IoT Controller

UC300 (Cellular)

User Guide

Safety Precautions

Milesight will not shoulder responsibility for any loss or damage resulting from not following the instructions of this operating guide.

❖ The device must not be remodeled in any way.

❖ Do not place the device close to objects with naked flames.

❖ Do not place the device where the temperature is below/above the operating range.

❖ Power off the device when installing or wirings.

❖ Make sure electronic components do not drop out of the enclosure while opening.
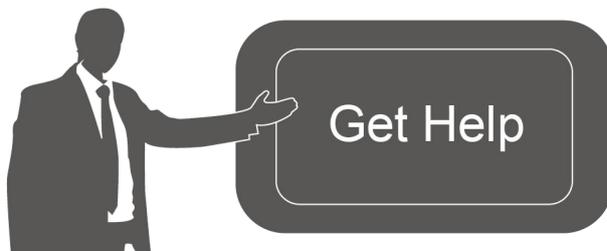
❖ The device must never be subjected to shocks or impacts.

Declaration of Conformity

UC300 is in conformity with the essential requirements and other relevant provisions of the CE, FCC, and RoHS.

Get Help

For assistance, please contact

Milesight technical support:

Email: iot.support@milesight.com

Tel: 86-592-5085280

Fax: 86-592-5023065

Address: Building C09, Software Park III,

Xiamen 361024, China

Revision History

Date	Doc Version	Description
Mar. 17, 2022	V 1.0	Initial version
June 30, 2023	V 1.1	1. Add cellular IMS options; 2. Support to set initial counting values; 3. Support to add variables on custom server message; 4. Add RS485 transparent communication.

# Contents

1. Product Introduction

1.1 Overview

UC300 is an IoT controller used for remote control and data acquisition from multiple sensors. It contains different I/O interfaces such as analog inputs, digital inputs, relay outputs, serial ports and so on, which support remote device data transmission and control via 3G/4G networks or SMS. Besides, UC300 supports multiple trigger conditions and actions which works autonomously even when the network drops.

1.2 Features

- Easy to connect with diverse wired sensors through DI/DO/AI/PT100/RS232/RS485 interfaces
- Support 3G/4G wireless communication
- Multiple triggering conditions and actions
- Embedded watchdog for work stability
- Industrial metal case design with wide operating temperature range
- Support multiple network protocols to be compatible with IoT platforms
- Quick and easy management with Milesight IoT Cloud solution

2. Hardware Introduction

2.1 Packing List
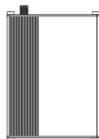
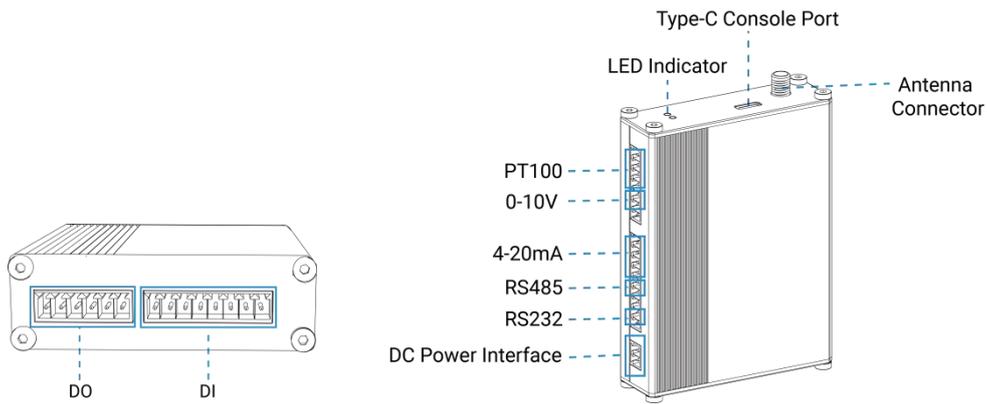| 1 × UC300 Device | 1 × Cellular Antenna | 1 × Power Adapter | 5 × Terminal Blocks |
| 1 × DIN Rail Mounting Clip | 4 × Wall Mounting Kits | 4 × Fixing Screws | 1 × Quick Start Guide |

