Operation Manual

ICA417 Series
4G IoT Data Transmission Terminal

SHENZHEN INVT ELECTRIC CO., LTD.

No.	Change description	Version	Release date
1	First release.	V1.0	December 2022
2	● Added three function descriptions (antenna gain, power consumption and heat dissipation method) in section 1.2 Product specifications. ● Added product weight data in section 2.3 Outline dimensions and weight. ● Updated all operation descriptions and interface diagrams in chapter 3 Quick startup.	V1.1	September 2024
	● Added the mainstream industrial protocols supported in chapter 1 Product overview. ● Added support for S7, PPI, MC-3E, SLMP, and FINS communication protocols in section 1.2 Product specifications. ● Updated operation steps in section 3.1.2.1 IWOstudio monitoring equipment. ● Updated operation steps in section 3.1.2.2 Monitoring devices via the web portal. ● Updated operation steps in section 3.2 VPN pass-through configuration.	V1.2	June 2025

Contents

Safety precautions

Read the safety precautions to ensure safe operation before operating the IoT data transmission terminal.

- The account and password are the authentication credentials of INVT industrial Internet platform and can be used for device management after login. You shall keep you account and password properly and take sufficient precautions to prevent others from stealing them. If the user name and password are stolen, significant losses may be caused.
- You shall communicate with the field personnel to ensure safety before using the device for remote operation, otherwise significant losses may be caused.
- The IoT SIM card is forced to be machine-card binding, SIM card can only be used in the device which is first powered on and networked. You shall not insert the IoT SIM card into other devices, otherwise the SIM card will be locked.
- This product is an industrial IoT product, we have taken necessary technical means to ensure data security, but there may be hacker invasion and other network security risks that are not under our control or responsibility. If the harm is not caused by the quality defects of our products, we shall not be liable for related losses.

1 Product overview

INVT ICA417 series 4G IoT data transmission terminal is an industrial-grade 4G IoT data transmission terminal. It operates on public carrier networks and provides stable and reliable remote data acquisition, program upload/download, and debugging functions to meet the demands of harsh industrial environments.

The product integrates multi-network access capabilities, including 4G, Ethernet, and Wi-Fi. It provides routing and switching, VPN pass-through, and virtual serial port pass-through functions. Equipped with RS485 and RJ45 dual interfaces, it supports mainstream industrial protocols such as Modbus RTU, Modbus TCP, S7, PPI, MC, and FINS. Through the INVT Industrial Internet Platform, it enables cloud-based device data access, remote monitoring, and intelligent operation and maintenance management.

1.1 Product features

1. Standard set-up for easy operation

- Provides standard RS485 interface for direct connection with serial device to collect data.
- Provides standard RJ45 network ports: LAN port can be directly connected to network devices for data collection. WAN port can be used for networking.
- Intelligent data terminal, able to enter the data transmission state once upon power-on.
- Adopts standard rail installation.
- Powerful industrial Internet platform for easy device management.
- Easy system configuration and maintenance interface.

2. Powerful functions

- Supports remote data monitoring.
- Supports VPN pass-through (only in China), able to remotely upload, download, monitor PLC programs through network ports and VFD remote oscilloscope.
- Supports virtual serial port pass-through, able to remotely upload, download, and monitor PLC programs through serial ports.
- Supports remote upgrade of application programs and policy files.
- Supports 4G routing function to provide network for other devices.
- Supports exchange function.

- Supports multiple network connection methods.
- Supports APN (operator APN information needs to be provided overseas)
- Supports the upload of the data with changes, achieving the traffic saving mechanism.
- Supports 4G base station positioning.
- (Optional) Supports high-precision GNSS satellite positioning for real-time accurate acquisition of the device's geographic location.

1.2 Product specifications

Function	Description
Supported network	● LTE FDD (CN version): Band 1/3/5/8 ● LTE TDD (CN version): Band 34/38/39/40/41 ● LTE FDD (EU version): Band 1/3/5/7/8 ● LTE TDD (EU version): Band 20 ● LTE FDD (LA version): Band 1/2/3/4/5/7/8 ● LTE TDD (LA version): Band 12/17/28/38/40/66 ● WCDMA/HSPA+: Band 1, 8 ● TD-SCDMA: Band 34,39 ● CDMA/EVDO: BC0 ● GSM: 900/1800MHz
Supported interfaces	● 1 RS485 interface ● 3 standard RJ45 interfaces (1 WAN port and 2 LAN ports) ● 1 USB TYPE-C commissioning port ● 1 SMA 4G antenna interface ● 1 spring-loaded SIM card socket (large card)
Wire communication distance (unshielded)	● RS485: 50m ● LAN connection terminal control device: 10m ● WAN: 50m
Indicator	Power indicator, signal indicator, network status indicator, running status indicator
Communication protocol	● Modbus RTU, Modbus TCP, S7, PPI, MC-3E, SLMP, FINS and others mainstream protocols ● MQTT communication protocol ● FTP transfer protocol
Theoretical bandwidth	● LTE FDD Rel.9: 150Mbps DL/50Mbps UL ● LTE TDD Rel.9: 130Mbps DL/30.5Mbps UL ● WCDMA Rel.8: 384 kbps DL/384 kbps UL

Function	Description
	● TD-SCDMA Rel.4: 4.2Mbps DL/2.2Mbps UL ● GPRS: 85.6kbps DL/85.6kbps UL
Antenna gain	2.2dBi
Power supply	DC10–25V
Power consumption	Average power: 70mA@24V, maximum power: 500mA@24V.
Temperature range	-25–+60ºC
Shell	Sheet metal, ingress protection (IP) rating IP20
Mounting method	Rail/Wall mounting
Cooling method	Natural cooling

1.3 Model description

Model name illustration of INVT ICA series data transmission terminal:

