# LigoPTP PRO Configuration Manual
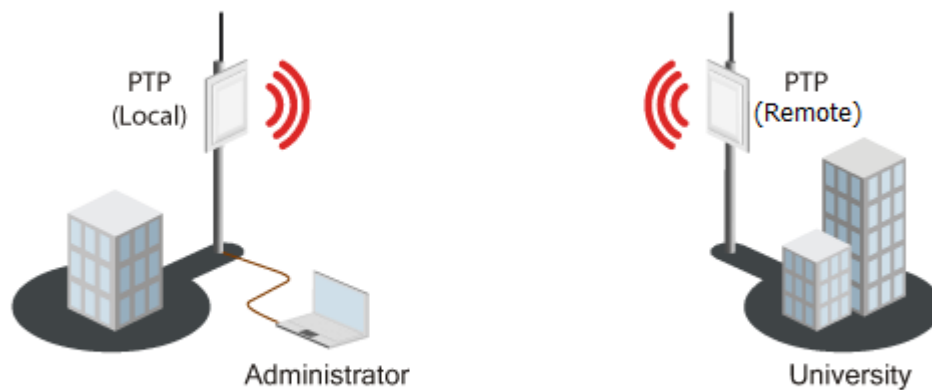
## Contents

# Introduction

The PTP link consists of two units, one on each end: **Master** and **Slave**. Master unit operates as an access point; therefore the Slave connects to the Master and operates as a client.

From the point of view of the administrator the **Local unit** is the one with the direct connection to the Web management interface and the **Remote unit** is the one which is connected to the Local unit in PTP link. The concept of the Local unit and the Remote unit is not related to the operating mode (Master or Slave). This terminology will be used throughout the manual, particularly in the description of statistics.

# Product Overview

LigoWave unleashes its highest capacity, license-free PTP device with the release of the LigoPTP PRO series product line. Making use of ground breaking 2x2 MiMo technology, the LigoPTP 5-23/5-N PRO delivers real aggregate throughput capability of up to 220 Mbps (110 Mbps full-duplex) combined with high packets-per-second performance. Additionally, the new product is compatible with previ¬ous LigoPTP 5-23 MiMo and LigoPTP 5-N MiMo models. This product enables carrier-class point-to-point capability, ideal for dedicated access or backhaul applications (including VOIP or other small packet applications). The LigoPTP PRO product family couples flexible channel width capability (20 or 40 MHz) and industry-leading proprietary software mechanisms to set the utmost standard in spectral efficiency.

The LigoPTP 5-23/5-N PRO products feature either an integrated dual-polarized antenna or two N-type connectors. They are housed in rugged, cast aluminum enclosures. Combining digital signal processing, dual polarization antennas and proprietary W-Jet 2 MiMo protocol these bridges have a high spectral efficiency of 7.5bit/Hz. The LigoPTP 5-23/5-N PRO showcase an array of advanced software mechanisms that provide optimal point-to-point connectivity for high-throughput, long distance links. LigoWave's proprietary PTP mechanisms utilize techniques such as Dynamic Time Division

Duplexing (TDD) to dynamically allocate bandwidth in the direction needed thus increasing link efficiency and greatly decreasing the impact that distance has on throughput of the link.

The LigoWave point-to-point products also features selective repeat ARQ technology, an enhanced error-correction software mechanism that optimizes data traffic to provide very high throughput over high-bandwidth, long-range links even in the presence of interference.

The new PRO series products have an extremely powerful integrated 28 dBm (+/-2 dBm) radio which allows building solid long-distance links even with an integrated antenna. The output power on highest modulation (MCS 15) is 23 dBm (+/- 2 dBm) which is hard to find elsewhere in the market today. Gigabit Ethernet port and 802.3 af standard support makes the PRO series product line even more flexible. Improvements on the SURGE and ESD protection side make this product ideal for mission critical and harsh-weather condition installations. SURGE and ESD protection was de¬signed according to IEC 61000-4-2 (ESD) and IEC 61000-4-5 (SURGE) standards.

The LigoPTP 5-23/5-N PRO is also compatible with LigoWave's online link calculator and WNMS, a centralized configuration, firmware, and statistics server offered by LigoWave for remote diagnostic and configuration.

# LigoPTP PRO Features

## Technical Features

- Flexible center channel and channel width capability (20/40 MHz) for throughput optimization
- Radio rate of up to 300Mbps
- True aggregate throughput up to 220 Mbps
- Advanced proprietary W-Jet wireless protocol that combines special techniques to achieve superior performance and reliability even over long distances.
- High packet-per-second (PPS) rate – ideal for VOIP back¬haul applications
- Low packet latency (2ms)
- Great spectral efficiency (7.5 bit/ Hz)
- ARQ (Selective Repeat) for very high throughput
- Dynamic TDD for allocating bandwidth in real-time to the direction needed
- Integrated dual-polarized antenna (2 N-type connectors for the LigoPTP 5-N PRO product)
- PoE built-in for single cable installation (802.3 af compatible)
- 1000 BaseT Ethernet port
- 28 dBm (per chain) integrated radio
- Advanced security technologies

## Management

- Web GUI
- Command line management via SSH
- WNMS server support for configuration

- SNMP V1/2/3 with traps supporting MIBs: 802.1, 802.1x, MIBII
- Syslog support
- Compatible with LigoWave link calculator
- Real-time alerts

**Reliability**

- Rugged articulating bracket solution for multi-facet mounting
- OLED screen for antenna alignment
- IP-67 compliant

# PTP Unit Installation

This chapter provides installation instructions for the hardware and software components of the LigoPTP PRO unit.

## Package Contents

The LigoPTP PRO system is available in two versions:

- PTP unit with integrated antenna (LigoPTP 5-23 PRO);
- PTP unit with N-type connector for external antenna (LigoPTP 5-N PRO).

Each PTP unit comes with the following:

| Component Name | Quantity |
|---|---|
| LigoPTP PRO unit | 1 |
| Articulating mounting bracket hardware | 1 |
| Screws for mounting bracket attaching to the device | 4 |
| Screws for pole mounting | 2 |
| Integrated 48V(product dependent) PoE Power Supply & Injector | 1 |

If any of these items are missing or damaged, please contact your reseller.

# Hardware Introduction

The PTP unit is housed in an aluminum enclosure and features an N-Female type connector (LigoPTP 5-N PRO) or an integrated 23dBi directional antenna (LigoPTP 5-23 PRO). The panel of the PTP unit contains:

- A **Gigabit Ethernet+PoE connector** in the form of passive PoE through standard Ethernet cable
- **N-Female** type antenna connector (for units with external antenna only)
- **OLED screen**
- **Grounding stud**

> The LigoPTP 5-23 PRO unit with integrated antenna has a custom enclosure hole plug instead of N-type connector.

General View of the LigoPTP 5-N PRO unit (N-type connectors are for LigoPTP 5-N PRO model only. If the unit comes with integrated antenna (LigoPTP 5-23 PRO), there will be no N-type connector):
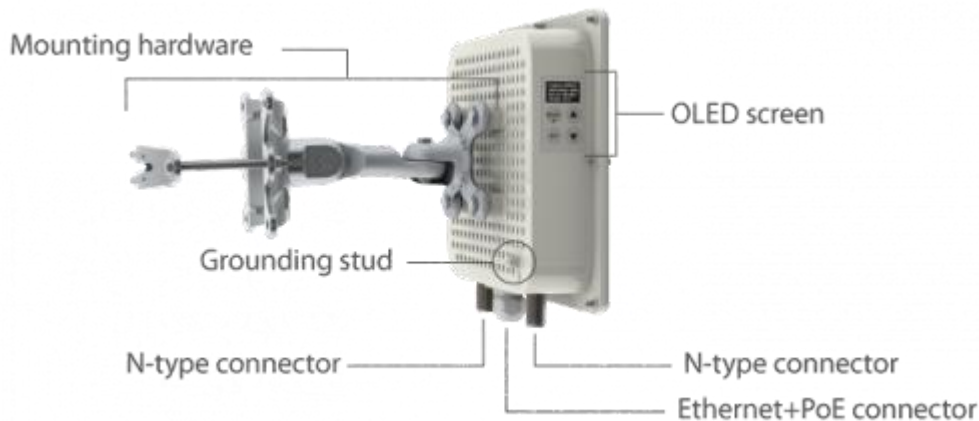


# Accessing to the PTP Unit's Web Management

The default IP address of the PTP unit is **192.168.2.66** with a subnet mask of 255.255.255.0.

**Step 1.** Configure your PC with a static IP address on the 192.168.2.0 subnet with mask 255.255.255.0.

**Step 2.** Connect the LigoPTP PRO unit in to the same physical network as your PC.

**Step 3.** Open the Web browser and type the default IP address of the LigoPTP PRO unit: https://192.168.2.66/

**Step 4.** Enter the default administrator login settings to access the Web management page. The default administrator login settings for PTP unit are:

> Login: **admin**
> Password: **admin01**

**Step 5**. After successful administrator log on you will see the main page of the LigoPTP PRO unit Web management interface. The LigoPTP PRO unit now is ready for configuration. For further instructions on configuration refer to the respective chapter Web Management

## Default Settings

The default settings of the PTP unit configuration parameters are listed in the table below:

| Parameter | Default Value |
|---|---|
| IP address | 192.168.2.66 |
| Netmask | 255.255.255.0 |
| Login name | admin |
| Login password | admin01 |
| Link ID | Link name |
| Encryption | None |
| Ethernet configuration | auto |
| SNMP R/O community | public |
| SNMP R/O user | public |
| SNMP R/O password | password |

# Quick Setup Guide

**Step 1. Log in to the PTP unit web management interface.** To access the PTP unit Web management interface, configure your PC with a static IP address on the 192.168.2.0 subnet with mask 255.255.255.0. Connect the LigoPTP PRO unit in to the same physical network as your PC. Open the

Web browser, type the default IP address of the LigoPTP PRO unit https://192.168.2.66/ to load the login page. Enter default administrator login settings:
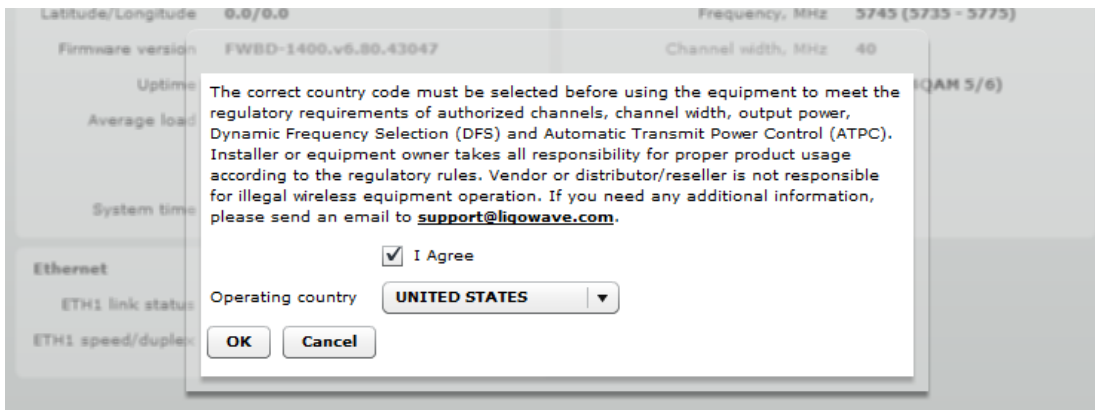


The default administrator login settings for LigoPTP PRO are:

Login: **admin** Password: **admin01**

After successful administrator login you will see the main page of the LigoPTP PRO unit Web management interface. The LigoPTP PRO unit now is ready for configuration.

**Step 2. Confirm the disclaimer of the LigoPTP PRO**. According to the chosen country the regulatory domain settings may differ. You are not allowed to select radio channels and RF output power values other the permitted values for your country and regulatory domain.



Additionally the **Antenna Gain** value must be specified for the LigoPTP 5-N PRO unit.

**Step 3. Specify the operation mode: Master or Slave.** The difference in configuration of Master and Slave is that the frequency does not need to be specified for the Slave. The Slave scans the air and chooses the frequency automatically after finding the Master.
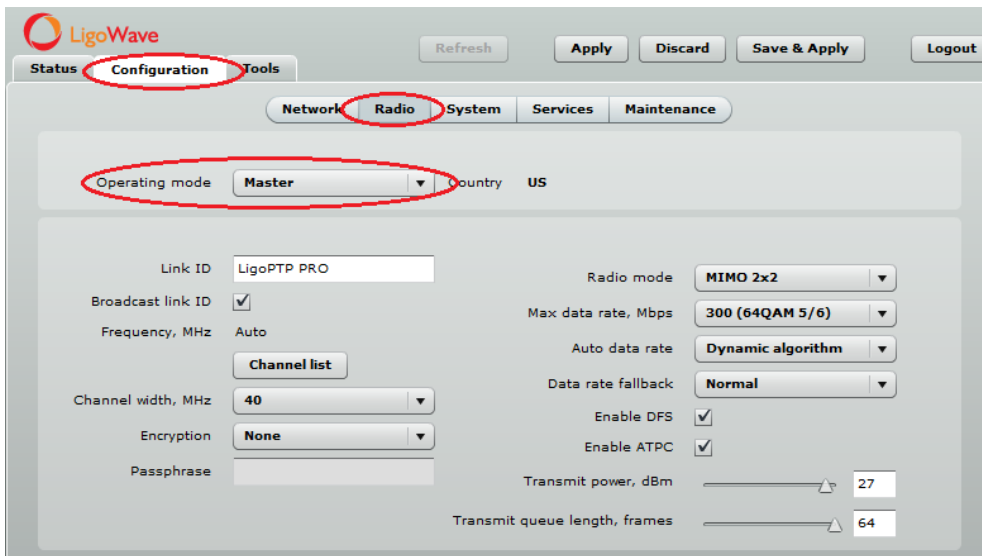
**Step 4. Specify a Link ID.** Link ID must be identical for each unit of the same link. For instructions on changing this setting refer to the Radio section in the Web management chapter.
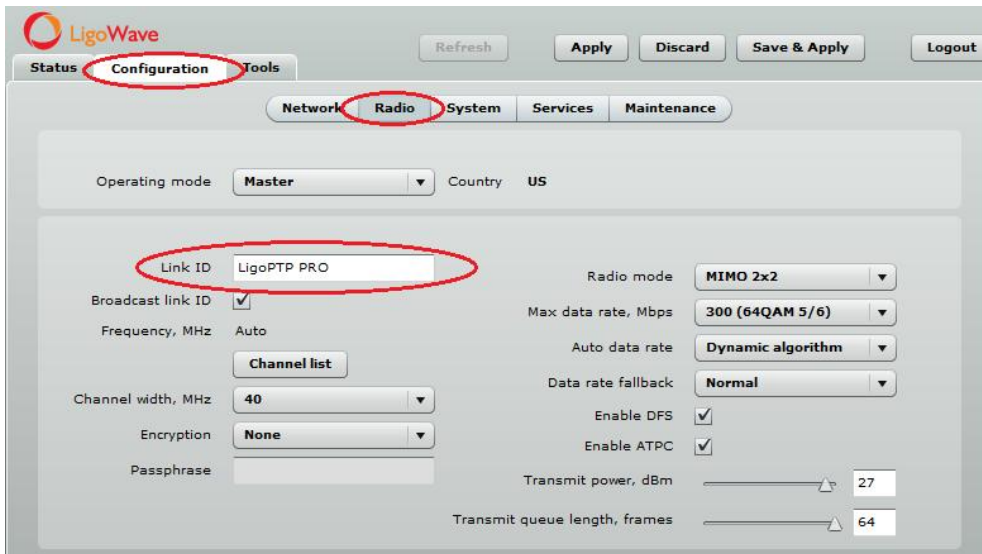


**Step 5.** Select Frequency at which LigoPTP PRO link will operate on Master unit, or leave the option Auto. The Frequency change applies only for Master units. The Slave unit will choose the frequency automatically after the Master unit will be found. For detailed instructions on changing this setting refer to the Radio section in the Web management chapter.
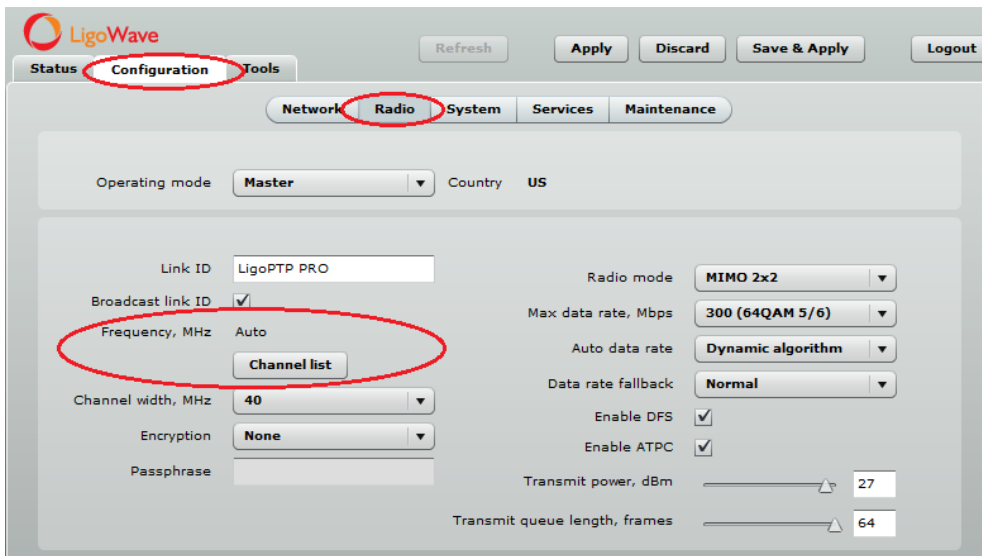
It is recommended to use Spectrum Analyzer to choose the operating frequency with the best signal level.

