

PE Smart Gateway Neptune US

AR41004 US

Installation manual

DRAFT

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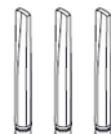
1 Product Description

PE Smart Gateway Neptune US is a key hardware element of Paradox Engineering's PE Smart Urban Network platform for city environments.

Refer to [PD_1] and [PD_2] for further product information.

2 Content List

The box contains the following items:

| Part Number | Description | Q.ty | Figure |
|-------------------|--|------|---|
| AR41004 US | PE Smart Gateway Neptune US | 1 |  |
| Mounting brackets | Mounting kit, provided in plastic bag | 1 |  |
| ANT-OUT-0020 | Outdoor Rubber Antenna Fixed Straight Half Wave, 920 MHz, 3 dBi gain, SMA type | 1 |  |
| ANT-OUT-0021 | Outdoor Omnidirectional Antenna, Dual Band Wi-Fi, 2.4-2.5 / 4.900-5.875 GHz, 5/7 dBi gain, N type | 3 |  |
| ELC-CON-0162 | IP67 Ethernet cable connector | 1 |  |
| DOC-TEM-0011 | PE Smart Gateway Neptune US configuration sheet | 1 |  |
| DOC-INS-0059-02 | Installation manual (this document) | 1 |  |

3 Warnings for installers and users

The following instructions provide important precautions to safely install, use and maintain the product.

Please read and follow them carefully before operating the unit: failure to comply may compromise people safety and/or damage the device, with serious consequences depending on circumstances.

List of symbols used in this document

| Symbol | Description |
|---|---|
|  | Warning: failure to follow these instructions properly may result in personal injury and/or product damage, which may be serious depending on the circumstances |
|  | Grounding instruction: be sure to establish an earth connection |
|  | Important notice: be sure to follow the instruction |



List of warnings

| | |
|---|---|
| The equipment is a Class I appliance and fits outdoor installations | |
| The equipment is intended for installation, service and repair by trained and skilled personnel only (no operator access) | |
| Install the product in accordance with the instructions provided in this installation manual | |
| Paradox Engineering is not responsible for errors or damages due to wrong mounting operations | |
| The product is intended to be used even in countries having IT type electricity supply systems | |
| This equipment is intended to be used with elevations up to 2,000 mt | |
| The product and the various units comprising the installation must only be used for the purpose for which they are intended. Any other use is considered improper and dangerous | |
| Unpack the product and check possible damages before installing and operating it | |
| Electrical work and installation must be performed in accordance with relevant local and national regulations, following the instructions provided in this installation manual. Refer to chapter 9 Certification for further details | |
| Before connecting the product, make sure that product voltage ratings correspond to the mains power supply voltage | |
| This equipment must be grounded. If the cable strand is not grounded, please ground the product by connecting a customer supplied ground wire to the grounding lug on the chassis, then fixing the other end to a reliable earth ground. If you are uncertain about the availability of suitable grounding, contact local electrical inspection authority or a skilled electrician. Refer to par. 4.1 Grounding instructions |  |
| Connecting the supplemental ground to the unit in accordance with the NESC is essential before connecting input supply cable |  |
| Cover all unused connectors with the provided plugs to safeguard product IP rating |  |
| Mount all antennas before powering the product |  |
| Before cleaning or servicing the product, disconnect it from the mains power |  |

A power supply cord with a minimum conductor section 0.75 mm² (AWG-18) suitable for outdoor use and compliant with relevant local and national regulations shall be used



In the final installation, an external 20 A magneto-thermal switch must be installed as means of short-circuit backup protection



It is recommended to apply an adequate splicing tape in the final outdoor installation as specified at par. 4.3.3.1. Paradox Engineering recommends the use of the following tape: Scotch® Linerless Rubber Splicing Tape 130C, 3M



Depending on final installation, the use of RF extension cord for the antenna mounting shall be performed as specified at par. 4.3.3.2



Dispose of packaging or product must be in compliance with applicable local and national waste disposal regulation



Keep this document for future use and reference

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4 Installation instructions

4.1 Grounding instructions



The equipment must be grounded.

PE Smart Gateway Neptune US is a Class I equipment provided with a grounded appliance inlet.

In addition to mains ground connection, it is possible to add a supplementary ground connection using a further ground cable with the bracket fixing screw identified by the following label:



Figure 1 Supplementary ground label on mounting brackets

The connection shall be made by fixing a Ring Terminal, M5 stud size after crimping the supplementary ground cable between the screw and the washer, as pictured in Figure 2. The protective earth conductor must be AWG-13. Please consider it is not provided along with the product.

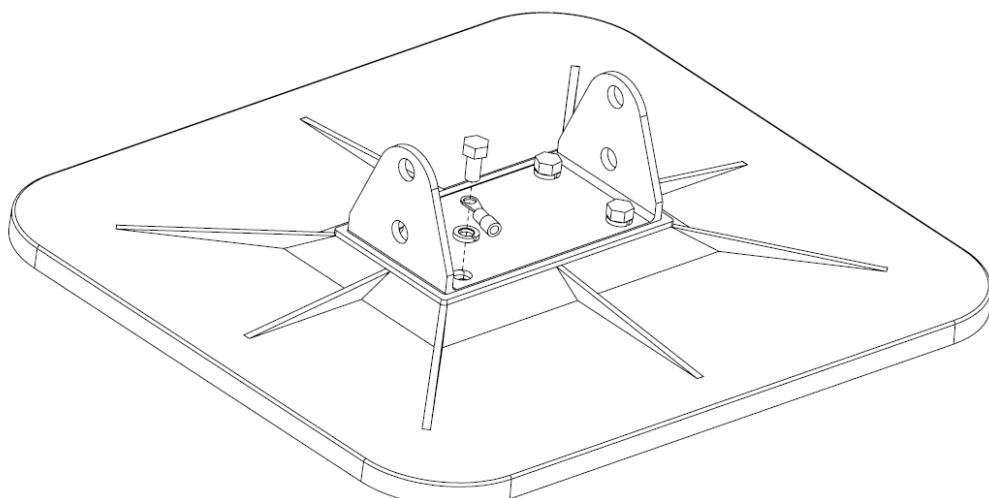


Figure 2 Grounding instructions

4.2 Dimensions

Mechanical dimensions of PE Smart Gateway Neptune US are pictured in Figure 3.