WARRANTY CARD

1 × Warranty Card

⚠️ **If any of the above items is missing or damaged, please contact your sales representative.**
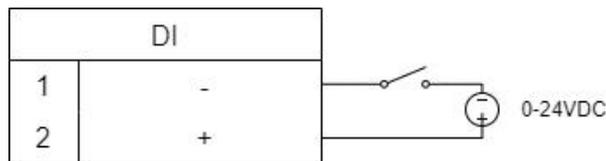
2.2 Hardware Overview

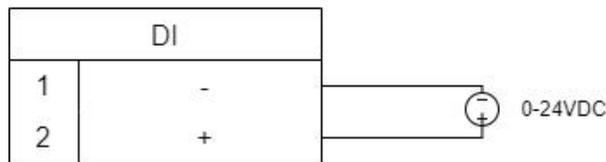

2.3 Wiring Examples

(1) Digital input wiring:
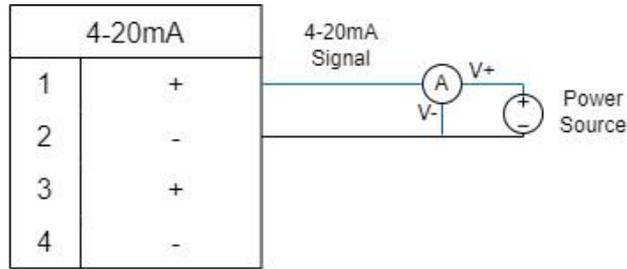
Dry Contact:

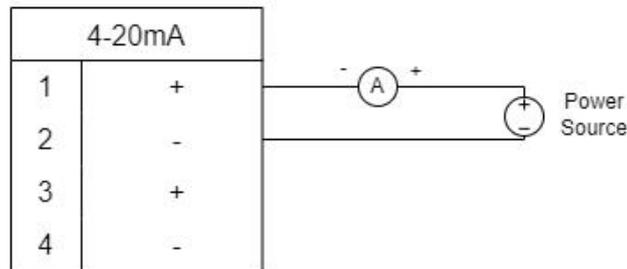Wet Contact:

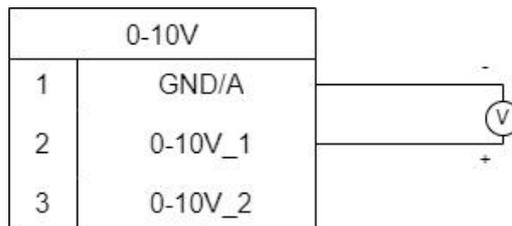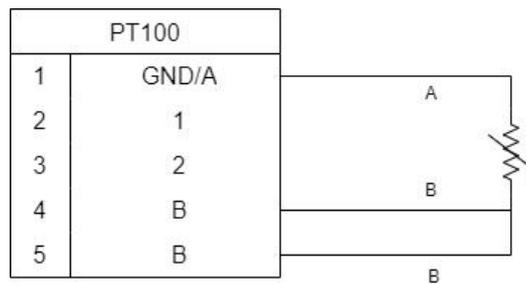### (2) Relay output wiring:
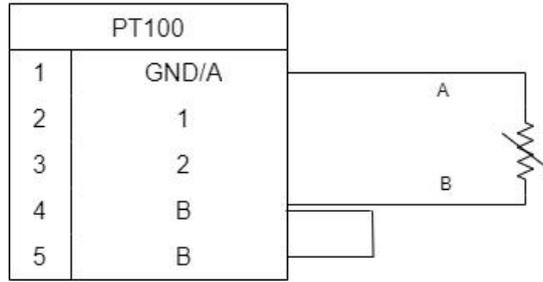
(3) 4-20mA wiring:

3-Wire:

2-Wire:

(4) 0-10V wiring:

(5) PT100 wiring:

3-Wire:

2-Wire:

(6) RS232/RS485 wiring:
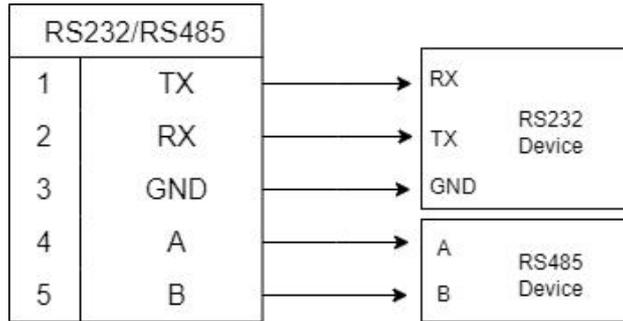
RS485 Terminal Resistor[1]:

DIP Switch	Description
1 on 2 off 3 off	Add 120 Ω resistor between A and B
1 off 2 on 3 off	Add pull-down resistor on B
1 off 2 off 3 on	Add pull-up resistor on A

2.4 LED Indicators

LED	Indication	Status	Description
SYS	System Status	Static On	System works
		Slowly Blinks	Fail to acquire data from data interfaces
		Static On	System error
ACT	Network Status	Off	Register to cellular network
		Blinks as Requests	Send registering network requests
		Blinks Twice→Static On	Succeed to register to network
		Blinks Once	Succeed to send uplinks
		Blinks Twice	Fail to send uplinks
		Blinks Twice	Receive downlinks

2.5 Reset Button

There is a reset button inside the device.

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[1] Add resistors to avoid data-corrupting reflections if RS485 data rate is high or cable length is is long.

Function	Description	
	SYS LED	Action
Reset	Static Green	Press and hold the reset button for more than 10 seconds.
	Static Green → Rapidly Blinking	Release the button and wait.
	Off → Static Green	The device resets to factory default.

2.6 Dimensions (mm)
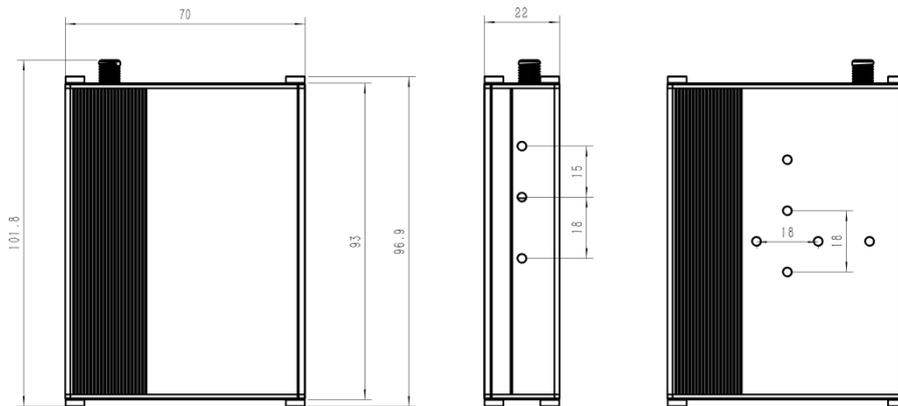
3. Hardware Installation

3.1 SIM Installation

Release the screws and cover on the antenna connector, insert the SIM card into the slot. If you want to take out the SIM card, press it to make it pop out.

3.2 Antenna Installation

Rotate the antenna into the antenna connector accordingly.
The external antenna should be installed vertically always on a site with a good signal.
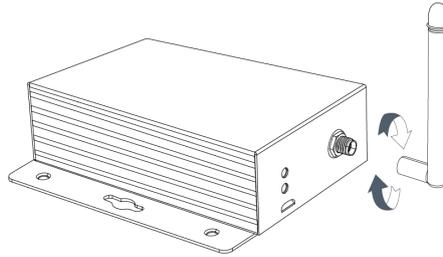
3.3 Device Installation

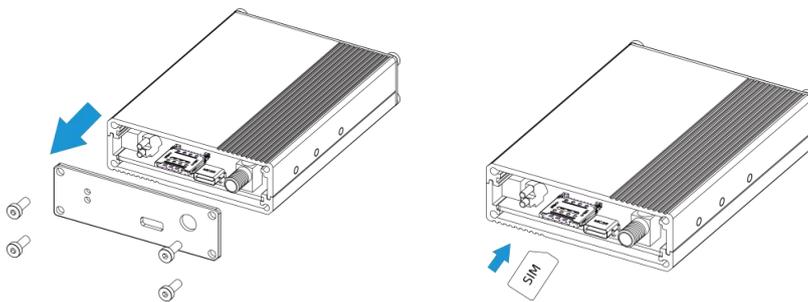UC300 device can be placed on a desktop or mounted to a wall or a DIN rail.

