

PE Smart Gateway Neptune US

AR41004 US

Installation manual

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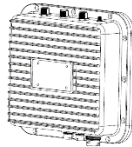
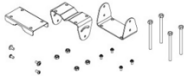


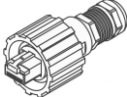


1 Product Description

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 mm ² (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.

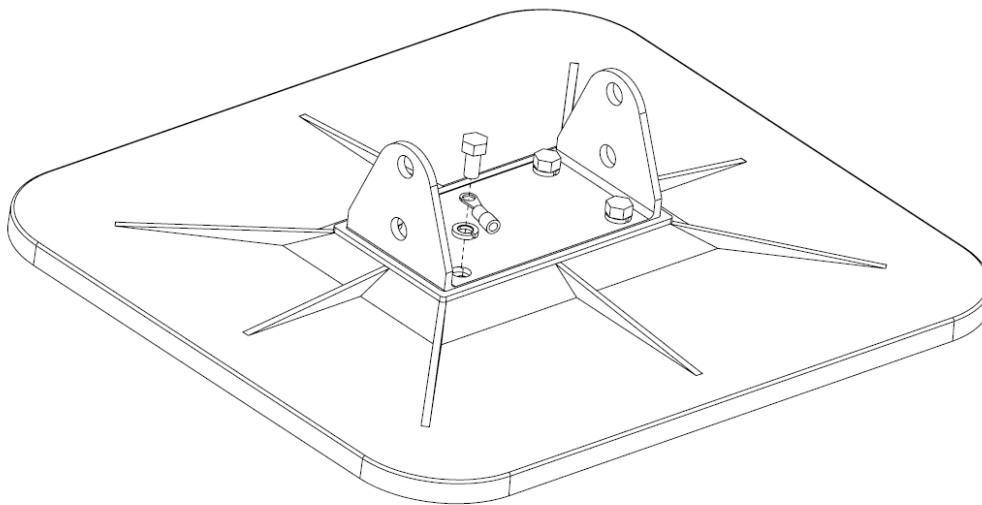


Figure 2 Grounding instructions

4.2 Dimensions

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

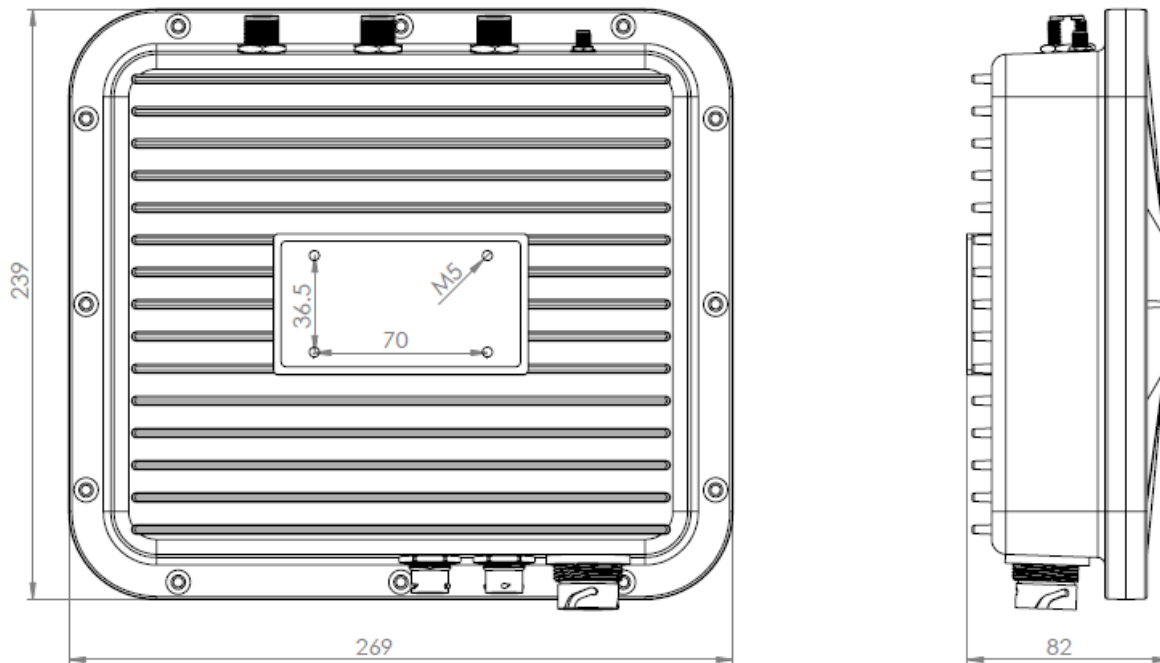


Figure 3 Dimensions of PE Smart Gateway Neptune US

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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