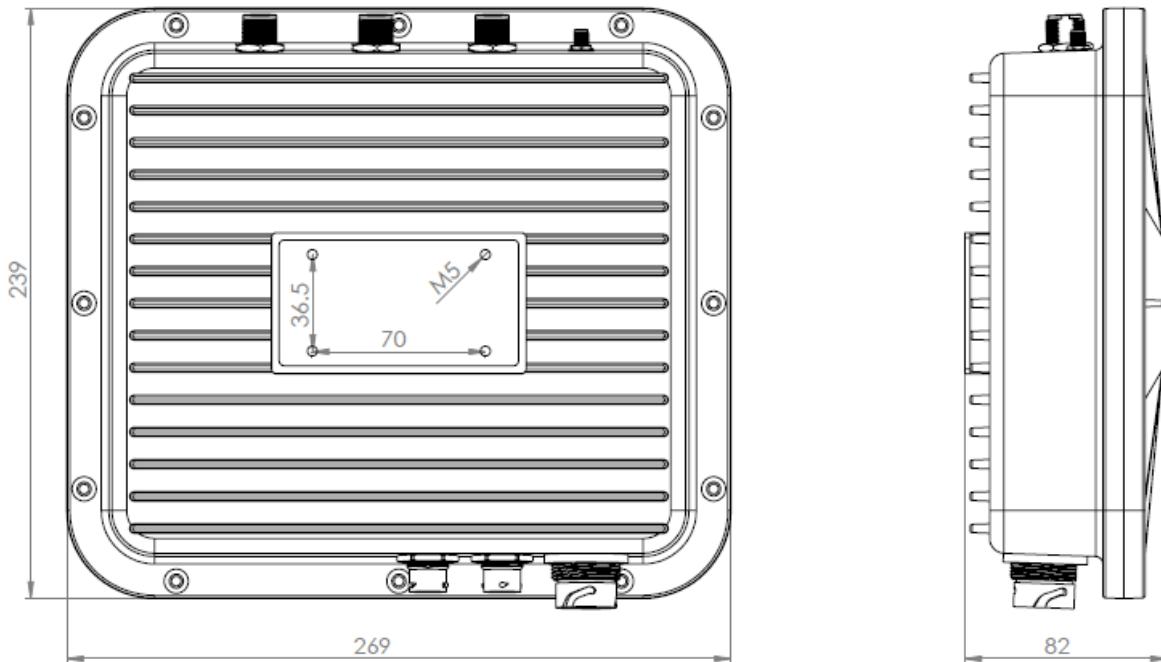


Figure 3 Dimensions of PE Smart Gateway Neptune US

4.3 Mounting

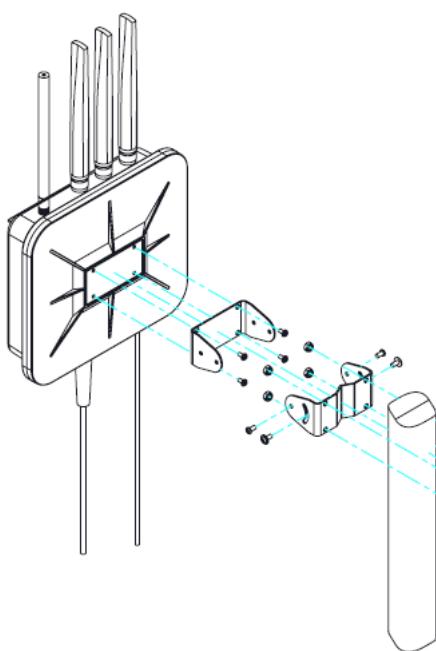
4.3.1 Standard mounting brackets

PE Smart Gateway Neptune US can be mounted on a flat surface or a pole. Figure 4 pictures a typical installation. Please consider the product can be mounted on poles with different diameters.

Relevant parameters for installation

| Item | Unit | Value | Notes |
|-----------------------------|------|-----------|--|
| Maximum installation height | m | 2000 | Above the sea level |
| Maximum pole diameter | mm | 74 ± 1 | See par. 4.3.2 for alternative mounting brackets |
| M5 screws torque force | N m | 5.2 ± 0.5 | Screws provided with mounting brackets |
| M6 screws torque force | N m | 5.2 ± 0.5 | Screws provided with mounting brackets |

Mounting on a pole



Mounting on a flat surface

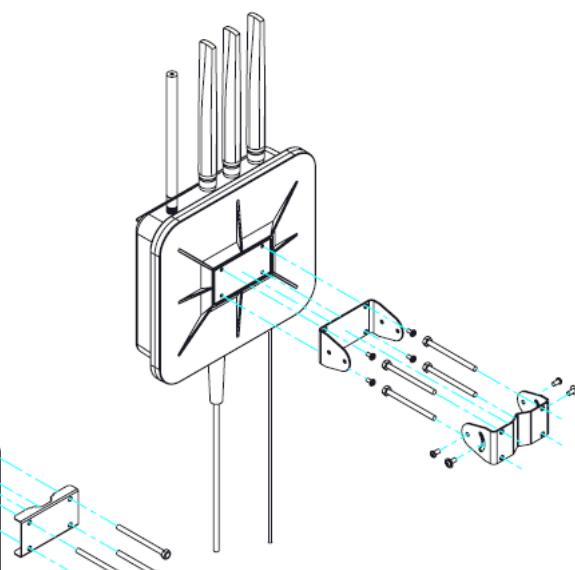


Figure 4 PE Smart Gateway Neptune US Mounting instructions on a pole (left) or a flat surface (right)

4.3.2 Alternative mounting brackets

Upon request, Paradox Engineering can provide an alternative set of mounting brackets to install the product on larger poles, as pictured in Figure 5.

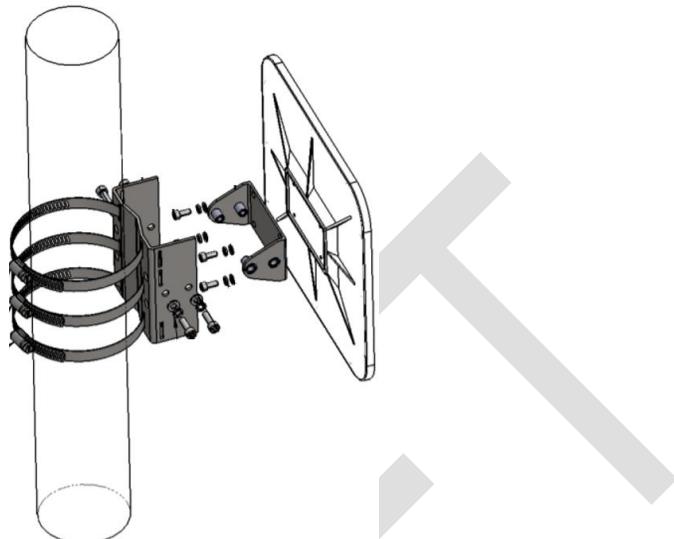


Figure 5 Alternative mounting set (example)

4.3.3 Antenna mounting



Mounting all antennas before powering the product is highly recommended to avoid product configuration issues

PE Smart Gateway Neptune US antenna connectors are pictured in Figure 6.

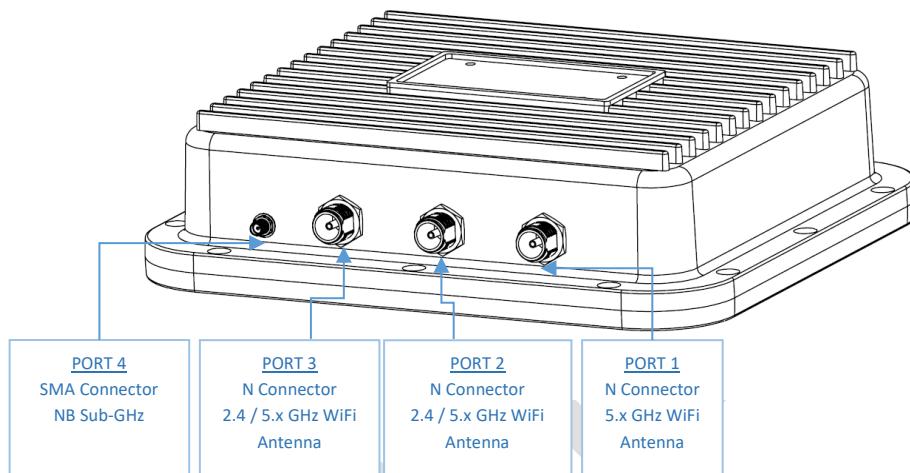


Figure 6 PE Smart Gateway Neptune US antenna connectors

Antennas to be used on PE Smart Gateway Neptune US are listed below¹:

Narrowband antennas

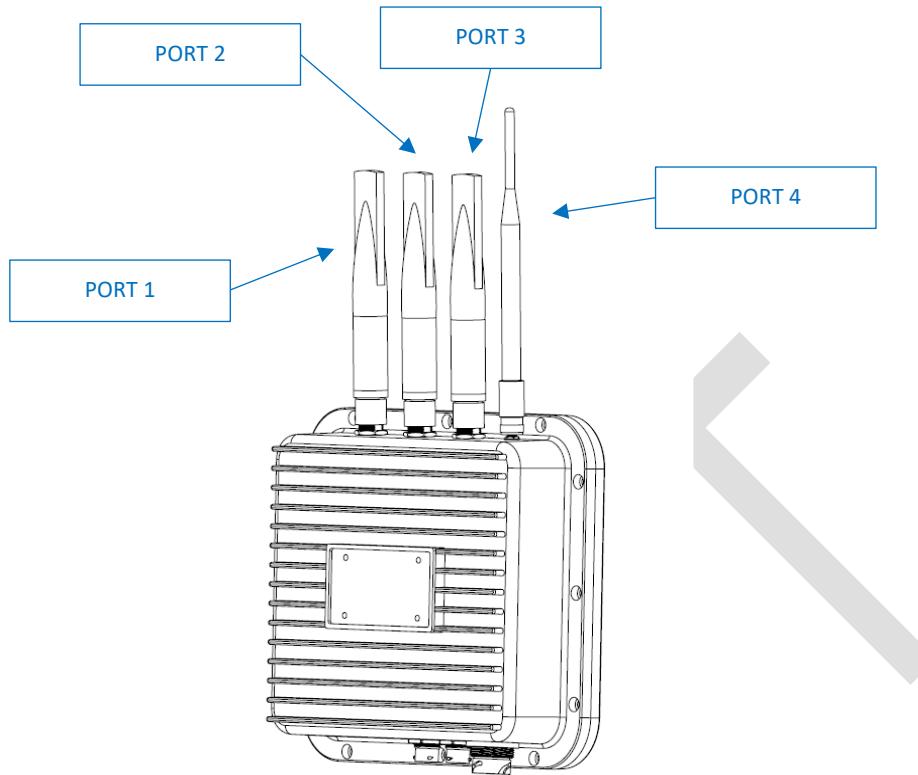
| Part Number | Manufacturer | Manufacturer part No. | Gain (dBi) | Band (MHz) | Connector |
|--------------|------------------------|-----------------------|------------|------------|-----------|
| ANT-OUT-0020 | Joymax Electronics Co. | MEGWX-1551SAAX-920 | 2.0 | 920 | Port 4 |

Broadband antennas

| Part Number | Manufacturer | Manufacturer part No. | Gain (dBi) | Band (GHz) | Connector |
|--------------|-----------------------|-----------------------|------------|------------|------------|
| ANT-OUT-0021 | Penson Wireless | OM24580703 | 5/7 | 2.4/5.x | Port 1,2,3 |
| ANT-OUT-0025 | MTI Wireless Edge Ltd | MT-485001 | 17.5/18 | 5.x | Port 1,2,3 |
| ANT-OUT-0030 | MTI Wireless Edge Ltd | MT-484032/NV | 16.5/17 | 5.x | Port 1,2,3 |

¹ According to FCC Permissive change policy [GD_1], FCC part 15 equivalent-type antennas may be substituted and marketed without a Class II Permissive Change (C2PC) if the following requirements are met:

- Must be of the same type;
- Must be of equal or less gain;
- Must have similar in-band and out-of-band features.



*Figure 7 PE Smart Gateway Neptune US antenna mounting.
Example with all broadband antennas ANT-OUT-0021 and narrowband antenna ANT-OUT-0020*

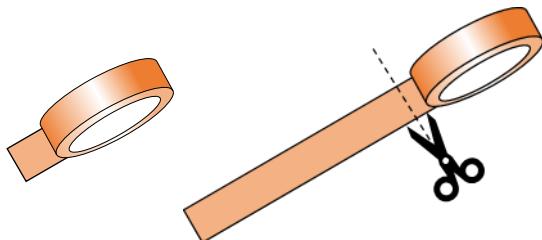
4.3.3.1 Application of the voltage splicing tape



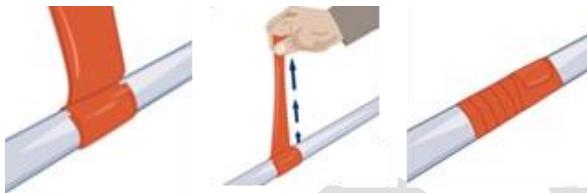
The application of the voltage splicing tape is highly recommended for final outdoor installations

The voltage splice tape shall be applied after that all antennas are mounted on PE Smart Gateway Neptune US. Please follow these instructions to properly apply the tape.

Cut the splicing tape at 20 cm and remove the protective film



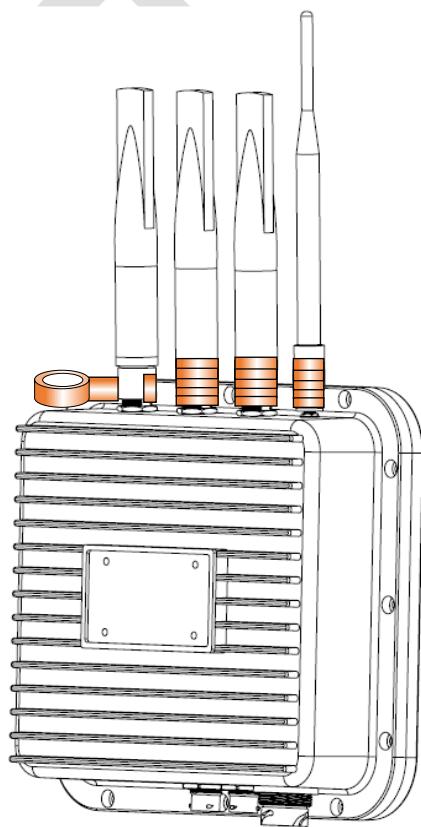
Ensure to tight the tape on each turn



Close-up of a taped antenna



Apply the tape to cover all the metallic bottom part of all antenna connectors. Perform at least 5 turns on each connector.



After the application of the voltage splicing tape, please repeat the procedure with a further insulating tape to increase the protection of the voltage splicing tape against outdoor conditions.

4.3.3.2 Use of RF extension cord for antenna mounting



In case of use of RF extension cords, these shall be safely locked on the pole or wall via cable ties or other adequate means, depending on field installation. Figure 8 pictures a typical method to fix antenna cables to the pole by using a cable tie

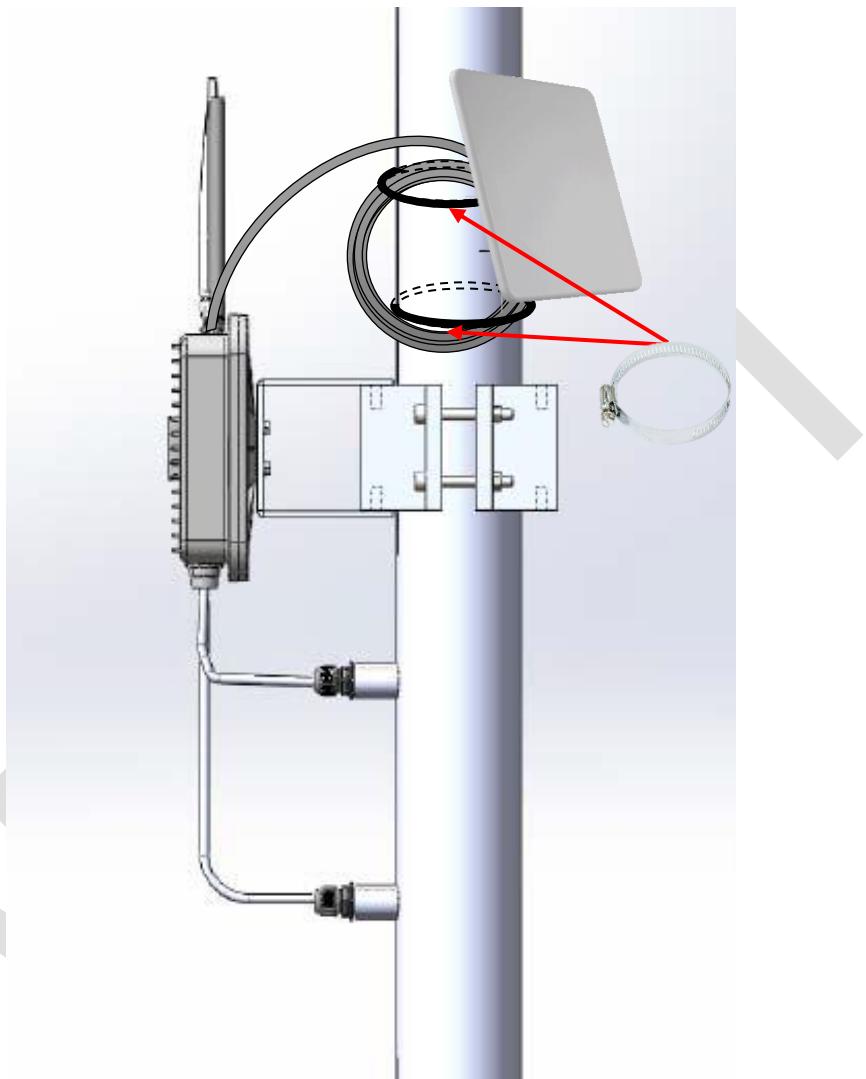


Figure 8 Representative illustration of RF extension cords mounted on a pole

4.4 Wirings

PE Smart Gateway Neptune US input connectors and wiring scheme are pictured in Figure 9 and Figure 10.

