MONITORING DEVICE

VEGA MT X LITE

User manual

REVISION NUMBER	FIRMWARE VERSION
1	0.10b rc31

CONTENTS

INTRODUCTION

This manual is designated for Vega MT X Lite monitoring device (hereinafter – the device) manufactured by Vega-Absolute OOO and provides information on powering and activation procedure, control commands and functions of the device.

This manual is targeted at specialists which familiar with installation and repairing procedures rules for motor transport and had holding of professional knowledges in the field of electronic and electrical equipment of different vehicles.

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

For successful using of the device, you should learn monitoring system principle of operation in complex and understand the function of every its part.

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 DESCRIPTION AND OPERATION

DEVICE DESCRIPTION

Vega MT X Lite device is designed for monitoring of vehicles by the using of GLONASS/GPS positioning systems including the determination of vehicle placement, speed, and motion direction as well as for transmitting of collected data through GSM.

Vega MT X Lite uses the processor with a supporting one CAN-bus.

The vehicle route is recorded as individual points in time (track). Along with the track, information is recorded coming into the device from internal and external sensors, as well as from an additional equipment. Non-volatile memory allows to store information about events and statuses of the device in the absence of power supply. Support of several servers allows to send information about vehicle status on the four servers simultaneously.

You can configure the device by SMS commands or through the "Configurator" application while the device connected with USB or by the air with TCP connection. Application also allows update a firmware and carry out the finest tuning such as operation scenarios for external equipment or CAN bus, features of fixing, recording, and transmitting of packets and many other. You can download application on the site in "Software" section and there is a Manual for work with "Configurator". Go to the program page.

FUNCTIONALITY

Vega MT X Lite provides the following functionality:

- ◉ Wialon IPS, Wialon Combine, VEGA protocols supporting
- ◉ Simultaneous operation with four servers through any of supported protocol
- ◉ Device activity can be programming by the "Scenarios" function (up to 10 scripts)
- ◉ Configuration via GPRS, USB, SMS
- ◉ Firmware updating via GPRS, USB
- ◉ Remotely configuring and monitoring of status via free engineer server
- ◉ Manage of actuators by the commands and by the events
- ◉ Built-in black box holding up to 100,000 entries
- ◉ SMS-notifications with a wide spectrum of set abilities
- ◉ GPS-odometer

- Geofences control with ability of SMS-notification and manage of actuators (up to 4 specified geofences)
- Trip counter
- Remotely diagnostic of the device status

MARKING

Device marked with sticker that contains the following information:

- Device name (MT X Lite);
- Device version (for example, Int, Ext etc./ v1, v2 etc.);
- Operating range of power supply;
- IMEI – individual number is used as device ID - is placed on sticker as number and QR-code;
- Release Date;
- Board revision (for example, rev.2);
- Certification mark, country of origin, trademark.
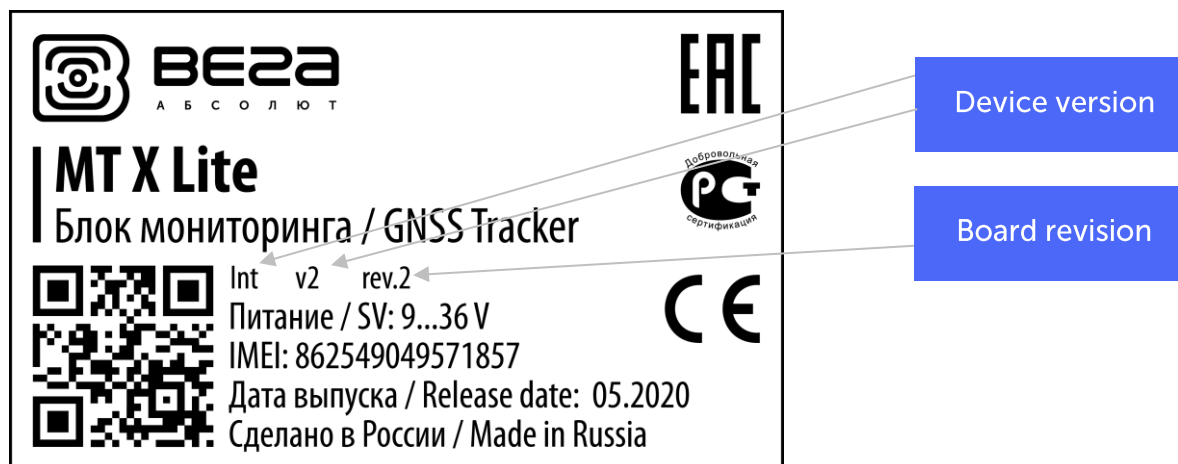
Sticker located in three places – on device case, in factory certificate and on the packing box.