Symbol	Field description	Contents
①	Product series abbreviation	ICA: Internet Communication Adapter
②	Wireless communication mode	0: Do not support wireless communication 1: WIFI 2: GPRS 3: 3G 4: 4G 5: 5G
③	Wired communication mode	0: Do not support wired communication 1: Ethernet
④	Local data collection mode	0: RS485 1: Ethernet 2: CAN 3: RS485+Ethernet 4: RS485+CAN 5: Ethernet+CAN

Symbol	Field description	Contents
		6: RS485+Ethernet+CAN 7: RS485+Ethernet+VPN
⑤	SIM card type	0: Plug-in card (Standard, default) 1: Embedded SIM card
⑥	IP rating	0: IP00 (without housing) 1: IP20 (wall-mounted housing) 2: IP20 (rail-mounted housing) 6: IP65 (direct-insert housing)
⑦	Special function	G: With GPS U: With USB flash disk A: Support audio V: Support video H: Cooperative development N: Built-in antenna P: With display screen This bit is omitted for standard configuration since it does not carry additional functions.
⑧	Voltage type	5: 4.5–6V The voltage for standard configuration is 10V–30V, so this bit is omitted for standard configuration.
⑨	International version	CN: China version EU: Europe version LA: Latin America version **Note: This bit is omitted for WIFI products.**

1.4 Port description

Port identifier	Port instruction
24V	Power supply +
GND	Power supply -
485+	485A
485-	485B
TYPE-C	Commissioning port
4G	4G antenna
WAN	WAN port
LAN	LAN port
SIM	SIM card
RESET	Reset key

1.5 Indicator description

Indicator identifier	Description
NET	4G network indicator Flash quickly: Data link established. Flash slowly: No SIM card/Network registration in progress/Network registration failed.
RUN	Run indicator Flash quickly: RS485 communication is normal. Flash slowly: RS485 communication is abnormal. On or off: The system works abnormally.
SIG	Signal indicator On: Signal value CSQ ≥ 17, good signal. Flash slowly: 9 ≤ signal value CSQ < 17, average signal. Off: Signal value CSQ < 9, poor signal.
PWR	Power supply indicator

2 Installation

2.1 Overview

ICA417 series 4G IoT data transmission terminal must be installed properly to achieve the designed function. Generally, the installation must be done under the guidance of our certified and qualified engineers.

Note: The device must be installed with power-off. Remove the rail clip before performing wall mounting.

2.2 Unpacking inspection

Before unpacking, check whether the package is in good condition and its product information is the same as on the order. The packing materials should be well maintained during inspection for future transshipment. If any question, please contact the supplier.

Table 2-1 Product deliverables

Deliverables	Qty	Remarks
4G data transmission terminal	1	/
4G antenna	1	/
Screw	3	Used for wall mounting
PIN port	1	4-pin port

2.3 Outline dimensions and weight

The outline dimensions of the IP20 model are as follows (unit: mm). The net weight of the product is about 260.6g, and the gross weight is about 427.5g.

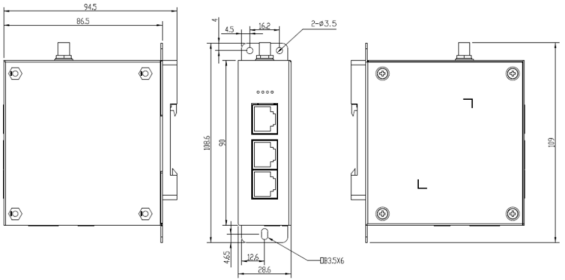


Figure 2-1 Outline dimensions for ICA417

3 Quick startup

3.1 IoT module use instructions

3.1.1 Installation instructions

Equipment required: Networked computer, 4G data transmission terminal, IoT SIM card

Step 1 Take out of the SIM card socket, and insert the SIM card into the card holder.

Step 2 Record the device ID and 6-digit key from the label and add them to the IoT monitoring system.

Step 3 Wire the product based on the port description.

Step 4 Connect the 4G antenna.

Step 5 Power on and start the 4G data transmission terminal.

Step 6 When the NET indicator flashes with an interval of 75ms, the network is ready and the data transmission starts.

Step 7 Go to real-time monitoring interface to review relevant information on the IoT monitoring platform.

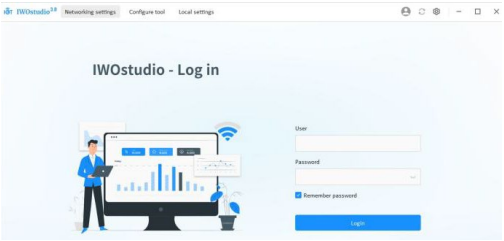
3.1.2 Monitoring platform operation instructions

You can monitor devices using three methods. For information on how to obtain the account and password, refer to section 3.1.3 Monitoring platform account.

- Host controller software: IWOstudio
- Web portal: IWoscene industrial IoT application platform
- Mobile portal: INVT Cloud app

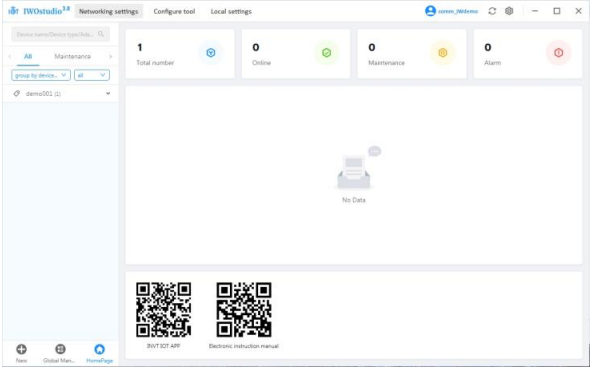
3.1.2.1 Monitoring devices via the IWOstudio

Step 1 Download IWOstudio from the official website (www.invt.com), install, and then open it.