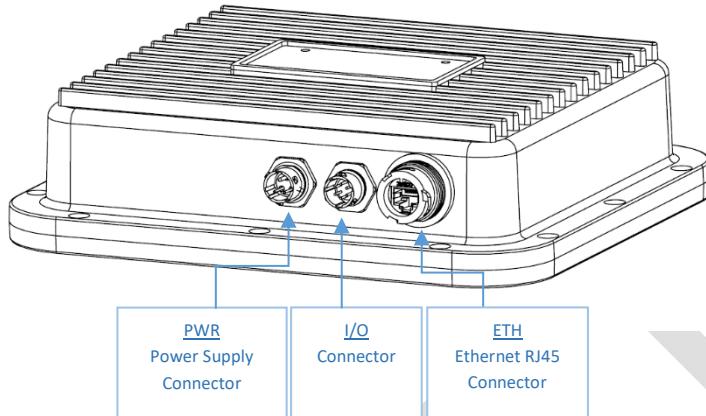


Figure 9 PE Smart Gateway Neptune US connectors

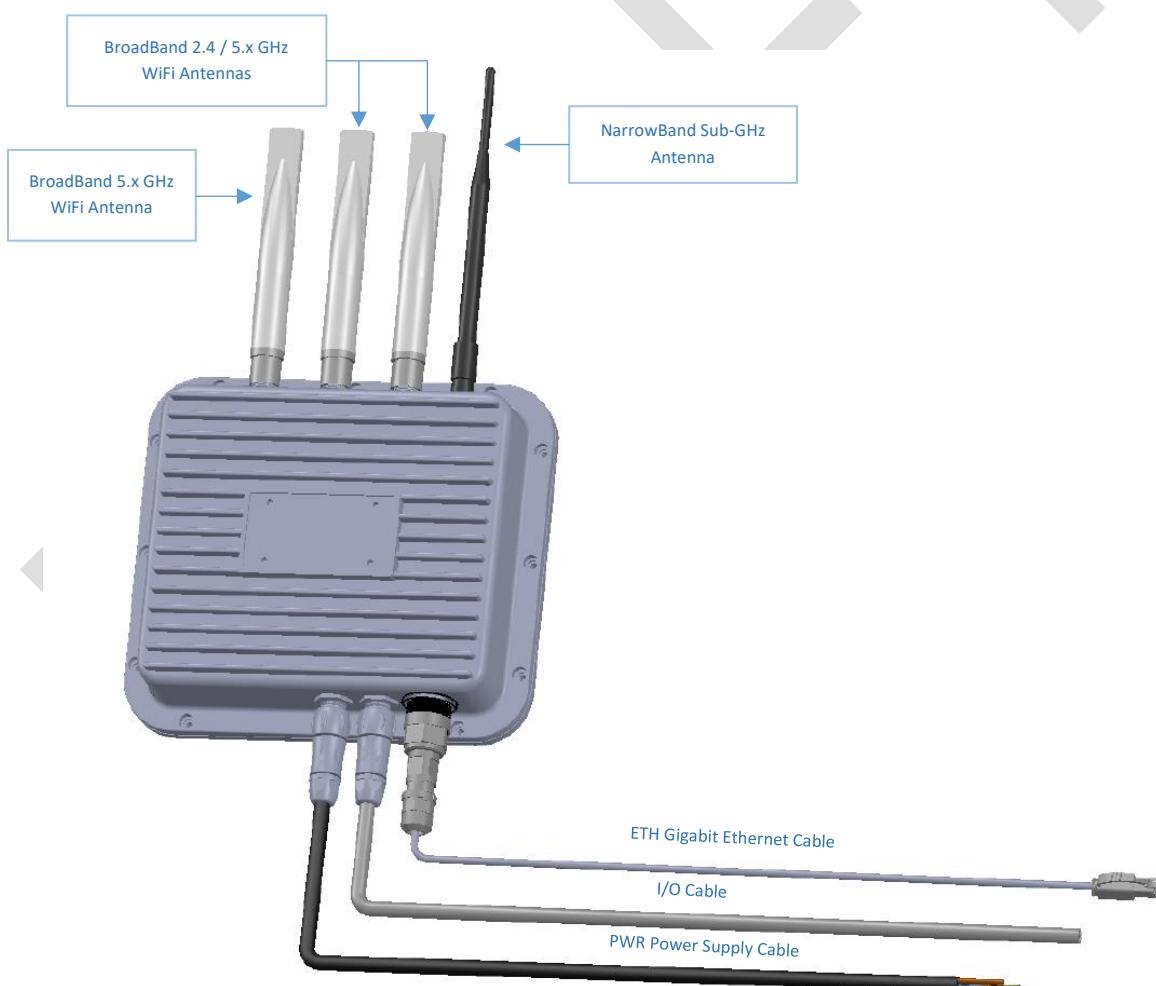


Figure 10 PE Smart Gateway Neptune US wiring scheme

Please notice that power supply cable, I/O cable and Ethernet cable are not supplied along with the product, but available as optional equipment.

Wirings technical specifications are listed below:

Wirings technical specifications

| Item | Unit | Power supply cable |
|---------------|-----------------|---------------------------------|
| Poles No. | - | 3 |
| Section | mm ² | 0.75 (min) |
| Length | mm | 3000 (max) |
| Rated voltage | V | 450/750 |
| Mating | - | UTS6JC103S Souriau |
| Compliance | - | Compliant with local regulation |

4.4.1 Power supply connector

! A power supply cord with a minimum conductor section 0.75 mm² (AWG-18) suitable for outdoor use and in compliance with relevant local and national regulations shall be used

Pinout of the power supply cable connector is pictured in Figure 11.