**Step 6.** Set Channel width at which LigoPTP PRO link will operate. For detailed instructions on changing this setting refer to the Radio section in the Web management chapter.
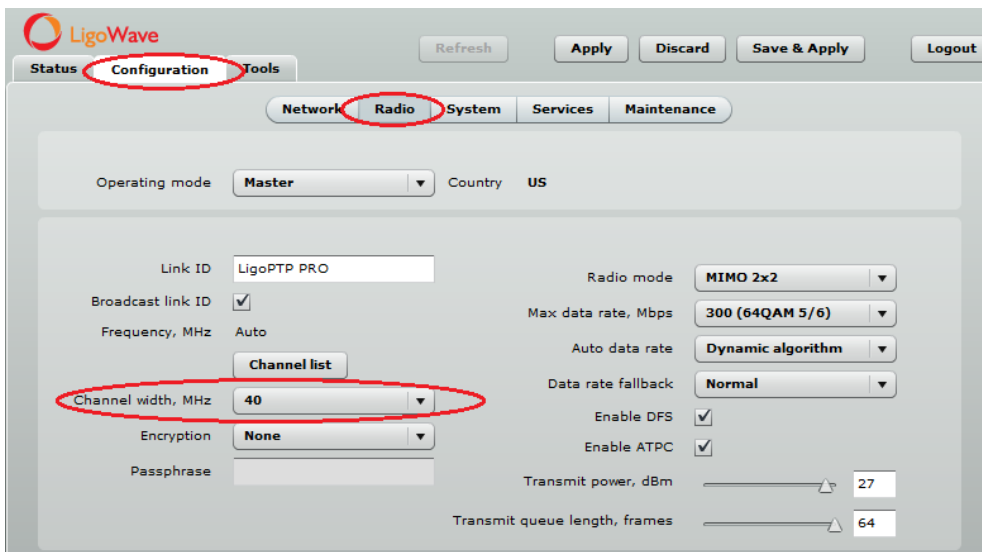


**Step 7.** Set link encryption for secure data transfer between LigoPTP PRO units. The security settings (encryption and passphrase) must be the same on each side of the link otherwise the link will not establish. For detailed instructions on changing this setting refer to the Radio section in the Web management chapter.
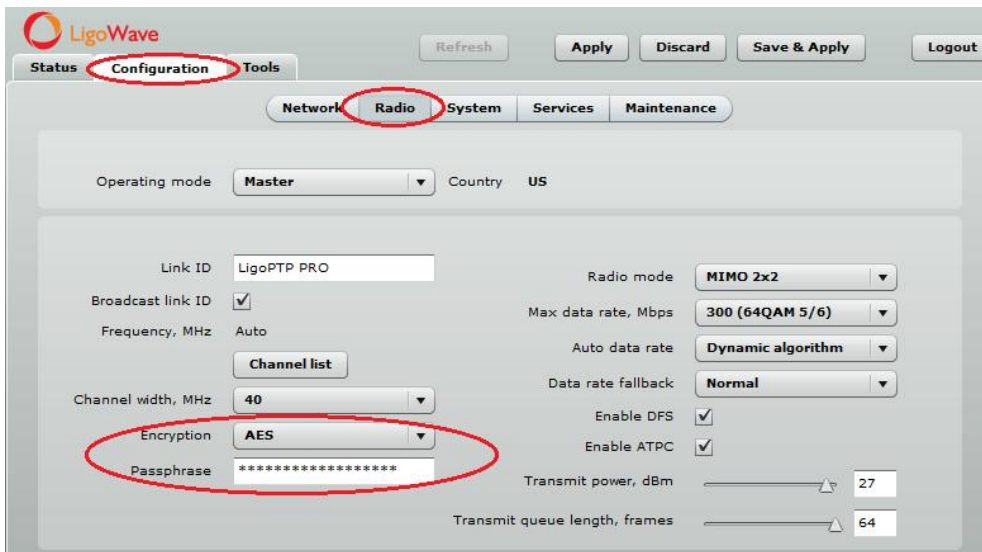
**Step 8.** Reduce Transmit Power before testing the units placed on a table. LigoPTP PRO units placed in short distance with high transmit power may work not work or even damage the peer's radio's receiver.

**Step 9.** Change web management login password. This is strongly recommended for security reasons. For instructions on changing the administrator's password refer to the corresponding section Administrative Account
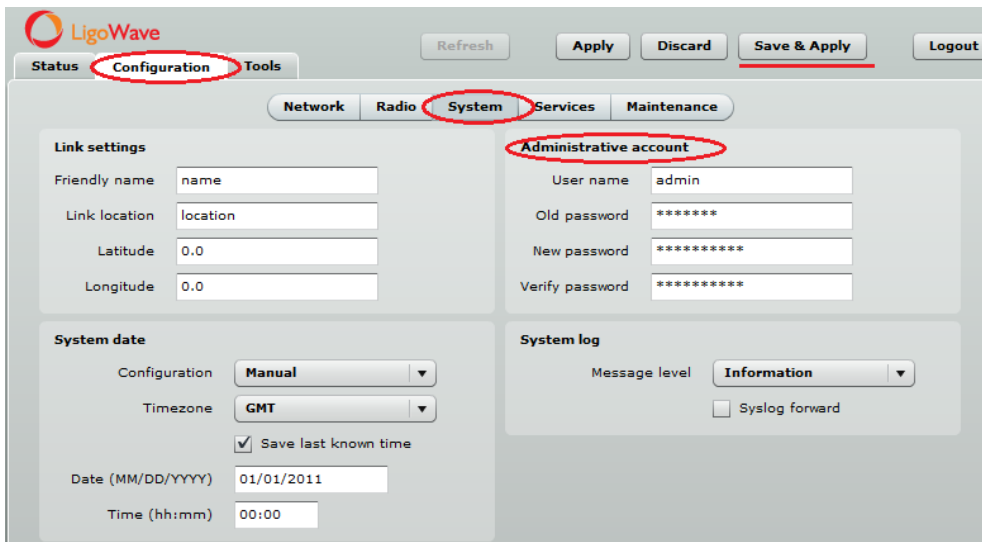


**Step 10.** Click **Save&Apply** button to save configuration.

**Step 11.** Setup the second unit of the LigoPTP PRO link in the same way and check if configured units established a Link.

# Verify PTP Link Connection

After the both units of the LigoPTP PRO link are configured, verify the link quality:

**Step 1.** Connect to the unit's web management interface.

**Step 2.** Check the Signal Indicator bar located at the bottom of the web management interface:



**Step 3.** Run the *iperf* tool (or use Link Test tool on the unit's web management) on server and client sides to verify the point-to-point connection:

```
File  Edit  View  Terminal  Help
mindaugas@mindaugas-desktop:~$ iperf -c 192.168.10.124 -w 85K -M 1.0K -l 2.0M -t 102 -i 2
WARNING: attempt to set TCP maximum segment size to 1024, but got 536
------------------------------------------------------------
Client connecting to 192.168.10.124, TCP port 5001
TCP window size:   170 KByte (WARNING: requested 85.0 KByte)
------------------------------------------------------------
[  3] local 192.168.10.1 port 43074 connected with 192.168.10.124 port 5001
[ ID] Interval       Transfer     Bandwidth
[  3]  0.0- 2.0 sec  14.0 MBytes  58.7 Mbits/sec
[  3]  2.0- 4.0 sec  22.0 MBytes  92.3 Mbits/sec
[  3]  4.0- 6.0 sec  20.0 MBytes  83.9 Mbits/sec
[  3]  6.0- 8.0 sec  22.0 MBytes  92.3 Mbits/sec
[  3]  8.0-10.0 sec  22.0 MBytes  92.3 Mbits/sec
[  3] 10.0-12.0 sec  20.0 MBytes  83.9 Mbits/sec
[  3] 12.0-14.0 sec  22.0 MBytes  92.3 Mbits/sec
[  3] 14.0-16.0 sec  20.0 MBytes  83.9 Mbits/sec
[  3] 16.0-18.0 sec  22.0 MBytes  92.3 Mbits/sec
[  3] 18.0-20.0 sec  22.0 MBytes  92.3 Mbits/sec
[  3] 20.0-22.0 sec  20.0 MBytes  83.9 Mbits/sec
[  3] 22.0-24.0 sec  20.0 MBytes  83.9 Mbits/sec
[  3] 24.0-26.0 sec  20.0 MBytes  83.9 Mbits/sec
[  3] 26.0-28.0 sec  20.0 MBytes  83.9 Mbits/sec
[  3] 28.0-30.0 sec  20.0 MBytes  83.9 Mbits/sec
[  3] 30.0-32.0 sec  20.0 MBytes  83.9 Mbits/sec
[  3] 32.0-34.0 sec  20.0 MBytes  83.9 Mbits/sec
[  3] 34.0-36.0 sec  20.0 MBytes  83.9 Mbits/sec
[  3] 36.0-38.0 sec  22.0 MBytes  92.3 Mbits/sec
[  3] 38.0-40.0 sec  16.0 MBytes  67.1 Mbits/sec
[  3] 40.0-42.0 sec  20.0 MBytes  83.9 Mbits/sec
[  3] 42.0-44.0 sec  18.0 MBytes  75.5 Mbits/sec
[  3] 44.0-46.0 sec  22.0 MBytes  92.3 Mbits/sec
[  3] 46.0-48.0 sec  20.0 MBytes  83.9 Mbits/sec
[  3] 48.0-50.0 sec  22.0 MBytes  92.3 Mbits/sec
[  3] 50.0-52.0 sec  20.0 MBytes  83.9 Mbits/sec
[  3] 52.0-54.0 sec  20.0 MBytes  83.9 Mbits/sec
[  3] 54.0-56.0 sec  20.0 MBytes  83.9 Mbits/sec
[  3] 56.0-58.0 sec  22.0 MBytes  92.3 Mbits/sec
[  3] 58.0-60.0 sec  22.0 MBytes  92.3 Mbits/sec
[  3] 60.0-62.0 sec  20.0 MBytes  83.9 Mbits/sec
[  3] 62.0-64.0 sec  22.0 MBytes  92.3 Mbits/sec
[  3] 64.0-66.0 sec  22.0 MBytes  92.3 Mbits/sec
[  3] 66.0-68.0 sec  22.0 MBytes  92.3 Mbits/sec
[  3] 68.0-70.0 sec  22.0 MBytes  92.3 Mbits/sec
[  3] 70.0-72.0 sec  20.0 MBytes  83.9 Mbits/sec
[  3] 72.0-74.0 sec  22.0 MBytes  92.3 Mbits/sec
[  3] 74.0-76.0 sec  22.0 MBytes  92.3 Mbits/sec
[  3] 76.0-78.0 sec  22.0 MBytes  92.3 Mbits/sec
[  3] 78.0-80.0 sec  20.0 MBytes  83.9 Mbits/sec
[  3] 80.0-82.0 sec  22.0 MBytes  92.3 Mbits/sec
[  3] 82.0-84.0 sec  22.0 MBytes  92.3 Mbits/sec
[  3] 84.0-86.0 sec  22.0 MBytes  92.3 Mbits/sec
[  3] 86.0-88.0 sec  20.0 MBytes  83.9 Mbits/sec
[  3] 88.0-90.0 sec  22.0 MBytes  92.3 Mbits/sec
[  3] 90.0-92.0 sec  20.0 MBytes  83.9 Mbits/sec
[  3] 92.0-94.0 sec  22.0 MBytes  92.3 Mbits/sec
```

```
File Edit View Terminal Help
mindaugas@mindaugas-desktop:~$ iperf -c 192.168.10.1 -u -b 95M -t 38 -i 2 -d -w 110k
------------------------------------------------------------
Server listening on UDP port 5001
Receiving 1470 byte datagrams
UDP buffer size:   220 KByte (WARNING: requested   110 KByte)
------------------------------------------------------------
------------------------------------------------------------
Client connecting to 192.168.10.1, UDP port 5001
Sending 1470 byte datagrams
UDP buffer size:   220 KByte (WARNING: requested   110 KByte)
------------------------------------------------------------
[  4] local 192.168.10.1 port 46203 connected with 192.168.10.1 port 5001
[  3] local 192.168.10.1 port 5001 connected with 192.168.10.1 port 46203
[ ID] Interval        Transfer     Bandwidth
[  4]  0.0- 2.0 sec  22.8 MBytes  95.6 Mbits/sec
[  3]  0.0- 2.0 sec  22.8 MBytes  95.6 Mbits/sec  0.006 ms    0/16260 (0%)
[  4]  2.0- 4.0 sec  22.8 MBytes  95.6 Mbits/sec
[  3]  2.0- 4.0 sec  22.8 MBytes  95.6 Mbits/sec  0.000 ms    0/16260 (0%)
[  4]  4.0- 6.0 sec  22.8 MBytes  95.6 Mbits/sec
[  3]  4.0- 6.0 sec  22.8 MBytes  95.6 Mbits/sec  0.000 ms    0/16260 (0%)
[  4]  6.0- 8.0 sec  22.8 MBytes  95.6 Mbits/sec
[  3]  6.0- 8.0 sec  22.7 MBytes  95.1 Mbits/sec  0.001 ms   86/16260 (0.53%)
[  4]  8.0-10.0 sec  22.8 MBytes  95.6 Mbits/sec
[  3]  8.0-10.0 sec  22.8 MBytes  95.6 Mbits/sec  0.001 ms    0/16261 (0%)
[  4] 10.0-12.0 sec  22.8 MBytes  95.6 Mbits/sec
[  3] 10.0-12.0 sec  22.8 MBytes  95.6 Mbits/sec  0.002 ms    0/16260 (0%)
[  4] 12.0-14.0 sec  22.8 MBytes  95.6 Mbits/sec
[  3] 12.0-14.0 sec  22.8 MBytes  95.6 Mbits/sec  0.003 ms    0/16260 (0%)
[  4] 14.0-16.0 sec  22.8 MBytes  95.6 Mbits/sec
[  3] 14.0-16.0 sec  22.8 MBytes  95.6 Mbits/sec  0.000 ms    0/16260 (0%)
[  4] 16.0-18.0 sec  22.8 MBytes  95.6 Mbits/sec
[  3] 16.0-18.0 sec  22.7 MBytes  95.1 Mbits/sec  0.001 ms   88/16260 (0.54%)
[  4] 18.0-20.0 sec  22.8 MBytes  95.6 Mbits/sec
[  3] 18.0-20.0 sec  22.7 MBytes  95.0 Mbits/sec  0.001 ms  101/16260 (0.62%)
[  4] 20.0-22.0 sec  22.8 MBytes  95.6 Mbits/sec
[  3] 20.0-22.0 sec  22.7 MBytes  95.0 Mbits/sec  0.000 ms  101/16261 (0.62%)
[  4] 22.0-24.0 sec  22.8 MBytes  95.6 Mbits/sec
[  3] 22.0-24.0 sec  22.8 MBytes  95.6 Mbits/sec  0.004 ms    0/16260 (0%)
[  4] 24.0-26.0 sec  22.8 MBytes  95.6 Mbits/sec
[  3] 24.0-26.0 sec  22.8 MBytes  95.6 Mbits/sec  0.001 ms    0/16260 (0%)
[  4] 26.0-28.0 sec  22.8 MBytes  95.6 Mbits/sec
[  3] 26.0-28.0 sec  22.8 MBytes  95.6 Mbits/sec  0.000 ms    0/16260 (0%)
[  4] 28.0-30.0 sec  22.8 MBytes  95.6 Mbits/sec
[  3] 28.0-30.0 sec  22.8 MBytes  95.6 Mbits/sec  0.001 ms    0/16260 (0%)
[  4] 30.0-32.0 sec  22.8 MBytes  95.6 Mbits/sec
[  3] 30.0-32.0 sec  22.8 MBytes  95.6 Mbits/sec  0.000 ms    0/16260 (0%)
[  4] 32.0-34.0 sec  22.8 MBytes  95.6 Mbits/sec
[  3] 32.0-34.0 sec  22.8 MBytes  95.6 Mbits/sec  0.001 ms    0/16261 (0%)
[  4] 34.0-36.0 sec  22.8 MBytes  95.6 Mbits/sec
[  3] 34.0-36.0 sec  22.8 MBytes  95.6 Mbits/sec  0.001 ms    0/16260 (0%)
[  4] 36.0-38.0 sec  22.8 MBytes  95.6 Mbits/sec
[  4]  0.0-38.0 sec   433 MBytes  95.6 Mbits/sec
[  4] Sent 308944 datagrams
[  3] 36.0-38.0 sec  22.8 MBytes  95.6 Mbits/sec  0.000 ms    0/16260 (0%)
```