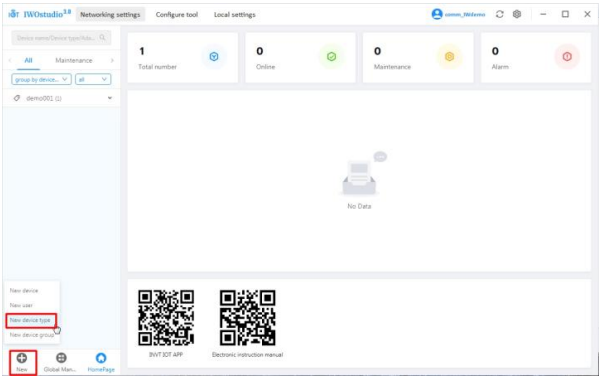


Step 2 Enter the account and password to log in and enter the network configuration interface.

Note: For account information, refer to section 3.1.3 Monitoring platform account.

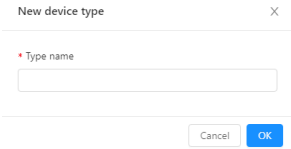


Step 3 If it is your first time using the software, you need to add a device type. Choose **New** > **New device type** at the bottom left corner. If it is not your first time adding a device type, proceed to Step 5.

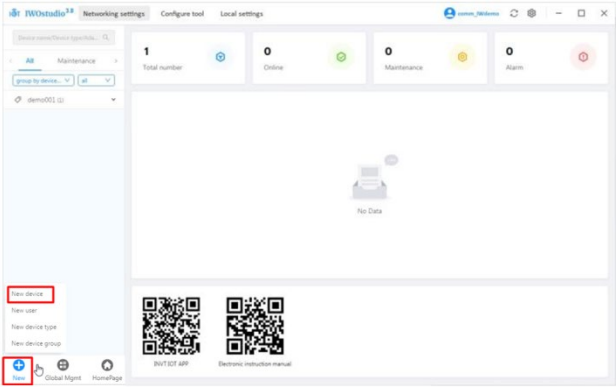


Step 4 Enter the **Type name** of the device, and click **OK**.

If the message **Successfully created** appears, the creation of the device type is complete.

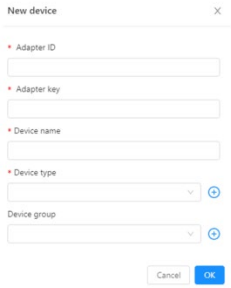


Step 5 Choose **New** > **New device** at the bottom left corner.



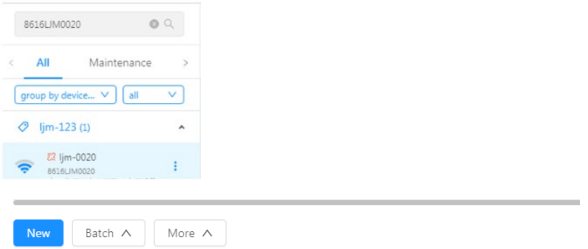
Step 6 Enter **Adapter ID**, **Adapter key**, **Device name**, select **Device type**, and click **OK** to complete the process.

Note: Adapter ID is the S/N code of the IoT terminal, and **Adapter key** is the six-digit number under the QR code next to the S/N code.

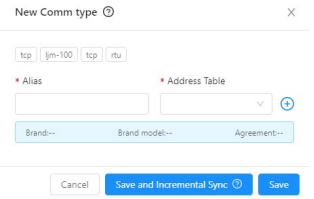


Step 7 Add a communication type.

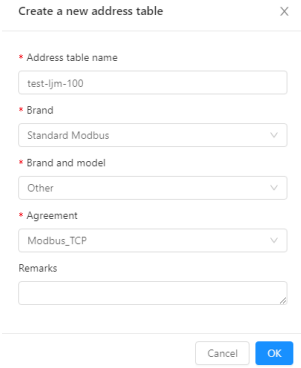
If the device is added for the first time, click the added device, you need to click Communication Type at the top right corner to add the communication type.



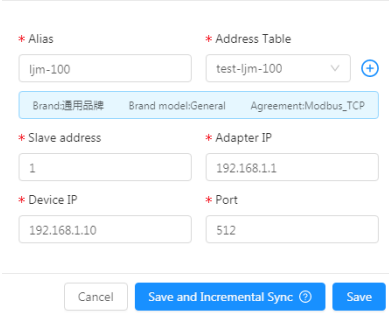
Create a communication type: Enter any alias in **Alias**, and select an **Address Table**. If no address table is available, click **+** next to **Address Table** to create a new one.



Create a new address table: Enter any name in **Address Table Name**, select a brand (such as INVT, Inovance, Siemens, Delta, Xunjie, Mitsubishi, and Omron) from **Brand**, select a model from **Brand and model**, choose the desired protocol from **Agreement**, and click **OK**.



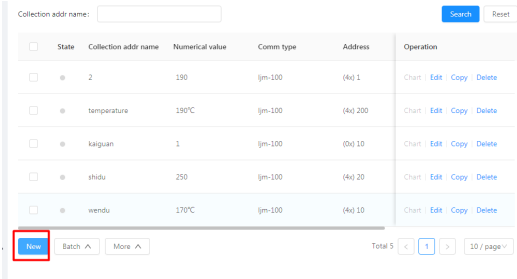
In the page that pops up, set the communication parameters, and click **Save and Incremental Sync**.



