graphical antenna alignment tool displays the signal levels for both devices and both polarizations, this makes an alignment process fast and accurate.

A green marker indicates the current signal level. To achieve the best performance, this marker should be as close as possible to the gray area values, which displays the maximum calculated value possible for this link. A gray marker indicates the maximum value that was reached on this channel.

7 Operation & Administration

- Web GUI Access
- Dashboard
- General settings
- Security settings
- Radio settings
- Network settings
- Switch Settings
- Spectrum Analyzer
- Antenna Alignment Tool
- Maintenance
- SNMP settings

7.1 Web GUI Access

Web User Graphical Interface (**Web GUI**) - is the basic way to configure and operate a wireless unit.

WANFleX OS starts automatically when you power on the unit, Web GUI is enabled by default. In order to access the unit via Web browser, type an IP address in the address bar.

NOTE

By default any username and any password can be used to login Quanta 5 Web GUI.

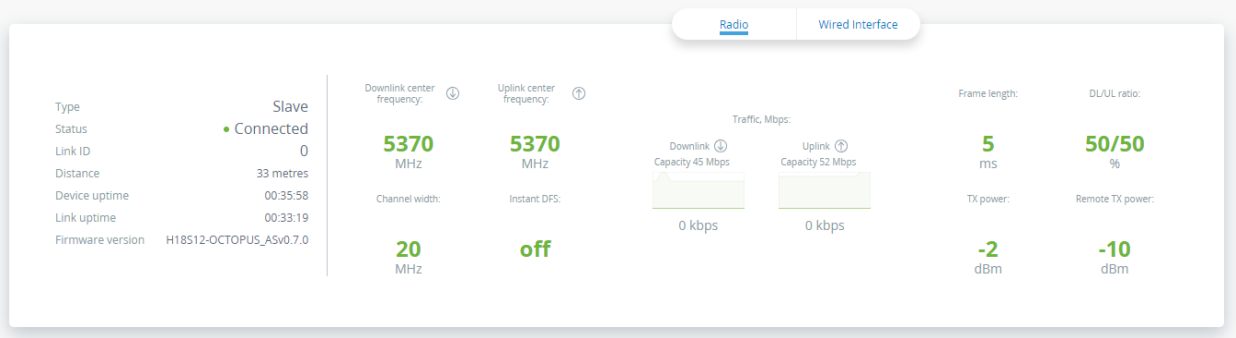
It's strongly recommended to set permanent username and password after the first log in. In order to do this go to the "General settings" section.

Figure - Web GUI login

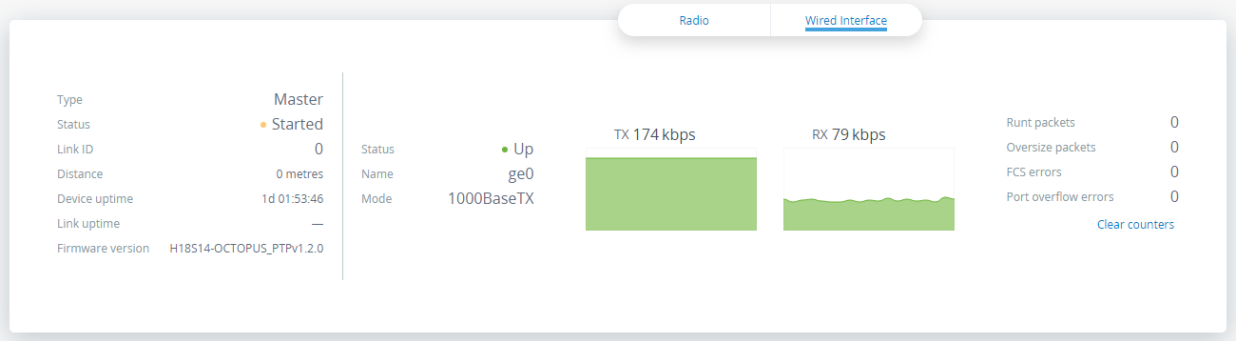
7.2 Dashboard

This section is intended to provide the main information about the wireless unit operation.

The Dashboard displays a read-only summary of the current link status information, local and remote device signal strength, capacity for downlink and uplink, current values of the basic configuration settings and Ethernet network status.



The “Radio” tab displays the current settings of the wireless connection, as well as the link load in the uplink and downlink directions.

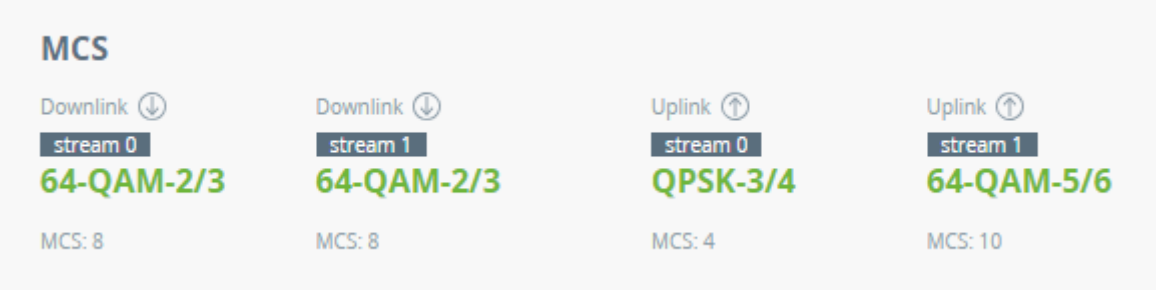


In the "Wired interface" tab, the Ethernet interface status can be monitored, as well as duplex mode and traffic load for reception and transmission. The wired interface statistic is available on the right side, it can be reset by the "Clear counters" button.

Parametr	Description
Runt packets	Packets less than 64 bytes in size
Oversize packets	Packets larger than 1518 bytes
FCS errors	Packets dropped due to checksum mismatch
Port overflow errors	Packets dropped due to port buffer overflow

7.2.1 Modulation code scheme

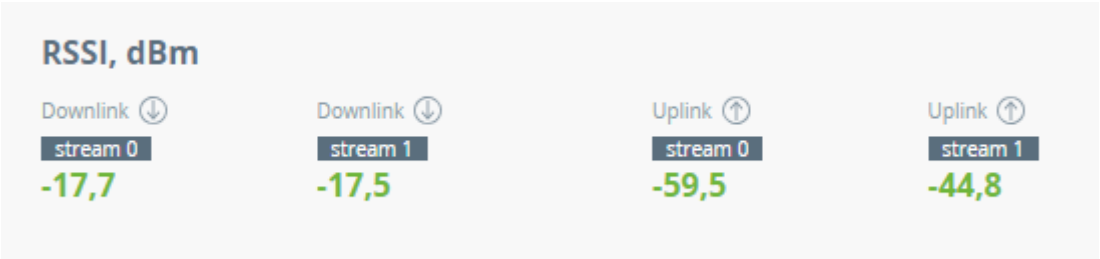
7.2.2 On Quanta 5 device, modulation and coding schemes are selected independently for each channel (uplink and downlink) for both polarizations. Current modulation for each channel is displayed in the MCS subsection.



7.2.3 Received signal strength indicator

The RSSI indicator displays the received signal level for each channel (uplink and downlink) and both polarizations. Available values:

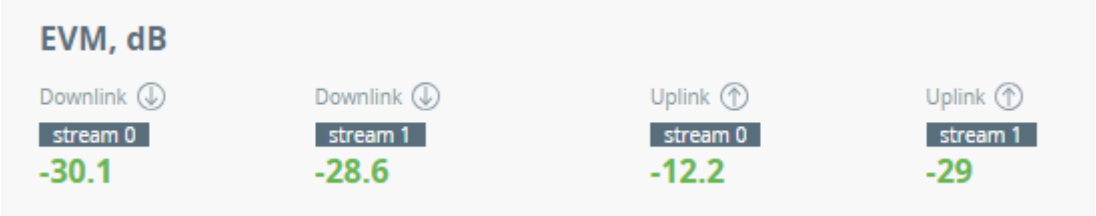
- **-90...-80 dBm** - close to the receiver sensitivity level, only the lowest modulations are available.
- **-80...-60 dBm** - average input range.
- **-60...-40 dBm** - the recommended range for achieving best performance.
- **>-40 dBm** - input signal level is too high.



7.2.4 EVM

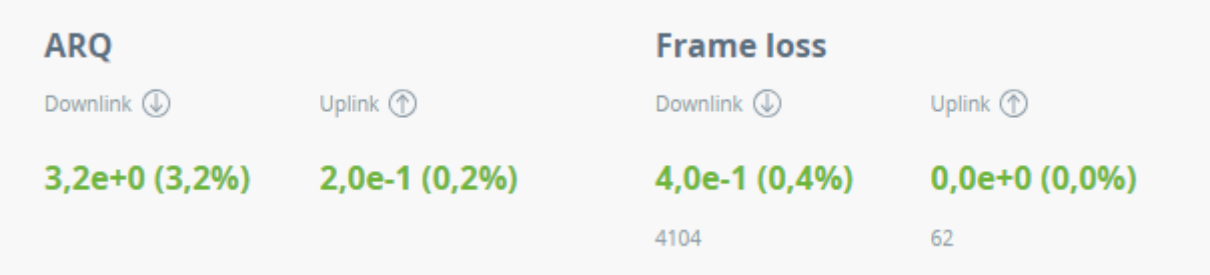
Error vector magnitude - indicator of the measured input signal quality, telling how far are the received constellation symbols compared to the ideal symbols of the constellation. The parameter value must be as high as possible in absolute value.

The recommended level should be less than -21 dB.



7.2.5 Retries and Frame loss

Retried and lost packets need also to be tracked. Retries should tend to zero, link with the retries value more than 5% should not be allowed to operation.



NOTE

Downlink - the direction from Master to Slave, Uplink - the direction from Slave to Master. These directions are correct for the whole link and do not depend on the roles of the devices.

7.3 General settings

The "General settings" section allows to configure basic system parameters, described in the table below.

This section includes two main csubsections:

7.3.1 Unit

These parameters are used for identification and link authorization.

Parameter	Description
Device Name	The arbitrary wireless unit name which will be used by network administrators for unit identification. It will be shown in Web GUI side panel.
Link ID	Wireless link identificator used to avoid connecting a unit to a wrong peer if there are several co-located units using the same center frequency. Specify different ID values for different links. Both ends of the same link must have the same ID.

