



# CONTROLLER OPCB-221B

## Operating Manual

Quality Management System of the product designing and production  
complies with the requirements of ISO 9001:2015

### PURPOSE

The Controller OPCB-221B (hereinafter referred to as the “Controller”, “Product” or “OPCB-221B”) provides MODBUS communication between clients and servers in TCP networks (Internet) and between devices in the RS-485 interface.

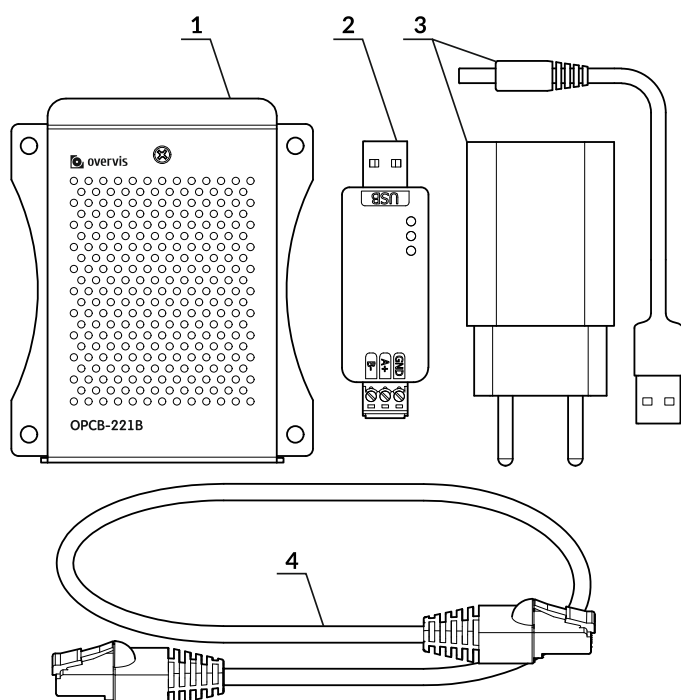
OPCB-221B is used to remotely monitor and control the operation of:

- Refrigeration controllers;
- HVAC systems controllers;
- Agricultural smart devices;
- Power network relays, meters, and other electrical equipment;
- Industrial IoT devices;
- Industrial sensors and meters;
- Other MODBUS-compatible electronics.

#### OPCB-221B features:

- MODBUS RTU/TCP converter;
- Built-in Overvis cloud support ([www.overvis.com](http://www.overvis.com));
- Serves as TCP server or client, MODBUS RTU master or slave;
- RS-485 network extension;
- MODBUS ASCII mode support;
- Supports LAN and/or Wi-Fi connection;
- Optional 3G/LTE connection using an external USB modem;
- Wi-Fi Access Point mode;
- WEB interface, accessible from the local network, via Wi-Fi Access Point, or using Overvis cloud connection;
- Remote configuration (using MODBUS or WEB interface);
- RS-485 network settings: baud rate, parity, response timeout;
- Supports multiple RS-485 networks;
- MODBUS request debugging tools;
- Automatic or manual firmware updates;
- HTTPAPI.

### COMPLETE SET



	Quantity
1 – Controller OPCB-221B (with installed MicroSD memory card and integrated Wi-Fi antenna, 3 dbm)	1 pcs.
2 – USB/RS-485 extension module (supporting up to 32 connected RS-485 devices)	1 pcs.
3 – Power adapter with USB Type-A output and DC Plug cable	1 pcs.
4 – Ethernet cable	1 pcs.
5 – Operating manual with Cloud Registration sticker	1 pcs.
6 – Packaging	1 pcs.

### TERMS AND ABBREVIATIONS

- **Wi-Fi station:** A device connected to another device through Wi-Fi (access point).
- **Wi-Fi access point:** A device enabling connection to it through Wi-Fi.
- **DHCP:** A protocol enabling the network units to automatically obtain TCP/IP parameters (IP address).
- **HTTP:** The transmission protocol for web pages and other data using client-server technology.
- **IP (address):** The address of the unit, which is unique within one network that is operated according to IP protocol.
- **IPv4:** A four-byte IP address.
- **MAC (address):** The address used in network transmissions for device identification. It is typically globally unique.
- **MAC-48:** A six-byte MAC address.
- **MODBUS:** The standard packet communication protocol based on the client-server technology intended for industrial electronic devices.
- **MODBUS RTU:** The devices linking protocol, where the packet is transmitted byte by byte.
- **MODBUS ASCII:** The devices linking protocol, where the packet is transmitted in ASCII characters.
- **MODBUS TCP:** MODBUS packet transmission protocol according to TCP/IP standard.
- **WEB:** The server documents access system used on the Internet.