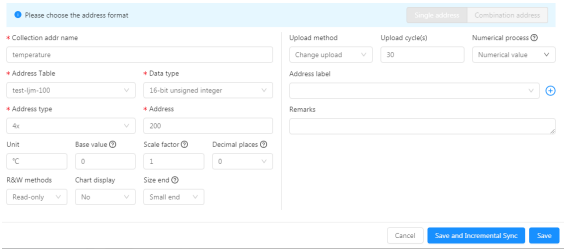
The communication type must be added upon first use. For subsequent use of the same communication type, you can select it directly.

Step 8 Add a connection address.

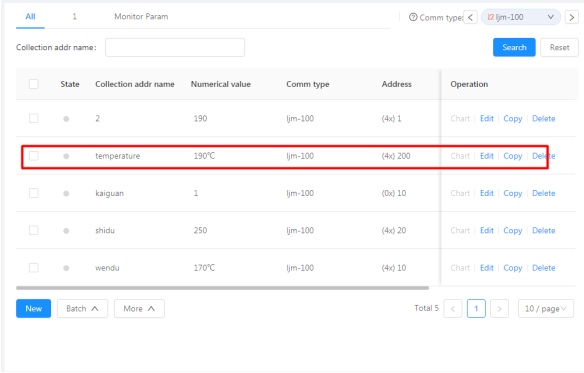
Click the desired device, and click **New**.



Address adding parameters: Fill in **Collection addr name** freely, select the address table you just created from **Address Table**, and select an option from **Data Type**, **Address Type**, and **Address** based on actual needs. Other parameters such as **Unit**, **Base value**, **Scale factor**, and **Decimal places** have default values and can be left unchanged or modified as needed. After completing the setting, click **Save**.

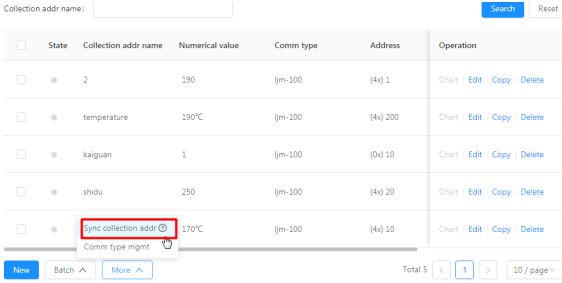


The added address is displayed in the monitoring interface.



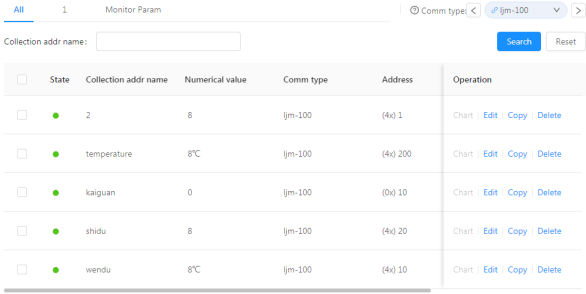
Click **New** to add other collection addresses.

After all the addresses have been added, click **More**, and then click **Sync collection addr** to send all the addresses to the module.



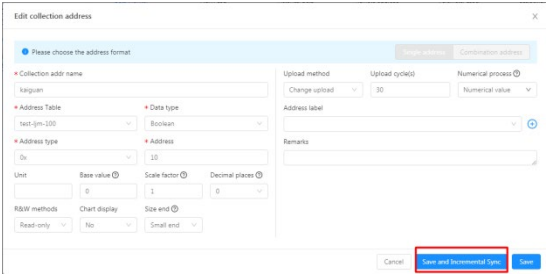
Step 9 Check data monitoring.

After receiving the address configuration, the data transmission terminal collects and uploads the data, which is then displayed on the monitoring interface, as shown in the following figure.



To modify a collection address, select the desired address and click **Edit**. After making the necessary changes, click **Save and Incremental Sync** to complete the modification.

To add a new collection address, click **New**, enter the necessary information for the new address, and then click **Save and Incremental Sync** to complete the addition.



3.1.2.2 Monitoring devices via the web portal

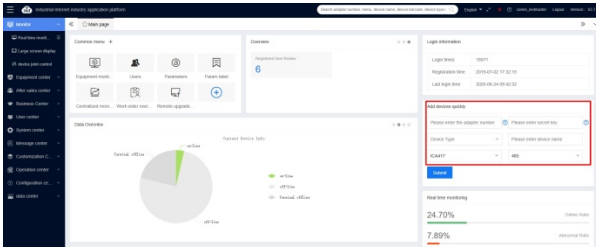
Step 1 Enter: iot.invt.com in the address bar of Google Browser and press **Enter** to visit the login page of the industrial IoT application platform. As shown in the following

figure, enter the account number and password to complete the login.

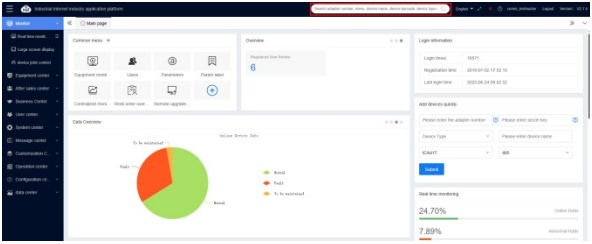
Note: For account information, refer to section 3.1.3 Monitoring platform account.

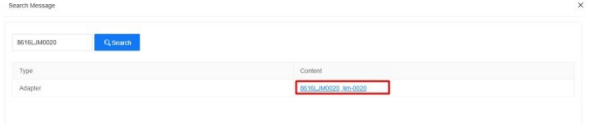
Step 2 After successful login, the homepage appears as shown below. Under **Add devices quickly**, enter the adapter number, secret key and device name; select the device type according to the monitoring type; select **ICA417** as the adapter type; and keep the default communication mode **485**, which can be changed to **LAN** if a network port is used. Then click **Submit** after confirming the input is correct.

Note: If the device has already been added via the IWOstudio or the app, this step can be skipped.