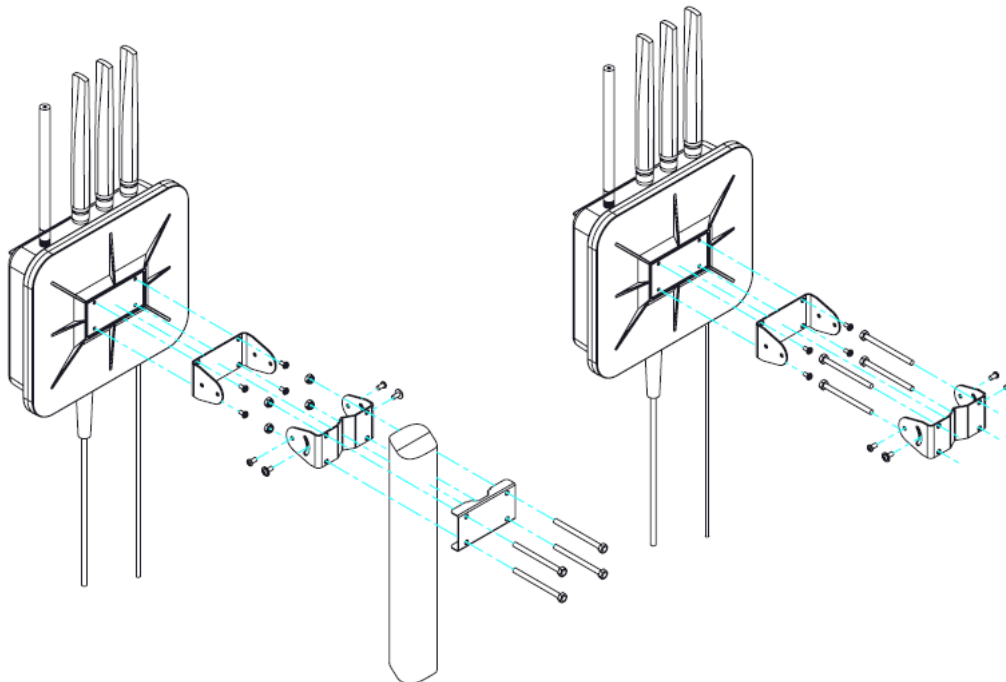


Figure 4 PE Smart Gateway Neptune US Mounting instructions on a pole (left) or a flat surface (right)

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.

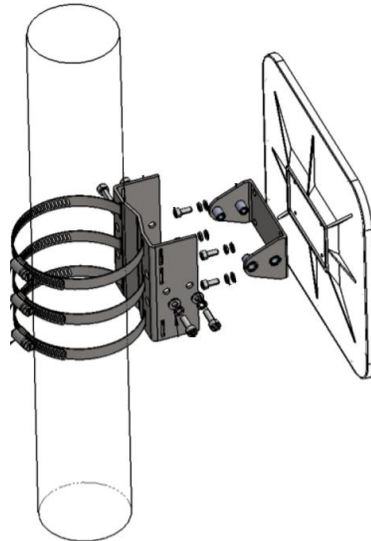


Figure 5 Alternative mounting set (example)

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.

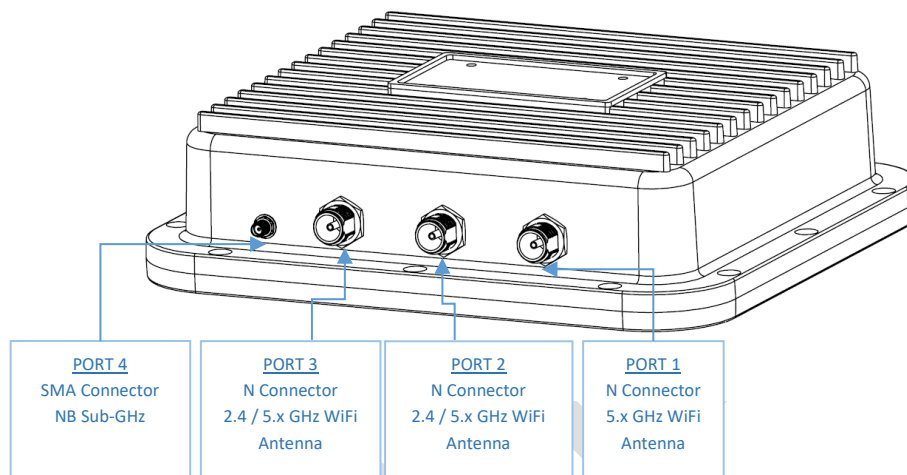


Figure 6 PE Smart Gateway Neptune US antenna connectors

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

Narrowband antennas

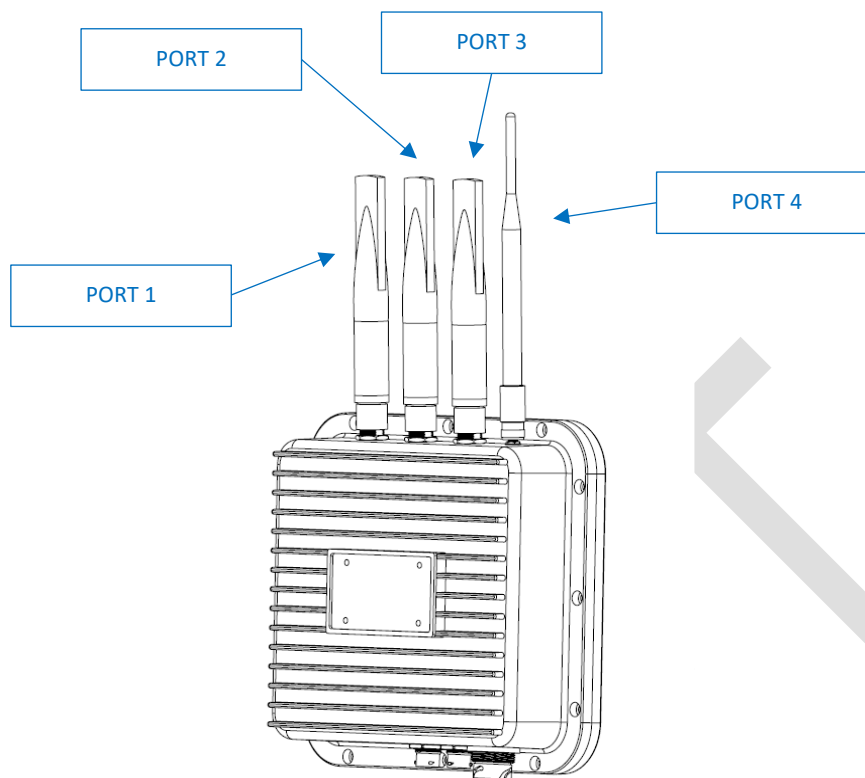
Part Number	Manufacturer	Manufacturer part No.	Gain (dBi)	Band (MHz)	Connector
ANT-OUT-0020	Joymax Electronics Co.	MEGWX-1551SAAX-920	2.0	920	Port 4

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.