### SERVICE LIFE AND MANUFACTURER WARRANTY

The lifetime of the product is 10 years. Upon expiration of the service life, contact the manufacturer. Shelf life is 3 years.

Warranty period of the product operation is 3 years from the date of sale.

During the warranty period of operation (in the case of failure of the product) the manufacturer is responsible for free repair of the product.

**ATTENTION! IF THE PRODUCT HAS BEEN OPERATED IN VIOLATION OF THE REQUIREMENTS OF THIS MANUAL, THE USER WILL LOSE THE RIGHT TO WARRANTY SERVICE.**

Warranty service is performed at the place of purchase or by the manufacturer of the product.

Post-warranty service of the product is performed by the manufacturer at current rates.

Before sending for repair, the product should be packed in the original or other packing which prevents mechanical damage.

### ACCEPTANCE CERTIFICATE

OPCB-221B has been manufactured and accepted in accordance with the requirements of current technical documentation and classified as fit for operation.

Head of QCD

\_\_\_\_\_

Date of manufacture

\_\_\_\_\_

Seal

OVERALL MOUNTING DIMENSIONS AND CONTROLS

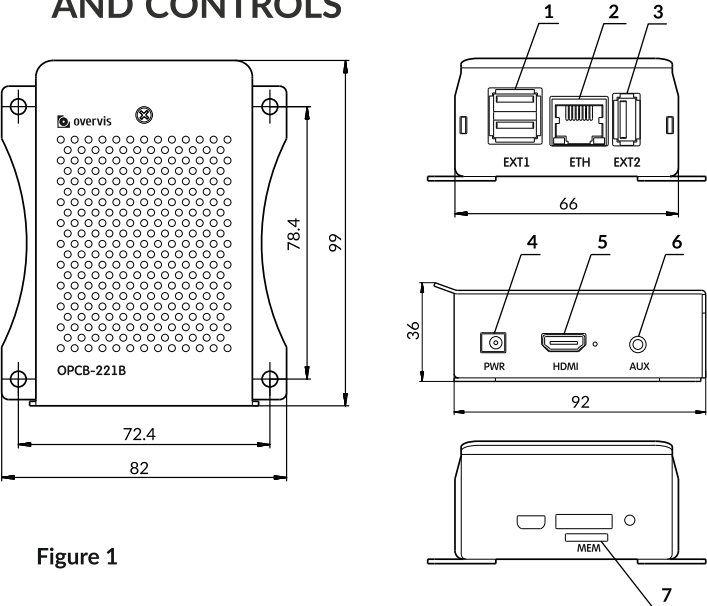


Figure 1

1. **EXT1** connectors: 2 USB Type-A connectors for connecting additional modules (e.g., RS-485 / RS-232 serial interface converters).
2. **ETH** connector: 8P8C/RJ45 for wired connection to the local Ethernet network.
3. **EXT2** connector: USB Type-A connector for connecting additional modules (e.g., RS-485 / RS-232 serial interface converters).
4. **PWR** connector: DC Plug for connecting a 5V DC power source with a power of at least 9W.
5. **HDMI** connector: HDMI output (not used).
6. **AUX** connector: Audio output (not used).
7. **MEM** slot: MicroSD card slot for accessing the pre-installed memory card.