DEVICE SERIES

Version	Antenna	GSM	GNSS
Int	Internal	Quectel MC60 4 band modem 850/900/1800/1900 MHz GPRS class 12 85.6kbps Up/Down	Quectel MC60 GLONASS/GPS/Galileo/QZSS Sensitivity: -167 dBm (tracking) Hot start: 1 s / Cold start: 35 s Warm start: 4,5 s Channels: Acquisition: 99, Tracking: 33 Positioning accuracy 2.5 m

2 SPECIFICATION

| Parameter	Value
Housing dimensions, no more than, mm	110 x 67 x 20
Ingress protection rating	IP53
External power, V	9...36

Consumption current, mA
        - in sleep mode
        - in active mode
	
	Up to 5
	40...300

Operating temperatures, °C	– 40...+85
Built-in battery	560 mAh
CAN/USB[1]	1
RS-485	1
UART	1
Lin/K-Line	1
Digital outputs	10
Multifunctional inputs	4
1-Wire	1
Ignition control input	1
Built-in accelerometer	Yes
GSM and GLONASS/GPS antenna	Internal or external[2]
SIM	2 SIM cards or 1 SIM-chip and 1 SIM-card
Mini-USB	Yes
Built-in black box	Up to 100 000 entries
Tamper sensor	2

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[1] Switching between USB or CAN interfaces is done by connecting / disconnecting the USB cable
[2] See «Device series» part

3 OPERATION BEGINNING

DEVICE APPEARANCE

Vega MT X Lite is represented in black plastic case which has four screws and mounting eyelets. On the case there are LED indicators signed by pictograms, wire connector and USB. Depend on device version there might be connectors for external antennas GSM and GNSS.
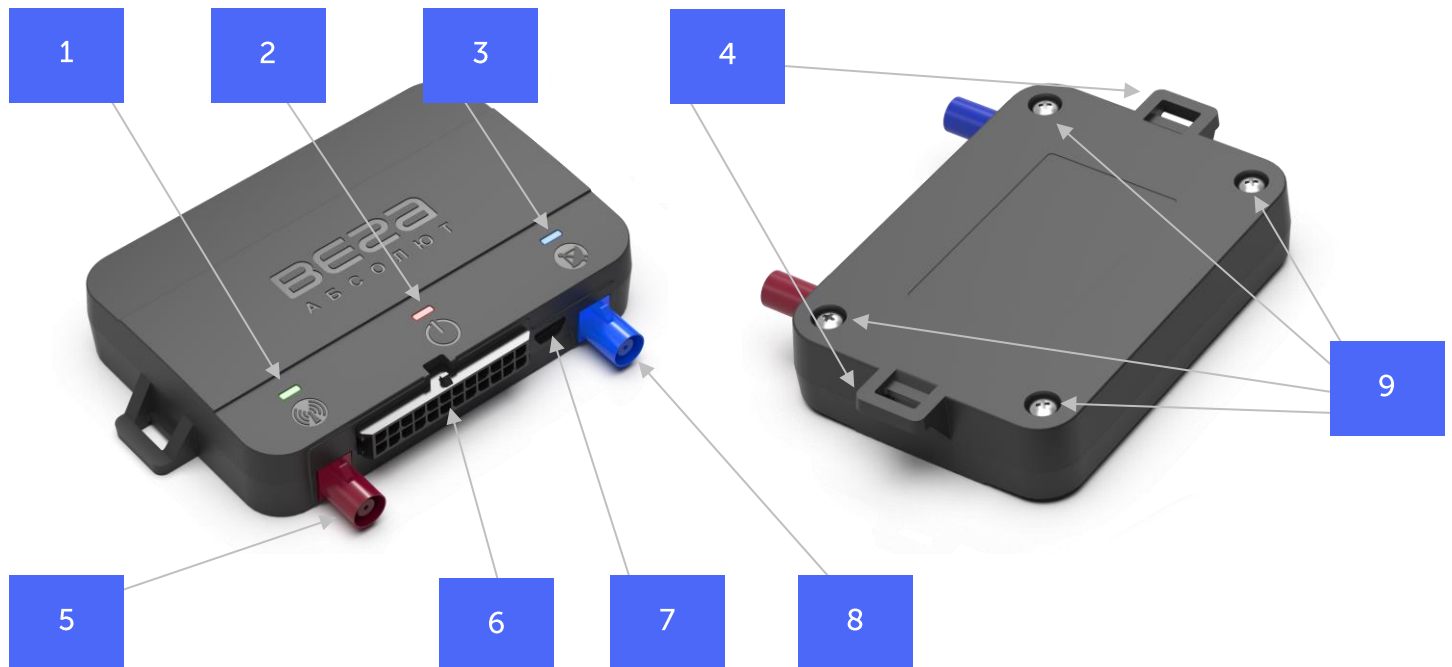
1 – LED indicator of GSM connection)