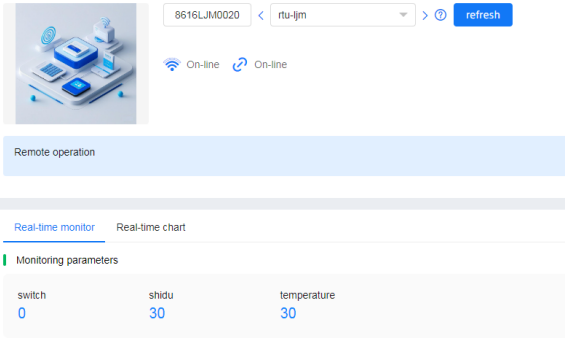


Step 3 Enter the adapter number in the search box on the homepage. Select the desired adapter to view its monitoring state.

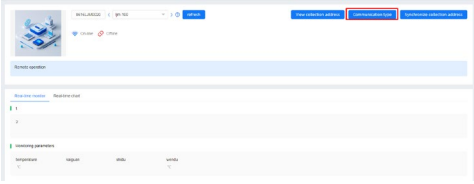




Access the device to view monitoring parameters. If the device's data collection address has already been added via the IWOstudio or the web portal, you can directly view the collected and uploaded data on the monitoring interface.

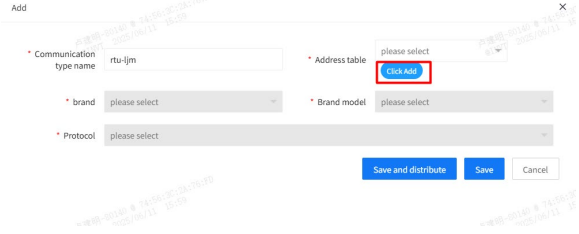


Step 4 If the device is added for the first time, click **Communication type** at the top right corner to add the communication type.



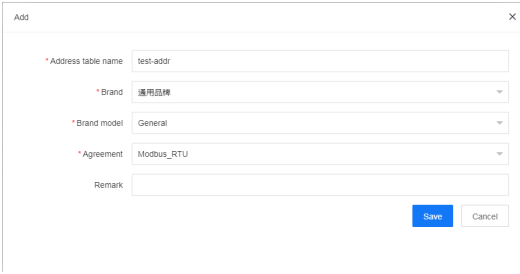
Click **+Add** on the communication type management interface.

Fill in the communication type name, and select the address table. If there is no address table available, click **Click Add** to create a new one.

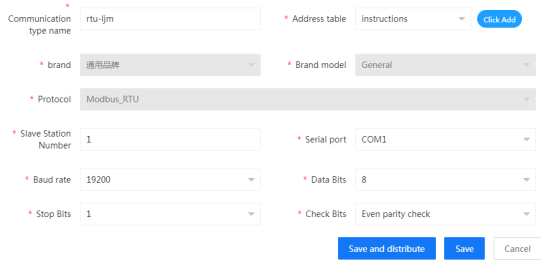


Click **+Add** on the address table management interface.

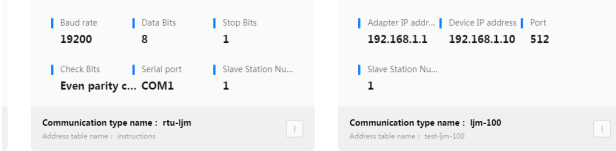
Add address table information based on actual needs, and click **Save**.



Return to the communication type filling interface, select the address table you just added, and set the communication parameters based on actual needs. Then click **Save and distribute**.

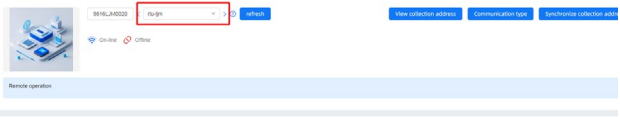


The newly added communication type will appear on the communication type management interface.

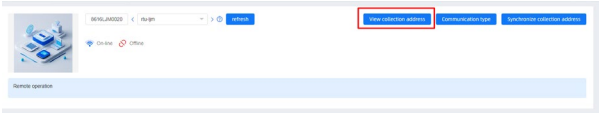


Step 5 Add the data collection address. The collection address needs to be added for the first time.

Go back to the device data monitoring interface, select the communication type you just added from the red drop-down list box shown below, and click **Refresh**. Since no monitoring data is displayed, you need to add the data collection address before monitoring the data.



Click **View collection address**.



Click **+Add** on the collection address management interface.

Fill in add related information. Fill in the name freely, and set the data type and address based on actual needs. If you need to set more parameters, click **More** to configure. After the input, click **Save**.

Repeat the address adding process until all the addresses have been added. Then click Synchronize collection address.

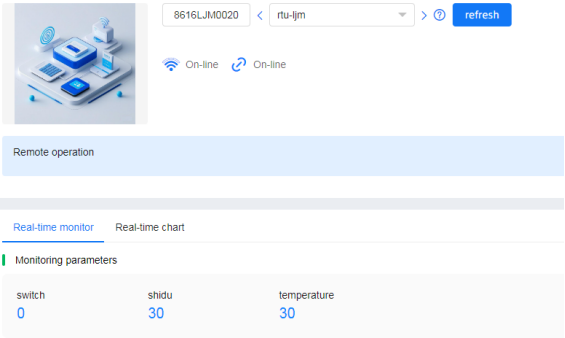
On the collection address synchronization interface, select the target adapter, and click **The agreement is delivered**.

If the distribution is successful, the distribution status becomes succeeded.

The collection address configuration is completed.

Step 6 Check data monitoring.

Go back to the monitoring interface to view the collection address data that has just been configured.