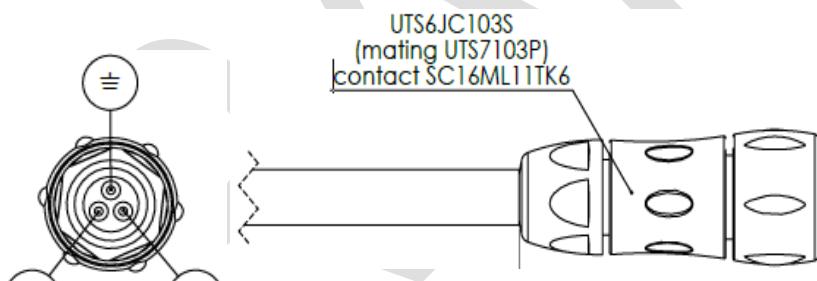


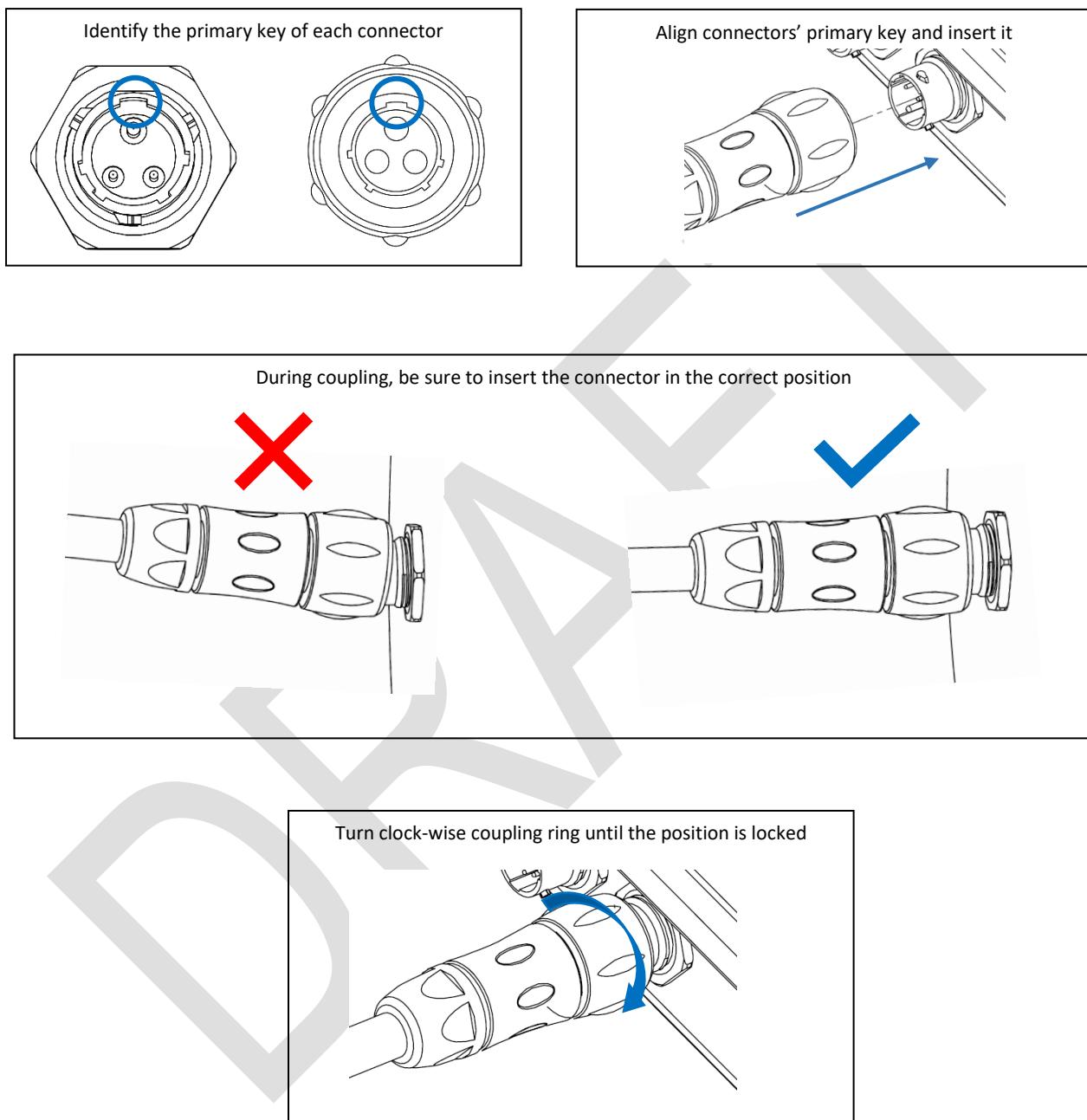
Figure 11 Pinout of the power supply cable, viewed from the connector side

Power supply cable wires description

| Label | Function |
|---|--------------------------------------|
| 1 (L) | Line/Phase input from AC mains power |
| 2 (N) | Neutral input from AC mains power |
|  | Ground |

4.4.1.1 Power connector mating procedure

The pictures below provide step-by-step instructions on how to properly mate the power plug and receptacle in order to avoid contacts damage.



4.4.2 I/O connector



If the I/O cable is unused, cover the port with the plug/cap to ensure product IP rating

The I/O cable mates with the I/O connector providing 1 opto-isolated dry contact input and 1 analog input.

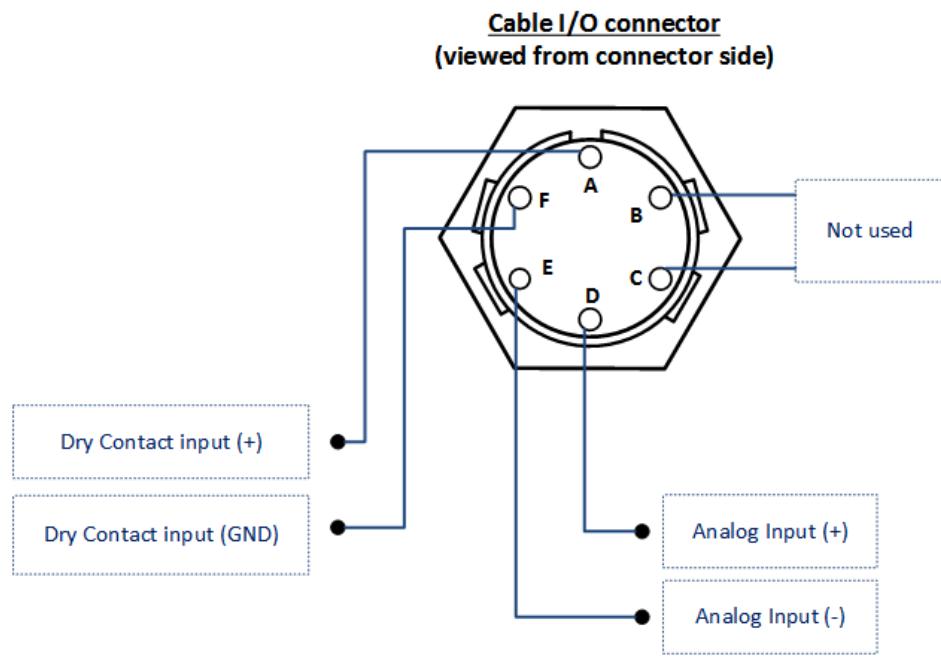


Figure 12 Pinouts of the I/O connector, viewed from the connector side

I/O cable wires description

| Label | Color | Function | Ratings |
|-------|-------|---|----------------------------|
| A | Blue | Dry Contact, External input (+) | DC 5.2 V (max), 3 mA (max) |
| B | Brown | Not used | Not used |
| C | Red | Not used | Not used |
| D | White | Analog input (+) | 0 – 10 V dc (100 kΩ) |
| E | Black | Analog input (-) | 0 – 10 V dc (100 kΩ) |
| F | Black | Dry Contact, External input (GND) – Opto-isolated | N/A |

4.4.3 Ethernet connector



If the Ethernet cable is unused, cover the port with the plug/cap to ensure product IP rating

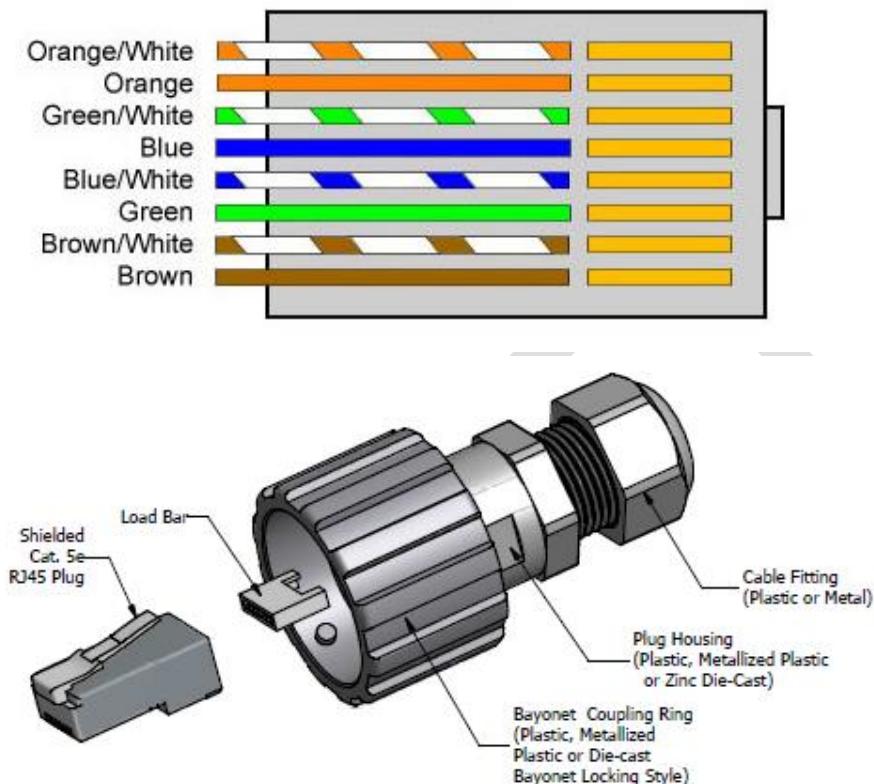


Figure 13 Pinout of the Ethernet connector

5 Product configuration

PE Smart Gateway Neptune US must be connected to the customer network via Ethernet port, configuring the IP address to match local addressing plan.