2 – LED indicator of power (red)

3 – LED indicator of GNSS module (blue)

4 – mounting eyelets

5 – connector for external GSM antenna

6 – wire connector

7 – USB connector

8 – connector for external GNSS antenna
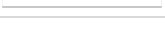
9 – screw ⌀3 x 10 mm, cross ✚

SIM slots are placed on the board inside the case (see part «SIM installing»).

CONTACTS DESCRIPTION

Contact	Wire color		Description
1	Black		Ground -
2	White + yellow		Multifunctional input 1
3	White + dark blue		Multifunctional input 2
4	White + red		Multifunctional input 3
5	Pink		Digital output 1
6	Dark blue		Digital output 3
7	Green		Digital output 5
8	Yellow + white		Digital output 7
9	Grey		Digital output 9
10	Pink + dark blue		RS-485 B
11	Black + red		CAN1 High
12	White		UART TX

13	Red		Power +
14	Yellow		Input of ignition control
15	White + brown		Multifunctional input 4
16	Purple		Digital output 2
17	Brown		Digital output 4
18	White + green		Digital output 6
19	Orange		Digital output 8
20	Dark blue + white		Digital output 10
21	Pink + red		K-Line
22	Pink + black		RS-485 A
23	Black + white		CAN1 Low
24	White + black		UART RX

DEVICE INDICATION

The device has three LED indicators. Blue indicator shows the navigation receiver status. Red indicator shows the presence of an external power. Green indicator shows GSM-connection status.

LED signal		Meaning
	Blue glowing	Navigation receiver in the mode of sputnik tracking. Location determined
	Blue flashing one per second	Location determination in progress
	Red glowing	External power supplying on
	Red flashing	External power supplying off
	Green not glowing	GSM-signal is absent
	Green glowing	The device is in range of a GSM network
	Green flashing	GSM data exchange in progress

SIM INSTALLING

To use the Vega MT X Lite monitoring device, you need a nano-SIM with support of SMS and GPRS functions. There must be cash on the account. PIN protection must be disabled.

The device supports the ability to use two SIM cards. In this case, one of them will perform the reserve function, and will be used only if it is not possible to send data from the first main SIM.

The devices have its own algorithm for SIM-card switching from main to reserve and back:

1) The device cannot connect to the network for 5 minutes while it operates with main or reserve SIM-card;

2) If 16 unsuccessful attempts were made to establish a TCP connection to each server (not disabled in the settings);

3) If a TCP connection is established, but there is no data at the application level from the servers for 5 minutes.

To install the SIM, you must remove the top cover of the device and de-energize the board by carefully disconnecting the battery. Then insert the SIM into the holder, connect the battery and assemble the device.