Unit parameters description

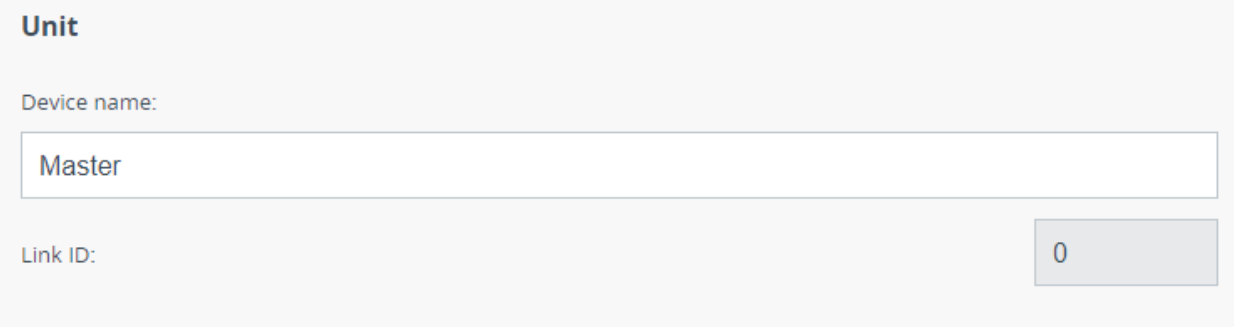


Figure - Unit parameters

7.3.2 Regulatory domain

Regulatory domain automatically limits the wireless device operation which is may be needed to meet the local law requirements. Each regulatory domain may limits the following parameters:

- Range of available center frequencies
- Requirement of use LBT (Listen Before Talk) technique.
- Maximum EIRP (Equivalent Isotropically Radiated Power) value.
- Requirement of use radar detection technique.

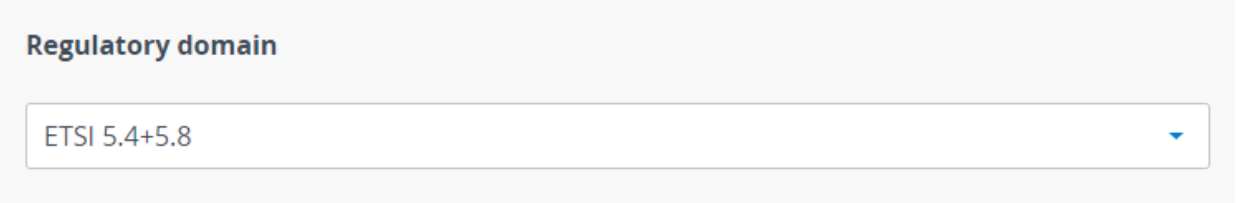


Figure - Regulatory domain settings

7.3.3 SNTP

Starts the SNTP time synchronization service. For proper operation, specify the SNTP server time zone and the IP address first. By default, the SNTP service is disabled.

Parameter	Description
SNTP Server Address	The SNTP server IP address, the SNTP service will synchronize the time on the device with. The device must have network access to the SNTP server.
Time Zone	The time zone at the place of device installation. For example: GMT + 5.

SNTP parameters description

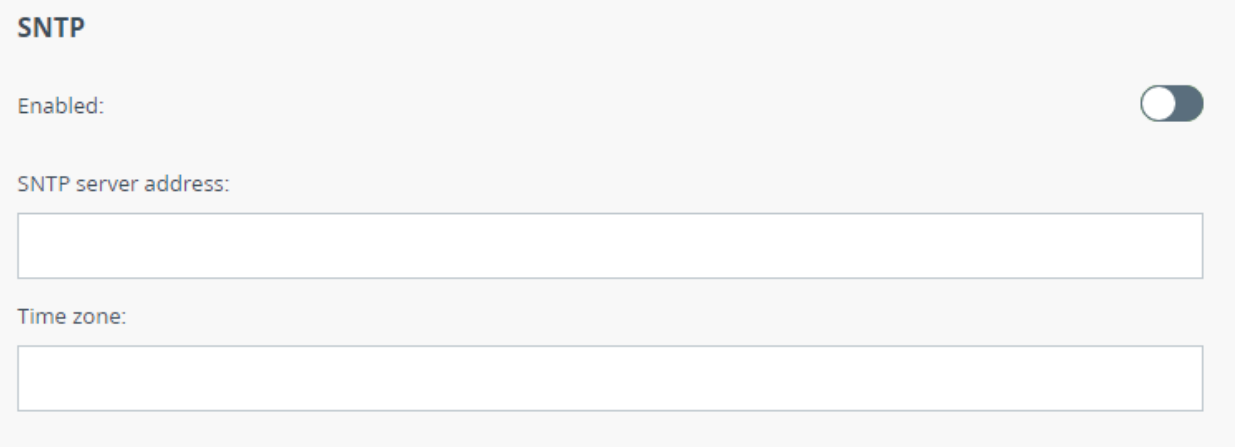


Figure - SNTP settings

7.4 Security settings

The "Security settings" section allows to configure device access and security settings.

This section includes following subsections:

7.4.1 Administrator access

Here you may change system administrator account login and password, to change the identification data, click the "Changing admin password" button. We strongly recommend you to set a login and password after the first login to the device.

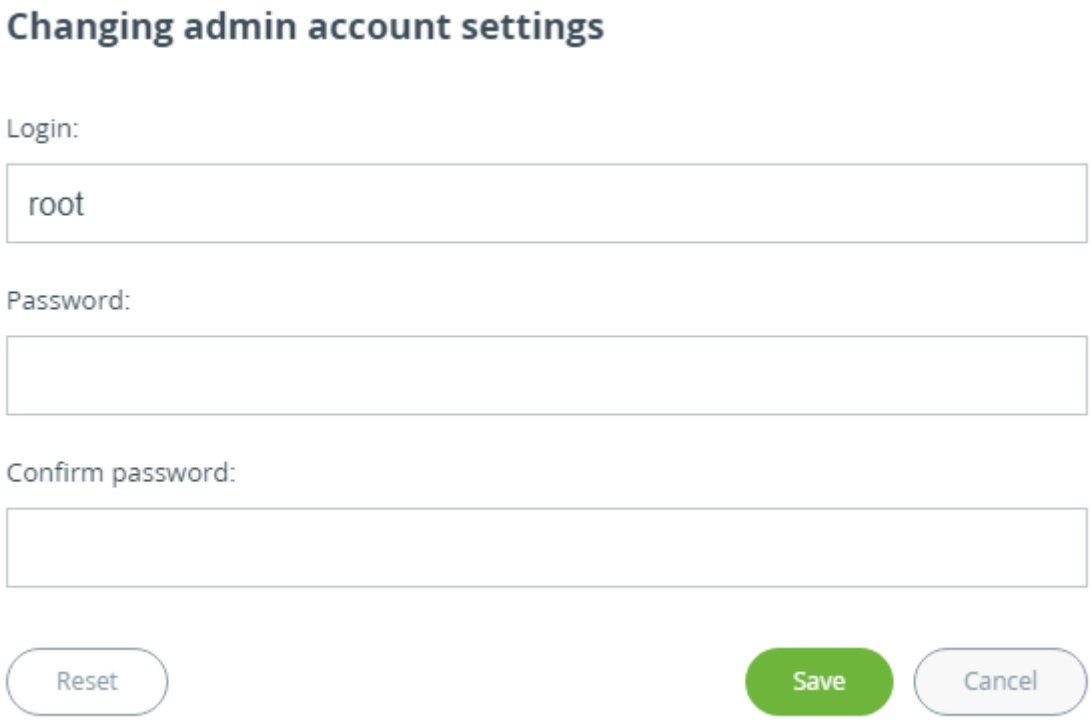


Figure - Admin access

7.4.2 Radius AAA

Here you may configure a device access control using a remote RADIUS server.

Parameter	Description
Address	Set the RADIUS server IP address.
Port	Set the RADIUS server port.
Secret	Set the server password.

Radius server parameters description

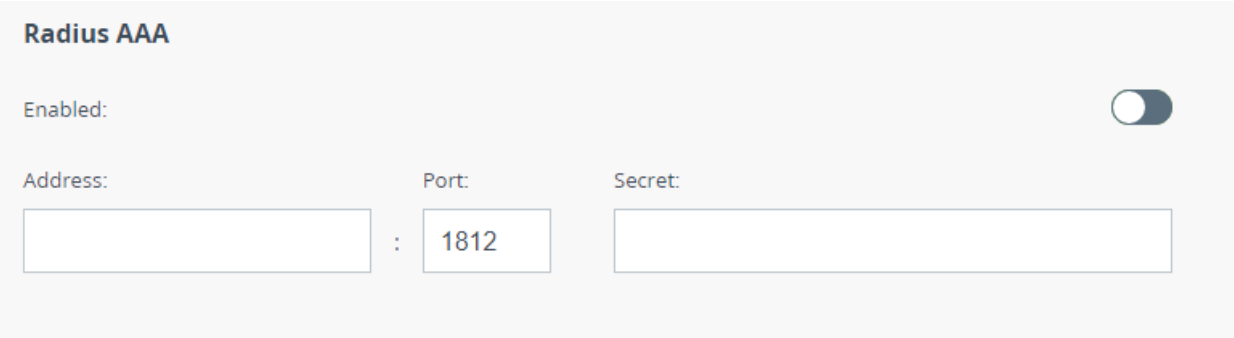


Figure - RADIUS parameters

7.4.3 Command line interface

Allows to enable / disable remote device control by the command line using Telnet and SSH protocols.

SSH (Secure Shell) protocol provides secure remote control to network devices. Its functionality is similar to the Telnet protocol, but, unlike Telnet, SSH encodes all protocol messages, including transmitted passwords. By default, only access via Telnet is enabled.

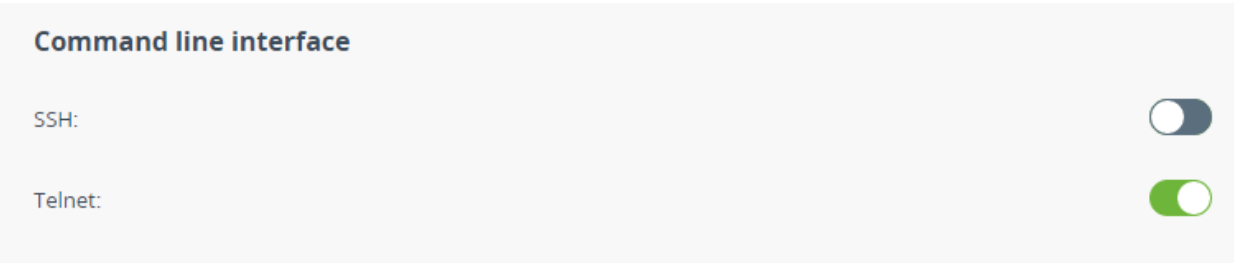


Figure - Access protocols

7.4.4 Network access

This section is used to create a list of subnets from which access to the device will be allowed.

