



GATEWAY

BS-1.2 / BS-2.2 /
BS-2.2 LTE

USER MANUAL



DOCUMENTATION REVISION	BS REVISION	SOFTWARE VERSION
28	3	1.0

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INTRODUCTION

This manual is designed for Vega BS-1, Vega BS-2, Vega BS-1.2, Vega BS-2.2 and Vega BS-2.2 LTE gateways (hereinafter – the gateway) manufactured by Vega-Absolute OOO and provides information on powering and activation procedure, control commands and functions of the gateway.



Gateways can be supplied without software by request

This manual is targeted at specialists familiar with installation work fundamentals for electronic and electrical equipment.



The gateway shall be installed and adjusted by qualified specialists to ensure proper operation of the device

Vega-Absolute OOO reserves the right to make changes to the manual related to the improvement of equipment and software, as well as to eliminate typos and inaccuracies, without prior notice.

1 DEVICE PURPOSE AND OPERATION PRINCIPAL

Vega BS gateway is designed to deploy LoRaWAN® network within 863-870 MHz frequency band.

The gateway operates with Linux operating system and is supplied with pre-installed Packet forwarder software.

The gateway is powered and communicates with the server via the Ethernet channel.

The device is configured through Ethernet with SSH protocol either via gateway web-interface or while USB connection with the computer. When gateway is connected via SSH or USB it may be configured with any terminal program (e. g. PuTTY).

Vega BS-2.2 gateway have an additional 3G-module for communication channel and GPS/GLONASS-module for gateway positioning, and internal clock synchronizing with navigation-satellites signals. Gateway BS-2.2 LTE is equipped with an LTE module.

2 SPECIFICATION

Model	BS-1.2	BS-2.2	BS-2.2 LTE
MAIN			
GPS/GLONASS module	no	yes	
GSM modem	no	yes	
Server communication link	Ethernet 10/100 Base-T	Ethernet 10/100 Base-T, GSM 3G ¹	Ethernet 10/100 Base-T, GSM LTE
Operating system	Linux		
USB-port	yes		
Operating temperatures	-40...+70 °C		
LORAWAN®			
Number of LoRa channels	8		
Frequency band	863-870 MHz		
Power output	up to 500 mW		
Antenna connector	N-Type female		
Radio coverage in restrained urban conditions	up to 5 km		

¹ 3G-modem used in BS-2.2 supports the following frequency:

Dual-Band UMTS (WCDMA/FDD)
 900 and 2100 MHz

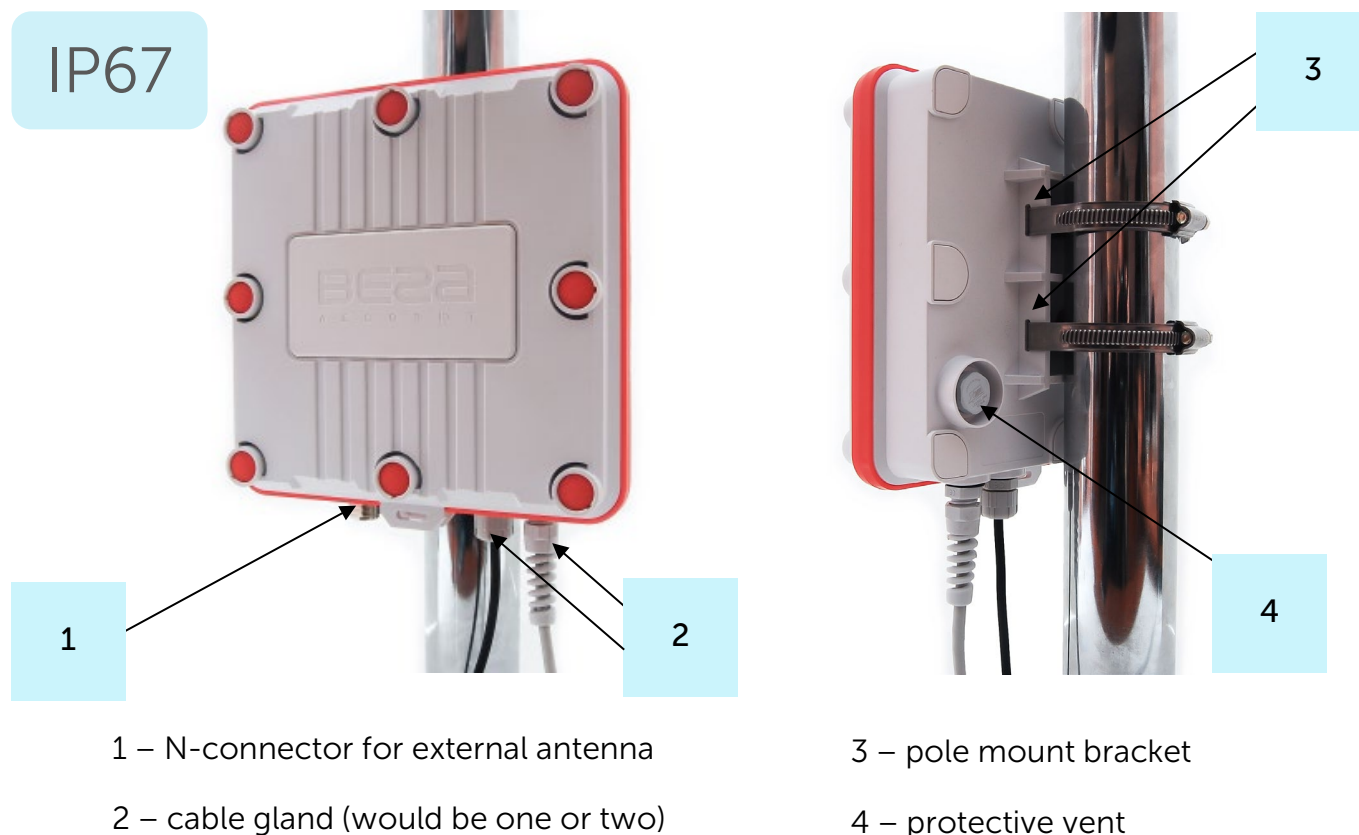
Dual-Band GSM
 900 and 1800 MHz

Model	BS-1.2	BS-2.2	BS-2.2 LTE
Radio coverage within line of sight	up to 15 km		
POWER			
Power consumption	up to 10 W		
Power supply	Passive PoE 4,5(+) 7,8(-) 15 W		
CASE			
Housing dimensions	190 x 183 x 75 mm		
Ingress protection rating	IP67		
Mounting	mast supports		

3 OPERATION

DEVICE APPEARANCE

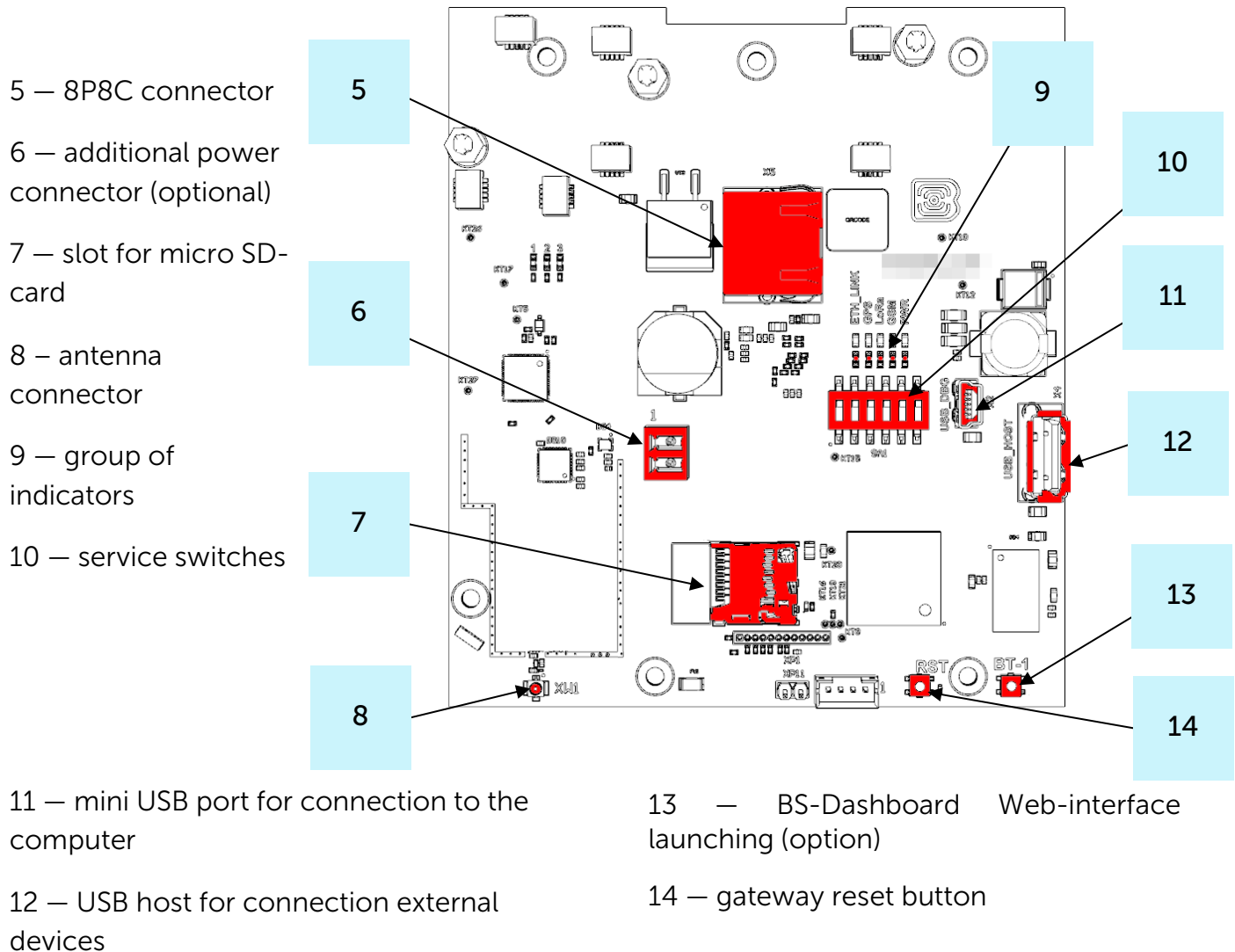
Gateway Vega BS is represented in strong case and compliant with a IP67 code. There are pole mount brackets on the back side of the case.