TECHNICAL SPECIFICATIONS

OPCB-221B CONTROLLER MAIN TECHNICAL SPECIFICATIONS

DC power supply voltage	5 V
Motherboard	Orange Pi PC Plus 1G RAM
TCP networks link interface	Ethernet, Wi-Fi
Ethernet communication interface	10BASE-T/100BASE-T (twisted pair)
Wi-Fi frequency	2.4 GHz
Supported Wi-Fi standards	IEEE 802.11 b/g/n
Supported TCP/IP protocols	MODBUS TCP, HTTP, DNS, DHCP, WireGuard
Maximum number of incoming connections via MODBUS TCP protocol	4
Maximum number of outgoing connections via MODBUS TCP protocol	4
Maximum number of serial interfaces	3 (through individual USB ports)
Supported serial interface protocols	MODBUS RTU, MODBUS ASCII
Supported serial MODBUS modes	Master, Slave
Maximum number of connected MODBUS devices	255
Built-in servers	MODBUS TCP, HTTP
Ready time at power up	≤ 60 s
Current consumption	max. 2000 mA
Product designation	Switchgear and control equipment
Rated operating condition	Continuous
Degree of protection	IP 30
Electric shock protection class	III
Climatic design version	NF 3.1
Permissible contamination level	II
Galvanic insulation:	- Power connector - Ethernet connector - USB
Weight	≤ 0.200 kg
Installation (mounting)	Panel
Overall dimensions, HxBxL	99x82x36 mm
The product meets the requirements of the following: EN 60947-1; EN 60947-6-2; EN 55011; EN 61000-4-2	
The Product remains functional at any position in space	
Case material: Aluminum	
Harmful substances in an amount exceeding the maximum permissible concentrations are absent	

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USB/RS-485 EXTENSION MODULE TECHNICAL SPECIFICATIONS

Communication speed	300 – 921600 bps
Direction control	Hardware automatically determines and controls data transmission direction
Transmission distance (at low speed)	About 1200 meters
Transmission mode	Up to 32 nodes in point pairs (repeaters are recommended for more than 16 nodes)
Balance resistance	Onboard 120 Ohm, switch-connectable
Current consumption	max. 50 mA
Interface protection	Provides 600 W lightning protection, surge and 15 kV static protection
Galvanic insulation	Present
Degree of protection	IP 20
Cross-section of wires to be connected	0.13 – 0.82 mm <sup>2</sup>
Tightening torque of terminal screws	0.3 N·m
Weight	≤ 0.01 kg
Overall dimensions, HxBxL	15x18x63 mm

POWER ADAPTER TECHNICAL SPECIFICATIONS

Input AC voltage range	100 – 240V
Input AC current	500 mA
Input AC frequency range	50/60 mA
Output voltage DC	5.0 V
Output current DC	max. 3000 mA
Current consumption	max. 50 mA
AC inlet	EU 2 pin plug
DC connector	USB Type-A
Degree of protection	IP 20
Electric shock protection class	II
Insulation voltage	Input/Output to outer case, 500VDC, greater than 10 MOhm
Input to output withstand voltage	AC 3kV / 10mA, 3 s
Weight	≤ 0.065 kg
Overall dimensions, HxBxL	80x30x75 mm

CONNECTION

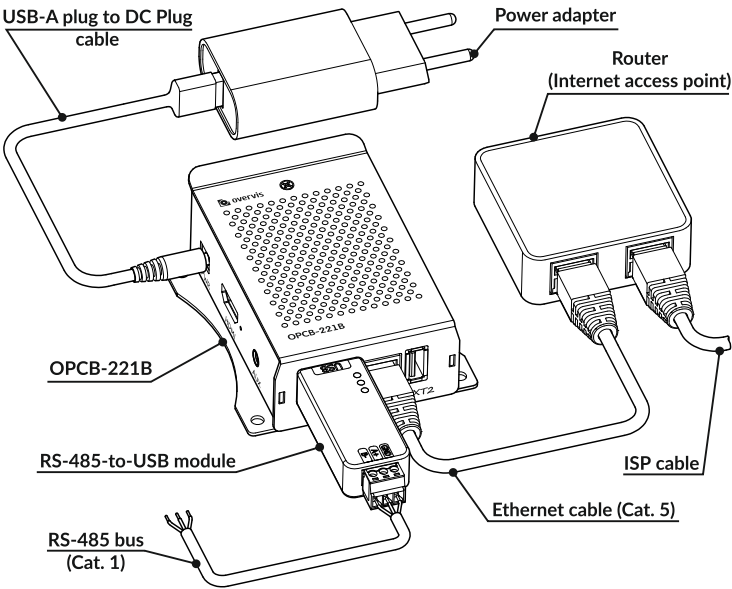


Figure 2

ATTENTION! ALL CONNECTIONS MUST BE PERFORMED WHEN THE PRODUCT IS DE-ENERGIZED.

Error when performing the installation works may damage the product and connected devices.