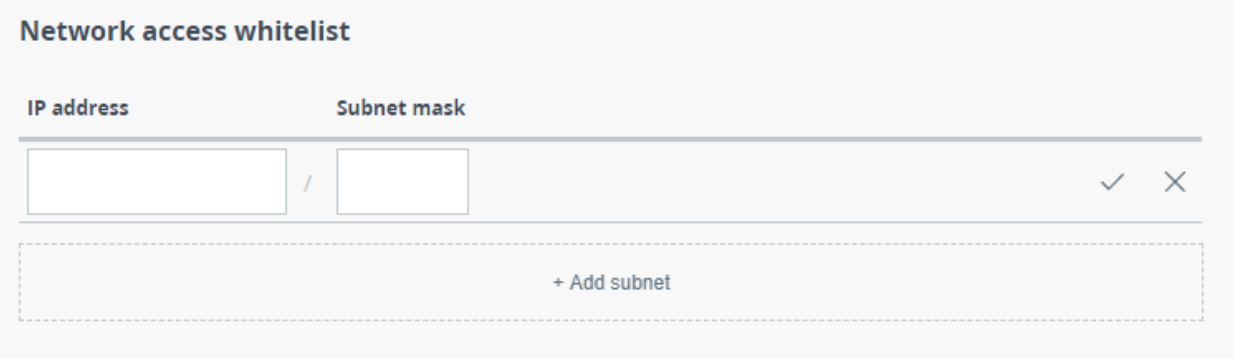
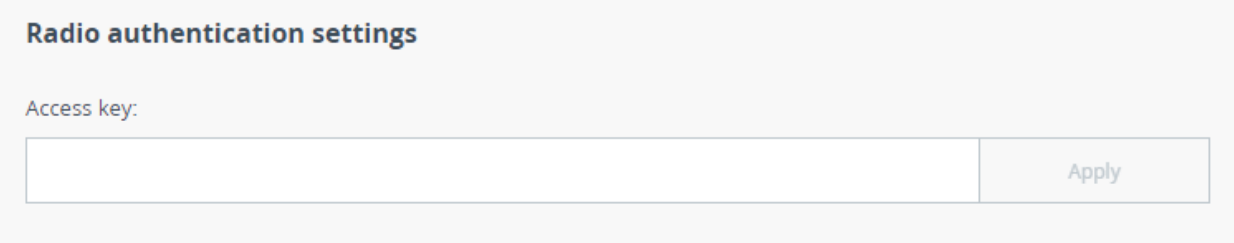


Figure - Network access

7.4.5 Radio authentication settings

Units at both ends of the wireless link should authorize each other before link establishment. Access key must be up to 64 characters long, without spaces and must be the same at both ends of the link.



Unit parameters description

7.5 Radio settings

The "Radio settings" section allows to configure radio parameters to establish wireless connection.

Radio settings are divided into the following categories:

7.5.1 Radio frontend

Parameter	Description

Parameter	Description
Unit role	One units must be set to Master and the other one to Slave. Please note that the following settings must be equal for "master" and "slave" unit to establish the radio link: ■ Center frequency - there are two ways: ○ Manually via "Downlink center frequency" and "Uplink center frequency" parameters. In this case wireless link will be setup at once. ○ Automatically with "Automatic selection of center frequency" function. In this case frequency channel grids must be set on both units. At the initial phase Master unit will select its center frequency automatically from grid, after that Slave unit will scan frequencies from its grid and wireless link will be established when Slave will find the center frequency which Master operates on. ■ Channel width - should be the same and set manually on both units. When a wireless link has been established Slave unit will continuously inherit radio frontend parameters from Master unit excluding frequency channel grids. So, if you change some values on Master they will be set on Slave automatically.
Fixed center frequency	Available only on the Slave unit. ■ Enabled - center frequency must be set manually on wich the Slave unit will operate. ■ Disabled - center frequenct will be selected automatically based on frequency channel grids.
Automatic selection of center frequency	There are several way to define center frequencies in Quanta 5: ■ Frequency selection off - center frequency will be set manually. ■ DFS and radar detection - center frequency will be set automatically according to frequency channel grids. In this mode Master unit will switch to the different frequency if high level interference or radar will be detected. Slave unit will switch too after some time.

Parameter	Description
Independent UL/DL center frequencies	Units may transmit on diffrerent center frequencies. ▪ Enabled - uplink and downlink frequencies can be set to different values. ▪ Disabled - uplink and downlink frequencies will be the same.  **NOTE** Downlink - the direction from Master to Slave, Uplink - the direction from Slave to Master. These directions are correct for the whole link and do not depend on the roles of the devices.
Power limit	This parameter limits the transmitter power, there are two modes: ▪ Transmitter output power - limits the power of transmitter to the set value. ▪ EIRP - limits the total system power calculated as: `Tx Power + Antenna gain + Cable loss`

Radio frontend settings description

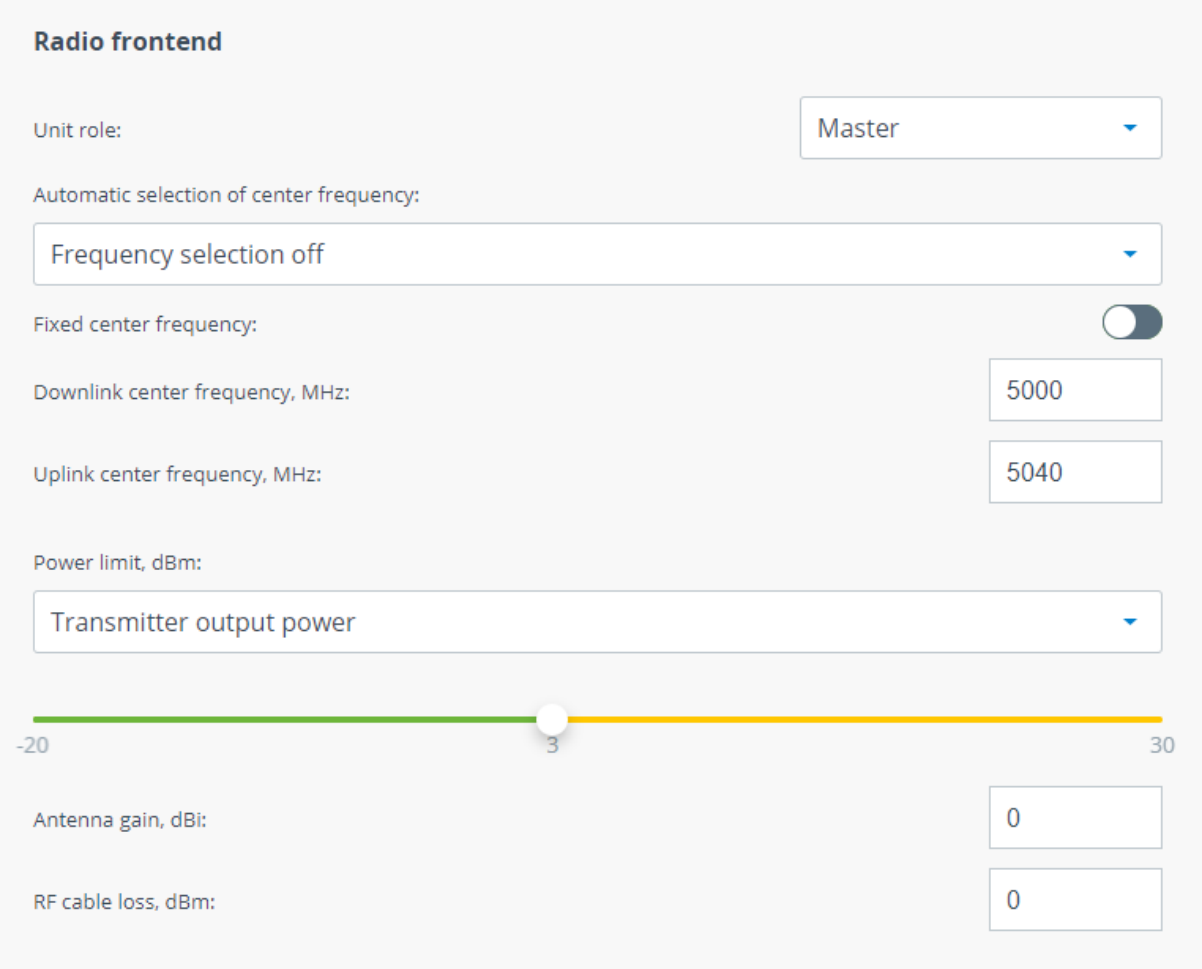


Figure - Radio frontend settings

7.5.2 Air frame

Parameter	Description
Channel width	Channel width, shoud be the same on both Master and Slave units.
Frame length	Frame period affects the following wireless link metrics: ▪ The greater frame period the more payload will be transmitted in one frame. Greater values increase latency. ▪ The lower frame period the less payload will be transmitted in one frame. Lower values decrease latency. Please note that frame period value is strongly depends on interference conditions. If larger frames will be dropped the larger payload is lost and system performance is decreased significantly. If smaller frames will be dropped the smaller payload is lost.
Guard interval	Guard interval is intended for intersymbol interference elimination. One of the intersymbol interference reasons is multipath propagation in which a wireless signal from a transmitter reaches the receiver via multiple paths. Guard interval affects payload size. So it should be increased only in case of significant intersymbol interference.
Uplink /Downlink ratio	Allows to configure quotes for uplink and downlink directions. Available values depend from: ▪ Channel width. ▪ Frame period.

Air frame settings description

Figure - Air frame settings

7.5.3 Automatic modulation and transmit power control

Parameter	Description
AMC strategy	There are following AMC strategies available: ▪ Normal - represents a balance between the error rate and throughput values. ▪ Conservative - assumes using higher CINR thresholds in order to minimize the error rate. ▪ Agressive - lowers the thresholds in order to use higher modulation levels and thus increase the throughput. ▪ Disabled - disables automatic modulation control.
Automatic transmit power control	ATPC allows to control transmitter output power automatically based on target RSSI value. If actual RSSI level is lower then unit increases transmitter output power of the remote unit and vice versa. ATPC could not set value that may exceed the "Power limit" value. ▪ The Master unit manages the transmit power of Slave unit. ▪ The Slave unit manages the transmit power of Master unit.
Target RSSI	RSSI value which will be used by ATPC as target.