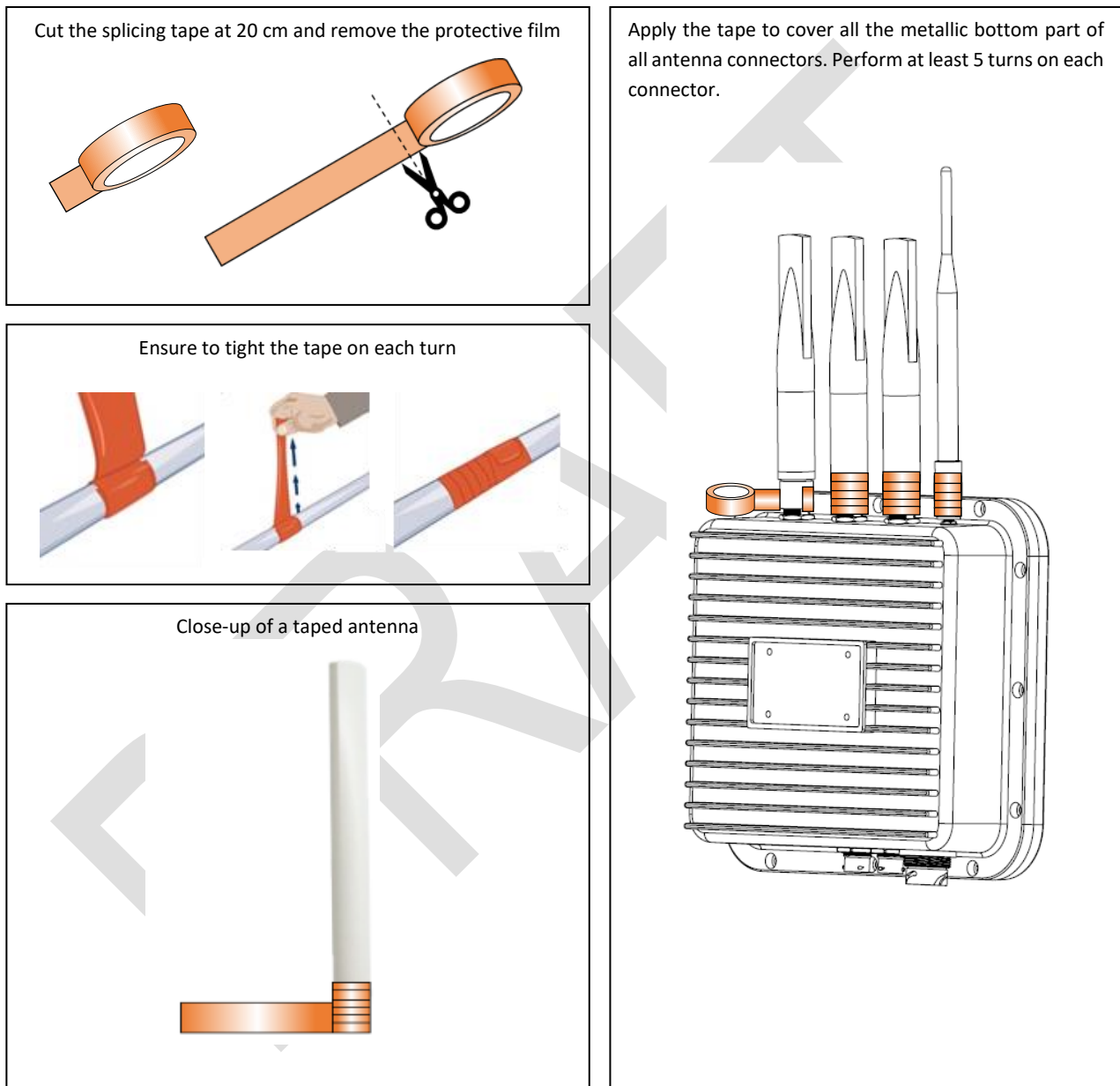


*Figure 7 PE Smart Gateway Neptune US antenna mounting.
Example with all broadband antennas ANT-OUT-0021 and narrowband antenna ANT-OUT-0020*

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.