3.3.1 Wall Mounting
1. Fix the wall mounting bracket to the device with 2 screws.
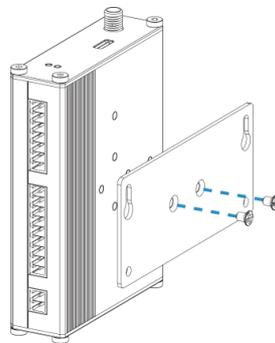
2. Drill 4 holes on the wall according to the bracket, then fix the wall plugs into the wall.
3. Fix the device to the wall plugs with screws. When installation, it's suggested to fix the two screws on the top at first.
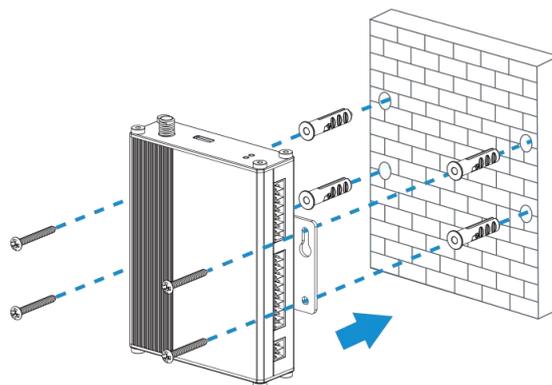
3.3.2 DIN Rail Mounting
1. Fix the mounting clip to the device with 3 screws.
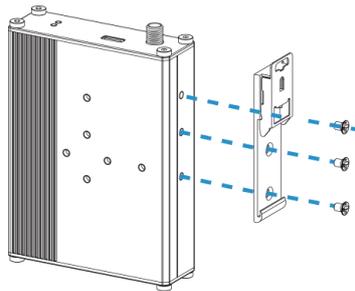
You can also try below installation methods:
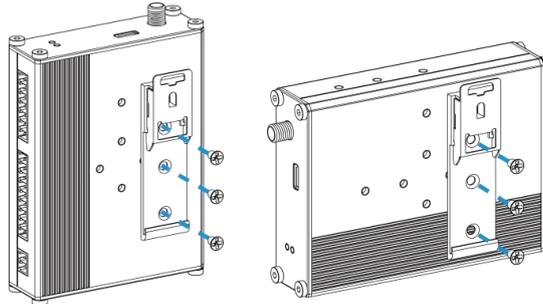
2. Hang the device to the DIN rail. The width of DIN rail is 3.5cm.
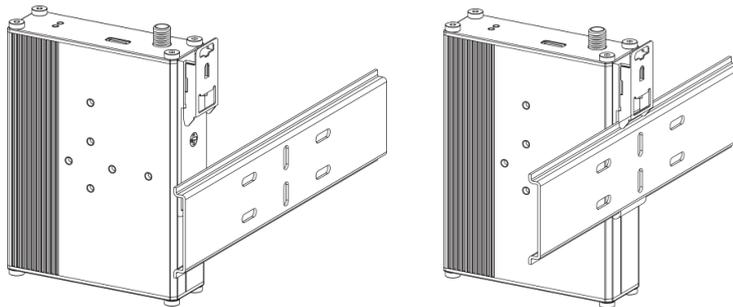
4. Operation Guide

4.1 Log in the ToolBox

1. Download ToolBox software from Milesight IoT website.

2. Power on the UC300 device, then connect it to computer via type-C port.
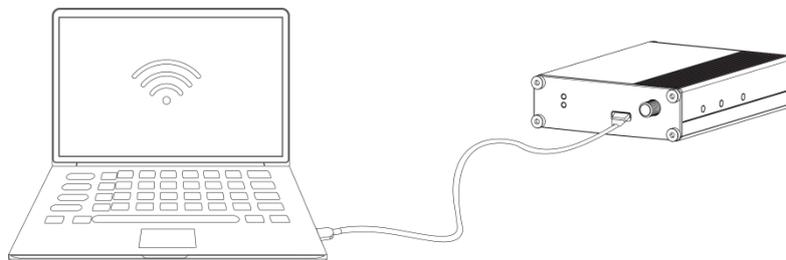
3. Open the ToolBox and select type as **General**, then click password to log in ToolBox. (Default password: **123456**)
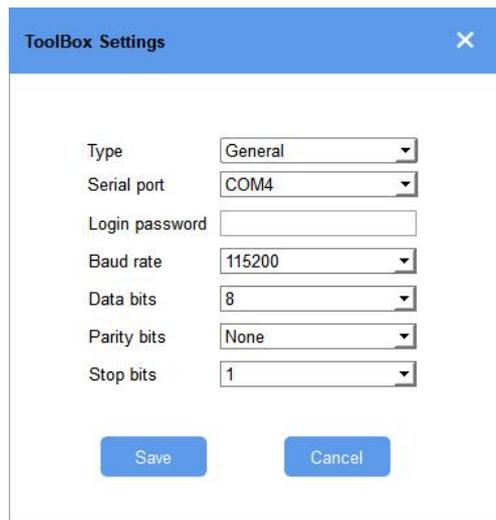
4. After logging in the ToolBox, you can change device settings.