	To avoid damage and malfunction, it is recommended to perform all manipulations with the board when it is de-energized

The location of the primary and secondary SIM slots is shown in the figure below.

SIM 2

SIM 1
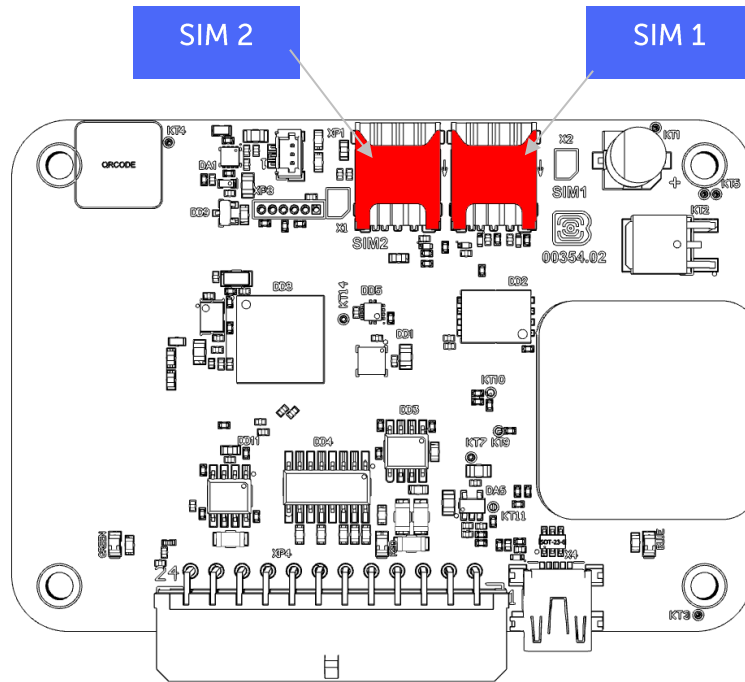
MOUNTING RECOMENDATIONS

First, you need to make connection settings, after you can configure and change other parameters at any time remotely via TCP as needed. Connection settings are:

- ⊙ monitoring servers' settings (protocol, IP-address and port);
- ⊙ network settings (SIM access point settings);
- ⊙ settings for transmitting readings (information that will be transmitted to the server).

Initial configuration is carried out through USB-port with Configurator application. For this you should follow the next steps:

1. Install the main SIM-card (see part "SIM Installing").
2. Connect the device to a PC via USB-port located on the front panel.
3. Run the Configurator application on the PC, press "Connect" button and choose the connection method like "Connect through USB".
4. On the left menu choose "Settings".
5. Make connection settings.

> Pay attention to the settings for connecting to the engineering server using the VEGA protocol. These parameters will be used when connecting to the device remotely through the Configurator program

6. After setting connection parameters press the "Save" button.
7. Disconnect USB-cable.
8. Try test connection by the air for checkup of the connection parameters.
9. If the connection is successfully done, then the device is ready for installing on a vehicle.

For mounting you will need:

- ⊙ wires and fuse which are included in a package;
- ⊙ wire stripper;
- ⊙ laptop.

Step by step mounting is as follows:

1. De-energizing the connected equipment and the vehicle's on-board power.
2. Connection of external power wires according to the scheme via the fuse.
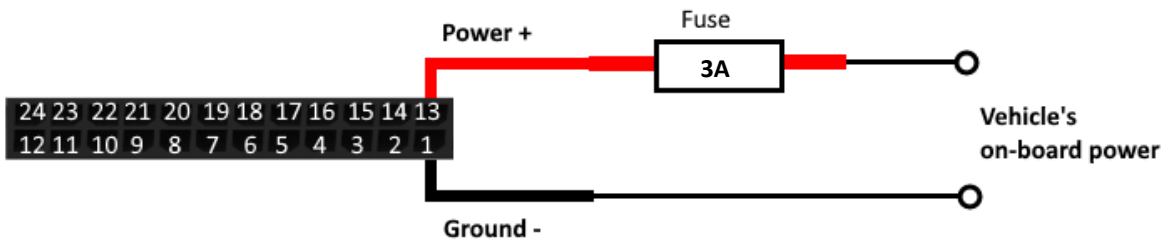
3. Power ON.
4. Connection of an external equipment, sensors, and configuration of them (see part "External equipment connection").
5. Device configuration, CAN bus operation if it is needed.
6. By the laptop you can make sure that the device is successfully configurated and sends the correct data.
7. Mounting of the device with zip ties.
8. Placement of external antennas if necessary.