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

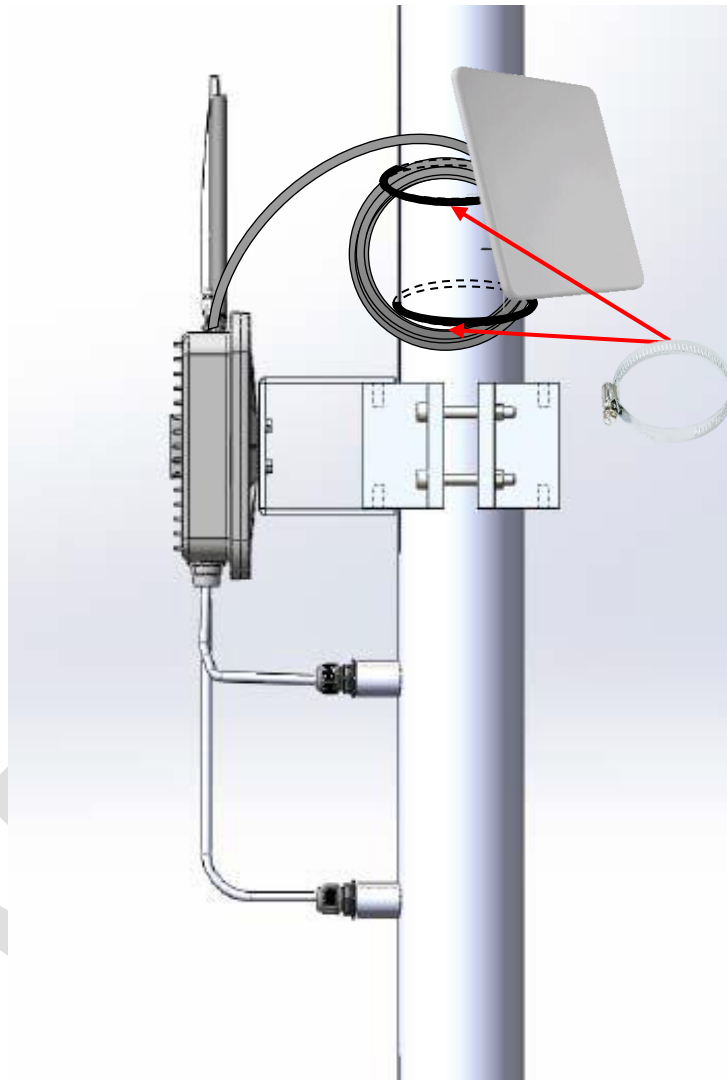


Figure 8 Representative illustration of RF extension cords mounted on a pole

4.4 Wirings

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

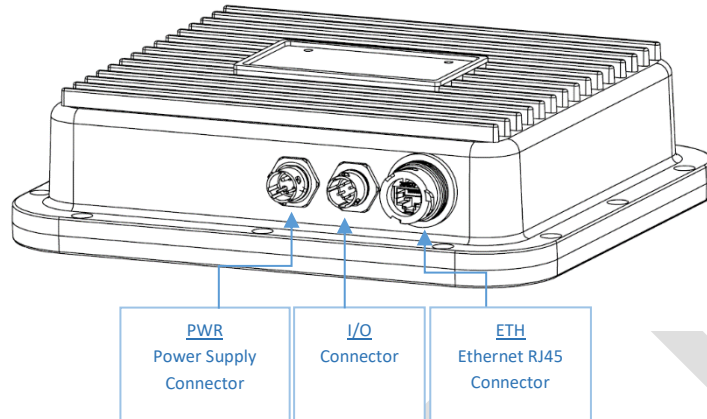


Figure 9 PE Smart Gateway Neptune US connectors

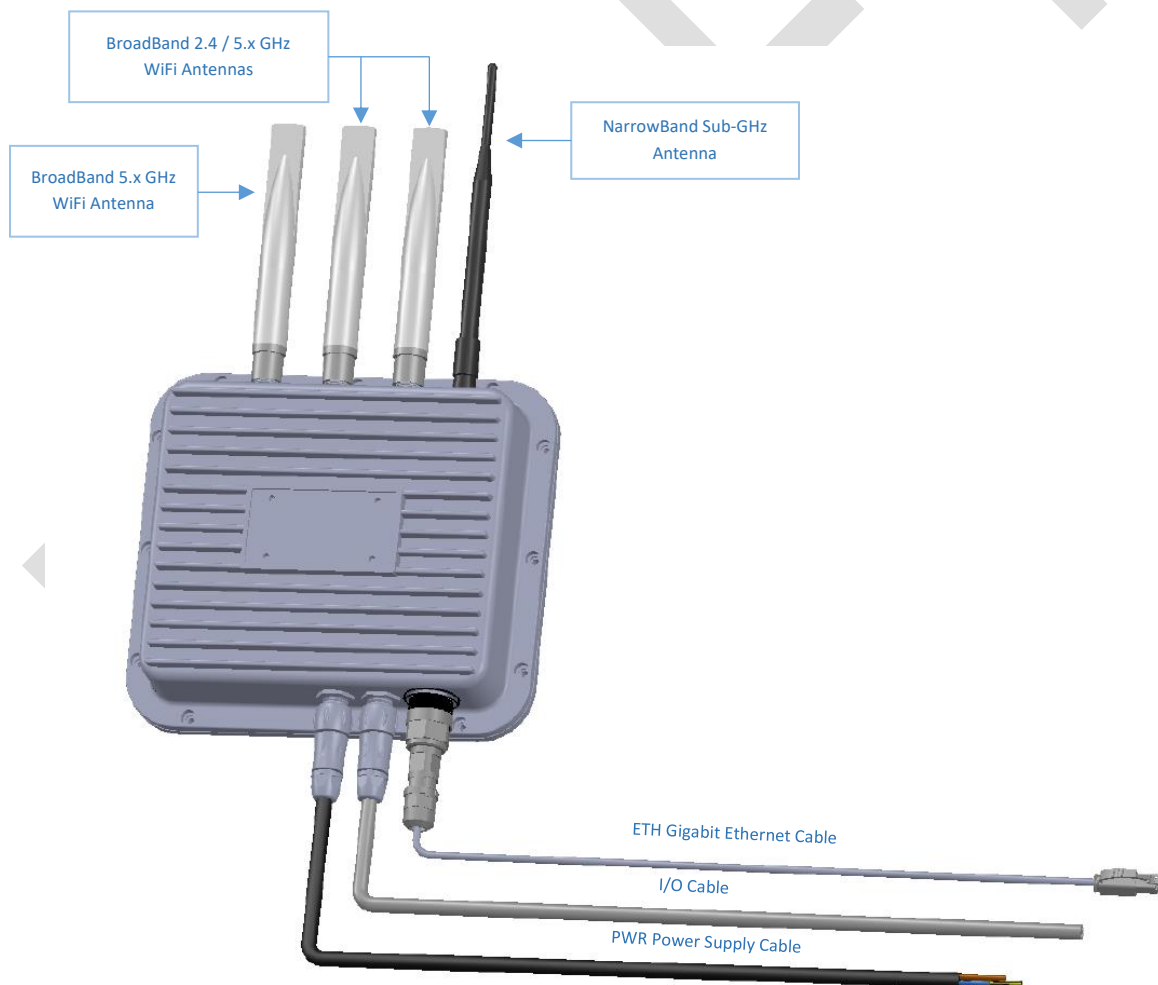


Figure 10 PE Smart Gateway Neptune US wiring scheme

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.