4.2 Communication Settings

4.2.1 Cellular Settings

Cellular settings is used for configuring the transmission parameters in cellular network.

Go to **General > Basic** to configure basic cellular settings.

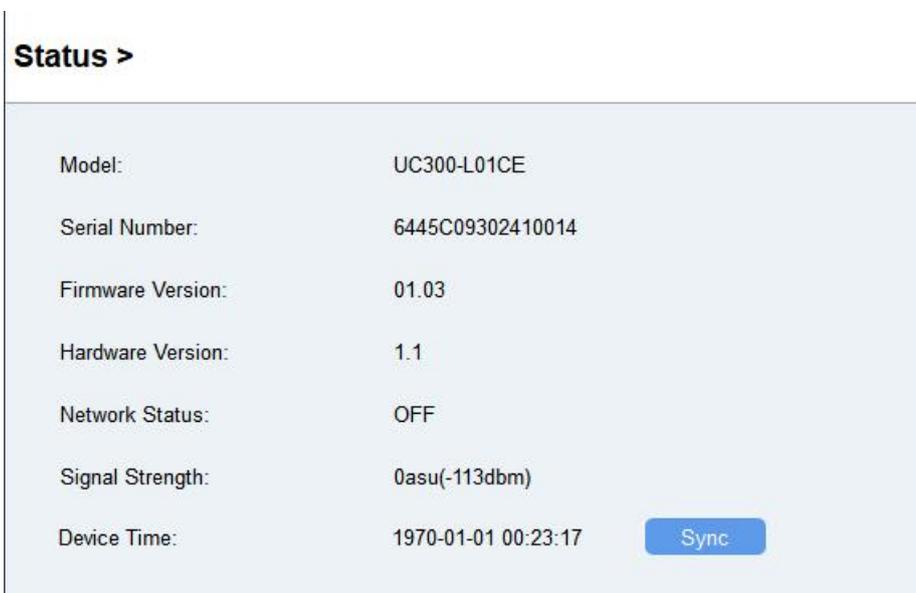| Parameters	Description
Network Type	Select from Auto, 4G Only, 3G Only, and 2G Only. Auto: connect to the network with the strongest signal automatically. 4G Only: connect to 4G network only. And so on.
IMS	"Enable VoLTE", "Disable VoLTE" and "MBN" are optional.
PIN Code	Enter a 4-8 characters PIN code to unlock the SIM.
User	Enter the username for cellular dial-up connection provided by local ISP. The max length is 31 characters.
Password	Enter the password for cellular dial-up connection provided by local ISP. The max length is 31 characters.
APN	Enter the Access Point Name for cellular dial-up connection provided by local ISP. The max length is 31 characters.
SMS Center Number	Enter the local SMS center number for storing, forwarding, converting and delivering SMS message. This is required if you need to use SMS control or reporting feature.
SMS Data Coding Scheme	7 Bit: standard GSM message coding for most common letters and symbols, can contain up to 160 characters. 8 Bit: suit for multimedia messages, can contain up to 140 characters. UCS-2: send Unicode characters and suit for more languages like Chinese, Korean and Arabic, can contain up to 70 characters.
NTP Server	Enter the NTP Server's IP address or domain name. After registered to network, the device will sync the device time from this server. Default:

	www.ntp.org
Change Password	Change the password to loggin ToolBox and SMS password validation.

4.2.2 Application Settings

Go to **Application > Application** to configure the settings to send data to corresponding servers. About the MQTT topics, please refer to the *UC300 Cellular Communication Protocol*.