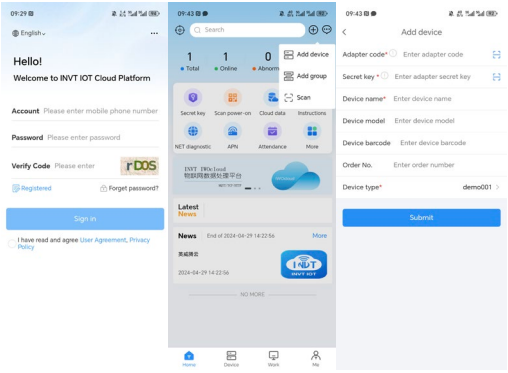
3.1.2.3 Monitoring devices via the app

Step 1 Download and install the INVT Cloud app on your mobile device.

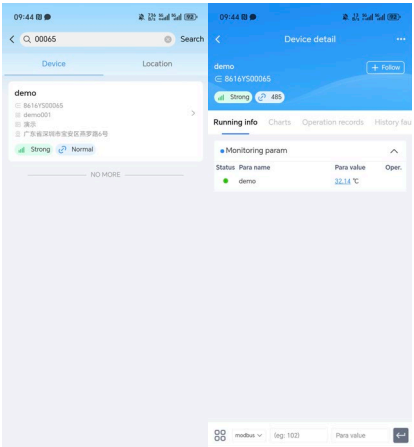
Note: In Android, search the app store or Google Play for INVT to download; in iOS, search the App Store for INVT to download.

Step 2 Open the INVT Cloud app, enter the account and password to log in. On the homepage, tap the **+** icon at the top right corner; enter **Adapter code**, **Secret key** and **Device name**, select **Device type;** and then tap **Submit** to complete the device addition.

Note: For account information, refer to section 3.1.3 Monitoring platform account.



Step 3 Enter the adapter number in the search box. Select the desired adapter to view its monitoring state.



3.1.3 Monitoring platform account

You can register a monitoring platform account through the Web or APP, and the same account and password can be used on all three monitoring platforms.

3.1.3.1 Registration via the web portal

Step 1 Enter iot.invt.com in the address bar of Google Browser and press **Enter** to visit the login page of the industrial IoT application platform.

Step 2 Click **Register**.

Step 3 Fill in the **Company name**, **User name**, **Password**, then confirm the password again. Enter your **Mobile number**, click **Verification code**, fill in the verification code received via SMS, and enter the invitation code. Invitation code: You can obtain it through the higher-level user account. If there is no higher-level one, you can fill in dbf20a (INVT administrator invitation code). Review and check the User Privacy Agreement, click **Register**, and wait for review. You will receive a notification via SMS once approved.

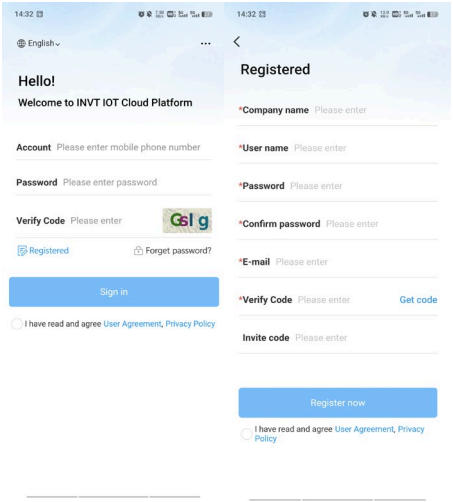
3.1.3.2 Registration via the app

Step 1 Download and install the INVT Cloud app on your mobile device.

Note: In Android, search the app store or Google Play for INVT to download; in iOS, search the App Store for INVT to download.

Step 2 Open the INVT Cloud app, and click **Registered**.

Step 3 Fill in the **Company name**, **User name**, **Password**, then confirm the password again. Enter your **Mobile number**, click **Verification code**, fill in the verification code received via SMS, and enter the invitation code. Invitation code: You can obtain it through the higher-level user account. If there is no higher-level one, you can fill in dbf20a (INVT administrator invitation code), review and check the User Privacy Agreement, click **Register**, and wait for review. You will receive a notification via SMS once approved.

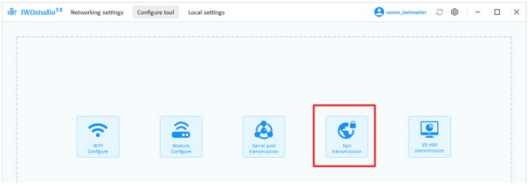


3.2 VPN pass-through configuration

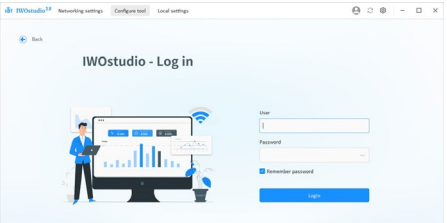
Note: VPN pass-through is only used in China.

Step 1 Open and run the host controller software iWoStudio.

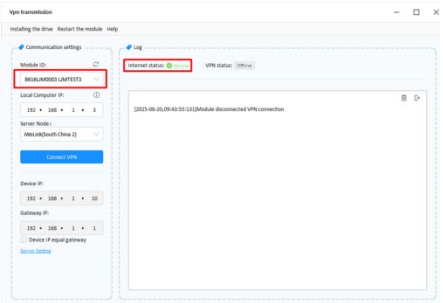
Step 2 Click **Configure tool** in the menu, then click **VPN transmission**.



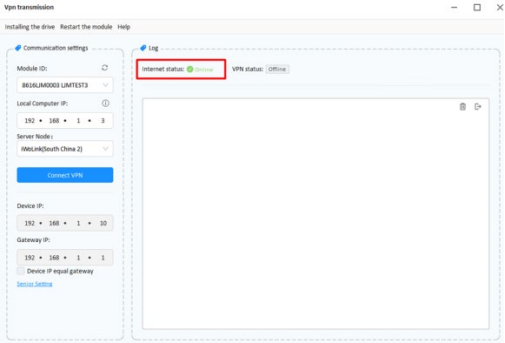
Step 3 Enter the user name and password to log in.