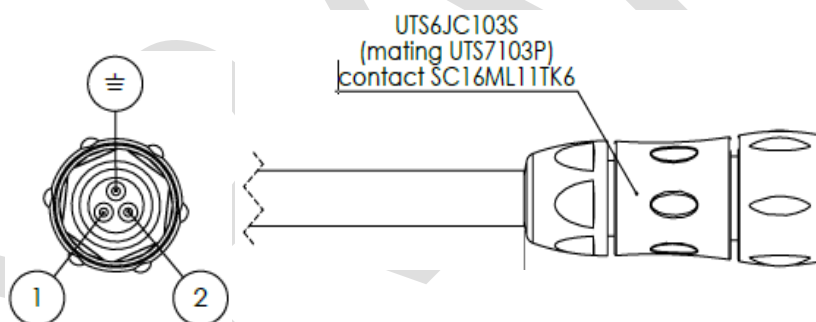


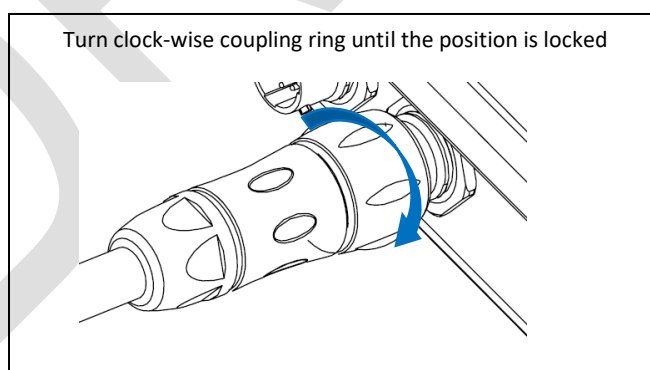
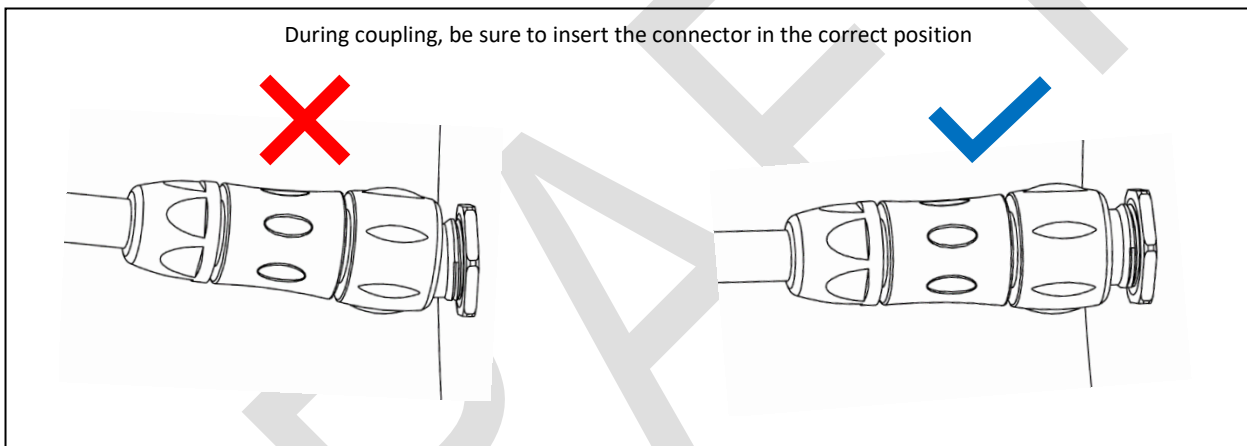
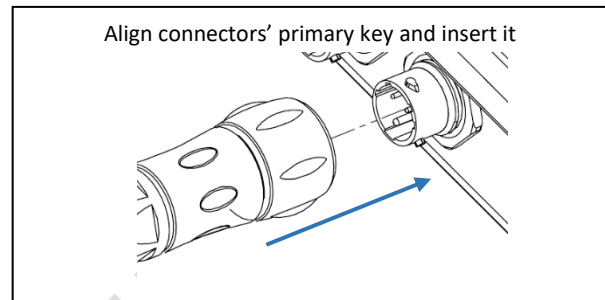
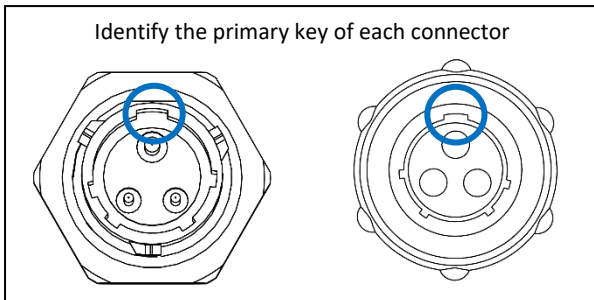
Figure 11 Pinout of the power supply cable, viewed from the connector side

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.