**Step 4.** If test results are meeting the requirement and are no configuration will be done Transmit power should be increased, before mounting PTP units outside. Note that if the distance between the units is short, do not set Transmit Power to the maximum value. Observe the Signal Indicator bar – if it is red, decrease the Transmit Power.

# PTP Link Establishment

This chapter provides instructions how to install a LigoPTP PRO link. A Point to Point link operates in pairs of two units with the same configuration. Both units must be installed, and the antennas aligned for maximum throughput.

# Mounting the PTP Unit

The LigoPTP PRO unit's mounting bracket is designed to make installation on a wall or a pipe easy. The unit is attached and it's position is fixed with the single bolt.

## Mounting on a Pole

The PTP units are supplied with mounting hardware for pole with diameters in the range 10mm to 70mm installations. Follow the steps for LigoPTP PRO installation on a pole:

**Step 1.** Make sure that the LigoPTP PRO unit is powered-off.

**Step 2.** Ground the unit. The unit must be properly grounded to protect against lightning. The grounding wire must be attached to the grounding stud on the unit.

> If the unit is attached to a metal pole which is earth-grounded, no further grounding is required.

**Step 3.** Connect the unit to the bracket together and tighten up with the screws:
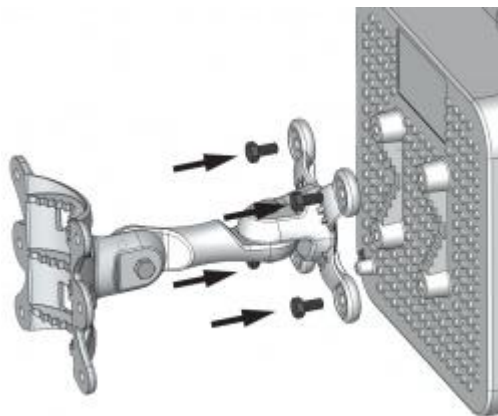


> It is recommended not to tighten the unit's mounting bracket details until the alignment process of the antenna is complete.

**Step 4.** Attach the mounting bracket and the pole clamp with the bolts and nuts. The clamp's orientation will differ according the pole's diameter as displayed below:
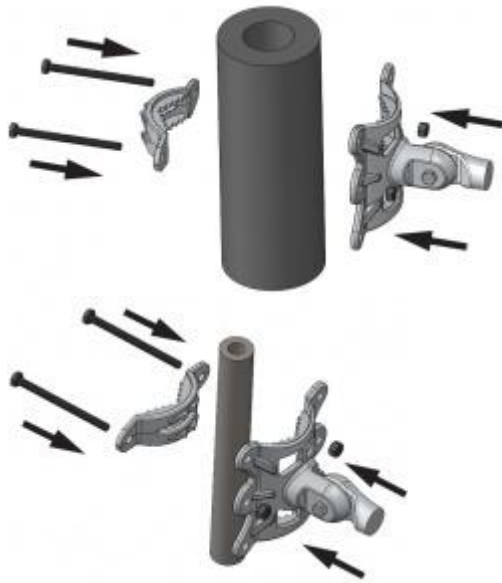
**Step 5.** Power-up the unit.

 IMPORTANT: make sure that external antennas are connected before powering up the LigoPTP 5-N PRO to avoid possible damage.

 It is recommended to use shielded Ethernet cable to reduce exposure of the electromagnetic noise.

## Mounting on a Wall

 The mounting bolts for unit installation on the wall are not included in the package.

For mounting LigoPTP PRO unit on the wall, first mount one half of the bracket to the wall and then connect the two halves of the bracket together and tighten the nut and bolt.

**Step 1.** Make sure that the LigoPTP PRO unit is powered-off.

**Step 2.** Ground the LigoPTP PRO unit. The unit must be properly grounded to protect against lightning. The grounding wire must be attached to the grounding stud on the unit.

**Step 3.** Dismantle mounting bracket into the two parts for easier attachment to the wall:

**Step 4.** Attach the following part of the mounting bracket to the LigoPTP PRO unit with 4 screws as displayed below:
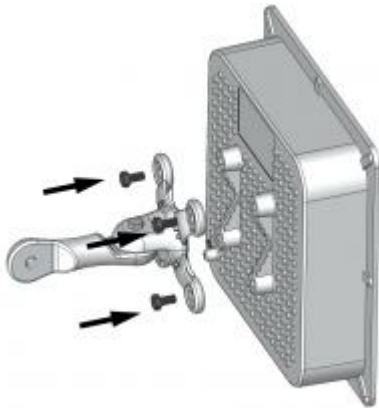


**Step 5.** Attach the second part of the mounting bracket to the wall using screws (not included) as displayed below:
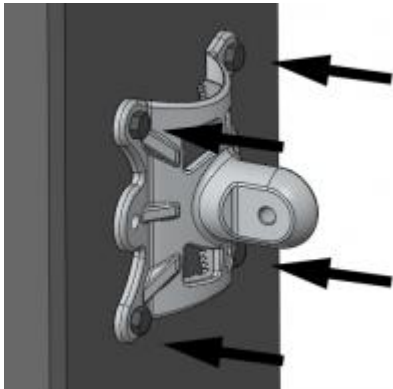


**Step 6.** Connect the mounting bracket together as displayed below and tighten up:
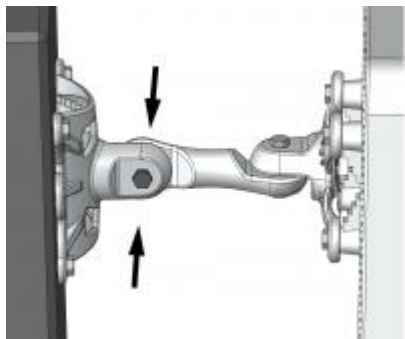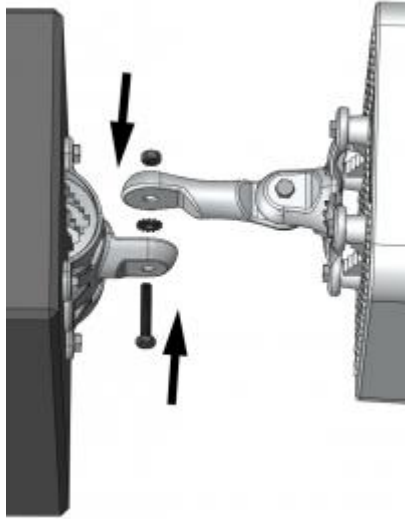
ℹ️ It is recommended not to tighten the units to its mounting brackets until the alignment process of the antenna is complete.

**Step 7.** Power-up the unit.

❗ IMPORTANT: make sure that external antennas are connected before powering up the LigoPTP 5-N PRO to avoid possible damage.

ℹ️ It is recommended to use shielded Ethernet cable to reduce exposure of the electromagnetic noise.

# Aligning Antennas

 Avoid standing directly in front of an operating antenna.

The LigoPTP PRO units are equipped with two signal strength feedback systems: antenna alignment tool on the Web management interface and antenna alignment tool on the OLED screen.

Follow the steps to establish a radio link between the two LigoPTP PRO units and align the units for the best signal strength:

**Step 1.** Ensure that power is supplied to both LigoPTP PRO link units.

**Step 2.** Ensure normal operation of the unit: check the OLED screen or Status page on the Web management interface.

**Step 3.** Run the **Antenna Alignment** tool on the selected interface (OLED or Web management) and move the antenna in the horizontal and vertical planes until the maximum RSSI visible on the Antenna Alignment graph is achieved.



Antenna Alignment on OLED interface:

For detailed instructions on Antenna Alignment tool, refer to the respective sections:
Web management – Antenna Alignment
OLED screen – Run Antenna Alignment

**Step 4.** After the maximal RSSI is reached, tighten down the unit in the optimum position.

# PTP Unit's Web Management

LigoPTP PRO products are designed to provide superior performance at long range distances. With a proprietary wireless driver that was written for the sole purpose of optimizing wireless point to point links, one can achieve much higher throughput, especially at longer links, than standards based products.

## General Operation

This section provides information about concepts used in LigoPTP PRO unit's Web management interface.

### Applying and Saving Configuration Changes

There are three general buttons located on the right top corner of the Web GUI allowing managing device configuration:

- **Apply** – if pressed new configuration settings are applied instantly. It will take few seconds and the device will be running with new settings. It should be noted that pressing Apply button settings are not written to the permanent memory. Therefore, if the device is rebooted it will start with old configuration settings.
- **Discard** – if pressed parameter changes are discarded. It should be noted that if Apply or Save&Apply is pressed it is not possible to discard changes.
- **Save&Apply** – if pressed new configuration settings are applied instantly and written to the permanent memory.

It is not required to press **Apply** or **Save&Apply** in every Web GUI tab. The device remembers all changes made in every tab and after action button is used, all changes will be applied.

### Signal Indicator

The LigoPTP PRO web management interface has a link signal indicator. This indicator displays real-time signal level in dBm of the Local and Remote units.

The color of the Signal indicator will change according to the signal level quality of the unit. The green color means excellent link quality while the red color of the indicator means that link quality is poor.

The red circle ● beside full filled red indicator switches on immediately when the signal level becomes too high and overload is detected.



This may happen on an incorrect link layout, for example, in the case when the TX power parameter in the LigoPTP PRO units is set to maximum but physically the units are too close to each other (e.g. testing units are placed on a table).

The screenshot below displays Signal indicator if there is no LigoPTP PRO link established between units:



# Status

Use the Status menu to check the current status of the LigoPTP PRO unit and established link (this is the default page when accessing the device's web management interface). The Information page displays generic information and status of the LigoPTP PRO unit. The page is divided into three main categories: System, Network and Wireless. The System section displays the identification information of the LigoPTP PRO unit. The Wireless section presents main wireless settings. The Ethernet section describes the PTP unit's network identity and connectivity.

The information in the page can be updated using **Refresh** button.

**System**

System section displays general information of the LigoPTP PRO unit.

**Product name** – displays the product name.

**Link name** – describe the link name to identify the LigoPTP PRO unit on the network.

**Link location** – describe the link location, to identify the LigoPTP PRO unit on the network.

**Link distance** – displays automatically calculated LigoPTP PRO link distance.

**Latitude/Longitude** – displays the coordinates of the device.

**Firmware version** – displays the device hardware and software version.

**Uptime** – displays the time, expressed in days, hours and minutes since the system was last rebooted.

**Average load** – displays the average load of the device processor in the period of the last 1minute, 5 minutes and 15 minutes (a larger value means a larger average load on the processor).

- <1.0 – System is idle
- =1.0 – Normal load
- >1.0 – Processor is busy.

**System time** – displays current system time.

**Ethernet**

**ETH1 link status** - displays the status of the Ethernet link. A State **UP** indicates that the Ethernet link is established. A state **DOWN** indicates that the Ethernet link is not established.

**Ethernet speed/duplex** - displays the negotiated speed and duplex of the Ethernet interface specified in Mbps. The N/A will be displayed if the Ethernet status is down. Full duplex means that data can be transmitted in both directions on a signal carrier at the same time. Half duplex means that data can be transmitted in both directions on a signal carrier, but not at the same time. Auto means that the system will detect link speed and duplex mode automatically.

**Wireless**

**Wireless link status** - displays the status of the Wireless link. A State **UP** indicates that the Wireless link between local and remote units is established. A state **DOWN** indicates that the Wireless link between local and remote units is not established.

**Link uptime** - displays the time, expressed in days, hours and minutes since the point to point link was established.

**Operating mode** - displays the operating mode of the device. The operating mode can be Master or Slave.

**Link ID** - displays LigoPTP PRO link ID, specified by the user.

**Encryption** - displays encryption method: none or AES.

**Frequency, MHz** - displays frequency in MHz at which the LigoPTP PRO link communicates.

**Channel width, MHz** - displays the channel width (5/10/20/40) at which the LigoPTP PRO link communicates.

**Data rate, Mbps** - displays data rates at which the LigoPTP PRO link communicates.

**Antenna gain, dBi** - displays the antenna gain value.
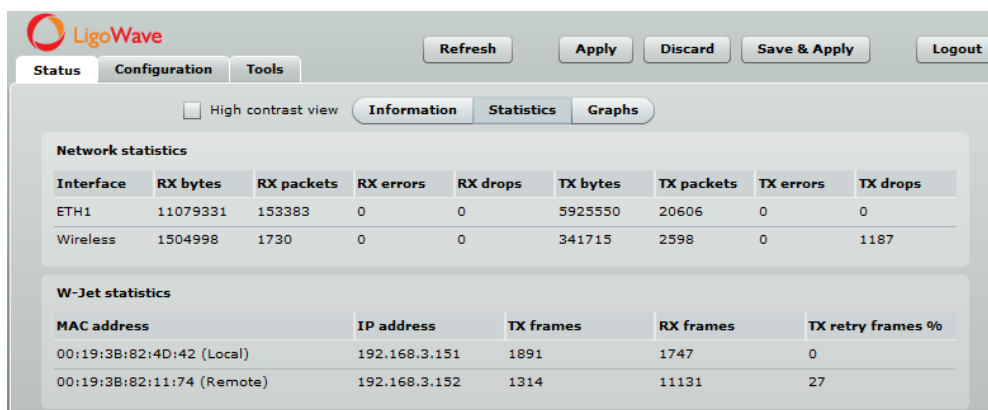
**Transmit power, dBm** - displays TX power value of the local LigoPTP PRO unit.