AMC and ATPC settings description

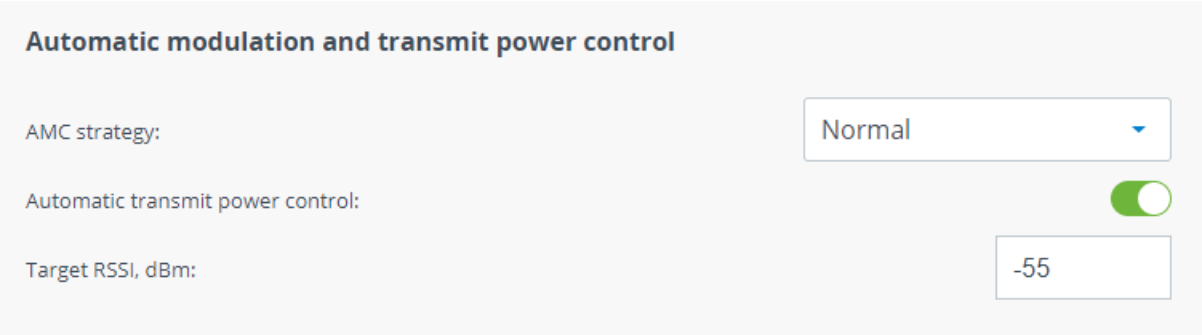


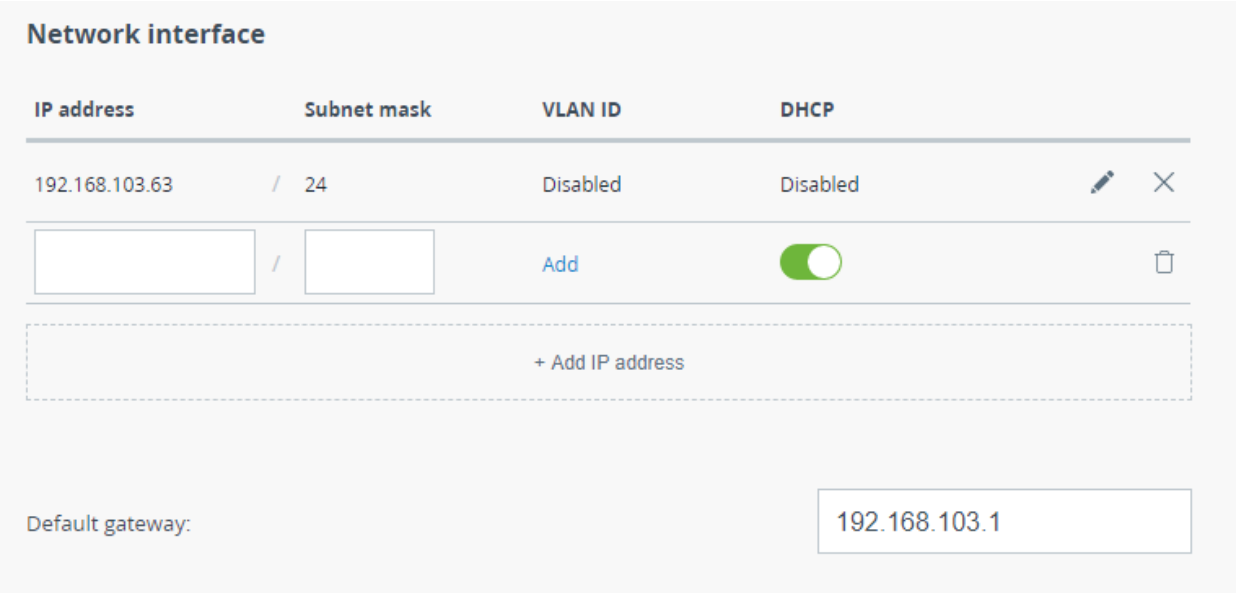
Figure - AMC and ATPC settings

7.5.4 Frequency channel grids

The frequency grid allows to limit the scan range in case the center frequency is automatically selected. Also Instant DFS will use these restrictions when monitoring the noise situation. Narrow grid of available frequencies speeds up scanning and link establishing process. Manual center frequency selection will also be limited to the values indicated in the grid.

7.6 Network settings

This section allows to assign an IP address or several addresses to the wired interface, the default gateway value can also be specified.



Click the "Add IP address" button to add a new address. There are two ways to assign an IP address:

- Automatically - the IP address will be obtained automatically from the DHCP server.
- Manual - the IP address and netmask are specified manually.

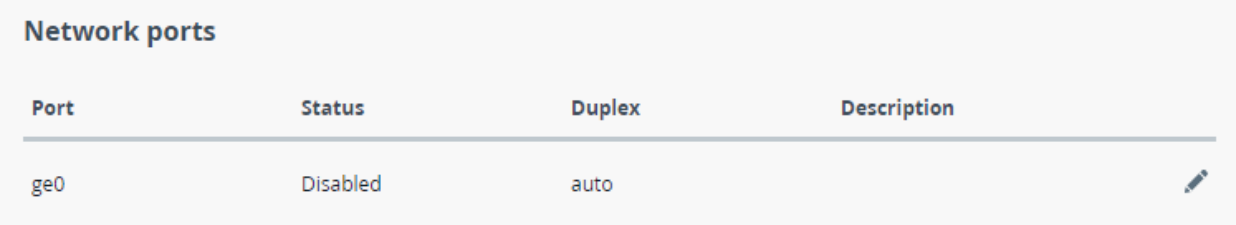
The VLAN tag value can also be set in this section, the VLAN ID value should be in range from 1 to 4096.

7.7 Switch Settings

7.7.1 //<![CDATA[AJS.toInit(function(){ /* For anonymous users */ if (AJS.params.remoteUser == ''){ /* Remove action menu on selected text */ AJS.$('#action-menu-link').hide(); /* Remove comments section */ AJS.$('#comments-section').hide(); /* Find elements with inline comments */ var commentedElements = Array.from (document.getElementsByClassName("inline-comment-marker")); /* If any found */ if (commentedElements.length > 0) { /* For each inline-commented element clear data-ref and class */ for (var i=0; i < commentedElements.length; i++) { commentedElements[i].dataset.ref= ""; commentedElements[i].className = ""; } } /* Else do nothing */ } }); //]]> Network ports

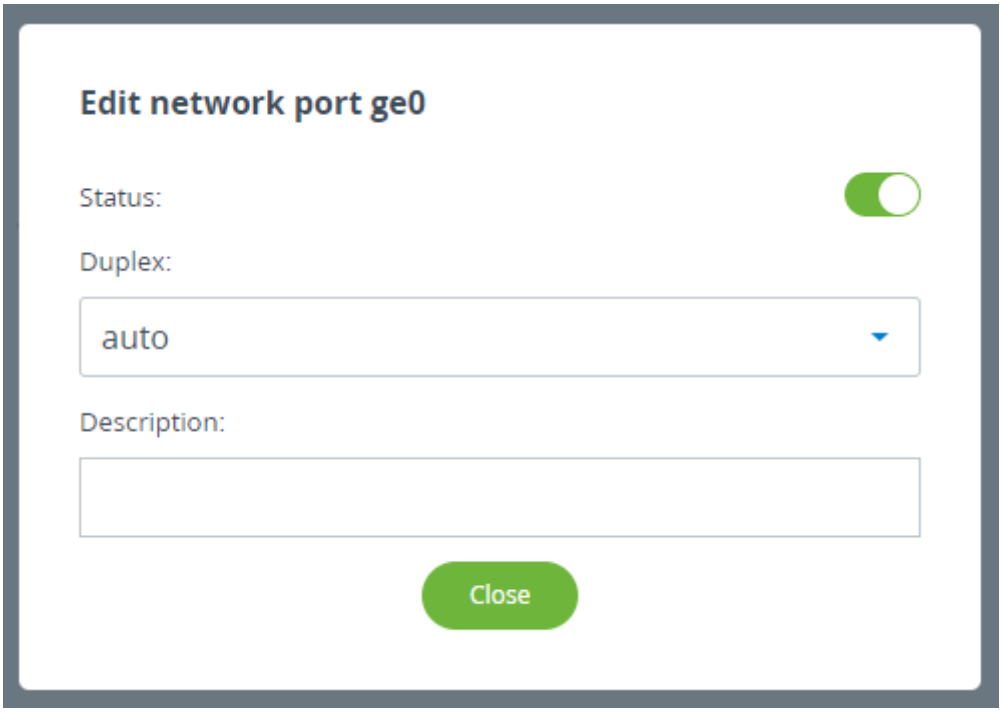
Each Quanta 5 family device has 3 ports:

- ge0 - Gigabit Ethernet 1000BASE-T port;
- radio - internal radio interface;
- mgmt - internal interface for device management.



Only ge0 interface is available to configure. The following parameters can be changed:

- **Status:** enabled/disabled.
- **Duplex:** duplex mode, "auto" is by default.
- **Description:** arbitrary text description.



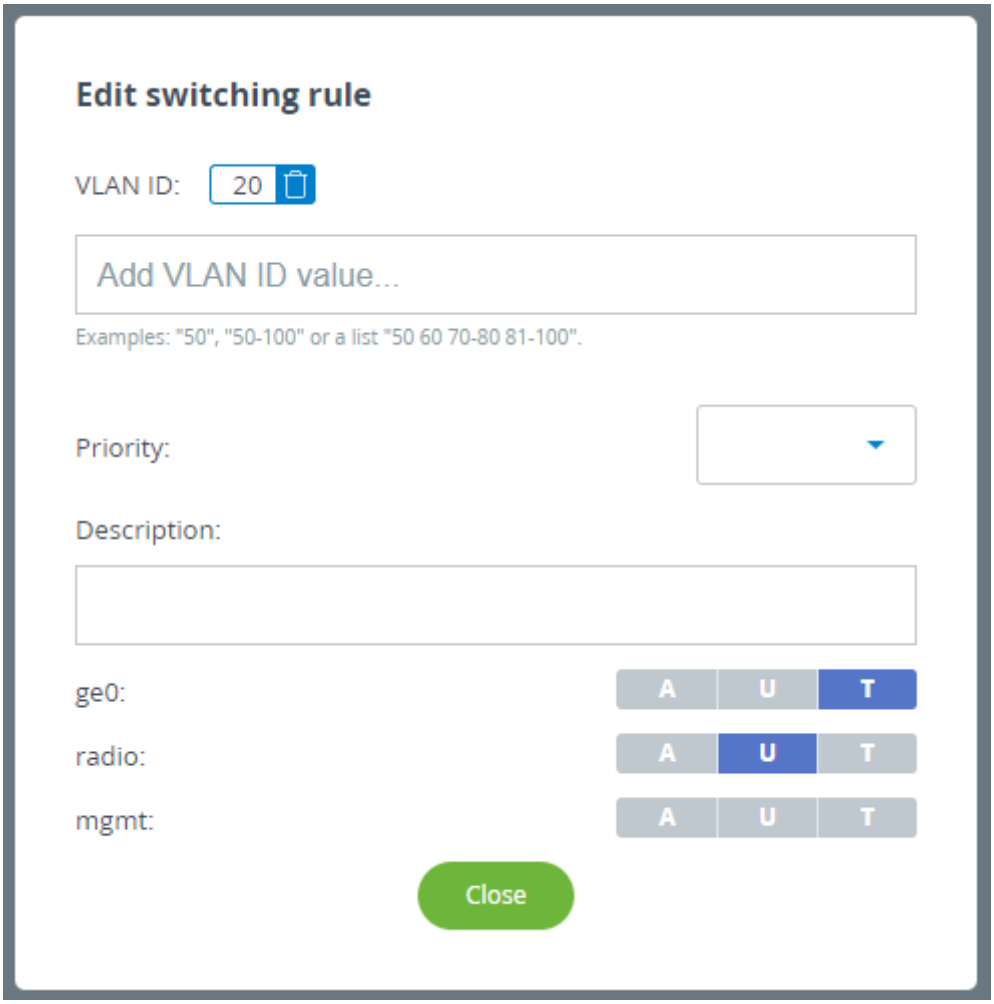
7.7.2 QoS

Enable/disable prioritization strategy. Unit will recognize the 802.1p tags in Ethernet frame headers. Based on these tags priorities will be autlomatically assigned to the frames when they are sent over the radio interface. After transmission over radio interface frames with tags are sent to Ethernet. Priorities may be adjusted manually if a VLAN based switching is enabled.

7.7.3 VLAN based switching

VLAN based switching allows to create list of allowed VLANs and their handling on the unit switch plane. If VLAN based switching is enabled but no VLANs are added, device ports will allow untagged traffic only. Each entry of list establishes the relationship between VLAN ID and ports VLAN modes. "VLAN 1" is created by default and could not be deleted, it's enough to set all interfaces to "off" mode to disable it.