When connecting to the RS-485 bus, use a twisted pair cable, cat. 1 or higher. Strip the ends of insulation by 4±0.5 mm and tighten with bushing tips. A shielded grounded cable is recommended.

DO NOT LEAVE ANY BARE WIRE PROTRUDING BEYOND THE TERMINAL BLOCK.

For reliable contact, tighten the terminal screws with the force indicated in the technical characteristics table.

When connecting to Ethernet, use the supplied cable, or a twisted pair cable of cat. 5e with an 8P8C (RJ45) plug.

When fixing the wires, avoid mechanical damage, twisting, or wearing down the insulation of wires.

**Before starting:**

- *Unpack and inspect the product for damage after transportation. If any damage is found, contact the supplier or the manufacturer.*
- *Before connecting to the power supply, keep the product under operating conditions for two hours (in case of possible condensation on the elements).*
- *Carefully study the operating manual. If you have any questions regarding the installation of the product, please contact the manufacturer by telephone number indicated at the end of this Operating Manual.*

Connect OPCB-221B according to Figure 2, in the following order:

- 1) Using a twisted-pair cable of category 1 or higher, connect the terminal block of the RS-485 module to the serial interface bus (or directly to a device with this interface). Note: Contact "A" is for the non-inverted signal (D+), and contact "B" is for the inverted signal (D-).
- 2) If a cable connection to a local area network or the Internet is required, connect the product **ETH** connector to the appropriate router or PC connector using the supplied Ethernet cable or a Cat. 5e cable with 8P8C (RJ45) plug.
- 3) Ensure the memory card is present in the **MEM** slot (installed by the manufacturer).
- 4) Connect the RS-485 module to one of the **EXT1** or **EXT2** (USB Type-A) connectors.
- 5) Connect the power adapter (included) to the **PWR** (DC Plug) connector.
- 6) Optionally: Secure the USB connections with plastic cable ties to avoid accidental disconnection.
- 7) Connect the power adapter to the power supply network (220-240 VAC, 50 Hz).

## OPCB-221B OPERATION

OPCB-221B has a 32-bit processor running a POSIX-compliant OS (Armbian). It routes traffic between the USB extension modules, such as serial RS-485/RS-232 interfaces (MODBUS RTU/ASCII protocols), and Ethernet/ Wi-Fi LAN interfaces (MODBUS TCP protocol), possibly routed further to the Internet.

OPCB-221B has a built-in WEB interface that can be used for configuration.

OPCB-221B can connect to a cloud server for remote monitoring and configuration of the product and connected devices.

OPCB-221B provides a Wi-Fi Access Point (hotspot) to simplify the initial setup. Wi-Fi Access Point can be disabled in the settings.

**OPCB-221B stores the operating system and data on the pre-installed microSD memory card. Removing or replacing the memory card will render the product inoperable.**

### POWER UP AND REBOOT SEQUENCE

After powering up, OPCB-221B loads the operating system and sets up the communication interfaces. This process usually takes up to 1 minute.

With an internet connection provided, OPCB-221B automatically connects to the cloud server if allowed in the settings. By default, unconfigured OPCB-221B creates a Wi-Fi access point with SSID "OPCB\_XXXXXX" (where XXXXXX are the last 6 characters of the device's MAC) and a password specified on the Registration sticker (attached to this manual).

To perform a soft reboot of the OPCB-221B, use the WEB interface by pressing the "Reboot device" button on the "Control" page. This will finish all ongoing operations, store the data, and reboot the product within 1 minute.

To perform a hard reboot, turn off the power by unplugging the product, wait 5 seconds, and then turn the power back on.

### OPERATION VIA HTTP

OPCB-221B provides an HTTP WEB interface and HTTP REST API for WEB applications. OPCB-221B accepts HTTP connections via Ethernet or Wi-Fi interfaces on TCP port 80.

To access the HTTP WEB interface:

1. Connect to the OPCB-221B Wi-Fi access point with a PC or mobile device and open the following URL in the browser: <http://192.168.4.1/>.
2. Alternatively, using any PC or mobile device in the local network, open the IP address of the OPCB-221B in the browser. The OPCB-221B IP address can usually be found by accessing the local network router interface. Additionally, the IP address can be retrieved from OPCB-221B by using the control file (see Appendix F).