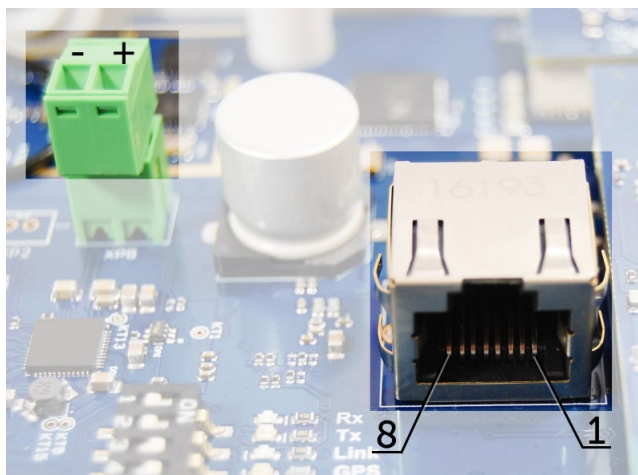
The case is equipped with a **hermetic gland** of M12 size. A sealant is installed inside the gland, ensuring compliance with the declared Ingress Protection rating of the device case. Also, sealant is placed on the perimeter of case between two case parts. Removing the sealant can

lead to moisture entering the gateway case. Waterproof protective vent serves to equalize the air pressure inside and outside the case.

The gateway terminal board has control and indication instruments, input, and output interfaces.



The gateway is connected to the network with an 8-core network cable (twisted pair) through 8P8C connector on the board. Cable shall be crimped in compliance with T568A and T568B standards. Contacts are numerated from 1 to 8 in order right-to-left.



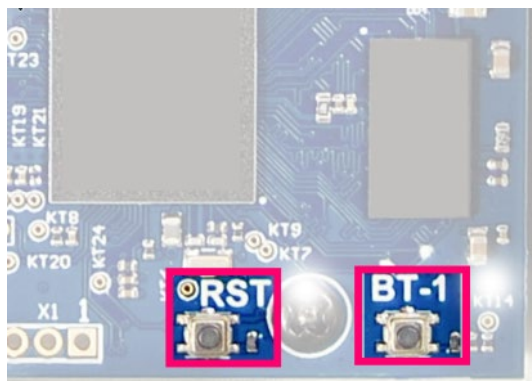
Colors are shown for cable T568B:

Contact number	Color	Designation
1	Orange-and-white	TD+ signal
2	Orange	TD- signal
3	Green-and-white	RD+ signal
4	Blue	Power
5	Blue-and-white	Power
6	Green	RD- signal
7	Brown-and-white	Ground
8	Brown	Ground

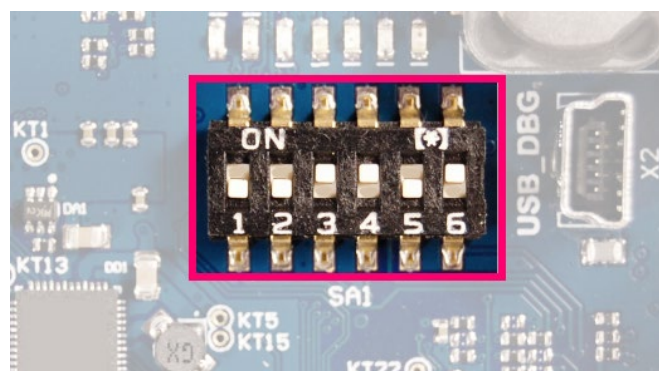
There is an additional power connector on the board. It can be connectable only when power contacts 4, 5 and 7, 8 in the network cable are disabled. Permissible power voltage is 12-48 V. Minimum power is 20 W.

CONTROL INSTRUMENTS – BUTTONS AND SWITCHES

There are two buttons on the gateway board. **BT1** launches BS-Dashboard Web-interface. Press **RST** button for the gateway instantaneous rebooting.

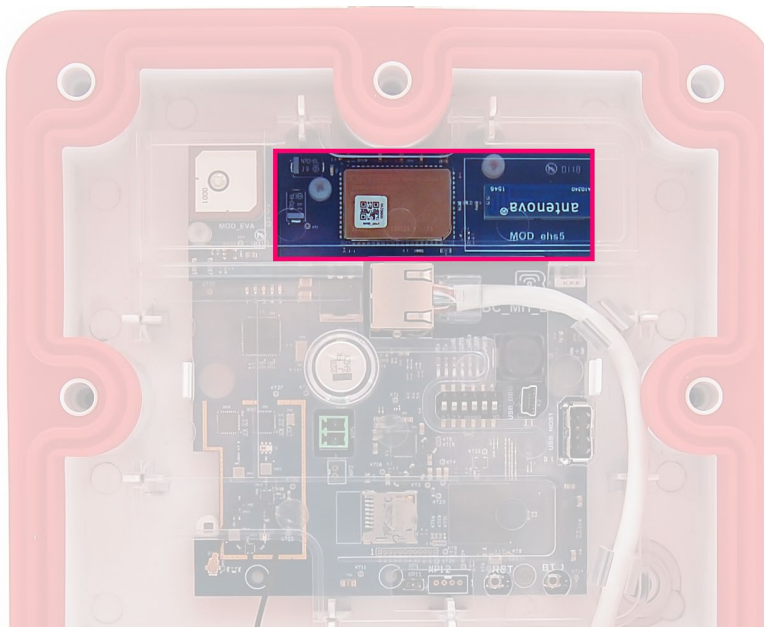


In addition, there are **service switches** on the board used to select the download option of the firmware image: from internal memory, from the SD card or via mini-USB from the computer. The switches are only for service conditions. In operating mode, only switches 3 and 4 shall be enable, see picture below.



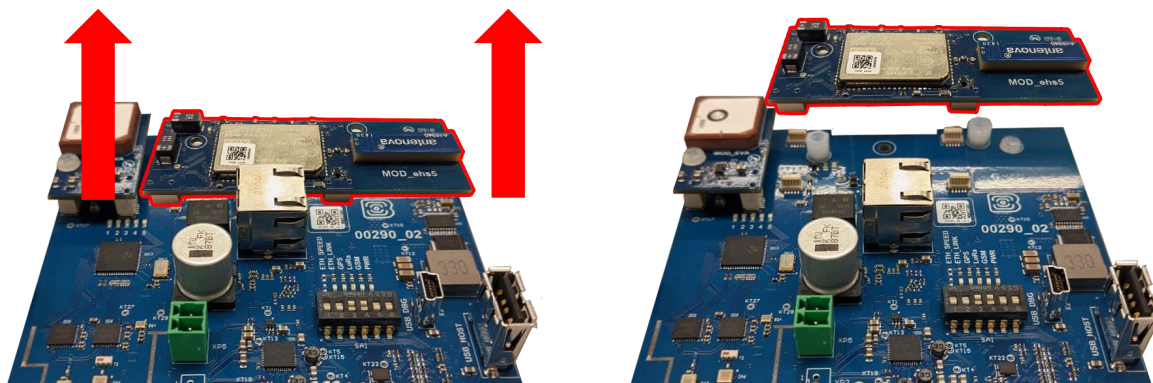
SIM CARD INSTALLATION AT THE BS-2.2 AND BS-2.2 LTE

Vega BS-2.2 and Vega BS-2.2 LTE gateways include a GSM (or LTE) module, which is placed on the main board.

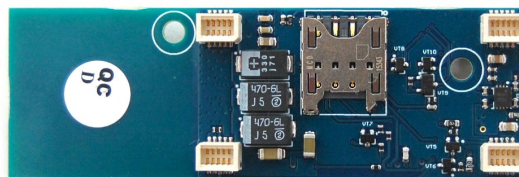


The SIM card must be installed at a temperature not lower than room temperature. If the device was in low temperatures, then before installing the SIM card, you must first keep the device at room temperature for several hours.

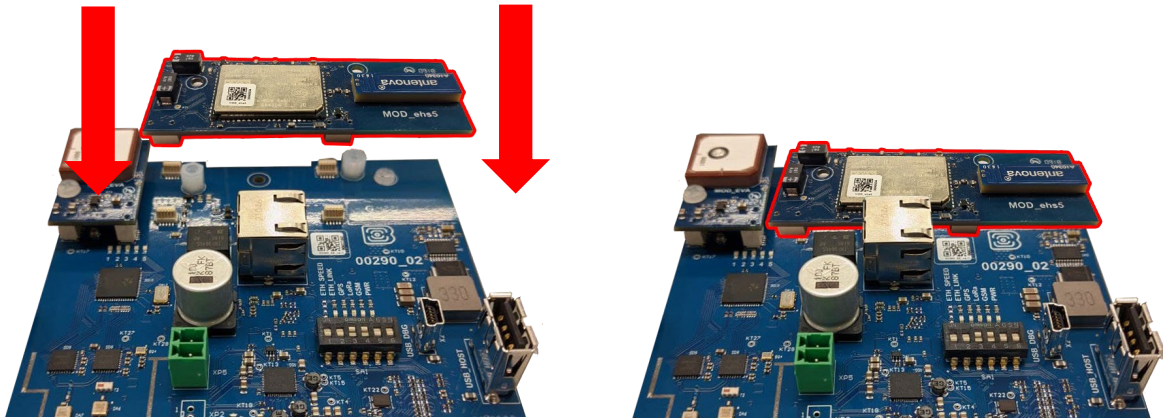
The module must be removed manually strictly vertically, observing a uniform load on the connectors. To remove, do not use auxiliary items such as screwdrivers, scissors, knives, etc. as levers, as this may damage the device.



The SIM slot is located on the back side of the module. To install the SIM card, you must disconnect the GSM module from the main board and turn it over.



You need to insert the SIM card of the micro-SIM format into the slot, and then return the GSM module on its own place.



INDICATION

There is a **group of LED indicators** on the terminal board; their signals showing in the table below. They indicate operation of different systems: power (on / off), visibility of GPS satellites, GSM modem (on / off), operation of the LoRa signals processing program (Packet forwarder on/off), Ethernet activity.