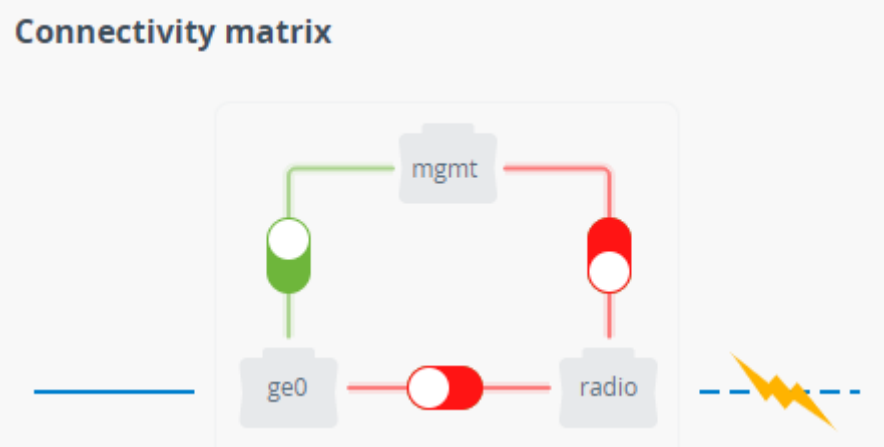
VLAN ID	VLAN tag in range from 1 to 4095. May be set in a few ways, examples: ■ 12 ■ 10-20 ■ 100,200,300 ■ 23,24,25,50-100
Description	Arbitrary text description.
Priority	Allows to set the priority of a specific VLAN according to 802.1p ranging from 0 to 7, where 0 - the lowest priority level, 7 - the highest, the QoS support function must be enabled.
Port mode	VLAN mode should be set for each of network ports. Mode determines the way which VLAN tagged network packets will be handled by switch. There are three ports modes: ■ Off - denies all traffic of a specified VLAN. If none of the modes is selected, the port will be marked as "Off". ■ Access - operates as access port, allows only untagged traffic. ■ Tagged - operates as trunk port, allows tagged traffic of a specific VLAN to pass through this port ■ Untagged - operates as trunk port, allows untagged traffic of a specific VLAN to pass through this port.


Edit switching rule
VLAN ID:
20
Add VLAN ID value...
Examples: "50", "50-100" or a list "50 60 70-80 81-100".
Priority:
Description:
ge0:
A U T
radio:
A U T
mgmt:
A U T
Close

Connectivity matrix

Allows to configure the traffic transfer between the network ports of the device. Configuration is performed visually using switches. The green switch indicates allowed connections, the red one - denied.

Traffic flow between ports is performed in accordance with VLAN modes set, if the VLAN based switching is enabled.



7.8 Spectrum Analyzer

In the "Spectrum Analyzer" menu, you can perform a deep analysis of the radio emissions in the environment where the unit is placed. The unit scans the radio spectrum on all available frequencies. In order to obtain the information as accurate as possible, the scanning process may take a while.

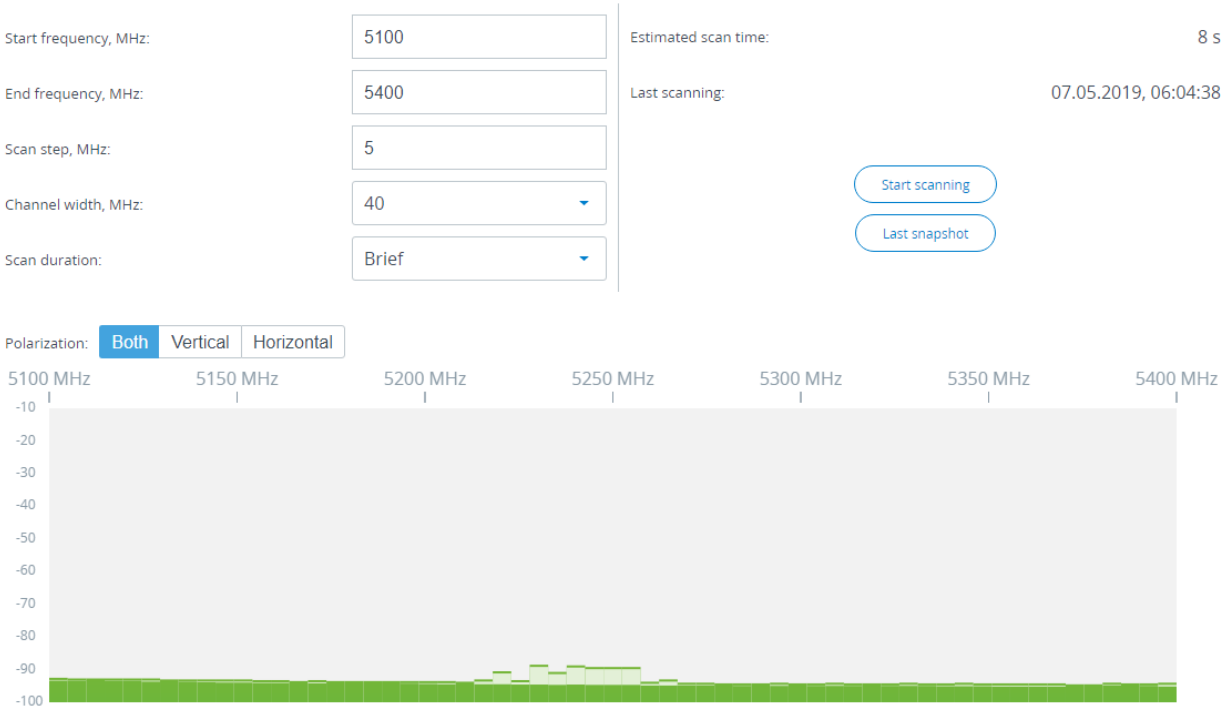


Figure - Spectrum analyzer result

The following parameters are available in order to operate the Spectrum Analyzer:

Parameter	Description
Start Frequency	▪ Set the first frequency for scanning (in MHz).
Stop Frequency	▪ Set the last frequency for scanning (in MHz).
Scan step	▪ Set the scanning frequency step (in MHz). ▪ It is recommended to set 1 MHz "*step*" value to get more precise scanning results.
Channel width	▪ Set the bandwidth (in MHz).
Scan Duration	▪ Set the time period for the scanning process (in seconds). ▪ After the end of this time period, scanning is stopped and the radio interface will be back to its normal mode operation.
Estimated scan time	▪ Estimated scan duration.

Table - Spectrum analyzer parameters

Click on "Start scanning" button to start scanning. You may stop scanning by clicking on appropriate button.

By clicking the "Last Snapshot**"** button, you get the final scanning results. The most common usage of this feature is when you perform a spectrum scan at the remote unit on the other side of the wireless link. When running a spectrum scan at such a unit (accessible via the RF interface), connection to this unit will be lost for a scan time. "*Last Snapshot*" option allows viewing scan results when the connection gets up again.

7.9 Antenna Alignment Tool

The graphical antenna alignment tool allows to visualize the signal characteristics on both sides of the link in order to make the antenna alignment process more accurate and easier. It helps to find the best antenna position via comparing the actual received signal level with the calculated reference value. The accuracy of the antenna alignment at the neighbor device is very important for the link quality. Antenna alignment tool operates online and does not break the wireless connection.

Each side of the link (local and remote) has two similar test indicator sets, corresponding to each antenna polarization. This allows controlling the alignment process for each antenna polarization for the local and for the remote device simultaneously.

The main idea is to achieve the actual signal level (green square) is closer to the reference value (pale area). Grey square shows maximal achieved value on each channel.

Figure - Antenna alignment tool

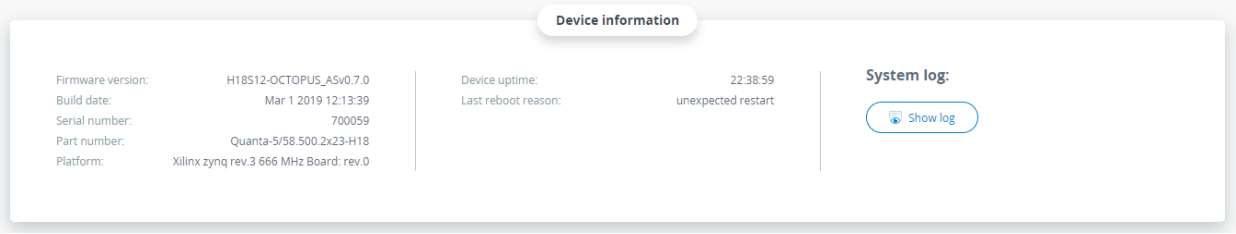
7.10 Maintenance

This section is available in the "Service" tab, is used for firmware updates, operations with licenses and configuration. Allows to view extended information about the device, reboot and reset to factory settings.

7.10.1 Device information

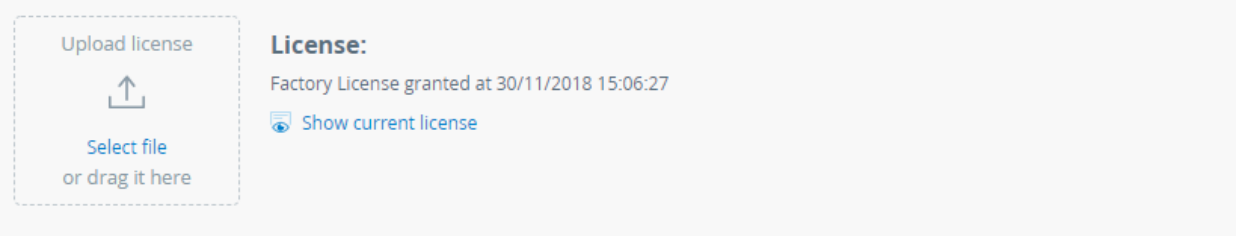
The following information is displayed on information panel:

- Firmware version and build date.
- Device serial number.
- Device part number.
- Hardware platform version.
- Time since last reboot.
- Last reboot reason, following values are possible:
  - Software fault.
  - Unexpected restart.
  - Manual restart.
  - Manual delayed restart.
  - Firmware upgrade.
  - SNMP managed restart.
  - Test firmware loaded.
  - Watchdog.
  - Panic.
- System log.



7.10.2 License

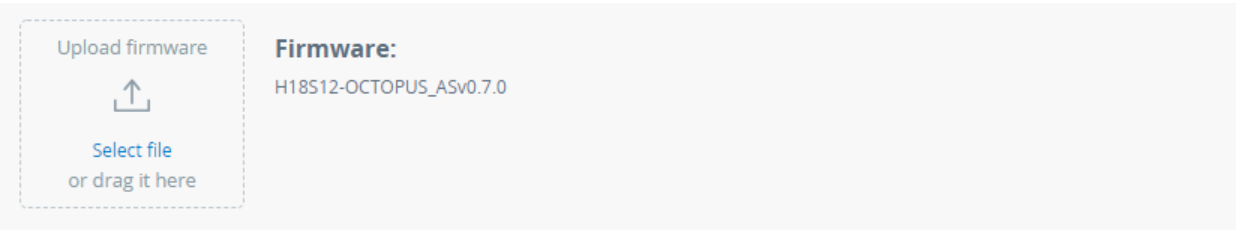
License contains information about allowed frequencies, channel width and power limit. This section allows to view the current license and upload a new one. To upload a license on device, click the "Upload license" button drag and drop a file from your file manager into the dotted area.