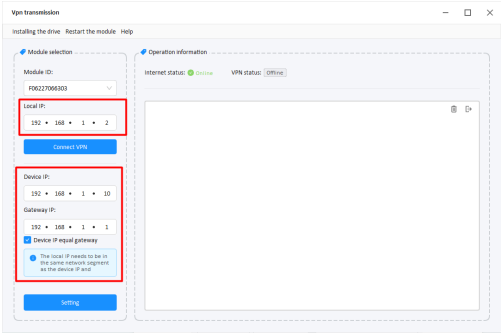
Step 4 Select or search for the module ID of the adapter that requires VPN pass-through.



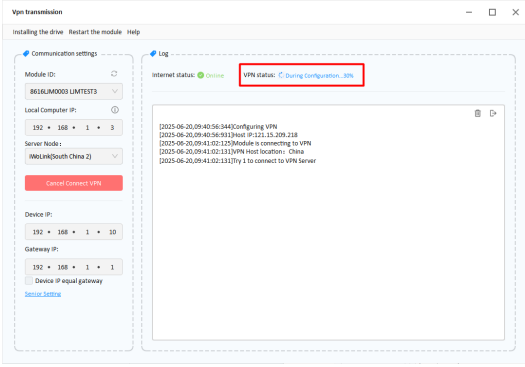
Step 5 After the module ID is selected, the information of the module (including module ID and device VPN online state) will be displayed automatically. If the VPN status is Offline, the current module does not use the VFD pass-through function. If the VPN status is Online, the current module is performing pass-through and cannot be connected.



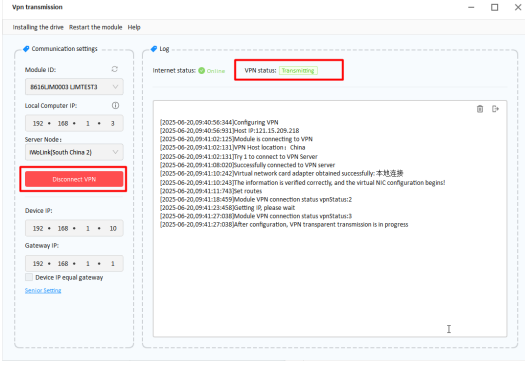
Step 6 Set the local virtual IP. Note that the local IP needs to be in the same network segment with the device IP and module IP of the PLC/VFD but they cannot be the same. **Obtain IP timeout time** is null by default, and you have no need to set it. **Device IP** can be set in the module strategy file, which is consistent with IP of the VFD/PLC.



Step 7 After the settings are complete, click **Connect VPN**. The connection process will take one to two minutes.



Step 8 When **The configuration is complete, and VFD pass-through is performing** is displayed, it indicates that VPN channel is established successfully and VFD pass-through can be conducted. To exit the VPN passthrough, click **Disconnect VPN**.

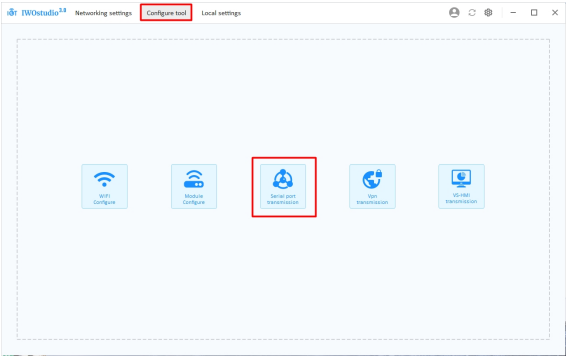


Step 9 Open the VFD/PLC upper computer, and operate the commissioning device as same as the local.

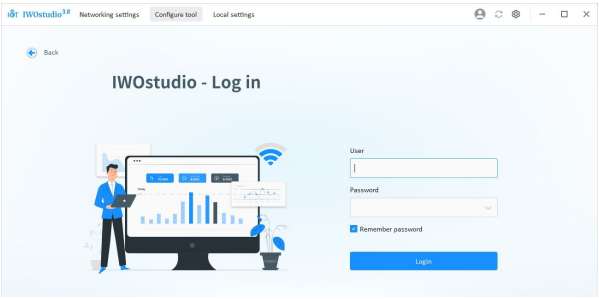
3.3 Virtual serial port pass-through configuration

Step 1 Run the host controller software IWOstudio.

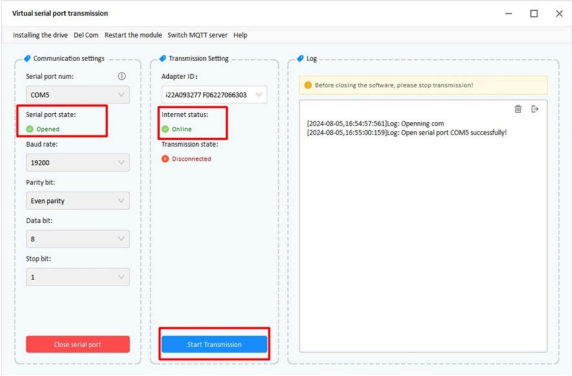
Step 2 Click **Configure tool** in the menu, and click **Serial port transmission**.

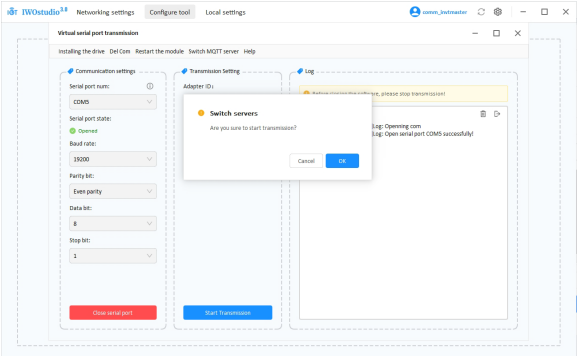


Step 3 Enter the account and password to log in.