Three different network devices are embedded on PE Smart Gateway Neptune US, and each of them is reachable from the external Ethernet port:

- Narrowband IPv4
- Broadband IPv4
- Parking IPv4

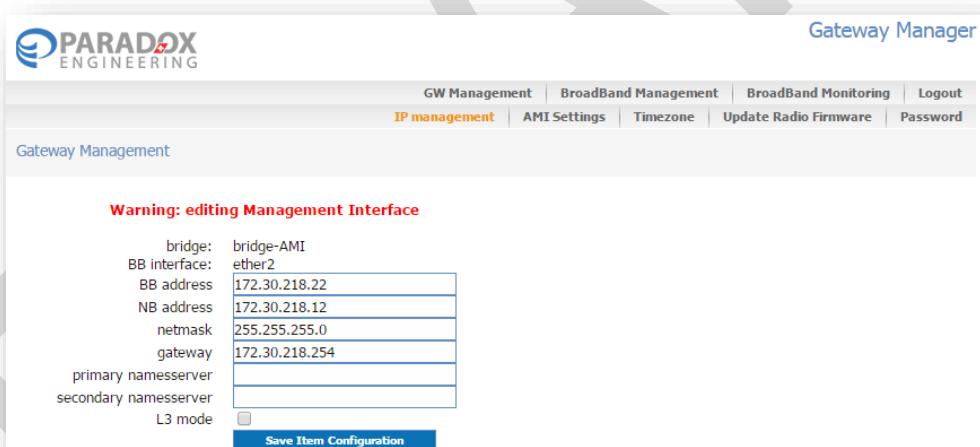
5.1 Configuring the IP address (narrowband and broadband)

PE Smart Gateway Neptune US is delivered with pre-configured addressing. Please refer to PE Smart Gateway Neptune US Configuration Sheet to find out the IP addressing set on your device.

To change the configuration, connect a PC directly to PE Smart Gateway Neptune US and configure a static IP address on the same product subnet.

Point your browser to PE Smart Gateway Neptune US Narrowband IPv4 address to reach the device management interface.

After login (credentials are available on PE Smart Gateway Neptune US Configuration Sheet), click on “IP management” and enter the desired network configuration, as provided by your network administrator. Click on “Save Item Configuration”. If available, please enter your DNS server IP address(es).



PE Smart Gateway Neptune US will apply the new configuration and try to redirect your browser to the new web interface address.

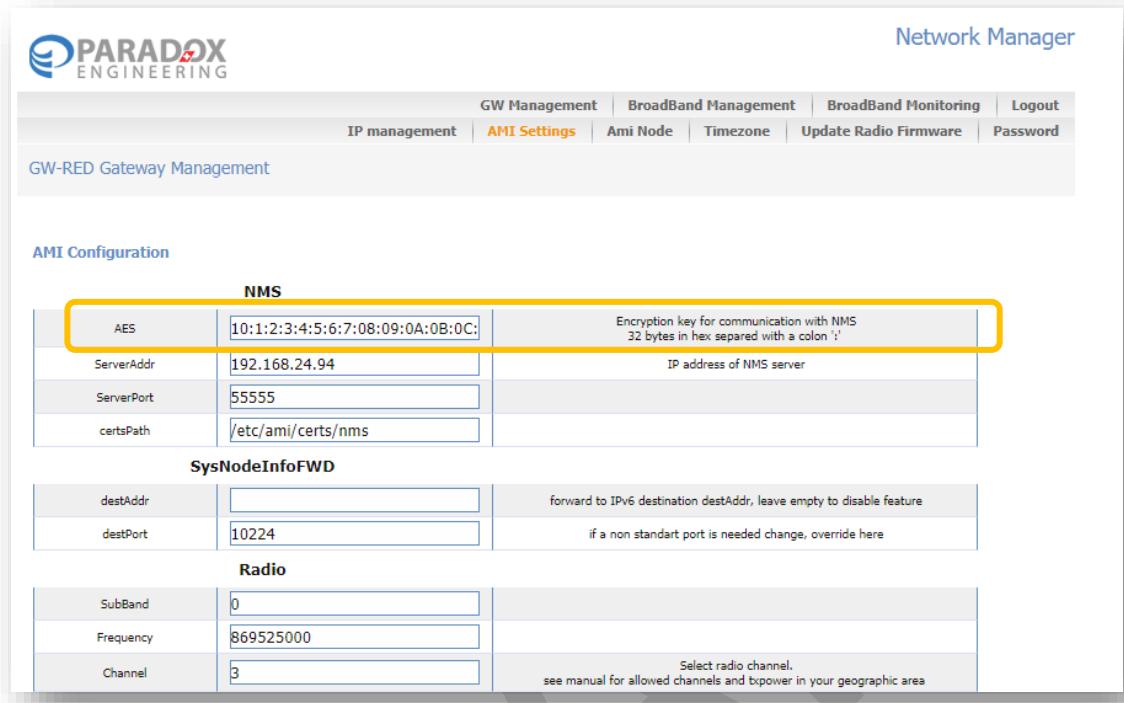
Connect PE Smart Gateway Neptune US to the customer's local network, reconfigure the client PC to its usual IP address and reload the page on your browser, or point the browser to PE Smart Gateway Neptune US assigned IP address.

5.2 Gateway to CMS

PE Smart Gateway Neptune US must be able to establish a TCP connection to the hosted instance of CMS Server on TCP port 55555 (if not differently mentioned). Please DO NOT modify it, unless receiving specific instruction by Paradox Engineering.

If CMS' IP is different from default setting, please modify it accordingly in the AMI Settings section of GW Manager by changing the "ServerAddr" IP.

Please ensure to correctly configure your network firewall to allow bidirectional communication over the TCP port range.



The screenshot shows the Network Manager interface with the following configuration details:

| AMI Configuration | | |
|-----------------------|----------------------------------|--|
| NMS | | |
| AES | 10:1:2:3:4:5:6:7:08:09:0A:0B:0C: | Encryption key for communication with NMS 32 bytes in hex separated with a colon ':' |
| ServerAddr | 192.168.24.94 | IP address of NMS server |
| ServerPort | 55555 | |
| certsPath | /etc/ami/certs/nms | |
| SysNodeInfoFWD | | |
| destAddr | | forward to IPv6 destination destAddr, leave empty to disable feature |
| destPort | 10224 | if a non standard port is needed change, override here |
| Radio | | |
| SubBand | 0 | |
| Frequency | 869525000 | |
| Channel | 3 | Select radio channel. see manual for allowed channels and txpower in your geographic area |

5.3 Gateway to PE

PE Smart Gateway Neptune US will attempt to establish a VPN link to Paradox Engineering network through TCP port 21194. This link will be used for remote support purposes only.

Allowing this port in your network firewall is not mandatory, but warmly recommended to have a prompt and efficient remote support from Paradox Engineering.

5.4 NTP configuration

PE Smart Gateway Neptune US should have time configured by an NTP server. The product is pre-configured to use public NTP servers.

If public NTP servers (UDP port 123) are filtered by your firewall, or if a DNS server is not available, other NTP servers can be configured under AMI Settings/NTP. Enter one or more IP addresses or names, separated by commas in the NTP/Servers textbox, then click on “Save Settings” and on “Restart AMI Service”.