Parameters	Description
Application Mode	Select from Milesight IoT Cloud, AWS, TCP, UDP, and MQTT.
Reporting Interval (s)	The interval of reporting interface data. Default: 1800s, Range: 10-64800s Note: for Milesight IoT Cloud mode, the reporting interval should be configured on the cloud webpage.
Milesight IoT Cloud	
Keep Alive Interval (s)	After connected, the device will send heartbeat packet regularly to keep alive. Default: 200 s, Range: 1-3600 s
AWS	
Server Address	Fill in the AWS server domain name which the data sends to.
Keep Alive Interval (s)	After connected, the device will send heartbeat packet regularly to keep alive. Default: 200 s, Range: 1-3600 s
CA File	Import the CA.crt file.
Client Certificate	Import the client certificate.
Client Key	Import the client key.

TCP/UDP	
Description	After TCP/UDP connection established, the device will send one package including the description to identify the device. The max length is 32 characters.
Keep Alive Interval (s)	For TCP connection, the device will send heartbeat packet regularly to keep alive. Default: 60 s, Range: 60-7200 s
Custom Heartbeat Mode	After enabled, the device will send custom heartbeat packets to TCP server.
Custom Content	Customize the heartbeat packet content. The max length is 32 characters.
Heart Interval (s)	The device will send custom heartbeat packet regularly. Default: 30 s, Range: 30-3600 s
Require Response	After the device send custom heartbeat packet, it needs a specific response from server.
Response Content	Customize the server reply content after receiving custom heartbeat packets. The max length is 32 characters.
Server Address	Fill in the TCP/UDP server address (IP/domain name).
Server Port	Fill in the TCP/UDP server port. Range: 1-65535. **Note:** The server address and port should not exactly the same as the TCP/UDP settings on **RS232** page.
Status	Show the connection status between the device and the server.
MQTT	
Broker Address	Fill in MQTT broker address to receive data.
Port	Fill in MQTT broker port to receive data.
Client ID	Client ID is the unique identity of the client to the server, it must be unique when all clients are connected to the same server.
Keep Alive Interval (s)	After the client is connected with the server, the client will send heartbeat packet regularly to keep alive. Default: 60 s, Range: 1-65535 s
User Credentials	
Enable	Enable user credentials.
Username	The username used for connecting to MQTT broker.
Password	The password used for connecting to MQTT broker.
TLS	
Enable	Enable the TLS encryption in MQTT communication.
Protocol	It's fixed as TLS v1.2.

CA File	Import the CA.crt file.
Client Certificate	Import the client certificate.
Client Key	Import the client key.

4.2.3 SMS Settings

UC300 cellular version supports SMS control and SMS report. Before that, ensure the device has registered to cellular network and SMS Center Number is typed in **General > Basic** settings. About the SMS control commands and report contents, please refer to the *UC300 Cellular Communication Protocol*.

SMS Control	
Parameters	**Description**
Enable	Enable to allow users to send SMS to control the device.
Control Center Number	The number used to control this device. 2 control numbers can be added at most.
Success Confirmation	After control success, the device will send success reply to the control center number.
Failure Confirmation	After control failure, the device will send failure reply to control center number.

SMS Report	
Parameters	**Description**
Enable	Enable to allow device to report device DI/DO status via SMS.
Any Change Report	When any of DI/DO interfaces' status changed, the device will send the current status via SMS.
Regular Report Interval	Report the time, signal, network type and data interface status/values of device regularly via SMS. Default: 720 mins, Range: 1-1440 mins.
SMS Messaging Protocol	Select the SMS messaging protocol. It's General by default. **General:** send SMS as general string format. **UCP:** send SMS as hex format, you can decode it referring to UC300 Communication Protocol document.
Number	Reports SMS to these phone numbers. 6 numbers can be added at most.

4.3 Data Interface Settings

4.3.1 Digital Input/Pulse Counter

UC300 supports 4 digital inputs and every input can work as either digital input mode to detect high/low level or pulse counter to record counting values. When working as digital input, UC300 will upload the data according to reporting interval or when status changes.