General recommendations for the placement of antennas boil down to two rules: avoid covering the GSM antenna with metal parts of the vehicle and, if possible, provide a line of sight to satellites (i.e., open skies) for the GNSS antenna.

4 EXTERNAL EQUIPMENT CONNECTION

FUEL LEVEL SENSORS

The monitoring device allows you to connect fuel level sensors via the RS-485 bus and operates with them using the LLS protocol.

To do this, you need to connect to the device via the "Configurator" program and go to the "Settings" menu -> "Inputs/Outputs" tab. For each connected fuel level sensor, it is necessary to select "Sensor Type" – RS-485 and specify the sensor address on the bus in the "Bus Address" field. The specified address must match the address specified when the sensor programming (see instructions for the used sensor).

Up to four fuel level sensors can be connected simultaneously.

Click the "Save" button to put information about sensors into device memory.
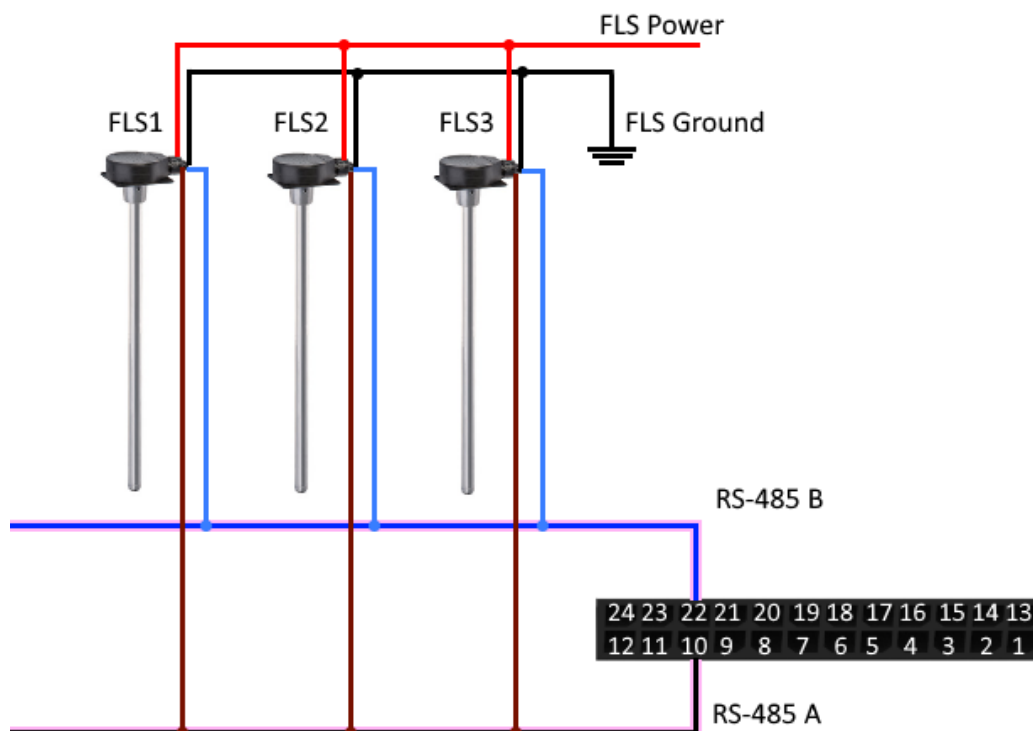
EXTENSION UNIT

Vega MT X Lite monitoring device allows you to connect the Vega BR-1 expansion unit via the RS-485 interface. Vega BR-1 has 15 multifunction inputs and 15 digital outputs.