**Remote transmit power, dBm** - displays TX power value of the remote LigoPTP PRO unit.

# Statistics

The statistics page displays detailed statistics of the LigoPTP PRO link performance. The Statistics page is divided into the two sections: Networks statistics and W-Jet statistics.

**Network statistics** contains detailed statistics of Ethernet and Wireless interfaces:



**RX bytes** - displays the total number of received bytes by the Ethernet or Wireless interface of the LigoPTP PRO link.

**RX packets** - displays the total number of received packets by the Ethernet or Wireless interface of the LigoPTP PRO link.

**RX errors** - displays the total number of received corrupted packets by the Ethernet or Wireless interface of the LigoPTP PRO link.

**RX drops** - displays the total number of dropped packets by the Ethernet or Wireless interface of the LigoPTP PRO link.

**TX bytes** - displays the total number of sent bytes by the Ethernet or Wireless interface of the LigoPTP PRO link.

**TX packets** - displays the total number of sent packets by the Ethernet or Wireless interface of the LigoPTP PRO link.

**TX errors** - displays the total number of sent corrupted packets by the Ethernet or Wireless interface of the LigoPTP PRO link.

**TX drops** - displays the total number of dropped packets by the Ethernet or Wireless interface of the LigoPTP PRO link.

**W-Jet** is advanced proprietary wireless protocol that combines special techniques to achieve superior performance and reliability even over long distances. This table displays statistical counters of the LigoPTP PRO link communication protocol.

| W-Jet statistics | | | | |
|---|---|---|---|---|
| **MAC address** | **IP address** | **TX frames** | **RX frames** | **TX retry frames %** |
| 00:19:3B:82:4D:42 (Local) | 192.168.3.151 | 2344 (+0) | 915 (+0) | 0 (+0) |
| 00:19:3B:82:11:74 (Remote) | 192.168.2.66 | 866 (+0) | 25037 (+0) | 33 (+0) |

**MAC address** – displays MAC addresses of the Local and Remote units.

**IP address** – displays IP addresses of the Local and Remote units.

**TX frames** – number of transmitted data frames. The number in brackets (+xx) displays the data change since the last page refresh.

**RX frames** – number of transmitted data frames. The number in brackets (+xx) displays the data change since the last page refresh.

**TX retry frames %** – the percentage of attempts to retransmit data frames. The number in brackets (+xx) displays the data change since the last page refresh.

## Graphs

The Graphs page contains device statistics in graphic diagrams and is used for device monitoring. Select the required statistics (RSSI, Traffic, RX/TX errors, Memory, CPU load or Frequency change) and the corresponding graphic diagrams will be displayed. The statistics in diagrams are displayed on hourly, daily, weekly, monthly or yearly basis; hourly is chosen by default. The option **Display current time set on the system** gives possibility to convert the time stamps on the diagrams in current date, set on the administrator's PC.
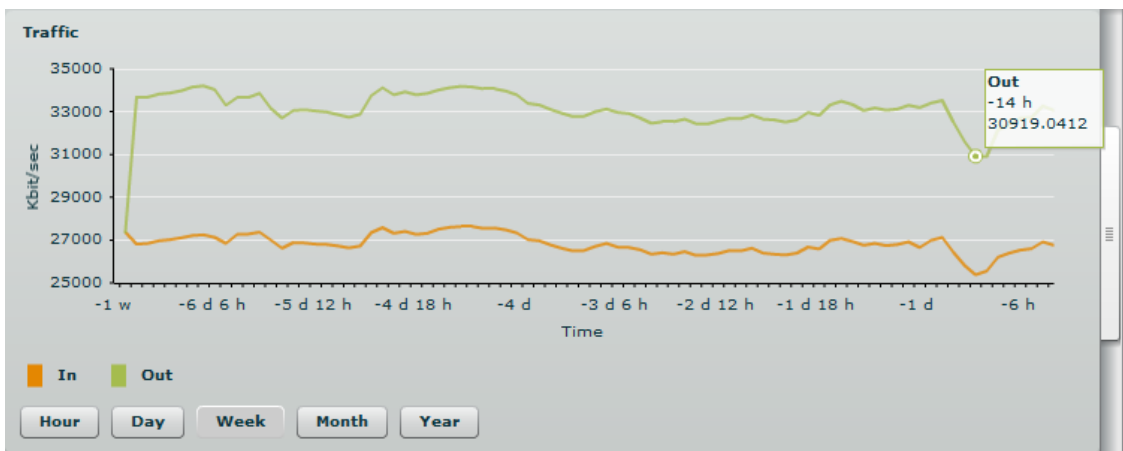
To update statistics data click **Refresh** button.

Point the mouse cursor on the diagram line and you will get the numeric expression of the particular statistic.

**Signal strength** diagram displays RSSI change of the Local and Remote LigoPTP PRO units at the chosen period:
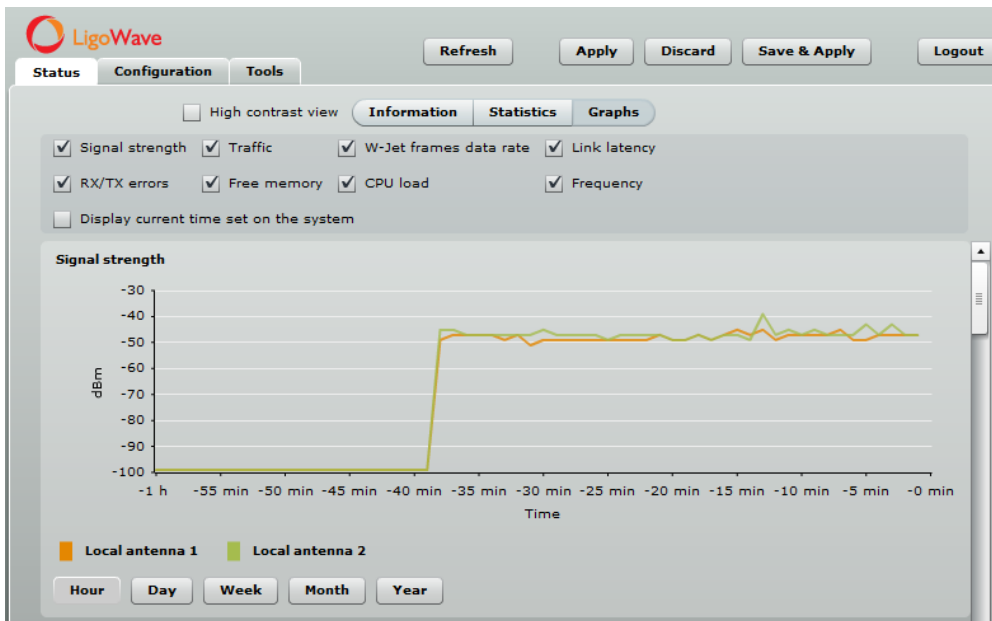
**Traffic** diagram displays Incoming and Outcoming traffic statistical data:



**W-Jet data rates** diagram displays the count of data frames send on chosen data rates. This gives possibility to choose the most effective data rates for the PTP unit. The data on diagram must be observed carefully: the correctly chosen data rates must generate diagram with one distinguished data rate column (300 Mbps data rate column in first picture below), thus meaning that a little or no data frame were sent on lower data rates. The second picture shows that a lot of retries were on 270 Mbps data rate (this means that administrator needs to lower the data rate).
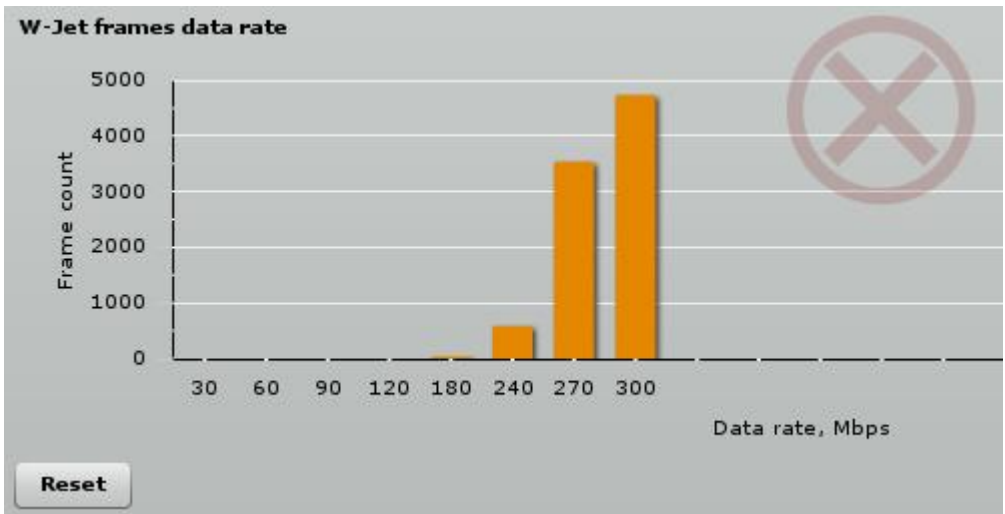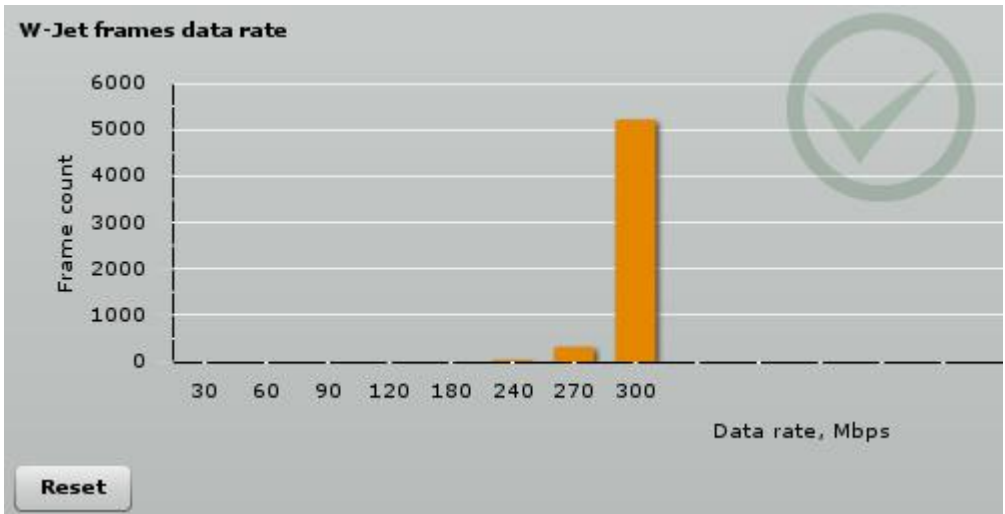
**RX/TX errors** diagram displays statistical data of RX drop of the Local and Remote units, TX try of the Local and Remote units:
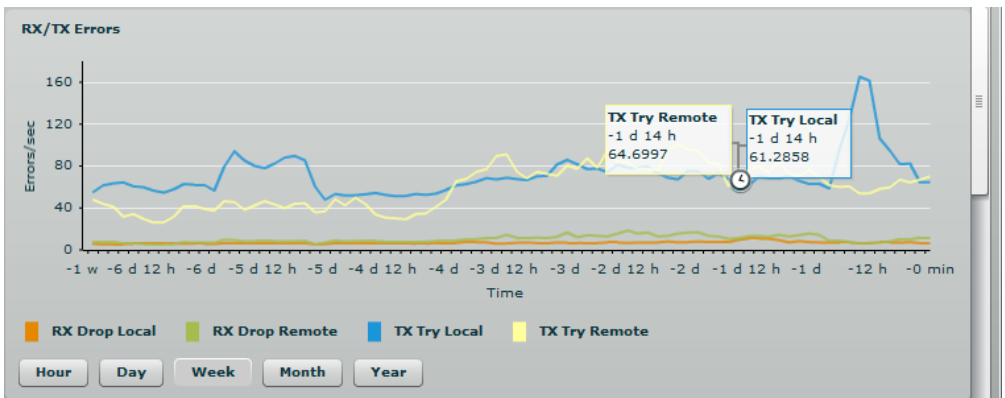
**Link latency** diagram calculates the round-trip delay time (RTD) - the length of time it takes for a packet to be sent from Local unit to Remote unit, plus the length of time it takes receive packet back from Remote unit to a Local unit.
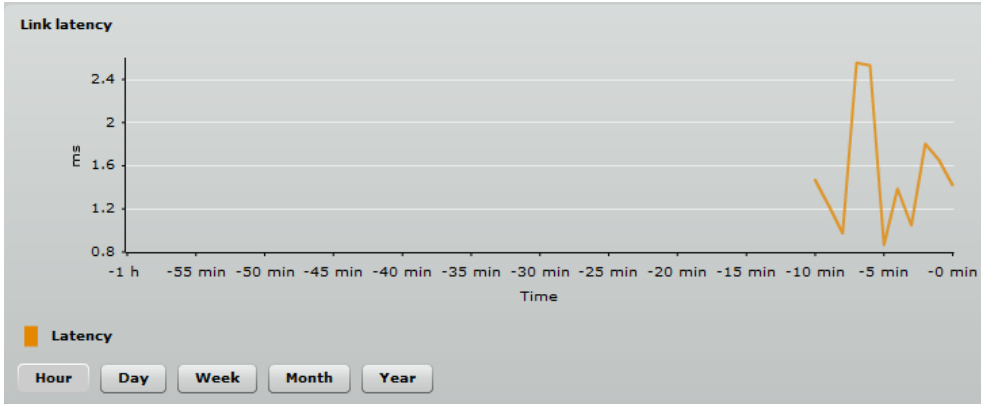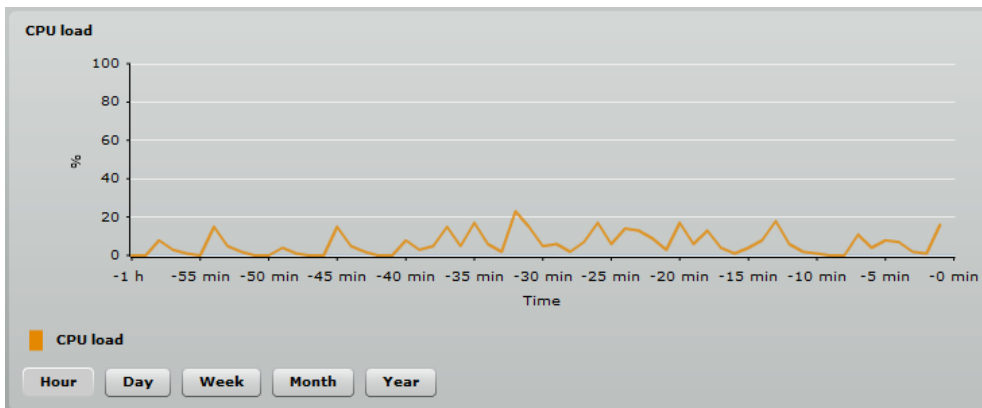


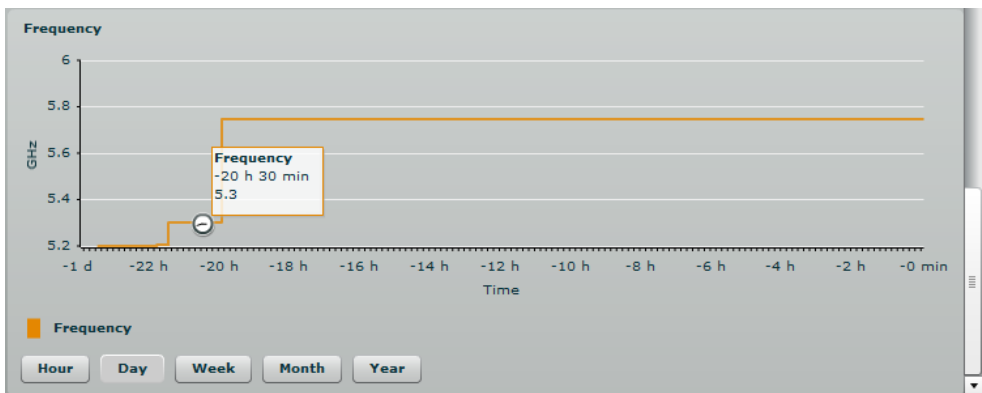The **Link latency** graph will be displayed only if both PTP units (Remote and Local) are on the same subnet

**Free memory** diagram displays memory usage data:



**CPU load** diagram displays device CPU load in appropriate time basis:

**Frequency** diagram displays device operating frequency in GHz:



# Configuration

The Configuration page is subdivided into following pages:

- Network - to set main network configuration for LigoPTP PRO unit.
- Radio - to setup radio settings of the LigoPTP PRO link.
- System - to setup system date, administrator's access settings, configure system log feature and control OLED.
- Services - to setup SNMP, WNMS settings and configure device alerts.
- Maintenance - for device firmware update, reboot, reset device to factory defaults, troubleshooting file download and to view system log messages.