7.10.3 Firmware

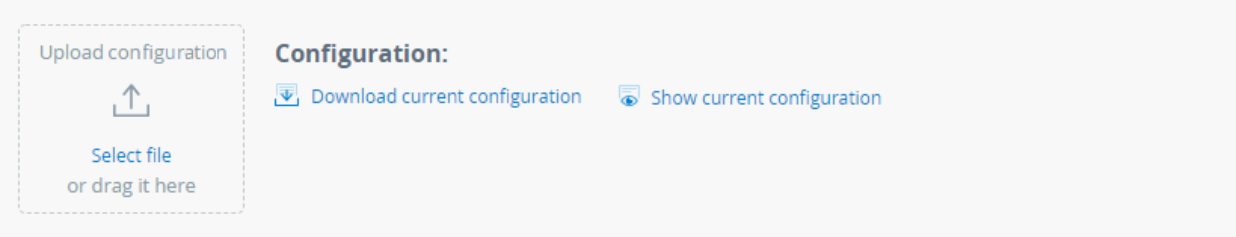
There are two options to upgrade firmware on the device:

- Manually - new firmware should be downloaded from official Infinet FTP server: ftp://ftp.infinet.ru/pub/Firmware/. Click on "Upload firmware" button and choose a firmware file. Or you can drag and drop a file from your file manager into the dotted area.
- Automatically (coming soon) - firmware may be upgraded to the latest firmware version automatically. Click on "Update firmware to the latest version", after that your web browser will try to download the latest firmware version and upload it to the unit. Firmware will be applied after unit reboot.



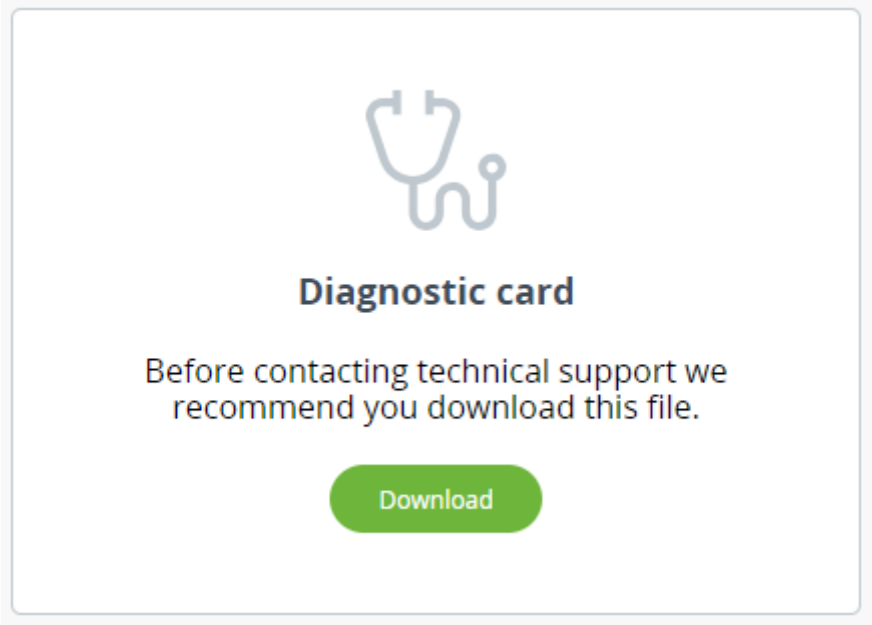
7.10.4 Configuration

Quanta 5 device allows to upload, download and view current configuration in text form. To view the configuration, click the "Show current configuration" button, the file will open in new window. To download the configuration, click the "Download current configuration" button, the configuration can be loaded by clicking the "Upload configuration" button, or you can drag and drop a file from your file manager into the dotted area.



7.10.5 Diagnostic card

In situation then helps of InfiNet Wireless technical support team is requiered, the diagnostic card is necessary tool which helps to detect and solve an issue faster and more effective. Click on "Download" button to create diagnostic card.



7.11 SNMP settings

SNMP allows the administrator to gather information about key device parameters and wireless links, including information about changes. The use of any monitoring system helps to timely receive information about the network infrastructure state using InfiNet devices. Currently, the Quanta 5 devices family supports SNMP protocol versions v.1 and v.2c.

The SNMP Protocol has two branches, the agent and the management stations:

- The agent sends data to the management station. Monitoring system - provides data gathering from all agents in the network.
- The monitoring system receives and processes events.
- The information is passed through requests and replies with the use of the MIB.
- The management station or monitoring system is responsible for decoding the SNMP packets and providing an interface to the administrator.

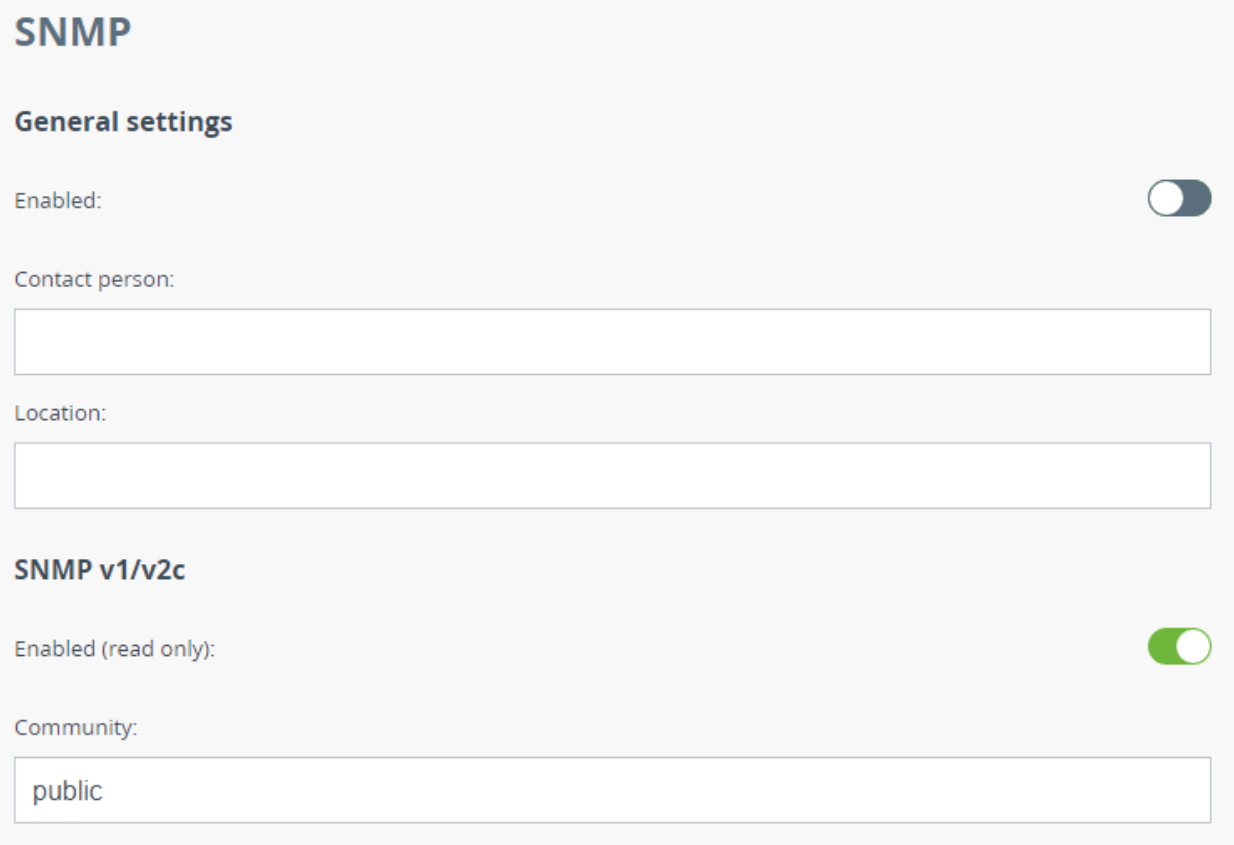


Figure - SNMP configuration

Parameter	Description
Enabled	Enable/disable the SNMP service in the device.
Contact person	A reference information about the device owner.
Location	The geographical location where the unit is installed, used as a reference information about the physical device's location.
SNMP v1/v2c	
Enabled	Enable/disable the SNMP v.1 and v.2c support. The first version of the SNMP protocol lacks security, that hinders its use for network management, so SNMP v.1 and v.2c operates in read-only mode. Enabled by default.
Community	Set the community name for read-only mode of SNMP v.1 and v.2c, by default: "*public*". The community name passes along with the data packet in clear text.

8 Troubleshooting

This lesson describes basic troubleshooting actions to be taken in case a problem occurs to the wireless link.

List of possible problems:

1. No access to the local unit.
2. No access to the remote unit .
3. Expected throughput is not met .
4. No data is being transferred .
5. Unit management is lost .

8.1 1.No access to the local unit

Step 1: Local unit check

Check the network connectivity between the monitoring server and the local unit. If no connectivity appear, go on site to the local unit location. Check if it is powered on, power indicator has three possible states: red – the power is on, yellow – 10/100 Mbps wired connection, green – 1000 Mbps wired connection. If there is no power supply please check the AC power supply, the Ethernet cables and connector. Check the RF cables state, in case of devices with external antennas are used. Check if the local connection works by using a laptop or ERConsole.

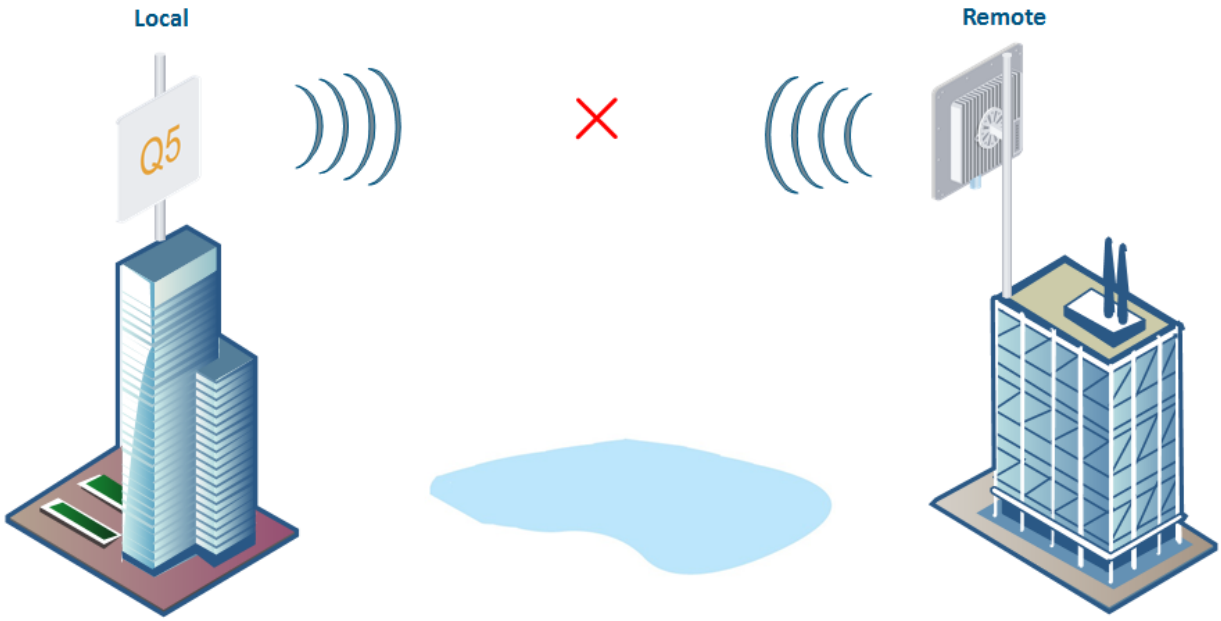
If the local connection is allowed, after the authentication step in web interface, check the operational status of the Ethernet port. Enable the port if found disabled, check the connectivity matrix and VLAN settings if used. Reboot the unit at the "Maintenance" section.