To configure the inputs, you must connect to the device via the "Configurator" program, go to the "Settings" menu -> "Inputs/Outputs" tab and select the "Input/output extension unit". Next, you need to select the connection interface - RS-485. After that, you can configure multifunctional inputs in accordance with the desired tasks.

To configure the outputs, it is necessary to connect to the device through the "Configurator" program, go to the "State" menu -> "Input/output expansion unit" tab. At the very bottom of the I/O list of the expansion unit are the digital output controls - the "On" and "Off" buttons.

ACTUATORS

Actuators are connected to the device via digital outputs 1, 2, 3 and 4, which are "Open collector" type.

So, for example, you can connect a relay for blocking the engine/petrol pump/ignition, etc. After connecting the relay according to the scheme, you can send commands to the device to block or unblock the relay (see the section "SMS commands", command **setout**).
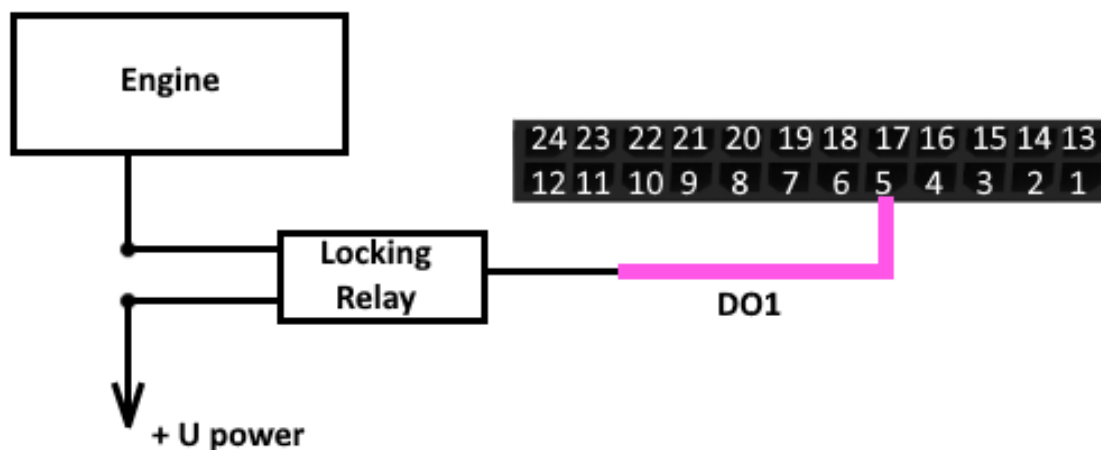
> ℹ️ Permissible load on each digital output 0.5 A

To increase the load on the outputs of the device, you must use an external relay. The relay connection diagram is shown below.

Direct current diode 3A and reverse voltage not less than 200V
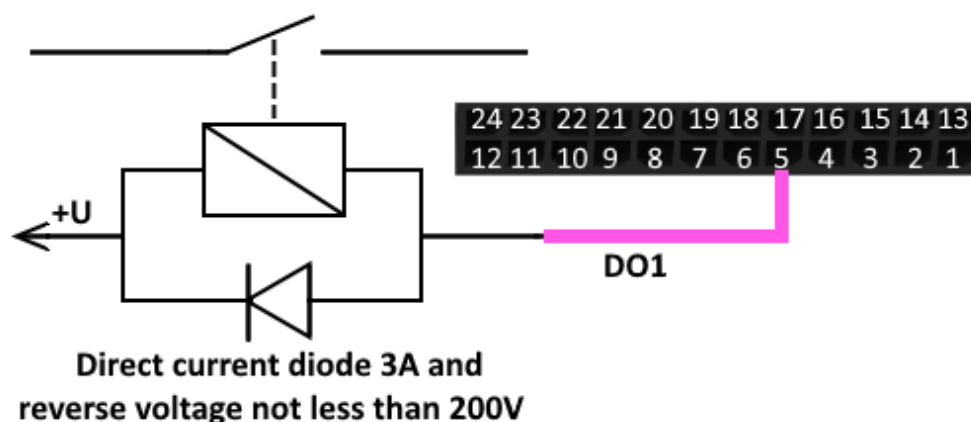
By default, after a device reboot, the state of the digital output is reset to 0, means "off". In the settings, it is possible to save the state of the device output and digital outputs of the connected extension unit.