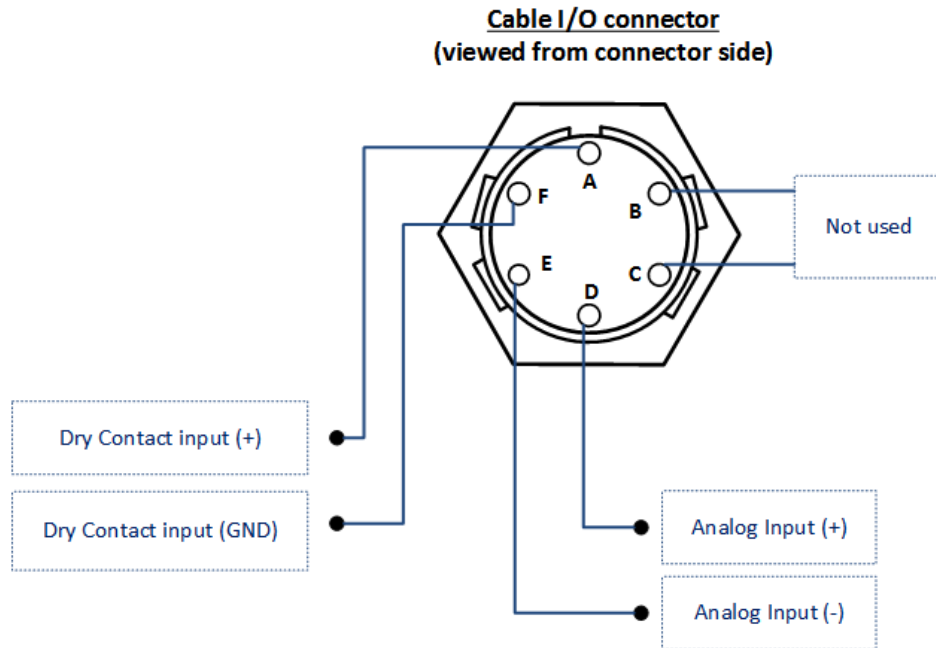


Figure 12 Pinouts of the I/O connector, viewed from the connector side

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

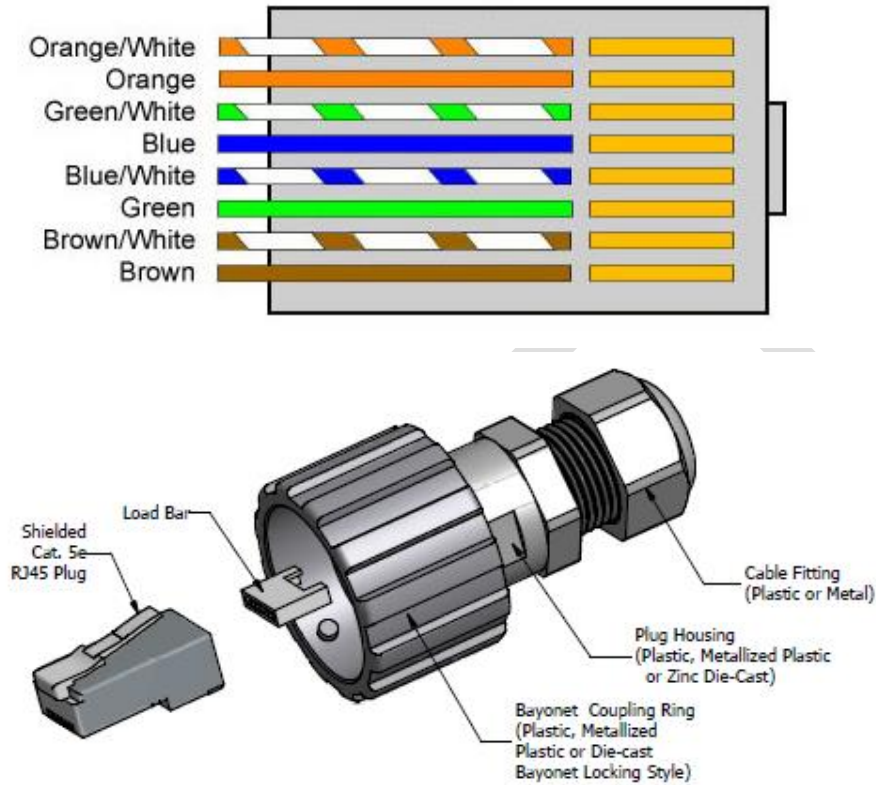


Figure 13 Pinout of the Ethernet connector

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

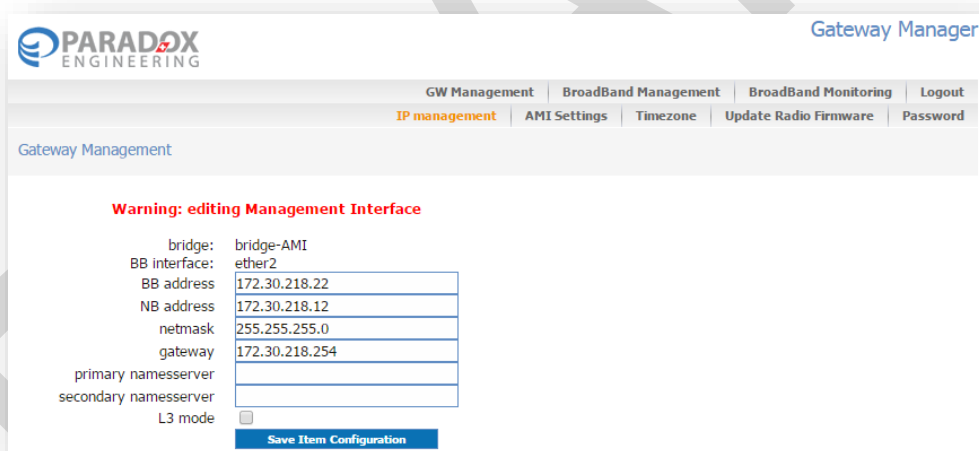
5.1 Configuring the IP address (narrowband and broadband)

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.