Parameters	Description
Enable	Enable digital input to detect status and upload the data.
Digital Input	
Fetch	Click to get the current input status.
Counter	
Digital Filter	It's recommended to enable when pulse period is greater than 250 us.
Start/Stop	Click to start/stop counting. Note that UC300 will send non-changeable counting values if you do not click **Start**.
Refresh	Refresh to get latest counter values.
Clear	Count the value from 0.
Modify the	Set the initial counting value.

count values	

4.3.2 Digital Output

UC300 supports 2 digital outputs to control the devices.

Parameters	Description
Enable	Enable the digital output to control the device and upload changed status.
When Power is Restored, DO	After the device power is restored, the DO status will return to normally closed or normally open according to this parameter.
Fetch	Click to get the current output status.
Switch	Click to change the DO status.

4.3.3 RS485

UC300 has one RS485 port to support Modbus RTU or transparent device connection.

1. Connect RS485 device to RS485 port.
2. Go to **General > RS485** to enable RS485 and configure serial port settings. Serial port settings should be the same as the RS485 terminal devices.

Parameters	Description
Enable	Allow the device to collect RS485 data and upload the data.
Stop Bit	1 bit/2 bit are available.
Data Bit	8 bit is available.
Parity	None, Odd and Oven are available.
Baud Rate	1200/2400/4800/9600/14400/19200/38400/57600/115200 are available.
Execution Interval (ms)	The execution interval between each Modbus channel command.
Max Resp Time (ms)	The maximum response time that the UC300 waits for the reply to the command. If it does not get a response after the max response time, it is determined that the command has timed out.
Max Retry Time (ms)	Set the maximum retry times after device fails to read data from RS485 terminal devices.
Transparent Communication	If transparent communication is enabled, the device will work as a bridge to transmit messages between server and RS485 terminal devices transparently.
Transparent mode	Select transparent mode when **Transparent Communication** is enabled. **Active Transparent Communication:** the RS485 device can react according to server commands only when the server sends any type of command to it. **Two-way Transparent Communication:** not only can server send any type of command to RS485 device, but also RS485 device supports transmitting the data to the server actively.

Note: When **Two-way Transparent Communication** is enabled, Modbus channels cannot be used, and corresponding IF-THEN command will not work.

3. Click ⊕ to add Modbus channels, then save configurations.

Parameters	Description
Channel ID	Select the channel ID you want to configure from 16 channels.
Name	Customize the name to identify every Modbus channel.
Slave ID	Set Modbus slave ID of terminal device.
Address	The starting address for reading.
Quantity	Set read how many digits from starting address. It can be set as 1~4.
Type	Select data type of Modbus channels.
Byte Order	Set the Modbus data reading order if you configure the type as Input register or holding register. This will affect the uplink order and for details refer to *UC300 Cellular Communication Protocol.* INT32/Float: ABCD, CDBA, BADC, DCBA INT16: AB, BA
Sign	The tick indicates that the value has a plus or minus sign.
Fetch	After click, UC300 will send Modbus read command to test if it can read correct values. **Example:** the device will send command as below settings: 01 03 00 00 00 01 84 0A

4. Click **Fetch** to check if UC300 can read correct data from terminal devices.

Note: Do not click **Fetch** frequently since response time to reply is differ for every terminal device.

4.3.4 RS232

UC300 has one RS232 interface for transparent communication. Usually it will use different tunnels from other data interfaces to communicate with server.

Parameters	Description
Baud Rate	1200/2400/4800/9600/14400/19200/38400/57600/115200 are available.
Data Bit	8 bit is available.
Stop Bit	1 bit/2 bit are available.
Parity	None, Odd and Oven are available.
Packet Length (byte)	When the device receives RS232 data up to this length, it will fragment it as a single packet and send to server.
Serial Frame Interval (ms)	The interval that the device sends out real serial data stored in the buffer area to public network. The range is 10-65535 milliseconds.

	Note: data will be sent out when real serial data size reaches the preset packet size, even though it's within the serial frame interval.
Protocol	TCP or UDP is protocol.
Keep Alive Interval (s)	For TCP connection, the device will send heartbeat packet regularly to keep alive. Default: 60s, Range: 60-7200 s
Reconnect Interval (s)	After connection failure, the device will reconnect to the TCP server after the preset interval. Default:10 s, Range: 10-60 s.
Register String	After TCP/UDP connection established, the device will send the register string to identify the device. The max length is 32 characters.
Server Address	Fill in the TCP or UDP server address (IP/domain name).
Server Port	Fill in the TCP or UDP server port. Range: 1-65535. **Note:** The server address and port should not exactly the same as the TCP/UDP settings on **Application Mode** settings.
Status	Show the connection status between the device and the TCP server.