LED	Color	Indication
ETH_LINK	Green	<i>Flashes</i> – activity via Ethernet
GPS ²	Blue	<i>Doesn't light</i> – no data from GPS-receiver <i>Flashes</i> – there data exist, but are not valid for use by Packet forwarder <i>Lights</i> – location identified
LoRa	Yellow	<i>Lights</i> – Packet forwarder is started <i>Doesn't light</i> – Packet forwarder is stopped
GSM	Green	<i>Lights</i> – GSM-modem is enabled <i>Doesn't light</i> – GSM-modem is disabled
PWR	Red	<i>Lights</i> – gateway is powered <i>Doesn't light</i> – gateway is not powered

² GPS LED indicates the GPS system functioning only while Packet forwarder processing (LoRa LED lights).

MOUNTING RECOMENDATIONS

The necessary stage for the network deploying including a big quantity of end devices is a radio planning work with nature experiments.

For mounting **you will need:**

- ⦿ cross-shaped screwdriver for gateway assembling;
- ⦿ mounting belts and tool for them;
- ⦿ wire cutters;
- ⦿ a set of tools for cable crimping (stripper, crimper, twisted pair tester, cap, connector);
- ⦿ antenna mounting wrenches;
- ⦿ laptop.

Step by step mounting guide:

1. Setting the gateway is usually carried out in the office (see Network Deployment Manual).
2. Determination of suitable places for mounting at the object with a network tester — radio planning work.
3. Antenna placement and mounting. It's important to place the gateway antenna properly for high-quality signal reception. Antenna installing recommendations see below.
4. Connection PoE-injector cable to the gateway. To do this, you need to pass it through the cable gland of the case, and then crimp it with an Ethernet connector.
5. Gateway placement on the pole with mounting belts.
6. Power applying on the PoE.
7. By the laptop you can make sure that the device successfully sends the data.
8. Installing of gateway case top.

ANTENNA MOUNTING RECOMMENDATIONS

The Antenna usually has fasteners for installation on a mast support. To ensure maximum communication range, follow the installation guidelines for the antenna:

1. Install the antenna outside, preferably on the roof of the building (the higher - the better, depending on the surrounding buildings). Installing the antenna in the room significantly weakens the sensitivity of the antenna.

2. The installation site shall be as far as possible from the cellular antennas. Antenna tuning requires the maximum distance from other antennas. After tuning and testing, antenna can be brought back closer to the cellular antennas, if the quality of the communication is satisfactory.

3. The antenna shall not stand in the proximity to obstacles (about 2 meters from railing, walls, etc.). The sensitivity towards the obstacle weakens.

4. The gateway shall be installed in the proximity to the antenna – at the length of the antenna coaxial conductor. Increase of the cable length between the antenna and the gateway will result in a loss of antenna sensitivity.



For example, 25 meters of RG-58 cable attenuate the signal by 14 dBm, i. e. if transmission power is 14 dBm (25mW), the power on the antenna will be 1mW

5. The antenna directional pattern shall be considered. In the horizontal plane, the antenna has a circular direction, but no vertical direction. Therefore, the quality of communication directly under the antenna will be worse than at some distance from the antenna.

MAINTENANCE RECOMMENDATIONS

To prevent equipment failures during operation, it is recommended to carry out **periodic maintenance** of the gateway. The maintenance period is set depending on the operating conditions and can be **from 6 to 24 months**.

List of possible works during maintenance:

1. Checking the operation status of the gateway.
2. Software updating.
3. Cleaning external elements from dust.
4. Maintenance of mounting, external mounting wires, contact connections.
5. Checking the operation status of the PoE-injector.

The recommended order for each type of work is given in the table below.

Maintenance	Auxiliary materials and tools	Maintenance procedure
Checking the operation status of the gateway	<ul style="list-style-type: none"> • cross-shaped screwdriver for gateway assembling. 	<ol style="list-style-type: none"> 1. Disassemble the gateway case, remove the cover 2. Make sure that all LEDs from the group of BS status indicators are light according to the table 3. Install the cover in place, assemble the BS
Software updating	<ul style="list-style-type: none"> • laptop. 	<ol style="list-style-type: none"> 1. Connect to the gateway via the Web-interface 2. Check for an update (exclamation mark next to the "About Device" section) 3. Update software
Cleaning external elements from dust	<ul style="list-style-type: none"> • microfiber cloth. 	<ol style="list-style-type: none"> 1. De-energize the BS 2. Wipe the outer parts of the BS case with a damp cloth

		<ol style="list-style-type: none"> 3. Wipe the PoE-injector with a damp cloth 4. Wipe the antenna
Maintenance of mounting	<ul style="list-style-type: none"> • mounting belts and tool for them; • antenna mounting wrenches. 	<ol style="list-style-type: none"> 1. Carefully check the security of the gateway 2. If necessary, tighten the screws or replace the ties 3. Check the reliability of the antenna mounting
Maintenance of external mounting wires, contact connections	<ul style="list-style-type: none"> • cross-shaped screwdriver for gateway assembling; • insulating tape; • cable glands, wires and cables for replacement; • a set of tools for cable crimping. 	<ol style="list-style-type: none"> 1. Inspect the external mounting wires of the BS, antenna and PoE-injector for abrasions and damage 2. If necessary, replace the wires or repair the insulation 3. Make sure that the contact connections are tight 4. Make sure that the cable glands are in good condition, and the seal is intact 5. If necessary, replace the cable glands
Checking the operation status of the PoE-injector	<ul style="list-style-type: none"> • multimeter. 	<ol style="list-style-type: none"> 1. Make sure the PoE-injector LED is green 2. Disconnect the Ethernet cable 3. Measure the voltage at the power outputs of the PoE-injector with a multimeter 4. Make sure the voltage is $48V \pm 1V$

4 CONFIGURING OF THE GATEWAY WITH WEB-INTERFACE

INTERFACE LAUNCH – THE OPERATION BEGINING



If gateway is made after the 1st December 2019, then it has a pre-install Web-interface – see description in part 4, also it still has an option of configuring via terminal program – see part 5.

If gateway was made early, then it has not a Web-interface, but you still can configure it via terminal program – see part 5 – or make a request for 'how to install the gateway Web-interface' manual.

Web-interface software consist of two parts:

1. Server's API "BS-Dashboard" which (in depending on received data) transmits current settings, device information and saved new settings at the device memory. API «BS-Dashboard» is available on the port 3001 by default.
2. Client's Web-application operating with server's API "BS-Dashboard" – is developed for visual displaying data, for validation of changes and for sending the settings to save at the device. Client's Web-application is available on the port 80.

"BS-Dashboard" launched by the pressing the button BT1 on the gateway board. It may be changed in the settings. After holding the button in a pressed state during more than 6 seconds the launch begins, which may be continuing about 1 or 2 minutes in depending on the device loading.

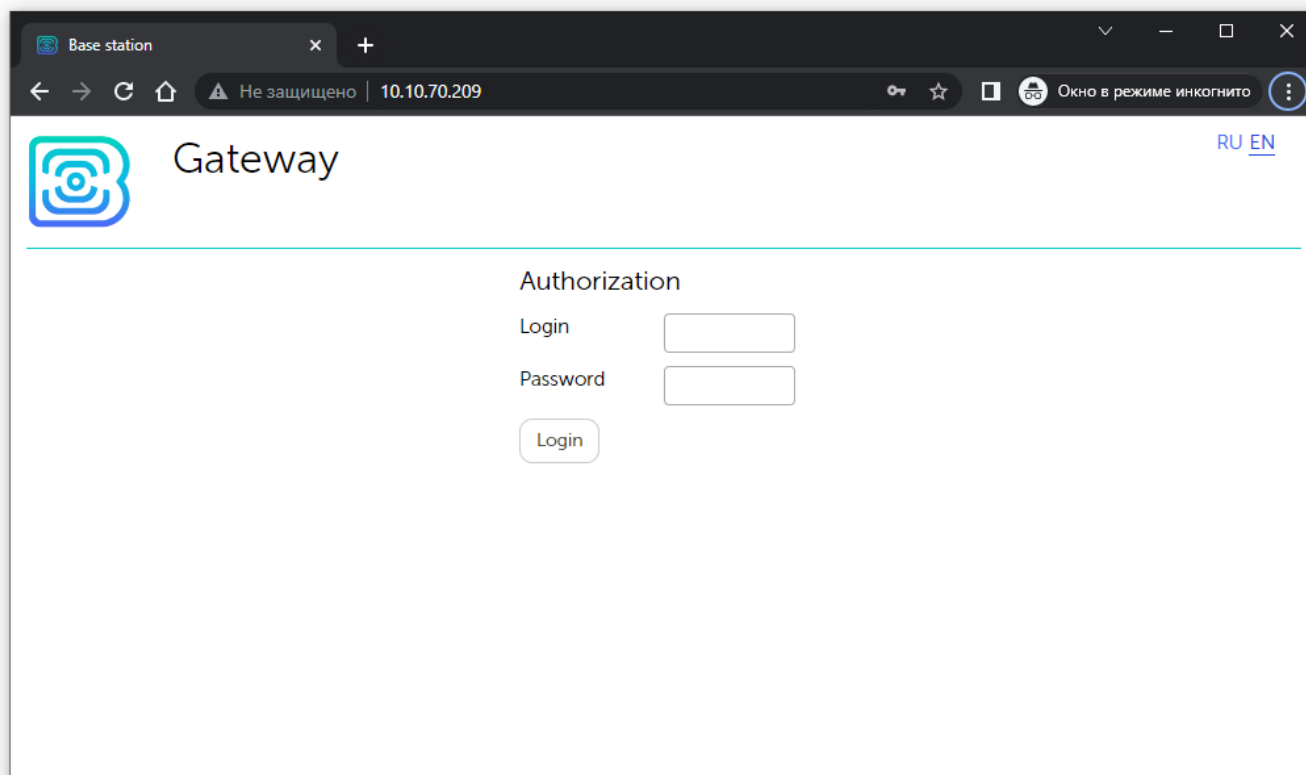
For entering to a client's web-application IP-address of the gateway is needed. You can find out it with terminal program (for example, with a free PuTTY program). Part 5 describes in detail how to connect to a gateway with a terminal program. You should enter the command **ifconfig** in terminal window.

```
root@am335x-evm:~#  
root@am335x-evm:~# ifconfig  
eth0      Link encap:Ethernet  HWaddr 98:F0:7B:A7:55:58  
          inet addr:10.10.70.158  Bcast:0.0.0.0  Mask:255.255.255.0  
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1  
          RX packets:14531 errors:0 dropped:0 overruns:0 frame:0  
          TX packets:3561 errors:0 dropped:0 overruns:0 carrier:0  
          collisions:0 txqueuelen:1000  
          RX bytes:1094624 (1.0 MiB)  TX bytes:520013 (507.8 KiB)  
          Interrupt:56  
  
lo        Link encap:Local Loopback  
          inet addr:127.0.0.1  Mask:255.0.0.0  
          UP LOOPBACK RUNNING  MTU:65536  Metric:1  
          RX packets:3710 errors:0 dropped:0 overruns:0 frame:0  
          TX packets:3710 errors:0 dropped:0 overruns:0 carrier:0  
          collisions:0 txqueuelen:0  
          RX bytes:185500 (181.1 KiB)  TX bytes:185500 (181.1 KiB)  
  
root@am335x-evm:~#
```

The next step is to open a browser and enter IP-address in the address bar. If the “BS-Dashboard” server is launched successfully then the authorization page for login into the client’s Web-application will appear.