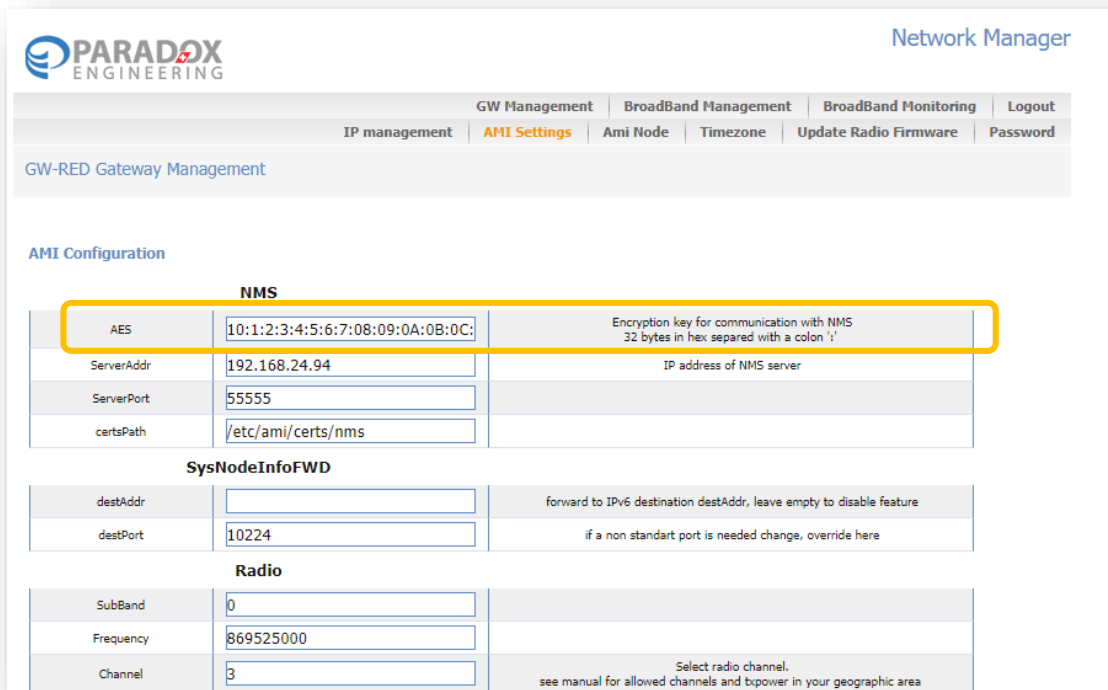
Connect PE Smart Gateway Neptune US to the customer’s local network, reconfigure the client PC to its usual IP address and reload the page on your browser, or point the browser to PE Smart Gateway Neptune US assigned IP address.

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 'AMI Settings' tab selected. The 'AMI Configuration' section is expanded to show the 'NMS' configuration. The 'AES' field is highlighted with a yellow box. Below it are fields for 'ServerAddr', 'ServerPort', and 'certsPath'. The 'SysNodeInfoFWD' section has fields for 'destAddr' and 'destPort'. The 'Radio' section has fields for 'SubBand', 'Frequency', and 'Channel'.

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 standart 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”.

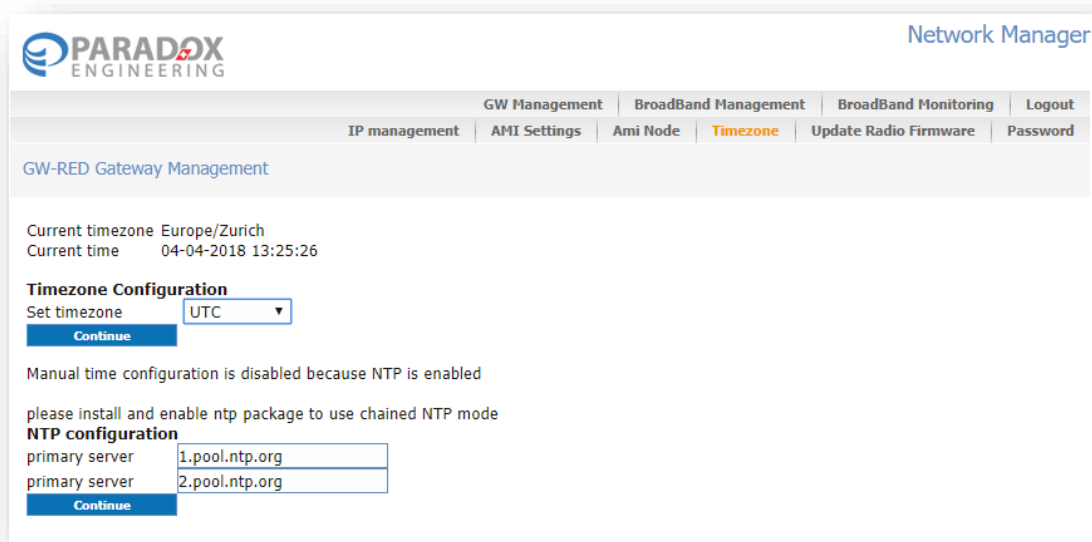
If an NTP service is not available on your network, leave the NTP/Servers textbox blank, click on “Save Settings” and then on “Restart AMI Service”, and manually configure time under the “Timezone” page.

TriggeringEnabled	<input type="text" value="both"/>	React to external events sending broadcast LM ON/OFF master: follow I/O port status slave: follow signal from master none
MaxNumberTrigger	<input type="text" value="2"/>	
SlaveListFile	<input type="text" value="/etc/ami/GWSlaves.txt"/>	
CtrlCheck	<input type="text" value="1"/>	
DisableConsoleColors	<input type="text"/>	
NTP		
Servers	<input type="text" value="1.pool.ntp.org,2.pool.ntp.org"/>	Comma-separated list of host addresses.
UpdateInterval	<input type="text" value="5"/>	(Empty the server list or set interval to 0, to disable NTP synchronization)
HTTP/XML control interface		
HttpServer	<input type="text" value="true"/>	1 = Enable HTTP/XML control interface
HttpHost	<input type="text" value="0.0.0.0"/>	
HttpPort	<input type="text" value="8080"/>	TCP port for the HTTP/XML control service
HttpLoggingServer	<input type="text" value="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.