4.3.5 Analog Input/PT100

UC300 has two 4-20mA analog inputs, two 0-10V analog inputs and two PT100 inputs for analog device connection. After wirings, you can click **Fetch** to check if the value is correct.

PT100 Note:

1) The temperature unit in the reporting package is fixed as °C.

2) Please modify the command IF condition threshold settings if you change the temperature unit.

4.4 IF-THEN Command

UC300 supports configuring locally IF-THEN commands to do some actions automatically even without network connection. One device can be added 16 commands at most.

1. Go to **Command** page, click **Edit** to add commands.

2. Set a IF condition based on the terminal device data or UC300 device status. Users can add at most 2 conditions in one command.

Condition	Description
Time	Set the time condition. The device time will be synced once after joining/registering to network, you can also sync the time manually on **Status** page.
Digital Input	When UC300 device detects the DI as a specific status. **Is continued for:** the DI changed status should last for some time. **Set lockout time:** after the lockout time, UC300 will detect if DI status matches the condition. 0 means this IF condition will only be detected once.
Counter	When pulse counter reaches a specific value. This only works when DI works as counter mode.
Channel/4-20mA/0-10V/PT100	When the value reaches any threshold. **Is continued for:** the analog value should last for some time. **Set lockout time:** after the lockout time, UC300 device will detect if analog value matches the condition. 0 means this IF condition will only be detected once. **Note:** if this Modbus channel quantity is more than 1, this condition will only judge the first value.
Received a server message	When the device receive a specific message from server.
The Device Restarts	When the device restarts.
The signal strength is weak	When cellular signal is lower than 10 asu.

3. Set THEN action according to your request. Users can add at most 3 actions in one command.

Action	Description
Send a server message	Send a custom message to the server. Users can add variables on the message. **Example:** PT100=$T1 The message will replace the "$T1" as real temperature value. Corresponding variable names are shown as below: <table><tr><th>Data Interface</th><th>Variable Name</th></tr><tr><td>DI 1/2/3/4</td><td>$DI1, $DI2, $DI3, $DI4</td></tr><tr><td>Counter 1/2/3/4</td><td>$C1, $C2, $C3, $C4</td></tr><tr><td>DO 1/2</td><td>$DO1, $DO2</td></tr><tr><td>4-20mA 1/2</td><td>$A1, $A2</td></tr><tr><td>0-10V 1/2</td><td>$V1, $V2</td></tr><tr><td>PT100 1/2</td><td>$T1, $T2</td></tr><tr><td>RS485 Channel 1/2...16</td><td>$R01, $R02, $R03, ...$R15, $R16</td></tr></table>
Output Trigger	DO can be set to normally open/normally closed/change status. **Delay Time:** this action will trigger after a specific time; **Duration:** the output status will last for a specific time, 0 means permanent.
Restart the Device	Reboot the device.
Send a device status message via SMS	Send a status message, this should ensure the SMS Report feature is enabled.

4. After setting all commands, click **Save**.

4.5 Maintenance

4.5.1 Upgrade

UC300 supports upgrade locally via ToolBox software.

1. Download firmware from www.milesight.com to your PC.

2. Go to **Maintenance > Upgrade**, click **Browse** to import firmware and upgrade the device.
Note: Any operation on ToolBox is not allowed during upgrading, otherwise the upgrading will be interrupted, or even the device will break down.

4.5.2 Backup

UC300 devices support configuration backup for easy and quick device configuration in bulk.

Backup is allowed only for devices with the same model.

1. Go to **Maintenance > Backup and Reset**, click **Export** to save current configuration as json format backup file.

2. Click **Browse** to select backup file, then click **Import** to import the configurations.

4.5.3 Reset to Factory Default

Please select one of following methods to reset device:

Via Hardware: Open the case of UC300, hold on the reset button for more than 10s until SYS LED blinks.

Via ToolBox Software: Go to **Maintenance > Backup and Reset** to click **Reset**.

5. Device Payload

Please refer to the *UC300 Cellular Communication Protocol*, for decoders of Milesight IoT products please click here.

-END-