Step 2: Report the problem to the InfiNet Wireless support team

If you are unable to identify the cause of the problem, please contact the InfiNet Wireless support team. It is necessary to provide diagnostic card, antenna alignment test results screenshots, the installation points photos, the installation points coordinates.

8.2 2. No access to the remote unit

The section describes how to test the link when there are no radio communication and no access to the remote unit, but there is access to the local unit.



Step 1: Local unit check

Check if the radio parameters values of the local unit correspond to the settings from the radio planning stage:

- Unit role.
- Center frequency.
- Channel width.
- Maximum transmit power.
- Frame length.
- Guard interval.
- Link ID.
- Access key.

If some parameters have different values, perform the modifications and check the wireless link establishment after unit reboot. In case the wireless link is still down, go on site to the location of the local unit and check the cables and connectors.

Step 2: Remote unit check

In case the wireless link is down even if the parameters were set according with the radio planning results, go on site to the location of the remote unit. Check if it is powered on, power indicator has three possible states: red – the power is on, yellow – 10/100 Mbps wired connection, green – 1000 Mbps wired connection. If there is no power supply please check the AC power supply, the Ethernet cables and connector. Check the RF cables state, in case of devices with external antennas are used. Check if the local connection works by using a laptop or ERConsole.

If the local connection is allowed, after the authentication step in web interface, check all radio parameters by connecting to it using a laptop. The values for the following radio parameters must be the same on both units:

- Link ID.
- Center frequency.
- Channel width.
- Frame length.
- Guard interval.
- Downlink/Uplink ratio.
- Access key.

Step 3: Path profile check

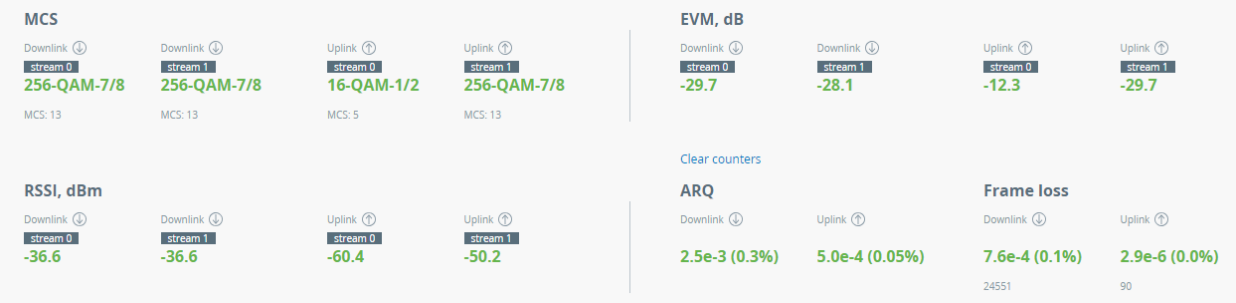
If the wireless link is down after previous steps, check the antennas alliagnment with two teams working simultaneously, one at the remote side and the other one at the local side. Also,redo the radio planning to avoid the situation when coordinates at the initial radio planning stage is different from the current location: huge interferences on the working set of frequencies, Fresnel zone obstruction are possible reasons why the wireless link cannot be established, etc.

Step 4: Report the problem to the InfiNet Wireless support team

If you are unable to identify the cause of the problem, please contact the InfiNet Wireless support team. It is necessary to provide diagnostic card, antenna alignment test results screenshots, the installation points photos, the installation points coordinates.

8.3 3. Expected throughput is not met

The wireless link is established but the capacity is less than expected.



Step 1: Local and remote units settings check

Login to both units via web interface, check the availability of the new firmware version. If a newer firmware version is available, proceed with the firmware upgrade in order to benefit of the latest radio features and improvements.

In the "Dashboard" section check the EVM and RSSI parameters values:

- EVM values are significantly differed from the initial, and RSSI values - are not. It may indicate the noise appearance. It is recommended to use the "Spectrum analyzer" tool to determine the noise level on the current channel and to select a new frequency channel.
- EVM and RSSI values are significantly differed from the initial. It is required to check the antennas alignment, cables condition and obstructions in the first Fresnel zone or line of sight.

Proceed to the "Radio" section and check the frame length value, if it is too small, try to increase it. Perform the antenna alignment with built-in tool especially in case of low RSSI and EVM values.

Step 2: Check at the units location site

Further actions should be done on the site of units location. Check the Ethernet connection, as well as the cables integrity. Tighten the connector and check the antennas, as well. Perform proper antenna alignment on site. If after the alignment the EVM level is still low, it indicates the presence of external interference. Try to use another frequency if available or perform a spectrum scanning.

Step 3: Report the problem to the InfiNet Wireless support team

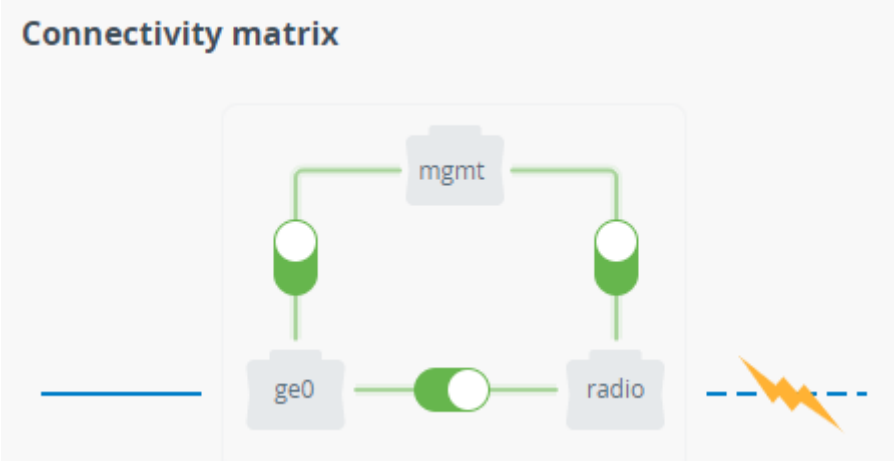
If you are unable to identify the cause of the problem, please contact the InfiNet Wireless support team. It is necessary to provide diagnostic card, antenna alignment test results screenshots, the installation points photos, the installation points coordinates.

8.4 4. No data is being transferred

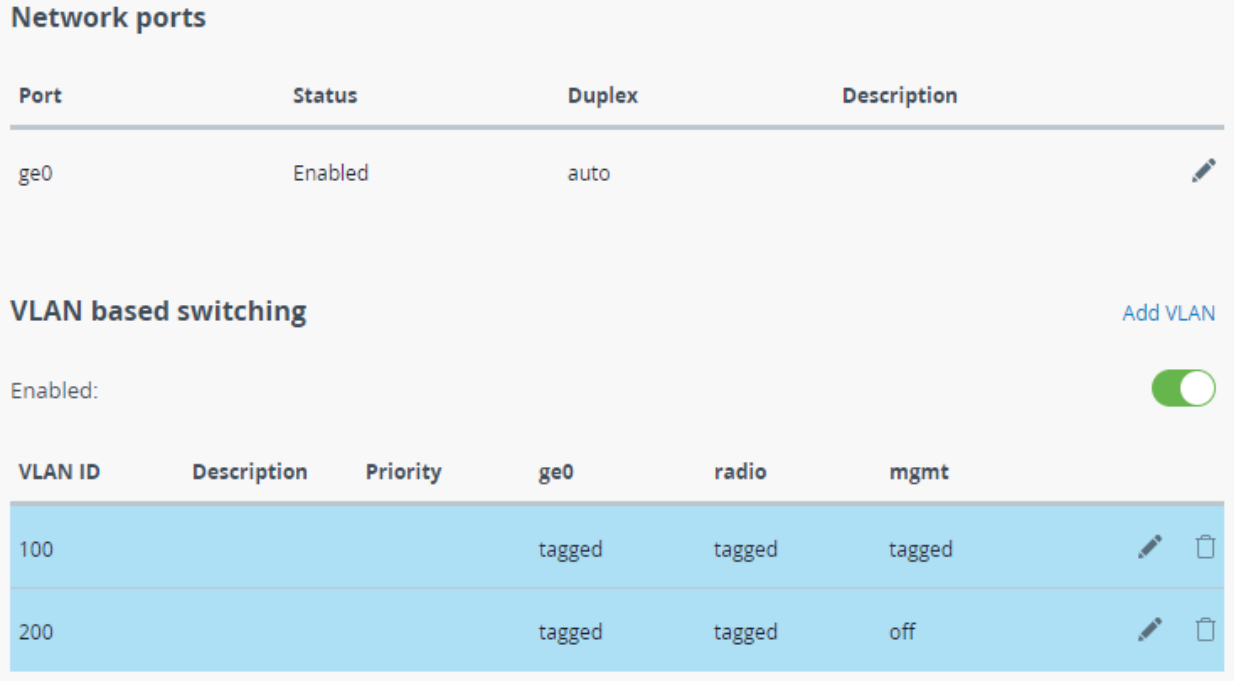
The wireless link is established but no data is being transffered.

Step 1: Local and remote units settings check

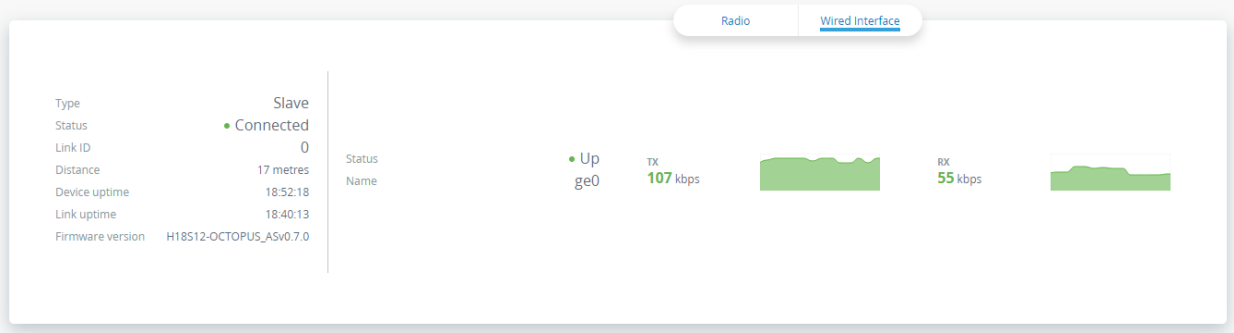
Connect to the unit web interface and check the matrix connectivity in the "Switch" section, ge0 port must be connected with the radio port.



Check the operation status of the ge0 port. Enable the port if it was disabled. In case of using VLANs, proceed to the "Switch" section and make sure that the VLAN configuration is correct, the specific traffic VLAN ID is allowed to pass through the port.