To do this, you need to connect to the device via the "Configurator" program, go to the "Settings" menu -> "Inputs/Outputs" tab and select the "Restoring output states after reboot". Opposite the desired output, select "restore" in the drop-down menu. Then, after a reboot, this digital output will be restored to the state that was written to the non-volatile memory of the device before the reboot.

> ℹ️ Writing of statuses into non-volatile memory carried out at every 30 seconds

INPUTS

Vega Вега MT X Lite monitoring device has four multifunctional inputs that can operate in four modes:

- ◉ Analog;
- ◉ Digital;
- ◉ Frequency;
- ◉ Pulse.

In analog mode, the input voltage is measured. Such an input can be used for sensors whose readings vary in a certain range.

> 𝒾 Range of measured voltages of the analog input is 0...36 V

In digital mode, the input signal level (0 or 1) is measured. Such an input can be used for logic sensors, the readings of which are determined by two states (on/off).

In frequency mode, the frequency of the pulse signal is measured. Such an input, for example, is convenient to use for a car tachometer.

In pulse mode, the number of pulses at the input is counted. Such an input can be used for flow rate sensors, for example, fuel consumption.

In the settings of multifunctional inputs in the "Configurator" program, in addition to select a mode for each input, there is a parameter called "Active Level". It can take the value "low" and "high" and characterizes the magnitude and direction of the input tightening.

Input type	Low active level	High active level
Analog	Pull-down to the ground 240 kOhm	Pull-down to the ground 240 kOhm
Digital	Pull-up to external power 44 kOhm	Pull-down to the ground 240 kOhm
Pulse	Pull-up to external power 44 kOhm	Pull-down to the ground 240 kOhm
Frequency	Pull-up to external power 44 kOhm	Pull-down to the ground 240 kOhm

Pull-up to external power cannot be carried out while battery powered device

When the unit is rebooted, the input is pulled to the ground

5 COMMUNICATION PROTOCOLS

Vega MT X Lite monitoring device supports several protocols: EGTS, WIALON IPS, WIALON Combine, VEGA, NDTP. The current protocol description is contained in a special document, «CP description Wialon EGTS», which can be found on the website fmsvega.ru.

6 MANAGING USING SMS-COMMANDS

Some settings of the Vega MT X Lite monitoring device can be managed remotely via SMS commands. General command format is @PIN:command, where PIN is a four numbers PIN of the device (See "Security" part). There are also two information commands, in response to which an SMS message with information about the device settings.

Command	Format	Example
nosleep - not switch to the sleep mode	@PIN:nosleep	@5555:nosleep _____ PIN – 5555
reboot – device reboot	@PIN:reboot	@3333:reboot _____ PIN – 3333
rebootgnss - GNSS transmitter reboot	@ PIN:rebootgnss	@7767: rebootgnss _____ PIN – 7767
tofactory - factory reset	@PIN:tofactory	@1234:tofactory _____ PIN – 1234
bboxclear – clear black box	@PIN:bboxclear	@1234:bboxclear _____ PIN - 1234
setout – set the output state	@PIN:setout$Y$=Z _____ Y – output number Z – state (0 or 1)	@4321:setout2=1 _____ PIN – 4321 Output number – 2 State - 1
setextout – set the output state of extension unit	@PIN:setextout$Y$=Z _____ Y – output number of extension unit Z – state (0 or 1)	@4444:setextout8=0 _____ PIN – 4444 Output number of extension unit – 8 State – 0