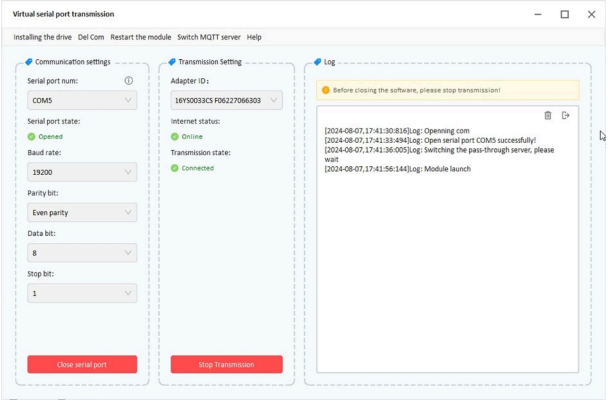


Step 4 After logging in, enter the main interface of the software, and select the ID of the module that needs to be connected to the upgraded PLC. Click **Start Transmission**, click **OK** in the pop-up window, and remember the serial port number at this time.

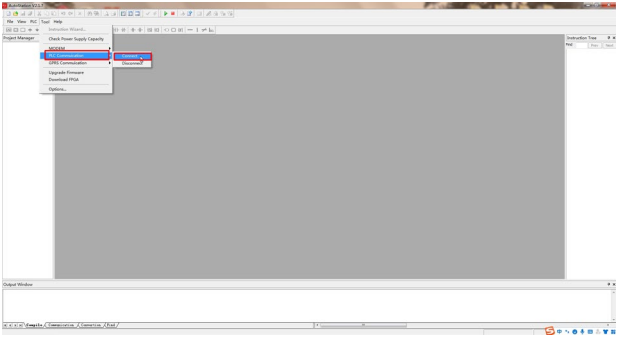




When the message **Transmission status disconnected** changes to **Transmission status connected**, it indicates that the transmission channel has been established and the next operation can be carried out.

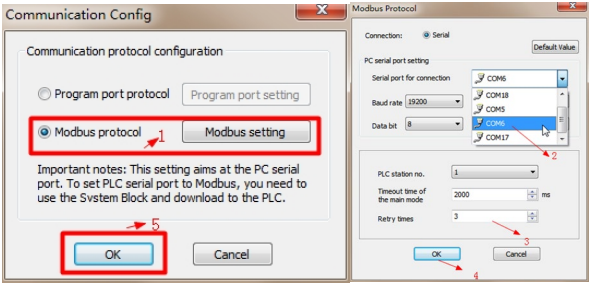


Step 5 Open the PLC host controller software (using Auto Station as an example) to enter the main interface, and choose **Tool** > **PLC Communication** > **Connect**. A communication configuration window pops up.



Step 6 In the **Communication Config** window, choose **Modbus protocol**, and click **Modbus setting**. In the **Modbus Protocol** window that displays, select the serial port number +1 for serial port of connecting the PC to the PLC (for example, if the serial port of the virtual pass-through tool is set to COM5, then the serial port number for connection is set to COM6); set the serial port communication

parameters according to the PLC; and click **OK** to complete the settings.



Step 7 Perform program upload, download, running, stop, and other debugging operations as if you were on site.

3.4 FAQs

1. After powering on, the power indicator does not flash or light up.

Answer: Check whether the power supply voltage polarity is reversed, and whether the input voltage 24V and GND are in consistent with the silkprint on the casing.

2. When 4G network is used, the network status indicator keeps flashing slowly, and the status offline is displayed on the web page.

Answer:

1) The SIM card is not installed properly. Power off and re-install it for a good connection.

2) Move the 4G antenna to a place with good signal.

3) Ensure that the SIM card is activated and has remaining balance.

3. Data uploading doesn't match the web page display.

Answer:

1) Re-power on and upload all data again.

2) Check whether the policy file and device type are matched, if not, please contact the manufacturer.

4. The 4G network indicator and signal indicator flash normally but the web system displays no data.

Answer: Check the communication cable between the Modbus terminal device and IoT

transmission terminal is well connected.

5. In the web system, only data content can be displayed, and commands cannot be issued.

Answer: Check that the signal enabling switch of the Modbus terminal device is turned on.

6. When VPN pass-through is enabled, the device IP displayed by the VPN pass-through tool does not match the actual device IP.

Answer: The device IP displayed by the VPN pass-through tool is MSIP set in the IoT module strategy file. When the device IP displayed by the VPN pass-through tool is inconsistent with the actual device IP, you can modify the MSIP in the strategy file to keep consistent with the actual device IP.

7. Enter the VPN pass-through, and programs cannot be downloaded remotely.

Answer:

1) VPN pass-through is only applicable to devices whose programs are downloaded through network ports. For devices whose programs are downloaded through serial ports, you need to use virtual serial port pass-through.

2) Ensure that the laptop computer has only one networking method. If there are other networks, disable other network cards and disconnect VPN pass-through, then enter VPN pass-through again.

3) Ensure that the actual IP of remote device is in the same network segment with LAN port gateway of the module.

8. Downloading programs remotely through virtual serial port pass-through failed.

Answer: Increase the main mode timeout time when setting the host controller communication. It is recommended to be no less than 8000ms.

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Two companies are commissioned to manufacture: (For product code, refer to the 2nd/3rd place of S/N on the name plate.)

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Industrial Automation: HMI, PLC, VFD, Servo System, Elevator Intelligent Control System, Rail Transit Traction System

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