If the port status is "Up" but no packets are received, check the configuration of the equipment which is directly connected.



Step 2: Check at the units location site

Further actions should be done on the site of the units location. Check the Ethernet connector, as well as the integrity of the cables.

Step 3: Report the problem to the InfiNet Wireless support team

If you are unable to identify the cause of the problem, please contact the InfiNet Wireless support team. It is necessary to provide diagnostic card, antenna alignment test results screenshots, the installation points photos, the installation points coordinates.

8.5 5. Unit mangement is lost

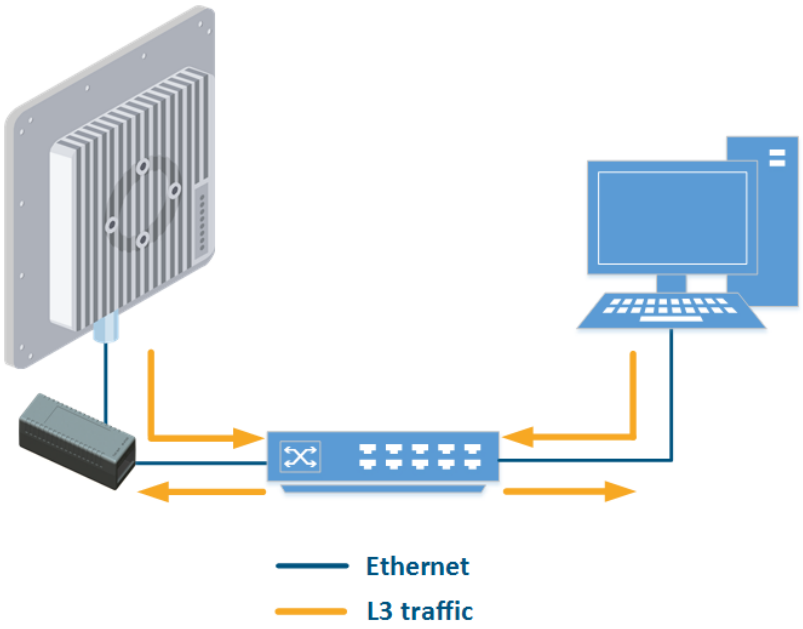
If the management of the unit is completely lost (of the local and/or the remote one), the ERConsole recovery procedure should be used. ERConsole is a software application created to recover or add a new IP address to the InfiNet Wireless units. Additionally, the ERConsole can be used to reset the InfiNet Wireless units to the factory default configuration.

Software requirements::

- ERConsole: ftp://ftp.infinet.ru/pub/Utils/EmergenceRepairConsole/ERConsole.zip.
- Java Runtime Environment: http://www.java.com/en/download/.

It is recommended to turn off any anti-virus or firewall running on your computer and to turn off all the network interfaces, except the Ethernet interface connected to the same broadcast subnet as the Infinet Wireless unit. If no device can be discovered by ERConsole, turn on the firewall, and add an UDP connection port 10009 as an exception.

We also recommend to use a simple unmanaged switch as intermediary unit between your PC and the InfiNet Wireless unit. It is essential to reboot the InfiNet Wireless unit each time in order to activate the Emergency Repair Protocol on the unit, therefore the switch would prevent your PC Ethernet interface from flapping up and down. Using Cisco Catalyst switches for unit recoverty is not recommended due to a known issue port mode negotiation delay.



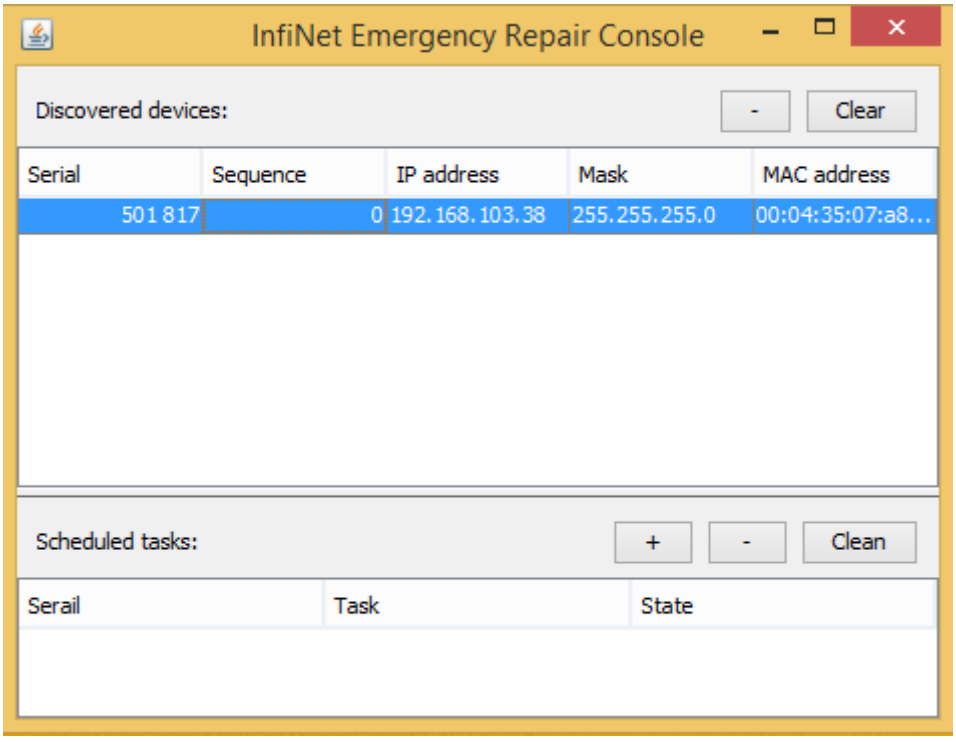
NOTE

ERConsole and InfiNet Wireless units exchange information only during the bootup process, therefore each time you need to read the units IP address, to add a new IP or to restore to the default configuration, the InfiNet Wireless unit should be rebooted.

8.5.1 Access to the unit recovery

If you have lost management to your unit, proceed as follows:

- Run the ERConsole.
- Turn off the unit and then turn it on in a few seconds.
- Wait for 30 seconds and the ERConsole screen should receive update from the unit. The serial number, number of unit reset cycles ("Sequence" field), IP address, network mask and MAC adress will be displayed on the screen.



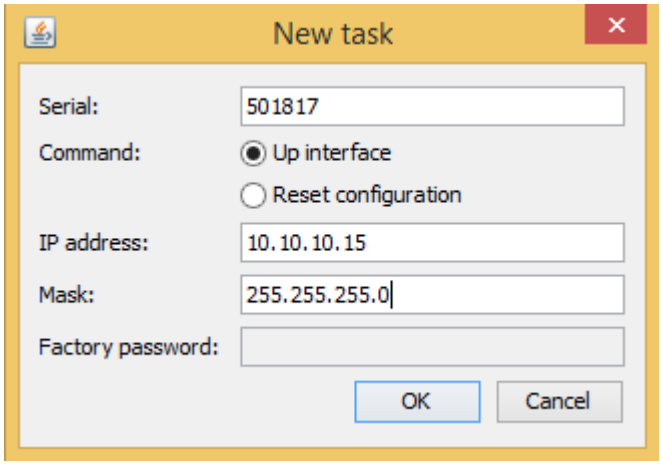
Further recovery depends on whether the IP-address is assigned or not to the unit.

IP address and net mask are assigned

Configure on your PC an IP belonging to the same network and connect to the unit in order to perform the modifications and checking required. If there is no IP, displayed (0.0.0.0), proceed with the next step.

IP address and net mask are not assigned

- Click the "+" button in the ERConsole application and a new window will appear.
- In the "New task" window, set the additional IP address and network mask, then click "OK".



- Turn off and on the unit. Wait for 30 seconds until the IP is assigned.
- Add an IP address from the same network subnet to your PC and access the unit. ERConsole will not show newly assigned IP address.
- Login to the unit using the new IP. Do not reboot the unit until the new configuration has been saved because the additional IP address is temporary.

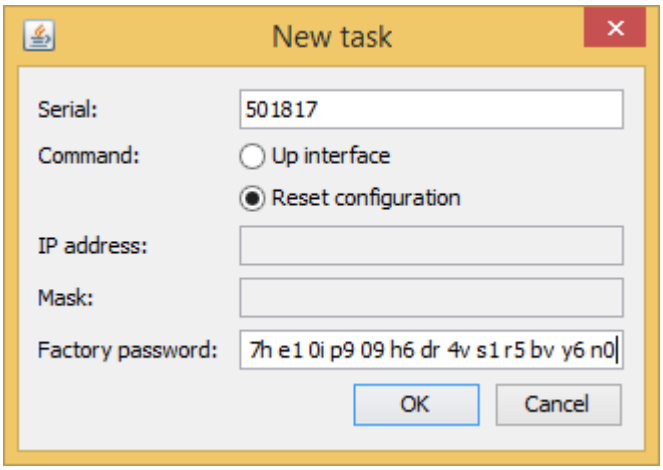
8.5.2 Restore to the factory default settings

In case you need to restore your unit to the factory default settings, proceed as follows.

NOTE

If the management of the unit is lost due to unknown user name or password it can be restored using factory password. Enter the device serial number to the "Login" field and factory password - to the "Password" field.

- Obtain the factory password. In order to do this, please contact the distributor through whom the unit was purchased, or in case purchasing the unit directly in InfiNet Wireless, send a request to the InfiNet Wireless support team. The request must include the unit serial number and the value of "Sequence" field (if it's non-zero).
- Obtain the unit IP address using the ERConsole as described in the section above.
- Click on the "+" button in the ERConsole application and a new window will appear.
- Select "Reset configuration" option and enter the factory password to the "Factory password" field, then click "OK". The password must be entered at the same format as it has been got from the distributor or IW support team (with the gaps).



- Turn off and on the unit and then wait for about 30 seconds.
- The unit will start in a special emergency mode with the IP address 10.10.10.1 and mask 255.255.255.0.
- Login to the unit and use "Restore factory settings" button on the "Maintenance" section to switch off emergency mode.
- Set new login and password, then save the configuration and restart the unit.

9 Glossary

- AC - Alternating Current
- AMC - Automatic Modulation Control
- ARQ - Automatic Repeat reQuest
- ATPC - Automatic Transmit Power Control
- DHCP - Dynamic Host Configuration Protocol
- DC - Direct Current
- DFS - Dynamic Frequency Selection
- ERC - Emergence Repair Console
- ETH - Ethernet
- EVM - Error Vector Magnitude
- FTP - File Transfer Protocol
- H-FDD - Hybrid Frequency Division Duplexing
- IP - Internet Ptotocol
- LBT - Listen Before Talk
- LOS - Line of Sight
- MAC - Media Access Control
- MCS - Modulation and Coding Scheme
- NLOS - Non-Line of Sight
- PHY - Physical layer
- PoE - Power over Ethernet
- QAM - Quadrature Amplitude Modulation
- QoS - Quality of Service
- QPSK - Quadrature Phase Shift Keying
- RF - Radio Frequency
- RSSI - Received Signal Strength Indicator
- SDR - Software-Defined Radio
- SC-FDE - Single-Carrier Frequency Domain Equalization
- STP - Spanning Tree Protocol
- TDD - Time Division Duplexing
- VLAN - Virtual Local Area Network