## Network

The network configuration as described below is required for LigoPTP PRO management purposes. Use the **Network** menu to setup the network settings of the LigoPTP PRO unit:

**Method** - specify IP configuration mode:

- **Static IP** - choose to specify static IP of the device.
- **Dynamic IP** - choose to use dynamic IP given by the DHCP server (running DHCP server is required).

**IP address** – specify the device IP address [digit and dots]. When shipped from the factory or reset to factory settings, device defaults to a static IP address of 192.168.2.66.

**Subnet mask** – specify the device subnet mask [digit and dots]. When shipped from the factory or reset to factory settings, the device defaults to a subnet mask of 255.255.255.0.

**Default gateway** – specify the IP address of the device gateway [digit and dots]. When shipped from the factory or reset to factory settings, the device defaults to a gateway IP address of 192.168.2.1.

**DNS server 1** – specify the IP address of the primary DNS server [digit and dots]. The DNS (Domain Name Service) service translates Internet host names into their IP addresses.

**DNS server 2** – specify the IP address of the secondary DNS server.

**ETH1 configuration** – configures the Ethernet link speed and the duplex mode of the Ethernet port. Choose "auto" for automatic detection of link speed and duplex mode.

- auto
- 10baseT/Half
- 10baseT/Full
- 100baseT/Half
- 100baseT/Full
- 1000baseT/Half
- 1000baseT/Full

**Limit outgoing traffic** – specify traffic speed limit in Mbps of outgoing traffic [0-100].
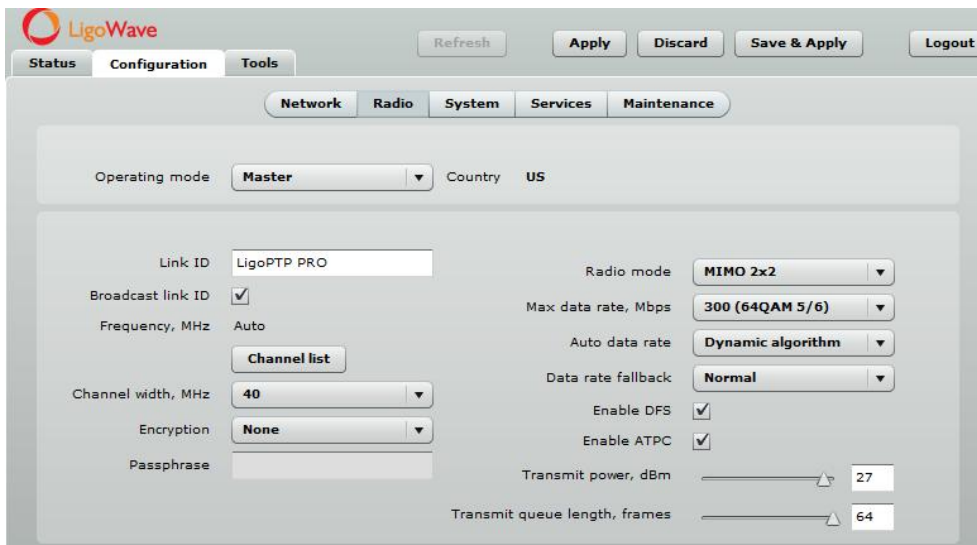
**Management VLAN enabled** – select to enable management VLAN. If management VLAN is enabled, all traffic received by the device must by tagged with the management VLAN ID to access the network. All non-tagged traffic will be dropped, thus reducing the risk of unauthorized access.

**Management VLAN ID** – specify the management VLAN ID [2-4094].

**Restrict management to** – select interfaces on which management access will be restricted.

## Radio

Use the **Configuration | Radio** menu to set up radio settings for the LigoPTP PRO link:



**Operating mode** – specify the operating mode of the local device to create LigoPTP PRO link [Master/Slave].

- **Master** – in this mode the LigoPTP PRO unit is the controlling PTP link unit.
- **Slave** – in this mode the LigoPTP PRO unit connects to the Master unit thus creating the LigoPTP PRO link.

**Link ID** - specify known network name of the remote device to establish a LigoPTP PRO link.

> For LigoPTP PRO link establishment both units (Master and Slave) of a link must have exactly the same **Link ID**, and **Encryption** specified.

**Broadcast link ID** - enables or disables the broadcasting of the link ID for master unit.

**Frequency** - specify frequency at which the LigoPTP PRO link will operate. . If more than one channel is selected, then autochannel feature will be enabled. Automatic channel selection allows PTP unit to select a channel which is not used by any other wireless device or, if there are no free channels available - to select a channel which is least occupied. The table displays detailed information about each channel:

| Channel/Frequency | Channel width | TX power limit | EIRP limit | DFS/ATPC required |
|---|---|---|---|---|
| ☐ 5735 MHz | 20/40 MHz | 47 dBm | 47 dBm | No |
| ☐ 5740 MHz | 20/40 MHz | 47 dBm | 47 dBm | No |
| ☑ 5745 MHz | 20/40 MHz | 47 dBm | 47 dBm | No |
| ☑ 5750 MHz | 20/40 MHz | 47 dBm | 47 dBm | No |
| ☑ 5755 MHz | 20/40 MHz | 47 dBm | 47 dBm | No |
| ☑ 5760 MHz | 20/40 MHz | 47 dBm | 47 dBm | No |
| ☑ 5765 MHz | 20/40 MHz | 47 dBm | 47 dBm | No |
| ☑ 5770 MHz | 20/40 MHz | 47 dBm | 47 dBm | No |
| ☑ 5775 MHz | 20/40 MHz | 47 dBm | 47 dBm | No |
| ☑ 5780 MHz | 20/40 MHz | 47 dBm | 47 dBm | No |
| ☑ 5785 MHz | 20/40 MHz | 47 dBm | 47 dBm | No |
| ☑ 5790 MHz | 20/40 MHz | 47 dBm | 47 dBm | No |
| ☑ 5795 MHz | 20/40 MHz | 47 dBm | 47 dBm | No |
| ☑ 5800 MHz | 20/40 MHz | 47 dBm | 47 dBm | No |
| ☑ 5805 MHz | 20/40 MHz | 47 dBm | 47 dBm | No |
| ☐ 5810 MHz | 20/40 MHz | 47 dBm | 47 dBm | No |
| ☐ 5815 MHz | 20/40 MHz | 47 dBm | 47 dBm | No |
| ☐ 5820 MHz | 20/40 MHz | 47 dBm | 47 dBm | No |

Select all    Clear

OK    Cancel

**Channel width** - choose the channel width in MHz [20/40]. The default channel bandwidth for 802.11 radio is 20MHz. The 802.11n allow channel bonding in such way the total channel width becomes 40MHz.

**Encryption** - select the security level for the LigoPTP PRO link:

- **None** - means no security on link.
- **AES** - means encryption with passphrase.

**Passphrase** - specify passphrase of the AES security [8-63 characters]. This parameter appears and is mandatory when AES security is chosen.

**Radio mode** – choose the LigoPTP PRO antenna operating mode:

- **SISO** – single input single output. The device will use only one antenna for data transfer. The antenna will be chosen automatically.

- **MIMO** – multiple input multiple output. The device will use two antennas for data transfer (two simultaneous streams). In this mode the link capacity doubles if compared to SISO mode.

**Max data rate, Mbps** – choose the data rates in Mbps at which LigoPTP PRO should transmit packets. LigoPTP PRO will attempt to transmit data at the highest data rate set. If there will be an interference encountered, the device will step down according the selected method (**Auto data rate** and **Data rate fallback** settings below) to the next highest rate that allows data transmission.

**Auto data rate** - select the algorithm at which the LigoPTP PRO will choose the proper data rates in case the signal degrades:

- **Fixed algorithm** - with this method the LigoPTP PRO will start transmitting data with the specified **Max data rate** and step down gradually until the best data rate of the transmission will be reached.
- **Dynamic algorithm** - with this method the LigoPTP PRO will start transmitting data with automatically calculated data rate by specific algorithm and step down to the next automatically calculated data rate until the best data rate of the data packet transmission will be reached.

**Data rate fallback** – choose the data rate fallback method: normal or aggressive.

- **Normal** - the LigoPTP PRO will start transmitting data at the highest data rate and then decreases it until the best rate of the transmission will be reached.
- **Aggressive** - with this method selected, the data rate will be decreasing down faster and more aggressive: the LigoPTP PRO will start transmitting data at the highest data rate and renegotiate down every two data rate until the best rate of the transmission will be reached, even changing the radio mode from MIMO to SISO.

**DFS** - select to enable a radar detection. With enabled DFS, LigoPTP PRO unit monitors the operating frequency for radar signals. If radar signals are detected on the channel, the unit randomly selects a different channel.

> If the LigoPTP PRO unit is operating on channel where DFS is required (check on the Channel list table), the DFS option will be enabled automatically.

**Enable ATPC** – select to enable Automatic Transmit Power Control (ATPC). If enabled, LigoPTP PRO radio will continuously communicate with remote unit's radio in order to adjust the optimal transmit power automatically.

**Transmit power** - set the radio transmit power at which the device will transmit data. The larger the distance, the higher transmit power is required. To set transmit power level use the slider or enter the value manually. When entering the transmit power value manually, the slider position will change according to the entered value. The maximum transmit power level is limited to the allowed value by country's in which device is operating regulatory agency.

**Transmit queue length, frames** - specify the maximum number of frames of the transmit queue [1-64].

## System

The System page is subdivided into 4 sections:

- Link settings - to specify LigoPTP PRO link settings.
- System date - to setup system date and time of the LigoPTP PRO unit.
- Administrative account - to change administrator's password.
- System Log - to configure logging of the system messages.

### Link Settings



**Friendly name** - specify name of the LigoPTP PRO link that is used to identify the unit on the network [maximum 255 ASCII characters].

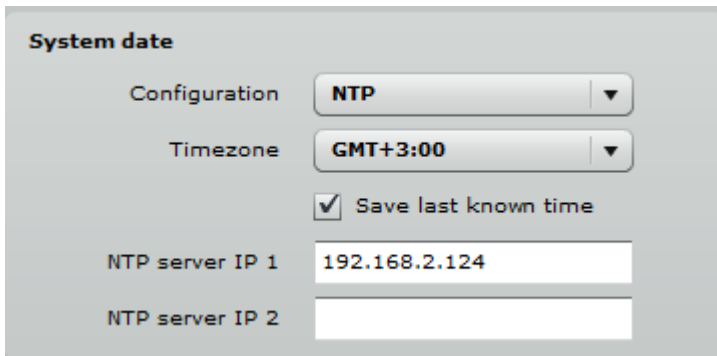**Link location** - describe the location of the LigoPTP PRO unit [maximum 255 ASCII characters].

**Longitude** - specify the longitude coordinates of the LigoPTP PRO unit [specific decimal format, e.q. 54.869446].

**Latitude** - specify the latitude coordinates of the LigoPTP PRO unit [specific decimal format, e.q. 23.891058]. Both coordinates helps indicate accurate location of the LigoPTP PRO unit's.

**System Date**

Use this section to manage the system time and date on the device automatically, using the Network Time Protocol (NTP), or manually, by setting the time and date on the PTP unit.

he NTP (Network Time Protocol) client synchronizes the clock of the device with the defined time server. Choose NTP from the configuration menu, select your location timezone and enter NTP server in order to use the NTP service.



**Configuration** – choose the system clock configuration mode [NTP/Manual].

**Timezone** – select the timezone. Time zone should be specified as a difference between local time and GMT time.

**Save last known time** – select to recall the timestamp that was saved on last reboot. When NTP is enabled, this option will set system clock to last reboot time if no NTP servers are available.

**NTP server** – specify the trusted NTP server IP or hostname for synchronizing time with [IP address].

To adjust the clock settings manually, choose the configuration mode as **Manual** and specify the following settings:

**Configuration** – choose the system clock configuration mode [NTP/Manual].

**Timezone** – select the timezone. Time zone should be specified as a difference between local time and GMT time.

**Save last known time** – select to recall the timestamp that was saved on last reboot.

**Date** – pecify the new date value in format MM/DD/YYYY

**Time** – specify the time in format hh:mm.

 If the device hardware has no internal clock, the configured manual time will be reset to the specified date and time after each device reboot.

**Administrative Account**

 We recommend changing the default administrator password as soon as possible.

The Administrative Account menu is for changing the administrator's credentials.

**User name** – enter new administrators username.

**Old password** – enter the old administrator password.

**New password** – enter the new administrator password for user authentication.

**Verify password** – re-enter the new password to verify its accuracy.

The only way to gain access to the web management if you forget the administrator password is to reset the device to factory default settings. Default administrator login settings are

- User name: **admin**
- Password: **admin01**

**System Log**

Use the Configuration | System menu to configure device to save log messages to the local or remote server using standard syslog facility:



**Message level** – specify system's message tracing level. The level determines the importance of the message and the volume of messages generated by the PTP unit. The levels are in increased importance order [emergency, alert, critical, error, warning, notice, information, debug]. Default: info.

The LigoPTP PRO unit can be configured to send system log messages to a remote server:

**Syslog forward** – select to enable remote system logging.

**Forward server** – specify the remote host IP address or hostname where syslog messages will be sent.

**Forward port** – specify the port to which syslog messages will be forwarded [0-65535]. Default: 514.

**Forward message level** – specify the message level that will be send to the remote syslog server. The level determines the importance of the message and the volume of messages generated by the PTP unit. The levels are in order of increasing importance [emergency/alert/critical/error/warning/notice/information/debug]. Default: information.

**Forward backup** – select to enable remote syslog logging backup.

**Backup server** – specify the backup host IP address or hostname where syslog messages will be send to.

**Backup port** – specify the port to which syslog messages will be forwarded [0-65535]. Default: 514.

To view logged system messages locally, navigate to the menu View system log.