The default username for the WEB interface is "admin" with the password specified on the Registration sticker (attached to this manual).

For general information about the WEB interface usage, see Appendix B.

### OPCB-221B OPERATION VIA MODBUS (TCP/RTU/ASCII)

OPCB-221B receives MODBUS TCP requests via Ethernet or Wi-Fi interfaces and transmits them in MODBUS RTU or MODBUS ASCII format over the serial interface. Responses are converted to MODBUS TCP and sent back to the requesting side.

OPCB-221B can also be configured to receive MODBUS RTU or MODBUS ASCII requests via the serial interface and transmit them in MODBUS TCP format to specified IP addresses via Ethernet or Wi-Fi interfaces. In this case, the responses (converted to the request protocol) are sent back to the serial line. See Appendix A for the main principles of OPCB operation.

Connections from a PC or mobile device can be made using any software MODBUS TCP clients.

MODBUS registers of the OPCB-221B are not described in this manual because they are configurable in the WEB interface on the "Connections" page in the section "OPCB Modbus access."

MODBUS routing between the connected devices is configured in the WEB interface on the "Connections" page in the section "Routing."

## OPCB-221B OPERATION USING THE OVERVIS CLOUD SERVER

OPCB-221B can establish connections to the Overvis cloud server using any interface with Internet access. OPCB-221B communicates with the Overvis cloud using an Overvis VPN connection, which provides full encryption of traffic between the device and the Overvis cloud server.

Overvis VPN cloud connection is enabled by default and can be disabled in the settings.

The cloud operation can be configured and managed by creating an account on the Overvis cloud: <https://www.overvis.com/>.

The OPCB-221B set includes an Overvis Cloud registration sticker. Sticker information includes:

- **Model** of the product (OPCB-221B).
  - **MAC** address of the LAN interface.
  - **Private key:** The unique private key of the product for Overvis VPN access, also used as a unique registration code for the Overvis cloud. This key is needed to restore the product license in case of firmware reflashing.
  - **PIN** code: The unique PIN code for quick identification of the product on the Overvis cloud.
  - **Wi-Fi SSID** and **password** for the initial connection to the Wi-Fi Access Point.
  - **Default username** and **password** for WEB interface access.
  - **Quick setup link** (with QR-code) for easy connection to the Overvis cloud.
- Access the link on the sticker and follow the instructions on the Overvis website to set up the product cloud operation and access the OPCB-221B interface through the Overvis cloud.

### FACTORY RESET

A partial factory reset can be performed in one of the following ways:

- **Using a control key USB flash drive:** write an empty file or an empty folder named "RESET\_CONF" to a USB flash drive, then connect it to one of the **EXT1** or **EXT2** slots to reset the settings to the factory defaults. The reset may take up to 30 seconds; the USB flash drive can be disconnected afterward.
- **Through the WEB interface** on the "Control" page.

### FIRMWARE UPDATE

By default, the new version is installed automatically after the product is powered on or within 24 hours of operation. Automatic updates guarantee the backward compatibility of all OPCB-221B functions. Releases without backward compatibility require manual installation.

The currently installed version is displayed in the OPCB-221B WEB interface. The changelog for each version is available here: <https://github.com/overvis/opcb-release/blob/opcb/CHANGELOG.md>

### MANUAL FIRMWARE UPDATE AND FULL FACTORY RESET

A manual update requires a full factory reset by uploading a new firmware image to the SD memory card. All current firmware images can be found on the release page: <https://github.com/overvis/opcb-release/releases>

The full factory reset procedure is described in Appendix D.

## INITIAL SETUP

The product can be configured via the WEB interface. Configuration parameters are stored in a file on the SD memory card.

**Note: Some settings require a soft reboot. Clients may lose the connection and have to reconnect.**

1. After the product is plugged in and operational, access the WEB interface by connecting to the Wi-Fi Access Point or using the local network.

By default, an unconfigured OPCB-221B creates a Wi-Fi access point with SSID "OPCB\_XXXXXX" (where XXXXXX are the last 6 characters of the device's MAC) and a password specified on the Registration sticker (attached to this manual).

Connect to the OPCB-221B Wi-Fi access point with a PC or mobile device and open the following URL in the browser: <http://192.168.4.1/>.