server - set the server address	@PIN:serverY:addr:port&protocol&period&terminal_addr _____ **Y** – server number **addr** – server address **port** – server port **protocol** – protocol type: off vega – engineering server egts – EGTS egts_l1 – EGTS Light 1 egts_l2 – EGTS Light 2 wcombine – Wialon Combine wips – Wialon IPS ndtp – NDTP **period** – communication period with server **terminal_addr** – device address for NDTP or device ID for EGTS protocol	@2222:server3:193.193.165.165:20332&wips&0&90008 _____ PIN – 2222 Server number – 3 Server address – 193.193.165.165 Server port – 20332 Exchange protocol – Wialon IPS Communication period – 0 (constantly in touch) NDTP address or EGTS device ID – 90008
setapn - set APN	@PIN:setapn:apn&user&pass _____ **apn** – APN **user** – username **pass** – password	@1234:setapn:internet.beeline.ru& beeline& beeline _____ PIN – 1234 APN – internet.beeline.ru Username – beeline Password – beeline
info? - current device state request	@PIN:info?	@1234:info? _____ PIN – 1234
server? - request **monitoring server** settings	@PIN:server?	@4444:server? _____ PIN – 4444
runcanscript – run CAN script number X	@PIN:runcanscriptX **X** – CAN number that is needed to run	@4444:runcanscript3 _____ PIN – 4444 CAN script number 3

t:unixtime – set lifetime for the command	@PIN:XXXX/t:unixtime **XXXX** – command for which is needed to set a lifetime **unixtime** – time in UTC when the command will not execute even the SMS with it just comes. For example, we send the command for device rebooting at the 14.00 and set lifetime for that command until 14.10. So if the device receives the command from 14.00 to 14.10 the command will execute as usual, but if the SMS will delayed, will not be delivered immediately etc., and the device receives the command at the 14.15 the command will not execute because lifetime is up. After the time has passed, the message "Execution time has expired" will come	@4444: reboot/t: 1577196600 _____ PIN – 4444 Command – device reboot Lifetime of the command is until 14:10:00 24.12.2019
changesim – change current SIM	@PIN:changesim	@4444:changesim _____ PIN – 4444
changesim1 – change SIM to the first	@PIN:changesim1	@4444:changesim1 _____ PIN – 4444
changesim2– change SIM to the second	@PIN:changesim2 Answer examples: *changesim:2 ok* – command successfully done; *changesim:2 err, already in use* – SIM2 already used.	@4444:changesim2 _____ PIN – 4444

When requesting the current state of the block, a message arrives with the following contents:

Vega MT X Lite Int v0.10b-rc31 – device name and firmware version

imei: 355217043382910 – device IMEI number

lat: 55.1173, lon: 37,9475, - device coordinates (latitude and longitude)

sat inview: 22, - number of visible satellites

sat inuse: 14, - number of satellites used

valid: 1 – validity of certain coordinates (0 – no, 1 – yes)

ign: 0, - ignition (0 – no, 1 – yes)

acc: 4.1, ext: 12.1, - built-in battery and vehicle voltage

temp: 19,5, - environment temperature

move: 0 – moving (0 – no, 1 – yes)

black box: 0, 4, 0, 0 – the number of messages in black boxes in order in the 1st, 2nd, 3rd and 4th.

When you request monitoring server settings, a message appears with the following contents:

server1:

193.193.165.144:20333&wips&0&0

server2:

46.183.183.4:16122&egts&15&43382912

server3:

193.193.154.154:20453&off&0&0

server4:

37.194.197.213:5604&vega&0&0

Here in order are indicated - server address: port & protocol (if enabled) or off (if data exchange with this server is turned off) & communication period in minutes & device address for NDTP or device ID for EGTS protocol.

> If you enter an incorrect PIN, the device does not respond to the sender

7 STORAGE AND TRANSPORTATION REQUIREMENTS

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

The device shall be transported in covered freight compartments of all types at any distance at temperatures -40 °C to +85 °C. After transporting the devices at low temperatures, it is recommended to hold them at room temperature for 24 hours before starting operation.

8 CONTENT OF THE PACKAGE

Vega MT X Lite monitoring device – 1 pc.

Wire connector – 1 pc.

Fuse – 1 pc.

Factory certificate – 1 pc.

9 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 for the battery is provided separately and is 6 months.

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 (DevEUI, EMEI) printed on the product differs from the serial number (DevEUI, EMEI) specified in the factory certificate;

- the product has been subject to alterations in the design and / or software 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.).

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

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