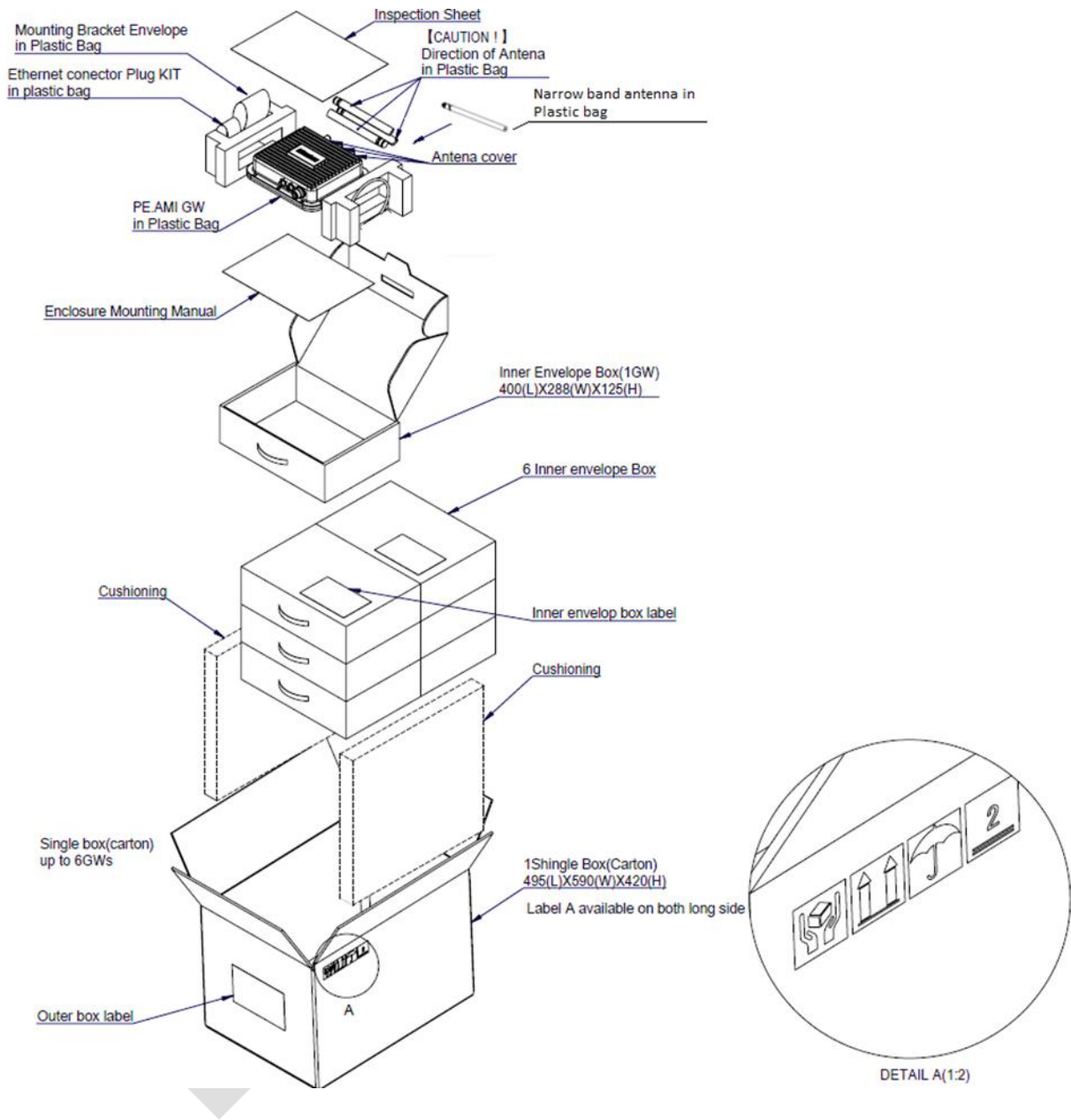


Figure 14 Packing scheme

7 Label

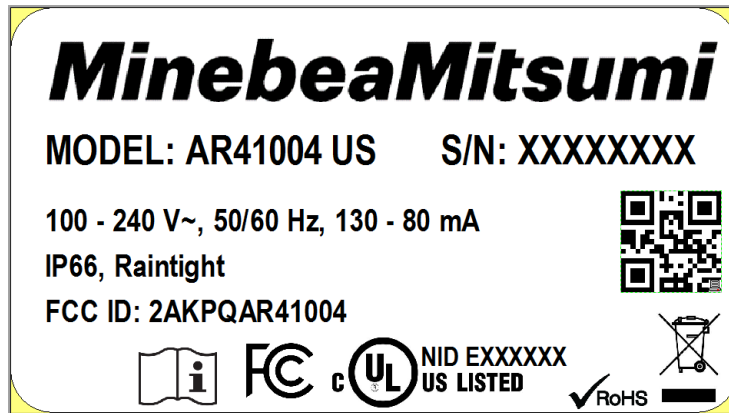


Figure 15 PE Smart Gateway Neptune US label

Label icons description

Symbol	Description
MinebeaMitsumi	MinebeaMitsumi 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

- Mikrotiks 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:

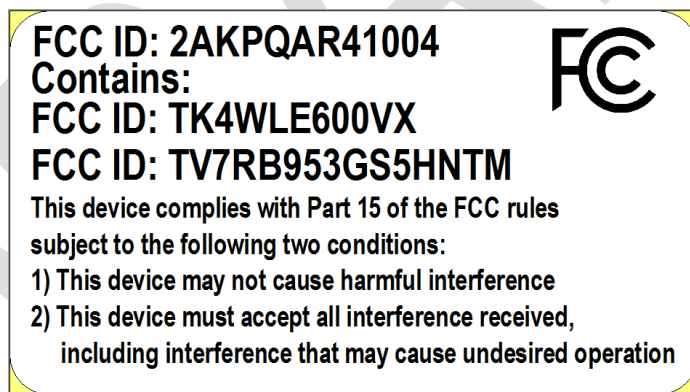


Figure 16 FCC ID label

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 Verified by Approved by	Date	Description
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



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