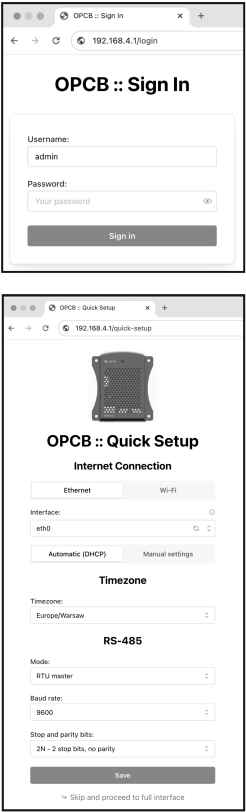
2. Log in to the WEB interface using the default username “admin” and the password specified on the Registration sticker (attached to this manual).

3. After logging in, the quick setup page will be displayed. If the product was configured previously and reconfiguration is needed, the quick setup page can be accessed from the drop-down drawer in the header under the logo.

**ATTENTION! Wireless Internet connection requires disabling the Wi-Fi access point. Before saving the settings, make sure your Internet connection is set up correctly. Otherwise, an incorrect configuration may prevent any communication with the OPCB-221B, which can only be fixed with a factory reset.**

4. After the initial setup, the product will connect to the internet using the specified settings and will be available in the Overvis cloud.

Access the link on the sticker and follow the instructions on the Overvis website to set up the product cloud operation and access the OPCB-221B interface through the Overvis cloud.



## QR-CODES FOR APPENDIXES

Appendix A.  
Principles & Applications



Appendix D.  
Reflashing/Manufacturing



Appendix B.  
Web Interface Overview



Appendix E.  
HTTP API Reference



Appendix C.  
Troubleshooting



Appendix F.  
Control Files Reference



Full online documentation is available at  
<https://docs.overvis.com/#/OPCB/>



## OPERATION CONDITIONS

*The product is intended for operation in the following conditions:*

- Ambient temperature: from minus 10 to +55 °C;
- Atmospheric pressure: from 84 to 106.7 kPa;
- Relative humidity (at temperature of +25 °C): 30 ... 80 %.

**ATTENTION! The product is not intended for operation in the following conditions:**

- Significant vibration and shocks;
- High humidity;
- Aggressive environment with content in the air of acids, alkalis, etc., as well as severe contaminations (grease, oil, dust, etc.).

## SAFETY PRECAUTIONS

To ensure the product's safe operation, it is strictly forbidden to:

- Carry out installation works and maintenance without disconnecting the product from the mains.
- Open and repair the product without professional help.
- Operate the product with mechanical damages to the housing.

During operation and maintenance, the regulatory document requirements must be met, namely:

- Regulations for Operation of Consumer Electrical Installations.
- Safety Rules for Operation of Consumer Electrical Installations.
- Occupational Safety in Operation of Electrical Installations.

**LIQUID INGRESS ON TERMINALS, CONNECTORS AND INTERNAL ELEMENTS OF THE DEVICE IS UNACCEPTABLE.**

## MAINTENANCE

WHEN MAINTAINING, THE PRODUCT AND DEVICES CONNECTED TO IT MUST BE DISCONNECTED FROM THE POWER SUPPLY.

Maintenance of the product should be performed by qualified technicians. Recommended frequency of maintenance is every six months.

Procedure:

- check the reliability of wire connections; tighten if necessary.
- check the reliability of USB connections; fix them with plastic clamps if needed.
- visually inspect the integrity of the housing. In case of damage, take the product out of service and send it for repair.
- if needed, clean the housing of the product with a dry cloth.

*Do not use abrasives or solvents for cleaning.*

## TRANSPORTATION AND STORAGE

The product in its original packaging is permitted to be transported and stored at temperatures ranging from -45 to +60 °C and with relative humidity of no more than 80%. During transportation, the product should be protected from mechanical damage.

### Cloud Registration sticker

*The Company is grateful to you for the information about the quality of the device and suggestions for its operation.*

For all questions, please contact the manufacturer:

NOVATEK-ELECTRO Ltd,  
59, Admiral Lazarev Str.  
Odessa, 65007, Ukraine.

Tel.: +38 (048) 738-00-28,  
Tel./fax: +38 (0482) 34-36-73.  
[www.novatek-electro.com](http://www.novatek-electro.com)

Date of sale \_\_\_\_\_

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