If an NTP service is not available on your network, leave the NTP/Servers textbox blank, click on “Save Settings” and then on “Restart AMI Service”, and manually configure time under the “Timezone” page.

| | | |
|----------------------|-----------------------|--|
| TriggeringEnabled | both | React to external events sending broadcast LM ON/OFF master: follow I/O port status slave: follow signal from master none |
| MaxNumberTrigger | 2 | |
| SlaveListFile | /etc/ami/GWSlaves.txt | |
| CtrlCheck | 1 | |
| DisableConsoleColors | | |

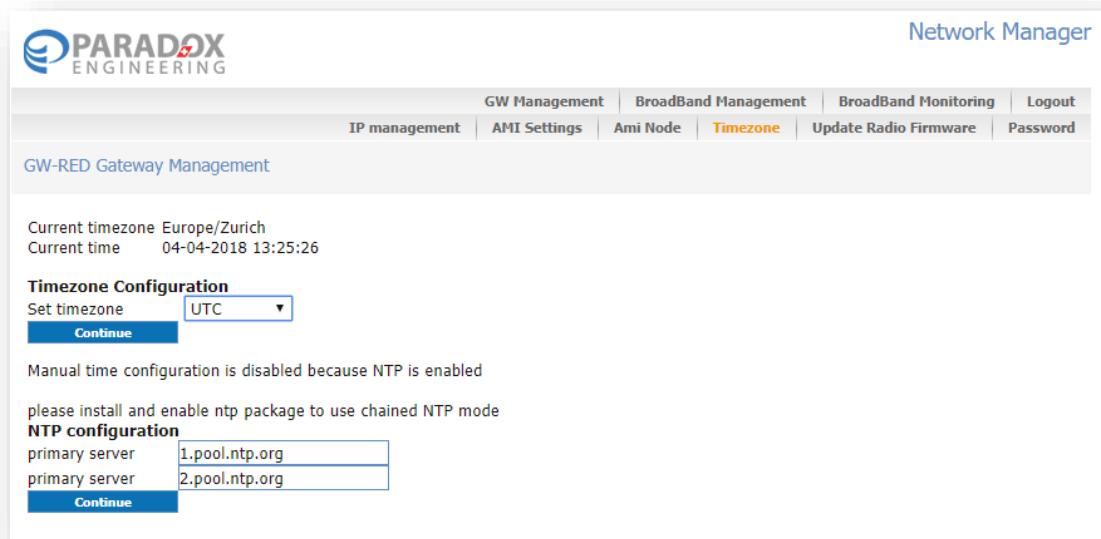
| | | |
|----------------|-------------------------------|--|
| NTP | | |
| Servers | 1.pool.ntp.org,2.pool.ntp.org | Comma-separated list of host addresses. |
| UpdateInterval | 5 | (Empty the server list or set interval to 0, to disable NTP synchronization) |

| | | |
|-----------------------------------|---------|---|
| HTTP/XML control interface | | |
| HttpServer | true | 1 = Enable HTTP/XML control interface |
| HttpHost | 0.0.0.0 | |
| HttpPort | 8080 | TCP port for the HTTP/XML control service |
| HttpLoggingServer | 0.0.0.0 | IP address to which HTTP/XML notifications are sent |

5.5 Timezone configuration

To set timezone, click on the “Timezone” page, select the desired option from the drop-down menu and click on “Continue” to confirm.

Based on your selected timezone, further options may be requested. Please select accordingly and click on “Continue” to confirm and complete configuration.



5.6 Other configurations

Please DO NOT modify any other setting, unless receiving specific instructions by Paradox Engineering.

6 Packing

A representative packing scheme for PE Smart Gateway Neptune US is pictured in Figure 14.

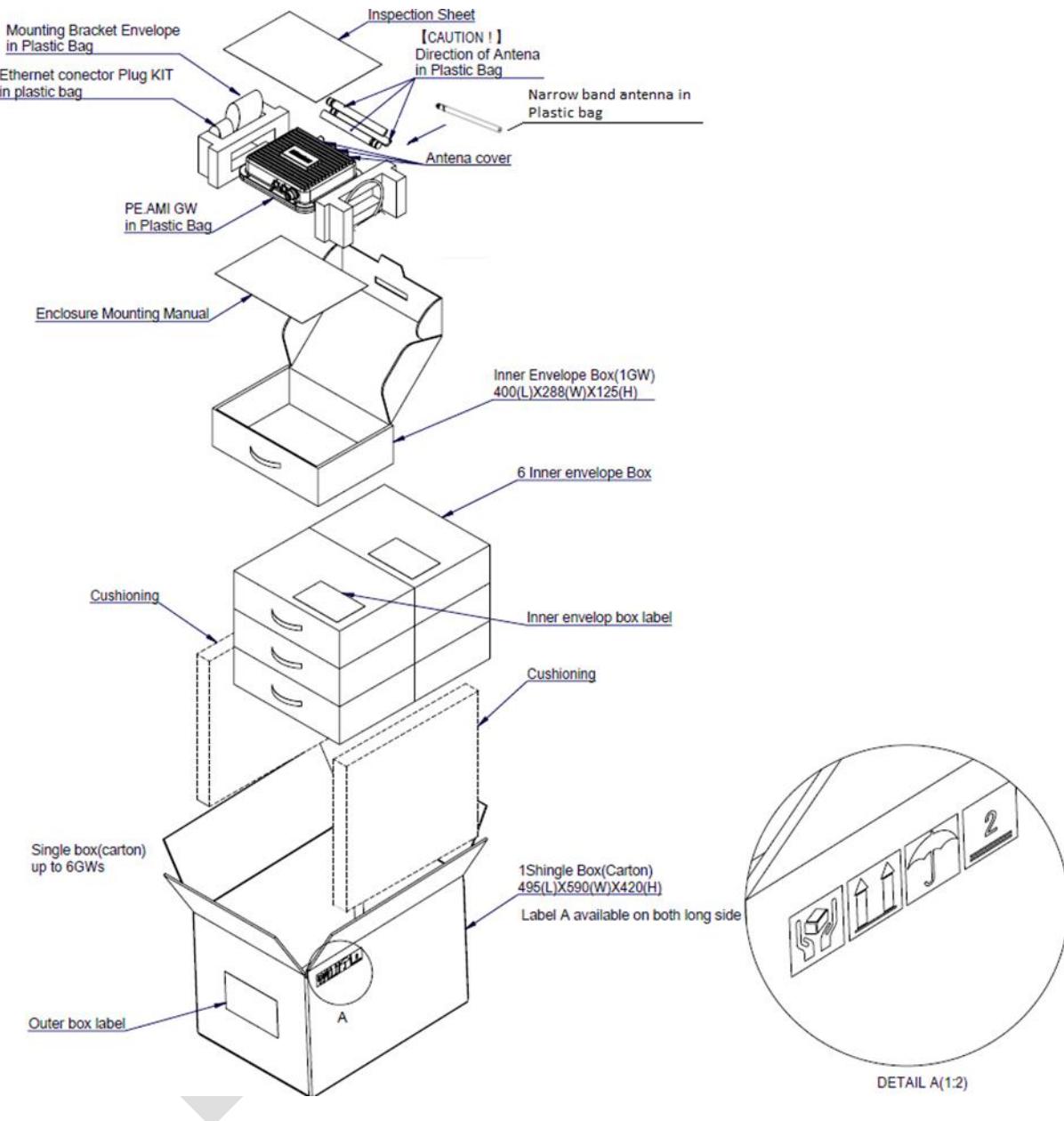


Figure 14 Packing scheme

7 Label

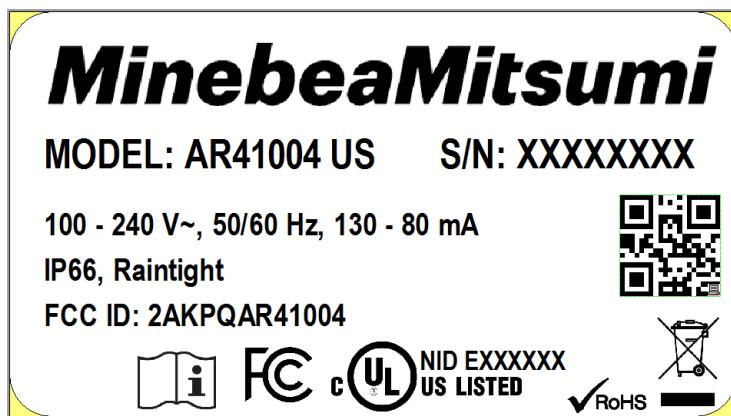


Figure 15 PE Smart Gateway Neptune US label

Label icons description

| Symbol | Description |
|---|--|
| MinebeaMitumi | MinebeaMitumi trademark |
| FCC | FCC compliance |
| c UL US LISTED | UL listing mark |
| ✓ RoHS | RoHS compliance |
|  | Waste Electrical and Electronic Equipment Directive (WEEE Directive) |
|  | Refer to the installation manual |