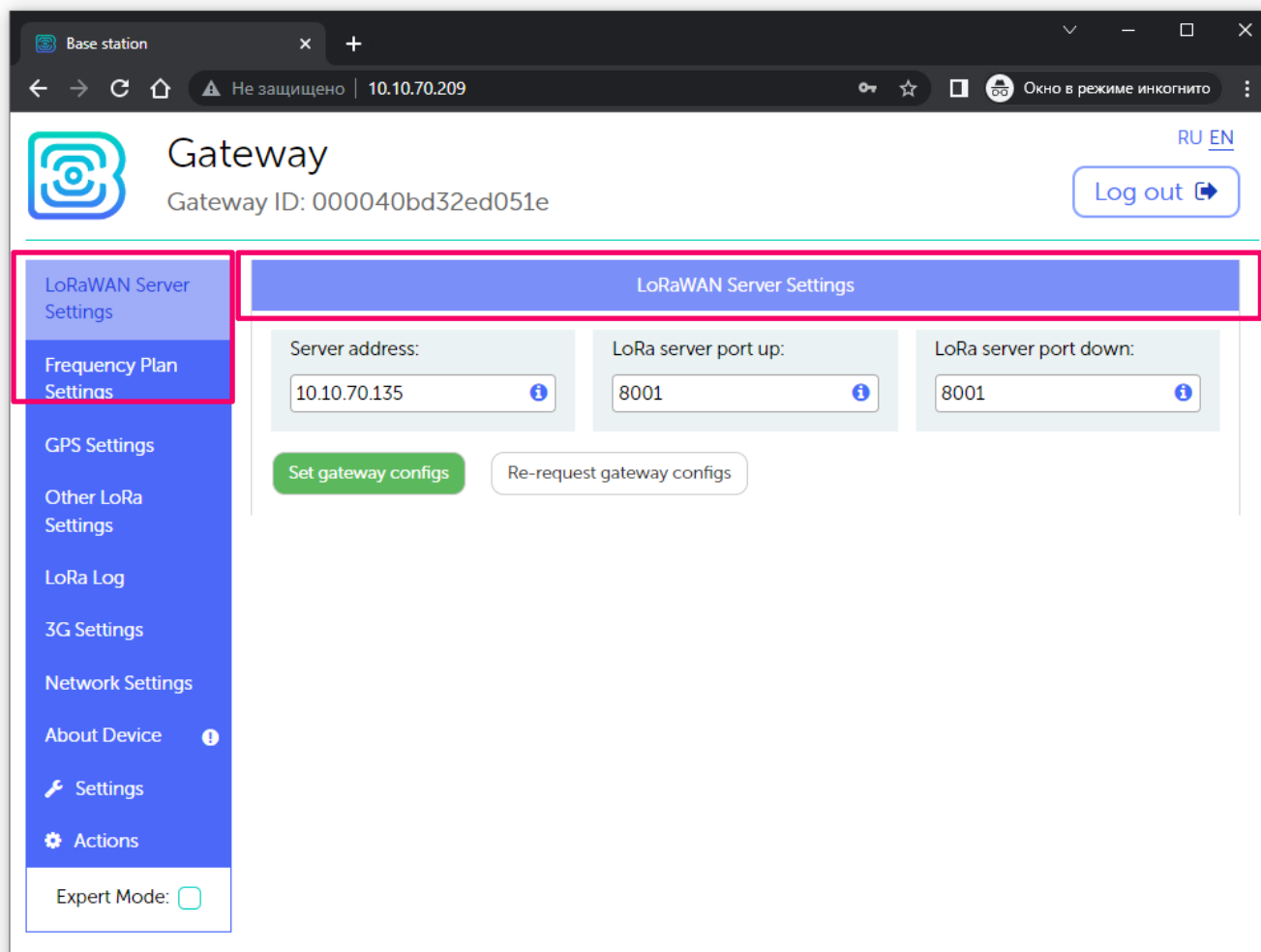


If there is no connection to Web-interface and authorization page is not appearing, then you need to add port number 80 to IP address of the gateway in the address bar.
It may look like this, for example: <http://192.168.1.228:80>



After entering login and password of the gateway (**root** and **temppwd** by default) gateway's Web-interface page appears.

At the top of the page is the name of the menu section in which you are currently.



If the Web-interface is launched by pressing the button, then when the gateway is restarted, it will become unavailable again. For the Web-interface to always be available, you need to change the server startup settings. To do this, go to the "Settings" menu, then "Manager Settings" and in the "BS-Dashboard Server Startup Method" field change the value to "Always On". After that, be sure to click the "Save" button so that the settings go to the gateway.

LoRaWAN Server Settings
 Frequency Plan Settings
 GPS Settings
 Other LoRa Settings
 LoRa Log
 3G Settings
 Network Settings
 About Device ⓘ
⚙ Settings
 ⚙ Actions
 Expert Mode: ☐

Settings

Change WEB interface password:
 Current password ⓘ
 New password ⓘ
 New password 2
 Save password

Manager settings ▲

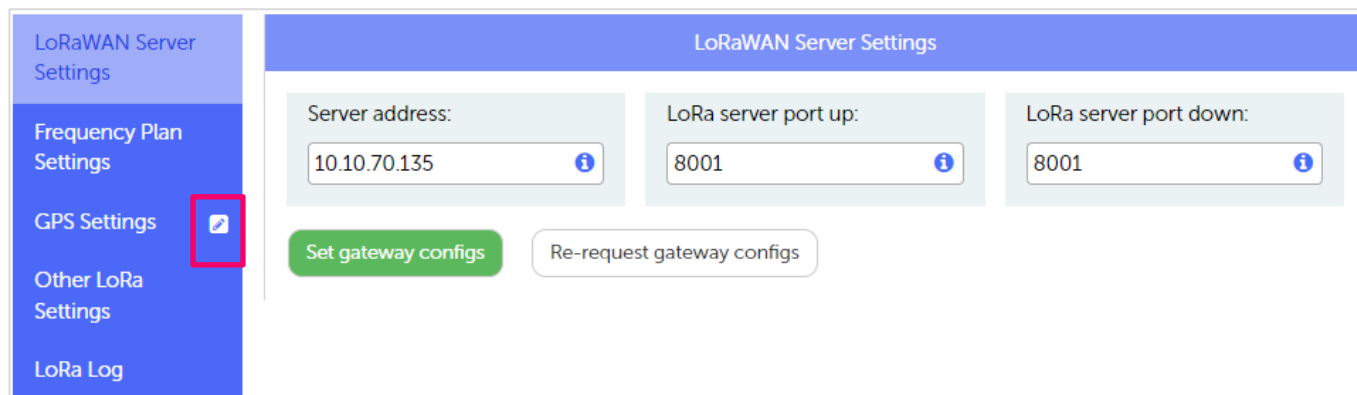
Update settings:
 Update check interval (minutes)

Other manager settings:
 "BS-Dashboard" server startup method ⓘ
 Logger level ⓘ

Set configs
 Re-request configs

The main features of working with the Web-interface:

1. If you change something in any menu, and then proceed to the next, these changes are saved in the client, but not saved on the gateway, and the edit icon appears in the menu block, where the unsaved changes remained.



LoRaWAN Server Settings

Server address: 10.10.70.135

LoRa server port up: 8001

LoRa server port down: 8001

Set gateway configs Re-request gateway configs

2. To apply the settings changes at the gateway, you always need to click the "Save" button.
3. If you click the "Reset these settings" button, then all unsaved changes will be lost.
4. The buttons "Save" and "Reset settings" apply only to the group of parameters under which they are directly located.
5. The "Expert" mode allows you to see additional settings in the sections "Frequency plans", "3G settings", "Network settings", "Settings" (only the "Manager settings" subsection) and "Actions".

If the latest software updates are available, an exclamation mark icon will be displayed next to the "About Device" section. In this case, go to this section and click the "Update" button.

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5 CONFIGURING OF THE GATEWAY WITH TERMINAL PROGRAM

GATEWAY CONNECTING TO THE COMPUTER – THE OPERATION BEGINING



If gateway is made after the 1st December 2019, then it has a pre-install Web-interface – see description in part 4, also it still has an option of configuring via terminal program – see part 5.