## Services

Services page is divided into 3 sections:

- HTTP Settings - to setup HTTP port on the LigoPTP PRO unit.
- SSH Settings - to setup SSH port on the LigoPTP PRO unit.
- SNMP configuration - to enable SNMP and setup SNMP on the LigoPTP PRO unit.
- WNMS configuration - to enable and setup WNMS agent on the LigoPTP PRO unit.
- Alerts - to enable and setup system alerts.

### HTTP Settings

**HTTPS** connection via the standard port 8080 is always enabled on the LigoPTP PRO units.

Use this menu to control HTTP connection on device web management:

**Enable** management through HTTP – select tis option to enable or disable HTTP access to the device management.

**Port** – specify HTTP port. Standard HTTP port is 80.

### SSH Settings

Use this menu to manage access to the device via SSH port:



**Enabled** – enable or disable SSH access to device.

**Port** – the SSH service port. By default SSH port is 22.

### SNMP Configuration

SNMP is the standard protocol that is widely used for remote network management over the Internet. With the SNMP service enabled, the LigoPTP PRO unit can act as SNMP agent.

To communicate with SNMP manager you must configure SNMP communities and identifiers on both ends (manager and agent).



**Enable SNMP** – specify the SNMP service status.

**Friendly name** – displays an administratively assigned name. This

**Link location** – displays the physical location of the LigoPTP PRO unit [string].

**Contact information** - displays contact information of the LigoPTP PRO unit [string].
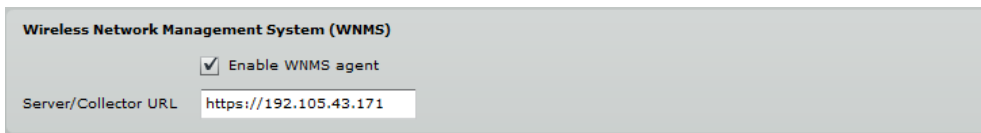
**R/O community** – specify the read-only community name for SNMP version 1 and version 2c [string]. The read-only community allows a manager to read values, but denies any attempt to change values.

**R/O user** – specify the user name for read-only SNMPv3 access [string]. The read-only community allows a manager to read values, but denies any attempt to change values.

**R/O user password**– specify the password for read-only SNMPv3 access [string].

**WNMS Configuration**

Wireless Network Management System (WNMS) is a centralized monitoring and management system for wireless network equipment. The communication between managed devices and the WNMS server is always initiated by an WNMS agent service running on every device.



**Enable WNMS** – select to enable WNMS agent settings.

**Server/Collector URL** – specify the URL with ending `/collector` of the WNMS server that heartbeat notifications will be sent to.

**System Alerts**

The LigoPTP PRO unit is able to send external alerts when there are system errors. The alerts can be sent via SNMP Traps or/and SMTP notifications.

**Enable alerts** - select to enable alert notifications on the system.

**System check interval, s** - specify interval in seconds at which the device will send notifications of unexpected system behavior.

**System alerts:**

- ▪ **Wireless link status change** – system will send notification on Wireless link status change.
- ▪ **Ethernet link status change** – system will send notification on Ethernet link status change.
- ▪ **RSSI level lower than** – system will send notification when RSSI reach value lower than specified. Default: 25
- ▪ **Noise level greater than** – system will send notification when signal noise will reach value greater than specified. Default: -60 dBm.
- ▪ **RX drop greater than** – ssystem will send notification when the specified percent of RX dropped packets becomes higher than specified value. Default: 35%.
- ▪ **TX retry greater than** – system will send notification when the specified percent of TX retries becomes higher than specified value. Default: Default: 35%.
- ▪ **Device reboot** – system will send notification about unexpected or administrator initiated device reboot.
- ▪ **Frequency change** – system will send notification on frequency change.

**SNMP Traps Settings**

**Manager address** - specify the IP address or hostname of Trap receiver.

**Manager port** - specify the port number of the Trap receiver. Default port number is 162.

**Trap community** - specify the SNMP community string. This community string acts as password between SNMP manager and PTP unit. by default Trap community string is "public".

**Use inform** - select to wait for an acknowledgment from SNMP manager that trap was received.

**Retry count** - specifies maximum number of times to resend an inform request [1-10]. Default: 5.

**Retry timeout** - specifies number in seconds to wait for an acknowledgment before resending request [1-10]. Default: 1.

**SMTP Settings**

**Server address** - specify the IP address or hostname of the networked SMTP server.

**Server port** - specify the SMTP Port Number is the port number used by the networked SMTP server. By default the port number is 25.

**Source e-mail** - specify the e-mail address that will be used by the LigoPTP PRO unit.

**Destination e-mail** - specify the e-mail address where the LigoPTP PRO unit will send the alert messages.

**E-mail notification interval** - specify interval in seconds at which the e-mail notification will be sent from the LigoPTP PRO unit [0-86400]. If 0 specified, then device will send an e-mail notification immediately after unexpected system behavior.

**Username** - provide the user name required to access the SMTP server.
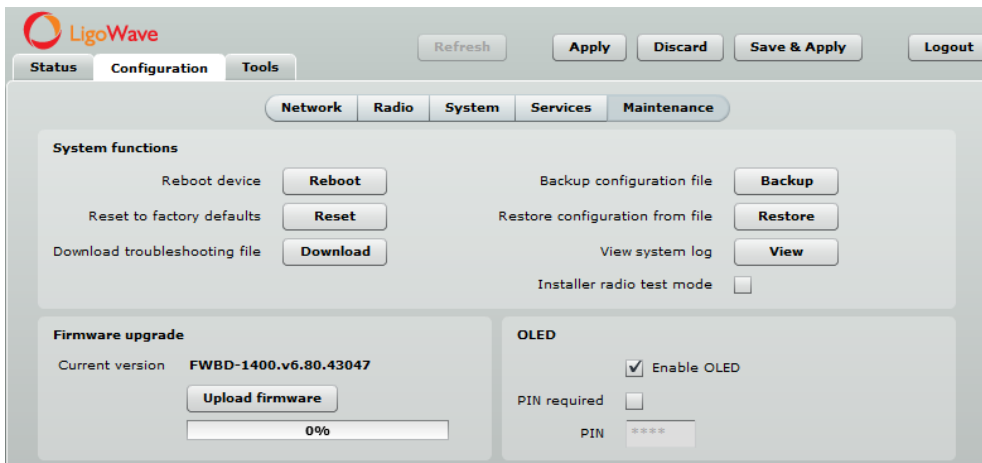
**Password** - provide the password required to access the SMTP server.

**Encryption** - select the encryption method of SMTP authentication: none, TLS 1.0 or SSL 3.0

## Maintenance

Use Maintenance menu for device firmware update, reboot, reset device to factory defaults, troubleshooting file download and to view system log messages and control OLED

**System Functions**

**Reboot device** – reboot device with the last saved configuration.

**Reset device to factory defaults** – click to restore LigoPTP PRO unit's factory configuration.

> Resetting the device is an irreversible process. Current configuration and the administrator password will be set back to the factory default.

**Download troubleshooting file** – click to download the troubleshooting file. The troubleshooting file contains valuable information about device configuration, routes, log files, command outputs, etc. When using the **troubleshooting file,** the device quickly gathers troubleshooting information automatically, rather than requiring you to gather each piece of information manually. This is helpful for submitting problems to the support team.

**Backup configuration file** - click to save the current configuration file. The saved configuration file is useful to restore a configuration in case of a device misconfiguration or to upload a standard configuration to multiple devices without the need to manually configure each device through the web interface..

**Restore configuration from file** - click to upload an existing configuration file to the LigoPTP PRO unit.

**View system log** - click to view current trace messages. The Syslog viewer utility provides debug information about the system services and protocols. If the device's malfunction occurs recorded messages can help operators to locate misconfiguration and system errors.
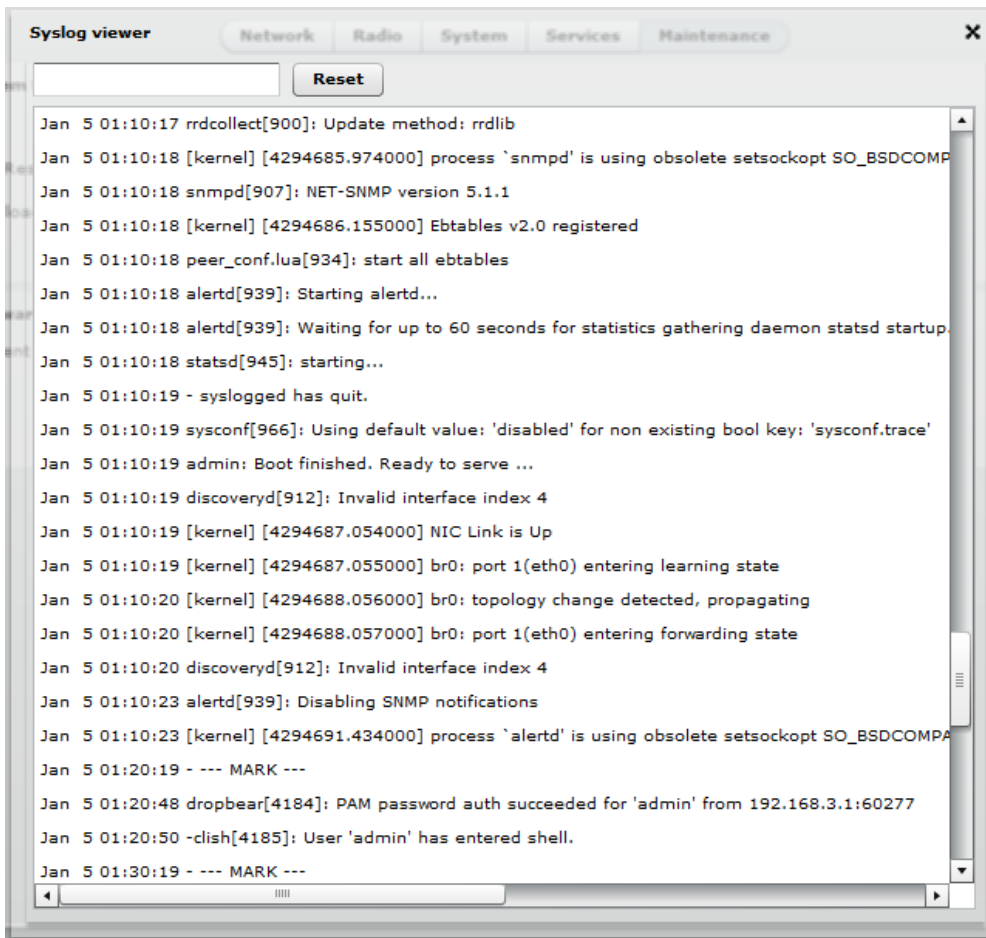
**Filter** – filter content of the system messages by entering required words or symbols.

> To change level of the system messages displayed in the Syslog Viewer use menu System log.

**Installer radio test mode** – select to enable Installer radio test mode. If enabled, responsibility for the compliance of the LigoPTP PRO unit performance with the regulatory rules must be taken by the installer.

**OLED Control**

Use this section under **Maintenance** tab to control status or assign a PIN code for the LigoPTP PRO unit's OLED interface:

**Enable OLED** – select to enable or disable OLED on the LigoPTP PRO unit.

**PIN required** – select to enable or disable OLED protection with PIN.

**PIN** – enter 4 digits for OLED protection.

**Firmware Update**

To update your device firmware use the **Firmware upgrade** section under the **Maintenance** menu, select the firmware file and click the **Upload** button:



**Current version** – displays version of the current firmware.

**Upload firmware** – click the button to select the new firmware image for uploading it to the device.

The device system firmware upgrade is compatible with all configuration settings. When the device is upgraded with a newer version or the same version builds, all the system's configuration will be preserved after the upgrade.

The new firmware image is uploaded to the controller's temporary memory. It is necessary to save the firmware into the device permanent memory. Click the **Upgrade** button:

**Upgrade** – upgrade device with the uploaded image and reboot the system.

Do not switch off and do not disconnect the device from the power supply during the firmware update process as the device could be damaged.

# Tools

Use the Tools menu to use the following device applications:

- Antenna alignment – to align device antenna.
- Link test – to check quality of the established LigoPTP PRO link.
- Site survey – to view the list of wireless networks in the surrounding area.
- Delayed reboot – to set time for automatic reboot of the LigoPTP PRO unit.
- Spectrum analyzer – to check channel occupation in the area.

## Antenna Alignment

The antenna alignment test measures signal quality between the master and slave units of the LigoPTP PRO link. For best results during the antenna alignment test, turn off all wireless networking devices within range of the device except the device(s) with which you are trying to align the antenna. Watch the constantly updated display in the antenna alignment test window as you adjust the antenna.

The Antenna Alignment test results appear when you click the **Start** button, and finishes when you click the **Stop** button.
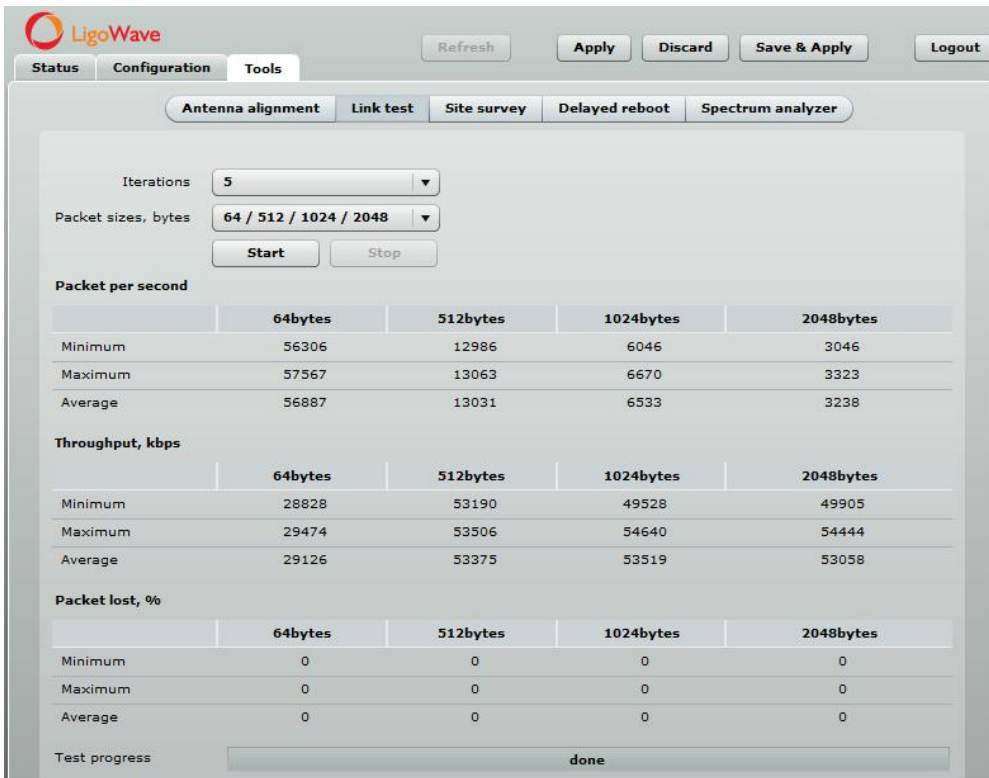
**Average** – if this option selected, the graph will display the average RSSI of both antennas.

## Link Test

We recommend to ensure that there is no traffic on the link before running the Link Test as results may not be completely accurate.

Use the Link test tool to check the quality of the established LigoPTP PRO link. This tool tests the throughput at selected packet sizes and iterations. Link test can be run from either the Remote unit or Local unit. Results represents the maximum, minimum and average value of the performed test.