8 Maximum Permissible Exposure (MPE) limits

PE Smart Gateway Neptune US is compliant to Maximum Permissible Exposure (MPE) limits.

The following tables summarize the results of the calculations carried out assuming no co-location or operation in conjunction with any other antenna or transmitter. It is also indicated the minimum distance to keep between antennas and the public:

3.2 EUT composition

- Mikrotikls SIA - FCC ID: TV7RB953GS5HNTM with 5GHz 18dBi Panel Antenna, mti-485001
- Compex Systems Pte Ltd – FCC ID: TK4WLE600VX with 2,4GHz 5dBi Omni-antenna OM24580703 and 5GHz 18dBi Panel Antenna, mti-485001
- Paradox Engineering SA – FCC ID: 2AKPQAR41004 with 920MHz 2.15dBi $\lambda/2$ antenna MEGWX-1551SAAX-920

3.3 Calculation method, results and limits

| FCC ID | Frequency | Power | Power | Antenna Gain | EIRP | EIRP | Distance | Power Density | Limit |
|-----------------|-----------|-------|-------|--------------|------|-------|----------|--------------------|--------------------|
| | MHz | dBm | W | dBi | dBm | mW | Cm | mW/cm ² | mW/cm ² |
| TV7RB953GS5HNTM | 5745 | 24,6 | 0,288 | 18 | 42,6 | 18172 | 50 | 0,578 | 1,0 |
| TK4WLE600VX | 2412 | 23,86 | 0,243 | 5 | 28,9 | 769 | 50 | 0,024 | 1,0 |
| TK4WLE600VX | 5745 | 22,8 | 0,191 | 18 | 40,8 | 12020 | 50 | 0,383 | 1,0 |
| 2AKPQAR41004 | 902 | 22,4 | 0,174 | 2 | 24,4 | 275 | 50 | 0,008 | 0,6 |

3.4 Result

| FCC ID | Power Density | Limit | PD/Limit |
|-----------------|-------------------|--------------------|----------|
| | mW/m ² | mW/cm ² | |
| TV7RB953GS5HNTM | 0,578 | 1,0 | 0,578 |
| TK4WLE600VX | 0,024 | 1,0 | 0,024 |
| TK4WLE600VX | 0,383 | 1,0 | 0,383 |
| 2AKPQAR41004 | 0,008 | 0,6 | 0,013 |
| | $\Sigma =$ | 0,998 | |

Notice

Changes or modifications made to this equipment not expressly approved by Paradox Engineering may void the user's authority to operate this equipment.

Note

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense

Radiofrequency radiation exposure information

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance of 50 cm between the radiator and your body.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Product operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

The FCC ID label is pictured in Figure 16:

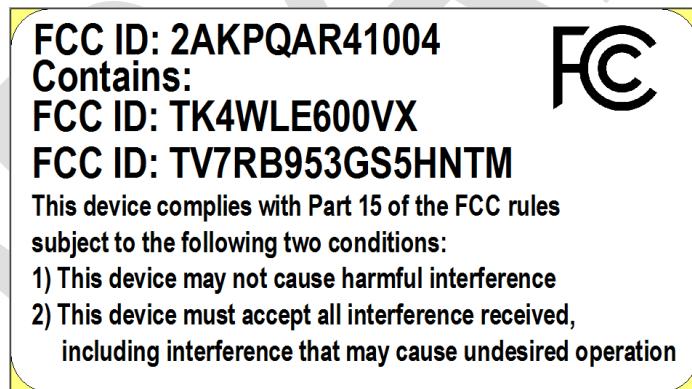


Figure 16 FCC ID label

9 Certification

Directives

| Directive | Title |
|------------|--|
| 2011/65/EU | Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment |

Standards

| Standard | Title |
|--------------------|---|
| UL 62368-1 | Audio/video, information and communication technology equipment - Part 1: Safety requirements |
| FCC 47 CFR part 15 | FCC 47 CFR Part 15, Subpart C - Intentional Radiators |

9.1 Approval and compliance

Approval

| Approval | Issued by | Certificate No. |
|---|-----------|-----------------|
|  | TBD | TBD |
|  | TBD | TBD |

Compliance

| Compliance | Description |
|---|---|
|  | RoHS compliant, refer to [OD_1] |
|  | WEEE Directive compliant, refer to [OD_1] |

10 Ordering codes

| Ordering codes | |
|--|-----------------|
| Product name | Code |
| PE Smart Gateway Neptune US | AR41004 US |
| Optional power supply cable ² | CAB-PWR-0019-01 |
| Optional signal cable ³ | CAB-SIG-0026 |
| Alternative mounting brackets ⁴ | MEC-OTH-0036 |
| Optional outdoor directional panel antenna 5.15-5.875 GHz, 18 dBi gain, Linear V/H Polarity, N Type | ANT-OUT-0025 |
| Optional outdoor directional panel antenna (sector) 4.9-5.875GHz, 90deg V polarization, 17 dBi gain, N type | ANT-OUT-0030 |

11 Acronyms

| Acronym | Description |
|--------------|---|
| PE | Paradox Engineering |
| CMS | Central Management System |
| IPv6/6LoWPAN | IPv6 over Low-Power Wireless Personal Area Networks |
| NA | Not Applicable |
| TBC | To Be Confirmed |
| TBD | To Be Defined |

² The product is not provided with the power supply cable.

³ The signal cable is related to the I/O interface.

⁴ The product is supplied with a standard mounting bracket for installation to flat wall or to poles up to (74 ± 1) mm diameter. For larger poles it is recommended the use of the alternative mounting bracket.

All optional items shall be clearly specified in the order.

12 References / Related documents

12.1 General Documents

| Item | Document Number | Document Title/Description |
|--------|-----------------|------------------------------|
| [GD_1] | 178919 D01 | FCC Permissive Change Policy |

12.2 Paradox Engineering Documents

| Item | Document Number | Document Title/Description |
|--------|-----------------|---|
| [PD_1] | DOC-DAT-0007 | PE Smart Gateway Neptune US Datasheet |
| [PD_2] | DOC-INS-0065 | PE Smart Gateway Neptune US User manual |

12.3 Other documents

| Item | Document Number | Document Title/Description |
|--------|-----------------|---|
| [OD_1] | EM10507 | MinebeaMitsumi Group Green Procurement Standard |

13 Revision History

| Revision | Document No. | Created by | Date | Description |
|----------|-----------------|--|------------|--|
| | | Verified by | | |
| | | Approved by | | |
| 00 | DOC-INS-0059-00 | M. Merletti /R. Palmiero L. Grillo C. Bernocco | 27.03.2018 | First document release |
| 01 | DOC-INS-0059-01 | R. Palmiero F. Bottazzi L. Grillo | 12.10.2018 | Updated the MPE table and FCC notices. Product label revised according FCC certification. |
| 02 | DOC-INS-0059-02 | R. Palmiero F. Bottazzi L. Grillo | 23.11.2018 | Minor changes related to FCC certification |

DRAFT



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