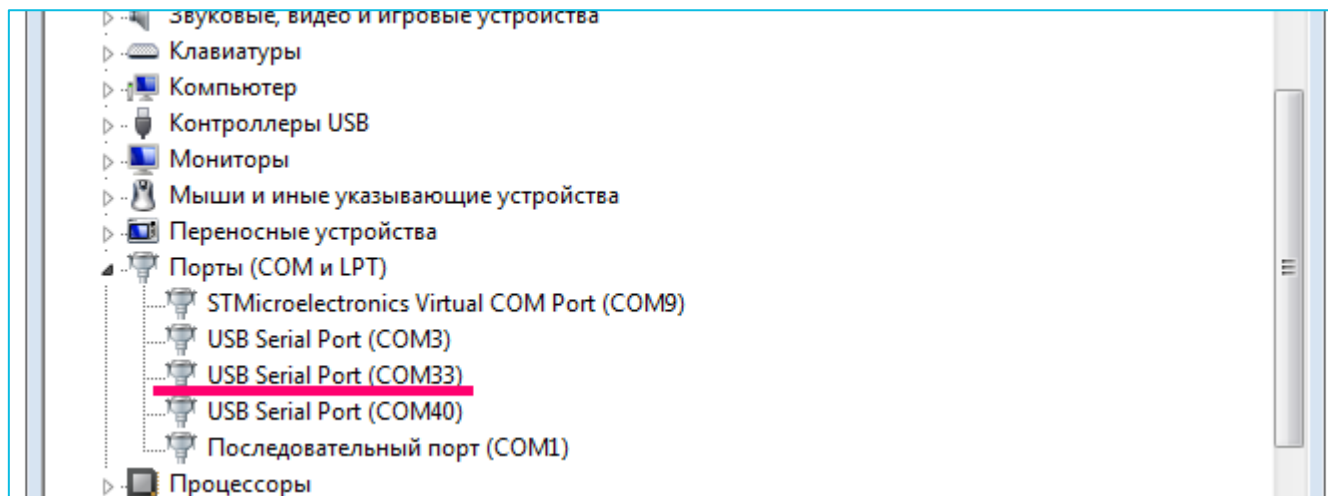
If gateway was made early, then it has not a Web-interface, but you still can configure it via terminal program – see part 5 – or make a request for 'how to install the gateway Web-interface' manual.

Connection is possible, for example, with a free PuTTY program. There are two ways of connection to the gateway – with direct connection via USB or remote connection via SSH.

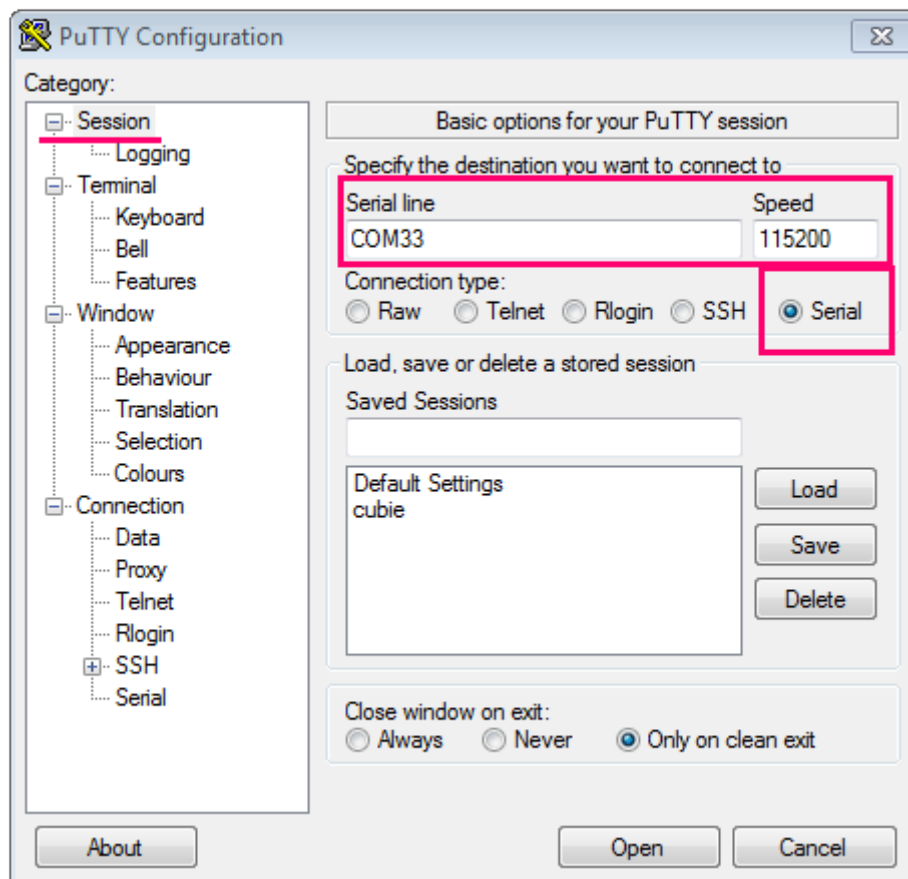
1. Connection via USB

In case of a USB connection, you need to connect the gateway to a personal computer with a mini-USB connector by a cable. Next, connect to a virtual COM port by installing the driver for MCP2200. **"Ports (COM and LPT)"** menu appears at the device manager.

Search **"USB Serial Port"** in the "Ports" menu and see its number.



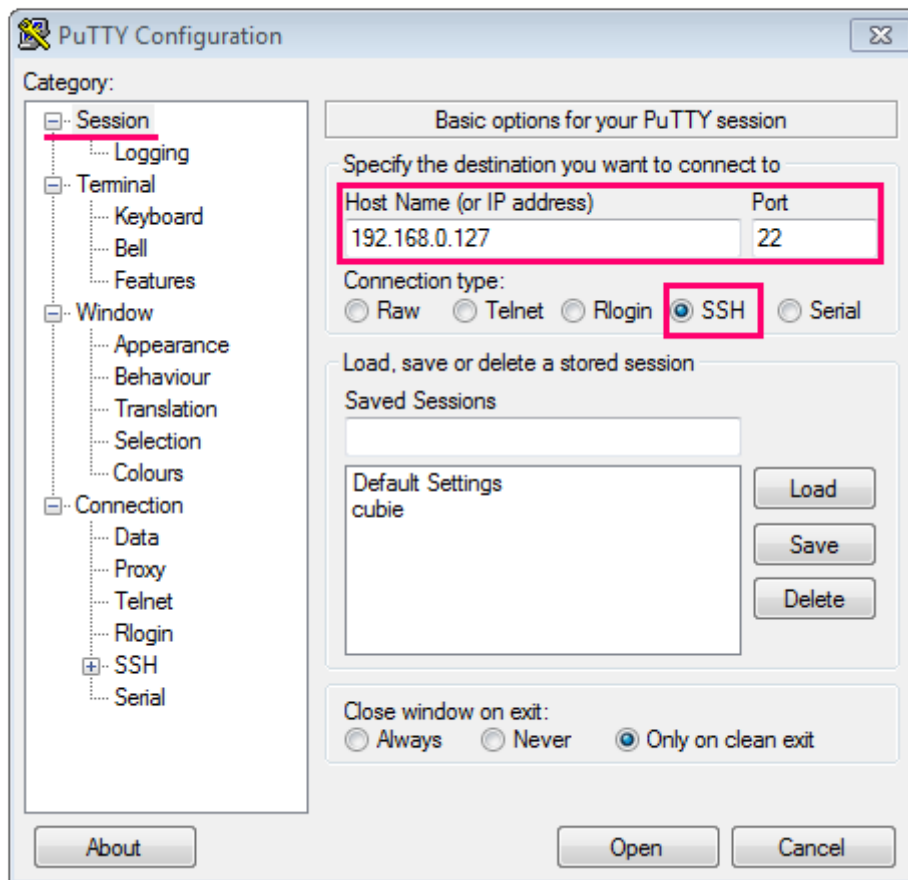
Open PuTTY, select **Serial**, enter number of the gateway virtual COM-port and speed (115200) in the corresponding fields.



Press **“Open”** button.

2. Connection via SSH

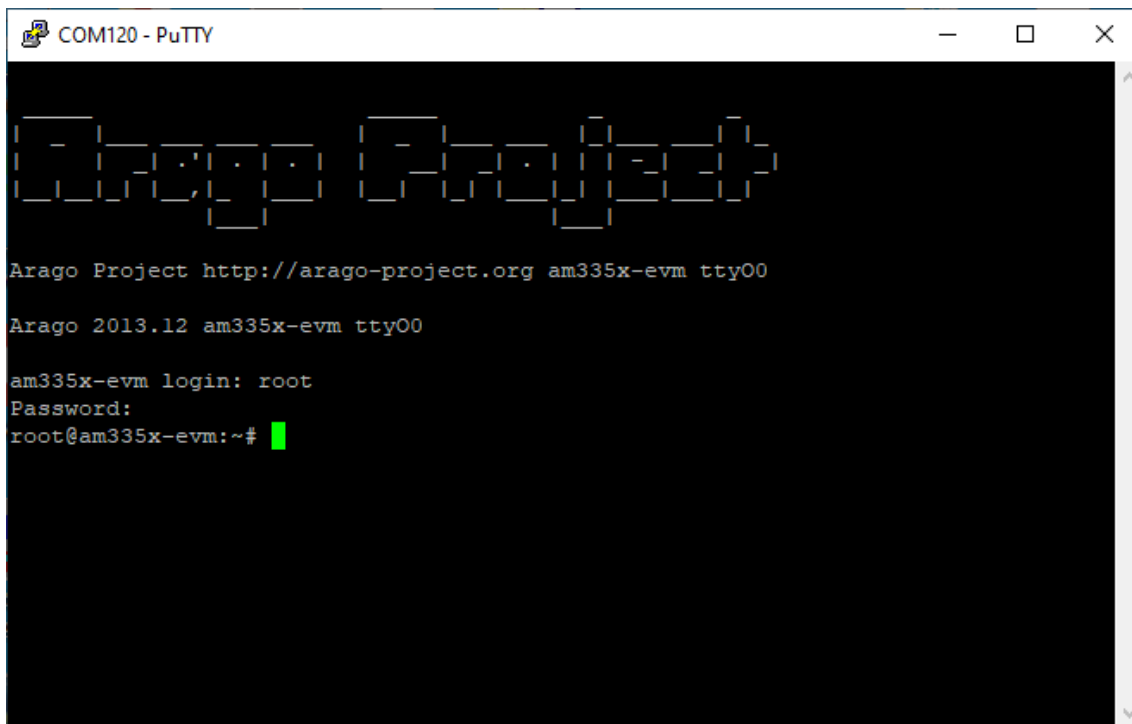
The direct connection to gateway is not required in case of SSH connection. Select SSH connection in the PuTTY dialog box, enter the device's IP-address and port 22. By default, the device obtains an IP-address via DHCP when connected via Ethernet.