**Packet per second**

|  | 64bytes | 512bytes | 1024bytes | 2048bytes |
| --- | --- | --- | --- | --- |
| Minimum | 56306 | 12986 | 6046 | 3046 |
| Maximum | 57567 | 13063 | 6670 | 3323 |
| Average | 56887 | 13031 | 6533 | 3238 |

**Throughput, kbps**

|  | 64bytes | 512bytes | 1024bytes | 2048bytes |
| --- | --- | --- | --- | --- |
| Minimum | 28828 | 53190 | 49528 | 49905 |
| Maximum | 29474 | 53506 | 54640 | 54444 |
| Average | 29126 | 53375 | 53519 | 53058 |

**Packet lost, %**

|  | 64bytes | 512bytes | 1024bytes | 2048bytes |
| --- | --- | --- | --- | --- |
| Minimum | 0 | 0 | 0 | 0 |
| Maximum | 0 | 0 | 0 | 0 |
| Average | 0 | 0 | 0 | 0 |

Test progress — done

**Iterations** - specify number of test iterations.

**Packet sizes** - specify packet sizes in bytes at which the test will be performed.

**Start** – click to start the throughput test.

**Stop** – click to stop the throughput test.

## Site Survey

The **Site Survey** test shows overview information for wireless networks in a local geographic area.

Using this test, an administrator can scan for working access points, check their operating frequency, encryption, see signal/noise levels and view whether device has enabled W-Jet or not. This feature may be used by the administrator find unused wireless channel so that LigoPTP PRO unit would not interference with adjacent working devices thus getting best possible performance.

Note that Site Survey function can take several minutes to perform.

To perform the Site Survey test, click the **Start scan** button:



**Start scan** – click to perform the Site Survey test.

**Show only W-Jet AP** - select this option to sort Site Survey results.

## Delayed Reboot

This tool is extremely useful while tuning radio settings – once you defined hypothetical radio parameters and set them with **Apply** button (not written to the permanent memory), device starts operating with the new settings, and in case the LigoPTP PRO link fails, device will be rebooted in specified minutes, thus the old settings will be set back.
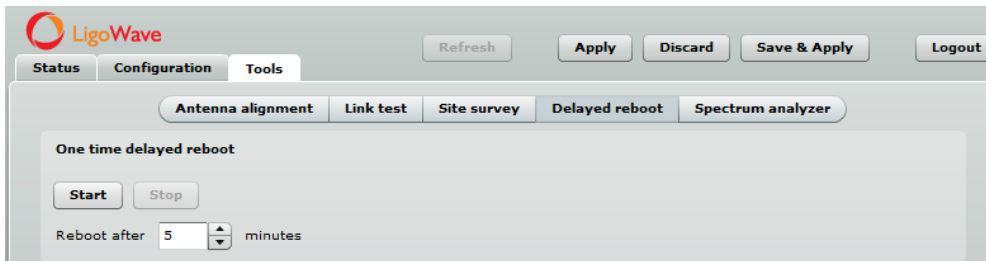


**Reboot after** – specify time in minutes, after which the device will be rebooted.

**Start/Stop** – click to start or stop delayed reboot tool.

## Spectrum Analyzer

The **Spectrum analyzer** test displays detailed information about signal level of each LigoPTP PRO unit's antenna on each frequency. This enables administrator choose the best available frequency/channel for the particular unit operation. The frequency list depends on the Country at which the unit is operating, and chosen channel width.

 Do not use the Spectrum analyzer on the **remote unit** of the link, as the connection to the device will be lost during the test.

Click **Start** button to perform the test:
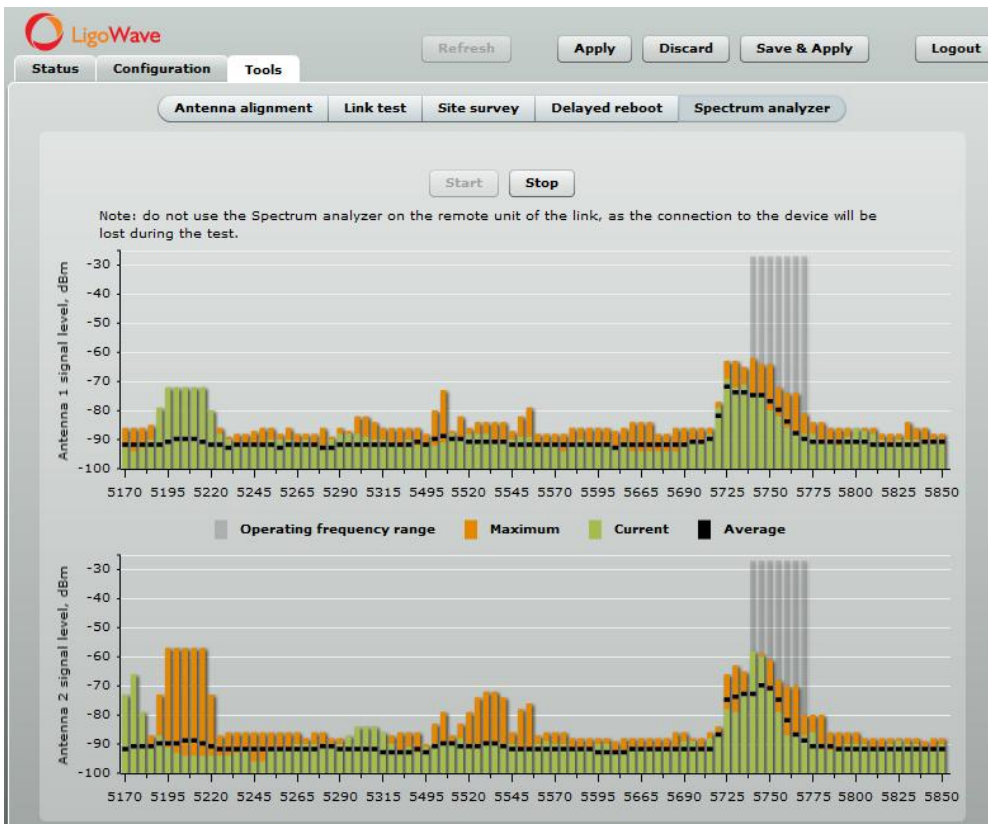
**Operating frequency range** – displays the channel frequency range at which the particular LigoPTP PRO unit is operating currently.

**Maximum** – the maximum achieved signal level on the appropriate frequency.

**Current** – current signal level on the appropriate frequency.

**Average** – displays average of the signal level on the appropriate frequency.

# OLED Management

This chapter provides information about OLED control. Please note that this description applies for units with integrated OLED only.

## OLED States

During power up the PTP unit will display its state in OLED screen:

**Loading...** – string being printed from the OLED display control board to indicate the moment device was powered.

**Booting...** – string being printed from kernel and must appear as quickly as possible after powering up the device.

**Locked…** – string appears after OLED has been locked and has been awakened from sleep mode Press and hold SET button for 3 seconds to unlock the OLED. After 3 seconds the OLED notifies to release SET button, otherwise it locks again.

**Sleep mode** – the OLED display will be locked and the OLED screen will be turned off automatically after 5 minutes of inactivity. Press any key to activate OLED.

## OLED Usage

There are 4 buttons on OLED. Two of them (MODE and SET) are functional keys; the other two keys are for navigation purpose.



**MODE** – used for menu navigation.

**SET** – executes the particular action.

E.g. navigate to "Link test" menu using the arrow key, then press SET (S) key to enter the second level menu – throughput options by packet size. Change packet size using the MODE (M) button to 512 bytes and press the SET (S) key to execute throughput test action.

# OLED Structure

The 2 level OLED menu contains such functionality:

- Lock
- Alignment
- Link test

  - packet size 64
  - packet size 512
  - packet size 1024
  - packet size 2048

- Statistics

  - Wireless
  - W-Jet
  - Ethernet
  - Device status
  - IP

- Reset to defaults
- Reboot

 **BACK** menu item, located at the end of each sub-menu, returns you to the first level menu. Use an arrow keys to navigate on the Back menu and then press SET (S) key.

The following diagram represents OLED menu structure and navigation:
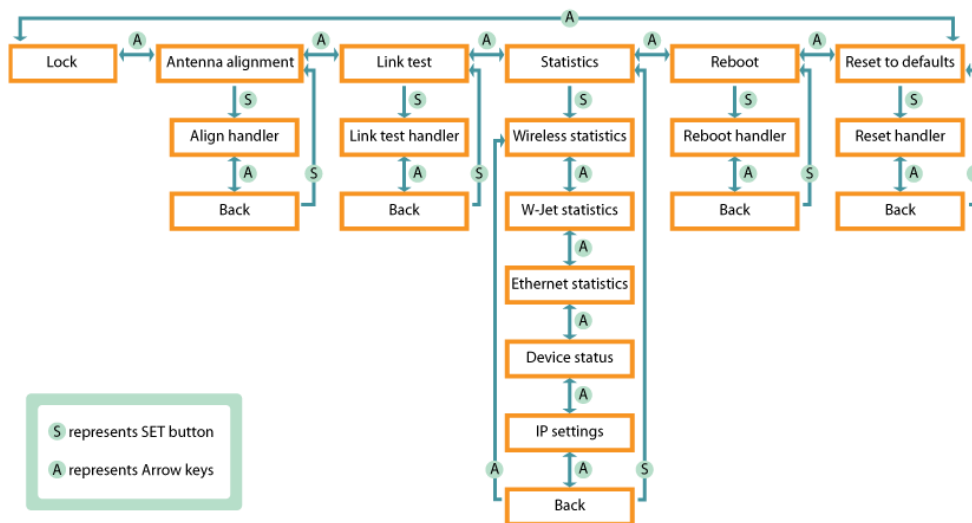
# OLED Functionality

If OLED is OFF it might be in a Sleep mode (press any key to wake-up) or disabled (refer at the corresponding section OLED Control on how to enable and set PIN code on PTP unit).

The short description of each menu screen is provided below.

## Unlock OLED

By default the OLED is locked to prevent an accidental OLED control. The OLED unlock procedure depends on either PIN code is enabled or not ((refer at the corresponding section OLED Control on how to enable and set PIN code on PTP unit).

Press and hold SET (S) button for 3 seconds to unlock the OLED. After 3 seconds the OLED notifies to release SET button, and asks to enter a PIN code if required, otherwise it locks again. Use arrow keys to set a required number and confirm it by pressing MODE (M) key.
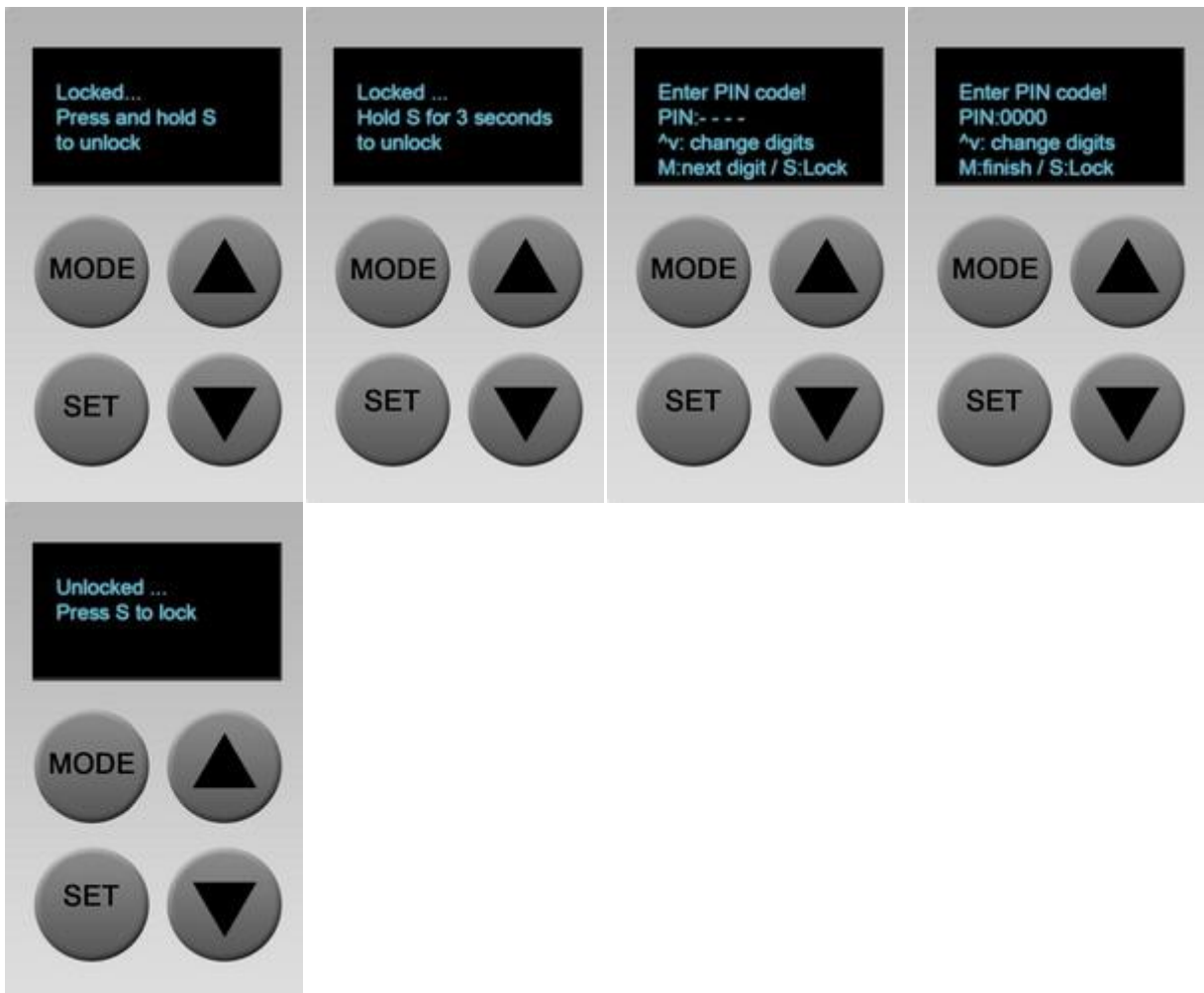
If the specified PIN code is incorrect, the user will be informed with the string "Wrong PIN".

## Run Antenna Alignment

The Antenna alignment will show RSSI (Signal strength / Noise level dBm) in numbers of both sides (where L means Local and R means Remote unit) if link is established. In case the device has 2 antennas, the information of each of them will be displayed.
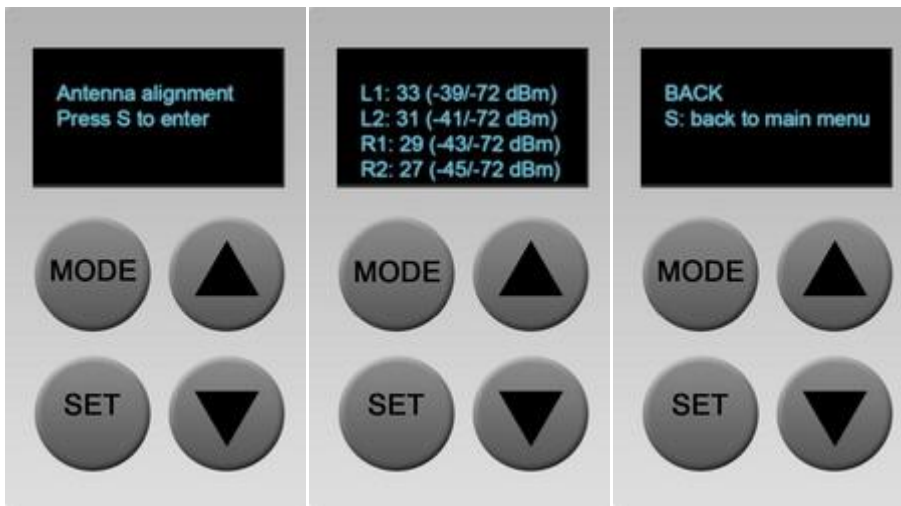
L1, L2 stands for local unit antenna 1 and antenna 2.

R1, R2 stands for remote unit antenna 1 and antenna 2.

To return to the upper level menu, use an arrow key to navigate to the Back menu and then press SET (S) key.

## Run Link Test

This menu contains throughput test handlers that performs a link throughput test with the chosen packets size (64, 512, 1024, 2048 bytes). Press MODE (M) key to choose the packet size and SET (S) key to start the test. Running this test will take several seconds (progress in % is displayed while test results are loading).
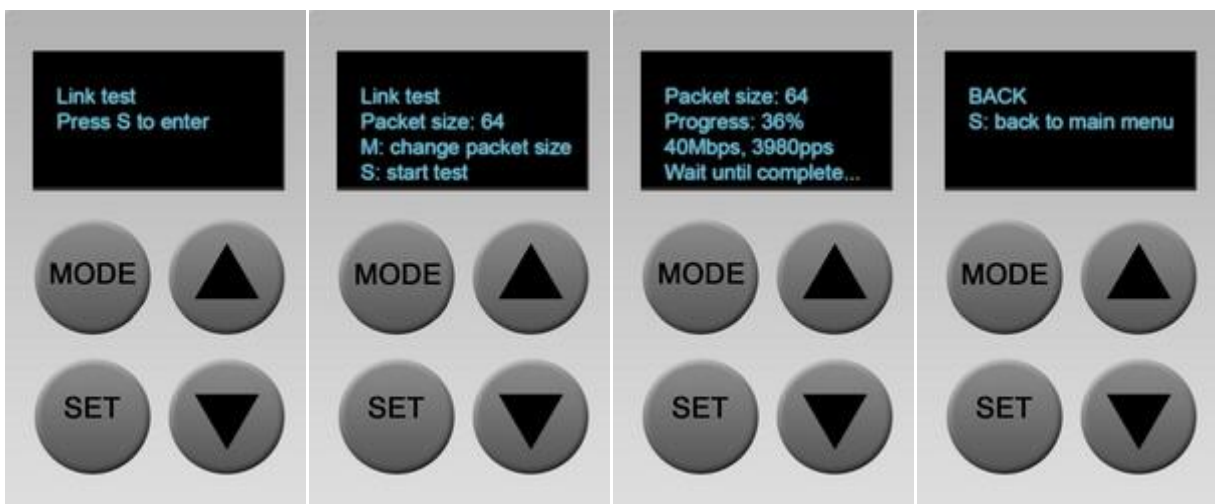
If PTP link is not established, the Link test menu displays the corresponding message "PTP connection is lost".

To return to the upper level menu, use an arrow key to navigate to the Back menu and then press SET (S) key.

## Statistics

The status menu consists of 5 submenus and the sixth Back menu to return to the upper level menu:

**Wireless** menu displays link wireless statistics: frequency, channel width, data rate at which the link communicates, and TX power of Local and Remote units (L/R).



If the statistics value length is high and can't fit into the OLED's display, the value shall be divided by $10^3$, $10^6$ or $10^9$ and the additional letter K, M or G shall be added then (e.g. TX: 40K/234M)

If the PTP link is not established, no counters of the W-Jet statistics will be displayed, the string "---" will be shown instead (e.g. TX power: 20/--- dBm).

**W-Jet** menu displays Local and Remote (L/R) sides W-Jet statistics: TX (Tx packets), RX (Rx packets), Duplicated packets, and Retry count.

If the statistics value length is high and can't fit into the OLED's display, the value shall be divided by $10^3$, $10^6$ or $10^9$ and the additional letter K, M or G shall be added then (e.g. TX: 40K/234M)

If the PTP link is not established, no counters of the W-Jet statistics will be displayed, the string "---" will be shown instead.

**Ethernet** menu displays Ethernet statistics. The statistics contains information about RX and TX throughput in Mbps, RX and TX packets per second (pps), RX and TX errors per second. The Ethernet configuration is displayed in the following format:

`speed/duplex AUTO|FIXED link-status`, where:

      `speed` is either 10, 100, 1000 (if possible);
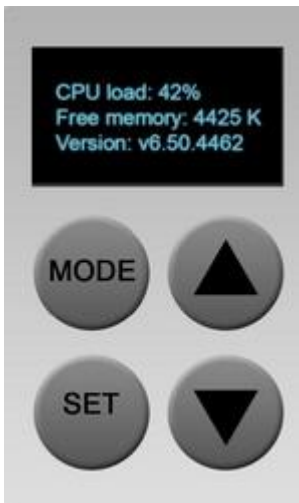      `duplex` is FD/HD (full or half duplex);
      `AUTO|FIXED` is either AUTO (auto negotiating) or FIXED (auto negotiating is disabled)
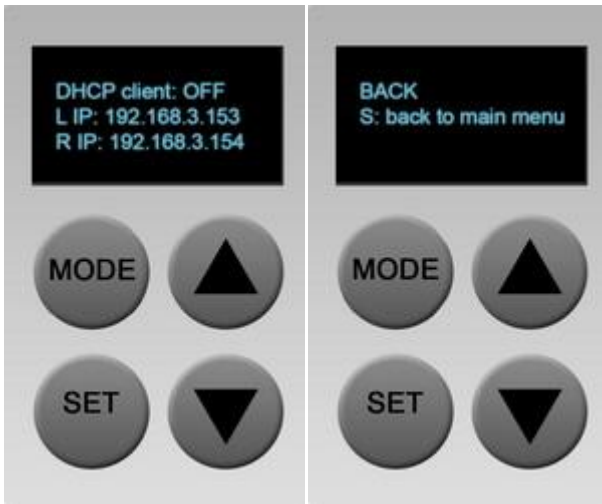      `link status` is ether "UP" or "DOWN".

The rest statistics contains info: RX and TX throughput in Mbps, RX and TX PPS (packets per second)

**Device** menu contains information about CPU load, Free memory and Firmware version:
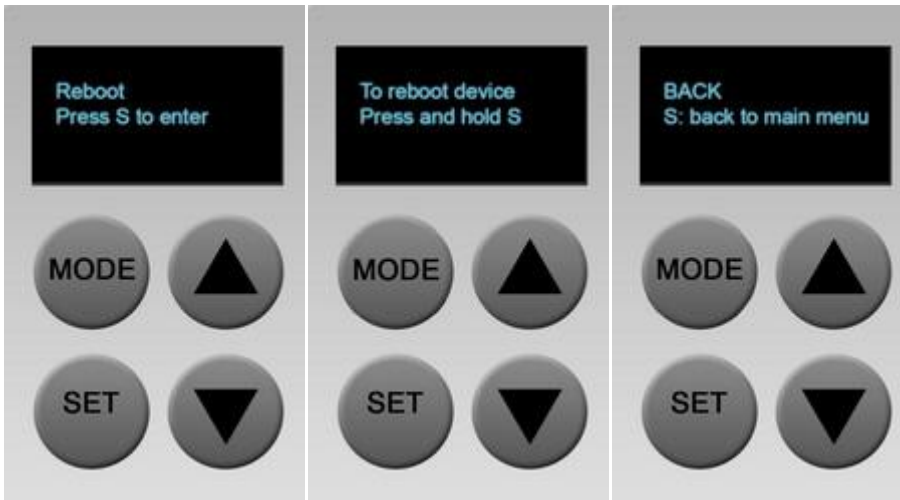


**IP settings** menu displays DHCP status and current IP addresses of Local and Remote units.
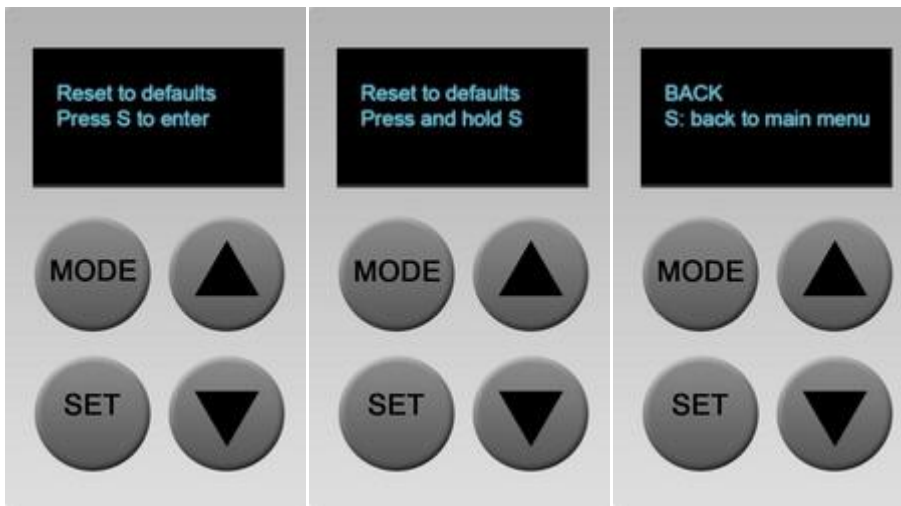
## Reboot Device

Use this menu to reboot the PTP unit after confirmation:



To return to the upper level menu, use an arrow key as a Back button and then press SET (S) key.

## Reset Device to Defaults

Use this menu to reset PTP unit to factory defaults. Press SET key to start reset process.

To return to the upper level menu, use an arrow key as a Back button and then press SET (S) key.

⚠️ Resetting the device is an irreversible process. Current configuration, administrator password and OLED access settings will be set back to the factory default.

## Lock OLED

The OLED display will be locked and the OLED screen will be turned off automatically after 5 minutes of inactivity. To lock OLED display manually, use arrow keys to navigate on Unlocked menu and press SET (S) key.

# Appendix

## Resetting Unit to Factory Defaults

PTP units have the capability of being reset to defaults by pinging the device with a certain packet size when the radio is booting. During the startup of the device, when the drivers of the ethernet interfaces are loaded, the discovery daemon is started. The daemon suspends startup process for 3 seconds and waits for ICMP `echo request` packet of length 369 bytes. If the packet received, the discoveryd resets the device to default configuration.

> It is recommended to connect PC to the device via switch, as depending on PC OS settings, the ARP table might be flushed during wired link status change (connecting the device that will be reset).

Steps to reset to default settings:

**Step 1.** Power off the device.

**Step 2.** Obtain the device MAC address.

**Step 3.** Connect a PC to the same physical subnet as the device.

**Step 4.** Execute 'arp -s' command to assign the IP address (IP address should be from the same subnet as PC) to the device MAC address:

```
arp -s <IP address to assign> <device MAC address>
```
Note that syntax of MAC address differs depending on OS:

> - Linux OS: AA:BB:CC:DD:EE:FF
> - Windows OS: AA-BB-CC-DD-EE-FF

**Step 5.** Start pinging the device:

**For Linux users:** `ping <IP address> -s 369`
**For Windows users:** `ping <IP address> -l 369 -t -w 200`

**Step 6.** Power up device and wait about 30sec or more (depending on device hardware).

**Step 7.** Stop pinging the device, and let the device boot as usual. The device should start up with factory default settings.

# Run PTP link in Small Distance

Follow up the steps to run the LigoPTP PRO link for testing it in small distances (e.g. testing on a table) and achieve throughput up to 70 Mbps.

**Step 1.** Power-up both units: Master and Slave.

**Step 2.** LigoPTP PRO units must be placed at least a distance of 2 meters from each other.

**Step 3.** Change major **Radio** parameters for both units (Master and Slave):



- ▪ **Channel width**: 40 MHz
- ▪ **Frequency**: auto
- ▪ **Channel width**: 40 MHz

- **Radio mode**: MIMO 2x2
- **Data rate**: auto
- **Enable ATPC**: on
- **Transmit power**: 0 dBm
- **Transmit queue length**: 64 frames

Click **Apply** button for configuration to take effect.

**Step 4.** Observe the Signal Indicator bar at the bottom of the screen. If it is green the quality of the link is excellent whereas the red color indicates a poor quality of the link. If results do not meet the requirements increase or decrease the Transmit Power on Radio page depending on the status of the Signal Indicator bar. The Signal must be approximately 25-30dBm

**Step 5.** Start the testing: start the iperf server , then iperf client:

```
tester@node208:~$ iperf -s -i 1
------------------------------------------------------------
Server listening on TCP port 5001
TCP window size: 85.3 KByte (default)
------------------------------------------------------------
[  4] local 192.168.199.102 port 5001 connected with 192.168.199.100 port 34253
[ ID] Interval       Transfer     Bandwidth
[  4]  0.0- 1.0 sec  18.7 MBytes   157 Mbits/sec
[  4]  1.0- 2.0 sec  20.1 MBytes   168 Mbits/sec
[  4]  2.0- 3.0 sec  20.0 MBytes   168 Mbits/sec
[  4]  3.0- 4.0 sec  20.4 MBytes   171 Mbits/sec
[  4]  4.0- 5.0 sec  20.6 MBytes   173 Mbits/sec
[  4]  5.0- 6.0 sec  20.8 MBytes   175 Mbits/sec
[  4]  6.0- 7.0 sec  21.2 MBytes   177 Mbits/sec
[  4]  7.0- 8.0 sec  21.1 MBytes   177 Mbits/sec
[  4]  8.0- 9.0 sec  20.4 MBytes   171 Mbits/sec
[  4]  9.0-10.0 sec  20.5 MBytes   172 Mbits/sec
[  4]  0.0-10.1 sec   205 MBytes   171 Mbits/sec
```

```
tester@node208:~$ iperf -s -u -i 1
------------------------------------------------------------
Server listening on UDP port 5001
Receiving 1470 byte datagrams
UDP buffer size:  224 KByte (default)
------------------------------------------------------------
[  3] local 192.168.199.102 port 5001 connected with 192.168.199.100 port 56843
[ ID] Interval       Transfer     Bandwidth        Jitter   Lost/Total Datagrams
[  3]  0.0- 1.0 sec  24.9 MBytes   209 Mbits/sec   0.045 ms    0/17780 (0%)
[  3]  1.0- 2.0 sec  24.9 MBytes   209 Mbits/sec   0.077 ms    0/17774 (0%)
[  3]  2.0- 3.0 sec  24.8 MBytes   208 Mbits/sec   0.061 ms   29/17725 (0.16%)
[  3]  3.0- 4.0 sec  24.4 MBytes   205 Mbits/sec   0.077 ms  468/17882 (2.6%)
[  3]  4.0- 5.0 sec  25.3 MBytes   212 Mbits/sec   0.029 ms   21/18073 (0.12%)
[  3]  5.0- 6.0 sec  25.0 MBytes   209 Mbits/sec   0.107 ms    0/17805 (0%)
[  3]  6.0- 7.0 sec  25.1 MBytes   210 Mbits/sec   0.085 ms    0/17879 (0%)
[  3]  7.0- 8.0 sec  25.1 MBytes   210 Mbits/sec   0.039 ms    0/17879 (0%)
[  3]  8.0- 9.0 sec  24.8 MBytes   208 Mbits/sec   0.085 ms    0/17684 (0%)
[  3]  9.0-10.0 sec  24.8 MBytes   208 Mbits/sec   0.050 ms   61/17785 (0.34%)
[  3]  0.0-10.0 sec   250 MBytes   209 Mbits/sec   0.049 ms  580/178563 (0.32%)
[  3]  0.0-10.0 sec  1 datagrams received out-of-order
```

**Step 6.** If the result meets the requirements, before mounting LigoPTP PRO units outside, increase the Transmit Power.

Retrieved                                                                                                   from
"http://www.ligowave.com/wiki/index.php?title=LigoPTP_PRO_Configuration_Manual&oldid=1561"

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