Press "Open" button.

After connecting to the gateway by one of the methods, PuTTY terminal window appears where you should enter login and password. By default, login **root** and password **temppwd** (symbols not displaying while entering the password) are used for connection to

the gateway. At the first connection, it is recommended to change the password for individual access.



```
COM120 - PuTTY

Arago Project http://arago-project.org am335x-evm tty00
Arago 2013.12 am335x-evm tty00

am335x-evm login: root
Password:
root@am335x-evm:~#
```

Now the configuration can be carrying out.

OPERATION WITH THE CONFIGURATION FILE

Packet forwarder starts automatically when the system starts. Before the gateway configuring, stop Packet forwarder by entering command:

`/etc/init.d/lora_watchdog stop`

```
10.10.96.217 - PuTTY
login as: root
root@10.10.96.217's password:
root@am335x-evm:~# /etc/init.d/lora_watchdog stop
```

Configuration file **global_conf.json** is in the directory **LoRa/** – it may contain frequency band, the gateway ID, IP-address and server ports settings.

Enter the command, containing the required configuration file to change the settings, for example:

```
10.10.96.217 - PuTTY
root@am335x-evm:~#
root@am335x-evm:~#
root@am335x-evm:~# nano LoRa/global_conf.json
root@am335x-evm:~#
```

After all changes completed enter the command:

/etc/init.d/lora_watchdog start

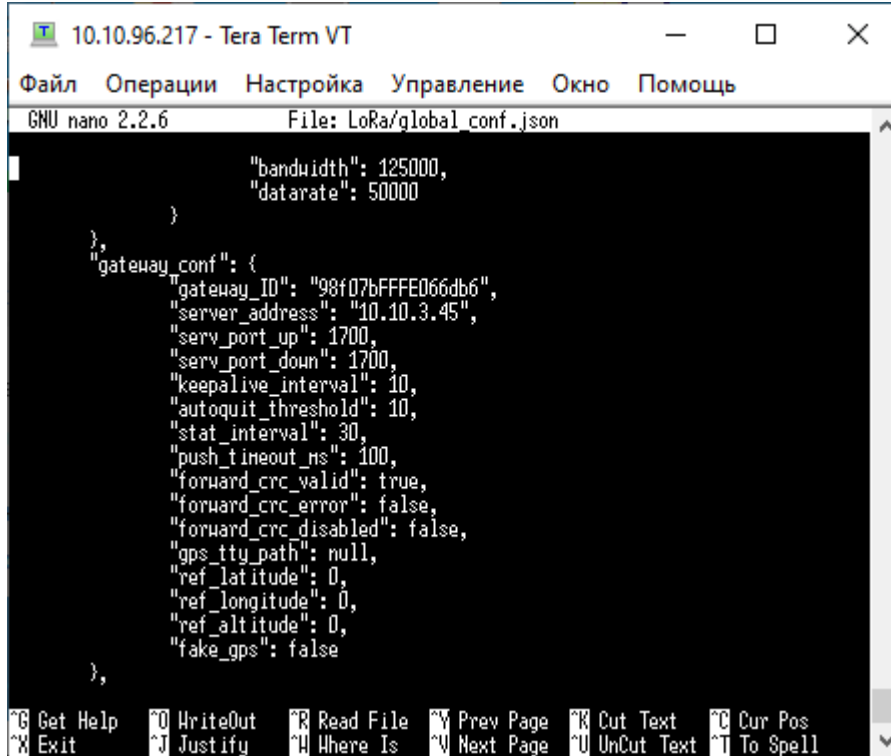
```
10.10.96.217 - PuTTY
login as: root
root@10.10.96.217's password:
root@am335x-evm:~# /etc/init.d/lora_watchdog start
```

Packet forwarder will automatically start with new settings.



To connect the gateway to the server, you must use the UDP port specified in the server configuration file. On the gateway, the port configuration is in the **global_conf.json file**

In the **global_conf.json** file, the UDP port settings are in the **gateway_conf** section, there are **server_port_up** and **server_port_down** parameters.



```
10.10.96.217 - Tera Term VT
Файл  Операции  Настройка  Управление  Окно  Помощь
GNU nano 2.2.6      File: LoRa/global_conf.json

    "bandwidth": 125000,
    "datarate": 50000
  },
  "gateway_conf": {
    "gateway_ID": "98f07bFFFE066db6",
    "server_address": "10.10.3.45",
    "serv_port_up": 1700,
    "serv_port_down": 1700,
    "keepalive_interval": 10,
    "autoquit_threshold": 10,
    "stat_interval": 30,
    "push_timeout_ms": 100,
    "forward_crc_valid": true,
    "forward_crc_error": false,
    "forward_crc_disabled": false,
    "gps_tty_path": null,
    "ref_latitude": 0,
    "ref_longitude": 0,
    "ref_altitude": 0,
    "fake_gps": false
  },
},
```

Get Help WriteOut Read File Prev Page Cut Text Cur Pos
Exit Justify Where Is Next Page UnCut Text To Spell

In order to communicate with the server correctly, you should make sure that these UDP port parameters correspond to those specified in the server configuration file (see details in the «IoT Vega Server Manual»).

To replace configuration file (for example, for change frequency plan) you need to make the following steps:

1. Go to Packet forwarder directory by the command:
cd LoRa/cfg/
2. If there is no file with the required frequency plan in the specified directory, then download it from the FTP storage using the command (following command is exactly for that file):
wget

ftp://lora_guest:vnml\$4JHW@178.208.75.230:21/BS_x.2/rev.2/BS_1.2_rev.2/global_conf_EU868.json

3. Make a copy of downloaded file (global_conf_EU868 in our example) with a new name global_conf.json by the command:

```
cp EU868_global_conf.json global_conf.json
```

4. Open file global_conf.json by the command:

```
nano LoRa/global_conf.json
```

and specify parameters, - *"gateway_ID"*, *"server_address"*, *"serv_port_up"*, *"serv_port_down"*, and then save and close the file.

Parameter *gateway_ID* is formed out of gateway MAC address and "FFFE" symbols.
For example:

To get gateway MAC address you need to enter a command `ifconfig`

```
root@am335x-evm:~# ifconfig
eth0      Link encap:Ethernet  HWaddr 98:F0:7B:A7:55:58
          inet addr:10.10.70.174 Bcast:0.0.0.0 Mask:255.255.255.0
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:6774 errors:0 dropped:0 overruns:0 frame:0
          TX packets:2803 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:571437 (558.0 KiB)  TX bytes:359977 (351.5 KiB)
          Interrupt:56

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:428 errors:0 dropped:0 overruns:0 frame:0
          TX packets:428 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:21400 (20.8 KiB)  TX bytes:21400 (20.8 KiB)
```

In our example MAC address is: 98:F0:7B:A7:55:58.

Then you need to copy that MAC address, delete ":" symbols and put "FFFE" at the middle of line.

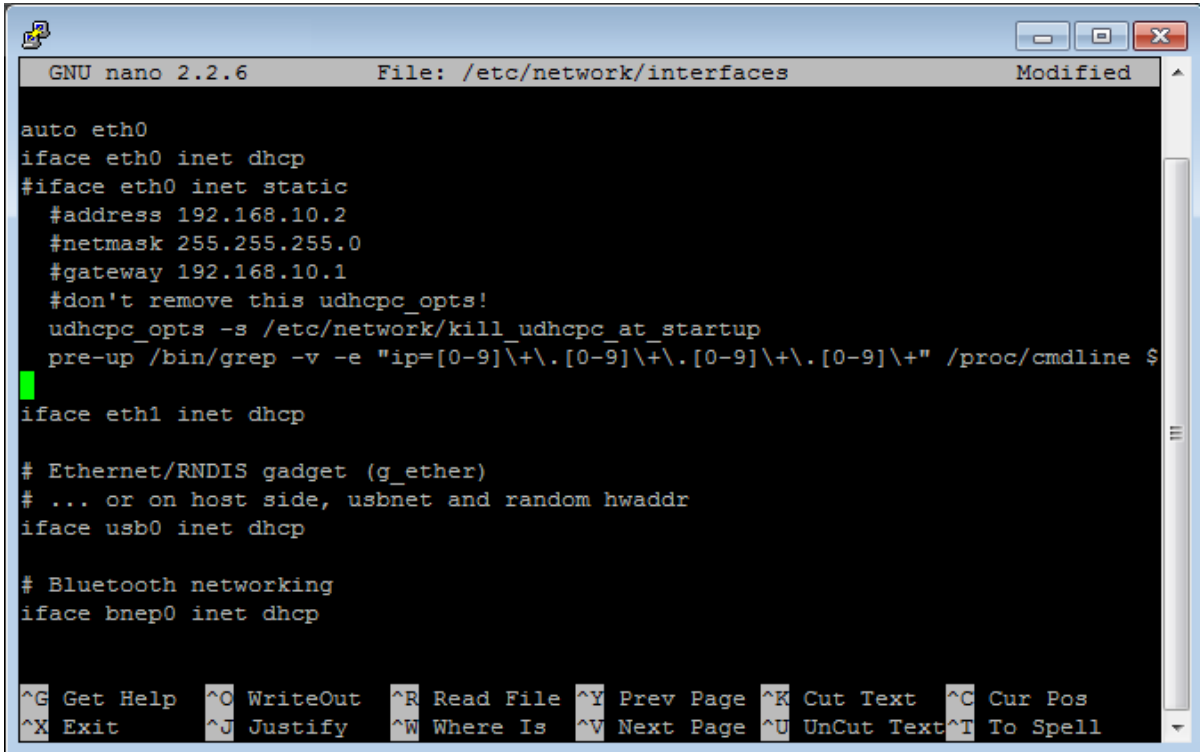
Example of ready *gateway_ID*: 98F07BFFFEA75558

5. Restart gateway by the command: **reboot**

CONFIGURATION OF A STATIC IP-ADRESS FOR THE GATEWAY

Configuration of a static IP is carrying out with the terminal program in the following way:

1. After connecting to the gateway, enter login and password in the PuTTY terminal window.
2. Open file **nano /etc/network/interfaces**. Search authorization settings in this file:



```

GNU nano 2.2.6      File: /etc/network/interfaces      Modified
auto eth0
iface eth0 inet dhcp
#iface eth0 inet static
#address 192.168.10.2
#netmask 255.255.255.0
#gateway 192.168.10.1
#don't remove this udhcpc_opts!
udhcpc_opts -s /etc/network/kill_udhcpc_at_startup
pre-up /bin/grep -v -e "ip=[0-9]\+\.[0-9]\+\.[0-9]\+\.[0-9]\+" /proc/cmdline $
iface eth1 inet dhcp

# Ethernet/RNDIS gadget (g_ether)
# ... or on host side, usbnet and random hwaddr
iface usb0 inet dhcp

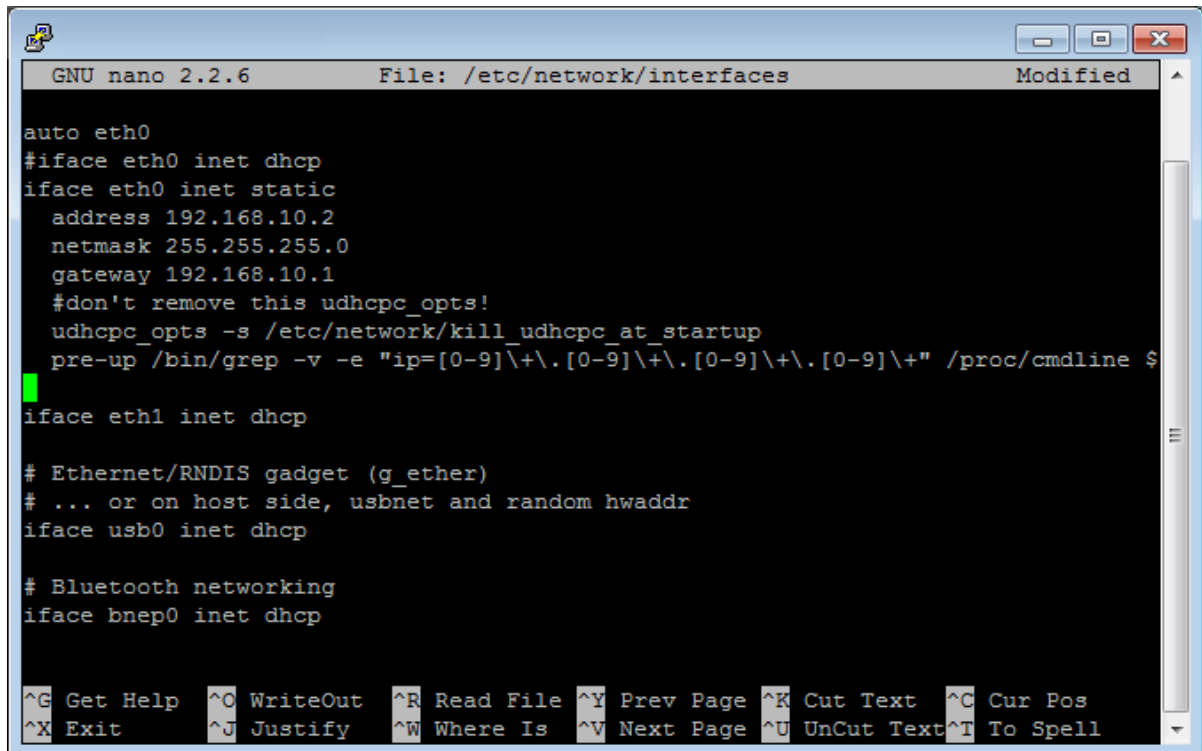
# Bluetooth networking
iface bnep0 inet dhcp

^G Get Help  ^O WriteOut  ^R Read File ^Y Prev Page ^K Cut Text  ^C Cur Pos
^X Exit      ^J Justify   ^W Where Is ^V Next Page ^U UnCut Text ^T To Spell
  
```

- That are strings exactly:

```
auto eth0
iface eth0 inet dhcp
#iface eth0 inet static
#address 192.168.10.2
#netmask 255.255.255.0
#gateway 192.168.10.1
#don't remove this udhcpd_opts!
```

- For static IP mode, you should remove # symbol from the 3rd to 6th strings and specify your parameters are address, netmask and gateway.
- Comment the 2nd string, there is result on the following screenshot (but another addresses value):



```
GNU nano 2.2.6      File: /etc/network/interfaces      Modified
auto eth0
#iface eth0 inet dhcp
iface eth0 inet static
address 192.168.10.2
netmask 255.255.255.0
gateway 192.168.10.1
#don't remove this udhcpd_opts!
udhcpd_opts -s /etc/network/kill_udhcpd_at_startup
pre-up /bin/grep -v -e "ip=[0-9]\+\.[0-9]\+\.[0-9]\+\.[0-9]\+" /proc/cmdline $
iface eth1 inet dhcp

# Ethernet/RNDIS gadget (g_ether)
# ... or on host side, usbnet and random hwaddr
iface usb0 inet dhcp

# Bluetooth networking
iface bnep0 inet dhcp

^G Get Help  ^O WriteOut  ^R Read File ^Y Prev Page ^K Cut Text  ^C Cur Pos
^X Exit      ^J Justify   ^W Where Is  ^V Next Page ^U UnCut Text ^T To Spell
```



**In that example shown setting of the static IP-address 192.168.10.2 and gateway 192.168.10.1
You need to change those values to others, which are necessary to your own case**

6. Type **reboot** in command line for gateway restarting with new settings.
7. Going back is similar.

BS-2.2 SETTING UP FOR 3G OPERATION

Gateway **BS-2.2** setting up for 3G operation using the terminal program is in the following order:

1. Check, that in file `nano /etc/wvdial.conf` entered strings highlighted in red:

```
; Init1 = ATZ
; Init2=ATQO V1 E1 &C1 &D2 +FCLASS=0
Init1 = AT+CPIN?
Init2 = AT+CGDCONT=1,"IP","internet.beeline.ru"
Modem Type = USB Modem
Baud = 460800
New PPPD = yes
Auto Reconnect = off
Modem = /dev/ttyACM0
ISDN = 0
Phone = *99#
Password = beeline
Username = beeline
```

where "internet.beeline.ru" is APN cellular operator. Change APN value according to APN cellular operator using by the gateway.



**In that example shown 3G setting for Beeline cellular operator
You need to change those values to others, which are necessary to your
own case**

If the strings correspond to the figure above, you do not need to change anything, except the APN. If these strings are not present, then you should add them. At that, strings

```
Init1 = AT+CPIN?
Init2 = AT+CGDCONT=1,"IP","internet.beeline.ru"
```

are entering instead string

```
Init = AT+CGDCONT=1,"IP","internet.beeline.ru"
```

The last three strings of the file specify the required dial-up phone, username, and password (different for each cellular operator):

```
Phone = *99#  
Password = beeline  
Username = beeline
```



Password and Username fields could not be empty, if those parameters are not used by the cellular operator, then you may to enter 'internet' word at both fields for example



BS-2.2 gateways are switching between Ethernet and 3G automatically

For recommendations for gateways using white IP, see [further](#).



If you use such two communication channels as Ethernet and 3G at the same time you should to remember that Ethernet has a priority for communication and 3G used as a backup option if gateway cannot communicate with the server via Ethernet

BS-2.2 LTE GATEWAY SETTING UP FOR LTE OPERATION

Gateway **BS-2.2 LTE** setting up for LTE operation using the terminal program is in the following order:

Check, that in file `nano /etc/wvdial.conf` entered strings highlighted in red:

```
; Init1 = ATZ
; Init2=ATQO V1 E1 &C1 &D2 +FCLASS=0
Init1 = AT+CPIN?
Init2 = AT+CGDCONT=1,"IP","internet.beeline.ru"
Modem Type = USB Modem
Baud = 460800
New PPPD = yes
Auto Reconnect = off
Modem = /dev/ttyACM0
ISDN = 0
Phone = *99#
Password = beeline
Username = beeline
```

where "internet.beeline.ru" is APN cellular operator. Change APN value according to APN cellular operator using by the gateway.



**In that example shown LTE setting for Beeline cellular operator
You need to change those values to others, which are necessary to your
own case**

If the strings correspond to the figure above, you do not need to change anything, except the APN. If these strings are not present, then you should add them. At that, strings

```
Init1 = AT+CPIN?  
Init2 = AT+CGDCONT=1,"IP","internet.beeline.ru"
```

are entering instead string

```
Init = AT+CGDCONT=1,"IP","internet.beeline.ru"
```

The last three strings of the file specify the required dial-up phone, username and password (different for each cellular operator):

```
Phone = *99#  
Password = beeline  
Username = beeline
```



Password and Username fields could not be empty, if those parameters are not used by the cellular operator, then you may to enter 'internet' word at both fields for example



BS-2.2 LTE gateways are switching between Ethernet and LTE automatically

For recommendations for gateways using white IP, see below.



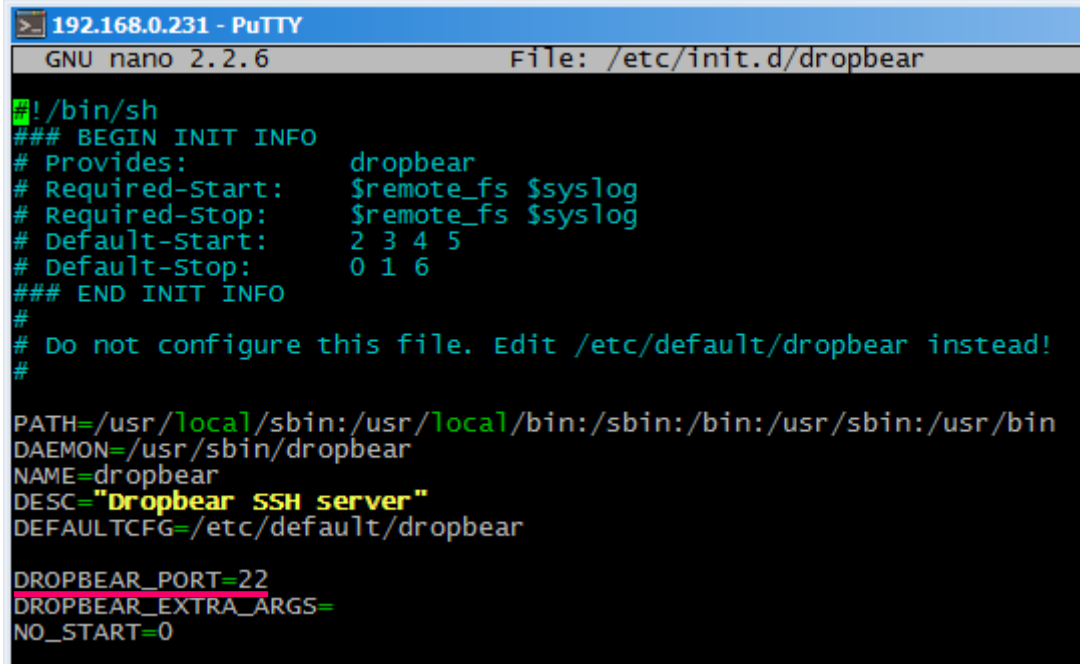
If you use such two communication channels as Ethernet and LTE at the same time you should to remember that Ethernet has a priority for communication and LTE used as a backup option if gateway cannot communicate with the server via Ethernet

RECOMMENDATIONS FOR GATEWAY USING IN WHITE IP NET

In case the BS is used in network with white IP, it is recommended to change the standard port numbers of ssh and telnet to others. This should be considered while port forwarding. The steps sequence for changing BS dropbear and telnetd ports is described below.

To change ssh port:

1. Enter at the command line of the terminal program `/etc/init.d/dropbear stop`
2. Open file `nano /etc/init.d/dropbear`



```
> 192.168.0.231 - PuTTY
GNU nano 2.2.6 File: /etc/init.d/dropbear

#!/bin/sh
### BEGIN INIT INFO
# Provides: dropbear
# Required-Start: $remote_fs $syslog
# Required-Stop: $remote_fs $syslog
# Default-Start: 2 3 4 5
# Default-Stop: 0 1 6
### END INIT INFO
#
# Do not configure this file. Edit /etc/default/dropbear instead!
#

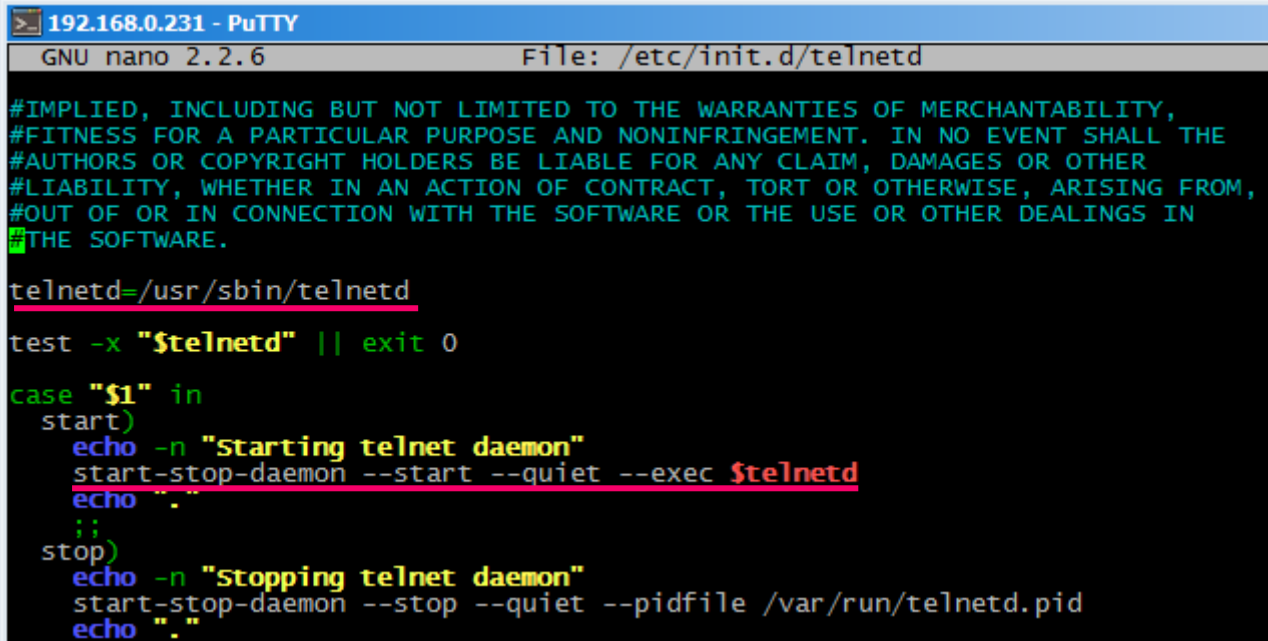
PATH=/usr/local/sbin:/usr/local/bin:/sbin:/bin:/usr/sbin:/usr/bin
DAEMON=/usr/sbin/dropbear
NAME=dropbear
DESC="Dropbear SSH server"
DEFAULTCFG=/etc/default/dropbear

DROPBEAR_PORT=22
DROPBEAR_EXTRA_ARGS=
NO_START=0
```

3. Find string `DROPBEAR_PORT=22` and change standard port «22» to another, then save the file.
4. Enter at the command line of the terminal program `/etc/init.d/dropbear start`

To change telnet port:

1. Enter at the command line of the terminal program `/etc/init.d/telnetd stop`
2. Enter at the command line `killall -15 telnetd`
3. Open file `nano /etc/init.d/telnetd` - and find strings:



```
192.168.0.231 - PuTTY
GNU nano 2.2.6 File: /etc/init.d/telnetd

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#OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN
#THE SOFTWARE.

telnetd=/usr/sbin/telnetd
test -x "$telnetd" || exit 0

case "$1" in
  start)
    echo -n "Starting telnet daemon"
    start-stop-daemon --start --quiet --exec $telnetd
    echo ":"
    ;;
  stop)
    echo -n "Stopping telnet daemon"
    start-stop-daemon --stop --quiet --pidfile /var/run/telnetd.pid
    echo ":"
```

4. Enter strings highlighted in red (instead of "2224" enter the desired port number):

```
telnetd=/usr/sbin/telnetd
port="-p 2224"
...
start-stop-daemon --start --quiet --exec $telnetd -- $port
```

Save file and enter at the command line `/etc/init.d/telnetd start`

6 STORAGE AND TRANSPORTATION REQUIREMENTS

Vega BS gateways shall be stored in the original packaging in heated room at temperatures +5 °C to +40 °C and relative humidity less than 85 %.

The gateway transportation is permissible in covered freight compartments of all types at any distance at temperatures -40 °C to +85 °C.

7 CONTENT OF THE PACKAGE

The gateway delivered complete with:

Vega BS gateway – 1 pc.

PoE-injector – 1 pc.

Factory certificate – 1 pc.

8 WARRANTY

The manufacturer guarantees that the product complies with the current technical documentation, subject to the storage, transportation and operation conditions specified in the "User Manual".

The warranty period is 36 months.

The warranty does not apply to PoE-injector.

The warranty period of operation is calculated from the date of sale marked in the product factory certificate, and from the release date when such a mark is absent. During the warranty period, the manufacturer is obliged to provide repair services or replace a failed device or its components.

The manufacturer does not bear warranty obligations in the event of a product failure if:

- ⦿ the product does not have a factory certificate;
- ⦿ the factory certificate does not have an TCD stamp and / or there is no sticker with information about the device;
- ⦿ the serial number (MAC) printed on the product differs from the serial number (MAC) specified in the factory certificate;
- ⦿ the product has been subject to alterations in the design which are not provided for in the operational documentation;
- ⦿ the product has mechanical, electrical and / or other damage and defects arising from violation of the conditions of transportation, storage and operation;
- ⦿ the product has traces of repair outside the manufacturer's service center;
- ⦿ the components of the product have internal damage caused by the ingress of foreign objects / liquids and / or natural disasters (flood, fire, etc.).

The average service life of the product is 5 years.

In the event of a warranty claim, contact the service center:

119A, Bol'shevistskaya Str., Novosibirsk, 630009, Russia.

Tel.: +7 (383) 206-41-35.

e-mail: remont@vega-absolute.ru

DOCUMENT INFORMATION	
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Document number	V02-BS-01
Revision and date	28 of 10 November 2022

Revision History

Revision	Date	Name	Comments
01	27.04.2017	KEV	Document creation date
02	15.05.2017	PKP	Minor edits
03	18.05.2017	KEV	General manual on BS-1 and BS-2
04	13.06.2017	KEV	Edits in the content of the package
05	14.06.2017	KEV	Part « Configuration » was edit, A5 format
06	14.08.2017	KEV	Antenna mounting recommendation was added
07	16.08.2017	KEV	Part « Operation » was edit
08	28.08.2017	KEV	Minor edits in the « Configuration of a static IP-address »
09	27.09.2017	KEV	«SIM card installation» was added
10	02.11.2017	KEV	Parts « Gateway setting up for 3G operation », « Recommendations » were added, new format
11	29.06.2018	KEV	Vega BS-1.2 and Vega BS-2.2 description is added, content of the package is changed, working temperatures are changed
12	23.08.2018	KEV	Minor changes
13	18.09.2018	KEV	Minor changes

14	24.10.2018	KEV	Ethernet type added in specification
15	20.11.2018	KEV	Changes in part « Configuration of a static IP-address », adds to part « Start of work »
16	29.04.2019	KEV	Operating position of DIP-switches changed (fig. 3.3)
17	14.11.2019	KEV	There is a new part added which describes gateway interface
18	05.12.2019	KEV	File links changed on the page 28 and 29 .
19	26.03.2020	KEV	Specification for 3G modem is updated
20	06.10.2020	KEV	Now the setting for 3G operation is only for BS-2.2
21	19.10.2020	KEV	Power consumption is changed
22	28.06.2021	KEV	Scheduled revision of document
23	14.09.2021	KEV	Note has been added at 15 th page
24	29.10.2021	KMA	Information about the BS-2.2 LTE version has been added, edits in the " SIM-card installation "
25	13.01.2022	KMA	Minor edits
26	13.04.2022	KEV	Scheduled revision, new parts , new board version, changes in part 5 (config file has changed the directory)
27	23.08.2022	KMA	Warranty clarified
28	10.11.2022	KEV	New parts: software updating and maintenance recommendations



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